The Sizewell C Project

8.14 Ch Water Framework Directive Compliance Assessment Report - Second Addendum

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EXECUTIVE SUMMARY

NNB Generation Company (SZC) Limited (SZC Co.) submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 for the Sizewell C Project (referred to as the ‘Application’) in May 2020. The Application was accepted for examination in June 2020.

As part of the Application, SZC Co. developed a **Water Supply Strategy** [APP-601], which recognised that there is likely to be insufficient potable water available locally to meet the full demands of the Project and identified options to provide for the necessary supply. Further engagement and design work in collaboration with Northumbrian Water Limited has identified the need for a change to the construction water supply strategy for the Sizewell C Project, through the provision of a temporary desalination plant during the construction phase. Desalination is the process of removing salt and other minerals from seawater. The desalinated water would then be treated as necessary to create potable water.

This report provides information to support the assessment of whether the proposed change to the Application (i.e. the proposal to construct a temporary construction-phase desalination plant) is compliant with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 2017/407) and whether the new proposals alter the conclusions of the DCO-stage **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

This report is the second addendum to the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620, APP-621, APP-622 and APP-623] and is a companion to the earlier addendum submitted in January 2021. The first addendum determined whether the design changes that were introduced following engage with the local authorities, environmental organisations, local stakeholder groups and the public, and additional assessments undertaken since submission of the Application in May 2020 would change the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620, APP-621, APP-622 and APP-623].

This assessment uses the three stage method described in detail in **Part 1** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620].

The Stage 1 screening assessment found that the proposed change could potentially impact upon two river water bodies (Leiston Beck and Minsmere Old River), a coastal water body (Suffolk) and a groundwater body (Waveney and East Suffolk Chalk and Crag).

The Stage 2 scoping assessment concluded that the construction and operation of the temporary desalination plant would not affect the status of the Leiston Beck, Minsmere Old River and Waveney and East Suffolk Chalk and Crag water bodies. Although no mechanisms to impact upon the status of the Suffolk coastal water body during construction were identified, potential impacts on the water body resulting from operational discharges were progressed to the Stage 3 detailed assessment.

The Stage 3 detailed assessment considered the potential impacts on the chemistry, physico-chemistry (salinity and nutrient loading), biology resulting from the discharge or reject water, and also considered the potential for cumulative impacts with other components of the project. However, the assessment did not identify any parameters at risk of deterioration such that class status for any of the parameters would decrease. As a result, the proposed activities alone and in combination with other construction-stage activities, are considered to be compliant with the requirements of the WFD. This means that the proposed addition of a temporary construction-phase desalination plant would not alter the findings of **Parts 2**, **3** or **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

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1 INTRODUCTION

1.1.1 NNB Generation Company (SZC) Limited (SZC Co.) submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 for the Sizewell C Project (referred to as the 'Application') in May 2020 (Ref. 1). The Application was accepted for examination in June 2020.

1.1.2 As part of the Application, SZC Co. developed a water supply strategy by engaging with stakeholders including the Environment Agency and Northumbrian Water Limited (trading locally as Essex and Suffolk Water ("ESW")) to consider potential water sources. This is set out in the **Water Supply Strategy** [APP-601]. This strategy recognised that there is likely to be insufficient potable water available locally to meet the full demands of the Project and identified options.

1.1.3 The **Water Supply Strategy Update** (**ES Addendum Volume 3, Appendix 2.2D**) [AS-202] considers this further and explains why all potable water sources apart from one (a new Sizewell transfer main from Barsham Water Treatment Works) have been discounted. Barsham Water Treatment Works is located in the neighbouring Northern/Central Water Resource Zone (WRZ). The Sizewell transfer main would be provided by ESW and does not form part of the proposed development in the Application.

1.1.4 For the early years of construction, while the Sizewell transfer main is being constructed, SZC Co.'s expectation was that ESW would be able to balance water between the Northern/Central WRZ and the local Blyth WRZ using existing network connections with no net increase in abstraction within the Blyth WRZ. However, ESW have now confirmed that this will not be feasible. A temporary supplementary potable water source is therefore necessary before the principal supply of water comes online.

1.1.5 The proposed change to the Application is therefore for a temporary construction-phase desalination plant. Desalination is the process of removing salt and other minerals from seawater. The desalinated water would then be treated as necessary to create potable water.

1.1.6 This report provides information to support the assessment of whether the proposed change to the Application (i.e. the proposal to construct a temporary construction-phase desalination plant) is compliant with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 2017/407) (Ref. 2) and whether the new proposals alter the conclusions of the DCO-stage **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623]. This is presented in

Section 3, which follows a summary of the construction, operation and decommissioning phases in **Section 2**. **Section 3** should therefore be read in conjunction with **Parts 1, 2**, **3** and **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620, APP-621, APP-622 and APP-623], which were provided in support of SZC Co. Application.

1.1.7 This report is the second addendum to the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620, APP-621, APP-622 and APP-623].and is a companion to the earlier addendum submitted in January 2021. The first addendum determined whether the design changes that were introduced following engage with the local authorities, environmental organisations, local stakeholder groups and the public, and additional assessments undertaken since submission of the Application in May 2020 would change the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620, APP-621, APP-622 and APP-623].

2 SCHEME DESCRIPTION

2.1 Introduction

2.1.1 The desalination process comprises the following core components, based on the construction and operational assumptions set out in the updated **Construction Method Statement** (Doc Ref. 6.3 (3A-3D(B) Ch)), pursuant of Requirement 8 of the DCO:

- Onshore desalination and associated equipment.
- Seawater intake pipe and associated headworks.
- Brine water outfall pipe and associated diffusers.

2.2 Description of proposed desalination plant

a) Onshore desalination and associated equipment

2.2.1 The temporary construction-phase desalination plant would create potable water using a Sea Water Reverse Osmosis (SWRO) system. This is based on a modularised containerised approach, the units of which can be transported to site by road vehicles. These units are then positioned on to hardstanding areas using mobile crane systems. Additional equipment such as the centrifuges and control facilities would need to be installed within weatherproof structures.

2.2.2 The permeate from the SWRO system is treated to produce potable water. This would require disinfection with sodium hypochlorite (or similar chemical) prior to extended retention in a chlorine contact tank to ensure the required level of bacteriological contaminants. The disinfected water would then be dosed with an alkali (e.g., hydrated lime or sodium hydroxide) and possibly carbon dioxide for pH adjustment and water stabilisation. This would be required to ensure that the water is non-corrosive and has low scaling potential. The treated water is then discharged into one of two potable water storage tanks ready for use.

2.2.3 The plant is required to produce potable water for the construction period. It is anticipated that the temporary construction-phase desalination plant would be used to provide a maximum potable water demand of approximately 2,600m^3 per day in Phase 1 and approximately 4,000m^3 per day in Phase 2 (see **section 2.3** for an explanation of phases).

b) Seawater intake pipe and associated headworks

2.2.4 A desalination plant typically converts 40% of the seawater it abstracts into fresh water. Therefore, the seawater intake pipe would be sized to abstract up to 10,000m^3 water per day. This requires a pipeline of approximately 35cm diameter. The pipe would extend approximately 490m seaward from the temporary sea defence in a minimum of 5m depth of water at lowest astronomical tide (LAT).

2.2.5 The seawater intake would consist of a Passive Wedge-Wire Cylinder (PWWC) screen with a mesh size of approximately 2mm to minimise debris carry over and fish entrainment. The screen would be approximately 60cm in diameter and the headworks would be approximately 1.6m in length. The headworks would be orientated to reduce the tidal forcing against the screens and minimise approach velocities.

2.2.6 The intake screen and pipework would be maintained by periodic cleaning using a compressed air cleaning system. Periodic shock chlorination within the headworks would be applied to prevent biofouling. Chlorine dosing would be flow controlled and angled inwards to minimise chlorine emissions to the environment. Abstracted water would be dechlorinated prior to the SWRO membranes.

2.2.7 Following abstraction of seawater from the intake structure, water would be pumped from the intake pumping station through buried pipework to the temporary construction-phase desalination plant.

c) Brine water outfall pipe and associated diffusers

2.2.8 As part of the desalination process, seawater of a high salinity or ‘brine’ would need to be discharged via a pumping station to the outfall. This requires a pipeline of approximately 35cm diameter. The outfall would be located approximately 390m seaward of the temporary sea defence in a minimum water depth of 4.5m at LAT.

2.2.9 The outfall diffusers are likely to be based on a ‘duck bill’ design to prevent intrusion of sand, sediment, saltwater and marine growth. The brine discharge is expected to have a maximum flow of 6,000m^3 per day (limited to Phase 2).

d) Other waste

2.2.10 Some low volumes of solids accumulated during the abstraction and treatment process would be generated via centrifuge technology. This dewatering step would produce a dewatered cake of approximately up to 25% dry solids which would require disposal offsite.

e) Operation and Maintenance

2.2.11 Key activities are relatively minimal and are likely to include:

- Routine inspection and maintenance of plant equipment within the temporary construction-phase desalination plant compound;
- Removal of sludge cake(s) for disposal via licenced disposal facilities offsite;
- Replacement of membranes;
- A Clean-In-Place operation every three months which would produce a liquid waste to be tankered off-site for disposal; and,
- replacement of cartridge filters from the SWRO prefiltration system on a quarterly basis.

2.3 Construction

2.3.1 The temporary construction-phase desalination plant would need to be located in two positions in a phased approach as the site develops. It would initially be located within the main platform of the proposed development (Phase 1), and then in the Temporary Construction Area (TCA) (Phase 2). These locations are shown in **Figure 2.1**. Construction of the desalination plant is anticipated to take place in Phase 1 and would involve the works completed at the headworks for both the intake and outfall tunnels.

2.3.2 The temporary construction-phase desalination plant infrastructure would consist of between six and nine containerised plant modules with associated chlorination units, equipment and other tanks. To install the modules, the following activities would be required:

- Enabling works, to include installation of local compound fencing and site clearance, creation of foundations and levelling of material;
- Use of mobile crane units to facilitate the construction of desalination plant modules and storage tanks; and,
- Delivery and emplacement of temporary buildings, including welfare and temporary site office accommodation (temporary buildings would use modular prefabricated buildings on concrete foundations).

2.3.3 It is proposed that the pipeline between the desalination plant pumping station and the marine heads is constructed using a directional drilling or other trenchless methodology. For directional drilling, this would consist of a drilling rig and ancillary equipment within a compound of compacted ground on the main construction area. Sheet piles would be used to provide the anchorage for the drilling rig and a small entry pit (approximately 1.5-2.0m deep) excavated adjacent to this.

2.3.4 Surface casing may be required for the first short section of borehole due to differing ground conditions. If this is required, a casing of a larger size than the final reaming hole would be installed (i.e. with a casing hammer) into dense sand and removed after pipe installation.

2.3.5 Bentonite slurry would be injected through the drill bit and circulated back around the outside of the drilling rods to the entry pit where this is pumped to the recycling unit to separate the cuttings for disposal. The profile of the drill would progress downwards from the landward side, run below the beach and seabed and return back out at the exit pit at the headworks location.

2.3.6 The pilot hole would be stopped short of the exit point so that the slurry is not lost to the sea. The pilot hole would then be enlarged through one or more reaming passes of progressively larger diameters. Once at the correct size, the hole would then be "punched out" by extending the drill assembly through the exit point. There may be a small amount of slurry lost to the sea.

2.3.7 For the installation of the pipes, a typical "pullback" method would be used where the pipe is floated out to sea and pulled into the borehole through the exit point using the drilling rig. The pipe would be fabricated in a single length.

