Saltire Area Decommissioning Environmental Appraisal Report

Final

28th November 2022

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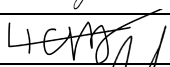
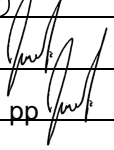
Checked by	Liang Wang		28/11/2022
Reviewed by	Robbie Dunbar-Smith		28/11/2022
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Terms and Abbreviations

Abbreviation	Explanation
AIS	Automatic Identification System
BAT	Best Available Technology
BEIS	Department for Business, Energy and Industrial Strategy
BEP	Best Environmental Practice
BOCC	Birds Of Conservation Concern
CA	Comparative Assessment
cm	Centimetre
CNS	Central North Sea
CoP	Cessation of Production
DECC	Department of Energy and Climate Change
DNS	Decom North Sea
DNV	Det Norske Veritas
DP	Decommissioning Programme
EA	Environmental Appraisal
EDC	Engineering Down and Cleaning
EIA	Environmental Impact Assessment
EMS	Environmental Management System
ENVID	Environmental issues Identification
ES	Environmental Statement
EU	European Union
EUNIS	European Nature Information System
FCA	Flotta Catchment Area
HLV	Heavy Lift Vessel
HSE	Health and Safety Executive OR Health, Safety and Environment
ICES	International Council for the Exploration of the Sea
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
IMO	International Maritime Organisation
IUCN	International Union for Conservation of Nature and Natural Resources
km	Kilometre
km²	Kilometre squared

Abbreviation	Explanation
km^2yr	Kilometre squared year (in relation to the persistence of cuttings piles - the area of seabed where the concentration of oil remains above 50 $\mu g g^{-1}$ and the duration that this contamination level remains)
LAT	Lowest Astronomical Tide
LSA	Low Specific Activity (radioactive material which has a limited specific activity)
m	Metre
mm	Millimetre
m^2	Metre squared
m^3	Metre cubed
MarLIN	Marine Life Information Network
MARPOL	The International Convention for the Prevention of Pollution from Ships 1973 (this is an international agreement for the protection of the marine environment)
MAT	Master Application Template (this is a central application for proposed activities under which many Subsidiary Applications (see SAT below) may be submitted, in the UK oil and gas environmental permitting system)
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MPA	Marine Protected Area
NCMPA	Nature Conservation Marine Protected Area
nm	nanometre
NM	Nautical mile
NM^2	Nautical mile squared
NMP	National Marine Plan
NMPi	Scottish National Marine Plan Interactive
NNS	Northern North Sea
NORM	Naturally Occurring Radioactive Material
OBM	Oil Based Mud
NSTA	North Sea Transition Authority
OEUK	Offshore Energies UK
OGUK	Oil and Gas UK
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo Paris Convention (this is an agreement to protect the marine environment of the North-East Atlantic)
P&A	Plugging and Abandonment
PFPS	Piper flange protection structure
PLANC	Permits, Licences, Authorisations, Notifications and Consents register

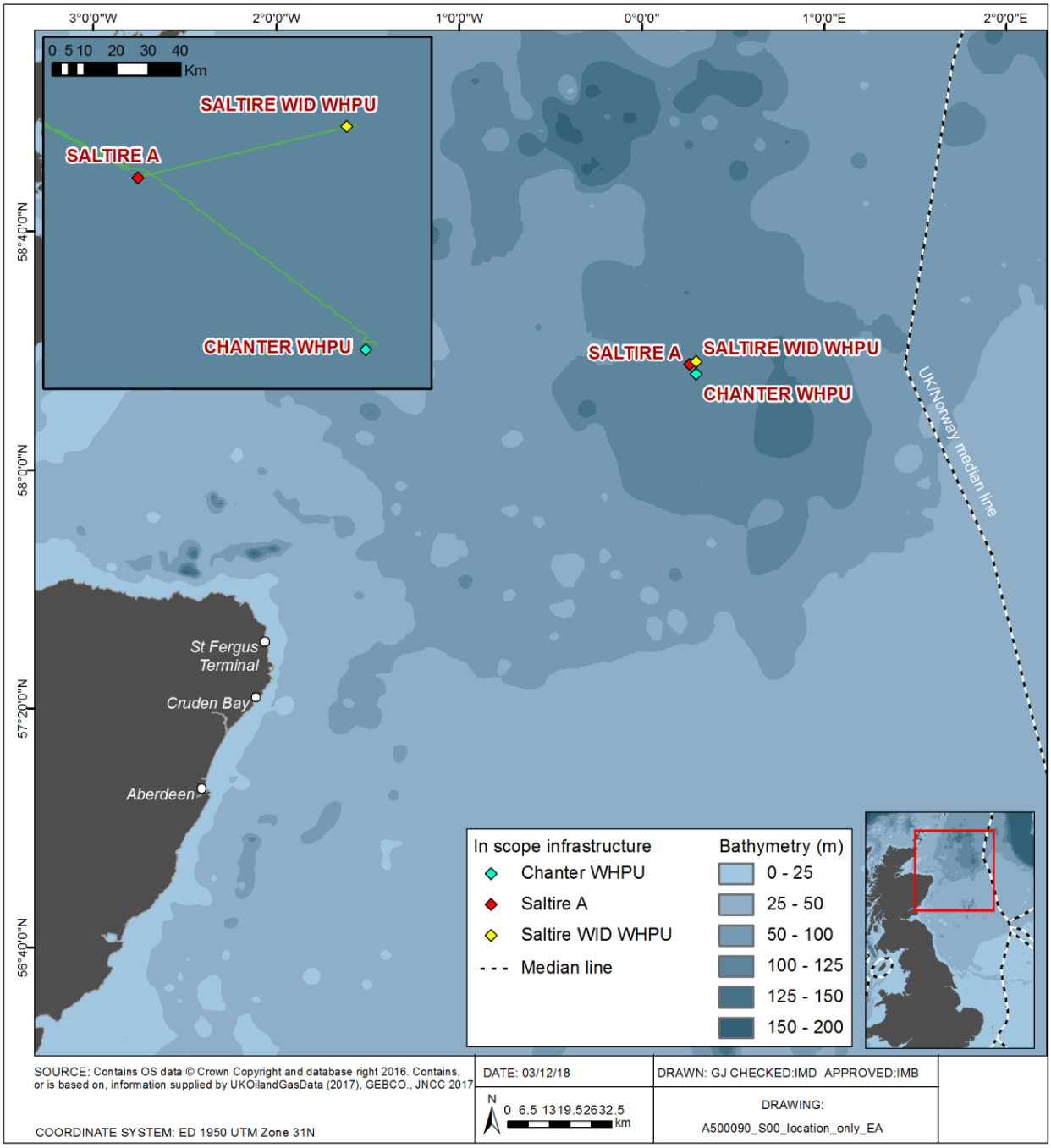
Abbreviation	Explanation
PMF	Priority Marine Feature
ppm	Part per million
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SAT	Subsidiary Application Template (these applications are required for specific types of Environmental Impact Assessment directions e.g. to drill a well, to install or augment a pipeline)
SCANS	Small Cetaceans in European Atlantic waters
SEPA	Scottish Environment Protection Agency
SFPS	Saltire flange protection structure
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SLV	Single Lift Vessel
SOSI	Seabird Oil Sensitivity Index
SSSI	Site of Special Scientific Interest
t/yr	Tonne per year
THC	Total Hydrocarbon
TOC	Total Organic Carbon
µm	Micrometre
$\mu g g^{-1}$	Microgram per gram
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USV	Underwater Safety Valve
VMS	Vessel Monitoring System
WHS	World Heritage Site
WI	Water injection
WID	Water Injection Development
WHPU	Wellhead Protection Unit
yr	Year
"	Inches

Non-Technical Executive Summary

Introduction

This summary outlines the findings of the Environmental Appraisal (EA) conducted by Repsol Sinopec Resources UK Limited for the proposed decommissioning of the Saltire Area Development located approximately 200 km north-east of Aberdeen in 145 m of water in UK block 15/17 (Figure 1).

Figure 1: Location of the Saltire Area Facilities

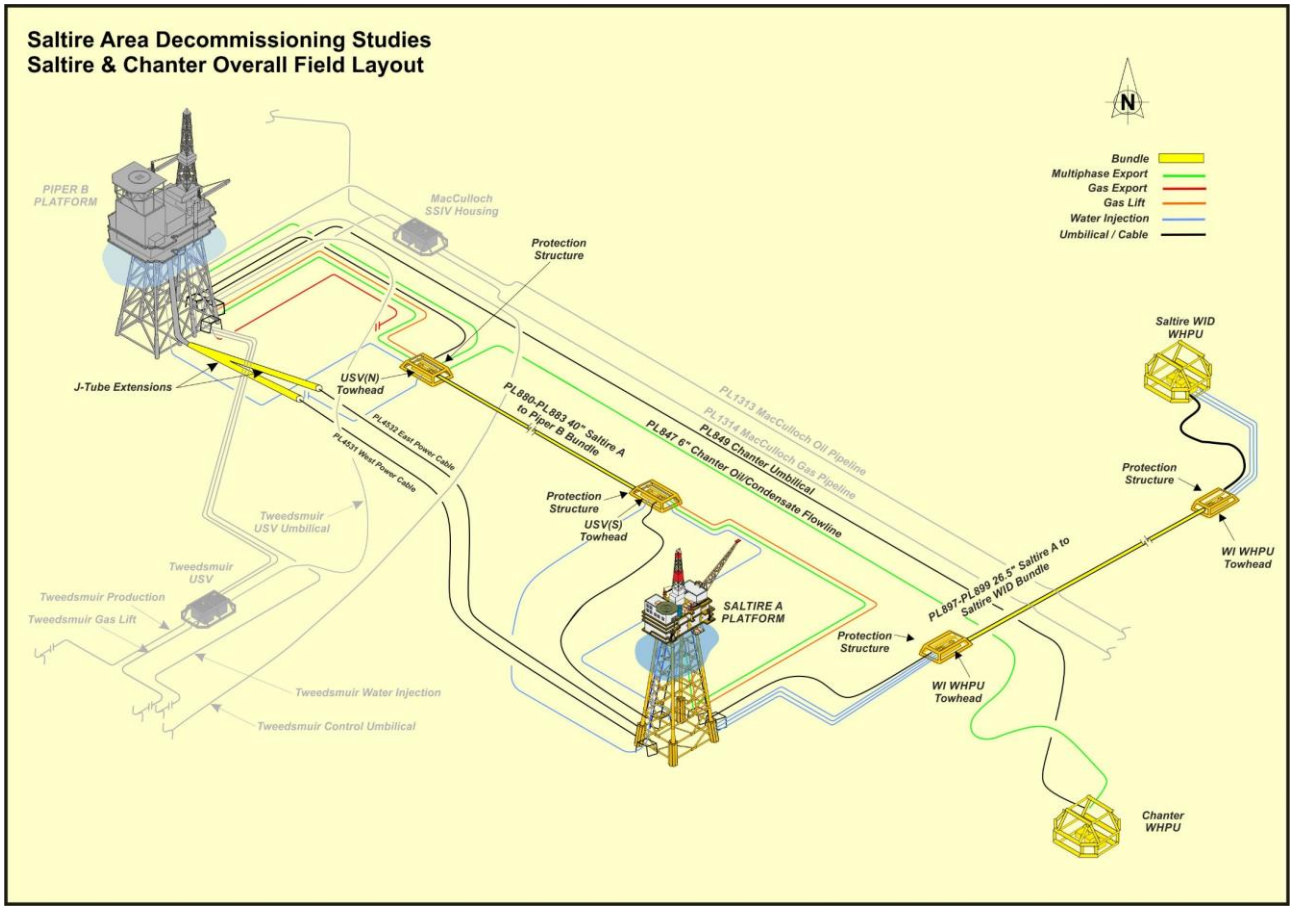


Notes:

(i) The Iona field was drilled and produced from the Saltire A platform. There is no dedicated infrastructure associated with the Iona field, which is therefore not shown on this figure.

The Saltire Area Development supports production from the Saltire, Iona and Chanter fields. The infrastructure was installed in 1992 as part of the Piper Area redevelopment and consists of the Saltire A platform, the subsea Saltire Water Injection Development (WID), the subsea Chanter production system and all pipeline/umbilicals linking these assets to the Piper B platform (Figure 2).

Figure 2: Schematic Summary of Facilities at Saltire to be Decommissioned)



Notes:

(i) Items coloured light grey are not in decommissioning scope and are shown for context only.
(ii) The Iona field was drilled from the Saltire A platform. As a result, no infrastructure is shown for this field on the above schematic.

The Saltire and Iona fields are produced via wells on the Saltire A platform with the Chanter field produced via a combination of wells on the Saltire A platform and a separate subsea production well.

Saltire A is a fixed drilling/production platform supported on a 4-leg steel jacket structure with a total of 14 production wells (ten Saltire wells, two Iona wells and two Chanter wells). The Wellhead Protection Unit (WHPU) at the Saltire WID has four water injector wells. The WHPU at the Chanter subsea production system consists of one production well and two appraisal wells. Prior to production being suspended in 2016, oil and gas was exported from Saltire A to Piper B via a 40-inch pipeline bundle[1], which contains one 10-inch diameter export line, one 8-inch diameter gas lift line and two 16-inch diameter sea water injection lines. An additional pipeline bundle (26.5-inch diameter) supplied water for downhole injection via three 6-inch lines from Saltire A to the Saltire WID WHPU.

[1] A pipeline bundle is essentially several pipelines (often of different types and sizes) bundled together within a larger diameter carrier pipe.

As part of the planning for decommissioning and to obtain regulatory approval for the activities, a Decommissioning Programme (DP) has been prepared. The scope of this, and therefore the scope of this EA, covers:

- The Saltire A topsides[2];
- The Saltire A jacket[3];
- Associated drill cuttings piles;
- Subsea structures: protection structures, mattresses, grout bags; and
- Pipeline bundles, umbilicals and cables.

The DP and EA do not cover well plugging and abandonment, or the flushing and cleaning operations that will be undertaken on the topsides and subsea (pipelines, umbilicals, manifolds) as part of the preparatory work preceding decommissioning.

Stakeholder Engagement

Consulting with stakeholders is an important part of the decommissioning EA process as it allows any concerns or issues which stakeholders may have to be communicated and addressed. As part of the stakeholder engagement process, a draft Scoping Letter was informally shared with stakeholders in 2018 to obtain preliminary feedback prior to an initial stakeholder engagement meeting. This was then updated with project information and issued formally to stakeholders in September 2019. The Scoping Letter provided an overview of the Saltire Area Development, the proposed decommissioning activities as known at the time and an overview of the impacts to be assessed in this EA. Stakeholders were invited to comment on the decommissioning proposals and planned EA with respect to any concerns they may have. Following issue of the draft Scoping Letter, Repsol Sinopec Resources UK Limited organised a number of informal stakeholder engagement sessions. These have included separate meetings with individual stakeholders, together with a Stakeholder Engagement Workshop to which many stakeholders were invited. Comments received through the process have been summarised in this EA Report and used to inform the impact assessments.

Options for Decommissioning and Comparative Assessment

Potential opportunities for re-use of the Saltire Area infrastructure were considered. Options to re-use the infrastructure *in-situ* for future hydrocarbon developments were considered, but none have yielded a viable commercial opportunity. The reason for this is the absence of remaining hydrocarbon reserves in the vicinity.

In line with the latest Department for Business, Energy and Industrial Strategy (BEIS) guidelines on decommissioning, Repsol Sinopec Resources UK Limited has committed to recovering the Saltire A topsides to shore. Similar decisions have been reached for the subsea structures, in line with BEIS decommissioning guidance.

The Saltire A jacket weighs >10,000 tonnes and is therefore a case for derogation (i.e. for leaving its footings *in-situ*). As required by BEIS guidance, the Saltire A jacket has been subject to a Comparative Assessment (CA) process in which all feasible options for decommissioning have been scored against each other with respect to criteria including technical feasibility, environmental impact and safety in order to establish the best option for decommissioning.

Beneath the Saltire A jacket, and also at the Saltire WID WHPU and the Chanter WHPU, there are piles of mud and cuttings containing oil deposited on the seabed when the wells were originally drilled. Detailed survey work has shown that the three cuttings piles are below internationally agreed

[2] On an offshore installation, the topsides comprises the deck and all the facilities on it including accommodation, drilling unit, processing equipment, cranes and helideck.
[3] In an offshore installation, the jacket is the steel lattice tower sitting on the seabed that supports the topsides.

thresholds for oil leaching and persistence, which means that the best option for the environment is for the piles to be left *in-situ* to degrade naturally.

With regards to pipeline bundles, umbilicals and cables, these were considered on a case-by-case basis. BEIS decommissioning guidance states that a CA is required for pipelines and that all feasible decommissioning options should be considered.

The recommendations made for decommissioning have been supported by appropriate specialist studies and the CA process and are summarised in Table 1.

Table 1: Decommissioning Recommendations for Saltire Area

Item	Subject to CA?	Recommendation
Topsides	No	Full removal
Jackets >10,000 tonnes (Saltire A)	Yes	Partial removal, leaving footings *in-situ*
Subsea structures	No	Full removal
Drill cuttings	No	Leave *in-situ* where possible
Pipelines: Group 1 - 40-inch Saltire A to Piper B Bundle, surface laid and exposed (PL880-PL883)	Yes	Leave *in-situ* exposed on the seabed for the majority of its length, with rock placed at the ends and free span locations
Pipelines: Group 2 - 26.5-inch Saltire A to Saltire WID WHPU Bundle, surface laid and exposed (PL897-PL899)	Yes	Leave *in-situ* exposed on the seabed for the majority of its length; rock placed at the ends and free span locations
Pipelines: Group 3 - 6-inch Chanter oil/condensate flexible flowline, mostly trenched and buried but exposed at seven midline locations (PL847)	Yes	Leave *in-situ*; remove pipeline ends; cut ends with all exposures trenched and buried
Pipelines: Group 4 - Trenched and buried umbilicals/ power cables	Yes	Leave *in-situ* trenched and buried; cut ends trenched and buried

Decommissioning Activities

At this stage, the specific method by which each activity will take place has not been finalised. These decisions will depend to some degree on the proposals made by the eventual contractor. The outline methods currently anticipated are summarised in Table 2.

Table 2: Decommissioning Activities for Saltire Area

Item	Method
Saltire A topsides	Complete removal and recovery to shore for re-use, recycling or disposal. Removal as a single unit or in sections.
Saltire A jacket	Partial removal to shore for re-use, recycling or disposal. Cut jacket above footings, retrieve top part of jacket as single or multiple components and leave footings *in-situ*.
Subsea structures	All subsea infrastructure will be disconnected, fully removed and recovered to shore for re-use, recycling or disposal:
Pipelines: Group 1 - 40-inch Saltire A to Piper B Bundle	Leave *in-situ*; remediate ends and free span only
Pipelines: Group 2 - 26.5-inch Saltire A to Saltire WID WHPU Bundle	Leave *in-situ*; remediate ends and free spans only
Pipelines: Group 3 - 6-inch Chanter oil/condensate flexible flowline (PL847)	Leave *in-situ*; trench and bury exposures
Pipelines: Group 4 - Trenched and buried umbilicals/power cables	Leave *in-situ*; trench and bury exposures
Protection and support items	Protection and support items such as mattresses and grout bags that are accessible (e.g. not buried or under a pipeline) and are safe to recover will be lifted for transfer to shore

Schedule

The schedule for decommissioning is currently under review.

Subject to market availability of cost effective removal services, the topsides will be decommissioned following permanent down-manning of the Saltire A platform.

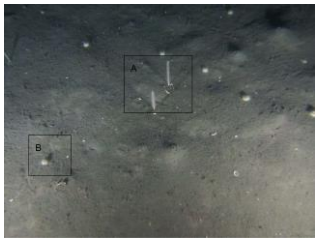
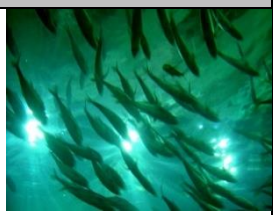
The Saltire A jacket structure is protected by sacrificial anodes that will remain *in-situ* with their structural integrity uncompromised for extended periods. This allows the possibility for a cost-effective approach to jacket decommissioning, in which the Saltire A jacket could be bundled with other Repsol Sinopec Resources UK Limited infrastructure into a campaign to leverage economies of scale. Moreover, this approach also allows newly emerging technologies to be considered in future.

Subject to market availability of cost effective removal services, the Saltire Area subsea infrastructure will be decommissioned following permanent plugging and abandonment of the Saltire Area subsea wells.

Environmental and Socio-Economic Baseline

The key environmental and social sensitivities in the Saltire Area have been summarised in Table 3.

Table 3: Key Environmental and Social Sensitivities for the Saltire Area

Sediment type and seabed features
Water depths across the three survey areas ranged between 142 m and 145 m relative to Lowest Astronomical Tide (LAT). The seabed at all three fields consists primarily of sediments with very little hard substrata. The main sediment types present over the area were mud, with a small area of sandy mud in the vicinity of the Saltire WID WHPU. This corresponds well with published information, which describes the seabed type in this part of the North Sea as the EUNIS broadscale habitat A5.3 sublittoral mud.
Seabed habitats and species
 Species living on the seabed observed through photography were generally sparse, due mainly to dominance of muddy sedimentary habitats and the relative absence of hard substrata, and similar over the whole area surveyed. The more frequently observed species included sea-pens, sea urchins, starfish, shrimps, hermit crabs and hagfish. Sea-pens and faunal burrows were observed in the video footage and stills throughout the Saltire Area, tying in with known information for the region. The invertebrate community living within the sediments and sampled by grab was generally similar across the Saltire Area, and the most abundant species mainly polychaete species characteristic of background conditions in this part of the CNS, and evident in the earliest baseline surveys. However, a subtle platform-related gradient in distribution was evident, with the identity of the most abundant species within 200 m differing very slightly from those further away.
Cuttings Piles
There are bathymetrically distinct cuttings piles present on the seabed beneath the jacket at Saltire A, and at the Saltire WID WHPU and the Chanter WHPU. Detailed survey work has shown that the pile at Saltire A has a surface area of 6,580 m^2, a volume of 2,455 m^3 and a maximum depth of 2.4 m. The piles at the Saltire WID WHPU and the Chanter WHPU were much smaller, with surface areas of 757 m^2 and 655 m^2, volumes of 158 m^3 and 78 m^3 and maximum depths of 0.5 m and 1.0 m respectively. Each pile was surrounded by a central zone of elevated hydrocarbon contamination in which total hydrocarbon concentrations were ≥50 $\mu g g^{-1}$. At Saltire A the size of this area was 0.369 km^2, but was much smaller at the Saltire WID WHPU and the Chanter WHPU (0.01 km^2).
Fish and shellfish
The Saltire Area fields lie within known spawning areas for cod, Norway pout, and Norway lobster. The region is a low intensity nursery ground for anglerfish, blue whiting, cod, hake, ling, mackerel, plaice, sandeels, spotted ray, spurdog and whiting. Norway pout, Norway lobster and sprat are also known to use all or part of the area as a nursery ground. However, published sensitivity maps indicate that the probability of aggregations of juvenile anglerfish, blue whiting, hake, haddock, herring Clupea harengus, mackerel, horse mackerel, Norway pout, plaice, sprat and whiting occurring in the offshore decommissioning Project area is low.  Of the fish identified as spawning in the Saltire cod is listed as vulnerable by the IUCN. The Saltire area is also a low intensity nursery ground for numerous species of which mackerel and spurdog are listed as vulnerable by the IUCN. Of the species identified as using the Saltire area for spawning or nursery grounds cod, Norway put, anglerfish, blue whiting, ling, mackerel, spurdog, whiting, herring and horse mackerel are listed as Priority Marine Features (PMF).
Seabirds
Large numbers of moulting auks (e.g. razorbills, guillemots, puffins) disperse from their coastal colonies and into offshore waters from July onwards and are sensitive to surface pollution as they are flightless at this time. Of these species, puffins are listed as IUCN 'Vulnerable' and razorbills are IUCN 'Near Threatened'; all other species in the area are listed as IUCN 'Least Concern'. The most abundant seabird species found in the Project area are northern fulmar, black-legged kittiwake and common guillemot. Herring gulls, glaucous gull and great black-backed gulls also use the area in winter. Following the 'Seabird Oil Sensitivity Index' developed by

Offshore Energies UK, the vulnerability of seabirds to surface oil pollution in the vicinity of the Saltire Area and surrounding blocks is considered low between January – March and June – August, high to extremely high in September and October, and very high in November and December. There was no data for April/May in most of the blocks located in the vicinity of the Saltire Area.
Marine mammals
The harbour porpoise and the white-beaked dolphin are the most frequently recorded cetaceans in and around the Saltire Area. The predicted densities of these species in the vicinity of the Saltire Area from recent Small Cetaceans in European Atlantic waters (SCANS-III) surveys is approximately 0.7 – 0.8 harbour porpoise per km² and 0.25 – 0.3 white-beaked dolphins per km², which is average compared to data across the UK. Grey seal densities vary across the offshore waters of the Project areavery low at <1 seal per 25 km². Harbour seal density is also predicted to be very low across the Project area, at <1 animals per 25 km². Additionally, from June to September harbour seals are on shore more often than at other times of the year.

Conservation
The closest designated site to the Saltire Area is the Scanner Pockmark Special Area of Conservation (SAC), 38 km to the south-east and designated for the presence of submarine structures made by leaking gases, listed as an Annex I feature in the EU Habitats Directive. Other designated sites are more than 49 km from the Saltire Area. Features of conservation importance noted in survey work across the whole of the Saltire Area include the Scottish Priority Marine Feature (PMF) 'burrowed mud' and one of its constituent biotopes, the OSPAR-listed threatened and/or declining habitat/species 'sea-pens and burrowing megafauna communities'. In addition, the ocean quahog (a type of clam) is listed by OSPAR as a threatened and/or declining species, is also listed as a ScottishPMF; records of this species occur throughout the CNS region around the Saltire Area. Survey work over the Saltire Area found no adult-sized specimens, but juveniles were recorded in grab samples at most stations. No Annex I habitat such as rocky, stony or biogenic reef, or submarine features made by leaking gases were recorded within the Saltire Area.
Fisheries and shipping
According to fisheries statistics for the UK provided by Marine Scotland, the region around the Saltire Area has targeted primarily for pelagic fish in terms of landed weight over the period 2013 - 2017. The tonnage of demersal species is a lot less, but its value is generally on a par with the value of pelagic catches. Shellfish catches, dominated by Norway lobster, have been approximately 700 tonnes or less between 2013 and 2017, but in 2017 accounted for 40% of the landed value. Both fishing effort and landings have been low over the last six years of statistics, but summer months are generally busiest. Vessel monitoring data indicate that fishing effort is multinational; the majority of fishing to the south and west of the Saltire Area was from UK-registered vessels (all demersal trawlers), while most of the fishing to the north and east was from overseas vessels Overall, the fishing effort in the vicinity of the Saltire Area is low compared to other UK offshore areas. Shipping density in the CNS in the vicinity of the proposed decommissioning activities is low. Average densities range from 0.2 vessels up to approximately five vessels per week and are mainly cargo and supply vessels.
Other sea users
The proposed decommissioning operations are located in a well-developed area for oil and gas extraction. Although several pipelines and two cables are located in the vicinity of the Project area (apart from those specific to the Saltire Area), the closest active field, Piper B, is 7 km to the north west of Saltire A.

Impact Assessment Process

This EA Report has been prepared in line with the BEIS Decommissioning Guidelines and also with Decom North Sea's EA Guidelines for Offshore Oil and Gas Decommissioning. The BEIS Decommissioning Guidance states that an EA in support of a DP should be focused on the key issues related to the specific activities proposed; and that the impact assessment write-up should be proportionate to the scale of the project and to the environmental sensitivities of the project area.

The Saltire Area Decommissioning Project EA has been informed by a number of different processes, including engagement with the Regulators and their statutory advisors, an environmental issues identification workshop with specialists and the CA process. The decision on which issues required specific assessment in the EA Report was based on technical familiarity with the proposed decommissioning activities, knowledge of the environmental sensitivities in the Saltire Area (informed by site-specific environmental survey work together with shipping and fisheries studies), a review of industry experience of decommissioning impact assessment and on an assessment of wider stakeholder interest, informed in part by the stakeholder engagement undertaken. Those issues that were not assessed as key environmental or social sensitivities were scoped out, with reasoned justification.

For the potentially significant impacts identified, detailed impact assessment has been undertaken, using tried and tested methodology following best practice. Measures to mitigate and eliminate or reduce environmental and social impacts have been applied where appropriate; these include both

industry standard and project-specific measures. The intention is that such measures should remove, reduce or manage the impacts to a point where the resulting residual significance is at an acceptable or insignificant level. Mitigation has also been proposed in some instances to ensure impacts that are predicted to be not significant remain so.

Where there is a possibility of impacts overlapping with or acting additively with those of other projects, a cumulative impact assessment has been undertaken. The likelihood of impacts from Saltire Area Decommissioning overlapping UK national boundaries into adjacent states (transboundary impacts) has also been considered.

Table 4 presents the findings of the assessment for the potentially significant impacts identified for the Saltire Area Decommissioning Project. The potential for cumulative and transboundary impacts was also considered.

Table 4: Impacts Summary for Decommissioning Activities at the Saltire Area

Key Potential Impacts Assessed
Impacts of Seabed Disturbance including Disturbance of Drill Cuttings Piles
Direct Impacts of Seabed Disturbance: Decommissioning activities at the Saltire Area will physically disturb the local seabed environment through subsea infrastructure removal, seabed remediation and the final overtrawling trials to ensure a clear safe seabed. The predicted level of direct physical disturbance amounts to 0.0317 km² excluding overtrawl trials this is made up of 0.0240 km^2 of physical disturbance and 0.0077 km^2 of habitat loss from rock placement. If overtrawling is required for validation of a clear seabed then the total disturbance and loss is 6.7404 km². Including the area around this, within which indirect impacts from peripheral settlement of sediment plumes are expected (5.4095 km²), this amounts to a total impacted area of 12.1702 km². Most impacts from seabed disturbance are expected to be limited to the Project area and immediate surroundings and are therefore very localised. No nationally or internationally important receptors such as the ocean quahog or the habitat 'sea-pens and burrowing megafauna communities' are expected to be affected significantly. This impact is temporary, with published monitoring and modelling studies indicating that recovery of the seabed fauna expected within five years or so. *Direct Impacts of Habitat Change:* In spatial terms, the area of hard substrata to introduced by the decommissioning activities amounts to 0.0061km^2 of rock cover, together with 0.093 km^2 of infrastructure in place since the early 1990s and now to be decommissioned *in-situ* (jacket footings 0.003 km^2 and surface-laid pipeline bundles 0.09 km²). Habitat change due to hard substrata (which is also occupying natural sedimentary habitat) constitutes a long-term impact; however, it is very small and localised in scale and the proposed rock material and the continuing presence of steel flowlines/footings will not result in significant change to the types of benthic fauna typically present in the area. *Direct Impacts through Degradation of Materials Left In-situ:* Information was reviewed for each of the material types to be left *in-situ* following Saltire Area Decommissioning, as follows: > Inhibited (chemically treated) or natural seawater - the Saltire A to Piper B bundle/pipeline/umbilical, and the Saltire A jacket legs will be filled with seawater, and other pipelines/umbilicals with inhibited seawater; > Pipeline scale containing naturally occurring radioactive material (NORM); > Steel; > Sacrificial anodes (zinc and aluminium); > Concrete; and > Plastic coatings. Scientific and engineering studies indicate that degradation and release of these contents or components will take place gradually over tens to hundreds of years, at rates which mean that none will build up, bioaccumulate or reach levels that are intrinsically harmful to the marine environment. The sensitivity of the benthos receptor to physical disturbance proposed is raised by the presence of features of conservation importance, but the magnitude of impacts is likely to be not detectable due to the slow rates of corrosion/release and the dilution/dispersion available. *Impacts of Drill Cuttings Disturbance:* Although the Saltire A jacket footings will be left in place, meaning no disturbance to the cuttings pile there, removal of subsea structures from the Saltire WID WHPU and Chanter WHPU drill centres will require prior dredging and disturbance of the seabed and associated cuttings piles at those locations. Published monitoring and modelling studies, together with modelling conducted specifically for the Saltire Area Decommissioning Project, indicate that decommissioning activities will not cause existing levels of benthic impact and contamination to increase or worsen; levels of contamination are likely to remain similar to the current status quo, and disturbance effects could even speed up the long-term process of recovery. The size of area affected either on the seabed or in the water column is small, very transient and remains within the areas currently affected both by drilling discharges. At some point following decommissioning, the Saltire A jacket footings will fail and collapse due to corrosion, potentially disturbing the cuttings pile beneath. Engineering estimates suggest collapse could occur after several hundred years. International research into cuttings pile longevity suggests that the presence of significant contamination is likely to be measured in centennial timescales of 500 to 1,500 years for water depths of more than 120 m. On this basis the potential for significant disturbance and spread of contamination from this event is debatable; however, combined with the evidence from monitoring and modelling studies conducted for physically larger levels of disturbance (outlined above) significant impact is unlikely. *Indirect Impacts through Resettlement of Sediment Plumes:* As determined in the modelling study undertaken for disturbance of the cuttings piles, most of the sediment disturbed will re-settle within the existing area of direct disturbance. states that impacts arising from sediment re-suspension are short-term (generally over a period of a few days to a few weeks). In addition, seabed communities living in sediments are naturally habituated to levels of sediment

transport and fluctuations in sedimentation rates. This type of impact will be localised, and published studies also suggest that resettling sediments should not be expected to result in significant changes to biota in the short or long-term.

Impacts of Disturbance to Protected Sites and Seabed Features of Conservation Concern:

The nearest protected site is the Scanner Pockmark Special Area of Conservation, 38 km to the south-east. No protected sites are close enough to be impacted either directly or indirectly by Saltire Area Decommissioning activities. Impacts to the seabed and to features of conservation interest such as ocean quahogs or burrowed mud habitats will be highly localised and largely temporary in nature with good recovery potential. Modelling and monitoring studies suggest that neither the intensity or scale of existing impact to the seabed will increase as a result of the proposed decommissioning.

Mitigation:

Rock placement will be undertaken using a vessel with a flexible fall pipe, assisting with positional accuracy and minimising the spread of material. No vessel anchoring is planned during decommissioning operations. The cuttings piles will be marked on Kingfisher charts and FishSAFE plotter files, to highlight their presence to fishermen and reduce the frequency of trawling interactions (over which time the cuttings piles will continue to naturally degrade). In addition, leaving the Saltire A jacket footings in place will eliminate disturbance of these cuttings through foundation removal, and at the same time minimise any cuttings disturbance through overtrawling.

Cumulative and Transboundary Impacts:

Decommissioning activities are approximately 65 km west of the UK/Norway median line at their closest point. Planned activities are not anticipated to create any significant transboundary impacts with regards to disturbance of the seabed and cuttings piles.

Conclusion:

The resulting assessment for all potential impacts to the benthic environment is that these will be low and not significant.

Impacts to Other Sea Users of Items Decommissioned *In-situ*

Impacts to Other Sea Users:

At this location, sea users other than fisheries mainly relates to shipping. In offshore deep waters, shipping is generally not sensitive or vulnerable to infrastructure being decommissioned *in-situ* at the seabed, makes limited use of the area, and will experience only very localised effects including the beneficial returned availability of areas formerly occupied in the long-term by installations and safety exclusion zones. On this basis, the consequence is negligible and the impact not significant.

Through prior consultation, the fishing industry is expected to be tolerant of short-term interference whilst decommissioning is underway; also, the removal of infrastructure and safety exclusion zones in the Saltire Area means that fisheries will regain the use of sea areas from which they have been excluded long-term, which is considered a positive impact. Fishing effort in the area is low, as are recorded catch values; however, snagging risk will remain from the Saltire A jacket footings decommissioned *in-situ*. Given the approach and design of decommissioning activities proposed, stakeholder consultation and information to be provided of changes to update Admiralty Charts and FishSAFE and an assurance programme of surveys and overtrawl trials to ensure a seabed free of avoidable snagging hazards, the impact magnitude is considered not significant.

Mitigation:

Stakeholder consultation. Information on facilities changes to be provided to update navigational charts and FishSAFE plotters. Notification procedures. An assurance programme of surveys and overtrawl trials post-decommissioning to ensure a seabed free of avoidable snagging hazards.

Cumulative and Transboundary Impacts:

Decommissioning activities are approximately 65 km west of the UK/Norway median line at their closest point. Fishing effort in the locality is low, and although there is an international component to fisheries here, the mitigation measures to be applied will mean that significant transboundary impacts are not anticipated.

Conclusion:

Combining these, the impact consequence is considered to be low and not significant.

Conclusion

A review of potentially significant environmental and social interactions has been completed and, considering the mitigation measures that will be built into the project activities, there is expected to be no significant impact on receptors. As part of this review, cumulative and transboundary impacts were assessed and determined to be not significant.

The potential for the Saltire Area Decommissioning activities to impact European or nationally designated sites was considered. As outlined in Table 3 above, the closest designated site to the Saltire Area is the Scanner Pockmark Special Area of Conservation (SAC), 38 km to the south-east and designated for the presence of submarine structures made by leaking gases (listed as an Annex I feature in the EU Habitats Directive). Having reviewed the decommissioning project activities, there is not expected to be a significant impact either on this site (too distant) in addition to which none of these features have been observed within the Saltire Area.

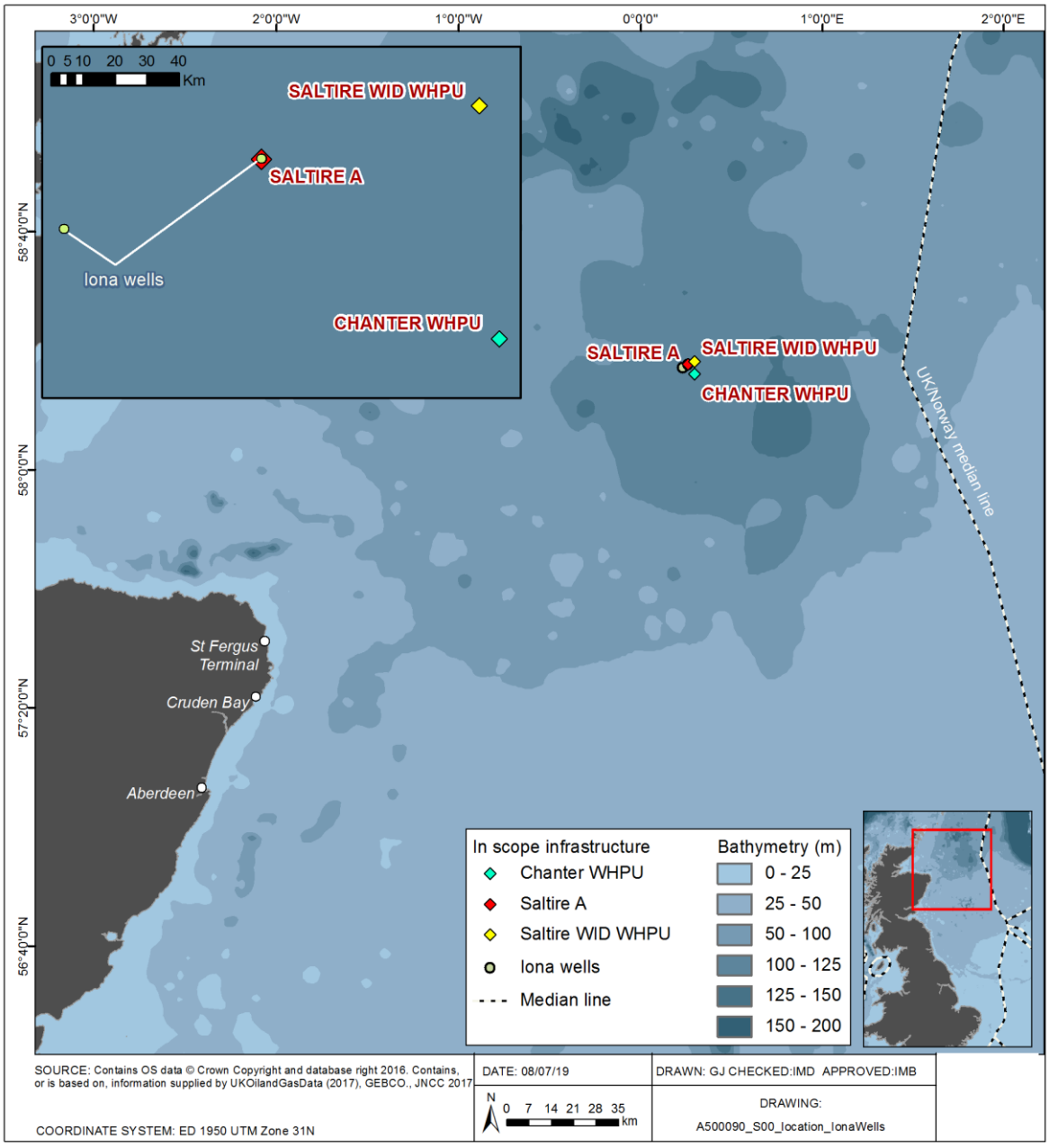
Finally, this EA has considered the Marine Policy Statement issued as the framework for preparing UK Marine Plans and taking decisions affecting the marine environment within the area of the Scottish National Marine Plan (NMP). Repsol Sinopec Resources UK Limited considers that the proposed decommissioning activities are in broad alignment with such objectives and policies.

