Maintenance Dredging Protocol Baseline Document

Stour and Orwell Estuaries, Harwich/Felixstowe Harbour and Deep Water Channel

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1 BACKGROUND INFORMATION

1.1 Objective of Baseline Document

This Baseline Document provides information to enable the assessment of maintenance dredging activities within Harwich and Felixstowe and the surrounding area and their effects on the Stour and Orwell Estuaries Special Protection Area (SPA). It draws on existing and readily available information to describe current and historic patterns of dredging in relation to the conservation objectives of the Stour and Orwell Estuaries SPA.

The Marine Management Organisation, relevant statutory regulators and the ports and leisure industries have agreed a Maintenance Dredging Protocol (MDP), which enables consideration of the implications of on-going maintenance dredging operations. The draft protocol outlines the requirements of the baseline document which draws on available information on current and historical dredging patterns and the conservation status of the European site and the interaction between the two. The presumption is that where current or new activities are broadly in line with what has occurred historically, and the site is in a stable or improving condition, there will not be an adverse effect on the site. The findings can then be used to inform decisions in compliance with the requirements of The Conservation of Habitats and Species Regulations 2010 in relation to the appropriate assessment of activities within a European site.

The baseline document requires updating on a regular basis (every 5-6 years) to take account of any changes to the dredging regime or the status of the site.

1.2 Area of Coverage for Baseline Document

The study area covers maintenance dredging and disposal activities carried out within the tidal limits of the Stour and Orwell estuaries, Harwich Harbour and the Deep Water Channel to the South Shipwash buoy (as illustrated on Figures 1 and 2). It considers past and present maintenance dredging operations carried out by, or on behalf of, Harwich Haven Authority (HHA), The Port of Felixstowe, Harwich International Port, Associated British Ports (ABP) Ipswich (formerly the Ipswich Port Authority), Harwich Navyard, Mistley Quay and various Marinas and Yacht Clubs.

1.3 Description of the Site

The Stour and Orwell estuaries are recognised as being of national and international importance for their nature conservation value. The estuaries include extensive mudflats, low cliffs, saltmarsh and small areas of vegetated shingle. The mudflats and areas of saltmarsh provide feeding grounds and roosting habitat for large numbers of wintering and passage waders and wildfowl and also support nationally scarce saltmarsh plants and invertebrate species. The hinterland comprises important areas of open farmland, parks and woodland, all of which provide a rich diversity of habitats and wildlife including a variety of Red Data Book species. For details of the interest features and the conservation objectives for the site, see section 9.

The estuaries, although treated as one entity for the purposes of the Habitats Regulations, have very different characteristics in terms of bird populations and habitats. The average number of waterfowl found on the Orwell is around 17,000, whereas on the Stour there are typically around 48,000 birds in winter months (data from WeBS counts). In the past, land claimed for agriculture and commercial development has led to the loss
and change of intertidal habitats, with some parts of the estuaries accreting and others eroding.

The Stour and Orwell estuaries are designated as SPA under the EC Birds Directive because they support internationally important numbers of waders and wildfowl. The estuaries also qualify as a Ramsar site under the Ramsar Convention (1971), which aims to promote the conservation of wetlands. The boundaries of the Stour and Orwell Estuaries SPA and Ramsar site are shown on Figure 3.

The Stour Estuary, the Orwell Estuary and Landguard Common are Sites of Special Scientific Interest (SSSIs) designated under the Wildlife & Countryside Act (1981). Most of the estuaries (excluding the south side of the Stour) are part of the Suffolk Coast and Heaths Area of Outstanding Natural Beauty.

The Haven ports (Felixstowe, Harwich International, Ipswich, Harwich Navyard and Mistley) are among the most successful in Britain and are an integral part of Britain’s transport infrastructure. The Port of Felixstowe is the largest container port in Britain and the fourth largest in Europe. The ports are of importance nationally, to the economic development of East Anglia and locally to the communities at Harwich, Felixstowe and Ipswich. Commercial success can contribute to the cost of sustainable estuary management.

HHA and ABP Port of Ipswich are the two harbour authorities with statutory responsibility for navigation and conservancy throughout the Stour and Orwell estuaries. Harwich Haven Authority’s jurisdiction includes the lower harbour, the seaward deepwater channels, the whole of the Stour estuary and the downstream end of the Orwell (up as far as Fagbury Point). ABP Ipswich’s jurisdiction covers the Orwell from Ipswich to Fagbury. This jurisdiction covers all activities below the mean high water line, commercial and recreational, and the licensing of third party developments. Increasingly over recent years, legislation, such as the Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations), has required ports and harbour authorities to have greater regard for environmental issues in the execution of their activities and in the application of their management responsibilities. The requirement under the Habitats Regulations for appropriate assessment of maintenance dredging activities is addressed by the production of this baseline document as outlined in section 1.1 above.
2 MAINTENANCE DREDGING REQUIREMENTS

2.1 Stour and Orwell estuary sites

Figure 4 provides an overview of locations where maintenance dredging is undertaken in the Stour and Orwell estuaries and Harwich Harbour.

Mistley Quay and Forwarding, at the western end of the Stour (Figure 5), operates small coasters trading in agricultural products, stone, timber, and other commodities. Vessels on the Mistley berths are NAABSA ("Not always afloat but safely aground"). Plough dredging is carried out on an occasional basis to maintain water depth on the quay and preserve a sufficiently flat bed to prevent vessel damage.

Ploughing occurs approximately 3 or 4 times per year, each requiring about 4 - 8 hours of work in the channel and berth. This work is undertaken by the HHA and moves about 1,000 m$^3$ per session. There have been more extensive dredges in the past, at more than 10 year intervals and thus defined by Defra as Capital dredge projects. A summary of capital projects is included in Section 5 (History of dredging and disposal). Berths and approaches have been dredged to -1.5m CD but are currently maintained at between -1.0m CD and -1.5m CD. Small scale trials have been carried out using water injection techniques in this area.

Mistley Marine and Leisure (Figure 5) operate a slip way, work boats, a yacht storage facility and mud berths at a quay wall and pontoons. Small volumes of plough dredging are required to maintain water depths around the slipway and pontoons. In conjunction with plough dredge operations at Mistley Quay, small amounts of material are dredged from the toe of the slipway and in the yacht berth areas using a plough vessel. This work is overseen by the HHA and moves about 500m$^3$ per session, up to 6 times per year as necessary.

Although not previously requiring a disposal consent under FEPA legislation, the work at Mistley Quay and at Mistley Marine and Leisure has been subject to sediment quality analysis as it constituted work which could lead to an adverse effect on the SPA. Results of the analysis and working methods were discussed with Natural England and it was agreed that the work was not likely to pose any threat to the SPA.

The Stour Sailing Club at Manningtree (Figure 5) maintains a slip and boat storage area. There have been occasional minor works (with a plough and shore based plant) carried out to retain adequate depths of water on the slip but there is no regular maintenance dredging requirement.

Shotley Marina (Figure 6), at the confluence of the rivers in the Harbour provides berths behind the sea wall with a lock entrance from the Harbour. The approach channel across the inter-tidal area requires annual plough dredging to maintain its dredged depth of -2.0m CD. This normally occurs once a year in the spring when material is ploughed into the main river flows. The work is undertaken by the HHA and requires approximately 15 hours of plough time, moving about 2,000 m$^3$ per year. A small water injection dredger has also been trialled on this work in 2010 and 2011. Shotley Marina has, in 2011, been granted consent by the MMO for a small dredge and disposal operation. Up to 4,500 m$^3$ of silt will be dredged from within the marina and placed on the foreshore close to the sea wall.
Suffolk Yacht Harbour (SYH) (Levington) (Figure 7) provides leisure berths and moorings within a protected area on the east shore of the Orwell. Dredging is carried out each winter using a cutter suction dredger to maintain water depths around the pontoons and berths. Dredged material was discharged from the 1960’s till 1993 into on-shore settling areas and since then, in two beneficial placement schemes licensed by Defra and approved by Natural England. The placement areas are on the upper foreshore, to the north and south of the marina. Between 15,000 and 20,000m$^3$ of silt is dredged each year and placed on the foreshore. Operations are carried out between mid November and early April each year.

Woolverstone Marina and Royal Harwich Yacht Club, (Figure 8) situated on adjacent sites on the west shore of the Orwell, provide pontoon berths and moorings on the open river shore.

Woolverstone Marina (Figure 8) has until recently, been carrying out maintenance dredging in association with works undertaken by ABP Ipswich in the river Orwell channel. Works were undertaken in 2001, 2003, 2006, 2008 and 2010. Trailer dredgers, working for ABP Ipswich, dredged a displacement trench on the edge of the Orwell channel. This trench was up to 300m long and 20m wide, with a theoretical capacity of 15,000m$^3$. A plough vessel was then used to dredge around the pontoons in the marina to approximately -2.0m CD, with material pulled out into the displacement trench.

From 2011, ABP Ipswich confirmed that it was not able to carry out the works for Woolverstone. The marina has therefore made an application of its own to the MMO for consent to dredge with a small backhoe and barge, disposing of material in the licenced site in the Orwell used by ABP Ipswich (TH034). Siltation rates are predicted to be approximately 7,000m$^3$ per year and the proposal is to dredge in a three year cycle: half the marina in year one, the second half in year two and carry out no dredging in year three.

The marina is currently carrying out redevelopment and expansion. In 2010, 15,600 m$^3$ of capital material was dredged using a backhoe and disposed of in the Orwell disposal site (TH034) under a FEPA licence. A second phase of dredging is due in 2011 / 2012 and the marina has made an application to the MMO for works and dredging consent.

The Royal Harwich Yacht Club (Figure 8) facilities were established in 1999 adjacent to the Woolverstone Marina site. It has required up to 4,000m$^3$ of plough dredging each year in order to maintain depths of -2.0m CD around the pontoons. Ploughing takes place for about 10-20 days between January and March. In early 2006, a proposed increase in number of pontoon berths required about 4,000m$^3$ of capital dredging which was licensed by the MCEU. The material was disposed of within the River Orwell in the area used by ABP Ipswich. Future plough works will require consent from the MMO.

