

Chichester Harbour

Unit limits

Approximately 80km of shoreline, meeting Langstone Harbour at the dismantled rail bridge in the northwest, but not including islands or tide locked marinas. For shoreline management purposes the harbour ends at the northern tips of East Head and Sandy Point spits on either side of the entrance channel.

General character

The margins of Chichester Harbour are less developed than those of the other two large harbours. They are generally low lying and include substantial areas of farmland on reclaimed intertidal marshes that are now potentially at risk from flooding. Most of the shoreline is delineated by walls and embankments built to prevent erosion and flooding, but there are a number of stretches of natural coastline and some structures built to form jetties or marina walls.

Coastal processes

The shoreline is influenced by waves generated within the harbour, by tidal currents and by water levels. Relative to the open coast outside the harbour, the processes are low in energy and evolution of the shoreline generally take place over long time periods, with the exception of occasional changes induced by severe storms. Human intervention in the form of reclamation has caused greater and more rapid change.

<i>Geology</i>	<ul style="list-style-type: none"> - Underlying geology comprises easily eroded Tertiary strata, except in north where there is more resistant Upper Chalk - Surface deposits comprise <ul style="list-style-type: none"> · Alluvium within the intertidal area and along some low lying margins · Sandy gravel deposits forming substantial flood tide banks opposite the harbour entrance · London Clay strata along low lying areas of south east Hayling Island · Easily eroded raised beach deposits between West Wittering and West Itchenor, providing a feed of gravel to the upper foreshore · Blown sand deposits on East Head · A small area of reclaimed ground on the south shore of Thorney Island · Easily eroded River Terrace deposits along the shore between Langstone and Emsworth, providing a feed of gravel to the upper foreshore before defences were built · Brickearth deposits around the remaining shore
<i>Wave climate</i>	<ul style="list-style-type: none"> - Depends on fetch and nearshore bathymetry - 1.4m H_s waves are predicted for 1:50 years storms in areas exposed to the south or southwest - Some wave energy enters through the entrance channel, affecting the south shore of Thorney Island.
<i>Tidal regime</i>	<ul style="list-style-type: none"> - Currents are weak along the shoreline, but are stronger in the main channel and particularly in the entrance - Maximum water levels vary around the harbour

Table 1 Extreme water levels

Maximum water level (MoD)	Probability			
	1:1 year	1:10 years	1:50 years	1:200 years
Entrance	2.70	3.05	3.18	3.35
W Itchenor	2.85	3.20	3.33	3.50
Emsworth	2.90	3.25	3.38	3.56

- Saltmarshes*
- Active *Spartina* along Bosham, Thorney and Chichester Channels
 - Extensive degenerate *Spartina* along Hayling Island and southwest of Thorney Island
 - *Spartina* marshes generally in recession, allowing greater wave attack along shoreline

- Sediment transport*
- Influx of sand through entrance to form flood tide banks
 - Fine sediment carried in suspension throughout harbour
 - Deposition of muds in sheltered areas
 - Wave driven erosion and transport of muds and coarser sediment in areas exposed to larger waves
 - Saltmarsh areas generally contracting and releasing sediments for redistribution

- Possible future change*
- 300mm sea level rise over 50 years
 - Increased wave energy
 - Increased tidal currents due to greater tidal volume

Existing defences

The Chichester Harbour shoreline is defined by seawalls, revetments and embankments, plus a number of lengths of natural coastline, largely within Bosham and Chichester channels. Many of the defences are in need of maintenance or upgrading to provide a reasonable standard of service for the future, particularly in view of rising sea levels. Areas of particular concern include the east shore of Hayling Island, the shoreline around the MoD establishment at Thorney Island, the Mill Pond at Emsworth and the west shore of the Chidham Peninsula.

Natural environment

The entire shoreline and intertidal area, plus parts of the margins, are within Chichester Harbour SSSI (also SPA, Ramsar site and proposed Maritime SAC). The area is designated for a variety of habitats and is of particular importance for its bird populations. In addition to the main SSSI there are numerous smaller designated areas of woodland, freshwater pools, brackish lagoons, meadows and other habitats. Shoreline management must give due consideration to environmental impacts and legislation, particularly the Habitats Directive.

