MOTT MACDONALD

Anglian Water Revised Draft Water Resource Management Plan 2024 Environmental Report

Sub-Report A: Habitats Regulations Assessment (HRA)

August 2023

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Sub-Report A: Habitats Regulations Assessment (HRA)

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Executive summary

As a water company, Anglian Water has a statutory obligation to produce a Water Resources Management Plan (WRMP) every five years. The WRMP sets out how a sustainable and secure supply of clean drinking water will be provided to its customers over a minimum 25 year planning period whilst showing how its long-term vision for the environment will be achieved. This Habitat Regulations Assessment (HRA) report sits within the suite of environmental assessment documents that accompanies the revised draft Water Resources Management Plan 2024 (rdWRMP24). This assessment process feeds into the plan-making process as part of the Anglian Water's best value planning (BVP) approach.

This report presents the results of the Habitats Regulations Assessment of the rdWRMP24, pursuant to Regulation 63 of the Habitats Regulations. In respect of supply options, Stage 1 screening results are found at Appendix C, and the Stage 2 Appropriate Assessments (AA) for 20 of the options are set out in the body of the report. This report also presents an assessment of the effects on the national site network of the other components of the plan, namely the policy decisions. The primary objective of the HRA is to safeguard the protected features of a Special Area of Conservation (SAC) or Special Protection Areas (SPA), collectively known as Habitats Sites. It is government policy to afford the same level of protection to a candidate Special Area of Conservation (cSAC), potential Special Protection Area (pSPA), a listed or proposed Ramsar site and sites identified, or required, as compensatory measures for adverse effects on the above listed site designations.

The AA assesses the implications these will have on the conservation objectives of Habitats Sites and ultimately as to whether there is an adverse effect on site integrity. Mott MacDonald Limited undertook this AA following the methodology in the UK Water Industry Research Limited's '*Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)'*.

The rdWRMP24 presents significant opportunities to bolster water available to the environment in order to support healthy rivers and watercourses, ensuring the protection and enhancement of our natural habitats. The BVP proposed by Anglian Water includes 50 supply-side, five WINEP, and an Aspirational Demand Management Strategy. In total, 35 options have no likely significant effects (LSE) and were screened out at the screening stage of the HRA process (Appendix C). The remaining 20 options are taken forward to the AA stage of the HRA process, the results of which are presented in this report.

Prior to mitigation, there is reasonable scientific doubt as to the absence of adverse effects on the integrity of Habitats Sites for all 20 options. The robust mitigation measures described in this assessment can avoid and mitigate adverse effects, ensuring the plan's compatibility with the statutory protection afforded to Habitats Sites.

In this report the importance of establishing robust programmes of investigation is recognised, conducting further research, and implementing effective mitigation measures to proactively inform option design. These actions will reinforce the plan's positive effects on biodiversity and environmental well-being. The findings indicate that the successful implementation of the rdWRMP24 and the achievement of its intended positive outcomes are contingent on the diligent and full adherence to the identified mitigation measures developed with consideration to the appropriate guidance such as the Common Standards Monitoring Guidance JNCC.

Assuming that all proposed mitigation measures are implemented it is considered that there will not be a significant change in:

- The extent and distribution of qualifying natural habitats and the habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats or the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The population of qualifying species
- The distribution of qualifying species within Habitats Sites.

As such it is considered that Anglian Water can ascertain beyond reasonable scientific doubt that the proposed rdWRMP24 Best Value Plan will not adversely affect the integrity of any Habitat Site alone or in combination with other plans or projects.

Table of acronyms

Acronym	Meaning
AA	Appropriate Assessment
BAU	Business as usual
BAU+	Business as usual plus
BVP	Best Value Plan
CEMP	Construction and Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
cSAC	Candidate SAC
CTMP	Construction Traffic Management Plan
DMO	Demand Management Option
dWRMP	Draft Water Resource Management Plan
EA	Environment Agency
ECoW	Ecological Clerk of Works
HOF	Hands Off Flow
INNS	Invasive Non-Native Species
IROPI	Imperative Reasons of Overriding Public Interest
LSE	Likely Significant Effect
Ml/d	Mega litres per day
NBMP	National Bat Monitoring Programme
NSN	National Site Network
PPG	Pollution Prevention Guidance
ppt	Parts per thousand
pSPA	Proposed SPA
RBMP	River Basin Management Plan
rdWRMP24	Revised draft Water Resources Management Plan 2024
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SEPA	Scotting Environment Protection Agency
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SR	Strategic Reservoir
SRO	Strategic Resource Option
TIDE Toolbox	Tidal River Development Toolbox
UKWIR	UK Water Industry Research
WeBS	Wetland Bird Survey
WFD	Water Framework Directive
WRMP	Water Resources Management Plan
WRMP24	Water Resources Management Plan 2024
WRPG	Water Resources Planning Guideline
WR	Water Reuse
WRC	Water Recycling Centre
WTW	Water Treatment Works
ZoI	Zone of Influence

1 Introduction

1.1 Water resource management planning

1.1.1.1 Anglian Water is the largest water and wastewater company in England and Wales geographically, covering 20% of the land area.

1.1.1.2 As a water company, Anglian Water has a statutory obligation to produce a Water Resources Management Plan (WRMP) every five years. The WRMP sets out how a sustainable and secure supply of clean drinking water will be provided to its customers over a minimum 25 year planning period, whilst showing how its long-term vision for the environment will be achieved. Wider societal benefits, such as tourism, are also considered and balanced against the plan being affordable to create a 'best value' plan (BVP).

1.1.1.3 In the development of a WRMP, companies in England and Wales must follow the Environment Agency / Ofwat Water Resources Planning Guideline (WRPG)[1], consider broader government policy objectives and adhere to the relevant legislation. Anglian Water's plan-making for rdWRMP24 has undertaken all six environmental assessments that were highlighted in the WRPG. The broad scope of the Strategic Environmental Assessment (SEA) process has been used as a framework to integrate the findings of the other environmental assessments to avoid duplication and inconsistency across the specific requirements of each assessment:

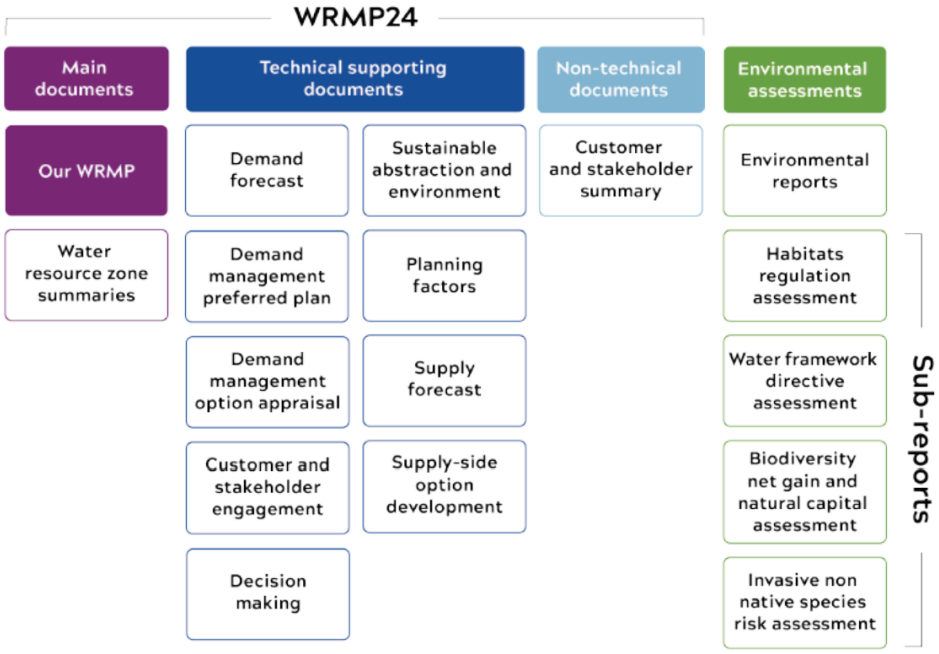
- Habitats Regulations Assessment (HRA)
- Water Framework Directive (WFD) assessment
- Natural Capital Assessment via Ecosystem Services (NCA)
- Biodiversity Net Gain (BNG) assessment (BNGA)
- Invasive Non-Native Species (INNS) risk assessment

1.1.1.4 The development of a WRMP is a complex process involving the analysis of different types of information and data, the application of modelling and decision-making, and interacting, as required, with the six environmental assessments above. To read more about the plan making process, please visit the suite of rdWRMP24 reports for more information on each aspect (Figure 1.1).

1.1.1.5 This HRA report sits within the suite of environmental assessment documents that accompany the rdWRMP24. The assessment process undertaken to generate it feeds into the plan-making process as part of the Anglian Water's BVP approach, discussed below.

[1] Environment Agency, Natural Resources Wales, Office for Water Services (2023). Water resources planning guideline. Available at: https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline

Figure 1.1: The rdWRMP24 reports



Source: Anglian Water

1.2 Anglian Water's rdWRMP24 challenge

1.2.1.1 Anglian Water's geographic area is divided into 28 Water Resource Zones (WRZs) stretching from the Humber estuary north of Grimsby to the Thames estuary and then from Buckinghamshire to Lowestoft on the east coast. It includes the South Humber Bank which is a non-potable WRZ that sits within central Lincolnshire. The Hartlepool area in northeast England is part of Anglian Water's geographic area, however, Hartlepool is not covered further in this report as only demand management options (e.g. smart meters, leakage reduction) are required to maintain its supply demand balance through the WRMP24 period. Assessment of this element of the plan-making process is reported in the rdWRMP24 SEA Environmental Report, namely Chapter 5's policy decisions on demand management portfolio selection.

1.2.1.2 The East of England is one of the driest regions in the UK, with low rainfall (receiving approximately 600mm, only two thirds of the national average rainfall each year,) and high evaporation losses.[2] Water supply is under pressure from multiple challenges. The supply and demand forecast upon which the rdWRMP24 is based must account for all these challenges, including population growth, climate change, sustainability reductions (i.e., licence capping, environmental destination and ambition) and the need to increase resilience of water supplies to severe drought.[3]

1.2.1.3 The WRPG sets out the requirements for developing the rdWRMP24. Some components of the forecasts of supply and demand are not fixed in the guideline and need to be optimised as part of the BVP modelling. There are five key policy decisions that the plan-making process must take, and which influence the rdWRMP24 environmental outcomes (the assessment of which

[2] Anglian Water Official Website (accessed 04.07.22): https://www.anglianwater.co.uk/about-us/media/fast-facts/#:~:text=We%20operate%20in%20the%20driest,grow%20by%20another%20175%2C000%20homes.

[3] Anglian Water Official Website (accessed 04.07.22): https://www.anglianwater.co.uk/about-us/our-strategies-and-plans/water-resources-management-plan/

are presented in the rdWRMP24 SEA Environmental Report, within Chapters 5 and 6). The five key policy areas underpinning the plan are:

1. Level of demand management
2. Licence capping
3. Timing of 1 in 500 year drought resilience
4. Level of environmental destination
5. Level of environmental ambition

The combined effects of the identified challenges (e.g. population growth, climate change) together with the policy decisions adopted under the above headings influence the change in the amount and timing of water available to Anglian Water to deliver secure public water supplies throughout the planning period (2025-2050). The combination of these challenges and decisions (Figure 1.2) indicates that rdWRMP24 must deliver well over 500/d of new demand management and supply-side infrastructure through the planning period in order to deliver the statutorily required supply-demand balance

1.2.1.4 For each policy, Anglian Water is required to substantiate the respective decision(s) made regarding the portfolio/scenario selected and/or the timing of implementation. Further information on this is provided in Chapter 5 of the Environmental Report.

1.2.1.5 To deliver long-term sustainability and environmental resilience, Anglian Water must identify an environmental destination scenario and Environmental Ambition strategy (the timing of delivery for the Destination) within their rdWRMP24 BVP and alternative plans. The combined outcome of these decisions result in reductions to existing Anglian Water public water supply abstractions that will lead to a reduction in deployable output (DO) in the WRMP24 supply forecast and thus affects which supply options are selected, as well as their DO and timing.

1.2.1.6 A detailed description of the suite of environmental destination scenarios is provided in Section 5.2 of the Environmental Report. For the purpose of this document, note that the BVP assumed a Business as Usual 'Plus' (BAU+) scenario. This achieves flows to support Good Ecological Status under the Water Framework Directive, as does Business as Usual (BAU), but goes further by including reductions to existing public water supply abstractions that will act to protect Habitats Sites and the national site network. When fully implemented around 241 Ml/d is expected to be kept within the environment, due to the deployable output reductions.

1.2.1.7 Anglian Water must implement sustainability reductions to their licences known as licence capping. What this means for the rdWRMP24 is that there is a reduction in the maximum amount of water that Anglian Water could abstract from each of its existing public water supply abstraction licences, and a corresponding volume of water that is ensured to be retained within the environment after the new licence cap is introduced. The implementation of the licence capping over the course of the rdWRMP24 is expected to have a significant beneficial effect on a number of receptors, due to the removal of the potential for Anglian Water to abstract beyond recent usage to its current maximum licence cap. This therefore ensures water is retained within the environment (specifically groundwater and river systems) and having a positive effect on hydrologically linked biodiversity sites, water bodies (surface and groundwater) and also introduces an aspect of mitigation of climate change on these sites through the retention of water.

1.2.1.8 The timing of the implementation of the enhancing of Anglian Water's public water supply system to be resilient to a 1 in 500 year drought, is outlined within the rdWRMP24 Decision Making Report technical supporting document. This decision is key to Anglian Water as it helps to understand the time by which certain supply-side options need to be in place to ensure a supply demand balance is maintained when additional water must be retained from day-to-day operational use to enable improved resilience to extreme drought.

1.2.1.9 Negative effects from the resilience to a 1 in 500 year drought are possible, as retention of water for the purpose of drought resilience introduces a need for approximately 60 Ml/d of additional supply infrastructure to meet day to day operational demand options needs - and maintain the WRMP's statutorily required supply demand balance. This however reduces potential stress on Habitats Sites arising from the implementation of emergency permits.

1.2.1.10 Alongside the decisions on environmental destination and licence capping, which restrict the volume of water Anglian Water is able to abstract, is the requirement for Anglian Water to define their Demand Management Strategy (in this case, referred to as “Portfolios”). Thus, within their rdWRMP24 decision making, Anglian Water modelled four demand management portfolios, comprised from complementary elements of leakage reduction, smart metering and water efficiency interventions. Once implemented, demand management options reduce the need for a comparable volume of water to be generated from additional new supply.

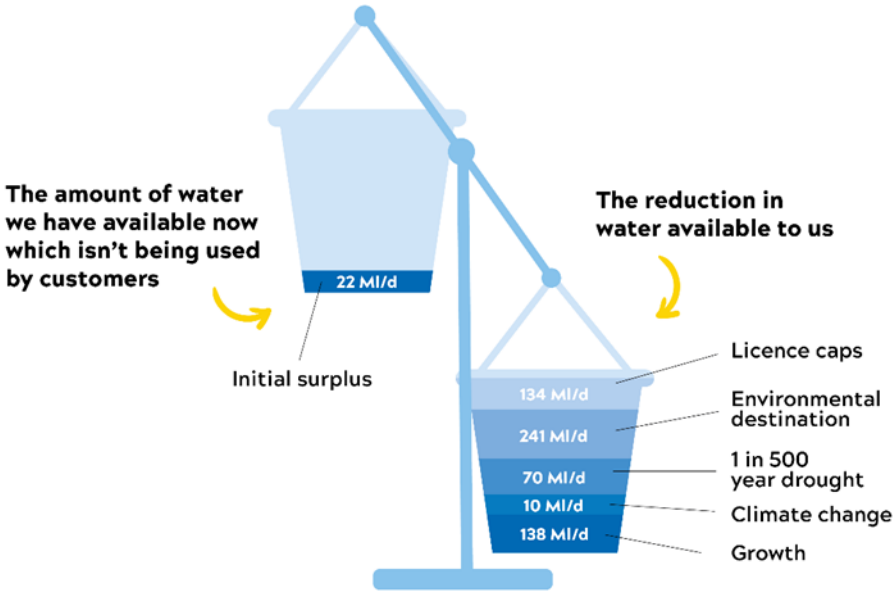
1.2.1.11 The rdWRMP24 includes a series of catchment level options that will be delivered in the first five years of the plan period. These activities are defined by the WINEP and involve actions related to improving rivers that are considered to be negatively affected by water company abstractions and have been identified as having positive effects on Habitats Sites. One scheme has been identified as requiring Stage 2 AA associated with physical modifications. The selection of these options – which are then included in the rdWRMP24 – sit outside the plan-making process and is related to optioneering and cost benefit analysis undertaken within WINEP. The WINEP options included in rdWRMP24 have been subject to HRA.

1.2.1.12 The Aspirational Demand Management Strategy includes three option types: Metering (Smart and Other-- Distribution Loss, Plumbing Loss, Supply-side pipes, Shared supplies monitoring); Water Efficiency (education/communication) and Leakage (Operational-- Company side).

1.2.1.13 Effects from Aspirational Demand Management Option (DMO) include a number of moderate beneficial effects to protected sites, biodiversity, potential indirect benefits for chalk streams of keeping water within the natural environment, water bodies (surface and groundwater) and landscape.

1.2.1.14 While effects on specific Habitats Sites as a result of the policy decisions cannot be identified at this strategic plan level, the overall retention of water in the environment from the policy decisions and demand management strategies is considered to be beneficial to the maintenance of the national site network.

Figure 1.2: The impact of expected challenges for Anglian Water's WRMP24



Source: Anglian Water

1.3 Anglian Water's WRMP24 plan-making

1.3.1.1 Once the supply demand forecast has determined the scale of challenge to be met, the plan-making process identifies how demand management and new supply-side options can deliver a supply and demand balance for all water resource zones at all times throughout the planning period (2025-2050).

1.3.1.2 To begin with, demand management options are implemented. Demand management options reduce the amount of water used by customers or lost in the water network. Examples of demand management options include leakage reduction, smart metering and water efficiency.

1.3.1.3 The objective led approach of the SEA has been used to assess the rdWRMP24 demand management as it is well suited to assessment activities with a broad scale effect. However, the five other environmental assessments require specific geographic location to base the assessment upon. Further information on the assessment of demand management can be found in Chapters 5, 6 and 7 of the Environmental Report.

1.3.1.4 Following the implementation of demand management options, supply-side options are required to resolve the deficit within the planning period. Due to the numerous challenges Anglian Water face in the coming 25 years, especially in terms of sustainability reductions, they are required to deliver a programme of significant new supply infrastructure.

1.3.1.5 Supply-side options produce new, additional water that can be put into the water network to supply customers. The types of supply-side options available to Anglian Water on their constrained list to deliver rdWRMP24 are:

- Aquifer storage and recovery
- Backwash recovery
- Conjunctive use
- Desalination
- Groundwater treatment

- Reservoirs
- Tankering
- Transfers
- Trading
- Water reuse
- Water treatment works

1.3.1.6 The environmental assessments applied to the rdWRMP24 have influenced the components of the constrained list and in some cases, they have contributed to the removal of potential supply-side options (for more information see the rdWRMP24 Supply-side options development technical support document).

1.3.1.7 In addition to the above, the six environmental assessments completed have produced environmental metrics which have formed part of the BVP decision making framework, thus, being used throughout the decision-making process. To read more about the environmental assessment metrics, please visit Chapter 5 of the Environmental Report and the rdWRMP24's Decision Making Report technical supporting document.

1.3.1.8 Whilst option level environmental assessments are essential for producing a constrained list and facilitating decision making, there must also be a focus on the environmental consequences of the WRMP as a whole plan. This is set out in the Environmental Report in Chapters 6-7. In this HRA, the effects arising from policy decisions, which at this plan level cannot be particularised to locally specific Habitats Sites, have been assessed and are considered to be generally beneficial to the national site network as summarised above.

1.3.1.9 It is also important to recognise the strategic plan level of the rdWRMP24 and that, following its adoption, individual supply-side options will be progressed at a project level. This will require detailed design, engagement with key stakeholders, detailed environmental assessments, compliance with environmental laws and policies and gaining any required consents/licences before they could be built and operated.

1.4 The purpose of the Habitats Regulations Assessment

1.4.1.1 This HRA has been undertaken for Anglian Water's Revised Draft Water Resource Management Plan 2024 (rdWRMP24).

1.4.1.2 A Habitats Regulations Assessment (HRA) refers to the several distinct stages of assessment which must be undertaken in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) ('the Habitats Regulations") to determine if a plan or project may affect the protected features of a Habitats Site before deciding whether to undertake, permit or authorise it.

1.4.1.3 All plans and projects which are not directly connected with, or necessary for, the conservation management of a Habitat Site, require consideration of whether the plan or project, in this case the rdWRMP24, is likely to have significant effects on that site. This consideration – typically referred to as the 'Habitats Regulations Assessment screening' – should take into account the potential effects both of the plan itself and in combination with other plans or projects. At this stage, mitigation is not to be taken into account.

1.4.1.4 Where the potential for Likely Significant Effect (LSE) cannot be excluded, a competent authority must make an appropriate assessment of the implications of the plan for that Habitat Site, in view the site's conservation objectives (Regulation 63).

1.4.1.5 The competent authority may agree to the plan only after having ruled out adverse effects on the integrity of the habitats site. Where an adverse effect on the site's integrity cannot be ruled

out, and where there are no alternative solutions, the plan can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured (Regulation 64).

Assumptions and limitations

1.4.1.6 Information provided by third parties, including publicly available information and databases, is considered to be correct at the time of publication. Due to the dynamic nature of the environment, conditions may change in the period between the preparation of this report, and the undertaking of the proposed works.

1.4.1.7 Any uncertainties surrounding, and limitations of, the assessment process are acknowledged and highlighted. Recommendations for avoidance and mitigation measures to address the potential adverse effects on the integrity of the Habitats Sites identified by this report are also based on the information available at the time of the assessment. It is acknowledged that the requirement for mitigation may change as the design of the options is subject to further development.

1.4.1.8 At the plan making stage, the assessment of potential effects and the conclusions drawn are based on the best evidence currently available, exercising professional judgement and applying a precautionary approach. The added safeguard to the Habitats Sites is the requirement under the Habitats Regulations in due course to re-visit each option within the adopted plan, as the detailed project comes forward. The conclusions set out in this plan can be re-tested and considered in the light of further detail and refinement of the individual options.

2 Habitats Regulations Assessment Process

2.1 Habitats Regulations Assessment process

2.1.1.1 The Habitats Regulations establishes a network of protected areas known as the 'national site network' to maintain the favourable conservation status of habitats and species listed in the EU Habitats Directive [92/43/EEC] and the Birds Directive [2004/25/EC].

2.1.1.2 The national site network includes those areas designated under the Habitats Regulations as a Special Area of Conservation (SAC) or Special Protection Areas (SPA), collectively known as 'Habitats Sites.' It is government policy to afford the same level of protection to a candidate Special Area of Conservation (cSAC), potential Special Protection Area (pSPA), a listed or proposed Ramsar site and sites identified, or required, as compensatory measures for adverse effects on the above listed site designations.

2.1.1.3 For plans or projects that are not directly connected with, or necessary for, the conservation management of a Habitat Site there is a requirement under the Habitats Regulations to determine if such a plan or project may have adverse effects on the integrity of a Habitats Site. The process of undertaking this assessment is known as an HRA. The competent authority may agree to the plan or project only after having ruled out adverse effects on the integrity of the Habitats Site

2.1.1.4 The HRA process consists of three main stages, each stage being informed by the one preceding, to ensure an iterative and objective assessment. If the conclusion of the screening stage is that there will be no LSE, there is no requirement to undertake further stages. Similarly, if the AA stage concludes there will be no adverse effect on site integrity, then the assessment with respect to Regulation 63 of the Habitats Regulations is concluded. The HRA stages with respect to Regulation 63 are summarised within Table 2.1.

2.1.1.5 The third stage of the procedure is governed by Regulation 64 of the Habitats Regulations. If the AA stage concludes that there is likely to be an adverse effect on site integrity, it must be demonstrated that there are no alternative solutions to the plan or project, that the plan or project must be carried out for imperative reasons of overriding public interest, and that suitable compensatory measures can be secured to ensure that the overall coherence of the national site network is protected.

2.1.1.6 This report contains results of screening (Stage 1) for all options on the constrained list (Appendix B) and of AA (Stage 2), only options within Plan B were assessed in the AA. No stage 3 assessment needed to be undertaken because, following consideration of mitigation at AA stage, there were considered to be no residual adverse effects on the integrity of Habitat Sites.

Table 2.1: HRA stages under Regulation 63 of the Habitats Regulations

Stage	Description
Screening (Stage 1)	A pre-assessment stage ('screening') to ascertain whether the plan or project is directly connected with, or necessary to, the management of a Habitats Site, and, if this is not the case, then whether it is likely to have a significant effect on the site (either alone or in combination with other plans or projects) in view of the site's conservation objectives. Measures intended to prevent or reduce effects on Habitats Sites (i.e. Mitigation) cannot be considered at this stage of the assessment process.
Appropriate Assessment (Stage 2)	Where LSE cannot be excluded beyond reasonable scientific doubt in screening, the next stage of the procedure involves assessing the impact of the

Stage	Description
	plan or project (either alone or in combination with other plans or projects) against the site's conservation objectives and ascertaining whether it will adversely affect the integrity of the Habitats Site, taking into account any mitigation measures. In light of the findings of the appropriate assessment, it will be for the competent authorities to decide whether or not the plan or project can be approved under Regulation 63.

Source: Based on European Commission, 2021. Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC.

2.1.1.7 This assessment has been undertaken in an iterative and objective manner with reference to best practice guidance and relevant case law (Appendix D) to inform for example the interpretation and therefore correct application of the terms 'likelihood', 'significance', 'adverse effect' and 'in combination'.

2.1.1.8 Mott MacDonald Limited undertook this HRA having due regard to the methodology in the UK Water Industry Research *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15).*[4]

2.2 Screening assessment methodology

Options taken forward to the HRA process

2.2.1.1 As a precursor to the application of the SEA Framework, high-level environmental screening assessments for the constrained list of WRMP24 options were completed in October 2021.

2.2.1.2 Hartlepool was screened out because only demand management options (e.g., smart meters, leakage reduction) are required to maintain its supply demand balance through the WRMP24 period.

2.2.1.3 High-level environmental screening was undertaken to highlight environmental risks and constraints at an early stage in the options development process, in accordance with UKWIR (2021) *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans* (21/WR/02/15). The results were also taken forward into the WRMP SEA, WFD and HRA assessments.

2.2.1.4 Once these options had passed the high-level environmental screening process, they progressed to HRA screening.

Screening

2.2.1.5 Habitats Sites were identified using a distance-based threshold of 10km. This threshold is based on the premise that Natural England's SSSI Impact Risk Zones extend out to a maximum of a 10km radius (excluding bespoke Impact Risk Zones) this was considered a robust threshold which was extended where appropriate when impact pathways were identified. Habitats Sites were assessed where they occur entirely or partly within the 10km threshold or where impact pathways link the option to more distant Habitats Sites, for example, those Habitats Sites that are hydrologically connected via surface or groundwater catchments. For pipeline routes, screening was conducted for the entire route, even if the route sits outside of the Anglian Water's geographic area.

2.2.1.6 Where LSE were identified for an option taken forward to be included in Plan B, that option has been subject to an AA.

[4] UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15), 287p.

2.3 Appropriate Assessment methodology

Approach

2.3.1.1 Where a plan or project cannot rule out LSE upon a Habitats Site, an assessment must be made of the implications of the plan or project, either alone or in combination with other plans or projects, on the integrity of the Habitats Site in view of the Habitat Site's conservation objectives. This takes into account information on the habitats or species for which the site was selected, including but not limited to citations and Ramsar Information Sheets, conservation objective supplementary advice and site improvement plans.

2.3.1.2 If adverse effects on the site's integrity have been identified during the AA, or these cannot be ruled out, consideration is then given to introducing mitigation measures that will avoid or reduce these effects to a level where they will no longer adversely affect the integrity of the Habitats Site.

2.3.1.3 The approach in this assessment is to minimise the additional assumptions that have to be made, which, in practice, means relying on existing data, evidence and decisions. The assessment aims to reasonably predict the effects of the plan in a way that allows the assessment to inform the development of the plan options. It is considered that a reasonable assessment can be performed if:

- Effect pathways can be identified and it is possible to determine which Habitats Sites are likely to be affected and how.
- The magnitude of those effects can be estimated using existing information about the distribution, abundance and conservation status of those features and the nature of the option envisaged within the plan.
- The effects thus quantified can be related to the conservation objectives of the Habitats Site and a proportionate and precautionary conclusion can be formed, with reasonable certainty, about whether an adverse effect on site integrity can be excluded or not.

2.3.1.4 Based on UKWIR (2021) guidance and given the nature of the selected options, the effects considered in this assessment are summarised in Table 2.2. Proposed zones of influence (ZoI) are also provided following the same guidance to determine if, where a pathway has been identified, the effect may adversely affect the habitats or species for which the Habitats Site(s) are designated.

Table 2.2: Potential impacts associated with plan options

Impacts	Scenarios where impacts may lead to significant effects
Physical loss Destruction	**Construction activities leading to the conversion of natural or semi-natural habitats to man-made surfaces.** Physical loss may result in significant effects where the option is located within the boundary of the Habitats Site, within functionally linked land or where natural processes link the option to the Habitats Site, such as through hydrological connectivity and coastal processes.
Physical damage Habitat degradation Erosion Smothering Trampling/Compaction Fragmentation Severance/barrier effects Edge effects	**Construction or operational activities leading to permanent or temporary damage.** Physical damage may result in significant effects where the option is located within or directly adjacent to the boundary of the Habitats Site, within functionally linked land or where natural processes link the option to the Habitats Site, such as through hydrological connectivity and coastal processes.

Impacts	Scenarios where impacts may lead to significant effects
Non-physical disturbance Noise Visual presence Light pollution	**Temporary elevation in baseline noise levels from construction or operational activities.** Taking into consideration the noise level generated from general building activity [c. 122Db(A)] and considering the lowest noise level identified in guidance as likely to cause disturbance to waterbird species (although this guidance is designed primarily for estuarine birds it was considered appropriate to use for this plan), it is concluded that noise effects may be significant up to 1km from the boundary of a Habitats Site, subject to the context, level and frequency of the noise.. **Presence of construction or operational plant and personnel** Disturbance may be significant where the option is within 500m of a Habitats Site or functionally linked land depending on the nature and level of disturbance. **Use of artificial lighting during construction or operation** The effects of light pollution**,** e.g., from security lighting around a pumping station, may be significant where the option is within 500m of a Habitats Site or functionally linked land.
Water table/availability Drying Flooding/storm water Changes to surface water levels and flows Changes to groundwater level and flows	**Change to water levels and flows due to water abstraction, storage, discharges and interception**. Changes in water table/availability may result in significant effects where the option is located within the same ground or surface water catchment as the Habitats Site. However, the effects of changes such as reductions in wetted width of rivers from abstraction or reduced compensation flow are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up or downstream from that site.
Toxic contamination Water pollution Soil contamination Air pollution	**Reduced dilution in downstream or receiving water bodies due to construction or changes in abstraction or reduced compensation flow releases to river systems.** Toxic contamination may result in significant effects where the option is located in the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up or downstream from that site. **Air emissions associated with plant and vehicular traffic during construction and operation.** Toxic contamination may result in significant effects where the option is within or adjacent to the boundary of a Habitats Site. Effects of road traffic emissions from transport routes only have the potential to be significant where the Habitats Site falls within 200 metres of the edge of a road affected. This is considered a robust threshold as Natural England are currently revising the distance criteria for use in assessments. Reference should be made to *JNCC Report 66 Guidance on Decision Making Thresholds for Air Pollution.*
Non-toxic contamination Nutrient enrichment (e.g., of soils and water) Algal blooms Changes in turbidity Changes in sedimentation/silting	**Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, discharges, storage, or reduced compensation flow releases to river systems.** Non-toxic contamination may result in significant effects where the option extent is located within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up or downstream from that site.
Biological Disturbances Direct mortality Introduction of invasive non-native species Introduction of disease	**Killing or injury due to construction or operational activity.** The risk of killing or injuring a species that is the reason for the designation of a Habitats Site may be significant where the option is located in or is directly adjacent to the Habitats Site or functionally linked land. **Creation of new pathway for spread of non-native invasive species and disease.** The risk of spreading non-native invasive species and disease may be significant where the option is located in the Habitats Site or an upstream tributary of the Habitats Site, or where the option includes an inter-catchment water transfer.

Adapted from: UK Water Industry Research (2021)[5].

2.3.1.5 To meaningfully inform the mitigation proposals for options within the plan, this assessment must be able to indicate how the effects can be avoided or mitigated through specific changes to the nature, scale, timing and location of development.

2.3.1.6 Where the plan recommends changes to the nature, scale, timing and location of development and the other measures, it is assumed that the design and implementation of the option at the project level will have regard to the conservation objectives of the Habitats Site in question which will be a requirement of any future consenting process. In particular, consideration will be given to the 'desired state' for the attributes (ecological characters) potentially affected, which if safeguarded, will enable achievement of the conservation objectives.

2.3.1.7 This assessment has been undertaken having had due regard to the following guidance, legislation and caselaw summarised in (Appendix D).

- Appropriate Assessment. Guidance on the use of Habitats Regulations Assessment.[6]
- Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans[7]
- Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC[8]
- Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC [9]

2.3.1.8 For each option a review was conducted of Natural England's SSSI Impact Risk Zones, including those relevant to 'Pipelines and underground cables, pylons and overhead cables' and all planning application ('All Consult'). The full dataset (May 2023) was obtained from Natural England to enable identification of individual zones and their associated Habitats Sites. In undertaking this review, functionally linked land was identified and factored into the assessment, and the risk of significant effects could be ruled out where it was clear there the option was not within a risk zone associated with a Habitats Site.

2.3.1.9 Functionally linked land refers to the role or 'function' that land (or sea) beyond the boundary of a Habitats Site might fulfil in terms of ecologically supporting the populations for which the site was designated or classified.[10] Whilst it is not possible at the plan level assessment to undertake species presence/absence surveys over multiple years in order to define precisely what land within a option's zone of influence is functionally linked to a Habitats Site, reliance can be placed on existing information. In this case functionally linked land or sea is considered to fall within the distance based SSSI Impact Risk Zone or the bespoke zones defined by Natural

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[5] UK Water Industry Research (UKWIR, 2021). *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15).*

[6] UK Government (2019). Guidance on the use of HRA [online] available at: https://www.gov.uk/guidance/appropriate-assessment (last accessed August 2023).

[7] UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15), 287p.

[8] European Commission (2021). Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC [online] available at: https://ec.europa.eu/environment/nature/natura2000/management/pdf/methodological-guidance_2021-10/EN.pdf (last accessed August 2023).

[9] European Commission (2018). Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE [online] available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/EN_art_6_guide_jun_2019.pdf (last accessed August 2023).

[10] Chapman, C. & Tyldesley, D. 2016. Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects - a review of authoritative decisions. Natural England Commissioned Reports, Number207.

England, e.g., 'Goose and Swan Functional Land' and 'Humber Estuary Lamprey Migration Routes'. This is considered to be a suitably precautionary approach.

2.3.1.10 The assessment has taken a worst-case scenario approach for each option, assuming that all the habitats and species for which a Habitats Site is designated are likely to be present in the ZoI of construction and operation. In some cases where it has been possible on the basis of existing information(e.g. habitat distribution mapping on Magic.gov.uk and information contained within Natural England and JNCC site designation documentation) to exclude some habitats or species because their distribution in the Habitats Site falls outside the expected ZoI, this has been stated in the assessment of the option.

2.3.1.11 In considering the predicted impacts and assessing the potential effects we have, in line with guidance and case law given the most weight to the formal conservation objectives which are clearly set out for each designation under the relevant project AA.

Consultation

2.3.1.12 Stakeholder consultation is summarised in the rdWRMP24 Customer and Stakeholder Summary document. It should be noted for the purposes of this AA that Natural England has been engaged with during the development of the rdWRMP24 in: March to April 2021, June 2021, May 2022 (twice), July 2022, August 2022, December 2022, February 2023, April 2023, May 2023, June 2023, and August 2023.

2.4 Overview of Options

2.4.1.1 All options on Anglian Water's constrained list underwent screening and this informed the selection of the rdWRMP24, however, only those included in the BVP (Plan B) have been taken forward to AA and these are discussed within this report. The findings of the screening assessment are presented in Appendix C. Table 2.3 outlines which options have been considered as part of Plan B and which of these options were screened in or out for further assessment. The following Chapters (Chapter 3 – 21) report the findings of the AA.

