DUMFRIES & GALLOWAY SHORELINE MANAGEMENT PLAN

Appendix A – Baseline Understanding

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APPENDIX A – BASELINE UNDERSTANDING

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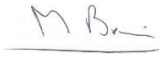
Malcolm Brian  22 December 2022

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1 ASSESSMENT OF THE PAST AND PRESENT SHORELINE PROCESSES & BEHAVIOUR

Appendix A1 provides information on the current understanding of shoreline processes and coastline behaviour along the extent of the Dumfries & Galloway coastline. This reference material provides supportive material for the decision-making processes involved in developing the Dumfries & Galloway Shoreline Management Plan (SMP).

A1.1 Introduction

The main objective of a shoreline management plan is to provide a broad assessment of the long-term risk associated with coastal processes; therefore, it is imperative that there is a good understanding of the key coastal processes within the area concerned as well as the broader area. Understanding coastal processes is essential for assessing issues related to coastal defence, land use, cultural heritage, and the protected and natural environment. A comprehensive understanding of shoreline processes and behaviour supports the selection of sustainable long-term policy, therefore, Appendix A1 is a fundamental part of the review and update of the SMP for the Dumfries & Galloway coastline.

The current (2005) SMP for the Dumfries & Galloway coastline (SMP05) provided detail on the coastal processes that operate along the Dumfries & Galloway shoreline. Information relating to waves and tides, as well as broad scale sediment transport and coastal morphology processes were presented based on the best evidence available at that time. Following the completion of the SMP05 additional information has been developed and released. The main drivers for the generation of additional information have been in response to the Flood Risk Management (Scotland) Act 2009 and the Climate Change (Scotland) Act 2009. Following the implementation of these Acts, steps have been undertaken to better understand and inform sustainable mitigation of coastal flooding and erosion. Research led by the Scottish Government has improved understanding of coastal flood risk through the National Flood Risk Assessment (NFRA), while the understanding of coastal erosion risk has been improved through the Dynamic Coast Project. As part of this SMP update, these new datasets have been used to identify coastal flood and erosion risk. Additionally, Marine Scotland who advocate an integrated management approach of Scotland's seas, hosts a web portal that provides access to important spatially relevant contextual information on shoreline processes and behaviour that has added to the overall coastal knowledge base used to inform the SMP Update.

A1.2 Coastal Processes

The DEFRA guidance document on Shoreline Management Planning simply defines coastal processes as the **'set of processes that operate along a coastline'**. This simplistic definition does not account for the formation of the Dumfries & Galloway coastline which is a function of geology, glacial and sea-level history, and sediment availability. The origin and development of the Scottish coast, including the Dumfries & Galloway shoreline is heavily influenced by the underlying geology. Generally, along the coastline, areas of weak rock retreat at a faster rate than adjacent more resistant segments. In the context of the Dumfries & Galloway coast, areas of 'Hard Substrate' or extensive rocky shores fringe the shoreline of the Western Rhinns and the Machars. The various Ice Ages have magnified these geological differences, whereby glaciers have eroded the 'softer' rocks resulting in the formation of peninsulas and bays and re-deposited this ground-up material as sediment deposits, such as the extensive unconsolidated sediments located within Solway Firth. Since the Ice Age, this extensive sediment source has been reworked into the contemporary beaches, coastal dune and saltmarsh located along this shoreline, mainly through the fluctuation of relative sea level.

The Dumfries & Galloway coastline shows extensive evidence of historic variations in sea-levels. Following the retreat of the last Scottish ice sheet about 18,000 years ago, the rate of land rebound was such that any rise in sea-level that followed the melting of ice was cancelled out. Around 8,500 years ago, the rate of land rebound was overtaken by sea-level rise which reached a peak sometime around 6,000 years ago. Following what is referred to as the 'Holocene Peak', relative sea-level fell back again (Refer to Figure A1-1), resulting in the presence of extensive relict shoreline and raised beach deposits along the Dumfries & Galloway shoreline. These provide evidence of the long-term response to isostasy

and Holocene relative sea-level change mechanisms. Sea level is now rising again due to anthropogenic climate change.

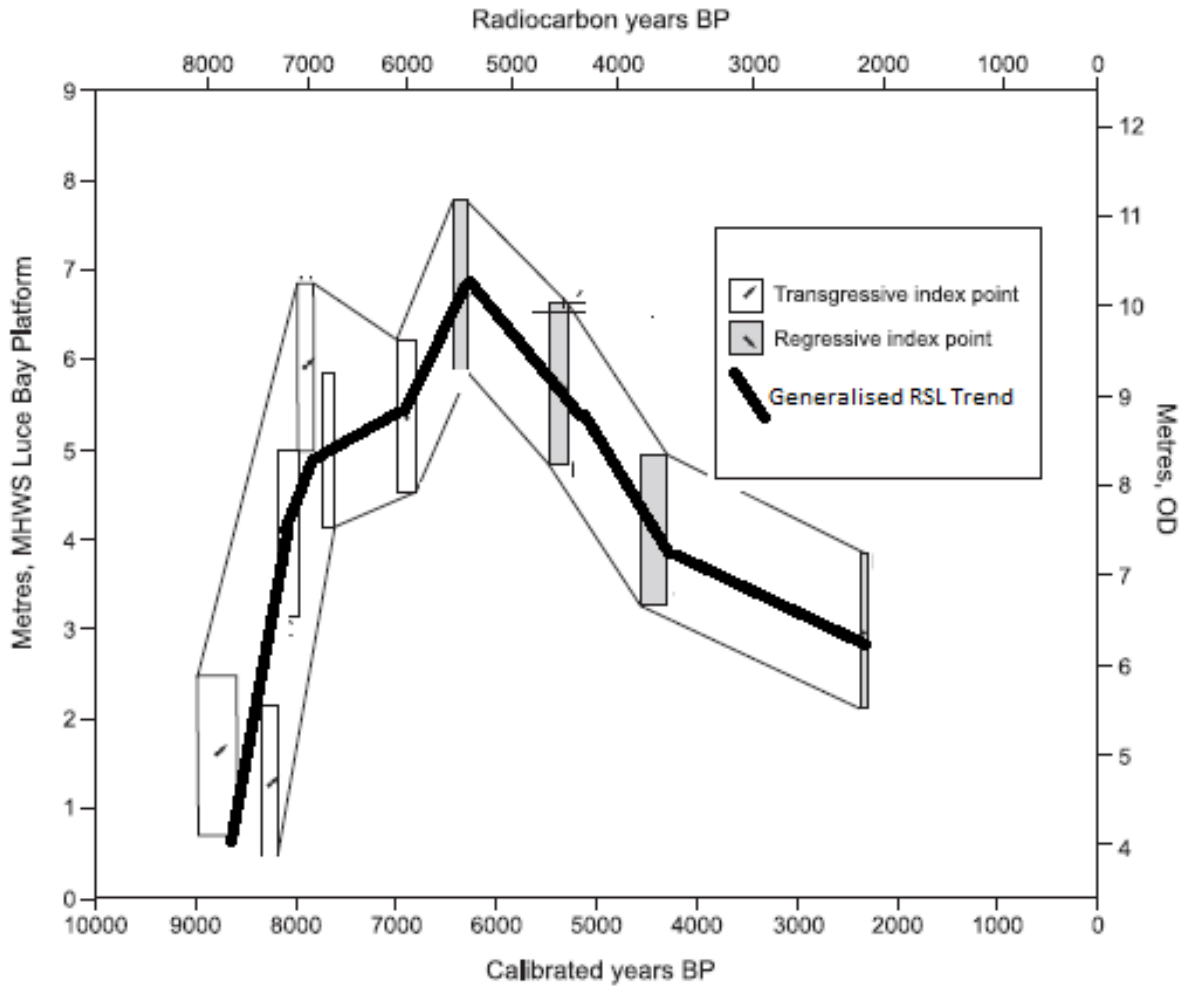

Figure A1-1 Generalised Relative Sea Level Curve for Luce Bay (after Smith *et al* 2020)

The Generalised Relative Sea-Level (RSL) Curve shown in Figure A1-1 is based upon numerous index points that comprise archaeological, sedimentological and micropaleontological evidence. Transgressive index point supports a higher than present RSL. Regressive index point relates to a lower than present RSL (Refer to Smith *et al* 2020 for further detail).

A1.2.3 Marine Scotland Information

Marine Scotland is responsible for the integrated management of Scotland's seas for prosperity and environmental sustainability. The promotion of a sound scientific evidence base, mainly to inform marine policy, has been beneficial for this SMP review and update. Physical characteristics relating to all of Scotland's shoreline and marine environment are summarised on the [1]Marine Scotland MAPS web portal. For this review, the latest information relevant to the Dumfries & Galloway shoreline was extracted and summarised for each Coastal Process Unit (CPU) of the Plan area.

[1] Marine Scotland MAPS web portal (https://marinescotland.atkinsgeospatial.com/nmpi/).

Figure A1-2 is a Marine Scotland map showing the spatial variation of the Mean Tidal Spring Range along the Dumfries & Galloway shoreline. The highest range is associated with the Inner Solway Firth with a lesser range associated with the Western Rhinns shoreline. [2]No information is displayed for Loch Ryan.

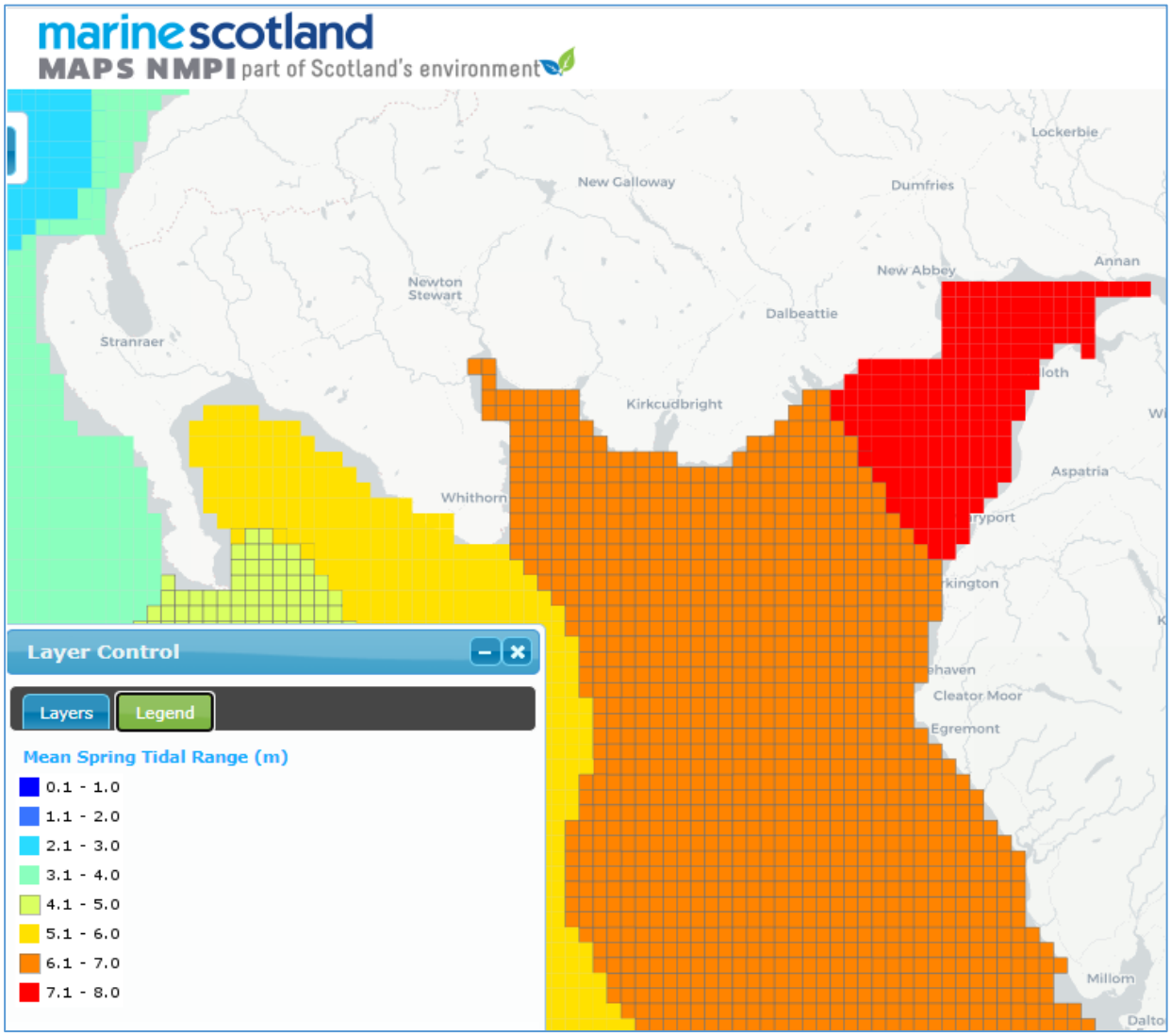

Figure A1-2 Mean Tidal Spring Range for Dumfries & Galloway Shoreline

[2] Greater detail can be found at https://marinescotland.atkinsgeospatial.com/nmpi

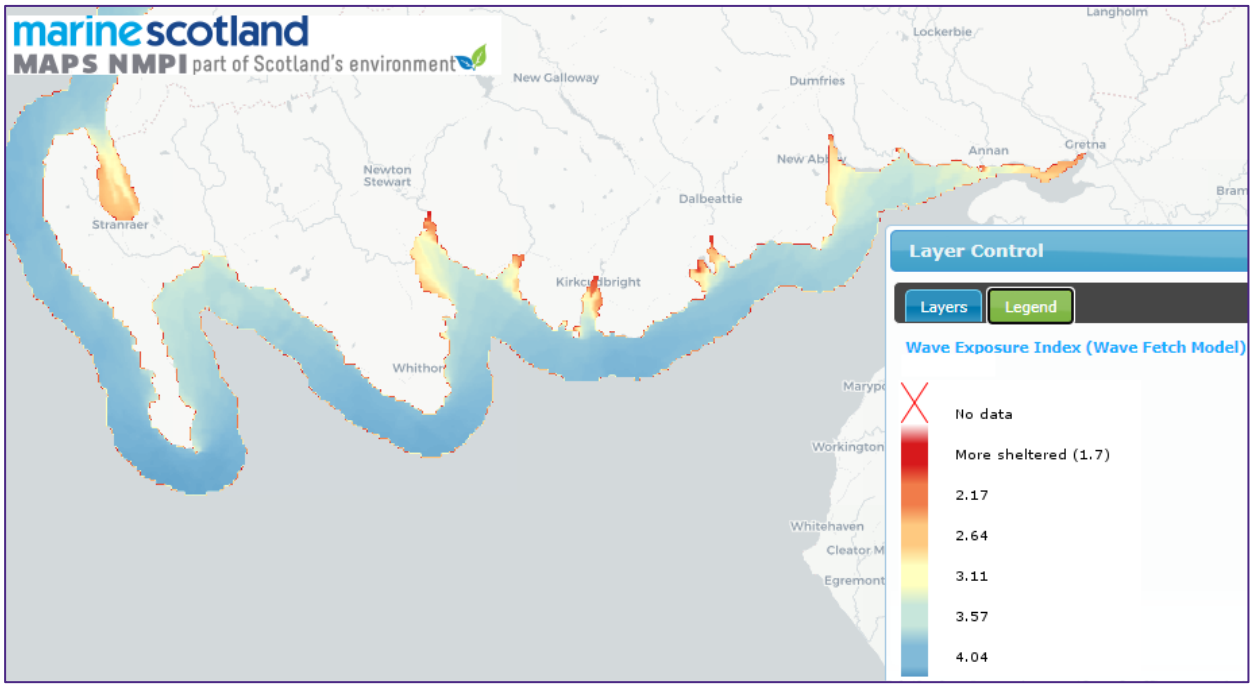

Figure A1-3 Wave Exposure Index for Dumfries & Galloway Shoreline

Figure A1-3 is a Marine Scotland map showing the spatial variation of the Wave Exposure Index along the Dumfries & Galloway Shoreline. The areas with the least exposure to waves are located within the Inner Solway Firth and at the head of estuaries. The wave exposure index is derived from wave fetch data, the longer the fetch, the higher wave index.

