Rampion Offshore Wind Farm

ES Section 19 – Other Marine Users

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E.ON Climate & Renewables UK Rampion Offshore Wind Limited

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19.1 Introduction

19.1.1 This section of the Environmental Statement (ES) presents an assessment of the potential impacts that may arise from construction, operation and decommissioning of the proposed Rampion Offshore Wind Farm (the Project) on the other human users of the marine and intertidal environment, not already covered in other Sections. The assessment has been made using data gathered from desk-based assessments and consultations.

19.1.2 This section addresses the following topics:

- Assessment methodology;
- An overview of the baseline of other marine users of the area (human users of the marine and intertidal environment in the area);
- An account of potential impacts on these human users, together with discussion of appropriate mitigation; and
- A summary of residual impacts in tabular form.

19.1.3 This assessment includes both the intertidal (landfall) and subtidal (offshore) environments that the Project and its export cable route may impact.

19.2 Scoping and consultation

19.2.1 Consultation has taken place with various statutory and non-statutory consultees regarding the possible impacts from the Project on other marine users. These consultations have informed the ES and associated application documents.

19.2.2 Initial consultation was carried out via the Rampion Offshore Wind Farm Scoping Document (E.ON/RSK, September 2010, see Appendix 5.1), with responses received being presented in the Infrastructure Planning Commission (IPC) Scoping Opinion report (see Appendix 5.2). Further consultation exercises were undertaken in 2011 and 2012 with non-statutory consultees. Most of this engagement has been undertaken via the Sea Users Project Liaison Group.

19.2.3 Engagement has also been undertaken with recreational diving groups, in particular in relation to the installation of a met mast at the Project site in April 2012. A Diving Liaison Officer has been appointed, who will act as a focal point for continued communications with divers on the project. The information and advice received during the scoping process with regard to issues regarding other marine users is summarised in Table 19-1, which also identifies the location in the document where these comments have been addressed.

Table 19-1: Scoping responses relating to other marine users.

Date	Consultee	Summary of issues	Sections where addressed
12/10/2010	Brighton and Hove City Council	The importance of marine aggregates as local source of construction material should be considered.	In the introduction to 19.5.1
11/10/2010	East Sussex County Council	Cumulative impacts should include the displacement of industries such as fishing and aggregate extraction, as well as Marine Conservation Zones (MCZ's)	Discussed in section 19.9
12/10/2010	Marine Management Organisation (MMO)	The British Marine Aggregate Producers Association should be consulted.	Discussed in section 19.5.1
18/10/2010	Maritime and Coastguard Agency	Cumulative should include adjacent dredging licences	Discussed in section 19.9

19.2.4 The scope of the assessment was modified accordingly to take account of the above consultee responses and the opinions of the IPC, the findings of which were reported in the Draft ES and subject to stakeholder consultation.

Formal Pre-application Consultation

19.2.5 As detailed in Section 5 – EIA Methodology, an extensive programme of engagement has been undertaken with regard to the Project, details of which are provided in the Consultation Report for the Project (Document 5.1). This included publication of the Draft ES as part of the Section 42 and Section 48 consultation in June 2012.

19.2.6 Key consultees provided responses to the draft ES on other marine users. These responses, and the modifications subsequently made to the final ES, are summarised as follows:

- Sussex Inshore Fisheries & Conservation Authority (IFCA) noted that the importance and likely impacts on charter boat, diving, and angling (both sea and beach) should be further investigated, along with exploring suitable mitigation options. In response, further baseline information on these sectors was added to this Section and consideration presented in the impacts section. Revised modelling of the potential impacts of piling noise on both humans (e.g. divers) and a range of fish species (some of which, e.g. bass, cod, and black bream, are important targets of recreational angling activity) by expert underwater noise consultants Subacoustech;

- Surfers Against Sewage (SAS, also representing other surf-based watersports) raised significant concern regarding the potential direct (i.e. reduction in wave height) and indirect (e.g. loss of local business from surfers) impacts that were reported in the draft ES. These initial impact predictions were the results of hydrographic modelling of a worst-case scenario of gravity based foundations being used for the maximum number of 195 wind turbines under consideration at that time. In response, consultation with SAS has been undertaken, and further modelling work was commissioned based on refined and more realistic worst case design estimates of turbine foundation types that could be used in different locations within the Project Site. Predicted impacts of this scenario were considerably less than those in the draft ES. Further details on the potential impacts to wave heights can be found in Section 6 – Physical Processes.

19.3 Legislation and Policy Context

National Policy Statements (NPS)

19.3.1 The assessment of potential impacts upon other human activities has been made with reference to the relevant National Policy Statements (NPS). Paragraph 2.6.35 of EN-3 states that:

"there may be constraints imposed on the siting or design of offshore wind farms because of restrictions resulting from the presence of other offshore infrastructure or activities." Paragraph 2.6.179 states that "*where a potential offshore wind farm is proposed close to existing operational offshore infrastructure, or has the potential to affect activities for which a licence has been issued by Government, the applicant should undertake an assessment of the potential effect of the proposed development on such existing or permitted infrastructure or activities*."

19.3.2 Paragraph 2.6.180 states that "*applicants should engage with interested parties in the potentially affected offshore sectors early in the development phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application to the IPC [now Secretary of State]*."

19.3.3 The UK is a signatory to various international treaties and conventions including the United Nations Convention on the Law of the Sea (UNCLOS) 1982, and the Convention for the Protection of Submarine Telegraph Cables (1884). These agreements include the following text that is of relevance to the Project.

UNCLOS - ***Article 79 continental shelf areas***

Submarine cables and pipelines on the continental shelf

1. All States are entitled to lay submarine cables and pipelines on the continental shelf, in accordance with the provisions of this article.

2. Subject to its right to take reasonable measures for the exploration of the continental shelf, the exploitation of its natural resources and the prevention, reduction and control of pollution from pipelines, the coastal State may not impede the laying or maintenance of such cables or pipelines.

3. The delineation of the course for the laying of such pipelines on the continental shelf is subject to the consent of the coastal State.

4. Nothing in this Part affects the right of the coastal State to establish conditions for cables or pipelines entering its territory or territorial sea, or its jurisdiction over cables and pipelines constructed or used in connection with the exploration of its continental shelf or exploitation of its resources or the operations of artificial islands, installations and structures under its jurisdiction.

5. When laying submarine cables or pipelines, States shall have due regard to cables or pipelines already in position. In particular, possibilities of repairing existing cables or pipelines shall not be prejudiced.

UNCLOS - ***Article 113 high sea areas***

Breaking or injury of a submarine cable or pipeline

Every State shall adopt the laws and regulations necessary to provide that the breaking or injury by a ship flying its flag or by a person subject to its jurisdiction of a submarine cable beneath the high seas done wilfully or through culpable negligence, in such a manner as to be liable to interrupt or obstruct telegraphic or telephonic communications, and similarly the breaking or injury of a submarine pipeline or high-voltage power cable, shall be a punishable offence. This provision shall apply also to conduct calculated or likely to result in such breaking or injury. However, it shall not apply to any break or injury caused by persons who acted merely with the legitimate object of saving their lives or their ships, after having taken all necessary precautions to avoid such break or injury.

Breaking or injury by owners of a submarine cable or pipeline of another submarine cable or pipeline

Every State shall adopt the laws and regulations necessary to provide that, if persons subject to its jurisdiction who are the owners of a submarine cable or pipeline beneath the high seas, in laying or repairing that cable or pipeline, cause a break in or injury to another cable or pipeline, they shall bear the cost of the repairs.

Convention for the Protection of Submarine Telegraph Cables (1884)

The breaking or injury of a submarine cable, done wilfully or through culpable negligence, and resulting in the total or partial interruption or embarrassment of telegraphic communications, shall be a punishable offence, but the punishment inflicted shall be no bar to a civil action for damages.

19.3.4 Should the offshore wind farm or associated export cable cross any established seabed infrastructure (telecommunication / electricity cables and pipelines), crossing agreements between E.ON and the operator of the seabed infrastructure may be required. These crossing agreements will be put in place in advance of the installation of the wind farm and export cable. No requirements for crossing agreements have been established during the consultation to date.

19.4 Assessment Methodology

Establishment of Baseline Environment

19.4.1 Other human uses (not already covered in preceding sections, e.g. Section 18 - Commercial Fisheries and Section 14 – Navigation and Shipping) of the marine and intertidal environment that take place within or near the Project site are considered in this section. Information was collated from a variety of publicly available sources (e.g. EIAs for similar or nearby developments, regional environmental reports, published literature, the internet), and consultation with stakeholders (e.g. industry, recreational users) and government organisations (e.g. Cefas).

19.4.2 In order to identify the location of the most popular sites for diving (n.b. potentially including snorkelling and spearfishing) and/or recreational fishing sites, Automatic Identification System (AIS) vessel-tracking data from registered dive vessels was mapped against known seabed features identified from the ES. These features included wrecks and natural features of interest, such as reefs and/or Marine Sites of Nature Conservation Interest. The AIS data covered the six month period from April to September 2011 inclusive. However, it should be noted that these data only represents vessels that voluntarily carry AIS tracking equipment and will not, for example, represent shore-launched rigid inflatable boats (RIBs) which are unlikely to be equipped with AIS. Also, it only represents vessels that broadcast their activity on AIS as “Engaged in diving operations”. As some diving vessels undertake other activities (such as angling), it is therefore unlikely that all dive trips are captured by the AIS data as these vessels may broadcast their activity simply as ‘Pleasure craft’ (Anatec, pers. comm. 2012).

Assessment of piling noise impacts

Humans underwater

19.4.3 Underwater noise from piling could present a safety hazard to underwater human receptors (i.e. divers and snorkelers, including spearfishers) if not controlled effectively. Sussex and the South Coast in general have a very high level of recreational diving activity and spearfishing compared with other areas in the UK where piling of foundations for offshore wind farms has previously been carried out.

19.4.4 Ensuring the safe construction and operation of a project is of paramount importance to E.ON, not only in meeting its duties under the Health & Safety At Work Act, Construction Design & Management (CDM) Regulations and other legislation, but is a fundamental value of the company to provide a duty of care to others who may be affected by its activities.

19.4.5 In order to understand the potential impacts of subsea noise from piling operations on humans underwater, Subacoustech Environmental Ltd. were commissioned to undertake a study. This study used their proprietary sub-sea acoustic modelling software package (INSPIRE), which calculates contours that show the approximate limits of the impact of underwater sound caused by an underwater noise. A summary of the study is presented in this Section. Details of methodology and results can be found in Appendix 8.6.

19.4.6 The underwater noise modelling assessment was carried out for two locations within the Project Site (East and West), as indicated in Appendix 8.6. At each location three scenarios were modelled; for tripod, jacket and monopiles; the details and assumptions for each are shown in Table 19-2.

Table 19-2: **Scenarios modelled in the underwater noise assessment**

	Scenario A – pin pile foundations	**Scenario B – pin pile foundations**	**Scenario C – monopile foundation**
Number and diameter of piles	4 x 1.53m	4 x 2.6m	1 x 6.5m
Maximum hammer blow energy	600kJ	900kJ	1500kJ
Number of piles installed in a 24 hour period	3	3	1

Scenario B (2.6m diameter piles) relates to either a tripod foundation (3 piles) to support a 3-4MW turbine, or piles for a jacket foundation (4 piles) to support a 5-7MW turbine.

19.4.7 The effects of waterborne noise on humans have not been widely investigated, with most research and analysis having been conducted for the military sector. However, where there has been a great deal of attention given to exposure of humans to noise in air then the possibility of waterborne noise exposure should be taken into consideration. In the case of potential impacts due to piling for the installation of offshore wind turbines located in the vicinity of popular diving sites, the potential risk of adverse effects exists.

19.4.8 The effects of exposure of humans to underwater impulsive sound depends on the level of exposure, and may be divided into three categories – primary (life-threatening physical injury, or fatality); secondary (non-life threatening physical injury, in particular auditory damage); and tertiary (injury or death from behavioural effects, such as becoming startled from noise and sustaining injury indirectly, such as rapid surfacing without appropriate decompression).

19.4.9 In addition, there are different approaches to assessing the impact of noise. One method is based upon the subject receiving a cumulative noise 'dose' which, were it to occur over a prolonged period, would eventually lead to noise induced hearing loss. The second is based upon the effects of exposure to a single loud event.

19.4.10 The only statutory guidelines available are the Control of Noise at Work Regulations (CoNaWR) which define action levels in terms of 8 hour exposure (in air). In this context a person would reach the 2nd action level (where mitigating action is mandatory) after being subjected to a dose of 85dB(UW) over 8 hours (equivalent to 97dB(UW) over 30 minutes). It could be expected that an individual regularly receiving a daily nose dose in excess of this level would eventually suffer permanent hearing damage. However it should be noted that the guidelines and limits are written in the context of an employee receiving this dose every working day. A one-off or even weekly dose of 97dB(UW) over 30 minutes is highly unlikely to cause permanent damage as the time between exposures will allow the hearing to recover (assuming the individual is not exposed to very high noise levels from other sources).

