

Loughor Estuary (12)



Recommendations:

Long Term Plan

The Loughor Estuary (Burry Inlet) is a large shallow estuary of international environmental importance. The upper estuary is dominated by low-lying marshland backed by rising agricultural land. The outer estuary and middle estuary are characterised by an extensive inter-tidal area along the sheltered southern shore and industrial and residential development on the low-lying northern shore, both of which are vulnerable to future changes in the alignment of low water channels within the estuary. The preferred plan is to continue to manage the risk of coastal erosion and flooding to the main residential communities (at Crofty, Penclawdd, Loughor, Llanelli, Burry Port and Pembrey) and industrial assets at Llanelli through maintenance and upgrading of existing defences, subject to the future availability of public funding for coastal erosion and risk management. The risk of coastal erosion and flooding to railway infrastructure will continue to be monitored and suitable mitigation measures will be developed and implemented as required, which may include construction of defences along currently undefended sections of shore, subject to obtaining the necessary consents, licences and approvals.

In order to maintain the significant biological and environmental interest within the estuary, undeveloped areas (where there are few assets at risk and defences have not been constructed) will be allowed to continue to develop and evolve naturally to conserve these features.

Location (Policy Unit)		Preferred SMP2 policy and proposed approach to implementing the Plan		
		0-20 years	20-50 years	50-100 years
12.1	Whiteford Point to Llanrhidian Marsh	The policy is to allow natural evolution of the estuary to continue along this largely undeveloped frontage through no active intervention , to maintain landscape and environmental features of this shoreline.		
12.2	Crofty to Penclawdd	In order to manage the risk of flooding and erosion to Crofty and Penclawdd, the long term policy is to hold the line through maintaining and upgrading existing defences, subject to the outcome of an ongoing EAW tidal flood risk assessment and the future availability of public funding for coastal erosion and risk management.		
12.3	Gowerton (Dan-y-lan to Island Bridge)	The policy is to allow inter-tidal areas to continue to evolve naturally through no active intervention . However, the risk of coastal erosion and flooding to the locally important North Gower access route, B4295, would be monitored and if necessary, secondary defences could be constructed inshore of the inter-tidal areas to manage the risk of coastal erosion and flooding to the road, subject to obtaining the necessary consents, licences and approvals.		
12.4	Loughor (Island Bridge to Bwchymyndd)	Residential properties and associated infrastructure within Loughor and railway infrastructure are the main assets at risk from coastal erosion and flooding along this frontage. Therefore the policy is to hold the line . This will involve maintenance and upgrading of existing defences, subject to the future availability of public funding for coastal erosion and risk management. This may involve the construction of new defences to continue to manage the risk to Loughor and railway infrastructure, subject to obtaining the necessary consents, licences and approvals. Under this policy it is assumed that the railway and A484 road bridges across the estuary and associated infrastructure will be maintained.		
12.5	River Loughor East Bank (Bwchymyndd to NTL, south of Pontardulais)	The policy is to allow natural estuary evolution to continue along this largely undeveloped frontage through no active intervention . Under this policy it is assumed that the railway and M4 road bridges across the estuary and associated infrastructure will be maintained.		
12.6	River Loughor West Bank (NTL, south of Pontardulais to Loughor Bridge)	<p>The policy is to allow natural estuary evolution to continue through no active intervention, although continue to manage flood and erosion risk to critical assets, in particular railway infrastructure, Llangennech and Bynea sewage works and Bynea industrial estate. Llangennech sewage works may require relocation or adaptation/resilience measures, due to its location on the edge of low-lying saltmarsh, which may become inundated as sea level rises.</p> <p>There is both a recent and long-term history of flooding to the village of Llangennech. Flooding can emanate from a number of sources, in particular the sea, the Afon Marlais and the Afon Mwrwg. EAW is undertaking a full topographic survey of the area during 2010, which will lead to the production of a hydraulic model in 2011/2012. This in turn will lead to a greater understanding of the risk and the interaction between the flooding sources, and hence to the most efficient way of managing that risk.</p> <p>EAW has identified a flood route from the tide via the right bank of the lower Loughor Estuary, at Glynea. There is a risk to approximately 60 properties, a mix of residential and commercial in the village of Bynea. An existing access track, which acts as a tidal defence, will be bolstered in order to raise the standard of protection to the village. Funding has been approved and the construction works are programmed to take place during the 2010/11 financial year.</p> <p>Under this policy it is assumed that the railway, A484 and M4 road bridges across the estuary and associated infrastructure will be maintained.</p>		
12.7	Morfa Bacas (Loughor Bridge to Wildfowl and Wetlands Centre)	Existing defences will be maintained through a policy of hold the line to manage risk of flooding and erosion. Future options for the Millennium Coastal Path will be considered.	The medium and long term policy is managed realignment by setting back existing defences to allow the frontage to evolve naturally with minimum intervention, whilst continuing to manage the risk of coastal erosion and flooding to built assets on low-lying land inshore including railway infrastructure. It is recommended that the Millennium Coastal Path is realigned inshore along this frontage.	
12.8	Wildfowl and Wetlands Centre to Penrhyn Gwyn	Maintain and upgrade existing set back defences, through a policy of hold the line to continue to manage the risk of coastal erosion and flooding to the extensive developed low-lying hinterland of Llanelli (which includes residential properties, industrial development, potentially contaminated land and associated infrastructure), subject to the future availability of public funding for coastal erosion and flood risk management. This policy should enable the fronting saltmarsh to develop naturally to a point and will manage the risk of erosion and release of potentially contaminated material into the estuary.		
12.9	Machynys (Penrhyn	Maintain and upgrade existing defences under a policy of hold the line , subject to the future availability of public		

