VikingCCS

Viking CCS Pipeline

Environmental Statement Volume IV – Appendix 11-4: Water Framework Directive Assessment - Revision A (Clean)

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a Harbour Energy Company
PINS Reference: EN070008
Planning Act 2008 (as amended)
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)
Date: May 2024

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1 Introduction

1.1 Background

1.1.1 This Water Framework Directive Assessment (WFDa) has been produced in support of the Environment Statement (ES) for the Viking CCS Pipeline, hereafter referred to as 'the Proposed Development'.

1.1.2 The Proposed Development intends to transport compressed and conditioned CO_2 from the proposed Immingham Facility in a new pipeline through to the Theddlethorpe Facility, where the CO2 will be transferred into the existing Lincolnshire Offshore Gas Gathering System Pipeline, for onward transportation and storage in depleted gas reservoirs in the Southern North Sea. The Proposed Development relates to the onshore works only, from the Immingham Facility down to the mean low water springs (MLWS) east of the Theddlethorpe Facility and consists of:

- Immingham Facility;
- Approximately 55.5 km buried 24 inch onshore steel pipeline (including cathodic protection);
- Three Block Valve Stations;
- Theddlethorpe Facility – both Option 1 and Option 2;
- Existing LOGGS Pipeline to the extent of the DCO limits at MLWS and shutdown and isolation valves; and
- Dune Isolation Valve.

1.1.3 Full details of the various Proposed Development components are provided in *ES Volume II Chapter 3: Description of the Proposed Development (Application Document 6.2.3).*

1.1.4 The Proposed Development interacts with 13 Water Framework Directive (WFD) surface water bodies and two groundwater bodies, and thus it is necessary to consider the activities and constituent parts of the Proposed Development to determine compliance with WFD objectives. This includes assessing the impact of the pipeline crossings and supporting infrastructure on the biological, physico-chemical and hydromorphological quality elements that comprise the WFD to ensure no deterioration and no prevention of future improvement in water body status. Both surface and groundwater bodies are considered.

1.1.5 In accordance with the Planning Inspectorate's Advice Note Eighteen (**Ref 1**)[1], a three-stage approach may be adopted:

- **Stage 1: WFD Screening** - Identification of the proposed work activities that are to be assessed and determination of which WFD water bodies could potentially be affected through identification of a Zone of Influence. This step also provides a rationale for any water bodies screened out of the assessment;
- **Stage 2: WFD Scoping** - For each water body identified in Stage 1, an assessment is carried out to identify the effects and potential risks to quality elements from all activities. The assessment is made taking into consideration embedded mitigation (measures that can reasonably be incorporated into the design of the proposed works) and good practice mitigation (measures that would occur with or without input from the WFD assessment process); and

[1] The Planning Inspectorate (2017) The Water Framework Directive – Advice Note Eighteen: The Water Framework Directive May 2024

- **Stage 3: WFD Impact Assessment** - A detailed assessment of the water bodies and activities carried forward from the WFD screening and scoping stages.

1.2 Study Area

1.2.1 The Proposed Development runs between Immingham and Theddlethorpe along the northeast coast of England, over a distance of approximately 55.5km. The DCO Site Boundary is shown in **Figure 1** below and in more detail in Figure 3-8 of *ES Volume II Chapter 3: Description of the Proposed Development (Application Document 6.3.2)*.

1.2.2 For the purposes of this assessment, and consistent with *ES Volume II Chapter 11: Water Environment (Application Document 6.2.11)*, a general study area (Zone of Influence) of approximately 500m from the DCO Site Boundary has been considered to identify water bodies that are hydrologically connected to the Proposed Development and have the potential to be directly impacted by the activities associated with it. However, given that impacts may propagate downstream, where relevant the assessment also considers a wider study area to as far downstream as a potential impact may influence the quality or quantity of the water body (which in this case is typically for a few kilometres). Professional judgement has been applied to identify the extent to which such features are considered.

1.2.3 The study area falls within the following surface water body catchments (**Ref 2**)[2]:

- Great Eau (downstream of South Thoresby) (GB105029061660);
- Long Eau (GB105029061670);
- South Dike and Grayfleet Drain (GB105029061680);
- Trusthorpe Pump Drain (upper end) (GB105029061640).
- Black Dyke Catchment (trib of Louth Canal) (GB104029062000);
- Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530);
- Land Dike Drain to Louth Canal (West) (GB104029062162);
- Louth Canal (GB104029061990);
- Mawnbridge Drain (GB104029067540);
- New Dike Catchment (trib of Louth Canal) (GB104029062030);
- North Beck Drain (GB104029067575);
- Poulton Drain Catchment (trib of Louth Canal) (GB104029062010); and
- Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100).

1.2.4 There are also over one hundred tributaries of these water bodies present within the study area; these are predominantly unnamed agricultural ditches, drains and springs. It should be noted that WFD requirements apply equally to all watercourses regardless of whether they are Environment Agency reportable reaches.

1.2.5 The study area is also underlain by two WFD groundwater bodies:

- South Lincolnshire Chalk Unit (GB40501G401600); and
- North Lincolnshire Chalk Unit (GB40401G401500).

1.2.6 For a more detailed report of the baseline conditions for the study area refer to *ES Volume II Chapter 11: Water Environment (Application Document 6.2.11).*

[2] Environment Agency Catchment Data Explorer website (https://environment.data.gov.uk/catchment-planning).

Revision: 1 Drawn: LC Checked: KSB Approved: MW Date: 2024-05-16

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North Killingholme Haven Pits

Humber Lower

North Beck Drain

Section 1

Section 2

Skitter Beck / East Halton Beck

Mawnbridge Drain

Laceby Beck / River Freshney Catchment (to N Sea)

N

1:50,000 @ A3

1 0.5 0 1 2 3 4 5 km

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LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

WFD River, Canal and Surface Water Transfer Waterbody

Ecological Classification

- Moderate
- Poor
- Bad

WFD River Waterbody Catchment Boundary

Ecological Classification

- Moderate
- Poor
- Bad

WFD Transitional and Coastal Waterbody

Ecological Classification

- Moderate

NOTES:

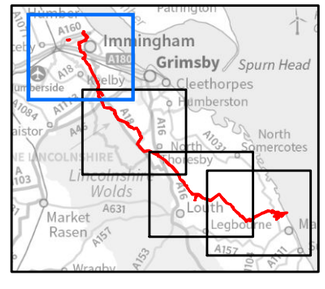

FIGURE TITLE

Figure 1 (1 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

WATER FRAMEWORK DIRECTIVE

PROJECT NUMBER / REFERENCE

60668955 / VCCS_240516_ESA_11-4-1

North Beck Drain

Mawnbridge Drain

Section 2

Section 3

Laceby Beck / River Freshney Catchment (to N Sea)

Buck Beck from Source to N Sea

Waithe Beck lower catchment (to Tetney Lock)

New Dike Catchment (trib of Louth Canal)

Land Dike Drain to Louth Canal (West)

Section 3

Section 4

Poulton Drain Catchment (trib of Louth Canal)

Louth Canal

Humber

NORTH EAST LINCOLNSHIRE

1:50,000 @ A3

1 0.5 0 1 2 3 4 5 km

N

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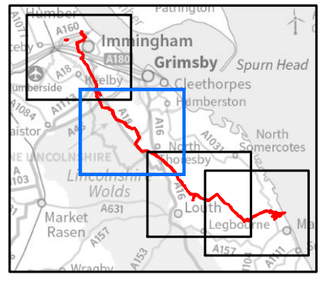

FIGURE TITLE

Figure 1 (2 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

WATER FRAMEWORK DIRECTIVE

PROJECT NUMBER / REFERENCE

60668955 / VCCS_240516_ESA_11-4-1

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New Dike Catchment (trib of Louth Canal)

Land Dike Drain to Louth Canal (West)

Section 3

Section 4

Poulton Drain Catchment (trib of Louth Canal)

Black Dyke Catchment (trib of Louth Canal)

Louth Canal

South Dike and Grayfleet Drain

Section 4

Section 5

Great Eau (downstream of South Thoresby)

Long Eau

N

1:50,000 @ A3

1 0.5 0 1 2 3 4 5 km

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NOTES:
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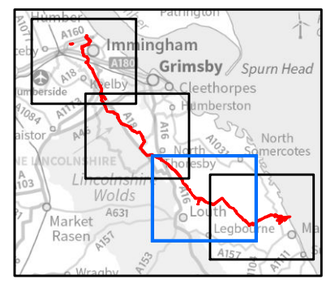

FIGURE TITLE

Figure 1 (3 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

WATER FRAMEWORK DIRECTIVE

PROJECT NUMBER / REFERENCE

60668955 / VCCS_240516_ESA_11-4-1

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Louth Canal

South Dike and Grayfleet Drain

Long Eau

Great Eau (downstream of South Thoresby)

Trusthorpe Pump Drain (upper end)

Section 4

Section 5

Lincolnshire

1:50,000 @ A3

1 0.5 0 1 2 3 4 5 km

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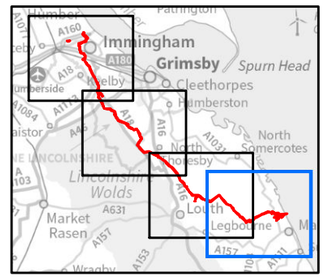

FIGURE TITLE

Figure 1 (4 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

WATER FRAMEWORK DIRECTIVE

PROJECT NUMBER / REFERENCE

60668955 / VCCS_240516_ESA_11-4-1

2 Methodology

2.1 Introduction to the Water Framework Directive

2.1.1 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (**Ref 2**), commonly referred to as the Water Framework Directive (WFD), aims to protect and enhance the water environment.

2.1.2 The WFD takes a holistic approach to sustainable management of the water environment by considering interactions between surface water, groundwater and water-dependent ecosystems. Ecosystem conditions are evaluated according to interactions between classes of biological, chemical, physico-chemical and hydromorphological elements known as 'Quality Elements'.

2.1.3 Under the WFD, 'water bodies' are the basic management units, defined as all or part of a river system or aquifer. Waterbodies form part of a larger 'river basin district' (RBD), for which 'River Basin Management Plans' (RBMPs) are used to summarise baseline conditions and set broad improvement objectives. RBMPs are produced every six years, in accordance with the river basin management planning cycle. The current RBMPs at the date of this assessment are the 2015 Cycle 2 plans, which are due to be updated to Cycle 3 plans in 2021. Cycle 3 plans have not yet been published at the time of writing.

2.1.4 In England, the Environment Agency (EA) is the competent authority for implementing the WFD, although many objectives are delivered in partnership with other relevant public bodies and private organisations, for example local planning authorities, water companies, rivers trusts, and private landowners and developers.

2.1.5 The EA is also responsible for managing flood risk and other activities on Main Rivers. Local planning authorities or drainage boards are responsible for consenting certain activities on Ordinary Watercourses. Local planning authorities are responsible for highways drains, and landowners are responsible for ditches and watercourses and also piped watercourses and culverts. While the EA is ultimately responsible for the WFD on any water body, local authorities are required to plan and consent WFD related activities on Ordinary Watercourses.

2.1.6 As part of its regulatory and statutory consultee role on planning applications and environmental permitting (under the Environmental Permitting Regulations (England and Wales) 2016) (**Ref 3**), the EA and WFD-partnering organisations, must consider whether proposals for new developments have the potential to:

- Cause a deterioration of any quality element of a water body from its current status or potential; and / or
- Prevent future attainment of good status or potential where not already achieved.

2.1.7 Regulation 33 of the Water Environment Regulations 2017 (**Ref 2**) (i.e. the WFD) states that, like other public bodies, local authorities have a statutory duty to "*have regard to the River Basin Management Plan*" and "*any supplementary plans*" covering proposed activities when exercising its functions. Local authorities must therefore reflect water body improvement priorities as outlined in RBMPs.

2.1.8 In determining whether a development is compliant or non-compliant with the WFD objectives for a water body, the EA and partnering organisations must also consider the conservation objectives of any Protected Areas (such as water dependent SSSI, and/or Ramsar wetland sites) and adjacent WFD water bodies, where relevant.

2.2 WFD Methodology

2.2.1 Guidance on how to undertake WFD assessments can be found in the Environment Agency's 'Water Framework Directive risk assessment - How to assess the risk of your activity' (**Ref 4**)[3] and Planning Inspectorate's 'The Water Framework Directive - Advice note eighteen: The Water Framework Directive' (**Ref 2**)[4]. These guidance documents have informed the approach taken in this screening exercise.

2.2.2 A stepwise approach consisting of screening, scoping and impact assessment phases is generally followed in order to: (a) rationalise the levels of WFD assessment and impact mitigation that are required; and (b) verify that proposals meet the requirements of the WFD. The general approach is described by The Planning Inspectorate (2017) (**Ref 1**) and briefly summarised below. This WFD assessment comprises the Screening element only.

