

7. Protecting the Exe



Image 7a: **Coastal defences at Exmouth**
Source: Exe Estuary Management Partnership

The Exe Estuary is an important resource which supports a variety of human uses, and an impressive array of wildlife. In order to protect the Estuary it is necessary to balance these competing demands, and to be prepared to deal with events which may pose a threat to the resource. Good preparation may be in the form of preventative measures, consistent monitoring and / or rapid response to harmful events.

7.1 Contingency Planning

There are various risks to the Exe Estuary and its environment. Local authorities and organisations have identified the main risks and have produced a number of different contingency plans in an attempt to mitigate against these risks. Some of these plans are required by law whilst others have simply been prepared in response to a specific threat.



Image 7b: **Boom deployment at the mouth of the Exe**
Source: Exe Estuary Management Partnership

Risks of Pollution on the Exe

The English Channel is the busiest shipping lane in the world with a third of the world's shipping passing along it each year. Despite the fact that most of this shipping passes incident free, there is always the risk of vessels having an incident and pollution affecting the Exe Estuary.

Another identified risk is the ship to ship transfers which used to take place in Lyme Bay. Lyme Bay saw a sudden increase in transfers in 2003 following the loss of the tanker Prestige, the damage to the Princess Eva and the introduction of ship to ship regulations by the Danish government, together with the agreement of the Danish shipping industry not to support ship to ship transfers outside territorial waters. Originally there were 1 or 2 transfers a year in the area, involving non-persistent cargoes such as kerosene and jet fuel. In 2003 this activity increased to approximately 20 transfers involving tankers carrying between 18,000 and 265,000 tonnes of Russian heavy oil, identical to that lost from the Prestige. Ship to ship transfers are not currently carried out in Lyme Bay as there is a voluntary ban in place. It is hoped that the Department of Transport will bring out regulations soon to cover these operations and where they can be carried out.

There is also the risk of flooding both from coastal and fluvial sources.

Contingency Plans on the Exe

Contingency plans exist which lay out the roles and responsibilities of a multi agency response to an emergency such as a major pollution incident. There are a number of different plans which may be activated in event of an incident on the Exe Estuary.

The Exe Estuary is also covered by the Devon Flood Warning and Response Plan of April 2004, which is currently being updated. The Maritime and Coastguard Agency are in the process of updating the National Contingency Plan for Marine Pollution from Shipping and Offshore Installations which should be available from the end of March 2006. Devon County Council has produced a Coastal Pollution Plan 2000 which, once the National Contingency Plan is updated, will also be rewritten and will then be known as the Devon Coastal Pollution Plan. Teignbridge District Council, East Devon District Council and Exeter City Council all have plans in place if there is an incident. The District Councils' plans link into the Devon County Council Plan and the National Contingency Plan. The contingency plans of the organisations involved must be compatible and linked.

Waste disposal of pollutants is an issue and a joint project is currently being carried out to look at site protocol and disposal issues. There will also be a review carried out on the booming plan which is currently in place for the Exe Estuary. Other types of emergency which may occur in and around the Exe Estuary are covered by the different responding agencies' Emergency Response Plans and the Joint Emergency Response Protocol.

Simon Wilkins, Emergency Planning, Devon County Council, 2006

Oil Spill Response

In the event of a pollution incident from shipping the first report would come from a HM Coastguard station. They will inform the duty Regional Operations Manager – Counter Pollution and Response (ROM-CPS) if they believe there is a threat of pollution. The ROM-CPS then activates the appropriate level of response. In the event of a major incident three major control centres may be set up near to the incident:

- A Salvage Control Unit – Led by the Secretary of State’s representative for marine Salvage and Intervention, who oversees and approves any salvage operation and can intervene if appropriate.
- A Marine Response Centre – Led by the MCA to co-ordinate all at sea counter pollution and clean-up operations.
- A Shoreline Response Centre – Led by the Local Authority with technical support from the MCA. This centre co-ordinates the shoreline clean-up operations.

Not all of these control centres will need to be set up in every incident and this will be dictated by the scale and type of incident.

An Environment Group may also be set up at the early stages of an incident. This group provides environmental and public health advice to the incident control centres. The Environment Group is made up of representatives of the relevant statutory nature conservation body, environmental regulator, Government fisheries department and the local health authority.

In the UK, spills are categorised by the internationally adopted Tier system:

Tier One: A small operational spill employing local resources during any clean-up. This would be managed by the harbour authority, district or city council depending on the location.

Tier Two: A medium sized spill, requiring regional assistance and resources.