	Gwyn) to the northern end of Llanelli Beach	funding for coastal erosion and flood risk management. The policy will continue to manage the risk of coastal erosion and flooding to the extensive developed low-lying hinterland of Llanelli and Machynys, which includes residential properties, industrial development, potentially contaminated land and associated infrastructure. This policy will manage the risk of erosion and release of potentially contaminated material into the estuary.	
12.10	Pwll railway frontage (Llanelli Beach to Tywyn Bâch)	The policy is to hold the line by maintaining and upgrading existing defences in order to continue managing the risk of coastal erosion and flooding to railway infrastructure, subject to the future availability of funding. Due to the proximity of a low water channel immediately adjacent to the existing defences, the defences are likely to come under increasing pressure as sea level rises and therefore it is likely that they will need to be upgraded and improved in the short term (<20 years). It is assumed that these defences would also manage the risk of coastal erosion and flooding to assets in the low-lying hinterland, including residential properties and the A484 road.	
12.11	Burry Port east (Tywyn Bâch to the slipway)	Continue to manage the risk of coastal erosion and flooding by maintaining and upgrading existing defences, subject to the future availability of public funding for coastal erosion and flood risk management, under a policy of hold the line . Although there are limited socio-economic assets at risk (an industrial estate, local access road and railway infrastructure - which is some distance inshore), there is a risk of coastal erosion to a potentially contaminated area and the Millennium Coastal Path.	
12.12	Burry Port west (the slipway to Burry Port Marina)	Continue to manage the risk of coastal erosion and flooding by maintaining and upgrading existing defences, subject to the future availability of public funding for coastal erosion and flood risk management, under a policy of hold the line . Structures associated with the marina are not covered by the SMP since their maintenance is the responsibility of the port authority and they are not covered by public funding of coastal erosion and flood risk management. However since they provide a coastal defence function it has been assumed that they would continue to be maintained in order to ensure the continued operation of the marina.	
12.13	Burry Port Marina to The Nose	The short term policy is to hold the line to manage the risk of coastal erosion and flooding by maintaining existing defences, whilst the potential for realignment of the Millennium Coastal Path is investigated.	The medium and long term policy is to enable the dune system to function naturally with minimum interference, but allow localised dune management to manage the risk of a breach and enable relocation of the Millennium Coastal Path, through managed realignment . This would not, however, preclude the right of landowners to privately maintain or improve existing defences at the golf course or to fund construction of new defences, subject to obtaining necessary consents, licences and approvals. However, the future requirement for defences along this frontage is likely to reduce, should the current trend for accretion continue, as The Nose extends further eastward into the estuary.

A review of the impacts of the preferred SMP2 policies on coastal evolution and behaviour is provided in Appendix E: Policy Development and Appraisal, Section E1.3.