Stage 1: Screening

2.2.3 Screening identifies the zone of influence of a proposed development, and if proposed activities pose a risk to the water environment. It is used to identify if there are activities that do not require further consideration for WFD objectives, for example activities which have been ongoing since before the current RBMP plan cycle and which have thus formed part of the baseline.

Stage 2: Scoping

2.2.4 Scoping is used to identify any potential impacts of the proposed activities to specific WFD receptors and their water quality elements. This involves review of WFD impact pathways, shortlisting which WFD water bodies and quality elements could or could not be affected by proposed activities, and collecting baseline information from the relevant RBMP on the status and objectives for each water body.

Stage 3: Impact Assessment

2.2.5 This involves rationalised assessment of water bodies and quality elements that could be affected by proposed activities, in order to identify any areas of WFD non-compliance. Proposed activities are reviewed in terms of both positive and negative impacts, and the baseline mitigation measures, enhancements, and contributions to the WFD objectives described in the RBMP. Any proposed activities with potentially deleterious impacts are reviewed simultaneously with their corresponding mitigation proposals, to determine a net effect on WFD objectives.

Mitigation Commitments

2.2.6 Mitigation activities relied upon to demonstrate compliance at any of the stages referred to above must be appropriately defined and sufficiently secured. Mitigation could be secured through planning licence conditions, Development Consent Orders, or other legally binding methods.

Regulation 19/ Article 4.7 Derogation

2.2.7 Where the potential for deterioration of water bodies is identified, and it is not possible to mitigate the impacts to a level where deterioration or failure to improve can be avoided, the project would need to be assessed in the context of Article 4.7 of the WFD. Where a derogation is necessary, Applicants will need to provide the necessary information to justify their case, bearing in mind that Applicants must always seek to avoid deterioration of the water environment. It is a matter for the Secretary of State to consider whether derogation

[3] Environment Agency (2016) Water Framework Directive Risk Assessment: how to assess the risk of your activity.
[4] The Planning Inspectorate (2017) The Water Framework Directive – Advice Note Eighteen: The Water Framework Directive.

under Article 4.7 is justified in relation to a Proposed Development. At this stage, a derogation under Article 4.7 is not considered necessary.

Desk Study

2.2.8 A desk-based study was carried out to capture information pertaining to the Proposed Development to support the understanding of baseline conditions. Review of relevant information relating to the study area was undertaken to develop a baseline overview for WFD catchments, watercourses and surrounding areas. The following data sources were used for the desk study:

- WFD status and objectives from the appropriate River Basin Management Plan for Cycle 2 data, available from the Catchment Data Explorer (**Ref 5**)[5];
- Defra's Multi-agency geographical information for the countryside website (MAGIC), including contemporary Ordnance Survey (OS) maps (**Ref 6**)[6];
- Historical maps (**Ref 7**)[7];
- British Geological Survey maps (**Ref 8**)[8];
- Soilscapes website (**Ref 9Ref 9** *Cranfield Soil and Agrifood Institute (2023).* Soilscapes. Available at: http://www.landis.org.uk/soilscapes/ [Accessed May 2023].)[9];
- Aerial photography (**Ref 10**)[10];
- Hydrological information (**Ref 11**)[11];
- Climate information (**Ref 12**)[12];
- Environment Agency Fish and Ecology Data Viewer (**Ref 13**)[13]; and
- Environment Agency Water Quality Archive website (**Ref 14**)[14].

2.3 Field Survey

2.3.1 An initial site walkover was undertaken on 25th and 26th May 2022 by a surface water specialist and hydromorphologist in warm, dry and fair conditions. The walkover focused on surface waterbodies in the Study Area, observing their current character and condition, the presence of existing risks and any potential pathways for construction and operational impacts from the Proposed Development.

2.3.2 A second site walkover was undertaken in February and March 2023.

2.3.3 A summary of the site walkover is provided in *ES Volume IV Appendix 11-2: Site walkover technical note (Application Document 6.4.11.2).*

2.4 Assumptions and Limitations

2.4.1 The assessment has been undertaken using available data and the Proposed Development's design details at the time of writing.

[5] Environment Agency Catchment Data Explorer website (https://environment.data.gov.uk/catchment-planning)
[6] DEFRA'S Multi Agency Geographical Information for the Countryside website https://magic.defra.gov.uk/MAGICMAP.ASPX
[7] Historic mapping: National Library of Scotland (https://maps.nls.uk/GEO/EXPLORE/#zoom=5&lat=56.00000&lon=-4.00000&layers=1&b=1)
[8] British Geological Survey borehole and online mapping (h[redacted]
[9] Soilscapes website (http://www.landis.org.uk/soilscapes/)
[10] Bing Maps ([redacted]
[11] National River Flow Archive website[redacted])
[12] Met Office website (https://www.metoffice.gov.uk/).
[13] Environment Agency Fish and Ecology Data Explorer (https://environment.data.gov.uk/ecology/explorer/).
[14] Environment Agency Water Quality Archive. (https://environment.data.gov.uk/water-quality/view/landing)

2.4.2 A reasonable assumption has been made that all works will take place using best practice. This best practice, including implementation of the measures set out in the Draft Construction Environmental Management Plan (CEMP) as presented in *ES Volume IV: Appendix 3.1 Draft CEMP)*. The Draft CEMP describes the principles for the protection of the water environment during construction. The Draft CEMP is supported by a Water Management Plan (WMP) (ES Volume IV Appendix 11.6 Outline Water Management Plan) that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction. Ahead of any construction work, this Draft CEMP will be developed into a Final CEMP by the construction contractor.

3 WFD Screening and Scoping

3.1 WFD Screening

3.1.1 The purpose of the WFD screening stage is to identify a zone of influence of the Proposed Development and to determine whether that influence has the potential to adversely impact upon WFD water body receptors; this approach has been taken in this assessment. A study area of generally 500m around the DCO Site Boundary has been considered in order to identify water bodies that are potentially hydrologically connected to the Proposed Development and potential works associated with the Proposed Development that could cause direct impacts.

3.1.2 The screening stage also identifies specific activities of the Proposed Development that could affect receptor water bodies' WFD status and carries them forward to subsequent stages of the assessment process. Justification is provided where water body receptors are screened out and are not carried forward through the assessment. Water bodies or activities screened 'out' of the assessment are therefore not considered further at the impact assessment stage.

Screening of WFD Water Bodies

3.1.3 The Proposed Development interacts with 13 WFD surface water bodies and 2 groundwater bodies. WFD Screening of these water bodies is provided in **Table 1**:. Water bodies such as smaller tributaries within each of the WFD water body catchments that may be impacted by the Proposed Development have been included in this assessment. Any other remaining downstream water bodies not mentioned below are considered sufficiently far downstream to avoid impacts of the Proposed Development and are therefore screened out of further assessment.

Table 1: Screening of WFD Water Bodies potentially impacted by the Proposed Development

Water Body ID	Screening Outcome	Justification
Great Eau (downstream of South Thoresby) (GB105029061660)	**Screened In**	WFD water bodies may be directly impacted by the Proposed Development due to a range of activities that would interact with the local watercourse network during construction, operation, and decommissioning phases.
Long Eau (GB105029061670)		
South Dike and Grayfleet Drain (GB105029061680)		
Trusthorpe Pump Drain (upper end) (GB105029061640)		
Black Dyke Catchment (trib of Louth Canal) (GB104029062000)		
Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530)		
Land Dike Drain to Louth Canal (West) (GB104029062162)		
Louth Canal (GB104029061990)		

Water Body ID	Screening Outcome	Justification
Mawnbridge Drain (GB104029067540)		
New Dike Catchment (trib of Louth Canal) (GB104029062030)		
North Beck Drain (GB104029067575)		
Poulton Drain Catchment (trib of Louth Canal) (GB104029062010)		
Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100)		
South Lincolnshire Chalk Unit (GB40501G401600)	**Screened In**	WFD groundwater bodies may be directly impacted by the Proposed Development due to a range of activities that would interact with the groundwater receptors during construction, operation, and decommissioning phases.
North Lincolnshire Chalk Unit (GB40401G401500)		

3.1.4 There are no designated protected areas including: SSSIs, Special Areas of Conservation (SACs), National Nature Reserves (NNRs) or Local Nature Reserves (LNRs) within the study area. However, all WFD surface water bodies screened into this assessment fall within a Nitrate Vulnerable Zone (NVZ). The Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC) are located along the north-east coast of Lincolnshire, adjacent to the study area. These all may be hydrologically connected to watercourses that interact with the Proposed Development, especially given the watercourses flow into the Humber Estuary, and are further discussed in **Table 2.**

Screening of Activities

3.1.5 As described in Section 1, the Proposed Development comprises a number of components, whose associated activities may present a potential risk to the WFD status of water bodies. These components and activities are listed in **Table 2**: together with a screening assessment.

Table 2: Screening of the Proposed Development's Activities against WFD Quality Elements

Component	Description	Screening Outcome	Justification
Immingham Facility	This component consists of inlet manifold; permanent PIG launcher and receiver; PIG handling area for the PIG receiver and launcher; high-integrity pressure protection system (HIPPS); emergency shutdown valves (ESDV); Venting system; central control room (CCR); local equipment room (LER); analyser house; and supporting utilities. It is currently proposed that such infrastructure would be located at TA 1702 1685, a currently unused section of land, around 10,900 m^2, to the south of the VPI Immingham site. Due to assumed soft ground near the surface, supported by geotechnical investigation results from the adjacent VPI site, piling will be required for cable bridges, pipe-racks, and	**In** • North Lincolnshire Chalk Unit (GB40401G401500) - Groundwater. **Out** – • Great Eau (downstream of South Thoresby) (GB105029061660); • Long Eau (GB105029061670); • South Dike and Grayfleet Drain (GB105029061680); • Trusthorpe Pump Drain (upper end) (GB105029061640); • Black Dyke Catchment (trib of Louth Canal) (GB104029062000); • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530); • Land Dike Drain to Louth Canal (West) (GB104029062162); • Louth Canal (GB104029061990); • Mawnbridge Drain (GB104029067540); • New Dike Catchment (trib of Louth Canal) (GB104029062030); • North Beck Drain (GB104029067575); • Poulton Drain Catchment (trib of Louth Canal) (GB104029062010); • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100);	North Lincolnshire Chalk Unit groundwater body is screened in based on the possibility that groundwater will be artesian in the chalk and piling could cause artesian flow. South Lincolnshire Chalk Unit groundwater body is screened out due to the lack of interactions with the Immingham Facility. The proposed location of the Immingham Facility is not within 10m of a water body (measured from the edge of watercourses defined broadly by the position of the main channel and normal flow water's edge) and so should not have an effect on the WFD status of the surrounding river water body. Any works that may generate runoff or spillages during construction are anticipated to be adequately addressed through measures to be outlined in the CEMP and WMP in order to avoid adverse impacts on water quality to watercourses receiving drainage from the site.

Component	Description	Screening Outcome	Justification
	above-ground pipelines. The piles will be founded in the chalk layer underlying the surface alluvium and glacial till, at around 20-25 m depth. Raft foundations are assumed for other equipment and buildings not sensitive to settlement.	• South Lincolnshire Chalk Unit (GB40501G401600).	The CEMP, particularly the pollution control measures, if followed appropriately, will mitigate any impacts being propagated downstream by any hydrological connectivity between the watercourses that interact with the Proposed Development and protected areas such as NVZs, Humber Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC). Therefore, these protected areas are not considered further in this assessment.
Onshore pipeline including road, railway, and watercourse crossings	The pipeline will have an internal diameter of around 609 mm and be buried to a minimum depth of 1.2m to the top of the pipe, which will be increased at crossing points of watercourses, railways, and roads. Crossings of main rivers/ditches, canals, will be installed by non-intrusive trenchless methods; however, most small watercourses and ditches will be crossed using open-cut methods. All crossings of railways will be non-intrusive trenchless	**In** – • Great Eau (downstream of South Thoresby) (GB105029061660); • Long Eau (GB105029061670); • South Dike and Grayfleet Drain (GB105029061680); • Black Dyke Catchment (trib of Louth Canal) (GB104029062000); • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530); • Land Dike Drain to Louth Canal (West) (GB104029062162); • Louth Canal (GB104029061990); • North Beck Drain (GB104029067575);	The pipeline crosses 13 WFD surface water bodies and these are screened into the assessment even where non-intrusive crossing methods are proposed for the crossing of main rivers. This is because there may still be effects during the construction phase, such as the uncontrolled release of construction site runoff or dewatering of launch/receiving pits that may include high levels of fine sediment, oils and drilling muds if this runoff is not carefully managed. If there is a risk that drilling/excavation is required within the chalk bedrock, the EA would be consulted as part of