Table 2.3: Plan B Options

Option ID	Description overview	Screened into AA
CAM4	Ruthamford South to Cambridge Water potable transfer (50 Ml/d)	Yes
LNC25	Lincolnshire East to Lincolnshire Central potable transfer (29 Ml/d)	Yes
EXC3	Essex South to Essex Central potable transfer (10Ml/d)	No
EXC7	Backwash water recovery, Essex South WTW (0.3Ml/d)	No
FND26	Backwash water recovery, Fenland WTW (0.2Ml/d)	No
FND22	Marham Abstraction (7.9Ml/d up to 2039, 12.3Ml/d after 2039)	Yes
LNC30	Lincolnshire Central WTW Upgrade (3.2Ml/d)	No
LNE11	Lincolnshire East Groundwater (7.5Ml/d)	Yes
LNE12	Lincolnshire East Surface Water (13Ml/d before 2039, 7.3Ml/d after 2039)	No
LNN3	Lincolnshire Retford and Gainsborough WTW Upgrade (0.72Ml/d)	No
NAY1	Norwich and the Broads to Aylsham potable transfer (3 Ml/d)	Yes
NBR6	Fenland to Norfolk Bradenham potable transfer (50 Ml/d)	Yes
NEH3	Suffolk Thetford to Norfolk East Harling potable transfer (5 Ml/d)	Yes
NHL4	Norfolk East Harling to Norfolk Harleston potable transfer (5 Ml/d)	No

NTB10	Norfolk Bradenham to Norwich and the Broads potable transfer (20 Ml/d)	Yes
RTS16	Ruthamford South Drought permit (2.07Ml/d)	No
RTS21	Ruthamford South surface water enhancement (9.5Ml/d up to 2040, 6Ml/d after 2040)	No
SUE23	Suffolk East WTW Upgrade (1.7Ml/d)	No
SUE24	Suffolk Sudbury to East Suffolk potable transfer (10 Ml/d)	No
SUT6	Backwash water recovery, Suffolk East WTW (0.05Ml/d)	No
SWC8	Cambridge to Suffolk West Cambs potable transfer (50Ml/d)	No
SWC13	Suffolk West & Cambs groundwater relocation (2.6Ml/d)	No
EXS7	Backwash water recovery, Essex South WTW (0.3Ml/d)	No
NBR9	Fenland to Norfolk Bradenham potable transfer (50 Ml/d)	No
NNC5	North Norfolk Coast WTW backwash water recovery (0.18Ml/d)	No
NNC6	North Norfolk Coast WTW backwash water recovery (0.2Ml/d)	No
LNE3	Backwash water recovery, Lincolnshire East WTW (1.3Ml/d)	No
NAY4	Backwash water recovery, Norfolk Aylsham WTW (0.75Ml/d)	No
NED3	Backwash water recovery, Norfolk East Dereham WTW (0.1Ml/d)	No
NHL7	Backwash water recovery, Norfolk Harleston WTW (0.2Ml/d)	No
NAY5	Backwash water recovery, Norfolk Aylsham WTW (0.1Ml/d)	No
EXS19	Colchester Reuse direct to Ardleigh Reservoir (no additional treatment) (11.4Ml/d up to 2039, 13.9Ml/d after 2039)	Yes
SUT5	Norfolk Bradenham to Suffolk Thetford potable transfer (15 Ml/d)	Yes
SUE25	Backwash water recovery, Suffolk East WTW (0.17Ml/d)	No
LNN1	Lincolnshire Central to Lincolnshire Retford and Gainsborough potable transfer (3Ml/d)	No
NED2	Norfolk Bradenham to Norfolk East Dereham potable transfer (10 Ml/d)	Yes
NNC4	Norfolk East Dereham to North Norfolk Coast potable transfer (10 Ml/d)	Yes
SHB9	South Humber Bank Non-potable desalination (60Ml/d)	Yes
FND29	Fens Reservoir 50MCM (usable volume) (44.4Ml/d)	Yes
EXS10	Holland on Sea desalination (seawater) (26 Ml/d)	Yes
LNB1	Ruthamford North to Bourne potable transfer (20 Ml/d)	No
LNC16	Ruthamford North to Lincolnshire Central potable transfer (20 Ml/d)	No
LNC28	Bulk trade agreement - River Trent (7Ml/d)	No
LNE6	Mablethorpe desalination Seawater (50 Ml/d)	Yes
NTB17	Bacton desalination (seawater) (25 Ml/d)	Yes
NWY1	Norwich and the Broads to Norfolk Wymondham potable transfer (5 Ml/d)	No
RTN30	Lincolnshire Central to Ruthamford North potable transfer (75 Ml/d)	Yes
RTS24	Ruthamford North to Ruthamford South potable transfer (75 Ml/d)	No
RTN17	Lincolnshire Reservoir 50MCM (usable volume) (169Ml/d)	Yes
RTC3	Ruthamford South to Ruthamford Central potable transfer (20 Ml/d)	No

2.4.1.2 In addition, five Water Industry National Environment Programme (WINEP) options will be implemented as part of the rdWRMP24 (Table 2.4).

Table 2.4: rdWRMP24 WINEP options

Option ID	Description overview	Screened into AA
Brett	River Support Scheme with 2 Ml/d at Lavenham, 2 Ml/d at either Semer or Raydon and 2 Ml/d at Shelley.	No
Colne	River support from Great Yeldham (at current daily licenced quantity) plus River Restoration.	No
Gipping	An optimised combination of river restoration options #11, #12, and #13 (Reach #2 (Brantham Road (B1113), south of Great Blakenham, to the railway crossing west of Ipswich) and reach #3 (from the railway crossing west of Ipswich to the tidal limit).	Yes
Pant	River support from Hawkspur Green source.	No
Stiffkey	Houghton St Giles river support to Q90 RA flows at Warham All Saints (18 Ml/d).	No

3 Ruthamford South to Cambridge Water potable transfer (50 Ml/d) (CAM4)

3.1 Introduction

3.1.1.1 This pipeline option will transfer potable water from Ruthamford South to Cambridge Water and will be operational in 2030.

3.1.1.2 Screening could not rule out LSE in relation to:

- Eversden and Wimpole Woods SAC (UK0030331) – approximately 9.8km south-east of the option

3.1.1.3 The Eversden and Wimpole Woods SAC comprises a mixture of ancient coppice woodland (Eversden Wood) and high forest woods likely to be of more recent origin (Wimpole Woods). A colony of barbastelle bats (*Barbastella barbastellus*) is associated with the trees in Wimpole Woods. These trees are used as summer maternity roosts where the female bats gather to give birth and rear their young. Most of the roost sites are within tree crevices and other tree features. The bats also use the SAC as a foraging area, and parts of the woodland and treelines are also used as commuting corridors to support bat movements to foraging resources outside of the SAC. It is known that there is a second maternity roost on the Wimpole estate, but outside the SAC. The limited radio-tracking studies that have been carried out showed that individuals foraged as far as 11km at night,[11] but that the core sustenance zone (CSZ) may occur within 6km of a roost.[12]

3.1.1.4 The AA is set out below for the Habitats Site, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

3.2 Appropriate Assessment

Assessment summary

3.2.1.1 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment.

3.2.1.2 This option is not located in a relevant SSSI Impact Risk Zone for Eversden and Wimpole Woods SAC or the CSZ.

3.2.1.3 The option is not within the same water catchment as the Habitats Site and in any case the option passed the Water Framework Directive (WFD) Stage 1 screening for all water bodies (i.e., there is no risk of WFD deterioration or impediment to reaching future objectives).

3.2.1.4 On this basis, it is concluded that there will be no adverse effect on the integrity of any Habitats Site.

[11] Natural England (2018) European Site Conservation Objectives: supplementary advice on conserving and restoring site features. Eversden and Wimpole Woods Special Area of Conservation (SAC) Site code: UK0030331. Available at: https://publications.naturalengland.org.uk/file/6553352997699584. Last accessed: 14/08/2023.

[12] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost (Bat Conservation Trust, 2020. Core Sustenance Zones and habitats of importance for designing Biodiversity Net Gain for bats. https://www.bats.org.uk/resources/guidance-for-professionals/bat-species-core-sustenance-zones-and-habitats-for-biodiversity-net-gain).

Eversden and Wimpole Woods SAC (UK0030331) (approximately 9.8km)

Qualifying features

3.2.1.5 The site has been designated for the following qualifying features:

- S1308. *Barbastella barbastellus*; Barbastelle bat

Conservation objectives

3.2.1.6 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of the habitats of the qualifying species
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

3.2.1.7 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from construction activities were identified in screening, those relevant to this Habitats Site are:

Physical loss and/or damage

3.2.1.8 The construction of the pipeline may result in the removal of grassland, hedgerows and trees outside the Habitats Site. These habitats, approximately 9.8km from the Habitats Site, will be outside the area within 6km of the Habitats Site that is considered significant for the resilience and conservation status of the colony in the Habitats Site (i.e. the Core Sustenance Zone).

3.2.1.9 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on the integrity.

Non-physical disturbance

3.2.1.10 The construction of the pipeline will take place approximately 9.8km beyond the boundary of the Habitats Site, beyond the 5km buffer defined by the relevant SSSI Impact Risk Zone and the 6km CSZ.

3.2.1.11 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site, SSSI Impact Risk Zones and CSZ.

3.2.2 On this basis, a change in the supporting processes on which the feature and/or its supporting habitat relies is not reasonably foreseeable and it is concluded that there will be no adverse effect on the integrity.

Toxic contamination

3.2.2.1 The option is not located within the same water catchment as the Habitats Site and the ZoI for air pollutants (200m) falls outside the Habitats Site, SSSI Impact Risk Zones and CSZ.

3.2.2.2 On this basis, a change in the supporting processes on which the feature and/or its supporting habitat relies is not reasonably foreseeable and it is concluded that there will be no adverse effect on the integrity.

Biological disturbances

3.2.2.3 The construction of the pipeline may result in the introduction of non-native species to the construction site. The construction site, approximately 9.8km from the Habitats Site, will be outside the SSSI Impact Risk Zones and CSZ.

3.2.2.4 On this basis, a change in the supporting processes on which the feature and/or its supporting habitat relies is not reasonably foreseeable and it is concluded that there will be no adverse effect on the integrity.

Operational effects

3.2.2.5 No LSE from operational activities were identified in screening.

3.3 Measures to avoid and mitigate adverse effects

3.3.1.1 No mitigation is required because the risk of an adverse effects is not reasonably foreseeable at the plan making stage either from construction or operation. It should be noted that although this option did indicate LSE at Stage 1 HRA, further assessment associated with AA indicated that mitigation at plan level was not required.

3.4 Further studies and monitoring

3.4.1.1 No further studies and monitoring to support the project level assessment have been identified at the plan level assessment.

4 Lincolnshire East to Lincolnshire Central potable transfer (29 Ml/d) (LNC25)

4.1 Introduction

4.1.1.1 This pipeline option will transfer potable water from Lincolnshire East to Lincolnshire Central and will be operational by 2030.

4.1.1.2 Screening could not rule out LSE in relation to:

- Humber Estuary SAC (UK0030170) – approximately 3km from the option
- Humber Estuary Ramsar site (UK11031) – approximately 3km from the option
- Humber Estuary SPA (UK9006111) – approximately 3km from the option

4.1.1.3 The Humber Estuary is approximately 365km^2 and is the second largest coastal plain estuary in the UK and the largest coastal plan estuary on the east coast of Britain.

4.1.1.4 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

4.2 Appropriate Assessment

Assessment summary

4.2.1.1 This option is not located in a Habitats Site, but it is located in the SSSI Impact Risk Zones (Goose and Swan Functional Land and Humber Estuary Compensation) associated with the Humber Estuary SPA/Ramsar site. Hydrological connectivity links the option to the Habitats Sites of the Humber Estuary and the Humber Estuary Lamprey Migration Route SSSI Impact Risk Zone via surface water features; including North Beck Drain, Keelby Beck, Skitter Beck / East Halton Beck (chalk streams) and Mawnbridge Drain.

4.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

4.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see ‘Measures to avoid and mitigate adverse effects’ below).

4.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Humber Estuary SAC (UK0030170) (approximately 3km)

Qualifying features

4.2.1.5 The site has been selected for the following qualifying features:

- H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks
- H1130. Estuaries
- H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats

- H1150. Coastal lagoons
- H1310. Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand
- H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- H2110. Embryonic shifting dunes
- H2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram
- H2130. Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland*
- H2160. Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn
- S1095. Petromyzon marinus; Sea lamprey
- S1099. *Lampetra fluviatilis*; River lamprey
- S1364. *Halichoerus grypus*; Grey seal

Conservation objectives

4.2.1.6 With regard to the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

4.2.1.7 Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

4.2.1.8 The construction of the pipeline will temporarily cross water features that flow directly into the estuary and mudflats and sandflats not covered by seawater at low tide (e.g., North Beck Drain, Keelby Beck, Skitter Beck / East Halton Beck (chalk streams) and Mawnbridge Drain).

4.2.1.9 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Toxic / Non-toxic contamination

4.2.1.10 The construction of the pipeline will take place approximately 3km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

4.2.1.11 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

4.2.1.12 The construction of the pipeline will take place approximately 3km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

4.2.1.13 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

4.2.1.14 No LSE from operational activities were identified in screening.

Humber Estuary Ramsar (UK0030170) (approximately 3km)

Qualifying features

4.2.1.15 The site has been designated based on the following criteria:

4.2.1.16 **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
- Coastal brackish/saline lagoons

4.2.1.17 **Ramsar Criterion 3:** The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* 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 *Bufo calamita*.

4.2.1.18 **Ramsar Criterion 5:** Assemblages of international importance: Species with peak counts in winter: 153,934 waterfowl (5-year peak mean 1996/97-2000/2001).

4.2.1.19 **Ramsar Criterion 6:** Species/populations occurring at levels of international importance.

- Bar-tailed godwit, *Limosa lapponica* - Wintering
- Black-tailed godwit, *Limosa limosa* - Passage
- Black-tailed godwit, *Limosa limosa* - Wintering
- Dunlin, *Calidris alpina* - Passage
- Dunlin, *Calidris alpina* – Wintering
- Golden plover, *Pluvialis apricaria* - Passage
- Golden plover, *Pluvialis apricaria* - Wintering
- Knot, *Calidris canutus* - Passage
- Knot, *Calidris canutus* - Wintering
- Redshank, *Tringa totanus* - Passage

- Redshank, *Tringa totanus* - Wintering
- Shelduck, *Tadorna tadorna* - Wintering

4.2.1.20 **Ramsar Criterion 8:** The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

Conservation objectives

4.2.1.21 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

4.2.1.22 LSE from construction activities were identified in screening. Natterjack toad is located beyond the ZoI and is not considered further in this assessment. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

4.2.1.23 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Arable land within Goose and Swan Functional Land is used for foraging by pink-footed goose (a main assemblage feature) and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

4.2.1.24 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

4.2.1.25 The construction of the pipeline will temporarily cross water features that flow directly into the estuary and mudflats and sandflats not covered by seawater at low tide (e.g., North Beck Drain, Keelby Beck, Skitter Beck / East Halton Beck (chalk streams) and Mawnbridge Drain).

4.2.1.26 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

4.2.1.27 On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

4.2.1.28 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within Goose and Swan Functional Land.

4.2.1.29 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

4.2.1.30 The construction of the pipeline will take place approximately 3km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic

contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

4.2.1.31 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

4.2.1.32 The construction of the pipeline will take place approximately 3km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

4.2.1.33 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

4.2.1.34 No LSE from operational activities were identified in screening.

Humber Estuary SPA (UK9006111) (approximately 3km)

Qualifying features

4.2.1.35 The site has been selected for the following qualifying features:

- A021 *Botaurus stellaris*; Bittern (Non-breeding)
- A021 *Botaurus stellaris*; Bittern (Breeding)
- A048 *Tadorna tadorna*; Shelduck (Non-breeding)
- A081 *Circus aeruginosus*; Marsh harrier (Breeding)
- A082 *Circus cyaneus*; Hen harrier (Non-breeding)
- A132 *Recurvirostra avosetta*; Avocet (Non-breeding)
- A132 *Recurvirostra avosetta*; Avocet (Breeding)
- A140 *Pluvialis apricaria*; Golden plover (Non-breeding)
- A143 *Calidris canutus*; Knot (Non-breeding)
- A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
- A151 *Philomachus pugnax*; Ruff (Non-breeding)
- A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
- A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
- A162 *Tringa totanus*; Redshank (Non-breeding)
- A195 *Sterna albifrons*; Little tern (Breeding)
- Waterbird assemblage

Conservation objectives

4.2.1.36 With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:
  - The extent and distribution of the habitats of the qualifying features

- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features
- The distribution of the qualifying features within the site

Construction effects

4.2.1.37 Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

4.2.1.38 The construction of the pipeline will temporarily cross water features that flow directly into the estuary and mudflats and sandflats not covered by seawater at low tide (e.g., North Beck Drain, Keelby Beck, Skitter Beck / East Halton Beck (chalk streams) and Mawnbridge Drain).

4.2.1.39 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

4.2.1.40 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within Goose and Swan Functional Land.

4.2.1.41 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

4.2.1.42 The construction of the pipeline will take place approximately 3km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

4.2.1.43 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

4.2.1.44 The construction of the pipeline will take place approximately 3km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

4.2.1.45 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

4.2.1.46 No LSE from operational activities were identified in screening.

4.3 Measures to avoid and mitigate adverse effects

4.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

4.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical loss and/or damage
  - Directional drilling will be used to avoid crossing watercourses >3m (e.g., Skitter Beck and North Beck Drain)
- Non-physical disturbance
  - Application of good industry practice, including but not limited to:
    - Government guidance on 'Light pollution. Advice on how to consider light within the planning system' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government[13].
    - British Standard (BS 5228-1:2009+A1:2014) 'Code of practice for noise and vibration control on construction and open sites'[14].
  - Application of a voluntary cessation of construction during severe winter weather (JNCC 'Scheme to reduce disturbance to waterfowl during severe winter weather')[15].
  - Employment of an ornithology specialist as an Ecological Clerk of Work to identify the presence/absence of significant numbers of qualifying interest features and if present to implement the 'TIDE Toolbox: Waterbird Disturbance and Mitigation Toolkit' and the obligations set out in the CoCP and CEMP[16].
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to:
    - C741 Environmental good practice on site guide (CIRIA)[17]
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)[18]
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)[19]
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)[20]

[13] Light pollution - GOV.UK (www.gov.uk)

[14] British Standard (BS 5228-1:2009+A1:2014) untitled (warrington.gov.uk)

[15] Scheme to reduce disturbance to waterfowl during severe winter weather Severe weather scheme | JNCC - Adviser to Government on Nature Conservation

[16] .Waterbird Disturbance and Mitigation Toolkit TIDE toolbox - TIDE tools (tide-toolbox.eu)

[17] Environmental good practice on site guide. Item Detail (ciria.org)

[18] Pollution Prevention Guidance PPG1 Title (publishing.service.gov.uk)

[19] Pollution Prevention Guidance PPG6 ppg-6.pdf (netregs.org.uk)

[20] Guidance for Pollution Prevention Works and maintenance in or near water: gpp-5-works-and-maintenance-in-or-near-water.pdf (netregs.org.uk)

  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to:
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)[21]
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)[22]

4.3.1.3 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

4.4 Further studies and monitoring

4.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

4.4.1.2 Surveys of Goose and Swan Functional Land should establish if the option footprint within this SSSI Impact Risk Zone at Elsham is regularly used by pink-footed geese. If the land is regularly used by pink-footed geese, then a Goose and Swan Functional Land Mitigation Plan shall be agreed with Natural England. It is expected that this will be secured through a pre-commencement planning condition.

[21] Biosecurity and management of invasive non-native species for construction sites and Controlled activities (sepa.org.uk)

[22] Check, Clean Dry: preventing the spread of invasive species. Freshwater Habitats Trust

5 Marham Abstraction (7.9Ml/d up to 2039, 12.3Ml/d after 2039) (FND22)

5.1 Introduction

5.1.1.1 This pipeline option will transfer potable water from the River Nar to Marham WTW. There will be an associated increase in abstraction from the River Nar. This option will be operational by 2030.

5.1.1.2 Screening could not rule out LSE in relation to:

- The Wash & North Norfolk Coast SAC (UK0017075) – approximately 5.8km from the option
- The Wash Ramsar site (UK11072) – approximately 5.8km from the option
- The Wash SPA (UK9008021) – approximately 5.8km from the option

5.1.1.3 The Wash is the largest embayment in the UK. It is connected via sediment transfer systems to the north Norfolk coast. Together, the Wash and North Norfolk Coast form one of the most important marine areas in the UK and the European North Sea coast and includes extensive areas of varying, but predominantly sandy, sediments subject to a range of conditions.

5.1.1.4 Functionally linked land defined in Natural England's SSSI Impact Risk Zone dataset has also been identified on land crossed by the pipeline option. This functionally linked land in the River Nar floodplain, Goose and Swan Functional Land, is associated with the Ouse Washes SPA and Ramsar site.

5.1.1.5 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

5.2 Appropriate Assessment

Assessment summary

5.2.1.1 This option is not located in a Habitats Site, but it is located in a SSSI Impact Risk Zone (Goose and Swan Functional Land) associated with the Ouse Washes SPA/Ramsar site. Hydrological connectivity links the option to the Habitats Sites of the Wash via the River Nar.

5.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

5.2.2 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

5.2.3 In addition, the operation of the proposed option will be subject to specific regulation by the Environment Agency in meeting the legally binding environmental objectives of the RBMP, in this case those objectives regarding the maintenance of flows supporting the ecological status of the River Nar and the flows into The Wash.

5.2.3.1 On this basis, it is concluded that there will be no adverse effect on the integrity of any Habitats Site.

The Wash & North Norfolk Coast SAC (UK0017075) (approximately 5.8km)

Qualifying features

5.2.3.2 The site has been selected for the following qualifying features:

- H1110. Sandbanks which are slightly covered by sea water all the time
- H1140. Mudflats and sandflats not covered by seawater at low tide
- H1160. Large shallow inlets and bays
- H1170. Reefs
- H1310. Salicornia and other annuals colonizing mud and sand
- H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)*
- H1420. Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)
- H1150. Coastal lagoons *laguna costera*
- H1365. Harbour seal *Phoca vitulina*
- H1355. Otter *Lutra lutra*

Conservation objectives

5.2.3.3 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

5.2.3.4 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

5.2.3.5 Construction activities will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.6 Otter is the only qualifying species that may regularly range outside the Habitats Site. Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km).[23] [24] Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore unlikely to fall within the 2km buffer defined by the relevant SSSI Impact Risk Zone and will not interact with the construction of the option.

[23] Kruuk, H., 2006. Otters: ecology, behaviour and conservation: ecology, behaviour and conservation. OUP Oxford.

[24] Kruuk H. Moorhouse A., 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology 224:41–57.

5.2.3.7 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.8 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.9 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.10 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Toxic / Non-toxic contamination

5.2.3.11 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone. The option intake on the River Nar is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

5.2.3.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

5.2.3.13 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone. The option intake on the River Nar is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

5.2.3.14 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

5.2.3.15 Since screening, design development has allowed a more precise understanding of the location and operation of the option to inform the plan level assessment. This new abstraction will replace an upstream abstraction (current Marham abstraction) which is due to be closed and will support increased river flow. Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

5.2.3.16 The new abstraction could result in changes in flow downstream of the new abstraction location. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water supply within the Habitats Site is not reasonably foreseeable.

5.2.3.17 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.18 The operation of the abstraction on the River Nar will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.19 Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km). Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore unlikely to fall within the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.20 Non-physical disturbance (e.g. noise from pumping station) may be measurable within 500m of the option and therefore outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.21 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying natural habitats and species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-toxic contamination

5.2.3.22 The new abstraction could result in changes in water quality (e.g. turbidity and sedimentation) downstream of the new abstraction location. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water quality within the Habitats Site is not reasonably foreseeable.

5.2.3.23 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Biological disturbances

5.2.3.24 The new abstraction could result in changes in water quality which can under some circumstances lead to an increased frequency and extent of algal blooms. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water quality and consequently the risk of an increased frequency and extent of algal blooms within the Habitats Site is not reasonably foreseeable.

5.2.3.25 Fish are a main dietary component of otter and harbour seal. The distribution of harbour seal is associated with sand and mudflats in the Habitats Site and will not interact with the intake location. The core range of otter are likely to fall within the 2km buffer defined by the relevant SSSI Impact Risk Zone but will not interact with the intake location. Therefore, given the distance separating the intake from the Habitats Site, the entrainment/impingement of fish at the intake is not likely to result in a measurable change in prey availability for either qualifying feature in the Habitats Site.

5.2.3.26 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

The Wash Ramsar site (UK11072) (approximately 5.8km)

Qualifying features

5.2.3.27 The site has been designated based on the following criteria:

5.2.3.28 **Ramsar criterion 1**: The Wash is a large shallow bay comprising very extensive saltmarshes, major intertidal banks of sand and mud, shallow water and deep channels. It is the largest estuarine system in Britain.

5.2.3.29 The intertidal flats of the Wash form one of the largest intertidal areas in Britain and these are predominantly sandy. The flats support high concentrations of marine worms and shellfish (wetland invertebrate assemblage). There is an abundant growth of algae and high concentrations of marine invertebrates which provides a food source for over wintering wildfowl and supports an important fishery and seal colony [harbour (common) seal *Phoca vitulina*].

5.2.3.30 **Ramsar Criterion 3:** Qualifies because of the inter-relationship between its various components including saltmarshes, intertidal sand and mud flats and the estuarine waters. The saltmarshes and the plankton in the estuarine water provide a primary source of organic material which, together with other organic matter, forms the basis for the high productivity of the estuary.

5.2.3.31 **Ramsar Criterion 5**: Assemblages of international importance: Species with peak counts in winter: 292541 waterfowl (5-year peak mean 1998/99-2002/2003).

5.2.3.32 **Ramsar Criterion 6:** bird species/populations occurring at levels of international importance.

- Bar-tailed godwit, *Limosa lapponica* - Wintering
- Curlew, *Numenius arquata* - Wintering
- Dark-bellied brent goose, *Branta bernicla* - Wintering
- Dunlin, *Calidris alpina* - Wintering
- Grey plover, *Pluvialis squatarola* - Wintering
- Knot, *Calidris canutus* - Wintering
- Oystercatcher, *Haematopus ostralegus* - Wintering
- Pink-footed goose, *Anser brachyrhynchus* - Wintering
- Pintail, *Anas acuta* - Wintering
- Redshank, *Tringa totanus* - Wintering
- Sanderling, *Calidris alba* - Wintering
- Shelduck, *Tadorna tadorna* - Wintering
- Turnstone, *Arenaria interpres* - Wintering

Conservation objectives

5.2.3.33 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

5.2.3.34 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

5.2.3.35 Construction activities will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.36 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.37 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.38 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.39 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Toxic / Non-toxic contamination

5.2.3.40 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone. The option intake on the River Nar is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

5.2.3.41 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

5.2.3.42 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone. The option intake on the River Nar is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

5.2.3.43 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

5.2.3.44 Since screening, design development has allowed a more precise understanding of the location and operation of the option to inform the plan level assessment. This new abstraction will replace an upstream abstraction (current Marham abstraction) which is due to be closed and will help to increase river flow. Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

5.2.3.45 The new abstraction could result in changes in flow downstream of the new abstraction location. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water supply within the Habitats Site is not reasonably foreseeable.

5.2.3.46 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.47 The operation of the abstraction on the River Nar will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.48 Non-physical disturbance (e.g. noise from pumping station) may be measurable within 500m of the option and therefore outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.49 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying natural habitats and species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-toxic contamination

5.2.3.50 The new abstraction could result in changes in water quality (e.g. turbidity and sedimentation) downstream of the new abstraction location. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water quality within the Habitats Site is not reasonably foreseeable.

5.2.3.51 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Biological disturbances

5.2.3.52 The new abstraction could result in changes in water quality which can under some circumstances lead to an increased frequency and extent of algal blooms. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water quality and consequently the risk of an increased frequency and extent of algal blooms within the Habitats Site is not reasonably foreseeable.

5.2.3.53 Fish are a main dietary component of harbour seal. The distribution of harbour seal is associated with sand and mudflats in the Habitats Site and will not interact with the intake location. Therefore, the entrainment/impingement of fish at the intake is not likely to result in a measurable change in prey availability for either qualifying feature.

5.2.3.54 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

The Wash SPA (UK9008021) (approximately 5.8km)

Qualifying features

5.2.3.55 The site has been selected for the following qualifying features:

- A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
- A040 *Anser brachyrhynchus*; Pink-footed goose (Non-breeding)
- A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
- A048 *Tadorna tadorna*; Shelduck (Non-breeding)
- A050 *Anas Totanus*; Wigeon (Non-breeding)
- A051 *Anas strepera*; Gadwall (Non-breeding)
- A054 *Anas acuta*; Pintail (Non-breeding)
- A065 *Melanitta nigra*; Common scoter (Non-breeding)
- A067 *Bucephala clangula*; Goldeneye (Non-breeding)
- A130 *Haematopus ostralegus*; Oystercatcher (Non-breeding)
- A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
- A143 *Calidris canutus*; Knot (Non-breeding)
- A144 *Calidris alba*; Sanderling (Non-breeding)
- A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
- A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)

- A157 *Limosa lapponica;* Bar-tailed godwit (Non-breeding)
- A160 *Numenius arquata*; Curlew (Non-breeding)
- A162 *Tringa Totanus;* Redshank (Non-breeding)
- A169 *Arenaria interpres*; Turnstone (Non-breeding)
- A193 *Sterna hirundo*; Common tern (Breeding)
- A195 *Sterna albifrons*; Little tern (Breeding)
- Waterbird assemblage

Conservation objectives

5.2.3.56 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of the habitats and the qualifying features
  - The structure and function of the habitats and the qualifying features
  - The supporting processes on which the habitats and the qualifying features rely
  - The populations of each of the qualifying features
  - The distribution of qualifying features within the site

Construction effects

5.2.3.57 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

5.2.3.58 Construction activities will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.59 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.60 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.61 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.62 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Toxic / Non-toxic contamination

5.2.3.63 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone. The option intake on the River Nar is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

5.2.3.64 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

5.2.3.65 The construction of the pipeline will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone. The option intake on the River Nar is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

5.2.3.66 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

5.2.3.67 Since screening, design development has allowed a more precise understanding of the location and operation of the option to inform the plan level assessment. This new abstraction will replace an upstream abstraction (current Marham abstraction) which is due to be closed and will help to increase river flow. Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

5.2.3.68 The new abstraction could result in changes in flow downstream of the new abstraction location. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water supply within the Habitats Site is not reasonably foreseeable.

5.2.3.69 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.70 The operation of the abstraction on the River Nar will take place approximately 5.8km beyond the boundary of the Habitats Site and outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.71 Non-physical disturbance (e.g. noise from pumping station) may be measurable within 500m of the option and therefore outside the 2km buffer defined by the relevant SSSI Impact Risk Zone.

5.2.3.72 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying natural habitats and species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-toxic contamination

5.2.3.73 The new abstraction could result in changes in water quality (e.g. turbidity and sedimentation) downstream of the new abstraction location. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water quality within the Habitats Site is not reasonably foreseeable.

On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Biological disturbances

5.2.3.74 The new abstraction could result in changes in water quality which can under some circumstances lead to an increased frequency and extent of algal blooms. Due to the dynamic nature of the Wash, the pass forward flow into the estuary and high tidal range, the abstraction of 7.9Ml/d up to 2039 and 12.3Ml/d after 2039, a measurable change in water quality and consequently the risk of an increased frequency and extent of algal blooms within the Habitats Site is not reasonably foreseeable.

5.2.3.75 On this basis, a change in the supporting processes on which the qualifying species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Ouse Washes SPA (UK9008041) (approximately 13.5 km)

Qualifying features

5.2.3.76 The site has been selected for the following qualifying features:

- A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
- A038 *Cygnus cygnus*; Whooper swan (Non-breeding)
- A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
- A051 *Anas strepera*; Gadwall (Breeding)
- A052 *Anas crecca;* Eurasian teal (Non-breeding)
- A053 *Anas platyrhynchos;* Mallard (Breeding)
- A054 *Anas acuta;* Northern pintail (Non-breeding)
- A055 *Anas querquedula;* Garganey (Breeding)
- A056 *Anas clypeata;* Northern shoveler (Non-breeding)
- A056 *Anas clypeata;* Northern shoveler (Breeding)
- A082 *Circus cyaneus;* Hen harrier (Non-breeding)
- A151 *Philomachus pugnax;* Ruff (Breeding)
- A156a *Limosa limosa*; Black-tailed godwit (Breeding)
- Waterbird assemblage
- Breeding bird assemblage

Conservation objectives

5.2.3.77 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of the habitats and the qualifying features
  - The structure and function of the habitats and the qualifying features
  - The supporting processes on which the habitats and the qualifying features rely
  - The populations of each of the qualifying features
  - The distribution of qualifying features within the site

Construction effects

5.2.3.78 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Due to the distance separating the option from

the Habitats Site, no impact pathway exists in relation to the qualifying interest features except those associated with Goose and Swan Functional Land, i.e. whooper swan and Bewick's swan.

5.2.3.79 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

5.2.3.80 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Arable land within Goose and Swan Functional Land is used for foraging and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

5.2.3.81 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.82 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within Goose and Swan Functional Land.

5.2.3.83 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

5.2.3.84 The construction of the pipeline will take place within Goose and Swan Functional Land. The pipeline route through Goose and Swan Functional Land includes surface water features and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

5.2.3.85 Air quality impacts associated with construction are likely to occur within 50 metres of the footprint (to account for the physical effects of dust deposition) and 200 metres of the footprint and haul routes (to account for changes in air pollutants) respectively. Goose and swan functionally linked land is comprised of arable farmland and air quality is not considered to materially affect the quantity or quality of food resources (e.g., cereal grains, carrots, potatoes and sugar beet).

5.2.3.86 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

5.2.3.87 The construction of the pipeline within Goose and Swan Functional Land. The pipeline route through Goose and Swan Functional Land includes surface water features and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach functional land.

5.2.3.88 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

5.2.3.89 Potential effects from operational activities are not reasonably foreseeable.

Ouse Washes Ramsar (7UK012) (approximately 13.5km)

Qualifying features

The site has been designated based on the following criteria:

5.2.3.90 **Ramsar criterion 1a**: The site is a good representative example of a natural or near-natural wetland characteristic of its biogeographic region. It is one of the most extensive areas of seasonally flooding washland of its type in Britain, and the wetland has high conservation value for many plants and animals.

5.2.3.91 **Ramsar criterion 2a**: The site supports appreciable numbers of nationally rare plants and animals. This includes several nationally scarce plants, including, small water pepper *Polygonum minus*, whorled water-milfoil *Myriophyllum verticillatum*, greater water parsnip *Sium latifolium*, river water-dropwort *Oenanthe fluviatilis*, fringed water-lily *Nymphoides peltata,* long-stalked pondweed *Potamogeton praelongus,* hair-like pondweed *Potamogeton trichoides*, grass-wrack pondweed *Potamogeton compressus*, tasteless water-pepper *Polygonum mite* and marsh dock *Rumex palustris*. Invertebrate records indicate that the site holds good relict fenland fauna, including the National Red Data Book species, large darter dragonfly *Libellula fulva* and the rifle beetle *Oulimnius major.*

5.2.3.92 **Ramsar criterion 5**: Internationally important waterfowl assemblage (greater than 20,000 birds).

5.2.3.93 **Ramsar criterion 6**: Over winter the site regularly supports internationally important populations of: Bewick`s Swan *Cygnus columbianus bewickii,* Gadwall *Anas strepera,* Pintail *Anas acuta,* Shoveler *Anas clypeata*, Teal Anas crecca, Whooper Swan *Cygnus cygnus*, Wigeon *Anas penelope.*

Conservation objectives

Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

5.2.3.94 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Due to the distance separating the option from the Habitats Site, no impact pathway exists in relation to the qualifying interest features except those associated with Goose and Swan Functional Land, i.e. whooper swan and Bewick's swan.

5.2.3.95 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

5.2.3.96 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Arable land within Goose and Swan Functional Land is used for foraging and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

5.2.3.97 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

5.2.3.98 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within Goose and Swan Functional Land.

5.2.3.99 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

5.2.3.100 The construction of the pipeline will take place within Goose and Swan Functional Land. The pipeline route through Goose and Swan Functional Land includes surface water features and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

5.2.3.101 Air quality impacts associated with construction are likely to occur within 50 metres of the footprint (to account for the physical effects of dust deposition) and 200 metres of the footprint and haul routes (to account for changes in air pollutants) respectively. Goose and swan functionally linked land is comprised of arable farmland and air quality is not considered to materially affect the quantity or quality of food resources (e.g., cereal grains, carrots, potatoes and sugar beet).

5.2.3.102 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

5.2.3.103 The construction of the pipeline within Goose and Swan Functional Land. The pipeline route through Goose and Swan Functional Land includes surface water features and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach functional land.

5.2.3.104 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

Potential effects from operational activities are not reasonably foreseeable.

