Document Control

Title	West of Walney Marine Conservation Zone MMO Fisheries Assessment
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Approver	T Dixon/L Stockdale/N Greenwood
Owner	T Dixon

Revision History

Date	Author	Version	Status	Reason	Approver(s)
05/04/2017	L Hildebrand	V0.1	Draft	Initial draft of Part A	T Dixon
05/04/2017	L Hildebrand	V0.2	Draft	Incorporation of comments	T Dixon
06/04/2017	L. Hildebrand	V0.3	Draft	Addition of maps	T Dixon
07/04/2017	L Hildebrand	V0.4	Draft	Scope of Part C	T Dixon
11/12/2017	T Dixon	V0.5	Draft	Update of Part A and checking scope of Part C	T Dixon
13/12/2017	T Dixon/K Lowes	V.06	Draft	Part B	N/A
03/01/2017	T Dixon/M Kirby	V.07	Draft	Part B p values	N/A
08/01/2017	T Dixon	V.08	Draft	Adding new style Part C	N/A
15/01/2018	R Joyce	V.09	Draft	Proof Read	N/A
20/02/2018	T Dixon	V.10	Draft	Updating as per first QC	N/A
21/02/2018	T Dixon	V.11	Draft	Addition of maps	N/A
12/03/2018	T Dixon	V.12	Draft	Action tracked changes QC	N/A
12/03/2018	T Dixon	V.13	Draft	Restructure of part B	N/A
13/03/2018	M Kirby	V.14	Draft	Addition of maps	N/A
13/07/2018	N Greenwood	V.15	Draft	Amendments to terminology and p-value reporting	N/A
17/07/2018	T Dixon	V.16	Draft	Amendments after consultation responses	N/A
27/07/2018	T Dixon	V.17	Draft	Amendments after first QC	N Greenwood
27/07/2018	L Stockdale	V.18	Draft	QC of document	N/A
21/08/2018	T Dixon	V.19	Draft	Final amendments	V Morgan
23/08/2018	R Joyce	V.20	Final	Final P maps, format changes.	

This document has been distributed for information and comment to:

Title	Organisation	Date sent	Comments received
Laurence Browning; Katherine Nisbett; Mike Quigley	Natural England	20 May 2018	20 July 2018

West of Walney Marine Conservation Zone MMO Fisheries Assessment

1. Summary

Table 1 shows a summary of the outcomes of this assessment of the impact of fishing activities on site features.

Table 1: Assessment Summary

Features	Activity/gear	Part A outcome	Part B outcome	In-combination assessment
Subtidal sand **and** Subtidal mud **and** Sea-pen and burrowing megafauna communities	Beam trawl (whitefish)	Capable of affecting (other than insignificantly)	Significant risk of hindering conservation objectives	N/A
	Beam trawl (shrimp)			
	Beam trawl (pulse/wing)			
	Heavy otter trawl			
	Multi-rig trawl			
	Light otter trawl			
	Pair trawl			
	Towed (demersal/pelagic)			
	Scallop dredging			
	Pump scoop (cockles, clams)			
	Mussel, clam, oyster dredging			
	Pots/creels (crustacea/gastropoda)		No significant risk of hindering conservation objectives	No significant risk of hindering conservation objectives in combination
	Cuttle pots			
	Fish pots			
	Anchor seine			
	Scottish/fly seine	Not capable of affecting (other than insignificantly)	N/A	N/A
	Suction (cockles)			
	Gill nets			
	Trammels			
	Entangling nets			
	Drift nets (demersal)			
	Beach seines/ring nets			
	Shrimp push-nets			
	Fyke and stakenets			
	Bait dragging			

Sea-pen and burrowing megafauna communities	Longlines (demersal)	N/A	N/A	No significant risk of hindering conservation objectives in combination
	Commercial diving			

2. Introduction

Table 2 shows the name and legal status of the site.

Table 2: Site details

Name and legal Status of site:	Name of site	Legal status
	West of Walney	Marine Conservation Zone (MCZ)

West of Walney Marine Conservation Zone (MCZ) is located in the Irish Sea, off the coast of Cumbria and to the west of Walney Island. The MCZ protects an area of approximately 388 km^2, most of which is in inshore waters, but with a small section crossing the 12 nautical mile (nm) boundary into offshore waters (Department for Environment, Food, and Rural Affairs, 2016).

This site was chosen for the extensive areas of subtidal mud and sand habitats and plant and animal communities present. The subtidal mud in this site is an important habitat for many animals like worms, cockles, urchins and sea cucumbers. Other larger animals, such as mud shrimps and fish, live within this habitat and burrow into the mud. This creates networks of burrows which shelter smaller creatures like worms and brittlestars. The mud also provides a habitat for sea-pens, which are tall, erect and luminous animals, which live in groups. The sand on the seabed is also an important habitat as flatfish and sand eels camouflage themselves on the surface of it, and it supports burrowing megafauna communities, such as the Norway lobster (*Nephrops norvegicus*) (Department for Environment, Food, and Rural Affairs, 2016).

This site enhances the marine protected area (MPA) network with subtidal sand and mud as well as sea-pen and burrowing megafauna communities as neither of these features are sufficiently protected in the region by the current network.

The conservation objective for all MCZs is that the features:

(a) so far as already in favourable condition, remain in such condition; and
(b) so far as not already in favourable condition, be brought into such condition, and remain in such condition.

More specific information on how to achieve the conservation objective of an MCZ is provided in the general management approach within the factsheet for each site[1].

This assessment uses an initial screen of fishing activities and designated features, based on the the Matrix of fisheries gear types and European marine site protected features[2] (hereafter 'the Matrix') developed as part of Defra's revised approach to the management of commercial fishing

[1] MCZ factsheets are available online: http://publications.naturalengland.org.uk/category/1721481
[2] www.gov.uk/government/publications/fisheries-in-european-marine-sites-matrix

in European marine sites (EMS)[3]. The Matrix classifies interactions between EMS features and different fishing activities as red, amber, green or blue.

All interactions classified as 'blue' are screened out of this assessment as there is no pathway for impact. Interactions classified as 'green' are considered low risk, but are included when assessing impacts in-combination with other activities. Interactions classified as amber are subject to full assessment. A classification of 'red' indicates that an assessment is not required and the interaction should automatically be addressed through a management measure.

MCZs are associated with an overlapping but different set of designated features to those associated with EMS. Therefore, for the purposes of the initial screen in this assessment, the designated features have been matched with equivalent EMS features. Where there is no clear match, a precautionary (ie more sensitive) EMS feature has been used. This precautionary matching applies only to the initial screen, and not to the later, more detailed assessment.

Table 3 shows the features for which this MCZ has been designated, their associated general management approach, and the EMS features which they have been matched with.

Table 3: Designated features and general management approach

Feature	Matrix sub-feature match	General Management Approach
Subtidal sand	Subtidal muddy sand used as it is the most precautionary	Recover to favourable condition
Subtidal mud	Subtidal mud	
Sea-pen and burrowing megafauna communities	Brittlestar beds used as brittlestars are a fragile, demersal feature which likely experiences the same fishing activity/feature interactions as sea-pens and burrowing megafauna. As all are subtidal, benthic features, any intertidal and pelagic fishing activity interactions could be excluded and thus brittlestar beds were selected as the best suitable match.	

2.1 Subtidal sand

This feature is not very extensive within the West of Walney site and is only located in the north eastern corner of the site. This relatively small area of subtidal sand is surrounded predominantly by subtidal mud. Subtidal sands occurring close inshore are often undisturbed by waves and tides. Sand seascapes may appear barren, however contain many animals such as flat fish, sand eels, worms and bivalves (Joint Nature Conservation Committee, 2014a).

[3] https://www.gov.uk/government/publications/revised-approach-to-the-management-of-commercial-fisheries-in-european-marine-sites-overarching-policy-and-delivery

2.2 Subtidal mud

Subtidal mud is found throughout the site and forms the majority of the sediment type within the West of Walney MCZ. Subtidal muds occur in areas too deep to be exposed to the tide and are mainly found in extremely sheltered areas with very weak tidal currents. As a result of these low energy dynamics, sea-pens can often be found here with their upright, delicate structures not suited to high energy environments. Additionally, subtidal muds frequently support large communities of burrowing megafauna, particularly the Norway lobster (*Nephrops norvegicus*) (Joint Nature Conservation Committee, 2014b).

2.3 Sea-pen and burrowing megafauna communities

Sea-pen and burrowing megafauna communities occur almost entirely across the West of Walney site, with only a few relatively small patches where they are absent. On stable plains of fine mud, areas of the seabed may be marked by mounds and burrows which are caused by the burrowing activities of animals below the surface, such as the Norway lobster (*Nephrops norvegicus*). The burrows created by *Nephrops* offer shelter to a wide range of smaller animals, resulting in a diverse benthic community. Sea-pens, which protrude from the surface of the mud and can grow to more than 2 m in height. (Joint Nature Conservation Committee, 2015). *Virgularia mirabilis* has been present in the muddier sediment habitats within the site[4]. Currently, the abundance and distribution of these communities is limited to the information on *Nephrops norvegicus* from stock assessment surveys (OSPAR, 2016). These surveys indicate burrow densities are higher in the central part of the MCZ where finer mud sediments occur[5].

2.4 Scope of this assessment - fishing activities assessed

The geographic scope of this assessment covers the part of the site within 12 nm of the coast, and therefore includes all three designated features.

Part of the site falls within the North Western Inshore Fisheries Conservation District (from the coast to 6 nm), meaning that assessment and management of fishing would ordinarily be the responsibility of the North Western Inshore Fisheries and Conservation Authority (NWIFCA). However, because the majority of the site is outside of this district, and to allow a consistent approach, MMO and NWIFCA have agreed that MMO will assess the whole of the site inshore of 12 nm.

The remaining portion of the site is offshore of 12 nm, where the European Union has competency for environmental management of fishing. Management of this part of the site will be progressed through the provisions of Article 18 of the Common Fisheries Policy[6].

[4] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010027/EN010027-000340-10.2.9%20ES%20Annex%20B.4.A%20Benthic%20Ecology%20Technical%20Report.pdf

[5] https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UKMCZ0045&SiteName=walney&SiteNameDisplay=West+of+Walney+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=

[6] https://ec.europa.eu/fisheries/cfp_en

Figure 1: West of Walney MCZ and surrounding area.

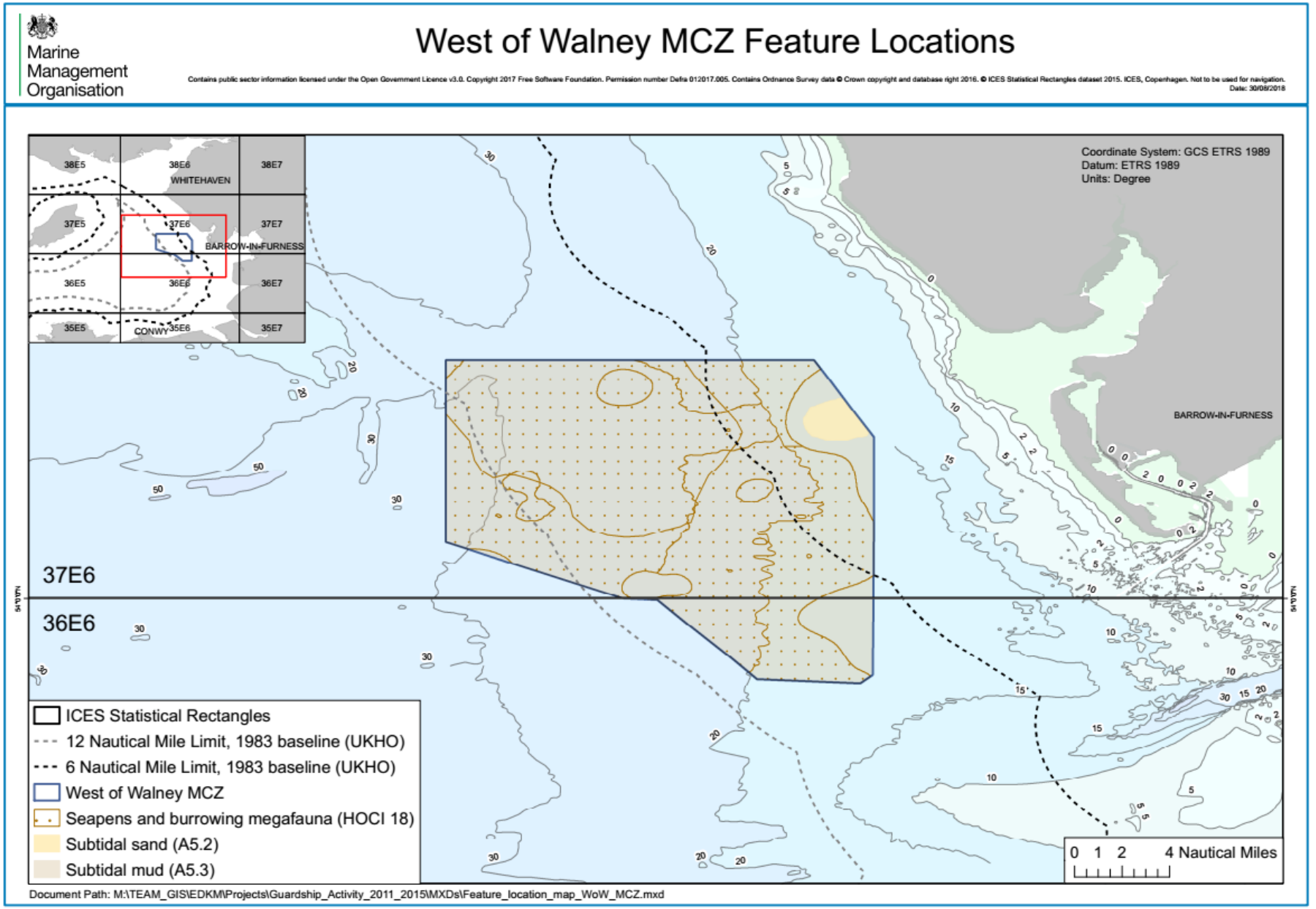


Table 4 shows the fishing activities classified as having amber interactions with features of this site. The ‘Matrix gear type’ column shows the categories used in the Matrix. These are matched to the ‘aggregated method’ categories used in Natural England conservation advice packages.

Table 4: Fishing activities with amber interactions to be included for assessment if they take place. Matrix gear matched to aggregated method.

Feature	Matrix Gear Type	Natural England Aggregated Method
Subtidal sand **and** Subtidal mud **and** Sea-pen and burrowing megafauna communities	Beam trawl (whitefish)	Demersal trawl
	Beam trawl (shrimp)	
	Beam trawl (pulse/wing)	
	Heavy otter trawl	
	Multi-rig trawl	
	Light otter trawl	
	Pair trawl	
	Towed (demersal/pelagic)	
	Anchor seine	Demersal seine
	Scottish/fly seine	
	Scallop dredging	Dredges
	Mussels, clams, oysters	
	Pump scoop (cockles, clams)	
	Suction (cockles)	Hydraulic dredges
	Pots/creels (crustacea/gastropods)	Traps
	Cuttle pots	
	Fish traps	
	Gill nets	Anchored nets/lines
	Trammels	
	Entangling nets	
	Drift nets (demersal)	
	Beach seines/ring nets	Shore-based activities
	Shrimp push-nets	
	Fyke and stakenets	
	Bait dragging	
Sea-pen and burrowing megafauna communities	Longlines (demersal)	Anchored nets/lines

Commercial sea fishing has the potential to vary in nature and intensity over time. This assessment considers a particular range of recent and likely future activity based on activity levels and type as identified in section four.

To ensure the achievement of the conservation objectives of the site is not hindered should future activity occur outside of this range, activity will be monitored at this site, and this assessment may

be reviewed should activity levels change significantly. See section seven for more information on ongoing monitoring and control at this site.

3. Part A Assessment

Table 5 shows the Natural England conservation advice package used to inform this assessment.

Table 5: Advice packages used for assessment

Feature	Package	Link
Subtidal sand **and** Subtidal mud **and** Sea-pen and burrowing megafauna communities	Natural England and JNCC Conservation Advice for Marine Protected Areas West of Walney MCZ - UKMCZ0045	https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0045&SiteName=walney&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=

Part A of this assessment was carried out in a manner that is consistent with the 'capable of affecting (other than insignificantly)' test required by section 126(1) (b) of the Marine and Coastal Access Act 2009[7].

For each fishing activity, a series of questions were asked:

1. Does the activity take place, or is it likely to take place in the future?
2. What are the potential pressures exerted by the activity on the feature?
3. Are the pressures capable of affecting (other than insignificantly) the protected features of the MCZ?

For each activity assessed in Part A, there were two possible outcomes for each identified pressure-feature interaction:

1. The pressure-feature interactions were not included for assessment in Part B if:
    a. the feature is not exposed to the pressure, and is not likely to be in the future; or
    b. the pressures are not capable of affecting (other than insignificantly) the protected features of the MCZ.

2. The pressure-feature interactions were included for assessment in Part B if:
    a. the feature is exposed to the pressure, or is likely to be in the future; and
    b. the pressure is capable of affecting (other than insignificantly) the feature; or
    c. it is not possible to determine whether the pressure is capable of affecting (other than insignificantly) the feature.

Consideration of exposure to or effect of a pressure on a protected feature of the MCZ includes consideration of exposure to or effect of that pressure on any ecological or geomorphological process on which the conservation of the protected feature is wholly or in part dependent.

[7] www.legislation.gov.uk/ukpga/2009/23/contents

3.1 Activities not taking place

Table 6 shows activities which are excluded from further assessment as they do not take place and are not likely to take place in the future.

Table 6: Activities not taking place and not likely to take place in the future

Feature	Gear type	Justification
Subtidal sand **and** Subtidal mud **and** Sea-pen and burrowing megafauna communities	Scottish/fly seine	Vessel monitoring system (VMS) data were used in order to determine which fishing activities are not taking place in West of Walney MCZ. VMS data shows that this activity does not occur in the site. Sightings data and MMO and NWIFCA expert opinion also indicate no effort within the site
	Suction (cockles)	
	Gill nets	
	Trammels	
	Entangling nets	
	Drift nets (demersal)	
	Beach seines/ring nets	West of Walney MCZ has no shore component and so is not subject to shore-based activities.
	Shrimp push-nets	
	Fyke and stakenets	
	Bait dragging	
Sea-pen and burrowing megafauna communities	Longlines (demersal)	Vessel monitoring system (VMS) data were used in order to determine which fishing activities are not taking place in West of Walney MCZ. VMS data shows that this activity does not occur in the site. Sightings data and MMO and NWIFCA expert opinion also indicate no effort within the site

3.2 Potential pressures exerted by the activities on the feature

For the remaining activities, potential pressures were identified using the Natural England conservation advice identified in table 5 and associated advice on operations tables. All pressures identified other than those categorised as ‘not relevant’ were included.

Table 7a and 7b show the potential pressures identified for subtidal mud/sand and sea-pen and burrowing megafauna communities, respectively.

Table 7a: Potential pressures for gears on Subtidal sand/Subtidal mud

Feature	Aggregated method	Potential pressures
Subtidal sand **and**	Demersal trawl **and**	Abrasion/disturbance of the substrate on the surface of the seabed
		Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion

Subtidal mud	Demersal seine **and** Dredges **and** Traps	Removal of non-target species
		Deoxygenation
		Hydrocarbon & PAH contamination
		Introduction of light
		Introduction or spread of invasive non-indigenous species (INIS)
		Organic enrichment
		Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)
		Transition elements & organo-metal (eg TBT) contamination
		Underwater noise changes
		Visual disturbance
	Demersal trawl **and** Demersal seine **and** Dredges	Changes in suspended solids (water clarity)
		Smothering and siltation rate changes (light)
		Nutrient enrichment
		Physical change (to another sediment type)
	Dredges	Introduction of microbial pathogens
	Traps	Barrier to species movement

Table 7b: Potential pressures for gears on sea-pen and burrowing megafauna communities

Feature	**Aggregated method**	**Potential pressures**
Sea-pen and burrowing megafauna communities	Demersal trawl **and** Demersal seine **and**	Abrasion/disturbance of the substrate on the surface of the seabed
		Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion
		Removal of non-target species
		Deoxygenation
		Hydrocarbon & PAH contamination

	Dredges **and** Traps	Introduction of light
		Introduction or spread of invasive non-indigenous species
		Organic enrichment
		Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)
		Transition elements & organo-metal (eg TBT) contamination
	Demersal trawl **and** Demersal seine **and** Dredges	Changes in suspended solids (water clarity)
		Smothering and siltation rate changes (light)
		Nutrient enrichment
		Physical change (to another sediment type)
	Demersal Trawl **and** Traps	Removal of target species
	Dredges	Introduction of microbial pathogens

3.3 Significance of effects/impacts

To determine whether each pressure is capable of affecting (other than insignificantly) the site's features, the sensitivity assessments and risk profiling of pressures from the advice on operations section of the Natural England conservation advice package were used.

Table 8a and 8b identify the pressures from particular gears which are capable of affecting (other than insignificantly) each feature. Where a pressure from a particular gear is identified as not being capable of affecting (other than insignificantly), justification is provided. Features with similar sensitivities have been considered together.

Table 8a: Summary of pressures from specific activities on subtidal sand/subtidal mud taken to Part B

Potential pressures	**Demersal trawl**								**Demersal seine**	**Dredges**			**Traps**		
	TBBW	TBBS	TBBPW	OTH	MRT	OTL	PT	TDP	SDN	DRBS	DRBM	DRBP	FPOP	FPOC	FPOF
Abrasion/disturbance of the substrate on the surface of the seabed	Capable of affecting (other than insignificantly) – Abrasion/surface disturbance can be caused by contact between the gear/anchors and the sea bed.														
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	Capable of affecting (other than insignificantly) – Gears are designed to dig into the seabed.												Capable of affecting (other than insignificantly) – Gears are designed to interact with the seabed.		
Removal of non-target species	Capable of affecting (other than insignificantly) – Removal of non-target species is likely to affect the presence and/or abundance of typical species found in Subtidal sand/Subtidal mud.														
Deoxygenation	Not capable of affecting (other than insignificantly) – These features are sensitive to deoxygenation, but it is considered a low risk pressure when caused by these activities.														
Hydrocarbon & PAH contamination	Not capable of affecting (other than insignificantly) – Deliberate releases of oil or oil/water mixtures from vessels are already prohibited. Accidental discharges of such substances from fishing levels leading to significant releases are extremely rare.														
Introduction of light	Not capable of affecting (other than insignificantly) – Introduction of light from fishing activities is unlikely to significantly affect the presence and/or abundance of typical species found in the Subtidal sand/Subtidal mud.														
Introduction or spread of invasive	Not capable of affecting (other than insignificantly) – Ballast water is the principal vector for invasive non-indigenous species[8]. Fishing vessels less than 45m must have permanent ballast and thus this vector is not available[9].														

[8] http://qsr2010.ospar.org/media/assessments/p00440_Shipping_Assessment.pdf
[9] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/441098/MGN_501_Combined.pdf

non-indigenous species (INIS)		
Organic enrichment	Not capable of affecting (other than insignificantly) – Habitat is subject to a degree of wave action or tidal currents suitable enough to make organic enrichment unlikely.	
Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)	Not capable of affecting (other than insignificantly) – Potential source is from vessel hull antifouling treatments. TBT has been banned on vessels under 25m since 1987. Copper wash can enter the marine environment but the degree of wave action or tidal currents is sufficient to prevent accumulation of such contaminants.	
Transition elements & organo-metal (eg TBT) contamination		
Underwater noise changes	Not capable of affecting (other than significantly) – Underwater noise changes are unlikely to significantly affect presence and/or abundance of typical species found in the Subtidal sand/Subtidal mud.	
Visual disturbance	Not capable of affecting (other than insignificantly) – Visual disturbance is unlikely to significantly affect the presence and/or abundance of typical species found in the Subtidal sand/Subtidal mud.	
Changes in suspended solids (water clarity)	Capable of affecting (other than insignificantly) – Water clarity and siltation rate changes due to physical disturbance of the sediment, coupled with hydrodynamic action caused by the passage of towed gear, would likely affect the presence and/or abundance of the typical species found in Subtidal sand/Subtidal mud.	Not capable of affecting (other than significantly) – Any plumes created by the impact of gear will be small, localised and very short-lived.
Smothering and siltation rate changes (light)		
Nutrient enrichment	Not capable of affecting (other than insignificantly) – Habitat is subject to a degree of wave action or tidal currents suitable enough to make nutrient enrichment unlikely as nutrient content will be removed from the area.	
Physical change (to another sediment type)	Not capable of affecting (other than insignificantly) – The seabed at this site is predominantly muddy with no other types of sediment present, hence there is no other type that the seabed could be converted to.	
Introduction of microbial pathogens	Not capable of affecting (other than insignificantly) – West of Walney MCZ is not a shellfish production site.	

Barrier to species movement	Not capable of affecting (other than insignificantly) – Fishing activity is unlikely to significantly affect movement of typical species found in Subtidal sand/Subtidal mud.

