

SILLOTH HARBOUR TO SKINBURNESS**Baseline Information****Start co-ordinate:** 310417, 553559 **Finish co-ordinate:** 312744, 556234**Total length:** 3.7km **Defended length:** 3.7km
Sea Wall: 2.8km **Rock Armour:** 0.9km**Environmental designations:**

- SSSI
- SAC
- SPA
- Ramsar
- AONB

Monitoring carried out:

- 29 beach profiles
- Topographic survey
- Coastal defence inspection

Site overview:

Up until the mid 19th century the foreshore comprised largely sand deposits, however the construction of the harbour in the 1850s and particularly construction of a 300 metre long breakwater structure, changed the conditions applying by effectively cutting off the natural drift that had until then fed the frontage. As a result the shoreline north of the harbour started to recess, a process that has continued to the present day and which has resulted in the current conditions applying.

The frontage is also influenced by the main channel of the Solway Firth "the Swatchway". Over the past 150 years the channel has migrated landward reducing the width of the intertidal zone and providing a conduit for wave energy penetration and longshore current generation to move material northwards. This has caused steepening of the beaches and erosion of the shoreline.

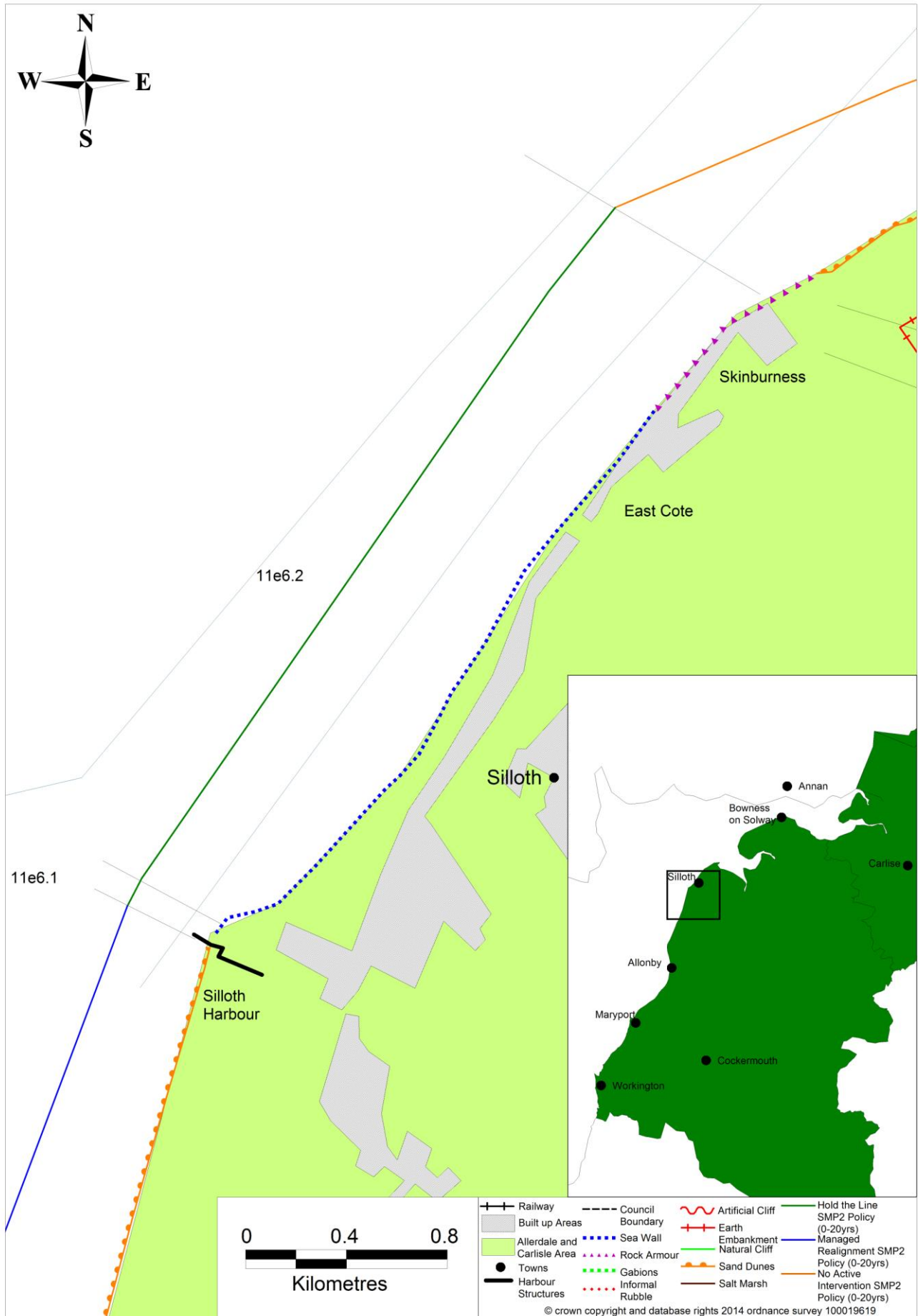
The majority of this frontage is defended by a seawall, which originally dates from 1979. At the southern end, near the harbour, the wall consists of a vertical concrete wall supported by a concrete apron with a steel sheet pile toe curtain. Moving north to Eastcote the defences consist of a stepped concrete revetment supported by a steel sheet pile toe curtain, with a rear wave return wall. Beach movement is constrained by a series of timber groynes, constructed in 1979, across the whole frontage. In the past the beaches have been nourished with crushed rocks and dredging arisings from Silloth harbour.

