

Case study 56. Levington Saltmarsh Restoration, Suffolk

Author: Robert Harvey

Main driver: Beneficial use of dredging and habitat restoration

Project stage: Ongoing (1997 to present)



Photo 1: Levington Lagoon (source: Suffolk Wildlife Trust)

Project summary:

Levington Marina (Map 1) on the River Orwell in Suffolk is dredged each winter using a 10-foot cutter suction dredger to maintain water depths around the pontoons and berths. Since 2014, dredged material has been deposited in 2 beneficial placement schemes licensed by Defra and approved by Natural England. Each year 15,000–20,000m³ of silt is dredged and placed on the foreshore. Operations are carried out between mid-November and early April.

A Marine Management Organisation (MMO) licence is held by Suffolk Yacht Harbour for beneficial foreshore disposal. Dredged material is recovered as a slurry and conveyed by one of two fixed pipes to a deposition area east and west of the harbour where saltmarsh has been degraded and fragmented. The ends of the fixed pipes are moved each year to vary the location in which dredged material is discharged. Photo 1 shows the Levington Lagoon.

Coir rolls and wooden stakes have been introduced into the deposition areas to contribute to:

- retaining discharged material in place
- impede flow
- make it easier to deposit sediment during the dredging operation

Significant accretion of between 100mm and 300mm has been noted during the 3 years of monitoring. It is anticipated that this will translate into more robust growth of pioneer saltmarsh vegetation and in due course colonisation by high saltmarsh vegetation.

Key fact:

A partnership approach has delivered environmental benefits from using maintenance dredgings to accrete and restore fragmented areas of saltmarsh local to the dredging site and at a relatively modest cost.



Map 1: Levington Marina (source: Ordnance Survey)

1. Contact details

Contact details	
Name:	Jonathan Dyke
Lead organisation:	Levington Marina
Partners:	Suffolk Yacht Harbour, Ipswich Borough Council, Suffolk Coast and Heaths AONB Unit, Environment Agency, Natural England and Suffolk Wildlife Trust
e-mail address:	jonathan@syharbour.co.uk

2. Location and coastal/estuarine water body description

Coastal/estuarine water body summary	
National Grid Reference:	TM 24754 38013
Town, County, Country:	Levington, Suffolk, UK
Regional Flood and Coastal Committee (RFCC) Region:	Anglian
Transitional and coastal water body size (km²):	Information not available
Transitional and coastal water body and location:	Information not available
Water Framework Directive water body reference:	Information not available
Land use, geology, substrate, tidal range:	Clay and estuarine gravels and sands Marina, saltmarsh, mudflat

3. Background summary of the coastal/estuarine water body

Socioeconomic/historic context

Construction of Levington Marina in the River Orwell upstream of Felixstowe began in 1967. Material excavated to create the harbour was deposited landward of the seawall where it formed swales. In the 1990s, planning applications were submitted to level adjacent land. In 1995 to 1997, a plan was developed to recharge the foreshore, depositing material on degraded mudflat owned by the marina, Ipswich Borough Council and Associated British Ports (ABP). In 2014, this operation was refined and improved, and this process has continued to the present time.

Flood and coastal erosion risk management problem(s)

There is no flood and coastal erosion risk management issue to properties. Landward and to the east of the marina, there is rising ground immediately to landward. West of the marina, an area of low-lying farmland, a brackish nature conservation site managed by Suffolk Wildlife Trust, and a length of footpath are protected from flooding by a clay river wall (owner unknown) fronted by saltmarsh.

Other environmental problems

Saltmarsh along the north shore of the Orwell both east and west of the marina was becoming eroded and degraded.

The West Marsh (Photo 2) is a substantial area of degraded saltmarsh between the entrance to Levington Creek and Suffolk Yacht Harbour. Seasonally there is a good crop of samphire (*Salicornia europaea*), cordgrass (*Spartina anglica*) and sea aster (*Aster tripolium*). However, there is insufficient overall elevation for this to progress any further beyond pioneer growth apart from a margin of middle marsh close to the defence wall and in isolated patches in the body of the marsh that have been colonised by sea purslane (*Halimione portulacoides*) and sea lavender (*Limonium vulgare*).



Photo 2: West Marsh

The east site beside Loompit Lake is predominantly mudflat, with very a small saltmarsh fringe of mainly sea purslane and cordgrass towards the landward side. There is a substantial plume of sand at the western end that has progressively built up over at least 10 years. This is possibly the result of sediment dropping out from dredging spoil discharged on the adjacent foreshore and carried in on the ebb. In the shelter of this formation, examples of other vegetation types such as shrubby sea blight (*Suaeda vera*), golden samphire (*Limbarda crithmoides*) and frosted orache (*Atriplex laciniata*) have been recorded.

