Offshore Petroleum Regulator
for Environment & Decommissioning

The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020

Regulation 14(3)
Secretary of State Decision

Net Zero North Sea Storage Limited

Northern Endurance Partnership Development

To: [redacted]

Decision Recommendation:

That you agree on behalf of the Secretary of State, to the grant of consent by the Oil and Gas Authority (OGA) (The Oil and Gas Authority now operates under the business name of the North Sea Transition Authority (NSTA).

As set out further below, taking into account the relevant considerations, I have concluded that the project will not have any significant effects on the environment and have decided that no conditions need to be attached to agreement to the grant of consent.

From: [redacted]
Environmental Manager

Date: **2 October 2024**

ES Title:	Offshore Environmental Statement for the Northern Endurance Partnership
Developer:	Net Zero North Sea Storage Limited
Consultants:	Xodus Group Ltd.
OGA Field Group:	Southern North Sea (SNS)
ES Report No:	D/4271/2021
ES Submission Date :	19 September 2023
Block No/s:	The NEP Development covers UKCS Blocks 41/11, 41/12, 41/13, 41/14, 41/19, 41/20, 42/16, 42/17, 42/18, 42/23, 42/24, 42/25, 42/28, 42/27, 47/2, 47/7, 47/6 located in the SNS
Project Type:	Activities related to the geological storage of carbon dioxide.
OGA Reference No:	CS001

Project Description

The Northern Endurance Partnership Carbon Capture and Storage Project ("NEP Development") proposal consists of the drilling of six wells for the storage of dense phase fluid carbon dioxide within the Endurance Store, which is a saline aquifer making up part of the Bunter Sandstone formation. The project proposes that carbon dioxide will be transported to the Endurance store site using a 28" concrete coated pipelines going ashore at Teesside. A

later expansion phase will include a Humber gathering system and further 28” pipeline. The project does not include any surface infrastructure.

The Endurance Store is located approximately 63 km from the nearest coastline in water depths of approximately 65 m. The Teesside Pipeline, approximately 142 km in length, will make landfall on the Tees coast to the south of the mouth of the Tees Estuary. The Humber Pipeline, approximately 100 km in length, will make landfall on the Holderness coast in East Riding of Yorkshire to the north of the Dimlington gas terminal. An electric power and fibre-optic communications control cable will run from Teesside to the subsea infrastructure at the Endurance Store. The Humber Pipeline has been removed from the scope of the Storage Permit and as such is not part of the project for which agreement to the grant of consent is now being sought. The Humber gathering system and pipeline will form part of a later expansion phase. The information provided by the developer, including the ES, does include an assessment of the environmental impacts of the Humber Pipeline, and this has been taken into account in this EIA to the extent relevant at this stage. Further EIA may still be required before any consents, authorisations etc. can be granted for the Humber pipeline in future.

Six wells are proposed to be drilled and include five injector wells and one monitoring well. The monitoring well will allow for monitoring of the CO_2 plume within the sandstone formation. It is anticipated that it will take 63 days to drill each well. The well locations will be distributed across the store to maximise injection capability. Requirements for a drilling rig have not been finalised however due to the water depth at the Endurance Store it is likely a jack-up rig will be used. Alternatively, a semi-submersible mobile offshore drilling unit (MODU) may be required. The worst cases relating to both has been assessed within the ES.

The NEP Development is the first phase of a strategic initiative of a zero-carbon industrial cluster known as the East Coast Cluster. The first phase aims to capture and store 4 million tonnes per annum (MtPA) of CO_2.

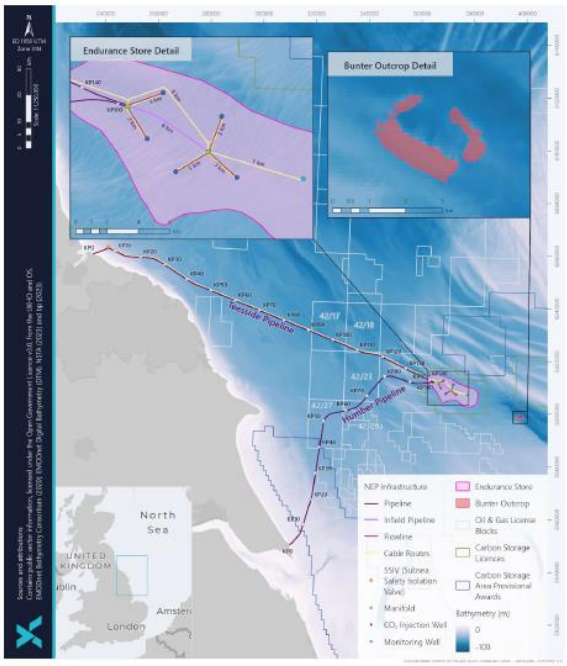

Figure 1: Location of the NEP Development

Key Environmental Impacts

The Environmental Statement (ES) identified and discussed the following as having the potential to have an effect on the environment:

- Effects on local air quality and climate from the atmospheric emissions generated by the project.
- Effects from underwater noise caused by:
    - piling of the manifolds in the endurance store area, a subsea isolation valve (SSIV) on the Teesside pipeline and Horizontal Directional Drilling (HDD) trestles at the pipeline landfall locations
    - seismic surveys during monitoring activities
    - seabed preparation and dredging activities
    - presence of either a jack-up or semi-submersible drilling rig and vessels
    - drilling of the 5 injection wells and one monitoring well
- Effects on water quality, protected species and habitats, fauna and flora from an accidental event resulting in a release of chemicals, diesel, CO_2 or store formation water.
- Effects on water quality from seepage of formation water at the Bunter outcrop.
- Effects on the sediment, seabed habitats, fauna and flora from seabed disturbance from the physical presence of temporary and permanent infrastructure; and
- Effects on users of the sea (e.g. commercial fishing and shipping) from the physical presence of temporary and permanent infrastructure, and the construction phase of the project.

Key Environmental Sensitivities

The ES identified the following environmental sensitivities:

Fish and shellfish

Endurance Store: The proposed Endurance store area lies within numerous spawning and nursery areas of fish species. Of the species which may be present in the Endurance Store area, cod and spurdog are on The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) list of threatened and/or declining species and habitats. Spurdog is additionally globally classed as vulnerable under the International Union for Conservation of Nature Red list. Sandeels (specifically *Ammodytes marinus*) are listed as a species of principle importance under the UK Biodiversity Action Plan and as Features of Conservation Importance (FOCI) defined in relation to the Marine Conservation Zone (MCZ) network. There is evidence that the western end of the store exhibits some suitability for sandeel spawning.

Teesside Pipeline: Species using the proposed pipeline route for spawning and nursery grounds are similar to the proposed Endurance store area, however, *Nephrops*, plaice and ling may use points on the pipeline route as nursery grounds. *Nephrops* also use some of the area as spawning grounds. Much of the pipeline route has been identified as either rarely or occasionally used by cod for spawning. Sediment along the pipeline route were assessed as being 'prime', 'sub-Prime' or 'suitable' for sandeel spawning at several stations distributed along the route and preferred herring spawning potential was identified at four locations.

