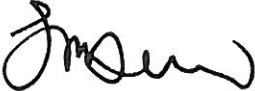


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# DECOMMISSIONING STRATEGY

## GWYNT Y MÔR OFFSHORE WIND FARM LTD

### Signatories

Document Author or Owner	Approver	GMOL Acceptor
		
<b>Name:</b> Julie Drew <b>Role:</b> Development Manager	<b>Name:</b> Mike Unsworth <b>Role:</b> Senior Project Manager	<b>Name:</b> Toby Edmonds <b>Role:</b> Project Director
<b>Date:</b> .....	<b>Date:</b> .....	<b>Date:</b> .....

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## 1. Introduction

The Gwynt y Môr Offshore Wind Farm will be composed of 160 wind turbines, generating a total capacity of up to 576MW. The project covers an area of some 79 km<sup>2</sup>. Gwynt y Môr is located approximately 13 to 15km off the North Wales coast and 18km off the Wirral coast, within Liverpool Bay.

The project is being developed by Gwynt y Môr Offshore Wind Farm Ltd which is a wholly owned subsidiary of RWE Npower Renewables.

In December 2008, Gwynt y Môr Offshore Wind Farm Ltd was granted consent under Section 36 of the Electricity Act 1989 to build and operate an offshore wind farm in an area off the north Wales coast known as Gwynt y Môr. At this time, the Department for Energy and Climate Change (DECC) also issued Gwynt y Môr Offshore Wind Farm Ltd a notice under Section 105(2) of the Energy Act 2004 regarding the requirement to prepare and obtain approval for a decommissioning programme for the project prior to the start of offshore construction.

This document outlines the draft decommissioning programme for the Gwynt y Môr offshore wind farm. This document has been submitted to DECC for consideration in accordance with the requirements of the Energy Act 2004 and the guidance on decommissioning produced by DECC in 2006 (relating to Stage 3 of the process as set out in the guidance and indicated below).

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7	Stage 8
Preliminary discussions with DTI initiated by developer	Issue of a notice by the Secretary of State requiring a decommissioning programme*	Detailed discussions; submission and consideration of a draft programme (including proposed financial security measures)	Consultation with interested parties; DTI conducts decommissioning Appropriate Assessment (where necessary)	Formal submission of a programme and approval under the Energy Act*	Reviews and modifications of decommissioning programme (and any financial security); review or conduct of decommissioning Appropriate Assessment (where necessary)	Undertake approved decommissioning programme	Monitoring of site

Subsequently, under Stage 4 of the process, Gwynt y Môr Offshore Wind Farm Ltd will conduct a consultation exercise on the draft programme with interested parties and where appropriate prepare a final draft prior to formal submission for approval (Stage 5 of the process). The consultation process and formal submission of the programme (Stages 4 and 5) will take place prior to the commencement of construction.

This draft decommissioning programme has been informed and supported by the Environmental Impact Assessment (EIA) contained within the Environmental Statement for the Gwynt y Môr offshore wind farm project that was submitted to DECC (then DTI) in November 2005 and the subsequent Supplementary Environmental information submitted in support of the application in August 2007.

This draft programme, in line with the decommissioning guidance from DECC, considers only those components of the wind farm below mean low water (the offshore components). The onshore aspects of the project and the associated decommissioning requirements fall under general planning regulation.

The design life for the wind turbines that will be installed at Gwynt y Môr will be between 20 and 23 years. However the lease term for the project area issued by the Crown Estate is for a 50 year period. It is therefore possible, although not certain at this stage, that the Gwynt y Môr project could be re-powered midway through the lease term. However, notwithstanding this possibility, Gwynt y Môr Offshore Wind Farm Ltd acknowledges the UK's international obligations requiring installations to be decommissioned as soon as is reasonably practicable. The current decommissioning programme set out in this document therefore sets out the measures to decommission the project at the end of the design life of the equipment during year 21/22.

## 2. Executive Summary

This preliminary decommissioning programme describes how the structures comprising the Gwynt y Môr offshore wind farm would be decommissioned in accordance with the guidance provided by DECC<sup>1</sup>. The decommissioning programme will be reviewed following consultations with DECC and other interested parties prior to a formal application for approval under the Energy Act.

A final decommissioning programme will be prepared at least a year before decommissioning activities commence. It is anticipated that this final programme would be informed by an updated environmental impact review and influenced by the technology available and the legislative framework in place at the time.

A summary of the proposals for decommissioning the offshore components of the Gwynt y Môr offshore wind farm are outlined in the table below, with further detailed information provided in the subsequent sections:

Component	Decommissioning Proposal
Offshore wind turbines	Complete removal from site
Foundations and transition pieces <ul style="list-style-type: none"> <li>- Piled foundations (monopiles and multipiles)</li> <li>- Gravity base foundations</li> <li>- Suction caissons</li> </ul>	Cut off at or below seabed and removed to a depth so as not to become uncovered in the future. Any remaining obstruction will be marked and maintained until obstruction removed or not considered to be a hazard Complete removal Complete removal
Sub-sea cables (inter-array and export)	Left in situ
Anemometry masts	Complete removal of structure
Transformer platforms	Complete removal of topside

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<sup>1</sup> Decommissioning of Offshore Renewable Energy Installations Under the Energy Act 2004 – Guidance notes for industry. December 2006. Department for Energy and Climate Change.



Component	Decommissioning Proposal
Scour material	Left in situ (if used, unless deemed necessary to remove following EIA)

In the event that the wind farm is not re-powered, Gwynt y Môr Offshore Wind Farm Ltd intends to begin decommissioning the project at year 22/23 and it is intended that this process be completed over approximately a 2 year period.

### 3. Background Information

The Gwynt y Môr offshore wind farm is located within Liverpool Bay, 13 to 15 km off the north Wales coast and 18km from the Wirral. The project area extends from Penrhyn Bay in the west to Prestatyn in the east occupying an area of approximately 79 km<sup>2</sup> (Figure 1). Gwynt y Môr Offshore Wind Farm Ltd has been awarded an option for a 50 year lease for the Gwynt y Môr site from The Crown Estate.

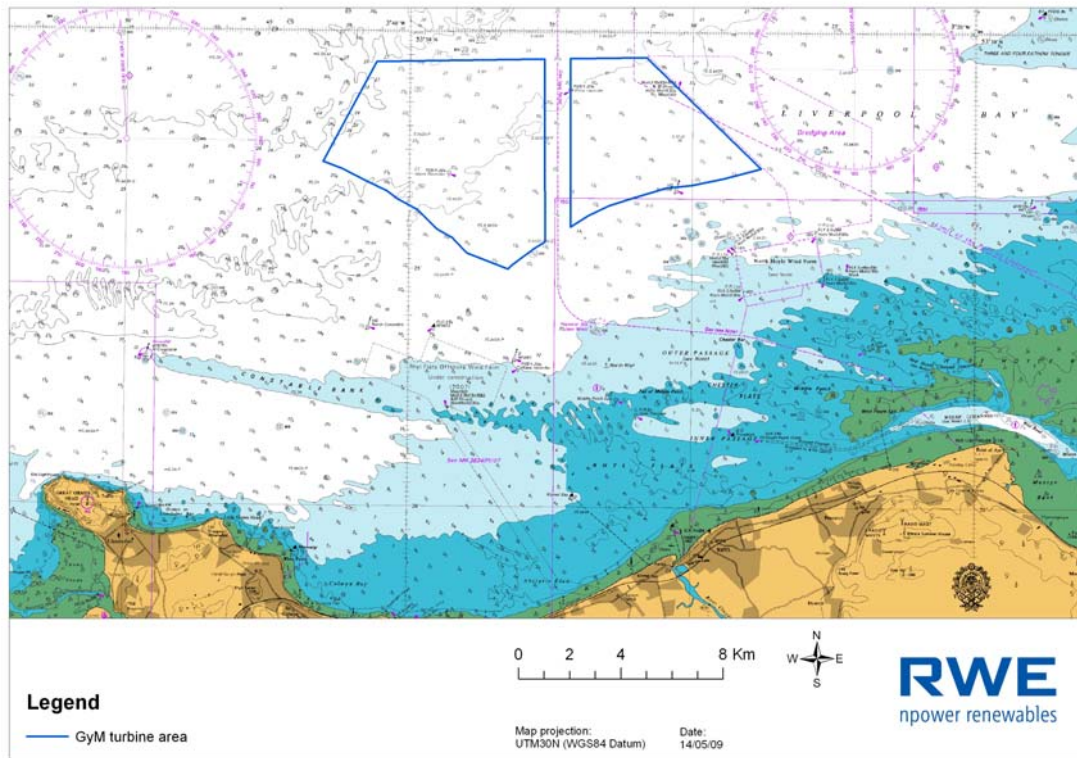


Figure 1. Gwynt y Môr offshore wind farm

The offshore project components as described in the project Environmental Statement and considered by this decommissioning programme may be summarised as follows:

- 160 wind turbines and associated foundations and transition pieces
- 2 offshore substations / transformer platforms
- Up to 5 meteorological / anemometry masts
- Inter-array cables
- 4 export cables
- Scour protection (where deployed)

The layout of the facilities to be decommissioned can be seen in Figure 2.

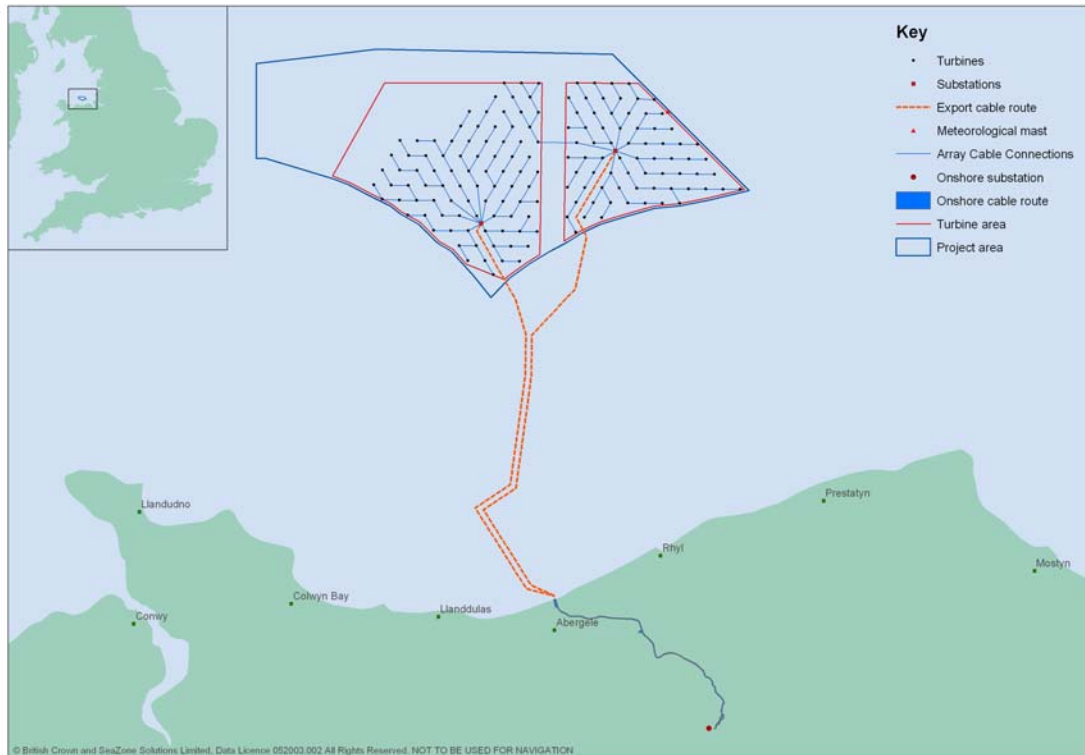


Figure 2. Array layout at Gwynt y Môr offshore wind farm

### 3.1. Site characteristics

#### 3.1.1. Physical environment

A range of surveys have been completed to establish the physical environment at the Gwynt y Môr site. A summary of the physical characteristics of the site are given below while the Environmental Statement (ES) submitted in November 2005 presents a full description of the sites characteristics.

Characteristic	Descriptive range
Water depth	12m to 34m LAT (Lowest Astronomical Tide)
1 year significant wave height	5.3m
50 year design wave height	13.6m
Associated period (design wave)	11.2m
Tidal rise (MHWS)	8.5m
Storm surge	2.1m
Depth averaged current	1.7m/s
Tidal currents spring tide	Maximum 1.4 knots Direction 104° and 270°
Tidal currents neap tide	Maximum 0.8 knots Directions 104° and 270°
Mean water temperature	5-7.5°C Feb/Mar; 13-16°C Aug/Sep
Salinity	31-32 g/kg winter 31-33 g/kg summer
Average wind speed (10m above MSL)	14 knots (7.2 m/s)

### 3.1.1.1. Seabed conditions

Relatively mobile granular sediments are known to exist across the central and western half of the area, with a maximum thickness of circa 12m in places, although the average thickness is generally less than 6m. Over the remainder of the area, a variable mobile thin (0 to 1m) covering of sands and fine gravels overlies a generally granular glacial till (see Figure 3).

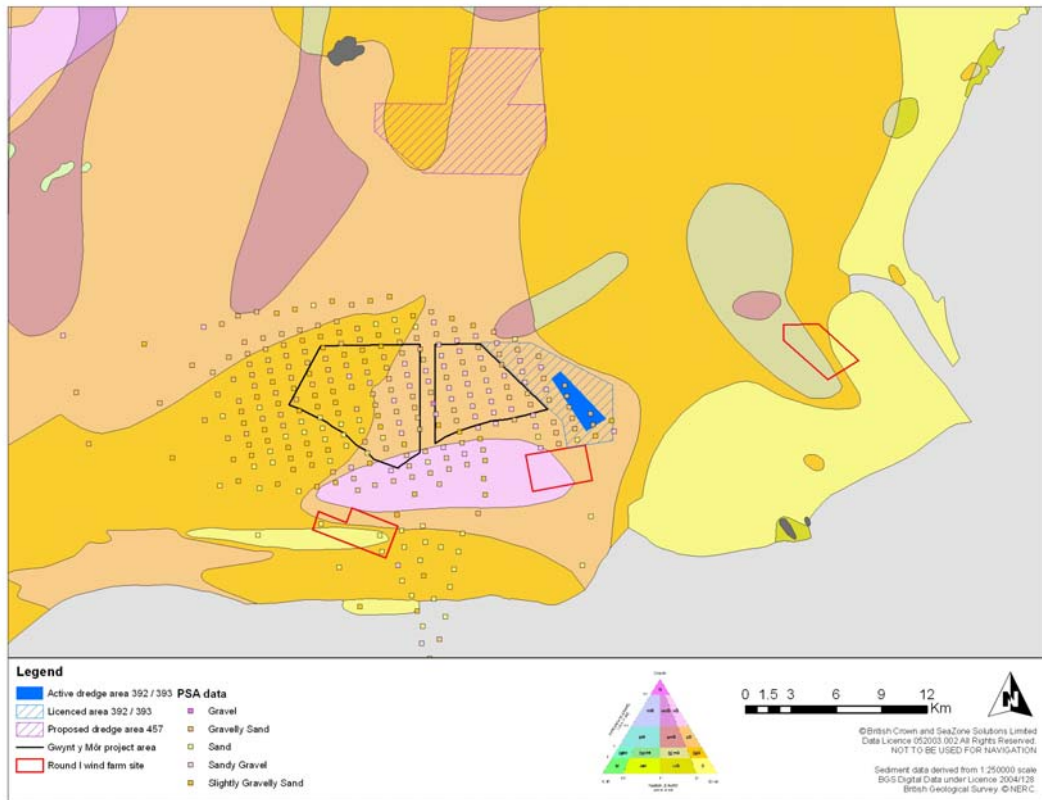


Figure 3. Particle size data overlain on the British Geological Survey (BGS) sediment composition classification

### 3.1.2. Relevant projects and activities

Liverpool Bay and the surrounding coastline, from Anglesey in the west to the Sefton coastline in the east, are heavily developed and support a range of facilities and human activities. The following key activities are highlighted and drawn from the project Environmental Statement which provides a more detailed review:

#### 3.1.2.1. Shipping Activity

Busy shipping lanes, particularly to the north of Gwynt y Môr which are used by ships carrying a wide variety of cargoes and approaching the Port of Liverpool. Much smaller amounts of shipping also pass to the south of the area to the Port of Mostyn in the Dee Estuary.

Following a navigational risk assessment undertaken as part of the Gwynt y Môr EIA, it was established that there was a need to set up a means to reduce the possibility of a vessel to vessel collision in an area that lies to the north of the proposed wind farm. In consultation with a wide range of navigational stakeholders it was determined that the most appropriate method of achieving the reduction in the possibility of a vessel to vessel collision, in the area to the north of the proposed offshore wind farm, would be to establish an International Maritime Organisation (IMO) adopted routeing measure comprising a traffic separation scheme. This has been adopted and appeared on navigational charts in Q4 2009 (see Figure 4).

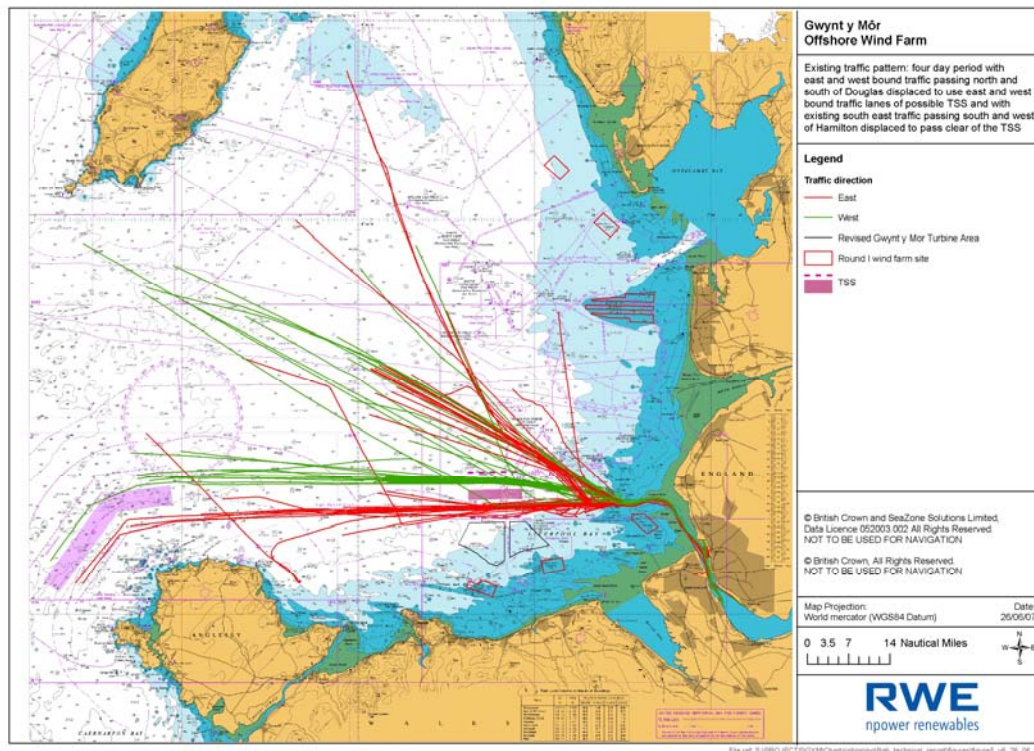


Figure 4. Shipping routes in Liverpool Bay with new and existing Traffic Separation Scheme

### 3.1.2.2. Fishing Activity

Commercial fishing is undertaken in and around the project area although it is mainly composed of activity by a very few locally based vessels and is therefore of a low intensity when compared with other parts of the eastern Irish Sea. Data analysis confirms that a greater intensity of commercial fishing activity occurs further north or west from the Gwynt y Môr project area.