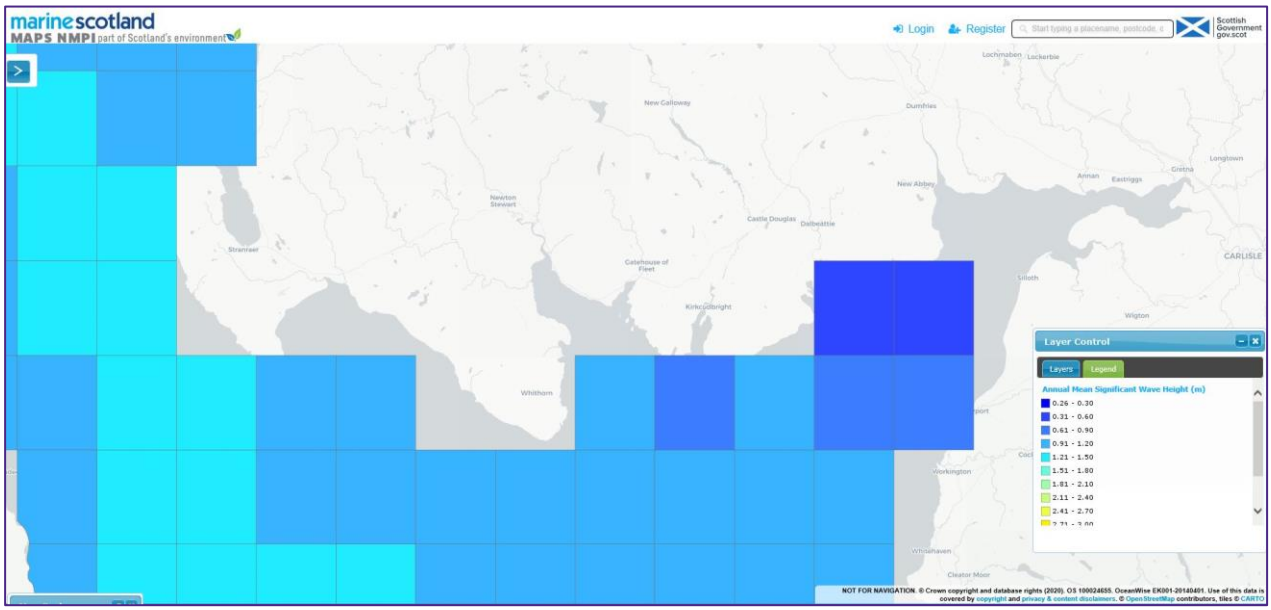

Figure A1-4 Annual Mean Significant Wave Height (m) for Dumfries & Galloway Shoreline

Figure A1.4 is a Marine Scotland map showing the spatial variation Annual Mean Significant Wave Height (m) in proximity to the Dumfries & Galloway Shoreline. The broad grid scale provides a generalised representation, with the highest waves associated with the more exposed Western Rhinns coastline, while the lowest waves are found within the sheltered Inner Solway Firth.

A1.2.4 Scottish Saltmarsh Survey (SSS)

Between 2010 and 2012 all known saltmarshes larger than 3ha were surveyed and mapped across Scotland. Numerous large areas (30-100ha) of saltmarsh were surveyed along the shores of the Solway Firth, with a total of circa 2,324ha of saltmarsh identified within the Solway Firth. The largest of Scotland's saltmarshes are found at Caerlaverock, Kirkconnell Merse and Wigtown all within this SMP area. Kirkconnell Merse (213ha) is associated with the Nith Estuary, Caerlaverock (716ha) lies between the Nith Estuary and the Lochar Water and is part of the wider Solway Firth, while Wigtown's saltmarshes (676ha) are associated with the Cree Estuary. In between these large complexes are narrow borders of saltmarsh, which are present along most of the northern shoreline of the Solway Firth. Southerness was recorded to have areas of degraded saltmarsh, with only a few clumps of former saltmarsh sediment with dead plants found on the sandy beach. The caveat associated with this dataset is that it was completed a decade ago (at the time of writing) and the shoreline is a dynamic system that changes over time hence the spatial coverage of salt marsh reported above will probably have changed.

A1.3 Assessment of Shoreline Behaviour and Dynamics

In general terms, coastal processes include those associated with sediment erosion, transportation and deposition. Erosion is the removal of material through the force of waves and tides, transportation is the movement of this material via the work of waves and tides and deposition is the process by which waves, and tides lose energy, and the material is released. These coastal processes generally operate within sediment cells or littoral cells, which are closed systems in which sediment transfer is contained. The boundaries of these enclosed units are determined by coastal geomorphology. Coastal sediment cell identification has assisted the development of sustainable shoreline management plans around the UK for a number of years.

In a Scottish context, HR Wallingford (1997) identified seven coastal cells around the Scottish coastline, with the Dumfries & Galloway shoreline included within coastal cell 7 and part of coastal cell 6 (6d). However, given the diverse nature of the Scottish coast and the lack of sediment interconnectivity, the coastal cell approach has subsequently been deemed 'unfit for purpose' in a Scottish context, with Hansom et al. 2004, arguing that the Inner Solway Firth was the only sub-cell that suited this approach. Considering this opinion, SMP05 divided the Dumfries & Galloway shoreline into six 'Coastal Process Units', which reflected the different character and processes of each area, as well as the usage and development of the immediate hinterland. The original coastal cell 7 was divided into four CPUs and sub-cell 6d was divided into a further two CPUs. Loch Ryan (CPU 6) is also incorporated into the Ayrshire SMP and defined as sub-cell 6d2. The Solway Firth shoreline within the jurisdiction of England includes Sub-cell 11e, which includes the Cumbria coastline from St Bees Head to the Scottish Border.

A1.3.1 CPU 1 - Inner Solway Firth

The Inner Solway Firth includes the narrowing section of this large macro-tidal estuary, with a Mean Spring Tidal Range of 7.9m at Eastriggs decreasing to 7.41m at Southerness Point. In the context of this SMP, the Inner Solway Firth and its north shore is referred to as CPU 1, which extends from the mouth of the River Sark at Gretna seawards to Southerness Point. In terms of SMP policy CPU 1 is further subdivided in to seven Policy Units (Policy Unit 1 to Policy Unit 7).

The Marine Scotland Wave Exposure Index indicates that CPU 1 is relatively sheltered with low indices of 2.27 at Gretna, 2.17 at the mouth of the River Annan and 2.20 at Kirkconnell Merse. From Eastriggs to Southerness Point the exposure to waves is increased as evident by the higher indices of 3.23 to 3.67.

The output from the Dynamic Coast Project described this shoreline as being soft, except for a stretch of artificial shoreline at Newbie (Policy Unit 4). There is also a section of hard & mixed shoreline to the north of Policy Unit 7 between Borron Point and the Arbigland estate.

CPU 1 is a sediment sink and the supply and movement of material is heavily influenced by tidal processes, with sediment transferring between the River Sark and the River Eden. The shoreline is lined with beaches and salt marshes, whilst during low tide a vast area of intertidal mud and sand is exposed.

The current form of the Inner Solway Firth is influenced by its geology, with the relatively subdued relief of the inner Solway Firth in part due to the underlying New Red Sandstone of Permo-Triassic age. The evolution of the Inner Solway Firth has been ongoing since the last glaciation, with the surrounding coastal lowlands comprised of unconsolidated sediment that owes its origin to the fluvio-glacial outwash sourced from the Devensian ice mass and its subsequent deterioration. This sediment has been re-worked, through a pattern of rapid relative sea level rise during the early Holocene period culminating in a mid-Holocene sea-level maximum, with a gradual fall to the present day. East of Powfoot and within the Nith estuary there are examples of Holocene raised beaches. The presence of short stretches of gravel beach at Southerness, Annan, Torduff Point and Browhouses provide evidence of a former wave dominated shoreline at these locations.

There are areas of coastal sand dune located at the head of Gillfoot Bay, these landforms have developed under the influence of south-westerly winds, which transported sand across the Southerness headland towards Gillfoot Bay. The Southerness headland has a subdued dune relief.

Many coastal landforms including saltmarsh owe their existence to Holocene shoreline emergence and the abundance of unconsolidated sediment. Saltmarsh is composed of sandy sediment of a relatively high salinity and is occupied / stabilised by vegetation that can tolerate the tidal inundation of salty water. Based on the Scottish Saltmarsh Survey data there is about 14km² of saltmarsh within CPU 1, with Policy Unit 5 containing the largest areas, including Caerlaverock (7.6 km²) and Kirkconnell Merse (2.2 km²). Table A1-1 provides summary of the location and extent of saltmarsh within CPU 1**.**

Policy Unit	Location	Saltmarsh Extent (Ha)[1]
1	Gretna to Redkirk	47
2	Browhouses	9
	Torduff Point	4
	Dornock	5
3	Annan	35
4	Milnfield Merse	47
5	Priestside Bank	136
	Caelaverock	762
	Carse Bay	62
	Kirkconnell Merse	228
6	Greenmerse	3
	Glencaple & Kelton	34
7	Southerness	0

[1] Based on SSS

Table A1-1 Saltmarsh Location and Extent within CPU 1

The western edge of Caerlaverock has undergone substantial erosion, which has been attributed to several factors, including the dredging of the main Nith channel, the increased frequency of high-water levels (storm surge combined with high tide) resulting in increased erosion of the saltmarsh edge, creek development, overgrazing by large numbers of wintering wildfowl and finally sea-level rise. Accretion located to the east of this site is reflective of the highly dynamic and complex nature of coastal processes along this section of the shoreline.

Elsewhere within CPU 1, some saltmarshes show signs of erosion and rebuilding such as the Annan saltmarsh located within Policy Unit 3, while some areas of saltmarsh have completely eroded, including that formerly located at Southerness. Overall, it has been noted that Atlantic saltmarsh is displacing pioneering saltmarsh in the Solway Firth, suggesting that sediment deposition is outpacing relative sea level rise.

A1.3.2 CPU 2 - Outer Solway Firth

The Outer Solway Firth refers to the wider area of the firth as it opens out towards the Irish Sea. The spatial extent of CPU 2 extends from Southerness Point to Torrs Point to the west and includes four

policy units (Policy Unit 8 to Policy Unit 11). The Outer Solway Firth is an area of shallow open sea with numerous inlets and enclosed bays that is also macro-tidal with a large tidal range, the Mean Spring Tidal Range (m) is 7.41m at Southerness Point decreasing westwards to 6.45m at Torrs Point. The shoreline of CPU 2 is flanked by shingle, dunes and maritime cliffs. Between Rough Firth and Mersehead Sands the Caledonian Criffel granitic batholith maritime cliffs exceed 50m in height. Between Balcary Point and Abbey Head Carboniferous rocks including sandstones and mudstones are exposed as intertidal shore platforms that produce a rugged shoreline. There are several pocket beaches located within CPU 2, including White Port Beach (Policy Unit 11).

From Southerness Point to Southwick, Marine Scotland reports a wave exposure index of 3.76 although the presence of an extensive intertidal sand bank, Mersehead Sands may act to reduce wave exposure at the shoreline in this location. Regardless of this, the coastal edge of Preston Merse has and continues to experience coastal erosion. The heads of Auchencairn and Orchardton Bays and the Rough Firth are sheltered from wave exposure due to the indented nature of the shoreline. These embayment's act as a natural trap to sediment movement within the nearshore zone, with the shallow water depths limiting wave action and subsequent erosion. From Balcary Point to Torrs Point the wave exposure index increases from 3.90 to 3.99 and this section of shoreline is backed by rugged cliffs and several gravel dominated pocket beaches. Within CPU 2, Marine Scotland data reports the Annual Mean Significant Wave Height to be 0.51m.

The shoreline of CPU 2 is a complex combination of soft, hard and artificial types. The largest section of soft shoreline is located to the east of Southerness Point and extends towards the Southwick Water (Policy Unit 8). Other notable areas of soft shoreline are located in the bay head areas of Policy Units 9 and 10.

There are coastal sand dunes located at Mersehead and Sandyhills Bay. Southerness Golf Course located to the east of Mersehead also shows clear but subdued dune morphology. The small area of active linear frontal dunes located along the shoreline towards Mersehead is influenced mostly by the occurrence of south-easterly winds. Similarly, the coastal dunes located at Sandyhills Bay, are influenced by the south-easterly fetch across Mersehead Sands. There is a low spit actively developing at mouth of the Southwick Water, indicating a westwards movement of sediment at this location.

Saltmarsh is found within the sheltered confines of Auchencairn Bay, Orchardton Bay, Rough Firth and at Southwick. The Southwick area located within Policy Unit 8 is the largest single site, whereas Policy Unit 10 contains the largest total coverage of saltmarsh, refer to Table A1-2.

