



West of Wales Shoreline Management Plan 2

Section 4. Coastal Area F

November 2011

Final

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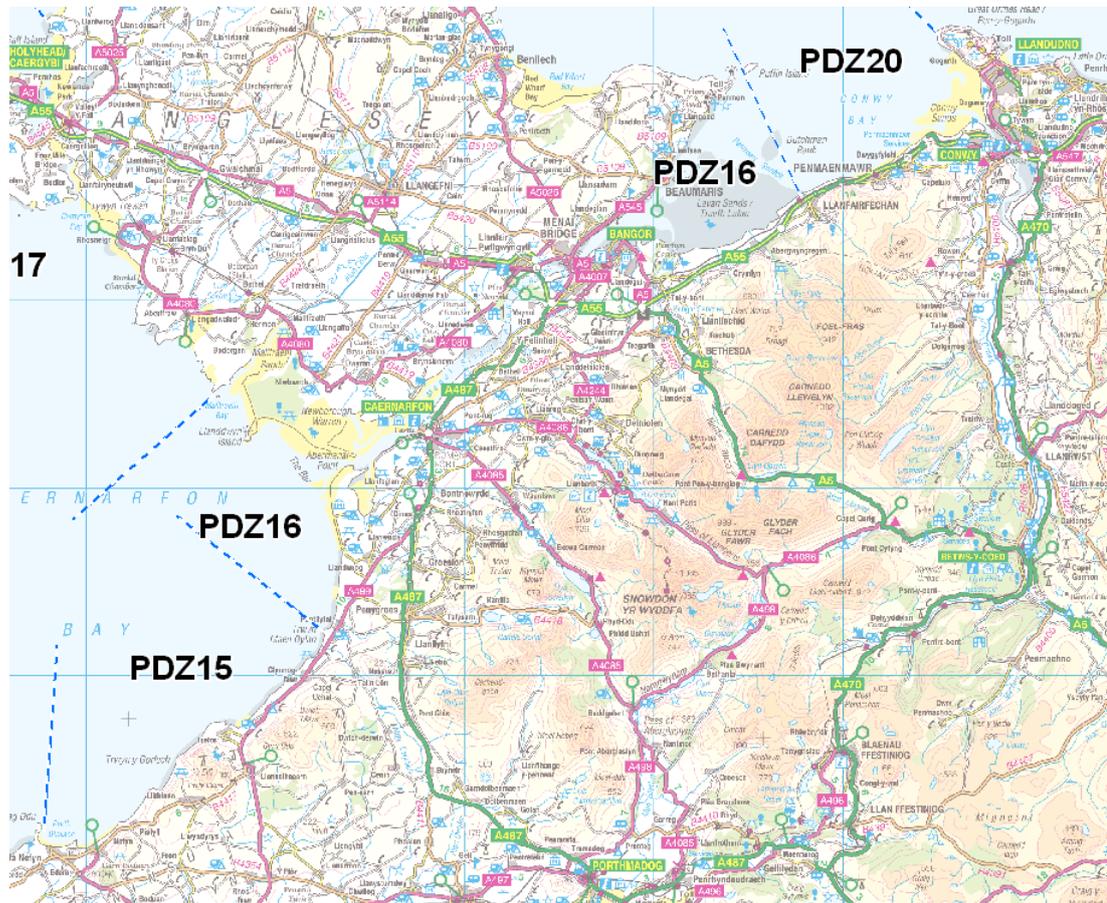
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West of Wales Shoreline Management Plan 2