2.3.8 Marine support works would be required for the excavation and preparation of the seabed exit pit (by backhoe dredger or similar), connection and installation of the pipeline to the pullback assembly, and installation of the intake and diffuser heads and backfill of the pits once the pipework is fully installed. This is likely to be undertaken via a barge or jack up barge, supported by workboats and divers.

2.3.9 The amount of dredging needed to complete these works is expected to be similar to that of the Fish Recovery and Return system (FRR) tunnels (i.e., $1850m^3$ to be dredged with sediment disposed on-site via a pipe that transports it 500m down drift (see **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] for further detail). This is a conservative assumption as the diameter of the plant intake and outfall pipelines (approximately 35cm) is smaller than the FRR pipeline (approximately 65cm). Prior to any marine works, surveys would be undertaken to confirm the seabed configuration and risk of unexploded ordnance (UXO).

2.3.10 For the construction of the sea water intake pumping station wet well, a shaft would be installed using a wet caisson method (or alternatively by sheet pile cofferdam) due to the ground water level. Chamber rings would be assembled at the top of the shaft on top of a sacrificial cutting edge before being sequentially excavated down utilising a grab or similar. The rings would be sunk to a clearance level above the installed pipe, and from there the caisson would be constructed downwards around the pipe using divers. To facilitate installation, an *in situ* concrete collar would be formed to act as a guide ring. Concrete would be tremmied to the bottom of the shaft to seal this before being emptied.

2.3.11 Use of workboat(s) or barge(s) to support placement of the intake structure and diffuser valve / head and installation of a temporary hazard marker at both the intake structure and diffuser valve / head would be required. Upon completion, appropriate securing armour and scour protection would be installed to manage the effects of seabed level changes.

2.4 Decommissioning and removal

2.4.1 The temporary construction-phase desalination plant could be used throughout the construction phase if required but would be decommissioned prior to the operation of the FRR system. This would consist of removal of on-site plant, removal of the intake and outfall heads in a similar process to the installation, as well as stopping up of the pipelines and filling via grouting or similar.

2.4.2 Decommissioning of the onsite plant would involve removal of the containerised plant modules via wagons and mobile cranes. Associated tanks would be stripped down to foundations and removed off site. The remaining concrete foundations would be broken up and crushed for storage on site and reused if required.

2.4.3 It is considered that the decommissioning activities would remain within the envelope of effects assessed for the construction phase and therefore decommissioning is not considered further within this assessment.

2.5 In-built control measures

2.5.1 To avoid confusion with the mitigation measures required under the WFD to deliver Good Ecological Potential (GEP) in Heavily Modified Water Bodies (HMWBs) as set out in the River Basin Management Plans (RBMPs), any additional mitigation measures required to prevent impacts on WFD parameters described in this report will be referred to as “control measures”.

2.5.2 A **Code of Construction Practice** (CoCP) (Doc Ref 8.11D)], secured pursuant to Requirement 2 of the DCO, has been developed to guide the proposed construction works for the Project and therefore is also relevant to the construction of the temporary construction-phase desalination plant. This document is in three parts as follows, two of which are relevant for construction activities at the main development site (and therefore construction of the temporary construction-phase desalination plant):

- CoCP Part A: Site Wide Controls: sets out the purpose and scope of the CoCP and describes the measures and procedures that are applicable across the Sizewell C Project. Part A would be applied across all Sizewell C construction works including the temporary construction-phase desalination plant.
- CoCP Part B: Main development site: describes the specific controls that apply to the main development site, and supplement and refine the controls set out in Part A.

2.5.3 The CoCP includes a suite of measures that are designed to protect the biology, hydromorphology, physico-chemistry and chemistry of surface waters and the quality of groundwater. These measures, which would also apply during the construction and operation of the temporary construction-phase desalination plant, are summarised in

Table 2.1 Summary of measures outlined in the CoCP with relevance to WFD Compliance

Topic	WFD quality elements	Measure
Terrestrial ecology	Hydromorphology, physico-chemistry, chemistry and biology	During the construction phase, the management and storage of spoil and other materials to have regards to the measures outlined in the Outline Landscape and Ecology Management Plan (itself secured pursuant to Requirement 14 of the DCO).
	Physico-chemistry, chemistry and biology	Guidance for Pollution Prevention (GPPs) will be followed for all works.
Soils and agriculture	Hydromorphology, physico-chemistry, chemistry and biology	Earthworks: Ensure soils are stripped and handled in the driest condition possible.
		Ensure protection of stockpiles from erosion and tracking over.
		All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters.
Geology and land quality	Hydromorphology, physico-chemistry, chemistry and biology Groundwater quality	Additional ground investigation would be undertaken to inform the final design of the proposed development and to confirm the ground conditions and contamination status of the site
		Remediation of soil and groundwater contamination would be undertaken prior to construction (e.g. source removal, treatment or capping) if deemed necessary
		Recording of any pollution incidents or contamination found either on- or offsite, and the action taken to resolve the situation.
		Storage and stockpiling of made ground and natural materials separately and where necessary on impermeable surfaces and covered depending on the level of contamination.
		All temporary stockpiles would be managed to prevent soil erosion, windblown dust and surface water run-off by methods such as capping, sealing or covering stockpiles, fencing, hydroseeding, dampening down and avoiding over stockpiling to reduce compaction of soil and loss of integrity.
		The area and duration of soil exposure would be minimised and timely reinstatement of vegetation or hardstanding would be undertaken to prevent soil erosion and reduce temporary effects on soil compaction.
		Appropriate pollution incident control e.g. plant drip trays, bunding and spill kits would be implemented

Topic	WFD quality elements	Measure
		Appropriate and safe storage of fuel, oils and equipment would be implemented in accordance with the Environment Agency's guidance and best practice.
		Appropriate working methods would be implemented during construction to ensure that there is no surface water run-off from the works or any stockpiles into adjacent surface watercourses or leaching into underlying groundwater in accordance with best practice.
Groundwater and surface water	Hydromorphology, physico-chemistry, chemistry and biology Groundwater quality and Groundwater Dependent Terrestrial Ecosystems (GWDTE)	For earthworks and construction works - The wheels of all vehicles would be washed before leaving site. It is assumed that the wheels of all vehicles delivering materials to site would be washed on departure from their point of origin.
		Protection of watercourses - Buffer zones would be established adjacent to watercourses prior to commencement of work within 50m of a watercourse or within flood zones 2 or 3.
		A risk assessment for all works within surface water buffer zones shall be carried out and for any use of cementitious materials within 50m of any active watercourse or within flood zones 2 or 3.
		Concrete and cement mixing and washing areas would be situated at least 10m away from surface water receptors. These would incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment would be undertaken in a contained area, and all water would be collected for off-site disposal.
		Adequate drainage systems would be installed prior to construction works with appropriate treatment prior to discharge. This would include sediment treatment and the inclusion of oil separators where necessary.
		The drainage system would be appropriately maintained throughout the works such that it remains efficient. Sediment would go to sediment lagoons.
		Sustainable drainage - incorporate sustainable drainage measures such as swales, filter drains, detention basins and soakaways to promote infiltration.
		Measures taken to prevent the deposition of silt or other material arising from work operations in existing watercourse or catchment areas would accord with principles set out in industry guidelines, including GPP.
		Appropriate storage and disposal of wastes would be undertaken in accordance with current guidance.

Topic	WFD quality elements	Measure
		Foul water management – prior to construction of the Combined Drainage Outfall (CDO), foul water would be collected and tankered away offsite for suitable disposal.

3 WFD COMPLIANCE ASSESSMENT

3.1 Method

3.1.1 This assessment uses the three stage method described in detail in **Part 1** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620]. This method, which is based on best practice guidance from the Environment Agency (Ref. 3) and the Planning Inspectorate (Ref. 4) includes three stages:

- Stage 1 Screening: this stage consists of an initial screening exercise to divide the proposed activity into components and identify relevant water bodies which have the potential to be impacted by the construction and operation of each component.
- Stage 2 Scoping: this stage identifies whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1.
- Stage 3 Detailed Assessment: this stage determines whether any activities that have been put forward from Stage 2 have the potential to cause deterioration and whether this deterioration will have a significant non-temporary effect on the status of one or more WFD quality elements at water body level.

3.1.2 The outcomes of each stage of the assessment are described in the subsequent sections.

3.2 Stage 1 Screening

3.2.1 This section divides the construction and operation of the proposed temporary construction-phase desalination plant into activities for assessment and identifies the WFD water bodies that are potentially at risk. As outlined in **section 2**, decommissioning activities are considered likely to be within the envelope of effects assessed during the construction phase so are not considered further here.

a) Activities

3.2.2 The works for the proposed change have been separated into activities in line with the requirements of Clearing the Waters for All (Ref. 3). These are listed in **Table 3.1**.

Table 3.1 Activities identified for assessment

Reference Number	Activity	Sub-activities included
Construction		
C1	On land site preparation and construction of plant	Enabling works which include installation of local compound fencing and site clearance, creation of foundations and levelling of material, use of mobile crane units to facilitate the construction of desalination plant modules and storage tanks; and delivery and emplacement of temporary buildings, including welfare and temporary site office accommodation (temporary buildings would use modular prefabricated buildings on concrete foundations). Also includes compound for directional drilling.
C2	Construction of marine structures	Includes directional drilling exit, headworks for intake and outfall structures
Operation		
O1	Presence of desalination plant	This includes onshore presence of plant and supporting infrastructure
O2	Presence and operation of marine structures	This includes all marine structures including the potential effects associated with water intake and brine discharges

b) Water bodies

3.2.3 **Figure 3.1** shows the WFD water bodies in the vicinity of the desalination plant and supporting infrastructure. The water bodies potentially at risk are identified as:

- Waveney and East Suffolk Chalk and Crag groundwater body (GB40501G400600). This groundwater body underlies the onshore elements of the proposed temporary construction-phase desalination plant.
- Suffolk coastal water body (GB650503520002). The marine structures would be located within this water body.
- Leiston Beck (GB105035046271). The Phase 1 and Phase 2 locations for the desalination plant are within this water body catchment and the pipeline would need to cross this water body.

- Minsmere Old River (GB105035046270). This water body catchment would not contain any elements of the proposed temporary construction-phase desalination plant. However, the water body is downstream of and in hydrological connectivity with Leiston Beck.

3.2.4 These water bodies have therefore been screened in for further assessment. Potential impacts arising from each activity are considered in more detail in Stage 2 (**section 3.3**).

3.3 Stage 2 Scoping

a) Purpose of this section

3.3.1 This section presents the result of the scoping assessment undertaken on the water bodies identified in **section 3.2** using the method outlined in **section 3.1** and in more detail in **Part 1** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620].

3.3.2 This assessment examines the potential for activities to impact upon WFD water bodies and their quality elements. The results of this scoping stage determine which water bodies and quality elements will require further assessment as part of the Stage 3 Compliance Assessment.

3.3.3 It may be possible for relatively straightforward reasons (e.g. no identifiable impact pathway) to scope out some scheme activities during Stage 2 of the WFD Compliance Assessment process. However, to do so requires sufficient project information to be available to allow reasoned and clear conclusions to be reached. Where there is uncertainty over the potential for an activity to have an effect, then a precautionary view has been taken, and the activity scoped in for further assessment.

b) Impacts of project activities on water body quality elements

3.3.4 The scoping stage considers the following WFD water bodies:

- Waveney and East Suffolk Chalk and Crag groundwater body (GB40501G400600). This groundwater body underlies the development and could be impacted by C1 and O1.
- Suffolk coastal water body (GB650503520002). The marine structures would be located within this water body and therefore could be impacted by C2 and O2
- Leiston Beck (GB105035046271). The two locations are within this water body catchment and the pipelines would cross under this water body. This water body could therefore be impacted by C1 and O1.