Policy Unit	Location	Saltmarsh Extent (Ha)[1]
8	Southwick	62
9	Rough Firth	50
10	Auchencairn Bay Orchardton Bay	18 43
[1] Based on SSS		

Table A1-2 Saltmarsh Location and Extent within CPU 2

A1.3.3 CPU 3- Wigtown and Kirkcudbright Bays

CPU 3 encompasses the Dumfries & Galloway shoreline around the large embayment of Wigtown Bay and the smaller estuaries of Kirkcudbright Bay and Fleet Bay indented into its eastern shoreline. Major rivers including the Dee, the Water of Fleet, the Cree and the Bladnoch flow into CPU 3 which represents the central and southern portion of the Dumfries & Galloway shoreline. CPU 3 incorporates seven Policy Units (Policy Unit 12 to Policy Unit 18). At its widest Wigtown Bay is circa 13km wide and is macro-tidal, with the Mean Spring Tidal range (m) varying from 6.45m at Torrs Point to 6.52m at Creetown. From Creetown towards the Isle of Whithorn the Mean Spring Tidal range decreases to 6.18m. This pattern is reflective of the morphology of a narrowing estuary.

The Marine Scotland Wave Exposure Index show that the indented estuaries including Kirkcudbright and Fleet Bays are relatively sheltered from waves. Whereas the Isle of Whithorn and the seaward

extent of Brighouse Bay are significantly more exposed locations. Table A1-3 provides a summary of the Marine Scotland Wave Exposure Index for CPU 3.

Policy Unit	Location	Wave Exposure Index[2]
13	Kirkcudbright	1.86
14	Fleet Bay	2.16
15	Carsluth	3.18
	Creetown	2.28
	Wigtown	2.66
16	Garliestown	3.00
17	Portyerrock Bay	3.39
18	Isle of Whithorn	3.67

[2] https://marinescotland.atkinsgeospatial.com/nmpi/

Table A1-3 Wave Exposure Index (CPU 3)

Dynamic Coast described the shoreline of CPU 3 as dominated by soft types at the head of Kirkcudbright Bay, within the River Cree Estuary and along the north-western shoreline of Wigtown Bay. Seawards from these more sheltered locations, there is a predominance of hard coastal types, with artificial shorelines located at Garlieston and the Isle of Whithorn.

At the head of Wigtown Bay, there are extensive intertidal sediment deposits including Wigtown Sands and Baldoon Sands. Beyond the extent of these intertidal deposits, the shoreline is more exposed and is fringed with rugged cliffs, outcrops and rock platforms composed of Silurian rocks. There are several pocket beaches and small crescentic bays indented into this predominately rocky shoreline including Brighouse Bay, Ross Bay, Garlieston and the Isle of Whithorn.

Saltmarsh occurs within the sheltered confines of the estuaries, including the head of Kirkcudbright Bay (Manxman's Lake, along the shore of the tidally influence section of the River Dee), at the head of the Water of Fleet and in Skyeburn Bay. The most extensive saltmarsh deposits are located along the shores of the River Cree at Creetown and Wigtown, refer to Table A1-4. The presence of these wide intertidal sand banks acts to dissipate wave energy, however the shoreline at Creetown has undergone substantial erosion in recent times.

Within CPU 3, Marine Scotland data indicates the Annual Mean Significant Wave Height to range from 0.56m to 0.91m in an east to west direction.

Policy Unit	Location	Saltmarsh Extent (Ha)[1]
12	Fleet Bay	22
	Manxman's Lake	15
13	River Dee (Kirkcudbright)	32
15	Wigtown	674

[1] Based on SSS

Table A1-4 Saltmarsh Location and Extent within CPU 3

The presence of small coastal dune systems is recorded at Dalavan Bay, southwest of the Gatehouse of Fleet and Rigg Bay located on the Whithorn peninsula. These coastal dunes are located at the head of sheltered pocket beaches.

Raised beach and marine deposits are found within CPU 3, these landforms provide evidence of a shoreline that has evolved due to the long-term response to isostasy and Holocene relative sea-level change. Raised beaches are located at Kirkcudbright, the Water of Fleet, the shoreline of Wigtown Bay and at Garlieston. The foreshore of Brighouse Bay also shows evidence of high late-glacial sea levels.

A1.3.4 CPU 4 Luce Bay

CPU 4 encompasses the shoreline of Luce Bay, a 20km wide macro-tidal marine embayment located along the northern coast of the outer Solway Firth. This coastal Process unit contains eight SMP policy units (Policy Unit 19 to Policy Unit 26). Marine Scotland data indicates the Mean Spring Tidal Range (m) within Luce Bay to range from 5.3m in the north at Luce Sands to 4.91m at the Mull of Galloway to the south. CPU 4 is described as a self-contained sediment unit with Burrow Head being a drift divide. Within Luce Bay the tidal stream is reported to rotate in an anticlockwise direction with a peak spring rate of 2m/s.

Luce Bay is exposed to the south-east where fetch lengths extend approximately 200km to the Lancaster coast. However, the largest waves are generated from the south-west which diffract into the bay driving a general northwards drift of sediment towards the head of the bay. This northward drift of sediment has contributed to siltation issues at Drummore. Table A1-5 summarises the Marine Scotland Wave Exposure Index for Luce Bay, Burrow Bay and the Mull of Galloway are most exposed to waves, whereas the Torrs Warren area to the north of Luce Bay is more sheltered in comparison. Within CPU 4 Marine Scotland data indicates the Annual Mean Significant Wave Height to be 0.97m.

Policy Unit	Location	Wave Exposure Index[2]
19	Burrow Head	4.04
20	Port William	3.87
21	Auchenmaig	3.64
22	Torrs Warren	3.16
23	Sandhead	3.55
	Ardwell	3.6
24	Kilstay	3.66
25	Drummore	3.44
26	Maryport	3.70
	Mull of Galloway	3.98

[2] https://marinescotland.atkinsgeospatial.com/nmpi/

Table A1-5 Wave Exposure Index (CPU 4)

Dynamic Coast categorised the shoreline of CPU 4 as being predominately soft, with areas of hard shoreline located towards the northern extent of Policy Unit 21 and at the Mull of Galloway, Policy Unit 26. There are also small sections of artificial shoreline, notably at Port William (Policy Unit 20) and along the shoreline of Policy Unit 24.

Policy Unit 22 includes the head of Luce Bay and encompasses a 24km² coastal dune system (Torrs Warren / Luce Sands) which is fronted by a wide and shallow ridge and runnel beach. This dune field stretches 8km from Sandhead in the south-west to Ringdoo Point in the north-east. The dunes reach an altitude of over 28m OD at their highest[3]. These coastal landforms are indicative of a sediment sink as sand dunes only form where the rate of beach deposition is greater than erosion. The antecedent glacial / deglacial environment of the late-Pleistocene and the Holocene relative sea level change have been important factors in the coastal evolution of Luce Bay. Deglaciation left extensive sediments that provide a source for depositional coastal landforms, while in response to Holocene sea-level change coastal barriers developed and dunes formed across them.

The distribution of saltmarsh within CPU 4 is indicated in Table A1-6, this is predominantly located at the head of Luce Bay in three separate locations associated with the sheltered back-beach environment of this coastal dune complex.

[3] Refer to Holocene coastal change at Luce Bay, South West Scotland (wiley.com), p754

Policy Unit	Location	Saltmarsh Extent (Ha)[1]
22	Glen Luce Luce Bay Luce Sands	9 46 8
[1] Based on SSS		

Table A1-6 Saltmarsh Location and Extent within CPU 4

Gravel beaches and marine deposits are located along the west and east shorelines of Luce Bay, including at Terally Bay. Raised beaches are located on the eastern side of Luce Bay, where a relict cliff line is fronted by a raised beach which determines the present route of the A747. The lack of sand on the upper beaches has been attributed to the predominance of a northerly sediment drift and the transportation of sediment towards the head of Luce Bay. The presence of extensive coastal protection works along the A716 are indicative of considerable erosion along the coastal edge and various attempts to arrest it. Storm waves are known to overtop this defence, strewing the road with gravel.

A1.3.5 CPU 5 Western Rhinns of Galloway

The Western Rhinns of Galloway extends from the Mull of Galloway northwards to Milleur Point located close to the entrance of Loch Ryan. Marine Scotland data indicates the Mean Spring Tidal Range to generally decrease in a south to north direction, close to Port Logan it is 4.02m, 3.66m at Portpatrick decreasing further at Milleur Point to 3.01m. CPU 5 contains three SMP policy units (Policy Unit 27 to Policy Unit 29).

Much of the shoreline of CPU 5 is exposed to the open sea conditions of the North Channel. The Mull of Galloway acts as a drift divide to any sediments being moved by wave action along the coast but does not hinder sediment moved by strong tidal currents. Based on the Marine Scotland wave exposure index data presented in Table A1-7, Saltpan Bay located to the north of Portpatrick is the most exposed to waves, whereas Port Logan is less exposed. According to Marine Scotland data the Annual Mean Significant Wave Height along the shoreline of CPU 5 ranges from 0.99m at the Mull of Galloway to 1.22m towards the outer harbour area of Portpatrick.

Policy Unit	Location	Wave Exposure Index[2]
27	Port Logan	3.48
28	Portpatrick	3.79
29 / 30	Saltpan Bay	4.01
	Milleur Point	3.75
[2] https://marinescotland.atkinsgeospatial.com/nmpi/		

Table A1-7 Wave Exposure Index (CPU 5)

Dynamic Coast categorised the shoreline of CPU 5 as being predominately hard, with smaller areas of soft shoreline located situated within bays.

The shoreline of CPU 5 is generally steep and rocky, with rugged cliffs, outcrops and shore platforms composed of Ordovician and Silurian rocks being dominant. Several small crescentic bays and pocket beaches are indented into this rocky coastline, including Float Bay and Clanyard Bay. There are several sandy beaches are located at the head of such bays. The settlements of Port Logan and Portpatrick are situated within similar relevantly sheltered locations. Portpatrick Harbour has encountered siltation issues and a small beach is located along the shore. Port Logan is a self-contained beach with coastal sand dunes located along the back beach. Small areas of coastal dune morphology are also located at Knock Bay to Killitrangan, indicative of a westerly and north-westerly fetch across the North Channel.

Storm surges are an important factor in producing high coastal water levels and high waves along this section of the Dumfries & Galloway coastline, these conditions can lead to localised flooding and accelerated erosion issues. For example, from the 3rd to 6th January 2014, Storm Anne coincided with a high spring tide (4.2m) and caused high waves to overtop the frontage at Portpatrick. This storm

generated a total water level of circa 4.98m, including a 0.78m surge which has been reported to equate to a 1 in 18-year return period event.

A1.3.6 CPU 6 Loch Ryan

CPU 6 encompasses the shoreline of Loch Ryan, described as an enclosed bay with a tidal range of 2.8m at Stranraer. The northern extent of Loch Ryan is defined by Milleur Point and Finnart Port located to the west and east, respectively. Loch Ryan measures about 5km wide and 13km long, and its morphology is attributed to its geological past, particularly the erosive influence of ice that carved out the softer Permian Sandstone at a faster rate than the surrounding harder Ordovician rock, hence leaving behind the Loch Ryan basin. CPU 6 contains six SMP policy units (Policy Unit 30 to Policy Unit 35).

CPU 6, Loch Ryan is generally sheltered, as indicated by the Marine Scotland Wave Exposure Index illustrated in Figure A1-5 and summarised in Table A1-8. The short fetch within the confines of this sea loch, and the bathymetry / topography restrict the wave conditions at the shoreline within the Loch. Thus, while the northern end of Loch Ryan is exposed to waves as indicated by an index of 3.54, the south of the loch at Stranraer is much less exposed with an index of 2.51.

Marine Scotland do not provide any Annual Mean Significant Wave Height data for within Loch Ryan, however a value of 1.18m is reported at the northern entrance to Loch Ryan. For further information refer to https://marinescotland.atkinsgeospatial.com/nmpi/.

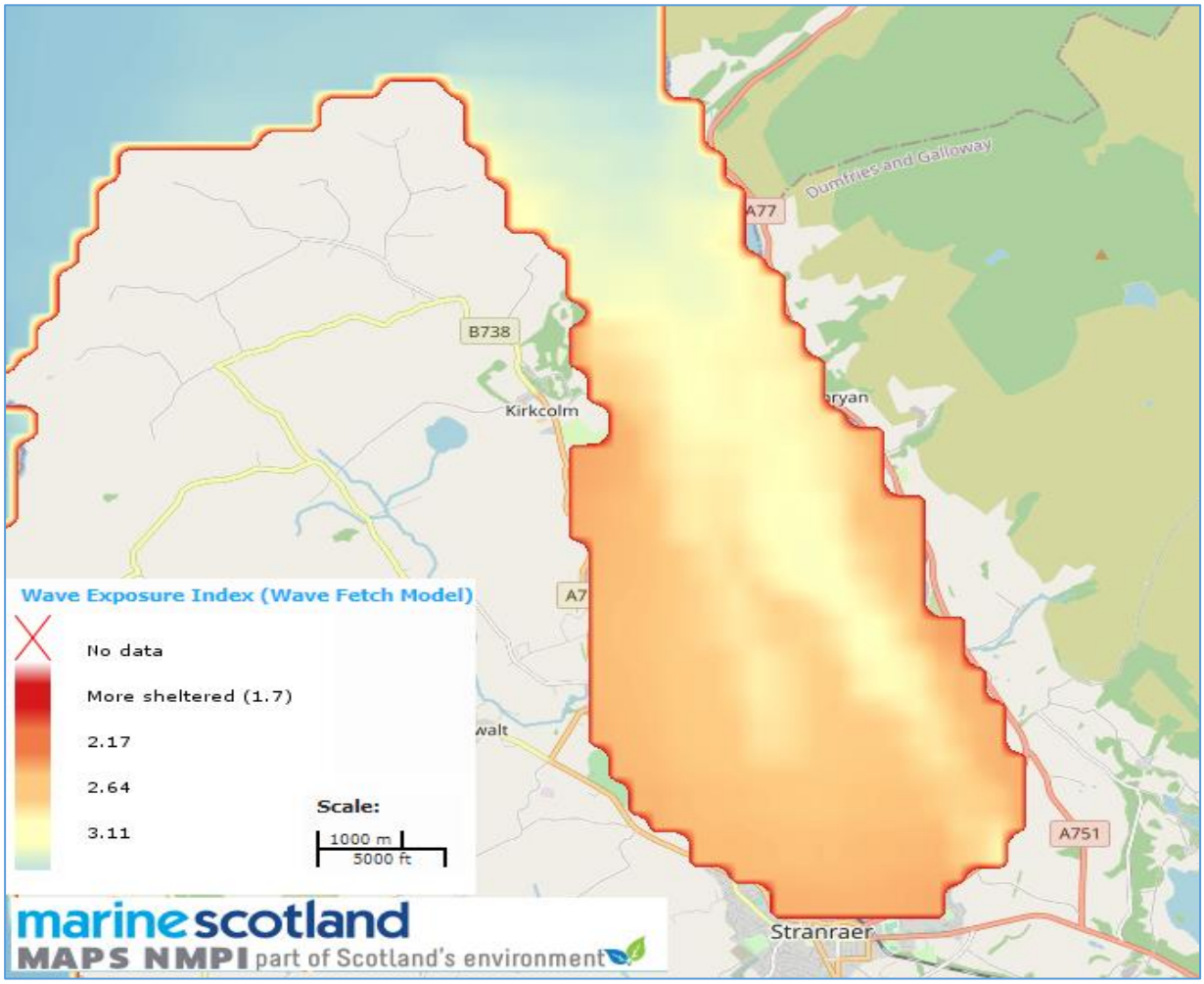

Figure A1-5 Wave Exposure Index for Loch Ryan (CPU 6)

Policy Unit	Location	Wave Exposure Index[2]
30	Milleur Point	3.75
31	Kirkcolm	2.51
	The Wig	2.47
32	Stranraer	2.51
	Sandmills	3.05
34	Cairnryan	3.04
Ayrshire	Finnarts Port	3.70

[2] https://marinescotland.atkinsgeospatial.com/nmpi/

Table A1-8 Wave Exposure Index (CPU 6)

Dynamic Coast categorised the shoreline of CPU 6 as being predominately soft, with smaller areas of hard shoreline located situated towards the north of Loch Ryan and along Policy Unit 33 located in the SSE corner of the Loch. There is an extensive stretch of artificial shoreline at Stranraer (Policy Unit 32 located at the head of Loch Ryan.