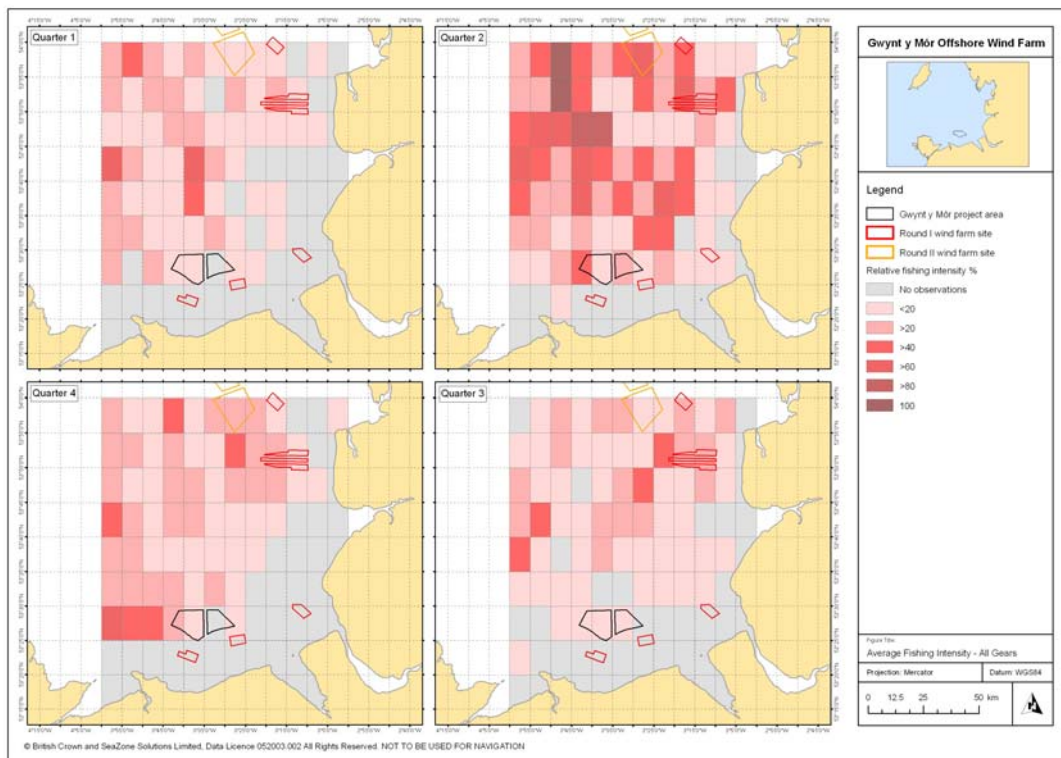


Figure 5. Average fishing intensity in Liverpool Bay

### 3.1.2.3. Sub-sea cables

Sub-sea cables and pipelines also run through Liverpool Bay connecting the offshore gas production platforms to onshore processing facilities at the Point of Ayr (Dee Estuary) and linking telecommunications between the English coast, the Isle of Man and Ireland. Of particular importance to the Gwynt y Môr site is the BHP gas pipeline which runs from the Douglas platform, through the middle of the Gwynt y Môr site, to the gas processing facility at the Point of Ayr. In addition, a new electricity interconnector cable (EIRGRID) is currently being planned between North Wales and Ireland which will cross one or more of the Gwynt y Môr export cables.

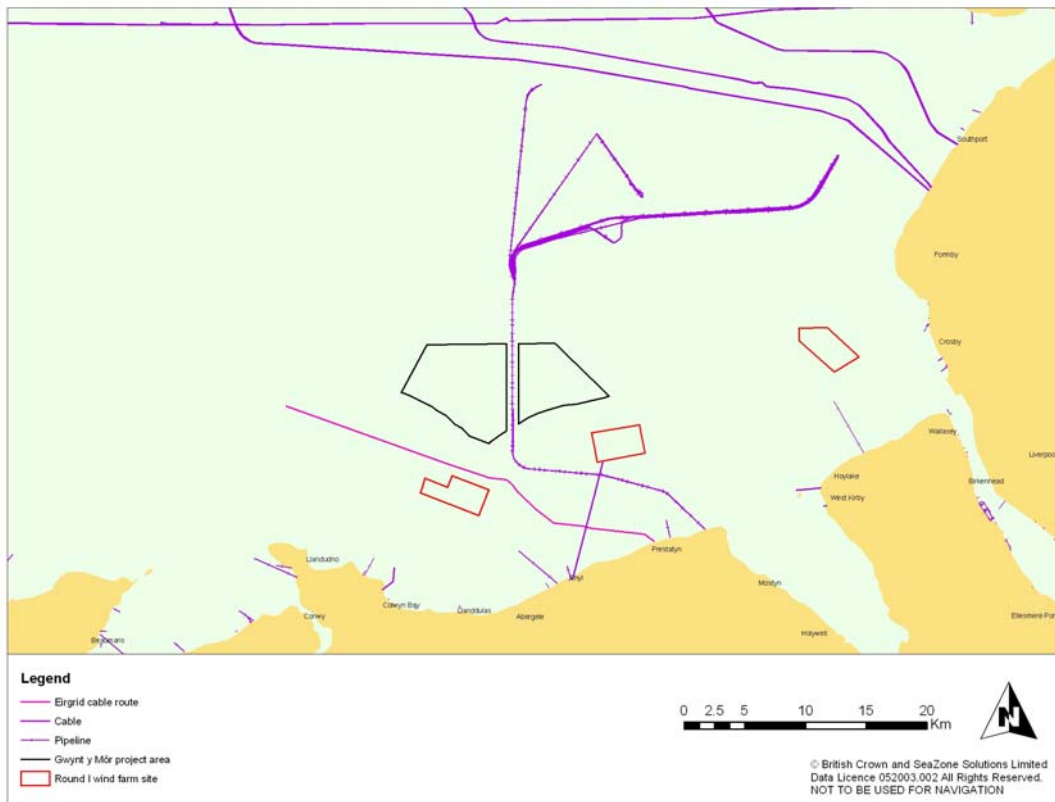


Figure 6. Sub-sea cables extending across the Liverpool Bay area

### 3.1.2.4. Oil and gas

There are a number of offshore oil and gas fields present in Liverpool Bay operated by BHP Billiton Petroleum Limited. The Liverpool Bay Asset is a near-shore oil and gas production facility which comprises four offshore platforms, offshore storage and loading facilities and a gas processing terminal at the Point of Ayr on the north Wales coast (see Figure 7).

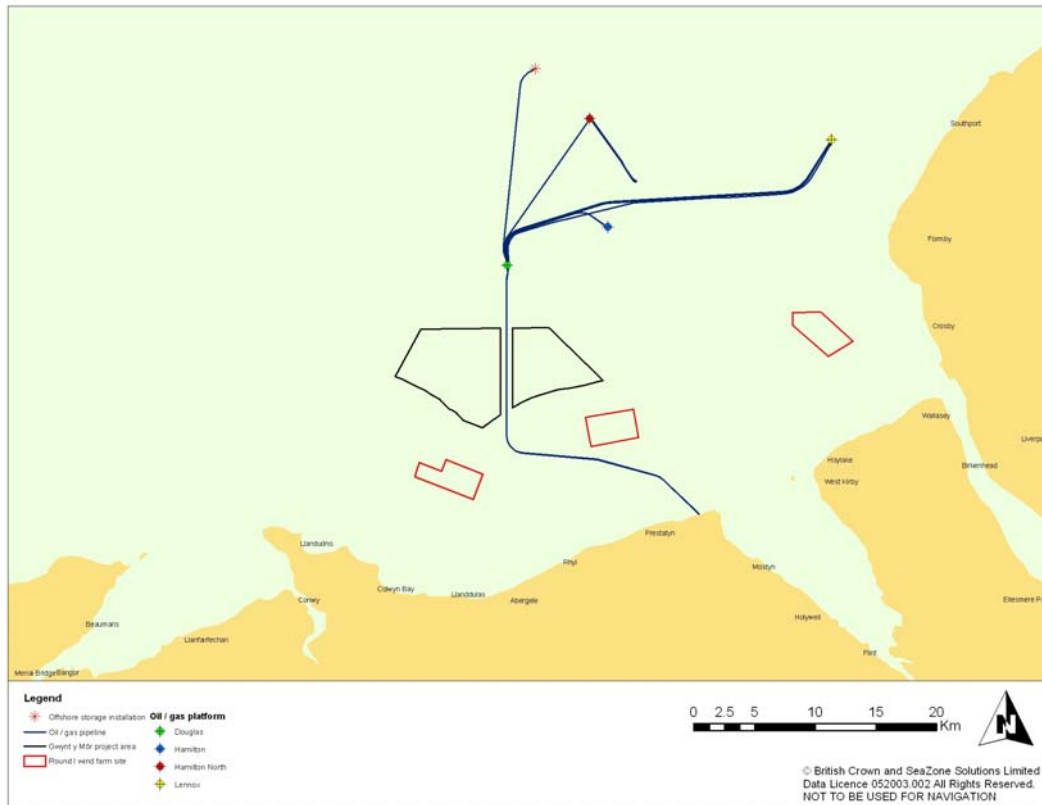


Figure 7. Offshore oil and gas facilities in Liverpool Bay

BHP Billiton uses microwave links to transmit data from its offshore installations to sites located in the north coast of Wales. There are two fixed links within the vicinity of the Gwynt y Môr project area. The link located at Gwaeynsgor, Denbighshire transmits to/from the Hamilton platforms, whilst the link at Penmaen Rhos transmits to/from the Douglas Platforms, as shown in Figure 8.

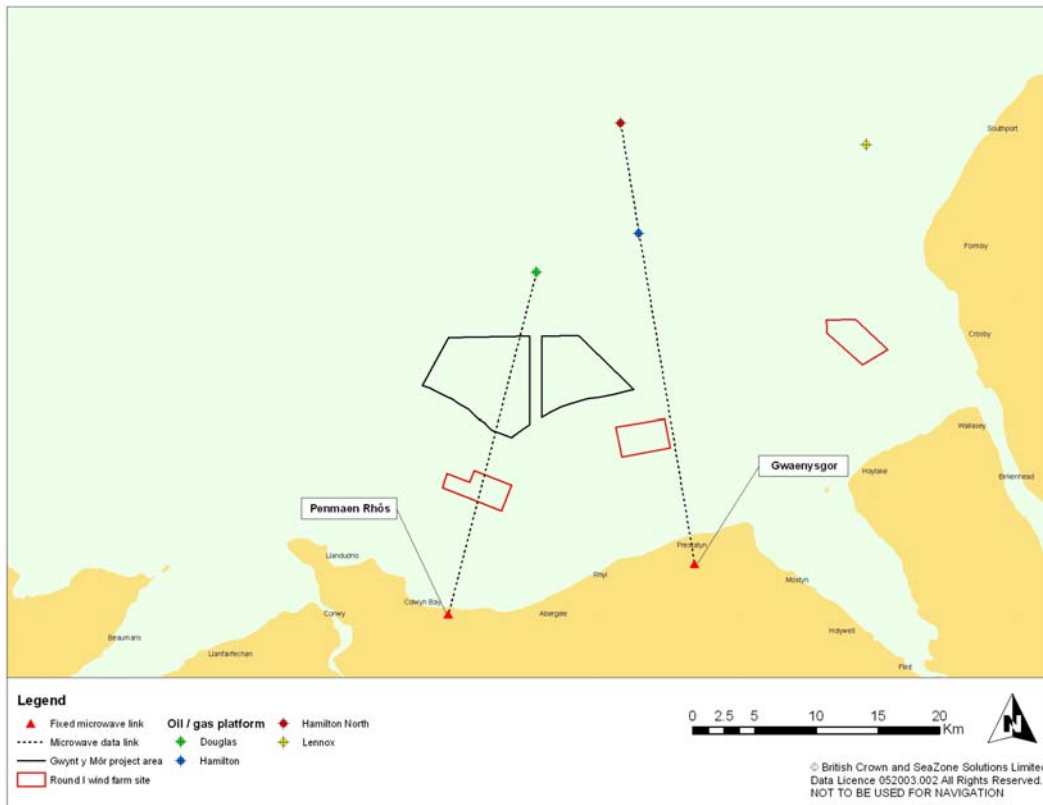


Figure 8. Microwave links across Liverpool Bay



### 3.1.2.5. Aviation

Helicopter landing platforms are located on the Douglas and Hamilton offshore installations to the north of Gwynt y Môr. The helicopters serving the installations are operated by CHC-Scotia from Blackpool Airport and are used mainly to transport personnel to and from the installations in Liverpool Bay. Under normal circumstances, only one helicopter is operating on the route to and from the offshore installations at any one time, with 90% of flights arriving or departing through the Douglas Complex from where they also operate services to the other associated installations. Figure 9 shows the helicopter flight paths between Blackpool and the Douglas Platform.

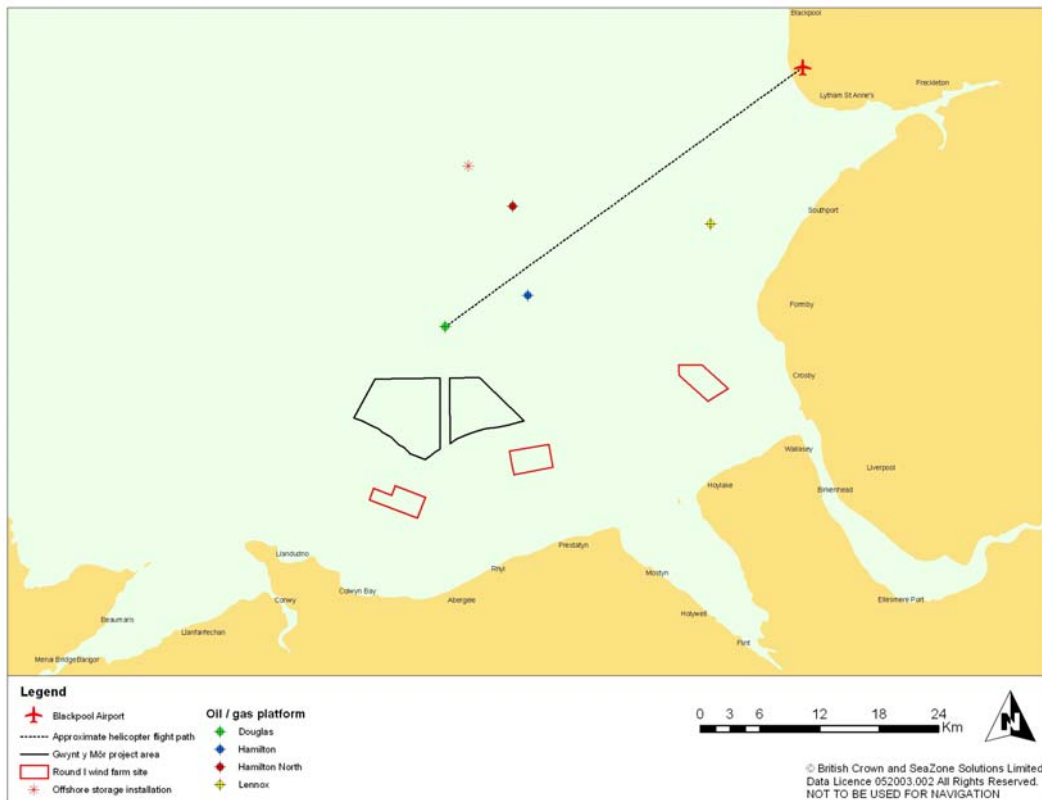


Figure 9. Helicopter flight path between Blackpool and the Douglas Platform

The airports, RAF bases and private airfields located in the north west and North Wales region are identified in Figure 10 and listed in the table below with reference to their distance from the Gwynt y Môr Offshore Wind Farm project area.

Site name	Description	Distance from Gwynt y Môr (km)
Liverpool John Lennon	Major airport	42
Blackpool	Major airport	45
Bae Warton	Minor airport	49
Hawarden	Minor airport	44
RAF Woodvale	RAF base	30
RAF Sealand	RAF base	40
RAF Valley	RAF base	56
RAF Mona	RAF base	46
Ince	Private airfield	30
Greenlands	Private airfield	21
Lleweni Parc	Private airfield	27
Rhedyn Coch	Private airfield	20
Altcar	PEXA	25

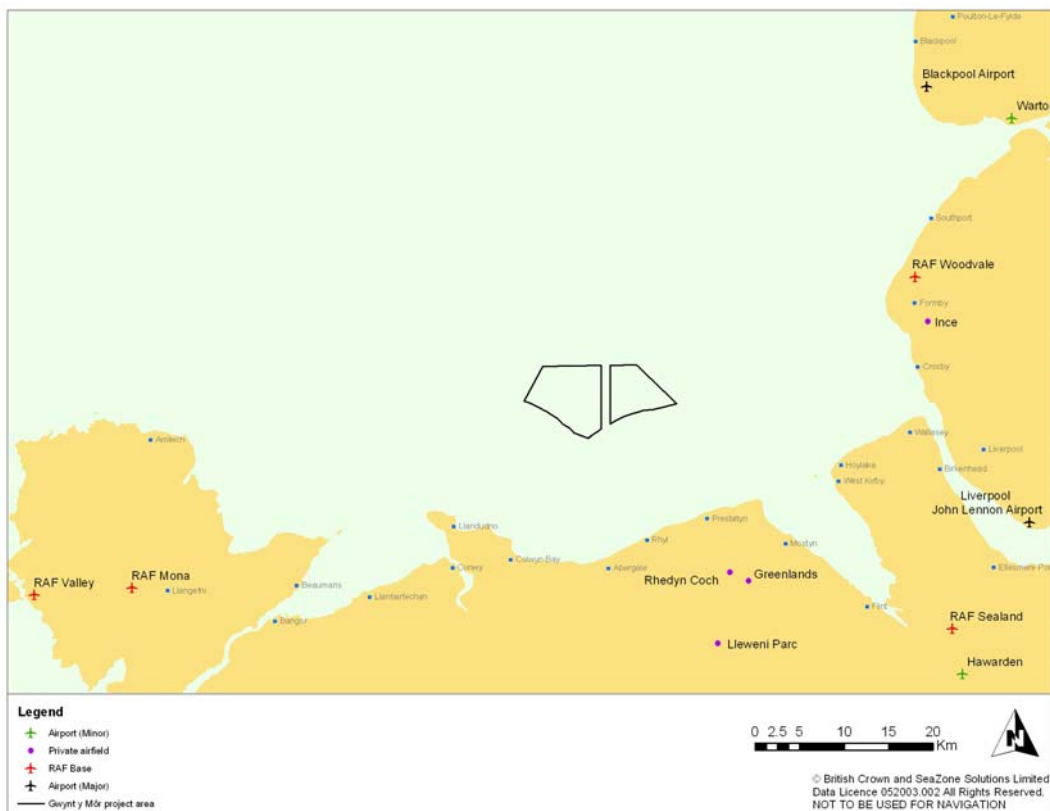


Figure 10. RAF bases and private airfields in the north west and North Wales region

Following concerns that Gwynt y Môr offshore wind farm could interfere with the St Annes radar service located on the Fylde coast, Gwynt y Môr Offshore Wind Farm Ltd has consulted with NATS (National Air Traffic Service) to mitigate this potential impact. Gwynt y Môr Offshore Wind Ltd has funded work by NERL (NATS En-route Ltd) to design, develop and deliver changes to the Prestwick Centre Surveillance Data Processing system. These changes will remove the radar data generated by St Annes above the wind farm and use radar from the Cleve Hill radar for that volume of airspace.