19.4.11 In terms of the effects of a single loud event, the CoNaWR peak limit of 137dB(C) (2nd action level) is a less useful reference as the criteria is primarily concerned with the onset of auditory injury from a single loud event. However, in the context of diving the effect of startle is more relevant as this may lead to tertiary injury as a result of the diver panicking and surfacing too quickly or losing control of their breathing or apparatus. In this instance Nedwell (Subacoustech Report ref. E356R0105) has proposed 110dB(UW) as the level of a single event that may evoke a significant startle response.

19.4.12 It is difficult to definitively quantify the levels of exposure to underwater sound and the effects it can have on humans, however, based on the above paragraphs and a number of underwater studies (see Appendix 8.6), as well as referring back to the levels of exposure defined for airborne noise, the following source levels and durations of exposure have been used in the noise modelling to characterise the main levels of injury. It should also be noted that the potential impacts of noise on humans underwater is an area of ongoing scientific research.

19.4.13 The model for the assessment of noise impacts on humans underwater used two criteria; **dB underwater levels (UW)**, and **unweighted lethal and physical injury effect levels**.

19.4.14 It should be stated at the outset that the potential worst case scenario (fatal traumatic shock) from piling at very close proximity is treated with utmost caution and it is ensured that this risk is 'designed out' of any piling operation by imposing strict exclusion zones which extend significantly beyond this zone of risk.

19.4.15 For **dB (UW)**, three levels of noise contour are plotted (Figure 19.4 and Appendix 8.6):

- 130dB (UW): this represents the level above which it is assumed permanent hearing damage to humans could occur from a single exposure;

- 110dB (UW): this is likely to represent an unpleasant level of noise to humans, which may trigger a 'startle' reaction; and

- 90dB (UW): a level of 90dB(A) in air is judged to be 'very loud', and therefore a level of 90 dB(UW) peak level probably forms a suitable criterion (until better information becomes available) for a level of noise above which strong avoidance (startle) reactions may occur.

19.4.16 For unweighted effects levels Parvin *et al.* (2007) present a comprehensive review of information on physical impacts (potentially lethal in direct proximity to piling) on marine species (including humans underwater) for underwater noise and proposes the following criteria, both of which were used in the noise modelling assessment:

- Lethal effect may occur where peak-to-peak noise levels exceed **240**dB re 1µPa; and

- Physical injury (such as rupturing of gas-containing structures) may occur where peak-to-peak noise levels exceed **220**dB re 1µPa.

19.4.17 It is worth re-iterating that these extreme scenarios from piling at very close proximity is treated with utmost caution. This risk will be 'designed out' of any piling operation by imposing strict exclusion zones which extend significantly beyond these zones of risk.

Piling noise and recreational fisheries

19.4.18 Piling noise also has the potential to impact fish, some species of which are of importance as a target of recreational fisheries (by boat anglers, shore anglers and spearfishers). Potential impacts of noise on fish (including e.g. bass, cod and black bream) were modelled by Subacoustech (using the same piling scenarios as for humans underwater), and are described in Section 8 – Fish and Shellfish Ecology. Potential impacts to recreational fisheries are considered in the current Section.

Identification and Assessment of Impacts

19.4.19 Impacts were identified and assessed based on expert judgement. The sensitivity of the receptor was considered as part of the impact assessment (Table 19-3).

Table 19-3: Sensitivity of receptor

Receptor sensitivity	Examples
High	Activities where the safety of humans is dependent on the environmental conditions in which they are undertaken (e.g. diving, spearfishing) Areas which are particularly important due to their support of an activity which has a very limited range or those where activities are restricted to an extremely short period.
Medium	Areas which form part of a much wider area that is used for a similar activity or where the season is not temporally restricted.
Low	Areas which are not used for commercial or recreational activities.

19.4.20 The magnitude of impact was then assessed according the criteria presented in Table 19-4.

Table 19-4: Magnitude of impact

Magnitude	Definitions
Large	Effects where the health and/or safety of humans is compromised Effects on a wide area, where recovery from the impact is likely to take more than 5 years and alternative sources of income/ resource are restricted.
Medium	Short term effects on a wide area, or longer term effects on a smaller area, likely to affect some of the population. Temporary loss or restriction of access to a resource e.g. caused by construction vessels and traffic.
Small	Temporary and localised impacts e.g. temporary diversion of a sailing route.
Negligible	No effect detectable.
Beneficial	Increases in area or temporal availability of areas, which are used for commercial or recreational activity, or improvement in the quality of existing resources.

Significance of Residual Effects

19.4.21 The overall significance of residual impacts was determined by combining sensitivity of the receptor (Table 19-3) and the magnitude of the impact (Table 19-4), as presented in (Table 19-5).

Table 19-5: Significance of Effect

	Sensitivity/Importance		
Magnitude	**High**	**Medium**	**Low**
Large	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Minor
Small	Moderate	Minor	Minor
Negligible	Minor	Negligible	Negligible

19.4.22 An assessment has been made of the significance of residual effects, i.e. those remaining after mitigation.

Uncertainty and Technical Difficulties Encountered

19.4.23 Detailed design of the Project is still progressing; hence the assessment made in this section has been made based on a worst-case scenario in respect of all possible impacts. Accordingly, the actual impact magnitudes, which will occur during the construction, operation and decommissioning of the wind farm and export cable are likely to be much reduced in comparison with those which are described in the impacts section (Section 19.6).

19.4.24 It has been noted above that research on the effects of noise on humans underwater is ongoing.

19.4.25 No other particular difficulties were encountered whilst assessing the impact of the Project on other marine users.

19.5 Baseline Environment

Aggregate extraction

19.5.1 The Owers bank and eastern English Channel represent a significant aggregate extraction resource for the UK aggregate industry, and a local source of construction material. There are a number of extraction areas, both current and planned, located in the vicinity of the Project. These fall into two main clusters:

- Inshore, shallow-water (c. <40 m) areas to the west of the Project site, at least ~10km off the coast of Worthing and Littlehampton. This area is known as the Owers Bank. Details are presented in Table 19-6, with locations shown in Figure 19.1. Of particular relevance to the Project are:

- Pre-application area 499: a strip along the northern border of this area overlaps with a small section in the southwest of the Project Site. It may or may not be included in the final Project Site depending on a decision on whether the aggregates option holder intends to exercise their option or not. The option on this area expires in 2013; and

- Licensed areas 122/1B, 123B and 124/1B; the eastern edge of which lies just outside the western part of the Project site.

19.5.2 In deeper-water areas to the southeast, a cluster of aggregate extraction areas known as the Eastern English Channel area is located approximately 27km offshore between Hastings and Brighton. Within this, the nearest licensed aggregate extraction area to the Project site are Areas 473 1/2, situated approximately 26km to the southeast. The Eastern English Channel also includes Areas 458, 461, 464, 474, 475, and 478 (East Channel Association, 2011). An additional area, Area 477 was an extraction zone under recent consideration that would have been located closer to the Project site, but this application has been dropped (East Channel Association, pers. comm. to RSK, 15 September 2011).

Table 19-6: Details of aggregate extraction in the inshore, Owers Bank area

Licence Area	Operator	Status
123 A–G	CEMEX UK Marine Ltd	Licensed area
435/1-2	Hanson Aggregates	Licensed area
124/1B	Hanson Aggregates	Licensed area
122/1 A–G	Tarmac Marine Dredging	Licensed area
396/1-2	Tarmac Marine Dredging	Licensed area
453	CEMEX UK Marine Ltd	Application area
488	Tarmac Marine Dredging	Application area
499	Hanson Aggregates	Pre-Application area

Marine disposal sites

19.5.3 Designated areas of seabed around the UK coast are licensed marine disposal sites. These sites are often used for the disposal of dredge tailings, dredged material from marinas, ports and access channels, and for the disposal of land derived waste types, such as the historic disposal of treated sewage sludge. Table 19-7 presents details of the disposal sites in the vicinity of the Project site and Figure 19.2 shows their locations.

19.5.4 The sites listed in Table 19-7 are currently active for the disposal of maintenance dredge tailings, with the exception of W1011, which is active as a site for the burial of human remains at sea (Cefas, pers. comm. to RSK, 7th October 2011). Maintenance dredgings are comprised of the material that builds up in ports,

marinas and navigation channels due to natural siltation. These areas are dredged to maintain navigational access and function.

Table 19-7: Details of marine disposal sites

Marine Disposal Area	OSPAR Disposal Site code	Waste Type	Status	Total Quantity disposed in 2010 (in metric tonnes)
Brighton / Rottingdean	WI020	Maintenance dredging	Dredged material from Brighton Marina	24,984
Newhaven	WI010	Maintenance dredging	Dredged material from Newhaven harbour and the Ouse Estuary	282,902
Burial at Sea Site	WI011	Human remains	Disposal of human remains at sea	No data
Shoreham	WI031	Maintenance dredging	Dredged material from Shoreham, Littlehampton and Brighton	57,249

Offshore energy

Oil and gas

19.5.5 The eastern English Channel is not currently important for the exploration and production of hydrocarbons, and there are no licensed developments near the Project site. The nearest developed field (for oil) is in Dorset and includes Wytch farm, one of western Europe's most productive onshore oil fields; this extends under inshore sections of the adjacent seabed (Metoc, 2007).

Offshore wind

19.5.6 Compared to the North Sea and Irish Sea, the English Channel is relatively undeveloped in terms of offshore wind and there are presently no wind farms in the immediate vicinity of the Project site. The closest, located approximately 94km to the west, is the proposed Navitus Bay Wind Park, which is Zone 7 in The Crown Estate's Round 3 Offshore wind Farm licensing programme and is being developed by Eneco and EDF. The total area of Zone 7 is 720.7 km^2, although it is believed that only up to 30% of this will be developed, which may provide around 900 MW capacity. It is understood that construction is anticipated for 2016, with full operational status currently planned for 2019 (The Crown Estate, 2011; EDF/Eneco 2012).

19.5.7 After Navitus Bay Wind Park, the nearest UK offshore wind developments are at least 115km away (direct line distance) in the Thames estuary, and include Kentish Flats (Round 1) London Array (Round 2) and Thanet (Round 2). There are also a number of planned offshore wind farm developments off the Normandy coast of northern France, approximately 120km due south of the Project site,

which represent an initial round of French offshore wind farms to be installed by 2020. These include Le Tréport (750MW), Fécamp (500MW) and Courseulles-Sur-Mer (500MW).

Other renewable energy

19.5.8 There are currently no wave or tidal energy devices in the vicinity of the Project site. However, the Isle of Wight Council has recently secured European funding to finance preparatory works for a proposed Solent Ocean Energy Centre (SOEC) (Anon. 2012; SOEC 2012).

Military activity and munitions

19.5.9 Although the English Channel is a major centre of naval activity with the UK's two largest bases, i.e. Portsmouth and Devonport in the region, no designated military Practice and Exercise Areas (PEXA) overlap the proposed development (Metoc, 2007). The nearest live firing exercise area is on the coast of Dorset at Lulworth Cove, which is used by the Army (Metoc, 2007).

19.5.10 The nearest official munitions dump site to the Project site is for conventional weapons and located off St. Catherine's Point, off the southern tip of the Isle of Wight (Metoc, 2007). The site is known to have been used as a munitions dump during the Second World War. However, it is possible that munitions exist in the development area as a result of poor record-keeping at time of dumping, or associated with wreckage of military ships or aircraft. Dedicated geophysical surveys undertaken of the Project site area and cable route have not uncovered any munitions.

Cables, pipelines, outfalls and groynes

Cables

19.5.11 There are no existing power cables within the Project development area. However, an active telecommunications cable ('UK-France 3') extends southwards from Brighton for around 5 km before running in a SE direction, along the eastern boundary of the Project site, into the English Channel towards Dieppe (Metoc, 2007). Existing and redundant cables and pipelines are shown in Figure 19.2.

19.5.12 Further offshore in the mid-Channel >10 km to the southeast of the Project site is a further active telecommunication cable, the Atlantic Crossing 1 (AC1-B1) (Kingfisher Charts, 2011).

19.5.13 An England-France HVDC interconnector (Interconnexion France-Angleterre, IFA2) cable is planned to connect landfalls in the areas of the Solent and near Caen. It is currently in the feasibility stage and if successful could be operational by 2020.

19.5.14 In addition, there are two out of service communication cables of interest:

- Brighton - Gibraltar telegraph cable, in service from 1930-1942, can be seen in Figure 19.2 as a blue line running in a northeast - southwest direction through the Project site; and

- Cuckmere - Le Havre: one or more cables, possibly owned by Western Union, pass through the eastern section of the Project site.

Pipelines, outfalls and groynes

19.5.15 There are no oil or gas pipelines in the vicinity of the Project site (Metoc, 2007), and there are no known plans for these or carbon capture and storage (CCS) pipelines in the area.