Land use

The margins of Chichester Harbour are mainly used for agriculture, with some high value residential areas, the larger of which are at Eastoke, Emsworth and Bosham. There are numerous recreational facilities, including camp grounds, marinas, sailing clubs and boat yards. The MoD has an airfield and other facilities on Thorney Island. The immediate backshore area around the base is farm land.

Human environment

The harbour is designated as an Area of Outstanding Natural Beauty due to its undeveloped margins. The Harbour Conservancy are statutory consultees within the land use planning procedure and actively seek to retain the existing character and landscape of the harbour.

The area is highly valued for recreation, mainly related to the water. There are numerous sites of historic/archaeological interest along the shoreline and within the intertidal zone, and several Scheduled Monuments. The harbour encompasses a commercial native oyster fishery and includes other fisheries interests such as designation as a bass nursery.

Planning policies

There are no areas set aside for future development within Chichester District, and there are only a few development sites on Hayling Island that are of importance to the shoreline.

These are:

1. Land for Housing; the allocated sites are:
 - Northney Holiday Camp, Sandy Point Hospital and various small infill sites on Hayling Island (Havant Borough).
2. Land for Industry, Business and Services, the allocated sites are:
 - Mill Rythe Lane on Hayling Island (Havant Borough)

- Statutory policy documents*
- Hampshire County Structure Plan, Deposit Draft
 - Hampshire Minerals and Waste Local Plan, Deposit Draft
 - West Sussex County Structure Plan, Deposit Draft
 - West Sussex Minerals Local Plan, Consultation Draft
 - Havant Borough District Wide Local Plan, Consultation Draft
 - Chichester District Local Plan, Deposit Draft

- Non-statutory harbour policy*
- Chichester Harbour Management Plan

Strategic defence options

Many of the existing defences around the harbour are in a poor state of repair or do not provide an adequate standard of defence under existing or future sea conditions. Lack of maintenance would result in failure of many defences in the short or medium term. In some cases failure may lead to loss of valuable assets including residential areas, important habitats, MoD property, recreation facilities and high grade farmland.

There are also large lengths of existing defences which have been built to defend farm land that was originally upper saltmarsh subject to regular flooding under normal tidal conditions. Continued defence of such areas in the future will become increasingly costly and the desirability of committing public funds to their maintenance must be questioned.

As discussed in the introductory section of this document, the harbour shoreline has been classified by management types according to potential for flooding or erosion, existing defences and the existing land use. The frontages referred to by each type are presented on the accompanying map. The preferred options for the various frontages are in line with the statements in Chapter 4, and summarized in Table 2. There are a number of sites where the standard approaches may not be appropriate. These sites are indicated on the accompanying map and the alternative approaches for each site are discussed. The text also provides preliminary guidance for setting boundaries relevant to the scheme strategy studies that will follow the adoption of the SMP.

Table 3 Preferred options for management types

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Type	Description	Preferred option
1	No risk, or minor risk of flooding/erosion Undeveloped area No existing protection	Non-intervention
2	No risk Developed or sensitive area No existing protection	Non-intervention
3	Erosion risk, no flooding Undeveloped area Existing protection	Maintain standards along the existing line of defence
4	Erosion risk, no flooding Developed or sensitive area Existing protection	Maintain standards along the existing line of defence
5	Flooding risk (possible erosion) Undeveloped area Existing protection	Maintain or upgrade standards along the existing line of defence
6	Flooding risk (possible erosion) Developed or sensitive area Existing protection	Maintain or upgrade standards along the existing line of defence
7	Shoreline formed by structure designed for purpose other than defence	Maintain or upgrade standards along the existing line of defence (review when structure becomes redundant)

The largely residential areas of South Hayling from Eastoke to Mengham are partly protected by walls, revetment, and jetties in varying condition. The defences standards should be maintained and upgraded along the existing line to provide adequate future defences against flooding. The defences along the north shore of Eastoke share a flood risk area with the open coast Unit 6 (Volume 2). The two frontages should be considered together in a strategy study.

There is a length of undefended shoreline on the north shore of Eastoke Lake, which is believed to be subject to occasional flooding. Further investigations are required to determine the existing level of risks to property due to flooding. The area is discussed below as Site 1.

