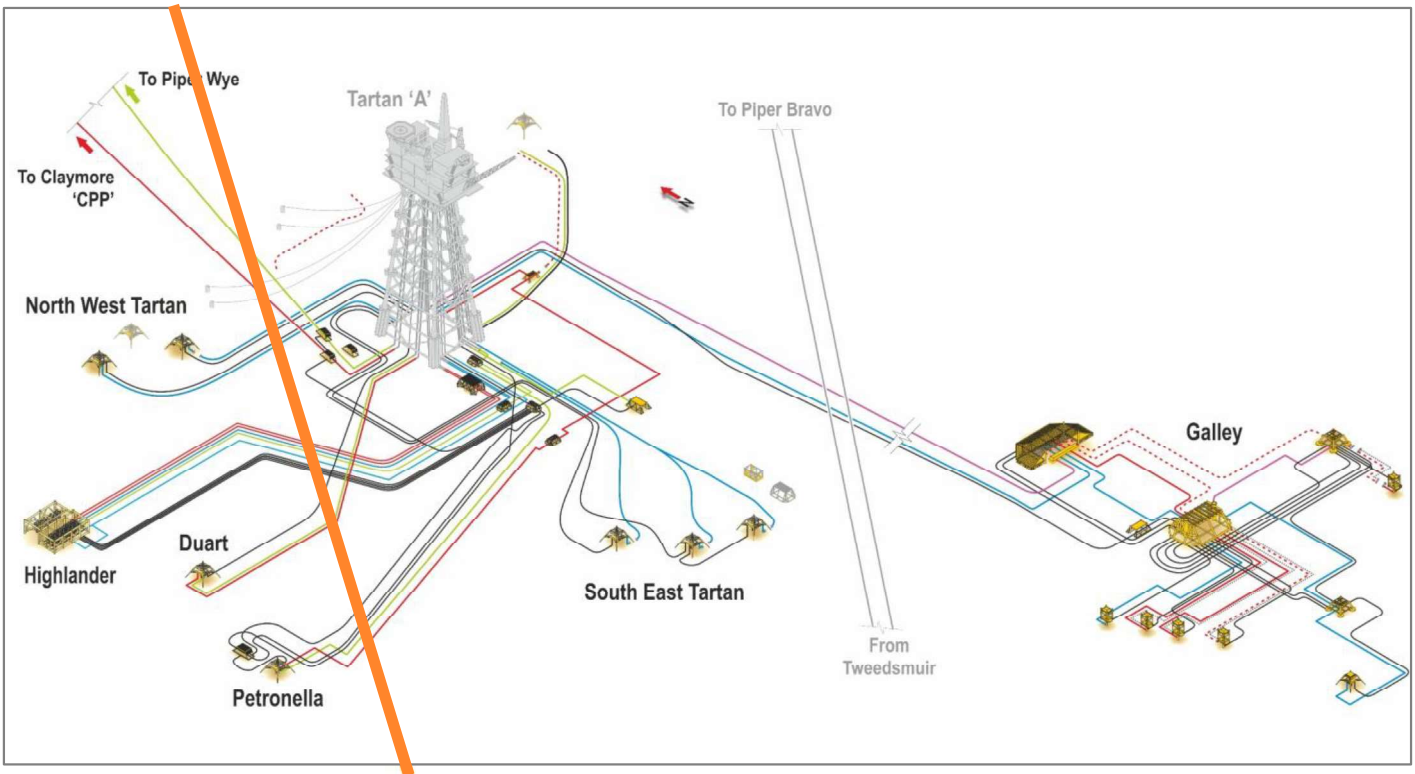

TARTAN DEVELOPMENT AREA DECOMMISSIONING

Subsea Environmental Appraisal Report

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SUMMARY INFORMATION SHEET

<table>
<tr><td>Project Name</td><td>Tartan Development Area Subsea Decommissioning Environmental Appraisal</td></tr>
<tr><td>Block No</td><td>Block Numbers 14/19, 14/20, 15/16, 15/17, 15/22 and 15/23</td></tr>
<tr><td>Type of Project</td><td>Decommissioning</td></tr>
<tr><td>Undertaker</td><td>Repsol Sinopec Resources UK Limited.,
163 Holburn Street,
Aberdeen AB10 6BZ.</td></tr>
<tr><td>Licensees/Owners</td><td>
<table>
<tr><th>Field</th><th>Owner</th></tr>
<tr><td>Tartan, Highlander & Petronella Fields</td><td>Repsol Sinopec Oil Trading Limited</td></tr>
<tr><td>Galley Field</td><td>Repsol Sinopec Resources UK Limited</td></tr>
<tr><td>Duart Field</td><td>Repsol Sinopec Resources UK Limited
Repsol Sinopec LNS Limited,
NEO Energy (Production) Limited</td></tr>
</table>
</td></tr>
<tr><td>Short Description</td><td>The Tartan Development Area comprises a number of fields tied back to the Tartan Alpha (A) platform, located c. 140 km east of the nearest Scottish coastline. The fields include Tartan, Highlander, Duart, Petronella and Galley.

All of the fields associated with the Tartan Development Area are now in the decommissioning phase. Given the expanse of infrastructure associated with the Tartan Development Area, five draft Decommissioning Programme (DP) submissions will be submitted for approval: a Tartan A topsides DP; a Tartan A substructure DP and three subsea DPs. This document considers the environmental and socio-economic impact of the activities associated with the three subsea DPs.

Infrastructure at the fields comprises a number of surface laid and trenched and buried pipelines and umbilicals, subsea structures and stabilisation features. In line with the results of a Comparative Assessment all exposed surface laid pipelines and umbilicals will be recovered. The trenched and buried lines where the depth of lowering is > 0.6 m will be decommissioned in situ and the exposed ends will be remediated. The base case is that trenched and buried lines where both the depth of cover and the depth of lowering are < 0.6 m will also be recovered. Similarly, the base case is that surface laid lines protected with rock berms will also be recovered.

All subsea structures, and exposed mattresses and grout bags will be recovered. Existing rockdump will be decommissioned in situ.

The impact assessment presented in this Environmental Appraisal determined that there are no significant long term/ legacy environmental or socio-economic impacts associated with the proposed decommissioning activities. Given the expanse of the infrastructure to be decommissioned the short term impact of disturbing the seabed is considered moderate, however, it is recognised that seabed recovery will commence as soon as the activities have been completed.</td></tr>
<tr><td>Company Ref. No.</td><td>RP-DTATAR001-HS-0151</td></tr>
<tr><td>EA Prepared by</td><td>Repsol Sinopec Resources UK Limited and Genesis Oil and Gas Consultants Ltd.</td></tr>
</table>

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EXECUTIVE SUMMARY

Following Cessation of Production (CoP) at the Tartan Field in August 2020, Repsol Sinopec Resources UK Limited are currently preparing to decommission the Tartan Development Area. The Development comprises a number of fields (Tartan, Highlander, Duart, Petronella and Galley) tied back to the Tartan Alpha (A) platform. From the Tartan A platform, oil was exported to the Claymore platform, whilst a gas export/import pipeline connects Tartan A to the Frigg Gas Pipeline System (Figure 1).

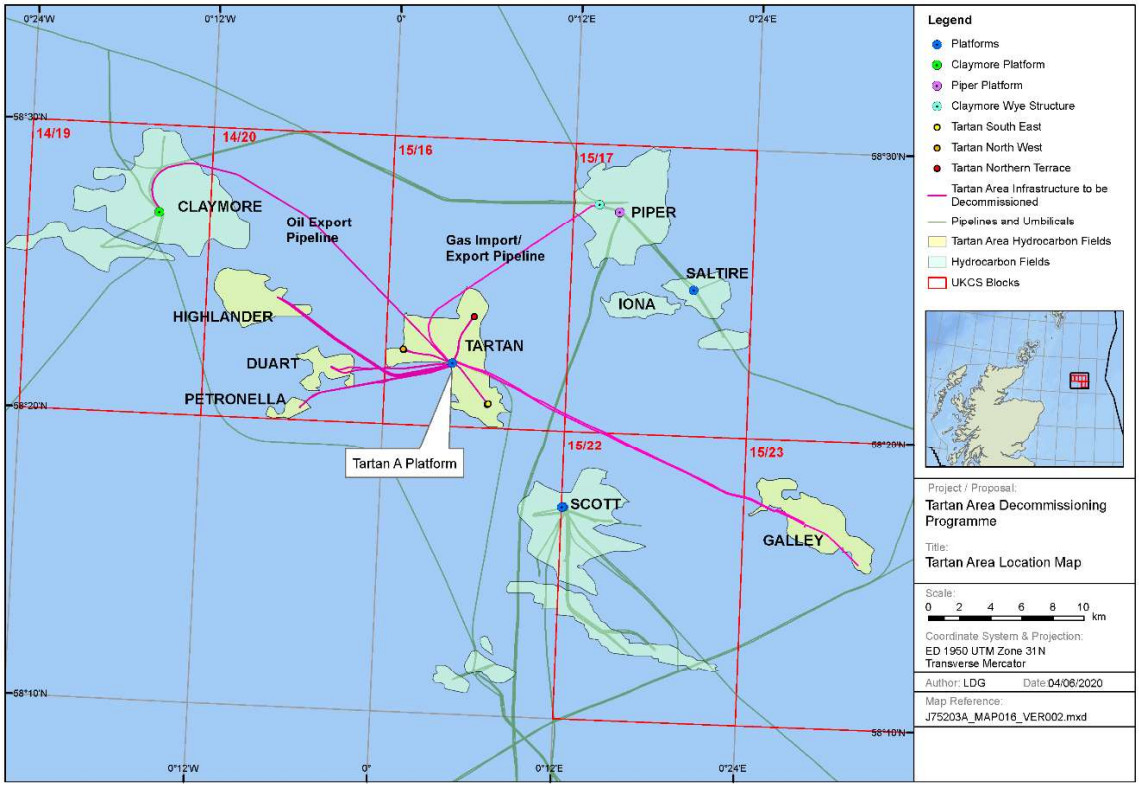


Figure 1: Location of the Tartan Development Area.

Given the number of fields and expanse of infrastructure associated with the Tartan Development Area, Repsol Sinopec Resources UK Limited will submit five draft Decommissioning Programme (DP) submissions to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED);

- Draft DP submission for the Tartan A platform topsides;
- Draft DP submission for the Tartan A platform substructure (i.e. the jacket); and
- Three draft DP submissions for the subsea infrastructure, one each for:
  - The Tartan, Highlander and Petronella Fields, the oil export pipeline and the gas export/import pipeline;
  - The Galley Field; and
  - The Duart Field.

As operator, Repsol Sinopec Resources UK Limited has prepared this Environmental Appraisal (EA) under the Petroleum Act 1998, in support of the three draft DP submissions capturing the subsea infrastructure[1].

[1] A separate EA will be submitted to support the Tartan A substructure draft DP. Given the nature of the activities associated with the decommissioning of the Tartan A topsides, Repsol Sinopec Resources UK Limited agreed with OPRED that a separate EA to support the topsides

Background Information

The Tartan A platform is located in Block 15/16 in the Central North Sea (CNS) *c*. 140 km east of the nearest Scottish coastline and *c*. 82 km from the Norwegian/UK median line. As shown in Figure 1, the subsea infrastructure associated with the Tartan Development Area traverses a number of blocks in the vicinity of the Tartan A platform.

The Tartan Development Area comprises five fields tied back to the Tartan A platform (Figure 2):

- The Tartan Field: comprising subsea tie-backs (Tartan Northern Terrace (TNT); Tartan North West (TNW); and Tartan South East (TSE)) and platform wells (Block 15/16);
- The Highlander Field: a subsea tie-back located *c*. 13 km northwest of the Tartan A platform (Block 14/20);
- The Petronella Field: a subsea tie-back located *c*. 10.5 km southwest of the Tartan A platform (Block 14/20);
- The Galley Field: a subsea tie-back located *c*. 26 km east of the Tartan A platform (Block 15/23); and
- The Duart Field: a subsea tie-back located *c*. 8 km west of the Tartan A platform (Block 14/20).

A total of 91 wells (including exploration, appraisal, water injection, and production wells) have been drilled across the Tartan Development Area: 21 platform wells and 70 subsea wells, many of which have been long term plugged, shut-in or suspended prior to CoP at the Tartan Field.

As shown in Figure 2, multiple lines have been laid to connect the various subsea wells to the platform and a number of subsea structures were installed to support the fields. In addition, an oil and a gas export/import pipeline connect to the Claymore platform and the Frigg Gas Pipeline System respectively.

draft DP was not required. Instead, the environmental impacts and proposed mitigation measures will be captured within the draft DP submission itself.

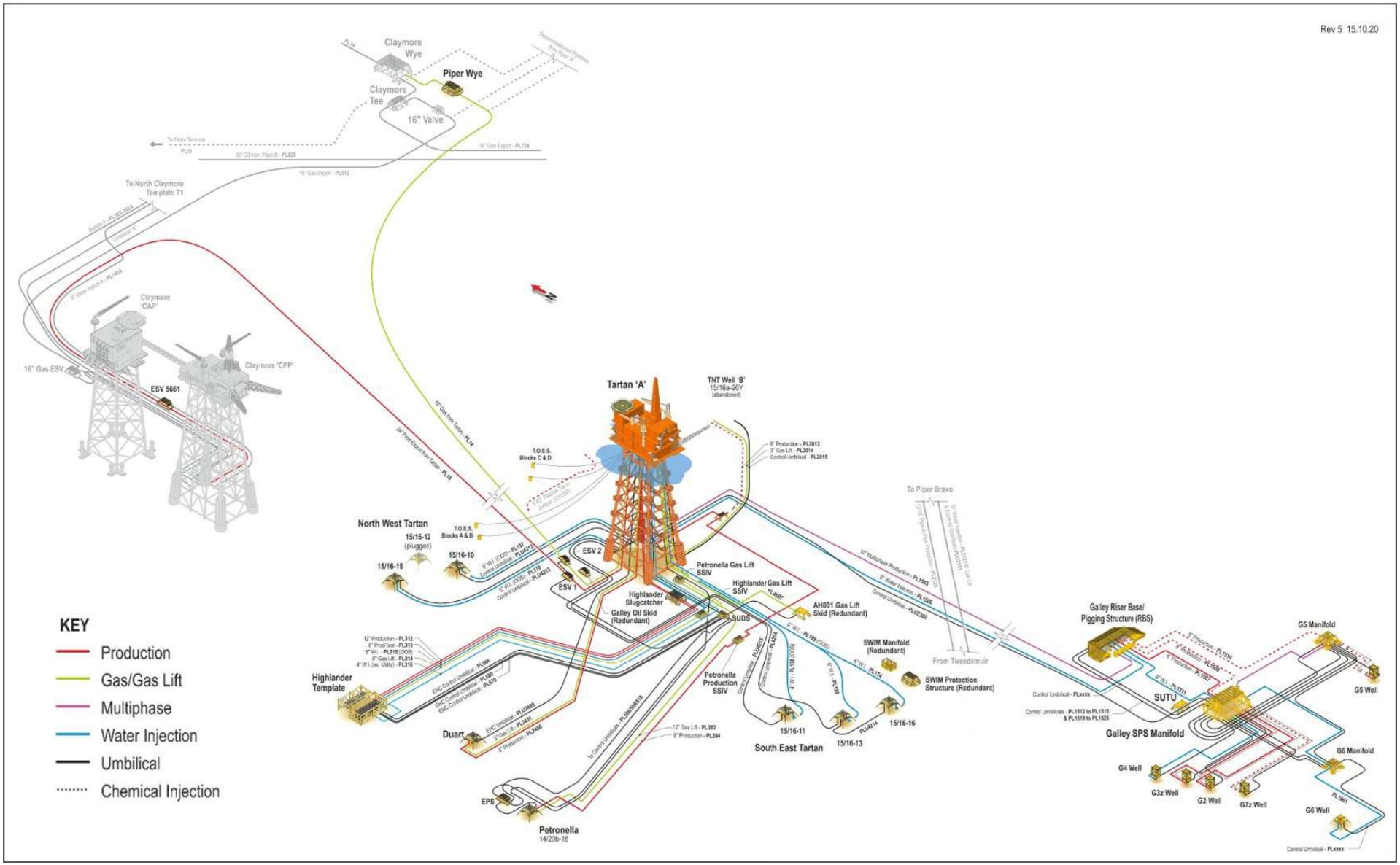


Figure 2: Representative schematic of the Tartan Development Area.

Stakeholder Engagement

In August 2020 as part of the informal stakeholder engagement process Repsol Sinopec Resources UK Limited issued a Scoping Report (Repsol Sinopec Resources UK Limited, 2020a) to a number of stakeholders. The Scoping Report provided an overview of the Tartan Development Area, the proposed decommissioning activities and an overview of the impacts to be assessed in this EA. Stakeholders were invited to comment on the Scoping Report with respect to any concerns they may have and comments received have been addressed in this report.

In addition to issuing the Scoping Report, Repsol Sinopec Resources UK held two Stakeholder Engagement Workshops in February 2021. Comments received on the Scoping Report and issues raised during the workshops are addressed in the EA Report.

Decommissioning Activities

A Comparative Assessment (CA) was carried out to determine the best method of decommissioning the pipelines and umbilicals associated with the Tartan Development Area.

In line with the results of the CA, the base case is that:

a) all exposed surface laid pipelines and umbilicals will be recovered to shore;

b) Trenched lines where neither the Depth of Cover (DOC) or the Depth of Lowering (DOL) exceed 0.6 m will be recovered to shore;

c) Trenched lines where the DOL is > 0.6 m will be decommissioned *in situ*; and

d) Surface laid lines with rock cover along their full lengths will be recovered to shore.

Results of the CA also identified decommissioning *in situ* options as viable options for those lines captured in b) i.e. lines laid in shallow trenches and d) i.e. rock covered lines, such that Repsol Sinopec Resources UK Limited propose to take decommissioning *in situ* through to the Contracts and Procurement tendering phase. Should these secondary options be found more favourable during the C&P phase, Repsol Sinopec Resources UK Limited will engage with OPRED before progressing.

All surface laid spools and umbilical jumpers will also be recovered to shore.

All surface laid structures, and exposed mattresses and grout bags will be recovered to shore whilst existing rock cover will be decommissioned *in situ*.

Following recovery and remediation activities, Repsol Sinopec Resources UK Limited will get independent verification of a clear seabed. Preference will be given to methods not resulting in seabed disturbance e.g. side scan sonar surveys, however if deemed necessary over trawl trials will be undertaken.

Environmental and Socio-Economic Baseline

In September/October 2019, Repsol Sinopec Resources UK Limited commissioned a pre-decommissioning environmental survey across the Tartan Development Area. The survey results indicate that the sediments across the area are relatively homogenous and comprise three main habitats: circalittoral fine mud (EUNIS A5.36), circalittoral sandy mud (EUNIS A5.35) and deep circalittoral mixed sediment (EUNIS A5.45).

The sea pens *Virgularia mirabilis* and *Pennatula phosphorea* and burrows and tracks created by megafauna (e.g. *Nephrops norvegicus*) were widespread throughout the survey area. The majority of the Tartan Development Area is therefore considered to meet the criteria for the OSPAR listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'.

Juvenile *Arctica islandica* (Ocean quahog), an OSPAR designated bivalve species were found to occur throughout the area.

In some areas within the Galley field the bacterial mats were found to occur in patches on hard concretions which could indicate Methane Derived Authigenic Carbonates (MDAC) habitat partially covered by sediment. This area of potential MDAC habitat could represent an Annex I habitat; however, no evidence of gas bubbles, pockmark features or larger topographic structures were seen that would be required to confirm that it meets the criteria of the feature.

As a result of the wells drill at the Highlander, Galley, TNW and TSE locations, small cuttings piles occur at each of these locations (two at the Galley field). The largest of these piles (the Highlander cuttings pile) has a volume of 495 m^3 and a maximum height of 0.27 m. The estimated total hydrocarbon content within the Highlander cuttings pile is 0.44 te whilst the hydrocarbon content within each of the remaining cuttings piles is < 0.12 te.

Plankton, benthic and fish species in the area are typical of the CNS. Of the fish species identified in the area, cod, Norway pout, whiting, blue whiting and anglerfish have been assessed by Scottish Natural Heritage (SNH) and the Joint Nature Conservation (JNCC) as Priority Marine Features (PMFs) in Scotland.

Minke whale, harbour porpoise, Atlantic white-sided dolphin and white-beaked dolphin are among the cetacean species recorded in the area. All cetaceans in UK waters are considered to be European Protected Species (EPS) such that under the Habitats Regulations, it is an offence to deliberately disturb, capture, injure or kill any of these species. Harbour porpoise is also protected under annex II of the Habitats Directive.

A number of seabird species are known to occur in the area including (but not limited to) the northern gannet, northern fulmar, black-legged kittiwake, lesser and greater black-backed gull, razorbill, great and Arctic skua, little auk, herring gull, common gull, common guillemot and Atlantic puffin.

Fishing gear types associated with the area include both demersal and pelagic gear. Available fishing effort and landings data suggests the area is relatively important to the UK fishing industry.

Shipping activity in the vicinity of the Tartan Development Area is considered low, and there are no offshore windfarm developments in the area.

Impact Assessment

In order to determine the significance of the impact of the proposed decommissioning activities an ENVironmental Issues IDentification (ENVID) Workshop was undertaken. Receptors considered in the workshop included: air quality, water quality, sediment quality, plankton, benthic species, fish, marine mammals, seabirds, fisheries, shipping, landfill resources and resource use. The impacts associated with emissions to air, discharges to sea, seabed disturbance, underwater noise, waste production, the physical presence of the vessels during operations and the legacy impacts of the items (buried pipelines and umbilicals and surface laid rock cover) to be decommissioned *in situ* were considered on each of the receptors.

Applying industry standard mitigation measures (see Table 1), the impact significance of many of the resultant aspects e.g. discharges to sea, emissions to air, underwater noise, resource use, waste production, was considered to be Low. Only those impacts associated with disturbing the seabed were considered to potentially result in a Moderate impact. Following scoping of the ENVID results, a further assessment was carried out on:

1) the impacts of the potential seabed disturbance associated with the proposed activities, and
2) the legacy impacts associated with decommissioning the buried pipelines and umbilical, and the surface laid rockdump *in situ*.

In both cases the results of this further assessment aligned with the initial results of the ENVID Workshop and concluded that, with the application of industry standard mitigation measures, the impact significance is Low with respect to legacy impacts (both environmental and socio-economic). The short term impact of disturbing the seabed was still considered Moderate given the expanse of the infrastructure to be recovered, however the long term impact on the seabed is considered Low.

Environmental Management

The Tartan Development Area Decommissioning Project will be aligned to Repsol Sinopec Resources UK Limited's goal to 'minimise the impact to the environment'.

Atmospheric emissions will be managed by inspection of the vessels contracted to carry out the work and by planning vessel schedules to ensure efficient operations.

The inventory of decommissioned items will distinguish equipment that can be reused, materials that can be recycled and waste for appropriate disposal. Naturally Occurring Radioactive Material (NORM) is not expected to be present, but if it is detected, the contaminated waste will be sent for appropriate treatment. Waste management activities will be conducted in full compliance with all relevant legislation and regulatory controls. Disposal to landfill will be the waste management option of last resort.

Following the decommissioning activities, independent verification of the seabed state will be obtained, and evidence of clearance will be provided to all relevant governmental and non-governmental organisations. A post-decommissioning environmental survey will be carried out following decommissioning activities to establish the condition in which the seabed is left. An ongoing monitoring survey strategy will be agreed with OPRED, the aim of which will be to verify recovery of the seabed and that the pipelines and umbilical decommissioned *in situ* remain buried and do not present a risk of snagging to other users of the sea.

Stringent control measures and operational procedures will be implemented to prevent accidental events involving the release of hydrocarbons or chemicals.

Table 1 lists procedural and technical controls and mitigation measures identified in the ENVID workshop and during the preparation of this EA to reduce impacts to a level that is 'as low as reasonably practicable'.

Table 1: Decommissioning of the Tartan Development Area project specific commitments.

Aspect	Commitment
Physical presence	• Ongoing consultation with Scottish Fishermen's Federation (SFF). • Notice to mariners will be circulated. • Vessel use will be optimised. • A Collision Risk Management Plan will be produced if required. • All vessels engaged in the project operations will have markings and lightings as per the International Regulations for the Prevention of Collisions at Sea (COLREGS) (International Maritime Organisation, 1972). • A clean seabed will be achieved as part of the decommissioning activities. • If used, rock cover will be optimised and carefully managed. A fall pipe will be used to ensure accuracy of the rock dumping. Size of rock cover will be in accordance with industry practice which is also the preferred SFF / industry best practices. • Location of remaining material will be mark on FishSafe.
Atmospheric emissions and energy use	• As part of the tendering process, proposed vessels will go through a detailed assurance process which will include a review of generator and engine maintenance which leads to better efficiency in line with manufacturer's specifications. • Decommissioning vessel schedules will be planned to minimise vessel use. • Prior to the contract award, Repsol Sinopec Resources UK Limited will audit the decommissioning yards to ensure suitable permits are in place and that atmospheric emissions are being managed. • Activities will be carried out in line with Repsol Sinopec Resources UK Limited's environmental policy which includes minimising emissions.
Discharges to sea	• Repsol Sinopec Resources UK Limited will carry out a detailed assurance process on all vessels prior to contract award. • Work procedures will be in place to minimise offshore campaigns. • Only MARPOL compliant vessels will be used.

Aspect	Commitment
	• Flushing and cleaning of pipelines and umbilicals has been completed in line with Best Available Technique (BAT)/Best Environmental Practice (BEP) requirements. • All contracted vessels will be signed up to the International Maritime Organisation (IMO) and will adhere to their guidelines. • Any associated discharges will be managed to minimise impact.
Physical disturbance of the seabed and marine species	• Cutting/jetting/dredging and lifting procedures will be in place. • With respect to remediation on the exposed ends of the buried pipelines and umbilical, trench and bury or cut and recover will be prioritised over rockdump. • If rock cover is added, volumes will be minimised, and a fall pipe will be used to lay it on the seabed. • With respect to determining a clear seabed status after decommissioning activities are completed, the use of surveys for example side scan sonar surveys will be prioritised over the use of over trawl trials.
Onshore activities	• Contract award will be to an established yard with appropriate experience, capability, licences, consents and community engagement in place.
Waste generation and resource use	• The Tartan Development Area Decommissioning Project will have in place a Waste Management Plan (WMP) developed to describe and quantify waste arising from decommissioning activities and identify available disposal options for those wastes. • Waste management options will take account of the waste hierarchy. • As part of Repsol Sinopec Resources UK Limited's Duty of Care, contract award will be to an established yard with appropriate experience, capability, licences and consents in place.
Accidental events	• Any infrastructure decommissioned *in situ* will be marked on FishSafe and communicated accordingly. • Work procedures in place. • Vessel assurance inspections. • Pre-hire vessel audits. • Emergency response plans in place including the Tartan OPEP (oil pollution emergency plan) and SOPEPs (shipboard oil pollution emergency plan). • Compliance activities will be managed by means of the independently verified Company integrated Safety and Environmental Management System (SEMS).

Conclusion

This EA has assessed the environmental and socio-economic impacts associated with the proposed Tartan Development Area decommissioning activities in the context of the environment within which the fields are situated. With implementation of the proposed mitigation measures, the environmental impact of the decommissioning activities will be minimised and the proposed decommissioning activities will leave the area in a condition suitable for re-colonisation by local species and safe for fishermen.

In addition, the EA has considered the objectives and marine planning policies of the Scottish National Marine Plan (NMP) across the range of policy topics including biodiversity, natural heritage, cumulative impacts and oil and gas. Repsol Sinopec Resources UK Limited considers that the proposed decommissioning activities are in broad alignment with such objectives and policies.

ACRONYMS

%	Percent
“	Inches
<	Less than
>	More than
µM	Micro meter
°C	Degrees Celsius
A	Alpha (as in Tartan Alpha platform)
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
BAT	Best Available Technique
BAC	Background assessment concentrations
BC	Background concentrations
BEIS	(Department of) Business, Energy and Industrial Strategy
BEP	Best Environmental Practice
c.	Circa
CA	Comparative Assessment
cm	Centimetre
CMID	Common Marine Inspection Documents
CNS	Central North Sea
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COLREGS	International Regulations for the Prevention of Collisions at Sea
C&P	Contracts and Procurement
CoP	Cessation of Production
CRA	Collision Risk Assessment
CSV	Construction Support Vessel
DOC	Depth of Cover
DOL	Depth of Lowering
DP	Decommissioning Programme
DREAM	Dose-related Risk and Effect Assessment Model
DSV	Dive Support Vessel
EA	Environmental Appraisal
EBS	Environmental Baseline Survey
EC	European Commission
EEC	European Economic Community
EEMS	Environmental Emissions and Monitoring System
EIA	Environmental Impact Assessment
ENVID	ENVironmental issues IDentification
EPS	European Protected Species
ERL	Effect range low
ESAS	European Seabirds at Sea
ESIA	Environmental and Socio-Economic Impact Assessment
ESRA	Environmental and Socio-Economic Risk Assessment
EU	European Union
EUNIS	European Nature Information System
GEN	National Marine Plan General Policies
H	Height
HSE	Health, Safety and Environmental
ICES	International Council for the Exploration of the Sea
ID	Internal Diameter
IMO	International Maritime Organisation
IoP	Institute of Petroleum
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
kg	Kilogram
km	Kilometres
km^2	Kilometres squared
KP	Kilometre Point
kW/m	Kilowatts per meter
L	Length
m	Meter

m^3	Meters cubed
m^3/hr	Meters cubed per hour
m^2	Meters squared
MAS	Marine Assurance Standards
MARPOL	The International Convention for the Prevention of Pollution from Ships
MBES	Multi-Beam Echo Sounder
MCZ	Marine Conservation Zone
MDAC	Methane Derived Authigenic Carbonates
MEMW	Marine Environmental Modelling Workbench
mg/kg	milligrams per kilogram
mm	Millimeter
MPA	Marine Protected Area
m/s	Meters per second
MSS	Marine Scotland Science
MU	Management Units
N/A	Not Applicable
NB	Nominal Bore
NCMPA	Nature Conservation Marine Protected Area
nm	Nautical miles
nm	Nanometres
NMP	National Marine Plan
NMPi	National Marine Plan Interactive
NOx	Nitrogen oxides
NTF	Not Technically Feasible
OBM	Oil Based Mud
OD	Outer Diameter
OGA	Oil and Gas Authority
OGUK	Oil and Gas UK
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo Paris Convention
P&A	Plug and Abandonment
PAH	Polycyclic Aromatic Hydrocarbons
P/C/B	Physical, Chemical and Biological
PL	Pipeline (as in pipeline number e.g. PL18)
PLU	Umbilical (as in umbilical number (e.g. PLU4215)
PMF	Priority Marine Feature
PNEC	Predicted No Effect Concentration
ppb	Parts per Billion
PPC	Prevention and control permits
ppm	Parts per million
RAG	Red-Amber-Green
REACH	Registration, Evaluation, Authorisation and restriction of Chemicals
RBS	Riser Base Structure
ROV	Remotely Operated Vehicle
RSRUK	Repsol Sinopec Resources UK Limited
SAC	Special Area of Conservation
SCANS	Small Cetacean Abundance in the North Sea
SEEMP	Ship Energy Efficiency Management Plan
SEMS	Safety and Environmental Management System
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SIMOPS	Simultaneous Operations
SINTEF	Stiftelsen for Industriell og Teknisk Forskning
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SO	Screened Out
SO_X	Sulphur Oxides
SOPEP	Ship Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Area
SPS	Subsea Production Skid

SSIV	Subsea Isolation Valve
SSS	Side Scan Sonar
SUDS	Subsea Umbilical Distribution System
SWIM	Subsea Water Injection Manifold
Te / te	Tonnes
THC	Total Hydrocarbon Content
TNT	Tartan Northern Terrace
TNW	Tartan North West
TOES	Totally (Enclosed Motor Propelled Survival Craft) Orientation and Evacuation System
TSE	Tartan South East
UK	United Kingdom
UKBAP	UK Biodiversity Action Plan
UKHO	United Kingdom Hydrographic Office
UKCS	United Kingdom Continental Shelf
UKOOA	UK Offshore Operators Association
W	Width
WHPS	Wellhead Protection Structure
WMP	Waste Management Plan
yr	year

1. INTRODUCTION

Following Cessation of Production (CoP) of the Tartan Field in August 2020, Repsol Sinopec Resources UK Limited are currently preparing to decommission the Tartan Development Area, located in the Central North Sea (CNS), *c.* 140 km east of the nearest Scottish coastline and *c.* 82 km from the Norway/UK median line (Figure 1-1).

The Tartan Development Area comprises a number of fields tied back to the Tartan Alpha (A) platform located in United Kingdom Continental Shelf (UKCS) Block 15/16 in a water depth of *c.* 138 m. The fields include Tartan, Highlander, Duart, Petronella and Galley. From the Tartan A platform, the processed oil was exported to the Claymore platform. In addition, a gas export/import pipeline ties into the Frigg Gas Pipeline System[1].

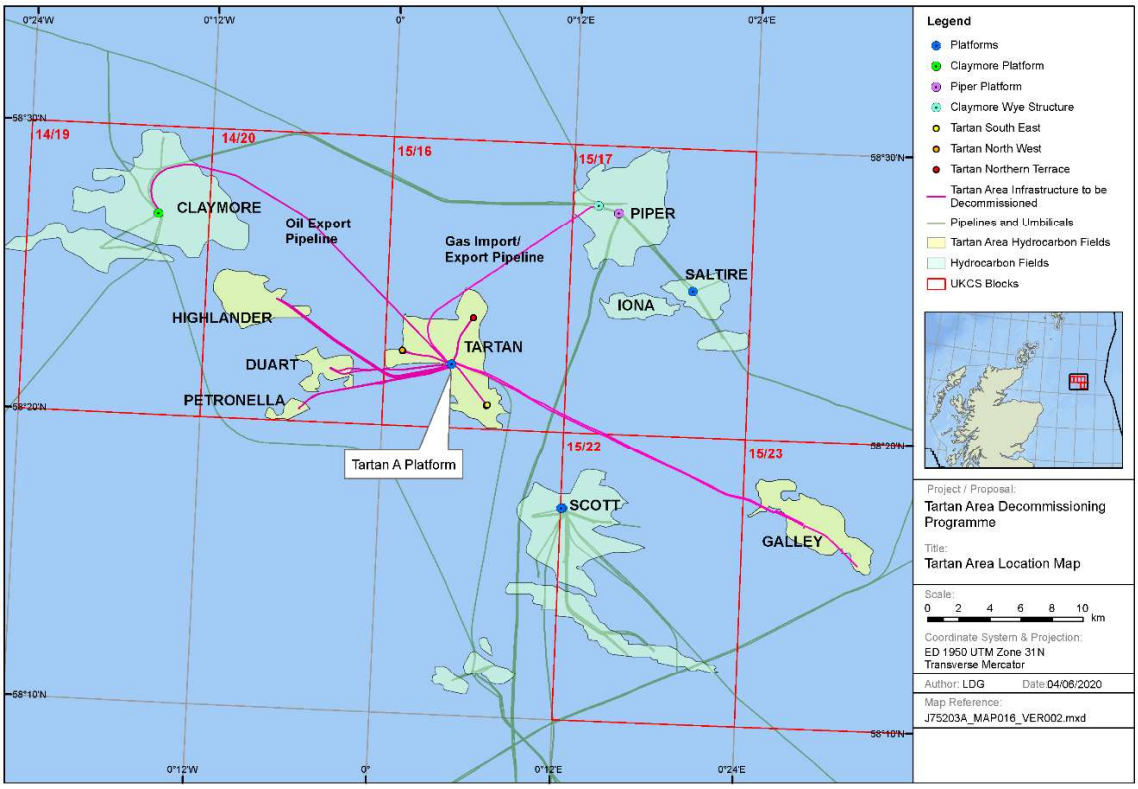


Figure 1-1: Location of the Tartan Development Area.

Given the number of fields and expanse of infrastructure associated with the Tartan Development Area, Repsol Sinopec Resources UK Limited will submit five draft Decommissioning Programmes (DP) submissions to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED);

- Draft DP submission for the Tartan A platform topsides;
- Draft DP submission for the Tartan A platform substructure (i.e. the jacket); and
- Three draft DP submissions for the subsea infrastructure, one each for:
  - The Tartan, Highlander and Petronella Fields, the oil export pipeline and the gas export/import pipeline;
  - The Galley Field; and
  - The Duart Field.

[1] The gas export/import line ties into the Frigg system at the Claymore wye structure which is located in relatively close proximity to the Piper platform (Figure 1-1).

The environmental and social impacts associated with the proposed decommissioning activities are captured in two Environmental Appraisal (EA) submissions[2]: one supporting the Tartan A substructure draft DP and the second (this document) supporting the three draft DP submissions capturing the subsea infrastructure.

1.1 Overview of the Tartan Development Area

1.1.1 Field Overview

The Tartan Development Area comprises a number of fields tied back to the Tartan A platform (Figure 3-1):

- The Tartan Field: comprising subsea tie-backs (Tartan Northern Terrace (TNT); Tartan North West (TNW); and Tartan South East (TSE)) and platform wells (Block 15/16);
- The Highlander Field: a subsea tie-back located *c*. 13 km northwest of the Tartan A platform (Block 14/20);
- The Petronella Field: a subsea tie-back located *c*. 10.5 km southwest of the Tartan A platform (Block 14/20);
- The Galley Field: a subsea tie-back located *c*. 26 km east of the Tartan A platform (Block 15/23); and
- The Duart Field: a subsea tie-back located *c*. 8 km west of the Tartan A platform (Block 14/20).

A total of 91 wells (including exploration, appraisal, water injection, and production wells) have been drilled across the Tartan Development Area: 21 platform wells and 70 subsea wells.

As shown in Figure 3-1, multiple lines have been laid to connect the various subsea wells to the platform and a number of subsea structures were installed to support the fields. In addition, an oil and a gas export/import pipeline connect to the Claymore platform and the Frigg Gas Pipeline System respectively.

1.1.2 Tartan A Platform

As the impacts associated with the decommissioning of the Tartan A platform are not captured in this EA, only a brief overview of the platform is provided here.

The Tartan A platform (installed in 1979) is a four-legged, fixed installation comprising a steel jacket substructure and a module support frame on which modular topside packages are mounted. Modular packages on the topsides include accommodation, process facilities, utilities (including power generation), wellheads and drilling facilities.

The jacket is secured to the seabed via 28 piles. Following installation, soft soils at the platform location resulted in the jacket structure settling into the seabed to such an extent that the bottom plan bracing was buried to a depth of up to 3 m. Drill cuttings subsequently deposited during platform drilling have increased the depth of burial such that there are localised areas where depth of burial is over 4 m.

1.1.3 Drill Cuttings Piles

A pre-decommissioning environmental survey carried out in 2019 identified six drill cuttings piles associated with the Tartan Development Area (APEM, 2020g). According to the Norwegian Oil and Gas Association Guidance (2016) all the piles are "small cuttings piles", except for the pile at the Tartan A platform, which is in the lower end of the "medium" sized category. The five small cuttings piles have estimated oil contents of much less than 0.5 te. Management of the Tartan A cuttings pile is captured in the Tartan A substructure draft DP and therefore is not discussed in detail in this EA. Further details are provided in Section 3.2.5.

1.2 Purpose of the Document

The purpose of the EA is to assess and describe, in a proportionate manner the potential environmental and social impacts associated with the proposed decommissioning activities presented in the three subsea draft DP

[2] Given the nature of the activities associated with the decommissioning of the Tartan A topsides, Repsol Sinopec Resources UK Limited agreed with OPRED that a separate EA to support the topsides draft DP was not required. Instead the environmental impacts and proposed mitigation measures will be captured within the draft DP submission itself.

submissions, and to identify mitigation measures to reduce the level of these impacts to 'as low as reasonably practicable' (ALARP).

1.3 Regulatory Context

The UK's international obligations on decommissioning are governed principally by the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention). OSPAR Decision 98/3 requires that all installations should be completely removed and recovered to shore for re-use, recycling or final disposal unless a derogation is granted. Pipelines and cables are not included within the Decision, however OPRED's decommissioning guidance notes (BEIS, 2018) requires that operators aim to achieve a clear seabed and robustly assess decommissioning options, based on evidence and data, using the CA process.

The decommissioning of offshore oil and gas infrastructure (including pipelines) in the UKCS is principally governed by the Petroleum Act 1998 (as amended by the Energy Act 2008). This Act sets out the requirements for a formal DP, which must be approved by OPRED before the owners of an offshore installation or pipeline may proceed with decommissioning.

There is no statutory requirement to undertake an Environmental Impact Assessment (EIA), but OPRED's decommissioning guidance notes (BEIS, 2018) advise that any DP is supported by an assessment of the environmental impacts of undertaking the decommissioning activities described. This EA has been prepared to meet this requirement.

1.4 Document Layout

Table 1-1 details the structure of the EA Report.

Table 1-1: Structure of the EA Report.

Chapter No.	Title	Contents
	Non-Technical Summary	A summary of the EA Report.
1	Introduction	Introduction to the project and scope of the EA. This chapter also includes a summary of applicable legislation.
2	Stakeholder Engagement	Details of the consultation process to date.
3	Project Description	A description of the infrastructure to be decommissioned, the proposed decommissioning activities and an indicative schedule of activities.
4	Comparative Assessment	Summary of the results of the CAs carried out for the Tartan Development Area pipelines and umbilical.
5 and 6	Environmental and Socio-Economic Baseline	A description of the environmental (Chapter 5) and socio-economic (Chapter 6) receptors in the area.
7	Scoping of Potential Environmental Impacts	Overview of the methodology used to determine the environmental and socio-economic impact significance of the proposed decommissioning activities. Results of the ENVID (ENVironmental issues IDentification) Workshop and justification for selecting those aspects not requiring further assessment in the EA. Justification is also provided for those aspects that are assessed further.
8 to 9	Assessment of Aspects	Assessment of seabed disturbance during operations (Chapter 8); and physical presence with respect to legacy impacts on other sea users and on the environment (Chapter 9).
10	Environmental Management	A description of Repsol Sinopec Resources UK Limited's Environmental Management Procedures and how they apply to the Decommissioning Project.
11	Conclusions	Key findings including a register of commitments.
12	References	Data sources used to support the EA.
Appendix A:		Impact Assessment Methodology.

2. STAKEHOLDER ENGAGEMENT

Consulting with stakeholders is an important part of the decommissioning impact assessment process as it allows any concerns or issues which stakeholders may have, to be communicated and addressed. In August 2020, as part of the informal stakeholder engagement process, Repsol Sinopec Resources UK Limited issued a Scoping Report (Repsol Sinopec Resources UK Limited, 2020a) to stakeholders. The Scoping Report provided an overview of the Tartan Development Area, and the impacts to be assessed in the two EAs to be submitted in support of the five Tartan Development Area DP submissions. Stakeholders were invited to comment on the Scoping Report with respect to any concerns they may have. In addition to issuing the Scoping Report, Repsol Sinopec Resources UK held two Stakeholder Engagement Workshops in February 2021[1]. Comments received on the Scoping Report and issues raised during the workshops are summarised in Table 2-1 and Table 2-2.

The formal statutory and public consultation process was triggered by the submission of the consultation draft of the DPs and supporting documents (including this EA report) to OPRED. As the project progresses, further consultation will be undertaken in line with the Tartan Decommissioning Project's Stakeholder Management Plan.

Table 2-1: Comments received on Scoping Report.

Date of contact	Comments / Issues / Concerns Raised on Scoping Report issued on 18/8/2020
United Kingdom Hydrographic Office (UKHO)	
Response received on 19/8/2020	UKHO advised that at this point of the project they had no specific requests and would comment on the DPs issued for public consultation. General guidance relating to the notice required by the UKHO in advance of offshore activities was provided. In addition, the UKHO requested that Repsol Sinopec Resources UK Limited adheres to the guidance provided in the BEIS Decommissioning Guidance Notes (BEIS, 2018) in relation to marking of remaining infrastructure and safety zones. *Response: Repsol Sinopec Resources UK Limited commit to adhering to the guidance provided by the UKHO.*
Scottish Fishermen's Federation (SFF)	
Response received on 28/8/2020	SFF advised that at this time they had no comments on the Scoping Report. In their response they advised Repsol Sinopec Resources UK Limited of SFF's Oil and Gas Decommissioning Policy which primarily relates to safety and the physical impact on the fishing grounds of the long-term presence of oil industry infrastructure on the seabed. *Response: Repsol Sinopec Resources UK Limited are committed to the key principles of the SFF's Oil and Gas Decommissioning Policy through ongoing engagement and commitment to demonstrating a safe seabed following the offshore decommissioning activities. See Chapter 9 of the EA.*
Joint Nature Conservation Committee (JNCC)	
Response received on 17/9/2020 JNCC Ref. No. OIA 7514	With respect to survey data presented in the EA, JNCC advised that: • Survey data should at least include the area of proposed operations. • Survey data should provide adequate evidence that habitats and species of nature conservation concern (including Annex I habitats) are or are not present. • It is good practice to include a diagram indicating the surveyed area in the context of the proposed activity and to identify any sample points or the location of photographic evidence. Data provided should also include high resolution acoustic data, video and / or still images.

[1] Note: The HSE were not available to attend the Stakeholder Engagement Workshop held on 15th February 2021. Therefore, Repsol Sinopec Resources UK Limited held a separate meeting with them on 16th February 2021.

Date of contact	Comments / Issues / Concerns Raised on Scoping Report issued on 18/8/2020
	Response: JNCC's advice is noted and has been followed during production of Chapter 5 'Environmental Baseline'. With respect to the environmental description provided in the EA, JNCC advised that: • The environmental description should focus on that of the actual area to be developed and not just provide a generic description of the local environment. • Any gaps or limitations in environmental information should be acknowledged with, where appropriate, strategies to address these gaps or limitations. • Though the environmental description should focus on the proposed site of operations, this area should also be placed in the context of its surroundings. • The Seabird Oil Sensitivity Index (SOSI) should not be used to inform environmental baselines on seabird populations. Instead JNCC recommends data sources such as Kober *et al*. (2010). *Response: JNCC's advice is noted and has been followed during production of Chapter 5 'Environmental Baseline'.* With respect to stabilisation material, JNCC: • Recommend that the amount of hard substrate to be introduced is minimised; • Request following details for any rock that may be introduced: location of dump sites; size/grade of rock to be used; volume including continency volume; method of delivery; footprint of rock and assessment of impact. *Response: This has been noted and Repsol Sinopec Resources UK Limited will aim to minimise the use of rock by prioritising recovery or trench and bury approaches. Volumes of contingency rock have been included in the EA.* With respect to the impact assessment within the EA, JNCC recommend that: • The Project is considered alongside other projects in the area including: approved developments under construction, approved developments that have not yet commenced construction, developments submitted for approval but not yet approved, as well as any other significant appropriate development for which some realistic figures are available; and • The worst-case scenario is assessed in the EA. *Response: JNCC's advice has been noted and has been followed during production of the EA.*
Other consultees that received the Scoping Report	
Marine Scotland Science, Maritime and Coastguard Agency, OPRED, Scottish Environment Protection Agency, the Oil and Gas Authority and the Health and Safety Executive. Note: at the time of writing, feedback on the Scoping Report had not been received from these consultees.	

Table 2-2: Comments from Stakeholder Engagement Workshop.