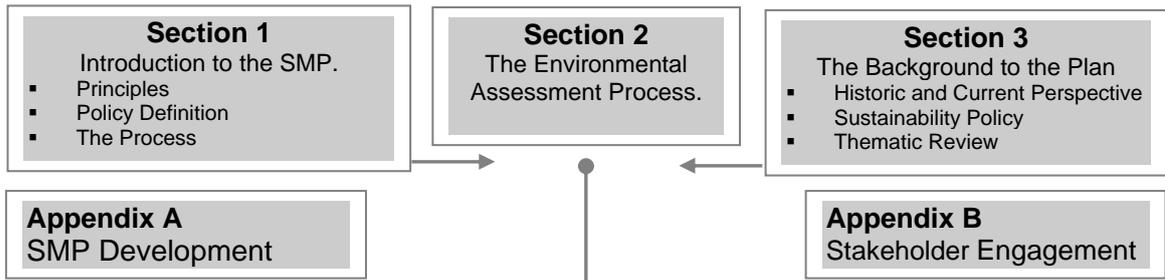
Coastal Area F,

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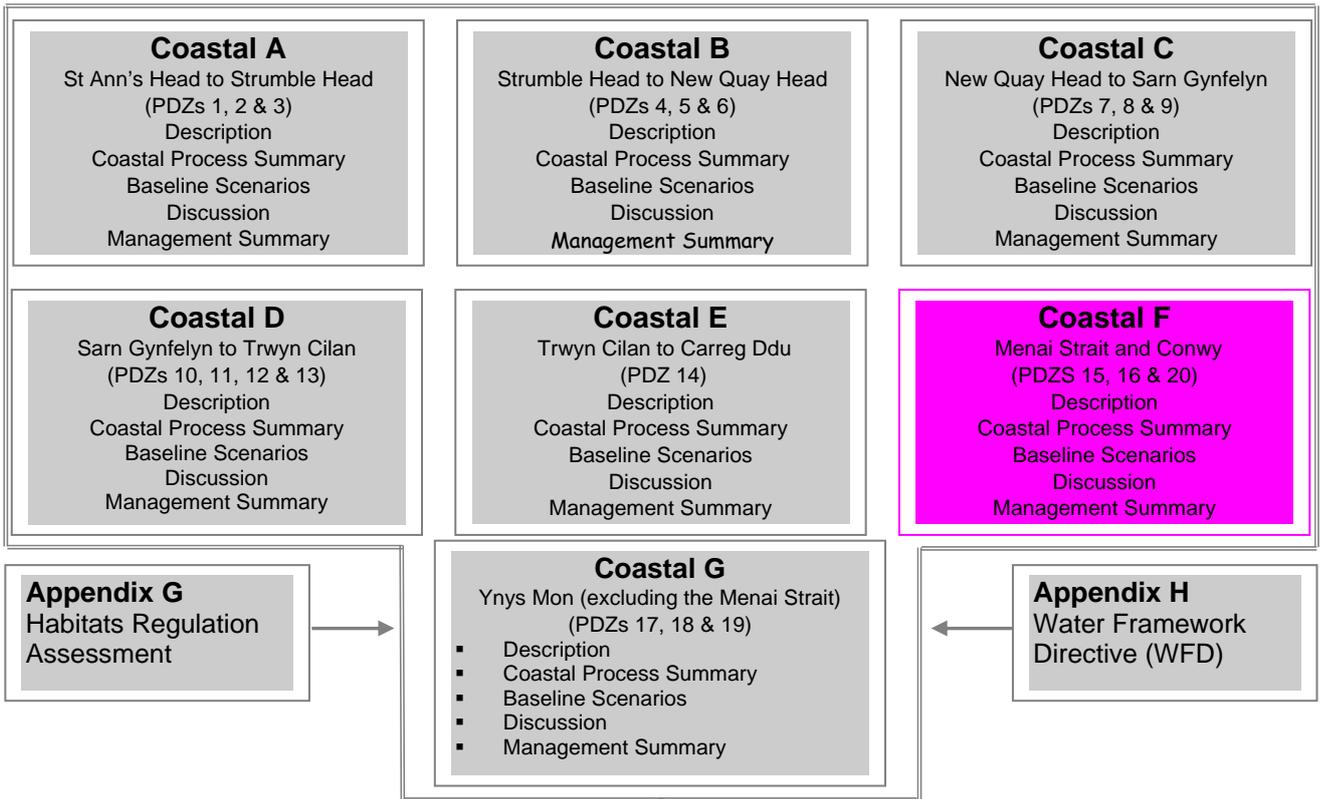
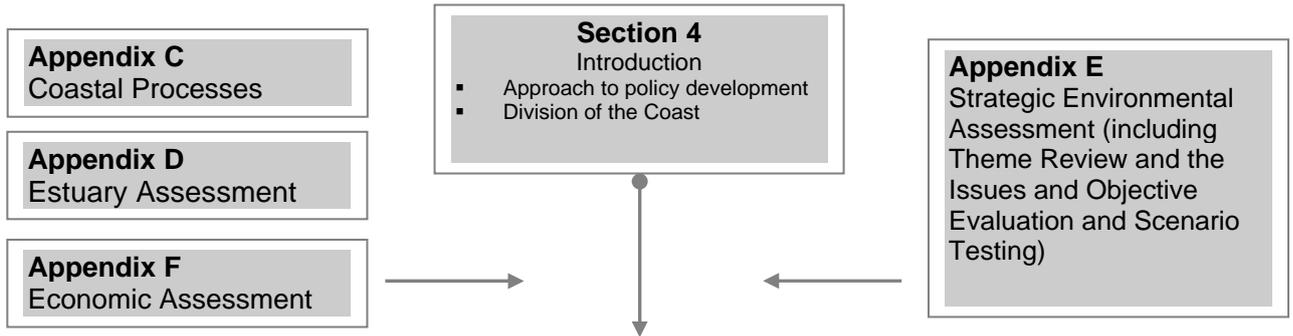
Menai Strait and Conwy