The east shore of Hayling Island from Mengham north to the A3023 road bridge is largely undeveloped. The low lying land is protected against flooding by a mixture of walls, revetments and embankments in various degrees of disrepair. There is a need to upgrade the defences standards in most areas, but not necessarily along the existing line. Areas for potential landward realignment or tiered defence are discussed below as Sites 2,3,4 and 5. The remaining defences should be upgraded along their present line to protect built assets, transport routes and recreation developments, and to avoid land drainage problems.

For the purposes of the follow up scheme strategy studies for Hayling Island the east shore should be considered in at least five independent units:

- Eastoke, including the open coast frontage of Unit 6 (see Volume 2)
- Eastoke to Mengham (including Site 1 below)
- Mengham to Verner Common (including Site 2 below)
- Verner Common (Site 3 below)
- North Hayling from Verner Common to the A3023 bridge(including Sites 4 and 5 below)

The abutments to the A3023 road bridge are protected by revetments, which will need to be maintained to protect the bridge against scour.

The area of Chichester Harbour between the road bridge and the former rail bridge are more appropriately considered within Langstone Harbour. The defences along the north shore are discussed as Site 4 of the Langstone Harbour management plan. The defences along the south shore prevent flooding of an area of low grade grazing land that extends south to Stoke and should be considered within an independent scheme strategy study for west shore of Hayling Island.

At Emsworth the residential land is low lying and at risks of flooding and the preferred option is to maintain and extend the standard of defences. The high amenity value of the shoreline frontage and the environmental value of the saltmarsh should be taken into account in the upgrading of future defences.

Between Langstone and Emsworth stretches of wall, revetments and gabion protect grazing land, some of which is prone to erosion while other parts are at risk from flooding. Where the shoreline is protected against flooding there is scope for shoreline realignment. At Conigar Point, breaching has already taken place and low lying land behind is occasionally flooded. The area flooded is of limited agricultural value. Non intervention is the preferred option, as discussed below as Site 6. The policy would require the coastal footpath to be diverted. East of Conigar Point a stretch of woodland is partly protected by a revetment which has fallen into disrepair. This frontage can be effectively considered as having no existing protection and the preferred option here is one of non-intervention.

At Emsworth residential land is protected against flooding by a rock armoured revetment, a wall around Emsworth Pond and further walls extending to Targin Marina. Potential losses of property due to flooding determine the need for maintaining or upgrading the defence standard. Along most of the frontage the existing defence line should be maintained, but further investigations are required around Emsworth Pond to determine the most appropriate approach. The wall across the mouth of the Pond is regularly overtopped, causing flood problems upstream. Possible options include maintenance of the wall combined with risk management, upgrading the wall along the present line or implementing tiered defences to protect directly properties at risk (the area is discussed as Site 7 below). The scheme strategy for the Pond must give consideration to the Emsworth frontage to the west as there is a shared flood risk area.

Between Emsworth and Thorney Island the former marshland is protected by walls and revetments requiring considerable maintenance. The present preferred option by the Environment Agency is one of maintaining the standard of defence. This will need to be reconsidered in the future when the defences are next in need of significant maintenance. It may then be appropriate to consider abandoning the existing line of defence and adopting a new line closer to the natural shoreline position, thereby creating a large area of natural saltmarsh across what is now artificially maintained transitional habitat and low grade grazing system. This area is discussed below as Site 8. Management of this shoreline is directly related to the management of the shoreline on the opposite side of the Thorney peninsula, where a corresponding realignment option should be considered in the future (Site 10 below); the defences on the eastern shoreline are the responsibility of the MoD.

The MoD base at Thorney Island is mainly on higher ground but has an area of low lying farmland to the west. It is protected against flooding and erosion by walls and revetments, some of which are derelict. There is also a stretch of unprotected shoreline at its southern tip. The MoD have already developed plans to upgrade the defences along the southern shore based on their own assessment of benefits and costs. The future of the western shore is less certain, and is discussed below as Site 9.

North of the MoD defences along the east shore of the peninsula is an area known as Thornham Point. Erosion of the flood embankment surrounding the point has led to breaching and regular flooding of a small area of low grade grazing land. An area of upper salt marsh has developed and no attempt has been made to reinstate the defences. The new saltmarsh is an environmental benefit and should be allowed to become fully established; however works may be required to prevent the flood area from extending further as several residential properties are at risk. The potential flood area may also extend into the low lying ground between Emsworth and Thorney Island as discussed above. Thornham Point forms Site 11 below.

