Davy North & Davy East Subsea Installation Decommissioning

Environmental Appraisal Report

For Perenco UK Limited

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ABBREVIATIONS

Abbreviation	Description
Al	Aluminium
AL1	Action Level 1
AL2	Action Level 2
AIS	Automated Identification Systems
AMOSS	Amoco Minimum Offshore Support Structure
As	Arsenic
BAP	Biodiversity Action Plan
Ba	Barium
BAC	Background Assessment Concentration
BDL	Below Detection Limit
BEIS	Business, Energy, and Industrial Strategy
BOEPD	Barrels Of Oil Equivalent Per Day
BSH	Broad Scale Habitat
Ca	Cadmium
CCS	Carbon Capture and Storage
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CPI	Carbon Preference Index
CRA	Collision Risk Assessment
Cr	Chromium
Cu	Copper
DESNZ	Department for Energy Security and Net Zero
DP	Decommissioning Programme
dB	Decibel
DSV	Diving Support Vessel
e.g.	For example
EA	Environmental Appraisal
EC	European Council
EEC	European Economic Council
EIA	Environmental Impact Assessment
ENVID	Environmental Impacts Identification
ERL	Effects Range-Low
EU	European Union

Abbreviation	Description
EUNIS	European Nature Information System
Fe	Iron
Ft	Feet (unit)
Fl/Py	Fluoranthene / Pyrene
GHG	Green House Gas
GWP	Global Warming Potential
Hg	Mercury
HMW	Heavy molecular weight
HSE	Health, Safety and Environmental
HSSE	Health, Safety, Security and Environment
i.e.	That is
ICES	International Council for the Exploration of the Sea
INNS	Invasive Non-Native Species
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Committee
JUB	Jack Up Barge
km	Kilometre
km^2	Square kilometre
lbs	Pounds
m	Metre
m^2	Square metre
m^3	Cubic metre
mg.kg-1	Milligrams per kilogram
MARPOL	International Convention for the Prevention of Pollution from Ships
MAT	Master Application Template
MBES	Multi Beam Echo Sounder
MCA	Maritime & Coastguard Agency
MCZ	Marine Conservation Zones
MMO	Marine Management Organisation
MMMU	Marine Mammal Management Units
MPA	Marine Protected Area
MU	Management Unit
N_2O	Nitrous oxide
Ni	Nickel
NDP	Naphthalene, phenanthrene and dibenzothiophene

Abbreviation	Description
NFFO	National Federation of Fishermen's Organisations
NOx	Nitrogen oxides
NSTA	North Sea Transition Authority
OEUK	Offshore Energies UK (Formerly Oil and Gas UK)
OESEA	Offshore Energy Strategic Environmental Assessment
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OPEP	Oil Pollution Emergency Plan
OPPC	Oil Pollution Prevention and Control
OSPAR	Oslo Paris Convention
P&A	Plugged and Abandoned
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PEL	Probable Effect Level
PETS	Portal Environmental Tracking System
Ph/Ant	Phenanthrene/ Anthracene ratio
PL	Pipeline
PLU	Pipeline Umbilical
POMS	PUK Operating Management System
PTS	Permanent Threshold Shift
PUK	Perenco UK Limited
SAC	Special Area of Conservation
SCANS	Small Cetacean Abundance of the North Sea
SEMS	Safety and Environmental Management System
SFF	Scottish Fishermen's Federation
SNS	Southern North Sea
SO_2	Sulphur dioxide
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
spp	Specie
SSS	Side-Scan Sonar
te	Tonnes (UK)
TEL	Threshold Effect Level
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TTS	Temporary Threshold Shift
UK	United Kingdom
UKCS	United Kingdom Continental Shelf

Abbreviation	Description
UKHO	UK Hydrographic Office
UKOOA	United Kingdom Offshore Operators Association
V	Vanadium
VOC	Volatile Organic Compound
WHPS	Wellhead Protection System
Xmas tree	Xmas Tree Assembly & Valves
Zn	Zinc
%	Percentage
>	Greater than
<	Less than
°C	Degree Celsius
kW/m	Kilowatt/metre
$\mu g.kg^{-1}$	Micrograms per kilogram
µPa	Micro Pscal
“	Inches

EXECUTIVE SUMMARY

In accordance with the Petroleum Act 1998, Perenco UK Limited (PUK) are applying to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to obtain approval for the decommissioning of the Davy East and Davy North subsea installations.

The Davy Field is located in the Southern Basin of the United Kingdom Continental Shelf (UKCS) approximately 100km offshore from the Bacton Gas Terminal. Davy North is in license block 49/30A (license number P64) and Davy East is in license block 53/5b (license number P787).

Davy East and Davy North were developed with subsea installation tiebacks to the Davy platform. Operations on the Davy platform were controlled remotely from the Indefatigable field. The first production occurred in October 1995. Gas from the Davy, Davy East, Davy North, Brown, and Boyle fields is routed via the Davy platform to the Indefatigable AT and Leman BT platforms before it arrives at the Bacton Terminal on the Norfolk coast.

The Davy North subsea well is connected to Davy via a 10.31km 8” Pipeline (PL) (PL 1871) and associated umbilical (Pipeline Umbilical (PLU)1872) and then tied into a 6” manifold flexible riser system. Its first production occurred in November 2001. The Davy East subsea well is connected to the Davy platform via a 5.71km 6” (PL 2344) and the associated umbilical (PLU 2345), then tied into the 6” riser manifold. The riser occupies the central conductor slot inside the substructure support column.

Both Davy North and Davy East subsea installations are located within the boundaries of the Southern North Sea (SNS) Special Area of Conservation (SAC), which features the Annex II species, the Harbour porpoise. Additionally, they are located approximately 30km to the east of the North Norfolk Sandbanks and Saturn Reef SAC, which features the Annex I Habitat, Sandbanks.

The Davy subsea installations, including the subsea Xmas Tree Assembly & Valves (Xmas trees), wellheads, Well Head Protection Structures (WHPS) will be removed to shore for reuse, recycling, or disposal. The subsea wells will be abandoned in AB3 phase. If any practical difficulties are encountered PUK will consult OPRED.

In line with legislation and regulatory guidance, this Environmental Appraisal (EA) report has been produced to support the Davy East and Davy North Installation Decommissioning Programme (DP) by assessing the potentially significant impacts associated with the preferred decommissioning operation.

This EA Report sets out to describe, in a proportionate manner, the potential environmental impacts of the proposed activities associated with the Davy subsea installations decommissioning and to demonstrate the extent to which these will be mitigated and controlled to an acceptable level.

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1 INTRODUCTION

1.1 Purpose of Document

This EA Report sets out to describe, in a proportionate manner, the potential environmental impacts of the proposed activities associated with the Davy subsea installations decommissioning and to demonstrate the extent to which these will be mitigated and controlled to an acceptable level. The key components and structure of this report are laid out in Table 1.1.

Table 1.1: EA Structure

Section	Description
	Executive summary
Section 1	Introduction to the decommissioning project for the Davy installation materials and a description of the EA report scope and structure.
Section 2	The regulatory context and guidance for undertaking a decommissioning EA.
Section 3	A summary of the stakeholder engagement process and activities carried out by PUK to date.
Section 4	An outline of the options considered for decommissioning, the decision-making process undergone by PUK to arrive at the selected decommissioning strategy and a description of the proposed decommissioning activities.
Section 5	A summary of the baseline sensitivities relevant to the activities taking place and the assessments that support this EA.
Section 6	A summary of the project Environmental Issues Identification process and findings.
Section 7	An outline of the EA method used a review of the potential impacts from the proposed decommissioning activities and justification for scoping potential impacts in or out of assessment in this EA Report
Section 8	Assessment conclusions
Section 9	Environmental management
Section 10	References
Section 11	Appendices

1.2 Field and Infrastructure Description

The Davy Field is located in the Southern Basin of the UKCS approximately 100km offshore from the Bacton Gas Terminal. Davy North is in license block 49/30A (license number P64) and Davy East is in license block 53/5b (license number P787).

The Davy field was the first gas field to be discovered in the Davy Area and was discovered in January 1970 by the Amoco well 49/30A-2. Davy, Boyle, and Brown were developed through re-completed exploration wells or sidetrack tiebacks to the Davy 49/30A (30A) Amoco Minimum Offshore Support Structure (AMOSS) platform. Davy East and Davy North were developed with subsea installation tiebacks to the Davy platform. Operations on the Davy platform were controlled remotely from the Indefatigable field. The first production occurred in October 1995.

The Davy Area gas fields are located approximately 90km from the nearest landfall on the Norfolk coast and approximately 40km Southeast of the Indefatigable field. Davy Area production and infrastructure are part of PUK's Southern Hub operations (Figure 1-1 and Figure 1-2). Davy has a single AMOSS platform, platform 30A, positioned centrally over the main Davy gas field. Gas from the Davy, Davy East, Davy North, Brown, and Boyle fields is routed via the Davy platform to the Indefatigable AT and Leman BT platforms before it arrives at the Bacton Terminal on the Norfolk coast.

The Davy North subsea well is tied to Davy via a 10.31km 8" PL (PL 1871) and associated umbilical (PLU 1872) and tied into a 6" manifold flexible riser system. Its first production occurred in November 2001. The Davy East subsea well is connected to the Davy platform via a 5.71km 6" PL (PL 2344) and the associated umbilical (PLU 2345), tied into the 6" riser manifold. The riser occupies the central conductor slot inside the substructure support column.

The flow from the subsea wells is tied into the Davy production manifold and commingled with the production from the platform wells. From Davy, the gas is transported by a 16" subsea PL (PL1054) to the Inde 49/23A installation and combined with production from other Inde installations. It is then exported from the Inde 49/23A via a 30" PL (PL 22) to Leman 49/27B. From there, the flow travels via a 30" PL (PL 234) to the Bacton Gas Terminal.

Both Davy North and Davy East subsea installations are located within the boundaries of the Southern North Sea (SNS) Special Area of Conservation (SAC), which features the Annex II species, the Harbour porpoise. Additionally, they are located approximately 30km to the east of the North Norfolk Sandbanks and Saturn Reef SAC, which features the Annex I Habitat, Sandbanks.

The PUK Section 29 Notice Holders assessed options for extending the producing life of the subsea installations, but none proved commercially viable. The PUK Section 29 Notice Holders then considered options for the relocation of the subsea infrastructure but concluded that there was no feasible use.

The Davy North Subsea Installation comprises of the following:

- One subsea production well
- Xmas tree and associated WHPS.

The Davy East Subsea Installation comprises of the following:

- One subsea production well
- Xmas tree and associated WHPS.

Figure 1-1: Davy and Surrounding Fields in SNS

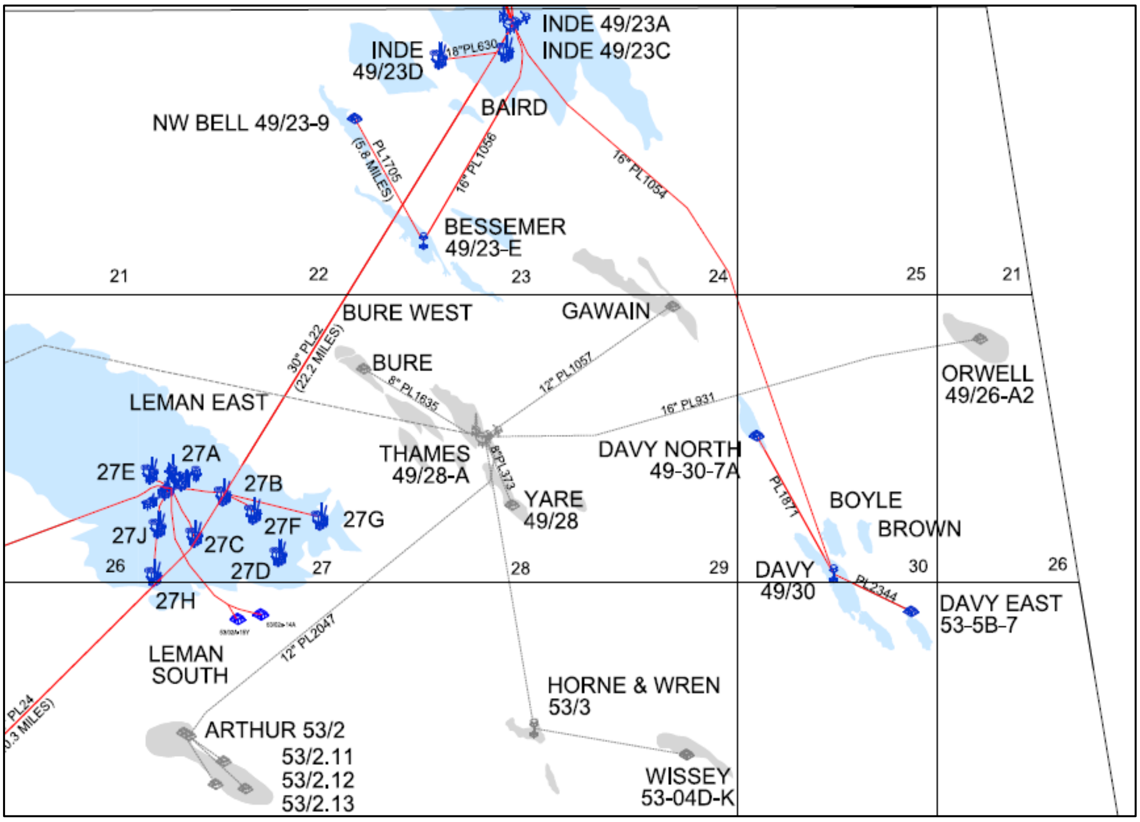
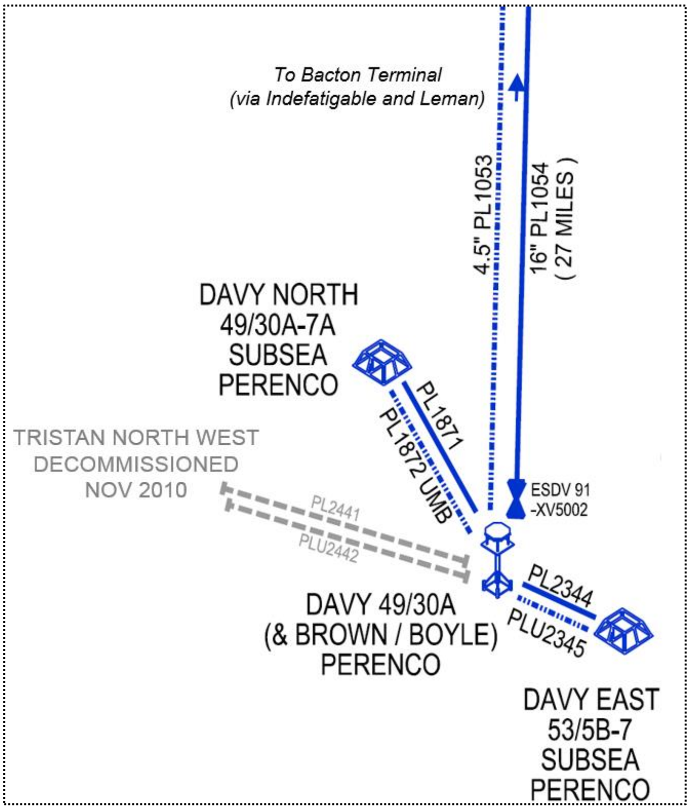


Figure 1-2: Davy Field Layout



1.3 PUK Limited

PUK, a subsidiary of Perenco, is an independent oil and gas company operating in the UK, specialising in hydrocarbon exploration, development, and production.

Perenco operates in 13 countries across the globe, ranging from Northern Europe to Africa and from South America to Southeast Asia.

Perenco currently produces approximately 450,000 barrels of oil equivalent per day (BOEPD), of which 250,000 BOEPD is net to the company. The group is present in world-class exploration basins such as Brazil, Peru, northern Iraq, Australia and the North Sea. While PUK's growth has been driven by acquisitions, the Group's strategy evolved rapidly towards increasing production and reserves, renewing licenses, and securing additional acreage for new exploration and development opportunities.

In the SNS Gas Basin, PUK and other operators, manage 17 offshore fields owned by PUK, along with associated pipelines and onshore processing facilities, including the Bacton and Dimlington Terminals. PUK’s gas production in the North Sea is around 72,000 BOEPD.

PUK operates under a Safety and Environmental Management System (SEMS) which is certified to conform to the International Organisation for Standardisation (ISO) 14001 for environmental management systems. SEMS provides the framework for PUK to achieve safe and reliable operations and ensures compliance with PUK’s Health, Safety, Security and Environment (HSSE) Policy. Further detail on PUK’s SEMS is provided in Section 9.

2 Policy & Regulatory Context

The decommissioning of offshore oil and gas installations and pipelines on the UKCS is principally governed through the Petroleum Act 1998 and is amended by the Energy Act 2008.

The United Kingdom (UK) international obligations in relation to decommissioning is principally governed by the 1992 Oslo Paris Convention (OSPAR) for the protection of the Marine Environment of the Northeast Atlantic. Agreement in relation to the offshore decommissioning regime was reached at a meeting of the OSPAR commission in 1998 (OSPAR Decision 98/3). As a result, The OPRED guidance in relation to offshore decommissioning is aligned.

The primary objection of OSPAR decision 98/3 remains to prevent the dumping of offshore installations at sea, with the default position of full removal. The decision however allows the granting of derogations to leave all or part of a structure in place, subject to a CA process.

In the context of marine planning and being located in the English offshore waters of the SNS, Davy gas field falls within the area of the East Offshore Marine Plan [49]. These plans were developed to help ensure sustainable development of the UK marine area; The broad aims and policies outlined in the Marine Plan have therefore been considered in this EA Report.

The primary guidance for offshore decommissioning [8] details the need for an EA to be submitted in support of the DP. The guidance sets out a framework for the required environmental inputs and deliverables throughout the approval process. It now describes a proportionate EA process that culminates in a streamlined EA report rather than a lengthy Environmental Statement as would be required under the Environmental Impact Assessment (EIA) Directive (Directive 2011/92/EU as amended by Directive 2014/52/EU) [18, 24].

3 Consultee responses

Table 3.1 provides details of stakeholder responses in response to this EA.

Table 3.1: Consultee Responses

Who	Response	PUK Response
Stakeholder Consultations		
Maritime & Coastguard Agency (MCA)	The MCA responded purely for information/guidance	Perenco notes the information and guidance provided.
Health and Safety Executive	No responses were received.	N/A
Environment Agency	No responses were received.	N/A
UK Hydrographic Office (UKHO)	The UKHO responded purely for information/guidance.	Perenco notes the information and guidance provided.
Marine Management Organisation (MMO)	The MMO responded purely for information/guidance.	Perenco notes the information and guidance provided.
Trinity House	Trinity House notes the need for a collision assessment.	Perenco notes the guidance provided.
OPRED OEI	OPRED OEI provided guidance on potential discharges to sea and the need for approved permits.	Perenco notes the information and guidance provided.
Public		
	During the Consultation DP Phase, a press notice was placed in a local newspaper and national journal and draft copies of the DP were made available at the Perenco Norwich office. An email address for responses to the press notices was also provided. No responses were received.	N/A
Statutory Consultations		
National Federation of Fishermen's Organisations	The NFFO has no comments to make or concerns to raise on the planned methodology in the documentation and NFFO Services department looks forward to working closely with Perenco throughout the decommissioning process of these two subsea assets.	Perenco will continue communications with NFFO throughout the decommissioning process.
Scottish Fishermen's Federation	Considering the proximity of the Davy North & East Installation, we are content for the NFFO to comment on this consultation.	Perenco has ensured that all fishermen organisations were contacted.
Northern Ireland Fish Producers Organisation	No responses were received.	N/A
Global Marine Group	I have reviewed the content provided and there are no active telecoms cables in the vicinity (closest is >20km away), I have no further comments. In the event that the decom information changes,	Perenco will notify any nearby cable owners of upcoming operations should decommissioning information change.

	and seabed invasive operations are to occur near existing telecom infrastructure, it will be important to notify any nearby cable owners of any upcoming operations.	
NSTA	Perenco has consulted with NSTA under S29(2A) of the Petroleum Act.	N/A

4 Decommissioning Activities & Parameters

This section details the infrastructure being decommissioned and provides details on the selected decommissioning method along with proposed timings.

4.1 Relevant Infrastructure

The Davy subsea installation subject to this DP is located in two different UKCS blocks: block 49/30A for the North Subsea Installation and block 53/5b for the East Subsea Installation.

Table 4.1, Table 4.2, Table 4.3, and Table 4.4 provides details on the infrastructure relevant to the Davy installation DP and EA. The Davy infield pipelines (PL 1871 and PL 2344), the umbilical (PLU 2345 and PLU 1872) and associated stabilisation material currently connected to the Davy installations. However, these are beyond the scope of this EA and associated DP and will be addressed in a separated pipelines and stabilisation material DP.

Table 4.1: Details of Davy North Subsea Installation Subject to the DP

Subsea Installation	Number	Size/ Weight Tonnes (te)	Location (WGS84)	Water Depth (m)	Comments/Status
Xmas-tree	1	17.56	53° 05' 01.9960"N 02° 49' 04.5857"E [5881828.600N 487897.400E]	36.27	Well has been suspended and will undergo plug and abandonment, and wellhead, Xmas-tree and conductor removal.
Wellhead	1	14.6			
WHPS	1	24.11			
Conductor	1	4.2			

Table 4.2: Details of Davy East Subsea Installation Subject to the DP

Platform Installation	Number	Size/ Weight Tonnes (te)	Location (WGS84)	Water Depth (m)	Comments/Status
Xmas-tree	1	16	52° 58' 57.405"N 02° 58' 21.168"E [5870547.300N 498248.700E]	41.15	Well has been permanently shut-in and will undergo plug & abandonment prior to wellhead, Xmas-tree and conductor removal.
Wellhead	1	14.6			
WHPS	1	24.11			
Conductor	1	4.2			

Table 4.3: Davy Subsea Wells Information

Wells	Oil & Gas Field	Designation	Status	Category of Well
49/30a- 7A	North Davy field	Gas Production	Abandoned Phase 1	SS-3-0-3
53/05b- 7	East Davy field	Gas Production	Completed (Shut-in)	SS-3-0-3

Note: The 53/05b-5 Davy East Discovery well is outside the scope of this EA and associated DP.

Table 4.4: Details of Well Conductors to be Recovered

Installation	Conductor size	Length (ft)	Weight/Grade	Weight (lbs)
Davy East	30"	16	456	7296
	13 3/8"	18	68	1224
	9 5/8"	15	47	705
Davy North	30"	16	456	7296
	13 3/8"	18	68	1224
	9 5/8"	14	47	658

4.2 Decommissioning activities and methodology

PUK has assessed options for extending the producing life of Davy subsea installations, but none proved commercially viable. Considerations were made for the relocation of the subsea infrastructure but no feasible use was identified. However, PUK will continue to review, the subsea installation's equipment inventories to assess the potential for adding to their existing asset portfolio spares inventory or for resale to the open market.

4.2.1 Preparatory works

Decommissioning of the Davy subsea installation is anticipated to commence in Q4 2025.

To recover the subsea installations from the seabed, previous work has been carried out to date, including:

<u>Davy North</u>

- Well 49/30a- 7A was taken out of operation (shut-in) in 2009
- Injectivity study completed in August 2024
- Pre-decommissioning environmental survey was conducted in April 2024

<u>Davy East</u>

- Well 53/05b- 7 was taken out of operation (shut-in) in 2021

- Injectivity study completed in August 2024
- Pre-decommissioning environmental survey was conducted in April 2024

Prior to decommissioning these wells will be Plugged and Abandoned (P&A) in accordance with Offshore Energies UK (OEUK) Guidelines for the suspension and abandonment of wells. These works will be supported by a Master Application Template (MAT) and supporting Subsidiary Application Templates (SATs) submitted within the Portal Environmental Tracking System (PETS) at the appropriate time.

Prior to start of the subsea installation decommissioning, the respective pipelines and umbilicals for the wells will be flushed from Davy platform and the fluid from the flushing operation displaced into respective wells. Following that, the pipeline and umbilical will be air-gapped at the topsides of Davy platform. The wells will then be Plugged and Abandoned (P&A), pipelines and umbilicals will be severed subsea, adjacent to the WHPS to facilitate the retrieval of the subsea assets.

This will be achieved by cutting PL 1871 and PL 2344 using a diamond wire saw or super grinder to disconnect from the Xmas-trees and to remove potential snagging associated with the pipeline ends. PLU 1872 and PLU 2345 will be cut to separate them from the associated subsea Xmas-trees. A dedicated Oil Pollution Prevention and Control (OPPC) and chemical license will be in place to cover the subsea severance of the pipelines and umbilicals.

4.2.2 Davy Subsea Installation Decommissioning

The Davy North and East subsea Xmas trees, wellheads and associated WHPS frame will be removed from their current location to obtain a clear seabed clearance certificate.

The subsea Xmas-trees, wellheads and associated WHPS frames will be lifted from the seabed and recovered to the deck for transport onshore. If any practical difficulties are encountered PUK will consult OPRED.

The Davy North and East pipelines (PL 1871 and PL 2344), umbilicals (PLU 1872 and PLU 2345) and the associated stabilisation features will remain on the seabed for future decommissioning and be addressed in a separate Pipeline DP. The seabed will be excavated to a sufficient depth to allow cutting. Ensuring the pipelines are separated from the Xmas trees as close to the seabed as possible to prevent the formation of any snagging hazard, such as the exposed pipeline cut ends.

The subsea wells, 49/30a-7A and 53/05b-7, will be shut in and abandoned to AB3. The well casings/conductor will be cut at circa 3m below the seabed.

4.2.3 Schedule

Table 4.5: Schedule of Davy Subsea Installation Decommissioning Activities

Year	2024				2025				2026				2027				2028				2029				2030			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pipeline Decommissioning Programe																												
Submission of DP																												
Consultation																												
Approval of DP																												
P&A and Removal Campaign																												
Davy East & Davy North P&A & WHPS Removal																												
Post Decommissioning Activities and Surveys																												
Post Decommissioning Surveys																												
Remediation (if required)																												
Clear Seabed Verification																												
Close Out report																												

LEGEND	
	Earliest date task could be completed
	Period in which the task expected to be completed
	Latest date task could be completed

5 Environmental and Societal Baseline

5.1 Introduction

As part of the EA process, it is important that the main physical, biological and societal sensitivities of the receiving environment are well understood. As such, this section describes the main characteristics of the physical and biological environment, identifies the other users of the sea present in and around the Davy development, and highlights any key sensitivities.

This environmental baseline description draws upon a number of data sources including published papers on scientific research in the area, industry wide surveys (for example (e.g.), the Offshore Energy Strategic Environmental Assessment programme (OESEA)) and site-specific investigations commissioned as part of the exploration and development processes and pre-decommissioning survey work at Davy field.

5.2 Planned surveys

5.2.1 Davy North Pre-Decommissioning Environmental Seabed Monitoring Survey 2024: Technical Report [58]

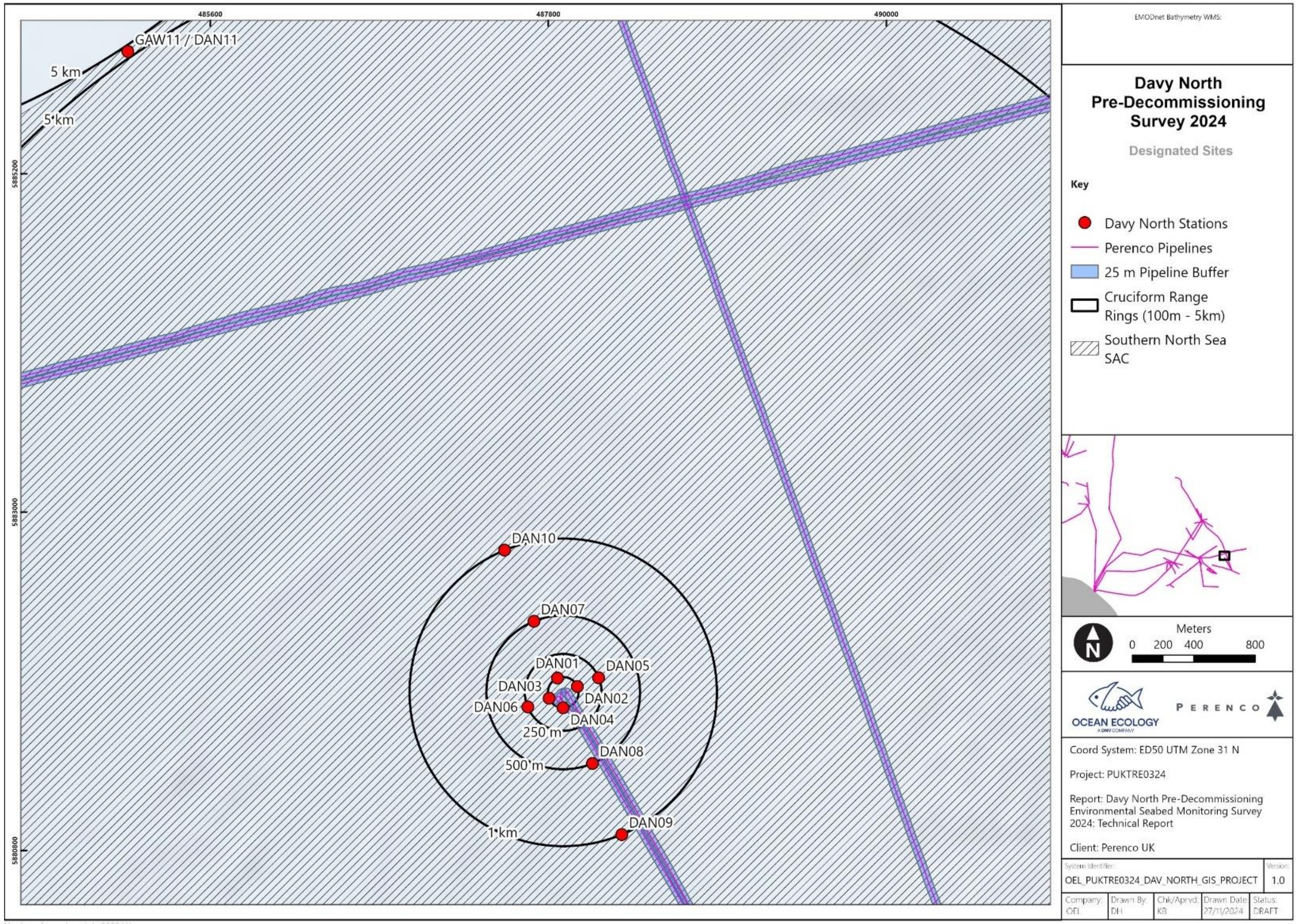
A pre-decommissioning environmental survey of the Davy North asset was completed in 2024 including an assessment of chemical contaminants and benthic fauna. The survey also set out to identify and determine the extent and distribution of potential Annex I habitats.

