

Resource and Constraints
Assessment for Offshore Wind

Characterisation Area Report
Irish Sea

17

Characterisation Area Report: 17 – Irish Sea

38255-TCE-REP-022 Characterisation Area Report: 17 – Irish Sea		
Version	Status	Issue date
1.1	Draft	July 2018
1.2	Draft	November 2018
1.3	Final	September 2019

The information included in this report should be read in conjunction with the *Resource and Constraints Assessment for Offshore Wind: Methodology Report* and the *Summary Stakeholder Feedback Report*. The trigger distance for constraints to be included in the constraints analysis section of this report is 1 nautical mile (NM).

The Crown Estate has undertaken the analysis in this report using the evidence available to it, internal expertise and support from external advisers where appropriate. The analysis does not obviate any potential need for any Habitat Regulations Assessment (HRA) or any project level consideration of the potential impact of development. The analysis does not supersede any statutory policies or marine plans. The analysis, including the data and information contained in this document, presents a point in time assessment with changes likely to both the presence and nature of constraints.

This report is provided for information purposes only and no party may rely on the accuracy, completeness or fitness of its content for any particular purpose. The Crown Estate makes no representation, assurance, undertaking or warranty in respect of the analysis in the report including all data and information contained in it.

Receptor rating		Area rating	
Receptor assessed but no interaction noted		Receptor assessed but no interaction noted	
Interaction acceptable with best practice/accepted mitigation		The constraint will present the need to implement best practice/accepted mitigation measures to enable acceptable development within the whole area	
Interaction acceptable with moderate mitigation		The constraint will present the need to implement moderate mitigation measures to enable acceptable development within the whole area	
Interaction acceptable with significant mitigation		The constraint will present the need to implement significant and/or strategic level mitigation measures to enable acceptable development within the whole area	
Significant/insurmountable issue that would be challenging to mitigate within the area of influence of a receptor		Significant/insurmountable issue that would be challenging to mitigate for any development within the whole area	
No data coverage across the area		No data coverage across the area	

Constraints analysis

Note that in addition to The Crown Estate leases/licences within this table, The Crown Estate has also identified key resource areas (KRAs) which may be suitable for the future development of different marine sectors. Information about overlapping KRAs that overlap this characterisation area is described in a latter section of this document.

Exclusions model – Hard constraints			Receptor rating	Area rating
	Present	Commentary		
The Crown Estate agreements	Pipelines: there are numerous active and inactive pipelines intersecting the southern and eastern parts of the characterisation area landing into North Wales and Barrow.	The pipelines have been removed from the characterisation area and will need to be avoided; this should be possible with best practice/accepted mitigation. However, the large number of pipelines may be a constraint on the area available for new arrays.		
	Telecoms and interconnector cables: there are numerous active and inactive cables intersecting the southern and central parts of the characterisation area landing at various points on the English coast.	The cables have been removed from the characterisation area and will need to be avoided; this should be possible with best practice/accepted mitigation. However, the large number of cables may be a constraint on the area available for new arrays. Since cable crossings require cable protection (which may have adverse environmental effects), crossings should be minimised where practicable.		
	Walney Wind Farm (1 and 2) and associated OFTO cable infrastructure, as well as proposed extension areas (3 and 4) are all within the central, eastern parts of the characterisation area.	The cumulative impact of offshore wind farm (OWF) developments and associated cable infrastructure will need to be considered in this area as there may be concerns around wind resource and proximity to existing sites. There will need to be a 5 km buffer around existing offshore wind projects – any new wind developments within 5 km will need the permission of the incumbent party. Cumulative pressures around landing locations for export cables may also cause a concern. Since cable crossings require cable protection (which may have adverse environmental effects), crossings should be minimised where practicable.		
	West of Duddon Sands Wind Farm and associated Offshore Transmission Owners (OFTO) cable infrastructure is within the central, eastern edge of the characterisation area.	The cumulative impact of OWF developments and associated cable infrastructure will need to be considered in this area as there may be concerns around wind resource and proximity to existing sites. There will need to be a 5 km buffer around existing offshore wind projects – any new wind developments within 5 km will need the permission of the incumbent party. Cumulative pressures around landing locations for export cables may also cause a concern. Since cable crossings require cable protection (which may have adverse environmental effects), crossings should be minimised where practicable.		
	Ormonde Wind Farm and associated OFTO cable infrastructure is within the central, eastern edge of the characterisation area.	The cumulative impact of OWF developments and associated cable infrastructure will need to be considered in this area as there may be concerns around wind resource and proximity to existing sites. There will need to be a 5 km buffer around existing offshore wind projects – any new wind developments within 5 km will need the permission of the incumbent party. Cumulative pressures around landing locations for export cables may also cause a concern. Since cable crossings require cable protection (which may have adverse environmental effects), crossings should be minimised where practicable.		
	Barrow Wind Farm and associated OFTO cable infrastructure is within the central, eastern edge of the characterisation area.	The cumulative impact of OWF developments and associated cable infrastructure will need to be considered in this area as there may be concerns around wind resource and proximity to existing sites. There will need to be a 5 km buffer around existing offshore wind projects – any new wind developments within 5 km will need the permission of the incumbent party. Cumulative pressures around landing locations for export cables may also cause a concern. Since cable crossings require cable protection (which may have adverse environmental effects), crossings should be minimised where practicable.		
	Gateway Gas Storage Project open disposal site is within the eastern, central part of this characterisation area.	This would need to be avoided and may need a buffer distance around it; liaison with the customer is required.		
	Aggregates area 457: active dredging site located within the southern part of this characterisation area.	Active dredging site within the characterisation area – this would require a 2 km buffer around it and negotiations with the customer.		
	Other energy infrastructure	There are 24 active platforms in or within 1 NM of the area, as well as two wellheads and one manifold. These are distributed through the centre of the area and running down to the south-eastern edge.	There are potential conflicts between oil and gas activity and offshore wind energy, with existing development standing off by 4 km to development. The potential offshore wind capacity in the southern part of the area could be greatly inhibited by the presence of oil and gas infrastructure, but there is still some capacity. Overall only 32% of the area is within the 0-3 NM and 3-6 NM helicopter consultation zones for existing platforms, mainly due to the fact that there is no oil and gas infrastructure in the northern part of the characterisation area.	
Navigation	Some of the Liverpool Bay traffic separation scheme intersects with the area.	The scheme means that traffic is concentrated into defined routes due to the volume of vessels and for safety reasons. Any impact on the traffic separation scheme should be avoided where possible, although there is significant potential elsewhere in the characterisation area for this not to be an issue.		