1 Introduction

1.1 Background

Repsol Sinopec Resources UK Limited has commenced planning for the decommissioning of the Saltire Area development (comprising the Saltire, Chanter and Iona fields) and is undertaking studies to support the preparation of Decommissioning Programmes (DPs) for these assets through 2018. The planned decommissioning activities have been the subject of an Environmental Appraisal (EA) in order to understand their potential environmental impact. This document summarises the findings of the EA. The location of the Saltire Area facilities in the Central North Sea (CNS) is shown in Figure 1-1.

Figure 1-1: Location of the Saltire Area Facilities



Notes:

(i) The Iona field was drilled and produced from the Saltire A platform. There is no dedicated infrastructure associated with the Iona field, which is therefore not shown on this figure.

1.2 Overview of the Saltire Area Facilities

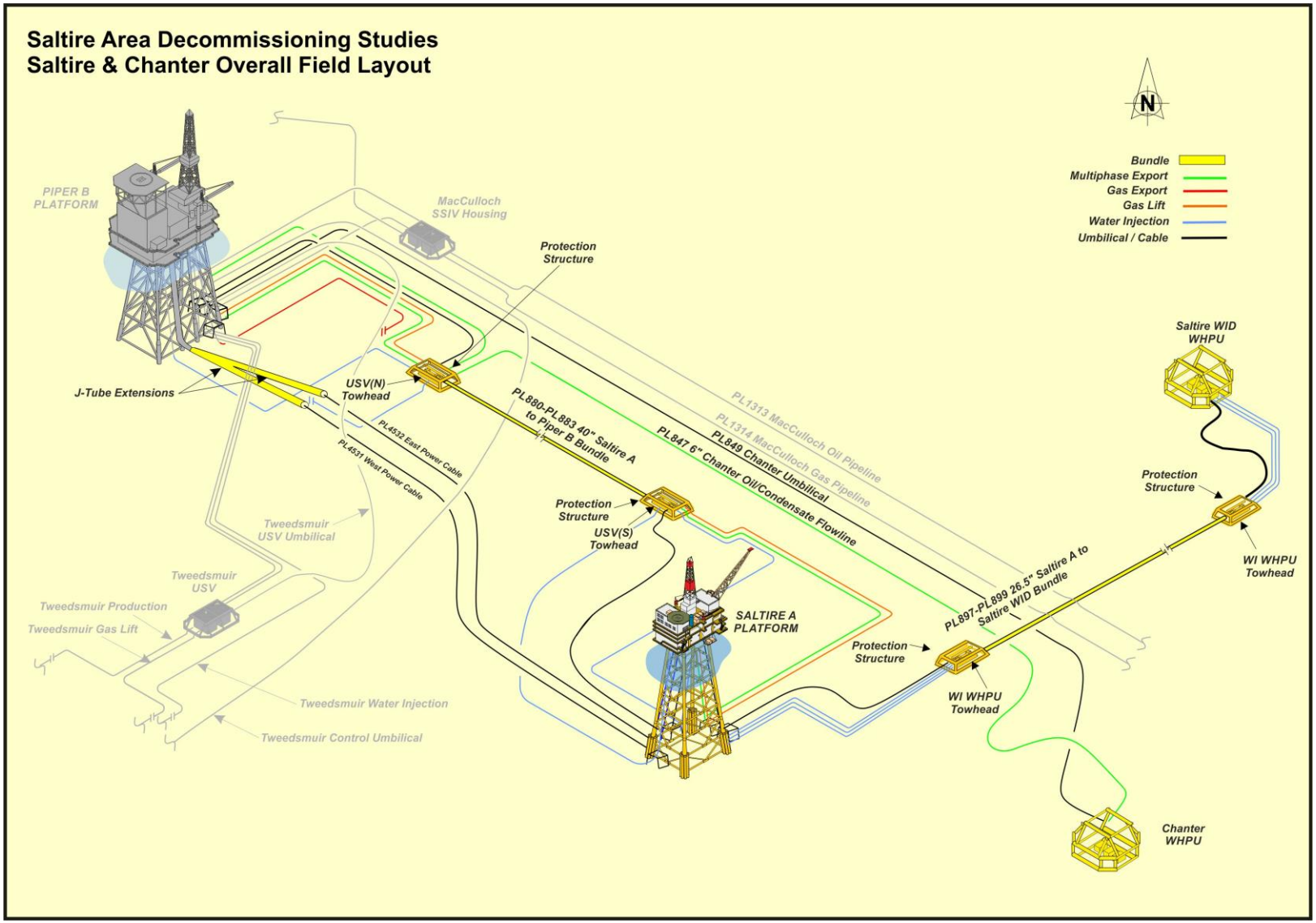
The Saltire Area facilities are located approximately 200 km north-east of Aberdeen in 145 m of water in UK block 15/17. They support production from the Saltire, Iona and Chanter fields, which form part of the Flotta Catchment Area (FCA) system, connecting into the system through the Piper B installation. The Saltire Area infrastructure was installed in 1992 as part of the Piper Area redevelopment and consists of the Saltire A platform, the subsea Saltire Water Injection Development (WID), the subsea Chanter production system and all pipeline/umbilicals linking these assets to the Piper B platform (Figure 1.2). The Saltire and Iona fields are produced via wells on the Saltire A platform with the Chanter field produced via a combination of wells on the Saltire A platform and a separate subsea production well.

Saltire A is a fixed drilling/production platform (Figure 1-3), located 7 km south-east of the Piper B platform. The Saltire A facility is supported on a 4-leg jacket structure with a total of 14 well slots, all of which have been utilised for production wells (ten Saltire wells, two Iona wells and two Chanter wells). Thirteen of these wells have been suspended with the remaining well plugged and abandoned (P&A). The weight of the Saltire A jacket structure is estimated at to be 15,925 tonnes with an estimated topsides weight of 12,874 tonnes. The Wellhead Protection Unit (WHPU) at the Saltire WID has four water injector wells, three of which have been shut in and the other plugged and abandoned. The WHPU at the Chanter production system consists of one production well, which has been shut in, and two appraisal wells, which have been suspended.

Prior to production being suspended in 2016, oil and gas was exported from Saltire A to Piper B via a 40-inch pipeline bundle, which contains one 10-inch diameter multiphase export line, one 8-inch diameter gas lift line and two 16-inch diameter sea water injection lines. An additional pipeline bundle (26.5-inch diameter) supplied water for downhole injection via three 6-inch lines from Saltire A to the Saltire WID WHPU.

Additional detail on the installation and associated subsea pipelines and infrastructure in the Saltire Area can be found in the Saltire Area DP **[Ref. 1]**. Further information on the items to be decommissioned can also be found in Section 2.3.

Figure 1-2: Schematic Summary of Facilities at Saltire to be Decommissioned



Note: i) Items coloured light grey are not in decommissioning scope and are shown for context only. ii) The Iona field was drilled from the Saltire A platform. As a result, no infrastructure is shown for this field on the above schematic.

Figure 1-3: The Saltire A Platform

1.3 Regulatory Context

The Petroleum Act 1998 (as amended by the Energy Act 2008) governs the decommissioning of offshore oil and gas infrastructure, including pipelines, on the United Kingdom Continental Shelf (UKCS). The Act requires the operator of an offshore installation or pipeline to submit a draft DP for statutory and public consultation and to obtain approval of the DP from the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), part of the Department for Business, Energy and Industrial Strategy (BEIS), before executing decommissioning work. The DP provides detail on the infrastructure being decommissioned and outlines the options for decommissioning that were considered and the options selected.

Formal Environmental Impact Assessment (EIA) to support the DP is not explicitly required under existing UK legislation. However, the primary guidance for offshore decommissioning that was published in 2011 by the Department of Energy and Climate Change (DECC) (the fore-runner to BEIS) detailed the need for an Environmental Statement (ES) to be submitted in support of the DP. In response to lessons learned and experience gained from the numerous DPs that that have been submitted to the Regulator since 2011, the Decommissioning Guidelines have been updated. The latest decommissioning guidance **[Ref. 2]** sets out a new framework for the required environmental inputs and deliverables throughout the approval process. It also describes a more focussed environmental process that culminates in a streamlined EA Report.

In the context of marine planning and being located in the Scottish offshore waters of the CNS, the Saltire Area falls within the area of the Scottish National Marine Plan (NMP). The NMP covers the management of both Scottish inshore waters (out to 12 NM) and offshore waters (12 to 200 NM). The aim of the NMP is to help ensure the sustainable development of the marine area through informing and guiding regulation, management, use and protection of the Marine Plan areas. The NMP acknowledges the large technical and commercial challenges that will be faced with cessation of production from offshore fields over the coming years, as well as the potential opportunities that such activities can bring. The aims and policies outlined in the NMP, as summarised in Table 1.1, have therefore been considered in this EA Report.

The proposed operations as described in this permit have been assessed against the Marine Plan Objectives and policies, specifically GEN 1, 4, 5, 9, 12, 14 and 21.

Assessment of compliance against relevant policies has already been achieved through the environmental issues identification process in Section 4.1 and the impact assessments in Section 5, in support of this EIA Justification. The proposed operations do not contradict any of the marine plan objectives and policies.

Table 1.1: National Marine Plan Policies Relevant to Saltire

Policy	Title	Details
GEN-1	General planning and principle	Development and use of the marine area should be consistent with the Marine Plan, ensuring activities are undertaken in a sustainable manner that protects and enhances Scotland's natural and historic marine environment. Repsol Sinopec Resources UK Limited will ensure that any potential impacts associated with Saltire operations will be kept to a minimum as discussed in Section 5.
GEN-4	Co-existence	Where conflict over space or resource exists or arises, marine planning should encourage initiatives between sectors to resolve conflict and take account of agreements where this is applicable. Repsol Sinopec Resources UK Limited will ensure that any potential impacts on other sea users associated with the proposed Saltire operations will be kept to a minimum, as discussed in Table 4.1 and Section 5.2.
GEN-5	Climate change	Marine planners and decision makers should seek to facilitate a transition to a low carbon economy. They should consider ways to reduce emissions of carbon and other greenhouse gasses. Repsol Sinopec Resources UK Limited will ensure that any potential impacts associated with Saltire operations will be kept to a minimum as discussed in Table 4.1.
GEN-9	Natural heritage	Development and use of the marine environment must: Comply with legal requirements for protected areas and protected species. Not result in significant impact on the national status of Priority Marine Features. Protect and, where appropriate, enhance the health of the marine area. Repsol Sinopec Resources UK Limited will ensure that any potential impacts to protected species and sites associated with Saltire operations will be kept to a minimum, as discussed in Table 4.1 and Section 5.1.
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. Repsol Sinopec Resources UK Limited will ensure that any potential impacts to water quality associated with Saltire operations will be kept to a minimum, as discussed in Table 4.1.
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. Repsol Sinopec Resources UK Limited will ensure that any potential impacts via underwater noise associated with Saltire operations will be kept to a minimum, as discussed in Table 4.1.
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. Some development and use may result in increased emissions to air, including particulate matter and gasses. Impacts on relevant statutory air quality limits must be taken into account and mitigation measures adopted, if necessary, to allow an activity to proceed within these limits. Repsol Sinopec Resources UK Limited will ensure that any potential impacts to air quality with Saltire operations will be kept to a minimum, as discussed in Table 4.1.
GEN-21	Cumulative impacts	Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation. Repsol Sinopec Resources UK Limited will ensure that any potential impacts to air and water quality and biological communities with Saltire operations will be kept to a minimum, as discussed in section 5.1.6 and 5.2.4.

1.4 Scope of the EA

This EA Report sets out to describe, in a proportionate manner, the potential environmental impacts of the proposed activities associated with Saltire Area decommissioning and to demonstrate the extent to which these can be mitigated and controlled to an acceptable level. The key components and structure of this report are laid out as follows:

- Introduction to the decommissioning project for the Saltire Area, the regulatory context and guidance for undertaking a decommissioning EA, plus a description of the EA Report scope and structure (Section 1);
- An outline of the options considered for decommissioning and the decision-making process undergone by Repsol Sinopec Resources UK Limited to arrive at the selected decommissioning strategy (Section 2);
- A description of the proposed decommissioning activities (Section 2);
- A summary of the baseline sensitivities relevant to the activities taking place and the assessments that support this EA (Section 3);
- An outline of the EA method used, a review of the potential impacts from the proposed decommissioning activities and justification for scoping potential impacts in or out of assessment in this EA Report (Section 4);
- Assessment of key potential impacts (Section 5); and
- Conclusions (Section 6).

This EA Report has been prepared in line with the BEIS Decommissioning Guidelines **[Ref. 2]** and also with Decom North Sea's EA Guidelines for Offshore Oil and Gas Decommissioning **[Ref. 3]**.

2 Project Description

2.1 Consideration of Alternatives and Selected Approach

This section outlines the key legislation that influences how decommissioning may or may not proceed, the options considered for decommissioning and the evaluation and decision-making process by which Repsol Sinopec Resources UK Limited has arrived at the selected decommissioning strategy.

2.1.1 Decision-Making Context

2.1.1.1 Platforms

As a Contracting Party of the Convention for the Protection of the Marine Environment of the North-East Atlantic ('OSPAR'), the UK has agreed to implement OSPAR Decision 98/3, which prohibits leaving offshore installations wholly or partly in place. The legal requirement for Operators to comply with the OSPAR Convention is implemented through the Petroleum Act 1998 (as amended by the Energy Act 2008). OSPAR Decision 98/3 states that the topsides of all installations should be returned to shore and that all jackets with a weight of less than 10,000 tonnes are completely removed for reuse, recycling or final disposal on land. The Decision recognises that there may be difficultly in removing the footings of large steel jackets weighing >10,000 tonnes. As a result, there is a facility for derogation from the main prohibition for steel jackets >10,000 tonnes installed prior to 9 February 1999.

The Saltire A jacket is >10,000 tonnes and was installed prior to 1999. It has therefore been subject to a Comparative Assessment (CA) process, in which all feasible options for decommissioning have been scored against each other with respect to criteria including technical feasibility, environmental impact and safety in order to establish the best option for decommissioning **[Ref. 4]**.

2.1.1.2 Subsea Infrastructure

The current Decommissioning Guidelines **[Ref. 2]** state that subsea installations (e.g. drilling templates, wellheads and their protective structures, production manifolds and risers) must, where practicable, be completely removed for reuse or recycling or final disposal on land. Any piles used to secure such structures in place should be cut to 3 m below natural seabed level or to such a depth that ensures that any remains are unlikely to become uncovered. Should an Operator wish to make an application to leave a subsea installation in place because of the difficulty of removing it, justification in terms of the safety, environmental, technical feasibility, societal impact and economic factors would be required.

With regards to pipelines (including flowlines and umbilicals), these should be comparatively assessed on a case-by-case basis. The BEIS guidance **[Ref. 2]** states that a CA will be required in all pipeline decommissioning programmes and that all feasible decommissioning options should be considered, taking account of safety, environmental, technical, societal and economic factors to arrive at a preferred decommissioning solution. In addition, the guidance states:

- Any removal or partial removal of a pipeline should be performed in such a way as to cause no significant adverse effects upon the environment;
- Any decision that a pipeline may be left in place should have regard to the likely deterioration of the material involved and its present and possible future effect on the marine environment; and
- Account should also be taken of other users of the sea, and the future use by fishing activities in the area.

The BEIS guidance also highlights instances where pipelines could be decommissioned *in-situ*; for example, pipelines that are adequately buried or trenched or are expected to self-bury over a sufficient length within a reasonable time and remain so buried.

Finally, the guidance states that mattresses and grout bags installed to protect pipelines should be removed for disposal onshore, if their condition allows. If the condition of the mattresses or grout bags is such that they cannot be removed safely or efficiently, any proposal to leave them in place must be supported by an appropriate CA of the options and evidence that the deposits will not interfere with other users of the sea.

2.1.2 Alternatives to Decommissioning

The potential opportunities for re-use of the Saltire Area infrastructure were considered as part of the asset cessation of production (CoP) approval process with the North Sea Transition Authority(NSTA). Options to re-use the Saltire Area infrastructure *in-situ* for future hydrocarbon developments were considered, but none have yielded a viable commercial opportunity. The main reason for this is the absence of remaining hydrocarbon reserves in the vicinity. CoP was therefore granted in November 2016 and, as such, there is no reason to delay decommissioning in a way that is safe and environmentally and socio-economically acceptable.

2.1.3 Comparative Assessment

Repsol Sinopec Resources UK Limited has undertaken two CAs in order to arrive at an optimal decommissioning method; one for the Saltire A jacket and the other for subsea infrastructure. The CAs, conducted in line with the BEIS and Offshore Energies UK guidance **[Refs. 2, 5]**, are described in the Jacket CA Report **[Ref. 4]** and Subsea and Pipelines CA Report **[Ref. 6]**, while the screening process that preceded the CAs is described in the Removal Options Screening Report **[Ref. 7]**.

A summary of the infrastructure for which a CA of options was made, the options considered and the selected option (based on consideration of safety, environmental, technical, societal and economic factors) is given in Table 2.1 and Table 2.2. Note that, to facilitate the CA process, asset infrastructure was grouped according by type/size and other characteristics; this grouping is evident in Table 2.2, and is referred to in other parts of this report.

Periodic monitoring and remediation will be carried out as required. RSRUK will consider an approach to periodically review the bundles with a view to selecting a permanent option in the future, e.g. full removal or full rock placement, dependent on technology advances and an associated step change in safety (relative to the other options). Any permanent solution will be discussed and agreed with OPRED.

Table 2.1: Options Considered for Decommissioning of Saltire A Jacket

Group	Infrastructure Type	Option 1	Option 2a	Option 2b	Option 3a	Option 3b	Option 3c
-	Jacket structures > 10,000 tonnes	Leave *in-situ* "Rig to Reef"	Partial Removal Section cut and lift	Partial Removal Single lift	Full Removal Section cut and lift	Full Removal Single lift	Full Removal Buoyancy tanks

Table 2.2: Options Considered for Decommissioning of Saltire Area Subsea Infrastructure

Group	Infrastructure Type	Option 1a	Option 1b	Option 2a	Option 2b	Option 2c	Option 3a	Option 3b
1	40-inch Saltire A to Piper B Bundle, surface laid and exposed	Leave *in-situ* (minor intervention) Do nothing	Leave *in-situ* (minor intervention) Remediate ends and free spans only	Leave *in-situ* (major intervention) Trench and bury exposures	Leave *in-situ* (major intervention) Cut and remove exposures	Leave *in-situ* (major intervention) Rock cover exposures	Full Removal Cut and lift	Full Removal Reverse installation
2	26.5-inch Saltire A to Saltire WID WHPU Bundle, surface laid and exposed	Leave *in-situ* (minor intervention) Do nothing	Leave *in-situ* (minor intervention) Remediate ends and free spans only	Leave *in-situ* (major intervention) Trench and bury exposures	Leave *in-situ* (major intervention) Cut and remove exposures	Leave *in-situ* (major intervention) Rock cover exposures	Full Removal Cut and lift	Full Removal Reverse installation
3	Chanter oil/condensate flexible flowline, mostly trenched and buried but exposed at seven midline locations	Leave *in-situ* (minor intervention) Do nothing	Leave *in-situ* (minor intervention) Remediate ends only	Leave *in-situ* (major intervention) Trench and bury exposures	Leave *in-situ* (major intervention) Cut and remove exposures	Leave *in-situ* (major intervention) Rock cover exposures	Full Removal Reverse reeling	-
4	Trenched and buried umbilicals/power cables	Leave *in-situ* (minor intervention) Do nothing	Leave *in-situ* (minor intervention) Remediate ends only	Leave in-situ (major intervention) Trench and bury exposures	Leave *in-situ* (major intervention) Cut and remove exposures	Leave *in-situ* (major intervention) Rock cover exposures	Full Removal Reverse reeling	-
5	Subsea Structures	-	-	-	-	-	Full Removal	-
6	Towhead Umbilicals	-	-	-	-	-	Full Removal	-
7	Spools / Jumpers	-	-	-	-	-	Full Removal	-
8	Mattresses & Grout Bags	-	-	-	-	-	Full Removal	-

Key	Option screened out in CA process	Option taken through CA	Selected option following CA

Note 1: For options where bundle infrastructure will be left in situ, periodic monitoring and remediation will be carried out as required. RSRUK will consider an approach to periodically review the bundles with a view to selecting a permanent option in the future, e.g. full removal or full rock placement, dependent on technology advances and an associated step change in safety (relative to the other options). Any permanent solution will be discussed and agreed with OPRED.

2.2 Proposed Schedule

Saltire A Topsides

Subject to market availability of cost effective removal services, the topsides will be decommissioned following permanent down-manning of the Saltire A platform.

Saltire A Jacket

The Saltire A jacket structure is protected by sacrificial anodes that will remain *in-situ* with their structural integrity uncompromised for extended periods. This allows the possibility for a cost-effective approach to jacket decommissioning, in which the Saltire A jacket could be bundled with other Repsol Sinopec Resources UK Limited infrastructure into a campaign to leverage economies of scale. Moreover, this approach also allows newly emerging technologies to be considered in future.

Saltire Area Subsea Infrastructure

Subject to market availability of cost effective removal services, the Saltire Area subsea infrastructure will be decommissioned following permanent plugging and abandonment of the Saltire Area subsea wells.

2.3 Decommissioning Activities

2.3.1 Preparation for Decommissioning

2.3.1.1 Well Plug and Abandonment

Note: Well P&A is not within the scope of this EA and will be assessed as updates/variations to existing operational permits.

The 21 wells associated with the decommissioning of the Saltire, Chanter and Iona fields will be plugged and abandoned prior to removal of any of the associated platform or subsea infrastructure. This means that each well will be systematically and permanently closed (most likely through the placement of cement plugs in the well) in accordance with well abandonment best practice (e.g. OGUK **[Ref. 8]**).

2.3.1.2 Flushing and Cleaning Operations

Note: Flushing and cleaning operations are not within the scope of this EA and will be assessed as updates/variations to existing operational permits.

Platform

Platform cleaning will be completed in line with the Repsol Sinopec Resources UK Limited Drain, Flush, Purge and Vent Philosophy ahead of the preparatory work required to support topsides removal. During the final cleaning and disconnect activities, all the processing systems on the platform will be progressively depressurised, purged with an inert gas (most likely nitrogen) and rendered safe for removal operations. The pipework and tanks will be visually inspected where possible and may be further treated should any sources of solids, oils and other fluids be identified.

Pipelines

The Saltire A to Piper B Bundle multiphase pipeline will be filled with seawater. Other pipelines/umbilicals will be filled with inhibited seawater.

2.3.2 Platform Decommissioning

2.3.2.1 Topsides Removal

The Saltire topsides will be completely removed and returned to shore. At this stage, Repsol Sinopec Resources UK Limited has not finalised the specific method for removal. However, the options expected to be feasible at the time of decommissioning are summarised in Table 2.3. Further detail is provided in the DP **[Ref.1]**.

Table 2.3: Options for Topsides Removal

Reverse Installation
Removal of separated topsides modules by heavy lift vessel (HLV) for transportation to onshore facility for deconstruction. Selected equipment to be re-used where practical with deconstructed material recovered for recycling and/or disposal.
Single Lift
Removal of topsides as a complete unit using a single lift vessel (SLV) for transportation to onshore facility for deconstruction. Selected equipment to be re-used where practical with deconstructed material recovered for recycling and/or disposal.

2.3.2.2 Jacket Removal

The base case is that the Saltire A jacket will be partially removed by cutting and removing the jacket structure above the footings and transporting it to shore. The jacket footings will decommissioned *in-situ*.

As with topsides removal, the specific method by which the jacket will be partially removed and returned to shore has not been finalised. However, as a base case Repsol Sinopec Resources UK Limited has selected removal of the jacket by sectional cut and lift. The steel pieces that make up the jacket will be cut into sections (size dictated by vessel lift capacity). Each jacket section will be taken to an onshore disposal yard, either on a barge or HLV. Following jacket removal, the 500 m zone around Saltire A will be surveyed as part of the process to ensure that risks to third party users of the sea are communicated and minimised.

2.3.3 Subsea Infrastructure Decommissioning

2.3.3.1 Overview

A full inventory of subsea infrastructure to be decommissioned is provided in the Saltire Area DP **[Ref. 1]** and the methodologies and activities to be used in undertaking the decommissioning work are detailed in the CA report for the subsea production infrastructure in the area **[Ref. 6]**.

Pipelines and umbilicals will be physically disconnected from subsea structures and all mattresses and grout bags that cover the disconnection points that can be safely and efficiently accessed will be removed. The only mattresses and grout bags that are proposed to be left in-situ are those that are unsafe to access/remove. All relevant removal methods will be considered at the time of removal alongside assessment of whether the operation to access/remove the items is safe. Where mattresses/grout bags cannot be safely recovered due to degradation, Repsol Sinopec Resources UK will consult with OPRED before any alternative option is executed.

Following this, the lines and infrastructure will be prepared for decommissioning as summarised in Table 2.4 (the location of these items can be seen in the schematic shown in Figure 1-2).

Table 2.4: Pipeline and Umbilical Decommissioning Summary

Group	Option	Decommissioning Approach
1	Leave *in-situ*	**40-inch Saltire A to Piper B Bundle (6.7 km in length) surface laid and exposed (PL880-PL883)** The bundle will be left *in-situ*, exposed on the seabed for the majority of its length, with rock placed at the ends and free span locations, A summary of the free spans and locations is located in Appendix B. The offshore operations for this option consist of performing a pre-works survey, followed by placing rock locally over the cut ends of the bundle and at the fifteen free spans currently located along its length. Following rock placement, a trawl sweep will be conducted before a post-works survey is carried out. Following decommissioning, additional rock cover may also be required due to degradation and development of free spans over time.
2	Leave *in-situ*	**26.5-inch Saltire A to Saltire WID Bundle (2.1 km in length) surface laid and exposed (PL897-PL899)** The bundle will be left *in-situ*, exposed on the seabed for the majority of its length, with rock placed at the ends and at free span locations. The bundle is currently rock-covered at two crossings. The offshore operations for this option consist of performing a pre-works survey, followed by placing rock locally over the cut ends of the bundle, and at the single free span currently located along its length. Following rock placement, a trawl sweep will be conducted before a post-works survey is carried out. Following decommissioning, additional rock cover may also be required due to degradation and development of free spans over time.
3	Leave *in-situ*	**6-inch Chanter Oil/Condensate Flexible Flowline (10.7 km in in length), mostly trenched and buried with intermittent exposure at mid-line connections (PL847)** The ends of the flowline will be cut and removed. The cut ends and areas of the flowline which are exposed or have free spans will then be buried to a target depth of 0.6 m below seabed level. The primary method will be to bury these areas with seabed material where possible. Only where this is not possible will rock dump be used. The majority of the line will be left *in-situ* as it is already buried. The offshore operations for this option consist of performing a pre-works survey, followed by DSV operations to cut/disconnect and remove the flowline ends. A trenching vessel will then trench the cut ends and locations that are free spans/exposed. Following trenching, a trawl sweep and post-works survey will be carried out.
4	Leave *in-situ*	**Chanter Umbilical PL849 (10.8 km in in length), and East and West power cables (approximately 7.2 km in length), trenched and buried** The ends of the umbilical/cables will be cut and removed. The cut ends and areas of the umbilical which are exposed or free spanning will then be buried to a target depth of 0.6 m below seabed level. The primary method will be to bury these areas with seabed material where possible. Only where this is not possible will rock dump be used. The cables have no known exposures or free spans. The majority of the lines will be left *in-situ* as they are already buried. The offshore operations for this option consist of performing a pre-works survey, followed by DSV operations to cut/disconnect and remove the umbilical/cable ends. A trenching vessel will then trench the cut ends and five locations of the umbilical which are free spanning. Following trenching, a trawl sweep and post-works survey will be carried out.
5, 6, 7	Full removal	**Subsea infrastructure** Subsea infrastructure including towhead structures, wellhead protection structures, flange protection structures, spools, jumpers and towhead umbilicals will be disconnected, fully removed and recovered for transfer to shore.
8	Full removal	**Protection and support items** Protection and support items such as mattresses and grout bags that are accessible (e.g. not buried or under a pipeline) and are safe to recover will be recovered for transfer to shore. Where mattresses/grout bags cannot be safely recovered due to degradation, Repsol Sinopec Resources UK will consult with OPRED before any alternative option is executed.

2.3.4 Drill Cuttings

During early drilling campaigns at the Saltire Area locations, drill cuttings and oil-based mud (OBM) were discharged to sea. Based on the results of survey work conducted in 2017, there are bathymetrically distinct cuttings piles containing both weathered and unweathered OBM residues which are still present on the seabed at Saltire A, the Saltire WID WHPU and the Chanter WHPU. Figure 2-1 to Figure 2-3 show the aerial extent of these cuttings piles **[Refs. 9, 10]**.

In describing the footprints of cuttings piles, the United Kingdom Offshore Operators Association (UKOOA), now Offshore Energies UK (OEUK) used the analogy of a fried egg, in which the 'yolk' represents the bathymetrically distinct part of the pile, while the 'white' represents the contaminated area of seabed surrounding the pile in which hydrocarbon levels are ≥50 $\mu g g^{-1}$(also referred to as the 50 $\mu g g^{-1}$ sediment hydrocarbon footprint)[4].

[4] 50 $\mu g g^{-1}$ total hydrocarbons has been taken as the threshold above which measurable ecological effects are expected in seabed invertebrate communities.

The piles have been surveyed and their volume, surface area, height and surrounding 50 μgg^{-1} sediment hydrocarbon footprints mapped as summarised in Table 2.5. Further detail on the results of cuttings pile survey work is provided in Section 3.4. In addition to the cuttings pile data available from the latest survey work, older information for Saltire A and for Chanter is available from a Stage 1 cuttings pile Screening Assessment commissioned by Talisman **[Ref. 11]**, which is also included in Table 2.5; although these figures are based on assumptions about the numbers of wells drilled (rather than from survey work) they provide an indication of how the seabed has recovered over time.

Table 2.5: Cuttings Pile Data for Saltire A, Saltire WID WHPU and Chanter WHPU

	Pile surface area (m^2)	Pile volume (m^3)	Maximum depth (m)	50 μgg^{-1} sediment hydrocarbon footprint (km^2)
Saltire A end of drilling Note 1 **[Ref. 11]**	3,413	19,731	Not Applicable	n/a
Saltire A 2017 **[Ref. 9]**	6,580	2,455	2.4	0.369
Saltire WID WHPU 2017 **[Ref. 9]**	757	158	0.5	0.01
Chanter WHPU end of drilling Note 1 **[Ref. 11]**	731	2,148	Not Applicable	n/a
Chanter WHPU 2017 **[Ref. 10]**	655	77.9	1.0	0.01

Note 1: Cuttings pile surface area and volume estimated from numbers of wells drilled (14 at Saltire A, 3 at Chanter). No survey data available to calculate 50 μgg^{-1} sediment hydrocarbon footprint.

A six-year Joint Industry Programme (JIP) was instigated by UKOOA, to understand better the physical characteristics of cuttings piles, their environmental impact and the options for long-term management **[Ref. 12]**. This resulted in OSPAR Recommendation 2006/5 **[Ref. 13]**, relating to cuttings piles derived from more than one well, where oil based muds were used and discharged, and the requirement for these to be assessed against thresholds for persistence and for oil release rate.

Based on the UKOOA JIP and OSPAR Recommendation 2006/5 and data in Table 2.5, estimates of the persistence and yearly oil loss rate of cuttings piles at Saltire A, the Saltire WID WHPU and the Chanter WHPU have been made. The results are shown in Table 2.6, alongside early estimates of yearly oil loss from the piles at Saltire A and the Chanter WHPU based on assumptions stemming from the numbers of wells drilled **[Ref. 11]**. The OSPAR Recommendation 2006/5 thresholds are also shown **[Ref. 13]**.

Table 2.6: Estimates of Cuttings Pile Persistence and Annual Oil Loss for Saltire A, Saltire WID WHPU and Chanter WHPU in Relation to OSPAR 2006/5 Thresholds

	Yearly oil loss (tonnes/year)		Persistence (km^2year)	
	Calculated value	OSPAR threshold	Calculated value Note 2	OSPAR threshold
Saltire A end of drilling Note 1 **[Ref. 11]**	0.65	10	Not Applicable	500
Saltire A 2017 **[Ref. 9]**	1.25		0.707 - 21.2	
Saltire WID WHPU 2017 **[Ref. 9]**	0.14		0.707	
Chanter WHPU end of drilling Note 1 **[Ref. 11]**	0.14		Not Applicable	
Chanter WHPU 2017 **[Ref. 10]**	0.12		Not Applicable	

Note 1: Yearly oil loss calculated on basis of estimated cuttings pile dimensions.
Note 2: Persistence calculated for the range in 50 μgg^{-1} sediment hydrocarbon footprint values derived from the cuttings pile survey reports **[Ref. 9]** and **[Ref. 10]**

The oil loss rates and persistence values calculated for three Saltire Area cuttings piles based on 2017 survey results were all well below the OSPAR thresholds. According to OSPAR 2006/5, where both the rate and persistence are below the thresholds and no other discharges have contaminated the cuttings pile, no further action is necessary and the cuttings pile may be left *in-situ* to degrade naturally. Leaving the piles *in-situ* to degrade naturally where possible is the option selected for the Saltire Area, based on information from detailed environmental survey **[Refs. 9, 10]** to characterise

the cuttings piles and also a BAT/BEP[5] study **[Ref. 76-79]** to assess the potential environmental and socio-economic impacts of various management/disposal options. From a range of options including onshore treatment and reuse, onshore treatment and disposal, offshore injection, bioremediation *in-situ*, covering *in-situ*, and natural degradation *in-situ*, the option involving least impact to the environment and other users of the sea was natural degradation *in-situ*. The potential environmental impact of disturbing these piles, either during or following decommissioning, is discussed in Section 5.1.3.4.

[5] BAT = Best Available Technology; BEP = Best Environmental Practice.

Figure 2-1: Saltire A Cuttings Pile Estimated Aerial Extent [Ref. 9]

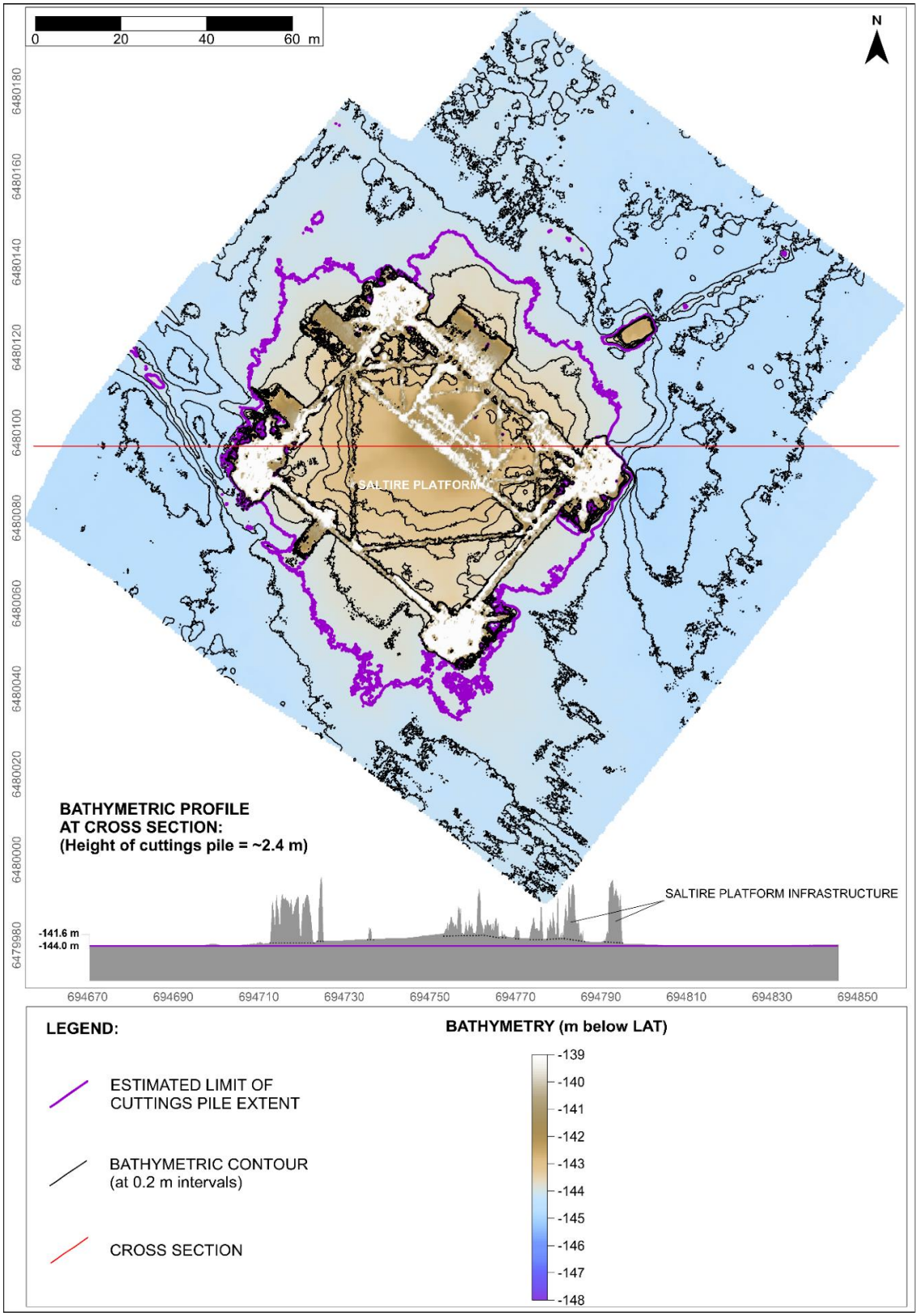


Figure 2-2: Saltire WID WHPU Cuttings Pile Estimated Aerial Extent [Ref. 9]

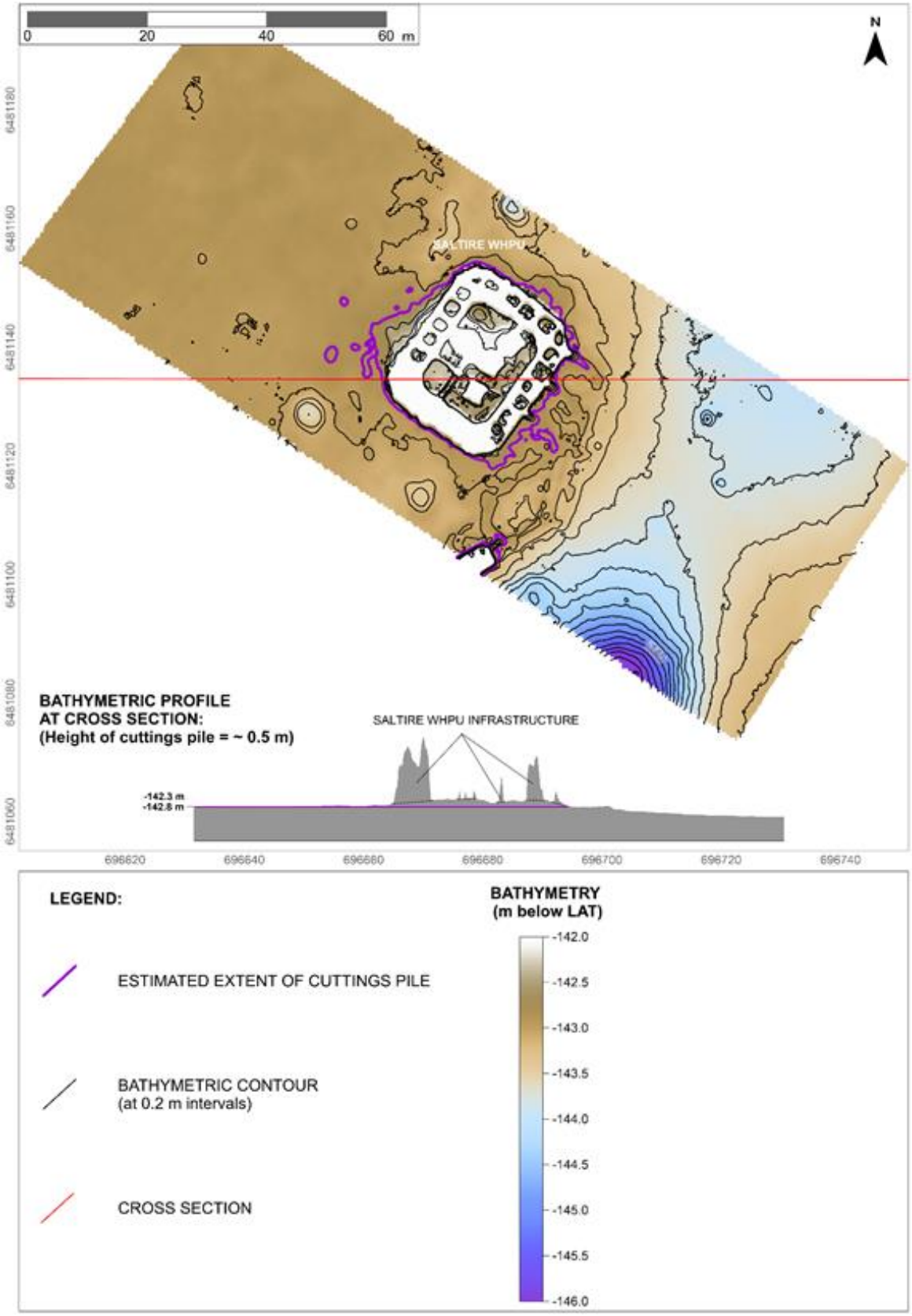
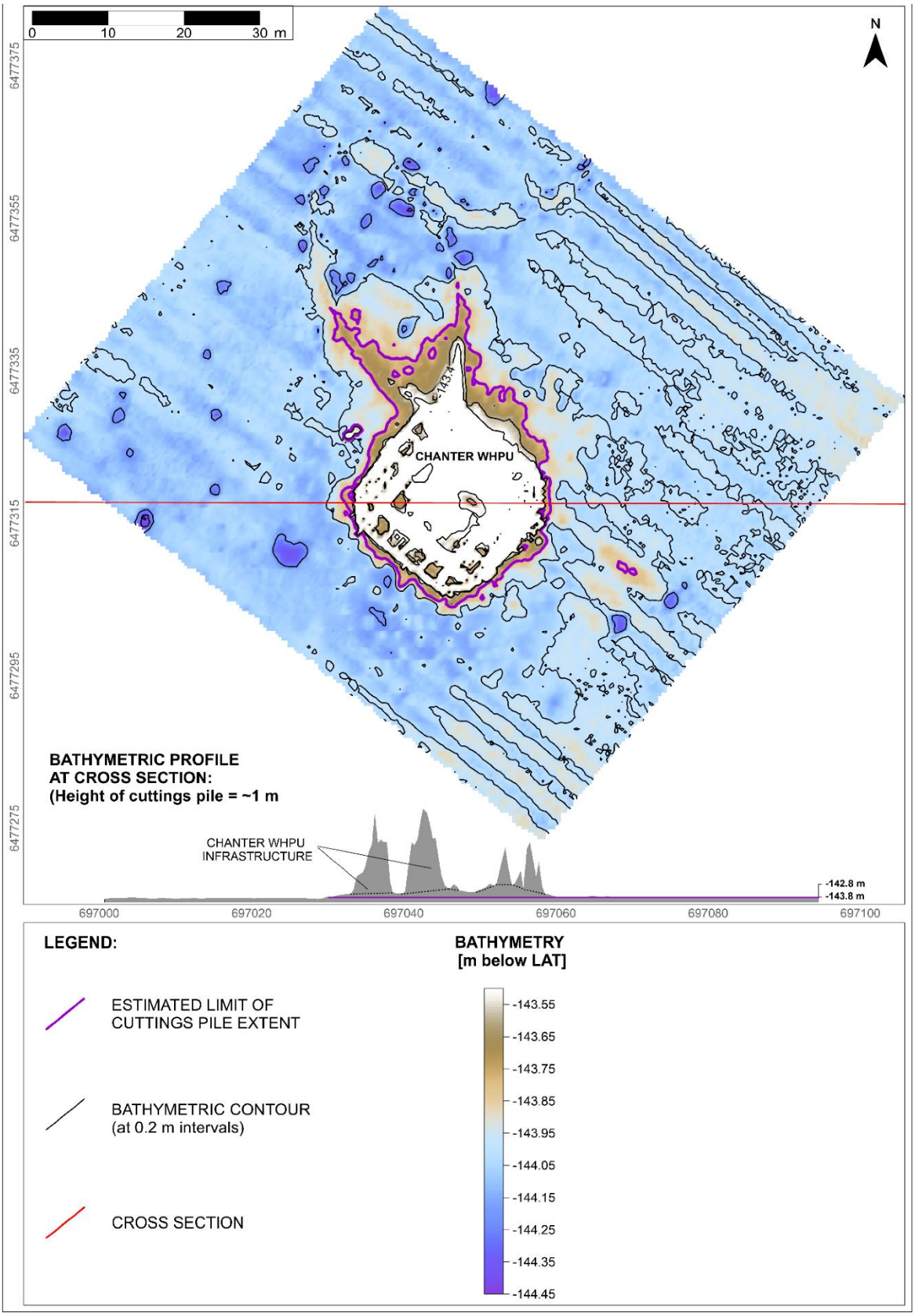


Figure 2-3: Chanter WHPU Cuttings Pile Estimated Aerial Extent [Ref. 10]



2.4 Post Decommissioning

Following decommissioning activities, Repsol Sinopec Resources UK Limited will conduct post-decommissioning survey work. Part of this will be to provide assurance of a safe seabed for other sea users, cleared of significant debris items, within a 500 m radius of the Saltire A platform and the Saltire WID and Chanter WHPUs plus within 100 m corridors of pipelines and umbilicals.