Policy sensitivities and key uncertainties (further detail is included in Appendix K)

All policy units – there is significant uncertainty with regard to how the estuary will evolve in the future, particularly in response to future sea level rise. Monitoring of future response is therefore highly recommended.

Policy units 12.1, 12.8 and 12.9 – these units are considered to be of low sensitivity and therefore unlikely to change.

Policy unit 12.2 – there are limited assets at risk at the villages of Crofty and Penclawdd, whilst defence length is long in relation to the number of residential properties/ people and associated infrastructure at risk, therefore this policy is sensitive to the future availability of public funding for coastal erosion and flood risk management.

Policy units 12.3 and 12.5 – there are limited socio-economic assets at risk and therefore a key driver is to allow the estuary to continue to evolve as naturally as possible, with minimal intervention. However, subject to the results of monitoring, mitigation measures/ localised lengths of defence may be required in future to manage the risk of coastal erosion and flooding to key assets.

Policy units 12.4, 12.6, 12.7 and 12.10 – railway infrastructure is a key policy driver along these frontages and therefore this policy is dependent upon the future plans, and availability of funding for maintenance/ improvement of defences adjacent to the Swansea – Llanelli – Carmarthen – Pembroke Dock railway line. However along the majority of these frontages there are sufficient assets at risk from coastal erosion and flooding, even without the railway line, to justify a policy of hold the line, subject to the future availability of public funding for coastal erosion and flood risk management.

Policy unit 12.11 – the potential contamination risk is a key driver along this frontage. However, it is possible that decontamination could cost less than defence and should be investigated further.

Policy unit 12.12 – this policy is sensitive to the future management strategy for Burry Port marina. It has been assumed that the harbour structure would be maintained, which is the responsibility of the marina operating authority. Should the future management strategy for the marina change, it would be necessary to manage the risk of coastal erosion and flooding to low-lying residential and commercial developments and other defence options would need to be considered.

Policy unit 12.13 – policy is dependent on the importance of retaining the Millennium Coastal Path. Should the situation change with regard to this path, the short term policy option may change.

Changes from present management / SMP1 policy¹

The majority of policies remain unchanged from either the present management or SMP1 policy. The key differences are:

Policy units 12.5 and 12.6 – SMP1 did not consider areas upstream of the A484 Loughor road and railway bridges.

Policy unit 12.7 – the SMP1 policy was hold the line throughout, which would lead to coastal squeeze of environmentally important intertidal areas. The recommended policy is managed realignment, to enable the construction of set back defences, which will manage the risk of coastal erosion and flooding to the low-lying hinterland, whilst enabling roll-back of the inter-tidal area.

¹ The SMP1 documents should be referred to for more details as unit boundaries do not always align with SMP2 policy units and the policies refer to different time periods.