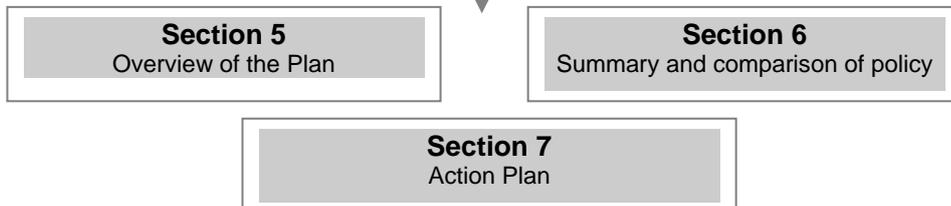
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PLAN AND POLICY DEVELOPMENT



OVERVIEW



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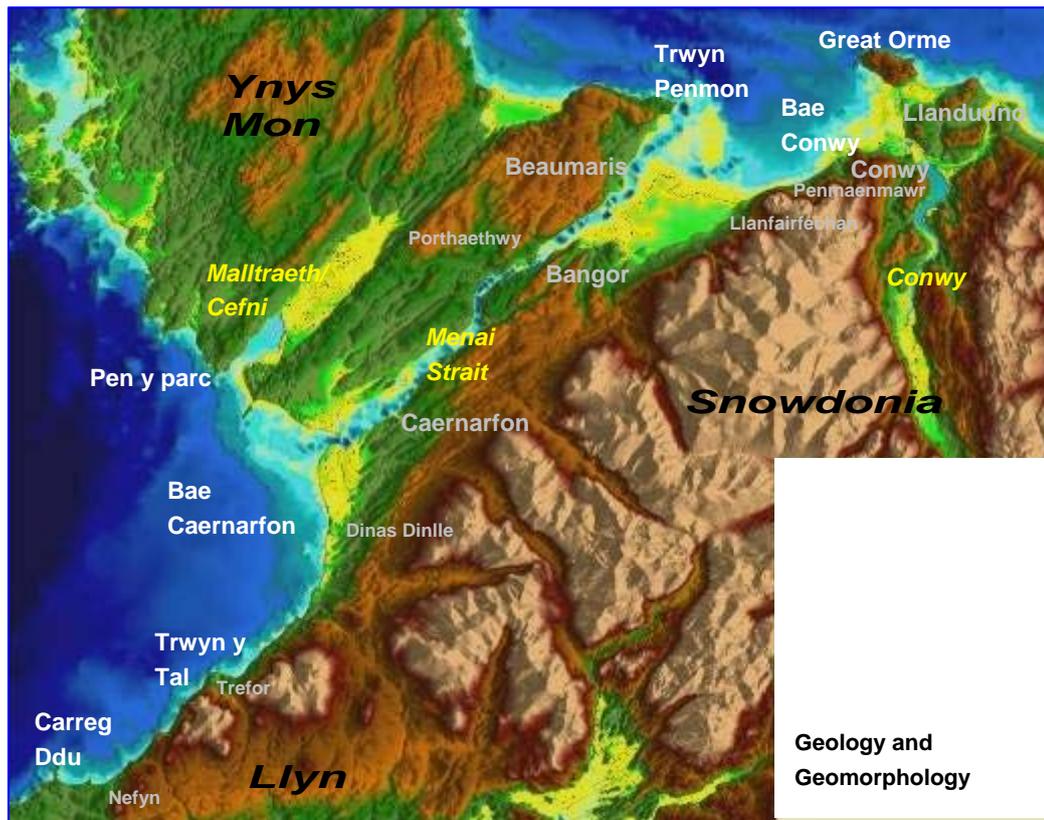
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4F.1 GENERAL DESCRIPTION

1.1 Character

(Further detail for the area is covered in Appendix D with individual features of the coast identified in Appendix E.)

This coastal area is one of the most diverse sections of coast considered as one area in the SMP frontage. The area extends from Careg Ddu, in the west on the North Llyn coastline, through to Pen-y-parc, a small promontory on the southwest shore of Ynys Mon, and then extends in the east to take in the whole of Conwy Bay and the Conwy Estuary, ending at the Great Orme at the northern end of the SMP area. The two areas of open coast are linked by the Menai Strait.



The area around Conwy and Llandudno form one of the most significant economic hubs identified by the Wales Spatial Plan, with strong links to the north Wales coastal area and to large conurbations of North West England. The A55 road link and the main railway route has strengthened regeneration of the Conwy and Llandudno Hub over the last 20 years, such that maintaining the operation and potential of this economic centre is seen as being an important driver for shoreline management. There are large areas within this development centre that are at significant risk from coastal flooding, the outer Conwy Estuary, together with the historic aspects of Conwy, the water use and recreational value of the shore, mean that shoreline management is inextricably linked to the economic vitality of the area.