Tier Three: A large spill, requiring national assistance and resources.

Various other organisations also have a responsibility to respond to pollution in the UK:

- Maritime and Coastguard Agency takes the lead in responding to pollution from shipping at sea
- Ports, Harbours, Oil facilities and offshore installations have responsibility for clean-up in their jurisdictions (ports to tier 2, offshore installations to tier 3)
- Environment Agency takes the lead in responding to pollution from land based sources and would be likely to deploy the booms to protect the Exe Estuary
- Local Authorities have accepted the non-statutory responsibility for shoreline clean-up

7.2 Coastal Defence and Flood Management Image



Image 7c: **Wooden groyne at Dawlish Warren**
Source: Exe Estuary Management Partnership



Image 7d: **Foundations of the original sea wall at Exmouth revealed and reinforced with rock armour**
Source: Exe Estuary Management Partnership

Coastal defence is a term used for both coast protection and sea defence. Coast protection is the protection of the land from erosion and sea defence is the defence against sea and tidal flooding. The aim of coastal defence is to reduce the risks to people and the developed and natural environment from flooding and coastal erosion by encouraging the provision of technically, environmentally and economically sound and sustainable defence measures.

Options for coastal defence

Hard engineering: the establishment of structures which aim to resist the energy of the waves and tides. For example, breakwaters and seawalls are designed to oppose wave energy inputs, groynes are designed to increase sediment storage on the shore, and flood embankments and barrages are designed as water tight barriers.

Soft engineering: the establishment of elements which work with nature by manipulating natural systems which can adjust to the energy of the waves, tides and wind. This approach has economic benefits while minimising the environmental impact of traditional engineering structures. The methods which can be used include artificial nourishment, the set back of structures and plantations of osier hedges and marram grass.

Protecting habitats such as reedbeds, mudflats and saltmarsh is another way to strengthen natural coastal defences. For information on the different benefits provided by the habitats on the Exe please see Section 3.1.

The choice of strategic defence options for sections of the coastline is influenced by land use, economic and social considerations, and the available scientific understanding.

One coastal defence approach is called Managed Realignment. It involves setting back the line of actively maintained defence and promoting the creation of intertidal habitat on the land between the old and new defences. Depending on the situation and the requirements of the scheme the original front defence may be retained until it degrades naturally, or may be either wholly or partially removed. Managed realignment is not a do-nothing option but requires active management.

Shoreline Management Plans

Shoreline Management Plans (SMPs) are non-statutory documents which define coastal defence policies which are designed to reduce risk to people and the developed, natural and historic environment in a sustainable manner. These documents form part of the strategy for flood and coastal defence for DEFRA. The schemes and strategies developed within each SMP area are generally subject to planning consent, the Food and Environment Protection Act (1985) and coast protection licences and will, therefore, be in line with other government and local policies.

Shoreline Management Plan for the Exe Estuary

The SMPs are divided into smaller Management Units. The Management Unit applicable to the Exe Estuary is called Management Unit 16 (MU16) which is within Coastal Process Unit 7b. The following is an extract from the Shoreline Management Plan (Posford Duvivier, 1998).

Management Unit 16 (MU16) / CPU7: Orcombe Rocks – Langstone Rocks

Preferred Strategic Option for Coastal Defence: Selectively hold the line

Unit Specific Objectives:

- To protect property in the town of Exmouth
- To maintain the integrity of the nationally and internationally designated sites
- To protect the railway line
- To not further restrict navigational access to the estuary
- To ensure that the shellfish industry is not affected adversely
- To maintain the natural coast protection and flood defence values to the system
- To maintain the continuity of the South West Coast Path
- To protect listed buildings at risk and conservation areas

A variety of hard and soft engineering forms of coastal defence exist on the Exe Estuary. These are identified in Figure 7a.

Sediment Dynamics

There are complex coastal processes present within the Exmouth and Dawlish sediment cell. The sediment dynamics are controlled by a combination of tidal flows into and out of the Estuary and wave action. Dawlish Warren is closely associated with a series of sandbanks, of which Pole Sand, seaward of the spit, and Bull Hill Bank, landward of the spit, are the most significant. These features combine to provide both the Estuary and the Exmouth frontage with significant protection from wave attack, coastal surges and other coast-induced processes.

It is believed that there is a circular movement of sediment in the mouth of the Exe, with limited input of sediment from either adjacent lengths of coast or from offshore. This circulation pattern is interrupted during storm events when large quantities of sediment can be removed from Pole Sand, Dawlish Warren and the Exmouth frontage and deposited in the channels.