Loughor Estuary (12) (this is a summary of impacts, for full details see Appendix G SEA Report)	
Issue	Appraisal
Receptor: Property, population and human health Larger settlements along this frontage include: Gowerton, Loughor, Llanelli and Burry Port, a number of villages: Crofty, Penclawdd, Llangennech, Pwll and Pembrey and other small settlements and isolated properties. The shoreline of the estuary comprises a mixture of defended/ developed and undefended/ developed frontages.	
Will SMP policy maintain coastal settlements and manage the impact of coastal flood and erosion?	<ul style="list-style-type: none"> + The risk of coastal erosion and flooding to key communities would be managed by maintaining and upgrading existing defences, subject to the future availability of public funding for coastal erosion and flood risk management. EAW is currently undertaking flood risk assessments at Crofty, Penclawdd and Llangennech. - Various isolated properties may be at increased risk of coastal erosion and flooding, subject to future estuary evolution and response to sea level rise.
Will SMP policy directly increase the actual or potential coastal erosion or flood risk to communities?	+ Within the estuary the risk of coastal erosion and flooding to communities would be managed through maintenance and upgrading of existing defences, subject to the future availability of public funding for coastal erosion and flood risk management. Typically, currently undefended frontages will be allowed to evolve naturally.
Is SMP policy sufficiently flexible to take account of dynamic coastal change?	+ Along undeveloped frontages within the estuary, the policy is no active intervention to enable dynamic coastal change. Elsewhere existing defences will be maintained, and possibly improved, to manage the risk of coastal erosion and flooding to developed areas. Defences are either set-back from fringing saltmarshes and mudflats (at the Wildfowl and Wetlands Centre), adjacent to exposed coasts which do not sustain this type of habitat (between Machynys, Llanelli and Burry Port), or will not result in significant loss of intertidal habitat - along the south shore natural ground levels inshore rise steeply which will not enable natural roll-back of the intertidal zone (Crofty and Penclawdd). Therefore natural coastal change would not be significantly affected.
Could there be a detrimental impact on the fabric of coastal communities?	<ul style="list-style-type: none"> + Along most of this shoreline, there will be no significant impact on the major coastal communities within the Loughor Estuary (Loughor, Llanelli and Burry Port) since existing defences will be maintained and upgraded to maintain a suitable standard of protection in response to future climate change, subject to the future availability of public funding for coastal erosion and flood risk management. - If insufficient public funding is available then at smaller settlements, due to the limited socio-economic value of assets at risk, existing defences may be maintained but not upgraded which will manage the risk of coastal erosion, whilst the risk of flooding will increase over time. This may have wider scale impacts in terms of obtaining property insurance, property value depreciation and future investment.
Receptor: Land use, infrastructure and material assets Along with the various coastal communities, there are industrial areas in Llanelli, including Bynea industrial estate and Trostre steel works and at Burry Port. The railway is of strategic importance and runs adjacent to the north shore of the outer and middle estuary and the west shore of the inner estuary, crossing the estuary south of the M4 road bridge and south of the Loughor A484 road bridge. There are also a number of sewage works adjacent to the shore.	
Will SMP policy maintain key industrial, commercial and economic assets and manage the impact of coastal flooding and erosion?	+ The risk of coastal erosion and flooding to many key assets would be managed through maintenance and upgrading of existing defences. Bynea industrial estate, just north of the Loughor Bridge, may be at risk dependent on estuary response to sea level rise, but the policy allows for defences to be implemented if necessary, subject to obtaining necessary consents, licences and approvals.
Will the SMP policy ensure critical services and infrastructure remain operational, for as long as required?	<ul style="list-style-type: none"> - A number of sewage works will be at risk from coastal erosion and flooding as a result of future climate change, therefore relocation or adaptation/ resilience measures may be required. Risk would be dependent on location and estuary response to sea level rise, although Llangennech sewage works appears to be at greatest risk due to its location on the seaward edge of the marshland. + The risk of coastal erosion and flooding to railway infrastructure would be monitored and managed to ensure that services remain operational. This will include maintenance and upgrading of existing defences and is likely to include construction of defences in currently undefended areas, subject to obtaining the necessary consents, licences and approvals. It is assumed that the Loughor road and railway bridge, and the M4 road bridge and the railway bridge to the south and associated infrastructure, would continue to be maintained in order to retain key transport links. - There is risk of coastal erosion and flooding to local access roads, including the B4295 running along the shoreline between Crofty, Penclawdd and Gowerton and a number of other minor roads. Risk to the B4295 would be such that periodic closure may be required