Generally, a clearance survey would involve the use of fishing gear or chain systems towed over the seabed. However, the use of further tools including sidescan sonar and other acoustic systems will be investigated as a means to identify possible snagging hazards. ROVs could be used to assist in the recovery of large debris items and overtrawling to clear smaller items of debris. Any significant oil and gas-related seabed debris will be recovered for onshore recycling and disposal.

Subject to certification of seabed clearance by an appropriate body and to acceptance of the Saltire Area DP **[Ref. 1]** and Decommissioning Close-out Report by OPRED, all safety zones around the Saltire A platform and subsea infrastructure will be removed.

A post-decommissioning monitoring programme covering the jacket footings, bundles, flowline and umbilical/power cables remaining *in-situ* will be agreed with OPRED.

3 Environmental Baseline

3.1 Background and Survey Data Sources

The North Sea is a large shallow sea with a surface area of around 750,000 km². Water depths in the CNS gradually deepen from south to north between approximately 40 m at the Dogger Bank and 100 m at the Fladen/Witch Ground **[Ref. 14]**. The Saltire Area is located within UKCS Block 15/17 almost in the northern part of the CNS with a least distance to landfall in the UK of approximately 156 km, and a least distance to the UK/Norway median line of 65 km.

Repsol Sinopec Resources UK Limited commissioned a pre-decommissioning survey around the Saltire A platform, Saltire WID WHPU, Chanter WHPU, and associated pipelines in October to November 2017. The survey was based on wide-area survey using multibeam echosounder and sidescan sonar for gathering information about the seabed, augmented by ground-truth sampling using video, still images, grabs and coring devices. The report outputs from this work include the following:

- A habitat assessment report covering all three fields **[Ref. 15]**, based on the wide-area acoustic survey together with the video, still images and field-assessment of the sediment samples retrieved by grab. This assessment was prepared in order to identify seabed features (physical and biological) and the visible fauna present, classify benthic communities and identify any features highlighted as of conservation importance under Annex I of the European Habitats Directive, the OSPAR list of threatened/declining species/habitats or the Marine and Coastal Access Act 2009.
- An environmental baseline survey report covering the Saltire A platform and Saltire WID WHPU locations plus a further report covering Chanter WHPU **[Refs. 16, 17]**, in which the results of analysis of sediment samples for physico-chemical and macrofaunal determinands are presented and discussed.
- Drill cuttings pile assessment reports for the piles at the Saltire platform and the Saltire WID WHPU **[Ref. 9]** and that at the Chanter WHPU **[Ref. 10]**. The sampling programme for these was based on the detailed bathymetry data gathered, and use of 1 m and 1.5 m core tubes deployed by remote operated vehicle (ROV) to collect cuttings pile samples for sectioning and physico-chemical analysis.

A total of 68 environmental sampling stations were sampled around Saltire A, Saltire WID WHPU and Chanter WHPU. Of these, 40 stations were centred around Saltire A, including 21 stations on cruciform transects intersecting at the platform, 15 stations within the cuttings pile and 4 stations around pipelines. At the Saltire WID WHPU site, 11 stations were sampled overall, including 8 stations around the WID WHPU and 3 stations within the cuttings pile. At the Chanter WHPU site, a total of 15 stations were sampled, including 6 stations around the Chanter WHPU, 3 stations within the cuttings pile and 6 stations around pipelines. Additionally, two reference stations were sampled remote from all infrastructure, at stations REF01 and REF02, located 10 km to the south-east and 6 km to the south-west of Saltire A. The locations of the environmental sampling stations around Saltire A, the Saltire WID WHPU and the Chanter WHPU are shown in Figure 3-1 and Figure 3-2 (note that the reference station locations only appear in Figure 3-2).

An earlier environmental baseline survey was carried out at the Saltire Area in 1990 **[Ref. 18]**. A total of 21 stations centred around the Saltire A platform were sampled on a cruciform transect pattern, oriented north-west to south-east and south-west to north-east. Sediment samples were taken using a 0.1 m² grab for analysis of particle size, and hydrocarbon, metals and macrofaunal content but no photography was obtained.

Figure 3-1: Environmental Sampling Locations Around Saltire A and the Saltire WID WHPU including cuttings pile sampling [Ref. 15]

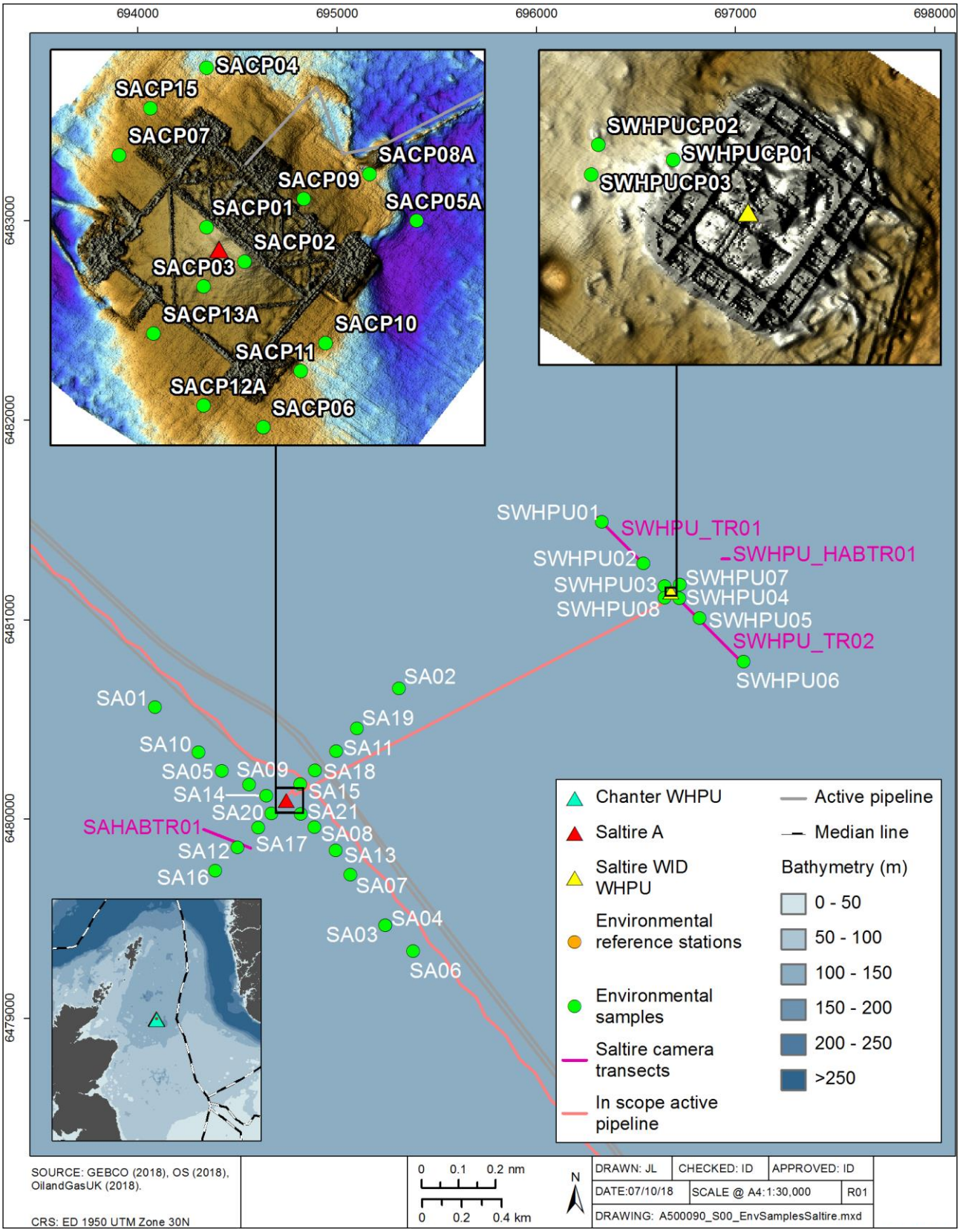
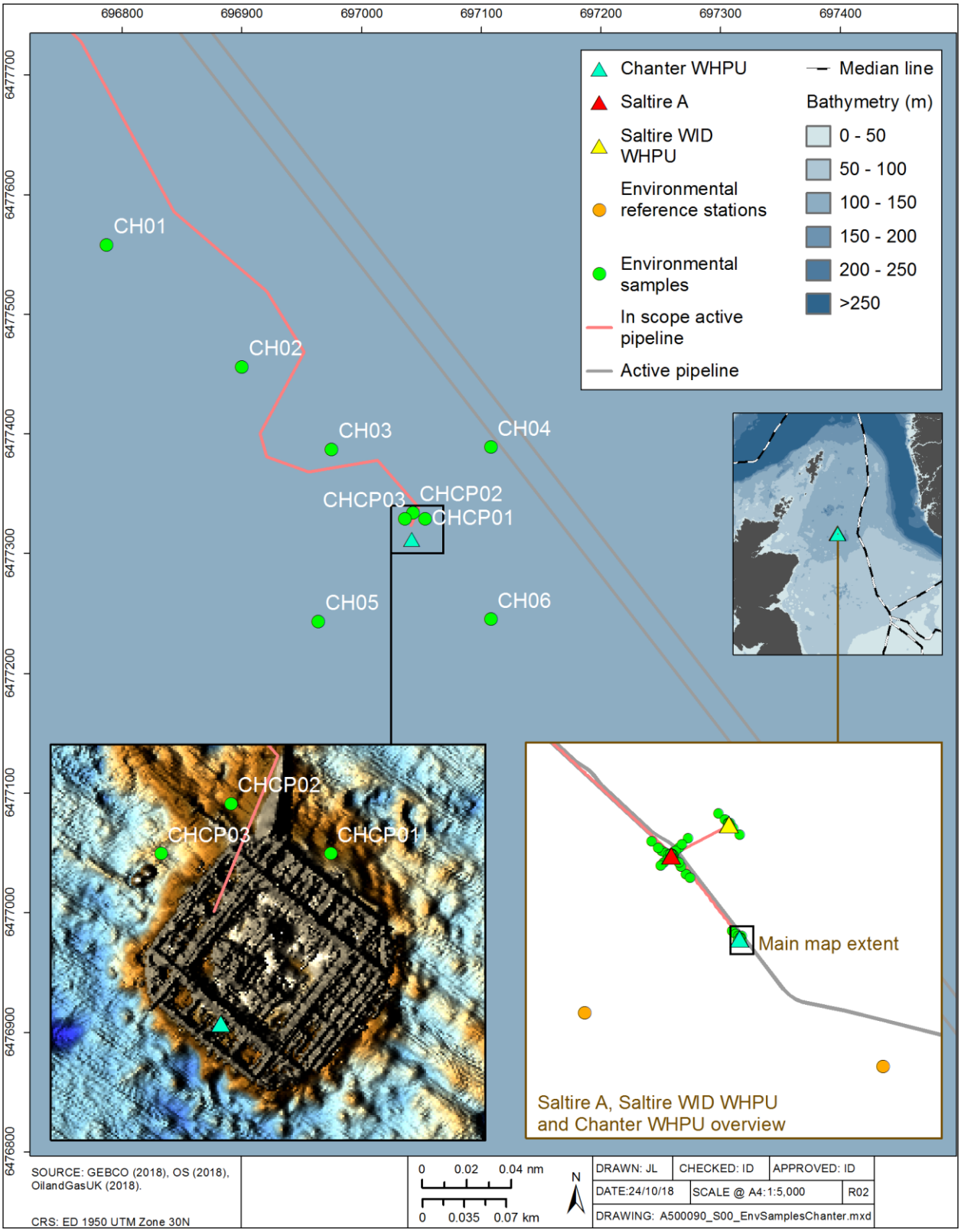


Figure 3-2: Environmental Sampling Locations Around the Chanter WHPU Including Cuttings Pile Sampling and Reference Stations [Ref. 15]



3.2 Seabed Habitat - Physical

From the habitat assessment report commissioned for the Saltire Area Decommissioning Project, water depths recorded ranged between 140 – 146 m relative to lowest astronomical tide (LAT) [**Ref. 15]**.

The seabed across all three fields consisted primarily of sediments with very little hard substrata. Sidescan sonar data backed up by field observations of the retrieved grab samples indicated that the main sediment type over the Saltire Area was mud, although some stations around the Saltire WID WHIPU consisted of muddy sand. For most stations, animal tubes and burrows were a common feature and shell debris was also occasionally present.

The large areas of low sonar reflectivity observed around Saltire A and the Chanter WHPU, including the reference stations, were classified as circalittoral fine mud (European Nature Information System - EUNIS classification A5.36) and circalittoral muddy sand (EUNIS classification A5.26). The lower reflectivity sediments around the Saltire WID WHPU were classified as circalittoral muddy sand (EUNIS classification A5.26). The very localised occurrences of higher reflectivity sediments present at all three locations represented circalittoral mixed sediments (EUNIS classification A5.44), typically where patchy shell debris occurred **[Ref. 15]**.

In addition to the natural benthic habitat, the cuttings piles present at Saltire A, the Saltire WID WHPU and the Chanter WHPU, together with infrastructure covered with rock or mattresses, were classified as 'industrial waste' (J6.5). Example images of the four broadscale habitats identified in survey work are shown in Figure 3-3.

This corresponds with mapped data for the region available in the Marine Scotland NMPi online data resource, which classifies this region of the North Sea as the EUNIS broadscale habitat A5.3 sublittoral mud **[Ref. 19]**.

3.3 Seabed Sediment Characteristics

3.3.1 Saltire A

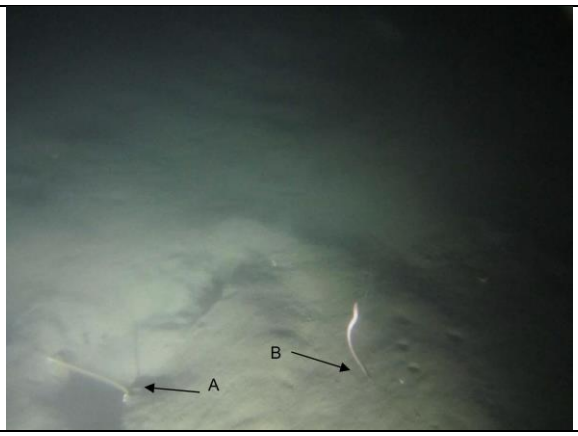
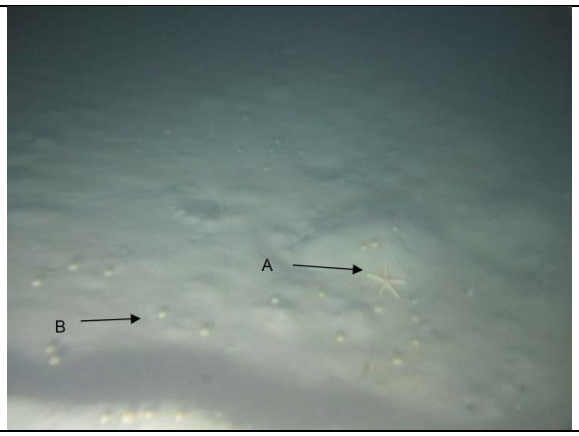
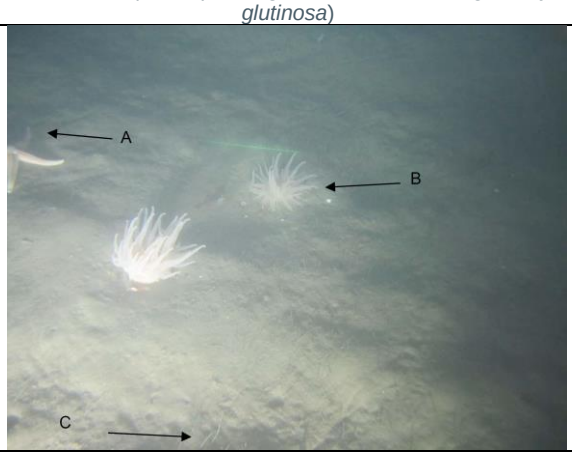
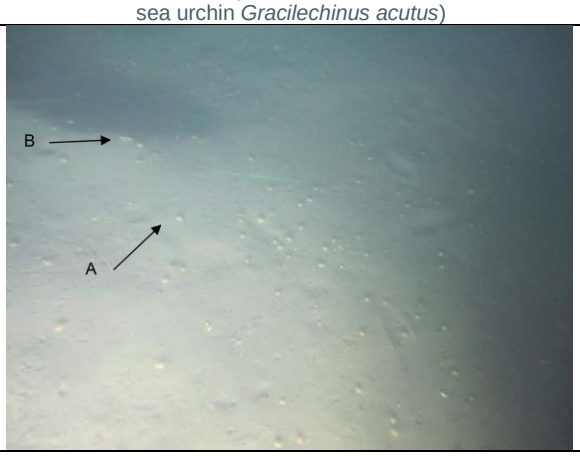
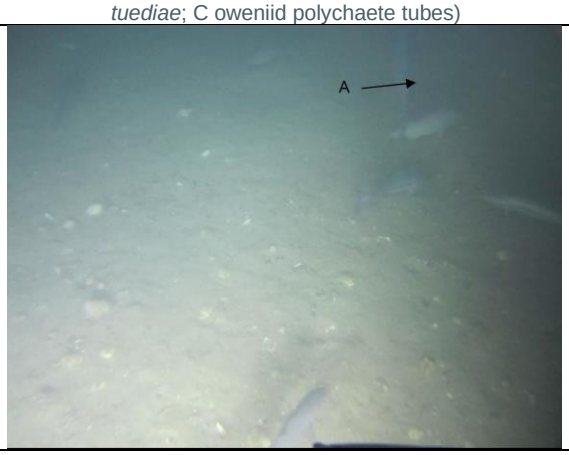
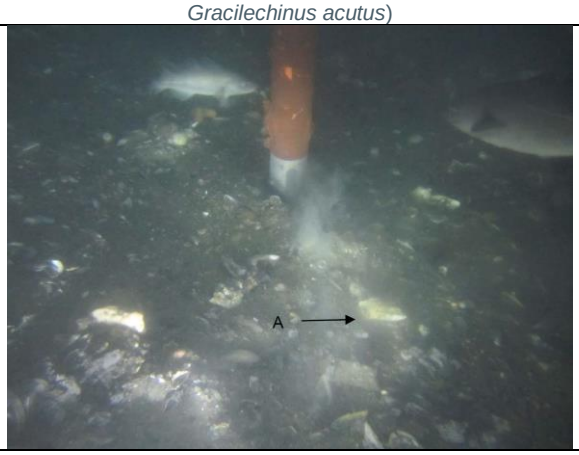
Across the Saltire A survey area, and including the station along the Saltire A to Saltire WID Bundle (PL897-PL899), sediments were mostly classified as medium silt (mean particle size 22 – 99 µm) with silt/clay content ranging mostly between approximately 39 – 78% **[Ref. 16]**. The sediment type was similar at both reference stations, lying between 6 and 10 km from Saltire A. Sediment particle sizes around the Saltire A platform and pipeline route were very similar to those recorded in an earlier baseline survey of the Saltire field in 1990 **[Ref. 18]**.

Total hydrocarbon (THC) concentrations in sediments ranged from 5.3 $\mu g g^{-1}$ at Station SA05 (400 m west-north-west of Saltire A) to 32.5 $\mu g g^{-1}$ at Station SA21 (100 m south-east). Mean and median THC levels for the whole survey area including the reference stations were similar to the mean background reference concentration for the CNS (mean 9.5 $\mu g g^{-1}$ **[Ref. 20]**) but background levels were exceeded at individual stations 100 m from Saltire A (13.7 – 32.5 $\mu g g^{-1}$ at stations SA15, SA20 and SA21). However, THC concentrations at all stations were lower than those at which measurable adverse effects might be expected in benthic communities (50 $\mu g g^{-1}$) - the OSPAR 'ecological effect' threshold **[Ref.16]**. The THC concentrations recorded in 2017 were similar to the mean hydrocarbon concentrations determined by infra-red spectroscopy during the pre-drilling baseline survey in 1990 **[Ref.18]**. In 1990, a hydrocarbon concentration range of 2.3 – 15.4 $\mu g g^{-1}$ was determined for stations between 200 – 10,000 m from Saltire A; this compares to the range of 5.3 – 11.5 $\mu g g^{-1}$ found in 2017 if the stations within 200 m are excluded. However, caution should be applied in comparing data from these two surveys due to the different analytical methods used.

Gas chromatograph (GC) traces indicated that the four stations within 150 m of the Saltire A platform were contaminated to some degree with oil based drilling fluids. Residues of low-toxicity oil based drilling fluid were noted at station SA21, while evidence of a synthetic fluid was present at the other three stations (SA14, SA15 and SA20). Similar drilling-related inputs were not seen around the Saltire A location in 1990; this survey pre-dated the platform installation and development drilling.

Around Saltire A, total 2 - 6 ring polycyclic aromatic hydrocarbon (PAH) concentrations ranged from 0.168 μgg^{-1} at station SA08 to 0.478 μgg^{-1} at station SA20 with no clear pattern or concentration gradients evident. Total PAH concentrations at the reference stations were 0.345 μgg^{-1} and 0.231 μgg^{-1}. In the 1990 preoperational survey the range in total 2 - 6 ring PAH concentrations was 0.301 to 0.876 μgg^{-1} **[Ref.18]**. Similar to the range of values present in 2017, these were thought to be largely derived from atmospheric inputs from background fossil fuel combustion.

Figure 3-3: Example Images of the Four Broadscale Habitats Identified in Survey Work Around the Saltire Area [Ref. 15]

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>SA09 250 m east of Saltire A: circalittoral fine mud A5.36 with faunal burrows (A sea-pen Virgularia mirabilis; B hagfish Myxine glutinosa)</td><td>REF01 10 km south-east of Saltire A: circalittoral fine mud A5.36 with mounds and burrows (A common starfish Asterias rubens; B sea urchin Gracilechinus acutus)</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>SWHPU07 50 m north-east of Saltire WID WHPU: circalittoral muddy sand A5.26 (A common starfish; B anemone Bolocera tuediae; C oweniid polychaete tubes)</td><td>SWHPU03 50 m north-west of Saltire WID WHPU: circalittoral muddy sand A5.26 A common starfish; B sea urchin Gracilechinus acutus)</td></tr>
<tr><td> 
</td><td> 
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<tr><td>SA15 100 m north-east of Saltire A: circalittoral mixed sediments A5.44 (A saithe Pollachius virens)</td><td>SACP03 beneath Saltire A: industrial waste J6.5 (A saithe Pollachius virens)</td></tr>
</table>

The concentration ranges for barium and other selected metals found around Saltire A are summarised in Table 3.1. Table 3.1 also includes figures for the same metals recorded in the baseline survey of 1990 **[Ref. 18]**. Total barium concentrations are typically monitored as a potential marker of drilling mud influence; around Saltire A, levels ranged from 105 μgg^{-1} at station SA11 to 2,070 μgg^{-1} at station SA15 100 m north-east of the platform **[Ref. 16]**. Total barium concentrations were highest in the immediate vicinity of the platform and drill centre but were elevated at many stations within 800 m compared to the mean background reference of 348 μgg^{-1} reported for the central North Sea **[Ref. 20]**. Whilst this ties in with the elevated THC concentrations and weathered oil based mud material identified at the central stations, indicating influence from drilling mud discharges from Saltire A, an elevated level of 1,610 μgg^{-1} was recorded at one of the reference stations (station REF01 10 km south-east of Saltire A) for reasons that are unclear. Of the other metals shown in Table 3.1, all showed elevation in relation to both reference station values, and to the respective reference background concentrations. Sediments collected closest to Saltire A (particularly within 250 m) tended to have the highest concentrations of metals. The sediment zinc concentration at station SA15 (for location see Figure 3-1) exceeded the OPSAR ERL threshold[6] of 150 μgg^{-1}. No metals exceeded their respective ERL value at any other stations.

Although metals levels at locations close around Saltire A show clear elevation above reference background concentrations, it can be seen from Table 3.1 that metals data from the reference stations sampled in 2017 are at similar levels to those recorded around Saltire A in 1990.

Table 3.1: Concentration Ranges for Selected Metals around Saltire A

Item	Value	Ranges in metal concentrations recorded (μgg^{-1} dry weight)					
		Barium Note1	Total Barium Note 2	Cadmium	Mercury	Lead	Zinc
Saltire A (2017) **[Ref. 16]**	Range	334 - 2,740	105 - 2,070	0.046 - 0.720	0.002 - 0.030	3.56 - 30.7	32.7 - 216
	Mean	936	716	0.087	0.009	11.5	49.1
Reference stations (2017) **[Ref. 16]**	Range	148 - 171	82.5 - 1,610	0.050 - 0.060	0.013 - 0.014	10.1 - 10.9	34.0 - 34.1
Saltire A (1990) **[Ref. 18]**	Range	158 - 419	-	-	0.006 - 0.021	8.41 - 11.9	27.2 - 38.6
	Mean	259			0.011	9.57	32.8
Mean reference background level **[Ref. 20]**	Mean	178	348	0.03	0.03	6.75	13.48
Effects Range Low (ERL; **[Ref. 21]**)		-	-	1.20	0.15	47.0	150.0

Note 1: Barium by 50% nitric acid digest
Note 2: Total barium by alkali fusion

3.3.2 Saltire WID WHPU

Over the Saltire WID WHPU survey area, sediments were mostly classified as coarse silt (mean particle size 25 – 46 µm) with silt/clay content ranging mostly between approximately 51 – 72% **[Ref. 16]**. The sediment type was similar at both reference stations, REF01 and REF02 lying between 6 and 10 km to the southeast and south-west respectively. Sediment particle sizes around the Saltire WID WHPU were very similar to those recorded around Saltire A in 2017, and across the Saltire field in an earlier survey carried out in 1990 **[Ref. 18]**.

THC concentrations in sediments ranged from 10 μgg^{-1} to 55.6 μgg^{-1}, though concentrations were highest at the four 50 m stations (24, 32.1, 40.6 and 55.6 μgg^{-1}). At stations 200 to 500 m distant, THC levels were 10 – 14.8 μgg^{-1}, close to values recorded at the reference stations (6.7 – 9.9 μgg^{-1}) and similar to the mean background reference concentration for the CNS (9.5 μgg^{-1} **[Ref. 20]**). THC concentrations at all but one station were well below the 50 μgg^{-1} threshold, above which measurable adverse effects might be expected **[Ref.16]**. GC traces indicated signs of contamination

[6] ERL – adopted for use in assessments by OSPAR, based on United States Protection Agency (EPA) sediment quality guidelines. The ERL value is defined as the lower tenth percentile of the data set of concentrations in sediments which were associated with biological effect. Adverse effects on organism are rarely observed when concentrations fall below the ERTL value.

by two types of low-toxicity oil based drilling fluids at the four stations located 50 m from the Saltire WID WHPU.

Total 2 - 6 ring polycyclic aromatic hydrocarbon (PAH) concentrations ranged from 0.258 $\mu g g^{-1}$ at station SWHPU02, 200 m from the WID WHPU, to 0.484 $\mu g g^{-1}$ at station SWHPU01 located 500 m from the WID WHPU. There were no clear patterns or concentration gradients evident in the PAH data. The range in values recorded was very similar to that found around Saltire A and at the reference stations, and also to that found in the 1990 preoperational survey **[Ref. 18]**. The PAH material in the sediments here is thought to be largely derived from atmospheric inputs from background fossil fuel combustion.

The concentration ranges for barium and other selected metals found around the Saltire WID WHPU are summarised in Table 3.2. Total barium concentrations are typically monitored as a potential marker of drilling mud influence; levels ranged from 379 $\mu g g^{-1}$ to 4,400 $\mu g g^{-1}$ **[Ref. 16]**. Total barium concentrations tended to be highest in the immediate vicinity of the WID WHPU (i.e. at the 50 m stations), but were slightly elevated at most locations including at reference station REF01, compared to the mean background reference of 348 $\mu g g^{-1}$ reported for the central North Sea **[Ref. 20]**. Of the other metals shown in Table 3.2, mercury levels were generally at or similar to reference background levels, and barium, cadmium lead and zinc were elevated. Sediments collected closest to the Saltire WID WHPU tended to have the highest concentrations of metals, although no ERL values were exceeded at any stations specific to the survey area around this infrastructure.

Table 3.2: Concentration Ranges for Selected Metals around Saltire WID WHPU

Item	Value	Ranges in metal concentrations recorded ($\mu g g^{-1}$ dry weight)					
		Barium Note 1	Total Barium Note 2	Cadmium	Mercury	Lead	Zinc
Saltire WID WHPU **[Ref. 16]**	Range	262 - 4,470	379 - 4,400	0.044 - 0.081	0.016 - 0.052	10.2 - 13.6	32.1 - 47.4
	Mean	1,880	924	0.058	0.026	12.0	39.8
Reference stations **[Ref. 16]**	Range	148 - 171	82.5 - 1,610	0.050 - 0.060	0.013 - 0.014	10.1 - 10.9	34.0 - 34.1
Mean reference background level **[Ref. 20]**	Mean	178	348	0.03	0.03	6.75	13.48
Effects Range Low (ERL; **[Ref. 21]**)		-	-	1.20	0.15	47.0	150.0

Note 1: Barium by 50% nitric acid digest
Note 2: Total barium by alkali fusion

3.3.3 Chanter WHPU

Over the Chanter WHPU survey area, sediments were all classified as medium silt (mean particle size 19 – 29 µm) with silt/clay content ranging mostly between approximately 67.7 – 81.8% **[Ref.17]**. The sediment type was similar at both reference stations, REF01 and REF02 lying to the south-east and south-west respectively. Sediment particle sizes around the Chanter WHPU were very similar to those recorded around Saltire A in 2017, and across the Saltire field in an earlier survey carried out in 1990 **[Ref. 18]**.

THC concentrations in sediments ranged from 8.3 $\mu g g^{-1}$ to 10.9 $\mu g g^{-1}$, and no concentration gradients or elevated levels were apparent **[Ref. 17]**. THC levels were close to values recorded at the reference stations (6.7 – 9.9 $\mu g g^{-1}$) and similar to the mean background reference concentration for the CNS (9.5 $\mu g g^{-1}$ **[Ref. 20]**). GC traces showed no signs of contamination by oil based drilling fluids, and all stations shared a common hydrocarbon profile typical of low level diffuse inputs of weathered petroleum residues commonly found in CNS sediments.

Total 2 - 6 ring polycyclic aromatic hydrocarbon (PAH) concentrations ranged from 0.280 $\mu g g^{-1}$ to 0.418 $\mu g g^{-1}$ **[Ref. 17]**. There were no clear patterns or concentration gradients evident in the PAH data. The range in values recorded was very similar to that found around Saltire A and at the

reference stations, and also to that found in the 1990 preoperational survey **[Ref. 18]**. The PAH material in the sediments here is thought to be largely derived from atmospheric inputs from background fossil fuel combustion.

The concentration ranges for barium and other selected metals found around the Chanter WHPU are summarised in Table 3.3. Total barium concentrations are typically monitored as a potential marker of drilling mud influence; levels ranged from 293 μgg^{-1} to 2,180 μgg^{-1} **[Ref. 17]**. Total barium concentrations were elevated at three of the 100 m stations around the WHPU and at 200 m (also at one of the reference stations, REF01) but were at or close to the reference background level of 348 μgg^{-1} reported for the central North Sea elsewhere **[Ref. 20]**. Of the other metals shown in Table 3.3, mercury levels were generally at or below reference background levels, and barium, cadmium lead and zinc were elevated but without any obvious concentration gradients evident. No ERL values were exceeded at any stations specific to the survey area around the Chanter WHPU.

Table 3.3: Concentration Ranges for Selected Metals around the Chanter WHPU [Ref. 17]

Item	Value	Ranges in metal concentrations recorded (μgg^{-1} dry weight)					
		Barium Note 1	Total Barium Note 2	Cadmium	Mercury	Lead	Zinc
Chanter WHPU **[Ref. 17]**	Range	271 - 719	293 - 2,180	0.046 - 0.061	0.021 - 0.029	11 - 14.3	36.3 - 47.8
	Mean	245	865	0.053	0.023	12.3	39.5
Reference stations **[Ref. 17]**	Range	148 - 171	82.5 - 1,610	0.050 - 0.060	0.013 - 0.014	10.1 - 10.9	34.0 - 34.1
Mean reference background level **[Ref. 20]**	Mean	178	348	0.03	0.03	6.75	13.48
Effects Range Low (ERL; **[Ref. 21]**)		-	-	1.20	0.15	47.0	150.0

Note 1: Barium by 50% nitric acid digest
Note 2: Total barium by alkali fusion

3.4 Cuttings Piles

Sampling at the three cuttings piles present during survey work in 2017 was concentrated on that part of each pile that was visible on bathymetric data, and within approximately 50 m of the approximate pile centre at Saltire A or 30 m at the Saltire WID WHPU and Chanter WHPU **[Ref. 9]** **[Ref. 10]**.

3.4.1 Saltire A Cuttings

Thirteen core samples were successfully taken (either 1.0 or 1.5 m length) to depths of 28 – 76 cm and sectioned at 10 cm intervals (Figure 3-1).

The mean particle size recorded for sediments collected within the Saltire platform cuttings pile ranged from 13.7 µm to 214 µm (in 0 cm to 10 cm core sections), with a high variability across the cuttings pile. This corresponds to a range of fine silt to fine sand on the Wentworth scale. Particle size generally became smaller with depth into the pile, alongside a corresponding increase in silt/clay content. The mid and bottom sections of some of the cores at the outer edges of the pile were comparable to reference stations and could be considered as representing basal sediment.