	There is significant navigational dredging adjacent to the area at ports of Workington and Barrow.	Impacts on ports' dredging operations and access to maintained channels should be avoided by appropriate siting within the area.				
Social	None within the trigger distance.					
Restrictions model – Soft constraints					Receptor rating	Area rating
Economic tier						
Navigation	The area is within 1 km of the Port of Liverpool, Port of Barrow and Whitehaven Harbour authority areas	There is no direct overlap, but approaches to these ports should be maintained. The scale of the area means that the impacts on navigation should be easily mitigatable through appropriate siting.				
	There are numerous disposal sites in the area, four of which are linked to navigation interests.	These features do not pose a significant impact and should be mitigatable through appropriate siting.				
	There is significant traffic exiting Barrow and Heysham which traverses the area. This splits into three forks going to and from the Isle of Man, north to Scotland and west to Northern Ireland.	This could pose some issues as traffic is of sufficient volume to be likely to cause some restrictions on development in the area.				
Subsurface	None within the trigger distance.					
Fishing	See assessment below.				N/A	
Environmental tier						
<p>The assessment of the sensitivity of Marine Protected Areas (MPAs) to pressures caused by offshore wind development and operation is assessed in a separate spreadsheet which will be made available as part of the Round 4 evidence base. Commentary has been noted in the relevant characterisation document where MPAs either overlap or are within 1 NM of the characterisation area and have been assessed as a yellow rating or above. For more information on the methodology for this assessment, please refer to the methodology report.</p> <p>Royal Society for the Protection of Birds (RSPB) note the presence of the west coast flyway across this characterisation area. It is important for the migration of internationally important populations of waterbirds, many of which are features of Special Protection Area (SPA)/Ramsar sites along the flyway.</p> <p>Assessments of Annex II species have not been made as part of the characterisation process. Such assessments will need to be undertaken at project level for individual developments within the characterisation area.</p> <p>The Wildlife Trusts (TWT) note that harbour porpoise and bottlenose dolphin are key Annex II species to consider for this characterisation area.</p> <p>TWT also note that around 30 species of shark are found in the Irish Sea and that impacts on these will also need to be considered for developments within this characterisation area.</p>						
Type of designation	Name of designation	Designated features/species	Conservation objectives	Commentary		
European marine designations	Special Areas of Conservation (SACs)	Drigg Coast (400 m)				
	SAC	Shell Flat and Lune Deep (1.3 km)	Subtidal sandbanks Reefs	Conservation objectives for both reef and sandbank features are to maintain the features in their current favourable condition.	<p>The reef feature is located within the Lune Deep section of the site, a deep-water channel containing boulder and bedrock reef. The sandbank feature is within the Shell Flat section of the site (which is also part of the Liverpool Bay SPA and is important for supporting Diver/Scoter populations). The distance between the SAC and the characterisation area means that impacts on these features are likely to be limited to cabling impacts. It is considered that the potential impact of cabling on Shell Flat sandbanks is mitigable and the potential impact of cabling on Lune Deep reefs is probably avoidable.</p> <p>It is noted in the advice on operations that the Walney 2 export cable runs through the northern tip of Shell Flat, and that damage</p>	

