

## PDZ 5. THE TEIFI :

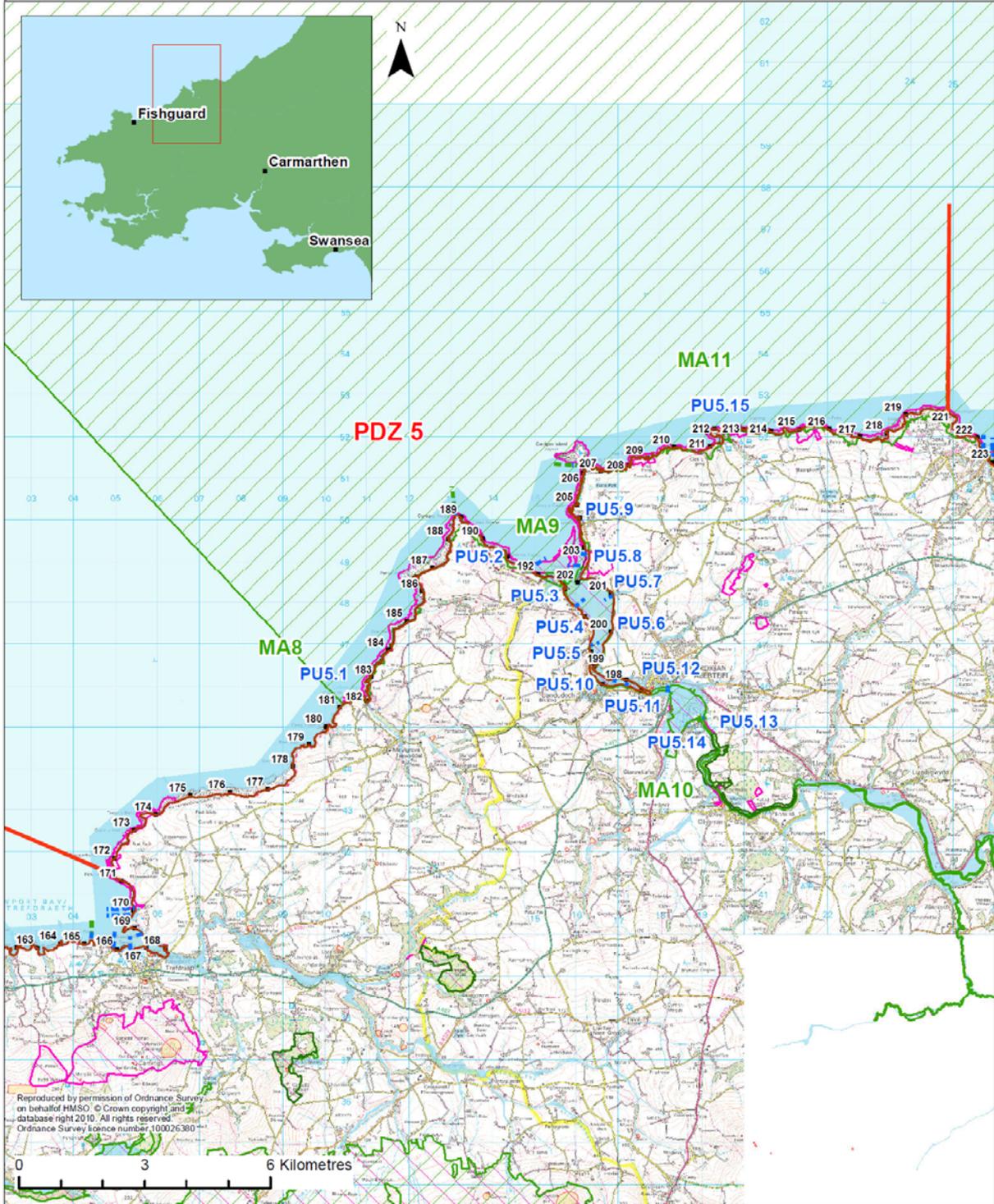


## Pen y Bal to Pencribach (including the Teifi Estuary and Cardigan Island)

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**Shoreline Management Plan Sub Cell 9  
Baseline Location Map  
Policy Development Zone 5 - Teifi**



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Key			
	Existing Coastline and Chainage		Ramsar
	100 Year Recession Line with No Active Intervention		SAC
	Policy Development Zone		SPA
	Management Area		EA Flood Zone 3
	Policy Unit		SSSI
			NNR



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## Definitions of Scenarios Considered in Policy Development

This section defines the various scenarios that are used throughout the discussion of the Policy Development Zone.

### Sea Level Rise

It is recognised that there is a continuing uncertainty with respect to Sea Level Rise (SLR). Taking different SLR scenarios may affect the scale of impact or the timing of some changes, either in terms of sustainable management or in terms of impacts. In the discussion below of the baseline and alternative management scenarios, the Defra guidance on SLR has been generally been used. Where, in any specific area, the impact of SLR is felt to be significant and may change the context of management this discussion is held within a separate box, relevant to that section of text.

### Management scenarios;

#### *Unconstrained Scenario*

Under this scenario, the behaviour of the coast is considered as if there were no man made defences, effectively if they were suddenly not there. Although recognised to be a totally theoretical scenario it does provide a better understanding of how we are influencing the coastal behaviour and therefore the stresses and broader scale impact that are introduced. This assists in assessing first how the coast might wish to change, but also in defining the limits of interaction which the SMP should be considering.

#### *Baseline Scenarios*

- **No Active Intervention (NAI) – Scenario 1**, where there would be no further work to maintain or replace defences. At the end of their residual life, structures would fail. There would be no raising of defences to improve standards of protection.
- **With Present Management (WPM)– Scenario 2**. This scenario applies the policies set in the SMP1 or, where relevant, takes updated or clarified policies, if subsequent work has been undertaken e.g. studies or strategies. In many locations, the approach to management defined by SMP1 only covers a 50 year period. Where this is so, the intent of how the coast is being managed has been assumed to apply into the future. It should be noted that WPM does not necessarily imply a Hold The Line approach throughout the zone, in many areas present management may be for a No Active Intervention approach or one of Managed Realignment.

The aim of the No Active Intervention is to identify what is at risk if defences were not maintained. In a similar way, With Present Management aims to examine how the coast may develop, identifying where there are benefits in this management approach or where there may be issues arising in the future.

At the end of this sub-section a brief summary and comparison of the economic risk for each of the baseline scenarios is provided, based on the MDSF (Modelling Decision Support Framework) analysis undertaken during the SMP (including other study findings where relevant). The baseline scenarios are also assessed in terms of how they address the overall objectives for the Zone. This comparison between the baseline scenarios sets the scene for discussing possible alternative management scenarios which better address all the issues. This discussion is provided in the subsequent sub-section.

## 1 Local Description

The zone covers the Teifi Estuary, upstream to Cardigan and the two sections of open coast hard rock cliff to north and south of the estuary. Virtually the whole area falls within either the Bae Ceredigion or Afon Teifi SAC, with only the southern section of cliff frontage excluded. Much of the area is therefore also covered by SSSI designations. The recognised interests range from important botanical and marine biological interest, through to locations of international geomorphological and physiographic value. In several areas these interests extend in land beyond the cliff line, to include the unimproved grassland and rich heath lands at Aberporth, the important value of the softer wet coastal slopes at Gwbert, or the Pentood Marsh of the inner Teifi.

The whole of the Teifi Valley is designated as an important Historic Landscape Area and there are prehistoric promontory forts at Castelltreruffydd, at Ceibwr Bay and at Gwbert, together with the medieval Old Castle Mound and Cardigan Castle within the Teifi, which are all designated SAMs. There is a plethora of listed buildings at St Dogmaels and particularly around the area of the Castle, waterfront and bridge at Cardigan.

These historic and nature conservation values come across strongly within this area, providing the context for management within an area of outstanding environmental, cultural and historic value.



The cliffs to the open coast both sides of the estuary have a predominantly hard geology with, characteristically, craggy series of high cliffs, narrow headlands and small bays and coves.

There are local areas of softer geology, typically backing the small bays and creating areas of local coastal slope instability.

Along the cliffs to the south, the most significant of these bays is at Ceibwr, where the bay sets back some 300m from the cliff line with a shingle backed foreshore and small footbridge forming part of the coastal path. Generally, the crest of the cliff line is scrub or agricultural grazing land. There are no settlements at the cliff crest.

The coast to the north of the Teifi is, similarly, principally rough pasture. Only at Mwnt is there a car park, Lime Kiln, road, access steps and facilities close to the crest of the softer clay coastal slope. The Pencribach Headland at the north-eastern end of the Zone is the Aberporth Royal Aircraft Establishment. This is generally set back from the coastal edge.

The Teifi Estuary cuts a wide, typical 'V' shaped valley within this rocky shoreline. The outer cliffs comprise hard rock, forming Cemaes Head to the southwest side and Craig-y-Gwbert and running out to Cardigan Island, to the northeast. These cliffs define the north-westerly facing entrance to the estuary. On both sides, the harder rock cliffs give way to softer geology, further within the entrance. On the southern side there are the Penrhyn Castle Cliffs, with various properties above and the small jetty and boathouse at Cei-bach. On the northern side are the harder exposed cliffs below the village of

Gwbert, with the softer slumping coastal slope running through to Pen-yr-Ergyd, with the coastal road running at the crest of the slope.



The wide Poppit Sands build out across the outer estuary from the south, and the main channel to the estuary runs close against the Gwbert cliffs on the northern side. There is a significant sand bar across the mouth of the channel and to the back of the Poppit Sands are the Poppit Dunes. The dune area in-fills the valley floor and fronts an area of scrub, with the road and small community of Poppit located behind it. Some properties have been built within the dunes, and the main

RNLI inshore rescue station is situated close to the front of the dunes at their northern end. The pasture land behind the road rises relatively steeply.

At the southern end of the dunes the estuary



channel cuts in hard against the dune frontage and has eroded all of the former Poppit Sand Spit, which used to extend into the inner estuary, and much of the saltmarsh area in front of the Webley Hotel. The coastal road rises from the Webley Hotel, over higher ground through to St Dogmaels, where it again drops down to the edge of the estuary. The southern side of the estuary tends to comprise a narrow width of saltmarsh and shingle beach, which sits quite tight to the rising hill side.

On the northern side of the estuary, the Pen-yr-Ergyd Spit, principally a shingle feature, has extended across the entrance opposite the southern end of the Poppit Dunes. At the root of the spit is the higher dune area of the Patch Caravan Park. The spit and dune limit the width of the entrance to the inner estuary, which widens out as a large area of intertidal sand banks, with saltmarsh to the fringes. Within the direct shelter of the Pen-yr-Ergyd Spit is the sailing club, and running south close to the edge of the estuary is



Coronation Drive, the main access to Gwbert and properties along the edge of the inner estuary from Cardigan. The inner estuary is important for its small fishing industry, with moorings in the entrance channel and a recently provided floating landing stage within the shelter of the Pen-yr-Ergyd Spit. There are also a significant number of moorings associated with the sailing club, in this area.

This use of this whole area, including the Poppit Dunes, the use of the entrance to the estuary and the Patch Caravan Park, is identified as being important to tourism and to the local economy.

Along the eastern flank of the inner estuary are a few isolated properties close to the rising land, forming this part of the estuary shoreline. The estuary narrows to the south as it approaches St Dogmaels, forming the start of the upper estuary.

On the St Dogmaels side there is a small road bridge and landing stage, where the road drops to the foreshore. The road then rises behind houses, which line the side of the estuary. On the eastern side the main channel is constrained by the hard rock outcrop of Castle Farm, narrowing the channel as almost a gorge between this outcrop and the rising bank on the St Dogmaels side. Through this narrowest section of the upper estuary there are few properties to the crest of the high slope on the eastern side. The alignment of the channel then sweeps around to run east-west out into the broader open valley past the town of Cardigan. The nature of the channel changes from estuarine to more riverine past Cardigan, with the large but defended Pentood Marsh just upstream of the A487 road bridge to the east of Cardigan. The normal tidal limit of the river is, however, some 3km further upstream of the town and the effect of tidal influence on river levels is felt as far as Llechryd 6.5km from Cardigan.