The improvement to the A55, together with the construction of the A55 tunnel under the Conwy, has extended the influence of the transport route to the west, opening the opportunity for development of the Menai Hub, comprising Bangor, Caernarfon and

Beaumaris, and Porthaethwy areas on Ynys Mon. Maintaining this improved transport route, together with the railway through to Holyhead is, therefore, seen as a further key driver in terms of management of the shoreline. The Menai Hub itself has a different quality to that of the more densely developed area around Conwy, such that while both are underpinned by their respective outstanding natural landscape and quality, the core aim driving the development of the Menai Hub is “A *high-quality natural and physical environment supporting a cultural and knowledge-based economy that will help the area to maintain and enhance its distinctive character, retain and attract back young people and sustain the Welsh language.*” This reflects the distinctive character of the individual centres within the Menai Hub, each contributing in different ways to the overall economic prosperity of the area.

In terms of shoreline management, therefore, the Conwy/Llandudno Hub has to be considered very much as one unit, with the close interrelationship between management of specific areas as a whole. Within the Menai Hub, the aim is far more one of considering the distinctive individual areas with the intent of sustaining what each area contributes to the whole. The main link between the two areas is the A55/railway corridor and interaction along the shoreline over this section.

At the western end, the Menai Strait opens out on the broad expanse of Caernarfon Bay. The general open coast area is identified as being predominantly a sediment sink and this might be envisaged as being a large sandy dune-backed bay held by the hard rock of Ynys Mon to the north and running through to the rocky shoreline of the north Pen Llyn, if it were not for the entrance to the Menai Strait cutting through in the centre. This major estuary quite evidently influences the behaviour of the shoreline over this central section, with the ebb delta and channel system modifying the whole shape of the shoreline to north and south. The main sediment interaction is identified as being across the whole nearshore area, rather than being solely one of shoreline drift.



Various studies of the area have shown there to be a drift potential over the nearshore zone of the Llyn in towards the head of the bay, rather than a significant supply from the shoreline cliffs of this area.

More specific to the shoreline there is a potential for sediment to be moved north along the shore, but this is constrained by the harder rock outcrops and features of this north Llyn coastline. While it is important to recognise the potential broad scale impacts, at the typical local management scale with respect to much of this north Llyn area, the area south of Pontllyfni can be seen substantially as a separate unit. North of Pontllyfni, the same does not apply. There are considered to be important local influences that need to be taken into account over the whole frontage leading through to the entrance to the Menai Strait.

In term of land use and the interaction with the shoreline, quite clearly the management on Ynys Mon of the Malltraeth Estuary has important implications with respect to the A55 transport route through the centre of Ynys Mon and, as such, is closely tied with the significance of the Menai Hub. On the southern coast of the Menai Strait, Caernarfon is the main support centre for the hinterland around Foryd bay and is the main transport hub to the north Llyn and down into Snowdonia, with the main A487 running through to Porthmadog and the A499 branching off to north Llyn. However, it is only to the north of Pontllyfni where the A499 is at risk of coastal flooding and, therefore, it is only here that there are significant hinterland issues relating to shoreline management. Equally, in terms of the national seascape survey, a clear distinction is made between the generally cliffed coast of north Llyn, with its local communities at or along the shoreline, and the more open landscape of the Foryd area. This open aspect is considered an important landscape value.

The whole of this coastal area is important for its landscape and nature conservation values. The whole of the Menai Strait is designated SAC with the important SPA designation of the Traeth Lafan and Bangor Flats; this latter designation sitting comfortably within the PDZ covering the Menai Strait. The Conwy Bay areas, although only covered in part by the international SAC designation, fall almost entirely within the SSSI designations

In terms of the historic environment there are various areas designated as Historic Landscape Areas and three World Heritage Sites at Caernarfon, Beaumaris and Conwy. In addition there are many SAMs within the area reflecting the overall historic association with the shoreline; within the western area of the Menai Strait there are the prehistoric features of Dinas Dinlle Camp and Tywyn-y-Parc Promontory Fort and the Medieval St Dwynwen's Church, numerous fish weirs and traps within, and to the eastern end of, the Menai valley, together with the castles of Caernarfon and Beaumaris, and Conwy castle, the Canovium Roman Site and the site of Aberconwy Abbey within the Conwy valley.