				<p>was caused to the feature by trenching - the damage is recorded as 'significant but temporary'. Potential future exposure of trenched cables is noted as a concern.</p> <p>Consideration should be given to the SNCB's report on cable sensitivity entitled 'Natural England and JNCC advice on key sensitivities of habitats and Marine Protected Areas in English Waters to offshore wind farm cabling within Proposed Round 4 leasing areas'.</p>		
Harbour Porpoise SAC	None within the trigger distance					
Sites of Community Importance (SCIs)	None within the trigger distance					
Ramsar	None within the trigger distance					
Special Protection Areas (SPAs)	Morecambe Bay and Duddon Estuary	<p>Little egret (non-breeding) Whooper swan (non-breeding) Pink-footed goose (non-breeding) Common shelduck (non-breeding) Northern pintail (non-breeding) Eurasian oystercatcher (non-breeding) Ringed plover (non-breeding) European golden plover (non-breeding) Grey plover (non-breeding) Red knot (non-breeding) Sanderling (non-breeding) Dunlin (non-breeding) Ruff (non-breeding) Black-tailed godwit (non-breeding) Bar-tailed godwit (non-breeding) Eurasian curlew (non-breeding) Common redshank (non-breeding) Ruddy turnstone (non-breeding) Mediterranean gull (non-breeding) Lesser black-backed gull (non-breeding) Lesser black-backed gull (breeding) Herring gull (breeding) Sandwich tern (breeding) Common tern (breeding) Little tern (breeding)</p>	Maintain/restore as appropriate. Conservation Advice Package currently under development.	<p>This site is an amalgamation of two former SPAs - Morecambe Bay SPA and Duddon Estuary SPA. The SPA area itself has been excluded from the characterisation area, although they share a boundary. Many of the birds at the site are wintering waders and wildfowl which do not feed at sea and are therefore less at risk from array development within the characterisation area (although they are likely to be exposed on passage). The foraging areas for breeding tern species are included within the designation area. Tern species could be a concern in relation to this SPA, especially since there are a number of existing wind farms in the area which may already be located in tern feeding areas (the SPA designation has been updated since consent was granted for the majority of these wind farms, and terns may therefore pose more of an HRA issue for future developments). It may be sensible to liaise with Natural England to identify whether they have concerns over cumulative impacts on terns (and other species) from this site, particularly lesser black-backed gull and herring gull as these have been an issue at other Irish Sea wind farms in the past.</p> <p>Natural England have commented that cable landfall through this site could have significant impacts on habitats which support birds, especially saltmarsh.</p>		

			Waterbird assemblage Seabird assemblage				
		Liverpool Bay / Bae Lerpwl	Common scoter (wintering) Red-throated diver (wintering) Little gull (wintering) Waterfowl assemblage (all seasons) Little tern (breeding) Common tern (breeding)	Draft revised conservation objectives (July 2016) indicate that populations should be stable or increasing and that the supporting habitat should be maintained (this includes areas which are of importance for little gull, and to protect important foraging areas for little tern and common tern).	Common scoter and red-throated diver are sensitive to displacement from offshore wind projects, and gulls and terns are sensitive to collision risk. The exclusion of the majority of the SPA area from the characterisation area will go a long way to mitigating impacts on these species. However, it should be noted that displacement may occur for up to 12 km away for red-throated diver and they are also sensitive to displacement by increases in boat traffic. This will need to be taken into account for impact assessments. This site crosses the border between England and Wales. Advice should be sought from both Natural England and Natural Resources Wales. RSPB note that whilst common and little tern from this site tend to be associated with shallow inshore waters, offshore wind development in the North Wales, Irish Sea or Anglesey characterisation areas could have an impact on them. RSPB note that there are significant numbers of cormorant within this site (as well as the overlapping Puffin Island/Ynys Seiriol SPA) and that these should be considered as part of any impact assessment. Natural England are concerned about potential cumulative impacts on scoter and diver at this site from existing wind farms in this area, combined with development in the Irish Sea characterisation area and a potential extension to Gwynt y Môr.		
	Potential Special Protection Area (pSPA)	Solway Firth	(all wintering) Whooper swan Barnacle goose Pink-footed goose Pintail Scaup Oystercatcher Golden plover Knot Redshank Bar-tailed godwit Curlew Red-throated diver Common scoter Goosander Waterbird assemblage	All features have a conservation objective to maintain them in favourable condition.	The pSPA is a marine extension (and site name change) to the terrestrial Upper Solway Flats and Marshes SPA. Red-throated diver, common scoter and goosander are added to the designation, along with other named species within the waterbird assemblage. The northern part of the characterisation area intersects the outer reaches of the marine extension which is of importance for red-throated diver and common scoter. These species would also be vulnerable to disturbance if cabling activities were carried out within the site or if vessel traffic were to increase. Avoiding construction within this section of the characterisation area would reduce the risk to site features, and since the species are wintering there may be an opportunity to reduce impacts by seasonal restrictions on working.		
Marine Conservation Zones (MCZs)		Cumbria Coast	High energy intertidal rock Honeycomb worm (<i>Sabellaria alveolata</i>) reefs Intertidal biogenic reefs Intertidal sand and muddy	The general management approach for the site is to maintain all features in favourable condition. Razorbill	This site is designated for its rocky shore habitats. The majority of the site is excluded from the characterisation area, but it is in a location which may mean that cables could be run through the site (although the rocky nature of much of the shoreline may make it a less suitable landfall site). The advice on operations for		