Humber Pipeline: Species using the proposed pipeline route for spawning and nursery grounds are similar to that for the Endurance store. Unlike the store and the Teesside route, lemon sole (*Microstomus kitt*) may use the area for spawning. Sediment was categorised for herring spawning as 'prime' and 'preferred' at three stations. Good potential for sandeel spawning, consisting of 'preferred' and 'suitable' habitats were notable along the mid-section of the pipeline route. One station was classified as 'preferred' and 'sub-Prime'. The probability of presence of buried sandeel and predicted density is marginally higher along the Humber Pipeline route than along the Teesside Pipeline. This constitutes a low probability of presence and a density of up to approximately 90 individuals per m^2 in highly localised areas. The Humber Pipeline route is located 2.74 km from the Humber Estuary Special Area of Conservation (SAC) which is noted for the presence of Annex II species river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*).

Seabirds

Multiple species of seabird could be present in the vicinity of the store or pipelines in various levels of abundance, dependent upon the season. The Humber Pipeline passes through Greater Wash Special Protection Area (SPA) which is classified for the protection of red-throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*), and little gull (*Hydrocoloeus minutus*) during the non-breeding season, and for breeding Sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*) and little tern (*Sternula albifrons*). This site also protects important foraging areas for the largest breeding populations of little tern and important areas used by the second largest non-breeding populations of red-throated diver and little gull within the UK SPA network. The Teesside pipeline passes through the Teessmouth and Cleveland Coast SPA which supports breeding little tern (*Sterna albifrons*) and passage of sandwich tern (*Sterna sandvicensis*). It also supports wintering knot (*Calidris canutus islandica*), redshank (*Tringa totanus totanus*), and an assemblage of over 20,000 wintering waterfowl. The 2001 SPA review identified an internationally important population of passage ringed plover (*Charadrius hiaticula*). In addition, the 2 pipelines are within 50 kilometres of the following SPAs:

- Humber Estuary SPA (3 km south-southeast of the Humber Pipeline route): designated for numerous breeding and non-breeding bird species and waterbird assemblages.
- Northumbria Coast SPA (15 km north-northwest of the Teesside Pipeline route): designated for breeding Arctic tern and little tern and non-breeding purple sandpiper and turnstone.
- Flamborough Head and Filey Coast SPA (22 km west-northwest of the Humber Pipeline route): designated for breeding gannet, guillemot, kittiwake, razorbill and general seabird assemblages.

Protected habitats.

The Humber pipeline (not part of the storage permit application) intersects the following Marine Conservation Zones (MCZ):

- Holderness Offshore MCZ is designated for subtidal coarse sediment, subtidal sand, subtidal mixed sediments and part of a North Sea glacial tunnel valley. The diverse seabed hosts a wide variety of species which live both in and on the sediment such as, crustaceans (crabs and shrimp), starfish and sponges. This site is also a spawning and nursing ground for a range of fish species for example lemon sole (*Microstomus kitt*), plaice and European sprat (*Sprattus sprattus*). Therefore, the species living both in and on the sediment may benefit from the protection afforded

to the habitat features within this site. The slow-growing bivalve, Ocean quahog (*Arctica islandica*) have also been found in the site.

- Holderness Inshore MCZ is designated for Intertidal sand and muddy sand; moderate energy and high energy circalittoral rock; subtidal coarse sediment; subtidal mixed sediments; subtidal sand and subtidal mud which supports a variety of species including red algae, sponges and other encrusting fauna.

European Protected Species and pinnipeds:

A total of 19 species of cetacean have been recorded in UK waters. With the exception of harbour porpoise, the SNS typically has a lower density of cetaceans than the Northern North Sea (NNS) and Central North Sea (CNS). Across the Endurance store and pipeline routes, bottlenose dolphin, harbour porpoise, white-sided dolphin, pilot whale, minke whale, white-beaked dolphin, and common dolphin have all been observed at various times of year in differing numbers. Harbour porpoise is the most abundant cetacean species in the area.

The Endurance store lies within the Southern North Sea Special Area of Conservation (SNS SAC) of which Harbour porpoise is the designated feature.

Offshore, at the Endurance Store, the density of grey and harbour seals is relatively low. Grey seal densities are highest along the Humber Pipeline route and are concentrated close to the coast with the Humber Estuary known to support a number of seal haul-out points and colonies. The Teesmouth and Cleveland Site of Special Scientific Importance (SSSI) is designated for both geological and biological features, including breeding harbour seals and will be intersected by the Teesside pipeline.

Other Users of the Sea

Fisheries

Commercial fishing effort in the project area ranges from being recorded as being 'disclosive' (meaning fewer than five vessels (>10 m) spent time fishing that month within the relevant International Council for the Exploration of the Seas (ICES) Rectangle) at the Endurance store to 'High' in an area closest to shore which the Humber pipeline route passes. The fishing effort for the majority of the project area is low to moderate. The most common gear types in the NEP Development area close to shore are pots and traps, and gears using hooks. Further offshore, demersal trawls/seines, beam trawls, and dredges dominate.

Shipping

Shipping density in the project area ranges low a density of 5.1 average weekly vessel transits to 250 transits per 4 km^2. Vessel presence is lowest at the Endurance Store, and this increases as the pipelines get closer to the shore. The Humber Estuary is a busy shipping area and this area of coastline, from Teesside to Humber is extremely busy with most traffic attributed to cargo vessels and tankers.

Military Activity

Military Practice and Exercise Areas (PEXAs) overlap with the NEP Development, including the two pipeline routes. The Endurance Store is located within PEXA D323C. In addition, special consultation conditions are flagged by the Ministry of Defence (MoD) in relation to some of the UKCS Blocks in the vicinity of the NEP Development due to their proximity to training ranges.

Cables

The proposed Teesside Pipeline route will cross two wind cable lease areas which are currently in the planning phase. The chosen export cable route for the Dogger Bank South Offshore Wind Farms (OWFs) will cross the proposed Teesside Pipeline and Teesside – Store Cable.

The Teesside Pipeline route will cross the following telecom cables:

- UK-Denmark 4 (operated by British Telecom (BT)) disused cable.
- Pangea North (operated by ASN) active cable.
- A fibre optic cable associated with the Breagh field: and
- TATA North Europe (operated by TATA Communications) active cable.

The Humber Pipeline route does not come within 20 km of any telecom cables.

The proposed Scotland England Green Link 2 (SEGL2) is a High Voltage Direct Current link between Peterhead and Drax that is currently in the pre-planning phase. It is anticipated that this will cross the Teesside Pipeline route. The proposed Hornsea Project Four proposed export cable corridor will cross the Humber Pipeline route.

Archaeological Features

There are no records of protected wrecks in the vicinity of the Humber Pipeline, or the Teesside Pipeline routes. Archaeological interpretation of survey data obtained within the NEP Development area identified two wrecks within the Endurance Store area, 11 wrecks along the Teesside Pipeline route, and seven along the Humber Pipeline route.

In-combination, cumulative and transboundary sensitivities

The project area is located 105 km from the UK/Netherlands median line. The installation of infrastructure (siting of the wells and infield flowlines at the Endurance Store and the two pipelines) will reduce availability of the natural environment to activities such as fishing, but this will be offset by trenching and burying of the infield flowlines and utilising construction methods such as HDD for the pipelines nearshore which will mean no infrastructure will be on the seabed long term so that fishing activities can continue in those locations. The proposed NEP Development is located in an area of oil and gas exploration and production and there is a large amount of oil and gas infrastructure in the region. There are 16 oil and gas installations located within 40 km of the Endurance Store. Much of the oil and gas infrastructure is due to be decommissioned in the coming years which could potentially increase interactions with the NEP Development due to increased vessel presence and activities in the surrounding waters.