Component	Description	Screening Outcome	Justification
	methods. Crossings of roads will be a combination of intrusive and non-intrusive. Any works within main rivers or ordinary watercourses will be conducted in accordance with a method approved under environmental permits issued under the Environmental Permitting Regulations (**Ref 3**) or the protective provisions of the DCO for the benefit of the Environment Agency, Lead Local Flood Authorities, Local Drainage Boards and Landowners. For non-intrusive crossings, it is understood that launch and receive pits will be dug that will be set back from the water's edge by a minimum of 10m, drilling beneath the watercourse bed to avoid disturbance to the channel, with the pipeline passed through this bore. The HDD technique	• Poulton Drain Catchment (trib of Louth Canal) (GB104029062010); • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100); • South Lincolnshire Chalk Unit (GB40501G401600); • North Lincolnshire Chalk Unit (GB40401G401500). **Out** – • Trusthorpe Pump Drain (upper end) (GB105029061640); • Land Dike Drain to Louth Canal (West) (GB104029062162); • Mawnbridge Drain (GB104029067540); • New Dike Catchment (trib of Louth Canal) (GB104029062030).	further risk assessment. Based on available BGS data, chalk bedrock may be present below 10m bgl in some locations. However, some other locations BGS borehole records indicate chalk may be potentially up to 35m bgl. In these locations the thick covering of low permeability Glacial Till beneath the base of the proposed excavations should provide sufficient protection to the underlying Chalk. However, where Chalk is shallower there remains a risk. In addition, where sand and gravel lenses may be encountered subject to future ground investigation, the thickness of Glacial Till to act as a barrier will be reduced and the risk may also be greater, especially where excavations/HDD is required below the sand and gravel. In these circumstances mitigation measures may be required to manage the risk of the underlying chalk Principal Aquifer. Two WFD ground water bodies are therefore screened in for the watercourses, road, and railways where non-intrusive cuttings are planned due to the risk of groundwater breakout and artesian flow during drilling. Mitigation for this risk is secured through the CEMP and the proposed hydrogeological risk

Component	Description	Screening Outcome	Justification
	requires a smooth curve for the HDD bore profile in which to install the pipeline from the entry and exit points at ground level and typically pass well below the object of the crossing (e.g., a river or canal); therefore, the maximum depth of pipeline could be up to 20 m beneath the surface. Where possible, consideration will be given to limiting this depth to no more than 10 metres where the underlying chalk layer is closer to the surface. For open-cut trench excavation, the pipe trench would be dug either with mechanical excavators straddling or running alongside the pipeline trench or using a specialised trenching machine, down to a typical estimated depth of 2.0 - 2.2 m. The depth from the top of the pipeline to the ground surface will be a minimum of 1.2 m but will likely be		assessment (Commitment E3 in the Draft CEMP). The EA would be consulted as part of this further risk assessment In the case of intrusive crossings of watercourses, there is potential for direct impacts to the riparian zone and channel and increased fine sediment delivery to water bodies and pollution of water bodies during construction works. Although construction works will be temporary, the impact on riparian habitat will persist until vegetation re-establishes. Groundwater is considered unlikely to be encountered within the shallow excavations for intrusive crossings. If groundwater is encountered during the ground investigation prior to construction, a dewatering plan will be in place to manage the water appropriately during construction as secured through the CEMP. In the case of water bodies where an activity is not screened in, this is on the basis that watercourses are situated a significant distance from the pipeline:

Component	Description	Screening Outcome	Justification
	deeper in some locations. This involves digging a trench directly across the asset or infrastructure to be crossed, following which a short section of the pipe is installed and the trench backfilled with the graded excavated material. The surface is then reinstated with appropriate material.		New Dike Catchment (trib of Louth Canal) lies 2.3km to the east of the pipeline at its closest point. Mawnbridge Drain is 4.5km to the east of the pipeline at its closest point. Land Dike Drain to Louth Canal (West) is 2.6km away from the pipeline at its closest point. Trusthorpe Pump Drain (upper end) is 1.8km away from the pipeline at its closest point. Despite having some likely hydrological connectivity to drainage channels, it is anticipated that any water quality issues relating to construction runoff or spillages that have potential to enter these tributaries will be mitigated by the CEMP, which will be secured under the DCO, and WMP. The CEMP will be standard procedure for the Proposed Development and will describe the principles for the protection of the water environment during construction. The CEMP will be supported by the WMP, that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction including requirements for water quality monitoring. A Draft CEMP has been prepared – refer to *ES Volume IV Appendix 3.1 (Application Document*

Component	Description	Screening Outcome	Justification
			6.4.3.1). Given this mitigation and the lack of any direct works to these water bodies, it is considered that they can be screened out of further assessment. The CEMP, particularly the pollution control measures, will mitigate any impacts being propagated downstream by any hydrological connectivity between the watercourses that interact with the Proposed Development and protected areas such as NVZs, Humber Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC). Therefore, these protected areas are not considered further in this assessment.
Temporary watercourse crossing for construction traffic passage	Where watercourses are encountered that require the passage of construction traffic, measures to be applied include the use of 'flume' pipes or temporary spanned bridges. Flume pipes are temporary pipes placed in the watercourse to permit the flow of water through the pipe. The level above the flume pipe will be built-up to bank level using selected excavated material over the flume pipe as necessary to create the haul	**In –** • Great Eau (downstream of South Thoresby) (GB105029061660); • Long Eau (GB105029061670); • South Dike and Grayfleet Drain (GB105029061680); • Black Dyke Catchment (trib of Louth Canal) (GB104029062000); • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530); • Land Dike Drain to Louth Canal (West) (GB104029062162); • Louth Canal (GB104029061990);	These watercourse crossings may impact WFD quality elements due to the potential uncontrolled release of construction site pollution that may include high levels of fine sediment and oils if it is not carefully managed, and produce hydromorphological impacts, so are screened in. The CEMP, particularly the pollution control measures, if followed appropriately, will mitigate any impacts being propagated downstream by any hydrological connectivity between the watercourses that interact with the Proposed Development and protected areas such as NVZs, Humber

Component	Description	Screening Outcome	Justification
	road and allow connectivity along the working area for plant and vehicles. Where installation of a flume pipe crossing is not possible then a temporary spanned bridge (Bailey type bridge) can be installed and requires the construction of a raised soil platform each side of the watercourse (set back from the watercourse banks) before a temporary bridge structure is lifted onto the spoil platform. Temporary bridges and their supports will be designed specifically to consider the span length and the weight and size of plant and equipment that will cross the bridge. Approximately 125 watercourses will be flumed and four will be crossed by Bailey bridge. Approximately 18 watercourses won't be flumed or temporarily spanned by a bridge.	• North Beck Drain (GB104029067575); • Poulton Drain Catchment (trib of Louth Canal) (GB104029062010); • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100); • Trusthorpe Pump Drain (upper end) (GB105029061640); • Land Dike Drain to Louth Canal (West) (GB104029062162); • Mawnbridge Drain (GB104029067540); • New Dike Catchment (trib of Louth Canal) (GB104029062030). **Out –** • South Lincolnshire Chalk Unit (GB40501G401600); • North Lincolnshire Chalk Unit (GB40401G401500).	Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC). Therefore, these protected areas are not considered further in this assessment. Groundwater is considered unlikely to be encountered within any shallow excavations for watercourse access crossings. If groundwater is encountered during the ground investigation prior to construction, a dewatering plan will be in place to manage the water appropriately during construction as secured through the CEMP. Therefore, groundwater bodies are screened out.

Component	Description	Screening Outcome	Justification
Block Valve Stations	Block valves are used to isolate pipeline sections for maintenance or in case of emergency, and would be installed below ground level, with minimal above ground infrastructure. There are three Block Valve Stations proposed, at TF 3588 9057, TA 2628 0030, and TA 1955 0718. Most of the site will be permeable surface to minimise runoff.	**Out** – • Great Eau (downstream of South Thoresby) (GB105029061660); • Long Eau (GB105029061670); • South Dike and Grayfleet Drain (GB105029061680); • Trusthorpe Pump Drain (upper end) (GB105029061640). • Black Dyke Catchment (trib of Louth Canal) (GB104029062000); • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530); • Land Dike Drain to Louth Canal (West) (GB104029062162); • Louth Canal (GB104029061990); • Mawnbridge Drain (GB104029067540); • New Dike Catchment (trib of Louth Canal) (GB104029062030); • North Beck Drain (GB104029067575); • Poulton Drain Catchment (trib of Louth Canal) (GB104029062010); • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100); • South Lincolnshire Chalk Unit (GB40501G401600); • North Lincolnshire Chalk Unit (GB40401G401500)	The proposed locations of the Block Valve Stations are not within 10m of a water body (measured from the edge of watercourses defined broadly by the position of the main channel and normal flow water's edge) and so should not have an effect on the WFD status of the surrounding water body. Any works that may generate runoff or spillages during construction are anticipated to be adequately addressed through measures to be outlined in the CEMP and WMP in order to avoid adverse impacts on water quality to watercourses receiving drainage from the site. The CEMP, particularly the pollution control measures, if followed appropriately, will mitigate any impacts being propagated downstream by any hydrological connectivity between the watercourses that interact with the Proposed Development and protected areas such as NVZs, Humber Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC). Therefore, these protected areas are not considered further in this assessment.

Component	Description	Screening Outcome	Justification
			Groundwater is considered unlikely to be encountered within any shallow excavations for Block Values. If groundwater is encountered during the ground investigation prior to construction, a dewatering plan will be in place to manage the water appropriately during construction as secured through the CEMP. Therefore, groundwater bodies are screened out.
Theddlethorpe Facility	The facility is required to enable the CO_2 to flow from the new pipeline into the existing LOGGS pipeline via a cross-over connection. There are currently two options for locating the Theddlethorpe Facility: For option 1, the onshore pipeline would enter the repurposed TGT site from the west and terminate at new facilities built next to the existing LOGGS Pipeline, which enters the site from the east. For option 2, the existing LOGGS pipeline would be extended to the west, tying in the existing LOGGS pipeline to the new	**In –** • South Lincolnshire Chalk Unit (GB40501G401600). **Out** – • Great Eau (downstream of South Thoresby) (GB105029061660); • Long Eau (GB105029061670); • South Dike and Grayfleet Drain (GB105029061680); • Trusthorpe Pump Drain (upper end) (GB105029061640). • Black Dyke Catchment (trib of Louth Canal) (GB104029062000); • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530); • Land Dike Drain to Louth Canal (West) (GB104029062162); • Louth Canal (GB104029061990);	South Lincolnshire Chalk Unit groundwater body is screened in based on the possibility that groundwater is artesian in the chalk and piling could cause artesian flow. The Theddlethorpe Facility is not located above the North Lincolnshire Chalk Unit groundwater body which is therefore screened out due to the lack of any pathway. The proposed location of the Theddlethorpe Facility is not within 10m of a water body (measured from the edge of watercourses defined broadly by the position of the main channel and normal flow water's edge) and so should not have an effect on the WFD status of the surrounding river water body.

Component	Description	Screening Outcome	Justification
	Theddlethorpe Facility to the west of the TGT site. The key components of this consist of a LOGGS pipeline tie-in; emergency shutdown valves; PIG receiver and launcher; high-integrity pressure protection system; venting system including vent pipework, valves and vent stack; and local equipment room (LER); and supporting infrastructure. Based on the ground conditions identified during the original site investigation at Theddlethorpe it is estimated that approximately 30 x 300 mm diameter piles would be required to a depth of 18 m (within stiff boulder clay) to provide the necessary support to above ground pipelines. If surface bearing foundations were used, they would be subject to significant settlements. For the LER and other equipment not sensitive to settlement, raft foundations	• Mawnbridge Drain (GB104029067540); • New Dike Catchment (trib of Louth Canal) (GB104029062030); • North Beck Drain (GB104029067575); • Poulton Drain Catchment (trib of Louth Canal) (GB104029062010); • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100); • North Lincolnshire Chalk Unit (GB40401G401500).	Any works that may generate runoff or spillages during construction are anticipated to be adequately addressed through measures to be outlined in the CEMP and WMP in order to avoid adverse impacts on water quality to watercourses receiving drainage from the site. The CEMP, particularly the pollution control measures, if followed appropriately, will mitigate any impacts being propagated downstream by any hydrological connectivity between the watercourses that interact with the Proposed Development and protected areas such as NVZs, Humber Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC). Therefore, these protected areas are not considered further in this assessment.