On the St Dogmaels side of the river there are some properties close to the main channel as it emerges out into the wider Cardigan section of the valley. There are also properties along the higher south bank in the area of the main town. On the Cardigan side is the main sewage works and then properties and businesses at Netpool, where



the Afon Mwldan joins the Teifi, and along the recently improved Cambrian Quay, just downstream of the old bridge. Upstream of this bridge, the defences are lower, as is the land behind the defences in the area of The Strand and the Hospital, on the north side, and Station Road, the Pentood Industrial Estate and the Market on the south bank. The old railway line acts as a partial defence to the Pentood Marsh upstream of the new bridge on the southern side, and the main A484 from

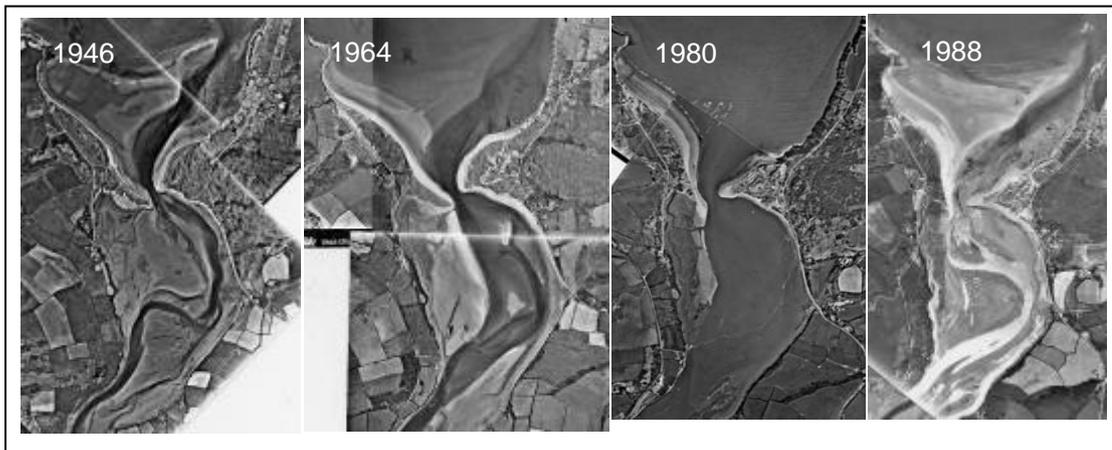
Newcastle Emlyn is set back behind low lying fields on the northern side.

Since SMP1 the Schedule 4 boundary defined by the Coast Protection Act 1949 has been moved from St Dogmaels to the By-Pass Road Bridge. This reflects the coastal nature of the area around Cardigan.

## Coastal Processes

Over the main open cliffed coast, the processes are relatively straightforward. The coast is relatively exposed to a wave climate dominated by large south-westerly waves, through to St George's Channel to the south. In addition, there is significant wave action from the west through to the north. The hard cliffs continue to erode very slowly and where there are sections of softer geology, bays have formed and are often backed by easily eroded till coastal slopes, at their heads. Where the bays indent deeply enough, shingle and sand beaches have formed. There tends to be continuing erosion of softer material, and with Sea Level Rise the beaches will roll back, along with further slope instability and erosion of the soft geology.

The processes outlined above also occur within the outer, cliffed section of the Teifi. However, within the Estuary's main outer and inner areas, processes are far more complex and not fully understood in detail. Never-the-less, there have been several studies of this area and a consensus has been developed regarding the overall development of existing behaviour. Historical charts show that the main channel of the estuary used to run relatively centrally between the higher mound at the root of Pen-yr-Ergyd and the sand spit forming into the estuary from the Poppit Dunes. The Poppit Sands still extended across the mouth of the outer estuary, with the main channel running through them. Some event, or trend in processes, possibly the obstruction of the estuary channel by a wreck or the process of infill within the inner estuary triggered a change that has developed since the turn of the last century (some time between 1907 and 1938). The important shift was that the outer channel moved over to the north-eastern side beneath the Gwbert Cliffs. This allowed development of the Poppit Sands over the main area of the outer estuary, tending to pin the channel to the east. Subsequently, with the channel in this position and with deeper water and greater exposure of the cliffs (particularly the softer clay cliffs and the beaches along the eastern shoreline), these areas started to erode.



At that time the mass of and forward position of Pen-yr-Ergyd tended to hold the main channel flow away from the Gwbert Cliffs to the north. As Pen-yr-Ergyd eroded and became less prominent, so the broader channel and wave action tended to erode the cliff line. This area of cliff was protected, and with further limitation of sediment supply, the spit thinned further whilst still extending as a shingle ridge across the estuary. This spit has continued to grow, forcing the erosion of the Poppit Sand Spit and altering the configuration of the channels within the inner estuary. Associated with these changes has been the growth of the dunes to the northern end of Poppit Dunes, as this frontage has been allowed to belly out to the back of Poppit Sands. Also, with the change in the position of the channels, there has been a change in the position of saltmarsh growth

and erosion within the inner estuary. At the time of SMP1 there was concern that the shingle spit might breach. In the intervening years although the shingle ridge has narrowed, there have, over the last decade, been insufficient large storms with high water levels to actually breakdown the barrier. The spit is, however, all the time losing bulk and making a breach more inevitable. At the time of the SMP1 there was also uncertainty over whether the spit would continue to grow to the west, further cutting behind the Poppit Dunes. It was considered more likely that a recurve would develop as flows increased within the constrained entrance channel. This has been borne out by monitoring and observation.



The affect of the recurve has been to further constrain flows and encourage accretion within the narrow gut-channel behind the spit, and to the fishing facility and the sailing club.

Whilst it is possible to predict that the spit will breach, probably at its neck, just west of the caravan park, there is difficulty in predicting with certainty how the estuary will then evolve. There are reports that the estuary is continuing to fill with sediment; there is also an assessment given in the SMP Appendix D. It seems likely that with flows no longer forced so much to the east, the channel will tend to widen, and at least increase pressure on the final groyne in front of Pen-yr-Ergyd. It also seems probable that there would be increased movement of sand from the Poppit Dunes, which would go towards re-establishing, to a degree, the Poppit Sand Spit beyond the mouth and to the inner estuary. Associated with this, would be erosion to the northern end of Poppit Dunes. This process would not be exactly the same as it has been in the past, because there is no longer the control imposed by the main Pen-yr-Ergyd Headland.

There is an additional area of change where the flows through the St Dogmaels channel enter the inner estuary. This can be influenced by changes at the mouth of the inner estuary, but the changes have, in the past, resulted in erosion and then accretion of the saltmarsh along the Bryn-y-mor frontage. Further upstream, although there can be some change in the river bed, the area is relatively stable.

Over the whole estuary, with Sea Level Rise there is the potential for more infill of sediment within the inner estuary. There will be pressure for the shoreline of Poppit Dunes to roll back and there is potential, depending on the ability of saltmarsh growth in line with Sea Level Rise, for there to be squeeze against the relatively steeply rising ground around the fringe of the estuary.

### POTENTIAL BASELINE EROSION RATES

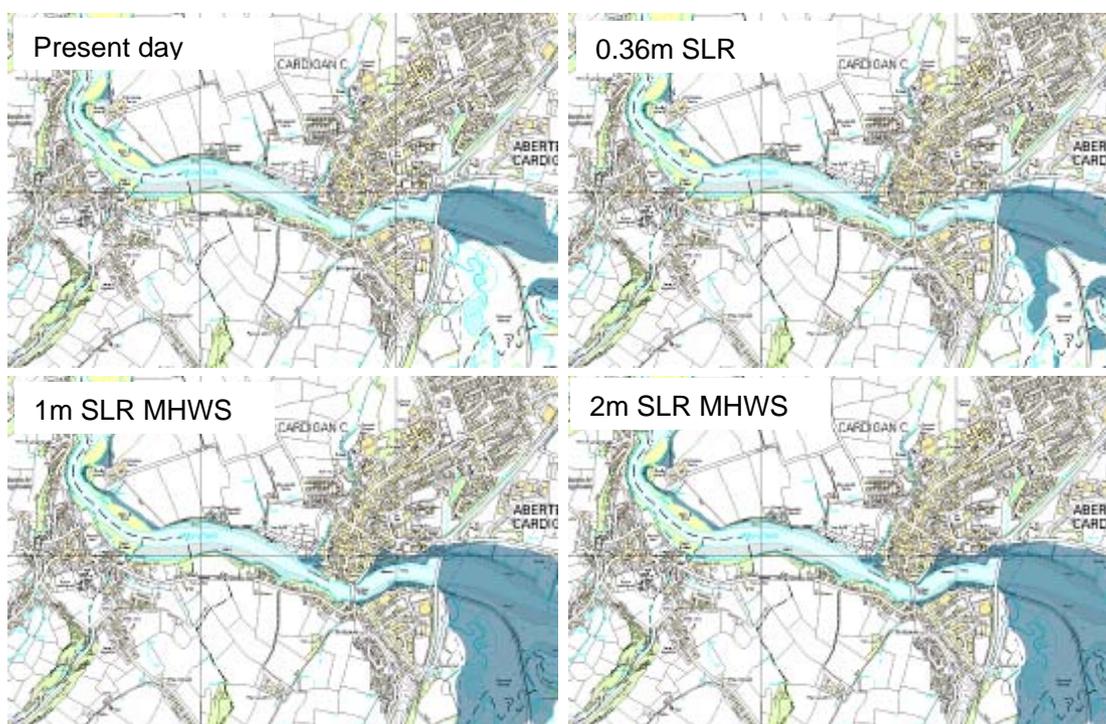
A distinction is made between basic erosion of the shoreline and cliff recession, affecting the crest of cliffs and coastal slopes. This is noted in the table below together with other relevant factors. In assessing erosion and recession in the future, allowance has been made for Sea Level Rise and this is discussed in Appendix C. This is also discussed briefly following the table.

Location	NAI Base Rate (m/yr)	Notes	100yr. Erosion range (m)
Cemaes Cliffs	0.05 to 0.1	Local areas of landslipage	5 to 10
Penrhyn Castle	0.1		20
Poppit Dunes	0.05 to 0.1	Dependent on estuary behaviour	10 to 30
St Dogmaels N	0.05	Local failure of defences	10 to 20
Coronation Dr. S	0.05	Erosion resulting from failure of defences	15
Patch	0.2	Dependent on estuary behaviour	50
Coronation Dr. N	0.2	Subject to failure of defence and land slippage	60 to 100
Gwbert Cliffs	0.05	Slow cliff failure	5 to 10
Mwnt	0.05	Roll back of beach and landslide	50 to 90

Base rates have been assessed from monitoring and historical data. The range of potential erosion is assessed in terms of variation from the base rate and sensitivity in potential Sea Level Rise. Further detail on erosion rates together with erosion maps are provided in Appendix C.

### FLOODING

In terms of increasing Sea Level Rise there would be significantly greater flood risk around the estuary, increasing flood risk to the road and car park area behind the Poppit Dunes, but principally within the upper estuary at Cardigan. This is shown in the following plots of indicative areas at risk from normal Spring Tide flooding under different Sea Level Rise Scenarios.



Under the 1m SLR Scenario there is risk of regular tidal flooding (Mean High Water Springs MHWS) to the areas along the Strand, St Mary Street and hospital area. The water front in front of Station Road could be subject to regular flooding. The Mwldan

would be at increased risk of tide locking (where the system is unable to get rid of high freshwater flow during periods of high, rising tide). However, there would be no substantially increased area of tidal flooding. Flooding at Finch Street would similarly be at higher risk due to tidal locking.

In addition, there would be increased risk of tidal flooding of the river valley at Llechryd but no properties at risk. There would, however, be significantly increased fluvial risk due to tidal locking and this is an area where the CFMP has already identified risk to properties.

#### Impact of different Sea Level Rise Scenarios

Under the 2m scenario there is little increase in extent under the MHWS situation compared to the 1m SLR. There would be additional risk areas however for the 2m / 200 year event. This increases tidal flooding risk beyond St Mary Street, up the Mwldan and at St Dogmaels.

#### EXISTING DEFENCES

Outside of the Teifi, there are only local and very minor areas that are defended. At Ceibwr Bay there is a limited length of gabion and at Mwnt there is some protection to the access steps going down the cliff. These defences have no significant impact on coastal processes.

Within the Teifi is the Cei Bach breakwater, which acts to protect the cliff and the boathouse in the area. At the northern end of Poppit Dunes the small collection of properties are defended by a sea wall which is, at present, well behind the normal active beach area. There are local defences to property within the Poppit Dunes and a low wall to the back of the saltmarsh and the Webley Hotel.

On the eastern side of the estuary there is a large revetment beneath the coastal slope to the coast road north of Pen-yr-Ergyd through to Gwbert. The road within the inner estuary runs along the defended section of Coronation Drive. Defences around Pen-yr-

#### ***The Patch Caravan Park***



Ergyd comprise short groynes along the caravan park frontage with an infill of rock armour between the groynes. At the back of Pen-yr-Ergyd there are various short sections of defence to the dunes and in front of the sailing club. Much of the defence around Pen-yr-Ergyd are private works. There has been recent beach management to the Pen-yr-Ergyd Spit, placing sediment won from within the estuary along the frontage.

At St Dogmaels, the short section at the northern end of the village is defended, where the road is close to the shoreline. Private defences then continue for properties, for another 100m. There are defences to both sides of the river through Cardigan. In the Netpool area the defence comprises, principally, a gabion wall. This was substantially improved where the Mwldan joins the main river, with a heavy masonry wall and piling. There is a section of private works, Lloyds Wharf and Cambrian Quay, through to the new coast protection wall at Prince Charles Quay, and there are plans to improve the defences along the section between the two bridges. On the south side of the river there are various walls along most of the frontage. A lot of the private defences are in moderate to poor condition with a potential residual life of some 10 to 15 years. More

formal defences tend to be in better condition with a life ranging from 25 to 50 years, for new defences. In reality, defences such as the revetment at Gwbert or the new wall in Cardigan might be expected to remain for the next 75 to 100 years.

#### **UNCONSTRAINED SCENARIO**

Under this scenario the behaviour of the coast is considered as if there were no man made defences, effectively if they were suddenly not there. Although recognised to be a totally theoretical scenario, it does provide a better understanding of how we are influencing the coastal behaviour and therefore, the stresses and broader scale impact that are introduced. This assists in assessing; first, how the coast might wish to change but also in defining the limits of interaction which the SMP should be considering.