In considering all these various issues, management of the upper part of Conwy Estuary is significant in terms of general flood risk management and the impact this has in terms of the natural environment and issues such as transport links in to the hinterland. These issues then relate to aspects of management further down the Conwy, at Glan Conwy and Llandudno Junction. Therefore, even though in Appendix D, from the perspective of the physical interaction, the boundary of the SMP might sensibly be set just upstream of Glan Conwy, the decision has been made to extend the SMP boundary further upstream at Llanrwst. This provides a sensible link with the assessment provided by the Catchment Flood Management plan for the area.

1.2 Physical Process Overview

(Further detail on coastal processes and geomorphology is provided in Appendix C).

EXPOSURE

Water levels: Tidal range across the area varies considerably, with the typical 4m tidal range associated with the North Llyn and western entrance to the Menai Strait, and the much larger range, typically between 6m to 7m, at the eastern entrance to the Menai Strait and Conwy Bay, associated with the Liverpool Bay regime. The timing of the tidal curve also alters across the area with high water in the eastern area lagging nearly two hours behind that in the west. In addition to giving significantly different character to the two areas, the variation in range and timing gives rise to the peculiar tidal flow characteristics of the Menai Strait.

Location	Tide m. AOD				Extreme Levels (return period) m AOD			
	MLWS	MLWN	MHWN	MHWS	10 yr	50 yr	100 yr	200 yr
Porth Dinllaen	-1.90	-0.60	1.00	2.20	3.29	3.5	3.63	3.76
Trefor	-1.90	-0.70	1.00	2.30				
Fort Belan	-2.00	-0.80	0.90	2.00				
Llanddwyn Island	-2.09	-0.89	1.11	2.30				
Caernarfon	-2.20	-0.90	1.20	2.40	3.53	3.76	3.91	4.04
Port Dinorwic	-2.25	-1.05	1.35	2.55				
Menai Bridge	-3.10	-1.50	2.00	3.50				
Beaumaris	-3.20	-1.50	2.00	3.60	4.93	5.21	5.38	5.56
Trwyn Dinmor	-3.10	-1.50	1.90	3.50				
Conwy	-2.90	-1.40	2.20	3.90	5.18	5.44	5.61	5.77
Llandudno	-3.05	-1.55	1.85	3.75				

Waves: In the western half of the area the wave climate is still strongly influenced by the dominant southwesterly wave climate coming up through Cardigan Bay and St Georges Channel, although clearly equally strongly influenced by the north to north westerly fetch across the Irish sea. The nearshore climate, therefore, is strongly biased towards energy driving in from the west sector towards Caernarfon Bay. This is modified by the local headlands such that within the bays of north Llyn the energy is diffracted to be more from the north. With the shelter of Ynys Mon, the western half of the offshore wave climate is driven by the offshore climate of the southern Irish Sea, with a dominant northwest to north wave field. This is further modified by the headlands of Trwyn Penmon (and Puffin Island) and the Great Orme, giving rise to a north easterly dominant wave climate in towards Bangor and the eastern entrance of the Menai Strait and a more open and north westerly dominated climate towards the entrance of the Conwy.

GEOMORPHOLOGY:

The hard rock headland, cliffed, crenulate bayed frontages of the north Llyn coastline give way to transitional area of exposed low cliff, narrow shingle foreshore north of Trefor, before opening to the wider dune backed foreshore at the head of Caernarfon Bay. The northern section of Caernarfon Bay maintains much of this open sandy character but is fixed by the rock outcrops of Ynys Llanddwyn and Pen-y-parc. These rock outcrops also form the mouth of the Malltraeth Sands and Cefni Estuary. The strong flow regime of the Menai Strait has influenced the development of the head of Caernarfon Bay with Morfa Dinlle held forward by the banks of the