5.3 Measures to avoid and mitigate adverse effects

5.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

- Non-physical disturbance
  - Application of good industry practice, including but not limited to —

    - Government guidance on 'Light pollution. Advice on how to consider light within the planning system' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government[25].
    - British Standard (BS 5228-1:2009+A1:2014) 'Code of practice for noise and vibration control on construction and open sites'[26]
  - Application of a voluntary cessation of construction during severe winter weather (JNCC 'Scheme to reduce disturbance to waterfowl during severe winter weather')[27].
  - Employment of an ornithology specialist as an Ecological Clerk of Work to identify the presence/absence of significant numbers of qualifying interest features and if present to implement the 'TIDE Toolbox: Waterbird Disturbance and Mitigation Toolkit' and the obligations set out in the CoCP and CEMP[28].
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to —
    - C741 Environmental good practice on site guide (CIRIA)[29]
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)[30]
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)[31]
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)[32]
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to —
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)[33]
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)[34]
  - Use of silt traps and screens

5.3.1.2 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

5.4 Further studies and monitoring

5.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how

[25] Light pollution - GOV.UK (www.gov.uk)

[26] British Standard (BS 5228-1:2009+A1:2014) untitled (warrington.gov.uk)

[27] Scheme to reduce disturbance to waterfowl during severe winter weather Severe weather scheme | JNCC - Adviser to Government on Nature Conservation

[28] .Waterbird Disturbance and Mitigation Toolkit TIDE toolbox - TIDE tools (tide-toolbox.eu)

[29] Environmental good practice on site guide. Item Detail (ciria.org)

[30] Pollution Prevention Guidance PPG1 Title (publishing.service.gov.uk)

[31] Pollution Prevention Guidance PPG6 ppg-6.pdf (netregs.org.uk)

[32] Guidance for Pollution Prevention Works and maintenance in or near water: gpp-5-works-and-maintenance-in-or-near-water.pdf (netregs.org.uk)

[33] Biosecurity and management of invasive non-native species for construction sites and Controlled activities (sepa.org.uk)

[34] Check, Clean Dry: preventing the spread of invasive speciesFreshwater Habitats Trust

adverse effects can be avoided or mitigated, the following studies and monitoring are recommended.

5.4.1.2 Surveys of Goose and Swan Functional Land should establish if the option footprint within this SSSI Impact Risk Zone is regularly used by pink-footed geese or whooper and Bewick's swan. If the land is regularly used by pink-footed geese, then a Goose and Swan Functional Land Mitigation Plan shall be agreed with Natural England. If required, this should be supported by a noise model to define the project-specific zone of influence.

6 Lincolnshire East Groundwater (7.5Ml/d) (LNE11)

6.1 Introduction

6.1.1.1 This option proposes a net increase the daily abstraction volume from licences on North Lincolnshire Chalk groundwater sources and the development of a nitrate removal plant and disinfectant treatment at Little London Water Treatment Works (WTW). It will be operational by 2030.

6.1.1.2 Screening could not be ruled out LSE in relation to:

- Humber Estuary SAC (UK0030170) – approximately 4.7km from the option
- Humber Estuary Ramsar site (UK11031) – approximately 4.7km from the option
- Humber Estuary SPA (UK9006111) – approximately 4.7km from the option

6.1.1.3 The Humber Estuary is approximately 365km^2 and is the second largest coastal plain estuary in the UK and the largest coastal plan estuary on the east coast of Britain.

6.1.1.4 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

6.2 Appropriate Assessment

Assessment summary

6.2.1.1 This option is not located in a Habitats Site, but it is located within SSSI Impact Risk Zones (Goose and Swan Functional Land and Humber Estuary Compensation) associated with the Humber Estuary SPA/Ramsar site. Hydrological connectivity links the option to the Habitats Sites of the Humber Estuary and the Humber Estuary Lamprey Migration Route SSSI Impact Risk Zone via North Beck.

6.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

6.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see ‘Measures to avoid and mitigate adverse effects’ below).

6.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Humber Estuary SAC (UK0030170) (approximately 4.7km)

Qualifying features

6.2.1.5 The site has been selected for the following qualifying features:

- H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks
- H1130. Estuaries
- H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats

- H1150. Coastal lagoons*
- H1310. Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand
- H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- H2110. Embryonic shifting dunes
- H2120. Shifting dunes along the shoreline with *Ammophila arenaria* (“white dunes”); Shifting dunes with marram
- H2130. Fixed dunes with herbaceous vegetation (“grey dunes”); Dune grassland*
- H2160. Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn
- S1095. Petromyzon marinus; Sea lamprey
- S1099. *Lampetra fluviatilis*; River lamprey
- S1364. *Halichoerus grypus*; Grey seal

Conservation objectives

6.2.1.6 With regard to the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

6.2.1.7 Due to the distance separating the option from the Habitats Site, no impact pathway exists in relation to habitats H2110, H2120, H2130, H2160 and grey seal.

6.2.1.8 Potential effects from construction activities relevant to this Habitats Site and qualifying habitats (i.e. H110, H1130, H1140, H1150, H1310, H1330) and species (i.e. sea lamprey and river lamprey) are:

Physical damage

6.2.1.9 The construction of the pipeline will temporarily cross water features that flow directly into the estuary and mudflats and sandflats not covered by seawater at low tide (e.g., North Beck Drain).

6.2.1.10 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Toxic / Non-toxic contamination

6.2.1.11 The construction of the pipeline will take place approximately 4.7km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

6.2.1.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

6.2.1.13 The construction of the pipeline will take place approximately 4.7km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

6.2.1.14 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

6.2.1.15 Due to the distance separating the option from the Habitats Site, no impact pathway exists in relation to habitats H2110, H2120, H2130, H2160, sea lamprey and grey seal. The LSE from operational activities that were identified in screening in relation to habitats H110, H1130, H1140, H1150, H1310, H1330 and river lamprey are:

Physical damage

6.2.1.16 There may be a risk to the water balance of North Beck Drain due to the increase in groundwater abstraction from various groundwater sources. There is also the potential for this option to further reduce natural flows.

6.2.1.17 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

6.2.1.18 On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Humber Estuary Ramsar (UK0030170) (approximately 4.7km)

Qualifying features

6.2.1.19 The site has been designated based on the following criteria:

6.2.1.20 **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
- Coastal brackish/saline lagoons

6.2.1.21 **Ramsar Criterion 3:** The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* 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 *Bufo calamita*.

6.2.1.22 **Ramsar Criterion 5:** Assemblages of international importance: Species with peak counts in winter: 153,934 waterfowl (5-year peak mean 1996/97-2000/2001)

6.2.1.23 **Ramsar Criterion 6:** Species/populations occurring at levels of international importance

- Bar-tailed godwit, *Limosa lapponica* – Wintering
- Black-tailed godwit, *Limosa limosa* – Passage
- Black-tailed godwit, *Limosa limosa* – Wintering
- Dunlin, *Calidris alpina* – Passage
- Dunlin, *Calidris alpina* – Wintering
- Golden plover, *Pluvialis apricaria* – Passage
- Golden plover, *Pluvialis apricaria* – Wintering
- Knot, *Calidris canutus* – Passage
- Knot, *Calidris canutus* – Wintering
- Redshank, *Tringa totanus* – Passage
- Redshank, *Tringa totanus* – Wintering
- Shelduck, *Tadorna tadorna* – Wintering

6.2.1.24 **Ramsar Criterion 8:** The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

Conservation objectives

6.2.1.25 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment..

Construction effects

6.2.1.26 LSE from construction activities were identified in screening. Natterjack toad is located beyond the ZoI and is not considered further in this assessment. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

6.2.1.27 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Arable land within Goose and Swan Functional Land is used for foraging by pink-footed goose (a main assemblage feature) and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

6.2.1.28 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

6.2.1.29 The construction of the pipeline will temporarily cross water features that flow directly into the estuary and mudflats and sandflats not covered by seawater at low tide (e.g., North Beck Drain).

6.2.1.30 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

6.2.1.31 On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

6.2.1.32 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within Goose and Swan Functional Land and SSSI Impact Risk Zones associated with the Humber Estuary and Humber Estuary Compensation that may also be used by qualifying species.

6.2.1.33 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

6.2.1.34 The construction of the pipeline will take place approximately 4.7km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

6.2.1.35 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

6.2.1.36 The construction of the pipeline will take place approximately 4.7km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

6.2.1.37 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

6.2.1.38 The potential LSE from operational activities that were identified in screening are:

Physical damage

6.2.1.39 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

6.2.1.40 On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Humber Estuary SPA (UK9006111) (approximately 4.7km)

Qualifying features

6.2.1.41 The site has been selected for the following qualifying features:

- A021 *Botaurus stellaris*; Bittern (Non-breeding)
- A021 *Botaurus stellaris*; Bittern (Breeding)
- A048 *Tadorna tadorna*; Shelduck (Non-breeding)
- A081 *Circus aeruginosus*; Marsh harrier (Breeding)
- A082 *Circus cyaneus*; Hen harrier (Non-breeding)
- A132 *Recurvirostra avosetta*; Avocet (Non-breeding)
- A132 *Recurvirostra avosetta*; Avocet (Breeding)
- A140 *Pluvialis apricaria*; Golden plover (Non-breeding)
- A143 *Calidris canutus*; Knot (Non-breeding)
- A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
- A151 *Philomachus pugnax*; Ruff (Non-breeding)
- A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
- A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
- A162 *Tringa totanus*; Redshank (Non-breeding)
- A195 *Sterna albifrons*; Little tern (Breeding)
- Waterbird assemblage

Conservation objectives

6.2.1.42 With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying features
  - The supporting processes on which the habitats of the qualifying features rely
  - The population of each of the qualifying features
  - The distribution of the qualifying features within the site

Construction effects

6.2.1.43 Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

6.2.1.44 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Arable land within Goose and Swan Functional Land is used for foraging by pink-footed goose (a main assemblage feature) and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

6.2.1.45 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

6.2.1.46 The construction of the pipeline will temporarily cross water features that flow directly into the estuary and mudflats and sandflats not covered by seawater at low tide (e.g., North Beck Drain).

6.2.1.47 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

6.2.1.48 The construction of the pipeline will take place outside the Habitats Site but partly within the Goose and Swan Functional Land SSSI Impact Risk Zone. Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within Goose and Swan Functional Land and SSSI Impact Risk Zones associated with the Humber Estuary and Humber Estuary Compensation that may also be used by qualifying species.

6.2.1.49 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

6.2.1.50 The construction of the pipeline will take place approximately 4.7km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

6.2.1.51 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

6.2.1.52 The construction of the pipeline will take place approximately 4.7km beyond the boundary of the Habitats Site but within the relevant SSSI Impact Risk Zones. The pipeline route is upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

6.2.1.53 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

6.2.1.54 The LSE from operational activities that were identified in screening are:

Physical damage

6.2.1.55 Due to the dynamic nature of the Humber Estuary, the pass forward flow into the estuary, high tidal range and high sediment load, a measurable change in water supply and the natural levels of turbidity within the Habitats Site is not reasonably foreseeable.

6.2.1.56 On this basis, a change in the supporting processes on which the qualifying habitats and species rely is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

6.3 Measures to avoid and mitigate adverse effects

6.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

6.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Non-physical disturbance
  - Application of good industry practice, including but not limited to:
    - Government guidance on 'Light pollution. Advice on how to consider light within the planning system' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government
    - British Standard (BS 5228-1:2009+A1:2014) 'Code of practice for noise and vibration control on construction and open sites'
  - Application of a voluntary cessation of construction during severe winter weather (JNCC 'Scheme to reduce disturbance to waterfowl during severe winter weather')
  - Employment of an ornithology specialist as an Ecological Clerk of Work to identify the presence/absence of significant numbers of qualifying interest features and if present to implement the 'TIDE Toolbox: Waterbird Disturbance and Mitigation Toolkit' and the obligations set out in the CoCP and CEMP.
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to:
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to:
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)

6.3.1.3 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

6.4 Further studies and monitoring

6.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

6.4.1.2 Surveys of Goose and Swan Functional Land should establish if the option footprint within this SSSI Impact Risk Zone at Elsham is regularly used by pink-footed geese. If the land is regularly used by pink-footed geese, then a Goose and Swan Functional Land Mitigation Plan shall be agreed with Natural England. It is expected that this will be secured through a pre-commencement planning condition.

7 Norwich and the Broads to Aylsham potable transfer (3 Ml/d) (NAY1)

7.1 Introduction

7.1.1.1 This pipeline option will transfer potable water from Norwich and the Broads to Aylsham and will be operational by 2030.

7.1.1.2 Screening could not be ruled out LSE in relation to:

- The Broads SAC (UK0013577) – approximately 2.1km from the option
- Broadland SPA (UK9009253) – approximately 2.1km from the option
- Broadland Ramsar site (UK11010) – approximately 2.1km from the option

7.1.1.3 The Broads are a low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The open distinctive landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow. Assemblages of rare plants and invertebrates occur at the site including nationally rare dragonflies, spiders, moths, and butterflies. Additionally, the area is a stronghold for the butterfly *Papilio machaon brittanica* as well as a number of nationally rare breeding birds, including bittern *Botaurus stellaris* and marsh harrier *Circus aeruginosus*. Several species of waterbirds winter across the Habitats Sites and include internationally important numbers of Bewick's swan *Cygnus columbianus bewickii*.

7.1.1.4 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

7.2 Appropriate Assessment

Assessment summary

7.2.1.1 This option is not located in a Habitats Site or a relevant SSSI Impact Risk Zones. Hydrological connectivity links the option to the Habitats Sites of the Broads via surface water features, including the River Bure.

7.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

7.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

7.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Broadland SPA (UK9009253) (approximately 2.1km)

Qualifying features

7.2.1.5 The site has been selected for the following qualifying features:

- A021. *Botaurus stellaris*; Bittern (Breeding)
- A037. *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
- A038. *Cygnus cygnus*; Whooper swan (Non-breeding)
- A050. *Anas Penelope*; Wigeon (Non-breeding)
- A051. *Anas strepera*; Gadwall (Non-breeding)
- A056. *Anas clyperta*; Shoveler (Non-breeding)
- A081. *Circus aeruginosis*; Marsh harrier (Breeding)
- A082. *Circus cyaneus*; Hen harrier (Non-breeding)
- A151. *Philomachus pugnax*; Ruff (Non-breeding)

Conservation objectives

7.2.1.6 With regard to the SPA and the individual species and/or assemblages of species for which the site has been classified, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying features
  - The supporting processes on which the habitats of the qualifying features rely
  - The population of each of the qualifying features
  - The distribution of the qualifying features within the site

Construction effects

7.2.1.7 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from construction activities were identified in screening, those relevant to this Habitats Site are:

Physical loss and/or damage

7.2.1.8 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone.

7.2.1.9 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

7.2.1.10 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone

7.2.1.11 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site but within the SSSI Impact Risk Zone.

7.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

7.2.2.1 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone. The construction of the option will be near water features that flow directly into the Habitats Site (e.g., River Bure) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

7.2.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

7.2.2.3 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone. The construction of the option will be near water features that flow directly into the Habitats Site (e.g., River Bure) therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

7.2.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

7.2.2.5 No LSE from operational activities were identified in screening.

The Broads SAC (UK0013577) (at closest approximately 2.1km)

Qualifying features

7.2.2.6 The site has been selected for the following qualifying features:

- H3140. Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp*.; Calcium-rich nutrient-poor lakes, lochs and pools
- H3150. Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed
- H6410. Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows
- H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable `quaking` surface
- H7210. Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge)
- H7230. Alkaline fens; Calcium-rich springwater-fed fens
- H91E0. Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae); Alder woodland on floodplain
- S1016. *Vertigo moulinsiana*; Desmoulin`s whorl snail
- S1355. *Lutra lutra;* Otter
- S1903. *Liparis loeselii*; Fen orchid
- S4056. *Anisus vorticulus*; Little whorlpool ram's-horn snail

Conservation objectives

7.2.2.7 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species.
  - The structure and function (including typical species) of qualifying natural habitats.
  - The structure and function of the habitats of qualifying species.
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.
  - The populations of qualifying species.
  - The distribution of qualifying species within the site.

Construction effects

7.2.2.8 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

7.2.2.9 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone.

7.2.2.10 Otter is the only qualifying species that may regularly range outside the Habitats Site. Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km).[35] [36] Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore unlikely to fall within the 2km buffer defined by the relevant SSSI Impact Risk Zone and will not interact with the construction of the option.

7.2.2.11 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

7.2.2.12 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone

7.2.2.13 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site but within the SSSI Impact Risk Zone.

7.2.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

[35] Kruuk, H., 2006. Otters: ecology, behaviour and conservation: ecology, behaviour and conservation. OUP Oxford.

[36] Kruuk H. Moorhouse A., 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology 224:41–57.

Toxic / Non-toxic contamination

7.2.3.1 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone. The construction of the option will be near water features that flow directly into the Habitats Site (e.g., River Bure) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

7.2.3.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

7.2.3.3 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone. The construction of the option will be near water features that flow directly into the Habitats Site (e.g., River Bure) therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

7.2.3.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

No LSE from operational activities were identified in screening.

Broadland Ramsar site (UK11010) (approximately 2.1km)

Qualifying features

7.2.3.5 **Ramsar Criterion 2:** The site supports a number of rare species and habitats within the biogeographical zone context, including the following Habitats Directive Annex I features and Annex II species:

- H7210 Calcareous fens with *Cladium mriscus* and species of the *Caricion davallianae* Calcium-rich fen dominated by great fen sedge (saw sedge).
- H7230 Alkaline fens Calcium-rich springwater-fed fens.
- H91E0 Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) Alder woodland on floodplains, and the Annex II species
- S1016 *Vertigo moulinsiana;* Desmoulin`s whorl snail
- S1355 *Lutra lutra*; Otter
- S1903 *Liparis loeselii*; Fen orchid

7.2.3.6 **Ramsar Criterion 6:** species/populations occurring at levels of international importance. Species with peak counts in winter:

- Bewick's swan, *Anas Penelope*, NW Europe
- Gadwall, *Anas strepera strepera*, NW Europe
- Shoveler, *Anas clypeata*, NW & Central Europe

Conservation objectives

7.2.3.7 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

7.2.3.8 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

7.2.3.9 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone.

7.2.3.10 Otter is the only qualifying species that may regularly range outside the Habitats Site. Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km).[37] [38] Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore unlikely to fall within the 2km buffer defined by the relevant SSSI Impact Risk Zone and will not interact with the construction of the option.

7.2.3.11 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Non-physical disturbance

7.2.3.12 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone.

7.2.3.13 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site but within the SSSI Impact Risk Zone.

7.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

7.2.4.1 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone. The construction of the option will be near water features that flow directly into the Habitats Site (e.g., River Bure) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

7.2.4.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

7.2.4.3 The construction of the pipeline will take place approximately 2.1km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone. The construction of the option will be near water features that flow directly into the Habitats Site (e.g., River Bure) therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

[37] Kruuk, H., 2006. Otters: ecology, behaviour and conservation: ecology, behaviour and conservation. OUP Oxford.

[38] Kruuk H. Moorhouse A., 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology 224:41–57.

7.2.4.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

7.2.4.5 No LSE from operational activities were identified in screening.

7.3 Measures to avoid or reduce adverse effects

7.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

7.3.1.2 Measures to avoid and mitigate adverse effects will include:

  - Directional drilling will be used to avoid crossing watercourses >3m (e.g., River Bure)
- Non-physical disturbance
  - Application of good industry practice, including but not limited to:
    - Government guidance on ‘Light pollution. Advice on how to consider light within the planning system’ (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government
    - British Standard (BS 5228-1:2009+A1:2014) ‘Code of practice for noise and vibration control on construction and open sites’
- Toxic contamination / Non-toxic contamination
  - Directional drilling will be used to avoid crossing watercourses >3m (e.g., River Bure)
  - Application of good industry practice, including but not limited to:
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to:
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - ‘Clean Check Dry’ (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

7.4 Further studies and monitoring

No further studies and monitoring to support the project level assessment have been identified at the plan level assessment.

8 Fenland to Norfolk Bradenham potable transfer (50 Ml/d) (NBR6)

8.1 Introduction

8.1.1.1 This pipeline option will transfer potable water from Fenland to Norfolk Bradenham and will be operational by 2030.

8.1.1.2 Screening could not rule out LSE in relation to:

- Breckland SPA (UK9009201) – approximately 0.04km from the option.
- Breckland SAC (UK0019865) – approximately 1.6km from the option.

8.1.1.3 The Breckland SAC and SPA is characterised by an extensive area of grass heath (and some heather heath), large arable fields, and the largest coniferous forest in lowland England. Together, these support over 2000 priority species, many of which are confined to the area, or have their core UK distribution there. Breckland SPA holds internationally important populations of stone curlew, nightjar and woodlark. Stone curlew establishes nests on open ground provided by arable cultivation in the spring, while woodlark and nightjar breed in recently felled areas and open heath areas within the conifer plantations.

8.1.1.4 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

8.2 Appropriate Assessment

Assessment summary

8.2.1.1 This option is not located in a Habitats Site, but it is located in relevant SSSI Impact Risk Zones associated with Breckland Habitats Sites.

8.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

8.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see ‘Measures to avoid and mitigate adverse effects’ below).

8.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Breckland SPA (UK9009201) (approximately 0.04km)

Qualifying features

8.2.1.5 The site has been selected for the following qualifying features:

- A133 *Burhinus oedicnemus*; Stone-curlew (Breeding)
- A224 *Caprimulgus europaeus*; Nightjar (Breeding)
- A246 *Lullula arborea*; Woodlark (Breeding)

Conservation objectives

8.2.1.6 With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying features
  - The supporting processes on which the habitats of the qualifying features rely
  - The population of each of the qualifying features
  - The distribution of the qualifying features within the site.

Construction effects

8.2.1.7 The construction of the option will take place outside the Habitats Site (0.04km) but within relevant SSSI Impact Risk Zones. Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

8.2.1.8 The habitats within the SSSI Impact Risk Zones have the potential to act as supporting off-site habitat (courtship, nesting, feeding).

8.2.1.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

8.2.1.10 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore inside the Habitats Site and the SSSI Impact Risk Zone.

8.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / non-toxic contamination

8.2.2.1 Air quality impacts associated with construction are likely to occur within 50 metres of the footprint (to account for the physical effects of dust deposition) and 200 metres of the footprint and haul routes (to account for changes in air pollutants) respectively.

8.2.2.2 On this basis, a change in the supporting processes on which the feature and/or its supporting habitat relies is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Biological disturbances

8.2.2.3 The construction of the pipeline may include activities where there is a risk of increased mortality (i.e., destruction of eggs and dependent young) and the introduction of invasive non-native species to the construction site.

8.2.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

8.2.2.5 No LSE from operational activities were identified in screening.

Breckland SAC (UK9009201) (approximately 1.6km)

Qualifying features

- H2330. Inland dunes with open *Corynephorus* and *Agrostis* grasslands; Open grassland with grey-hair grass and common bent grass of inland dunes
- H3150. Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed
- H4030. European dry heaths
- H6210. Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*); Dry grasslands and scrublands on chalk or limestone
- H91E0. Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*); Alder woodland on floodplains*
- S1166. *Triturus cristatus*; Great crested newt

Conservation objectives

8.2.2.6 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

8.2.2.7 The construction of the option will take place outside the Habitats Site (1.6km) but within relevant SSSI Impact Risk Zones. Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

8.2.2.8 The habitats within the SSSI Impact Risk Zones have the potential to provide functional connectivity with wider landscape for great crested newt and may be hydrologically linked to ponds within the Habitats Site.

8.2.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / non-toxic contamination

8.2.3.1 The construction of the option will be near permanent or temporary surface water features used by great crested newt. The accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

8.2.3.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

The construction of the pipeline may include activities where there is a risk of increased mortality (i.e., destruction of great crested newt resting places) and the introduction of invasive non-native species to the construction site.

8.2.3.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

8.2.3.4 No LSE from operational activities were identified in screening.

8.3 Measures to avoid or reduce adverse effects

8.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

8.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical damage
  - Directional drilling will be used to avoid crossing watercourses >3m
- Non-physical disturbance
  - Application of good industry practice, including but not limited to:
    - Government guidance on ‘Light pollution. Advice on how to consider light within the planning system’ (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government
    - British Standard (BS 5228-1:2009+A1:2014) ‘Code of practice for noise and vibration control on construction and open sites’
    - Line of sight screening (site personnel and vehicles)
  - Pre-construction surveys to identify the presence or likely absence of stone-curlew, nightjar, woodlark and great crested newt within the project’s ZoI
  - If necessary, employment of an ornithology specialist as an Ecological Clerk of Work to implement the obligations set out in the CoCP and CEMP.
  - If necessary, application of seasonal avoidance stone-curlew, nightjar and woodlark
    - March to September, inclusive (nightjar (stone-curlew, nightjar and woodlark) — Avoidance of disturbance to stone-curlew and woodlark is required under the Wildlife and Countryside Act 1981 (as amended). Planning conditions will likely require that no potentially disturbing activities take place within 500m of an active stone-curlew.
    - November to February, inclusive (great crested newt hibernation)
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to —
    - C741 Environmental good practice on site guide (CIRIA)

    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to —
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

8.4 Further studies and monitoring

8.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

8.4.1.2 Prior to the submission of a planning application the relevant protected species surveys should be undertaken to ensure the relevant information is secured to support the project level HRA.

9 Suffolk Thetford to Norfolk East Harling potable transfer (5 Ml/d) (NEH3)

9.1 Introduction

9.1.1.1 This pipeline option will transfer potable water from Suffolk Thetford to Norfolk East Harling and will be operational by 2030.

9.1.1.2 Screening could not rule out LSE in relation to:

- Breckland SPA (UK9009201) – approximately 0.01km from the option
- Breckland SAC (UK0019865) – approximately 0.5km from the option

9.1.1.3 The Breckland SAC and SPA is characterised by an extensive area of grass heath (and some heather heath), large arable fields, and the largest coniferous forest in lowland England. Together, these support over 2000 priority species, many of which are confined to the area, or have their core UK distribution there. Breckland SPA holds internationally important populations of stone curlew, nightjar and woodlark. Stone curlew establishes nests on open ground provided by arable cultivation in the spring, while woodlark and nightjar breed in recently felled areas and open heath areas within the conifer plantations.

9.1.1.4 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

9.2 Appropriate Assessment

Assessment summary

9.2.1.1 This option is not located in a Habitats Site, but it is located in a relevant SSSI Impact Risk Zone associated with Breckland Habitats Sites.

9.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

9.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

9.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on site integrity of any habitats site.

Breckland SPA (UK9009201) (approximately 0.01km)

Qualifying features

9.2.1.5 The site has been selected for the following qualifying features:

- A133 *Burhinus oedicnemus*; Stone-curlew (Breeding)
- A224 *Caprimulgus europaeus*; European nightjar (Breeding)
- A246 *Lullula arborea*; Woodlark (Breeding)

Conservation objectives

9.2.1.6 The conservation objectives set for this Habitats Site states:

9.2.1.7 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species.
  - The structure and function (including typical species) of qualifying natural habitats.
  - The structure and function of the habitats of qualifying species.
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.
  - The populations of qualifying species.
  - The distribution of qualifying species within the site.

Construction effects

9.2.1.8 The construction of the option will take place outside the Habitats Site (0.01km) but within relevant SSSI Impact Risk Zones. Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

9.2.1.9 The habitats within the SSSI Impact Risk Zones have the potential to act as supporting off-site habitat (courtship, nesting, feeding).

9.2.1.10 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

9.2.1.11 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore inside the Habitats Site and the SSSI Impact Risk Zone.

9.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / non-toxic contamination

9.2.2.1 Air quality impacts associated with construction are likely to occur within 50 metres of the footprint (to account for the physical effects of dust deposition) and 200 metres of the footprint and haul routes (to account for changes in air pollutants) respectively.

9.2.2.2 On this basis, a change in the supporting processes on which the feature and/or its supporting habitat relies is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Biological disturbances

9.2.2.3 The construction of the pipeline may include activities where there is a risk of increased mortality (i.e., destruction of eggs and dependent young) and the introduction of invasive non-native species to the construction site.

9.2.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

9.2.2.5 No LSE from operational activities were identified in screening.

Breckland SAC (UK9009201) (approximately 0.5km)

Qualifying features

- H2330. Inland dunes with open *Corynephorus* and *Agrostis* grasslands; Open grassland with grey-hair grass and common bent grass of inland dunes
- H3150. Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed
- H4030. European dry heaths
- H6210. Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*); Dry grasslands and scrublands on chalk or limestone
- H91E0. Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*); Alder woodland on floodplains*
- S1166. *Triturus cristatus*; Great crested newt

Conservation objectives

9.2.2.6 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

9.2.2.7 The construction of the option will take place outside the Habitats Site (0.5km) but within relevant SSSI Impact Risk Zones. Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

9.2.2.8 The habitats within the SSSI Impact Risk Zones have the potential to provide functional connectivity with wider landscape for great crested newt and may be hydrologically linked to ponds within the Habitats Site.

9.2.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / non-toxic contamination

9.2.3.1 The construction of the option will be near permanent or temporary surface water features used by great crested newt. The accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

9.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

The construction of the pipeline may include activities where there is a risk of increased mortality (i.e., destruction of great crested newt resting places) and the introduction of invasive non-native species to the construction site.

9.2.4.1 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

9.2.4.2 No LSE from operational activities were identified in screening.

9.3 Measures to avoid or reduce adverse effects

9.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

9.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical damage
  - Directional drilling will be used to avoid crossing watercourses >3m
- Non-physical disturbance
  - Application of good industry practice, including but not limited to:
    - Government guidance on ‘Light pollution. Advice on how to consider light within the planning system’ (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government
    - British Standard (BS 5228-1:2009+A1:2014) ‘Code of practice for noise and vibration control on construction and open sites’
    - Line of sight screening (site personnel and vehicles)
  - If necessary, employment of an ornithology specialist as an Ecological Clerk of Work to implement the obligations set out in the CoCP and CEMP.

  - If necessary, application of seasonal avoidance stone-curlew, nightjar and woodlark
    - March to September, inclusive (stone-curlew, nightjar and woodlark): avoidance of disturbance to stone-curlew and woodlark is required under the Wildlife and Countryside Act 1981 (as amended). Planning conditions will likely require that no potentially disturbing activities take place within 500m of an active stone-curlew.
    - November to February, inclusive (great crested newt hibernation)
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to:
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to:
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - ‘Clean Check Dry’ (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

9.4 Further studies and monitoring

9.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

9.4.1.2 Prior to the submission of a planning application the relevant protected species surveys (e.g. stone-curlew, nightjar, woodlark and great crested newt) should be undertaken to ensure the relevant information is secured to support the project level HRA.

10 Norfolk Bradenham to Norwich and the Broads potable transfer (20 Ml/d) (NTB10)

10.1 Introduction

10.1.1.1 This pipeline option will transfer potable water from Norfolk Bradenham to Norwich and the Broads and will be operational by 2030.

10.1.1.2 Screening could not rule out LSE in relation to:

- River Wensum SAC (UK0012647) – option crosses SAC
- Broadland Ramsar site (UK11010) – 0km, adjacent to option
- The Broads SAC (UK0013577) – 0km, adjacent to option
- Broadland SPA (UK9009253) – 0km, adjacent to option
- Norfolk Valley Fens SAC (UK0012892) – approximately 0.09km from option

10.1.1.3 The River Wensum is a designated SAC for 71km of its 73km length and is considered to be a key example of a naturally enriched calcareous lowland river in the United Kingdom (UK), with over 100 species of plants, a rich invertebrate fauna and a relatively natural corridor. The upper reaches of the river are fed by springs that rise from the chalk and by run-off from calcareous soils rich in nutrients, which gives rise to dense beds of submerged and emergent vegetation, characteristic of a chalk stream. Further downstream, the chalk is overlain with boulder clay and river gravels.

10.1.1.4 Broadland SPA/Ramsar site is a low-lying wetland complex located between the east Norfolk and northern Suffolk boundary. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The open distinctive landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow.

10.1.1.5 The Broads SAC contains a variety of habitats including naturally nutrient-rich lakes that support a diversity of relict vegetation and aquatic invertebrate assemblages, rich areas of stoneworts, large blocks of alder (*Alnus glutinosa*) woodland, calcareous fens and wet heath.

10.1.1.6 Norfolk Valley Fens SAC is one of two Habitats Sites in East Anglia, where the main concentration of lowland alkaline fens occurs. This site comprises a series of valley-head spring-fed fens. Such spring-fed flush fens are very rare in the lowlands. The individual fens vary in their structure according to intensity of management and provide a wide range of variation. There is a rich flora associated with these fens, including species such as grass-of-Parnassus, common butterwort, marsh helleborine and narrow-leaved marsh orchid.

10.1.1.7 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

10.2 Appropriate Assessment

Assessment summary

10.2.1.1 This option crosses the River Wensum SAC and it is located in relevant SSSI Impact Risk Zones associated with the Habitats Sites associated with the Broads and Norfolk Valley Fens, albeit those zones are outside the sites themselves. The option is hydrologically connected to the Habitats Sites associated with the Broads and Norfolk Valley Fens via surface water features, including the River Bure and the River Tud respectively.

10.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

10.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

10.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

River Wensum SAC (UK0012647) (0km)

Qualifying features

10.2.1.3 The site has been selected for the following qualifying features:

- H3260. Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho Batrachion* vegetation; Rivers with floating vegetation often dominated by water-crowfoot
- S1016. *Vertigo moulinsiana*; Desmoulin`s whorl snail
- S1092. *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish
- S1096. *Lampetra planeri*; Brook lamprey
- S1163. *Cottus gobio*; Bullhead

Conservation objectives

10.2.1.4 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

10.2.1.5 The pipeline route crosses the Habitats Site. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

10.2.1.6 The pipeline route crosses the Habitats Site however it is assumed that directional drilling will be used to route the pipeline under the river. Directional drilling could cause subsidence of the river bed.

10.2.1.7 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

10.2.1.8 The pipeline route crosses the habitats and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

10.2.1.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

10.2.1.10 The pipeline route crosses the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

10.2.1.11 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

10.2.1.12 No LSE from operational activities were identified in screening.

Broadland Ramsar site (UK11010) (0km)

Qualifying features

10.2.1.13 **Ramsar Criterion 2:** The site supports a number of rare species and habitats within the biogeographical zone context, including the following Habitats Directive Annex I features:

- H7210 Calcareous fens with *Cladium mriscus* and species of the *Caricion davallianae* Calcium-rich fen dominated by great fen sedge (saw sedge).
- H7230 Alkaline fens Calcium-rich springwater-fed fens.
- H91E0 Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) Alder woodland on floodplains, and the Annex II species
- S1016 *Vertigo moulinsiana;* Desmoulin`s whorl snail
- S1355 *Lutra*; Otter
- S1903 *Liparis loeselii*; Fen orchid

10.2.1.14 **Ramsar Criterion 6:** species/populations occurring at levels of international importance. Species with peak counts in winter:

- Bewick's swan, *Anas Penelope*, NW Europe
- Gadwall, *Anas strepera*, NW Europe
- Shoveler, *Anas clypeata*, NW & Central Europe

Conservation objectives

10.2.1.15 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

10.2.1.16 The construction of the pipeline will take place adjacent to the Habitats Site and within the 2km buffer defined by the relevant SSSI Impact Risk Zones as well as Goose and Swan Functional Land.

10.2.1.17 The pipeline route crosses the River Bure however it is assumed that directional drilling will be used to route the pipeline under the river. Directional drilling could cause subsidence of the river bed.

10.2.1.18 Potential effects from construction activities were identified in screening, those relevant to this Habitats Site are:

Physical loss and/or damage

10.2.1.19 The construction of the pipeline will take place adjacent to the Habitats Site, and partly within the relevant SSSI Impact Risk Zone, including Goose and Swan Functional Land. Arable land within Goose and Swan Functional Land is used by Bewick's swan for foraging and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

10.2.1.20 Otter may regularly range outside the Habitats Site. Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km).[39] [40] Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore likely to fall within the 2km buffer defined by the relevant SSSI Impact Risk Zone.

10.2.1.21 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

10.2.1.22 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site but within the SSSI Impact Risk Zone.

10.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

10.2.2.1 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site (e.g., River Bure) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

10.2.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

[39] Kruuk, H., 2006. Otters: ecology, behaviour and conservation: ecology, behaviour and conservation. OUP Oxford.

[40] Kruuk H. Moorhouse A., 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology 224:41–57.

Biological disturbance

10.2.2.3 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site (e.g., River Bure) therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

10.2.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

10.2.2.5 No LSE from operational activities were identified in screening.

The Broads SAC (UK0013577) (0km)

Qualifying features

10.2.2.6 The site has been selected for the following qualifying features:

- H3140. Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp*.; Calcium-rich nutrient-poor lakes, lochs and pools
- H3150. Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed
- H6410. Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows
- H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable `quaking` surface
- H7210. Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich
- fen dominated by great fen sedge (saw sedge) *
- H7230. Alkaline fens; Calcium-rich springwater-fed fens
- H91E0. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*); Alder woodland on floodplains*
- S1016. *Vertigo moulinsiana*; Desmoulins's whorl snail
- S1355. *Lutra*; Otter
- S1903. *Liparis loeselii*; Fen orchid
- S4056. *Anisus vorticulus*; Little whorlpool ram's-horn snail

Conservation objectives

10.2.2.7 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species

– The distribution of qualifying species within the site

Construction effects

10.2.2.8 The construction of the pipeline will take place adjacent to the Habitats Site and within the 2km buffer defined by the relevant SSSI Impact Risk Zones.