TBBW: beam trawl (whitefish); TBBS: beam trawl (shrimp); TBBPW: beam trawl (pulse/wing); OTH: heavy otter trawl; MRT: multi-rig trawl; OTL: light otter trawl; PT: pair trawl; TDP: towed (demersal/pelagic); SDN: anchor seine; DRBS: scallop dredging; DRBM: mussels, clams, oysters; DRBP: pump scoop (cockles, clams); FPOP: pots/creels (crustacea/gastropoda); FPOC: cuttle pots; FPOF: fish pots

Table 8b: Summary of pressures from specific activities on sea-pen and burrowing megafauna communities taken to Part B

Potential pressures	**Demersal trawl**								**Demersal seine**	**Dredges**			**Traps**		
	TBBW	TBBS	TBBPW	OTH	MRT	OTL	PT	TDP	SDN	DRBS	DRBM	DRBP	FPOP	FPOC	FPOF
Abrasion/disturbance of the substrate on the surface of the seabed	Capable of affecting (other than insignificantly) – Abrasion/surface disturbance can be caused by contact between the gear/anchors and the sea bed.														
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	Capable of affecting (other than insignificantly) – Gears are designed to dig into the seabed.												Capable of affecting (other than insignificantly) – Gears are designed to interact with the seabed.		
Removal of non-target species	Capable of affecting (other than insignificantly) – Removal of non-target species by fishing activities will affect the presence and/or population size of the feature.														
Removal of target species	See column 5	See column 4	See column 5	Column 4 - Capable of affecting (other than insignificantly) – Target species of fishing activity directly affects the feature.					Column 5 - Not capable of affecting (other than insignificantly) – Target species of fishing activity does not affect the feature.				See column 4	See column 5	
Deoxygenation	Not capable of affecting (other than insignificantly) – This features are sensitive to deoxygenation, but it is considered a low risk pressure when caused by these activities.														
Hydrocarbon & PAH	Not capable of affecting (other than insignificantly) – Deliberate releases of oil or oil/water mixtures from vessels are														

contamination	already prohibited. Accidental discharges of such substances from fishing levels leading to significant releases are extremely rare.	
Introduction of light	Not capable of affecting (other than insignificantly) – Introduction of light from fishing activities is unlikely to significantly affect the feature.	
Introduction or spread of invasive non-indigenous species	Not capable of affecting (other than insignificantly) – Ballast water is the principal vector for invasive non-indigenous species[10]. Fishing vessels less than 45m must have permanent ballast and thus this vector is not available[11].	
Organic enrichment	Not capable of affecting (other than insignificantly) – Habitat is subject to a degree of wave action or tidal currents suitable enough to make organic enrichment unlikely.	
Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)	Not capable of affecting (other than insignificantly) – Potential source is from vessel hull antifouling treatments. TBT has been banned on vessels under 25m since 1987. Copper wash can enter the marine environment but the degree of wave action or tidal currents is sufficient to prevent accumulation of such contaminants.	
Transition elements & organo-metal (eg TBT) contamination		
Changes in suspended solids (water clarity)	Capable of affecting (other than insignificantly) – Water clarity and siltation rate changes due to physical disturbance of the sediment, coupled with hydrodynamic action caused by the passage of towed gear, would likely affect the feature.	Not capable of affecting (other than significantly) – Any plumes created by the impact of gear will be small, localised and very short-lived.
Smothering and siltation rate changes (light)		
Nutrient enrichment	Not capable of affecting (other than insignificantly) – Habitat is subject to a degree of wave action or tidal currents suitable enough to make nutrient enrichment unlikely as nutrient content will be removed from the area.	

[10] http://qsr2010.ospar.org/media/assessments/p00440_Shipping_Assessment.pdf
[11] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/441098/MGN_501_Combined.pdf

Physical change (to another sediment type)	Not capable of affecting (other than insignificantly) – The seabed at this site is predominantly muddy with no other types of sediment present, hence there is no other type that the seabed could be converted to.
Introduction of microbial pathogens	Not capable of affecting (other than insignificantly) – West of Walney MCZ is not a shellfish production site.
Barrier to species movement	Not capable of affecting (other than insignificantly) – Fishing activity is unlikely to significantly affect movement of species.

TBBW: beam trawl (whitefish); TBBS: beam trawl (shrimp); TBBPW: beam trawl (pulse/wing); OTH: heavy otter trawl; MRT: multi-rig trawl; OTL: light otter trawl; PT: pair trawl; TDP: towed (demersal/pelagic); SDN: anchor seine; DRBS: scallop dredging; DRBM: mussels, clams, oysters; DRBP: pump scoop (cockles, clams); FPOP: pots/creels (crustacea/gastropoda); FPOC: cuttle pots; FPOF: fish pots

4. Part B Assessment

Part B of this assessment was carried out in a manner that is consistent with the 'significant risk' test required by section 126(2) of the Marine and Coastal Access Act 2009.

Tables 9a and 9b show the fishing activities and pressures included for assessment in part B. Pressures with similar potential impacts to a particular feature were grouped to save repetition during this assessment.

Table 9a: Fishing activities and pressures included for part B assessment for both subtidal sand and subtidal mud features

Natural England Aggregated Method	Fishing gear type	Pressures
Demersal trawl	beam trawl (whitefish)	• Abrasion/disturbance of the substrate on the surface of the seabed • Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion • Removal of non-target species
	beam trawl (shrimp)	
	beam trawl (pulse/wing)	
	heavy otter trawl	
	multi-rig trawl	
	light otter trawl	
	pair trawl	
	towed (demersal/pelagic)	
Demersal seine	anchor seine	
Dredges	scallop dredging	
	mussel, clam, oyster dredging	
	pump scoop (cockles, clams)	
Traps	pots/creels (crustacea/gastropoda)	
	cuttle pots	
	fish pots	
Demersal trawl	beam trawl (whitefish)	• Changes in suspended solids (water clarity) • Smothering and siltation rate changes (light)
	beam trawl (shrimp)	
	beam trawl (pulse/wing)	
	heavy otter trawl	
	multi-rig trawl	
	light otter trawl	
	pair trawl	
	towed (demersal/pelagic)	
Demersal seine	anchor seine	
Dredges	scallop dredging	
	mussels, clams, oysters	
	pump scoop (cockles, clams)	

Table 9b: Fishing activities and pressures included for part B assessment for sea-pen and burrowing megafauna communities feature

Natural England Aggregated Method	Fishing gear type	Pressures
Demersal trawl	beam trawl (whitefish)	• Abrasion/disturbance of the substrate on the surface of the seabed • Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion • Removal of non-target species
	beam trawl (shrimp)	
	beam trawl (pulse/wing)	
	heavy otter trawl	
	multi-rig trawl	
	light otter trawl	
	pair trawl	
	towed (demersal/pelagic)	
Demersal seine	anchor seine	
Dredges	scallop dredging	
	mussel, clam, oyster dredging	
	pump scoop (cockles, clams)	
Traps	pots/creels (crustacea/gastropoda)	
	cuttle pots	
	fish pots	
Demersal trawl	beam trawl (whitefish)	• Changes in suspended solids (water clarity) • Smothering and siltation rate changes (light)
	beam trawl (shrimp)	
	beam trawl (pulse/wing)	
	heavy otter trawl	
	multi-rig trawl	
	light otter trawl	
	pair trawl	
	towed (demersal/pelagic)	
Demersal seine	anchor seine	
Dredges	scallop dredging	
	mussel, clam, oyster dredging	
	pump scoop (cockles, clams)	
Demersal trawl	beam trawl (shrimp)	• Removal of target species
	heavy otter trawl	
	multi-rig trawl	
	light otter trawl	
	pair trawl	
	towed (demersal/pelagic)	
Traps	pots/creels (crustacea/gastropoda)	

The important targets for favourable condition were identified within Natural England's conservation advice supplementary advice tables. 'Important' in this context means only those targets relating to attributes that will most efficiently and directly help to define condition. These attributes should be clearly capable of identifying a change in condition.

Tables 10a and 10b show which targets were identified as important. The impacts of pressures on features were assessed against these targets to determine whether the activities causing the pressures are compatible with the site's conservation objectives.

Table 10a: Relevant favourable condition targets for identified pressures to subtidal sand and subtidal mud

Attribute	Target	Relevance/justification
Extent and distribution	Maintain the total extent and spatial distribution of subtidal mud/sand.	Pressures will not significantly alter the extent or distribution of the feature.
Distribution: presence and spatial distribution of biological communities	Recover the presence and spatial distribution of subtidal mud/sand communities.	Important to all pressures.
Structure and function: presence and abundance of key structural and influential species	Restore the abundance of listed species*, to enable each of them to be a viable component of the habitat	Important to all pressures
Structure: sediment composition and distribution	Maintain the distribution of sediment composition types across the feature.	Pressures will not significantly alter to sediment composition or distribution.
Structure: species composition of component communities	Recover the species composition of component communities.	Important to all pressures.
Supporting processes: sediment contaminants	Restrict surface sediment contaminant levels to concentrations where they are not adversely impacting the infauna of the feature.	Pressure will not introduce sediment contaminants at a significant level.
Structure: Non-native species and pathogens	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	Pressures will not result in the introduction of INNS at a significant level.
Supporting processes: energy / exposure	Maintain the natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the biotopes and stability, across the habitat.	Pressures will not significantly alter the energy or exposure of the feature.
Supporting processes: sediment movement and hydrodynamic	Maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered or prevented from responding to changes in environmental	Pressures will not significantly alter the sediment movement or hydrodynamic regime.

regime	conditions.	
Supporting processes: water quality - contaminants	Restrict aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	Pressures will not significantly impact on nutrient levels.
Supporting processes: water quality - dissolved oxygen	Maintain the dissolved oxygen (DO) concentration to levels equating to High Ecological Status (specifically ≥ 5.7 mg per litre (at 35 salinity) for 95 % of year), avoiding deterioration from existing levels.	Pressures will not significantly impact levels of dissolved oxygen.
Supporting processes: water quality - nutrients	Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features.	Pressures will not significantly impact on nutrient levels.
Supporting processes: physico-chemical properties	Maintain the natural physico-chemical properties of the water.	Pressures will not significantly impact on chemical properties of the water.
Supporting processes: water quality - turbidity	Maintain natural levels of turbidity (eg suspended concentrations of sediment, plankton and other material) across the habitat.	Important to: • Abrasion/disturbance of the substrate on the surface of the seabed • Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion • Changes in suspended solids (water clarity) • Siltation rate changes (Low), including smothering (depth of vertical sediment overburden)

Table 10b: Relevant favourable condition targets for identified pressures to sea-pen and burrowing megafauna communities

Attribute	Target	Relevance/justification
Distribution: presence and spatial distribution of biological communities	Recover the presence and spatial distribution of sea-pen and burrowing megafauna communities.	Important to all pressures.

Extent and distribution	A target is not being advised for the feature at this point. Further investigation of the evidence is needed regarding the current and historical distribution of the sea-pen and burrowing megafauna communities within the site.	Important to all pressures.
Structure and function: presence and abundance of key structural and influential species	[Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Important to all pressures
Structure: energy / exposure	Maintain the natural physical energy resulting from waves, tides and other water flows, so that the exposure [High / Medium / Low] does not cause alteration to the biotopes, and stability, across the habitat.	Pressures will not significantly alter the energy or exposure of the feature.
Structure: non-native species and pathogens	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	Pressures will not result in the introduction of INNS at a significant level.
Structure: sediment composition and distribution	Maintain the distribution of sediment composition types across the feature.	Pressures will not significantly alter to sediment composition or distribution.
Structure: species composition of component communities	Recover the species composition of component communities.	Important to all pressures.
Supporting processes: physico-chemical properties	Maintain the natural physico-chemical properties of the water.	Pressures will not significantly impact on chemical properties of the water.
Supporting processes: sediment contaminants	Restrict surface sediment contaminant levels to concentrations where they are not adversely impacting the infauna of the feature.	Pressures will not significantly impact on nutrient levels.
Supporting processes: sediment movement and hydrodynamic regime	Maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered or prevented from responding to changes in environmental conditions.	Pressures will not significantly alter the sediment movement or hydrodynamic regime.
Supporting processes: water quality -	Restrict aqueous contaminants to levels equating to High Status according to Annex VIII and Good	Pressures will not significantly impact on nutrient levels.

contaminants	Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	
Supporting processes: water quality - dissolved oxygen	Maintain the dissolved oxygen (DO) concentration to levels equating to High Ecological Status [(specifically ≥ 5.7 mg per litre (at 35 salinity) for 95 % of the year)], avoiding deterioration from existing levels.	Pressures will not significantly impact levels of dissolved oxygen.
Supporting processes: water quality - nutrients	Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features.	Pressures will not significantly impact on nutrient levels.
Supporting processes: water quality - turbidity	Maintain natural levels of turbidity (eg concentrations of suspended sediment, plankton and other material) across the habitat.	Important to: • Abrasion/disturbance of the substrate on the surface of the seabed • Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion • Changes in suspended solids (water clarity) • Siltation rate changes (Low), including smothering (depth of vertical sediment overburden)

4.1 Activity description: demersal trawl, dredging, demersal seins and traps

4.1.1 Fisheries Access/existing management

UK and Irish vessels operate throughout this site.

There are various NWIFCA byelaws[12] that pertain to the 0-6nm portion of the site. The below are relevant for the scope of this assessment:

- BYELAW 3 - PERMIT TO FISH FOR COCKLES (*Cerastoderma edule*) AND MUSSELS (*Mytilus edulis*)

Provides a cockle and mussel fishery closure between 1st May and the 31st August in the same year. Protects from disturbance from fishing activities.

[12] www.nw-ifca.gov.uk/byelaws

- BYELAW 12 - RESTRICTIONS ON FISHING FOR BIVALVE MOLLUSCAN SHELLFISH

Restriction on how fishing for bivalves can take place. Protects features by reducing pressure from fishing activities.

- BYELAW 13A - COCKLES AND MUSSELS - MANAGEMENT OF THE FISHERY

Can provide spatial/temporal closures of shellfish beds. Protects features within the closure from disturbance from fishing activities.

- BYELAW 16 – SHELL FISHERY -TEMPORARY CLOSURE.

Provides for closures of shellfish areas. Protects features from disturbance from fishing activities.

- EMERGENCY BYELAW: RESTRICTIONS ON FISHING FOR BIVALVE MOLLUSCAN SHELLFISH 2016

A person must not fish for bivalve molluscan shellfish using a dredge. Protects features from disturbance from fishing activities.

4.1.2 Evidence Sources

To determine the levels of fishing activity, the following evidence sources and analyses were used:

- vessel monitoring system (VMS) data
- fisheries landings data (logbooks and sales records)
- Fishermap stakeholder mapping report data
- expert opinion from MMO marine officers and inshore fisheries and conservation officers
- spatial footprint analysis using P-values

Table 11 summarises the description, strengths and limitations of some of the evidence sources used. For more information about the evidence sources used, please see appendix 1: MMO methodology.

Table 11: Summary of generic confidence associated with fishing activity evidence

Evidence source	Confidence	Description, strengths and limitation
VMS data	High / Moderate	• Confidence in VMS is high for describing activity relating to larger vessels (>15m). But VMS information was not developed specifically for management of MPAs, and does not describe activity in smaller vessels. • There are assumptions in the processing that speed of <6 knots is 'fishing speed'. • VMS records the location, date, time, speed and course of the vessel. Fishing gear information has to be linked to the VMS data itself by either matching its logbook information where possible, using the fleet register which may not be up to date or local marine officer knowledge of the said vessel. • Known guard vessel data have been removed from these data.
Fishermap	Low	• The data were collected in 2012 and are therefore relatively dated. • A condition of the research was that only those interviewees

		who explicitly gave permission for their data to be shared would have their own mapping represented in the final product shared with third parties. This equated to approximately 50% of responses. • The data are self-reported estimates. • The number of skippers who allowed their data to be used represent just over one fifth of the number of licensed under 15m fishing vessels registered in England.
Defra 2015 (MB0117)	Moderate	• Based on recent work to describe fishing activity, but is limited by raw data and other limitations highlighted in the report.
Expert judgement	Low / Moderate	• This depends on the area, and the knowledge of the area from MMO and IFCA staff.
P-values	Moderate/High	• Spatial footprint values do not include information for non-VMS vessels. • The methodology used to calculate spatial footprints requires 'matching' of VMS data to specific gear types held on UK or EU fishing fleet registers. This therefore relies on these registers being kept up to date.
Sightings data	High	• Taken from IFCA and Royal Navy patrols and targets inspection. • Covers all vessels, not limiting to size class.

4.1.3 Fishing gear types used

General characteristic of fishery

The site is located on the edge of one of the major *Nephrops* fishing grounds in the Irish Sea and is used by fishing vessels from Fleetwood, Barrow and Northern Ireland. Inshore vessels target plaice, skate, dogfish, sole, Norway lobster and dab.

Expert advice (NWIFCA, *pers comms)* indicates that netting and lines are not used within 0-6 and there are no VMS reports for these methods anywhere within the site boundary within the 12nm limit.

Fishing is mainly bottom towed gear, peaking over summer months. A small number of small potting vessels also operate within the site (NWIFCA, *pers comms)*.

Sightings data do not add any further information beyond that gathered by expert opinion, Fishermap and VMS data.

