

Great Yarmouth Third River Crossing

Application for Development Consent Order

Document 6.2: Environmental Statement Volume II: Technical Appendix 11E: Water Framework Directive Assessment

Planning Act 2008

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CONTENTS	PAGE No.
Tables	ii
Plates	iii
1 Water Framework Directive Assessment	1
1.1 Introduction	1
1.2 Assessment Methodology	6
1.3 Waterbody Details	9
1.4 Potential Impacts and Mitigation	22
1.5 Assessment against individual Quality Elements.....	34
1.6 Summary and Conclusion.....	67
1.7 References	68

Tables

Table 1.1: WFD Surface Waterbodies.....	11
Table 1.2: Bure & Waveney & Yare & Lothing Transitional Waterbody.....	12
Table 1.3: Norfolk East Coastal Waterbody	17
Table 1.4: Broadland Rivers Chalk and Crag Waterbody.....	19
Table 1.5: Potential Construction Impacts and Mitigation.....	24
Table 1.6: Potential Operation Impacts and Mitigation.....	30
Table 1.7: Bure & Waveney & Yare & Lothing Transitional Waterbody Assessment	36
Table 1.8: Norfolk East Coastal Waterbody Assessment.....	50
Table 1.9: Broadland Rivers Chalk & Crag Groundwater Waterbody Assessment ..	59

Plates

Plate 1.1: Surface Water Classification (Ref 11E.4)	5
Plate 1.2: Groundwater Classification (Ref 11E.4)	6

1 Water Framework Directive Assessment

1.1 Introduction

Project Background

- 1.1.1 This Water Framework Directive (WFD) assessment has been prepared to assess the impacts of the Great Yarmouth Third River Crossing scheme (hereafter referred to as the 'Scheme') in support of the Development Consent Order (DCO) application. This WFD assessment has been prepared as an appendix to ES Chapter 11: Road Drainage and the Water Environment and draws upon information and assessment described in that report.
- 1.1.2 The WFD assessment investigates whether the Scheme will result in deterioration of the current quality status of relevant WFD waterbodies or prevent improvement in the status of waterbodies in accordance with the objectives and measures set out in the Anglian River Basin Management Plan (RBMP) (Ref 11E.1). The relevant WFD waterbodies are illustrated in the Water Bodies in a 'River Basin Management Plan' Plan (document reference 6.4B). The WFD assessment is provided to assist the Secretary of State in carrying out his duties under the WFD and The Water Environment (Water Framework Directive (England and Wales) Regulations 2017).
- 1.1.3 This assessment has been undertaken with reference to published Environment Agency guidance relating to WFD assessments in estuarine and coastal waterbodies (Ref 11E.2) and the Planning Inspectorate (PINS) advice note 18 on WFD assessments (Ref 11E.3).
- 1.1.4 The Scheme involves the construction, operation and maintenance of a new crossing of the River Yare in Great Yarmouth. The Scheme consists of a new dual carriageway road, including a road bridge across the river, linking the A47 at Harfrey's Roundabout on the western side of the river to the A1243 South Denes Road on the eastern side. A full description of the Scheme is included in the ES Chapter 2: Description of the Scheme.
- 1.1.5 The Study Area for this assessment comprises the extent of the Scheme and the area within 1km of the Application Site, which incorporates the Principal Application Site area and the Satellite Application Sites, for the assessment of impacts on surface water and 2km for the assessment of impacts on groundwater. The surface water Study Area has been extended along the River Yare to its outfall to the North Sea. Figure 11-1 shows the location of the Scheme and Study Area.
- 1.1.6 The Study Area for the assessment of impacts has incorporated the Principal Application Site and the Satellite Application Sites, but given that no surface

water features are found within the Satellite Application Sites (for the installation of VMS), and that physical works associated with these will be minimal, their effects on the waterbodies have not been assessed further in the WFD assessment.

The Water Framework Directive

- 1.1.7 The Water Framework Directive (WFD) (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000) is a European Union directive which aims to bring about the effective co-ordination of water environment policy and regulation across Europe. The main aims of the legislation are to ensure that all surface water and groundwater reaches “good” status (in terms of ecological and chemical quality and water quantity as appropriate). Under the Directive “waterbodies” are defined as all ground and surface waters, including rivers, lakes, transitional waters and coastal waters (up to one nautical mile from shore).
- 1.1.8 As detailed in the PINS Advice Note 18, the overall aims and objectives of the WFD are to:
- Enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems;
 - Ensure progressive reduction of groundwater pollution;
 - Reduce pollution of water, especially by Priority Substances and Certain Other Pollutants;
 - Contribute to mitigating the effects of floods and droughts;
 - Achieve at least good surface water status for all surface water bodies and good chemical status in groundwater bodies by 2015 (or good ecological potential in the case of artificial or heavily modified water bodies); and
 - Promote sustainable water use.
- 1.1.9 Article 4 of the Water Framework Directive sets out the default environmental objectives that all surface waters and groundwaters should aim to meet.
- 1.1.10 With regard to surface waters these objectives include:
- Prevention of deterioration in the status of waterbodies;
 - Protect, enhance and restore waterbodies with the aim of achieving good status for all waterbodies by 2015. In the case of artificial or heavily modified waterbodies the aim is to achieve good ecological potential and

good chemical status. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027 or set a less stringent objective;

- Progressive reduction in pollution from specified priority substances and cessation of discharges of priority hazardous substances.

1.1.11 With regard to groundwaters these objectives include:

- To prevent or limit the input of pollutants into groundwater receptors and prevent deterioration in status i.e. groundwater quality;
- Protect, enhance and restore groundwater waterbodies with the aim of achieving good status for all groundwater waterbodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027 or set a less stringent objective;
- Reversal of any significant and sustained upward trends in pollutant concentrations in groundwater receptors i.e. groundwater quality.

1.1.12 In addition, measures should be implemented to achieve compliance with standards and objectives for designated “protected areas”. These include areas designated for drinking water abstraction, the protection of economically significant aquatic species, designated recreational waters, nutrient sensitive areas and relevant areas designated for the protection of habitats or species (e.g. Natura 2000 sites).

1.1.13 For surface waters, the ‘good status’ is determined from the combined ecological and chemical status of surface waters. Ecological status is determined from a number of individual quality elements, as follows. The specific measures vary depending on the type of waterbody.

- Biological quality elements (e.g. fish, benthic invertebrates, aquatic flora);
- Supporting hydromorphological quality elements (e.g. flow regime, river continuity and substrate of the river bed); and
- Supporting physical-chemical quality elements (e.g. temperature, oxygenation and nutrient conditions).

1.1.14 The chemical quality refers to environmental quality standards for river basin specific pollutants and the priority substances specified under the WFD. These standards specify maximum concentrations for specific water pollutants. The WFD works on a ‘one out, all out’ basis, so if one such concentration is exceeded, then the waterbody will not be classed as having a ‘good status’.

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- 1.1.15 The ecological status of surface waters is classified as being ‘high’, ‘good’, ‘moderate’, ‘poor’ or ‘bad’, whilst waterbodies that have been modified (e.g. canals or which contain significant flood defences) are classed as ‘Heavily Modified Waterbodies’ (HMWB) and have to reach at least ‘good ecological potential’ by their objective year.
- 1.1.16 Groundwater waterbodies are classified as either ‘good’ or ‘poor’ and their status is determined from the combined quantitative and chemical status of groundwater. The quantitative status considers elements such as impacts of saline intrusion, ability to serve groundwater and surface water abstractions, and ability to support groundwater dependent terrestrial ecosystems. The chemical status refers to the environmental quality standards for river basin specific pollutants and the priority substances specified under the WFD.
- 1.1.17 Plates 1.1 and 1.2 overleaf illustrate the classification approach for surface water and groundwater respectively.
- 1.1.18 The WFD introduced River Basin Districts (RBDs) in order to better manage waterbodies without administrative and political boundaries. Each river basin is managed to achieve the objectives of the WFD through the development River Basin Management Plans (RBMP), which provide a clear indication of the way the objectives set for the river basin are to be reached within the required timescale and set out a programme of measures.
- 1.1.19 Article 4.7 of the WFD sets out reasons why physical modifications or activities may be allowed to cause deterioration in quality status or prevent good status being achieved (for example where activities are in the overriding public interest). If a scheme or activity is predicted to cause deterioration in waterbody status or prevent the waterbody from meeting any of its objectives, then assessment is required against the conditions listed in WFD Article 4.7, all of which must be met for the scheme to proceed without contravening the WFD. The impact of the scheme / activity on other waterbodies within the River Basin District must also be considered (Article 4.8) and protection given by existing Community Legislation to any Protected Areas must also be maintained (Article 4.9).

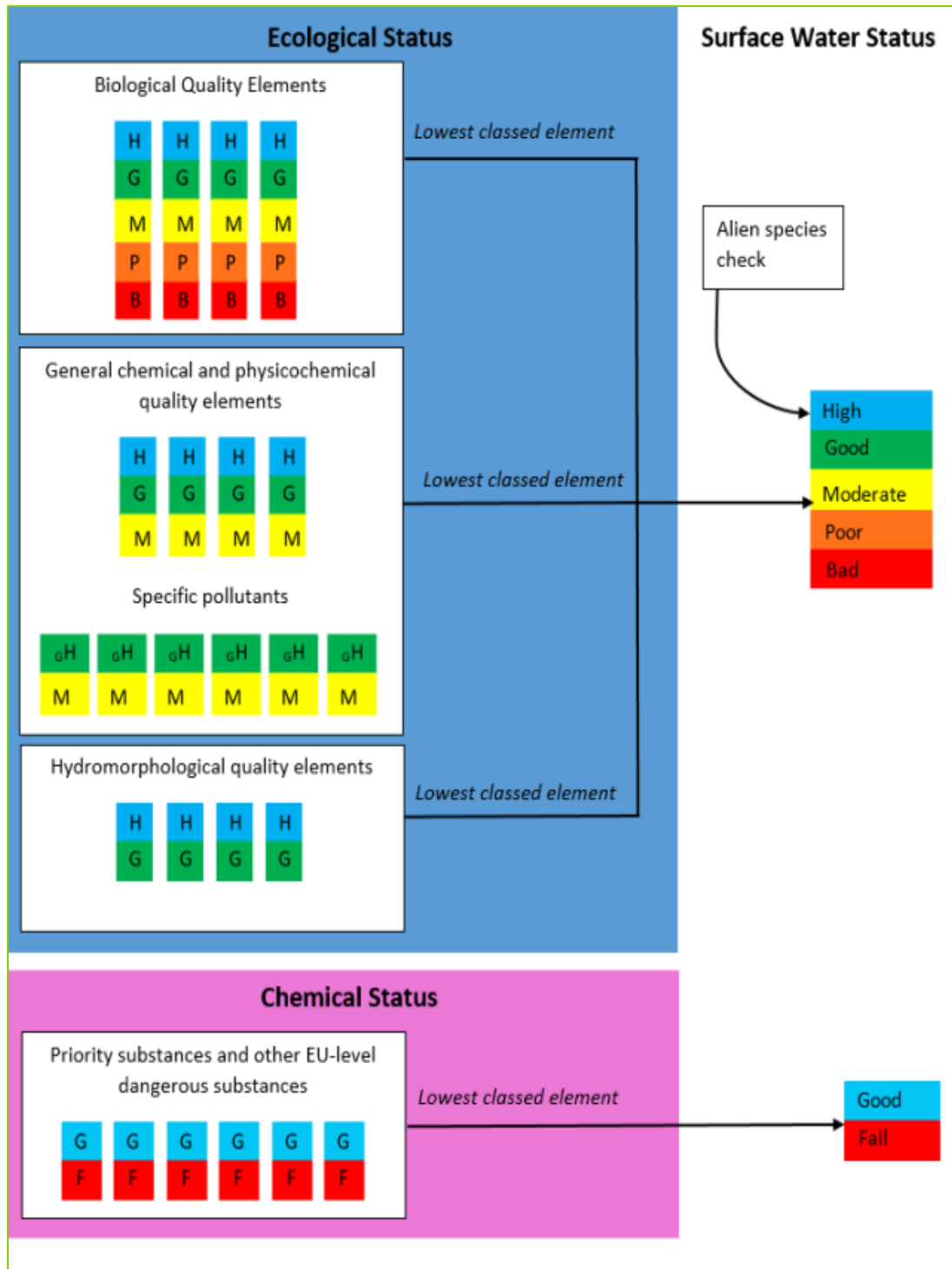


Plate 1.1: Surface Water Classification (Ref 11E.4)