Fox’s Marina, and Orwell Yacht Club, Ipswich (Figure 9) operate from the area shown on Figure 8 at the head of the Orwell in Ipswich. The Yacht Club has a slip, a jetty, pontoons and moorings on the north side of the channel. Fox’s operate an 80 vessel marina on the southern side adjacent to their boat repair and other facilities. The marina carries out maintenance dredging operations at between 5 and 7 year intervals; previously in 2002 and 1995, which has included an element of work on behalf of the Yacht Club. A small cutter suction dredger was deployed in 2002, discharging onto the mudflat outside the marina in a beneficial disposal scheme licensed by the MCEU and
approved by Natural England. Approximately 10,000m$^3$ was removed in the operation, together with a small amount which was ploughed from the entrance channel in the main river flow. Future use of a small cutter suction dredger will be considered if necessary. Occasional use is made of a small plough to level areas in the entrance channel, maybe requiring 4 or 5 days operation. The works described here, and in Table 5.1, are the combined works for Fox’s Marina and the Orwell Yacht Club.

**ABP Ipswich** (Figure 10), at the head of the river Orwell, is a ro-ro, container and bulk products port operation and is the Statutory Harbour Authority for the Orwell. It carries out dredging on the berths and in the river to maintain depth and width of the channel to Ipswich using their in-house dredging company, UK Dredging. Trailing hopper dredgers have been used, disposing of material in the lower Orwell (Figure 11) in order to retain material within the estuary system. Amounts have varied over the years but recently have been between 30,000 and the maximum 100,000 tonnes per year as allowed in the previous licence, carried out in one or two campaigns. The Orwell is dredged to maintain the published depth of -5.6m CD.

In 2010 ABP commenced a revised programme of combined maintenance dredging to the Ipswich berths and in sections of the Orwell river channel. Disposal continues to be in the lower river as before. The new licence permits a temporary increase in material disposed to 200,000 tonnes per year for two years in order to restore the channel to its previous profile. Following this work it is intended that the channel will be maintained at this profile going forward. A programme of monitoring has been agreed by CEFAS and reports are submitted by ABPmer.

### 2.2 Harwich Harbour Sites

Port of Felixstowe, Harwich International Port, Harwich Navyard, and Trinity House (main UK operations base) are separate commercial operations within Harwich Harbour, which require regular dredging of the berths and approaches to maintain operational depths and navigational safety. The above areas, together with berths for visiting yachts, the RNLI and harbour vessels are maintained by the HHA, which is the Statutory Harbour Authority for the Stour, Harbour and seaward approaches.

**Port of Felixstowe** (Figures 12) maintenance dredging works are carried out by HHA at approximately 10 -12 week intervals, as part of the regular major dredging sessions. The main areas are dredged by trailer suction hoppers, utilising either two hoppers of 6,000 to 8,000 m$^3$ capacity or one of up to 16,000 m$^3$, with disposal to the Inner Gabbard disposal site. The trailers are assisted by a plough dredger which moves material from the berths and inaccessible areas to where the trailers can load it. Trials have also been carried out using a small water injection dredger in some shallower berths and channels. Dredging is undertaken to maintain the published depths of -14.5m CD in the channel and approaches and berth depths of between -7.3m CD and -16.0m CD. Each main session removes approximately 400,000 m$^3$ to 600,000 m$^3$ of silt material. In addition to the main dredge sessions, material from this area is used in the beneficial sediment replacement scheme. Details of this are provided in Section 6. In total, between 2.6M m$^3$ and 3.0M m$^3$ are dredged annually from the siltation areas in the Port.

**Harwich International Port** (Figures 13) maintenance dredging works are carried out by HHA at approximately 10 -12 week intervals, as part of the regular major dredging sessions. Most berths are plough dredged to remove siltation close to quay faces and...
level uneven areas. Dredging is undertaken to maintain the published depths of -9.0m CD and -8.0m CD in the approaches and berth depths of between -7.0m CD and -10.5m CD. The plough is deployed for about 30 hours per session and moves about 10,000 m$^3$. There is some build up of silt at the eastern end of the berths which is removed with trailing suction dredgers, approximately once every two years, taking about 12,000 m$^3$ of silt to the Inner Gabbard disposal site.

Harwich Navyard (Figures 14) maintenance dredging works are carried out by HHA at approximately 10 -12 week intervals, as part of the regular major dredging sessions. Most berths are plough dredged to remove siltation close to quay faces and level uneven areas. Dredging is undertaken to maintain the published berth depths of between -6.5m CD and -8.5m CD. The plough is deployed for about 15 hours per session and moves about 5,000 m$^3$.

Trinity House Pier (Figures 14) maintenance dredging works are carried out by HHA at approximately 10 -12 week intervals, as part of the regular major dredging sessions. The pier berths are plough dredged to remove siltation and level uneven areas. Dredging is undertaken to maintain the published berth depths of -5.0m CD. The plough is deployed for about 8 hours per session and moves about 1,000 m$^3$.

Harwich Quay and Halfpenny Pier (Figure 14) maintenance dredging works are carried out by HHA at approximately 10 -12 week intervals, as part of the regular major dredging sessions. Most berths are plough dredged to remove siltation and level uneven areas. This area has also been dredged using a water injection dredger (WID). Dredging is undertaken to maintain the published depths of between -3.0m and -2.0m CD. The plough is deployed for about 10 hours per session and moves about 1,000 m$^3$.

Navigation House Jetty (HHA) (Figure 14) berths and approaches to the HHA’s jetty at Navigation House are dredged by HHA at approximately 10 -12 week intervals, as part of the regular major dredging sessions. The area is plough dredged to remove siltation and level uneven areas. The plough is deployed for about 10 hours per session and moves about 1,000 m$^3$. Dredging is undertaken to maintain the published berth depths of between -2.5m CD and -3.5m CD. A modified back-hoe and a small cutter dredger have been trialled for removal of silt from under pontoons. The material was re-handled by plough dredging or was pumped directly into stronger tidal flows to be dispersed. The total volume involved was no more than about 1,500 m$^3$ per year. More recently this area was dredged using a water injection dredger (WID).

Deep Water Channel (Figures 15) is the designated deep water approach to the Haven Ports and requires occasional dredging along the channel edges, and between the Walker and South Shipwash buoys to maintain safe navigation at the published depth of -14.5m CD.

From the Fort buoy, out to the South Shipwash, the Deep Water Channel is generally self maintaining apart from a number of small areas.

- Some accretion of very fine sandy silt occurs along the channel edges from No.1 & 2 buoys in to No.7 & 8 buoys, which is dredged by trailer hoppers and disposed of at the Inner Gabbard site. Up to 100,000 m$^3$ is dredged in a session, approximately every 2 to 3 years.
- There has been some accretion of silt close to the channel edge on the outside of the Beach End bend, since the area was dredged in the capital works of 1998.
- 2000. It was dredged in August 2005 for the first time as part of the harbour operations, taking approximately 40,000m$^3$ to the Inner Gabbard site.

- Between the South Shipwash and Walker buoys (Figure 16), some fine sand (predominantly single size, 100 micron sand) accretes in the eastern side of the channel, from the Shipwash Sand. This is dredged with trailers about every 2 years. In the past some has been used for shore reclamation works but a FEPA licence has been held for disposal of limited volumes, spread in the outer section of the Navigation Channel. Approximately 25,000 to 35,000 m$^3$ is removed on each session.

2.3 Summary of details of current maintenance dredging practice

A summary of the current maintenance dredging practice in the approaches to Harwich Harbour, the Harbour itself and the Stour and Orwell estuaries is provided in Table 2.1.

Table 2.1 Summary of current dredge levels and approximate period between maintenance dredging operations

<table>
<thead>
<tr>
<th>Main dredge area or berth</th>
<th>Dredge level (CD)</th>
<th>Approximate period between dredge operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep water Channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel edges (Buoys 1 - 7)</td>
<td>-14.5m CD</td>
<td>12 - 24 months</td>
</tr>
<tr>
<td>Beach End bend</td>
<td>-14.5m CD</td>
<td>(once in 10 years)</td>
</tr>
<tr>
<td>South Shipwash / Walker buoys</td>
<td>-14.5m CD</td>
<td>12 - 24 months</td>
</tr>
<tr>
<td>Felixstowe berths and approaches</td>
<td></td>
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<tr>
<td>Main approach area</td>
<td>-14.5m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Landguard approaches</td>
<td>-12.0m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Trinity 1 approach</td>
<td>-11.6m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Ro-Ro 4 approach</td>
<td>-9.75m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Trinity berth 1</td>
<td>-11.6m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Trinity berth 2</td>
<td>-11.9m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Trinity berth 3</td>
<td>-14.0m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Trinity berth 4</td>
<td>-14.0m CD</td>
<td>10 - 12 weeks</td>
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<td>Ro-Ro 4</td>
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<td>Felixstowe berth 8</td>
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<td>Felixstowe berth 9</td>
<td>-16.0m CD</td>
<td>10 - 12 weeks</td>
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<td>Harwich Navyard</td>
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<tr>
<td>Outer berth (no 2/3) and approach</td>
<td>-8.5m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Inner berths (no 4 and 5) and approach</td>
<td>-6.5m CD</td>
<td>10 - 12 weeks</td>
</tr>
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</table>
Table 2.1 (continued)