The survey involved collection of seabed imagery and sediment samples at 10 stations. These sampling stations were arranged in a cruciform arrangement centered on the subsea asset, as well as at a single reference station, for a total of 11 stations (see Figure 5-1).

The key objectives of the technical report were to:

- Describe the benthic communities present within the survey area, including described biotopes according to the European Nature Information System (EUNIS) classification, covering biodiversity, function, abundance, extent, species richness, representativeness, rarity, and sensitivity. This covered the range of water depths across the sites and include both infaunal and epifaunal communities.
- Identify and assess the status of species and habitats of conservation importance, including Annex I protected species and habitats (such as *Sabellaria spinulosa* biogenic reef or stony reef), and Annex V species of the Habitats Regulations, species listed under Schedule 5 of the Wildlife & Countryside Act, OSPAR species and habitats and designated features of the Marine Protected Area (MPA) network (e.g. SAC and Marine Conservation Zone (MCZ) features).
- Confirm the presence / absence of any epibenthic invasive non-native species (INNS), species non-native to UK waters and species non-native to the local habitat types (e.g. hard-substrate specialists in a wider sedimentary habitat).

Figure 5-1: Davy North survey area overview, including infrastructure, sampling design, and designated site



5.2.2 Davy East Pre-Decommissioning Environmental Seabed Monitoring Survey 2024: Technical Report [59]

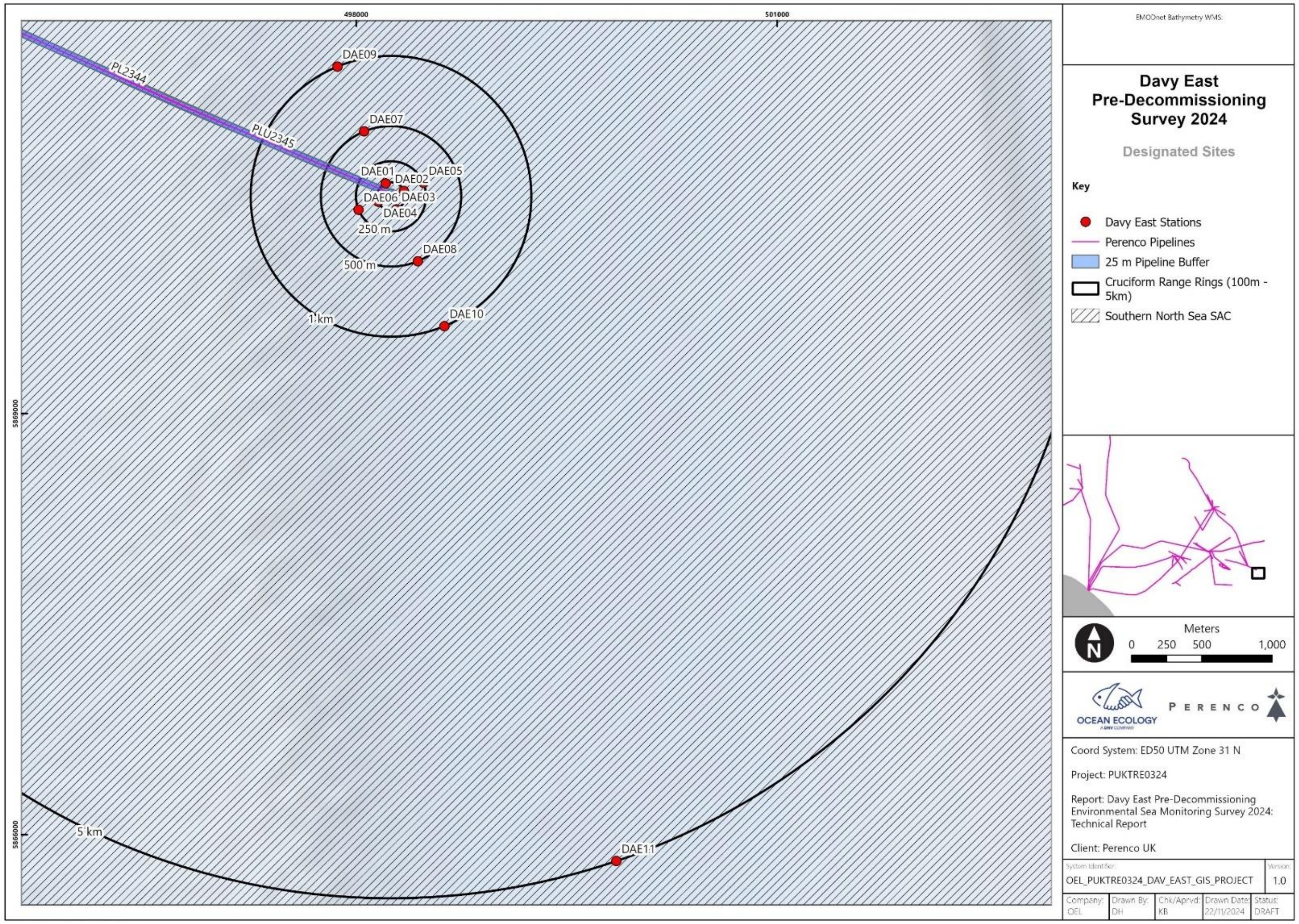
A pre-decommissioning environmental survey of the Davy East asset was completed in 2024 including an assessment of chemical contaminants and benthic fauna. The survey also set out to identify and determine the extent and distribution of potential Annex I habitats.

The survey involved collection of seabed imagery and sediment samples at 11 stations. These sampling stations were arranged in a cruciform arrangement centred on the platform asset and at a single reference station (see Figure 5-2).

The key objectives of the technical report were to:

- Describe the benthic communities present within the survey area, including described biotopes according to the EUNIS classification, covering biodiversity, function, abundance, extent, species richness, representativeness, rarity, and sensitivity. This covered the range of water depths across the sites and include both infaunal and epifaunal communities.
- Identify and assess the status of species and habitats of conservation importance, including Annex I protected species and habitats (such as *S. spinulosa* biogenic reef or stony reef), and Annex V species of the Habitats Regulations, species listed under Schedule 5 of the Wildlife & Countryside Act, OSPAR species and habitats and designated features of the MPA network (e.g. SAC and MCZ features).
- Confirm the presence / absence of any epibenthic INNS, species non-native to UK waters and species non-native to the local habitat types (e.g. hard-substrate specialists in a wider sedimentary habitat).

Figure 5-2: Designated Sites around the Davy East survey area



5.3 Physical Environment

5.3.1 Bathymetry

The SNS extends from the Flamborough front in the south to north of the Dover Strait in the south, with a transition from south sea water to Atlantic water. This region is shallow (generally 0-50m), with a predominantly sandy seabed [16]. Mapped information [47] indicates that the SNS generally comprises of sand and muddy sand with significant areas of coarse sediment, especially closer to shore.

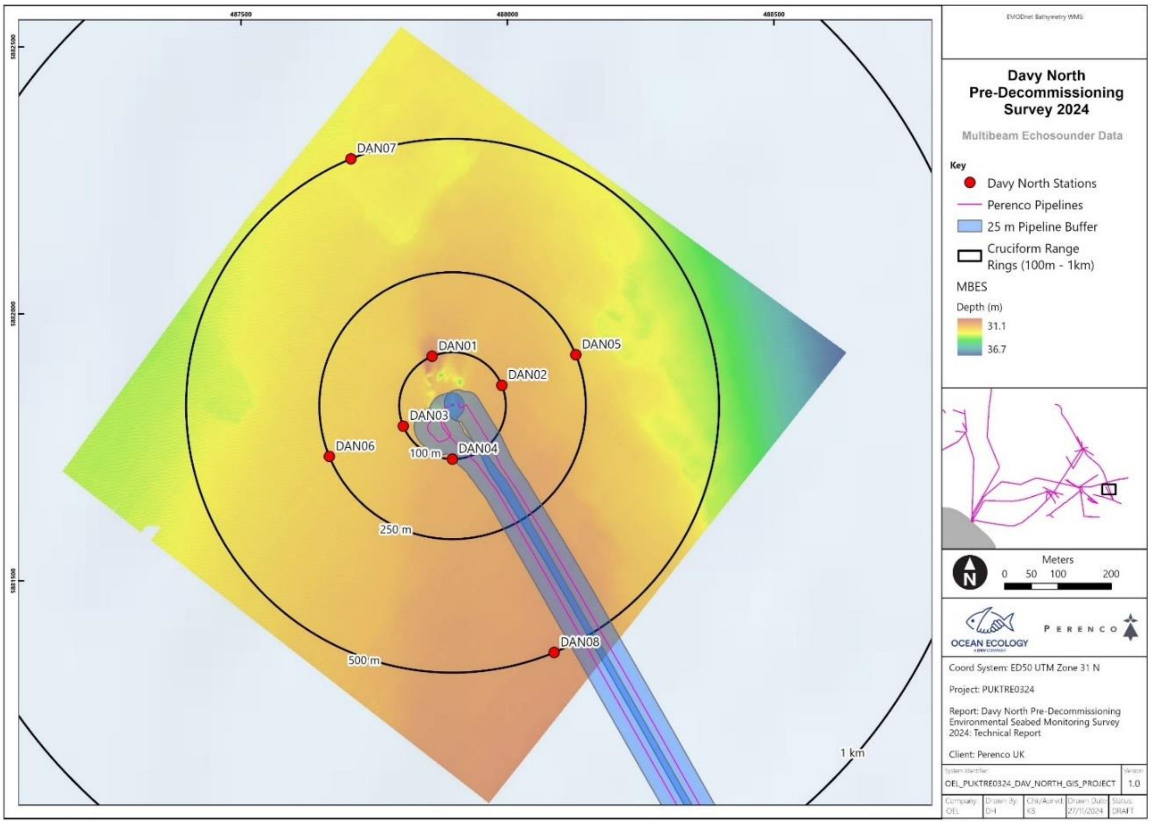
The SNS has many extensive sandbanks features present at less than 25m depth; these include areas which have been designated under the European Union (EU) Habitats Directive (92/43/EEC) such as Dogger Bank SAC and the North Norfolk Sandbanks SAC [16].

Davy North Asset

Water depth at the Davy North subsea installation is recorded at 36.27m.

The bathymetric data was interpreted as relatively uniform with wave and ripple bedforms present. The site gently deepens to the east. Water depth ranged ~ 31m- 7m (see Figure 5-3). Bathymetric highs were observed within the centre of the survey area [58].

Figure 5-3: MBES Data Collected from across the Davy North Survey Area

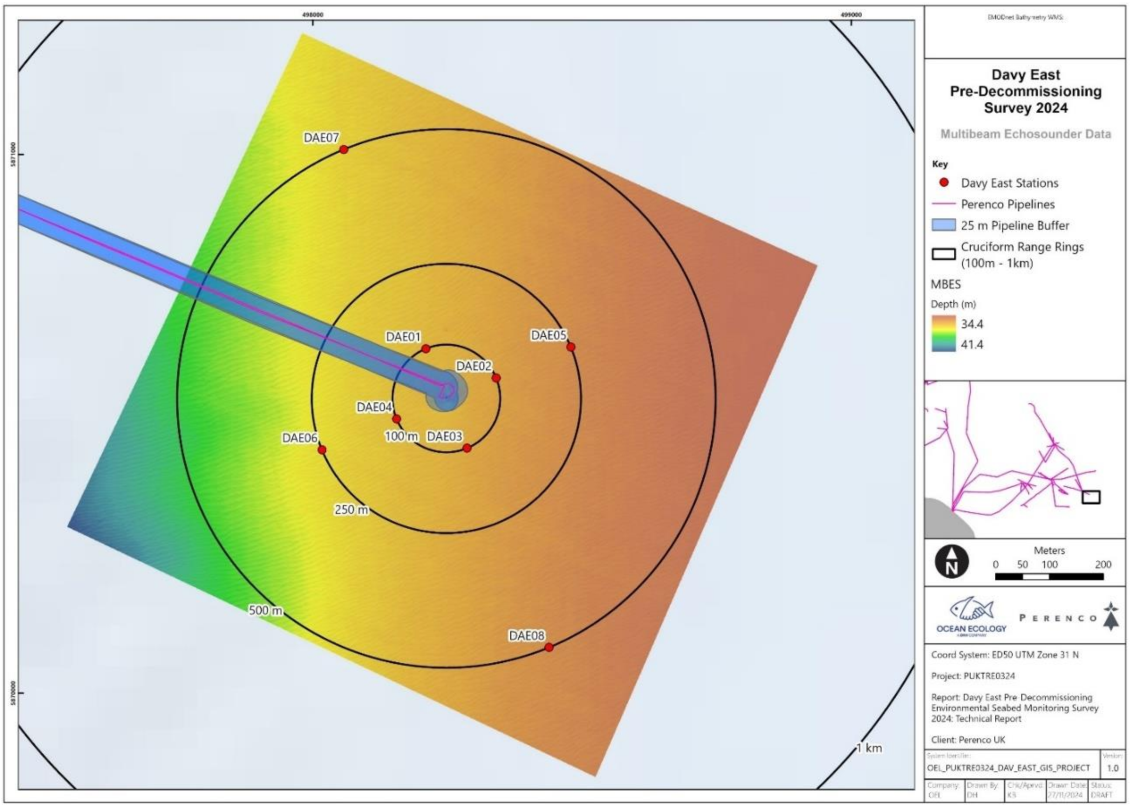


Davy East Asset

Water depth at the Davy East subsea installation is recorded at 41.15m.

The bathymetric data was interpreted as relatively uniform with some rippled (< 10 cm height) bedforms present. The site gently deepens to the west. Water depth ranged from ~ 34 m – 42 m (Figure 5-4). There was little change in roughness of the seabed across the site, as indicated by the Side-Scan Sonar (SSS) [59].

Figure 5-4: MBES data collected across the Davy East survey area



5.3.2 Seabed Sediments

The following EUNIS seabed classifications have been identified in the vicinity of the Davy subsea installations (Figure 5-7) [13, 16, 33]. The broadscale habitat encountered at the specific installations location were A5.27 Deep circalittoral sand for the Davy North subsea installation, and A5.37: Deep circalittoral mud for the East subsea installation, both habitats classified as Endangered by the European Red List of Habitats. Other EUNIS habitats have been identified in the near vicinity of the installations:

A5.27: Deep circalittoral sand - Offshore (deep) circalittoral habitats with fine sands or non-cohesive muddy sands. Very little data is available on these habitats however they are likely to be more stable than their shallower counterparts and characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms.

A5.37: Deep circalittoral mud - In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70 m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment. Communities are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira spp*., echinoderms and foraminifera.

A5.15: Deep circalittoral coarse sediment - Offshore (deep) circalittoral habitats with coarse sands and gravel or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little quantitative data available. Such habitats are quite diverse compared to shallower versions of this habitat and generally characterised by robust infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore mixed sediments and in some areas settlement of *Modiolus modiolus* larvae may occur and consequently these habitats may occasionally have large numbers of juvenile *M. modiolus*. In areas where the mussels reach maturity their byssus threads bind the sediment together, increasing stability and allowing an increased deposition of silt leading to the development of the biotope A5.622.

A5.25 or A5.26: Circalittoral fine sand or Circalittoral muddy sand - Circalittoral non-cohesive muddy sands with the silt content of the substratum typically ranging from 5% to 20%. This habitat is generally found in water depths of over 15-20m and supports animal-dominated communities characterised by a wide variety of polychaetes, bivalves such as *Abra alba* and *Nucula nitidosa*, and echinoderms such as *Amphiura spp* and *Ophiura spp*., and *Astropecten irregularis*. These circalittoral habitats tend to be more stable than their infralittoral counterparts and as such support a richer infaunal community.

A5.45: Deep circalittoral mixed sediments - Offshore (deep) circalittoral habitats with slightly muddy mixed gravelly sand and stones or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little data available. Such habitats are often highly diverse with a high number of infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore gravels and coarse sands and in some areas populations of the horse mussel *M. modiolus* may develop in these habitats.

Survey Data

Full coverage Multi Beam Echo Sounder (MBES) and SSS data was obtained of the Davy North and East survey area [58, 59]. These data were interpreted together with the seabed imagery to inform the seabed habitat assessment and mapping process.

Across the North survey area only one EUNIS Level 4 habitat complex was identified in the seabed imagery: EUNIS A5.35 'Circalittoral sandy mud', which was assigned to all 82 images (see Figure 5-5). Across the East survey area only one EUNIS Level 4 habitat complex was identified in the seabed imagery: EUNIS A5.35 'Circalittoral sandy mud' (Figure 5), which was assigned to all 55 images (see Figure 5-6).

Despite the survey assessment encountering different EUNIS habitats compared to those recoded in public available data, the findings showed close habitat type similarities for both subsea areas. This slight difference may be due to the predictive nature of EUSea mapping, and potentially limited availability of ground truthing data for habitat modelling.

Figure 5-5: Example seabed imagery collected during survey of the Davy North assets

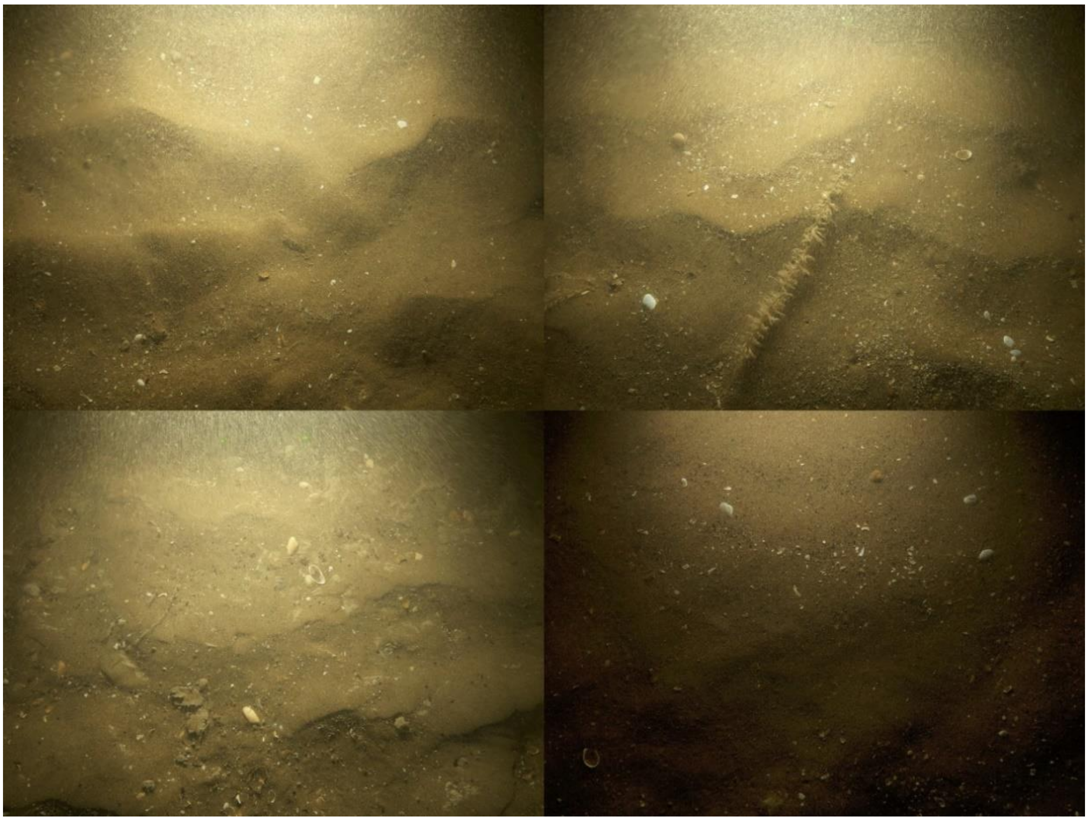
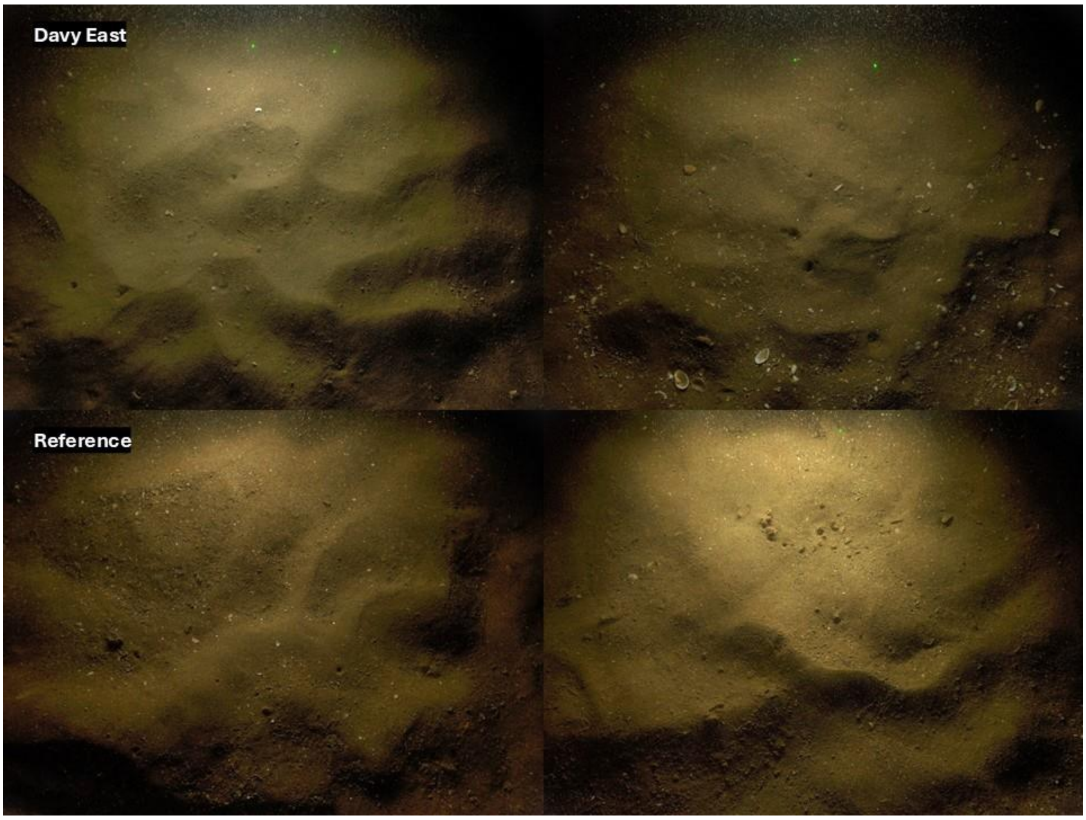


Figure 5-6: Example imagery from Davy East and the Davy East Reference station.



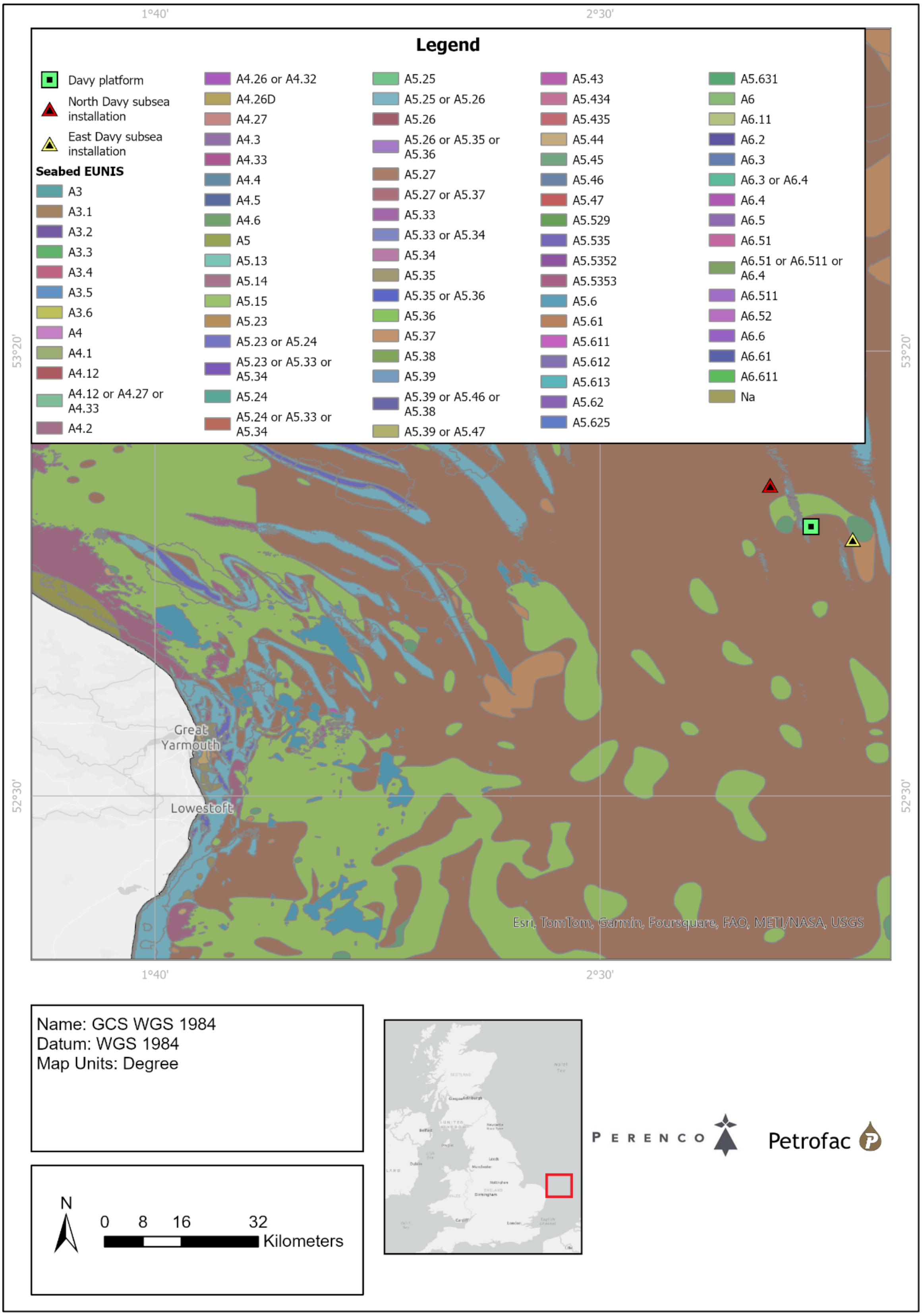
European Council (EC) Habitats Directive Annex I habitats

A comprehensive Annex I reef assessment was conducted on all 82 images collected across the North survey and on all 55 images collected in the East survey area. None of the images analysed met the criteria for Annex I reef [58, 59].

All infrastructure associated with Davy is located within the Southern North Sea SAC, designated due to the presence of Annex II specie Harbour porpoise.

The North Norfolk Sandbanks and Saturn Reef SAC located approximately 30km west of the North subsea installations features Annex I habitats: Sandbanks which are slightly covered by sea water all the time, and Reefs. However, no biogenic reefs or sandbanks have been identified in the pre-decommissioning surveys.

Figure 5-7: Seabed EUNIS Broad-scale Seabed Classification



5.3.3 Sediment Composition

Based on grab sample data, sediments across the North survey area were primarily classified as Broad Scale Habitat (BSH) A5.3 'Mud and Sandy Mud' and A5.2 'Sand and Muddy Sand' and only A5.2 for East survey area.

These sediment types are typical of offshore settings along the UK coast and considered a component of the UK priority habitats 'Subtidal sands and gravels' and 'Mud habitats in deep water' under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. 'Subtidal sands and gravels' are one of the most common subtidal habitats found around the coast of the UK and comprise a range of sediment types from mainly sand, through various combinations of sand and gravel, to mainly gravel. They support diverse infaunal and epifaunal communities which vary greatly depending on environmental conditions and the sediment present.

'Mud habitats in deep water' are common in many areas of the UK marine environment and are typically found below 20 – 30m. The relatively stable conditions associated with these habitats often lead to the establishment of communities of burrowing megafauna [9].

These habitats are known to be associated with the OSPAR habitat 'Sea-pen and burrowing megafauna communities', however this was not found to be present in seabed imagery collected from the Davy North and East survey area.

Existing EUSeaMap broad scale predictive habitat mapping suggested the presence of the EUNIS classification A5.27 'Deep circalittoral sand' across the entire Davy North survey area. This is largely in line with the findings of sediment Particle Size Distribution (PSD) analysis where the majority of samples were described as A5.3 and A5.2, however water depths described by MBES data ranged from 31m – 37m suggesting that water depth was too shallow to support a deep circalittoral habitat such as A5.27.

In addition, within the Davy East survey area the prediction was that most of the stations would fall within A5.37 'Deep circalittoral mud' and the adjacent predicted habitat of A5.27 'Deep circalittoral sand' covered the remaining station (DAE09). The sediment PSD analysis indicated the reverse, that most stations were sand dominated, with DAE09 and DAE11 having more mud content. In addition, the water depths described by the MBES data for stations ranged from 38 – 41 m, which would be too shallow for deep circalittoral habitats such as A5.37 or A5.27.