Over the open coast, the shoreline will continue to erode slowly. Only in areas such as Mwnt is erosion likely to trigger more major failure of the coastal slope.

The main area of change would be, and has been, at Pen-yr-Ergyd. The protection of the coastal slope and subsequent protection of the caravan park and highway has successfully limited erosion to these frontages. There would have been substantial failure of the coastal slope, and erosion could have moved the face of Pen-yr-Ergyd back by some 50m. While this would have provided sediment to the developing spit, creating possibly greater erosion on the Poppit side, by now, the more solid end of the Pen-yr-Ergyd Headland may have itself breached through, separating the spit from the mainland area, with the potential for a beach to develop well over to the eastern side of the Estuary. Under this scenario there is likely to have been extensive erosion of the Poppit Dunes, and development of a large sand spit in front of the Webley Hotel.

Along Coronation Drive, in the absence of the wall there would be no road. The estuary would have adjusted slightly such that the fringe shingle beach and salting would have moved back to the rising coastal slope behind the road.

Within the Cardigan frontage the walls really just formalise the river channel. The Mwidan would form as a small sub-estuary and the areas of the Strand and the market on the south side would be intertidal marshes. The Pentood marshes would also be intertidal and transitional marsh to higher ground.

#### **KEY INTERACTION WITH DEFENCES**

Clearly, intervention along the Gwbert and Pen-yr-Ergyd frontages has had a major impact on the behaviour of the estuary. Their presence has stopped a significant breach of the Pen-yr-Ergyd Headland and has prevented the natural repositioning of the channel to the east. Their influence has, therefore, both allowed and preserved the development of the spit. At the same time, by preventing new sediment supply reaching the spit, they are causing it to thin, and in the near future will cause its demise.

The only other area where there has been significant impact has been at Pentood, where the railway embankment has prevented the natural development of the marshland.

In other areas, defences have only a minor impact on natural process. The local defences around the estuary will tend to increase squeeze of fringe habitat. This has potentially already occurred to some degree along Coronation Drive, although it is noted that at Nant-y-ferwig, at the southern end of Coronation Drive, there has been a significant growth of shingle based salting.

### 3 Management Scenarios

#### 3.1 No Active Intervention – Baseline Scenario 1.

The open coast will continue to erode. The main impact of this will be at Mwnt where, due to erosion at the foreshore and the continued slippage of the coastal slope, it might be anticipated that both the road and part of the car park would be lost, possibly beginning by the end of the first Epoch. In other areas where there are small shingle beaches, the backshore will roll back with Sea Level Rise.

Under this scenario minor works may fail over the first Epoch with increased erosion of the cliffs inside Cemaes Head, within the estuary. This is unlikely to result in loss of property, but could cause re-activation of coastal slope movement further in land.

The revetment beneath the coastal road to Gwbert would remain relatively unaffected over much of the period of the SMP. However, with Sea Level Rise there would be increased overtopping which could re-activate the slope above. This may result in damage to the revetment and would, in any event, result in loss of the road to the village.

#### Impact of different Sea Level Rise Scenarios

With 2m SLR there would be substantial overtopping of the revetment even within the next 50 years. This would reduce the life of the road.

The whole of the backshore of the outer estuary and the behaviour of the inner estuary really has to be considered as one. It seems probable, even with the recent recharge of the spit, that the spit will breach over the next five years. This will result in a widening of the mouth to the inner estuary and the distinct possibility that the channel will tend to move to the east. Over the first Epoch, the defences along the Patch frontage may fail and with the flow focussed on this side of the estuary the frontage and the length of the frontage will erode. This may also increase the pressure for the foreshore in front of the revetment further north to erode. As the sediment supply to the end of the frontage increases, there would be a good possibility that a spit would develop into the inner estuary.

With the main flow at the entrance moved to the east, the Poppit Sand Spit is likely to develop further within the estuary, and this will tend to increase the rate of infill. In effect, the channel would tend to flow through the area now occupied by the fishing facility and to either side the coast would develop two inward facing spits. There would be consequences for the moorings and the fishing fleet. The northern area of Poppit Dunes would erode, potentially exposing the RNLI station and the properties to the north.

With Sea Level Rise, it is uncertain how the Poppit Sands will respond. They may flatten, potentially creating the conditions for the estuary channel to re-establish a more central course to the sea. Alternatively, they may be further consolidated, possibly even creating an outer spit.

As Sea Level Rises there would be increased tidal overtopping at Coronation Drive and at Nant-y-ferwig. The wall would fail, possibly over the next 20 years and access to property, the sailing club and fishing moorings would be lost.

The use and character of the whole area would substantially and significantly change.

At the northern end of St Dogmaels, with Sea Level Rise and through deterioration of the defences, the road would be lost. This, together with the regular flooding of the road behind Poppit the properties in this area would lose their access.

At Cardigan this scenario would lead to significant areas of flooding to the important waterfront areas of the town, as defences fail or as they are overtopped significantly. There would be significant risk to life and property. Under the 1m SLR Scenario some 77 properties would be at risk from flooding.

### 3.2 With Present Management – Baseline Scenario 2.

The table below sets out current policy and management approach for the Zone.

SMP 1			Subsequent Management Approach
No.	Management Unit	Policy	
<b>Pembrokeshire SMP1</b>			
22CHM/B	Newport Sands to Ceibwr Bay	DN/DN	
22CHM/A	Ceibwr Bay	DN/DN(SHTL)	
22 TRA	Ceibwr Bay to Cemaes Head	DN/DN	
23CHT/B	Cemaes Head to Penrhyn Castle	DN/DN	
23CHT/A	Penrhyn Castle to IRB Station	HTL/HTL	
23POP	Poppit Sands		ATLF Business Plan 2009
23DOG	West Inner Teifi Estuary	DN/DN	ATLF Business Plan 2009
23 EBT	East Inner Bank Teifi Estuary	SHTL/SHTL	ATLF Business Plan 2009
23GWBlt	Gwbert	HTL/HTL	ATLF Business Plan 2009
<b>Ceredigion SMP1</b>			
1.1	Cemaes Head	HTL	
1.2	Poppit	DN	ATLF Business Plan 2009
1.3a	Teifi inner south	DN	ATLF Business Plan 2009
1.3b	Teifi inner north	HTL	ATLF Business Plan 2009
1.4	Gwbert	HTL	ATLF Business Plan 2009
2.1	Cardigan south	HTL	
2.2	Cardigan north	HTL	
3.1	Mwnt Cliffs	DN	
3.2	Mwnt	DN	
4.1	Aberporth Cliffs	DN	

**Key:** DN – do nothing, HTL – Hold The Line, SHTL – Selectively Hold The Line, R – Retreat, deferred – policy deferred subject to further monitoring or study.

In addition, the following information and policy is abstracted from the Pembrokeshire and Ceredigion Rivers CFMP Draft Plan.

<b>Policy Unit 3 Lower Teifi</b>	The Lower Teifi Policy Unit drains the Afon Teifi from Lampeter to the river mouth in Cardigan Bay.
<b>Problem / risk:</b>	<p><b>Problem:</b> The main sources of flooding in this Policy Unit are from the Afon Teifi and from tidally influenced fluvial flooding. Surface water flooding and flooding from sewers is also experienced in the main urban areas in this Policy Unit.</p> <p><b>Current Flood Risk:</b> – Flood risk in the Policy Unit has been assessed as low.</p>

	<ul style="list-style-type: none"> <li>- The greatest risk of flooding to people and property is concentrated in the urban areas of Llanbydder, Llandysul and Cardigan.</li> <li>- Environmentally designated sites (including SACs, SSSIs and a NNR) and a landscape designated site (ESA) are at risk of flooding. The impact of flooding is generally beneficial as a number of sites rely on periodic flooding to maintain conditions for existing habitats and species.</li> <li>- A small area (8%) of the Lower Teifi Valley Historic Landscape Area is currently at risk from flooding.</li> </ul> <p><b>Future Flood Risk:</b></p> <ul style="list-style-type: none"> <li>- Flood risk is expected to increase in the Policy Unit as a result of climate change. Landuse change and urbanisation is not expected to have a significant impact in this Policy Unit.</li> <li>- During the future 1% AEP flood event, the population at risk is expected to rise by 124%; the number of residential and commercial properties at risk of flooding is expected to increase by approximately 118%.</li> <li>- The area of ESA, SAC and SSSIs at risk from flooding increases into the future. However, the level of flood risk in these environmentally and landscape designated sites is not expected to increase significantly.</li> <li>- The number of critical infrastructures services at risk from flooding also increases throughout this policy unit.</li> <li>- It is likely that flood depths will increase in the future, with typical depths of flooding during a 1% AEP flood event increasing by nearly 1m in Cardigan, and between 0.2 and 0.5m Newcastle Emlyn as a result of sea level rise.</li> </ul>
<b>Policy selected</b>	Policy 4 – Take further action to sustain the current level of flood risk into the future.
<b>Justification and alternative policies considered</b>	<p>Policy 4 – This option would provide the opportunity to continue existing and/or implement new flood risk management measures in order to maintain the current level of risk in this Policy Unit into the future. This policy is appropriate because the flood risk in this Policy Unit is currently low but expected to increase in the future. Increased peak flow in the downstream Afon Teifi, resulting in increased floodwater depth and lateral extent, presents a greater hazard to life and increases the disruption to community and critical infrastructure.</p> <p>The current Standard of Protection offered by the existing defences is likely to be reduced with climate change and annual average damages in the Lower Teifi are expected to almost double, from £300,000 to £570,000 (an increase of 90%). In addition to property, the increase in the lateral flood outline will result in an increase in flooding of the Lower Teifi Valley Historic Landscape Area and numerous SSSIs, which may have a detrimental impact on existing habitats and species that occupy those areas. All the catchment objectives can be met using this policy.</p> <p>A policy 4 would allow further measures to be put in place in areas which are currently undefended but may be put under increased flood risk in the future, to mitigate the impacts of climate change and urbanisation, thereby sustaining the current level of protection throughout the whole Policy Unit area into the future.</p> <p>We have selected this policy based on the risk posed by inland flooding sources and tidal flooding sources. If the risks posed by tidal flooding were removed from the policy appraisal process, preliminary estimates suggest that this policy would change from a policy 4 to a policy 3.</p>

	<p><b>Alternative policy options considered:</b></p> <p>Policy 1 – Using a policy option 1 will significantly increase the risk to people, property and the environment. Following a reduction in flood risk management measures, damage to residential and commercial properties would increase significantly, resulting in far higher Annual Average Damage costs and considerable disruption to local communities and critical infrastructure. Without maintaining flood warning systems and defences against increasing flood frequency, floodwater depths and lateral extent, the risk to life would significantly increase. This policy option would also not deliver any catchment objectives.</p> <p>Policy 2 - A policy option 2 will also increase the risk to people, property and the environment to a level that would not be feasible for this Policy Unit. Similar effects would be seen using a policy 2 as to those using a Policy 1 scenario; flood risk management measures are required to reduce the expected future level of risk down to the current accepted level, where catchment objectives can still be met under the present conditions.</p> <p>Policy 3 - A policy option 3 would result in an increase in flood frequency and depth in the future. The residents and businesses of Llanbydder, Llandysul and Cardigan would be affected by an increase in disruption to infrastructure, social stress and economic loss. Although policy 3 could be considered as a possible option, annual average damages are expected to almost double (from £300,000 to £570,000) if the existing levels of flood risk management activities are simply maintained at their current level. Policy option 4 allows for this future figure to be reduced if the level of risk can be sustained, as opposed to increasing under a policy 3. This policy would also not meet all the catchment objectives.</p> <p>Policy 5 - A policy option 5 would result in the current level of risk being reduced in the future. As the current level of risk is considered to be low, there is no justification for investing in additional flood risk management measures to reduce flood risk further.</p> <p>Policy 6 - A policy 6 is not feasible for this Policy Unit. There is no further scope for flood storage by way of a flood attenuation scheme or for increased frequency of flooding in this Policy Unit, without having detrimental impacts on environmental and landscape designations. There are opportunities to work with land owners and managers to better control surface run-off from the land, however this is only likely to occur on a local scale and will not have a significant impact at retaining water and reducing flood risk on a catchment-scale.</p>
<p><b>Catchment-wide opportunities &amp; constraints</b></p>	<p><b>Opportunities:</b></p> <p>To reduce future flood risk by influencing and informing the planning process for new developments planned for Cardigan, Llandysul and other smaller settlements in this policy unit, to prevent vulnerable land use from being located in the floodplain and through the appropriate use of SuDS.</p> <p>To help meet the national biodiversity action plan (BAP), the Local Ceredigion BAP and the Carmarthenshire Local BAP targets through flood risk management activities.</p>

To reduce surface water run-off and sediment loss in the upper catchments of the tributaries of the Lower Teifi, Bedw and Clettwr, and improve water storage in the lower catchments through applying environmental and land management initiatives, such as Tir Cynnal, Tir Gofal and Catchment Sensitive Farming to the dairy farming activities in this policy unit.

To reduce flood risk to Cardigan, Llechryd, Newcastle Emlyn, Llandysul and Llanybydder through improved flood warning and emergency response.