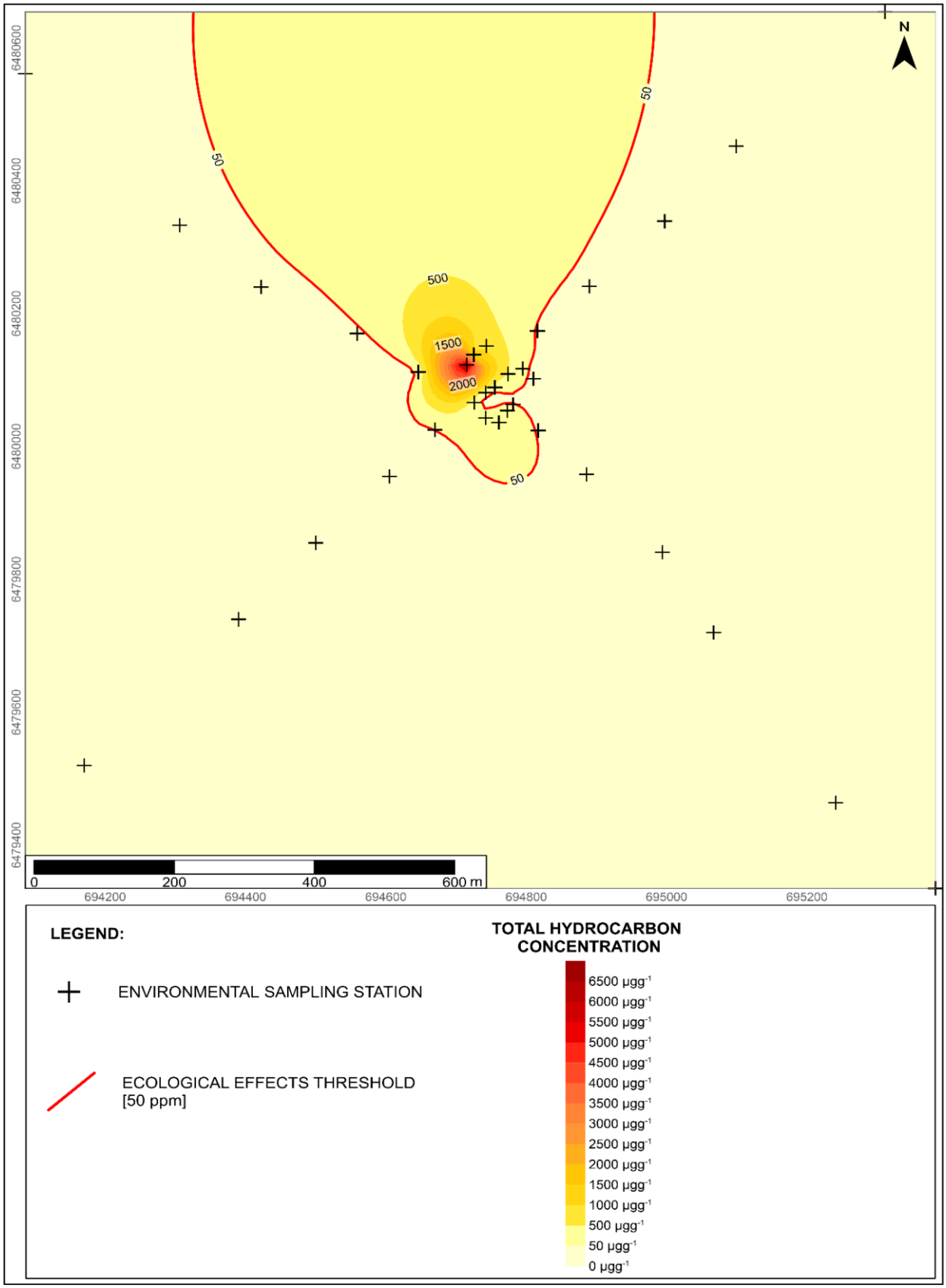
All cuttings pile samples showed evidence of a synthetic olefin-based drilling fluid. Relatively un-weathered polyalphaolefin (PAO) inputs were observed within all core sections at most stations, and in either the surface and/or middle core sections at other stations. Paraffinic synthetic based fluids (PSBF) were also widely observed within the Saltire platform cuttings pile. Evidence of low-toxicity oil based fluid (LTOBF) was only found in surface samples from seven stations. From a review of historic monitoring reports and drilling records, the fluid types identified correspond with those most commonly used drilling fluids at Saltire A.

THC levels ranged from 3.2 μgg^{-1} to 37,800 μgg^{-1}, with a mean of 3,810 μgg^{-1} and a median of 39.4 μgg^{-1}, illustrating high variation throughout the cuttings pile **[Ref. 9]**. Layering was evident, with

THC levels generally highest in the top 30 cm of sediment and decreasing with depth. THC levels within the deeper sediment core sections (>30 cm) were comparable to concentrations at the reference and 100 m stations (Section 3.3.1).

As noted in Section 2.3.4, the area of the bathymetrically visible cuttings pile present at Saltire A (Figure 2-1) is estimated to be approximately 6,580 m^2, with a volume of 2,455 m^3 and a maximum depth of 2.4 m, representing a significant decrease in size since drilling was completed. This central pile is surrounded by an outer zone of hydrocarbon contamination that is not visible in bathymetry data, where THC levels exceed the OSPAR cuttings pile ecological effects threshold of 50 $\mu g g^{-1}$. Using data from both the cuttings pile survey **[Ref. 9]** and the wider scale environmental baseline survey **[Ref. 16]**, the total area of the Saltire A cuttings pile including the 50 $\mu g g^{-1}$ footprint was calculated to be 0.369 km^2 (shown in Figure 3-4). As is evident in Figure 3-4, the extent of the area of the footprint ≥50 $\mu g g^{-1}$ to the north of Saltire A may be overestimated **[Ref. 9]**. This is thought to be due to a combination of the statistical gridding method used (kriging, in Surfer v10 software) and the survey data point distribution. Due to this apparent overestimation, this area was also calculated using the closest stations where THC concentrations were <50 $\mu g g^{-1}$ and drawing a rough square over these as a basis for re-calculating the area. Using both methods produced results ranging from 0.01 km^2 to 0.369 km^2. Although the figure of 0.369 km^2 is thought to overestimate the total cuttings pile area **[Ref. 9]**, it represents a conservative figure that has been used to estimate the cuttings pile oil release rate and persistence shown earlier in Table 2.6.

Figure 3-4: Contour Map of THC Concentrations Around the Saltire A Cuttings Pile, Highlighting the Zone Within Which THC Levels Exceed 50 µgg^{-1} [Ref. 9]



3.4.2 Saltire WID WHPU Cuttings

Three core samples were successfully taken (1.5 m length) to depths of 45 – 62 cm and sectioned at 10 cm intervals (Figure 3-1).

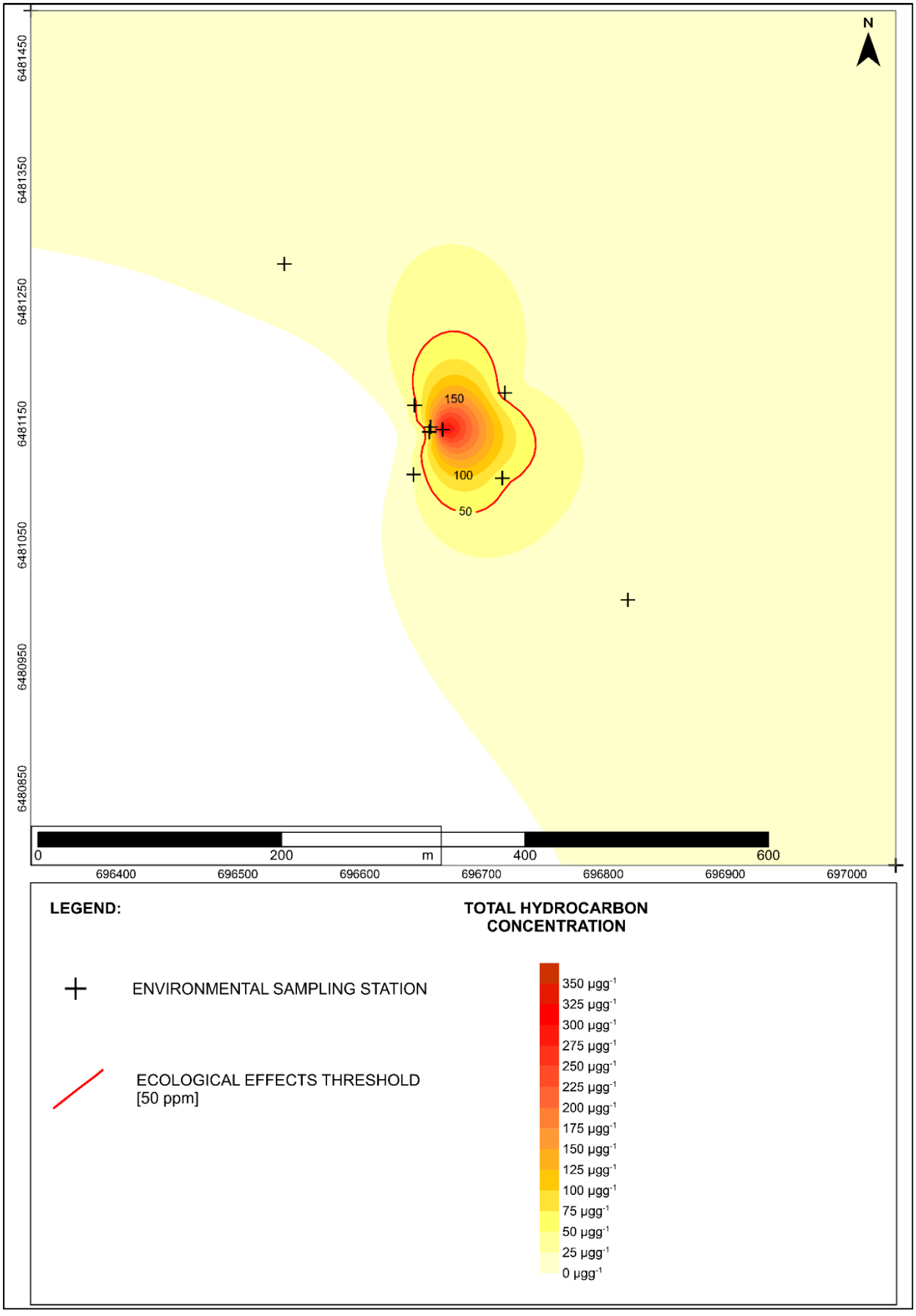
The mean particle size recorded for surface sediments sampled within the Saltire WID WHPU cuttings pile ranged from 43.3 µm to 61.6 µm (0 cm to 10 cm sections), with moderate variability across the cuttings pile **[Ref. 9]**. This corresponds to a range from fine silt to coarse silt on the Wentworth scale. Layering through the cores was evident and particle size generally became smaller with depth into the pile, alongside a corresponding increase in silt/clay content. As at Saltire A, the bottom sections of some of the cores at the outer edges of the pile were comparable to reference stations and could be considered as representing basal sediment.

THC levels ranged from 4.3 $\mu g g^{-1}$ to 333 $\mu g g^{-1}$, and were generally highest in the top 10 cm of sediment **[Ref. 9]**. The THC levels within many of the deepest sediment core sections (>30 cm) were comparable to concentrations at the reference and 100 m stations, suggesting that the cores may have penetrated through the cuttings material and into basal sediments.

Sediments containing evidence of enhanced mineral oil base fluid (EMOBF) were observed within the surface and middle sediment sections at the Saltire WID WHPU cuttings pile. Evidence of LTOBF was also seen, but only in a middle sediment section at one station.

As noted in Section 2.3.4, the area of the bathymetrically visible cuttings pile (Figure 2-2) is estimated to be approximately 757 m^2, with a volume of 158 m^3 and a maximum depth of 0.5 m. This central pile is surrounded by an outer zone of hydrocarbon contamination that is not visible in bathymetry data, where THC levels exceed the OSPAR cuttings pile ecological effects threshold of 50 $\mu g g^{-1}$. Using data from both the cuttings pile survey **[Ref. 9]** and the wider scale environmental baseline survey **[Ref. 16]**, the total area of the Saltire WID WHPU cuttings pile including the 50 $\mu g g^{-1}$ footprint was calculated to be 0.01 km^2 (shown in Figure 3-5).

Figure 3-5: Contour Map of THC Concentrations Around the Saltire WID WHPU Cuttings Pile, Highlighting the Zone Within Which THC Levels Exceed 50 µgg^{-1} [Ref. 9]



3.4.3 Chanter WHPU Cuttings Pile

Three ROV-operated push core samples were successfully taken (1.0 m length) to depths of 40 – 63 cm and sectioned at 10 cm intervals (Figure 3-2).

The mean particle size recorded for surface sediments sampled within the Chanter WHPU cuttings pile ranged from 37.6 µm to 1,020 µm (0 cm to 10 cm sections), with moderate variability across the cuttings pile **[Ref. 10]**. This corresponds to a range from medium silt to coarse sand on the Wentworth scale. At stations CHCP01 and CHCP02 the proportions of coarser sediment were highest at the surface and decreased with depth. At station CHCP03 the coarsest sediment was at the middle depth. The top section of station CHCP02 (and to a lesser extent middle section of station CHCP03) was modified in comparison to the other core and is likely to contain quantities of drilling related chippings (gravel/rock). As at Saltire A and the Saltire WID WHPU, sediments in the bottom section of each core were comparable to reference stations and therefore indicative of background sediment.

THC levels ranged from 22.9 $\mu g g^{-1}$ to 57.3 $\mu g g^{-1}$, and at two of the three stations were highest in the middle section sediment (115 $\mu g g^{-1}$ at station CHCP01, and 38.2 $\mu g g^{-1}$ at station CHCP02) **[Ref. 10]** . The THC levels within the deepest sediment core sections (>30 cm) were comparable to concentrations at the reference and 100 m stations. Sediments containing evidence of weathered diesel or diesel oil base fluid were observed within the surface and middle sediment sections at two stations, and within the middle section at the third station.

As noted in Section 2.3.4, the area of the bathymetrically visible cuttings pile (Figure 2-3) is estimated to be approximately 655 m^2, with a volume of 77.9 m^3 and a maximum depth of 1 m, representing a decrease in size since drilling was completed. This central pile is surrounded by an outer zone of hydrocarbon contamination that is not visible in bathymetry data, where THC levels exceed the OSPAR cuttings pile ecological effects threshold of 50 $\mu g g^{-1}$. However, the cuttings pile survey **[Ref. 10]** and the wider scale environmental baseline survey **[Ref. 17]** together did not provide the information necessary to map this outer part of the cuttings pile, or to derive a figure for its area. Due to the similarities between the mud and cuttings discharges at the Saltire WID WHPU and the Chanter WHPU in terms of numbers of wells, the size and type of seabed infrastructure, water depth and location, it has been assumed that the 50 $\mu g g^{-1}$ THC footprint at the Chanter WHPU is similar to that at the Saltire WID WHPU (i.e. approximately 0.01 km^2).

3.5 Benthos

3.5.1 Introduction

The biota living near, on or in the seabed is collectively termed benthos; the term infauna refers to those species living predominantly within the sediment, whilst the term epifauna refers to those species living predominantly on or just above the sediment. The type, diversity and biomass of the benthos is dependent on a number of factors including substrata (e.g. sediment, rock), water depth, salinity, the local hydrodynamics and degree of organic enrichment.

3.5.2 Epifauna and Sensitive Habitats

The habitat assessment resulting from the pre-decommissioning survey **[Ref. 15]** undertaken across the Saltire Area showed that epifaunal species observed the survey area were generally sparse, due mainly to dominance of muddy sedimentary habitats and the relative absence of hard substrata. The dominant species, present around Saltire A, the Saltire WID WHPU and the Chanter WHPU, included sea-pens (*Virgularia mirabilis*, *Pennatula phosphorea*), sea urchins (including *Gracilechinus acutus*), starfish (including *Asterias rubens, Astropecten irregularis*), shrimps, hermit crabs, king crabs (*Lithodes maja*) and hagfish (*Myxine glutinosa*). Other fish species observed infrequently included saithe (*Pollachius virens*), haddock (*Melanogrammus aeglefinus*), Norway pout (*Trisopterus esmarkii*) and unidentified flatfish. Faunal burrows and mounds were common across the survey area (see example seabed images in Figure 3-3).

Sparse sessile epifauna was also observed in areas where anthropogenic debris and shell fragments were present, and included anemones (particularly the plumose anemone *Metridium dianthus*), barnacles, hydroid/bryozoan turf, brittlestars, soft corals (including *Alcyonium digitatum*) and sponges **[Ref. 15]**. The cuttings pile beneath Saltire A was characterised in particular by the presence of high densities of mussel shells and shell fragments together with common starfish, plumose anemones and saithe. The mussel shells are those of the common mussel *Mytilus edulis*, most likely colonising the upper parts of the jacket from where their empty shells fall to the seabed. This layer of mussel shells and fragments appeared to be absent from the seabed/cuttings piles immediately around the Saltire WID WHPU and Chanter WHPU.

The presence of *P. phosphorea* and *V. mirabilis* along with faunal burrows suggested the potential presence of the OSPAR-listed threatened and/or declining habitat 'sea-pens and burrowing megafauna communities' in the survey area. Sea-pens and burrows were observed through video footage at the majority of stations located within the Saltire and Chanter survey areas. The density of burrows was assessed as frequent, common or abundant at most stations throughout the Saltire Area including the reference stations, although the species responsible for creating these was unclear. The Saltire Area is located in an area of seabed classified as 'burrowed mud' **[Ref. 19]**, a habitat listed as Scottish PMF **[Ref. 19]**. In addition, records of the OSPAR threatened and/or declining habitat 'sea-pens and burrowing megafauna communities' (one of the biotopes listed under the habitat 22'burrowed mud') occur throughout the CNS region around the Saltire Area **[Ref. 22]**.

No other OSPAR-listed threatened and/or declining habitats/species or PMF were observed in the environmental survey work undertaken (see discussion of the infaunal species PMF ocean quahog in Section 3.5.3 below). In addition, no Annex I habitats such as rocky, stony or biogenic reef or submarine features made by leaking gases were evident within the survey area either from the acoustic data or the photographic record **[Ref. 15]**.

3.5.3 Infauna

The macrofaunal invertebrate communities living within the sediments and sampled by grab were generally similar around Saltire A, the Saltire WID WHPU and the Chanter WHPU in spite of the slight variations in sediment type evident over the area as a whole (Section 3.2). The most abundant species overall at most stations away from the direct influence of cuttings piles (including the reference stations) were the polychaetes *Paramphinome jeffreysii, Heteromastus filiformis, Galathowenia oculata, Levinsenia gracilis,* and *Ampharete falcata* **[Refs. 16, 17]**.

Around Saltire A, however, fine differences were identified in the dominant taxa present in relation to distance from the platform:

- Stations within 200 m of the platform were generally dominated by *Galathowenia oculata*, together with relatively high numbers of *Pholoe assimilis*;
- Stations between 200 – 800 m from the platform generally dominated by *Paramphinome jeffreysii*;
- Stations at more than 800 m including the two reference stations generally dominated by *Heteromastus filiformis*.

Similar gradients in species abundance and dominance were not noted at the two subsea tiebacks, although numbers of taxa and individuals were highest at the 100 m stations at the platform and at the 50 m stations around the Saltire WID WHPU. These subtle patterns were thought to be related to residual effects of the cuttings piles present at these locations. At the Chanter WHPU, no gradients in dominant taxa or in numbers of taxa and individuals at each station were noted. However, multivariate analyses did indicate differences between the stations around the Chanter WHPU and the two reference stations that appeared to be due to the presence/absence of certain less abundant taxa, e.g. the polychaetes *Gyptis* sp., *Paradoneis eliasoni*, *Prionospio cirrifera*, *Eunereis longissima* and the mollusc *Tellimya ferruginosa* (none of which were included in the lists of top ten most abundant taxa).

Results from the 1990 baseline survey centred on the Saltire A location identified the polychaete *Heteromastus filiformis* as dominant at most stations. The polychaetes *Paramphinome jeffreysii*, *Nephtys* sp. and *Levinsenia gracilis* were also most abundant at individual stations **[Ref. 18]**. Other benthic species characteristic of the area in 1990 included the polychaetes *Ampharete falcata, Lumbrineris gracilis* and *Orbinia norvegica*, the amphipod *Eriopisa elongata*, and the small bivalve mollusc *Thyasira* spp. **[Ref. 18]**. All of these taxa were present in 2017, but in slightly different relative densities compared to 1990. When the data from the two surveys were corrected for differences in sample sizes, Fugro found that the mean numbers of taxa and individuals in 2017 were up to three times higher than in 1990. Much of the difference appears to be due to the presence of a greater variety of additional taxa in 2017, in addition to rises in numbers of some of the main species including *Paramphinome jeffreysii*, and *Galathowenia oculata*. These changes appear to be general and widespread, and in combination with the currently low levels of sediment THC across all three survey areas, are thought unlikely to be due to drilling-related THC contamination **[Refs. 16, 17]**.

As outlined in Section 3.2, in terms of the EUNIS biotope classification Fugro **[Refs. 16, 17]** considered the sediments around Saltire A and the Saltire WID WHPU to be mostly A5.36 Circalittoral fine mud. More detailed definition of biotopes taking into account the epifauna and infauna present was not taken forward in reports of the 2017 survey work **[Refs. 16, 17]**. However, the EUNIS biotope A5.376 *Paramphinome jeffreysii*, *Thyasira* spp. and *Amphiura filiformis* in offshore circalittoral sandy mud appears to be a good fit for the infaunal data and sediment type.

The description for this is as follows:

> "Deep, offshore cohesive sandy mud communities characterised by the polychaete *Paramphinome jeffreysii*, bivalves such as *Thyasira equalis* and *Thyasira gouldi* and the brittlestar *Amphiura filiformis*. Other taxa may include *Laonice cirrata*, the sea cucumber *Labidoplax buski* and the polychaetes *Goniada maculata*, *Spiophanes kroyeri* and *Aricidea catherinae*. *Amphiura chiajei* may be occasional in this biotope as may *Philine scabra*, *Levinsenia gracilis* and *Pholoe inornata* (now *P. assimilis*)."

No adult individuals of the clam species ocean quahog (*Arctica islandica*) were observed in the photographic data or grab samples during the wider scale pre-decommissioning survey work **[Refs. 15, 16, 17]**, or in the cuttings piles **[Refs. 9, 10]**. However, small juvenile specimens were found in low numbers at most stations. These had also been recorded in low numbers in the 1990 baseline survey **[Ref. 18]** (see Section 3.5.3 below). The ocean quahog is listed by OSPAR as a threatened and/or declining species, is also listed as a Priority Marine Feature (PMF) in Scottish waters **[Ref. 22]** and records of this species occur throughout the CNS region around the Saltire Area **[Ref. 22]**.

3.5.4 Cuttings Piles

The cuttings pile sediment sampling undertaken at the Saltire A platform, Saltire WID WHPU and Chanter WHPU included infaunal sampling/analysis at Saltire A only **[Ref. 9]**.

The macrofaunal community across the cuttings pile at Saltire A has been affected by the discharge and continued presence of oil based drilling muds on the seabed. Although all four stations on the Saltire A cuttings pile were dominated numerically by the polychaetes *P. jeffreysii* and *G. oculata* (which were also dominant at most of the wider field stations) other infauna present amongst the top ten most abundant species included the primary and secondary opportunist polychaetes *Pholoe baltica, P. assimilis*, *Capitella*, *Raricirrus* and *Cirratulus,* together with the bivalve *Thyasira sarsi*. These are all known to colonise locations such as cuttings piles subject to organic enrichment and/or oily contamination. On the basis of the benthos present, the predominant biotope identified across the Saltire A platform and Saltire WID WHPU cuttings piles corresponds broadly to the EUNIS biotope '*Capitella* sp and *Thyasira* spp. in organically enriched offshore circalittoral mud and sandy mud' (A5.374).

From photographic data and sediment samples, large numbers of anemones, possibly *Metridium dianthus*, were identified as present on both live and empty mussel (*Mytilus edulis*) shells on the cuttings pile at Saltire A. The presence of *M. edulis* is related to the presence of the platform and other infrastructure. The *M. edulis* are likely to have initially colonised the infrastructure and then become dislodged onto the seabed below. No shell accumulations with accompanying epifauna were evident at the Saltire WID WHPU or the Chanter WHPU.

3.6 Fish and Shellfish

The Saltire Area lies in an area of spawning ground for cod *Gadus morhua,* Norway pout *Trisopterus esmarkii* and Norway lobster *Nephrops norvegicus.* The site also falls within low intensity nursery grounds for anglerfish *Lophius piscatorius*, blue whiting *Micromesistius poutassou*, cod, hake *Merluccius merluccius*, ling *Molva molva*, mackerel *Scomber scombrus*, plaice *Pleuronectes platessa*, sandeels (various species), spotted ray *Raja montagui*, spurdog *Squalus acanthias* and whiting *Merlangius merlangus* **[Refs. 23, 24]** the intensity that these species spawn within the Salite Area is shown Figure 3-6**,** Figure 3-7 and Figure 3-8. Norway pout and Norway lobster are also known to use the area as nursery ground, whilst sprat *Sprattus sprattus* use the western part of the area.

Figure 3-6 Nursey and Spawning Ground Intensity for Cod

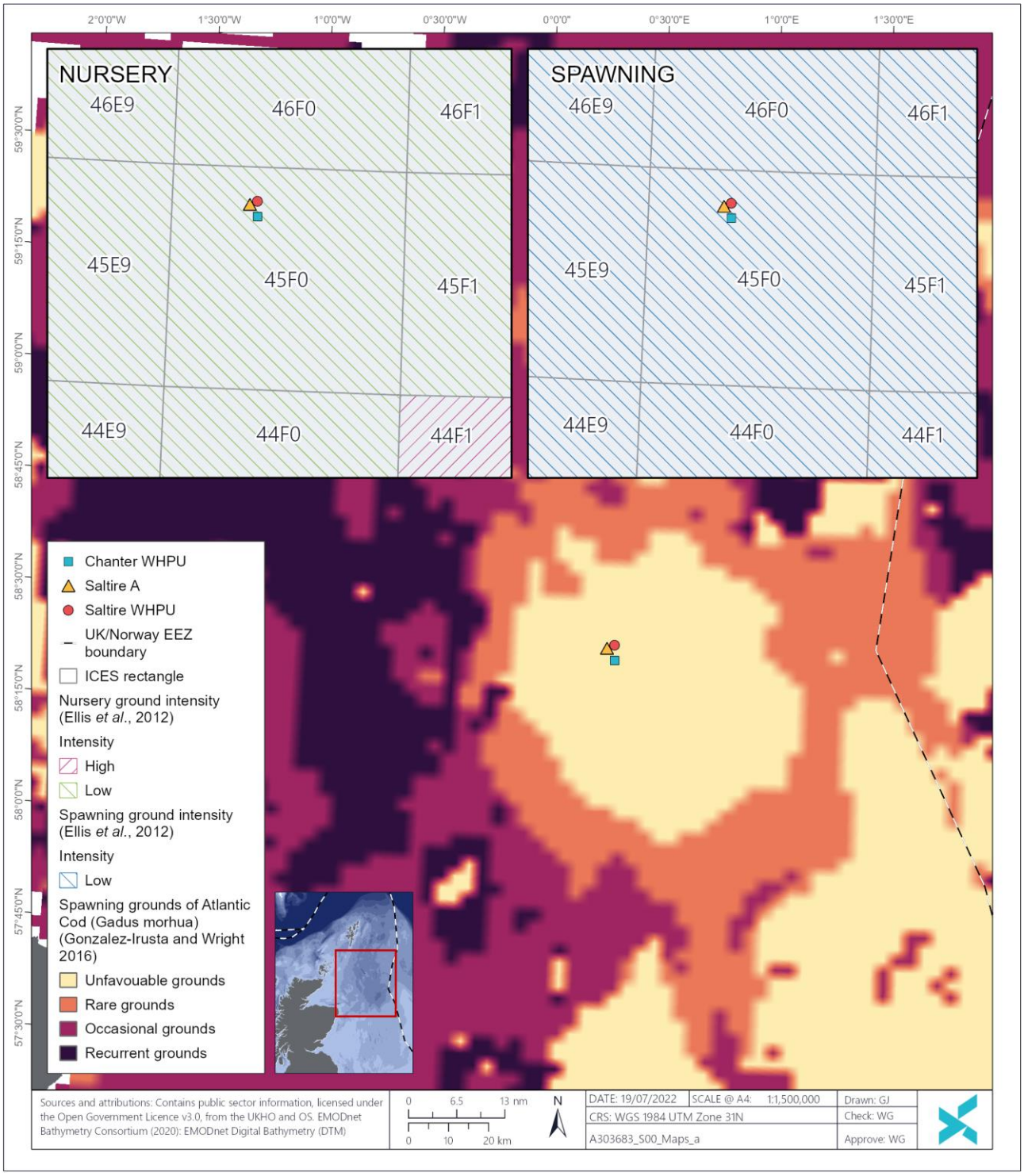


Figure 3-7 Nursey Ground Intensity in the Saltire Area

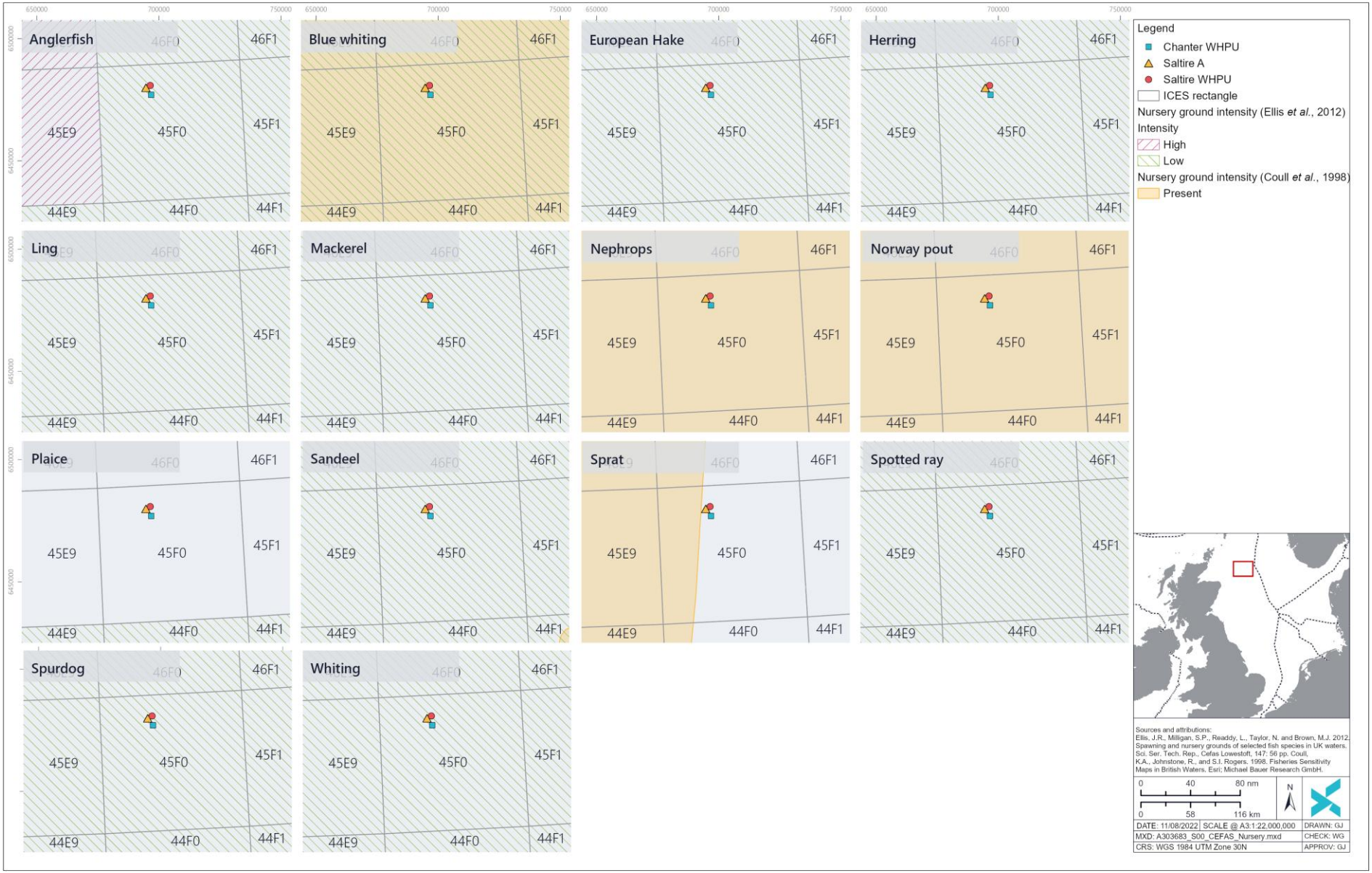
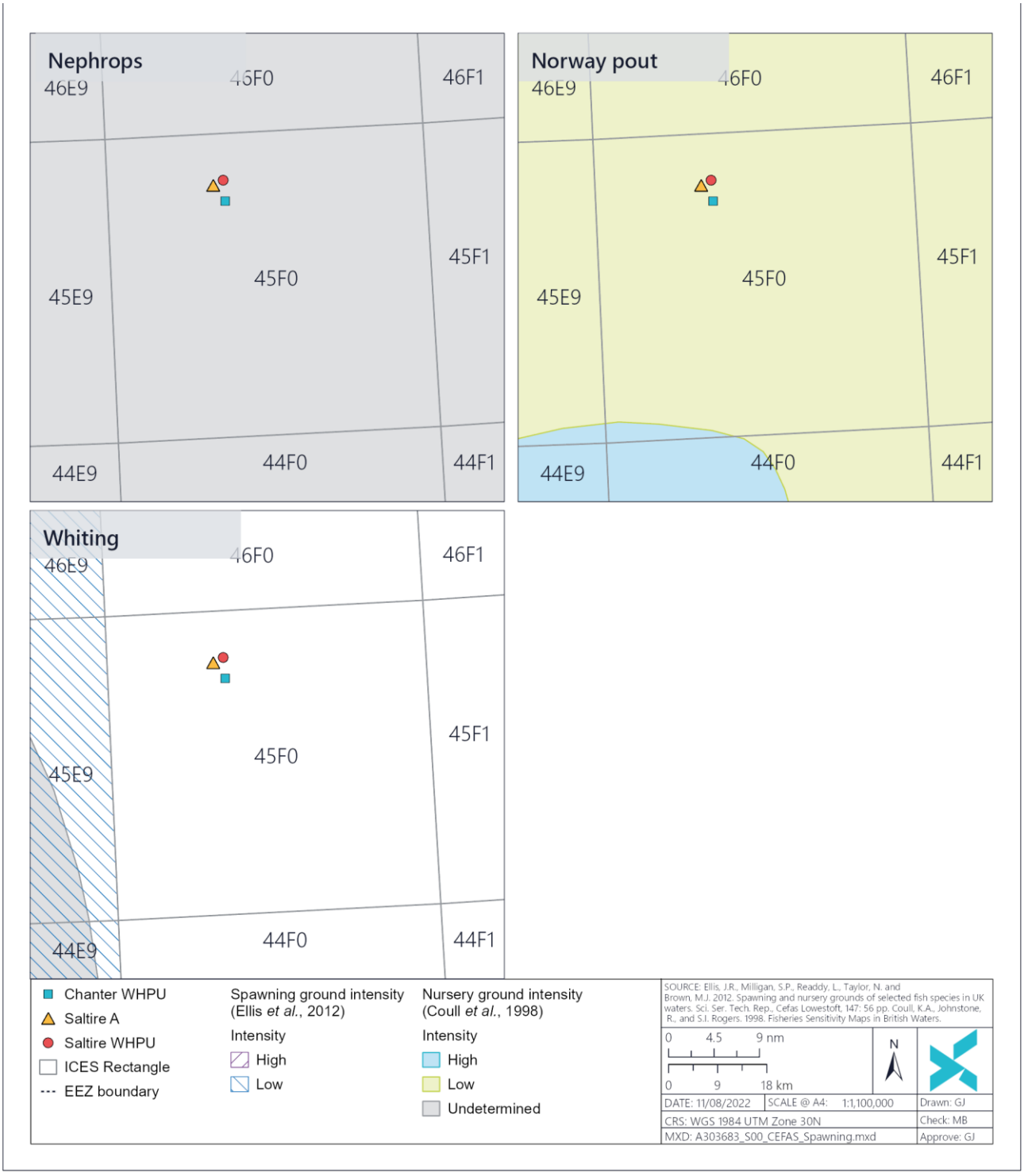


Figure 3-8 Spawning and Nursery Ground Intensity in the Saltire Area



Fisheries sensitivity maps produced by Aires *et al.* **[Ref. 25]** show the probability of aggregations of fish species in the first year of their life (i.e. group 0 larvae or juvenile fish) occurring around the UKCS. These indicate that the likelihood of aggregations of 0 group juvenile anglerfish, blue whiting, hake, haddock *Melanogrammus aeglefinus*, herring *Clupea harengus*, mackerel, horse mackerel *Trachurus trachurus*, Norway pout, plaice, sprat and whiting is low. Note that for hake and anglerfish the maps show probability of presence of 0 group juvenile fish as opposed to presence of aggregations.

3.7 Seabirds

Large numbers of moulting auks (e.g. razorbills, guillemots, puffins) disperse from their coastal colonies and into offshore waters from July onwards and are sensitive to surface pollution as they are flightless at this time. Of these species, puffins are listed as IUCN 'Vulnerable' and razorbills are IUCN 'Near Threatened'; all other species in the area are listed as IUCN 'Least Concern'. The most abundant seabird species found in the Saltire Area are northern fulmar, black-legged kittiwake and common guillemot. Herring gulls, glaucous gull and great black-backed gulls also use the area in winter. Following the 'Seabird Oil Sensitivity Index' (SOSI) developed by Offshore Energies UK, the vulnerability of seabirds to surface oil pollution in the region of the Saltire Area is generally low between January – March and June – August, Table 3.4, high to extremely high in September and October, and very high in November and December. There was no data for April/May in most of the blocks located in the vicinity of the Saltire Area **[Ref. 26].**

Table 3.4 Seabird Oil Sensitivity Index (SOSI)

Seabird Oil Sensitivity Index												
Block	J	F	M	A	M	J	J	A	S	O	N	D
15/11	4	4	4*	N	N	5*	5	5	5	5*	2*	2
15/12	5	5	5*	N	4*	5*	5	5	5	5*	2*	2
15/13	5*	5	5*	N	4*	5*	5	5	5	5*	N	2*
15/16	4	5	5*	N	5*	5	5	5	2	2*	2*	2
15/17	5*	5	5*	N	5*	5	5	5	3	3*	N	2*
15/18	5*	5	5*	4*	4	5	5	5	4	4*	N	2*
15/21	1	5	5*	N	5*	5	5	5	1	1*	2*	2
15/22	2	5	5*	N	5*	5	5	5	3	3*	N	2*
15/23	5*	5	5*	4*	4	5	5	5	4	4*	N	N
Key	1 = Extremely high		2 = Very high		3 = High		4 = Medium		5 = Low		N = No data	
	* in light of coverage gaps, an indirect assessment of SOSI has been made											

3.8 Marine Mammals

3.8.1 Cetaceans

The CNS and adjacent Northern North Sea (NNS) regions possess a moderate to high diversity and density of cetaceans, with a general trend of increasing diversity and abundance with latitude **[Ref. 27]**. White-beaked dolphin *Lagenorhynchus albirostris* and harbour porpoise *Phocoena phocoena* are the most widespread and frequently encountered species within the CNS/NNS regions. Minke whales *Balaenoptera acutorostrata* are regularly recorded as seasonal visitors throughout the summer months **[Ref. 27]**. Atlantic white-sided dolphin *Lagenorhynchus acutus*, Risso's dolphin *Grampus griseus* and long-finned pilot whale *Globicephala melas* can also be considered occasional visitors, particularly in the north of the Saltire Area **[Ref. 28]**. Killer whales *Orcinus orca* are sighted with increasing frequency north of the Saltire Area **[Ref. 27]**.

White-beaked dolphin and harbour porpoise have been recorded in the vicinity of the Saltire Area **[Refs. 27, 19]**. The predicted densities of these species in the vicinity of the Saltire Area from recent Small Cetaceans in European Atlantic waters (SCANS-III) surveys is approximately 0.7 – 0.8 harbour porpoise per km² and 0.25 – 0.3 white-beaked dolphins per km², which is average compared to data across the UK **[Ref. 29]**.

Both species are listed Scottish PMFs **[Ref. 30]**, while harbour porpoise are additionally listed in Annex II of the EU Habitats Directive.

3.8.2 Pinnipeds

Approximately 38% of the world's grey seals breed in the UK and 88% of these breed at colonies in Scotland, with the main concentrations in the Outer Hebrides and Orkney. Grey seal mean densities are very low across the offshore waters of the Project area, (<1 per 25 km^2) **[Ref. 31]**.

In the case of harbour seals, approximately 30% of the world's population are found in the UK. Pupping season is between June and July, and the moult occurs in August and September; therefore, from June to September harbour seals are on shore more often than at other times of the year. Harbour seal mean densities are very low across the offshore waters of the Project area, (<1 per 25 km^2) **[Ref. 31]**.

Both grey and harbour seals are listed in Annex II of the EU Habitats Directive and are considered PMFs by the Scottish Government **[Ref. 30]**.

3.9 Sites of Conservation Importance

Sites or potential features of conservation importance located in the vicinity of the Saltire Area are listed in Table 3.5 and their locations shown in Figure 3-9.

The closest designated site to the Saltire Area is the Scanner Pockmark Special Area of Conservation (SAC), 38 km to the south-east and designated for the presence of submarine structures made by leaking gases, listed as an Annex I feature in the EU Habitats Directive.