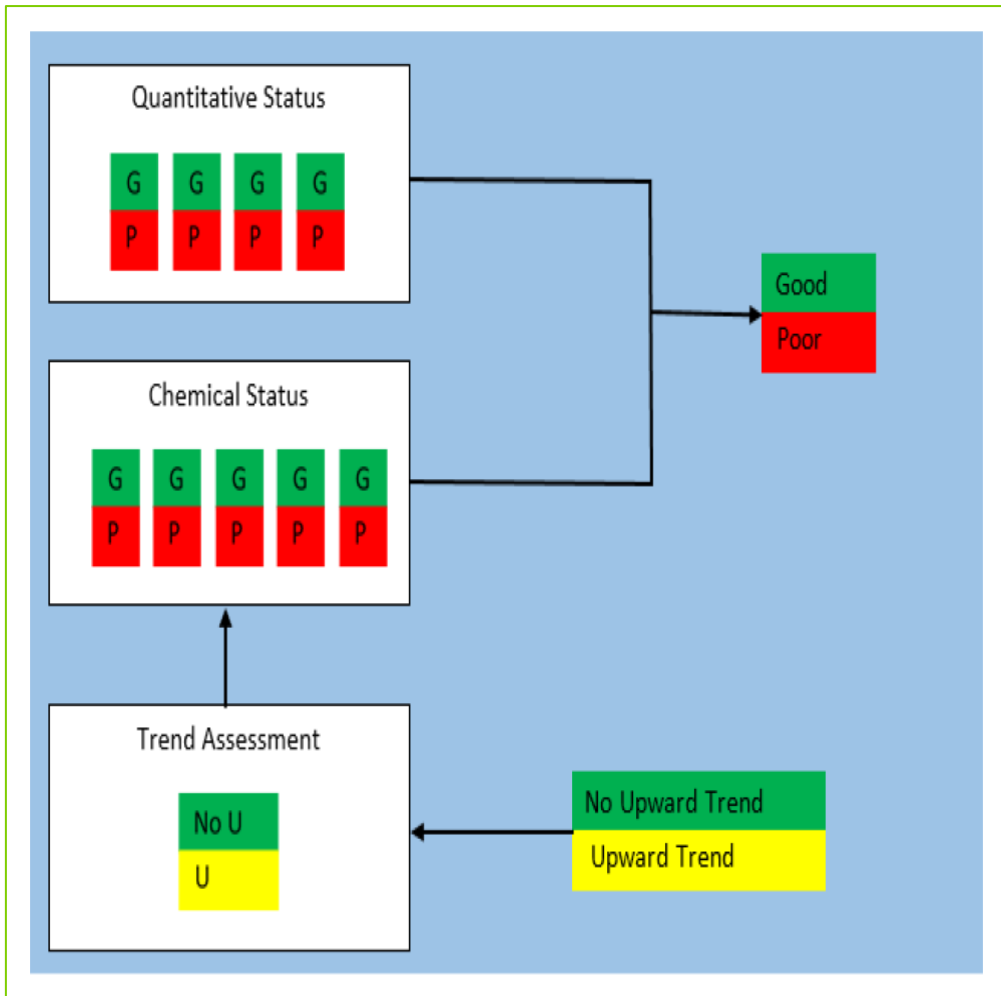


Plate 1.2: Groundwater Classification (Ref 11E.4)

1.2 Assessment Methodology

1.2.1 Determination of WFD compliance for this Scheme comprises a series of steps intended to establish the potential impacts of the Scheme at an appropriate level of detail using available information, and then to examine whether the identified impacts contravene the objectives of the WFD.

1.2.2 The PINS Advice Note 18 sets out a three-staged approach to the WFD process:

- Stage 1 – WFD screening to identify the extent to which the Scheme is likely to affect the waterbodies (i.e. defining the Scheme's zone of influence) and to determine if there are any activities associated with the Scheme that could be screened out;

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- Stage 2 – WFD scoping to identify risks from the Scheme’s activities to receptors based on the relevant waterbodies and their water quality elements (including information on status, objectives, and the parameters of each waterbody) and to identify waterbodies where a more detailed impact assessment is required; and
 - Stage 3 – WFD impact assessment (this document) which is a detailed assessment of the waterbodies and activities carried forward from the WFD screening stage.

1.2.3 At each stage the WFD impact assessment should be set within the context of the appropriate RBMPs and should include the following, with an appropriate level of detail at each stage:

- Identification of WFD waterbodies in the Study Area with potential to be affected by the Scheme;
- Obtain information to identify the current status and objectives for the waterbodies, important features such as linked protected areas and relevant habitats, and improvement measures set out in the RBMP;
- A description of the Scheme and the aspects of the development considered within the scope of the WFD assessment;
- Identification of aspects of the Scheme with potential to affect WFD waterbodies, mitigation included in the Scheme proposals and consideration of further mitigation where necessary;
- For those criteria where a potential adverse effect has been identified, assessment of the Scheme (including relevant mitigation) against the individual quality elements to determine if these effects are sufficient to cause a deterioration in the quality status of each element;
- Assessment of the Scheme (including relevant mitigation) to determine if the Scheme will impact upon the proposed mitigation measures and objectives for the waterbodies and objectives for individual quality elements;
- Assessment of the Scheme against the wider catchment objectives and aims of the WFD; and
- Where applicable, application of the Article 4.7 test.

1.2.4 Formal screening and scoping assessments (Stage 1 and 2 above) have not been completed for this Scheme as it was established at an early stage that a detailed (Stage 3) assessment would be required. The Stage 3 detailed assessment incorporates the elements of both Stage 1 and Stage 2 of the WFD process.

1.2.5 This assessment is a qualitative assessment of potential impacts of the Scheme against WFD quality elements and measures. The data sources used for this assessment are as follows:

- Anlian River Basin Management Plan (Ref 11E.1)
- Catchment Data Explorer for Cycle 2 waterbody status and objectives (Ref 11E.5);
- Published Ordnance Survey topographic maps (Ref 11E.6);
- British Geological Society (BGS) Geology of Britain viewer (Ref 11E.7);
- Burgh Castle District Water Level Management Plan 2014 (Ref 11E.8);
- DEFRA MAGIC Map portal (Ref 11E.9)
- Flood Estimation Handbook (FEH) web service portal (river catchment boundaries) (Ref 11E.10)
- UK Estuaries Database (Ref 11E.11)
- Assessments undertaken for the Scheme:
 - ES Chapter 11: Road Drainage and the Water Environment;
 - ES Chapter 8: Nature Conservation;
 - ES Chapter: 16 Geology and Soils;
 - Drainage Strategy (document reference 6.2, Technical Appendix 12C);
 - Piling Risk Assessment (document reference 6.2, Technical Appendix 16D);
 - Sediment Transport Assessment (Appendix 11C);
- Scheme proposals:
 - Engineering Section Drawings and Plans (document reference 2.10)
 - General Arrangement Plans (document reference 2.2)
 - Work Plans (document reference 2.6)

1.2.6 The following factors have been considered when determining whether the potential adverse effects of the Scheme are likely to lead to a deterioration in status or prevent objectives being met:

- Whether the impact is temporary (such as short-term construction impacts) or permanent / long term;
- The characteristics and sensitivity of the specific water features affected by the Scheme (which may be different to the designated WFD waterbody);
- The scale and importance of the specific water features affected by the Scheme to the designated WFD waterbody;
- The nature, scale and extent of potential impact in the context of the existing pressures and proposed measures for the waterbody.

1.3 Waterbody Details

Background

1.3.1 The Scheme lies within the Anglian River Basin District (RBD), which covers an area of 27,900km² and extends from Lincolnshire southwards to Essex and from Northamptonshire at its westernmost point to the East Anglian coast. Major urban centres include Lincoln, Northampton, Milton Keynes, Norwich and Chelmsford. The Anglian RBD has a rich diversity of wildlife and habitats, supporting many species of global and national importance. It is recognised as a rich region for wetland wildlife, with the Norfolk Broads being Britain's largest nationally protected wetland, and is important for wintering wildfowl. The management catchments that make up the river basin district include many interconnected rivers, lakes, groundwater and coastal waters. These range from chalk and limestone ridges to the extensive lowlands of the Fens and East Anglian coastal estuaries and marshes.

1.3.2 According to the Anglian River Basin Management Plan (2015) (Ref 11E.1) 42% of the surface water bodies in this river basin district have an objective of maintaining or aiming to achieve good ecological status between 2015 and 2027, whilst all the surface water bodies in the river basin district are expected to achieve good chemical status by 2027. With respect to groundwater bodies, 84% are expected to maintain or achieve good quantitative status by 2027, while 58% are predicted to achieve good chemical status by 2027. The main reasons for not achieving good status and for deterioration are related to physical modifications to rivers, lakes and estuaries, which have the potential to alter natural flow levels, cause excessive build-up of sediment in surface water bodies and the loss of

habitats and recreational uses; diffuse and/or point source pollution from waste water, from towns, cities and transport and from rural areas; reduced flow and water levels in rivers and groundwater receptors; and negative effects of invasive non-native species. Mitigation measures have been identified in the RBMP to tackle these issues as follows:

- Water company investment programme to address point source impacts from sewage treatment works and discharges from the sewer network, with further investment to tackle abstraction and flow pressures.
- Countryside Stewardship scheme to address soil management and reduce the effects of nutrients, sediment and faecal contamination with the aim to reduce the impact of eutrophication and benefit bathing waters, shellfish waters and drinking water.
- Highways England's environment fund to tackle pollution from highway runoff through the use of sustainable drainage systems (SuDS) and to address physical modification pressures by adopting techniques such as fish and eel passes to allow fish migration.
- The Environment Agency's Flood and Coastal Erosion Risk Management investment programme to reduce the risks of flooding and erosion to homes and the economy. The programme will promote the use of natural/sustainable flood risk management measures to reduce the impact on the condition of waterbodies and, where possible, contribute towards improving the status of waterbodies, protecting wildlife sites and creating new habitats.
- Catchment level government funded improvement schemes to reduce the impact of pollution from rural and urban areas along with habitat improvement measures to increase biodiversity.
- Water resources sustainability measures to address current abstraction and flow pressures and to support sustainable supplies of water for the future.

Surface Water Bodies

- 1.3.3 The Environment Agency's catchment data explorer shows the Study Area to be contained within the Broadland Rivers Management Catchment, which includes the Waveney Operational Catchment covering the Waveney, Lower Yare & Lothingland Internal Drainage Board (IDB) drainage district, and the Bure Operational Catchment. The Study Area also covers land within the Anglian Transitional and Coastal (TraC) Management Catchment, which includes the Norfolk East TraC Operational Catchment incorporating the tidal section of the River Yare, the River Bure, Breydon Water and the coastal waters of Great Yarmouth.

- 1.3.4 Surface waterbodies located within and in the vicinity of the Study Area have been identified from the catchment data explorer website and are summarised in Table 1.1.

Table 1.1: WFD Surface Waterbodies

	Inland		Transitional & Coastal	
Management catchment	Broadland Rivers		Anglian TraC	
Operational catchment	Waveney	Bure	Norfolk East TraC	
Waterbody	Waveney (Ellingham Mill – Burgh St. Peter) (closest to Scheme)	Muck Fleet (closest to Scheme)	Bure & Waveney & Yare & Lothing (transitional water)	Norfolk East (coastal water)

- 1.3.5 The Waveney, Lower Yare & Lothingland IDB drainage district to the west of the Scheme is located within the Waveney Operational Catchment, a freshwater operational catchment under the WFD. However, based on the IDB's watercourse network plan, it is understood that the IDB catchment ultimately drains into Breydon Water and then into the River Yare. Hence it is more likely to contribute to the water quality of these surface water features, which form part of the Bure & Waveney & Yare & Lothing transitional waterbody, rather than the water quality of any freshwater bodies located within the Waveney Operational Catchment. The closest freshwater body within this operational catchment is the Waveney (Ellingham Mill – Burgh St. Peter) waterbody, which is located approximately 24km upstream from the Scheme. This distance is such that no impact on this waterbody is likely to result from the Scheme and the Scheme is not located within the hydrological catchment of this waterbody. Furthermore, the Scheme is not expected to have any effects on the measures identified for the Waveney Operational Catchment, which are mainly related to waste water treatment and habitat restoration (Waveney Habitat Project). As such, no detailed assessment has been undertaken for this freshwater catchment.