There are a number of Offshore Wind Farm (OWF) licensed areas and OWF projects under development in the vicinity of the NEP Development. The Endurance Store area overlaps with the lease area for the proposed Hornsea 4 project. Hornsea 2 is currently under construction and Hornsea 1 is operational. No other renewables lease areas, operational or under agreement, are located within 50 km of the Endurance Store.

The ES identifies and assesses the potential cumulative effects from various projects including oil and gas infrastructure, OWFs, Seabed Cables and Aggregate and Mineral Extraction.

Public Consultation(s)

The ES and the summary of the project was subject to public consultation, with the public notice published on 5 October 2023 and ending on 6 November 2023. There were no public representations received.

Further information was requested on 10 November 2023, 25 March and 21 June 2024, under Regulation 12(1) notices. The further information was considered, and it was concluded that the information presented did not meet the test in Regulation 12(3)(b) so as to require a further public consultation.

Consultation with Other Authorities

The Joint Nature Conservation Committee (JNCC), Ministry of Defence (MoD), Trinity House, Marine Management Organisation (MMO), Centre for Environment, Fisheries and Aquaculture Science (Cefas), Environment Agency (EA), Natural England (NE), Maritime and Coastguard Agency (MCA), Crown Estate (CE), Redcar & Cleveland Borough Council and East Riding of Yorkshire Council were consulted on the ES submission. Except for the EA, CE, Redcar & Cleveland Borough Council and East Riding of Yorkshire Council, all consultees submitted responses.

In relation to the proposed Humber pipeline, NE stated that they objected to the assessment on the grounds that they considered the installation of the Humber pipeline is not fully assessed and will hinder the conservation objectives of the Holderness Inshore MCZ. A summary of the assessment and consideration of NE response are found in "*Seabed habitat and species*" below. JNCC were unable to agree with the conclusions related to the proposed Humber pipeline in the Holderness Offshore MCZ is not likely to hinder the conservation objectives of the MCZ and advised further information and evidence was required to inform the assessment. JNCC did also not agree with the conclusions of the assessment regarding the Humber pipeline construction within the Greater Wash SPA or the installation of the infield infrastructure and sections of both the Teesside and Humber pipelines within the Southern North Sea SAC. A summary of the assessment and consideration of JNCC response are found in the "Seabed habitat and species" and "Physical presence of temporary and permanent infrastructure" sections below.

Consultation with other Countries

Given the location of the project proposal, and as set out further below in relation to transboundary impacts, it was not considered that the project could have a significant effect on the environment of another country. No other country has notified the Secretary of State that its environment is likely to be significantly affected by the project. No countries have therefore been included in the consultation process.

Conclusion on the significant effect of the project on the environment

I have reviewed and considered the following:

- The ES;
- The further information obtained under Regulation 12 as summarised above.
- The representations received from other authorities as summarised above; and
- Any conditions that the Secretary of State may attach to the agreement to the grant of consent pursuant to regulation 4(4).

Taking those matters into account to the extent required under Regulation 14(2), I have concluded on behalf of the Secretary of State that this project will not have any significant effects on the environment.

I have also considered other relevant duties, including those arising under the Marine and Coastal Access Act 2009, section 58 ('Decisions affected by marine policy documents') addressed in the 'Marine Plans' section of this document and section 126 (Duties of public authorities in relation to certain decisions where the act is capable of affecting the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent). This is addressed throughout this document where the assessment considered the designated features of the relevant MCZs.

I have also considered the impacts from the project on SACs and SPAs and the requirements of:

- The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended); and
- The Conservation of Offshore marine Habitats and Species Regulations 2017 (known as the Offshore Marine Habitats Regulations).

Under these regulations, and in coordination with this assessment under the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020, an "Appropriate Assessment" was conducted to determine the implications for the relevant SPAs and SACs integrity and conservation objectives. These considerations are summarised throughout this document, to the extent relevant for the purposes of the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020.

Physical presence of temporary and permanent infrastructure

The physical presence of the drilling rig and supporting vessels, and the pipelay vessel whilst the project is under construction (around 2 and a half years), will displace other users of the sea, which is predominately shipping, fishing and seabirds. In addition, the infield infrastructure, including the protection structures, manifolds and infield pipelines of the six wells are considered to be permanent infrastructure.

Shipping

Intensity of shipping activities varies across the project area with shipping levels being highest nearer the Humber Estuary. There will be a temporary exclusion zone (500 m safety zone centred on the drilling rig) during construction, which will also exclude vessels from the project area. There will be a permanent 500 m safety zones at the wellhead, manifold and SSIV

locations meaning vessels will be excluded permanently from these sites. The Endurance Store area experiences low vessel traffic and the safety zone will be in an area of open water which will allow vessels to avoid the safety zone. It is not anticipated that access to any ports or harbours will be reduced as a result of the construction work at the store.

The pipeline installation works will lead to temporary and short-term exclusion to vessels from the immediate vicinity of the installation vessels as they travel along the proposed pipeline routes. Limited exclusion impacts are expected during operation. The two pipelines are proximal to a number of ports and harbours, and as such construction vessels have the potential to reduce access to the ports, however these operations will be localised and occur over a short time period. The expectation is that vessels will be able to navigate past the construction and any delays will be minimal.

Fishing

Fishing intensity is highest at the nearshore areas, which includes fishing using pots and traps, as well as scallop dredging. Demersal trawling is the primary fishing method at the Endurance Store area. Nearshore, the two pipelines will be installed using one of three techniques which will potentially reduce the amount of pipeline on the seabed nearshore. This will depend on the technique chosen following survey work. The highest landings values and fishing effort occur in the coastal ICES rectangles relevant to the proposed pipeline routes, with considerably lower landings values and effort in the Endurance Store area. Fishing vessels may experience temporary loss or restricted access to fishing grounds in the immediate vicinity of the installation vessels. Temporary loss of access will represent a small portion of the available fishing grounds in the area.

The surface laid or partially trenched sections of the pipeline route will represent increased snagging risk for trawler vessels but represents a small extent of the fishing grounds available to fishing activities, and fisherman will be made aware of the location of all infrastructure through existing systems e.g. FishSafe and navigational charts. The area lost to fishing activity represents a small extent of the available grounds in the area, and therefore, limited long-term exclusion is expected from the operation of the SSIV, pipelines or cables. The impacts to the fishing industry are not considered significant.

Renewables

The Endurance Store area overlaps with the lease area for the Hornsea 4 project; however, a commercial agreement has been reached with Ørsted (the developer of Hornsea 4) to avoid construction of Hornsea 4 infrastructure within the area of overlap with the Endurance Store. Hornsea 2 is currently under construction and Hornsea 1 is operational. No other renewables lease areas, operational or under agreement, are located within 50 km of the Endurance Store. There are a number of smaller OWF's operational close to the pipeline routes. As with the shipping routes, the expectation is that vessels will be able to navigate past the construction areas and any delays or disruption will be minimal.

Seabirds

Any disturbance to seabirds relating to the physical presence of vessels will predominantly occur during the construction period. At the Endurance Store, drilling activities and pipeline and cable installation will be of a short duration and localised, and therefore any impact associated with the physical presence of vessels and the drilling rig during the construction activities is considered to be not significant The bird species most likely to be found in the NEP Endurance Store area have some degree of habitat flexibility and are not generally considered vulnerable. In the case of species which are more sensitive, the extent of disturbance

predicted in line with the construction of the Development is such that any significant effect is not anticipated.