10.2.2.9 Potential effects from construction activities were identified in screening, those relevant to this Habitats Site are:

Physical loss and/or damage

10.2.2.10 The construction of the pipeline will take place adjacent to the Habitats Site and within the relevant SSSI Impact Risk Zone.

10.2.2.11 The pipeline route crosses the River Bure however it is assumed that directional drilling will be used to route the pipeline under the river. Directional drilling could cause subsidence of the river bed.

10.2.2.12 Otter is the only qualifying species that may regularly range outside the Habitats Site. Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km).[41] [42] Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore likely to fall within the 2km buffer defined by the relevant SSSI Impact Risk Zone.

10.2.2.13 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

10.2.2.14 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site but within the SSSI Impact Risk Zone.

10.2.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

10.2.3.1 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site (e.g., River Bure) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

10.2.3.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

10.2.3.3 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site (e.g., River Bure) therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

[41] Kruuk, H., 2006. Otters: ecology, behaviour and conservation: ecology, behaviour and conservation. OUP Oxford.

[42] Kruuk H. Moorhouse A., 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology 224:41–57.

10.2.3.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

10.2.3.5 No LSE from operational activities were identified in screening.

Broadland SPA (UK9009253) (0km)

Qualifying features

10.2.3.6 The site has been selected for the following qualifying features:

- A021 *Botaurus stellaris*; Bittern (Breeding)
- A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
- A038 *Cygnus*; Whooper swan (Non-breeding)
- A050 *Anas penelope*; Wigeon (Non-breeding)
- A051 *Anas strepera*; Gadwall (Non-breeding)
- A056 *Anas clypeata*; Shoveler (Non-breeding)
- A081 *Circus aeruginosus*; Marsh harrier (Breeding)
- A082 *Circus cyaneus*; Hen harrier (Non-breeding)
- A151 *Philomachus pugnax*; Ruff (Non-breeding)

Conservation objectives

10.2.3.7 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

10.2.3.8 The construction of the pipeline will take place adjacent to the Habitats Site and within the 2km buffer defined by the relevant SSSI Impact Risk Zones as well as Goose and Swan Functional Land.

10.2.3.9 Potential effects from construction activities were identified in screening, those relevant to this Habitats Site are:

Physical loss and/or damage

10.2.3.10 The construction of the pipeline will take place adjacent to the Habitats Site, and partly within the relevant SSSI Impact Risk Zone, including Goose and Swan Functional Land. Arable land within Goose and Swan Functional Land is used by Bewick's swan for foraging and the area

within the construction area will be reinstated to its pre-construction condition in a short period of time.

10.2.3.11 The pipeline route crosses the River Bure however it is assumed that directional drilling will be used to route the pipeline under the river. Directional drilling could cause subsidence of the river bed.

10.2.3.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

10.2.3.13 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within the Habitats Site and the relevant the SSSI Impact Risk Zones.

10.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

10.2.4.1 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site (e.g., River Bure) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

10.2.4.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

10.2.4.3 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site (e.g., River Bure) therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

10.2.4.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

10.2.4.5 No LSE from operational activities were identified in screening.

Norfolk Valley Fens SAC (UK0012892) (0.09km)

Qualifying features

The site has been selected for the following qualifying features:

- H4010. Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath
- H4030. European dry heaths
- H6210. Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*); Dry grasslands and scrublands on chalk or limestone
- H6410. Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows

- H7210. Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge) *priority natural habitat or species
- H7230. Alkaline fens; Calcium-rich springwater-fed fens
- H91E0. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*); Alder woodland on floodplains*
- S1014. *Vertigo angustior*; Narrow-mouthed whorl snail
- S1016. *Vertigo moulinsiana*; Desmoulins's whorl snail

Conservation objectives

10.2.4.6 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

10.2.4.7 The pipeline passes within the 200m buffer defined by the relevant SSSI Impact Risk Zones for Bradley Moor SSSI, a component of the Habitats Site.

10.2.4.8 There is a hydrological connection to the Habitats Site via the crossing of the River Tud. This SSSI supports 'H7230. Alkaline fens; Calcium-rich springwater-fed fens' and 'H6410. *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows'. No other qualifying features of the Habitats Site are known to be associated with this SSSI and therefore these are not considered further in this assessment.

10.2.4.9 The pipeline route crosses the River Tud and Crostwick Beck however it is assumed that directional drilling will be used to route the pipeline under the river. Directional drilling could cause subsidence of the bed of the river or beck.

10.2.4.10 Potential effects from construction activities were identified in screening, those relevant to this Habitats Site are:

Physical damage

10.2.4.11 The pipeline route crosses the River Tud upstream of the Habitats Site and within 200m of it.

10.2.4.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

10.2.4.13 The pipeline route crosses the River Tud upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing and quantity, measurable downstream in the Habitats Site.

10.2.4.14 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

10.2.4.15 The pipeline route crosses the River Tud upstream of the Habitats Site and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

10.2.4.16 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

10.2.4.17 No LSE from operational activities were identified in screening.

10.3 Measures to avoid or reduce adverse effects

10.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

10.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical loss and/or damage
  - Directional drilling will be used to avoid crossing watercourses >3m (e.g., River Bure, River Tud and River Wensum)
  - Engineering in the water environment: good practice guide river crossings (SEPA)
- Non-physical disturbance
  - Application of good industry practice, including but not limited to:
    - Government guidance on ‘Light pollution. Advice on how to consider light within the planning system’ (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government
    - British Standard (BS 5228-1:2009+A1:2014) ‘Code of practice for noise and vibration control on construction and open sites’
  - Application of a voluntary cessation of construction during severe winter weather (JNCC ‘Scheme to reduce disturbance to waterfowl during severe winter weather’)
  - Employment of an ornithology specialist as an Ecological Clerk of Work to identify the presence/absence of significant numbers of qualifying interest features and if present to implement the ‘TIDE Toolbox: Waterbird Disturbance and Mitigation Toolkit’ and the obligations set out in the CoCP and CEMP
  - Employment of an Ecological Clerk of Work to identify the location of breeding and resting places of otter, if any, and implement the obligations set out in the CoCP and CEMP; including protection zones (i.e. 30m for couches and resting places and 150m for natal holts)
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to:
    - C741 Environmental good practice on site guide (CIRIA)

    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to:
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

10.4 Further studies and monitoring

10.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

10.4.1.2 Prior to the submission of a planning application the relevant protected species surveys [e.g. Desmoulin`s whorl snail (River Wensum and Crostwick Marsh SSSI), otter (River Bure and Crostwick Marsh SSSI) and whooper and Bewick's swan in Goose and Swan Functional Land should be undertaken to ensure the relevant information is secured to support the project level HRA.

10.4.1.3 A desk-based hydrogeological assessment is required when more information is available to ensure that the pipeline installation proposed does not cause subsidence of the riverbed on the River Wensum.

11 Colchester Reuse direct to Ardleigh Reservoir (no additional treatment) (11.4Ml/d up to 2039, 13.9Ml/d after 2039) (EXS19)

11.1 Introduction

11.1.1.1 This option proposes a new reuse treatment works at Colchester Reuse and a pumping station that would transfer 11.4Ml/d of treated water until 2039, and 13.9Ml/d after 2039, from Colchester to Ardleigh Reservoir with an outfall. The option will be operational by 2032.

11.1.1.2 Screening could not rule out LSE in relation to:

- Colne Estuary (Mid-Essex Coast Phase 2) SPA (UK9009243) – approximately 3km from the option
- Colne Estuary (Mid-Essex Coast Phase 2) Ramsar site (UK11015) – approximately 3km from the option
- Essex Estuaries SAC (UK0013690) – approximately 3km from the option

11.1.1.3 The Colne Estuary is a short and branching estuary, with five tidal arms which flow into the main river channel. The estuary has a narrow intertidal zone predominantly composed of flats of fine silt with mudflat communities typical of south-eastern estuaries.

11.1.1.4 Essex Estuaries is the second largest estuarine site on the east coast of England. It contributes to the essential range and variation of estuaries in the UK as the best example of a coastal plain estuary system on the British North Sea coast.

11.1.1.5 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

11.1.1.6 It is assumed that the pipeline will be installed via directional drilling (trenchless) methods for the River Colne crossing and other watercourses present >3m. It is also assumed that the treatment of the brine via reverse osmosis will remove invasive non-native species prior to brine water being discharged into the River Colne during operation.

11.2 Appropriate Assessment

Assessment summary

11.2.1.1 This option is located in SSSI Impact Risk Zones associated with the downstream Habitats Sites of the River Colne. Hydrological connectivity links the option to the Habitats Sites via the River Colne.

11.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

11.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see ‘Measures to avoid and mitigate adverse effects’ below).

11.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Colne Estuary (Mid-Essex Coast Phase 2) SPA (UK9009243) (approximately 3km)

Qualifying features

11.2.1.3 The site has been selected for the following qualifying features:

- A046a. *Branta bernicla;* Dark-bellied brent goose (Non-breeding)
- A059. *Aythya ferina*; pochard (Breeding)
- A082. *Circus cyaneus*; Hen harrier (Non-breeding)
- A137. *Charadrius hiaticula*; Ringed plover (Breeding)
- A162. *Tringa totanus*; Redshank (Non-breeding)
- A195. *Sternula albifrons*; Little tern (Breeding)
- Waterbird assemblage

Conservation objectives

11.2.1.4 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying features
  - The supporting processes on which the habitats of the qualifying features rely
  - The population of each of the qualifying features, and,
  - The distribution of the qualifying features within the site. site

Construction effects

11.2.1.5 The proposed option is not located in any SSSI Impact Risk Zone associated with the Habitats Site. The proposed new reuse treatment works and a pumping station at Colchester Water Recycling Centre (WRC) are located in Hythe Lagoons Local Wildlife Site (LWS) and adjacent to the Upper Colne Marshes SSSI. Whilst species associated with the Habitats Sites may be found within the LWS and SSSI beyond the SSSI Impact Risk Zones associated with the Habitats Site, these sites are in any case safeguarded under Colchester City Council's Local Plan policies (Policy ENV1: Environment). The local planning authority will seek to secure "…mitigation and compensation through planning conditions/obligations where necessary".

11.2.1.6 Potential effects from construction activities relevant to this Habitats Site are:

Toxic / Non-toxic contamination

The construction of the option will be near the River Colne upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

11.2.1.7 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

11.2.1.8 The construction of the option will be near the River Colne upstream of the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

11.2.1.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

11.2.1.10 Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

11.2.1.11 The discharge of brine water into the River Colne upstream of the Habitats Site has the potential to alter the supporting processes on which the habitats of the qualifying features rely.

11.2.1.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

11.2.1.13 The discharge of brine water into the River Colne upstream of the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium.

11.2.1.14 Changes in baseline conditions may alter the supporting processes on which the habitats of the qualifying features rely.

11.2.1.15 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Colne Estuary (Mid-Essex Coast Phase 2) Ramsar site (UK11015) (3km)

Qualifying features

11.2.1.16 The site has been selected for the following criteria:

11.2.1.17 **Ramsar Criterion 1:** The site is important due to the extent and diversity of saltmarsh present. This site, and the four other sites in the Mid-Essex Coast complex, includes a total of 3,237 ha, that represent 70% of the saltmarsh habitat in Essex and 7% of the total saltmarsh in Britain.

11.2.1.18 **Ramsar Criterion 2:** The site supports 12 species of nationally scarce plants and at least 38 British Red Data Book invertebrate species.

11.2.1.19 **Ramsar Criterion 3:** This site supports a full and representative sequences of saltmarsh plant communities covering the range of variation in Britain.

11.2.1.20 **Ramsar Criterion 5:** Assemblages of international importance: 32041 waterfowl (5 year peak mean 1998/99-2002/2003)

11.2.1.21 **Ramsar Criterion 6:** Species/populations occurring at levels of international importance

11.2.1.22 Species with peak counts in winter (identified at designation):

- Dark-bellied brent goose, *Branta bernicla*
- Redshank, *Tringa totanus*

Conservation objectives

11.2.1.23 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

11.2.1.24 The proposed option is not located in any SSSI Impact Risk Zone associated with the Habitats Site. The proposed new reuse treatment works and a pumping station at Colchester Water Recycling Centre (WRC) are located in Hythe Lagoons Local Wildlife Site (LWS) and adjacent to the Upper Colne Marshes SSSI. Whilst species associated with the Habitats Sites may be found within the LWS and SSSI beyond the SSSI Impact Risk Zones associated with the Habitats Site, these sites are in any case safeguarded under Local Plan policies (Policy ENV1: Environment). The local planning authority will seek to secure "…mitigation and compensation through planning conditions/obligations where necessary".

11.2.1.25 Potential effects from construction activities relevant to this Habitats Site are:

Toxic / Non-toxic contamination

The construction of the option will be near the River Colne upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

11.2.1.26 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

11.2.1.27 The construction of the option will be near the River Colne upstream of the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

11.2.1.28 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

11.2.1.29 Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

11.2.1.30 The discharge of brine water into the River Colne upstream of the Habitats Site has the potential to alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

11.2.1.31 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

11.2.1.32 The discharge of brine water into the River Colne upstream of the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium.

11.2.1.33 Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

11.2.1.34 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Essex Estuaries SAC (UK0013690) (approximately 3km)

Qualifying Species

- The site has been selected for the following qualifying features:
- H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks
- H1130. Estuaries
- H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats
- H1310. Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand
- H1320. Spartina swards (*Spartinion maritimae);* Cord-grass swards
- H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)*
- H1420. Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*); Mediterranean saltmarsh scrub

Conservation objectives

11.2.1.35 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

11.2.1.36 The proposed option is not located in any SSSI Impact Risk Zone associated with the Habitats Site. The proposed new reuse treatment works and a pumping station at Colchester Water Recycling Centre (WRC) are located in Hythe Lagoons Local Wildlife Site (LWS) and adjacent to the Upper Colne Marshes SSSI.

11.2.1.37 Whilst species associated with the Habitats Sites may be found within the LWS and SSSI beyond the SSSI Impact Risk Zones associated with the Habitats Site, these sites are in any case safeguarded under Local Plan policies (Policy ENV1: Environment). The local planning authority will seek to secure "…mitigation and compensation through planning conditions/obligations where necessary".

11.2.1.38 It is assumed that the pipeline will be directionally drilled under the River Colne.

11.2.1.39 Potential effects from construction activities relevant to this Habitats Site are:

Toxic / Non-toxic contamination

11.2.1.40 The construction of the option will be near the River Colne upstream of the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

11.2.1.41 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

11.2.1.42 The construction of the option will be near the River Colne upstream of the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

11.2.1.43 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

11.2.1.44 Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

11.2.1.45 The discharge of brine water into the River Colne upstream of the Habitats Site may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

11.2.1.46 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

11.2.1.47 The discharge of brine water into the River Colne upstream of the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

11.2.1.48 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity. This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary

11.3 Measures to avoid or reduce adverse effects

11.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

11.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to —

    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to —
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)

11.3.1.3 The operational limits of abstraction and brine water discharge will be constrained by the updated Anglian River Basin Management Plan (RBMP) — the principal safeguard related to river basin management. RBMPs set the legally binding, locally specific, environmental objectives that underpin water regulation (such as permitting) and planning activities. The environmental objectives in the RBMP are legally binding once the plan is approved by Secretary of State for Environment, Food and Rural Affairs. All public bodies must have regard to these objectives when making decisions that could affect the quality of the water environment and WRMPs or actions arising from them should act as mechanisms to deliver RBMP objectives.

11.3.1.4 The Local Plan policies also require developments to contribute positively towards delivering the aims and objectives of the Anglian RBMP. The overarching environmental objectives relevant to this assessment include: (1) preventing deterioration of the status of surface waters and groundwater; and (2) achieving objectives and standards for protected areas.

11.3.1.5 The Habitats Regulations Assessment for the Anglian River Basin RBMP identified measures that were considered "inherently capable of improving the integrity and resilience of Habitats Sites". The following RBMP measures will be considered in the option development include:

- Control pattern/timing of abstraction
- Use alternative source/relocate abstraction or discharge
- Mitigate/remediate point source impacts on receptor (i.e., implement compensation/augmentation flow – as stated in WFD Level 2 assessment)
- Reduce point source pollution at source (i.e., measures to dilute RO concentrate before discharged into the River Colne – as stated in WFD Level 2 assessment)

11.3.1.6 The significance of changes to salinity levels will depend on the concentration and volume of brine discharge at the proposed outfall point. However, as per Common Standards Monitoring Guidance for Estuaries (JNCC 2004), readings should not deviate from the salinity range predicted for the Habitats Site by the baseline data.

11.3.1.7 Specific measures for consideration in the option design are:

- Methods for brine discharge or processing that will remove the need to discharge into the estuary.
- Installation of a salinity and residual chemical diffuser on the out take. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the estuarine bed.

- Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water).
- Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the estuarine environment.
- Brine water could discharge into lagoons. If this option were to be pursued then the use and harvesting of salt or highly concentrated brine for use as refrigerating fluid, water softening and purification and de-icing could be considered.

11.3.1.8 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

11.4 Further studies and monitoring

11.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

11.4.1.2 With respect to the Habitats Sites the following studies are recommended:

- A hydroecology impact assessment.
- Hydrological assessment of the changes in flow, sedimentation and hydromorphology from the abstraction and discharges.
- Water quality studies to determine the effects of the brine discharge on other physiochemical parameters in the River Colne including water chemistry, salinity and temperature regime.
- Nutrient neutrality assessment and further modelling of sedimentation water quality monitoring and modelling to determine the potential adverse effects of water quality changes.
- A climate change scenario analysis to account for mid and long-term effects.

12 Norfolk Bradenham to Suffolk Thetford potable transfer (15 Ml/d) (SUT5)

12.1 Introduction

12.1.1.1 This pipeline option will transfer potable water from West Bradenham WTW to Mundford Road Water Reuse (WR) and will be operational by 2032.

12.1.1.2 Screening could not rule out LSE in relation to:

- Breckland SPA (UK9009201) – 0km, option crosses the SPA
- Breckland SAC (UK0019865) - 0km, option crosses the SAC

12.1.1.3 The Breckland SAC and SPA is characterised by an extensive area of grass heath (and some heather heath), large arable fields, and the largest coniferous forest in lowland England. Together, these support over 2000 priority species, many of which are confined to the area, or have their core UK distribution there. Breckland SPA holds internationally important populations of stone curlew, nightjar and woodlark. Stone curlew establishes nests on open ground provided by arable cultivation in the spring, while woodlark and nightjar breed in recently felled areas and open heath areas within the conifer plantations.

12.1.1.4 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

12.2 Appropriate Assessment

Assessment summary

12.2.1.1 This option is located in the Breckland Habitat Sites and its SSSI Impact Risk Zones.

12.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

12.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see ‘Measures to avoid and mitigate adverse effects’ below).

12.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

12.3 Breckland SPA (UK9009201) (0km)

Qualifying features

12.3.1.1 The site has been selected for the following qualifying features:

- A133 *Burhinus oedicnemus;* Stone-curlew (Breeding)
- A224 *Caprimulgus europaeus*; European nightjar (Breeding)
- A246 *Lullula arborea*; Woodlark (Breeding)

Conservation objectives

12.3.1.2 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

12.3.1.3 A small section of this option is located in lowland dry acid grassland within Breckland SPA where it also falls partly with the A1075 trunk road.

12.3.1.4 The grassland in the Habitats Site where the pipeline route passes may be supporting habitat for woodlark and nightjar only, as stone-curlew typically avoid nesting close to woodland, roads and human recreational activities (e.g., dog walking), all of which are present in this area.

12.3.1.5 The construction of the option will otherwise take place within relevant SSSI Impact Risk Zones.

12.3.1.6 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

12.3.1.7 In addition to the Habitats Site, a small section of this option is located in lowland dry acid grassland within Breckland SPA and otherwise crosses multiple SSSI Impact Risk Zones associated with this Habitats Site. The pipeline route at the time of this plan level assessment falls partly or fully with the A1075 trunk road in places and clearly represents an early iteration to the design process.

12.3.1.8 The grassland may be supporting habitat for woodlark and nightjar only, as stone-curlew typically avoid nesting close to woodland, roads and human recreational activities (e.g., dog walking), all of which are present where the pipeline routes passes through the SPA. the habitats within the SSSI Impact Risk Zones also have the potential to act as supporting off-site habitat (courtship, nesting, feeding).

12.3.1.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

12.3.1.10 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore inside the Habitats Site and the SSSI Impact Risk Zone.

12.3.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / non-toxic contamination

12.3.2.1 Air quality impacts associated with construction are likely to occur within 50 metres of the footprint (to account for the physical effects of dust deposition) and 200 metres of the footprint and haul routes (to account for changes in air pollutants) respectively.

12.3.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

12.3.2.3 The construction of the pipeline may include activities where there is a risk of increased mortality (i.e., destruction of eggs and dependent young) and the introduction of invasive non-native species to the construction site.

12.3.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

No LSE from operational activities were identified in screening.

Breckland SAC (UK0019865) (0km)

Qualifying features

12.3.2.5 The site has been selected for the following qualifying features:

- 2330. Inland dunes with open *Corynephorus* and *Agrostis* grasslands
- 3150. Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation
- 4030. European dry heaths
- 6210. Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*)
- 91E0. Alluvial forests with *Alnus g*lutinosa and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature
- 1166. Great crested newt *Triturus cristatus*

Conservation objectives

12.3.2.6 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

12.3.2.7 A small section of this option is located in lowland dry acid grassland within Breckland SAC where it also falls partly with the A1075 trunk road.

12.3.2.8 The grassland has the potential to meet the identification criteria for the qualifying feature 'H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)'.

12.3.2.9 The construction of the option will otherwise take place within relevant SSSI Impact Risk Zones.

12.3.2.10 Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

12.3.2.11 The habitats within the SSSI Impact Risk Zones have the potential to provide functional connectivity with wider landscape for great crested newt and may be hydrologically linked to ponds within the Habitats Site.

12.3.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / non-toxic contamination

12.3.3.1 The construction of the option will be near permanent or temporary surface water features used by great crested newt. The accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

12.3.3.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

The construction of the pipeline may include activities where there is a risk of increased mortality (i.e., destruction of great crested newt resting places) and the introduction of invasive non-native species to the construction site.

12.3.3.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

No LSE from operational activities were identified in screening.

12.4 Measures to avoid or reduce adverse effects

12.4.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

12.4.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical damage

  - Pipeline route optimisation to align route through the SPA and SAC entirely within the A1075 corridor.
  - Government guidance on great crested newts: advice for making planning decisions (Natural England).
  - Great Crested Newt Mitigation Guidelines (English Nature).
- Non-physical disturbance
  - Application of good industry practice, including but not limited to —
    - Government guidance on 'Light pollution. Advice on how to consider light within the planning system' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government
    - British Standard (BS 5228-1:2009+A1:2014) 'Code of practice for noise and vibration control on construction and open sites'
    - Line of sight screening (site personnel and vehicles).
  - If necessary, employment of an ornithology specialist as an Ecological Clerk of Work to implement the obligations set out in the CoCP and CEMP
  - If necessary, application of seasonal avoidance stone-curlew, nightjar and woodlark
    - March to September, inclusive (stone-curlew, nightjar and woodlark) — Avoidance of disturbance to stone-curlew and woodlark is required under the Wildlife and Countryside Act 1981 (as amended). Planning conditions will likely require that no potentially disturbing activities take place within 500m of an active stone-curlew
    - November to February, inclusive (great crested newt hibernation)
- Toxic contamination / Non-toxic contamination
  - Directional drilling will be used to avoid crossing watercourses >3m
  - Application of good industry practice, including but not limited to —
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to —
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)
    - Great Crested Newt Mitigation Guidelines (English Nature)

12.4.1.3 Government guidance on great crested newts: advice for making planning decisions (Natural England).On the basis of the above identified measures, it is considered at this plan level there is confidence adverse effects can be avoided or fully mitigated.

12.5 Further studies and monitoring

12.5.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how

adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

12.5.1.2 Prior to the submission of a planning application the relevant protected habitats species surveys (e.g., H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*), stone-curlew, nightjar, woodlark and great crested newt) should be undertaken to ensure the relevant information is secured to support the project level HRA.

13 Norfolk Bradenham to Norfolk East Dereham potable transfer (10 Ml/d) (NED2)

13.1 Introduction

13.1.1.1 This pipeline option will transfer potable water from West Bradenham WTW to East Dereham WTW (10 Ml/d) and will be operational by 2035.

13.1.1.2 Screening could not rule out LSE in relation to:

- River Wensum SAC (UK0012647) – approximately 4km from the option

13.1.1.3 The River Wensum is a designated SAC for 71km of its 73km length and is considered to be a key example of a naturally enriched calcareous lowland river in the United Kingdom (UK), with over 100 species of plants, a rich invertebrate fauna and a relatively natural corridor. The upper reaches of the river are fed by springs that rise from the chalk and by run-off from calcareous soils rich in nutrients, which gives rise to dense beds of submerged and emergent vegetation, characteristic of a chalk stream. Further downstream, the chalk is overlain with boulder clay and river gravels.

13.1.1.4 The AA is set out below for the Habitats Site, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

13.2 Appropriate Assessment

Assessment summary

13.2.1.1 This option is not located in a relevant SSSI Impact Risk Zone for the River Wensum SAC. Hydrological connectivity links the option to the Habitats Sites via surface water features, including Wending Beck.

13.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

13.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see ‘Measures to avoid and mitigate adverse effects’ below).

13.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on site integrity of any habitats site.

River Wensum SAC (UK0012647) (approximately 4km)

Qualifying features

13.2.1.3 The site has been selected for the following qualifying features:

- H3260. Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation; Rivers with floating vegetation often dominated by water-crowfoot
- S1016. *Vertigo moulinsiana*; Desmoulin`s whorl snail
- S1092. *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish

- S1096. *Lampetra planeri*; Brook lamprey
- S1163. *Cottus gobio*; Bullhead

Conservation objectives

13.2.1.4 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

13.2.1.5 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment.

13.2.1.6 The construction of the pipeline will take place approximately 4km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone.

13.2.1.7 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

13.2.1.8 The construction of the pipeline will take place approximately 4km beyond the boundary of the Habitats Site and the 2km buffer defined by the relevant SSSI Impact Risk Zone.

13.2.1.9 On this basis, a change in the extent, distribution, structure and function of the qualifying natural habitats and the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

Toxic / Non-toxic contamination

13.2.1.10 The construction of the option will be near water features that flow directly into the Habitats Site (e.g., Wending Beck) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

13.2.1.11 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

13.2.1.12 The construction of the option will be near water features that flow directly into the Habitats Site (e.g., Wending Beck) therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

13.2.1.13 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

13.2.1.14 No LSE from operational activities were identified in screening.

13.3 Measures to avoid or reduce adverse effects

13.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

13.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical damage
  - Directional drilling will be used to avoid crossing watercourses >3m
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to:
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to:
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - ‘Clean Check Dry’ (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

13.4 Further studies and monitoring

13.4.1.1 No further studies and monitoring to support the project level assessment have been identified at the plan level assessment.

14 Norfolk East Dereham to North Norfolk Coast potable transfer (10 Ml/d) (NNC4)

14.1 Introduction

14.1.1.1 This pipeline option will transfer potable water from Norfolk East Dereham to North Norfolk Coast potable transfer (10 Ml/d) and will be operational by 2035.

14.1.1.2 Screening could not rule out LSE in relation to:

- River Wensum SAC (UK0012647) – 0km, option crosses the SAC.

14.1.1.3 River Wensum is a designated SAC for 71km of its 73km length and is considered to be a key example of a naturally enriched calcareous lowland river in the United Kingdom (UK), with over 100 species of plants, a rich invertebrate fauna and a relatively natural corridor. The upper reaches of the river are fed by springs that rise from the chalk and by run-off from calcareous soils rich in nutrients, which gives rise to dense beds of submerged and emergent vegetation, characteristic of a chalk stream. Further downstream, the chalk is overlain with boulder clay and river gravels.

14.1.1.4 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

14.2 Appropriate Assessment

Assessment summary

14.2.1.1 This option crosses the River Wensum SAC and the associated SSSI Impact Risk Zones.

14.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

14.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see ‘Measures to avoid and mitigate adverse effects’ below).

14.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

River Wensum SAC (UK0012647) (0km)

Qualifying features

14.2.1.3 The site has been selected for the following qualifying features:

- H3260. Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation; Rivers with floating vegetation often dominated by water-crowfoot
- S1016. *Vertigo moulinsiana*; Desmoulin’s whorl snail
- S1092. *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish
- S1096. *Lampetra planeri*; Brook lamprey
- S1163. *Cottus gobio*; Bullhead

Conservation objectives

14.2.1.4 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

14.2.1.5 The pipeline route crosses the Habitats Site. Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

14.2.1.6 The pipeline route crosses the Habitats Site.

14.2.1.7 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

14.2.1.8 The pipeline route crosses the habitats and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

14.2.1.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

14.2.1.10 The pipeline route crosses the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

14.2.1.11 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

14.2.1.12 No LSE from operational activities were identified in screening.

14.3 Measures to avoid or reduce adverse effects

14.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be

included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

14.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical loss/damage
  - Directional drilling will be used to avoid crossing watercourses >3m
  - Engineering in the water environment: good practice guide River crossings (SEPA
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to:
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to:
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - 'Clean Check Dry' (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

14.4 Further studies and monitoring

14.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

14.4.1.2 Prior to the submission of a planning application the relevant protected species surveys (e.g., Desmoulin's whorl snail) should be undertaken to ensure the relevant information is secured to support the project level HRA.

14.4.1.3 A desk-based hydrogeological assessment is required to inform pipeline design to ensure that the pipeline installation does not cause subsidence of the riverbed on the River Wensum.

15 South Humber Bank Non-potable desalination (60Ml/d) (SHB9)

15.1 Introduction

15.1.1.1 These options propose the construction of a new desalination treatment plant and is intended to be operational by 2036.

15.1.1.2 Screening could not rule out LSE in relation to:

- Greater Wash SPA (UK9020329) – 0 km, option within SPA
- Humber Estuary Ramsar site (UK11031) – approximately 3.5km from option
- Humber Estuary SPA (UK9006111) – approximately 3.5km from option
- Humber Estuary SAC (UK0030170) – approximately 3.5km from option
- Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC (UK0030270) 0 km, option within SAC

15.1.1.3 The Greater Wash SPA is in the mid-southern North Sea between Bridlington Bay in the north and the Outer Thames Estuary SPA in the south. To the north, off the Holderness coast in Yorkshire, seabed habitats primarily comprise coarse sediments, with occasional areas of sand, mud and mixed sediments. Subtidal sandbanks occur at the mouth of the Humber Estuary, primarily comprising sand and coarse sediments. Offshore, soft sediments dominate, with extensive areas of subtidal sandbanks off The Wash as well as north and east Norfolk coasts. Closer inshore at The Wash and north Norfolk coast, sediments comprise a mosaic of sand, muddy sand, mixed sediments and coarse sediments, as well as occasional Annex I reef.

15.1.1.4 The Humber Estuary Ramsar site, SPA, and SAC are located on the east coast of England and comprises extensive wetland and coastal habitats. The inner estuary supports extensive areas of reedbed, with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. Parts of the estuary are owned and managed by conservation organisations.

15.1.1.5 Saltfleetby–Theddlethorpe Dunes and Gibraltar Point SAC comprises two dune systems within the Lincolnshire Coast & Marshes National Character Area (NCA) separated by about 25km. Saltfleetby–Theddlethorpe Dunes are the larger of the two systems and run between Saltfleet and Mablethope. Gibraltar Point is located further south adjacent to Skegness, close to where the Wash and the North Sea meet.

15.1.1.6 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

15.2 Appropriate Assessment

Assessment summary

15.2.1.1 These options are located in the Greater Wash SPA and Saltfleetby–Theddlethorpe Dunes and Gibraltar Point SAC (i.e., brine discharge pipeline) and well as the SSSI Impact Risk Zones associated with the Habitats Sites of the coastal portion of the Humber Estuary.

15.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

15.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

15.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Greater Wash SPA (UK9020329) (0km)

Qualifying features

15.2.1.3 The site has been selected for the following qualifying features:

- A195 *Sternula albifrons*; Little tern (Breeding)
- A193 *Sterna hirundo*; Common tern (Breeding)
- A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
- A177 *Hydrocoloeus minutus*; Little gull (Non-breeding)
- A001 *Gavia stellata*; Red-throated diver (Non-breeding)
- A065 *Melanitta nigra*; Common scoter (Non-breeding)

Conservation objectives

15.2.1.4 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

15.2.1.5 The proposed offshore pipeline is located within the Habitats Site and the onshore elements of the option are hydrologically connected via Great Eau.

15.2.1.6 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.7 The construction of the option may include activities that risk converting supporting natural habitat in the Habitats Site to built infrastructure and increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

15.2.1.8 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.9 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

15.2.1.10 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.11 The option will be within the Habitats Site and near water features that flow directly into the Habitats Site (e.g., Great Eau) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

15.2.1.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

15.2.1.13 The proposed offshore water intake and brine water discharge pipeline is located within Habitats Sites.

15.2.1.14 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.15 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes have the potential to alter supporting habitats.

15.2.1.16 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.17 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

15.2.1.18 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.19 The discharge of brine water into the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

15.2.1.20 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.21 Operation of the option may include activities where there is a risk of displacement and mortality of prey species (e.g., sea water intake and brine discharge). Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

15.2.1.22 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Humber Estuary Ramsar (UK11031) (3.5km)

Qualifying features

15.2.1.23 The site has been selected for the following criteria:

15.2.1.24 **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
- Coastal brackish/saline lagoons

15.2.1.25 **Ramsar Criterion 3:** The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* 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 *Bufo calamita*.

15.2.1.26 **Ramsar Criterion 5:** Assemblages of international importance: 153,934 waterfowl, non-breeding season (5 year peak mean 1996/97-2000/2001)

15.2.1.27 **Ramsar Criterion 6:** Species/populations occurring at levels of international importance

- Golden plover, *Pluvialis apricaria altifrons* subspecies – North West (NW) Europe, Western (W) Continental Europe, NW Africa population
- Knot, Calidris canutus islandica subspecies
- Dunlin, *Calidris alpine alpina* subspecies – W Europe (non-breeding) population
- Black-tailed godwit, *Limosa islandica* subspecies
- Redshank, *Tringa totanus brittanica* subspecies
- Shelduck, *Tadorna* North-Western Europe (breeding) population
- Golden plover, *Pluvialis apricaria altifrons* subspecies – NW Europe, W Continental Europe, NW Africa population

15.2.1.28 **Ramsar Criterion 8:** The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

15.2.1.29 Species with peak counts in spring/autumn:

- Golden plover, *Pluvialis apricaria*, Iceland & Faroes/E Atlantic
- Knot, *Calidris canutus islandica*, W & Southern Africa (wintering)
- Dunlin, Calidris *alpina*, W Siberia/W Europe
- Black-tailed godwit, *Limosa islandica*, Iceland/W Europe
- Redshank, Tringa totanus,

15.2.1.30 Species with peak counts in winter:

- Shelduck, *Tadorna*, NW Europe

- Golden plover, *Pluvialis apricaria*, Iceland & Faroes/Eastern (E) Atlantic
- Knot, *Calidris canutus islandica*, W & Southern (S) Africa (wintering)
- Dunlin, *Calidris alpina*, W Siberia/W Europe
- Black-tailed godwit, *Limosa islandica*, Iceland/W Europe
- Bar-tailed godwit, *Limosa lapponica*, W Palearctic

Conservation objectives

15.2.1.31 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment..

Construction effects

15.2.1.32 The option is located beyond the Habitats Site but within the associated SSSI Impact Risk Zones, including Goose and Swan Functional Land.

15.2.1.33 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.34 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

15.2.1.35 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.36 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

15.2.1.37 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.38 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

15.2.1.39 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.40 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

15.2.1.41 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

15.2.1.42 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

15.2.1.43 Potential effects from operation activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.44 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

15.2.1.45 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.46 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

15.2.1.47 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.48 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

15.2.1.49 The discharge of brine water into the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

15.2.1.50 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.51 Operation may include activities where there is a risk of displacement and mortality of qualifying species (e.g. sea lamprey and river lamprey) as well as prey species as a result of the sea water intake and brine discharge. Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

15.2.1.52 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the operational site to reach the Habitats Site.

15.2.1.53 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Humber Estuary SPA (UK9006111) (3.5km)

Qualifying features

15.2.1.54 The site has been selected for the following qualifying features:

- A021 *Botaurus stellaris*; Great bittern (Non-breeding)
- A021 *Botaurus stellaris*; Great bittern (Breeding)
- A048 *Tadorna*; Common shelduck (Non-breeding)
- A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
- A082 *Circus cyaneus*; Hen harrier (Non-breeding)
- A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
- A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
- A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
- A143 *Calidris canutus*; Red knot (Non-breeding)
- A149 *Calidris alpina*; Dunlin (Non-breeding)
- A151 *Philomachus pugnax*; Ruff (Non-breeding)
- A156 *Limosa islandica*; Black-tailed godwit (Non-breeding)
- A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
- A162 *Tringa totanus*; Common redshank (Non-breeding)
- A195 *Sterna albifrons*; Little tern (Breeding)
- Waterbird assemblage

Conservation objectives

15.2.1.55 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

15.2.1.56 The option is located beyond the Habitats Site but within the associated SSSI Impact Risk Zones, including Goose and Swan Functional Land.