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	during extreme storm/ tidal events. However the risk is dependent on future sea level rise and estuary response.
Will there be an impact on marine operations and activities?	+ It is assumed that Burry Port marina would remain operational, which will require the continued maintenance and improvement of breakwaters and associated structures and maintenance dredging of the approach channel.
Will SMP policy impact coastal flooding or erosion on agricultural activities?	- Small areas of agricultural land will be subject to increasing flood and erosion risk, particularly north of the A484 Loughor road bridge. However, risk will be dependent on the estuary response to future sea level rise, and changes in the alignment of the low water channel.
Will the SMP policy ensure that MoD (Qinetiq) ranges remain operational?	x There are no MoD (Qinetiq) assets along this shoreline.
Receptor: Amenity and recreational use The Loughor Estuary is not a significant area for tourism and amenity. However, towns such as Llanelli and Burry Port contain recreational and amenity facilities. The Llanelli Millennium Coastal Park extends from Bynea near the A484 Loughor road bridge to Pembrey, and offers a traffic-free cycle/footpath, the National Wetlands Centre Wales, Machynys championship links golf course, Llanelli Beach, the Discovery Centre, Millennium Quay and Burry Port marina.	
Could the SMP policy have an impact on tourism in the area?	+ The risk of coastal erosion and flooding to the majority of amenity, tourist and recreational facilities at Llanelli and Burry Port would continue to be managed by maintenance and upgrading of existing defences, subject to the future availability of public funding for coastal erosion and flood risk management. - A short section of the Millennium Coastal Path at Morfa Bacas is at risk from coastal erosion and flooding in its present alignment, managed realignment in the medium and long term will provide an opportunity for realigning the path along a more sustainable route inshore to enable roll-back of intertidal habitats.
Will SMP policy affect coastal access along, or to, the coast?	- No significant risk to the vast majority of coastal access along this frontage. There is a risk to a short section of the Millennium Coastal Path at Morfa Bacas, which will be realigned inshore in the medium to long term.
Receptor: Historic environment There are a range of Scheduled Monuments adjacent to the estuary including Penclawdd Sea Dock and Canal, Llandeilo Castle Mound, Site of St Teilo's Old Parish Church and Hendy Castle Mound and Earthwork. Locally important archaeology includes military features, Edwardian rifle range, 18th/19th century Llangennech marshes with industrial remains, prehistoric peat deposits and a submerged forest.	
Will SMP policy maintain the fabric and setting of key historic listed buildings, cultural heritage assets and conservation areas?	- Risk to archaeological and historic assets in intertidal areas, including Penclawdd Sea Dock and Canal which is seaward of existing defences. Scheduled Monuments situated within the upper reaches of the estuary, including Llandeilo Castle Mound and Hendy Castle Mound are at risk from coastal erosion and flooding, although this risk is subject to future sea level rise and future estuary evolution. + The risk of coastal erosion and flooding to listed buildings within Penclawdd, Llanelli and Burry Port would be managed through maintenance and upgrading of existing defences.
Will the SMP provide sustainable protection of archaeological and palaeo-environmental features or ensure adequate time for monitoring, assessment and mitigation measures to be devised in response to ongoing and future erosion.	● Along currently undefended/ undeveloped lengths of shore there is no intention to provide new defences, since this is unsustainable and there is limited socio-economic justification. Where appropriate undertake monitoring, development and assessment of alternative options and implementation of preferred mitigation measures, subject to future climate change impacts and estuary evolution.
Receptor: Landscape character and visual amenity There are no specific landscape designations along this frontage. The southern bank of the middle and inner estuary and the upper estuary are generally undeveloped and characterised by extensive saltmarshes, whilst the northern bank of the middle and inner estuary is more developed and industrial in nature.	
Will SMP policy maintain a range of key natural, cultural and social features critical to the integrity of the coastal landscape?	● For much of this shoreline there is no proposed change from existing policy, therefore minimal change to the landscape, particularly in the short term.
Could SMP policy lead to the introduction of features which could be unsympathetic to the character of the landscape?	+ There is generally no intention to introduce defences. Any defences constructed to manage the risk of coastal erosion or flooding to the railway would be linear defences adjacent to the railway line itself and thus are not considered to adversely affect the landscape. Managed realignment of defences at Morfa Bacas offers an opportunity for redevelopment of this section of the Millennium Coastal Park.
Receptor: Biodiversity, flora and fauna Burry Inlet is a designated SPA, Ramsar and SSSI, and the foreshore and intertidal areas throughout are part of the Carmarthen Bay and Estuaries SAC, Special Protection Areas (SPA) and Ramsar Site.	
Will SMP policy enable a sustainable approach to habitat management?	+ There are no new defences proposed in currently undefended areas, therefore this is considered a sustainable approach to natural evolution of the coastline and its habitats.
Will SMP policy maintain or enhance any international, national or local sites of natural conservation interest?	+ Managed realignment of defences at Morfa Bacas will locally improve saltmarsh habitats. ● Natural intertidal narrowing may lead to a reduction in intertidal habitat and therefore reduced habitat for wading birds. This will