**Constraints:**

Dispersed, smaller settlements with limited scope or justification for individual defences, such as Llechryd. When combined, however, these dispersed settlements amount to a relatively large number of properties at risk from flooding.

The presence of protected species and habitats with specific water level, water quality and habitat requirements, such as otters and water crowfoot in this Policy Unit. These must be protected, and not only will they restrict certain activities, they may require additional specific activities and actions to ensure their continued protection.

Tourism, leisure and recreation amenities are vital to the economy of the area. Flood risk management must be sensitive to the features and landscape on which these activities depend, whilst also ensuring that flood risk management accounts for the additional risk visitors to the area creates. For example, fishing sites for salmon fishing on the Teifi may be affected by high flows, and the kayak course at Llandysul is reliant upon flows, preferably high for this recreational activity.

In overall terms With Present Management looks to sustain the level of defence at Cardigan and to manage various areas within the inner and outer Teifi Estuary, but with a policy of No Active Intervention to the open coast.

The implications of present management are discussed below, particularly with respect to the uncertainties associated with the behaviour of the estuary and the increasing flood risk with Sea Level Rise at Cardigan.

Under this scenario the aim would be to Hold The Line south of Penrhyn Castle through to the RNLI Station. This would involve significant future investment in both the existing jetty and local defences as well as, presumably, works to protect the toe of the cliff. This would impact on the nature conservation interest as well as potentially reducing the important sediment source to the estuary. South of Trwyn Careg-ddu, the effort involved in protecting the properties and the RNLI Station would depend on management at the estuary mouth. Certainly, holding the line in this area could, in the future, require protection to the line of the dunes and this could, with Sea Level Rise start significantly impacting on the behaviour of the frontage, with the intent to manage this into the future.

On the Gwbert side, protection of the road is seen as being feasible through maintaining the existing revetment. This would need to be undertaken in a manner that maintained the relative natural function of the coastal slope. The need for this defence would largely depend on the policy for the road to the south along Coronation Drive. Under this scenario, the policy would be Hold The Line, and therefore, the access to Gwbert would be maintained and the need to defend the road further north would also need to be

maintained. Holding the line along Coronation Drive would be technically feasible, even under a 2m Sea Level Rise Scenario. It would require further work to strengthen the road wall and the need to raise the defence level against more extreme flood events. There could be the possibility of increased squeeze and this could result in loss of intertidal habitat which could impact on the SAC. Maintaining the road would sustain the opportunity to sustain transport to the fishing industry as well as maintaining access to properties.

SMP1 for the area gave considerable discussion of management of Pen-yr-Ergyd and the Poppit frontages. The intent was for continued management of the Patch frontage and potential management of the spit, but then to allow a more natural approach to be taken on the Poppit side of the estuary. Sea Level Rise was considered less of an issue and because management was only being considered over a 50 year period. If anything,



the situation has become more uncertain, because over the last decade there have been significant further changes in development of the spit, and because it is now necessary to consider how the Hold The Line policy would need to be implemented in the face of Sea Level Rise that could be as much as 2m. Management responsibilities have, in part, been devolved down to a more local level through the Fairways Committee, but with involvement of the statutory consultees and the overall supervision of the two councils and the

Environment Agency. This is seen as a very positive step in that many of the issues are at a community level. However, the complexity of management and the increased uncertainty as to how a policy for holding the Line at the estuary mouth can be applied can be seen from the Afon Teifi Fairways Ltd Business Plan (2009); the approach to management is still very uncertain. The main conclusion drawn from the Plan is the intent to manage the spit through continued recharge, using dredged material. This is recognised to be an over simplification of the intent of future management but is taken as the baseline scenario in terms of examining possible implications.

Under this approach and policy, the aim would be to replenish the spit with necessary sediment, to sustain its current position. This may be feasible over the next decade although to have the necessary outcome this would need greater and greater effort. The works would need to be increased in scale with Sea Level Rise, allowing for further raising of the spit level to prevent overwash. Associated with this would be the need to harden defence of the spit as the pressure of erosion increases.

There is little supply of sediment to this whole frontage. The short rock groynes in front of the caravan park have allowed retention of some shingle and this supports the toe of the rock revetment constructed between the groynes. Even so, there is only limited sediment held in this area.

With sea level rise, less shingle would be retained and, even with recharge to the spit, there would be increased pressure for the whole length of the shoreline to retreat. At the same time, to maintain use of the front row of caravan plots within Patch Caravan Park over the long term, the land levels along the most vulnerable frontage would need to be

raised to avoid regular flooding under normal tide levels. Further work would then be required to protect against even the 1:10 year event.

#### Impact of different Sea Level Rise Scenarios

With the 2m SLR scenario, there the level of the spit would need to be raised in excess of 1m within the next 50 years and by in excess of 2m over the 100 year period.

In effect, the approach taken at present to holding the line would require full encasement along the Patch frontage and the spit to be maintained as a fully artificial feature in the future. To adopt this as management practice and then to base the future management of all other issues associated with the use of the estuary would not be considered sensible nor sustainable (it is acknowledged that the ATFL Business Plan recognises this and the above baseline scenario is given purely to provide the baseline for further discussion within the SMP).

The approach above would, in theory, sustain the current general situation with respect to Poppit, but would result in a situation where there was increasing vulnerability to sudden change in future policy. There would still be an increasing risk of flooding behind the Poppit Dunes, and under this scenario this would be accepted as part of the use of the area.

The short section of defence to the road at the northern end of St Dogmaels would continue to be defended as part of the general Hold The Line policy for the western side of the upper estuary. This would maintain the access through to Poppit.

The policy at Cardigan would be for Hold The Line to both sides of the river. Technically, this policy is seen as being sustainable, even with increased SLR. The waterfront areas of Cardigan have been identified as being important aspects of developing the town. Despite this technical feasibility, funding for such works is likely to require joint funding over and above that provided for by grant in aid. The key issue would be the vulnerability of property behind the defences in areas such as the Strand and the Market, on the south bank. These areas are low enough that there would be substantial increased risk of tidal locking and increased risk to very extreme events causing high residual risk to life.

#### 4 Summary Comparison and Assessment of Baseline scenarios.

Table 1 compares the economic damages that might arise under the two baseline scenarios. Table 2 provides a summary comparison in terms of the overall objectives based on the key issues identified in the introduction to this Coastal Area.

Erosion damages and those associated with flooding are identified separately in Table 1. The aim of this table is to demonstrate the potential economic damage that might arise from either flooding or erosion. As such properties that might be lost in the future due to erosion are not discounted from the assessment of flooding. Similarly, properties whose value may have been written off due to regular flood damage are still included within the assessment of erosion. Such an approach is clearly not strictly in line with normal economic appraisal at strategy or scheme level. It is however, considered appropriate at the higher level of the SMP assessment where the essential aim is in identifying potential different forms of risk in assessing different scenarios. Where this is felt to disproportionately distort the economic assessment then this is identified in appendix H and the economic case adjusted accordingly.

The assessment of economic damage is made using a simplified Modelling Decision Support Framework (MDSF). In the case of erosion, this GIS based tool takes the predicted erosion distance for any section of the coast based on the assessment of erosion by the end of each epoch. It is then taken that there would be a linear erosion rate between these timelines (e.g. a property located midway between the epoch 1 timeline (20 years) and that for epoch 2 (50 years) would be taken as being lost in 35 years). Each property is defined by a single point rather than by its full footprint. No account is taken in the assessment of loss of access or loss of services, although this is discussed in the text where critical. The MDSF method then draws information from a property data base, providing general information with respect to that property. The value of the property is discounted in terms of when that property may be lost.

In the case of flooding, the open coast water levels are assessed against threshold levels for individual properties based again on the property point source data base. No detailed modelling has been undertaken to assess flow paths and or possible increase in water levels due to estuary processes. It is taken that, when a flood defence fails or is overtopped, the whole flood area behind a defence is open to flooding and that flooding would occur to the full extent of the potential flood plain, over a single high water period. Damages are assessed in relation to the depth of flooding that would occur based on the type of property identified in the data base. From this assessment of potential flood damage for any specific water level condition, annual average flood damages are determined during each epoch. An average annual average damage value is taken between the present (2010) and 50 years time (2060) and between 2060 and 2110. This average value is taken in determining an estimate of discounted Present Value (PV) Damages over the period of the SMP. This simplified approach allows consideration of flood risk under different sea level rise predictions for different scenarios.

**Table 1. Economic Assessment**

The following table provides a brief summary of erosion damages determined by the SMP2 MDSF analysis for the whole PDZ. Further details are provided in Appendix H. Where further, more detailed information is provided by studies, this is highlighted. The table aims to provide an initial high level assessment of potential damages occurring under the two baseline scenarios.

**ASSESSMENT OF EROSION DAMAGES**

Epoch	0 -20 year		20 – 50 years		50 – 100 years		50 – 100 years (2m SLR)		PV Damages (£x1000)			
	No. of properties:		Value x £k	No. of properties:		Value x £k	No. of properties					
Location	Res.	Com.		Res.	Com.		Res.	Com.	Res.	Com.		
Poppit Dunes	0	0	0	0	0	1	0	197	1	0	37	
Cardigan North	0	0	0	1	0	128	0	0	2	0	56	
<b>Total for PDZ1</b>										<b>93</b>		
With Present Management	No. of properties		Value x £k	No. of properties		Value x £k	No. of properties		Value x £k	No. of properties		PV Damages (£x1000)
	Res.	Com.		Res.	Com.		Res.	Com.		Res.	Com.	
Poppit Dunes	0	0	0	0	0	0	1	0	197	1	0	37
Cardigan North	0	0	0	0	0	0	0	0	0	0	0	
<b>Total for PDZ1</b>										<b>37</b>		
Notes: PVD determined for 1m SLR in 100 yrs.												
Other information:												

The following flood damages have been determined through use of MDSF. These figures are aimed to indicate the level and impact of flood risk rather than being a detailed economic appraisal. In many areas substantial numbers of properties would be liable to flooding on the more frequent events both under NAI and WPM, a nominal write off value has been allowed in the table for properties at frequent risk; this generally excludes values at risk at present on a 1:1 year event, in 50 years time for the 1:10 year event and in 100 year time the 1:50 year event.

#### ASSESSMENT OF POTENTIAL FLOOD RISK

No Active Intervention	Flood risk tidal 2010			Flood risk tidal 2060			Flood risk tidal 2110			tidal risk 2m SLR		PVD (£x1000)
	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		
	<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr	
<i>Location</i>												
Poppit Sands	2	0	8	2	2	88	2	0	106	2	0	1246
St Dogmaels	0	0	0	0	0	0	0	0	0	0	5	0
Bridgend	3	5	10	3	7	19	9	10	225	19	9	1040
East Cardigan	25	17	22	25	30	190	25	52	157	81	12	2533
West Cardigan	6	0	39	6	2	298	6	6	127	19	1	3700
Pen yr Ergyd	0	1	0.33	1	0	3	1	0	14	1	1	75
<b>Total for PDZ5</b>											8593	
With Present Management	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		PVD (£x1000)
<i>Location</i>	<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr	
Poppit Sands	0	2	8	1	1	88	2	0	76	2	4	1154
St Dogmaels	0	0	0	0	0	0	0	0	0	0	5	0
Bridgend	0	8	3	0	10	5	0	19	11	0	28	137
East Cardigan	0	42	6	0	55	10	0	77	18	0	93	251
West Cardigan	0	6	7	0	8	10	0	12	13	0	20	75
Pen yr Ergyd	0	1	0.33	1	0	3	1	0	14	1	1	75
<b>Total for PDZ5</b>											1870	

**Table 2. General Assessment of Objectives**

The following table provides an overall assessment of how the two baseline scenarios impact upon the overall objectives. Specific objectives are set out in more detail within Appendix E. The table aims to provide an initial high level assessment of the two baseline scenarios, highlighting potential issues of conflict. These issues are discussed in the following section, examining alternative management scenarios from which SMP2 policy is then derived.

STAKEHOLDER OBJECTIVE	NAI			WPM		
	Fails	Neutral	Acceptable	Fails	Neutral	Acceptable
Reduce risk to life.						
Protect properties from flood and erosion loss.						
Minimise the need for increasing effort and management of coastal defences.						
Avoid reliance on defence particularly where there is a risk of catastrophic failure.						
Maintain access to the communities and villages.						
Maintain recreational use of beaches.						
Maintain access to the coast including car parking and facilities.						
Maintain access for boat use and associated water sport activity.						
Maintain navigation and RNLI station within the Teifi.						
To maintain the important commercial, social and cultural centre of Cardigan.						
To support the opportunities for waterside development within Cardigan.						
Maintain character and integrity of coastal communities.						
To support the commercial fishing industries particularly within the Teifi.						
Maintain agricultural based communities.						
Identify risk and reduce risk of loss of heritage features where possible.						
Maintain historic landscape.						
Prevent disturbance or deterioration to historic sites and their setting.						
Maintain or enhance the condition or integrity of the international (SAC, SPA) designated sites and interest features within the context of a dynamic coastal system.						
Maintain or enhance the condition or integrity of the national (SSSI) designated sites and interest features within the context of a dynamic coastal system.						
Maintain and enhance educational and scientific understanding of geology and geomorphology.						