Stakeholder Engagement Workshops (15th and 16th February 2021)	
Stakeholders / consultees represented	
• OPRED Offshore Decommissioning Unit (ODU) • OPRED Environmental Management Team (EMT) • Oil and Gas Authority (OGA) • Joint Nature Conservation Committee (JNCC)	• Scottish Fishermen's Federation (SFF) • Scottish Environment Protection Agency (SEPA) • Marine Scotland Science (MSS) • Health and Safety Executive (HSE)
Comments / Issues / Concerns	
The stakeholders were provided with an overview of the Tartan Development Area and the proposed decommissioning activities captured in the subsea and topsides DPs. • MSS requested that the Tartan Alpha jacket EA (to be submitted at a later date) cross references the Tartan Development Area subsea EA where relevant. *Repsol Sinopec Resources UK Limited note the comment and will ensure cross referencing is made where appropriate.* • MSS queried if each of the cuttings piles had 500 m zones associated with them. *Repsol Sinopec Resources UK Limited confirmed that all the cuttings piles occurred within existing 500 m exclusion zones. This has been clarified in Section 3.2.5 of the EA Report. Interaction of fishing gear with the cuttings piles is discussed in Section 9.4.* • MSS asked for details on samples taken from the cuttings piles and whether or not the core samples had penetrated the piles to the seabed. *Repsol Sinopec Resources UK Limited confirmed that the core samples had penetrated the pile to the seabed. Depth of each sample is provided in Table 5-3 of the EA Report.* • MSS queried if there was a possibility if during the decommissioning activities, if cuttings disturbed at each location could overlap with cuttings from other locations. *Potential cumulative impact of disturbance to the different cuttings piles associated with the subsea tie-backs are considered in Section 8.3.* • MSS requested clarification on whether or not Pipeline Group D1 was naturally backfilled. *Repsol Sinopec Resources UK Limited confirmed that the pipelines and umbilicals in this group are naturally backfilled. This is clear in the draft DP submissions and in Chapter 3 of the EA.* • MSS queried the impact of the remaining rock currently covering pipeline Group E (surface laid and rock covered the full length). *Table 8-2 of the EA Report details how the pipelines would be exposed and quantifies the area of seabed impacted by the proposed activities.* • MSS and SFF commented on the exposures associated with the Tartan Development Area. SFF asked if free spans would be submitted for inclusion on FishSafe. MSS requested that individual assessment of exposures is considered rather than a holistic assessment to ensure no outliers missed. *Repsol Sinopec Resources UK Limited confirmed that all spans will be mitigated. Details of exposures associated with the Development Area are available in the CA Report and in Chapter 3 of the EA Report.* • JNCC queried if the modelling results detailed the likely thickness of the redistributed cuttings piles after dredging. *Potential thicknesses of the redistributed cuttings piles are discussed in Section 8.2.1.1.* • JNCC sought clarification regarding what portion of the cuttings pile would be disturbed by the structure removal activities. *Section 8.2.1 details the anticipated percent of the Highlander cuttings pile to be disturbed during recovery of the Highlander template.* • JNCC queried extent of rock cover associated with Pipeline Group C (rigid trenched and buried lines)	

Stakeholder Engagement Workshops (15th and 16th February 2021)
Volumes of existing rock cover associated with the different pipelines and umbilicals have been captured in Chapter 3 and legacy impacts considered in Chapter 9. • JNCC and HSE queried if rock cover would be used to mitigate exposed ends of trenched and buried lines given the sediment type in the area. *The CA identified rock cover of exposed line ends to be a feasible option for the trenched and buried lines to be decommissioned in situ. This option is included in the DPs and in the EA Report, though it is identified as the least preferred option.* • OGA queried if reuse options for the pipelines had been considered. *Repsol Sinopec Resources UK Limited explained that reuse options were considered, and none identified. This is captured in the DP submissions and is not addressed in the EA Report.* • SFF queried if the structures would be removed. *Repsol Sinopec Resources UK Limited confirmed the sub-structures would be recovered. The EA Report captures the impacts associated with recovering the sub-structures.* • OPRED EMT queried the proposed schedule for the offshore activities. *Section 3.2.1 of the EA report presents an indicative schedule for the offshore activities.* • HSE queried sediment types in the area. *Sediment types are described in Sections 5.4.1 of the EA.* • HSE queried if there would be post activity ground truthing of the results of the modelling of cuttings piles disturbance. *Repsol Sinopec Resources UK Limited confirmed this would be done as part of the post decommissioning surveys. Section 3.3 of the EA Report discusses the post decommissioning survey requirements.* • Note: HSE had several additional comments/queries regarding: implications on the Safety Case; timing of public consultation; impacts of BREXIT; engagement with HSE diving specialist (if a need for divers is later identified); and whether or not well activities are included in the Tartan Development Area DP submissions. *Repsol Sinopec Resources UK Limited discussed these queries in the workshop. The queries did not require actioning in the DP submissions or supporting documentation.*

3. PROJECT DESCRIPTION

This chapter describes the Tartan Development Area infrastructure to be decommissioned and outlines the proposed decommissioning activities.

3.1 Tartan Development Area Overview

The wells associated with the Tartan Development Area were produced via the Tartan A platform. From the Tartan A platform, the fluids were commingled before being exported to the Claymore platform and onward to the Flotta pipeline. The associated gas was compressed and treated before being exported to the Frigg pipeline and onwards to the St. Fergus terminal.

A total of 91 wells (including exploration, appraisal, water injection, and production wells) have been drilled across the Tartan Development Area: 21 platform wells and 70 subsea wells. Well name, type and status (prior to CoP at the Tartan Field) for each of the subsea wells are provided in Table 2.5 of the draft subsea DPs. Details of the platform wells are captured in the draft Tartan A Topsides DP.

Further details of the wells are not provided here as the activities associated with Plug and Abandonment (P&A) are out with the scope of the draft DPs and the EA.

Infrastructure captured within the draft DP submissions is illustrated in Figure 3-1. Section 3.2 and the subsections therein provide details of this infrastructure and describe the proposed decommissioning activities.

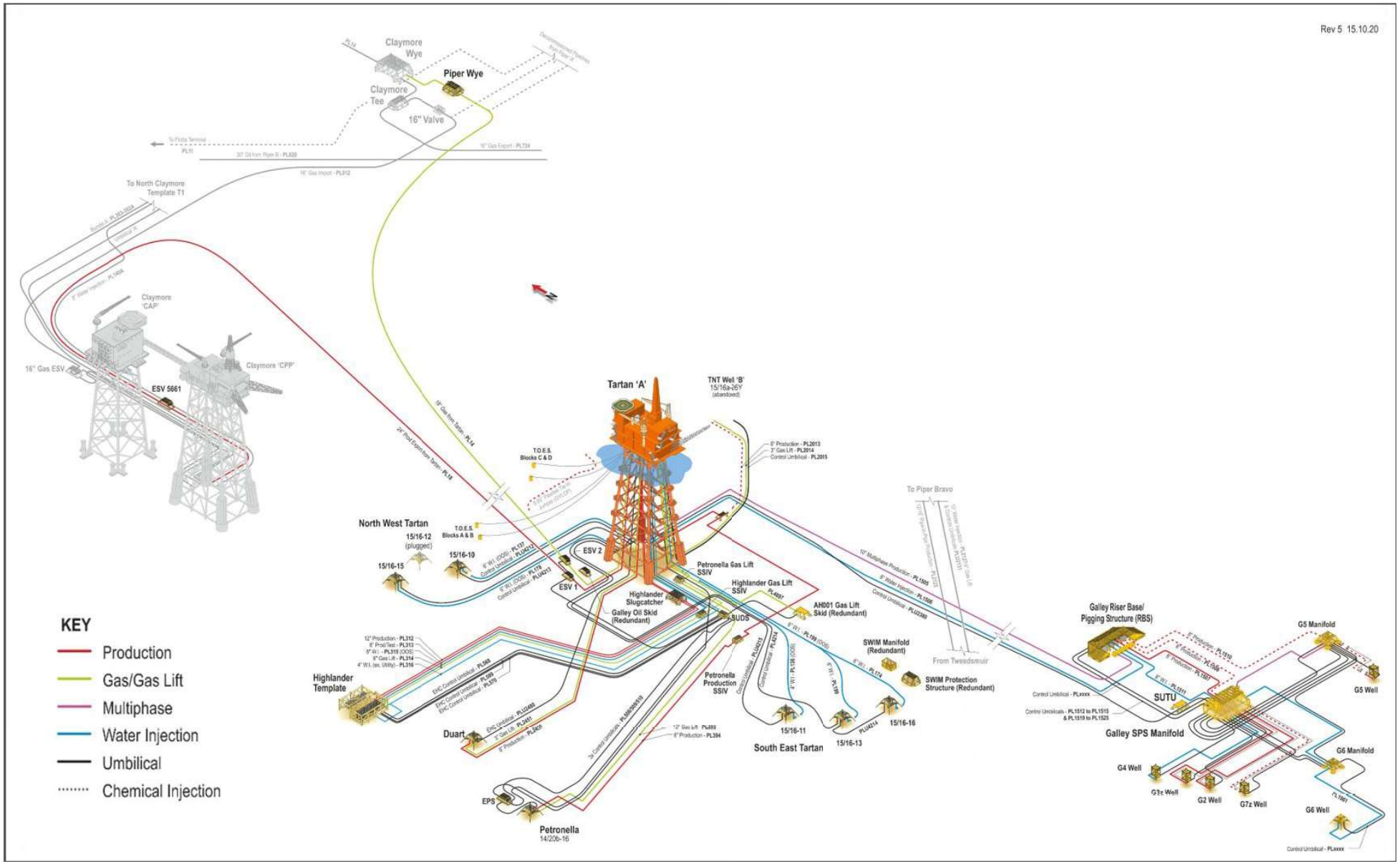


Figure 3-1: Infrastructure associated with the Tartan Development Area.

3.2 Proposed Activities

3.2.1 Schedule

Repsol Sinopec Resources UK Limited propose to progress P&A and decommissioning activities in line with the indicative schedule shown in Figure 3-2.

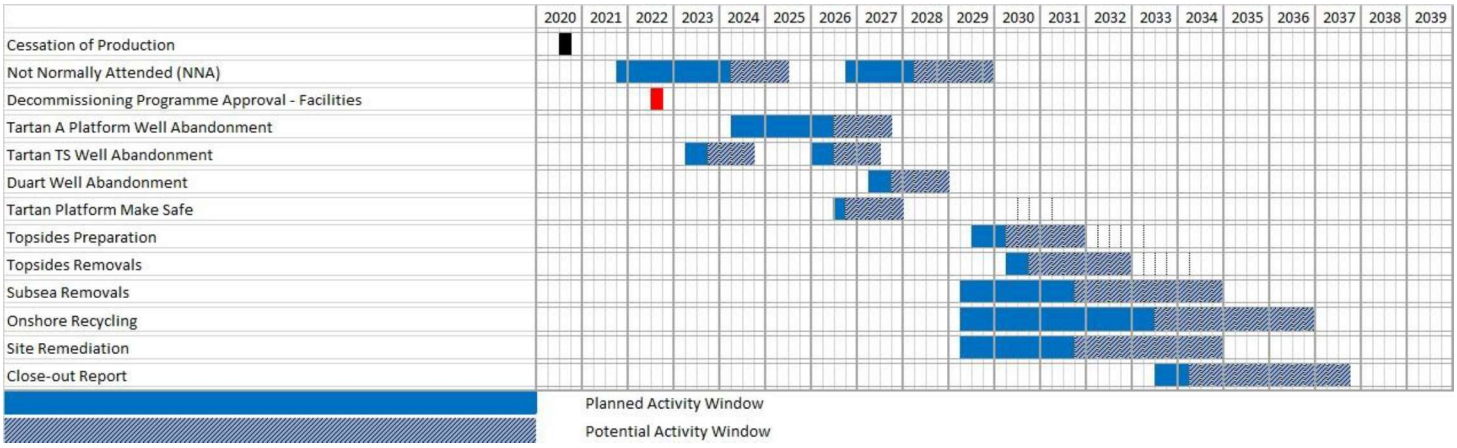


Figure 3-2: Indicative schedule for the Tartan Development Area decommissioning activities.

3.2.2 Preparatory Works

Prior to commencing the offshore decommissioning activities each of the hydrocarbon pipelines (gas and fluids) will be flushed and cleaned to reduce hydrocarbon content to ALARP. All pipelines will be filled either with plain seawater or inhibited seawater and where practicable to do so, umbilical cores will be cleaned and flushed. Contents of each of the lines and umbilical cores at the time of decommissioning are as shown in Table 3-1.

Prior to disconnection / recovery activities, chemical and oil discharge permit applications will be submitted to OPRED seeking consent for the discharge of any residual pipeline and umbilical contents.

3.2.3 Plug and Abandonment

Each of the wells associated with the Tartan Development Area will be plugged and abandoned in accordance with Oil & Gas UK (OGUK) well decommissioning guidelines (OGUK, June 2018) and Repsol Sinopec Resources UK Limited standards.

3.2.4 Decommissioning Activities

This section provides an overview of the pipelines and umbilicals, subsea structures and the stabilisation features associated with the Tartan Development Area and their proposed fate i.e. decommissioned *in situ* or returned to shore.

3.2.4.1 Pipelines and Umbilicals

Table 3-1 summarises the pipelines and umbilicals associated with the Tartan Development Area (information is taken from Table 2.3 of the three draft DP submissions). The table shows which pipelines/umbilicals were surface laid and which were trenched and buried.

A CA was carried out to determine the optimal approach to decommissioning the pipelines and umbilicals. The CA approach and results are detailed in the CA report (Repsol Sinopec Resources UK Limited, 2020b) and summarised in Chapter 4 of this report.

In line with the results of the CA, Table 3-2 describes the fate of the pipelines and umbilicals at the time of decommissioning. In summary:

- All exposed surface laid pipelines and umbilicals will be recovered to shore (CA Group B).
- Base case for trenched lines where neither the Depth of Cover (DOC) or the Depth of Lowering (DOL) exceed 0.6 m will be to recover the lines to shore (CA Group D2). However, the CA process also identified trench and bury as a feasible option, such that it will be carried through to the Contracts and Procurement (C&P) tendering phase.
- Trenched lines where the DOL is > 0.6 m will be decommissioned *in situ* (CA Groups A, C, D1 and F) with remediation of exposed sections. Preference will be given to trench and bury in line with the results of the CA, however cut and lift and rock cover of the exposed sections were also identified as feasible options, such that these options will also be carried through to the C&P tendering phase.
- Base case for rock covered surface laid lines will be to recover the lines to shore (Group E). However, the CA process also identified three remediate *in situ* options as feasible, such that they will be carried through to the C&P tendering phase.

It should be noted that Repsol Sinopec Resources UK Limited will engage with OPRED if the C&P tendering phase results in the base case options being less favourable when considered in terms of a total campaign strategy.

All risers and surface laid spools and umbilical jumpers will also be recovered to shore.

Table 3-2 provides summary details of the exposed lengths associated with the trenched and buried pipelines and umbilicals to be decommissioned *in situ*. The CA process identified that the following remediate *in situ* options are acceptable for the exposed pipeline and umbilical ends:

- Trench and bury;
- Cut and recover; or
- Addition of rock cover.

All three options will be carried through the C&P tendering phase. Preference will be given to trench and bury or to cut and recovery. Should the option to rock cover the exposed sections be considered more favourable during the C&P tendering phase, Repsol Sinopec Resources UK Limited will engage with OPRED before a decision is taken on the overall strategy.

Table 3-1: Pipelines and umbilicals associated with the Tartan Development Area.

DESCRIPTION	PIPELINE NUMBER	LENGTH (KM)	DESCRIPTION OF COMPONENT PARTS	PRODUCT CONVEYED	FROM – TO END-POINTS	BURIAL STATUS	CURRENT CONTENT
Oil export and gas export/import pipelines							
Oil export pipeline	PL18	27.085	Carbon steel / plastic coatings / concrete coating	Oil	Tartan A platform to the Claymore A platform	Trenched / natural backfill	Treated seawater
Electric and hydraulic umbilical	PLU5048	0.3	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids	SUDS to Tartan Oil Export Subsea Isolation valve (SSIV) (ESV1)	Surface laid	Pelagic 100
Electric and hydraulic umbilical	PLU5049	0.105	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids	Claymore Production Platform to Claymore SSIV (ESV5661)	Surface laid	Pelagic 100
Gas export/import pipeline	PL14	17.171	Carbon steel / plastic coatings / concrete coating	Gas	Claymore wye piece to the Tartan A platform	Trenched / natural backfill	Seawater
Electric and hydraulic umbilical	PLU5050	0.090	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids	Tartan Oil Export SSIV (ESV1) to Tartan Gas Import SSIV (ESV2)	Surface laid	Pelagic 100
Lines associated with the TNT, TNW and TSE subsea tie-backs							
Production pipeline	PL2013	3.603	Carbon steel / plastic coatings	Oil	Previous TNT tree location to dis-connection at ex.TNT tee piece	Trenched / backfilled	Treated seawater
Gas lift pipeline	PL2014	3.569	Carbon steel / plastic coatings	Lift gas	Tartan A platform to previous TNT tree location	Trenched / backfilled	Treated seawater
EHC umbilical	PLU2015	3.600	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	Tartan A platform to previous TNT tree location	Trenched / backfilled	Hydraulic cores filled with Pelagic 100/ Chemical cores filled with treated seawater
Water injection pipeline	PL137	3.795	Carbon steel / plastic coatings	Injection water	Tartan A platform to TNW well 15/16-10 (TS10)	Surface laid	Water injection fluids
Water injection pipeline	PL178	3.793	Carbon steel / plastic coatings	Injection water	Tartan A platform to TNW well 15/16-15 (TS15)	Surface laid	Water injection fluids
Hydraulic umbilical	PLU4212	3.600	Carbon steel / plastic & misc. coatings	Hydraulic fluids	Tartan A platform to TNW well 15/16-10 (TS10)	Surface laid	Pelagic 100
Hydraulic umbilical	PLU4213	3.600	Carbon steel / plastic & misc. coatings	Hydraulic fluids	Tartan A Platform to TNW well 15/16-15 (TS15)	Surface laid	Pelagic 100
Water injection pipeline	PL138	3.540	Carbon steel / plastic coatings	Injection water	Blinded Big Inch Connecter (adjacent Petronella gas lift SSIV) to sensor spool at TSE	Surface laid	Water injection fluids

DESCRIPTION	PIPELINE NUMBER	LENGTH (KM)	DESCRIPTION OF COMPONENT PARTS	PRODUCT CONVEYED	FROM – TO END-POINTS	BURIAL STATUS	CURRENT CONTENT
					well 15/16-11 (TS11)		
Water injection pipeline	PL199	3.540	Carbon steel / plastic coatings	Injection water	Tartan A platform to TSE well 15/16-13 (TS13)	Surface laid	Water injection fluids
Water injection jumper	PL174	0.016	Carbon steel / plastic & misc. coatings	Injection water	Wye piece to sensor spool at TSE well 15/16-16 (TS16)	Surface laid	Water injection fluids
Umbilical	PLU4215	3.530	Carbon steel / plastic & misc. coatings	Hydraulic fluids / chemicals	Tartan A platform to TSE well 15/16-11 (TS11)	Surface laid	Hydraulic cores filled with Pelagic 100 / chemical cores filled with treated seawater
Hydraulic umbilical	PLU4214	3.580	Carbon steel / plastic & misc. coatings	Hydraulic fluids	Tartan A platform to TSE well 15/16-13 (TS13)	Surface laid	Pelagic 100
Highlander							
Production pipeline	PL312	13.567	Carbon steel / plastic coatings	Oil	Highlander template to Tartan A platform	Trenched / natural backfill	Seawater
Test / production pipeline	PL313	13.571	Carbon steel / plastic coatings	Oil	Highlander template to Tartan A platform	Trenched / natural backfill	Seawater
Gas lift pipeline	PL314	13.290	Carbon steel / plastic coatings	Lift Gas	Petronella gas lift SSIV to Highlander template	Trenched / natural backfill	Seawater
Water injection pipeline	PL315	13.610	Carbon steel / plastic coatings	Injection water	Tartan A platform to Highlander template	Trenched / natural backfill	Water injection fluids
Water injection pipeline	PL316	13.290	Carbon steel / plastic coatings	Injection water	Tartan A platform to Highlander template (via tee piece)	Trenched / natural backfill	Water injection fluids
Hydraulic & chemical umbilical	PL570	12.950	Carbon steel / plastic & misc. coatings	Hydraulic fluids / chemicals	Tartan A platform to Highlander template	Trenched / natural backfill	Hydraulic cores filled with Pelagic 100 / chemical cores filled with wax & corrosion inhibitors
Electrical umbilical	PL568	12.950	Carbon steel / copper / plastic & misc. coatings	N/A	Tartan A platform to Highlander template	Trenched / natural backfill	N/A
Chemical umbilical	PL569	12.950	Carbon steel / plastic & misc. coatings	Chemicals	Subsea Umbilical Distribution System (SUDS) to Highlander template	Trenched / natural backfill	Wax & corrosion inhibitors
Hydraulic & chemical umbilical	PL324-PL326	0.540	Carbon steel / plastic & misc. coatings	Hydraulic fluids / chemicals	Tartan A platform to Highlander slugcatcher	Surface laid	Hydraulic cores filled with Pelagic 100 / chemical cores filled with wax & corrosion inhibitors

DESCRIPTION	PIPELINE NUMBER	LENGTH (KM)	DESCRIPTION OF COMPONENT PARTS	PRODUCT CONVEYED	FROM – TO END-POINTS	BURIAL STATUS	CURRENT CONTENT
Hydraulic & electric umbilical	PLU5052	0.050	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids	SUDS to Highlander gas lift SSIV	Surface laid	Hydraulic cores filled with Pelagic 100
Electrical umbilical - acoustic telemetry cable	PLU5053	0.230	Carbon steel / plastic & misc. coatings	N/A	Tartan Al Platform to monitoring unit on Highlander protection/test pipeline PL313	Surface laid	N/A
Petronella							
Production pipeline	PL394	10.924	Carbon steel / plastic coatings	Oil	Well 14/20b-16 (PS16) to Tartan A platform	Trenched / natural backfill	Treated seawater
Gas lift pipeline	PL393	10.877	Carbon steel / plastic coatings	Lift Gas	Tartan A platform to well 14/20b-16 (PS16)	Surface laid	Treated seawater
Electrical umbilical	PL510	11.300	Carbon steel / copper / plastic & misc. coatings	N/A	Tartan A platform to Petronella Early Production Skid (EPS)	Trenched / natural backfill	N/A
Hydraulic & chemical umbilical	PL509	11.030	Carbon steel / plastic & misc. coatings	Hydraulic fluids / chemicals	SUDS to Petronella EPS	Trenched / natural backfill	Hydraulic cores filled with Pelagic 100 / chemical cores filled with wax & corrosion inhibitors
Hydraulic & chemical umbilical	PL508	11.300	Carbon steel / plastic & misc. coatings	Hydraulic fluids / chemicals	SUDS to Petronella EPS	Trenched / natural backfill	Hydraulic cores filled with Pelagic 100 / chemical cores filled with wax & corrosion inhibitors
Chemical umbilical	PL395-PL399	0.400	Carbon steel / plastic & misc. coatings	Chemicals	Tartan A platform to SUDS	Surface laid	Seawater
Chemical umbilical	PL400	0.200	Carbon steel / plastic & misc. coatings	Chemicals	SUDS to Tartan A platform	Surface laid	Corrosion inhibitor
Galley							
Production pipeline	PL1505	23.591	Carbon steel / plastic coatings	Oil	Riser Base Structure (RBS) to Tartan A platform	Trenched & buried with spot rock cover	Treated seawater
Water injection pipeline	PL1506	22.275	Carbon steel / plastic coatings	Injection water	Tartan A platform riser to RBS	KP0-KP7.48 surface laid in shallow trench KP7.48-KP23.55 trenched & buried	Water injection fluids
Redundant water injection pipeline	PL1506A	7.440	Carbon steel / plastic coatings	Injection water	Adjacent to Galley pipeline end at Tartan A Platform to	Trenched & buried	Water injection fluids with dye sticks

DESCRIPTION	PIPELINE NUMBER	LENGTH (KM)	DESCRIPTION OF COMPONENT PARTS	PRODUCT CONVEYED	FROM – TO END-POINTS	BURIAL STATUS	CURRENT CONTENT
					adjacent Pipeline Repair Tie-in		
Production pipeline	PL1507	2.239	Carbon steel / plastic coatings	Oil	Subsea Production Skid (SPS) to RBS	Trenched / natural backfill	Treated seawater
Production pipeline	PL1508	2.021	Carbon steel / plastic coatings	Oil	SPS to RBS	Trenched / natural backfill	Treated seawater with dye sticks
Production pipeline	PL1510	2.011	Carbon steel / plastic coatings	Oil	M5 Manifold to RBS	Trenched / natural backfill	Treated seawater with dye sticks
Water injection pipeline	PL1511	2.003	Carbon steel / plastic coatings	Injection water	RBS to SPS	Trenched / natural backfill	Water injection fluids
Production jumper	PL1511-J-G1/G7z	0.050	Carbon steel / plastic & misc. coatings	Oil	G1/G7z Tree to SPS (Disconnected both ends)	Surface laid	Treated seawater with dye sticks
Production spool-piece	PL1511-J-G2	0.054	Carbon steel / plastic coatings	Oil	G2 Tree to SPS	Surface laid	Treated seawater with dye sticks
Water injection jumper	PL1511-J-G4	0.050	Carbon steel / plastic & misc. coatings	Injection water	SPS to G4 Tree	Surface laid	Water injection fluids
Production jumper (captured across two rows to show how one section still contains oil due to blockage)	PL1510-J-G5	0.031	Carbon steel / plastic & misc. coatings	Oil	G5Tree to M5 Manifold (Disconnected both ends)	Surface laid	Treated seawater dye sticks
		0.045			M5 manifold to SPS manifold		Oil (blocked)
Water Injection Pipeline	PL1961	4.608	Carbon steel / plastic & misc. coatings	Injection water	SPS to G6 Tree	Surface laid with continuous rock cover	Injection water
AH001 gas jumper*	PL4697 (Ex. PL514)	0.430	Carbon steel / plastic & misc. coatings	Gas	Tartan A platform to AH001 gas skid	Surface laid	Treated seawater with dye sticks
EHC umbilical	PLU2380	26.000	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	Tartan A Platform to SPS	Trenched & buried with spot rock cover	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
Galley infield hydraulic & chemical umbilical	PL1512 to 1515 & PL1519 to 1525	1.900	Carbon steel / plastic & misc. coatings	Hydraulic fluids / chemicals	RBS to SPS	Trenched / natural backfill	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
Galley infield electrical umbilical	PLU5056	1.900	Carbon steel / copper / plastic & misc. coatings	N/A	RBS to SPS	Trenched / natural backfill	N/A
EHC umbilical	PL4053, PLU4054 & PL1518	0.090	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	SPS to G1/G7z Tree (Disconnected both ends)	Surface laid	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater

DESCRIPTION	PIPELINE NUMBER	LENGTH (KM)	DESCRIPTION OF COMPONENT PARTS	PRODUCT CONVEYED	FROM – TO END-POINTS	BURIAL STATUS	CURRENT CONTENT
EHC umbilical	PL1517	0.060	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	SPS to G2 Tree	Surface laid	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
EHC umbilical	PL4051, PLU4052 & PL1516	0.066	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	SPS to G3 Tree	Surface laid	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
Electric & hydraulic umbilical	PLU5057	0.040	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids	SPS to G4 Tree	Surface laid	Hydraulic cores filled with Pelagic 100
EHC umbilical	PLU2380-J-G5	0.075	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	SPS to G5 Manifold (disconnected both ends)	Surface laid	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
EHC umbilical	PL4049 & PL4050	0.045	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	G5 manifold to G5 tree (disconnected both ends)	Surface laid	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
Electric umbilical	PLU5058	0.100	Carbon steel / copper / plastic & misc. coatings	N/A	SPS to G6 manifold	Surface laid	N/A
Hydraulic umbilical	PLU5059	0.110	Carbon steel / plastic & misc. coatings	Hydraulic fluids	G5 manifold to G6 manifold	Surface laid	Hydraulic cores filled with Pelagic 100
EHC umbilical	PLU5060	4.500	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	G6 Manifold to G6 Tree	Surface laid with continuous rock cover	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
AH001 hydraulic umbilical*	PLU5051	0.200	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	Tartan Alpha Platform to SUDS	Surface laid	Hydraulic cores filled with Pelagic 100
Duart							
Production pipeline	PL2450	8.05	Carbon steel / plastic coatings	Oil	Duart well to the Tartan A platform	Trenched / backfilled	Treated seawater
Gas lift pipeline	PL2451	8.043	Carbon steel / plastic coatings	Lift gas	Tartan A platform to the Duart well	Trenched / backfilled	Treated seawater

DESCRIPTION	PIPELINE NUMBER	LENGTH (KM)	DESCRIPTION OF COMPONENT PARTS	PRODUCT CONVEYED	FROM – TO END-POINTS	BURIAL STATUS	CURRENT CONTENT
EHC umbilical	PLU2480	8.400	Carbon steel / copper / plastic & misc. coatings	Hydraulic fluids / chemicals	Tartan A platform to the Duart well	Trenched / backfilled	Hydraulic cores filled with Pelagic 100/ chemical cores filled with treated seawater
*The AH001 gas jumper and AH001 hydraulic umbilical were previously associated with the AH001 floating production facility previously deployed in the Rubie and Renee Fields. The AH001 facility has been taken off station and the AH001 gas jumper and AH001 hydraulic umbilical were part of an earlier configuration of the Galley Field (when Galley exported gas), and as such these lines have been included in the Galley DP.							

Table 3-2: Proposed decommissioning methods for the Tartan Development Area pipelines and umbilicals.

PIPELINE/UMBILICAL[1]	PROPOSED DECOMMISSIONING METHOD[2]
CA Group A PL18 oil export line from KP0 to KP15.6 (15,600 m) PL14 gas export/import line (17,171 m)	To be decommissioned *in situ*. This group comprises concrete coated rigid pipelines laid in a trench and left to backfill naturally. Average DOL and average DOC are both > 0.6 m. Total length of lines in this group is *c*. 32.771 km of which *c*. 0.471 km comprises risers/surface laid spools. Of the remaining *c*. 32.3 km of lines, *c*. 0.071 km are exposed. Risers and spools will be recovered. Trenched and buried lines will be decommissioned *in situ* and the exposed sections will be remediated with preference given to trench and bury or cut and recover. If following the C&P tendering process, the addition of rock cover is selected as the remediate *in situ* option, *c*. 978 te of rock would be required. Any intermittent rock along the lines will be decommissioned *in situ* (detailed in Section 3.2.4.3).
CA Group B TNW - PL137 (3,795 m) and PL178 (3,793 m) TNW - PLU4212 (3,600 m) and PLU4213 (3,600 m) TSE - PL138 (3,540 m) and PL199 (3,540 m) TSE - PLU4214 (3,530 m) and PLU4215 (3,580 m) Galley – PL1506 part 1 (7,481 m)	To be recovered to shore. This group comprises surface laid rigid and flexible pipelines and umbilicals. Total length of lines in this group is *c*. 36.259 km of which *c*. 3.368 km comprises risers and/or surface laid spools and umbilical jumpers. Full length of the lines (including risers, spools, umbilical jumpers and main line lengths) will be recovered. Any intermittent rock along the lines will be decommissioned *in situ* (detailed in Section 3.2.4.3).
CA Group C TNT- PL2013 (3,603 m), PL2014 (3,569 m) and PL2015 (3,600 m) Highlander - PL316 (13,290 m) Galley - PL1505 (23,591 m), PL1506 A (7,440 m) PL1506 part 2 (14,794 m) and PLU2380 (26,000) Petronella - PL508 (11,300 m), PL509 (11,030 m), PL510 (11,300 m), PL393 (10,877 m), and PL394 (10,924 m) Duart PL2450 (8,050 m), PL2451 (8,043 m) and PLU2480 (8,400 m)	To be decommissioned *in situ*. This group comprises trenched and buried rigid pipelines and umbilicals. Average DOL and average DOC are both > 0.6 m. Total length of lines in this group is *c*. 188.771 km of which *c*. 4.688 km comprises risers and/or surface laid spools and umbilical jumpers. Of the remaining *c*. 184.083 km m of lines, *c*. 2.386 km are exposed. Risers spools and umbilical jumpers will be recovered. Trenched and buried lines will be decommissioned *in situ* and the exposed sections will be remediated with preference given to trench and bury or cut and recover. If following the C&P tendering process, the addition of rock cover is selected as the remediate *in situ* option, c. 10,922 te of rock would be required. Any intermittent rock along the lines will be decommissioned *in situ* (detailed in Section 3.2.4.3).
CA Group D1 Galley – PL1507 (2,239 m), PL1508 (2,021 m), PL1510 (2,011 m) PL1511 (2,003 m), and EHC umbilical PL1512 to PL1515 and PL1519 to PL1525 (1,900 m) and	To be decommissioned *in situ*. This group comprises trenched and shallow buried naturally backfilled rigid pipelines and umbilicals. Average DOC is < 0.6 m however average DOL is > 0.6 m. Total length of lines in this group is *c*. 12,074 km of which *c*. 0.585 km comprises risers and/or surface laid spools and

PIPELINE/UMBILICAL[1]	PROPOSED DECOMMISSIONING METHOD[2]
PLU5056 (1,900 m)	umbilical jumpers. Of the remaining *c*. 11.489 km m of lines, *c*. 0.621 km are exposed. Risers, spools and umbilical jumpers will be recovered. Trenched and buried lines will be decommissioned *in situ* and the exposed sections will be remediated with preference given to trench and bury or cut and recover. If following the C&P process, the addition of rock cover is selected as the remediate *in situ* option, *c*. 3,975 te of rock would be required to remediate the exposed sections. Any intermittent rock along the lines which will be decommissioned *in situ* (detailed in Section 3.2.4.3).
CA Group D2 Highlander - PL312 (13,567 m), PL313 (13,571 m), PL314 (13,290 m), PL315 (13,610 m), PL568 (12,950 m) PL569 (12,950 m) and PL570 (12,950 m)	Base case is full recovery, however given the results of the CA process, the option to trench and bury will also be taken through to the C&P process. This group comprises shallow buried naturally backfilled (DOC < 0.6 m) and shallow trenched (DOL < 0.6 m) rigid pipelines and umbilicals. Given that DOC and DOL are both < 0.6 m, the full line lengths were considered exposed. Total length of lines in this group is *c*. 79.938 km of which *c*. 2.408 km comprises risers and/or surface laid spools. Base case is that the full length of the lines (including risers, spools, umbilical jumpers and main line lengths) will be recovered. However, the CA process considered trench and bury to also be a feasible option, in which case the risers, spools and umbilical jumpers will be recovered, and the remaining 77.530 km of pipelines will be trenched and buried. Any intermittent rock along the lines which will be decommissioned *in situ* (detailed in Section 3.2.4.3 Table 3-4).
CA Group E Galley - PL1961 (4,608 m) and PLU5060 (4,500 m)	Base case is full recovery, however given the results of the CA process, the three leave *in situ* options will also be carried through the C&P tendering process. The two lines in this group are surface laid and protected with a single rock berm along their full lengths. Total length of pipelines and umbilicals in this group is *c*. 9.108 km of which *c*. 0.108 km comprises surface laid spools and umbilical jumpers. Base case is that the full length of the lines (including spools, umbilical jumpers and main line lengths) will be recovered. However, the CA process considered that decommissioning the lines *in situ* and remediating the exposed sections by trench and bury, cut and recover or adding rock are also feasible options, in which case the risers, spools and umbilical jumpers will be recovered, and the remaining 9.0 km will be decommissioned *in situ*. Of the 9 km of main line lengths, 0.524 km of lines are exposed. If following the C&P tendering process, the addition of rock cover is selected as the remediate *in situ* option, *c*. 2,820 te of rock would be required to remediate the exposed sections.
CA Group F PL18 oil export line from KP 15.6 to KP 26.56	To be decommissioned *in situ*. This group comprises the concrete coated rigid oil export line with an average DOC < 0.6 m, and average DOL > 0.6 m. Total length of pipeline in this group is *c*. 10.96 km of which *c*. 0.002 km comprises surface laid spools.

PIPELINE/UMBILICAL[1]	PROPOSED DECOMMISSIONING METHOD[2]
	Of the remaining 10.958 km of pipeline, 1.487 km is exposed. The spool will be recovered, and the trenched and buried line will be decommissioned *in situ* and the exposed sections will be remediated with preference given to trench and bury or cut and recover. If following the C&P tendering process, the addition of rock cover is selected as the remediate *in situ* option, c. 22,396 te of rock would be required. Any intermittent rock along the line will be decommissioned *in situ* (detailed in Section 3.2.4.3 Table 3-4).
Surface laid umbilical jumpers and spools, not associated with the pipelines and umbilicals identified above. Tartan oil export and gas export/import: Three umbilical jumpers ranging in length from 0.09 m to 0.3 m. Total combined length of 495 m. Highlander: Three umbilical jumpers, lengths ranging from 0.05 m to 0.54 m. Total combined length of 820 m. Petronella: Four umbilical jumpers, lengths ranging from 0.04 m to 0.4 m. total combined length 740 m. Galley: Total of 15 spools/umbilical jumpers, lengths ranged from 0.03 m to 0.43 m. Total combined length of 1,446 m.	To be recovered to shore. Total length of spools and umbilical jumpers in this group is 3.501 km.

[1] Line lengths presented include risers and spools/umbilicals where applicable such that lengths presented align with lengths presented in the DPs.

[2] In all instances where more than one decommissioning option was considered feasible following the CA process, preference will be given to the most preferred option. If following the C&P tendering phase of the project, one of the other feasible options is preferable, Repsol Sinopec Resources UK Limited will engage with OPRED before a final decision is taken on the overall strategy.

Note: should any rock be added to mitigate exposed ends, this rock will be laid in an over trawlable profile.

3.2.4.2 Subsea Installations

Table 3-3 summarises the subsea installations associated with each of the Tartan Development Area subsea DP submissions. It is proposed that all the structures identified will be recovered to shore.

Table 3-3: Subsea Installations associated with the Tartan Development Area.

Description	Number	Dimensions	Comments
Structures associated with the oil and gas export/import pipelines and the TNT, TNW and TSE tie-backs			
Wellhead Protection Structure (WHPS)	6 Various dimensions	Dimensions of largest WHPS: 18.0 m (L) x 18.0 m (W) x 7.8 m (H)	Gravity based
Anode Skids	6	12.2m (L) x 2.4m (W) x 1.0m (H)	Gravity based
Protection structure and manifold skid associated with redundant Subsea Water Injection Manifold (SWIM)	2	Protect structure: 6.5 m (L) x 5.9 m (W) x 2.3 m (H) Skid: 3.8 m (L) x 3.5 m (W) x 1.9 m (H)	Gravity based
Gas lift tee piece Wye piece Sensory spool skid	3 Various dimensions	Dimensions of structure with largest footprint: 2.4 m (L) x 1.4 m (W) x 0.4 m (H)	Gravity based
SSIV	3 Various dimensions	Dimensions of SSIV with largest footprint: 12.4 m (L) x 12.2 m (W) x 4.2 m (H)	Gravity based
SSIV protection frames	3 Various dimensions	Dimensions of protection frame with largest footprint: 16.2 m (L) x 14 m (W) x 5 m (H)	Gravity based
Protection cages on tie-in spool pieces	3 Various dimensions	Dimensions of largest protection cage: 19.2 m (L) x 10.2 m (W) x 3.2 m (H)	Gravity based
Piper Wye on gas export/import	1	21.7 m (L) x 15.3 m (W) x 4.1 m (H)	Gravity based
TOES Blocks	4	2 m (L) x 2 m (W) x 2 m (H)	Gravity based
Highlander			
Highlander drilling template	1	39.1 m (L) x 19.8 m (W) x 12.7 m (H)	Piled structure
Highlander WHPS (template extension)	1	32.9 m (L) x 16.7 m (W) x 13.5 m (H)	Piled structure
Highlander slug catcher	1	26.6 m (L) x 15.6 m (W) x 13.5 m (H)	Piled structure
Subsea Umbilical Distribution System (SUDS)	1	9.0 m (L) x 4.0 m (W) x 4.0 m (H)	Gravity based
Highlander gas lift SSIV	1	2.0 m (L) x 2.0 m (W) x 1.5 m (H)	Gravity based
Petronella			
WHPS	1	16.5 m (L) x 16.5 m (W) x 5 m (H)	Gravity based
Production Tee Piece	1	5.7 m (L) x 1.1 m (W) x 0.5 m (H)	Gravity based
SSIV	2 Various dimensions	Dimensions of SSIV with largest footprint: 5.7 m (L) x 2.3 m (W) x 1.5 m (H)	Gravity based
Petronella Early Production Skid	1	4.0 m (L) x 4.3 m (W) x 3.1 m (H)	Gravity based

Description	Number	Dimensions	Comments
(EPS)			
Galley			
Galley WHPS	6	9.6 m (L) x 8.7 m (W) x 5.4 m (H)	Secured to seabed by well conductors
Riser Base / Pigging Structure (RBS)	1	13.4 m (L) x 6.4 m (W) x 2.6 m (H)	Gravity based
Subsea Production Skid (SPS) manifold	1	18 m (L) x 10.4 m (W) x 5.0 m (H)	Piled structure
G5 and G6 manifolds	2	Both structures have same dimensions: 9.6 m (L) x 9.6 m (W) x 7.4 m (H)	Piled structures
Anode Skid Redundant Galley Oil Skid AH001 Gas Skid	3 Various dimensions	Dimensions of skid with largest footprint: 10 m (L) x 4.5 m (W) x 3 m (H)	Gravity based
Duart			
Duart WHPS	1	9.2 m (L) x 8.7 m (W) x 5.4 m (H)	Secured to seabed by well conductor
Chemical injection valve support skid	1	0.7m (L) x 0.4m (W) x 0.6m (H)	Gravity based

3.2.4.3 Stabilisation Features

Stabilisation features associated with the Tartan Development Area are summarised in Table 3-4.

Table 3-4 : Summary of stabilisation features associated with the Tartan Development Area.

Stabilisation Feature	No.	Weight (Te)	Location	Comments/Status
Stabilisation features associated with the oil and gas export/import pipelines and the TNT, TNW and TSE tie-backs				
Grout skirt along each side of the piper wye structure 2 sides: 15.7 m (L) x 0.75 m (W) 2 sides: 13.1 m (L) x 0.75 m (W)	1	110.25	Piper wye.	Grout skirt will be recovered.
Concrete mattresses - exposed 6 m (L) x 3 m (W) x 0.15 m (H)	206	968.20	Various locations across the Tartan Field and on the export lines.	All mattresses are exposed, and it is expected that all will be recovered.
Grout bags - exposed (25 kg bags)	1,153	29	Various locations across the Tartan field and on export lines.	All grout bags are exposed and will be recovered at the time of decommissioning.
Timber mud mats – exposed 7.5 m (L) x 2 m (W) x 0.3 m (H)	9	17.1	Protection structures at the Tartan A end of the oil export and gas export/import lines.	All timber mud mats are exposed, and it is expected that all will be recovered.
Concrete protection units – exposed 3.3 m (L) x 4.9 m (W) x 2.1 m (H) (53 of) 3.3 m (L) x 5.8 m (W) x 1.5 m (H) (12 of)	65	776.5	Protection structures on Claymore end of the oil export line.	All concrete protection units are exposed, and it is expected that all will be recovered.
Rock cover	N/A	14,263	Intermittent deposits on the gas import/export line at approaches to the Tartan A platform and the Piper wye	Rock cover will be decommissioned *in situ*.

Stabilisation Feature	No.	Weight (Te)	Location	Comments/Status
			structure.	
Highlander				
Grout bags - exposed (25 kg bags)	1,600	40	Various locations across the Highlander lines.	All grout bags are exposed and will be recovered at the time of decommissioning.
Rock cover	N/A	5,266	Intermittent deposits on the Highlander lines	Rock cover will be decommissioned *in situ*.
Petronella				
Concrete mattresses - exposed	124	587.6	At the Tartan A platform end of the Petronella lines	All mattresses are exposed, and it is expected that all will be recovered.
Grout bags - exposed (25 kg bags)	4,350	108.8	At Tartan A platform and at various locations across the Petronella lines.	All grout bags are exposed and will be recovered at the time of decommissioning.
Rock cover	N/A	261	Intermittent deposits on the Petronella lines.	Rock cover will be decommissioned *in situ*.
Galley				
Concrete mattresses - exposed 6 m (L) x 3 m (W) x 0.3 m (H) (6 of) 6 m (L) x 3 m (W) x 0.15 m (H) (302 of) 5 m (L) x 2 m (W) x 0.15 m (H) (342 of)	656	2,647.6	At the Tartan A platform, the RBS and the SPS locations. Also located intermittently along the following lines: PL1505, PL1506, and PLU2380.	All mattresses are exposed, and it is expected that all will be recovered.
Grout bags - exposed (25 kg bags)	11,730	293.3	Around perimeter of Galley RBS around perimeter of WHPS at the G6w well. Also located intermittently along the following lines: PL1505, PL1506, and PLU2380.	All grout bags are exposed and will be recovered at the time of decommissioning.
Rock cover	N/A	85,706	At the RBS location and adjacent to the G6 well. Also located intermittently along the following lines: PL1505, PL1506, and PLU2380.	Rock cover will be decommissioned *in situ*.
Duart				
Concrete mattresses - exposed 6 m (L) x 3 m (W) x 0.3 m (H) (11 of) 6 m (L) x 3 m (W) x 0.15 m (H) (111 of)	122	613	At each end of the Duart lines i.e. at Duart well and in vicinity of Tartan A platform	These mattresses are exposed, and it is expected that all will be recovered.
Concrete mattresses - buried 6 m (L) x 3 m (W) x 0.3 m (H)	22	182.6	At crossings with Highlander lines	Buried under rock and will be decommissioned *in situ.*
Grout bags – exposed (25 kg bags)	200	5	At each end of the Duart lines i.e. at Duart well and at Tartan A platform end.	All grout bags are exposed and will be recovered at the time of decommissioning.
Rock cover	N/A	75,376	At Highlander crossings, intermittently along the Duart production line and at the	Rock cover will be decommissioned *in situ*.

Stabilisation Feature	No.	Weight (Te)	Location	Comments/Status
			Duart well and Tartan A locations	

Flexible Concrete Mattresses

The exposed flexible concrete mattresses (total number 1,108) will be recovered to a vessel either using a grab or will be lifted onto recovery frames (steel cargo nets or speed loaders) while subsea, and then lifted to the surface via vessel crane. Should any exposed individual flexible concrete mattresses be found to be severely degraded and at risk of disintegrating on removal, baskets may be deployed on the seabed for filling by Remotely Operate Vehicles (ROVs) or divers. If during the offshore campaign it is found that any of the flexible mattresses cannot be recovered, Repsol Sinopec Resources UK Limited will consult with OPRED before any alternative option is executed. Note that the Scope of Work issued to contractors will highlight the risks associated with mattress removal and will request that appropriate mitigation measures are available. The 22 mattresses associated with the Duart-Highlander crossings are buried beneath rock cover and will be decommissioned *in situ*.

Grout Bags (25 kg)

The 25 kg grout bags (total number of bags: 18,673) comprise sacks filled with cement grout. Where technically feasible to do so, Repsol Sinopec Resources UK Limited plan to recover all the grout bags. It is likely these will be placed into baskets for removal to the surface. If during the offshore campaign it is found that any of these 25 kg grout bags cannot be recovered, Repsol Sinopec Resources UK Limited will consult with OPRED before any alternative option is executed.

Rockcover

All existing rockcover (estimated to be 180,872 te) will be decommissioned *in situ*. Surveys to monitor the burial status of the pipelines and umbilical and associated protection materials are discussed in Section 3.3.

Other Stabilisation Features

The timber mats are expected to be lifted by grab through the water column.

It is thought that the concrete protection structures are too large for a grab. It is therefore expected that a rigging system will be used to recovered these structures, passing the rigging under the structures to minimise chances of them breaking up when lifted.