In 2001 a rock armour revetment was constructed at the northern end of the frontage. Immediately following the construction of the defences, recession of 15-20m took place at the northern terminal end, although some recovery has been evident since.

The Current (SMP2) Policy:

- **Silloth Harbour to Skinburness:** Hold the Line in the short term (0-20yrs), medium term (20-50yrs) and long term (50-100yrs).

The plan overleaf summaries the above information graphically:



Summary of behaviour

This section of shoreline is marginally rotated eastwards compared to the section to the south, with the Swatchway channel providing the main influence on exposure conditions and process behaviour.

The behaviour of the Swatchway has three main influences:

- it controls the width of the intertidal zone;
- it provides a conduit for wave energy penetration; and
- it provides for movement of sediment northwards by the generation of a longshore current.

There is little input of material into this section apart from re-distribution of the existing shingle around the ends or over the groynes. Some finer material can be moved into the area via the channel.

The following key points arise from analysis of the contemporary monitoring data:

Offshore Wave Climate:

- No relevant data available.

Wind Climate:

- No relevant data available.

Sea Levels:

- Maximum tide level recorded at Workington in the last 20 years = +5.76 (m ODN) in February 1997, which also equates to approximately a 1 in 50 return period.
- The following predicted extreme tide levels apply (m ODN):

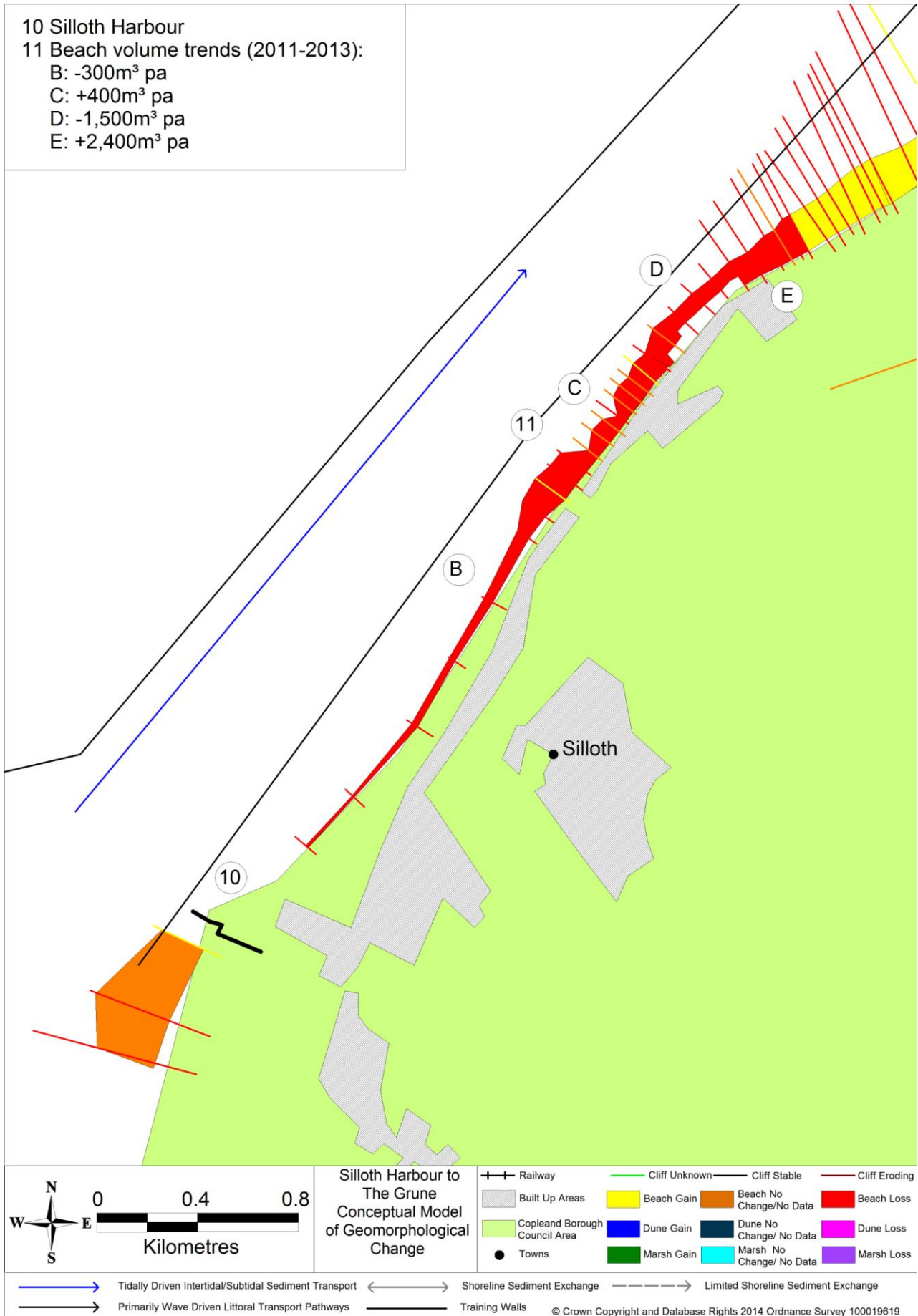
Return Period (years)	Workington	Silloth	Skinburness
10	5.49	6.03	6.13
100	5.84	6.48	6.63
1000	6.18	6.98	7.18