The installation of the proposed Humber pipeline (not part of the storage permit application) would involve the use of a jack-up barge which will be located in the Greater Wash SPA for 360 days. Applying a buffer of 2 km around the barge would equate to an area of disturbance equating to 0.04% of the Greater Wash SPA area. The presence of any vessels along this section of the route will be short lived and once a vessel has moved on from a position, the source of disturbance is removed, and birds are anticipated to return at any time. Red-throated divers are considered to have a high vulnerability to disturbance and have a low habitat flexibility meaning they are restricted in terms of the habitats they are able to exploit. Comparing the area of disturbance with the average density of red-throated divers in the area, an affected population of approximately seven birds can be estimated, representing 0.5% of the SPA population. By assessing other vessels which may be used during the construction activities and following a conservative worst-case approach, there is the potential for the affected population to rise to 27 birds or 2% of the SPA population.

HDD trestle piling works will be undertaken 1 km seaward of MLWS and may have the potential to cause disturbance for knot and redshank through displacement or the displacement of prey species. Piling at the HDD trestles will install two piles per day; four hours per pile; eight piles in total, i.e., piling would be completed within four days of construction activity, and piling will only take place for eight hours on each day of activity. Both knot and redshank are highly sensitive to noise disturbance. However, no reaction would be anticipated from either species to piling noise at a distance of 1 km.

I agree with the assessment, that the impacts resulting from the physical presence of the drilling rig, vessels and associated infrastructure, will have no significant effect on the environment.

Seabed disturbance and impacts

Aspects of the project which will lead to seabed disturbance and seabed impacts are (note the Humber pipeline is not within the scope of the storage permit application):

- Construction of the pipeline landfalls at Teesside and Humber.
- Seabed preparation, trenching, installation, burial and protection (as required) of the Teesside and Humber Pipelines, the Teesside – Store cable and the Teesside – SSIV cable.
- Installation of subsea infrastructure at the Endurance Store and the SSIV nearshore on the Teesside Pipeline.
- Seabed preparation, trenching, installation, burial and protection (as required) of the infield pipeline, flowlines and cables; and
- Physical presence of the surface-laid pipelines, subsea infrastructure and protection structures for the lifetime of the NEP Development.
- Presence of either a jack-up or semi-submersible drilling rig and vessels and the drilling of the 5 injection wells and one monitoring well.

Pipeline landfall

The landfall installation of the pipelines will lead to seabed disturbance. The final known technique is not known with three options being assessed within the ES. The three options are as follows:

- Direct pipe;

- Microtunnel with cofferdam;
- HDD.

All three options involve a borehole going ashore from varying distances offshore so that the pipeline will be under the seabed and have minimal seabed disturbance. The distance from the onshore bore entry point varies from 1.14 km to 2.69 km for Teesside and between 0.28 km to 0.99 km for the Humber. HDD and direct pipe options are proposed for the short section of a pre-cut trench for the Teesside approach and the direct pipe and microtunnel option for the Humber approach. The 4.4 km of trench at Teeside and 15.31 km of trench for Humber will be backfilled.

For the Teeside pipeline landfall, the option of direct pipeline installation represents the option with the largest footprint, which equates to a direct disturbance area of 0.67 km^2 and an overall impact area of 1.35 km^2. These impacts are considered to be temporary in nature as the seabed will return to its original state after the construction phase.

For the Humber pipeline landfall (not part of the storage permit application), the option which represents the largest impact footprint is the micro tunnel and cofferdam option and equate to a direct disturbance area of 0.67 km^2 with an overall impact area of 1.35 km^2. Again, any impacts will be temporary in nature with the seabed returning to its original state after the construction phase.

Offshore pipeline installation

The offshore sections of the pipelines will be installed using an “S” lay pipelay vessel. The operator’s preference is to use dynamic positioning (DP) to position the vessel however anchors may be required and the impact from both have been assessed.

The remaining sections of the pipelines will be surface laid except where partial trenching may be required to mitigate scour, and the design of the pipelines aims to minimise the requirements for rock protection. The base case is for no rock placement along the route of the pipeline however contingency may be required, and the following scenarios of rock placement have been assessed:

- At each pipeline crossing
- For freespan correction.
- For upheaval buckling mitigation.
- For additional protection in specific section if/where required e.g. where required trenching depth cannot be achieved.
- To stabilise the pipeline where a rocky seabed prevents embedment and where the maximum practical concrete thickness (150 mm) is not sufficient for stability; and
- At the ends of the flowlines.

The worst-case scenario is the Teesside flowline requiring rock placement to protect 40.9 km of the pipeline and the Humber pipeline requiring rock placement along 5.1 km of the pipeline. This equates to 1 195 019 tonnes and 156 374 tonnes of rock respectively. Additional volumes may be required for trench transitions, infield pipelines and flowlines giving a worst cast rock placement of 597 855 m^3 or 1 434 853 tonnes.

An electric power and fibre-optic communications control cable will run from Teesside to the subsea infrastructure at the Endurance Store. The cable may be laid within the Teesside pipeline trench, however installation via a separate pre-cut trench has been assumed for the purposes of the ES as a worst-case scenario. During trenching, a corridor up to 15 m wide along the cable route may be disturbed. The cable will require rock protection along sections

of the route with the worst-case total of 262,781 tonnes of rock. Where it is established that rock placement is needed, this would be applied above the cable by installation of a berm of crushed rock, achieving a minimum depth of cover of 0.5 m.

Drilling operations

Water based muds and the associated cuttings from drilling the top sections of each well will be discharged to sea. Cuttings modelling indicates the lateral extent of the section of the water column predicted to have an impact risk on more than 5% of species present, extends to a maximum of 5.7 km to the north of the release sites and 3.1 km east. The majority of the risk in the water column occurs between days 2 and 7 after drilling begins. The risk is shown to dissipate rapidly after this, where the risk falls below 5% at day 9, and after day 19 the risk returns to zero.

Other sources of disturbance include the potential use of a jack up drilling rig to drill the wells with the jack-up having three spud cans each of 18 m diameter resulting in a seabed disturbance of 0.0046 km^2 across the six wells. It is not predicted that anchors will be required for the drilling.

Archaeological features

The operator has identified a number of wrecks which have the potential to be impacted by the NEP Development activities e.g. trenching and backfilling works when laying pipelines and subsea infrastructure. Archaeological Exclusion Zones have been placed around these wrecks and there is agreed measures to avoid impacts. There is also agreed protocol in place to deal with unexpected discoveries.

Seabed habitats and species

The presence of rock protection, surface-laid pipeline and infrastructure on the seabed will result in a permanent impact to the seabed and have the potential to cause topographical changes due to the presence of structures on the seabed. Boulder clearance activities may also result in permanent impact due to increased concentrations of rocks and boulders to the sides of the pipeline corridor. Boulder clearance and ridge flattening will remove and disturb seabed habitat from within the trenching corridor and installation activities.