19.5.16 There are three outfall structures in the intertidal/shallow subtidal at the landfall location, details of which are presented in the intertidal survey (Appendix 7.1). These are:

- Emergency overflow sewer outfall (concrete) located just to the west of the cable landfall and lying within the corridor route corridor. The outfall discharges onto the mid shore. The outfall is owned and operated by Southern Water. The location of this short outfall is indicated in Figure 19.2;

- A sewage outfall, carrying treated effluent, and located just to the west of the outfall described above and again lying within the cable route corridor. This outfall runs from the upper shore out to approximately 5 km offshore and is shown on Figure 19.2. The outfall is marked as 'unspecified' on Admiralty charts and is connected to a diffuser in the subtidal. On a low tide the outfall is visible over the length of the intertidal. The outfall is owned and operated by Southern Water and runs in a north-south orientation; and

- Unknown outfall (metal and wood), only the terminal end of which is visible in the mid-shore of the beach.

19.5.17 There are two types of groyne on the upper part of the intertidal environment at the landfall site, running perpendicular to the shoreline: rock groynes constructed of large (ca. 2m diameter) imported boulders, which are interspersed with much smaller wooden groynes.

Recreation

Seaside resort tourism and recreation

19.5.18 The beaches at Worthing and Lancing, in the vicinity of the landfall site, are popular for seaside tourism, particularly during the summer months. Both beaches are traditional beach resorts considered safe for bathing (see Section 19.5.19 below) and are popular destinations for kite-surfers. The beach at Worthing (closest to the proposed cable landfall) has beach huts, cafes, shops and refreshment kiosks. The beach is backed by the seafront esplanade for pedestrians and cyclists, and the main coastal road has numerous guest houses,

small hotels, shops, amusement arcades and self-catering flats and apartments. Worthing Beach has a Victorian pier with cafés, amusements and a nightclub.

Bathing and water quality

19.5.19 To comply with the EU Bathing Waters Directive, the Environment Agency undertakes weekly monitoring of faecal coliforms in seawater at bathing beaches throughout the period May to September and compares them against standards. The two sampling locations that are closest to the landfall are Worthing and Lancing, which in 2010 were deemed 'Excellent' and 'Good' respectively (Environment Agency, 2011). The nearest internationally designated Blue Flag beaches (i.e. conforming to a number of criteria including water quality, environmental education and management, and access) are at Littlehampton and Bognor Regis (Blue Flag, 2012). Sea swimming is popular in the area and Worthing Swimming Club runs an annual competition every summer that has taken place for over 40 years.

Boating

19.5.20 This section only includes small scale inshore recreational boating; the majority of recreational sailing in larger yachts is addressed in Section 14 - Shipping and Navigation. There are a number of inshore sailing clubs and organisations in the Project area operating primarily from Littlehampton, Worthing, Lancing, Shoreham, Hove, Brighton and Newhaven. A number of sailing schools and other training establishments also exist along this stretch of coastline.

19.5.21 The area is popular for dinghy sailing racing (which is undertaken from the various sailing clubs above, as well as independently from beaches and harbours) and during the summer months in particular, windsurfing, jet-skis, water skiing and small recreational motor boats are launched from the beaches along the coast.

19.5.22 The majority of these activities take place well inshore of the Project Site.

Recreational sea angling (including charter boats)

19.5.23 The south coast is a significant area for recreational sea angling largely because the area is close to a large human population; there is a broad diversity of fish species and habitats (or 'marks') and good boat access provided by sheltered moorings (Sussex IFCA, 2012). The shallower waters and many wrecks of the English Channel attract many anglers (Drew Associates, 2004).

19.5.24 Shore angling occurs all along the Sussex coast from piers, marinas and harbour walls throughout the year as well as from beaches, bays and estuaries (Sussex IFCA, 2012). Chichester, Worthing, Brighton, Bognor, Hastings and Eastbourne are popular places for shore angling and Saltdean in particular, is a popular location for bass fishing. Shore angling at the proposed landfall location is likely to take place to some extent, although Lancing beach is not identified as a notable or favoured fishing location (Sussex Sea Fishing, 2011).

19.5.25 Boat angling offshore is targeted by privately owned vessels, numerous angling club boats and charter angling boats (Sussex IFCA, 2012). Offshore, sea angling is popular in an area known as 'Utopia' for tope fishing; 'The Overfalls' (just outside the 6 mile limit) for bass fishing (both of these sites are in the eastern Solent) and a bream nesting area near 'Kingmere' offshore from Littlehampton (Sussex IFCA, 2012).

19.5.26 On the Sussex coast, there are at least 50 charter angling boats which are mostly based at Littlehampton, Brighton and Newhaven (Drew Associates, 2004). However, it is uncertain how many charter boats actually target areas within the project area. At least one club (Newhaven Deep Sea Anglers) has stated that its boats are unlikely to range as far as the project area (A. Brothers, Angling Trust sea angling representative in Sussex, pers. comm. to RSK September 2011), although representatives of the charter fleet have identified specific fishing grounds in and around the project area within a radius of approximately 50km from Brighton Marina.

19.5.27 Charter boats carry clients for fishing as well as diving trips, and each trip tends to last between 8 and 10 hours and travel up to 20 miles offshore. Vessels typically range from 5-13m in length and fish for 20-250 days per year. Fishing is undertaken by rod and line, both at anchor and whilst drifting over wrecks, reefs and banks. Ground and reef fishing tends to take place in shallower waters (up to 30m in depth), while wreck fishing tends to attract more experienced anglers and is concentrated offshore in deeper waters (up to 65m in depth). Drifting is generally performed from February through to July.

19.5.28 Drew Associates (2004) reported that sea anglers catch on average between 5 (shore anglers) and 13 (boat anglers) fish per trip, and keep just under 40% of their catch. Most sea anglers (71%) were reported to have observed a decline in the number of fish caught in the last 5 years and most (62%) have observed a decline in the size of fish caught in the same period (Drew Associates, 2004). In particular, areas on the south coast of England have reportedly been severely affected by a lack of catch which has negatively affected the experience of sea angling (Drew Associates, 2004). However, the south coast is renowned for black bream fishing and British records have been set for bass, cod and tope in the area (sourced from various sea angling charter boat websites in Sussex, accessed August 2012).

19.5.29 Most sea anglers (70%) target white fish such as cod, pollack and bass but oil rich fish (e.g. mackerel) and flat white fish (e.g. plaice, sole, flounder) are also popular (Drew Associates, 2004). Sea anglers are most active in summer months (Drew Associates, 2004). Charter boats tend to target species depending on the season; cod, spurdog and whiting (October to January), pollack (January to July), black bream (May and June) and mackerel, rays, bass and turbot (May to October) (sourced from sea angling charter boat websites in Sussex, accessed August 2012). Other species include plaice, dabs, conger eel, tope and smoothhound which are targeted from spring (sourced from sea angling charter boat websites in Sussex, accessed August 2012).

Diving and spearfishing

19.5.30 Diving is extremely popular off the Sussex coast and takes place mostly in the summer months. Sussex Diving Club is based in Brighton Marina and operates two fast RIBs that have a range of up to 15 nautical miles; Worthing BSAC also has a RIB, and is generally based out of Littlehampton. Diving in the area is centred on two main features of interest (Sussex Diving Club, 2011):

- Wrecks: The English Channel is reported to offer some of the best wreck diving in the world, with a large number of wrecks within 15 miles of Brighton in depths amenable to diving; and

- Hard substrate (e.g. chalk reefs): the chalk bedrock and topography (e.g. steep rock faces) provides ideal opportunities for divers interested in the wide array of organisms found here, including both encrusting (e.g. algae, anemones, hydroids, bryozoans, sponges) and mobile species (e.g. nudibranchs, lobster, conger eel). The Sussex Seasearch project is a well-established part of a nationwide scheme that uses divers to record details of biota observed during dives. In 2009, Sussex Seasearch performed 70 dives on 30 sites (including some which are in the Project area), recording 215 species (Sussex Seasearch, 2009).

19.5.31 Based on cross-referencing vessel-tracking data from registered dive vessels against known seabed features, Figure 19.3 presents popular diving sites (that may also be used for e.g. angling and spearfishing) in and around the project area (NB It should be noted that this map is not exhaustive, and there will be other locations around the area). Key sites visited by these recreational users are:

- In the cable route corridor, the wreck of the *Pentrych* and an unnamed wreck are popular;

- Within the wind farm boundary, the wrecks *City of Waterford*, *Pagenturn* and '*Ikeda*' (likely to be incorrectly named) are all popular; there are also two unnamed wrecks within the wind farm;

- Reef features to the north and north-west of the wind farm site are popular; and

- The entire area – including that both landward, seaward, and east and west of the wind farm site - contains sites popular with recreational users such as divers.

19.5.32 Spearfishing is popular off the Sussex coast and is one of the few locations in the UK where this sport is well established; Sussex Spearfishing Club is over forty years old. Key target species include pollack, bass, and black bream; the UK record of the latter species was speared at Kingmere Rocks in 2007 (British Spearfishing Association, 2011). The Sussex IFCA has a voluntary Code of Conduct

for spearfishing (SSFDC, 2012), which includes not spearing fish which are exhibiting mating or nesting behaviour.

Sightseeing trips

19.5.33 Several charter boat operators offer sightseeing cruises as well as angling and diving trips. The most popular trips run along Brighton and Eastbourne seafronts to the cliffs at Beachy Head and its lighthouse. There are also trips to the Royal Sovereign Light Tower, and powerboat trips in Eastbourne Bay. A few vessels in the area offer wildlife watching trips but many offer bespoke trips on demand (including scattering of ashes, corporate trips, hen and stag parties and sailing lessons).

Surfing

19.5.34 Surfing is highly popular along the English south coast, despite the wave regime along this section of coast being described as of relatively low quality and low consistency (SAS, 2010), to those that participate in wave-related sports (stand-up paddle boarding, kite surfing, wind surfing and kayaking) they are of high value. Typical wave conditions of the area in the vicinity of the Project are described in detail in Appendix 6.6 (Coastal Processes Assessment).

19.5.35 Established surf spots in the area include locations known as West Pier, Hot Pipe and Brighton Marina near Brighton, Westbeach at Littlehampton, Bracklesham/East Wittering and West Wittering, to the west of Selsey, and Sandy point near Hayling Island. Surfing along the Sussex coast is most popular during the summer months, with the peak surf conditions associated with the late summer and autumn months.

19.5.36 Despite the relatively low quality of the surfing conditions along this section of coastline in comparison with other coastal areas of the UK, surfing and other wave related sports such as (including kite-surfing) is popular on suitable beaches along the coastline adjacent to the Project.

19.6 Potential Impacts

19.6.1 In line with the use of the “Rochdale Envelope” (see Chapter 5), the assessment in this section has been based on a development scenario, which is considered to be the worst case in terms of impacts to other marine users. Table 19-8 lists the components of the design of the marine part of the project that could influence the magnitude of impacts to other marine users. The realistic worst-case scenario in terms the number of the turbines installed at the Project, the type of pile installed, and the number and frequency of vessels used for their installation and maintenance are presented in Section 2 Project Description.

Table 19-8: Wind farm design features and their influence on the Rochdale envelope for other marine users

Design feature	Design options
Wind farm site layouts	Full layout scenario could create a greater obstruction for other users to route around (both during construction, operation and decommissioning).
Wind turbines	Fewer turbines likely to reduce interruption to use of the site and the surrounding area for other users. Larger turbines result in larger pins/piles and higher underwater noise for divers and fish. Selection of smaller turbines is likely to result in more foundations being constructed, which may mean that construction takes place over a longer timescale, extending the impacts period. More smaller turbines are likely to produce the worst case in terms of reduction of wave height – which has the potential of affecting surf quality.
Foundations	Type of foundation selected can influence both the levels of noise generated from installation (which can affect e.g. the diving sector) and other tourist industries. Type of foundation selected could produce a worst case in terms of reduction in wave height (gravity base is the worst type of foundation in this respect).
Cables	Installation of cables at landfall, in cable route corridor and in the windfarm will be worst-case in summer for diving and beach users.
Construction and Installation	Longer construction period would produce a greater effect. Largest exclusions zones during construction would be worst effect - potentially caused by splitting operations between 2 sides of the wind farm.
Operation and Maintenance	Higher maintenance frequency may result in greater impact to other marine users.
Decommissioning	Cables (or mattressing) left in situ after decommissioning could impact other activities in the future, such as dredging or cable routing. Decisions on the degree of material left in situ at the end of the project's life will influence the degree of impact (including possible positive gains) for divers and anglers as focal points of activity.

19.6.2 Installing the maximum number of turbines would be associated with a longer construction period, higher levels of construction vessel traffic in the area and a greater potential for conflict with other marine users than the fewer, larger turbine option. These same aspects are also relevant for the decommissioning phase where there the maximum number of turbines would be need to be removed from the site. During operation, the maximum number of turbines would require more maintenance vessel movements and possibly repairs to a greater number of turbines than the 100 turbine option.