Historically the spit at Dawlish Warren has undergone periods of accretion and depletion, with movement of Warren Point also occurring. There is a significant exchange of sediment between the spit and the sandbanks, governed largely by the tides at the Estuary mouth, and resulting in fluctuations of all these features. To the east of the Estuary, the beach at Exmouth also contributes to the complex sediment transport system. Although usually fairly stable, the beaches and dunes are sensitive to storm and tidal influences. There is an interrelationship between the movement of sediment at the Exmouth and Dawlish which means that whatever happens at one site will affect the situation at the other. For example, there is concern that there is a long-term trend of retreat along the Dawlish Warren seafront dunes. In contrast the level of Pole Sand is increasing. (Posford Duvivier, 1998)

Devon County Council, East Devon District Council, English Nature, the Environment Agency, and Teignbridge District Council are all cooperating to commission a survey of sediment dynamics in the mouth of the Exe Estuary which will inform understanding of the links between erosion and accretion at Exmouth and Dawlish and will feed into the new Exe Estuary Management Plan to aid future decision making.

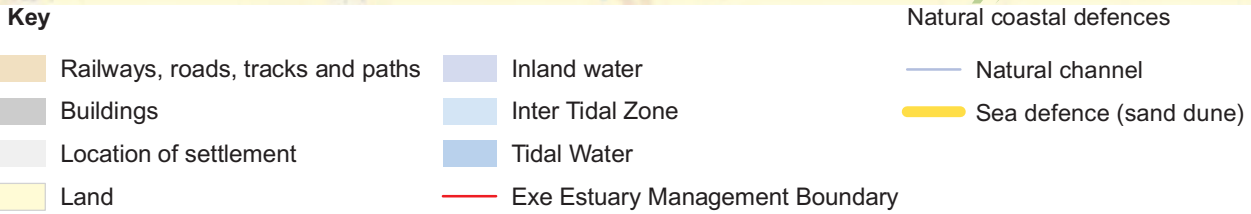
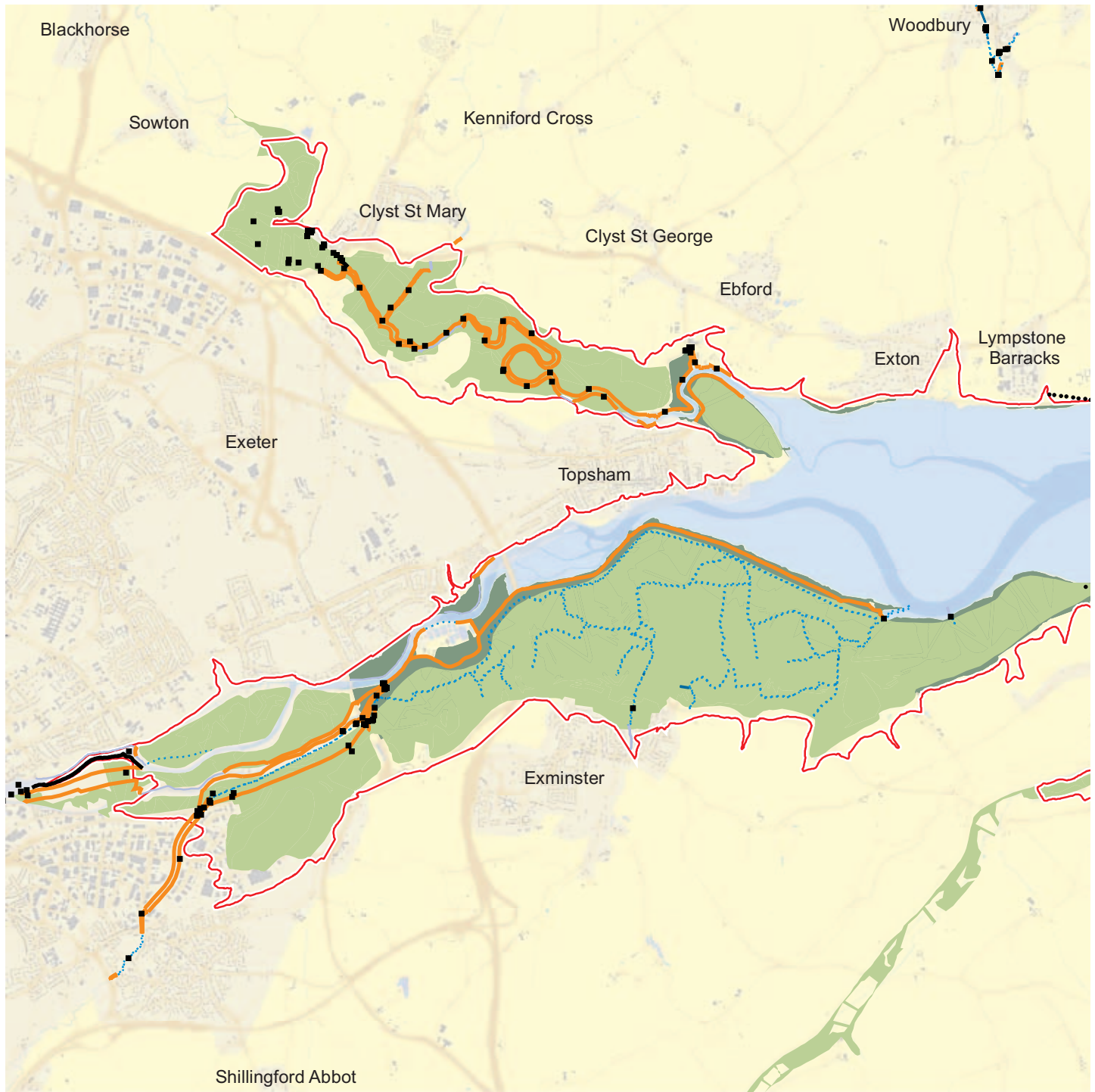