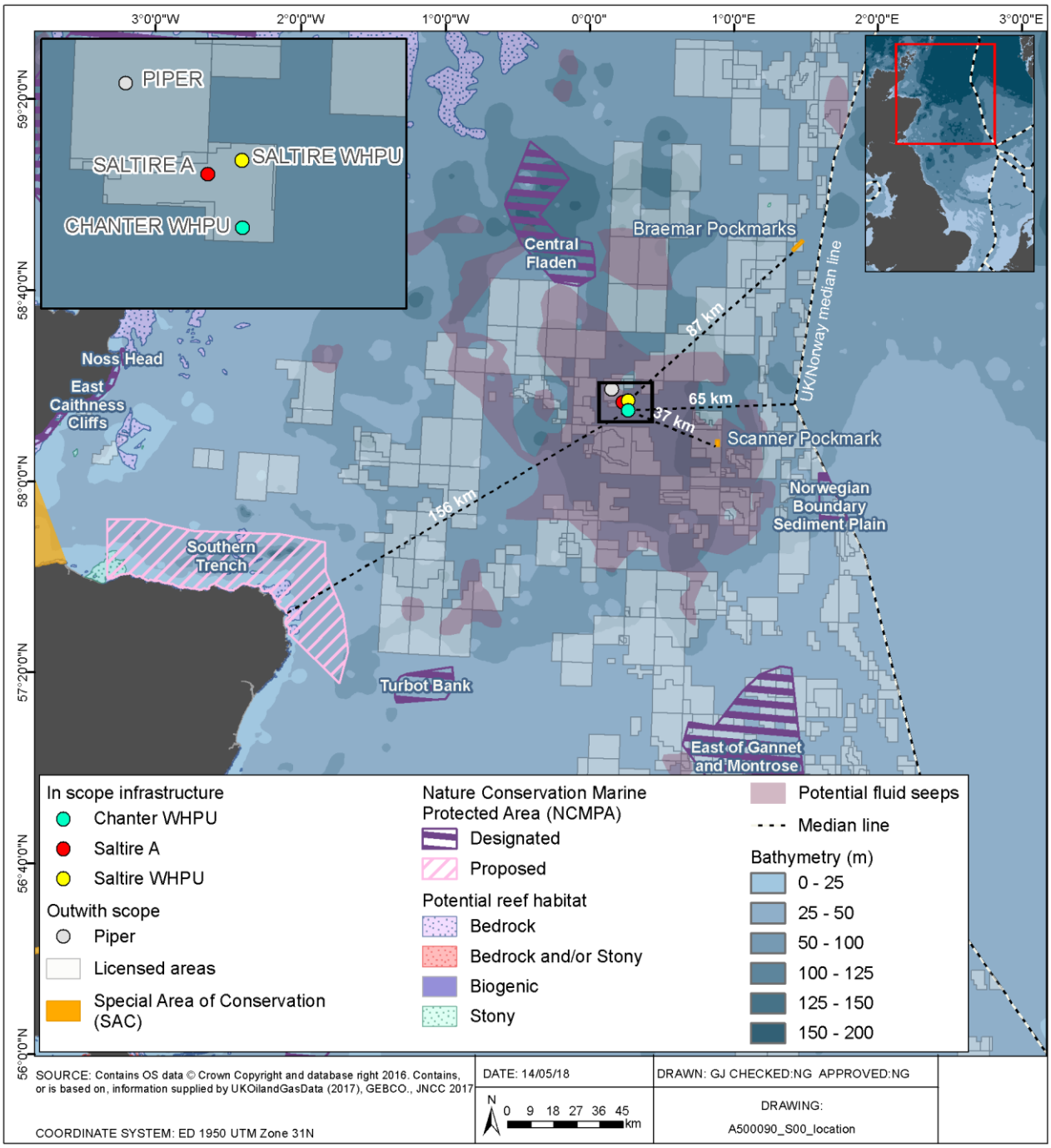
Table 3.5: Conservation Sites Located in the Vicinity of the Saltire Area

Protected feature	Conservation status	Distance from Saltire Area
Scanner Pockmark SAC		
Submarine structures made by leaking gases	> Annex I list of the EU Habitats Directive;	38 km to south-east
Central Fladen Nature Conservation Marine Protected Area (NCMPA)		
Burrowed mud – sea-pens and burrowing megafauna and tall sea-pen components	> OSPAR Threatened and/or Declining habitat across the North-east Atlantic; > Scottish PMF	49 km to north-west
Sub-glacial tunnel valley representative of the Fladen Deeps Key Geodiversity Area	Geodiversity protected feature in Scottish waters	
Norwegian Boundary Sediment Plain NCMPA		
Ocean quahog aggregations	> OSPAR Threatened and/or Declining habitat across the North-east Atlantic; > Scottish PMF	79 km to south-east

In addition to the designated sites, where known and validated examples of species or habitat features are located, Figure 3-9 also shows the extent of areas where marine habitat or species features of conservation importance are potentially thought to occur. Examples include rocky, stony or biogenic reefs, and submarine features made by leaking gases that are highlighted in the EU Habitats Directive. Figure 3-9 therefore indicates that the Saltire Area is remote from any known areas of potential reef habitat, but is located within a large area where submarine features made by leaking gases may potentially occur. As noted in Section 3.5 (Benthos), environmental survey work conducted over the Saltire Area found no rocky, stony or biogenic reef, or submarine features made by leaking gases **[Ref. 15]**.

However, one of the features of conservation importance noted in Table 3.5 that was identified in survey work (see Section 3.5) was the 'burrowed mud' habitat, and the biotope 'sea-pens and burrowing megafauna communities'. This feature is widespread in CNS region around the Saltire Area **[Ref. 19]**. Similarly, although not observed in acoustic or photographic data from the Saltire Area survey work **[Ref. 15]**, juveniles of the ocean quahog clam were recorded from grab samples at many stations over the Saltire Area **[Refs. 16, 17]**. It is commonly recorded in this part of the CNS and was also recorded during pre-drilling baseline survey work around the Saltire A location in 1990 **[Ref. 18]**. Both burrowed mud habitat and the ocean quahog are protected features in the more distant designated sites listed in Table 3.5 – the former in the Central Fladen NCMPA and the latter in the Norwegian Boundary Sediment Plain NCMPA.

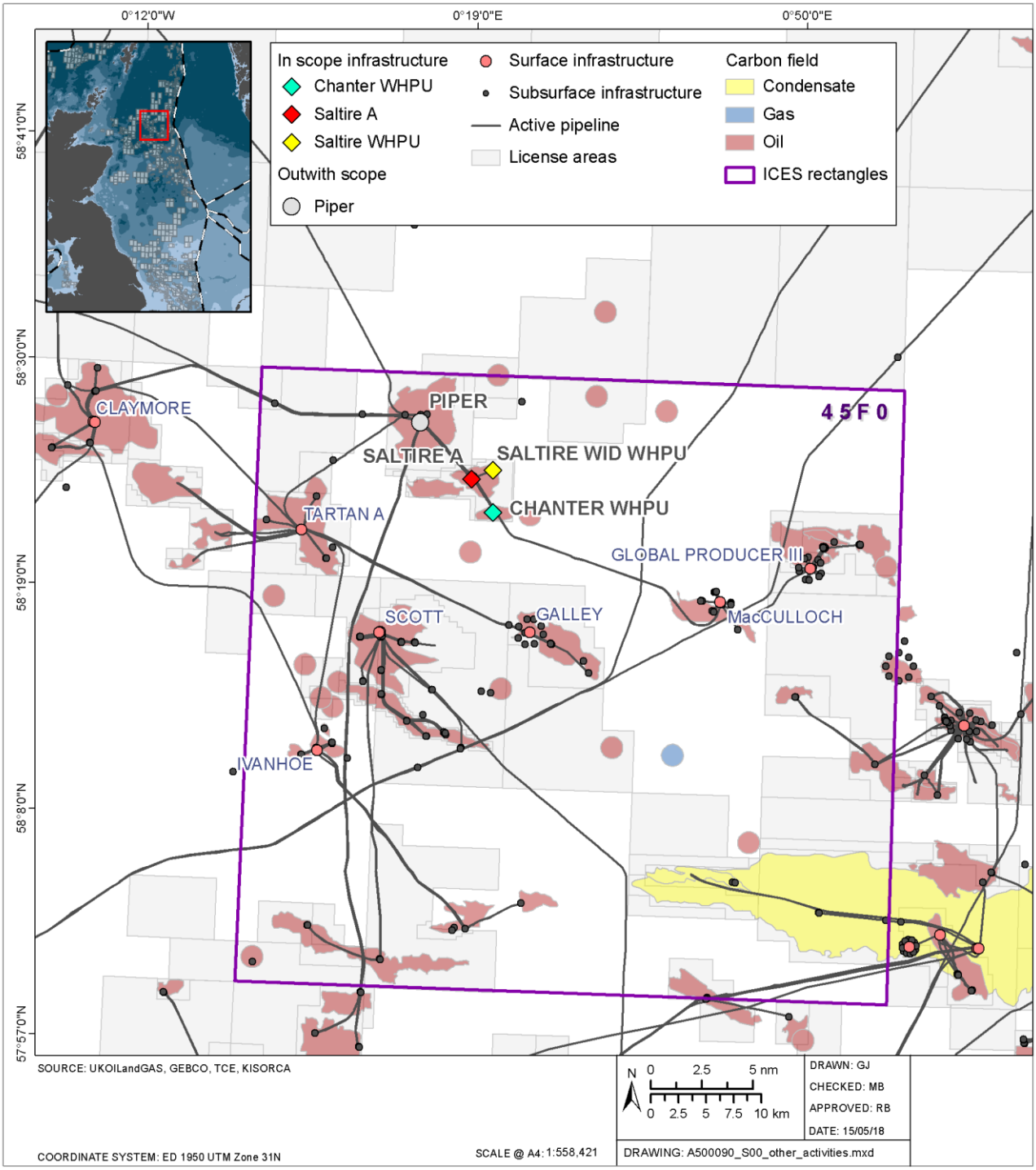
Figure 3-9: Offshore Designated Sites and Potential Features of Marine Conservation Importance in the CNS in Relation to the Saltire Area



3.10 Commercial Fisheries

The Saltire Area is located in International Council for the Exploration of the Sea (ICES) rectangle 45F0 (Figure 3-10). Table 3.6 shows the provisional fisheries data from 45F0 for 2021 and the four preceding years data back to 2017 **[Ref. 32]**[7].

Figure 3-10: ICES Fisheries Rectangle and Oil and Gas Infrastructure in the Vicinity of the Saltire Area



[7] Fisheries statistics for the whole of the UK are available from the Scottish Government. Landings data provide the quantity (live weight) and value of landings of sea fish by UK vessels into the UK and abroad, and landings into the UK by foreign vessels. Effort data covers voyages by UK vessels of over 10 m in length.

Based on final statistics for 2021, landings by vessels into the UK for ICES rectangle 45F0 show that demersal species accounted for 41% of the landed live weight and 29% of the value. Pelagic species represented <1% of the landed live weight and <1% of the value in 2021. Finally, shellfish species only represented 59% of the landed live weight and they contributed to 71% of the total value of the landings from 45F0 in 2021 **[Ref. 32]**.

Table 3.6: Live Weight and Value of Fish and Shellfish from ICES Rectangle 45F0 Between 2017 and 2021 [Ref. 32]

Species type	2021		2020		2019		2018		2017	
	Value (£)	Live weight (tonnes)	Value (£)	Live weight (tonnes)	Value (£)	Live weight (tonnes)	Value (£)	Live weight (tonnes)	Value (£)	Live weight (tonnes)
Demersal	1,765,845	998	901,382	511	942,971	504	1,023,713	554	2,159,704	1,125
Pelagic	3,924	5	6,875,613	7,173	392,542	1,118	119,145	228	1,477,408	3,146
Shellfish	4,291,057	1,428	1,381,435	608	2,175,141	764	540,117	147	2,562,953	630
Total	**6,060,826**	**2,430**	**9,158,430**	**8,292**	**3,510,654**	**2,386**	**1,682,975**	**928**	**6,200,065**	**4,901**

The live weight of pelagic landings between 2017 - 2021 has show high variability ranging from 5 tonnes in 2021 to 7,173 tonnes in 2020. Demersal landing weights have remained constant throughout the period, 1,125 tonnes in 2017 and 998 tonnes in 2021. Shellfish landing weights have ranged from a low of 147 tonnes in 2018 to 1,428 tonnes in 2021.

In 2021, the total fishing effort amounted to 1,541 days, with peaks in March and August of 510 and 238 fishing days respectively (see Table 3.7). Where fewer than five vessels over 10 m in length undertook fishing activity in an ICES rectangle (e.g. June 2021), fishing effort data is classed as 'disclosive'[8] and is not made available publicly. The total effort in 2021 was more than double that that recorded in 2020 and 2019, although Table 3.7 shows that considerable fluctuations have occurred from year to year over the five-year period up to 2021. The most used gear types in ICES Rectangle 45F0 over the last five years of data have been demersal trawls, and in 2021 these were associated with a fishing effort of 1,541 days. The remaining fishing effort is mostly associated with seine nets, surrounding nets and miscellaneous gear which are deployed by fewer than five vessels over 10 m in length in 45F0 over the same 5-year period **[Ref. 32]**.

Table 3.7: Number of Days Fished per Month (All Gears) in ICES Rectangle 45F0 Between 2017 and 2021 [Ref 32]

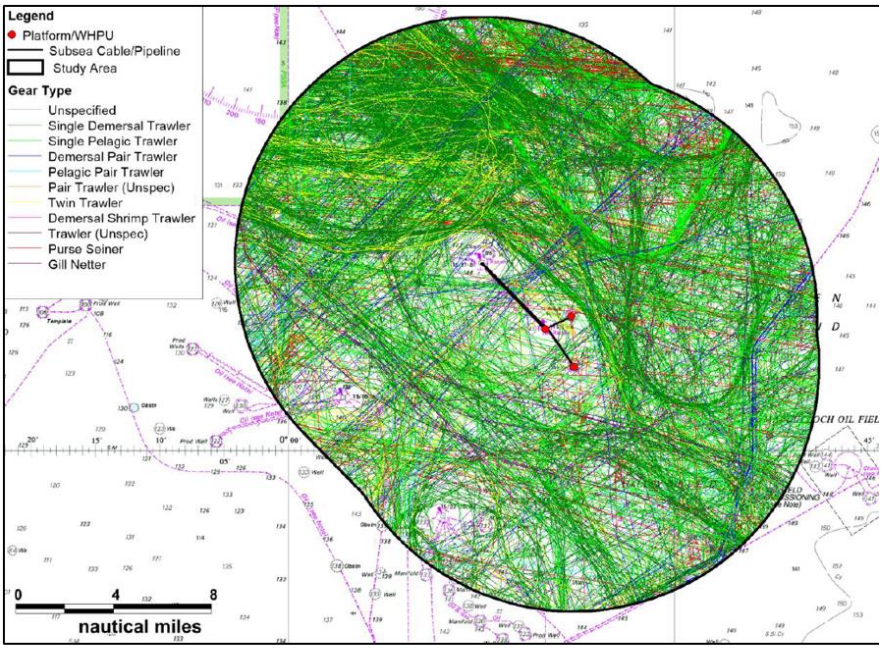
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2021	37	97	510	85	34	D	29	238	204	165	117	23	1,541
2020	37	26	129	21	D	28	40	75	147	111	69	D	719
2019	D	71	36	29	D	5	38	204	169	71	79	51	760
2018	47	27	9	15	91	9	23	7	29	104	12	8	381
2017	11	163	117	92	199	11	15	53	92	264	111	D	1,137

Note: Monthly fishing effort by UK vessels landing into Scotland: Blank = no data, D = Disclosive data (indicating very low effort), green = 0 – 100 days fished, yellow = 101 – 200, orange =201-300, red = ≥301]

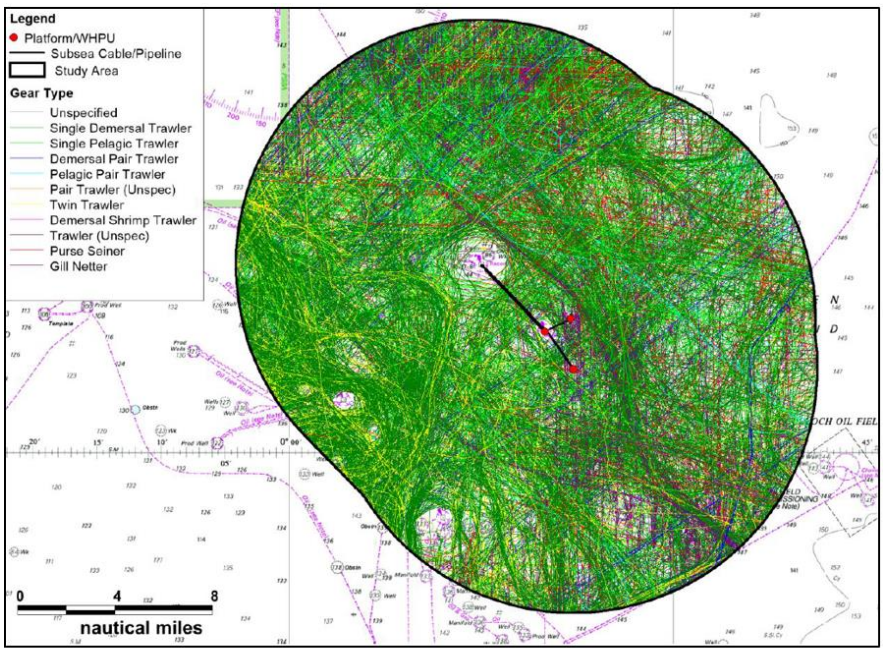
[8] The term undisclosed data refers to periods when the statistics for an area result from fewer than five vessels, and the need to preserve the privacy of those individual fishing crews.

The preponderance of demersal gears over other types of fishing, together with the level of effort overall, is evident in the amalgamated VMS intensity layers for 2009 to 2013 available from the NMPi, which also indicate that fishing intensity for *Nephrops* in the Saltire Area was moderate compared to other areas in the North Sea **[Ref. 19]**. Satellite monitoring and Automatic Identification System (AIS) data analysis by Anatec over a two-year period **[Ref. 33]** also indicated that the main fishing gear used is demersal, with 70% of the fishing vessels recorded within the vicinity using demersal gear and 25% using pelagic gear (Figure 3-11). The AIS track plots in Figure 3-11 clearly show the fishing vessels avoiding actively fishing within the Saltire Area 500 m safety exclusion zones.

Figure 3-11: AIS Fishing Activity over 2016 – 2018 Within Vicinity of Saltire Area [Ref. 33]



AIS Fishing Tracks by Gear Type (Mar 2016 - Feb 2017)



AIS Fishing Tracks by Gear Type (Mar 2017 - Feb 2018)

Both the moderate levels of effort invested in prawn fishing, and the relatively high value contributed to this fishery compared to other landings categories indicated in the data reviewed accords with information provided by the Scottish Fishermen's' Federation (SFF). Analysis of both VMS and AIS data by Anatec **[Ref. 33]** also highlighted international fishing effort in the region and showed that UK-registered vessels were more frequently recorded than any other nationality. The other most frequently recorded nationalities were Danish and Norwegian vessels, although effort from Holland, France, Germany, Ireland, Sweden, Faroe, Lithuania and Greenland also occurred at low level over the 2015 – 2017 study period. In terms of spatial distribution of fishing effort, it was noted that the majority of fishing to the south and west of the Saltire Area was from UK-registered vessels, while most of the fishing to the north and east was from overseas vessels **[Ref. 33]**. Trawlers (demersal, pelagic and twin) were the only gear types recorded from UK vessels, while other nationalities (particularly Denmark and Norway) used additional methods such as purse seines and gill nets.

3.11 Offshore Oil and Gas Activities, Pipelines and Cables

The proposed decommissioning operations are located in a well-developed area for oil and gas extraction. The oil and gas infrastructure and submarine cables located in the vicinity of the Saltire Area are shown in Table 3.8. The surface infrastructure located within 20 km of the Saltire A platform is listed in Table 3.8.

Table 3.8: Oil and Gas Infrastructure Within 20 km of the Saltire Area

Name	Operator	Distance/Direction	Status
Fields / Platform			
Piper B	Repsol Sinopec Resources UK Limited	7.0 km north-west	Operational
Tartan A	Repsol Sinopec Resources UK Limited	15.5 km west	Operational
Scott	Nexen Petroleum UK Limited	16.0 km south-west	Operational
Pipelines			
PL1313	Repsol Sinopec Resources UK Limited	10" 35.5 km pipeline from MacCulloch to Piper B.	Out of Use
PL1314	Repsol Sinopec Resources UK Limited	10" 35.5 km pipeline from MacCulloch to Piper B.	Out of Use
PL2125	Repsol Sinopec Resources UK Limited	12" in 18" Pipe-in-pipe Pipeline 54 km from Tweedsmuir to Piper B	Operational
PL2127	Repsol Sinopec Resources UK Limited	10" pipeline 54 km from Tweedsmuir to Piper B	Operational
PL2129	Repsol Sinopec Resources UK Limited	4" pipeline 54 km from Tweedsmuir to Piper B	Operational
PLU2131	Repsol Sinopec Resources UK Limited	54 km control umbilical from Tweedsmuir to Piper B	Operational
PLU2134	Repsol Sinopec Resources UK Limited	Approximately 300 m umbilical from Tweedsmuir USV to Piper B	Operational

3.12 Shipping

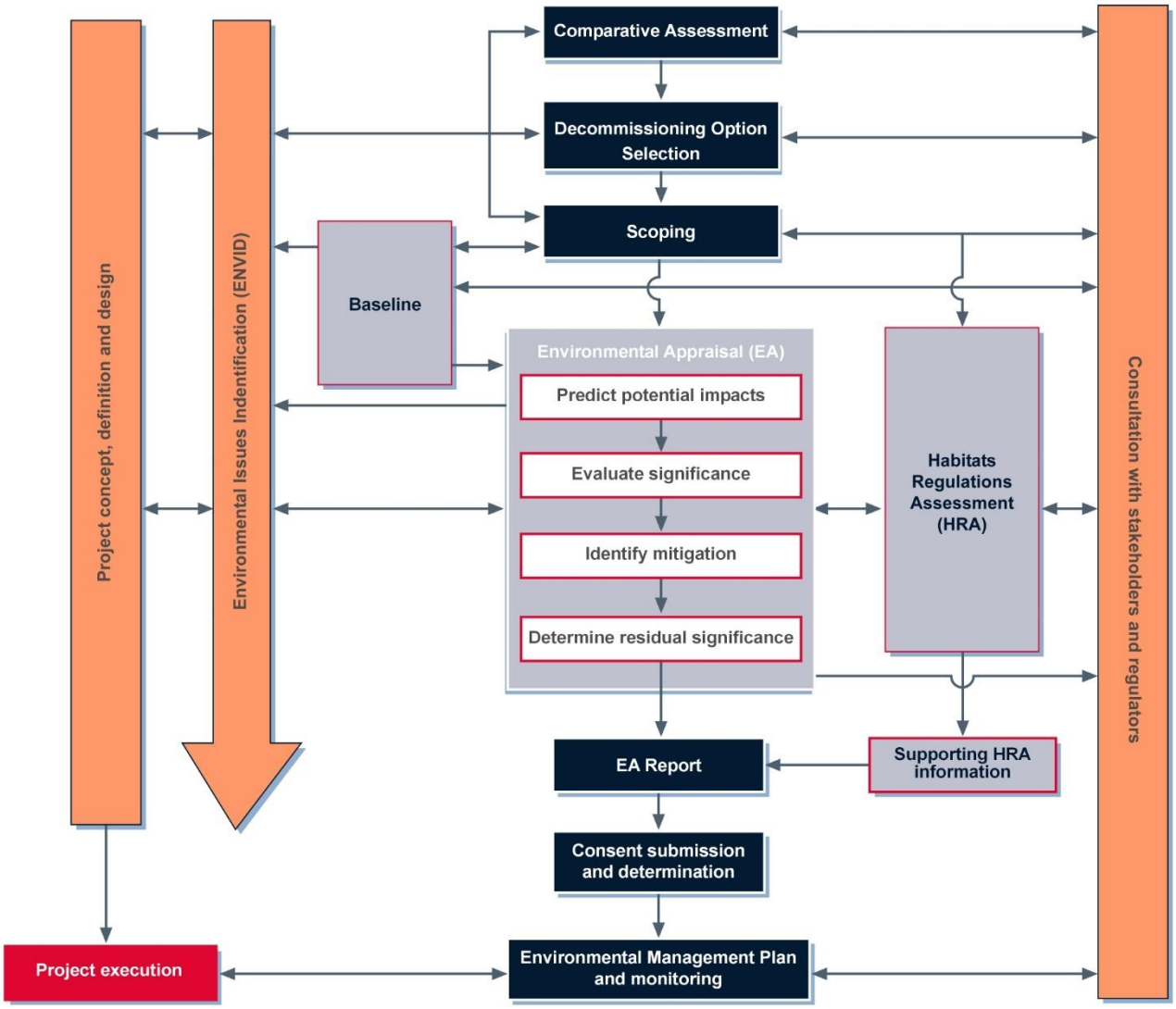
The level of shipping density in Block 15/17, where the Saltire Area lies, is considered low **[Ref. 28]**. Analysis of AIS data from 2012 suggests that the average number of vessels in the vicinity of the Saltire Area was 0.2 – 5 vessels per week **[Ref. 28**]. Data available through the Marine Scotland NMPi show that similar vessel transit densities applied for the whole period 2012 – 2015 and indicates that most of this limited vessel traffic consisted of fishing vessels, tankers and both port and non-port service craft **[Refs. 19, 33]**.

4 EA Methodology

4.1 Identification of Environmental Issues

The Decommissioning Guidance **[Ref. 2]** states that an EA in support of a DP should be focused on the key issues related to the specific activities proposed; and that the impact assessment write-up should be proportionate to the scale of the project and to the environmental sensitivities of the project area. This does not mean, however, that the impact assessment process should be any less robust than for a statutory EIA or consider any fewer impact mechanisms. A flowchart outline of the EA process followed is shown in Figure 4-1.

Figure 4-1: Overview of EA Process



Early in the EA process, Repsol Sinopec Resources UK Limited undertook a thorough environmental issues identification (ENVID) workshop attended by technical experts including the project engineering and environmental delivery leads. This workshop identified the key environmental sensitivities, discussed all the sources of potential impact and ultimately highlighted those impacts which required further assessment. The decision on which issues required further assessment was based on the specific proposed activities and environmental sensitivities, 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 Section 4.2). The ENVID workshop was recorded in a matrix format and reported in an ENVID report. The ENVID matrix is shown in full in Appendix A, in addition to which the salient points, providing justification for the inclusion and exclusion of impact mechanisms through subsequent EA, are summarised in Table 4.1.

Table 4.1: Summary of the ENVID Workshop Findings, with Justification for the Inclusion and Exclusion of Impact Sources

Impact	Further Assessment?	Rationale
Energy use and emissions to air, including vessel use, power generation and material recycling/ replacement	No	Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur in the context of the cessation of production. As such, emissions from operations and vessels associated with the Saltire Area will cease. Reviewing historical European Union (EU) Emissions Trading Scheme data and comparison with the CA study suggests that emissions relating to decommissioning will be small relative to those during production and in comparison to other UKCS vessel emissions. A review of previous decommissioning ESs shows that atmospheric emissions in highly dispersive offshore environments are exclusively concluded to have no significant impact, and are usually extremely small in the context of UKCS/global vessel emissions. Vessels, combustion machinery and fuel use conform to UK and international emissions standards, will be optimised/minimised for the decommissioning activities, and established contractors with appropriate capability, licences and maintenance procedures will be selected and audited. By decommissioning this asset emissions will be significantly reduced. The total vessel emissions from the decommissioning activities proposed will only form a small part of the total emissions from vessels operating on the UKCS. Considering the above, atmospheric emissions are not assessed further in this report.
Seabed interaction: Disturbance to the seabed, including to cuttings piles	Yes – Section 5.1	Although Saltire Area infrastructure is not located within or close to any designated conservation sites, seabed disturbance, particularly if extensive, permanent or involving interaction with cuttings piles, is likely to be one of the key environmental stakeholder concerns. On this basis, further assessment has been undertaken.
Physical presence of vessels in relation to other sea users (including commercial shipping)	No	The presence of vessels for decommissioning activities will be relatively short-term in the context of the life of the Saltire, Chanter and Iona fields. Activity will occur using similar vessels to those currently deployed for oil and gas across the CNS. Vessels will also generally be in use around existing infrastructure and will not occupy 'new' areas. Other sea users will be notified in advance of activities occurring, meaning those stakeholders will have time to make any necessary alternative arrangements for the limited period of operations. A review of previous decommissioning environmental statements shows that some projects indicate a greater potential issue with short-term vessel presence, but those largely relate to project-specific sensitive locations, which is not the case for this decommissioning project. Considering the above, temporary presence of vessels is not assessed further in this report.

Impact	Further Assessment?	Rationale
Physical presence of infrastructure decommissioned *in-situ* in relation to other sea users, both in terms of possible exclusion and risk of snagging	Yes – Section 5.2	The preferred option from the CA is to decommission the bundles, flowline and trenched and buried umbilical/power cables *in-situ*. While the jacket structure will be removed, the jacket footings will be left *in-situ*, and so may pose a risk of snagging. Although protection/support materials (mattresses and grout bags) are to be removed, there may be circumstances where removal of certain items is not feasible. Subsea structures, towhead, umbilicals and spool/jumpers will be recovered in full so are not considered further here. The general preferred approach from a Regulatory perspective is for full removal of infrastructure where possible (taking into account safety, environmental, technical feasibility, societal impact and economic factors). Additionally, decommissioning infrastructure *in-situ* has been raised as a key stakeholder concern in many previous decommissioning projects. On this basis, further assessment has been undertaken.
Physical presence of cuttings piles left *in-situ* in relation to other sea users.	Yes – Section 5.2	Interactions between fishing gear and the cuttings pile at Saltire A will be prevented by the jacket footings decommissioned *in-situ*. The consequence of interactions with the cuttings piles at the Saltire WID WHPU and Chanter WHPU is expected to be low due to small size of these piles. However, there is the potential for regulatory and local public awareness and concerns about the pile interactions. On this basis, further assessment has been undertaken.
Discharges to sea (short-term): Release of hydrocarbons, chemicals, metals etc. as cuttings disturbed during dredging etc	Yes – Section 5.1	While dredging or jetting cuttings is likely to raise sediment and associated contaminants into the water column, modelling such interactions shows that water column impacts are short-term and localised near the seabed. Although the Saltire Area infrastructure is not located within or close to any designated conservation sites, seabed disturbance, particularly if involving interaction with drill cuttings piles, is likely to be one of the key environmental stakeholder concerns. On this basis, further assessment has been undertaken.
Discharges to sea (short-term): Routine vessel discharges (e.g. grey water, black water, ballast) Minor chemical, hydrocarbon and NORM discharges during decommissioning (e.g. disconnections)	No	Discharges from vessels are regulated activities that are managed on an ongoing basis through existing legislation and compliance controls. Any discharges from infrastructure occurring during decommissioning activities will assessed in detail as part of the environmental permitting process (e.g. through Master Application Templates/Subsidiary Application Templates). Controls will be in place as relevant, through the Offshore Chemical Regulations and the Oil Pollution Prevention and Control Regulations. Residual liquids will be treated before being discharged to sea, such that the discharge will comprise treated water. While these routine discharges are not generally considered to be a major oil and gas issue, a review of previous decommissioning environmental statements shows that these discharges are often included in assessment. However, the level of detail varies and is often limited; the permitting system is considered a more appropriate location for any specific risk assessment of such discharges. Considering the above, discharges to sea during decommissioning activities are not assessed further in this report.
Discharges to sea (long-term): Release of hydrocarbons, chemicals, metals, NORM, plastic etc. as material (including structures) decommissioned *in-situ* degrades	Yes – Section 5.1	Degradation of materials left *in-situ* is also an area of increased stakeholder interest, especially for materials such as plastics, and assessment of this is a requirement of the decommissioning guidance. Since most structures or materials decommissioned *in-situ* are on or buried in the seabed, this has been assessed as a seabed impact. On this basis, further assessment has been undertaken.
Discharges to sea (long-term): Release of hydrocarbons, chemicals, metals and NORM as cuttings piles degrade	No	The drill cuttings are expected to leach contents, but the drill cuttings assessment has shown this to be below the OSPAR 2006/5 threshold (Section 2.3.4). Considering the above, discharges to sea during decommissioning activities are not assessed further in this report.

Impact	Further Assessment?	Rationale
Underwater noise emissions from vessels and cutting or dredging and rock placement operations	No	No use of explosives, piling or seismic sources will be used, so no high-energy impulsive noises (which would be the most likely to cause injury to biota). The project will not be using any new activities that have not previously been assessed as 'acceptable' through previous permit applications in the area. This project is not located within an area protected for marine mammals. With mitigation measures, EIAs for offshore oil and gas decommissioning typically show no injury, or significant disturbance. For projects outside of protected marine mammal habitats, this issue could be scoped out. On this basis, underwater noise assessment for decommissioning activities is not assessed further in this report.
Resource use Energy consumption Use of landfill space	No	Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Material will be returned to shore as a result of project activities, and most that is returned is expected to be recycled. There may be instances where infrastructure returned to shore is contaminated and cannot be recycled, but the weight/volume of such material is not expected to result in substantial landfill use. Considering the above, resource use and landfill take is not assessed further in this report.
Offshore light on living receptors, particularly seabirds	No	There will be vessels present on site for a short duration, in an area of low vessel activity. Therefore, it is considered this will have a negligible environmental effect. Additionally, existing lighting from the operational platform will be removed. RSRUK will follow current guidance regarding nesting birds and will undertake appropriate surveys and monitoring prior to any removals and develop a bird management plan as required. Considering the above, lighting is not assessed further in this report.
Onshore dismantling yard activities including airborne noise, odour, light, dust and aesthetics	No	All onshore yards at which decommissioned material will be handled already deal with potential environmental and social issues as part of their existing site management plans. There is anticipated to be no change in potential for impact as a result of any of the material proposed for recovery. Multiple disposal facilities are likely. Whilst the yards are yet to be selected, they will be in the UK or Europe. Repsol Sinopec Resources UK Limited procedures require suitably approved facilities, including site visits, review of permits and consideration of how new facility and construction and design has been developed to minimise impact. Considering the above, onshore interactions are not assessed further herein.
Waste, including non-hazardous, hazardous, radioactive and marine growth	No	While Waste was initially scoped in for assessment at the ENVID stage (see Appendix A), reference to Table 1 of the Decommissioning Guidance **[Ref. 2]**, confirms there is no expectation for the EA to include an assessment of wastes or waste management returned to shore for treatment or disposal. Considering the above, waste is not assessed further in this report.
Employment	No	The variable potential for impact from project activities was not identified as a differentiator in the CA. Whilst it is recognised that there could be a negative effect resulting from cessation of production, there will be a countering benefit in the additional work required to effect the decommissioning activities. It is expected that the main mechanisms for socio-economic impact will be through potential interaction with fisheries (assessed in Section 5.2). Considering the above, changes in employment (positive or negative) are not assessed further herein.

Impact	Further Assessment?	Rationale
Unplanned events - chemical/hydrocarbon release	No	Well plugging and abandonment is outside of the scope of this specific impact assessment, since it not dependent on approval of the DP. The possibility of a well blowout therefore does not require consideration in this assessment (it is assessed as part of separate well intervention and marine licence applications). Pipelines and umbilicals will have been flushed and cleaned prior to the decommissioning activities described herein being carried out. Release of a live hydrocarbon and chemical inventory is therefore also out of scope of this assessment. The HLV potentially to be used for removing the Saltire A jacket will have the largest fuel inventory of any vessel involved in the decommissioning activities. The largest HLV available has a fuel inventory amounting to 18,846 m^3 in total, predominantly of heavy fuel oil. This is much less than the worst-case crude oil spill from loss of well containment modelled and assessed in the Saltire field oil pollution emergency plan (OPEP). In addition, the vessel's fuel inventory is split between 11 separate fuel tanks, significantly reducing the likelihood of an instantaneous release of a full inventory. Therefore, the potential impact from fuel inventory release will be at worst less than that already assessed and mitigated for the operational phase of the Saltire Area. Considering the above, and given Repsol Sinopec Resources UK Limited's management and mitigation measures, the potential impacts from accidental chemical/hydrocarbon releases during decommissioning activities are not assessed further in this report.

4.2 Stakeholder Engagement

A draft Scoping Letter was prepared and issued in August 2018 to the following stakeholders.

- BEIS (OPRED EMT);
- JNCC;
- Scottish Fishermen's Federation (SFF);
- Marine Scotland; and
- Northern Lighthouse Board.

In addition, a meeting was hosted by Repsol Sinopec Resources UK Limited in Aberdeen on 21 August 2018 to discuss issues arising from decommissioning proposals. This was attended by:

- OPRED EMT;
- JNCC;
- Scottish Fishermen's Federation (SFF); and
- Marine Scotland.

A final Scoping Letter was issued in September 2019. The Scoping Letter provided an overview of the Saltire Area Development, the proposed decommissioning activities as known at the time and an overview of the impacts to be assessed in this EA. Stakeholders were invited to comment on the decommissioning proposals and planned EA with respect to any concerns they may have. In addition to issuing the Scoping Letter, Repsol Sinopec Resources UK Limited organised a number of informal stakeholder engagement sessions. These have included separate meetings with individual stakeholders, together with a Stakeholder Engagement Workshop to which many stakeholders were invited. Comments received through the scoping process have been summarised in Table 4.2.

Table 4.2: Stakeholder Issues and Concerns Raised in Response to Scoping

Issues/concerns	Outline response and EA section where addressed
SFF	
Has the recent high level of prawn fishing activity in the Saltire are been taken into account within the DP or EA?	The prawn fishing activity levels have been taken into account as part of the fishing and marine vessel studies that formed the basis for the comparative assessment work, and is outlined in Section 3.10 of the EA.
How are the remaining drill cuttings going to be identified and communicated to fishermen?	The locations of any remaining drill cuttings will be captured on Fishsafe, Kingfisher and Admiralty Chart updates (see Section 5.2.3).
It is noted that ICES rectangle 45F0 has the highest concentration of pipelines / free spans in the UKCS	Noted and understood (see Section 3.11). Any reportable free spans on the bundles that will be left in situ will be remediated during decommissioning with the remaining bundle periodically monitored and remediated as required.
Strongly against the potential for leaving the bundle towheads and associated protection structures in-situ.	Decommissioning plan is to fully remove all bundle towheads and associated protection structures, as outlined in Section 2 of the EA and detailed in the DP.
JNCC	
Are the sea-pens and burrowing megafauna communities going to be discussed/assessed within the DP or EA?	The impact of the proposed decommissioning activities on these communities is fully discussed and assessed within Section 5.1 of the EA.
What is proposed method of removal for piles on Wellhead Protection Unit structures that cannot be pulled out?	Such piles will be cut 3 m below the seabed (see Section 2.1.1.2).
Is there evidence of scour and free span creation following rock installation around the bundles?	Video footage of previous rock placement areas around bundle reviewed and no major scour issues identified.
Concerns over rock placement being applied in an area that has sea-pen and burrowing megafauna communities.	The level of rock placement estimated for each pipeline being decommissioned in-situ in Section 5.1.2.4 of the EA, and impact assessment for this is given in Sections 5.1.3.1 and 5.1.3.2 of the EA.
If the bundles are self-buried to 0.5 m, why has additional rock placement not been considered to comply with current regulations of 0.6 m buried depth for infrastructure left in the seabed?	Full rock placement of the bundles to comply with 0.6 m burial was considered as part of the CA for the bundles and was found to not be the most appropriate overall solution, mainly due to the environmental impact on a sensitive area and of the significant quantity of rock required.
Survey data should at least include the area of proposed operations, unless justification is provided as to why wider area surveys are sufficiently representative of conditions at the site of proposed operations.	Survey data covers all proposed operations. Sections 3.1 to 3.5 of the EA.
Survey data should provide adequate evidence that habitats and species of nature conservation concern (including Annex I habitats) are or are not present within operational impact areas.	Evidence presented in Sections 3.1 - 3.5 of the EA, and the conclusion about habitats and species of conservation concern outlined in Section 3.5.2 of the EA.
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.	Diagrams of sample stations and survey area included as Figures 3.1 and 3.2 of the EA. Sonar data findings and example photographic images are provided in Section 3.3 of the EA.
As per guidance, the environmental description should focus on the actual area to be developed and not just provide a generic description of the local environment. Evidence should be presented within the application confirming that the data used are still relevant.	A focused environmental description that incudes any necessary surrounding context has been provided in Section 3 of the EA.
Any gaps or limitations in environmental information should be acknowledged with, where appropriate, strategies to address these gaps or limitations.	No gaps identified.
The definition of the OSPAR threatened and declining feature 'Sea-pens and burrowing megafauna communities' is the subject of on-going discussions between Contracting Parties as scientific knowledge improves, particularly for deep sea areas. As outlined in **[Ref. 80]**, the presence of burrowing megafauna is the essential defining characteristic; the presence or absence of sea-pens does not	Based on site-specific survey data, Section 3.5.2 acknowledges that Saltire is located within a seabed area that can regarded as largely consisting of sea-pen and burrowing megafauna habitat.