Bottom Trawling

Figure 2a: ICES 36E6 and ICES 37E6 fishing activity in 2011

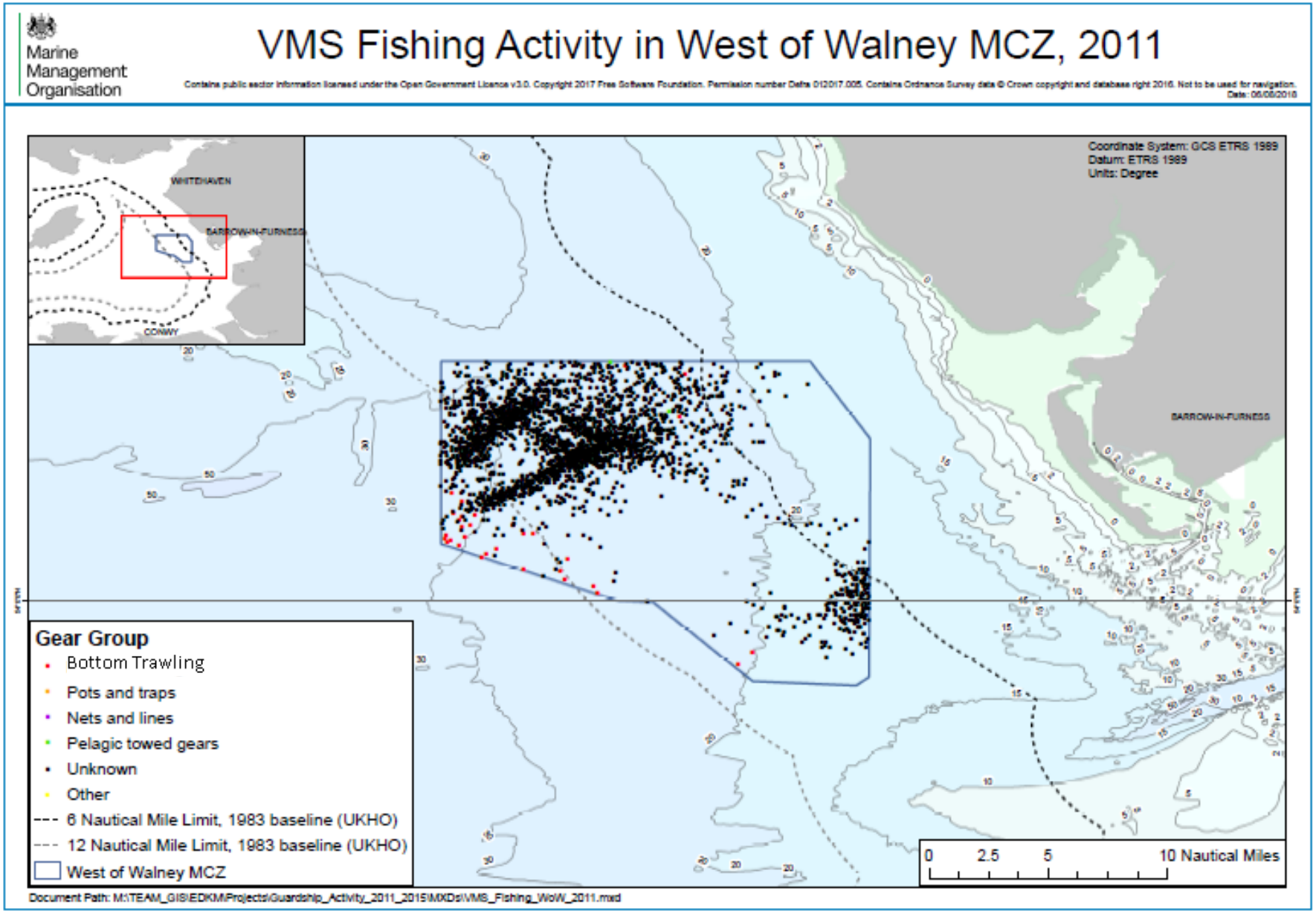


Figure 2b: ICES 36E6 and ICES 37E6 fishing activity in 2012

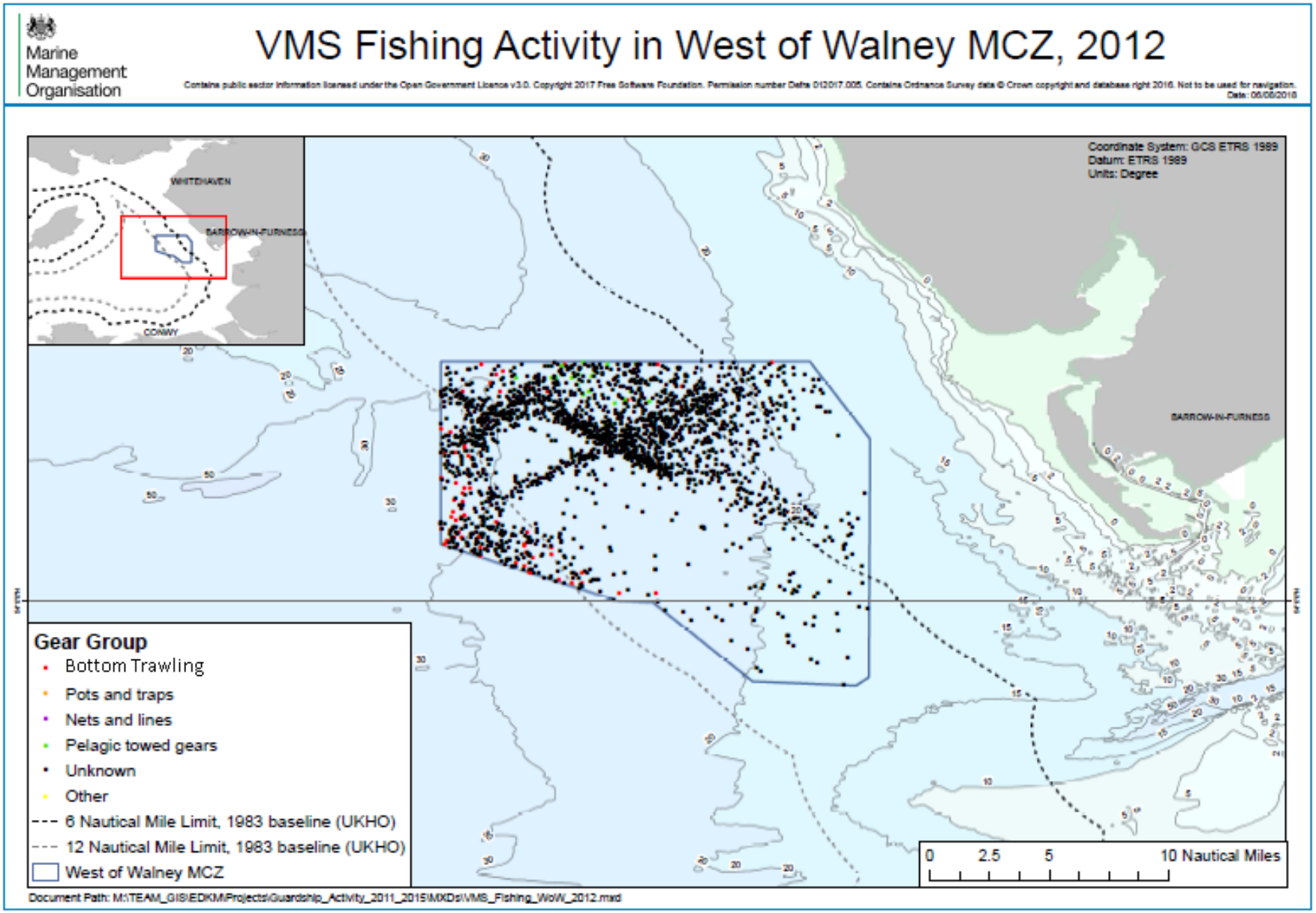


Figure 2c: ICES 36E6 and ICES 37E6 fishing activity in 2013

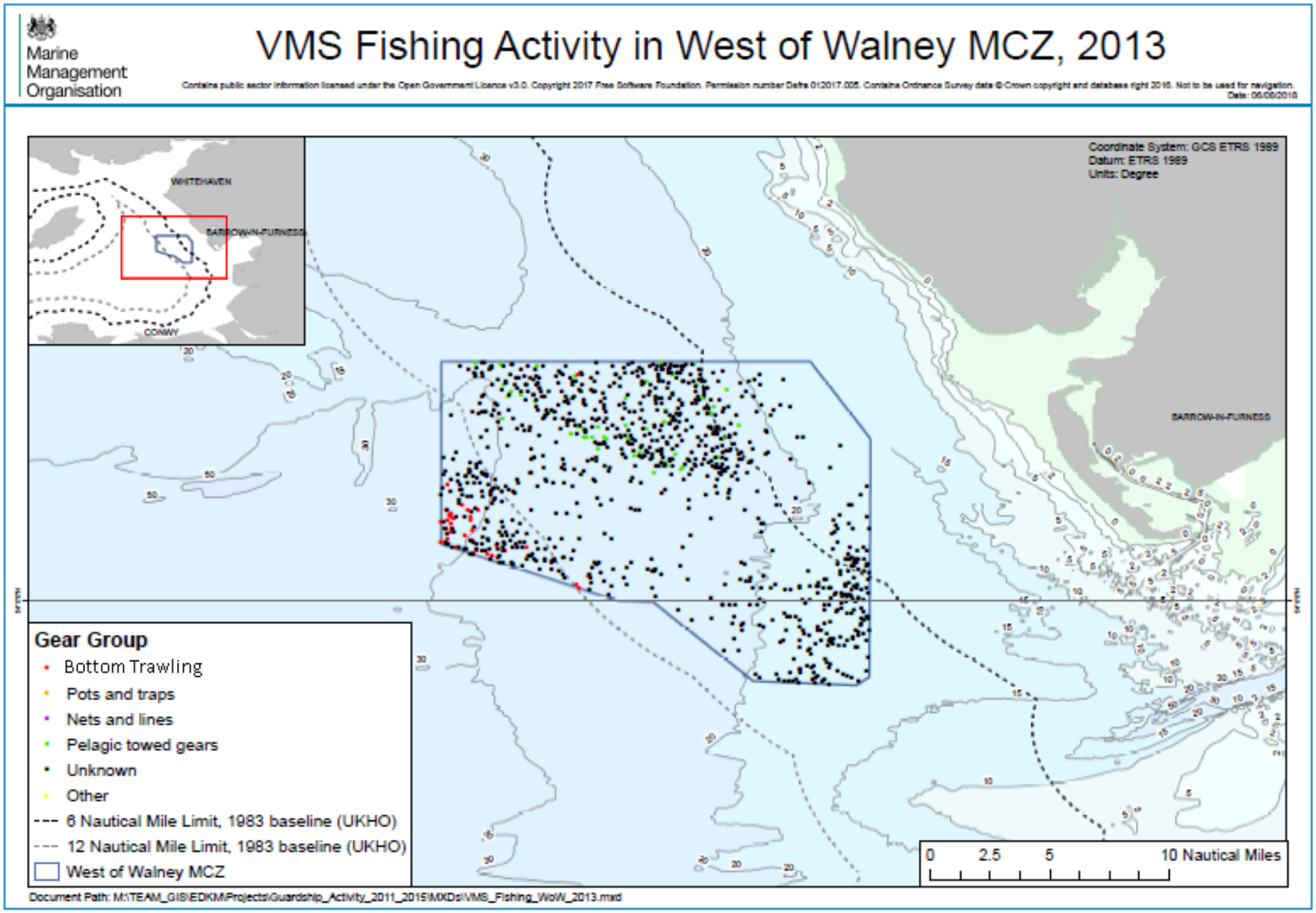


Figure 2d: ICES 36E6 and ICES 37E6 fishing activity in 2014

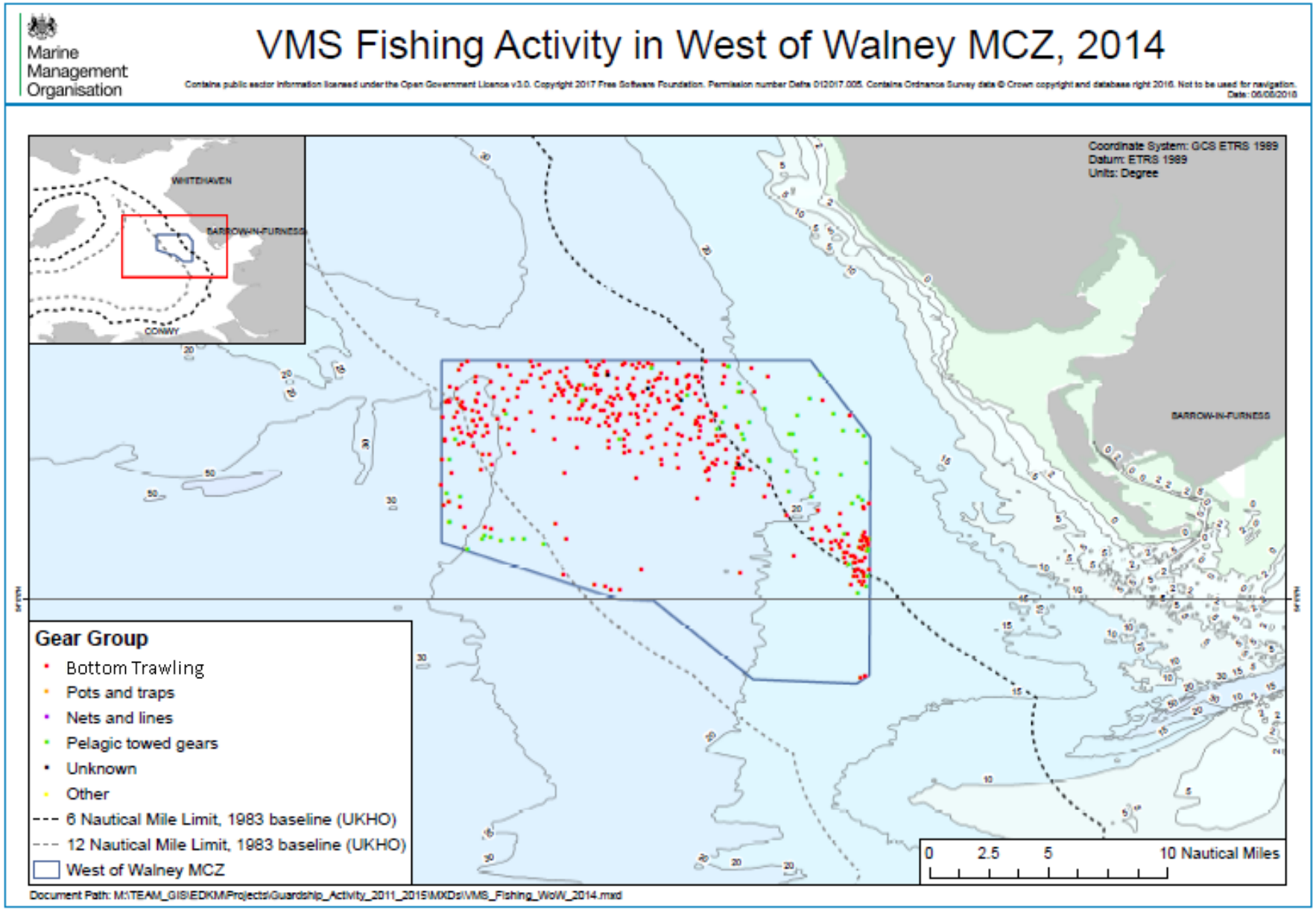


Figure 2e: ICES 36E6 and ICES 37E6 fishing activity in 2015

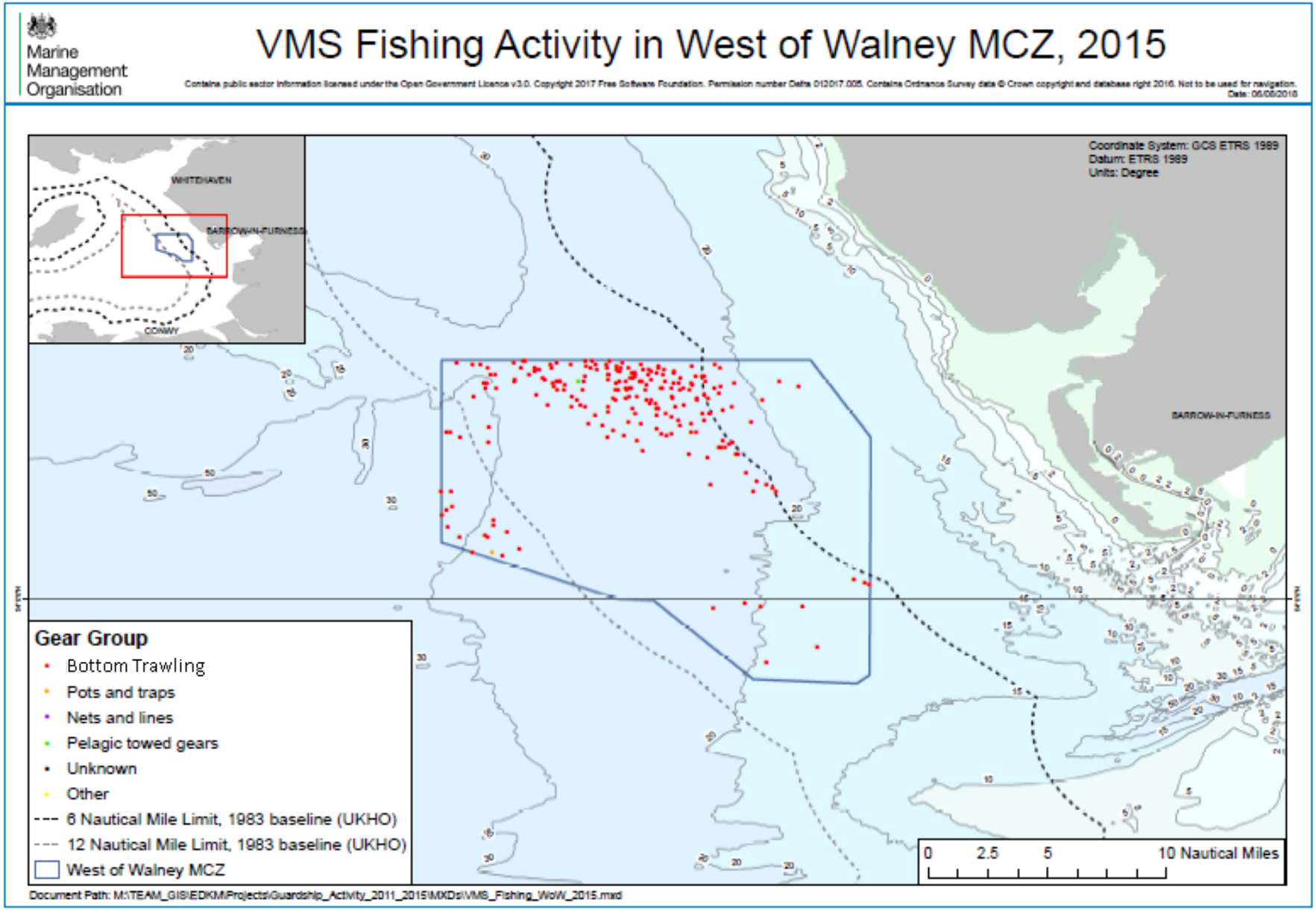


Figure 2f. Fishing activity, based on Vessel Monitoring System (VMS) information of UK and Irish vessels within ICES rectangles 36E6 and 37E6 in 2011.

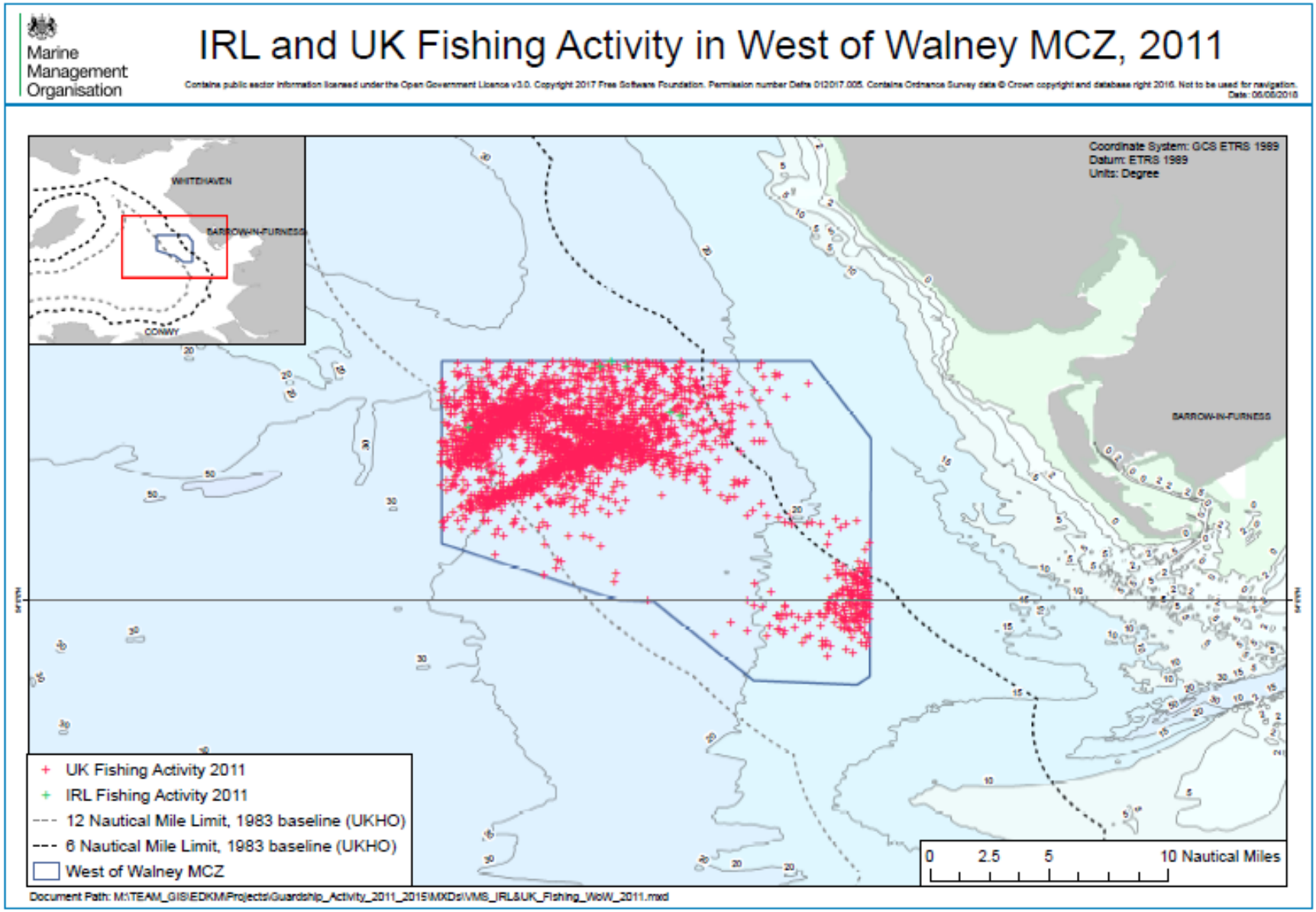


Figure 2g. Fishing activity, based on VMS information of UK and Irish vessels ICES rectangles 36E6 and 37E6 in 2012.

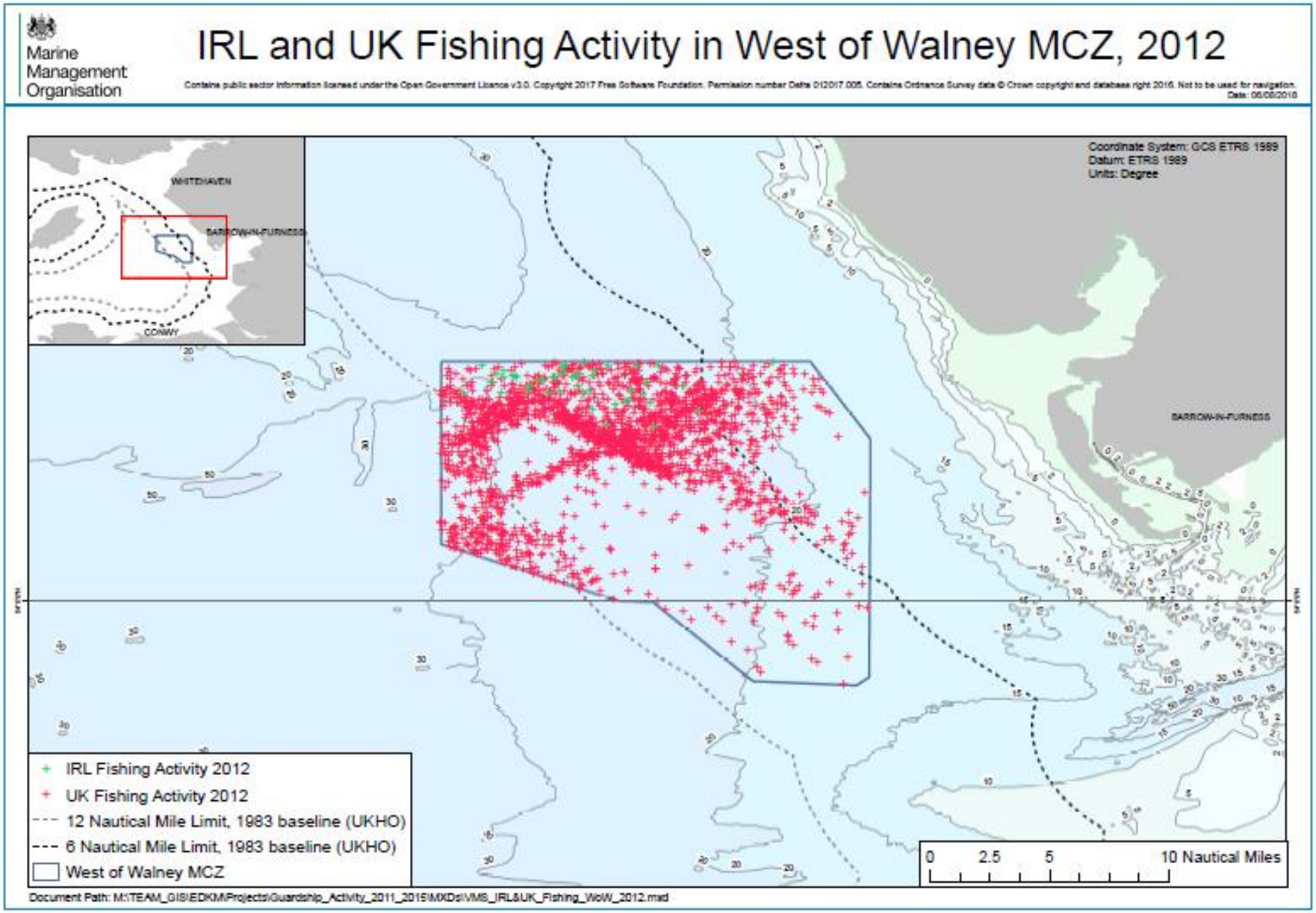


Figure 2h. Fishing activity, based on VMS information of UK and Irish vessels ICES rectangles 36E6 and 37E6 in 2013.

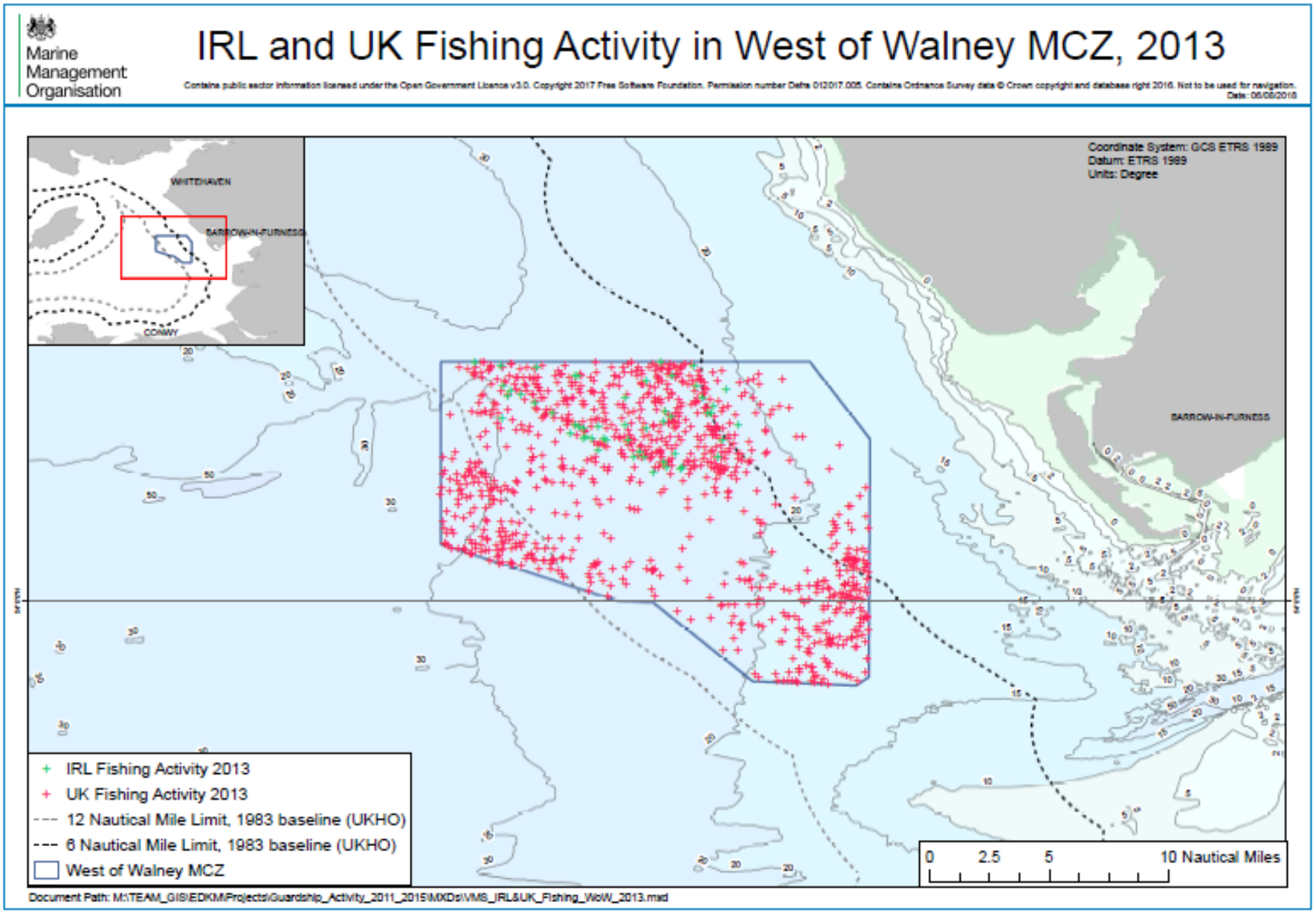


Figure 2i. Fishing activity, based on VMS information of UK and Irish vessels ICES rectangles 36E6 and 37E6 in 2014.