- Minsmere Old River (GB105035046270). Although the desalination plant is not located within the catchment of this water body, its hydrological connectivity to Leiston Beck means that any effects resulting from C1 and O1 could potentially also affect this water body.

i. Assessment of potential mechanisms for impact

3.3.5 The scoping questions presented in **Part 1** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-620] have been applied to each water body individually for each of the construction and operational stage activities listed in **Table 3.1**. The results of the scoping assessment are provided in **Appendix A** of this document and summarised in **Table 3.2**.

Table 3.2 Summary of scoping for water body quality elements

Activity	Water bodies	Summary of findings	Further assessment required?
Construction			
C1 On land site preparation and construction of plant	Leiston Beck (GB105035046271) Minsmere Old River (GB105035046270) Waveney and East Suffolk Chalk and Crag (GB40501G400600)	Scoped out given control measures to be put in place and use of directional drilling to install pipelines	No
C2 Construction of marine structures	Suffolk (GB650503520002)	Scoped out as effects would be localised to the activity and temporary	No
Operation			
O1 Presence of desalination plant	Leiston Beck (GB105035046271) Minsmere Old River (GB105035046270) Waveney and East Suffolk Chalk and Crag (GB40501G400600)	Scoped out – no mechanism for impact	No
O2 Presence and operation of	Suffolk (GB650503520002)	There is the potential for effects on water quality (physico-chemistry and	Yes

marine structures		chemistry) and biology (habitats)	

c) Impacts of project activities on Invasive Non-native Species (INNS)

3.3.6 Any activities which use equipment that has been used on another site where INNS species are located could potentially be at risk of spreading INNS. Non-native species can also be introduced in ballast water of construction vessels if not treated effectively.

3.3.7 Section 14(2) of the Wildlife and Countryside Act 1981 makes it illegal to plant or otherwise cause to grow in the wild any plant which is included in Part II of Schedule 9 of the Act.

3.3.8 The **Code of Construction Practice** (CoCP) (Doc Ref 8.11) [APP-615], secured pursuant to Requirement 2 of the DCO, will include measures to ensure that INNS risks are managed effectively. These will include:

- Contractors will be required to undertake a biosecurity risk assessment and a management plan put in place to avoid potentially facilitating the spread of non-native species during construction.
- A general strategy will be to establish a viable vegetation cover quickly, before invasive plant species can become established. Any invasive species that colonise an area during construction will be removed and disposed of as required.
- Any imported soils will be subject to appropriate control processes to ensure they are free of any seeds / roots / stems of any invasive plant covered under the Wildlife and Countryside Act 1981.
- The potential for non-native species to be introduced during ballast water activities will be managed by compliance with the International Maritime Organisation (IMO) Ballast Water Management Convention.

3.3.9 As a result, the risk of introducing INNS is not considered further within the WFD Compliance Assessment.

d) Impacts of project activities on RBMP improvement and mitigation measures

3.3.10 **Table 3.3** summarises the mitigation measures for HMWBs and improvement measures (for other water bodies) identified in the RBMP for each of the water bodies considered in the scoping assessment (**section 3.3**).

Table 3.3 RBMP mitigation or improvement measures identified for each water body

WFD water body	RBMP mitigation measure (in place)	RBMP mitigation measure (not in place)
Leiston Beck GB105035046271	None identified	Remove obsolete structure Remove or soften hard bank Preserve or restore habitats In-channel morph diversity Re-opening culverts Alter culvert channel bed Flood bunds Set-back embankments Floodplain connectivity Fish passes Reduce fish entrainment Enhance ecology Changes to locks etc. Selective vegetation control Vegetation control Vegetation control timing Invasive species techniques Retain habitats Sediment management strategy Maintain channel bed / margins Woody debris Water level management Align and attenuate flow
Minsmere Old River GB105035046270	Selective vegetation control Vegetation control Vegetation control timing Invasive species techniques Sediment management strategy	Remove obsolete structure Remove or soften hard bank Preserve or restore habitats In-channel morph diversity Re-opening culverts Alter culvert channel bed Flood bunds Set-back embankments Floodplain connectivity Fish passes Reduce fish entrainment Enhance ecology Changes to locks, etc. Retain habitats Maintain channel bed / margins Woody debris Water level management Align and attenuate flow Educate landowners
Suffolk GB650503520002	None identified	None identified
Waveney and East Suffolk Chalk and Crag GB40501G400600	None identified	None identified

3.3.11 **Table 3.3** demonstrates that the RBMP does not identify any mitigation or improvement measures for the Suffolk coastal and Waveney and East Suffolk Chalk and Crag groundwater bodies. However, the RBMP does identify several sediment and vegetation management measures that are in place (i.e. currently undertaken) in the Minsmere Old River, and identified a suite of measures that are required (but not yet implemented) to improve hydromorphological conditions and in-channel habitats in the Leiston Beck and Minsmere Old River water bodies.

3.3.12 An assessment of potential impacts from the proposed development on the mitigation measures identified in the RBMP for the Leiston Beck and Minsmere Old River water bodies is presented in **Table 3.4**. This demonstrates that the proposed temporary construction- phase desalination plant would not prevent the future implementation of the majority of the RBMP mitigation measures that are not yet in place in Leiston Beck or the Minsmere Old River.

Table 3.4 Potential impacts on mitigation measures identified in the RBMP for Leiston Beck and the Minsmere Old River

<table>
<tr><th>RBMP mitigation measure</th><th>Leiston Beck (GB105035046271)</th><th>Minsmere Old River (GB105035046270)</th></tr>
<tr><td>Remove obsolete structure</td><td colspan="2">No mechanism for impact identified – the activity will not install any new structures in the river channel.</td></tr>
<tr><td>Remove or soften hard bank</td><td colspan="2">No mechanism for impact – the activity will not affect the banks of the watercourse.</td></tr>
<tr><td>Preserve or restore habitats</td><td colspan="2">No mechanism for impact – the activity will not directly interact with the river channel or prevent the improvement of in-channel habitats.</td></tr>
<tr><td>In-channel morphological diversity</td><td>No mechanism for impact – the use of directional drilling techniques for watercourse crossings will prevent impacts on channel morphology and will not therefore prevent the implementation of improvements to in-channel morphological diversity in the future.</td><td>No mechanism for impact – the activity will not directly interact with the river channel or prevent the enhancement of in-channel morphological diversity.</td></tr>
<tr><td>Re-opening culverts</td><td colspan="2">No mechanism for impact identified – the activity will not install any new structures in the river channel or prevent the opening of existing culverts.</td></tr>
<tr><td>Alter culvert channel bed</td><td colspan="2">No mechanism for impact identified – the activity will not install any new structures in the river channel or prevent the modification of existing culverts.</td></tr>
<tr><td>Flood bunds</td><td colspan="2">No mechanism for impact – the activity will not affect existing flood defences.</td></tr>
<tr><td>Set-back embankments</td><td colspan="2">No mechanism for impact – the activity will not affect existing flood defences or prevent them being set back in the future.</td></tr>
<tr><td>Floodplain connectivity</td><td colspan="2">No mechanism for impact identified – the activity will not introduce new barriers to floodplain connectivity or prevent the improvement of connectivity in the future.</td></tr>
<tr><td>Fish passes</td><td colspan="2">No mechanism for impact identified – the activity will not install any new structures in the river channel or prevent the installation of fish passes on existing structures.</td></tr>
<tr><td>Reduce fish entrainment</td><td colspan="2">No mechanism for impact identified – the activity will not abstract water from the river channel or prevent measures to reduce entrainment from existing abstractions.</td></tr>
</table>

RBMP mitigation measure	Leiston Beck (GB105035046271)	Minsmere Old River (GB105035046270)
Enhance ecology	No mechanism for impact – the activity will not directly interact with the river channel or prevent the improvement of in-channel habitats.	
Changes to locks, etc.	No mechanism for impact identified – the activity will not install any new structures in the river channel or prevent the modification of existing structures.	
Selective vegetation control	No mechanism for impact – the activity will not directly interact with the river channel or prevent the implementation of vegetation control measures in the future.	No mechanism for impact – the activity will not directly interact with the river channel or reduce the effectiveness of existing vegetation control measures.
Vegetation control	No mechanism for impact – the activity will not directly interact with the river channel or prevent the implementation of vegetation control measures in the future.	No mechanism for impact – the activity will not directly interact with the river channel or reduce the effectiveness of existing vegetation control measures.
Vegetation control timing	No mechanism for impact – the activity will not directly interact with the river channel or prevent the implementation of vegetation control measures in the future.	No mechanism for impact – the activity will not directly interact with the river channel or reduce the effectiveness of existing vegetation control measures.
Invasive species techniques	No mechanism for impact – the activity will not directly interact with the river channel or prevent the implementation of invasive species control measures in the future.	No mechanism for impact – the activity will not directly interact with the river channel or reduce the effectiveness of existing invasive species control measures.
Retain habitats	No mechanism for impact – the activity will not directly interact with the river channel or prevent the retention of habitats during channel maintenance.	
Sediment management strategy	No mechanism for impact – the activity will not directly interact with the river channel, increase sediment supply in the catchment (as a result of the control measures set out	No mechanism for impact – the activity will not directly interact with the river channel, increase sediment supply in the catchment, or reduce the effectiveness of existing sediment management strategies.

RBMP mitigation measure	Leiston Beck (GB105035046271)	Minsmere Old River (GB105035046270)
	in **section 2.5**), or prevent the future implementation of a sediment management strategy.	
Maintain channel bed / margins	No mechanism for impact – the activity will not directly interact with the river channel or prevent the retention of the bed and margins during channel maintenance. The use of directional drilling for any watercourse pipeline crossings will prevent further disturbance of the channel bed and banks.	No mechanism for impact – the activity will not directly interact with the river channel or prevent the retention of the bed and margins during channel maintenance.
Woody debris	No mechanism for impact – the activity will not directly interact with the river channel or prevent the retention of woody debris during channel maintenance.	
Water level management	No mechanism for impact – the activity will not affect existing water levels or prevent their management in the future.	
Align and attenuate flow	No mechanism for impact – the activity will not affect existing discharges or prevent their improved management in the future.	
Educate landowners	No mechanism for impact on measures to educate landowners identified.	

e) Impacts of project activities on protected areas

i. Protected areas in each water body

3.3.13 The Environment Agency's 'Clearing the Waters For All' guidance (Ref. 3) recommends further assessment of potential impacts on any protected areas that are within 2km of a proposed new project activity. This 2km Zone Of Influence (ZOI) has been adopted across all water bodies for each project activity and the results of the process are shown in **Figure 3.2** and summarised in **Table 3.5**.