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Issue	Appraisal
	depend upon the rate of future sea level rise.
Will SMP policy <u>accelerate</u> intertidal narrowing (coastal squeeze) and will this affect designated habitats?	<ul style="list-style-type: none"> - There may be intertidal narrowing, i.e. coastal squeeze, along currently defended/ developed frontages, although this is partially dependent on low water channel migration and estuary response to future sea level rise. + Undertaking managed realignment at Morfa Bacas will locally allow natural retreat of the saltmarsh and may slow narrowing in this location.
Will there be a net loss of BAP habitat within the SMP timespan as a result of SMP policy?	<ul style="list-style-type: none"> + Extension of intertidal habitat at Llanrhidian due to natural evolution of the shoreline. This would occur in the short, medium and long term. + Build up of existing saltmarsh along the northern and southern banks of the Loughor Estuary in the short, medium and long term. + Extension of blue mussel beds as coastline is allowed to naturally evolve. Extension of the beds would occur in the short, medium and long term. - Intertidal habitat at Crofty would be lost due to the provision of defences. This would occur in the short, medium and long term. - Peat exposures with no piddock evidence would be lost in the short, medium and long term. • Loss of intertidal habitat at Burry Port in the short term however, there would be an opportunity for the habitat to occur again in the medium and long term due to realignment of defences.
Receptor: Earth heritage, soils and geology	
Bury Inlet is designated SPA, Ramsar and SSSI, and the foreshore and intertidal areas throughout are part of the Carmarthen Bay and Estuaries SAC, Special Protection Areas (SPA) and Ramsar Site.	
Does SMP policy work with natural processes and enhance or maintain natural features?	<ul style="list-style-type: none"> • The preferred SMP policy is no active intervention along undeveloped sections of the shore to enable natural coastal/ estuarine processes to continue. However, in developed areas the intent to maintain/ upgrade existing defences will restrict natural processes to some extent.
Will SMP policy maintain or enhance the visibility of coastal geological exposures, where designated?	<ul style="list-style-type: none"> - Designated features are typically in the intertidal zone and therefore seaward of existing defences. However, as sea level rises, fixed defences may lead to coastal squeeze, narrowing of saltmarshes and other features.
Receptor: Water	
There are numerous coastal, freshwater, transitional (areas of water near river mouths, which are partially saltwater but are influenced by freshwater) and groundwater bodies in the SMP2 area that have the potential to be affected by SMP2 policies.	
Will SMP policy manage the risk of pollution from contaminated sources?	<ul style="list-style-type: none"> + Maintaining existing defences west of Tywyn Bach will manage the risk of erosion of potentially contaminated material from the hinterland.
Will SMP policy adversely affect water bodies in the coastal zone?	<ul style="list-style-type: none"> • The southern and eastern Loughor Outer and Loughor water bodies will both experience largely natural coastal processes as a result of the combined NAI and MR policies along the majority. WFD objectives will not be affected. - HTL is proposed for much of the northern Loughor Outer and Loughor water bodies. Adverse effects on biological quality elements are anticipated because this will exacerbate the risk of erosion in particular where the low-water channel lies close to the shore. This extensive saltmarsh area represents the largest area of continuous saltmarsh in Wales. There is a risk of failing WFD objectives. + The northern Loughor Outer and Loughor water bodies will experience some localised improvement in biological quality elements where MR is proposed at Morfa Bacas (PU12.7) and west of Burry Port marina (PU12.13), which would allow the development of further saltmarsh and dune wetland habitats, respectively. This will support WFD objectives. • The Carmarthen Carboniferous Coal Measures groundwater body and large number of river water bodies will be unaffected.