15.2.1.57 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.58 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

15.2.1.59 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.60 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

15.2.1.61 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.62 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

15.2.1.63 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.64 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

15.2.1.65 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

15.2.1.66 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

15.2.1.67 Potential effects from operation activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.68 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

15.2.1.69 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.70 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

15.2.1.71 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.72 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

15.2.1.73 The discharge of brine water into the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

15.2.1.74 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.75 Operation may include activities where there is a risk of displacement and mortality of prey species as a result of the sea water intake and brine discharge. Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

15.2.1.76 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the operational site to reach the Habitats Site.

15.2.1.77 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC (UK0030270) (0km)

Qualifying features

- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)
- 2130 Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature
- 2160 Dunes with *Hippophae rhamnoides*
- 2190 Humid dune slacks
- 2110 Embryonic shifting dunes

Conservation objectives

15.2.1.78 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

15.2.1.79 The option is located partly within the Habitats Site where ‘H2110 Embryonic Shifting Dunes’ and ‘H2120 Shifting Dunes with marram’ are likely to be present.

15.2.1.80 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.81 The construction of the option may include activities within the Habitats Site. Direct and indirect impacts have the potential to alter the extent of qualifying features.

15.2.1.82 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.83 The construction of the option may include activities within the Habitats Site and the relevant SSSI Impact Risk Zones where the accidental release or resuspension of toxic and non-toxic contaminants may occur.

15.2.1.84 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.85 The construction of the option may include activities within the Habitats Site and the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

15.2.1.86 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

15.2.1.87 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

15.2.1.88 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.89 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

15.2.1.90 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.91 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

15.2.1.92 The discharge of brine water into the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

15.2.1.93 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.94 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species introduced at the operational site to reach the Habitats Site.

15.2.1.95 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Humber Estuary SAC (UK0030170) (approximately 3.5km)

Qualifying features

15.2.1.96 The site has been selected for the following qualifying features:

- H1110 Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks
- H1130 Estuaries
- H1140 Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats
- H1150 Coastal lagoons*
- H1310 Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand
- H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- H2110 Embryonic shifting dunes
- H2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram
- H2130 Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland*
- H2160 Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn
- S1095 *Petromyzon marinus*; Sea lamprey
- S1099 *Lampetra fluviatilis*; River lamprey
- S1364 *Halichoerus grypus*; Grey seal

Conservation objectives

15.2.1.97 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

15.2.1.98 The option is located beyond the Habitats Site but within the associated SSSI Impact Risk Zones, including Goose and Swan Functional Land.

15.2.1.99 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.100 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

15.2.1.101 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.102 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

15.2.1.103 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.104 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

15.2.1.105 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.106 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

15.2.1.107 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

15.2.1.108 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

15.2.1.109 Potential effects from operation activities relevant to this Habitats Site are:

Physical loss and/or damage

15.2.1.110 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

15.2.1.111 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

15.2.1.112 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

15.2.1.113 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

15.2.1.114 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

15.2.1.115 The discharge of brine water into the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium there may also be an increase in temperature. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

15.2.1.116 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

15.2.1.117 Operation may include activities where there is a risk of displacement and mortality of qualifying species (e.g. sea lamprey and river lamprey) as well as prey species as a result of the sea water intake and brine discharge. Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

15.2.1.118 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the operational site to reach the Habitats Site.

15.2.1.119 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

15.3 Measures to avoid or reduce adverse effects

15.3.1.1 The East Inshore and Offshore Marine Plan sets out priorities and directions for future development within the plan area and among other things helps marine users understand the best locations for their activities, including where new developments may be appropriate. When applying for a licence or approval it must be demonstrated how the marine plan has been considered and how the project contributes to achieving objectives in the marine plan.

15.3.1.2 The following marine plan policies will be considered in the detailed design of the option:

- E-MPA-1 Marine protected areas - Any impacts on the overall Marine Protected Area network must be taken account of in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network.

15.3.1.3 The measures to avoid or reduce adverse effects that would facilitate compliance with the marine plan policies should include:

- Design measures incorporated in:
  - Detailed Pipe/Cable Laying Plan
  - Scour Protection Plan

  - Brine Water Discharge Management Plan
  - Climate Change Resilience Assessment
- Construction/decommissioning measures incorporated in:
  - Code of Construction Practice
  - Code of Conduct for Vessel Operators
  - Chemical Risk Assessment
  - Marine Pollution Contingency Plan
  - Biosecurity Plan
- Operational measures incorporated in:
  - Code of Conduct for Vessel Operators
  - Chemical Risk Assessment
  - Marine Pollution Contingency Plan
  - Biosecurity Plan
  - Biodiversity Impingement and Entrainment Adaptive Management Plan

15.3.1.4 Specific measures for consideration in the option design are:

- Methods for brine discharge or processing that will remove the need to discharge into the estuary.
- Installation of a salinity and residual chemical diffuser on the out take. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the estuarine bed.
- Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water).
- Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the estuarine environment.

15.3.1.5 Brine water could discharge into lagoons. If this option were to be pursued then the use and harvesting of salt or highly concentrated brine for use as refrigerating fluid, water softening and purification and de-icing could be considered.

15.3.1.6 Measures will be delivered at the project level using the principles set out below:

- An engagement plan will set out the expectations and timescales of consultation so that stakeholders can provide advice during the design and consenting processes.
- Option design and the development of measures to safeguard the Habitats Site will be informed by further research (listed below).
- In planning the location of marine infrastructure, the emphasis should be on avoiding Habitats Sites. If this is not possible, adverse effects must be minimised through design, so they are no longer significant.
- Where it is necessary to minimise adverse effects of marine infrastructure at the project level, appropriate measures should ideally be agreed with statutory stakeholders and be capable of being secured within project design and/or consents. Mitigation measures will also need to be acceptable to competent authorities.
- ‘Best available techniques’ (BAT) for preventing or minimising impacts on the environment. Consideration of BAT will include the use of technology, design as well as construction, operation, maintenance and decommissioning methods.
- Current best practice environmental considerations, guidance and advice from statutory nature conservation bodies (e.g., Natural England) will be taken into account during the detailed design process.

- Planning of marine infrastructure should be undertaken in consultation with key stakeholders (e.g., Natural England and, where appropriate, JNCC). Other non-statutory consultees should also be included in the consultation (e.g., RSPB).

15.3.1.7 The above measures have all been implemented on consented nationally significant infrastructure projects and therefore there is practical certainty they can be implemented and in place at the relevant time when the project level appropriate is undertaken. The full implementation of these measures, together with any site-specific efficacy research, will be secured and enforced as it has on other projects, in the project planning process.

15.3.1.8 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

15.4 Further studies and monitoring

15.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

15.4.1.2 Prior to the submission of a planning application the relevant protected habitat and species surveys (onshore and offshore) should be undertaken to ensure the relevant information is secured to support the project level HRA.

15.4.1.3 Further studies will be required to inform measures related to coastal processes, the brine discharge and its effect on baseline water quality, salinity and temperature.

16 Fens Reservoir 50MCM (usable volume) (44.4 Ml/d) (FND29)

16.1 Introduction

16.1.1.1 This option proposes a new reservoir in the Fens. The proposed site is between Chatteris and March, near to Doddington, Wimblington and Manea. The Fens Reservoir is a proposed development of a 55 cubic megametres (Mm^3) reservoir with a useable volume of 50Mm^3. The initial proposal was to fill the reservoir with abstraction from the River Great Ouse at Earith and the River Delph, during high flow periods. Additional points of abstraction from the Sixteen Foot Drain, the River Nene and the Counter Drain (Nene) are being assessed. The water stored at the reservoir will then be treated and distributed.

16.1.1.2 This option is identified to be operational by 2036.

16.1.1.3 Screening could not rule out LSE in relation to:

- Ouse Washes SAC (Distance from reservoir 5km)
- Ouse Washes Ramsar site (Distance from reservoir 5km)
- Ouse Washes SPA (Distance from reservoir 5km)
- Nene Washes SPA (Distance from reservoir 12km)
- Nene Washes Ramsar site (Distance from reservoir 12km)
- Nene Washes SAC (Distance from 12km)
- The Wash and North Norfolk Coast SAC (Distance from reservoir 35km)
- The Wash Ramsar site (Distance from reservoir 35km)
- The Wash SPA (Distance from reservoir 35km)

16.1.1.4 The Ouse Washes is, subject to winter the largest area of washland habitat remaining in the country (approximately 30km long by 1 km wide). It encompasses two canalised main river channels of the River Great Ouse that run each side of its length, and an extensive area of wet grassland and field drains in between.

16.1.1.5 Covering a total area of approximately 88 hectares within the Fens National Character Area (NCA), the Nene Washes lie north-west of the Ouse Washes. The Nene Washes are one of the country's few remaining areas of low-lying, periodically inundated grassland (washland) habitat and this site is notable for the diversity of plant and associated animal life within its network of dykes.

16.1.2 The Wash is the largest embayment in the UK. It is connected via sediment transfer systems to the north Norfolk coast. Together, the Wash and North Norfolk Coast form one of the most important marine areas in the UK and the European North Sea coast and includes extensive areas of varying, but predominantly sandy, sediments subject to a range of conditions.

16.2 Appropriate Assessment

Assessment summary

16.2.1.1 This option is partly located in the Ouse Washes SAC/SPA/Ramsar site (i.e., water intake) and its SSSI Impact Risk Zones including Goose and Swan Functional Land. Hydrological connectivity links the option to the habitat's sites of the Ouse Washes, Nene Washes and the

Wash via surface water features, including the Middle Level drainage network between the Ouse and Nene Washes and the River Ouse to the Wash.

16.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

16.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

16.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on site integrity of any habitats site.

Ouse Washes SAC (UK0013011) (5km)

Qualifying features

16.2.1.3 The site has been selected for the following qualifying features:

- S1149. *Cobitis taenia*; Spined loach

Conservation objectives

16.2.1.4 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

16.2.1.5 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

16.2.1.6 The construction of the option may include activities that risk converting supporting habitat in the Habitats Site to built infrastructure (i.e., water intake) and increasing sedimentation and siltation from surface water runoff in drainage ditches outside the Habitats Site. Impacts on surface waters may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.1.7 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

16.2.1.8 The construction of the option may include activities where there is a risk of pollution. Spined loach may be particularly vulnerable to deposited pollutants due to their burrowing and feeding habits. Pollutants may result in obvious lethal effects, however, a wide variety of sub-lethal effects, such as reduced fertility may affect the overall fitness of spined loach. Contamination of surface waters have the potential to alter habitat structure and function.

On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

16.2.1.9 The construction of the pipeline may include activities where there is a risk of introducing invasive non-native species. Invasive non-native species have the potential to alter supporting habitat structure and function.

On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

16.2.1.10 Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

16.2.1.11 The operation of the option may include activities (i.e., water intake) that risk changes to the hydrological regime. Changes in the deposition rates of fine sediment on gravels may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.1.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-toxic contamination

16.2.1.13 In operation (i.e., water intake), there is a risk of changes to the hydrological regime and decreases in dissolved oxygen that may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.1.14 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

16.2.1.15 In operation (i.e., water intake) there is a risk of increasing mortality. Increased mortality has the potential to alter population size of the qualifying species.

16.2.1.16 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Ouse Washes Ramsar (UK11051) (5km)

Qualifying features

16.2.1.17 The site has been selected for the following qualifying features:

16.2.1.18 **Ramsar criteria 1:** Representative example of a near-natural wetland type: washland habitat with unimproved neutral grassland, associated dykes and base-rich, slow flowing lowland rivers with a great variety of aquatic plants.

16.2.1.19 **Ramsar criteria 2:** Supporting notably 10 nationally rare water plants, relict Fenland invertebrates, the nationally red-listed large darter dragonfly and rifle beetle, plus an assemblage of nationally rare breeding birds associated with seasonally flooded wet grassland).

16.2.1.20 **Ramsar criteria 5:** Assemblages of international importance. Species with peak counts in winter: 59133 waterfowl (5 year peak mean 1998/99-2002/2003).

16.2.1.21 **Ramsar criteria 6:** Species/populations occurring at levels of international importance:

- Bewick's swan, *Cygnus columbianus bewickii*
- Whooper swan, *Cygnus cygnus*
- Wigeon, *Anas penelope*
- Gadwall, *Mareca strepera*
- Teal, *Anas crecca*
- Pintail, *Anas acuta*
- Shoveler, *Anas Clypeata*

Conservation objectives

16.2.2 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

16.2.2.1 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

16.2.2.2 The construction of the option may include activities that risk converting supporting habitat in the Habitats Site to built infrastructure (i.e., water intake) and increasing sedimentation and siltation from surface water runoff in drainage ditches outside the Habitats Site. Impacts on surface waters may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.2.3 The construction of the option will take place in SSSI Impact Risk Zones associated with the Habitats Site. Some of the land that could be needed for supporting infrastructure and during construction (69.68ha) is also located in Goose and Swan Functional Land. The habitats within these areas have the potential to act as supporting off-site habitat (moulting, roosting, loafing, feeding).

16.2.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

16.2.2.5 The construction of the option may result in temporary changes to baseline levels noise, vibration, human presence and artificial light.

16.2.2.6 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

16.2.2.7 The construction of the option may include activities where there is a risk of pollution. The wetland invertebrate and plant assemblages may be particularly vulnerable to deposited pollutants. Pollutants may result in obvious lethal effects, however, a wide variety of sub-lethal effects. Contamination of surface waters may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.2.8 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

16.2.2.9 The construction of the pipeline may include activities where there is a risk of introducing invasive non-native species. Invasive non-native species have the potential to alter supporting habitat structure and function.

16.2.2.10 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

16.2.2.11 Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

16.2.2.12 The operation of the option may include activities (i.e., water intake) that risk changes to the hydrological regime. Resulting changes in the deposition rates of fine sediment on gravels may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.2.13 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Water table / availability

16.2.2.14 The operation of the transfers and associated infrastructure may include changes in water quantity within the Habitats Site that may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-toxic contamination

16.2.2.15 In operation (i.e., water intake), there is a risk of changes to the hydrological regime and decreases in dissolved oxygen that may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.2.16 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Ouse Washes SPA (UK9008041) (5km)

Qualifying features

16.2.2.17 The site has been selected for the following qualifying features:

- A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
- A038 *Cygnus*; Whooper swan (Non-breeding)
- A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
- A051 *Anas strepera*; Gadwall (Breeding)
- A052 *Anas crecca;* Eurasian teal (Non-breeding)
- A053 *Anas platyrhynchos;* Mallard (Breeding)
- A054 *Anas acuta;* Northern pintail (Non-breeding)
- A055 *Anas querquedula;* Garganey (Breeding)
- A056 *Anas clypeata;* Northern shoveler (Non-breeding)
- A056 *Anas clypeata;* Northern shoveler (Breeding)
- A082 *Circus cyaneus;* Hen harrier (Non-breeding)
- A151 *Philomachus pugnax;* Ruff (Breeding)
- A156a *Limosa limosa*; Black-tailed godwit (Breeding)
- Waterbird assemblage
- Breeding bird assemblage

Conservation objectives

16.2.2.18 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

16.2.2.19 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

16.2.2.20 The construction of the option will take place in SSSI Impact Risk Zones associated with the Habitats Site. Some of the land that could be needed for supporting infrastructure and during construction (69.68ha) is also located in Goose and Swan Functional Land. The habitats within these areas have the potential to act as supporting off-site habitat (moulting, roosting, loafing, feeding).

16.2.2.21 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

16.2.2.22 The construction of the option may result in temporary changes to baseline levels noise, vibration, human presence and artificial light.

16.2.2.23 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

16.2.2.24 The construction of the option may include activities where there is a risk of pollution. Pollutants may result in obvious lethal effects, however, a wide variety of sub-lethal effects. Contamination of surface waters may alter the supporting processes on which the habitats of qualifying species rely.

16.2.2.25 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

16.2.2.26 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary

Operational effects

16.2.2.27 Potential effects from operational activities relevant to this Habitats Site are:

Water table / availability

16.2.2.28 The operation of the transfers and associated infrastructure may include changes in water quantity within the Habitats Site that may alter the supporting processes on which the habitats of qualifying species rely.

16.2.2.29 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Nene Washes SPA (13km)

Qualifying species

16.2.2.30 The site has been selected for the following qualifying features:

- A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
- A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
- A051 *Anas strepera;* Gadwall (Breeding)
- A051 *Anas strepera;* Gadwall (Non-breeding)
- A052 *Anas crecca;* Eurasian teal (Non-breeding)
- A054 *Anas acuta;* Northern pintail (Non-breeding)
- A055 *Anas querquedula;* Garganey (Breeding)
- A056 *Anas clypeata;* Northern shoveler (Non-breeding)
- A056 *Anas clypeata*; Northern shoveler (Breeding)
- A156a *Limosa limosa*; Black-tailed godwit (Breeding

Conservation objectives

16.2.2.31 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

16.2.2.32 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

16.2.2.33 The construction of the transfer and associated infrastructure for Nene's Counter Drain involves a number of options not yet fully designed, including abstraction, pipe, pump and outfall and a navigable connection with lock. Some of the land that could be needed for supporting infrastructure and during construction may be located in the SSSI Impact Risk Zones associated with the Habitats Site and Goose and Swan Functional Land. The habitats within these areas have the potential to act as supporting off-site habitat (moulting, roosting, loafing, feeding).

16.2.2.34 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

The construction of the option may result in temporary changes to baseline levels noise, vibration, human presence and artificial light.

On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

16.2.2.35 The construction of the option may include activities where there is a risk of pollution. Contamination of surface waters, deposition of dust and the chemical effects of air pollutants may alter the supporting processes on which the habitats of qualifying species rely.

On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

16.2.2.36 The construction of the pipeline may include activities where there is a risk of introducing invasive non-native species. Invasive non-native species have the potential to alter supporting habitat structure and function.

16.2.2.37 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary.

Operational effects

16.2.2.38 Potential effects from operational activities relevant to this Habitats Site are:

Water table / availability

16.2.2.39 The operation of the transfers and associated infrastructure may include changes in water quantity within the Habitats Site that may alter the supporting processes on which the habitats of qualifying species rely.

16.2.2.40 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Nene Washes Ramsar (12km)

Qualifying features

16.2.2.41 The site has been selected for the following qualifying features:

16.2.2.42 **Ramsar criterion 6:** species/populations occurring at levels of international importance.

16.2.2.43 Qualifying Species/populations with peak counts in winter are:

- Bewick's swan*, Cygnus columbianus bewickii,* 2.3% of the population

16.2.2.44 Species/populations identified subsequent to designation for possible future consideration under criterion 6 with peak counts in spring/autumn are:

- Black-tailed godwit, *Limosa limosa islandica,* 1.3% of the population

16.2.2.45 Species/populations identified subsequent to designation for possible future consideration under criterion 6 with peak counts in winter are:

- Northern pintail, *Anas acuta,* NW Europe 3% of the population

16.2.2.46 Species currently occurring at levels of national importance with peak counts in winter are:

- Whooper swan, Cygnus cygnus, 1.3% of the population
- Eurasian wigeon, *Anas penelope,* 2.3% of the population
- Eurasian teal, *Anas crecca,* 1% of the population
- Northern shoveler, *Anas clypeata,* 2.3% of the population
- Common pochard, *Aythya ferina,* NE & NW Europe 3% of the population
- European golden plover, Pluvialis apricaria, 1.1% of the population
- Ruff, *Philomachus pugnax,* 14% of the population

Conservation objectives

16.2.2.47 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

16.2.2.48 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

16.2.2.49 The construction of the transfer and associated infrastructure for Nene's Counter Drain involves a number of options not yet fully designed, including abstraction, pipe, pump and outfall and a navigable connection with lock. Some of the land that could be needed for supporting infrastructure and during construction may be located in the SSSI Impact Risk Zones associated with the Habitats Site and Goose and Swan Functional Land. The habitats within these areas have the potential to act as supporting off-site habitat (moulting, roosting, loafing, feeding).

16.2.2.50 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

16.2.2.51 The construction of the option may result in temporary changes to baseline levels noise, vibration, human presence and artificial light.

16.2.2.52 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

16.2.2.53 The construction of the option may include activities where there is a risk of pollution. Contamination of surface waters, deposition of dust and the chemical effects of air pollutants may alter the supporting processes on which the habitats of qualifying species rely.

16.2.2.54 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

16.2.2.55 The construction of the pipeline may include activities where there is a risk of introducing invasive non-native species. Invasive non-native species have the potential to alter supporting habitat structure and function.

16.2.2.56 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

16.2.2.57 Potential effects from operational activities relevant to this Habitats Site are:

Water table / availability

16.2.2.58 The operation of the transfers and associated infrastructure may include changes in water quantity within the Habitats Site that may alter the supporting processes on which the habitats of qualifying species rely.

16.2.2.59 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Nene Washes SAC (UK0030222) (12km)

Qualifying features

16.2.2.60 This site qualifies as it supports a population of fish:

- 1149 Spined loach *Cobitis taenia*

Conservation objectives

16.2.2.61 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

16.2.2.62 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

16.2.2.63 The construction of the transfer and associated infrastructure for Nene's Counter Drain involves a number of options not yet fully designed, including abstraction, pipe, pump and outfall and a navigable connection with lock. The construction of the transfers and associated infrastructure will include activities within and outside the Habitats Site. The habitats within these areas have the potential to act as supporting habitat.

16.2.2.64 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

16.2.2.65 The construction of the option may include activities where there is a risk of pollution. Contamination of surface waters, deposition of dust and the chemical effects of air pollutants may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.2.66 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

16.2.2.67 The construction of the pipeline may include activities where there is a risk of introducing invasive non-native species. Invasive non-native species have the potential to alter supporting habitat structure and function.

16.2.2.68 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

16.2.2.69 Potential effects from operational activities relevant to this Habitats Site are:

Physical damage

16.2.2.70 The operation of the option may include activities (i.e., water intake) that risk changes to the hydrological regime. Changes in the deposition rates of fine sediment on gravels may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.2.71 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-toxic contamination

16.2.2.72 In operation (i.e., water intake), there is a risk of changes to the hydrological regime and decreases in dissolved oxygen that may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

16.2.2.73 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

16.2.2.74 In operation (i.e., water intake) there is a risk of increasing mortality. Increased mortality has the potential to alter population size of the qualifying species.

16.2.2.75 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

The Wash SPA (UK9008021) (35km)

Qualifying features

16.2.2.76 The site has been selected for the following qualifying features:

16.2.2.77 ARTICLE 4.1 – During the breeding season the area regularly supports:

- *Sterna albifron*
- Over winter the area regularly supports:
- *Cygnus columbianus bewickii, Limosa lapponica*

16.2.2.78 ARTICLE 4.2 – Over winter the area regularly supports: *Anas acuta, Anas penelope, Anas strepera, Anser brachyrhynchus, Arenaria interpres, Branta bernicla bernicla, Bucephala clangula, Calidris alba, Calidris alpina alpina Calidris canutus, Haematopus ostralegus, Limosa limosa islandica, Melanitta nigra, Numenius arquata, Pluvialis squatarola, Tadorna tadorna, Tringa totanus.*

16.2.2.79 ARTICLE 4.2 – Over winter the area regularly supports: *Cygnus columbianus bewickii, Anser brachyrhynchus, Branta bernicla bernicla, Tadorna tadorna, Anas penelope, Anas strepera, Anas acuta, Melanitta nigra, Bucephala clangula, Haematopus ostralegus, Pluvialis squatarola, Calidris canutus, Calidris alba, Calidris alpina alpina, Limosa limosa islandica, Limosa lapponica, Numenius arquata, Tringa totanus, Arenaria interpres.*

Conservation objectives

16.2.2.80 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

16.2.2.81 The Wash SPA is located approximately 25km from the option. The option is not located within a SSSI Impact Risk Zone associated with this Habitats Site and relevant to the development type. Based on the assessment of risk, adverse effects during the construction phase are not reasonably foreseeable.

Operational effects

16.2.2.82 The implications of the new abstractions on downstream water bodies have been assessed in the WFD assessment. The assessment related to the Habitats Site downstream of the Ouse Washes identified no risk of deterioration in relation to the Wash Inner transitional water body. It is considered that there is sufficient flexibility over the exact location, scale, timing and nature of the option that it can be implemented in a way that will be compliant with the legally binding environmental objectives set out in the River Basin Management Plan (RBMP).

16.2.2.83 The environmental objectives of the RBMP that are directly relevant to this option are:

- Preventing deterioration of the status of surface waters and groundwater
- Achieving objectives and standards for protected areas
- Aiming to achieve good status for all water bodies

16.2.2.84 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity

The Wash Ramsar Site (UK11072) (35km)

Qualifying features

16.2.2.85 The site has been selected for the following qualifying features:

16.2.2.86 **Ramsar Criteria 1:** The Wash is a large shallow bay comprising very extensive saltmarshes, major intertidal banks of sand and mud, shallow water, and deep channels.

16.2.2.87 **Ramsar Criteria 3:** Qualifies because of the inter-relationship between its various components including saltmarshes, intertidal sand and mud flats and the estuarine waters. The saltmarshes and the plankton in the estuarine water provide a primary source of organic material which, together with other organic matter, forms the basis for the high productivity of the estuary.

16.2.2.88 **Ramsar Criteria 5:** Assemblages of international importance:

- 292541 waterfowl (5-year peak mean 1998/99-2002/2003)

16.2.2.89 **Ramsar Criteria 6:** Species/populations occurring at levels of international importance:

- Eurasian oystercatcher, *Haematopus ostralegus ostralegus,* Europe & NW Africa -wintering
- Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa (wintering)
- Red knot, *Calidris canutus islandica,* W & Southern Africa (wintering)
- Sanderling, *Calidris alba,* Eastern Eurasian curlew, *Numenius arquata arquata, N. a. arquata* Europe (breeding)
- Common redshank, *Tringa totanus totanus,*
- Ruddy turnstone, *Arenaria interpres interpres,* NE Canada, Greenland/W Europe & NW Africa

Species with peak counts in winter:

- Pink-footed goose*, Anser brachyrhynchus*, Greenland, Iceland/UK
- Dark-bellied brent goose, *Branta bernicla bernicla,*
- Common shelduck, *Tadorna tadorna,* NW Europe
- Northern pintail, *Anas acuta,* NW Europe
- Dunlin, Calidris *alpina alpina,* W Siberia/W Europe
- Bar-tailed godwit, *Limosa lapponica lapponica,* W Palearctic

Conservation objectives

16.2.2.90 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

16.2.2.91 The Wash Ramsar is located approximately 25km from the option. The option is not located within a SSSI Impact Risk Zone associated with this Habitats Site and relevant to the development type. Based on the assessment of risk, adverse effects during the construction phase are not reasonably foreseeable.

Operational effects

16.2.2.92 The implications of the new abstractions on downstream water bodies have been assessed in the WFD assessment. The assessment related to the Habitats Site downstream of the Ouse Washes identified no risk of deterioration in relation to the Wash Inner transitional water body. It is considered that there is sufficient flexibility over the exact location, scale, timing and nature of the option that it can be implemented in a way that will be compliant with the legally binding environmental objectives set out in the River Basin Management Plan (RBMP).

16.2.2.93 The environmental objectives of the RBMP that are directly relevant to this option are:

- Preventing deterioration of the status of surface waters and groundwater
- Achieving objectives and standards for protected areas
- Aiming to achieve good status for all water bodies

16.2.2.94 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

The Wash and North Norfolk Coast SAC (UK0017075) (35km)

Qualifying features

16.2.2.95 The site has been selected for the following qualifying features:

- 1110 Sandbanks which are slightly covered by sea water all the time
- 1140 Mudflats and sandflats not covered by seawater at low tide
- 1160 Large shallow inlets and bays
- 1170 Reefs
- 1310 Salicornia and other annuals colonising mud and sand
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- 1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi)*
- 1150 Coastal lagoons * Priority feature
- 1365 Common seal (*Phoca vitulina)*
- 1355 Otter (*Lutra lutra)*

Conservation objectives

16.2.2.96 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

16.2.2.97 The Wash SPA is located approximately 25km from the option. The option is not located within a SSSI Impact Risk Zone associated with this Habitats Site and relevant to the development type. Based on the assessment of risk, adverse effects during the construction phase are not reasonably foreseeable.

Operational effects

16.2.2.98 The implications of the new abstractions on downstream water bodies have been assessed in the WFD assessment. The assessment related to the Habitats Site downstream of the Ouse Washes identified no risk of deterioration in relation to the Wash Inner transitional water body. It is considered that there is sufficient flexibility over the exact location, scale, timing and nature of the option that it can be implemented in a way that will be compliant with the legally binding environmental objectives set out in the River Basin Management Plan (RBMP).

16.2.2.99 The environmental objectives of the RBMP that are directly relevant to this option are:

- Preventing deterioration of the status of surface waters and groundwater
- Achieving objectives and standards for protected areas

- Aiming to achieve good status for all water bodies

16.2.2.100 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity

16.3 Measures to avoid and mitigate adverse effects

16.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

16.3.1.2 With respect to the location of water intake infrastructure, site selection must demonstrate at the project level assessment that the potential effects on the Habitats Site have been carefully considered throughout the development of the option. The option design must also have regard to the advice given by Natural England.

16.3.1.3 Good industry practice should include, but not limited to, the following:

- CIRIA C741 ‘Environmental good practice on site guide’
- ‘PPG1: General Guide to Prevention of Pollution’ (Environment Agency)
- ‘PPG6: Pollution prevention guidance for working at construction and demolition sites)’ (Environment Agency).
- ‘Clean Check Dry’ (Aquatic Biosecurity Partnership)

16.3.1.4 The design of the option should consider include, but not limited to, the following:

- Locating option (e.g. water intake) with exiting built infrastructure in the Habitats Site
- Silt screening during construction
- Directional drilling of watercourses >3m wide

16.3.1.5 The above measures have all been implemented on consented nationally significant infrastructure projects and therefore there is practical certainty they can be implemented and in place at the relevant time when the project level appropriate is undertaken. The full implementation of these measures, together with any site-specific efficacy research, will be secured and enforced as it has on other projects, in the project planning process.

16.3.1.6 The nature and scale of the water intake must demonstrate how, through the integration with the relevant Ouse Washes Water Level Management Plan (WLMP), the effects on the Habitats Site, including water quality, have been carefully considered.

16.3.1.7 Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within an Impingement and Entrainment Adaptive Management Plan and an Operational Environmental Management Plan (OEMP). It is expected that the Impingement and Entrainment Adaptive Management Plan and the OEMP will be secured through DCO Requirement.

16.3.1.8 Good industry practice should include, but not limited to, the following:

- CIRIA C741 ‘Environmental good practice on site guide’
- 'Engineering in the Water Environment Good Practice Guide - Intakes and outfalls’ (SEPA)
- 'Screening for intake and outfalls: a best practice guide' (Environment Agency)

16.3.1.9 The design of the option should consider include, but not limited to, the following:

- Fish screens at the intake and discharge structures

16.3.1.10 The nature and scale of the water intake will be regulated by the relevant Water Level Management Plan (WLMP), which is the principal safeguard related to water management on the Ouse Washes and the Nene Washes. The WLMP is a non-statutory plan that provides a means by which the water level requirements for a range of activities, including flood management, conservation and agriculture can be balanced and integrated in a particular area. The production of a WLMP is the responsibility of the relevant flood management operating authority, in the case of the Ouse Washes, the Environment Agency (Great Ouse catchment, East Anglia area) and for the Nene Washes, the North Level District Internal Drainage Board. The WLMP is a live document that must be formally endorsed by Natural England.

16.3.1.11 The Ouse Washes are currently in an unfavourable conservation status because the site's water level management is unable to ameliorate the effects of flooding driven by the catchment level flood risk management and the effects of the climate change. Whist the drivers of the unfavourable condition are beyond the control of the WLMP, the WLMP seeks to management water levels to maximise the potential to restore the site to favourable condition when prevailing flood and weather conditions allow. By contrast, the Nene Washes is largely in favourable condition although excessive flooding can lead to difficulties in managing the wet grassland habitats resulting in low numbers of target bird species successfully breeding. Flooding may also affect the numbers of wintering birds present at the site.

16.3.1.12 Proposals to transfer water from the Ouse Washes and to a lesser extent the Nene Washes during winter and/or summer flood conditions may provide conservation benefits by helping to restore management measures necessary to restore the structure, function and/or the supporting processes of the Habitats Site. Considering the above, the nature and scale of the water intake must demonstrate at the plan level assessment how, through the integration with the relevant WLMP the effects on the Habitats Site, including water quality, have been carefully considered and that all reasonable efforts have been made to avoid significant effects.

16.3.1.13 The implications of the new abstractions on downstream water bodies have been assessed in the WFD assessment. The assessment related to the Wash Habitats Site downstream of the Ouse Washes identified no risk of deterioration in relation to the Wash Inner transitional water body. Whilst the confidence is this assessment is low, it is considered that there is sufficient flexibility over the exact location, scale, timing and nature of the option that it can be implemented in a way that will be compliant with the legally binding environmental objectives set out in the River Basin Management Plan (RBMP).

16.3.1.14 Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within an Operational Environmental Management Plan (OEMP). It will be at the project level assessment that a full and precise analysis of the measures capable of avoiding or reducing any significant effects will be made. It is expected that the OEMP will be secured through DCO Requirement.

16.3.1.15 It is considered possible that the carefully consideration of the potential effects on the Habitats Site related to the emergency drawdown throughout the development of the option can demonstrate at the project level assessment that an adverse effect on site integrity can be avoided. The option design must also have regard to the advice given by Natural England.

16.3.1.16 The above measures have all been implemented on consented nationally significant infrastructure projects and therefore there is practical certainty they can be implemented and in place at the relevant time when the project level appropriate is undertaken. The full

implementation of these measures, together with any site-specific efficacy research, will be secured and enforced as it has on other projects, in the project planning process.

16.3.1.17 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

16.4 Further studies and monitoring

16.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

16.4.2 Prior to the submission of a planning application the relevant protected species surveys should be undertaken to ensure the relevant information is secured to support the project level HRA.

17 Holland on Sea desalination (seawater) (26 Ml/d) (EXS10)

17.1 Introduction

17.1.1.1 This option proposes the construction of a new desalination treatment plant at Holland on Sea. The deployable output is 26 Ml/d and will be operational by 2040.

17.1.1.2 Screening could not rule out LSE in relation to:

- Outer Thames Estuary SPA (UK9020309) – 0 km adjacent

17.1.1.3 The Outer Thames Estuary SPA is located on the south-east coast of England, stretching from Caister-on-Sea in Norfolk down the Suffolk coast to Sheerness on the Kent coastline and reaching Canvey Island into the Thames Estuary. The SPA has areas of shallow and deep water, high tidal current streams and mobile sediments.

17.2 Appropriate Assessment

Assessment summary

17.2.1.1 This option is not located in a relevant SSSI Impact Risk Zone for any Habitats Site, but it is adjacent to the Outer Thames Estuary SPA.

17.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

17.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

17.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Outer Thames Estuary SPA (UK9020309) (0km)

Qualifying features

17.2.1.3 The site has been selected for the following qualifying features:

- A001 *Gavia stellata;* Red-throated diver (Non-breeding)
- A193 *Sterna hirundo*; Common tern (Breeding)
- A195 *Sternula albifrons*; Little tern (Breeding)

Conservation objectives

17.2.1.4 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species

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

Construction effects

17.2.1.5 The proposed offshore pipeline is located adjacent to the Habitats Site and the onshore elements of the option are hydrologically connected via Holland Brook.

17.2.1.6 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

17.2.1.7 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

17.2.1.8 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

17.2.1.9 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

17.2.1.10 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

17.2.1.11 The option will be adjacent to the Habitats and the onshore elements of the option are hydrologically connected via Holland Brook. The accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

17.2.1.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

17.2.1.13 The proposed offshore pipeline is located adjacent to the Habitats Site and the onshore elements of the option are hydrologically connected via Holland Brook. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

17.2.1.14 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

17.2.1.15 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes have the potential to alter supporting habitats.

17.2.1.16 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

17.2.1.17 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

17.2.1.18 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

17.2.1.19 The discharge of brine water into the sea adjacent to the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

17.2.1.20 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

17.2.1.21 Operation of the option may include activities where there is a risk of displacement and mortality of prey species (e.g., sea water intake and brine discharge). Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

17.2.1.22 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

17.3 Measure to avoid or mitigate adverse effects

17.3.1.1 The South East Inshore Marine Plan sets out priorities and directions for future development within the plan area and among other things helps marine users understand the best locations for their activities, including where new developments may be appropriate. When applying for a licence or approval it must be demonstrated how the marine plan has been considered and how the project contributes to achieving objectives in the marine plan.