Table 3.5 List of protected areas within 2km of the proposed activities

Water body name and ID number	Protected Area Driver	Protected area name/reference
Waveney and East Suffolk Chalk and Crag GB40501G400600	Nitrates Directive	Nitrate Vulnerable Zones (NVZ) 78,166
Suffolk GB650503520002	Conservation of Wild Birds Directive	Outer Thames Estuary Special Protected Area (SPA). Minsmere-Walberswick SPA and Ramsar.
	Habitats and Species Directive	Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC)
	Nitrates Directive	NVZ 661
Leiston Beck GB105035046271	Nitrates Directive	NVZ 415, 661
	Habitats and Species Directive	Minsmere to Walberswick Heaths and Marshes SAC
	Conservation of Wild Birds Directive	Minsmere-Walberswick SPA and Ramsar. Sandlings SPA

ii. Assessment for potential mechanism for impact

3.3.14 Several Natura 2000 protected areas are located within the 2km ZOI. WFD Compliance Assessments require the consideration of the potential effects on WFD quality elements (hydromorphological, physico-chemical, chemical and biological), many of which support ecological interest features for which the Natura 2000 protected areas are designated. The Shadow Habitats Regulations Assessment Report (Doc. Ref. 5.10 Ad 3 Ch) therefore builds on the output of this assessment to assess the potential effects on designated site interest features. Therefore, to avoid duplication, impacts on the designated site interest features themselves are not considered here.

3.3.15 The following areas protected under other Directives are located within the ZOI and are not considered elsewhere:

- Surface water NVZ 415 and 661.
- Groundwater NVZ 78 and 166.

3.3.16 With respect to NVZs 415, 417, 661 and 166, foul water generated on site could release nitrates and other nutrients if discharged, untreated to the water environment. However, all foul waters generated during construction and operation would be contained and/or adequately treated to ensure that the project activities would not result in the release of significant quantities of nitrates and other nutrients. Therefore, all protected areas have been scoped out of the assessment.

f) Summary of Stage 2

3.3.17 **Table 3.6** summarises the activities and quality elements scoped in to Stage 3.

Table 3.6 Summary of scoping

Activity	Water body	Quality elements	RBMP mitigation measures	Protected areas
C1: On land site preparation and construction of plant	Leiston Beck (GB105035046271) Minsmere Old River (GB105035046270) Waveney and East Suffolk Chalk and Crag (GB40501G400600)	Scoped out	Scoped out	Scoped out
C2: Construction of marine structures	Suffolk (GB650503520002)	Scoped out	Scoped out	Scoped out
O1: Presence of desalination plant	Leiston Beck (GB105035046271) Minsmere Old River (GB105035046270) Waveney and East Suffolk Chalk and Crag (GB40501G400600)	Scoped out	Scoped out	Scoped out
O2: Presence and operation of marine structures	Suffolk (GB650503520002)	Scoped in: Physico-chemistry: General, specific pollutants, chemical and biology	N/A	Scoped out

3.4 Stage 3 Detailed Assessment

a) Introduction

3.4.1 **Section 3.3.16f)** demonstrates that operational discharges from the temporary construction-phase desalination plant could potentially impact upon the biology, physico-chemistry and chemistry and subsequently marine habitats of the Suffolk coastal water body. This section presents a further assessment to determine whether the activity could affect water body status, and also considers the potential for cumulative effects with other aspects of the Sizewell C project.

b) Suffolk coastal water body: baseline

3.4.2 **Table 3.7** provides a summary of the baseline status information for the Suffolk coastal water body from Catchment Data Explorer (Ref. 5). More detailed information for this water body is provided in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621].

Table 3.7 latest classification information for the Suffolk coastal water body

Parameter	Suffolk coastal water body GB650503520002
Water body area (km^2)	146.5
Overall water body status (2019)	Moderate
Ecological Status	Moderate (dissolved inorganic nitrogen DIN)
Chemical status	Fail (Polybrominated diphenyl ethers (PBDE), mercury and its compounds)
Target water body status and deadline	Moderate (2015)
Hydromorphology status of water body	Not assessed
Is the water body designated as heavily modified or artificial? If so record reason	Heavily modified (coastal and flood protection)
Lower sensitivity habitats[1]	Cobbles, gravel and shingle (1929.57ha), intertidal soft sediment (816.46ha), rocky shore (1.78ha), subtidal sediments (10569ha)
Higher sensitivity habitats[2]	Polychaete reef (11.57ha), saltmarsh (197.49ha),
Phytoplankton classification	Good
History of harmful algae	Not monitored

3.4.3 Salinity at Sizewell follows an annual trend with lowest values observed in Winter months. The mean annual salinity is 33.3psu (practical salinity units)

[1] Higher sensitivity habitats include chalk reef; clam, cockle and oyster beds; intertidal seagrass; maerl; mussel beds, including blue and horse mussel; polychaete reef; saltmarsh; subtidal kelp beds; subtidal seagrass

[2] Lower sensitivity habitats include cobbles, gravel and shingle; intertidal soft sediments like sand and mud; rocky shore; subtidal boulder fields; subtidal rocky reef; subtidal soft sediments.

whilst the 5th percentile Winter salinity is 31.7psu (**Section 21.4B.b** of **Volume 2**, **Chapter 21** of the **ES** [APP-314]).

c) Detailed assessment: O2 Presence and operation of marine structures

i. Introduction

3.4.4 This activity includes the physical presence of the marine structures and their operation, however, only effects associated with the discharge were identified in **Appendix A** as at risk of impacting WFD compliance parameters (see **Table 3.8**). This assessment therefore focuses on this sub-activity.

Table 3.8 Summary of water bodies, quality elements, RBMP measures and protected areas scoped in for further assessment O2

Water body	Quality elements	RBMP measures	Protected areas
Suffolk coastal water body	Water quality (chemistry and physico-chemistry) and biology (habitats) associated with the discharge of reject water	None identified	Scoped out

d) Discharge characteristics

3.4.5 Approximately 60% of the abstracted seawater would be discharged back into the sea and would consist of concentrated saline water, increased concentrations of naturally occurring metals as well as added phosphorus. The maximum flow rate has been identified as 6,000m^3 per day and the anticipated concentrations of parameters within the discharge are shown in **Table 3.9**. The discharge is also predicted to have an approximate salinity of 53psu.

Table 3.9 Maximum concentrations of substances likely to be present in the reject water

Substance	Maximum concentration (µg/l)	Maximum total concentration (µg/l)	Marine Environmental Quality Standard (EQS) (µg/l)	Marine background concentration (µg/l)
Aluminium	19.6	21.52	24 (AA)[3]	12
Arsenic	1.71	4.17	25 (AA)[4]	1.07
Cadmium	0.08	0.08	0.2(AA) 1.5(MAC)	0.05

[3] Annual Average (AA)

[4] Maximum allowable concentration (MAC)

Substance	Maximum concentration (µg/l)	Maximum total concentration (µg/l)	Marine Environmental Quality Standard (EQS) (µg/l)	Marine background concentration (µg/l)
Chromium	0.93	2.94	0.6(AA) 32(MAC)	0.57
Copper	3.55	4.8	3.76(AA)	2.15
Iron	165	2352	1000(AA)	<100
Lead	-	3.38	1.3(AA) 14(MAC)	2.07
Mercury	0.03	0.03	0.07 (MAC)	0.02
Nickel	1.3	2.70	8.6(AA)	0.79
Zinc	24.95	31.66	6.8(AA)	15.12
Ammoniacal nitrogen	18.02	n/A	21 (AA)	11.38
Boron	4929	4956	7000 (AA)	4225

i. Physico-chemistry (salinity)

3.4.6 To consider the potential impacts of the discharge, modelling using the USEPA supported CORMIX mixing zone model was undertaken. A conservative approach of modelling a single riser discharge 1m off the seabed was considered representative of a worst-case discharge scenario. Although the discharge would be highly saline, the results indicate that excess salinity falls to within 1psu of background levels within approximately 6-10m from the discharge location. As a result, a non-temporary deterioration in physico-chemistry of the Suffolk water body on a water body scale is not predicted.

ii. Chemistry

3.4.7 As detailed in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], the concentrations of substances present in the discharge are assessed against a list of specific pollutants and compared to their EQS. For substances that breech the EQS (test 1) a further test (test 5) considers the initial dilution of the substance on discharge, however, given the higher salinity of the discharge, test 5 is not suitable for a negatively buoyant plume.

3.4.8 Cefas in TR552 (Ref. 6), however, applied test 5 to provide an indication of the priority order of substances for modelling. The maximum concentration values were therefore based on the total daily loading for each chemical, divided by the total volume of concentrate produced and discharged over a 24 hour period. The results are presented in **Table 3.10**.

Table 3.10 Summary of results for Tests 1 and 5

Substance	Maximum total concentration (µg/l)	Test 1 <100% EQS)	Test 5 (EVF<AEVF)[5]
Aluminium	21.52	0.9	0.12
Arsenic	4.17	0.17	-
Cadmium	0.08	0.41	-
Chromium	2.94	4.9	6.76
Copper	4.8	1.28	0.21
Iron	2352	2.35	0.18
Lead	3.38	2.6	N/A note that the background concentration is higher than the EQS (see Part 2)
Mercury	0.03	0.48	0.05 (although less than 1 in test 1, precautionary assessment considered all parameters where the result of test 1 was close to or greater than 0.5.
Nickel	2.70	0.31	-
Zinc	31.66	4.65	N/A note that the background concentration is higher than the EQS (see Part 2)
Ammoniacal nitrogen	N/A	0.014	-
Boron	4956	0.71	0.12

3.4.9 **Table 3.10** indicates that chromium would fail screening test 5 and zinc and lead were also further investigated because the high background values for both these metals were already shown to exceed EQS levels.

3.4.10 To consider the impact of the parameters identified in **Table 3.10** further, modelling was undertaken using CORMIX. Given that lead and zinc are already above EQS and chromium is very close to exceeding EQS in the baseline, the threshold for modelling was set at the limit at which the parameter would no longer be detected above the background concentration.

3.4.11 Additionally, to investigate how the plume evolves over the state of the tide, multiple stages of the tide were considered: peak flood, peak ebb, high water, and low water. As the water depth at the discharge is 5.8m, the modelling identified a risk of seabed impacts from slack water pooling at low water, where the depths and low velocities will inhibit mixing. Therefore,

[5] Test 5 divides the concentration of a substance and volume discharged in litres/second (the discharge specific Effective Volume Flux, EVF) by its EQS minus background concentration in micrograms/per litre (the location specific Allowable Effective Volume Flux, AEVF). If the EVF is not greater than the AEVF, then the discharge is screened out. The AEVF references the discharge depth, and this value can be up to a maximum of 3.5m. For Sizewell, the water depth at the desalination outfall concentrate headworks discharge relative to chart datum is 4.2m therefore a maximum value of 3.5m was used as the AEVF.

a sensitivity analysis around low water was conducted, with tidal flows at 0.5, 1 and 2 hours either side of low water. The results are presented in Error! Reference source not found..

Table 3.11 Summary of results

Substance	Distance at which EQS is reached (m)	Area of WFD water body (ha)
Chromium	38.5[6]	0.08
Lead	11-20	0.02
Zinc	13-25	0.03

3.4.12 Based on the assumption that the maximum plume extent of 38.5m (for chromium) represents the radius of a circle around the discharge point, the maximum bounding area affected by substances in the desalination discharge is precautionarily estimated as <0.5 ha. This equates to less than 0.003% of the water body area. Overall, therefore, given that only a small area of the water body would be impacted for the period during which the plant is operating, a non-temporary deterioration in the WFD water body is not predicted. It should also be noted that chromium, lead and zinc are not added to water as part of the desalination process; instead, these substances are already present in the intake water and become concentrated through the membranes.

3.4.13 It should be noted that the modelling is considered conservative because:

- Additional mixing and dilution due to waves is not accounted for.
- The maximum daily discharge volume of 6000m^3/d was modelled which is only required during Phase 2.