### 3.1.2.6. Marine aggregate extraction

Marine aggregate is dredged from sites within Liverpool Bay (including Area 392/393 immediately to the east of Gwynt y Môr, see Figure 11, whilst spoil generated by the maintenance of the major port facilities is disposed of at offshore sites. There are currently seven licensed dredged material dumping sites within Liverpool Bay.

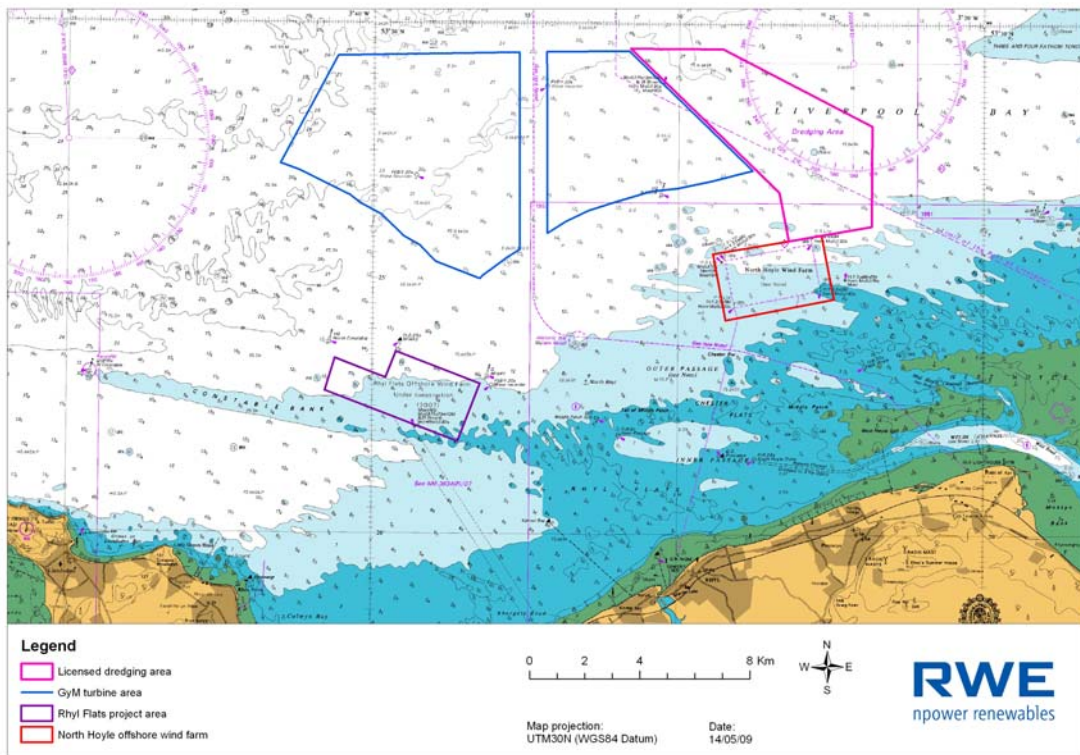


Figure 11. Licensed dredging areas and marine disposal sites in Liverpool Bay

### 3.1.2.7. Other offshore wind farms

Two Round 1 offshore wind farms – North Hoyle and Rhyl Flats lie inshore of the Gwynt y Môr project area and serviced by operational vessels based at the Port of Mostyn. Both of these projects are also wholly or partly owned by RWE Npower Renewables. Both of these Round 1 projects would be expected to have been decommissioned prior to the end of the Gwynt y Môr lease term.

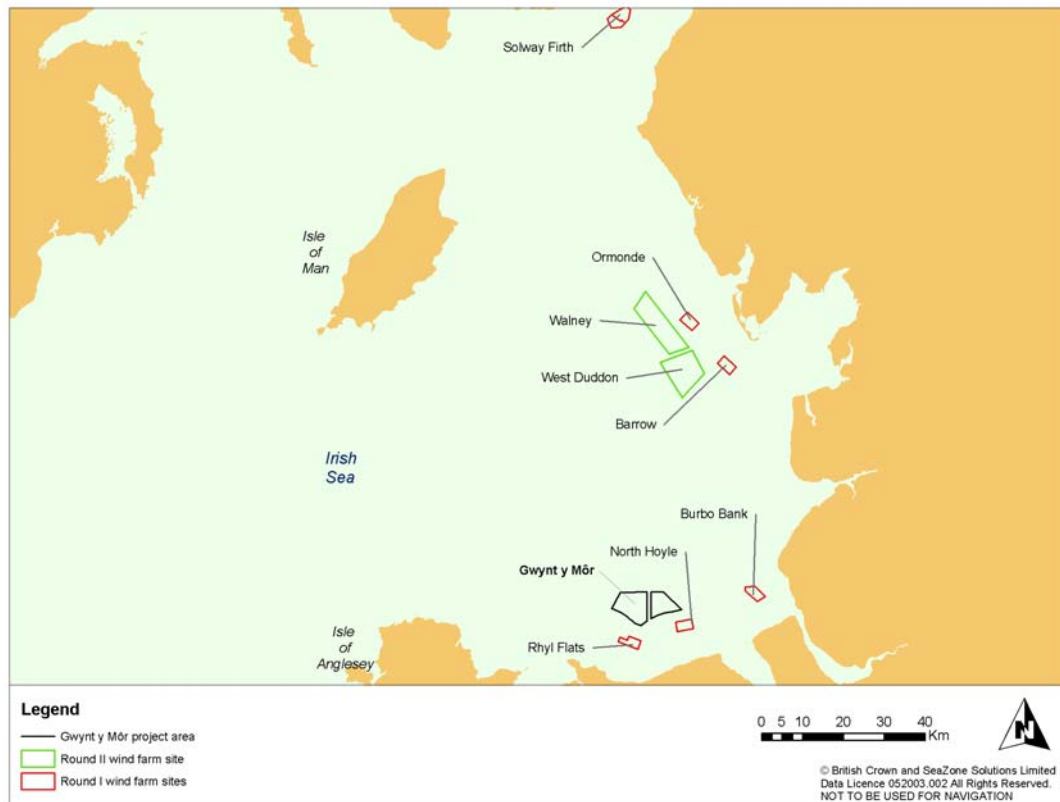


Figure 12. Round I and II wind farm sites in Liverpool Bay

### 3.1.2.8. Other activity in the area

- A national railway line runs immediately adjacent to the coast; the export cables from the Gwynt y Môr site will cross beneath this railway line once ashore.
- Recreational sailing occurs at a level described by the RYA as of 'medium density' with cruising routes identified between Conwy Bay/Menai Straits and Morecombe Bay; between the north coast of Anglesey and the approaches to Liverpool; between Conwy Bay/Menai Straits and the approaches to the River Ribble.
- Recreational angling from private and charter angling vessels occurs through Liverpool Bay including within the Gwynt y Môr area.
- Recreational diving
- Occasional visits by vessels inspecting / servicing aids to navigation and research vessels undertaking survey activities.

Extensive consultation was undertaken with key stakeholders to inform the Environmental Statement which was submitted in support of the Electricity Act Section 36 application. A full analysis of the projects and activities relevant to the Gwynt y Môr project is contained in Section 7 of the Environmental Statement.

### 3.1.3. Nature Conservation

The Gwynt y Môr project lies within the recently designated Liverpool Bay/Bae Lerpwl Special Protection Area for non-breeding seabirds in inshore waters, designated as part of the Marine Natura 2000 process. Although this designation has only recently been approved by the European Commission, effects on the potential marine SPA were considered as part of the EIA process and were subject to an Appropriate Assessment for the project completed by DECC. The purpose of the Appropriate Assessment was to determine whether, in the terms of Regulation 48 (5) of the Habitats Regulations, the project would be likely to adversely affect the integrity of the Liverpool Bay SPA (and also the Cardigan Bay SAC); in particular the impact on the populations of common scoter and red-throated diver at the proposed Liverpool Bay SPA. The conclusions of the Appropriate Assessment were that the Gwynt y Môr offshore wind farm would not cause an adverse effect on the integrity of the relevant European site (Liverpool Bay/Bae Lerpwl SPA) either alone or in-combination with other plans or projects.

Effects on this site and its qualifying features will be considered as part of the final decommissioning programme. Before approval of the final decommissioning programme, under Stage 4 of the aforementioned process, DECC will undertake an Appropriate Assessment (where required under the EU Habitats and Birds Directives) on the draft programme.

In addition to this, many parts of the adjacent Welsh and English coastlines have some form of conservation status. Full details of these can be found in Section 6 of the Environmental Statement but the main sites are summarised in the table below.

Name	Approximate distance from project area	Qualifying interest
Sefton Coast SAC	35 km east	Presence of a variety of dune habitats (identified under Annex I). Presence of the great crested newt and species of Petalwort (identified under Annex II).

Name	Approximate distance from project area	Qualifying interest
Conwy Bay and Menai Straits SAC	26.3 km south west	Presence of reef habitats, subtidal sandbanks and intertidal mudflats and sandflats. Also a significant presence of sea caves and large shallow inlets and bays (Annex I).
Pen y Gogarth / Great Orme headland SAC	14.7 km south west	Presence of three Annex I habitats: vegetated sea cliffs, European dry heaths and semi-natural dry grasslands and scrub facies on calcareous substrate.
Ynys Seriol (Puffin Island) SPA	23 km south east	Site of European importance for its breeding population of cormorant.
Martin Mere SPA	42.1 km north east	Wildfowl refuge of international importance, with a large and diverse wintering, passage and breeding bird community. Significant wintering populations of Beswick's swan, Whooper swan, pink-footed geese, pintail and wigeon.
Mersey Estuary SPA	34.1 km south west	Important site during wintering periods for ducks and waders, and also during the spring and autumn migration periods for wader populations moving along the west coast of Britain.
Mersey Narrows and North Wirral Foreshore SPA	28.9 km east	Important feeding habitat for waders; high-tide roost site as well as a nesting site for terns. Over winter the area supports breeding populations of the common tern (Annex II species).
Ribble and Alt Estuaries SPA	50 km north east	The salt marshes and coastal grazing marshes support high densities of grazing and seed-eating wildfowl and these, together with the intertidal sand and mudflats, are used as high-tide roosts. Annex II species such as the common tern and the lesser black-backed gull are found here.
Traeth Lafan / Lavan Sands SPA	26.8 km south west	Site of importance for wintering waterbirds, especially oystercatcher and during periods of severe winter weather,
Dee Estuary SPA and SAC	14.2 km south east	Designated as an SPA for the passage and wintering populations of waterfowl and for regularly holding more than 20,000 waterfowl. National and internationally important numbers of tern species including common tern, little tern and the sandwich tern. Annex I habitats such as embryonic shifting dunes, salt meadows, fixed dunes with herbaceous vegetation, dune slacks, vegetated sea cliffs and mudflats and sandflats, which are exposed at low tide.

Table 1. Special Areas of Conservation (SAC) (under the Habitats Directive) and Special Protected Areas (SPA) (under the Birds Directive) located within 50km of the Gwynt y Môr project site.

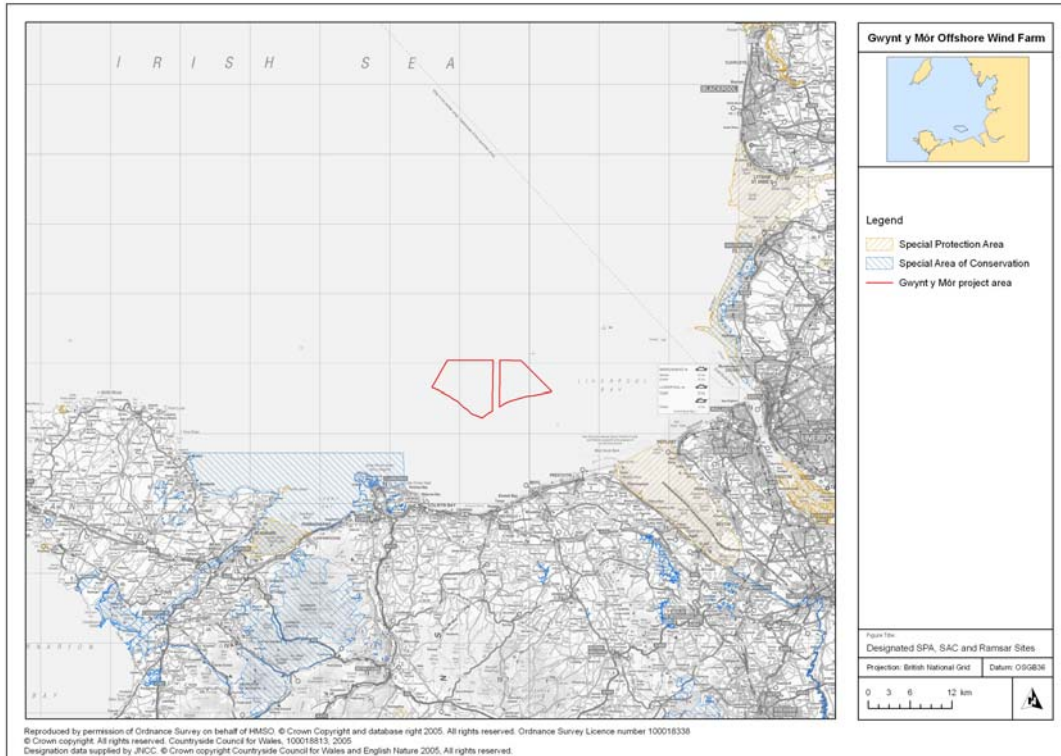


Figure 13. Designated areas of nature conservation in the North Wales region

## 4. Description of items to be decommissioned

This section of the decommissioning plan contains details of all items which Gwynt y Môr Offshore Wind Farm Ltd believes will form part of the scope of future offshore decommissioning works at Gwynt y Môr. At the time of writing, final design choices relating to alternative turbines and foundations were yet to be finalised. As a result this draft decommissioning programme considers all of the project component options that could be installed at Gwynt y Môr (i.e. foundation types, various types of scour protection etc). The decommissioning of the final, installed components would be considered in greater detail as part of the review of the decommissioning program prior to decommissioning actually taking place.

The following offshore elements are considered for decommissioning and further details are given below:

- Offshore wind turbines
- Foundations and transition pieces
- Sub-sea cables (export and inter-array)
- Anemometry masts
- Transformer platforms/substations
- Scour material

### 4.1. Turbines

Details of the wind turbine size and total generating capacity of the wind farm have now been finalised. These are confirmed as 160 turbines each with a capacity of 3.6MW giving a total maximum capacity for the wind farm of 576MW. The turbines will be located in depths of approximately 12m to 34m at lowest astronomical tide (LAT) and the minimum distance between the turbines will be no less than 350m. The turbine height from the sea to the array tip will not exceed 165m LAT and the rotor diameter shall not exceed 134m, according to our consents. The turbines to be installed are the Siemens SWT-3.6-107 and have a height to tip from the sea of approx 132m and a rotor diameter of 107m.

The turbines will be of a design incorporating three rotor blades attached to a nacelle housing containing the generator, gearbox and other operating equipment on top of tubular support towers. The electrical transformer unit will be located at either the tower base or at the top of the tower depending on design requirements.

Based on the 3.6 MW Siemens turbine, an approximate total weight of 300 tonnes will be comprised of a tubular steel turbine support tower weighing approximately 80 tonnes; a rotor weighing 95 tonnes and the nacelle weighing 125 tonnes.

The nacelle is likely to comprise the following:

- Gearbox
- Generator
- High speed shaft
- Brake
- Yaw motors
- Other ancillary equipment

Key components of the tower section are likely to include:



- Ladders
- Lift
- Power inverter
- Power cable
- Control equipment
- Bolts
- Tower sections
- Other ancillary equipment

## 4.2. Inter-array and export cables

The inter-array cables will connect the turbines to each other and to the offshore substations. Export cables will connect the offshore substations to the onshore components of the project and will make landfall at Pensarn Beach, North Wales.

**Inter-turbine cables:** The inter-turbine cables will operate at 33kV and will be composed of a three-core copper conductor with insulation/conductor screening, and a steel wire armouring with optical fibres embedded between the cores. The cables are expected to have a diameter of between 90 and 150mm. The total length for inter-turbine array cables is estimated to be between 150 and 200km.

**Export cables:** There will be 4 export cables rated at a voltage of 132kV and will be composed of three-core copper conductors with insulation/conductor screening and steel wire armouring. The cable will be insulated and will include a lead sheath. Optical fibres will be embedded between the cores. The cables are likely to have diameters of between 150mm and 300mm. The length of each export cables is estimated to be circa 15 to 20km, giving a range of between 45 and 120 km for all of the export cabling. The export cables will be separated by a minimum spacing of approximately 50m at the offshore extents, reducing to a minimum of 10m spacing as they approach the landfall and the connection with the onshore cables. The export cable route is shown in Figure 2.

The cables will be buried using an underwater cable plough or trenching tool, such as a water jetting unit, to a nominal target depth of approximately 0.5 to 1m below the seabed surface. The final target burial depth will be determined as part of the final engineering design work, which will incorporate a burial risk assessment and will vary depending on the nature and long-term stability of the seabed. Where the export cable crosses with the proposed Eirgrid Interconnector, or vice versa, the burial depth will be approximately 2m (Figure 6.)

## 4.3. Foundations and transition pieces

The site has been divided into sections for construction which is due to take place in two phases. The foundation type to be used for each phase has yet to be finalised. However, Gwynt y Môr Offshore Wind Farm Limited, have consent to use monopiles, suction caissons, multipile/jacket foundations and gravity base foundations at the site.