Impact colour key	+ Positive	• Neutral	- Negative	x Not applicable
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Loughor Estuary (12)						
ACTION PLAN						
Action	Action Ref	Policy Unit	Action Description (to be approved)	Potential source for funding (subject to approval)	Responsibility Lead partner * (supporting partners)	When by (subject to funding)
1. Studies for Scenario Area	1.1	All	Undertake study to investigate the future evolution of Carmarthen Bay and adjacent estuaries including the Loughor Estuary to confirm impacts of future climate change on estuary development and the dune systems and the potential impacts of the continued degradation of the navigation channel training walls. This will require the collection of data relating to bathymetric change, wind and wave regime, tidal regime, rainfall, river discharge, sediment sources, transport pathways and sediment fluxes in the long term since there is currently a lack of such data to enable a full understanding of the interactions between physical processes and coastal morphological change.	WAG	Coastal Group (Wales Coastal Monitoring Centre)	0 to 100 years
	1.2	All	Install, maintain and operate tide gauge in the Loughor Estuary to provide local reference to enable monitoring of future sea level rise in Carmarthen Bay. Currently there are tide gauges at Swansea and Milford Haven linked with the British Oceanographic Data Centre as required.	WAG	Coastal Group (Wales Coastal Monitoring Centre)	0 to 100 years
	1.3	All	Ensure that any future management plans for the Loughor Estuary (Burry Inlet) training walls are monitored and used to inform and, where appropriate, update the SMP.	WAG	Coastal Group	Ongoing
2. Studies for Policy Units	2.1	12.2, 12.4 to 12.12	Undertake a scoping assessment to identify when a feasibility study of the upgrading/improvement options to existing defences needs to be carried out and/or identify the criteria/factors that would trigger this feasibility study. The timing of this feasibility study will be influenced by factors such as existing frequency of flooding, type of receptors at risk, depths and velocity of flooding and residual asset life. Consider alternative funding options where it is not possible to justify public investment in coastal erosion and flood risk management.	WAG	CCS & EAW (12.2), CCS (12.4 and 12.5), CCC (12.6 to 12.12) (Network Rail (12.6 and 12.10))	0 to 20 years
	2.2	12.2	Develop a Flood Consequences Assessment for Penclawdd to consider the risk of flooding from sources other than tidal, such as surface water and ground water and develop options to reduce this risk.	WAG	City and County of Swansea (Environment Agency Wales)	0 to 20 years
	2.3	12.6	Engage with and encourage Dŵr Cymru Welsh Water to identify the existing and future risk of coastal erosion and flooding to Llangennech sewage treatment works to inform the development of a management plan, taking into consideration future climate change (sea level rise) and potential alternative flood mitigation/ protection/ resilience and adaptation measures.	Dŵr Cymru Welsh Water	Dŵr Cymru Welsh Water	0 to 5 years
	2.4	12.7 to 12.13	Undertake a study into the nature of the potentially contaminated land between Llanelli and Burry Port	WAG	CCC (EAW)	0 to 20 years
	2.5	12.7	Develop managed realignment scheme at Morfa Bacas	WAG	CCC (EAW)	0 to 20 years
	2.6	12.7 to 12.9	Undertake a Strategic Flood Consequences Assessment for Llanelli and Burry Port	WAG	CCC (EAW)	0 to 20 years
	2.7	12.10	Detailed inspection of the existing defences, in particular with respect to the proximity of the low water channel to the defence toe, and development of proposals to improve or upgrade the existing defences to reduce the risk of failure, coastal erosion and flooding of assets in the low-lying hinterland.	WAG	Network Rail (CCC/ EAW)	0 to 20 years
	2.8	12.12	Undertake modelling to investigate future development in bathymetry and the sand spit at the entrance to Burry Port marina to enable development and assessment of alternative options to maintain a navigable channel to the marina as part of the consideration of the future evolution of the Carmarthen Bay and the Loughor Estuary.	WAG	CCC (CCS)	0 to 20 years
	2.9	12.12	Ensure that any future management plans for Burry Port Harbour, including future maintenance dredging and proposals wrt extending the breakwater, are monitored and used to inform and, where appropriate, update the SMP.	WAG	CCC	Ongoing
	2.10	12.13	Develop managed realignment scheme between Burry Port Marina and the Nose	WAG	CCC (EAW)	0 to 20 years
3. Strategy						
4. Scheme work	4.1	12.2	Implement the recommendations of the EAW fluvial and tidal flood alleviation studies at Crofty and Penclawdd,	WAG	EAW (CCS)	0 to 20 years