5.3.4 Seabed Chemistry

Sediment samples for chemical analysis were collected at all targeted stations across the North and East surveyed area. Grab samples taken for chemical analyses were analysed for Total Organic Carbon (TOC) and total moisture content, heavy and trace metals, Polycyclic Aromatic Hydrocarbon (PAH)s and hydrocarbons.

5.3.4.1 TOC and Total Moisture Content

TOC content in sediments across the Davy north survey area was low, with a maximum value of 1.3% at station DAN07 and an average value of 0.30 ± 0.10% compared to the average content of 0.5 % for the deep ocean or 2% for coastal seas [70]. Similarly, TOC content in sediments across the Davy East survey area was also low, with a maximum value of 0.22% at stations DAE09 and DAE11 and average value of 0.15% ± 0.01%, compared to the global average content for the deep ocean or coastal seas.

Total moisture content ranged from 18.8 % at station DAN02 to 37.2% at station DAN04 with a mean (± SE) of 27.4% ± 1.4% at Davy north survey area. The east survey area had similar values, with total moisture content ranging from 18.1% at station DAE06 to 28.6% at station DAE11, with a mean (± SE) of 23.6 ± 0.9%.

5.3.4.2 Heavy Metals

Heavy and trace metal concentrations in sediments were determined as these can be introduced in the marine environment not only through natural cycles but also as either impurities or additive present in gelling and viscosifying agents or in viscosity controllers derived from the oil and gas industry. For the oil and gas industry, the OSPAR commission recommended the monitoring of metals to focus on Cd, Pb and Hg [61], as well as on Ba as these are associated with drilling related discharges.

The heavy and trace metal analysed at the Davy North and Davy east area sediments were Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), and Zinc (Zn). In addition, five secondary heavy and trace metals were analysed to provide a more in-depth picture of potential sediment contamination. These were: Barium (Ba) and Total Barium (TBa), Tin (Sn), Vanadium (V), Aluminium (Al) and Iron (Fe).

Davy North

Among all metals measured as part of this assessment, only As exceeded reference levels, with OSPAR Background Assessment Concentration (BAC) exceeded at all stations except for stations DAN05, DAN10 and DAN11 and As concentrations exceeding CEFAS AL1 at all stations except for DAN10 and DAN11.

Arsenic may be linked to Barite, a common additive in oil-based drilling muds, which contains heavy metals like Hg, As, Pb, Cd, and others. While elevated As levels were observed near Davy N, the low concentrations of other metals suggest these levels are not related to oil-based drill mud discharge.

It's unlikely that geological inputs or historical industrial discharges have had an impact on As levels due to the distance to the near costal area. Production chemicals or the mobilisation of metal-rich shales by offshore drilling activities might explain these elevated levels.

Background levels of Cd for the North Sea vary from 0.85 mg kg-1 within 500 m from an active platform to 0.43 mg kg-1 at locations over 5,000 m away from active platforms [79]. This indicates that current Cd concentrations ranging from Below Detection Limit (BDL) to 0.05 mg kg-1 were well below background levels.

Background levels of Pb for the North Sea vary between 57.52 $mg.kg^{-1}$ within 500m from an active platform and 12.12 $mg.kg^{-1}$ at locations over 5,000m away from active platforms [79]. Current Pb concentrations ranged from 5.3 $mg.kg^{-1}$ to 15.8 $mg.kg^{-1}$ across the survey area therefore, Pb concentrations were well below the relative background concentration with distance from the well.

Ba varied between 6.2 $mg.kg^{-1}$ and 15.2 $mg.kg^{-1}$ across the survey area but no background values for Ba are available for the North Sea. TBa varied from 100$mg.kg^{-1}$ to a maximum of 300$mg.kg^{-1}$. North Sea background level of TBa range from 33,562.12 $mg.kg^{-1}$ within 500m from an active platform to 320.26 $mg.kg^{-1}$ at locations over 5,000m away from active platforms, meaning that TBa concentrations across the survey area were below background levels.

There are no national reference levels for the 5 secondary heavy metals surveyed at Davy North; however, North Sea background levels were available for Fe and V. Background levels of Fe in the North Sea range from 14,096 mg.kg^{-1} within 500m from an active platform to 7,052 mg.kg^{-1} over 5km from an active platform. Background levels of V in the North Sea range from 32.61 mg.kg^{-1} within 500 m from an active platform to 20.15 mg.kg^{-1} over 5km away. All stations within 500m of the platform except for DAN05 were above background levels of Fe with the highest concentration of 24,700 mg.kg^{-1} recorded at station DAN07. Likewise, all stations within 500m of the Davy North platform were above background levels of V expected in the North Sea. The elevated levels could be as a result of the Davy North platform.

No strong correlation between metal concentrations and TOC content in sediments was observed.

Table 5.1: Summary of Heavy and Trace Metal Concentrations (mg kg-1) for the Davy North Sediment Stations

Station	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
DAN01	43.4	<0.04	9.9	2.9	14.4	<0.01	7.3	37.9
DAN02	31.8	<0.04	13.5	4.1	12.9	<0.01	10	47.7
DAN03	50.4	<0.04	8.6	1.9	12.7	<0.01	6.2	35
DAN04	28.2	<0.04	12	3.7	13.8	<0.01	8.8	41.7
DAN05	22.2	<0.04	10.4	2.8	9.9	<0.01	7	30.6
DAN06	42.6	<0.04	8.5	2.2	12.5	<0.01	5.7	37.3
DAN07	69.6	0.05	11.9	4.3	15.8	<0.01	10	43.9
DAN08	29	<0.04	11.6	3.6	12.3	<0.01	7.7	42.7
DAN09	25.8	<0.04	10.2	3.7	10.7	<0.01	7.1	35.1
DAN10	7.8	<0.04	8.8	1.4	5.3	0.01	4.3	18.5
DAN11	18.0	<0.04	6.7	1.7	5.7	<0.01	4.8	22.9
Min	7.8	0.05	6.7	1.4	5.3	BDL	4.3	18.5
Max	69.6	0.05	13.5	4.3	15.8	0.01	10	47.7
Mean	33.5	0.1	10.2	2.9	11.5	0.0	7.2	35.8
SE	5.1	-	0.6	0.3	1.0	-	0.6	2.7
CEFAS AL1	**20**	**0.4**	**40**	**40**	**50**	**0.3**	**20**	**130**
CEFAS AL2	**100**	**5**	**400**	**400**	**500**	**3**	**200**	**800**
OSPAR BAC	**25**	**0.31**	**81**	**27**	**38**	**0.07**	**36**	**122**
ERL	**8.2***	**1.2**	**81**	**34**	**47**	**0.15**	**21***	**150**
TEL	**7.24***	**0.7**	**52.3**	**18.7**	**30.2**	**0.13**	**-**	**124**
PEL	**41.6**	**4.2**	**160**	**108**	**112**	**0.7**	**-**	**271**

Red shading indicates levels above CEFAS AL1.

*The Effects Range-Low (ERL) and Threshold Effect Level (TEL) for As and Ni are below the BACs therefore As and Ni concentrations are usually assessed only against the BAC

Davy East

Only As and Ni exceeded reference levels, with both the OSPAR BAC and Cefas AL1 exceeded for As at the reference station DAE11, and Cefas AL1 exceeded for Ni at station DAE09. Background concentrations of Ni in the North Sea range from 17.79 $mg.kg^{-1}$ within 500m of an active platform to 9.5 $mg.kg^{-1}$ over 5km away. The Ni records at DAE09 of 28.2 $mg.kg^{-1}$ are above background levels expected within 500m of an active platform, and within 1km of an active platform (14.36 $mg.kg^{-1}$). North Sea background concentrations for As were unavailable at the time of writing this report. These two stations were at the opposite end of the cruciform ring, with DAE09 located 1km to the northwest and DAE11 5km to the southeast of the Davy East well, thus implying that it is unlikely these elevated levels were caused by the Davy East well. However, they were also the stations with the highest mud concentrations, which points to an affinity of contaminants to finer sediment.

Hg, Cd, Pb, TBa concentrations at all stations were below the mean background concentrations across the North Sea and the mean concentration known to be found within 500m of active platforms [79]. Ba varied between 5.4 $mg.kg^{-1}$ and 11.4 $mg.kg^{-1}$ across the survey area but no background values for Ba are available for the North Sea.

North Sea background levels were available for Fe and V. For both, the only station to record concentrations above background levels expected for the corresponding distance away from an active platform was DAE11, with an Fe concentration of 16,800 $mg.kg^{-1}$ and V concentration of 35.8 $mg.kg^{-1}$. However, as DAE11 was the reference station and 5km from the well, the elevated levels above background are unlikely to be due to the Davy East well. Station DAE11 was 2.32km southeast of a legacy well decommissioned in 1994 (53/05b-4), 2.35km west from an exploration borehole from 1990 (54/01a-3) and 3.5km north of an active pipeline (BBL BALGZAND to BACTON), which are possible although unlikely sources of DAE11's observed contamination.

Table 5.2: Summary of Heavy and Trace Metal Concentrations (mg.kg^{-1}) for the Davy East Sediment Stations

Station	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
DAE01	7.4	<0.04	9.1	1.6	5.0	<0.01	5.7	20.0
DAE02	6.5	<0.04	9.3	1.4	4.8	<0.01	5.5	21.8
DAE03	5.6	<0.04	8.9	2.2	4.8	<0.01	5.1	24.2
DAE04	5.5	<0.04	9.1	1.7	4.7	0.01	5.6	20.8
DAE05	5.4	<0.04	9.7	1.6	5.1	<0.01	5.7	23.6
DAE06	9.4	<0.04	9.6	1.8	5.0	<0.01	5.5	25.3
DAE07	6.0	<0.04	9.5	1.1	4.8	<0.01	5.3	25.7
DAE08	6.6	<0.04	10.1	2.0	5.8	<0.01	6.4	26.0
DAE09	7.1	0.20	27.9	8.8	6.6	<0.01	28.2	118.0
DAE10	6.4	0.07	12.6	3.1	6.1	<0.01	8.5	30.8
DAE11	34.6	<0.04	12.0	3.4	10.9	<0.01	9.4	36.3
Min	5.4	< 0.04	8.9	1.1	4.7	<0.01	5.1	20.0
Max	34.6	0.20	27.9	8.8	10.9	0.01	28.2	118.0
Mean	9.1	0.05	11.6	2.6	5.8	<0.01	8.3	33.9
SE	2.6	0.02	1.7	0.7	0.5	0.0	2.0	8.5
Cefas AL1	**20**	**0.4**	**40**	**40**	**50**	**0.3**	**20**	**130**
Cefas AL2	**100**	**5**	**400**	**400**	**500**	**3**	**200**	**800**
OSPAR BAC	**25**	**0.31**	**81**	**27**	**38**	**0.07**	**36**	**122**
ERL	**8.2***	**1.2**	**81**	**34**	**47**	**0.15**	**21***	**150**
TEL	**7.24***	**0.7**	**52.3**	**18.7**	**30.2**	**0.1**	**-**	**124**
PEL	**41.6**	**4.2**	**160**	**108**	**112**	**0.7**	**-**	**271**

Results above AL1 are in bold.

*The ERL and TEL for As and Ni are below the BACs therefore As and Ni concentrations are usually assessed only against the BAC.

5.3.4.3 Hydrocarbons

Davy North

- Total Petroleum Hydrocarbons (TPH): Values varied between from 1,320 µg.kg^{-1} at Station DAN10 to 17,900 µg.kg^{-1} at Station DAN04 with a mean (±SE) concentration of 7,535 ± 1,490 µg.kg^{-1} across the survey area. No pattern emerged when comparing TPH with the correspondent TOC which could have been related to transportation and deposition of hydrocarbons across the survey area. The only exception to this was station DAN04 where both ethe highest TPH and TOC concentrations were measured.

Two comprehensive background datasets for the SNS (UKOOA) [79] and wider North Sea area (NSTF) [54] exists. UKOOA reported background TPH levels between 11,048,820 µg.kg^{-1} within 500m of an active platform, to 6,890 µg.kg^{-1} over 5km from an active platform. NSTF report background concentrations between 10,000 µg.kg^{-1} and 450,000 µg.kg^{-1}. The current mean TPH concentration of 7,535 µg.kg^{-1} recorded across the Davy North survey area is lower than the background concentrations reported within 500m of an active platform but is slightly higher than the background concentrations over 5km of an active platform.

Based on Carbon Preference Index (CPI) assessment, all stations had hydrocarbons of biogenic origin. Diatom populations have been found to be a biogenic source of n-alkanes in aquatic environments especially for the n-alkanes C15-C31, which fits well with C30 and C27 being among the most abundant alkanes across the survey area [5].

Where measurable, Pristane / Phytane ratios indicated biogenic sources of n-alkanes suggesting marine / aquatic inputs at all stations but station DAN08 where data suggested terrestrial inputs [52].

- PAH: Concentrations were generally low; however, concentrations of Naphthalene, Phenanthrene and Pyrene were above OSPAR BAC reference levels at station DAN04 located on the southern extent of the 100m cruciform ring.

When assessing the source origin of PAH compounds in sediments, the naphthalene, phenanthrene and dibenzothiophene (NPD) / heavy molecular weight (HMW) ratio was found to be lower than one at all except station DAN07 and DAN11, indicating a pyrogenic origin of PAHs. PAHs of pyrogenic origin can derive from various activities which ultimately involve the combustion of organic substances at high temperatures under low oxygen conditions. These may include incomplete combustion of motor fuels, or products derived from the foundry and steel industries. Stations DAN07 and DAN11 reported PAHs of petrogenic origin based on this ratio, which typically includes crude oil and refined crude oil products such as gasoline, heating oil, asphalt, and coal whilst the NPD / HMW ratio could not be calculated at station DAN10. Where calculable, the ratio between Fluoranthene / Pyrene (Fl/Py) suggested PAHs were of pyrogenic origin whereas the Phenanthrene/ Anthracene ratio (Ph/Ant) suggested both petrogenic and pyrogenic origins. It is not uncommon to find a mixture of petrogenic and pyrogenic PAHs sources in marine sediment [6]; [22].

NPDs are volatile compounds that break down more easily than their heavier counterparts meaning that elevated NPDs can be an indicator of recent sediment contamination. NPD concentration ranged between BDL at station DAN10 and 451 ug/kg at station DAN04. Station DAN04 was located on the 100m ring in the direction of the predominant currents which could be the reason for the overall higher concentrations of contaminants at this station compared to the others.

Station DAN10 is located 1km from the platform whereas station DAN04 is located 100m from the Davy platform which could explain the higher contaminant levels at station DAN04 with it being closer to the well.

Davy East

- TPH: The sediment samples collected across the Davy East survey area ranged from 1,350 $\mu g.kg^{-1}$ at station DAE05 to 4,590 $\mu g.kg^{-1}$ at station DAE03 with an average value (± SE) of 2,615 ± 343 $\mu g.kg^{-1}$. Station DAE03 was located 100m to the southeast of the Davy East well.

N-alkanes (saturates) in sediments had carbon chain lengths ranging between C10 and C37, with the dominant chains being C31 for the odd-numbered chains and C30 for the even-numbered chains. The highest concentration of total n-alkanes was recorded at station DAE11 (630$\mu g.kg^{-1}$), while the lowest concentration of 18.7 $\mu g.kg^{-1}$ was found at station DAE10. The average (± SE) number of n-alkanes across the Davy East survey area was 133 ± 61 $\mu g.kg^{-1}$.

Pristane reached a maximum of 7.9 µg.kg^{-1} at station DAE11. Pristane was BDL at 5 stations, and Phytane was recorded as BDL for all 11 stations. Therefore, it was not possible to calculate a Pristane / Phytane ratio for any station.

All CPI values across the Davy East stations were greater than 1, indicating the origin of n-alkanes was biogenic, apart from DAE05 for which CPI couldn't be calculated as the overall number of alkanes was too low. The highest value of 8.54 µg.kg^{-1} was recorded at DAE02 whilst the lowest CPI of 1.35 µg.kg^{-1} was found at station DAE07.

- PAH: The sum of all fractions of PAH ranged from BDL at 6 stations, to 100 µg.kg^{-1}at DAE09, with an average of 74.3 ± 4.6 µg.kg^{-1}.

Across NPD, several were BDL, with the highest concentration at stations DAE09 of 3.44 µg.kg^{-1} of Phenanthrene. The ratio between NPD and 4-6 ring PAH were all below 1 indicating a pyrogenic source of PAH compounds in sediments, apart from station DAE04, with a ratio of 1.28 indicating a petrogenic source of PAH compounds in the sediments.

Concentrations of anthracene at all stations were BDL. The Ph / Ant ratio for all stations was below 10, indicating a pyrogenic source origin of the hydrocarbons.

The highest concentration of Fluoranthene or Pyrene was 5.88 µg.kg^{-1} of Pyrene at station DAE01. The Fl / Py ratio for 5 stations was above 1, indicating the hydrocarbons were pyrogenic in origin (stations DAE01, DAE03, DAE06, DAE09 and DAE11). The remaining 6 stations had a ratio that was BDL; the detection limit was 2 and so it is not possible to confirm if their Fl / Py ratios were above or below 1.

5.3.5 Waves

Waves are the result of energy being transferred between two fluids moving at different rates [1]. They are caused at sea by the differential motion of the air (wind) and the seawater. The height of a wave is the distance from the crest to trough, but as the waves at any one time are not of equal size, the significant wave height is taken and corresponds approximately to the mean height of the highest third of the waves. The wave period is the (mean) time between two wave crests, called the zero up-crossing period and is given in seconds. The wave climate of the area provides information on the physical energy acting on structures and dictates the structural design requirements.

The annual mean wave height at Davy installations varies between 1.53 to 1.55m with an annual mean power from 9.57 to 9.88 kW/m [1].

5.3.6 Water Circulation and Tides

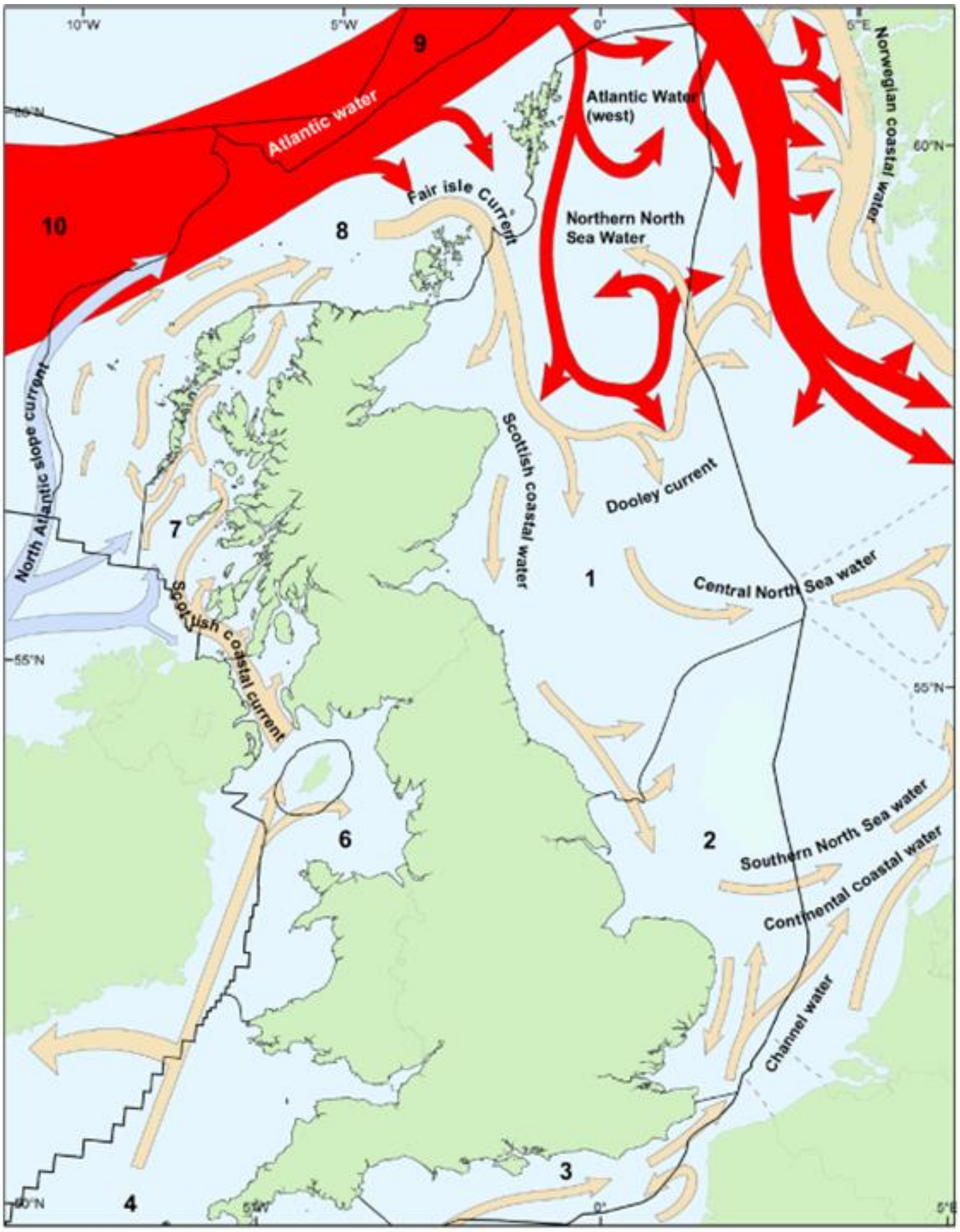
The general circulation of near-surface water masses in the North Sea is cyclonic, mostly driven by the ingression of Atlantic surface water in the western inlets of the northern North Sea. As a result, residual water currents near the sea surface tend to move in a south-easterly direction along the coast towards the English Channel [54, 16].

In addition, counter currents occur towards the English/ Dutch sector median line, flowing northeast towards Denmark (Figure 5-8). The effect of these two bidirectional counter current are noticeable in Davy installations, moving the near-surface water towards the eastly direction.

Tides in this region of the SNS are predominately semi-diurnal and increase towards Hunstanton coast. The mean height spring tidal ranges from 1.21m at the East subsea installation to 1.49m in the North subsea installation [2].

It is important to note that significant variations in local currents occur in the UKCS blocks of interest, which can influence near bottom flow and current amplification around these features [26, 12]. The shallow bathymetry and relatively fast water circulation in this area of the SNS lead to a relatively well-mixed water column throughout the year [16]. This leads to a consistent level of biological productivity throughout the year, with only minor peaks seen in spring and late summer, which are typical of deeper waters.

Figure 5-8: Major Current Flows Around the UK [16]



Data source: UKOilandGasData, Turrell *et al* (1992), Ellett and Blindheim(1992), DECC UK Renewables Atlas. Contains public sector information licensed under the Open Government Licence v3.0	**Major residual current flows** The width of arrows is indicative of the magnitude of volume transport. Red arrows indicate relatively pure Atlantic water.	0 35 70 140 210 Km N ED1950
		HAL_OESEA3_G17_VER01

5.3.7 Temperature & Salinity

Winter water temperatures in the SNS are in the range of 4 – 8ºC, while summer water surface temperatures are in the range of 16ºC – 19ºC, with little variation, either down the water column or from near shore to offshore waters [21].

Sea surface temperatures at the installation location reach the minimum peak in February (5.23°C) and maximum peak in August (16.14°C), with an average mean annual temperature of 10.36°C. Near seabed temperatures follow the same monthly variation pattern, varying from 5.39°C to 15.90°C, with an annual mean of 10.24°C [43].

The salinity in the blocks of interest varies throughout the year. The mean annual salinity of the sea surface varies between 34.59 parts per thousand (ppt) to 34.62ppt, decreasing towards the cost. While the mean salinity of the near seabed varies between 34.097ppt to 34.63ppt, with an overall mean of 34.337ppt [43].

Salinities decrease both towards the south and towards the coastline, reflecting the influence of freshwater inputs from the adjacent landmasses.

5.4 Biological Environment

5.4.1 Benthic Biodiversity

The Davy North and East subsea installations are located within the boundaries of the Southern North Sea SAC. The habitat encountered in the vicinity is characterised by coarse sediment, sand and gravel beds. The SAC ranges in depth from Mean Low Water down to 75m, with the majority of the site shallower than 40m, and is characterised by its sandy, coarse sediments which cover much of the site. These physical characteristics are thought to be preferred by harbour porpoise, likely due to availability of prey.

Davy North

A relatively sparse macrobenthic assemblage was identified across the Davy North survey area with a total of 919 individuals and 93 taxa recorded. The pea urchin *Echinocyamus pusillus* was the most abundant taxon sampled accounting for 28% of all individuals recorded and the most frequently occurring having been found in 82% of the samples. This species also reported the maximum abundance per sample and the highest average density per sample. This specie was followed by *Kurtiella bidentata,* Nemertea, *Ophiuridae Juvenile, N. nitidosa, Nephtys Juvenile, Glycera alba, Goniada maculata, Spiophanes bombyx, Lumbrineris cingulata Confer* in order of total abundance contribution across the survey area (top 10 macrobenthic taxa).

Macrobenthic communities are heavily influenced by ambient environmental conditions such as sediment composition [14] hydrodynamic forces and physical disturbance [25], depth [20], and salinity [77]. This was reflected in the macrobenthic communities observed across the survey area which presented some variability based on the sediment type present. The macrobenthic communities observed differed slightly based on weather sediments were predominantly fine sand (A5.521), muddy sand (A5.261) or muddy sediments (A5.351).

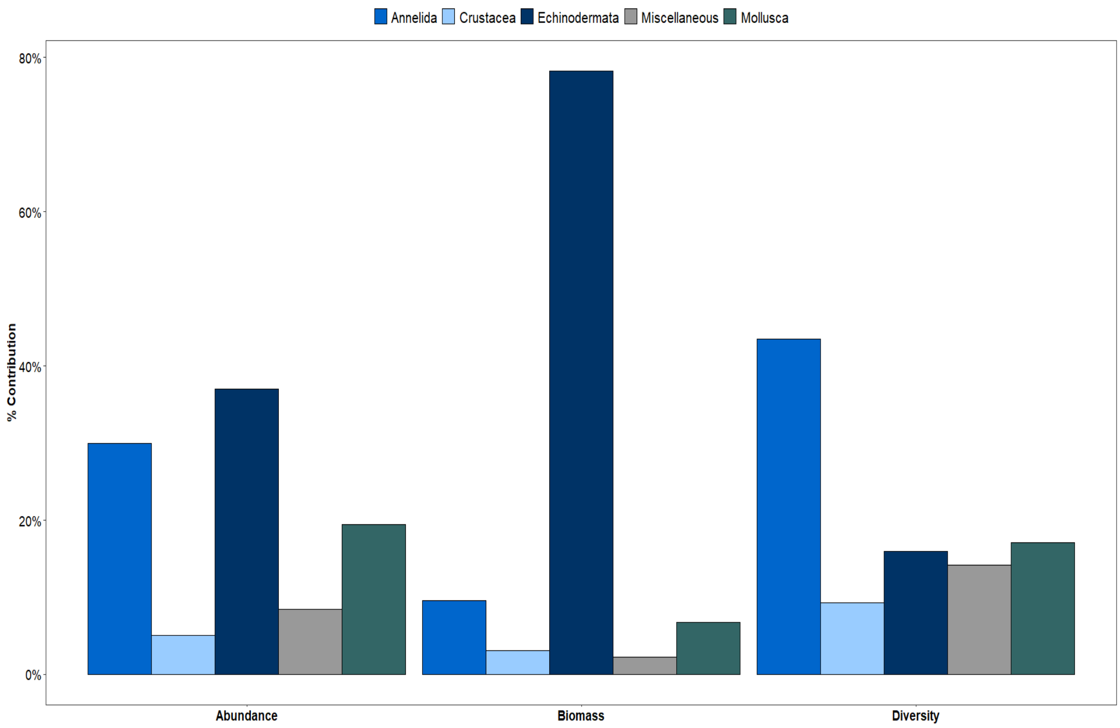
The multivariate analysis conducted on macrobenthic abundance data revealed four statistically different groups and one outlier station largely reflecting the changes in sediment composition across the survey area. For macrobenthic group A, the macrobenthic community closely aligned with the EUNIS biotope A5.251 '*E. pusillus*, *Ophelia borealis* and *A. prismatica* in circalittoral fine sand' with the sediments at stations within group A reflected by A5.2 Sand and Muddy Sand.

Stations within macrobenthic group B were made up of A5.3 Mud and Sandy Mud with macrobenthic communities more typical of muddy sediments observed, lending it to the biotope A5.351 '*Amphiura filiformis, Mysella bidentata* and *A. nitida* in circalittoral sandy mud'.

The macrobenthic community found at group C closely aligned with the biotope A5.261 '*A. alba* and *N. nitidosa* in circalittoral muddy sand or slightly mixed sediment', with the majority of samples belonging to the Slightly Gravelly Muddy Sand textural group.

The macrobenthic community of group D contained very common species which are found in a number of different biotopes meaning it was not possible to assign this group as any one biotope. The species typical of this macrobenthic group tend to be common in muddy sand sediments. This group was therefore assigned based on sediment PSD analysis and depth as a combination of A5.25 'Circalittoral fine sand' and A5.35 'Circalittoral sandy mud'.

Figure 5-9: Relative Contribution of the Major Taxonomic Groups to the Total Abundance, Diversity and Biomass of the Macrobenthos Sampled across the Davy North Survey Area



Additionally, the 2024 Davy North survey identified the most commonly occurring epifauna observed in the seabed imagery to be the Brittle star of the genus *Ophiura* sp., identified as present in 23 images. Tube worms of the order Sedentaria were identified in 22 images and faunal burrows were identified within 13 images, while 30 images showed no visible fauna.

