10 WATER QUALITY

1. The section commences with a description of the water quality of the Harbour and near-shore area with reference to relevant water quality legislation and areas that are designated with respect to their water quality. Of particular relevance to the proposed development is the existing suspended sediment regime of the Harbour area, as one of the main potential impacts of the development (in particular the capital dredging component) is the resuspension and dispersion of fine material during dredging operations.

2. Another potential effect of the dredging on water quality is the potential elevation in contaminant concentrations due to their release from the particulate phase as fine sediment is disturbed. Due to the predicted effect of the proposed development on the hydrodynamic regime of the Harbour area, potential effects on the dispersion of faecal coliforms from sewage outfalls has also been modelled. In addition, the potential impact on the initial dilution of effluent (and hence water quality) from an outfall that is currently present within the proposed development area, and which would require relocation, has been modelled.

3. The potential effects of surface water run-off into the estuarys and accidental pollution due to the reconfiguration are also considered. For completeness, a detailed assessment of risks potentially arising from the handling and transport or dangerous goods is provided in Appendix 5.

10.1 EXISTING ENVIRONMENT

10.1.1 Bathing water beaches

1. There are a number of bathing water beaches designated under the EU Bathing Water Directive (76/160/EEC) within the area surrounding the development, although there are no designated beaches within the estuarine system. The nearest beaches are located at Dovercourt to the south of the mouth of the estuarine system (OS NGR TM2517 3064) and Felixstowe (South) (OS NGR TM2970 3370) to the north. Designated beaches have to meet certain water quality criteria during the bathing season (May to September). These criteria include microbiological parameters (total coliforms, faecal coliforms, salmonella and enteroviruses) and physico-chemical parameters (pH, colour, mineral oils, surface-active substances, phenols and transparency). The Bathing Waters Directive is translated into UK legislation via The Bathing Waters (Classification) Regulations 1991.

2. Since the Anglian Water Services (AWS) sewage treatment works at Marsh Farm was upgraded to include secondary treatment in 1998, the bathing water at Dovercourt has been compliant with the guideline standard of the Bathing Water Directive. In 2001, Dovercourt achieved European Blue Flag status; meeting the guideline standard for water quality is a prerequisite for achieving this status. In addition to water quality, the European Blue Flag is awarded on the basis of facilities provided, environmental awareness and health and safety criteria.

10.1.2 Dangerous Substances Directive

1. The EC Dangerous Substances Directive was adopted in 1976 to control pollution caused by certain dangerous substances on the aquatic environment. The Directive established two lists of substances:

- List I – substances regarded as particularly dangerous because of their toxicity, persistence and bioaccumulation; pollution by these substances must be eliminated. List I includes cadmium, mercury and many organochlorine compounds (mainly pesticides) such as DDT, PCP and HCH; and,
- List II – substances regarded as less dangerous but which have a deleterious effect on the aquatic environment; pollution by these substances must be reduced. List II includes other metals such as arsenic, chromium, copper, lead, nickel and zinc, and TBT.

2. The Dangerous Substances Directive proposes Environmental Quality Standards (EQSs) as an approach for the control of List I substances. EQSs for List I substances have been established on a community level under a series of 'daughter' Directives. The requirement to comply with EQSs in controlled waters influences the conditions on discharge consents containing List I substances. In England and Wales, discharge consents and EQSs are administered by the Environment Agency. All member states are also required to establish EQSs for List II substances on a national level. EQSs for List II substances have been implemented in the UK by the Surface Waters (Dangerous Substances) (Classification) Regulations 1997 and 1998.

10.1.3 Sediment flux and suspended sediment concentrations

1. In February 2001, two sets of through-tide spring tide sediment flux measurements were made within Harwich harbour and the lower Stour and Orwell estuaries (HR Wallingford, 2001a). One of the measurement transects was located approximately across the seaward limit of the proposed dredging and construction works. On the larger of the spring tides when measurements were made, the measurements suggested a flux of about 33,000 tonnes of sediment moving back and forth through across the transect with the ebb and flood tides. On the smaller of the spring tide measurement periods the flux was about 18,000 tonnes. On a neap tide substantially smaller exchange would be expected.