			subject to the future availability of public funding for coastal erosion and risk management.			
	4.2	12.2	Implement surface water (and groundwater) flood risk management measures at Penclawdd, subject to the future availability of public funding for coastal erosion and risk management.	WAG	CCS (EAW)	0 to 20 years
	4.3	12.6	Implement the recommendations of the EAW study at Llangennech, subject to the future availability of public funding for coastal erosion and risk management.	WAG	EAW (Dŵr Cymru Welsh Water and Network Rail)	0 to 20 years
5. Monitoring (data collection)	5.1	All	Undertake beach and coastal defence asset monitoring to inform further studies and future SMP reviews. In particular rates of dune erosion should be monitored. This information should not only be used in future coastal management, but also to assist in stakeholder liaison by use of data in public education campaigns.	WAG	CCS/ CCC (Wales Coastal Monitoring Centre)	0 to 100 years
	5.2	All	Continue with existing beach profile monitoring programme and provide information to Wales Coastal Monitoring Centre for storage and analysis. Use beach profile data to identify the future risk of undermining and overtopping of existing defences.	WAG	Coastal Group (Wales Coastal Monitoring Centre)	0 to 100 years
	5.3	All	Undertake periodic defence inspection, including condition assessment and photographs. Confirm defence crest levels.	WAG	CCS/ CCC (Wales Coastal Monitoring Centre)	0 to 100 years
	5.4	All	Undertake further studies, and associated modelling, to better understand sediment regimes in the SMP area and inform future coastal management. Undertake monitoring of current velocities within the estuary.	WAG	Coastal Group	0 to 20 years
	5.5	All	Undertake annual LIDAR survey and vertical aerial photography of the entire estuarine system (undertaken as quickly as possible during a single period of low spring tides) to provide a consistent data set for a particular date (which can be effectively compared to subsequent data sets) to enable efficient monitoring of variations in the alignment of low water channels, sand banks, intertidal mudflats and saltmarshes. Link with regular bathymetric surveys, in particular of the offshore areas of Carmarthen Bay and Three Rivers estuarine complex.	WAG	Coastal Group (Wales Coastal Monitoring Centre)	0 to 20 years
	5.6	All	Extend monitoring programmes up to NTL, south of Penclawdd.	WAG	Coastal Group (Wales Coastal Monitoring Centre)	0 to 20 years
	5.7	12.1 to 12.3	Monitor the risk of flooding to the local important 295 North Tower Road.	WAG	EAW	0 to 20 years
	5.8	12.4 to 12.13	Continued regular monitoring of the risk of coastal erosion and flooding to railway infrastructure, which may require mitigation measures to be developed, assessed and implemented (subject to obtaining necessary consents, licences and approvals).	Network Rail	Network Rail	0 to 20 years
	5.9	All	Monitor risk to the coastal station and investigate potential re-routing of the path where appropriate.	WAG	CCS/ CCC	Ongoing
6. Asset management	6.1	All	Ensure that extents of public and privately owned defences are defined and mapped to inform future management decisions.	WAG	CCS/ CCC (Wales Coastal Monitoring Centre)	0 to 20 years
	6.2	All	Undertake an appraisal of asset inspection and beach profile monitoring data to assess the existing and future risk of undermining and overtopping of existing structures.	WAG	CCS/ CCC (Wales Coastal Monitoring Centre)	0 to 20 years
7. Communication	7.1	All	Undertake consultation with the local community, key stakeholders and general public during the development of suitable mitigation measures and whenever appropriate to ensure an acceptable approach is developed and adopted.	WAG	CCS/ CCC and EAW	0 to 20 years
	7.2	All	Undertake monitoring and management of Action Plans to ensure SMP policies are put into practice.	WAG	Coastal Group	0 to 100 years
8. Interface with planning and land management	8.1	All	Continue with risk-based improvements to flood risk maps to provide an appraisal of likely future projected sea level rise.	WAG	EAW	0 to 20 years
	8.2	All	Ensure SMP policies and flood and erosion risks are accounted for in the next revisions of land use plans in order to help manage residual risks from coastal erosion and flooding to inform future planning decisions.	WAG	CCS planning and CCC planning	0 to 20 years
9. Emergency response	9.1		Development, monitoring and review of emergency response plans to prepare for storm events which are likely to exceed existing defence standards of protection or lead to failure of existing defences (for example following	WAG	CCS and CCC	0 to 20 years

SUPERSEDED

Contact SCBOEG for current action plan

			breach or overtopping).			
10. Adaptation / resilience			-			
11. Flood forecasting and warning	11.1	All	Continue with risk-based improvements to flood risk maps and inundation modelling to provide improved flood warning service.	WAG	EAW	0 to 20 years
12. Habitat creation and environmental mitigation	12.1	All	Welsh Assembly Government instructed Environment Agency Wales to scope out the scale of potential coastal habitat gains and losses for Wales. The scoping exercise was completed in February 2011 and identified potential options for implementation of a National Habitat Creation Programme for Wales. How this programme is to be delivered and funded has yet to be decided.	WAG	TBC	Ongoing
* Note: It is recommended that the lead partner/s investigate the potential for local partnerships and alternative sources of funding.						

