Saltmarsh Restoration

Robin Whittle and Robert Simper

The information in this paper has been gathered from many sources and provides a record for the River Deben Association (RDA) and other interested parties. It considers the current state of the saltmarshes on the River Deben and gives some possible reasons for their deterioration together with other observations. Proposals are made for a possible trial to help restore badly eroded areas.

1. **Background information:**
   a) **Deben Estuary Plan:** This was published in April 2015 and emphasizes the importance of maintaining and enhancing the saltmarshes of the Deben Estuary (3.3).
   b) **Formation of the Suffolk Saltmarsh Group:** This was formed in May 2017 to support the common interests of local partnerships (e.g. Deben Estuary Partnership, Alde and Ore Estuary Partnership etc.).
   c) **The Deben Estuary Partnership (DEP) Saltmarsh Group:** This was reformed in February 2017 to manage Saltmarsh Restoration work on the River Deben and provide information to the Suffolk Saltmarsh Group.
   d) **The River Deben Association (RDA) Research Group:** This was formed in 2016 to study and set up projects to investigate the reasons for erosion of saltmarshes in the River Deben Estuary. It is intended that this will lead to proposals on how to restore saltmarshes in an economic and acceptable way.
   e) **Project Proposal: Suffolk Saltmarsh Pilot - Deben Estuary:** In May 2017 a proposal was made seeking financial support from the Dedham Vale AONB and Suffolk Coast AONB to develop a saltmarsh restoration pilot for the Deben Estuary which will utilise dredgings from local marine businesses, and use traditional approaches to restore badly degraded SSSI saltmarshes that provide a wide range of benefits to the environment, wildlife, communities and businesses in the area

2. **Regular dredging carried out by local businesses:**
   Businesses currently dredge what they think is necessary. Licensing (from Marine Management Organisation) is an unnecessary expense for them. It is unlikely that the boatyards will finance more dredging than they require.
   Regular dredging takes place, at
   i. Waldringfield Boatyard (crane) (300m^3/2yrs)
   ii. Woodbridge Boatyard (plough) (50m^3/yr)
   iii. Ferry dock and Deben Yacht Club slipway (crane) (750m^3/2yrs)
   iv. Tide Mill Yacht Haven (pump) (400m^3/yr)
   v. Robertsons Boatyard (plough) (100m^3/yr)
   vi. Melton Boatyard (pump) (1000m^3/yr)
   vii. Larkmans Boatyard (200m^3/yr)
   TOTAL – 2,275m^3/yr sufficient to create about 0.6ha/yr of saltmarsh.
   See also RDA Note ‘Dredging to enhance the saltmarsh of the River Deben’ (14/3/2016) - Appendix A.

3. **Recent Projects**

There have been a number of projects set up over the last decade to restore and monitor the saltmarshes in the River Deben (See Figures 1 & 2). Unfortunately there has been little documentation of any measurements on any of these. Much of the effect of these projects on the growth or erosion of the saltmarsh relies on hearsay. The projects include:

a) 2009: RDA Scheme at Ferry Cliff opposite the Tide Mill (Cost £6,000). A barrier along the shore/saltings constructed of oak posts set in a zig-zag pattern linked heavy gauge perforated plastic mesh. The recent depositing of silt from the Tide Mill Yacht Haven into the river just downstream of the entrance (planning permission given) has caused a change in the channel and the current has recently eroded away some of the bank behind the barrier. The depositing of silt has also caused a back eddy around the Tide Mill and Ferry Dock where the amount of silt has increased.