2. In the main navigation channel, near-bed suspended solids concentrations were measured on the largest spring tides to vary between about 100mg/l and 800mg/l with concentrations greater at high water than low water. Over the shallow subtidal area between the channel and Harwich (i.e. adjacent to the area of the proposed channel widening) the near-bed concentrations were found to vary between about 50mg/l and 400mg/l. Concentrations close to the navigation channel were found to be greater than those closer to shore. During neap tides, tidally averaged concentrations have been found to be approximately half of that measured on spring tides in the lower estuaries.

10.1.4 DSM Bakery Ingredients outfall

1. DSM Bakery Ingredients hold a discharge consent for an outfall which is located near-bed at the end of the oil jetty. The outfall was reconfigured to this position in the

Harbour in the late 1990's following concerns over a visible plume. The outfall is an 18m long diffuser with five 75mm diameter ports.

10.1.5 Anglian Water Services outfall

1. There is an existing AWS outfall that discharges into the Harbour from a point on the existing Landguard Terminal.

10.2 POTENTIAL IMPACTS DURING THE CONSTRUCTION PHASE

10.2.1 Elevated suspended sediment concentration during the dredging works

1. The suspended sediment concentrations described in Section 10.1.3 are typical of conditions during spring tides that are likely to occur in the areas where dredging is to take place. In the area of dredging adjacent to the proposed reclamation, regular maintenance dredging takes place and elevated concentrations during these periods are to be expected. The capital dredging would be undertaken at lower production rates than the maintenance dredging, the majority being undertaken with a backhoe loading into barges. Thus, there should be no effects on suspended solids concentrations outside the envelope of those regularly occurring during maintenance dredging campaigns associated with this part of the capital dredging.

2. For the dredging required to widen the approach channel to the west, natural suspended sediment concentrations are typically lower. The proposed capital dredging in this area would be largely backhoe loading into barges and the fines content is generally lower. The production rates would be much lower than during maintenance dredging activities, which involve trailer dredging and indirectly affect this area. Providing overflow of the barges is controlled, localised increases in suspended solids concentrations would be minimal and the significance of the impact is, therefore, predicted to be of **negligible significance.**

Mitigation and residual impact

3. No mitigation measures are required beyond those described in Section 6.2.3 and the residual impact is expected to be of **negligible significance**.

10.2.2 Remobilisation of contaminants through sediment disturbance

1. Sediment disturbance is an important factor affecting contaminants because most contaminants within the bed sediments are attached to particulate surfaces rather than dissolved in interstitial water (i.e. the water in the sediment pore spaces). Sediment disturbance can, therefore, mobilise attached and dissolved contaminants into the overlying water column with the potential to affect water quality. Deterioration in water quality would be significant if it affected the requirements of the Dangerous Substances Directive.

2. The survey of the sediment quality of the proposed dredge areas indicates that the level of contamination is relatively low, with concentrations of metals, PAHs and PCBs being around the PEL as defined by the Canadian ISQGs. There is, however, a very localised area of high total PAHs within the proposed dredged area to the west of the existing approach channel.

3. The aspect of the construction phase that would cause most disturbance to marine sediments is the dredging phase. During this period, the ambient suspended sediment concentration would increase in the vicinity of the dredger; the magnitude of this increase in the context of ambient concentrations of suspended sediment and concentrations arising during maintenance dredged is discussed in Section 10.2.1. Significant increases above ambient concentrations are not expected to arise beyond the immediate vicinity of the dredger. A proportion of the contaminants that are adsorbed to the surface of particulate matter would be released into the water column and, therefore, there is the potential for an impact on water quality to arise during the dredging works. The degree to which the sediment and contaminants disassociate is variable for different contaminants and depends on the partitioning coefficient between the adsorbed and dissolved phases. Many contaminants (including metals and organic compounds) have very low solubilities and so only a small fraction of the mobilised contaminants can become directly dissolved into the water column. Therefore, the majority of the contaminants mobilised into the water column would remain bound to the resuspended sediment.

4. An important factor in assessing the potential impact on water quality is the extent to which contaminants (whether bounds to sediment or dissolved) would disperse and, therefore, their concentrations decrease. In the case of the proposed dredging in the Harbour, significant dispersion would be expected as the area is not enclosed and is tidal waters. Given this, and considering that the relatively low levels of contaminants within the sediments, the potential impact on water quality is expected to be of **negligible significance.** As a result, it is not expected that there would be any effect on the Dangerous Substances Directive.