Annual loads

3.4.14 With respect to total annual loads, concentrate discharges are 0.07kg for mercury and 0.18kg for cadmium. Based on estimates of annual construction discharges including these trace metals, a total cumulative load for cadmium over 3.5 years of the construction period was 0.45kg and for mercury was 0.05 kg (**Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]). The combined source loadings for cadmium (0.63kg) and mercury (0.12kg) therefore do not exceed significant annual loads (in discharges) of 5kg/year for cadmium and 1kg/year for mercury.

[6] Note, for some conditions the EQS may not be reached as the CORMIX simulation reaches a condition of tidal state reversal and the plume cannot propagate any further. This occurs at low water for chromium with concentrations of 0.61 µg/l extending approximately 38.5m, compared to an EQS of 0.6 µg/l.

iii. Nutrients and phytoplankton

3.4.15 Descaling chemicals used for cleaning the RO membranes contain phosphorus so this, together with the phosphorus already present in the abstacted seawater, is also present in the reject water at approximately 20kg per day. Based on the seawater natural nitrogen background levels, the RO process also results in increased nitrogen concentrations of approximately 0.6kg per day in the desalination discharge.

3.4.16 The nitrogen and phosphorus inputs from the desalination process were considered together with other construction activity inputs (treated sewage and groundwater) and the total loading was evaluated in an annual assessment using the combined phytoplankton and macroalgal model (see **Part 2 WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] for more detail). The additional nutrient loading of the desalination discharge during the construction period is predicted to result in a 0.17% increase in annual production in Sizewell Bay relative to the baseline situation including Sizewell B.

3.4.17 The combination of construction period nutrient inputs from treated sewage and groundwater with those for desalination, result in an increase of 0.39% in production relative to the current baseline with Sizewell B. However, despite these additional nutrient inputs there is still an overall reduction in production in Sizewell Bay due to the influence of Sizewell B. The influence of Sizewell B in reducing production in Sizewell Bay and the small positive additions to production that would occur due to nutrient inputs from construction and desalination would not be detectable against a natural background and therefore, a non-temporary deterioration in the water body is not predicted.

iv. Biology (habitats)

3.4.18 With respect to salinity, changes in excess of 1psu would be restricted to within only 10m of the discharge point. Exposure to salinity changes would therefore be extremely small for all benthic invertebrate populations. Moreover, a study of macroinvertebrate communities located inside a 10m saline plume of a desalination plant found that they were not significantly different from communities at control sites with ambient salinity (Ref. 7). This suggests that, even within the very small plume footprint, it is unlikely that benthic invertebrate communities would be significantly affected by the saline discharge. As a result, a non-temporary deterioration in benthic invertebrates on a water body scale is not predicted.

3.4.19 As outlined above, three metals (zinc, chromium and lead) are predicted to be in excess of EQS or applied thresholds as a result of the desalination discharge. Notably, background levels of lead and zinc are above their respective EQS levels and therefore an assessment was made relative to background levels.

3.4.20 Exposure to moderate concentrations of heavy metals can produce a variety of non-lethal effects on benthic organisms, however, benthic invertebrates were determined to be not sensitive to discharges of heavy metals (chromium and zinc) from the CDO, primarily because of the highly restricted spatial extent of the plume and, thus, the very limited exposure to the pressure at the population level (see **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]). Given the small areas over which the effects would occur and the temporary nature of the discharge, a non temporary effect on benthic invertebrates is not predicted on a water body scale.

e) Detailed assessment: Cumulative effects assessment

i. Introduction

3.4.21 Consideration of the risk of within project cumulative effects identified that there is the potential for the discharge from the desalination plant to combine with the discharge from the CDO.

3.4.22 Additionally, dredging for the desalination plant intake and outfall heads would not interact with other project activities such as dredging for the FRR heads or CDO because of timescales, however, it could coincide with maintenance dredging for the enhanced permanent Beach Landing Facility (BLF).

3.4.23 Note that the desalination plant is only required for the construction phase of Sizewell C (and structures would be removed during decommissioning of the desalination plant) therefore effects during the powers station operational phase are screened out of this assessment.

ii. Cumulative effects assessment with the CDO

3.4.24 Consideration has been given the combined discharges of both the CDO and the desalination plant, as both are discharging some of the same chemicals assessed in the CORMIX modelling (i.e. zinc, chromium, and lead).

3.4.25 The easting of the desalination outfall places it approximately 300m to the south of the CDO meaning the discharges of both follow the same hydrodynamic streamline. The desalination intake is offset from the CDO by approximately 100m east.

3.4.26 Previous CORMIX modelling of chromium and zinc discharges from the CDO (see **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621])) highlight that chromium would fall below the EQS within 25m and zinc within 3m of the discharge point. CORMIX modelling of the desalination plant indicates that chromium would fall below the EQS within 38.5m and zinc would fall below the limit of detection with 24.9m from the point of discharge. As such, the likelihood of the two plumes combining at levels above the EQS is very low, given the two outfalls are separated by 300m. Overall therefore, a non temporary deterioration resulting from these discharges combining is not predicted.

iii. Cumulative effects assessment with dredging for the enhanced BLF

3.4.27 If dredging activities occur simultaneously, suspended sediment concentrations and sedimentation rate changes may increase. The impact of combined dredge plumes for the BLF maintenance and dredging for the FRR was modelled and the results reported in **Part 2** (**Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621])). It was concluded that the effect due to the temporal coincidence of the dredging activities would not result in additional effects. Overall therefore, a non-temporary deterioration on a water body scale is not predicted.

f) Summary

3.4.28 The assessment presented in the previous sections demonstrates that the Stage 3 assessment did not identify any parameters at risk of deterioration such that class status for any of the parameters would decrease. As a result, the proposed activities alone and in combination with other construction-stage activities, are considered to be compliant with the requirements of the WFD.

3.4.29 This means that the proposed addition of a temporary construction-phase desalination plant would not alter the findings of **Parts 2**, **3** or **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

REFERENCES

1. Parliament of the United Kingdom, Planning Act (London, 2008).
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6. Cefas. 2021. BEEMS Technical Report TR552 Sizewell C Desalination Plant Construction Discharge Assessment.
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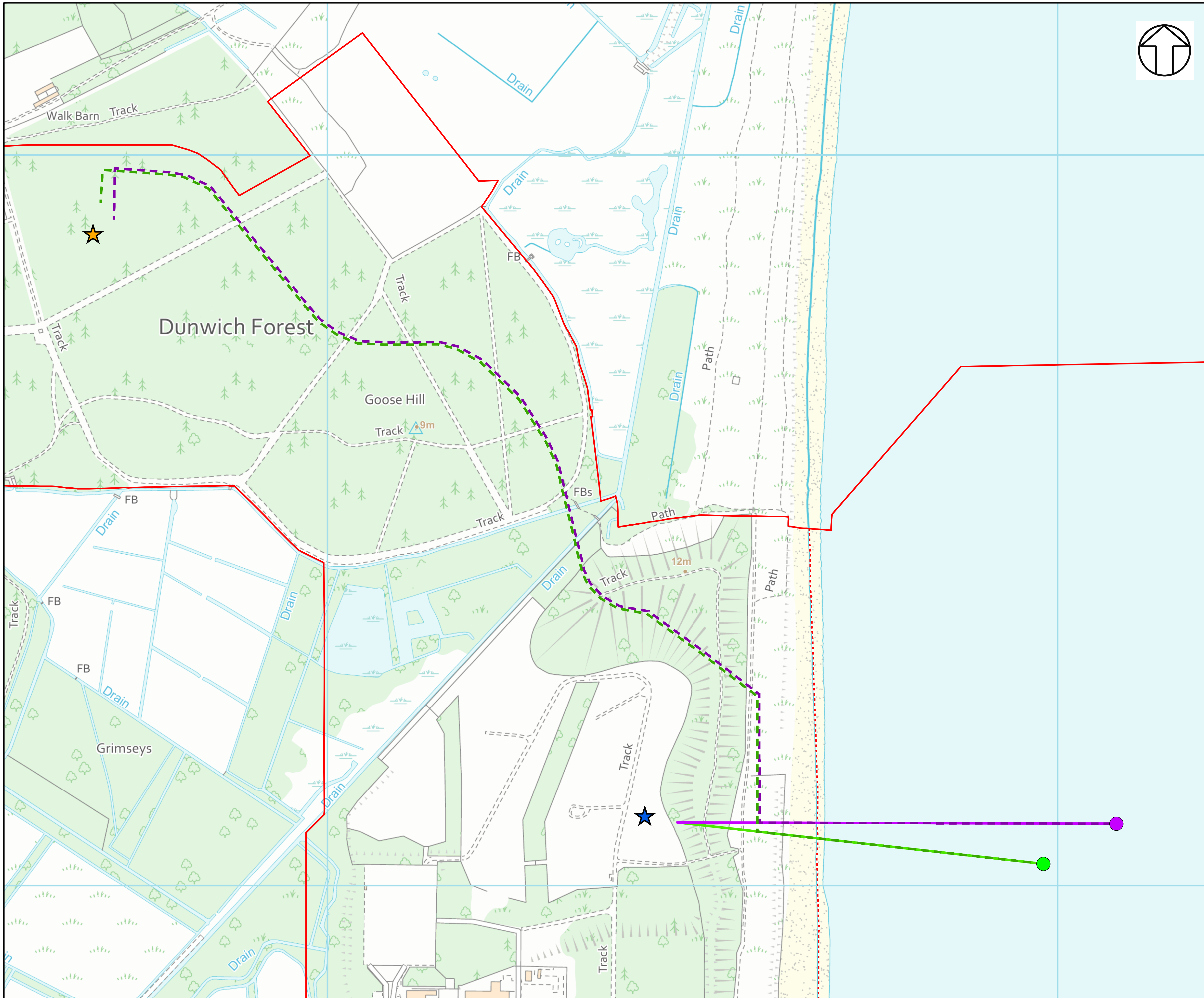
FIGURES



NOTES

KEY

- SIZEWELL C MAIN DEVELOPMENT SITE BOUNDARY
- DEMARCATION LINE
- INDICATIVE INTAKE PIPE LOCATION 1
- INDICATIVE INTAKE PIPE LOCATION 2
- INDICATIVE OUTFALL PIPE LOCATION 1
- INDICATIVE OUTFALL PIPE LOCATION 2
- INDICATIVE DESALINATION PLANT LOCATION 1
- INDICATIVE DESALINATION PLANT LOCATION 2
- INTAKE
- OUTFALL

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DOCUMENT:
SIZEWELL C
WFD COMPLIANCE ASSESSMENT
SECOND ADDENDUM
Doc. Ref. 8.14 Ad 2 Ch