- 1.3.6 The Environment Agency's catchment data explorer also shows the Study Area to be contained within the Bure Operational Catchment. However, the closest freshwater body (Muck Fleet) is located approximately 18km upstream from the Scheme. Inspection of OS mapping indicates there is no direct hydraulic connection between the Scheme and this waterbody and that the Scheme is located outside of the hydrological catchment of this waterbody. For these reasons, the Scheme is not considered likely to have any impact on Muck Fleet waterbody or the objectives and measures identified with the Bure Operational Catchment, which mainly focus on

reducing diffuse pollution pathways (Broadland Slow the Flow Project), and this has not been assessed further.

1.3.7 The tidal section of the River Yare, the River Bure and Breydon Water are all part of the Bure & Waveney & Yare & Lothing waterbody within the Norfolk East TraC Operational Catchment. This transitional waterbody is linked with several protected areas, including the Breydon Water Special Protection Area (SPA), but is also heavily modified, consisting of engineered flood protection, bridge and navigational infrastructure. This waterbody was assessed by the Environment Agency to have an overall status of Moderate in 2016. The reasons for not achieving Good status are primarily related to sewage discharge and also some unknown activities which are pending investigation. The objective for this waterbody is to achieve/maintain Moderate status by 2027, however no known measures have been identified at present to achieve this objective. Details of the current status of this waterbody are provided in Table 1.2.

1.3.8 The coastal waters of Great Yarmouth, which incorporate part of the North Sea, are included in the Norfolk East coastal waterbody within the Norfolk East TraC Operational Catchment. This waterbody is located approximately 3km downstream of the Scheme and covers the coastal area of Sheringham to Great Yarmouth and was assessed by the Environment Agency to have an overall status of Moderate in 2016. The reasons for not achieving Good status are related to diffuse and point source pollution associated with poor nutrient management and sewage discharge. The objective for this waterbody is to maintain Moderate status, however no known measures have been identified at present to maintain this objective. Details of the current status of this waterbody are provided in Table 1.3.

Table 1.2: Bure & Waveney & Yare & Lothing Transitional Waterbody

Water Body ID	GB510503410700	Water Body Name	Bure & Waveney & Yare & Lothing
Water Body Type	Transitional Water	Water Body surface area	8.878km ²
Hydromorphological Designation	Heavily modified - flood protection and navigation, ports and harbours		
Description	One of the main surface water features within this TraC waterbody is the River Yare, which flows from north to south through the Scheme. The River Yare has a catchment area estimated at around 3,000km ² . The river flows in a generally eastward direction, along the southern fringes of the city of Norwich before entering into The Broads, a significant area of low-lying land drained by a network of ditches and channels. At the village of Burgh Castle, it is joined by the River Waveney before discharging into the inland tidal estuary of Breydon Water. Beyond Breydon Bridge, which marks the		

Water Body ID	GB510503410700	Water Body Name	Bure & Waveney & Yare & Lothing
			<p>downstream extent of Breydon Water, the River Yare confluences with the River Bure before turning south, flowing through the town of Great Yarmouth, and discharges into the sea at Gorleston-on-Sea. Through the Study Area, the river is around 100m wide, with banks consisting of engineered quay walls. Bathymetry data provided by Peel Ports (collected in 2017) suggests that the River Yare channel through Great Yarmouth is affected by regular dredging activity, where the channel bed is dredged to around -7mAOD with steep banks. The River Yare is a tidal river and the estuary boundary incorporates the section of the Yare through Great Yarmouth and Breydon Water. According to the UK Estuaries Database the estuary has a spring tidal range of 1.9m, indicating it is microtidal as characterised by the small tidal range (<3m). A sediment transport assessment (Appendix 11C) has been undertaken for the Scheme to assess the existing regime of the estuary and the results confirm the narrow tidal range of the estuary, where the Mean High-Water Spring (MHWS) was estimated to be 1mAOD and the Mean Low-Water Spring (MLWS) -0.6mAOD. Based on the above and the general profile of the River Yare channel through Great Yarmouth, which is deep due to dredging, the channel bed and associated habitat will not be exposed during low tide. The results of the assessment also suggest that the estuary is ebb dominant i.e. there is a net export of sediment from the system. However, the engineered channel through Great Yarmouth has the potential to restrict sediment movement through the estuary, hence sediment is transporting out of Breydon Water at a slower rate than would be expected in an ebb dominant system.</p> <p>Results of sediment sampling completed for the Scheme indicate that majority of the sediment in the River Yare channel is made up of a combination of fine to coarse sand, with the D50 particle size ranges from 0.03mm to 0.55mm diameter. Chemical analysis of the sediment samples generally suggests high levels of heavy metals, but the contaminated sediments within the river are not significantly affecting the water quality and chemical status of this waterbody, which is classified as Good for all chemical status elements and High for specific pollutants, such as Copper and Zinc.</p> <p>The River Yare is included in the Outer Thames Estuary SPA, which extends from Caister on Sea south to the Thames Estuary. Connecting upstream is the Breydon Water SPA, an</p>

Water Body ID	GB510503410700	Water Body Name	Bure & Waveney & Yare & Lothing
	<p>internationally important RSPB nature reserve, and also a designated Ramsar and Site of Special Scientific Interest (SSSI). Within Breydon Water, extensive areas of mud are exposed at low tide and these intertidal mudflats support diverse species of flora and fauna.</p> <p>Based on the findings of the aquatic survey provided in Chapter 8: Nature Conservation, the subtidal environment of the River Yare supports a range of fish and benthic communities but they are considered of limited conservation value. Habitat modification, as a result of existing dredging activities, means there are existing pressures on aquatic species.</p> <p>The River Bure joins the Yare approximately 2km upstream from the Scheme. It is one of the largest tributaries of the River Yare, with a catchment area estimated at around 1000km². The lower Bure, from downstream of Runham to the confluence with the River Yare, is also included in the Outer Thames Estuary SPA.</p> <p>There are a number of smaller drains and watercourses located within the Application Site and within the 1km Study Area, which are contained within the Waveney, Lower Yare & Lothingland IDB drainage district. These form part of the surface water drainage for the urban areas of Great Yarmouth, and they are connected to the main dyke system within the marshes in the western part of the IDB district by a series of culverts underneath the main A47 road. Water level within the IDB district is managed by pumping, which removes excessive runoff from the marshes, urban area and the upland catchment to the River Yare.</p>		
Overall Status	Moderate	Status Objective	Moderate by 2027 – unfavourable balance of costs and benefits; cause of adverse impact unknown
Overall Ecological Status	Moderate	Status Objective	Moderate by 2027 – unfavourable balance of costs and benefits; cause of adverse impact unknown
Overall Chemical Status	Good	Status Objective	Good by 2015
Protected Area Designation	Breydon Water SPA; nutrient sensitive areas		

Water Body ID		GB510503410700		Water Body Name		Bure & Waveney & Yare & Lothing	
Reasons for not achieving Good status		Sewage discharge (continuous); unknown (pending investigation)					
Waterbody measures		None identified					
Supporting Elements							
Mitigation measures assessment (dredging disposal strategy; reduce impact of dredging; sediment management; dredge disposal site selection; manage disturbance; retain habitats)				Good			
<u>Biological Quality Elements</u>							
Overall biological quality elements		Poor		Objective		Good by 2027 – cause of adverse impact unknown	
Angiosperms		Poor		Objective		Good by 2027 – cause of adverse impact unknown	
Fish		Good (2012)		Objective		n/a	
Invertebrates		Good		Objective		Good by 2015	
Microalgae		High		Objective		Good by 2015	
Phytoplankton		Good		Objective		Good by 2015	
<u>Biology: Higher Sensitivity Habitats</u>							
Chalk reef				n/a			
Clam, cockle and oyster beds				n/a			
Intertidal seagrass				n/a			
Maerl				n/a			
Mussel beds, including blue and horse mussel				n/a			
Polychaete reef				n/a			
Saltmarsh				13.63 ha (Breydon Water, approximately 3km upstream from the Scheme; River Bure, approximately 4km upstream from the Scheme)			
Subtidal kelp beds				n/a			
Subtidal sea grass				n/a			

Water Body ID	GB510503410700	Water Body Name	Bure & Waveney & Yare & Lothing
Biology: Lower Sensitivity Habitats			
Cobbles, gravel and shingle		n/a	
Intertidal soft sediments like sand and mud		453.78 ha (Breydon Water and isolated areas along the right bank of the River Yare approximately 700m downstream from the Scheme; no intertidal habitat has been identified within the Application Site).	
Rocky shore		n/a	
Subtidal boulder fields		n/a	
Subtidal rocky reef		n/a	
Subtidal soft sediments like sand and mud		3.46 ha (coastline)	
Physico-chemical Quality Elements			
Overall physico-chemical	Moderate	Objective	Moderate – Unfavourable balance of costs and benefits
Dissolved inorganic Nitrogen	Moderate	Objective	Moderate – Unfavourable balance of costs and benefits
Dissolved Oxygen	High	Objective	Good by 2015
Specific pollutants	High	Objective	High by 2015
Hydromorphological Quality Elements			
Overall hydromorphological	Supports Good	Objective	Supports Good by 2015
Hydrological regime	Supports Good	Objective	Supports Good by 2015
Chemical Quality Elements			
Overall chemical	Good	Objective	Good by 2015
Priority substances	Good	Objective	Good by 2015
Other pollutants	Does not require assessment (Good in 2014)	Objective	Does not require assessment
Priority hazardous substances	Good	Objective	Good by 2015

Table 1.3: Norfolk East Coastal Waterbody

Water Body ID		GB650503520003	Water Body Name		Norfolk East
Water Body Type	Coastal Waterbody		Water Body surface area	211.2km ²	
Hydromorphological Designation	Heavily modified – flood and coastal protection				
Description	The River Yare discharges to the North Sea at Gorleston-on-Sea. Under the WFD, this is included in the Norfolk East coastal waterbody. This waterbody is classified as heavily modified due to physical modifications for flood and coastal protection. It is also linked with several protected areas, including a number of bathing waters protected areas along the beach of Great Yarmouth. The entire waterbody is included in the Outer Thames Estuary SPA and a proportion, from Caister-on-Sea to the suburb of Newton in Great Yarmouth is included in the Great Yarmouth North Denes SPA.				
Overall Status	Moderate		Status Objective	Moderate by 2015 – unfavourable balance of costs and benefits	
Overall Ecological Status	Moderate		Status Objective	Moderate by 2015 – unfavourable balance of costs and benefits	
Overall Chemical Status	Good		Status Objective	Good by 2015	
Protected Area Designation	Outer Thames Estuary SPA; Great Yarmouth North Denes SPA; Great Yarmouth South and Great Yarmouth Pier bathing waters				
Reasons for not achieving Good status	Poor nutrient management; sewage discharge (continuous); unknown (pending investigation)				
Waterbody measures	None identified				
Supporting Elements					
Mitigation measures assessment (Sediment management; dredge disposal site selection; manage disturbance)			Good		
Biological Quality Elements					
Overall biological quality elements	Good		Objective	Good by 2015	
Angiosperms	n/a		Objective	n/a	
Fish	n/a		Objective	n/a	
Invertebrates	n/a		Objective	n/a	

Water Body ID	GB650503520003	Water Body Name	Norfolk East
Microalgae	n/a	Objective	n/a
Phytoplankton	Good	Objective	Good
Biology: Higher Sensitivity Habitats			
Chalk reef		2893.73ha (off coastline)	
Clam, cockle and oyster beds		n/a	
Intertidal seagrass		n/a	
Maerl		n/a	
Mussel beds, including blue and horse mussel		n/a	
Polychaete reef		40.09ha	
Saltmarsh		n/a	
Subtidal kelp beds		n/a	
Subtidal sea grass		n/a	
Biology: Lower Sensitivity Habitats			
Cobbles, gravel and shingle		12971.88ha (off coastline)	
Intertidal soft sediments like sand and mud		718.96ha (coastline)	
Rocky shore		n/a	
Subtidal boulder fields		n/a	
Subtidal rocky reef		2019.66ha (off coastline)	
Subtidal soft sediments like sand and mud		7840.13ha (off coastline)	
Physico-chemical Quality Elements			
Overall physico-chemical	Moderate	Objective	Moderate by 2015 - unfavourable balance of costs and benefits
Dissolved inorganic Nitrogen	Moderate	Objective	Moderate by 2015 - unfavourable balance of costs and benefits
Dissolved Oxygen	High	Objective	Good by 2015
Specific pollutants	High for Toluene; Moderate (2014) for Zinc	Objective	High by 2015
Hydromorphological Quality Elements			
Overall hydromorphological	n/a	Objective	n/a
Hydrological regime	n/a	Objective	n/a

Water Body ID	GB650503520003	Water Body Name	Norfolk East
Chemical Quality Elements			
Overall chemical	Good	Objective	Good by 2015
Priority substances	Good	Objective	Good by 2015
Other pollutants	Does not require assessment	Objective	Does not require assessment
Priority hazardous substances	Good	Objective	Does not require assessment

Groundwater Waterbodies

- 1.3.9 The Environment Agency's catchment data explorer shows that the Scheme overlies the Broadland Rivers Chalk & Crag groundwater waterbody within the Anglian Groundwater Management Catchment. Details of the current status of this waterbody are provided in Table 1.4.