17.3.1.2 The following marine plan policies will be considered in the detailed design of the option:

- SE-MPA-1 Marine protected areas - Proposals that support the objectives of marine protected areas and the ecological coherence of the marine protected area network will be supported. Proposals that may have adverse impacts on the objectives of marine protected areas must demonstrate that they will, in order of preference, avoid, minimise or mitigate adverse impacts, with due regard given to statutory advice on an ecologically coherent network.
- SE-MPA-2 Marine protected areas - Proposals that enhance a marine protected area's ability to adapt to climate change, enhancing the resilience of the marine protected area network, will be supported. Proposals that may have adverse impacts on an individual marine protected area's ability to adapt to the effects of climate change, and so reduce the resilience of the marine protected area network, must demonstrate that they will, in order of preference, avoid, minimise or mitigate adverse impacts.
- SE-DIST-1 Disturbance - Proposals that may have significant adverse impacts on highly mobile species through disturbance or displacement must demonstrate that they will, in order of preference: avoid, minimise or mitigate adverse impacts so they are no longer significant.
- SE-WQ-1 Water quality - Proposals that protect, enhance and restore water quality will be supported. Proposals that cause deterioration of water quality must demonstrate that they

will, in order of preference, avoid, minimise or mitigate the deterioration of water quality in the marine environment.

- SE-INNS-1 Invasive non-native species - Proposals that reduce the risk of introduction and/or spread of invasive non-native species should be supported. Proposals must put in place appropriate measures to avoid or minimise significant adverse impacts that would arise through the introduction and transport of invasive non-native species, particularly when: 1) moving equipment, boats or livestock (for example fish or shellfish) from one water body to another; and 2) introducing structures suitable for settlement of invasive non-native species, or the spread of invasive non-native species known to exist in the area.
- SE-INNS-2 Invasive non-native species - Public authorities with functions to manage activities that could potentially introduce, transport or spread invasive non-native species should implement adequate biosecurity measures to avoid or minimise the risk of introducing, transporting or spreading invasive non-native species.

17.3.1.3 The measures to avoid or reduce adverse effects that would facilitate compliance with the marine plan policies should include:

- Design measures incorporated in:
  - Detailed Pipe/Cable Laying Plan (SE-MPA-1)
  - Scour Protection Plan (SE-MPA-1)
  - Brine Water Discharge Management Plan (SE-WQ-1)
  - Climate Change Resilience Assessment (SE-MPA-2)
- Construction/decommissioning measures incorporated in:
  - Code of Construction Practice (SE-MPA-1, SE-DIST-1, SE-WQ-1)
  - Code of Conduct for Vessel Operators (SE-DIST-1)
  - Chemical Risk Assessment (SE-WQ-1)
  - Marine Pollution Contingency Plan (SE-WQ-1)
  - Biosecurity Plan (SE-INNS-1, SE-INNS-2)
- Operational measures incorporated in:
  - Code of Conduct for Vessel Operators (SE-DIST-1)
  - Chemical Risk Assessment (SE-WQ-1)
  - Marine Pollution Contingency Plan (SE-WQ-1)
  - Biosecurity Plan (SE-INNS-1, SE-INNS-2)
  - Biodiversity Impingement and Entrainment Adaptive Management Plan (SE-MPA-1)

17.3.1.4 Specific measures for consideration in the option design are:

- Methods for brine discharge or processing that will remove the need to discharge into the estuary.
- Installation of a salinity and residual chemical diffuser on the out take. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the estuarine bed.
- Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water).
- Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the estuarine environment.

17.3.1.5 Brine water could discharge into lagoons. If this option were to be pursued then the use and harvesting of salt or highly concentrated brine for use as refrigerating fluid, water softening and purification and de-icing could be considered.

17.3.1.6 Measures will be delivered at the project level using the principles set out below:

- An engagement plan will set out the expectations and timescales of consultation so that stakeholders can provide advice during the design and consenting processes.
- Option design and the development of measures to safeguard the Habitats Site will be informed by further research (listed below).
- In planning the location of marine infrastructure, the emphasis should be on avoiding Habitats Sites. If this is not possible, adverse effects must be minimised through design, so they are no longer significant.
- Where it is necessary to minimise adverse effects of marine infrastructure at the project level, appropriate measures should ideally be agreed with statutory stakeholders and be capable of being secured within project design and/or consents. Mitigation measures will also need to be acceptable to competent authorities.
- 'Best available techniques' (BAT) for preventing or minimising impacts on the environment. Consideration of BAT will include the use of technology, design as well as construction, operation, maintenance and decommissioning methods.
- Current best practice environmental considerations, guidance and advice from statutory nature conservation bodies (e.g., Natural England) will be taken into account during the detailed design process.
- Planning of marine infrastructure should be undertaken in consultation with key stakeholders (e.g., Natural England and, where appropriate, JNCC). Other non-statutory consultees should also be included in the consultation (e.g., RSPB).

17.3.1.7 The above measures have all been implemented on consented nationally significant infrastructure projects and therefore there is practical certainty they can be implemented and in place at the relevant time when the project level appropriate is undertaken. The full implementation of these measures, together with any site-specific efficacy research, will be secured and enforced as it has on other projects, in the project planning process.

17.3.1.8 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

17.4 Further studies and monitoring

17.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided and mitigated, the following studies and monitoring are recommended.

17.4.1.2 Prior to the submission of a planning application the relevant protected habitat and species surveys (onshore and offshore) should be undertaken to ensure the relevant information is secured to support the project level HRA.

17.4.1.3 Further studies will be required to inform measures related to coastal processes and the brine discharge and its effect on baseline water quality, salinity and temperature.

18 Mablethorpe desalination Seawater (50Ml/d) (LNE6)

18.1 Introduction

18.1.1.1 This option proposes the construction of a new desalination treatment plant at Mablethorpe. It is intended to be operational by 2040.

18.1.1.2 Screening could not rule out LSE in relation to:

- Greater Wash SPA (UK9020329) – 0 km, option within SPA
- Humber Estuary Ramsar site (UK11031) – approximately 3.5km from option
- Humber Estuary SPA (UK9006111) – approximately 3.5km from option
- Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC (UK0030270) 0 km
- Humber Estuary SAC (UK0030170) – approximately 3.5km from option

18.1.1.3 The Greater Wash SPA is located in the mid-southern North Sea between Bridlington Bay in the north and the Outer Thames Estuary SPA in the south. To the north, off the Holderness coast in Yorkshire, seabed habitats primarily comprise coarse sediments, with occasional areas of sand, mud and mixed sediments. Subtidal sandbanks occur at the mouth of the Humber Estuary, primarily comprising sand and coarse sediments. Offshore, soft sediments dominate, with extensive areas of subtidal sandbanks off The Wash as well as north and east Norfolk coasts. Closer inshore at The Wash and north Norfolk coast, sediments comprise a mosaic of sand, muddy sand, mixed sediments and coarse sediments, as well as occasional Annex I reefs.

18.1.1.4 The Humber Estuary Ramsar site, SPA, and SAC are located on the east coast of England and comprises extensive wetland and coastal habitats. The inner estuary supports extensive areas of reedbed, with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. Parts of the estuary are owned and managed by conservation organisations.

18.1.1.5 Saltfleetby–Theddlethorpe Dunes and Gibraltar Point SAC comprises two dune systems within the Lincolnshire Coast & Marshes National Character Area (NCA) separated by about 25km. Saltfleetby–Theddlethorpe Dunes are the larger of the two systems and run between Saltfleet and Mablethope. Gibraltar Point is located further south adjacent to Skegness, close to where the Wash and the North Sea meet.

18.1.1.6 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

18.2 Appropriate Assessment

Assessment summary

18.2.1.1 These options are located in the Greater Wash SPA and Saltfleetby–Theddlethorpe Dunes and Gibraltar Point SAC (i.e., brine discharge pipeline) and well as the SSSI Impact Risk Zones associated with the Habitats Sites of the coastal portion of the Humber Estuary.

18.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

18.2.1.1 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

18.2.1.2 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Greater Wash SPA (UK9020329) (0km)

Qualifying features

18.2.1.3 The site has been selected for the following qualifying features:

- A195 *Sternula albifrons*; Little tern (Breeding)
- A193 *Sterna hirundo*; Common tern (Breeding)
- A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
- A177 *Hydrocoloeus minutus*; Little gull (Non-breeding)
- A001 *Gavia stellata*; Red-throated diver (Non-breeding)
- A065 *Melanitta nigra*; Common scoter (Non-breeding)

Conservation objectives

18.2.1.4 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

18.2.1.5 The proposed offshore pipeline is located within the Habitats Site and the onshore elements of the option are hydrologically connected via Great Eau.

18.2.1.6 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.1.7 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

18.2.1.8 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.1.9 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

18.2.1.10 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.1.11 The option will be within the Habitats Site and near water features that flow directly into the Habitats Site (e.g., Great Eau) and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

18.2.1.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

18.2.1.13 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

18.2.1.14 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.1.15 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes have the potential to alter supporting habitats.

18.2.1.16 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.1.17 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

18.2.1.18 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.2 The discharge of brine water into the Habitats Site may increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

18.2.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.1 Operation of the option mat include activities where there is a risk of displacement and mortality of prey species (e.g., sea water intake and brine discharge). Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

18.2.3.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Humber Estuary Ramsar (UK11031) (3.5km)

Qualifying features

18.2.3.3 The site has been selected for the following criteria:

18.2.3.4 **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
- Coastal brackish/saline lagoons

18.2.3.5 **Ramsar Criterion 3:** The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* 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 *Bufo calamita*.

18.2.3.6 **Ramsar Criterion 5:** Assemblages of international importance: 153,934 waterfowl, non-breeding season (5 year peak mean 1996/97-2000/2001)

18.2.3.7 **Ramsar Criterion 6:** Species/populations occurring at levels of international importance

- Golden plover, *Pluvialis apricaria altifrons* subspecies – North West (NW) Europe, Western (W) Continental Europe, NW Africa population
- Knot, Calidris canutus islandica subspecies
- Dunlin, *Calidris alpine alpina* subspecies – W Europe (non-breeding) population
- Black-tailed godwit, *Limosa limosa islandica* subspecies
- Redshank, *Tringa totanus brittanica* subspecies
- Shelduck, *Tadorna tadorna* North-Western Europe (breeding) population
- Golden plover, *Pluvialis apricaria altifrons* subspecies – NW Europe, W Continental Europe, NW Africa population

18.2.3.8 **Ramsar Criterion 8:** The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

18.2.3.9 Species with peak counts in spring/autumn:

- Golden plover, *Pluvialis apricaria apricaria*, Iceland & Faroes/E Atlantic
- Knot, *Calidris canutus islandica*, W & Southern Africa (wintering)
- Dunlin, Calidris *alpina*, W Siberia/W Europe
- Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe
- Redshank, Tringa totanus totanus,

18.2.3.10 Species with peak counts in winter:

- Shelduck, *Tadorna tadorna*, NW Europe

- Golden plover, *Pluvialis apricaria apricaria*, Iceland & Faroes/Eastern (E) Atlantic
- Knot, *Calidris canutus islandica*, W & Southern (S) Africa (wintering)
- Dunlin, *Calidris alpina alpina*, W Siberia/W Europe
- Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe
- Bar-tailed godwit, *Limosa lapponica lapponica*, W Palearctic

Conservation objectives

18.2.3.11 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

18.2.3.12 The option is located beyond the Habitats Site but within the associated SSSI Impact Risk Zones, including Goose and Swan Functional Land used by foraging pink-footed goose (a main assemblage feature).

18.2.3.13 On this basis, a change in the extent, distribution, structure and function of the habitats of the qualifying species is not reasonably foreseeable and it is concluded that there will be no adverse effect on site integrity.

18.2.3.14 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.15 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

18.2.3.16 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.3.17 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

18.2.3.18 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.19 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

18.2.3.20 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.21 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

18.2.3.22 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

18.2.3.23 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

18.2.3.24 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.25 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

18.2.3.26 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.3.27 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

18.2.3.28 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.29 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

18.2.3.30 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.31 Operation will include activities where there is a risk of displacement and mortality of qualifying species (e.g. sea lamprey and river lamprey) as well as prey species as a result of the sea water intake and brine discharge. Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

18.2.3.32 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the operational site to reach the Habitats Site.

- On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Humber Estuary SPA (UK9006111) (3.5km)

Qualifying features

18.2.3.33 The site has been selected for the following qualifying features:

- A021 *Botaurus stellaris*; Great bittern (Non-breeding)
- A021 *Botaurus stellaris*; Great bittern (Breeding)
- A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
- A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
- A082 *Circus cyaneus*; Hen harrier (Non-breeding)
- A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
- A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
- A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
- A143 *Calidris canutus*; Red knot (Non-breeding)
- A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
- A151 *Philomachus pugnax*; Ruff (Non-breeding)
- A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
- A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
- A162 *Tringa totanus*; Common redshank (Non-breeding)
- A195 *Sterna albifrons*; Little tern (Breeding)
- Waterbird assemblage

Conservation objectives

18.2.3.34 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

18.2.3.35 The option is located beyond the Habitats Site but within the associated SSSI Impact Risk Zones, including Goose and Swan Functional Land used by foraging pink-footed goose (a main assemblage feature).

18.2.3.36 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.37 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

18.2.3.38 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.3.39 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

18.2.3.40 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.41 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

18.2.3.42 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.43 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

18.2.3.44 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

18.2.3.45 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

18.2.3.46 Potential effects from operation activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.47 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

18.2.3.48 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.3.49 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

18.2.3.50 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.51 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

18.2.3.52 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.53 Operation will include activities where there is a risk of displacement and mortality of prey species as a result of the sea water intake and brine discharge. Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

18.2.3.54 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the operational site to reach the Habitats Site.

18.2.3.55 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC (UK0030270) (0km)

Qualifying features

- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)
- 2130 Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature
- 2160 Dunes with *Hippophae rhamnoides*
- 2190 Humid dune slacks
- 2110 Embryonic shifting dunes

Conservation objectives

18.2.3.56 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

18.2.3.57 The option is located partly within the Habitats Site where ‘H2110 Embryonic Shifting Dunes’ and ‘H2120 Shifting Dunes with marram’ are likely to be present.

18.2.3.58 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.59 The construction of the option may include activities within the Habitats Site. Direct and indirect impacts have the potential to alter the extent of qualifying features.

18.2.3.60 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.61 The construction of the option may include activities within the Habitats Site and the relevant SSSI Impact Risk Zones where the accidental release or resuspension of toxic and non-toxic contaminants may occur.

18.2.3.62 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.63 The construction of the option may include activities within the Habitats Site and the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

18.2.3.64 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

18.2.3.65 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

18.2.3.66 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.67 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

18.2.3.68 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.69 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

18.2.3.70 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Humber Estuary SAC (UK0030170) (approximately 3.5km)

Qualifying features

18.2.3.71 The site has been selected for the following qualifying features:

- H1110 Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks
- H1130 Estuaries

- H1140 Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats
- H1150 Coastal lagoons*
- H1310 Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand
- H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- H2110 Embryonic shifting dunes
- H2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram
- H2130 Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland*
- H2160 Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn
- S1095 *Petromyzon marinus*; Sea lamprey
- S1099 *Lampetra fluviatilis*; River lamprey
- S1364 *Halichoerus grypus*; Grey seal

Conservation objectives

18.2.3.72 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

18.2.3.73 The option is located beyond the Habitats Site but within the associated SSSI Impact Risk Zones.

18.2.3.74 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.75 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

18.2.3.76 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.3.77 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

18.2.3.78 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.79 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

18.2.3.80 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.81 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

18.2.3.82 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

18.2.3.83 The option is located beyond any of the relevant SSSI Impact Risk Zone associated terrestrial Habitats Sites. The brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

18.2.3.84 Potential effects from operation activities relevant to this Habitats Site are:

Physical loss and/or damage

18.2.3.85 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes may alter supporting habitats.

18.2.3.86 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

18.2.3.87 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

18.2.3.88 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

18.2.3.89 Operation will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones and the accidental release or resuspension of toxic and non-toxic contaminants may occur during operation.

18.2.3.90 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

18.2.3.91 Operation will include activities where there is a risk of displacement and mortality of qualifying species (e.g. sea lamprey and river lamprey) as well as prey species as a result of the sea water intake and brine discharge. Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

18.2.3.92 The option will be in coastal waters and inland surface water features within the relevant SSSI Impact Risk Zones therefore there is a direct pathway for non-native species and pathogens introduced at the operational site to reach the Habitats Site.

On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

18.3 Measure to avoid or mitigate adverse effects

18.3.1.1 The East Inshore and Offshore Marine Plan sets out priorities and directions for future development within the plan area and among other things helps marine users understand the best locations for their activities, including where new developments may be appropriate. When applying for a licence or approval it must be demonstrated how the marine plan has been considered and how the project contributes to achieving objectives in the marine plan.

18.3.1.2 The following marine plan policies will be considered in the detailed design of the option:

- E-MPA-1 Marine protected areas - Any impacts on the overall Marine Protected Area network must be taken account of in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network.

18.3.1.3 The measures to avoid or reduce adverse effects that would facilitate compliance with the marine plan policies should include:

- Design measures incorporated in:
  - Detailed Pipe/Cable Laying Plan
  - Scour Protection Plan
  - Brine Water Discharge Management Plan
  - Climate Change Resilience Assessment
- Construction/decommissioning measures incorporated in:
  - Code of Construction Practice
  - Code of Conduct for Vessel Operators
  - Chemical Risk Assessment
  - Marine Pollution Contingency Plan
  - Biosecurity Plan
- Operational measures incorporated in:
  - Code of Conduct for Vessel Operators
  - Chemical Risk Assessment
  - Marine Pollution Contingency Plan
  - Biosecurity Plan
  - Biodiversity Impingement and Entrainment Adaptive Management Plan

18.3.1.4 Specific measures for consideration in the option design are:

- Methods for brine discharge or processing that will remove the need to discharge into the estuary.
- Installation of a salinity and residual chemical diffuser on the out take. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the estuarine bed.
- Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water).
- Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the estuarine environment.

18.3.1.5 Brine water could discharge into lagoons. If this option were to be pursued then the use and harvesting of salt or highly concentrated brine for use as refrigerating fluid, water softening and purification and de-icing could be considered.

18.3.1.6 Measures will be delivered at the project level using the principles set out below:

- An engagement plan will set out the expectations and timescales of consultation so that stakeholders can provide advice during the design and consenting processes.
- Option design and the development of measures to safeguard the Habitats Site will be informed by further research (listed below).
- In planning the location of marine infrastructure, the emphasis should be on avoiding Habitats Sites. If this is not possible, adverse effects must be minimised through design, so they are no longer significant.
- Where it is necessary to minimise adverse effects of marine infrastructure at the project level, appropriate measures should ideally be agreed with statutory stakeholders and be capable of being secured within project design and/or consents. Mitigation measures will also need to be acceptable to competent authorities.
- ‘Best available techniques’ (BAT) for preventing or minimising impacts on the environment. Consideration of BAT will include the use of technology, design as well as construction, operation, maintenance and decommissioning methods.
- Current best practice environmental considerations, guidance and advice from statutory nature conservation bodies (e.g., Natural England) will be taken into account during the detailed design process.
- Planning of marine infrastructure should be undertaken in consultation with key stakeholders (e.g., Natural England and, where appropriate, JNCC). Other non-statutory consultees should also be included in the consultation (e.g., RSPB).

18.3.1.7 The above measures have all been implemented on consented nationally significant infrastructure projects and therefore there is practical certainty they can be implemented and in place at the relevant time when the project level appropriate is undertaken. The full implementation of these measures, together with any site-specific efficacy research, will be secured and enforced as it has on other projects, in the project planning process.

18.3.1.8 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

18.4 Further studies and monitoring

18.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how

adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

18.4.1.2 Prior to the submission of a planning application the relevant protected habitat and species surveys (onshore and offshore) should be undertaken to ensure the relevant information is secured to support the project level HRA.

18.4.1.3 Further studies will be required to inform measures related to coastal processes, the brine discharge and its effect on baseline water quality, salinity and temperature.

19 Bacton desalination (seawater) (25 Ml/d) (NTB17)

19.1 Introduction

19.1.1.1 This option proposes the construction of a new desalination treatment plant at Bacton to increase supply of treated water at Mousehold WTW and will be operational by 2040.

19.1.1.2 Screening could not rule out LSE in relation to:

- Greater Wash SPA (UK9020329) – 0 km, option within SPA
- Southern North Sea SAC (UK0030395) – 0 km, option within SAC
- Broadland SPA (UK9009253) – approximately 0.7km from the option
- The Broads SAC (UK0013577) – approximately 0.7km from the option
- Broadland Ramsar site (UK11010) – approximately 0.7km from the option
- Paston Great Barn SAC (UK0030331) – approximately 1.0km from the option

19.1.1.3 The Greater Wash SPA is located off the east coast of England. It is situated in the middle of the southern North Sea and its boundary stretches from Bridlington Bay in the north to the existing boundary of the Outer Thames Estuary SPA in the south. The Greater Wash contains a broad range of habitats, primarily comprised of coarse sediments, with occasional areas of sand, mud and mixed sediments with subtidal sandbanks. There are also extensive areas of offshore subtidal sandbanks. In the inshore section of the site, sediments are comprised of a mosaic of sand and mixed sediments, as well as muddy sands, coarse sediments and occasional Annex I reef, whilst soft sediments dominate the southern extent of the site. The majority of the site is less than 30m deep, with a deeper channel of 90m at the Wash approach channel.

19.1.1.4 The Southern North Sea SAC lies along the east coast of England, in the offshore waters of the central and southern North Sea, from north of Dogger Bank to the Straits of Dover in the south. This site stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south, covering an area of 36,951km2, making it the largest SAC in UK and European waters at the point of designation in 2019. The SAC ranges in depth from mean low water down to 75m, with the majority of the site shallower than 40m, and is characterised by its sandy, coarse sediments which cover much of the site.

19.1.1.5 The Broads SAC and Broadland SPA/Ramsar consists of a low-lying wetland complex located between the east Norfolk and northern Suffolk boundary. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The open distinctive landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow. In addition, the sites include naturally nutrient-rich lakes that support a diversity of relict vegetation and aquatic invertebrate assemblages, rich areas of stonewort and large blocks of alder (*Alnus glutinosa*) woodland.

19.1.1.6 Paston Great Barn SAC is one of the best preserved, and few remaining, Great Barns left in England. It has a complex roof structure that contains a multitude of voids, many of these provide suitable roosting locations for bats. The walls also contain many cracks and crevices that support roosting bats.

19.1.1.7 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

19.2 Appropriate Assessment

Assessment summary

19.2.1.1 This option is located in the Greater Wash SPA and Southern North Sea SAC and well SSSI Impact Risk Zones associated with the Paston Great Barn SAC and Broadland SPA/Ramsar Site (Goose and Swan Functional Land).

19.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

19.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

19.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Greater Wash SPA (UK9020329) (0km)

Qualifying features

19.2.1.5 The site has been selected for the following qualifying features[43]:

- A001 *Gavia stellata;* Red-throated diver (Non-breeding)
- A065 *Melanitta nigra;* Common scoter (Non-breeding)
- A177 *Hydrocoloeus minutus;* Little gull (Non-breeding)
- A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
- A193 *Sterna hirundo;* Common tern (Breeding)
- A195 *Sternula albifrons*; Little tern (Breeding)

Conservation objectives

19.2.1.6 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

[43] https://publications.naturalengland.org.uk/publication/4597871528116224Natural England, 2016. European Site Conservation Objectives for Greater Wash SPA (UK9020329) Available at: https://publications.naturalengland.org.uk/publication/4597871528116224

Construction effects

19.2.1.7 The proposed offshore pipeline is located within the Habitats Site.

19.2.1.8 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

19.2.1.9 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

19.2.1.10 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

19.2.1.11 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

19.2.1.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

19.2.1.13 The option will be within the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

19.2.1.14 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

19.2.1.15 The proposed offshore pipeline is located within the Habitats Site and the brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

19.2.1.16 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

19.2.1.17 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes have the potential to alter supporting habitats.

19.2.1.18 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

19.2.2 The discharge of brine water into the Habitats Site will increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

19.2.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

19.2.3.1 Operation of the option will include activities where there is a risk of displacement and mortality of prey species (e.g., sea water intake and brine discharge). Changes in the distribution, abundance and availability of key food and prey items may alter supporting habitat.

19.2.3.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Southern North Sea SAC (UK0030395) (0km)

Qualifying features

19.2.3.3 The site has been selected for the following qualifying features:

- M1315 *Phocoena phocoena;* Harbour porpoise

Conservation objectives

19.2.3.4 The conservation objectives set for this Habitats Site states:[44]

19.2.3.5 The conservation objectives (CO) for the Southern North Sea SAC are to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for harbour porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that:

- CO 1. Harbour porpoise is a viable component of the site.
- CO 2. There is no significant disturbance of the species.
- CO 3. The condition of supporting habitats and processes, and the availability of prey is maintained.
- The conservation objectives for the protected feature of the Southern North Sea SAC are further explained in the Conservation Objectives and Advice on Operations document.

Construction effects

19.2.3.6 The proposed offshore pipeline is located within the Habitats Site.

19.2.3.7 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

19.2.3.8 The construction of the option may include activities that risk increasing sedimentation and siltation in the Habitats Site from surface water runoff and disturbance of the seabed.

19.2.3.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

[44] JNCC (2019) Harbour Porpoise (*Phocoena phocoena*) SAC: Southern North Sea. Conservation Objectives and Advise on Operations. Available at: https://data.jncc.gov.uk/data/206f2222-5c2b-4312-99ba-d59dfd1dec1d/SouthernNorthSea-conservation-advice.pdf.

Non-physical disturbance

19.2.3.10 The construction of the option may result in temporary changes to baseline levels of noise and vessel movement.

19.2.3.11 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

19.2.3.12 The option will be within the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

19.2.3.13 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

19.2.3.14 The proposed offshore pipeline is located within the Habitats Site and the brine water discharge plume from the proposed pipeline may extend into the Habitats Site.

19.2.3.15 Potential effects from operational activities relevant to this Habitats Site are:

Physical loss and/or damage

19.2.3.16 The operation of the option may include activities that risk interacting with coastal process. Impacts on coastal processes have the potential to alter supporting habitats.

19.2.3.17 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

19.2.3.18 The operation of the option may result in temporary changes to baseline levels of noise and vessel movement (e.g., pipeline inspection and maintenance).

19.2.3.19 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

19.2.4 The discharge of brine water into the Habitats Site will increase the baseline concentrations of chloride, phosphate and sodium. Changes in baseline conditions may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

19.2.4.1 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

19.2.4.2 The operation of the option may include activities where there is a risk of injury and mortality of the qualifying feature ((e.g., vessel collision) and the displacement and mortality of prey species (e.g., sea water intake and brine discharge). Increased mortality of qualify features may change population abundance within the Habitats Site. Changes in the mortality rates, distribution, abundance and availability of key food and prey items has the potential to alter supporting habitat.

19.2.4.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Broadland SPA (UK9009253) (approximately 0.7km)

Qualifying features

19.2.4.4 The site has been selected for the following qualifying features[45]:

- A021 *Botaurus stellaris;* Great bittern (Breeding)
- A037 *Cygnus columbianus bewickii;* Bewick's swan (Non-breeding)
- A038 *Cygnus cygnus*; Whooper swan (Non-breeding)
- A051 *Anas strepera*; Gadwall (Non-breeding)
- A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
- A082 *Circus cyaneus;* Hen harrier (Non-breeding)

Conservation objectives

19.2.4.5 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

19.2.4.6 The construction of the pipeline will take place adjacent to the Habitats Site and within the 1km buffer defined by the relevant SSSI Impact Risk Zones as well as Goose and Swan Functional Land.

19.2.4.7 Potential effects from construction activities were identified in screening, those relevant to this Habitats Site are:

Physical loss and/or damage

19.2.4.8 The construction of the pipeline will take place adjacent to the Habitats Site, and partly within the relevant SSSI Impact Risk Zone, including Goose and Swan Functional Land. Arable land within Goose and Swan Functional Land is used by Bewick's swan for foraging and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

[45] Natural England, 2014. European Site Conservation Objectives for Broadland SPA (UK9009253). Available at: https://publications.naturalengland.org.uk/publication/5310905998901248

19.2.4.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

19.2.4.10 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore within the relevant the SSSI Impact Risk Zones, including Goose and Swan Functional Land.

19.2.5 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

19.2.5.1 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

19.2.5.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

19.2.5.3 The construction of the option will be adjacent to the Habitats Site and near water features that flow directly into the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

19.2.5.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity. This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary

Operational effects

19.2.5.5 No LSE from operational activities were identified during screening. This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary

The Broads SAC (UK0013577) (Approximately 0.7km)

Qualifying features

19.2.5.6 The site has been selected for the following qualifying features:[46]

- H3140. Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp*.; Calcium-rich nutrient-poor lakes, lochs and pools
- H3150. Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed
- H6410. Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows

[46] Natural England, 2014. European Site Conservation Objectives for The Broads SAC (UK0013577). Available at: https://publications.naturalengland.org.uk/publication/6190476679970816

- H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable 'quaking' surface
- H7210. Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge) * Priority feature
- H7230. Alkaline fens; Calcium-rich springwater-fed fens
- H91E0. Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*); Alder woodland on floodplains* Priority feature
- S1016. *Vertigo moulinsiana*; Desmoulin's whorl snail
- S1355. *Lutra lutra*; Otter
- S1903. *Liparis loeselii*; Fen orchid
- S4056. *Anisus vorticulus*; Little whorlpool ram's-horn snail

Conservation objectives

19.2.5.7 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

19.2.5.8 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

19.2.5.9 The construction of the pipeline will take place approximately 0.7km beyond the boundary of the Habitats Site and within the 1km buffer defined by the relevant SSSI Impact Risk Zone.

19.2.5.10 Otter is the only qualifying species that may regularly range outside the Habitats Site. Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km).[47] [48] Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore likely to fall within the 1km buffer defined by the relevant SSSI Impact Risk Zone and may interact with the construction of the option.

19.2.6 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

[47] Kruuk, H., 2006. Otters: ecology, behaviour and conservation: ecology, behaviour and conservation. OUP Oxford.

[48] Kruuk H. Moorhouse A., 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology 224:41–57.

Non-physical disturbance

19.2.6.1 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site but within the SSSI Impact Risk Zone.

19.2.7 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

19.2.7.1 The construction of the option will be near water features that flow directly into the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

19.2.7.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

19.2.7.3 The construction of the option will be near water features that flow directly into the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

19.2.7.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

19.2.7.5 No LSE from operational activities were identified in screening.

Broadland Ramsar site (UK11010) (approximately 0.07km)

Qualifying features

19.2.7.6 The site has been selected for the following criteria:[49]

19.2.7.7 **Ramsar criterion 2:** The site supports a number of rare species and habitats within the biogeographical zone context, including the following Habitats Directive Annex I features:

- H7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Calcium-rich fen dominated by great fen sedge (saw sedge)
- H7230 Alkaline fens Calcium-rich springwater-fed fens
- H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) Alder woodland on floodplains, and the Annex II species:
  - S1016 Vertigo moulinsiana *Desmoulin`s whorl snail*
  - S1355 *Lutra lutra* Otter
  - S1903 *Liparis loeselii* Fen orchid.
- The site supports outstanding assemblages of rare plants and invertebrates including nine British Red Data Book plants and 136 British Red Data Book invertebrates.

[49] JNCC, 1994. Broadland Ramsar site Information Sheet (UK11010). Available at: https://jncc.gov.uk/jncc-assets/RIS/UK11010.pdf

19.2.7.8 **Ramsar Criterion 6:** Species/populations occurring at levels of international importance. Species with peak counts in winter:

- Bewick's swan, *Cygnus columbianus bewickii*, NW Europe
- Eurasian wigeon, *Anas penelope*, NW Europe
- Gadwall, Anas *strepera strepera*, NW Europe
- Northern shoveler, *Anas clypeata*, NW & C Europe
- Species/populations identified subsequent to designation for possible future consideration under criterion 6.
- Species with peak counts in winter:
- Pink-footed goose, *Anser brachyrhynchus*, Greenland, Iceland/UK
- Greylag goose, *Anser anser anser*, Iceland/UK, Ireland

Conservation objectives

19.2.7.9 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

19.2.7.10 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

19.2.7.11 The construction of the pipeline will take place approximately 0.7km beyond the boundary of the Habitats Site and within the 1km buffer defined by the relevant SSSI Impact Risk Zone and Goose and Swan Functional Land. Arable land within Goose and Swan Functional Land is used by Bewick's swan for foraging and the area within the construction area will be reinstated to its pre-construction condition in a short period of time.

19.2.7.12 Otter may regularly range outside the Habitats Site. Whilst the ranging behaviour of otter may be very large (32km for males and 20km for females), core ranges may be much smaller (0.5–1.6km).[50] [51] Core ranges and their supporting habitats extending beyond the boundary of the Habitats Site are therefore likely to fall within the 1km buffer defined by the relevant SSSI Impact Risk Zone.

19.2.8 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

19.2.8.1 Temporary changes to baseline levels noise, vibration, human presence and artificial light are likely to be measurable within 500m of the option and therefore outside the Habitats Site but within the SSSI Impact Risk Zone.

19.2.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

[50] Kruuk, H., 2006. Otters: ecology, behaviour and conservation: ecology, behaviour and conservation. OUP Oxford.

[51] Kruuk H. Moorhouse A., 1991. The spatial organization of otters (*Lutra lutra*) in Shetland. Journal of Zoology 224:41–57.

Toxic / Non-toxic contamination

19.2.9.1 The construction of the option will be near water features that flow directly into the Habitats Site and the accidental release or resuspension of toxic and non-toxic contaminants may occur during construction.

19.2.9.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

19.2.9.3 The construction of the option will be near water features that flow directly into the Habitats Site therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

19.2.9.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

19.2.9.5 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary.

Operational effects

19.2.9.6 No LSE from operational activities were identified in screening.

19.2.9.7 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary.

Paston Great Barn SAC (UK0030331) (approximately 1.0km)

Qualifying features

19.2.9.8 The site has been selected for the following qualifying features:

- S1308. *Barbastella barbastellus*; Barbastelle bat

Conservation objectives

19.2.9.9 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of the habitats of the qualifying species
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

19.2.9.10 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss and/or damage

19.2.9.11 The construction of the pipeline may result in the temporary removal of grassland, hedgerows and woodland outside the Habitats Site. These habitats have the potential to act as supporting off-site habitat (flight-lines and foraging areas).

19.2.9.12 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Non-physical disturbance

19.2.9.13 The construction of the pipeline may result in temporary changes to baseline levels noise, vibration, human presence and artificial light. These changes in baseline levels have the potential to alter the supporting processes that barbastelle bat relies.

19.2.9.14 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity..

Operational effects

19.2.9.15 Potential effects from operational activities relevant to this Habitats Site are:

Non-physical disturbance

19.2.9.16 The operation of the desalination plant may result in long-term changes to baseline levels noise, vibration, human presence and artificial light. These changes in baseline levels have the potential to alter the supporting processes that barbastelle bat relies.

19.2.9.17 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

19.3 Measure to avoid or mitigate adverse effects

19.3.1.1 The East Inshore and Offshore Marine Plan sets out priorities and directions for future development within the plan area and among other things helps marine users understand the best locations for their activities, including where new developments may be appropriate. When applying for a licence or approval it must be demonstrated how the marine plan has been considered and how the project contributes to achieving objectives in the marine plan.

19.3.1.2 The following marine plan policies will be considered in the detailed design of the option:

- E-MPA-1 Marine protected areas - Any impacts on the overall Marine Protected Area network must be taken account of in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network.

19.3.1.3 The measures to avoid or reduce adverse effects that would facilitate compliance with the marine plan policies should include:

- Design measures incorporated in:
  - Detailed Pipe/Cable Laying Plan
  - Scour Protection Plan
  - Brine Water Discharge Management Plan
  - Climate Change Resilience Assessment
- Construction/decommissioning measures incorporated in:
  - Code of Construction Practice

  - Code of Conduct for Vessel Operators
  - Chemical Risk Assessment
  - Marine Pollution Contingency Plan
  - Biosecurity Plan
- Operational measures incorporated in:
  - Code of Conduct for Vessel Operators
  - Chemical Risk Assessment
  - Marine Pollution Contingency Plan
  - Biosecurity Plan
  - Biodiversity Impingement and Entrainment Adaptive Management Plan

19.3.1.4 Specific measures for consideration in the option design are:

- Methods for brine discharge or processing that will remove the need to discharge into the estuary.
- Installation of a salinity and residual chemical diffuser on the out take. This will increase mixing and enhance rapid initial dilution of the concentrate, minimising increases in local salinity and its influence on the estuarine bed.
- Further brine dilution with cooling water (this will also be mitigated by permits governing the temperature of discharged water).
- Where chlorine dosing is required to reduce/remove biofouling, this should be applied in the direction of the plant to avoid chlorine discharge into the estuarine environment.

19.3.1.5 Brine water could discharge into lagoons. If this option were to be pursued then the use and harvesting of salt or highly concentrated brine for use as refrigerating fluid, water softening and purification and de-icing could be considered.