<table>
<thead>
<tr>
<th>Main dredge area or berth</th>
<th>Dredge level (CD)</th>
<th>Approximate period between dredge operations</th>
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<tbody>
<tr>
<td>Harwich Quay</td>
<td></td>
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<tr>
<td>Halfpenny Pier - outer face</td>
<td>-3.0m CD</td>
<td>10 - 12 weeks</td>
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<tr>
<td>Halfpenny Pier - inside pontoons</td>
<td>-2.5m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Trinity House Pier berths</td>
<td>-5.0m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Fishermen's berths</td>
<td>-3.0m CD</td>
<td>12 - 24 months</td>
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<td>Navigation House Jetty</td>
<td>-2.5m to -3.5m CD</td>
<td>10 - 12 weeks</td>
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<td>Harwich International Port</td>
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<tr>
<td>Approaches - East of Ro-Ro 2</td>
<td>-9.0m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Approaches - West of Ro-Ro 2</td>
<td>-8.0m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Container berth</td>
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<td>10 - 12 weeks</td>
</tr>
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<td>Ro-Ro 2</td>
<td>-8.0m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Ro-Ro 3</td>
<td>-8.0m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Ro-Ro 4</td>
<td>-7.5m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Berth 5</td>
<td>-7.5m CD</td>
<td>10 - 12 weeks</td>
</tr>
<tr>
<td>Tanker berth</td>
<td>-8.0m CD</td>
<td>10 - 12 weeks</td>
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<tr>
<td>ABP Ipswich</td>
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<tr>
<td>Orwell Channel</td>
<td>-5.6m CD</td>
<td>6 - 12 months</td>
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<tr>
<td>Ipswich berths</td>
<td>-5.6m CD</td>
<td>6-12 months</td>
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<tr>
<td>Mistley Quay</td>
<td></td>
<td></td>
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<tr>
<td>Berths and approaches</td>
<td>-1.0m to -1.5m CD</td>
<td>10 - 24 weeks</td>
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<tr>
<td>Shotley Marina</td>
<td></td>
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<tr>
<td>Entrance channel</td>
<td>-2.0m CD</td>
<td>12 months</td>
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<td>Suffolk Yacht Harbour</td>
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<tr>
<td>Berths</td>
<td>-2.5m CD</td>
<td>12 months</td>
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<tr>
<td>Woolverstone Marina</td>
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<tr>
<td>Berths</td>
<td>-2.0m CD</td>
<td>12 months</td>
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<td>Royal Harwich Yacht Club</td>
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<td>-2.0m CD</td>
<td>12 months</td>
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<tr>
<td>Fox's Marina</td>
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<td></td>
</tr>
<tr>
<td>Berths</td>
<td>-2.0m CD</td>
<td>12 months</td>
</tr>
</tbody>
</table>
3 Methods of Dredge, Transport and Disposal

- **Plough dredging (or bed levelling)** is carried out by dragging material along the sea bed using a frame or beam, suspended from a tug or similar vessel. The beam is held at a specific level and is pulled by the vessel, moving bed material from one area into deeper water, where it drops from the beam. A certain amount of material is brought into suspension by the process, but it remains close to the bed unless in very shallow water. The process is carried out in various locations with different equipment, with ploughs ranging from less than 4m to 10m wide. The maximum distance moved is normally less than 200m. Material is kept within the system and simply moved to areas where it is not restricting navigation.

- **Trailing suction Hopper dredgers** are self contained dredging units which pump soft sediments from the sea bed via a suction pipe or pipes, into an in-board hopper. The vessel loads whilst moving slowly forward, with the suction head of the pipe suspended at a predetermined level. When the hopper is full the dredger proceeds to the disposal ground where it is released through bottom doors. The current Inner Gabbard disposal licence requires that material is placed at a controlled rate whilst the vessel is underway so that it is dispersed into the water column. Sediment placement operations for beneficial use and mitigation schemes are described in Section 6.

- **Suction or cutter suction dredgers** are, in the context of this document, small pontoon mounted dredgers with a suction pipe which may or may not be equipped with a rotary cutter head. This pipe is suspended at the dredge level and the pontoon moved by wires or against spud legs. They are used in the marinas to dredge around and under pontoons. The material dredged is pumped through a pipeline and disposed of either on-shore in settling lagoons or in licenced beneficial schemes on the foreshore. Placement operations for beneficial use are described in Section 6.

- **Water injection Dredging** operates in many ways like plough dredging, loosening and re-distributing bed material, but using high volume, low pressure water jets. These disaggregate the bed material and generate density flows into deeper water and areas of stronger currents which then disperse it.

- **Excavation by grab or back-hoe;** has been used for small scale dredging operations in the past, with material disposed of by barges to licenced sea disposal areas, to beneficial foreshore sites or into existing deeper areas in the rivers or harbour.
With the exception of the predominantly 100 micron fine sand which is occasionally dredged from the Deepwater Navigation Channel at the South Shipwash Buoy, all the maintenance dredging undertaken in the harbour and rivers is largely silt sized with a variable clay fraction. The clay content (< 2 micron) varies from up to 30% in the lower harbour to about 10% or less further up the estuaries. The typical material generally has less than 5% fine sand or any coarser material. Recently deposited material is dredged at a density of about 1.25 T/m$^3$ whilst older material can reach a density of 1.35 T/m$^3$.

CEFAS, which carries out the analysis for the licensing authorities, did not until recently publish the sediment quality results or send them to the applicant. As it carried out the assessment on an individual case-by-case basis, taking into account the local environment and background levels, there was simply either approval or rejection of the material as suitable for disposal at the specified site. Analysis work carried out for larger capital projects has tended to be published and recently results for capital and maintenance projects have been available from Defra on request.

Figure 17 shows locations from which samples have historically been taken for analysis of sediment quality. Results have been obtained from CEFAS for the HHA and ABP Ipswich maintenance licences and are included in Appendix A. Whilst there are a few samples showing results above the Action Level 1 figures, they are nowhere near Action Level 2. CEFAS has taken the view that these materials are acceptable for disposal at sea. Past EIA’s (such as for the 2000 Channel Deepening, Bathside Bay and the 2010 Felixstowe South project) have concluded that dredging of these materials does not present a risk of contaminant release.
5 HISTORY OF DREDGING AND DISPOSAL

5.1 Maintenance dredging and disposal/placement activities

Table 5.1 summarises the history of maintenance dredging and disposal (including estimates of material that is plough dredged) over the period 2000 to 2010. The amounts of material are quoted in wet tonnes to the nearest 1,000 tonnes disposed at each location as these are the figures used in the FEPA disposal returns. Figures can be converted to approximate volumes in cubic metres by dividing by 1.30. It should be noted that the reduced tonnage of maintenance material (926,000 wet tonnes) disposed of by the HHA in 2000 compared with other years is due to the fact that approximately 1,500,000 tonnes of maintenance material was removed as part of the capital dredging project undertaken in 2000.

The amount of material that is plough dredged has been estimated (see footnotes to Table 5.1 for details of how these estimates have been reached).

Figure 5.1 summarises the data presented in Table 5.1 over the period 2000 to 2010.

Figure 5.1 Dredging and disposal volumes (2000-2010) (figures presented are in wet tonnes)
Table 5.1  Dredging and disposal quantities from 2000 to 2010 (figures in wet tonnes) (includes estimates of ploughed amounts)

<table>
<thead>
<tr>
<th>Location</th>
<th>HHA: Harwich and Felixstowe</th>
<th>HHA: Harwich and Felixstowe (1)</th>
<th>HHA: Various (2)</th>
<th>HHA: Harwich and Felixstowe (1)</th>
<th>ABP Ipswich</th>
<th>Suffolk Yatch Harbour</th>
<th>Woolverstone Marina</th>
<th>Royal Harwich Yacht Club</th>
<th>Foxes Marina</th>
<th>Sholley Marina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredge &amp; disposal method</td>
<td>Trails to offshore disposal</td>
<td>Trailers to in-river, beneficial disposal</td>
<td>Plough - in combination with trailer operations</td>
<td>Plough</td>
<td>Other beneficial disposal sites (Wallasea and Horsey)</td>
<td>Trailers to in-river, beneficial disposal</td>
<td>Cutter suction to fore-shore disposal</td>
<td>Plough</td>
<td>Plough</td>
<td>Cutter suction to fore-shore disposal</td>
</tr>
<tr>
<td>2010</td>
<td>3,058,833</td>
<td>137,978</td>
<td>273,000</td>
<td>60,000</td>
<td>0</td>
<td>198,407</td>
<td>19,500</td>
<td>19,500</td>
<td>5,200</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>2,867,066</td>
<td>215,707</td>
<td>273,000</td>
<td>60,000</td>
<td>0</td>
<td>75,072</td>
<td>19,500</td>
<td>0</td>
<td>5,200</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>3,332,589</td>
<td>439,768</td>
<td>273,000</td>
<td>60,000</td>
<td>0</td>
<td>76,060</td>
<td>19,500</td>
<td>19,500</td>
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<td>2007</td>
<td>3,015,706</td>
<td>538,073</td>
<td>273,000</td>
<td>60,000</td>
<td>0</td>
<td>33,539</td>
<td>19,500</td>
<td>0</td>
<td>5,200</td>
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<tr>
<td>2006</td>
<td>3,125,000</td>
<td>649,000</td>
<td>273,000</td>
<td>60,000</td>
<td>341,000</td>
<td>98,800</td>
<td>19,500</td>
<td>19,500</td>
<td>5,200</td>
<td>0</td>
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<tr>
<td>2005</td>
<td>2,602,000</td>
<td>599,000</td>
<td>273,000</td>
<td>60,000</td>
<td>221,000</td>
<td>53,000</td>
<td>19,500</td>
<td>0</td>
<td>5,200</td>
<td>0</td>
</tr>
<tr>
<td>2004</td>
<td>3,289,000</td>
<td>592,000</td>
<td>273,000</td>
<td>60,000</td>
<td>0</td>
<td>35,000</td>
<td>19,500</td>
<td>0</td>
<td>5,200</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>2,823,000</td>
<td>581,000</td>
<td>273,000</td>
<td>60,000</td>
<td>161,900</td>
<td>33,000</td>
<td>19,500</td>
<td>19,500</td>
<td>5,200</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>2,680,000</td>
<td>565,000</td>
<td>273,000</td>
<td>60,000</td>
<td>0</td>
<td>29,000</td>
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<td>5,200</td>
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<td>2001</td>
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<td>18,000</td>
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<tr>
<td>2000</td>
<td>926,000</td>
<td>327,000</td>
<td>273,000</td>
<td>60,000</td>
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<td>11,000</td>
<td>19,500</td>
<td>0</td>
<td>5,200</td>
<td>0</td>
</tr>
</tbody>
</table>