Issues/concerns	Outline response and EA section where addressed
in itself define the feature. Sea-pens may form a prominent feature of the seabed, but do not have to be present to define this habitat. This assumption is equally true of the Scottish 'burrowed mud' PMF.	
We are available for discussion if required, concerning protected habitats and species, to ensure that the correct information is provided within the EA and DP and to allow assessment of whether proposed operations may adversely affect habitats or species of conservation importance.	Noted and understood.
The proposed operations are not within a marine protected area. We recommend checking the status of any sites discussed in the EA and DP prior to submission; further information can be found on the JNCC web page (http://jncc.defra.gov.uk/offshoreMPAs)..	Information on marine protected sites in the vicinity has been checked and is provided in Section 3.9.
We encourage the operator to minimise the amount of hard substrate material used during all operations and welcome detailed commentary on any stabilisation operations to allow further understanding of their actual nature conservation impact. This would include locations, size/grade of rock used, tonnage/volume, footprint, impact assessment and expected fate of the deposits. Where use of stabilisation material cannot be avoided, we recommend using a more targeted placement method where possible e.g. fallpipe vessel rather than side discharge methods.	Noted and understood. See section 5.1.2.4 and Table 5.4 for rock placement detail, quantification and methods.
We would recommend that where possible the Seabird Oil Sensitivity Index (SOSI) is used. The purpose of this index is to identify areas where seabirds are likely to be most sensitive to oil pollution by considering factors that make a species more or less sensitive to oil-related impacts. We highlight, however, that this index is not intended to inform environmental baselines on seabird populations and recommend consideration of other data sources for this purpose. JNCC would also like to highlight that JNCC and BEIS are currently in the process of revising the periods of concern for drilling activities, based on the SOSI. While previous recommendations were considering periods of concern when there were two or more sequential months of very high seabird vulnerability (OVI), the updated periods of concern for drilling will be defined as any single month that presents, in a given licence block, either a very high or extremely high seabird median sensitivity.	Other data sources have been used in addition to consideration of SOSI (see Section 3.7). Noted, although since the proposed activities do not involve drilling or seismic survey of any type, no discussion of periods of concern for these is given in Section 3.7 (we note here that there are currently no periods of concern highlighted for either drilling or seismic activities in UKCS Block 15/17).
JNCC note the presence of harbour porpoise and white-beaked dolphin in the vicinity of the development. The SCANS III 2017 publication **[Ref. 29]** indicates the presence of white sided dolphins and minke whales in low densities in the area. We request that white sided dolphins and minke whales are included in any future marine mammal baseline data.	The presence of white sided dolphins and minke whales in the region is noted in Section 3.8.
Injury thresholds and hearing functions for marine mammals previously published by Southall et al (2007) were updated in 2016 (NMSF, 2018) and most recently in 2019 (Southall et al., 2019). The thresholds and functions presented in these 2019 documents are identical and reflect the most comprehensive and up to date scientific knowledge relating to the risk of auditory injury to marine mammals. We therefore require these new thresholds and functions be used for any marine mammal noise assessments; however, we highlight the terminology used to identify the hearing function groups does differ between the two documents. Future applications should be clear as to which reference has been used in the assessment. NOAA has also published a spreadsheet to estimate injury range as a result of a proposed activity, based on the cumulative SEL metric. We are still assessing whether this would be an appropriate tool for use in the UKCS.	As noted in Table 4.1 of the EA, no project activities will generate high-energy impulsive noises (which would be the most likely to cause injury to biota). No explosives, piling or seismic sources will be used. On this basis assessment of injuries or significant disturbance through noise to marine mammals was scoped out of assessment in the Saltire EA. However, this information is noted for future assessments.
JNCC considers it best practice to consider the full worst-case scenario to enable a meaningful assessment of the full environmental impacts of a project.	This principle has been applied throughout the Saltire EA.
JNCC suggests that the proposed operations are assessed alongside 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	Cumulative assessment takes into account other approved developments nearby, together with seabed trawling by the fishing industry (relevant to the overtrawling activities that may ensue at Saltire as part of debris removal or provision of

Issues/concerns	Outline response and EA section where addressed
appropriate development for which some realistic figures are available.	assurance on a snag-free seabed (Sections 5.1.6 and 5.2.4 of the EA).
OPRED EMT	
If bundles are left in-situ, operator will be required to review technology and report back to OPRED for 10 years, in a similar manner to other operators with decommissioned bundles.	Noted and understood.

4.3 Impact Assessment Methodology For Planned Activities

4.3.1 Overview

The potential impact for the planned activities has been assessed in accordance with Repsol Sinopec Resources UK Limited's Environmental Assessment Methodology. As part of this methodology, it is necessary to determine the significance of the environmental/social impact of planned activities on each of the susceptible receptors. This achieved as follows:

The Sensitivity of the Receptor	x	The Magnitude of the Effect on the Receptor	=	The Significance of the Impact

The significance of the impact can then be categorised as Low, Medium, High or Very High. In the event that an impact is considered to be significant (i.e. Medium or above) in the initial assessment, it is necessary to identify further, project-specific, mitigations that aim to prevent or reduce the magnitude of effect, and to then conduct a second assessment to determine the significance of the residual impact. As part of this process, all residual impacts will be reduced to being as low as reasonably practical (ALARP).

4.3.2 Receptor Sensitivity

Assessment of the 'Sensitivity of Receptor' draws upon the Environmental Baseline (Section 3 of this report) and in alignment with best practice **[Refs. 34, 35, 36, 37, 38]** and considers a number of factors including, but not limited to:

- The relative importance of the local population size;
- The conservation status of the habitat or species e.g. does it sit within an IUCN (International Union for Conservation of Nature) threat category, is it listed in the OSPAR list of threatened and/or declining species or is it a Habitats Directive Annex II species;
- Whether the habitat is a designated conservation site e.g. a Habitats Directive Annex I Special Area of Conversation (SAC);
- The seasonal migrations and abundance of species and populations e.g. whether or not the species or population is likely to be in the area at the time of the proposed activity; and
- Awareness of vulnerable periods of a species' lifecycle.

High level guidelines were developed to inform the assessment of receptor sensitivity (Table 4.3). These guide descriptions are purposefully kept at a high level to afford a degree of flexibility and judgement during the assessment. Detail on the rationale behind the allocation of a category (e.g. 'Low') is provided in the narrative in the impact assessment chapters and, again, a precautionary approach must be taken. For example, each descriptor may not be applicable to each receptor and/or some receptors may be classified within two different categories. In practice, where a receptor has an IUCN status of 'Least Concern' ('Low') but is listed as an Annex II species ('High'), the worst-case category ('High') is applied.

Four categories of Receptor Sensitivity are applied ranging from 'Low' to 'Very High' as shown in Table 4.3.

While the sensitivity of most receptors is based on local conditions, it is acknowledged that emissions have a global impact on climate change. Consequently, the sensitivity of the atmosphere, or global climate, as a receptor is not included within the sensitivity guidelines in Table 4.3, as it is considered to be 'Very High' in line with the 2014 Climate Change Report produced by the Intergovernmental Panel on Climate Change **[Ref. 39]**.

Table 4.3: Receptor Sensitivity

Nature	Definition
Low (1)	**Flora/Fauna/Habitats within the zone of influence:** • Population sizes are considered to be of little to no geographical importance. • Species do not have designated conservation status and/or 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 has no heritage importance. **Resource availability:** (e.g. landfill sites, diesel use) Resource is renewable and/or abundant. **Third party users:** have capacity to absorb change without impact.
Medium (2)	**Flora/Fauna/Habitats within the zone of influence:** • Significant numbers of at least one receptor of national importance (e.g. Priority Marine Features (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:** Sparsely 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) Resource is renewable and/or available. **Third party users:** have capacity to absorb change without significant impact.
High (3)	**Flora/Fauna/Habitats within the zone of influence:** • Significant numbers of at least one receptor of regional (European) importance (e.g. Habitats/Bird Directive Annex I, II or 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 Special Protection Areas (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) Resource is not renewable and/or has limited availability. **Third party users:** have low capacity to absorb change and significant impact is likely to occur.
Very High (4)	**Flora/Fauna/Habitat within the zone of influence:** • 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) Resource is not renewable and/or has scarce availability. **Third party users:** have no capacity to absorb change e.g. unemployment due to long term closure of fisheries.

4.3.3 Magnitude of Effect

High level guidelines for assessing the Magnitude of Effect on the receptors are presented in Table 4.4. Prior to determining the Magnitude of Effect during the initial assessment, it is assumed that all legal compliance requirements have been met and that industry-standard/best-practice has been applied.

Table 4.4: Magnitude of Effect

Magnitude Level	Description	
	Environmental Impact	**Social Impact**
Positive/No Effect (0) *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.
Negligible (1) *Regulatory compliance or Company goals are not breached.*	**Negligible environmental effects** • Negligible environmental effect, change not detectable above background variability, rapidly and fully reversible once activity ceases; highly localised effects. No habitat / population effects. • Negligible contribution to global emissions (e.g. when compared to annual UKCS emissions or annual emissions during production operations).	**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. Project vessels working out-with the existing 500 m exclusion zones could temporarily impact on a shipping route or 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, rock cover or landfill).**
Minor (2) *Regulatory compliance is not breached.*	**Minor, localised, short term, reversible effect** • Any change to the receptor is considered low and at same scale as existing variability. • Recover naturally with no Company intervention required. • Low contribution to global emissions (e.g. when compared to annual UKCS emissions or annual emissions during production operations)	**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 project 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, rock cover or landfill).**
Serious (3) *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. • Moderate contribution to global emissions (e.g. when compared to annual UKCS emissions or annual emissions during production operations)	**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, rock cover or landfill).**
Major Effect (4) *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 which is eventually reversible. • Company response (with Corporate support) required to restore the environment. • Large contribution to global emissions (e.g. when compared to annual UKCS emissions or annual emissions during production operations)	**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, rock cover or landfill).
Critical Effect (5) *Major breach of regulatory compliance resulting in project delays and prosecution.*	**Persistent severe environmental damage** • Very high, widespread long-term (>5 years) degradation to the receptor that cannot be readily rectified and is not reversible. • Major impact on the conservation objectives of internationally/nationally protected sites. • Full Corporate response required. • Extensive contribution to global emissions (e.g. when compared to annual UKCS emissions or annual emissions during production operations)	**International public concern and media interest affecting the Company's reputation** **Very high decrease in availability of a resource and potentially livelihood of users 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).

4.3.4 Impact Significance

The 'Sensitivity of Receptor' and the 'Magnitude of Effect' are combined using the matrix presented in Table 4.5 to determine the significance of the impact of planned activities.

Table 4.5: Matrix for Determining the Overall Significance of the Impact of Planned Activities

Impact Significance		Receptor Sensitivity			
		Low (1)	Medium (2)	High (3)	Very High (4)
Magnitude of Effect	Critical (5)	High	High	High	High
	Major (4)	Moderate	Moderate	High	High
	Serious (3)	Moderate	Moderate	Moderate	High
	Minor (2)	Low	Low	Moderate	Moderate
	Negligible (1)	Low	Low	Low	Low
	Positive/No Effect (0)	Positive	Positive	Positive	Positive

Impact Significance	Description
Positive / No Effect	• Positive or no environmental or social impact. • No public interest or positive public support.
Low	• No/negligible environmental and social impact. • No concerns from consultees.
Moderate	• Discernible environmental and social impacts. • Requirement to identify project-specific mitigation measures. • Concerns by consultees which can be adequately addressed by the Company.
High	• Substantial environmental and social impacts. • Serious concerns by consultees requiring Corporate support. • Alternative approaches should be identified.

4.4 Impact Assessment Methodology for Unplanned Events

4.4.1 Overview

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

(----------Impact significance----------)

The Sensitivity of the Receptor	x	Magnitude of the Effect on the receptor	x	The Likelihood of Occurrence of the unplanned or accidental event	=	The significance of the risk

As with the impact assessment process for planned events, should a risk be considered significant (i.e. medium or above) in the initial assessment, it is necessary to identify project-specific mitigations designed to prevent or reduce the Magnitude of Effect, or to reduce the Likelihood of Occurrence and to conduct a second assessment to determine the significance of the residual risk. All residual risks will be reduced to ALARP.

4.4.2 Significance of the Impact Associated with an Unplanned Event

The significance of the impact that may result from an unplanned or accidental event is determined using the methodology described above for planned events.

4.4.3 Likelihood of an Unplanned Event

Once the significance of the impact that may result from an unplanned event has been determined, it is necessary to assess the likelihood of the unplanned event occurring in order to determine the risk. Five categories of 'Likelihood of Occurrence' have been identified as presented in Table 4.6.

Table 4.6: Likelihood of an Unplanned Event

Likelihood category	Definition
Extremely Remote (1)	Has never occurred within industry or similar industry but theoretically possible.
Remote (2)	Similar event has occurred elsewhere but unlikely to occur with current practices.
Unlikely (3)	Event has occurred in the industry during similar activities.
Possible (4)	Event could occur during project activities.
Likely (5)	Event is likely to occur more than once during the project.

4.4.4 Risk Significance

The significance of the environmental / social risk has been determined using the matrix presented in Table 4.7. Note the potential for a beneficial impact significance has been removed as it is not expected that an unplanned event could lead to any beneficial environmental impact.

Table 4.7: Matrix for Determining the Overall Significance of the Impact of Planned Activities

Risk significance		Impact Significance[1]		
		Low	**Moderate**	**High**
Likelihood of event	**Likely**	Low	High	High
	Possible	Low	Moderate	High
	Unlikely	Low	Moderate	Moderate
	Remote	Low	Low	Moderate
	Extremely Remote	Low	Low	Low

[1]Determined using methodology for planned events

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

4.5 Mitigation

Where potentially significant impacts (i.e. those ranked as being of moderate impact level or higher in Table 4.5 or Table 4.7) are identified, mitigation measures must be considered. The intention is that such measures should remove, reduce or manage the impacts to a point where the resulting residual significance is at an acceptable or insignificant level. Mitigation is also proposed in some instances to ensure impacts that are predicted to be not significant remain so.

4.6 Residual Impacts

Residual impacts are those that remain once all options for removing, reducing or managing potentially significant impacts (i.e. all mitigation) have been taken into account.

4.7 Cumulative Impact Assessment

Although the scope of this impact assessment is restricted to the decommissioning of the Saltire Area facilities as outlined in Section 2, it is recognised that the decommissioning workscope will also occur in the context of other oil and gas and non-oil and gas activities, with which there is the potential to interact. To this end, the impact assessments presented in the following sections specifically consider the potential for cumulative impact within the definition of significance.

4.8 Transboundary Impact Assessment

For most potential impacts from decommissioning, the likelihood of transboundary impact is low. However, where impacts on mobile receptors are of concern, the likelihood of a transboundary impact is higher. The impact assessments presented in the following sections have identified the potential for transboundary impacts and the potential for transboundary impact is considered within the definition of significance.

4.9 Habitats Regulations Assessment and NCMPA Assessment

Under Article 6.3 of the Habitats Directive, it is the responsibility of the Competent Authority (BEIS) to undertake Appropriate Assessment, if necessary, of the potential impacts of a plan, programme or project, alone or in combination, on a Natura site (SAC or SPA) in view of the site's conservation objectives and the overall integrity of that site. In a similar process of assessing impact on protected sites, there is also a requirement under the Marine and Coastal Access Act (2009) and the Marine (Scotland) Act 2010 for the Competent Authority to consider the potential for the proposed activities to impact upon NCMPAs. As with SACs and SPAs, BEIS is the Competent Authority for NCMPAs with respect to oil and gas development. Where relevant, the impact assessments presented below provide information on the potential for the proposed activities to affect the protected features of SPA, SAC and NCMPAs, or to affect ecological or geomorphological processes on which the SPAs, SACs and NCMPAs are dependent.

5 Impact Assessment

5.1 Seabed

5.1.1 Introduction

This section discusses the potential environmental impacts associated with seabed disturbance resulting from the proposed decommissioning activities. The measures planned by Repsol Sinopec Resources UK Limited to minimise these impacts are detailed in Section 5.1.5.

The decommissioning activities have the potential to impact the seabed in the following main ways:

- Direct impact through:
  - Removal of subsea infrastructure;
  - Presence of subsea infrastructure and drill cuttings left *in-situ*;
  - Excavation and cutting of flowline/umbilical/cable ends;
  - Trenching and burying of flowline/umbilical/cable exposures;
  - Disturbance of drill cuttings;
  - Rock-placement for bundle termination points and free span remediation; and
  - Overtrawl surveys by chain mats.
- Indirect impacts through:
  - The re-settling of sediment raised in sediment plumes; and
  - The opening of the area to fishing activity.

5.1.2 Description and Quantification of Impact

In order to assess the impacts of the proposed activities, the area of potential disturbance must be quantified. The area of direct disturbance expected for each activity is presented in to Table 5.5 and summarised in Table 5.6. Areas where decommissioning activities overlap have been accounted for, ensuring that the extent of impact is not unrealistically overestimated. The sub-sections below re-cap briefly on some of the information provided in Section 2.

5.1.2.1 Jacket Removal

The jacket is to be partially removed leaving the footings in place. Selection of this option will mean that no seabed disturbance and corresponding impact associated with jacket removal is expected, although there will be an ongoing impact due to jacket footings being decommissioned *in- situ*, which is discussed in Sections 5.1.3.2 and 5.1.3.3.

The area of seabed occupied by the footings of the Saltire A jacket being left *in-situ* is shown in Table 5.1. The disturbance area associated with the decommissioning of the jacket footings is assumed to be equal to the dimensions of the mud mats plus a 5 m buffer to allow for decommissioning activities and debris removal. The size of the Saltire A jacket footings is illustrated in Figure 5-1 and Figure 5-2.

Table 5.1: Footprint Remaining on Seabed as a Result of Saltire A Footings Being Decommissioned *In-Situ*

Structure	Dimensions (m x m)	Disturbance Footprint	
		(m^2)	(km^2)
Saltire A jacket footings (x4)	22 x 16 plus 5 m buffer on all sides	3,328	0.003
	TOTAL	3,328	0.003

Figure 5-1: Extent of Saltire A Jacket Footings

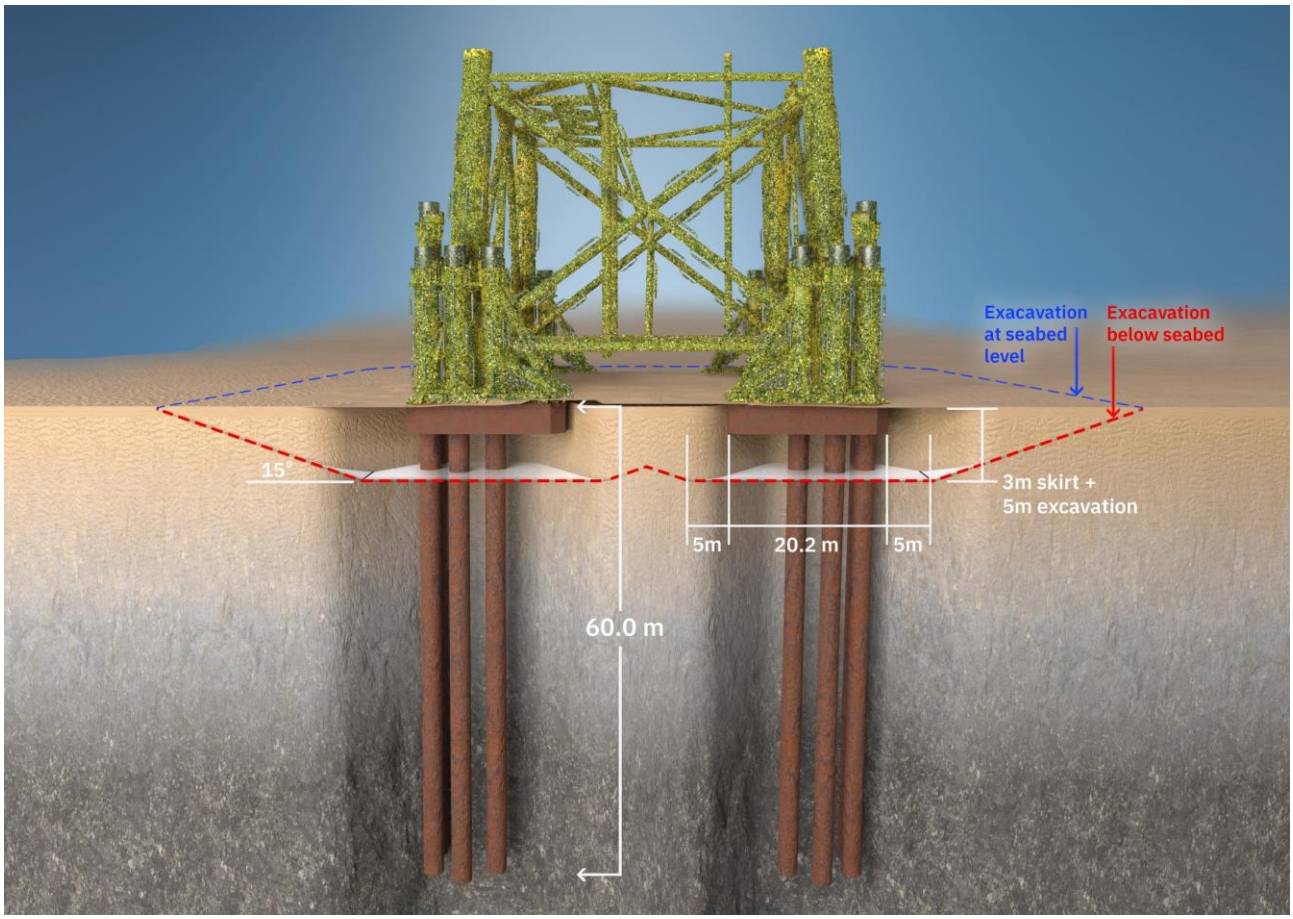


Figure 5-2: Photograph of Saltire A showing the mud mats

5.1.2.2 Decommissioning of Subsea Infrastructure In-Situ

The Saltire bundles (Group 1 and Group 2), the Chanter oil/condensate flexible flowline (Group 3), the Chanter umbilical (Group 4) and the east and west power cables will be decommissioned *in-situ*, and their footprints are presented in Table 5.2. The two Saltire bundles are surface-laid and will be decommissioned *in-situ* as they are. The majority of the Chanter oil/condensate flexible flowline is

already trenched and buried and is to be decommissioned *in-situ* by trenching and burying any exposures. The Chanter umbilical and the east and west power cables are already trenched and buried and will be decommissioned *in-situ* as they are. The area of impact is assumed to be equal to the lengths of the lines being left *in-situ*, multiplied by a 10 m impact corridor (5 m each side of the centre line) as a worst-case estimate. Minor remediation to cover free spans, pipeline ends or to trench and bury midline exposures for some of these lines is quantified in Section 5.1.2.4.

It should be noted that the lengths of the infrastructure below represent the lengths that will be left *in-situ*, representing a worse case. Structures, spools, jumpers, etc. associated with the infrastructure but included in their lengths as defined in the relevant Pipeline Works Authorisation records will be removed during the decommissioning process.

Table 5.2: Pipelines Being Decommissioned *In-Situ*

Item name	CA Group	Dimensions (m x m) Note 1	Footprint remaining on seabed (km²)
Pipelines Being Decommissioned In-Situ Surface-Laid			
Saltire A to Piper B bundle	Group 1	6,690 x 10	0.07
Saltire A to Saltire WID bundle	Group 2	2,106 x 10	0.02
		Sub-total	**0.09**
Partially Buried Pipelines Being Fully Trenched and Buried Prior to Being Decommissioned In-Situ			
Chanter oil/condensate flexible flowline	Group 3	10,675 x 10	0.11
		Sub-total	**0.11**
Pipelines Already Trenched and Buried and to be Decommissioned In-Situ			
Chanter electro-hydraulic control umbilical	Group 4	10,790 x 10	0.11
East power cable		6,643 x 10	0.07
West power cable		6,621 x 10	0.07
		Sub-total	**0.24**
		TOTAL	**0.44**

Note 1: The infrastructure lengths shown are those that will be left *in-situ* following decommissioning. Therefore, these lengths do not necessarily correspond to those shown for the complete infrastructure items prior to decommissioning listed in the subsea and pipelines CA or DP.

5.1.2.3 Disturbance to Seabed from Removal of Subsea Infrastructure

Subsea structures, towhead, umbilicals, spools/jumpers and mattresses/grout bags will be removed. Table 5.3 quantifies the potential direct impact to the seabed from removal activities for this infrastructure. In addition, the Chanter oil/condensate flexible flowline and the trenched and buried Chanter umbilical plus the east and west power cables, while recommended for decommissioning *in-situ*, will have their ends cut and recovered and remaining exposures trenched into the seabed. The disturbance associated with this operation is also presented in Table 5.3.

There is a worst-case potential that the cut ends of Group 3 and Group 4 may require new rock placement to cover them. This is therefore assessed separately in Section 5.1.2.4.

Table 5.3: Potential Direct Impact Area as a Result of Subsea Infrastructure Removal

Item name	Dimensions (m)	Total direct seabed impact (km²)
Towhead USV(North)	23.5 x 3.75	

Item name	Dimensions (m)	Total direct seabed impact (km²)
Towhead USV(South)	23.5 x 3.75	Note[9]
Towhead USV(North) protection structure	25.9 x 9.15	0.0002370
Towhead USV(South) protection structure	25.9 x 9.15	0.0002370
Towhead WI Saltire	7.89 x 2.70	0.0000213
Towhead WID WHPU	7.98 x 2.70	0.0000215
Towhead WID Saltire protection structure	8.56 x 4.56	0.0000390
Towhead WID WHPU protection structure	8.56 x 4.56	0.0000390
Saltire WID WHPU	26.3 x 21.8	0.0005733
Chanter WHPU	20.2 x 19.9	0.0004016
Saltire flange protection structure (SFPS) 1	9.20 x 5.80	0.0000534
SFPS2	13.5 x 6.63	0.0000895
SFPS3	9.18 x 5.77	0.0000530
SFPS4	9.08 x 5.93	0.0000538
Roof structure between SFPS4 and SFPS4	8.80 x 4.93	0.0000434
Piper flange protection structure (PFPS) 2	7.70 x 5.80	0.0000447
PFPS3	10.2 x 7.02	0.0000713
PFPS5	11.1 x 5.80	0.0000641
Towhead USV(North) umbilical	360 x 0.123	0.0000443
Towhead USV(South) umbilical	300 x 0.123	0.0000369
Saltire WID umbilical (Saltire A to towhead WI Saltire)	240 x 0.146	0.0000350
Saltire WID umbilical (towhead WI WHPU to Saltire WID WHPU)	43.0 x 0.146	0.0000063
Saltire A to Piper B Bundle Saltire A tie-in spools		
PL880 water injection (failed) spools	178 x 0.406	0.0000722
PL881 water injection spools	154 x 0.406	0.0000625
PL882 multiphase export spools	155 x 0.273	0.0000422
PL883 gas lift spools	156 x 0.219	0.0000342
Saltire A to Piper B Bundle Piper B tie-in spools		
PL880 water injection (failed) spools	135 x 0.406	0.0000548
PL881 water injection spools	149 x 0.406	0.0000606
PL882 multiphase export spools	136 x 0.273	0.0000372
PL883 gas lift spools	138 x 0.219	0.0000303
Power Cable J-tube extensions		
East power cable J-tube extension	150 x 0.273	0.0000410
West power cable J-tube extension	150 x 0.273	0.0000411
Saltire A to Saltire WID Bundle Saltire A tie-in spools		
PL897 water injection spools	49.2 x 0.168	0.0000083
PL898 water injection spools	47.5 x 0.168	0.0000080
PL899 water injection spools	45.9 x 0.168	0.0000077
Saltire A to Saltire WID Bundle Saltire WID WHPU tie-in spools		

[9] The seabed impact from removing the Towheads is captured within the value for removing the Towhead protection structure

Item name	Dimensions (m)	Total direct seabed impact (km²)
PL897 water injection spools	37.3 x 0.168	0.0000063
PL898 water injection spools	44.1 x 0.168	0.0000074
PL899 water injection spools	51.2 x 0.168	0.0000086
Chanter Oil/Condensate Flexible Flowline tie-in spools		
PL847 flexible jumper from towhead USV(North) to Piper B platform	217 x 0.245	0.0000531
Drop-down spool at Chanter WHPU tie-in	2.00 x 0.168	0.0000003
Stabilisation / protection materials		
Concrete mattresses - total (1,089)	6.00 x 3.00	0.0196020
Grout bags – total (4,340)	1.00 x 0.500	0.0021700
	TOTAL	**0.025**

5.1.2.4 Preparation of Pipelines for Decommissioning In-Situ

For the Saltire A to Piper B Bundle and Saltire A to Saltire WID Bundle, rock placement will be conducted to ensure that cut bundle ends and free spans do not present a snagging hazard for other sea users. While the base decommissioning option for the Chanter oil/condensate flexible flowline, Chanter umbilical plus the East and West power cables is to trench and bury their cut ends, rock placement could also potentially be used to ensure that the cut ends of these do not present a snagging hazard for other sea users. In addition, the Chanter oil/condensate flexible flowline is currently mostly trenched and buried but has several mid-line exposures where it lies on the seabed. These exposures will be trenched and buried prior to decommissioning *in-situ*, and no need for additional rock is anticipated. The potential seabed area directly disturbed by preparing pipelines for decommissioning *in-situ*, and whether by rock placement or trenching and burial, is presented in Table 5.4. Trenching and burying the very short sections of exposure/ends will have significantly less impact than rock dumping these areas if burial is not possible. Therefore, rock dumping of these free spans and ends has been assumed in Table 5.4 to represent the worst case.

Table 5.4: Area of Direct Disturbance to Seabed Due to Decommissioning

Structure	Rock Tonnage (Te) Estimate	Dimensions (m x m)	Total direct seabed impact (km²)
Rock placement at free spans and ends as prep for Decommissioning In-Situ			
Saltire A to Piper B bundle (Group 1)	8,500 (300 tonnes for cut ends, 520m of midline remediation) Note 1	361 x 10	0.0054
Saltire A to Saltire WID bundle (Group 2)	1,000 (300 tonnes for cut ends, 40m of midline remediation) Note 2	22 x 10	0.0006
Chanter oil/condensate flexible flowline (Group 3)	0 – base case 1,900 – possible contingency case (200 tonnes per cut end, 300 tonnes for exposures)	15 x 10	0.0006
Trenched and buried umbilicals/power cables (Group 4)	0 – base case 800 – possible contingency case (600 tonnes per cut end, 300 tonnes for exposures)	15 x 10	0.0006
Sub-totals for rock placement	**4,700 (incl. possible contingency)**		**0.00712**
Trench and burial of exposures as prep for Decommissioning In-Situ			
Chanter oil/condensate flexible flowline (Group 3)	-	58 x 10 Note 3	0.00058
	TOTAL area disturbed		**0.0077**

Note 1: There are two FishSafe reportable free spans on the Saltire A to Piper B Bundle
Note 2: One FishSafe reportable free spans was identified on the Saltire A to Saltire WID bundle
Note 3: Excluding the pipeline ends (estimated in the upper part of the table), there are 17 mid-line exposures over 58 linear metres, and an assumed width of 10 m.

5.1.2.5 Footprint of Seabed Disturbance From Overtrawl Surveys Post-Decommissioning

Once the decommissioning activities are complete, surveys will be conducted to check that the seabed has been left in a condition that does not present a hazard to other sea users – particularly the fishing industry.

Surveys will use a variety of techniques, particularly acoustic tools such as sidescan sonar. However, as part of this, a fishing vessel may be required to carry out overtrawling of the seabed within the 500 m safety zones of the Saltire A platform, the Saltire WID WHPU, the Chanter WHPU and within a 100 m corridor (50 m each side) of bundles, umbilicals and cables to verify that this has been achieved.

Table 5.5 presents an estimate of the total potential seabed impact due to overtrawl surveys. It is possible that the total area to be overtrawled will only focus on certain key areas (rather than the whole area subject to decommissioning activities). As a result of this, and because of other unknowns such as turning circle of the vessel plus trawl system to be used, there is little value in attempting to finely calculate the exact area to be overtrawled, e.g. by excluding the space occupied by the remaining Saltire A footings, or the length of pipeline within 500 m safety exclusion zones (to avoid over-inflating the trawled area estimate). Overall, it is considered that the figure of 12.1182 km² shown in Table 5.5 represents a pragmatic estimate of the total area potentially affected.

Table 5.5: Potential Area of Direct Impact on Seabed Due to Overtrawling

Activity	Dimensions	Total direct seabed impact (km²)
Overtrawl surveys of pipelines/umbilicals/cables	Pipelines/umbilicals/cables – 43.525 km x 0.1 km	4.3525
Overtrawl surveys of platforms and subsea installations	Platforms and subsea installations – (1 platform and 2 WHPUs x 500 m radius)	2.3562
	TOTAL Direct Disturbance	**6.7087**
Indirect Disturbance: additional 50 m either side of pipeline trawl area and an additional 100 m buffer for 500 m zones		5.4095
	TOTAL Direct plus Indirect Disturbance	**12.1182**

5.1.2.6 Summary

The potential impact areas from the various decommissioning activities are summarised in Table 5.6.

Table 5.6: Summary of Potential Direct Seabed Impacts and Footprint of Remaining Infrastructure

Activity	Table	Seabed disturbance impact during decommissioning activities (km²)	Footprint of remaining infrastructure (km²)
Saltire A jacket footings decommissioned *in-situ*	5.1	0.0000	0.0033
Decommissioning of pipelines *in-situ*	5.2	0.0000	0.4373
Removal of subsea infrastructure	5.3	0.0240	0.0000
Preparation of pipelines for decommissioning *in-situ*	5.4	0.0077	0.0000
Total from decommissioning operations		0.0317	0.4406
Overtrawl surveys - direct seabed disturbance	5.5	6.7087	0.0000
Overtrawl surveys - indirect seabed disturbance (peripheral sedimentation)	**5.5**	5.4095	0.0000
Total from decommissioning operations plus overtrawl surveys		12.1702	0.4406

5.1.3 Direct Disturbance of Seabed Habitats During Decommissioning

5.1.3.1 Benthic Disturbance Due to Removal of Subsea Infrastructure, Seabed Remediation and Overtrawling

The footprint physically disturbed by decommissioning activities includes the area of seabed affected by infrastructure removal (0.0240 km²), by rock placement or trenching and burial of pipeline ends or exposures (0.0077 km²), and by overtrawling activities (12.1385 km²) as summarised in Table 5.6. It should be noted that this is a worse case position and that intentions are to undertake non-intrusive verification of clear seabed. HoweverHowever, should further verification or remediation be required, this will be discussed and agreed with OPRED. The main mechanism of direct disturbance will potentially come from overtrawling at the end of decommissioning activities. Impacts from these activities may include mortality and injury arising from crushing of benthic and epibenthic fauna that cannot move away, as well as disturbance of motile fauna as they move away from the area of disturbance. The sediment structure, including burrows of any animals present, will be disturbed.

Upon completion of the subsea decommissioning activities, it is expected that a benthic community typical of the area will start to become re-established in the overturned and resettled sediment. This will occur through a combination of rehabilitation of some of the existing disturbed fauna working their way back to a new sediment surface **[Ref. 41]**, migration of animals from adjacent undisturbed seabed, and natural settlement by larvae and plankton **[Ref. 42]**.

In a series of large scale field experiments **[Ref. 42]**, the recovery of benthic communities within a variety of sediment types (clean sand, silty sand, muddy sand and mud) to physical disturbance was studied. Of the four sediment types investigated, the communities from muddy sands and mud showed the longest recovery rates. In low-energy areas of the North Sea subject to extensive dredging, another study showed that local fauna took approximately three years to recover to the original level of species abundance and diversity **[Ref. 43]**.

The recovery time for benthic communities following disturbance by beam-trawling in the southern North Sea and CNS was modelled **[Ref. 44]**, which indicated that mud habitats on average took longer to recover (approximately four years) than shallower high energy sand and gravel areas (approximately two years). The Saltire Area is located in the CNS and the seabed is predominantly mud and muddy sand, indicating a probable recovery time in the region of three to four years, i.e. a similar timescale to that found in the field studies of **[Ref. 42]** and **[Ref. 43]**.

The scale and duration of seabed disturbance impacts from the proposed decommissioning is small when compared to the other main subsea activity in the North Sea, commercial trawling. According to the Seafish Gear Database **[Ref. 45]**, beam trawls used in the North Sea for demersal fishing can be up to 12 m in width and may be towed at up to 7 knots (3 m/s). A commercial trawler with a 12 m-wide chain mat type beam trawl trawling at 2 m/s would take approximately 76 hours to cover an area equivalent to the maximum overtrawl requirement in the Saltire Area (6.7087 km^2; see Table 5.6). Maximum fishing effort in ICES rectangle 45F0 between 2013 and 2017 was approximately 49 days per year, or 1,171 hours. In this context, the scale of the area of impact from the overtrawling activity is small, representing just 7% of commercial trawling effort in the area. As the area is already fished, and will continue to be fished, that third-party activity means that the seabed will be returned to a condition similar to that of the surrounding area sooner. In addition, the overtrawling required as part of decommissioning will only take place once and will not be repeated.

The ocean quahog is included on the OSPAR list of threatened and declining habitats and species **[Ref. 22]** and is a qualifying species for several offshore UK protected sites. No adult specimens were recorded during pre-decommissioning survey work in 2018 **[Refs. 15, 16, 17]**, but small juvenile specimens were found in low numbers at most stations and had also been recorded in low numbers in the 1990 baseline Saltire field survey **[Ref. 18]**. The ocean quahog is considered to be moderately tolerant of smothering. It is a burrowing species that can switch between suspension and surface deposit feeding. It is thought to preferentially engage in suspension feeding, remaining buried in the sediment with its inhalant and exhalent siphons exposed. It periodically buries itself further in the sediment, respiring anaerobically often for one to seven days (although the longest recorded is 24 days) before returning to the surface **[Ref. 46]**. Another study **[Ref. 47]** also reported on the

abilities of buried fauna to burrow back to the surface, and confirmed that bivalves are able to burrow back up through 20 – 50 cm of overburden depending on species and substrate.

On the basis of this published research, the similarity between the proposed overtrawling activity to the commercial trawling undertaken over the CNS as a whole, and as overtrawling is not expected to result in deep burial, any impact to ocean quahogs at a population level is not likely to be significant.

5.1.3.2 Impacts from Existing Infrastructure Decommissioned In-Situ – Habitat Change

The following existing infrastructure will be left in place:

- 40-inch Saltire A to Piper B Bundle (6,690 m in length) surface laid and exposed (PL880-PL883);
- 26.5-inch Saltire A to Saltire WID Bundle (2,106 m in length) surface laid and exposed (PL897-PL899);
- 6-inch Chanter Oil/Condensate Flexible Flowline (10,675 m in in length), mostly trenched & buried with intermittent exposure at mid-line connections (PL847);
- Chanter Umbilical PL849 (10,790 m in in length), and East and West power cables (6,643 m and 6,621 m in length), trenched and buried; and
- Saltire A jacket footings (four footings, each measuring 22 m x 16 m).

The decommissioning activities will result in the introduction of approximately 0.0077 km² (Table 5.4) of new hard substrata in the form of rock-placement. There are no other existing lines or structures within the project infrastructure that are entirely rock-covered, although there are areas of existing rock placement for pipeline crossings in the area. Pre-existing hard substrata that have been in place for the life of the Saltire Area and which will be left in place include the steel footings of the Saltire A jacket (occupying a seabed area of approximately 0.003 km² - Table 5.1), and the two surface-laid steel pipeline bundles covering 0.09 km² (Table 5.2). The footprint of these new and pre-existing items together totals approximately 0.1 km².

While the rock cover in particular may be influenced or even partially covered by sediment via bedload transport over time, it is likely that the small amount of new rock cover will eventually support an epifaunal community typical of the scattered hard material already present in the area in the form of anthropogenic structures (e.g. mattresses, surface-laid pipelines) and natural material (e.g. shells or shell fragments and occasional stones). Survey work **[Ref. 15]** indicated this community includes anemones, barnacles, hydroid/bryozoan turf, brittlestars, soft corals (*Alcyonium digitatum*) and sponges. Given the existing footprint and the small introduction of additional substrate the impact on any benthic spawning fish habitat is expected to be negligible. The introduction of the proposed rock material, and the continuing presence of steel flowlines/footings, will not change the species typically present in the area as a whole in terms of either the epifauna or infauna.

There will be a small impact to the benthic community due to the infrastructure that is left *in-situ* taking up a footprint that would otherwise be available for colonisation by sediment fauna. The footprint of the material remaining *in-situ* will be approximately 0.4386 km² (Table 5.6) although most of this will be buried and it is only the jacket footings and surface-laid bundles that would have the effect of excluding surface communities. This area amounts to approximately 0.09 km² and is negligible compared to the available remaining sedimentary habitat area. Impacts from this mechanism are therefore expected to be negligible.