The site was a reclaimed field where historically the defences had failed upriver before the construction of Suffolk Yacht Harbour. From then the process of returning to an intertidal landscape followed a predictable cycle where, in the first instance, saltmarsh vegetation colonised the hard clay of drained pasture. As the original clay defence walls progressively disintegrated, tidal ingress became more dynamic, eroding the derelict pasture while depositing soft estuarine silts. Towards the north of the site where it meets rising land, this process is slowing down although the saltmarsh vegetation continues to die away. As in many sites where reclaimed land has returned to the intertidal zone, it has remained in a transitional state for a surprisingly long period of time. Without intervention it must eventually reach some kind of equilibrium. But through artificially lowering the tidal dynamic within the site and introducing dredging spoil as recharge, this process is likely to be more rapid and sustainable over a much wider area.

4. Defining the problem(s) and developing the solution

What evidence is there to define the flood and coastal erosion risk management problem(s) and solution(s)

There is no flood and coastal erosion risk management issue to properties. Landward and to the east of the marina there is rising ground immediately to landward. West of the marina an area of low-lying farmland, a brackish nature conservation site managed by Suffolk Wildlife Trust, and a length of footpath are protected from flooding by the river wall. The ownership and defence standard of the river wall are not known. East of the marina, the former river wall failed some decades ago and intertidal habitat now extends to rising ground landward of the shoreline.

What was the design rationale?

- Beneficial use of maintenance dredgings

Project summary

Area of transitional and coastal water body or length benefiting from project:	Not quantified
Types of measures/interventions used (Working with Natural Processes and traditional):	Saltmarsh restoration through beneficial use of dredged material
Numbers of measures/interventions used (Working with Natural Processes and traditional):	1
Standard of protection for project as a whole:	Not applicable
Estimated number of properties protected:	None

How effective has the project been?

Monitoring of accretion rates is carried out annually using 65 stakes in fixed locations. Initial results have shown accretion of between 150mm and 300mm within a 50m arc on the west side and between 100mm and 150mm where material has been discharged on the east side.

Systematic vegetation monitoring is not yet underway, but samphire is growing more strongly where gullies/runnels have been infilled by accretion. It is anticipated that species typical of high saltmarsh will soon begin to colonise accreted area west of the marina.

5. Project construction

How were individual measures constructed?

Dredging is carried out each winter using a 10-foot cutter suction dredger (Photo 3) to maintain water depths around the pontoons and berths. Dredge level of berths are -2.5m chart datum (CD), with a period of approximately 12 months between dredge operations. Different parts of the harbour are dredged in different years.

Dredged material was discharged from the 1960s until 1993 into onshore settling areas and since then on the foreshore. In 2014, the operation was refined and improved to place material in 2 beneficial

placement schemes (east and west of the marina), licensed by Defra and approved by Natural England. Between 15,000m³ and 20,000m³ of silt is dredged each year and placed on the foreshore. Operations are carried out between mid-November and early April.

An MMO licence is held by Suffolk Yacht Harbour for beneficial foreshore disposal. Dredged material is recovered as a slurry and conveyed by one of two fixed pipes to deposition area east and west of the harbour. The ends of the fixed pipes are moved each year to vary the location in which dredged material is discharged.



Photo 3: Dredging machinery

Since 2014, coir rolls and wooden stakes have been introduced into the deposition areas to contribute to retaining discharged material in place, impede flow and make the deposition of sediment during the dredging operation easier. The following approach was adopted.

- The site was mapped to identify the gradients and direction of flow within the marsh.
- Coir logs were placed strategically within the system to incrementally interrupt flow. Care was taken to avoid the build-up of bodies of standing water sufficient to increase the hydraulic pressure to the extent that it will cause failure through either undermining or diversion.
- In the first instance, 48 coir logs were staked into the channels radiating from the proposed discharge point. In an effort to mitigate the effects of higher velocities and levels of flow, the coir logs are positioned more tightly together near the point of discharge than at the outer limits of the channel system.

Three further measures were put in place to the east side of the marina. Examples the measures are shown in Photo 4.

- The 2 main breaches in the original defence wall were blocked to ensure that the spoil would not be carried out directly into the tideway and that tidal exchange within the site was controlled.
- A pen of brushwood was constructed, backed up with coir logs, and using a coir blanket around the

outfall to mitigate the immediate effects of scour at the point of impact.