Davy East

A relatively sparse macrobenthic assemblage was identified across the Davy East survey area with a total of 787 individuals and 75 taxa recorded. The pea urchin *E. pusillus* and bean-like tellin *F. fabula* were the most abundant, commonly occurring both at individual stations and across the stations. They were followed by *O. Juvenile, N. Juvenile, G. maculata, Echinocardium cordatum, Tellimya ferruginosa, Bathyporeia guilliamsoniana, Magelona johnstoni,* and *Euspiura nitida* (top 10 macrobenthic taxa).

The two stations DAE09 and DAE11, along with the lowest abundance, had the highest levels of chemical contaminants, both of heavy metals and hydrocarbons. Furthermore, both were characterised by the opportunistic species *G. alba* and the tolerant species *A. alba* (DAE09) or *K. bidentata* (DAE11).

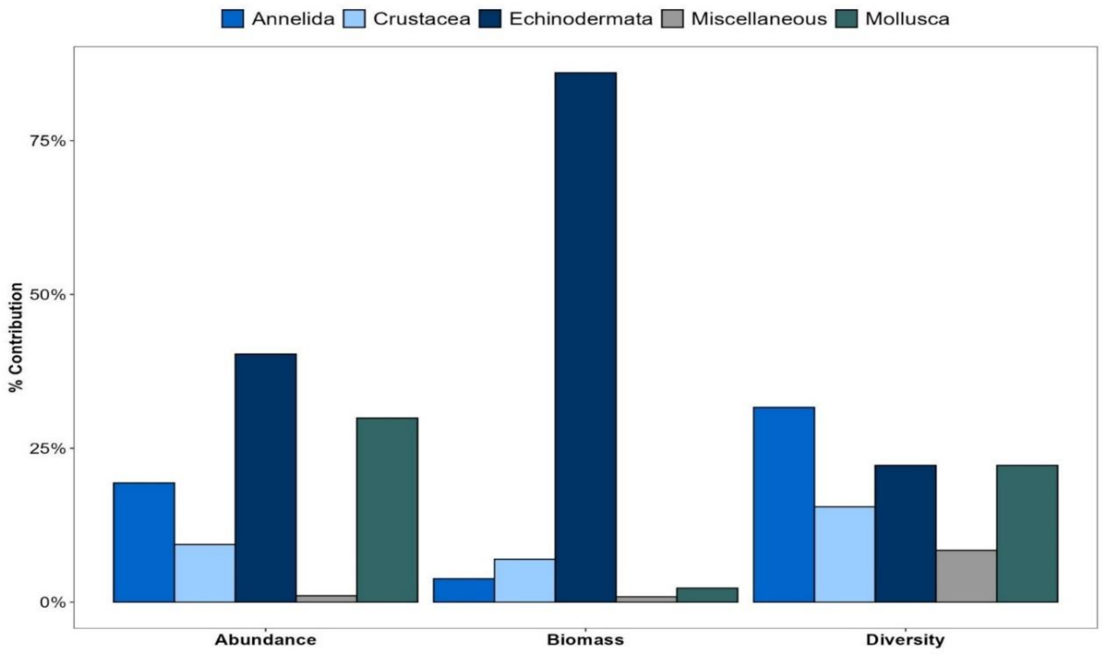
The three statistically different groups of stations revealed by multivariate analysis conducted on macrobenthic abundance partly reflected the PSD analysis. Stations DAE09 (group C) and DAE11 (group A), were allocated separate macrobenthic groups to the rest of the stations and each other by the multivariate analysis. The PSD analysis had identified that DAE09 and DAE11 were the only two stations with mud content higher than 15 % (DAE09 19.1 %; DAE11 27.3 %). This explains the presence of different macrobenthic communities with higher affinity for muddy sediments at these stations.

Macrobenthic group B included most stations, with some species typically found in the intertidal zone observed here, suggesting the presence of biotope A5.242. Despite these stations not being located in the intertidal zone, water depths were still shallow enough to be supportive of species such as *F. fabula*. For this reason, the mosaic habitat A5.242 / A5.251 was assigned to this group.

The stations with the lowest macrobenthic abundance, DAE09 and DAE11, were the two stations which had concentrations of a heavy metal above Cefas AL1 (DAE09 Arsenic and DAE11 Nickel). In addition, station DAE11 had the highest concentration of total n-alkanes and DAE09 had the highest concentration of PAHs. These results together may suggest contamination as the driver of the low abundance at these two sites. However, DAE11 is the reference station located 5 km away from the Davy East well and DAE09 is also 1 km away. It is therefore unlikely that the source of the contamination at this stations were the Davy East well, as the remaining stations closer to the well do not show similar levels of contamination.

Dense subtidal aggregations of tubes created by *S. spinulosa* may form biogenic reefs that can form solid, raised structures above the surrounding seabed and provide a biogenic habitat for onto which various epibenthic species may become established (Pearce et al. 2011). *S. spinulosa* was observed at station DAE1 but in very low abundance, and therefore not in reef form. No other notable taxa were observed during this survey.

Figure 5-10: Relative Contribution of the Major Taxonomic Groups to the Total Diversity Abundance, and Biomass of the Macrobenthos Sampled at the Davy East Survey Area



Additionally, the most commonly occurring evidence of epifauna observed across the survey area from seabed imagery were faunal burrows, identified as present in 38 images. Hermit crabs (Paguridae) and tube worms (Sedentaria) were each observed in 7 images.

5.4.2 Plankton

The collective term plankton describes the plants (phytoplankton) and animals (zooplankton) that live freely in the water column and drift passively with the water currents. Planktonic assemblages exist in large water bodies and are transported simultaneously with tides and currents as they flow around the North Sea. Plankton forms the basis of marine ecosystem food webs and therefore directly influences the movement and distribution of other marine species. Typically, in the SNS a phytoplankton bloom occurs every spring, generally followed by a smaller peak in the autumn [16].

The SNS is characterised by shallow, well-mixed waters, which undergo large seasonal temperature variation. The region is largely enclosed by land and as a result the marine environment is highly dynamic with considerable tidal mixing and nutrient-rich run-off from land (eutrophication). Under these conditions, nutrient availability is fairly consistent throughout the year therefore organisms with high nutrient uptake that thrive in dynamic waters, such as diatoms, are particularly successful [42]. The phytoplankton community in the Regional Sea 2 area is dominated by the dinoflagellate genus Tripos (*T. fusus, T. furca, T. lineatus*), along with higher numbers of the diatom, Chaetoceros (subgenera Hyalochaete and Phaeoceros) than are typically found in the northern North Sea. From November to May when mixing is at its greatest, diatoms comprise a greater proportion of the phytoplankton community than dinoflagellates [16].

The zooplankton community is dominated by copepods including *Calanus helgolandicus* and *C. finmarchicus* as well as *Paracalanus spp*., *Pseudocalanus spp*., *Acartia spp*., *Temora spp* and cladocerans such as *Evadne spp*. There has been a marked decrease in copepod abundance in the SNS, which has been linked to changes in global weather phenomena [16]. However, the planktonic assemblage in the vicinity of the proposed deposit operations is not considered unusual.

5.4.3 Fish & Shellfish

The North Sea supports a diverse fish and selfish communities, many species of which are umbrella species, providing an essential food source for larger marine predators (such as marine mammals and seabirds), or area of commercial importance. Several fish species of conservation importance also utilise the North Sea.

The migratory fish species that may be present in the North Sea include lampreys, shads, salmonids, European eel (*Anguilla Anguilla*), and smelt (*Osmerus eperlanus*) [23]. These species may utilise both freshwater river systems and saltwater sea areas for spawning before migrating to the sea. Commercially important fish species in the North Sea include Atlantic cod (*Gadus morhua*), European plaice (*Pleuronectes platessa*), Dover sole (*Solea solea*), lemon sole (*Microstomus kitt*), whiting (*Merlangius merlangus*), sprat (*Sprattus sprattus)*, thornback ray (*Raja clavate)*, blonde ray (*R. brachyura*), Atlantic mackerel (*Scomber scrombrus*), Atlantic herring (*Clupea harengus*), and sandeel species Ammodytidae. The latter 3 are of also high ecological importance, supporting wider populations of fish and other marine predators [23].

Generally, there is little interaction between fish and offshore developments, although some species congregate around platforms and along pipelines. However, spawning individuals and juveniles can be sensitive to seismic activities, seabed disturbance activities, discharges to sea and, in some cases, accidental spills.

The Northeast Atlantic and North Sea is split into a statistical grid called International Council for the Exploration of the Sea (ICES) Rectangles in order to statistically map fisheries information about an area. The Davy North subsea installation is located at the southeast corner of ICES Rectangles 35F2, and the Davy East subsea installation at the northeast corner of ICES Rectangle 34F2.

CEFAS and the Marine Management Organisation (MMO) has published data on critical spawning and nursery grounds for selected fish species around the UK [10]; [19]. Data is based on historic and more recent ichthyoplankton trawls to identify key spawning, nursery habitats and species of interest (Table 5.3).

Species that spawn or nurse within ICES rectangles 35F2 and 34F2 re represented in Table 5.3, and includes Atlantic herring (*Clupea harengus*), mackerel (*Scomber scombrus*), sandeel (*Ammodytes* spp.), whiting (*Merlangius merlangus*), cod (*Gadus morhua*), plaice (*Pleuronectes platessa*), *Nephrops,* Sprat (*Sprattus sprattus*), and tope shark (*Galeorhinus galeus*), plaice (*Pleuronectes platessa*), lemon sole (*Microstomus kitt*), sole (*Solea solea*) [10]; [19].

Table 5.3: Fish Spawning and Nursery Species within Davy installation ICES Rectangles

Species \ ICES	34F2	35F2	Spawning months (*peak months*)
Mackerel	x	x	May-August (*May-July*)
Whiting	x	x	February-June
Plaice	x	x	December-March (*January-February*)
Lemon sole	x	x	April-September
Sole	x	x	March-May (*April*)
Sandeels	x	x	November-February
Sprat	x	x	May-August (*May-June*)
Nephrops	-	x	All year (*April-June*)
Cod	x	-	January-April (*February-March*)
Tope shark	-	-	Viviparous species (gravid females can be found all year)
Herring	-	-	November-January
	Nursery grounds:	Presence	Absence
	Spawning grounds:	x	-

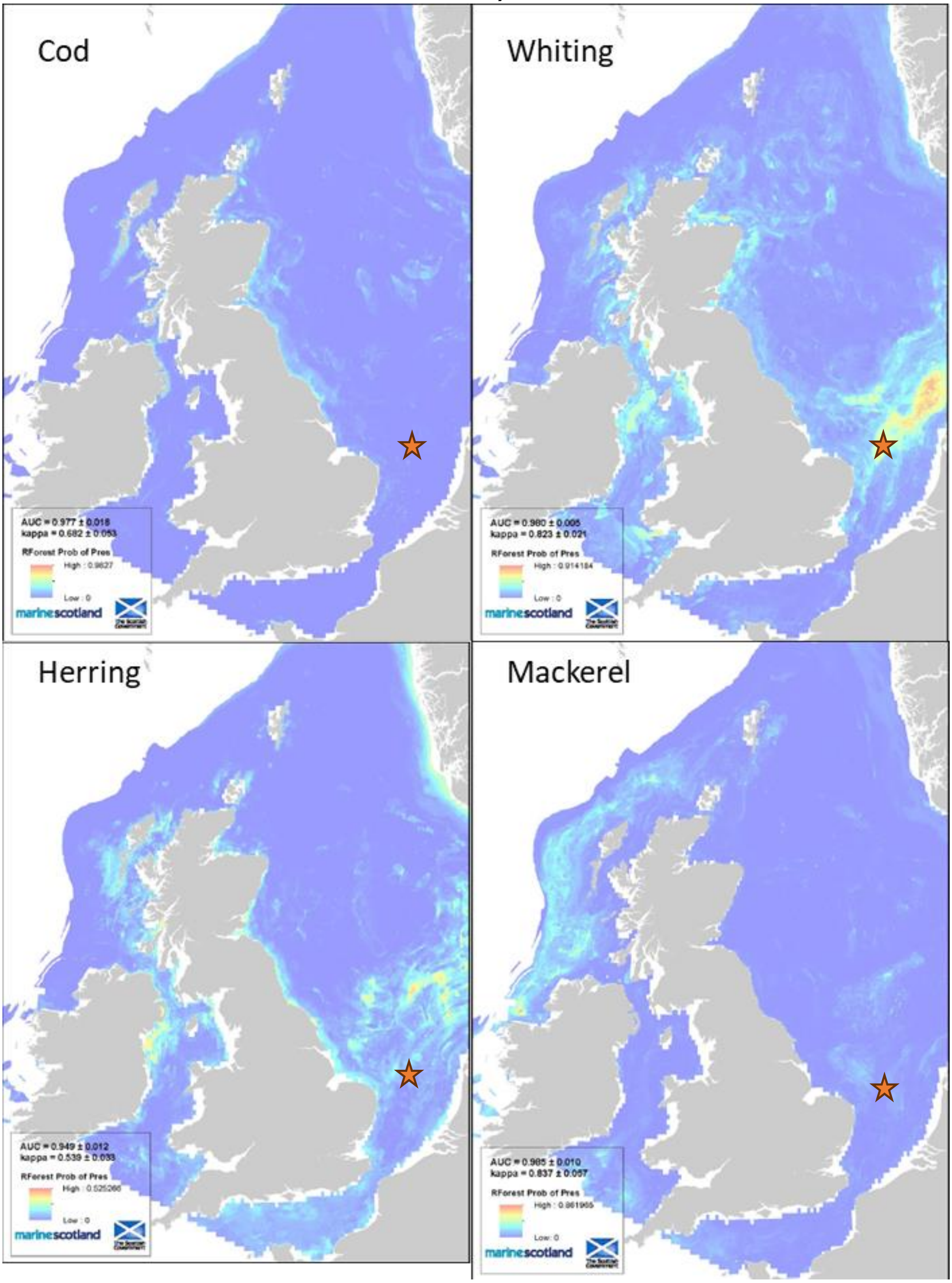
Nursery grounds colour key: 34F2/35F2 cells shaded blue = Presence; shaded yellow = Absence. (Mackerel 35F2, Plaice 34F2 and 35F2, Sole 34F2 and 35F2, Nephrops 34F2 shaded yellow; all others blue.)

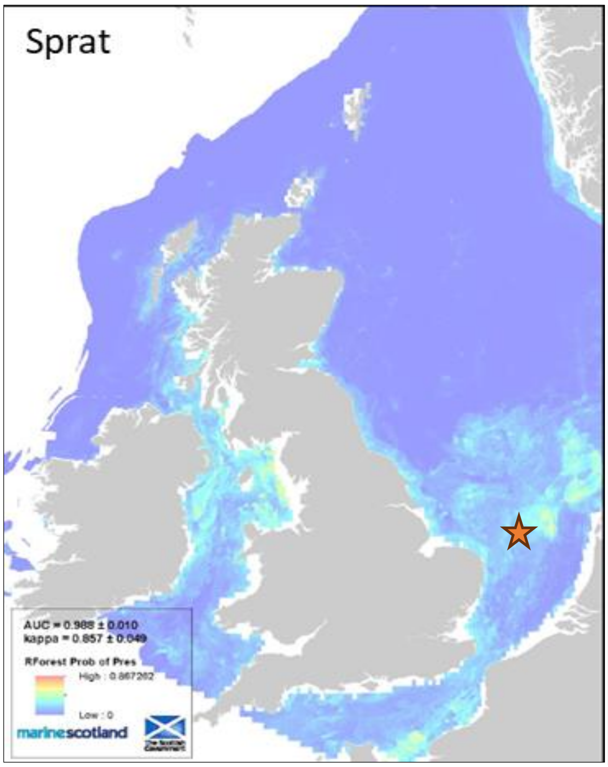
All of the species listed in Table 5.3, with the exception of tope shark, lemon sole, *Nephrops* and sprat, are listed as UK Biodiversity Action Plan (BAP) priority marine species [34]. Cod is the only specie within the OSPAR List of Threatened and/or Declining Species and Habitats [60]. In addition, cod is listed as 'Vulnerable' globally on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species and should therefore be considered as a priority for protection. All other species from Table 5.3 are listed as Least Concern IUCN [30].

Shellfish species of commercial importance that have been recorded in the area, including brown crab (*Cancer pagarus*), common whelk (*Buccinum undatum*), European lobster (*Homarus gammarus*), Norway lobster (*Nephrops norvegicus*), brown shrimp (*Crangon crangon*), pink shrimp (*Pandalus montagui*) and velvet swimming crab (*Necora puber*).

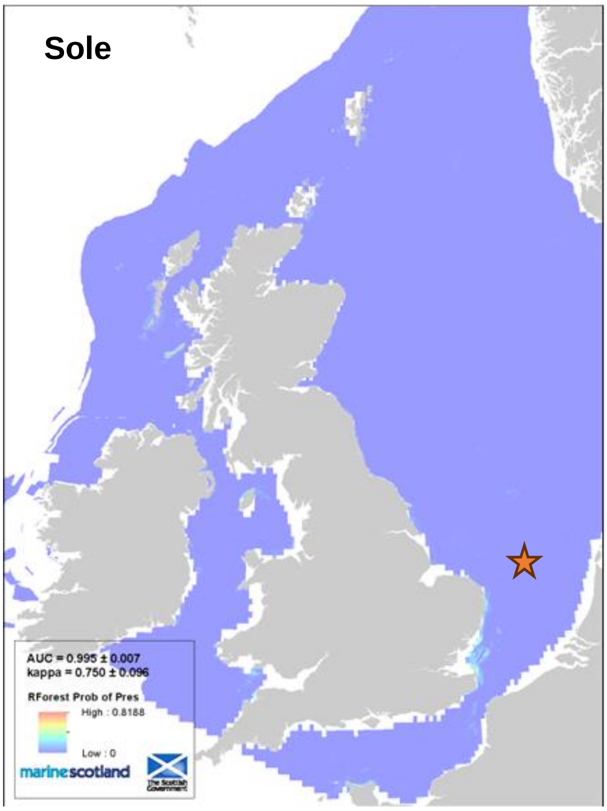
Shellfish species of non-commercial importance includes blue mussel (*Mytilus edulis*); cockle (*Cerastoderma edule*); razor clam (*Ensis directus*).

Figure 5-11: Sensitivity Maps for Selected Species [4] (Star Indicates Approximate Project Location)




Sprat
AUC = 0.988 ± 0.010
kappa = 0.857 ± 0.049
RForest Prob of Pres
High : 0.867202
Low : 0
marinescotland


Plaice
AUC = 0.997 ± 0.003
kappa = 0.893 ± 0.030
RForest Prob of Pres
High : 0.807249
Low : 0
marinescotland


Sole
AUC = 0.995 ± 0.007
kappa = 0.750 ± 0.096
RForest Prob of Pres
High : 0.8188
Low : 0
marinescotland

Elasmobranch Species

Elasmobranch species (sharks, skates and rays) are also an important component of the North Sea ecosystem. Elasmobranchs have a low fecundity and slow growth rate, leaving them vulnerable to overfishing pressures and pollution events, and subsequent recovery of populations in response to disturbance events is low. Historically, many elasmobranch species have been fishery targets due to their fins and liver oils [41]. While many species are no longer subjects of targeted fisheries, they are still under threat from commercial pelagic and demersal fishery by-catch.

In a survey of the distribution of elasmobranchs in UK waters was undertaken by Ellis et al. in 2004 a total of 26 elasmobranch species were recorded throughout the North Sea and surrounding waters. Species which have been recorded in the SNS at various times throughout the year and may therefore be present in the vicinity of the UKCS Blocks 49/30 and 53/5, are listed in Table 5.4 [19].

Table 5.4: Elasmobranch Species Likely to be Found in the Vicinity of the Davy Location

Common Name	Latin Name	Depth Range (m)	Global IUCN Status Note 1
Blonde skate	*Raja brachyura*	10 – 900	Near Threatened
Common smoothhound	*Mustelus mustelus*	5 – 350	Endangered
Cuckoo skate	*Leucoraja naevus*	12 – 290	Least Concern
Small spotted catshark	*Scyliorhinus canicula*	< 400	Least Concern
Spiny dogfish	*Squalus acanthias*	15 – 528	Vulnerable
Spotted skate	*Raja montagui*	< 530	Least Concern
Starry smoothhound	*Mustelus asterias*	0 – 100	Near Threatened
Thornback skate	*Raja clavata*	10 – 300	Near Threatened
Tope shark	*Galeorhinus galeus*	0 – 2000	Critically Endangered
Undulate skate	*Raja undulata*	50 – 200	Near Threatened

Note 1: Status as of December 2024.

Of these species, blonde skate, common smooth-hound, spiny dogfish, starry smooth-hound, thornback skate and tope shark are of most concern due to their unfavourable conservation status [30]. In addition, spotted skate, thornback skate, and spiny dogfish are listed on the OSPAR list of threatened and/or declining species and habitats [60].

5.4.4 Seabirds

Seabird distribution and abundance in the southern North Sea Regional Sea 2 varies throughout the year, with offshore areas in general, containing peak numbers of birds in and around the shallow sandbanks following the breeding season and through winter [16]. Regional Sea 2 also includes several areas suitable for cliff nesting seabirds and some of the most important sites for wintering and passage waterbirds in a national and international context, including the Wash and Thames Estuary. Therefore, individuals found offshore in the vicinity of the Davy installation location may originate from onshore colonies or be passing migrants. Numbers of seabirds are generally lower in Regional Sea 2 compared to further north [16].

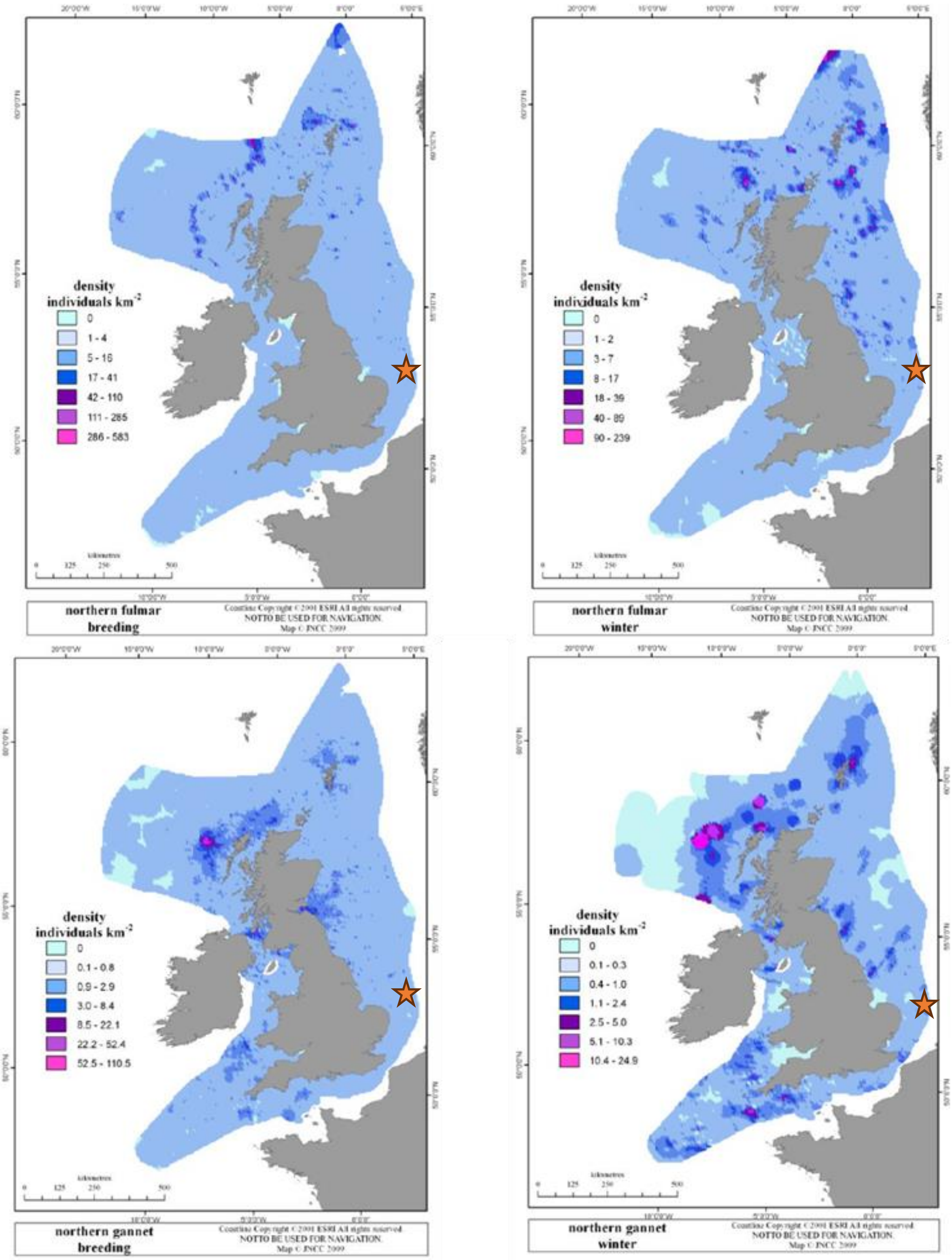
The most common species of seabird found in this area of the SNS include: Northern fulmar (*Fulmarus glacialis*), Great Skua (*Stercorarius skua*), Black legged kittiwake (*Rissa tridactyla*), Great black backed gull (*Larus marinus*), Common gull (*Larus canus*), Lesser black backed gull (*Larus fuscus*), Herring gull (*Larus argentatus*), Common guillemot (*Uria aalge*), Razorbill (*Alca torda*), Little auk (*Alle alle*) and Atlantic puffin (*Fratercula arctica*) [40] (Figure 5-12). In general, species can be found breeding at low densities from March to November, predominantly during the summer months (June, July and August).

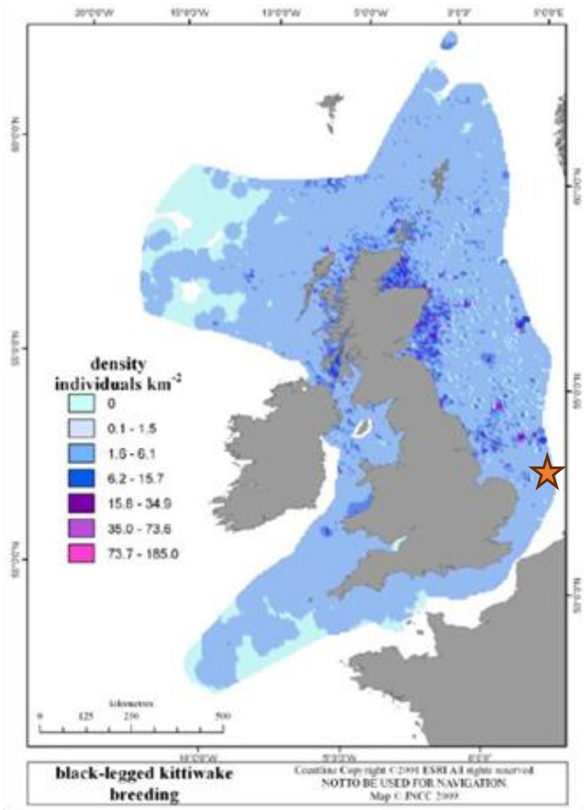
Fulmars are present in highest numbers during the early and late breeding seasons, leading to peak densities in September. Kittiwakes are widely distributed throughout the year. Lesser black-backed gull are mainly summer visitors, while in contrast guillemot numbers are greatest during winter months. In addition, substantial numbers of terns migrate northwards through the offshore North Sea area in April and May, with return passage from July to September [16].

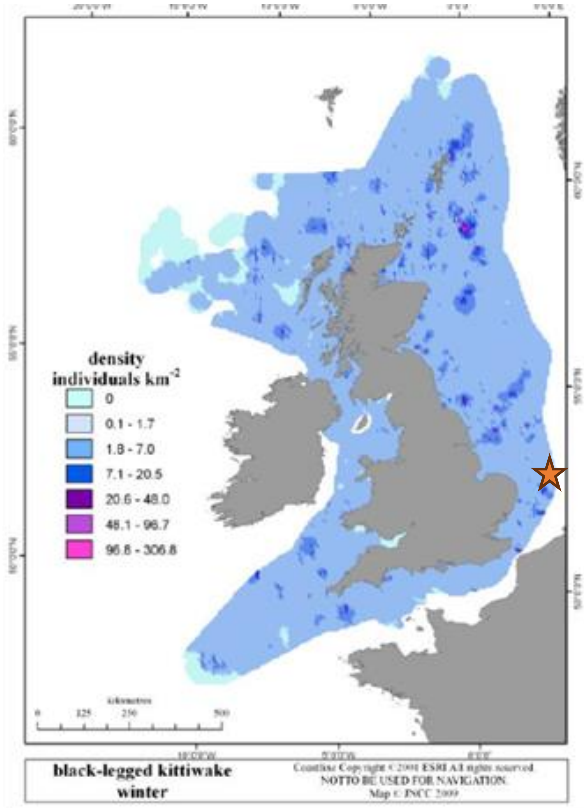
The Davy North and Davy East subsea installations are situated approximately 75km from the Greater Wash Special Protection Area (SPA) which covers an area of 3,536km^2 and classified for the protection of Red-throated diver (*Gavia stellata*), Common scoter (*Melanitta nigra*), and Little gull (*Hydrocoloeus minutus*) during the non-breeding season, and for breeding Sandwich tern (*Sterna sandvicensis*), Common tern (*Sterna hirundo*) and Little tern (*Sternula albifrons*).