		sand Intertidal under boulder communities Moderate energy infralittoral rock Peat and clay exposures Razorbill (<i>Alca torda</i>)	are to be recovered to favourable condition.	the MCZ indicates that many of the features within the site are sensitive to impacts of cabling, but impacts on the site should be mitigable (or avoidable) through choice of landfall location and cabling methodology. The razorbill feature was added following consultation on Tranche 3 MCZs.		
	West of Walney	Sea pens and burrowing megafauna Subtidal mud Subtidal sand	The general management approach for the site is to restore all features to favourable condition.	This site intersects much of Walney Wind Farm and the entire Ormonde Wind Farm. These sections of the site are obviously excluded from the characterisation area, and much of the remainder of the MCZ is also excluded. Cabling could potentially run through the site, and the features within it are likely to be sensitive to some impacts of cabling. The features within the site are not currently in favourable condition so it may be difficult to mitigate impacts. Consideration should be given to the SNCB's report on cable sensitivity entitled 'Natural England and JNCC advice on key sensitivities of habitats and Marine Protected Areas in English Waters to offshore wind farm cabling within Proposed Round 4 leasing areas'.		
MCZs	West of Copeland			Assessed as low risk; details available in separate spreadsheet.		
Sites of Special Scientific Interest (SSSIs)	Silver Tarn; Hollas and Harnsey Mosses (1.2 km), Drigg Coast (400 m)			Assessed as low risk; details available in separate spreadsheet.		
SSSI	St. Bees Head (10 m)	Maritime cliff and slope Geological/Earth Heritage Black guillemot (breeding) Fulmar (breeding) Guillemot (breeding) Kittiwake (breeding) Puffin (breeding) Razorbill (breeding) Shag (breeding)	All features are in favourable condition	Terrestrial and geological features are not exposed to offshore activities. These features could be affected by cable routes through the site, but the impacts are likely to be mitigable/avoidable. There is the potential for birds from this SSSI to interact with offshore arrays since many of them feed offshore. The SSSI is not protected by an overlapping SPA. Impacts on the birds would need to be considered at project level, but could probably be mitigated by array placement/turbine design.		
Spawning and nursery grounds		There are a large number of overlaps in the area (up to nine) with the data showing this area to be important for spawning and as a nursery for juvenile fish. There are also high-intensity cod spawning grounds and herring spawning grounds to the west of the area.		Noise disturbance has the potential to be an issue with the potential for seasonal restrictions on piling during breeding. It will depend on whether the spawning grounds are still active and their precise locations, which may need to be determined by surveys. Cod are particularly sensitive to noise impacts.		
Social tier						
Royal Yachting Association (RYA) Automatic Identification System (AIS) intensity		Some traffic exits Liverpool and heads along the boundary of the area; there is also significant activity around Whitehaven		Not the level of density that would be a concern and easily mitigatable.		
Marinas		Whithaven Marina within 1 km of the area		Not a significant issue due to the spatial flexibility in the area.		
Bathing beaches		Seven bathing beaches within 1.5 km along the coast		Not a significant issue due to the spatial flexibility in the area.		

Visibility from sensitive receptors	See visual analysis below.			
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Review layers

Visibility from landscape designations and from the coast

The bands of significant visual impact are taken from the OSEA3¹ environmental report. It should be noted that these bands were challenged through the statutory stakeholder engagement by the Statutory Nature Conservation Bodies (SNCBs) so further analysis and engagement should be conducted to understand the visual constraint in potential development areas more fully.

The visibility from landscape designations analysis has been conducted using designations which include protections for landscapes and settings namely: National Parks, Areas of Outstanding Natural Beauty (AONBs), Heritage Coasts and World Heritage sites. For more information on these, please consult the methodology report. The analysis draws on visibility from these designations but not the sensitivity of them to offshore wind developments. Proposals should draw on the relevant management plans or local policies to fully understand the level of constraint that exists in the vicinity of these landscape designations. As such, more analysis is required to fully understand the potential constraint.

	Band of significant visual impact	% of overlap with the characterisation area	Commentary	Area rating
Medium sensitivity receptors	0-13 km (3.6 MW turbines)	26%	A significant proportion of this area is all contained within 30 km of the coast. Note that the western boundary of the area is visible from the Isle of Man.	
	13-20 km (4-8 MW turbines)	11%		
	20-30 km (10-15 MW turbines)	27%		
High sensitivity receptors	0-30 km	64%		

Visibility of sea surface from landscape designations	Receptor rating	Area rating
Relevant designations include: <ul style="list-style-type: none"> • Lake District National Park • Solway Firth AONB • Arnside and Silverdale AONB • Forest of Bowland AONB • St Bees Head Heritage Coast 	<p>The visibility between these sites and the characterisation area presents a significant potential risk with the north-eastern portion of the area particularly sensitive. Cumulative impacts with the existing projects in the area could exacerbate sensitivities. The southern section of the area looks relatively less constrained.</p> <p>Natural England considers that offshore wind development within this characterisation area may result in significant visual impacts to the Lake District National Park and the St Bees Head Heritage Coast.</p>	

Ornithology outside of Special Protection Areas (SPAs) for high-risk species

Joint Nature Conservation Committee (JNCC), Natural England and Royal Society for the Protection of Birds (RSPB) advise that there are a number of information sources which should be taken into consideration in the assessment of potential impacts from offshore wind development in this characterisation area. These are:

- Site Information Centres on the JNCC website (<http://jncc.defra.gov.uk/page-6895>) which provide up-to-date information on protected areas, their features and status.
- Marine Ecosystems Research Programme (MERP) seabird distribution maps (https://marine-ecosystems.org.uk/Research_outcomes/Top_predators)
- Future of the Atlantic Marine Environment (FAME) and Seabird Tracking and Research (STAR) tracking data from the RSPB (<https://rspb.maps.arcgis.com/apps/Cascade/index.html?appid=d6c3aa1ec7184a2895a01cebf451c7b3>)
- Wakefield, E., Owen, E., Baer, J., Carroll, M., Daunt, F., Dodd, S., Green, J., Guilford, T., Mavor, R., Miller, P., Newell, M., Newton, S., Robertson, G., Shoji, A., Soanes, L., Votier, S., Wanless, S. & Bolton, M. (2017) Breeding density, fine-scale tracking, and large-scale modeling reveal the regional distribution of four seabird species. Ecological Applications <https://doi.org/10.1002/eap.1591>
- Cleasby, I.R., Owen, E., Wilson, L.J., Bolton, M. (2018) Combining habitat modelling and hotspot analysis to reveal the location of high density seabird areas across the UK: Technical Report. RSPB Research Report no. 63

¹ BEIS (2016), OSEA3 Environmental Report. Crown copyright 2016, p 291. URN 16D/033.

- Kober, K., Webb, A., Win, I., Lewis, M., O'Brien, S., Wilson, L.J., Reid, J.B. (2010) An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs. JNCC Report 431 (and the distribution maps therein) (<http://jncc.defra.gov.uk/page-5622>)
- Sansom, A., Wilson, L.J., Caldow, R.W.G. & Bolton, M. 2018. Comparing marine distributions maps for seabirds during the breeding season derived from different survey and analysis methods. PLOS ONE <https://doi.org/10.1371/journal.pone.0201797>
- Bradbury, G., Trinder, M., Furness, B., Banks, A.N., Caldow, R.W.G. & Hume, D. 2014. Mapping Seabird Sensitivity to Offshore Wind Farms. PLoS ONE 9(9): e106366. doi:10.1371/journal.pone.0106366
- Thaxter, C.B., Ross-Smith, V., Bouten, W., Clark, N., Conway, G., Rehfish, M. & Burton, N. (2015) Seabird–wind farm interactions during the breeding season vary within and between years: A case study of lesser black-backed gull *Larus fuscus* in the UK. *Biological Conservation* 186: 347-358

Species	Site	Commentary on coverage	Area rating
Lesser black-backed gull	Ribble and Alt Estuaries SPA	<p>The lesser black-backed gull's mean maximum seaward foraging range extends 141 km from the Ribble and Alt Estuaries SPA, wholly encompassing the Irish Sea characterisation area. Two other characterisation areas lie within this foraging range, as well as a high level of existing offshore wind development; cumulative collision risk effects are therefore likely to be a key consent consideration for any development in this characterisation area.</p> <p>Summer density of the lesser black-backed gull is concentrated closer to shore around the SPA colony and in the central part of the Liverpool Bay region. Lesser black-backed gull density is highest in the eastern part of the Irish Sea characterisation area; locating any development west of this and toward the north of the characterisation area would help to minimise any impacts on this SPA colony.</p> <p>RSPB advise the use of the British Trust of Ornithology's (BTO) tracking data for lesser black-backed gull from colonies in the north-west of England to assist with impact assessments.</p>	Yellow
Lesser black-backed gull	Morecambe Bay and Duddon Estuary SPA	<p>The lesser black-backed gull's mean maximum seaward foraging range extends 141 km from the Morecambe Bay and Duddon Estuary SPA, wholly encompassing the Irish Sea characterisation area. Two other characterisation areas lie within this foraging range, as well as a high level of existing offshore wind development; cumulative collision risk effects are therefore likely to be a key consent consideration for any development in this characterisation area.</p> <p>Summer density of the lesser black-backed gull is concentrated closer to shore around the SPA colony, and in the central part of the Liverpool Bay region. Lesser black-backed gull density is highest in the eastern part of the Irish Sea characterisation area; locating any development west of this and toward the north of the characterisation area would help to minimise any impacts on this SPA colony.</p> <p>RSPB advise the use of BTO's tracking data for lesser black-backed gull from colonies in the north-west of England to assist with impact assessments.</p>	Yellow
Lesser black-backed gull	Bowland Fells SPA	<p>The Bowland Fells SPA is situated inland of the Morecambe Bay and Duddon Estuary SPA. The lesser black-backed gull mean maximum seaward foraging range extends 141 km from the SPA, encompassing the North Wales characterisation area. The North Wales characterisation area also lies within this foraging range, as well as a high level of existing offshore wind development; cumulative collision risk effects are therefore likely to be a key consent consideration for any development in this characterisation area.</p> <p>Summer density of the lesser black-backed gull is concentrated closer to shore around the SPA colony, and in the central part of the Liverpool Bay region. Lesser black-backed gull density is highest in the eastern part of the Irish Sea characterisation area; locating any development west of this and toward the north of the characterisation area would help to minimise any impacts on this SPA colony.</p> <p>RSPB advise the use of BTO's tracking data for lesser black-backed gull from colonies in the north-west of England to assist with impact assessments.</p>	Yellow
Herring gull	Morecambe Bay and Duddon Estuary SPA	<p>The herring gull's mean maximum seaward foraging range extends 61 km from the Morecambe SPA, overlapping the eastern and central parts of the Irish Sea characterisation area. The remainder of the characterisation area lies within the maximum range (92 km). Given the existing offshore wind development within the herring gull range, the cumulative impacts of development within the Irish Sea area with other offshore wind development are likely to be a consent consideration.</p> <p>Summer density of the herring gull within its foraging range is highest close the coast and around the SPA colony; the northern and more western parts of the characterisation area have lower herring gull densities. Locating any development in the north and west of the area, and beyond the herring gull's mean maximum foraging range (i.e. more than 61 km) would help to minimise any impacts on the Morecambe Bay and Duddon Estuary SPA colony.</p>	Green
Sandwich tern	Morecambe Bay and Duddon Estuary SPA; Dee Estuary SPA	<p>The sandwich tern's mean maximum seaward foraging range extends 49 km from the Morecambe Bay and Duddon Estuary SPA and Dee Estuary SPA. The central and southern parts of the Irish Sea characterisation area overlap the Morecambe Bay and Duddon Estuary foraging ranges, while the south-eastern corner of the area overlaps the Dee Estuary foraging range. Given the restricted foraging range of the species, the cumulative impacts of development within this characterisation area with other offshore wind development are likely to be of less concern than with other sandwich tern colonies.</p>	Green

