4 Existing shoreline management

4.1 Introduction

A review of past shoreline management practice and the condition of existing structures provides important information for future management. Past schemes may have provided good service and may still have a considerable useful life. Alternatively they may have been unsatisfactory, either locally or due to their effect on adjacent frontages, or they may be nearing the end of their useful life and a new approach may be appropriate.

The following section outlines the existing defences and management practices. Information has been derived from site visits, consultations with the responsible authorities and a review of the MAFF Coast Protection Survey (MAFF, 1994), the NRA (Environment Agency) Sea Defence Survey (NRA, 1991) and various documents held by the Local Authorities. The site visits and consultations were particularly useful in providing an updated review of the present state of the shoreline and their likely residual life.

Appendix 2 presents information on each defence element, including location, length, maintaining authority, structure type, condition and residual life. This information is based on the MAFF and NRA surveys, updated during the SMP process. Figures 17, 18 and 19 summarise the extent of different defence types. For classification purposes within this SMP it should be noted that walls and timber breastworks are vertical, while revetments include all sloping structures whether concrete, timber or rock, except gabions. Complex structures including both vertical and sloped elements have been classified according to their dominant element. Unprotected embankments are earth banks raised above the hinterland level with no armouring on their seaward face. Regraded slopes are formerly eroding natural or reclaimed frontages that have been artificially graded and/or vegetated to improve the landscape or reduce possible safety hazards. Unprotected frontages have been left to respond naturally to coastal processes.

4.2 Review

Selsey Bill to Pagham Harbour

The foreshore north east from Selsey Bill comprises a steeply shelving shingle beach controlled by closely spaced timber groynes and backed by a concrete wall. At the north eastern end of the built up area of Selsey the concrete wall changes to a short length of timber breastwork and then gives way to a broad shingle backshore; the beach is controlled by widely spaced timber groynes and is fronted by the lower shingle foreshore of the Inner Owers. Further north accretion of shingle has created a wide foreland that extends into the Pagham Harbour Spit. The Spit itself is narrow and liable to breaching.

Selsey East Beach underwent very rapid erosion prior to construction of the present seawall and groyne system. The processes causing the erosion are still active, and although the groynes reduce the rate of transport there is still an ongoing problem of beach loss. Beach nourishment has been undertaken to make up for continuing losses and the groyne system has required extension and repair; ongoing maintenance is required to retain the existing situation. Most of the seawall remains in good condition, though some sections near the Lifeboat Station pier are in need of upgrading. Without a substantial beach the seawall would suffer overtopping and possible breaching, both leading to damage to property on the low lying backshore. A large area of public open space and residential development would be liable to flooding in the event of a breach or serious overtopping during an extreme storm.

Losses from East Beach feed the shoreline further north. Groynes are in generally good condition, except on the Spit to the south of the entrance to Pagham where they are too low to have much impact. Regular recycling of shingle (15,000 m^3/year) and regrading of the beach face is undertaken along the Spit to maintain an adequate defence against breaching. The Inner Owers bank provides fresh material to the beach and dissipates wave energy. Shingle reaching the end of the Spit enters the harbour channel and is transported seaward for later return to the shore, predominantly to the Pagham Estate beach north east of the entrance.
On the north side of the harbour entrance the wide shingle backshore has been partly developed and there is a strip of housing at Pagham Beach Estate. There is a local drift divide along the beach with a southerly drift of shingle towards the Harbour entrance and an eastward drift outside the influence of the Harbour; this divide has caused concern about beach erosion. Recently a number of rock groynes have been constructed across the lower foreshore recently to counteract this drift and related erosion but to date they have not had time to have any significant impact on shoreline development. Although the shingle beach along this frontage is very wide and the threat to properties arising from coastal recession is not serious at present, there is a need for continuing monitoring to determine the future trends.