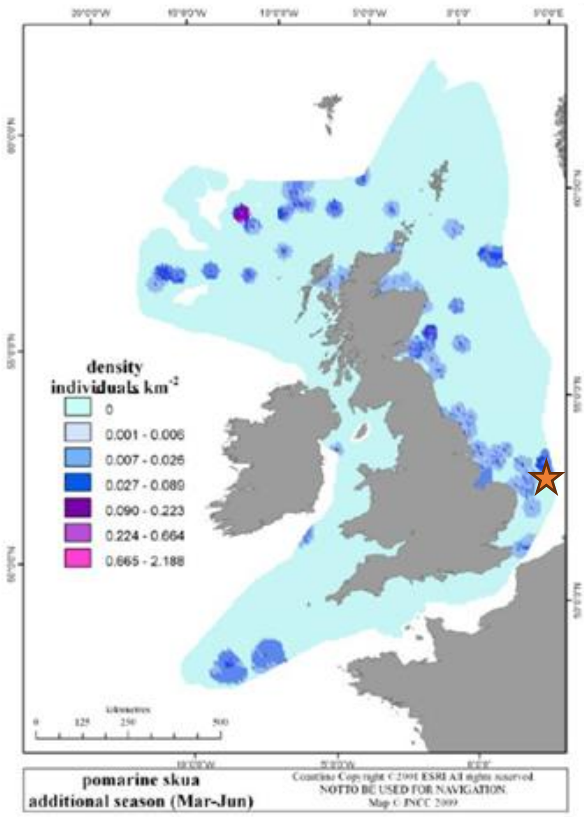
The closest UK landfall is Winterton-on-Sea, situated approximately 90km west from Davy platform.

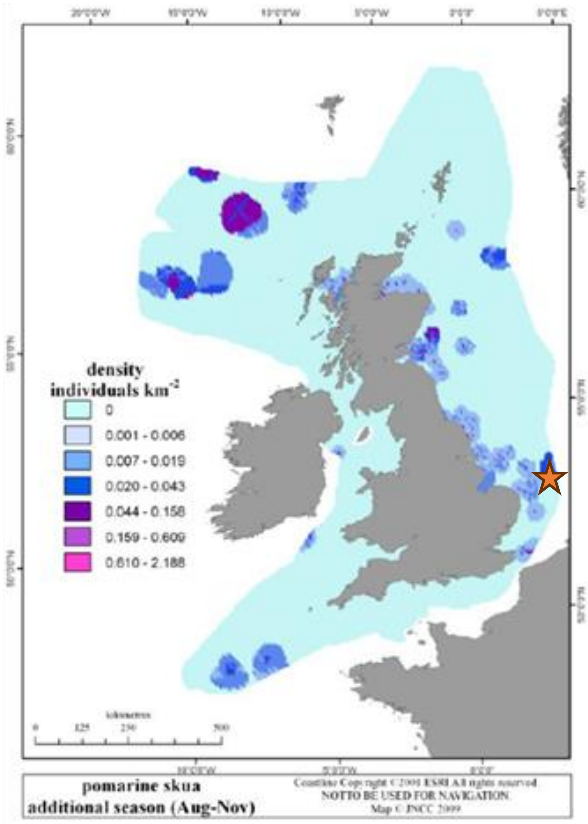
Figure 5-12: Seabird Density Surface Maps for the Species Identified as Frequently Occurring in the SNS (Star Indicates Approximate Project Location) [40].

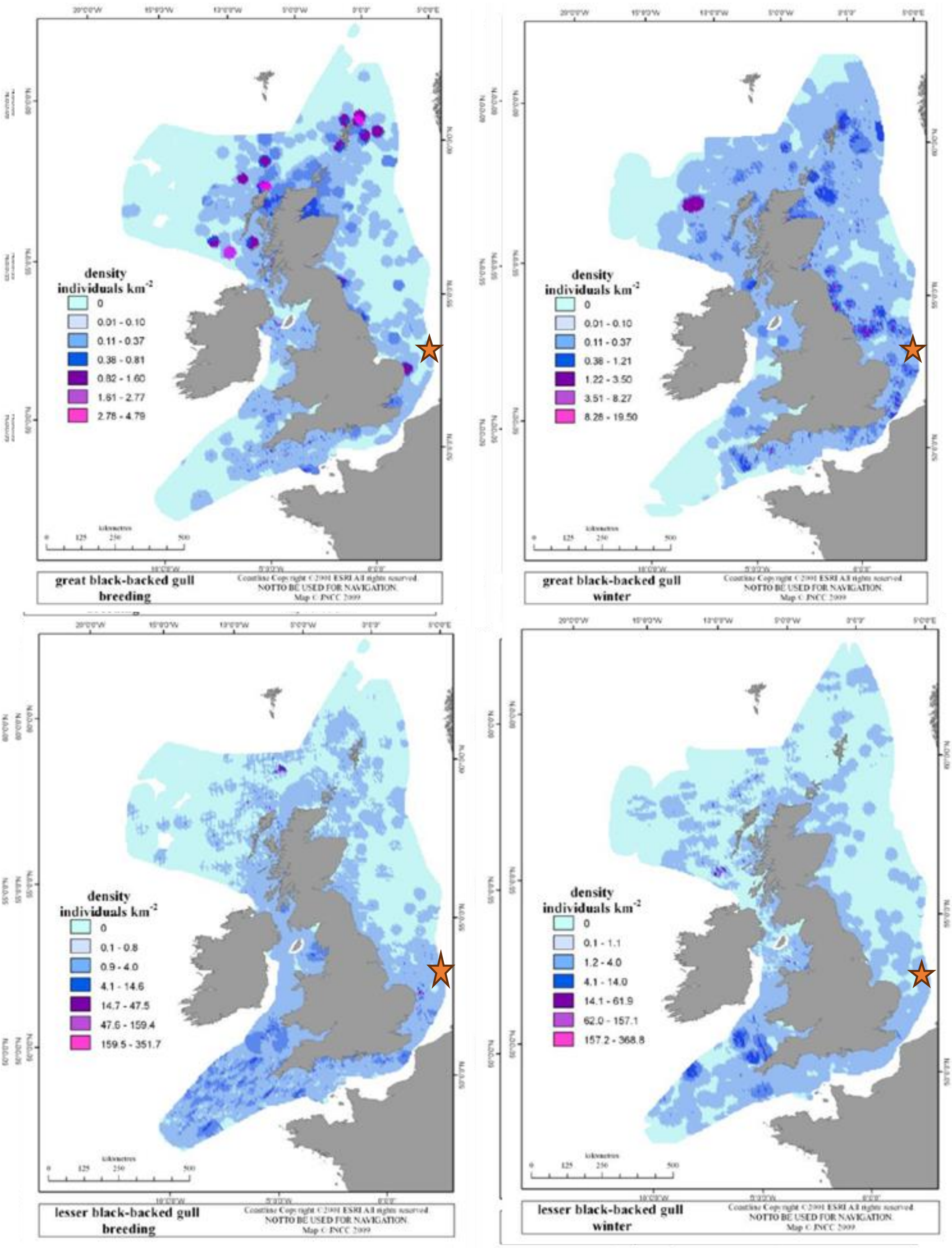


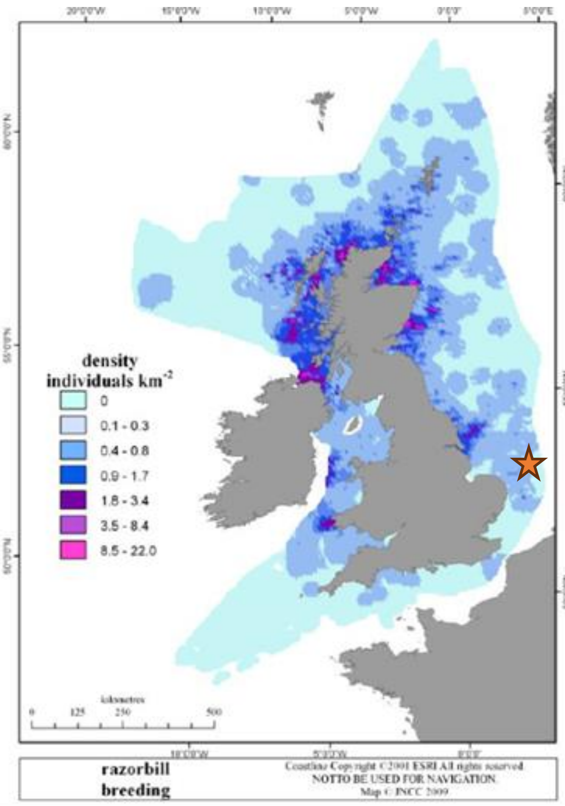

density
individuals km^{-2}
0
0.1 - 1.5
1.6 - 6.1
6.2 - 15.7
15.8 - 34.9
35.0 - 73.6
73.7 - 185.0
black-legged kittiwake
breeding
NOT TO BE USED FOR NAVIGATION

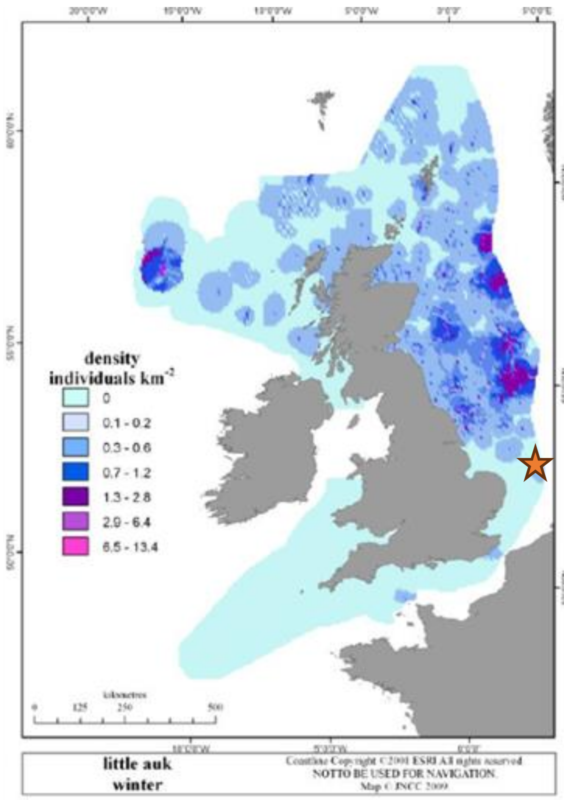

density
individuals km^{-2}
0
0.1 - 1.7
1.8 - 7.0
7.1 - 20.5
20.6 - 48.0
48.1 - 96.7
96.8 - 306.8
black-legged kittiwake
winter
NOT TO BE USED FOR NAVIGATION

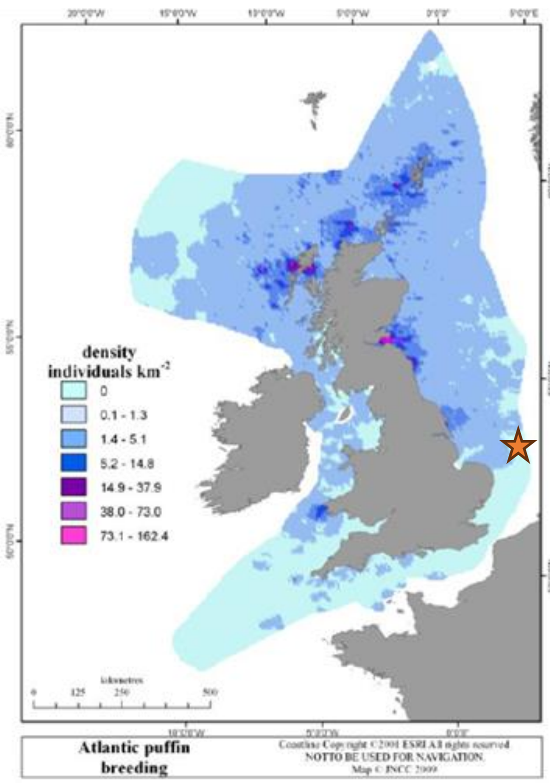

density
individuals km^{-2}
0
0.001 - 0.006
0.007 - 0.026
0.027 - 0.089
0.090 - 0.223
0.224 - 0.664
0.665 - 2.188
pomarine skua
additional season (Mar-Jun)
NOT TO BE USED FOR NAVIGATION

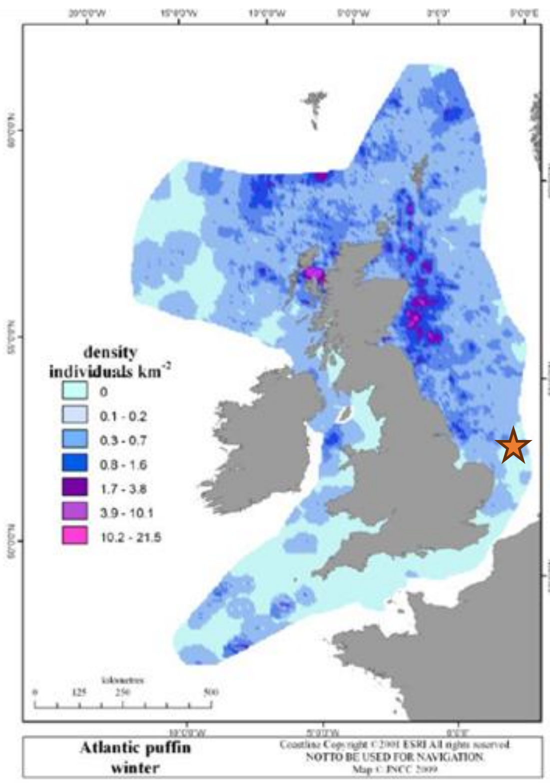

density
individuals km^{-2}
0
0.001 - 0.006
0.007 - 0.019
0.020 - 0.043
0.044 - 0.158
0.159 - 0.609
0.610 - 2.188
pomarine skua
additional season (Aug-Nov)
NOT TO BE USED FOR NAVIGATION


density individuals km-2
0
0.01 - 0.10
0.11 - 0.37
0.38 - 0.81
0.82 - 1.60
1.61 - 2.77
2.78 - 4.79
great black-backed gull breeding
Coastline Copyright ©2001 ESRI All rights reserved
NOT TO BE USED FOR NAVIGATION
Map © JNCC 2009
density individuals km-2
0
0.01 - 0.10
0.11 - 0.37
0.38 - 1.21
1.22 - 3.50
3.51 - 8.27
8.28 - 19.50
great black-backed gull winter
density individuals km-2
0
0.1 - 0.8
0.9 - 4.0
4.1 - 14.6
14.7 - 47.5
47.6 - 159.4
159.5 - 351.7
lesser black-backed gull breeding
density individuals km-2
0
0.1 - 1.1
1.2 - 4.0
4.1 - 14.0
14.1 - 61.9
62.0 - 157.1
157.2 - 368.8
lesser black-backed gull winter


density
individuals km^{-2}
0
0.1 - 0.3
0.4 - 0.8
0.9 - 1.7
1.8 - 3.4
3.5 - 8.4
8.5 - 22.0
kilometres
0 125 250 500
razorbill
breeding
Coastline Copyright ©2001 ESRI All rights reserved
NOT TO BE USED FOR NAVIGATION
Map © JNCC 2009


density
individuals km^{-2}
0
0.1 - 0.2
0.3 - 0.6
0.7 - 1.2
1.3 - 2.8
2.9 - 6.4
6.5 - 13.4
kilometres
0 125 250 500
little auk
winter
Coastline Copyright ©2001 ESRI All rights reserved
NOT TO BE USED FOR NAVIGATION
Map © JNCC 2009


density
individuals km^{-2}
0
0.1 - 1.3
1.4 - 5.1
5.2 - 14.8
14.9 - 37.9
38.0 - 73.0
73.1 - 162.4
kilometres
0 125 250 500
Atlantic puffin
breeding
Coastline Copyright ©2001 ESRI All rights reserved
NOT TO BE USED FOR NAVIGATION
Map © JNCC 2009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individuals km^{-2}
0
0.1 - 0.2
0.3 - 0.7
0.8 - 1.6
1.7 - 3.8
3.9 - 10.1
10.2 - 21.5
kilometres
0 125 250 500
Atlantic puffin
winter
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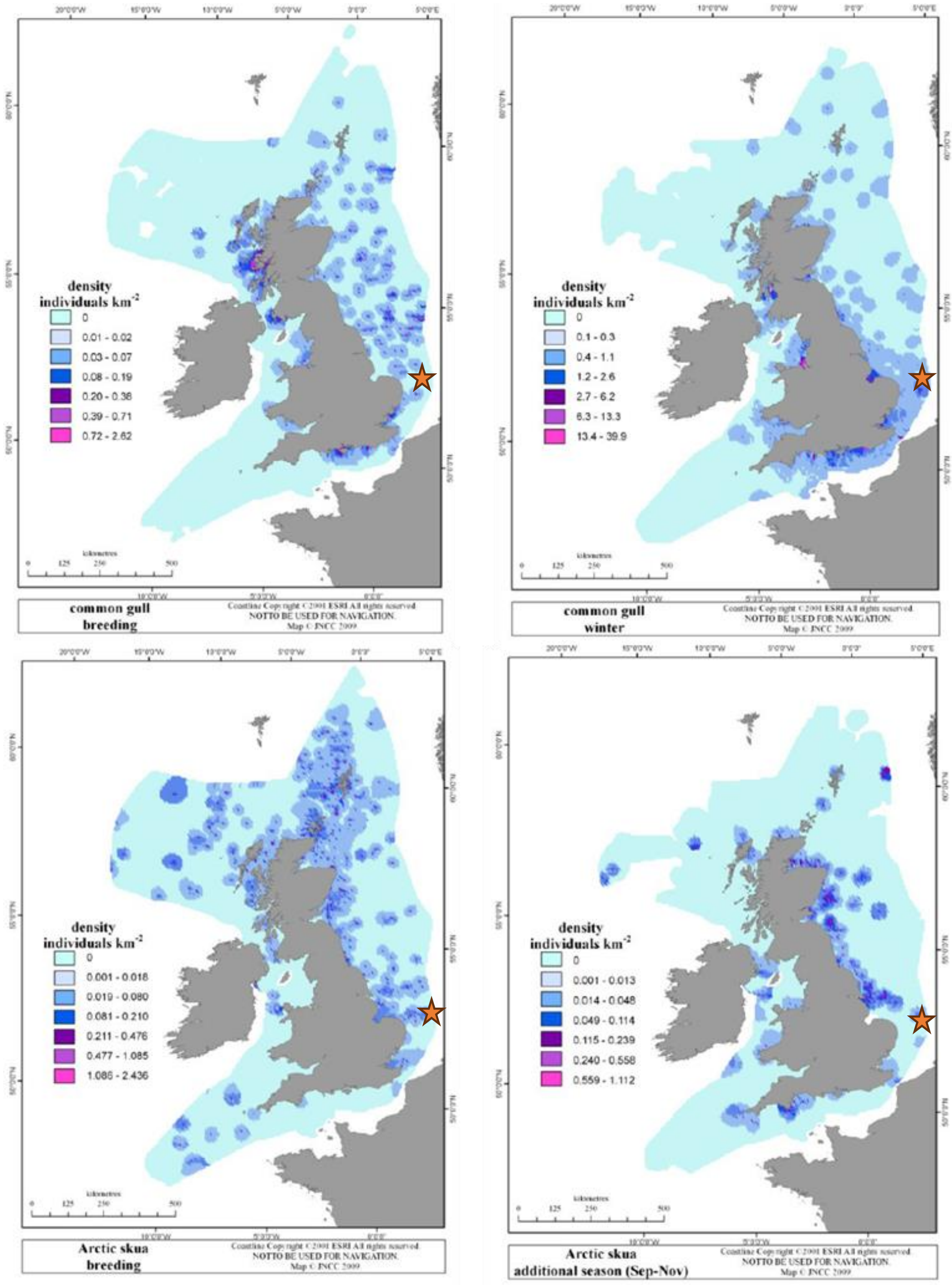
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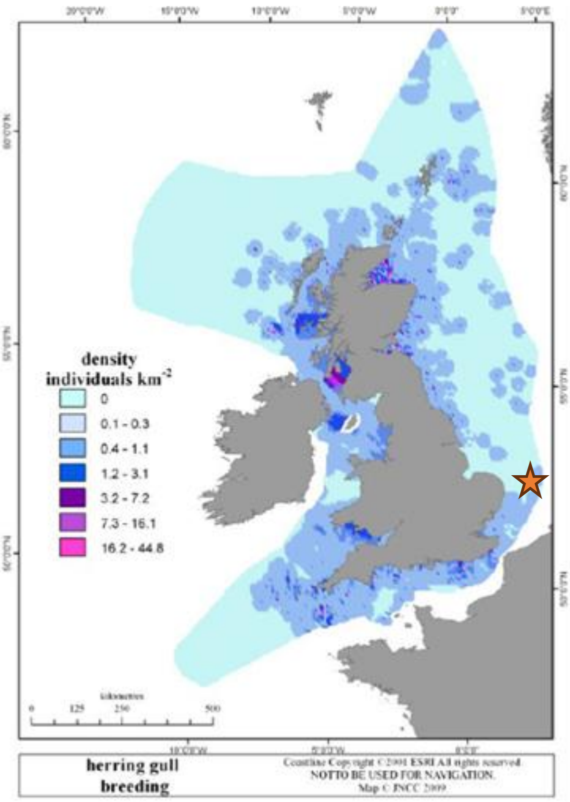
0.03 - 0.07
0.08 - 0.19
0.20 - 0.38
0.39 - 0.71
0.72 - 2.62
common gull
breeding
density individuals km-2
0
0.1 - 0.3
0.4 - 1.1
1.2 - 2.6
2.7 - 6.2
6.3 - 13.3
13.4 - 39.9
common gull
winter
density individuals km-2
0
0.001 - 0.018
0.019 - 0.080
0.081 - 0.210
0.211 - 0.476
0.477 - 1.085
1.086 - 2.436
Arctic skua
breeding
density individuals km-2
0
0.001 - 0.013
0.014 - 0.048
0.049 - 0.114
0.115 - 0.239
0.240 - 0.558
0.559 - 1.112
Arctic skua
additional season (Sep-Nov)
NOT TO BE USED FOR NAVIGATION.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individuals km^{-2}
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1.2 - 3.1
3.2 - 7.2
7.3 - 16.1
16.2 - 44.8
herring gull
breeding
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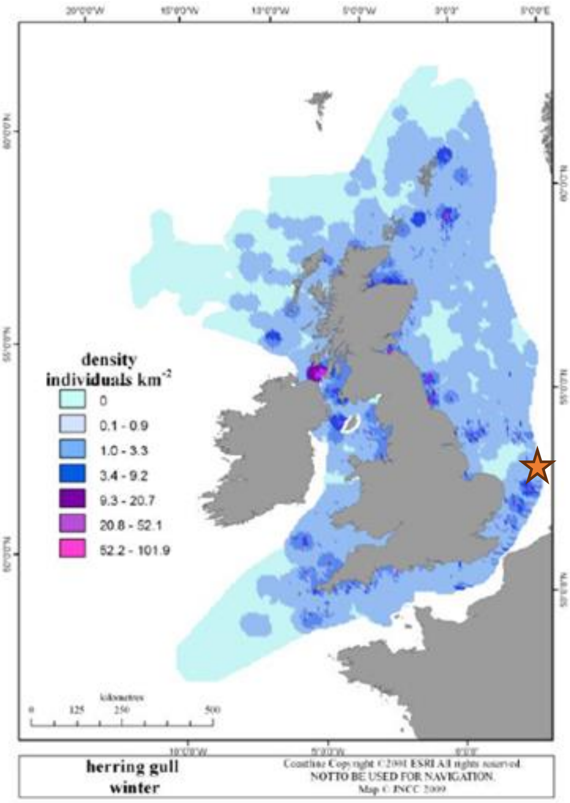
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individuals km^{-2}
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1.0 - 3.3
3.4 - 9.2
9.3 - 20.7
20.8 - 52.1
52.2 - 101.9
herring gull
winter
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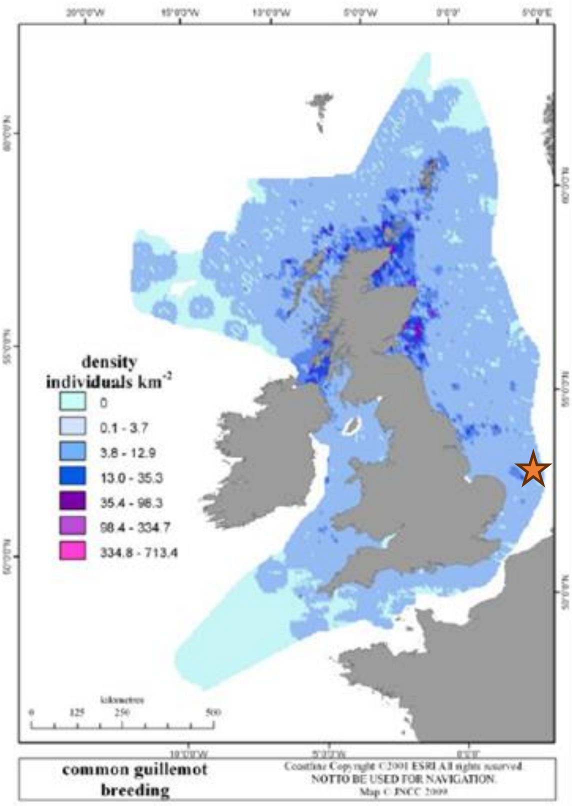
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individuals km^{-2}
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3.8 - 12.9
13.0 - 35.3
35.4 - 98.3
98.4 - 334.7
334.8 - 713.4
common guillemot
breeding
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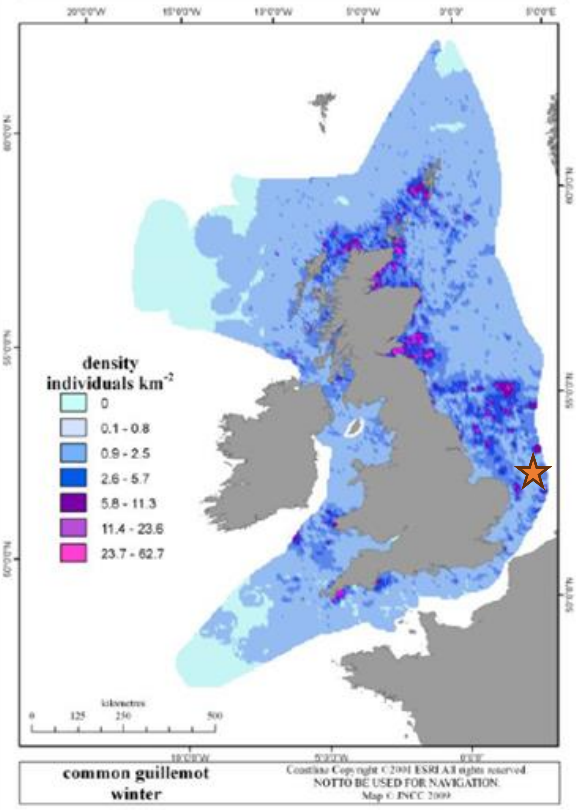
density
individuals km^{-2}
0
0.1 - 0.8
0.9 - 2.5
2.6 - 5.7
5.8 - 11.3
11.4 - 23.6
23.7 - 62.7
common guillemot
winter
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5.4.4.1 Seabird Vulnerability to Oil Pollution

Seabirds are not normally affected by routine offshore oil and gas operations. However, seabird populations are particularly vulnerable to surface pollution.

The vulnerability of bird species to oil pollution varies considerably throughout the year and is dependent on a variety of factors, including time spent on the water, total biogeographical population, reliance on the marine environment and potential rate of population recovery. Species considered most vulnerable to sea surface pollution are those which spend a great deal of time on the sea surface, for example, puffin, guillemot, and razorbill. Species considered to be at lower risk due to spending less time on the sea surface include gannet, cormorant, and kittiwake.

The Seabird Oil Sensitivity Index (SOSI) has been developed to identify areas where seabirds are likely to be most sensitive to oil pollution [81]. The SOSI combines seabird data collected between 1995 and 2015 and individual seabird species sensitivity index values to create a single measure of seabird sensitivity to oil pollution. The SOSI score for each UKCS Block can be ranked into sensitivity categories, from 1 (extremely high sensitivity) to 5 (low sensitivity). An assessment of the median SOSI scores indicates that the sensitivity of seabirds to oil pollution in UKCS blocks of interest can be extremely high from February to April.

Table 5.5: SOSI scores for UKCS blocks of interest

UKCS Blocks	January	February	March	April	May	June	July	August	September	October	November	December
53/5	3	1	1	1	N	5	5	5	5	N	3	3
49/30	3	N	1	N	5	5	5	5	5	N	3	3
50/26	5	N	1	N	5	5	2	5	5	N	5	5
54/1	5	N	1	N	5	5	3	5	5	N	5	5
54/6	5	1	1	1	N	5	5	5	5	N	5	5
53/10	3	1	1	1	N	N	5	5	5	N	3	3
53/9	3	1	1	1	N	N	5	5	5	N	3	3
53/4	3	4	4	4	N	5	5	5	5	N	3	3
49/29	3	4	4	4	5	5	5	5	5	N	3	3
49/24	5	5	5	5	5	5	5	5	5	5	5	5
49/25	5	N	5	N	5	5	5	5	5	5	5	5
50/21	5	N	N	N	5	5	4	5	5	5	5	5

Key: 1 = Extremely High; 2 = Very High; 3 = High; 4 = Medium; 5 = Low; 'N'= No Data.
SOSI sensitivity category in red and underlined indicates an indirect assessment of SOSI scores, in light of coverage gaps.

Vulnerability index	5 = low	4 = medium	3 = high	2 = very high	1 = extremely high	N = No data

5.4.5 Marine Mammals

5.4.5.1 Cetaceans

Cetaceans (whales, dolphins, and porpoises) are protected under Annex IV of the Council Directive 92/43/EEC (also known as the Habitats Directive). Cetacean abundance in the SNS is relatively low compared to the northern and central North Sea, with the exception of the harbour porpoise (*Phocoena phocoena*).