1. Estimates of ploughing carried out as part of HHA trailer dredging operations are based on average plough hours deployed.
   The amount ploughed is: 14 days * 12 hrs * 5 operations per year * 250 m³/hr * 1.3 tonnes/m³ = 273,000 tonnes

2. Estimates of HHA (Various) plough operations are based on m³ figures quoted in the text, * 1.3 tonnes/m³
   The amount is for Harwich Navyard and Harwich Quay, Navigation House jetty, Trinity House and Mistley

Source

- From MCEU / MMO 
- Returns

15,000 m³*1.3
15,000 m³*1.3
4,000 m³*1.3
10,000 m³*1.3
2,000 m³*1.3
5.2 Summary of capital dredge projects since 1990

The list below summarises the capital dredge projects that have taken place in the estuaries since 1990 (further details of these projects can be obtained from HHA or ABP Ipswich):

- 1990 Approach Channel widened between North Shelf and Cliff Foot 0.3M m$^3$
- 1991 Improved approaches to Mistley Quay 30,000 m$^3$
- 1992 Tanker Terminal at west end of Parkeston Quay (HIP) 0.2M m$^3$
- 1994 Navigation Channel deepened to -12.5m CD 8.5M m$^3$
- 1995 Trinity III berth added to Trinity terminal (Felixstowe) 2.8M m$^3$
- 1997 Major maintenance in Orwell (treated as Capital) 0.2M m$^3$
- 1997 Parkeston Quay (HIP) approaches deepened to -9.0m CD 0.8M m$^3$
- 1998 – 2000 Navigation Channel deepened to -14.5m CD 18.0M m$^3$
- 2000 Trinity III extension added to Trinity berths 0.9M m$^3$
- 2003 – 2005 ABP Ipswich Ro-Ro 2 construction 74,000 tonnes
- 2008 – 2010 FSR Phase 1 dredging and construction 3.55M m$^3$

5.3 Disposal Licences currently in place

Licences and consents held by HHA:

- Dredging from Felixstowe berths and approaches, Harwich Navyard and other berths, Harwich International Port and the Deep Water Channel for disposal at the Inner Gabbard off-shore disposal area: 3.38M tonnes per year (Current licence runs until November 2013)
- Dredging from Felixstowe berths and approaches for disposal to the beneficial sediment replacement scheme in the Orwell, Stour and Harbour: 260,000 tonnes per year (Current licence runs until October 2013)
- Licence for dredging sand from the outer channel in region of South Shipwash and re-distributing it in the main channel (Current licence runs until March 2015)

Licence held by ABP Ipswich:

- Beneficial disposal licence held by ABP Ipswich (34278/10/1); for Ipswich berths and Orwell Channel: 200,000 tonnes per year (Current licence runs until May 2012)

Other current licences:

- Licence held by Suffolk Yacht Harbour; for beneficial foreshore disposal. (Current licence runs till 06/01/2014)
- Licence held by Woolverstone Marina; (for capital dredging and disposal)

There are some conditions on the existing licences, for example, restricting the HHA sediment replacement disposals to the winter months and requiring it to be completed in three separate phases. The main HHA sea disposal licence has a limit of 1,000,000 m$^3$ in any rolling four week period and requires disposal whilst underway at a dispersive site (Inner Gabbard). The ABP Ipswich disposal must be carried out in separate operations.
of no more than 100,000 tonnes each time and is subject to a monitoring scheme agreed with CEFAS.

Whilst not a specific disposal licence requirement, the continued Harwich and Felixstowe maintenance dredging is subject, through the capital works consents, to an extensive Compensation, Mitigation and Monitoring agreement as detailed in section 7 of this document.
6 BENEFICIAL USES, MITIGATION AND COMPENSATION SCHEMES

6.1 Beneficial uses of maintenance dredge material

- **Horsey Island** placements - a site within Hamford Water (Walton Backwaters) which has been the subject of a number of Environment Agency sponsored schemes to protect coastal defences and also trial innovative schemes. The most recent project involved 50,000 m$^3$ of maintenance dredgings placed between November 2005 and February 2006 to enhance saltmarsh growth.

- **Wallasea Island** Habitat Creation Project - a Defra funded project to create over 110 hectares of inter-tidal habitat to compensate for losses from developments in the UK. Approximately 450,000 m$^3$ of maintenance dredgings were used between November 2005 and April 2006 to raise areas of the existing site to levels which will sustain salt-marsh.

- **Suffolk Yacht Harbour (Levington) and Fox’s Marina (Ipswich)** – both dispose of dredgings onto adjacent mudflat foreshores in schemes approved by Defra and Natural England as beneficial disposals.

- **River Orwell - ABP Ipswich** disposes of dredgings into the water column in the lower Orwell in a scheme approved by Defra and Natural England as beneficial use.

6.2 Mitigation Schemes using maintenance dredge material

- Sediment replacement scheme - mitigation for channel and harbour deepening. Designed to mitigate the effect of increased inter-tidal erosion due to trapping and removal of incoming sediment. Between 2000 and 2008, approximately 500,000 m$^3$ of material was dredged annually and placed at 5 sites in the Stour (Erwarton and Copperas (Holbrook Bay – no longer active)) and lower Orwell (Orwell East and West), and one site in the Harbour (North Shelf – no longer active) where it naturally erodes and feeds back into the system (Figure 18). This work, for which HHA is responsible, is a requirement of the agreements set up under the Channel deepening (1998 – 2000) and Trinity III Extension consents¹. It is overseen by the Regulators group which includes Defra, Natural England, Environment Agency, CEFAS, and others, to whom annual reports are presented. In 2007, the Regulators Group approved a proposal to reduce the amount placed by 50%, beginning in the Autumn of 2008 and to use a revised method, aimed at distributing the material more widely.

6.3 Compensation Schemes using maintenance dredge material

- **Trimley managed realignment site** – compensation for loss of inter-tidal area and uncertainty regarding the sediment replacement scheme. Approximately 30,000m$^3$ of dredgings were placed within the newly constructed area to provide soft sediments for colonisation by benthic organisms to assist in the development of a productive inter-tidal area. This area is subject to monitoring.

and reporting as referred to above and has now been incorporated into the Orwell SPA.

- Shotley and Trimley inter-tidal habitat enhancement – combined flood protection and enhancement of degraded inter-tidal habitat. Works were carried out as compensation for increased exposure and erosion due to Trinity III Extension, as agreed under the CMMA. Approximately 161,876 m³ of maintenance dredgings were placed behind clay or gravel bunds on the foreshore in 2003 and are subject to monitoring and reporting annually.
7 MONITORING REQUIREMENTS OF PREVIOUS AND CURRENT LICENCES AND CONSENTS

The current monitoring requirements have been established to meet a number of consents and licences. These include:

- The Trinity III Extension consent
- The Section 106 Agreement entered into by the Port of Felixstowe for the Felixstowe South Reconfiguration.
- FEPA disposal licences for maintenance dredging carried out separately by HHA, ABP and the marina operators.

The general monitoring regime for the Harwich and Felixstowe schemes has been coordinated by HHA and is summarised below:

- A 5 year rolling programme of bathymetric surveys throughout the Stour and Orwell Estuaries and Hamford Water;
- A 5 year rolling programme of topographic surveys of saltmarsh and monitoring of intertidal vegetation in the Stour and Orwell Estuaries;
- A 5 year rolling programme of sediment type and distribution throughout the Estuaries together with mapping of benthic communities (since 2008 this has been increased to annual monitoring);
- Suspended sediment monitoring to further define sediment pathways and behaviour;
- Low water over-wintering bird counts (four per year) and analysis of high water WeBS data against a historical baseline and in comparison with regional and national trends;
- Definition of the fishery including populations and spatial variability of plankton, shellfish and pelagic and demersal fish;
- Benthic invertebrate and sediment size distribution monitoring by grab sampling within disposal sites;
- Benthic invertebrate, sediment size distribution and saltmarsh monitoring of mitigation and compensation sites (Trimley managed realignment site and Shotley and Trimley enhancement sites).

This monitoring, together with the assessment of the sediment replacement scheme and mitigation or compensation works for the various projects, is reported annually to a Regulators Group. This group comprises Natural England, Environment Agency, Defra (CEFAS), and DfT as formal Regulators and RSPB, Wildlife Trusts, Fisheries Committees, ABP (Ipswich), leisure users and Local Authority representatives as advisors. A formal report is submitted demonstrating compliance with the consent requirements and recommending changes to the next year’s work. The Group is specifically empowered to add, delete or amend the appropriate conditions.

The annual report collates as much of the monitoring work carried out by others as is practically possible.

There has also been monitoring work carried out by ABP (Ipswich) since 2004. This work was required in order to meet the FEPA disposal licence conditions for dredge material disposal in the Orwell, and has included sediment settlement rates, particle size distribution and bathymetry surveys (ABP Marine Environmental Research, 2011).
8 RESULTS OF EXISTING MONITORING

Copies of the reports to the Regulators Group, for the monitoring undertaken for the HHA, are available for the years 2000 to 2011 from the HHA (Royal Haskoning and HR Wallingford, 2001 – 2012). The 2005 report, together with details reported in 2006, provide more detailed coverage of the first 5 year cycle of monitoring. The 2012 report provides details of the period 2005 to 2011. In summary, the reports for the first 10 years of monitoring indicated that:

- The 2012 Annual Report presented an analysis of intertidal and subtidal area and volume based on combined 2005/2006 and 2010/2011 bathymetric and LiDAR data. This has shown that both the Stour and Orwell estuaries are experiencing significant subtidal accretion. With regards intertidal volume, the analysis shows contrasting results for the two estuaries, with accretion in the Stour and erosion in the Orwell. It is apparent, therefore, that the main difference is associated with the ability of the estuaries to retain sediment on the intertidal rather than the sediment supply (i.e. there is no issue with the subtidal supply of material into the rivers).

- Analysis of the benthic monitoring data shows that similar communities have been present in the Stour and Orwell in each of the survey years to date. As would be expected, there have been some minor changes between years and shifts between biotopes for certain stations. It seems that the upper Stour biotope is relatively stable while the lower Orwell has changed with each survey and often includes several biotopes within the group. It can be concluded that there has not been a marked change in abundance, biomass, number of taxa or biotope composition beyond what would be expected to occur through natural variation over time.