Component	Description	Screening Outcome	Justification
	or footings can be used to spread the load adequately.		
Existing LOGGS pipeline	The existing LOGGS 914.4 mm pipeline (offshore pipeline) enters the former TGT site from the east and terminates at an existing shutdown valve within the site.	**Out** – • Great Eau (downstream of South Thoresby) (GB105029061660); • Long Eau (GB105029061670); • South Dike and Grayfleet Drain (GB105029061680); • Trusthorpe Pump Drain (upper end) (GB105029061640). • Black Dyke Catchment (trib of Louth Canal) (GB104029062000); • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530). • Land Dike Drain to Louth Canal (West) (GB104029062162); • Louth Canal (GB104029061990); • Mawnbridge Drain (GB104029067540); • New Dike Catchment (trib of Louth Canal) (GB104029062030); • North Beck Drain (GB104029067575); • Poulton Drain Catchment (trib of Louth Canal) (GB104029062010) • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100); • South Lincolnshire Chalk Unit (GB40501G401600);	The existing LOGGS pipeline is not within 10m of a water body (measured from the edge of watercourses defined broadly by the position of the main channel and normal flow water's edge) and so should not have an effect on the WFD status of the surrounding water body. Any works that may generate runoff or spillages during construction are anticipated to be adequately addressed through measures to be outlined in the CEMP and WMP in order to avoid adverse impacts on water quality to watercourses receiving drainage from the site. The CEMP, particularly the pollution control measures, if followed appropriately, will mitigate any impacts being propagated downstream by any hydrological connectivity between the watercourses that interact with the Proposed Development and protected areas such as NVZs, Humber Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC). Therefore, these

Component	Description	Screening Outcome	Justification
		• North Lincolnshire Chalk Unit (GB40401G401500)	protected areas are not considered further in this assessment. The existing LOGGS pipeline should not have any interaction with groundwater as it is assumed there will be no new excavations. Groundwater is considered unlikely to be encountered within any shallow excavations. If groundwater is encountered during the ground investigation prior to construction, a dewatering plan will be in place to manage the water appropriately during construction as secured through the CEMP. Therefore, groundwater bodies are screened out.
Dune Isolation Valve	The existing isolation valve (Dune Isolation Valve) on the onshore section of the LOGGS pipeline, A new valve will be provided in the same location, in order to reduce the risk of LOGGS pipeline inventory impacting the Theddlethorpe Facility and neighbouring populations, in the event of a leak upstream of this isolation valve.	**Out** – • Great Eau (downstream of South Thoresby) (GB105029061660); • Long Eau (GB105029061670); • South Dike and Grayfleet Drain (GB105029061680); • Trusthorpe Pump Drain (upper end) (GB105029061640). • Black Dyke Catchment (trib of Louth Canal) (GB104029062000); • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530);	The location of the valve is not within 10m of a water body (measured from the edge of watercourses defined broadly by the position of the main channel and normal flow water's edge) and so should not have an effect on the WFD status of the surrounding water body. Any works that may generate runoff or spillages during construction are anticipated to be adequately addressed through measures to be outlined in the CEMP and WMP in order to avoid adverse impacts on water quality to watercourses receiving drainage from the site.

Component	Description	Screening Outcome	Justification
		• Land Dike Drain to Louth Canal (West) (GB104029062162); • Louth Canal (GB104029061990); • Mawnbridge Drain (GB104029067540); • New Dike Catchment (trib of Louth Canal) (GB104029062030); • North Beck Drain (GB104029067575); • Poulton Drain Catchment (trib of Louth Canal) (GB104029062010); • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100); • South Lincolnshire Chalk Unit (GB40501G401600); • North Lincolnshire Chalk Unit (GB40401G401500)	The CEMP, particularly the pollution control measures, if followed appropriately, will mitigate any impacts being propagated downstream by any hydrological connectivity between the watercourses that interact with the Proposed Development and protected areas such as NVZs, Humber Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR) and Humber Estuary (SSSI, SAC). Therefore, these protected areas are not considered further in this assessment. Dune isolation valves should not have any interaction with groundwater as it is assumed there will be no new excavations. However, if there are they will be shallow. Groundwater is considered unlikely to be encountered within any shallow excavations. If groundwater is encountered during the ground investigation prior to construction, a dewatering plan will be in place to manage the water appropriately during construction as secured through the CEMP. Therefore, groundwater bodies are screened out.

3.2 WFD Scoping

3.2.1 The WFD scoping stage defines the level of detail required for further WFD assessment. This includes identifying risks to the WFD receptors from the Proposed Development's activities. The scoping stage assessment is presented in **Table 3**:.

Table 3: Scoping of the Proposed Development's Activities against WFD Quality Elements

WFD Quality Element	Potential Risk to Receptor (Yes/No)	Justification	Scoping Outcome (In/Out)
Biological Quality Elements			
Fish	Yes	Non-intrusive crossings and watercourse crossings for site access may result in a spillage of drilling fluids or pollutants, which have the potential to impact fish populations during the construction phase. Temporary blockages in longitudinal connectivity from intrusive crossing methods of water bodies, and watercourse crossings required for site access. Potential for loss of biological continuity resulting in interference with fish population movements and blocking the exchange of individuals among populations, reducing gene flow and disrupting the ability of 'source' populations to support declining populations nearby. Potential direct impact on fish populations from disturbance of the bed and / or release of contaminated construction site runoff, including the risk of 'break out' during directional drilling operations.	In
Invertebrates	Yes	Non-intrusive crossings of water bodies may result in a spillage of drilling fluids or pollutants, which have the potential to impact fish populations during the construction phase. Intrusive crossings and watercourse crossings for site access may cause direct mortality of invertebrates or the smothering of habitat with fine sediment.	In
Macrophytes and Phytobenthos Combined	Yes	Non-intrusive crossings and watercourse crossings for site access may result in a spillage of drilling fluids or pollutants, which have the potential to impact fish populations during the construction phase.	In

WFD Quality Element	Potential Risk to Receptor (Yes/No)	Justification	Scoping Outcome (In/Out)
		Intrusive crossings of water bodies may cause the removal of macrophytes, and removal of the bed or macrophytes supporting phytobenthos. Similar impacts could arise from installation of watercourse crossings for site access.	
Physico-Chemical Quality Elements			
Thermal conditions	No	Non-intrusive crossings could alter the level of shading to water bodies following potential riparian vegetation removal, however this is very unlikely to result in a notable change in shading or associated change in water temperature given launch and receive pits will be located at least 10m from the water body. Intrusive crossings and watercourse crossings for site access may result in riparian vegetation removal, yet this will only be at a very local scale and would not alter the water body temperature.	Out
Oxygenation conditions	Yes	Non-intrusive, intrusive crossings, and watercourse crossings for site access may increase sediment and organic material entry into watercourses.	In
Salinity	No	No materials that may alter the salinity of the watercourses are known to be proposed for use in the Proposed Development.	Out
Acidification status	No	No materials that may alter the pH of water bodies are known to be proposed for use in the Proposed Development. The CEMP and WMP will specify measures to manage the spillage risk of chemicals used in construction.	Out
Nutrient conditions	Yes	Non-intrusive, intrusive crossings, and watercourse crossings for site access may increase sediment loads to watercourses and organic material from site clearance works.	In
Hydromorphological Quality Elements			
Quantity and dynamics of water flow	No	There is no mechanism for any crossing method to impact this element; intrusive crossings and watercourse crossings for site access will preferably be carried out during dry periods or maintain water body	Out

WFD Quality Element	Potential Risk to Receptor (Yes/No)	Justification	Scoping Outcome (In/Out)
		flow by installation of a pipe or flume or by over-pumping the flow for the relatively short duration of the works.	
Connection to groundwater bodies	No	Pipeline will cross beneath water bodies and other infrastructure, but this should not impact connectivity to groundwater bodies due to the small scale of activity compared to water body size. Watercourse crossings for site access may also present a barrier to connection with groundwater bodies, but this will be extremely localised and would not present an impact at the water body scale.	Out
River continuity	Yes	Intrusive crossings will present a temporary blockage to continuity whilst excavation takes place. Watercourse crossings for site access can also interrupt river continuity. There is no mechanism for non-intrusive crossings to affect this quality element.	In
River depth and width variation	Yes	Intrusive crossings may lead to local changes in channel profile to impact this element. Watercourse crossings for site access would also impact this element locally by their uniform, unchangeable nature.	In
Structure and substrate of the riverbed	Yes	Intrusive crossings may lead to local changes in bed substrate to impact this element. Watercourse crossings for site access can present an interruption to the natural bed substrate.	In
Structure of the riparian zone	Yes	Intrusive crossings will involve digging below the watercourse bed, which will inevitably involve disruption of the watercourse banks and the riparian zone as they will be temporarily removed before being reinstated. Non-intrusive crossings will also involve excavations each side of riverbanks, but these will be set back by a minimum of 10m from the normal flow channel/ water's edge. Watercourse crossings for site access can locally disconnect the river channel from the riparian zone.	In
Groundwater Quality Elements			

WFD Quality Element	Potential Risk to Receptor (Yes/No)	Justification	Scoping Outcome (In/Out)
Quantitative Elements	Yes	There are potential impacts from artesian groundwater conditions causing water resource loss at excavations for foundation pilings and non-intrusive crossings on certain water bodies, roads, and the railway.	In
Chemical Elements	Yes	There are potential impacts from groundwater ingress to excavations for foundation piling and non-intrusive crossings of watercourses, railways, and roads	In

4 Baseline Conditions and Desk Study

4.1 Topography and Land Use

4.1.1 Generally, the topography for the entire study area is relatively subdued, with elevations typically ranging from 4mAOD to 50mAOD westwards towards the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB). This is due to the Proposed Development's proximity to the coast, which is typically formed of low-lying farmland and marshland.

4.1.2 The landcover of the catchment is dominated by arable land, with approximately 70% coverage, this is followed by improved grassland at 15% coverage, and supralittoral sediment at 8% coverage. Notable landcover equal to/lower than 5% is suburban, urban, and deciduous woodland. The major urban areas within the study area are Immingham, Grimsby, and Mablethorpe, however, there are many small villages such as Alvingham Grimoldby; Ashby cum Fenby; and North Thoresby.

4.2 Geology and Soils

4.2.1 A review of British Geological Survey (BGS) geological maps identified that the catchment was characterised by five different Superficial Deposits (from greatest proportion to least) (**Ref 8**)[15]:

- Glacial Till (a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton).
- Tidal Flat Deposits (consolidated soft silty clay, with layers of sand, gravel, and peat).
- Glaciofluvial Deposits (sand and gravel with rare clay interbeds; often cross-bedded; of glacial origin).
- Alluvium present in localised channels between Immingham and Aylesby (comprise soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat, and basal gravel).

[15] British Geological Survey borehole and online mapping (https://www.bgs.ac.uk/map-viewers/geology-of-britain-viewer/).

- Lacustrine Deposits (laminated clay and silt and can contain thin layers of organic material or sand).

4.2.2 Most of the study area is characterised by Burnham Chalk Formation bedrock geology, comprising white, thinly bedded chalk with common tabular and discontinuous flint bands and sporadic marl seams.

4.2.3 The eastern coastal section of the study area has a bedrock geology of Chalk of the Flamborough Chalk Formation. This is a white, well-bedded, flint-free chalk with common marl seams (characteristically approximately one per metre).

4.2.4 Chalk of the Welton Chalk Formation underlies the majority of the western section of the study area. Generally comprising white, massive, or thickly bedded chalk with common flint nodules, lacking tabular flint bands.

4.2.5 Soil composition within catchment is composed of two main types (**Ref 9**)[16]. The eastern section is characterised by loamy and clayey soils of coastal flats with naturally high groundwater. The western section of the study area is slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. The habitats common with both type of soilscape is seasonally wet pastures and woodlands which has moderate fertility and impeded drainage.

4.3 Hydrology

4.3.1 Within the screened-in waterbodies, there are three NRFA gauging stations (**Ref 11**)[17]. Great Eau at Claythrope Mill located within Great Eau (downstream of South Thoresby) (GB105029061660); Lud at Louth located within Louth Canal (GB104029061990); and Waithe Beck at Brigsley located within Waithe Beck lower catchment (to Tetney Lock) (GB104029062100). Flow metrics recorded at these stations is detailed in **Table 4**.

Table 4: NRFA Gauging Data for Stations Within Screened-In Waterbodies[17].

	Great Eau at Claythrope Mill (1962 – 2021)	Lud at Louth (1968 – 2021)	Waithe Beck at Brigsley (1960 – 2021)
Mean Flow (m^3/s)	0.664	0.458	0.305
95% Exceedance (Q95) (m^3/s)	0.250	0.127	0.063
70% Exceedance (Q70) (m^3/s)	0.399	0.246	0.130
50% Exceedance (Q50) (m^3/s)	0.529	0.355	0.195
10% Exceedance (Q10) (m^3/s)	1.150	0.891	0.681
5% Exceedance (Q5) (m^3/s)	1.380	1.113	0.919

4.3.2 There are two Met Office monitoring locations within the waterbody catchments within the study area: Cleethorpes and Manby. Cleethorpes has an average annual maximum temperature of 14.05, with the warmest months July, August and September and the coolest December, January, and February, as typical of a northern hemisphere temperate climate

[16] Soilscapes website (http://www.landis.org.uk/soilscapes/).
[17] National River Flow Archive website (https://nrfa.ceh.ac.uk/).

(**Ref 12**)[18]. Total annual rainfall is 600.71mm, which is below the national average of 1162.93, likely a result of the area positioning on the east side of England which is typically dry.