Mitigation and residual impact

5. Beyond the measures proposed to minimise the resuspension of fine material during dredging (as stated in Section 6.2.3), no mitigation measures are required. The residual impact would be of **negligible significance.**

10.2.3 Accidental pollution

1. During the construction phase, there is the potential for accidental pollution to occur. This could be due to the spillage or leakage of oil, diesel, or chemicals from construction plant. The risk of these arising can be minimised by following standard good practice with regard to construction activities.

2. In addition, the Port of Felixstowe has an oil and chemical pollution recovery contingency plan in place. This plan is largely developed for use in the event of an operational accident but is equally relevant for the construction phase and would be employed in the event of an accidental pollution.

3. The Port of Felixstowe is a signatory to a Memorandum of Understanding as part of the Haven Oil Working Group (HOWG). With HHA, the local ports, County and District Councils, Environment Agency and with local industry, the Group agreed to assist each other in the event of an oil spillage incident. Expertise, equipment and manpower will be made available one to the other as required. Protocols and procedures have been exercised in order to maintain an effective force to fight pollution.

This alone brings a large resource immediately to hand when needed, in the Ports case notably from HHA who can supply booms, skimmers, other equipment and launches immediately.

4. In order to comply with the requirements of the Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998, known as OPRC, HHA has contracted with Oil Spill Response Ltd (OSRL) to provide Tier 2 response to an oil spill. This agreement effectively covers Port waters as well, both as defined by the respective harbour areas and by the terms of the HOWG agreements.

5. In addition to the above, a number of Marine Division Management and supervisory staff have already undergone training in fighting oil pollution. Besides their having experience in other environments, the Port has financed their attendance at an MCA residential course and/or the accredited MCA approved courses to Level 4P or Level 3 as appropriate, in order to comply with OPRC requirements. Training is ongoing to bring the balance of management and supervisory staff to at least Level 3. Other training is undertaken where appropriate.

6. Involvement with HOWG enables staff to keep abreast of developments, to participate in both table top and live exercises and also to ensure the Ports interests and requirements are fully recognised.

7. All staff are trained to full County Emergency Services standards and there is a continuous programme of training both in Port and externally. They work with Felixarc Marine to deploy booms under the direction of the Assistant Portmaster and take part in exercises both with Felixarc and other members of HOWG.

8. The Port Fire Department provide support to and operate equipment for the Marine Division.

9. In the event of an oil spill incident, control rests with the Marine Division under the Assistant Portmaster. He will direct the deployment of booms and permit the use of dispersant within very specific parameters. Gathering samples, taking statements, advising other interested parties, calling for reinforcements and additional resources will all be directed by him.

10. In the absence of the Assistant Portmaster the Duty Berthing Master will assume control until such time as the Assistant Portmaster or his representative arrives to assume control.

11. In the event that an incident assumes such proportions that it impinges beyond the area of jurisdiction of the Port then HHA, under the direction of the Harbour Master, will take over as lead body for control of the incident. However Felixstowe will continue to take all practicable countermeasures within its own area of jurisdiction.

12. 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, etc). However, the adoption of good site practice means that the potential for accidental pollution occurring is **minimal**.

Mitigation and residual impact

13. In the normal course of a construction project, statutory regulations oblige the contractor to prevent spills and leaks into controlled waters (i.e. watercourses and tidal waters under the jurisdiction of the Environment Agency). In addition, construction materials must be stored in a safe and secure manner.

14. It is recommended that the appointed contractor undertakes the construction works in accordance with the Environment Agency's Pollution Prevention Guidelines PPG No. 5 on Works In, Near or Liable to Affect Watercourses and PPG No. 6 on Working at Construction and Demolition Sites. It is also recommended that concrete pouring and filling works are monitored by the appointed contractor and, in case of spills into the harbour, that appropriate remedial action is taken to clean up spills and avoid pollution.

15. The risk of an impact occurring is **minimal**; should accidental pollution occur, the significance of the impact would be dependant on the nature of the incident.