STAKEHOLDER OBJECTIVE	NAI			WPM		
	Fails	Neutral	Acceptable	Fails	Neutral	Acceptable
Avoid damage to and enhance the natural landscape.						
Maintain the human landscape and character of communities.						
Maintain transport route between Fishguard and Cardigan and gateway to West Wales.						

## 5 Discussion and Detailed Policy Development

On the open coast the policy under both baseline scenarios is the same, for No Active Intervention. There would be some risk to the access and use at Mwnt, but without very major works to stabilise the coastal slope this could not be avoided. The policy at Mwnt should be for No Active Intervention but recognising the need for managing the land use issues as a consequence.

The frontage from Cemaes Head through Cei-bach to Trwyn Careg-ddu was for continued intervention. It seems unlikely that, beyond supporting an intent to manage the jetty and the boat house, there would be justification for undertaking any substantial shoreline management works in the area. There might in the long term be issues associated with land instability, aggravated by erosion of the cliff; although there is no evidence recorded of this at present. Even so it would run counter to the objectives of maintain the important nature conservation values to undertake any major works to prevent this. The policy for the frontage, therefore, changes to one of No Active Intervention. This would not preclude specific works to maintain the jetty and boathouse subject to normal approvals.

The Afon Tiefi Fairways Ltd (ATFL) Business Plan, highlights the complexity of the management at the mouth of the inner estuary. Assessing the management approach of purely recharging the spit with dredgings shows this to be unsustainable and would require significant associated works in defending the Patch caravan park frontage. This is seen as significantly affecting the use and landscape of the area and is likely to result in loss of the very benefits upon which the caravan park are based. A Hold the Line policy for Pen-yr-Ergyd, merely by increasing existing defences, is not considered sustainable in the longer term. The same would apply to the Poppit dunes frontage and the area around the RNLI Station and the properties to the north. This is not to underestimate the important values of the community at Poppit, the importance of the RNLI Station and the fishing, boating and recreational activities in the area, or the important contribution the Patch caravan park makes to the local economy. These are identified both by ATFL and through consultation as being essential features of the area. The community involvement is equally seen as being an initial step to the necessary integrated plan for management of the area, alongside the management of the historic and nature conservation interest. This area is also seen as being an important part of the economic value of the whole area in terms of spatial planning with respect to sustaining the attractiveness and economic wellbeing of Cardigan.

However, the current management practice at the entrance to the estuary is little more, at present, than reactive response to a highly dynamic situation. Continuing such an approach is most likely to result in a policy of No Active Intervention as, one by one, the various uses and interests in the area become unsustainable. Even with the proposed practice of opportunistic recharge of the spit, the spit will breach; quite probably over the next decade. Attempts will be made to respond to this and this might be initially based on harder linear defence and increased dredging. However, as pressures grow, as a result of this, it is unlikely that such a response undertaken in an unplanned manner would be sustainable, either in terms of physical works or use.

It is seen as being inappropriate for the SMP to actually define the detailed approach to management, as this needs to be subject to more detailed analysis of the area. However, it is felt appropriate to significantly change the perspective from that of SMP1, to defining this whole area between Trwyn Careg-ddu and the start of the defences at the Patch, through to the area in front of the Webley and across to the sailing club as

one policy area. The policy most appropriate to this whole area is seen as being one of Managed Realignment, supporting the recognition that management of the area needs to be adjusted to the on-going changes in the behaviour of the estuary entrance. This does not imply a need to abandon all defences or the potential value in recharging the area of the spit. Rather, the policy highlights the need for a detailed reassessment of how this whole area is managed.

On the southern side, this should look to sustaining the RNLI Station and the community to the north but in a manner sympathetic to the natural function of the dunes. This is seen as sustainable and of value, regardless of management at the estuary mouth, but in detail as to how this would be delivered is very much dependent on how the estuary mouth is managed.

There would not be substantial improvement to flood defence behind Poppit Dunes and this would need to be managed through planning and adaptation of how the area is used. There would be no guarantee that defences to properties actually within the dunes would be protected and there would be a substantial risk that further defence would not be permitted as this could significantly impact on the way the estuary mouth develops and could have implications for management of other sections of the area. However, consideration of defence to these properties should be included in developing a detailed management plan.

The ATFL business plan document identifies important uses for the area, including the continued viability of the fishing fleet, moorings and recreational use of the estuary. These are seen as being important for development of the local area and sustaining tourism, which has broader implications for the region. During consultation on the Draft SMP, the importance of the Patch Caravan Park was also highlighted. The Park contains over 100 caravans, which add significantly to the overall use and value of the area.

All these features of the area need to be taken into account, while also recognising the important management of the SAC, management of the various SSSIs and the increasing pressure on existing management and defences as the estuary attempts to adapt.

It would be the intent to sustain the fishing community and the recreational boat use of the area, managing and responding to change in the future.

At present, the defence to the Patch Caravan Park does provide a relatively good defence, and also provides defence to the sewage outfall. However, if the spit does breach, as seems highly likely, this would immediately put pressure on the southern-most groyne. In the longer term, with sea level rise, holding the existing defence line to the Patch Caravan Park will become more difficult and the benefit in the significant increased investment in reinforcing this defence on its present alignment would be questionable.

This highlights the need to plan how the frontage is to be managed in the future, providing a framework within which shorter-term changes are managed. This needs to be planned in association with management of the entrance to the estuary. It needs to be developed in detail so that the interaction between the Patch frontage, the spit and the influence on Poppit is taken into account in an integrated manner. In the medium to long term, this could mean that some adjustment of the Patch Caravan Park frontage is probable. This may result in the loss of some, or potentially all, of the lower caravan

spaces to the area and this needs to be considered now, so as to allow time for such adaptation. It is considered that additional width and the ability to adjust use of this area could be critical to an overall managed realignment, in the future, to provide a longer term sustainable management of the frontage.

Various approaches could be taken. These might include allowing the frontage to move back or might involve management of the channel flow along the Patch frontage with the intent of restoring but controlling a more natural beach. Consideration would then be given to beneficial use of dredging in a more controlled manner. The area of moorings and fishing facility might also need to change. Without developing such a planned approach and without the possibility of joint funding, the default policy from the perspective of the SMP and flood and coast protection risk management would be for No Active Intervention.

It has been suggested, in response to the Draft SMP, that the whole area, covering Poppit and Pen yr Ergyd, should be further subdivided, particularly with reference to a Hold the Line policy for the existing defended sections. While maintaining existing defences might be accepted quite possibly over the next 20 years, defining a policy for Managed Realignment over the whole area highlights the broader interactions that have to be considered. It would not preclude maintaining existing defences but emphasises the need for this to be managed in a planned manner, looking beyond the next 20 years and therefore avoiding commitment to an unsustainable approach.

In terms of the defence along the Gwbert coastal road, it is considered sustainable to manage this area, balancing the need to improve the effectiveness of the defence against the need to maintain the ecological significance of the coastal slope. Alongside this, the intent would be to maintain the road along Coronation Drive. This is seen as being sustainable but would require an adaptive approach with regard to how the entrance was managed. Detailed management of this area would need to be adapted to changes in the estuary. There is the potential along this section to improve and encourage development of estuary fringe habitat and to allow this to develop in line with sea level rise. This may involve some intervention along the foreshore and that would also support defence of the frontage. The alternative of allowing the road to be lost would in effect result in loss of access to and, therefore, loss of properties on the slope behind. The benefit in terms of nature conservation in setting back the road would be minimal as there would be no significant width created and no reduction in the exposure of the frontage. This would also require construction of new defences. An adaptive approach to management of the defence would provide the same development of fringe habitat as would No Active Intervention.

In other areas of the inner estuary frontages, the policy would be for No Active Intervention, with the specific exception of the road frontage to the north end of St Dogmaels. Here the policy, with respect to the road, would be Hold The Line. This is seen as meeting the objective to maintain access to the rural communities towards Poppit. The road could be at greater risk of flooding and in addressing this it would be sensible to look at how local management would sustain the use of the landing stage and small recreational area and property to the south.

In the Cardigan area it is seen as being technically sustainable to maintain and improve defences along both sides of the river. There would be no environmental gain in opening up areas to natural flooding due to their long history of human use. However, flood risk management and planning control would be key considerations in future development of the area. This would include looking critically at the resilience of existing buildings and

recognition that there would be substantially greater risk from surface water flooding and extreme event flooding as sea level rises.

Upstream of the bridge on the north side the key asset is the main road. This could be protected locally. To the south side the developing management approach is for realignment. From a flood management perspective there would be no intent to sustain defences. Management is driven by adaptation of habitat.

The increased risk as a result of sea level rise needs to be considered further upstream as far as Llechryd. Direct sea level flooding is not seen as affecting property but this would increase tidal locking and therefore be a significant factor in management of fluvial flooding.

## 6 Management Summary.

The intent of the plan over the open coast is to allow natural behaviour of the coast. There would be a need for management within the Teifi. The management approach of the entrance to the Teifi is not felt to benefit from being overly divided as in SMP1 and there is uncertainty as to the detailed management of this area, which needs to be addressed below policy level. The Zone is divided in to four Management Areas and policy is summarised below.

### M.A.8 CARDIGAN CLIFFS WEST: From Pen-y-Bal to Cemaes Head.

Policy Unit		Policy Plan			
		2025	2055	2105	Comment
5.1	Pen-y-Bal to Cemaes Head	NAI	NAI	NAI	
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

### M.A.9 TEIFI ESTUARY: From Cemaes Head to Gwbert and through to north St Dogmaels.

Policy Unit		Policy Plan			
		2025	2055	2105	Comment
5.2	Cemaes Head to Trwyn Carreg-ddu	NAI	NAI	NAI	This would not preclude local management of the jetty at Penrhyn Castle subject to normal approvals.
5.3	Poppit Dunes and Pen-yr-Ergyd	MR	MR	MR	Requirement for a detailed integrated management plan. Default policy of NAI
5.4	Inner Estuary west	NAI	NAI	NAI	
5.5	St Dogmaels north	HTL	HTL	HTL	With the intent to maintain access road.
5.6	Bryn-y-mor	NAI	NAI	NAI	
5.7	Coronation Drive	HTL	HTL	MR	Adaptive approach to support fringe habitat development
5.8	Gwbert Road	HTL	HTL	HTL	
5.9	Gwbert Cliffs	NAI	NAI	NAI	
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

**M.A.10 CARDIGAN:** From St Dogmaels to Cardigan.

Policy Unit		Policy Plan			
		2025	2055	2105	Comment
5.10	St Dogmaels and Castle Farm	NAI	NAI	NAI	
5.11	Cardigan North	HTL	HTL	HTL	Requirement for planning control and consideration of flood risk issues in redevelopment of the area.
5.12	Cardigan South	HTL	HTL	HTL	Requirement for planning control and consideration of flood risk issues in redevelopment of the area.
5.13	Upstream of By-Pass bridge north	MR	MR	MR	Improve defence to the road set back from the estuary
5.14	Upstream of By-Pass bridge south	MR	MR	MR	Subject to nature conservation interest
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

**M.A.11 MWNT AND ABERPORTH CLIFFS:** From Cardigan Island to Pencribach

Policy Unit		Policy Plan			
		2025	2055	2105	Comment
5.15	Mwnt and Aberporth Cliffs	NAI	NAI	NAI	Adaptive management of access and facilities at Mwnt.
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

**PDZ5**  
**Management Area Statements**

**Cardigan Cliffs West**  
*Pen y Bal to Cemaes Head*

**Teifi Estuary**  
*Cemaes Head to Gwbert and through to North St Dogmaels*

**Cardigan**  
*St Dogmaels to Cardigan*

**Mwnt and Aberporth Cliffs**  
*Cardigan Island to Pencribach*

<b>Location reference:</b>	<b>Cardigan Cliffs West</b>
<b>Management Area reference:</b>	<b>M.A. 8</b>
<b>Policy Development Zone:</b>	PDZ5

\* Note: Predicted shoreline mapping is based on a combination of monitoring data, analysis of historical maps and geomorphological assessment with allowance for sea level rise. Due to inherent uncertainties in predicting future change, these predictions are necessarily indicative. For use beyond the purpose of the shoreline management plan, reference should be made to the baseline data.

The following descriptions are provided to assist interpretation of the map shown overleaf.

**100 year shoreline position:**

The following maps aim to summarise the anticipated position of the shoreline in 100 years under the two scenarios of “With Present Management” and under the “Draft Preferred Policy” being put forward through the Shoreline Management Plan.

-  In some areas the preferred policy does not change from that under the existing management approach. In some areas where there are hard defences this can be accurately identified. In other areas there is greater uncertainty. Even so, where the shoreline is likely to be quite clearly defined by a change such as the crest of a cliff the estimated position is shown as a single line.
- Where there is a difference between With Present Management and the Draft Preferred Policy this distinction is made in showing two different lines:

-  With Present Management.
-  Draft Preferred Policy.

**Flood Risk Zones**



General Flood Risk Zones. The explanation of these zones is provided on the Environment Agency’s web site [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk). The maps within this Draft SMP document show where SMP policy might influence the management of flood risk.



Indicate areas where the intent of the SMP draft policy is to continue to manage this risk.



Indicate where over the 100 years the policy would allow increased risk of flooding.

The maps should be read in conjunction with the text within the Draft SMP document.