Sediment transport within CPU 6 is in a predominantly southerly direction, with sediment deposited on mudflats at Stranraer, and as a result the shoreline of Loch Ryan is generally more rugged and rocky towards the north and east, with a greater occurrence of sand and gravel beaches in the south and west. Stranraer is located along the head of Loch Ryan and fronted by a sandy beach referred to as the Cockle Shore Beach. The Wig, located on the western side of Loch Ryan is indicative of the northward movement of sediment from Soleburn to Kirkcolm Point.

Much of the coastline of Loch Ryan, from Kirkcolm to Old House Point consists of raised beaches, and marine deposits, providing evidence of a shoreline that has evolved due to the long-term response to isostasy and Holocene relative sea-level change.

A1.4 Coastal Flood Risk in Dumfries & Galloway

A key outcome of the FRM Scotland Act has been the national scale production of flood hazard and risk maps for Scotland. SEPA have described these maps as the most comprehensive national source of data on flood hazard and risk ever produced. The 'Coastal Flood Maps' are based on the propagation of astronomical tide level plus a surge factor. Thus, wave action or wave overtopping, and the effects of flood defences are not considered. The strategic nature of these maps is sufficient to support flood risk management planning at a community level such as a Shoreline Management Plan but not appropriate for a property level assessment. However, this is not a significant issue for the review of the SMP given the strategic nature of this study.

For this SMP update the SEPA present day Medium Likelihood coastal flood extents were used to assess the risk and potential impact to receptors located around the Dumfries & Galloway coast. Based on the NFRA data, there are currently a total of 544 homes, 262 Businesses, 40 Utilities, 47.3km of Road and 2,587ha of Agricultural Land at a Medium Likelihood Coastal Flood Risk. The largest coastal flood risk is associated with the Inner Solway Firth (CPU 1), involving 198 homes, 95 businesses, 16 Utilities, 19km of road and over 1,000ha of Agricultural land. The towns of Annan and Dumfries are located within CPU 1, as are the communities of Browhouses, Newbie, Powfoot, Carsethorn and Southerness. Within CPU 1, Policy Unit 4 has the greatest number of homes affected by coastal flooding (114). This relatively low-lying and level coastal area also contains 42% of the total Agricultural Land affected by coastal flooding. In contrast, the Western Rhinns (CPU 5) is the least affected area. Overall, this area is mainly rural and sparsely populated, with most of the coastal flood risk associated with Portpatrick and Port Logan. Policy Unit 32 includes the town of Stranraer where 78 homes are at coastal flood risk, this accounts for all the homes at coastal flood risk within CPU 6.

It is estimated that the projected global sea level rise over the next 100 years will range from 25cm to around 1m although some estimates put it much higher than this. The rate of change will be influenced by greenhouse gas emissions, upon which there is a considerable amount of uncertainty, and the uncertain future response of the Antarctic ice sheet to climate change. Research has shown that trends in observed Scottish tidal records lie close to the 95th projection of the UKCP09 High Emission Scenario and that the isostasy (land rebound) does little to offset rising sea level. Previously, it was generally

accepted that rising land levels associated with Scotland's recovery from the last ice age were mitigating the impact of global sea level rise. Current estimates indicated that since 1880 sea level around Scotland has risen by 21-24cm and between 2018 and 2019, the global sea level increase was 6.1mm.

SEPA has produced a series of climate change coastal flood maps based on the projected impact of climate change related sea level rise as defined by UKCP09 *(*95th percentile *of the UKCP09 high emissions scenario (A1F1) for 2080)* which were used to identify future trends in terms of coastal flood risk along the Dumfries & Galloway coastline. While it is acknowledged that the UKCP09 projections have now been superseded by those of UKCP18, and SEPA is currently updating the National Flood Risk Assessment (NFRA) based on the UKCP18 projections (AR5), this still requires significant analysis and interpretation. When approached during the development of this SMP, SEPA advised that the update to UKCP18 **would take some time to complete** and hence would not be available within the timeframe for this SMP update. Consequently, the future coastal flood maps used to assess the change in coastal flood risk around the Dumfries & Galloway shoreline, are based on the UKCP09 High emissions 95th percentile relative sea level rise projections for the year 2080. **However, initial analysis has indicated that this can be considered a proxy for the 50th percentile UKCP18 high emissions scenario (RCP8.5) sea level projections for 2100.** This suggests that with limited global action to tackle climate change there is a 50:50 chance that the sea level rise by 2100 will be higher than that mapped in the future coastal flood maps. The Met Office Hadley Centre estimates that projected sea level will continue to rise beyond 2100 for all emissions scenarios in the UKCP18 exploratory projections. Under the UKCP18 high emissions scenario (RCP8.5), the scenario mapped in the current SEPA future flood hazard dataset was estimated to likely be exceeded shortly after 2100. Additional sea level rise beyond the current projected ranges cannot be ruled out as there is uncertainty regarding the Antarctic ice sheet contribution to sea level rise.

Based on the available SEPA climate change coastal flood mapping the future coastal flood risk along the Dumfries & Galloway coastline is projected to increase to 914 homes, 413 Businesses, 49 Utilities, 66.4km of Road and 3305ha of Agricultural Land at a Medium Likelihood Coastal Flood Risk by 2100.

Refer to Table A1-9 for a summary of Medium Likelihood Flood Risk with and without Climate Change and Table A1-10 for an Overall Summary of Flood Risk. For further information on flood risk refer to the Preferred Policy Plans in Appendix D and the SEPA flood assessment information available at https://www.sepa.org.uk/data-visualisation/nfra2018/.

		Medium likelihood								*Medium likelihood with climate change							
	Policy Unit	Homes	Business Premises	Utilities	Community facilities	Cultural Heritage	Transport roads (km)	Transport rail (km)	Agricultural Land (ha)	Homes	Business Premises	Utilities	Community facilities	Cultural Heritage	Transport roads (km)	Transport rail (km)	Agricultural Land (ha)
CPU 1	1	2	3	0	0	3	1.39	0	144	5	5	3	0	3	1.82	0	171
	2	5	3	0	0	0	0.68	0	58	8	6	2	0	0	0.85	0	129
	3	12	9	1	0	0	0.9	0	58.5	14	10	1	0	0	1.4	0	100
	4	**115**	36	4	0	40	6.9	0.16	53.9	**191**	61	5	0	49	9.4	0.18	85.8
	5	12	15	0	0	3	5.1	0	582	20	42	0	0	4	7.7	0	731
	6	16	25	9	1	22	3.1	0	168	44	44	10	1	35	5.2	0	207
	7	37	4	1	0	3	1	0	17	58	8	1	0	7	2	0	22
CPU 2	8	3	8	0	0	0	1.4	0	163	4	8	0	0	0	1.8	0	204
	9	38	11	2	0	2	1.97	0	80	49	17	2	0	2	2.5	0	89
	10	0	0	1	0	1	0.4	0	87	0	0	1	0	1	0.5	0	107
	11	0	0	0	0	1	0	0	4	0	0	0	0	1	0.02	0	5
CPU 3	12	4	1	0	0	7	2.6	0	105	6	3	0	0	7	3.5	0	124
	13	70	15	4	2	5	1.5	0	27	120	40	5	2	8	2	0	37
	14	5	4	0	0	4	4	0	139	7	4	1	0	7	0.42	0	46
	15	46	40	4	2	3	6.8	0	841	62	49	5	2	3	9.3	0	1013
	16	36	11	3	1	18	2.2	0	8	44	11	3	1	23	2.5	0	11
	17	0	0	0	0	4	0	0	3	0	0	0	0	4	0.13	0	4
	18	50	13	1	0	29	0.6	0	0.8	54	13	1	0	30	0.7	0	1.7
CPU 4	19	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	5.4
	20	2	8	3	0	4	0.75	0	4.3	10	14	4	0	4	1.1	0	5.4
	21	0	0	0	0	1	0.1	0	3.5	0	0	0	0	1	0.5	0	5.4
	22	0	1	0	0	1	0.06	0	76	1	1	0	0	1	0.3	0	118
	23	0	0	1	0	1	1.1	0	3.2	4	1	1	0	4	1.8	0	6.2
	24	0	0	0	0	1	0.1	0	0.3	0	0	0	0	1	0.2	0	0.68
	25	5	6	0	0	0	0.29	0	0.3	9	7	0	0	0	0.32	0	0.4
	26	0	0	0	0	0	0	0	1.6	0	0	0	0	1	0	0	3
CPU 5	27	0	0	0	1	11	0.25	0	20	3	0	0	1	11	0.4	0	22
	28	8	8	1	1	15	0.43	0	0	9	13	1	2	15	0.51	0	0
	29	0	1	0	0	5	0	0	0.65	0	1	0	0	5	0	0	0.8
CPU 6	30	0	0	0	0	0	0	0	1.2	0	0	0	0	0	0	0	1.5
	31	0	0	0	0	0	3.4	0	16	1	0	0	0	0	4.3	0	21
	32	78	38	3	3	9	3.8	0.69	12	191	73	3	3	11	5	1.86	16
	33	0	0	0	0	0	0	0	4.6	0	0	0	0	0	0	0	6
	34	0	2	0	0	3	0.1	0	1.4	0	2	0	0	4	0.19	0	2.2
	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A1-9 Summary of Medium Likelihood Flood Risk and Medium Likelihood Flood Risk with Climate Change

Receptor	Medium likelihood	*Medium likelihood with climate change
Homes	544	914
Business Premises	262	433
Utilities	40	49
Community facilities	11	12
Cultural Heritage	198	244
Transport roads (km)	47.27	66.36
Transport rail (km)	0.85	2.04
Agricultural Land (ha)	2587.25	3305.08
Refer to https://www.sepa.org.uk/data-visualisation/nfra2018/ regarding flood assessment information *Climate change is based on UKCP09 projections.		

Table A1-10 Overall Summary of Flood Risk

A1.5 Coastal Erosion Risk in Dumfries & Galloway

There are numerous assets presently at some degree of risk from coastal erosion along the Dumfries & Galloway shoreline, and due to climate change and anticipated sea level rise, this risk will increase in the future.

The Dynamic Coast Project commissioned by the Scottish Government and undertaken by Scottish Natural Heritage (now NatureScot), first published a national coastal change assessment in August 2017. This study suggested that across the majority of Scotland's soft coast (i.e., all soft coast excluding salt marsh) around 38% were experiencing coastal erosion, with an average rate of 0.43m/yr. A further update, Dynamic Coast 2, published in 2021, employing improved analysis techniques and more data increased this estimate to 46% of the Scottish coastline being subject to erosional forces.

Dynamic Coast 2 also considered the influence of sea level rise on future erosion and concluded that whilst erosion rates were expected to quicken with rising relative sea level rise, the first decades where erosion is anticipated to be more prevalent than deposition is the 2020-2030s. Whilst natural coastal defences still retain some capacity to cope with the increased erosional impact, left unchecked accelerating coastal erosion and associated enhanced coastal flood risk, is expected to have an increasingly disruptive influence on society's coastal assets. It therefore follows that society should start resilience and adaptation planning now.

Dynamic Coast 2 modelled anticipated shoreline change under High Emissions, Medium and Low Emissions Scenarios, thus the available data is comparable to that from the National Flood Risk Assessment, with a consistent approach applied at a national scale and simplified management scenarios, such as 'do nothing' or 'maintain existing defences' assumed.

Within Dynamic Coast 2 anticipated coastal erosion has been modelled (using a modified Bruun method), considering an open coast and inner inlet approach. Recent coastal change is considered alongside recent relative sea level (RSL) rise. Future RSL is projected to estimate future change rates. under the High, Medium and Low Emissions Scenarios (UKCP18 RCP 8.5 95th percentile, RCP4.6 50th percentile and RCP2.6 50th percentile). Anticipated coastal erosion areas were created by forming a polygon between the known modern (2020) shoreline and the anticipated 2050 and 2100 shorelines, respectively, three erosional buffer zones are identified as follows:-

- **Erosional Area (EA)** is the area is expected to be located seaward of the MHWS by 2050 or 2100. This area is highly likely to be affected or damaged by erosion or wave thrown debris during storm events.
- **Erosional Influence (EI),** this is a 10m buffer added landward of the EA, to identify adjacent area that might be directly impacted by erosional events. This area is likely to be affected or damaged by erosion or wave thrown debris during storm events.

- **Erosion Vicinity (EV),** this is an additional 50m buffer landward of the EI allowing for the identification of adjacent assets which could be indirectly impacted by events and hence should be flagged for further consideration by Local Authorities and asset managers.

Within the SMP analysis, positions of coastal assets were derived from OS and partner datasets (as points, lines, and polygons) which were then 'selected by location (intersect)' with the EA, EI & EV areas generated above for 2050 and 2100. Where an asset straddled more than one of these erosion areas, then the greatest risk (most-seaward) asset or asset group is reported. For detail relating to how the EA, EI and EV was considered during the identification of the Preferred Policies, refer to Appendix D for information relating to each Policy Unit.