Figure 7a: **Flood and coastal defences situated on the Exe Estuary**
 Source: DCC 2006 and OS 2006 background mapping. EA 2006 and EN 2006 data



BAP Priority habitats contributing to flood defence

- Coastal and floodplain grazing marsh
- Coastal sand dunes
- Reedbeds

Man made coastal defences

- Location of flood defence structure
- Coastal protection
- Culverted channel
- Flood defence structure
- Maintained channel
- Raised coastal defence
- Raised defence
- Sea defence

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Exmouth

Since the early 1980s the Exmouth approach channel has been steadily accreting. By the mid 1980s accretion was such that it caused navigational difficulties, which led to the grounding of a vessel in 1986. Following the grounding 40,000m³ of material was dredged from the channel, with further dredging work taking place in 1996. The last sludge ferry operation was in 1998 and the need for an open accessible commercial channel has now been reduced. However, a serviceable navigation channel is still very important for fisheries, life boats and recreational boats. Exeter City Council surveys the area to identify the channel depths every 6 months.

There are extensive rock revetments, sea walls and groynes protecting Exmouth, and the beach and offshore sandbanks act as a soft defence structure. However, there has been a general reduction in beach levels on the Esplanade and Beach Gardens frontage over the past 10 years. It has been observed that beach movements are quite volatile, and that levels can change by between 1 - 2m over the period of 1 or 2 tides (Royal Haskoning, 2005). The Exe Estuary sub-tidal survey (2005) will help to influence the monitoring of coastal processes and evaluation of coastal defences. It will give accurate and thorough depth readings for all the Exe Estuary channels.

During a storm in October 2004, the hard sea defences at Exmouth experienced a lot of damage as shown in the images below. The resultant exposure of the timber foundation of the mid 19th century esplanade seawall increases the risk of failure of this defence structure. During the October 2004 storms a section of the seawall failed, resulting in the partial subsidence of the Beach Gardens section of the seawall and subsidence, cracks and damage to the footpath behind. The failed length of seawall is now fronted by rock armour placed there in early November 2004 as emergency works to provide protection to the seawall. Plans are in place to carry out permanent repairs and strengthening works to the whole length of the wall commencing in April 2006. In autumn 2006, it is intended to commence an Exe Estuary Coastal Management Study. The objectives of this study would be to:



Investigate the function, and the best solution for long-term, sustainable flood risk management of the groyne and gabion defences at Dawlish Warren, and the implications and effectiveness of beach recharge; and the defences being maintained, removed or partially removed.

- Investigate the possible options and determine the best solution for long-term, sustainable flood risk management and coastal protection to maintain the long-term stability of Exmouth sea wall
- Determine the best long-term management solution to achieve and maintain favourable condition for Dawlish Warren and Exe Estuary SSSI
- Review existing SMP policies and inform the delivery of future SMP requirements
- Inform the development of related studies including, for example, the South West Coastal Monitoring Programme; the Exe Estuary Management Plan; Clyst & Powderham Banks Managed Re-alignment Projects etc

With climate change anticipated to lead to general sea level rise, the likelihood of further removal of sand from Exmouth Beach and, therefore, increased vulnerability of the seawall foundations.