	<p>Southern Sands and Braich Abermenai forming as a spit to Newborough Warren and a southern extension of Llanddwyn Bay into the estuary. These two coastal features enclose the broader funnel shaped entrance of the Menai Strait with Foryd Bay to the south and Traeth Abermenai to the north.</p> <p>The Strait then narrows to the effectively geologically constrained gorge of the Swellies and Porthaethwy.</p> <p>The Strait opens again into the strongly tidally dominated western section of Conwy Bay, between Trwyn Penmon and the Penmaen Mawr (Pen-y-Clip) headland. The coastal form immediately changes again to the wave dominated, tidally influenced sandy outer estuary mouth of the Conwy, fixed by Penmaen-bach Point and the Great Orme, and the associated, tombola formed, isthmus of Llandudno.</p> <p>The inner Conwy estuary is confined by the Conwy and Deganwy headlands, by the man made defences of the Conwy and Deganwy shoreline, and the bridges and causeway at Conwy, before widening into the classic funnel shaped upper Conwy valley.</p>
Drift	<p>Drift in the western part of the area is predominantly to the east although constrained by the harder features of the shoreline of the Llyn. Drift along Morfa Dinlle is relatively low and towards the mouth of the Menai. Drift along the Newborough Warren frontage is similarly quite weak and towards the south east, with an anticipated recycling of sediment from within the mouth of the Menai back into the nearshore of Caernarfon Bay. North of Ynys Llanddwyn, there would be an anticipated drift into the Malltraeth or Cefni Estuary.</p> <p>To the eastern part of the area, there is general trend of wave driven sediment movement in towards the Menai Strait over the western half of Conwy Bay, with a typically tidal driven movement of sediment along the northern Ynys Mon shoreline past Beaumaris. Along the western section of this area the small shallow bays of Lleiniog and Penmon are more strongly influenced by wave action although separated from a sediment supply by the main channel from the Menai Strait.</p> <p>From Penmaen Mawr (Pen-y-Clip) the drift is to the east (although reversal can occur) and the dominant drift along West Shore Llandudno is similarly in towards the Conwy estuary. Sediment is recycled into the nearshore banks system of the estuary.</p>
Erosion/ Accretion:	<p>The overall trend along the soft shoreline is one of erosion, though this is only severe in local areas. Generally the trend is for quite low erosion as part of long term processes of eroding the toe of coastal slopes and low areas of coastal cliff, adjusting to changes in the estuaries and slow response to general drift patterns. Locally there have been areas of accretion, again in terms of long-term response to changes in the estuaries. Typical accretional features can be seen as the northern end of the Dinlle Morfa, the dunes across the mouth of the Cefni and at Conwy Morfa, although in each case further adjustment of these features has resulted in areas of erosion. The dunes and sands within the Cefni have been reported to have been accreting over recent years. More significant local areas of accretion have been seen at Dinas Dinlle and at Llandudno West shore,</p>

	<p>where intervention has actively encouraged build up of sediment. However, at Llandudno West Shore, whilst structures have trapped material and, in combination with beach recharge, have stabilised upper beach levels, lower beach erosion is taking place.</p>
<p>LONG TERM EVOLUTION: (unconstrained)</p>	<p>With sea level rise, there will be greater pressure for erosion along much of the shoreline, particularly where there are existing defences controlling the natural erosion of the cliffed backshore areas. The general nearshore area is seen as being rich in sediment. As such, with sea level rise, and if the ability of the coast to roll back is maintained, then there is a strong likelihood that the shoreline would maintain an ability to keep pace with sea level rise. In particular, it has been assessed that the estuaries are in relative equilibrium with a history of acting as sediment sinks. The indicative longer term process would therefore be for unconstrained warping up of the estuaries in line with sea level rise. This would apply typically to the area of the Traeth Lafan. There is a high degree of uncertainty, however, in relation to the behaviour of the Menai Strait and the impact sea level rise might have on their flow regime. This could then influence the behaviour of the open coast features at the western end and the behaviour of the Traeth Lafan.</p>
<p>FLOOD RISK</p>	<p>Over many areas of the coast flooding is seen as being a significant issue, both now and with sea level rise. The north Llyn shoreline has possibly been least affected under the existing situation. However, with sea level rise there would be substantially increased risk both of direct flooding and flooding due to increased wave overtopping. A similar situation is true for local areas within the Menai Strait.</p> <p>The main areas of potential flood risk and increased flood risk are Foryd Bay and the larger area of reclaimed land within the Cefni Estuary. In areas of Bangor and Beaumaris, there would be a marked increase of flood risk with sea level rise. This is particularly the case for with respect to Beaumaris where this risk is likely to increase further due to the threat of wave overtopping. Areas of Llanfairfechan are at risk at present and this area of risk increases significantly with sea level rise, with the potential flood risk including sections of the A55 under the higher sea level rise scenarios.</p> <p>At present the main areas of flood risk in the Conwy area are around Conwy Morfa, Llandudno Junction and Llandudno. While there is an increased area of flooding around these specific locations, the main impact of sea level rise is in the potential frequency and depth of flooding.</p> <p>Within the Conwy Valley, there are areas at present known to be at risk from fluvial flood events and even locally under normal tidal levels (MHWS). With projected sea level rise and more obviously under a 2m SLR condition, much of the lower valley floor, upstream of Tal-y-cafn, could be affected by normal tidal flooding. This would not, however, significantly affect the number of properties at risk.</p>

1.3 Present Management and Key Issues and Objectives

Existing management practice

The following table sets out SMP1 policy (developed over a 50 year period), how the coast has been subdivide into management units and, where relevant, where more recent decisions have been made, or where discussion is on going with respect to individual areas.