Table 1.4: Broadland Rivers Chalk and Crag Waterbody

Water Body ID	GB40501G400300	Water Body Name	Broadland Rivers Chalk & Crag
Water Body Type	Groundwater	Water Body surface area	3076km ²
Description	<p>This waterbody underlies the Broadland Rivers catchment and is characterised by Chalk (to the west) and Crag (to the east) bedrock geology. This is largely covered by superficial glacial deposits of sand, silt and clay. According to the British Geological Survey and the findings from the ground investigation completed between September 2017 and March 2018, the bedrock geology underlying the entirety of the Scheme is the Crag Group Formation consisting of sands, gravels, silts and clays. This formation is classified as a Principal Aquifer by the Environment Agency, i.e. permeable strata capable of supporting water supplies at a regional scale, and is within a <i>Major Aquifer High</i> Groundwater Vulnerability Zone. The London Clay Formation, Thanet Formation and the Chalk Group underlie the Crag Group. The Chalk Group is also classified as a Principal Aquifer but no direct interaction between this aquifer and the Scheme is anticipated due to the overlying London Clay Formation, a substantially thick low permeable layer, which acts as a barrier.</p> <p>The most prevalent superficial deposits underlying the Principal Application Site comprise the North Denes</p>		

Water Body ID	GB40501G400300	Water Body Name	Broadland Rivers Chalk & Crag
	<p>Formation (quaternary sand and gravel deposits) and Breydon Formation (peat and clay and silts). These are low productivity aquifers of limited or local potential, where borehole yields are expected to be small. The Environment Agency designates the North Denes Formation as Secondary A Aquifers and the Breydon Formation as Unproductive Strata.</p> <p>The superficial deposits are not considered to be in hydraulic continuity (locally) with the underlying Crag Group due to the variable lithology of the superficial deposits which comprise a mixture of clayey, gravel, silt and sand and presents an inconsistent multi-layered aquifer. Hydraulic continuity may exist where non-laterally extensive clay lenses exist.</p> <p>The waterbody is designated as a Drinking Water Protected Area and is protected under the Nitrates Directive. It is at Poor status mainly due to groundwater abstraction associated with agriculture and rural land management. The objective for this waterbody is to achieve Good status by 2027, however no known measures have been identified at present to achieve this objective.</p> <p>Groundwater quality sampling was carried out across the boreholes sunk as part of the intrusive ground investigation (2017-2018). The results were screened against annual average EQS concentrations of potentially hazardous chemicals as defined under the WFD for freshwater waterbodies. Exceedances were recorded in contaminants such as arsenic, mercury, zinc, and polyaromatic hydrocarbons (PAHs). The groundwater quality results also conclude that there is some influence from seawater within the Principal Application Site with higher concentrations of electrical conductivity (EC) recorded on the western banks of the River Yare. The River Yare is a tidal river and EC concentrations are expected to increase near the coast and tidal reaches of the river due to saline infiltration.</p>		
Overall Status	Poor	Status Objective	Good by 2027 – Groundwater status recovery time
Overall Quantitative Status	Poor	Status Objective	Good by 2021
Overall Chemical Status	Poor	Status Objective	Good by 2027 – Groundwater status recovery time
Protected Area	This waterbody is protected under the Nitrates Directive and		

Water Body ID	GB40501G400300	Water Body Name	Broadland Rivers Chalk & Crag
Designation	Drinking Water Protected Area (location and extent unknown)- the Study Area is not in a Source Protection Zone (SPZ).		
Reasons for not achieving Good status	Groundwater abstraction (Quantitative Groundwater Dependent Terrestrial Ecosystems (GWDTEs) test)		
Waterbody measures	None identified		
Supporting Elements			
<u>Quantitative Status Elements</u>			
Saline Intrusion	Good	Objective	Good by 2015
Water Balance	Good	Objective	Good by 2015
Groundwater Dependent Terrestrial Ecosystems (GWDTE) test	Poor	Objective	Good by 2021
Dependent Surface Water Body Status	Good	Objective	Good by 2015
<u>Chemical Status Elements</u>			
Drinking Water Protected Area	Poor	Objective	Good by 2027 – Groundwater status recovery time
General Chemical Test	Good	Objective	Good by 2015
GWDTE test	Good	Objective	Good by 2015
Dependent Surface Water Body Status	Good	Objective	Good by 2015
Saline Intrusion	Good	Objective	Good by 2015
Trend Assessment	Upward trend		

1.4 Potential Impacts and Mitigation

1.4.1 This assessment addresses the potential construction and operational impacts of the Scheme on the waterbodies (both surface water and groundwater) identified in Section 1.3. Details of the Great Yarmouth Scheme are provided in Chapter 2: Description of the Scheme in the ES.

1.4.2 The key elements of the Scheme that could potentially impact on the WFD status of the surrounding surface and groundwater bodies are provided below:

- Construction of a new double-leaf bascule bridge providing an opening span to facilitate vessel movement within the river. This would include structures to support and accommodate the operational requirements of the bridge-opening mechanism, including counterweights below the level of the bridge deck. The bridge would be supported on driven piles;
- New substructures, supported by driven piles, to support the double leaf bascule bridge within the existing quays either side of the river and within the river itself, requiring new permanent “knuckle” walls, creating cofferdams in the waterway;
- Dredging may be required during operation to remove any sediment build up within the navigation channel. Any operational dredging will be incorporated into the current dredging regime along the River Yare and is not expected to significantly alter the current dredging regime;
- Associated changes, modifications and/or improvements to the existing local highway network;
- The relocation of existing allotments to compensate for an area to be lost as a result of the Scheme and other accommodation works, including those at the MIND Centre and Grounds; and
- New highway drainage. The key principles of the Drainage Strategy (document reference 6.2, Technical Appendix 12C) are stated as follows:

The western side of the Principal Application Site (the section of the Scheme due west of the bridge mid-point)

- Runoff from the western side of the Scheme will be attenuated and discharged either via gravity into the existing Internal Drainage Board (IDB) ordinary watercourse network adjacent to the Scheme or via a pumped system into the River Yare.
- Runoff to be attenuated to as close as practical to greenfield runoff rates for the 1 in 100-year event, including climate change. Where this is not

achievable, the post development runoff rates and volumes should not exceed existing scenario values. The required attenuation storage will, as a minimum, consist of an underground storage tank and a pond/wetland feature.

- Runoff will be treated before discharge. Pollution control measures currently proposed include proprietary treatment devices (vortex separator) that treat runoff that discharges into the underground storage and natural treatment in the form of wet pond/wetland feature. Penstocks are also proposed as control of spillages.
- Realignment of existing IDB watercourse and extension and/or replacement of existing culverts in the vicinity of the new roundabout.

The eastern side of the Principal Application Site (the section of the Scheme due east of the bridge mid-point)

- Runoff from the eastern side of the Scheme will be discharged into existing Anglian Water combined sewer.
- Runoff to be attenuated, via oversized pipes and/or underground storage tanks, to achieve the restricted discharge rate of 10l/s as agreed with Anglian Water.
- Runoff to be treated, via proprietary devices, before discharge into the Anglian Water combined sewer.

1.4.3 Works to facilitate the construction of the above elements will include:

- Construction of cofferdams to facilitate in-channel works within the River Yare. The cofferdams will eventually be integrated into the permanent works bridge foundation. Temporary works associated with the construction of the bridge substructures will occur within the cofferdams. No dredging is proposed.
- Temporary groundwater control systems and associated water disposal arrangements to facilitate the construction of the bascule pit cofferdams.
- Creation of temporary construction compounds adjacent to the River Yare.
- Temporary drainage arrangements and temporary works associated with the IDB drains and ordinary watercourses within the Principal Application Site, such as temporary culverting or diversion to maintain existing drainage routes.

- Provision of small vessel waiting facilities to the north and south of the new crossing, either as floating pontoons or additional fendering to the existing berths.

1.4.4 Table 1.5 and Table 1.6 summarise the potential impacts of the Scheme on the waterbodies, including details of embedded mitigation incorporated into the proposals and Outline Code of Construction Practice (document reference 6.16).

Table 1.5: Potential Construction Impacts and Mitigation

Potential Impact	Description and Mitigation
Impacts on water quality of receiving waterbodies, from mobilised suspended solids, spillage of fuels, lubricants, hydraulics fluids and cements from construction, and from dust/debris associated with demolition works.	<p>An Outline Code of Construction Practice (CoCP) (document reference 6.16) has been prepared for the construction phase. The Outline CoCP includes details regarding the management of accidental spillages, the control of runoff from temporary construction compounds, areas of stockpiling, the disposal of contaminated sediments, as well as information regarding training and monitoring procedures during construction to reduce the likelihood of contaminants, sediment laden runoff and dust/debris entering surface waterbodies. Measures include restrictions on the siting of stockpiles and timing of certain works; bunded storage areas and leak-proof containers for waste fuels; silt barriers and settlement areas; barriers to screen off receptors from dust producing activities and adequate water supply for dust suppression.</p> <p>Temporary works associated with the construction of the bridge substructures will occur within the cofferdams. This will exclude work areas from the main waterbody of the River Yare, thus reducing the likelihood of contaminants entering the main water flow during construction.</p> <p>Whilst these measures will not eliminate the risk entirely, particularly where works take place within or immediately adjacent to watercourses, it will significantly reduce the likelihood and impacts of a pollution incident should it occur. Furthermore, any potential effects will be temporary as the pollutants entering the receiving watercourses will be diluted and dispersed over time via natural tidal and/or fluvial processes.</p>
Pollution to surface water due to disturbance of	All temporary works associated with the construction of the bridge substructures will occur within the cofferdams, which will be integrated into the permanent works bridge

Potential Impact	Description and Mitigation
<p>contaminated sediments within the River Yare during construction of the bridge substructures</p>	<p>foundation. No additional temporary works are proposed outside of the cofferdams and no dredging is planned during construction. Furthermore, soft start piling techniques will be employed to minimise the disturbance of contaminated sediment within the River Yare. Hence the construction of the cofferdams is not expected to disturb any sediments additional to that assessed under Operational impacts.</p> <p>An Outline Code of Construction Practice (CoCP) (document reference 6.16) has been prepared for the construction phase, which details the above mitigation measures to be implemented for the construction of the bridge substructures.</p>
<p>Impact to surface water due to dewatering and discharge of abstracted water from the cofferdams</p>	<p>Temporary groundwater control systems i.e. dewatering will be required to facilitate the construction of the bascule pit cofferdams, but the method of discharge of the abstracted water has yet to be determined. If the water is to be discharged into the River Yare or the IDB watercourse, there may be detrimental effects on the receiving watercourse in relation to the quantity and quality of the discharges.</p> <p>Results from the groundwater modelling of the bascule pit groundwater control system (Appendix 11F) suggest that the total abstractions rates for each cofferdam will be in the range of 0.16l/s to 15.5l/s. These rates are negligible compared with the flow rates in the River Yare. The groundwater modelling also indicates a potential reduction in baseflow in the River Yare of between 6 and 31 l/s due to the dewatering. These rates are also insignificant compared with the flows in the River Yare. Therefore, no impact is expected on the hydrological regime of the River Yare.</p> <p>Groundwater quality sampling undertaken across the Principal Application Site suggests hydraulic connection between the local groundwater system and the River Yare, it is therefore expected that the groundwater quality of the groundwater discharge would be similar to that in the river. As the discharge volume is very small any differences will not affect the water quality in the Yare. However, discharges into surface waterbodies will be subject to relevant permitting and consent requirements from relevant authorities, as detailed in the Consents and Agreements Position Statement</p>