DRAWING TITLE:
DESALINATION PLANT AND INFRASTRUCTURE LOCATIONS

DRAWING NO:
FIGURE 2.1

DATE:	DRAWN:	SCALE :	REVISION:
AUG 2021	J.T.	1:5,000 @A3	2.0

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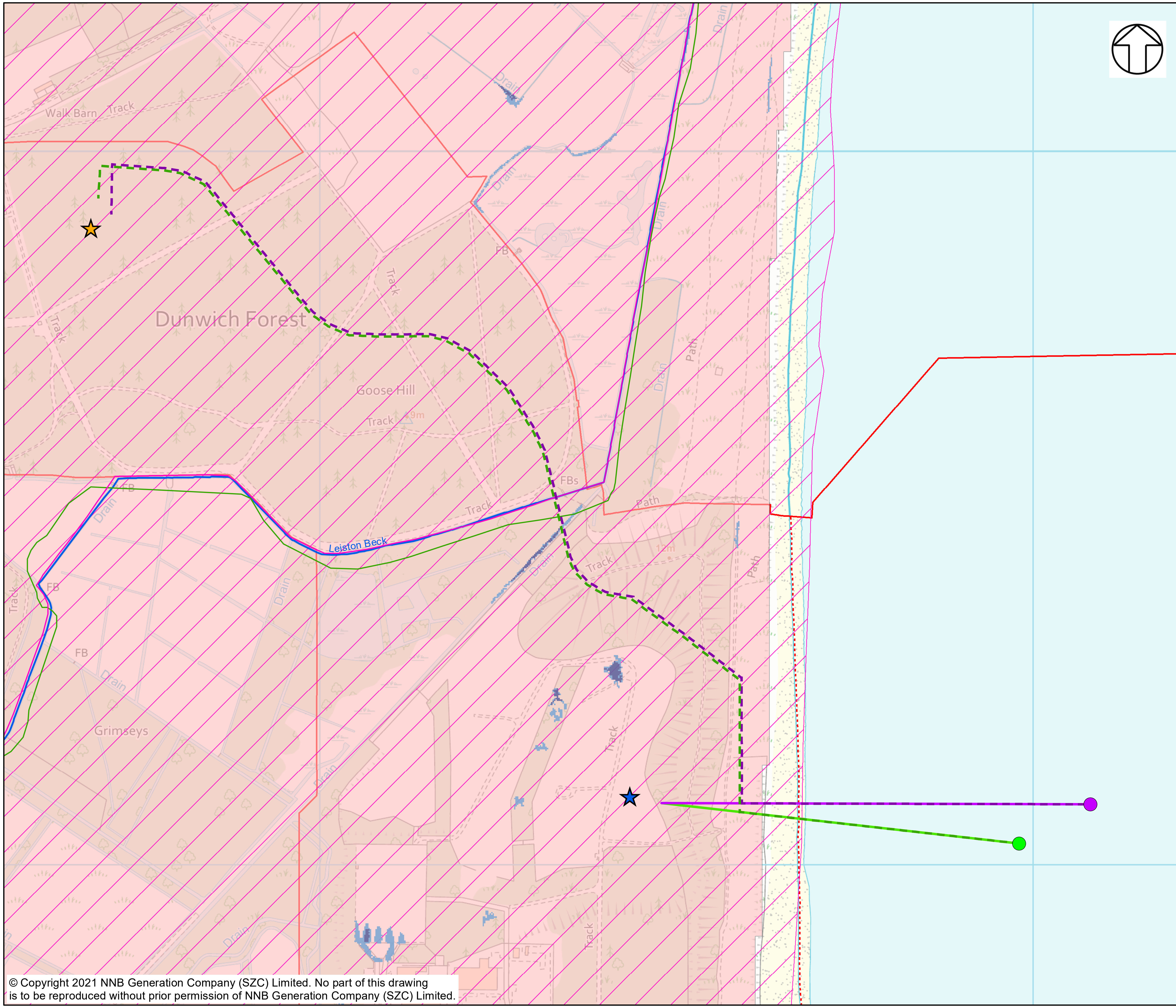

NOTES

KEY

- SIZEWELL C MAIN DEVELOPMENT SITE BOUNDARY
- DEMARCATION LINE
- INDICATIVE INTAKE PIPE LOCATION 1
- INDICATIVE INTAKE PIPE LOCATION 2
- INDICATIVE OUTFALL PIPE LOCATION 1
- INDICATIVE OUTFALL PIPE LOCATION 2
- INDICATIVE DESALINATION PLANT LOCATION 1
- INDICATIVE DESALINATION PLANT LOCATION 2
- INTAKE
- OUTFALL

ENVIRONMENT AGENCY RISK OF SURFACE WATER FLOODING

- HIGH RISK (GREATER THAN 1 IN 30 ANNUAL PROBABILITY OF FLOODING)
- MEDIUM RISK (BETWEEN 1 IN 100 AND 1 IN 30 ANNUAL PROBABILITY OF FLOODING)

WFD GROUNDWATER CATCHMENTS

- WAVENEY AND EAST SUFFOLK CHALK AND CRAG

WFD RIVER WATER BODY CATCHMENTS

- LEISTON BECK
- MAIN RIVERS
- WFD RIVER WATER BODIES
- WFD RIVER CANAL AND SURFACE WATER TRANSFER WATER BODIES

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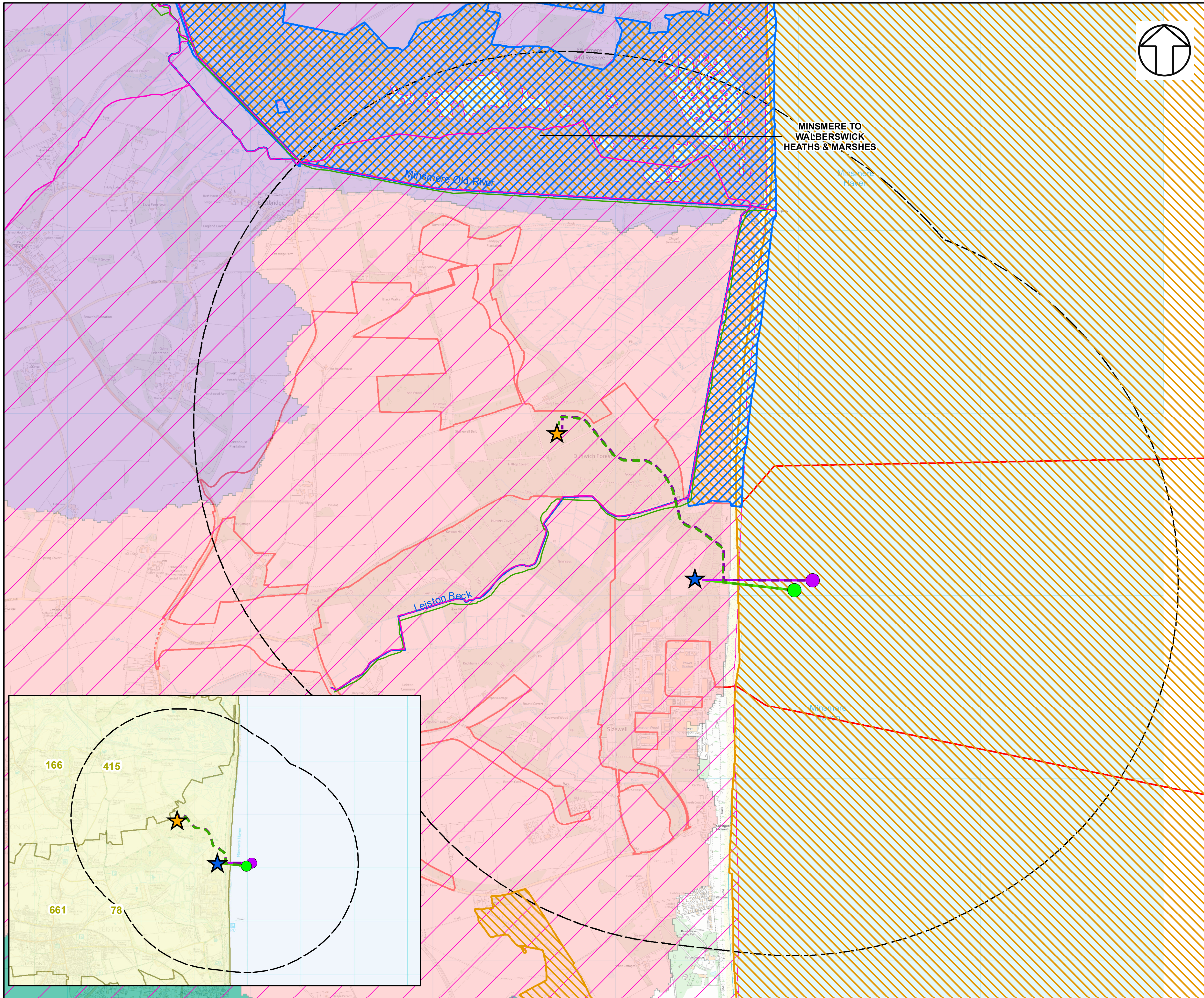
SECOND ADDENDUM
Doc. Ref. 8.14 Ad 2 Ch

DRAWING TITLE:
DESALINATION PLANT AND INFRASTRUCTURE LOCATIONS SHOWN AGAINST WFD WATER BODY BOUNDARIES

DRAWING NO:
FIGURE 3.1

DATE:	DRAWN:	SCALE :	REVISION:
AUG 2021	J.T.	1:5,000 @A3	2.0

SCALE BAR
0 30 60 90 120 150 Metres



NOTES

KEY

- 2KM BUFFER
- SIZEWELL C MAIN DEVELOPMENT SITE BOUNDARY
- DEMARCATION LINE
- INDICATIVE INTAKE PIPE LOCATION 1
- INDICATIVE INTAKE PIPE LOCATION 2
- INDICATIVE OUTFALL PIPE LOCATION 1
- INDICATIVE OUTFALL PIPE LOCATION 2
- INDICATIVE DESALINATION PLANT LOCATION 1
- INDICATIVE DESALINATION PLANT LOCATION 2
- INTAKE
- OUTFALL

WFD GROUNDWATER CATCHMENTS

- WAVENEY AND EAST SUFFOLK CHALK AND CRAG

WFD RIVER WATER BODY CATCHMENTS

- HUNDRED RIVER
- LEISTON BECK
- MINSMERE OLD RIVER

DESIGNATIONS

- Special Area of Conservation (SAC)
- SPECIAL PROTECTION AREA (SPA)
- NITRATE VULNERABLE ZONES
- MAIN RIVERS
- WFD RIVER WATER BODIES
- WFD RIVER CANAL AND SURFACE WATER TRANSFER WATER BODIES

NOT PROTECTIVELY MARKED

Doing the power of good for Britain

DOCUMENT:
SIZEWELL C
WFD COMPLIANCE ASSESSMENT
SECOND ADDENDUM
Doc. Ref. 8.14 Ad 2 Ch

DRAWING TITLE:
DESALINATION PLANT AND INFRASTRUCTURE LOCATIONS SHOWN AGAINST WFD WATER BODY BOUNDARIES AND PROTECTED AREAS

DRAWING NO:
FIGURE 3.2

DATE:	DRAWN:	SCALE :	REVISION:
AUG 2021	J.T.	1:20,000 @A3	2.0

SCALE BAR
0 140 280 420 560 700 Metres

APPENDIX A: STAGE 2 ASSESSMENT TABLES

CONTENTS

1 STAGE 2 ASSESSMENT TABLES

1.1 C1 Leiston Beck river water body (GB105035046271)

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Hydromorphology			
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	The activities could affect the volume and rate of surface water discharge as a result of land use changes and discharges from the site drainage system. However, as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, drainage would be managed through the implementation of a temporary site drainage system. Any impacts on the hydrological regime during construction and decommissioning are therefore predicted to be insufficient to result in a change in the status of this quality element.	No
Morphological conditions	Could the activity change the width, depth, bank conditions,	The activities could increase sediment load as a result of increased sediment generation and entrainment through runoff and exacerbate existing sedimentation in the	No

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	bed substrates and structure of the riparian zone?	channels. However, as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, surface water run-off would be contained and managed within the temporary site drainage system. Any impacts on morphological conditions during construction and decommissioning are therefore predicted to be insufficient to result in a change in the status of this quality element.	
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	The activities would not create a barrier to the downstream movement of water and/or sediment and therefore would not impact upon river continuity. Any pipeline crossings of Leiston Drain would be installed using directional drilling techniques and would not directly interact with the river channel.	No
Physico-chemistry			
General	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	There is potential for the activities to impact upon pH, oxygenation, salinity and specific pollutant concentrations in the water body through the runoff of sediment and construction materials. However, as described in the **Code of Construction Practice** (Doc Ref. 8.11D)	No