SMP 1			Subsequent Management Approach
No.	Unit	Policy	
Gwynedd/Ynys Mon			
1.3	Porth Dinllaen to Porth Bodeilas	SHTL	
1.4	Porth Bodeilas to Trefor	DN	
1.5	Trefor	SHTL	
1.6	Trefor to Dinas Dinlle	SHTL	
1.7	Dinas Dinlle	HTL	
1.8	Dinas Dinlle to Fort Belan	SHTL	
5.1	Fort Belan to Port Dinorwic (both sides)	SHTL	
5.1a	Traeth Melynog	DN	
5.1b	Foryd Bay	SHTL	
5.1c	Caernarfon	HTL	
5.1d	Port Dinorwic	HTL	
5.2	Port Dinorwic to Britannia Bridge (both sides)	SHTL	
5.3	Britannia Bridge to Menai Bridge (both sides)	SHTL	
5.4	Menai Pier to Bangor Pier (both sides)	SHTL	
5.5	Gazelle Hotel to Gallows Point (Anglesey side)	SHTL	
5.6	Beaumaris	HTL	
5.7	Beaumaris to Black Point	SHTL	
5.8	Bangor Pier to Port Penrhyn (Hirael Bay)	HTL	
6.1	Port Penrhyn to Afon Ogwen	DN	
6.2	Afon Ogwen to Llanfairfechan (Lavan Sands)	DN	
6.3	Llanfairfechan to Pen-y-clip	HTL/MR	
6.4	Pen-y-clip to Penmaen bach	HTL	
Conwy			
7.1	Conwy Morfa	SHTL	
7.2	Deganwy Narrows to Conwy bridge (both sides)	HTL	
7.3	Conwy bridge to Glan Conwy (both sides)	HTL/DN	
7.4	Glan Conwy to Tal-y-Cafn(both sides)	HTL/DN	
7.5	Deganwy Narrows to Gogarth	HTL	
7.6	Great Orme (west face)	DN	

Key: DN – do nothing, HTL – Hold the Line, SHTL – Selectively Hold the Line, MR – Managed Retreat, deferred – policy deferred subject to further monitoring or study.

Under the SMP1 policy, the approach has been to maintain defences very much to all local settlements, under a policy of selective Holding The Line. The approach is also to maintain defence to the more major areas of development; although much of the coast in fact still aims to sustain its natural behaviour. This tends to reinforce the relatively low pressure at present for coastal change. This situation becomes more acute under the influence of sea level rise, raising the issues of both increased pressure and much more severe risk of flooding.

Key Management issues

The larger-scale issues are in relation to sustaining the important economic hubs as identified in the Wales Spatial Plan and reflected in the regeneration that is evident at the more specific level. In relation to this is the substantial increase in probability of flooding, both directly and in terms of overtopping as a result of sea level rise. Strongly linked to this is the need to maintain the A55 transport route and the main network of roads within the Menai area, and the clear constraint this imposes on management of the shoreline between Llanfairfechan and Penmaenmawr.

Strongly linked to the aims for regeneration is the need to sustain the important recreational activities; the use of the beaches, the growing national status of much of this area in terms of water use, and the development of important mooring and marina facilities. Underlying this is the cultural and community aspects of the existing settlements and the more historic aspects of Conwy, Bangor, Beaumaris and Caernarfon. These aspects underpin not just a quality of life and place for residents in the area, but also provide the mainstay of the highly important tourist industry.

Alongside this are the more rural and agricultural communities and the risk both from flooding and erosion of significant areas of land. Also there are difficult issues in relation to several of the local coastal communities actually at the shoreline. To defend these communities in an inappropriate manner would be to destroy their quintessential value; whether this be their historic links as fishing communities or their current value as tourist destinations. The risk to agriculture is especially increased within the Conwy valley as sea level rise imposes, not just the potential need to raise defences, if current use is to be sustained, but then also the increased risk of fluvial and surface water flooding. Increasing defence here sets a trend in longer-term management where land drainage becomes more difficult and more fundamental to that current use.

In many areas, the coast needs width to develop naturally and to reduce the impact of the increased energy as a result of sea level rise. This is also needed to support and maintain both the natural and man made defence, as well as the space within which the essential nature conservation interest can be sustained.

Policy Development Zones

Considering these key issues, the A55 corridor runs close to, and in places directly along, the shoreline, with very little or no scope for realignment, due, in part, to the steeply rising ground behind but also the substantial infrastructure investment. This man made constraint, together with the natural constraint of the cliff line, in effect at the broad scale, defines where the shoreline will be over the next 100 years in this area. In terms of coastal behaviour, the length of coast, quite specifically between Llanfairfechan and Penmaenmawr, is seen also as a natural divide between the influence of the Conwy Estuary to the west and the Menai Strait to the east, with this being a natural sediment drift divide. In terms of broad scale management of the shoreline, this provides a

suitable point at which to divide the areas into separate Policy Development Zones (PDZs), while recognising that this is not a complete divide at a more local scale.

