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7 MARINE AND COASTAL WATER QUALITY

7.1 Introduction

The Thanet Offshore Wind Farm (Thanet) project has the potential to impact on water quality, predominantly through the resuspension of seabed sediments. This section identifies the water quality characteristics of the study area and assesses the magnitude and significance of impacts with reference to a number of EC Directives concerning water quality.

7.2 Assessment Methodology

The offshore location of the Thanet site means that the information available on water quality for the area where the turbines would be installed is limited. Monitoring programmes carried out by the various responsible authorities such as the Environment Agency, generally only cover inshore areas where interest features are located. Classification schemes for waters in estuaries exist, however similar systems for coastal waters do not. This will be revised with the introduction of the Water Framework Directive, where both coastal and estuarine environments will be assessed and classified based on a wide range of environmental parameters. Monitoring for the Water Framework Directive classifications will start in 2006.

There are two types of water quality designations in the vicinity of the export cable route:

- Bathing waters; and
- Shellfish waters.

These are described below. The Environment Agency is responsible for monitoring water quality at these locations and reports the data against environmental quality standards (EQS), which are designed to protect the environment and human health. Relevant legislation for this project therefore includes the EC Bathing Waters Directive and the EC Shellfish Waters Directive. The approach to assessing water quality effects compares predicted impacts against the assessment criteria established as water quality standards or environmental quality standards (EQS) within these Directives.

7.3 Existing Environment

7.3.1 Designated bathing waters

There are two designated bathing waters at Sandwich Bay and Ramsgate located near the export cable route. These bathing waters are shown as individual locations on **Figure 7.1** and reflect the Environment Agency's monitoring points. These points are 0.5km and 5km respectively from Ramsgate and Sandwich Bay locations. Bathing water quality is assessed by the standards listed in the EC Bathing Waters Directive. The Directive was adopted by the Council of the European Communities in 1975 and transposed into law for England and Wales to form the Bathing Waters (Classification) Regulations 1991. The Directive is concerned with the quality of bathing waters for the purpose of protecting public health and requires monitoring of microbiological parameters and a small number of physical parameters e.g. visible oil.



There are two types of microbiological standards set out in the Directive, namely the mandatory standards and the more stringent guideline standards.

The mandatory standards are:

- 10,000 total coliforms per 100ml of water; and
- 2,000 faecal coliforms per 100ml of water.

For a bathing water to comply with the Directive, 95% of samples collected within a bathing season (15th May to 30th September) must meet these and the other physical criteria.

The more stringent guideline standards should be achieved where possible and are:

- 500 total coliforms per 100ml of water (in 80% samples);
- 100 faecal coliforms per 100ml of water (in 80% samples); and
- 100 faecal streptococci per 100ml of water (in 90% samples).

Bathing water quality at Sandwich Bay and Ramsgate for the period 1989 to 2004 is illustrated in **Table 7.1**. Water quality is classified as 'excellent', 'good' or 'poor'. 'Excellent' relates to the achievement of the more stringent guideline standards and 'good' relates to the achievement of the mandatory standards. Bathing waters classified as 'poor', fail to meet the Directive's minimum mandatory standard.

Both bathing waters have exhibited either good or excellent quality for at least the last five years. Historically, there have been failures of the mandatory standards, however, significant improvements in the levels of sewage treatment over the past ten years are likely to account for the improvement.

Table 7.1Bathing water quality at Sandwich Bay and Ramsgate bathing
waters

Bathing Water	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Ramsgate	Ρ	Ρ	Ρ	Ρ	Ρ	Ρ	Ρ	Е	Е	G	Е	Е	G	G	Е	Е
Sandwich Bay	Ρ	Ρ	Ρ	Ρ	Ρ	Ρ	G	G	Е	G	G	G	G	Е	Е	G

Bathing Waters Classifications: E = Excellent, G = Good, P = Poor

The European Commission put forward a proposal to revise the EC Bathing Waters Directive in December 2000. Although the publication of the revision was expected in June 2002, it is still in discussion. The main differences to the current Directive include:

- A change in the standards and parameters to be applied;
- A new bathing water classification system;
- Proactive beach management;

- A significant increase in the information available to the public;
- The classification of the bathing water based on three seasons of data rather than the current one season; and
- The opportunity for member states to make changes to the list of designated bathing waters, the length of the bathing season and the location of the monitoring point.

7.3.2 Designated shellfish water

The designated shellfish water is located within the Pegwell Bay area (see **Figure 7.1**). The Shellfish Waters Directive (79/923/EEC) is designed to protect the aquatic habitat of the bivalve and gastropod molluscan species of shellfish. Species covered include oysters, mussels, cockles, scallops and clams but not shellfish crustaceans such as crabs, crayfish and lobsters. The Shellfish Waters Directive is implemented in the UK under the Shellfish Waters (Shellfish) (Classifications) Regulations 1997.