The Humber pipeline (not part of the storage permit application) would pass through the Holderness Offshore MCZ and the Holderness Inshore MCZ. The Holderness Offshore MCZ is designated for one species feature of conservation importance (ocean quahog) and one feature of geological interest, Silver Pit glacial tunnel. The MCZ covers a total area of 1,176 km^2. The 'North Sea glacial tunnel valleys' were scoped out from further assessment as the Humber pipeline would not interact with this feature. The pipeline may have an impact on the protected features including intertidal sands and muddy sands, circalittoral rock, and a range of subtidal sediment types. Within the Holderness Offshore MCZ the Humber pipeline would be mostly surface laid, with the exception of a short section being trenched and buried. There would be varying requirements for rock placement along the length of the Humber pipeline. The base case within the ES is for no rock placement within the MCZ, however a worst case of 5% of the pipeline length to be covered was assessed, totalling 991 m in length. No evidence of adult Ocean quahog was identified in the survey work within the MCZ.

JNCC considered that activities associated with the Humber pipeline have the potential to lead to a permanent impact on the designated features of the Holderness Offshore MCZ. Within the Holderness Offshore MCZ the area of habitat loss from the proposed Humber pipeline would equate to 0.023 km2 or 0.0019% of the Holderness Offshore MCZ. Taking a worst case of the habitat loss from the Tolmount Humber Gathering System (HGS), an export line which became operational in 2022, and assessing both developments cumulatively, results in a loss of 0.0049% of the MCZ. The comments received from JNCC were considered alongside the information within the ES and was sufficient information to reach a conclusion. The ES demonstrates that the disturbance and burial of a small proportion of these interest features will not disrupt their overall structure and functioning across the MCZ. There is no significant risk of the Humber pipeline construction hindering the achievement of the conservation objectives for the MCZ. Despite the feature sensitivity to pressures associated with pipeline installation, due to ongoing functioning and wider persistence of the interest features across the MCZ, the conservation objectives to “maintain” will be sustained.

The Holderness Inshore MCZ covers an area of 309 km^2 extending from MHWS to 6 km offshore. The subtidal part of the Holderness Inshore MCZ supports a mosaic of habitats comprised of clay bedrock, cobbles, boulders, gravel, sand, mud and shells and is designated for seven different habitats and one geomorphological feature. Within the Holderness Inshore MCZ, the Humber Pipeline will be trenched and buried. Rock placement may be required along the pipeline route within the MCZ with a worst case of 7.5% of the pipeline length to be covered. Preparation of the seabed for pipeline and cable installation e.g. boulder relocation, may use a plough, but this will be a targeted approach, and the use of a plough is a contingency option if post-lay trenching is required. In addition, the presence of the pipeline and rock placement along the pipeline will have a direct impact on the sediment features, however the area of disturbance is minimal with respect to the overall area of the interest features within the MCZ.

NE considered that activities associated with the pipeline represented a significant risk to the designated features of the site, in particular circalittoral rock features and the mixed and coarse subtidal sediments. The total area of the Holderness Inshore MCZ is approximately 309 km^2 and approximately 0.0018% of the whole MCZ area will be impacted by the proposed pipeline activities. Rock coverage along the pipeline will only be used where the required burial depth cannot be achieved, driven by engineering requirements for pipeline safety. The installation of the pipeline may affect two individual clay ridges. However, there are frequent examples of clay features across the Holderness Inshore MCZ and much of the coastline. Overall, while the impact on the finite clay ridge/moderate energy rock features represents a permanent loss of this habitat, the scale is very small in the context of the Holderness Inshore MCZ as a whole.

The potential area of habitat lost associated with the proposed Humber pipeline is less than 0.01% of each habitat impacted within the Holderness Inshore MCZ. The interest features cover much of the Holderness Inshore MCZ and are governed by wave, tide and sediment transport processes that occur at regional scales. Despite the feature sensitivity to pressures associated with pipeline installation, due to ongoing functioning and wider persistence of the interest features across the MCZ, there is no significant risk of the Humber pipeline construction hindering the achievement of the conservation objectives stated for the MCZ.

Fish and Shellfish

The construction works and drilling operations may have an impact on fish and shellfish through seabed disturbance (smothering) and sediment re-suspension, and through long term changes to the seabed habitat due to new infrastructure on the seabed. Adult and sub-adult fish and shellfish are expected to move away from disturbance and re-colonise the NEP Development area once the disturbance from installation activities has ceased. Suspension of sediment is expected to be very short term with most sediment settling after 24 hours and rapid recovery of populations.

Fish eggs are sensitive to smothering and sediment re-suspension and the work overlaps with the period of herring spawning. However, impacts arising from smothering and sediment re-suspension are short-term (generally over a period of a few days to a few weeks). Given the small area of potential herring spawning ground and spawning grounds of other species that may be affected, and the expected short-term nature of the disturbance, the NEP Development will not have a significant effect on herring spawning or the spawning of other species at the population level.

Seabirds and harbour porpoise

Indirect effects on seabirds and harbour porpoise may occur either through settlement of additional sediment on the seabed causing smothering of benthic prey items, or through the suspension of sediment in the water column reducing visibility and the ability of birds to find food.

The sensitivity of birds to habitat loss varies with species. Species that are sensitive to habitat loss generally have smaller foraging ranges and/or utilise fewer specific habitat. Species which may be impacted due to habitat loss are little tern and Red throated divers.

The nearshore section of the Humber Pipeline (not part of the storage permit application) will pass through the Greater Wash SPA which is designated for red-throated diver in the non-breeding season (October to March). Densities of red-throated diver are above 0.05 birds/km^2 up to the 20 km point of the pipeline. It is therefore considered that beyond 20 km any effect upon red-throated divers is not likely to be significant. Along the nearshore length of the pipeline the total seabed area directly affected during construction would be approximately 0.83 km^2. The area of seabed directly affected by the presence of the jack-up barge is 0.64 km^2. The total affected area of seabed would therefore be 1.47 km^2. The average density in the area affected is 0.25 birds/km^2. When multiplied by the area potentially affected (1.47 km^2), this provides an affected population of less than one bird. The regional population of red-throated diver in the SNS is 10,177 birds (Furness, 2015). An affected population of less than one bird therefore represents less than 0.01% of the regional population and therefore not considered to be significant.

Little terns are considered to be highly sensitive to habitat loss having a low habitat flexibility. The Humber Pipeline makes landfall 3 km to the north of Easington Lagoon, passing through areas potentially used by little terns for foraging. The landfall option with the largest potential to impact the foraging area of little tern is the use of a micro tunnel and cofferdam resulting in a total area of potential habitat loss on the beach of 0.004 km^2 and a pre-cut shore approach trench disturbing an area of 0.036 km^2. The presence of a jack-up barge could also result in temporary habitat loss, representing an area of 0.64 km^2. The overall worst-case loss of habitat to little tern would therefore be approximately 0.68 km^2.

Site-specific foraging range data for little tern suggests that little terns from the Easington Lagoons colony will forage up to 5 km along the shore. In addition, birds will forage up to 3 km

seaward from the colony therefore representing an area of up to 30 km^2. The affected seabed area (0.68 km^2) would therefore represent less than 2.3% of this area. Little terns are not considered sensitive to disturbance and are likely therefore to forage around any construction activity, reducing the potential impacted area and therefore the area lost for foraging. Previous studies have indicated that little tern productivity has not previously been adversely affected by pipeline construction in nearby, similar habitat. Any impact will be short term with the work taking place over six months.

The effects of the NEP Development project associated with seabed disturbance on little tern are considered to be not significant.