Image 7e: **Sand lost from Exmouth after the storm October 2004, revealing foundations of the sea wall**
Source: Exe Estuary Management Partnership

Image 7f: **Cracks in the pavement of the main walkway at Exmouth following the storm in October 2004.**
Source: Exe Estuary Management Partnership

Lympstone



As part of the new flood defence scheme at Lympstone the Environment Agency has made improvements to the coastal defences in the village, including a new seawall and reinforcements to the stone groyne on the beach at the far end of Quay Lane. Along Lympstone’s shoreline there is dramatic evidence of the erosion which is occurring as shown in image 7g.

Image 7g: Erosion at Lympstone
Source: Exe Estuary Management Partnership

Dawlish Warren



Image 7h: Coastal defences at Dawlish Warren
Source: Exe Estuary Management Partnership

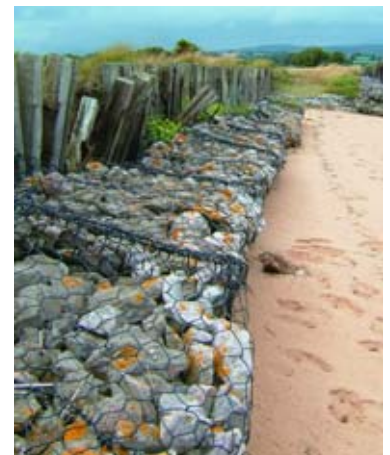


Image 7i: Rock gabions at Dawlish Warren
Source: Exe Estuary Management Partnership

Dawlish Warren sand spit has historically shown periods of accretion and depletion. The spit is supported by a system of revetments, groynes and gabions in various states of repair. Dunes and saltmarshes act as a soft defence structure both behind the Warren and on the seaward side. It is a highly dynamic system that changes naturally. Figure 7b illustrates the dramatic changes in morphology that Dawlish Warren has seen over the last century. Dawlish Warren has undergone various coastal defence works in order to prevent erosion and flooding of the back land, to provide safe beach use for the public, and to maintain its conservation value. The reconstruction of the Dawlish Warren spit from the 1946 aerial to the shape that we recognise today can be largely attributed to coastal defence work which stabilised the Warren by preventing erosion.