4.3.3 Manby has an average annual maximum temperature of 13.94, with the warmest months June, July and August and the coolest December, January, and February (**Ref 12**)[18]. Total annual rainfall is 634.53mm, which is also below the national average.

4.4 Historical Channel Change

4.4.1 Analysis of historic mapping from the late 19th century shows that there have been only minor adjustments to channel planform of WFD watercourses over the past century[19]. However, this is thought to be a result of significant modification prior to the advent of available mapping rather than a reflection of a natural and unmodified area as the watercourses in question are clearly straightened, over deep, and artificial in places.

4.4.2 However, many agricultural drainage ditches have been created since the late 19th century even though many already existed.

4.5 WFD Surface Waterbodies

4.5.1 The study area falls within 13 WFD surface water body catchments and all of these were screened in.

4.5.2 There are also several tributaries of these water bodies present within the study area; these are predominantly unnamed agricultural ditches, drains, and springs.

4.5.3 Further details regarding the WFD classifications of the screened in water bodies are given in Table 5.

[18] Met Office website (https://www.metoffice.gov.uk/).
[19] Historic mapping: National Library of Scotland (https://maps.nls.uk/GEO/EXPLORE/#zoom=5&lat=56.00000&lon=-4.00000&layers=1&b=1).

Table 5: Summary of the WFD Status of the Screened -In WFD Surface Water Bodies[20]

WFD Parameter	Status / Summary												
Water Body ID	GB105029061660	GB105029061670	GB105029061680	GB105029061640	GB104029062000	GB104029067530	GB104029062162	GB104029061990	GB104029067540	GB104029062030	GB104029067575	GB104029062010	GB104029062100
Water Body Name	Great Eau (downstream of South Thoresby)	Long Eau	South Dike and Grayfleet Drain	Trusthorpe Pump Drain (upper end)	Black Dyke Catchment (trib of Louth Canal)	Laceby Beck / River Freshney Catchment (to N Sea)	Land Dike Drain to Louth Canal (West)	Louth Canal	Mawnbridge Drain	New Dike Catchment (trib of Louth Canal)	North Beck Drain	Poulton Drain Catchment (trib of Louth Canal)	Waithe Beck Lower Catchment (to Tetney Lock)
Water Body Type	River	River	River	River	River	River	River	River	River	River	River	River	River
Water Body Area (m^2)	55.02	41.00	61.87	36.96	20.88	101.16	20.12	26.55	27.55	21.94	56.65	32.62	69.75
Water Body Length (m)	55.15	37.41	41.69	29.68	27.84	67.16	24.07	49.35	36.23	25.92	50.83	29.23	53.10
Hydrological	Heavily Modified	Heavily Modified	Heavily Modified	Artificial	Heavily Modified	Heavily Modified	Heavily Modified	Heavily Modified	Heavily Modified	Heavily Modified	Heavily Modified	Heavily Modified	Heavily Modified

[20] Environment Agency Catchment Data Explorer website (https://environment.data.gov.uk/catchment-planning).

WFD Parameter	Status / Summary												
Designation													
Overall Ecological Status	Poor	Moderate	Moderate	Moderate	Moderate	Moderate	Bad	Poor	Moderate	Moderate	Moderate	Moderate	Moderate
Current Overall Status	Poor	Moderate	Moderate	Moderate	Moderate	Bad	Bad	Poor	Moderate	Moderate	Moderate	Moderate	Moderate
Status Objective	Good by 2027	Moderate by 2015	Good by 2027	Good by 2027	Good by 2021	Moderate by 2027	Good by 2027	Moderate by 2027	Good by 2027	Good by 2027	Good by 2027	Good by 2027	Good by 2027
Biological Quality Elements	Poor	Poor	Bad	Good	Poor	Bad	Bad	Poor	N/A	High	N/A	Moderate	Good
Physico-chemical Quality Elements	High	Moderate	N/A	Moderate	N/A	Moderate	Moderate	Good	N/A	N/A	N/A	N/A	Good
Hydromorphological Quality	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good

WFD Parameter	Status / Summary												
Elements													
Chemical	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail

4.6 WFD Groundwater Bodies

4.6.1 The Proposed Development is underlain by two groundwater bodies, with activities screened in for both groundwater bodies. A summary of the WFD status of both water bodies is given in Table 6.

Table 6: Summary of The WFD Status Of The Screened-In Groundwater Bodies (Ref 5)[21]

WFD Parameter	Status / Summary	
Water Body ID	GB40501G401600	GB40401G401500
Water Body Type	South Lincolnshire Chalk Unit	North Lincolnshire Chalk Unit
Water Body Area	Ground Water Body	Ground Water Body
Overall Status	Poor	Poor
Quantitative	Good	Poor
Quantitative Status Elements	Good	Poor
Quantitative Saline Intrusion	Good	Poor
Quantitative Water Balance	Good	Good
Quantitative GWDTEs test	Good	Good
Quantitative Dependent Surface Water Body Status	Good	Poor
Chemical	Poor	Poor
Chemical Status Elements	Poor	Poor
Chemical Drinking Water Protected Area	Good	Poor
General Chemical Test	Poor	Poor
Chemical GWDTEs test	Good	Good
Chemical Dependent Surface Water Body Status	Good	Good
Chemical Saline Intrusion	Good	Good
Prevent and Limit Objective	Active	Active

4.7 Hydromorphological Quality Elements

4.7.1 A site walkover was conducted on in February and March 2023, in part to assess the hydromorphological condition and quality of watercourses set to be crossed by the Proposed Development. The findings of this are detailed in *ES Volume IV Appendix 11-2 Site Visit Technical Note (Application Document 6.4.11.2).*

4.7.2 The majority of visited watercourses were comprised of a straight, artificial, or heavily modified channel with a trapezoidal cross section, which were disconnected from the adjacent floodplain, and surrounded by agricultural fields.

4.7.3 There were several watercourses, including North Beck Drain and Waithe Beck, that did not follow this trend. Details are in **Table 7**:.

[21] Environment Agency Catchment Data Explorer website (https://environment.data.gov.uk/catchment-planning)

Table 7: North Beck Drain and Waithe Beck Site Visit Hydromorphological Details

Parameter	North Beck Drain	Waithe Beck
Channel Form	North Beck Drain is a chalk stream. The watercourse displayed natural sinuosity in parts, although had been straightened in the vicinity of the proposed crossing. It was incised and disconnected from the adjacent floodplain.	Waithe Beck is a chalk stream. The channel displayed a natural sinuosity through much of the survey length, although there was evidence of historic modification, including channel straightening, in parts. Vegetated berms were noted providing a variation in channel width. A review of mapping and aerial imagery indicates that channel straightening has occurred over a greater length.
Substrate Conditions	Bed substrate largely comprised fine gravels, although there was a significant input of fine sediment which likely enters the watercourse from the adjacent agricultural land. Some areas of coarser gravels were noted in the more natural wooded areas.	A gravel bed was observed, although fine sediment could be seen in parts. The water was turbid and not representative of the clear waters expected in a chalk stream, indicating an input of fine sediment. It is likely that adjacent land use contributes a significant input of fine sediment.
Flow Conditions	There were some varying flow types, particularly where the watercourse flows through woodland as this is a more natural length with varying widths and depths. Flow was more uniform through the straightened length in the vicinity of the proposed crossing, mostly comprising of run flow type. Some areas of coarser gravels and in-channel vegetation provided some flow variation.	Numerous flow types were noted through the more sinuous lengths, with berms, in-channel and marginal vegetation, and woody material all helping to provide varied flow.
Floodplain Characteristics	The watercourse was incised and disconnected from the adjacent floodplain.	The floodplain mostly comprised agricultural fields, although a narrow strip of trees and grasses buffered the watercourse in parts.
Riparian Zone	The riparian zone comprised agricultural fields, although the left bank was buffered by occasional trees, scrub and longer grasses. The watercourse also flowed through some small parcels of woodland.	The riparian zone comprised trees, grasses, shrubs and scrub in parts, although there was a considerable encroachment of agricultural fields.

Parameter	North Beck Drain	Waithe Beck
Modifications	The watercourse has been straightened in the vicinity, with modifications resulting in an incised channel that is disconnected from the floodplain. There is also a significant input of fine sediment, likely from the adjacent agricultural land use.	Although the watercourse displayed a natural sinuosity over much of the surveyed length, evidence of historic straightening was present. A review of aerial imagery indicates that a greater degree of straightening has occurred beyond the surveyed length. The watercourse was culverted under a farm access track near Barnoldby Le Beck Park, and adjacent land use has been heavily modified for agricultural purposes.

4.8 Biological Quality Elements

4.8.1 There has been no EA freshwater fish surveying within the study area in the past 10 years (**Ref 13**)[22].

4.8.2 Invertebrates have been sampled at two sites across the study area in the past 10 years, with 15 surveys conducted across these. The BWMP ASPT (Biological Monitoring Working Party Average Score Per Taxon) ranged from 4.43 (fair biological quality) to 5.37 (very good biological quality), with an average of 4.93 that suggests that the sites generally have good biological quality (**Ref 13**)[22].

4.8.3 One macrophyte survey has been conducted in the same timeframe across one site, which found three flowering plants, of which all were non-native (Callitriche, Filipendula ulmaria, and Phragmites australis). No protected taxa were found (**Ref 13**)[22].

4.9 Physico-chemical Quality Elements

4.9.1 Water quality sampling of Louth Canal is conducted by the Environment Agency at XY Coordinate 536484, 390849, a site approximately 600 m of the proposed Louth Canal crossing point. Analysis has been conducted on the most recent 10 samples, which covers a time period from June 2022 to March 2023. Summary statistics and the resultant WFD classification are displayed in **Table 8.**

4.9.2 **Table 8** indicates the Louth Canal is slightly alkaline in nature with an average pH of 8.05 and falls within the WFD High classification based on the 10 samples considered here. Dissolved oxygen saturation is classified as Good which suggests the waterbody is not limited by dissolved oxygen levels. Ammonia levels fall within the WFD classification for High which suggests pollution from organics such as sewage materials may not be having a detrimental impact on the waterbody.

[22] Environment Agency Fish and Ecology Data Explorer. **(**https://environment.data.gov.uk/ecology/explorer/)

Table 8: Summary of Physico-Chemical Parameters Of Louth Canal (Ref 14)[23]

Physico-chemical quality element	Average	Minimum	Maximum	WFD Classification (2019)
Acid Neutralising Capacity	200	180	210	High
Ammonia (mg/l)	0.00314	0.0011	0.0138	High
Orthophosphate reactive as P (mg/l)	0.1916	0.087	0.33	Good
Oxygen, Dissolved as O2	10.847	6.17	13.2	Good
pH	8.05	7.73	8.35	High
Water Temperature (°C)	11.33	5	18.7	High

4.9.3 Water quality sampling of Waithe Beck at Brigsley Bridge is conducted by the Environment Agency at XY Coordinate 525221, 401690, a site approximately 1 km of the proposed Waithe Beck crossing point. Analysis is conducted on the most recent 10 samples, which covers a time period from July 2022 to April 2023. Summary statistics and the resultant WFD classification are displayed in **Table 9**:.

4.9.4 **Table 9**: indicates Waithe Beck is slightly alkaline in nature with an average pH of 8.30 and falls within the WFD High classification based on the 10 samples considered here. Dissolved oxygen saturation is classified as High which suggests the waterbody is not limited by dissolved oxygen levels. Ammonia levels fall within the WFD classification for High which suggests pollution from organics such as sewage materials may not be having a detrimental impact on the waterbody.

Table 9: Summary of Physico-Chemical Parameters of Waithe Beck (Ref 14)[24]

Physico-chemical quality element	Average	Minimum	Maximum	WFD Classification (2019)
Acid Neutralising Capacity	213	190	230	High
Ammonia (mg/l)	0.000571	0.00035	0.00081	High
Orthophosphate reactive as P (mg/l)	0.0942	0.026	0.16	Good
Oxygen, Dissolved as O2	11.274	9.7	13.3	High
pH	8.3	7.99	8.53	High
Water Temperature (°C)	10.08	4	15.3	High

[23] Environment Agency Water Quality Archive. (https://environment.data.gov.uk/water-quality/view/landing).
[24] Environment Agency Water Quality Archive. (https://environment.data.gov.uk/water-quality/view/landing).

5 WFD Impact Assessment

5.1 Site Specific Assessment of the Proposed Development Against WFD Quality Elements

5.1.1 Components of the Proposed Development and their potential impacts have been introduced along with mitigation measures in **Table 10**:. The purpose of this table is to introduce the key sources of potential impacts and associated mitigation; the compliance assessment follows which considers impacts on WFD quality elements of each water body.