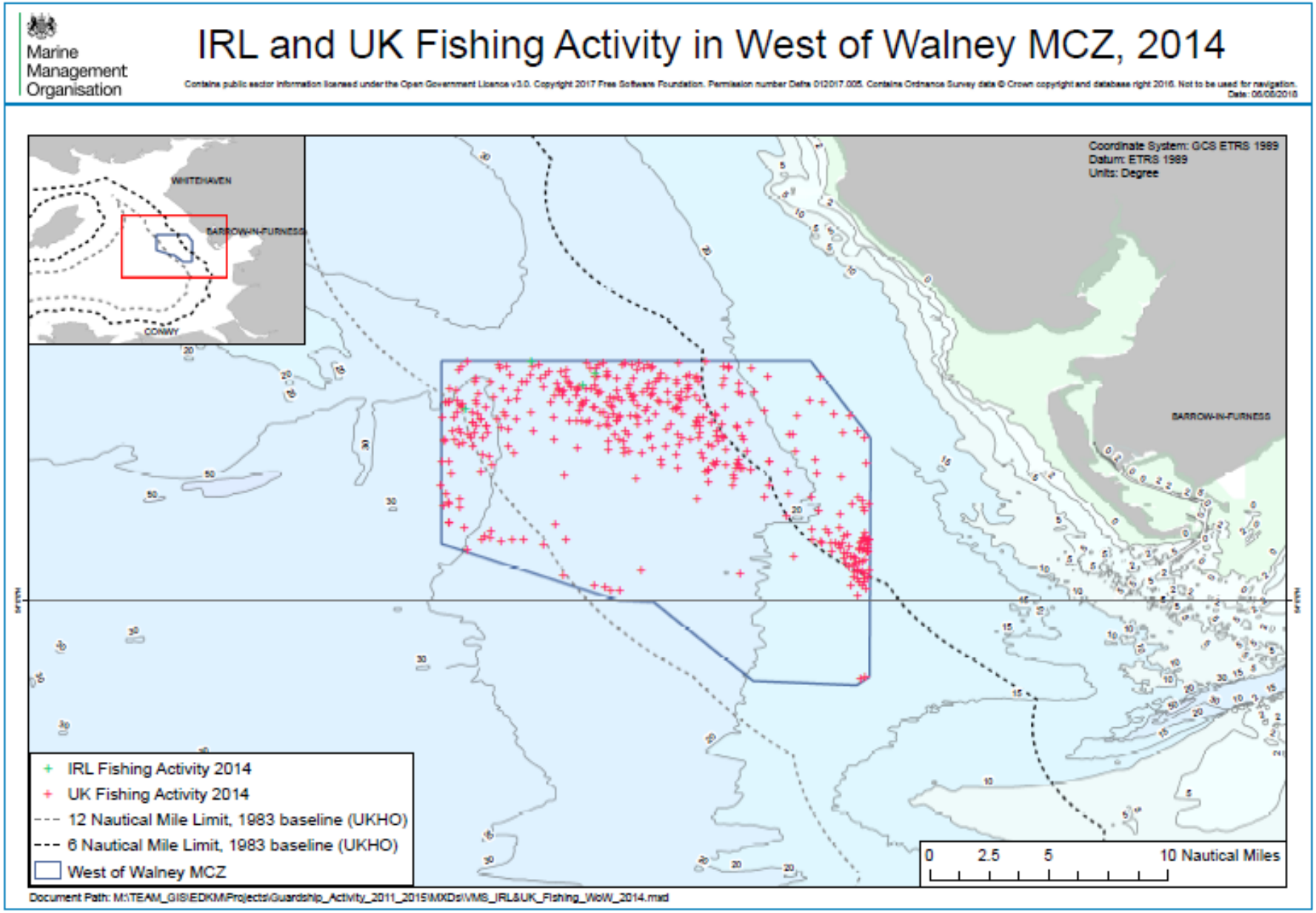
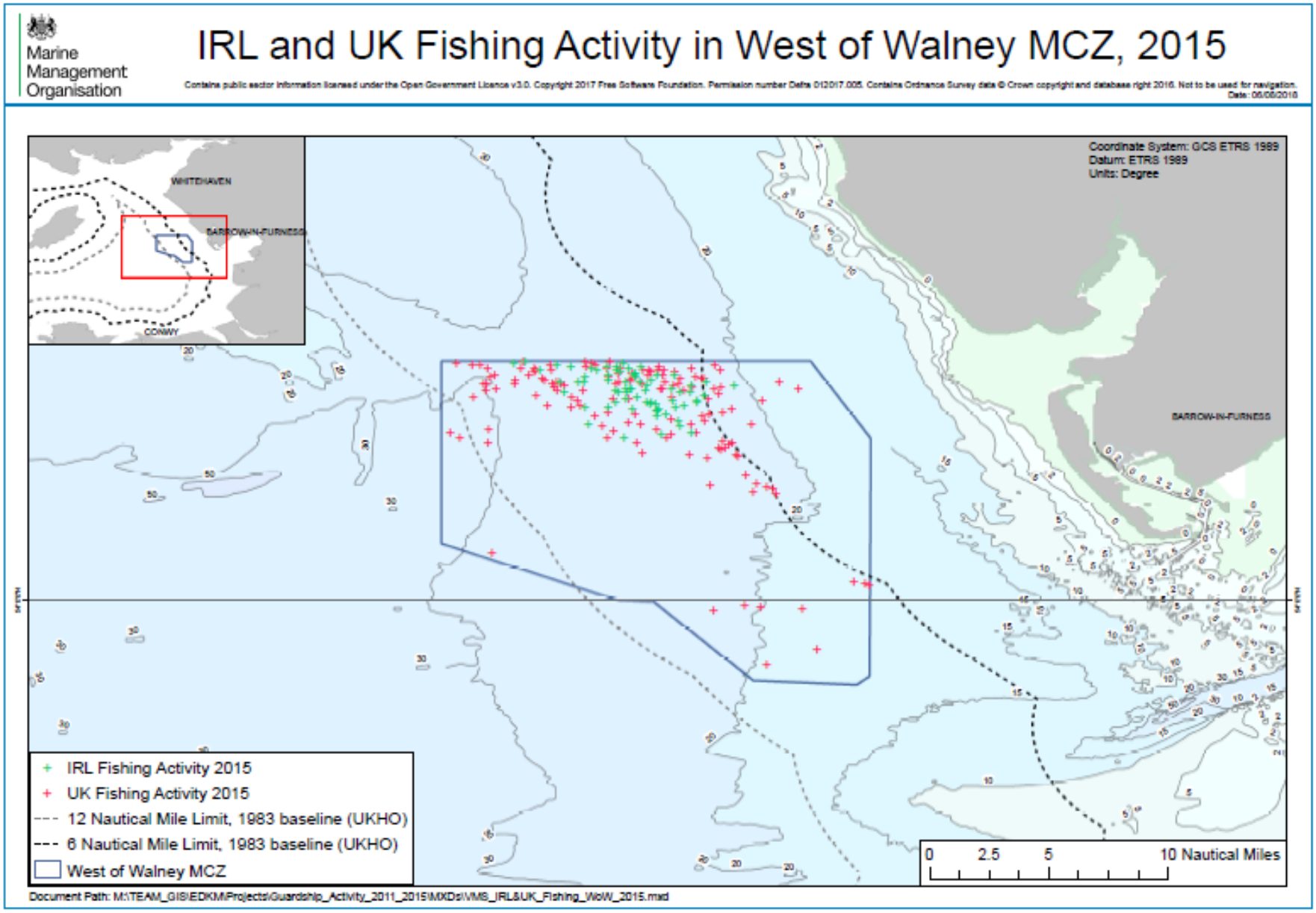


Figure 2j. Fishing activity, based on VMS information of UK and Irish vessels ICES rectangles 36E6 and 37E6 in 2015



4.1.3.1 Aggregated method: Demersal Trawls

This fishing method was throughout the site with the heaviest fishing effort concentrated along the western and northern boundaries (Annex 2).

Beam trawls

Beam trawl nets are kept open by a beam which varies in length from 4 to 12 m depending on the size of the vessel. Trawl heads support the beam and are fitted with sole plates which are constantly in touch with the seabed during fishing. Tickler chains or chain matrices are used depending on the ground; therefore the weight of the gear varies.

Otter trawls

Demersal otter trawls feature a variety of designs and riggings depending on the nature of the ground to be fished and the target species.

Otter trawl rigs consist of netting divided into wings, belly and cod-end. To the sides of the net wings, a pair of otter boards, or trawl doors, open the net horizontally and depress the trawl to the seabed. They also stimulate the fish to swim into the path of the trawl, sometimes through the creation of a sediment cloud. Cables known as bridles and sweeps connect the otter boards to the net wings and these can be from a few meters up to a few hundred meters long. The front of the trawl is framed on the top by a head line, which frequently has floats attached to keep the mouth of the net open, and a ground rope usually constructed of wire. The ground rope will often have associated ground gear attached to it to protect the net from damage and prevent entanglement with the bottom. Ground gear can vary from rock hoppers to bobbins of various dimensions. Tickler chains may also be attached to the net opening, and mechanically stimulate fish through contact with the bottom.

The managing fisheries in MPA gear glossary defines heavy otter trawl gear as:

Any otter trawl that uses any of the following:

- sheet netting of greater than 4 mm twine thickness
- rockhoppers or discs of 200 mm or above diameter
- a chain for the foot/ground line (instead of wire)
- multiple tickler chains

Light otter trawl

The light otter trawl is defined as an otter trawl gear which does not meet the definition of a heavy otter trawl.

4.1.3.2 Aggregated method: Dredges

Rigid structure towed on the seabed usually for shellfish. Dreading occurs over subtidal mud and megafauna feature in small amounts (Annex 3). This is made up of only UK vessels.

Scallop dredging

Scallop dredging uses steel dredges with a leading bar fitted with a set of spring loaded, downward pointing teeth. A mat of steel rings is fitted behind this toothed bar.

A heavy net cover (back) is laced to the frame, sides and after end of the mat to form a bag. Sets of dredges are shackled to a hollow steel tow bar, which is connected to the main towing warp by a series of chain bridles. Larger vessels generally tow two bars, one on each quarter. Dredge gear is often rigged in a very similar way to beam trawls[13].

4.1.3.3 Aggregated method: Traps

Traps is a collective term for structures into which fish or shellfish are guided or enticed through funnels that encourage entry but limit escape.

Within the site, UK vessels fish small amounts in the south east section of the site. Potting appears to not occur over the subtidal sand feature.

Trap types: Pots/creels

The main pots used in this area are whelk pots. These are either purpose built plastic designs or recycled plastic containers. Both designs have an entrance and means to secure the bait.

4.1.3.3 Aggregated method: Demersal seines

A demersal seine is a net used to encircle fish on the seabed. The demersal seine is characterized by having its net bounded by lead-weighted ropes that are not encircled with rollers or bobbins. Demersal seine gear is fished without the use of steel cables or otter boards.

VMS data indicate that this method of fishing has not occurred for VMS vessels within the sample period. Therefore this gear will not be assessed further.

4.1.4 Fishermap

In order to identify the potential gear activity from smaller vessels, Fishermap (Annex 5) data was used to assess effort. The data is presented as a year's activity, collected from a series of monthly totals of vessel numbers, per grid cell. These data are made up from number of skippers that indicated that they may fish in within the site boundary.

[13] http://www.seafoodscotland.org/ru/responsible-sourcing/catching-methods/scallop-dredging.html

Table 11: Number of under 15 metre fishing vessel visits per year over the whole site (both features) by gear type and Fishermap grid cell[14]

Subtidal mud, subtidal sand and sea-pen and borrowing mega-fauna	Number of fishing vessel visits per year by gear type		
	Demersal Trawl	Dredging	Traps
Between 0 – 12nm	Up to 21	Up to 8	Up to 15

The dredging Fishermap (Annex 5) indicates that dredging occurs in the southern and eastern sections of the site, over the footprint of all three features. This activity straddles the 6 nm line and runs north-south through the entire site.

The bottom trawling gear Fishermap (Annex 5) indicates that this fishery occurs throughout the site, with highest effort in the north, north-west section of the site.

The potting Fishermap (Annex 5) indicates that this fishery is limited to the eastern section of the site and covers all three features.

The netting Fishermap (Annex 5) does show some netting activity clipping the eastern boundary of West or Walney MCZ. However this is contrary to *pers comms* from NWIFCA who indicate that there is no netting within the 0-6 nm section of the site. Given the limitations of fishermap as detailed above, the fact that there are no sightings data for this fishing method over the data period, and the opinion that this fishery does not occur within the 0-6 nm, MMO conclude that netting does not currently occur within the site. As such netting will not be included in this assessment.

4.1.5 Spatial footprint analysis using P-values

Analysis was undertaken of the total spatial footprint of fishing gear used each year. The total spatial footprint of a particular gear group was then compared to the total area of the feature, producing a ratio (P). A P-value of less than 1 means that the total spatial footprint of the gear in a given time period was smaller than the total area of the feature. A P-value of more than one means that the total spatial footprint of the gear in a given time period was greater than the total area of the feature. The spatial footprint analysis used in this assessment is based on a report commissioned by Defra's Impact Evidence Group on the feasibility of using a spatial footprint method in appropriate assessments[15] (report reference: MMO1108). It should be noted that P-values are derived from VMS data, and therefore only capture vessels with VMS.

Estimates of the P-values for each fishing gear at this site are displayed in Annex 6. The assumptions used when calculating footprints are displayed in Annex 7.

4.1.5.1 Subtidal sand

[14] As these areas fall over a number of grid cells the worst case scenario has been included.
[15] MARG Ltd in association with Envision Mapping Ltd, 2015

Of the years analysed, P-values were highest in 2012 (annex 6, table 13). This P-value is equivalent to 0.7 km^2 being disturbed within that year.

In 2012 and 2014 there were peaks of otter trawling at the site. These produced P-values of 0.106 and 0.016 respectively (annex 6, table 13).

The MMO consider this to be low effort over this feature for this gear type.

4.1.5.2 Subtidal mud and sea-pen and burrowing megafauna communities

Given the almost identical distribution of these features they have been discussed together. Where a number is referenced MMO had used the largest number.

Of the years analysed, P-values were highest for UK vessels in in 2012 (annex 6 tables 1 and 7 and Figure 2b), this P-value is equivalent to 19.2% being disturbed in that year for subtidal mud and 20.9% for the sea-pen and burrowing megafauna feature. For non-UK vessels these greatest yearly figures were 1.06% and 1.18% respectively (annex 6 tables 4 and 10). The greater portion of this figure is made up from the UK fleet. The can be attributed mainly to bottom otter trawling throughout the year, with only September, October and December where numbers of vessels were recorded at under 20 days over a month's period, and peaking at 29 day of fishing within May and July (annex 6, table 2 and 8).

In 2012 the peak of bottom otter trawls produced P-values of 0.22 for both features (annex 6, tables 1 and 7).

Dredging peaked in 2012, creating a p-value of 0.006 (annex 6, tables 1 and 7).

P-values created from potting over this feature result in figures on 0. Effort is so low that the resolution in the P-value does not register a value for this level of effort (annex 6, tables 1 and 7).

4.1.6 VMS data

VMS data indicate that fishing occurs within all three administrative sections of the site (Annexes 2-4). Data highlight that fishing using bottom trawling gear is the most abundant throughout the site and occurs over all three features, as does potting. There appears to be less fishing occurring within the footprint of the existing windfarm developments.

4.1.7 Summary

It is clear that there is interaction from fishing activity and the protected features within the West of Walney MCZ. The sections below begin to explore the pressure that each fishing type exerts on both of the features of the site. These pressures are discussed in depth in the below sections. Pressures are exerted from bottom towed gears and potting. Data suggest that nets and lines are absent within the site.

For pressures where potential impacts to features are of a similar nature, those pressures have been consolidated to avoid repetition during this stage of the assessment. For each subsequent

pressure, new information regarding the potential effects of that pressure could have on the feature has been discussed.

4.2 Abrasion/disturbance of the substrate on the surface of the seabed AND penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion

General information

The sensitivity of the subtidal sand features to physical damage from static gears is through surface abrasion from pots, through deployment, movement of gear on the benthos due to tide, current and storm activity; and as the gear is dragged along the seafloor on retrieval.

The sensitivity varies depending on the substrate. Mixed sediments are more susceptible to surface and sub-surface penetration than subtidal sand and subtidal coarse sediments (Tillin *et al*, 2010). As a result, less dynamic sand communities are therefore more sensitive to physical damage and recoverability/resilience tends to take longer/be lower (Tillin *et al*, 2010). In general, more dynamic habitats that are subjected to regular, natural disturbance are able to recover more quickly from the effects of fishing (Sewell & Hiscock, 2005).

The effects of demersal trawling on seabed gravel communities can vary depending on how dynamic the environment is (wave action/tidal streams) with more mobile sand being less sensitive than the more stable sediments due to the more developed epifauna and infauna (Glawys *et al,* 2014; Hall *et al,* 2008). The infaunal communities are adapted to this environment by being able to rapidly re-bury themselves into this dynamic environment. Areas of reduced sediment movement support communities of attached bryozoans, hydroids and sea anemones. Sand mason worms and keel worms along with bivalves and crustaceans are also associated with this sub-feature (Glawys *et al*, 2014). The increased recoverability of the sandbanks depends on tidal current speed and the closeness of areas with high abundance of species that can re-colonise from high wave movement (Glawys *et al*, 2014).

The impact of demersal trawls varies depending on the weight of the gear used (Tilin *et al,* 2010; Grieve *et al* 2011). For example, the shoes of a ’flatfish’ beam trawl can penetrate the seabed up to 6 cm, and the tickler chain/ground gear from 2–2.2 cm.

Jones (1992) concludes that the effects of beam trawls, otter trawls and dredges are similar in their effect on the seabed.

The magnitude of the pressure will depend on the towing speed with beam trawl pressure from trawl heads varying from 0.2 to 1.1 N/cm^2. If the sole plate is tilted the pressure can be increased up to 3 times. Contact with the seafloor will vary depending on the fishing grounds with more contact over harder ground (Fonteyne, 2000).

The chains of beam trawls penetrate the upper few centimetres of the sediment which have the potential to interact with organisms living just below the surface of the seabed (Grieve *et al*, 2014).

Within the more stable areas the effects will be more pronounced; areas more exposed to tidal currents and wave action and will be naturally more adapted to disturbance and therefore recoverability will be quicker (Magda *et al*, 2000; Grieve *et al*, 2014; Bolam *et al*, 2014).

The chains of a beam trawl and the teeth of a scallop dredge penetrate the upper few centimetres of the sediment, and these run the entire width of the gear. The trawl doors are the only part of an otter trawl that penetrates into the sediment (Løkkeborg, 2005).The physical impacts on benthic environments caused by otter trawling are likely to be different from those caused by beam trawling and scallop dredging. The latter two gear types penetrate into the sediment, the most visible physical impact is flattening of the seabed (Kaiser *et al*, 1996; Løkkeborg, 2005).

Species close to the surface, larger less mobile species, and animals not covered by a shell are more prone to physical damage from mobile gears (Bolam *et al,* 2014; Magda *et al*, 2000). Sedentary species that dominate the top-layer of the sediment are the most sensitive to physical damage (Tillin & Tyler-Walters, 2014).

Light otter trawling is less damaging than heavier gears such as beam trawlers and sand is thought to be highly sensitive at high levels of fishing, moderate at moderate levels and not sensitive at other levels on stable species rich mixed sediments (Hall *et al*, 2008). Heavy otter trawling does not occur within West of Walney MCZ and light otter trawling only occurs at low levels.

Bridles and sweeps may also have contact with the seafloor with longer bridles coming into contact more frequently than shorter bridles which are mainly used in rougher ground. These can therefore impact on species close to the surface of the seabed. The ground ropes of an otter trawl may also have contact with the seabed (to varying degrees) and can have similar impacts than bridles (Grieves, *et al* 2014).

Subtidal sand

Impacts of potting

During potting there is potential for fragile epifauna to be damaged through snagging and entanglement especially at high levels of fishing (Hall *et al,* 2008; Roberts *et al,* 2010). However the use of pots or creels is thought to be far less damaging to benthic habitats than the use of mobile gears in general (Sewell & Hiscock, 2005). This does not preclude the possibility that traps cannot significantly impact the benthos, however it does frame the risk to the feature compared to other gear types. Fishermap data indicated that there were only limited amounts of under 12 m vessels potting within the site. The P-value for this feature gear interaction is 0 across all years (annex 6, table 13). Overall, this describes a small footprint and low effort for a gear type that is thought not to have significant impacts on benthic habitats at low or medium levels of intensity. As such the MMO is content that **there is not a significant risk of abrasion or penetration from potting hindering the achievement of the conservation objectives stated for this MCZ for the subtidal sand feature.** This is a conclusion also reached by Roberts *et al* (2010) who state (for another area) that potting, as a result of the small footprint of the seabed, creates only small impacts. Additionally effects are less in areas where trawling occurs (Roberts *et al*, 2010) and trawling and scallop dredging occurs in the same area as potting (Annexes 2 and 5).

Impacts of bottom towed gears

Bottom fishing can cause death of benthic organisms and physical changes in sediment composition and topography (Sciberras *et al,* 2018).

At shallow sandy sites (< 7 m) tracks from trawling were no longer visible after a few days (Kaiser & Brian, 1996). In fact the physical impact on non-living substrate is generally thought to be minor, particularly for lighter gear such as otter trawls, for which impact is largely restricted to the doors (Hall, 1999). Fonteyne (2000) examined the effects of a beam trawls on sandy substrate at 20-30 m depth (the depth of West of Walney MCZ). Tracks completely faded after 52 hours and re-suspended material (fine sand fraction) settled down within a few hours. The MMO is content that the physical structure of the subtidal sand will not be significantly effected by beam trawling given the documented resilience of the feature and the effort of fishing.

All bottom towed gear will penetrate the surface of the subtidal sand and subtidal mud features. Beam trawling penetrates slightly further into the sediment than otter trawling (2.44 ± 0.69cm compared to 2.72 ± 0.72cm (Sciberras *et al,* 2018).

Evidence suggests that there is no detectable impact from otter trawling on sand and gravel communities (Kaiser *et al*, 2006), however earlier evidence suggests that there may be some detectable (Collie *et al*, 2000; Kaiser *et al*, 2002) impacts but the magnitude of impact increases depending on the size of gear, area fished and depth of fishing. The main physical impacts from otter trawls are from the penetration of the otter boards/doors which can penetrate the sediment between 0.7 – 1.9 cm depending on the width of gear (Grieve *et al*, 2011).

Johnson, 2002, reviewed six studies of trawling on sandy habitats. The author reports that beam trawling decreases the abundance of macrofauna in sandy habitats. This could obviously cause a risk of hindering the conservation objectives of the site. A change in species composition of prey species is also associated with prolonged beam trawling (Johnson, 2002). From available data the MMO do not consider bottom towed gear trawling effort in the West of Walney MCZ over the subtidal sand feature to be prolonged in nature.

It is likely that areas that are trawled with greater frequency would take longer to recover. Almost all studies (within the scope of the Johnson 2002 study) documented recovery after a single, acute pass by a trawl rather than after the multiple passes that are typical in frequently trawled, heavily fished area[16].

Sciberras *et al,* 2018, noted that in experimental bottom fishing a single gear pass reduced species richness by 19% and abundance of invertebrates by 26% and reduced all abundance in general. Course sandy sediments recover faster than finer mud habitats (Sciberras *et al,* 2018).

[16] Committee on Ecosystem Effects of Fishing: Phase 1—Effects of Bottom Trawling on Seafloor Habitats (2002) Ocean Studies Board. Division on Earth and Life Studies. National Research Council. NATIONAL ACADEMY PRESS

Regarding listed species that are vital for the function of the subtidal sand feature, the MMO look to conclusions surmised by Johnson (2002). The four studies discussed by Johnson (2002) noted effects of chronic trawling documented a decreased abundance and biomass of sedentary macrofauna and decreased diversity. These conclusions are also found by Vergnon & Blanchard (2006) who noted that species diversity was lower in the areas most exploited by trawling.

The ABPmer report Supporting Risk-Based Assessments of Fisheries in MPAs highlights that different gears exert varying levels of pressure. This is important when understanding pressure to the subtidal sand and subtidal mud features. The most prevalent type of towed gear fishing in the West of Walney is otter trawling for nephrops. Otter trawling typically has less impact than beam trawling or dredging, however the evidence referenced in this section demonstrates a significant negative impact from otter trawling on sedimentary habitats (eg Sciberras *et al*, 2018).

As noted in the conservation advice for this site, vulnerability assessments indicates that the subtidal sand feature is subjected to pressures to which it is sensitive, primarily associated with the regular use of bottom towed fishing gear in the site. In particular, fragile and/or long lived species of the subtidal sand community can be affected by pressures associated with bottom towed gear namely physical abrasion and disturbance, resulting in benthic communities modified to varying degrees relative to the un-impacted state (Bergman and van Santbrink, 2000), (Kaiser *et al*, 2006).

The ABPmer report Supporting Risk-Based Assessments of Fisheries in MPAs notes that the significance of any effects from fishing should be considered in relation to the conservation objective of the site and there is a need for clarity of the baseline against which achievement of the conservation objectives is assessed. In this case, all three features are reported to be in unfavourable condition[17][18], and the conservation objective for the site is to recover these features to favourable condition.

The above paragraphs outline that the feature is sensitive to these pressures exerted by these fishing methods. These impacts are more pronounced in low energy, stable environments where benthic organisms are less resistant to disturbance events. Although a single pass from a vessel creates less of an impact than that of repeated disturbance, an isolated 'single pass' may result in a high level of impact to which later passes only add a marginal degree of additional impact. This is both in terms of the structure of the feature but also impacts to the organisms that live in that benthic environment. The MMO understands that that there is a degree of grading between the subtidal mud and subtidal sand feature (Natural England *Pers Comms*) and that the habitat could become more suitable for the recovery of the sea-pen and burrowing megafauna communities feature. When this is coupled with the recover general management approach of the sub-tidal sand feature the MMO concludes that **there is a significant risk of abrasion or penetration from both dredging and bottom towed gears hindering the achievement of the conservation objectives stated for this MCZ for the subtidal sand feature.**

Subtidal mud

[17] Finding Sanctuary, Irish Seas Conservation Zones, Net Gain and Balanced Seas. 2012. Impact Assessment materials in support of the Regional Marine Conservation Zone Projects' Recommendations

[18] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492471/mcz-west-walney-factsheet.pdf

Impacts of bottom towed gears

Field experiments carried out by Tuck *et al* (1998) showed that the effects of continuous disturbance by otter trawling became significant after approximately five months of fishing.

Annex 6 shows VMS data split by month for the five year data period. Within the 60 months in that period only 6 months no fishing with bottom towed gear occurred Annex 6, table 2). Over that period fishing occurred from the UK fleet alone on 809 days peaking in 2012 with 263 days where fishing occurred (annex 6, table 3). This describes prolonged, continuous fishing effort far beyond the intensity described in Tuck *et al* (1998) where effects were described as significant.

The same vulnerability assessment discussed in the subtidal sand abrasion and penetration section above is also relevant here.

In addition, in habitats that are 90% mud content, a penetration depth similar to that exerted from trawling gear used in West of Walney MCZ was modelled by Sciberras *et al,* 2018 regarding abundance after a trawl. If was found that recovery of abundance was not expected to return to pre-fished levels before 3 years.

The above paragraphs in the general information part of this section outline that the feature is sensitive to these pressures exerted by these fishing methods. These impacts are more pronounced in low energy, stable environments where benthic organisms are less resistant to disturbance events. VMS data show that there is significant effort over the footprint of the sub tidal mud. MMO surmise that this is a logical conclusion given that the target fishery is located primarily within the boundary of the mud feature. Although there is a degree of constant churn in this stable environment caused by the natural movement of the megafauna in the site this is insignificant when compared to the churn and disturbance of the benthic mud habitat as a result of bottom towed fishing activities.