Construction

Aggregate extraction

19.6.3 It is likely that construction and cable installation vessels associated with construction phase of the Project may impinge on marine aggregate extraction activities in the area. This impact is expected to be greatest in the Owers Bank extraction area due to its proximity to the development area (particularly Areas 122/1 B; 123 B; 124/1 B). Informal agreement has been reached with the

aggregates companies who dredge these areas to discuss and agree appropriate measures to ensure no conflicts arise. Extraction areas in the eastern English Channel may experience some levels of disruption, however these impacts are expected to be lower than those for the Owers Bank due to the increased distance from the Project.

19.6.4 Impacts are expected to occur in the form of interruptions to the normal routes and navigational passages used by aggregate extraction vessels, due to in part to the implementation of exclusion zones at the development site and from increased vessel traffic associated with the presence of Project construction vessels.

19.6.5 These impacts may lead to increased distances, and increased transit times for vessels involved in aggregate extraction activities. It is not expected that any aggregate extraction areas will be closed for operations during construction. Impacts are anticipated to be temporary in duration and localised in extent.

Marine disposal sites

19.6.6 Figure 19.2 shows that marine disposal sites WI020 (Brighton/Rottingdean), WI010 (Newhaven) and WI031 (Shoreham) are located well inshore of the Project, and are not near the export cable corridor. WI011 (a burial at sea site) is located approximately 5km to the southeast of the Project Site. It is possible that there may be minor and temporary impacts on the use of marine disposal areas, resulting from increased vessel traffic from construction and installation vessels, coupled with temporary safety exclusion zones, may impinge on the use of marine disposal areas.

19.6.7 Impacts are expected to be in the form of interruptions to normal routes and navigational passages. This may lead to increased transit distances and transit times. It is not expected that any disposal areas will be closed for operations during construction activities. Impacts are anticipated to be temporary in duration and localised in overall extent.

Offshore energy

19.6.8 As there are no existing oil and gas, offshore wind, or other renewable energy developments near the Project site, there are predicted to be no impacts to offshore energy activities.

Military activity and munitions

19.6.9 As the Project site is not within any designated PEXA areas, there are not anticipated to be any impacts on the activities undertaken within such areas. Potential impacts to vessel traffic, which could include naval vessels transiting the area, are discussed in Section 14 (Shipping and Navigation).

19.6.10 Although the Project does not lie within an area that has been designated for live military firing practice, pre-construction surveys will be performed across the development area to locate munitions, as it is possible that previously undetected war-time munitions may be encountered during construction operations.

Cables, pipelines, outfalls and groynes

19.6.11 Construction operations offshore and in the intertidal may have the potential to interfere with, or damage, existing infrastructure (e.g. cables, outfalls and groynes) through use of trenching equipment (e.g. trenching/ploughing; anchors; landfall barges).

19.6.12 Redundant cables in the vicinity of the Project site, such as Brighton-Gibraltar telegraph cable, will be either removed or avoided if there is the potential to interact with turbines and inter-array or export cables.

19.6.13 At the landfall location three outfalls are present in the intertidal area, all of which lie outside the proposed HDD working area. Wooden groynes and large boulder groynes located along the upper shore are not expected to be impacted by landfall works, as the cable installation will be undertaken via HDD. Accordingly, no impacts are anticipated to outfalls and groynes in the vicinity of the landfall works.

Recreation

19.6.14 Potential impacts of piling noise on both humans underwater, and to recreational fisheries (through effects on fish) are discussed further below. Other potential impacts to recreational users during the construction period are as follows:

- Temporary impacts to bathers and divers through increasing suspended sediment concentrations during cable landfall operations. However, it is anticipated that any additional suspended sediment will be rapidly dispersed and, except in areas very close to construction (from which bathers will be excluded for safety), will fall quickly to concentrations within natural variation. No impacts are anticipated to indicators of bathing water quality (e.g. faecal coliforms), as all vessels and landfall operations will operate appropriate sanitary systems, and observe MARPOL regulations on discharge.

- Temporary exclusion of intertidal recreational interests (e.g. bathers, walkers, beach anglers, dog walkers, kite surfers) during landfall of the export cable;

- Temporary exclusion of recreational vessels (e.g. charter angling boats, yachts, dive RIBs, kayaks) from a safety zone around construction vessels; and

- Potential construction-related impacts to tourism through loss of visual amenity and other disturbances are discussed in Sections 12 – Seascape,

Landscape and Visual Impacts, 26 - Landscape and Visual Impact (onshore) and 17 – Socio-economics respectively).

Piling noise on humans underwater

19.6.15 Minimum and maximum ranges for **dB (UW) levels** for the modelled piling scenarios are presented in Table 19-9.

Table 19-9: **Minimum and maximum ranges (km) to which 130, 110 and 90 dB(UW) peak-to-peak levels are estimated to occur in relation to humans underwater, based on piling scenarios**

Pile diameters	Potential for permanent traumatic auditory injury	'Startle' – unpleasant	'Startle' – very loud
	130 dB(UW) (km)	110 dB(UW) (km)	90 dB(UW) (km)
1.53m pin pile	0.26-0.27	3.8-5.1	12-32
2.6m pin pile	0.35-0.38	4.6-6.7	13-36
6.5m monopile	0.42-0.48	5.0-7.5	13-39

19.6.16 Noise contours for 130, 110 and 90 dB (UW) are also presented on Figure 19.4, for both the 1.53m pin pile and 6.5m monopile foundation options. These are overlaid onto the centres of offshore recreational activity that were presented in Figure 19.1 (again, acknowledging that this map is illustrative and not exhaustive).

19.6.17 For 130 dB (UW) (i.e. permanent traumatic auditory injury) it can be seen that for all piling scenarios, the maximum range to which this level extends is less than 500m. The greatest distances (480m) are for the 6.5m monopile, whereas distances for the 1.53m pile are around half of this distance (260-270m).

19.6.18 For 110 dB (UW) (i.e. 'startle' - unpleasant) minimum and maximum distances range from 3.8km (1.53m pin pile) to 7.5km (6.5m monopile). There is some overlap between the distances for all piling options, with for example the maximum distance for the smallest pile (5.1km) being greater than that for the minimum of the largest pile (5.0km).

19.6.19 For 90 dB (UW) (i.e. 'startle' - very loud), minimum and maximum distances for all piling scenarios are broadly similar.

19.6.20 For the **unweighted effect levels** estimated distances are all no greater than 65m, and are as follows:

- For lethal effects (240 dB re.1µPa): 10m for all modelled scenarios; and

- For physical injury (220 dB re. 1 µPa): distances of 25m (1.53m pin pile), 40m (2.6m pin pile) or 65m (6.5m monopile).

19.6.21 However, as noted in Section 8 – Fish and Shellfish Ecology – it is important to consider that a number of factors significantly limit the actual extent of piling noise:

- Piling noise will be intermittent and temporary. The average expected time for the driving of a monopile is approximately two hours, typically ranging between one and four hours. There will typically then be a significant break as the installation jackup vessel jacks up its legs, repositions and puts its legs back down, a typical time between successive foundations being 1 day;

- Based on this average, piling noise will only be generated for one-twelfth (~8.5%) of any given monthly period. These percentages may be reduced if ground conditions allow for a shorter piling time, or in the event of weather or technical delays; and

- Modelled noise contour maps display maximum hammer blow energies for each pile size; it is anticipated that the majority of piles will be installed without blow energies reaching these maxima. It is also important to consider the soft-start process which will be employed for all pile installation work (see Section 19.7.7).

19.6.22 Figure 19.4, the modelled noise levels could therefore impact on humans underwater (divers and spearfishers) as follows:

- Humans may experience unpleasant (110 dB (UW)) levels of noise up to 7.5km away from the source. Although these levels are not though to be capable of directly producing injury, they may lead to adverse reactions such as divers surfacing without adequate decompression. Mitigation measures will be in place to ensure that divers/spearfishers are excluded from this area during piling (see Mitigation below for further details);

- A lower level of noise (90 dB (UW)) could extend significantly further (up to ~40km in the worst-case) and also lead to startle effects. The much greater distance of this, combined with the high levels of vessel activity in the area, will make it impractical to exclude divers/spearfishers from the area during piling. While mitigation measures will be in place to ensure details of piling are widely publicised to the diving and spearfishing communities, it is possible that some divers/spearfishers could be underwater and exposed to these levels; and

- While noise levels generated during piling have the potential to cause permanent auditory injury, serious physical injury or even death to humans, the distances at which these levels are reached are small (≤500m, and much smaller for serious injury/death), and a number of mitigation measures will

be in place to ensure no humans are in an area far beyond this (see Mitigation below for further details).

19.6.23 During piling, recreational usage of some of the area by divers/spearfishers will therefore be necessarily limited for safety reasons. However, as can be seen from Figure 19.4, the 90db (UW) contour for any given scenario (even for the 6.5m monopile) leaves a number of alternative diving locations that are not affected, and could be used as alternatives. It should also be noted that exclusion zones will be centred on construction activity, and will therefore move as construction work moves. This is likely to result in only temporary limitation to some dive sites during the construction process. A schedule of temporary limitations will be co-ordinated by the project diving liaison officer and notified well in advance to diving and spearfishing groups.

19.6.24 While the worst-case significance of impacts theoretically has the potential to be major (i.e. high sensitivity of human receptors underwater, and large magnitude of their safety being compromised by piling noise), the mitigation measures in place will significantly reduce this to moderate-minor (based on medium sensitivity of a network of widely distributed dive sites; and medium-small magnitude, based on temporary loss of resource over a wide area).

Piling noise on recreational fisheries

19.6.25 Potential impacts to fish are described in Section 8 - Fish and Shellfish Ecology, and the detailed methodology used to estimate impacts is detailed in Appendix 8.6.

19.6.26 In considering piling noise (as noted above for humans underwater and in Section 8), a number of factors that limit potential impacts should again be considered: i.e. that each piling event takes on average only 2 hours; that piling will on average occupy only ~8.5% of any given monthly period; that noise modelling contours represent a worst-case of maximum hammer blow energy (which is unlikely to be reached in most cases, and would always be preceded by a soft-start programme – see Section 19.7.7) and that fish do not habituate to higher levels of noise at all.

19.6.27 Potential impacts to four popular angling species – cod (n.b. likely to represent other gadoids such as whiting), bass (likely to represent wrasse), black bream, and dab (other flatfish, eels) are summarised in the following Tables. Table 19-9 presents distances from the piling source over which different fish species might show avoidance behaviour, and is applicable to boat anglers offshore (where noise contours radiate in a roughly spherical manner from the source). Table 19-9 presents estimates of distances of shoreline (=shore anglers) that might be affected by these reactions.

Table 19-10: Minimum and maximum avoidance reactions distances (km) of fish commonly targeted by boat anglers, in relation to a piling noise source

Species	6.5m monopile		1.53m pin pile	
	Strong avoidance (km)	Significant avoidance (km)	Strong avoidance (km)	Significant avoidance (km)
Cod*	13.0-39.2	13.5-81.1	6.2-10.8	12.8-37.4
Bass	3.0-4.1	10.2-22.7	0.8-1.0	4.9-7.5
Black bream	6.9-11.8	13.5-43.1	2.3-3.0	9.0-18.1
Dab**	5.6-9.4	13.2-36.9	0.7-0.9	4.0-6.1

*Including similar species coalfish, whiting, pollack and ling; ** including other flatfish and eels

Table 19-11: Approximate estimated length of coastlines (km) which may experience avoidance reactions of fish commonly targeted by shore anglers, in relation to a piling noise source

Species	6.5m monopile		1.53m pin pile	
	Strong avoidance (km)	Significant avoidance (km)	Strong avoidance (km)	Significant avoidance (km)
Cod*	30	60	0	30
Bass	0	<20	0	0
Dab**	0	30	0	0

*Including similar species coalfish, whiting, pollack and ling; ** including other flatfish and eels

19.6.28 Potential avoidance reactions of fish from intermittent piling noise may mean that fish are temporarily displaced from an area. Theoretically this movement could be both away from, and towards, recreational fishers.

19.6.29 For both boat and shore angling, (medium sensitivity, i.e. an activity that takes place over a broad area), worst-case impacts (i.e. the reaction of cod when a 6.5m monopile is being piled) will be of moderate significance, given medium magnitude (short term effects on a wide area). However, for less sensitive species such as bass and flatfish (and with smaller piles) magnitude could be small or negligible, giving overall impact of minor-negligible.

Operation

Aggregate extraction

19.6.30 The physical presence of the Project may interfere with established transit routes used by aggregate extraction vessels, while also presenting a navigational risk. These aspects are discussed in Section 14 - Shipping and Navigation.

19.6.31 The footprint of the Project site could result in areas with potential for aggregate extraction being unavailable for this activity in the future.