**Monopiles:** These are welded steel tubular sections, which are driven vertically into the seabed. If used, monopile foundations will typically have a diameter of up to 6m installed either by “driving” or by using the “drill-drive-drill” method. The table below shows indicative monopile dimensions for 3MW class and 5MW class turbines.

	3MW class	5MW class
<b>Diameter</b>	Up to 5m	Up to 6m
<b>Total length</b>	Up to 85m	Up to 90m
<b>Seabed penetration</b>	Up to 40m	Up to 45m
<b>Steel plate thickness</b>	Up to 100mm	Up to 100mm
<b>Total weight</b>	200 to 700 tonnes	400 to 900 tonnes

**Multipiles/jackets:** These support structures typically consist of a large vertical steel tube located centrally under the main turbine tower, supported by a three-leg frame of smaller steel tubulars. The table below shows indicative dimensions of multipiles/jackets that could be used at Gwynt y Môr for 3MW class and 5MW class turbines.

	3MW class	5MW class
<b>Diameter central tubular</b>	Up to 5m	Up to 6m
<b>Diameter frame tubulars</b>	Up to 2.2m	Up to 3m
<b>Pile spacing</b>	Up to 30m	Up to 30m
<b>Diameter piles</b>	Up to 2.2m	Up to 3m
<b>Pile penetration</b>	Up to 45m	Up to 50m
<b>Steel plate thickness</b>	Up to 100mm	Up to 100m
<b>Total weight</b>	400 to 650 tonnes	500 to 750 tonnes

**Gravity bases:** These use a large diameter steel or concrete base, which sits on the seabed to support the turbine tower. The structure can additionally incorporate “skirts” around the perimeter, which penetrate approximately two metres into the seabed (depending on ground conditions) and help to resist horizontal movement and reduces scour. If constructed from steel, the gravity base structure is filled with sand, rock or iron-ore ballast to increase the weight without adding significant structural costs. If constructed from concrete, the structures are likely to be heavier reducing or negating the need for additional ballast. If consented, gravity base foundations at Gwynt y Môr are likely to be flat with a base diameter of between 25.2 and 26.6m, a height of base above seabed of between 3.8 and 6m, a diameter of centre column between 5.8m and 6m with approximate spacing of 610m between foundations centres.

**Suction caissons:** These are similar in design to the gravity bases but smaller in diameter with perimeter skirts than penetrate further into the seabed. It is possible that suction caissons will be used for the substation foundations at Gwynt y Môr .

**Transition pieces:** This is a steel tubular section slightly larger than the central tubular of the foundation. It is attached to the foundation piece using a grouted connection, and then to the lower tower section using a bolted flange connection. The use of a transition piece allows for adjustment in the foundation to take account of any deformation resulting from the installation process. Typical transition pieces used at Gwynt y Môr are likely to be of up to 6.5m in diameter and up to 55m in length.



Figure 14. Installed transition piece



Figure 15. Installation of J-tubes

Ancillary equipment: The following ancillary equipment will be fitted to the support structure. The precise design of all ancillary equipment will be finalised under the construction contract.

- **Cable J-tubes:** These are steel tubes that run from the bottom of the tower down the support structure and bend outwards in a j shape, ending at the seabed in a wide bell-mouth. They may be located either inside the central tubular of the support structure or on the outside.
- **Access ladders and landings:** The support structure will be fitted with between one and three access ladders, positioned around the outside of the support structure. Ladders, approximately 600mm wide with rungs at approximately 300mm spacings, will extend to the water level.
- **Boat access system:** This will be fitted to the outside of the support structure to provide operational personnel with access to the ladders.
- **Access platform:** These will be located at the interface between the bottom of the tower and the top of the support structure. It is likely to extend approximately 3m from the tower on three sides and 5m on one side.
- **Corrosion protection system:** Sacrificial anodes will be welded to the outside of the support structure in the area between the splash zone and the seabed. The anodes would be up to 2m long and protrude approximately 300mm from the support structure.
- **HV equipment and cabling:** All 33kV equipment associated cabling and communication systems will be mounted within the transition piece.

#### 4.4. Transformer platforms / substations

The purpose of an offshore substation platform is to transform the voltage of the electricity generated at the wind turbine (normally at 33kV) to a higher voltage suitable for transmission of power to shore (in the case of Gwynt y Môr 132kV). Up to four offshore substations will be required and they will be located within the turbine array.

Each offshore substation will comprise a support structure with associated foundation (likely to be monopile, jacket or suction caisson similar in design and size to those used for the turbines and described above) and a top-side structure housing the required electrical equipment.

Indicative dimensions of the Gwynt y Môr offshore substations are as follows:

- Topside weight: 800 to 1000 tonnes
- Foundation and support structure weight: 400 to 1000 tonnes
- Height from sea level to underside of topside structure: 27m above LAT
- Height from water level to top of topside structure: 40m above LAT
- Area of topside: 676m<sup>2</sup> (or circa 26m x 26m)

The topside structure will provide space for the following infrastructure:

- Power transformers with oil spillage facility
- Utility transformer
- Gas insulated switchgear (GIS) area for transmission voltage equipment
- GIS area for distribution voltage equipment
- Low voltage (LV) switchgear room
- Protection, control and instrumentation systems
- Diesel generator
- Uninterruptible power supply system (UPS)
- Cable ducts and J tubes



Figure 16. An example of an offshore substation

#### 4.5. Scour material

Limited scour is expected over the eastern half of the Gwynt y Môr area, where surface sediments are generally between 0 and 1m thickness, so extensive scour protection is not likely to be required. Over the rest of the site, rock is considered the most likely material for scour protection.

It is possible that scour protection may also be required for some parts of the sub-sea cable routes such as the pipeline crossing. Where this is the case, scour protection is also likely to be rock. However, scour protection is designed to meet the site conditions and may take the form of rock, concrete mattresses, grout bags, frond mattresses or sandbags; all of which are consented under the FEPA license.

**Rock scour** – consists of rock placed into scour areas to locally stabilise the seabed.

**Grout bags** – are fabric bags which are filled with cementitious grout. They would either be filled with grout prior to deployments (similar to sand bags) or be placed in position on the seabed and then filled with grout from a grouting spread on the surface.

**Concrete mattresses** – consist of concrete elements linked together with high strength non-degradable polypropylene rope. The mattresses would be deployed by crane from a host vessel to locations where scour protection is required.

**Fronn mattresses** – are made from polypropylene and are attached to a polypropylene net. The net can either be fixed to the seabed using a number of specially designed anchors which are attached to the webbing net, or the fronn net can be attached onto a concrete mattress to provide further protection and stability.

#### 4.6. Anemometry / meteorological masts

Consent was given for the installation of up to five meteorological masts; one of which was constructed in 2005. The remaining masts will be constructed at the same time as the main Gwynt y Môr turbine array.

The met masts will consist of a lattice tower up to 100m above LAT, supported by a foundation solution similar to the turbine installation but on a smaller scale. The monitoring equipment is expected to consist of a number of anemometers, wind vanes and other meteorological sensors at regular intervals up the mast; an integrated wave and tide monitoring system; and associated infrastructure (such as power sources, data logging equipment, access equipment etc.)



Figure 17. Met-mast installed at the eastern boundary of Gwynt y Môr

## 5. Description of proposed decommissioning measures

Final decommissioning of the wind farm components or their replacements would take place when they have reached the end of their design life. This may involve decommissioning of the entire wind farm or removal and decommissioning of selected components, followed by replacement as described in the Environmental Statement.

The following decommissioning measures have been proposed with regard to:

- the Best Practicable Environmental Option (BPEO);
- safety of surface and subsurface navigation;
- other users of the sea
- and health and safety considerations.

Components to be left in situ following decommissioning are aligned with the standards set out by the International Maritime Organisation (IMO) that specify an installation or structure need not be entirely removed if:

- it is not technically feasible (however, the design and construction should be such that entire removal would be feasible);
- it would involve extreme cost;
- it would involve an unacceptable risk to personnel;
- it would involve an unacceptable risk to the environment.

The Construction (Design and Management) Regulations 2007 (CDM2007) will be applied to the decommissioning of the wind farm. The key aim of CDM2007 is to integrate health and safety into the management of the project. The definition of 'construction work' includes the demolition or dismantling of a structure.

Designers in designing the wind farm are required to plan for the dismantling of structures recording key activities assumed in the original design to prevent danger in dismantling to as low as reasonably practicable (Regulation 29 CDM2007). These plans will be retained in the Health and Safety File, a key document required under the CDM2007 Regulations.

The Health and Safety File will be passed to dismantling contractors during the contracting process for their consideration and incorporation into their methods of work.

Gwynt y Môr Offshore Wind Farm Ltd also has a number of other duties under CDM2007 such as ensuring competent contractors are appointed.

### 5.1. Offshore wind turbines

The process of decommissioning of the turbines themselves is likely to involve the following sequence:

- Each turbine is disconnected from the electrical distribution and SCADA system
- Any hazardous or potentially polluting fluids or materials are removed from the nacelle in so far as risk assessment identifies them as posing a potential hazard to the environment during turbine dismantling
- A vessel similar to that used during installation is mobilised to site
- The rotors are unbolted from the nacelle and lifted onto the decommissioning vessel
- The nacelle is unbolted from the tower and lifted onto the decommissioning vessel

- The tower sections are unbolted and lifted onto the decommissioning vessel
- All of the components are transported to port, and dismantled
- The decommissioned turbines may be overhauled and sold for re-use
- Redundant material such as steel from the towers or other components would be recycled where possible and other materials disposed of in an approved manner

## 5.2. Foundations and transition pieces

The final selection of the foundation options for the turbines to be installed at Gwynt y Môr is yet to be finalised. A number of foundation options are still being considered; decommissioning approaches for each of these are provided below.

### Monopiles

For piled foundations it is envisaged that the foundation pile would be cut to below the natural level of the seabed to such a depth to ensure that the remains are unlikely to become uncovered. Complete removal of the pile below the seabed is considered neither practical nor environmentally desirable. The appropriate depth for removal would depend upon the sea-bed conditions and site characteristics at the time of decommissioning. This is in line with the IMO standards as complete removal of the foundations would involve an unacceptable risk to the marine environment and are likely to involve extreme cost. If an obstruction exists above the sea bed or an obstruction appears following decommissioning which is attributable to the wind farm, this obstruction will be marked by the owner so as not to present a hazard to other sea users. The marking will remain in place until such time as the obstruction is removed or is no longer considered to be a hazard to other sea users. The monitoring of this obstruction will be built into the decommissioning monitoring and maintenance programme.

Decommissioning of each pile structure, on that basis, is likely to proceed as follows:

- divers are deployed to inspect each pile footing and reinstate lifting attachments if necessary
- a jack-up barge or heavy lift vessel is mobilised to the site
- any scour protection that has been placed around the base of the support structures is cleared where it is obstructing the cutting process
- crane hooks are deployed from the decommissioning vessel and attached to the lift points
- the pile(s) is cut below the natural level of the seabed, as appropriate
- following pile removal, the seabed is inspected for debris and any found is subsequently removed
- the pile, transition piece and any debris are transported back to shore either by lifting on to a jack-up, barge or heavy lift vessel, or by buoyant tow
- the pile and transition piece, which do not contain any hazardous materials, would then be cut up and the steel could be recycled.

### Multipile / Jacket Foundations

Decommissioning of multipile / jacket foundations is likely to follow a similar process to that of monopile foundations described above.

### Gravity Base Foundations

Gwynt y Môr Offshore Wind Farm Ltd is considering the use of gravity base foundations at the site.

If installed at Gwynt y Môr, it will be preferable to completely remove the foundations at the time of decommissioning. The only exception to complete removal would be if, at the time of decommissioning, the assessment concluded that it would entail excessive cost or risk to personnel or the environment (under IMO Guidelines) to do so. This would be subject to discussions with key stakeholders and regulators.

If, following the final review of the decommissioning programme, the most favourable option was still to remove the entire base, this would most likely be achieved as follows:

- ROVs or divers are deployed to establish the base structural integrity and reinstate lifting attachments if necessary
- a suction dredging vessel is mobilised to remove the gravity ballast
- the ballast material would be properly disposed of either on shore or in an offshore spoil area
- divers are then deployed to inspect the base, and ensure all the remaining ballast is removed
- a heavy lift vessel is mobilised to lift the bases completely out of the seabed and onto a transportation vessel which would take them to shore
- the seabed is subsequently inspected and any debris is removed
- steel bases do not contain any hazardous material and would be cut up and the material could be recycled. Concrete bases would be disposed of in an approved manner.

If, following the final review of the Programme and discussions with stakeholders and regulators, the decision is taken to leave the foundations in the seabed, as it was deemed to risky or costly to remove them (according allowable exceptions under the IMO Guidelines), the steel tubular mounted in the base would be cut off and the base left in place. The tubular would be removed and disposed of in the same manner as the piles discussed above.

Complete removal of gravity base foundations poses a number of issues which will need to be addressed at the time of decommissioning<sup>2 3 4</sup> :

- the weight or depth of the installed foundation may make removing it technically difficult. The attachment of lift points onto the concrete structure will also be problematic;
- expensive heavy lift crane will be required even if the base is filled with air;
- removal may present an unacceptable risk to personnel;
- build-up and scouring may distort initial lift calculations due to considerable additional forces required to break suction under the bases. This creates considerable operation risk;

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<sup>2</sup> Offshore Windfarm Decommissioning: A proposal for guidelines to be included in the European Maritime Policy. May 2007. Januario, C., Semino, S. and Bell, M.

<sup>3</sup> Decommissioning Wind Turbines In the UK Offshore Zone. 2001. Pearson, D.

<sup>4</sup> Decommissioning Offshore Concrete Platforms with an Executive Summary by Graham Morrison of the Health and Safety Executive. Prepared by Atkins Process Limited and Olav Olsen A/S for the Health and Safety Executive 2003. Research Report 058.



- removal may prove difficult due to the suction effect created by seabed sediment, and once the foundation is removed, the re-establishment of the benthic community will take some time;
- possible solutions will involve extreme cost in addition to towing costs if refloated;
- the concrete is unlikely to have a re-sale value which may lead to disposal issues. This is compounded by the large volumes which make the energy balance prohibitive.

However, it is likely that advancing technology will make these issues manageable. A review of the final programme will be undertaken prior to decommissioning (stage 6 of the process) at which point available technologies or techniques for decommissioning installations will be appraised and the method of decommissioning gravity base foundations finalised.

### **Suction Caissons**

If, for the reasons highlighted above, it is deemed necessary to leave suction bases in the seabed, the steel tubular mounted in the base would be cut off and the base left in place. The tubular would be removed and disposed of in the same manner as the piles discussed above.

If, following the final review of the decommissioning programme it was considered necessary to remove the entire base, this would be achieved as follows:

- the suction caisson base is inspected to establish its structural integrity, and reinstate any lifting points if necessary
- the water pressure under the base is increased using a pumping system, to overcome the suction between the base and the seabed
- the base is then removed intact from the seabed using a combination of the under-base pressure and a heavy lift vessel
- the bases are lifted onto a transportation vessel and transported to shore
- the steel bases, which do not contain hazardous materials, would be cut up and the material could be recycled.

### **5.3. Sub-sea cables (export and inter-array)**

Offshore cabling will be removed except where it is certain that the cables will remain buried. The precise risk of exposure will be established by monitoring cable burial depth over the life of the wind farm.

In the vicinity of the pipeline crossings, cables will remain in place to avoid unnecessary risk to the integrity of the gas pipeline and EirGrid Interconnector.

For the remaining cables, pending the review of the cable monitoring data it is currently anticipated that the sub-sea intra-array and export cables will be left in-situ. This approach is in line with the IMO standards, it is considered that complete removal could involve unacceptable risk to the marine environment and a potential impact on other users of the sea.

However, where required, offshore cable removal is likely to be achieved by the following:

The cable will be de-buried by a combination of the following techniques:

- peel-out: using a grapnel to pull the cable out of the seabed
- under runner: pulling an under-runner by a steel cable to push the electrical cable from the seabed

- jetting seabed material from the cable using a water jetting tool similar to that used during cable installation

once de-buried, the cable will be winched onto a vessel similar to that used during installation and taken to shore for recycling

#### 5.4. Anemometry masts

It is proposed that all anemometry equipment and supporting towers are completely removed and deconstructed onshore. The foundations will be removed in accordance with the provisions set out in section 5.2.

#### 5.5. Transformer platforms / substations

The decommissioning of the transformer platforms and associated foundations will follow a similar method to that described for the turbines and turbine foundations.

The complete topside structure will have the major components removed before being lifted from the support structure and taken by a suitable vessel to port where it will be dismantled and the constituent parts processed for reuse, recycling and/or disposal.

#### 5.6. Scour material

In recognition of the IMO standards and DECC guidance, it would be preferable to leave any scour protection used around the turbine bases or covering cables in place to preserve the marine habitat that will have established over the life of the wind farm, on the assumption that to do so would not have a detrimental impact on the environment, conservation aims, the safety of navigation and other uses of the sea. The impacts of leaving the scour protection in place will be fully assessed in the pre-decommissioning EIA in consultation with all statutory authorities and if following the final review of the decommissioning programme it was considered necessary to remove the scour protection, it would be achieved by either:

- dredging the scour protection and disposing of the fill material at an approved offshore spoil location
- dredging the scour protection and transporting the dredged material to shore to be disposed of in an approved manner
- in the case of scour protection in the form of large rocks, lifting the rock using a grab vessel, depositing in a hopper barge and transporting it to a shore for appropriate disposal.

#### 5.7. Waste management

Waste management will be carried out in accordance with all the relevant legislation at the time and paying regard to the waste hierarchy which suggests that reuse should be considered first, followed by recycling, incineration with energy recovery and, lastly, disposal. It is intended that the vast majority of all elements from the offshore wind farm will be taken back to land for re-use and recycling. A waste management plan will be drawn up prior to commencement of decommissioning to ensure adequate time remains for the proper provisions to be made.

## 6. Environmental impact assessment

The original EIA for this project included an assessment of the decommissioning scope envisaged under this plan. Appendix A includes a summary of the EIA analysis with respect to the potential impacts of decommissioning.

The final decommissioning EIA will follow on from the assessments presented as part of the original Gwynt y Môr ES submitted in support of the consent application process. It is anticipated that this original EIA of the proposed decommissioning process will be reviewed and, where necessary, a revised assessment undertaken towards the end of the life of the installation based on up to date knowledge of both the environment in and around Gwynt y Môr and the decommissioning process.

Key criteria that will inform this decision include:

- Identification and assessment of the potential impacts on the environment arising from the proposed decommissioning including such factors as:
  - exposure of biota to contaminants associated with the wind farm
  - other biological impacts arising from the physical effects of decommissioning (e.g. noise, sediment plumes etc)
  - conflicts with the conservation of species, with the protection of their habitats, or with mariculture.
- Identification and assessment of the potential impacts relating to interference with other legitimate uses of the sea including for example commercial fishing, shipping, Oil & Gas activities, aggregate dredging,
- Identification and assessment of the potential impacts on amenities (e.g. recreational use of the Gwynt y Môr area and surrounding coastal areas), the activities of communities and on future uses of the environment
- Identification and assessment of the potential impacts on the historic environment.