The relative abundance and density of cetaceans in the vicinity of the Davy field location can be derived from data obtained during the Small Cetacean Abundance of the North Sea (SCANS-IV) aerial and ship-based surveys. This project identified the abundance and density of cetacean species within predefined sectors of the North Sea and North-East Atlantic. The Davy field location is situated within SCANS-IV Block 'NS-C' for Davy North subsea installation, and Block 'NS-B' for Davy East subsea installation (Table 5.6), in which harbour porpoise, bottlenose dolphin, minke whale, white-beaked dolphin and common dolphin have been recorded [84]. The density of the harbour porpoise within the SCANS-IV Block 'NS-C' is higher than the total surveyed area, suggesting that the area may be important for these species (Table 5.6). Densities for minke whale and Bottlenose dolphin were similar to the total surveyed area, whereas densities for white-beaked dolphin and Common dolphin were a magnitude lower. The number of cetaceans in Block 'NS-B' is noticeably lower compared to Block 'NS-C'. Harbour porpoises were found with only half the density in this surveyed area, and the other types of cetaceans were not identified.

In addition to the aforementioned cetaceans, other species have been observed or have been modelled to have presence in the North Sea [80]. These include the Atlantic white-sided dolphin (*Lagenorhynchus acutus*), Risso's dolphin (*Grampus griseus*), and short-beaked common dolphin (*Delphinus delphis*).

Table 5.6: Cetacean Abundance and Density Recorded in SCANS-IV Aerial Survey Area Block 'NS-C' and 'NS-B' [84]

Species	SCANS-IV Block 'NS-C'		SCANS-IV Block 'NS-B'	
	Abundance	Density Note1	Abundance	Density Note1
Harbour porpoise	36,286	0.6027	7,982	0.3096
Bottlenose dolphin	2,520	0.0419	-	-
White-beaked dolphin	894	0.0149	-	-
Minke whale	412	0.0068	-	-
Common dolphin	192	0.0032	-	-
Note1: Density is the number of animals per km^2				

The UK Statutory Nature Conservation Bodies have identified Marine Mammal Management Units (MMMU's) to provide information on the geographical range and abundance of marine mammals, and therefore understand the potential effects of anthropogenic activities on populations [28]. The abundance of cetacean species within their respective MMMU is shown in Table 5.7.

It is evident that harbour porpoises are the most abundant species in the North Sea compared to other species identified in Table 5.7, despite its MMMU being smaller in area.

Table 5.7: Estimates of Cetacean abundance in the Relevant MMMUs [28]

Species	Management unit	Abundance of animals	95% Confidence Interval	Density Note 1
Bottlenose dolphin	Greater North Sea (639,886km^2)	0	-	-
Harbour porpoise	North Sea (678,206km^2)	227,298	176,360 – 292,948	0.335
Risso's dolphin Note 2	Marine Atlantic Note 3	-	-	-
Common dolphin	Celtic and Greater North Sea (1,560,875km^2)	56,556	33,014 – 96,920	0.036
Minke whale		23,528	13,989 - 39,572	0.015
White-beaked dolphin		15,895	9,107 – 27,743	0.010
White-sided dolphin		69,293	34,339 – 139,828	0.044

Note 1: Density (individuals per km) was calculated using the total area of the Management Unit (MU) and the abundance of animals within that MU
Note 2: There is no current abundance estimate available for Risso's dolphin
Note 3: 'Marine Atlantic' MU comprises all UK waters and extends to the seaward boundary used by the EC for Habitats Directive reporting

5.4.5.2 Pinnipeds

Two species of seals; grey seal (*Halichoerus grypus*) and the harbour (or common) seal (*Phoca vitulina*) are found in the North Sea around the English east coast (Figure 5-13; Figure 5-14). Both species are listed under Annex II of the EC Habitats Directive, protected under the Conservation of Seals Act 1970 (from 0 to 12 nautical miles from the coast), and listed as UK BAP priority marine species.

Grey and harbour seals feed both in inshore and offshore waters depending on the distribution of their prey, which changes both seasonally and yearly. Both species tend to be concentrated close to shore, particularly during the pupping and moulting season. Important number of grey and harbour seals are present off the east coast of England, particularly around The Wash where [16].

On the east coast of England, established colonies of grey seals are present at Donna Nook, at the mouth of the Humber, and around Blakeney on the North Norfolk coast [69]. Like all seals, grey seals spend a significant proportion of their time hauled out on land during the breeding, moulting and pupping seasons and also between tides and foraging trips [69]. Grey seals forage down to depths of 100m and at distances of up to 100km from their haul-out sites and, therefore, whilst unlikely, could be present in the vicinity of Davy installations. Models of marine usage by grey seals show that there are high levels of foraging activity along the east coast of England. The Davy subsea installations are located approximately 90km to the nearest landfall at Winterton-on-Sea, and thus the distribution of grey seals is considered very low (0-15 individual per 25km^2) [68].

Harbour seals are the smaller of the two species and tend to be found closer to the coast [69]. As with grey seals, the UK harbour seal population is predominantly found around the Scottish coast with smaller colonies around The Wash and along the east coast of England [69]. Harbour seals are restricted to their haul-out sites and the surrounding waters during pupping (June and July) and during their annual moult (August) [69]. This species can be found offshore from late August through to the following June and tends to forage within 40 – 50km of its haul-out sites. Therefore, the harbour seal distribution in the vicinity of the Davy installation location is considered very low (0-10 individual per 25km^2) [68].

Figure 5-13: Grey Seal (*H. grypus*) at Sea Density

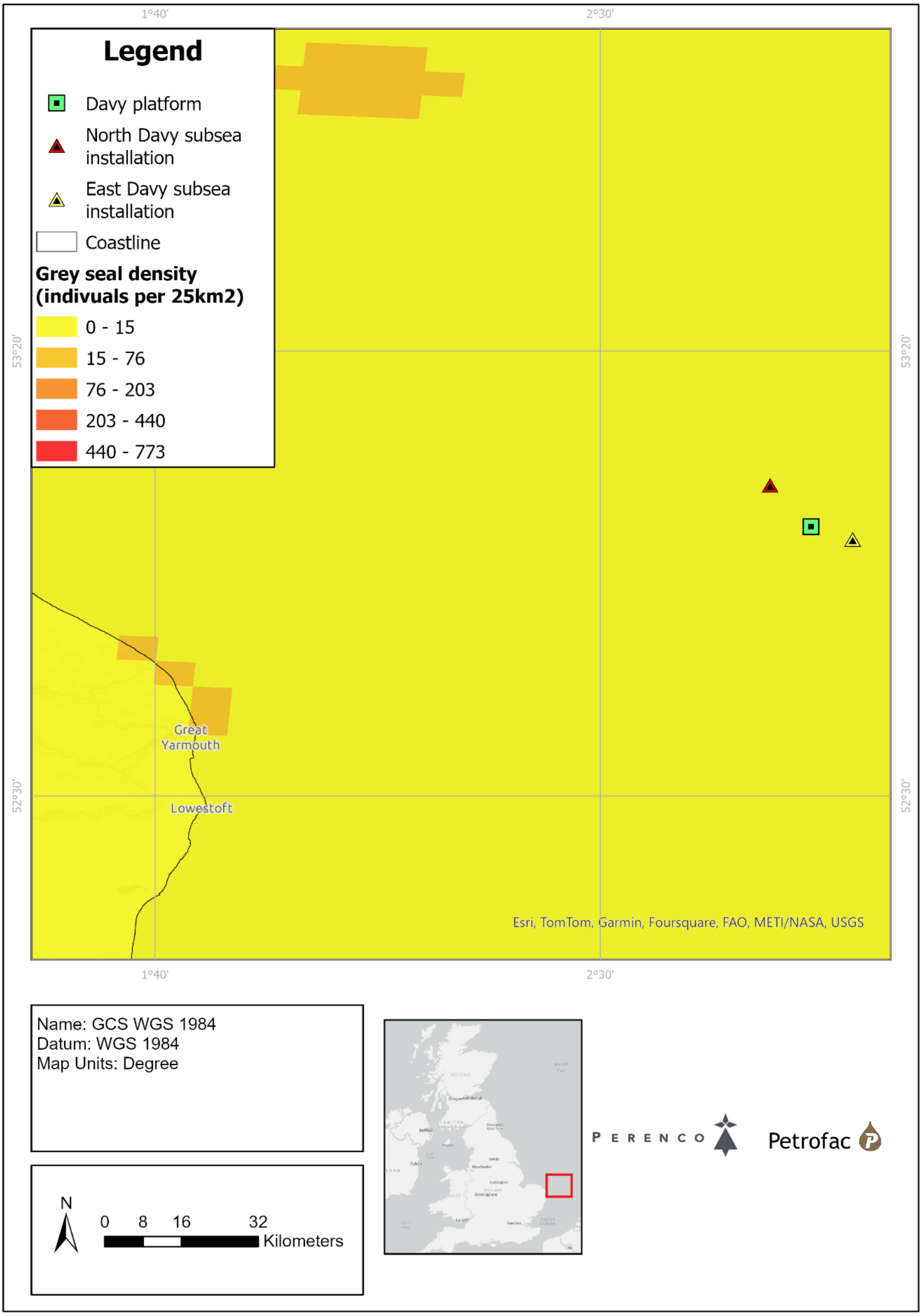
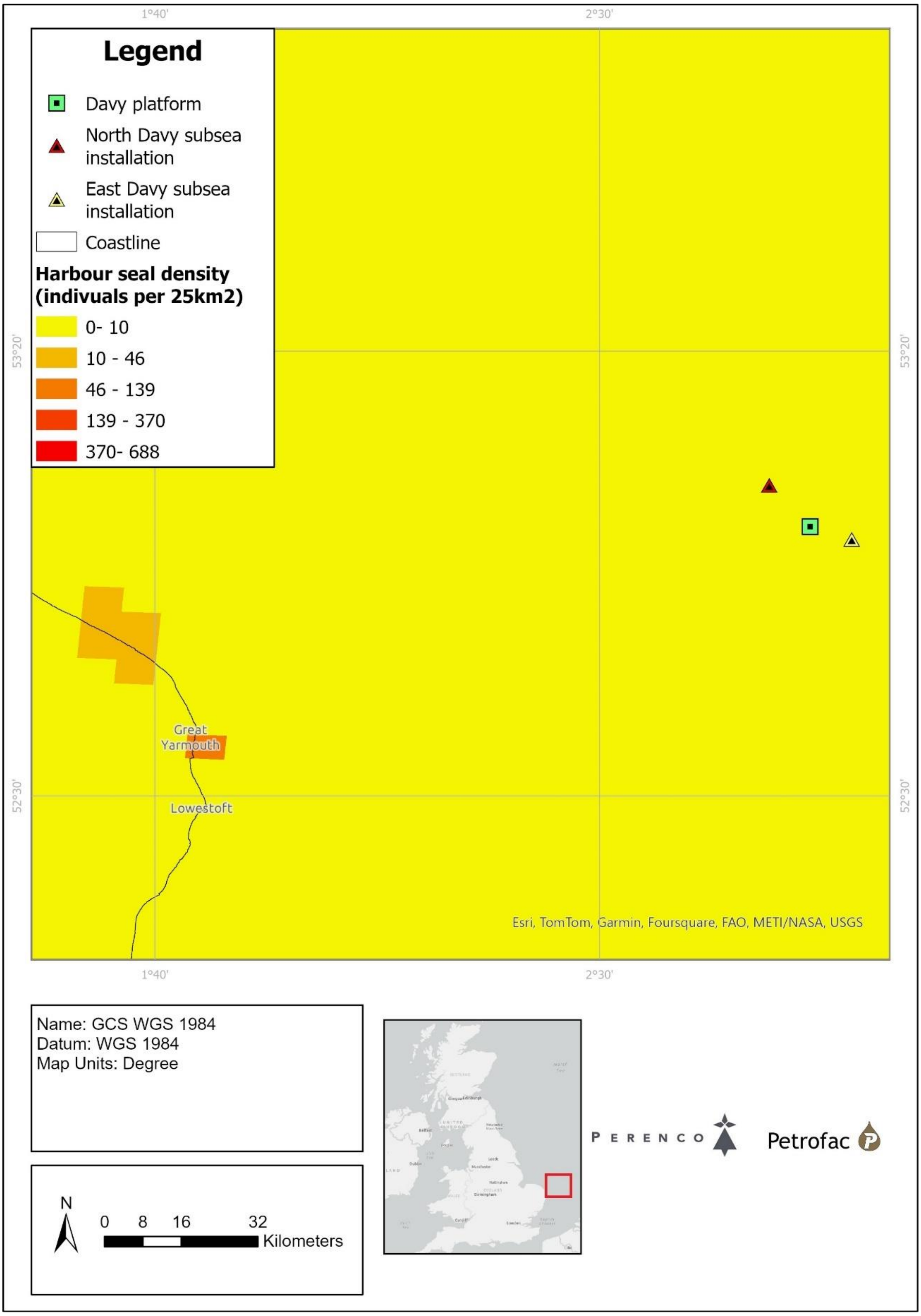


Figure 5-14: Harbour Seal (*P. vitulina*) at Sea Density.



5.5 Management

5.5.1 Conservation Areas

The UK is party to a number of international agreements to establish an ecologically network of MPA's in UK waters. As a signatory to the OSPAR Convention the UK must establish an ecologically coherent and well-managed network of MPAs across the North-East Atlantic by 2016 [32]. These commitments are transposed through national legislation and regulations. The main types of MPA's in UK waters are:

- SAC's (also known as European Sites of Community Importance which are designated for habitats and species listed under the EU Habitats Directive. These qualifying features include three marine habitat types (shallow sandbanks, reefs and submarine structures made by leaking gases) and four marine species (grey seal, harbour seal, bottlenose dolphin and harbour porpoise) [32]. In the UK there are 115 SACs with marine components [32].
- SPA's which are designated to protect birds under the EU Wild Birds Directive. The Directive requires conservation efforts to be made across the sea and land area. In the UK 112 SPAs with marine components have been designated, including four marine SPAs [32].
- MCZ's which are designated under the Marine and Coastal Access Act (2009) to protect nationally important marine wildlife, habitats, geology and geomorphology and can be designated anywhere in English, Welsh territorial or UK offshore waters [32]. To date there are 97 designated MCZ's in UK waters [32].

SAC's and SPA's form part of the European Natura 2000 network. Other international designations such as Ramsar Wetlands of International Importance (hereafter referred to as Ramsar sites), and national designations such as Sites of Special Scientific Interest also form part of the UK MPA network through their protection of marine, coastal terrestrial and geological features [32]. OSPAR MPA's encompass existing MPA's designated under existing legislation and Conventions including SAC's, SPA's and MCZ's [32].

The Davy field is located within the boundary of the Southern North Sea SAC. There is an additional MPA located within a 40km range of either Davy North or Davy East subsea manifolds, as shown in Figure 5-16.

Table 5.8: MPA's within 40km of the Davy East and North Subsea Installation

Site Name	Distance and Direction	Qualifying Features and Site Description
Southern North Sea SAC	0km	**Features:** Annex II species; Harbour porpoise (*Phocoena phocoena*) (1351). **Description**: The site has been identified as an area of importance for harbour porpoise and supports 17.5% of the UK North Sea Management Unit (MU) population. This site covers an area of 36,951km^2. The majority of this site lies offshore, though it does extend into coastal areas of Norfolk and Suffolk. The northern two thirds of the site are recognised as important for porpoises during the summer season (April – September), whilst the southern part supports persistently higher densities during the winter (October – March).
North Norfolk Sandbanks and Saturn Reef SAC	26km west	**Features:** Annex I Habitat: Sandbanks which are slightly covered by sea water all the time and reefs. **Description:** Located in the southern North Sea, the North Norfolk Sandbanks are the most extensive example of the offshore linear ridge sandbank type in UK waters. The banks support communities of invertebrates which are typical of sandy sediments in the southern North Sea such as polychaete worms, isopods, crabs and starfish. Areas of *S. spinulosa* biogenic reef are present within the site, consisting of thousands of fragile sand-tubes made by ross worms (polychaetes) which have consolidated together to create solid structures rising above the seabed.
Outer Thames Estuary SPA	60km southwest	**Features:** The site features three Annex I birds species. **Description:** This site is classified for the protection of the largest aggregation of wintering red-throated diver (*Gavia stellata*) in the UK, an estimated population of 6,466 individuals, which is 38% of the wintering population of Great Britain. It also protects foraging areas for common tern (*Sterna hirundo*) and little tern (*Sternula albifrons*) during the breeding season.

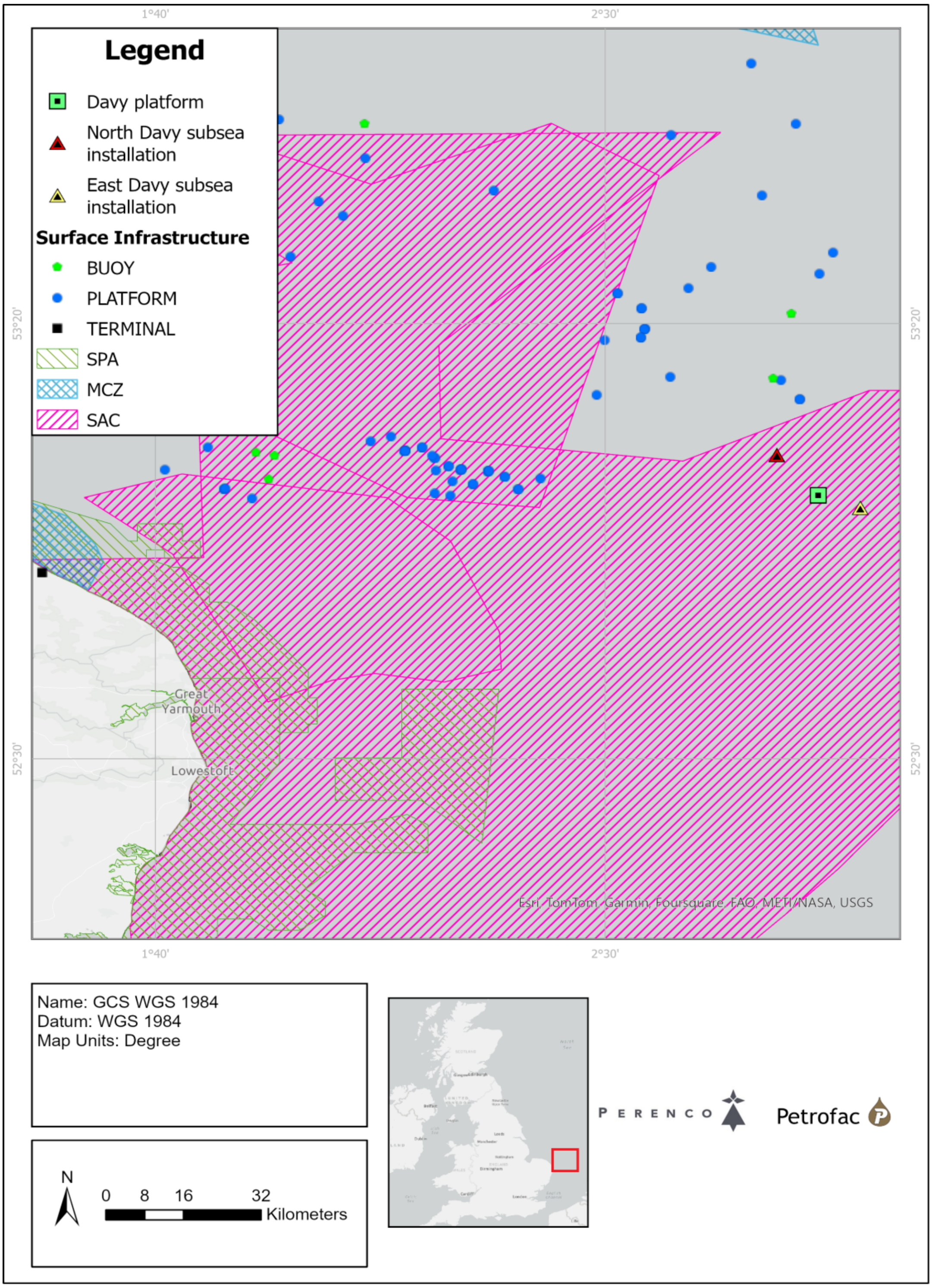
5.5.1.1 The Southern North Sea SAC

The Southern North Sea SAC is an area of importance for harbour porpoise, supporting an estimated 17.5% of the UK North Sea Management Unit (MU) population. Approximately two-thirds of the site, the northern part, is recognised as important for porpoises during the summer season, whilst the southern part supports persistently higher densities during the winter [36].

The entirety of the SAC is considered a representative functioning example of the Annex II feature harbour porpoise (*P. phocoena*) (see Figure 5-15).

Figure 5-15: Southern North Sea SAC in reference to Davy subsea installations

Figure 5-16: Davy Location in Relation to UK Offshore Infrastructure and MPAs.



5.5.2 National Marine Plans

Table 5.9 details policies and objectives contained within relevant marine plans and highlights how these have been addressed by the proposed decommissioning strategy [49].

Table 5.9: Marine Planning Objectives and Policies Relevant to the Proposed Decommissioning Strategy.

Relevant Objectives	Associated Policies	Addressed by Project
Economic Productivity - To promote the sustainable development of economically productive activities, taking account of spatial requirements of other activities of importance to the East marine plan areas.	**EC1** - Proposals that provide economic productivity benefits which are additional to Gross Value Added currently generated by existing activities should be supported.	The proposed decommissioning strategy is in line with minimising taxpayer costs for decommissioning oil & gas infrastructure in the SNS.
Employment and Skill Levels - To support activities that create employment at all skill levels, taking account of the spatial and other requirements of activities in the East marine plan areas.	**EC2** - Proposals that provide additional employment benefits should be supported, particularly where these benefits have the potential to meet employment needs in localities close to the marine plan areas.	The proposed operations will utilise local contractors in the area and a support base close to the proposed operations.

Relevant Objectives	Associated Policies	Addressed by Project
Heritage Assets - To conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area.	**SOC2** - Proposals that may affect heritage assets should demonstrate, in order of preference: a) that they will not compromise or harm elements which contribute to the significance of the heritage asset; b) how, if there is compromise or harm to a heritage asset, this will be minimised; c) how, where compromise or harm to a heritage asset cannot be minimised it will be mitigated against, or; d) the public benefits for proceeding with the proposal if it is not possible to minimise or mitigate compromise or harm to the heritage asset. **SOC3** - Proposals that may affect the terrestrial and marine character of an area should demonstrate, in order of preference: a) that they will not adversely impact on the terrestrial and marine character of an area; b) how, if there are adverse impacts on the terrestrial and marine character of an area, they will minimise them; c) how, where these adverse impacts on the terrestrial and marine character of an area cannot be minimised they will be mitigated against; d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.	The proposed decommissioning strategy not anticipated to have an impact on any heritage assets or the character of the marine area.
Healthy Ecosystem - To have a healthy, resilient and adaptable marine ecosystem in the East marine plan areas.	**ECO1** - Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation.	Refer to Section 7. Environmental & Social impact assessment.
	ECO2 - The risk of release of hazardous substances as a secondary effect due to any increased collision risk should be taken account of in proposals that require an authorisation.	The proposed decommissioning strategy minimises the risk of release of hazardous substances which would be limited to vessel fuel inventory during decommissioning operations.
Biodiversity - To protect, conserve and, where appropriate, recover biodiversity that is in or dependent upon the East marine plan areas.	**BIO1** - Appropriate weight should be attached to biodiversity, reflecting the need to protect biodiversity as a whole, taking account of the best available evidence including on habitats and species that are protected or of conservation concern in the East marine plans and adjacent areas (marine, terrestrial).	The proposed decommissioning strategy reduces any potential impact on biodiversity in the East marine plan and terrestrial areas.

Relevant Objectives	Associated Policies	Addressed by Project
MPAs - To support the objectives of MPAs (and other designated sites around the coast that overlap or are adjacent to the East marine plan areas), individually and as part of an ecologically coherent network.	**MPA1** - Any impacts on the overall MPA network must be taken account of in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network	Refer to Section 5.5.1. The decommissioning strategy will not significantly impact the objectives of the SAC located within the East Marine Plan area.
Governance - To ensure integration with other plans, and in the regulation and management of key activities and issues, in the East marine plans, and adjacent areas.	**GOV2** - Opportunities for co-existence should be maximised wherever possible.	Refer To Section 5.6
	GOV3 - Proposals should demonstrate in order of preference: a) that they will avoid displacement of other existing or authorised (but yet to be implemented) activities; b) how, if there are adverse impacts resulting in displacement by the proposal, they will minimise them; c) how, if the adverse impacts resulting in displacement by the proposal, cannot be minimised, they will be mitigated against, or; d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts of displacement.	Refer To section 5.6

5.6 Societal

5.6.1 Commercial Fisheries

The North Sea is one of the world's most important fishing grounds, and major UK and international fishing fleets operate in the SNS, targeting a mix of demersal, shellfish and pelagic fish stocks.

The Davy North and East fields are located within ICES rectangle 35F2 and 34F2 there is currently no data published on fishing effort in this area. Activity within the adjacent ICES rectangle 36F2 included 193 days of fishing effort during 2021, 265 days of effort in 2020 and 112 days of effort in 2019. The types of gear used were primarily Seine nets, traps, trawls and dredges. A total of 289te were landed in 36F2 in 2021, 400te in 2020 and 215te in 2019. Landed species are made up predominantly of Edible crabs (*Cancer pagarus*), Plaice, and Scallops [44].

5.6.2 Oil & Gas Activities

Oil and gas activity within the SNS is generally high and targets a number of existing gas fields. There is significant surface and subsurface oil and gas infrastructure in UKCS Blocks 49/30 and 53/5.

The Davy field infrastructure lies towards the south edge of a collection of gas fields in the SNS, and therefore, oil and gas activity surrounding are considered to be moderate to high [57]. The closest oil and gas infrastructure is the Welland South Normally Unattended platform, operated by PUK. It's situated in 49/29b, around 12.5km southwest of the Davy North subsea installation, with its three subsea templates positioned even further east. North of Welland sits Tristan North West installation which is currently abandoned. To the north of Davy North Subsea installation is present Sean gas development (19km) operated by One-Dyas UK Limited, and the abandoned installations from Gawain (10km) and Orwell fields (16km). Towards the southwest of Davy East subsea installation, is located Wissey field (17km), with status of abandoned (Figure 5-17).

A total of 20 and 9 wells have been drilled in the UKCS blocks 49/30 and 53/5 respectively. Among them, 21 are in the abandoned phase 1, while the remaining are distributed between Phase 2 and 3.

5.6.3 Marine Aggregates

There are no licensed aggregate production site nearby the Davy assets. The nearest aggregate site is Cross Sands, located over 70km west, in from of Great Yarmouth and operated by Hanson Aggregates Marine Limited (Figure 5-18).

5.6.4 Offshore wind

There are four proposed windfarm sites within 40km of Davy field infrastructure, as represented in Figure 5-18.

Norfolk Boreas windfarm is located within the North subsea installation and currently under government support on offer. Norfolk Vanguard East windfarm is located within the East Subsea installation with granted consent, as well as the North Vanguard West development located 27km west of it. Lastly, East Anglia THREE windfarm is under construction 24km south of Davy East subsea installation [15].

5.6.5 Commercial Shipping

The density of shipping traffic in the SNS is relatively high due to the presence of fishing vessels, some ferries between the UK and the rest of Europe and cargo and offshore support vessels [16].

The waters surrounding Davy installation are described as having 'moderate' shipping activity, requiring a Vessel Traffic Survey (VTS) and a Collision Risk Assessment (CRA) under the Consent to Location application process [55] for any stationary installations.

5.6.6 Telecommunications & Cables

The closest telecommunication cable passing through blocks 53/05a and 53/05b is the BT UK-GERMANY 5 (operational status is Decommissioned), located at 3.3km east of Davy East subsea installation. Additionally, two other decommissioned telecommunication cables are in the vicinity. The UK-NETHERLANDS 14 cable, operated by Vodafone and KPN, is situated 14 km S of the Davy East installation, and The SEA-ME-WE3 cable, operated by Deutsche Telekom AG, is located approximately 13 km E of the Davy East installation [39]. However, the closest active telecommunication cable passing near the interest assets are the ICENI, located approximately 17.5km southeast of the Davy East installation and the NORSEA COM 1 LOW-MUR 28km W of the Davy North installation [39].

5.6.7 Military Activity

The UKCS Blocks 49/30 or 56/5 are not located within a known military practice and exercise area (PEXAs) [16]; [56]. However, an area of intense aerial activity (D323D) is located in block 49/19 at the distance of approximately 57km.

5.6.8 Wrecks

There are no protected wrecks recorded in the near vicinity of the subsea assets [50]. However, there are 3 wrecks identified within the UKCS blocks of interest [3].

5.6.9 Tourism

Due to the distance between the Davy installations and the nearest landfall, no recreational vessel use is known to occur in the area.