5.1.3.3 Impacts from Existing Infrastructure Decommissioned In-Situ – Material Degradation

A further impact to the benthos may occur as the structures degrade. Structural degradation of the bundles and jacket footings will be a long-term process caused by corrosion leading to eventual collapse under their own weight. During this process, degradation products derived from the exterior and interior of the bundles/pipelines/umbilicals and jacket footings will breakdown and potentially become bioavailable to benthic fauna in the immediate vicinity.

The Saltire A to Piper B Bundle multiphase pipeline will be filled with seawater, rather than inhibited seawater. This is because there is no intention to re-use the pipeline in future, and therefore no reason to prolong its integrity using chemicals that will subsequently be discharged into, and potentially have an effect on, the marine environment.

On the basis that the bundles/pipelines/umbilicals will have been flushed and cleaned prior to decommissioning, the primary degradation products will originate from the following components:

- Bundle/pipeline/umbilical and jacket leg contents (seawater and inhibited seawater);
- Pipeline scale containing naturally occurring radioactive material (NORM)[10];
- Steel;
- Sacrificial anodes (zinc and aluminium);
- Concrete; and
- Plastic coating.

The potential impacts associated with degradation products are summarised below. As the seawater used to fill the Saltire A to Piper B Bundle multiphase pipeline is a natural substance with no potential to cause environmental impacts, it is excluded from further assessment.

Inhibited Seawater

As the structures corrode, any inhibited seawater content will gradually become exposed to the overlying seawater and sediments through leak paths caused by corrosion and material breakdown over time. Contents release and mixing with ambient seawater, or sediments and pore-waters, will occur as a prolonged process involving small quantities at a time. The chemicals used in inhibited seawater will have been selected, permitted under the operational permitting system, and will be very similar to those used through all phases of the Saltire Area development. The following chemical types are generally present in inhibited seawater:

- Oxygen scavenger: these are typically classified as PLONOR[11] chemicals;
- Biocide: this would be the most toxic component which by the mode of action is designed to kill bacteria. By their mode of action biocides typically become deactivated (either within the pipeline or structure, or if released into the environment; **[Ref. 48]**;
- Scale Inhibitor: although not PLONOR-listed, scale inhibitors are typically low toxicity and present a low environmental risk; and
- Corrosion Inhibitor: these are typically surface-active chemicals (surfactants) which provide corrosion protection by forming a protective layer on the metal surface. This mechanism of action reduces the potential discharge to sea as it will preferentially remain on the metal surface.

The small scale and gradual nature of this type of release over a timescale in which the chemicals will have become degraded and ineffective (in terms of their original purpose) will mean that any impacts to biota in the vicinity will be negligible.

NORM

NORM-contaminated scale may be present in oil production wells, associated flowlines and in topsides pipework and processing facilities. Although the quantity of NORM in the topsides (being returned to shore) is known, the amount present in the bundles/flowlines is currently unknown quantification **[Ref. 1]**. The most significant radioactive element in NORM scale and produced water is radium, in particular the stable isotope 226Ra which has a half-life of 1,620 years **[Ref. 49]**. When scale precipitates from produced water, the radium in the water will sometimes be concentrated into

[10] Although NORM has been found to be present when breaking containment at Saltire A, the levels and volumes recorded are not unusual for an offshore installation in the North Sea, but further study work is needed to enable quantification **[Ref. 1]**.
[11] Posing Little Or No Risk to the environment

the scale at concentrations higher than those originally present in the water **[Ref. 50]**. 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 **[Ref. 49]**.

NORM scale discharged from offshore installations is insoluble in seawater and when produced water rich in barium and radium is discharged to sulphate-rich seawater, the radium precipitates rapidly as a complex of barium, radium and sulphate which is also insoluble. 226Ra therefore has a very low concentration in solution in seawater and has a low bio-availability to marine organisms. Dissolved cations in seawater, particularly calcium and magnesium, also inhibit the bioaccumulation of NORM **[Ref. 50]**. The quantities of this material are expected to be small and any release into the benthic environment would also be very gradual; available research indicates that the risk to the environment from such inputs is negligible **[Ref 50]**, but that the number of studies from which to draw conclusions is limited.

Metals

It is expected that metals will be released into the sediments and water column during the breakdown of the steel footings and pipelines, and sacrificial anodes (zinc and aluminium). The total quantity of metal to be decommissioned *in-situ* is approximately 12,374 tonnes of which 212 tonnes is non-ferrous (mostly zinc and aluminium from sacrificial anodes) **[Ref. 1]**. The concern is that metals have the potential to exert toxic effects in marine biota or to bioaccumulate through the food web. Metals can 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 in marine benthic organisms **[Refs. 51, 52]**.

In the CNS, seabed temperatures are consistently less than 10°C throughout the year, oxygen concentrations are fairly uniform and salinity is in the order of 35‰. Under these conditions corrosion rates for unprotected steel range between 0.1 to 0.2 mm/year **[Ref. 53]**, although corrosion could be slowed by protective coatings, sacrificial anodes, marine growth or burial, to 0.02 to 0.05 mm/year. Corrosion rates can be increased on a localised basis if metal pitting occurs, or where conditions permit attack by sulphate-reducing bacteria, to as much as 0.5 to 2 mm/year. Early estimates anticipated that failure of pipelines due to through-wall degradation would begin to occur after many decades - of the order of 60 to 100 years **[Ref. 54]**. More recent estimates suggest longer periods for jacket footings, pipelines, umbilicals and cables of potentially hundreds of years **[Ref. 55]**. This ties in with studies carried out for the Ninian North Platform jacket footings, in which failure and collapse due to corrosion were estimated to take place after 300 to 400+ years **[Ref. 56]**.

In a study of the impacts of aluminium sacrificial anodes on the marine environment **[Ref. 57]**, it was noted that anodic dissolution does not significantly increase the concentration of Al in the water, but that both enrichment and an increase in the mobility of Al were evident in sediments in the immediate vicinity. Sacrificial anodes generally have a 20 to 25-year design life **[Ref. 55]** and their protection is maintained through replacement over the operational life of structures and pipelines. Such maintenance and protection will cease for infrastructure decommissioned *in-situ*, the effect of which will be that inputs of metals such as zinc and aluminium from these sources will cease shortly after decommissioning while there could be corresponding increase in the rate of steel corrosion.

The metals released by corrosion are likely to form bonds with the particulates and sediments, making them less bioavailable to marine organisms **[Ref. 58]**. Along buried pipeline corridors and around the footings there may be accumulations of iron and other metals in the sediments localised to within a few metres.

As outlined in Section 3.3, the recorded concentrations of most metals in the Saltire Area may exceed background values typical of the CNS in the immediate vicinity of drill centres, but rarely approach the ERL values (where these are available) above which detectable adverse effects start to become apparent in toxicity assays or monitoring studies. The structures to be decommissioned *in-situ* have already been in place releasing metals for many years, and their degradation will continue slowly over decadal or centurial timescales **[Ref. 59]**. On this basis it is not expected that concentrations of

metals in water and sediments will build or accumulate significantly. In addition, trace metals are regulated in marine organisms and few have been shown to bioaccumulate significantly **[Ref. 58]**.

Overall, the slow release of the metals associated with the pipeline and jacket footings is expected to have a negligible impact on the local environment.

Concrete

None of the pipelines in the Saltire Area have concrete coatings but some concrete may remain on the seabed if any mattresses cannot be retrieved safely, together with the 353 tonnes of grout used to fix the Saltire A jacket piles (and those of the Saltire WID WHPU and the Chanter WHPU) in position during installation **[Ref. 60]**. Any remaining concrete will 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 present. Impacts on benthic fauna are likely to be negligible due to the small area impacted and reduce further over time as the coarse material is slowly covered by the fine sediment characteristic of the area.

Plastics

The Saltire Area bundles, pipelines and umbilicals incorporate plastic materials, estimated to total 436 tonnes **[Ref. 1]**. It is not possible to give an accurate timescale for the degradation of polymers used for umbilical/cable coating as they have not been in use in a seawater environment long enough for their complete degradation to be observed and recorded. In any case its degradation is expected to occur over many decades, or possibly centuries **[Ref. 61]**. Over time these materials are likely to gradually fragment and disperse as microplastics or even nanoplastics[12]. There is virtually no information on weathering of plastics at sea, especially those submerged in seawater or sediment beyond the direct influence of photo/ultraviolet degradation **[Ref. 62]**.

Plastics in general have been considered non-toxic in the marine environment **[Ref. 63]**. As no micro-organisms have evolved to utilise the chemically resistant polymer chains as a carbon source, plastics can be expected to persist in the environment for centuries **[Ref. 59]**. While there has been much reporting on the issue of plastics in the marine environment, particularly in recent years, very little is known about the fate and impacts of its breakdown products (e.g. **[Ref. 62]** and **[Ref. 64]**). Adverse effects of microplastics on marine organisms can potentially arise from physical effects, including the physical obstruction or damage of feeding appendages or digestive tract or other physical harm. In addition, it has been thought that microplastics can act as vectors for chemical transport into marine organisms causing chemical toxicity **[Ref. 62]**, although the results from some recent studies investigating this hypothesis appear to show that this is not the case **[Ref. 65]**.

The plastics within the inventory being decommissioned *in-situ* will be either contained with the bundles or trenched and buried or buried underneath rock cover so, once degradation becomes evident, it is likely to be many years before significant dispersal of breakdown products into the wider marine environment occurs. Globally, at least 8 million tons of plastic end up in the marine environment every year **[Ref. 66]**. Much uncertainty remains about the impacts of plastics in the marine environment; however, against global levels of input, and recognising the relatively small and very gradual inputs over an extended time period from the breakdown of plastics decommissioned *in-situ* in the Saltire Area, environmental impacts are expected to be small and not significant.

5.1.3.4 Disturbance of Drill Cuttings

As outlined in Section 2.3.4, the cuttings pile at Saltire A is 2,455 m³ in volume and has a maximum height of 2.4 m. The cuttings pile at the Saltire WID WHPU has a volume of 158 m³ and is up to 0.5 m high, while that at the Chanter WHPU is 78 m³ and is 1 m high. Survey work also shows that, since 2008, the volume of the pile at Saltire A has more than halved (from 5,838 m³ to 2,455 m³) while that at Chanter has also reduced in size over the same time period (from 2,148 m³ to 78 m³) **[Ref. 9]** and **[Ref. 10]**. There is no earlier data for the pile size at Saltire WID WHPU.

[12] Microplastics are sometimes defined as particles in the size range 1 µm to 5 mm, and nanoplastics as particles 1 nm to 1 µm.

Note that from hereon, this section does not discuss the Saltire A cuttings pile, as this will remain undisturbed during and following decommissioning operations as a result of leaving the jacket footings in place. This section focuses on disturbance of the Saltire WID WHPU and Chanter WHPU cuttings piles.

The main mechanism of disturbance for the cuttings piles at the Saltire WID WHPU and Chanter WHPU is expected to be the dredging or jetting operations required to expose and remove these structures, the cut locations associated with the WHPU are assumed to be within the same footprint as the dredging operations so any disturbance associated with the cutting operation is captured by the dredging disturbance.

As a worst case, these operations are likely to result in re-distribution of the entire cuttings pile contents, along with entrained contaminants. Further disturbance may subsequently occur during decommissioning-related overtrawl surveys. Following the completion of decommissioning operations, the area will be opened to commercial fishing activity and additional disturbance due to commercial trawling may occur.

Cuttings Disturbance as Part of Subsea Structure Removal

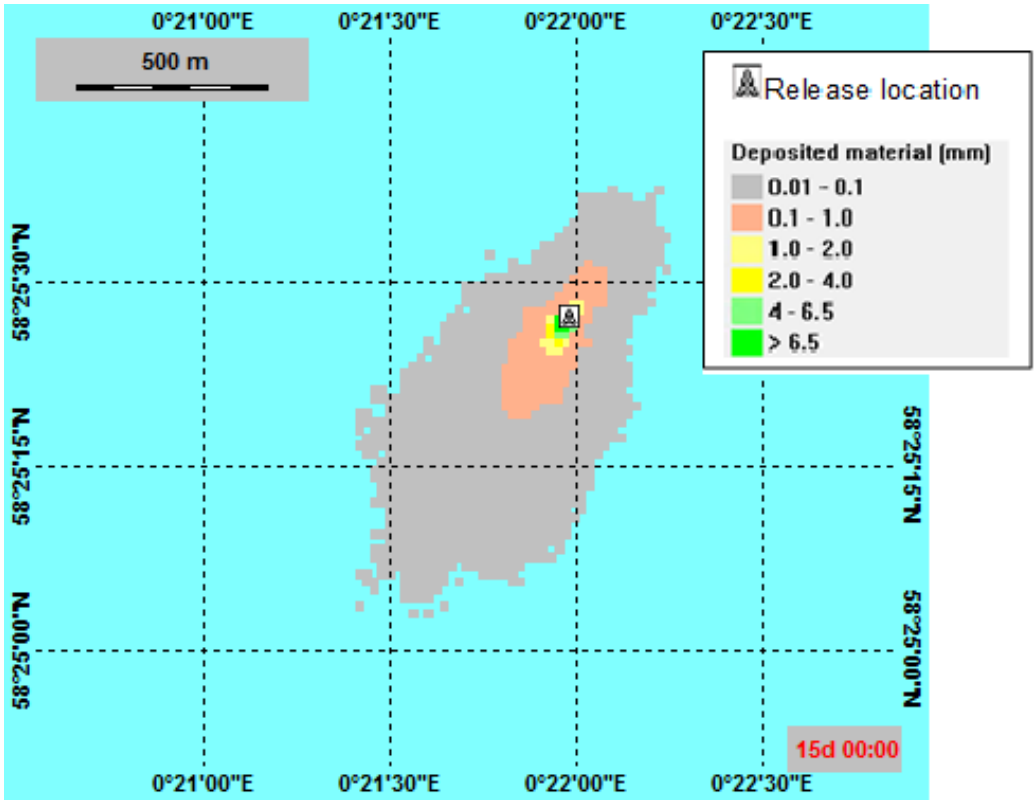
The fate and effects of discharges from disturbing the cuttings piles, potentially necessary to externally cut structures free of the seabed were modelled for the Saltire WID WHPU and Chanter WHPU locations. Sintef's DREAM (Dose-related Risk and Effect Assessment Model) software was used, along with input data from recent sampling of the piles, to predict the effect of particulate materials discharged to the marine environment and also calculate risk to the environment using a metric known as the Environmental Impact Factor (EIF). Full details of the modelling approach, inputs and results are provided in **[Ref. 67]**.

Complete disturbance of the entire cuttings pile volume was assumed at both locations, with cuttings material assumed to be extracted from the piles by a suction dredger and discharged near the seabed 50 m south of the extraction point through a 150 mm hose at a rate of 60 tonnes per hour.

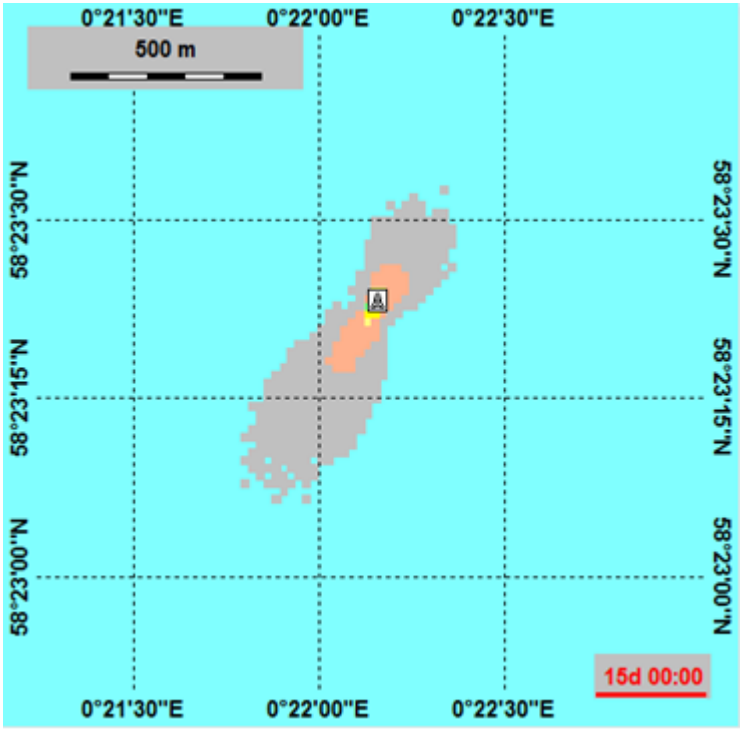
Modelling results are summarised in Figure 5-3 and indicated that the maximum thickness of solids deposition would occur within 25 m (Saltire WID) and 20 m (Chanter) from the discharge point. Maximum thickness of deposited material was predicted to be 304 mm at Saltire WID WHPU and 69.7 mm at Chanter WHPU. The thickness of deposited material reduced rapidly with increasing distance from the discharge point; deposit thickness reduced to less than 0.1 mm within 300 m (Saltire WID WHPU) and 215 m (Chanter WHPU) along the main axis of tidal movement. THC levels in the re-settled cuttings material were not expected to exceed the OPSAR 50 μgg^{-1} biological effects threshold in either scenario. This means that sediment contamination levels around each of these drill centres should not be increased or spread significantly beyond currently mapped levels by the dredging activities. Therefore the areas of seabed within which THC levels exceed 50 μgg^{-1} (see Table 2.5, and Section 3.4.2 for the Saltire WID WHPU and Section 3.4.3 for the Chanter WHPU) will not be enlarged beyond the existing 0.01 km^2 footprints, and existing levels of environmental impact should not be made worse.

Figure 5-3: Thickness of Deposited Material Following Cuttings Pile Disturbance for a) Saltire WID WHPU and b) Chanter WHPU

a)



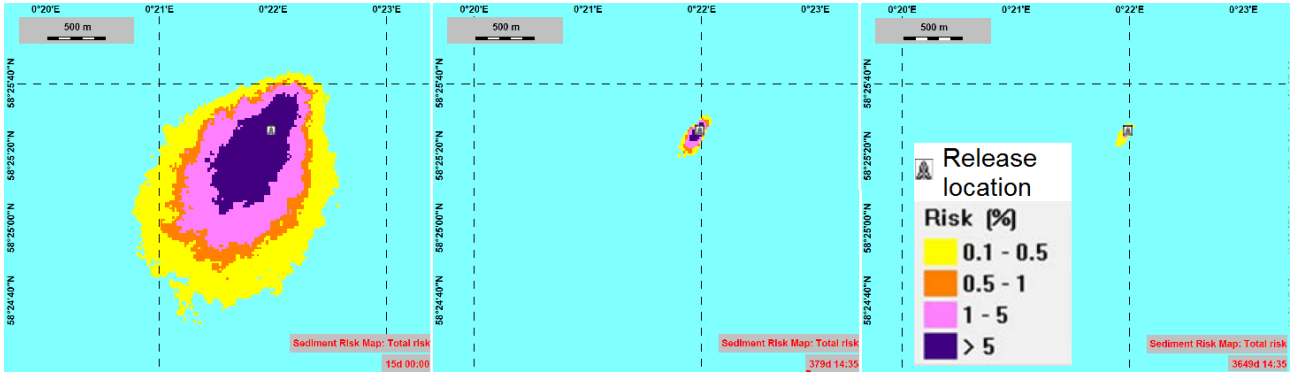
b)



The risk to the seabed sediments[13] from toxicity, oxygen depletion, grain size change and burial thickness have been modelled and are presented for the Saltire WID WHPU in Figure 5-4 and for the Chanter WHPU in Figure 5-5, where the shape of the risk contours generally reflect the depositional pattern. These figures also shows the recovery of the seabed over time, at one year and ten years following the activity.

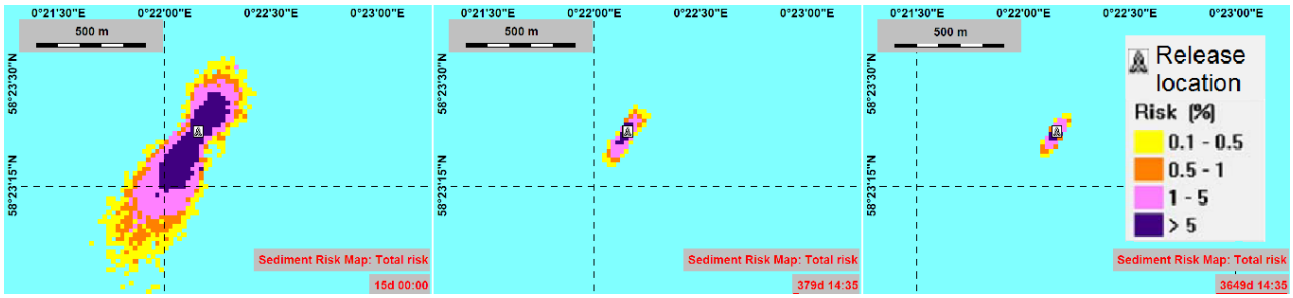
Immediately following the excavation discharges, the Environmental Impact Factor (EIF) for the sediment at the Saltire WID WHPU is predicted to be 58 and this represents an impact over an area that is approximately 0.58 km². This is predicted to decrease rapidly to an EIF of 1.16 by one year over an area of 0.014 km², and then to an EIF of 0.24 over 0.0024 km² within 10 years.

Figure 5-4: Risk to Seabed from Dredging Discharges for Saltire WID WHPU (Left: Immediately Following Discharge; Centre 1 Year Later; Right: 10 Years Later)



At the Chanter WHPU, the picture is predicted to be similar in terms of size and recovery, with a maximum EIF of 6.4 over an area of approximately 0.064 km². This decreases to 0.44 after one year (0.0036 km²) and 0.28 after 10 years (0.0028 km²).

Figure 5-5: Risk to Seabed from Dredging Discharges for Chanter WHPU (Left: Immediately Following Discharge; Centre 1 Year Later; Right: 10 Years Later)



The largest contribution to the risk level (almost 100%) arises from oil toxicity in the cuttings pile, together with the barite weighting agent (a non-reactive weighting agent added to drilling fluids). It must be noted, however, that this impact is taking place within an area where the fauna has been subject to the same impacts since drilling commenced in the 1990s and has been modified for two decades to date.

In the water column, the discharge plume is predicted to move around the discharge points with the currents. The water column risk of >5% extends to approximately 2.5 km and 2.3 km from the modelled discharge for Saltire WID WHPU and Chanter WHPU respectively. The impacted volume of the water column remains within about 32 m of the seabed for the scenarios at both locations; the upper water column is not therefore predicted to be at risk. The water column within the modelled area is predicted to return to levels <5% risk within 5 days of commencing operations for the Saltire

[13] In most consenting regimes, risks <5% as calculated by the DREAM model are considered acceptable, with limited effect and a high expectation of recovery, and changes in the ecosystem may in many cases be undetectable. Where the risk is >5%, risks are potentially significant and should be investigated and justified.

WID WHPU and within 3.5 days for Chanter WHPU. The maximum water column EIF of 499 occurs after 2.1 days for the Saltire WHPU and 621 after 3.4 days for Chanter WHPU.

The sources of risk to the water column were predicted to be a mixture of toxicity risk from oil, and from the fine suspended solids - most of which will be transported out of the modelled area to contribute to background levels of suspended particulates in the water column. It can be noted that risks of this type and magnitude resulting from particulate stress in the water column are routine as a result of consented discharges of water-based muds and cuttings.

While indicative of the potential environmental impacts that could occur associated with the cuttings pile disturbance at Saltire WID WHPU and Chanter WHPU, the DREAM model is expected to be conservative in its predictions of environmental risk **[Ref. 67]**. A review of the observed impacts observed during actual cuttings pile dredging operations presented by OSPAR **[Ref. 68]** provides further context on the likely environmental impacts following disturbance of the Saltire WID WHPU and Chanter WHPU cuttings piles and is summarised below (note also that the OSPAR study was dealing with cuttings piles much bigger than those at Saltire WID WHPU and Chanter WHPU):

- For comparison, the North West Hutton platform cuttings pile was approximately 30,000 m^3 and consisted of 48% rock, 45% seawater and 7% oil/other chemicals used during drilling operations.
- Dredging of the North West Hutton platform cuttings pile including repeated dredge back-flushes resulted in significant re-suspension of cuttings material, which showed:
    - Drifting of re-suspended material was low during operations.
    - Hydrocarbon concentrations on dredged cuttings were similar to those on undisturbed cuttings, and whilst levels of alkylphenol ethoxylates and barium were higher in the dredge-recovered water at the platform topsides, hydrocarbon levels in the water remained low, indicating that the majority of hydrocarbons remained bound to the cuttings and did not become free in the dredged water.
    - Corroborating the above, hydrocarbons were not increased significantly in the seawater samples from monitoring stations as a result of the dredging, and there was no detectable oil in the plumes generated during the trial.
    - There were no visible indications of an oil sheen at the surface, and little discernible effect was seen in the water column more than 100 m from the dredging operations.
- Use of high-pressure water jets to clear OBM cuttings from the Hutton Tension Leg platform, causing significant re-suspension of cuttings, had no major effect on the spatial distribution of cuttings contamination, or on biological communities outside 100 m from the original platform location.

The investigations at North West Hutton and the Hutton Tension Leg Platform suggest that seabed and water column impacts resulting from drill cuttings disturbance can be expected to be minimal, and the majority of hydrocarbons present would remain bound to the cuttings **[Ref. 69].** On the basis of the DREAM modelling results and the observed cuttings disturbance exercises recorded in **[Ref. 67]**, the potential impact on receptor groups is expected to be low; this is described for the key groups in Table 5.7.

Table 5.7: Potential Impacts on Receptor Groups Due to Disturbance of Drill Cuttings

Receptor group and discussion of potential impact
Plankton
[Ref. 69] cites a number of sources indicating the impacts of drill cuttings discharge on plankton are negligible. Recorded deleterious effects on phytoplankton are generally attributed to light attenuation due to suspended solids. The majority of the disturbed material is expected to re-settle rapidly. Modelling indicated that impacts on the water column would cease within 5 days of the discharge occurring, which is expected to be a conservative estimate. No significant impacts on plankton are expected.
Benthic fauna
Whilst disturbance of the Saltire WID WHPU and Chanter WHPU cuttings accumulations will cause spreading of contaminated material over a small additional area, it is unlikely to result in significant toxic effects, especially when considering that similar disturbance events (such as described above) have been actively investigated for environmental impacts and have been found to have no discernible effect on the spatial distribution of cuttings contamination, or on biological communities located more than 100 m from the disturbance location **[Ref. 68]**. *Burying* **[Ref. 69]** reports a threshold drilling fluid/cuttings burial depth causing mortality of benthic organisms of 6.5 mm. Simulation of Saltire WID WHPU and Chanter WHPU cuttings pile excavation indicated that the thickness of re-settled cuttings layers exceeding 6.5 mm would be restricted to within 50 m to 100 m of the discharge point **[Ref. 67]**. These discharges would be occurring on relatively undisturbed sediment outside the original cuttings pile boundaries and would therefore be expected to have some impact on the benthic fauna through burying. Given the homogenous benthic community in the area, and the extensive area of similar habitat available, these effects are not expected to be significant at the community level. *Anoxia* In addition to toxicity and burial, drill cuttings can impact the benthos through anoxia caused by a combination of organic enrichment (which increases the biochemical oxygen demand) and through introduction of fine sediments (which restricts oxygen penetration into sediments). Modelling, corroborated by the observations in OSPAR **[Ref. 68]** indicated that the area experiencing thick re-settlement of cuttings material will be restricted to within approximately 50 - 100 m of the discharge point. Coarse or consolidated material is likely to sink to the seabed immediately upon discharge and form a mound very close to the discharge point, and it is likely that the seabed under this mound will become anoxic due to the formation of an oxygen barrier and organic enrichment. Finer material is likely to re-settle progressively further from the discharge point. Fine, unconsolidated material will settle gently and therefore there is likely to be oxygenated water in the pore spaces initially. Settled material in this zone is not expected to form an effective barrier to oxygen penetration from the surrounding seawater. In addition, the act of re-suspension is likely to partially re-oxygenate the material. The material settling outside the mound at the discharge point is not likely to be thick enough to kill the infauna, which is expected to burrow back to the surface and assist in re-working the sediment. **[Ref. 68]** suggests that spreading of cuttings material will encourage aeration and degradation of cuttings material. *Conclusion* It is likely that a small area within a few metres of the discharge point will be covered with coarse and consolidated material, and this area may well exhibit death of the infauna from burial, as well as anoxia caused by organic enrichment and prevention of oxygen penetration. Observable impacts due to burial of the infauna may extend up to 50 - 100 m from the discharge point, although anoxia is not expected to extend this far, since recolonization of the sediment as well as the survival of sediment re-workers that are better able to withstand burial is expected to allow the reworking of the sediment and the prevention of oxygen barrier formation in all but the thickest deposits. While there may be a small but longer-lasting impact on the benthos very close to the discharge point, the area impacted is negligible given the area of similar habitat available in the vicinity. No significant impacts are expected at the community level.
Fish
The cuttings pile sediment may be toxic since hydrocarbon concentrations at several survey stations exceeded the OSPAR ecological effects threshold of 50 $\mu g g^{-1}$. However, **[Ref. 68]** indicates that hydrocarbons are likely to remain bound to sediments rather than become free in the water column and therefore pathways for toxic components into fish are likely to be limited. The most significant effect on fish is likely to be interference with feeding behaviour due to increased sediment load in the water column. The ability of fish to forage or hunt may be impaired by increased suspended sediment. Some fish may move away from the disturbance area, thus interrupting their feeding. Increased sediment load as a result of the proposed activities is expected to be short-term and is insignificant when compared to the sediment disturbance caused by commercial trawling activity in the area. For this assessment, shellfish are considered to be part of the benthic fauna and are included in the assessment above.
Seabirds
The most familiar effect of oil pollution on seabirds is the contamination of plumage, resulting in flightlessness and lack of insulation, compounded by ingestion of toxins through preening during attempts to remove contamination. The decommissioning of the Hutton Tension Leg Platform and the large-scale disturbance of the cuttings accumulation resulted in no visible surface sheen. It is therefore highly unlikely that decommissioning activities at the Saltire WID WHPU and Chanter WHPU cuttings accumulations will result in any hydrocarbon contamination at the surface. It is anticipated that there will be no effect on seabirds from disturbance of the cuttings accumulation.
Marine mammals
There is little published data available on the impacts of synthetic-based fluids on marine mammals. **[Ref. 9]** indicates toxic components of the drilling fluids are still present in the cuttings piles at concentrations exceeding background. Modelling predicted that sediment raised into the water column would either re-settle or be distributed to sub-toxic concentrations within 5 days of the release terminating. As such, marine mammals in the area will experience minimal exposure and significant impacts are not expected.

Cuttings Disturbance as Part of Overtrawling Post-Decommissioning

Overtrawl surveys following the removal of seabed infrastructure are likely to further disturb cuttings material that has been re-distributed by dredging or jetting at the WHPUs. Any overtrawling that might take place over all or part of the dispersed cuttings pile material will involve a lesser degree of physical disturbance. Also, any overtrawling of the WHPU cuttings piles would be occurring in the context of earlier dredging or jetting disturbance having recently taken place around the piles at the WHPUs prior to their removal.

The modelling results indicated that the effect of the dredging discharges at the seabed would be largely confined to small central areas around the Saltire WID WHPU and Chanter WHPU that had already been subject to impacts from the original drilling discharges. On this basis, it is likely that any potential overtrawling would disturb smaller proportions of each of the WHPU cuttings piles than those predicted to occur from dredging activities, and that impacts would cover smaller areas and pose less risk to the environment.

At the Saltire A platform, any overtrawling around the location would be limited by the presence of the jacket footings decommissioned *in-situ*.

Modelling conducted by DNV (reported in **[Ref. 68]**), undertaken as part of wider research on the potential impact of drill cuttings being left *in-situ*, estimated that trawling a medium sized oil-based cuttings pile would disturb only the top 20 cm of material. Of that disturbed sediment, 96.7% would immediately re-settle without becoming suspended in the water column. Some 3.3% of the top 20 cm of the drill cuttings would become suspended, with 2.47% re-settling within the existing accumulation area and only 0.83% of the top 20 cm re-settling outside of the existing accumulation area. Using the DNV modelling results reported in **[Ref. 68]**, it is possible to estimate the effects of overtrawling the Saltire WID WHPU and Chanter WHPU cuttings accumulations as follows. Note that the as-surveyed (pre-dredging/jetting) accumulation dimensions have been used as there is no way to know the dimensions of the accumulations post-dredging:

- The Saltire WID WHPU cuttings accumulation has an area of approximately 757 m^2 and the Chanter WHPU accumulation has an area of approximately 655 m^2. Assuming as a worst case that both accumulations were trawled to a depth of 20 cm, a total volume of 282 m^3 of material would be disturbed;
- Of this, 273 m^3 would resettle immediately without becoming suspended and 7 m^3 would become suspended and re-settle within the existing cuttings accumulation; and
- Only 2.3 m^3 would become suspended and settle outside the existing cuttings accumulation boundaries.

The estimates above indicate that the degree of disturbance expected due to overtrawling is much smaller than that expected from dredging/jetting of the Saltire WID WHPU and Chanter WHPU. The dredging impacts at these locations were localised in extent and not significant. Impacts from smaller scale overtrawling disturbance are therefore also expected to be negligible.

Cuttings Disturbance as a Result of Saltire A Footings Collapse

At some point following decommissioning, the Saltire A jacket footings will fail and collapse due to corrosion, and there is the potential for this to result in disturbance to the cuttings pile beneath. As outlined in Section 5.1.3.3, there are no exact predictions for how long the Saltire A jacket footings will remain standing, but estimates suggest collapse is likely after several hundred years.

Consideration also needs to be given to the likely persistence of the cuttings pile and status of oil based mud contamination at the time of footings collapse. The conclusion from the UKOOA JIP on cuttings piles longevity was that the presence of significant contamination is likely to be measured in decadal timescales, e.g. 10 to 50 years in water depths of around 70 m, but at centennial timescales of 500 to 1,500 years for water depths of more than 120 m **[Ref. 12]**. The Saltire Area, in the CNS at 140 - 146 m, may be closer to the centennial timescales predicted. It is therefore debatable whether significant contamination will be present after the timescale for failure and

collapse of the footings. However, combined with the evidence from monitoring and modelling studies conducted for physically larger levels of disturbance (as outlined above) significant impact is unlikely. It is likely therefore that cuttings pile disturbance from any dredging, jetting and overtrawling procedures, as assessed above, represent greater sources of concern.

5.1.4 Indirect Disturbance Due to Sediment Suspension and Re-Settling

Removal of infrastructure from the seabed, trenching activities, deposition of new protection material and subsequent overtrawling will cause sediment disturbance and re-distribution in the local area. The significant majority of any area of impact resulting from the settlement of sediment plumes is likely to arise from overtrawling (Table 5.6). As determined in the modelling study undertaken for jetting or dredging around the cuttings piles here **[Ref. 67]**, most of the sediment disturbed will re-settle within the existing area of direct disturbance, but if it is assumed that some will land within an additional 100 m wide peripheral area around the margins (along the pipeline routes and around the 500 m safety exclusion zones), this would amount to a total area of approximately 5.2 km² indirectly impacted by the settling of sediment raised by decommissioning activities. Combined with the total area of direct impact as presented in Table 5.6, this amounts to a direct plus indirect impacted area of 11.8 km².

Sediments that are redistributed and mobilised as a result of the proposed decommissioning activities will be transported by the seabed currents before settling out over adjacent seabed areas. The creation of higher than normal loads of sediment suspended in the water column, and the subsequent re-settling of that sediment has the potential for negative impacts on habitats and species through burial and/or smothering. This may particularly affect epifaunal species **[Ref. 70]** with the degree of impact related to individuals' ability to clear particles from their feeding and respiratory surfaces (e.g. **[Ref. 71]**). However, Defra **[Ref. 72]** states that impacts arising from sediment re-suspension are short-term (generally over a period of a few days to a few weeks). In addition, infaunal communities are naturally habituated to sediment transport processes and are therefore less susceptible to the direct impact of temporarily increased sedimentation rates.

These impacts on benthic habitats and species will be localised and are not expected to result in significant changes to the benthic community in the short or long-term.

5.1.5 Mitigation Measures

Rock placement will be undertaken using a vessel with a flexible fall pipe, assisting with positional accuracy and controlling the spread of the material. Additionally, the localised dredging/jetting undertaken to enable recovery of infrastructure on the seabed will be highly targeted and controlled by diver or ROV. No vessel anchoring is planned during decommissioning operations.

Disturbance of the cuttings piles during decommissioning operations is expected to occur during the removal of the Saltire WID WHPU and the Chanter WHPU and from overtrawling, but also to an undefined extent from future fishing activity. Repsol Sinopec Resources UK Limited will ensure that data is made available to enable the cuttings piles to be marked on Kingfisher charts and FishSAFE plotter files. This will highlight the presence of the cuttings piles to fishermen and assist in reducing the frequency of trawling interactions (over which time the cuttings piles will continue to naturally degrade). In addition, leaving the Saltire A jacket footings in place will eliminate any disturbance of cuttings through foundation removal, and at the same time minimise any cuttings disturbance through overtrawling. It is likely that the activities potentially causing the most disturbance to the cuttings piles may speed up recovery of the seabed in the longer term.

5.1.6 Cumulative Assessment

Other oil and gas surface installations in the vicinity of the Saltire Area include the Piper B platform the Tartan A platform and the Scott platform (Figure 3-10). However, there are no major infrastructure projects ongoing at these developments that could create a cumulative impact with Saltire Area Decommissioning. Due to the distance between the Saltire Area decommissioning activities and other decommissioning projects that are planned or ongoing in the North Sea (for

example, Repsol Sinopec UK Limited's Auk, Fulmar and Auk North and Beatrice decommissioning projects) and the predicted localised effects on the seabed, a cumulative impact in terms of direct overlap (and possible intensification of impacts to the seabed) will not occur.

The seabed area affected by infrastructure removal from the Saltire Area will mostly coincide with the areas that were disturbed during the initial construction, installation and operational phases of the developments. In addition, the decommissioning activities proposed will reduce the footprint of infrastructure on the seabed – both within the Saltire Area and in relation to the oil and gas industry seabed footprint in the region overall. Overall therefore it is considered that this decommissioning will result in a reduction of impact to the seabed from the oil and gas industry in the region and the North Sea in additive terms.

The scale of these impacts is small when compared to other subsea activities in the North Sea involving seabed disturbance such as commercial trawling. A commercial trawler with a 15 m-wide beam trawl trawling at 4 km/h would take approximately 110 hours to cover the maximum area that will potentially be overtrawled during the proposed decommissioning operations. Maximum annual fishing effort in ICES rectangle 45F0 between 2013 and 2017 was 1,282 days, or 30,768 hours (in 2017), with all fishing effort comprising trawling. While the available data does not break down this effort into demersal and pelagic trawls, approximately 76% of the value of the catch (and 36% of the total tonnage) was of shellfish or demersal fish species **[Ref. 32]**, indicating a large proportion of fishing effort was demersal trawling. The commercial trawling activity in the region may also mean that the small areas of seabed disturbed by decommissioning activities will return to a similar state to the surrounding seabed over a shorter timescale. In this context, the proposed overtrawling activity is small compared to the level of commercial trawling in the area. In addition, and unlike the continual trawling effort in the area, overtrawling activity for decommissioning will occur once and will not be repeated.

5.1.7 Transboundary Impact

The decommissioning activities are located approximately 65 km west of the UK/Norway transboundary line. As discussed in the quantification of direct plus indirect impacts (Sections 5.1.3 and 5.1.4 respectively), impacts from the proposed operations will be confined to a total estimated area of 11.8 km² concentrated along pipeline routes and around cuttings piles within the Saltire Area. As such, transboundary impacts are not expected.

5.1.8 Protected Sites

The nearest protected site to the proposed operations is the Scanner Pockmark SAC located 38 km to the south-east. Direct seabed impacts are not expected to extend more than 100 m from the disturbance location with any associated fallout of particles within the a few kilometres of the disturbance, as such, decommissioning activities within the Saltire Area are not anticipated to have any significant impacts on protected sites.

5.1.9 Residual Impact

The residual impact to seabed habitat and benthic communities due to the planned decommissioning activities is summarised in Table 5.8.