The project will lead to the loss of seabed for Harbour Porpoise to utilise and cause potential changes to the availability of harbour porpoise prey fish species within the SNS SAC. The seabed footprint for the structures proposed to be installed on the seabed within the SAC amounts to a worst case of 0.1683 km2, representing 0.0004% of the overall SAC seabed area. Given the localised seabed footprint of the subsea infrastructure and pipeline installation, the impacts on the supporting habitats and the availability of harbour porpoise prey species within the SNS SAC are not considered to be significant or pose a likely significant effect on the SNS SAC either alone or in-combination. Further assessment will be undertaken through subsequent approvals nearer the time of the proposed activity.

Discharges to sea

Drilling and pipeline discharges

There will be limited discharges to sea, with the majority of the discharges from the drilling of the wells (drill cuttings, drilling mud, wellbore clean up fluids, chemicals and cement). Water based muds and the associated cuttings from drilling the top sections of each well will be discharged to sea. Cuttings modelling indicates the lateral extent of the section of the water column predicted to have an impact risk on more than 5% of species present, extends to a maximum of 5.7 km to the north of the release sites and 3.1 km east. The majority of the risk in the water column occurs between days 2 and 7 after drilling begins. The risk is shown to dissipate rapidly after this where the risk falls below 5% at day 9, and after day 19 the risk returns to zero.

There will be limited discharges of chemicals used during the drilling phases and pipeline commissioning. Water quality and marine organisms were identified as key receptors. The impacts to water quality are likely to be localised and short term, given the short timeframe for the drilling activities and the selection of chemicals which are low risk to the environment. The discharge of drill cuttings and chemicals are not considered to have a significant effect on the environment.

Formation water displacement

The Bunter Sandstone Formation forms an outcrop at the seabed ~25 km east of the Endurance Store structure. The Bunter outcrop is not considered to be a potential CO_2 leakage pathway. As CO_2 is injected into the Endurance Store, pressure will increase within the Bunter Sandstone Formation. Pressure increases within the Bunter Sandstone Formation will dissipate throughout the formation and the surrounding area, which will lead to the displacement of formation water into the water column from the upper 140 m of the formation.

The maximum seepage of formation water will be 1,600 cubic metres (m^3)/day across the Bunter outcrop area which would equate to ~1.13 L/d/m^2. The displaced formation water will have an increased salinity in comparison to sea water, although borehole analysis

demonstrated that salinity decreased the closer to the surface the water was. The formation water also contains increased concentrations of minerals and metals, but borehole analysis showed a clear trend that concentrations increase with depth, with samples taken from 166 m having a composition closer to that of seawater. There would be the potential for the displacement of formation water to have an effect on plankton, the larvae of fish and invertebrates by causing a drop in osmotic pressure, however such impacts are usually only associated with very large and concentrated discharges of hypersaline water.

Computational Fluid Dynamics (CFD) modelling and Whole Effluent Testing (WET) testing was undertaken using samples taken from the borehole drilling at 291 m True Vertical Depth Sub Sea (TVDss) (this was a conservative approach given that the displacement will come from the upper 140 m where salinity and concentrations of minerals will be less). A displacement of 1,590 m^3 per day occurring over an area of 700,000 m^2 was modelled. The CFD modelling predicted that there is a small region of low dilution factors in the vicinity of the displacement, but the dilution factor is above 98% at a distance of 150 m from the displacement. The dilution, required to achieve a PNEC (Predicted No Effect Concentration) of less than 1, will be achieved within 150 m. This dilution will bring the ion imbalance caused by the displaced Formation Water within the range tolerated by marine organisms and no adverse effect is predicted outside of this range.

Monitoring will be undertaken at the outcrop through a fixed lander which will be located at the site. Monitoring will follow a risk-based approach and additional sample locations across the exposed outcrop along with Autonomous Underwater Vehicle (AUV) surveys may be undertaken as required. Monitoring will allow for the observation of changes to pH, identification of acoustic anomalies, salinity out of the expected range or pockmarks or bubble streams.

I agree with the assessment that the impact to water quality and marine organisms from the discharge of chemicals and the seepage of formation water from the Bunter outcrop to sea will not result in a significant effect, given the dilution and dispersion expected in the marine environment.

Atmospheric Emissions

Local air quality and climate change were the primary receptors considered in relation to atmospheric emissions from the project. Atmospheric emissions will arise from the project from the vessel fuel combustion during installation, commissioning, drilling of wells and operations and maintenance (O&M). Emissions during the O&M phase of the project will consist of emissions from venting from the wells and subsurface safety valve (SSSV), and vessel emissions associated with maintenance. Note total atmospheric emissions include a worst case by including emissions associated with construction of the Humber pipeline, which is not part of the storage permit application.

Atmospheric emissions from the construction phase of the project will be related to fuel combustion from the drilling rig (semi-sub is presented as the worst case in terms of atmospheric emission though a jack-up may be used), numerous vessels and helicopter traffic. The total estimated CO_2(e) emissions from the drilling of the wells and the installation of all subsea infrastructure and landfall works is equivalent to 2.1% of 2019 emissions from UK shipping emissions (2019 shipping emissions were estimated from the total emissions from commercial fishing in UK waters, coastal shipping and leisure craft and did not include international shipping in UK waters). During O&M, vessel emissions related to the NEP Development will be around 3 kt CO_2e per annum, which represents 0.06% of 2019 UK shipping emissions.

Effects on air quality will be localised and given the distance from the UK/Netherlands median line, no transboundary impacts are expected. At Teesside, the nearest human receptors are recreational and include the Cleveland Golf Links and Redcar Beach Caravan Park which lie within 1 km of the landfall. At Humber, there are no recreational or residential receptors within 1 km of the landfall. Throughout the lifecycle of the NEP Development, there will be atmospheric emissions from vessel activity which have the potential to impact on local air quality. Shipping activity for the NEP Development area is described as busy Nearshore, emissions from vessels that are temporarily present as a result of the NEP Development are considered negligible and are unlikely to be discernible from existing ongoing activities in the area.

The UK Climate Change Committee assessment for shipping (CCC, 2020; CCC, 2022), estimates that the Government's Net Zero pathway requires shipping emissions to fall by around 28% by 2035, relative to 2019 levels (i.e. from 14.3 $MtCO_2e$/year to 10.3 $MtCO_2e$/year). Currently there are no statutory sectoral emissions targets in the UK, including for the shipping sector. In 2035, vessel emissions from the Development are estimated to be around 3 kt CO_2e, representing 0.03% of the 10.3 $MtCO_2e$ (i.e., the 28% reduction in emissions relative to 2019 levels).

Emissions from venting from the wells and SSSV and during pigging operations are estimated to total 726.1 tCO_2e over the entire 25 years O&M phase of the project.

I agree with the assessment undertaken and the conclusion that the sensitivity of climate change as a receptor is considered high, but the magnitude of effect is considered low. Overall, I agree with the assessment that the environmental effects from the atmospheric emissions are not significant.

Underwater noise

Noise generated from the drilling activities, vessel presence, dredging activities and potential rock dumping are non-impulsive noise sources and therefore considered to have a negligible effect on the marine environment.

The following sound sources from the project were considered to have a greater effect and further assessed:

- Piling during installation of:
    - Manifolds in the Endurance Store area.
    - SSIV on the Teesside Pipeline; and
    - HDD trestles at Teesside and Humber pipeline landfalls.
- Seismic surveys as part of monitoring activity during the life cycle of the NEP Development (Seismic survey utilising 400 cu in airgun or 480 cu in airgun.)