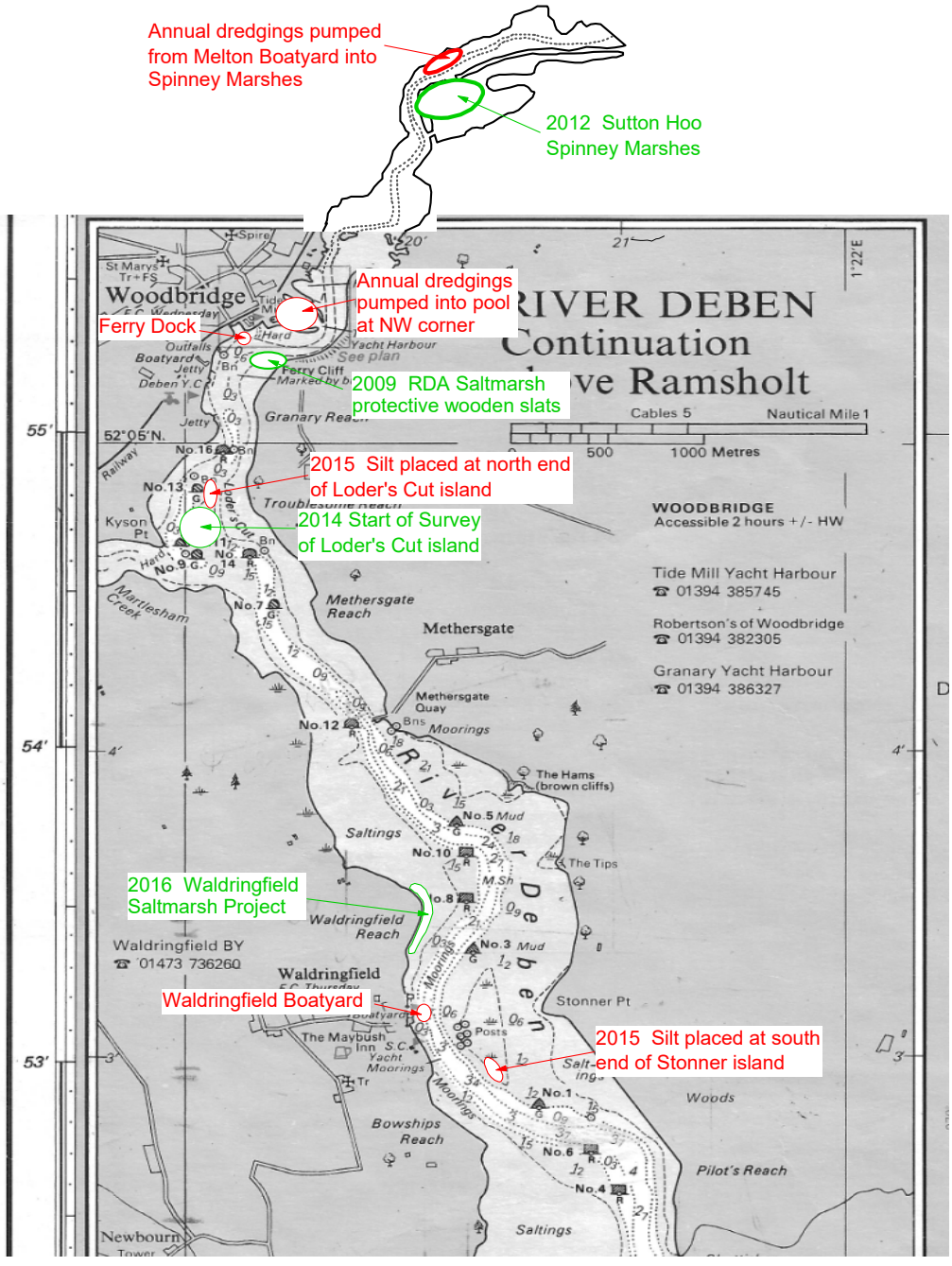


Figure 1: Upper Reaches of the River Deben

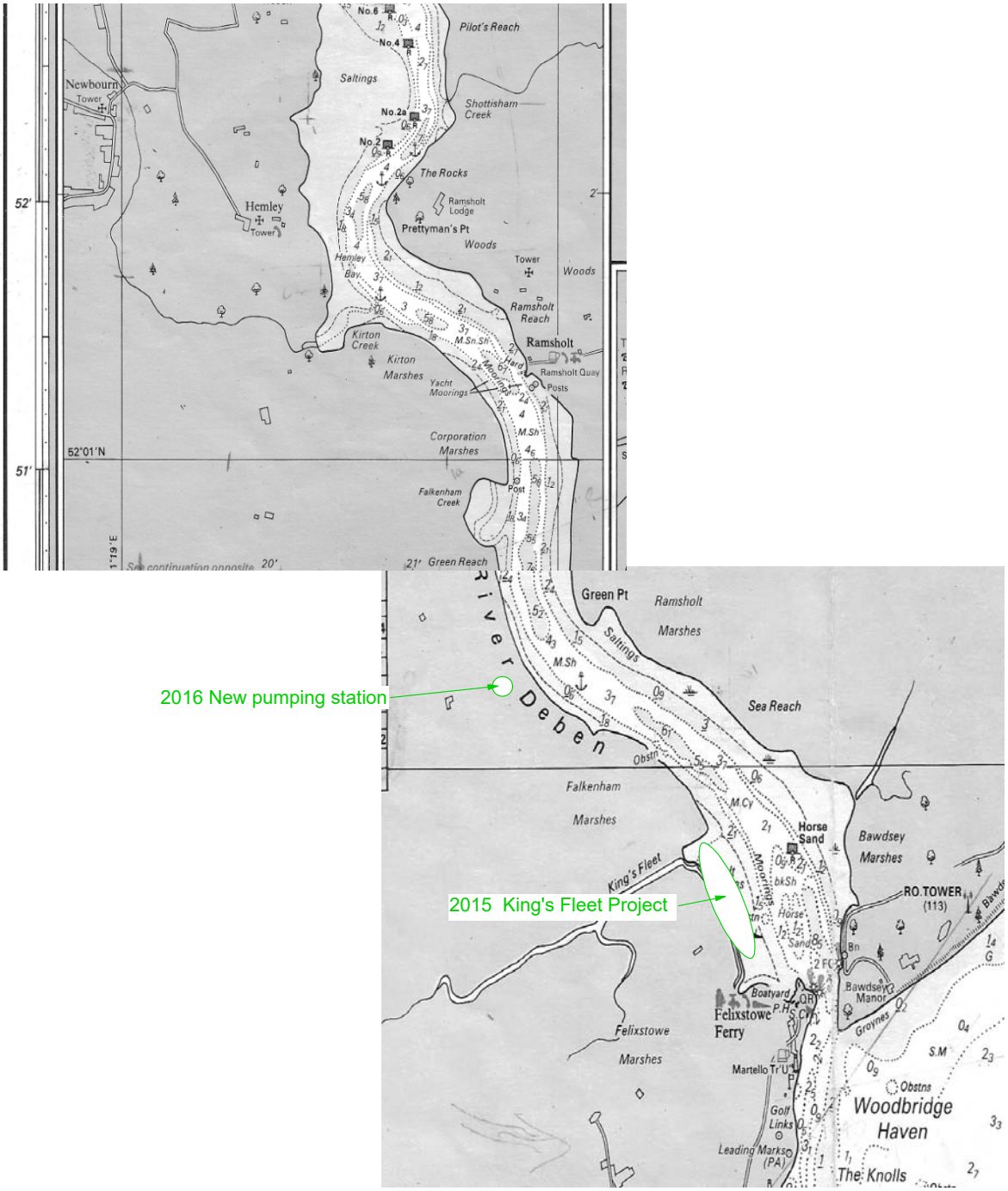


Figure 2: Lower Reaches of the River Deben

b) **2012: DEP Scheme at Sutton Hoo Spinney Marshes (Cost £20,000).** A mesh fence was constructed along the remains of the old river wall from a point opposite Larkmans Boatyard to the gap in the river wall, created by a World War 2 bomb. This has collected weed but no sediment. A wooden sill and channel guide was created at the bomb crater. The effect of the work at the inlet/outlet (old bomb crater) has increased width of this entrance. The level of the saltmarsh within the marsh area has risen due to the annual pumping of silt from the Melton Boatyard.

c) **2015: 'Touching the Tide' Project at King's Fleet (Cost £20,000).** The work carried out was to help preserve the existing saltmarsh. NE decided that the existing sluice from King's Reach was not adequate which led to the construction of a new pump station

placed on the SW side of Sea Reach. This has caused the channel through the saltmarsh from the old sluice from King's Fleet to silt up. Some of the soft structures put in place have washed away.

d) **2015: Dredging at Ferry Dock (Cost £13,600).** 750m^3 of mud placed by crane on north end of Loder's Cut Island from Ferry Dock and DYC slipway. This has remained in place and allowed four different species of maritime plants to grow within a year.
e) **2016: Dredging at Waldringfield Boatyard (Cost £7,300).** Mud placed by crane on downstream end of Stonner Island from the locality of Waldringfield Boatyard. Much of this has been washed away. The material that has remained has grown algae and helps to protect the saltmarsh behind.
f) **2016: Waldringfield Flood Defence Group Waldringfield Project, Phase 2 - Saltmarsh Restoration Project (Cost £100,000).** A low level polder fencework 1km long placed 5m from the river wall, was constructed from driven chestnut stakes supporting strapped bundles of hazel faggots. Measurements of any silting have yet to be documented.