19.3.1.6 Measures will be delivered at the project level using the principles set out below:

- An engagement plan will set out the expectations and timescales of consultation so that stakeholders can provide advice during the design and consenting processes.
- Option design and the development of measures to safeguard the Habitats Site will be informed by further research (listed below).
- In planning the location of marine infrastructure, the emphasis should be on avoiding Habitats Sites. If this is not possible, adverse effects must be minimised through design, so they are no longer significant.
- Where it is necessary to minimise adverse effects of marine infrastructure at the project level, appropriate measures should ideally be agreed with statutory stakeholders and be capable of being secured within project design and/or consents. Mitigation measures will also need to be acceptable to competent authorities.
- ‘Best available techniques’ (BAT) for preventing or minimising impacts on the environment. Consideration of BAT will include the use of technology, design as well as construction, operation, maintenance and decommissioning methods.
- Current best practice environmental considerations, guidance and advice from statutory nature conservation bodies (e.g., Natural England) will be taken into account during the detailed design process.
- Planning of marine infrastructure should be undertaken in consultation with key stakeholders (e.g., Natural England and, where appropriate, JNCC). Other non-statutory consultees should also be included in the consultation (e.g., RSPB).

19.3.1.7 The above measures have all been implemented on consented nationally significant infrastructure projects and therefore there is practical certainty they can be implemented and in place at the relevant time when the project level appropriate is undertaken. The full implementation of these measures, together with any site-specific efficacy research, will be secured and enforced as it has on other projects, in the project planning process.

19.3.1.8 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

19.4 Further studies and monitoring

19.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided and reduced, the following studies and monitoring are recommended.

19.4.1.2 Prior to the submission of a planning application the relevant protected habitat and species surveys (onshore and offshore) should be undertaken to ensure the relevant information is secured to support the project level HRA.

19.4.1.3 Further studies will be required to inform measures related to coastal processes, the brine discharge and its effect on baseline water quality, salinity and temperature.

20 Lincolnshire Central to Ruthamford North potable transfer (75 Ml/d) (RTN30)

20.1 Introduction

20.1.1.1 This pipeline option will transfer potable water from Lincolnshire Central to Ruthamford North and will be operational by 2040.

20.1.1.2 Screening could not rule out LSE in relation to:

- Nene Washes SAC (UK0030222) – approximately 7.3km from the option
- Nene Washes SPA (UK9008031) – approximately 6.4km from the option
- Nene Washes Ramsar site (UK11046) – approximately 6.4km from the option

20.1.1.3 Covering a total area of approximately 88 hectares within the Fens National Character Area (NCA), the Nene Washes lie north-west of the Ouse Washes. The Nene Washes are one of the country's few remaining areas of low-lying, periodically inundated grassland (washland) habitat and this site is notable for the diversity of plant and associated animal life within its network of dykes.

20.1.1.4 The general site character is predominantly standing and running water, with bogs, marshes, water fringed vegetation and fens, and areas of improved grassland. The washlands are used for the seasonal uptake of floodwaters and, traditionally, for cattle grazing in the summer months. The mosaic of rough grassland and wet pasture provide a variety of sward structure and herbs of importance respectively for bird nesting habitat and feeding. Additional winter feeding is provided by remains of arable cropping on small areas. Many of the ditches hold a rich flora which includes such uncommon species as frogbit *Hydrocharis morsus-ranae*, water violet *Hottonia palustris* and flowering rush *Butomus umbellatus*.

20.1.1.5 These washlands play an additional role in relation to the nearby Ouse Washes in that they accommodate wildfowl populations displaced from the Ouse Washes when deep floodwaters prevent their feeding. In summer, the site is of importance for an assemblage of breeding waders whilst in winter the site holds large numbers of waders and wildfowl.

20.1.1.6 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

20.2 Appropriate Assessment

Assessment summary

20.2.1.1 This option is not located in any SSSI Impact Risk Zone associated with a Habitats Site. Hydrological connectivity links the option to the Habitat Sites of the Nene Washes via the River Nene.

20.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

20.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

20.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Nene Washes SAC (UK0030222) (approximately 7.3km)

Qualifying features

20.2.1.5 The site has been selected for the following qualifying features:

20.2.1.6 S1149. *Corbitis taenia*; Spined loach.

Conservation objectives

20.2.1.7 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

20.2.1.8 The option is located beyond any of the relevant SSSI Impact Risk Zone associated with the Habitats Site. There is hydrological connectivity between the option and the Habitats Site via the River Nene.

20.2.1.9 The Environment Agency have recorded spined loach close to the option route alignment at Castor Mill Channel and at Yarwell Mill Back Channel, approximately 10km upstream of the option. It is possible therefore that spined loach is present within the option's ZoI.

20.2.1.10 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

20.2.1.11 The construction of the option may include activities that risk increasing sedimentation and siltation in the River Nene from surface water runoff.

20.2.1.12 The pipeline route crosses the River Nene and Black Dike however it is assumed that directional drilling will be used to route the pipeline under the river. Directional drilling could cause subsidence of the river bed.

20.2.1.13 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

20.2.1.14 The construction of the option may include activities where the accidental release or resuspension of toxic and non-toxic contaminants may occur in the River Nene upstream of the Habitats Site.

20.2.2 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

20.2.2.1 The construction of the pipeline may include activities where there may be a risk of introducing invasive non-native species to the construction site upstream of the Habitats Site.

20.2.3 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

20.2.3.1 No LSE from operational activities were identified in screening.

Nene Washes SPA (UK9008031) (approximately 6.4km)

Qualifying features

20.2.3.2 The site has been selected for the following qualifying features:

- A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
- A050 *Anas penelope*; Wigeon (Non-breeding)
- A051 *Anas strepera*; Gadwall (Breeding)
- A051 *Anas strepera*; Gadwall (Non-breeding)
- A052 *Anas crecca*; Teal (Non-breeding)
- A054 *Anas acuta*; Pintail (Non-breeding)
- A055 *Anas querquedula*; Garganey (Breeding)
- A056 *Anas clypeata*; Shoveler (Non-breeding)
- A056 *Anas clypeata*; Shoveler (Breeding)
- A156a *Limosa limosa*; Black-tailed godwit (Breeding)

Conservation objectives

20.2.3.3 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

20.2.3.4 The option is located beyond any of the relevant SSSI Impact Risk Zone associated with the Habitats Site. There is hydrological connectivity between the option and the Habitats Site via the River Nene.

20.2.3.5 It is likely that the qualifying features of this Habitats Site are not present within the option's ZoI.

20.2.3.6 Potential effects from construction activities relevant to this Habitats Site are:

Toxic / Non-toxic contamination

20.2.3.7 The construction of the option may include activities where the accidental release or resuspension of toxic and non-toxic contaminants may occur in the River Nene upstream of the Habitats Site.

20.2.4 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

20.2.4.1 No LSE from operational activities were identified in screening.

Nene Washes Ramsar (UK11046) (approximately 6.4 km)

Qualifying features

20.2.4.2 The site has been selected for the following criteria:

20.2.4.3 **Ramsar Criterion 2:** The site supports an important assemblage of nationally rare breeding birds. In addition, a wide range of raptors occur through the year. The site also supports several nationally scarce plants including *Nymphoides peltata, Potamogeton trichoides* and *Rumex palustris*. Additionally, two vulnerable and two rare British Red Data Book invertebrate species have been recorded including the aquatic snail *Valvata macrostoma*, the water beetle *Agabus undulatus*, the dragonfly *Libellula fulva* and the hoverfly *Anasimyia interpuncta*.

20.2.4.4 **Ramsar Criterion 6:** Species/populations occurring at levels of international importance

20.2.4.5 Qualifying Species/populations (as identified at designation):

20.2.4.6 Species with peak counts in winter:

- Bewick's swan, *Cygnus columbianus bewickii*, NW Europe

Conservation objectives

20.2.5 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects

20.2.5.1 The option is located beyond any of the relevant SSSI Impact Risk Zone associated with the Habitats Site. There is hydrological connectivity between the option and the Habitats Site via the River Nene.

20.2.5.2 It is likely that the qualifying features of this Habitats Site are not present within the option's ZoI.

20.2.5.3 Potential effects from construction activities relevant to this Habitats Site are:

Physical loss/damage

20.2.5.4 The construction of the option may include activities that risk increasing sedimentation and siltation in the River Nene from surface water runoff.

20.2.5.5 The pipeline route crosses the River Nene and Black Dike however it is assumed that directional drilling will be used to route the pipeline under the river. Directional drilling could cause subsidence of the river bed.

20.2.5.6 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

20.2.5.7 The construction of the option may include activities where the accidental release or resuspension of toxic and non-toxic contaminants may occur in the River Nene upstream of the Habitats Site.

20.2.5.8 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operational effects

20.2.5.9 No LSE from operational activities were identified in screening.

20.3 Measures to avoid or mitigate adverse effects

20.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through pre-commencement planning conditions.

20.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical loss and/or damage
  - Directional drilling will be used to avoid crossing watercourses >3m (e.g., River Nene)
  - Engineering in the water environment: good practice guide river crossings (SEPA)
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to —
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to —
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)

- ‘Clean Check Dry’ (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

20.4 Further studies and monitoring

20.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how adverse effects can be practically avoided and mitigated, the following studies and monitoring are recommended.

20.4.1.2 Prior to the submission of a planning application the relevant protected species surveys (i.e., spined loach river condition assessment) should be undertaken to ensure the relevant information is secured to support the project level HRA.

20.4.1.3 A desk-based hydrogeological assessment is required to inform pipeline design to ensure that the pipeline installation does not cause subsidence of the riverbed on the River Nene and Back Dike.

21 Lincolnshire Reservoir 50MCM (usable volume) (169Ml/d) (RTN17)

21.1 Introduction

21.1.1.1 This option proposes an earth embanked winter storage reservoir located in the south Lincolnshire area. Abstraction will be from the River Trent, with a transfer via the River Witham. This will be operational by 2040.

21.1.1.2 The HRA Stage 1 screening did not identify Habitats Sites within the vicinity of this option. The Scheme is, however, potentially hydrologically connected to the seven following Habitats Sites listed below:

- The Wash SPA (UK9008021) – approximately 23km from the option
- The Wash and North Norfolk Coast SAC (UK0017075) – approximately 23km from the option
- The Wash Ramsar – approximately 23km from the option
- Humber Estuary SPA (UK9006111) – approximately 74.5km from the option
- Humber Estuary SAC (UK0030170) – approximately 52.5km from the option
- Humber Estuary Ramsar site (UK11031) – approximately 52.5km from the option
- Baston Fen SAC (UK0030085) – approximately 2km from the option

21.1.1.3 The proposed water transfer route is situated approximately 2km from Baston Fen SAC and crosses the River Glen to the north east of the Habitats Site. The unrefined route is partly located inside a SSSI Impact Risk Zone for Baston Fen SAC and Goose and Swan Functional Land. Refinement of the option design will ensure that the route is outside these SSSI Impact Risk Zones.

21.1.1.4 The Wash is the largest embayment in the UK. It is connected via sediment transfer systems to the north Norfolk coast. Together, the Wash and North Norfolk Coast form one of the most important marine areas in the UK and the European North Sea coast and includes extensive areas of varying, but predominantly sandy, sediments subject to a range of conditions.

21.1.1.5 The Humber Estuary Ramsar site, SPA, and SAC are located on the east coast of England and comprises extensive wetland and coastal habitats. The inner estuary supports extensive areas of reedbed, with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. Parts of the estuary are owned and managed by conservation organisations.

21.1.1.6 Since screening, design development has allowed a more precise understanding of the location of the option to inform the plan level assessment. Potential effects from the proposed pipeline routes had been identified at screening to the following sites due to hydrological connection. These sites are located upstream and therefore there will be no adverse effects on site integrity:

- Nene Washes SPA (UK9008031) – approximately 9km from the option
- Nene Washes SAC (UK0030222) – approximately 9km from the option
- Nene Washes Ramsar site (UK11046) – approximately 9km from the option

21.2 Appropriate Assessment

Assessment summary

21.2.1.1 This option is not located in any SSSI Impact Risk Zones associated with any Habitats Site. Hydrological connectivity links the option to the Habitat Sites of the Humber Estuary and the Wash via surface water features; including the River Trent (abstraction source) and the River Witham (transfer abstraction) respectively.

21.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary

21.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

21.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

The Wash SPA (UK9008021) (Approximately 23km)

Qualifying features

21.2.1.5 The site has been selected for qualifying features under the following articles of the Conservation of Wild Birds Directive[52] :

Article 4.1

21.2.1.6 During the breeding season the area regularly supports:

- *Sterna albifrons*
- *Sterna hirundo*

21.2.1.7 Over winter the area regularly supports:

- *Cygnus columbianus bewickii*
- *Limosa lapponica*

Article 4.2

21.2.1.8 Over winter the area regularly supports:

- *Anas acuta*
- *Anas Penelope*
- *Anas strepera*
- *Anser brachyrhynchus*
- *Arenaria interpres*
- *Branta bernicla bernicla*
- *Bucephala clangula*
- *Calidris alba*
- *Calidris alpina alpine*
- *Calidris canutus*

[52] EUR-Lex - 32009L0147 - EN - EUR-Lex (europa.eu)

- *Haematopus ostralegus*
- *Limosa limosa islandica*
- *Melanitta nigra*
- *Numenius arquata*
- *Pluvialis squatarola*
- *Tadorna tadorna*
- *Tringa totanus*

Article 4.2 An internationally important assemblage of birds

21.2.1.9 400,367 waterfowl (5-year peak mean 1991/92-1995/96) Including:

- *Cygnus columbianus bewickii*
- *Anser brachyrhynchus*
- *Branta bernicla*
- *Tadorna tadorna*
- *Anas Penelope*
- *Anas strepera*
- *Anas acuta*
- *Melanitta nigra*
- *Bucephala clangula*
- *Haematopus ostralegus*
- *Pluvialis squatarola*
- *Calidris canutus*
- *Calidris alba*
- *Calidris alpina*
- *Limosa islandica*
- *Limosa lapponica*
- *Numenius arquata*
- *Tringa totanus*
- *Arenaria interpres*

Conservation objectives

21.2.1.10 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

The Wash and North Norfolk Coast SAC (UK0017075) (approximately 23km)

Qualifying features

21.2.1.11 This site has been selected for the following qualifying features:

- 1110 Sandbanks which are slightly covered by sea water all the time
- 1140 Mudflats and sandflats not covered by seawater at low tide
- 1160 Large shallow inlets and bays
- 1170 Reefs
- 1150 Coastal lagoons
- 1310 *Salicornia* and other annuals colonising mud and sand
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- 1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)
- 1365 Common seal (*Phoca vitulina*)
- 1355 Otter (*Lutra lutra*)

Conservation objectives

21.2.1.12 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

The Wash Ramsar site (UK11072) (approximately 23km)

Qualifying features

21.2.1.13 The site has been selected for qualifying features under the following Ramsar criterions:

21.2.1.14 **Ramsar criterion 1**

21.2.1.15 The Wash is a large shallow bay comprising very extensive saltmarshes, major intertidal banks of sand and mud, shallow water and deep channels. It is the largest estuarine system in Britain.

21.2.1.16 **Ramsar criterion 3**

21.2.1.17 Qualifies because of the inter-relationship between its various components including saltmarshes, intertidal sand and mud flats and the estuarine waters. The saltmarshes and the plankton in the estuarine water provide a primary source of organic material which, together with other organic matter, forms the basis for the high productivity of the estuary.

21.2.1.18 **Ramsar criterion 5**

21.2.1.19 Assemblages of international importance:

- Species with peak counts in winter:
  - 292,541 waterfowl (5-year peak mean 1998/99-2002/2003)

21.2.1.20 **Ramsar criterion 6**

21.2.1.21 Species/populations occurring at levels of international importance:

- Species with peak counts in spring/autumn:
  - Eurasian oystercatcher, *Haematopus ostralegus,* Europe & North West (NW) Africa – wintering
  - Grey plover, *Pluvialis squatarola,* East (E) Atlantic/ West (W) Africa – wintering
  - Red knot, *Calidris canutus islandica,* W & Southern Africa (wintering)
  - Sanderling, *Calidris alba*, Eastern Atlantic
  - Eurasian curlew, *Numenius arquata.* N. a. arquata Europe
  - Common redshank, Tringa totanus
- Species with peak counts in winter:
  - Pink-footed goose, *Anser brachyrhynchus,* Greenland, Iceland/UK
  - Dark-bellied brent goose, *Branta bernicla*
  - Common shelduck, *Tadorna,* NW Europe
  - Dunlin, *Calidris alpina*, W Siberia/W Europe
  - Bar-tailed godwit, *Limosa lapponica,* W Palearctic
  - Black-headed gull, *Larus ridibundus*, N & Central (C) Europe

21.2.1.22 Species/populations identified subsequent to designation for possible future consideration under criterion 6:

- Species with peak counts in spring/autumn:
  - Ringed plover, *Charadrius hiaticula,* Europe/Northwest Africa
  - Black-tailed godwit, *Limosa islandica,* Iceland/W Europe
- Species with peak counts in winter:
  - European golden plover, *Pluvialis apricaria,* Iceland & Faroes/E Atlantic
  - Atlantic Northern lapwing, *Vanellus vanellus*, Europe - breeding

Conservation objectives

21.2.1.23 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects on the Habitats Sites of the Wash

21.2.1.24 The reservoir and associated water transfer infrastructure are not located in a SSSI Impact Risk Zone associated with this Habitats Site. No adverse effects from construction are therefore reasonably foreseeable.

Operation effects on the Habitats Sites of the Wash

Physical damage

21.2.1.25 The proposed transfer of flows from the River Trent into the upper Witham system will result in increased flows in the River Witham, down to the abstraction point at Langrick Bridge (upstream of the Wash). This will increase the potential for abstraction, allowing transferred flows to be taken out as a minimum when the transfer is operated.

21.2.1.26 The transfer from the Trent is unlikely to occur at a constant rate throughout the year. In reality, it will stop when there is sufficient water in the Witham system, and it will also be subjected to Hands Off Flow (HOF) conditions on the Trent.

21.2.1.27 Abstraction rules shall ensure that HOF conditions are maintained and thus reduction in flows in the River Witham will only occur at certain times of year in medium and high flow periods. Overall, reductions in flows will be maximal during the winter months (December to March) whereas in the summer months (June to September), little will be abstracted from the river system.

21.2.1.28 The preferred solution for emergency drawdown at this stage is to discharge to South Forty Foot Drain which is hydrologically connected to the Wash, but this is to be further modelled and confirmed as part of the next stage of development.

21.2.1.29 The operation of the transfer poses a risk of hydrological change within the Habitats Site that may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

21.2.1.30 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbances

21.2.1.31 The operation of the transfer poses a risk of the introduction of invasive non-native species that may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

21.2.1.32 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

21.2.1.33 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary.

Humber Estuary SPA (UK9006111) (74.5km)

Qualifying features

21.2.1.34 The site has been selected for qualifying features under the following articles of the Birds Directive:

21.2.1.35 Article 4.1

21.2.1.36 During the breeding season the area regularly supports:

- *Botaurus stellaris*
- *Circus aeruginosus* - 6.3% of the population in Great Britain
- *Recurvirostra avosetta*
- *Sterna albifrons*

21.2.1.37 Over winter the area regularly supports:

- *Botaurus stellaris*
- *Circus cyaneus*
- *Limosa lapponica*
- *Pluvialis apricaria* (NW Europe - breeding)

- *Recurvirostra avosetta*

21.2.1.38 On passage the area regularly supports:

- Philomachus pugnax

21.2.1.39 **Article 4.2**

21.2.1.40 Over winter the area regularly supports:

- *Calidris alpina alpine*
- *Calidris canutus*
- *Limosa limosa islandica*
- *Tadorna tadorna*
- *Tringa totanus*

21.2.1.41 On passage the area regularly supports:

- *Calidris alpina alpine*
- *Calidris canutus*
- *Limosa limosa islandica*
- *Tringa totanus*

21.2.1.42 **Article 4.2 – An internationally important assemblage of birds.**

21.2.1.43 In the non-breeding season, the area regularly supports:

- *Anas crecca*
- *Anas Penelope*
- *Anas platyrhynchos*
- *Arenaria interpres*
- *Aythya farina*
- *Aythya marila*
- *Botaurus stellaris*
- *Branta bernicla bernicla*
- *Bucephala clangula*
- *Calidris alba*
- *Calidris alpina alpina*
- *Calidris canutus*
- *Charadrius hiaticula*
- *Haematopus ostralegus*
- *Limosa lapponica*
- *Limosa limosa islandica*
- *Numenius arquata*
- *Numenius phaeopus*
- *Philomachus pugnax*
- *Pluvialis apricaria*
- *Pluvialis squatarola*
- *Recurvirostra avosetta*
- *Tadorna tadorna*

- *Tringa nebularia*
- *Tringa totanus*
- *Vanellus vanellus*

Conservation objectives

21.2.1.44 With regard to the SPA and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Humber Estuary SAC (UK0030170) (approximately 52.5km)

Qualifying features

21.2.1.45 The site has been selected for the following qualifying features:

- H1110 Sandbanks which are slightly covered by sea water all the time
- H1130 Estuaries
- H1140 Mudflats and sandflats not covered by seawater at low tide
- H1150 Coastal lagoons
- H1310 Salicornia and other annuals colonising mud and sand
- H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- H2110 Embryonic shifting dunes
- H2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('White dunes')
- H2130 Fixed dunes with herbaceous vegetation ('Grey dunes')
- H2160 Dunes with *Hippophae rhamnoides*
- S1095 Sea lamprey (*Petromyzon marinus*)
- S1099 River lamprey (*Lampetra fluviatilis*)
- S1364 Grey seal (*Halichoerus grypus*)

Conservation objectives

21.2.1.46 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats

- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species
- The distribution of qualifying species within the site

21.2.1.47 This site has been identified as an area of importance for aquatic habitats including estuaries, mudflats and sandflats not covered by sea water at low tide, intertidal mudflats and sandflats, costal lagoons, Atlantic salt meadows and embryonic shifting dunes. As salinity declines upstream, reedbeds and brackish saltmarsh communities fringe the estuary. These are best represented at the confluence of the Rivers Ouse and Trent at Blacktoft Sands.

21.2.1.48 Qualifying fish species include river lamprey (*Lampetra fluviatilis*) and sea lamprey (Petromyzon marinus) which breed in the River Derwent, a tributary of the River Ouse. Grey seals (*Halichoerus grypus*) come ashore in autumn to form breeding colonies on the sandy shores of the south bank at Donna Nook.

Humber Estuary Ramsar site (UK11031) (74.5km)

Qualifying features

21.2.1.49 The site has been selected for qualifying features under the following Ramsar criterions:

21.2.1.50 **Ramsar criterion 1**

21.2.1.51 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.

21.2.1.52 **Ramsar criterion 3**

- The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* 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 Salt Fleet- by-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*.

21.2.1.53 **Ramsar criterion 5**

21.2.1.54 Assemblages of international importance:

- 153,934 waterfowl, non-breeding season (5 year peak mean 1996/97-2000/2001)

21.2.1.55 **Ramsar criterion 6**

21.2.1.56 Species/populations occurring at levels of international importance:

- Species with peak counts in spring/autumn:
  - European golden plover, *Pluvialis apricaria,* P. a. altifrons Iceland & Faroes/E Atlantic
  - Red knot, *Calidris canutus islandica,* W & Southern Africa (wintering) Dunlin
  - Dunlin , *Calidris alpina alpina,* W Siberia/W Europe
  - Black-tailed godwit, *Limosa limosa islandica,* Iceland/W Europe
  - Common redshank, Tringa totanus totanus
- Species with peak counts in winter:
  - Common shelduck, *Tadorna tadorna*, NW Europe

- European golden plover, *Pluvialis apricaria apricaria,* P. a. altifrons Iceland & Faroes/E Atlantic
- Red knot, *Calidris canutus islandica*, W & Southern Africa (wintering) Dunlin
- Dunlin, *Alidris alpina alpina*, W Siberia/W Europe
- Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe
- Bar-tailed godwit, *Limosa lapponica lapponica*, W Palearctic

21.2.1.57 **Ramsar criterion 8**

21.2.1.58 The Humber Estuary acts as an important migration route for both *Lampetra fluviatilis* and *Petromyzon marinus* between coastal waters and their spawning areas.

Conservation objectives

21.2.1.59 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC and SPA are regarded as a reasonable surrogate for the purposes of the plan level assessment.

Construction effects on the Habitats Sites of the Humber Estuary

21.2.1.60 The reservoir and associated water transfer infrastructure are not located in a SSSI Impact Risk Zone associated with this Habitats Site, including the Humber Estuary Lamprey Migration Route. No adverse effects from construction are therefore reasonably foreseeable.

Operation effects on the Habitats Sites of the Humber Estuary

21.2.1.61 The transfer from the River Trent, which is hydrologically connected to the Humber Estuary, is unlikely to occur at a constant rate throughout the year. In reality, it will stop when there is sufficient water in the Witham system, and it will also be subjected to HOF conditions on the Trent.

Physical damage

21.2.1.62 The transfer from the River Trent, which is hydrologically connected to the Humber Estuary, is unlikely to occur at a constant rate throughout the year. In reality, it will stop when there is sufficient water in the Witham system, and it will also be subjected to HOF conditions on the Trent. Reduction in flows may alter the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

21.2.1.63 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

21.2.2 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary

21.3 Measures to avoid or mitigate adverse effects

21.3.1.1 The operational limits of abstraction and emergency drawdown discharge will be constrained by the updated Anglian River Basin Management Plan (RBMP), the principal safeguard related to river basin management. RBMPs set the legally binding, locally specific, environmental objectives that underpin water regulation (such as permitting) and planning activities. The environmental objectives in the RBMP are legally binding once the plan is approved by Secretary of State for Environment, Food and Rural Affairs. All public bodies must have regard to these objectives when making decisions that could affect the quality of the water environment

and WRMPs or actions arising from them should act as mechanisms to deliver RBMP objectives.

21.3.1.2 This AA concludes that the aspects of option design described above (see paragraphs 20.2.1.29-20.2.1.33) will allow adherence to the RBMP and ensure no adverse effect on site integrity will result from water abstraction or emergency drawdown.

21.3.1.3 The Habitats Regulations Assessment for the Anglian River Basin RBMP identified measures that were considered “inherently capable of improving the integrity and resilience of Habitats Sites”. The following RBMP measures will be considered in the option development:

- transfer pipeline route avoiding SSSI Impact Risk Zones (Baston Fen SAC and Goose and Swan Functional Land).
- directional drilling will be used to avoid crossing watercourses >3m control pattern/timing of abstraction.

21.3.1.4 Measures will be delivered at the project level using the principles set out below:

- An engagement plan will set out the expectations and timescales of consultation so that stakeholders can provide advice during the design and consenting processes.
- Option design and the development of measures to safeguard the Habitats Site will be informed by further research (listed below).
- In planning the location of infrastructure, the emphasis should be on avoiding Habitats Sites. If this is not possible, adverse effects must be minimised through design, so they are no longer significant.
- Where it is necessary to minimise adverse effects of marine infrastructure at the project level, appropriate measures should ideally be agreed with statutory stakeholders and be capable of being secured within project design and/or consents. Mitigation measures will also need to be acceptable to competent authorities.
- ‘Best available techniques’ (BAT) for preventing or minimising impacts on the environment. Consideration of BAT will include the use of technology, design as well as construction, operation, maintenance and decommissioning methods.
- Current best practice environmental considerations, guidance and advice from statutory nature conservation bodies (e.g., Natural England) will be taken into account during the detailed design process.
- Planning of infrastructure should be undertaken in consultation with key stakeholders (e.g., Natural England and, where appropriate, JNCC). Other non-statutory consultees should also be included in the consultation (e.g., RSPB).

21.3.1.5 The above measures have all been implemented on consented nationally significant infrastructure projects and therefore there is practical certainty they can be implemented and in place at the relevant time when the project level appropriate is undertaken. The full implementation of these measures, together with any site-specific efficacy research, will be secured and enforced as it has on other projects, in the project planning process.

21.4 Further studies and monitoring

21.4.1.1 Prior to the submission of a planning application the relevant protected species surveys should be undertaken to ensure the relevant information is secured to support the project level HRA.

21.4.1.2 Additional recommended studies include:

- Studies and modelling of the water demand from the River Trent and the inter-catchment transfer into the River Witham to identify measurable changes in the water levels and flows in the Humber Estuary and the Wash.

- Environmental flow compliance assessment to indicate where abstraction pressures may start to cause undesirable effect in the Humber Estuary and the Wash.

21.4.1.3 On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

22 WINEP Option: Gipping River Restoration

22.1 Introduction

22.1.1.1 This option proposes river restoration and improvement works to take place within reaches two and three of the River Gipping (downstream of Stowmarket). This would extend from near Claydon (grid reference TM 12681 49565) to Ipswich (grid reference TM 15396 44140).

22.1.1.2 It is important to clarify that these location references are high level recommendations prior to the programme commencement and design.

22.1.1.3 This option proposes restoration and in channel improvements to the River Gipping between Claydon and Ipswich, in order to rectify some of the issues of low flow in the catchment, caused by abstraction of groundwater.

22.1.1.4 The potential improvements being considered are:

- additional riparian planting
- wetland and backwater creation areas
- weir removal
- additional fish passages
- marginal habitats to improve flow and water quality
- the narrowing of the channel in selective places
- floating habitat islands

22.1.1.5 Screening could not rule out LSE in relation to:

- Stour and Orwell Estuaries SPA (UK9009121) – approximately 3.5km downstream of the option.
- Stour and Orwell Estuaries Ramsar (UK11067) – approximately 3.5km downstream of the option.

22.1.1.6 The Stour and Orwell estuaries straddle the eastern part of the Essex/Suffolk border. The estuaries include extensive mudflats, low cliffs, saltmarsh and small areas of vegetated shingle on the lower reaches. The site also includes areas of low-lying grazing marsh at Shotley Marshes on the south side of the Orwell and at Cattawade Marshes at the head of the Stour.

22.1.1.7 The AA is set out below for the Habitats Sites, with detailed consideration given to the effects predicted to occur at both the construction and operational phases.

22.2 Appropriate Assessment

Assessment summary

22.2.1.1 This option is not located in a Habitats Site, but it is located in relevant SSSI Impact Risk Zones associated with Habitats Sites.

22.2.1.2 Those LSE identified in screening are assessed below, with details of measures to avoid or mitigate adverse effects also provided where such measures have been identified as being necessary.

22.2.1.3 It is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of

measures described in this plan level HRA assessment (see 'Measures to avoid and mitigate adverse effects' below).

22.2.1.4 On this basis, it is concluded that at the plan level there will be no adverse effect on the integrity of any habitats site.

Stour and Orwell Estuaries SPA (UK9009121) SPA (UK9009201) (approximately 3.5km)

Qualifying features

22.2.1.5 The site has been selected for the following qualifying features:

- A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
- A054 *Anas acuta*; Pintail (Non-breeding)
- A132 *Recurvirostra avosetta*; Avocet (Breeding)
- A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
- A143 *Calidris canutus*; Knot (Non-breeding)
- A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
- A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
- A162 *Tringa totanus*; Redshank (Non-breeding)
- Waterbird assemblage

Conservation objectives

22.2.1.6 With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying features
  - The supporting processes on which the habitats of the qualifying features rely
  - The population of each of the qualifying features
  - The distribution of the qualifying features within the site.

Construction effects

22.2.1.7 The construction of the option will take place outside the Habitats Site but directly upstream (3.5km) and within relevant SSSI Impact Risk Zones. Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

22.2.1.8 In channel and marginal works will take place outside the Habitats Site but within the relevant SSSI Impact Risk Zones. The option is 3.5km upstream of the Habitats Site at its closest point and construction activities risk increasing sedimentation and siltation in the Habitats Site from disturbance of the riverbed.

22.2.1.9 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

22.2.1.10 In channel and marginal works will take place outside the Habitats Site but within the relevant SSSI Impact Risk Zones. The option is 3.5km upstream of the Habitats Site at its closest point and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

22.2.1.11 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

22.2.1.12 The option is 3.5km upstream of the Habitats Site at its closest point and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

22.2.1.13 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

22.2.1.14 No LSE from operational activities were identified in screening because the option ultimately provides benefits to the River Gipping which may result in better flows and water quality downstream within Habitats Site.

Stour and Orwell Estuaries Ramsar (UK11067) (approximately 3.5km)

Qualifying features

- **Ramsar criterion 2:** Contains seven nationally scarce plants: stiff saltmarsh-grass (*Puccinellia rupestris*); small cord-grass (*Spartina maritima*); perennial glasswort (*Sarcocornia perennis*); lax-flowered sea lavender (*Limonium humile*); and the eelgrasses *Zostera angustifolia, Z. marina and Z. noltei.*

  Contains five British Red Data Book invertebrates: the muscid fly (*Phaonia fusca*); the horsefly (*Haematopota grandis*); two spiders (*Arctosa fulvolineata* and *Baryphema duffeyi*); and the Endangered swollen spire snail (*Mercuria confuse*).
- **Ramsar criterion 5:** Assemblages of international importance. Species with peak counts in winter: 63017 waterfowl (5 year peak mean 1998/99-2002/2003)
- **Ramsar criterion 6**: Species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation):
  - Species with peak counts in spring/autumn:
    - Redshank, *Tringa totanus totanus*
  - Species with peak counts in winter:
    - Dark-bellied brent goose, *Branta bernicla bernicla*
    - Pintail, *Anas acuta*
    - Grey plover, *Pluvialis squatarola*
    - Knot, *Calidris canutus islandica*
    - Dunlin, *Calidris alpina alpina*
    - Black-tailed godwit, *Limosa limosa islandica*
    - Redshank, *Tringa totanus totanus*

Conservation objectives

22.2.1.15 With regard to the SAC and the natural habitats and/or species for which the site has been designated, and subject to natural change:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species
  - The structure and function (including typical species) of qualifying natural habitats
  - The structure and function of the habitats of qualifying species
  - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
  - The populations of qualifying species
  - The distribution of qualifying species within the site

Construction effects

22.2.1.16 The construction of the option will take place outside the Habitats Site but directly upstream (3.5km) and within relevant SSSI Impact Risk Zones. Potential effects from construction activities relevant to this Habitats Site are:

Physical damage

22.2.1.17 In channel and marginal works will take place outside the Habitats Site but within the relevant SSSI Impact Risk Zones. The option is 3.5km upstream of the Habitats Site at its closest point and construction activities risk increasing sedimentation and siltation in the Habitats Site from disturbance of the riverbed.

22.2.1.18 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Toxic / Non-toxic contamination

22.2.1.19 In channel and marginal works will take place outside the Habitats Site but within the relevant SSSI Impact Risk Zones. The option is 3.5km upstream of the Habitats Site at its closest point and the accidental release or resuspension of toxic and non-toxic contaminants during construction may be, subject to timing (e.g. tidal state) and quantity, measurable downstream in the Habitats Site.

22.2.1.20 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Biological disturbance

22.2.1.21 The option is 3.5km upstream of the Habitats Site at its closest point and therefore there is a direct pathway for non-native species and pathogens introduced at the construction site to reach the Habitats Site.

22.2.1.22 On this basis, the implementation of the measures to avoid and mitigate the potential effects that are detailed in this plan level assessment will be required to conclude no adverse effect on site integrity.

Operation effects

22.2.1.23 No LSE from operational activities were identified in screening because the option ultimately provides benefits to the River Gipping which may result in better flows and water quality downstream within Habitats Site.

22.3 Measures to avoid or mitigate adverse effects

22.3.1.1 A code of construction practice (CoCP) will be produced to set out the control measures and the standards to be implemented as well as the approach to the management of construction activities. Following consultation with the relevant stakeholders during the detailed design stage, site-specific measures including the use of British Standards and good industry practice will be included within a Construction Environmental Management Plan (CEMP). It is expected that both the CoCP and the CEMP will be secured through the permits issued under the appropriate regulatory regime by the Environment Agency or through pre-commencement planning conditions.

22.3.1.2 Measures to avoid and mitigate adverse effects will include:

- Physical damage
  - Application of good industry practice, including but not limited to —
    - Weir removal, lowering and modification: a review of best practice (Environment Agency)
    - C763 River weirs – Design, maintenance, modification and removal (CIRIA)
    - Manual of River Restoration Techniques (River Restoration Centre)
  - Use of silt traps and screens
- Toxic contamination / Non-toxic contamination
  - Application of good industry practice, including but not limited to —
    - C741 Environmental good practice on site guide (CIRIA)
    - Pollution Prevention Guidance PPG1: General Guide to Prevention of Pollution (Environment Agency)
    - Pollution Prevention Guidance PPG6: PPG for working at construction and demolition sites (Environment Agency)
    - Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 (Net Regs)
  - Use of silt traps and screens
- Biological disturbance
  - Application of good industry practice, including but not limited to —
    - Biosecurity and management of invasive non-native species for construction sites and Controlled Activities (SEPA)
    - ‘Clean Check Dry’ (Aquatic Biosecurity Partnership)

On the basis of the above identified measures and through adjustments to the detailed design of the scheme, it is considered at the plan level there is confidence adverse effects can be avoided or fully mitigated.