Table A1-11 highlights the assets at risk under a High Emission Scenario and a 'do nothing' coastal management scenario by policy unit. This assumes that artificial and natural defences are not maintained and where present erosion can affect landward assets. Table A1-12 provides an overall summary of the erosion risk estimated for the Dumfries & Galloway shoreline in 2050 and 2100.

	Homes			Businesses			Roads (all) (km)				Homes			Businesses			Roads (all) (km)		
	2050										2100								
PU	Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity		Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity
1	No Data										No Data								
2																			
3	0	0	10	0	0	6	0	0.13	0.21		0	4	7	0	0	8	0.22	0.03	0.17
4	0	0	6	0	0	13	0.08	0.03	0.47		3	1	5	3	5	12	0.13	0.19	0.8
5	No Data										No Data								
6																			
7	11	9	92	2	3	34	0	0.16	1.1		41	21	91	8	2	10	0.4	0.34	1.2
8	0	0	4	0	1	1	0	0	0.11		0	1	5	1	0	1	0	0	0.79
9																			
10	0	0	1	0	0	1	0.03	0.03	0.22		1	0	0	1	0	1	0.11	0.05	0.29
11	0	0	0	0	0	0	0	0.08	1.31		0	0	0	0	0	0	0.43	0.27	0.14
12	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0.07
13	No Data										No Data								
14																			
15	0	0	3	0	0	2	0	0	0.13		0	0	12	0	0	4	0.05	0.054	0.77
16	0	0	1	0	0	0	0.02	0.123	0.31		0	0	2	0	0	0	0.66	0.08	0.06
17	0	0	0	0	0	0	0	0	0.012		0	0	0	0	0	0	0	0	0.012
18	No Data										No Data								
19	0	0	0	0	0	0	0	0	0.01		0	1	1	0	0	2	0.014	0.013	0.04
20	0	0	9	0	0	0	0	0	0.15		0	5	26	0	0	13	0.13	0.24	0.5
21	0	0	2	0	0	0	0	0	3.4		1	0	9	1	0	2	0.76	0.57	6.5
22	No Data										No Data								
23	0	2	30	0	1	3	0.27	0.5	1.3		147	6	27	25	0	4	3.2	0.3	1.38
24	0	1	3	0	0	4	0	0.78	0.99		1	2	2	2	2	5	1.9	1.12	1.09
25	0	0	0	0	0	0	0	0	0.34		0	0	9	0	0	1	0.36	0.09	0.32
26	0	0	0	0	0	1	0	0	0		0	0	0	0	0	1	0	0	0
27	0	12	7	0	3	2	0.98	0.15	1.07		17	1	2	0	4	4	0.99	0.22	0.66
28	No Data										No Data								
29																			
30	0	0	0	0	0	0	0.22	0.12	0.53		0	0	0	0	0	0	0.23	11.9	0.53
31	0	1	1	0	0	0	0.23	0.36	1.78		1	1	0	0	0	0	1.23	0.64	1.08
32	0	0	1	0	0	0	0	0.15	0.64		0	0	1	0	0	1	0.58	0.12	0.38
33	0	0	0	0	0	0	0.09	0.06	1.3		0	0	0	0	0	1	0.49	0.15	0.96
34	No Data										No Data								
35																			

Table A1-11Summary of Erosion Risk Based on Policy Unit

Homes			Businesses			Roads (all) (km)		
2050								
Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity
11	25	170	2	8	67	1.92	2.673	15.382
2100								
Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity
212	43	202	41	13	72	11.884	16.377	18.22

Table A1-12 Overall Summary of Erosion Risk within Dumfries & Galloway

2 ASSESSMENT OF SHORELINE PROCESSES

A2.1 Introduction

Appendix A1 has reviewed the available information relating to the past and present coastal processes that influence the Dumfries & Galloway coastline, and assets at risk from coastal flooding and erosion. This Appendix aims to provide an understanding of how the shoreline processes are likely to change over the next 100 years. Following the official DEFRA Shoreline Management Plan guidance, a 'behavioural systems approach' is followed, whereby 'how' and 'why' the shoreline will change is considered.

The combination of natural coastal change, increasing anthropogenic pressure together with climate change and sea level rise have implications and present significant challenges for the future management of any shoreline. Consequently, an understanding of these likely future changes is essential for the identification of management issues, including erosion and flooding, and hence the selection of appropriate management policies. Solutions for current and future problems must be implemented and sustained over the long-term. For this reason, the SMP needs to clearly define the implications of longer-term coastal change (50 to 100 years) to define management policies for the shoreline. This is particularly important where the scale of predicted coastal change means that the current approach for management of risk may no longer be practical in the future.

A SMP allows for **planning - adaptation - action**, which allows for decisions to be made under a degree of uncertainty. For example, if a change in the speed or progression of sea level rise is detected or projected, measures can be scaled up or down accordingly. The policies presented by this SMP can be reviewed by Dumfries & Galloway Council at any time. This flexibility facilitates responsiveness to changing risk scenarios and situations which is essential when considering an evolving situation such as climate change.

A2.2 Baseline Scenarios 'Do-Nothing' & With Present Management (SMP05)

Following the Defra (2006a) shoreline management plan guidance two baseline scenarios have been applied to the Dumfries & Galloway shoreline and appraised, these include,

- Baseline Scenario 1, No Active Intervention (Do Nothing Approach)
- With Present Management (SMP05)

It is important to note that these assessments are NOT intended to be realistic scenarios for managing the coast. Instead, these form contrasting examples for the basis of policy appraisal. In some locations the structures discussed are multi-functional and may not have a primary purpose as coastal defence structures, for example in harbours.

A2.2.1 Baseline Scenario 1 – No Active Intervention (Do Nothing Approach)

The No Active Intervention scenario applies that a 'Do Nothing Approach' is followed which basically means that effects of coastal erosion and flooding are ignored, and the coastline allowed to react to natural phenomena without any human intervention. It therefore assumes that there will be no further expenditure on maintaining / improving existing coastal defences and consequently defences will become 'ineffective' over time as defences deteriorate, the efficiency at which they provide protection against flooding and / or erosion is reduced. The time it takes for coastal defences to become ineffective will depend on their 'Residual Life', this is determined by reference to the defence condition assessment (refer to Appendix B). Other factors such as shoreline condition and exposure to storms and waves have also been considered, as well as the anticipated future impact of sea level rise. The exact timing of failure of defences has not been defined but is considered in terms of the three epochs: short (0 to 20 years), medium (20 to 50 years) and long (50 to 100 years). Table A2-1 outlines the likely consequences in terms of erosion and flooding for each policy unit, based on applying a 'Do Nothing' approach through a No Active Intervention policy.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
1	The shoreline at Redkirk is backed by an exposed cliff line. Erosion of the coastline continues. There is no erosion rate information relating to Policy Unit 1 due to uncertainties with how salt marsh will react to rising sea levels. Hence, the indication of no significant erosion risk within this policy unit by the Dynamic Coast data may not be accurate.	There is no erosion rate information relating to Policy Unit 1 due uncertainties with how salt marsh will react to rising sea levels. Based on the UKCP09 'High Emissions' 2080 scenario 523ha, of low-lying land is inundated with coastal floodwater, following the occurrence of a medium likelihood coastal flood event a 7% increase on today.	Sea-level continues to rise. The inundation of low-lying areas allows the development of new intertidal areas.
2	Policy Unit 2 represents a dynamic shoreline with areas of accretion as well as erosion. Dynamic Coast 2 estimates that by 2030 the shoreline of Policy Unit 2 will have advanced seawards by up to 6m at some locations, whilst receding landwards by up to 17m along other sections of this shoreline. Low-lying farmland at Eastriggs is inundated with coastal flood water during a medium likelihood flood event. The defences maintain the shoreline at Browhouses from erosion. Elsewhere the shoreline will retreat at a variable rate.	Flood risk increases due to sea-level rise. Based on UKCP09 'High Emissions' 2080 scenario 428ha of farmland at Eastriggs is inundated with coastal floodwater, following the occurrence of a medium likelihood coastal flood event. Defences at Browhouses (BHOUSE001) start to fall into disrepair, this will increase the erosion risk to the adjacent access road. There is continued frontal erosion of Torrduff Point and adjacent area, by 2050 erosion will have increased to the point that the entire shoreline is anticipated to be eroding. Possible contamination risk stemming from erosion at the former munitions site. Coastal squeeze affecting saltmarsh at Browhouses.	BHOUSES001 has collapsed and sections of the road start to slump and collapse. Saltmarsh habitat has rolled forward or disappeared. By 2100, erosion of the soft coastal cliffs located to the west and east of Toffduff Point will continue. It is anticipated that three homes and 0.48km of access road will be located within the Erosion Vicinity while 4.3km of the Scottish Water clean water network will be at erosion risk. The inundation of low-lying areas allows the development of new intertidal areas.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
3	The defences at Battlehill begin to fail and fall into disrepair. 325ha of low-lying farmland is inundated with coastal flood water during a medium likelihood flood event. By 2030 the shoreline of Policy Unit 3 will have advanced seawards by up to 24m at some locations, whilst receding landwards by up to 7m along other sections of this shoreline.	By 2050, Dynamic coast predicts this shoreline to be predominately erosional. The coastal defences at Battlehill have failed. Coastal erosion continues at Battlehill, Seafield and Waterfoot, up to 0.61ha may be lost. Flood risk has increased due to sea-level rise.	Based on UKCP09 'High Emissions' 2080 scenario 370ha of farmland is inundated with coastal floodwater, following the occurrence of a medium likelihood coastal flood event. The coastline continues to erode. By 2100, there will be four homes located within the Erosion Influence, seven homes and eight businesses located within the Erosion Vicinity and 0.22km of the Seafield Road within the Erosional Area, with a further 0.03km of road within the Erosion Influence and 0.17km within the Erosion Vicinity. Dynamic Coast also identified Scottish Water Facilities to be at erosion risk including about 0.08km of the Clean Water Network. Sea-levels continue to rise.
4	Coastal flood water inundates 53.9ha during a medium likelihood flood event. The settlements of Annan, Newbie and Powfoot are affected. The defences at Powfoot begin to fail and fall into disrepair. Elsewhere the shoreline retreats at a variable rate.	At Newbie some defences are expected to fail and fail into disrepair. Coastal erosion along unprotected sections of the coast continues. Flood risk increases due to sea-level rise. By 2050 the shoreline made advance landwards by up to 71.38m. By 2050, there will be six homes and 13 businesses located within the Erosion Vicinity, in addition, 0.08km of access road at Newbie Barns will be within the Erosional Area and directly impacted by coastal erosion, while 0.03km will be within the Erosion Influence and 0.47km within the Erosion Vicinity.	Sea-level continues to rise. The beach may narrow and as the beach erodes and defences fail, damage to infrastructure or industrial property may occur. Based on UKCP09 'High Emissions' 2080 scenario 85.8ha area is inundated with coastal floodwater, following the occurrence of a medium likelihood coastal flood event, Annan, Newbie and Powfoot are affected. All defences have failed along this shoreline. By 2100, there will be homes and businesses directly impacted by coastal erosion, including 0.13km of road located at Newbie Barns and Newbie Mains.
5	This shoreline is unprotected. It is highly dynamic and there are areas of retreat and erosion. Due to a high level of uncertainty associated with the response of saltmarsh to sea level rise, Dynamic Coast does not provide data on projected coastal change for much of Policy Unit 5. Dynamic Coast	By 2050, it is estimated that the effect of sea level rise will result in the shoreline of Policy Unit 5 being predominately erosional. No assets are identified to be at risk of coastal erosion. Saltmarsh habitat rolls landward as response. Inland freshwater habitats are at risk.	Based on UKCP09 'High Emissions' 2080 scenario 2,973ha is inundated with coastal floodwater, following the occurrence of a medium likelihood coastal flood event. By 2100, it is estimated that the effect of sea level rise will result in the shoreline of Policy Unit 5 being predominately erosional. It is uncertain but Caerlaverock Saltmarsh may roll landward as response. Inland freshwater habitats are at a