4. **RDA Saltmarsh Research on the River Deben:**
   a) **Loder's Cut Island:** Bi-annual surveys have been taking place since Spring 2014. Twelve posts have been used as reference points and measurements of the height and extent of the saltmarsh, in plan, have been made at each post. The readings are showing that the level of this saltmarsh rises at the same rate as the relative Mean High Water Springs Sea Level Rise (MHWS SLR) 3.5mm/yr. Sediment from the sea is deposited naturally when the saltmarshes are flooded. This is of no surprise and is confirmed by the difference in the level of the saltmarsh on the riverside of the river walls and the level of land on the landside of the river walls which is considerably lower (1 metre or more). Over a period of hundreds of years the sediment coming in from the sea has increased the level of the saltmarshes. This is also confirmed in the joint Defra/EA R&D Technical Report FD1922/TR 'Managed realignment at Tollesbury' - Figures 2.2 and 2.3 of that report show that over a period from 1994 to 2007 the Old Hall saltmarsh has risen at a mean rate of 3.1mm/yr and at Tollesbury saltmarsh has risen at a mean rate of 4.2mm/yr (see Figure 3).

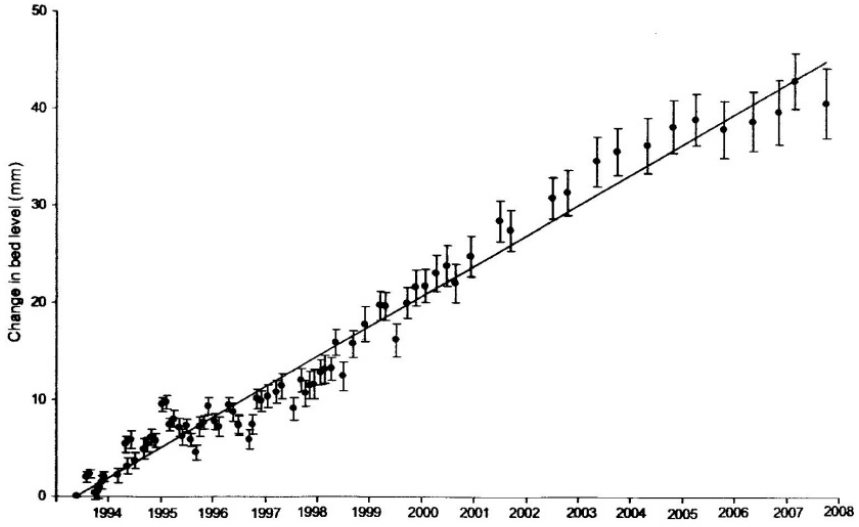


Figure 2.2 Mean sedimentation (n=12) for the Old Hall salt marshes between May 1993 and October 2007 with best fit line. Mean rate is 3.1mm year^{-1} (regression equation: y = - 1.136 + 0.008529 day; r^2=97.1%, p<0.001).