- Fisheries studies show an estuary with an abundance of species. There are large fluctuations through the year and between years and an improved understanding has been achieved of how the estuaries function. There is no evidence to show changes are linked to any of the works in the area;

- As would be expected, there is variation in waterbird populations over the monitoring period. For most species, no substantial change occurred (based on WeBS data), whereas declines were seen for other species which led to short term alerts being triggered. In most cases, these declines were reflected at the national level, although black tailed godwit and cormorant declines were not reflected nationally. It is difficult to attribute changes in waterbird populations to factors influencing the estuary system, and many external factors are likely to influence waterbird populations at greater geographic scales. However, it is important to note that those aspects that do have the potential to be directly affected by dredging (habitat extent and quality) do not appear to be adversely affected on the basis of the findings of the monitoring programme.

- The 2012 Annual Report assesses changes in saltmarsh extent based on aerial photographs between the period 2005 to 2010. This assessment concluded that there does not appear to be loss of saltmarsh through erosion within the estuary system, and gains in area have been seen in some regions of the estuaries.
However, it is likely that any changes observed are within the margin of error of the analysis technique.

- The period of monitoring for the Trimley Marshes managed realignment site is now complete and the 10 years of monitoring has provided a clear indication of the development and successional changes within the site, a clear sign of the success of this habitat realignment site. At the 2011 Regulators meeting it was agreed that future surveys will be undertaken at five year intervals to verify whether the site is continuing to meet its objectives. The next benthic invertebrate survey will, therefore, be undertaken in 2015.

- The Trimley and Shotley enhancement sites have developed over the years into valuable intertidal feeding habitat for a variety of waterbirds. They support a diverse community of benthic invertebrates which provide suitable prey species for the foraging birds. The vegetation, particularly around the Shotley sites, has developed over time into a well-established saltmarsh. The monitoring which has been undertaken at the sites since 2003 indicates that the objectives of the habitat enhancement sites have been achieved.

- The monitoring undertaken by ABPmer in the Orwell concludes that disposed dredge material is transient and moves down the estuary through the monitoring area. During lower tides, there is evidence of some temporary settlement on the northern side of the river and in the middle of the monitoring area. However, this material is re-eroded as tidal ranges increase and the supply of material (from the disposal of dredged material) ceases. A very small proportion of the material is likely to continually accrete at the highest levels and within the marsh area, which can only occur on the highest tides. Comparison of post dredge surveys from February and November 2010 indicates that some erosion and accretion can be seen over the surveyed area, although the largest differences at the channel edges are attributed to the variation in survey lines between the surveys. However, a direct comparison of the two surveys (i.e. using the February 2010 survey as a pre-dredge baseline) does not account for naturally occurring accretion and erosion taking place over the 9 month period (ABPmer, 2011).
9 INTEREST FEATURES AND CONSERVATION OBJECTIVES OF THE SITE

The interest features and conservation objectives of the Stour and Orwell SPA are detailed in the Natural England document:


The Conservation Objectives for the site can be summarised as:

*Subject to natural change, to maintain in favourable condition the habitats for both the internationally important populations of the regularly occurring Annex 1 bird species and the regularly occurring migratory bird species under the Birds Directive – in particular the inter-tidal mudflat and the saltmarsh.*

In this context, ‘favourable condition’ means the maintenance of the geomorphological form and functioning of the estuaries, so that they are capable of sustaining the populations of internationally and nationally important birds for which the site qualifies.

In 1997 and 2001 the qualification of the Stour and Orwell Estuaries SPA was as follows:

*Populations of internationally / nationally important over-wintering birds, based on:*

- Notable numbers of golden plover (under Article 4.1);
- Important populations of dunlin; shelduck; dark-bellied geese; redshank; grey plover; black-tailed godwit; turnstone; ringed plover; wigeon; knot; curlew; pintail; mute swans; goldeneye and scaup (under Article 4.2).

However, in 2003 the boundaries of the constituent SSSIs were extended and in May 2005, the SPA boundary was extended to include an additional 360 hectares. Following the re-notification of SSSI’s in 2003 and the SPA in 2005, the site now qualifies under Article 4.1 of the Wild Birds Directive (79/409/EEC) by supporting 1% or more of the Great Britain population of avocet (*Recurvirostra avosetta*). Over the period 1996 to 2000 the SPA supported 21 breeding pairs. It also qualifies under Article 4.2 of the Directive as it is used regularly by 1% or more of the bio-geographical populations of a number of migratory species (other than those listed in Annex I to the Directive), as summarised in Table 9.1.

The site further qualifies under Article 4.2 as it is used regularly by over 20,000 waterbirds in any season. In the non-breeding season, the site regularly supports 63,017 individual waterbirds (based on the 5 year peak mean recorded between 1993/94 and 1997/98).
Table 9.1 Internationally important populations of regularly occurring migratory bird species in the Stour and Orwell Estuaries SPA for the five year period 1995/96 to 1999/00

<table>
<thead>
<tr>
<th>Migratory species</th>
<th>5 year peak mean (1995/96-1999/00) and season</th>
<th>% of subspecies/population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunlin <em>Calidris alpina alpina</em></td>
<td>19,114 (wintering)</td>
<td>1.4% <em>alpina</em>, Western Europe (non-breeding)</td>
</tr>
<tr>
<td>Pintail <em>Anas acuata</em></td>
<td>741 (wintering)</td>
<td>1.2% North-western Europe (non-breeding)</td>
</tr>
<tr>
<td>Dark-bellied Brent goose <em>Branta bernicla bernicla</em></td>
<td>2,627 (wintering)</td>
<td>1.2% <em>bernicla</em>, Western Siberia (breeding)</td>
</tr>
<tr>
<td>Redshank <em>Tringa totanus</em></td>
<td>2,588 (autumn passage)</td>
<td>1.0% <em>totanus</em>, Eastern Atlantic (non-breeding)</td>
</tr>
<tr>
<td>Grey plover <em>Pluvialis squatarola</em></td>
<td>3,261 (wintering)</td>
<td>1.3% Eastern Atlantic (non-breeding)</td>
</tr>
<tr>
<td>Black-tailed godwit <em>Limosa limosa islandica</em></td>
<td>2,559 (wintering)</td>
<td>7.3% <em>islandica</em></td>
</tr>
<tr>
<td>Knot <em>Calidris canutus islandica</em></td>
<td>5,970 (wintering)</td>
<td>1.3% <em>islandica</em></td>
</tr>
<tr>
<td>Redshank <em>Tringa totanus</em></td>
<td>3,687 (wintering)</td>
<td>1.5% <em>totanus</em>, Eastern Atlantic (non-breeding)</td>
</tr>
</tbody>
</table>
10 CONDITION ASSESSMENT AND IMPACT OF THE DREDGING WORKS

10.1 Condition Assessment

The condition of SSSI’s in England is assessed by Natural England as part of a six year cycle, using categories agreed across England, Scotland, Wales, and Northern Ireland through the Joint Nature Conservation Committee. There are six reportable condition categories: favourable; unfavourable recovering; unfavourable no change; unfavourable declining; part destroyed and destroyed.

The latest assessment of the Stour Estuary SSSI and Orwell Estuary SSSI was undertaken in 2010 and has concluded that the majority of sectors within both estuaries are in favourable condition.

Within the Stour Estuary, 8 out of 9 units are in favourable condition. The unit which is in ‘unfavourable declining’ condition is adjacent to Manningtree in the upper estuary and Natural England conclude that the reason for the adverse condition is coastal squeeze. All other units are favourable within the Stour.

Within the Orwell estuary, there are 21 units of which 3 are ‘unfavourable declining’, 4 are ‘unfavourable no change’ and the remaining 14 are considered to be in favourable condition. The units in ‘unfavourable declining’ condition are:

- Unit 1 in the upper estuary where coastal squeeze is given as the reason preventing development of extensive salt marsh in this area;
- Unit 8 (east of Chelmondiston) is cited as experiencing coastal squeeze which has lead to the loss of pioneer saltmarsh; and,
- Unit 13 (Trimley) where coastal squeeze is cited as the cause of the condition status leading to loss of saltmarsh vegetation.

The units classified as ‘unfavourable no change’ are 12, 15 and 16 which occur around the mouth of the Orwell and unit 11 on the east side of the estuary south of Levington. Each of these units is considered to be ‘unfavourable no change’ due to the presence of sea walls causing coastal squeeze thereby constraining the natural development of saltmarsh.

10.2 Water Framework Directive and Maintenance Dredging

References in this section are to the River Basin Management Plan (RBMP): Anglian River Basin District: December 2009 and its associated annexes; all available on the EA Web-site.

The study area covers three water bodies:

- **Harwich Approaches** - Coastal (WFD ID: 650503190000)
- **Stour (Essex)** - Transitional (WFD ID: GB520503613602)
- **Orwell** - Transitional (WFD ID: GB520503613601)

All three WB’s are designated as **Heavily Modified**

Annex B of the Anglian RBMP indicates that the following protected area designations of relevance to the WFD are in force:
Orwell Transitional WB: N2K, Nitrates Directive

It is unclear how the Stour transitional water body can include a freshwater fish area, although the (freshwater) River Stour is designated from Langham to Cattawade, the latter being at the upstream end of the Stour Estuary. No further details appear to be given in Annex D in respect of how this designation affects the transitional water body. Neither are details of the Nitrates and Bathing water Directive designations provided in Annex D. However, as the RBMP does not record any WFD-related failure to meet the objectives of these Directives in the above three water bodies, it is assumed that they are currently compliant.

Current Status of Water bodies

Harwich Approaches:
Good overall potential (i.e. good ecological potential and good chemical status)

Stour (Essex):
Moderate overall potential (Invertebrates and Dissolved inorganic Nitrogen at moderate status – Chemical status at ‘Good’ – mitigation measures; in place)

Orwell:
Moderate overall potential (Invertebrates and Dissolved inorganic Nitrogen at moderate status – Chemical status at ‘Good’ – mitigation measures; in place)

The elements and issues which are indicated as causing the less than good potential of the water bodies are given as Invertebrates, Nitrogen and the unfavourable condition of the protected areas (prior to the 2010 re-assessment by NE).