Figure 5-17: Davy Installation in Relation to Surrounding Oil and Gas Activity

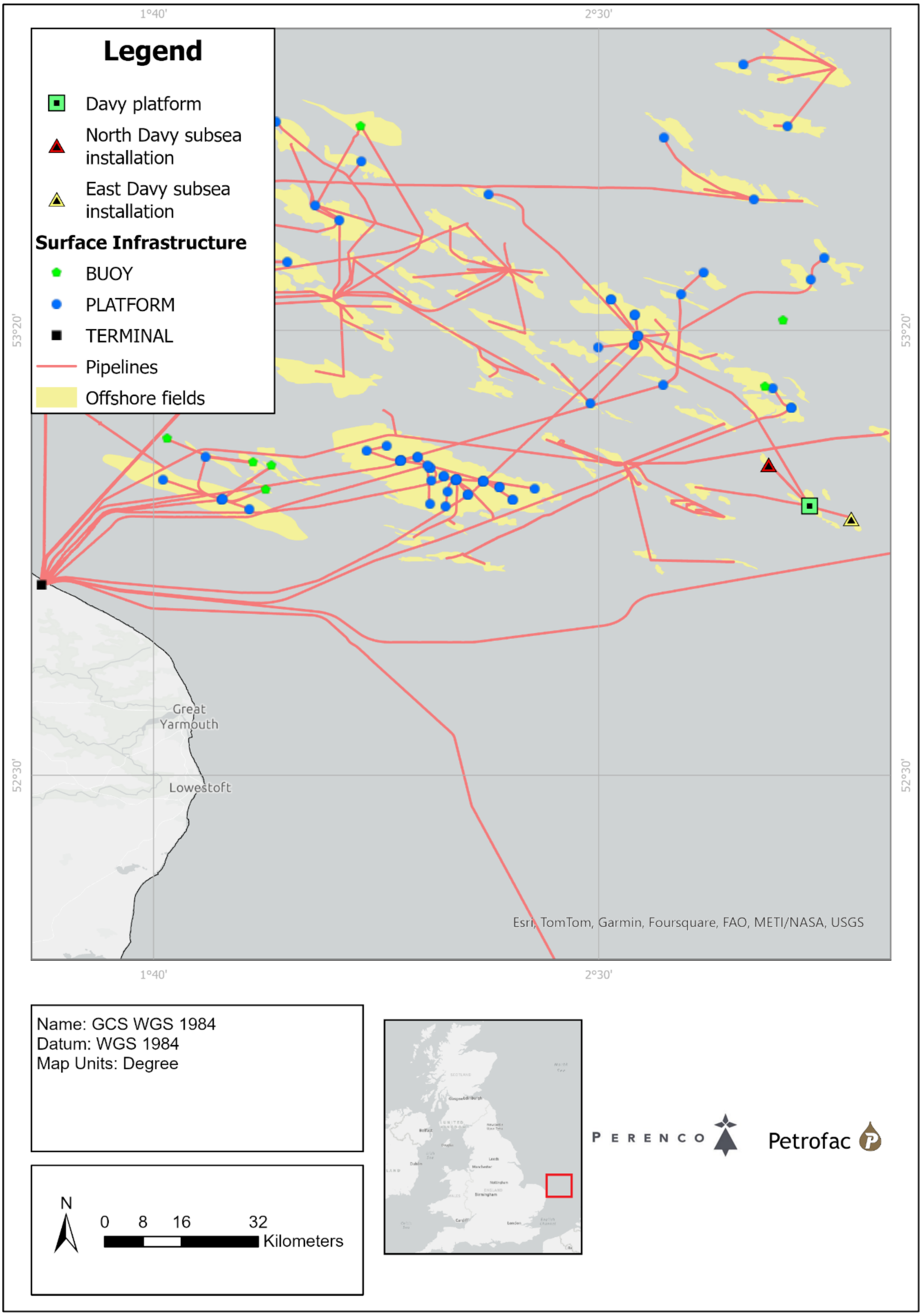
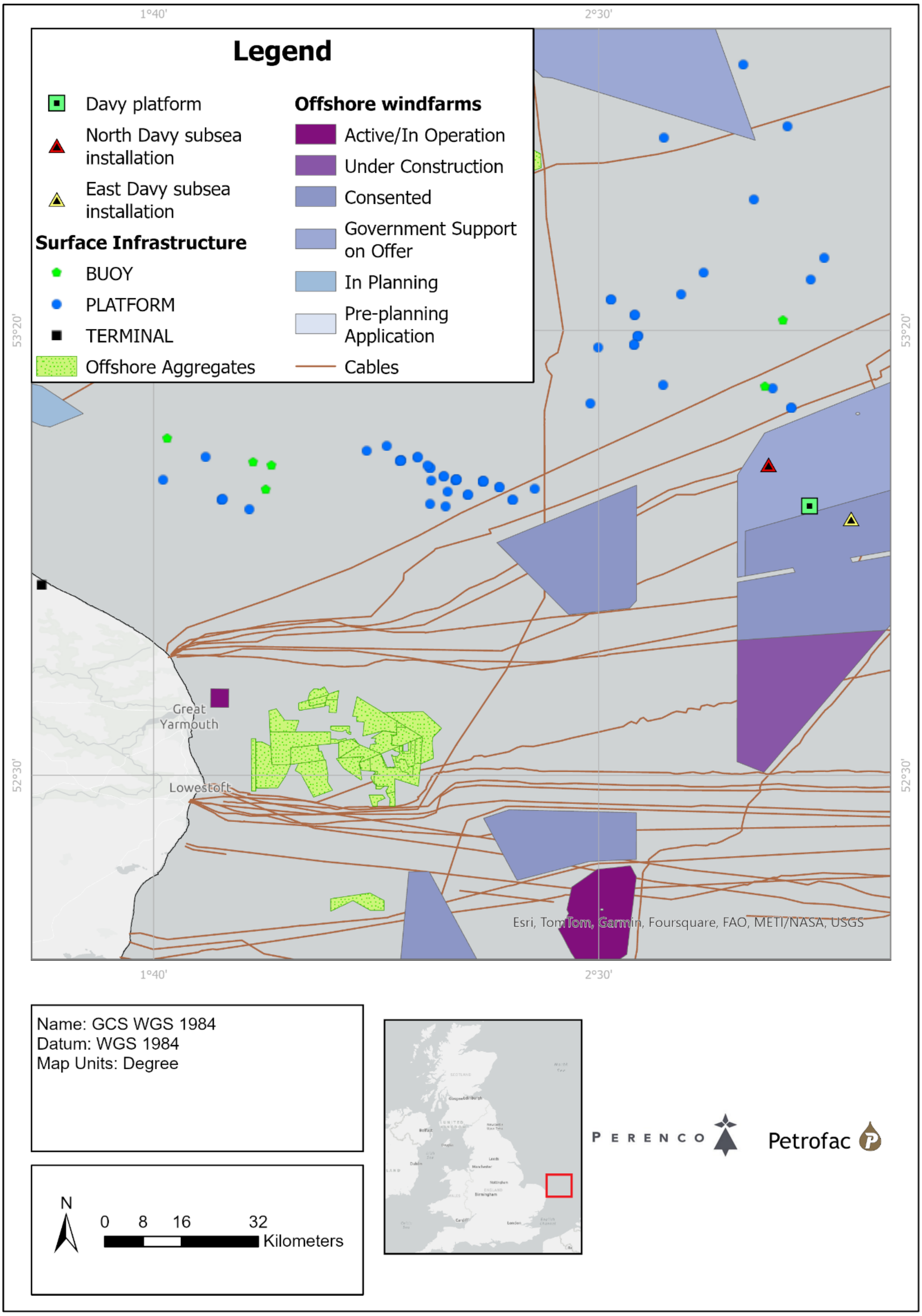


Figure 5-18: Davy Installation in Relation to Surrounding Aggregate, Offshore Renewables and Cable Activity.



6 Environmental Impacts Identification Summary

Table 6.1 provides details of the potential impacts associated with the preferred decommissioning option as identified in the Environmental Impacts Identification (ENVID). All significant potential impacts have been scoped in for further assessment in section 7.

Table 6.1: Assessment of Impacts From the Preferred Decommissioning Option

Assessment Topic	Project Activity / Event	Physical Receptors				Biological Receptors						Human Receptors										
		Seabed Sediments	Water Quality	Air Quality	Climate	Plankton	Benthic Communities	Fish & Shellfish	Seabirds	Marine Mammals	MPAs	Shipping	Commercial Fisheries	Oil & Gas & CCS Activity	Subsea Cables	Renewable Energy Activity	Cultural Heritage	Military Activity	Disposal, Dredging & Aggregate Activity	Seascape	Tourism & Leisure	Population & Human Health
General																						
Physical presence	Use of decommissioning vessels	*	*	*	*	*	*	*	*	*	*	A	A	A	*	*	*	*	*	*	*	*
	Removal of 500m subsea exclusion zone	*	*	*	*	*	*	*	*	*	*	*	P	P	*	*	*	*	*	*	*	*
Seabed Disturbance	Overtrawl survey	A	A	*	*	*	A	A	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Excavation around manifold and wells	A	A	*	*	*	A	A	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Positioning of jack up Barge (JUB)	A	A	*	*	*	A	A	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Removal of infrastructure	A	A	*	*	*	A	A	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Noise emissions	Underwater cutting/excavation equipment	*	*	*	*	*	*	A	*	A	*	*	*	*	*	*	*	*	*	*	*	*
	Use of survey vessels	*	*	*	*	*	*	A	*	A	*	*	*	*	*	*	*	*	*	*	*	*
	Use of survey equipment	*	*	*	*	*	*	A	*	A	*	*	*	*	*	*	*	*	*	*	*	*
Marine discharges	Vessel discharges (operational/domestic)	*	A	*	*	A	*	A	A	A	*	*	*	*	*	*	*	*	*	*	*	*
Atmospheric emissions	Use of vessels	*	*	A	A	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Waste (Hazardous/non-hazardous)	Operational/domestic waste from vessel	*	*	A	A	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	A
	Decommissioning waste	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	A
Accidental Events	Vessel collision	*	A	A	A	A	A	A	A	A	*	A	A	A	*	*	*	*	*	*	*	*

Key:

(dark blue)	Potential for significant effects	(light blue)	No potential for significant effects	A Adverse effect	P Beneficial effect	* No interaction

7 Environmental & Social Impact Assessment

7.1 Assessment Methodology

7.1.1 Introduction

The method PUK has used to determine if the project is likely to have any significant effects on the environment is described in this section and follows EIA good practice guidance [24, 11, 73, 29]. The process commences with the identification of project activities (or aspects) that could impact environmental and socio-economic receptors (i.e. components of the receiving environment), with consideration given to both planned (routine) activities and unplanned (accidental) events. The terms “impact” and “effect” have different definitions in EIA and one may occur as a result of the other. Impacts are defined as changes to the environment as a direct result of project activities and can be either beneficial or adverse.

Effects are defined as the consequences of those impacts upon receptors. Impacts that could potentially result in significant effects are then subject to detailed assessment based on best available scientific evidence and professional judgement so that, where necessary, measures can be taken to prevent, reduce or offset what might otherwise be significant adverse effects on the environment through design evolution or operational mitigation measures. Residual effects are those that are predicted to remain assuming the successful implementation of the identified mitigation measures and are reviewed by PUK to confirm that the project complies with legal requirements and does not adversely impact the East Offshore Marine Plan policy goals and objectives.

7.1.2 Identification of Impacts

Environmental and social receptors that may be impacted by the project, have been identified in the receptor-based activity and events matrix in Table 6.1. The matrix has been populated by PUK after completion of an ENVID, with reference to the requirements of Article 3(1) of the EIA Directive [24], the Business, Energy, and Industrial Strategy (BEIS) Guidance [8] and relevant Department for Energy Security and Net Zero (DESNZ) Offshore SEA Reports (2003-2022).

It is noted that the type of impacts which could occur from the project can be categorised as follows:

- **Direct:** resulting from a direct interaction between a planned or unplanned project activity and a receptor;
- **Indirect:** occurring as a consequence of a direct impact and may arise as a result of a complex pathway and be experienced at a later time or spatially removed from the direct impact;
- **In-combination (or Intra-Project):** arising from different activities within the Project resulting in several impacts on the same receptor or where different receptors are adversely affected to the detriment of the entire ecosystem;
- **Cumulative (or Inter-Project):** resulting from incremental changes caused by other past, present or reasonably foreseeable projects/proposals together with the Project itself.

The nature, duration, scale and frequency of the effects resulting from these impacts will vary and are described using the terminology in Table 7.1.

Table 7.1: categories and definitions of effects

Category	Descriptor	Definition
Nature	Adverse	Unfavourable consequences on receptors.
	Beneficial	Favourable consequences on receptors.
Duration	Short-term	Effects are predicted to last for a few days or weeks.
	Medium-term	Effects are predicted to last for a prolonged period of time, between one and five years.
	Long-term	Effects are predicted to last for a prolonged period of time, greater than 5 years.
	Temporary	Effects are reversible.
	Permanent	Effects are irreversible.
Scale	Local	Effects are limited to the area surrounding the project site or are restricted to a single habitat/biotope or community.
	Regional	Effects occur beyond the local area to the wider region.
	National	Effects occur at a national level (UKCS).
	Transboundary	Effects occur at an international level (outside of the UKCS).
Frequency	One-off	Effects which occur only once.
	Intermittent	Effects that occur on an occasional basis.
	Continuous	Effects that occur continuously.

PUK has undertaken a preliminary assessment of the impacts identified in Table 6.1 to determine whether there is the potential for any significant effects on the environment to occur.

Where it has been identified that a project activity has the potential to result in a likely significant effect on the environment, a detailed assessment of the impact(s) and effect(s) has been undertaken, using the significance criteria defined in Section 7.1.3. The results of the assessment are documented in section 7.2. For some project activities, potential impacts have been identified, but none of the resulting effects are likely to be significant. These impacts have therefore been scoped out from detailed assessment.

7.1.3 Evaluation of Impact Significance

This section describes the criteria used for determining the likely significance of effects on the environment to ensure the assessment process is as transparent and consistent as possible. Where uncertainty exists, this has been acknowledged in the assessment text.

Planned Activities

For planned activities, the significance of effects has been evaluated by considering the sensitivity of the receptor affected in combination with the magnitude of impact that is likely to arise, having regard to the criteria detailed in Annex III of the EIA Directive, including:

- The magnitude and spatial extent of the impact (geographical area and size of the population likely to be affected);
- The nature of the impact;

- The transboundary nature of the impact;
- The intensity and complexity of the impact;
- The probability of the impact;
- The expected onset, duration, frequency and reversibility of the impact;
- The accumulation of the impact with the impact of other existing and / or approved projects and / or projects not yet approved, but that PUK is aware of;
- The possibility of effectively reducing the impact.

Sensitivity Criteria

Sensitivity is a function of the value of the receptor (a measure of its importance, rarity and worth), its capacity to accommodate change when a pressure is applied (resistance or tolerance), and its subsequent recoverability (resilience). The criteria presented in Table 7.2 has been used as a guide in this assessment to determine the sensitivity of receptors.

Table 7.2: Determining Sensitivity.

		Resistance and Resilience			
		Very High	***High***	***Medium***	***Low***
Value	***Low***	Low	Low	Medium	Medium
	Medium	Low	Medium	Medium	High
	High	Low	Medium	High	Very High
	Very High	Medium	High	Very High	Very High

Definitions:

Resistance and Resilience	
Very High:	Highly adaptive and resilient to pressure. High recoverability in the short-term.
High:	Some tolerance / capacity to accommodate pressure. High recoverability in the medium-term.
Medium:	Limited tolerance / capacity to accommodate pressure. Recoverability is slow and/or costly.
Low:	Very limited or no tolerance / capacity to accommodate pressure. Recovery is unlikely or not possible.
Value	
Very High:	Very high value and/or of international importance.
High:	High value and/or of national importance.
Medium:	Moderate value and/or of regional importance.
Low:	Low value and/or of local importance.

Magnitude of Impact Criteria

The magnitude of impact considers the characteristics of the change that are likely to arise (e.g. a function of the spatial extent, duration, reversibility, and likelihood of occurrence of the impact) and can be adverse or beneficial. Where it is not possible to quantify impacts, a qualitative assessment has been carried out, based on best available scientific evidence and professional judgement. The criteria presented in Table 7.3 has been used as a guide in this assessment to define the magnitude of impact.

Table 7.3: Determining Magnitude of Impact

Magnitude	Definition
Substantial	Permanent or long-term (>5 years) change in baseline environmental conditions, which is certain to occur. Impact may be one-off, intermittent, or continuous and/or experienced over a very wide area (i.e. transboundary in scale). Impact is likely to result in environmental quality standards or threshold criteria being routinely exceeded.
Major	Medium to long-term (1 – 5 years), reversible change in baseline environmental conditions, which is likely to occur. Impact may be one-off, intermittent, or continuous and/or experienced over a wide area (i.e. national in scale). Impact could result in one-off exceedance of environmental quality standards or threshold criteria.
Moderate	Short to medium-term (< 1 year), temporary change in baseline environmental conditions, which is likely to occur. Impact may be one-off, intermittent, or continuous and/or regional in scale (i.e. beyond the area surrounding the Project site to the wider region). Impact is unlikely to result in exceedance of environmental quality standards or threshold criteria.
Minor	Short-term (a few days to weeks), temporary change in baseline environmental conditions, which could possibly occur. Impact may be one-off, intermittent and/or localised in scale, limited to the area surrounding the proposed Project site. Impact would not result in exceedance of environmental quality standards or threshold criteria.
Negligible	Immeasurable or undetectable changes (i.e. within the range of normal natural variation).

Significance of Effect

For planned activities, the overall significance of an effect has been determined by cross referencing the sensitivity of the receptor with the magnitude of impact, using the matrix shown in Table 7.4.

In the context of this assessment, effects classed as **Major** or **Moderate** are considered to be "significant" in EIA terms and therefore mitigation measures are required to be identified in order to prevent, reduce or offset adverse significant effects or enhance beneficial effects. The overall significance of the effect is then re-evaluated, taking the mitigation measures into consideration, to determine the residual effect utilising the methodology outlined above.

Effects classed as Minor are not considered to be significant and are usually controlled through good industry practice.

Effects classed as **Negligible** are also not considered to be significant.

Table 7.4: Significance Evaluation Matrix (Planned Activities)

		Magnitude of Impact				
		Negligible	Minor	Moderate	Major	Substantial
Receptor Sensitivity	Low	Negligible	Minor	Minor	Minor	Minor / Moderate note1
	Medium	Negligible	Minor	Minor	Moderate	Moderate / Major[1]
	High	Negligible	Minor	Moderate	Major	Major
	Very High	Negligible	Minor / Moderate[1]	Moderate / Major[1]	Major	Major

Note 1 The choice of significance level is based upon professional judgement and has been justified in the assessment text.

7.2 Insignificant Impacts

With regards to the aspects presented in Table 6.1 following the methodology outlined above, the aspects for which PUK consider there to be minimal or non-significant impact and therefore have been screened out from further detailed assessment within this EA report are described below.

7.2.1 Unplanned Events

The most significant unplanned event which could impact on the environment from the described operations is a loss of containment of hydrocarbons from the wells. Both, well 49/30a-7A (north) and well 53/05b-7 (east), have ceased production. Well 49/30a-7A is currently in Phase 1 of abandonment meaning that the reservoir has been permanently isolated, while well 53/05b-7 remains in the shut-in phase. Both wells will be P&A and permanently shut in prior the start of decommissioning operations. Despite this, operations will still be covered by the Southern Hub Oil Pollution Emergency Plan (OPEP) Action Plan [66] during operations on location.

Decommissioning operations are anticipated to be completed by a JUB with support from a supply vessel, tugs, and Diving Support Vessel (DSV). Typical JUBs, have a fuel oil capacity of 12m^3 and 10m^3 of hydraulic oil. When not operating under the Southern Hub OPEP, any loss of containment from the vessels will be managed in line with MARPOL requirements including the requirement to operate a Shipboard Oil Pollution Emergency Plan (SOPEP).

No other unplanned events are anticipated.

Sensitivity: Medium

Magnitude: Moderate

Significance: Minor

OPEP will be followed for activities on location. Outside of the working location, vessels best practices will be employed to minimise the potential for spills to sea and to minimise any impacts should they occur. This includes compliance with all MARPOL requirements and operation of a SOPEP.

As a result, no further assessment is required.

7.2.2 Energy and Emissions

Although the project will produce atmospheric emissions and consume energy to undertake (both onshore and offshore), these activities are required to be undertaken to meet decommissioning obligations for the infrastructure. Decommissioning activity for both subsea installations are anticipated to be completed within 70 days using a JUB and support from a supply vessel, tugs, and DSV. Consequently, any associated emissions during the decommissioning campaign will be minimal.

Details of anticipated emissions and relationship to UK emissions are presented in Appendix A. These contributions are far below any thresholds for emissions in the UKCS or on a global scale and are not significantly larger than general vessel operations in the region. Future legacy survey frequency will be determined and agreed with OPRED, however the resulting emissions from these surveys are determined to be negligible as they will be extremely small in the context of UKCS and global emissions.

Although there will be a short term and localised increase in emissions from the proposed operations, the total emissions will contribute in an extremely small percentage to the offshore and UK total Carbon dioxide equivalent (CO2e) emissions. An assessment of total expected emissions is presented in Appendix A.

Sensitivity: High

Magnitude: Negligible

Significance: Negligible

Best practices will be employed to minimise this environmental footprint. This includes optimal operational planning and procurement of vessels which operate effective environmental management systems minimising their emissions.

As a result, no further assessment is required.

7.2.3 Operational Discharges to Sea

Prior to Davy decommissioning activities, the wells will be P&A and all pipework and subsea flowlines shall be flushed clean to an agreed standard with OPRED and disconnected at the Davy subsea locations.

Any potential residual hydrocarbon volumes that may escape to sea during the Davy decommissioning operations are expected to be minimal and will be considered under the individual permit consent applications for the decommissioning activities through the PETS.

Sensitivity: Medium

Magnitude: Negligible

Significance: Negligible

Potential residual volumes discharged to sea during cutting operations will be assessed and permitted under an OPPC permit applied for via the UK energy portal.

Vessel based discharges will be limited to those generally associated with the decommissioning vessel controlled via established methods under MARPOL. Approved contractor procedures will assess and minimise vessel-based discharges.

As a result, no further assessment is required.

7.2.4 Physical Presence of Vessels in Relation to Other Sea Users

Shipping traffic at the Davy installation location within UKCS Block 49/30 and 53/5 is recorded as 'moderate' shipping activity. The requirement to deploy vessels to the area will be limited mainly to a single decommissioning vessel (JUB) and periodically support from other small size vessels. The 500m subsea exclusion zone around Davy installations will remain in place during decommissioning activities. A temporary surface 500m exclusion zone will be applied around the JUB.

It is anticipated that the vessel will require 70 days to complete both subsea installation decommissioning, which will including travel to and from port.

Sensitivity: Medium

Magnitude: Negligible

Significance: Negligible

Vessel traffic will be managed by issuing of kingfisher notice to mariners and vessel operated Automated Identification Systems (AIS). There will be an overall positive benefit of opening up of 500m subsea exclusion zone following seabed clearance at the Davy North and East subsea installations location.

As a result, no further assessment is required.

7.2.5 Waste Generation

Waste generated from decommissioning activities will be limited to vessel generated waste and the Davy subsea infrastructures. All waste will be handled and recovered or disposed of in line with existing waste management legislation following the principles of the waste hierarchy. Raw materials will be returned to shore with the expectation to recycle the majority of the returned non-hazardous material. Other non-hazardous waste which cannot be reused or recycled will be disposed of to a landfill site.

Details for the Davy installations which will be recover to shore are presented below in Table 7.5 for Davy north subsea installation and Table 7.6 for Davy east subsea installation.

Table 7.5: Davy North Installation waste summary

Installation (North)	Number	Weight (te)	Destination
Xmas-tree	1	17.56	Reuse, recycling, or disposal
Wellhead	1	14.6	Reuse, recycling, or disposal
Conductor	1	4.2	Reuse, recycling, or disposal
WHPS	1	24.11	Reuse, recycling, or disposal
Vessel hazardous waste *	1	1.19	Incineration / landfill
Vessel non-hazardous waste*	1	0.92	Reuse, recycling, or disposal

Table 7.6: Davy East Installation waste summary

Installation (East)	Number	Weight (te)	Destination
Xmas-tree	1	16	Reuse, recycling, or disposal
Wellhead	1	14.6	Reuse, recycling, or disposal
Conductor	1	4.2	Reuse, recycling, or disposal
WHPS	1	24.11	Reuse, recycling, or disposal
Vessel hazardous waste *	1	1.19	Incineration / landfill
Vessel non-hazardous waste*	1	0.92	Reuse, recycling, or disposal

* Typical waste generation for Island condor obtained from ASCO waste reports. 0.013te/day (Hazardous), 0.010te/day (Non-hazardous), for expected 91.5 days campaign for each installation (for all vessels).

Only licensed contractors will be used for waste handling and treatment/disposal.

Sensitivity: Medium

Magnitude: Negligible

Significance: Negligible

As a result, no further assessment is required.

7.3 Assessment of Potentially Significant Impacts

7.3.1 Seabed Disturbance

7.3.1.1 Sources of Potential Impact

The Davy North and East Subsea decommissioning operations will require activities that interact with the seabed which may result in either short-term or long-term disturbance to the seabed sediments and marine organisms. The extent of any disturbance, combined with the seabed type and hydrodynamic conditions during the activities, will determine the burial and smothering from suspended sediments and any indirect impact to species or habitats.

The proposed decommissioning activities for the recovery of Davy North and East subsea installations will directly impact the seabed and the benthic fauna living in and on the sediments in the following ways:

- Positioning of the JUB (Spud cans, chains, and anchors)
- Excavation and cut of PL 1871/ PLU 1872, PL 2344/ PLU 2345 and conductors at the WHPS location;
- Removal of the Xmas trees, wellheads, and WHPS (north and east installations);
- Indirect disturbance through re-suspension and deposition of seabed sediments.

7.3.1.2 Assessment of Potential Impact

The principal sources of potential seabed impact from the selected decommissioning option is the positioning of the JUB at each subsea installation location and the seabed excavation for pipeline cutting and lifting operations. Table 7-8 describes the expected environmental seabed impact duration from Davy decommissioning operations activities. The overall seabed impact area is summarised Table 7.8.

Table 7.7: Summary of Seabed Impacts from the Proposed Decommissioning Option

Decommissioning activities	**Impact Duration**			
	Suspended sediments	Release of contaminants	Burial and smothering	Change in habitat
Pipeline, umbilical excavation and cutting	Short-term	Limited	Short-term	Short-term
Xmas trees, wellheads, and WHPS removal	Short-term	Limited	Short-term	Short-term
JUB spudcans	Short-term	Limited	Short-term	Short-term
JUB anchors	Short-term	Limited	Short-term	Short-term
JUB chains	Short-term	Limited	Short-term	Short-term

The JUB will 'jack-up' onto the seabed, with each of its four legs terminating in a spud can with an estimated area of 22m^2 that will be placed on the seabed. As such, the four spud cans will disturb a total area of 88m^2 with a spud can penetration of two metres into the seabed. In addition, prior to the legs being installed on the seabed, anchors will be used to assist in the final positioning. Each of the four JUB anchors has an estimated disturbance area of nine square metres and the anchor chains have a length of 500m, of which 250m of chain will be laid on the seabed with a lateral movement of two metres. The estimated seabed disturbance from anchors is therefore 2,036m^2 (anchors plus anchor chains). The total area of seabed disturbed from the mooring of the JUB is therefore 2,124m^2 (0.002km^2) for each decommissioning operation.

A single subsea cut will be made on PL 1871 and on PL 2344 below seabed level to separate them from the Xmas trees and prevent the formation of any snagging hazard, such as the exposed pipeline cut ends, following the completion of the Davy decommissioning activities. In order to make the cut, the seabed will be excavated to a depth big enough to allow cutting by diamond wire saw. In order to cut the 8" (PL 1871) and 6" (PL 2344) lines, an excavated area of approximately 1m^2 has been assumed to a depth of 1m resulting in a total seabed impact volume of 1m^3 for each subsea pipeline cut. In addition to the pipelines, a single cut on PLU 1872 (north) and PL 2345 (east) umbilicals will be required below seabed with same seabed impact area predicted as per the pipelines.

The north and east Xmas tree installations are located within the boundaries of the WHPS. As such any disturbance will occur within the disturbance footprint of the WHPS removal. Each WHPSs measures 12.2m by 12.2m. For the removal of the Xmas tree and WHPS a total seabed disturbance area of 149m^2 has been assumed for each asset. It is anticipated that the seabed will be disturbed within this area to a depth of 2m.

For the removal of the Davy 49/30a-7A and 53/05b-7 wells, limited seabed excavation will be required to access and cut the casing/conductors using a diamond wire saw. These wells are located within the footprint of the corresponding WHPS, where seabed impacts have previously been accounted for up to a depth of 2m below the mudline. However, for this operation, an excavation depth of up to 3m below the mudline is anticipated to achieve the required cutting depth and facilitate recovery to shore. The excavation is expected to disturb an area with a diameter of approximately 2m around the 30-inch conductor, resulting in a total impact area of 17.35m^2. Consequently, the additional seabed disturbance volume within the WHPS area as a result of the conductor excavation is estimated at 17.35m^3 per well.

Table 7.8: Potential Seabed Impact From Davy Decommissioning Operations

Activity	Area (m^2)	Depth (m)	Volume (m^3)
North subsea installation			
JUB spud cans	88	2	176
JUB anchors	36	1	36
JUB chains	2000	1	2000
Seabed excavation and cut of PL1871 and PLU1872	2	1	2

Activity	Area (m^2)	Depth (m)	Volume (m^3)
Removal of Xmas tree, wellhead, and WHPS	149	2	298
Conductor excavation and cut (49/30a-7A)	17	1	17
East subsea installation			
JUB spud cans	88	2	176
JUB anchors	36	1	36
JUB chains	2000	1	2000
Seabed excavation and cut of PL2344 and PLU2345	2	1	2
Removal of Xmas tree, wellhead, and WHPS	149	2	298
Conductor excavation and cut (53/05b-7)	17	1	17
Total	**4,550**	**-**	**5,058**

Indirect disturbance may occur through re-suspension and deposition of seabed sediments; however, it is likely to be temporary and short term in all instances. Resuspension of sediments is not predicted to exceed levels of natural variability. Overall, it is expected that these effects will be limited and occur within close proximity to the disturbance footprint.

Impacts from Overtrawl Surveys

The disturbance associated with any post decommissioning overtrawl surveys have not been included in this assessment as they cannot be quantified at this time. Overtrawl surveys, or other alternative methods of seabed verification are an important element of the decommissioning process to ensure that no snagging hazards are present before the removal of exclusion zones or approval to leave pipeline and other materials in situ.

Following approval of the Davy North and East subsea installation DP, it will be necessary to confirm that no snagging hazards are present in the wellhead areas. A clear seabed will be validated by an independent verification survey of the area. The aim of this clean seabed verification is to ensure the seabed is left in a safe condition for future fishing effort, in line with the current decommissioning guidance.

The main impacts from the completion of overtrawl surveys will be physical damage to the seabed in the survey area.