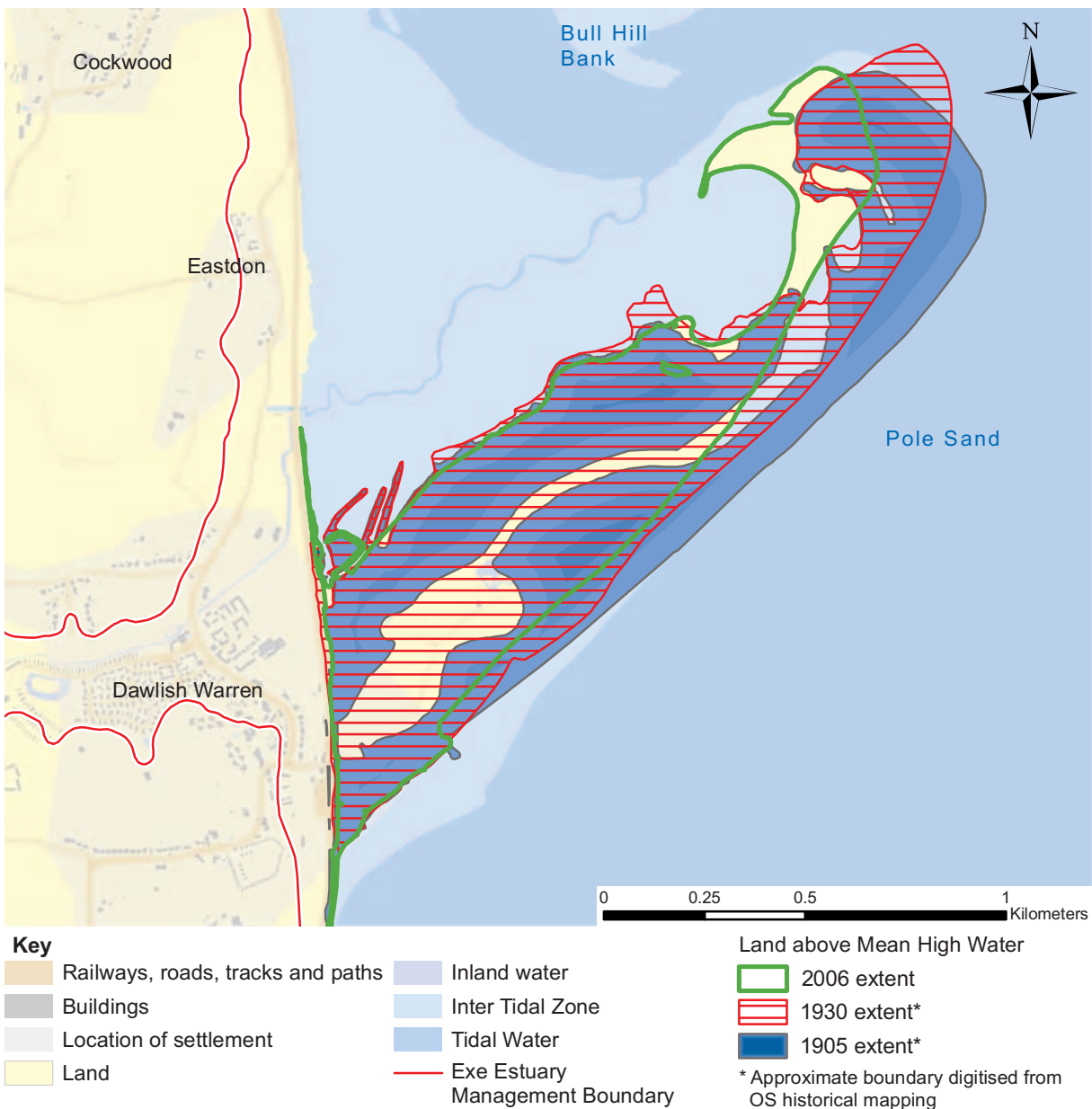


Figure 7b: The changing coastline of Dawlish Warren 1905 -2006.

Source: DCC 2006 and OS 2006 background mapping.
OS 2006 and LM 2005 data

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A Chronological History of Dawlish Warren

1817	5 acres of the Warren were washed away in a single storm
1844	Dawlish Warren covered 300 acres
1869	A storm ripped through the Warren and closed an oyster farm
1899	The first bungalow is built on Dawlish Warren
1905	The "Warren Halt" railway platforms were built by the Great Western Railway
1911	'The Gale' washes away several homes
1917	400 metre rock armoured revetment was constructed to protect the railway line
1937	A series of storms and high tides removed bungalows on the Warren
1939/40	Winter storms destroy more homes
1949 to 1959	Protection of the Warren by British Rail: brushwood fences were erected, trees planted and barriers made of railway sleepers
1959	Dawlish Urban District Council installed five timber groynes
1960	The last home is removed from the Warren in a south-easterly gale
1963 and 1969	Severe storms breached the Warren and dune heights were lowered
1970s	300m long concrete sea wall was built to the east of the railway rock revetment, a promenade was provided on the top of the wall; at the end of the sea wall 300m of gabions, wire cages filled with rocks, were installed to absorb wave energy
1989 and 1990	Storms damaged the revetments and emergency work was carried out by Teignbridge District Council
1992	The National Rivers Authority began work to reconstruct the rock armoured revetment; landward of the timber piles, a 300m line of steel sheet piles were sunk to offer further stability; 35,000 tonnes of Norwegian granite boulder were imported

Source: National Rivers Authority (1993) and Barber (2001)

The following photos highlight the power of destruction of one storm event as they illustrate how the gabions were exposed and a considerable amount of sediment was lost. During this time the tip of the Warren was also breached.



Image 7j: Rock gabion exposure prior to south easterly gales
 Source: Exe Estuary Management Partnership



Image 7k: Rock gabion exposure after the storm of October 2004
 Source: Exe Estuary Management Partnership

Goosemoor Regulated Tidal Exchange Project



Image 71: **Panorama of the Goosemoor site**
Source: Richard Knott, RSPB-images.com

Managed realignment is the setting back of hard sea defences to allow tidal flooding of previously defended land. An example of managed realignment on the Exe Estuary is Regulated Tidal Exchange (RTE). This is the regulated exchange of seawater to an area behind fixed defences, through engineered structures such as sluices, tide-gates or pipes to create saline or brackish habitats. It is a good method for creating intertidal habitats and supporting wildlife. This technique is being demonstrated as a pilot project on Goosemoor an area of the Exe owned by the Royal Society for Protection of Birds. The aim of the pilot project is to build understanding on RTEs, demonstrate the flood defence benefits, improve biodiversity and develop partnerships. It is hoped that the work will create 0.75ha of saline lagoons, 0.75ha of mudflats, 4.25ha of saltmarsh and 0.5ha of banks. This will contribute to national targets for habitat recreation.