Nephrops are a characteristic species of the feature and as such the MMO concludes that **there is a significant risk of abrasion or penetration from both dredging and bottom towed gears hindering the achievement of the conservation objectives stated for this MCZ for the subtidal mud feature.**

Impacts of potting

Building on the above discussion on sand, which are also relevant to mud, the Evidence for Management of Potting Impacts on Designated Features paper[19] states that there is sufficient evidence to conclude that subtidal mud is not sensitive to potting. In addition, sensitivity assessments recognise that when pots are deployed correctly they are of limited concern on subtidal mud due to their limited contact with the seabed (Roberts *et al*, 2010; Hall *et al*, 2008). Additional to this is the P-value of 0 for each year (annex 6, table 13). This illustrates almost a “no interaction” for this fishing type and as such impacts of potting on this habitat are not significant.

19 http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjBlfLWj7LZAhWMCsAKHXA0AvsQFggmMAA&url=http%3A%2F%2Frandd.defra.gov.uk%2FDocument.aspx%3FDocument%3D12953_MMO1086-PottingImpactsStudy-FINAL.pdf&usg=AOvVaw1W5tKogBqOKTRnGdvXziad

As such the MMO is content that **there is not a significant risk of abrasion or penetration from potting hindering the achievement of the conservation objectives stated for this MCZ for the subtidal sand feature.**

Sea-pen and burrowing megafauna communities

Impacts of bottom towed gears

Large, slow-growing species such as sea-pens are particularly vulnerable to trawling disturbance (Dinmore *et al*, 2003).

Bottom trawling has many direct and indirect impacts, the latter of which has greater impacts to species such as sea-pens that are particularly vulnerable to trawling disturbance, while smaller individuals and species suffer lower mortality rates (Dinmore *et al*, 2003). Considering the global benthic community, differential vulnerability to trawling leads to lower biomass and production of communities in heavily trawled areas and a dominance by smaller, faster growing individuals and species (Jennings *et al*, 2001). The mortality of benthic invertebrates that are removed as trawl bycatch is high but the mortality rates caused by bottom trawling are significantly higher for animals that remain on the seabed (Queiros *et al*, 2006). The higher mortality of organisms on the seabed is because they are damaged by the hard parts of the fishing gear, whereas those that are removed as bycatch receive less damage as they are more gently handled by the gear on the way into the net. (Queiros *et al*, 2006).

As with the subtidal sand and mud features there is a degree of disturbance. The P-value for the entire 5 year period was 0.6, with the highest single year P-value being 0.23 in 2012 (annex 6, table 7). The fishing effort is fairly consistent; over the five year period there are only five months where there was no fishing (annex 6, table 8). The MMO consider this to be a significant impact.

Pressure on the feature is nearly constant given the constant fishing effort, therefore there is little scope for the feature to recover.

As such MMO concludes that **there is a significant risk of abrasion or penetration from both dredging and bottom towed gears hindering the achievement of the conservation objectives stated for this MCZ for the sea-pen and burrowing megafauna communities feature.**

Impacts of potting

The results of three separate experiments (Eno *et al*, 2001) on the effects of dragging a creel over a sea-pen showed that all sea-pens were able to recover fully from creel impact.

Additionally, the slow-growing, long-lived, pink sea fan *Eunicella verrucosa* flex under the weight of pots as they passed and then returned back to an upright position (Eno *et al*, 2001) further indicating that erect, sessile organisms such as sea-pens are relatively insensitive to the physical impacts of potting.

Although there is clearly the potential for this pressure to be exerted by this gear, P-values (annex 6, table 13) and fishermap data indicates a low effort of this fishing type over this feature.

As such the MMO is content that **there is not a significant risk of abrasion or penetration from potting hindering the achievement of the conservation objectives stated for this MCZ for the sea-pen and burrowing megafauna communities feature.**

Abrasion and penetration conclusion

It is clear that impacts of bottom towed gear on subtidal mud and subtidal sand features are linked to intensity. The fishing effort in West of Walney MCZ could be described as chronic, and it is this chronic abrasion and penetration that does not allow the structure or associated species to recover as per the general management approach. It is also clear that abrasion and penetration from bottom towed gear at its current level has the potential to negatively impact the sea-pen and burrowing megafauna communities feature. To allow these features to recover it is the conclusion of the MMO that bottom towed gear must be managed within the site to best further the conservation objectives of the site.

Potting at its current level exerts less pressure on all three features. MMO are content that fishing using pots is compatible with the conservation objectives of the site as all three features are capable of withstanding small amounts of disturbance.

Management is required to mitigate for the impacts of bottom towed gear on all three features of the site. This mitigation is outlined in section 7 of this assessment. Given the nature of the management in section 7, only pressures from fishing other than bottom towed gears will be assessed further in part B of this assessment.

Table 12: Abrasion/disturbance of the substrate on the surface of the seabed AND Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion assessment

Pressure	Interest feature	Favourable condition target	Activity	Compatible with conservation objectives?
Abrasion/ disturbance of the substrate on the surface of the seabed and Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Subtidal sand And Subtidal mud	Recover the presence and spatial distribution of subtidal mud/sand communities	Demersal Trawl	N
			Dredges	N
			Traps	Y
		Restore the abundance of listed species*, to enable each of them to be a viable component of the habitat	Demersal Trawl	N
			Dredges	N
			Traps	Y
		Recover the species composition of component communities	Demersal Trawl	N
			Dredges	N
			Traps	Y
		Maintain natural levels of turbidity (eg suspended concentrations of sediment, plankton and other material) across the habitat.	Demersal Trawl	Y
			Dredges	Y
			Traps	Y
	Sea-pen and burrowing megafauna communities	Recover the presence and spatial distribution of sea-pen and burrowing megafauna communities.	Demersal Trawl	N
			Dredges	N
			Traps	Y
		A target is not being advised for the feature at this point. Further investigation of the evidence is needed regarding the current and historical distribution of the sea-pen and burrowing megafauna communities within the site.	Demersal Trawl	Given the lack of target the MMO cannot asses
			Dredges	Given the lack of target the MMO cannot asses
			Traps	Given the lack of target the MMO cannot asses
		[Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Demersal Trawl	N
			Dredges	N
			Traps	Y
		Recover the species composition of component communities.	Demersal Trawl	N
			Dredges	N
			Traps	Y
		Maintain natural levels of turbidity (eg concentrations of suspended sediment, plankton and other material) across the habitat.	Demersal Trawl	N
			Dredges	N
			Traps	Y

4.3 Changes in suspended solids (water clarity) AND smothering and siltation rate changes (light)

For these pressures only bottom towed gears were originally screened out. Given the conclusions outlined in 4.2, there is no requirement to consider these pressures further in part B of this assessment.

4.4 Removal of non-target species

Subtidal sand and subtidal mud

General discussion

There is very little data surrounding the removal of non-target species that specifically discusses the type of substrate that the non-target species are located upon. As such both the mud and sand features will be considered together. If there is found to be a significant impact because of this pressure, under the precautionary principle, conservation objectives for both features will be considered hindered.

The direct effects of potting will include removal of target species such as crabs and lobsters which have a role in maintaining the diversity of the habitat. Removal of target and non-target species can have significant impacts on the structure and functioning of benthic communities over and above the physical effects of fishing methods, particularly as some fish species fill upper roles in the trophic web[20].

Jennings (1998) noted that within heavily fished areas, the removal of large epibenthic organisms can lead to long-term reductions in structural complexity and declines in the abundance of fishes associated with the epibenthic community.

It is written in the Evidence for Management of Potting Impacts on Designated Features paper that there is sufficient evidence to conclude that subtidal mud is not sensitive to potting. In addition, sensitivity assessments recognise that when pots are deployed correctly they are of limited concern on subtidal mud. This is due to their limited contact with the seabed (Roberts *et al*, 2010; Hall *et al*, 2008).

Due to the low sensitivity of mud and sand from potting and very low current exposure of the features to potting the MMO considers **there is not a significant risk of removal of non-target species from potting hindering the achievement of the conservation objectives stated for this MCZ for the subtidal mud or subtidal sand feature**

Sea-pen and burrowing megafauna communities

Due to the low sensitivity of species that live in mud very low current exposure of the features to potting the MMO considers **there is not a significant risk of removal of non-target species**

[20] http://publications.naturalengland.org.uk/publication/3251957

from potting hindering the achievement of the conservation objectives stated for this MCZ for the sea-pen and burrowing megafauna communities feature

Pressures conclusion

There are species that make up the sea-pen and burrowing megafauna feature that could be caught as non-target species. Additional to this, the typical species that are part of both the sub tidal sand and sub tidal mud features have the potential to also be caught as non-target species. Because of low levels of potting effort in the site and low levels of bycatch associated with potting in comparison to other methods, the MMO concludes that this pressure is not significant.

Table 13: Removal of non-target species assessment

Pressure	Interest feature	Favourable condition target	Activity	Compatible with conservation objectives?
Removal of non-target species	Subtidal sand And Subtidal mud	Recover the presence and spatial distribution of subtidal mud/sand communities.	Traps	Y
		Restore the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Traps	Y
		Recover the species composition of component communities.	Traps	Y
	Sea-pen and burrowing megafauna communities	Recover the presence and spatial distribution of sea-pen and burrowing megafauna communities.	Traps	Y
		A target is not being advised for the feature at this point. Further investigation of the evidence is needed regarding the current and historical distribution of the sea-pen and burrowing megafauna communities within the site.	Traps	Given the lack of target the MMO cannot asses
		[Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Traps	Y
		Recover the species composition of component communities.	Traps	Y

4.5 Removal of target species assessment

Sea-pen and burrowing megafauna communities

West of Walney is located within Functional Unit (FU) 14 (Irish Sea, East) for N*ephrops* International Council for the Exploration of the Sea (ICES) stock assessment purposes. ICES considers density of *Nephrops* with FU14 to be 'medium' (~0.48 burrow m^{-2}, average 2011–2017) when compared to other FUs (ICES, 2017). ICES advice states that harvest rates are below maximum sustainable yield and that *Nephrops* stock levels are above the biological trigger point, indicating that the *Nephrops* stock is being harvested sustainably in FU14.

Fisheries stock considerations are, however, different from those that underpin the conservation objectives of a site; a level of fishing which maintains a particular stock at or below maximum sustainable yield may not be compatible with the favourable conservation status of an area. This is further brought into focus when considering that this feature has a recover conservation objective.

Using pots/creels to fish for *Nephrops* may be a viable method of prosecuting this fishery. The MMO consider that whilst pots do catch *Nephrops* this is at a significantly lesser volume than those caught by trawling methods. Given a small effort of this fishing type (P-value 0, annex 6, table 13)) the MMO determines that the **impacts of the removal of target species from pots/creels are not capable of affecting (other than insignificantly) sea-pen and burrowing megafauna communities at this site.**

Pressures conclusion

There are species that make up the sea-pen and burrowing megafauna communities feature that are caught as target species. However at current levels of fishing, this pressure is not significant.

Table 15: Removal of target species assessment

Pressure	Interest feature	Favourable condition target	Activity	Compatible with conservation objectives?
Removal of target species	Sea-pen and burrowing megafauna communities	Recover the presence and spatial distribution of sea-pen and burrowing megafauna communities.	Pots/creels (crustacea/ gastropoda)	Y
		A target is not being advised for the feature at this point. Further investigation of the evidence is needed regarding the current and historical distribution of the sea-pen and burrowing megafauna communities within the site.	Pots/creels (crustacea/ gastropoda)	Given the lack of target the MMO cannot asses

		[Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Pots/creels (crustacea/ gastropoda)	Y
		Recover the species composition of component communities.	Pots/creels (crustacea/ gastropoda)	Y

4.6 Fisheries management measures

Significant risk to the site's conservation objectives from bottom towed fishing across the part of the site to which this assessment applies cannot be ruled out.

Therefore fisheries management measures will be introduced by the appropriate regulators to ensure that these fishing activities are excluded from this part of the site. Section 7 contains further details of these measures.

4.7 Part B conclusion (fishing alone)

MMO concludes, taking into account the future introduction of management measures for bottom towed fishing gear outlined in section 6, that the fishing activities assessed, alone, will not pose a significant risk to the conservation objectives of West of Walney MCZ.

5. Part C Assessment

In-combination assessment

This section assesses the effects of activities considered as compatible with the conservation objectives of West of Walney MCZ in combination with other relevant activities taking place which includes the following**:**

- fishing activity/pressure combinations which were excluded in Part A of this assessment but which may have an effect on conservation features (see table 17);
- fishing interactions assessed in Part B but not resulting in adverse effect;
- fishing activities with interactions at the site identified as being in green status in the Matrix; and
- plans and projects (see table 19).

When discussing the pressures in this section, it is considered that the management as outlined in section 7 will be introduced. Therefore those pressures resulting from fishing that is to be managed has not been included in the assessment within section 5.

The MMO SPIRIT (SPatial InfoRmatIon Toolkit) system was used to check regulated and unregulated activities that occur within, or adjacent to, the West of Walney MCZ where there could

be a pathway for disturbance. Expert judgement has been used as to whether a pathway for disturbance exists on an activity by activity basis. These activities are displayed in table 19.

5.1 Pressures exerted by fishing and plans or projects

Plans or projects with the potential to affect West of Walney MCZ in combination with fishing activities are displayed in table 19.

Table 19. Plans and projects considered in combination with fishing activities included in this assessment on subtidal sand, subtidal mud and sea-pen and burrowing megafauna communities

Relevant activity	Description	Feature(s) where a pathway exists
Submarine cables	Numerous cables run through the site	All
Walney 3 and 4 UXO clearance corridor	UXO clearance licence. L/2016/00236/1	Subtidal mud and sea-pen and burrowing megafauna communities
Offshore Wind Farms (Walney 1 and 2, Ormonde, West of Duddon Sands)	Maintenance of existing works, water injection dredging and removal of marine growth	All
Walney Offshore Wind Farm Extension	Construction of Walney 4 OWF Extension	Subtidal mud and sea-pen and burrowing megafauna communities
Well heads	11 well heads are located within the site, as well as two additional wellheads in the immediate vicinity	All
Pipelines	Three pipelines run through the site	Subtidal mud and sea-pen and burrowing megafauna communities

To identify the specific pressures that the above activities exert on the feature of this site the MMO has used the Advice on Operations (AoO) section in Natural England's conservation advice package for West of Walney MCZ. This required identified activities to be matched against the activity categories used in Natural England's advice. Table 20 shows how the activities were matched.

Table 20: Categories from the AoO section that have been used to inform pressures information for identified activities and Amber and Green fishing activities.

Name of Activity	NE AoO Operation	Activity
Submarine cables	Cables	Power cable: operation and maintenance
Walney 3 and 4 UXO clearance corridor	Electricity from renewable energy sources	Offshore wind: operation and maintenance
Offshore Wind Farms (Walney 1 and 2, Ormonde, West of	Electricity from renewable energy sources	Offshore wind: operation and maintenance

Duddon Sands)		
Walney 4 Wind Farm	Electricity from renewable energy sources	Offshore wind: during construction
Well heads	Oil, gas and carbon capture storage	Oil and gas production
Pipelines	Oil, gas and carbon capture storage	Pipelines
Longlines (demersal)	Fishing	Anchored nets/lines
Commercial diving	Fishing	Diving
Pots	Fishing	Traps

Information in the West of Walney MCZ conservation advice package was used to determine which pressure-feature interaction to include in this part of the assessment.

A list of pressures has been collated from fishing activity, and it is only those pressures that have been discussed below. Equally if a multiple plans or projects give off a pressure that fishing does not contribute towards, those pressures are not within the scope of this assessment.

All pressure feature interactions from fishing other than those identified as “Not Relevant” (the evidence base suggests that there is no interaction of concern between the pressure and the feature OR the activity and the feature could not interact) have been considered. For a pressure to be discussed below at least one of the plans or projects must exert that pressure as well.

From these consideration, below are the pressures that have been screened out for requiring further consideration in this assessment as they do not exert a pressure on the subtidal sand/subtidal mud feature of the West of Walney MCZ:

- Above water noise
- Changes in suspended solids (water clarity)
- Collision above water with static or moving objects not naturally found in the marine environment (eg boats, machinery, and structures)
- Collision below water with static or moving objects not naturally found in the marine environment (eg boats, machinery, and structures)
- Electromagnetic changes
- Emergence regime changes, including tidal level change considerations
- Genetic modification & translocation of indigenous species
- Habitat structure changes - removal of substratum (extraction)
- Introduction of microbial pathogens
- Introduction of other substances (solid, liquid or gas)
- Nutrient enrichment
- Physical change (to another seabed type)
- Physical change (to another sediment type)
- Physical loss (to land or freshwater habitat)
- Radionuclide contamination
- Salinity changes
- Smothering and siltation rate changes (heavy)
- Smothering and siltation rate changes (light)
- Temperature changes
- Vibration

- Water flow (tidal current) changes, including sediment transport considerations
- Wave exposure changes

Below are the pressures that have been screened out for requiring further consideration in this assessment as they do not exert a pressure on the sea-pen and burrowing megafauna communities feature of the West of Walney MCZ:

- Above water noise
- Changes in suspended solids (water clarity)
- Collision above water with static or moving objects not naturally found in the marine environment (eg boats, machinery, and structures)
- Collision below water with static or moving objects not naturally found in the marine environment (eg, boats, machinery, and structures)
- Electromagnetic changes
- Emergence regime changes, including tidal level change considerations
- Genetic modification & translocation of indigenous species
- Habitat structure changes - removal of substratum (extraction)
- Introduction of microbial pathogens
- Introduction of other substances (solid, liquid or gas)
- Nutrient enrichment
- Physical change (to another seabed type)
- Physical change (to another sediment type)
- Physical loss (to land or freshwater habitat)
- Radionuclide contamination
- Salinity changes
- Smothering and siltation rate changes (heavy)
- Smothering and siltation rate changes (light)
- Temperature changes
- Vibration
- Water flow (tidal current) changes, including sediment transport considerations
- Wave exposure changes

Walney 3 and 4 UXO clearance corridor activity has completed and therefore will no longer be considered in this assessment.

5.2 In-combination pressure discussion for remaining pressures

5.2.1 Abrasion/disturbance of the substrate on the surface of the seabed

This pressure is relevant for all gears in combination with submarine cables, offshore wind farms, Walney Offshore Wind Farm Extension and pipelines

Sensitivity of the West of Walney MCZ conservation feature to physical damage from static gears and anchored nets/lines is through surface abrasion from pots, through deployment, movement of gear on the benthos due to strong tidal current and storm activity; and as the gear is dragged along the seafloor during retrieval during fishing activities.

The marine licences will be required for any maintenance works on the existing windfarms within the site. The MMO is also a statutory consultee for BEIS, as the licensing body, for the decommissioning of oil and gas platforms. These activities, if licenced, will have mitigation attached to the licence to minimum impacts to the features of the MCZ. Additionally these disturbance events will be one off impacts which does not have the same impact in terms of significance that repeated trawling has on the features of the site. The footprint of the existing windfarms, although, within the site, is not considered to be over the area of the feature.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.2 Barrier to species movement

This pressure is relevant for Pots and Longlines (demersal) in combination with submarine cables, offshore wind farms, Walney Offshore Wind Farm Extension and well heads.

All licensed plans or projects have the potential to disrupt movement of the species that are found within the sandbank feature. However the volume at which fishing occurs and the fact that any licenced activity would be limited in the time that impacts would be apparent means that impacts would be significantly less than 50% of the area of the site (as the specified benchmark). The cables are already in place and hence typical species found in the subtidal sand/subtidal mud feature would be adapted to their presence now.

While the wind farm pylons and well heads are an obstruction not naturally found in the marine environment, typical species found associated with the subtidal sand/subtidal mud are unlikely to be significantly affected in their movements as they can move around them.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.3 Deoxygenation

This pressure is relevant for pots and longlines (demersal) in combination with submarine cables, well heads and pipelines.

Discards are not spatially concentrated at this site and it is not an area of low flow so the conditions for localised hypoxia or anoxia of the sea bed are not present. Given the size and dynamics of the site the combined effects of fishing and plans or projects would not reduce oxygen concentration over a prolonged period, capable of affecting the Water Framework Directive status. Installed cables do not cause this pressure. Maintenance would be licenced and this pressure mitigated against.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.4 Hydrocarbon & PAH contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.

This pressure is relevant for all gears in combination with all plans or projects.

Deliberate releases are already prohibited. Accidental discharges from fishing vessels and maintenance vessels leading to significant releases are extremely rare. As above maintenance of existing infrastructure would be licenced and this pressure mitigated against.

While the MMO acknowledges that an accident involving leakage from a well head or pipeline is possible, pragmatically it is highly unlikely that such an event should occur and thus has been ruled out as exerting a pressure on this feature.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.5 Introduction of light

This pressure is relevant for all gears in combination with submarine cables, offshore wind farms, well heads and pipelines.

At the depth that West of Walney MCZ is located there would only be insignificant levels of light reaching the feature from fishing and works vessels on the surface. There is the potential for light to reach the feature from benthic operations; however these effects would be extremely isolated and short in duration.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.6 Introduction or spread of invasive non-indigenous species (INIS)

This pressure is relevant for all gears in combination with submarine cables, offshore wind farms, well heads and pipelines. Ballast water is the main vector for the transmission of non-indigenous species. Fishing vessels less than 45m must have permanent ballast and thus this vector is not available.

There is the potential for INIS to transit to the site on the hull of maintenance vessels. However the MMO do not consider this a significant pathway. As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.7 Organic enrichment

This pressure is relevant for pots and longlines (demersal). Degraded remains from these fishing gears will not result in significant impacts to the site as the tidal range and water movement would not allow levels to reach the pressure benchmark.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.8 Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion

This pressure is relevant for all gears in combination with submarine cables, offshore wind farms, well heads and pipelines.

The MMO has discussed abrasion/disturbance of the substrate on the surface of the seabed above and consider this current pressure be similar in impacts. As penetration can only occur after abrasion occurs to the feature, the MMO conclude that all of the narrative in section 5.2.1 on abrasion is relevant here.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.9 Removal of non-target species

This pressure is relevant for longlines (demersal) only and therefore will not be considered further.

5.2.10 Removal of target species

This pressure is relevant for pots only and therefore will not be considered further.

5.2.11 Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals). Includes those priority substances listed in Annex II of Directive 2008/105/EC

This pressure is relevant for all gears in combination with submarine cables, offshore wind farms, well heads and pipelines. This pressure is relevant for all gears and all plans or projects. The potential source is from vessel hull antifouling treatments. TBT has been banned on vessels under 25m since 1987. Copper wash can enter the marine environment but due to the strong tidal currents at this site, they are not likely to accumulate here raising levels of those compounds beyond those of background levels.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.12 Transition elements & organo-metal (eg TBT) contamination Includes those priority substances listed in Annex II of Directive 2008/105/EC

This pressure is relevant for all gears in combination with submarine cables, Offshore Wind Farms, Well heads and pipelines.

Through licencing processes all material disposed at sea would have passed Cefas testing to be below Action Level 2.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.13 Underwater noise changes

This pressure is relevant for all gears in combination with submarine cables, Offshore Wind Farms, well heads and pipelines.

Installed cables, pipelines and well heads do not cause this pressure. Maintenance would be licenced and this pressure mitigated against.

While wind farms (both operation and construction) do emit underwater noise, these are unlikely to significantly affect the presence and/or abundance of typical species found in the subtidal sand/subtidal mud.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.2.14 Visual disturbance

This pressure is relevant for all gears in combination with submarine cables, Offshore Wind Farms, well heads and pipelines.

Installed cables, pipeline and well heads do not cause this pressure. Maintenance would be licenced and this pressure mitigated against.

Typical species found in subtidal sand/subtidal mud would not be significantly affected by this pressure from the presence or construction of the wind farms.

As such the MMO consider that this pressure from non-fishing activities, when combined with all fishing pressures **does not cause a significant risk of hindering the achievement of the conservation objectives stated for this MCZ.**

5.3 Part C conclusion (fishing in-combination with relevant activities)

MMO concludes, taking into account the introduction of management areas for bottom towed fishing gear outlined in section 6, that fishing activities in combination with other relevant activities are not adversely affecting the conservation features of the West of Walney MCZ.

6. Assessment result

6.1 Fishing alone

The MMO consider that there is a pathway for disturbance, and fishing gear moving along the bottom, alone, is sufficient to affect (other than insignificantly) the features of the site.

6.2 In-combination

As with the assessment of fishing alone above, this section assumes that management for bottom towed gear will be introduced. The MMO consider that whilst there is a pathway for disturbance, this is not sufficient to affect (other than insignificantly) the features of the site from the following in-combination factors:

- All fishing gear on all pressures combined
- All fishing gear on all pressures combined in relation to both existing licenced activity within the site.

7. Proposed management

Option 1: Nothing is required.

Option 2: No additional management. Introduce a monitoring and control plan within the site.

Option 3: Reduce/limit pressures. Due to the potential impacts of bottom towed gears on the more stable sub features of the site, zoned management will be introduced to ensure the achievement of the conservation objectives.

Option 4: Remove/avoid pressures (site closures). Prohibit bottom contacting towed gears in all areas of the site.