**Shoreline Management Plan Sub Cell 10  
Baseline Location Map  
Management Area 8**

- Management Area
- Policy Unit
- Policy Development Zone
- Scheduled Monument



<p><b>Key</b></p> <p>100 Year Shoreline Position:</p> <ul style="list-style-type: none"> <li><span style="color: red;">—</span> Preferred Policy would be the same as With Present Management</li> <li><span style="color: orange;">—</span> With Present Management where this differs from the Preferred Policy</li> <li><span style="color: purple;">—</span> Preferred Policy where this differs from the With Present Management</li> </ul>	<ul style="list-style-type: none"> <li><span style="border: 1px solid orange; display: inline-block; width: 15px; height: 10px;"></span> Ramsar</li> <li><span style="border: 1px solid green; display: inline-block; width: 15px; height: 10px;"></span> SAC</li> <li><span style="border: 1px solid blue; display: inline-block; width: 15px; height: 10px;"></span> SPA</li> <li><span style="border: 1px solid pink; display: inline-block; width: 15px; height: 10px;"></span> SSSI</li> <li><span style="border: 1px solid lightgreen; display: inline-block; width: 15px; height: 10px;"></span> NNR</li> </ul>	<ul style="list-style-type: none"> <li><span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> Existing Indicative EA Flood Zone 3</li> <li><span style="background-color: lightblue; border: 1px dashed black; display: inline-block; width: 15px; height: 10px;"></span> EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding</li> </ul>
		<p style="font-size: small; margin: 0;">I:\9T001\Technical_Data\GIS\Projects\SMP_Report_Figures\Management_Areas</p>

## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

The intent of the plan is to allow the natural development of the shoreline. There are only very local areas of defence associated with minor roads and the coastal footpath. Maintenance of such defences would not impact on the broader intent of No Active Intervention. It is the aim of the plan that there would be no increase in defence in the area. In this way the natural function of the coast is maintained. There are two promontory forts within the area of historic significance. The intent of the plan would not be to protect these from erosion and necessary measures would need to be put in place for historic recording.

### KEY ISSUES/RISK AND UNCERTAINTY:

The generally slow rates of erosion associated with the frontage would continue and any uncertainty is most unlikely to influence the choice of management in the area.

### ACTIONS:

ACTION	PARTNERS
Shoreline monitoring associated with footpath management.	PNP
Assess in detail potential impact on historic environment	
Plan relocation of coastal path	PNP

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

Policy Unit		Policy Plan			
		2025	2055	2105	Comment
5.1	Pen-y-Bal to Cemaes Head	NAI	NAI	NAI	.
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

PREFERRED POLICY TO IMPLEMENT PLAN:	
<b>From present day</b>	Maintain natural function of the coast.
<b>Medium term</b>	Maintain natural function of the coast
<b>Long term</b>	Maintain natural function of the coast

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

In SMP 1 there was a policy for selectively holding the line at Ceibwr Bay, due to the road. While locally defences might be retained, the overall plan for the area changes to No Active intervention.

### ECONOMIC SUMMARY

Economics (£k PV)	by 2025	by 2055	by 2105	Total £k PV
NAI Damages	0.0	0.0	0.0	0.0
Preferred Plan Damages	0.0	0.0	0.0	0.0
Benefits	0.0	0.0	0.0	0.0
Costs	0.0	0.0	0.0	0.0

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

There is no property identified at risk from erosion or flooding.

#### BENEFITS OF THE PLAN

The plan allows the natural function of the coast supporting nature conservation and landscape values.

**SUMMARY OF STRATEGIC ENVIRONMENTAL ASSESSMENT (INCLUDING HRA)**

PDZ 5				
SEA Objective	Impact of Preferred Policy for each Epoch			
	1	2	3	Mitigation
<b>Policy Units 5.1 to 5.15</b>				
To support natural processes, maintain and enhance the integrity of internationally designated nature conservation sites. Maintain / achieve favourable condition of their interest features (habitats and species).				
To avoid adverse impacts on, conserve and where practical enhance the designated interest of nationally designated nature conservation sites. Maintain/achieve favourable condition.				
To avoid adverse impacts on, conserve and where practical enhance national and local BAP habitats.				Habitat creation
To support natural processes and maintain geological exposures throughout nationally designated geological sites.				
To conserve and enhance nationally designated landscapes in relation to risks from coastal flooding and erosion and avoid conflict with AONB and National Park Management Plan Objectives.				Appropriate design
To minimise coastal flood and erosion risk to scheduled and other internationally and nationally important cultural heritage assets, sites and their setting.				Excavation and recording
To minimise the impact of policies on marine operations and activities.				
To minimise coastal flood and erosion risk to critical infrastructure and maintain critical services.				
To minimise coastal flood and erosion risk to agricultural land and horticultural activities.				
To minimise coastal flood and erosion risk to people and residential property.				Relocation
To minimise coastal flood and erosion risk to key community, recreational and amenity facilities.				
To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.				

Mitigation associated with the impacted features of the historic environment may include excavation and recording and monitoring of erosion rates.

**This table provides a summary of the SEA (appendix E) and reference should be made to the Appendix for full details of the assessment.**

These next two sections provide a headline summary of the findings of the HRA (Appendix G) and the WFA (Appendix H). Reference should be made as appropriate to these Appendices for full details.

## HRA SUMMARY

The SMP policy in this PDZ provides a range of policies along the coastline including NAI, HTL and MR. PDZ 5 includes interest features of the Afon Teifi / River Teifi SAC and the Cardigan Bay / Bae Ceredigion SAC.

- 6.1 *Afon Teifi/ River Teifi SAC: no adverse effect on the integrity of the SAC.*
- 6.2 *Cardigan Bay/ Bae Ceredigion SAC: no adverse effect on the integrity of the SAC.*

## SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT

This area was scoped out of the assessment.

Water body (and relevant PDZ)	Environmental Objectives met?				WFD Summary Statement required?	Achievement of Any South East RBMP Mitigation Measures?	Details on how the specific South East RBMP Mitigation Measures have been attained (dark green = achieved; light green = partly achieved & red = not achieved)
	WFD 1	WFD2	WFD3	WFD4			
Cardigan Bay South (Coastal – C2)  (PDZs 3,4 and 5)  (MAN part 4, 5, 6, 7, 8, 9 and 10)	N/A	✓	✓	✓	No - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they are of benefit.	There were no relevant measures to the SMP2 for this water body.	N/A

<b>Location reference:</b>	<b>Teifi Estuary</b>
<b>Management Area reference:</b>	<b>M.A. 9</b>
<b>Policy Development Zone:</b>	<b>PDZ5</b>

\* Note: Predicted shoreline mapping is based on a combination of monitoring data, analysis of historical maps and geomorphological assessment with allowance for sea level rise. Due to inherent uncertainties in predicting future change, these predictions are necessarily indicative. For use beyond the purpose of the shoreline management plan, reference should be made to the baseline data.

The following descriptions are provided to assist interpretation of the map shown overleaf.

#### **100 year shoreline position:**

The following maps aim to summarise the anticipated position of the shoreline in 100 years under the two scenarios of “With Present Management” and under the “Draft Preferred Policy” being put forward through the Shoreline Management Plan.

-  In some areas the preferred policy does not change from that under the existing management approach. In some areas where there are hard defences this can be accurately identified. In other areas there is greater uncertainty. Even so, where the shoreline is likely to be quite clearly defined by a change such as the crest of a cliff the estimated position is shown as a single line.
- Where there is a difference between With Present Management and the Draft Preferred Policy this distinction is made in showing two different lines:

-  With Present Management.
-  Draft Preferred Policy.

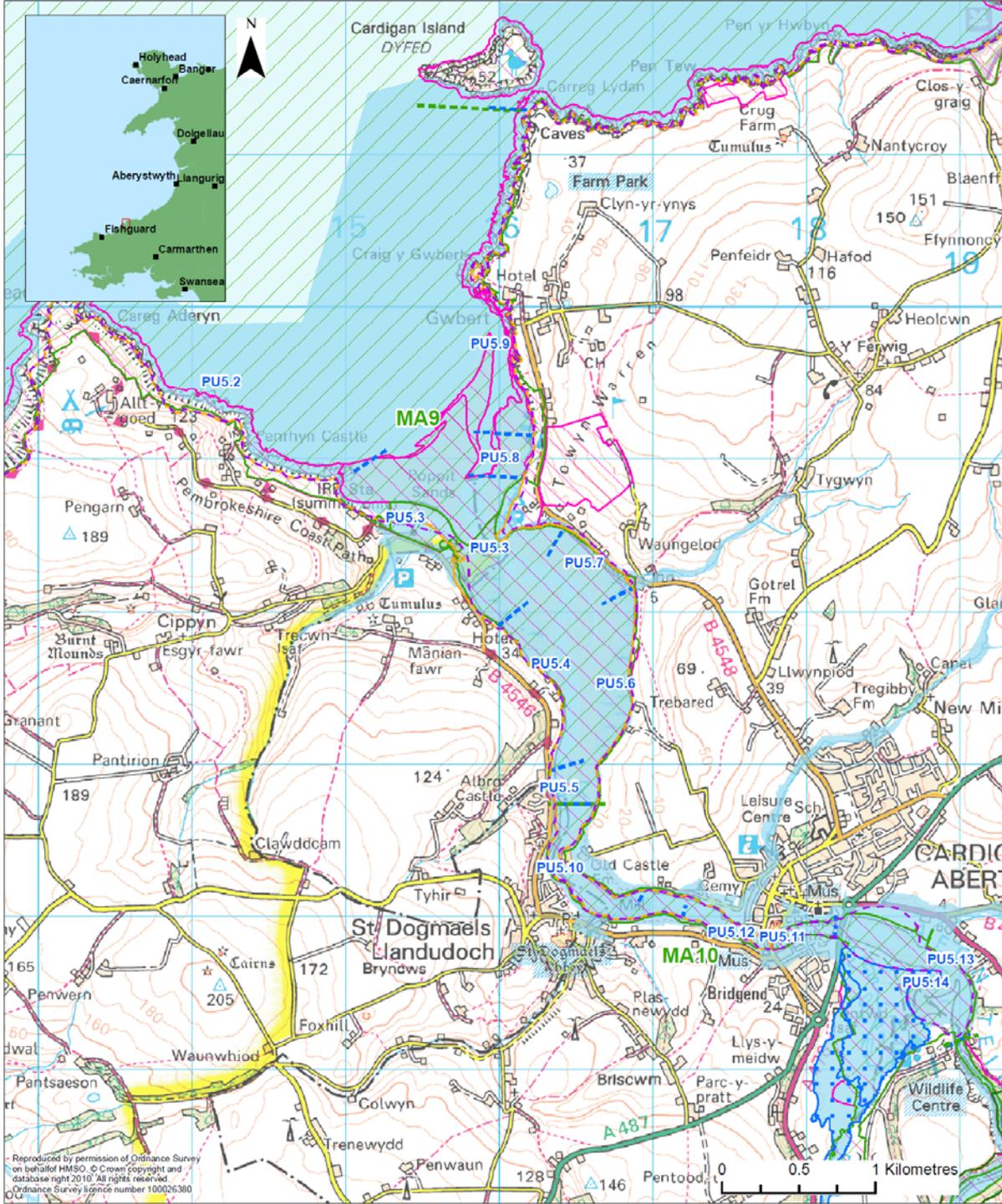
#### **Flood Risk Zones**

-  General Flood Risk Zones. The explanation of these zones is provided on the Environment Agency’s web site [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk). The maps within this Draft SMP document show where SMP policy might influence the management of flood risk.
-  Indicate areas where the intent of the SMP draft policy is to continue to manage this risk.
-  Indicate where over the 100 years the policy would allow increased risk of flooding.

The maps should be read in conjunction with the text within the Draft SMP document.

**Shoreline Management Plan Sub Cell 10**  
**Baseline Location Map**  
**Management Area 9 & 10**

- Management Area
- Policy Unit
- Policy Development Zone
- Scheduled Monument



Key	
<span style="color: red;">---</span> 100 Year Shoreline Position:	<span style="border: 1px solid orange; padding: 2px;"> </span> Ramsar
<span style="color: blue;">---</span> Preferred Policy would be the same as With Present Management	<span style="border: 1px solid green; padding: 2px;"> </span> SAC
<span style="color: orange;">---</span> With Present Management where this differs from the Preferred Policy	<span style="border: 1px solid blue; padding: 2px;"> </span> SPA
<span style="color: purple;">---</span> Preferred Policy where this differs from the With Present Management	<span style="border: 1px solid pink; padding: 2px;"> </span> SSSI
	<span style="border: 1px solid lightgreen; padding: 2px;"> </span> NNR
	<span style="background-color: lightblue; border: 1px solid blue; padding: 2px;"> </span> Existing Indicative EA Flood Zone 3
	<span style="background-color: lightblue; border: 1px dashed blue; padding: 2px;"> </span> EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding



## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

The aim of the plan is to manage the critical area at the entrance to the estuary in such a manner as to allow as far as possible the natural function of this area of the estuary. However, the estuary is important both as a natural resource and for its use. There are key interests, in terms of the fishing, boat activity and tourism features such as the caravan park and the facilities behind the Poppit Dunes, all of which are important to the local and regional economy. The area is recognised as being an important tourist resource and as a recreational area associated with Cardigan. The roads both on the west and east side of the estuary provide essential access to the Poppit and the properties out towards Cemaes Head and to Gwbert and properties along Coronation Drive.