19.6.32 During the operational lifetime of the Project there will be the requirement to undertake regular maintenance, repair and/or survey activities. Operation and maintenance activities are discussed in Section 2a - Offshore Project Description. These vessel activities may have an impact similar to that discussed for the construction phase, where short term increases in vessel traffic and the implementation of temporary exclusions areas may occur.

Marine disposal sites

19.6.33 With the exception of W1011, it is unlikely the presence of the Project will interfere with transit routes of vessels out of port and harbours along the Sussex coast to disposal sites. Vessels transiting from areas outside of this may experience some interference with transit routes, with the offshore wind farm also presenting a navigational risk. These aspects are discussed in Section 14 (Shipping and Navigation).

19.6.34 During the operational lifetime of the Project there will be the requirement to undertake maintenance, repair and/or survey activities. These activities may have an impact similar to that discussed for the Project's construction phase, where short term increases in vessel traffic and the implementation of temporary exclusions areas may occur, which may impinge on the normal use of the disposal sites.

19.6.35 The impacts on disposal sites during the operation of the Project are expected to be in the form of interruptions to normal routes and navigational passages. This may lead to increased transit distances and times. It should be noted that any such interruptions would be very infrequent and of short duration. It is not anticipated that any disposal areas will be closed for operations during the operation of the Project. Any activities likely to have an impact on the normal operation of the disposal sites would be discussed with the operators in advance, as well as official Notices to Mariners being broadcast. The impacts on marine disposal sites are anticipated to be temporary in their duration and localised in extent.

Offshore energy

19.6.36 As there are no existing oil and gas, offshore wind, or other renewable energy developments near the Project site, there are not predicted to be any impacts to offshore energy operations.

Military activity and munitions

19.6.37 As the Project site is not within any designated PEXA areas, no impacts to these areas or operations are anticipated. Possible impacts on vessel traffic, including naval vessels from the presence of the Project are discussed in Section 14 (Shipping and Navigation).

Cables, pipeline, outfalls and groynes

19.6.38 Once installed, it is not anticipated that the Project (or the associated export cable) will impact existing infrastructure.

Recreation

19.6.39 Potential impacts to recreational users during operation of the Rampion offshore wind farm are as follows:

- Permanent exclusion of recreational vessels from within 50m of turbine structures may be sought. Coastal and offshore shipping impacts are discussed in Section 14 - Shipping and Navigation. It is unlikely that there will be significant impacts to most recreation users of the area, e.g. inshore sailing and other water sports, which are generally limited to the immediate coastal waters;

- Impacts to seaside tourism. Potential impacts to visual amenity for intertidal and coastal users from the presence of the Project are discussed in Sections 12 – Seascape, Landscape and Visual Impact Assessment and 26 – Landscape and Visual Assessment respectively). The development of a Rampion visitor centre may be beneficial to the local tourism industry.

- Modification to the local wave regime may impact the height and energy of waves resources available for recreational surfing activities. Appendix 6.6 (Coastal Processes Assessment) (ABPmer, 2012) provides an assessment of the potential impacts that the turbine array could have in terms of interruption of offshore wave transmission and the reduction in swell energy. Stakeholder concerns that these potential impacts could result in compromised surfing conditions have been raised and the assessment summarised here aims to address those concerns;

- Modelling, based on the worst case scenario predicts that there will be a reduction in significant wave height along the coast inshore of the Project turbine array. Typically the change is less than 1% of wave height, direction and period, and the maximum will be less than 7% (Appendix 6.6). Surfers Against Sewage consider that worst case changes in wave height of less than 7% are not detrimental to the surfing regime. On this basis, the potential for changes to the surfing conditions resulting from the presence of the wind farm infrastructure are considered to be of low magnitude, have a limited spatial effect although are present over the life-time of the wind farm;

- It is noted that the majority of the known established surfing locations along the South coast are outside the area where the magnitude of change in terms of the reduction in significant wave heights are greatest. The notable exceptions to this are the beaches close to Brighton, in particular east of the city close to the marina;

- There is the potential for beneficial impacts to divers, spearfishers and recreational anglers as a result of the presence of turbines (and possibly rock armour) on the seabed, in the form of a newly established habitat. This is likely to result in an increase in aggregations of fish (including desirable sport species associated with introduced seabed features and foundation structures). In addition, the introduced structures will support a gradually increasing sessile community including epifauna and flora, which in turn will help to support fish. A 50m exclusion zone around each of the wind turbines may be sought, meaning that divers, anglers and spearfishers would not be able to approach turbine structures directly, thus limiting to some extent the overall beneficial impacts. There will however still be a beneficial impact for these activities immediately outside the 50m exclusion zone should such an exclusion be sought;

- It is unlikely that overall levels of angling would be impacted by the presence of the wind farm development. If there is an impact, it is likely that angling will be displaced elsewhere with corresponding benefits to employment and income, rather than curtailed entirely (Drew Associates, 2004);

- It is unlikely that sightseeing trips will be impacted as they currently operate mostly inshore alongside the coast; and

- The effect of the visual presence of the wind farm on tourism, users of the beach and other recreational facilities at the landfall site has been discussed in Section 12 - Landscape, Seascape and Visual Impact Assessment.

Decommissioning

19.6.40 It is anticipated that impacts arising from the decommissioning of the Project, such as temporary exclusion areas and increased vessel traffic, will be similar to those experienced during the construction period.

19.6.41 In a scenario where the export cable is removed from the seabed as part of the decommissioning of the Project site, impacts within the export cable corridor are expected to be similar to those produced during the construction phase.

19.6.42 In the event that the export cables are left in place, no impacts are expected along the export cable route. The decommissioning of the Project will require an environmental assessment to be undertaken prior to actual decommissioning taking place. This will determine the optimal method for the decommissioning of the Project. The environmental assessment will assess the impacts associated with these operations according to recognised best practice at this time.

19.7 Mitigation Measures

During Construction

Aggregate extraction

19.7.1 E.ON are currently in discussions with the option holder and The Crown Estate regarding aggregate extraction option area 499, which if exercised may be directly affected by the construction (and operation) of the Project. A Memorandum of Understanding (MoU) has been drawn up between E.ON and the aggregates extraction option holder to set out how things will work in practice, including buffer zones to ensure safe co-existence of wind farm and aggregates interests. The area of overlap of the aggregates option and the Rampion site can be seen in Figure 19.1 and Figure 19.2.

19.7.2 Additionally there are currently active aggregates extraction licenses located to the west of the Project. Whilst there is no overlap between the wind farm site and these aggregates areas, it is important that the right mitigations are put in place to ensure no conflicts arise between the aggregates and wind farm activities occurring within relatively close proximity to each other. Productive dialogue is ongoing with the aggregates companies who dredge these areas to discuss and agree appropriate measures.

19.7.3 General consultation will determine how best to minimise the impacts arising from the installation of the Project. Potential disturbances to normal operations will be communicated to affected parties in the form of Notices to Mariners, including the communication of construction timings and information on temporary exclusion zones. Practices such as minimising the size of exclusion zones where possible, the considered temporal planning of these areas, and the timing of construction activities will help to minimise impacts to normal aggregate extraction operations.

Marine disposal sites

19.7.4 Mitigation measures discussed in section 19.7.3 will also be used for vessels requiring access to and from marine disposal areas.

Recreation

19.7.5 Construction works in the intertidal and nearshore areas will be undertaken in consultation with all relevant consultees to inform them of the schedule and location of planned works. This will be particularly relevant in the landfall area where the construction activity will be at its closest to recreational interests, and will aim to reduce potential impacts on recreational users of the area.

19.7.6 For recreational and public users of the area in the vicinity of the development, public notifications outlining the timing and scale of construction operations, as well as Notices to Mariners for users of nearshore areas, will be provided well in advance of construction works commencing and throughout the construction phase.

19.7.7 Potential impacts to diver/spearfishers from underwater piling noise will be mitigated in a number of ways.

- The risk of primary (life-threatening physical injury, or fatality) or secondary (non-life threatening damage) injury to humans will be managed by the imposition of an exclusion zone of approximately 2km radius around all piling operations within which no-one (including construction personnel) is permitted to enter the water. This exclusion zone will be actively patrolled by guard vessels until piling ceases;

- E.ON will ensure that noise levels of 110dB will not be exceeded at the perimeter of the exclusion zone at the commencement of the soft-start procedures (110dB could induce a startle response to human being under water, see Section 19.4.15). A 'soft-start' procedure will be used in all pile driving operations, whereby the frequency and intensity of noise impulses are gradually increased to full power. The soft start period is currently expected to cover a period of 30 minutes (for a 6.5m diameter pile) during which time reduced hammer blow energies will be used. Preliminary calculations based on a 6.5m pile suggest that blow energies of 200kJ would meet this criteria (for comparison, maximum blow energy for 6.5m pile will be 1500kJ). To establish the exact blow energy which can be used at start-up further modelling will be required once exact pile sizes have been determined;

- The soft-start programme will be determined in discussion with the Diving Liaison Officer. Consideration will be given to the potential for divers to be in the water outside of the exclusion zone at the start of pile driving. This consideration will also include diving activities that could result in divers drifting into the exclusion zone as part of their dive (i.e. tide and wind conditions will be assessed as part of the programme). Other considerations may include a commitment not to commence pile driving works during slack tide periods if "startle" noise levels (110dB) towards the end of the soft-start period could reach divers at popular nearby locations (i.e. wreck diving may rely or be centred on slack water periods);

- To limit potential exposure to hazardous levels of underwater noise, a comprehensive awareness and communications strategy (a Diver Communication Plan) will be developed by E.ON in agreement with regulatory authorities to notify the diving/spearfishing community of the timing and duration of proposed works. This will include but not be limited to the appointment of a Diving Liaison Officer (who will be the main point of contact) to work with dive centres, diving clubs (including education

establishments), boat operators, Coast Guard, and facilities within jetties and marinas etc. The strategy will include widely publicising (e.g. on the internet) details of the nature, location and timing of pile driving works and the extent of any relevant exclusion zones. The 'startle' reaction to underwater noise is anticipated as being less likely to occur in divers/spearfishers who have prior knowledge of the possibility of piling noise occurring; and

- The above suite of mitigation measures have already been successfully implemented during piling of the foundation for meteorological mast installed at the Rampion site in April 2012, with no incidents or undue concerns arising during the operation.

19.7.8 Potential impacts to recreational anglers will be mitigated by publicising the location and timing of scheduled works in advance. This will allow for anglers to plan excursions to avoid piling activities.

19.7.9 Further mitigation measures for users of the offshore areas around the Project are discussed in Section 14 (Shipping and Navigation), which outlines mitigation measures proposed to reduce potential impacts to shipping and navigation interests.

During Operation

19.7.10 Although routine maintenance activities unlikely to affect other users will be ongoing throughout the lifetime of the Project, there may occasionally be the need for activities that require e.g. vessel exclusion zones. In these cases, details will be communicated to commercial and other marine users in order to minimise disturbance.

During Decommissioning

19.7.11 Towards the end of the lifetime of the development a comprehensive study will be carried out to determine the optimal method of decommissioning for the wind farm and associated export cable.

19.7.12 Decommissioning will be undertaken according to future industry and environmental best practice.

19.8 Significance of Residual Effects

19.8.1 This section presents the assessment of the impacts which are predicted to remain following the imposition of the mitigation measures proposed above. Table 19-12 presents a summary of these impacts.

During Construction

19.8.2 In the case of aggregate extraction, marine disposal sites and recreational users receptor sensitivities are all considered to be of medium significance. The magnitude of impacts that the development is likely to impart following the appropriate mitigation measures that have been discussed in section 19.7, are all considered to be of small magnitude, resulting in residual impacts of minor significance.

19.8.3 These minor effects are attributed to the disruption of normal commercial and recreational vessel use, and some temporary restrictions in use of limited nearshore and intertidal areas. These effects are further considered to be minor as disruptions will be localised in their extent, of short duration, occur at a relatively small scale, and will have no lasting negative effects.

Piling noise

19.8.4 Following mitigation measures, the residual significance to divers/spearfishers from pile driving noise is considered to be moderate-minor, based on medium sensitivity of a network of widely distributed dive sites; and medium-small magnitude, considering temporary loss of resource over a wide area.

19.8.5 For recreational anglers, the residual significance is considered to be moderate-negligible, depending on the fish species involved and the piling activity. It should be noted that restrictions on piling (see Section 8 – Fish and Shellfish Ecology) in both winter (to mitigate impacts on herring) and early summer (black bream) will be likely to reduce impacts to recreational fisheries (notably for cod in winter, and black bream in early summer).

19.8.6 No residual impacts are predicted for offshore energy activities, existing military activities, or cables, pipelines and coastal defence structures from the construction works for the Project.

During Operation

19.8.7 During the operational phase of the Project, the residual effects are expected to be minor for receptors, which include the aggregate extraction industry, marine disposal operations, and the majority of recreational receptors. For example, access to existing recreational dive sites will be available post-construction. The receptor sensitivities are classed as being of medium sensitivity, with a magnitude of impact following appropriate mitigation of small. Despite maintenance, repair, survey or monitoring activities at the development site being regular over the lifetime of the site, these activities are not expected to cause significant levels of disruption as the frequency and scale of works is expected to be small. As a consequence the overall environmental impact that the Project operations will have on these activities is anticipated to be of minor significance.