MMO has ascertained that, due to the significant risk to the site's conservation objectives from fishing with gears that trawl or dredge the seabed, current management is not sufficient to protect West of Walney MCZ.

As such, the implementation of **Option 4** will be required to best further the conservation objectives of the site.

Therefore, the following management measure will be introduced:

- An MMO byelaw to prohibit all bottom-towed fishing within the 0 to 12nm portion of this site.

Annex 8 includes a map showing the proposed management measure.

There is currently no marine plan for this area. This decision has been made in accordance with the Marine Policy Statement (MPS). Specifically:

Section 2.6:

2.6.1.1 Marine plan authorities should be mindful that, consistent with the high level marine objectives, the UK aims to ensure:

> • A halting and, if possible, a reversal of biodiversity loss with species and habitats operating as a part of healthy, functioning ecosystems

2.6.1.6 Many individual wildlife species receive statutory protection under a range of legislative provisions. Other species and habitats have been identified as being of principal importance for the conservation of biodiversity in the UK and thereby requiring conservation action or are subject to recommended conservation actions by an appropriate international organisation. Priority marine features are being defined in the seas around Scotland. The marine plan authority should ensure that development does not result in a significant adverse effect on the conservation of habitats or the populations of species of conservation concern and that wildlife species and habitats enjoying statutory protection are protected from the adverse effects of development in accordance with applicable legislation.

3.8.8 Fishing can have negative environmental impacts. As well as over-exploitation of commercial fish stocks, this can include threats to vulnerable or rare species, including by-catch, and can cause extensive damage or destruction to habitats and the historic environment. Such impacts can often be associated with particular gear types and the intensity of fishing activity. Interactions between fishing activity and marine developments and their consequent impacts on fish stocks and the environment are complex and need to be considered. It should also be recognised that many fishing activities are compatible with other sea users.

8. Review of this assessment

MMO will review this assessment every two years or earlier if significant new information is received.

Such information could include:

- updated conservation advice;
- updated advice on the condition of the feature;
- significant change in activity levels.

To coordinate the collection and analysis of information regarding activity levels, and to ensure that any required management is implemented in a timely manner, a monitoring and control plan will be implemented for this site. This plan will be developed in line with the MMO Monitoring and Control Plan framework.

Monitoring of activity levels will occur through a combination of surface surveillance and ongoing monitoring of VMS and landings data. Should activity levels increase significantly or in a manner that could affect the site features, this will trigger further investigation into the level and distribution of the activity, including consultation with Natural England regarding current site condition. Any subsequent evidence gathered would be used to assess the need for further management measures.

Possible management measures include an MMO emergency byelaw, which can be implemented immediately for up to 12 months, or a (non-emergency) MMO byelaw which would be subject to public consultation before implementation.

An overview of the monitoring and control process is illustrated in Annex 9.

9. Conclusion

MMO have had regard to best available evidence and through consultation with relevant advisors and the public, conclude that bottom towed fishing activities are not compatible with the conservation objectives and General Management Approach of this marine protected area with fishing effort at the current level.

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Annex 1 - MMO Methodology

The need for assessment

In 2012, the Department for Environment, Food and Rural Affairs (Defra) announced a revised approach to the management of commercial fisheries in European marine sites (EMS)[21]. The objective of this revised approach is to ensure that all existing and potential commercial fishing activities are managed in accordance with the provisions of Article 6 of the Habitats Directive[22]. The revised approach was extended to include management of commercial fisheries in marine conservation zones (MCZ) in 2014[23]. This approach is being implemented using an evidence based, risk-prioritised, and phased basis. Risk prioritisation is informed by using a matrix of the generic sensitivity of the sub-features of EMS to a suite of fishing activities. These activity/sub-feature interactions have been categorised according to specific definitions, as red, amber, green or blue[24].

Activity/sub-feature interactions identified as red, occurring in sites designated prior to 2013, were addressed first, with management measures to avoid deterioration of sites where these interactions occur implemented by the beginning of 2014[25].

Management measures required to address all other interactions in sites designated before 2016 must be in place by the end of 2016.

Activity/sub-feature interactions identified within the matrix as amber require a site-level assessment to determine whether management of activity is required to conserve site features. Activity/sub-feature interactions identified within the matrix as green also require a site level assessment if there are “in combination effects” with other plans or projects.

Site-level assessments are carried out in a manner consistent with the requirements of Article 6(3) of the Habitats Directive for EMS and the requirements of section 126 of the Marine and Coastal Access Act 2009 for MCZ. For EMS the assessments will determine whether, in light of the sites conservation objectives, fishing activities are having an adverse effect on the integrity of the site. For MCZ the assessments will determine whether there is a significant risk of fishing activities hindering the conservation objectives of the site.

Assessment process

The fisheries assessments have two stages:

[21] www.gov.uk/government/publications/revised-approach-to-the-management-of-commercial-fisheries-in-european-marine-sites-overarching-policy-and-delivery
[22] Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora
[23] The MMO responsibilities in relation to management of MCZs are laid out in Sections 125 to 133 of the Marine and Coastal Access Act 2009
[24] Managing Fisheries in MPAs matrix: www.gov.uk/government/publications/fisheries-in-european-marine-sites-matrix
[25] For designated EMS

Part A: A coarse assessment using generic sensitivity information to identify which fishing activities can be discounted from further assessment (Part B) as they are not taking place or not a significant concern.

Part B: An in-depth analysis to assess the effects of remaining pressures on the features of the site, and a pressure in combination assessment.

Part C: An in-combination assessment between all activities occurring

Sources of evidence

Evidence used in the assessments falls into two broad categories:

1. Fishing activity information. This includes patterns, intensity, and trends of fishing activities and types of gear used.
2. Ecological information, in particular the location, condition and sensitivity of designated features.

Fishing activity information

VMS data
VMS data are derived from positional information reported by UK and other Member States (OMS) vessels carrying the EU mandated vessel monitoring system (VMS). Since 2015 all commercial fishing vessels of 12 metres and over in length have been required to report their position, course and speed at regular intervals using VMS. Prior to 2015 this requirement applied to commercial fishing vessels of 15 metres and over.

VMS data were analysed in ArcGIS. VMS reports not associated with fishing activity were removed. These included reports with speeds greater than 6 knots (indicating non-fishing) and reports from vessels known to be performing guard ship duties for marine developments.
Gear type was assigned to VMS data by matching each report to gear types recorded in relevant landings declarations, logbooks and the Community Fishing Fleet Register.

Landings data
Landings data are recorded at International Council for the Exploration of the Sea (ICES) statistical rectangle[26] level through landings declarations and logbooks.

In areas where a high proportion of landings came from vessels with VMS, landings data from vessels with VMS were linked to VMS-derived location reports to provide spatial estimates of where landings were derived from within an ICES rectangle. Otherwise estimates of landings from within a specified area (eg MPA or area of feature) were based on the relative size the area compared to the sea area of the containing ICES rectangle(s).

[26] ICES statistical rectangles are part of a widely used grid system for North Eastern Atlantic waters. For more information see: www.ices.dk/marine-data/maps/Pages/ICES-statistical-rectangles.aspx

Landings data were analysed to determine quantities and values of landings by gear group, species and vessel size group.

Spatial footprint

To provide a link between fishing effort and impact on features a footprint analysis approach was used. This is based on a Defra report was commissioned to test the feasibility of a method for measuring spatial footprint of fishing gear (ref: MMO1108[27]).

The report provides the following fishing impact equation:

$$P = \frac{E \times A_{(i)}}{A_{(f)}}$$

Where: E = fishing effort (vessel days) expended within the feature area; A(i) = the area impacted by an individual vessel in one day; A(f) = the total area of the protected feature; P = fishing footprint.

In this assessment, a 450 metre by 450 metre grid was applied to the area assessed, and the above equation was calculated for each grid cell.

Fishing effort (E) was estimated using VMS data, with each VMS report of less than 6 knots (and therefore assumed to be fishing) assigned two hours of fishing effort. The VMS data were standardised to account for any vessels reporting more frequently than every two hours.

The area impacted (A_i) by an individual vessel for each two hour period was estimated based on a number of assumptions based on information from the original report (MMO1108), from a Seafish reporting on fishing gear impacts (Lart 2012), or from fishing gear manufacturers. The assumptions used are provided in Annex 7.

The total area of the feature was calculated based on spatial data provided by Natural England[28,29].

The equation is an approximation of the area impacted by fishing as a proportion of the total area of a protected feature or site. This allows for a standardised methodology for assessing the impact of fisheries.

Vessel sightings

Sighting information is recorded into the Monitoring Control and Surveillance System (MCSS). It is collected by various bodies such as MMO coastal staff, IFCAs, Navy patrols and other relevant agencies and contains the following:

[27] www.gov.uk/government/uploads/system/uploads/attachment_data/file/523798/Evidence_Project_Register.csv/preview

[28] https://data.gov.uk/dataset/d89714eb-95be-4eee-8744-ae7cf52fcc2b/habitat-features-of-conservation-importance-marine-conservation-zone-features-polygons-england

[29] https://data.gov.uk/dataset/462a5e68-198f-4868-8ffa-b7741c3204e8/broad-scale-habitats-marine-conservation-zone-features-polygons-england

1. Date and time of sighting
2. Reporting body
3. Vessel name, ID, gear type
4. Approximate location of vessel
5. Approximate speed of vessel
6. Whether the vessel is: Laid/tied up, steaming or fishing.

A Defra commissioned Cefas project to better understand trends in inshore fisheries, including collating and analysing fisheries sightings data from 2010 to 2012. These data were displayed as national layers of sightings (of certain fishing activities - trawling, potting, netting etc) per unit effort.

MMO and IFCA expert opinion on fishing activity
Source: MMO and IFCA

MMO marine officers and IFCA inshore fisheries and conservation officers provided information on fishing activity within MPAs. Information included number and size of vessels fishing, target species, type and amount of fishing gear used and seasonal trends in activity. Confidence levels were provided alongside expert opinion and estimates were provided where exact numbers were not known.

Fishermap data

Source: 2012 Marine Conservation Zone Project Stakmap Commercial Fishing under 15m vessels lines summary by month.

In 2012 the Fishermap project conducted interviews with almost 1000 skippers of the under 15m fishing fleet, with the aim of mapping the activities of the commercial fishing fleet. Of those interviewed, 594 gave their permission for their data to be shared with third parties.
The data are presented as a year’s activity, collected from a series of monthly totals of vessel visits, per grid cell.

Summary data is provided as a series of monthly totals of vessel visits per grid cell.
Fishermap data and expert opinion is used to calculate numbers of under 15m vessels operating in a given site.

Ecological information

The fisheries assessments use the conservation advice packages produced by Natural England and the Joint Nature Conservation Council. These provide information on the features of the site, their area and conditions. The packages also contain an advice on operations and supplementary advice documents which allow the assessment of which pressure/gear combinations a feature may be sensitive too.

For some assessments, further ecological information has also been provided by Natural England. This information is available in the relevant assessments.

Sensitivity and vulnerability

The following definitions of sensitivity and vulnerability are used in MMO assessments. Sensitivity is defined as:

a measure of tolerance (or intolerance) to changes in environmental conditions.[30]

Vulnerability is defined as:

a combination of the sensitivity of a feature to a particular pressure/activity, and its exposure to that pressure/activity.

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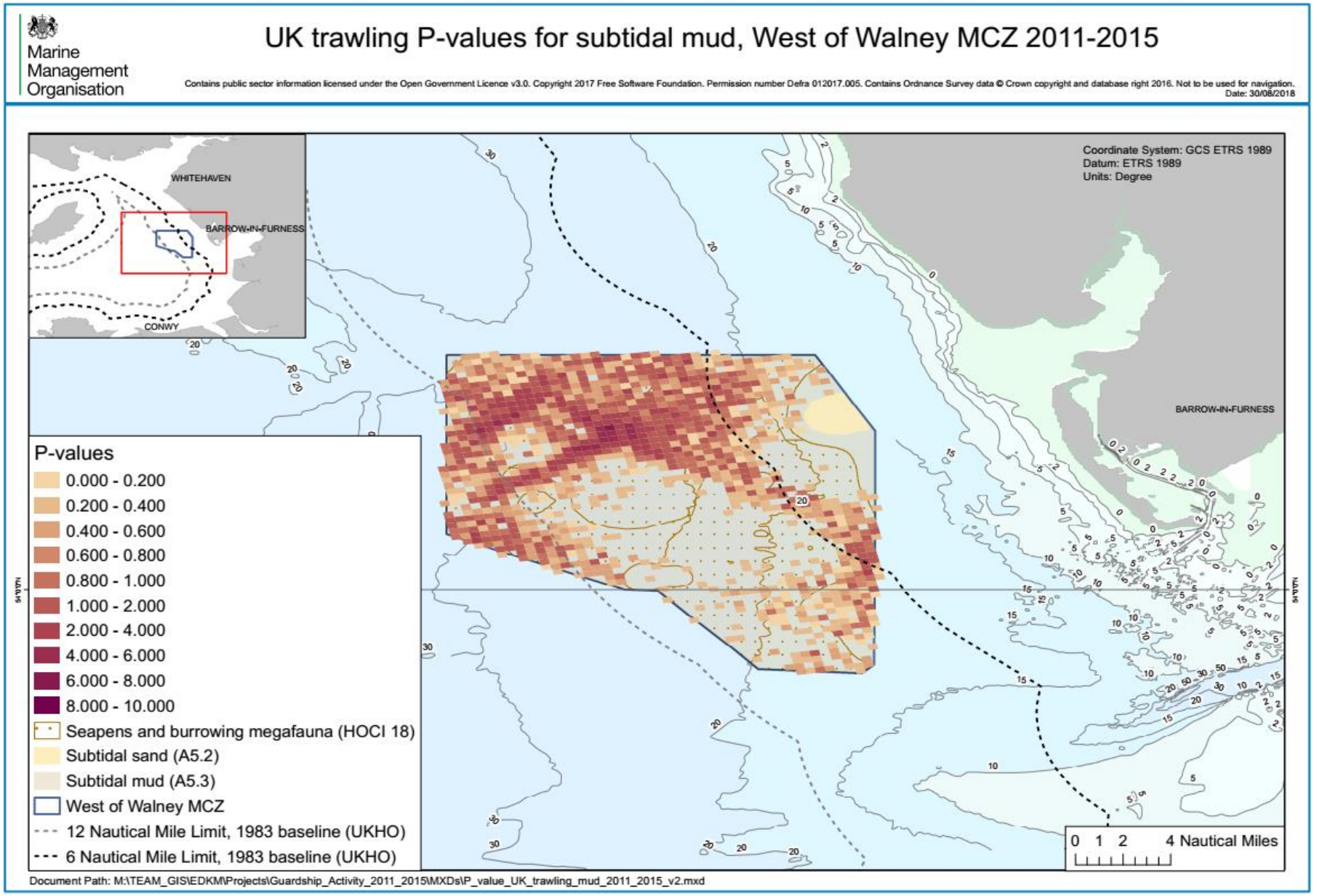
Lart, W. (2012) Fishing spatial-temporal pressures and sensitivities analysis for MPA Fishing Industry Collaboration Pilot FES 252: Report on Seafish workshop on the physical effects of fishing activities on the Dogger Bank

Roberts, C., Smith, C., Tillin, H. Tyler-Walters, H. (2010). Review of existing approaches to evaluate marine habitat vulnerability to commercial fishing activities.

Tilin, H.M., Hull, S.C., Tyler-Walters, H. (2010) Development of a sensitivity Matrix (pressures-MCZ/MPA features). Report to the Department of Environment, Food and Rural Affairs from ABPMer, Southampton and the Marine Life Information Network (MarLIN) Plymouth: Marine Biological Association of the UK. Defra Contract No. MB12 Task 3A, Report No. 22.

[30] Tilin *et al* 2010, Roberts *et al* 2010

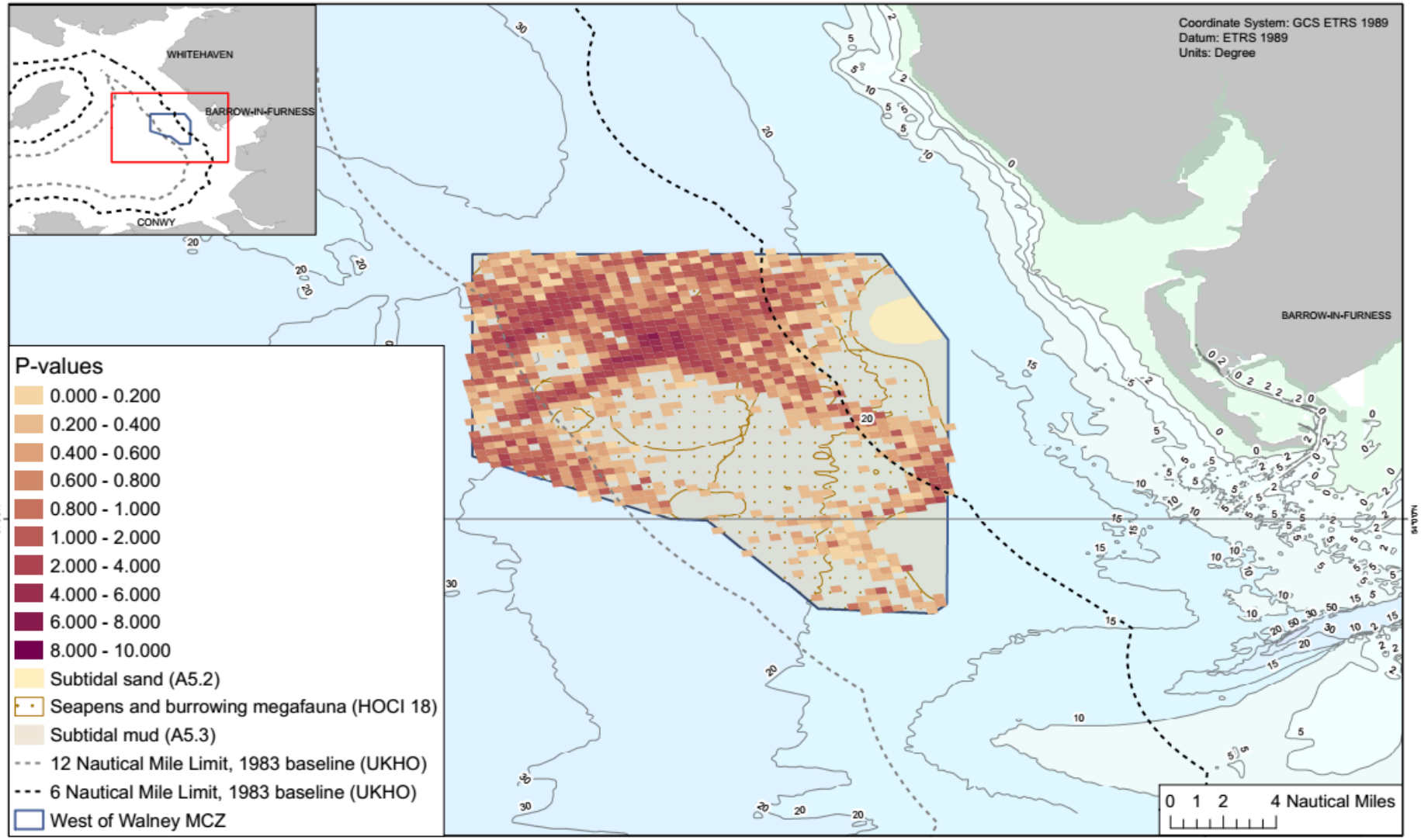
Annex 2 – Bottom towed gear P-values (based on VMS data)



Marine Management Organisation

UK trawling P-values for megafauna, West of Walney MCZ 2011-2015

Date: 30/08/2018



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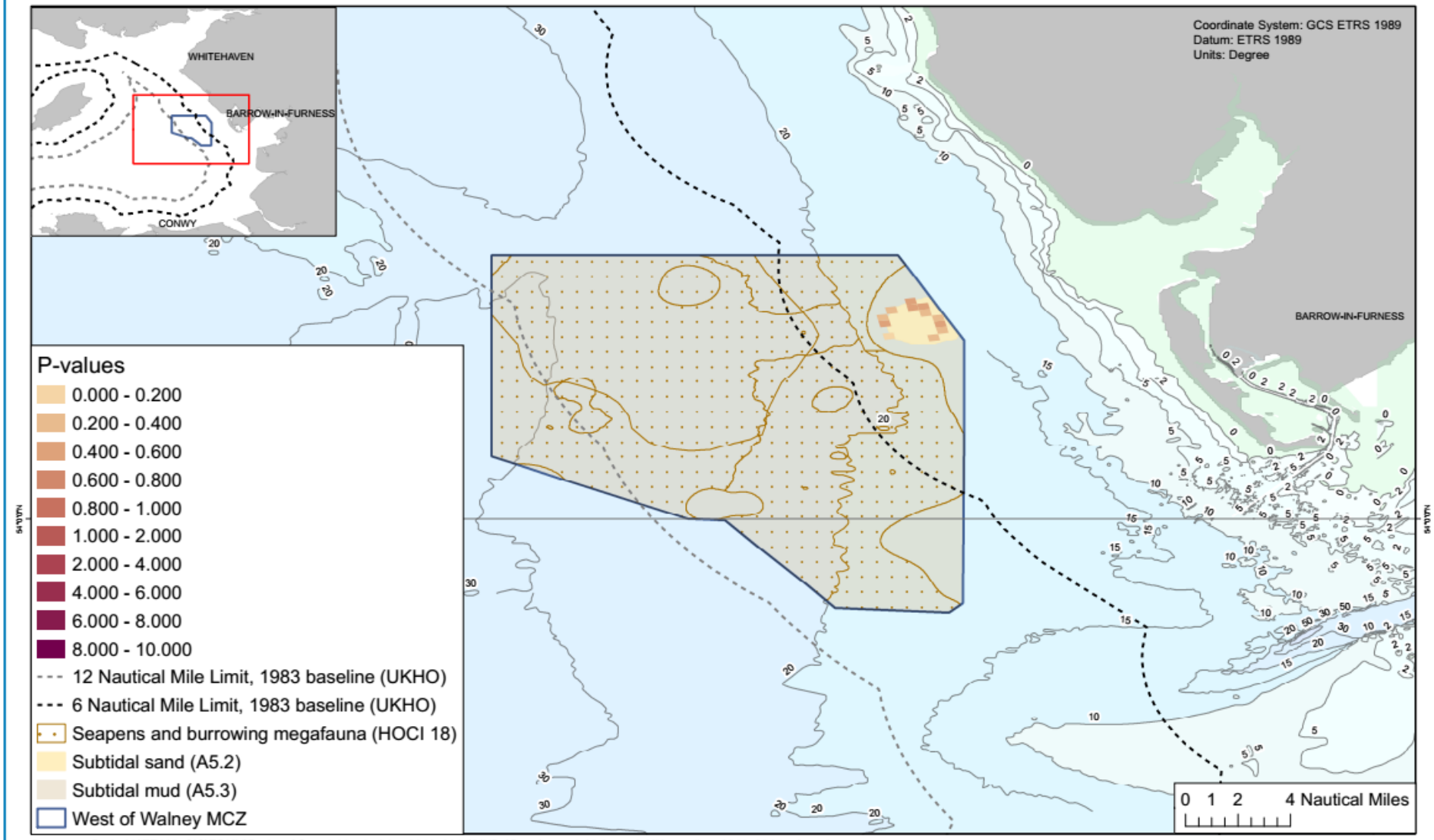
Marine Management Organisation