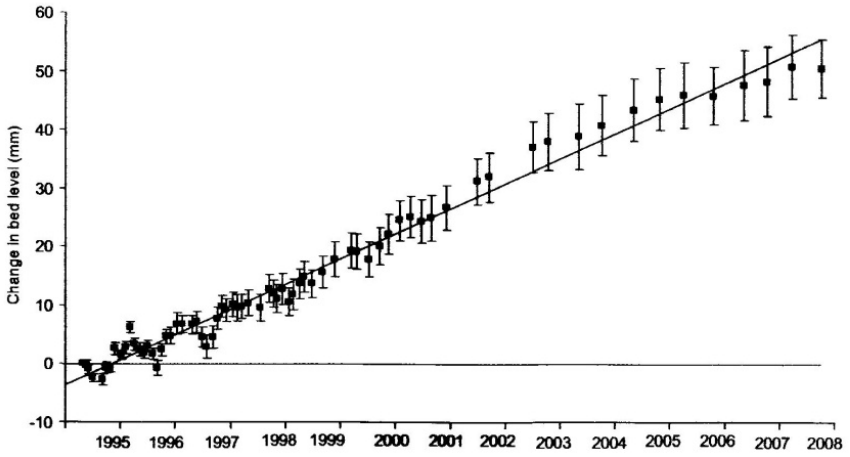
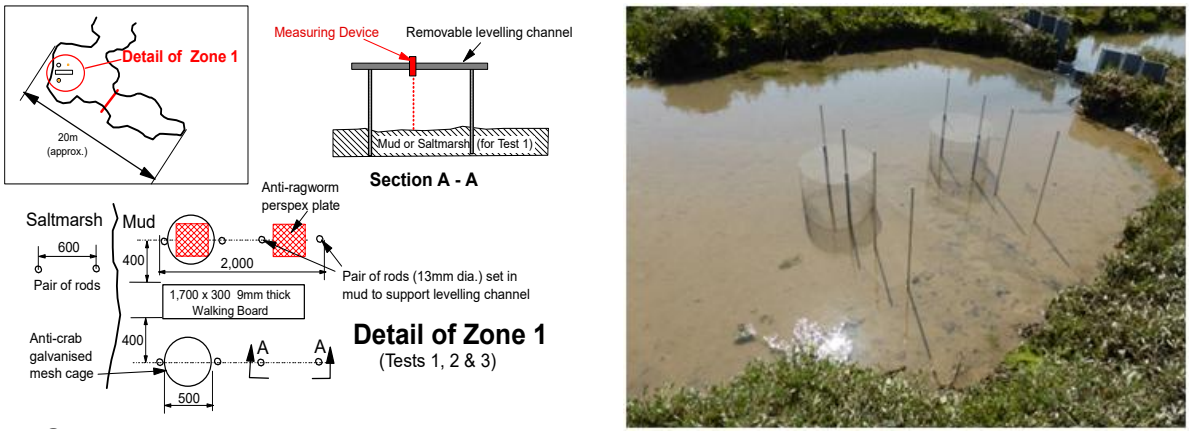


Figure 2.3 Mean sedimentation (n=16) for the Tollesbury salt marshes between April 1994 and October 2007 with best fit line. Mean rate is 4.2mm year^{-1} (regression equation: y = -7.505 + 0.01162 day; r^2=97.9%, p<0.001).

Figure 3: Figures 2.2 and 2.3 from Technical Report FD1922/TR

b) Waldringfield Pilot Study: This work has been carried out under the umbrella of the Waldringfield Flood Defence Group - Phase 2. It is a project to determine the effect of shore crabs and ragworms on the erosion of saltmarshes away from the main channel of the River Deben over a period of five years. This was started in spring 2016. In 2017 three posts were added to provide more information about the level of the saltmarsh (similar to that of Loder's Cut Island). The layout of the equipment for the pilot study is shown in Figure 4.



a) Schematic Layout **b) Equipment in the Field**

Figure 4: Layout of equipment for pilot study

Results of the measurements so far show that:

i. The saltmarsh level is essentially flat and rising.

ii. A sill**,** created by interlocked plastic sheet piling (1m long), set at 200mm below the saltmarsh level has caused the level of the mud in the lagoon upstream to rise by 25mm in the first year.

iii. The erosion of the 'saltmarsh cliff face' inland from the river measured at eight separate points shows an average erosion of 15mm/yr.

iv. The measurements of the effect of shore crabs and ragworms on the level of ooze below the saltmarsh do not show a clear trend yet and this may not become apparent until after several years. Measurements are being taken of:
The level of ooze (mud below the saltmarsh) in the **control area,** without any exclusion.
The level of ooze **excluding shore crabs and ragworms (Plate and Cage)** relative to the control area.
The level of ooze **excluding ragworms only (Plate)** relative to the control area.
The level of ooze **excluding shore crabs only (Cage)** relative to the control area.

The videos of the underwater activity close to the 'saltmarsh cliff' show shore crab activity in and out of the burrows in the wall and erosion of the walls by the shore crabs as they climb up and down the walls under water.

5. Main findings of surveys

There are still many aspects of the erosion of saltmarshes in the River Deben that are not understood. It is considered unlikely that chemicals introduced into the river from sewage farms or run off from fields, have had a significant effect on erosion, since, with regard to shell fishing, it is the second cleanest estuary (to Whitstable) in the country. However there are some significant results from the current surveys which are indisputable:

a) The surface level of the saltmarsh is essentially flat and rising at the same rate as the relative sea level rise (3.5mm/yr).

b) The erosion of the saltmarsh cliff face inland from the river channel is significant (up to 20mm/yr in places).

c) Creating a sill 200mm below the level of the saltmarsh to restrict the ebb in the saltmarsh channels (inland from the main river channel) allows natural sediment to accrete upstream of the sill at a significant rate (up to 25mm/yr).