22.4 Further studies and monitoring

22.4.1.1 This assessment has been made by relying on existing data and evidence, together with generic mitigations which can be reasonably assumed to be feasible in the absence of reasons to the contrary. Nevertheless, to allow the project level assessment to specifically identify how

adverse effects can be practically avoided or mitigated, the following studies and monitoring are recommended.

22.4.2 Prior to the submission of a planning application the relevant protected species surveys should be undertaken to ensure the relevant information is secured to support the project level HRA.

23 In Combination Assessment

23.1.1.1 This in combination assessment aims to identify where the rdWRMP24 is likely to interact with other plans and projects at a strategic scale and determined the degree to which such interaction may lead to adverse effects on Habitats Sites.

23.1.1.2 There is confidence that the measures detailed in this plan level assessment can avoid and mitigate for all potential effects and therefore bearing in mind these findings, adverse in combination effects are not anticipated.

23.1.1.3 GIS was used to identify any plans and strategic projects that interacted with receptors affected by one or more options included in the rdWRMP24.

23.1.1.4 Strategic plans and projects identified that may interact with the rdWRMP24 are:

- River Basin Management Plans (RBMPs)
- Marine plans
- Anglian Water's Drought Plan
- Anglian Water's Drainage and Waste Water Management Plans
- Other water company draft WRMPs
- Large existing and emerging Local Plan housing allocations
- NSIPs listed on the Planning Inspectorate's Website
- Hybrid Bills
- Transport and Works Act Orders for large-scale transport infrastructure
- Minerals and waste applications, including for landfill and energy from waste projects

23.1.1.5 In terms of the sustainable management of water quantity and quality, WRMPs and RBMPs contain similar objectives. Marine plans have complementary objectives to RBMPs, with an overall objective to achieve 'Good Environmental Status' in marine waters, including the same objectives for good ecological and chemical status. All local development plans use RBMPs and where relevant marine plans to inform the planning policies, forming a complimentary approach to delivering the objectives of the RBMPs and marine plans.

23.1.1.6 Any interactions with other plans are only likely to affect water dependent Habitats Sites with respect to RBMPs and coastal/estuarine habitats sites with respect to marine plans. WRMPs are identified within the RBMPs as plans to work alongside the RBMP to address pressures on water body status and meet specific plan level objectives. WRMPs and the options arising from them should therefore act as mechanisms to deliver RBMP objectives for water dependent Habitats Sites. Similarly for coastal/estuarine Habitats Sites, WRMPs and the options arising from them should act as mechanisms to deliver the sustainable development objectives of the marine plans they interact with.

23.1.1.7 Although there is current uncertainty regarding the timing construction and implementation of other development activities, it is assumed that generic mitigations will be put in place in accordance with the respective policy framework set out in emerging plans and within planning conditions and requirements. Therefore, taking in the specific findings of this HRA set out above, no adverse effect on the integrity of any Habitats Sites is anticipated from in-combination effects.

24 Next Steps

24.1.1.1 It is considered that at the plan level there is confidence adverse effects can be avoided or fully mitigated through adjustments to the detailed design of the scheme and the application of measures described in the individual assessments (Chapters 3 – 21).

24.1.1.2 Further studies will be carried out ahead of applications for planning permission/development consent for individual projects. These studies will be used to inform the HRA undertaken at project level. Consultation with Natural England can be undertaken to define the scope and objectives of these investigations for the different options.

24.1.1.3 The investigations will need to be undertaken by Anglian Water, in partnership with other organisations. The investigations will require more detail on the design, construction and likely operational activities of the supply option / options included in them. To facilitate the assessment the investigations are very likely to need to gather new data and may require new research to be conducted in relation to the habitats sites. The environmental scope of the investigations should focus on the qualifying features having regard to the contents of this HRA and should ensure the precautionary principle is applied and thus keep an open mind as to whether the scope needs to expand beyond issues related to those specific features discussed above. At the plan level, it is concluded that there will be no adverse effect on the integrity of any Habitats Site.

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B. HRA Stage 1 Assessments and Appropriate Assessments

B.1.1 *Available upon request*

C. Legislation

The authors of this document have relied upon their understanding of the key provisions of the relevant Directives and corresponding UK legislation as discussed below.

C.1 The Directives

Under the EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna, commonly referred to as "the Habitats Directive" (Council Directive 92/43/EEC), Member States are required to take special measures to maintain the distribution and abundance of certain priority habitats and species (listed in Annexes I and II of the Directive). Each Member State is required to designate the most suitable sites as SACs. All such SACs will form part of the Natura 2000 network under article 3(1) of the Habitats Directive.

Article 2(3) sets out that Member States have a duty, in exercising their obligations under the Habitats Directive, to:

".. take account of economic, social and cultural requirements and local characteristics."

There is an obligation under the Habitats Directive for Member States to designate sites before turning to measures for their protection.

Article 6(2) requires Member States to take appropriate steps to avoid the deterioration of natural habitats and disturbance of species for which the sites have been designated, in so far as the disturbance could be significant in relation to the objectives of the Directive. Article 6(3) and Article 6(4) require that a plan or project not directly connected with the management of the site, but likely to have a significant effect upon it, either individually or in combination with other plans or projects, must be subject to an appropriate assessment of its implications on the site, in view of the sites conservation objectives.

Having undertaken an appropriate assessment, the competent authority may agree to a plan or project where it can be concluded that it will not adversely affect the integrity of the designated site. In light of a negative assessment on the implications for the integrity of the site, Article 6(4) provides that the plan or project may still proceed where it can be demonstrated that there are no alternatives and there are imperative reasons of over-riding public interest as to why it must proceed. In the event that a plan or project is to proceed on the basis of imperative reasons of over-riding public interest, by direction of Article 6(4), compensatory measures must be put in place to ensure that the overall coherence of the Natura 2000 network is protected.

The Conservation (Natural Habitats, etc.) 2017

The Habitats Regulations, transpose the requirements of the Habitats Directive into UK legislation. The Habitats Regulations aim to protect a network of sites that have rare or important habitats and species in order to safeguard biodiversity.

Under the Habitats Regulations, Competent Authorities have a duty to ensure that all the activities they regulate have no adverse effect on the integrity of any of the Natura 2000 sites. Regulation 63 of the Habitats Regulations 2017 requires that:

"63(1) A competent authority before deciding to undertake, or give any consent, permission or other authorisation for a plan or project, which: -

> *(a) is likely to have a significant effect on a European site in Great Britain (either alone or in combination with other plans or projects) and*

(b) is not directly connected with or necessary for the management of the site,

shall make an appropriate assessment of the implications for the site in view of that site's conservation objectives.

…

63(5) In light of the conclusions of the assessment, and subject to regulation 64, the authority shall agree to a plan or project only after having ascertained that it will not adversely affect the integrity of the European site.

…

63(6) In considering whether a plan or project will adversely affect the integrity of the site, the authority shall have regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given.

…"

Regulation 63 of the Habitats Regulations therefore sets out a two-stage process. The first test is to determine whether the plan / project is likely to have a significant effect on the European site, the second test (if applicable) is to determine whether the plan / project will affect the integrity of the European site.

Some key concepts of the Habitats Directive and Habitats Regulations have been clarified through case law. The most pertinent cases are discussed below.

C.2 Case Law

Waddenzee Judgement

In the 'Waddenzee' case the European Court of Justice considered the trigger for 'Appropriate Assessment'. It decided that an appropriate assessment is required for a plan or project where there is a probability or a risk that it will have a significant effect on the SPA. The Judgement states [at paragraph 3(a)] that:

"…any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects."

Hence the need for an appropriate assessment should be determined on a precautionary basis.

The Judgement gives clarity that the test of 'likely significant effect' should also be undertaken in view of the European site's conservation objectives. It is stated at paragraph 3(b)] that:

"where a plan or project not directly connected with or necessary to the management of a site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site."

Paragraph 4 of the Judgement emphasises the requirement for the appropriate assessment to rely on objective scientific information:

"…an appropriate assessment…implies that, prior to its approval, all the aspects of the plan or project which can, by themselves or in combination with other plans or projects, affect the site's conservation objectives must be identified in the light of the best scientific knowledge in the field. The competent national authorities, taking account of the appropriate assessment of the

implications…for the site concerned in the light of the site's conservation objectives, are to authorise such an activity only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects."

In terms of Objective evidence, the decision in Smyth v Secretary of State for Communities & Local Government 2 (the Exminster Marshes decision) the English Court of Appeal clarified at Paragraph 46 to 48 of the Judgement that objective evidence includes that knowledge, experience and expertise of an expert. The contention brought before the Court of Appeal was that an expert witness's evidence amounted "merely to assertion, unsupported by any objective evidence".

However, the Court of Appeal rejected this assertion, finding that:

Para 46. "Three points should be made. First, I consider that on a fair reading of Mr Goodwin's proof of evidence it can be seen that he has drawn on specific information relevant to the SPA and the SAC, as well as the development site and proposed mitigation measures, in a manner which supports in an entirely conventional and acceptable way his expressions of opinion as an ecological expert. By way of example, at paras. 10.4 and 10.5 of his proof, he pointed out that, contrary to the suggestion made by GIE's representative at the inquiry, it was not appropriate to use the analogy of mitigation measures developed for heathland sites (a 400m exclusion zone), where ground nesting birds might be subject to predation by cats, since for the SPA "the designating bird features are wintering or passage species and access to large parts of the site is not possible in any event" (because it is marshland or cut off by water). He referred to the Interim Report and the Disturbance Study, as appropriate. Mr Goodwin demonstrated a good understanding of the particular ecological and mitigation features relevant to the SPA and the SAC. Contrary to Mr Jones's contention, Mr Goodwin's evidence was very far from being unsupported, free-standing assertion."

Para 47. "Secondly, in my view it is acceptable and to be expected that an expert will draw on his own background knowledge, experience and expertise in the field to inform the opinions which constitute his evidence to a relevant decision-maker (here, the Inspector). That is, indeed, in large part the point of looking to expert witnesses to provide assistance on technical matters. In this case, Mr Goodwin's own practical experience, the practical experience of ecologists generally and the knowledge shared between them all informed the expertise which he was able to bring to bear in giving his views regarding the effects of the development and the practical impact and viability of the mitigation options which he reviewed in his proof of evidence."

Para 48. "Thirdly, expert evidence of the kind given by Mr Goodwin was objective evidence on which the competent authority, the Inspector, was entitled to rely in making his assessment for the purposes of Article 6(3) of the Directive. Where, as in this case, an assessment is called for of impacts on bird species and of how large numbers of people might be expected to react to incentives to direct their recreational habits away from a protected site or of how on-site control measures could be expected to limit their impact, the views of an expert ecologist drawing on his practical experience and knowledge of the effectiveness of ecological initiatives elsewhere may constitute highly material and relevant objective evidence. The Inspector clearly thought he would be assisted by such evidence, which is why he adjourned the inquiry to provide an opportunity for Bellway to provide it. It cannot be said that this indicates any error of approach on the part of the Inspector. On the contrary, in my view it indicates the care with which the Inspector approached the question of application of the Habitats Directive in this case."

Dilly Lane Decision

In applying the tests of the Habitats Regulations it is important to refer to the Judgment of Justice Sullivan (as he was then) in relation to the decision handed down in the English High Court regarding the case of Hart District Council v The Secretary of State for Communities and Local Government, Luckmore Ltd and Barratt Homes Ltd (commonly known as "the Dilly Lane Judgment").

The Secretary of State's decision to allow an appeal in relation to applications for a total of 170 new homes on a greenfield site off Dilly Lane, Hartley Witney, was challenged in the English High Court by Hart District Council. The legal challenge was made on the grounds that the Secretary of State had erred in departing from her Inspector's conclusions as to the effects on the Thames Basin Heaths SPA. A key issue for the case was whether mitigation measures should be disregarded when assessing whether the project would have a significant effect on the SPA. Mr Justice Sullivan ruled in favour of the Secretary of State after concluding that there was no absolute legal rule [see below] that mitigation measures should be disregarded in assessing whether the new homes would have significant effect on the SPA. Importantly Mr Justice Sullivan states at paragraph 55 of his judgement:

"The competent authority is not considering the likely effect of some hypothetical project in the abstract. The exercise is a practical one which requires the competent authority to consider the likely effect of the particular project for which permission is being sought. If certain features (to use a neutral term) have been incorporated into that project, there is no sensible reason why those features should be ignored at the initial, screening, stage merely because they have been incorporated into the project in order to avoid, or mitigate, any likely effect on the SPA."

As such, it was judged right and proper that mitigation or avoidance measures, which form a feature of a plan / project should be viewed as integral to the plan / project and not excluded when considering the likely significance test, in this instance at Regulation 63(1).

It should however be noted that more recent case law now supersedes that approach but what remains useful from the Sullivan Judgment is the overall consideration of the approach ie HRA is essentially a practical exercise of assessing the plan or project which is being considered.

Sweetman Case

Further guidance in relation to the consideration of impacts in the light of the Habitats Regulations is provided in the Sweetman case. The case as set out by the Advocate General considered in detail the test for likely significant effect in paragraphs 50 and 51:

"50. The test which that expert assessment must determine is whether the plan or project in question has 'an adverse effect on the integrity of the site', since that is the basis on which the competent national authorities must reach their decision. The threshold at this (the second) stage is noticeably higher than that laid down at the first stage. That is because the question (to use more simple terminology) is not 'should we bother to check' (the question at the first stage) but rather 'what will happen to the site if this plan or project goes ahead; and is that consistent with "maintaining or restoring the favourable conservation status" of the habitat or species concerned'…

51. It is plain, however, that the threshold laid down at this stage of Article 6(3) may not be set too high, since the assessment must be undertaken having rigorous regard to the precautionary principle. That principle applies where there is uncertainty as to the existence or extent of risks. The competent national authorities may grant authorisation to a plan or project only if they are convinced that it will not adversely affect the integrity of the site concerned. If doubt remains as to the absence of adverse effects, they must refuse authorisation."

The Court of Justice of the European Union (CJEU) agreed with the Advocate General's conclusions, and held:

"40. Authorisation for a plan or project, as referred to in Article 6(3) of the Habitats Directive, may therefore be given only on condition that the competent authorities – once all aspects of the plan or project have been identified which can, by themselves or in combination with other plans or projects, affect the conservation objectives of the site concerned, and in the light of the best scientific knowledge in the field – are certain that the plan or project will not have lasting adverse effects on the integrity of that site. That is so where no reasonable scientific doubt remains as to the absence of such effects."

Hence a plan or project may be authorised only if no reasonable scientific doubt remains as to the absence of effects. Reasonable scientific doubt will exist if the evidence is not sufficiently conclusive, or if there are gaps in the information.

The A5 Judgment

The A5 judgement handed down by Mr Justice Stephens provides guidance in relation to the application of the Habitats Regulations/Directive on two main counts. The first being the requirement to demonstrate the efficacy of mitigation. The second being the fact that a clear difference exists between what is required of a screening assessment and what is required of an Appropriate Assessment.

At paragraph 89 Mr Justice Stephens considers the Judgment of Mr Justice Sullivan in relation to the Dilly Lane case (as referred to above). He states:

"[89] In R (on the application of Hart District Council) v Secretary of State for the Communities and Local Government the competent authority was not the developer. In that case Sullivan J stated:

'If the competent authority does not agree with the proponents' view as to the likely efficacy of the proposed mitigation measures, or is left in some doubt as to the efficacy, then it will require an appropriate assessment because it will not have been able to exclude the risk of a significant effect on the basis of objective information (see Waddenzee above)."

He goes on:

"I consider that is the test to be applied by the competent authority, namely if it is left in some doubt as to the efficacy of the mitigation measures. In this case the Department is both the competent authority and the developer but that does not relieve the Department of its obligation to have an appropriate assessment if it is left in some doubt as to the efficacy of the mitigation Thus the Judgment is clear that the efficacy of the mitigation must be demonstrable if the Competent Authority are to hold at the first stage of the legal tests being applied (namely at Regulation 63(1), and not move to undertake an Appropriate Assessment.

Paragraph 91 gives direction as to what is required of a screening assessment and what is required of an Appropriate Assessment. It is stated:

"[91] A screening opinion is different from an appropriate assessment which involves detailed consideration. The screening opinion does not require all considerations to be mentioned."

Wealden v SSCLG [2017] ('the Wealden Judgment 2017')

Specifically, in relation to air quality impacts on designated sites (most notably in relation to Nitrogen deposition), until relatively recently, Natural England's advice regarding the screening threshold for a likely significant effect was as follows. Where either, the resulting deposition / concentration equates to 'less than 1% of the relevant benchmark', or the predicted AADT value

is less than 1000, a likely significant effect can be screened out for the project when it is considered both alone and in combination with other plans or projects.

However, relevant guidance has changed in the light of the High Court judgment in Wealden v SSCLG [2017] ('the Wealden Judgment 2017').

The Wealden Judgment confirms that the use of the project / plan level 1000 AADT threshold (equivalent to 1% of the critical level/load for receiving habitat) as the only means of addressing in combination effects was not appropriate, particularly where other AADT values are known and importantly which, when added together, breach the threshold. The 1000 AADT (and 1%) thresholds themselves were not questioned in terms of their use for assessment purposes.

The Judgment clarified that whilst the 1000 AADT (and 1% of the critical load / level) threshold is appropriate for use in screening assessments when applying the tests of the Habitats Regulations, a true in combination assessment must be undertaken, in view of all relevant AADT data.

People over Wind (Sweetman II) [C323/17]

This CJEU judgment concerned a Preliminary Ruling in Case C-323/17. A request for a preliminary ruling was made to the CJEU concerning the interpretation of Article 6(3) of Council Directive 92/43/EEC (the Habitats Directive). The request was made in relation to proceedings brought by 'People Over Wind', and Mr Peter Sweetman against Coillte Teoranta. The ruling is as follows:

"Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site."

The ruling from the CJEU, departs from previous domestic jurisprudence (in particular the Dilly Lane Decision, discussed above), where it was deemed acceptable to include consideration of any mitigation / avoidance measures, which formed an integral part of the plan or project, in considering the first stage of assessment and screening for LSE on a European site (or Ramsar site). In that case, where it could be concluded that no likely significant effect arises there was no recourse to move to Appropriate Assessment and address the Integrity test.

In view of this ruling from the CJEU, in addressing the test at Regulation 63(1) of the Habitats Regulations, it is necessary to undertake the screening assessment in the absence of any consideration of avoidance or mitigation measures.

ESB Wind Developments (Sweetman III) [Case C164/17]

In this case a request for a preliminary ruling was made to the CJEU concerning the interpretation of Articles 6(3) and 6(4) of Council Directive 92/43/EEC (the Habitats Directive). The request was made in relation to proceedings brought by Mr Peter Sweetman and Edel Grace against the decision of An Bord Pleanála (National Planning Appeals Board, Ireland) concerning the latter's decision to grant ESB Wind Developments Ltd and Coillte permission for a wind farm project within an SPA. The ruling was handed down on 25th July 2018.

For the purpose of the application of Articles 6(3) and 6(4) of the Directive, this ruling distinguishes between 'mitigation' that consists of measures intended to avoid or reduce harm to the protected site, and measures intended to compensate for any harm (Compensatory measures). It is stated:

"Article 6 of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora must be interpreted as meaning that, where it is intended to carry out a project on a site designated for the protection and conservation of certain species, of which the area suitable for providing for the needs of a protected species fluctuates over time, and the temporary or permanent effect of that project will be that some parts of the site will no longer be able to provide a suitable habitat for the species in question, the fact that the project includes measures to ensure that, after an appropriate assessment of the implications of the project has been carried out and throughout the lifetime of the project, the part of the site that is in fact likely to provide a suitable habitat will not be reduced and indeed may be enhanced may not be taken into account for the purpose of the assessment that must be carried out in accordance with Article 6(3) of the directive to ensure that the project in question will not adversely affect the integrity of the site concerned; that fact falls to be considered, if need be, under Article 6(4) of the directive."

The ruling clarifies (in the context of the specifics of that project) what constitutes mitigation and what should correctly be termed compensation. It confirms that mitigation should be subject to Appropriate Assessment under article 6(3) but that measures designed to compensate for any harm rather than prevent it, cannot be considered under article 6(3) (Appropriate Assessment). In such instances, the proposal must be considered under article 6(4) and thus it cannot be permitted unless there are, "Imperative Reasons of Overriding Public Interest".

Holohan Judgment

In the case of Holohan v. An Bord Pleanála the CJEU considered the appropriate assessment procedure to be adopted when considering potential impacts on a European Site. In considering this case, the CJEU ruled, amongst other matters:

a) An appropriate assessment (AA) must catalogue the entirety of the habitat types and species for which a site is protected.

b) It must also identify and examine the implications of the proposed project for the species present on that site and for which that site has not been listed. Additionally, it must examine the implications for habitat types and species outside the boundaries of the protected site, as far as those implications are liable to affect the site's Conservation Objectives.

c) Where the competent authority rejects findings of an expert that additional information must be obtained, the Appropriate Assessment must include a detailed statement dispelling all reasonable scientific doubt concerning effects on the protected site.

The Dutch Nitrogen Cases

On 7th November 2018 the Judgment of the CJEU was handed down pursuant to a reference for a Preliminary Ruling relating to the application of Article 6 of Directive 92/43/EEC (the Habitats Directive) in joined cases C-293/17 and C294/17.

The cases concerned authorisation schemes for agricultural activities which cause nitrogen deposition on Natura 2000 (European) sites in the Netherlands.

Key parts of the ruling (as far as they are relevant to this assessment) are discussed below.

In line with preceding case law (Waddenzee and Sweetman, discussed above) the need for scientific rigour and firm conclusions as to the absence of effects are a pre-requisite for authorisation of a plan / project. Ruling 3 in the case states:

"Article 6(3) of Directive 92/43 must be interpreted as not precluding national programmatic legislation which allows the competent authorities to authorise projects on the basis of an

'appropriate assessment' within the meaning of that provision, carried out in advance and in which a specific overall amount of nitrogen deposition has been deemed compatible with that legislation's objectives of protection. That is so, however, only in so far as a thorough and in-depth examination of the scientific soundness of that assessment makes it possible to ensure that there is no reasonable scientific doubt as to the absence of adverse effects of each plan or project on the integrity of the site concerned, which it is for the national court to ascertain."
Ruling 4 in the case states:

"Article 6(3) of Directive 92/43 must be interpreted as not precluding national programmatic legislation, such as that at issue in the main proceedings, exempting certain projects which do not exceed a certain threshold value or a certain limit value in terms of nitrogen deposition from the requirement for individual approval, if the national court is satisfied that the 'appropriate assessment' within the meaning of that provision, carried out in advance, meets the criterion that there is no reasonable scientific doubt as to the lack of adverse effects of those plans or projects on the integrity of the sites concerned."

Ruling 5 in the case states:

"Article 6(3) of Directive 92/43 must be interpreted as precluding national programmatic legislation, such as that at issue in the main proceedings, which allows a certain category of projects, in the present case the application of fertilisers on the surface of land or below its surface and the grazing of cattle, to be implemented without being subject to a permit requirement and, accordingly, to an individualised appropriate assessment of its implications for the sites concerned, unless the objective circumstances make it possible to rule out with certainty any possibility that those projects, individually or in combination with other projects, may significantly affect those sites, which it is for the referring court to ascertain."

Ruling 6 in the case confirms that any measures which are relied upon to mitigate or avoid adverse effects on the integrity of the European site in question, must be certain at the time of assessment. It is stated:

"Article 6(3) of Directive 92/43 must be interpreted as meaning that an 'appropriate assessment' within the meaning of that provision may not take into account the existence of 'conservation measures' within the meaning of paragraph 1 of that article, 'preventive measures' within the meaning of paragraph 2 of that article, measures specifically adopted for a programme such as that at issue in the main proceedings or 'autonomous' measures, in so far as those measures are not part of that programme, if the expected benefits of those measures are not certain at the time of that assessment."

C.3 Guidance and other Relevant Documents

Guidance on the interpretation of key terms and concepts contained within the European and UK legislation of relevance to European designated sites is provided through several documents issued by the European Commission and national organisations such as the Joint Nature Conservation Committee ("JNCC") and DEFRA. This guidance is discussed below.

Natura Standard Data Forms

A standard reporting format has been developed for Natura 2000 sites (SACs and Special Protection Areas – SPAs) to ensure that the relevant site selection information is reported and stored in a consistent manner that can be easily made available.

A standard reporting form for SPAs and SACs was developed by the European Commission and published in 1996. The form is used for all sites designated or proposed to be designated as SPAs and SACs under the relevant Directives, with the information to be stored on a central database.

Article 4 of the Habitats Directive provides the legal basis for providing the data. Article 4 states that information shall include a map of the site, its name, location, extent and the data resulting from application of the criteria specified in Annex III and that this shall be provided in a format established by the Commission.

Whilst it is the relevant country agency *Natural England) that is responsible for designating a site, it is the JNCC who are responsible for collating the lists of European and international designated sites, together with relevant supporting information. The Natura 2000 Data Forms for SPAs and SACs are therefore made available by the JNCC.

Within the explanatory notes for Natura Standard Data Forms (European Commission 1996) the following "main objectives" of the Natura data form / database are given:

1. *"to provide the necessary information to enable the Commission, in partnership with the Member States, to co-ordinate measures to create a coherent NATURA 2000 network and to evaluate its effectiveness for the conservation of Annex I habitats and for the habitats of species listed in Annex II of Council Directive 92/43/EEC as well as the habitats of Annex I bird species and other migratory bird species covered by Council Directive 79/409/EEC."*

2. *"to provide information which will assist the Commission in other decision making capacities to ensure that the NATURA 2000 network is fully considered in other policy areas and sectors of the Commission's activities in particular regional, agricultural, energy, transport and tourism policies."*

3. *"to assist the Commission and the relevant committees in choosing actions for funding under LIFE and other financial instruments where data relevant to the conservation of sites, such as ownership and management practice, are likely to facilitate the decision making process."*

4. *"to provide a useful forum for the exchange and sharing of information on habitats and species of Community interest to the benefit of all Member States."*

Communication from the Commission on the Precautionary Principle (2000)

Enshrined within the Habitats Directive and Regulations (though not explicitly set out in either), based upon article 191 of the Treaty on the Functioning of the European Union, is the need to have due regard to the Precautionary Principle when assessing the risks posed to the integrity of the site(s). If a risk of significant effect to the integrity of a site cannot be excluded on the basis of objective information, then the application of the precautionary principle requires no consent to be given for such a project.

The document titled "Communication from the Commission on the Precautionary Principle" (2000) provides useful guidance in relation to the application of the Precautionary Principle in relation to European sites issues. Paragraph 6, sets out the six key matters for consideration when applying the Precautionary Principle. Paragraph 6 states:

- *"Where action is deemed necessary, measures based on the precautionary principle should be, inter alia:*
- *proportional to the chosen level of protection,*
- *non-discriminatory in their application,*
- *consistent with similar measures already taken,*
- *based on an examination of the potential benefits and costs of action or lack of action (including, where appropriate and feasible, an economic cost/benefit analysis),*
- *subject to review, in the light of new scientific data, and*

- *-capable of assigning responsibility for producing the scientific evidence necessary for a more comprehensive risk assessment."*

Under these bulleted points, the guidance gives specific definitions in relation to each of the above, with further detail provided within Section 6.

Managing Natura 2000 Sites (European Communities 2000)

The document entitled "Managing Natura 2000 Sites the provisions of article 6 of the Habitats Directive 92/43/CEE", published by the European Commission in 2000, provides guidelines to the Member States on the interpretation of certain key concepts used in Article 6 of the Habitats Directive. It should be noted that the Section relating to Article 6(4) has subsequently been replaced through the publication of a further guidance document by the European Commission in 2007 entitled "Guidance document on Article 6(4) of the 'Habitats Directive', which is considered below under the relevant heading.

This document states in Section 2.3.3 that conservation measures must correspond to the ecological requirements of the habitats and species present for which the site is designated and that these requirements *"involve all the ecological needs necessary to ensure their favourable conservation status".*

In Section 3.5 the guidance states, in relation to deterioration and disturbance of habitats or species:

"Deterioration or disturbance is assessed against the conservation status of species and habitats concerned. At a site level, the maintenance of the favourable conservation status has to be evaluated against the initial conditions provided in the Natura 2000 standard data forms when the site was proposed for selection or designation, according to the contribution of the site to the ecological coherence of the network. This notion should be interpreted in a dynamic way according to the evolution of the conservation status of the habitat or the species."

Section 4.4.1 sets out that in determining what may constitute a likely 'significant' effect one should take into account the conservation objectives for the site and other relevant baseline information. In the second paragraph of this section of the document it is stated:

"In this regard, the conservation objectives of a site as well as prior or baseline information about it can be very important in more precisely identifying conservation sensitivities."

Section 4.5.3 of the document sets out the duty of Member States to provide certain specific information in support of the inclusion of a site within the Natura 2000 network. This information is to be provided in a format specified by the European Commission (the Natura 2000 Standard Data Form).

A link is drawn between the Standard Data Form and the formation of the sites conservation objectives within the text box at the end of Section 4.5.3 of the guidance where it is stated:

"The information provided according to the standard data form established by the Commission forms the basis for a Member State's establishment of the site's conservation objectives."

With regard to an assessment of the effects of a plan / project on the integrity of a site, the 'integrity of the site' is defined in Section 4.6.3 as:

"… the coherence of the site's ecological structure and function, across the whole area, or the habitats, complex of habitats and / or populations of species for which the site is or will be classified."

The guidance is clear, within the text box at the foot of page 39, that an assessment as to the implications of the plan / project on the integrity of the site should be limited to an assessment against the sites' conservation objectives:

"The integrity of the site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives."

Section 5 of the document deals with Article 6(4) of the Habitats Directive. Note that this section has been expanded upon and replaced by further guidance issued by the European Commission entitled "Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC" (2007).

Assessment of Plans and Projects Significantly Affecting Natura 2000 sites Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission 2001)

This document, published by the European Commission in 2001, gives guidance on carrying out and reviewing those assessments required under Article 6(3) and (4) of the Habitats Directive. It is provided as supplementary guidance and does not over-ride or replace any of that set out within Managing Natura 2000 (European Commission 2000) which as stated at page 6 of the document, "*is the starting point for the interpretation of the key terms and phrases contained in the Habitats Directive*". The guidance provided is not mandatory and it is clearly set out that its use is "optional and flexible" and that it is for "*Member States to determine the procedural requirements deriving from the directive*".

The guidance sets out the key stages in following the tests contained within the Habitats Directive. Pertinent to this assessment of the Best Value Plan, stages one and two are relevant. Stage one is the screening stage assessing the likelihood of a plan / project resulting in a significant effect upon the European site. The second comprises the appropriate assessment.

Section 3.2.4 is concerned with Appropriate Assessment and specifically, the assessment against the conservation objectives of the European Site. Box 9 provides a list of five example conservation objectives for differing broad habitat types. One such example, that for a coastal site, taken from Box 9 is provided below:

"to maintain the status of the European features of this coastal site in favourable condition, allowing for natural change. Features include coastal shingle vegetation and lagoons (within a candidate special area of conservation (SAC), which is also an SPA)."

Common Standards Monitoring (JNCC February 2004)

Common Standards Monitoring is a means by which condition objectives for habitats, species, or other features of designated sites (e.g. SSSIs and SPAs) are set based on key attributes of the features.

The JNCC and the country Conservation Agencies (e.g. NE) developed guidance on the setting and assessment of condition objectives, as required under the Birds and Habitats Directives and set out a framework for this in 1999. This framework is provided in the form of Common Standards Monitoring ("CSM") guidance which comprises a suite of documents including an "Introduction to the Guidance Manual on Common Standards Monitoring" and several species/habitat specific documents. The Introduction to the Guidance Manual covers various relevant concepts and terms. It also provides a background to the setting of conservation objectives and sets out the desired approach to setting targets, monitoring, management and reporting on conservation measures in designated sites.

The Introduction to the CSM Guidance and CSM guidance for individual site attributes, sets out specific criteria regarding the identification of interest features, targets and methods of

assessment. There is in-built flexibility and allowances for 'judgements to be made' when assessing, for example, favourable condition.

It is understood that NIEA applies the Common Standards Monitoring approach to European designated sites through an assessment of the ASSI condition. This is undertaken on a cycle of approximately 6 years. The assessment does not relate to the Conservation Objectives of the European site, but provides a tool for tailoring future management of the ASSI such that favourable condition of the interest features can be maintained or restored as appropriate.

Guidance document on Article 6(4) of the 'Habitats Directive' (European Commission 2007)

This document, published by the European Commission in 2007, is intended to provide clarification on key terms / concepts as referred to within "Managing Natura 2000 Sites" and replaces the section on Article 6(4) within that earlier document.

The Guidance document covers, in particular, the concepts of Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensation Measures, Overall coherence and the Opinion of the Commission. With regard to ensuring the quality of an appropriate assessment, and to define exactly what needs to be compensated, it is stated in Section 1.3 that:

"Assessment procedures of plans or projects likely to affect Natura 2000 sites should guarantee full consideration of all elements contributing to the site integrity and to the overall coherence of the network, both in the definition of the baseline conditions and in the stages leading to identification of potential impacts, mitigation measures and residual impacts. These determine what has to be compensated, both in quality and quantity."

The need to use information contained within the Natura Standard Data Form, in tandem with the sites conservation objectives, when undertaking an appropriate assessment is specifically referred to (under the second hyphenated point in Section 1.3 on page 5).

Section 1.3.2 gives guidance on the application of Article 6(4) in respect of reasons of overriding public importance and Section 1.4.1 gives guidance on the application of Article 6(4) in respect of compensatory measures.

Managing Natura 2000 Sites – The provisions of Article 6 of the habitats Directive 92/43/EEC

In January 2019 the European Commission published updated guidance in relation to managing Natura 2000 sites, following initial guidance published in 2000 (see above).

The primary purpose of the revision was to incorporate relevant rulings of the Court of Justice of the European Union (EU) which have been issued since the initial guidance was published in 2000. It also integrates, into a single document, other relevant European Commission notes / guidance documents. Those key rulings (of the Court of Justice of the EU) and other relevant European Commission notes / guidance are discussed above in this report. The revised guidance provides clarifications of key concepts to Member State, authorities and stakeholders involved in the management of Natura 2000 sites (e.g. SPAs and SACs).

Conservation Objectives

Whilst Regulation 63 of the Habitats Regulations is explicit in setting out that any assessment of the implications of the plan/project on a European designated site should be undertaken in view of the site's "conservation objectives", the term 'conservation objective' is not explicitly defined within the Regulations. The term "conservation objectives" appears at Article 6(3) of the Habitats Directive which sets out the process of assessment for a plan or project which may be likely to have an effect on a designated site, however the term itself is not defined.

To understand what is meant by the term "conservation objective" it is necessary to look at the Habitats Directive in light of relevant European and other guidance. That guidance is not always consistent or clear about the use of the term "conservation objectives". For the purposes of this assessment, reference is made to the formal "conservation objectives" mentioned in Article 6(3) and Regulation 63 as "Conservation Objectives".

The term "conservation" is defined within the Habitats Directive at Article 1(a):

"conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status as defined in (e) and (i)".

The term "conservation status of a natural habitat" is defined within the Habitats Directive at Article 1(e):

"conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species within the territory referred to in Article 2."

The term "conservation status of a species" is defined within the Habitats Directive at Article 1(i):

"conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2:

The conservation status will be taken as 'favourable' when:

- *Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is it likely to be reduced for the foreseeable future, and*
- *There is and will probably continue to be a sufficiently large habitat to maintain its populations on a long-term basis."*

Article 3 of the Habitats Directive sets out that Member States have a duty to designate (in accordance with Article 4 of the Directive) special areas of conservation and that where necessary Member States shall endeavour to improve the ecological coherence of Natura 2000.

Article 4(1) of the Habitats Directive states that Member States must provide a list of sites, indicating which Annex I habitats and species occurring on Annex II are present. This Article also clarifies the type of information that must be submitted for each listed site (map, name, location, extent and the results of the application of qualification criteria listed at Annex III of the Directive). This information provides the basis of the Natura 2000 Data Form discussed elsewhere within this document. Article 4(4) states:

"Once a site of Community importance has been adopted in accordance with the procedure laid down in paragraph 2, the Member State concerned shall designate that site as a special area of conservation as soon as possible within six years at most, establishing priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a natural habitat type in Annex 1 or a species in Annex 2 and for the coherence of Natura 2000, and in the light of the threats of degradation or destruction to which those sites are exposed."

Full regard has been had to the significant weight to be applied to the formal Conservation Objectives when considering a plan or project and applying the tests of the Habitats

Regulations. Regard has also been had to other relevant information including that available from the JNCC.

C.4 Summary

The above legal framework, case law and guidance documents, have been used by the Authors of this HRA in determining the effects of both the individual elements of the Plan and the Plan as a whole. In doing so the judgements made rely on the baseline information currently available and the information regarding the nature of the proposals at this the Plan making stage.