- A series of low bunds was constructed within the site to manage increased flow, discourage the tendency to form substantial drain channels and to encourage deposition as evenly as possible across the site. This is a low-key intervention using coir logs in a similar way to how they were deployed on the north marsh.



Photo 4: Example of measures implemented at Levington

How long were measures designed to last?

The current dredging licence, granted in 2013, is for 5 years. The project is intended to last 25 years.

Where there any landowner or legal requirements which needed consideration?

The land is owned by Levington Marina and Ipswich Borough Council. The council considered charging for dredged material to be placed but did not.

Granting of the MMO licence required reports from the Environment Agency, Natural England and Suffolk Wildlife Trust, but an environmental impact assessment was not required. Planning permission was not needed.

Contamination testing is required under the MMO licence. No elevated contaminant levels have so far been found.

6. Funding

Funding summary for Working with Natural Processes (WWNP)/Natural Flood Management (NFM) measures	
Year project was undertaken/completed:	Ongoing since 1997 Current operation introduced in 2014
How was the project funded:	Capital cost of £61,000 for pipeline installation contributed by project partners Dredging costs £100,000 to £150,000 annually (excluding capital cost of dredger) from Levington Marina operational budget The dredger would cost ~£500,000 to replace but has been in operation since 1970s with repair and maintenance.
Total cash cost of project (£):	Capital cost: £61,000 Annual cost: £100,000 to £150,000 per year
Overall cost and cost breakdown for WWNP/NFM measures (£):	Capital cost: £61,000 Annual cost: £100,000 to £150,000 per year
WWNP/NFM costs as a % of overall project costs?	Dredging would have to be carried out, regardless of beneficial use of dredgings, to maintain navigability of marina. The additional cost of beneficial use is mostly the discharge pipeline, though in the absence of beneficial use, the cost for disposal elsewhere would probably be higher.
Unit breakdown of costs for WWNP/NFM measures:	The estimated capital budget for the project was approx ~£55,000. This fund was made up of in-kind support from Suffolk Wildlife Trust (£4,000) and Ipswich Borough Council (£3,000), amounts already invested by the Environment Agency (£12,000), Suffolk Yacht Harbour (£7,000), direct support from Suffolk County Council (£10,000), ABP Ipswich (£2,000), the AONB Sustainable Development Fund (£3,000) and Veolia (£14,200). Maintenance (dredging) costs are met by Levington Marina as part of its operating costs.
Cost–benefit ratio (and timescale in years over which benefit cost ratio has been estimated):	Not available

7. Wider benefits

What wider benefits has the project achieved?

- Raising level of intertidal mudflat
- Saltmarsh restoration

How much habitat has been created, improved or restored?

- Saltmarsh restoration (10ha, of which 8ha is west of the marina and 2ha is east of the marina)

8. Maintenance, monitoring and adaptive management

Are maintenance activities planned?

Beneficial use of dredgings is ongoing. The dredger requires regular maintenance.

Is the project being monitored?

Monitoring of mud levels and vegetation has been carried out by Simon Reed and Andrew Excell (Suffolk Wildlife Trust) since 2014. Bird monitoring is conducted as part of the Wetland Bird Survey (WeBS).

Monitoring of accretion rates is carried out annually using 65 stakes in fixed locations. Initial results have shown accretion of between 150mm and 300mm within a 50m arc on the west side and between 100mm and 150mm accretion where material has been discharged on the east side.

Systematic vegetation monitoring is not yet underway, but samphire is growing more strongly where gullies/runnels have been infilled by accretion. It is anticipated that species typical of high saltmarsh will soon begin to colonise accreted area west of the marina.

Has adaptive management been needed?

Brushwood mats have been installed for dredged material to be deposited onto and to reduce scour around the end of the discharge pipe.

9. Lessons learnt

What was learnt and how could it be applied elsewhere?

The project is a cost-effective way to dispose of dredged material in a beneficial way to provide an environmental enhancement.

The project demonstrates the value of working with partners and consultees, and identifying areas of common ground.

Pumping dredged material is only realistic over short distances (up to one mile). If dredged material were to be transported to another location to deliver FCERM benefits, it would need to be recovered using a backhoe dredger and moved by barge. This would greatly increase the costs of the operation.

10. Bibliography

None provided

Project background

This case study relates to project SC150005 'Working with Natural Flood Management: Evidence Directory'. It was commissioned by Defra and the Environment Agency's [Joint Flood and Coastal Erosion Risk Management Research and Development Programme](#).