The Menai Hub, together with the strong physical link along the Strait, means that it is sensible to consider this central section of the area as one Zone.

In terms of the more detailed analysis of shoreline management policy the particular needs and issues associated with the north Llyn frontage are seen as being quite distinct from the more interactive shoreline between Pontllyfni and the main areas of the Menai Strait. The headland just south of Pontllyfni becomes a sensible breakpoint between the local management issues of the north Llyn and the broader, higher level issues associated with the management of the central Menai Strait area.

The area is, therefore, divided into three basic Policy Development Zones.

- PDZ15** **North Llyn:**
Porth Dinllaen to Trwyn Mean Dylan
Chainage: 561km to 587km
- PDZ16** **Menai Strait:**
Trwyn Mean Dylan to Llanfairfechan and Pen-y-parc to **Black Point**
Chainage: 587km to 643km. and 0Km to 48km (west) and 193km to 0km (east)
- PDZ20** **Conwy:**
Llanfairfechan to the Great Orme
Chainage: 643km to 686km.

Overarching objectives are defined based on the overall principles upon which the SMP is developed and drawing together the various specific detailed objectives set out in the features and issues table contained within Appendix E. These overarching objectives aim to guide the assessment of different management scenarios and the development of individual SMP policies.

Overall Objectives

Principles	Objectives	Relevant to
To contribute to sustainable communities and development	<ul style="list-style-type: none"> • Reduce risk to life • Protect properties from flood and erosion loss. • Identify communities at risk and allow opportunity for adaptation. 	All All PDZ15 & 16
To minimise reliance on defence and increase resilience of communities.	<ul style="list-style-type: none"> • Minimise the need for increasing effort and management of coastal defences • Avoid reliance on defence particularly where there is a risk of catastrophic failure 	All All
To support an integrated approach to spatial planning, in particular recognising the interrelationships between:		
- Centres of development and surrounding communities.	<ul style="list-style-type: none"> • Maintain access to rural communities and support their connectivity to principal support centres. 	All
- Human activity and the natural and historic environment: in being essential for community identity, well being and vitality and in being highly significant for tourism and economic regeneration.	<ul style="list-style-type: none"> • Maintain recreational use of beaches and bays • Maintain access to the coast including car parking and facilities • Maintain access for boat use and associated water use activity • Maintain existing water sport activities and facilities within the Conwy and Menai Strait 	All All All PDZ16 & 20
To maintain and support the main centres of economic activity	<ul style="list-style-type: none"> • Maintain Llandudno as a viable commercial centre and tourist destination in a sustainable manner. • Maintain Deganwy and Llandudno Junction as a viable commercial centre in a sustainable manner. • Maintain Conwy as an historic and vital community and tourist destination in a sustainable manner. • Maintain Bangor as a viable commercial centre and tourism centre in a sustainable manner. • Maintain Beaumaris as historic and vital community and tourist destination in a sustainable manner. • Maintain Caernarfon as historic and vital community, commercial centre and tourist destination in a sustainable manner. 	PDZ20 PDZ20 PDZ20 PDZ16 PDZ16 PDZ16
To sustain the vitality and support adaptation of smaller scale settlements.	<ul style="list-style-type: none"> • Maintain character and integrity of coastal communities • Maintain agricultural value of rural community 	All All
To support the cultural heritage and the use of the Welsh language.	<ul style="list-style-type: none"> • Maintain agricultural industry and allow adaptation. • Identify risk and reduce risk of loss of heritage features where possible 	All All

Principles	Objectives	Relevant to
	<ul style="list-style-type: none"> • Maintain historic landscape • Prevent disturbance or deterioration to historic sites and their setting • Maintain the value of World Heritage sites 	<p>All</p> <p>All</p> <p>PDZ16 & 20</p>
To avoid damage to, and seek opportunity to enhance, the natural environment.	<ul style="list-style-type: none"> • 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. 	<p>All</p> <p>All</p> <p>PDZ15 &16</p>
To maintain or enhance the high quality landscape.	<ul style="list-style-type: none"> • Avoid damage to and enhance the natural landscape. • Maintain the human landscape and character of communities 	<p>All</p> <p>All</p>
To sustain sustainable accessibility in terms of maintaining national and regional connectivity	<ul style="list-style-type: none"> • Maintain use of the A55 road and rail corridor. • Maintain the main road links to the Pen Llyn 	<p>PDZ16 & 20</p> <p>PDZ16</p>

Note: All objectives would be assessed in each management scenario, but all objectives will not necessarily be met.