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
	estimates that by 2030 the shoreline of Policy Unit 5 will have advanced seawards by up to 15m at some locations, whilst receding landwards by up to 4m along other sections of this shoreline.		great risk. Sea-level continues to rise. The inundation of low-lying areas allows the development of new intertidal areas. Erosion and accretion patterns are likely to fluctuate, due to the highly dynamic system.
6	168ha is inundated with coastal flood water during a medium likelihood flood event. Dumfries is well defended. Most defence structures are well maintained. Whitesands Scheme is ongoing. To the south of Dumfries the fields and parkland function as a floodplain (flood storage area).	207ha is inundated with coastal flood water during a medium likelihood flood event. Dumfries remains defended. Most defence structures are still in a reasonable condition, some start to fall into disrepair including those at Whitesands because of a do-nothing approach. To the south of Dumfries, the fields and parkland function as a floodplain (flood storage area), the area of marshland and saltmarsh increase. Flooding at Glencaple increases. The merse area retreats and saltmarsh is squeezed at Glencaple.	Most of the defences are breached, Dumfries is affected. The area of merse retreats. Sea-level continues to rise. Defence failure would cause considerable damage and flooding during storm conditions to property or infrastructure behind the defences.
7	17ha is inundated with coastal flood water during a medium likelihood flood event. Some coastal defences fall into disrepair. This soft sediment shoreline is protected with mainly private defences (hard engineering) at Carsethorn and Southerness. Increased wave overtopping is reported. By 2030, the shoreline will recede by up to 11.64m landwards, as estimated rate of 1.164m per year. By 2040, this erosion rate will increase up to 1.352m per year and moving 13.52m landwards.	By 2050, there will be 11 homes and two businesses located within the Erosional Area and nine homes and three businesses, as well as 0.16km of road will be situated within the Erosion Influence zone. 92 homes and 34 businesses are expected to be included within the Erosion Vicinity. Dynamic Coast has also estimated that by 2050, Scottish Water facilities including 1km of the clean water network and 0.4km of gravity pipes will be situated within the Erosion Vicinity, as well as a 1.08km^2 Area of scheduled monument, McCulloch's Castle at Arbigland. The shoreline will have retreated by 15.42m landwards (-1.542m per year).	Based on UKCP09 'High Emissions' 2080 scenario 22ha is inundated with coastal flood water during a medium likelihood flood event. Most of the defences have failed. Most of the defences are ineffective. Sea-level continues to rise. By 2100 it is anticipated that 41 homes and eight businesses will be located within the Erosional Area along with 0.4km of road, while 21 homes, two businesses and 0.34km of road will be within the Erosion Influence Zone and 91 homes and 10 businesses within the Erosion Vicinity. This apparent future decrease of assets located within the Erosion Vicinity does not signify mitigation, but rather that assets are now located within the Erosion Influence zone as the shoreline recedes. Scottish Water assets including 0.5km of the clean water network and 0.08km of gravity pipes will be situated within the Erosional Area.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
			The beach will continue to narrow and lower as sea levels rise increasing the vulnerability of the shoreline to wave attack during storm conditions.
8	Shoreline is largely undefended except for the defences at Port O'Warren. Natural cliffs to the west of Southwick prevent flooding. The shoreline to the east is a highly dynamic coastal system. Three homes and eight business premises including some minor roads presently at a medium likelihood of coastal flood risk. Small areas of sediment accretion occur in the west of Policy Unit 8 and are confined to the small bay areas including Sandyhills Bay (NX894551) and Portling Bay (NX883539). Dynamic Coast estimates that by 2030 the shoreline of Policy Unit 8 will have advanced seawards by up to13m at some locations, whilst receding landwards by up to 30m in others. Embryo dunes may form seasonally due to the release of sediment.	Due to a high level of uncertainty associated with the response of saltmarsh to sea level rise, Dynamic Coast does not provide data on projected coastal change. Natural saltmarsh habitats continue to adapt to sea level rise. Embryo dunes may form seasonally due to the release of sediment. These are likely to be short-lived. Linear dunes may advance landwards at Mersehead, if uninterrupted.	Based on UKCP09 'High Emissions' 2080 scenario 204ha area is inundated with coastal flood water during a medium likelihood flood event. The shoreline to the east of the Southwick Water that mainly comprises of softer sediment will be impacted the most by erosion. By 2100 erosion in this area is anticipated to have caused the shoreline to recede by up to -39m. Due to uncertainty as to how areas of salt marsh will respond to sea level rise Dynamic Coast does not present erosion predictions for such areas. This is particularly significant at Mersehead where there is extensive saltmarsh and no erosion is shown, however it cannot be presumed that these areas will not be impacted by erosion. Sea-level continues to rise.
9	An 80ha area is inundated with coastal flood water during a medium likelihood flood event. Homes, business, road, and other assets are at flood risk. The Port areas of Dalbeattie, Kippford and Rockcliffe have been identified to be at risk of flooding. The floodplain and intertidal zone operate naturally. Salt marsh is present and adds uncertainty as to how the shoreline will respond to sea level forcing. Some coastal defences fall into disrepair.	Salt marsh is present and adds uncertainty as to how the shoreline will respond to sea level forcing. Most defences are ineffective.	Based on UKCP09 'High Emissions' 2080 scenario 98ha is inundated with coastal flood water during a medium likelihood flood event. Most of the defences are ineffective. Sea-level continues to rise. Salt marsh is present and adds uncertainty as to how the shoreline will respond to sea level forcing. Most defences are ineffective. The intertidal area will continue to narrow and lower as sea-levels rise.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
10	Shoreline is defended along Balcary Bay, defences protect the road from erosion. 87ha is inundated with coastal flood water during a medium likelihood flood event, including low-lying farmland. Saltmarsh is located at the head of the bays. Salt marsh is present and adds uncertainty as to how the shoreline will respond to sea level forcing. By 2030, it is estimated that the western shore of Balcary Bay may have receded landwards by up to 6.31m with the north-west corner of Balcary Bay receding at the fastest rate.	Salt marsh is present and adds uncertainty as to how the shoreline will respond to sea level forcing.	Based on UKCP09 'High Emissions' 2080 scenario 107ha is inundated with coastal flood water during a medium likelihood flood event. Defences start to fall into disrepair and private and public road assets are compromised. Coastal defences are now ineffective. Sea-level continues to rise, private and public road assets are seriously compromised. By 2100, it is estimated that sections of this shoreline may recede by up to 12m. The beach is lowered and narrowed. Salt marsh is present and adds uncertainty as to how the shoreline will respond to sea level forcing.
11	Rugged and resistant cliffs fronted by a shore platform dominate this shoreline. The shoreline has largely remained stable since the 1870's. Some small areas of erosion located at the head of pocket beaches.	No issues identified, there is a 0.5% increase in the spatial extent of coastal flooding, which is restricted by the presence of cliffs. Natural coastal processes continue.	Sea-level continues to rise. Natural coastal processes continue. Potential loss of some pocket beaches where they are unable to retreat due to resistant cliffs behind, and the rock platforms fronting the cliffs may become submerged. The resistant nature of the cliffs will remain the dominant control on their erosion and therefore recession rates are not expected to be significantly affected by accelerated sea level rise.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
12	Defences are mainly located along the shoreline of Kirkcudbright Bay and Brighouse Bay, some of these have failed or will fall into disrepair. 105ha is inundated with coastal flood water during a medium likelihood flood event, including low-lying farmland. Saltmarsh is located at the head of the bays. There are some small areas of accretion within the sheltered bay-head areas.	Defences start to fall into disrepair and private and public road assets are compromised. Area of shoreline is lost. By 2040 the shoreline advances landwards up to 14m at Kirkclaugh.	Based on UKCP09 'High Emissions' 2080 scenario 124ha is inundated with coastal flood water during a medium likelihood flood event. Sea-level continues to rise, by 2100 up to 2.6ha of shoreline is lost. The inundation of low-lying areas allows the development of new intertidal areas. By 2100 it is estimated that 0.07km of the A75 at Kirkclaugh will be located within the Erosion Vicinity, while the risk to the Brogue Coast SSSI will have increased with 384Ha located within the Erosional Area with another 193Ha situated within the Erosion Influence.
13	70 homes, 15 business, roads, utilities cultural heritage features are currently at risk of medium likelihood coastal flooding. Defences protect land located to the north of the town (Janefield) and define Kirkcudbright Harbour, these are in a fair condition. 27ha is inundated with coastal flood water during a medium likelihood flood event, including low-lying farmland. Saltmarsh is squeezed against this embankment. The Dynamic Coast assessment does not extend into Policy Unit 13 therefore no assessment of coastal erosion risk has been possible.	The coastal defences at Janefield fail. Flood risk has increased due to sea-level rise.	Sea-level continues to rise. The inundation of low-lying areas allows the development of new intertidal areas Based on UKCP09 'High Emissions' 2080 scenario 37ha of farmland is inundated, saltmarsh rolls over into this area. Additional receptors are affected by flooding increasing by up to 50%. No areas of erosion are identified.
14	42ha is inundated with coastal flood water during a medium likelihood flood event. There are issues of flooding along the B796. The floodplain and intertidal zone operate naturally.	There are issues of flooding along the B796, the extent remains broadly similar although flood depths will increase.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 46ha is inundated with coastal flood water during a medium likelihood flood event. Natural coastal processes continue. The inundation of low-lying areas allows the development of new intertidal areas.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
15	841ha is inundated with coastal flood water during a medium likelihood flood event. The low-lying area adjacent Wigtown including Baldoon is inundated, including low level farmland. Wigtown Harbour falls into disrepair. Creetown is located on a soft coast and the original Dynamic Coast dataset indicated an area of erosion located seawards of the present A75 (NX465588). However due to the presence of salt marsh habitat, there is considerable uncertainty relating to future shoreline change along the coast both here and at Wigtown (NX446557). Consequently, the newer Dynamic Coast 2 dataset, no longer includes projected erosion lines for Wigtown Sands, the mouth of the River Bladnoch or the north of Baldoon Sands	Over 1ha of saltmarsh is expected to be lost at Creetown. Policy Unit 15 is expected to lose up to 10ha of shoreline. All coastal defence has failed, some sections of the A75 are compromised.	Based on UKCP09 'High Emissions' 2080 scenario 1,013ha is inundated with coastal flood water during a medium likelihood flood event. Creetown is located on a soft coast and the original Dynamic Coast dataset indicated an area of erosion located seawards of the present A75 (NX465588). However due to the presence of salt marsh habitat, there is considerable uncertainty relating to future shoreline change along the coast both here and at Wigtown (NX446557). The Dynamic Coast 2 dataset no longer includes projected erosion lines for Wigtown Sands, the mouth of the River Bladnoch or the north of Baldoon Sands. However, it is assumed that the intertidal zone rolls landwards as sea-level continues to rise. Some sections of the A75 are compromised.
16	Defences define Garlieston Harbour and the frontage of this village. These will have started to fail. 8ha is inundated with coastal flood water during a medium likelihood flood event, this affects the harbour area and fields located to north of the village.	Flood extent is restricted by surrounding elevated topography.	Sea-level continues to rise. Further defences fall into disrepair. The Harbour area is compromised. Based on UKCP09 'High Emissions' 2080 scenario 11ha is inundated with coastal flood water during a medium likelihood flood event. All former coastal defences are in a very poor state. 2070 the shoreline of Policy Unit 16 will be predominately erosional, with sections of this shoreline having receded by up to 27m by that time.
17	Largely an undefended shoreline, except for a small section of the B7063 road at Portyerrock. 3ha is inundated with coastal flood water during a medium likelihood flood event. Most of this shoreline is fronted by rock platform.	Coastal defence at Portyerrock falls into disrepair. By 2060, this shoreline will be predominately erosional, anticipated to have receded landwards by up to 9m.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 4ha is inundated with coastal flood water during a medium likelihood flood event. Coastal defence is in a very poor state, the shoreline may show signs of erosion compromising the B7063. By 2100 this could increase to 12m.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
	There are areas of accretion as well as erosion, with sediment accretion most notable along the head of Rigg Bay, and areas of erosion to the south of this pocket beach. By 2030 parts of the shoreline will have advanced seawards by up to 3m whilst other area will have receded landwards by up to 3m..		
18	Defences defining the Isle of Whithorn village frontage and harbour area start to fail. 0.8ha is inundated with coastal flood water during a medium likelihood flood event, this affects the harbour area the village frontage. Steep landward topography restricts the extent of coastal flooding. The B7063, Main Street and Harbour Row are the main roads affected.	Topography restricts the coastal flood extent. Coastal defences fall into disrepair.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 0.8ha is inundated with coastal flood water during a medium likelihood flood event. Coastal defences in a very poor state. The harbour area and village frontage are compromised. Failure of any of the outer harbour walls, under a severe storm, would lead damage to property and infrastructure. The defences may remain in some form and continue to provide some shelter.
19	Rugged and resistant cliffs fronted by a shore platform dominate this shoreline. By 2030 parts of the shoreline will have advanced seawards by up to 11m, while other areas will have receded landwards by up to 5m. Steep topography restricts the extent of coastal flooding.	By 2050, Dynamic Coast indicates that 0.01km of minor road at Monreith will be located within the Erosion Vicinity along with an area of Golf Course and Green space (0.06ha). This will also include an area (2ha) of the Back Bay to Carghidown SSSI.	Sea-level continues to rise. The resistant nature of the cliffs will remain the dominant control on their erosion and therefore recession rates are not expected to be significantly affected by accelerated sea level rise. By 2100, it is anticipated 0.014km of the same minor road will be located within the Erosional Area. By this stage, one home will be located within the Erosion Influence zone, with a further home and two businesses located within the Erosion Vicinity. 2.4ha of the Back Bay to Carghidown SSSI and (10ha) of Luce Bay and Sands SAC will also be located within the Erosional Area.
20	Defences defining the Port William frontage and harbour area start to fail. 4.3ha is inundated with coastal flood water during a medium likelihood flood event, this affects the harbour area the village frontage. Steep landward topography restricts the extent of coastal flooding. By	Most coastal defences fall into disrepair by the end of this epoch.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 5.4ha is inundated with coastal flood water during a medium likelihood flood event. Topography restricts the coastal flood extent. Coastal defences in a very poor state. The harbour area and village frontage are compromised. Failure of