Additional site surveys would be conducted where these are considered necessary in undertaking the review of the decommissioning EIA and could include, for example:

- Physical environment: geophysical surveying of the seabed
- Benthic: grab sampling and video/photographic surveys
- Ornithological: A programme to identify key species and assess whether there are particularly sensitive times of year for key bird species
- Marine mammals: marine mammal surveys to identify, for example, marine mammal distribution, behaviour or migrations in relation to the potential effects of decommissioning (such as sub-sea noise)
- Review of Nature Designations: to identify key species or habitats that could be affected by the decommissioning process.

The review of the decommissioning EIA will ultimately identify potential impacts arising from the programme and, where these are considered significant, will propose appropriate mitigation measures. In addition, pre, during and post decommissioning monitoring programmes may also be considered appropriate and, where these are identified, will be developed in partnership with the appropriate regulatory bodies.

## 7. Consultations with interested parties

The project ES issued in November 2005 included a description and review of the decommissioning proposals outlined in this plan and was consulted on widely at both national and regional levels.

The following organisations, identified by DECC, were consulted following the completion of the draft decommissioning programme (under Stage 4 of the decommissioning programme process set out by DECC) and before the final formal submission for approval:

- National Federation of Fishermen's Organisations
- North Western and North Wales Sea Fisheries Committee and any other relevant local Sea Fisheries Committee
- Chamber of Shipping
- Royal Yachting Association
- Joint Nature Conservation Committee
- Countryside Council for Wales
- Environment Agency
- Cadw
- The Maritime and Coastguard Agency
- Trinity House Lighthouse Service
- Relevant harbour authorities
- British Marine Aggregates Producers Association (BMAPA)

A summary of the consultation undertaken in respect of the draft decommissioning programme is outlined below (stage 5 of the process) with all relevant correspondence included in Appendix B.

The draft decommissioning programme (excluding costs) was sent via CD to the stakeholders listed above with a covering letter explaining the consultation process. Stakeholders were given a month to respond to the consultation and the comments that were received have been incorporated into the final decommissioning programme where possible.

Responses were received from:

- Trinity House
- Royal Yachting Association
- The Marine and Coastguard Agency
- Countryside Council for Wales

It is expected that an appropriate program of consultation will be continued throughout the project lifecycle and particularly in the lead up to the development of the final decommissioning programme and through decommissioning itself. This will range from consultation on any amendments to this draft programme and any accompanying EIA through more specific notices such as the issuing of appropriate Notices to Mariners and other navigational warnings during the decommissioning process.

## 8. Costs

In developing a capital cost for the project, Gwynt y Môr Offshore Wind Farm Ltd has made an estimate for the future decommissioning of the wind farm. A more detailed cost estimate will be developed for the decommissioning works once the construction activities are completed and the final decommissioning EIA has been reviewed in order to provide accurate estimates of:

- the removal of installations;
- management of the waste;
- any surveys which may need to be undertaken before or after decommissioning;
- post-decommissioning monitoring, maintenance and management of the site where an installation is not entirely removed.

In a study for DECC, Climate Change Capital Ltd (CCC) estimate net decommissioning costs to be around £40,000 per MW<sup>5</sup> (based on interviews with stakeholders using a 240MW wind farm as a model). If this assumption were applied to the Gwynt y Môr project it would indicate a net decommissioning cost of approximately £23 million for the installed capacity of 576MW. However, significant uncertainty remains over decommissioning costs, given the lack of experience and 20 year plus time horizon before actual decommissioning, during which market conditions, technology and environmental knowledge may all change.

The CCC estimate of decommissioning costs includes the complete removal of an offshore renewables energy device, including foundations and cables 1-2 metres below the seabed. However, it does not take into account the pre-decommissioning surveys that are required, management of the waste and any monitoring that may be required. Therefore, Gwynt y Môr Offshore Wind Farm Ltd proposes a decommissioning budget in the region of £400,000 per turbine or approximately £64m (for 160 turbines).

## 9. Financial security

Gwynt y Môr Offshore Wind Farm Ltd fully accept responsibility to provide funds to cover the main decommissioning activities that are expected to take place at year 22/23 should the wind farm not be re-powered.

The preference would be to secure decommissioning obligations through a mid-life accrual fund. If this was acceptable, Gwynt y Môr Offshore Wind Farm Ltd would commit to reserving one tenth of the expected net decommissioning costs per year for a period of 10 years before decommissioning activities were due to take place.

Gwynt y Môr Offshore Wind Farm Ltd have budgeted approximately £400,000 per turbine for decommissioning costs. Based on an array of 160 turbines, the total projected decommissioning budget would be around £64 million. Considering inflation and interest over a 10 years accrual, the actual decommissioning fund, under this scenario, is estimated to be at around £106 million. One tenth of this total fund, £10.6 million, will be reserved each year in a dedicated and restricted account. However, this figure is subject to change depending on the final array design. It is currently anticipated that these funds will be placed in an Escrow account.

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<sup>5</sup> Offshore Renewable Energy Installation Decommissioning Study – Final report 4<sup>th</sup> April 2006. Prepared by Climate Change Capital commissioned by DECC. [http://www.climatechangecapital.com/media/1735/OffshoreRenewableEnergyInstallationDecSt14\\_04\\_06\\_1.pdf](http://www.climatechangecapital.com/media/1735/OffshoreRenewableEnergyInstallationDecSt14_04_06_1.pdf)

This is a sensible and practical method for ensuring that the decommissioning obligations are met and does not involve excessive administrative burden. The financial strength of a renewable energy project midway through its operational life is such that decommissioning obligations can be met from operational cash flows.

## 10. Schedule

It is proposed that decommissioning will commence after 2034, coinciding with the end of the design life of the turbines and midway through the Crown Estate lease for the project. This is on the proviso that the construction is underway by 2012 and completed in 2014. .

There remains the possibility that the wind farm will be re-powered with new wind turbines for the remainder of the Crown Estate lease.

A detailed schedule of the decommissioning works will be prepared at least a year before the start of the works taking account of the results of the review of the decommissioning EIA and an appropriate consultation process. The schedule will clearly map out the sequence of decommissioning activities, providing detail for the offshore removal works. It is proposed that full decommissioning in accordance with the provisions described above will take around 2 years to complete.

Gwynt y Môr Offshore Wind Farm Ltd intends to undertake internal reviews of the decommissioning programme throughout the life of the project and proposes that a formal review exercise is undertaken with DECC at the following times:

- 5 years following commencement of generation;
- 10 years following the commencement of generation;
- 15 years following the commencement of generation.

It is proposed that a final review is undertaken around year 19. This will be the opportunity to finalise the detail of the decommissioning provisions, schedule and costs. As indicated in Section 6, this is also the opportunity to ensure that the impact of the works has been appropriately assessed and to determine in consultation with DECC and key stakeholders whether a revised EIA or Appropriate Assessment is necessary. This will also be the final opportunity to consult with the stakeholder identified in Section 7 above about the details of the decommissioning provisions and the schedule of works. If following the reviews, should any of them indicate an upward movement in decommissioning costs, additional contributions will be made to the accrual fund to ensure sufficient funds are available for decommissioning.

## 11. Seabed clearance

Following decommissioning, a full seabed survey will be carried out using appropriate remote surveying techniques with independent, third party involvement to show that the site has been cleared. The area to be covered will be determined prior to decommissioning but consideration will be given to the guidance for oil and gas installations which specifies a 500m radius around any installation.

These surveys will seek to identify any debris which may have arisen from the decommissioning activities and may pose a risk to navigation and other users of the sea or the marine environment. Where such items are identified, appropriate remedial action will be taken to ensure the safety of other sea users.

Due care and attention will be given to any declared Archaeological Exclusion Zones to ensure no artefacts of archaeological importance are removed or damaged. If, during decommissioning, a discovery of potential archaeological importance is made, the Protocol for reporting finds of archaeological interest will be followed as set out in the Written Scheme of Investigation (WSI).

## 12. Restoration of the site

The site will be restored as far as possible and desirable to the condition that it was in prior to the original construction of the Gwynt y Môr wind farm.

Consistent with the decommissioning provisions detailed above, the key restoration work will relate to:

- Ensuring that foundations are cut below the natural level of the seabed (turbines, met mast, platforms) and are made safe and adequately covered
- Ensuring that cable ends are adequately buried where cables have been cut and partially removed.

Active restoration relying on intervention with equipment is not proposed as it is considered that such works present unnecessary and unacceptable risk to personnel. Rather, it is considered that allowing the seabed to naturally settle is sufficient and less disruptive to marine life.

## 13. Post decommissioning monitoring, maintenance and management of the site

Given that the decommissioning programme will not fully remove all of the project components (e.g. cables), some post decommissioning monitoring and management are likely to be required in order to identify and mitigate any unexpected risks to navigation or other users of the sea which may be posed by the remaining materials.

A post decommissioning monitoring and maintenance plan will be developed as an output of the review of decommissioning EIA. This will establish what future management of the site may be required and whether this can be carried out as part of an industry-wide programme.

The appropriate regime for monitoring will be determined taking account of factors such as scale, nature and the conditions of any remains, including the risk that any remains below the seabed may be become uncovered and the proximity to other maritime activity. The regime will also be adapted over time (to be agreed with DECC) and will use relevant data from all phases of development, construction and operation.

As a minimum the regime will include a post decommissioning survey at the time of completion of decommissioning, with further surveys scheduled for subsequent years, the first of which is not to be more than 4 years following this initial survey. Survey effort will tail off with time, the exact requirements will be determined, in conjunction with DECC, by the results of the surveys.

In the event of protrusion of a decommissioned element above seabed level, or in the event that scour protection materials are left on site following decommissioning, initially the UK Hydrographic Office will be notified so that suitable notation of a potential anchoring hazard can be marked on relevant charts and mariners informed accordingly. The removal or making safe (eg reburying) of this protrusion will be assessed and undertaken at the earliest opportunity.

## 14. Supporting studies

Any supporting studies or investigations which are undertaken in support of future decommissioning plans will be included as appendices to the Decommissioning Plan. This plan includes, as an Appendix, a summary of the results of the original Environmental Impact Assessment conducted in 2005 relating to the decommissioning process.



## 15. Appendix A: Summary of the EIA for the offshore components

### Introduction

The following sections present a summary of the Environmental Impact Assessment (EIA) of the Gwynt y Môr project for the offshore environment; that is the components of the project located in the marine environment and up to the mean high water mark. The following summary relates to the potential effects of decommissioning on the physical, biological and human environment. For the full Environmental Impact Assessment, please refer to the Environmental Statement (ES).

The following offshore assessment considers the potential effects of Gwynt y Môr on the physical, biological and human environments.

### Potential impacts on the physical environment

The potential effects of the Gwynt y Môr project on the physical environment (e.g. waves, tides, sediment transport, sediment regime, water and sediment quality) have been assessed with due regard to the available statutory guidance

#### Potential effects on physical processes

#### ***Potential effect 1: The construction or decommissioning of the Gwynt y Môr offshore structures could have an influence on prevailing suspended sediment concentrations***

The results of the site specific assessment along with empirical evidence from other offshore wind farm sites suggest that the predicted increases in suspended sediment concentrations, from either foundation or cable installation, will be relatively small in magnitude (when compared to the natural variability within the system), temporary in duration and relatively localised. This issue is therefore considered to be of **Negligible** significance. In addition the short lived nature of the predicted plume effects from the laying of the offshore cable and the short distances over which these act will mean that plumes will not act cumulatively with subsequent or adjacent cable laying operations.

Mitigation: none considered necessary.

#### ***Potential effect 2: The construction, decommissioning or operational phases of Gwynt y Môr could have an influence on the prevailing hydrodynamic regime***

During the construction or decommissioning phases the potential effects on the hydrodynamic regime would be associated with the presence of engineering plant (e.g. jack-up barges, cable laying vessels, etc) on site to install foundations, turbines, offshore substations, met masts and cables. However, since the necessary plant will be located at a limited number of locations at any given time and will be needed for only a relatively short duration at each location, the effects on the hydrodynamic regime will be small in magnitude and both temporary and localised. Therefore, it is not anticipated that this phase will introduce any additional impacts other than those assessed in the operational phase.

#### ***Potential effect 3: The construction, decommissioning or operational phases of Gwynt y Môr could exacerbate the anticipated changes due to climate change***

The assessment of significance of any of the effects predicted due to the presence of Gwynt y Môr has concluded that the project will have a negligible effect on the existing physical environment, and there is no reason to believe that the effect of Gwynt y Môr will be anything other than negligible over the lifetime of the project.

#### Potential effects on sediment and water quality

The following section assesses the potential impacts of the construction, operation and decommissioning phases of the Gwynt y Môr Offshore Wind Farm on the sediment and water quality of Liverpool Bay.

#### ***Potential effect 4: The construction or decommissioning of Gwynt y Môr could disturb contaminated sediments which could act to reduce water quality.***

The various construction or decommissioning activities such as foundation installation or removal, cable installation or removal or the movement of jack-up vessel feet have the potential to disturb seabed sediments resulting in the release of contaminants. The physical process assessment has concluded that the majority of sediments disturbed would be sands and gravels and would settle out of the water column over a short distance. The results of the plume modelling presented in Section 10.2.2 of the ES has concluded that any sediment plumes generated by construction works, even under the 'worst case' scenarios will be at low concentrations and would be temporary, intermittent and transient in nature.

As a result of the low levels of contaminants and the intermittent, transient and spatially limited nature of any sediment plumes, the impacts on water quality resulting from the disturbance of seabed sediment contaminants during construction or decommissioning are assessed to be of Negligible significance. This is the case even in relation to the 'worst case' in terms of from the installation of gravity foundations or the water jetting of cables. Other activities, such as the removal of offshore structures are predicted to result in significantly less disturbance and therefore even less measurable effects on water quality.

#### ***Potential effect 5: Discharge of contaminants from vessels or plant involved in construction, operation or decommissioning could lead to a reduction in water quality.***

The normal operation of vessels engaged in the construction, operation or decommissioning phases has the potential to lead to accidental spillages of fuel, oil and lubricants. Litter generated by these vessels may also be accidentally deposited into the sea which could act to reduce water quality.

Mitigation and management: All plant will be fully serviced and inspected before use in order to limit any potential discharges to the marine environment. Standard waste generated by vessels will be treated according to MARPOL 73/78, the UK Merchant Shipping (prevention of pollution) Regulations 1983 and the Merchant Shipping (Prevention of Pollution by Garbage) Regulations (1988). In addition, adequate systems will be in place when refuelling so as to restrict any loss to the environment.

The Pollution Control Plan (PCP) will set out the procedures to be implemented prior to decommissioning. This will detail the control and treatment of any accidental spillages or disposal of waste that may occur.

The Site Environmental Management Plan (SEMP) will be managed and controlled by an appropriately qualified Environmental Manager. This will detail methods for the recording and control of all wastes or spillages. The SEMP will also include provision for the training of all decommissioning personnel in the proper control and disposal of waste material.

Monitoring: The proper reporting and control of all wastes and spillages through all phases of the project will be subject to compliance monitoring.

***Potential effect 6: Discharge of contaminants from the decommissioning process could result in water or sediment contamination.***

The low levels of contaminants that would be released during the various phases of Gwynt y Môr combined with the dilution effect of the receiving environment means that any effects on water or sediment quality are considered to be of Negligible significance.

Potential effect 7: The release of suspended solids during the decommissioning of the Gwynt y Môr project could lead to increased turbidity and a resulting decrease in dissolved oxygen in the surrounding waters.

The process of decommissioning will produce low levels of suspended sediments and are assessed as being of Negligible significance.

Monitoring: The low levels of suspended solids predicted and the intermittent nature of their generation, even under the 'worst case' scenario, together with the experience gained from the monitoring of the North Hoyle operations and other Round 1 sites indicates that monitoring of suspended solids during the decommissioning phases is not required at Gwynt y Môr.

***Potential effect 8: Gwynt y Môr could give rise to an increased risk of oil spills in Liverpool Bay***

The decommissioning of Gwynt y Môr could give rise to an increased risk of oil spills and pollution through a number of potential effects. The first of these is the release of oil from vessels engaged in activities associated with Gwynt y Môr. This has been dealt with above and is considered of Negligible significance.

The other potential effect would be where the presence of Gwynt y Môr gives rise to an increased risk of oil pollution from a ship or other offshore structure (for example the Douglas platform) as a result of an increased risk of vessel to vessel or vessel to structure collision.

The issue of navigational risk and collision is addressed in detail in Section 10.4.4 of the ES. The navigational risk assessment has concluded that the risk of collision is high but has applied suitable controls to mitigate this risk, providing a residual significance of Low. Indeed it is noted that the proposed mitigation measures, notably the proposal for an IMO-adopted routeing measure to the north of Gwynt y Môr could act to reduce the existing level of risk providing a positive improvement in the Liverpool Bay region.

Therefore, any effect on oil spill risk is assessed to be of Negligible significance.

Potential effects on the biological environment

The potential effects of the Gwynt y Môr project on the marine biological environment have been assessed with due regard to the available statutory guidance and with reference to the responses received during the Gwynt y Môr scoping process. The key statutory guidance on assessing impacts on the biological environment that may arise from offshore wind farm development are briefly summarised below.

#### Potential effects on the planktonic, subtidal and intertidal ecology of Liverpool Bay and the eastern Irish Sea

This section assesses the potential effects of the Gwynt y Môr project on the planktonic, benthic and intertidal communities of Liverpool Bay and the eastern Irish Sea.

##### ***Potential effect 9: The feet of jack-up rigs used during the decommissioning phases could physically disturb the seabed habitats***

When decommissioning the turbines and offshore substations it will be necessary for the jack-up rigs used to make contact with the seabed by lowering their jack-up legs.

During the decommissioning process the total area of seabed that might be disturbed by the jack-up rigs is predicted to be between 0.07 km<sup>2</sup> (in the case of illustrative layout scenario 3 in the ES) and 0.12 km<sup>2</sup> (in the case of illustrative layout scenario 1 in the ES).

The recoverability of the habitats recorded and the relatively small areas affected tend to mitigate the significance of any impacts resulting from jack-up operations.

##### ***Potential effect 10: Cable decommissioning could physically disturb subtidal and intertidal habitats***

The total length of sub-sea cabling required for the Gwynt y Môr project is currently predicted to be in the range 195–320 km. Decommissioning of the cables, where required, would be by pulling the cables from the seabed or possibly through the use of water jetting.

Following the disturbance of the seabed by the cable decommissioning process, the subtidal habitats are predicted to recover relatively rapidly with recolonisation of the disturbed sediments occurring from recruitment of macrofaunal species from the adjacent undisturbed biotopes.