19.8.8 Exceptions to the above assessed impact level include effects on surfers and divers, recreational users of the landfall and nearshore areas, and offshore energy activities, the reasons for which are considered in the following paragraphs.

19.8.9 Surfers have a high receptor sensitivity, due to the popularity of surfing along the South Coast. This is in spite of what is generally considered to be a relatively low quality resource (SAS, 2009). Despite the relatively minor predicted magnitude of change in wave conditions, there is no mitigation that can effectively reduce the potential effect on wave energy transmission and offshore swell energy that the Project will create. As such, while the magnitude of the change is considered to be negligible, the resulting assessed impact level is of minor significance.

19.8.10 The presence of the Project on the recreational users of the landfall and nearshore areas, which are considered a medium sensitivity receptor, is expected to have a negligible impact magnitude. This will result in an overall residual impact of minor significance. The effect of the visual presence of the wind farm on tourism, users of the beach and other recreational facilities at the landfall site is discussed in Section 12 (Landscape, Seascape and Visual Impact Assessment).

19.8.11 No residual impacts are predicted for offshore energy activities, existing military activities, or cables, pipelines and coastal defence structures from the operational activities associated with the Project.

During Decommissioning

19.8.12 Residual impacts arising from decommissioning activities within the Project site itself are expected to be minor, as impacts are expected to be analogous to those anticipated during construction phase.

19.8.13 The export cable is likely to be decommissioned by either the method of removing the cable from the seabed, or leaving it in-situ (to negate impacts arising from its removal). In the case of the export cable remaining in-situ, it is considered that this would have a negligible effect on commercial and recreational users.

19.9 Cumulative Impacts

19.9.1 This section assesses the cumulative impacts that may arise to the sensitive receptors relating to other marine users in the area during construction, operation and decommissioning of the Project resulting from interaction with other developments in the area.

19.9.2 The anticipated sources of potential cumulative impacts that may arise with respect to the Project on other marine users are from other committed or proposed offshore development projects. These projects that have potential to produce additive impacts include the proposed Navitus Bay offshore wind farm, and potential offshore wind farms off the northern coast of France.

19.9.3 As noted earlier in this Section, the planned Navitus Bay offshore wind farm is approximately 94km to the west of the Project site, and it is assumed that at least some of the turbine foundations for Navitus Bay (and the French wind farms) will be installed using piling.

19.9.4 It is considered unlikely that piling works for both Rampion and Navitus Bay (and/or the French wind farms) will overlap, with piling for the former expected to be completed prior to commencement of that for the latter. However, the schedules for both projects may change before construction takes place and therefore potential cumulative impacts are considered briefly here. In the unlikely event that turbine installation was to proceed at both developments at the same time, E.ON and the developer of Navitus Bay will take a joint approach to mitigating any cumulative impacts.

19.9.5 If unrestricted, worst-case piling in both Rampion and Navitus Bay were to take place simultaneously, it is theoretically possible that divers and spearfishers could be exposed to noise from both developments.

19.9.6 Additionally, fish (as targets of recreational anglers), through their avoidance reactions, could be displaced from their natural distribution from two different directions. For the more sensitive species (such as cod) it is also possible that these avoidance zones could join and even overlap, which could create relatively large areas which fish might be temporarily displaced from.

19.9.7 However, for both of these receptors it should be stressed that it is considered extremely unlikely that installation of the piles will be planned to take place at both developments, at the same time. Even if such a scheduling situation does arise, the developers will work together to mitigate cumulative impacts.

19.9.8 Once more project details (such as foundation types and construction schedule) are available for both developments detailed cumulative noise modelling may need to take place. Any results – in the form of both human noise exposure and fish avoidance zones – will need to be considered not only in the context of simultaneous piling at both developments, but also in relation to consecutive piling. For example, divers could potentially be exposed to unpleasantly loud noise in one geographical area (such as a favoured wreck) during piling at Rampion, and therefore choose to avoid diving there. If piling at Navitus Bay were then to commence shortly after Rampion piling was completed (and the noise generated extend to the same location), it is possible there could be avoidance for prolonged periods. This type of cumulative impact would also be discussed by the developers with regulators in order to reduce cumulative impacts to an acceptable level.

19.9.9 Other developments which have a cumulative impact on other marine users include potential new aggregate extraction at future licensing rounds, in particular at the Owers Bank offshore area, and also to a lesser degree at the Eastern English Channel and South Coast (off the Isle of Wight and eastern Solent) areas. Marine Conservation Zones (MCZs – see Section 9 Nature

Conservation), which are likely to be designated in 2013, may also restrict activities that can take place within their boundaries (such as aggregate extraction).

19.9.10 In addition to noise and vibration there will be an increase in vessel movements (particularly during construction phases of the Project), which will impact coastal human receptors. This will be particularly noticeable in the ports, which will service either or both the construction works for the Project and any future aggregate extraction activities. The main port handling the import of aggregates from the Owers Bank area is Shoreham, and to a lesser extent Newhaven, which also handles aggregates from the Nab area. Given the selection of Newhaven as the maintenance port, it would be anticipated that there will be a notable cumulative increase in vessel traffic to and from this port.

Table 19-12: Summary of Residual Effects and Mitigation Measures

Aspect	Effect	Proposed Mitigation Measures	Sensitivity	Magnitude	Residual Effect
Construction Phase					
Aggregate Extraction	Potential interference with aggregate extraction operations due to the implementation of exclusion zones, increased vessel traffic and presence of Project construction vessels.	Construction works will be undertaken in consultation with all relevant consultees (such as BMAPA) to inform of schedule and the location of planned works.	Medium	Small	Minor
Marine Disposal Sites	Interference with access to marine disposal sites due to the implementation of exclusion zones, and from the presence of Project construction vessels. Site WI011 in particular is located within close proximity to the wind farm site.	Construction works will be undertaken in consultation with all relevant potential users of marine disposal sites. This will inform of schedule and the location of planned works.	Medium	Small	Minor
Recreational Users – bathers	Temporary exclusion of recreational users of the beach and nearshore waters in the vicinity of the landfall during installation of the export cable, outwith of this predicted levels of suspended sediment in the water column during cable trenching and lay will be within the limit of natural variation.	Construction works will be undertaken in consultation with the local community, to inform of schedule and the location of planned works. Public notices will be provided in areas where bathers may be affected by construction works.	Medium	Small	Minor
Recreational Users – vessels and boating	Temporary exclusion of recreational vessels from wind farm area, and along the cable route.	Construction works will be undertaken in consultation with local community and yachting/ boating clubs in the area, to inform of schedule and the location of planned works.	Medium	Small	Minor

Aspect	Effect	Proposed Mitigation Measures	Sensitivity	Magnitude	Residual Effect
Recreational Users – landfall	Temporary exclusion of users at the landfall site.	Construction works will be undertaken in consultation with the local community, to inform of schedule and the location of planned works.	Medium	Small	Minor
Recreational Users – diving and spearfishing	Direct (auditory injury/physical injury/death) and indirect (startle) impacts of pile driving noise on divers and spearfishers. As a result of safety exclusion zones to ensure no harm, temporary displacement of diving/spearfishing activity.	Exclusion zone (in which no-one is permitted to enter the water) to be actively patrolled during pile driving operations Soft start procedure, for each pile driving event ensuring that 110dB not exceeded within the exclusion zone at the commencement of the soft-start programme. Appointment of diving liaison officer. Comprehensive communication strategy to inform divers and spearfishers of nature, schedule and location of planned works. Temporary and intermittent nature of piling.	Medium (i.e. diving activity that takes place over a broad area) (NB High sensitivity of damage to human health will not be applicable as mitigation will exclude this risk)	Medium-small	Moderate-minor

Aspect	Effect	Proposed Mitigation Measures	Sensitivity	Magnitude	Residual Effect
Recreational Users – angling target species	Indirect impacts of piling noise to recreational anglers, due to avoidance of angling target species.	Publicising proposed location and timing of works, to allow anglers to avoid piling activity. Temporary and intermittent nature of piling. Piling restrictions in place during peak spawning periods for herring and black bream may further reduce impacts.	Medium	Medium-negligible	Moderate-negligible
Operational Phase					
Aggregate extraction	The physical presence of the Project may interfere with transit routes used by aggregate extraction vessels. Exclusion zones and increased traffic during maintenance, repair or survey activities. The closure of seabed to future aggregate extraction.	Consultation with consultees (such as BMAPA) to minimise impacts of operation of the wind farm. Details of any maintenance, repair or survey activities that might affect other sea users proposed during the operational lifetime of the Project will be provided to commercial and recreational marine users in order to minimise disturbance. The duration of any of these activities will be kept to a minimum to reduce the duration of any exclusions.	Medium	Small	Minor

Aspect	Effect	Proposed Mitigation Measures	Sensitivity	Magnitude	Residual Effect
Marine Disposal Sites	Exclusion zones and increased traffic during maintenance, repair or survey activities.	Details of any maintenance, repair or survey activities that might affect other sea users proposed during the operational lifetime of the Project will be provided to commercial and recreational marine users in order to minimise disturbance. The duration of any of these activities will be kept to a minimum to reduce the duration of any exclusions.	Medium	Small	Minor
Recreational Users – vessels and boating	Operational activities, which may interrupt recreational vessels Permanent exclusion of recreational vessels from within 50m of turbine structures.	Details of any maintenance, repair or survey activities that might affect other sea users proposed during the operational lifetime of the Project will be provided to commercial and recreational marine users in order to minimise disturbance.. The duration of any of these activities will be kept to a minimum to reduce the duration of any exclusions. Permanent exclusions around turbine structures will be formally communicated and marked on navigation charts	Medium	Small/ Negligible	Minor
Recreational Users – landfall	Impacts to local tourism	Discussed in Section 12 (Landscape, Seascape and Visual Impact Assessment) and Section 17 (Socio-economics).	Medium	Negligible	Negligible

Aspect	Effect	Proposed Mitigation Measures	Sensitivity	Magnitude	Residual Effect
Recreational Users - Surfers	Interruption to wave energy transmission, and overall swell height. Alteration in wave energy direction and period. Modelled reduction in wave height will not be significant.	Consultation with stakeholder groups. Modelling has been based on worst-case in terms of usage of gravity based foundations, reductions in the number of gravity bases will decrease effects on the wave heights.	High	Negligible	Minor
Decommissioning Phase					
All Other Marine Users	Impacts such as temporary exclusion zones and vessel traffic attributed to decommissioning operations are expected to be similar to those resulting from the construction phase.	Proposed mitigation measures would be similar to those for construction works.	Medium	Small	Minor
All Other Marine Users – export cable removed	If the event where the export cable is to be removed from the seabed, impacts are likely to be similar to those experienced during the installation of the export cable.	Proposed mitigation would be similar to that for construction works.	Medium	Small	Minor
All Other Marine Users – Alternative scenario	In the event that the export cable is left in-situ, no impacts to other marine users are expected.	No proposed mitigation	Medium	Negligible	Negligible