	<p>Summer density of the sandwich tern tends to be concentrated closer to the coast; locating any development in the Irish Sea area to the north and south-west of the characterisation area, and beyond the sandwich tern's mean maximum foraging range (i.e. more than 49 km) would help to minimise impacts on these SPA colonies.</p> <p>The sandwich tern colony at the RSPB Hodbarrow reserve has increased significantly in recent years with around 1800 pairs nesting in 2018. RSPB consider that the protection of this recovering colony is an important issue to address in development of this characterisation area.</p>	
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Ministry of Defence (MoD) activity

Issues when using 250 m tip heights		Issues when using 350 m tip heights	Receptor rating
Air traffic control (ATC)	Warton Aerodrome ATC radar concerns. Great Dunfell radar concerns.	Warton Aerodrome ATC radar concerns. Great Dunfell radar concerns.	
Air defence radar (ADR)	No ADR concerns.	No ADR concerns.	
Threat radar	No threat radar concerns.	No threat radar concerns.	
Low flying	No low flying concerns, however, there will be a lighting requirement.	No low flying concerns, however, there will be a lighting requirement.	
Ranges, danger and exercise areas	<p>Concerns at both heights relating to Danger Areas D406, D406B, D406C and Eskmeals Range covering the northern section of the characterisation area. Concerns due to the potential physical impact of development. Long-range military firing is conducted in this area and the area is littered with ordnance; turbines within this area would constrain firing tests. Concerns also about the impact the turbines would have on the marine radar systems at the range.</p> <p>Concerns at both heights relating to Danger Area D405 Kirkcudbright, which is on the northerly edge of the characterisation area. Turbines in the northern part of the proposed area which fall within the danger area would be a concern. Military firing practice takes place here and turbines within the range would be incompatible with the range's activities.</p> <p>Unexploded ordnance (UXO) should be taken into account. The MoD would need to review routes to ensure highly surveyed routes are not obstructed by either cables or turbines. Routing cables through and coming ashore at the Eskmeals Range would be a concern.</p>	<p>Concerns at both heights relating to Danger Areas D406, D406B, D406C and Eskmeals Range covering the northern section of the characterisation area. Concerns due to the potential physical impact of development. Long-range military firing is conducted in this area and the area is littered with ordnance; turbines within this area would constrain firing tests. Concerns also about the impact the turbines would have on the marine radar systems at the range.</p> <p>Concerns at both heights relating to Danger Area D405 Kirkcudbright, which is on the northerly edge of the characterisation area. Turbines in the northern part of the proposed area which fall within the danger area would be a concern. Military firing practice takes place here and turbines within the range would be incompatible with the range's activities.</p> <p>UXO should be taken into account. The MoD would need to review routes to ensure highly surveyed routes are not obstructed by either cables or turbines. Routing cables through and coming ashore at the Eskmeals Range would be a concern.</p>	
Area commentary			Area rating
<p>ATC and danger area concerns. The danger areas cover large amounts of the northern section of the characterisation area and will inhibit development opportunities within these.</p> <p>There will be a lighting requirement and consideration of UXO as per standard industry practice.</p>			

Fishing activity

Gear type	Location and comments	
Mobile gear	<ul style="list-style-type: none"> There is a large <i>Nephrops</i> fishery in the eastern Irish Sea. Activity in the Solway Firth and Irish Sea primarily from ports at Annan, Kirkcudbright, Whitehaven and Maryport. The <i>nephrops</i> fishery is also targeted by vessels from Kilkeel, Ardglass and Portavogie and the Irish Republic. Scallops are also targeted in the area. There used to be a significant cod fishery in the area, which may return as a result of the cod recovery plan. 	
Static gear	<ul style="list-style-type: none"> Potting and netting take place in the inshore waters off Barrow and further north. 	
General	<ul style="list-style-type: none"> Isle of Man waters in this area only allow vessels to fish inside their waters if they demonstrate a presence in the area during a reference period. This restricts the potential grounds for many vessels and impacts fishing practices all around the coast, especially for the scalloping fleet. A primary <i>Nephrops</i> muddy habitat is off the Cumbrian coast and south of the Isle of Man. Approximately 12% of the <i>Nephrops</i> fishery area may be lost by designation of the West of Walney Recommended Marine Conservation Zone (rMCZ). This would increase the risk of significant cumulative/in-combination impacts on the remaining fishery from offshore wind development in the area. 	
Area commentary		Area rating
<p>There is potential for development in the area, assuming good engagement with local fisheries.</p> <p>Feedback from North Western Association of Inshore Fisheries and Conservation Authorities (IFCA) has indicated that development over fishing grounds in the Irish Sea would be a significant concern due to the current levels of cumulative pressure in the area.</p>		