Foreshore & Shoreline Changes:

- Average volume decrease in area B of -300m^3 per year equivalent, based on 2011-2013 data;
- Average volume decrease in area C of $+400\text{m}^3$ per year, based on 2011-2013 data;
- Average volume decrease in area D of $-1,500\text{m}^3$ per year equivalent, based on 2011-2013 data;
- Average volume increase in area E of $+2,400\text{m}^3$ per year, based on 2011-2013 data; and.
- Overall out of a total of 29 cross shore profiles recorded since 2004/05, 7% – accretion, 66% – erosion, and 28% – no change.

This behaviour is illustrated graphically on the plan overleaf.

Note: Where profile change is shown for individual profiles on the pictorial summaries, beach gain or loss is identified, where the magnitude of change in cross sectional area is greater than 2%. Where the magnitude of change is less than or equal to 2% this is denoted as no change.



Risk Assessment

The primary risks arising from the behaviour of coastal forcing processes (wind, waves and tides) and the reaction of the shoreline (beach and cliff changes, artificial defence conditions) across this frontage are:

- Overtopping of artificial defences causing flooding of the hinterland; and
- Breaching of artificial coastal defences, causing erosion of the shoreline.

The primary consequences of this behaviour are:

- Damage to and/or loss of property and infrastructure;
- Damage to environmental habitats; and
- Potential impact on AONB.

The table below shows the overall risk rating(s) that apply within this section of frontage. Overall risk is defined from the probability of conditions/behaviour occurring and the consequences the conditions/behaviour would have.

Silloth Harbour to Skinburness Overall Risk Rating					
Policy Unit (11e)	Section of Frontage	Exposure	Probability Index	Consequence Index	Overall Risk Rating
6.1	Silloth Harbour	High	Low	Medium/High	Medium
6.2	Silloth to Skinburness (open coast)	High	Medium	High	High

Current Behaviour

Analysis of the monitoring data collected in 2013 provides the following key points:

Offshore Wave Climate:

- No new data available for analysis.

Wind Climate:

- No new data available for analysis.

Sea Levels:

- Maximum tide level recorded on Workington tide gauge = +4.808m (m ODN), this level would be expected to be exceeded at least once a year.

Beach Changes:

- Overall erosion in beach volumes on both upper and lower beaches;
- Beach volumes in area B decreased by 3,300m³;
- Beach volumes in area C decreased by 4,500m³;
- Beach volumes in area D decreased by 11,400m³;
- Beach volumes in area E decreased by 4,500m³; and
- Overall out of a total of 29 cross shore profiles recorded, 7% – accretion, 38% – erosion, and 55% – no change.

Note: Where profile change is shown for individual profiles on the pictorial summaries, beach gain or loss is identified, where the magnitude of change in cross sectional area is greater than 2%. Where the magnitude of change is less than or equal to 2% this is denoted as no change.

The plot overleaf summarises the results from the monitoring data analysis for this section in 2013.

Uncertainties & Issues

The following uncertainties have arisen from the data monitoring programme and analysis of the data collected:

- Quantities of sediment arriving on the beach from channel unknown;
- Wave conditions occurring directly in front of shore currently unknown; and
- Flood risk not determined.

Future Management Actions

The following monitoring and management actions are recommended:

- Continue to carry out plan survey. No need to continue profile monitoring;
- Improve additional remote sensing e.g. LiDAR;
- On-going monitoring of condition of artificial defence structures; and
- Carry out remedial works to maintain integrity of defences, as required.

Linkage(s) to Decision Making

The monitoring provides information to support:

- Implementation of SMP2 policies, particularly; identification of timing for future capital works or capital maintenance works for artificial defences; and
- Decision making process in relation to development planning control.