Activity	**C1 On land site preparation and construction of plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Specific pollutants	Could the activity release dangerous chemicals into the water body?	secured pursuant to Requirement 2 of the DCO, best practice measures to prevent the accidental release of contaminants into the environment would be adopted, and drainage would be managed through the implementation of a temporary site drainage system. Any impacts on water quality during construction and decommissioning are, therefore, predicted to be insufficient to result in a change in the status of this quality element.	No
Biology			
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Impacts on the hydromorphology and water quality of the water body during construction and decommissioning are predicted to be insufficient to result in a change in the status of these quality elements (see above for details). Therefore no mechanisms for impact upon the aquatic flora that they support have been identified.	No
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of	Impacts on the hydromorphology and water quality of the water body during construction and decommissioning are predicted to be insufficient to result in a change in the status of these quality elements (see above for details).	No

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	habitats for aquatic invertebrates?	Therefore no mechanisms for impact upon the benthic invertebrates that they support have been identified.	
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Impacts on the hydromorphology and water quality of the water body during construction and removal and reinstatement are predicted to be insufficient to result in a change in the status of those quality elements (see above for details). Therefore no mechanisms for impact upon the fish that they support have been identified.	No

1.2 C1 Minsmere Old River water body (GB105035046270)

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Hydromorphology			
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	The activities could affect the volume and rate of surface water discharge as a result of land use changes and discharges from the site drainage system. However, as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, drainage would be managed through the implementation of a temporary site drainage system. Any impacts on the hydrological regime during construction and decommissioning are therefore predicted to be insufficient to result in a change in the status of this quality element.	No
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	The activities could increase sediment load as a result of increased sediment generation and entrainment through runoff and exacerbate existing sedimentation in the channels. However, as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, surface water run-off would be contained and managed within the temporary	No

Activity	**C1 On land site preparation and construction of plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		site drainage system. Any impacts on morphological conditions during construction and decommissioning are therefore predicted to be insufficient to result in a change in the status of this quality element.	
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	The activities would not create a barrier to the downstream movement of water and/or sediment and therefore would not impact upon river continuity. Any pipeline crossings of Leiston Drain would be installed using directional drilling techniques and would not directly interact with the river channel.	No
Physico-chemistry			
General	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	There is potential for the activities to impact upon pH, oxygenation, salinity and specific pollutant concentrations in the water body through the runoff of sediment and construction materials. However, as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, best practice measures to prevent the accidental release of contaminants into the environment would be adopted, and drainage would be managed through the implementation of a temporary site drainage system. Any impacts on	No
Specific pollutants	Could the activity release dangerous chemicals into the water body?		No

Activity	**C1 On land site preparation and construction of plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		water quality during construction and decommissioning are, therefore, predicted to be insufficient to result in a change in the status of this quality element.	
Biology			
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Impacts on the hydromorphology and water quality of the water body during construction and decommissioning are predicted to be insufficient to result in a change in the status of these quality elements (see above for details). Therefore no mechanisms for impact upon the aquatic flora that they support have been identified.	No
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	Impacts on the hydromorphology and water quality of the water body during construction and decommissioning are predicted to be insufficient to result in a change in the status of these quality elements (see above for details). Therefore no mechanisms for impact upon the benthic invertebrates that they support have been identified.	No
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the	Impacts on the hydromorphology and water quality of the water body during construction and removal and reinstatement are predicted to be insufficient to result in a	No

Activity	**C1 On land site preparation and construction of plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	change in the status of those quality elements (see above for details). Therefore no mechanisms for impact upon the fish that they support have been identified.	

1.3 C1 Waveney and East Suffolk Chalk and Crag groundwater body (GB40501G400600)

Activity	**C1 On land site preparation and construction of plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Quantity			
Groundwater quantity	Could the activity change groundwater levels, affecting Groundwater Dependent Terrestrial Ecosystems (GWDTEs) or dependent surface water features?	Construction activities could potentially affect local groundwater levels if dewatering is required. However, and changes are likely to be highly localised and not sufficient to result in deterioration in water body status.	No

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	Could the activity lead to saline intrusion?	The pipeline between the marine intake heads and the onshore desalination plant pumping station would be constructed using a directional drilling or other trenchless methodology. Although there is potential that this could result in increased saline intrusion into groundwater, this would be limited by the single bore. Furthermore, the groundwater body in this area is already affected by saline intrusion (as described in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]). The proposed activity is therefore unlikely to cause additional intrusion that is sufficient to result in deterioration in water body status.	No
	Could the activity result in groundwater abstraction in excess of recharge at a water body scale?	Although limited dewatering may be required during construction, this would be highly localised and insufficient to result in affects at water body scale.	No
	Could the activity lead to an additional surface water body becoming non-compliant and	Although limited dewatering may be required during construction, this would be highly localised and insufficient to affect connected surface waters.	No

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	lead to failure of the Dependent Surface Water test?		
	Could the activity result in additional abstraction that will exceed any groundwater body scale headroom between the fully licensed quantity and the limit imposed by the total recharge?	Although limited dewatering may be required during construction, this would be highly localised and insufficient to result in affects at water body scale.	No
	Could the activity result in additional groundwater depletion of surface water flows that will exceed any groundwater body scale headroom between Fully Licensed depletion and the limit imposed by the total low flows resource?	Although limited dewatering may be required during construction, this would be highly localised and insufficient to result in affects at water body scale.	No
Quality			
Groundwater quality	Could the activity result in or exacerbate diffuse pollution at a water body scale?	There is potential for the activities to impact upon groundwater quality through the accidental release of construction materials and fuels. However, as	No

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, best practice measures to prevent the accidental release of contaminants into the environment would be adopted, and drainage would be managed through the implementation of a temporary site drainage system. Any impacts on water quality during construction are therefore, predicted to be insufficient to result in a change in the status of this quality element.	
	Could the activity result in pollution of groundwater dependent terrestrial ecosystems (GWDTEs) or other dependent surface water features?	Following implementation of the control measures outlined in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, no mechanism to result in the pollution of GWDTEs has been identified.	No
	Could the activity lead to saline intrusion?	The pipeline between the marine intake heads and the onshore desalination plant pumping station would be constructed using a directional drilling or other trenchless methodology. Although there is potential that this could result in increased saline intrusion into groundwater, this would be limited by the single bore. Furthermore, the groundwater body in this area is	No

Activity	C1 On land site preparation and construction of plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		already affected by saline instruction (as described in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]). The proposed activity is therefore unlikely to cause additional intrusion that is sufficient to result in deterioration in water body status.	
	Could the activity cause deterioration in the quality of a drinking water abstraction?	Following implementation of the control measures outlined in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, no mechanisms to impact on drinking water abstractions have as been identified.	No
	Could the activity result in increasing trends in pollutant concentrations or reduce the ability to reverse significant trends in groundwater pollutants?	Following implementation of the control measures outlined in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, no mechanisms to result in increasing trends in pollutant concentrations have as been identified.	No
	Could the activity result in the failure of the 'prevent or limit' objective of the Groundwater Daughter Directive?	Following implementation of the control measures outlined in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO, no mechanisms to result in failure of the 'prevent or limit' objective have as been identified.	No

1.4 C2 Suffolk coastal water body (GB650503520002)

Activity	**C2 Construction of marine structures**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Hydromorphology			
Hydromorphology	Will the activity impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status?	The water body is not classed as being of high status	No
	Is the activity in a water body that is heavily modified for the same use as the activity?	The water body is heavily modified for coastal and flood protection.	No
	Will the activity significantly impact the hydromorphology of any water body?	The lowering of the bed due to dredging would only temporarily increase the water depth and any changes would be localised to the area due to the small scale over which the dredging would be required. The same can be said for the disposal of the material – water depths would be temporarily reduced however following	No

Activity	**C2 Construction of marine structures**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		dispersal, the effect would cease. The main effects would therefore be experienced in the operational phase – refer to O2	
Chemistry			
Chemistry	If the activity used or releases chemicals, are the chemicals on the Environmental Quality Standards Directive list?	Any coatings or treatments applied to the infrastructure must be suitable for use in the marine environment in accordance with best environmental practice i.e. be on the list of substances approved for use by the offshore oil and gas industry or have undergone a similar level of risk assessment. Work undertaken in the marine environment or in close proximity should have regard to best practice for pollution prevention as identified in Guidance for Pollution Prevention (GPP) i.e. GPP 5 works and maintenance in or near water, GPP 6 working at construction and demolition sites, GPP 8 safe storage and disposal of used oils, GPP 22 dealing with spills). By application of best practice,	No

Activity	C2 Construction of marine structures		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		negligible effects from chemicals leaching from structures would be predicted. The lubricating drilling mud predominantly used is a mix of water and a naturally occurring swelling clay, bentonite. Bentonite is on The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) commission PLONOR (Pose Little or No Risk to the Environment) list. A bentonite recovery system would also be used during drilling to minimise the potential for release should frac-out occur.	
	If the activity has a mixing zone, are the chemicals released on the Environmental Quality Standards Directive List?	Not applicable for construction phase	No
	If the activity uses or releases chemicals, will it disturb sediment with contaminants above Cefas Action Level 1?	Some dredging would be required but this would be limited to the localised area where head structures would be required. All pipelines would be installed via directional drilling or trenchless methodologies. Whilst	No

Activity	**C2 Construction of marine structures**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		information provided in **Part 2** of the **WFD Compliance Assessment** indicated levels of contamination above Cefas action level 1, the temporary nature and limited geographical scale of the works would not give rise to long term changes in water quality.	
Phytoplankton/ Physico-chemical			
Phytoplankton/ Physico-chemical	Will the activity affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)?	Construction in the marine environment might affect marine water transparency by increasing suspended solids concentrations as a result of seabed disturbance, drilling and dredging. However, given the small scale of the works, these effects would be temporary and limited in scale. If bentonite was released into the marine environment, following a frac-out, depending upon flow conditions, clays could remain in suspension which could potentially result in an increase in the	No

Activity	C2 Construction of marine structures		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		turbidity. The amount of bentonite that would be released in the event of a frac-out is however, likely to be minimal as a bentonite recovery system would be used during drilling to minimise emissions.	
	Is the activity in a water body with a phytoplankton status of moderate, poor or bad or harmful algae?	No	No
Biology - habitats			
Flora / fauna / angiosperms / benthic invertebrates / higher and lower sensitivity habitats	Which type of habitat is likely to be impacted and what percentage of the habitat is impacted within the water body. - If the footprint of the development is >0.5km^2 then scope element in. - If the activity is within 500m of a higher sensitivity habitat then scope that habitat in for further consideration and if >1% of a lower	Construction may potentially cause resuspension of sediments and localised habitat loss but this would be limited to lower sensitivity habitats. However the temporary nature of the works are unlikely to give rise to long term changes in water quality and would revert to baseline following completion. Habitats in areas not permanently lost under the structures are	No

Activity	**C2 Construction of marine structures**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	sensitivity habitat in a water body may be affected then scope in.	likely to recover. The activity is not within 500m of a higher sensitivity habitat.	