Pagham Harbour is very sheltered by the spits at the entrance and only the shorelines of the lagoon embankment, the caravan site to the west Pagham village and along the northern flood embankment (Pagham Wall) are subject to any significant wave action. Elsewhere the flood banks are fairly rudimentary and fronted by upper saltmarsh. Some reclaimed land along the course of the dismantled railway on the east side of the harbour is prone to erosion, though the worst area around an existing sluice has been protected by riprap. Land levels around Ferry House and between Sidlesham and Pagham are very low. In the event of the spits at the entrance becoming breached much of the shoreline would be at risk of erosion and failure of flood banks could take place. Figure 13 shows the extent of the very large potential flood area.

A particular management concern relating to Pagham Harbour is the need to improve storm water drainage from Chichester. The Environment Agency's favoured option is to route the storm water through Pagham Rife to the harbour via a sluiceway in the north shoreline. This approach will require a commitment to the long term maintenance of the existing revetment, in an area where managed retreat might be considered as an option.

Selsey Bill to East Head

The shoreline immediately west of Selsey Bill is protected only by the beach and erosion is ongoing due to exposure to waves and strong tidal currents. This area receives natural feed from the nearshore Kirk Arrow Bank and is offered some wave protection by submerged scarps of limestone further south. Further west from the Bill there are a variety of seawalls protecting higher ground. These include near derelict concrete walls, gabions, stepped walls, some with rock aprons, vertical walls and sloped concrete revetments. Despite being heavily groyned the beach reduces towards the west, becoming only a narrow strip exposed at low tide and providing little protection to the wall. Posford Duvivier (1992) reviewed the defences in this area.

West of Selsey a short section of shoreline is unprotected and erosion of the low cliffs of unconsolidated sands and gravel (Brickearth and Raised Beach deposits) is ongoing. Groynes resume further west where they are intended to stabilise a long shingle ridge fronting low lying land liable to extensive flooding. The ridge is retreating and was recharged with 225,000m^3 of shingle in 1975-80. It is now maintained by occasional smaller recharges, and a continual recycling and regrading operation. The groynes are generally in disrepair despite an ongoing maintenance programme, and they provide little interruption to drift.

Overtopping and breaching of the ridge have occurred on a number of occasions, with consequent flooding of the caravan park built on the low lying land behind. Future risks will increase as the underlying clay stratum is exposed on the lower foreshore and is undergoing slow erosion, resulting in increased wave attack to the ridge.

The Broad Rife outfall, near the centre of the shingle ridge, provides a substantial barrier to drift. The shingle ridge around the outfall has been artificially held in place and now acts as a focus for wave energy. Renourishment and regrading operations are most active along the ridge adjacent to the outfall due to the high risk of overtopping and breaching in this area.

Figure 18 (section a) Existing shoreline defences – Hayling and Portsea Islands
Ref; V1-Fig18

Figure 18 (section b) Existing shoreline defences – Hayling and Portsea Islands
Ref; V1-Fig18

At Bracklesham the backshore ground rises above flood level, and the shoreline is defined by concrete walls interspersed with sections of timber breastwork. Future risks will increase as the beach is of variable width and responds unpredictably to variations in the annual wave climate and intermittent feed from the east. Groynes and seawalls are generally in fair condition, apart from sections of private wall at the western end of East Wittering where houses are close to the wall crest and are liable to overtopping damage. Maintenance work is required to retain the present standards of protection including extensions to the footings.

Beyond East Wittering the shoreline is mainly protected by a groyned shingle beach, with sections of timber breastwork revetment. Several groyne compartments are severely depleted of shingle resulting in recent gabion work to prevent erosion of the low cliffs and dunes. Toward the Hinge there is a near continuous timber breastwork. Beach levels are maintained by intermittent recharges. The lower beach fluctuates due to shifting sand bars dominated by tidal currents. Long groynes provide partial barriers to transport, but suffer from scour channels and holes around their seaward ends.