5.1.2 There is a range of mitigation for the water environment within the Proposed Development, including watercourse buffers (i.e. the distance between work and the location of the watercourse), surface and foul water drainage strategies to outline the maintenance of SuDS (*ES Volume IV Appendix 11.3 Drainage Strategy)*. Where relevant, these are discussed in the screening of the Proposed Development's activities and components (**Table 2**), details can also be found in *ES Volume II Chapter 11: Water Environment (Application Document 6.2.11)*.

Table 10: Proposed Development Components, Potential Impacts, and Associated Mitigation Measures for Proposed Works to Water Bodies Scoped into this Assessment

Proposed Development component	Potential impacts	Mitigation measures
Immingham Facility and Theddlethorpe Facility: Foundation piling.	• Potential impacts from artesian groundwater conditions in the chalk due to foundation piling.	Where piling is proposed a Piling / Foundation Risk Assessment will be undertaken at FEED stage (e.g. drilling into the chalk Principal Aquifer, although considered unlikely). This will include consultation with the EA and will ensure that appropriate site-specific mitigation measures are in place prior to the works commencing. Please refer to E17 of the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. Where Sand and Gravel lenses are identified with potentially less thickness of Glacial Till between the sand and gravel and the underlying Chalk, clean drilling methods will be used if ground investigation or observations on site identify evidence of contamination. This will be achieved using a bentonite seal to

Proposed Development component	Potential impacts	Mitigation measures
		prevent any contamination in the strata above the Chalk to prevent the piling creating a new pollutant pathway. In addition, ground investigation will include chemical testing and risk assessment to identify potential risks to groundwater from mobilisation of contaminants, if present, within soil. All works will be undertaken in accordance with the CEMP. With the proposed mitigation in place, it is not expected that there would be a significant impact in the groundwater from the construction of the Immingham Facility or Theddlethorpe Facility.
Onshore Pipeline: Non-intrusive crossing of water body – excavation of launch and receive pits to facilitate trenchless crossings beneath watercourse bed, railways, and roads.	• Impacts to physico-chemical quality elements from potential increase in fine sediment load and organic matter delivered to water body. • Impacts to biological and physico-chemical quality elements from spillages of drill fluids or pollutants. • Potential impacts from groundwater ingress to excavations. • Potential impact on flows within rivers due to dewatering of the excavations for the non-intrusive crossings.	A more detailed hydrogeological risk assessment will be undertaken at FEED stage (e.g. drilling into the chalk Principal Aquifer, although considered unlikely). Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to treat the water prior to controlled discharge. Any such assessment will consider the effects of any draw down or impacts on nearby abstractions or resources. This will also include consultation with the EA as work progresses on a case-by-case basis assessment for each crossing location and will ensure that appropriate site-specific mitigation measures are in place prior to the works commencing.

Proposed Development component	Potential impacts	Mitigation measures
		Please refer to E3 of the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. Where Sand and Gravel lenses are identified with potentially less thickness of Glacial Till between the sand and gravel and the underlying Chalk, clean drilling methods will be used if ground investigation or observations on site identify evidence of contamination. This will be achieved using a bentonite seal to prevent any contamination in the strata above the Chalk to prevent the piling creating a new pollutant pathway. In addition, ground investigation will include chemical testing and risk assessment to identify potential risks to groundwater from mobilisation of contaminants, if present, within soil. The CEMP and WMP will be followed which outline measures which will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. Topsoil will be moved to the edge of the working area and heaped such that the spoil heap does not encroach outside the fenced area. Topsoil storage will be managed to maintain the nature of the soils and measures taken to prevent compaction, soil loss due to erosion, excessive weed growth, etc. The CEMP will be followed which outlines measures to reduce the risk of spillages. Water-based drilling fluids will be used. A frac-

Proposed Development component	Potential impacts	Mitigation measures
		out risk assessment will be carried out, with site specific mitigation included appropriate to the local ground conditions. The WMP will describe measures for implementation in the event of a 'break-out' under a watercourse to minimise the risk of pollution. Launch and receive pits will be located at least 10m from the edge of water/channel for normal flows to reduce the risk of pathways being created for runoff or pollutants to enter water bodies. The pipeline will be installed at least 2m below riverbed level. A more detailed hydrological and hydrogeological assessment will be undertaken at detailed design stage, where non-intrusive techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge
Onshore Pipeline: Intrusive crossing of water body – short-term disturbance of non-WFD designated watercourses during the construction phase.	• Localised but short-term loss of riparian habitat. • Short-term impediment to fish passage and ecological connectivity from impact to river continuity.	Where possible, intrusive crossings should be carried out in dry weather at low-flow conditions. If flow is present, this will be flumed or culverted through the works to maintain flow downstream and maintain a dry working area. A CEMP and WMP will be followed which will describe measures which will be taken to

Proposed Development component	Potential impacts	Mitigation measures
	• Potential removal of macrophytes and mortality of invertebrates. • Short-term adverse impacts to physico-chemical quality elements from potential increase in fine sediment load and organic matter delivered to water body, and chemical spillage risk. • Loss of morphological diversity; change in structure of riverbed. • Impacts to physico-chemical quality elements from potential increase in fine sediment load and organic matter delivered to water body from the newly reinstated, bare earth banks.	prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. Topsoil will be moved to the edge of the working area and heaped such that the spoil heap does not encroach outside the fenced area. Topsoil storage will be managed to maintain the nature of the soils and measures taken to prevent compaction, soil loss due to erosion, excessive weed growth, etc. The WMP will also describe all other pollution prevention measures and proposed water quality monitoring. A pre-works condition survey will be carried out to inform reinstatement of the channel. Reinstatement will return in-stream vegetation from its temporary locations, and the banks of the watercourse replanted and reseeded in accordance with the reinstatement plans contained within the Outline Landscape and Ecological Management Plan (LEMP). The area of bank reinstatement will be covered with hessian to encourage plant establishment and reduce the risk of soil erosion. The hessian will naturally degrade in-situ as the vegetation grows back.
Watercourse crossing for construction traffic passage	• Localised but short-term loss of riparian habitat. • Short-term impediment to fish passage and ecological connectivity from impact to river continuity. • Potential removal of macrophytes and	Where watercourses are encountered that require the passage of construction traffic, measures to be applied include the use of ‘flume’ pipes or temporary spanned bridges. Flume pipes are temporary pipes placed in the watercourse to permit the flow of water through the pipe. Once the flume pipe is installed, the area above the flume pipe is backfilled with selected

Proposed Development component	Potential impacts	Mitigation measures
	mortality of invertebrates. • Short-term adverse impacts to physico-chemical quality elements from potential increase in fine sediment load and organic matter delivered to water body, and chemical spillage risk. • Loss of morphological diversity; change in structure of riverbed.	excavated material, a layer of geo textile material prior to construction mats being placed over the backfilled area to permit the passage of plant, equipment, pipeline materials and people. The flume bed level will be set below the existing bed level to allow for the natural excavated bed to be placed over the flume base. The channel gradient will not be disrupted; there will be a smooth transition through the channel bed to the flume bed. Flume capacity will be designed to ensure flow velocities are not impacted, and the flume will be oversized to prevent backing up of higher flows. When works in the area are complete and/or the crossing is no longer required, the materials used to create the haul road will be removed. The seal around either end of the flume pipe will be slowly removed to allow the gentle return of the watercourse flow and then the flume removed. Where installation of a flume pipe crossing is not possible then a temporary spanned bridge (Bailey type bridge) will be installed and requires the construction of a raised soil platform each side of the watercourse. The soil platform will be set back to avoid sediment ingress into the watercourse. A pre-works condition survey will be carried out to inform reinstatement of the channel. Reinstatement will return in-stream vegetation from its temporary locations, and the banks of the watercourse replanted and reseeded in accordance with the reinstatement plans contained within the Outline Landscape and Ecological Management Plan (LEMP

Proposed Development component	Potential impacts	Mitigation measures
		Application Document 6.8). The area of bank reinstatement will be covered with hessian to encourage plant establishment and reduce the risk of soil erosion. The hessian will naturally degrade in-situ as the vegetation grows back. A CEMP and WMP will be followed which will describe measures which will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. The WMP will also describe all other pollution prevention measures and proposed water quality monitoring.

5.1.3 Site-specific impacts of the Proposed Development on the biological, physico-chemical and hydromorphological quality elements of the screened-in water bodies are provided in **Table 11**. The impact assessment on the groundwater bodies is provided in **Table 12** and only applies to non-intrusive crossings and, Immingham Facility and Theddlethorpe Facility foundation piling as all other activities have been screened out for ground water. The mitigation referred to in these tables forms the basis of this assessment, and the outcomes of the assessment are subject to the appropriate implementation of the mitigation measures provided.

Table 11: Impact Assessment on the WFD Quality Elements of the Surface Water Bodies Screened-In for this Assessment

WFD Quality Element	Potential Impact	Mitigation Measure and Compliance Assessment
Biological Quality Elements		
Fish	• Onshore Pipeline and Watercourse crossings for site access. • Potential for loss of biological continuity resulting in interference with fish population movements and blocking the exchange of individuals among populations, reducing gene flow, and disrupting the ability of "source" populations to support declining populations nearby, resulting from short-term blockages in longitudinal connectivity from the intrusive crossing method and potentially from watercourse crossings for access. • Possible harm to fish from spillages or pollution from fine sediment, drilling fluids (water based) and chemicals used during construction (e.g., fuel and hydraulic oil), and through disturbance when intrusive techniques and watercourse crossings for site access are used.	The CEMP and WMP will be followed for the installation of onshore pipelines and watercourse crossings for site access. They outline measures which will be taken to prevent the ingress of fine sediment or other material to, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material at the edge of the working area and heaped such that the spoil heap does not encroach outside the fenced area and the creation of raised soil platforms for Bailey bridges will be set back from the watercourse. The CEMP and WMP will outline measures to reduce the risk of spillages. Water-based drilling fluids will be used. Where possible, it is proposed to carry out the works for intrusive crossings and watercourse crossing for site access in relatively dry weather, wherein it is expected that the smaller water bodies proposed to be crossed by intrusive methods may be expected to be dry, and it is unlikely fish will be present. If flow is present within the watercourse, this will be over-pumped which will reduce impact to flow dynamics. Fish surveys and rescues, if required at the time of construction, will be carried out prior to works; this will be detailed in the CEMP. Launch and receive pits for non-intrusive crossings will be located at least 10m away from the watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies. For sensitive water crossings, the Working Width will be reduced to 10 metres, where possible. The flume bed level will be set below the existing bed level to allow for the natural excavated bed to be placed over the flume base. The channel gradient will not be disrupted; there will be a smooth transition through

WFD Quality Element	Potential Impact	Mitigation Measure and Compliance Assessment
		the channel bed to the flume bed. Flume capacity will be designed to ensure flow velocities are not impacted, and the flume will be oversized. All of these will mean that fish access is not impeded. Impacts to biological continuity are not considered to be significant given the localised, small scale, and short-term nature of the works, and the small nature of most of the water body at the crossing location that is unlikely to provide preferable habitat for fish. With the proposed mitigation in place, it is not expected that there would be an impact to this quality element.
Invertebrates	• Onshore Pipeline and watercourse crossings for site access. • Harm or direct mortality to invertebrates through excavation of the channel bed and bank. • Possible harm to invertebrates from spillages or pollution from fine sediment, drilling fluids (water based) and chemicals used during construction (e.g., fuel and hydraulic oil), and through disturbance when intrusive techniques and where Bailey bridges are used.	The CEMP and WMP will be followed for the installation of onshore pipelines and watercourse crossings for site access. They outline measures which will be taken to prevent the ingress of fine sediment or other material to, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material at the edge of the working area and heaped such that the spoil heap does not encroach outside the fenced area and the creation of raised soil platforms for Bailey bridges will be set back from the watercourse. The CEMP and WMP will outline measures to reduce the risk of spillages. Water-based drilling fluids will be used. Launch and receive pits for non-intrusive crossings will be located at least 10m away from the watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies. For sensitive water crossings, the Working Width will be reduced to 10 metres. Impacts to invertebrates from are not considered to be a significant given the localised, small scale, and short-term nature of the works. With the

WFD Quality Element	Potential Impact	Mitigation Measure and Compliance Assessment
		proposed mitigation in place, it is not expected that there would be an impact to this quality element.
Macrophytes and Phytobenthos	• Onshore Pipeline and watercourse crossings for site access • Possible smothering of macrophytes and phytobenthos from excessive fine sediment from construction runoff or drilling fluids, or toxic effects from chemical pollutants that may be spilt on the Draft Order Limits, and through disturbance when intrusive techniques are used and at watercourse crossings for site access. • Possible removal of macrophytes and phytobenthos from excavation of the channel bed and bank.	The CEMP and WMP will be followed for the installation of onshore pipelines and watercourse crossings for site access. They outline measures which will be taken to prevent the ingress of fine sediment or other material to, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material at the edge of the working area and heaped such that the spoil heap does not encroach outside the fenced area and the creation of raised soil platforms for Bailey bridges will be set back from the watercourse. The CEMP and WMP will outline measures to reduce the risk of spillages. Water-based drilling fluids will be used. Launch and receive pits for non-intrusive crossings will be located at least 10m away from the watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies. For sensitive water crossings, the Working Width will be reduced to 10 metres. Impacts to macrophytes and phytobenthos are not considered to be significant given the localised, small scale, and temporary, short-term nature of the works and the artificial nature of the majority of watercourses subject to this activity. With the proposed mitigation in place, it is not expected that there would be an impact to this quality element.
Physico-chemical Quality Elements		
Oxygenation conditions	• Onshore Pipeline and watercourse crossings for site access • Possible reduction in levels of dissolved oxygen from excavation activities for launch and receive	The CEMP and WMP will be followed for the installation of onshore pipelines and watercourse crossings for site access. They outline measures which will be taken to prevent the ingress of fine sediment or other material to, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material at the edge of the working area and heaped such that the spoil heap does not