The grout skirt associated with the piper wye structure is expected to be broken up using diver/ROV operated jack hammers and recovered using baskets.

3.2.4.4 Third Party Crossings

There are a number of crossings associated with the Tartan Development Area lines – these include crossings whereby both lines are part of the Tartan Development Area DP and others where one of the lines is not part of these DPs. The latter crossings are summarised in Table 3-5. It should be noted that although they are referred to as Third Party crossings to distinguish them from infield crossings that are captured in the subsea DPs, each of the lines are owned by Repsol Sinopec Resources UK Limited. Those crossings associated with the lines that are not part of the Tartan Development Area are summarised in Table 3-5.

Table 3-5: Third party crossings.

DP	Third party infrastructure	Crossing details	Status of Third party infrastructure
THP	PL820: 30" Oil Export Pipeline	At KP 16.313, PL14 (gas export/import line) crosses over PL820	Operational
	PL724: 16" Gas Export Pipeline	At KP 16.637 PL14 (gas export/import line) crosses over PL724	Operational
Galley	PL2125: 12"NB Production PL2127: 10" Water Injection PL2129 4"NB Gas Lift PLU2131: Control Umbilical	At *c*. KP 15.8, PL1507 (Galley production line) crosses under PL2125, PL2127, PL2129 and PLU2131	Operational
		At *c*. KP 7.5 PL1506 (Galley water injection line) crosses under PL2125, PL2127, PL2129 and PLU2131	Operational
		At *c*. KP 7.659 PLU2380 (Galley umbilical) crosses over PL2125, PL2127, PL2129 and PLU2131	Operational

3.2.5 Cuttings Piles Management

The pre-decommissioning environmental survey carried out in 2019 identified six bathymetrically distinct cuttings accumulations within the Tartan Development Area (APEM, 2020g; and Section 5.5 of this report). Under OSPAR 2005/6 criteria, five of these accumulations are considered to represent cuttings piles[1]. The sixth accumulation, located at the Galley G6 well site, comprises cuttings material from a single well and therefore is not considered a cuttings pile under OSPAR 2005/6. However, to reflect any potential worst case scenario, the EA will treat the G6 cuttings accumulation as a pile. TNT, Petronella and Duart were developed via single well tie-backs and did not have cuttings accumulations that were considered sufficient to qualify as cuttings pile under OSPAR Recommendation 2006/5. Therefore no drill cuttings sampling was undertaken at these locations. The management of the cuttings pile at the Tartan A platform will be captured within the Tartan A substructure DP and supporting EA, and therefore is not considered further in this section. The location and characteristics of the five remaining subsea cuttings piles are provided in Table 3-6 with further details provided in Section 5.5. It should be noted that all of the cuttings piles occur within existing 500 m exclusion zones.

[1] OSPAR 2006/5 define cuttings pile as 'an accumulation of cuttings on the seabed which has been derived from more than one well'. The survey reports also refer to a cuttings pile at the Galley G6 well location, however given that this accumulation of cuttings comprises discharges from only one well, it is not considered a cuttings pile in the DPs.

Table 3-6: Characteristics of the subsea cuttings piles.

Location	Estimated area (m^2)	Estimated height (m)	Estimated volume (m^3)	Estimated mass (te)	Estimated oil content (te)
Highlander template	1,801	0.27	495	1,357	0.44*
TNW drill centre	955	0.24	225	606	0.02
TSE drill centre	851	0.23	198	528	0.07
Galley SPS	90	0.14	13	35	0.11
Galley G6 well**	-	-	-	-	-

*Calculated based on average THCs in cuttings samples collected at Highlander and wet bulk density of the cuttings pile, in line with modelling inputs.

** Multi-Beam Echo Sounder (MBES) data was used to estimate the area, height and volume of the cuttings piles. MBES data was not collected at the G6 well location, however side scan sonar (SSS) data is consistent with it being a 'small' pile.

In 2006, OSPAR agreed Recommendation 2006/5 (OSPAR, 2006) on a Management Regime for Offshore Cuttings Piles. Stage 1 of the Recommendation required the assessment of drill cuttings piles against two criteria:

- A rate of oil loss to the water column of less than 10 tonnes/yr.; and
- A persistence, over the area of seabed contaminated, of less than 500 km^2.yr (*Note: a persistence of 500 km^2.yr could mean an area of 1 km^2 is contaminated for 500 years, or an area of 500 km^2 is contaminated for one year*).

Where both the rate and persistence are below the set thresholds and no other discharges have contaminated the cuttings pile, no further action is considered necessary and the cuttings pile may be left *in situ* to degrade naturally.

Given the estimates of total oil content in each of the tie-back cuttings piles (Table 3-6), leaching rates from the piles are significantly lower than the OSPAR threshold of 10 te/year.

Given the small volumes of the cuttings piles and the low estimated leaching rates, the five small cuttings piles are considered to be below the criteria. Therefore, if these piles were to be left undisturbed they could be left *in situ* to degrade naturally.

However as recovery of the subsea infrastructure is expected to result in some disturbance to one or more of the small cuttings piles identified in Table 3-6, Repsol Sinopec Resource UK Limited commissioned a BAT (Best Available Technique) assessment to determine the optimal approach for decommissioning the five small cuttings piles (Genesis 2020a). In accordance with OSPAR Recommendation 2006/5 the options considered in the BAT assessment were:

1. Leave undisturbed *in situ*;
2. Recover and dispose of by reinjection;
3. Recover, treat and discharge offshore;
4. Recover, transport onshore for treatment, coastal discharge of aqueous waste, reuse or disposal of treated solids; and
5. Dispersal of cuttings pile using a dredger.

The assessment undertook a high level comparative evaluation of several key environmental aspects (resuspension of the cuttings material, emissions to air (associated with vessel use), chemical use (likely to be required for reinjection), underwater noise, waste generation and accidental events for each option. In addition, safety, technical feasibility, regulatory clarity and cost were considered. As the largest of the subsea cuttings piles, modelling was undertaken to determine the fate/environmental impact of the cuttings disturbed during recovery of

the Highlander template (Genesis, 2020b) and the results were used to support the BAT assessment (Genesis 2020a)[2].

Approximately 80 - 100 % of the cuttings pile will require to be disturbed during removal of the Highlander template. Similarly, the recovery activities at the other locations will also result in some disturbance such that leaving the piles undisturbed is not viable. The conclusion of the comparative evaluation was that the environmental differences between Options 2 – 5 were small and, taken as a whole, the aggregated environmental impact was similar for all options, with Option 5 assigned best overall.

However, when considering the non-environmental aspects there was considerable technical uncertainty over the feasibility of the wells associated with the Tartan Development Area to accommodate the recovered cuttings and the risk of implications for P&A. Technical uncertainties over the feasibility of combined dredging, uplift and treatment were also identified, resulting in lower ratings for these options.

Therefore, Option 5, which enables access to the infrastructure by dispersal of a proportion of the drill cuttings piles either by suction dredging or water jetting is concluded to be BAT.

3.2.6 Vessel Use

A range of specialist and support vessels (Table 3-7) will be required to complete the decommissioning activities. At the time of writing, specific vessels have not yet been identified, however, the types of vessel required are well known and standard performance characteristics for typical vessels have been used for the purposes of estimating energy consumption and emissions to air. By estimating the fuel use based on generic vessel types (Institute of Petroleum (IoP) Guidelines, 2000 and industry experience) and the likely duration of the work programme for each vessel, estimates of fuel consumption can be made (Table 3-7). Although the detailed schedules for the different workscopes are still to be defined, the predicted maximum estimates of vessel use have been presented.

[2] As the cuttings pile at the Highlander location is the largest of the five small cuttings piles, the environmental impacts of disturbing this pile are considered to be representative of the worst-case impacts associated with disturbing any of the other three small cuttings piles.

Table 3-7: Anticipated vessel requirements and fuel usage.

Vessel type	Activity	Duration (days)[1]	Fuel consumption rate (te/day)[2]	Fuel usage (te)
Subsea decommissioning				
Tow tug large	Mob/demob	4	10	425
	In service	77	5	
Cargo Barge	Mob/demob	5	7	343
	In service	77	4	
CSV	Mob/demob	7.5	26	2364
	In service	120.5	18	
ROV vessel	Mob/demob	10	22	1300
	In service	60	18	
Crane Ship	Mob/demob	7	20	190
	In service	2	25	
Maintenance, monitoring and inspection vessel	Mob/demob	12	10	355
	In service	47	5	
Jet propeller/ excavator support vessel	Mob/demob	3	26	96
	In service	1	18	
Reel lay vessel	Mob/demob	13	26	986
	In service	36	18	
Seabed clearance and over trawlability surveys				
Trawler (trawl sweeps and trawl trials) (if used)	Mob/demob	6	4	200
	In service	44	4	
Post decommissioning survey				
Survey vessel (assumes seabed sampling and visual surveys full length of lines and area of 500 m zones)	Mob/demob	3	10	60
	In service	6	5	
Maximum anticipated fuel use across all operations				**6,319**

1. Vessel day estimates include allowance has been made for waiting on weather (10%).
2. IoP guidelines do not always have exact equivalent vessel: e.g. for the reel lay vessel – figures for a multipurpose support vessel were used.

Note: vessel days provided are worst case estimates. Prior to contract award it is difficult to determine accurately. Final vessel days will be captured in the environmental impact assessment supporting the Marine Licence to be submitted prior to commencement of offshore activities.

3.3 Survey and Monitoring Programme

A post decommissioning site survey will be carried out on completion of all decommissioning works. Surveys will be undertaken along all pipeline routes and at all sites where structures have been removed. Any significant debris will be recovered for onshore recycling or disposal. Independent verification of the seabed state will be obtained for the pipeline areas and installation locations and evidence of clearance will be provided to all relevant governmental and non-governmental organisations. Preference will be given to an approach not impacting on the seabed for example using side scan sonar data to show a clear seabed. However, if deemed necessary by any of the

stakeholders, an over trawl trial may be carried out. The EA assumes a worst case (due to the area of seabed disturbance) of an over trawl trial being carried out.

Inspections of the pipelines and umbilicals decommissioned *in situ* will be carried out to confirm that no further exposures develop and that existing rock berms have maintained their position. The timeline for inspections will be agreed with OPRED.

A post decommissioning environmental seabed survey (centred on the sites of the subsea structures and those sections of pipelines and umbilicals where remedial activities are required) will be carried out. The objective of the survey is to identify any chemical or physical disturbances to the seabed following decommissioning and to provide a baseline from which future surveys can be compared. The survey reports will be submitted to OPRED and a post monitoring survey regime will be agreed.

COMPARATIVE ASSESSMENT

4.1 Introduction

OPRED's Guidance Notes on the decommissioning of offshore installations and pipelines (BEIS, 2018) provide for a case by case consideration of pipeline decommissioning alternatives based on a CA.

A CA was carried out in line with the OGUK Guidelines for CA (OGUK, 2015). The CA Report (Repsol Sinopec Resources UK Limited 2020b), submitted in support of the three subsea draft DP submissions, provides full details of the assessment carried out for the Tartan Development Area pipelines and umbilicals. This chapter summarises the process followed and the results of the CA.

4.2 Pre-Screening of Decommissioning Options

To facilitate the CA workshop, and as per standard CA methodology, the Tartan Development Area pipelines and umbilicals were split into groups dependent on:

- Type (flexible or rigid);
- Whether or not they were concrete coated; and
- Whether they were trenched and buried or surface laid.

The pipeline and umbilical groupings are detailed in Table 3-6 of each of the three subsea DP submissions and are summarised and illustrated in Table 4-1 and Figure 4-1 respectively. Table 4-1: Pipeline and umbilical groupings applied in the Comparative Assessment.

Group ID	Component type / As-laid condition	Number of Lines	Pipeline/ Umbilical
A	- Rigid pipeline - Concrete coated - Trenched (DOL >0.6 m) and buried (DOC >1m) - Some supplementary rock cover	2	24”OD oil export line (KP 0 to KP 15.6): PL18 18”OD gas export/import line: PL14
B	- Rigid pipeline/ flexible pipeline/ umbilical - Surface laid	9	TNW - two 6”NB water injection lines: PL137 & PL178 TNW - two umbilicals: PLU4212 and PLU4213 TSE - two 6”NB water injection lines: PL138 and PL199 TSE - two umbilicals: PLU4214 and PLU4215 Galley - One 8”ID water injection line: PL1506 (part 1)
C	- Rigid pipeline/ umbilical - Trenched (DOL >0.6 m) and buried (DOC >0.6 m)	17	TNT – one 6”NB production line: PL2013 TNT – one 3”NB gas lift line: PL2014 TNT – one umbilical: PLU2015 Highlander – one 4”NB water injection line: PL316 Highlander – one umbilical: PL568 Galley – one 10”NB production line: PL1505 Galley - one 8”NB water injection line: PL1506 (part 2) Galley – redundant 8”NB water injection line PL1506A Galley - one umbilical: PLU2380 Petronella - three umbilicals: PL508, PL509 and PL510 Petronella – one 12”NB gas lift: PL393 Petronella – one 8”NB Production: PL394 Duart – one 8”NB production line: PL2450 Duart – one 3”NB gas lift line: PL2451 Duart – one umbilical: PLU2480
D1	- Rigid pipeline/ umbilical - Trenched (DOL >0.6 m) and shallow cover associated with natural backfill (DOC <0.6 m)	6	Galley – three 8”NB production lines: PL1507, PL1508 and PL1510 Galley – one 8”NB water injection line: PL1511 Galley - umbilicals: PL1512 to PL1515 and PL1519 to PL1525 Galley - one 75mm OD umbilical: PL5056
D2	- Rigid pipeline/ umbilical - Shallow trenched (DOL <0.6 m) and shallow cover associated with natural backfill (DOC <0.6 m)	7	Highlander - one 12”NB production and one 8”NB production/ test line: PL312 and PL313 respectively Highlander – one 8”NB gas lift line: PL314 Highlander – one 8”NB water injection line: PL315 Highlander – three umbilicals: PL568 (55 mm OD), PL569 (90 mm OD) and PL570 (108 mm OD)
E	- Flexible pipeline/ umbilical - Surface laid - Rock covered	2	Galley - one 6”ID water injection line: PL1961 Galley – one umbilical: PL5060
F	- Rigid pipeline - Concrete coated - Trenched (DOL >0.6 m) and shallow covered (DOC of around 0.4 m)	1	24” oil export line (KP 15.6 to KP 26.25): PL18

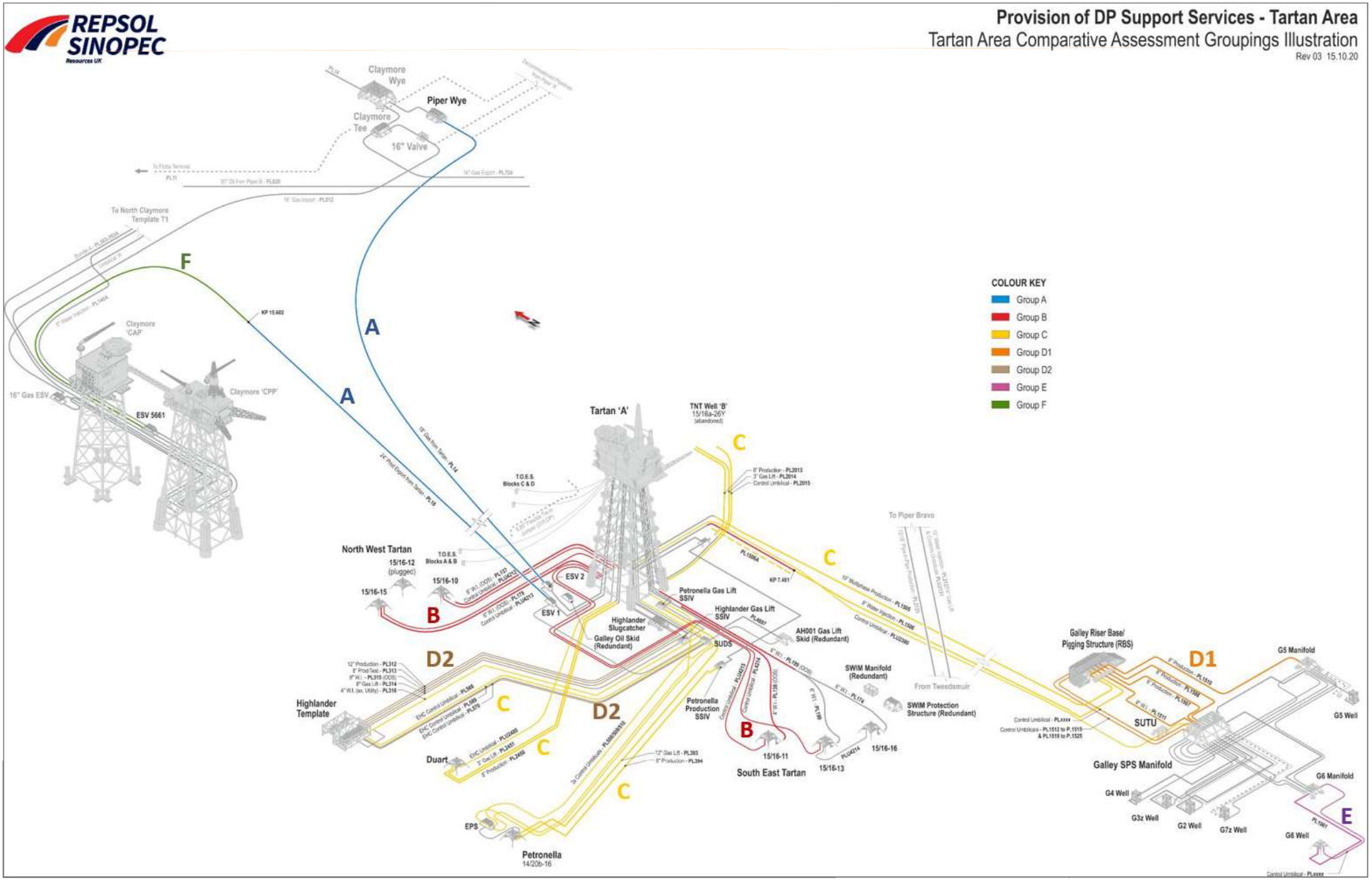


Figure 4-1: Comparative Assessment Groupings.

Prior to the CA, a pre-screening of a wide range of the potential decommissioning options for the pipeline and umbilical groups was carried out. Options considered included:

Option 1A: Total Removal by Reverse Reel-lay.

Option 1B: Total Removal by Reverse S-lay.

Option 1C: Total Removal by Cut and Lift.

Option 2A: Remediate *in situ*: Exposed Sections Rock Covered.

Option 2B: Remediate *in situ*: Exposed Sections Trenched and Buried.

Option 2C: Remediate *in situ*: Exposed Sections Cut and Removed.

Option 3: Do Nothing[1].

The total removal options (Options 1A to 1C) refer to total removal of the pipelines or umbilicals. The remediate *in situ* options (Options 2A to 2C) refer to leaving the buried pipelines and umbilicals *in situ* and remediating the exposed sections. The do nothing option (Option 3) refers to leaving the pipelines and umbilicals *in situ* and monitoring by post-decommissioning surveys.

In the pre-screening, each of the groupings were assessed against the above options. A qualitative assessment considering safety, environment, technical, societal and economic impacts was carried out using a Red-Amber-Green (RAG) evaluation method. The pre-screening is detailed in the CA Reports submitted with the DPs. The results of the pre-screening of the decommissioning options are shown in Table 4-2.

Table 4-2 Results of the decommissioning options pre-screening assessment.

Pipeline / Umbilical Group	Full Removal			Partial Remediation			Do Nothing
	1A	1B	1C	2A	2B	2C	3
Group A	X (NTF)	X (SO)	✓	✓	✓	✓	✓
Group B	✓	X (SO)	✓	✓	✓	X (NA)	X (NA)
Group C	✓	X (SO)	X (SO)	✓	✓	✓	X (NA)
Group D1	✓	X (NA)	✓	✓	✓	X (NA)	X (NA)
Group D2	✓	X (NA)	✓	✓	✓	X (NA)	X (NA)
Group E	✓	X (NA)	X (SO)	✓	✓	✓	X (NA)
Group F	X (NTF)	X (SO)	✓	✓	✓	✓	✓

✓ Selected for assessment in the CA — X (NTF) Not technically feasible — X (SO) Screened out — X (NA) Not applicable

[1] The Do Nothing option is only applicable to large pipelines where the external diameter is ≥ 16". Pipelines of this size are considered to be trunk lines and there is an expectation that due to their large diameter they do not pose a risk to other sea users if they remain *in situ*. Therefore, the Do Nothing option was only considered for pipeline Groups A and F.

4.3 Comparative Assessment Approach and Results

For all options selected for each of the Groups, scoring at the CA was carried out against safety, environment, technical feasibility, societal impacts, and economics. Within each of these criteria a number of sub-criteria were considered.

The results of the CA are captured in Table 4-3. In summary:

- Those lines that are trenched and buried with DOC and/or DOL > 0.6 m will be decommissioned *in situ* with remediation of the exposed sections (Groups A, C, D1, and F).
- All exposed surface laid pipelines and umbilicals (Group B) will be recovered.
- The base case for the surface laid rock covered lines (Group E) is to recover them to shore. However in the CA, decommissioning the Group E lines *in situ* and remediating the exposed sections either by trenching and burying, cutting and recovering or adding rock cover were also identified as feasible options such that decommissioning these lines *in situ* will be carried through the C&P tendering phase.
- Similarly trenching and burying the Group D2 lines and decommissioning them *in situ* was identified as a feasible option such that it will also be carried through the C&P tendering phase.
- The base case for those trenched lines where neither the DOL or the DOC are > 0.6 m (Group D2) is to recover them to shore. However in the CA, trenching and burying the Group D2 lines and decommissioning them *in situ* was also identified as a feasible option such that it will also be carried through the C&P tendering phase.

The CA process identified that all remediate *in situ* options are acceptable for Groups A, C, D1, and F, such that all three remediate *in situ* options will be carried through the C&P tendering phase. Should the option to cut and remove or rock cover the exposed sections be considered more favourable during the C&P tendering phase, Repsol Sinopec Resources UK Limited will engage with OPRED before a decision is taken on the overall strategy.

Similarly Repsol Sinopec Resources UK Limited will engage with OPRED should the C&P tendering phase identify decommissioning *in situ* to be preferable for Groups D2 and E when considering the wider field campaign strategy.

Table 4-3: Results of the Comparative Assessment.

Group ID	Component type / As-laid condition	Results of the CA
A	- Rigid concrete coated pipeline - Trenched (DOL >0.6 m) and buried (DOC >1m) - Some supplementary rock cover	Lines to be decommissioned *in situ* with remediation of exposed sections.
B	- Rigid pipeline/ flexible pipeline/ umbilical - Surface laid	Lines to be recovered.
C	- Rigid pipeline/ umbilical - Trenched (DOL >0.6 m) and buried (DOC >0.6 m)	Lines to be decommissioned *in situ* with remediation of exposed sections.
D1	- Rigid pipeline/ umbilical - Trenched (DOL >0.6 m) and shallow cover (DOC <0.6 m)	Lines to be decommissioned *in situ* with remediation of exposed sections.
D2	- Rigid pipeline/ umbilical - Shallow trenched (DOL <0.6 m) and shallow cover (DOC <0.6 m)	Base case is that the lines will be recovered, however the option to trench and bury these lines rank closely to full recovery such that both options will be carried through the C&P tendering phase.
E	- Flexible pipeline/ umbilical - Surface laid - Rock covered	Base case is that the lines will be recovered, however the remediate in situ options rank closely to full recovery. Therefore the full recovery and the remediate *in situ* options will be carried through to C&P tendering phase.
F	- Rigid concrete coated pipeline - Trenched (DOL >0.6 m) and shallow covered (DOC of around 0.4 m)	Lines to be decommissioned *in situ* with remediation of exposed sections.

5. ENVIRONMENTAL BASELINE

5.1 Introduction

This chapter describes the environment and the environmental receptors in the vicinity of the Tartan Development Area and has been prepared with reference to available literature and the results from a pre-decommissioning environmental survey carried out between September and October 2019 (APEM, 2020a-f).

5.2 Pre-Decommissioning Environmental Survey

As part of the pre-decommissioning survey a combination of geophysical and acoustic datasets, physical seabed samples and high definition seabed imagery were acquired. Following acquisition of acoustic data, seabed photography/video was used to ground-truth all key seabed habitats identified in the acoustic data. The main objectives of the environmental survey were to:

- Establish the current gradients of Physical, Chemical and Biological (P/C/B) perturbation within:
    - The 500 m zone at the Tartan A platform and at each of the subsea tie-backs; and
    - The 100 m corridors along the associated pipelines (50 m either side of each line).
- Identify and quantify any species/features of conservation importance near to the infrastructure to be decommissioned; and
- Determine the P/C/B characteristics of the drill cuttings, associated with the Tartan Development Area, in line with OSPAR Recommendation 2006/5, the OLF/NOREG Guidance 2016 and OSPAR Guidelines for the Sampling and Analysis of Cuttings Piles (Agreement 2017-03).

Out with the drill cuttings, a total of 211 stations were sampled during the environmental survey. Table 5-1 summarises the number of samples taken across the fields, the location of which are shown in Figures 5-1 to 5-3.

As discussed in Section 3.2.5, the survey identified the accumulation of drill cuttings with the potential to be classified as cuttings piles in line with OSPAR 2006/5 at six locations: the Tartan A platform, the Highlander template, the TNW drill centre, the TSE drill centre, the Galley SPS location and the Galley G6 well location. A combination of shallow core samples (using 1 m GeoROV core), deep core samples (using a vibrocorer) and grab samples (using a double Van Veen grab) were taken across these cuttings accumulations as summarised in Table 5-1 and illustrated in Figures 5-4 and 5-5.

Table 5-1: Environmental sampling stations and drill cuttings sampling stations types.

Area	Number of EBS Stations	Shallow core drill cuttings samples	Deep core drill cuttings samples	Drill cuttings grab samples
Tartan A platform	57	11	3	0
TNW and TSE drill centres	39	10	2	4
TNT drill centre	10	*	*	*
Highlander Field	31	5	1	2
Petronella Field	13	*	*	*
Galley Field	46	10	2	4
AH001	1	N/A	N/A	N/A
Duart Field	11	*	*	*
Reference samples*	3	N/A	N/A	N/A
*Reference samples were taken 3,000, 5,000 and 10,000 m from the Tartan A platform.				

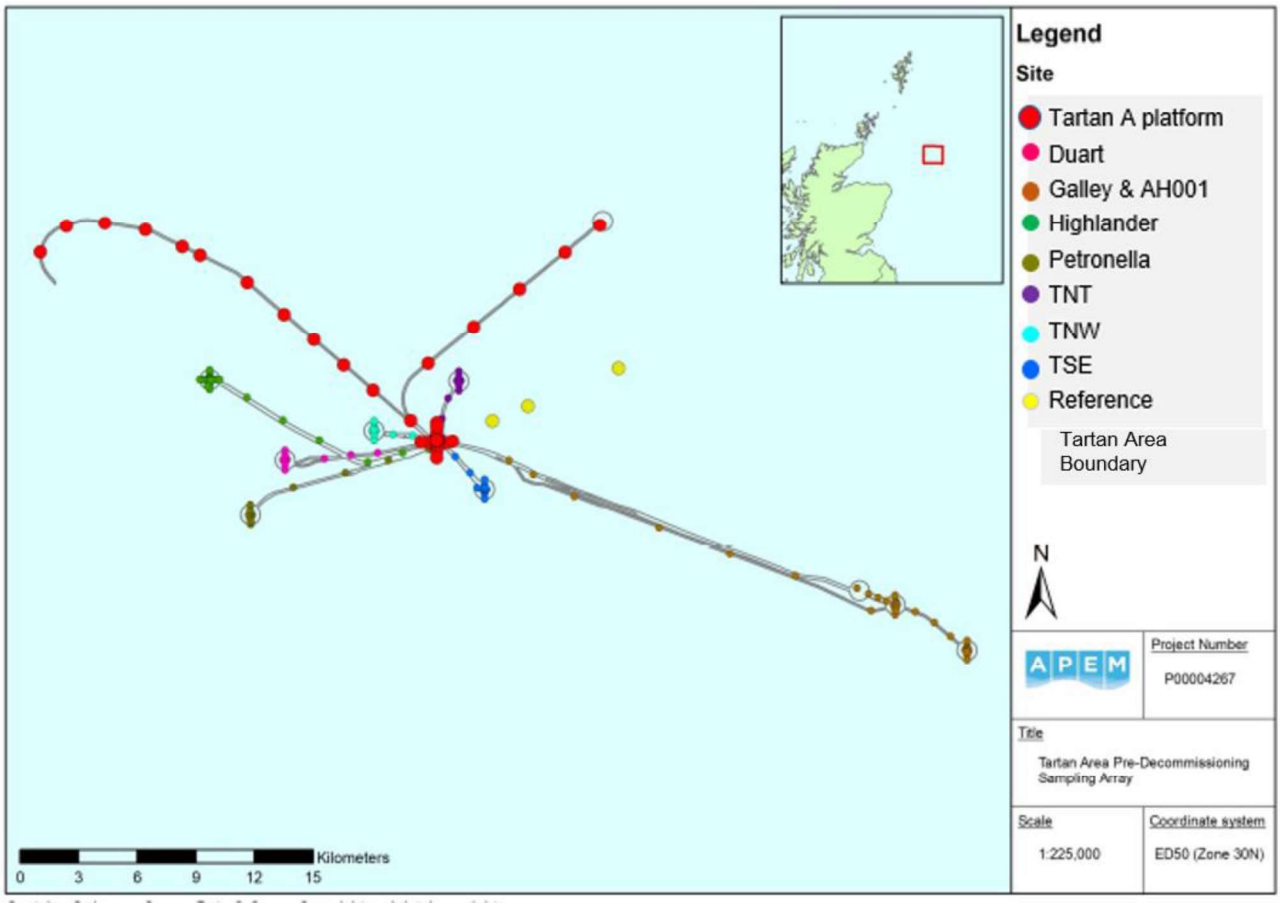


Figure 5-1: Locations of the environmental survey stations sampled as part of the pre-decommissioning survey (APEM, 2020a).

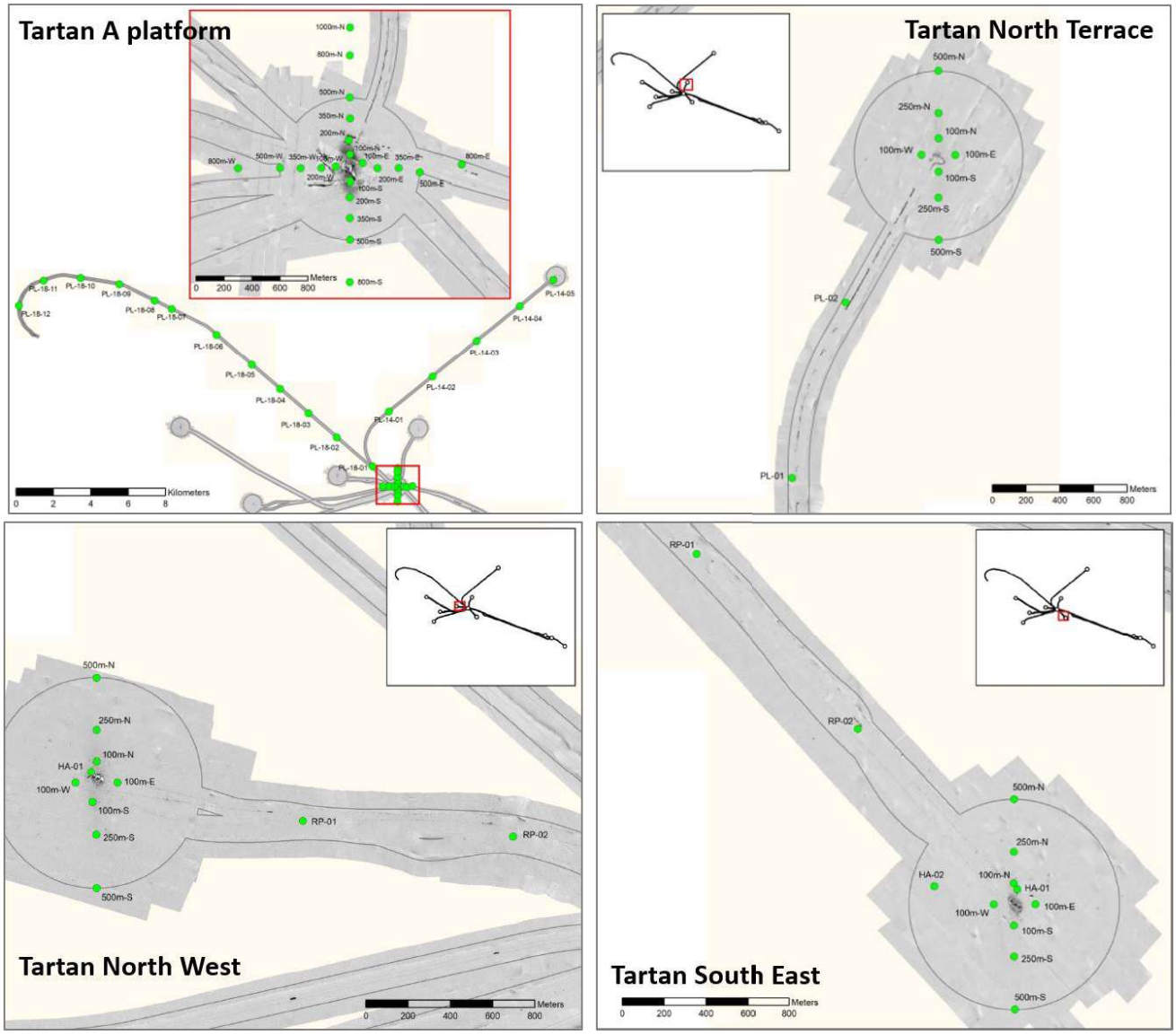


Figure 5-2: Seabed sampling locations taken across the Tartan Field, and along the oil export and gas import/export pipelines.

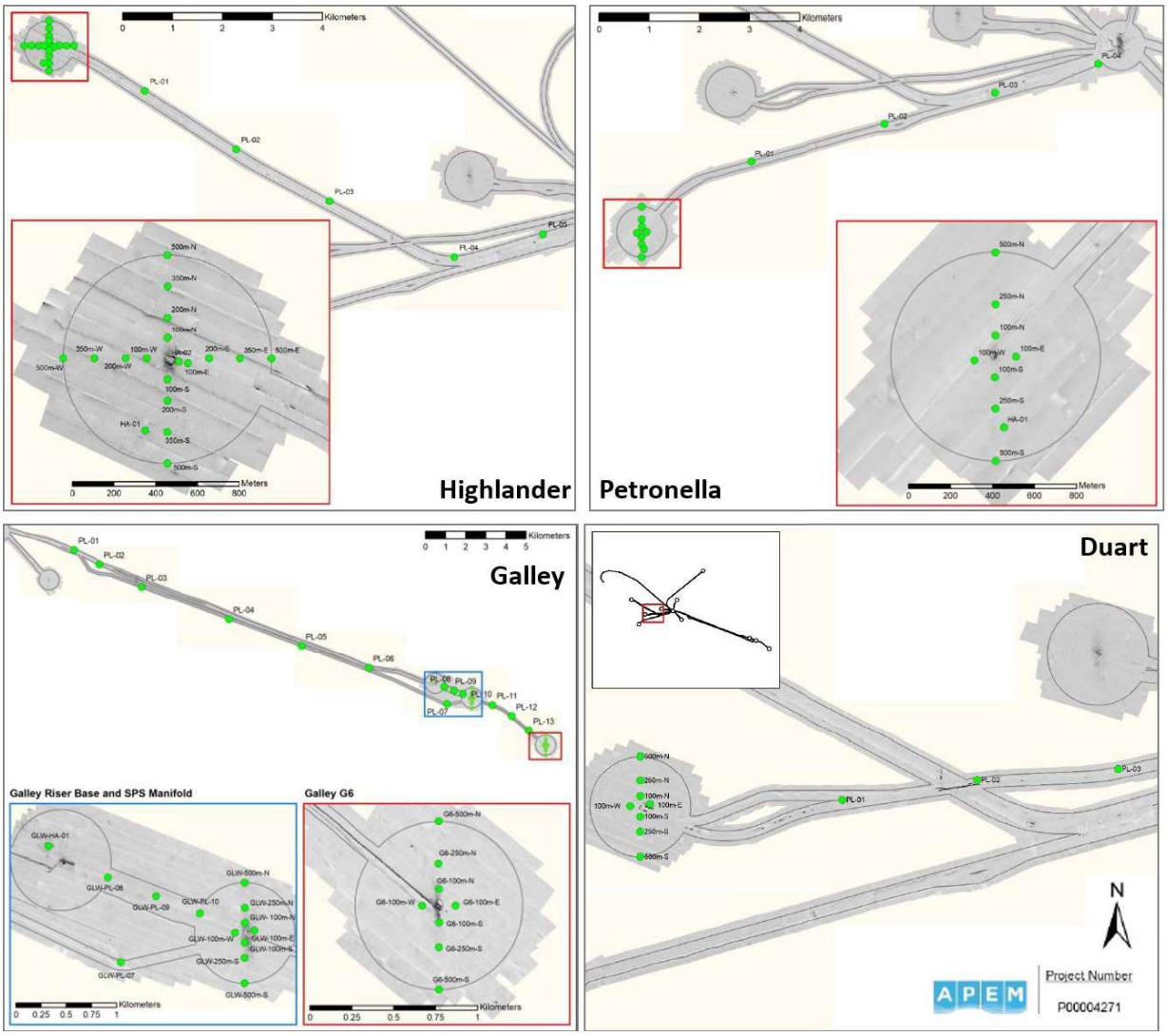


Figure 5-3: Seabed sampling locations at the Highlander, Petronella, Galley and Duart Fields.

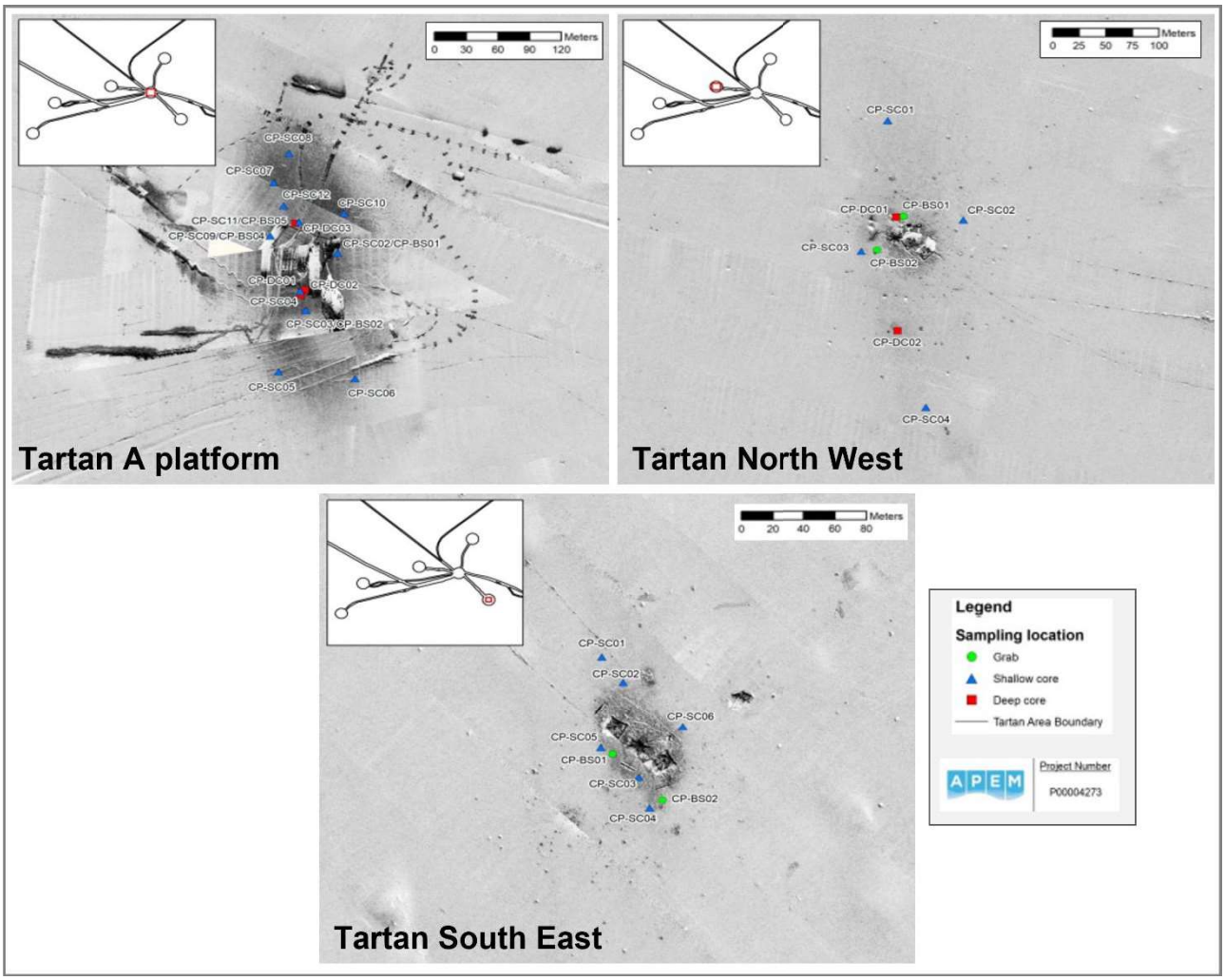


Figure 5-4: Location of drill cuttings samples within the Tartan Field (APEM,2020g).

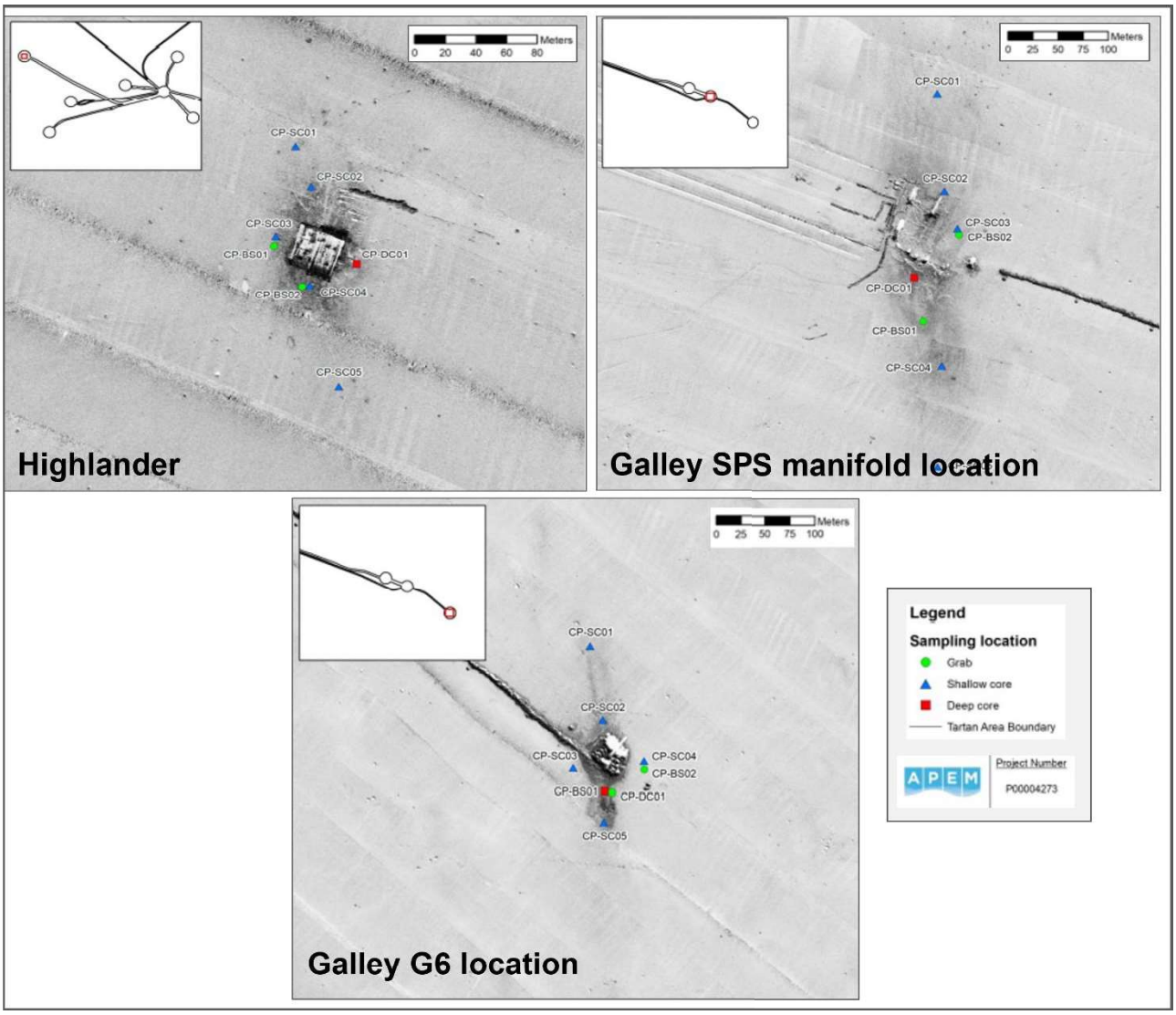


Figure 5-5: Location of the drill cuttings samples in the Highlander and Galley fields (APEM,2020g).

5.3 Metocean Conditions

Metocean (meteorological and oceanographic) conditions including bathymetry, currents, tides and circulation patterns all influence the type and distribution of marine life and the behaviour of emissions and discharges from offshore facilities. For example, the speed and direction of water currents have a direct effect on the transport, dispersion and ultimate fate of any discharges from a vessel or installation.

5.3.1 Bathymetry

Water depth within the Tartan Development Area varies from *c*. 135 m (Duart field) to *c*. 147 m (Galley field) and *c*. 138 m at the Tartan A platform location.

5.3.2 Hydrology

Water masses, and local current speeds and direction all influence the transport, dispersion and fate of marine discharges. The major water masses in the North Sea can be classified as Atlantic water, Scottish coastal water,

Northern North Sea water, Norwegian water, CNS water, Southern North Sea water, Jutland water and Channel water (Turrell, 1992).

The Tartan Development Area is located in the area influenced by the Northern North Sea water mass (Figure 5-6). The predominant regional current in the CNS originates from the vertically well-mixed coastal water and Atlantic water inflow of the Fair Isle/Dooley current, which flows around the north of the Orkney Islands and into the North Sea. The peak current flow for a mean spring tide in the Tartan area is 0.51-0.75 m/s (ABPmer, 2008; Figure 5-7).