Future oil and gas

Licensing round	Commentary	Receptor rating	Area rating
28th and 29th rounds – central part of the area	Two new blocks (110/12b and 110/13c) licensed via 28th Round. They overlap with the existing 0-3 NM and 3-6 NM helicopter consultation zones for existing platforms, so present a low additional constraint.		
30th round – southern tip of the area	In the 30th offshore licensing round there are five licences which overlap with the Irish Sea characterisation area. They are located in the central and eastern part of the characterisation area and may present a significant additional constraint. However, not all of these licenses will require platforms.		
31st round – central area	In the 31st offshore licensing round there are nine licences which overlap with the Irish Sea characterisation area. They are located in the central part of the characterisation area and may present a significant additional constraint.		

Marine plans

North West Marine Plan (in progress)	Spatially explicit policies	Issues	Area rating
	The policies for the North West Marine Plan have not yet been produced. Therefore the Marine Policy Statement is the default position, which does not provide any spatial prescription for marine activities.	There are currently no spatial restrictions on where any future offshore wind developments could be located.	

The Crown Estate key resource areas (KRAs) for other sectors

KRA category	Where	Commentary	Receptor rating	Area rating
Cables	Intersects the proportion of the area within 12 NM.	This KRA is significant in size and does not give a strong enough signal to be seen as a significant constraint to development in this area.	Green	Green
Carbon Capture Storage (CCS) stores	Overlaps with the Hamilton field, both of which have been economically appraised through the Energy Technologies Institute (ETI) Strategic Site Appraisal (SSA) work. The area also intersects a number of Moderate and Limited rated stores. These are distributed across the area.	This site has been identified as a commercially viable storage option, so is a sensitive receptor that should be considered in development plans. However, there are other opportunities in the area.	Orange	Green
CCS infrastructure	Wide coverage across the area.	This KRA is significant in size however there is significant opportunity for potential deployment of CCS infrastructure from industrial hubs along the west coast, transporting captured CO2 through the characterisation areas to potential stores in the Irish sea. Proposals should consider potential impacts on these potential infrastructure corridors that may be developed in the near to medium term.	Yellow	Green
Minerals	Covering the inshore waters around Mersey Bay.	Small market currently but this will increase in the future (maybe 5-10 years). There is an area of good potential resource between the Gwynt y Mor and Burbo Bank Wind Farms that should be avoided if possible.	Orange	Green
Pipelines	Only slightly covering the eastern part of the area within 12 NM.	This KRA is significant in size and does not give a strong enough signal to be seen as a significant constraint to development in this area.	Green	Green
Sandscaping	Coverage to the south of the area.	This KRA is significant in size and does not give a strong enough signal to be seen as a significant constraint to development in this area.	Green	Green
Tidal range	Coverage to the north of the area around the Solway.	There have been a number of proposals in this area, but overlaps are minimal and there is significant development potential elsewhere in the area so as to avoid interactions.	Orange	Green
Tidal stream	No interaction.		Light Green	Light Green
Wave	No interaction.		Light Green	Light Green

National Air Traffic Services (NATs) radar overlap

% Overlap with Primary Surveillance Radar (PSR) assessment buffer (200m turbines)	Commentary	Area rating
97.66%	Intersection throughout the area, so a further risk assessment will be required with only site-specific mitigation options available rather than siting.	Orange

Water Framework Directive (WFD)

Water body details						
	Type	Is it heavily modified	Overall status	Ecological status	Chemical status	Target date to achieve good status
Cumbria	Coastal	No	Good	Good	Good	2015
Solway Outer South	Coastal	No	Moderate	Moderate	Good	2027
% of the area covered	Spatial overlap with the area					Area rating
9%	The characterisation area mainly intersects in the Solway estuary, but the overlap also extends down the Cumbrian coast.		This area intersects only unmodified water bodies, which are in good to moderate overall condition. The overall overlap with the characterisation area is minimal and should not present a significant constraint to development.			