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Rampion Offshore Wind Farm

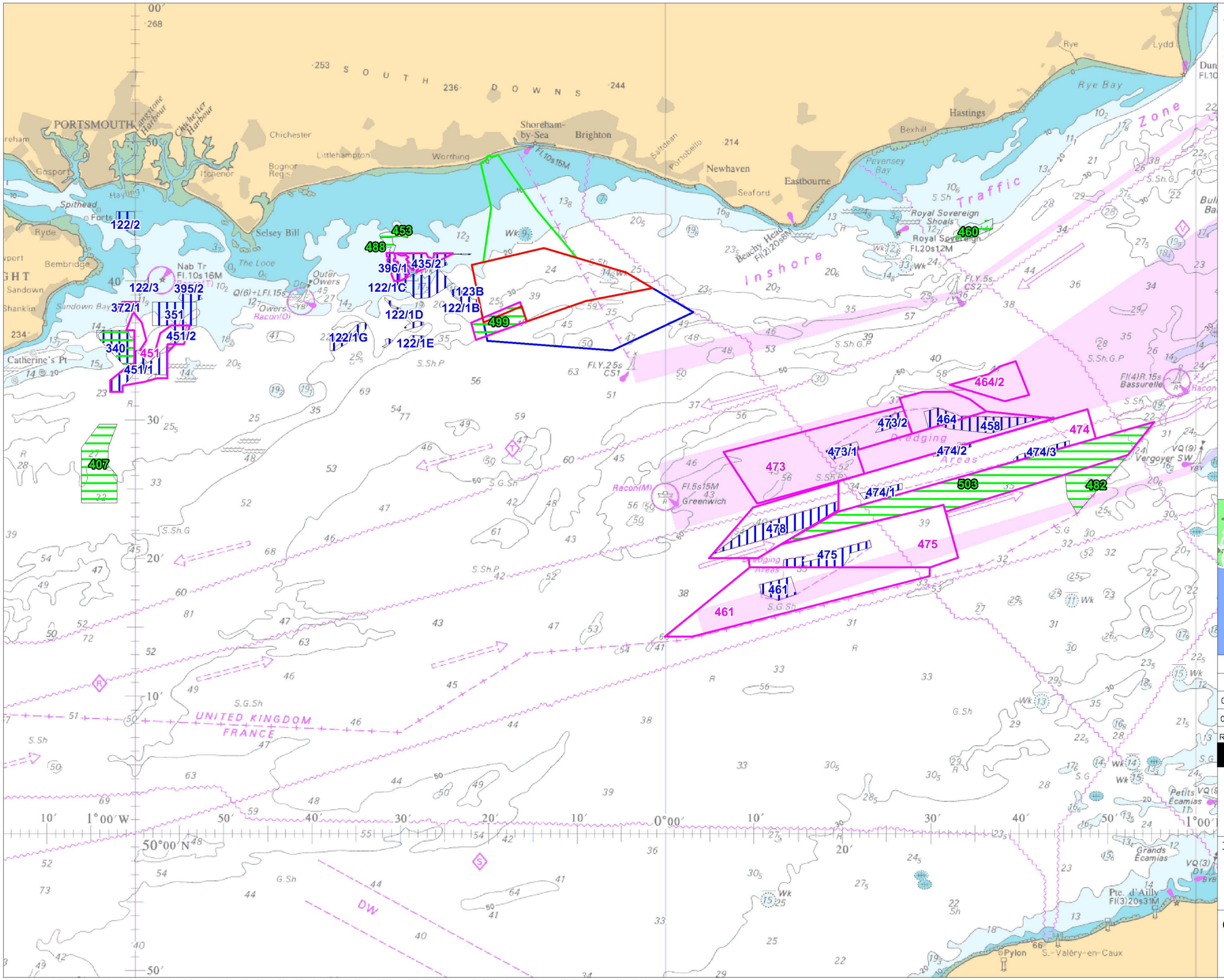
ES Section 19 – Other Marine Users
Figures 19.1 – 19.4b

RSK Environmental Ltd **Document 6.2.19**

December 2012 **APFP Regulation 5(2)(a)**

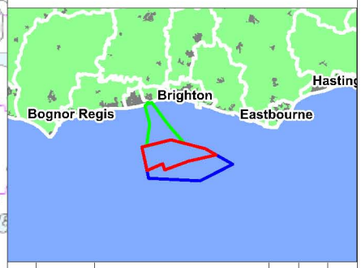
Revision A

E.ON Climate & Renewables UK Rampion Offshore Wind Limited



Legend

- Crown Estate Zone 6
- Rampion Offshore Wind Farm Site
- Export Cable Corridor
- Aggregate Licence Areas
- Aggregate Application Area
- Aggregate Option Areas



Rev	Date	Description	Drn	Chk	App
01	18.10.12	New Boundary	LH	AM	DW
00	15.05.12	First Draft	LH	CM	DW

Rampion Offshore Wind Farm

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Title :

Figure 19.1: Aggregate extraction areas in relation to Rampion OWF

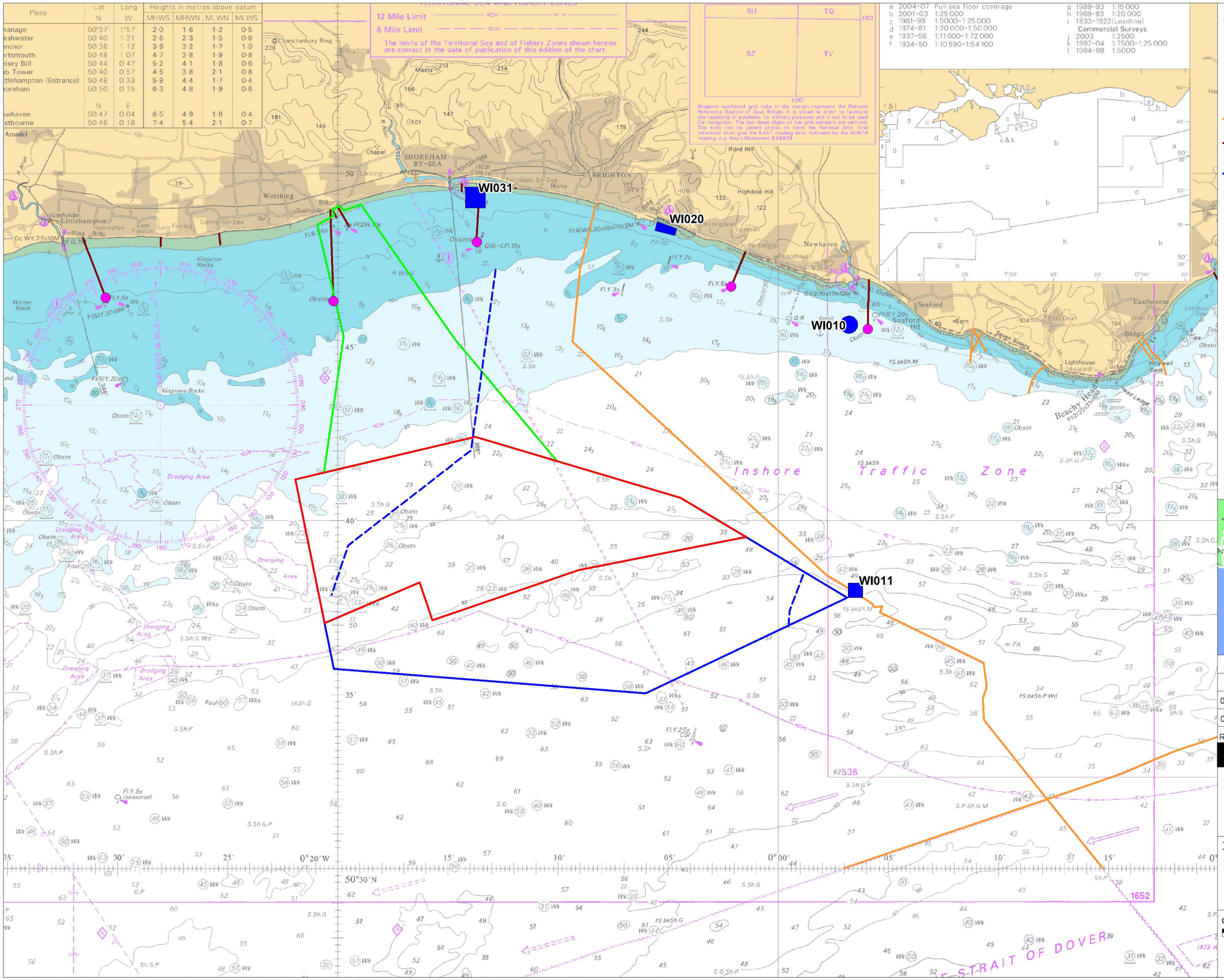
0 15 30

Kilometres

Scale = 1:500,000 @ A3

REV 01

FILE NAME: P41318 - Hastings Offshore Wind Farm105 - GIS\ES_Offshore_Dredging Areas.wor



Place	Lat N	Long W	Heights in metres above datum MHWS	MHWN	MLWN	MLWS
vanage	50°37′	1°57′	2·0	1·6	1·2	0·5
eshwater	50 40	1 31	2·6	2·3	1·5	0·8
ntnor	50 36	1 12	3·9	3·2	1·7	1·0
rtsmouth	50 48	1 07	4·7	3·8	1·9	0·8
lsey Bill	50 44	0 47	5·2	4·1	1·8	0·6
b Tower	50 40	0 57	4·5	3·8	2·1	0·8
ttlehampton (Entrance)	50 48	0 33	5·9	4·4	1·7	0·4
oreham	50 50	0 15	6·3	4·8	1·9	0·6
	N	E				
whaven	50 47	0 04	6·5	4·9	1·8	0·4
stbourne	50 46	0 18	7·4	5·4	2·1	0·7

TERRITORIAL SEA AND FISHERY ZONES
12 Mile Limit
6 Mile Limit
The limits of the Territorial Sea and of Fishery Zones shown hereon are correct at the date of publication of this edition of the chart.

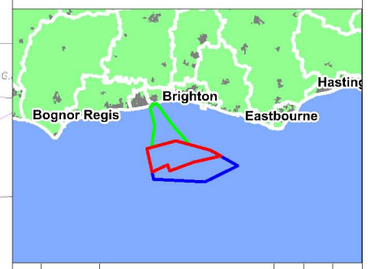
SU TQ SZ TV

Magenta numbered grid ticks in the margin represent the National Reference System of Great Britain. It is shown in order to facilitate the reporting of positions for military purposes and is not to be used for navigation. The last three digits of the grid numbers are omitted. The ticks can be joined across to form the National Grid. Grid reference must give the EAST reading first, followed by the NORTH reading, e.g. Hoy's Monument: ST4978

a	2004–07	Full sea floor coverage	g	1989–93	1:15 000
b	2001–03	1:25 000	h	1969–83	1:20 000
c	1981–99	1:5000–1:25 000	i	1833–1922	(Leadline)
d	1974–81	1:20 000–1:50 000	Commercial Surveys		
e	1937–58	1:11 600–1:72 000	j	2003	1:2500
f	1934–50	1:10 590–1:54 100	k	1997–04	1:7500–1:25 000
			l	1984–88	1:5000

Legend

- Crown Estate Zone 6
- Rampion Offshore Wind Farm Site
- Export Cable Corridor
- Submarine Cable
- Waste Water Outfalls
- Redundent Telecom Cable
- Offshore Diffuser
- Disposal Grounds



Rev	Date	Description	Drn	Chk	App
01	18.10.12	New Boundary	LH	AM	DW
00	16.05.12	First Draft	LH	CM	DW

Rampion Offshore Wind Farm

RSK e·on

Title :

Figure 19.2: Marine disposal sites and seabed cables and outfalls in the vicinity of the Rampion OWF

0 4 8 Kilometres

Scale = 1:200,000 @ A3

REV 01

FILE NAME: P41318 - Rampion Offshore Wind Farm\05 - GIS\ES_Offshore_ Disposal Sites.wor

Palace Pier Reef to Anchor Lumps
Miown / Silverspray
West Reef
Brighton Marina Reef
South West Rocks
Indiana
German Aircraft
Worthing Lumps
Kingsmere Rocks
Pentrych
Ikeda (wrongly named)
Fortuna
City of Waterford
T.R.Thompson
Vasco
Pagenturn
? Gerlen
HMS Keryado
Lornaston
? Dalhousie
Aristos
Clan McMillan

Legend

- Crown Estate Zone 6
- Rampion Offshore Wind Farm Site
- Offshore Cable Corridor
- Aircraft
- Reef
- Unknown Wreck
- Named Wreck

Rev	Date	Description	Drn	Chk	App
00	16.10.12	First Draft	LH	AM	DW

Rampion Wind Farm

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Title :

Figure 19.3: Sites important for recreational diving (and possibly angling and spearfishing)