10.3 POTENTIAL IMPACTS DURING THE OPERATIONAL PHASE

10.3.1 Potential impact on bacterial dispersion

1. The proposed development could potentially affect bacterial levels in the water column through alterations to the tidal regime and flow distribution. Changes to these aspects could affect the dispersion of faecal coliforms from two sewage outfalls into Harwich Harbour (Marsh Farm at Harwich and the outfall at Felixstowe). It is proposed that the existing Anglian Water Services outfall that discharges from the existing Landguard Terminal would be relocated from its existing location to a new point at the nearest location on the quayside. In the assessment of impact, it is assumed that the discharge characteristics of the relocated outfall will be identical to that at present.

2. Numerical modelling studies have been carried out (HR Wallingford, 2003x) to assess the likely effects of the proposed works on bacterial dispersion from the two outfalls using the PLUME-RW model. The model predicts that in (calm) windless conditions, faecal coliform concentrations at Dovercourt, Felixstowe North and Felixstowe South designated bathing water beaches will change little or be reduced by the proposed reconfiguration. This was also the case at Wrabness in the Stour estuary. Therefore, the proposed scheme will have **no impact** on water quality (faecal coliform concentration) at designated bathing waters.

3. Modelling was not undertaken under stronger wind conditions because no impact is predicted at the relevant bathing water beaches. That is, baseline conditions would not change significantly due to the proposed development. It can, therefore, be assumed that, although the conditions at bathing water beaches may be different under severe wind conditions, the effect of the additional influence of the proposed development on bacterial dispersion during windy periods would be insignificant.

Mitigation and residual impact

4. No mitigation measures are required and there would be **no residual impact**.

10.3.2 Potential impact on dispersion of effluent from the DSM Bakery Ingredients outfall

1. The effect on dilution as a result of relocating this outfall has been predicted by HR Wallingford (HR Wallingford, 2003). These studies have shown that if the same diffuser arrangement as that currently used was to be relocated to a point 3m above bed level on the new quay line, an improvement in initial dilution of the discharge of about 40% would be expected. This improvement assumes that the discharge characteristics at the diffuser would be unchanged after relocation of the outfall.

2. Given the above, there would be an improvement in water quality local to this outfall as a result of its relocation due to the proposed development. This is considered to represent an impact of **minor beneficial significance.**

Mitigation and residual impact

3. No mitigation is required and, assuming that the relocated outfall adopts the same diffuser arrangement, the residual impact would be of **minor beneficial significance.**

10.3.3 Potential effect of surface water run-off from the proposed development

1. During the operational phase, surface water from the proposed development would enter the Harbour via outfalls constructed into the quay face. Prior to discharge, surface water draining from areas where spillages of oil and diesel are most likely to occur (i.e. the RTG maintenance pad, areas around the workshop and the area around the refuelling point) would pass through light liquid bypass separators. This interception system works by separating light immiscible liquids (such as diesel and oil) from water prior to discharge into the Harbour. Given that minor spillages of these potential pollutants are the most likely spillages to occur, this is the most appropriate type of interception system. Similar systems are installed for large areas of vehicle parking. This is the same mechanism for drainage of surface water that currently operates and, therefore, there would be no direct discharge of surface water to the estuary. The drainage system would be compliant with the Water Resources Act 1991.

2. Given that the usage of the proposed reclaimed area is the same as that at present (i.e. container handling and storage), the nature of potential pollutants would not change from the existing situation. In terms of water quality implications, it is considered that there would be **no impact** compared with the existing situation.

Mitigation measures and residual impact

3. No mitigation measures are required and there would be **no residual impact.**

10.3.4 Accidental pollution

1. As stated in Section 9.2.3, the Port of Felixstowe has an oil and chemical pollution and recovery contingency plan in place. This plan is also relevant for prevention of, and recovery from, pollution during the operational phase. This plan would also apply to the proposed development.

2. 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, etc). However, the measures that will be put in place are designed to reduce the risk of an incident occurring as far as possible and, therefore, the potential for accidental pollution occurring is **minimal**.

3. See also Appendix 5, which considers the off-site risks of handling and transporting dangerous goods.

Mitigation and residual impact

4. Should a pollution incident occur, the contingency plan that has been developed at the Port of Felixstowe would be put into operation.

5. The risk of an impact occurring is **minimal**; should accidental pollution occur, the significance of the impact would be dependant on the nature of the incident.