Shellfish waters are monitored for various parameters based on water quality standards established by the Directive. These parameters include suspended solids, salinity, dissolved oxygen (DO), organo-halogenated substances (e.g. PCBs, organochlorine pesticides), metals and guideline values for coliforms in shellfish flesh. For each substance, the Directive specifies the minimum number of samples to be taken, the water quality standards to be met and the percentage of samples that must meet these standards. The standards are either a numeric limit or a descriptive standard (see **Table 7.2**). The water quality standards have been met if the following percentage of the samples analysed do not exceed the limit values:

- 100% for metals and organo-halogen compounds;
- 95% for salinity and dissolved oxygen (DO);
- 75% for other substances; and
- No evidence of harm to the shellfish from organo-halogenated compounds.

 Table 7.2
 Selected imperative standards for shellfish waters

Parameter	Units	Standard
Suspended solids	mg/l	A discharge affecting shellfish waters must not cause the suspended solid content of the waters to exceed by more than 30% the content of waters not affected.
Salinity	Parts per thousand (i.e. g/l)	≤40 parts per thousand A discharge affecting shellfish waters must not cause their salinity to exceed by more than 10% the salinity of the waters not affected.
Dissolved oxygen	% saturation	Average of individual values >70% and an individual measurement may not indicate a value lower than 60% unless there are no harmful consequences for the development of shellfish colonies.
Organo- halogenated substances	-	The concentration of each substance in the shellfish waters or in the shellfish flesh must not reach or exceed a level, which has harmful effects on the shellfish and their larvae.
Metals (Ag, As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	mg/l	The concentration of each substance in the shellfish waters or in the shellfish flesh must not reach or exceed a level, which has harmful effects on the shellfish and their larvae. The synergic effects of these metals must be taken into consideration.

Since its designation in 2004, the shellfish water at Pegwell Bay has complied with the mandatory standards.

The Shellfish Hygiene Directive, although not a Directive directly protecting water quality, stipulates the level of treatment required depending on numbers of bacteria in the shellfish flesh. This Directive is designed to protect human health. Since shellfish are grown in the natural environment, it is a commonly held view that the concentration of bacteria in the flesh directly relates to the quality of the surrounding water in which they grow. The monitoring undertaken as a consequence of this Directive can therefore be used as a rough indicator of water quality.

Under the Shellfish Hygiene Directive, standards are set in terms of concentrations of coliform bacteria and salmonella. Shellfish are classed in categories 'A', 'B', 'C' and 'P' where 'A' is the highest quality and can be collected direct for human consumption. 'P' is the poorest quality and shellfish are prohibited from collection. Monitoring for the Shellfish Hygiene Directive is carried out by the local authorities and the data is collated by the Food Standards Agency. Pegwell Bay is classified as class 'B' for the common edible cockle.

7.4 Impacts during Construction

7.4.1 Impacts due to resuspension of suspended sediments

Seabed sediment would be disturbed as a result of construction activities on the seabed, including turbine installation and cable burial. The suspended sediment would be subsequently transported and dispersed by tidal currents and deposited onto the seabed. This has the potential to impact on the water quality standards set out in the Shellfish Waters Directive, which stipulates that a discharge should not cause the increase of suspended solids to exceed 30% above background levels.

The Bathing Waters Directive does not have standards relating to suspended solids, however, aesthetic appearance of the bathing water during the bathing season can be important to the local community.

Installation of turbines

All methods of turbine installation (see **Section 2, Project Details**) would lead to varying amounts of sediment being brought into suspension. However, the moderately high natural background concentrations of suspended solids experienced in the location of the Thanet site of 30mg/l during the summer and 60mg/l during the winter (HR Wallingford, 2005), the distance to the designated areas and the exposed location of the area, which would ensure good dispersion and dilution, suggest that the impact on water quality is likely to be of **negligible** significance.

Installation of the interturbine array and export cables

Resuspension of sediment would also occur as a consequence of cable installation. Ploughing is considered to cause the least disturbance as excavated seabed material is largely returned as the cable is laid. Volumes of material put into suspension per metre of cable length would be relatively small compared to the natural background levels. HR Wallingford (2005) predicts peak concentrations of approximately 3mg/l within the plume. The short term increases to the background concentrations are unlikely to be significant compared to moderately high natural background concentrations and would not breach the 30% above background stipulated by the Shellfish Waters Directive.

It is likely that disturbed chalk would be visible as a milky plume. HR Wallingford (2005) predicts that concentrations would reduce with a half life of the order of a few tides to a week. The short time scale required for the plough installation and the distance from the bathing waters would minimise this impact.

In light of the exposed location of the Thanet project and the relatively high background levels of suspended sediments, it is predicted that the impact would be of **negligible** significance on both bathing and shellfish waters.