Marine Cultural Heritage

Heritage asset type	Where	Commentary on sensitivity from offshore wind development	Receptor rating
Maritime archaeology and wrecks	Significant potential throughout the characterisation area, but particularly where there are known wrecks in the waters off the Isle of Man, in proximity to Barrow-in-Furness and situated along shipping routes from Ireland and the Isle of Man into Lancaster and the Port of Liverpool.	<p>There is potential for maritime archaeological material from the Palaeolithic period to the present day to be present and to be affected by OWF development in the Irish Sea characterisation area. The area contains many wrecks, obstructions and historic losses, with particular concentrations in the waters off the Isle of Man close to Barrow-in-Furness, along shipping routes and on the approaches into the Port of Liverpool. Ships have been lost due to the numerous navigational hazards in the area. There is particular potential for the recovery of wrecks associated with local fishing, trade and industry from the 18th century onwards. The area also played a significant role in 20th century military conflict, with numerous important shipping and supply routes from Liverpool, Ireland and the west coast of Scotland to the Atlantic. In addition to military and trade vessels, early forms of watercraft are likely to have been utilised to traverse the coastal waters of the characterisation area in the late Palaeolithic and early Mesolithic periods.</p> <p>A number of established procedures exist to ensure that any historic wrecks, both known and unknown, and associated remains, are identified as part of any proposed OWF development and impacts are mitigated and minimised.</p>	
Aviation archaeology	Potential for the recovery of aviation archaeological remains throughout characterisation area and particularly in the waters off the Merseyside area.	<p>Despite not being an area of high concentration for crashed aircraft remains, the Irish Sea characterisation area has some potential for the recovery of crashed aircraft and associated material from airborne military conflict in the Second World War. The skies above the area saw conflict, with aircraft involved in protecting merchant shipping and passenger vessels in the Irish sea and to the north-west of England, and defending important centres and strategic locations along the coast including the Merseyside area and the north west of England. Very few known aircraft wrecks have been identified in the area due to the difficulty of identifying these sites on the seabed. However, the historic records attest to the high number of losses in the area which indicate the potential for aircraft wrecks. If present, any remains may be identified or impacted upon by wind farm development.</p> <p>Whilst existing standard mitigation measures may be utilised for specific projects in the area, further site-specific mitigation may be required, including the excavation and recovery of significant remains that are encountered and where impacts are unavoidable. However, it should be noted that this is an extreme example and would only be undertaken following significant discussion with advisors and in rare cases where preservation <i>in situ</i> was not a feasible option.</p>	
Submerged prehistoric landscapes	Potential across the characterisation area, with enhanced potential in areas close to the coast in the north, and geomorphological features such as the palaeochannels being worked by the marine aggregate industry in the south.	<p>During periods of lower sea level caused by three major glaciations (the Anglian, Wolstonian and Devensian), the Irish Sea characterisation area would have been covered by ice, so there is limited potential for the recovery of prehistoric archaeological material from these periods. Any remains would be expected to be associated with geomorphological features such as palaeochannels and valleys, and the geological deposits from these periods. Surviving <i>in situ</i> archaeological material may be preserved, but is likely buried under glacial sediments, with the potential for derived archaeological material from the period. As such, there is some potential for the survival of sediments and secondary context artefactual material in areas where glacial activity has not eroded earlier sedimentary deposits.</p> <p>There is particular potential for the recovery of material associated with the late Upper Palaeolithic and the Mesolithic periods in the southern part of the Irish Sea characterisation area and in areas closer to the coast or palaeolandscape features. Much of the Irish Sea characterisation area would have been exposed and potentially habitable during the Late Palaeolithic and Early Mesolithic periods, following the retreat of the Devensian ice sheet. This area contained geomorphological and landscape features, such as those identified in the West Coast Palaeolandscape Project, that may have been utilised as favourable locations by human ancestors during the Mesolithic period. Significant deposits and possible finds may therefore be anticipated in association with the early Mesolithic channel systems and other geomorphological features that were present and exposed prior to marine transgression. As such, there is the potential for remains from this period to be present and impacted by OWF development in the characterisation area.</p>	

		A number of established procedures exist to ensure that any submerged prehistoric landscapes, associated geographical and geomorphological features, and associated deposits, features and finds are identified as part of any proposed OWF development and impacts are mitigated and minimised.	
Area commentary			Area rating
There are a range of known heritage assets and the potential for recovery of further remains across the characterisation area, with particular potential for the recovery of significant historic wrecks associated with trade and military functions, and prehistoric archaeological remains from the early Mesolithic period. The application of standard mitigation measures on a strategic and project specific basis will minimise the risk to underwater cultural heritage in this area.			

Glossary of acronyms and abbreviations

ADR	Air Defence Radar
AONB	Area of Outstanding Natural Beauty
ATC	Air Traffic Control
BTO	British Trust of Ornithology
CCS	Carbon Capture Storage
ETI	Energy Technologies Institute
FAME	Future of the Atlantic Marine Environment
HRA	Habitat Regulations Assessment
IFCA	Association of Inshore Fisheries and Conservation Authorities
JNCC	Joint Nature Conservation Committee
km	Kilometre
KRA	Key Resource Area
m	Metre
MCZ	Marine Conservation Zone
MERP	Marine Ecosystems Research Programme
MoD	Ministry of Defence
MPA	Marine Protected Area
MW	Mega watt
NATS	National Air Traffic Services
NM	Nautical Mile
OESEA3	Offshore Energy Strategic Environmental Assessment 3
OFTO	Offshore Transmission Owners
OWF	Offshore Wind Farm
pSPA	Potential Special Protection Area
PSR	Primary Surveillance Radar
Ramsar	Ramsar Convention on wetlands of international importance especially as waterfowl habitat, also known as the 'Convention on Wetlands'.
rMCZ	Recommended Marine Conservation Zone
RSPB	Royal Society for the Protection of Birds
RYA AIS	Royal Yachting Association (RYA) Automatic Identification System (AIS)
SAC	Special Area of Conservation
SCI	Site of Community Importance
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SSA	Strategic Site Appraisal
SSSI	Site of Special Scientific Interest
STAR	Seabird Tracking and Research
TWT	The Wildlife Trusts
UXO	Unexploded Ordnance
WFD	Water Framework Directive