Gabions have been placed at the Hinge to prevent a breach separating East Head, but erosion may continue further along the neck. Shingle levels are low, but sand accretion has occurred along East Head, encouraged by active dune management by the National Trust who manage the area.

Hayling Island

Defences along the Eastoke frontage comprise a concrete seawall fronted by a recharged shingle beach and timber groynes. At Eastoke Point the wall gives way to a shingle ridge, protected by a rock revetment placed as Temporary Emergency Works in 1992 to prevent flooding due to rapid erosion. Rock has also been placed to support or replace existing timber groynes in an attempt to stabilise the beach and protect Sandy Point nature reserve. Existing plans to extend the rock revetment and groynes will be implemented in two phases between 1998 and 2002. Further northwards along the Chichester Harbour entrance channel a shingle beach fronts sections of timber or concrete walls. Groynes, gabions and seawalls of varying condition and effectiveness protect the spit running north to Sandy Point.

The recharge, placed in 1985, has had a mixed impact on the shoreline. Much of the initial volume has been redistributed east and west. The rock groynes at Eastoke Point were placed in 1990 to control losses into the Chichester Harbour entrance channel and a recycle programme has been initiated to bring material from accreting areas on the central Hayling frontage back to eroding areas, particularly after severe storms. The Eastoke frontage continues to be unstable despite these works, and a comprehensive scheme is needed to stabilise this area. The Chichester Approach Channel has been identified as a possible source of future recharge material. Maintenance dredging in 1988 removed 20,000m^3, and a further dredging operation is needed to re-establish the published safe navigation depth of -1.5m CDS (the material is high quality coarse sand and shingle and ideal for purposes of beach nourishment).

The central Hayling frontage is an area of accretion, although parts of the timber breastwork west of the Eastoke seawall that were formerly covered by the recharge are now exposed and are undergoing repair. Similarly, the breastwork west of the “Inn on the Beach” is exposed and has required repair, though the frontage has generally benefited from the recharge at Eastoke.

Gunner Point is an area of historic accretion although there has been some recent erosion. The area is a possible source of recycle material for Eastoke, though environmental constraints may prohibit its use.

The shoreline of the Langstone Harbour entrance channel is protected by short sections of seawall, block groynes and gabions. The seawalls and groynes are in poor condition. Further north the jetties and wharves at Langstone Ferry are in reasonable condition. Slow moving waves of shingle move up the channel from Gunner Point; troughs between the waves are areas of erosion.

Portsea Island

Eastney Point is presently an area of shingle accretion. A seawall runs along the backshore but is no longer within the active beach zone except along the south side of Fort Cumberland. Shingle is transported north along the Langstone Harbour entrance channel, but the beach deteriorates towards the ferry landing. Gabions and groynes have been used to protect Eastney Spit, but are in generally poor condition.

The main Eastney frontage is also an area of substantial shingle accretion although overtopping and localised flooding has occurred west of Fort Cumberland during storms. The backshore seawall comes into the active beach zone about 500m east of South Parade Pier, where the beach narrows and overtopping occurs more often. Available data suggests that beach levels have been stable, and that drift rates are low.

West of the Pier the beach continues to narrow up to the promontory formed by Southsea Castle, around which there is no upper beach. The wall around the promontory is in reasonable condition. Recurved crests and blockwork aprons have been added to reduce overtopping and toe scour.

From Southsea Castle to Clarence Pier there is a substantial shingle beach fronting the promenade. The beach suffers storm draw down and has been recharged recently with about 1000m^3 per year. Clarence Pier acts as a permeable groyne, causing accretion to the east and cut back to the west.

From the Pier to Portsmouth Harbour entrance the beach is generally only present below mid-tide, and the shoreline is protected by a variety of walls and revetments, some of which were intended as military, rather than coastal defences. The fortifications are of historical importance and date back to as early as 1415. All of the walls have undergone some repair work and most sections are in need of further work to retain their standard of service. Wave overtopping occurs at several points during extreme storms, leading to some flooding of the Old Portsmouth area. Flooding also occurs due to ground water levels during surge conditions being higher than ground levels.