The rapid erosion of the saltmarsh cliff inland from the river channel is caused by the large number of tunnels which have been created at many levels of the saltmarsh cliff. This information has been documented since the 1930s (e.g. Hervey Bensham's book *Essex Gold*). The tunnels have reduced the integrity of the wall face, and subsequently the remaining parts of the wall have collapsed or been washed away by the tidal currents. It is understood that the tunnels are created by shore crabs.

6. **Observations**

a) At spring tides the water level rises above the saltmarshes. The river walls are most vulnerable to erosion at such times when waves are created from strong winds. Only a short section of saltmarsh in front of the river walls (say 2m) is required to absorb the wave energy that otherwise would damage the river walls.

b) Erosion of the saltmarsh edges, 'saltings cliffs', in the River Deben takes place along the edges of the river channel and along internal channels (inland from the main river channel). The detailed reasons for this are still not fully understood but are thought to be the combined effect of wave action, shore crab burrows and ragworm bioturbation. The current population of shore crabs in the River Deben is estimated to be three million. See also 'Recent history of the changes to the Saltmarshes of the River Deben – 2014' - Appendix B.

c) Wave action is unlikely to have a large effect on the saltmarsh edges inland from the river channel.

d) The ditches along the riverside of the river walls have been largely created in the past by dragline dredging to build up the river walls. These channels increase erosion by shore crab burrowing and wave action and should be filled in. This need could be fulfilled by semi-natural means (e.g. use of sills to promote sediment accretion).

e) There are a few vulnerable places on the River Deben (e.g. Pilots Reach) where the river walls are not protected by saltmarsh.

f) Natural England (NE) and Inshore Fisheries and Conservation Authority (IFCA) have a prime interest in the preservation of saltmarshes and creeks to provide shelter and food for breeding fish and birds. The river walls provide the public with a means of viewing the wild life and this should and does provide revenue for NE and other bodies.

g) There is a perceived need to dredge regularly to prevent shoaling. This would entail dredging mud from the banks of the river and creeks up river from Kirton Creek. The channel depth will be unaffected by dredging but the width of channel at places such as Troublesome Reach and Martlesham Creek would be restored/enhanced.

h) There has been a stated wish by some organisations for more dredging to take place in particular areas of the river (e.g. Riverside Trust at Whisstocks, Waldringfield Sailing Club for the cut to the East of Stonner Island). However it is very unlikely that such organisations would be able to finance such dredging.

i) The current dredging equipment that Tam Grundy has available at present requires 5ft of water and has a capacity of $46m^3$ (70 Tonnes) per load of craned material/mud. The

limit of the crane's reach is about 50ft. Tam would expect to increase his equipment if the demand for dredging increased.

j) Pumping silt is costly but has the advantage that it can be placed where it is needed. It does, however, require channel sills (coir rolls or craned mud) to minimise silt returning to the river

7. **Proposals for the future**

a) Pilot project to restore saltmarsh: It is proposed that a pilot project should be carried out to test the effect of using plastic sheet piling to create a sill in a limited area (or part of an area) of eroded saltmarsh. The sill should be made of interlocked plastic sheet piling (say 1.5m -2m long) and set at 200mm below the saltmarsh level (see 4b above). The dimensions of each sheet pile 330mm wide by 120mm deep. The cost for 2m length is approximately £20/m^2. It is proposed that a 12mm dia. hole should be drilled near the top of each pile to allow it to be raised or removed at a later date.
The lower part of Granary Reach, upstream of Kyson's Point would be a suitable site (see Figure 5).

Figure 5: Saltmarsh upstream of Kyson's Point showing layout of proposed sill

b) Alternative to a): As an alternative to the use of plastic sheet piling, create a mud wall with dredgings. Lay pipes through the wall at a level 200mm below the saltmarsh level. See Figure 6.