Typically, overtrawl surveys are targeted trawls whereby bottom trawl gear is towed across the target area to determine if any snagging hazards are present. The targeted nature of these surveys will limit damage to the seabed to specific areas around the wellhead area.

Specific survey methods will be discussed and agreed with OPRED prior to commencement. Where possible to do so preference will be given to non-intrusive survey methods such as Side Scan Sonar and Remotely Operated Vehicle surveys to determine a clear seabed. Where these are deemed inconclusive, targeted overtrawling may be undertaken to ensure no residual risk of snagging remains post-decommissioning. Should overtrawling be required, it will be conducted by fishing vessel(s) using trawl gear that is appropriate for the area. Any debris identified shall be recovered and recycled / disposed of accordingly.

Impacts from Seabed Resuspension

Indirect disturbance may occur through re-suspension and deposition of seabed sediments; however, it is likely to be temporary and short term in all instances. Resuspension of sediments is not predicted to exceed levels of natural variability. Overall, it is expected that these effects will be limited and occur within close proximity to the disturbance footprint.

However, the resuspension and spread of contaminants present within the seabed footprint of oil and gas installations may lead to additional environmental impacts. Chemical contaminant analysis was undertaken at Davy North and East pre-decommissioning survey [58, 59]. Full analysis of the grab samples taken for chemical analyses were analysed for TOC and total moisture content, heavy and trace metals, PAHs and hydrocarbons.

The majority of the samples at both survey areas did not exceed the reference levels concentrations. At the Davy North survey area, only high concentrations of As and localised hydrocarbon contamination was identified. The elevated levels within close proximity to the Davy North well suggest that some local contamination may have occurred. However, levels of all other metals were identified below CEFAS Action level 1 suggesting, any potential contamination is not due to the discharge of historical drilling muds.

Several guidelines exist to assess the degree of contamination and likely ecological impacts of contaminants in marine sediments. These regulations define the levels below which effects are of no concern and/or rarely occur (AL1, BAC, TEL) and the levels above which adverse biological effects are considerable and/or occur frequently (AL2, ERL, PEL). Ad hoc decisions need to be made when contaminant concentrations fall between these levels. Note that CEFAS AL1 are typically the most conservative measures to assess sediment contamination and often result in “false positives” meaning that non-toxic sediment samples fail to pass this screening test. Conversely, AL2 tend to be rather permissive allowing samples with relatively high contaminant concentrations to fall between AL1 and AL2 and thus requiring judgment on their potential toxicity [46,51]. Recent studies have been revising these ALs with the goal of reducing the range of concentrations falling between AL1 and AL2 and minimise the number of samples requiring an ad hoc treatment; however, no policy has been made yet based on these recommendations and suggestions [46,50]. Only Arsenic was observed to be above the CEFAS AL1. All samples were however substantially below CEFAS AL2.

At Davy East survey area, lower overall contamination levels were identified, with single elevated As and Ni likely related to sediment characteristics.

Environmental effects from the discharge of chemicals into the marine environment can include acute or long term toxic effects to marine organisms [62]. Persistent and bioaccumulate chemicals can magnify in the food chain and result in high exposure levels for top predators like seabirds and marine mammals and for human seafood consumers. Low concentrations of some substances are sufficient to interfere with the hormone and immune system and reproduction processes. Biological effects can extend beyond individual marine organisms to a whole population with adverse consequences for species composition and ecosystem structures [62], although previous studies suggest the effects of oil contaminated drill cuttings deposits on the benthos are likely to be confined to within less than 2km [7].

Due to the moderately low levels of As and very low concentration of all other contaminants identified in the 2024 pre-decommissioning survey coupled with the limited seabed disturbance from the proposed operations, any significant impact to the wider marine ecosystem as a result of suspended sediments is expected to be negligeable to low.

Impacts on Benthic Communities

As detailed in Table 7.8 the total seabed impact as a result of the Davy North and East subsea installations decommissioning operations is expected to be 4,550m^2 (0.004km^2).

Published data sources indicates that the seabed habitat at Davy North installation is dominated by Deep circalittoral sand sediment (A5.14), and by deep circalittoral mud (A5.37) for Davy East subsea installation.

However, the pre decommissioning environmental survey [58, 59] found slightly different EUNIS habitats across the North and East survey areas. One EUNIS Level 4 habitat complex was identified in the seabed imagery: EUNIS A5.35 'Circalittoral sandy mud', which was assigned to all 82 images. Across the East survey area only one EUNIS Level 4 habitat complex was identified in the seabed imagery: EUNIS A5.35 'Circalittoral sandy mud', which was assigned to all 55 images.

Davy North survey area identified a total of 919 individuals and 93 taxa recorded. The pea urchin *E. pusillus* was the most abundant taxon sampled accounting and the most frequently occurring, followed by *E. pusillus, K. bidentata, Nemertea, O. Juvenile, N. nitidosa, N. Juvenile, G. alba, G. maculata, S. bombyx, L. cingulata Confer* (top 10 macrobenthic taxa). Echinodermata taxa contributed the most to overall abundance, accounting for approximately 37 % of all individuals recorded, followed by the phyla group Annelida (~30%), Mollusca (~20%) and in lower percentage Miscellaneous and Crustacea. Echinodermata taxa also contributed the most to the total biomass of microbenthic assemblages, accounting for 78 %. Annelida taxa contributed the most to overall diversity accounting for 43 %, followed by Mollusca with a total contribution of 17 %. Epifauna observed in the seabed imagery was the Brittle star of the genus *Ophiura* sp., identified as present in 23 images. Tube worms of the order Sedentaria were identified in 22 images and faunal burrows were identified within 13 images.

Davy East survey area identified a total of 787 individuals and 75 taxa recorded. The pea urchin *E. pusillus* and bean-like tellin *F. fabula* were the most abundant, commonly occurring both at individual stations and across the stations. They were followed in abundance by *O. Juvenile, N. Juvenile, G. maculata, E. cordatum, T. ferruginosa, B. guilliamsoniana, M. johnstoni,* and *E. nitida* (top 10 macrobenthic taxa). Echinodermata taxa contributed the most to the total biomass of macrobenthic assemblages, accounting for 86%. Echinodermata taxa also contributed the most to overall abundance, accounting for approximately 40 % of all individuals recorded, followed by Mollusca with 30 % of individuals, Annelida (~20%), and Crustacea (~10%). Annelida taxa contributed the most to overall diversity, accounting for 32%. Epifauna observed across the survey area from seabed imagery were faunal burrows, identified as present in 38 images. Hermit crabs (Paguridae) and tube worms (Sedentaria) were each observed in 7 images.

Species within highly mobile sandy biotopes are adapted to high levels of disturbance. They are able to withstand mobile sediments and are opportunistic [45].The faunal communities that are typical of the sediments in the working area are highly resilient to any level of impact with recovery often within a few days or weeks. Following severe disturbances recovery is expected to occur within 12 months [45]. The communities have low sensitivity to smothering and abrasion or disturbance to the seabed surface. However, they are highly sensitive to changes to different types of sediment and the physical loss of suitable habitat [45].

S. spinulosa was observed at one station in Davy East survey area, but in very low abundance, and therefore not in reef form. No evidence of biogenic reefs was recorded during Davy pre decommissioning surveys.

Due to the limited nature of the decommissioning activities, both spatially and temporally, any effects from physical damage to the seabed and the resulting settlement of suspended sediments would be small in nature and duration.

As such, while the proposed decommissioning activities will cause some seabed impact, this will be temporary and over a very limited area and is not expected to cause any significant impacts on the wider area or to protected species/habitat.

Sensitivity: Medium

Magnitude: Minor

Significance: Minor

To minimise impacts on the seabed, proposed cut locations will be carefully planned to avoid excessive disturbance. Cutting of Davy pipelines and well conductors will be carried out using diamond wire saw to prevent the deposition or garnet.

Options for Post decommissioning surveys will be discussed with OPRED. Where possible to do so preference will be given to non-intrusive survey methods such as Side Scan Sonar and Remotely Operated Vehicle surveys to determine a clear seabed.

7.3.1.3 Mitigation Measures - Seabed

The following mitigation measures will be taken to minimise impacts from the proposed works on the seabed:

- A detailed JUB positioning assessment will be made to avoid excessive disturbance from the positioning of the JUB.

- Proposed cut locations for infrastructure to be removed will be carefully planned to avoid excessive disturbance from excavation. The cutting of subsea infrastructure will be carried out using a diamond wire saw to prevent deposition or garnet.
- The lifting of infrastructure will be carefully planned to avoid unnecessary seabed disturbance.
- Options for post-decommissioning surveys will be discussed with OPRED. Where possible to do so preference will be given to non-intrusive survey methods such as Side Scan Sonar and Remotely Operated Vehicle surveys to determine a clear seabed.

7.3.2 Underwater Noise Emissions

The impact of underwater noise on marine life is influenced by several factors, including the nature of the sound (such as its type, strength, frequency range, and duration), the physical properties of the surrounding environment that affect how sound travels, the hearing capabilities of the affected organisms, and how these elements align across time and space.

Marine animals rely on sound for essential activities such as navigation, communication, and locating prey detection [53, 74, 67]. Therefore, the introduction of anthropogenic underwater noise can affect marine species by disrupting their capacity to perceive and utilise sound. These impacts can vary from obscuring natural communication and triggering minor behavioural changes to long-term disturbances, physical harm, or even death [63].

7.3.2.1 Sources of Underwater Noise Emissions

Noise emissions associated with the preferred decommissioning option are those from underwater cutting activities, excavation equipment, positioning and operation of the JUB for subsea recovery operations and post-decommissioning surveys.

Vessel operations

The decommissioning operation will involve the use of a single JUB for a total of 70 days and periodically support from a supply vessel, tugs, and DSV.

Large vessels, such as those exceeding 100m in length typically produce sound pressure levels between 180 and 190 dB re 1 μPa. In comparison, medium-sized support vessels (50-100 meters long) generate sound levels ranging from 165 to 180 dB re 1 μPa [63].

Lower sounds levels are expected from the use of JUBs in the proposed decommissioning activities, limited to the positioning and jacking phases. JUBs generate low underwater noise because they are stationary, supported by legs fixed to the seabed, with minimal underwater machinery and no use of continuous thrusters.

Tugs assistance will be required to position the JUB at Davy East and then move it from Davy East to Davy North. Approximately, three tugs will be required for each rig move. The duration of the tug requirement depends on the weather conditions and the distance involved in the move, but it is anticipated that 6 days of operation will be required for each of the tugs. Additionally, a supply vessels will operate throughout the entire duration of the project, accessing to the project area two to three times per week. A Diving Support Vessel (DSV) will also be required at the start of the Davy East campaign for an estimated duration of approximately 25 days.

Noise levels from the JUB's and other vessels are expected to be comparable to other shipping activities in the project area. The UKCS Blocks 49/30 and 53/5 are classified as having moderate shipping density, and the operation is not expected to significantly increase noise in the surrounding area. Any cumulative noise impact is anticipated to be negligible.

Cutting operations

Underwater cutting will be limited to three cuts using a diamond wire saw on PL 1871, PLU 1872 and well conductor at Davy North subsea installations. An additional three cuts will be performed at Davy East subsea installation to separate PL 2344, PLU 2345, and well conductor from the recovered installation.

Underwater noise emissions from this cutting tool is not expected to cause significant disturbance to marine fauna, as the tool use will be limited to 3 cuts at each subsea installations, intermittently and for a short duration.

EA's of previous decommissioning activities using similar cutting methods have indicated that associated noise levels from these operations fall far below those which may be considered significant in their potential to impact on fish or marine mammals.

Excavation operations

Underground excavation equipment, such as Mass Flow Excavators (MFE), will be required to expose sections of the pipeline and umbilicals prior to cutting, as well as to achieve a cutting depth of 3m below the mudline for the removal of the conductors.

MFE generate noise primarily from their hydraulic systems and high-velocity water jets used to displace seabed material. There is very little information available on underwater sound generated by this tool. Although MFE contribute to the overall underwater noise emissions, they are relatively quiet compared to any dredging operations. Seabed excavation operations will be limited to Davy subsea assets locations and emit continuous mid-level noise for a short period of time, resulting in overall low underwater noise disturbance.

Post-Decommissioning Surveys

Seabed surveys will be carried out as part of decommissioning obligations, which will typically employ low energy, high frequency acoustic surveying equipment such as SSS and MBES to generate images of the seabed. These sound sources are highly directional, resulting in minimal horizontal sound transmission. When used in shallow waters, they are unlikely to cause harm or major disturbances to marine life, as their operating frequencies generally fall outside the hearing range of the most sensitive species [78, 31]. As such, no potentially significant impacts on sensitive marine fauna are anticipated from the underwater noise emissions generated during the post-decommissioning surveys.

7.3.2.2 Assessment of Potential Impact

The most sensitive marine fauna to underwater noise are fish and marine mammals.

Fish

A range of fish species use Davy area for nursery and/or spawning grounds at different times of the year including Atlantic herring, mackerel, Sandeel, whiting, cod, plaice, Nephrops, Sprat, tope shark, plaice, lemon sole, and sole [10,18].

Fish species differ in their hearing capabilities depending on the presence of a swimbladder, which acts as a pressure receiver, and whether the swimbladder is connected to the otolith hearing system, which further increases hearing sensitivity [48, 64]. Most fish can hear within the range 100Hz to 1kHz, with some able to detect lower frequencies. Elasmobranchs do not have a swim bladder and therefore have less sensitive hearing [65].

Fish are mobile animals and are likely to swim away from sound sources that could pose a risk to them. If fish are disturbed by a sound, evidence suggests they will return to an area once it has stopped [71].

Fish often exhibit avoidance behaviour when vessels are nearby, with underwater noise from the vessels likely acting as the stimulus, which includes diving, horizontal movement, and changes in tilt angle [17]. The use of JUB instead of Dynamic position vessels will significantly reduce the noise generated by vessels and the potential disturbance to the fishes present within the Davy wells location.

There is limited published information on how fish respond to sound generated by underwater cutting, MFE, or post-decommissioning surveys. However, the noise generated by these activities is expected to be of short duration and confined to a small area, which greatly reduces the likelihood of causing harm to fish. As a result, the overall impact of underwater noise emissions on fish is predicted to be no significant.

Marine Mammals

Sound is essential for marine mammals, as they rely on it for critical functions such as navigation, communication, and locating prey. Human-generated underwater noise has the potential to interfere with these functions by disrupting their ability to detect or interpret sound. The severity of the impact is influenced by several factors, including the properties of the noise (such as its intensity, frequency, and duration), the species' sensitivity to sound, and their behavioral responses to the disturbance.

Davy North and East wells are located in an area for potential presence of marine mammals, in which Harbour porpoise, Bottlenose dolphin, White-beaked dolphin, Minke whale, and Common dolphin have been observed or identified as most likely to be present [84].

Exposure to intense underwater sound can impact the hearing of marine mammals, leading to what is referred to as a threshold shift. If their hearing recovers and returns to its original sensitivity after some time, this is classified as a temporary threshold shift (TTS). However, if the hearing does not recover and the sensitivity remains impaired, it is known as a permanent threshold shift (PTS). Both TTS and PTS are considered forms of auditory injury in marine mammals. Table 7.9 presents the estimated hearing range for these marine mammals species [75].

Table 7.9: Functional Marine Mammal Hearing Groups and Non-Impulsive PTS and TTS Thresholds [75]

Hearing Group	Species	Estimated Hearing Range	PTS Criteria (dB re 1 μPa2s)	TTS Criteria (dB re 1 μPa2s)
Low-frequency cetaceans	Minke whale	7Hz – 35kHz	199	179

High-frequency cetaceans	White-beaked dolphin, common dolphin, Bottlenose dolphin	150Hz – 160kHz	198	178
Very high-frequency cetaceans	Harbour porpoise	275Hz - 160kHz	173	153

None of the noise sources associated with the proposed decommissioning activities are anticipated to exceed any of the PTS/TTS thresholds or cause any physical injury to marine mammals. It is possible however that some sound induced disturbance to marine species may occur. Underwater noise levels from activities like vessel operations or the use of cutting tools might cause marine mammals to temporarily leave the area. However, these movements are expected to be restricted in both space and time, and are unlikely to disturb the broader population to a degree that would violate regulations such as the Conservation of Offshore Habitats and Species Regulations 2017.

There is no published information in the response of marine mammals to sound generated specifically by underwater cutting. The noise generated by these operations is comparatively mild when contrasted with the louder sounds emitted by vessel engines. Moreover, the cutting activities are anticipated to be of short duration and localised, affecting only a limited area.

The impact from underwater sound as a result of the pre-decommissioning surveys equipment depends on frequency, pulse characteristics, source and received levels, directivity, beam width and receptor species. A review of scientific literature shows that echo sounder surveys in shallow waters such as the depths encountered near Davy wells (36–41m) use high-frequency sounds that are beyond the hearing range of marine species. These sounds dissipate quickly, and the operating power is lower than that used in deeper waters [35].

The JNCC similarly deems the risk of injury or disturbance from SSS to be minimal, due to the high frequencies involved, which fall outside the hearing range of marine mammals and quickly lose intensity. Additionally, it is important to highlight that this type of survey is typically short in duration due to the very low seabed areas affected by the proposed decommissioning.

Considering the limited area, brief duration, and intermittent nature of the activities, the overall impact on marine mammals has been assessed as low.

Southern North Sea SAC

The Davy North and East subsea wells are located within the boundaries of the Southern North Sea SAC. The SAC is designated for the protection of Annex II species harbour porpoise, a cetacean species that is particularly responsive to noise. The site covers an area of 36,951km^2 and supports an estimated 17.5% of the UK North Sea MU population of harbour porpoises. The SCANS aerial survey estimates the harbour porpoise density near Davy North at 0.6027 individuals per km^2, while the density near Davy East is approximately half that, at 0.3096 individuals per km^2.

The southern part of the SAC, where the Davy field is located, covers an area of 12,687km^2 and supports persistently high densities of harbour porpoises during the winter (October – March), which might overlap in time with Davy wells decommissioning campaign.

Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs states that noise disturbance within an SAC from a plan/project, individually or in combination, is considered to be significant if it excludes harbour porpoises from more than [37]:

- 20% of the relevant area of the site in any given day, or
- An average of 10% of the relevant area of the site over a season.

Based on this, any noise disturbance caused by the proposed Davy wells decommissioning activities, in combination or individually, will not have the potential to became significant or cause detriment to the conservation objectives of the harbour purpose and the Southern North Sea SAC.

While decommissioning operations will generate some noise through the use of vessels, subsea cutting, excavation and acoustic surveys the level of noise that will be generated is considered to be far below that with may cause injury or disturbance to fishes, marine mammals, and the Southern North.

Sensitivity: Very High

Magnitude: Minor

Significance: Minor

Effective operational planning will minimise vessel time in the area. Cutting and excavation activities will be planned and carried out efficiently to prevent excessive noise generation.

Any required surveys will be scheduled and planned efficiently to minimise vessel operation time. If required, geotechnical survey equipment will be selected based on the lowest sound volume capable to achieving required survey results. Standard mitigations for minimising impacts on marine mammals will be employed where required.

7.3.2.3 Mitigation measures - Noise

The following mitigation measures will be taken to minimise impacts from the proposed works noise on the marine ecosystem:

- Vessel operations will be minimised where practical with work programmes planned to optimise vessel time in the field.
- The use of JUB is preferred over dynamically positioned vessels due to the lower noise emissions generated.
- Careful planning to mitigate conflicts with fishing and shipping interests and consultation with Fisheries and Maritime Agencies Kingfisher Information Services notified at least two weeks prior to commencement of the activities.
- Options for post-decommissioning surveys will be discussed with OPRED. Where possible to do so preference will be given to non-intrusive survey methods such as SSS and MBES surveys with reduced noise emissions.
- Internal cutting techniques will be considered for the conductors where feasible, as they generate less noise and reduce the need for using MFE. For external cuts, the diamond wire saw is the preferred subsea cutting tool.

7.3.3 Transboundary impacts

Due to the small-scale nature of the operations at the Davy and Davy East wells and the distance to the nearest median line (approximately 11 - 19km), no transboundary impacts are associated with the described decommissioning operations.

7.3.4 Cumulative impacts

PUK is not aware of any other activity occurring within the surrounding area with the sufficient significance to generate potential cumulate impacts. No cumulative impacts are associated with the described decommissioning operations.

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8 Assessment Conclusions

Following detailed review of the proposed decommissioning option, the environmental sensitivities present in the area and potential impacts on other sea users and the environment, it has been determined that the decommissioning of the Davy subsea installations will not present any significant impacts.

The majority of impacts associated with the decommissioning option are well understood and can be managed through the implementation of established mitigation measures. The only impacts with potential to be significant were those associated with seabed disturbance and noise emissions. However, following further assessment these were also determined not to be significant following the implementation of stated mitigation measures. Overall, the decommissioning option presented within this report is determined as having a minor impact.

In addition, the EA is considered by PUK to be in alignment with the objectives and marine planning policies of the East marine plan area.

Based on the assessment findings of this EA, including the identification and subsequent application of appropriate mitigation measures it is considered that the proposed Davy decommissioning activities do not pose any significant impact to environmental or societal receptors within the UKCS or internationally.

9 Environmental Management

This section describes the arrangements that will be put into place to ensure that the mitigation and other measures of control, including the reduction or elimination of potential impacts are implemented and conducted effectively. This section also serves to outline the key elements of relevant corporate policies and the means by which PUK will manage the environmental aspects of the Davy subsea decommissioning operations.

9.1 Introduction

PUK hold ISO 14001 standard certification. Additionally, PUK operate under a Safety and SEMS, which forms part of the PUK Operating Management System (POMS). The POMS provide the framework for PUK to achieve safe and reliable operations day-in and day-out and ensures compliance with PUK's HSSE Policy.

In addition to enabling the implementation of identified mitigation and control measures, the SEMS provides the means to monitor the effectiveness of these measures through check and environmental performance. The SEMS, by design, will enable PUK to control activities and operations with a potential environmental impact and provide the assurance on the effectiveness of the environmental management.

9.2 Scope of the SEMS

The SEMS provides the framework for the management of Health, Safety and Environmental (HSE) issues within the business. This SEMS is intended for application to all of PUK's activities as directed under the OSPAR recommendation 2003/5, promoting the design, use and implementation of Environmental Management Systems by the Offshore Industry. PUK, as a business, is centred on oil and gas exploration activities both onshore and offshore, with the offshore components of their business including seismic and drilling operations. As a relatively small operator PUK intend to resource such projects through the utilisation of contractors, should these not be available within the business itself.

The SEMS focuses on:

- Clear assignment of responsibilities;
- Excellence in HSE performance;
- Sound risk management and decision making;
- Efficient and cost effective planning and operations;
- Legal compliance throughout all operations;
- A systematic approach to HSE critical business activities; and
- Continual improvement.

9.3 Principle of the SEMS

The following sub-sections describe the principles followed though the utilisation of the SEMS.

9.3.1 Improvement Programmes and the Management of Change

The purpose of employing an improvement programme is to:

- Ensure the continuous development of the PUK policy commitment.
- Introduce changes and innovations that ensure the achievement of performance standards where current performance is below expectations.

The SEMS also makes provision for the management of change. Changes may occur for a number of reasons, and at a number of levels. A 'management of change' procedure specifies the circumstances under which formal control of change is required to ensure that significant impacts remain under control and/or new impacts are identified, evaluated and controlled.

9.3.2 Roles and Responsibilities

PUK will review existing environmental roles and responsibilities for staff participating in the Davy DP. These will be amended and recorded in individual job descriptions to ensure that they take into account any changes required for the management of the impacts identified in this EA.

9.3.3 Training and Competence

The competence of staff with environmental responsibilities is a critical means of control. The SEMS, in conjunction with the Human Resources department of PUK allows for the appointment of suitably competent staff. The development and implementation of training programmes facilitates understanding and efficient application.

9.3.4 Communication

Internal environmental communication generally employs existing channels such as management meetings, minutes, poster displays, etc. External communication with stakeholders and interested parties is controlled through a communication programme. This establishes links between each stakeholder, the issues that are of concern to them, and the information they require to assure them that their concerns and expectations are being addressed. This EA and the consultation process that informed its production will be used to design the ongoing communication programme. Communication and reporting will employ information derived from the monitoring programme.

9.3.5 Document Control

The control of the SEMS documents is managed in the PUK Document Control System.

9.3.6 Records

Records provide the evidence of conformance with the requirements of the SEMS and of the achievement of the objectives and targets in improvement programmes. The PUK SEMS specifies those records that are to be generated for these purposes, and controls their creation, storage, access and retention.

9.3.7 Monitoring and Audit

Checking techniques employed within PUK's SEMS are a combination of monitoring, inspection activities and periodic audits.

The requirement for monitoring and inspection stems from the need to provide information to a number of different stakeholders, but primarily regulators, and PUK management. As such, there is a requirement for the results of monitoring and inspection to be integrated with the PUK internal and external communication programme.

Monitoring and inspection activities focus on:

- Checks that process parameters remain within design boundaries (process monitoring);
- Checks that emissions and discharges remain within specified performance standards – (emissions monitoring); and
- Checks that the impacts of emissions and discharges are within acceptable limits (ambient monitoring).

9.3.8 Incident Reporting and Investigation

The PUK SEMS stipulates documented procedures to control the reporting and investigation of incidents.

9.3.9 Non-confidence and Corrective Action

The checking techniques outlined above are the means of detecting error or non-conformances. PUK's SEMS includes procedures for the formal recording and reporting of detected non-conformance, the definition of appropriate corrective action, the allocation of responsibilities and monitoring of close out.

9.3.10 Review

PUK's SEMS includes arrangements for management review. This provides the means to ensure that the SEMS remains an effective tool to control the environmental impacts of operations, and to re-configure the SEMS in the light of internal or external change affecting the scope or significance of the impacts. Of particular importance is the role management review plays in the definition and implementation of the improvement programme, and the management of change.

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Appendix A Emissions Assessment

Table 10.1: Total Emissions From Proposed Decommissioning Operations

Aspect	Total Fuel Use (te) Note 2	Emissions (te) Note 1							
		CO_2	NO_X	N_2O	SO_2	CO	CH_4	VOC	CO_2e Note 3
JUB	924	2956.8	54.9	0.2	3.7	14.5	0.2	1.8	3015.3
Supply vessel	924	2956.8	54.9	0.2	3.7	14.5	0.2	1.8	3015.3
DSV	330	1056.0	19.6	0.1	1.3	5.2	0.1	0.7	1076.9
Tugs (x3)	158	506.9	9.4	0.0	0.6	2.5	0.0	0.3	516.9
TOTAL	**2336**	**7476.5**	**138.8**	**0.5**	**9.3**	**36.7**	**0.4**	**4.7**	**7624.4**

Note 1: Emission factors from DESNZ (2008).

Note 2: It is assumed that the average daily diesel fuel consumption is 15m³ per vessel. This applies to the JUB, supply vessel, and DVS for 70, 70, and 25 days, respectively. Additionally, each of the three tugs is assumed to consume 15m³ per day for a total of 6 days each.

Note 3: Values for the non-carbon dioxide (CO_2) Green House Gases, methane (CH_4) and nitrous oxide (N_2O), are presented as CO_2 equivalents (CO_2e), using Global Warming Potential (GWP) factors from the Intergovernmental Panel on Climate Change (IPCC)'s Fifth assessment report (GWP for CH_4 = 28, GWP for N_2O = 265).

A quantitative comparison between the predicted CO_2e emissions generated during the proposed decommissioning operations and the local, regional and UK total CO_2e emissions has been made in. Although there will be a short term and localised increase in emissions from the proposed operations, the total emissions will contribute a small percentage to the offshore and UK total CO_2e emissions <0.0507% and <0.00178%, respectively).

Table 10.2: Comparison of CO2e Emissions From the Proposed Operations

Emission Source	Estimated CO_2e Emissions (te) Note 1
Davy Decommissioning Operations Note 2	7,624.4
UKCS Offshore CO_2 Emissions for 2021 Note 3	15,030,000
UK Net CO_2 Emissions 2021 Note 4	426,500,000

Note 1: Emission factors from DESNZ (2008).

Note 2: Totals from Table 10.1

Note 3: Based on total offshore emissions from OEUK (2022).

Note 4: Based on UK net total CO_2 emissions for 2021 (BEIS, 2023).

The Climate Change Act 2008 (as amended) requires the government to set legally-binding 'carbon budgets' to act as stepping-stones towards the 2050 Net Zero target. These carbon budgets restrict the total amount of Green House Gas (GHG) that the UK can emit over five-year periods, ensuring continued progress towards the UK's long-term climate target. Table 10.3 details the carbon budget of relevance to the proposed Davy decommissioning operations and confirms whether the UK is on track to meet these climate targets.

Table 10.3: UK Carbon Budgets (HM Government, 2021)

Carbon Budget	Carbon Budget Level	Reduction Below 1990 Levels	Due to Meet Target
4^{th} carbon budget (2023 to 2027)	1,950 million tonnes CO_2e	51% by 2025	Off track

Table 10.4 presents the predicted CO_2e emissions generated from the proposed decommissioning operations against the fourth UK carbon budget. It can be seen from this that the CO_2e emissions generated during the operations, contribute only a very small amount to the fourth UK carbon budget, equal to ca. 0.000391% of the UK budget.

Table 10.4: Comparison of the Proposed Operations CO2e Emissions against relevant UK Carbon Budgets

Emission Item	Carbon Accounting Period
	4^{th} Carbon Budget (2023 to 2027)
UK Carbon Budget CO_2e Target	1,950,000,000 te CO_2e
CO_2e Emissions Generated from Davy decommissioning Operations	7,624.4
% of UK Carbon Budget CO_2e emitted during Davy decommissioning Operations	3.91E-04%

To minimise the emissions generated, PUK will look to reduce vessel time in the field as far as practicable. In addition, PUK's contractor selection process will aim to ensure that the engines, generators and other combustion plant on the JUB are maintained and correctly operated to ensure that they work as efficiently as possible.

Given the above, the impact to the environment from atmospheric emissions has been scoped out from further assessment.