Accumulations of shingle inside the harbour entrance and at several points along the section of walls provide some protection to the walls against wave action, but equally serve to abrade them when storm waves hurl the shingle against the stone faces. Defences in this area are discussed in detail in Portsmouth (1991).

Aggregate dredging of up to 250,000m^3 per year occurs to the southeast. Although this area is considered to be a sediment sink it may be prudent to review the impact of removing so much material from such a complex sediment transport regime.

Gilkicker Point to Portsmouth Harbour

The Haslar seawall extends over most of this frontage. The sloping wall is built of masonry and concrete and has had extensive footings added to prevent undermining. The beach along the toe is narrow, with small accumulations around the short groynes. Ongoing maintenance is required to retain the present condition.

Gilkicker Point to Lee-on-the-Solent

From Gilkicker Point east to the Haslar seawall the steep shingle beach is groyned to retain the limited supply of shingle passing eastwards around the Point. The backshore is protected by a short section of seawall built along a narrow bank To landward is a low lying area of high environmental value. Overtopping of this frontage occurs, but has not caused significant damage.

Between Gilkicker Point and the short stretch of seawall several kilometres to the west where the coastal road impinges on the backshore, the wide plateau of low lying land is fronted by a substantial shingle beach. The area has no formal coastal defences, and the growth of vegetation on the backshore indicates that the area is unlikely

Figure 19 (section a) Existing shoreline defences – Portsmouth Harbour entrance to River Hamble
Ref: V1-Fig 19

Figure 19 (section b) Existing shoreline defences – Portsmouth Harbourentrance to River Hamble
Ref; V1-Fig19

to be affected by overtopping under present day climatic conditions. A promenade extends westwards from the Gosport and Fareham Inshore Rescue Station, but does not form part of the coastal defences.

In the centre of Stokes Bay the coast road meets the shoreline and is protected by a concrete seawall. This area has been protected since the latter part of the nineteenth century and due to the indented nature of the coastline here, continues to be a point which is sensitive to intermittent erosion and wave attack. Several timber groynes are found in front of the seawall, but these are generally well covered with shingle and do not seriously interrupt the eastwards littoral drift. Further recession of the beach line at this point will increase the severity of wave attack and overtopping. The risk of flooding of the hinterland is not serious, with housing being well landwards of the coast road and situated on slightly higher ground.

The outfall of the River Alver via a sluice has created a significant barrier to the eastward littoral drift. A small delta of shingle banks extends over the lower foreshore. The reduction of drift may be contributing to the erosion of the coast road seawall to the east, and the accreting shingle is causing a problem for land drainage through the sluice.

The firing ranges of Browndown occupy the frontage from the River Alver to Lee-on-the-Solent. The area is historically one of substantial shingle accretion indicated by a series of shore parallel shingle ridges. However, the construction of sea defences at Lee-on-the-Solent in the late 1950's initiated a phase of erosion to the east. The western extremity of Browndown Ranges has been groyned since the mid 1960's and more recently the shingle crest has been reinforced by the addition of concrete rubble to reduce local erosion. Both the backshore protection and the timber groyne field require considerable maintenance to fulfil their protective role. The 1996/97 recharge and groyne works at Lee-on-the-Solent will affect the future of this frontage.

Lee-on-the-Solent to Hill Head Harbour

This length of coastline comprises low cliffs with occasional low lying areas. The higher ground is heavily developed and the shoreline is defended by seawalls, timber breastwork and groynes. Several large outfalls and a slipway interrupt drift, causing beach widths to vary.

Prior to coast protection works, the cliffs which extend over virtually the whole of the Lee-on-the-Solent frontage, were eroding and producing a substantial supply of material to the beach zone. This, together with material from further west provided a plentiful supply to the downdrift frontage. The cliffs have subsequently been regraded and by 1959 the whole of the frontage was protected by a promenade/seawall. The frontage has been extensively groyned, but the volume of shingle on the upper beach has been decreasing. The lower beach and nearshore zone have also suffered erosion, resulting in a narrowing of the intertidal area and a reduction in natural wave energy dissipation.