Potential Impact	Description and Mitigation
	<p>(document reference 7.3)</p> <p>The rates and volume of groundwater discharge are also considered too small to significantly influence the hydrological regime of the IDB watercourses within the Principal Application Site and the wider IDB catchment. Given these watercourses are already ephemeral with levels and flows influenced by tide levels and local urban runoff, impacts caused by the reduction in groundwater level due to dewatering are also negligible. Any potential effects resulted from groundwater dewatering and discharge will be temporary and the hydrological regime of these watercourses will return to its current state when dewatering and discharge ceases. Given the risk of pollution already exists in the IDB catchment due to existing highway discharges and saline intrusion, any contaminants and/or elevated salinity in the discharge water are not expected to cause a significant deterioration in water quality.</p>
<p>Temporary alterations to the tidal and hydromorphological regime of the River Yare, such as changes to the tidal prism and erosion, deposition and channel migration processes associated with the construction of coffer dams to facilitate in-channel works within the River Yare.</p>	<p>All temporary works associated with the construction of the bridge substructures will occur within the cofferdams, which will be integrated into the permanent works bridge foundation. No additional temporary works are proposed outside of the cofferdams and no dredging is planned during construction. Furthermore, soft start piling techniques will be employed to minimise the disturbance of contaminated sediment within the River Yare. Hence the construction of the cofferdams is not expected to cause any significant changes to the tidal and hydromorphological regime of the River Yare, in terms of the tidal prism, erosion/deposition pattern and channel migration processes, additional to that assessed under Operational impacts.</p> <p>An Outline (CoCP) (document reference 6.16) has been prepared for the construction phase, which details the mitigation measures to be implemented for the construction of the bridge substructures.</p>
<p>Temporary alterations to the hydrological and morphological regime of the ordinary watercourses/IDB drains, such as</p>	<p>During the construction phase, existing ordinary watercourses/IDB drains within the Principal Application Site may be temporarily diverted, culverted or blocked to facilitate the construction of the channel realignments and new culverts. This may temporarily alter the hydrological regime, such as flow path and rate, and morphological characteristics of these watercourses.</p>

Potential Impact	Description and Mitigation
changes to the flow path and rate, associated with the construction of the channel realignments and new culverts.	The Outline CoCP (document reference 6.16) in line with usual good practice, includes measures to maintain appropriate drainage arrangements at all stages of construction, with temporary diversions, culverts or over pumping used as required. It is therefore unlikely that the works will have any significant effect on these watercourses as existing drainage routes and outfall locations will be maintained wherever possible through construction.
Potential impacts on the groundwater regime due to disturbance of geological strata resulting from piling and dewatering activities.	<p>The toe level of the cofferdam piles is expected to extend to the underlying Crag Group Aquifer (Principal Aquifer) and therefore may lead to localised disruptions in groundwater flow paths, which could result in adverse impacts to the principal groundwater receptor and aquifers. However, the piles will only occupy a very small cross sectional area and given they will be positioned parallel to groundwater flow to the river, the impacts to the groundwater regime (groundwater quantity and flow) will be negligible.</p> <p>Temporary groundwater control systems i.e. dewatering will be required to facilitate the construction of the bascule pit cofferdams. Modifications to groundwater conditions (locally) including groundwater level and flow by excavations and dewatering during the construction phase may cause alteration to groundwater receptors such as groundwater fed water supplies and/or local abstractions (water users).</p> <p>Appendix 11F: Groundwater Modelling Study of the Bascule Pit Groundwater Control System quantifies the impacts to local groundwater abstractor receptors and determines a dewatering zone of influence. The modelling suggests a zone of influence of approximately 400m from the cofferdam dewatering source with the change in groundwater levels diminishing rapidly with distance from the cofferdams. The nearest groundwater water user is located approximately 700m from the Principal Application Site, hence no impacts are predicted on groundwater abstraction, i.e. groundwater fed water supplies, within the Study Area due to dewatering of the cofferdams.</p>
Potential introduction	The Outline CoCP (document reference 6.16) will include

Potential Impact	Description and Mitigation
<p>of contaminants to groundwater receptors, through surface infiltration or through piling and dewatering activities</p>	<p>measures to reduce risks of contamination to surface water and groundwater. This will include measures such as lining of storage areas and drainage ponds where necessary to prevent significant infiltration of potentially contaminated water.</p> <p>It has been identified that driven piles are most appropriate for the ground conditions (predominantly granular soils) present across the Principal Application Site. The use of driven piles reduces geotechnical risks associated with ‘blowing sands’ and avoids the need for disposal of pile arisings and spillages entering the River Yare. However, driven piles can introduce preferential pathways for pollutants to migrate to the underlying aquifer due to the smooth surface of the piles and allow contaminated soils to be dragged along the shaft of the pile or be pushed ahead of the pile toe while driving. A Piling Works Risk Assessment has been completed as part of Chapter 16: Geology and Soils (document reference 6.2, Technical Appendix 16D) which considers these risks. The assessment suggests that piling activities are unlikely to cause an unacceptable pollution risk to the underlying groundwater system given limited contamination has been identified in the soil and sediment samples obtained across the Principal Application Site. Furthermore, the assessment states that vertical hydraulic continuity is likely to already exist between the superficial deposits and the underlying Crag Group Aquifer, hence piling is not expected to introduce new contamination.</p> <p>During construction of piled foundations and groundwater dewatering, water pumped from excavations may introduce or laterally expand any existing saline intrusion to fresh groundwater sources. However, groundwater quality sampling has confirmed the influence of saline intrusion in groundwater across the Principal Application Site, indicating hydraulic connection between the local groundwater system and the River Yare. In addition, the groundwater modelling has predicted a localised impact whereby the zone of influence only extends approximately 400m from the dewatering source. Based on the above, the impacts of dewatering-induced saline intrusion are considered marginal.</p>

Potential Impact	Description and Mitigation
	<p>The Outline CoCP (document reference 6.16) includes measures to avoid cross contamination and aquifer deterioration during construction of the piled foundations.</p>
<p>Disturbance through noise and vibration from piling and other construction related sources.</p>	<p>Installation of the cofferdams within the River Yare has the potential to disturb or harm fish, birds and invertebrates during piling. Birds and fish are likely to move away from the area into adjacent parts of the River Yare, or elsewhere during the disturbance, which will be temporary. It is unlikely that fish will be significantly affected within the River Yare as the river is large enough for fish to migrate away from the source of the noise and vibration during the works. Findings from the benthic and fish survey suggest that aquatic communities identified within the River Yare are of limited conservation value, therefore noise and vibration from construction works are considered to have limited impact on these communities in relation to the pressures already present due to habitat modification as a result of existing dredging activities (see Chapter 8: Nature Conservation).</p> <p>The Outline CoCP (document reference 6.16) sets out the framework to produce a noise and vibration management plan, which will be implemented and will control noise emissions from the construction site through the delivery of the Scheme. In addition, soft start piling techniques will be employed to minimise noise and vibration during construction of the bridge substructures.</p>
<p>Disturbance/loss of inter-tidal and aquatic habitat through siting of the cofferdams.</p>	<p>No intertidal habitat has been identified within the Application Site, and based on the tidal regime of the estuary and available bathymetry data provided for the River Yare, the channel through the Application Site is unlikely to support intertidal habitat as the river bed and habitat will not be exposed during low tide due to the narrow tidal range and the deep channel profile through the Application Site.</p> <p>Aquatic communities identified in the benthic ecology and fish survey are of limited conservation value and are subject to habitat modification due to existing dredging activities along the River Yare. Therefore, any disturbances or losses due to siting of the cofferdams are considered negligible.</p>

- 1.4.5 The construction impacts are expected to be temporary and localised with affected water features recovering over time as any residual pollutants settle and disperse through natural processes and following the removal of any temporary works or diversions. The construction impacts are therefore not assessed to have a permanent or long-term effect on the quality elements of the waterbodies (with respect to the waterbody objective timescales), which would affect the status of the quality elements sufficient to cause a deterioration or meeting the WFD objectives. Potential construction impacts have therefore not been considered further in this report.

Table 1.6: Potential Operation Impacts and Mitigation

Potential Impact	Description and Mitigation
<p>Release of contaminants into surface waterbodies from routine road runoff and through spillage.</p>	<p>The Drainage Strategy for the Scheme (document reference 6.2, Technical Appendix 12C) will include some level of treatment of road runoff prior to discharge. Pollution control measures currently proposed include vortex separator and natural treatment in the form of wet pond/wetland feature. Penstocks are also proposed as control of spillages.</p> <p>A HAWRAT assessment (Appendix 11D) has been completed for the western part of the Scheme to investigate the potential impacts of discharging into the IDB watercourse network adjacent to the Scheme and into the River Yare.</p> <p>Results of the assessment suggest that impacts to the River Yare will be negligible due to the significant dilution capacity of the waterbody. Greater impacts are predicted on the immediate IDB watercourse network due to the ephemeral nature of these features. However, it has been confirmed that these watercourses already receive existing highway discharges with no known treatment. Therefore, runoff from the Scheme is unlikely to cause significant deterioration in water quality of the IDB network, particularly with pollution control measures implemented as part of the Scheme Drainage Strategy. The impacts to the wider IDB catchment are also considered to be insignificant as contaminants released into the watercourses in vicinity of the Scheme would have been sufficiently diluted and dispersed before reaching the main dyke system within the marshes south of Breydon Water.</p> <p>With consideration of spillage containment, the HAWRAT assessment indicates that the risks of contamination through spillages would be negligible with the annual probability of a serious incident occurring estimated at 0.014%, which is well below the 1% threshold set by the</p>

Potential Impact	Description and Mitigation
	DMRB.
<p>Pollution to surface water due to disturbance of contaminated sediments within the River Yare due to increased scour and erosion caused by the bridge substructures</p>	<p>The sediment transport assessment (Appendix 11C) has shown that the Scheme will create areas of additional sediment erosion and deposition near the Principal Application Site. Additional erosion is predicted around the bridge substructures, where potentially contaminated sediments would be mobilised and re-suspended in the water column. However, the volume of disturbed sediments only represents a very small proportion of the volume of water that transits through the estuary. Hence, any contaminants released would be quickly dispersed/diluted through the tidal flow regime and are unlikely to cause significant deterioration in the water quality in the River Yare. The sediment transport modelling indicates disturbed sediments will deposit close to the Scheme, and will not settle out in any significant quantity elsewhere in the estuary. The benthic communities and fish identified in the River Yare are considered of limited conservation value (see Chapter 8: Nature Conservation). Considering only a small volume of sediments would be mobilised and the significant dilution capacity of the River Yare, the impacts to aquatic ecology as a result of the release of sediment-bound contaminants would be negligible.</p> <p>Findings from the sediment transport assessment also suggest that the effects on the hydromorphological regime of the River Yare are local and do not extend up or downstream to impact on receptors, such as Breydon Water, the River Bure and the North Sea, that are hydraulically linked to the Yare. Any sediment bound contaminants released in the River Yare would be sufficiently diluted before reaching these receptors. Therefore, no impacts are predicted on these surface water features.</p>
<p>Alterations to the tidal and hydromorphological regime of the River Yare, such as changes to the tidal prism and erosion, deposition and channel migration processes due to</p>	<p>The sediment transport assessment (Appendix 11C) has shown that the presence of the new crossing and associated bridge substructures will have negligible impacts on the tidal regime, in relation to the tidal prism, tidal symmetry and water level, of the River Yare estuary.</p> <p>With respect to the hydromorphological regime, the assessment predicts localised changes to the erosion/deposition pattern in the engineered channel of the River Yare close to the Principal Application Site for both the</p>