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
	2050, nine homes and 0.15km of the A747 will be located within the Erosion Vicinity.		the harbour defences, under a severe storm, would lead damage to property and infrastructure. The defences may still remain in some form and will continue to provide some shelter. By 2100, section of the A747 will be affected by erosion.
21	Defences are located along this shoreline at Garheugh Bay, Auchenmalg and Stairhaven Bay. Most of these will have failed or be falling into disrepair by the end of this epoch. 3.5ha is inundated with coastal flood water during a medium likelihood flood event some sections of the A747 are affected.	Most of the coastal defence fall into disrepair by the end of this epoch.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 5.4ha is inundated with coastal flood water during a medium likelihood flood event. Topography restricts the coastal flood extent. Coastal defences are now ineffective. Sections of the A747 are eroded.
22	76ha is inundated with coastal flood water during a medium likelihood flood event the main area affected is Wigtown County Golf Course. By 2030, parts of this shoreline are expected to recede landwards by between 16m to 60m.	By 2040 the shoreline is expected to erode landwards by 6.55m per year, increasing to 8.292m per year by 2070. If allowed, it is likely the coastal dunes may advance landwards whilst the spit will migrate east. The meander at Piltanton Burn may contribute to further erosion along the northern bank.	Sea-level continues to rise, and flood risk increases. Based on UKCP09 'High Emissions' 2080 scenario 118ha is inundated with coastal flood water during a medium likelihood flood event. The main area affected remains Wigtown County Golf Course. By 2100 the extent of erosion will have increased to between 47m to 94m. The area of coastal dune will have eroded significantly.
23	Defences are located along this shoreline at Sandhead, Dyemill and Chapel Rossan. Most of these will have failed or be falling into disrepair by the end of this epoch. 3.2ha is inundated with coastal flood water during a medium likelihood flood event the A716 is affected. By 2030 parts of the shoreline of will have advanced seawards by up to 6m, whilst others will have receded landwards by up to 16m. By 2030 accretion is confined to Drumantrae Bay.	Most of the coastal defence falls into disrepair and fails by the end of this epoch. By 2050, homes will be affected by erosion as well as some area of road.	Sea-level continues to rise and flood risk increases. Based on UKCP09 'High Emissions' 2080 scenario 381ha is inundated with coastal flood water during a medium likelihood flood event. Topography restricts the coastal flood extent. By 2100 the shoreline at Sandhead will potentially recede by up to 63m. 147 homes and 25 businesses will directly be impacted by coastal erosion.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
24	Extensive coastal defences are located along this shoreline. Most of these will have failed or fall into disrepair by the end of this epoch. 0.3ha is inundated with coastal flood water during a medium likelihood flood event. Wave overtopping becomes a greater issue. By 2030 parts of the will have advanced seawards by up to 4.15m, whilst others will recede landwards by up to 3.83m. By 2030 accretion is confined to New England Bay and Terally Bay.	Most of the coastal defence falls into disrepair and fails by the end of this epoch. Road remains open, dangerous driving conditions prevail during storms. By 2050 it is anticipated that this shoreline will be predominately erosional, receding by up to 5.87m along the shores of Kilstay Bay.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 0.68ha is inundated with coastal flood water during a medium likelihood flood event. Topography restricts the coastal flood extent. Wave overtopping is a major issue. The erosion of the raised beach will release sediment into the system, maintaining a beach in this location and feed the beaches to the north. By 2100, it is anticipated that parts of the shoreline will recede by up 17.8m. Homes, businesses and 1.9km of the A716 will be directly affected by erosion.
25	Defences defining the harbour area and protect the A716 located to the north of the village start to fail. 0.3ha is inundated with coastal flood water during a medium likelihood flood event, this affects the harbour area. Steep landward topography restricts the extent of coastal flooding. By 2030 parts of the shoreline will have advanced seawards by up to 5.7m, whilst others will have receded landwards by up to 3.3m.	Most of the coastal defence falls into disrepair and fails by the end of this epoch. The harbour continues to silt up. By 2060 it is anticipated that this shoreline will become predominately erosional, receding by up to 10m towards the north of Drummore Bay.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 0.4ha is inundated with coastal flood water during a medium likelihood flood event. Topography restricts the coastal flood extent. All coastal defence is ineffective by the end of this epoch. By 2100, it is anticipated that the shoreline north of Drummore Bay will probably recede by up 17m.
26	Defences protect the frontage at Maryport Holiday Park. These coastal defences are expected to fall into disrepair and fail by the end of this epoch. 1.6ha is inundated with coastal flood water during a medium likelihood flood event. By 2030 parts of the shoreline will have advanced seawards by up to 3.2m, whilst other areas will recede landwards by up to 5.4m. By 2030 accretion is confined to Cailness Bay.	Coastal defences are ineffective by the end of this epoch. By 2060 it is anticipated that this shoreline will also become predominately erosional, receding by up to 11.4m.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 3ha is inundated with coastal flood water during a medium likelihood flood event. Topography restricts the coastal flood extent. By 2100, it is anticipated that the shoreline at Cailness Bay will probably recede by up 18.4m.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
27	Rugged and resistant cliffs fronted by a shore platform dominate this shoreline. By 2030 parts of the shoreline will have advanced seawards by up to 3.29m, whilst others will have receded landwards by up to 5.24m. 20ha is inundated with coastal flood water during a medium likelihood flood event. Steep topography restricts the extent of coastal flooding. There are coastal defences associated with Port Logan frontage and harbour area which are expected to begin to fail by the end of this epoch.	Coastal defences have failed by the end of this epoch.	Sea-level continues to rise. Based on UKCP09 'High Emissions' 2080 scenario 22ha is inundated with coastal flood water during a medium likelihood flood event. Topography restricts the coastal flood extent. All coastal defence are ineffective by the end of this epoch. By 2100, 17 homes will be directly impacted by erosion, most of these properties are in Port Logan. Section of the B7065 will also be affected.
28	Defences define the Portpatrick frontage and harbour area. Flooding and wave overtopping affect the harbour area the village frontage. Steep landward topography restricts the extent of coastal flooding.	Topography restricts the coastal flood extent. Some coastal defences begin to fail by the end of this epoch. Wave overtopping remains an issue.	Sea-level continues to rise. All coastal defence are ineffective by the end of this epoch. Wave overtopping is an issue. Failure of the harbour defences, under a severe storm, would lead damage to property and infrastructure. The defences may remain in some form and will continue to provide some shelter.
29	Rugged and resistant cliffs fronted by a shore platform dominate this shoreline. The shoreline is relatively stable, some areas have advanced landwards by up to 3.27m, whilst other areas have receded by 6.25m. This is a low-risk area.	Sea-level rise will not significantly impact this section of shoreline due to the restrictive nature of the steep landward topography.	Sea-level continues to rise. The resistant nature of the cliffs will remain the dominant control on erosion and therefore recession rates are not expected to be significantly affected by sea level rise.
30	Rugged and resistant cliffs fronted by a shore platform dominate this shoreline. Steep topography restricts the extent of coastal flooding. By 2050, 0.22km of road will be directly affected by erosion. By 2050 it is anticipated that soft parts of this shoreline will become predominately erosional, receding by up to 12m along Lady Bay.	Sea-level rise will not significantly impact this section of shoreline due to the restrictive nature of the steep landward topography.	Sea-level continues to rise. The resistant nature of the cliffs will remain the dominant control on their erosion and therefore recession rates are not expected to be significantly affected by sea level rise. By 2100 soft sediment location including Lady Bay will have receded landwards by up to 13m.

Future Performance of Asset (No Active Intervention)			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
31	Defences are located along this section of shoreline at Marian Port (A718), Wig Bay and Low Salchrie. Most of these defences will fall into disrepair by the end of this epoch. By 2030 parts of the shoreline will recede landwards by up to 12m.	Coastal erosion along unprotected sections of the coast continues with a 0.1ha loss by 2050. Section of A718 will be affected by coastal erosion.	Erosion of the soft coastal cliffs will continue, up to 0.2ha will be lost. The A718 is compromised due to continuing erosion. Sea-level continues to rise. By the end of this epoch the defences at Low Salchrie fall into disrepair.
32	This shoreline is well-defended, most of the defence will be ineffective by the end of this epoch. Numerous receptors are associated with the coastal flooding of Stranraer. The shoreline is heavily modified shoreline, consequently anticipated future coastal change is restricted to a section of undefended shoreline in the east.	The harbour area and area around Bishops Burn to the east of the town are impacted. By the 2030s parts of the shoreline will recede landwards by up to 3.5m. The small areas of accretion will become increasingly constrained by 2060 after which this shoreline becomes predominately erosional.	Sea-level continues to rise. By the end of this epoch the all the current defences are deemed ineffective. By 2100, 0.58km of the A77 will be directly affected by erosion.
33	There is low flood risk associated with this section of shoreline. By the end of this epoch all the coastal defences will be deemed ineffective.	The spatial extent of coastal flooding is restricted by the steep landwards topography. Coastal erosion along unprotected sections of the coast continues, by 2050 0.09km of road will be impacted, particularly the A77.	Sea-level continues to rise. Coastal erosion along unprotected sections of the coast. By 2100, the extent of roads affected increases to 0.49km, particularly the A77.
34	This shoreline is heavily defended, some are in very poor condition and the majority will be ineffective by the end of this epoch.	The spatial extent of coastal flooding is restricted by the steep landwards topography.	Sea-level continues to rise. Potentially contaminated material is eroded.
35	Rugged and resistant cliffs fronted by a shore platform dominate this shoreline. Steep topography restricts the extent of coastal flooding. There is low risk.	Sea-level rise will not significantly impact this section of shoreline due to the restrictive nature of the steep landward topography.	Sea-level continues to rise. The resistant nature of the cliffs will remain the dominant control on erosion and therefore recession rates are not expected to be significantly affected by sea level rise.

Table A2-1 Summary of Baseline Scenario 1

A 2.2.1 Baseline Scenario 2 – With Present Management (SMP05)

The 'With Present Policies' (WPP) scenario assumes that the policies recommended in the 2005 Dumfries & Galloway Shoreline Management Plan (SMP05) are extended beyond their 50-year timeframe and applied for the next 100 years. In line with Defra guidance, the impact of this on the response of the coast has been considered for three time periods: 0 to 20, 20 to 50 and 50 to 100 years. With this scenario it has been assumed that all defences are maintained to provide a similar level of protection to that provided at present.

Table A2-2 outlines the anticipated impact on flooding and erosion and potential actions required within each Policy Unit over the three epochs based on the assumptions that the present SMP05 policies are continued.

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
1	SMP05 policy is: No Active Intervention (NAI) for the most part with Hold the Line (HTL) in individual areas. There are earth embankments along the River Sark, which are privately owned defences. The raising of the flood banks is not encouraged, therefore the standard of protection afforded diminishes over time. Erosion continues along Redkirk Point. There is localised recycling of sediment.	SMP05 Policy is: NAI for the most part with HTL in individual areas. The earth embankments along the River Sark, become increasingly less effective leading to increased flood frequency and extent. Erosion continues along Redkirk Point, salt marsh habitat and the intertidal zone adapts to sea level rise by rolling landwards. Some farmland is lost.	SMP05 Policy is: HTL should flood frequency increase significantly. Defences along the Sark are improved and cut off the River Sark floodplain leading to a reduction in flood storage space. This may cause problems further upstream and accelerate localised fluvial flooding exacerbated by a tidal block element. Erosion at Redkirk Point may be accelerated through projected sea level rise. The presence of new defences will contribute to loss of the intertidal zone and narrowing of saltmarsh habitats (Coastal Squeeze).
2	SMP05 Policy is: NAI for the most part with HTL in individual areas. HTL applies to pockets of developed frontage. For the most part erosion and flooding continue as at present.	SMP05 Policy is: NAI for the most part with HTL in individual areas. Implementation of the HTL policy will require some upgrading and rationalisation of defences. Cliff recession monitoring is required to identify where to provide coastal protection. Elsewhere erosion and flooding continue. Potential legacy contaminated material may be eroded from Torduff Point.	SMP05 Policy is: NAI for the most part with HTL in individual areas. Continuation of a HTL policy will require upgrading and rationalisation of defences. Cliff recession monitoring should inform where to enhance coastal protection. Potential legacy contaminated material may be eroded from Torduff Point. Flood frequency increases with sea level rise.
3	SMP05 Policy is: NAI for the most part with HTL in individual areas. HTL applies to pockets of developed frontage. For the most part erosion and flooding continue as at present.	SMP05 Policy is: NAI for the most part with HTL in individual areas. With rising sea level, the standard of defence may need to be increased. This may have implications for adjacent intertidal habitats such as saltmarsh.	SMP05 Policy: Localised 'Hard' defence is maintained at Battlehill and Seafield. continues for the rest of this shoreline. Shoreline continues to erode in places. The rate of erosion and flood extent maybe accelerated through projected sea level rise. The retention of defences will contribute to loss of the intertidal zone and narrowing of saltmarsh habitats (Coastal Squeeze). An obvious shoreline offset between the protected and unprotected shoreline may develop.

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
4	SMP05 Policy is: NAI for most part with HTL in individual areas. The shoreline at Newbie is well defended with hard defence. The town of Annan is located on high ground and at a low risk. The lower reach of the River Annan is defended by a series of embankments.	SMP05 Policy is: NAI for most part with HTL in individual areas. An offset may develop between protected and unprotected sections of the shoreline. The shoreline may become steeper resulting in coastal squeeze. Cliff erosion continues along the unprotected sections of shoreline. Siltation of the River Annan continues.	SMP05 Policy is: HTL in response to long term climate changes. HTL in individual areas will require some upgrading and rationalisation. Sea-level rises increasing frequency of flooding and erosion of the cliff line accelerates. Siltation of the River Annan continues. The shoreline may become steeper and there is coastal squeeze.
5	SMP05 Policy is: NAI for most part, but Limited Intervention in individual areas. This policy option is considered viable for this epoch before any significant changes in the wave and climate / sea level can occur.	SMP05 Policy is: NAI for most part, but Limited Intervention in individual areas. Consider Managed Realignment (MR). Environmental benefits may be achieved by opening greater areas of merse. This policy may also result in the loss of carefully maintained freshwater habitats within Caerlaverock.	SMP05 Policy is: NAI for most part, but MR in individual areas. Environmental benefits may be achieved by opening greater areas of merse. This will mean the loss of freshwater habitats at Caerlaverock as sea level rises.
6	SMP05 Policy is: NAI for most part with HTL in individual areas. HTL policy may conflict with environmental interests, so environmental impacts of improving defences will require detailed investigation.	SMP05 Policy is: NAI for most part with HTL in areas specified including the B725 between Glencaple and Dumfries. Greater flooding is anticipated. HTL has the potential to result in coastal squeeze and loss of saltmarsh. Existing defence will require ongoing maintenance and improvements.	SMP05 Policy is: NAI for most part. HTL along the shoreline between Glencaple and Dumfries (B725). Greater flooding is anticipated. HTL has the potential to result in coastal squeeze and loss of saltmarsh. Sea level rise has the potential to result in accelerated erosion of salt marsh habitat through coastal squeeze. The loss of this flood buffer will increase flood risk. During this epoch maintenance and improvement of defences is required.
7	SMP05 Policy is: NAI for the most part, with HTL in individual areas including Southerness and Carsethorn. Increased erosion and wave overtopping will occur. There will be continued erosion of unprotected shoreline to the south of Carsethorn. This may require extension of coastal defences. A series of 'ad hoc' coastal defences will require maintenance and improvement. Monitoring of beach level, sand dunes, storm damage to defence is recommended.	SMP05 Policy is: NAI for the most part with HTL in individual areas including Southerness and Carsethorn. The extension of defences may have consequences including the lowering of the beach. The majority of ad hoc coastal defence fall into disrepair. Erosion of the unprotected shoreline continues.	SMP05 Policy is: NAI for the most part with HTL in individual areas, including Southerness and Carsethorn. As sea-level rises, this may lead to the acceleration of erosion and increased flooding frequency. There may be a greater incidence of wave overtopping. Erosion of the unprotected shoreline continues at an accelerated rate due to sea level rise. An offset in the shoreline may

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
			develop as the unprotected shoreline retreats landward.
8	SMP05 Policy is: NAI for the most part with Limited Intervention at Sandyhills Bay. Advice should be given regarding the defence design at Sandyhills Bay. Monitoring of beach level, sand dunes, storm damage to defence is recommended.	SMP05 Policy is: NAI for the most part with Limited Intervention at Sandyhills Bay. HTL to the west of Southerness (Implies the Golf Course frontage). The shoreline continues to erode. Saltmarsh environment adapts and rolls landwards as sea level rises. If hard defence are emplaced along the golf course perimeter this will impact the natural hydrodynamic regime. This may result in the localised narrowing and steepening of the intertidal zone as sea level rises.	SMP05 Policy is: NAI for the most part with Limited Intervention at Sandyhills Bay. HTL to the west of Southerness (Implies the Golf Course frontage). Saltmarsh environment adapts and rolls landward as sea level rises, where not constrained by defences.
9	SMP05 Policy is: NAI for the most part, with HTL locally. Defences are too fragmentary to impact estuarial processes. Monitor beach levels and wave overtopping at Kippford.	SMP05 Policy is: NAI for the most part with HTL locally. Erosion and flooding in unprotected areas increases with sea level rise.	SMP05 Policy is: NAI for the most part, with HTL at the Flats, Dalbeattie and Palnackie. Intertidal zone will narrow as sea level rises along protected sections of coast.
10	SMP05 Policy is: NAI for the most part with HTL locally. Monitor beach levels and wave overtopping at Auchencairn. Coastal roads identified to be at flood risk.	SMP05 Policy is: NAI for the most part with HTL locally. Increasing incidence of erosion. The localised maintenance of defences will be required. Within this low energy and sheltered environment, the presence of these defences has a low impact.	SMP05 Policy is: NAI for the most part with HTL locally. Saltmarsh rolls landward as a response to sea level rise; some farmland is lost. Within this low energy and sheltered environment, the presence of existing defences has a low impact.
11	SMP05 Policy is: NAI. The hard and rocky cliff line is resistant to coastal processes.	SMP05 Policy is: NAI. Sea level rise will have a limited impact along this section of coast. The landward retreat of pocket beaches may be restricted by the presence of resistant cliffs.	SMP05 Policy is: NAI Predominantly hard rocky shoreline will establish 'equilibrium' with sea level rise.