- On the Annex B sheets for these water bodies it is stated that invertebrates are predicted to be at moderate status (potential) by 2015 and the justification for not achieving good status by 2015 is given as ‘Not Required (MS)’. The reference, MS, is to Morphology Sensitive which is explained in Annex E, page 34. This indicates that for TraC waters, issues with invertebrates are accepted as being linked to the WB’s HMWB designation. Alternative objectives and additional measures are therefore not applicable in these water bodies as a result of this issue alone (though may be for other issues).

- The Annex B sheets for these water bodies also predict that dissolved inorganic nitrogen will be at moderate status (potential) by 2015. The justification given for not achieving good status is ‘Disproportionately expensive (N1o)’. This reference to N1o is explained in Annex E, page 131 - 132. It states that for these water bodies, biological data for nutrient sensitive elements is suggesting good or better status so that there is low certainty that there is a risk of eutrophication. The combination of uncertainty that there is a real problem and the high cost of reducing nitrogen levels results in a significant risk of unfavourable balance of costs and benefits.

- Protected area status is detailed in Annex D and the N2K status shown on page 109. This gives the reason for the failure to meet the environmental objectives to be Coastal Squeeze. The measure which is proposed to improve to favourable conservation status, is Flood risk management which will be put in place by the EA no later than 2012. (This section was based on the pre-2010 assessment of largely unfavourable condition which has now been revised.)
The WFD documents thus indicate that the elements leading to the moderate water body status either cannot be appropriately addressed by additional measures (invertebrates and nitrogen) or are already covered by plans in place (protected areas). Given the extensive monitoring and mitigation work already in place, the relatively clean nature of the sediment dredged and the low percentage of water body area involved, it is considered highly unlikely that the maintenance dredging and disposal activities have affected or will affect the WFD status of the water bodies.

10.3 Potential impacts of the maintenance dredging works

Maintenance dredging within the Stour and Orwell Estuaries has been ongoing for many years. Any major changes to the maintenance dredging regime following changes to the depth of navigation channels due to capital dredging projects are subject to Environmental Impact Assessment as part of the overall consideration of the potential environmental impact associated with the capital works. The marine licensing process also controls the amount of materials dredged and the location of maintenance dredging.

In addition, for the Stour and Orwell Estuaries, there is a Regulatory Group which meets to discuss the results of monitoring of the mitigation measures formulated during the EIA process for the major schemes undertaken by Harwich Haven Authority and the Port of Felixstowe, which are reported annually. This group discusses and agrees any changes to the regime which includes the dredging and placement of maintenance materials. In this way, any impacts are monitored, assessed and managed at an acceptable level.

The potential impacts from maintenance dredging activities comprise the following:

1. Removal and disturbance of habitats and species from the seabed;
2. Noise and visual disturbance due to presence of the dredger;
3. Disposal of dredged sediment and resultant sediment plume and deposition;
4. Potential release of contaminants within the sediment (where present); and,
5. Changes to hydrodynamics.

The following sub-sections summarise the current condition of bird populations and habitats (intertidal mudflat and saltmarsh) in the estuaries (i.e. the aspects of relevance to the designated status of the Stour and Orwell Estuaries SPA and Ramsar site). Subsequently, Tables 10.1 to 10.3 provide an overview of the potential impact of dredging of relevance to the feature in question (i.e. waterbird populations, intertidal mudflat and saltmarsh), a summary of the mitigation, management and monitoring measures in place and note on the outcome of such measures. Following from this, an overall conclusion on the potential impact of maintenance dredging is made in the final column of Tables 10.1 to 10.3.

Waterbird populations

Based on WeBS alerts, short-term alerts have been triggered for 3 species. Alerts were recorded for 10 species in total over the medium term (10 years). In the longer term (25 years) only 2 alerts have been triggered (cormorant and dunlin), and many species have shown medium or high increases over this period.
Low water counts have shown decreasing trends for some species and increases for others. Declines in the numbers of pintail, redshank and black-tailed godwit have occurred, primarily from reductions in the populations wintering on the Stour.

Species that showed increasing trends for the monitoring period as a whole were shelduck (on the Orwell), knot (in the SPA), dunlin (on the Stour), black-tailed godwit (Orwell) and turnstone (Stour).

Findings of the low water counts and WeBS data are reported on an annual basis to the Regulators Group.

*Intertidal mudflat*

Both the Stour and Orwell estuaries are experiencing significant subtidal accretion. With regards intertidal volume, the analysis shows contrasting results for the two estuaries, with accretion in the Stour and erosion in the Orwell. Intertidal area has been shown to be increasing in both estuaries.

The benthic invertebrate monitoring has shown that there have been some minor changes between years and shifts between biotopes for certain stations. It can be concluded that there has not been a marked change in abundance, biomass, number of taxa or biotope composition beyond what would be expected to occur through natural variation over time.

*Saltmarsh*

Assessment of changes in saltmarsh extent has been made based on aerial photographs between the period 2005 to 2010. This assessment concluded that there does not appear to be loss of saltmarsh through erosion within the estuary system, and gains in area have been seen in some regions of the estuaries. However, it is likely that any changes observed are within the margin of error of the analysis technique.
Table 10.1 Potential impact of maintenance dredging with respect to waterbird populations

<table>
<thead>
<tr>
<th>Potential impact of maintenance dredging (generic)</th>
<th>Potential impact on waterbird populations</th>
<th>Current mitigation / management / monitoring</th>
<th>Summary of findings of the monitoring and outcome of the mitigation and management measures</th>
<th>Overall impact of maintenance dredging</th>
</tr>
</thead>
</table>
| Removal and disturbance of habitats and species | Loss of habitat (intertidal mudflat) through erosion and prey depletion due to effects on subtidal habitats and species | Five-year rolling hydrographic (bathymetry) and LiDAR surveys. Annual WeBS reporting and low waterbird counts. Sediment and benthic surveys undertaken. | • Bathymetric and LiDAR surveys show intertidal accretion in the Stour and erosion in the Orwell (in terms of intertidal volume). However, the analysis shows increase in intertidal area in both estuaries.  
• For most bird species no substantial changes occurred. Declines were seen for some species which are mostly reflected nationally. Importantly, habitat extent and quality do not appear to be adversely affected on the basis of the findings of the monitoring programme (see Tables 10.1 and 10.2).  
• There has not been a marked change in abundance, biomass, number of taxa or biotope composition beyond what would be expected to occur through natural variation over time. | None identified |
<p>| Noise and visual disturbance | Disturbance of feeding / roosting birds | Dredge areas avoid concentrations of roosting and feeding birds | • This is a management measure that is not specifically monitored. However, no adverse effects of dredging on feeding and roosting birds due to disturbance have been noted and therefore this is not considered to be an issue in the Stour and Orwell estuaries. | None identified |
| Disposal sediment plume and sediment deposition | Smothering of intertidal areas leading to prey depletion | Dredger overflow managed to avoid smothering effects; Disposal operations monitored. Sediment and benthic surveys undertaken. | • There has not been a marked change in abundance, biomass, number of taxa or biotope composition beyond what would be expected to occur through natural variation over time. There have been no reported issues regarding smothering of intertidal areas and therefore the management of dredger overflow appears to be successful in avoiding smothering of intertidal areas. | None identified |
| Release of contaminants | Loss of prey species | Dredge material is chemically analysed for MMO marine licence application | • There have been no issues regarding chemical quality of the dredged material and no conditions imposed on licences related to sediment quality | None identified |
| Change to hydrodynamics | n/a | n/a | n/a | n/a |</p>
<table>
<thead>
<tr>
<th>Potential impact of maintenance dredging (generic)</th>
<th>Potential impact on intertidal mudflat</th>
<th>Current mitigation / management / monitoring</th>
<th>Summary of findings of the monitoring and outcome of the mitigation and management measures</th>
<th>Overall impact of maintenance dredging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal and disturbance of habitats and species</td>
<td>Changes from erosion and accretion due to effects on sediment transport / sediment budget</td>
<td>Five-year rolling hydrographic (bathymetry) and LiDAR surveys.</td>
<td>• Bathymetric and LiDAR surveys show intertidal accretion in the Stour and erosion in the Orwell (in terms of intertidal volume). However, the analysis shows increase in intertidal area in both estuaries. None identified</td>
<td></td>
</tr>
<tr>
<td>Noise and visual disturbance</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>None identified</td>
</tr>
<tr>
<td>Disposal sediment plume and sediment deposition</td>
<td>Dredge plumes / deposition from disposal</td>
<td>Dredger overflow managed, disposal operations monitored. Sediment and benthic surveys undertaken.</td>
<td>• There has not been a marked change in abundance, biomass, number of taxa or biotope composition beyond what would be expected to occur through natural variation over time. There have been no reported issues regarding smothering of intertidal areas and therefore the management of dredger overflow appears to be successful in avoiding smothering of intertidal areas. None identified</td>
<td></td>
</tr>
<tr>
<td>Release of contaminants</td>
<td>Contaminants released if present</td>
<td>Dredge material is chemically analysed for MMO marine licence application</td>
<td>• There have been no issues regarding chemical quality of the dredged material and no conditions imposed on licences related to sediment quality None identified</td>
<td></td>
</tr>
<tr>
<td>Change to hydrodynamics</td>
<td>Potential erosion and accretion</td>
<td>No significant hydrodynamic changes</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Table 10.3 Potential impact of maintenance dredging with respect to saltmarsh