Potential Impact	Description and Mitigation
channel modifications and in-channel structures associated with the new bridge crossing.	<p>everyday and extreme tidal events. However, the changes will not lead to significant modifications to the morphological characteristics of the river, which is already heavily engineered and subject to regular dredging. There is no net change in sediment volume in the channel, meaning the Scheme will not impact on the volume of dredged material, but may alter the locations where dredging is required. The sediment transport assessment also predicts a negligible change in the tidal prism resulting from the Scheme.</p> <p>Based on findings from the sediment transport assessment, the predicted changes in hydromorphological regime in the River Yare will not extend up and downstream to impact on the River Bure, Breydon Water and the North Sea. This means the Scheme will have negligible impacts on the sediment transport regime of these surface water features.</p>
Increase in runoff from the Scheme leading to changes in the hydrological regime of receiving watercourses	<p>The Scheme Drainage Strategy (document reference 6.2, Technical Appendix 12C) will ensure runoff is attenuated to as close as practical to greenfield rates for the 1 in 100-year event, including climate change. Where this is not achievable, the post development runoff rates and volumes should not exceed existing scenario values. Therefore, the Scheme is not expected to result in significant changes to existing flows (hydrological regime) in receiving watercourses.</p>
Alterations to the hydrological and morphological regime of the ordinary watercourses/IDB drains, such as changes to the flow path and rate, associated with the channel realignments, new drainage outfalls and culvert extensions.	<p>The Scheme will include channel realignment and culvert extensions of the IDB watercourse network within the Principal Application Site. However, the proposals will maintain existing drainage routes and catchments, therefore significant changes in the hydrological regime are not expected. Increased lengths of culvert and new discharge outfalls into the IDB drains could impact on the morphological quality of the watercourses; however, the drains are already culverted in many places and form part of urban and highway drainage infrastructure. Thus, the effects are unlikely to significantly impact on the morphological characteristics of these watercourses or migrate downstream to impact on the wider IDB catchment.</p> <p>The outfalls will require some localised engineering and scour protection however, the scale of works will be small and is unlikely to significantly affect the morphological characteristics of the watercourses.</p>
Release of	The Drainage Strategy for the Scheme (document reference

Potential Impact	Description and Mitigation
contaminants into groundwater waterbodies from routine road runoff and through spillage (via infiltration).	<p>6.2, Technical Appendix 12C) will include some level of treatment of road runoff prior to discharge. Pollution control measures currently proposed include a vortex separator and natural treatment in the form of wet pond/wetland feature. Penstocks are also proposed as control of spillages. These will reduce the likelihood of contaminants infiltrating into the underlying groundwater downstream of the Scheme.</p> <p>The disposal of road runoff via infiltration (e.g. soakaway) is not proposed in the Drainage Strategy due to high groundwater levels in the Principal Application Site and any drainage features will be lined where necessary to limit any infiltration of polluted runoff to the underlying groundwater.</p>
Potential impacts on the groundwater regime and water quality due to introduction of piles	<p>The piles are expected to extend to the underlying Crag Group Aquifer (Principal Aquifer) and therefore may lead to localised disruptions in groundwater flow paths. However, the piles will only occupy a very small cross sectional area and given they will be positioned parallel to groundwater flow, the impacts to the groundwater regime will be negligible.</p> <p>The Principal Application Site only represents a very small proportion of the catchment of the Crag Group Aquifer, which receives recharge from multiple sources within the wider catchment. Furthermore, the Crag Group Aquifer underlies an inconsistent multi-layered superficial aquifer, which already limits recharge locally to the underlying Crag Group Aquifer where clay occurs. Hence changes to groundwater recharge to the Crag Group Aquifer as a result of the piles are considered negligible.</p> <p>There is the potential for increased saline intrusion pathway due to the introduction of piles. However, the effects will be localised and groundwater quality sampling has confirmed the influence of saline intrusion in groundwater across the Principal Application Site, indicating hydraulic connection between the local groundwater receptors and the River Yare. Hence the Scheme is not expected to cause any additional changes that would increase saline intrusion at a catchment scale.</p>
Disturbance/loss of Inter-tidal and aquatic habitat through placement of the bridge	<p>No intertidal habitat has been identified within the Application Site, and based on the tidal regime of the estuary and available bathymetry data provided for the River Yare, the channel through the Application Site is unlikely to support intertidal habitat as the river bed and habitat will not</p>

Potential Impact	Description and Mitigation
substructures.	<p>be exposed during low tide.</p> <p>Aquatic communities identified in the benthic ecology and fish survey are of limited conservation value and are subject to habitat modification due to existing dredging activities along the River Yare. Therefore, any disturbances or losses due to the bridge substructures are considered negligible.</p>

1.5 Assessment against individual Quality Elements

1.5.1 The following tables provide an assessment of the potential impacts of the Scheme on each of the respective waterbody quality elements, associated features, and the ability to meet the waterbody objectives as set out in the RBMP.

1.5.2 The key aspects of the Scheme have been consolidated into three elements in the assessment tables. The assessment considers the impacts and embedded mitigation incorporated into the proposals described in Section 1.4 against each of the quality elements (status and objectives) but does not repeat the detail. The consolidated Scheme elements are as follows:

1. River Yare bridge crossing:

- Bridge substructures and channel modifications associated with the new bridge crossing – these could have potential impacts on the hydromorphological, physico-chemical, biological and chemical quality elements of the Bure & Waveney & Yare & Lothing Transitional and Norfolk East Coastal waterbodies
- Introduction of piles to facilitate the construction of the cofferdams – this could have potential impacts on the quantitative and chemical quality elements of the Broadland Rivers Chalk & Crag groundwater waterbody.

2. Highway drainage across the whole Scheme:

- Changes in runoff and the construction of new outfalls – these could have potential impacts on the hydromorphological and biological quality elements of the Bure & Waveney & Yare & Lothing Transitional and Norfolk East Coastal waterbodies with respect to discharge of highway runoff into the IDB watercourse network within the Principal Application Site or into the River Yare.

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- Potential contaminants in highway runoff - these could have potential impacts on the physio-chemical, biological and chemical quality elements of the Bure & Waveney & Yare & Lothing Transitional and Norfolk East Coastal waterbodies with respect to discharge of highway runoff into the IDB watercourse network within the Principal Application Site or into the River Yare.
 - Potential contaminants in highway runoff infiltrating into the underlying groundwater– this element could have potential impacts on the quantitative and chemical quality elements of the Broadland Rivers Chalk & Crag groundwater waterbody.
3. Channel realignments and culvert extensions of the IDB watercourse network within the Principal Application Site – this element of the Scheme could have potential impacts on the hydromorphological and biological quality elements of the Bure & Waveney & Yare & Lothing Transitional and Norfolk East Coastal waterbodies; this element is not expected to impact on the Broadland Rivers Chalk & Crag groundwater waterbody.

Table 1.7: Bure & Waveney & Yare & Lothing Transitional Waterbody Assessment

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
Ecological status (current status: Moderate; Objective: Moderate)			
Hydromorphological quality elements Current status: Supports Good Objective: Supports Good - Hydrological Regime	Negligible change on the tidal / fluvial hydrological regime. Some localised effects on the hydromorphological regime of the River Yare where the Scheme will create areas of additional sediment erosion and deposition near the Principal Application Site. These localised effects will not lead to significant modifications to the morphological characteristics of the River Yare. Any changes to the	Slight change in runoff rates to receiving watercourses but runoff will be attenuated to greenfield rates wherever possible and where not possible will be limited to existing rates. Some detrimental effects on the morphological quality of the IDB watercourse where new discharge outfalls are proposed but effects considered insignificant as the watercourses already receive runoff from existing drainage system. On the other hand,	Slight effect on specific IDB watercourses affected but existing drainage routes and catchments maintained. Some detrimental effects on the morphological quality of the IDB watercourses due to increased lengths of culvert but effects considered insignificant as the watercourses are already culverted in many places and represent a very small proportion of the wider network. No effects expected on the

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	<p>hydromorphological regime along the River Yare will not extend upstream to impact on the River Bure or Breydon Water within the waterbody.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the hydromorphological quality (hydrological regime) of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>new discharge outfalls are not expected to impact on the morphological quality of the River Yare.</p> <p>Effects insignificant to hydrological regime of the waterbody as only a very small area affected.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the hydromorphological quality (hydrological regime) of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>hydrological regime.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the hydromorphological quality (hydrological regime) of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>
Physico-chemical quality elements	Some potential for the mobilisation of contaminated	Some potential for increased contaminants in receiving	N/A – this aspect of the Scheme will not alter the

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
<p>Current status: Moderate</p> <p>Objective: Moderate</p> <ul style="list-style-type: none"> - Dissolved inorganic Nitrogen - Dissolved Oxygen - Specific pollutants 	<p>sediments in the River Yare due to additional erosion caused by the flow constriction at the crossing. Volume of disturbed sediments would be very small compared to the tidal flows hence any contaminants released will be quickly dispersed/diluted and unlikely to cause significant impacts.</p> <p>Any changes to water quality in the River Yare will not extend upstream to impact on the River Bure or Breydon Water within the waterbody.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the</p>	<p>watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations insufficient to affect water quality in the waterbody due to relative size and existing sources of contamination affecting the waterbody.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the physico-chemical quality of the waterbody, with respect to Dissolved inorganic Nitrogen, Dissolved Oxygen and Specific pollutants, nor prevent the waterbody from meeting the objective of this</p>	<p>concentrations of Dissolved inorganic Nitrogen, Dissolved Oxygen and Specific pollutants in the waterbody.</p>

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	physico-chemical quality of the waterbody, with respect to Dissolved inorganic Nitrogen, Dissolved Oxygen and Specific pollutants, nor prevent the waterbody from meeting the objective of this element.	element.	
Biological Quality Elements Current status: Poor Objective: Good by 2027 <ul style="list-style-type: none"> - Angiosperms - Invertebrates - Microalgae - Phytoplankton 	Some detrimental effects on morphological characteristics and water quality in the River Yare due to mobilisation of potentially contaminated sediments at the crossing but unlikely to affect the ability of the watercourse to support existing aquatic ecology. Similar pressures already exist due to existing dredging operations.	Some potential for increased contaminants in receiving watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations insufficient to affect water quality and subsequent aquatic ecology in the waterbody due to relative size and existing sources of contamination affecting the waterbody.	Slight effect on morphological characteristics of local IDB drains but unlikely to significantly affect their ability to support existing aquatic ecology and only a small area of the waterbody would be affected. Therefore, this aspect of the Scheme is not expected to cause a deterioration to the biological quality of the

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	<p>No intertidal habitat has been identified within the Application Site and the Scheme is not predicted to impact on any intertidal habitation upstream and downstream of the Scheme.</p> <p>Effects of the Scheme are considered insignificant to the waterbody as only a small area affected. Any changes to the morphological regime and water quality in the River Yare at the crossing are not expected to impact on the wider catchment.</p> <p>Aquatic ecology assessment confirms no significant impacts resulting from the Scheme.</p>	<p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the biological quality of the waterbody, with respect to Angiosperms, Invertebrates, Microalgae and Phytoplankton, nor prevent the waterbody from meeting the objective of this element.</p>	<p>waterbody, with respect to Angiosperms, Invertebrates, Microalgae and Phytoplankton, nor prevent the waterbody from meeting the objective of this element.</p>

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	Therefore, this aspect of the Scheme is not expected to cause a deterioration to the biological quality of the waterbody, with respect to Angiosperms, Invertebrates, Microalgae and Phytoplankton, nor prevent the waterbody from meeting the objective of this element.		
Biology: Higher sensitivity habitats - Saltmarsh	No impact expected. The identified habitat (Saltmarsh) is found within Breydon Water and along the River Bure approximately 3 to 4km upstream from the Application Site. Given the distance from the Scheme, any changes to the hydromorphological characteristics and water quality in the surface water features at the crossing, including the River Yare which is in hydraulic connection with Breydon Water and the River Bure, are not expected to have any discernible impact on the identified habitat.		
Biology: Lower sensitivity	The identified intertidal habitats (Intertidal soft sediments and Subtidal soft sediments) are found		

Water body Name & ID			
Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700			
Scheme design element:			
	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
habitats			
<ul style="list-style-type: none"> - Intertidal soft sediments - Subtidal soft sediments 		<p>within Breydon Water and in isolated areas along the west bank of the River Yare approximately 700m downstream from the Scheme. No intertidal habitat has been identified within the Application Site. Any changes to surface water features resulting from the Scheme are not expected to have any discernible impact on the identified habitat.</p> <p>The identified subtidal habitat is found along the coastline and given the distance from the Scheme, any changes to surface water features at the crossing are not expected to impact on this habitat.</p>	
Chemical status (current status: Good; Objective: Good)			
Priority substances			
Current status: Good			
Objective: Good			
	Some potential for the mobilisation of contaminated sediments in the River Yare due to additional erosion caused by flow constriction as a result of the Scheme. Volume of disturbed sediments would be very small compared to the tidal flows hence any	Some potential for increased contaminants in receiving watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations highly unlikely to affect water quality in the waterbody due to relative size and existing	N/A - this aspect of the Scheme will not alter the concentration of Priority substances in the waterbody.