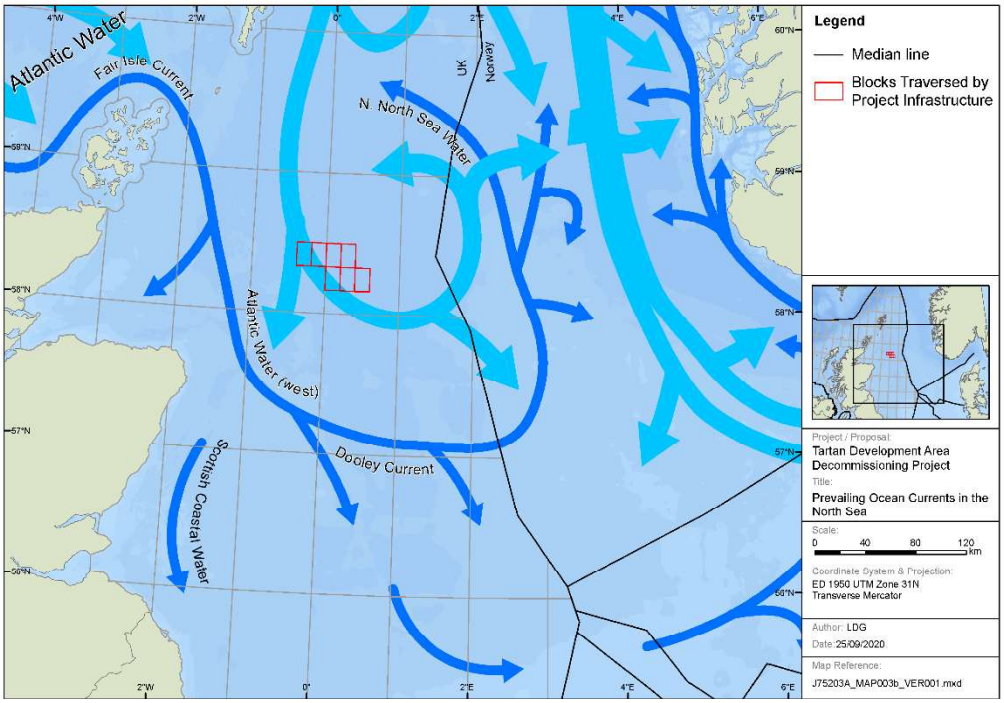


Figure 5-6: General circulation in the North Sea (Turrell, 1992).

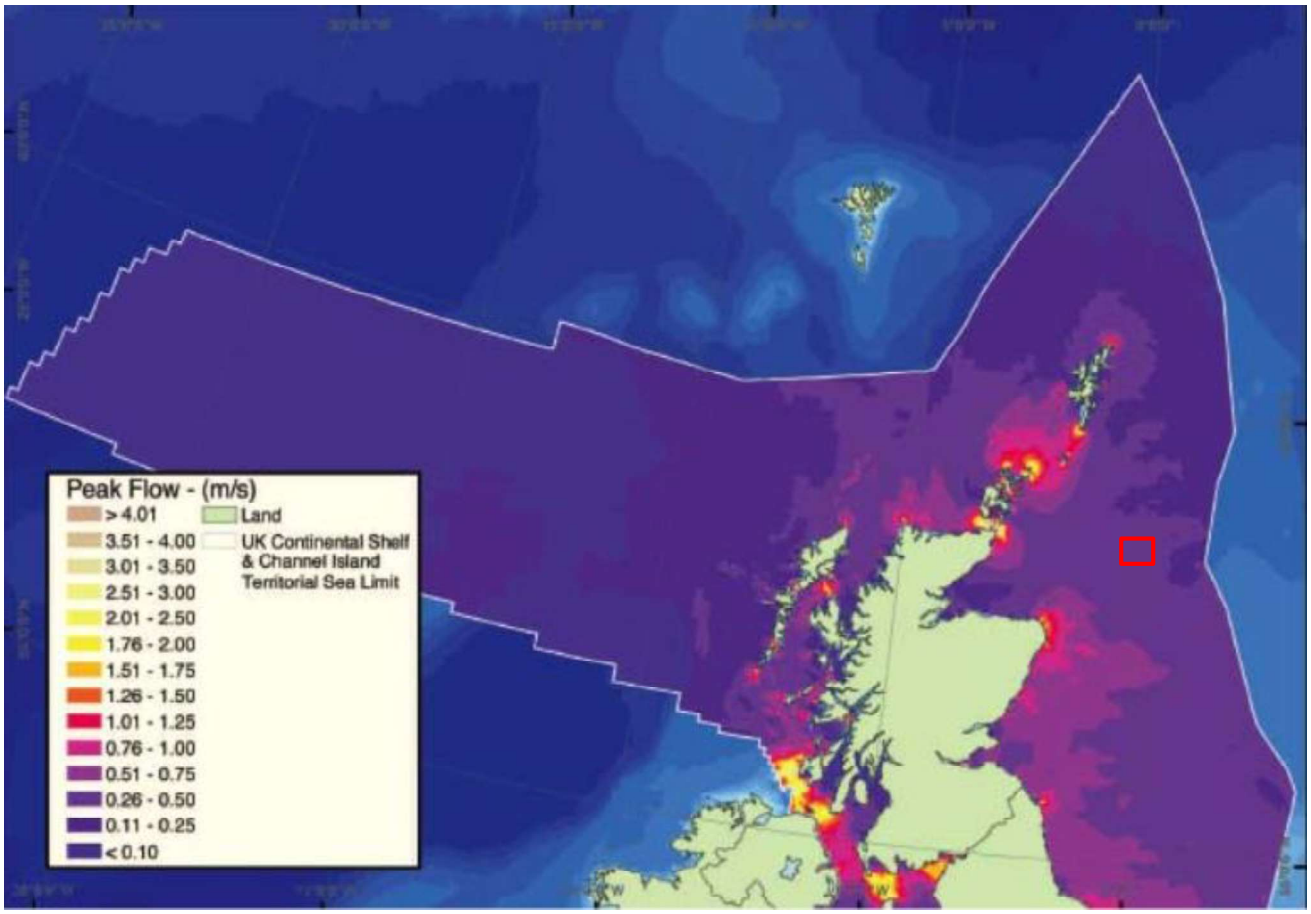


Figure 5-7: Peak current flow range (m/s) during mean spring tide around the Tartan area (ABPmer, 2008).

Mean significant wave heights in the area are 2.3 m and as can be seen from Figure 5-8a around 30 % of the waves in the area originate from a northerly direction.

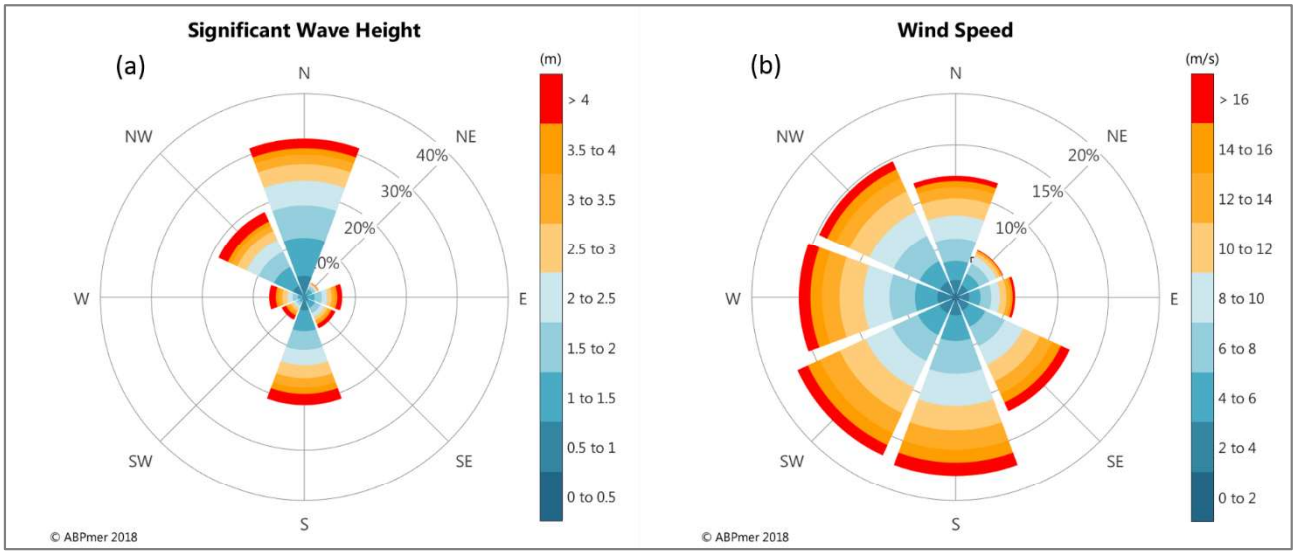


Figure 5-8: Wave rose (a) and wind rose (b) for the Tartan Development Area (Data Explorer, 2018).

The mean spring tidal range within the area is *c.* 1.4 m and the annual mean wave power is 26.68 kW/m (Scottish Government National Marine Plan Interactive (NMPi)).

5.3.3 Meteorology

Wind speed and direction directly influence the transport and dispersion of atmospheric emissions. These factors are also important for the dispersion of water borne emissions, including oil, by affecting the movement, direction and break up of substances on the sea surface. Mean wind speed in the area is 8.8 m/s and, as can be seen from Figure 5-8b, winds in the area originate from all directions though primarily from the south / southwest / west and northwest.

5.3.4 Sea Temperature and Salinity

Sea surface temperature and salinity in the area are governed by the flow of oceanic Atlantic waters into the North Sea through the Fair Isle Channel (Turrell, 1992). According to data collected between 1971 and 2000, the annual mean seawater surface temperature in the Tartan Development Area is *c.* 9.6 °C and the annual mean temperature at the seabed is *c.* 8 °C (Scottish Government NMPi).

Salinity in the area shows little seasonal variation through the water column with annual mean salinity near the seabed equalling 35.15 % and 35.07 % in surface waters (Scottish Government NMPi).

5.4 Seabed Characteristics out with the Cuttings

This section focuses on the results of the analysis of the samples taken out with the cuttings piles accumulations Those samples taken from the drill cuttings piles are discussed in Section 5.5.

5.4.1 Particle Size Distribution

The sediment types across the Tartan field sampling locations were largely homogenous, and are considered to fit within the EUNIS level 4 classification of 'deep circalittoral mud' (A5.37) and are predominantly classified as sandy mud using both Folk (1954) and Blott & Pye (2012). Exceptions to this included a single sampling station at the TNT location which was considered to be muddy sand. In addition, at two stations at TSE location and at one location at the TNT drill centre, the sediments were considered to be slightly sandy mud in the Blott and Pye (2012) classification due to its smaller mean particle diameter and higher proportion of muds.

Mean particle size at the TNW wells and TSE wells vary between 22.1 µm and 69.3 µm, with a mean of 29.6 µm and between 14.7 to 24.7 µm, with a mean of 21.3 µm, respectively. Mean particle size was consistent between the TNT stations, ranging from 19.2 to 24.4 µm, with a mean of 22.4 µm.

The sediment types across the Highlander, Petronella, Galley and Duart fields also meet the criteria of the EUNIS level 4 classification of 'deep circalittoral mud' (A5.37) with the majority of the samples being classified as sandy mud using both the Folk (1954) and Blott and Pye (2012) classifications. Exceptions include two stations at the Highlander field which had small amounts of gravel associated with them and as such were classified as slightly gravelly sandy mud' using Folk (1954) and 'very slightly gravelly sandy mud' using Blott and Pye (2012). It is thought the presence of small amounts of gravel at these stations may be indicative of drilling related gravel/rock chippings which have been deposited from the cuttings piles as the two sampling stations were located 25 m and 38 m from two drill cuttings sampling stations.

Exceptions from the sandy mud classification were also noted at the Galley field where five of the stations had very small amounts of gravel present and these were classified as 'slightly gravelly sandy mud'. In addition, stations located *c.* 100 m east and *c.* 100 m west of the Galley G6 well consisted almost entirely of fine material and were classified as 'mud' whilst a station 100 m north of the G6 well was found to be comprise almost entirely of mud with a small proportion of gravel and was classified as 'slightly gravelly mud'.

Mean particle size recorded in the samples taken from the Highlander (33.9 µm), Petronella (25.6-32.5 µm) and Duart (24 to 32.5 µm) fields were very similar, whilst mean particle size at the Galley field was slightly less at 19.1 µm.

Habitat classifications associated with these sediments are discussed in Section 5.6.2.1.

5.4.2 Sediment Hydrocarbons

5.4.2.1 Total Hydrocarbon Concentrations

Figures 5-8 and 5-9 show the total hydrocarbon concentrations recorded in the EBS samples across the Tartan Development Area. Note there is no figure presented for the Duart field as all samples had concentrations of < 25 mg/kg. 50g/kg (50 ppm) is recognised as the ecological effects level for total THC. No samples from the Duart or TNT drilling locations were found to have concentrations > 50 mg/kg whilst the Petronella and TNW locations have elevated THC concentrations in one 1 and 2 samples respectively. As expected the THCs are lower in the samples taken at greater distances from any historic drilling activities. The highest number of samples with concentrations > 50 mg/kg were found within 500 m of the Tartan A platform which is expected given that the largest number of wells were drilled at that location.

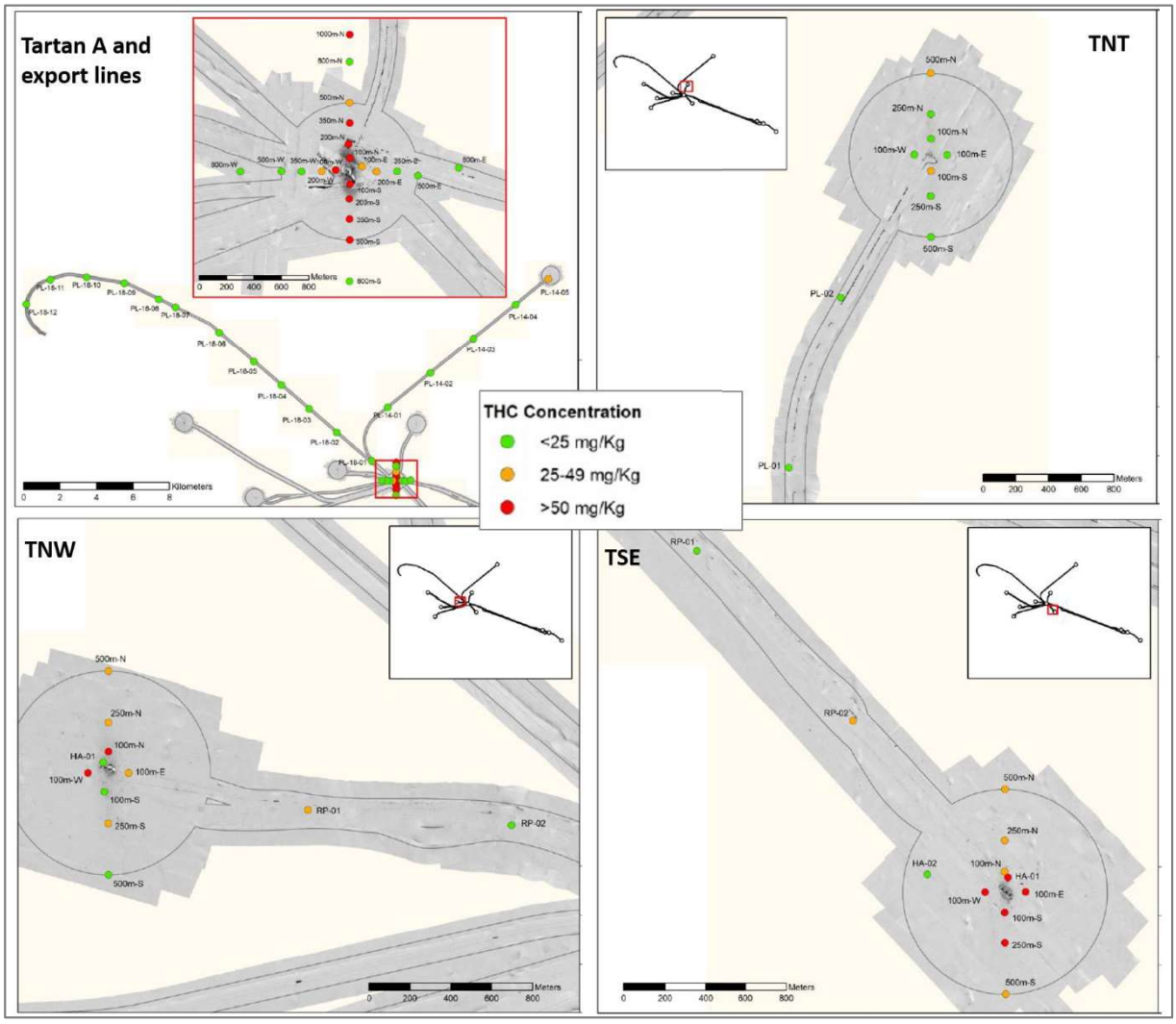


Figure 5-9: Total hydrocarbon concentrations in the EBS samples from the Tartan Field (including tie-back locations).

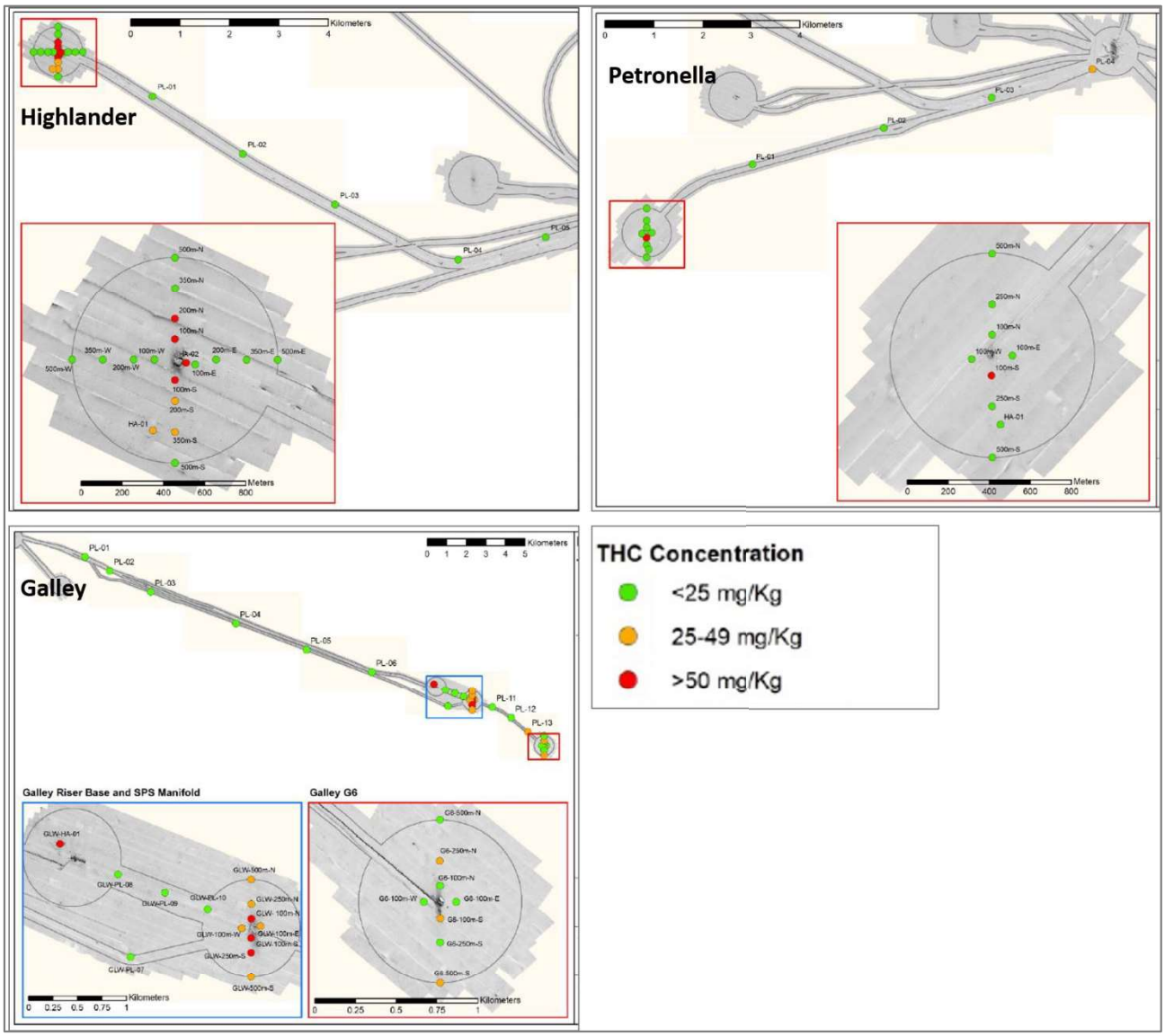


Figure 5-10: Total hydrocarbon concentrations from the EBS samples taken at the Highlander, Petronella and Galley fields.

5.4.2.2 Polycyclic Aromatic Hydrocarbons

Analysis of the PAH compounds considered as priority substances or priority hazardous substances by OSPAR (2009a) indicated low concentrations of all compounds from the Duart and Petronella EBS samples. At these fields the concentrations were below 'background concentrations' (BC) and 'background assessment concentrations' (BAC) (OSPAR, 2014a). Low concentrations of all PAH compounds were found at the majority of Highlander EBS sample stations, except for at station HLW-500m-N where the priority substance naphthalene slightly exceeded the BC for this compound. Low concentrations of all PAH compounds were also found at the TNT EBS sampling stations, except for concentrations of naphthalene and Indeno[123,cd]pyrene which exceeded background concentrations at one station each,TNT-PL-01 and TNT-100m-S, respectively.

In the Galley EBS samples the concentrations of a number of the PAH compounds considered as priority substances were above the BC and BACs. Most of these exceedances were associated with samples taken within 500 m of the Galley infrastructure. The highest concentrations of PAHs were recorded at G6W-100m-S, located closest to the south of the Galley G6 well. At this station concentrations of Benzo[b]fluoranthene, Benzo[a]pyrene and Benzo[ghi]perylene exceeded cAL1, as well as the BC and BAC for the latter two compounds. The concentration of Benzo[a]pyrene also exceeded the PEL at this station and concentrations of Anthracene and Indeno[123,cd]pyrene

were both above the BC and BAC. The concentrations of Naphthalene, Anthracene and Benzo[a]pyrene were above the BAC or BC at a number of stations within 100 m of the Galley infrastructure.

5.4.3 Heavy Metals

Metals are generally not harmful to organisms at concentrations normally found in marine sediments and some are essential for metabolism but can become toxic above a critical threshold. There are a number of tools available to enable assessments of hazardous concentrations in marine sediment and biota.

In order to quantify potential effects of metals on marine life, Long *et al.* (1995) defined the Effect Range Low (ERL) values as the lowest concentration of a metal that produced adverse effects in 10% of the data reviewed. Consequently, metal concentrations recorded below the ERL are not expected to elicit adverse effects.

OSPAR Background Assessment Concentrations (BAC) were developed to assess contaminant concentrations in the environment. The BACs are used to test whether concentrations are near background or close to zero in the case of manmade substances.

Table 5-2 summarises the number of samples associated with each field where metal concentrations exceeded the ERL or BAC concentrations. The table also provides the range of concentrations of those samples where the values are a greater than the ERL or the BAC levels.

In summary, metal concentrations across the samples were generally lower than or comparable to the reference stations for most metals. The main exception were the samples from the Galley field where concentrations of metals were generally higher than those recorded at any of the other survey sites. The lowest concentrations of metals were generally recorded at the Highlander sites, with the exception of barium, which had a lower mean concentration in the Duart and reference areas and mercury, which was lowest in the TNT, Petronella and reference areas.

Table 5-2: Summary of the number of samples where metal concentrations were greater than the ERL and BAC concentrations and associated elevated concentrations.

Sample location	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury
ERL concentrations (mg/kg)	**8.2**	**1.2**	**81**	**34**	**46.7**	**20.9**	**150**	**0.15**
TNT (10 samples)	-	-	-	-	-	**5** 20.9 - 22	-	-
TNW (11 samples)	**4** 10 - 12	-	-	-	**2** 72.2 - 76.7	-	-	1 0.26
TSE (12 samples)	-	-	-	-	**1** 76.7	**4** 21.4 - 27.6	-	-
Highlander (23 samples)	11 8.3 - 15.2	-	-	-	-	-	-	-
Petronella (13 samples)	-	-	-	-	-	-	-	-
Galley (30 samples)	**29** 9.0 - 22.1	-	**2** 84.3 - 231	3 53.7-623	9 49.4-199.0	19 21.2 - 46.3	9 190 - 1,315	3 0.17 – 0.9
Duart (11 samples)	-	-	-	-	-	-	-	-
Reference samples (4)	4 10 - 13.7	-	-	-	-	2 21.2 - 21.6	-	-
BAC concentrations (mg/kg)	**25**	**0.31**	**81**	**27**	**38**	**36**	**122**	**0.07**
TNT (10 samples)	-	**10** 0.4 - 0.8	-	**2** 28.8 - 30	-	-	-	-
TNW samples (11 samples)	-	**11** 0.4 - 0.8	-	-	**2** 72.2 - 76.7	-	-	-
TSE samples (12 samples)	-	12 0.4 - 0.8	-	-	2 41.1 - 76.6	-	-	-
Highlander (23 samples)	-	-	-	-	-	-	-	-
Petronella (13 samples)	-	-	-	-	-	-	-	-
Galley (30 samples)	-	29 0.4 - 1.1	2 84.3 - 231	7 28-623	10 44.0-199.0	**2** 38.2 - 46.3	**10** 149 - 1,315	**5** 0.10 - 0.90
Duart (11 samples)	-	-	-	-	-	-	-	-
Reference samples (4)	-	4 08 - 0.8	-	-	-	-	-	-

Note: numbers in bold are the number of samples where concentrations were > than either the ERL or BAC concentrations. Values in blue show the range of concentrations of the samples that were > the ERL or BAC concentrations.

5.5 Drill Cuttings

Table 3-6 provides a summary of the five small cuttings piles associated with the Tartan Development Area and Figures 5-4 and 5-5 show the location of the piles and the samples taken within each cuttings pile.

In summary, with respect to the small cuttings piles the largest volume of cuttings (*c.* 494 m^3) occurs at the Highlander template location with an estimated footprint of *c.* 1,801m^2, and a total hydrocarbon content of c. 0.44 te . The footprint of the cuttings piles at the TNW and TSE drill centres and at the Galley SPS location were estimated to be *c.* 47 % , 53 % and 95% less than the footprint of the Highlander cuttings pile respectively. Total hydrocarbon content at the TNW (*c.* 0.02 te) , TSE (*c.* 0.07 te) and Galley SPS (*c.* 0.11) piles were also significantly less than the total hydrocarbon concentration associated with the Highlander cuttings pile. As mentioned in Table 3-6, MBES data was not collected at te Galley G6 well location, such that equivalent data is not available for this cuttings pile. However, as it comprises cuttings from a single well it is expected to be significantly smaller than the Highlander cuttings pile.

Details of the cuttings pile at the Tartan A platform have not been included in Table 3-6 as the management of this cuttings pile will be captured in the Tartan A substructure DP. However, as a number of the pipelines and umbilicals connect to the Tartan A cuttings pile, details of the pile are included in this section. The Tartan A cuttings pile was estimated to have volume of 5,450 m^3, a footprint of 7,475 m^2 and a total hydrocarbon content of *c.* 151 te. It is therefore notable larger than the Highlander cuttings pile, and is according to the Norwegian Oil and Gas Association Guidance (OLF, 2016) it could be considered to be a 'medium' sized pile.

5.5.1 Sediment Hydrocarbons

5.5.1.1 Total Hydrocarbon Concentrations

THC recorded within each of the cuttings samples are shown in Figures 5-10 and 5-11 and values are provided in Table 5-3. Across the cuttings piles the THC levels in 19 of the 39 stations (c. 49% of the stations) exceeded the OSPAR cuttings pile ecological effects threshold (50 mg/kg) (values shaded red in Table 5-3) (APEM, 2019g). Hydrocarbon data including THC and PAHs were highly variable between all six of the cuttings piles analysed, indicating varying levels of oil contamination from historic drilling activity. In general, the highest concentrations of THC at cuttings piles which exceeded the OSPAR threshold peaked within the surface samples with concentrations decreasing with depth. However, it was noted in the survey report that the lower concentrations in the deeper core samples could be the result of the core penetrating the bottom of the cuttings pile and sampling the natural seabed rather than the cuttings pile.

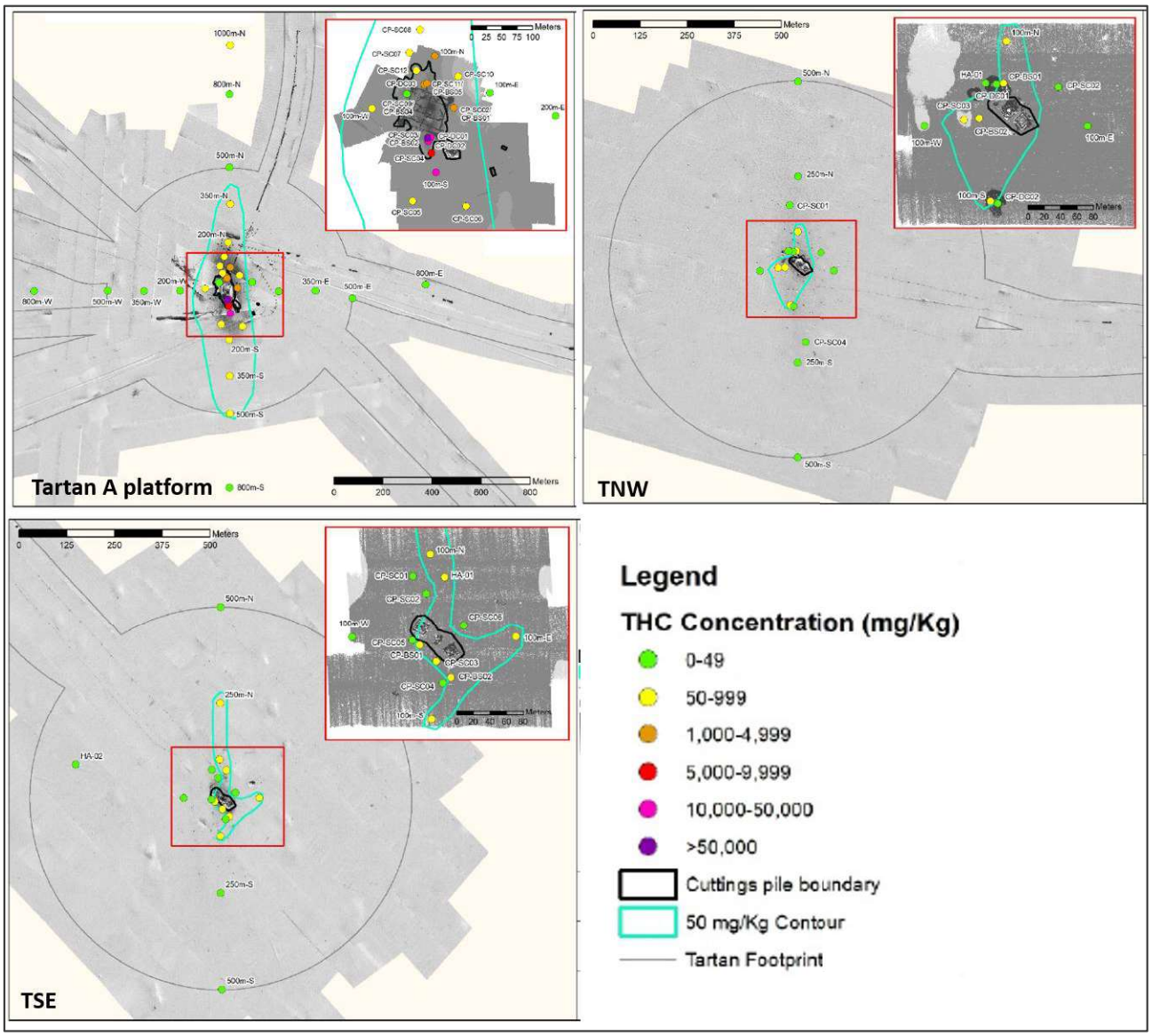


Figure 5-11: Total hydrocarbon concentrations at the Tartan A TNW and TSE cuttings piles (APEM, 2019g).

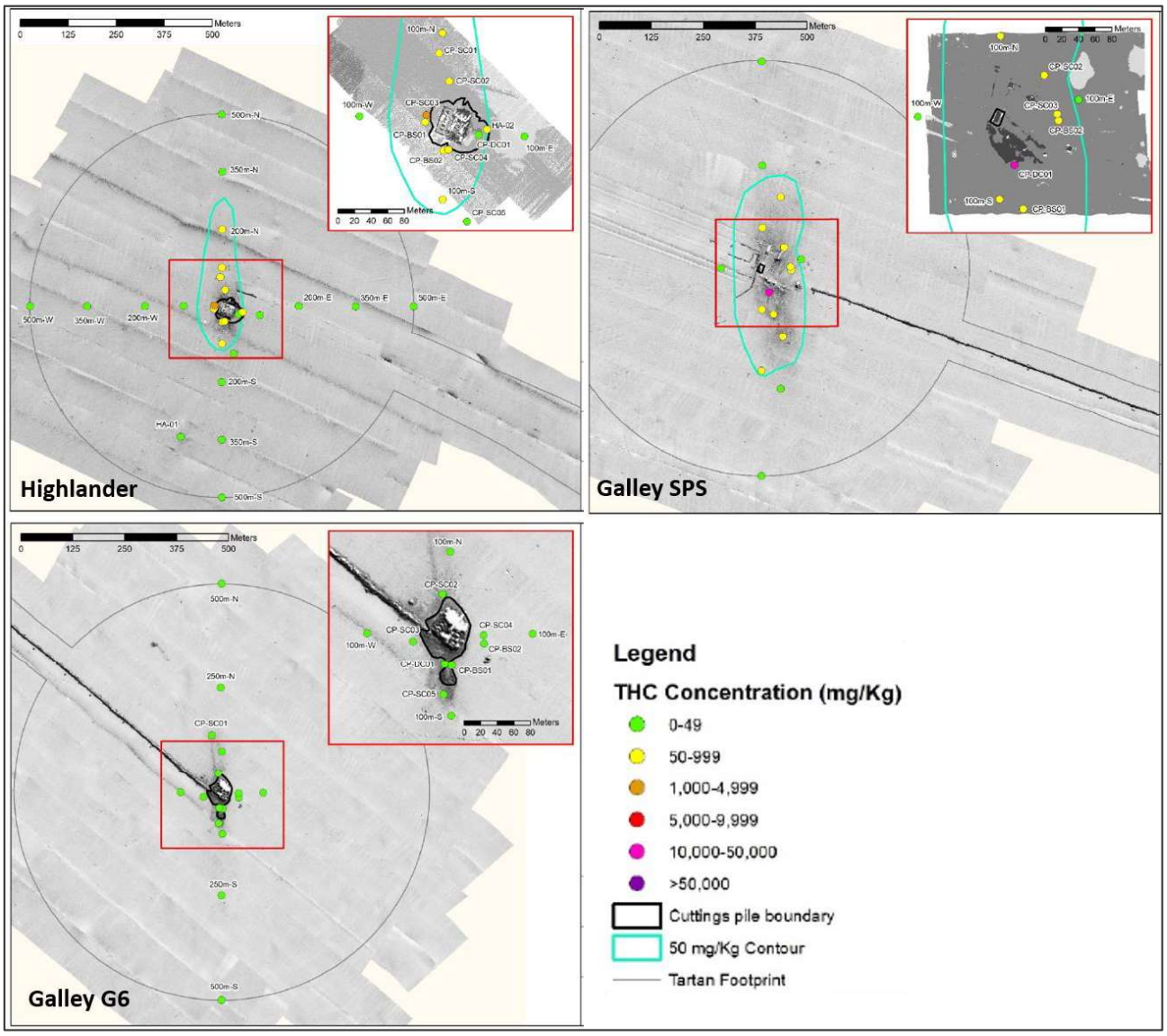


Figure 5-12: Total hydrocarbon concentrations at the Highlander, Galley SPS and Galley G6 cuttings piles. (APEM, 2019g).

Table 5-3: THC and PAH concentrations recorded in the cuttings pile samples (APEM, 2019g).

Station	Grab/ Core sub-layer location	Depth (cm)	THC (mg/kg)	Total PAHs (mg/kg)
Highlander				
HLW-CP-BS01	Surface grab	15	215	0.403
HLW-CP-BS02	Surface grab	16	300	0.581
HLW-CP-DC01	Deep core top	143	23.9	0.356
	Deep core mid	143	8.9	0.219
	Deep core bottom	143	13.1	0.272
HLW-CP-SC01	Shallow core	82	358	0.728
HLW-CP-SC02	Shallow core	85	132	0.429
HLW-CP-SC03	Shallow core	101	1,010	0.991
HLW-CP-SC04	Shallow core	73	708	1.09
HLW-CP-SC05	Shallow core	62	17	0.308
Galley G6				
G6W-CP-BS01	Surface grab	17	13.6	0.289
G6W-CP-BS02	Surface grab	18	20.6	0.431
G6W-CP-DC01	Deep core top	195	15.6	0.318
	Deep core mid	77	13.4	0.314
	Deep core bottom	170	14.1	0.391
G6W-CP-SC01	Shallow core	50	11.8	0.33
G6W-CP-SC02	Shallow core	55	6.73	0.127
G6W-CP-SC03	Shallow core	49	4.91	0.124
G6W-CP-SC04	Shallow core	50	8.1	0.228
Galley SPS				
GLW-CP-BS01	Surface grab	15	548	2.33
GLW-CP-BS02	Surface grab	18	87.1	0.416
GLW-CP-DC01	Deep core top	195	28,400	6.45
	Deep core mid	185	17.8	0.267
	Deep core bottom	185	19.8	0.466
GLW-CP-SC01	Shallow core	73	143	0.566
GLW-CP-SC02	Shallow core	73	286	1.34
GLW-CP-SC03	Shallow core	43	548	1.93
GLW-CP-SC04	Shallow core	56	229	1.1
GLW-CP-SC05	Shallow core	57	28.8	0.223
Tartan TS NW				
TTS-NW-CP-BS01	Surface grab	18	69.9	0.197
TTS-NW-CP-BS02	Surface grab	18	79	0.77
TTS-NW-CP-DC01	Deep core top	108	19.6	0.206
	Deep core mid	102	11	0.229
	Deep core bottom	179	14	0.394
TTS-NW-CP-DC02	Deep core top	193	3.25	0.0367
	Deep core mid	99	10	0.244
	Deep core bottom	143	17.6	0.496

Station	Grab/ Core sub-layer location	Depth (cm)	THC (mg/kg)	Total PAHs (mg/kg)
TTS-NW-CP-SC01	Shallow core	84	5.38	0.171
TTS-NW-CP-SC02	Shallow core	65	23.7	0.394
TTS-NW-CP-SC03	Shallow core	99	131	0.572
TTS-NW-CP-SC04	Shallow core	73	7.41	0.237
Tartan TS SE				
TTS-SE-CP-BS01	Surface grab	12	206	0.888
TTS-SE-CP-BS02	Surface grab	15	454	0.578
TTS-SE-CP-SC01	Shallow core	65	15	0.139
TTS-SE-CP-SC02	Shallow core	67	13.5	0.224
TTS-SE-CP-SC03	Shallow core	51	348	0.267
TTS-SE-CP-SC04	Shallow core	50	9.2	0.325
TTS-SE-CP-SC05	Shallow core	72	34.3	0.166
TTS-SE-CP-SC06	Shallow core	64	21.2	0.195

5.5.1.2 Polycyclic Aromatic Hydrocarbons

Table 5-3 shows the total PAH concentrations within the sediments located at each area. Total PAHs were observed in low concentrations and ranged between 0.12 mg/kg and 0.43 mg/kg and are comparable to concentrations (0.26 mg/kg) recorded at stations that are > 5000 m from active platforms in the central North Sea (UKOOA, 2001).

5.6 Marine Flora and Fauna

5.6.1 Plankton

The plankton community in the waters around the Tartan Development Area is similar to that found over the wider CNS area (DECC, 2016).

The phytoplankton community is dominated by the dinoflagellate genus *Ceratium* (*C. fusus, C. furca, C. lineatus*), with diatoms such as *Thalassiosira spp*. and *Chaetoceros spp*. also abundant, whilst the zooplankton community is dominated by calanoid copepods, with *Paracalanus* and *Pseudocalanus* also abundant (DECC, 2016). *Euphausiids*, *Acartia*, and decapod larvae are also important components of the zooplankton assemblage (DECC, 2016).

5.6.2 Habitat Type and Benthic Communities

5.6.2.1 Habitat Type

Applying the Joint Nature Conservation Committee (JNCC) marine habitat classification, three main habitats were identified across the Tartan Development Area. These habitat types are identified in Table 5-4 which also provides the corresponding European Nature Information System (EUNIS) classification. Photographs of the different habitat types are presented in Figure 5-13, whilst the distribution of the different habitat types across the survey area are shown in Figures 5-13 to 5-16.

Table 5-4: Habitat classifications.

Habitat	JNCC Marine Habitat Classification	JNCC Description	EUNIS Classification	EUNIS Description
Circalittoral fine mud communities	SS.SMu.CFiMu.SpnMeg SS.SMu.CFiMu	Seapens and burrowing megafauna in circalittoral fine mud	A5.36	Circalittoral fine mud
Circalittoral fine mud				
Sandier substrata with seapens and urchins	SS.SMu.CSaMu	Circalittoral sandy mud	A5.35	Circalittoral sandy mud
Mixed sediment with *Mytilus edulis* shells	SS.SMx.OMx	Offshore circalittoral mixed sediment	A5.45	Deep circalittoral mixed sediments

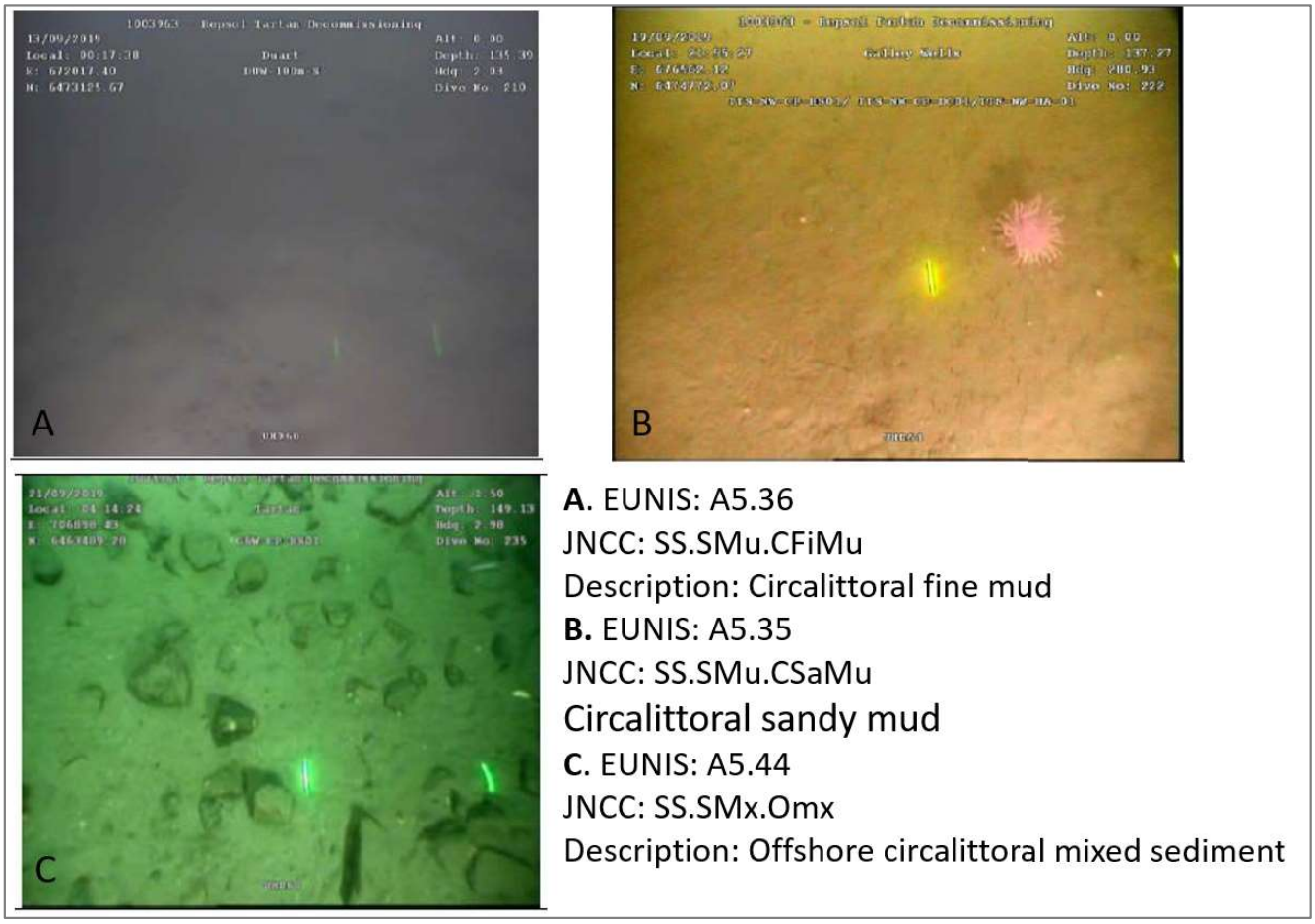


Figure 5-13: Photographs of different habitat types observed in the Tartan Development Area (APEM, 2020h).