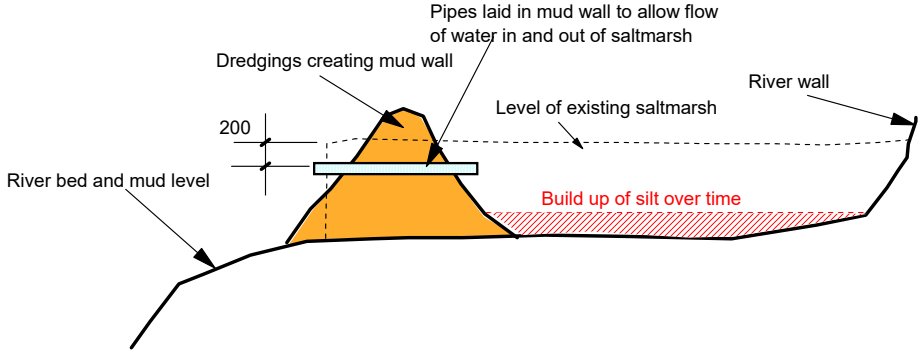


Figure 6: Section through mud wall as alternative to plastic sheet piling

c) **Pilot Study to reduce shore crab tunnels within the saltmarsh:** Place a short length of sill (about 4m) across one of the small channels within the saltmarsh (e.g. at a position shown in Figure 7 in the saltmarsh upstream of Waldringfield) using either Method 7a) or 7b). The purpose of this is to show that within the channel structure within a saltmarsh (away from the main river channel) it is possible to fill existing shore crab tunnels with natural siltation and restore the saltmarsh. It is believed that the shore crabs (they cannot swim) would leave this area or build more tunnels higher up, which would in turn fill up with silt .
The effects of this type of sill could be compared with the effects of creating one in another part of the saltmarsh using traditional polder methods (as preferred by Jon Wilkins of the Waldringfield Flood Defence Group).

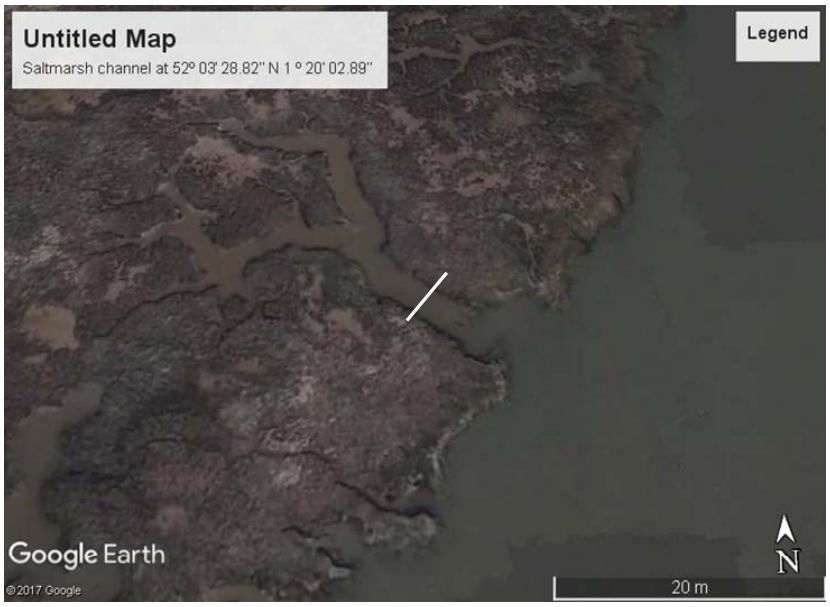


Figure 7: Provide sill across saltmarsh channel

d) **Discuss and record views of representatives of the River Community:** This would include the following organisations:
   i. **Landowners downstream of Wilford Bridge:** Chris Mann, the Adeane Estate, Robert and Jonathan Simper, Sir Guy Quilter, Peter Waring, Paul Brandt, John Cole, Lord Freeman, National Trust, Kingston Smith, Suffolk Coastal District Council, William Notcutt, Evans?, John Symes, David Parken, Shell Fish and Deben Fisheries, Waldringfield Boatyard, Maybush Pub, Martlesham Creek Boatyard, Woodbridge Boatyard, Riverside Trust, Ferry Dock, Tide Mill, Tide Mill Yacht Haven, Robertson's Boatyard, Melton Boatyard, Larkman's Boatyard.
   ii. **Fairway Committees:** Felixstowe Ferry, Ramsholt, Waldringfield, Kysons.
   iii. **Clubs:** Felixstowe Ferry Sailing Club, Bawdsey Haven Yacht Club, Water Ski Club, Waldringfield Sailing Club, Woodbridge School, Deben Yacht Club, Deben Rowing Club, Woodbridge Cruising Club, Melton Boat Club.

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