A scheme strategy plan is required for the whole of the Thorney Island peninsula due to the flood risk area and the potential impacts on recreation and the environment. The strategy area would include Sites 8,9,10 and 11.

The shoreline from Thorney Island eastwards to Nutbourne and around the Chidham peninsula is a flood risk area and developed frontages at Prinsted, Nutbourne and Chidham village will require the standards to be maintained or upgraded along the existing line of defence against flooding. These areas are protected by seawalls and revetments, some of which have been recently improved. From Nutbourne south along the Chidham peninsula the existing defences are in poor condition and the cost of upgrading may not be justifiable against the benefits of protecting the low lying farmland. The area presents an opportunity to create new habitat to enhance the Chichester Harbour SPA/SAC. This frontage is discussed further as Site 12.

Within the Bosham and Chichester Channels there are extensive frontages where the shoreline is unprotected and the backshore is undeveloped. In these areas a non-intervention policy is the preferred option. There are also short stretches of protected shoreline at Bosham, Bosham Hoe, between Fishbourne and Apuldram and between Birdham and West Itchenor. Here the defence standards for flooding or erosion should be maintained along their existing line.

The commercial frontages at Bosham, Dell Quay, Birdham and West Itchenor are defined by structures built for dock or marina facilities (Type 7). Maintaining the existing structures is appropriate for these frontages throughout their design life, although some of the structures have long since been redeveloped from their original function.

Between West Itchenor and East Head the shoreline is largely undeveloped and unprotected and non-intervention is generally the preferred option. However, there are short lengths of defence protecting low lying land from flooding and other short stretches where erosion may affect housing. The frontage is open to considerable wave action through Chichester Harbour entrance. Shelter provided by East Head Spit cannot be guaranteed in the long term. The preferred option is therefore to maintain or upgrade the standard of protection along these short developed frontages.

Shoreline management operations along the harbour frontage at West Wittering must be undertaken within a scheme strategy for the whole of the Selsey peninsula due to the influence of open coast processes on the stability of East Head and influence of East Head on the processes within the harbour.

Sites for alternative management policies

Site 1 The north shore of Eastoke Lake is unprotected. There is believed to be a limited area subject to occasional flooding. As this area is built up then a detailed survey should be undertaken to determine whether there is a significant risk of property damage due to flooding. Defences should be built if there are sufficient economic benefits, other wise a non-intervention policy is appropriate.

Site 2 Tournerbury Farm has been the subject of much controversy over the past year. The shoreline is formed by a substantial embankment, enclosing an area of very low lying unimproved pasture that serves as a land drainage storage basin for part of South Hayling. As the embankment was in danger of breaching the land owner has undertaken substantial works to prevent flooding of his land. The works were undertaken without Planning consent and have caused significant damage to the backshore habitat designated as a SSSI and SPA (protected by the Habitats Directive). In their present state the rebuilt defences are not adequate or sustainable as the seaward face will continue to suffer the erosion that led to the earlier breach risk.

Prior to the land owners action, the decision as to whether to upgrade the defence standard along the existing alignment, to establish a new line to landward or to allow a breach was balanced between land drainage, environmental and economic factors. Although the work undertaken contravenes environmental and planning legislation, the cost of the further works required to upgrade the defences to an adequate standard have been substantially reduced. Under the present situation the preferred short term option is to upgrade along the existing line. This option may not be sustainable in the medium to long term. Works undertaken to upgrade the embankment in the short term should recognise the need for future flexibility and must not cause further significant environmental damage.

Site 3 The peninsula of land to the east of Fleet, known as Verner Common, is currently defended from flooding by an embankment that is in need of upgrading if it is to provide adequate service. As the land is undeveloped and is not of significant environmental value in its existing state then maintaining

the defences is not justified. Upgrading the defence standard along a new alignment across the neck of the peninsula is the preferred option, thereby reducing the cost of flood defence and creating an area that can revert to upper saltmarsh. This will be an improvement on the existing situation as the embankment does not provide flood defence under extreme conditions. Construction of set back defences could therefore produce a significant improvement in the standard of flood protection to the hinterland, at relatively low cost and with environmental benefits. Further investigations are required to determine the appropriate line.