Marine mammals and fish are the main receptors of underwater noise. Modelling of the noise generated by the above activities was undertaken to assess the impact to marine mammals.

The predicted sound levels from the piling were compared to the sound pressure levels and sound exposure levels of the cetaceans known to frequent the area. The modelling concluded that the noise levels could disturb marine mammals up to a distance of 7.2 km (from the manifold piling work) and the potential to injure marine mammals would be within 100 m of the noise source. The developer has stated that JNCC mitigation guidelines will be followed during the piling operations, which includes the use of soft starts and a monitoring zone of 500 m. Given the proposed noise mitigation measures and that the piling works will be temporary in

nature and short duration, the project will not have a significant effect on marine mammals and fish.

Sound modelling was also undertaken for seismic activities which will be required to monitor the CO_2. Over the life of the project (25 years), up to six seismic surveys will be undertaken, each for a maximum of 75 days. The modelling concluded that the noise levels could disturb marine mammals up to a distance of 8.9 km where a change in behaviour may be exhibited by a small number of individual animals for the period of the seismic surveys. There will be a relatively small area impacted, and the intermittent nature of the planned seismic surveys and associated low numbers of marine mammals likely to be disturbed, it is considered unlikely that underwater sound generated by seismic surveys at the Endurance Store will result in a significant effect on marine mammals.

Sound modelling was also undertaken for fish species for both piling and seismic activity and concluded that injury would be temporary and highly localised, and disturbance is likely to occur over a slightly greater area range than for cetaceans. However, this is not likely to have a significant effect on fish species.

Harbour and grey seals may be present within the NEP Development area; however, the number of seals present is likely to be low and any noise impacts are considered not to pose a significant effect on seal species. Harbour seals may be impacted by HDD Trestle piling operations however Harbour seals are generalist predators, and their broad habitat range in UK waters indicates that harbour seal is a very adaptable species. Piling at the HDD trestles will install two piles per day; four hours per pile; eight piles in total, i.e., piling would be completed within four days of construction activity, and piling will only take place for eight hours on each day of activity. Modelling shows a potential radius of disturbance of 3.6 km from the piling sound source. Harbour seals in the UK, including those associated with the Tees estuary, are likely to forage generally within 50 km of their haul-out sites and there is extensive alternative foraging habitat out with the disturbance area.

The Endurance Store lies within the Southern North Sea SAC and as such additional protections exist for the effect of noise sources on Harbour porpoise. Any seismic survey activities to be undertaken as part of the monitoring plan would require further approval prior to the seismic monitoring being undertaken. As part of this, there will be procedures in place to ensure that daily and seasonal noise thresholds are not exceeded either for the activities alone or in combination. There is potential for prey species of harbour porpoise (fish) to be impacted by underwater sound, but neither the piling or seismic operations are considered to have a significant effect on fish species and will therefore not have a significant effect on harbour porpoise.

Effects of unplanned or accidental events

The following release scenarios are considered within the ES:

- Diesel from the jack-up rig and installation vessels.
- Chemicals from the jack-up rig and installation vessels.
- CO_2 from the pipelines, the wells or the Endurance Store; and
- Store Formation Water from wells.

Diesel release from drilling rig and installation vessels

In the event of an unplanned release, the maximum loss of diesel inventory from the drilling rig is 736 m^3 of diesel. Stochastic modelling of a release from the drilling rig showed the

maximum probability of shoreline oiling as being 31.8% at the East Riding of Yorkshire and the minimum arrival time was predicted to occur at Scarborough District in 1 day 21 hours. The maximum quantity of marine diesel shoreline oiling is predicted to be 19 kg in spring, and 21 kg in winter, with no mass of diesel predicted to be deposited at the shoreline for the summer and autumn scenarios. Given the small quantities of diesel, the quantity would not be detectible on the shoreline. There is no risk of a blowout of reservoir hydrocarbons from the Endurance Store.

In the event of an unplanned release, the maximum loss of diesel inventory from the pipelay vessel is 8098 m^3. For Teesside, stochastic modelling showed the maximum quantity of marine diesel predicted onshore was 1,308 tonnes. The maximum probability of contamination to a UK shoreline (99.1%) occurred at Redcar and Cleveland with an arrival time of 3 hours. Additional worst case deterministic runs were conducted based upon the results of the stochastic modelling to fully evaluate the predicted mass onshore. Worst case shoreline impact was predicted to be a maximum of 701 g/m^2 after 30 days, extending over a total shoreline area of 17.8 km^2.

In the event of an unplanned release from the pipelay vessel at the Humber nearshore location the maximum quantity of marine diesel predicted to reach onshore was 944 tonnes. The maximum probability of contamination to a shoreline (77.3%) occurred at East Lindsey District with an arrival time of 1 day 4 hours. Additional worst case deterministic runs were conducted based upon the results of the stochastic modelling to fully evaluate the predicted mass onshore. Worst case shoreline impact was predicted to be a maximum of 35.7 g/m^2 after 30 days, extending over a total shoreline area of 8.7 km^2.

Given the results of the modelling, and the type of hydrocarbons, it was concluded that the loss of hydrocarbons from the semi-submersible drilling rig or pipelay vessel will not have a significant effect on the environment.

In addition, the developer will have an Oil Pollution Emergency Plan (OPEP) for the drilling rig and Shipboard Oil Pollution Emergency Plan (SOPEP) for the vessels. Offshore training will be undertaken, and appropriate contracts will be in place to facilitate a response to a release should an event occur.

Chemical release from drilling rig and vessels

Approved operational procedures will be implemented to mitigate the likelihood of the accidental release of chemicals and to minimise their impact should they occur. The risk of a significant effect arising from the accidental release of the chemicals specifically used for the NEP Development are assessed to be negligible, due to the low quantities of chemicals present, the nature of chemicals and the low probability of an incident.

Should HDD be used during pipeline landfall, drilling will be undertaken using bentonite , which is on the OSPAR list of chemicals considered to pose little or no risk to the environment (PLONOR list). In the event of a surface breakout event, the fluids are expected to disperse rapidly in the marine environment. Prior to drilling, confirmatory ground investigation will be undertaken to optimise the drilling programme which will reduce the consequence and probability of a break-out of drilling fluid.

CO_2 Leakage Risk

There is the potential for accidental leakage of CO_2 from pipeline, wells or the Endurance Store. It is unlikely there will be a large release of CO_2 from the pipelines as a release will

result in a drop of pressure and pumping from onshore will cease. There will be multiple barriers preventing a release of CO_2 from the wells.

Well integrity and leak monitoring techniques for injection and legacy wells are summarised in the ES and presented in full in the Management, Monitoring and Verification plan which fulfils the requirements of Article 13 of the CCS Directive, and which was submitted as part of the Storage Permit application. Post-closure monitoring will be utilised to mitigate any risk of post-injection leaks.

The monitoring plan of the storage permit application will allow for the verification of the containment of CO_2 and monitor CO_2 in the subsurface after injection, including the associated response of the storage complex and wider aquifer. The following monitoring techniques will be used:

- 4D seismic imaging using vessels which will allow for monitoring of migration of CO_2 towards and beyond the edge of the Storage Complex (lateral leakage)
- 4D gravity and seabed deformation (seabed array)(subject to feasibility study) which will allow for an estimate of the plume shape and extent and the total brine displaced from the plume
- A monitoring well will be drilled to allow for additional continuous pressure and temperature monitoring capability remote from the injection wells. The monitoring well will allow for monitoring of CO_2 distribution in the reservoir and thus influence risk assessments for formation water displacement at the Bunter outcrop.