Along the outer part of the estuary between Cemaes Head and Trwyn Carreg-Ddu, the intent would be to not intervene along the shoreline or build additional defences. This would not preclude maintenance to the boat house. The management of the area covering Poppit Dunes, The Webley Hotel and Pen yr Ergyd needs to be considered as a whole, with the intent to develop an integrated approach which sustains the various interests while not rigidly fixing the estuary entrance. This approach cannot be defined precisely by the SMP and requires a detailed management. However, in examining options, consideration needs to be given to adaptation of the existing approach to defence along the Pen yr Ergyd Spit and the Patch Caravan Park frontages. This may result in loss of land to the Caravan Park in the future, but would not preclude maintaining existing defences during epoch 1. This overall plan is needed urgently, as by default the spit will breach and the opportunity for an integrated approach could be lost. The aim would be to maintain the RNLI station.

The intent would be to continue to defend the Coronation Drive frontage but to look to how this could be achieved to support development of saltmarsh. Associated with this would be the continued defence of Coronation Drive along to Gwbert. The road at the northern end of St Dogmaels would similarly be defended. The approach in other areas of the estuary would be for no intervention.

### KEY ISSUES/RISK AND UNCERTAINTY:

Funding for management of the estuary entrance is unlikely to attract significant flood and coastal erosion risk grant. Alternative funding mechanisms would be required.

The future change within the estuary needs to be monitored and approaches to management need to be capable of adaption as further information on estuary response as a result of sea level rise is identified.

### ACTIONS:

ACTION	PARTNERS
Shoreline monitoring	CSC/PCC
Adaption planning for the entrance to the estuary.	ATFL CSC Communities PCC
	PCC Highways CCW

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

Policy Unit		Policy Plan			Comment
		2025	2055	2105	
5.2	Cemaes Head to Trwyn Carreg-Ddu	NAI	NAI	NAI	This would not preclude local management of the jetty at Penrhyn Castle subject to normal approvals.
5.3	Poppit Dunes and Pen-yr-Ergyd	MR	MR	MR	Requirement for a detailed integrated management plan. Default policy of NAI
5.4	Inner Estuary west	NAI	NAI	NAI	
5.5	St Dogmaels north	HTL	HTL	HTL	With the intent to maintain access road.
5.6	Bryn-y-mor	NAI	NAI	NAI	
5.7	Coronation Drive	HTL	HTL	MR	Adaptive approach to support fringe habitat development
5.8	Gwbert Road	HTL	HTL	HTL	
5.9	Gwbert Cliffs	NAI	NAI	NAI	
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

PREFERRED POLICY TO IMPLEMENT PLAN:	
<b>From present day</b>	Develop management plan and implement. Maintain defences to roads.
<b>Medium term</b>	Implement management plan. Maintain defences to roads.
<b>Long term</b>	Review and implement management plan. Maintain defences to roads.

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

The essential change in policy is in the intent to develop an integrated plan with respect to the entrance to the estuary. The policy of HTL at Pen yr Ergyd changes to MR as does the policy of Do Nothing at Poppit, reflecting the need for these areas to be considered together as part of a larger plan for the area. While the broader scale policy is therefore Managed Realignment, this does not necessarily imply that existing defences are realigned in the short term. The policy for North St Dogmaels also changes from Do Nothing to HTL reflecting the need to maintain access.

### ECONOMIC SUMMARY

Economics (£k PV)	by 2025	by 2055	by 2105	Total £k PV
NAI Damages	108.5	554.3	695.5	1,358.3
Preferred Plan Damages	108.5	288.2	371.2	767.9
Benefits	0.0	266.2	324.3	590.4
Costs	3.4	389.0	448.7	841.1

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

It is not possible to identify loss of property as this would depend on the local management plan. However, there is significant flood risk in the future to properties at Poppit and the possible loss of property within the Dunes. There may also be loss of areas of the Caravan Park in the future subject to development of a long term plan of management.

#### BENEFITS OF THE PLAN

The main benefit of the plan is both to maintain access to, and sustain the varied interests of, the estuary.

**SUMMARY OF STRATEGIC ENVIRONMENTAL ASSESSMENT (INCLUDING HRA)**

PDZ 5				
SEA Objective	Impact of Preferred Policy for each Epoch			
	1	2	3	Mitigation
<b>Policy Units 5.1 to 5.15</b>				
To support natural processes, maintain and enhance the integrity of internationally designated nature conservation sites. Maintain / achieve favourable condition of their interest features (habitats and species).				
To avoid adverse impacts on, conserve and where practical enhance the designated interest of nationally designated nature conservation sites. Maintain/achieve favourable condition.				
To avoid adverse impacts on, conserve and where practical enhance national and local BAP habitats.				Habitat creation
To support natural processes and maintain geological exposures throughout nationally designated geological sites.				
To conserve and enhance nationally designated landscapes in relation to risks from coastal flooding and erosion and avoid conflict with AONB and National Park Management Plan Objectives.				Appropriate design
To minimise coastal flood and erosion risk to scheduled and other internationally and nationally important cultural heritage assets, sites and their setting.				Excavation and recording
To minimise the impact of policies on marine operations and activities.				
To minimise coastal flood and erosion risk to critical infrastructure and maintain critical services.				
To minimise coastal flood and erosion risk to agricultural land and horticultural activities.				
To minimise coastal flood and erosion risk to people and residential property.				Relocation
To minimise coastal flood and erosion risk to key community, recreational and amenity facilities.				
To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.				

Mitigation associated with the impacted features of the historic environment may include excavation and recording and monitoring of erosion rates.

**This table provides a summary of the SEA (appendix E) and reference should be made to the Appendix for full details of the assessment.**

These next two sections provide a headline summary of the findings of the HRA (Appendix G) and the WFA (Appendix H). Reference should be made as appropriate to these Appendices for full details.

#### HRA SUMMARY

The SMP policy in this PDZ provides a range of policies along the coastline including NAI, HTL and MR. PDZ 5 includes interest features of the Afon Teifi / River Teifi SAC and the Cardigan Bay / Bae Ceredigion SAC.

**6.3** *Afon Teifi/ River Teifi SAC: no adverse effect on the integrity of the SAC.*

**6.4** *Cardigan Bay/ Bae Ceredigion SAC: no adverse effect on the integrity of the SAC.*

## SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT

This area was scoped out of the assessment.

Water body (and relevant PDZ)	Environmental Objectives met?				WFD Summary Statement required?	Achievement of Any South East RBMP Mitigation Measures?	Details on how the specific South East RBMP Mitigation Measures have been attained (dark green = achieved; light green = partly achieved & red = not achieved)
	WFD 1	WFD2	WFD3	WFD4			
Cardigan Bay South (Coastal – C2)  (PDZs 3,4 and 5)  (MAN part 4, 5, 6, 7, 8, 9 and 10)	N/A	✓	✓	✓	No - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they are of benefit.	There were no relevant measures to the SMP2 for this water body.	N/A
Teifi (Transitional – T4)  (PDZ part 5)  (MAN 9 and 10)	N/A	✓	✓	✓	No - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they are of benefit.	There were no relevant measures to the SMP2 for this water body.	N/A

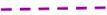
<b>Location reference:</b>	<b>Cardigan</b>
<b>Management Area reference:</b>	<b>M.A. 10</b>
<b>Policy Development Zone:</b>	PDZ5

\* Note: Predicted shoreline mapping is based on a combination of monitoring data, analysis of historical maps and geomorphological assessment with allowance for sea level rise. Due to inherent uncertainties in predicting future change, these predictions are necessarily indicative. For use beyond the purpose of the shoreline management plan, reference should be made to the baseline data.

The following descriptions are provided to assist interpretation of the map shown overleaf.

### 100 year shoreline position:

The following maps aim to summarise the anticipated position of the shoreline in 100 years under the two scenarios of "With Present Management" and under the "Draft Preferred Policy" being put forward through the Shoreline Management Plan.

-  In some areas the preferred policy does not change from that under the existing management approach. In some areas where there are hard defences this can be accurately identified. In other areas there is greater uncertainty. Even so, where the shoreline is likely to be quite clearly defined by a change such as the crest of a cliff the estimated position is shown as a single line.
- Where there is a difference between With Present Management and the Draft Preferred Policy this distinction is made in showing two different lines:

-  With Present Management.
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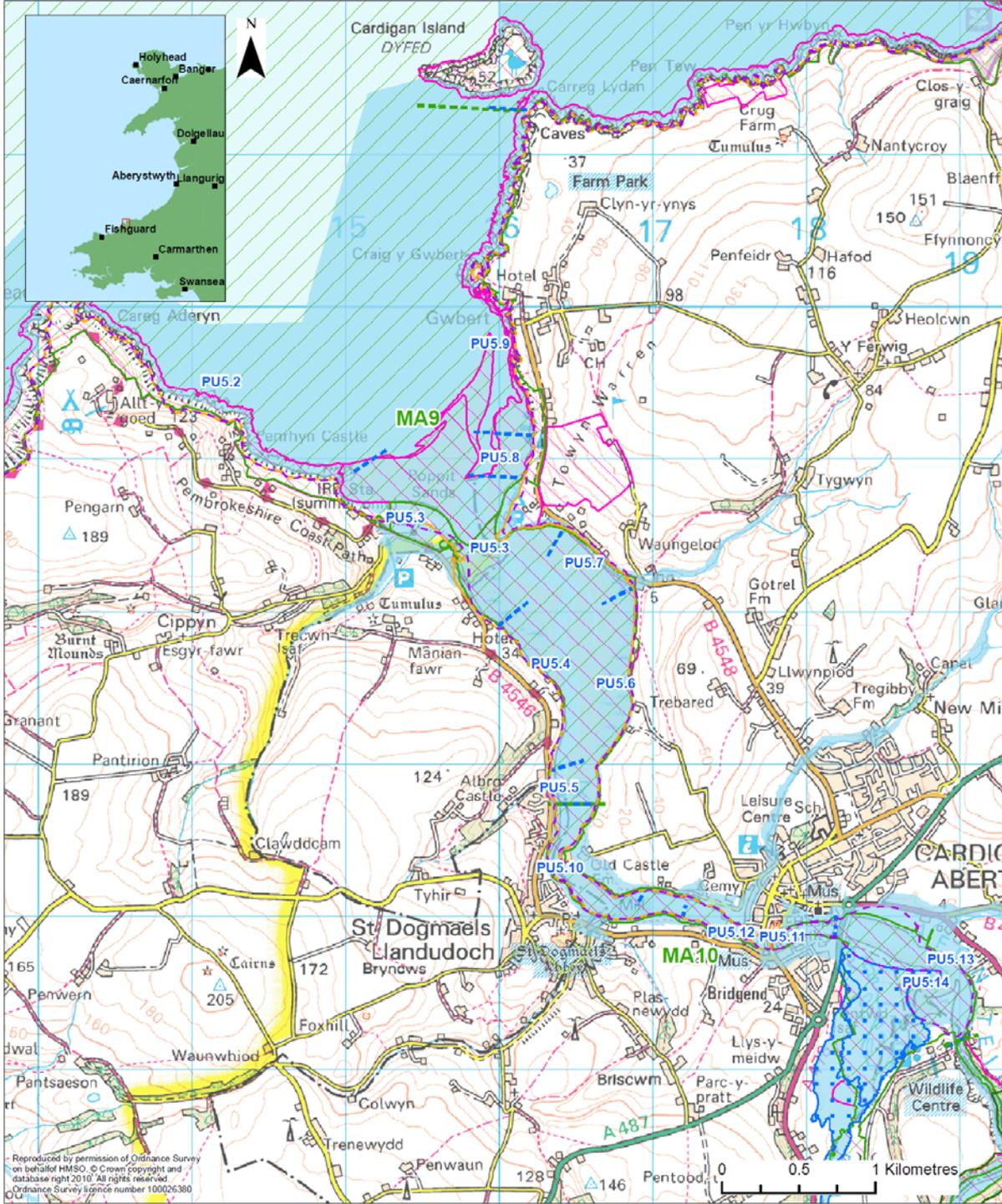
### Flood Risk Zones

-  General Flood Risk Zones. The explanation of these zones is provided on the Environment Agency's web site [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk). The maps within this Draft SMP document show where SMP policy might influence the management of flood risk.
-  Indicate areas where the intent of the SMP draft policy is to continue to manage this risk.
-  Indicate where over the 100 years the policy would allow increased risk of flooding.

The maps should be read in conjunction with the text within the Draft SMP document.