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	<p>contaminants released will be quickly dispersed/diluted and unlikely to cause significant impacts.</p> <p>Any changes to water quality in the River Yare will not extend upstream to impact on the River Bure or Breydon Water within the waterbody.</p> <p>Given the Good chemical status, the waterbody is not identified as being at pressure related to sediment-bound contaminants.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Priority substances quality of the waterbody nor prevent the</p>	<p>sources of contamination affecting the waterbody.</p> <p>Given the Good chemical status, the waterbody is not identified as being at pressure related to contaminants contained in road runoff.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Priority substances quality of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	waterbody from meeting the objective of this element.		
Other pollutants Current status: Does not require assessment Objective: Does not require assessment	N/A – no Other pollutants have been identified in the sediment sampling undertaken as part of the Scheme, therefore the mobilisation of contaminated sediments in the River Yare will not affect the Other pollutants quality of the waterbody.	Some potential for increased contaminants in receiving watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations highly unlikely to affect water quality in the waterbody due to relative size and existing sources of contamination affecting the waterbody. Given the Good chemical status, the waterbody is not identified as being at pressure related to contaminants	N/A – this aspect of the Scheme will not alter the concentration of Other pollutants in the waterbody.

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
		<p>contained in road runoff.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Other pollutants quality of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	
<p>Priority hazardous substances</p> <p>Current status: Good</p> <p>Objective: Good</p>	<p>Some potential for the mobilisation of contaminated sediments in the River Yare due to additional erosion caused by flow constriction as a result of the Scheme. Volume of disturbed sediments would be very small compared to the tidal flow regime hence any contaminants released will be quickly dispersed/diluted</p>	<p>Some potential for increased contaminants in receiving watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations highly unlikely to affect water quality in the waterbody due to relative size and existing sources of contamination affecting the waterbody.</p>	<p>N/A - this aspect of the Scheme will not alter the concentration of Priority hazardous substances in the waterbody.</p>

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	<p>and unlikely to cause significant impacts.</p> <p>Any changes to water quality in the River Yare will not extend upstream to impact on the River Bure or Breydon Water within the waterbody.</p> <p>Given the Good chemical status, the waterbody is not identified as being at pressure related to sediment-bound contaminants.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Priority hazardous substances quality of the waterbody nor prevent the waterbody from meeting the objective of this</p>	<p>Given the Good chemical status, the waterbody is not identified as being at pressure related to contaminants contained in road runoff.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Priority hazardous substances quality of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	element.		
Protected Areas Breydon Water SPA; nutrient sensitive areas	<p>Due to the distance from the Scheme, any changes to the hydromorphological regime and water quality in the River Yare, which is in hydraulic connection with the Breydon Water SPA, will not extend upstream to impact on the protected area.</p> <p>No impacts expected on protected area which relates to nitrate sensitivity.</p>		
Mitigation measures to achieve objectives	No impacts expected. No specific mitigation measures identified for waterbody.		

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
Mitigation measures for heavily modified water designated use (Flood protection; navigation, ports and harbours) <ul style="list-style-type: none"> - Dredging disposal strategy - Reduce impact of dredging - Sediment management - Dredge disposal site selection - Manage disturbance - Retain habitats 	<p>The Scheme will not impact upon existing flood protection measures or alter the existing requirements for navigation, ports and harbours. Changes to these would likely require wide ranging measures throughout the urban area that far outweigh the scale of the Scheme.</p> <p>The Scheme will not affect the identified mitigation measures for heavily modified water designated use.</p>		
Compliant with WFD objectives?	Yes – while there may be some localised effects on the watercourses directly affected by the Scheme these are not sufficient to affect the status of any of the quality elements of the Bure &		

Water body Name & ID	Bure & Waveney & Yare & Lothing (Transitional Waterbody) GB10503410700		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	<p>Waveney & Yare & Lothing waterbody. Similarly, they will not affect the ability to meet the objectives for the waterbody set out in the RBMP. In conclusion, the Scheme would not lead to a deterioration to the current overall status (Moderate) of the waterbody. In addition, the Scheme would not prevent the waterbody from achieving its objective, which is to achieve/maintain Moderate status by 2027. No known specific waterbody measures have been identified.</p>		

Table 1.8: Norfolk East Coastal Waterbody Assessment

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
Ecological status (current status: Moderate; Objective: Moderate)			
Hydromorphological quality elements – n/a	N/A – Hydromorphological quality is not a measured supporting element for this waterbody type. Effects on the hydromorphological regime at the crossing will not extend to the coast to impact on this waterbody.		
Physico-chemical quality elements Current status: Moderate Objective: Moderate <ul style="list-style-type: none"> - Dissolved inorganic Nitrogen - Dissolved oxygen - Specific pollutants (Toluene, Zinc) 	Some potential for the mobilisation of contaminated sediments in the River Yare due to additional erosion caused by flow constriction at the crossing. Volume of disturbed sediments would very small compared to the tidal flow regime hence any contaminants released will be quickly dispersed/diluted and area highly unlikely to cause significant impacts to water	Some potential for increased contaminants in receiving watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations insufficient to affect water quality in the Norfolk East waterbody due to relative size and existing sources of contamination affecting the waterbody. Therefore, this aspect of the	N/A - no direct connectivity to this waterbody.

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	<p>quality in the coastal waterbody. Only indirect connectivity exists between the Scheme and the Norfolk East waterbody.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the physico-chemical quality of the waterbody, with respect to Dissolved inorganic Nitrogen, Dissolved Oxygen and Specific pollutants, nor prevent the waterbody from meeting the objective of this element.</p>	<p>Scheme is not expected to cause a deterioration to the physico-chemical quality of the waterbody, with respect to Dissolved inorganic Nitrogen, Dissolved Oxygen and Specific pollutants, nor prevent the waterbody from meeting the objective of this element.</p>	
<p>Biological Quality Elements Current status: Good</p>	<p>Some detrimental effects on local morphological characteristics and water</p>	<p>Some potential for increased contaminants in receiving watercourses but will be</p>	<p>N/A – no direct connectivity to this waterbody</p>

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
Objective: Good - Phytoplankton	<p>quality in the River Yare due to mobilisation of potentially contaminated sediments at the crossing but unlikely to affect the ability of the watercourse to support existing aquatic ecology.</p> <p>Effects of the Scheme are considered insignificant to the Norfolk East waterbody as only indirect connectivity to the Scheme.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the biological quality of the waterbody, with respect to Phytoplankton, nor prevent the waterbody from meeting</p>	<p>reduced by road drainage treatment. Runoff volumes and concentrations insufficient to affect water quality and subsequent aquatic ecology in the waterbody due to relative size and existing sources of contamination affecting the water body.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the biological quality of the waterbody, with respect to Phytoplankton, nor prevent the waterbody from meeting the objective of this element.</p>	

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	the objective of this element.		
Biology: Higher sensitivity habitats Chalk reef Polychaete reef	No impact expected. Scheme has only indirect connectivity to the identified habitats (Chalk reef and Polychaete) via the Bure & Waveney & Yare & Lothing waterbody. Any changes to surface water features resulting from the Scheme are not expected to have any discernible impact on the Norfolk East waterbody and therefore on the identified habitats.		
Biology: Lower sensitivity habitats Cobbles, gravel and shingle Intertidal soft sediments Subtidal rocky reef Subtidal soft sediments	No impact expected. Scheme has only indirect connectivity to the identified habitats (Cobbles, gravel and shingle; Intertidal soft sediments; Subtidal rocky reef and Subtidal soft sediment) via the Bure & Waveney & Yare & Lothing waterbody. Any changes to surface water features resulting from the Scheme are not expected to have any discernible impact on the Norfolk East waterbody and therefore on the identified habitats.		
Chemical status (current status: Good; Objective: Good)			
Priority substances Current status: Good	Some potential for the mobilisation of contaminated sediments in the River Yare	Some potential for increased contaminants in receiving watercourses but will be	N/A - no direct connectivity to this waterbody.

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
Objective: Good	<p>due to additional erosion caused by flow constriction as a result of the Scheme. Volume of disturbed sediments would very small compared to the tidal flows hence any contaminants released will be quickly dispersed/diluted and unlikely to cause significant impacts.</p> <p>Effects are considered insignificant to the Norfolk East waterbody as only indirect connectivity to the Scheme and contaminants will be sufficiently diluted and dispersed prior to reaching this waterbody.</p> <p>Therefore, this aspect of the</p>	<p>reduced by road drainage treatment. Runoff volumes and concentrations insufficient to affect water quality in the waterbody due to relative size and existing sources of contamination affecting the water body.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Priority substances quality of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	Scheme is not expected to cause a deterioration to the Priority substances quality of the waterbody nor prevent the waterbody from meeting the objective of this element.		
Other pollutants Current status: Does not require assessment Objective: Does not require assessment	N/A - no Other pollutants have been identified in the sediment sampling undertaken as part of the Scheme, therefore the mobilisation of contaminated sediments in the River Yare will not affect the Other pollutants quality of this waterbody.	Some potential for increased contaminants in receiving watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations insufficient to affect water quality in the waterbody due to relative size and existing sources of contamination affecting the water body. Therefore, this aspect of the Scheme is not expected to	N/A - no direct connectivity to this waterbody.

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
		cause a deterioration to the Other pollutants quality of the waterbody nor prevent the waterbody from meeting the objective of this element.	
Priority hazardous substances Current status: Good Objective: Does not require assessment	Some potential for the mobilisation of contaminated sediments in the River Yare due to additional erosion caused by flow constriction as a result of the Scheme. Volume of disturbed sediments would very small compared to the tidal flow regime hence any contaminants released will be quickly dispersed/diluted and unlikely to cause significant impacts.	Some potential for increased contaminants in receiving watercourses but will be reduced by road drainage treatment. Runoff volumes and concentrations insufficient to affect water quality in the waterbody due to relative size and existing sources of contamination affecting the water body. Therefore, this aspect of the Scheme is not expected to cause a deterioration to the	N/A - no direct connectivity to this waterbody.