WFD Quality Element	Potential Impact	Mitigation Measure and Compliance Assessment
	pits, and intrusive crossing excavation activities, and watercourse crossings for site access which may create a source and pathway for the delivery of fine sediments and organic material to the water body.	encroach outside the fenced area and the creation of raised soil platforms for Bailey bridges will be set back from the watercourse. Intrusive crossings and watercourse crossings for site access will be carried out in dry weather when flow is at its lowest. Reinstated banks will be covered with biodegradable matting and seeded as soon as practicable to reduce risk of bank erosion and delivery of fine sediment and organic material to water bodies. Launch and receive pits for non-intrusive crossings will be located at least 10m away from the watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies. For sensitive water crossings, the Working Width will be reduced to 10 metres. With the proposed mitigation in place, it is not expected that there would not be a significant impact to oxygenation conditions.
Nutrient conditions	• Onshore Pipeline and watercourse crossings for site access • Possible increase in nutrient levels from excavation activities for launch and receive pits, and intrusive crossing excavation activities, and watercourse crossings for site access which may create a source and pathway for delivery of nutrients to the water body.	The CEMP and WMP will be followed for the installation of onshore pipelines and watercourse crossings for site access. They outline measures which will be taken to prevent the ingress of fine sediment or other material to, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material at the edge of the working area and heaped such that the spoil heap does not encroach outside the fenced area and the creation of raised soil platforms for Bailey bridges will be set back from the watercourse. Intrusive crossings and watercourse crossings for site access will be carried out in dry weather when flow is at its lowest. Reinstated banks will be covered with biodegradable matting and seeded as soon as practicable to reduce risk of bank erosion and delivery of fine sediment and organic material to water bodies. Launch and receive pits for non-intrusive crossings will be located at least 10m away from the watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies.

WFD Quality Element	Potential Impact	Mitigation Measure and Compliance Assessment
		For sensitive water crossings, the Working Width will be reduced to 10 metres. With the proposed mitigation in place, it is not expected that there would not be a significant impact to nutrient conditions.
Hydromorphological Quality Elements		
River continuity	• Onshore Pipeline and watercourse crossings for site access • There will be some unavoidable short-term interruption to river continuity during the construction phase from intrusive crossings and watercourse crossings for site access. The watercourses in question are mostly of low hydromorphological quality as they are artificial, trapezoidal drainage ditches.	Intrusive crossings will be carried out in dry weather when flow is at its lowest. At intrusive crossings, flow will be maintained if required by flumes. Watercourse crossings for site access with flume pipes will be sized to reflect the span width and the estimated flow characteristics of the watercourse under peak flow conditions. The flume bed level will be set below the existing bed level to allow for the natural excavated bed to be placed over the flume base. The channel gradient will not be disrupted; there will be a smooth transition through the channel bed to the flume bed. Where installation of a flume pipe crossing is not possible then a temporary spanned bridge (Bailey type bridge) will be constructed. Temporary bridges and their supports will be designed specifically to consider the span length and will reflect flow characteristics and the creation of raised soil platforms for Bailey bridges will be set back from the watercourse. For sensitive water crossings, the Working Width will be reduced to 10 metres. Before installation of the onshore pipeline by the intrusive crossing method, a pre-works condition survey will be carried out to inform reinstatement of the channel. Reinstatement should aim to provide an improved channel form. With the proposed mitigation in place, it is not expected that there would not be a significant impact to river continuity given the short-term nature and small scale of the barrier and the ephemeral or artificial nature of the majority of water bodies subject to this activity.

WFD Quality Element	Potential Impact	Mitigation Measure and Compliance Assessment
River depth and width variation	• Onshore Pipeline and watercourse crossings for site access • There will be some unavoidable short-term disturbance during the construction phase of pipeline crossings and watercourse crossings for site access. Flume pipes access crossings will present a short-term, uniform, unchangeable section of channel. The watercourses in question are mostly of low hydromorphological quality as they are artificial, trapezoidal drainage ditches.	A pre-works condition survey will be carried out to inform reinstatement of the channel for pipeline crossing and watercourse crossings for site access. The flume bed level will be set below the existing bed level to allow for the natural excavated bed to be placed over the flume base. The channel gradient will not be disrupted; there will be a smooth transition through the channel bed to the flume bed. Before installation of the onshore pipeline by the intrusive crossing method, a pre-works condition survey will be carried out to inform reinstatement of the channel. Reinstatement should aim to provide an improved channel form. Bed material, including any gravels and cobbles will be retained on site for reinstatement to the watercourse. Material will be cleaned of fine sediment where appropriate prior to reinstatement. With the proposed mitigation in place, it is not expected that there would be a significant impact to river depth and width variation.
Structure and substrate of the river bed	• Onshore Pipeline and watercourse crossings for site access • There will be some unavoidable short-term disturbance during the construction phase. • Flume pipe access crossings can present an interruption to the natural bed substrate. There are possible changes to bed substrate upon reinstatement of the channel from intrusive crossings and flume crossings. Bailey type bridges will not affect this element. The watercourses in question are mostly of low	The flume bed level will be set below the existing bed level to allow for the natural excavated bed to be placed over the flume base. The channel gradient will not be disrupted; there will be a smooth transition through the channel bed to the flume bed. Before installation of the onshore pipeline by the intrusive crossing method, a pre-works condition survey will be carried out to inform reinstatement of the channel. Reinstatement should aim to provide an improved river bed. Bed material, including any gravels and cobbles will be retained on site for reinstatement to the watercourse. Material will be cleaned of fine sediment where appropriate prior to reinstatement. For sensitive water crossings, the Working Width will be reduced to 10 metres. With the proposed mitigation in place, it is not expected that there would be a significant impact to the structure and substrate of the river bed.

WFD Quality Element	Potential Impact	Mitigation Measure and Compliance Assessment
	hydromorphological quality as they are artificial, trapezoidal drainage ditches.	
Structure of the riparian zone	• Onshore Pipeline and watercourse crossings for site access. • There will be some unavoidable short-term disturbance during the construction phase. The watercourses in question are mostly of low hydromorphological quality as they are artificial, trapezoidal drainage ditches. • Loss of riparian habitat at the location of the excavation for the pipeline and watercourse crossings for site access. Crossings would present a local removal and disconnection of the channel from the riparian zone.	Before installation of the onshore pipeline and site access crossings, pre-works condition survey will be carried out to inform reinstatement of the riparian zone. Reinstatement should aim to provide an improved the riparian zone form. The area of bank reinstatement will be covered with hessian to encourage plant establishment and reduce the risk of soil erosion. The hessian will naturally degrade in-situ as the vegetation grows back. Launch and receive pits for non-intrusive crossings will be located at least 10m away from the watercourse (edge of normal flow) and Bailey bridges require the construction of a raised soil platform each side of the watercourse (set back from the watercourse banks), which will help to minimise disturbance of the bank and riparian vegetation. For sensitive water crossings, the Working Width will be reduced to 10 metres. With the proposed mitigation in place, it is not expected that there would be a significant impact to the structure of the riparian zone.

Table 12: Impact Assessment for the Non-Intrusive Water Body Crossings and Foundation Piling on the WFD Status Elements of the Groundwater Body Screened into this Assessment

WFD Status Element	Potential Impact	Mitigation and Compliance assessment
Quantitative Status Elements		
Quantitative Saline Intrusion	No anticipated impact	No mitigation required

WFD Status Element	Potential Impact	Mitigation and Compliance assessment
Quantitative Water Balance	• Potential for groundwater ingress to excavations to facilitate the pipeline crossing. • Potential for uncontrolled water resource loss, due to unexpected artesian flow. • Launch and receive pits will be dug within the superficial till, sand, and silt deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise with river level, whereas pits in more of a clayey area would have a lower level of ingress.	A more detailed hydrogeological risk assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. This will include consultation with the EA as work progresses on a case-by-case basis assessment for each crossing location and will ensure that appropriate site-specific mitigation measures are in place prior to the works commencing. Please refer to E3 of the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. Excavations for watercourse crossings and programmed so that works are completed in the most efficient and timely manner possible. This will be detailed in the CEMP. An appropriate intrusive ground investigation of selected areas of the DCO Site Boundary will be undertaken in accordance with all relevant guidance and legislation including BS 10175:2011, Environment Agency/DEFRA Land Contamination Risk Management (LCRM) series of reports. If areas of the DCO Site Boundary are shown to pose a risk, if feasible, infrastructure would be moved to a different location. However, if it is not possible to move the infrastructure in contact with the ground, remedial measures would be implemented. Installation of the pipeline will be short term, temporary, transient and phased. Sides of excavations will be shored, the nature of which will depend on ground conditions, size, depth and purpose of excavation, which will further minimise groundwater ingress. Given the proposed mitigation, any impacts to the quantitative water balance would be very localised and temporary and would not be considered significant at the water body scale.

WFD Status Element	Potential Impact	Mitigation and Compliance assessment
Quantitative GWDTEs test	No GWDTEs are known to be present in the study area.	No mitigation required.
Quantitative Dependent Surface Water Body Status	• Potential for groundwater ingress to excavations to facilitate the pipeline crossing. • Launch and receive pits will be dug within the superficial till, sand, and silt deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise with river level, whereas pits in more of a clayey area would have a lower level of ingress.	A more detailed hydrogeological risk assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. This will include consultation with the EA as work progresses on a case-by-case basis assessment for each crossing location and will ensure that appropriate site-specific mitigation measures are in place prior to the works commencing. Please refer to E3 of the CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. Excavations for watercourse crossings and programmed so that works are completed in the most efficient and timely manner possible. This will be detailed in the CEMP. Installation of the pipeline will be short term, temporary, transient and phased. The detailed design for HDD will include depth and profile and consider methods to reduce the risk of groundwater breakout during drilling. If required, water could be returned to the watercourse following treatment to maintain flows. Groundwater ingress to excavations would be very localised, and given the proposed mitigation, any impacts to the quantitative dependent surface water body status would not be considered significant.
Chemical Status Elements		
Chemical Drinking Water	• The Louth Canal (GB104029061990) and Great Eau (downstream of South Thoresby) (GB105029061660) Drinking Water Protected Area (GB105037033530) are	Where piling is required a Piling / Foundation Risk Assessment will be undertaken at FEED stage (e.g. where there is a risk of mobilising existing ground contamination and drilling into the

WFD Status Element	Potential Impact	Mitigation and Compliance assessment
Protected Area	located within the southern half of the study area. • Excavations for installation of pipeline crossings may introduce pollutants to groundwater from equipment leaks/spills. • Potential for groundwater pollution from disturbing contaminated ground (mobilising contaminants).	chalk Principal Aquifer, although this is considered unlikely). Similarly, a more detailed hydrogeological risk assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. In both cases this will include consultation with the EA as work progresses on a case-by-case basis assessment for each piling/drilling/crossing location and will ensure that appropriate site-specific mitigation measures are in place prior to the works commencing. Please refer to E3 and E17 in the Draft CEMP where this mitigation is secured CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. The CEMP and WMP will be followed which outline measures which will be taken to prevent leaks and spills and clean up procedures in case of leaks/spills. It will also outline measures which will be taken to prevent the ingress of fine sediment or other material to groundwater. Additional assessment for contaminated spoil may be required. Depending on the findings of such an assessment, additional measures to reduce the potential risk to groundwater (e.g., segregation of materials and validation testing), over and above the standard 'good practice' measures included in the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)* for the rest of the Proposed Development may be required. Given the proposed mitigation, the risk of impacts is low, and would be temporary and localised, therefore there is not expected to be an impact to the Chemical Drinking Water Protected Area.
General Chemical test	• Excavations for installation of pipeline crossings may introduce pollutants to groundwater from equipment leaks/spills and	A more detailed hydrogeological risk assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater

WFD Status Element	Potential Impact	Mitigation and Compliance assessment
	mobilising contaminants through disturbing contaminated ground. • Potential for groundwater ingress to excavations to facilitate the pipeline crossing. Launch and receive pits will be dug within the superficial till, sand, and silt deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise with river level, whereas pits in more of a clayey area would have a lower level of ingress.	environments. This will include consultation with the EA as work progresses on a case-by-case basis assessment for each crossing location and will ensure that appropriate site-specific mitigation measures are in place prior to the works commencing. Please refer to E3 of the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. The CEMP and WMP will be followed which outline measures which will be taken to prevent leaks and spills and clean up procedures in case of leaks/spills. It will also outline measures which will be taken to prevent the ingress of fine sediment or other material to groundwater. Additional assessment for contaminated spoil may be required. Depending on the findings of such an assessment, additional measures to reduce the potential risk to groundwater (e.g. segregation of materials and validation testing), over and above the standard 'best practice' measures included in the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)* for the rest of the Proposed Development may be required. Installation of the pipeline will be transient and phased. The detailed design for HDD will include depth and profile and consider methods to reduce the risk of groundwater breakout during drilling. Given the proposed mitigation, impacts to this chemical status element would be very localised and short-term, and would not be considered significant at the water body scale.
Chemical GWDTEs test	No GWDTEs are known to be present in the study area.	No mitigation required.