Site 4 The shoreline west of North Hayling is a further area of low lying grazing and arable land defended by a wall and embankment in need of maintenance to prevent overtopping and breaching. The backshore area is designated as a SSSI and a SPA. If the defences are not maintained then the residential areas of North Hayling will be subject to more frequent flooding, causing property damage and cutting off road links to the rest of the island. In addition the land immediately behind the defences will lose its present agricultural value and will change to upper saltmarsh. As English Nature take the general view that the shoreline should be allowed, where possible, to evolve towards its natural state, then it is assumed that the creation of upper saltmarsh will be viewed as an environmental gain. The defence options for this area include maintaining or upgrading standards along the existing defence line, upgrading standards for the residential areas and some farmland by realigning landward, creating tiered defences by minor maintenance of the existing line combined with upgraded protection of property inland, or non-intervention combined with risk management. The Environmental Agency discussion document for this area advocates upgrading with a landward realignment but no planned removal of the existing defences. This approach is acceptable providing that residential areas are protected and the roads remain accessible at all times by emergency services vehicles. If these limitations cannot be met then a risk management strategy will also be required to ensure public safety. Further investigation of construction costs and potential benefits are underway that should lead to a full understanding of the implications of the various management options for the area.

Site 5 The north shore of Hayling Island between Northney and the A3023 is low lying and subject to flooding. The floodable area includes the road to Northney. At present the consequences of flooding have not been great enough to justify the cost of improvements. Future sea level rise may increase flood damage and frequency sufficiently to justify improvements to the road access into Northney, possibly by moving the road to a new position further south, or by raising the road onto a causeway. In the short term a risk management programme is required to ensure that North Hayling remains accessible by emergency vehicles at all times.

Sites 6 At Conigar Point, between Langstone and Emsworth, there is a small area of low-lying grazing land defended by walls and gabions. These are not able to provide an adequate flood defence under present day conditions. If no further works are undertaken then the backshore will be subject to regular flooding and will evolve towards an upper saltmarsh. As the losses to the agricultural value of the land will be limited and the creation of saltmarsh will be beneficial to the environment, non-intervention is the preferred option for this small site. Works may be necessary to reestablish the shoreline footpath further to landward. This area provides an opportunity to create new salt marsh habitat that may contribute to compensatory measures for significant damage to SPA/SAC due to shoreline management operations elsewhere in the Solent.

To the east of Conigar Point there is an area of wooded and undeveloped higher ground subject to slow erosion. The frontage is defended over part of its length, but as the consequences of future erosion are insignificant then non-intervention also appropriate for this length.

Site 7 The Mill Pond wall at Emsworth will need substantial maintenance within the short term. At present it does not provide adequate flood defence to a number of properties and the roads around the pond. The benefits of upgrading the wall are questionable and risk management or improvements to defences around individual properties may be more appropriate. Further investigations of the impact of not retaining the wall are required, including the potential changes to the flood risks and non-engineering factors such as amenity, landscape, etc.

Sites 8/10 The former marshes between Emsworth and Thorney Island are defended by substantial revetments with a total length of over 2.5km. At present these defences provide an adequate standard of protection and also support the public footpath to Thorney Island. When they become in need of substantial maintenance in the future it will be appropriate to consider abandoning them and establishing a new line of defence closer to the natural shoreline position, as defined by the potential flood area.

The Thorney Island MoD base is mainly built on higher ground so abandoning the defences will recreate the island. As access to Thorney Island may continue to be required, the road may have to be raised up as a causeway. Re-establishing such a large area of saltmarsh will have impacts in both Emsworth and Thorney Channels, as tidal flows will increase locally. This option of maintaining the standard of defence along a new line to landward at some time in the future may have environmental and economic benefits, and will be more sustainable than attempting to hold the line indefinitely. Further investigations of the economic, environmental, military and recreational benefits and costs will be required before the preferred option can be established.