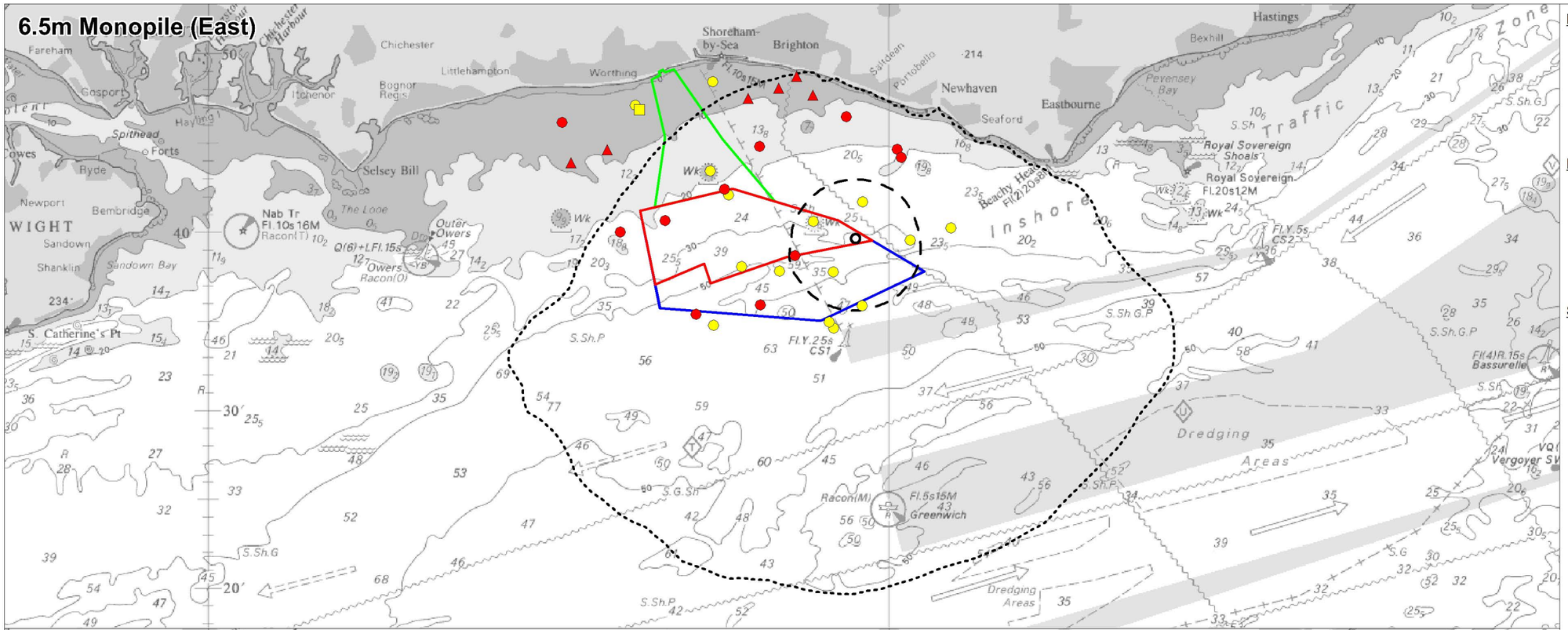
0 2 4 kilometres

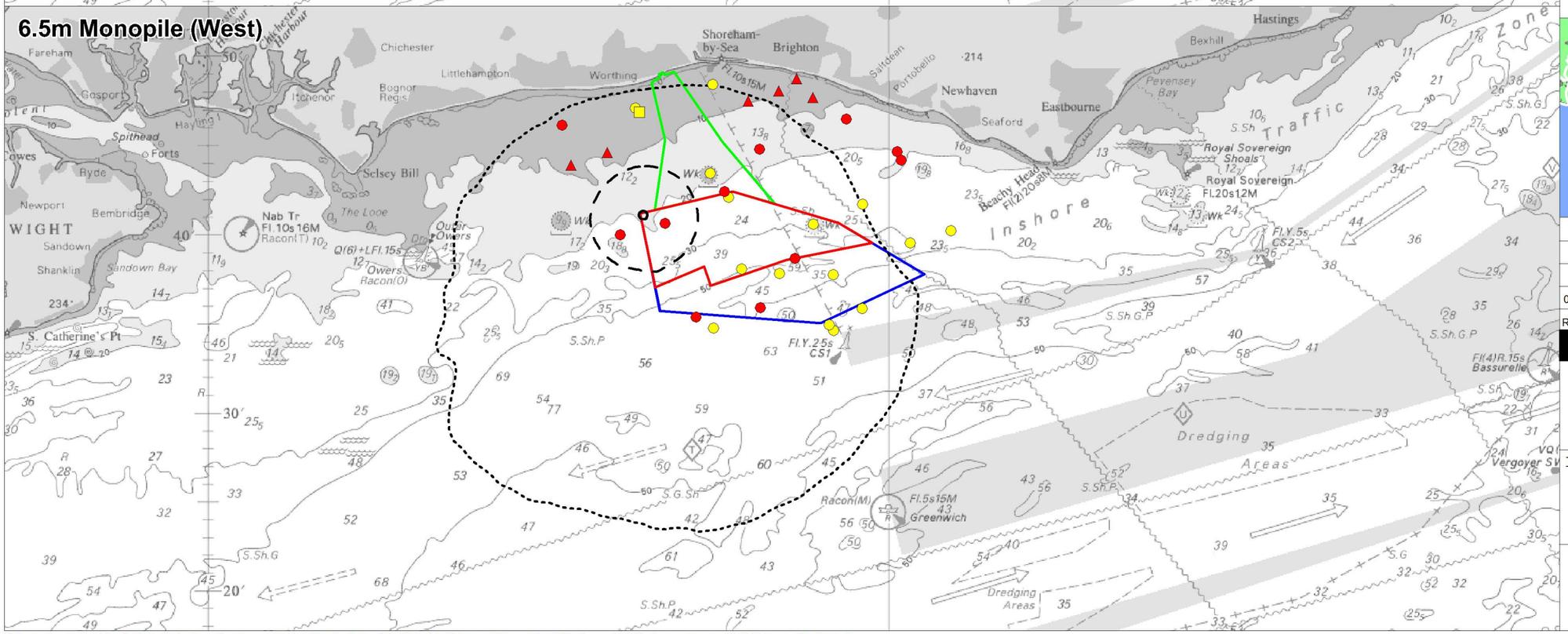
Scale = 1:150,000 @ A3

N W E S

REV 00

FILE NAME: P41318 \05 - GIS\ES_Fig 19-3 Diving baseline.wor





Rev	Date	Description	Drn	Chk	App
00	30.10.12	First Draft	AJ	AM	DW

Rampion Offshore Wind Farm

RSK e·on

Title :

Figure 19.4a: Predicted Impact of Piling Noise on Humans Underwater (6.5m monopile)

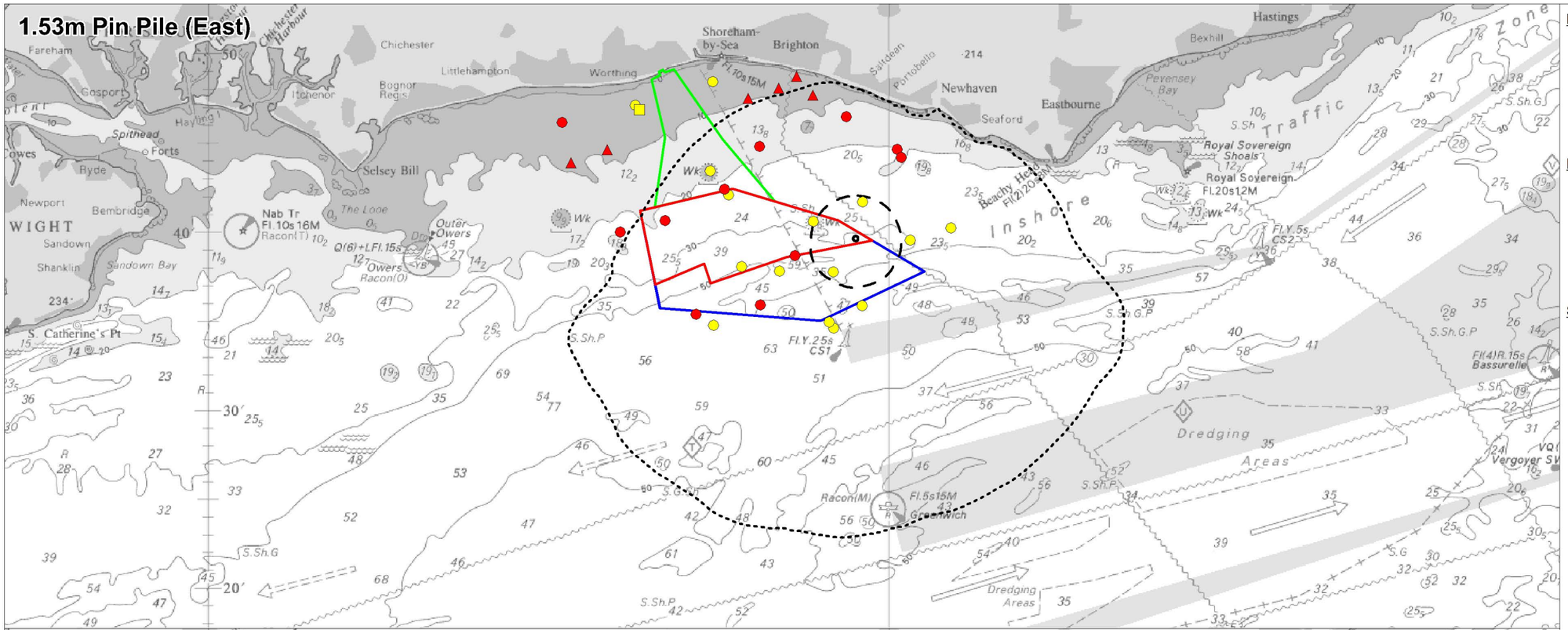
0 6 12
Kilometres

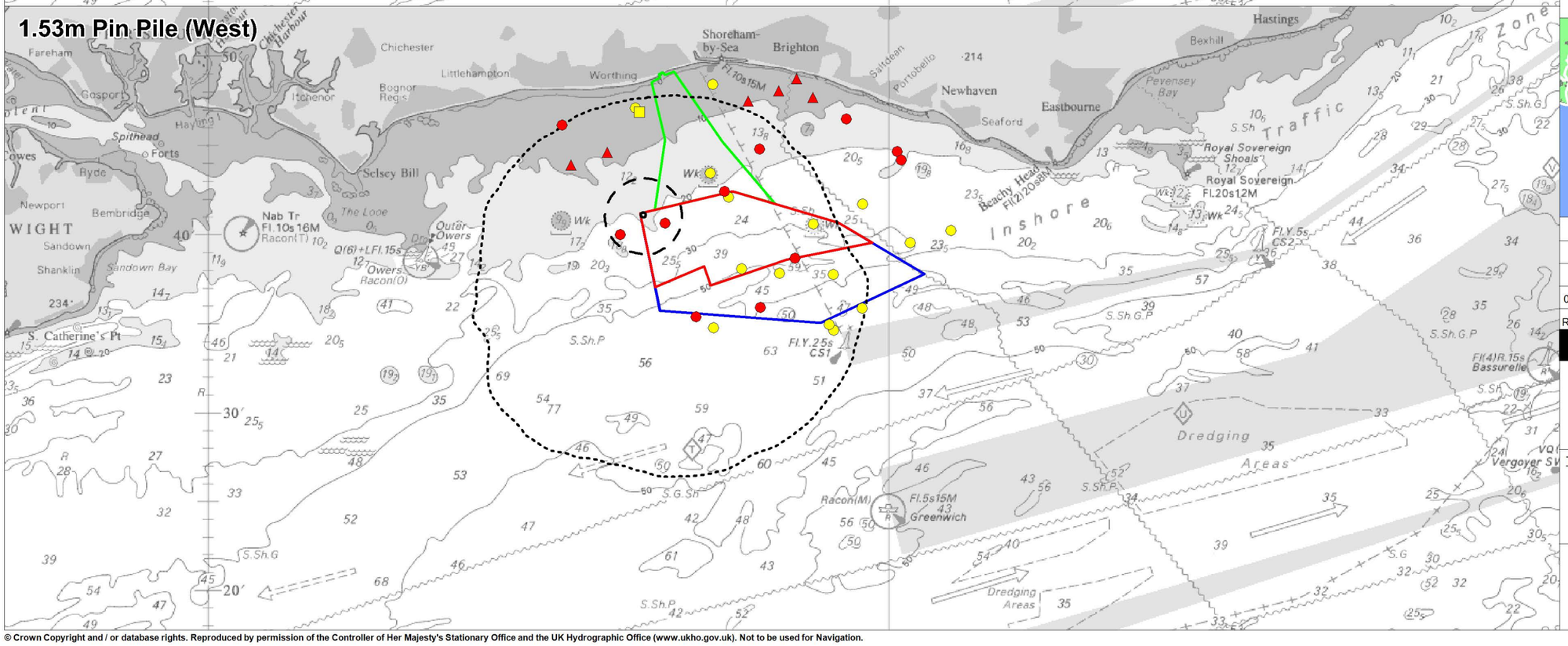
Scale = 1:500,000 @ A3

N W E S

REV 00

FILE NAME: P41318 - Rampion Offshore Wind Farm\05 - GIS\ES_Fig 19-4a Humans & Noise





Legend

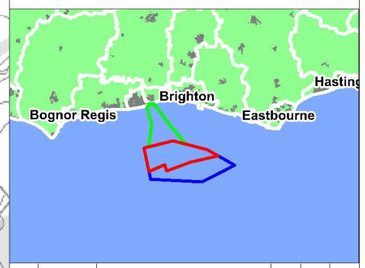
- Crown Estate Zone 6
- Rampion Offshore Wind Farm Site
- Export Cable Corridor

Noise Contours

- 130 dB (UW) (Permanent traumatic auditory injury)
- 110 dB (UW) ('Startle' - unpleasant)
- 90 dB (UW) ('Startle' - very loud)

Sites Important for Recreational Diving

- Aircraft
- Reef
- Unknown Wreck
- Named Wreck



Rev	Date	Description	Drn	Chk	App
00	15.11.12	First Draft	AJ	AM	DW

Rampion Offshore Wind Farm

RSK e·on

Title :

Figure 19.4b: Predicted Impact of Piling Noise on Humans Underwater (1.53m pin pile)

0 6 12
Kilometres

Scale = 1:500,000 @ A3

N W E S

REV 00

FILE NAME: P41318 - Rampion Offshore Wind Farm\05 - GIS\ES_Fig 19-4b Humans & Noise