In addition to the monitoring plan, the Storage of Carbon Dioxide (Licensing etc) Regulations 2010 require a corrective measures plan which details the measures to be taken to prevent or stop the leakage of CO_2 from the storage complex. Corrective measures identified range from 'immediate corrective measures' such as pipeline shutdown to 'longer term corrective measures such as drilling of a relief well. It also details triggered monitoring which would be undertaken to verify and obtain further information on a potential leak.

Should there be a CO_2 leakage, then a proportion of the CO_2 will ultimately end up in the carbon cycle and in the atmosphere. When released, the CO_2 will rise to the surface and dissolve into the water column. Larger bubbles will reach the surface and be released into the atmosphere. CO_2 absorbed into the seawater will lead to an increase in localised acidity of sea water. CO_2 leakage scenarios were modelled and concluded that bubbles fully dissolved within 40 m of the water column, with up to 90% of the dissolution occurring within the first 5 m. The localised nature of the water column impacts will mean fish and marine mammals may experience some behavioural changes but are unlikely to be significantly affected. In addition, CO_2 dissolution into seawater may decrease pH levels which may affect benthic and pelagic species; however, any effects will be localised, short term and recover within weeks of the leak stopping.

Given the mitigations in place and the localised potential impacts, there will be no significant effects on the environment from an accidental release of CO_2.

Brine and/or CO_2 leakage from Legacy Well

Brine or CO_2 could potentially leak from legacy wells in connection with the Bunter store. Should the cement casing come into contact with the aquifer fluid, the cement casing corrodes and provide a leak path to surface. Monitoring will be conducted to identify any indication of unplanned events such as brine leakage at the legacy wells. The incremental increase in leakage risk due to the NEP Development is limited. In the unlikely event of a leak, impacts will only occur over a limited area. Should there be a release from a legacy well, the corrective

measures plan outlines the remediation measures which would be followed. Detailed operational steps would be developed to the specific situation whilst at the same time mobilising a rig and contingency equipment to allow for well intervention. The ES states that, as there are no other CCUS projects in the vicinity which could result in the leak of brine or CO_2, cumulative impacts will not occur.

Cumulative Impacts

Physical Presence

The ES lists all proposed and active OWFs within 510 km of the Flamborough and Filey Coast SPA. This distance is the maximum foraging range of northern gannets, a species for which the SPA is designated. The nearest proposed project is the Orsted Hornsea Project 4 which is 3 km NNW of the of the Endurance Store. The nearest operational OWF is the Hornsea Two which is 25 km ESE from the Endurance Store and consists of 165 turbines and covers an area of 462 km^2. There will be no surface infrastructure built as a result of the NEP project however vessel activity may lead to some cumulative impacts for other users of the sea and seabirds. The cumulative impacts associated with the physical presence of the vessels has been assessed along with other vessels and permanent infrastructure in the area. Given the temporary and localised impacts associated with the vessels and the project is not likely to have a significant effect from the presence of the vessels. Further assessment is provided in the previous 'Physical Presence' section.

Seabed Disturbance

No significant cumulative effects are predicted from seabed disturbance as a result of the project. As previously described, the areas affected represent relatively small areas of the protected sites and each affected seabed habitat type. Further details are provided in the seabed disturbance section.

Noise

No significant cumulative effects are predicted from underwater noise as a result of piling and seismic operations as part of the project. At the time of the operations, Geological Survey applications will be submitted to the Department at which time cumulative impact assessments will be undertaken utilising up to date information with other noise sources. Operations within the Southern North Sea SAC will be assessed cumulatively with other operations to ensure that set thresholds of disturbance are not exceeded. If necessary, coordination will be undertaken with other developers) to ensure that projects do not overlap which could result in the thresholds being exceeded.

Atmospheric Emissions

The project contributes to the UK CO_2 emissions, emitting 116 kt CO_2e during the three years of construction, which equates to 2.1% of 2019 emissions from UK shipping emissions. (2019 shipping emissions are calculated from the total emissions from commercial fishing in UK waters, coastal shipping and leisure craft. They do not include international shipping in UK waters). During the operations and maintenance phase of the project, vessel emissions related to the NEP Development will be around 3 kt CO_2e per annum, which represents 0.06% of 2019 UK shipping emissions. Given the temporary nature of the construction phase emissions, the minor emissions during the operations and maintenance phase and the storage of CO_2 as

part of the project, it is not considered that the project will have a significant effect on cumulative (UK shipping) CO_2 emissions.

Discharges to Sea

With respect to discharges to sea, no cumulative effects with other oil and gas activities are expected because drilling and commissioning discharges will be temporary and spatially restricted.

Transboundary Impacts

The UK/Netherlands median lies approximately 105 km East from the nearest part of the NEP Development, which is the Endurance Store. There is the potential for the project to have an impact on global climate change however, as previously described, the project will not have a significant effect on UK emission levels. The storage of CO_2 will contribute to UK and global net zero goals. There is not expected to be any transboundary effects from seabed disturbance, underwater sound, discharges to sea, potential accidental events, air quality or the physical presence of vessels.

The Environmental Targets (Marine Protected Areas) Regulations 2022

The Environmental Targets (Marine Protected Areas) Regulations 2023 specifies that before the end of 31st December 2042, the number of protected features which are in favourable condition within all relevant MPAs is not less than 70% of the total number of all protected features within relevant MPAs; and all other protected features within relevant MPAs are in recovering condition. Given that it has been concluded that the NEP Development will not adversely affect / hinder the conservation objectives of the MPAs affected either alone or in-combination, it can be concluded that the NEP Development will not prevent those targets being achieved.

Marine Plans

The ES details, in Appendix E how the proposals meet the various objectives and policies of the East Marine Plan and North East Marine Plan. Much of the Objectives/Policies have been addressed throughout the ES, for example, the East Marine Plan states that 'Carbon Capture and Storage proposals should demonstrate that consideration has been given to the re-use of existing oil and gas infrastructure rather than the installation of new infrastructure (either in depleted fields or in active fields via enhanced hydrocarbon recovery),' this has been addressed in the ES chapter on the consideration of alternatives. Having considered the relevant information, I am content that agreeing to the grant of consent for this project would be in accordance with the appropriate marine policy documents.

Decision on Conditions to the agreement of the grant of consent

The developer has made a series of commitments within the storage permit application around monitoring and corrective measures. These commitments are summarised within the ES and have been assessed as part of the agreement to the grant of consent.

Taking into account those commitments, and my conclusion above on the significant effects of the project on the environment, I do not consider that it is necessary to attach any conditions to the agreement to the grant of consent.

Recommendation

I have set out above my conclusion on the significant effects of the project on the environment.

I recommend that the Secretary of State should agree to the grant of consent for this project because taking into account the effect of measures set out above, there will be no significant effects on the environment.

Date: 2 October 2024

[redacted]
Environmental Manager

Offshore Petroleum Regulator for Environment and Decommissioning

For and on behalf of the Secretary of State for Energy Security and Net Zero

Agreement decision

I accept the recommendation for the reasons given.

On behalf of the Secretary of State, I therefore agree to the grant of consent.

Date: 11 October 2024

[redacted] - Director, of Operations OPRED

Offshore Petroleum Regulator for Environment and Decommissioning

For and on behalf of the Secretary of State for Energy Security and Net Zero