UK trawling P-values for subtidal sand, West of Walney MCZ 2011-2015

Date: 30/08/2018



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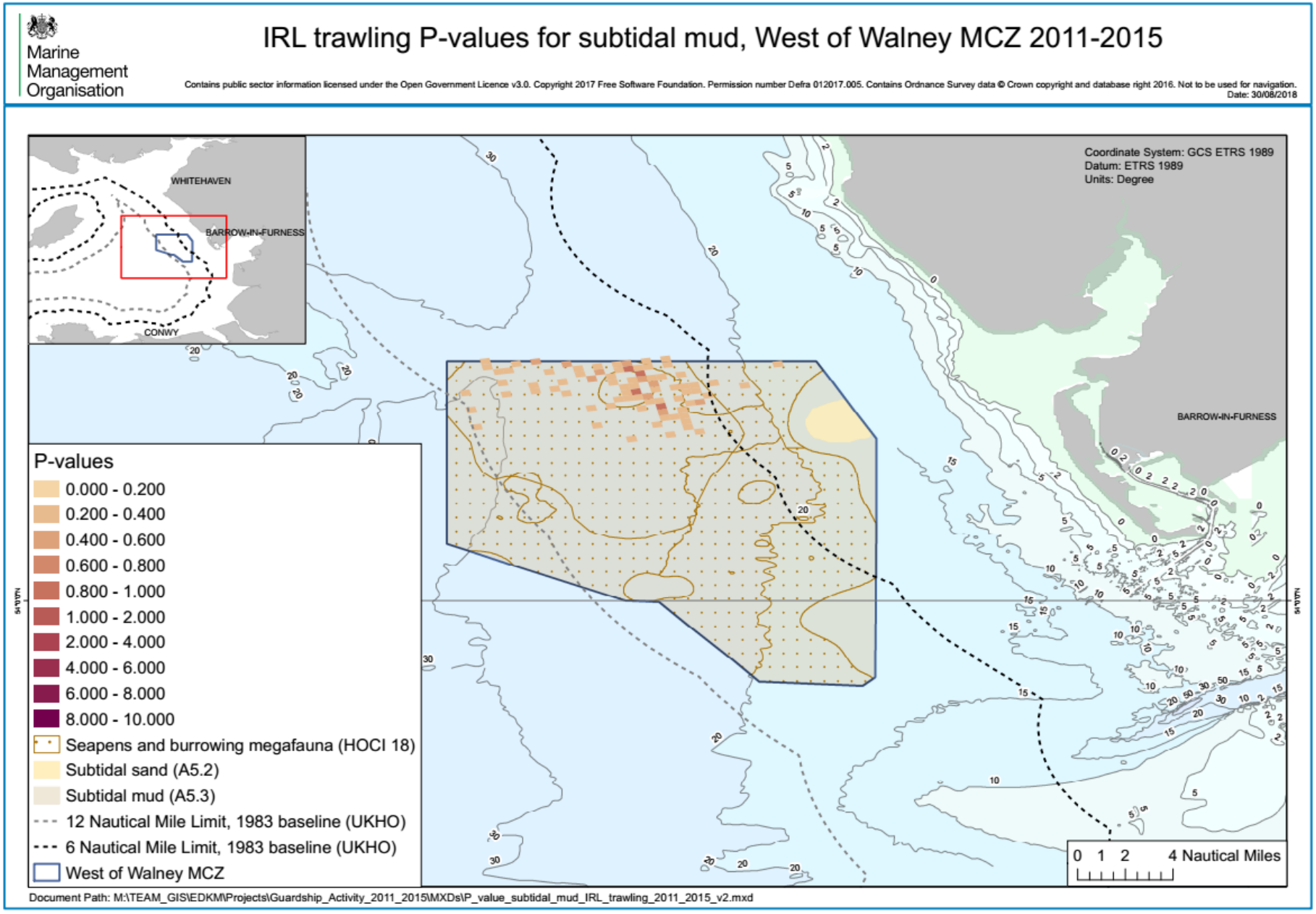
Marine Management Organisation
IRL trawling P-values for subtidal mud, West of Walney MCZ 2011-2015
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Date: 30/08/2018
WHITEHAVEN
BARROW-IN-FURNESS
CONWY
Coordinate System: GCS ETRS 1989
Datum: ETRS 1989
Units: Degree
P-values
0.000 - 0.200
0.200 - 0.400
0.400 - 0.600
0.600 - 0.800
0.800 - 1.000
1.000 - 2.000
2.000 - 4.000
4.000 - 6.000
6.000 - 8.000
8.000 - 10.000
Seapens and burrowing megafauna (HOCI 18)
Subtidal sand (A5.2)
Subtidal mud (A5.3)
12 Nautical Mile Limit, 1983 baseline (UKHO)
6 Nautical Mile Limit, 1983 baseline (UKHO)
West of Walney MCZ
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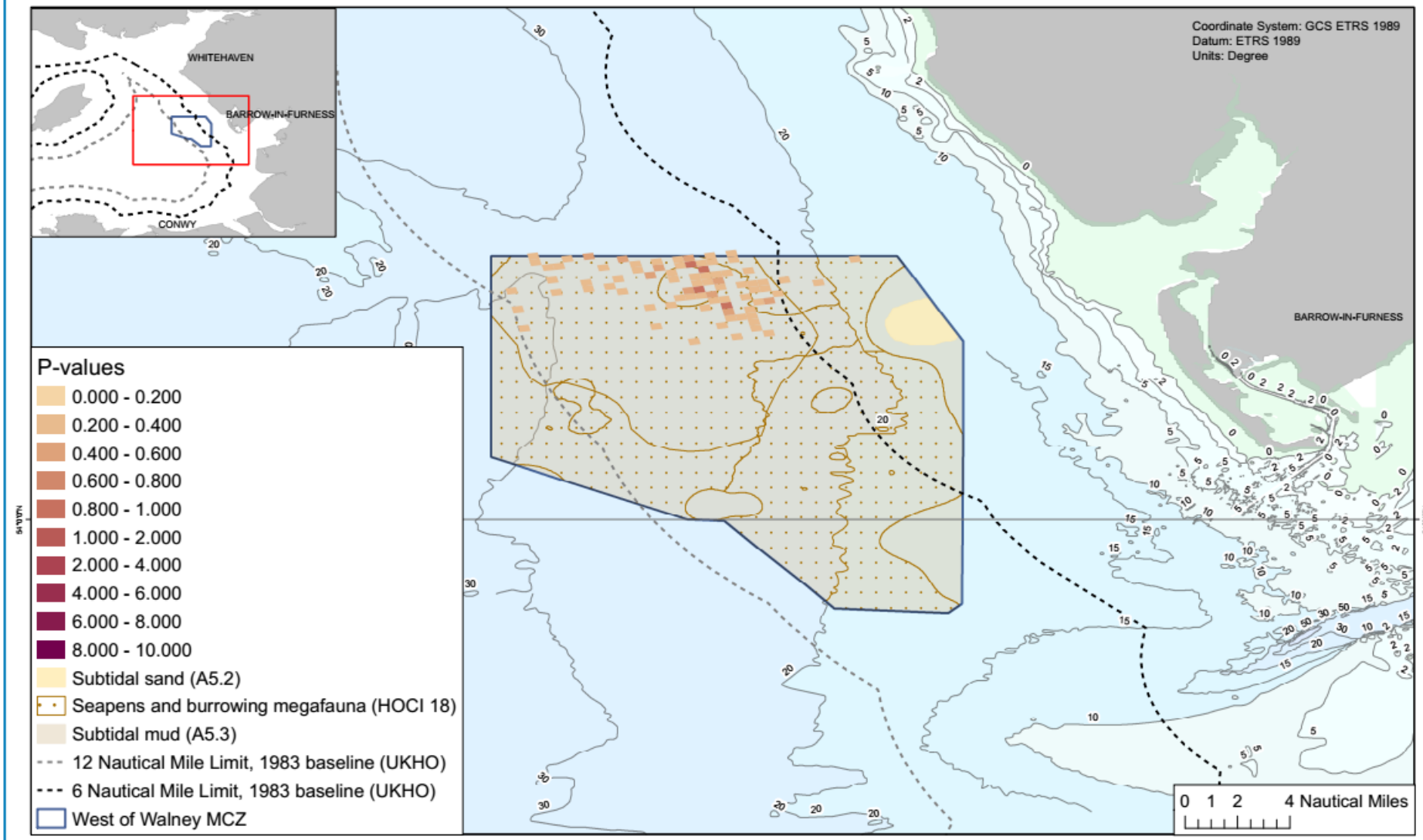
Marine Management Organisation

IRL trawling P-values for megafauna, West of Walney MCZ 2011-2015

Date: 30/08/2018



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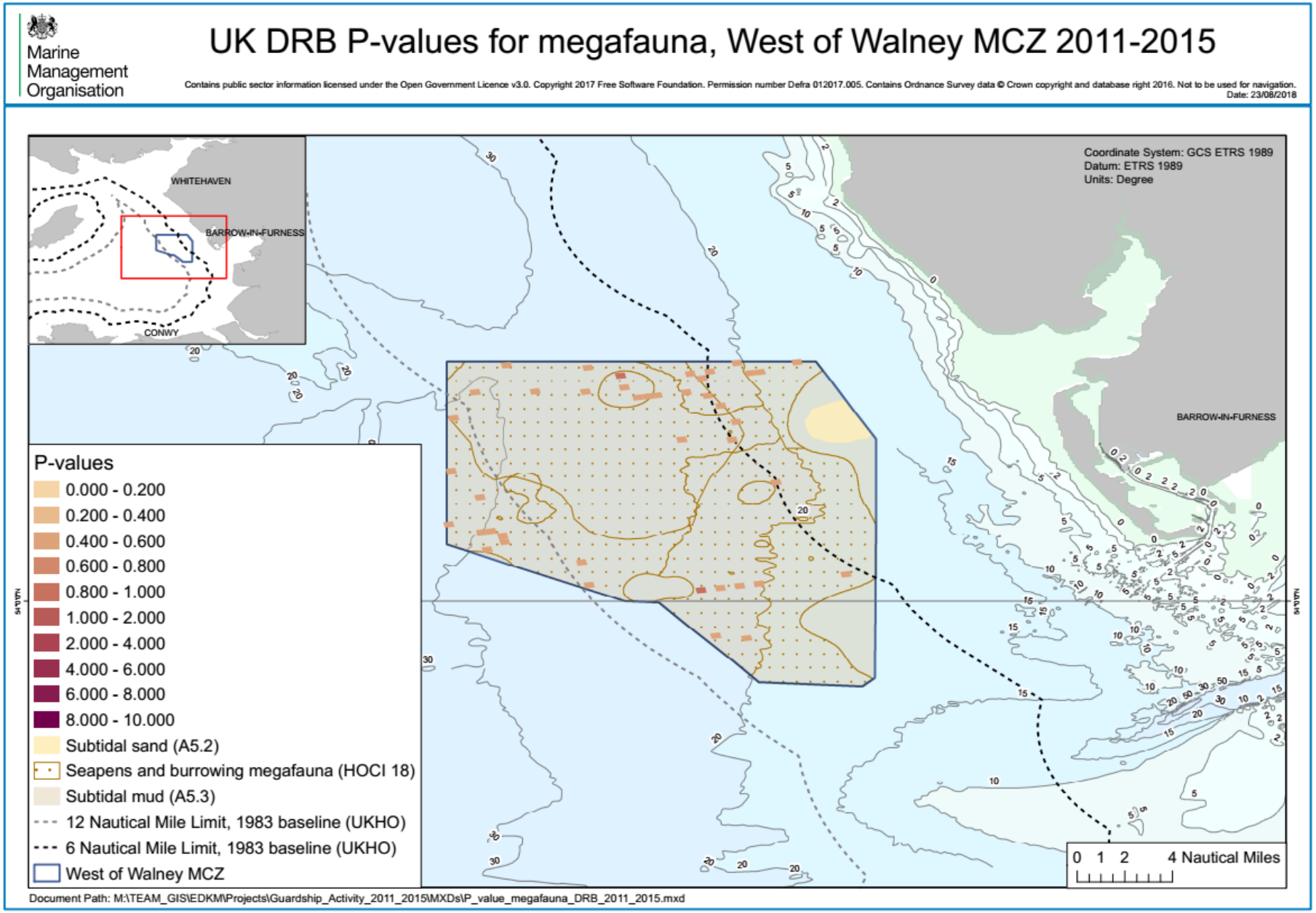
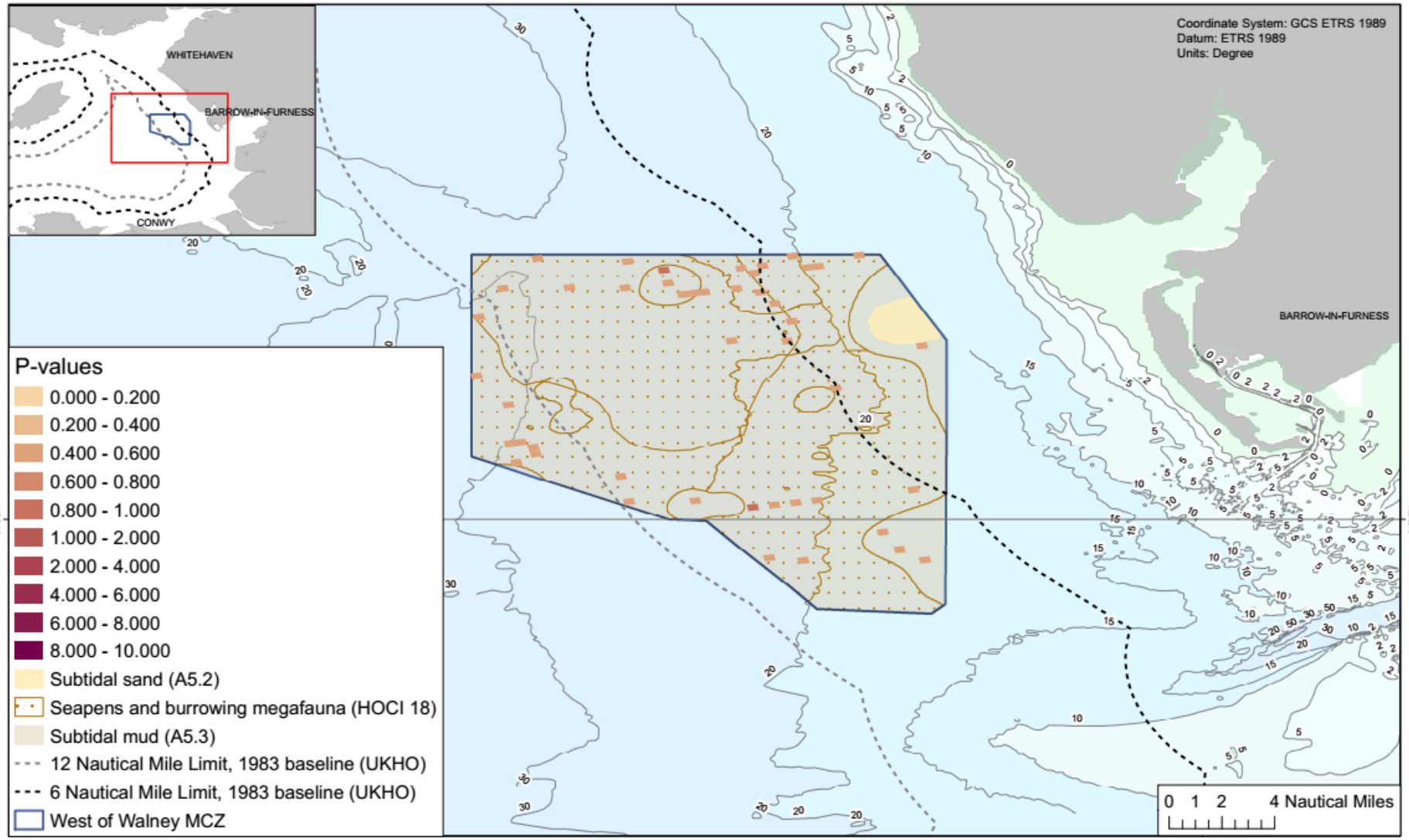
Annex 3 – Dredging distribution (DRB = dredges)



Marine Management Organisation

UK DRB P-values for subtidal mud, West of Walney MCZ 2011-2015

Date: 23/08/2018



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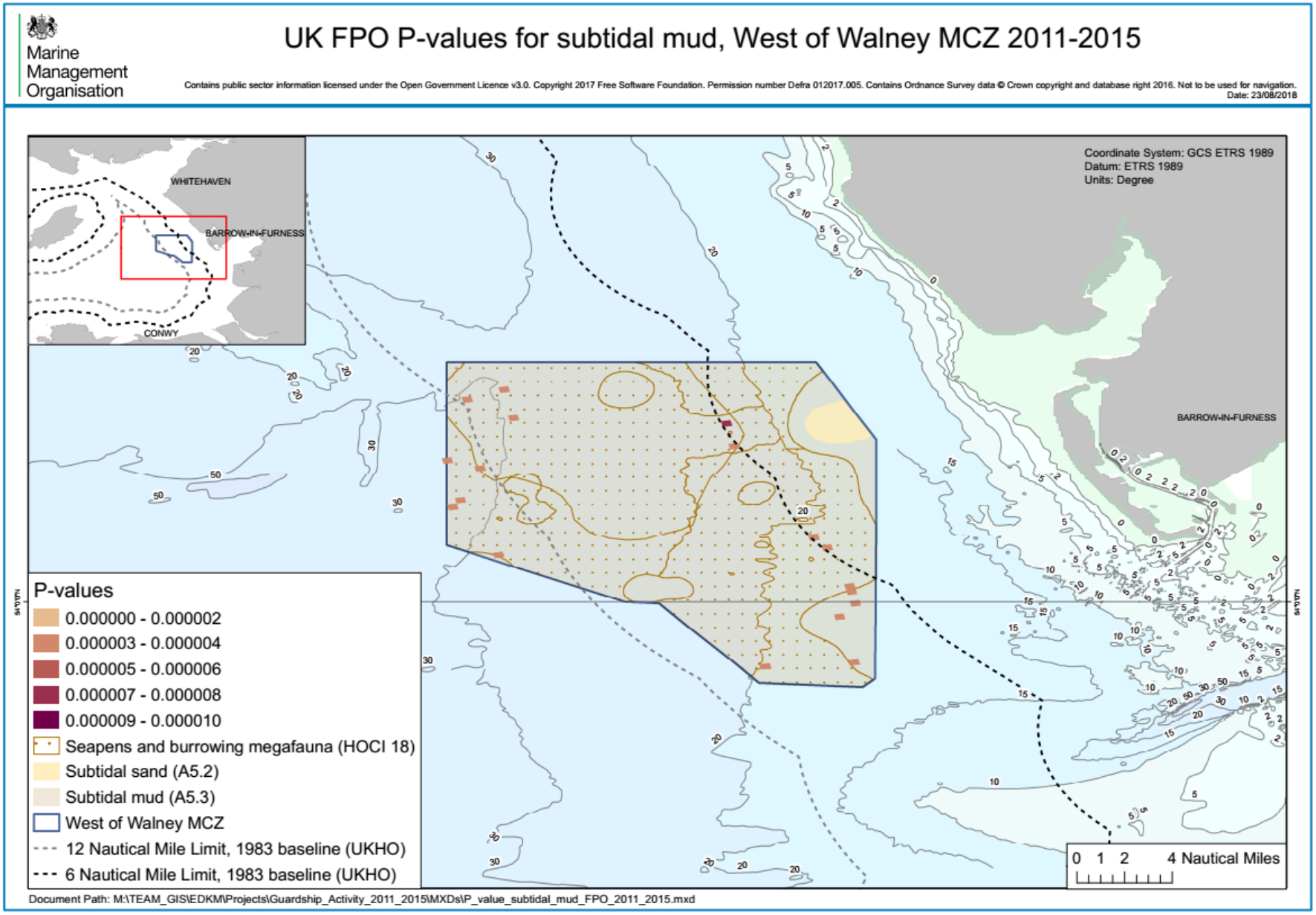
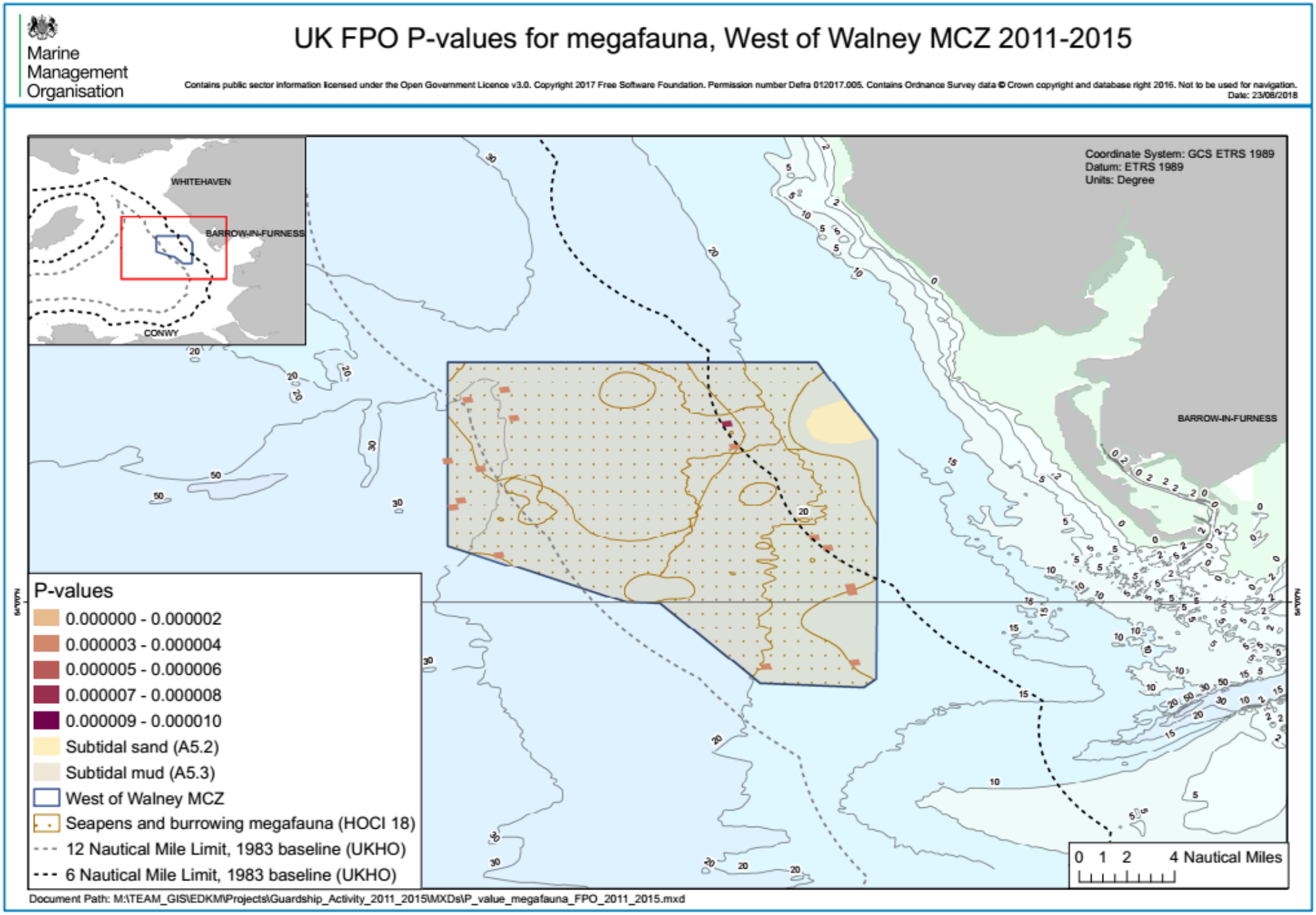
Annex 4 – Pots and traps distribution (FPO = pots and traps)