7.4.2 Impacts due to resuspension of contaminants

The resuspension of sediments during the installation of the cables and turbines, as discussed above, has the potential to result in the release of sediment-bound contaminants into the water column. A release of chemical contaminants could increase the concentration of contaminants in the water column and affect compliance with EQS monitored by the Environment Agency in response to the implementation of the Shellfish Waters Directive.

The concentrations of PCBs, PAHs and TBT were below the limit of detection for all four sites sampled for sediment contaminant concentrations, as part of the survey described in **Section 9, Marine Ecology**. However, concentrations of heavy metals vary. The main concern is therefore associated with the impact of the resuspension of sediments and consequent metal contamination of the designated shellfish waters.

The two sediment sample sites (Stations 46 and 47 in **Figure 7.1**) located within the designated shellfish waters do not show elevated concentrations of metals when compared to the Canadian Sediment Guidelines (see **Section 9**). This is likely to be due to the sediment having a relatively small percentage of fine material. Fine sediments can adsorb a greater quantity of contaminants relative to coarser sediments due to the relatively large surface area. Sediment sample Stations 48 and 49 located in the vicinity of the Port of Ramsgate show elevated concentrations of zinc, copper and lead. These results are thought to be associated with the historical sediment disposal site and crude sewage outfall located in the vicinity of the Port of Ramsgate breakwater, particularly at Station 48 (see **Section 9**). These samples are, therefore, not considered to be wholly representative of the general sediment quality in the area.

Given the above, the short duration of the cabling work, and the relatively small area over which the plough would impact, the risk of breaching the environmental quality standards is considered to be minimal. The high degree of mixing and dilution associated with the coastal location of the export cable route would also minimise the potential for impact. It is therefore considered that there would be a **negligible** impact on designated water quality.

7.4.3 Impacts due to resuspension of pathogens

There is the potential for bacteria present within the sediment to be resuspended into the water column during the construction phase. This could potentially cause exceedence of the standards set to protect the designated bathing and shellfish waters. Sediment samples taken from within the Pegwell Bay area show a relatively low percentage of fine material. This significantly reduces the risk of high levels of bacterial contamination in the sediments, since as explained above, fine mud sediments, with high organic content, retain more contaminants than relatively coarse sandy sediments.

Additionally, sewage discharges to the area have been significantly improved over the last ten years, further negating the risk of high levels of bacterial contamination within the sediments. Any bacterial contamination in sediment located further offshore, if released into the water column, is likely to be significantly diluted before it reaches the designated waters.

Given the above, the impact on the bathing and shellfish waters is deemed to be of **negligible** significance.

7.4.4 Impacts due to accidental spillage of construction materials

There is the potential for pollution from spills or leaks of fuel, oil and construction materials such as grout during the construction period. The risk of this arising can be minimised by following standard good practice with regard to the pollution prevention guidance issued by the Environment Agency.

It is not possible to assess the significance of a particular pollution incident, as this is dependant on the nature of the incident e.g. location, scale, type of pollutant. The adoption of good practice however, means that the potential for accidental pollution occurring is minimal.

7.5 Impacts during Operation

Work during the operational phase would not require any disturbance of the sediments. The only potential risk of impact on water quality is from accidental spillage of materials during routine maintenance. By ensuring pollution prevention guidelines and best practice guidelines are adhered to, the risk of accidental spillage would be minimised.

7.6 Impacts during Decommissioning

Impacts on water quality during decommissioning would largely be associated with the partial removal of the offshore structures. Resuspension of sediment is therefore a potential risk and impacts are likely to be similar to those described for the construction phase above. Impacts associated with the installation of the cables however would not be experienced, as it is likely that the cables would remain in situ once disconnected. Disturbance of the seabed is therefore predicted to be **negligible**.

7.7 Summary

There are two designated bathing waters and one designated shellfish water located within the vicinity of the Thanet site and export cable route. Impacts on water quality have been assessed against water quality criteria set out in the Directives protecting these designations.

Both Bathing Waters and the Shellfish Water meet the mandatory standards. The Bathing Waters have complied on a number of occasions with the more stringent guideline standards.

Impacts due to the resuspension of sediments during the construction phase are considered to be potentially most significant. However, the exposed location of the site, moderately high levels of natural background concentrations of suspended solids and distance of the works in relation to the designations deem the impact to be **negligible**. The impact of the resuspension of bacteria and sediment contaminants has also been assessed as **negligible**, predominantly due to the low risk of bacterial contamination and the general low level of contamination found within the sediments in the working areas. Adherence to standard pollution prevention guidance will reduce the risks to water quality from accidental spillage.

Impacts on water quality during the operational phase are considered to be **negligible** as sediment disturbance would not be required. Adherence to standard pollution prevention guidance will reduce the risks to water quality from accidental spillage during maintenance work.

Impacts during the decommissioning phase are again likely to be **negligible** and mainly associated with the partial removal of offshore structures. The disturbance of sediments in the vicinity of the designated waters would be kept to a minimum, as it is anticipated that the export cables would remain in situ following disconnection.