Flood Management

Changes in our climate, such as more severe storms and wetter winters, are expected to increase the risk of flooding in areas like the Exe Estuary. Using flood risk management techniques such as the management of land and river systems, and flood and coastal defences, the Environment Agency hopes to reduce the probability of flooding from rivers and the sea. They also work to reduce the damage floods can do through effective land use planning, flood warning and emergency responses.

The Environment Agency uses a probability based model of flood risk to inform its management of these events, Figure 7c illustrates the two main levels of flood risk that are available for the broader landscape; the 100 year flood (a flood with a 1% chance of occurring in any given year) and the 1000 year flood (a flood with a 0.1% chance of occurring in any given year).

The South West Strategic Coastal Monitoring Programme commences in April 2006. The Partnership of 17 local authorities and the Environment Agency will contract out work in order to gather data on beach profiles, bathymetry, aerial images, wave buoys and tidal gauging for a 5 year period. The information will be freely available for use on future flood management or related schemes.

New Flood Defences at Lympstone

Lympstone's flood defence used to comprise of a series of ad-hoc wooden stop boards (see Image 7m), but the community now benefits from a new tidal defence scheme which was introduced in 2005. As well as bespoke metal floodgates in the network of passageways to the foreshore there are new slipways near the sailing club and on the Green (Image 7n). Other improvements include a new seawall and reinforcements to the stone groyne on the beach at the far end of Quay Lane.



Image 7m: **Past flood defences at Lympstone**
Source: Exe Estuary Management Partnership



Image 7n: **Flood gate as part of Lympstone's new tidal defence scheme**
Source: Exe Estuary Management Partnership

Teignbridge District Council's Flood Management Planning

Teignbridge District Council is especially concerned with potential tidal flooding at Dawlish Warren, Cockwood and Starcross, and potential fluvial flooding at Shutterton Brook and Dawlish Warren. The Council's Planning Section have recently commissioned a Strategic Flood Risk Assessment project to identify flood areas in the District including the coastal towns on the Estuary. The assessment has been based on maps from the Environment Agency and the information is now stored on GIS for use by the Council's Planning Section.

Teignbridge District Council has recently developed a Coastal Flood Plan to prepare to help the local community in the event of a tidal flood incident. Sandbag stores have been situated along the coast, including at Dawlish Warren and Starcross on the Exe Estuary. The plan was developed following the flooding caused by extreme storms in October 2004.