The limited areas of seabed and intertidal habitat affected by cable decommissioning, the relatively short term and temporary nature of the disturbance, the common nature of the fauna affected within the Irish Sea and the relatively rapid recovery process that is predicted means that the physical disturbance to seabed and intertidal habitats is assessed to be of Low significance for the maximum anticipated length of sub-sea cables.

##### ***Potential effect 11: Decommissioning activities could raise suspended sediment levels within the water column potentially affecting subtidal benthic and plankton communities***

In summary, the intermittent and temporary nature of the increases in suspended solids across the project area resulting from decommissioning operations, the relatively rapid dispersion of sediment plumes to natural background levels and the natural tolerance of the fauna in the area to such events means that the impacts on benthic and planktonic communities are assessed to be of Negligible significance, even when considering the 'worst case' scenario.

***Potential effect 12: Discharge of contaminants during the decommissioning phase could adversely affect planktonic or benthic faunal communities***

The assessment of the potential effects of the accidental release of contaminants during the various phase of the Gwynt y Môr project is presented in Section 10.2.2 in the ES. It has been concluded that the effects would be negligible. This being the case, subsequent effects on the benthic or planktonic communities recorded from the project area would be expected to be of Negligible significance.

***Potential effect 13: Release of seabed contaminants disturbed as part of the decommissioning phase could affect plankton and macrobenthic populations***

The nature, distribution and effects of seabed contamination disturbed by the decommissioning of the Gwynt y Môr project on water quality have been assessed under Section 10.2.3 in the ES. It has been concluded that the very low levels of contaminants recorded, the dispersive nature of the Liverpool Bay area, and the temporary and intermittent nature of the disturbance that may result is unlikely to lead to significant effects. This being the case, subsequent effects on the planktonic or benthic faunal communities of the area are assessed to be of Negligible significance.

***Potential effect 14: Noise generated during the decommissioning phase could affect macrobenthic communities and plankton***

On the assumption that the use of explosives is precluded, it is considered that noise levels that would arise during the decommissioning phase would be less than those generated by construction works. The noise associated with decommissioning is therefore assessed to have No Impact on macrobenthic communities and plankton.

***Potential effect 15: The removal of the offshore structures and surrounding scour protection as a result of decommissioning could affect seabed habitat***

The placement of the offshore structures within the Gwynt y Môr project area could provide additional habitat for colonisation by benthic fauna as previously described. As part of the decommissioning phase the turbine and offshore substation supports and any associated scour protection would be removed and the seabed returned to its pre-installation condition. This will result in the loss of the habitat previously available as 'artificial reef'.

The removal of the offshore structures will be undertaken gradually over the duration of the decommissioning phase resulting in a gradual change to the benthic communities which are expected to revert to the biotopes that occurred prior to construction. The colonising species of the wind farm structures at North Hoyle, which are also expected to colonise the structures installed at Gwynt y Môr occur commonly on hard surfaces that occur within Liverpool Bay. The loss of hard substratum previously available as artificial reef as a result of decommissioning is predicted to have no effect on the biodiversity of Liverpool Bay. The impact of the removal of the structures and surrounding scour protection on the seabed habitat at Gwynt y Môr is therefore considered to be of Negligible significance.

Mitigation: none considered necessary.

Monitoring: A post-decommissioning benthic monitoring programme, similar to that previously described for the post-construction period, will be initiated to monitor the effects of the removal of the offshore structures upon the benthic communities of the Gwynt y Môr project area. The specification of this survey will be developed and agreed with the relevant statutory authorities, notably CCW and CEFAS.

Potential effects of the Gwynt y Môr Offshore Wind Farm on the fish and shellfish ecology of Liverpool Bay and the eastern Irish Sea

This section assesses the potential effects of Gwynt y Môr on the fish and shellfish ecology of Liverpool Bay and the eastern Irish Sea. Effects on fish and shellfish behaviour are assessed including effects on spawning, nursery and feeding grounds, in addition to migratory routes.

***Potential effect 16: Decommissioning of the sub-sea cables could disrupt or disturb key fish or shellfish habitat***

Recovery following decommissioning is predicted to occur rapidly. The effects of the suspended sediments generated by the various decommissioning activities, including cabling, in relation to fish or shellfish habitat are considered separately below under Potential Effects 17.

***Potential effect 17: Decommissioning activities could generate spoil and result in increases in suspended sediment levels which could affect fish and shellfish habitats and behaviour***

The effects on fish and shellfish species of the potential 'worst case' increases in suspended sediments are considered to have the potential to result in some small-scale avoidance response. The disposal of spoil will also tend to smother any shellfish species within the immediate area of decommissioning activities.

The dispersion of spoil material, where this is generated, and the highest concentrations of suspended sediments are also considered to have the potential to deter fish spawning activity. However, this is considered to be a small-scale and temporary effect. No longer term effects on spawning or nursery habitats or behaviour are anticipated due to the rapid dilution and dispersion of this material and the naturally high background levels of both turbidity and bedload in the Liverpool Bay area.

Similar avoidance responses are predicted for species such as salmon and sea trout and would be related to the concentration and persistence of the sediment plume. The effects would be localised to the vicinity of specific decommissioning activity rather than across the whole project area. However, such avoidance could nonetheless affect the migratory behaviour of these species, particularly where it occurs close to their natal rivers.

In conclusion, the effects of increased suspended sediment concentrations and spoil disposal on the fish and shellfish populations and habitats within Liverpool Bay are assessed as being of Low significance. This reflects the relatively small scale, temporary and intermittent nature of the predicted increases in suspended sediments resulting from decommissioning activities.

***Potential effect 18: The removal of the Gwynt y Môr offshore structures and scour protection will remove habitat available to fish and shellfish as an artificial reef***

As part of the decommissioning phase offshore structures and scour protection would be removed resulting in the loss of vertical habitat previously available as artificial reef for fish and shellfish species. The removal of the installations would occur over the duration of the 2–3 year period Gwynt y Môr decommissioning phase.

During this period, because the removal of structures will be a gradual process, it is expected that fish and shellfish will be able to readjust during this gradual change and any effects directly attributable to removal should last no longer than the decommissioning period. The removal of substratum previously available as artificial reef habitat to fish species will result in a dispersal of fish and a potential slight localised fall in fish production.

Any effect of the decommissioning process on fish and shellfish distributions will be highly localised and decommissioning is considered to be unlikely to have any detectable effect on populations in Liverpool Bay. Assuming all structures would be removed at least to seabed level, the overall significance of this impact is assessed as being Negligible.

Monitoring: A post-decommissioning survey programme will be implemented to monitor the affects of the removal of the offshore structures upon the fish and shellfish communities of Gwynt y Môr. The specification of this survey will be developed and agreed with the relevant statutory authorities, particularly CCW and CEFAS.

#### Potential effects of the Gwynt y Môr Offshore Wind Farm on marine mammals

This section assesses the potential effects of the Gwynt y Môr Offshore Wind Farm on the marine mammals of Liverpool Bay and the eastern Irish Sea. The assessment process has taken into consideration the conservation value of marine mammals and the protection afforded to them through the relevant legislation (both National and International).

#### ***Potential effect 19: Noise generated during the decommissioning phases could cause physiological damage to marine mammals***

On the assumption that the use of explosives is precluded, it is considered that noise levels that would arise during the decommissioning phase would be less than those generated by construction works. The effect of decommissioning noise on marine mammals is therefore assessed to be of potentially Low significance.

#### ***Potential effect 20: Marine mammals could become displaced from the area due to avoidance of noise/visual disturbances arising during decommissioning activities.***

For decommissioning activities, including the removal of structures (but precluding the use of explosives), the noise generated will be of a significantly low magnitude and therefore, although some small-scale disturbance to marine mammals may still occur, it is considered to be of Low significance.

#### ***Potential effect 21: Noise generated by decommissioning activities could interfere with the behavioural use of sound by marine mammals***

The large area over which marine mammals range combined with the likely intermittent and temporary nature of the most significant noise generated by decommissioning and the general lack of overlap with the key frequencies used by the most common marine mammals recorded from the area means that any such effects are considered to be of Low significance.

***Potential effect 22: Loss of marine mammal prey species could result from the displacement of prey items due to noise generated from decommissioning activities.***

The small scale of likely displacement, the intermittent and temporary nature of the most significant sources of disturbance and the ubiquitous distribution of prey species means that any effect on marine mammal prey and feeding is assessed to be of Low significance.

***Potential effect 23: increased vessel activity during the decommissioning phase of Gwynt y Môr could either disturb or cause physical harm to marine mammals***

There would be an increase in vessel traffic at Gwynt y Môr during the decommissioning phase associated with the removal of offshore structures and cables and for general component or personnel movement. Such vessels are likely to include mostly slow moving vessels producing sound of a low frequency. Marine mammals can exhibit an attraction to some vessels (e.g. seals to certain fishing vessels). However the usual response, especially by species such as harbour porpoise, is usually one of avoidance either by diving or moving away.

It is notable that the Liverpool Bay area, particularly the area immediately north of the Gwynt y Môr project area, already contains significant amounts of shipping and it is expected that cetaceans will already be avoiding those ships that they detect at considerable ranges. The relatively slow moving nature of the majority of vessels allows cetaceans sufficient time to move away and avoid any collision impacts. Seals spend a significant amount of time looking out from the surface of the water as they are more dependent on visual cues rather than noise. They are also considered to have sufficient time to take avoiding action from approaching vessels.

The response of marine mammals to the vessels that will be employed during the various phases of the Gwynt y Môr project is therefore predicted to be a small-scale avoidance which is considered to preclude any collision effects. The intermittent, temporary and small scale nature of any such disturbance, particularly when compared to the existing shipping levels around the site, means that any such effect are assessed to be of Low significance.

***Potential effect 24: The decommissioning of the turbine installations could result in a loss of habitat used by marine mammals for foraging***

The decommissioning of the Gwynt y Môr offshore structures and associated scour protection will result in a net loss of linear habitat previously available as artificial reef substratum. This will occur over the 2-3 year decommissioning phase which will allow marine mammal prey items such as fish species time to redistribute over the area. Marine mammals will also forage for food over a very wide area and this combined with the highly localised nature of the effect means that this is considered to be Negligible significance.

Potential effects on ornithology



This section assesses the potential effects of the Gwynt y Môr Offshore Wind Farm on the ornithology of Liverpool Bay. The assessment process has taken into consideration the conservation value of bird species and the protection afforded to them through the relevant legislation (both National and International).

The assessment of the significance of the potential effects of Gwynt y Môr on ornithological interests has been based on an approach developed by the BWEA and SNH, and the more detailed requirements for Appropriate Assessment under the 'Habitats Regulations'

***Potential Effect 25: Disturbance caused by the decommissioning of Gwynt y Môr could adversely affect the breeding, feeding, roosting and loafing behaviour of bird species and populations***

Disturbance to bird species using the area could arise from the movement of vessels and due to the effects of decommissioning activity.

Despite the short term increase in vessel movements, the significance of disturbance impacts on bird species is predicted to be of Low significance for the following reasons:

the routing of the vessels to and from the project area will generally be along existing and well established shipping routes, and as such would tend to avoid or reduce the risk of disturbance effects to sensitive bird species such as red-throated diver, common scoter and cormorant; and

decommissioning works at Gwynt y Môr will be programmed to continue throughout the year and over a 2 to 3 year phase. However, it is possible, given the prevailing weather conditions, that on average a greater level and consistency of activity might occur over the summer months, when weather conditions offshore are more settled. Both red-throated diver and common scoter will be largely absent from the area during the summer months.

most importantly, the ornithological surveys have consistently recorded the main populations of the majority of seabird species from areas inshore or to the west of Gwynt y Môr, including most notably the main populations of common scoter and red throated diver. This natural distribution of bird species will preclude any disturbance to these species during the main offshore decommissioning period.

***Potential Effect 26: The decommissioning of the proposed Gwynt y Môr Offshore Wind Farm could affect the flight lines of bird species and populations currently using the area within which the Gwynt y Môr site lies***

In conclusion, barrier effects could affect a number of seabird species. The majority of these species are either gulls, which have been recorded within the operational North Hoyle Wind Farm or species which typically forage over long distances such as manx shearwater and gannet. Both manx shearwater and gannet travel to forage from colonies outside Liverpool Bay, and the main densities have been recorded in areas which would not require them to cross the Gwynt y Môr project area to forage. The additional distance should they wish to fly around Gwynt y Môr is considered unlikely to result in significant energy costs effects on these species are therefore considered to be of Low significance.

#### Potential impacts on designated nature conservation sites

This section assesses the potential effects of Gwynt y Môr on the sites, species and habitats of nature conservation interest in the Liverpool Bay region. The assessment of impacts on features of nature conservation importance is drawn largely from the findings of the physical processes, benthic ecology, fish ecology, marine mammal and ornithology impacts sections. Particular regard has been paid to the available guidance on the effects of offshore wind farms on nature conservation (Defra, 2005 draft) in preparing the following sections.

#### ***Potential effect 27: The removal of the main Gwynt y Môr export cables could affect designated conservation sites in the offshore environment or in coastal area in the vicinity of the cable landfall***

There are currently no designated conservation sites although a number of species may be present within or around the export cable route corridor which are of conservation interest. These include species listed under Annex II of the Habitats Directive such as porpoise and seals and fish species such as salmon, Biodiversity Action Plan (BAP) species such as skates and rays and the grouped action plan fish species (cod, whiting sole and plaice) as well as rare or unusual species such as the thumbnail crab *Thia scutellata*. The potential effects on these various benthic invertebrate, fish and marine mammal species as a result of cable installation have been assessed separately under the preceding sections on marine ecology. The assessment has concluded that the short term and intermittent nature of the cable installation procedure, the small area of habitat affected and the rapid recovery of the environment to the pre-installation condition means that significant effects on any of these species will not occur.

Due to the distance of the proposed cable landfalls from the closest designated sites and the lack of BAP habitats or species at the landfall sites, No Impacts will occur on nature conservation features of interest as a result of removal of the Gwynt y Môr cables at any of the coastal landfall locations. Further offshore, some small-scale disturbance of some species or habitats of nature conservation interest may occur but this is considered to be of Negligible significance given the small area affected and the temporary nature of the disturbance.

#### ***Potential effect 28: The decommissioning of Gwynt y Môr could affect sites currently designated for their conservation interest or those of potential future designation***

With regard to potential direct impacts, it is noted that there are no designated sites within the Gwynt y Môr project area or export cable route corridor (with the exception of the 'proposed' Liverpool Bay SPA which is considered separately below). It, therefore, follows that the offshore components of the Gwynt y Môr project cannot have any direct effects on sites designated for their conservation interest.

The assessment of physical processes has concluded that effects on far-field hydrodynamic or sedimentary processes as a result of the Gwynt y Môr offshore structures during decommissioning will be of Negligible to Low significance. It is therefore concluded that Gwynt y Môr will have no indirect effects on the physical character of designated sites of conservation interest around the coasts of Liverpool Bay.

#### ***Potential Effect 29: The decommissioning of the Gwynt y Môr Wind Farm could affect bird species of conservation interest or the integrity of sites designated for their ornithological interest***

A number of statutory sites which are designated for their ornithological interest occur along the Welsh and English coastlines of Liverpool Bay including Special Protection Areas (SPAs), which are part of the Natura 2000 network. None of the currently designated sites will be directly affected by Gwynt y Môr. However over half of the Gwynt y Môr project area is likely to lie within the 'proposed' mSPA in Liverpool Bay.

In considering the effects against the likely conservation objectives (based on the objectives set out for the Carmarthen Bay SPA), it is concluded that there will be no likely significant effects on the site given that there will not be any significant deterioration of the habitats, significant alteration of the distribution or population of either species, or significant disturbance effects. The potential effects on the 'proposed' Liverpool Bay mSPA are therefore considered to be of Low significance.

***Potential effect 30: The decommissioning of the Gwynt y Môr Offshore Wind Farm could affect rare or protected marine species***

In summary, given the small areas of seabed habitat affected, the short term and temporary nature of decommissioning works and the relative unimportance of the project area for species such as marine mammals, impacts on the conservation status of these species are assessed to be of Low to Negligible significance.

***Potential effect 31: the presence of the Gwynt y Môr offshore structures and scour protection could provide additional habitat for rare and protected marine species***

The offshore structures would provide areas of new habitat which will become colonised by sedentary benthic organisms. These structures will then provide feeding opportunities for other marine species (as has been seen at North Hoyle) and may offer some form of shelter from currents or predators. This could be somewhat beneficial to protected marine species occurring within Liverpool Bay.

Species that are known to aggregate around such offshore structures include the gadoids cod and whiting which are UKBAP species under the Grouped Action Plan for marine commercial fish. In addition, such an aggregation of fish species is also considered likely to attract foraging marine mammal species of conservation interest such as grey seals and harbour porpoise. The new habitat provided by the offshore structures would act somewhat to negate the effect of the loss of the existing seabed habitat resulting from construction and may indeed provide new feeding opportunities for rare and protected species occurring within Liverpool Bay. It is also considered likely that the presence of the offshore structures would act to reduce commercial fishing activity within the wind farm area, potentially creating an effective marine protected area covering 124 km<sup>2</sup>.

The presence of the offshore structures and their effect as an artificial reef may, therefore, provide benefit to a range of protected species including marine mammals and fish. This potentially positive effect is currently considered to be of Negligible significance.

Mitigation: none proposed.

Monitoring: The specific monitoring proposed for benthos, fish and marine mammals may act to identify potential benefits for these protected marine species.

**Potential impacts on the human environment**

## Introduction

The potential effects of the decommissioning phases of the offshore components of Gwynt y Môr on the human environment are assessed in the following sections. Consideration is given to a range of the existing human uses of the surrounding environment.

The following sections have been completed with particular regard to the comments received during the scoping process and through subsequent detailed consultations and with reference to the wide range of statutory and non-statutory guidance. Guidance for each of the issues relating to the potential impacts on the human environment arising from the offshore components of the project includes:

### Potential socio-economic Impacts (e.g. DTI, 2002)

The socio-economic assessment should include an overview of the potential positive and negative effects of the project. This includes both direct and indirect impacts on employment and businesses and an appraisal of wider socio-economic effects such as education and skills and regional image.

### Potential impacts on recreation and tourism (e.g. DTI, 2002; RYA, 2004)

Requires the consideration of the possible effects on the tourism industry and coastal and offshore amenity use including sailing, angling and diving.

### Potential impacts on shipping and navigation (MCA, 2004)

Requires the consideration of the following:

- consideration of safety zone relative to the use of the area by a range of vessels and marine activities
- navigation Collision and Avoidance – including visual navigation, communications, radar, and positioning equipment
- navigational marking

### Potential impacts on commercial and recreational fisheries (CEFAS, 2001; BWEA, 2004)

The potential effects that should be considered:

- implications for fisheries during the decommissioning phase
- impact on commercially exploited fish and shellfish populations
- complete loss or restricted access to traditional fishing grounds
- interference with fishing activities
- removal of obstacles on the seabed post decommissioning to ensure vessel safety.