Site 9 The western shore of Thorney Island follows a convoluted line, and is formed of revetments in need of maintenance or replacement. The immediate backshore is subject to flooding and comprises farmland of limited value, so maintaining the existing shoreline may not be justified on cost benefit grounds. The MoD are embarking on a programme to upgrade their existing defences and should consider the environmental and economic benefits of establishing defences along a new line to landward. Works may be necessary to reestablish the shoreline footpath further to landward. The released land would evolve to form new upper saltmarsh, providing natural protection to the new line of defence and new habitats within the harbour. This area provides an opportunity to create new salt marsh habitat that may contribute to compensatory measures for significant damage to SPA/SAC due to shoreline management operations elsewhere in the Solent.

Site 11 At Thornham Point the existing defences have failed and new salt marsh is developing over a small area. This area is being actively managed by the Chichester Harbour Conservancy. A new line of defence has been established to landward. The new saltmarsh may be considered as a contribution to compensatory measures for damage to SPA/SAC habitats elsewhere around the Solent.

Site 12 The west shore of the Chidham peninsula is formed by revetments, walls and embankments protecting an area of potentially floodable farmland that may extend across the peninsula through parts of the village of Chidham. The existing defences are in very poor condition. The cost of upgrading along the existing line will be substantial and may be considered damaging to the natural environment. The preferred option for this frontage is to upgrade the standard of defence along a new line to landward, unless a sound economic case can be made for upgrading the existing defences without causing environmental damage. The benefits of realignment include reduced construction and long term maintenance costs, creation of new saltmarsh habitats and reduced future wave attack due to the effect of a wider channel with shallower margins. This area provides an opportunity to create new salt marsh/grazing marsh habitat that may contribute to compensatory measures for significant damage to SPA/SAC due to shoreline management operations elsewhere in the Solent. These benefits are set against the loss of arable farmland and some non-designated fresh water wetland and woodland habitat.

Alternative approaches to defence should also be considered for the benefit of the whole Thorney Channel shoreline, such as construction of islands within the channel to break up the long wave fetch to the south. Islands may be able to offer environmental enhancement by creating high water roosts and providing local shelter for natural development of mud flats or marshes. Further investigations are required to assess the economic and environmental costs and benefits of the possible defence options.

As well as the above site specific cases, there are also a number of short frontages along Bosham and Chichester Channels, and between West Itchenor and West Wittering where the main shoreline management operation at present is the maintenance and protection of footpaths. Protecting eroding paths with built defences will lead to a perception of the need for increasing future maintenance and will cause the destruction of the natural shoreline. Where existing paths are at risk from erosion, or subject to flooding, then it may be more appropriate to relocate

the path to landward rather than attempt to defend its present position. A policy by the Harbour Conservancy or County to purchase a coastal strip in areas suffering minor erosion or at risk from flooding would allow this approach to be implemented as and when this becomes required in the future.

Management operations

Upgrading of existing defences will be required around part of the harbour. Designs should take account of the factors discussed in Chapter 3 of the introductory section. Frontages that are currently undefended should be protected from backshore development to ensure that there is no future need to interfere with the natural transition from sea to land. All frontages will require ongoing monitoring to ensure that the management policies and operations continue to provide an appropriate standard of service.

There are limited opportunities for implementing novel defences except within Thorney Channel, where saltmarsh enhancement or the construction of islands may be appropriate, providing protection and possible environmental benefits.

In view of likely environmental restrictions on operations impacting on the intertidal areas, shoreline managers should consider tiered defences where ever upgrading is required and the backshore situation is favourable. This approach would typically involve maintenance or downgrading of the existing defences, together with construction of a set back wall or embankment to control flooding under extreme future conditions. The area between the two defence lines would be subject to occasional flooding, acceptable for promenades, low value recreation areas, minor roads etc.

Chichester Harbour Barrage

A scheme to build a surge barrage across the mouth of Chichester Harbour has been suggested as a possible method of reducing flood risks around the full extent of the Harbour. This scheme would involve construction of a barrier from the shoreline near East Head neck out to the deep entrance channel where the barrage would be sited. The barrage would only be operated during those extreme events when widespread flooding would otherwise occur. At the time of writing the scheme is not expected to progress.

The barrier would follow the early 19th Century shoreline that was formed by a substantial shingle ridge. The barrier would provide protection to East Head and may allow formation of an area of mudflats and saltmarsh in the protected waters to landward. The costs of this scheme would be set against benefits to the whole harbour. Extensive economic, engineering, hydrodynamic, navigational and environmental studies would be required to establish the viability and benefits of the barrage.