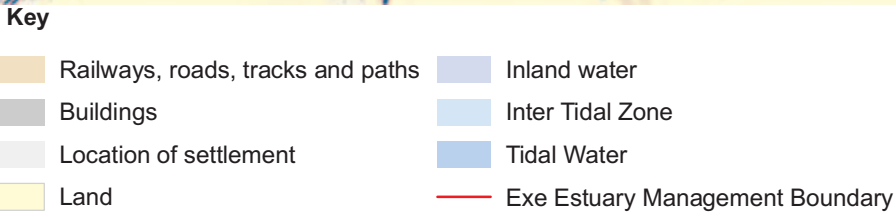
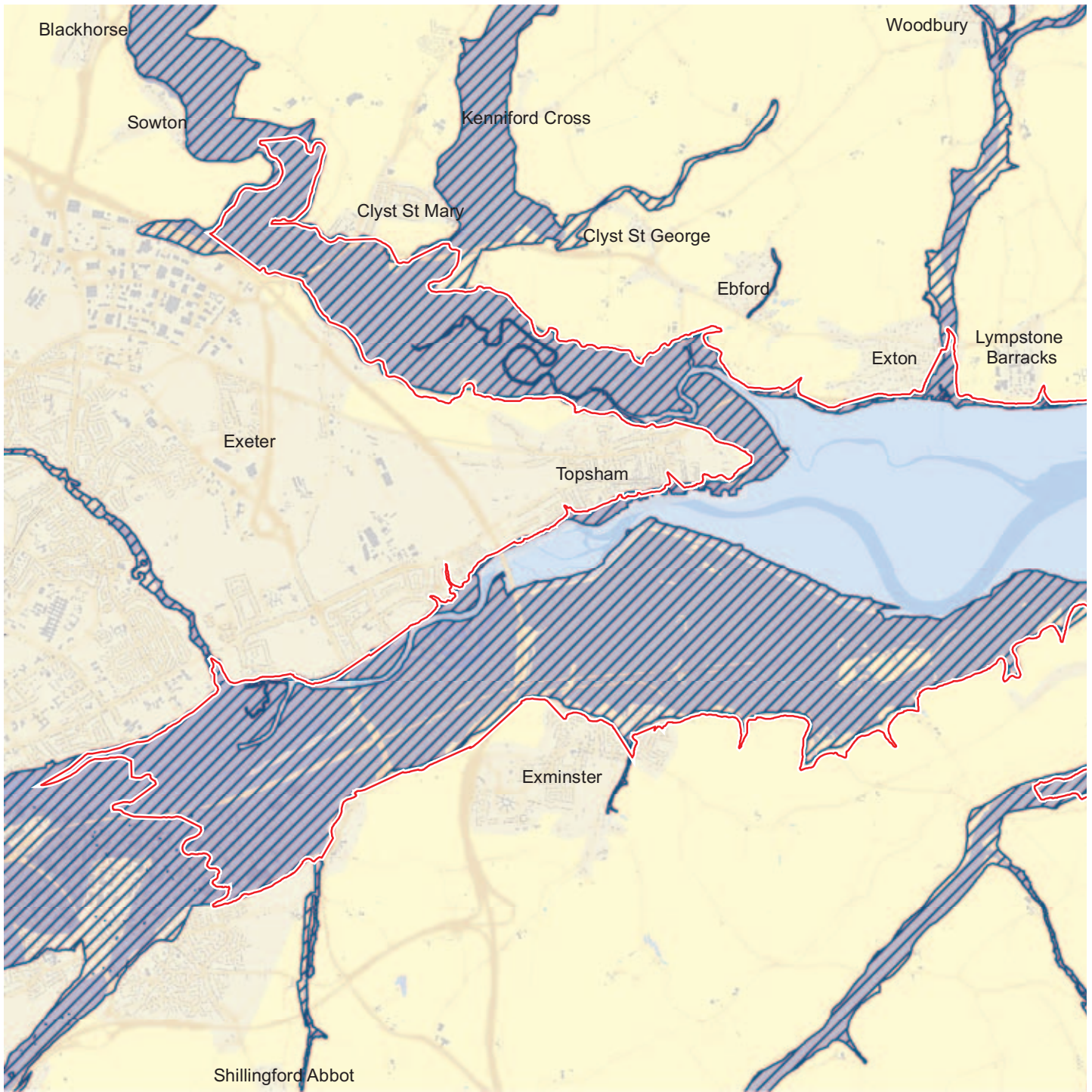




Figure 7c: **Areas at risk of flooding near the Exe Estuary**
 Source: DCC 2006 and OS 2006 background mapping. EA 2005 data



Areas at risk of flooding

-  Zone 2 (1000 year flood)
-  Zone 3 (100 year flood)

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7.3 Spatial Planning

Spatial Planning encompasses a very wide range of issues and is guided and informed by an immense number of documents. The most obvious are the Town and Country Planning Acts of 1990 and 2004, and the corresponding regulations. Also at national level there is a large amount of Government Guidance.

The process under the 1990 Act and its amending Acts was a two tier system of County Structure Plans and District Local Plans. Unitary Plans did not affect the Exe Estuary area.

The 2004 Planning and Compensation Act introduced a new planning system known as the Local Development Framework. This comprises a Regional Spatial Strategy and for each District a number of Local Development Documents. At present the two systems are in a period of transition where documents from both may be in force.

In the case of the South West the current strategy comprises both the South West RPG10 and the adopted Structure Plan. The emerging South West Regional Spatial Strategy is currently being prepared and this will become the principal document when adopted.

Similarly there are local plans which were prepared under the old act still in force. In the case of the Exe Estuary, the Local Plan for Teignbridge District Council was adopted in 1996 with proposals to 2001 and is, therefore, very out of date. A first Deposit Local Plan was prepared under the 1990/1 Acts but was never progressed to adoption and the current Local Development Framework process now applies.

In the case of Exeter City, a new Local Plan was adopted on the 31st March 2005.

The East Devon Local Plan is now proceeding towards adoption and modifications are expected to be made available for public comment in the very near future.

Progress is now being made in each District to implement the Local Development Frameworks as required under the 2004 Act and associated documents and regulations. None of these is expected to present any large scale developments within the timescale of this management plan. All of these plans support the aims and objectives of this management plan.

Dave Parsons, Spatial Planning Devon County Council, 2006