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
12	SMP05 Policy is: NAI for the most part with HTL locally. Monitor beach levels and wave overtopping at Auchencairn. Coastal roads likely to be at flood risk. The continued maintenance of defences will be required.	SMP05 Policy is: NAI for the most part with HTL locally. Defences will require continued maintenance. With sea level rise the standard of defences will need to be improved.	SMP05 Policy is: NAI for the most part with HTL locally. HTL in Brighouse Bay will require upgrading of defences to compensate for sea level rise.
13	SMP05 Policy is: NAI for the most part with HTL in selected areas. The improvement of flood defence at the harbour will have a low impact upon this already embanked location.	SMP05 Policy is: NAI for the most part with HTL in selected areas. As sea level rises and the fluvial flood defences at Janefield will be over-topped on a regular basis. The harbour and surrounding area will also be inundated more frequently.	SMP05 Policy is: NAI for the most part with HTL in selected areas. Flood risk will increase as sea level rises. The creation of flood storage areas to the north of Kirkcudbright cold be achieved through Managed realignment.
14	SMP05 Policy is: Limited Intervention. Gatehouse of Fleet is located on high ground and is at a low risk of coastal flooding.	SMP05 Policy is: NAI for the most part with HTL in selected areas including Alderpool to protect the B796. Flood risk is managed through this epoch.	SMP05 Policy is: NAI for the most part with HTL in selected areas. Increasing flood risk associated with sea level rise may be accommodated through Managed retreat in selected areas is feasible and should be considered (east bank of Water of Fleet downstream of the A75).
15	SMP05 Policy is: NAI for the most part with HTL at Carsluith and Wigtown Harbour. This policy is sustainable over this epoch, flooding and erosion increased in undefended areas.	SMP05 Policy is: NAI for the most part with HTL at Carsluith and Wigtown. Maintenance and upgrading of defences are required otherwise as sea level rises flooding and erosion will increase.	SMP05 Policy is: NAI for the most part with selective HTL. As sea level rises flooding and erosion risk will increase, requiring the upgrading of selected coastal defences.
16	SMP05 Policy is: NAI for the most part with selective HTL. Regular and frequent monitoring of defences will be required. Damage of the dry-stone walls and groynes located to the south of the harbour may be progressive and irreversible. The defences within Garlieston Bay will be vulnerable to erosion.	SMP05 Policy is: NAI for the most part with selective HTL. The Garlieston frontage becomes increasingly vulnerable to high waves and storm surge. As sea level rises defences will need upgraded.	SMP05 Policy is: NAI for the most part and selective HTL. Substantial work will be needed to maintain the standard of protection.

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
17	SMP05 Policy is: NAI for the most part with selective Limited Intervention. The Council will need to continue to provide protection to the B7063 coast road at Portyerrock.	SMP05 Policy is: NAI for the most part with selective HTL. Continued protection required to the B7063 coast road at Portyerrock. Monitoring of heritage features required. As sea-level rises the shoreline be subjected to greater incidences of erosion.	SMP05 Policy is: NAI for the most part with selective HTL. Improvement of coastal defence located along the A7063 will be required as sea-level rises.
18	SMP05 Policy is: HTL. Defences protect the Isle of Whithorn harbour area against erosion. Wave overtopping will increasingly exacerbate coastal flooding at this location.	SMP05 Policy is: HTL. As sea levels rise coastal storm waves are expected to reach further inland. This will exacerbate coastal flooding at Isle of Whithorn. The continued maintenance of defence is required. Improving the standard of defence may also be required.	SMP05 Policy is: HTL. As sea levels rise coastal storm waves are expected to reach further inland. This will exacerbate coastal flooding further. Improvement of defence is required to manage the risk of wave-induced erosion and / or overtopping.
19	SMP05 Policy is: Limited Intervention (monitor) This applies to the presence of cliff-top heritage. Erosion and flood risk increases with sea level rise although the resistant cliff-line is not particularly vulnerable to erosion.	SMP05 Policy is: Limited Intervention (monitor) This applies to the presence of cliff-top heritage. The resistant cliff-line is not particularly vulnerable to erosion and the effect of sea level rise.	SMP05 Policy is: Limited Intervention (monitor). HTL in Monreith Bay. Monitoring applies to the presence of cliff-top heritage. The resistant cliff-line is not particularly vulnerable to erosion and the effect of sea level rise. The gravel ridge at Monreith will readjust to sea level rise. HTL measures should be implemented if beach erosion threatens cliff toe.

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
20	SMP05 Policy is: HTL This will require the continued maintenance and improvement of defences at Port William.	SMP05 Policy is: HTL. As sea level continues to rise the continued maintenance and improvement of defences is required. The frequency of wave overtopping is likely to increase.	SMP05 Policy is: HTL. As sea level continues to rise additional improvement of defences is required. This will secure the A747 but may contribute to the narrowing and steepening of local beaches. Erosion is likely to be accelerated along the unprotected section of shoreline. This may require the need to extend coastal defence.
21	SMP05 Policy is: NAI for the most part, with selective HTL. Narrow beaches make this shoreline vulnerable to extreme storm action.	SMP05 Policy is: NAI for the most part, with selective HTL. As sea level rises the continued maintenance and improvement of the coastal defence that protect the A747 is required. Wave overtopping is an issue combined with sea-level rise this will accelerate localised erosion.	SMP05 Policy is: NAI for the most part, with selective HTL. As sea level rises the continued improvement of the coastal defence protecting the A747 is required. Wave overtopping is an issue combined with sea-level rise this will accelerate localised erosion.
22	SMP05 Policy is: NAI for the most part with Limited Intervention at the golf course. The beach and coastal dunes should respond to climate change by natural readjustment. The erosion risk at the golf course is too slight to require a 'hard defence' policy.	SMP05 Policy is: NAI for the most part with Limited Intervention at the golf course. As sea level rises the coastal processes adapt to hydrodynamic changes with little restriction. The introduction of hard coastal defence would impact upon littoral processes.	SMP05 Policy is: NAI for the most part with Limited Intervention at the golf course. As sea level continues to rise natural coastal processes adapt to hydrodynamic changes with little restriction. The introduction of hard coastal defence would impact upon littoral processes.
23	SMP05 Policy is: NAI for the most part with selective HTL. Defences will require continued maintenance.	SMP05 Policy is: NAI for the most part with selective HTL. As sea level rises, coastal defences will require improvement.	SMP05 Policy is: NAI for the most part with selective HTL. Coastal defences will require improvement.
24	SMP05 Policy is: NAI for the most part with selective HTL. Hard coastal defences protect a large section of the A716. This shoreline is prone to wave overtopping from large storm waves. This will continue to produce unsafe driving conditions at times.	SMP05 Policy is: NAI for the most part with selective HTL. As sea level rises most of the coastal defences will require improvement. The reflective nature of these defences will result in the narrowing and steepening of the shoreline. The impact of wave overtopping is likely to increase.	SMP05 Policy is: NAI for the most part with selective HTL. As sea level rises the defences will require improvement. Narrowing and steepening of the shoreline will occur. The impact of wave overtopping is likely to increase further.

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
25	SMP05 Policy is: HTL. The harbour area at Drummore will continue to be prone to siltation and the shoreline to the north prone to localised erosion. The A716 runs close to the top of this cliff line.	SMP05 Policy is: HTL. As sea-level rises there will be increasing pressure put upon the cliff-base defence. This will demand continued maintenance and improvement. The beach may narrow and steepen at this location.	SMP05 Policy is: HTL. As sea-level rises there will be increasing pressure on the cliff-base defence. This will require maintenance and improvement.
26	SMP05 Policy is: NAI for the most part with HTL at Maryport. The landwards retreat of the shoreline at Maryport will be prevented by the defence fronting the caravan park.	SMP05 Policy is: NAI for the most part with HTL at Maryport. As sea level rises the beach will become more gravel dominated. Erosion of the unprotected shoreline will continue. A shoreline offset will develop at the expense of adjacent farmland.	SMP05 Policy is: NAI for the most part with HTL at Maryport. As sea level rises and the sandy beach disappears, storm waves will put increased pressure on the defences. Erosion of the unprotected shoreline will continue, and the offset will increase. This will increase the risk to the static caravans located here.
27	SMP05 Policy is: NAI for the most part with HTL at Port Logan. Sea level rise will lead to a possible steepening of the beach or increased water depths at the toe of the existing defences, requiring increased maintenance.	SMP05 Policy is: NAI for the most part with HTL at Port Logan. As sea-level rises the beach may become narrower and steeper as the landwards retreat of the shoreline is restricted by the presence of the sea wall at Port Logan. Following the occurrence of storms, the coastal dunes may retreat. This will temporarily replenish the beach.	SMP05 Policy is: NAI for the most part with HTL at Port Logan. As sea-level continues to rise the beach is likely to become even narrower and steeper as the shoreline is held in place by a sea wall at Port Logan. Following the occurrence of storms coastal dunes will continue to retreat. The landwards retreat of the coastal dunes will put increasing pressure on the B7065.
28	SMP05 Policy is: HTL. Regular monitoring of walls will be needed including the outer harbour breakwaters and walls. Damage to the defences would increase wave action in the harbour.	SMP05 Policy is: HTL. Maintenance of defences will be required. Wave overtopping likely to increase as sea-level rises. Some defence improvements may be required.	SMP05 Policy is: HTL. Wave overtopping will increase as sea-level rises.
29	SMP05 Policy is: NAI. Natural coastal processes will continue and adjust is response to sea level rise.	SMP05 Policy is: NAI. Coastal flood and erosion will continue to adjust to sea level rise. Any flooding will become more frequent, and any erosion is likely to accelerate.	SMP05 policy is: NAI. Coastal flood and erosion will continue to adjust to sea level rise. Any flooding will become more frequent, and any erosion will be more rapid.

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
30	SMP05 Policy is: NAI. Natural coastal processes will continue and adjust is response to sea level rise.	SMP05 Policy is: NAI. Coastal flood and erosion will continue to adjust to sea level rise. Any flooding will become more frequent, and any erosion is likely to accelerate.	SMP05 Policy is: NAI with HTL locally if the need arises. Coastal flood and erosion will continue to adjust to sea level rise. Any flooding will become more frequent, and any erosion will be more rapid. Localised measures may need to be implemented where justified to HTL.
31	SMP05 Policy is: NAI for part with selective HTL. The small sections of existing coastal defence will require some upgrading to ensure continued protection to the coast road.	SMP05 Policy is: NAI for part with selective HTL. As sea level rises, beach lowering, and potential loss of sediment may be an issue in front of the defences. Improvements to defence may be required to reduce erosion along the coastal road.	SMP05 Policy is: NAI for part with selective HTL, including beach nourishment in erosion hotspots. As sea level rises, beach lowering, and potential loss of sediment may be an issue in front of the defences. Improvements to defence may be required to reduce erosion along the coastal road. Beach replenishment may be one measure to consider although its effectiveness is likely to be short lived due to increasing sea levels.
32	SMP05 Policy is: HTL, the Stranraer shoreline is well defended. The condition of the existing defences is variable so some maintenance / improvement will be required. Beach nourishment was suggested by SMP05 along Broadstone Road to improved conditions here.	SMP05 Policy is: HTL Defences will require ongoing maintenance and improvement. As sea level rises, there may be a lowering and narrowing of beaches and loss of sandy sediment. There may be an increased frequency of wave overtopping.	SMP05 Policy is: HTL. As sea level continues to rise, there is likely to be a lowering and narrowing of beaches and loss of sandy sediment. There is likely to increase the frequency of wave overtopping. Upgrading of defences likely to be required.
33	SMP05 Policy is: NAI for the most part with selective HTL. There will remain a low flood and erosion risk associated with this section of shoreline. Maintenance of the A77 defences will need to continue.	SMP05 Policy is: NAI for the most part with selective HTL. The backshore plateau will continue to erode and may be subjected to increased wave action associated with increasing sea level. The stability of A77 may be compromised.	SMP05 Policy is: NAI for the most part with selective HTL. The gravel beaches located here will probably narrow as sea level continues to rise, leading to greater exposure to wave attack and erosion. The stability of A77 may be compromised.
34	SMP05 Policy is: NAI for part with selective HTL. Most of this Policy Unit is protected by a range of defences that with continued maintenance should remain effective over this period.	SMP05 Policy is: Advance the Line to allow for the development and functioning of the ferry ports located here. Erosion at Cairn Point would continue and may begin to accelerate due to projected sea level rise. This may allow for the release of potential	SMP05 Policy is: Advance the Line to allow for the development of the ferry ports located here. Defences will require ongoing maintenance and improvement. Overtopping of defence may increase as sea level continues to rise. Erosion of Cairn Point likely to continue, allowing the

Baseline Scenario (With Continuation of SMP05 Policies).			
Policy Unit	**Short-Term (0-20)**	**Medium-Term (20-50)**	**Long-Term (50-100)**
		contaminates associated with the former use of this site into the surrounding area.	potential release of contaminated material into the surrounding area.
35	SMP05 Policy is: NAI, with selective HTL. Coastal structures/defences alongside the A77 will need to be maintained. Although this section of the shoreline is expected to remain relatively stable as it is a resistant shoreline. Coastal processes continue to function uninterrupted and adjust to sea level rise.	SMP05 Policy is: NAI, with selective HTL. It is not expected that sea level rise will significantly affect the rate of recession of this section of undefended cliff line.	SMP05 Policy is: NAI, with selective HTL. Due to the resistant nature of this shoreline, it is not anticipated that sea level rise will significantly affect erosion or flooding. There may however be a potential for localised cliff falls.

Table A2-2 Summary of Baseline Scenario 2