### Potential impacts on aviation and airports (e.g. DTI Wind Energy, Defence and Civil Aviation Interests Working Group, 2002)

Requires the assessment of potential effects on the operation of local aviation activities, including an assessment of any potential impact on aviation radar systems.

### Potential impacts for other sea users (e.g. DTI, 2002)

Oil and gas operations, cables and pipelines, dredging and spoil disposal and aggregate dredging should be considered in relation to the potential effects associated with decommissioning.

Potential impacts on archaeology (e.g. DTI, 2002; BMAPA 2003)

The decommissioning works present the possibility of damage or disturbance to known archaeological features such as historic landscapes and wrecks. A suitable assessment should therefore be conducted such that potential impacts can be mitigated accordingly.

Potential impacts on military usage (DTI Wind Energy, Defence and Civil Aviation Interests Working Group, 2002)

Interaction with military operations such as low flying areas or practice and exercise areas should be considered as part of the assessment.

Potential socio-economic effects of the Gwynt y Môr project

Socio-economic effects associated with Gwynt y Môr will arise from decommissioning. Following the end of the operational life of the project, the operator will be required to remove the offshore wind farm and return the environment to its current condition.

***Potential effect 31: The decommissioning of the Gwynt y Môr Offshore Wind Farm will have effects on local, regional and national employment***

The expenditure arising from the renewal of the project over its operating life and its eventual decommissioning are more difficult to predict given the timescales involved and the likely developments in technology and economics. However, current estimates by Climate Change Capital Ltd predict the costs of decommissioning at circa £30m, with further, undefined capital costs associated with the renewing of major components during operation where this process is required. In total it is estimated that decommissioning will support a total of 440 person years of employment, of which 80 could occur locally (this is equivalent to 8 permanent full time equivalent jobs).

Similarly, the decommissioning process could support a total of around 44 full time equivalent jobs in the UK through direct, indirect and induced effects with approximately 8 of these being located in the local area. This is considered to be a positive impact of **Low** significance to the local area.

Potential effects on recreation, tourism and leisure

An assessment into the potential impacts of the decommissioning of Gwynt y Môr on the local tourism business and the recreational use of the coast and adjacent waters is discussed in the following sections.

***Potential effect 32: The decommissioning of the Gwynt y Môr Offshore Wind Farm could have an affect on offshore recreational activities***

Gwynt y Môr lies within Liverpool Bay in an area crossed by a number of routes used by recreational craft. The project area is also used by recreational angling interests.

The temporary, but unavoidable nature of the exclusion of associated recreational activities during the decommissioning stage by the imposition of a safety zone is assessed to be of **Low** significance since although some alteration to the normal patterns of these activities may be required (particularly in the case of offshore yachting), these activities will nonetheless be able to continue within the Liverpool Bay region.

***Potential effect 33: The decommissioning of Gwynt y Môr could affect recreational diving activity***

The baseline assessment of recreational diving activity has identified that, although there are a small number of wreck sites within the Gwynt y Môr project area that are used as dive sites, activity in the area is of relatively low intensity when compared to other parts of Liverpool Bay (Gifford, 2005).

During the decommissioning of the Gwynt y Môr offshore structures, safety zones will be in place which will act to exclude navigation from the area for all vessels other than those required for decommissioning purposes. Recreational diving interests will be advised to avoid the areas affected by these activities. This exclusion of diving would be a temporary disturbance that would have only slight adverse effects, given the availability of alternative dive sites that would not be affected and the relatively low intensity of recreational diving in the project area.

The generation of suspended sediment during the decommissioning phases could also result in reductions in underwater visibility and/or smothering of dive sites. The physical processes assessment, presented in Section 10.2.2 of the ES, has concluded that even under the 'worst case' scenario sediment plumes will be short lived, spatially restricted and intermittent, quickly falling below the prevailing background turbidity. Significant effects on diving, given the imposition of the safety zone around such activity and the avoidance of wreck sites by construction activity, will not therefore occur.

Given that there are relatively few known dive sites in the Gwynt y Môr project area and that the exclusion during the decommissioning phase would be short term, effects on commercial dive operators and associated businesses and suppliers are not considered to be significant.

In conclusion, there are relatively few dive sites in the Gwynt y Môr project area. Although diving will be excluded from the area during the construction and decommissioning phase, during operation, divers will be free to continue diving within the Gwynt y Môr area (but with due regard to restrictions on vessels resulting from the operational safety zones). Indeed it is considered that the development may even prove attractive for diving trips representing a positive impact for divers and dive boat operators. In general, therefore, Gwynt y Môr will have a **Negligible** effect on recreational diving, most notably during the construction or decommissioning phases. Mitigation is set out which will avoid any significant impact on wreck sites so that the residual effect is **No Impact**.

Mitigation: Information on decommissioning safety zones will be provided to dive interests and major decommissioning activities will also be notified through an appropriate Notice to Mariners.

***Potential effect 34: The removal of the export cables at the beach landfall could affect recreational use of the area***

Adverse effects on coastal recreation and tourism in the area could occur as a result of the removal of the export cable route across the beach at the chosen landfall point (between Pensarn and Towyn).

After construction the beach will be reinstated to a high level and through agreement with the Local Authority so that no lasting effect will occur. Decommissioning of the cable is likely to have similar effects.

The duration of the temporary exclusion zones at the beach and noise disturbance will be short and proper re-instatement will ensure that there will be no lasting effects. Therefore, although some localised disturbance could occur, this is predicted to be temporary and spatially restricted and therefore is assessed to be of **Low** significance with regard to amenity use and effects on tourism business.

#### Potential impacts on shipping and navigation (including navigation systems)

#### ***Potential effect 35: The decommissioning of the Gwynt y Môr Offshore Wind Farm could interfere with areas currently used by marine craft***

The Gwynt y Môr project area lies in navigable waters in the south-eastern part of the Irish Sea, within Liverpool Bay. The eastern extremities of the project area lie within the charted limits of the Port of Liverpool. The area is presently used by a wide range of vessel types including commercial vessels proceeding to and from ports in the River Mersey, the Dee Estuary port of Mostyn Docks and the loading facility for small commercial vessels at Llandulas (Raynes jetty).

Gwynt y Môr has the potential to affect these vessels in a number of ways, including:

- the need to deviate from established routes
- vessel to vessel collision,
- vessel to wind farm structure collision.

The need for deviation from established routes

The assessment of shipping routes used by commercial vessels in the general Liverpool Bay area suggests that the majority of vessels would not normally navigate through the Gwynt y Môr project area.

However, vessels proceeding on certain routes, identified by the maritime traffic surveys (Anatec, 2005) and through consultation with the navigational working group, do currently transit across the project area. These vessels would almost certainly need to deviate around Gwynt y Môr during the decommissioning phase of the project.

#### Potential collision risk

The risk assessment process identified a number of hazards that could lead to a vessel to vessel collision or contact by a vessel with a wind farm structure. These hazardous events arise from the presence of the Gwynt y Môr structures and are considered to exist throughout the decommissioning phase of the project.

The assessment has concluded that unless the potential effects on existing navigation are addressed through additional mitigation, the impacts could be of **High** significance.

As a result, additional mitigation, beyond the presumed controls and assumed controls, has been developed. The introduction of this additional mitigation is considered to reduce the impact of Gwynt y Môr in relation to areas used by marine craft to a **Low** residual significance.

To achieve this level of significance the decommissioning phase of the project will be carefully planned to ensure that all assumed controls and additional mitigation are appropriately implemented.

Mitigation: In general terms the additional controls have been set out in order to address navigation in the project area and in the areas that are adjacent to Gwynt y Môr. They have been developed in consideration of the anticipated level of activity in the project area during the decommissioning phase of the project. In developing the additional mitigation, the opinions of the navigation working group and other consulted stakeholders have been considered.

Additional mitigation has also been developed in order to address the hazards associated with navigation during the decommissioning phase of the project as follows:

- the establishment of a safety zone around the co-ordinates of each of the offshore structures. Each safety zone would be established under the provisions of the Energy Act and provide a defined area in which all vessels, other than authorised vessels (e.g. those engaged in wind farm decommissioning activities, those seeking refuge in an emergency situation and the emergency services) would be prohibited. The extent of the defined area will be determined once the project design has been finalised
- co-ordination of all wind farm traffic so as to control the movement of vessels engaged in decommissioning
- the promulgation of information to mariners concerning decommissioning so as to ensure that all vessels navigating in the area are advised of and kept up to date with the position of all built or partially built structures.

***Potential effect 36: The decommissioning of Gwynt y Môr could increase the numbers of vessels operating within Liverpool Bay***

A wide range of vessel types and sizes navigate through and in the proximity of the Gwynt y Môr project area. These include commercial vessels, fishing vessels, recreational craft (including sailing vessels) and workboats. Whilst there is a diverse range of vessel types and sizes that presently navigate through or in the proximity of the project area, the number of vessels doing so is relatively small, the focus for the large majority of shipping being to the north of the project area. Additional vessels employed in the construction, operation or decommissioning of Gwynt y Môr have the potential to significantly increase that number and thereby introduce additional risks for the vessels currently navigating through Liverpool Bay.

During decommissioning, the number of vessels utilised in the construction activities will increase the number and density of vessel movements within and en route to and from the project area.



#### Potential effects on commercial and recreational fishing activity

The following section assesses the potential effects of Gwynt y Môr on the commercial and recreational fisheries of Liverpool Bay. Effects on towed and static fisheries together with recreational angling activity are assessed in terms of both the direct effects on these activities and the indirect effects through changes to fish behaviour or distributions previously addressed under Section 10.4.5 of the ES.

#### ***Potential effect 37: The decommissioning of Gwynt y Môr could disrupt normal fishing patterns and could necessitate fishing vessels avoiding the affected areas***

During the decommissioning phase of the Gwynt y Môr Offshore Wind Farm it will be necessary to establish safety zones to ensure the safety of other sea users. Decommissioning is likely to last for two to three years and is likely to be phased across the project area. The details of the safety zones will be finalised during the final project design process and through discussion with the statutory and regulatory bodies, but the currently anticipated approach is detailed under the navigational assessment presented in Section 10.4.4 of the ES.

For the purposes of assessment, it is considered that the 'worst case' displacement will result from the decommissioning process being undertaken in a number of phases so that at any time as much as two thirds of the Gwynt y Môr project area may be closed to fishing activity. While this represents a significant proportion of the total project area, it is a small fraction of the total fishing grounds of Liverpool Bay (estimated at circa 1.7%).

For the small, locally-based commercial and recreational fishing vessels that fish across and around the Gwynt Môr project area from spring to autumn, there may be a greater effect and this is considered to be of **Moderate** significance for these vessels. Application of the mitigation set out below will act to reduce the significance of this effect to a residual level of **Low to Moderate**. It should be noted that any such effects during the decommissioning phase is not sensitive to the final layout of the wind farm or the construction methods employed. All such effects are ultimately temporary in nature and reversible.

Mitigation: The area affected by the active decommissioning works will be kept as small as is practically possible without increasing risks to those within, or operating around, the project area. In addition, there will also be regular, direct VHF radio communication with any fishing vessels that are seen to be approaching or are working in proximity to the site and effective liaison with local fleets through the appointment of a Fisheries Liaison Officer (FLO) and a Fisheries Liaison Representative (FLR) and through the regular issuing of notice to mariners (NTMs). Local fishermen will be involved as closely as possible in the temporal and spatial planning of all decommissioning works.

#### ***Potential effect 38: Vessels engaged in the decommissioning of Gwynt y Môr could disrupt established fishing patterns***

Numerous vessels will be required for the decommissioning of the Gwynt y Môr Offshore Wind Farm. These will be moving within the established safety zones but also to and from the main construction port throughout the decommissioning period. At the time of writing, the port had not yet been selected but those considered suitable for decommissioning activities include Mostyn, Holyhead, Heysham, Liverpool and Barrow. The movements of these vessels have the potential to disturb established fishing activity for both towed gear and static gear fisheries.

The potential effects on the larger, offshore fishing vessels that operate predominantly to the north of Gwynt y Môr are considered to be of **Low** significance. For the locally based set netters the potential effect is considered to be of **Moderate** significance specifically for the main offshore set net season during the summer months. However, the mitigation set out below is considered to reduce the potential effect on the North Wales netting vessels to a **Low** residual significance.

Mitigation: An effective protocol for issuing 'Notice to Mariners' informing all maritime operators in Liverpool Bay of decommissioning vessel movements will be established, providing information on schedules of movements where possible. In addition, routine radio liaison will be established and maintained with the locally-based, inshore commercial and recreational fishing sectors, particularly during cable-laying operations. An FLO and FLR will be appointed for the Gwynt y Môr decommissioning phases and will be responsible for the effective liaison with all fishing fleets. Consideration will also be given to appointing representatives from the local fishing communities to act as liaison officers on the main decommissioning vessels.

Once the main decommissioning ports have been selected, a traffic management meeting will be held with the fishing industry before work begins. A traffic management plan will be developed and will seek to recognise the (seasonal) importance of particular fishing areas and will seek to route traffic away from such areas. The agreed routes will form part of the Gwynt y Môr SEMP and all decommissioning vessel skippers and crew will be fully trained in their use and importance, as well as in the routine liaison and communication with fishing vessels.

***Potential effect 39: Decommissioning of the export cables could affect existing patterns of fishing activity***

While the recovery of the main export cables is underway fishing activity would be effectively excluded from the area affected (although the export cable route will not be covered by a safety zone under the provision of the Energy Act 2004 as will be the case for the main project area). The removal of the export cables will be a constantly moving process so that any such effective exclusion is expected to be spatially limited. Removal of these export cables (if removed) is also expected to be relatively rapid. Access would subsequently be restored following recovery works and as the cable vessel proceeds along the cable route.

The slow moving nature and predictable track of the cable laying or recovery vessel tends to mitigate the significance of the potential effect on fishing. Nevertheless, while towed-gear fishing can respond to the position of the cable vessel as it progresses, static gear fishermen would need to keep clear of the recovery operations. Thus, static-gear fishermen working between the Gwynt y Môr project area and the shore may need to amend normal practice to accommodate the export cable recovery phases. Nonetheless, this effect, given the small area affected and the relatively short period required is considered to be of **Low** significance.

Mitigation: The process of early and effective communication and liaison with the local fishing fleets that operate within the area of the export cable route corridor will be act to mitigate any effects particularly for the local set netters.

Details of the cable tracks and intended schedule of operations will be made known through 'Notice to Mariners' and the Kingfisher Information Service, as well as to individual vessel operators known to work in the area.

***Potential effect 40: Noise generated during the decommissioning phase could affect the behaviour and distribution of fish thereby affecting catch rates***

Given the presence of a safety zone around the decommissioning activity which will already act to exclude fishing activity, additional effects on fishermen, particularly the locally based netting vessels is considered to be of **Negligible** significance. It should be noted that during the construction of the North Hoyle wind farm (using piling), two locally based netters continued to fish within 2–3 miles of the construction site without apparent adverse effects on catch rates (pers. comm. CFCM).

***Potential effect 41: The Gwynt y Môr decommissioning process could result in debris or spoil on the seabed rendering established grounds unsuitable for fishing***

During the course of decommissioning a variety of material and equipment will be transferred between vessels and from vessels to the offshore structures. It is possible that some of this material and equipment could be dropped or break free and could fall to the seabed. In addition, the removal of foundations or cables may give rise to spoil, debris or disturbed boulders on the seabed. Any such debris or spoil could subsequently cause damage to fishing gear or even prevent some types of fishing (for example towed gears or nets) in those areas affected.

The safety zone that will be in place for the main project area during the decommissioning phase will mitigate the significance of any such potential effects on fishing activity. However, following completion of the decommissioning phase, the safety zone would be lifted and fishing could theoretically re-commence within the project area.

Mitigation and monitoring: Following decommissioning operations in the project area, a detailed seabed survey using acoustic survey techniques such as side scan sonar or swath bathymetry will be used to identify any significant objects or accumulations of spoil at the seabed which might pose a risk to fishing. Where identified, these will be recovered or spoil will be levelled. This process will also cover the export cable route. Local fishermen will be involved in this process.

The position of any equipment lost on route to or from the project area will also be logged at the time of the loss and its position made known to the fishing industry through 'Notice to Mariners' and liaison with fishing industry representatives. At the earliest opportunity the area will be surveyed to pinpoint the position of debris and all reasonable efforts made to recover it.

***Potential effect 42: The decommissioning of the Gwynt y Môr Offshore Wind Farm structures will entail the loss of artificial reef features with potential effects on associated fish and shellfish populations and catch rates***

The decommissioning of the Gwynt y Môr Offshore Wind Farm will tend to reverse the trends described in relation to the artificial reef effect, tending to remove the opportunities for any potting fishery that may develop but also tending to reverse any effects on set net or towed gear fisheries. This would have a positive effect for these fisheries, but an obvious negative and potentially significant effect on any potting fishery that has developed and also a potentially significant effect on recreational angling.

#### Potential effects on oil and gas production

The nearest oil and gas extraction activity to Gwynt y Môr, within Liverpool Bay, is undertaken by BHP Billiton who operate a number of offshore installations and a connecting gas pipeline that runs through the Gwynt y Môr project area.

A number of potential impacts on the BHP Billiton Liverpool Bay assets and operations could arise as a result of the decommissioning of Gwynt y Môr. These are summarised as follows:

- potential effects on the gas pipelines: maintenance of access to the connecting gas pipeline and the crossing of the pipeline by the Gwynt y Môr cables
- potential increased collision risk: the effect of the Gwynt y Môr project on navigation routes passing the Douglas platform and the increased risk of collision
- potential impacts on oil spill contingency planning: effects on the current BHP oil spill contingency planning
- potential effects on the overall BHP Billiton safety case: the effect of the BHP safety case in relation to regulatory requirements.

#### Potential effects on the gas pipeline

npower renewables has agreed with BHP Billiton that no structures will be built within 500 metres of the gas pipeline, ensuring the integrity of the pipeline and allowing sufficient room for pipeline maintenance activities.

#### Potential effect on collision risk

The shipping and navigation assessment has considered, in detail, the potential effects of Gwynt Môr on the movement of shipping along the northern boundary and to the south of the Douglas platform. The assessment has identified a number of scenarios which could lead to an increased risk in terms of vessel to vessel collision or vessel to offshore structure collision. This increased risk has been identified as being potentially significant in relation to the integrity of the Douglas platform.

As a result, the navigational assessment has developed additional mitigation on navigation within the 'choke point' between the northern most Gwynt y Môr turbines and the Douglas platform, most notably in the form of an IMO adopted routing measure. This will seek to separate eastbound and westbound vessels and is considered to thereby reduce the potential collision risk in this area. In addition, an 'Area to be Avoided' will also be developed along the northern boundary of Gwynt y Môr which will seek to discourage vessels emerging from the northern edge of the wind farm. These mitigation measures will act to avoid vessels within the busy shipping lanes needing to take evasive action thereby reducing the associated collision risk. It is considered that, with this additional mitigation the collision risk to the north of Gwynt y Môr will not be significant and may, in fact, be reduced from its current level, thereby increasing the safety of the Douglas platform.