<table>
<thead>
<tr>
<th>Potential impact of maintenance dredging (generic)</th>
<th>Potential impact on saltmarsh</th>
<th>Current mitigation / management / monitoring</th>
<th>Summary of findings of the monitoring and outcome of the mitigation and management measures</th>
<th>Overall impact of maintenance dredging</th>
</tr>
</thead>
</table>
| Removal and disturbance of habitats and species   | Changes from erosion and accretion due to effects on sediment transport / sediment budget | Five-year rolling hydrographic (bathymetry) and LiDAR surveys and aerial photographs. | • Bathymetric and LiDAR surveys show intertidal accretion in the Stour and erosion in the Orwell (in terms of intertidal volume). However, the analysis shows increase in intertidal area in both estuaries.  
  • There does not appear to be loss of saltmarsh through erosion within the estuary system, and gains in area have been seen in some regions of the estuaries. However, it is likely that any changes observed are within the margin of error of the analysis technique. | None identified |
| Noise and visual disturbance                      | n/a                           | n/a                                         | n/a                                                                                  | None identified |
| Disposal sediment plume and sediment deposition   | Dredge plumes / deposition from disposal | Dredger overflow managed, disposal operations monitored. | • There has not been a marked change in abundance, biomass, number of taxa or biotope composition beyond what would be expected to occur through natural variation over time. There have been no reported issues regarding smothering of intertidal areas and therefore the management of dredger overflow appears to be successful in avoiding smothering of intertidal areas. | None identified |
| Release of contaminants                           | Contaminants released if present | Dredge material is chemically analysed for MMO marine licence application | • There have been no issues regarding chemical quality of the dredged material and no conditions imposed on licences related to sediment quality | None identified |
| Change to hydrodynamics                           | Potential erosion and accretion | No significant hydrodynamic changes         | n/a                                                                                  | n/a |
Conclusion

It is difficult to attribute changes in waterbird populations to factors influencing the estuary system, and many external factors are likely to influence waterbird populations at greater geographic scales. However, it is important to note that those aspects that do have the potential to be directly affected by dredging (habitat extent and quality) do not appear to be adversely affected on the basis of the findings of the monitoring programme. As waterbirds depend on these habitats, it can be implied, therefore, that maintenance dredging is not in itself having a significant effect on bird populations.

The extensive monitoring that is undertaken throughout the estuary system has demonstrated that the maintenance dredging activity does not appear to be causing an adverse impact on the habitats and species of the estuary system. The mitigation measures initiated for the 1998-2000 approach channel dredging are effective and are not accelerating the background rate of erosion of the intertidal areas of the estuary system. Furthermore, at the Regulators Group meeting held in March 2012, the Group was satisfied that all of the conditions had been met.

The Regulators Group and the process of annual reporting of the findings of the monitoring programme will continue to provide the mechanism for the review of the monitoring data and enables the monitoring programme to be adjusted by the Regulators Group in light of the findings of the programme.

It is emphasised that whilst the HHA undertakes and manages the most significant maintenance dredging programme in the estuary system, this document encompasses all maintenance dredging activity that is undertaken and, therefore, the findings of this document are relevant to the activities of all operators within the Stour and Orwell estuary system.

In conclusion, this Baseline Document, produced under the Maintenance Dredging Protocol, has assessed the current dredging operations under the Conservation of Habitats and Species Regulations 2010 (in line with the objective stated in Section 1.1) and concludes that there is no adverse effect on the integrity of the site and on the relevant interest features, subject to the mitigation and management proposed.

This Baseline Document has been sent to Natural England for approval. In response, Natural England issued a letter of support to the Baseline Document and agrees with the assessment of the impact of maintenance dredging activities (Appendix B).
REFERENCES


FIGURES
Roughs Tower (Now Closed to Use)

Inner Gabbard

Approximate boundaries shown for disposal sites

Disposal Sites & Dredging Locations Offshore Overview


Figure 2
The diagram illustrates the Stour and Orwell Estuaries SPA and Ramsar sites, including Stour Estuary SSSI, Orwell Estuary SSSI, Harwich Foreshore SSSI, and other designated areas such as ABP Ipswich Berths & Channel, Fox's Marina, Orwell East, Orwell West, Suffolk Yacht Harbour, Orwell Lower Reaches, Orwell Upper Reaches, Woolverstone Marina, Stour Estuary SSSI, and Orwell Estuary SSSI.

Approximate boundaries shown for dredging, disposal, and sediment replacement sites are highlighted. The map also indicates dredging areas, disposal areas, sites of special scientific interest (SSSI), special protection area (SPA), and Ramsar sites.

Figure 3: Maintenance Dredging Protocol Baseline Document Stour & Orwell Estuaries Harwich/Felixstowe Harbour & Deep Water Channel Designated Sites

Scale: 1:50,000 @ A3
KEY
APPROXIMATE BOUNDARIES SHOWN FOR DREDGING, DISPOSAL & SEDIMENT REPLACEMENT SITES

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<tr>
<td>DREDGING AREAS</td>
<td>-</td>
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<tr>
<td>DISPOSAL AREA</td>
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</tbody>
</table>

Approximate Boundaries

Scale 1:50,000 @ A3

Maintenance Dredging Protocol
Baseline Document
Stour & Orwell Estuaries
Harwich/Felixstowe Harbour & Deep Water Channel

Dredging & Disposal Sites Stour & Orwell Estuaries Overview

Figure 4
Maintenance Dredging Protocol
Baseline Document
Stour & Orwell Estuaries
Harwich/Felixstowe Harbour & Deep Water Channel
Dredging Sites
Upper Stour Estuary

Figure 5

Dredging Area
Approximate boundaries shown for dredging, disposal & sediment replacement sites.
**Maintenance Dredging Protocol**

**Baseline Document**

**Stour & Orwell Estuaries**

**Harwich/Felixstowe Harbour & Deep Water Channel**

**Dredging Sites**

**Shotley Marina**

**Figure 6**

**Scale 1:4,000 @ A3**

**KEY**

**APPROXIMATE BOUNDARIES SHOWN FOR DREDGING, DISPOSAL & SEDIMENT REPLACEMENT SITES**

- **DREDGING AREA**
- **INDICATIVE DISCHARGE OF DREDGED MATERIAL TO FORESHORE**

**DREDGING AREA**

**POSSIBLE EXTENSION TO DREDGE AREA**

**AREA TO BE DREDGED IN 2011**

**MATERIAL DISCHARGED TO FORESHORE (4,200 m³ MAX)**

**MARINA CHANNEL PLOUGH DREDGED ANNUALLY (-2.0 m CD)**

**Approximate Boundaries Shown for Dredging, Disposal & Sediment Replacement Sites**
Figure 7

Maintenance Dredging Protocol
Baseline Document
Stour & Orwell Estuaries
Harwich/Felixstowe Harbour & Deep Water Channel
Dredging Sites
Suffolk Yacht Harbour (Levington)

Figure 7
Maintenance Dredging Protocol
Baseline Document
Harwich/Felixstowe Harbour & Deep Water Channel
Dredging Sites
Orwell Estuary Upper Reaches

Figure 10

Approximate boundaries shown for dredging, disposal & sediment replacement sites:
- Dredging Areas
- Disposal Area

 Depths are in metres and are reduced to Chart Datum. Depths in red boxes are the lowest three meters below Chart Datum. Vertical clearance is to Highest Astronomical Tide. All other heights are High Water Springs. Positions are referred to the OSGB36 Datum.

National Horizontal Datum

Overhead Cables

Marina Facilities

Scale 1:20,000 @ A3

Harwich Haven Authority
Figure 12

KEY

APPROXIMATE BOUNDARIES SHOWN FOR DREDGING, DISPOSAL & SEDIMENT REPLACEMENT SITES

DREDGING AREAS

Scale 1:20,000 @ A3

Harwich Haven Authority

Maintenance Dredging Protocol
Baseline Document
Stour & Orwell Estuaries
Harwich/Felixstowe Harbour & Deep Water Channel

Dredging Sites
Port of Felixstowe

Figure 12

Stour & Orwell Estuaries
Harwich/Felixstowe Harbour & Deep Water Channel

Dredging Sites
Port of Felixstowe
KEY
APPROXIMATE BOUNDARIES SHOWN FOR DREDGING, DISPOSAL & SEDIMENT REPLACEMENT SITES

DREDGING AREAS

Figure 13

Maintenance Dredging Protocol
Baseline Document
Stour & Orwell Estuaries
Harwich/Felixstowe Harbour & Deep Water Channel

Dredging Sites
Lower Stour Estuary

Harwich Haven Authority

SOURCES
Commercial Surveys
2006 British Government Surveys
1:15,000

Hydrography
2007 Full Sea Floor coverage
1:25,000
1983 1:12,500

Aerial Photography
1991 1:1000
1992 Environment Agency Surveys
2002 1:100
Figure 14

Maintenance Dredging Protocol
Baseline Document
Stour & Orwell Estuaries
Harwich/Felixstowe Harbour &
Deep Water Channel

Dredging Sites
Harwich Quay, Navyard &
Navigation House Jetty

Figure 14
Figure 15

Maintenance Dredging Protocol
Baseline Document
Stour & Orwell Estuaries
Harwich/Felixstowe Harbour &
Deep Water Channel

Dredging Sites
Deep Water Channel

APPROXIMATE BOUNDARIES SHOWN FOR
DREDGING, DISPOSAL & SEDIMENT
REPLACEMENT SITES

DREDGING SITES
Samples have been taken over the years for MCEU / FEPA disposal consents. These samples, as specified by the Regulators, have been taken from the dredge areas involved and so are limited to the dredge sites in: Harwich & Felixstowe Harbour, the upper part of the ABP Ipswich channel and the Suffolk Yacht Harbour and Fox’s Marina applications.

Samples were also taken and analysed from the Mistley channel for HHA’s own consideration of ploughing and discussion with Natural England.