**Shoreline Management Plan Sub Cell 10**  
**Baseline Location Map**  
**Management Area 9 & 10**

- Management Area
- Policy Unit
- Policy Development Zone
- Scheduled Monument



Key		100 Year Shoreline Position:	
<span style="color: magenta;">—</span>	Preferred Policy would be the same as With Present Management	<span style="border: 1px solid orange; display: inline-block; width: 15px; height: 10px;"></span>	Ramsar
<span style="color: orange;">—</span>	With Present Management where this differs from the Preferred Policy	<span style="border: 1px solid green; display: inline-block; width: 15px; height: 10px;"></span>	SAC
<span style="color: purple;">—</span>	Preferred Policy where this differs from the With Present Management	<span style="border: 1px solid blue; display: inline-block; width: 15px; height: 10px;"></span>	SPA
		<span style="border: 1px solid magenta; display: inline-block; width: 15px; height: 10px;"></span>	SSSI
		<span style="border: 1px solid green; display: inline-block; width: 15px; height: 10px;"></span>	NNR
		<span style="background-color: lightblue; border: 1px solid blue; display: inline-block; width: 15px; height: 10px;"></span>	Existing Indicative EA Flood Zone 3
		<span style="background-color: lightblue; border: 1px dashed blue; display: inline-block; width: 15px; height: 10px;"></span>	EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding



## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

The principle area of concern is Cardigan. The estuary downstream would be encouraged to function naturally, while immediately upstream of Cardigan beyond the main road bridge, would undergo managed realignment. This would provide opportunity for sustainable habitat creation. The road on the northern side through to Llechryd would be defended but on a set back line of defence.

Within the main areas of Cardigan the intent of management would be to improve defences to the town. On both the south and the north there are areas of flood risk and this risk would increase with sea level rise. Along the northern bank the intent is to improve both the appearance and use of the defence area, but with the caveat that planning needs to take account of the increasing flood risk to the lower part of the town. Along the southern frontage, while the intent is to maintain the defences, any opportunity to realign defences or to allow more natural function of the estuary and channel should be considered in an integrated manner with spatial planning of the area.

### KEY ISSUES/RISK AND UNCERTAINTY:

There are uncertainties in terms of timing of change in flood risk are uncertain. There is also a need for a detailed planned response to this risk, particularly in considering new development. It will be important to relate this to national monitoring of sea level rise and more general climate change.

The SMP identifies significant risk management benefit in maintaining and improving defences. Even so, as been shown from recent works to the frontage, there may be opportunity for amenity benefit in addition purely to the flood defence function. As such it could be anticipated that alternative funding sources may be aligned with those of flood defence.

### ACTIONS:

ACTION	PARTNERS	
Plan adaption upstream of the road bridge	<b>CSC</b>	<b>CCW</b>
Opportunity planning for defence along the north bank.	<b>CSC</b> <b>Communities</b>	<b>Highways</b>
Spatial planning and planning control input to future development of low lying areas.	<b>CSC</b>	

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

Policy Unit		Policy Plan			Comment
		2025	2055	2105	
5.10	St Dogmaels and Castle Farm	NAI	NAI	NAI	
5.11	Cardigan North	HTL	HTL	HTL	Requirement for planning control and consideration of flood risk issues in redevelopment of the area.
5.12	Cardigan South	HTL	HTL	HTL	Requirement for planning control and consideration of flood risk issues in redevelopment of the area.
5.13	Upstream of By-Pass bridge north	MR	MR	MR	Improve defence to the road set back from the estuary
5.14	Upstream of By-Pass bridge south	MR	MR	MR	Subject to nature conservation interest
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

PREFERRED POLICY TO IMPLEMENT PLAN:	
<b>From present day</b>	Maintain existing defences. Plan for adaption of area upstream of the road bridge.
<b>Medium term</b>	Maintain and improve defence to north and south Cardigan.
<b>Long term</b>	Maintain defences.

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

There is no significant change from present management.

### ECONOMIC SUMMARY

<b>Economics (£k PV)</b>	<b>by 2025</b>	<b>by 2055</b>	<b>by 2105</b>	<b>Total £k PV</b>
NAI Damages	881.7	3,270.3	3,177.9	7,329.9
Preferred Plan Damages	198.3	228.9	213.7	640.9
Benefits	683.3	3,041.4	2,964.3	6,689.0
Costs	995.9	38.1	684.5	1,718.4

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

Key damages are with respect to residual flooding in excess of design standards of defence.

#### BENEFITS OF THE PLAN

The plan provides a longer term sustainable defence to Cardigan. Some 77 properties are identified within the flood risk area, 25 of these within an area of flood risk of 1:10 years or greater. The plan aims to reduce this risk to these properties.

**SUMMARY OF STRATEGIC ENVIRONMENTAL ASSESSMENT (INCLUDING HRA)**

PDZ 5				
SEA Objective	Impact of Preferred Policy for each Epoch			
	1	2	3	Mitigation
<b>Policy Units 5.1 to 5.15</b>				
To support natural processes, maintain and enhance the integrity of internationally designated nature conservation sites. Maintain / achieve favourable condition of their interest features (habitats and species).				
To avoid adverse impacts on, conserve and where practical enhance the designated interest of nationally designated nature conservation sites. Maintain/achieve favourable condition.				
To avoid adverse impacts on, conserve and where practical enhance national and local BAP habitats.				Habitat creation
To support natural processes and maintain geological exposures throughout nationally designated geological sites.				
To conserve and enhance nationally designated landscapes in relation to risks from coastal flooding and erosion and avoid conflict with AONB and National Park Management Plan Objectives.				Appropriate design
To minimise coastal flood and erosion risk to scheduled and other internationally and nationally important cultural heritage assets, sites and their setting.				Excavation and recording
To minimise the impact of policies on marine operations and activities.				
To minimise coastal flood and erosion risk to critical infrastructure and maintain critical services.				
To minimise coastal flood and erosion risk to agricultural land and horticultural activities.				
To minimise coastal flood and erosion risk to people and residential property.				Relocation
To minimise coastal flood and erosion risk to key community, recreational and amenity facilities.				
To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.				

Mitigation associated with the impacted features of the historic environment may include excavation and recording and monitoring of erosion rates.

**This table provides a summary of the SEA (appendix E) and reference should be made to the Appendix for full details of the assessment.**

These next two sections provide a headline summary of the findings of the HRA (Appendix G) and the WFA (Appendix H). Reference should be made as appropriate to these Appendices for full details.

#### **HRA SUMMARY**

The SMP policy in this PDZ provides a range of policies along the coastline including NAI, HTL and MR. PDZ 5 includes interest features of the Afon Teifi / River Teifi SAC and the Cardigan Bay / Bae Ceredigion SAC.

**6.5** *Afon Teifi/ River Teifi SAC: no adverse effect on the integrity of the SAC.*

**6.6** *Cardigan Bay/ Bae Ceredigion SAC: no adverse effect on the integrity of the SAC.*

## SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT

This area was scoped out of the assessment.

Water body (and relevant PDZ)	Environmental Objectives met?				WFD Summary Statement required?	Achievement of Any South East RBMP Mitigation Measures?	Details on how the specific South East RBMP Mitigation Measures have been attained (dark green = achieved; light green = partly achieved & red = not achieved)
	WFD 1	WFD2	WFD3	WFD4			
Cardigan Bay South (Coastal – C2)  (PDZs 3,4 and 5)  (MAN part 4, 5, 6, 7, 8, 9 and 10)	N/A	✓	✓	✓	No - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they are of benefit.	There were no relevant measures to the SMP2 for this water body.	N/A
Teifi (Transitional – T4)  (PDZ part 5)  (MAN 9 and 10)	N/A	✓	✓	✓	No - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they are of benefit.	There were no relevant measures to the SMP2 for this water body.	N/A

<b>Location reference:</b>	<b>Mwnt and Aberporth Cliffs</b>
<b>Management Area reference:</b>	<b>M.A. 11</b>
<b>Policy Development Zone:</b>	<b>PDZ5</b>

\* Note: Predicted shoreline mapping is based on a combination of monitoring data, analysis of historical maps and geomorphological assessment with allowance for sea level rise. Due to inherent uncertainties in predicting future change, these predictions are necessarily indicative. For use beyond the purpose of the shoreline management plan, reference should be made to the baseline data.

The following descriptions are provided to assist interpretation of the map shown overleaf.

**100 year shoreline position:**

The following maps aim to summarise the anticipated position of the shoreline in 100 years under the two scenarios of “With Present Management” and under the “Draft Preferred Policy” being put forward through the Shoreline Management Plan.

-  In some areas the preferred policy does not change from that under the existing management approach. In some areas where there are hard defences this can be accurately identified. In other areas there is greater uncertainty. Even so, where the shoreline is likely to be quite clearly defined by a change such as the crest of a cliff the estimated position is shown as a single line.
- Where there is a difference between With Present Management and the Draft Preferred Policy this distinction is made in showing two different lines:

-  With Present Management.
-  Draft Preferred Policy.

**Flood Risk Zones**

-  General Flood Risk Zones. The explanation of these zones is provided on the Environment Agency’s web site [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk). The maps within this Draft SMP document show where SMP policy might influence the management of flood risk.
-  Indicate areas where the intent of the SMP draft policy is to continue to manage this risk.
-  Indicate where over the 100 years the policy would allow increased risk of flooding.

The maps should be read in conjunction with the text within the Draft SMP document.

**Shoreline Management Plan Sub Cell 10  
Baseline Location Map  
Management Area 11**

- Management Area
- Policy Unit
- Policy Development Zone
- Scheduled Monument



Key	
<span style="border-bottom: 1px dashed orange; width: 20px; display: inline-block;"></span> 100 Year Shoreline Position:	<span style="border: 1px solid orange; width: 15px; height: 10px; display: inline-block;"></span> Ramsar
<span style="border-bottom: 1px dashed blue; width: 20px; display: inline-block;"></span> Preferred Policy would be the same as With Present Management	<span style="border: 1px solid green; width: 15px; height: 10px; display: inline-block;"></span> SAC
<span style="border-bottom: 1px solid blue; width: 20px; display: inline-block;"></span> With Present Management where this differs from the Preferred Policy	<span style="border: 1px solid blue; width: 15px; height: 10px; display: inline-block;"></span> SPA
<span style="border-bottom: 1px solid purple; width: 20px; display: inline-block;"></span> Preferred Policy where this differs from the With Present Management	<span style="border: 1px solid pink; width: 15px; height: 10px; display: inline-block;"></span> SSSI
	<span style="border: 1px solid green; width: 15px; height: 10px; display: inline-block;"></span> NNR
	<span style="background-color: #add8e6; width: 15px; height: 10px; display: inline-block;"></span> Existing Indicative EA Flood Zone 3
	<span style="background-color: #add8e6; border: 1px dotted blue; width: 15px; height: 10px; display: inline-block;"></span> EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding



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## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

The intent of the plan is to allow the natural development of the shoreline. This will increase the long term risk at the car park and access at Mwnt. The plan would not preclude maintaining the stepped access to the beach or the subsequent need to replace this access.

### KEY ISSUES/RISK AND UNCERTAINTY:

There are uncertainties in terms of timing loss to the area both due to uncertainty of cliff behaviour and as a result of sea level rise. Monitoring by inspection and by air photography is recommended to provide better information in addressing these uncertainties. It will be important to relate this to national monitoring of sea level rise and more general climate change.

### ACTIONS:

ACTION	PARTNERS
Shoreline monitoring	<b>CSC</b>
Adaption planning for loss of car park and parts of the access road.	<b>CSC</b> <b>NT</b> <b>Highways</b>
Assess in detail potential impact on historic environment	

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

Policy Unit		Policy Plan			
		2025	2055	2105	Comment
5.15	Mwnt and Aberporth Cliffs	NAI	NAI	NAI	Adaptive management of access and facilities at Mwnt.
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

PREFERRED POLICY TO IMPLEMENT PLAN:	
<b>From present day</b>	No Active Intervention
<b>Medium term</b>	Develop plan for relocation of car park and access.
<b>Long term</b>	No Active Intervention.

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

There is no change from present management.

### ECONOMIC SUMMARY

Economics (£k PV)	by 2025	by 2055	by 2105	Total £k PV
NAI Damages	0.0	0.0	0.0	0.0
Preferred Plan Damages	0.0	0.0	0.0	0.0
Benefits	0.0	0.0	0.0	0.0
Costs	0.0	0.0	0.0	0.0

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

There will be loss of the car park and potentially the access road.

#### BENEFITS OF THE PLAN

The plan maintains the important natural qualities of the coast, supporting nature conservation and tourism.

**SUMMARY OF STRATEGIC ENVIRONMENTAL ASSESSMENT (INCLUDING HRA)**

PDZ 5				
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To minimise coastal flood and erosion risk to scheduled and other internationally and nationally important cultural heritage assets, sites and their setting.				Excavation and recording
To minimise the impact of policies on marine operations and activities.				
To minimise coastal flood and erosion risk to critical infrastructure and maintain critical services.				
To minimise coastal flood and erosion risk to agricultural land and horticultural activities.				
To minimise coastal flood and erosion risk to people and residential property.				Relocation
To minimise coastal flood and erosion risk to key community, recreational and amenity facilities.				
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- 6.7** *Afon Teifi/ River Teifi SAC: no adverse effect on the integrity of the SAC.*
- 6.8** *Cardigan Bay/ Bae Ceredigion SAC: no adverse effect on the integrity of the SAC.*

### SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT

This area was scoped out of the assessment.

Water body (and relevant PDZ)	Environmental Objectives met?				WFD Summary Statement required?	Achievement of Any South East RBMP Mitigation Measures?	Details on how the specific South East RBMP Mitigation Measures have been attained (dark green = achieved; light green = partly achieved & red = not achieved)
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