#### Potential effects on dredging and spoil disposal

The potential impacts on dredging and spoil disposal activities within the vicinity of the Gwynt y Môr project area are discussed in the following section. Potential effects on the navigation of vessels engaged in spoil disposal have been considered separately under Section 10.4.4 of the ES.

***Potential effect 43: The decommissioning of Gwynt y Môr could affect licensed dredging and spoil disposal operations in Liverpool Bay***

Following consideration of existing dredging and spoil disposal sites it has been determined that there are no routine dredging or disposal sites located within or immediately adjacent to the Gwynt y Môr project area. The nearest such site is some 8 km to the north-northeast.

The navigational assessment has concluded that there will be no adverse effect on the operation of vessels engaged in spoil disposal. The physical processes assessment has indicated that there will be no direct or indirect effects on the spoil grounds as a result of the Gwynt y Môr construction activities.

It is, therefore, concluded that there will be **No Impact** on these existing activities.

Potential effects on cables and pipelines

The protection of any existing cables and pipelines is an essential duty placed on any offshore wind farm developer. Significant direct or indirect impacts on existing sub-sea cables or pipelines have the potential to result in environmental damage, health and safety concerns and economic loss.

***Potential effect 44: The decommissioning of Gwynt y Môr could directly or indirectly affect existing sub-sea cables or pipelines***

A review of the existing sub-sea cables and pipelines in Liverpool Bay has identified only a single pipeline within the Gwynt y Môr project area. This is the gas export pipeline running between the Douglas platform and the Point of Ayr gas processing plant.

Careful consideration will need to be given to the removal of the cables at the decommissioning stage.

Potential effects on maritime archaeology and cultural heritage

- Monitoring of potential effects on the archaeological resource

power renewables, Cadw, Denbighshire County Council Archaeologist and the archaeological officer from the Gwynedd Archaeological Trust (who advises Conwy Borough) will be identified as the monitoring authorities and they will monitor the impact of any mitigation strategies implemented in the offshore environment.

The monitors will also agree a measure of the efficiency in avoiding, reducing or remedying the impacts. Where necessary this measure could highlight any problem areas and ways in which the measures can be made more effective. In addition, when undertaking any monitoring of impacts on sensitive sites there will be performance indicators agreed between the parties against which the efficacy of the mitigation strategies can be gauged. Furthermore an appropriate time-frame for the monitoring programme will be developed, particularly as some deliverables arising from the mitigation actions may have a long-term life-span.

Ultimately, the long-term maintenance and possible replacement of certain components of and eventual decommissioning of Gwynt y Môr will need to be monitored and the appropriate mitigatory response adopted.

#### Potential noise effects

#### ***Potential effect 45: The decommissioning of the offshore components of Gwynt y Môr could result in noise impacts at the adjacent coastlines***

It is considered likely that noise arising from the decommissioning of the wind farm will be much less than during the construction phase and the noise generated by this phase is therefore considered to be of **Low** significance.

Mitigation: None currently proposed, although it is acknowledged that some further consideration to potential noise impacts may be appropriate closer to the time of decommissioning.

#### Potential seascape and visual impacts

##### - Visual impacts during construction and decommissioning

Decommissioning activities are predicted to have very similar visual impacts to construction. Turbine dismantling will be undertaken from jackup barges/platforms. In addition to the diminishing visual impacts of the array, the principal visual impacts will be increased shipping activity.

For most receptors gazing out to sea, the decommissioning activities and additional associated shipping will be a source of interest. It is considered unlikely that many will take exception to this activity and therefore, particularly in the context of a busy, developed hinterland, it will have a neutral or slight to moderate beneficial visual impact.

## 16. Appendix B: Summary of consultation responses

**From:** NavigationDirectorate[mailto:Navigation.Director@thls.org]

**Sent:** 11 March 2010 09:20

**To:** Couzens, Gemma

**Cc:** [offshore.renewables@decc.gsi.gov.uk](mailto:offshore.renewables@decc.gsi.gov.uk)

**Subject:** Gwynt y Mor Offshore Wind Farm Decommissioning Programme

Your ref: GyM DP

Our ref OWF/WC/10

Dear Gemma

**Gwynt y Mor Offshore Wind Farm Decommissioning Programme.**

I write in response to your letter of 26 February, enclosing the draft decommissioning programme for the Gwynt y Mor Offshore Wind Farm for comment.

I can advise that Trinity House concurs with the general approach to be taken by Gwynt Y Mor Offshore Wind Limited and the proposals summarised in the Executive Summary (Section 2) of the draft decommissioning programme. It is however our view that if the piled foundations of structures in the wind farm are not completely removed they should be cleared to at least one metre below seabed level to endeavour to guard against them becoming a future danger to navigation. We also believe that there should be a clear commitment in the decommissioning programme to provide & maintain appropriate marking by marine aids to navigation of any obstruction which remains after decommissioning, which at that time is considered to be a danger to navigation, until such time as the obstruction is removed or no longer considered to be a danger to navigation.

Regards

John Cannon

Navigation Services Officer

Trinity House.



# Cyngor Cefn Gwlad Cymru Countryside Council for Wales

CADEIRYDD/CHAIRMAN: JOHN LLOYD JONES OBE PRIF WEITHREDWR/CHIEF EXECUTIVE: ROGER THOMAS

Gofynwch eich ateb at/Please reply to: Mannon Lewis  
Ffôn/Tel: 01248 672500  
Ffacs/Fax: 01248 679259  
Ebostr/Email:

Rhanbarth y Gogledd/North Region  
Llys y Bont  
Parc Menai  
BANGOR  
Gwynedd LL57 4BN

Gemma Couzens,  
Offshore Renewables Officer,  
Aucland House,  
Lydiard Fields Business Park,  
Great Western Way,  
Wiltshire  
SN5 8ZT

Ein cyf/Our ref: CN1353026/ML/SH99  
Eich cyf/Your ref:

25/3/2010

## **GWYNT Y MÔR OFFSHORE WIND FARM LTD DECOMMISSIONING STRATEGY DRAFT FOR CONSULTATION FEBRUARY 2010**

Thank you for your consultation dated 26 February regarding the above.

In discharging its functions under section 130 of the Environmental Protection Act 1990, the Countryside Council for Wales champions the environment and landscapes of Wales and its coastal waters as sources of natural and cultural riches, as a foundation for economic and social activity, and as a place for leisure and learning opportunities. We aim to make the environment a valued part of everyone's life in Wales.

Please note that our comments are without prejudice to any comments we may wish to make when consulted on any subsequent drafts of the strategy or on the final document. At the time of any new consultation there may be new information available which we will need to take into account in making a formal response.

CCW's current stance on decommissioning is that all disused installations should be completely removed from site. We note that the report generally supports this ethos in all but the removal of scour protection material and sub sea cables. CCW believe that the strategy should commit to the principle of removing all scour protection material from site.

Please get in touch should you wish to discuss any of the points raised in this letter.

Yours sincerely

**Mannon Lewis**  
Casework Team Leader



*Gofalu am natur Cymru - ar y tir ac yn y môr • Caring for our natural heritage - on land and in the sea*

Prif Swyddfa/Headquarters

MAES-Y-FFYNNON, PENRHOSGARNEDD, BANGOR LL57 2DW FFÔN/TEL: 01248 385500 FFACS/FAX: 01248 355782

<http://www.ccw.gov.uk>





Maritime and Coastguard Agency

Navigation Safety Branch  
Bay 2/04  
Spring Place  
105 Commercial Road  
Southampton  
SO15 1EG

Gemma Couzens  
Offshore Renewables Developer  
RWE npower renewables  
Gwynt y Mor Offshore Wind Farm Limited  
Auckland House, Lydiard Fields Business Park  
Great Western Way, Swindon  
Wiltshire SN5 8ZT

Tel: +44 (0)23 8032 9523  
Fax: +44 (0)23 8032 9204  
E-mail: Paul.Townsend@mcga.gov.uk

Your ref: GyM DP  
Our ref: MNA 053/010/0356

26 March 2010

Dear Gemma

### **GWYNT Y MOR OFFSHORE WIND FARM DECOMMISSIONING PROGRAMME**

Thank you for your letter dated 26 February regarding the draft Decommissioning Strategy for Gwynt Y Mor Offshore Wind Farm. The draft programme has been carefully considered by Navigation Safety Branch and, on this occasion, would recommend the following is taken into consideration in the final document:

#### Section 3.1.2.7 Other offshore wind farms (Page 17)

It may be appropriate to remove the Shell Flats Round 1 OWF from the chartlet (Fig 12).

#### Section 3.1.3 Nature Conservation (Page 18)

It may be appropriate to include any Marine Environment High Risk Areas (MEHRAS) in this section. Further information on MEHRAs can be found on MCA's website [www.mcga.gov.uk](http://www.mcga.gov.uk) under 'Ships and Cargoes' and 'Environment'.

We are content with the Decommissioning Programme, on the understanding that DECC are satisfied with the sections not included in the draft document:

Section 8 – Costs;  
Section 9 - Financial Security elements; and  
Section 11 - Project management and verification elements.

We particularly welcome the consideration of the potential impacts on shipping and navigation (including navigation systems) in Appendix A.

Yours sincerely

Captain Paul Townsend  
Navigation Safety Manager



An executive agency of the  
Department for  
**Transport**



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Gemma Couzens  
Gwynt y Mor Offshore Wind Farm Limited  
Auckland House  
Lydiard Fields Business Park  
Great Western Way  
Swindon  
Wiltshire SN5 8ZT

RYA House  
Ensign Way, Hamble  
Southampton SO31 4YA  
United Kingdom

Tel +44 (0) 23 8060 4100  
Fax +44 (0) 23 8060 4299  
[www.rya.org.uk](http://www.rya.org.uk)

25<sup>th</sup> March 2010

Dear Gemma,

**RE: GWYNT Y MOR OFFSHORE WIND FARM DECOMMISSIONING PROGRAMME**

Thank you for giving the RYA the opportunity to comment on the draft decommissioning plan for the Gwynt y Mor Offshore Wind Farm. I have read the document and am generally supportive of your proposals.

Of greatest interest to the RYA is the principle of ensuring the rights and needs of legitimate users of the sea as well as the principle of no harm to people. The RYA therefore support the comments in section 5.2 of the plan which states 'For piled foundations it is envisaged that the foundation pile would be cut at or just below the seabed'. By removing the structure to a depth at or below seabed should ensure there is no residual hazard to navigation. However, it should be recognised that the seabed is a mobile environment and there may be some locations, particularly in the shallower waters, where the structures should be removed to a depth below the existing seabed to ensure that no future hazard to navigation remains.

The plan makes it clear that the final selection of the foundation options for the turbines to be installed at Gwynt y Môr is yet to be finalised. It is mentioned within section 5.2 of the document that if either 'gravity bases' or 'suction caissons' are the chosen turbine foundation, the bases could be left in place following decommissioning. One of the RYA's major concerns with the decommissioning of offshore wind farms is that remnant structures are left in situ, possibly due to the marine life that will accumulate over the 25 year life span of the installation. However, it is likely such remnants could become a hazard to navigation and may not be managed to the same extent they are when the wind farm is under operation. The RYA therefore supports the comment in section 11 which states that '...some post decommissioning monitoring and management are likely to be required in order to identify and mitigate any unexpected risks to navigation or other users of the sea which may be posed by the remaining materials.', and would be interested to see the 'post decommissioning monitoring and maintenance plan' in the future.

We are encouraged to see in section 9 of the report that the removal of the structures will be followed by extensive surveys ensuring any structures or materials left on the sea bed do not pose a hazard to navigation. The RYA is pleased to see that 'these surveys will seek to identify any debris which may have arisen from the decommissioning activities and may pose a risk to navigation and other users of the sea or the marine environment. Where such items are identified, appropriate remedial action will be taken to ensure the safety of other sea users.'

The RYA also supports the paragraph in section 11 which states 'In the event of protrusion of a decommissioned element above seabed level, or in the event that scour protection materials are left on site following decommissioning, the UK Hydrographic Office will be notified so that suitable notation of a potential anchoring hazard can be marked on relevant charts and mariners informed accordingly.' This should include any cabling or below bed structures that may become uncovered by shifting seabed material.

Should you have any further questions please do not hesitate to contact me.

Yours sincerely,

A handwritten signature in black ink that reads "Emma Stewart". The signature is written in a cursive style with a period at the end.

Emma Stewart  
RYA Planning and Environmental Officer

**From:** Saurabh Sachdeva [mailto:Saurabh.Sachdeva@british-shipping.org]  
**Sent:** 21 December 2010 16:39  
**To:** Lilly Robert (Energy Development)  
**Subject:** CoS response to Decommissioning plan for the Gwynt y Mor offshore wind farm:  
Comments requested by 29 November

Dear Robert,

Apologies for late submission as I was away on leave for the last few weeks.

I have reviewed the attached document and would like to express our concern regarding the 'Area to be Avoided' being used as a mitigation option during decommissioning phase.

*"As a result, the navigational assessment has developed additional mitigation on navigation within the 'choke point' between the northern most Gwynt y Môr turbines and the Douglas platform, most notably in the form of an IMO adopted routing measure. This will seek to separate eastbound and westbound vessels and is considered to thereby reduce the potential collision risk in this area. In addition, an 'Area to be Avoided' will also be developed along the northern boundary of Gwynt y Môr which will seek to discourage vessels emerging from the northern edge of the wind farm. These mitigation measures will act to avoid vessels within the busy shipping lanes needing to take evasive action thereby reducing the associated collision risk. It is considered that, with this additional mitigation the collision risk to the north of Gwynt y Môr will not be significant and may, in fact, be reduced from its current level, thereby increasing the safety of the Douglas platform."*

We feel that decommissioning of the site should be done in a manner that would ensure that commercial operations and routing is not disadvantaged and they should have a stand-by vessel to warn other ships of their ongoing activities. We would not support any measures that would lead to designate an area around the wind farm to be ATBA.

Other than that we have no additional comments and other measures are broadly in line with the decommissioning procedures.

Hope you have a nice Christmas and a very Happy New Year.

Best regards,

Saurabh  
Saurabh Sachdeva FICS, MNI  
Master Mariner

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Manager- Nautical, Renewables & Towage  
The Chamber of Shipping  
12, Carthusian Street  
London  
EC1M 6EZ  
Tel: +44 (020) 7417 2828

**From:** Navigation Directorate [mailto:Navigation.Directorate@thls.org]  
**Sent:** 12 November 2010 12:01  
**To:** Lilly Robert (Energy Development)  
**Cc:** Paul Townsend  
**Subject:** FW: Decommissioning plan for the Gwynt y Mor offshore wind farm: Comments requested by 29 November

Dear Robert

Thank you for your e-mail of 28.10.10 requesting comments from Trinity House on the draft Decommissioning Strategy for the Gwynt Y Mor Offshore Wind Farm submitted by RWE for DECC approval.

I can confirm that Trinity House was consulted by RWE on an earlier draft of the Strategy and we commented in terms of my e-mail of 11.3.10 which has been reproduced at Appendix B of the current document. It was our view that if the piled foundations of structures in the wind farm were not completely removed then they should be cleared to at least one metre below seabed level. The proposal now in the strategy document is to cut the piled foundations at or below seabed level and remove to a depth so that they will not be uncovered in the future, which would satisfactory meet our requirements (providing the post-decommissioning surveys proposed remain in place).

We also commented that there would be a need for a clear commitment from the developer to provide and maintain marking of any obstruction which was attributable to the wind farm activities and which remained on site after the decommissioning had been completed and was considered at the time to be a danger to navigation. Such marking will need to be maintained until either the obstruction was removed or until it was no longer considered to be a danger to navigation. We are not convinced that this has been recognised in the decommissioning strategy, where there is a presumption that everything will either be successfully removed or satisfactorily buried beneath the seabed. Whilst we really hope that this will be the case, our concern is that if it is not actually possible (or economic) at the time to remove the structure, it may need marking as a danger to navigation and the cost and responsibility for doing so should not fall on the General Lighthouse Fund (from which we are resourced).

Regards

John Cannon  
Navigation Services Officer  
Trinity House.



# Cyngor Cefn Gwlad Cymru Countryside Council for Wales

CADEIRYDD/CHAIRMAN: MORGAN PARRY

Anfonwch eich ateb at/Please reply to:

Delyth Rowlands  
Ffôn/Tel: 01248 672500  
Ffacs/Fax: 01248 679259  
E-bost/Email: d.rowlands@ccw.gov.uk

PRIF WEITHREDWR/CHIEF EXECUTIVE: ROGER THOMAS

Rhanbarth y Gogledd / North Region  
Llys y Bont  
Ffordd y Parc  
Parc Menai  
BANGOR  
LL57 4BN

Mr Robert Lilly  
Development Consents & Planning Reform  
Energy Development Unit  
Department of Energy and Climate Change  
Area A, 3<sup>rd</sup> Floor  
3 Whitehall Place  
London  
SW1A 2AW

30<sup>th</sup> November 2010

Dear Mr Lilly,

## DECOMMISSIONING STRATEGY FOR THE GWYNT Y MÔR OFFSHORE WINDFARM

Thank you for your email dated 27<sup>th</sup> October 2010 requesting CCW's comments on the decommissioning strategy for the Gwynt y Môr offshore wind farm (Document ref: GMOL-GM16-1603-EN-001019119-01).

In discharging its functions under section 130 of the Environmental Protection Act 1990, the Countryside Council for Wales champions the environment and landscapes of Wales and its coastal waters as sources of natural and cultural riches, as a foundation for economic and social activity, and as a place for leisure and learning opportunities. We aim to make the environment a valued part of everyone's life in Wales.

Please note that our comments are without prejudice to any comments we may wish to make when consulted on any subsequent drafts of the strategy or on the final document. At the time of any new consultation there may be new information available which we will need to take into account in making a formal response.

CCW's current stance on decommissioning is that all disused installations should be completely removed from the site. We note that the strategy generally supports this ethos in all but the removal of scour protection material and sub sea cables. CCW believe that the strategy should commit to the possibility of removal of all scour protection and that the developer should make appropriate plans / financial arrangements for this to be part of the overall decommissioning programme. This should be on the understanding that scour protection removal may not necessarily be deemed the best course of action following a final review of the decommissioning programme prior to its implementation, and the results of any impact assessments carried out in consultation with the relevant statutory authorities.

Please do not hesitate to contact me should you require any further advice or clarification.

Yours sincerely

**Delyth Rowlands**  
**Marine Casework Officer**  
**North Region Casework Team**



*Gofalu am natur Cymru - ar y tir ac yn y môr • Caring for our natural heritage - on land and in the sea*

Prif Swyddfa/Headquarters

MAES-Y-FFYNNON, PENRHOSGARNEDD, BANGOR LL57 2DW FFÔN/TEL: 01248 385500 FFACS/FAX:  
01248 355782

<http://www.ccw.gov.uk>