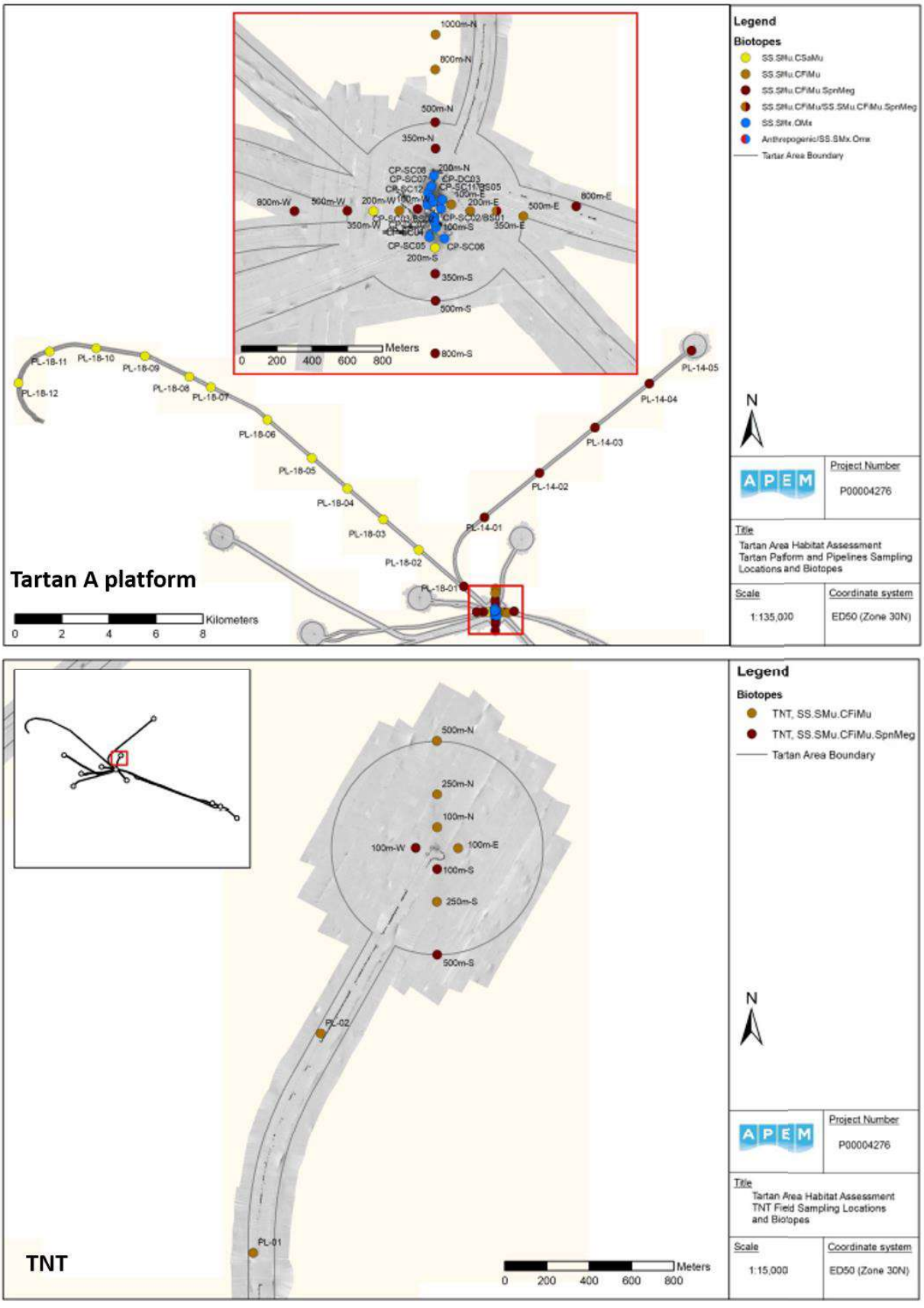


Figure 5-14: Distribution of habitat types at the Tartan A platform and the TNT drill location. (APEM, 2020h)

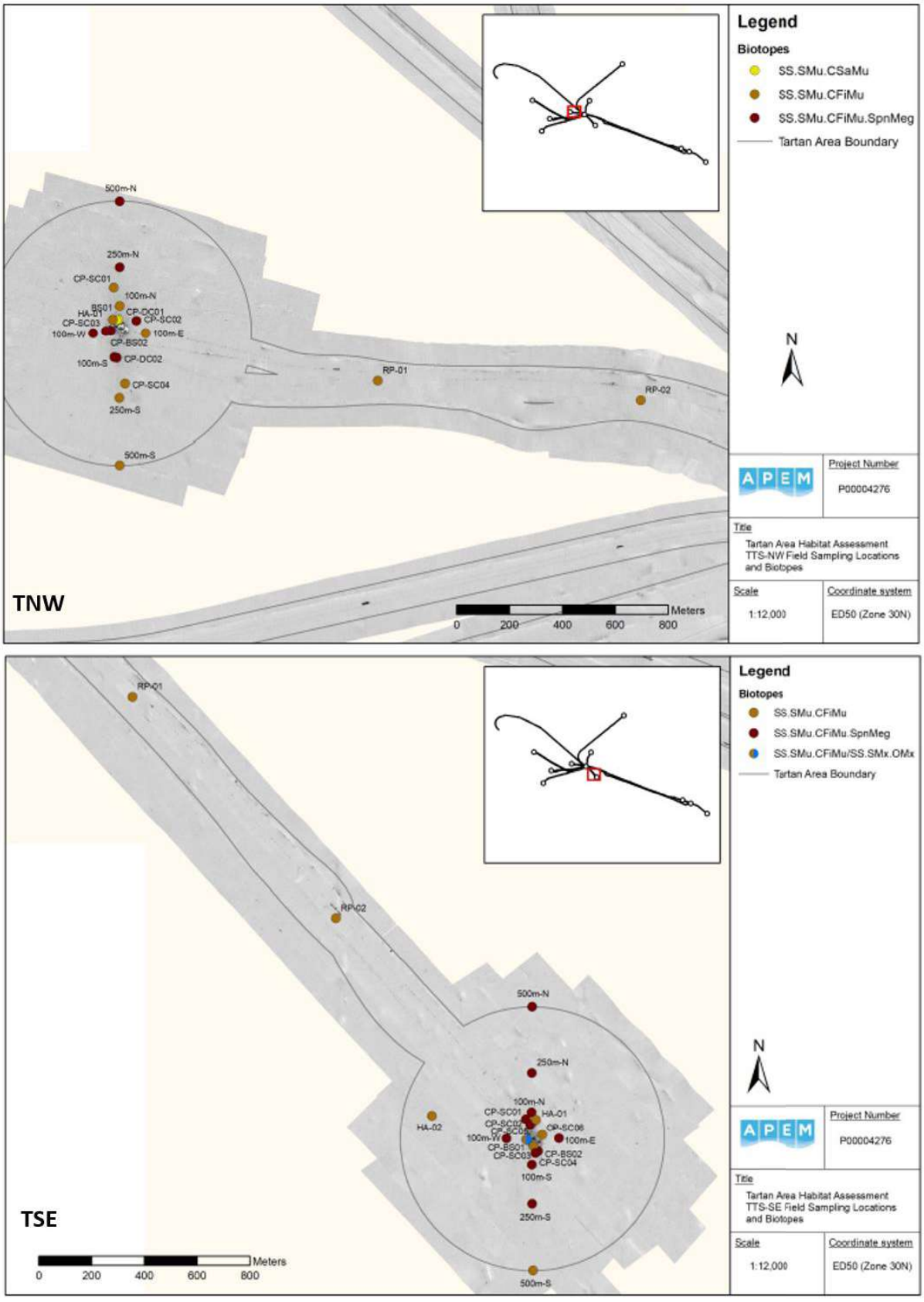


Figure 5-15: Distribution of habitats at the TNW and TSE drill centres (APEM, 2020h).

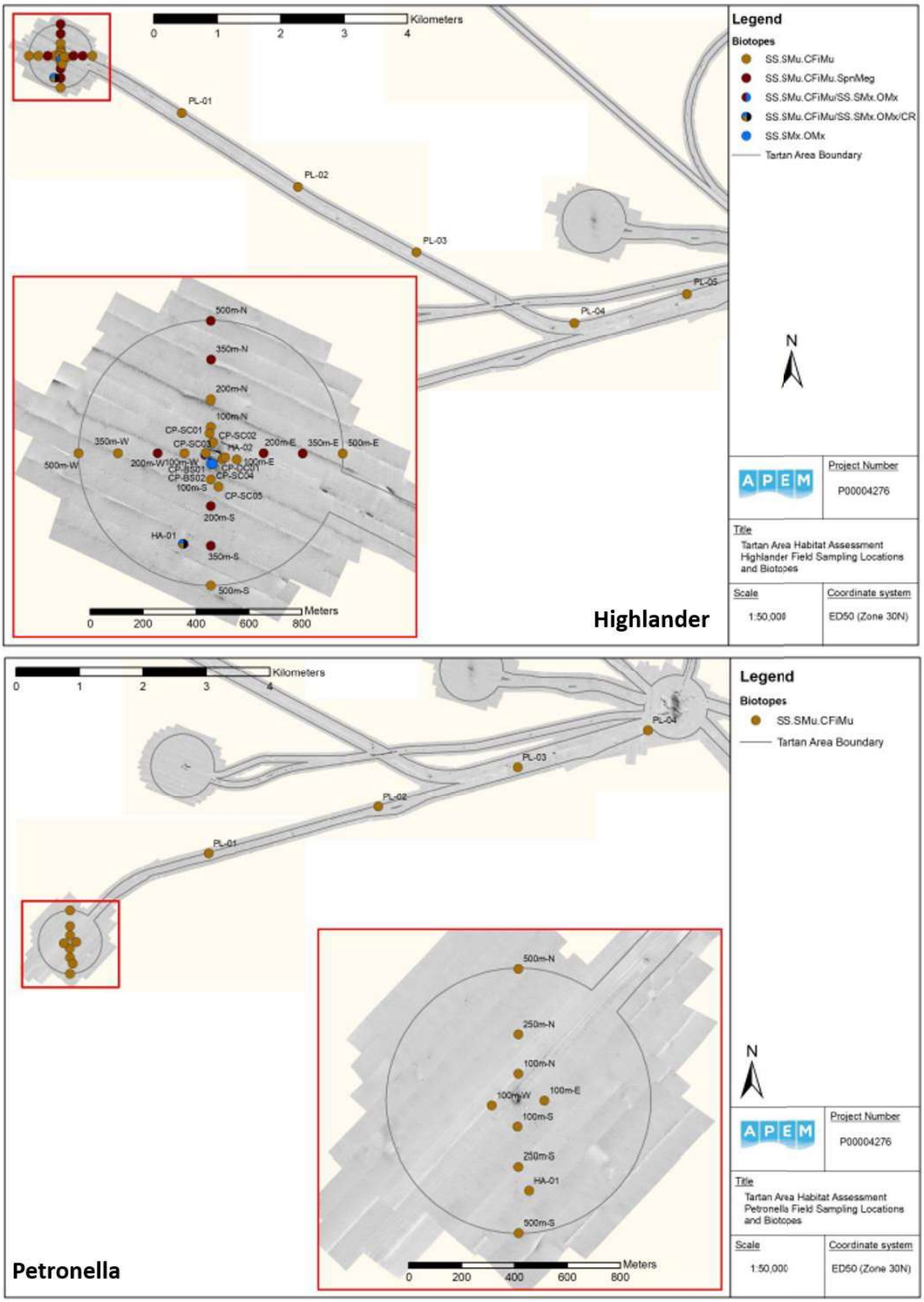


Figure 5-16: Distribution of habitats at the Highlander and Petronella fields (APEM, 2020).

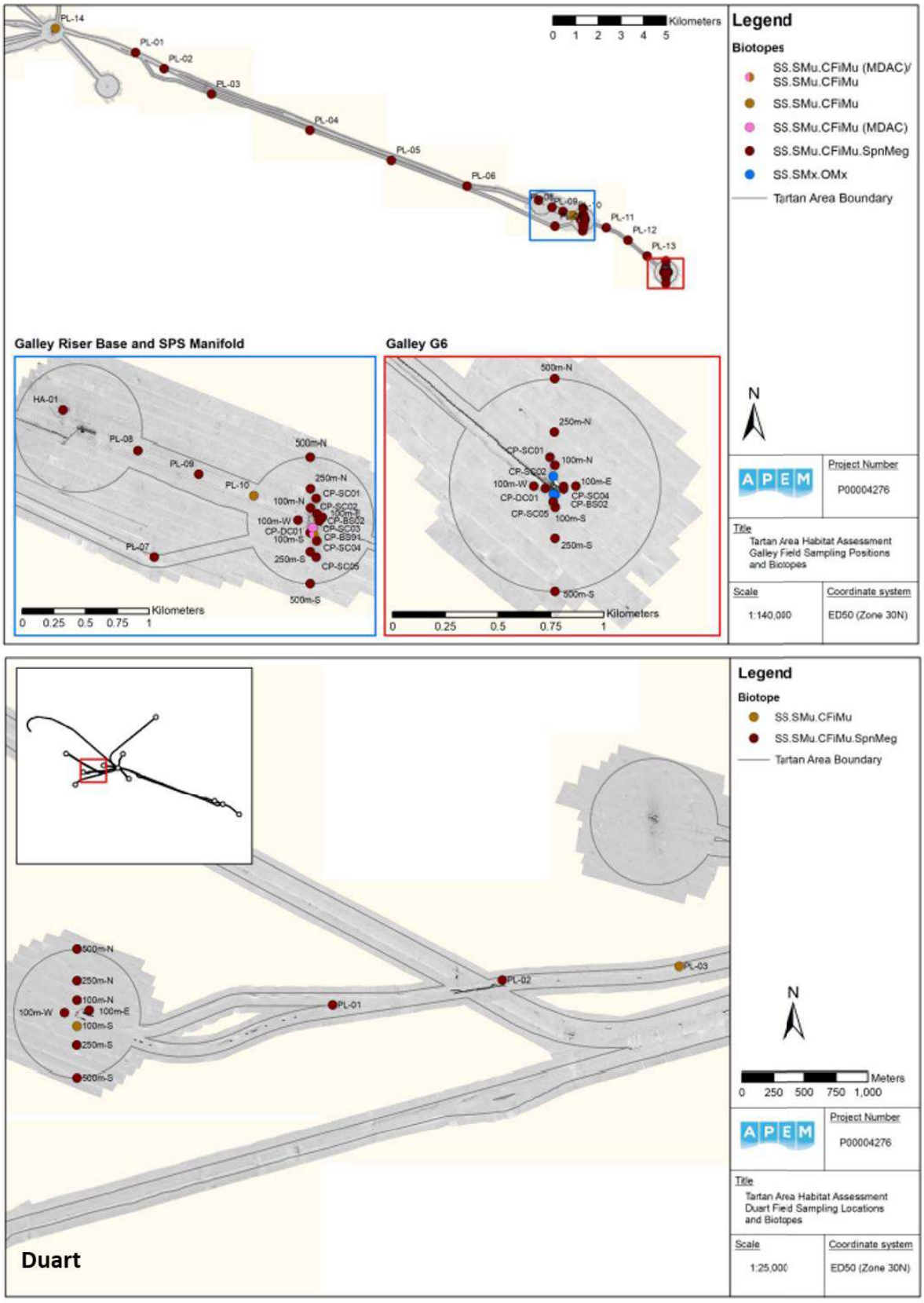


Figure 5-17: Distribution of habitat types at the Galley and Duart fields. (APEM, 202h).

The environmentally sensitive habitat of sea-pen and burrowing megafauna communities (Figure 5-18) was widespread across the survey area. In order to qualify for the OSPAR definition, it is the presence of burrowing megafauna in sufficient abundance that is considered essential (JNCC, 2014). Using burrow counts to assess abundance can be problematic due to possibility of multiple entrances to a single burrow and interconnected burrows of different species (Hill & Tyler-Walters, 2018). In addition, there can be difficulties with distinguishing *Nephrops norvegicus* burrows from those of smaller burrowing species Campbell *et al.*, (2009). The possibility of counting multiple entrances to a single burrow and counting burrows by smaller species can result in an over estimation of abundance metrics based on burrow counts. No distinction was made between burrow sizes due to variable resolution and image quality, but on transects with poorer quality footage smaller burrows (less than 3 cm) were not distinguishable therefore counts are assumed to primarily represent the larger *Nephrops* burrows at these stations. These also tended to be the transects with the lowest counts since it was not always possible to count burrows at all.

Thirty of the 144 transects had burrow counts exceeding 10 burrows per 10 m^2 with the highest count (45.67 per m2) being observed in the vicinity of the TNW drill centre Even if a conservative estimate of only one of those burrows per 10 m^2 could be attributed to *Nephrops norvegicus* this would still be sufficient to classify these transects, and therefore the majority of the survey area, as 'Sea-pen and burrowing megafauna communities' habitat according to the JNCC criteria (JNCC, 2014)[1].

Based on the EBS footage and burrow counts, the majority of the Tartan Development Area is therefore likely to constitute the OSPAR listed threatened and/or declining habitat 'Sea-pen and burrowing megafauna communities' as well as the UKBAP habitat 'mud habitats in deep water'.

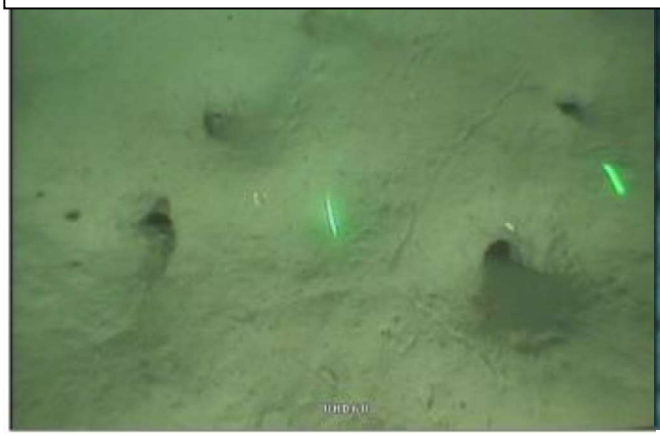
Faunal burrows at Galley Station G6W-500m-N	Bacterial matting (most likely *Beggiatoa* sp.) in potential Methane-Derived Authigenic Carbonate (MDAC) habitat at Galley Station GLW-CP-BS01
	

Figure 5-18: Photographs of faunal burrows and potential MDAC habitat at the Galley field (APEM, 2020h).

The presence of bacterial mats can be an indication of active seeps of methane and sulphide, in particular the bacterium *Beggiatoa*, which oxidises sulphides (Judd, 2001). The first video transect at station GLW-CP-BS01 at the Galley field revealed extensive bacterial matting considered likely to be *Beggiatoa* sp. along with potential MDAC concretions (Figure 5-18), although no larger structural formations or leaking gas bubbles were visible in the footage. To ensure that no destructive sampling was carried out within the boundary of this potentially sensitive area two further transects were carried out in a cruciform pattern running north to south and then west to east to determine

[1] JNCC guidance (JNCC, 2014) recommends a minimum of 1-9 megafaunal burrows (3-15 cm) per 10 m^2 to be classed as frequent on the SACFOR scale.

the extent of this habitat. Analysis of the resulting footage showed an area extending approximately 65 m north to south and 23 m east to west. However, the habitat was visible from the beginning of the north to south transect so may extend further around the Galley SPS manifold itself. Towards the southern extent of the habitat the concretions became more patchy and intermittent, which is typical of localised MDAC habitat (Judd, 2005). The extent of the habitat as recorded is mapped in Figure 5-19. Smaller patches of bacterial matting on hard concretions were also seen in a mosaic amongst areas of softer mud to the west at Station GLW-CP-DC01, which could indicate MDAC habitat partially covered by sediment.

The area of potential MDAC habitat identified near the Galley SPS Manifold could represent an Annex I habitat; however, no evidence of gas bubbles, pockmark features or larger topographic structures were seen that would be required to confirm that it meets the criteria of the feature.

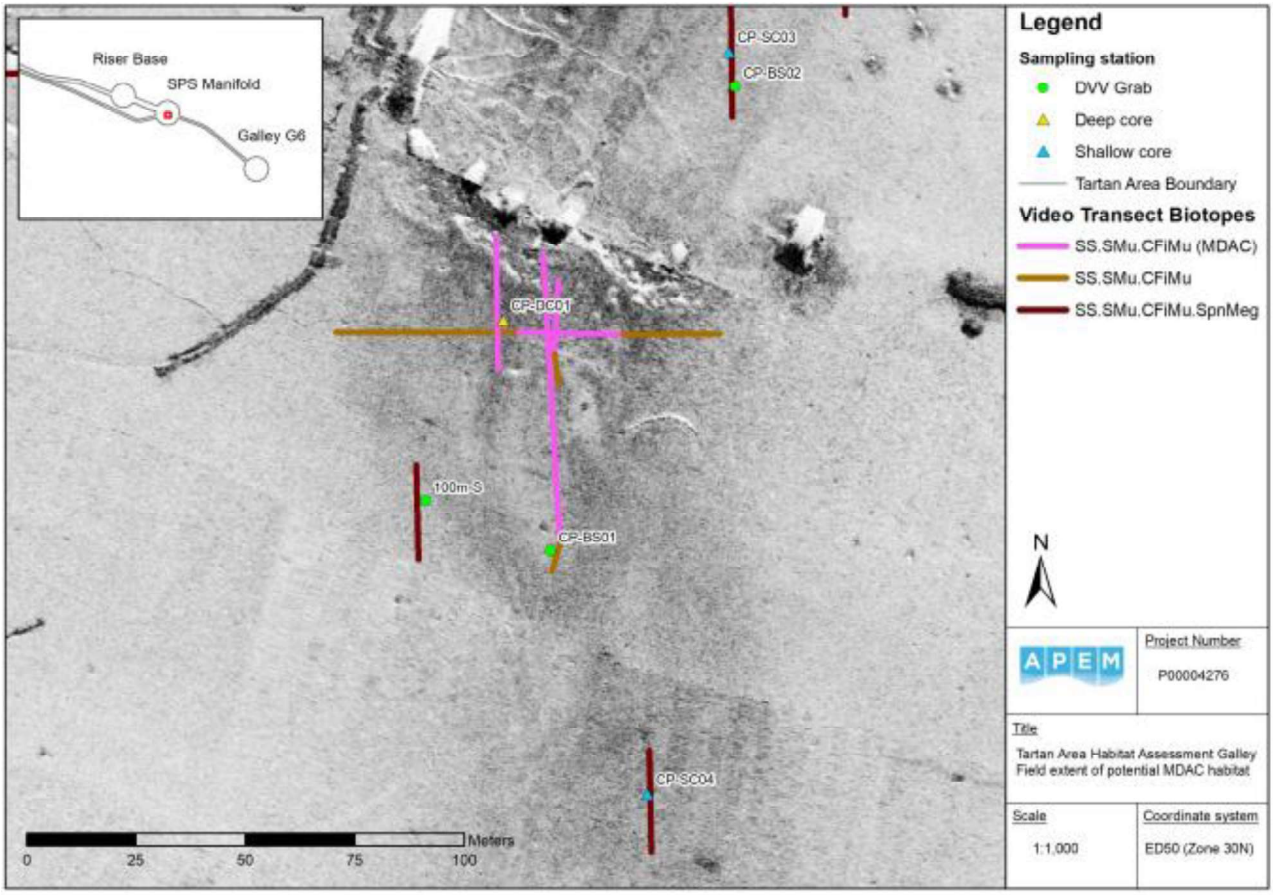


Figure 5-19: Map showing extent of potential MDAC habitat in the vicinity of the Galley SPS Manifold (APEM, 2020h).

In 2015 Fugro carried out a drill site survey in Block 15/16 on behalf of Summit Exploration and Production Limited (Fugro 2015). The survey area was located *c*. 13 km north of the Tartan A platform and *c*. 8 km north west of the Claymore wye structure. The survey reported numerous depressions which were interpreted as pockmarks. Though these pockmarks are in relatively close proximity to the Tartan Development Area, no pockmarks were detected as part of the pre-decommissioning survey (APEM, 2020h).

5.6.2.2 Benthic Communities

Bacteria, plants and animals living on or within the seabed sediments are collectively referred to as benthos. Species living on top of the sea floor may be sessile (e.g. seaweeds) or freely moving (e.g. starfish) and collectively are referred to as epibenthic or epifaunal organisms. Animals living within the sediment are termed infaunal species (e.g. tubeworms and burrowing crabs) while animals living on the surface are termed epifaunal (e.g. crabs and starfish). Semi-infaunal animals, including sea pens and some bivalves, lie partially buried in the seabed.

The dominant epifauna taxa found distributed across this mud habitat included sea pen species such as *Virgularia mirabilis* and *Pennatula phosphorea* and Norway lobsters (*Nephrops norvegicus*). White urchins (*Gracilechinus acutus)* were recorded from three transects at the Galley field. A single sand star (*Luidia sarsii*) was recorded from the Petronella survey.

On hard or artificial substrates, anemones were common and grazing starfish (mostly *Asterias rubens*) were noted. Northern stone crabs (*Lithodes maja*) and hermit crabs (Paguridae) were noted occasionally. In the TSE well survey area anthropogenic debris was recorded, including litter, cables, pipes, a frame and a large bag. The frame supported growth of dead men's fingers (*Alcyonium digitatum)* and plumose anemone (*Metridium senile)*. No ocean quahogs (*Arctica islandica*) were observed in the video, probably due to being buried in the sediment, however juvenile *A. islandica shells* were recorded in a large number of the grab samples returned from each of the Tartan Development Area fields. In addition, two adult specimens were recorded from two of the grab samples taken at the TSE drilling location.

Figure 5-20 shows photographs of some of the fauna observed on the seabed.

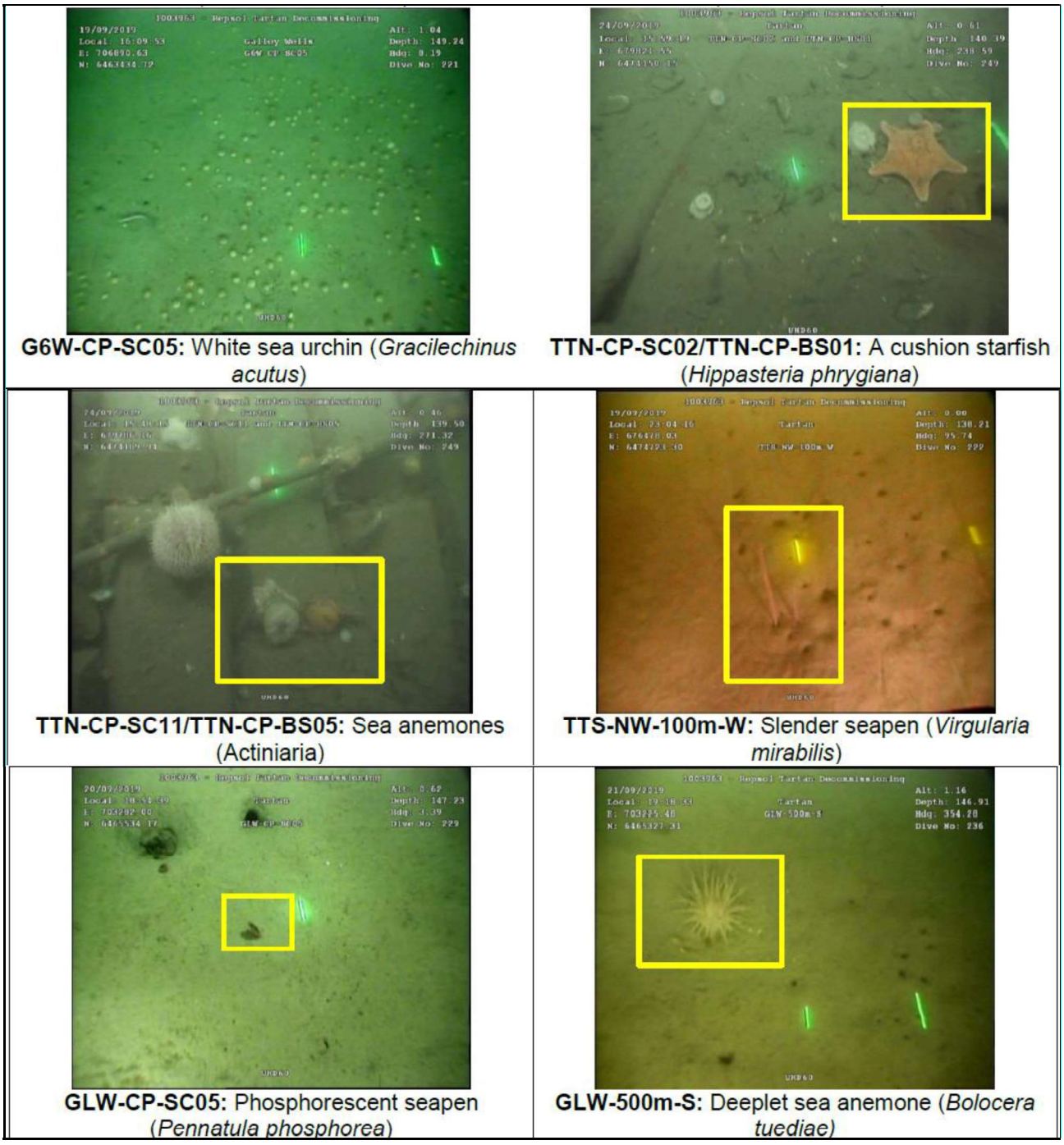


Figure 5-20: Photographs of different fauna associated with the area.

Macrofaunal analysis of the samples taken at the areas of seabed covered with drill cuttings showed relatively uniform faunal composition across the areas, with generally high diversity in all samples and species assemblages dominated by polychaete communities in sandy mud. Differences between samples were driven by differences in relative abundances of the dominant taxa.

5.6.3 Fish and Shellfish

More than 330 fish species are thought to inhabit the shelf seas of the UKCS (Pinnegar *et al*., 2010). Figure 5-21 and Table 5-5 shows the approximate spawning and nursery areas of some of the fish species known to occur in the vicinity of the Tartan Development Area (Coull *et al*., 1998; Ellis *et al.,* 2012) and Figure 5-22 shows the probability of juvenile fish for some species occurring in the area (Aires *et al*., 2014).

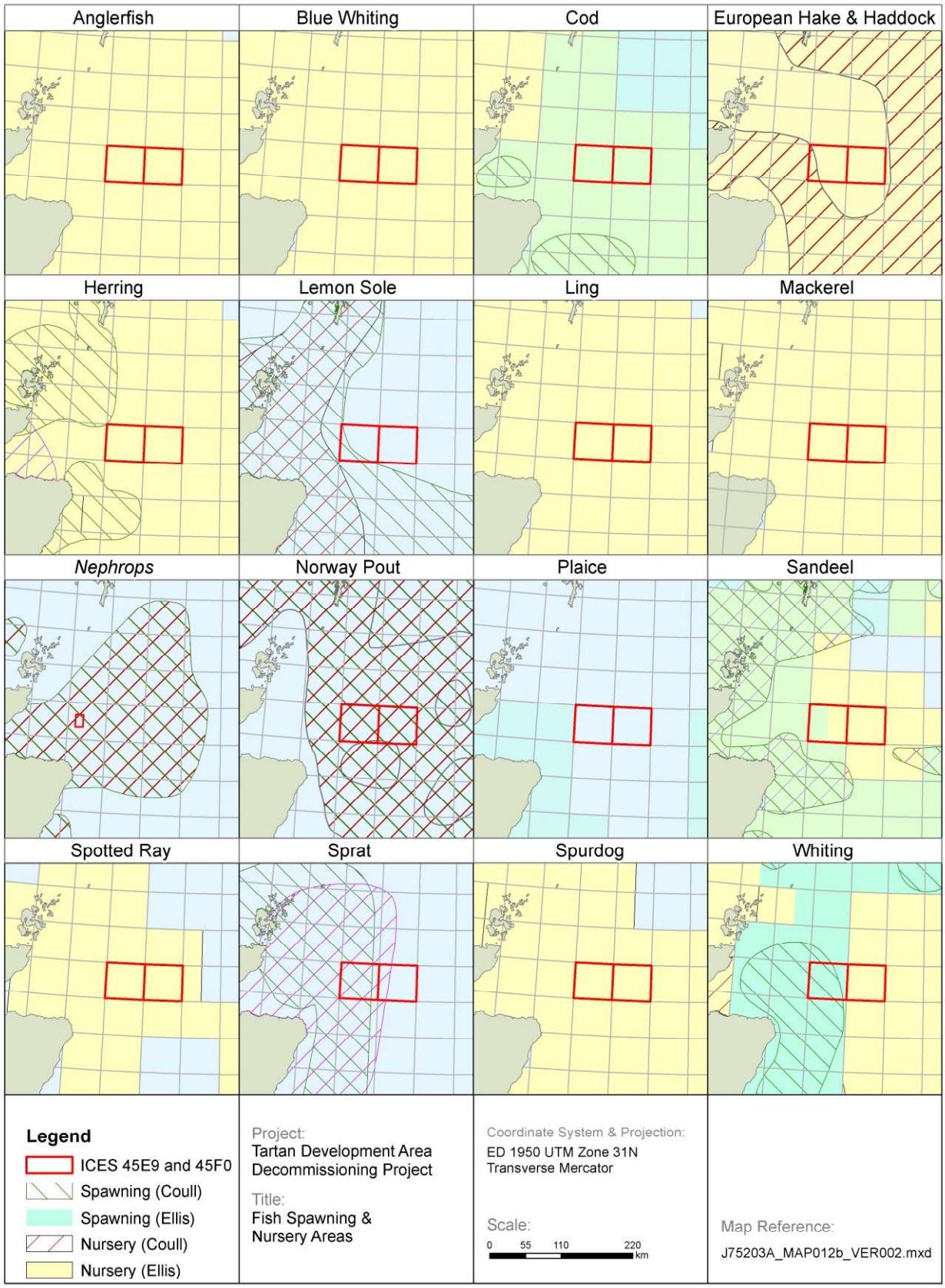


Figure 5-21: Spawning and nursery areas of fish species known to occur in the vicinity of the Tartan Development Area.

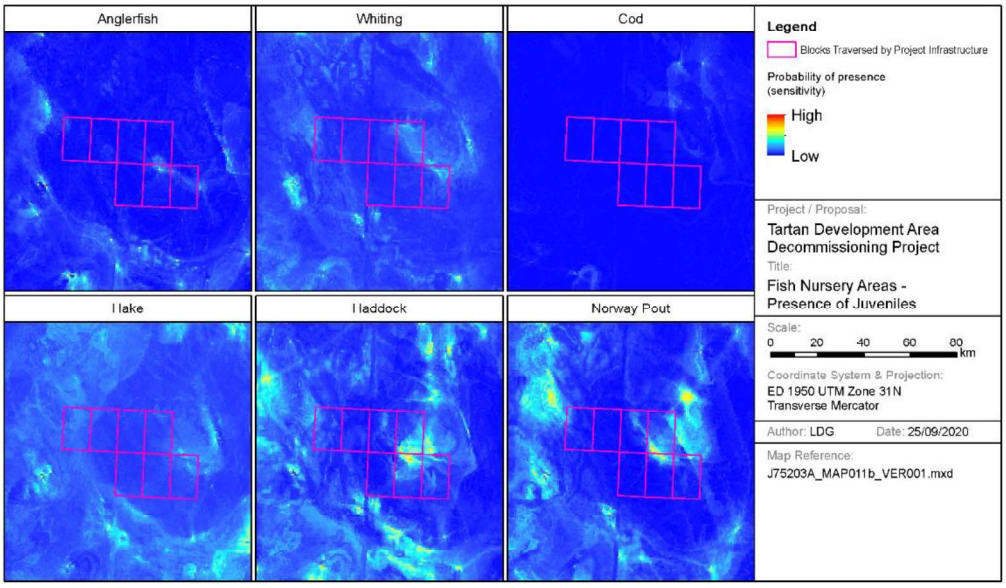


Figure 5-22 Probability of juvenile fish presence in vicinity of the Tartan Development Area (Aries et al., 2014)[2].

Table 5-5 Spawning grounds and nursery areas of commercially and ecologically important fish species in the Tartan Project area (Coull et al., 1998; Ellis et al., 2012; Aires et al., 2014).

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anglerfish	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Blue whiting	N	N	N	N	N	N	N	N	N	N	N	N
Cod	SN	S*N	S*N	SN	N	N	N	N	N	N	N	N
European hake	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Haddock	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Herring	N	N	N	N	N	N	N	N	N	N	N	N
Ling	N	N	N	N	N	N	N	N	N	N	N	N
Mackerel	N	N	N	N	N	N	N	N	N	N	N	N
Nephrops	SN	SN	SN	S*N	S*N	S*N	SN	SN	SN	SN	SN	SN
Norway Pout	NJ	NJ	SNJ	SNJ	SNJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Sandeel	N	N	N	N	N	N	N	N	N	N	N	N
Spotted ray	N	N	N	N	S*N	S*N	S*N	N	N	N	N	N
Sprat	N	N	N	N	N	N	N	N	N	N	N	N
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Whiting	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ	NJ
Key: S = spawning S* = peak spawning (2) N = nursery J = juveniles (i.e. 0 group fish) (3)												

Low intensity nursery grounds were recorded in the area for Norway pout, *Nephrops*, blue whiting, sprat, haddock and anglerfish, and spawning grounds were recorded for Norway pout (high density), cod, whiting, *Nephrops*, lemon sole and sprat (Ellis *et al.,* 2010).

Of the fish species identified in the area, cod, Norway pout, whiting, blue whiting, anglerfish, ling, herring, mackerel, spurdog and sandeel have been assessed by Scottish Natural Heritage (SNH) and JNCC as Priority Marine Features (PMFs) in Scotland (SNH, 2016). See Section 5.8 for further information on PMFs. In addition, cod is considered

[2] The data presented in Figure 5-22 uses Species Distribution Modelling (SDM) to predict where aggregations of 'Group 0' fish (fish in the first year of their life) may be found based on environmental information and catch records.

vulnerable on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. Similar to many other species, cod is a benthic spawner and is sensitive to seabed disturbance. They are known to aggregate over specific grounds to spawn and aggregate on a spawning arena where males hold small territories in a lek-like mating system. This aggregative behaviour together with seasonal site fidelity can make cod, especially vulnerable to anthropogenic impacts. The Tartan Development Area is recognised to be located within a cod recurrent spawning area (Jose *et al*,. 2016).

Table 5-5 does not identify the area as being suitable for sandeel spawning. Sandeels prefer spawning substrate with a low clay silt fraction (<10%) and water depths of 20 – 100m (Lancaster *et al*. (2014). As described in 5.3.1 water depths across the Tartan Development area range from *c*. 135 m to *c*. 147 m. Therefore, though there may be some areas withing the Greater Tartan Area that may be suitable habitat for spawning, the water depth is typically greater than that preferred by sandeels for spawning.

5.6.4 Marine Mammals

5.6.4.1 Pinnipeds

Two species of seal live and breed in UK waters: the grey seal (*Halichoerus grypus*) and the harbour (also called common) seal (*Phoca vitulina*). Both species are listed as Annex II species under the European Union (EU) Habitats Directive.

The foraging range of the harbour seal is typically within 40 – 50 km of their haul out site. Tracking of individual grey seals has shown that they can feed up to several hundred kilometres offshore, although most foraging tends to be within approximately 100 km (SCOS, 2013). Given the offshore location of the Tartan Development Area, telemetry data (1991-2012) and count data (1988-2012) indicate that seals are unlikely to be present in the vicinity of the fields.

5.6.4.2 Cetaceans

The JNCC has compiled an Atlas of Cetacean Distribution in Northwest European Waters (Reid *et al.,* 2003) which gives an indication of the annual distribution and abundance of cetacean species in the North Sea. Table 5-6 presents the annual abundance of cetacean species likely to occur in the Tartan Development Area. The data suggests that moderate to low densities of Atlantic white-sided dolphin and harbour porpoise and high to low densities of white-beaked dolphin and minke whale have been sighted in the area (Reid *et al*., 2003).

Table 5-6 Marine mammal seasonal abundance in the vicinity of the Blocks (Reid et al., 2003) (blue = species seen).

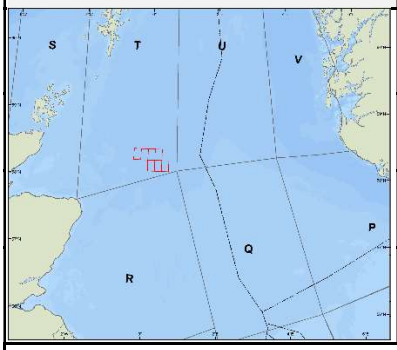
Species	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Minke whale					3	3	2					
Harbour porpoise						3	2	3				
Atlantic white-sided dolphin							3					
White-beaked dolphin		3				3	1	1	1	1		
Key	1 = High		2 = Moderate		3 = Low			Blank = No sightings				
Source: Reid *et al*., 2003.												

A series of Small Cetacean Abundance in the North Sea (SCANS) surveys have been conducted to obtain an estimate of cetacean abundance in North Sea and adjacent waters, the most recent of which is SCANS-III (Hammond *et al,* 2017).

The Tartan Development Area is located within SCANS-III Block 'T'. Aerial survey estimates of animal abundance and densities (animals per km^2) within this area are provided in Table 5-7. The data confirm that some of those species identified by Reid *et al*. (2003) frequent SCANS-III Block T (Hammond *et al*., 2017).

The JNCC have published the 'regional' population estimates for the seven most common species of cetacean occurring in UK waters (IAMMWG, 2015). Divided into Management Units (MU), these provide an indication of the spatial scale and the relevant populations at which potential impacts should be assessed. The relevant MU population estimates are also presented in Table 5-7.

Table 5-7 Cetacean Abundance in SCANS-III Survey Block T (Hammond et al., 2017).

SCANS-III Block T	Species	Animal Abundance[1]	Density (animals/km²)[1]	MU Population[2]
	Harbour porpoise	26,309	0.402	227,298
	Minke whale	2,068	0.032	23,528
	White-sided dolphin	1,366	0.021	69,293
	White-beaked dolphin	2,147	0.037	15,895

[1] Hammond *et al*., (2017) [2] IAMMWG (2015)
[2] The relevant MU area for bottlenose dolphin for the proposed survey area is the Greater North Sea MU area, which has an MU population of 0 (IAMMWG, 2015). The SCANS-III density estimate of bottlenose dolphin for Survey Block T is non-zero since it includes dolphins from the Central East Scotland MU population (IAMMWG, 2015).

Of the marine mammals known to occur in the area harbour porpoise is an Annex II species and therefore are protected under the Habitats Directive. In addition, all cetaceans in UK waters are Annex IV species i.e. European Protected Species (EPS). Under the Habitats Regulations, it is an offence to deliberately disturb any EPS, or to capture, injure or kill an EPS at any time.

5.6.5 Seabirds

The North Sea is an internationally important area for breeding and feeding seabirds. Using seabird density maps from European Seabirds at Sea (ESAS) data collected over 30 years, Table 5-8 identifies a number of the bird species (and their predicted maximum monthly abundance) known to occur in the Tartan Development Area (Kober *et al*., 2010).

The data indicates that a number of seabird species are likely to occur in the area over the summer breeding season and winter months. For all species combined, a maximum of 10 seabirds are predicted to occur per km2 during the breeding season (April to September), whilst during the winter months (November to March) a maximum of 15 seabirds are predicted to occur per km². It is recognised that some of these species may be qualifying features of coastal SPAs along the UK coastline. For example, fulmar has a foraging range of up to 400 km and is a qualifying feature for a number of SPAs along the east coast of Scotland e.g. Buchan Ness to Collieston, Troup, Pennan and Lion's Heads, Fowlsheugh and the East Caithness Cliffs.

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Table 5-8 Predicted monthly seabird surface density in the Tartan Development Area (Kober et al., 2010).

Species	Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern gannet	Breeding												
	Winter												
Northern fulmar	Breeding												
	Winter												
Black-legged kittiwake	Breeding												
	Winter												
Lesser black-backed gull	Breeding												
Great black-backed gull	Breeding												
	Winter												
Razorbill	Breeding												
	Winter												
Great skua	Breeding												
	Winter												
Little auk	Winter												
Herring gull	Breeding												
	Winter												
Arctic skua	Breeding												
Common Gull	Breeding												
	Winter												
Common guillemot	Breeding												
	Additional												
	Winter												
Atlantic puffin	Breeding												
	Winter												
All species combined	Breeding												
	Summer												
	Winter												

KEY: maximum number of individuals per km^2	Not recorded	≤ 1.0	1.0 – 5.0	5.0 – 10.0	10.0 - 15.0	15.0 - > 20.0

5.7 Marine Protected Areas

A network of Marine Protected Areas (MPAs) are in place to aid the protection of vulnerable and endangered species and habitats, through structured legislation and policies. These sites include Special Areas of Conservation (SAC) and Special Protection Areas (SPA), designated under the EC Habitats Directive (92/43/EEC) and EC Birds Directive (2009/147/EC) respectively, along with Nature Conservation Marine Protected Areas (NCMPAs) designated under the Marine (Scotland) Act 2010 or the Marine and Coastal Access Act 2009.

The protected sites in closest proximity to the Tartan Development Area are shown in Figure 5-23. The nearest are the Scanner Pockmark SAC *c.* 29 km east of the infrastructure to be decommissioned and the Central Fladden NCMPA, which is located *c*. 39 km north of the infrastructure to be decommissioned. Given the distance of the Tartan Development Area from the nearest designated sites, the proposed decommissioning activities will not impact on any protected areas.

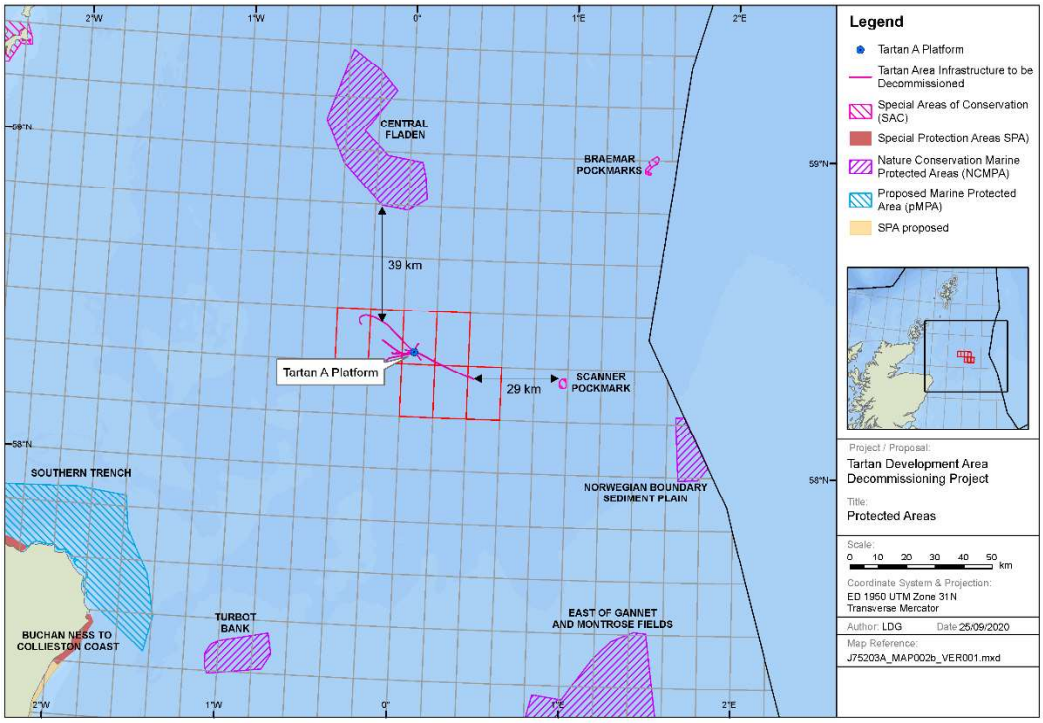


Figure 5-23 Location of the Tartan Development Area in relation to protected areas.

5.8 Sensitive Habitats and Species in the Area

As discussed in Section 5.6.2.1, based on the footage and burrow counts, the majority of the Tartan Development Area meets the criteria for the OSPAR listed threatened and/or declining habitat 'Sea-pen and burrowing megafauna communities'. This habitat is also likely to be considered as the UK Habitat Feature of Conservation Importance and UKBAP habitat 'mud habitats in deep water'.

Juvenile specimens of the OSPAR protected species ocean quahog (*Arctica islandica*) were recorded across all survey areas and two adult specimens were recorded from two samples taken at the TSE drilling location.

No Annex II species or other listed species were recorded from the underwater video footage. Hard substrates were colonised by various encrusting fauna but no cold-water corals (*Lophelia pertusa*) were observed. However, it should be noted that *L. pertusa* has previously been identified on the Tartan jacket (reference made in email correspondence between Scottish Association for Marine Science and Talisman in 2003). Colonies have subsequently been observed during ROV inspections of the jacket (Figure 5-24).

Figure 5-24: Photograph of L. pertusa on the Tartan A substructure (ROV footage from 2019).

As described in Section 5.6.4 a number of cetacean species occur in the area. Of the marine mammals known to occur in the area harbour porpoise is an Annex II species and therefore are protected under the Habitats Directive. In addition, all cetaceans in UK waters are Annex IV species i.e. EPS. Under the Habitats Regulations, it is an offence to deliberately disturb any EPS, or to capture, injure or kill an EPS at any time.

In addition to the list of features of nature conservation importance for which it is deemed appropriate to use area-based mechanisms (i.e. designated areas) as a means of affording protection, as part of the Scottish Marine Protection Area Project, SNH and JNCC have compiled a separate list of 80 habitats and species, termed PMFs which are considered to be of particular importance in Scotland's seas. The purpose of this list is to guide policy decisions regarding conservation in Scottish waters.

The following fish are considered PMF and are known to occur in the Tartan Development Area (Tyler-Walters, 2016):

- Anglerfish (*Lophiiformes spp.*)
- Blue whiting (*M. poutassou*)
- Cod *(G. morhua)*
- Norway pout *(Trisopterus esmarkii)*
- Herring (*Clupea harengus*)
- Ling (*Molva molva*)
- Mackerel (*Scomber scombrus*)
- Sandeel (*Ammodytes marinus*)
- Spurdog (*Squalus acanthias*)
- Atlantic white-sided dolphin *(Lagenorhynchus acutus)*
- Harbour porpoise *(Phocoena phocoena)*
- Minke whale *(Balaenoptera acutorostrata)*
- White-beaked dolphin *(Lagenorhynchus albirostris)*
- Whiting *(Merlangius merlangus)*

Other species know to occur in the area that are considered PMFs include the four cetacean species listed in Table 5-6: Atlantic white-sided dolphin, harbour porpoise, white-beaked dolphin and minke whale.