Marine Management Organisation
UK FPO P-values for megafauna, West of Walney MCZ 2011-2015
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Date: 23/08/2018
Coordinate System: GCS ETRS 1989
Datum: ETRS 1989
Units: Degree
WHITEHAVEN
BARROW-IN-FURNESS
CONWY
BARROW-IN-FURNESS
P-values
0.000000 - 0.000002
0.000003 - 0.000004
0.000005 - 0.000006
0.000007 - 0.000008
0.000009 - 0.000010
Subtidal sand (A5.2)
Subtidal mud (A5.3)
West of Walney MCZ
Seapens and burrowing megafauna (HOCI 18)
12 Nautical Mile Limit, 1983 baseline (UKHO)
6 Nautical Mile Limit, 1983 baseline (UKHO)
0 1 2 4 Nautical Miles
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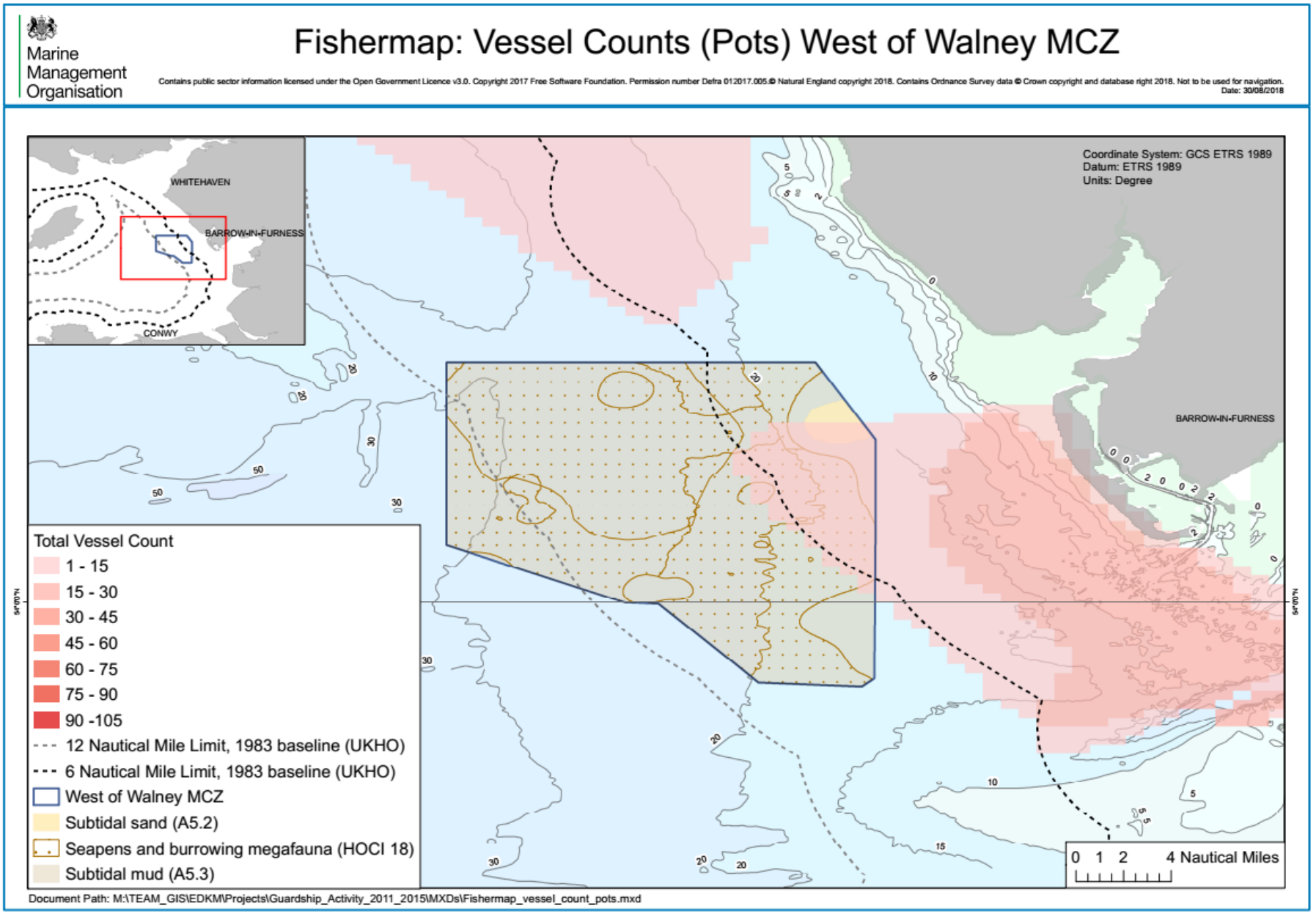
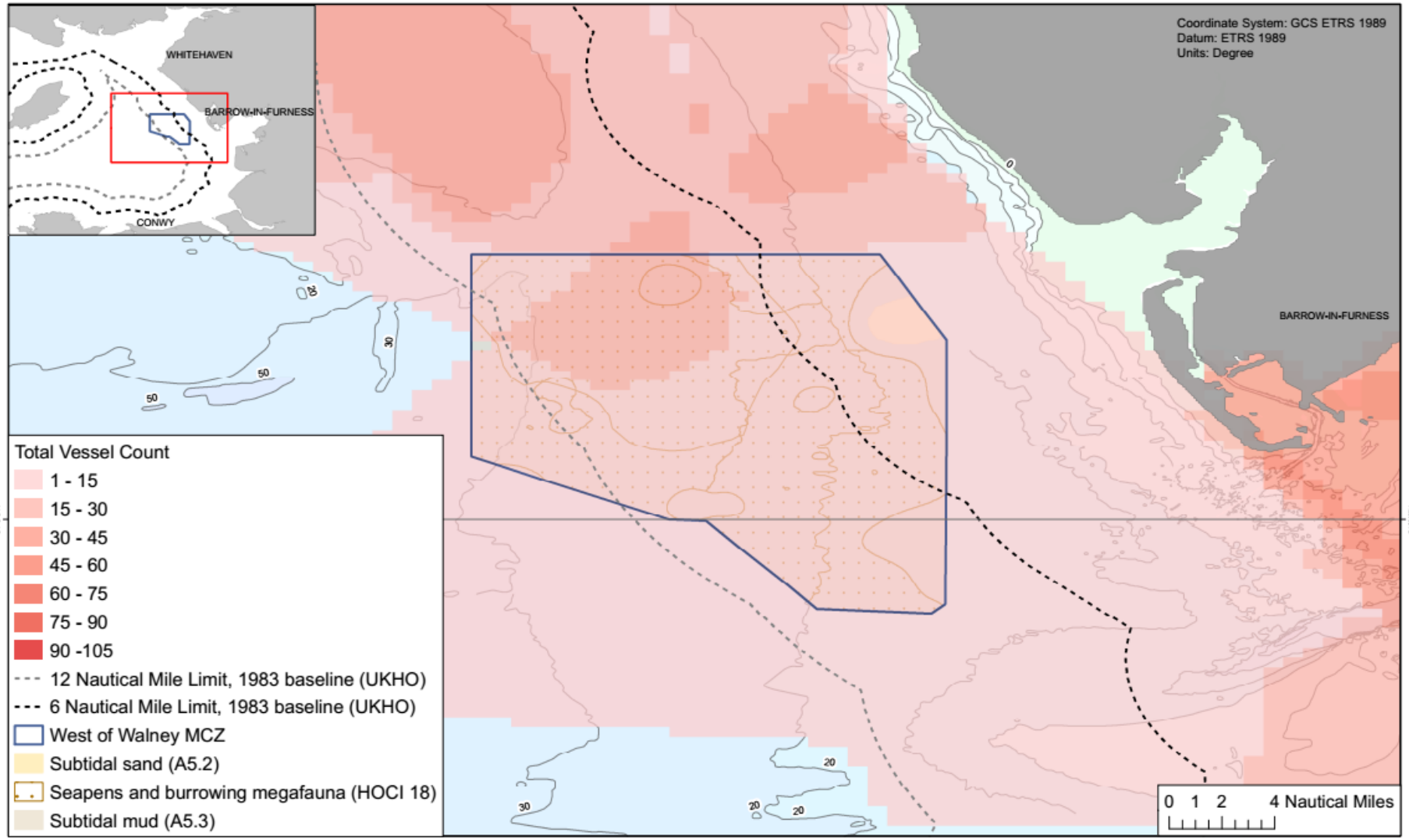
Annex 5 – Fishermap



Marine Management Organisation

Fishermap: Vessel Counts (Trawling) West of Walney MCZ

Date: 30/08/2018



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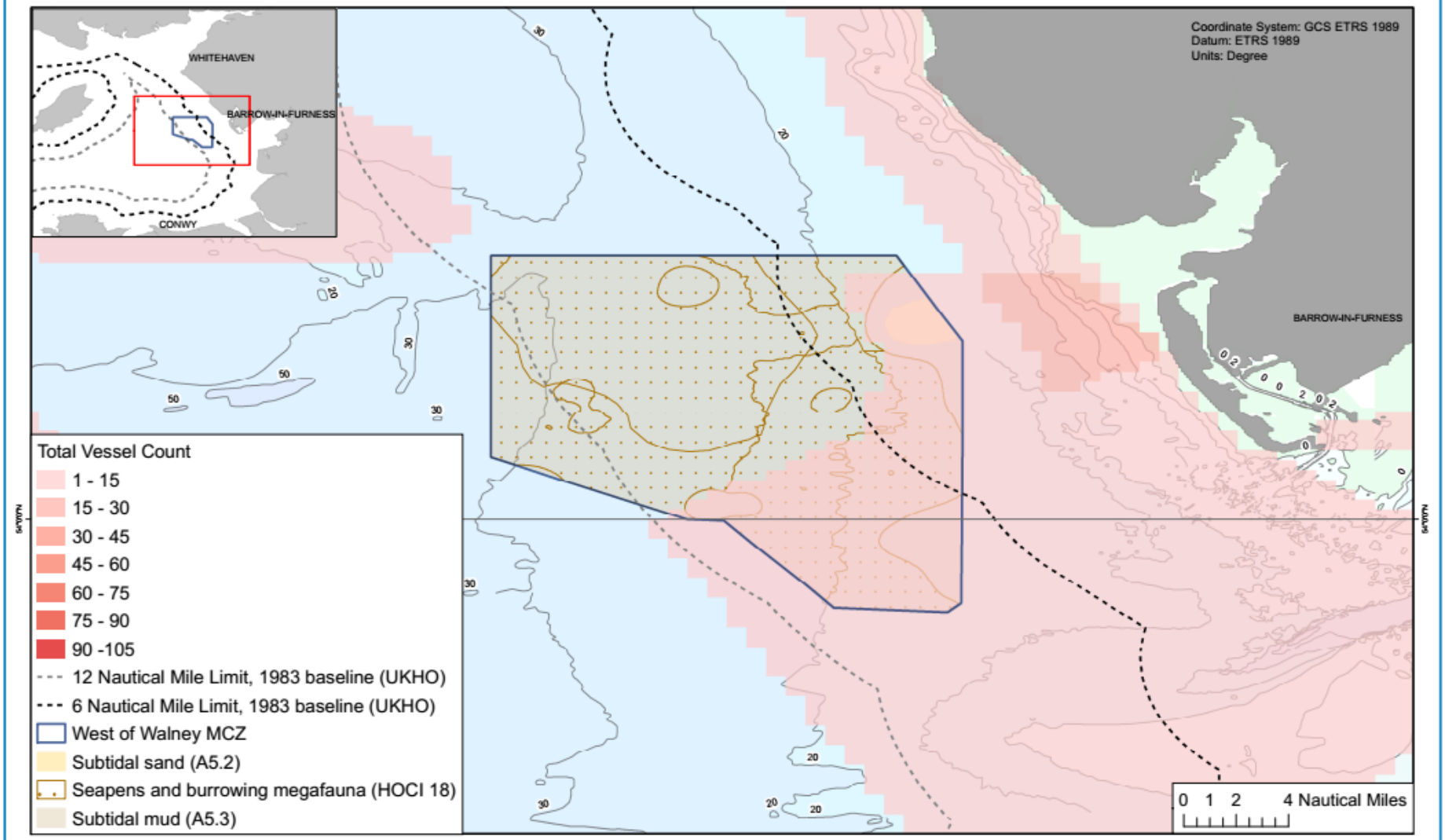
Marine Management Organisation

Fishermap: Vessel Counts (Dredges) West of Walney MCZ

Date: 30/08/2018

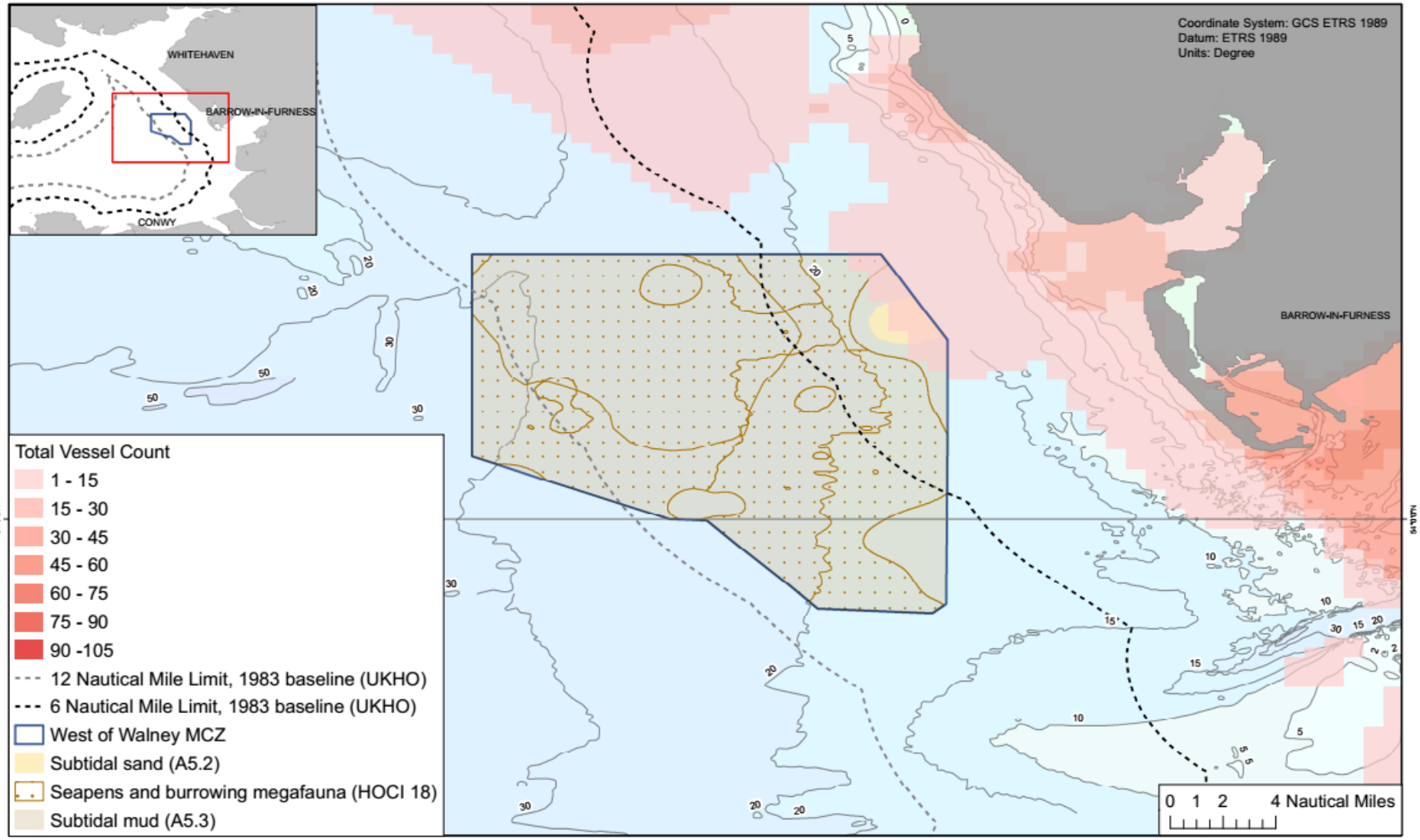


Document Path: M:\TEAM_GIS\EDKM\Projects\Guardship_Activity_2011_2015\MXDs\Fishermap_vessel_count_dredges.mxd

Marine Management Organisation

Fishermap: Vessel Counts (Nets) West of Walney MCZ

Date: 30/08/2018



Document Path: M:\TEAM_GIS\EDKM\Projects\Guardship_Activity_2011_2015\MXDs\Fishermap_vessel_count_nets.mxd

Annex 6 – P-value data

Table 1 Gear codes

Gear code	Gear type
DRB	Boat dredges
FPO	Pots and traps
OT	Otter trawl
OTB	Bottom otter trawl
OTT	Otter twin trawl
TBB	Bottom beam trawl
TBN	Bottom nephrops trawl

Table 2 Subtidal mud - UK fleet

Year	Gear	Area impacted (km2)	Sum area impacted (km2)	Impacted area	P-value	Sum P-value
2011	DRB	0.89	61.36	16.1068	0.002324	0.20770
2011	FPO	0.00			0.000000	
2011	OT	0.17			0.000450	
2011	OTB	54.11			0.187840	
2011	OTT	2.33			0.006251	
2011	TBB	0.81			0.002841	
2011	TBN	3.04			0.007990	
2012	DRB	2.39	73.18	19.2118	0.006276	0.21655
2012	FPO	0.00			0.000000	
2012	OT	0.40			0.001051	
2012	OTB	68.59			0.204506	
2012	OTT	0.57			0.001488	
2012	TBN	1.23			0.003232	
2013	DRB	0.80	36.39	9.5526	0.002092	0.09694
2013	OTB	33.09			0.088289	
2013	OTT	0.68			0.001786	
2013	TBN	1.82			0.004776	
2014	OTB	10.96	12.95	3.4007	0.028979	0.03423
2014	OTT	1.13			0.002977	
2014	TBN	0.86			0.002270	
2015	DRB	0.27	6.00	1.5752	0.000697	0.01575
2015	FPO	0.00			0.000000	
2015	OTB	5.38			0.014114	
2015	OTT	0.23			0.000595	
2015	TBN	0.13			0.000345	

Table 3 Number of days fishing occurred

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	2	7	8	26	28	30	31	30	24	16	21	11
2012	20	24	28	27	29	23	29	24	10	2	28	19
2013	23	14	2	6	24	21	26	8	7	10	10	5
2014	7	4	7	25	20	11	12	19		3	8	4
2015	4			11		7	1	4	7			2

Table 4 Number of vessels per month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	2	4	4	26	7	10	7	8	5	1	6	2
2012	4	7	2	24	5	2	2	18	4	3	5	4
2013	2	2	2	4	2	6	18	5	2	4	2	3
2014	2	2	3	11	9	9	13	3		2	2	3
2015	2			14		2	1	4	3			1

Table 5 Mud non-UK fleet

Year	Gear	Area impacted (km^2)	Sum area impacted (km^2)	Impacted area	P-value	Sum P-value
2011	OTB	0.17	0.17	0.0450	0.000450	0.000450
2012	OTB	1.14	1.14	0.3003	0.003003	0.003003
2013	OTB	0.06	0.06	0.0150	0.000150	0.000150
2014	OTB	0.17	0.17	0.0450	0.000450	0.000450
2015	OTB	4.06	4.06	1.0661	0.010661	0.010661

Table 6 Number of days fishing occurred

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011							1	1				
2012				7				2				
2013						1						
2014				1			2					
2015				3	3	10	10	3				

Table 7 Number of vessels per month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011							2	1				
2012				3				1				
2013						1						
2014				1			1					
2015				1	1	1	1	2				

Table 8 Sea-pen and burrowing megafauna communities UK fleet

Year	Gear	Area impacted (km^2)	Sum area impacted (km^2)	Impacted area	P-value	Sum P-value
2011	DRB	0.71	60.55	17.5214	0.002050	0.22678
2011	FPO	0.00			0.000000	

2011	OT	0.17			0.000497	
2011	OTB	54.00			0.206906	
2011	OTT	2.33			0.006891	
2011	TBB	0.81			0.003132	
2011	TBN	2.52			0.007307	
2012	DRB	2.12	72.28	20.9175	0.006150	0.23667
2012	FPO	0.00			0.000000	
2012	OT	0.34			0.000993	
2012	OTB	68.00			0.224286	
2012	OTT	0.57			0.001641	
2012	TBN	1.25			0.003603	
2013	DRB	0.80	33.67	9.7437	0.002306	0.09859
2013	OTB	30.37			0.089052	
2013	OTT	0.68			0.001969	
2013	TBN	1.82			0.005265	
2014	OTB	10.78	12.78	3.6992	0.031450	0.03723
2014	OTT	1.13			0.003281	
2014	TBN	0.86			0.002502	
2015	DRB	0.27	5.94	1.7199	0.000769	0.01720
2015	FPO	0.00			0.000000	
2015	OTB	5.32			0.015394	
2015	OTT	0.23			0.000656	
2015	TBN	0.13			0.000380	

Table 9 Number of days fishing occurred

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	2	7	8	26	28	30	31	29	24	16	21	11
2012	20	24	28	27	29	23	29	24	10	2	28	19
2013	23	14	2	6	23	21	26	8	7	9	10	5
2014	7	4	7	24	19	11	12	18		3	8	4
2015	4			11		7	1	4	7			2

Table 10 Number of vessels per month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	2	4	4	26	7	10	6	8	5	1	5	2
2012	4	7	2	23	5	2	2	18	4	3	4	4
2013	2	2	2	4	2	6	18	5	2	3	2	3
2014	2	2	3	11	9	9	13	3		2	2	3
2015	2			14		2	1	4	3			1

Table 11 Sea-pen and burrowing megafauna communities non-UK fleet

Year	Gear	Area impacted (km^2)	Sum area impacted (km^2)	Impacted area	P-value	Sum P-value
2011	OTB	0.17	0.17	0.0497	0.000497	0.000497
2012	OTB	1.14	1.14	0.3310	0.003310	0.003310
2013	OTB	0.06	0.06	0.0166	0.000166	0.000166
2014	OTB	0.17	0.17	0.0497	0.000497	0.000497

2015	OTB	4.06	4.06	1.1752	0.011752	0.011752

Table 12 Number of days fishing occurred

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011							1	1				
2012				7				2				
2013						1						
2014				1			2					
2015				3	3	10	10	3				

Table 13 Number of vessels per month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011							2	1				
2012				3				1				
2013						1						
2014				1			1					
2015				1	1	1	1	2				

Table 14 Subtidal sand UK fleet

Year	Gear	Area impacted (km^2)	Sum area impacted (km^2)	Impacted area	P-value	Sum P-value
2012	OTB	0.74	0.74	10.6023	0.106023	0.106023
2013	OTB	0.06	0.06	0.9142	0.008156	0.00914
2013	TBN	0.01			0.000986	
2014	OTB	0.11	0.11	1.6311	0.016311	0.016311

Table 15 Number of days fishing occurred

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011												
2012	1		1	3		2	3	3				
2013							1				1	
2014					1				1			
2015												

Table 16 Number of vessels per month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011												
2012	1		1	4		1	1	1				
2013							1				1	
2014					1				1			
2015												

Annex 7 - Assumptions used to calculate spatial footprint (P-values)

Pots

- Size of pot: based on GAEL Force Lobster/Crab creel (609.6 mm x 406.4 mm)
- Number of vessels and days spent fishing: derived from VMS/landings records.
- Number of pots used by vessels: derived from local fisherman.

Dredges

- Based on a 16.28 m scallop vessel with 2 x 6.7 m dredge bars each with two shoes at 720 mm wide. Each dredge bar has 8 x 76 cm dredges (Lart, 2012).
- Number of vessels and days spent fishing: derived from VMS/landings records.

Bottom towed gear

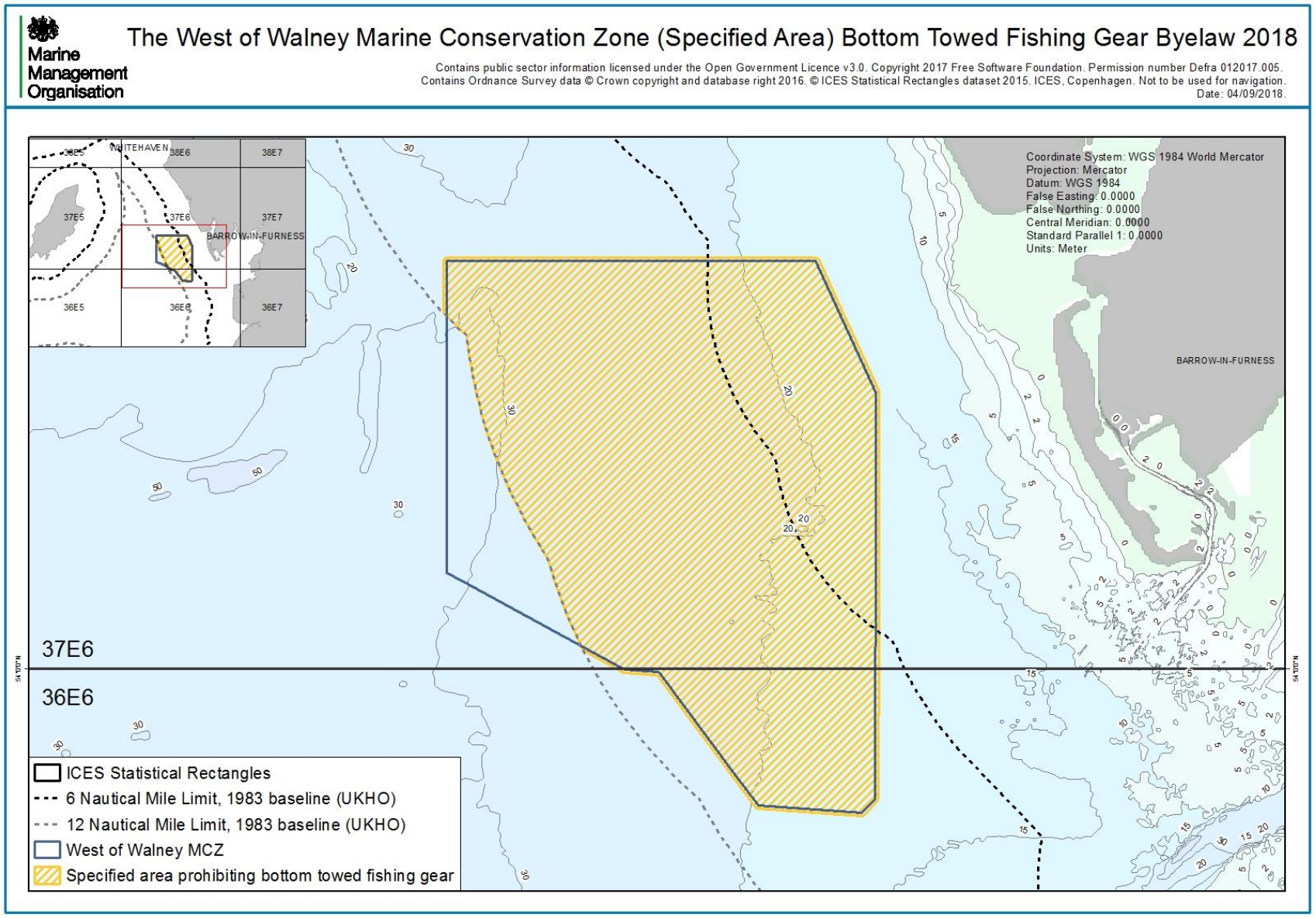
- Beam trawl: Based on a vessel with one 12 m trawl with two shoes at 720 mm wide and with 60 % ground rope interaction (Lart, 2012).
- Otter trawl: Based on a vessel with one 12 m trawl with two 1.2 m x 0.65 m otter boards and with 60 % ground rope interaction (Lart, 2012).
- Number of vessels and days spent fishing: derived from VMS/landings records.

When calculating P-values the gear type assigned by the MMO statistical team is used. If no gear has been assigned then if the vessel has an assigned statistical gear in the same year that gear is used. If no match can be found then the primary gear type assigned in the Food and Agriculture Organization of the United Nations (FAO) fishing vessel database is used.

References

Lart, W. (2012) Fishing spatial-temporal pressures and sensitivities analysis for MPA Fishing Industry Collaboration Pilot FES 252: Report on Seafish workshop on the physical effects of fishing activities on the Dogger Bank http://nffo.org.uk/uploads/attachment/108/report-on-seafish-workshop-on-the-physical-effects-of-fishing-activities-on-the-dogger-bank.pdf

Annex 8 – Proposed Management Measure



Annex 9 - Monitoring and Control Process