Table 5.8: Residual Impact to Seabed Habitat and Benthos

Receptor	Sensitivity	Magnitude
Direct disturbance to seabed and benthic communities	Medium	Minor
Impact of items decommissioned *in-situ* resulting in habitat change	Medium	Minor
Impact of long-term degradation of structures left *in-situ*	Medium	Negligible
Direct disturbance to cuttings piles	Medium	Minor
Rationale		
Decommissioning activities at the Saltire Area will cause a physical disturbance to the local seabed environment through subsea infrastructure removal and overtrawling. The predicted level of direct physical disturbance amounts to 0.0317 km² excluding overtrawl surveys and 6.7404 km² all included. Including the area around this within which indirect impacts from peripheral settlement of sediment plumes are expected (5.4095 km²), this amounts to a total impacted area of 12.1702 km². Most impacts from seabed disturbance are expected to be limited to the Project area and immediate surroundings, and are therefore very localised. No nationally or internationally important receptors such as the ocean quahog or the habitat 'sea-pens and burrowing megafauna communities' are expected to be affected significantly. This impact is temporary, with recovery of the seabed fauna expected within five years or so. The sensitivity of the benthos receptor to physical disturbance proposed is assessed as medium, and with an impact magnitude of minor the significance of physical disturbance-related impacts comes out at low. In spatial terms, the area of hard substrata to introduced by the decommissioning activities amounts to 0.0077 km² of rock cover, together with 0.093 km² of infrastructure in place since the early 1990s, and now to be decommissioned *in-situ* (jacket footings 0.003 km² and surface-laid pipeline bundles 0.09 km²). Habitat change due to hard substrata (which is also occupying natural sedimentary habitat) constitutes a long-term impact; however, it is very small and localised in scale and the proposed rock material and the continuing presence of steel flowlines/footings will not result in significant change to the types of benthic fauna typically present in the area. The sensitivity of the benthic fauna and habitats present is medium, and the impact magnitude minor, resulting in the significance of habitat change impacts being rated low. From the brief overviews given above for each of the material types to be left *in-situ* following Saltire Area Decommissioning, degradation and component release will take place gradually over tens to hundreds of years, at rates which mean that none will build up, bioaccumulate or reach levels that are intrinsically harmful to the marine environment. Methanol and gas pipelines coated with 3 Layer Polyethylene (3PLE) and Fusion-bonded Epoxy (FBE). 3PLE and FBE are considered non-toxic in the marine environment **[Ref. 63]**. However, as no micro-organisms have evolved to utilise the chemically resistant polymer chains as a carbon source, these plastics can be expected to persist in the environment for centuries **[Ref. 59]**. As biodegradability in the marine environment is also low, it can be assumed that the environmental effect of leaving these plastics in place is insignificant **[Ref 58]**. Due to the highly localised nature of any degradation products and the low concentrations of contaminants being released over an elongated period it is highly unlikely that these products will be detectable above current background conditions in the area given proximity to production assets. As a result, no likelihood of significant effect is expected to any designated sites. The sensitivity of the benthos receptor to physical disturbance proposed is considered medium, but the magnitude of impacts is likely to be negligible giving an overall impact significance level of low for materials degradation. Regarding disturbance of drill cuttings, decommissioning activities are not predicted to cause existing levels of benthic impact and contamination to increase or worsen; levels of contamination are likely to remain similar to the current status quo, and disturbance effects could even speed up the long-term process of recovery. The size of area affected either on the seabed or in the water column is small, very transient and remains within the areas currently affected both by drilling discharges as well as field infrastructure. Sensitivity is medium for the fauna present, and with an impact magnitude of minor, significance of drilling mud related impacts comes out at low. The resulting significance for all impacts to the benthic environment assessed is low.		
Impact significance		
Low		

5.2 Other Sea Users

5.2.1 Introduction

The proposed decommissioning activities have the potential to impact upon other users of the sea. This may happen during the decommissioning activities themselves or after decommissioning should any infrastructure decommissioned *in-situ* interact with activities such as fishing. Through the EA process, the following issues were considered as potentially having a significant impact on other sea users:

- Physical presence of subsea infrastructure and Saltire A jacket footings decommissioned *in-situ*; and
- Physical presence of cuttings piles at the Saltire A platform, Saltire WID WHPU and Chanter WHPU.

5.2.2 Description and Quantification of Impact

5.2.2.1 Long Term Physical Presence of Subsea Infrastructure Decommissioned In-Situ

The long-term presence of subsea infrastructure decommissioned *in-situ* has the potential to interfere with other sea users that may use the area. However, as described in Section 2.3.3, The Chanter flexible oil/condensate pipeline and the trenched and buried power cables will all be left trenched and buried and therefore not exposed to other sea users or fishing gear.

The Saltire pipeline bundles will be left surface-laid for their full length and there is no interaction expected with other sea users as the bundles themselves and any rock placement over the lines will be left overtrawlable.

Up to 20 m sections will be removed from the ends of each pipeline/umbilical or cable, leaving some of the ends exposed (as described in Section 2.3.3). In the case of the Saltire pipeline bundles that are surface laid and exposed, the cut ends will receive localised rock placement that will stand proud of the seabed. Trenched and buried pipelines, umbilicals and cables will be cut at the ends and these, together with any exposures or free spans, either trenched to below the seabed or rock-covered and profiled to be level with the surrounding seabed.

As outlined in Section 2.3.3, those mattresses and grout bags that are inaccessible (e.g. beneath pipelines that are being decommissioned *in-situ*) or which cannot be recovered safely will potentially be left in place. Where mattresses/grout bags cannot be safely recovered due to degradation, Repsol Sinopec will consult with OPRED before any alternative option is executed. These will be few in number; those that are inaccessible will by their nature not pose any snag risk to other sea users, either because they are beneath pipelines that are overtrawlable, or will be subject to the same trenching and burial or rock cover protection measures as the pipelines/pipeline ends with which they are associated. Any mattresses that are unsafe or cannot be removed (e.g. due to the rope links between concrete elements being worn and broken) will also be few but might be located in more open situations. Mattresses are designed to be overtrawlable, so isolated examples or their constituent parts on the seabed should not present a significant hazard.

Mattress removal procedures will be developed by the decommissioning contractor when appointed, including consideration of safe working practice. If mat degradation has occurred such that the product is fragmented but safe to access / remove, there are potential measures that could possibly be adopted such as collecting fragments and depositing in baskets suitable for subsequent recovery. The physical presence of the pipelines decommissioned *in-situ* and localised rock placement will not result in any increase to the existing potential for interaction with fishing gear. However, the removal of the 500 m safety exclusion zones at Saltire A, together with the Saltire WID WHPU and Chanter WHPU locations, will open these areas up to trawling interactions.

5.2.2.2 Long Term Physical Presence of Cuttings Piles and Platform Infrastructure

As described in Section 2.3.4, cuttings piles containing oil-based drilling muds are present at the Saltire A, Saltire WID WHPU and Chanter WHPU locations. The pile at the Saltire A platform is

estimated to have an area of approximately 6,580 m², while the piles at the Saltire WID and Chanter WHPUs are smaller at 757 m² and 655 m², respectively.

The current 500 m safety exclusion zones in place at Saltire A, the Saltire WID WHPU and the Chanter WHPU will be removed following decommissioning. This will allow access to areas that have been excluded to other sea users over the operational life of the fields. This also opens the potential for interaction between trawl nets and the drill cuttings piles, which could cause oily contamination and damage to gear, catch tainting and result in the spread of contamination over the seabed. With the Saltire A footings remaining *in-situ*, fishing would be excluded from this small area. In the context of the return of the 500 m zone to fishing, this would mean that the central ~1% of the 500 m zone would effectively remain inaccessible. It is also important to note that the hydrocarbon content of the cuttings piles will decline over time; the most recent Fugro survey cuttings piles surveys **[Ref. 9]** and **[Ref. 10]** confirmed that the drilling fluids present in the cuttings piles were relatively weathered. As each year passes, the hydrocarbon content of the cuttings piles will decline **[Refs. 9, 10]** and the potential for impact on fisheries will also decline.

The decommissioning option selected for the Saltire A platform is for the jacket above the footings and the topsides to be removed leaving the jacket footings in position. Any jacket substructure left in position will represent an ongoing snagging hazard. There is the also the potential for fishing gear to interact with the drill cuttings piles, also to be left *in-situ*[14], since the removal of the Saltire WID WHPU and Chanter WHPU is likely to open access to these piles (see Figure 2-2, Figure 2-3). This could pose risks to other sea users and the environment as outlined above in the case of the Saltire A platform cuttings pile.

The removal of the 500 m safety exclusion zones in the Saltire Area and opening access to these areas is seen as positive.

5.2.3 Mitigation Measures

A number of mitigation measures will be employed to eliminate or minimise the impact on other sea users:

- The minimum water depth over any remaining Saltire and Chanter infrastructure following decommissioning will be in excess of 55 m, as required by International Maritime Organisation (IMO) guidelines **[Ref. 73]** to allow adequate clearance for all other sea users;
- The Saltire and Chanter infrastructure is currently shown on Admiralty charts and the FishSAFE system. Once decommissioning activities are complete, information will be made available to allow Admiralty Charts and the FishSAFE system to be updated and all changes, including the ongoing presence of the Saltire A jacket footings, to be notified to fishermen and other sea users;
- Following decommissioning, surveys and debris searches will be conducted as part of a programme to ensure a safe seabed is left for other sea users. This may include overtrawling trials, to be conducted within the 500 m safety exclusion zones of former installation and WHPU locations and within a 100 m corridor (50 m each side) of pipelines/umbilicals/cables decommissioned in-situ as required or as necessary;
- Independent verification of seabed clearance will be obtained;
- Repsol Sinopec Resources UK Limited recognises its commitment to monitor any structures decommissioned in-situ and will make arrangements to undertake post-decommissioning monitoring. The type and frequency of monitoring required will be determined through a risk-based approach and agreed with OPRED. During the period over which monitoring is required, the status of the infrastructure decommissioned in-situ would be reviewed; and
- Post-decommissioning monitoring will include benthic environmental survey work to review the ongoing recovery and ongoing condition of the cuttings piles. The scope, specification and frequency of this monitoring will be agreed with OPRED and stakeholders.

[14] The cuttings piles at the WHPUs will be dispersed during decommissioning activity.

5.2.4 Cumulative Assessment

Considered alongside the low levels of fishing and shipping activity in the vicinity of the Saltire Area, the wide expanse of offshore water available for navigation, and the overtrawlable decommissioned infrastructure (other than the Saltire A jacket footings for which navigational details will be notified to the UK Hydrographic Office and to the fishing industry), it is not anticipated that there will be any significant cumulative impacts with respect to the long-term presence of decommissioned subsea infrastructure.

All infrastructure will be decommissioned *in-situ* in an overtrawlable condition, apart from the Saltire A jacket footings, and monitoring will be conducted to ensure the infrastructure decommissioned *in-situ* remains overtrawlable. Where decommissioned infrastructure becomes exposed, remedial action will be undertaken where required to ensure no further snagging risks. In terms of the scale of the decommissioning activities with regards to other sea users, there are estimated to be 457 safety zones in the UKCS **[Ref. 74]**. The decommissioning of the Saltire, Chanter and Iona fields will see the removal of effectively three of these, each approximately 0.2 km². This will reduce the area of the North Sea that is currently unavailable to other sea users and reduce the cumulative impact of oil and gas physical presence in the region. There are no negative cumulative impacts expected.

5.2.5 Transboundary Impact

As the Saltire Area is beyond the UK's 12 nautical mile limit, EU and non-EU vessels are also permitted to fish in the area, subject to management agreements including, for example, quota allocation and days at sea. Fishing activity in the area is considered to be low in comparison to other areas of the North Sea, and data from the Scottish Government indicates that the majority of fishing here is pelagic. Combined with the removal of infrastructure, and the overtrawlable nature of the infrastructure that is decommissioned *in-situ* (apart from the Saltire A jacket footings, which has a small footprint), there is no mechanism by which significant transboundary impacts could occur.

5.2.6 Residual Impact

The residual impact to other sea users due to the planned decommissioning activities is summarised in Table 5.9.

Table 5.9: Residual Impact to Other Sea Users

Receptor	Sensitivity	Magnitude
Other sea users, excluding fisheries	Low	Minor
Fisheries	Medium	Minor
Rationale		
At this location, sea users other than fisheries mainly relates to shipping. In offshore deep waters, shipping is generally not sensitive or vulnerable to infrastructure being decommissioned *in-situ* at the seabed and makes limited use of the area (thus Low sensitivity) and will experience only very localised effects including the beneficial returned availability of areas formerly occupied in the long-term by installations and safety exclusion zones (thus Minor magnitude). On this basis, the consequence is negligible and the impact not significant. Through prior consultation, the fishing industry is expected to be tolerant of short-term interference whilst decommissioning is underway; also, the removal of infrastructure and safety exclusion zones in the Saltire Area means that fisheries will regain the use of sea areas from which they have been excluded long-term, which is considered a positive impact. Fishing effort in the area is low, as are recorded catch values; however, snagging risk will remain from the Saltire A jacket footings decommissioned *in-situ* (thus Medium sensitivity). Given the approach and design of decommissioning activities proposed, stakeholder consultation and information to be provided of changes to update Admiralty Charts and FishSAFE and other notifications to be made, the impact magnitude is considered Minor. Combining these, the impact consequence is defined as Low and not significant.		
Impact significance		
Low		

6 Conclusions

Following a detailed review of the project activities, the environmental sensitivities of the decommissioning 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 for the Saltire Area:

- Seabed interaction, with disturbance to the seabed and to cuttings piles;
- The physical presence of infrastructure decommissioned *in-situ* in relation to other sea users, both in terms of possible exclusion and risk of snagging; and
- Discharges to sea including the release of hydrocarbons, chemicals, metals etc. as cuttings disturbed during dredging etc. (short term) and the release of hydrocarbons, chemicals, metals, NORM, plastic etc. as material (including structures) decommissioned *in-situ* degrades (long term).

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 impact on receptors. As part of this review, cumulative and transboundary impacts were assessed and determined to be not significant.

The Saltire Area infrastructure is located a substantial distance from designated sites; the closest is the Scanner Pockmark SAC, designated due to the presence of submarine structures made by leaking gases, which is 38 km to the southeast. Consideration of the potential impact on protected sites in the wider vicinity has been considered in the assessment. Having reviewed the decommissioning activities, there is not expected to be a significant impact on any protected sites.

Finally, this EA has considered the objectives and marine planning policies of the National Marine Plan 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.

In summary, the proposed operations have been rigorously assessed through the ENVIDs, CA and EA for the Saltire Area, resulting in a set of selected decommissioning options that are thought to present the least risk of environmental impact while satisfying safety risk, technical feasibility, societal impacts and economic requirements. Based on the findings of this EA and the identification and subsequent application of the mitigation measures identified for each potentially significant environmental impact, it is concluded that the proposed Saltire Area Decommissioning activities will result in no significant environmental impact.

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Appendix A ENVID MATRIX

Aspect		Activity						Mitigation	Sensitivity (P) / Likelihood (UP)	Justification	Magnitude (P) / Magnitude x Sensitivity (UP)	Justification	Significance	Consider further in EA?	Support for EA Position
		Reverse construction / prep work topsides / jacket	Subsea structures/ WHPUs, pipeline/ umbilical and spools removal/ prep for leave *in situ*	Remove platform topsides and transfer to shore	Partial jacket removal (including cutting) and transfer to shore, and leave *in situ* of footings	Offshore debris clearance and overtrawl trials to achieve seabed clearance certificate	Legacy (inc. debris clearance in future)								
1 Emissions to Air (Offshore)	i) Vessels	Yes	Yes	Yes	Yes	Yes	Yes	- Low sulphur diesel - Repsol Sinopec Resources UK Limited Contractor selection - maintenance programme - MARPOL compliance (programme for improvement, annex, maintenance) - Campaign, logistics, sharing vessels (across Repsol Sinopec Resources UK Limited portfolio) optimising vessels to minimise use	4	Due to sensitivity of global climate, sensitivity of atmospherics is considered Very High in line with 2014 Climate Change Report.	1	Score of 1 for magnitude as Repsol Sinopec Resources UK Limited definitions state magnitude should be in respect to UK Continental Shelf emissions values, or those from production. Short-term activity, especially when compared to production operations.	4	No	Emissions will occur in the context of stopping production and therefore stopping almost all future emissions (from operations, including vessels). Industry: Review of previous decommissioning ESs shows atmospheric emissions are almost always extremely small in the context of emissions UK Continental Shelf (UKCS)/globally, and therefore likely to have no significant impact. Compared to those previously arising from the assets through their operational phase, emissions from short term decommissioning activities are small.
	Power generation on Saltire topsides	Yes	No	No	No	No	No	- Low sulphur diesel - Repsol Sinopec Resources UK Limited Contractor selection - Maintenance programme	4	Due to sensitivity of global climate, sensitivity of atmospherics is considered Very High in line with 2014 Climate Change Report.	1	Score of 1 for magnitude as Repsol Sinopec Resources UK Limited definitions state magnitude should be in respect to UK Continental Shelf emissions values, or those from production. Short-term activity, especially when compared to production operations.	4	No	As above.
2 Resource Use (Offshore)	i) Use of raw materials and additives (including chemicals, rock cover and steel)	Yes	Yes	No	No	No	Yes	- Planning of activities will minimise use of materials (there is also a financial driver for this) - recycling as much as possible. - Investigate reuse of existing subsea protection materials i.e. mattresses and grout bags. (to minimise the use of rock placement).	2	Sensitivity 2 as resource is renewable and/or available.	1	Assessed as undiscernible use of a resource	2	No	Use of limited materials such as rock or steel, consistent with UKCS decommissioning projects. Given the limited use, and in line with the EA guidance pointing towards assessment of issues within Department for Business, Energy and Industrial Strategy (BEIS) competency, this issue will not be assessed further.
	ii) Energy consumption (fuel use on vessels and power generation on Saltire)	Yes	Yes	Yes	Yes	Yes	Yes	- Scheduling/design to optimise opportunities to use resources more efficiently (e.g. at same time)	2	As above	1	As above	2	No	Energy use will occur in the context of stopping almost all future energy use associated with the development (apart from limited survey activity). As there is no additional impact, no further assessment is proposed.
3 Disturbance to the Seabed and Cuttings Piles	i) Disturbance to the seabed (not including disturbance to the cuttings piles), including marine growth drop off during cleaning, garnite drop out during abrasive cutting, and overtrawls	No	Yes	No	Yes	Yes	Yes	- Limit the footprint of the activities - Optimise rock placement (e.g. use of fall pipe vessel, bags, grade etc.) - Review of survey data for distribution of sensitivities - Stakeholder consultation in line with Stakeholder Engagement Plan	2	A score of 2 for sensitivity is assigned due to presence of priority marine features (PMF), including ocean quahogs and burrowing megafauna and seapens.	2	There will be sediment disturbance from the activities, but it will be minor, localised and short term. Not likely 3 as no company intervention ever proposed.	4	Yes	The fields are not located within any designated areas of conservation concern, although features of conservation concern including sea pens and burrowing megafauna are present. Therefore seabed disturbance, particularly of an extensive or permanent nature, is likely to be one of the key environmental stakeholder concerns.
	ii) Disturbance to the Cuttings Piles (short term impact)	No	Yes	No	Yes	Yes	No	- Quantify footprints for options - Limit the footprint of the activities - Minimise disturbance of cuttings piles - Modelling study for cuttings disturbance - Optimise rock placement (e.g. use of fall pipe vessel, bags, grade etc.) - Review of survey data for distribution of sensitivities - Stakeholder consultation in line with Stakeholder Engagement Plan	2	As above	2	Whilst partial removal of the jacket will have only negligible impact on the seabed, from cutting prep, cutting discharges (garnite etc.), full removal of the wellhead protection units will require disturbance to the cuttings pile/seabed associated with the dredging etc. to access the piles for cutting. Fall out is likely to be in same footprint of existing piles. Will recover. No regulatory compliance issue.	4	Yes	The fields are not located within any designated areas of conservation concern, although features of conservation concern including sea pens and burrowing megafauna are present. In addition, activities including overtrawling may disturb cuttings piles and it will be necessary to justify the significance assessment through presentation of modelling and associated assessment text.
	iii) Exclusion to sedimentary infauna due to long-term presence of footings, and long-term presence of anthropogenic hard substrata in an otherwise sedimentary habitat (loss of habitat)	No	Yes	No	Yes	No	Yes	- Limit the footprint of the activities - Review of survey data for distribution of sensitivities - Stakeholder consultation in line with Stakeholder Engagement Plan	2	As above	2	Partial removal of jacket and some lines will result in alteration of the habitat for decades if not longer, not allowing the natural habitat to return. No company intervention. Recovery will occur. Very localised.	4	Yes	This item is not ranked as significant in environmental terms. However, with a likely stakeholder interest in this particular interaction, further assessment to understand and explain impact considered necessary.
	iv) Loss of Habitat (long-term habitat change) due to Cuttings Pile.	No	Yes	No	Yes	No	Yes	- Limit the footprint of the activities - Minimise disturbance of cuttings piles - Modelling study for cuttings disturbance - Review of survey data for distribution of sensitivities - Stakeholder consultation in line with Stakeholder Engagement Plan	2	As above	2	Partial removal of some structures will result in the remaining structures (and cuttings pile at the jacket) remaining in situ/altering the habitat, but expected to be minor, localised and reversible.	4	Yes	Jacket cuttings piles to be left in situ are likely to be below the OSPAR 2006/5 thresholds and thus unlikely to require further justification to be left in situ. However, these are likely to persist and are recognised as an area of stakeholder interest. Disturbance and re-settling of drill cuttings at two wellhead protection units will see settling in a new footprint.

Aspect		Activity						Mitigation	Sensitivity (P) / Likelihood (UP)	Justification	Magnitude (P) / Magnitude x Sensitivity (UP)	Justification	Significance	Consider further in EA?	Support for EA Position
		Reverse construction / prep work topsides / jacket	Subsea structures/ WHPUs, pipeline/ umbilical and spools removal/ prep for leave *in situ*	Remove platform topsides and transfer to shore	Partial jacket removal (including cutting) and transfer to shore, and leave *in situ* of footings	Offshore debris clearance and overtrawl trials to achieve seabed clearance certificate	Legacy (inc. debris clearance in future)								
4 Discharges to Sea	i) Routine vessel (e.g. greywater, blackwater, ballast) and/or facilities discharges	Yes	Yes	Yes	Yes	Yes	Yes	- IMO Ballast Water Management Convention, including Ballast water plan and log book - Treatment to IMO/MARPOL standards - Compliance with company's marine assurance standards	2	Sensitivity 2 - due to PMF marine mammals and fish, seabirds etc.	1	Not detectable so score of 1.	2	No	Well controlled activities managed by all vessels on an ongoing basis. Industry: This is not considered to be a major oil and gas industry issue and is assessed with varying levels of detail in both decommissioning and development assessments.
	ii) Chemicals/hydrocarbon/ naturally occurring radioactive material discharges, including from cutting of flooded members in the jacket (which may contain biocide) and chemical discharges from subsea infrastructure during removal/prep for leave in situ	Yes	Yes	No	Yes	No	No	- Selection of chemicals with less potential for environmental impact - Environmental risk assessment through the permitting system - Decom yard management plans, selection, auditing - Predefined cleanliness achieved through hydrocarbon freeing (Drain Flush Purge Vent) - Repsol Sinopec Resources UK Limited health, safety and environment management system	2	As above	1	As above.	2	No	Likely to be limited volumes of relatively 'clean' fluids, or those that will be assessed in more detail in the permitting process. These discharges are typically included in environmental appraisals (EA), but the permitting system is the more appropriate location for any specific risk assessment of discharges. As would be expected, significant impacts are not predicted from the scoring here, and no further assessment is proposed.
	iii) Release of hydrocarbons, chemicals, metals etc. as cuttings disturbed during dredging etc. (short term)	No	Yes	No	Yes	No	No	- Modelling study for drill cutting disturbance.	2	As above	2	Water column effects from the drill cuttings overtrawling will dominate, but are expected to be short-term with rapid recovery.	4	Yes	As part of the assessment of short term interaction with cuttings in a seabed context, the modelling will provide information on water column effects. This will be presented in the EA Report to address stakeholder concerns.
	iv) Release of hydrocarbons, chemicals, metals, naturally occurring radioactive material discharges, plastic etc. as material decommissioned *in situ* degrades, including degradation of structures and cuttings (long term, including when footings collapses onto cuttings)	No	Yes	No	Yes	No	No	- Cleaning of accessible infrastructure prior to decommissioning. - Modelling study for drill cutting disturbance.	2	As above	1	Some jacket and subsea materials will remain in situ, and the cuttings pile at the jacket will remain undisturbed. In this case, it will continue to persist for a considerable period of time, continuing to have a detectable environmental impact within the project area, that may at sometime require company intervention. Magnitude 1 as although long term it will be a negligible localised impact and will recover naturally.	2	Yes	The drill cuttings will leach contents, but the drill cuttings assessment is expected to show this is below OSPAR 2006/5 threshold and propose no further assessment. For degradation of materials left in situ, there is increased stakeholder interest in areas such as plastics and it is proposed that this issue is dealt with further in the EA Report.
5 Physical Presence	i) Physical presence of vessels in relation to other sea users (nearshore and offshore) (short term)	Yes	Yes	Yes	Yes	Yes	Yes	- Campaign, logistics, sharing vessels (across Repsol Sinopec Resources UK Limited portfolio) optimising vessels to minimise use. - UK Hydrographic Office standard communication channels including Kingfisher, Notice to Mariners and radio navigation warnings - Collision risk assessment - Stakeholder consultation - Logistics plan	1	Area of existing infrastructure and vessel usage (i.e. brownfield location). Activities largely within installation 500 m zone.	1	The additional vessels would be absorbed without impact and there would at worse be limited local awareness and no concerns.	1	No	Short term operations in the context of the life of the fields. Activity will occur using similar vessels to those currently deployed for oil and gas across the central North Sea. Vessels will generally be in use around existing infrastructure - they will not occupy 'new' areas. Other sea users will be notified in advance of activities occurring, meaning those stakeholders will have time to make any necessary alternative arrangements. The well known and practiced planning and notification measures mean that offshore activities such as these are not seen as a major issue in relation to shipping and other sea users - especially in an area such as this where shipping levels and presence of other sea users are low.
	ii) Physical presence of infrastructure decommissioned *in situ* in relation to other sea users	No	Yes	No	Yes	No	Yes	- Stakeholder consultation, especially discussion of issues with Scottish Fishermen's Federation and others as appropriate - Notifications and notice to mariners - Mark on charts	2	Sensitivity is based on the fishermen being able to absorb the 'loss' of fishing grounds due to remaining footings without significant impact.	3	The magnitude has been assessed as a 3, due to the known stakeholder concerns and because it will limit the fishermen's access for decades. Opted to remain at 3 rather than 4/5 (which could be more reflective of the timescale) as there is unlikely to be any national or international stakeholder concerns or media interest for derogation of a steel jacket - IF OSPAR have approved the derogation case.	6	Yes	The decommissioning of infrastructure in situ is a key stakeholder concern. It is also not aligned with the BEIS principles of clean seabed. On the basis of both of these, this issue will require further assessment.

Aspect		Activity						Mitigation	Sensitivity (P) / Likelihood (UP)	Justification	Magnitude (P) / Magnitude x Sensitivity (UP)	Justification	Significance	Consider further in EA?	Support for EA Position
		Reverse construction / prep work topsides / jacket	Subsea structures/ WHPUs, pipeline/ umbilical and spools removal/ prep for leave *in situ*	Remove platform topsides and transfer to shore	Partial jacket removal (including cutting) and transfer to shore, and leave *in situ* of footings	Offshore debris clearance and overtrawl trials to achieve seabed clearance certificate	Legacy (inc. debris clearance in future)								
	iii) Physical presence of cuttings pile left *in situ* in relation to other sea users	No	Yes	No	Yes	No	Yes	- Stakeholder consultation, especially discussion of issues with fisheries representatives - Cuttings disturbance modelling - Notifications and notice to mariners	2	As above	2	The magnitude is expected to be less than for the footings and subsea infrastructure as the remaining footings will exclude the fishermen from interacting with the pile. There would be some local public awareness and concerns about the pile interactions, however.	4	Yes	This will be dealt with as per the above item.
	iv) Aesthetics - Offshore and Nearshore (seascape - surface features)	No	No	Yes	Yes	No	Yes	- Campaign planning to limit vessel days to minimum required - Project location located well offshore	1	Sensitivity of 1 based on the project occurring in a brownfield location, with existing shipping traffic, so any aesthetic impact is expected to be low/undiscernible.	0	Positive as remove above surface structures	0	No	No environmental or stakeholder concerns.
6 Underwater Noise	i) Underwater noise from vessels (injury/disturbance to marine species)	Yes	Yes	Yes	Yes	Yes	Yes	- Campaign, logistics, sharing vessels (across Repsol Sinopec Resources UK Limited portfolio) optimising vessels to minimise use. - MARPOL compliant vessels	2	Sensitivity 2 - due to PMF marine mammals and fish, seabirds etc.	2	Existing brownfield location. Highly localised. No expected population effects and no real change over background. Low level of stakeholder concern about noise from vessels. Likely to be a large vessel.	4	No	Not within protected sites for marine mammals, although some protected species present (reflected in scoring). Low significance scoring. Indications from stakeholders is that this is not an area of major concern.
	ii) Underwater noise from cutting noise (including from possible cutting of debris) / dredging / Mass Flow Excavation (MFE) (injury/disturbance to marine species) and rock placement	No	Yes	No	Yes	Yes	Yes	- Suitable technology for cutting will be selected to ensure the effectiveness of the cutting, minimising the duration, disturbance and risk of requiring the activity to be repeated - No explosives use planned. - Cutting by hydraulic shears is base case for small jacket members, or abrasive water jetting if not. Use of hydraulic shears subsea.	2	As above	2	Existing brownfield location. Highly localised. No expected population effects and no real change over background. Low level of stakeholder concern about noise from cutting, but recognised it will be a different activity/noise source to those generally encountered in the area.	4	No	As above.
7 Others	i) Light - offshore (particularly seabirds)	Yes	Yes	Yes	Yes	Yes	Yes	- Lighting directed below the horizontal plane unless required for technical or safety reasons	2	As above	1	Existing brownfield location - Magnitude 1 as it is assessed as having negligible environmental effect and is short term and rapidly reversible once the activity ceases.	2	No	Not a major issue for project (a few vessels present on site for short duration) nor industry. Lighting removed from operational platform.
	iii Livelihood/employment	Yes	Yes	Yes	Yes	Yes	Yes	- Project to identify and share yard requirements, to allow yards to plan/bid	2	Sensitivity 2	2	Magnitude 2, as detectable but reversible.	4	No	The variable potential for impact from the decommissioning activities has not been identified as a differentiator. Whilst it is recognised that there could be a negative effect resulting from cessation of production, there will be a counter-benefit in the additional work required to effect the decommissioning.

Aspect		Activity						Mitigation	Sensitivity (P) / Likelihood (UP)	Justification	Magnitude (P) / Magnitude x Sensitivity (UP)	Justification	Significance	Consider further in EA?	Support for EA Position
		Reverse construction / prep work topsides / jacket	Subsea structures/ WHPUs, pipeline/ umbilical and spools removal/ prep for leave *in situ*	Remove platform topsides and transfer to shore	Partial jacket removal (including cutting) and transfer to shore, and leave *in situ* of footings	Offshore debris clearance and overtrawl trials to achieve seabed clearance certificate	Legacy (inc. debris clearance in future)								
8 Unplanned Events	i) Small accidental chemical/hydrocarbon release (inc. export pipelines, vessels, both offshore and nearshore)	Yes	Yes	Yes	Yes	Yes	Yes	- Ship Oil Pollution Emergency Plan (SOPEP), including modelling and appropriate response planning (for vessels over 400 gross register tonnage) - Collision risk assessment - Maintenance procedures - Simultaneous Operations Plan - Bulk handling procedures and personnel training - Vessels will be selected which comply with IMO/MCA codes for prevention of oil pollution - Preferred operational procedures to be in place onboard Vessels including use of drip trays under valves, use of pumps to decant lubricating oils, use of lockable valves on storage tanks and drums - Chemical storage areas contained to prevent accidental release of chemicals - Pre-mobilisation audits will be carried out including a comprehensive review of spill prevention procedures - Arrangements in place to track spills - Third party management/engagement for pipeline crossings, adjacent work sites and associated decommissioning work - Wells plugged and abandoned and topsides and pipelines flushed and cleaned and isolated - Saltire field Emergency Response Plan/OPEP will be updated to include details of the heavy lift vessel (if used) and adhered to within the 500 m safety exclusion zones around the platforms - Larger vessels have compartmentalised fuel storage	5	A small accidental release is likely to occur more than once during the project.	1	Sensitivity of 2 due to PMFs but not nearshore interaction. Magnitude impact of 1 . Combining sensitivity and magnitude gives low . Combining a low sensitivity with a likelihood of 5 gives an overall significance rating of low.	1	No	Well plugging and abandonment will have been completed prior to decommissioning and are outside the scope of the DP. Similarly, facilities and pipelines will also have been flushed and cleaned prior to decommissioning. Facilities and pipelines will therefore be 'clean' at the point the EA scope begins.
	ii) Large accidental chemical/hydrocarbon release (inc. export pipelines, vessels, both offshore and nearshore)	Yes	Yes	Yes	Yes	Yes	Yes	- SOPEP, including modelling and appropriate response planning (for vessels over 400 gross register tonnage) - Collision risk assessment - Maintenance procedures - Simultaneous Operations Plan - Bulk handling procedures and personnel training - Vessels will be selected which comply with IMO/MCA codes for prevention of oil pollution - Preferred operational procedures to be in place onboard Vessels including use of drip trays under valves, use of pumps to decant lubricating oils, use of lockable valves on storage tanks and drums - Pre-mobilisation audits will be carried out including a comprehensive review of spill prevention procedures - Arrangements in place to track spills - Third party management/engagement for pipeline crossings, adjacent work sites and associated decommissioning work - Wells P&A'd and topsides and pipelines flushed and cleaned and isolated - Saltire field Emergency Response Plan/OPEP will be updated to include details of the heavy lift vessel (if used) and adhered to within the 500 m safety exclusion zones around the platforms - Larger vessels have compartmentalised fuel storage	2	A similar event has occurred eleswhere but is unlikely to occur with current practices.	2	Sensitivity of 2 due to PMFs but not nearshore interaction. Magnitude impact of 4 due to reputation issues. Combining sensitivity and magnitude gives moderate. Combining with likelihood gives low.	1	No	Well plugging and abandonment will have been completed prior to decommissioning and are outside the scope of the DP. Similarly, facilities and pipelines will also have been flushed and cleaned prior to decommissioning. Facilities and pipelines will therefore be 'clean' at the point the EA scope begins. The accidental release of a live hydrocarbon and chemical inventory from project inventory is therefore also out of scope. Repsol Sinopec Resources UK Limited expects that the heavy lift vessel potentially to be used in jacket decommissioning will have the largest fuel inventory of any vessel involved in the Project activities. This amounts to 18,846 m3 in total, predominantly heavy fuel oil. This quantity is much less than the worst case crude oil spill from loss of well containment modelled and assessed in the Saltire OPEP. In addition the vessel's fuel inventory is split between 11 separate tanks. Therefore, the potential impact from fuel inventory release will be much less than that already assessed and mitigated for the operational phase of these fields.
	iii) Snagging of fishing gear	No	Yes	No	Yes	No	Yes	- Overtrawlability trials following activities - Stakeholder consultation - Remediation activities (spans) - Significant snag risks notified on FishSAFE	5	Likelihood 5 as footings and subsea infrastructure have been snagged before, an area of stakeholder concern, and the loss of the 500 m safety zone.	1	Inhibited ability to fish means stakeholder level concerns, thus magnitude of 2. With a sensitivity of 2, this is a significance of Low. A Low significance combined with a likelihood of 5 results in Low overall significance.	1	Yes	In environmental terms, the pipelines will be 'clean' and there is no risk resulting from snagging. However, this issue will need consideration as part of the in situ decommissioning impact on fisheries as it is considered to be a key socioeconomic issue. This is particularly true with the jacket footings being left in situ.
9 Waste Generation and Handling	i) Non-hazardous waste	Yes	Yes	Yes	Yes	Yes	Yes	- Repsol Sinopec Resources UK Limited Waste management strategy - Project waste management plan, use of licensed waste contractors/sites, waste transfer notes - Develop Waste Management Plan prioritising reuse and recycling - Contractor to maintain a waste audit trail through to recycling or disposal facility - Contractor to report waste inventories - Audit of contractors waste management systems	3	Landfill availability is recognised as a limited resource.	0	Should be largely recycled, so very limited impact on landfill, and would improve resource availability with recycled material	0	Yes	Waste management is a key stakeholder interest in decommissioning, and Repsol Sinopec Resources UK Limited expects to detail measures in place to manage waste in the EA. This will be outlined briefly in a section that describes the overall Repsol Sinopec Resources UK Limited Environmental Management System and how this will be applied to manage the decommissioning programme. This section will not seek to replicate inventory data from the DP, or to quantify waste streams in detail, but instead will discuss Repsol Sinopec Resources UK Limited expectations with regards appropriate handling. Regarding capacity, part of the waste tenderer's bid will need to include demonstration of capacity to handle expected volumes. Where a yard outside the UK is selected, Repsol Sinopec Resources UK Limited will ensure commitments regarding transfrontier shipments are met.
	ii) Hazardous waste	Yes	Yes	Yes	Yes	Yes	Yes	- Repsol Sinopec Resources UK Limited Waste management strategy - Project waste management plan (WMP), use of licensed waste contractors/sites, waste transfer notes - Develop WMP prioritising reuse and recycling - Contractor to maintain a waste audit trail through to recycling or disposal facility - Contractor to report waste inventories - Audit of contractors waste management systems - Licensed hazardous waste disposal contractor	3	Landfill availability is recognised as a limited resource.	1	Limited social and negligible environmental concerns for hazardous waste when appropriate waste handling strategy in place.	3	Yes	As above.

Aspect		Activity						Mitigation	Sensitivity (P) / Likelihood (UP)	Justification	Magnitude (P) / Magnitude x Sensitivity (UP)	Justification	Significance	Consider further in EA?	Support for EA Position
		Reverse construction / prep work topsides / jacket	Subsea structures/ WHPUs, pipeline/ umbilical and spools removal/ prep for leave *in situ*	Remove platform topsides and transfer to shore	Partial jacket removal (including cutting) and transfer to shore, and leave *in situ* of footings	Offshore debris clearance and overtrawl trials to achieve seabed clearance certificate	Legacy (inc. debris clearance in future)								
	iii) Radioactive waste (including naturally occurring radioactive material)	Yes	Yes	Yes	Yes	Yes	Yes	- Repsol Sinopec Resources UK Limited Waste management strategy - Project waste management plan, use of licensed waste contractors/sites, waste transfer notes - Develop WMP prioritising reuse and recycling - Contractor to maintain a waste audit trail through to recycling or disposal facility - Contractor to report waste inventories - Audit of contractors waste management systems - Licensed disposal contractor	3	As above	1	Limited social and negligible environmental concerns for radioactive waste when appropriate waste handling strategy in place.	3	Yes	Dealt with in the EA Report as part of the overall waste discussion, recognising this waste stream is subject to specific legislative controls.
	iv) Marine growth	No	Yes	No	Yes	Yes	Yes	- Project waste management plan, use of licensed waste contractors/sites, waste transfer notes - Develop WMP - Contractor to maintain a waste audit trail through to recycling or disposal facility - Audit of yard's waste management - Consider jetting offshore - Marine growth management plan	3	As above	1	Limited social and negligible environmental concerns for non-hazardous waste. Efforts will be made to recycle/compost.	3	Yes	As above.

Appendix B Saltire A to Piper B Bundle Free Span History

Pipeline	2011 GVI Note 1			2013 GVI Note 1			2017 GVI Note 1		
	KP		Free Span Length (km)	KP		Free Span Length (km)	KP		FreeSpan Length (km)
	Start	End		Start	End		Start	End	
Saltire A to Piper B Bundle	1.347	1.366	0.019	0.023	0.028	0.005	0.019	0.033	0.014
	3.276	3.292	0.017	0.029	0.032	0.003	0.093	0.099	0.006
	3.364	3.374	0.010	0.119	0.127	0.007	0.120	0.131	0.011
	3.376	3.398	0.023	0.145	0.149	0.004	0.143	0.152	0.009
	5.194	5.219	0.025	0.183	0.185	0.002	0.180	0.186	0.006
	5.221	5.228	0.007	0.200	0.208	0.007	0.201	0.210	0.009
	6.382	6.399	0.018	0.250	0.252	0.003	0.713	0.722	0.009
				0.267	0.270	0.003	1.345	1.372	0.027
				0.543	0.548	0.004	2.323	2.340	0.016
				0.666	0.670	0.004	3.274	3.294	0.021
				0.714	0.721	0.006	3.360	3.362	0.002
				1.346	1.367	0.021	3.363	3.374	0.011
				2.322	2.324	0.002	3.376	3.400	0.025
				3.274	3.294	0.020	5.194	5.230	0.036
				3.359	3.374	0.015	6.379	6.401	0.022
				3.375	3.399	0.024			
				5.194	5.220	0.026			
				5.220	5.229	0.009			
				6.378	6.402	0.024			

Note 1: GVI survey data was used for the comparison of free spans.

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