5.9 National Marine Plan (NMP)

The Tartan Development Area falls within the Scottish NMP area, which comprises plans for Scotland's inshore (out to 12 nm) and offshore waters (12 to 200 nm) as set out under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009. The plan represents a framework of Scottish Government policies for the sustainable development of marine resources and is underpinned by strategic objectives:

- Achieving a sustainable marine economy;
- Ensuring a strong, healthy and just society;
- Living within environmental limits;
- Promoting good governance;
- Using sound science responsibly.

These objectives are to be achieved through the application of 21 'General Planning Principles'. Table 5-9 identifies which of these 21 Principles are considered relevant to the proposed decommissioning activities.

Table 5-9 Scottish NMP's General Planning Principles.

Scotland's National Marine Plan Principles
GEN 1 General planning principle: There is a presumption in favour of sustainable development and use of the marine environment when consistent with the policies and objectives of this Plan. The proposed project is the decommissioning of an existing field. The EA assesses the impacts to the environment and to other sea users.
GEN 4 Co-existence: Proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision-making processes, when consistent with policies and objectives of this Plan. Repsol Sinopec Resources UK will ensure that any potential impacts on other sea users associated with the decommissioning operations will be kept to a minimum.
GEN 5 Climate change: Marine planners and decision makers must act in the way best calculated to mitigate, and adapt to, climate change. Fuel use associated with vessel movements will be minimised.
GEN 9 Natural heritage: Development and use of the marine environment must: a) Comply with legal requirements for protected areas and protected species. b) Not result in significant impact on the national status of PMFs. Protect and, where appropriate, enhance the health of the marine area. Repsol Sinopec Resources UK have commissioned environmental surveys in the area. Decommissioning activities will take account of these surveys.
GEN 12 Water quality and resource: Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply. Discharges to sea resulting from the proposed decommissioning activities have been identified and assessed. The proposed activities will not result in any measurable deterioration of water quality in the area.
GEN 13 Noise: Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects. There will be no piling or explosive use associated with the proposed activities. Vessel noise is not expected to significantly impact on the receptors in the area.
GEN 14 Air quality: Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits. Given the offshore location, impacts of vessel emissions are not considered significant and will be minimised through project planning.
GEN 21 Cumulative impacts: Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation. Cumulative impacts are considered in the EA and are considered proportionate to the size of the project. Cumulative impacts will be limited to impacts on climate change and those associated with the laying of rock cover (should the addition of rock be selected to mitigate the exposed ends). Project planning will minimise the use of vessels. In addition, Repsol Sinopec Resources will prioritise cut and recover or trench and bury of the exposed ends over the use of rock cover.

SOCIO-ECONOMIC BASELINE

6.1 Introduction

This chapter describes the socio-economic activities near the Tartan Development Area, which primarily includes fishing, shipping and oil and gas operations.

6.2 Fishing

The Tartan Development Area occurs within ICES rectangles 45E9 and 45F0. Data provided by the Scottish Government indicate that trawls and seine nets are used in ICES 45E9, and trawls are used in 45F0. Species targeted in the area include but are not limited to herring, mackerel, haddock, whiting, anglerfish, cod, halibut, *Nephrops*.

Using data provided by the Scottish Government (Scottish Government, 2021), fishing effort (vessel days), value and quantity data have been plotted for UK vessels ≥ 10 m in length (Figure 6-1 and Figure 6-2). The data suggests that these ICES rectangles encompass an area that is relatively important to the UK fishing industry such that fishing activity in the area can be considered relatively high. In addition, it demonstrates that bottom trawl gear is used, emphasising the importance of ensuring a safe seabed as part of the proposed decommissioning project.

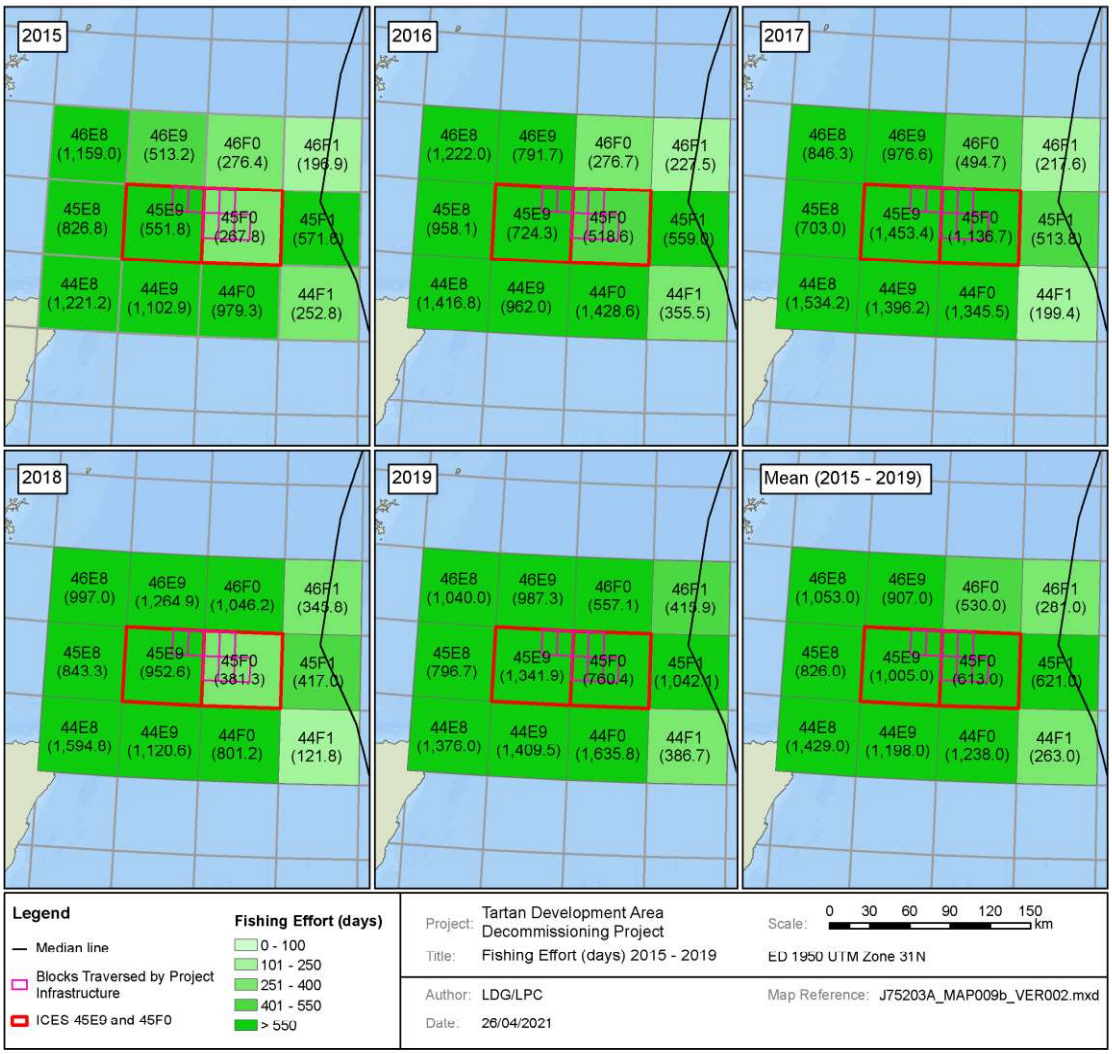


Figure 6-1: Annual fishing effort per ICES rectangle, 2015-2019 (Scottish Government, 2021).

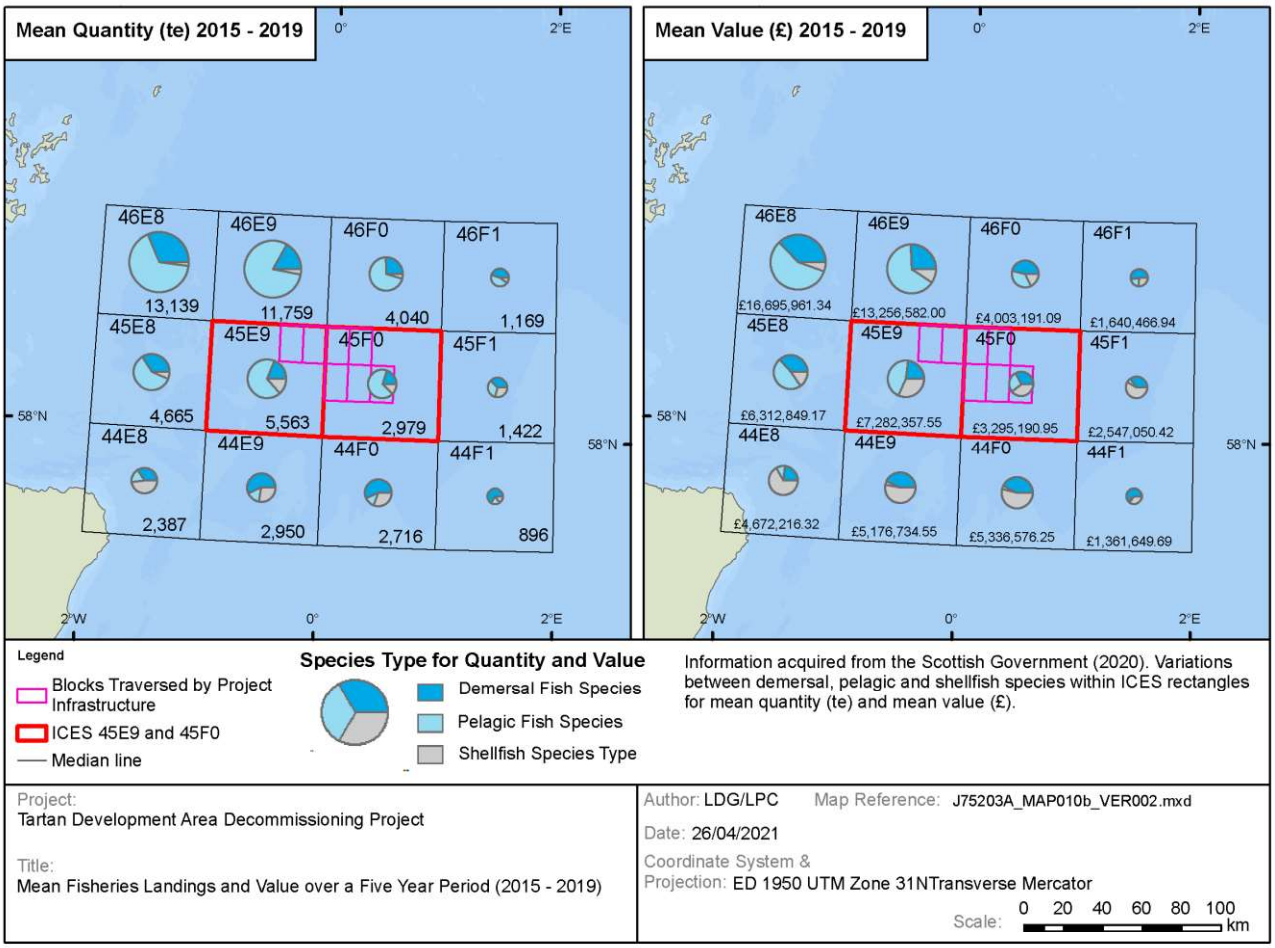


Figure 6-2: Annual fish landings by quantity (te) and by value (£) per ICES rectangle, 2015-2019 (Scottish Government, 2021).

6.3 Shipping Activity

Shipping densities in the North Sea are categorised by the Oil and Gas Authority (OGA) to be either: negligible; very low; low; moderate; high; or very high. As can be seen in Figure 6-3 the shipping activity around the Tartan Development Area is considered mostly low, except for Block 15/17 which is moderate (OGA, 2016).

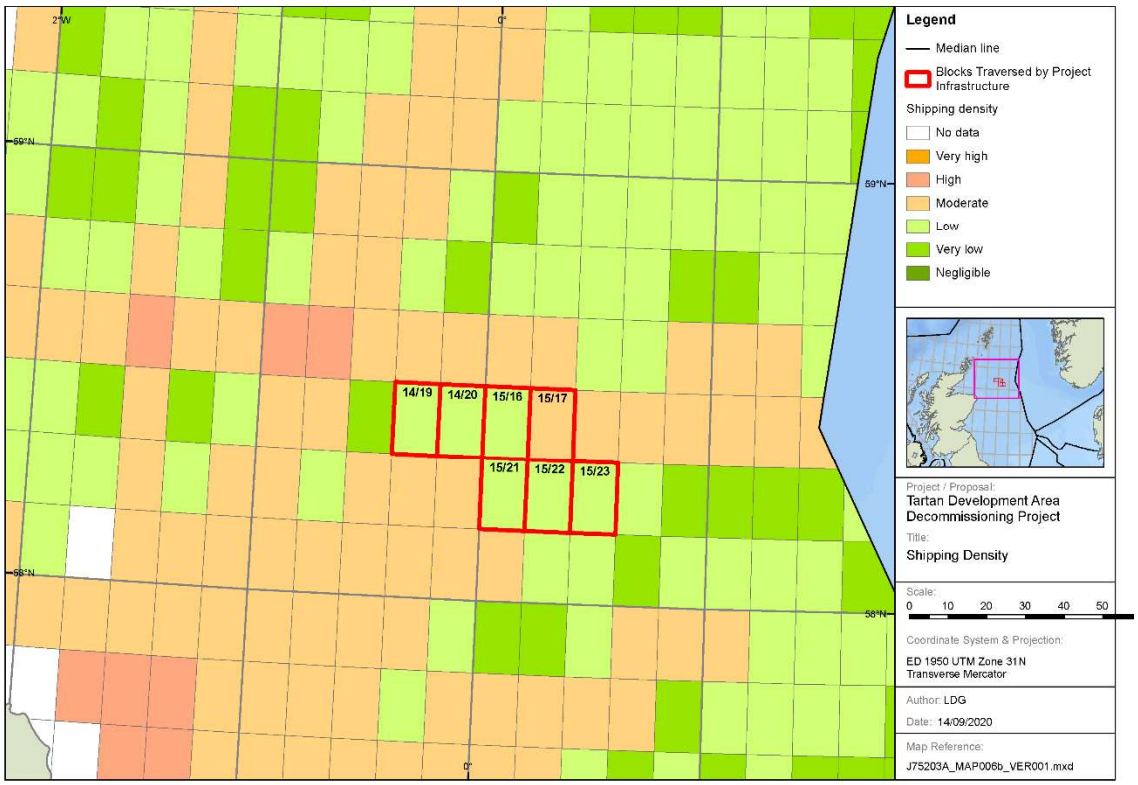


Figure 6-3: Shipping density in the vicinity of the Tartan Development Area as categorised by the OGA (OGA, 2016).

6.4 Surrounding Oil and Gas Infrastructure

The Tartan Development Area is situated in a well-developed oil and gas region within the CNS. Table 6-1 and Figure 6-4 identify those surface installations in closest proximity to the Tartan Development Area infrastructure.

Table 6-1: Approximate distance from neighbouring installations.

Installation	Approximate distance from the Tartan A platform
Scott platform	*c.* 11.5 km
Piper B platform	*c.* 14.5 km
Saltire platform	*c.* 16.5 km
Claymore platform	*c.* 21 km

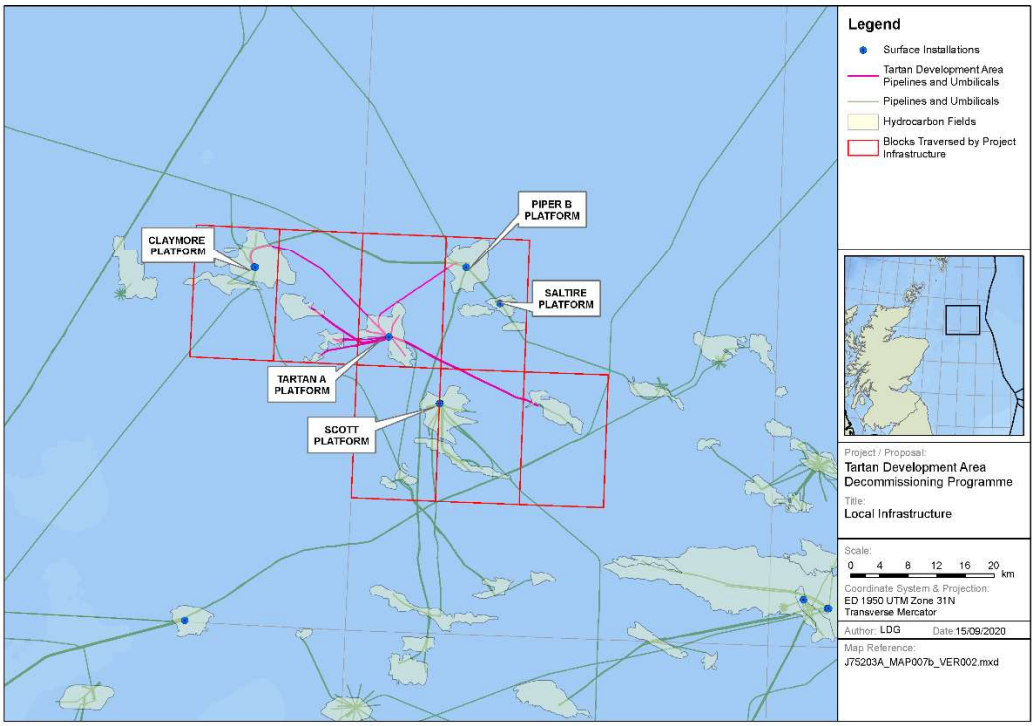


Figure 6-4: Oil and gas installations within the vicinity of the Tartan Development Area.

6.5 Other

There are no offshore windfarm developments or military exercise areas in the vicinity of the Tartan Development Area. The nearest military exercise area is *c.* 113 km west of the Tartan A platform (Figure 6-5). In addition, the project infrastructure does not cross any telecommunications cables: the closest fibre optic cable passes *c.* 56 km north of the Tartan Development Area infrastructure (Figure 6-6). The pre-decommissioning survey reported no evidence of wrecks across the survey area.

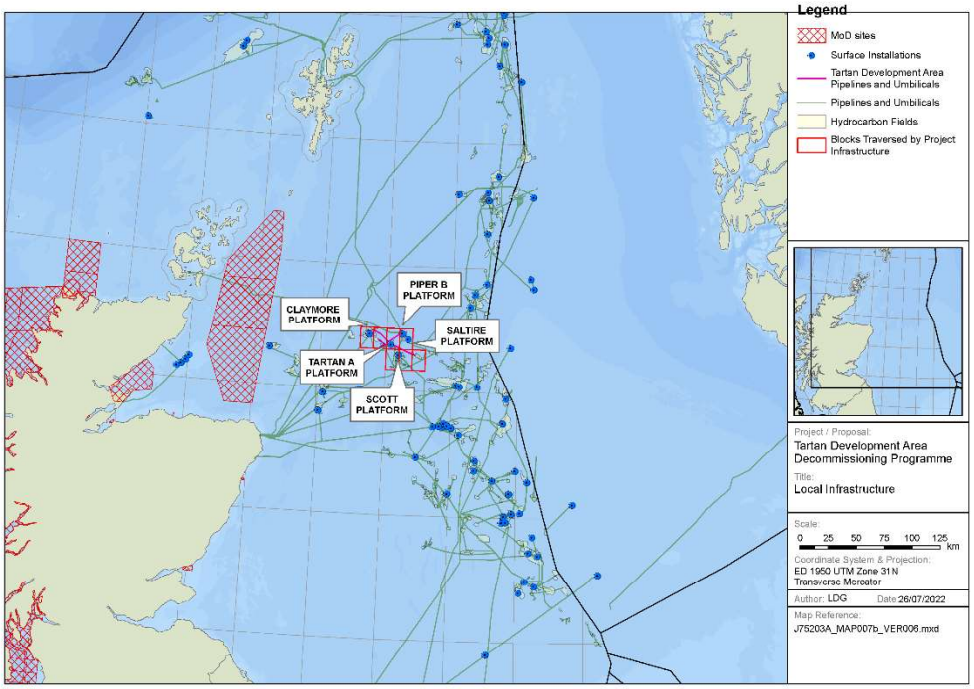


Figure 6-5: Location of military exercise area in closest proximity to the Tartan Development Area infrastructure.

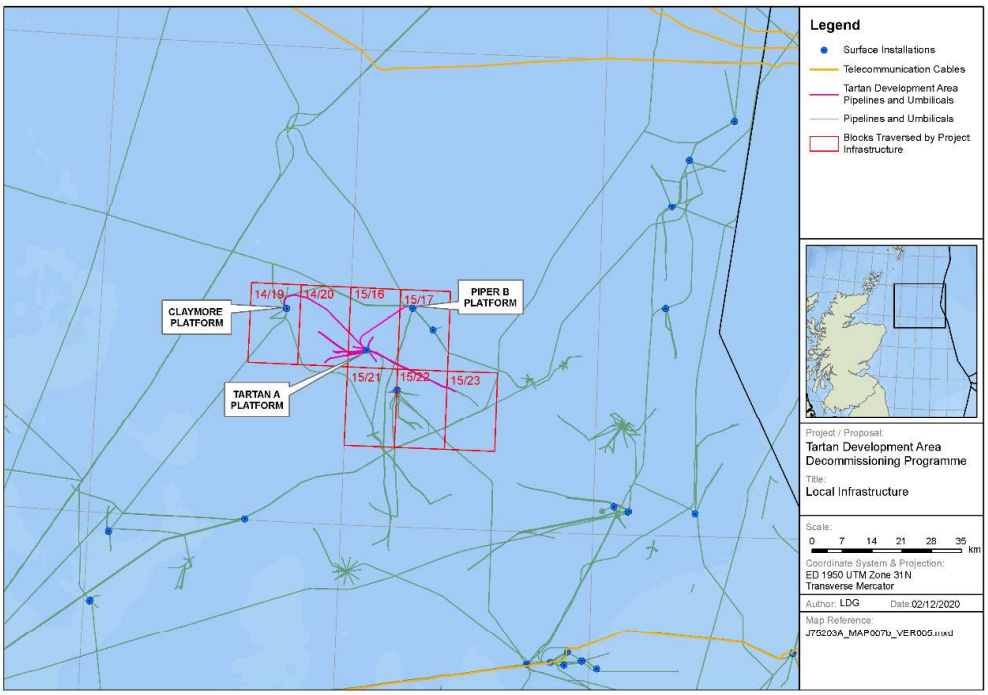


Figure 6-6: Location of telecommunications cables in relation to the Tartan Development Area infrastructure.

7. SCOPING OF POTENTIAL ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

7.1 Methodology

To determine the significance of the potential impacts associated with the proposed decommissioning activities, an ENVID Workshop was undertaken following a structured methodology as described in Appendix A and summarised here.

The workshop identified the key environmental and societal sensitivities, discussed all the sources of potential impact, and ultimately highlighted those impacts which required further assessment within the EA. The decision on which impacts required further assessment was reinforced by a review of industry experience of decommissioning impact assessment and on an assessment of wider stakeholder interest (informed in part by the stakeholder engagement described in Chapter 2).

Where relevant, the aspects considered in the ENVID for the different activities (e.g. recovery of structures) included:

- Physical presence/interaction with other sea users;
- Seabed and habitat disturbance;
- Under water noise impacts;
- Discharges to sea;
- Atmospheric emissions;
- Waste; and
- Accidental events.

Where relevant, the following environmental receptors were considered in the ENVID for each activity:

- Air quality;
- Water quality;
- Plankton;
- Fish;
- Seabirds;
- Resource availability e.g. landfill, fuel etc;
- Shipping;
- Cultural heritage (e.g. wrecks).
- Climate;
- Sediment quality;
- Benthic communities;
- Marine mammals;
- Designated areas;
- Fisheries;
- Local communities (e.g. yard activities etc.);

During the ENVID, the significance of the environmental/social impact of planned activities on each of the susceptible receptors was derived by considering the 'Receptor Sensitivity' in relation to the 'Magnitude of Effect' of the aspect. This was carried out by applying the Environmental and Socio-Economic Impact Assessment (ESIA) methodology described in Appendix A.

Worst case accidental events were also identified and assessed in the ENVID. To determine the environmental and social risk of an unplanned event, firstly the significance of the environmental impact of the event was determined. The likelihood of the unplanned event was then considered. Finally, a level of environmental risk (low, medium or high) was assigned by combining the impact significance and the likelihood of the event occurring using the Environmental and Socio-Economic Risk Assessment (ESRA) matrix presented in Appendix A.

7.2 Scoping

The results from the ENVID Workshop are presented in Table 7-1. Applying the industry standard mitigation measures, the significance of most of the environmental and socio-economic impacts was considered Low, with the exception of the impacts associated with disturbing the seabed, which were considered to be of Moderate significance.

Table 7-1 provides a justification for not assessing further the majority of the aspects identified in the ENVID, with the exception of:

- Seabed disturbance (which is assessed in Chapter 8); and
- Legacy impacts on the environment and on other sea users (which is assessed Chapter 9).

The potential impact of a loss of diesel inventory resulting for example from a vessel collision or fire was also considered in the ENVID. The significance of impact of such a release from one of the vessels was considered to be moderate, such that it could result in discernible environmental and social risks. The likelihood of such an event was considered to be Remote, in that it was recognised that a similar event has occurred elsewhere but is unlikely to occur during this project with the application of current industry standard practices. Combining the significance of impact with the likelihood, results in an overall Low environmental risk. In line with Subsection 12.4 of the OPRED Decommissioning Guidance (BEIS, 2018), the impacts of accidental events are not assessed further in the EA.

Table 7-1 ENVID results and justification for selecting / deselecting different impacts for further assessment in the EA.

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
Vessel use								
1	Emissions to air. Power generation.	Receptor: Air quality. Fuel combustion emissions (CO_2, CO, SOx, NOx, etc.) from vessels DSVs, ROVSV, reel lay vessels, rock dump and survey vessels. UK and EU Air Quality Standards not exceeded.	Minimise use of vessels through efficient journey planning and use of relevant vessels for each activity. Prior to contract award Repsol Sinopec Resources UK will review vessel Common Marine Inspection Documents (CMID) as part of vessel assurance (evidence of maintenance). All vessels will be in compliance with Repsol Sinopec Resources UK Limited's Marine Assurance Standards (MAS). Vessels will be MARPOL compliant.	A	2	L	Total fuel use by vessels required to complete the proposed decommissioning activities is *c.* 6,319 te (Table 3.7) resulting in *c.* 20,220 te of CO_2. When compared against total CO_2 shipping emissions on the UKCS in 2018 (14,300,000 te) (Committee on Climate Change, 2020), this equates to 0.14 %. In addition, total CO_2 emissions at the Tartan A platform in 2019 was *c.* 147, 160 te (EEMS returns). The emissions associated with the decommissioning vessels are therefore significantly less than those previously associated with production from Tartan A platform. Due to the offshore location of the project area, the sensitivity of air quality is considered low given the distance from any populated areas whilst the magnitude level is considered minor such that the overall impact significance on air quality is considered Low. As discussed in Section A.2.1.1 of Appendix A, the assessment methodology does not easily lend itself to assessing climate change. Repsol Sinopec Resources UK Limited, acknowledges that the atmospheric emissions associated with the use of vessels will contribute to climate change, however the relatively short duration of the vessel campaign, means the incremental increase in emissions to the atmosphere as a result of the proposed activities is not considered significant. As the impacts on air quality or climate change are not considered significant this aspect is not considered further in the EA.	No
2	Physical presence of vessels – socio-economic impact.	Receptor: Other sea users.	Minimise use of vessels, through efficient journey planning. Notify other sea users - e.g. Kingfisher and SFF.	A	1	L	Vessels associated with the proposed decommissioning activities have the potential to displace fishing vessels and potentially cause ships to avoid an area normally	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
		Presence of vessels will have the potential to impact on other sea users for example through collision with towed fishing gear.	Ongoing collaboration with SFF. All vessels engaged in the project operations will have markings and lightings as per the International Regulations for the Prevention of Collisions at Sea (COLREGS) (International Maritime Organisation, 1972). Navigational aids including radar, lighting and Automatic Identification Systems (AIS) will be used. A vessel Collision Risk Assessment (CRA) will be produced if required. Compliance activities will be managed by means of the independently verified Company integrated Safety and Environmental Management System (SEMS).				traversed. Though fishing effort in the area is considered relatively important to the UK fishing industry (see Section 6.2), taking account of the mitigation measures identified, the relatively short duration of the activities and the fact that a number of the activities will take place within existing 500 m zones, the impact significance of the presence of vessels on fishing activity during the proposed activities is considered Low and is not considered further in the EA. In the vicinity of the Tartan Development Area, shipping is considered low whilst the end of the gas export / import pipeline passes through an area where shipping density is considered moderate (Block 15/17) (see Section 6.3). As most of the decommissioning activities will take place across those blocks where shipping density is considered low and for similar reasons provided above, the impact significance of the presence of vessels on shipping activity during the proposed activities is considered Low and is not considered further in the EA.	
3	Physical presence of vessels - environmental impact.	Receptors: marine mammals and birds. Receptor sensitivity is considered Medium (B) given the presence of marine mammals and potential presence of birds from coastal SPAs. Possible behavioural changes in marine mammals e.g. could be attracted to the vessel or may move away from the area. Migrating birds could be attracted to the lights on the vessels.	Minimise use of vessels, through efficient journey planning.	B	1	L	In addition to being a busy shipping area, the North Sea has well developed fishing and oil and gas industries, such that marine mammals in the region are habituated to the presence of vessels. In addition, the evidence for lethal injury from boat collisions with marine mammals suggests that collisions with vessels are very rare (Cetacean Stranding Investigation Programme, 2011). Out of 478 post mortem examinations of harbour porpoise in the UK carried out between 2005 and 2010, only four (0.8 %) were attributed to boat collisions. The impact significance of the proposed vessel use on marine mammals is therefore considered to be Low and is not discussed further in the EA. The vessels have the potential to cause displacement of seabirds from foraging habitat and may cause flying birds to detour from their flight routes. For example, auk species	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
							(e.g. guillemot and little auk) are believed to avoid vessels by up to 200 to 300 m but gull species (e.g. kittiwake, herring gull and great black-backed gull) are attracted to the presence of them (Furness and Wade, 2012 and Weise *et al*. 2001). Though evidence suggests that the presence of the vessels could cause some bird species to be displaced from their foraging area, the very small proportion of their overall available habitat that will be occupied by the vessels means the impact is not considered to be noticeable. In addition, given the existing oil and gas vessel activity in the area, it is expected that the impact of the vessels on bird migration routes (e.g. they could be attracted to the vessel lights at night) is not expected to be significant. The impact significance on birds is therefore considered to be Low and is not discussed further in the EA.	
4	Discharges to sea. Vessel sewage, ballast water and biofouling.	Receptors: water quality and fauna associated with the water column. Sensitivity is considered to be Medium (B) based on presence of marine mammals and those fish species considered to be PMFs (see Section 5.6.3). Discharge of sewage; grey and black water macerated to <6 mm prior to discharge and discharge of food waste to sea. Water quality in the immediate vicinity of discharges of vessel sewage or ballast water may be reduced, but effects are usually minimised by rapid dilution in the receiving body of water and non-continuous discharge. May result in organic enrichment and chemical contaminant effects in water column and seabed sediments.	Minimise use of vessels, through efficient journey planning. Repsol Sinopec Resources UK Limited will review vessel CMID as part of vessel assurance and all vessels will be compliant with the Company's MAS. Vessels will be MARPOL compliant. All contracted vessels will originate from countries adhering to the International Maritime Organisation (IMO) Convention. The Company's audit procedures will ensure that the contracted vessels ballasting procedures are in line with IMO Convention aimed at preventing associated harmful effects. All discharges of ballast water will be monitored, and records maintained. As part of the Company's auditing process, only vessels adhering to the IMO 2011 Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Species will be	B	1	L	All vessels will be IMO and MARPOL compliant such that impact significance of any vessel sewage, ballast water or biofouling is considered Low and is not discussed further in the EA.	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
		Ballast water could introduce invasive species depending on vessel routes. Bio invasions as a result of biofouling (accumulation of organisms including plants, algae, or animals such as barnacles) on vessels could also occur.	used. All member states of IMO are signed up to these guidelines.					
5	Underwater noise.	Receptors: marine mammals and fish. Vessels will use dynamic positioning and will have the potential to cause disturbance to marine mammals and fish in the form of temporary displacement from the area. Marine mammals and fish are expected to return once the vessel(s) has left the area.	Minimise use of vessels, through efficient journey planning.	B	2	L	In addition to being a busy shipping area, the North Sea has well developed fishing and oil and gas industries, such that marine mammals and fish in the region are habituated to the underwater noise associated with vessels. Over the duration of the recovery and survey activities the total vessel days associated with the proposed activities is estimated to be *c.* 540 (see Section 3.2.6). Any impacts from vessel noise will be behavioural rather than physical, such that they may cause marine mammals or fish to vacate the area, however they would be expected to return once the vessels have left the field. The impact significance of underwater noise on marine mammals and fish is therefore considered to be Low and is not discussed further in the EA.	No
6	Waste production. General waste from vessels.	Receptor: use of landfill. In addition, there is the potential for impact on communities located in proximity to the landfill site (e.g. from traffic, noise and odour). Following application of the waste hierarchy, minimal quantities of materials will go to landfill.	Prior to contract award Repsol Sinopec Resources UK Limited will review the vessels Waste Management Plans (WMP) which will adhere to the waste hierarchy principle. The Company will ensure vessels are compliant with MARPOL and, as such, meet Repsol Sinopec Resources UK Limited 's MAS. As part of their auditing procedures, Repsol Sinopec Resources UK Limited will ensure the contractor adheres to the Waste Duty of Care Code of Practice.	B	1	L	MARPOL Annex V applies to all ships/vessels and generally prohibits the discharge of all garbage into the sea (there are some exceptions which relate for example to food waste and cleaning agents). As vessels will be compliant with MARPOL, there will be no significant impact offshore. Repsol Sinopec Resources UK Limited recognise landfill sites as a finite resource, however as the vessels will have WMPs in place that will adhere to the waste hierarchy principle of reduce, reuse recycle, the impact significance on the availability of landfill sites is considered Low.	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
			Only landfill sites with approved Pollution Prevention and Control (PPC) permits will be used.				Similarly, as only permitted sites will be used, the impact significance on local communities is also considered Low. As the impact significance of any waste from the vessels is considered Low and given that Section 12.8 of OPRED's Guidance Notes (BEIS, 2018) advises that an assessment of wastes returned to shore is not required in the EA (as it is not relevant to the impacts in the marine environment), the onshore impacts associated with vessel waste is not discussed further in the EA.	
7	Resource use.	Receptor: fuel	Scheduling/design to optimise opportunities to use vessels more efficiently (i.e. minimise transits, ensure vehicles are fully loaded). Under MARPOL Annex VI, all vessels will adhere to the Ship Energy Efficiency Management Plan (SEEMP) such that the vessels will have best practices for fuel efficiency in place.	A	1	L	Repsol Sinopec Resources UK Limited recognise that hydrocarbon-based fuel is a finite resource, however given the relatively short duration of the proposed decommissioning activities and the use of MARPOL compliant vessels the impact significance of the use of fuel is considered Low and is not discussed further in the EA.	No
8	Unplanned event: diesel spill. Unforeseen event during operations for example a collision or fire resulting in a loss of fuel inventory	Receptors: water quality, sediment quality, fisheries, marine mammals, birds, fish, plankton, benthic communities. Given the nature of diesel, a large volume of any diesel spill would be expected to evaporate. Given the offshore location, the probability of diesel beaching is expected to be low. In addition it is expected that the probability of surface oiling above 3 µm crossing any transboundary lines is also relatively low.	Vessel assurance inspections. Pre-hire vessel audits. Emergency response plans in place including the OPEP (Oil Pollution Emergency Plan) SOPEPs (Shipboard Oil Pollution Emergency Plan). SIMOPS (simultaneous operations) will be managed through bridging documents and communications. All vessels engaged in the project operations will have markings and lightings as per the COLREGS whilst the navigational aids will include radar, lighting and AIS. Compliance activities will be managed by means of the independently verified Company integrated Safety and Environmental Management System (SEMS).	C	2	M	The magnitude of effect of a loss of diesel inventory is considered minor. As marine mammals do occur in the area, receptor sensitivity to a spill is considered high such that the overall impact significance of such an event is considered Moderate. With the application of the mitigation measures the likelihood of a total loss of fuel inventory from a vessel is considered Remote such that the environmental risk is considered Low. In line with Subsection 12.4 of the OPRED Decommissioning Guidance (BEIS, 2018), the impacts of accidental events are not assessed in the EA.	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
Decommissioning of pipelines and umbilicals (including spools, mattresses and grout bags) and subsea structures								
9	Disturbance to the seabed. Recovery of spools, mattresses, grout bags, surface laid pipelines and umbilicals, and shallow trenched/shallow covered lines and subsea structures.	Receptors: sediment quality and benthic communities. All activities will take place out with any designated areas. The environmental survey identified the presence of megafauna burrowing communities at a density considered to be representative of the UK Habitat Feature of Conservation Importance of 'mud habitats in deep water', such that the receptor sensitivity is considered to be Medium.	Cutting/dredging/jetting work plans will be in place. Internal cutting of piles where possible. Dredging/jetting will be minimised. Lifting procedures in place.	B	3	M	Given the expanse of infrastructure to be recovered and the fact that recovery of some of the infrastructure will result in disturbance to the small cuttings piles, the overall impact significance is considered to be Moderate and is discussed further in the EA.	Yes
10	Disturbance to the seabed. Remediation of exposed pipeline / umbilical sections using trench and bury or cut and recover options.	Receptors: sediment quality and benthic communities. All activities will take place out with any designated areas. The environmental survey identified the presence of megafauna burrowing communities at a density considered to be representative of the UK Habitat Feature of Conservation Importance of 'mud habitats in deep water', such that the receptor sensitivity is considered to be Medium.		B	2	L	The magnitude of effect of the activities associated with either trenching and burying or cutting and recovering the exposed pipeline and umbilical sections is considered Minor, given that recovery of the seabed and associated benthic communities is expected to occur naturally without Company intervention. The overall impact significance is therefore considered to be Low. However, this impact will be considered further in the EA, in order allow an assessment of the cumulative seabed disturbance across all activities.	Yes
11	Disturbance to the seabed. Remediation of exposed pipeline / umbilical ends and mid-line sections using rockdump.	Receptors: sediment quality and benthic communities. Addition of rock cover would result in a change in habitat type. Some mortality of benthic animals belonging to species which are generally considered widespread throughout the CNS. Presence of megafauna burrowing communities at a density considered to be representative of the UK Habitat Feature of Conservation Importance of 'mud habitats	Alternative remediation options i.e. trench and bury or cut and recover will be prioritised. Minimise use of rock cover. Consultation with SFF regarding rock cover profile. Over-trawlability survey. Location of rock added to FishSafe.	B	3	M	Seabed habitat in the area is relatively homogenous and comprises three main habitats: sublittoral mud, deep circalittoral mixed sediment and circalittoral fine sands (see Section 5.6.2), such that the addition of rock cover would result in a long-term habitat change. In addition, the majority of the Tartan Development Area is likely to constitute the OSPAR listed threatened and/or declining habitat 'Sea-pen and burrowing megafauna communities' as well as the UKBAP habitat 'mud habitats in deep water'. If this remediate in situ option was selected during the C&P tendering phase, the overall impact significance is	Yes

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
		in deep water', such that the receptor sensitivity is considered to be Medium.					therefore considered to be Moderate and is discussed further in the EA.	
12	Discharges to sea. Discharges from surface laid spools, pipelines and umbilicals during recovery and discharges from cut ends of trenched and buried pipelines and umbilicals.	Receptor: water quality which subsequently could impact on fauna. Discharge of flushing fluids (plain seawater /inhibited seawater/water injection fluids) from the pipelines and spools) containing a corrosion inhibitors. Possibly release of chemicals from umbilical cores that could not be flushed due to compromised integrity.	All pipelines used to transport oil have been flushed and cleaned in line with BAT/BEP procedures to minimise oil concentrations. Where technically feasible to do so, umbilical cores will be cleaned and flushed, however the integrity of some of the umbilicals means that flushing all cores may not be possible.	B	2	L	Given the pipeline and umbilical flushing and cleaning activities, the magnitude of effect of any discharges during cuttings and/or recovery activities is considered Minor such that the impact significance is considered Low. The impact of these discharges are therefore not considered further in the EA.	No
13	Waste processing. Treatment of recovered materials.	Receptor: use of landfill. In addition, there is the potential for impact on communities located in proximity to the landfill site (e.g. from traffic, noise and odour). Following application of the waste hierarchy, minimal quantities of materials will go to landfill.	As part of Repsol Sinopec Resources UK Limited's Duty of Care, contract award will be to an established yard with appropriate experience, capability, licences and consents in place. As part of this the sites must demonstrate waste stream management throughout the deconstruction process. Waste management will follow the waste hierarchy: reduce, reuse, recycle. All waste will be handled and disposed of in line with regulations which will be detailed in the Waste Management Plan (WMP).	B	2	L	Repsol Sinopec Resources UK Limited recognise landfill sites as a finite resource, however applying the mitigation measures identified and considering the relatively small volumes of material to be returned (see Section 3.8 of the draft DPs) the impact significance on the availability of landfill sites is considered Low. Similarly, as only permitted sites will be used, the impact significance on local communities is also considered Low. Section 12.8 of OPRED's Guidance Notes (OPRED, 2018) advises that an assessment of wastes or waste management returned to shore for treatment or disposal is not required in the EA as it is not relevant to the impacts in the marine environment. For this reason, the processing of waste returned to shore and any onshore impacts associated with the returned material is not discussed further in the EA.	No

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
Over trawl trials								
14	Seabed disturbance. Clear seabed surveys and over trawl trials.	Receptor: benthic communities. Potential for over trawl trials to be carried out to demonstrate a clear seabed and/or over trawl trials. Will result in disturbance to the seabed habitats in the area.	Preference will be given to the use of side scan sonar surveys (SSS or similar) to determine a clear seabed. Possible that SSS surveys would also negate requirement for an over trawl trial. Note: Magnitude of Effect assigned assuming that over trawl trials will be carried out.	B	3	M	As a worst case an over trawl trial will be required to demonstrate a clear seabed. As fishing in the area is considered moderate, the impact of a trawl sweep or over trawl trial is not expected to be more significant that the impact of the demersal trawl gear associated with the wider area. However given the expanse of the area that would require to be over trawled, the magnitude of effect is considered serious and resulting impact significance is considered Moderate. The impact of over trawl trials will therefore be considered further in the EA.	Yes
Legacy Impacts								
15	Legacy socio-economic impacts associated with pipelines, umbilicals and rock cover left *in situ*.	Receptor: other sea users. Potential for access to seabed area being impeded due infrastructure/stabilisation features decommissioned *in situ*.	All surface laid infrastructure will be recovered. Seabed clearance surveys. Over trawl trials to be carried out if considered necessary. Additional rock cover will be minimised and if used it will be laid in profiles aligned with industry standards. Independent verification of a safe seabed will be obtained. Post decommissioning survey strategy.	B	2	L	Pipeline status reports have found the seabed to be stable over the trenched and buried pipelines and umbilical such that the potential for additional exposures to occur along these lines is considered low. Repsol Sinopec Resources UK Limited recognise that demersal trawl gear is used in the area (see Section 6.2), however given the stability of the seabed in the area and with the application of the mitigation measures identified, the impact significance with respect to impact on fishing activities is considered Low. Given stakeholder interests with respect to a clear seabed, the decommissioning of the buried pipelines and umbilicals, and rock cover (existing and any potential rock added to remediate exposed sections) will be considered further in the EA.	Yes
16	Legacy socio-economic impacts associated with surrendering of 500 m exclusion zones	Receptor: other sea users. Fishing vessels will get access to the exclusion areas around the Highlander, Petronella, Duart, and Galley fields	Following decommissioning activities, RSRUK will surrender the existing 500 m exclusion zones at the Highlander, Petronella, Galley, and Duart fields and at the Tartan Field subsea tie-backs. This will allow fishing vessels access to the area.	A	0	P	To assess total impact on other sea users with respect to materials (pipelines, umbilical and rock cover) decommissioned *in situ*, the impact on other users with respect to 'clear seabed' will also be considered further in the EA.	Yes

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
17	Legacy environmental impacts associated with discharges from pipelines and umbilicals decommissioned *in situ* following degradation.	Receptors: sediment quality and benthic communities. Over time the trenched and buried pipelines and umbilicals decommissioned *in situ* will degrade. Following degradation, there is the potential that any hydrocarbons/chemicals that may have remained in the pipelines/umbilicals following the flushing and cleaning activities may become exposed to the surrounding sediment.	The pipelines and umbilicals will be buried under sediment/rock such that following eventual degradation, it is expected that the disintegrated line components and contents will be restricted to their current location and will not make it into the water column. Cleaning and flushing of pipelines and umbilical cores in line with BAT/BEP.	B	2	L	All infrastructure decommissioned *in situ* will be trenched and buried or covered with rock such that impacts of degradation will be contained within a limited area around the pipelines and umbilicals. As the lines corrode the contents will 'seep' into surrounding sediments, however the impacts on biota is considered to be negligible given that only permitted chemicals were used. During the gradual breakdown there will be a release of metals and plastics into the sediment. As degradation will take place over decadal or centurial timescales it is not expected that metal concentrations in the sediment will accumulate significantly. Degradation of plastics is expected to take place over many decades or possibly centuries. As the lines are buried, it is expected that the broken-down products will remain contained within the area of the lines. The concrete associated with the oil export and gas export/import pipelines is relatively inert and the degraded products will primarily comprise sand, gravel and calcium carbonate. The impact from these products on the benthic fauna in the vicinity of the pipeline is not expected to be significant. Given the contents of the pipelines and umbilicals at the time of decommissioning and the fact that all infrastructure decommissioned *in situ* is trenched and buried or covered with rock, the impact significance of pipeline and umbilical degradation over time is considered Low. However, given public concern with respect to the impact of plastics in the environment the legacy impact of decommissioning the buried pipelines and umbilicals *in situ* is considered further in the EA.	Yes

No.	Aspect/Activity	Observations	Existing Mitigation	Receptor Sensitivity	Magnitude of Effect	Impact Significance	Justification for selecting/deselecting the aspect/impact for further assessment in the EA	Assessed further in the Environmental Appraisal
18	Legacy environmental impact associated with presence of existing rock cover and any additional rock used to remediate exposed sections	Receptors: sediment quality and benthic communities. Addition of rock would result in a change in habitat type. Some mortality of benthic animals belonging to species which are generally considered widespread throughout the CNS.	Cut and recover and trench and bury options will be prioritised over the addition of rock cover. If option to rock cover is selected, quantity required will be optimised.	B	2	L	There is an estimated 180, 972 te of rock associated with the tartan Area Development. If following the C&P tendering phase, the option to rock cover the exposed sections of lines to be decommissioned in situ it is estimated that an additional 41,092 te of rock would be added. Given that the additional rock will be added to an area with existing rock berms the environmental impact significance is considered Low. However, the addition of rock will be assessed further in the EA, in order to understand the cumulative impact of disturbance to the seabed.	Yes
19	Legacy environmental impacts associated with disturbance to the small cuttings piles	Disturbance of contaminated drill cuttings could result in an increase in the existing footprint where hydrocarbon concentrations are > 50 mg/kg.	Excavation and lifting procedures in place that will minimise sediment disturbance.	B	2	L	Given the small size and low volumes of hydrocarbons associated with the small cuttings piles (see Section 3.2.5) this possible increase in footprint is not considered to be significant. Any resettlement out with the current footprint is expected to settle out in a thin veneer such that over time hydrocarbon content will degrade and impacts can therefore be considered reversible. The magnitude of effect of disturbing the small cuttings piles is therefore considered Minor and the impact significant is considered Low. Given that the area is fished using trawl gear and therefore any legacy impacts are of stakeholder concern, the legacy impact of disturbing cuttings piles is considered further in the EA.	Yes

8 SEABED DISTURBANCE

When assessing the impact of the proposed activities during the ENVID Workshop (Chapter 7), activities associated with disturbing the seabed were considered to result in a significant environmental impact and therefore they are considered further here to allow for a full assessment to be completed.