WFD Status Element	Potential Impact	Mitigation and Compliance assessment
Chemical Dependent Surface Water Body Status	• Excavations for installation of pipeline crossings may introduce pollutants to groundwater from equipment leaks/spills. • Potential for groundwater ingress to excavations to facilitate the pipeline crossing. Launch and receive pits will be dug within the superficial sand and gravel deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise with river level, whereas pits in more of a clayey area would have a lower level of ingress.	A more detailed hydrogeological risk assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. This will include consultation with the EA as work progresses on a case-by-case basis assessment for each crossing location and will ensure that appropriate site-specific mitigation measures are in place prior to the works commencing. Please refer to E3 of the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. The CEMP and WMP will be followed which outline measures which will be taken to prevent leaks and spills and clean up procedures in case of leaks/spills. Given the mitigation will follow best practice, and any impacts to the water quality of groundwater would be short-term and minimal, no anticipated impacts to the chemical dependent surface water body status are expected.
Chemical Saline Intrusion	No anticipated impact.	No mitigation required.

6 Construction Impacts

6.1 Potential Construction Phase Impacts

6.1.1 There are a number of general adverse impacts to the water environment which may occur from construction activity, including:

- Pollution of surface or groundwater due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off;
- Temporary, short-term impacts on sediment dynamics and hydromorphology within watercourses and waterbodies, where new crossings are required due to construction works to lay pipeline and watercourse crossings for site access;
- Temporary, short-term changes in flood risk from changes in surface water runoff and exacerbation of localised flooding, due to deposition of silt, sediment in drains and ditches;
- Temporary, short-term changes in flood risk due to the construction of site compound and storage facilities, which alter the surface water runoff from the DCO Site Boundary; and
- Potential impacts on local water supplies.

6.1.2 Further details are provided in *ES Volume II Chapter 11: Water Environment (Application Document 6.2.11).*

6.2 Construction Mitigation

6.2.1 The construction will take place in accordance with the CEMP. The CEMP details the measures that would be undertaken during construction to mitigate the temporary effects on the water environment. A Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)* has been developed and will be finalised in advance of construction works by the Principal Contractor.

6.2.2 The CEMP will comprise good practice methods that are established and effective measures to which the development will be committed through the DCO – the CEMP will need to be substantially in accordance with the Draft CEMP *(ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*. The measures within the document will focus on managing the risk of pollution to surface waters and the groundwater environment. It will also consider the management of activities within floodplain areas (i.e., kept to a minimum and with temporary land take required for construction to be located out of the floodplain as far as reasonably practicable).

6.2.3 Construction of the Proposed Development will be in accordance with the CEMP and that document will describe the principles for the protection of the water environment during construction. The CEMP will be supported by a WMP (*ES Volume IV Appendix 11.6 Outline Water Management Plan*) that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction.

6.2.4 Good Practice Guidance is summarised in *ES Chapter 11: Water Environment (Application Document 6.2.11)* of the ES, which includes information on:

- Permissions and Consents;
- Management of Construction Site Runoff;

- Management of Construction Site Spillage Risk; and
- Management of Flood Risks.

6.2.5 It is anticipated that all WFD construction risks could be adequately mitigated with appropriate planning and management.

7 Assessment of the Proposed Development against WFD

7.1 Assessment of the Proposed Development against Water Body Mitigation Measures

7.1.1 The EA identifies mitigation measures for water bodies, which are actions that can be implemented to protect and improve the water environment and help achieve the objectives for each RBMP. This section of the assessment considers the nature of the measures identified by the EA for each water body and assesses whether the Proposed Development may prevent such measures being implemented.

7.1.2 The Proposed Development has been appraised against measures identified for all screened-in water bodies, which are available via the Catchment Data Explorer (**Ref 5**). This appraisal is presented in **Table 13**:.

Table 13: Appraisal of the Proposed Development against the Delivery of Measures identified for the Waterbodies scoped into this Assessment

Measure theme	Further detail on measure	Appraisal of the Proposed Development
To control or manage point source inputs of pollution from sewage and trade/industry discharge	Install nutrient reduction to mitigate impacts on receptor	The drainage strategy (*ES Volume IV Appendix 11.3 Drainage Strategy)* and the temporary works drainage strategy (which is included as a commitment within the Draft CEMP and which will be developed during FEED stage) for the Proposed Development would ensure no negative effects on nutrient pathways, as existing drainage would be mimicked, and the change in land (at above ground infrastructure) use may result in a decrease in the production of source inputs. Therefore, the Proposed Development would not impact the implementation of this measure.
To control or manage diffuse source impacts	Reduce diffuse pollution pathways (surface run-off and drainage management)	The drainage strategy (*ES Volume IV Appendix 11.3 Drainage Strategy)* and the temporary works drainage strategy (which is included as a commitment within the Draft CEMP and which will be developed during FEED stage) for the Proposed Development would
	Reduce diffuse pollution at source- nutrients	
	Reduce diffuse pollution at source- arable soils	

Measure theme	Further detail on measure	Appraisal of the Proposed Development
	Reduce diffuse pollution at source- livestock	ensure no negative effects on nutrient pathways, as existing drainage would be mimicked, and the change in land use (at above ground infrastructure) may result in a decrease in the production of source inputs. Therefore, the Proposed Development would not impact the implementation of these measures.
	Reduce diffuse pollution at source- pesticide management	
To improve modified habitat	Remove or ease barriers to fish migration to enable fish passage	There will be some unavoidable temporary disturbance during the construction phase of open-cut crossings and watercourse crossings for site access, but this will be over a relatively short timeframe. The watercourses in question are of low hydromorphological quality as they are artificial, trapezoidal drainage ditches and not thought to be sensitive to such works. Therefore the Proposed Development would not impact the implementation of these measures.

7.2 Assessment against WFD objectives

7.2.1 The compliance of the Proposed Development against WFD objectives is determined based upon an assessment against the following objectives relating to WFD quality elements, including biological, physico-chemical and hydromorphological quality elements:

- Whether the Proposed Development will cause deterioration in the Ecological Potential or Status of a water body;
- Whether the Proposed Development will compromise the ability of a water body to achieve Good Ecological Status or Potential;
- Whether the Proposed Development will cause a permanent exclusion or compromise achievement of the WFD objectives (e.g., mitigation measures) in other water bodies within the same RBD; and
- Whether the Proposed Development will contribute to the delivery of the WFD objectives (e.g., mitigation measures).

7.2.2 The WFD compliance assessment for the Proposed Development is summarised in **Table 14**; the Proposed Development is expected to be compliant with the objectives of the WFD.

Table 14: Compliance Assessment of the Proposed Development

Compliance Elements	Water body assessment	Groundwater body assessment
Water body name and ID	• Great Eau (downstream of South Thoresby) (GB105029061660) • Long Eau (GB105029061670) • South Dike and Grayfleet Drain (GB105029061680) • Black Dyke Catchment (trib of Louth Canal) (GB104029062000) • Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530) • Louth Canal (GB104029061990) • North Beck Drain (GB104029067575) • Poulton Drain Catchment (trib of Louth Canal) (GB104029062010) • Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100)	• South Lincolnshire Chalk Unit (GB40501G401600) • North Lincolnshire Chalk Unit (GB40401G401500)
Deterioration in the status/potential of the water body	The Proposed Development is not anticipated to cause a deterioration in potential or status of any water body.	The Proposed Development is not anticipated to cause a deterioration in status.
Ability of the water body to achieve Good Ecological Potential/Status	The Proposed Development and associated mitigation would not cause deterioration in status of the water bodies and would not prevent the water bodies achieving Good Ecological Potential.	The Proposed Development and associated mitigation would not prevent the water body reaching Good Status.
Impact on the WFD objectives of other water bodies within the same RBD	No downstream or upstream impacts are anticipated associated with the Proposed Development and the mitigation measures proposed.	No wider impacts are anticipated associated with the Proposed Development and the mitigation measures proposed.
Ability to contribute to the delivery of the WFD objectives	The Proposed Development does contribute to the delivery of WFD objectives within the Draft Order Limits through enhancements at the re-establishment stage.	The Proposed Development does contribute to the delivery of WFD objectives.

8 Conclusion

8.1.1 This assessment has considered the potential impacts and associated mitigation of the Proposed Development in relation to the WFD quality elements of the following surface and groundwater water bodies.

- Great Eau (downstream of South Thoresby) (GB105029061660);
- Long Eau (GB105029061670);
- South Dike and Grayfleet Drain (GB105029061680);
- Trusthorpe Pump Drain (upper end) (GB105029061640);
- Black Dyke Catchment (trib of Louth Canal) (GB104029062000);
- Laceby Beck / River Freshney Catchment (to N Sea) (GB104029067530);
- Land Dike Drain to Louth Canal (West) (GB104029062162);
- Louth Canal (GB104029061990);
- Mawnbridge Drain (GB104029067540);
- New Dike Catchment (trib of Louth Canal) (GB104029062030);
- North Beck Drain (GB104029067575);
- Poulton Drain Catchment (trib of Louth Canal) (GB104029062010);
- Waithe Beck Lower Catchment (to Tetney Lock) (GB104029062100);
- South Lincolnshire Chalk Unit (GB40501G401600); and
- North Lincolnshire Chalk Unit (GB40401G401500).

8.1.2 The assessment demonstrates that the Proposed Development is compliant with the objectives of the WFD: it would not cause deterioration in status of the water bodies and would not prevent the water bodies achieving Good Ecological Status and Good Ecological Potential.

9 References

Ref 1 *The Planning Inspectorate (2017).* The Water Framework Directive – Advice Note Eighteen: The Water Framework Directive. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-18/#:~:text=This%20Advice%20Note%20seeks%20to%20provide%3A&text=a%20clarification%20of%20the%20process,optional%20screening%20and%20assessment%20matrices.

Ref 2 *HM Government (2016).* The Water Environment (Water Framework Directive) (England and Wales) Regulations (2016). Available at: https://www.legislation.gov.uk/uksi/2016/138/contents

Ref 3 *HM Government (2016).* Environmental Permitting Regulations (England and Wales) 2016). Available at: https://www.legislation.gov.uk/uksi/2016/1154/contents/made

Ref 4 *Environment Agency (2016).* Water Framework Directive Risk Assessment: how to assess the risk of your activity. Available at: https://www.gov.uk/government/publications/water-framework-directive-how-to-assess-the-risk-of-your-activity

Ref 5 *Environment Agency (2023).* Catchment Data Explorer website. Available at: (https://environment.data.gov.uk/catchment-planning) [Accessed May 2023).

Ref 6 *Department for Environment, Food and Rural Affairs (2023).* Multi Agency Geographical Information for the Countryside website. Available at: https://magic.defra.gov.uk/MAGICMAP.ASPX [Accessed May 2023].

Ref 7 *National Library of Scotland (2023).* Historic mapping: National Library of Scotland. Available at: [redacted] [Accessed August 2022].

Ref 8 *British Geological Survey (2023)*. British Geological Survey borehole and online mapping. Available at: [redacted] *Accessed August 2023.*

Ref 9 *Cranfield Soil and Agrifood Institute (2023).* Soilscapes. Available at: [redacted] [Accessed May 2023].

Ref 10 *Microsoft Bing (2023).* Bings Maps. Available at: [redacted] [Accessed May 2023].

Ref 11 UK Centre for Ecology & Hydrology. National River Flow Archive website. Available at: [redacted] [Accessed August 2023].

Ref 12 *Met Office (2023)*. Met Office. Available at: https://www.metoffice.gov.uk/ [Accessed May 2023].

Ref 13 Environment Agency (2023). Fish and Ecology Data Explorer. Available at: https://environment.data.gov.uk/ecology/explorer/ [Accessed May 2023].

Ref 14 Environment Agency (2023). Water Quality Archive. Available at: https://environment.data.gov.uk/water-quality/view/landing

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