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
	<p>Effects insignificant to the Norfolk East waterbody as only indirect connectivity to the Scheme and contaminants will be sufficiently diluted and dispersed prior to reaching this waterbody.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Priority hazardous substances quality of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>Priority hazardous substances quality of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	
<p>Protected Areas</p> <p>Great Yarmouth South and Great</p>	<p>No impacts expected on protected areas. Some potential for increased contaminants due to mobilisation of contaminated sediments in the River Yare but further treatment by natural</p>		

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
Yarmouth Pier bathing waters, Outer Thames Estuary SPA; Great Yarmouth North Denes SPA	processes will occur prior to discharge to the coast. Highway runoff will be treated before discharge. Runoff volumes and concentrations insufficient to affect water quality in the Norfolk East waterbody due to relative size.		
Mitigation measures to achieve objectives	No impacts expected. No specific mitigation measures identified for waterbody.		
Mitigation measures for heavily modified water designated use (Flood and coastal protection) <ul style="list-style-type: none"> - Sediment management - Dredge disposal site selection - Manage disturbance 	The Scheme will not impact upon existing flood and coastal protection measures or provide an opportunity to alter these. Changes to these would likely require wide ranging measures that far outweigh the scale of the Scheme. The Scheme will not affect the identified mitigation measures for heavily modified water designated use.		
Compliant with WFD objectives?	Yes – while there may be some localised effects on the watercourses directly affected by the Scheme these are not sufficient to affect the status of any of the quality elements of the Norfolk East waterbody. Similarly, they will not affect the ability to meet the objectives for the waterbody set out in the RBMP. In conclusion, the Scheme would not lead to a deterioration to the current overall status (Moderate) of the waterbody. In addition, the		

Water body Name & ID	Norfolk East (Coastal Waterbody) GB650503520003		
Scheme design element:	River Yare bridge crossing (bridge substructures; channel modifications)	Highway drainage (changes in runoff, potential contaminants and new outfalls associated with discharge into the IDB watercourse or into the River Yare)	Channel realignments and culvert extensions of IDB watercourse within the Principal Application Site
		Scheme would not prevent the waterbody from achieving its objective, which is to maintain Moderate status. No known measures have been identified at present to maintain this objective.	

Table 1.9: Broadland Rivers Chalk & Crag Groundwater Waterbody Assessment

Waterbody Name & ID	Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)	
Scheme design element:	River Yare bridge crossing (piled foundations)	Highway drainage (potential contaminants)
Quantitative Status (current status: Poor; Objective: Good by 2021)		
Saline intrusion Current status: Good Objective: Good	Some potential for increased saline intrusion pathway due to piling but effects will be localised. Groundwater quality sampling has confirmed the existing influence of saline intrusion in groundwater receptors across the Principal	N/A – the disposal of highway runoff via infiltration (e.g. soakaway) is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels and drainage features will be lined where necessary to prevent mixing with groundwater,

Waterbody Name & ID	Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)	
Scheme design element:	River Yare bridge crossing (piled foundations)	Highway drainage (potential contaminants)
	<p>Application Site.</p> <p>The Scheme is not expected to cause any significant changes that would increase saline intrusion at the waterbody scale.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Quantitative Saline intrusion element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>therefore this aspect of the Scheme will not affect the Quantitative status (Saline intrusion) of this waterbody.</p>
<p>Water balance</p> <p>Current status: Good</p> <p>Objective: Good</p>	<p>Some potential for localised effects on groundwater pathways but insufficient to affect wider groundwater flows and availability.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Water balance element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>N/A – the disposal of highway runoff via infiltration (e.g. soakaway) is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels and drainage features will be lined where necessary to prevent mixing with groundwater. The scale of the Scheme is insufficient to affect groundwater recharge therefore this aspect of the Scheme will not affect the Quantitative status (Water balance) of this waterbody.</p>

Waterbody Name & ID	Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)	
Scheme design element:	River Yare bridge crossing (piled foundations)	Highway drainage (potential contaminants)
GWDTE tests Current Status: Poor Objective: Good by 2015	<p>Some potential for localised effects on groundwater pathways but insufficient to affect wider groundwater flows and quantity to groundwater receptors.</p> <p>No known GWDTEs identified in the vicinity of the Scheme.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Quantitative GWDTE element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>N/A – the disposal of highway runoff via infiltration (e.g. soakaway) is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels and drainage features will be lined where necessary to prevent mixing with groundwater, therefore this aspect of the Scheme will not affect the Quantitative status (GWDTE tests) of this waterbody.</p>
Dependent surface waterbody status Current status: Good Objective: Good	<p>Some potential for localised effects on groundwater pathways but insufficient to affect wider groundwater flows and quantity to groundwater receptors.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Quantitative Dependent surface waterbody status of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>N/A – the disposal of highway runoff via infiltration (e.g. soakaway) is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels and drainage features will be lined where necessary to prevent mixing with groundwater, therefore this aspect of the Scheme will not affect the Quantitative status (Dependent surface waterbody status) of this waterbody.</p>

Waterbody Name & ID		
Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)		
Scheme design element:		
River Yare bridge crossing (piled foundations)		Highway drainage (potential contaminants)
Chemical Status (current status: Poor ; Objective: Good by 2027)		
Drinking Water Protected Area Current status: Poor Objective: Good by 2027	<p>Some potential for ground based contaminants to enter through piling however the Scheme is not expected to cause any significant changes that would deteriorate groundwater quality at the waterbody scale.</p> <p>The Study Area does not lie within a SPZ. Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Drinking Water Protected Area of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>Some potential for contaminants to enter groundwater via infiltration however, disposal of highway runoff via infiltration is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels and the likelihood will be reduced as any drainage features will be lined where necessary to limit any infiltration of polluted runoff to the underlying groundwater receptors.</p> <p>The Study Area does not lie within a SPZ. Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Drinking Water Protected Area of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>
General Chemical Test Current Status: Good Objective: Good	<p>Some potential for ground based contaminants to enter through piling however the Scheme is not expected to cause any significant changes that would deteriorate groundwater quality at the</p>	<p>Some potential for contaminants to enter groundwater via infiltration however, disposal of highway runoff via infiltration is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels</p>

Waterbody Name & ID	Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)	
Scheme design element:	River Yare bridge crossing (piled foundations)	Highway drainage (potential contaminants)
	<p>waterbody scale.</p> <p>Waterbody not currently under pressure.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the General Chemical element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>and the likelihood will be reduced as any drainage features will be lined where necessary to limit any infiltration of polluted runoff to the underlying groundwater receptor.</p> <p>Waterbody not currently under pressure.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the General Chemical element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>
<p>GWDTE test</p> <p>Current Status: Good</p> <p>Objective: Good</p>	<p>Some potential for ground based contaminants to enter through piling however the Scheme is not expected to cause any significant changes that would deteriorate groundwater quality at the waterbody scale.</p> <p>No known GWDTEs identified in the vicinity of the Scheme.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Chemical GWDTE element of the waterbody</p>	<p>Some potential for contaminants to enter groundwater via infiltration however, disposal of highway runoff via infiltration is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels and the likelihood will be reduced as any drainage features will be lined where necessary to limit any infiltration of polluted runoff to the underlying groundwater receptors.</p> <p>No known GWDTEs identified in the vicinity of the Scheme.</p>

Waterbody Name & ID	Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)	
Scheme design element:	River Yare bridge crossing (piled foundations)	Highway drainage (potential contaminants)
	nor prevent the waterbody from meeting the objective of this element.	Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Chemical GWDTE element of the waterbody nor prevent the waterbody from meeting the objective of this element.
Dependent surface waterbody status Current Status: Good Objective: Good	<p>Some potential for ground based contaminants to enter through piling however the Scheme is not expected to cause any significant changes that would deteriorate groundwater quality at the waterbody scale.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Chemical Dependent surface waterbody status element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>Some potential for contaminants to enter groundwater via infiltration however, disposal of highway runoff via infiltration is not proposed in the Drainage Strategy (document reference 6.2 Appendix 12C) due to high groundwater levels and the likelihood will be reduced as any drainage features will be lined where necessary to limit any infiltration of polluted runoff to the underlying groundwater receptor.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Chemical Dependent surface waterbody status element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>

Waterbody Name & ID		Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)	
Scheme design element:		River Yare bridge crossing (piled foundations)	Highway drainage (potential contaminants)
<p>Saline intrusion Current Status: Good Objective: Good</p>	<p>Some potential for increased saline intrusion pathway due to piling but effects will be localised.</p> <p>Groundwater quality sampling has confirmed the influence of saline intrusion in groundwater across the Principal Application Site.</p> <p>The Scheme is not expected to cause any significant changes that would increase saline intrusion at the waterbody scale.</p> <p>Therefore, this aspect of the Scheme is not expected to cause a deterioration to the Chemical Saline intrusion element of the waterbody nor prevent the waterbody from meeting the objective of this element.</p>	<p>This aspect of the Scheme will not introduce saline intrusion in the groundwater and therefore no impacts are expected on this quality element.</p>	
<p>Trend assessment Upward trend</p>	<p>No impacts expected. Existing pressures relate to groundwater abstraction associated with agriculture and rural land management.</p>		
<p>Protected Areas Nitrate Directive, Drinking Water Protected Area</p>	<p>No impacts expected on protected areas. Some potential for increased contaminants via infiltration of road runoff or through piling. Existing waterbody pressures relate to groundwater abstraction. The Study Area of the Scheme is not located within a SPZ.</p>		

Waterbody Name & ID	Broadland Rivers Chalk & Crag (Groundwater Waterbody ID GB40501G400300)	
Scheme design element:	River Yare bridge crossing (piled foundations)	Highway drainage (potential contaminants)
Mitigation measures	No impacts expected. No specific mitigation measures are identified for groundwater waterbody.	
Compliant with WFD objectives?	Yes – while there may be some localised effects these are not sufficient to affect the status of any of the quality elements of the Broadland Rivers Chalk & Crag groundwater waterbody. Similarly, they will not affect the ability to meet the objectives for the waterbody set out in the RBMP. In conclusion, the Scheme would not lead to a deterioration to the current overall status (Poor) of the waterbody. In addition, the Scheme would not prevent the waterbody from achieving its objective, which is to achieve Good status by 2027, however no known measures have been identified at present to achieve this objective.	

1.6 Summary and Conclusion

- 1.6.1** This WFD assessment on behalf of the Applicant to assess the impacts and to identify appropriate mitigation measures for the proposed works associated with the Scheme.
- 1.6.2** The WFD waterbodies potentially affected by the Scheme were identified as the Bure & Waveney & Yare & Lothing (transitional), Norfolk East (coastal) and Broadland Rivers Chalk & Crag (groundwater). Although the Study Area of the Scheme is located within the designated boundary of the Waveney Operational Catchment and the Bure Operational Catchment, it is not considered to form part of the actual catchment for these fresh waterbodies or associated tributaries. The Scheme is therefore not considered to have any impact on these catchments.
- 1.6.3** The potential impacts of the Scheme, including relevant mitigation, have been assessed against each of the individual quality elements of the affected waterbodies to determine whether the Scheme will lead to any detriment in the current status of the waterbody and/or the ability to meet the stated objectives for the waterbody. The assessment has also considered potential effects on associated Protected Areas and planned mitigation measures.
- 1.6.4** The assessment has concluded that whilst the Scheme may have some localised effects on watercourses directly affected by the Scheme, and the local groundwater aquifer, these are insufficient to lead to any deterioration in status or ability to meet the objectives of the respective waterbodies. The Principal Application Site represents a very small proportion of the waterbody catchments and the works are relatively small in the context of the infrastructure and development already present. The potential impacts of the Scheme do not affect or alter the existing pressures on the waterbodies, which are largely due to flood and coastal protection; navigation, ports and harbours; continuous sewage discharge; poor nutrient management and groundwater abstractions.
- 1.6.5** Furthermore, the Scheme will not prevent the achievement of the wider WFD objectives in the Anglian River Basin District and is not predicted to have an impact on any other waterbody within the Anglian River Basin District or the proposed mitigation measures to achieve Good status.

1.7 References

Ref 11E.1: Environment Agency (2015). Anglian River Basin Management Plan.

Ref 11E.2: Environment Agency (2016 updated 2017). Water Framework Directive assessment: estuarine and coastal waters and EA.

Ref 11E.3: The Planning Inspectorate (2017). Advice note eighteen: The Water Framework Directive.

Ref 11E.4: Environment Agency (2011 updated 2015). The Water Framework Directive classification method statement.

Ref 11E.5: Environment Agency (2019, online). Catchment Data Explorer.

Ref 11E.6: Ordnance Survey (2018, online). Ordnance Survey Online Mapping.

Ref 11E.7: British Geological Society (2019, online). Geology of Britain viewer.

Ref 11E.8: The Waveney, Lower Yare & Lothingland Internal Drainage Board (2014). Burgh Castle District Water Level Management Plan.

Ref 11E.9: Department for Environmental and Rural Affairs, Natural England, Environmental Agency, Historic England, Forestry Commission and Marine Management Organisation (2019, online). Magic.

Ref 11E.10: Centre for Ecology & Hydrology (2019, online). Flood Estimation Handbook (FEH) web service portal.

Ref 11E.11: Department for Environment Food and Rural Affairs and Environment Agency (2015, online). UK Estuaries Database.