The bulk of the Estuaries are not sampled for specific contaminants but are monitored widely under the various compensation mitigation and monitoring agreements as set out with the Regulators.
APPENDIX A

SEDIMENT QUALITY RESULTS
### Metals and Tin Results for Defra

**Sample Information:**
- **Das:** 34819/100504 + 34815/100427
- **Licencee:** Harwich Haven Authority
- **Location:** Harwich and Felixstowe
- **DC:** 9021/9018
- **Date Sampled:** 02/06/2010

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<td>Area B, D and E</td>
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<td>18</td>
<td>22</td>
<td>56</td>
<td>&lt;LOD</td>
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</table>

**Mean:**

- 40.15
- 19.92
- 0.00
- 46.92
- 20.00
- 0.05
- 28.54
- 35.46
- 92.92
- #DIV/0!
- 0.031

**Limits of Detection (ppm dry):**

- 0.15
- 0.05
- 0.15
- 0.06
- 0.03
- 0.15
- 0.08
- 0.15
- 0.005
- 0.007

**Produced by:** S. Pacitto

**Date:** 21/06/2010

---

**Note:**

- **mg/kg (ppm):** Dry weight
- **LOD:** Limit of Detection
### Polycyclic Aromatic Hydrocarbon Results for Defra

**Dat:** 34819/100504 + 34815/100427  
**Application:** Harwich Haven Authority  
**Location:** Harwich and Felixstowe  
**DC/MCU:** 9021/2010  
**Date Sampled:** 02/06/2010

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<th>ACENAPHT</th>
<th>ACENAPT</th>
<th>ANTHRAC</th>
<th>BBA</th>
<th>BAP</th>
<th>BBP</th>
<th>BENZOH</th>
<th>BEEP</th>
<th>BKF</th>
<th>CIN</th>
<th>CTPHEN</th>
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<td>38.0486</td>
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<td>0.000</td>
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<td>0.135</td>
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<td>0.083</td>
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**Mean**  

| 0.000 | 0.000 | 0.000 | 0.171 | 0.018 | 0.087 | 0.163 | 0.094 | 0.101 | 0.095 | 0.509 | 0.342 |

**AL1 (ppm dry)**  

| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 100 |

<table>
<thead>
<tr>
<th>LSN</th>
<th>Sample No.</th>
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<th>Excluded</th>
<th>TS (%)</th>
<th>C2N</th>
<th>C3N</th>
<th>CHRYSEN</th>
<th>DBENZAPHT</th>
<th>FLUORAN</th>
<th>FLUOREN</th>
<th>INDOPYRENE</th>
<th>NAPHTH</th>
<th>PERYLEN</th>
<th>PHENANT</th>
<th>PYRENE</th>
<th>THC</th>
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<td>0.052</td>
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<td>0.174</td>
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<td>0.054</td>
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<td>40.0375</td>
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<td>0.234</td>
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</table>

**Mean**  

| 0.188 | 1.147 | 0.014 | 0.016 | 0.168 | 0.036 | 0.074 | 0.141 | 0.052 | 0.353 | 0.171 | 380 |

**AL1 (ppm dry)**  

| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 100 |

Produced by: S. pacitto  
Date: 21/07/2010  
F002_V5_SP_24/06/10
CHEMISTRY CERTIFICATE OF ANALYSIS

Report Number: C5354
Date Sample Received: 23/02/2010
Laboratory Sample Number: See below
Sample Description: Sediment
Sample Storage Conditions: Frozen

Test Results

1. Metals Results

Method SOP 2042/2043/2044

Units: mg/kg dry weight

<table>
<thead>
<tr>
<th>Laboratory Sample Number</th>
<th>Sample Description</th>
<th>Cr</th>
<th>Ni</th>
<th>Cu</th>
<th>Zn</th>
<th>As</th>
<th>Cd</th>
<th>Pb</th>
<th>Hg</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011/00377/01</td>
<td>Sample 1</td>
<td>99</td>
<td>60</td>
<td>268</td>
<td>448</td>
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<td>1.7</td>
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<td>57</td>
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<td>206</td>
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<td>76</td>
<td>0.330</td>
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<td>Sample 3</td>
<td>47</td>
<td>33</td>
<td>78</td>
<td>165</td>
<td>20</td>
<td>0.43</td>
<td>59</td>
<td>0.240</td>
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<tr>
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<td>Sample 4</td>
<td>81</td>
<td>41</td>
<td>100</td>
<td>207</td>
<td>24</td>
<td>0.77</td>
<td>89</td>
<td>0.520</td>
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<td>2011/00381/01</td>
<td>Sample 5</td>
<td>65</td>
<td>34</td>
<td>67</td>
<td>162</td>
<td>20</td>
<td>0.45</td>
<td>81</td>
<td>0.190</td>
</tr>
<tr>
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<td>Sample 6</td>
<td>77</td>
<td>46</td>
<td>62</td>
<td>167</td>
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<td>0.19</td>
<td>55</td>
<td>0.15</td>
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</table>

2. Organotins Results

Method SOP: OT in sediment

Units: mg/kg dry weight

<table>
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<th>Laboratory Sample Number</th>
<th>Sample Description</th>
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<th>TBT*</th>
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<tr>
<td>2011/00377/2</td>
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<td>0.160</td>
<td>0.745</td>
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<td>0.023</td>
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<td>0.067</td>
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<td>Sample 5</td>
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<td>2011/00382/2</td>
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3. **THC/PAHs Results**

**Method SOP** 1597 and 1598  
PAHs in µg/kg  
THC in mg/kg  

<table>
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<th>Laboratory Sample Number</th>
<th>Sample Description</th>
<th>Total Hydrocarbon Concentration</th>
<th>Naphthalene*</th>
<th>methyl naphthalenes*</th>
<th>dimethyl naphthalenes*</th>
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<td>403.42</td>
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<td>1027</td>
<td>171.09</td>
<td>516.76</td>
<td>702.73</td>
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<td>804</td>
<td>157.2</td>
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<tr>
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<td>1092</td>
<td>180.48</td>
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<td>670</td>
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<td>480.75</td>
<td>767.27</td>
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<th>Sample Description</th>
<th>trimethyl naphthalenes*</th>
<th>Acenaphthylene*</th>
<th>Acenapthene*</th>
<th>Fluorene*</th>
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<td>1555.76</td>
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<th>Phenanthrene*</th>
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<th>methyl phenanthrenes*</th>
<th>Fluoranthene*</th>
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<td>190.11</td>
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<table>
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<th>Laboratory Sample Number</th>
<th>Sample Description</th>
<th>Pyrene*</th>
<th>Benz[a] anthracene*</th>
<th>Chrycene*</th>
<th>Benzo[b] fluoranthene*</th>
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<td>2011/377/04 Sample 1</td>
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### 4. PCBs Results

**Method SOP** 1415, 1778, 1779, 1780

CBs in µg/kg

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<th>CB#105</th>
<th>CB#118</th>
<th>CB#153</th>
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<td>0.3</td>
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<td>&lt;0.2</td>
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<td>&lt;0.2</td>
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### 5. Particle Size Analysis (PSA) Results

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<th>CB#187</th>
<th>CB#18</th>
<th>CB#44</th>
<th>CB#47</th>
<th>CB#49</th>
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</tr>
<tr>
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Departure from testing conditions

Results marked with an asterisk fall outside the scope of accreditation.

The results provided in this report only relate to the sample(s) tested

Report authorised by: Thi Bolam

e-Signature: Thi Bolam

Position: Technical Manager

Date: 07/06/2011

Authorised Signatories: Jon Barber, Philippe Bersuder, Thi Bolam, Heather Rumney.
APPENDIX B

NATURAL ENGLAND LETTER OF SUPPORT
Dear John,

Harwich, Felixstowe and the Stour and Orwell Estuaries: Maintenance Dredging Protocol Baseline Plan

Thank you for your most recent email of 8th October consulting Natural England on further information and amendments to the above plan.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

We have checked our records and based on the information provided, we can confirm that this plan affects the following sites designated for nature conservation:

- Stour and Orwell Estuaries SPA (Special Protection Area for birds)
- Stour and Orwell Estuaries Ramsar site (Wetland of international importance)
- Stour Estuary SSSI; Orwell Estuary SSSI; Harwich Foreshore SSSI (Site of special scientific interest)

Government considers that the EC Habitats Directive (92/43/EC) requires maintenance dredging proposals, which could potentially affect European sites, to be assessed in accordance with Article 6(3) of the Directive.

In 2008, DEFRA introduced the maintenance dredging protocol for Ports and Harbours. The purpose of which was to develop a baseline document that recorded the current state of knowledge of dredging activities in a particular estuary/harbour, thus allowing an evaluation of the relationship between the maintenance dredging activities and the current condition of Natura 2000 (N2K) sites to be made.

The production of a baseline document provides a foundation for consistent and informed decision making by all competent authorities, in compliance with The Conservation of Habitats and Species Regulations 2010 (“The Habitats Regulations”). It also negates the need for the production of an environmental statement for individual consent applications.

By email only, no hard copy to follow
Assessment under the Conservation of Habitats and Species Regulations 2010
Natural England agrees with the conclusions of the Maintenance Dredging Protocol Document which acts as an appropriate assessment of the designated features of the site in accordance with Regulation 61 of the Conservation of Habitats and Species Regulations 2010. In Natural England’s opinion this proposal in its current form is unlikely to have an adverse effect on the integrity of the above SPA site subject to the mitigation and management in place.

Advice under S28I of the Wildlife & Countryside Act 1981 (as amended by the Countryside & Rights of Way Act 2000)
It is Natural England’s advice that the above SSSIs are also unlikely to be adversely affected by the above proposal however we stress that this letter does not constitute Natural England’s assent or advice for the purposes of s28H of the Wildlife and Countryside Act 1981 (as amended). When more details of the proposed operations become available and before carrying them out, the operating authority, having considered its general duty under section 28G(2) of The Wildlife and Countryside Act 1981 (as amended), is required to give notice to Natural England. The operating authority is required to carry out the works in accordance with the provisions of section 28H of the Wildlife and Countryside Act 1981 (as amended) as the proposed works are within or adjacent to the SSSIs found within the designated sites listed above.

In Summary, following the information received from the Harwich Haven Authority (HHA), we write to confirm that Natural England lends its support to the baseline document and agrees with the assessment of the impact of maintenance dredge activities in the River Stour and Orwell and to the surrounding N2K sites.

The Stour and Orwell Estuaries have been put forward by the Balanced Seas Project as a proposed Marine Conservation Zone. Please note that although the maintenance dredging protocol acts as mitigation for potentially damaging operations, new features of the MCZ may need to be considered within the protocol in the future.

If you require any further information regarding this response please do not hesitate to contact me.

Yours sincerely

Lisa Jenner
Lead Marine Adviser
Eastern Channel Team

Email: lisa.jenner@naturalengland.org.uk