8.1 Activities (Cause of Impact)

Activities that will result in an impact to the seabed include:

- Recovery of the subsea structures, surface laid pipelines and umbilicals (both exposed and rock covered), pipelines and umbilicals laid in shallow trenches (DOL < 0.6 m) with shallow cover (DOC< 0.6 m), spools, umbilical jumpers, mattresses and grout bags;
- Trenching and burying of the exposed ends of the trenched and buried pipelines and umbilicals to be decommissioned *in situ* (considered a larger impact than cutting and recovering of these sections);
- Use of rock cover to remediate exposed ends of pipelines and umbilical to be decommissioned *in situ*; and
- Over trawl sweeps and over trawl trials.

Note: it is recognised that not all these activities will necessarily be undertaken (e.g. rock cover or over trawl trials), however, they have been fully considered in this section to ensure the potential 'worst case' impact is assessed.

Table 8-1 presents the anticipated total area of temporary seabed disturbance associated with all the potential decommissioning activities (estimated at 1.1 km^2), other than the seabed disturbance associated with the over trawl trials/sweeps.

With regards to the exposed end sections of the pipelines and umbilicals to be decommissioned *in situ* (total length of 5.089 km) preference will be given to trench and bury or cut and recover. However, if following the C&P tendering phase the option to rock cover is selected, *c*. 41,092 te of rock will be required to remediate the exposed sections of the pipelines associated with pipeline Groups A, C, D1, E and F. Assuming a maximum rock berm width of 7 m this would equate to a maximum seabed footprint of *c*. 0.0356 km^2 (Table 8-2). It is expected that recovery of the Group E pipelines will result in an increase in footprint of the existing rock berm. The assessment assumes an increase in the impacted area by 3 m either side of the existing rock berm, therefore increasing its footprint by 0.0270 km^2. The total potential permanent impact as a result of the proposed activities is estimated to be 0.0148 km^2 (Table 8-2).

Should over trawl trials/ sweeps be carried out to demonstrate 'a clear seabed' the disturbance footprint for the activities captured within Figure 8-1 would fall within the area impacted by the over trawl trial which is estimated to be *c*. 23.22 km^2 (Figure 8-1). Table 8-3 shows the worst-case assumptions made to calculate this footprint.

Repsol Sinopec Resources UK Limited will explore the use of a side scan sonar survey or similar (e.g. multibeam sonar surveys) to demonstrate a clear seabed, and therefore minimise the area of temporary seabed disturbance to that estimated in Table 8-2.

Table 8-1: Anticipated area of temporary seabed disturbance associated with the proposed activities.

Activity	Assumptions made	Temporary area of disturbance (km^2)
Recovery of subsea installations	As identified in Table 3-3 a total of 56 structures with varying dimensions will be recovered. As a worst-case, calculation of the seabed disturbance around each structure assumes temporary disturbance out to 5 m on each side of each structure (note this will possibly be less for many of the smaller structures e.g. the anode skids and could be more for the larger structures such as the Highlander template, however this assumption is expected to be representative across all structures). The worst case area of disturbance associated with each DP submission is: THP structures: 45 structures with an estimated total area of temporary disturbance of 0.012 km^2. Galley structures: 13 structures with an estimated total area of temporary disturbance of 0.0025 km^2. Duart structures: 2 structures with an estimated total area of temporary disturbance of 0.00022 km^2.	0.0147
Recovery of exposed surface laid pipelines and umbilicals (pipeline Group B)	Using information provided in Table 3-2 the total length of surface laid pipelines and umbilicals to be recovered is *c.* 32.85 km. Note this does not include risers or surface laid spools or umbilical jumpers which are captured below. As a worst-case, calculation of the seabed disturbance assumes a corridor of temporary disturbance of 2 m along length of each pipeline and umbilical.	0.0658
Recovery of shallow trenched lines: DOL< 0.6 m (pipeline Group D2)	Using information provided in Table 3-2 the total length of shallow trenched pipelines and umbilicals to be recovered is *c.* 77.53 km. Note this does not include risers or surface laid spools or umbilical jumpers which are captured below. As these lines have some shallow covering associated with them, as a worst case, calculation of the seabed disturbance assumes a corridor of temporary disturbance of 10 m along length of each pipeline and umbilical.	0.7753
Trenching and burying of exposed sections associated with pipeline Groups A, C, D1, E and F	Using information provided in Table 3-2, the total length of exposed sections associated with the pipelines and umbilicals to be decommissioned *in situ* is 5.089 km. Note this does not include risers or surface laid spools or umbilical jumpers which are captured below. As a worst-case, calculation of the seabed disturbance assumes a corridor of temporary disturbance of 10 m along length of each of the sections to be trenched and buried.	0.0509
Recovery of rock covered surface laid pipelines and umbilicals (pipeline Group E)	Using information provided in Table 3-2 the total length of surface laid, rock covered pipelines and umbilicals to be recovered is *c.* 9 km. Note this does not include surface laid spools or umbilical jumpers which are captured below. As a worst-case, calculation of the seabed disturbance assumes a corridor of temporary disturbance of 10 m along the length of the pipeline and umbilical. However as both lines are laid under the same rock berm the area of impact assumes a length of 4.5 km. Note the permanent impact associated with disturbing the existing rock berm is considered in Table 8-2.	0.045
Recovery of risers, surface laid spools and umbilical jumpers	Using information provided in Table 3-2, the total length of risers, surface laid spools and umbilical jumpers to be recovered is *c.* 15.13 km. Note this includes risers/spools/umbilical jumpers associated with the pipelines in Groups A to E as well as those spools and umbilical jumpers with separate pipeline numbers. As a worst-case, calculation of the seabed disturbance assumes a corridor of temporary disturbance of 2 m along the full length of the risers, spools and	0.0303

Activity	Assumptions made	Temporary area of disturbance (km^2)
	umbilical jumpers.	
Recovery of mattresses	1,108 exposed mattresses associated with the fields. As a worst-case, calculation of the seabed disturbance uses the dimensions of the largest mattress for all mattresses i.e. 6 m (L) x 3 m (W) and assumes temporary disturbance out to 2 m on each side of each mattress.	0.0776
Recovery of grout bags	18, 673 x 25 kg grout bags associated with the fields each measuring 0.5 m (L) x 0.3 m (W). As a worst-case, calculation of seabed disturbance assumes temporary disturbance of 1 m^2 for each grout bag.	0.0187
Recovery of grout skirt at the piper wye structure	Total footprint of the grout skirt is c. 43.2 m^2. Assumes recovery will impact on an area 3 x the footprint of the grout skirt.	0.00013
Recovery of the timber mud mats and concrete protection units	Recovery of nine timber mud mats measuring 7.5 m (L) x 2 m (W). Recovery of 65 concrete protection units. Use dimensions of largest size unit: 3.3 m (L) x 5.8 m (W). As a worst-case, calculation of the seabed disturbance assumes temporary disturbance out to 2 m on each side of each timber mud mat and each concrete protection unit.	0.0052
Disturbance associated with relocated cuttings (see Section 8.2.1.1)	A burial thickness greater than 6.5 mm is considered to cause a potential risk to more than 5% of sensitive species. The area where, following relocation of cuttings, burial thickness exceeds 6.5 mm extends over approximately 10,000 m^2.	0.01
Total area of temporary disturbance		1.1 km^2
Note: area of disturbance calculated for each line item will overlap with other line items in a number of instances such that the area of temporary disturbance calculated is a worst case estimate.		

Table 8-2: Anticipated area of permanent seabed disturbance associated with the proposed activities.

Activity	Assumptions made	Permanent area of disturbance (km^2)
Use of rock cover to remediate exposed sections associated with Pipeline Groups A, C, D1, E and F	Total exposed lengths across the pipelines and umbilicals in these groups is 5.089 km. Note this does not include any risers, spools or umbilical jumpers associated with these lines as they will be recovered to shore. Calculations assume a maximum rock berm width of 7 m.	0.0356
Disturbance of the existing rock cover associated with Group E lines*	It is expected that a mass flow excavator would be used to expose the rock covered pipelines before recovery. As a worst case impact it is assumed the rock would be spread over an area extending 25 m either side of the existing rock berm.	0.225
Total area of potential permanent disturbance		0.261
*Following the C&P tendering phase it is possible that the Group E lines are decommissioned *in situ* such that this area of permanent impact would not be relevant. However in order to assess the worst case impacts it is assumed that the Group E lines will be recovered.		

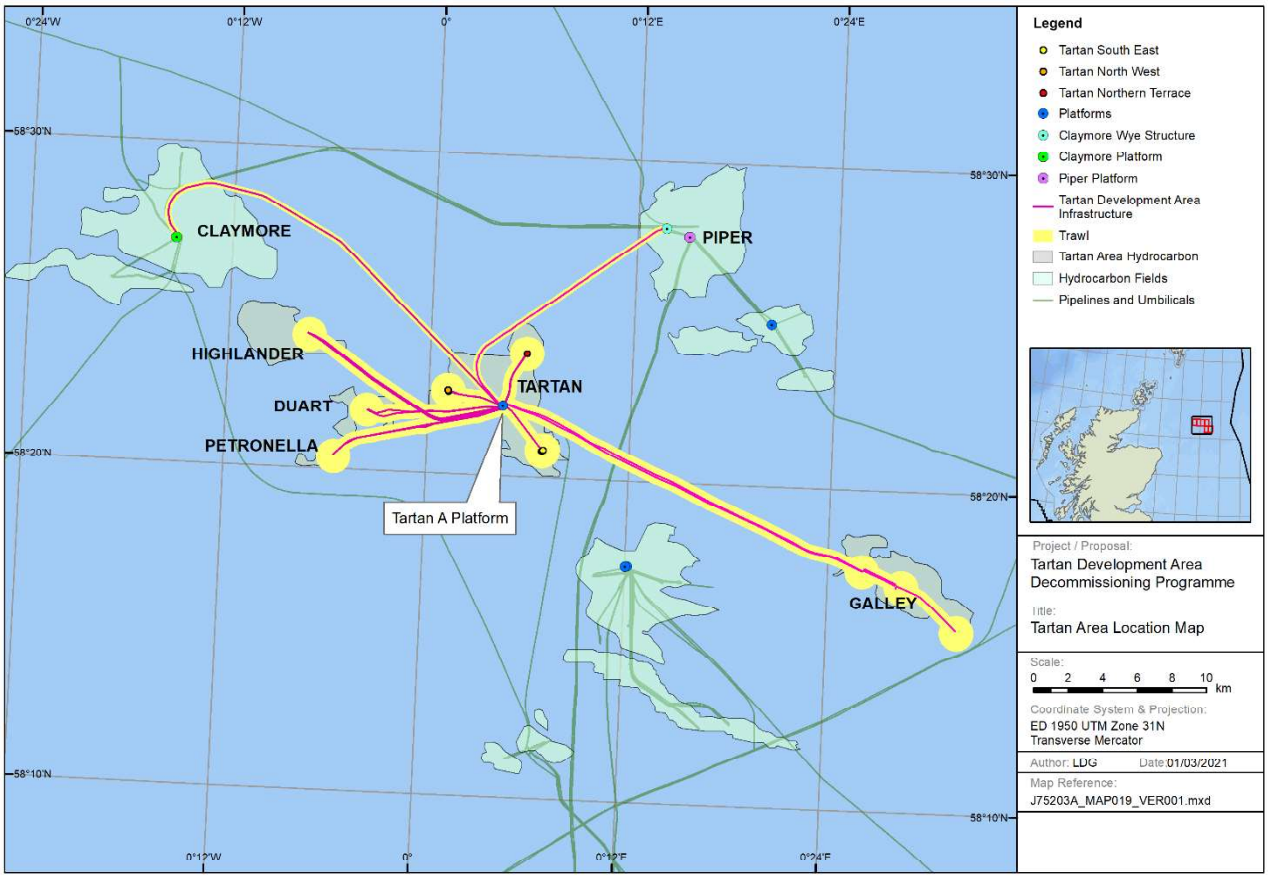


Figure 8-1: Area that could potentially be covered by the over trawl trials.

Table 8-3: Estimate of area impacted by over trawl trials.

Row No.	Activity	Assumptions made	Area impacted by over trawl activities (km^2)
1	Existing 500 m exclusion zones	There are currently 9 x 500 m exclusion zones in place at the fields: one each at the Tartan A platform, one each at the TNW and TSE drill centres, one each at the Highlander, Petronella and Duart Fields and three at the Galley Field The assessment accounts for over trawling in eight of the exclusion zones. Over trawling activities associated with the exclusion zone at the Tartan A platform will be captured in the Tartan A Substructure DP.	6.28
2	TNT well location	There is no 500 m safety zone at this drill location, however as a worst case the assessment assumes an area equivalent to the area of the exclusion zone (i.e. 500 m radius) will be over trawled to ensure a clear seabed.	0.78
3	Oil export pipeline route	Total length of line is 27.085 km. Area calculated assumes a 100 m corridor along the full length of the line.	2.71
4	Gas import/ export pipeline route	Total length of line is 17.171 km. Area calculated assumes a 100 m corridor along the full length of the line.	1.67
5	Lines from the TNT drill location	Maximum line length is 3.603 km (PL2013). Area calculated assumes a 200 m corridor (to cover multiple lines)and a line length of 3.103 km (500 m length at the TNT drill location is captured within the area covered by the over trawl trial of the 500 m exclusion zone described in Row 2).	0.62
7	Lines from the TNW drill location	Maximum line length is 3.795 km (PL137) Area calculated assumes a 200 m corridor (to cover multiple lines)and a line length of 3.295 km (500 m length at the TNW drill location is captured within the area covered by the over trawl trial of the 500 m exclusion zone described in Row 1).	0.66
8	Lines from the TSE drill location	Maximum line length is 3.580 km (PLU4214). Area calculated assumes a 200 m corridor (to cover multiple lines)and a line length of 3.08 km (500 m length at the TSE drill location is captured within the area covered by the over trawl trial of the 500 m exclusion zone described in Row 1).	0.61
9	Lines from the Highlander Field	Maximum line length is 13.571 km (PL313). Area calculated assumes a 200 m corridor (to cover multiple lines)and a line length of 13.071 km (500 m length at the Highlander field is captured within the area covered by the over trawl trial of the 500 m exclusion zone described in Row 1)	2.61
10	Lines from the Petronella Field	Maximum line length is 11.30 km (PL510). Area calculated assumes a 200 m corridor (to cover multiple lines)and a line length of 10.80 km (500 m length at the Petronella field is captured within the area covered by the over trawl trial of the 500 m exclusion zone described in Row 1).	2.16
11	Lines from the Galley Field	Maximum line length is 26.00 km (PLU2380). Area calculated assumes a 200 m corridor (to cover multiple lines)and a line length of 23.50 km (2,500 m length at the Galley field is captured within the area covered by the over trawl trial of the three 500 m exclusion zones described in Row 1).	4.70
12	Lines from the Duart Field	Maximum line length is 8.40 km (PLU2480). Area calculated assumes a 200 m corridor (to cover multiple lines)and a line length of 7.90 km (500 m length at the Duart field is captured within the area covered by the over trawl trial of the 500 m exclusion zone described in Row 1).	1.58
Total			24.39 km^2
It is recognised that the total area calculated captures the full length of lines, which in some instances will include risers. Therefore the estimated footprint is considered worst case.			

8.2. Impact on Receptors

The maximum area of temporary seabed disturbance associated with the worst case proposed decommissioning activities is 24.39 km^2. However, this relates to an area impacted by the over trawl trials and would be significantly less if side scan sonar surveys or similar (e.g. multibeam sonar surveys) are used to obtain evidence of a clear seabed. Impacts on this seabed area are considered temporary because, following completion of activities, the seabed will begin to recover.

The seabed area considered to be impacted permanently is limited to the areas where rock cover could be deposited or an existing rock berm (associated with pipeline Group E) may be disturbed resulting in a larger footprint. This assessment considered the potential worst-case scenario, whereby additional rock cover is required over a total length of 5.089 km of exposed pipeline and umbilical sections. In addition, it assumes a worst case whereby the rock berm associated with the Group E lines would impact on a corridor of c. 50 m along the length of the lines. These activities would result in an area of permanent disturbance equating to *c*. 0.261 km^2 (Table 8-2).

The trenching and burying of exposed sections associated with the pipelines and umbilicals to be decommissioned *in situ* has the potential to temporarily impact benthic communities. Trenching physically disturbs the benthic communities and their habitat within the area impacted and may cause some smothering in the wider region due to the re-deposition of excavated material. In addition, trenching can create a temporary plume of suspended solids. While some, mostly epifaunal, organisms may be killed by the passage of the trenching machinery, the majority will be displaced and are likely to survive. Some of the exposed organisms may not be able to re-bury before being predated upon while others may be relocated by water movements.

Given the nature of the sediment in the area, it is possible that disturbed sediment particles may be transported via tidal currents for re-settlement over adjacent seabed areas. Sessile epifaunal species may be particularly affected by increases in suspended sediment concentrations as a result of potential clogging or abrasion of sensitive feeding and respiratory apparatus (Nicholls *et al*., 2003). In the case of filter feeders, such as the juvenile *A. islandica*, an increased suspended sediment concentration could impact the ability to feed. Larger, more mobile animals, such as crabs and fish, are expected to be able to avoid areas of deposition and elevated suspended solid concentrations.

A. islandica have a thick, solid and heavy shell, they are considered to be highly sensitive to sub-surface abrasion/penetration. Damage is related to body size with larger specimens being more affected than smaller ones (Klein and Witbaard, 1993). As they burrow into the sediment, *A. islandica* are thought to be less sensitive to surface abrasion, however, they use a short inhalant siphon which sits above the sediment surface for feeding and respiration. If this is damaged then there may be an adverse effect on the organism, but the potential for this to happen is uncertain (Marine Scotland, 2020). It remains possible that individuals of this species may be directly impacted by seabed disturbance as a result of the proposed decommissioning activities, potentially resulting in individual mortality. Laboratory tests exposing *A. islandica* to sediment depths of up to 40 cm have found that the organism was able to burrow to the surface (Powilleit *et al*., 2009). Based on this evidence, Tyler-Walters and Sabatini (2017) conclude that deposits of up to 30 cm of fine material is unlikely to have a negative impact on *A. islandica*.

As described in Section 5.6.2, the pre-decommissioning surveys identified the presence of the environmentally sensitive habitat of burrowing megafauna communities, a habitat representative of the UK Habitat Feature of Conservation Importance of 'mud habitats in deep water'. The proposed decommissioning activities will impact on areas captured under this habitat type, however given the widespread distribution of the habitat across the survey area, the impact is not considered significant.

An area of bacterial mats was identified at the Galley field (see Section 5.6.2.2) and it is possible that it may extend around the Galley SPS manifold. Recovery of the manifold and any spools/jumper umbilicals will likely result in some disturbance to the bacterial mat if it does extend around the structure. This disturbance will be minimised as far as possible (e.g. work and lifting procedures will aim to minimise any impacts).

Any impacts from compression, caused for example by remedial rock cover and sediment re-suspension, are expected to be short lived since most of the smaller sedentary species associated with the area (such as polychaete worms) have short lifecycles and recruitment of new individuals from outside the disturbed area will be rapid.

Recolonisation of the impacted areas can take place in a number of ways, including mobile species moving in from the edges of the area (immigration), juvenile recruitment from the plankton, and burrowing species digging back to the surface. Recovery times for soft sediment faunal communities are difficult to predict, although some studies have attempted to quantify timescales. Collie *et al*. (2000) examined impacts on benthic communities from bottom towed fishing gear and concluded that, in general, sandy sediment communities were able to recover rapidly, although this was dependent upon the spatial scale of the impact. It was estimated that recovery from a small-scale impact, such as a fishing trawl, could occur within about 100 days assuming that recolonisation was through immigration into the disturbed area rather than from settlement or reproduction within the area. Recovery through immigration would be expected to take longer for the more extensive trawled areas, and larval recruitment or local reproduction by surviving individuals may be more important determining factors. Therefore, given the relatively small area of impact and the evidence for recovery from small scale impacts, the impact significance of the proposed activities on benthic communities is considered Low.

The loss of habitat and smothering of the benthos associated with the placement of rock cover creates habitats for benthic organisms that live on hard substrates; leading to a localised change in the local seabed community and an increase in local habitat and community diversity. However, these potential impacts are not considered significant given that such ecosystems already occur on the existing rock berms. In addition, within the Tartan platform area, the Tartan subsea drill centres and the Highlander drill centre, there are areas of mixed sediment comprising large stones. Therefore they type of ecosystem expected to occur on any new rock is likely to already occur in these areas. Mixed sediments were not observed within the Duart, Petronella and Galley drill centres, however each of these fields have rock cover associated with them such that the type of ecosystem that may develop on any new rock that could be placed is expected to occur on the existing rock. Therefore, across the fields if rock is laid on areas of muddy or fine sediment, any impacts are not considered significant given the existing volumes of rock laid across the fields and the areas of mixed sediments.

Evidence suggests that the sensitivity of fish to suspended sediments varies greatly between species and their life stages, and also depends on sediment composition (particle size and angularity), concentration, and the duration of exposure (Newcombe and Jensen, 1996). Being the major organ for respiration and osmoregulation, gills are directly exposed to, and affected by, suspended solids in the water. If sediment particles are caught in or on the gills, gas exchange with the water may be reduced leading to oxygen deprivation (Essink 1999; Clarke and Wilber, 2000). This effect is greatest for juvenile fish as they have small easily clogged gills and higher oxygen demand (FeBEC 2010). As described in Section 5.6.3, a number of fish species recognised as PMFs occur in the area, and it is possible that suspended sediments in the water column resulting from the recovery, and/or trench and bury activities, could impact on individual fish including PMFs. However, given the short duration of the activities, any impacts on fish in the area will be at an individual level such that the impact significance is considered Low.

It should be noted the Tartan Development Area infrastructure lies in an area that is targeted by demersal fishing gear and the temporary impacts of the decommissioning activities on the seabed are considered to be minor compared to the impacts to the seabed associated with these gear types.

8.2.1 Disturbance to the Small Drill Cuttings Piles

As described in Section 3.2.5 there are five small drill cuttings piles associated with the Tartan Development Area and some level of disturbance will occur at each of these piles during recovery activities. As the cuttings pile associated with the Highlander drilling template is the largest of the cuttings piles, modelling was carried out to determine the impacts of disturbing this pile.

The base case will be to cut the piles internally when recovering the Highlander template. It is estimated that up to 80% of the cuttings pile could be disturbed when recovering the Highlander template, while other parts of the pile may be disturbed when recovering spools, remediating pipeline ends etc. Therefore, to support a worst-case assessment, disturbance to the whole cuttings pile was modelled. It is expected that a suction dredger would be used to 'relocate' the cuttings. A typical set up of a suction dredger 'relocating' cuttings is shown in Figure 8-2 and Figure 8-3.

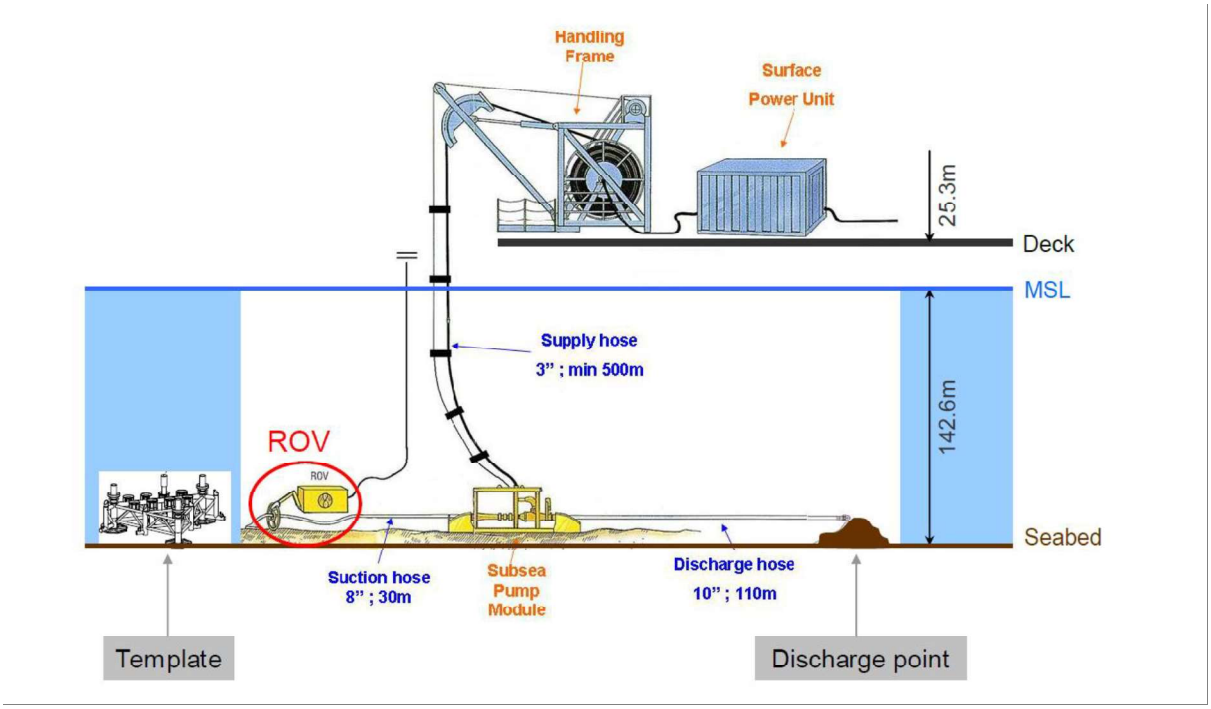


Figure 8-2: Schematic representation of redistribution of a cuttings pile using a dredger.

Figure 8-3: Photos of hose discharge and accumulation of cuttings at discharge point (DNV, 2017).

The total volume of cuttings at the Highlander template was estimated to be 495 m^3 covering an area of 1,801 m^2 (see Section 3.2.5).

The modelling was carried out using the Dose-related Risk and Effect Assessment Model (DREAM, Sintef), part of the Marine Environmental Modelling Workbench (MEMW) suite of models which incorporates the ParTrack sub-model used for modelling the dispersion and settlement of solids (Genesis, 2020b).

A single pumping regime was modelled to represent the pile being pumped to four separate locations, approximately 50 m from the Highlander template. A pumping rate of 34 m^3/hr for the cuttings was chosen based on the expected pumping rates of the Subsea Tooling Services Predator Dredger.

Based on the volume of cuttings and sediment needing to be moved and the pumping rate, the duration of each discharge was calculated. Each discharge would take *c*. 0.15 days (this was rounded up to 0.2 days in the model, given a total duration of relocation operations of 0.8 days). The model was run for 5 days to allow a few days for dispersion following the end of the final discharge.

The discharge was assumed to be approximately 2 m above the seabed. This ensures that in practice the hose does not become blocked with cuttings piling up in front of it.

8.2.1.1 Summary of Modelling Results

Figure 8-4 shows the distribution of cuttings shortly after the end of the dredging operations. The predicted maximum thickness is 34 mm (cross section shown in Figure 8-5).

A burial thickness greater than 6.5 mm is considered to cause a potential risk to more than 5% of sensitive species. The area where thickness exceeds 6.5 mm extends over approximately 10,000 m^2 (in total for all four discharges), in the immediate vicinity of the discharge points.

Particle deposition is determined by the currents around the discharge location. Currents in the north south direction predominate. Very fine particles (<0.5 mm) are deposited to distances of up to 1.0 km from the discharge points along the north-south axis, and out to *c*. 200 m along the east west axis. Even finer particles (< 0.05 mm) are deposited over a wider area, extending up to 5 km from the discharge points.

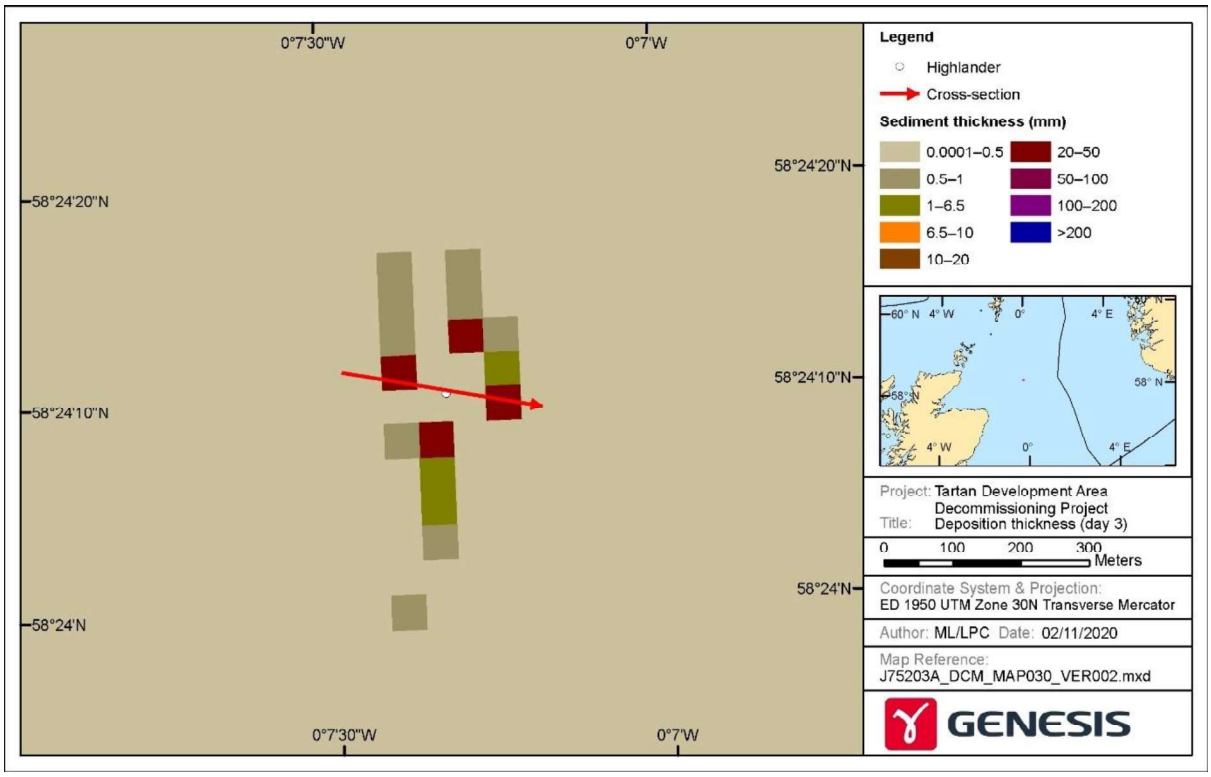


Figure 8-4: Deposition thickness: overall view at 3 days

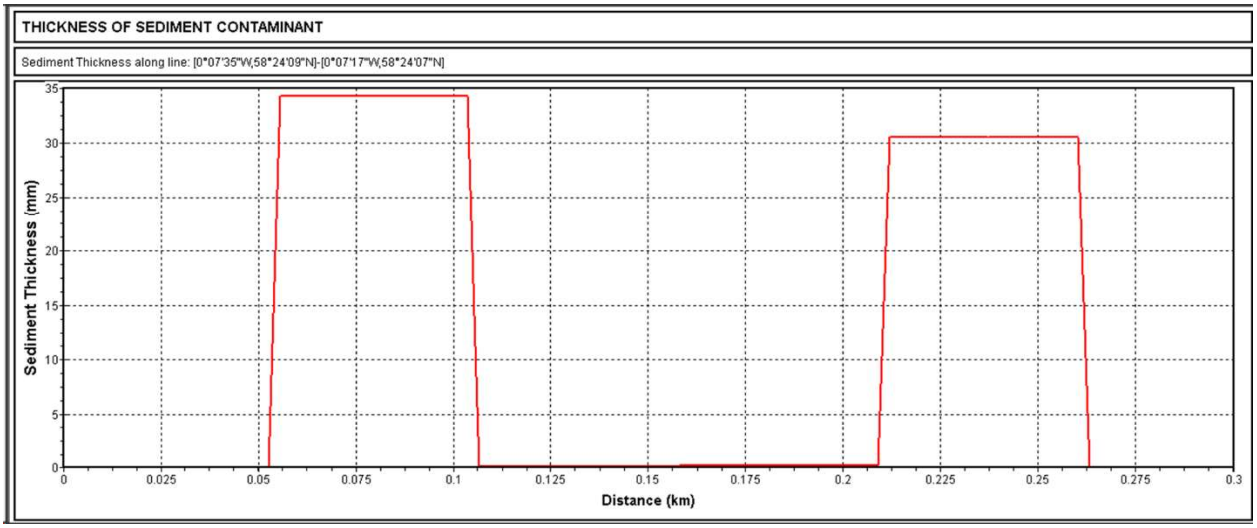


Figure 8-5: Deposition thickness – cross section at 3 days.

The model calculates a combined (total) risk to the seabed sediments based on four factors: oxygen depletion, burial thickness, grain size change and toxicity associated with the contaminants present within the existing cuttings pile. The model generates plots showing the percentage risk to sensitive species. A risk to less than 5% of sensitive species is deemed a tolerable risk level and has been used in the report as an indication of the level at which potential environmental impacts could become significant.

The total risk to the seabed sediment is made up of risk contributions resulting from:

- Chemical concentrations of oil base muds in pore water, where this exceeds the PNEC (Predicted No Effect Concentration);
- Burial thicknesses greater than 6.5 mm;
- A median grain size change greater than 52 µm; and
- Oxygen content depletion greater than 20%.

A risk of less than 5% is considered to be tolerable. The total risk to seabed sediments is shown in Figure 8-6.

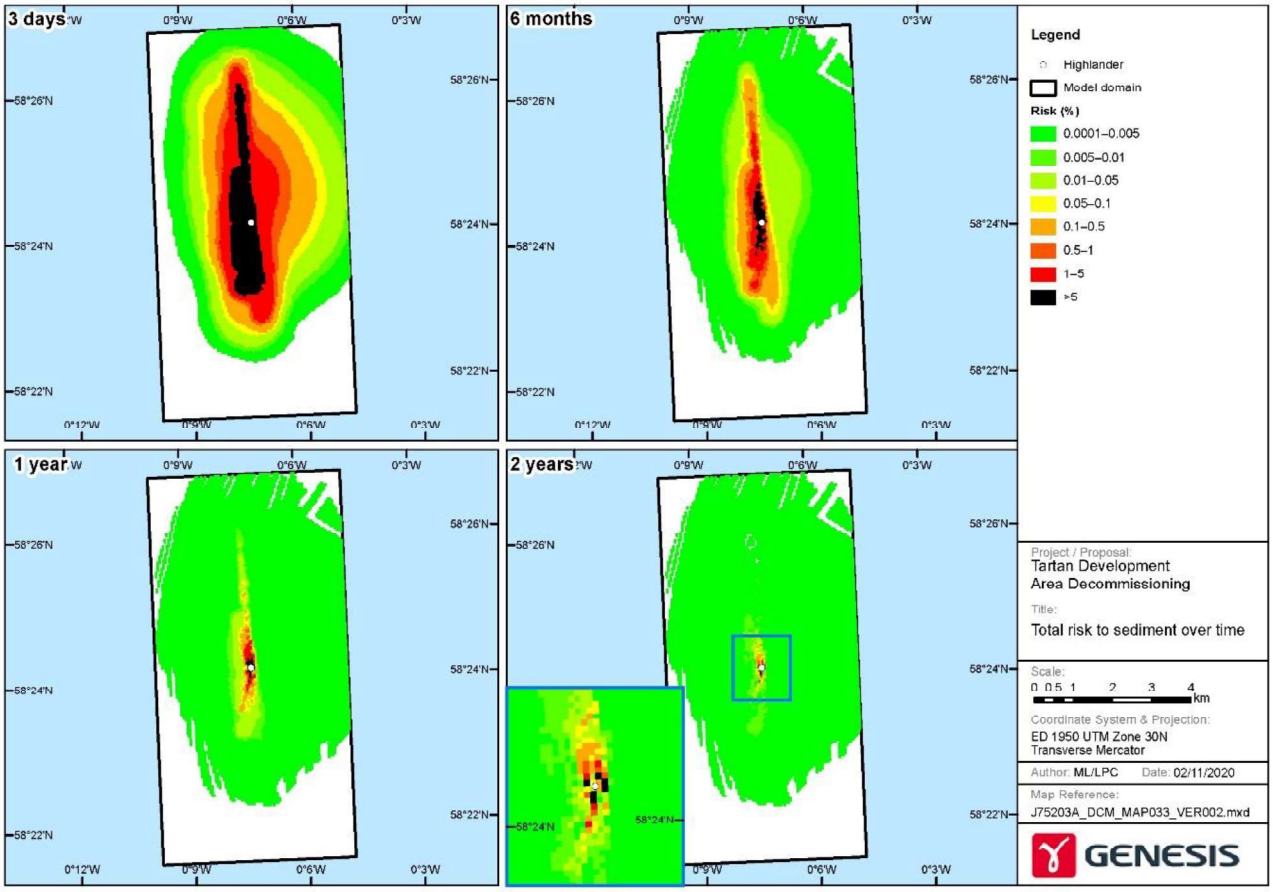


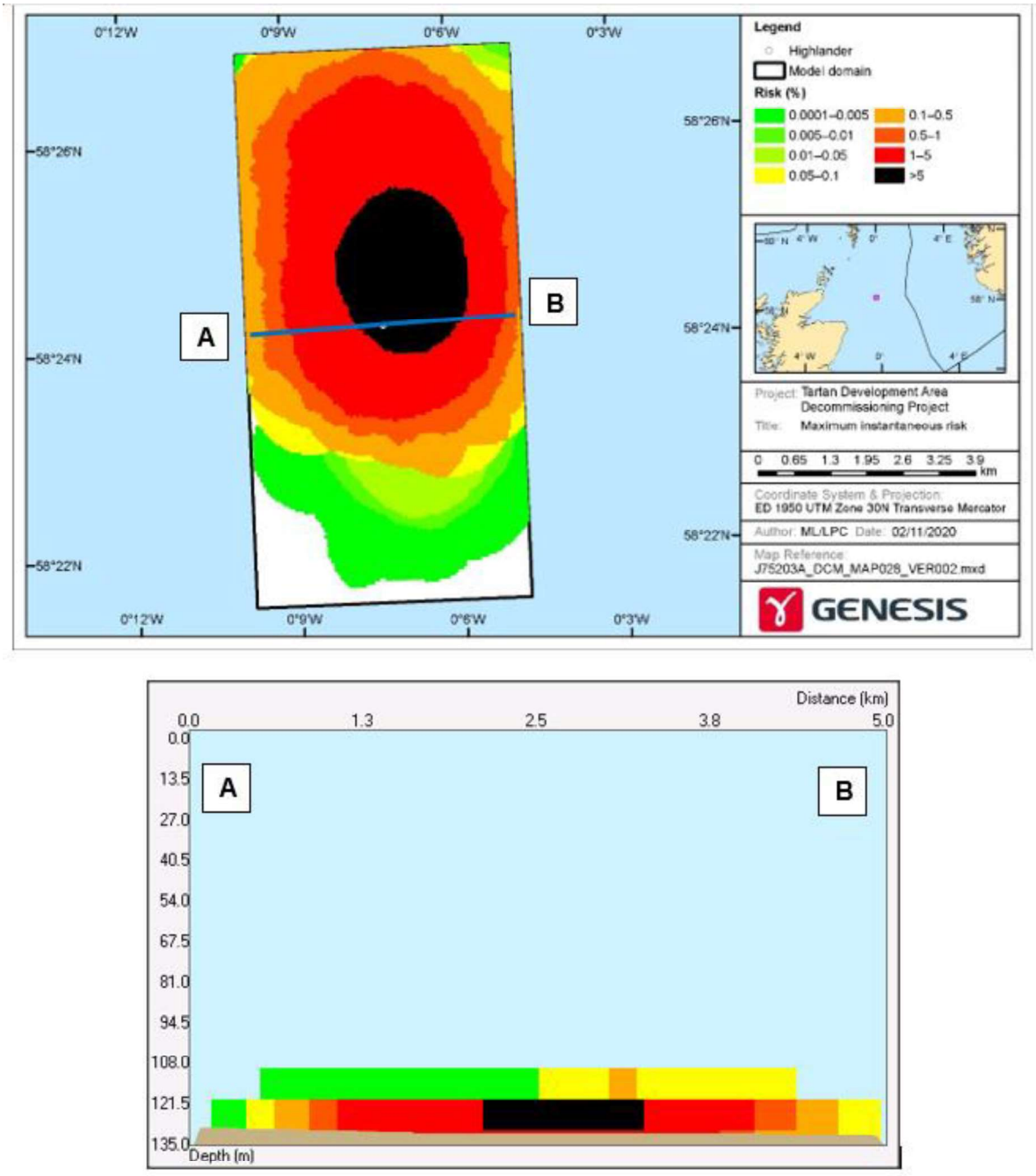
Figure 8-6: Total combined risk to the sediment over time.

The main mechanism leading to risks to the seabed sediment results from the toxicity of the oil within the cuttings (primarily from degraded hydrocarbons, referred to as unresolved complex mixtures), contributing to approximately 82% of the risk. Deoxygenation and burial thickness account for around 13% and 4% of the risk respectively. The area of seabed with a combined risk to more than 5% of the most sensitive species reduces over time, rapidly at first, then more slowly, as summarised in Table 8-4. Within less than 6 months the area of risk is predicted to be smaller than the exclusion zone around the template (for comparison the area of a 500 m radius exclusion zone around an installation is 0.79 km^2). After approximately 2.2 years the model predicts the area of risk remaining on the seabed is minimal.

Table 8-4: Areas of total combined risk > 5%.

Time period	Area (km^2)
3 days (max)	2.755
2 months	1.613
6 months	0.335
1 year	0.058
2 years	0.015
From 2.2 years	0.010

The area in the water column where risk is greater than 5% risk is restricted to 10 m above the seabed, with no risk in the upper part of the water column (Figure 8-7). This risk to the water column primarily results from the physical impacts of resuspension of bentonite particles on zooplankton and filter feeders, as well as a much smaller contribution to risk from the toxicity of hydrocarbons in the water. Impacts on the water column can extend to 0.26 km^3. As shown in Table 8-5 the impacts to the water column are very short-term and within less than two days of operations ending, the risk to the water column disappears.



Volume water where risk >5% = 0.078 km^3

Figure 8-7: Maximum instantaneous risk to the water column (swept path).

Table 8-5: Volume of water column with total risk > 5%.

Time period	Volume (km^3)
1.3 days	0.078
2.38 days	0.000
5 days	0.000

8.2.1.2 Impact on Receptors

The direct effects on benthic animals of disturbing the cuttings pile to facilitate recovery of the Highlander template could include mortality as a result of smothering, and possibly as result of suspended material (e.g. filter feeders) or habitat modification due to changed physio-chemical characteristics (such as sediment porosity and oxygenation). Disturbance could lead to leaching of hydrocarbon contaminants into the water column along with the suspension of particle bound contaminants that could assimilate in the gut of suspension feeders (Breuer *et al.* 2004).

Based on the results presented in Figure 8-4 and Figure 8-5 significant impacts on *A. islandica* due to changes in burial depths as a result of the relocation of the drilling cuttings are not considered significant given the results of the study by Powilleit *et al.*, 2009 (see Section 8.2).

However, given the small volume of the cuttings pile and associated hydrocarbon content (estimated at < 0.5 te) and the modelling results suggesting the relatively small impact and subsequent reduction over time, the impact significance of disturbing the cuttings pile to recover the Highlander template is considered Low.

Given the small volumes of cuttings at the other four cuttings piles (see Table 3-6), the impact significance of any disturbance to each of the other four cuttings piles is considered to be less than the impact of disturbance to the Highlander pile. The impact significance for each pile is therefore also considered Low.

8.3. Transboundary and Cumulative Impacts

Given the distance from the nearest transboundary line (*c.* 61 km from the Galley drill centre) there are no transboundary impacts anticipated as a result of the activities captured in this Chapter.

The cumulative impacts associated with the temporary seabed disturbance is negligible when seabed disturbance associated with demersal fishing in the area is taken into account.

The shortest distances between the cuttings piles at the subsea tie-backs are: *c.* 4.2 km (between the Galley G6 and Galley SPS cuttings piles), *c.* 5 km (between the TNW and TSE cuttings piles) and *c.* 8.8 km (between the Highlander and TNW cuttings piles). Distances between the remaining cuttings piles range from between *c.* 15.1 km (the Highlander and TSE cuttings piles) and 42 km (Highlander and Galley G6 cuttings piles). Results from the modelling of disturbance to the Highlander cuttings pile indicate that the area of seabed where the risk was found to be > 5 % extended a maximum of 3.5 km from the cuttings pile. This maximum distance occurred shortly after the disturbance activities were completed and was found to reduce significantly by six months at which time the maximum distance from the cuttings pile at which the risk was > 5 % was 1 km. Given the proximity of each of the small cuttings piles to each other and the small size and hydrocarbon quantities associated with the remaining cuttings piles considered in this EA, it is expected that the likelihood of an overlap of the > 5 % risk areas associated with each cuttings pile is low. In addition, should such overlap occur immediately after disturbance, any cumulative effects are expected to have gone after six months. The modelling results indicate that very fine particles (< 0.5 mm) could deposit up to 1 km from the discharge points and that even finer particles (< 0.05 mm) could deposit up to 5 km from the cuttings pile. At these distances there is the potential for accumulation of very fine particles (i.e. < 0.05 mm) between some of the cuttings piles. However, as this relates to very fine particles carried in the water column, any potentially cumulative effects are not considered significant.

If rock cover is used to remediate the exposed pipeline and umbilical sections, the additional quantities of rock (estimated at *c.* 41,092 te) would increase the existing rock volume (estimated 180,872 te of rock cover: see Section 3.2.4.3) by *c.* 23 %. This additional rock is expected to have a maximum seabed footprint of 0.0356 km^2.

In addition, recovery of the rock covered Group E pipelines will result in the footprint of the existing rock berm increasing by c. 0.0270 km^2. Across the Tartan Development Area, in addition to existing rock berms there are areas of mixed sediments which include large stones. Therefore, the ecosystems expected to develop on any new deposits are expected to exist in the area such that the impacts of any addition rock are not considered to have a significant cumulative impact.

8.4. Mitigation Measures

The following mitigation measures are proposed to minimise the environmental impacts related to the planned seabed disturbance associated with the subsea Tartan Development Area Decommissioning Project.

Proposed Mitigation Measures

- Cutting/jetting/dredging and lifting procedures will be in place which will minimise disturbance to the seabed and cuttings piles.
- With respect to remediation on the exposed ends of the buried pipelines and umbilical, trench and bury or cut and recover will be prioritised over rock cover.
- If rock cover is used, volumes will be minimised, and a fall pipe will be used to lay it on the seabed.
- Rock cover profiles will align with industry standards with respect to size of rock.
- Internal cutting of the piles at the piled structures will be prioritised over external cutting.
- Location of the cuttings piles will be marked on FishSafe.
- Preference will be given to the use of side scan sonar surveys (or similar e.g. multibeam sonar) to determine a clear seabed.

8.5. Conclusions

The decommissioning activities associated with the subsea Tartan Development Area Decommissioning Project will result in localised short-term disturbance to the seabed, including disturbance to small drill cuttings piles at five locations.