These conditions have caused Gosport Borough Council to undertake extensive maintenance work along the shoreline. As of 1997, the Council have implemented a shingle beach recharge and groyne scheme that will reduce their maintenance commitment. Downdrift monitoring will be required to determine the impact on the Browndown foreshore.

North from Lee-on-the-Solent the shingle beach is generally healthy, partly due to the drift barrier formed by the HMS Daedalus slipway. The groynes and seawalls are in a good condition.

Several large outfalls control the drift to the south of Hill Head, causing areas of updrift accretion and downdrift but back. The area is believed to benefit from feed from a nearshore shingle bar, but this may be an intermittent process.

The Hill Head frontage suffers from a deterioration in beach levels despite being groyned, and the backshore defences are fragmentary. Low lying properties are at risk from flooding if the beach erodes further. At the north end of Hill Head the shoreline is backed by a seawall protecting cliffs that previously suffered rapid erosion. The beach continues to be narrow, and is fed intermittently by shingle bypassing the entrance to Hill Head harbour.

Hill Head harbour to the River Hamble

Low lying land within Titchfield Haven is protected by a seawall and a wide shingle beach forming a spit along the south western side of Hill Head Harbour. Immediately east of the harbour an area of reclaimed foreshore is protected by a sheet steel piled wall which is occasionally subject to wave overtopping. In general, however, the level of protection is high, with seawall protection at the rear of the shingle beach. The beach levels are relatively stable, having a supply of shingle from the west. West of the harbour, the beach provides a high level of backshore protection to the beach houses, with shingle being supplied by the erosion of the cliffs further to the west.

The coastline to the west undergoes a rapid change in character. Cliffs of sandy clays are topped by a thick bank of gravel deposits which extend westwards to Solent Breezes. The coastline here is unprotected and erosion of these cliffs provides a significant amount of beach building material. The accumulation of sand and shingle is sufficiently large to provide a considerable level of protection to the cliffs along part of this frontage. Littoral drift appears to be low since the rate of accretion immediately west of Hill Head Harbour is only moderate.

Further north towards Solent Breezes the frontage is directly exposed to the longest wave generation fetch within the Solent. As a result the cliffs are undergoing more rapid erosion here than elsewhere, though drift rates are still low. The Solent Breezes holiday camp, several private houses and the National Grid tunnel to Fawley Power Station are the only developments along this frontage. Due to erosion of the adjacent cliffs, the gabion defences constructed for the holiday camp have formed a promontory. It is situated on a sediment drift divide, with material eroded from the cliffs to the southeast feeding the shoreline towards Hill Head and Stokes Bay while the erosion to the northwest feeds Hook Spit at the mouth of the River Hamble. Cliff erosion north of Solent Breezes has placed the National Grid tunnel under severe threat of flooding.

Hook Spit extends into the mouth of the River Hamble and encloses a large and environmentally important area of marsh. The marshes drain into Hook Lake. The shingle spit is unprotected and is vulnerable to breaching if the drift from the southeast is reduced or the beach is draw down by storm waves.

Hook Spit forms the natural end of the East Solent area, but its presence has an impact on the shoreline of the River Hamble estuary up to Warsash. This area receives little coarse sediment and has only a narrow beach. The shoreline up to Warsash pier is defined by timber and masonry walls subject to some overtopping despite the lack of waves of any size. Under extreme water level conditions these walls could suffer severe overtopping with consequent flooding of public and private land.

Beyond Warsash pier there is a stretch of low cliffs suffering very minor erosion. This natural shoreline gives way to the low revetments and walls around the Warsash frontage. The shoreline road and car park are subject to regular flooding, but damage is minimal.