1.5 O1 Leiston Beck river water body (GB105035046271)

Activity	**O1 Presence of desalination plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Hydromorphology			
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	Although the presence of the operational infrastructure could change local flow patterns, the site will be contained within the construction-stage drainage system (as described the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). Any impacts on the hydrological regime are therefore predicted to be insufficient to result in a change in the status of this quality element.	No

Activity	O1 Presence of desalination plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	The operational infrastructure will not directly interact with the river channel, or increase the supply of fine sediment. Any pipelines will be installed beneath the bed of the river and will not affect the channel. No mechanisms to affect morphological conditions during operation have been identified.	No
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	The operational infrastructure will not directly interact with the river channel, and any pipelines will be installed beneath the bed of the river and will not affect the channel. No mechanisms to reduce river continuity during operation have been identified.	No
Physico-chemistry			
General	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	The operation of the desalination plant will not result in any discharges into the water body. Chemical components used in the disinfection process (e.g. sodium hypochlorite or similar chemical, chlorine) alkali dosing (e.g. hydrated lime or sodium hydroxide) and pH adjustment (carbon dioxide) would be stored in suitable facilities with sufficient capacity to contain accidental spillages (as described in the **Code of**	No
Specific pollutants	Could the activity release dangerous chemicals into the water body?		No

Activity	O1 Presence of desalination plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		Construction Practice (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). Furthermore, aqueous discharges from chemical treatment will be tankered off-site for disposal. Any impacts on water quality are therefore predicted to be insufficient to result in a change in the status of this quality element.	
Biology			
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Impacts on the hydromorphology and water quality of the water body during operation are predicted to be insufficient to result in a change in the status of these quality elements (see above for details). Therefore no mechanisms for impact upon the aquatic flora that they support have been identified.	No
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	Impacts on the hydromorphology and water quality of the water body during operation are predicted to be insufficient to result in a change in the status of these quality elements (see above for details). Therefore no mechanisms for impact upon the benthic invertebrates that they support have been identified.	No

Activity	O1 Presence of desalination plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Impacts on the hydromorphology and water quality of the water body during operation are predicted to be insufficient to result in a change in the status of those quality elements (see above for details). Therefore no mechanisms for impact upon the fish that they support have been identified.	No

1.6 O1 Minsmere Old River water body (GB105035046270)

Activity	O1 Presence of desalination plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Hydromorphology			
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	Although the presence of the operational infrastructure could change local flow patterns, the site will be contained within the construction-stage drainage sytem (as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to	No

Activity	**O1 Presence of desalination plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		Requirement 2 of the DCO). Any impacts on the hydrological regime are therefore predicted to be insufficient to result in a change in the status of this quality element.	
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	The operational infrastructure will not directly interact with the river channel, or increase the supply of fine sediment. No mechanisms to affect morphological conditions during operation have been identified.	No
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	The operational infrastructure will not directly interact with the river channel. No mechanisms to reduce river continuity during operation have been identified.	No
Physico-chemistry			
General	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	The operation of the desalination plant will not result in any discharges into the water body. Chemical components used in the disinfection process (e.g. sodium hypochlorite or similar chemical, chlorine)	No

Activity	**O1 Presence of desalination plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Specific pollutants	Could the activity release dangerous chemicals into the water body?	alkali dosing (e.g. hydrated lime or sodium hydroxide) and pH adjustment (carbon dioxide) would be stored in suitable facilities with sufficient capacity to contain accidental spillages (as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). Furthermore, aqueous discharges from chemical treatment will be tankered off-site for disposal. Any impacts on water quality are therefore predicted to be insufficient to result in a change in the status of this quality element.	No
Biology			
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Impacts on the hydromorphology and water quality of the water body during operation are predicted to be insufficient to result in a change in the status of these quality elements (see above for details). Therefore no mechanisms for impact upon the aquatic flora that they support have been identified.	No
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water	Impacts on the hydromorphology and water quality of the water body during operation are predicted to be insufficient to result in a change in the status of these	No

Activity	O1 Presence of desalination plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	quality elements (see above for details). Therefore no mechanisms for impact upon the benthic invertebrates that they support have been identified.	
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Impacts on the hydromorphology and water quality of the water body during operation are predicted to be insufficient to result in a change in the status of those quality elements (see above for details). Therefore no mechanisms for impact upon the fish that they support have been identified.	No

1.7 O1 Waveney and East Suffolk Chalk and Crag groundwater body (GB40501G400600)

Activity	**O1 Presence of desalination plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Quantity			
Groundwater quantity	Could the activity change groundwater levels, affecting Groundwater Dependent Terrestrial Ecosystems (GWDTEs) or dependent surface water features?	No mechanism to impact on groundwater levels during operation of the desalination plant have been identified.	No
	Could the activity lead to saline intrusion?	The operation of the desalination plant will not require groundwater abstraction, and as such is not likely to result in additional saline intrusion into the groundwater body. Saline water being pumped ashore and reject brine being pumped offshore will be contained within the plant and will not result in the increased supply of saline water into the water body.	No
	Could the activity result in groundwater abstraction in excess of recharge at a water body scale?	The operation of the desalination plant will not require any groundwater abstraction.	No

Activity	O1 Presence of desalination plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	Could the activity lead to an additional surface water body becoming non-compliant and lead to failure of the Dependent Surface Water test?	The operation of the desalination plant will not require any groundwater abstraction.	No
	Could the activity result in additional abstraction that will exceed any groundwater body scale headroom between the fully licensed quantity and the limit imposed by the total recharge?	The operation of the desalination plant will not require any groundwater abstraction.	No
	Could the activity result in additional groundwater depletion of surface water flows that will exceed any groundwater body scale headroom between Fully Licensed depletion and the limit imposed by the total low flows resource?	The operation of the desalination plant will not require any groundwater abstraction.	No
Quality			

Activity	O1 Presence of desalination plant		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Groundwater quality	Could the activity result in or exacerbate diffuse pollution at a water body scale?	Chemical components used in the disinfection process (e.g. sodium hypochlorite or similar chemical, chlorine) alkali dosing (e.g. hydrated lime or sodium hydroxide) and pH adjustment (carbon dioxide) would be stored in suitable sealed facilities with sufficient capacity to contain accidental spillages (as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). The activity would not therefore exacerbate diffuse pollution at a water body scale.	No
	Could the activity result in pollution of groundwater dependent terrestrial ecosystems (GWDTEs) or other dependent surface water features?	Chemical components used in the disinfection process (e.g. sodium hypochlorite or similar chemical, chlorine) alkali dosing (e.g. hydrated lime or sodium hydroxide) and pH adjustment (carbon dioxide) would be stored in suitable sealed facilities with sufficient capacity to contain accidental spillages (as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). The activity would not therefore result in the pollution of	No

Activity	**O1 Presence of desalination plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		GWDTEs and other dependent surface water features.	
	Could the activity lead to saline intrusion?	The operation of the desalination plant will not require groundwater abstraction, and as such is not likely to result in additional saline intrusion into the groundwater body. Saline water being pumped ashore and reject brine being pumped offshore will be contained within the plant and will not result in the increased supply of saline water into the water body.	No
	Could the activity cause deterioration in the quality of a drinking water abstraction?	Chemical components used in the disinfection process (e.g. sodium hypochlorite or similar chemical, chlorine) alkali dosing (e.g. hydrated lime or sodium hydroxide) and pH adjustment (carbon dioxide) would be stored in suitable sealed facilities with sufficient capacity to contain accidental spillages (as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). The activity would not therefore cause deterioration in the quality of a drinking water abstraction.	No

Activity	**O1 Presence of desalination plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	Could the activity result in increasing trends in pollutant concentrations or reduce the ability to reverse significant trends in groundwater pollutants?	Chemical components used in the disinfection process (e.g. sodium hypochlorite or similar chemical, chlorine) alkali dosing (e.g. hydrated lime or sodium hydroxide) and pH adjustment (carbon dioxide) would be stored in suitable sealed facilities with sufficient capacity to contain accidental spillages (as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). The activity would not therefore result in an increase in pollutant concentrations.	No
	Could the activity result in the failure of the 'prevent or limit' objective of the Groundwater Daughter Directive?	Chemical components used in the disinfection process (e.g. sodium hypochlorite or similar chemical, chlorine) alkali dosing (e.g. hydrated lime or sodium hydroxide) and pH adjustment (carbon dioxide) would be stored in suitable sealed facilities with sufficient capacity to contain accidental spillages (as described in the **Code of Construction Practice** (Doc Ref. 8.11D) secured pursuant to Requirement 2 of the DCO). The activity	No

Activity	**O1 Presence of desalination plant**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
		would not therefore result in the failure of the ‘prevent or limit’ objective.	

1.8 O2 Suffolk coastal water body (GB650503520002)

Activity	**O2 Presence and operation of marine structures**		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
Hydromorphology			
Hydromorphology	Will the activity impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status?	The water body is not classed as being of high status	No
	Is the activity in a water body that is heavily	The water body is heavily modified for coastal and flood protection.	No

Activity	O2 Presence and operation of marine structures		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	modified for the same use as the activity?		
	Will the activity significantly impact the hydromorphology of any water body?	The pipework would be below the seabed so the only structures that could impact on hydromorphology would be the head structures which are relatively small scale. They would be located seaward of the outer longshore bar and beyond the main areas of longshore transport such that they do not interact with either the major physical features or marine processes. A small area of concrete mattress may be required to mitigate scour around the pipe connecting the drilled tunnel to each head - this would limit the development of scour. Therefore unlikely to have significant effects on hydromorphological parameters on a water body scale	No
Chemistry			
Chemistry	If the activity used or releases chemicals, are the chemicals on the	There is the potential for the desalination discharge to contain parameters on the EQSD. Chlorine is	Yes

Activity	O2 Presence and operation of marine structures		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	Environmental Quality Standards Directive list?	scoped out as it is dosed at the intake (facing inwards) and de-chlorinated before discharge.	
	If the activity has a mixing zone, are the chemicals released on the Environmental Quality Standards Directive List?		
	If the activity uses or releases chemicals, will it disturb sediment with contaminants above Cefas Action Level 1?	No mechanism for impact	No
Phytoplankton/ Physico-chemical			
Phytoplankton/ Physico-chemical	Will the activity affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)?	Yes there is the potential to impact on salinity and phosphorous concentrations. The discharge would be at ambient temperature.	Yes (salinity and nutrients only)

Activity	O2 Presence and operation of marine structures		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	Is the activity in a water body with a phytoplankton status of moderate, poor or bad or harmful algae?	No	No
Biology - habitats			
Flora / fauna / angiosperms / benthic invertebrates / higher and lower sensitivity habitats	Which type of habitat is likely to be impacted and what percentage of the habitat is impacted within the water body. - If the footprint of the development is >0.5km^2 then scope element in. - If the activity is within 500m of a higher sensitivity habitat then scope that habitat in for further consideration and if >1% of a lower sensitivity habitat in	Given that the nature of the plume is not yet know, there is the potential that the plume could extend to cover greater than 0.5km^2.	Yes

Activity	O2 Presence and operation of marine structures		
Parameter	**Scoping questions**	**Response**	**Further assessment required?**
	a water body may be affected then scope in.		
Fish (although not a compliance parameter for coastal water bodies, given the water body adjoins two transitional water bodies, fish are included here for completeness)	Is the activity in an estuary and could it affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary?	The outfall is located close to the outfall of the proposed Fish Recovery and Return Tunnel, beyond the inner bank. A passive wedge-wire cylinder (PWWC) screen approximately 60cm in diameter and 1.6m in length, with a mesh of approximately 2mm would be fitted. This screen will prevent ingress of glass eels and other early life stages of fish and larger invertebrates. The headworks would be positioned orthogonal to tidal currents to reduce the tidal forcing against the screens and minimise approach velocities.	No
	Could the activity impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)?		No
	Could the activity cause entrainment or impingement of fish?		No