Over trawl trials used to confirm a clear seabed will result in the largest area of impact, and Repsol Sinopec Resources UK Limited will investigate the use of side scan sonar (or similar e.g. multibeam sonar) to determine a clear seabed and therefore remove this impact.

Should rock cover be added to mitigate the exposed pipeline and umbilicals sections, it is estimated that a total of 41,092 te would be required. As described, the environmental impact is not considered significant given that, the ecosystem likely to develop on the additional rock is expected to occur on the existing rock berms and to be associated with the existing areas of mixed sediments. Should the rock be laid on areas of muddy or fine sediment, any impacts are not considered significant given that minimal volumes of rock that would be added.

Considering the scope of activities and the receptors in the area, the combined impact significance of disturbing the seabed could be considered Moderate (includes over trawl trials). However it should be noted that the majority of the impacts will be temporary with ecosystem recovery commencing as soon as the offshore activities have been completed. Permanent impacts associated with the use of rock cover to remediate exposed pipeline and umbilical sections will be associated with a relatively small area. In addition, trench and bury or cut and recovery options will be prioritised. Throughout the project Repsol Sinopec Resources UK Limited will apply the mitigation measures

identified and will work with the Company's framework for the effective management of Health, Safety and Environmental (HSE) issues involving their oil and gas activities in the UK (See Chapter 10).

The activities assessed in this Chapter will not contradict the NMP objectives and as the project progresses Repsol Sinopec Resources UK Limited will aim to comply with the NMP policies. In addition, the project will aim to comply with the oil and gas marine planning policies (see Section 5.9).

9. LEGACY IMPACTS

When assessing the impact of the proposed activities during the ENVID Workshop (Chapter 7), none of the legacy impacts were considered to result in a significant environmental impact. However, given stakeholder interest in legacy impacts and the fact that these impacts could change over time, they are considered further here.

9.1 Activities (Cause of Impact)

Proposed activities that could result in a legacy impact include:

- Decommissioning of the buried pipelines and umbilical *in situ*;
- Decommissioning of the existing rockdump *in situ* and additional rock to mitigate exposed pipeline ends; and
- Decommissioning of the cuttings piles *in situ*.

In line with the results of the CA, Repsol Sinopec Resources UK Limited propose to decommission the trenched and buried pipelines and umbilicals (where DOL is > 0.6 m) *in situ*. As described in Section 3.2.4.1, the preference is that the exposed pipeline and umbilical ends will be trenched and buried or cut and removed. However, the contingency of rock cover is being carried forward which could result in *c*. 41,092 te of rock being placed on the seabed.

The environmental and socio-economic legacy impacts of decommissioning the buried pipelines and umbilicals and rockdump are discussed here.

9.2 Environmental Impact of Infrastructure to be Decommissioned In-Situ

9.2.1 Buried Pipelines and Umbilical

Over time the buried pipelines and umbilicals will breakdown. Analysis by Atkins indicates that the process of deterioration of rigid steel pipelines in salt water environments may take from 220 to 600 years (Atkins, 2012) and OGUK suggest that steel structures below the seabed will corrode at rates in the region of 0.01 to 0.02 mm/year (OGUK, 2013). During this long-term process, the degraded components of the pipelines and umbilical and their contents could potentially become bioavailable to benthic fauna in the immediate vicinity of the lines.

The pipelines to be decommissioned *in situ* will contain plain or inhibited seawater dosed whilst for the most part the umbilical cores will contain seawater. As note previously it is possible that integrity issues may result in some of the umbilical cores not being flushed. As the lines corrode, their contents will be slowly released into the surrounding sediments. Given that:

- the release will be gradual;
- the chemicals contained within the pipelines are approved chemicals; and
- the hydraulic fluids are water based,

the impact significance of these discharges is considered Low.

The steel (*c*. 19,659 te), aluminium alloy (*c*. 122 te) and copper (*c*. 27 te) associated with the pipelines and umbilical to be decommissioned *in situ* will over time become exposed to the surrounding sediment as the pipelines and umbilical degrade. Some metals have the potential to exert toxic effects in biota and can bioaccumulate through the food web (Neff, 2002). Within benthic animals, accumulated metals may act as enzyme inhibitors, adversely affect cell membranes, damage reproductive and nervous systems, cause changes in metabolic and respiratory efficiency, affect growth and behaviour or act as carcinogens (Kennish, 1997; and Ansari *et al*., 2004). Aluminium, copper and zinc are all trace metals, few of which have been seen to significantly bioaccumulate in marine organisms. Taking account of:

- the buried nature of the lines;
- the slow anticipated rate of degradation; and
- the fact that trace metals have not been found to significantly accumulate in marine organisms,

the long term environmental impact significance of the metals associated with the lines decommissioned *in situ* is considered Low.

PL18 and PL14 have a total of *c*. 6,674 te of concrete pipeline coating associated with them. As the lines are buried any concrete is expected to degrade over centuries. The degradation products will be the aggregates (sand and gravel) used in the concrete and the reacted cement compounds, predominantly calcium carbonate. These degradation products are relatively chemically inert and are likely to result only in a slight increase in the coarse sediment in the area of the pipeline. Impacts on benthic fauna are therefore expected to be negligible, whilst there are no anticipated impacts on the water column. Therefore, the potential impact significance of the degraded concrete associated with PL18 and PL14 is considered Low.

The pipelines and umbilical to be decommissioned *in situ* have *c*. 1,285 te of plastic[1] associated with them (the majority of which is associated with the umbilicals. It is thought the deterioration of plastics within the pipelines and umbilicals will take significantly longer than the time expected for the steel pipelines to degrade (Dames *et al*., 1999).

The sea is a very complicated environment for the degradation of plastics because microorganisms, animals, salt, sunlight, fluctuations of water, etc. all play a part in the degradation process (Krasowska *et al*., 2015). Degradation can therefore be impeded by cold temperatures and a lack of ultra violet (UV) light. As pipelines and umbilicals to be decommissioned *in situ* are buried it can be expected that the majority of these degradation sources, such as UV light and high temperatures will not be relevant.

Physical forces such as heating/cooling or seabed movements can cause mechanical damage such as the cracking of polymeric materials, and these physical forces are more likely to occur, however again these are not expected to impact on the pipelines and umbilical. The growth of microorganisms within the sediment can cause small-scale swelling and bursting (Krasowska *et al*., 2015), leading to fragmentation and the eventual breakdown into microplastics (1 µm to 5 mm) or nanoplastics (1 nm to 1 µm).

The potential ecological and human health risks of microplastics/nanoplastics are relatively new areas of research, and there is currently a large degree of uncertainty surrounding this issue (GESAMP, 2015). Adverse effects of plastics on marine organisms have been observed through the physical obstruction or damage of feeding appendages/digestive tracts/breathing tubes has been frequently observed (GESAMP, 2015).

NORM-contaminated scale may be present in some of the pipelines to be decommissioned *in-situ*. The most significant radioactive element in NORM scale and produced water is radium and in particular the stable isotope 226Ra which has a half-life of 1,620 years (Hylland and Erikson, 2013). When scale precipitates from produced water, the radium naturally present in the water can become concentrated into the scale at concentrations higher than those originally present in the water. Marine organisms can potentially bioaccumulate radium from solution in seawater, from ingested seabed sediments or from their food. Studies of the impacts of 226Ra released into the North Sea via produced water and natural processes indicate that it is unlikely to cause effects on marine organisms (Hylland and Erikson, 2013). The quantities of NORM in the pipelines to be decommissioned *in situ* is thought to be low. Combined with the fact that only trenched and buried lines will be decommissioned *in situ*, and sediments that may be impacted will be in the immediate vicinity of the pipelines, such that its impact on benthic populations is not considered significant.

Due to the buried nature of the pipelines and umbilicals within this project it is expected that the timescale of degradation will be considerably slower than it is for plastic in the water column or at the surface. The impacts of mechanical forces acting on the plastic pipelines are predicted to be low, and it is expected that much of the eventual plastic contaminants produced will be contained within the sediment and prevented from reaching the water column. The long-term environmental impact significance of the plastics associated with the pipelines and umbilical to be decommissioned *in situ* is therefore considered Low.

9.2.2 Existing and Additional Rockdump

Approximately 180,872 te of rockdump has previously been deposited at various locations across the Tartan Development Area. Some of this rock has been in place for over 40 years creating a habitat for benthic organisms that

[1] The 1,285 te comprises a number of different plastics including coal tar enamel, polypropylene, fusion bonded epoxy, polyethylene, nylon and Hard Polyvinyl Chloride (HPVC).

live on hard substrate. If the option to rock cover the exposed sections of the pipelines and umbilical (to be decommissioned *in situ*) is selected, *c*. 41,092 te of rock will be required.[2]

As for the existing rock, this additional rock will create a habitat for benthic organisms that live on hard substrate. As described in Section 5.6.2, there are areas of mixed sediment which includes large stones across the fields that will also form a habitat for these species. Therefore, it is unlikely that the decommissioning of existing rock or the introduction of any additional rock will have a significant impact on the benthic species that occur in the area. The environmental impact of decommissioning existing rock *in situ* or adding new rock to mitigate the exposed ends of the pipelines and umbilical is therefore considered Low.

9.3 Socio-Economic Impacts of Infrastructure to be Decommissioned *In-Situ*

As described in Section 6.2, demersal trawl gear is used in the Tartan Development Area and therefore has the potential to interact with any infrastructure or rock remaining on the seabed. The buried pipelines and umbilical to be decommissioned *in situ* have a depth of lowering / cover in general of over 0.6 m and occur in an area where the seabed is stable. Trawl gear currently working in the area, have regularly traversed the buried sections of the pipelines and umbilicals without any interaction.

Assuming a worst case whereby rock is used to mitigate the exposed ends of the trenched and buried pipelines and umbilical, *c*. 41,092 te of rock will be required. In the event that any rock cover is laid, the rock size and profiles selected will be in accordance with industry best practice and SFF recommended practice such that demersal trawl gear would be expected to be able to access the area.

Recovery of the Group E pipelines (surface laid and rock covered) will require the existing rock berm to be displaced prior to the lines being lifted. The displaced rock will be spread to ensure it is over trawlable. This will be confirmed by the safe seabed surveys.

Following decommissioning activities independent verification of the seabed state will be obtained and evidence of clearance will be provided to all relevant governmental and non-governmental organisations.

As part of the DPs, Repsol Sinopec Resources UK Limited will commit to a post decommissioning survey strategy (agreed with OPRED) to monitor the burial status of the lines and stability of the rock profiles.

Therefore taking:

- the current buried condition of the lines into account;
- the stability of the seabed;
- the used of industry preferred rock size and profiles;
- demonstration of a clear seabed; and
- a post decommissioning survey strategy,

the socio-economic impact significance of these lines and rock being decommissioned *in situ* is considered Low.

9.4 Legacy Impacts of the Cuttings Piles Decommissioned *In Situ*

Figure 9-1 identifies the nine 500 m exclusions zones associated with the Tartan Development Area. The 500 m exclusion zones in place at the different subsea tie-backs will be removed following the proposed decommissioning activities. This will allow access to areas that have been excluded to other sea users over the operational life of the field and opens up the potential for interactions between demersal trawl gear and the drill cuttings piles.

[2] Approximately 216 te of rock covered mattresses (associated with crossings) will also be decommissioned *in situ*. As these are rock covered the impact is not considered is not considered separately as it is expected to be similar to that of rock cover.

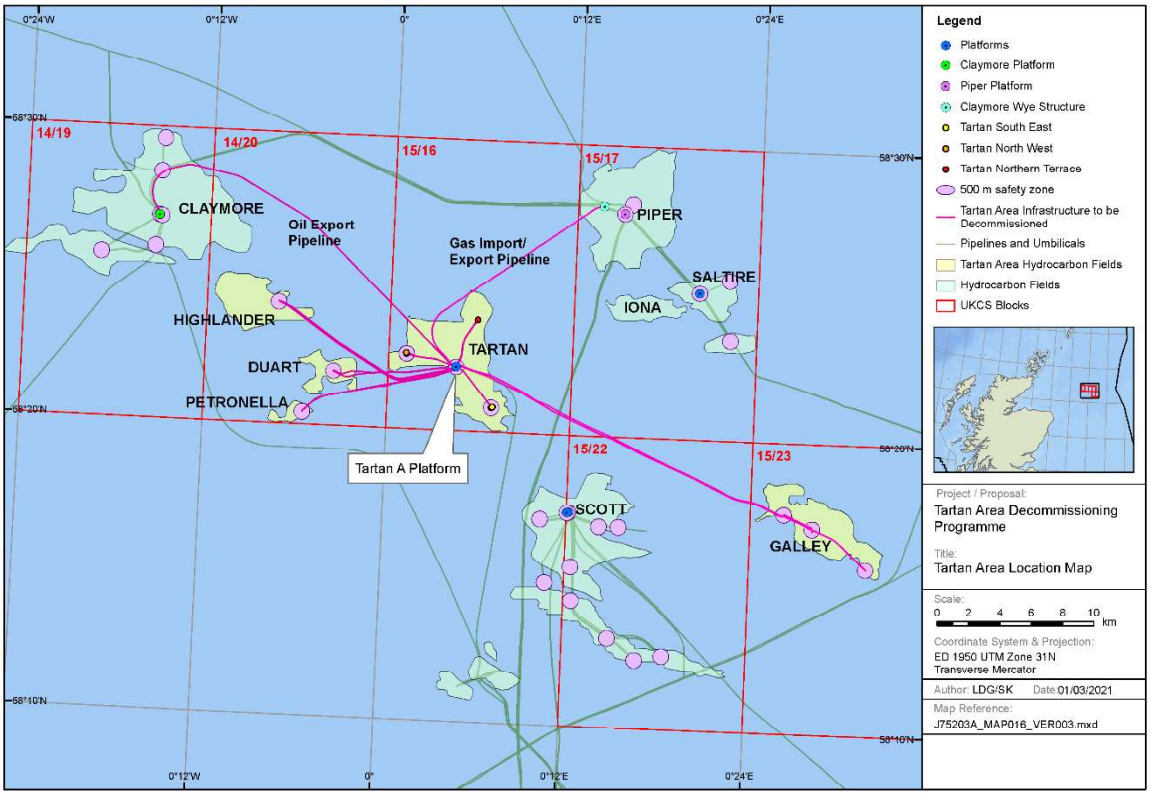


Figure 9-1: Location of 500 m zones across the Tartan Development Area.

A range of experimental studies have been undertaken to determine the potential depth of disturbance of fishing gear (OSPAR, 2009b). Durrieu de Madron *et al.* (2005) found that the particulate matter load resulted from the resuspension of less than the equivalent of 1 mm thickness of the sediment over the area of the trawl. These results suggest it is therefore unlikely that trawling gear will re-suspend large quantities of a cuttings pile. This agrees with other experimental evidence (OSPAR, 2009; Kaiser *et al*., 2006) which showed that the spatial extent of disturbed material from trawling was small and resettled material was at low concentrations. The Fisheries Research Service (FRS) also undertook studies which showed that no significantly increased environmental risk is likely to arise from the spread of contamination caused by fishing over piles (FRS, 2005). The exception might be if a cuttings pile is frequently over-trawled without recovery time so that material with higher metal and hydrocarbon concentrations from deeper in the pile was disturbed.

Interaction with the small cuttings piles therefore could cause some oil contamination to gear and catch tainting and could result in the spread of some residual contamination over the seabed, however studies suggest the impacts are unlikely to be significant. It is also important to note that the hydrocarbon content of each of the five small cuttings piles is low (total hydrocarbon content ranging from 0.02 te to 0.44 te) and that it will continue to decline over time. Therefore, the potential for impact on fishing activities will also decline. The removal of the 500 m safety exclusion zones in the area and opening access to this area is seen as a positive, whilst the location of the cuttings piles will be marked on FishSafe, informing other users of their locations. Therefore, the socio-economic impact significance of decommissioning the cuttings piles in-situ is considered Low.

9.5 Transboundary and Cumulative Impacts

Given the distance from the nearest transboundary line (*c*. 82 km from the Tartan A platform), there are no transboundary impacts anticipated as a result of the activities captured in this Chapter.

As all surface laid infrastructure will be recovered and any additional rockdump will be minimised the cumulative impact of the proposed activities in relation to other activities in the area is not considered significant.

9.6 Mitigation Measures

The following mitigation measures are proposed to minimise the environmental and socio-economic impacts associated with the infrastructure to be decommissioned *in situ* and any additional rockdump.

Proposed Mitigation Measures

- All surface laid infrastructure will be recovered.
- A clean seabed will be achieved as part of the decommissioning activities.
- Preference will be given to trenching and burying or cutting and recovering the exposed pipeline and umbilical ends.
- Lines decommissioned *in situ* have been flushed to reduce hydrocarbons and chemicals to ALARP.
- If used, rockdump will be optimised and carefully managed. A fall pipe will be used to ensure accuracy of the rock dumping. Size of rock and rock profiles will be in accordance with industry practice which is also the preferred SFF / industry best practices.
- Locations of remaining materials (including the cuttings piles) will be marked on FishSafe.
- Adherence to a post decommissioning survey strategy agreed with OPRED.

Repsol Sinopec Resources UK Limited's commitment to adhering to the mitigation measures identified means that the environmental and socio-economic impact significance of decommissioning the buried pipelines, umbilical, existing rock and any new rock *in situ* is considered Low.

The activities assessed in this chapter will not contradict the NMP objectives and as the project progresses Repsol Sinopec Resources UK Limited will aim to comply with the NMP policies. In addition, the Project will aim to comply with the oil and gas marine planning policies (see Section 5.9).

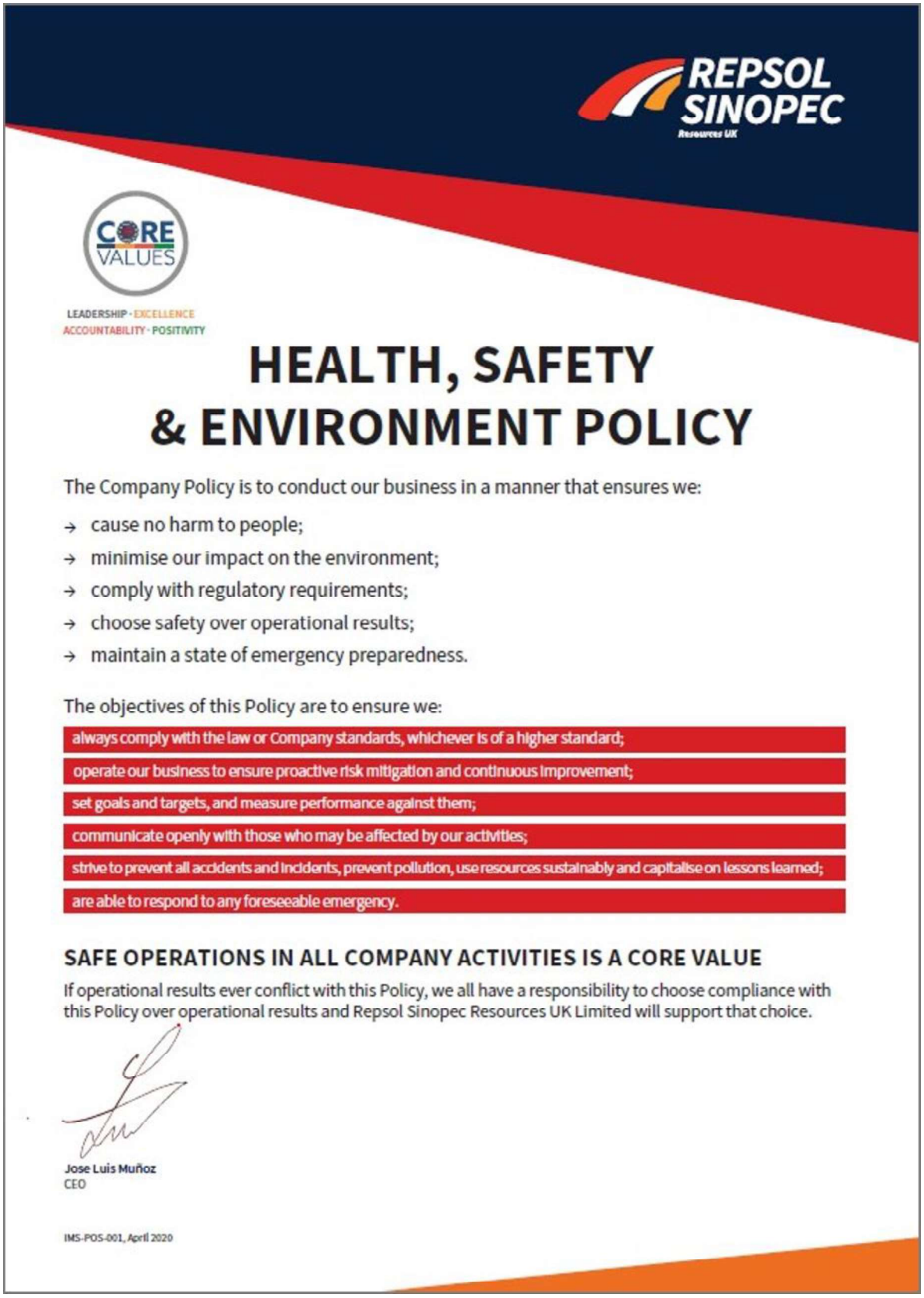
10. ENVIRONMENTAL MANAGEMENT

Repsol Sinopec Resources UK Limited are committed to conducting activities in compliance with all applicable legislation and in a manner that will minimise impacts on the environment. Environmental and social impacts identified through the impact identification processes will be input to the projects risk register. A summary of key environmental and social impacts and risks shall be included within the projects decision documentation throughout all phases of the project.

Repsol Sinopec Resources UK Limited has established a clear framework for the effective management of Health, Safety and Environmental (HSE) issues involving their oil and gas activities in the UK. The Company regards environmental management as being an integral part of its overall management responsibility; the fundamental aims being to support environmental protection, prevent pollution and comply with legislation and regulations. The principles of the International Standard for Environmental Management Systems (ISO14001) are incorporated within the Company's Safety and Environmental Management System (SEMS), which is an integral part of the company's overall management system.

Repsol Sinopec Resources UK Limited's structure, roles and responsibilities are outlined in the SEMS. In addition, the SEMS provides the framework for a 'Plan-Do-Check-Act' approach to HSE management, which actively promotes continual improvement in all aspects of the organisation's activities.

Repsol Sinopec Resources UK Limited's HSE Policy is a public declaration of the Company's commitment to create a working environment such that no harm is caused to people and where environmental impact is minimised. The Company's HSE Policy is shown in Figure 10-1.



REPSOL SINOPEC
Resources UK

CORE VALUES

LEADERSHIP · EXCELLENCE
ACCOUNTABILITY · POSITIVITY

HEALTH, SAFETY & ENVIRONMENT POLICY

The Company Policy is to conduct our business in a manner that ensures we:

- cause no harm to people;
- minimise our impact on the environment;
- comply with regulatory requirements;
- choose safety over operational results;
- maintain a state of emergency preparedness.

The objectives of this Policy are to ensure we:

always comply with the law or Company standards, whichever is of a higher standard;

operate our business to ensure proactive risk mitigation and continuous improvement;

set goals and targets, and measure performance against them;

communicate openly with those who may be affected by our activities;

strive to prevent all accidents and incidents, prevent pollution, use resources sustainably and capitalise on lessons learned;

are able to respond to any foreseeable emergency.

SAFE OPERATIONS IN ALL COMPANY ACTIVITIES IS A CORE VALUE

If operational results ever conflict with this Policy, we all have a responsibility to choose compliance with this Policy over operational results and Repsol Sinopec Resources UK Limited will support that choice.

Jose Luis Muñoz
CEO

IMS-POS-001, April 2020

Figure 10-1: Repsol Sinopec Resources UK Limited HSE Policy.

11. CONCLUSIONS

The Tartan Development Area comprising the Tartan, Highlander, Petronella, Galley and Duart Fields is to be decommissioned by Repsol Sinopec Resources UK Limited.

Given the number of fields and expanse of infrastructure associated with the Tartan Development Area, Repsol Sinopec Resources UK Limited will submit five DPs to OPRED; one each for the Tartan A platform topsides and substructure and three DP submissions for the subsea infrastructure. This EA assessed the environmental and social impacts of the proposed decommissioning activities captured in the three subsea DP submissions.

Included in the subsea infrastructure decommissioning activities is the recovery of all subsea structures, and surface laid pipelines, umbilicals, spools, umbilical jumpers, mattresses and grout bags. In addition, the base case is that surface laid rock covered lines and trenched lines where both the DOC and DOL are < 0.6 m will be recovered. The trenched and buried pipelines and umbilicals where DOL is > 0.6 m will be decommissioned *in situ* whilst the exposed ends will be remediated. Preference will be given to trench and bury or cut and recovering the exposed ends however the CA did also identify the use of rock cover as a suitable remediation option.

Following a detailed review of the project activities, the environmental sensitivities of the project area, industry experience with decommissioning activities and of stakeholder concerns, it was determined that further assessment of the following issues was required in order to properly define the potential impact of the proposed decommissioning activities associated with the subsea DPs:

- Seabed disturbance impacts – during recovery of infrastructure, trench and bury activities, potential rock cover and over-trawl sweeps/trials.
- Legacy impacts:
    - The release of hydrocarbons, chemicals, metals, NORM, plastic etc. as material (including the cuttings piles) decommissioned *in situ* degrades.
    - The physical presence of infrastructure (including five small cuttings piles with hydrocarbon contents of < 0.5 te) decommissioned *in situ* on other sea users, both in terms of physical exclusion and risk of snagging.

A review of each of these potentially significant environmental interactions has been completed and, considering the mitigation measures that will be built into the decommissioning project activities, there is expected to be no significant legacy impacts on receptors. Given the expanse of the infrastructure, the short term impact of disturbance to the seabed could be considered to be a moderate impact, however ecosystem recovery is expected to begin once the decommissioning activities are completed. As part of this review, cumulative and transboundary impacts were assessed and determined to be not significant.

The potential impact on protected sites in the wider vicinity has been considered in the assessment. The protected sites in closest proximity to the subsea infrastructure associated with the Tartan Development Area are the Scanner Pockmark SAC and the Central Fladden NCMPA located *c*. 29 km and *c*. 39 km respectively from the infrastructure. Having assessed the impact of the proposed decommissioning activities, no significant impacts are expected on any protected sites.

The EA has considered the objectives and marine planning policies of the Scottish NMP across the range of policy topics including biodiversity, natural heritage, cumulative impacts and oil and gas. Repsol Sinopec Resources UK Limited considers that the proposed decommissioning activities are in broad alignment with such objectives and policies. Similarly, Repsol Sinopec Resources UK Limited considers that the proposed activities are aligned with the oil and gas specific marine planning policies.

Based on the findings of this EA and the identification and subsequent application of the mitigation measures identified for each potentially significant environmental and societal impact, it is concluded that the proposed subsea decommissioning activities will result in no significant environmental or societal impacts.

12. REFERENCES

ABPmer (2008). Atlas of UK Marine Renewable Energy Resources. Available at: https://www.gov.scot/publications/scotlands-seas-towards-understanding-state/pages/7/.

Aires, C., González-Irusta, J.M. and Watret, R. (2014). Scottish Marine and Freshwater Science Report, Vol 5 No 10, Updating Fisheries Sensitivity Maps in British Waters. [online] Available at: http://www.gov.scot/Topics/marine/science/MSInteractive/Themes/fish-fisheries/fsm [Accessed January 2020].

APEM (2020a). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys Tartan. TS Sample Analysis Report. APEM Doc No. P00004264. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0037-C01.

APEM (2020b). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys. Tartan TNT Sample Analysis Report. APEM Doc No. P00004266. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0038-C01.

APEM (2020c). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys. Duart Sample Analysis Report. APEM Doc No. P00004271. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0042-C01.

APEM (2020d). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys Tartan Highlander Sample Analysis Report. APEM Doc No. P00004269. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0039-C01.

APEM (2020e). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys. Galley Sample Analysis Report. APEM Doc No. P00004272. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0040-C01.

APEM (2020f). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys. Petronella Sample Analysis Report. APEM Doc No. P00004270. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0041-C01.

APEM (2020g). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys: Tartan Drill Cuttings Sample Analysis Report. APEM Doc No. P00004273. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0043-C02.

APEM (2020h). Tartan, Highlander, Petronella, Duart & Galley Pre-Decommissioning Surveys Habitat Assessment Report. APEM Doc No. P00004276. Repsol Sinopec Resources UK Limited Doc No. RT-DTATAR001-GE-0035-C02.

BEIS (2018). Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998. Published November 2018

Blott, S.J. & Pye, K. (2012). Particle size scales and classification of sediment types based on particle size distributions: review and recommended procedures. Sedimentology 59: 2071-2096.

Committee on Climate Change (2020). Reducing UK Emissions 2020 Progress Report to Parliament. Available from: 2020 Progress Report to Parliament (b-cdn.net)

Coull, K.A., Johnstone, R. and Rogers, S.I. (1998). Fisheries Sensitivity Maps in British Waters. UKOOA Ltd.

Ellis, J., Milligan S., Readdy, L., Taylor, N. and Brown, M. (2012). Spawning and nursery grounds of selected fish Species in UK water. CEFAS Technical Report 147. Available at: https://www.cefas.co.uk/publications/techrep/TechRep147.pdf

Folk, R.L. (1954). The distinction between grain size and mineral composition in sedimentary rock nomenclature. Journal of Geology 62(4): 344-359.

Genesis (2020a). Tartan Development Area Decommissioning Project: Small Drill Cuttings Piles Management- BAT Assessment. Repsol Sinopec Resources UK Limited Reference No. RP-DTATAR001-HS-0234.

Genesis (2020b). Tartan Development Area Decommissioning Project: Drill Cuttings Modelling Report- Highlander. Repsol Sinopec Resources UK Limited Reference No. RP-DTATAR001-HS-0233.

GESAMP (2015). "Sources, fate and effects of microplastics in the marine environment: a global assessment" (Kershaw, P. J., ed.). (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). Rep. Stud. GESAMP No. 90, 96 p.

Hammond P.S., Lacey C., Gilles A., Viquerat S., Börjesson P., Herr H., Macleod K., Ridoux V., Santos M.B., Scheidat M., Teilmann J., Vingada J., Øien N. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCAN-III aerial and shipboard surveys. Available online: https://synergy.st-andrews.ac.uk/scans3/category/researchoutput/ [Accessed January 2020].

Hill, J.M. & Tyler-Walters, H. (2018). Seapens and burrowing megafauna in circalittoral fine mud. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. DOI https://dx.doi.org/10.17031/marlinhab.131.1

Hylland, K. and Erikson, D.O. (2013). Naturally occurring radioactive material in North Sea produced water: environmental consequences. Norsk Olje og Gass.

IAMMWG (Inter-Agency Marine Mammal Working Group) (2015). Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, Joint Nature Conservation Committee, Peterborough, UK, 42pp.

International Maritime Organisation (IMO) (1972). Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs). Further information available at: http://www.imo.org/about/conventions/listofconventions/pages/colreg.aspx

IPCC (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group | to the Sixth Assessment Report of the Intergovernment Panel on Climate Change. e [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)].

Judd, A.G. (2001). Pockmarks in the UK sector of the North Sea. Strategic Environmental Assessment- SEA2, Technical report TR_002. 70pp.

Judd, A.G. (2005). The distribution and extent of methane-derived authigenic carbonate. Strategic Environmental Assessment, Area 6 (SEA6). Technical Report. 69pp.

Kober, K., Webb, A., Win, I., Lewis, M., O'Brien, S, Wilson, L.J, Reid, J.B., (2010). An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs, JNCC Report 431, ISSN 0963-8091. Available at: http://archive.jncc.gov.uk/page-5622

OGA (2016). Information on levels of shipping activity. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/540506/29R_Shipping_Density_Table.pdf

OGUK (2013). Long term degradation of offshore structures and pipeline decommissioned and left in situ. Report no. O02=1201-RPT-001.

OGUK (2015). Oil and Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes. Published October 2015.

OGUK (2018). Well Decommissioning Guidelines. Issue 6. June 2018. Available for download from https://oilandgasuk.co.uk/product/well-decommissioning-guidelines/.

OSPAR. (2006). OSPAR Recommendation 2006/5 on a management regime for offshore cuttings piles.

OSPAR. (2014). Establishment of a list of Predicted No Effect Concentrations (PNECs) for naturally occurring substances in produced water. OSPAR agreement 2014-05.

Pinnegar J, Blasdale T, Campbell N, Coates S, Colclough S, Fraser H, Greathead C, Greenstreet S, Neat F, Sharp R, Simms D, Stevens, H. & Waugh, A. (2010). Charting Progress 2: Healthy and biologically diverse seas. Feeder Report, Section 3.4: Fish. Published by Defra, 128pp.

Reid, J., Evans, P.G.H. & Northridge, S. (2003). An atlas of cetacean distribution on the northwest European continental shelf. Joint Nature Conservation Committee, Peterborough, UK, 77pp. [online] Available at: http://jncc.defra.gov.uk/page-2713 [Accessed January 2020].

Repsol Sinopec Resources UK Limited (2020a). Tartan Development Area Decommissioning Project: Environmental Appraisal Scoping Report. Repsol Sinopec Resources UK Limited Document No. RP-DTATAR001-HS-0157.

Repsol Sinopec Resources UK Limited (2020b). Tartan Development Area: Pipelines Comparative Assessment Report. Repsol Sinopec Resources UK Limited Document No. RP-DTATAR001-GE-0095.

SCOS (Special Committee on Seals). (2013). Scientific advice on matters related to the management of seal populations: 2015. Special Committee on Seals, 211pp. [online] Available at: http://www.smru.st-andrews.ac.uk/research-policy/scos/

Scottish Government, (2021). Scottish Sea Fisheries Statistics, Fishing Effort and Quantity and Value of Landings by ICES Rectangle, 2018. Scottish Government. Available online: 2019 Scottish Sea Fisheries Statistics - Fishing Effort and Quantity and Value of Landings by ICES Rectangles | Marine Scotland Data Publications

Scottish Government National Marine Plan Interactive. (NMPi) (2020). Available at: https://marinescotland.atkinsgeospatial.com/nmpi/ [Accessed February 2020].

Scottish Natural Heritage (SNH). (2016). Marine Protected Areas (MPAs). [online] Available at: http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/marine-protected-areas-(mpa)/ [Accessed January 2020].

Turrell, W.R., Henderson, E.W., Slesser, G., Payne, R., & Adams, R.D. (1992). Seasonal changes in the circulation of the northern North Sea. Continental Shelf Research 12: 257-286.

Tyler-Walters, H., James, B., Carruthers, M. (eds.), Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J. & Crawford-Avis, O.T. (2016). Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406. Available at: https://www.nature.scot/snh-commissioned-report-406-descriptions-scottish-priority-marine-features-pmfs [Accessed January 2020].

UKOOA (2001). An analysis of U.K offshore oil & gas Environmental Surveys 1975-95, pp. 141.

APPENDIX A – IMPACT AND RISK ASSESSMENT METHODOLOGIES

This appendix presents the Environmental and Socio-Economic Impact Assessment (ESIA) and the Environmental and Socio-Economic Risk Assessment (ESRA) matrices used to determine the impact of the planned and accidental activities (respectively) associated with the project.

A.1. Receptors and Aspects

Prior to carrying out the ESIA / ESRA the potential receptors likely to be impacted were identified (Chapters 5 and 6), and the ways in which the activities may interact with the environment, i.e. the "aspects"(Chapter 3) were ascertained.

A.1.1 Environmental and Socio-Economic Receptors

Receptors to be considered in the ESIA and ESRA include:

Environmental receptors:

- Air quality;
- Climate;
- Water quality;
- Sediment quality;
- Plankton;
- Benthic communities (including flora and fauna);
- Fish;
- Marine mammals;
- Seabirds;
- Coastal marine communities;
- Designated areas.

Social receptors:

- Resource availability (e.g. diesel, landfill sites etc.);
- Fisheries;
- Shipping;
- Local communities (including other users e.g. tourism and persons living/working near the decommissioning yards, ports etc.);
- Cultural heritage (e.g. wrecks).

A.1.2 Identification of Aspects

Aspects to be considered include:

- Energy use and emissions to air;
- Physical presence of infrastructure decommissioned *in situ;*
- Disturbance to the seabed (including disturbance to the cuttings piles);
- Waste generation;
- Unplanned events;
- Physical presence of vessels;
- Discharges to sea;
- Underwater noise;
- Resource use;
- Yard activities e.g. noise, odour etc.

The aspects associated with each activity were assessed in terms of their impact on the receptors in the area. For example, the use of vessels will result in emissions to air, discharges to sea, underwater noise, physical use of space and, if anchored, disturbance to the seabed. Receptors potentially impacted by these aspects include air quality, climate, marine mammals, seabirds, other users of the sea, seascape and benthic communities (if anchored).

A.2. ESIA for Planned Activities

The significance of the environmental/social impact of planned activities on each of the susceptible receptors is derived by considering the 'Receptor Sensitivity' in relation to the 'Magnitude of Effect' of the aspect.

A.2.1 Receptor Sensitivity

Four categories of Receptor Sensitivity are applied ranging from 'Low' to 'Very High' as shown in Table A-1.

Table A-1: Receptor Sensitivity.

Category	Environmental Definition
(a) Low	**Flora/Fauna/Habitats - within the impacted area** • Population sizes are considered to be of little to no geographical importance. • Species do not have designated conservation status and are of IUCN 'Least Concern'. • No designated habitat/sites. • Impacted species are widespread in the North East Atlantic region. **Air quality:** Emissions may impact on other nearby installations. **Water quality**: Open offshore water body. **Cultural heritage sites**: Site integrity is already compromised. **Resource availability:** (e.g. landfill sites, diesel use) Renewable and/or abundant. **Third party users:** have capacity to absorb change without impact.
(b) Medium	**Flora/Fauna/Habitats – within the impacted area** • Significant numbers of at least one receptor of national importance (e.g. PMFs). • Significant numbers of a species which is listed as IUCN 'Near Threatened'. • Nationally designated habitat/sites (e.g. PMFs). • Species may be of regional value. **Air quality**: Populated areas nearby. **Water quality**: Semi-enclosed water body with good flushing. **Cultural heritage sites:** Site is of local heritage importance. **Resource availability**: (e.g. landfill sites, diesel use) Renewable and/or available. **Third party users:** have capacity to absorb change without significant impact.
(c) High	**Flora/Fauna/Habitats – within the impacted area** • Significant numbers of at least one receptor of regional (European) importance (e.g. Annex II / IV species and OSPAR designations). • Significant numbers of a species which are listed as IUCN 'Vulnerable'. • Regionally designated habitats/sites (e.g. OSPAR designations and Annex I habitats: SACs and SPAs). • Locally distinct sub-populations of some species may occur. **Air quality:** Densely populated areas nearby. **Water quality:** Semi-enclosed water body with limited flushing. **Cultural heritage sites:** Site is of regional heritage importance. **Resource availability:** (e.g. landfill sites, diesel use) Not renewable and/or limited availability. **Third party users:** have low capacity to absorb change and significant impact is likely to occur.

Category	Environmental Definition
(d) Very High	**Flora/Fauna/Habitat – within the impacted area** • Significant numbers of at least one receptor of international importance. • Significant numbers of a species which are listed as IUCN 'Endangered' or 'Critically Endangered'. • Internationally designated habitats/sites (e.g. Ramsar sites). • At least one receptor is endemic (unique) to the area. **Air quality:** Very densely populated area with sensitive receptors such as schools and hospitals. **Water quality:** Enclosed water body with no flushing. **Cultural heritage sites:** Site is of international heritage importance. **Resource availability:** (e.g. landfill sites, diesel use) Not renewable and/or scarce availability. **Third party users:** have no capacity to absorb change e.g. unemployment due to long term closure of fisheries.

A.2.1.1 Climate Change

With respect to the emission of greenhouse gases, climate is considered a global receptor rather than a local receptor. The categories identified in Table A-1 do not capture definitions for climate change. This is because the sensitivity status of climate is considered to be 'Very High' in line with the 2014 Climate Change Report produced by the Intergovernmental Panel on Climate Change (IPCC, 2021).

A.2.2 Magnitude of Effect

Definitions for the Magnitude of Effect on the receptors are presented in Table A-2. Prior to determining the Magnitude of Effect, industry recognised 'base case' mitigation measures were assumed to be applied e.g. on mobilisation of vessels to carry out the work Repsol Sinopec Resources UK Limited will notify other sea users such as SFF. Additional Repsol Sinopec Resources UK Limited or Project specific measures would include having a fisheries liaison officer on board any reel lay vessels that may be mobilised. These additional mitigations are considered prior to identifying the residual impact.

Table A-2: Magnitude of Effect.

Magnitude Level		Description	
		Environmental Impact	**Social Impact**
0	**Positive/No effect** *Regulatory compliance or Company goals are not a concern.*	**No environmental concerns** • Positive environmental impact e.g. retaining a 500 m zone resulting in a 'protected area'. • No significantly negative environmental effects.	**No public concerns** • Possible enhancement in the availability of a resource benefitting the persons utilising the area e.g. removal of 500 m zones results in return of access to fishing grounds. • No impacts on sites or features of cultural heritage. • No impact on resource or landfill availability.
1	**Negligible** *Regulatory compliance or Company goals are not breached.*	**Negligible environmental effects** • Any effects are unlikely to be discernible or measurable and will reverse naturally. • No beaching or transboundary impacts.	**Limited local public awareness and no concerns** • An intermittent short-term decrease in the availability of a resource which is unlikely to be noticed e.g. vessels working out-with existing 500 m exclusion zones could temporarily impact on a shipping route or

Magnitude Level		Description	
		Environmental Impact	**Social Impact**
			fishing area. • Undiscernible changes to a site or feature of cultural heritage that do not affect key characteristics and are not above background changes. • Undiscernible use of a resource (e.g. diesel, rockcover or landfill).
2	**Minor** *Regulatory compliance is not breached.*	**Minor, localised, short term, reversible effect** • Any change to the receptor is considered low, would be barely detectable and at same scale as existing variability. • Recover naturally with no Company intervention required. • No beaching or transboundary impacts	**Some local public awareness and concern** • A temporary (<1 year) decrease in the availability or quality of a resource e.g. access to fishing grounds may temporarily be inhibited due to presence of vessels. • Minor changes to a site or feature of cultural heritage that do not affect key characteristics. • Minor use of a resource (e.g. diesel, rockcover or landfill).
3	**Serious** *Possible minor breach of regulatory compliance.*	**Detectable environmental effect within the project area** • Medium localised changes to the receptor are possible. • Localised Company response may be required. • No beaching or transboundary impacts.	**Regional / local concerns at the community or stakeholder level which could lead to complaints** • Medium decrease in the short-term (1-2 years) availability or quality of a resource affecting usage e.g. bring a rig on site for 1-2 years. • Nuisance impacts e.g. marine growth odour coming from yards. • Partial loss of a site or feature of cultural heritage. • Moderate use of a resource (e.g. diesel, rockcover or landfill).
4	**Major effect** *Possible major breach of regulatory compliance.*	**Severe environmental damage extending beyond the project area** • High, widespread mid-term (2-5 years) degradation of the receptor. • Company response (with Corporate support) required to restore the environment. • Possible beaching and / or transboundary impacts.	**National stakeholder concerns leading to campaigns affecting the Company's reputation** • High mid-term (2-5 year) decrease in the availability or quality of a resource affecting usage e.g. closure of fishing grounds. • Substantial loss or damage to a site or feature of cultural heritage. • High use of a resource (e.g. diesel, rockcover or landfill).
5	**Critical effect** *Major breach of regulatory compliance resulting*	**Persistent severe environmental damage** • Very high, widespread long-term (>5 years) degradation to the receptor that cannot be readily rectified. • Major impact on the conservation	**International public concern and media interest affecting the Company's reputation** • Very high decrease in availability of a resource and potentially livelihood of users

Magnitude Level		Description	
		Environmental Impact	Social Impact
	in project delays and prosecution.	objectives of internationally/nationally protected sites. • Full Corporate response required. • Major beaching and/or transboundary impacts.	for > 5 years e.g. *hydrocarbons on beaches affecting tourism or tainting of fish resulting in the long-term closure of fishing grounds.* • Total loss of a site or feature of cultural heritage. • Significant use of a resource (e.g. diesel, rock cover or landfill).

A.2.3 Cumulative Impacts

The EA sets the activities and potential impacts in the context of all other activities taking place in the Tartan Development Area to determine the additional cumulative effects of the new activities. The potential cumulative effects are discussed in the impact assessment chapters e.g. cumulative impacts on climate change.

A.2.4 Environmental / Socio-Economic Impact Significance

The 'Receptor Sensitivity' and the 'Magnitude of Effect' were combined using the matrix presented in Table A-3 to determine the level of impact for planned activities.

Table A-3: ESIA matrix for planned activities.

		Receptor Sensitivity			
		(a) Low	(b) Medium	(c) High	(d) Very high
Magnitude of Effect	(0) Positive/No effect				
	(1) Negligible				
	(2) Minor				
	(3) Serious				
	(4) Major				
	(5) Critical				

(i) Positive / No effect significance	• Positive or no environmental or social impact. • No public interest or positive public support.
(ii) Low significance	• No/negligible environmental and social impact. • No concerns from consultees.
(iii)Moderate significance	• Discernible environmental and social impacts. • Requirement to identify project specific mitigation measures. • Concerns by consultees which can be adequately addressed by the Company.
(iv)High significance	• Substantial environmental and social impacts. • Serious concerns by consultees requiring Corporate support. • Alternative approaches should be identified.

A.2.5 Transboundary Impacts

Where relevant, transboundary impacts of each aspect on the receptors is discussed in the impact assessment chapters e.g. the impact of emissions on climate change.

A.3. ESRA for Unplanned Events

To determine the environmental and social risk of an unplanned event, the following approach considers firstly the significance of the environmental impact of an event should it occur and secondly the likelihood of the event occurring.

A.3.1 Environmental and Social Significance of an Unplanned Event

The ESIA approach described in Section A.2 for determining the environmental and social impacts of planned activities was also used to determine the significance of impacts that may result from unplanned events.

A.3.2 Likelihood of an Unplanned Event

Five categories of 'likelihood' have been identified as presented in Table A-4.

Table A-4: Likelihood of an unplanned event.

Likelihood Category	Definition
Extremely Remote	Has never occurred within industry or similar industry but theoretically possible.
Remote	Similar event has occurred elsewhere but unlikely to occur with current practices
Unlikely	Event has occurred in the industry during similar activities.
Possible	Event could occur during project activities.
Likely	Event is likely to occur more than once during the project.

A.3.3 Environmental Risk of an Unplanned Event

Combining the significance of the environmental/social impact with the 'likelihood of the unplanned event occurring' allows the level of environmental risk to be determined using the matrix presented in Table A-5. Note the potential for a beneficial impact significance has been removed as it is not expected that an unplanned event would lead to a beneficial environmental or social impact.

Table A-5: ESRA matrix for unplanned activities.

		Environmental significance of unplanned event*		
		(ii) Low	(iii) Moderate	(iv) High
Likelihood of event	Extremely remote	Low	Low	Low
	Remote	Low	Low	Medium
	Unlikely	Low	Medium	Medium
	Possible	Low	Medium	High
	Likely	Low	High	High

*Note the numbers associated with each significance level range from (ii) to (iv) in keeping with assignment in Table A-3.

Low risk	• Negligible environmental and social risks. • Mitigation measures are industry standard and no project specific mitigation required. • No consultee concerns.
Medium risk	• Discernible environmental and social risks. • Consultee concerns can be adequately resolved. • Local public interest.
High risk	• Significant environmental and social risks. • Serious consultee concerns. • Media interest and reputational impacts.