

BOWNESS ON SOLWAY TO DRUMBURGH**Baseline Information****Start co-ordinate:** 321676, 562612 **Finish co-ordinate:** 327936, 560460**Total length:** 7.6km **Defended length:** 1.6km
Sea Wall: 1.6km **Saltmarsh:** 6.0km**Environmental designations:**

- SSSI
- SAC
- SPA
- Ramsar
- AONB

Monitoring carried out:

- 8 beach profiles
- Coastal defence inspection (Bowness on Solway)

Site overview:

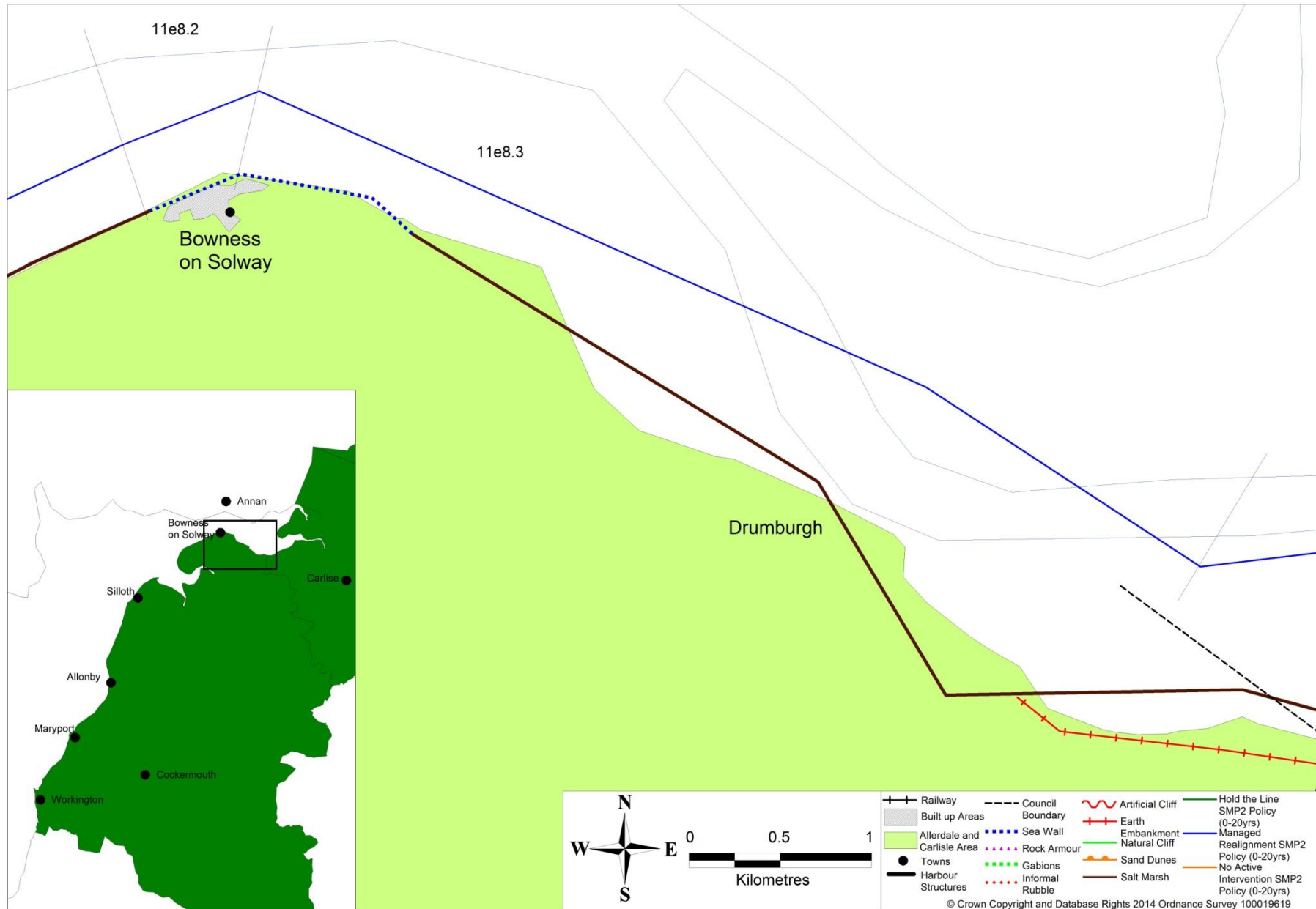
The section from Bowness on Solway to the boundary between Allerdale Borough Council boundary and Carlisle City Council, at Drumburgh is influenced by the position of the River Eden channel. Following removal of the Solway viaduct in the 1930s the channel returned to its previously unrestrained state and moved across the Firth to the northern side between Bowness and Port Carlisle, where its location is held away from the shoreline by the promontory of Kirkland Scar. Further upstream the channel moves to the south opposite Glasson. Upstream from Glasson extensive areas of saltmarsh (Easton Marsh and Burgh Marsh) have developed. The Eden channel runs along the edge of Easton Marsh, which is consequently susceptible to erosion.

Most of this section is undefended and consists of natural saltmarsh. Between Bowness on Solway and Grey Havens the coastline is defended by sections of blockwork wall and/or concrete walls with sloping concrete revetments added in places, which provide protection to the edge of the public highway.

The Current (SMP2) Policy:

- **Bowness on Solway to Drumburgh:** Managed Realignment 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

Due to its orientation the shoreline is sheltered from direct wave exposure from the Irish Sea but is exposed to locally generated waves across the estuary. Exposure conditions are therefore dominated by water levels which increase in level upstream. Residual currents in this section cause erosion and movement of sediment. Along the shoreline from Bowness on Solway to Port Carlisle, shelter and low energy conditions have led to the development of saltmarsh.

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 equates to approximately a 1 in 50 return period; and.
- The following predicted extreme tide levels apply (m ODN):

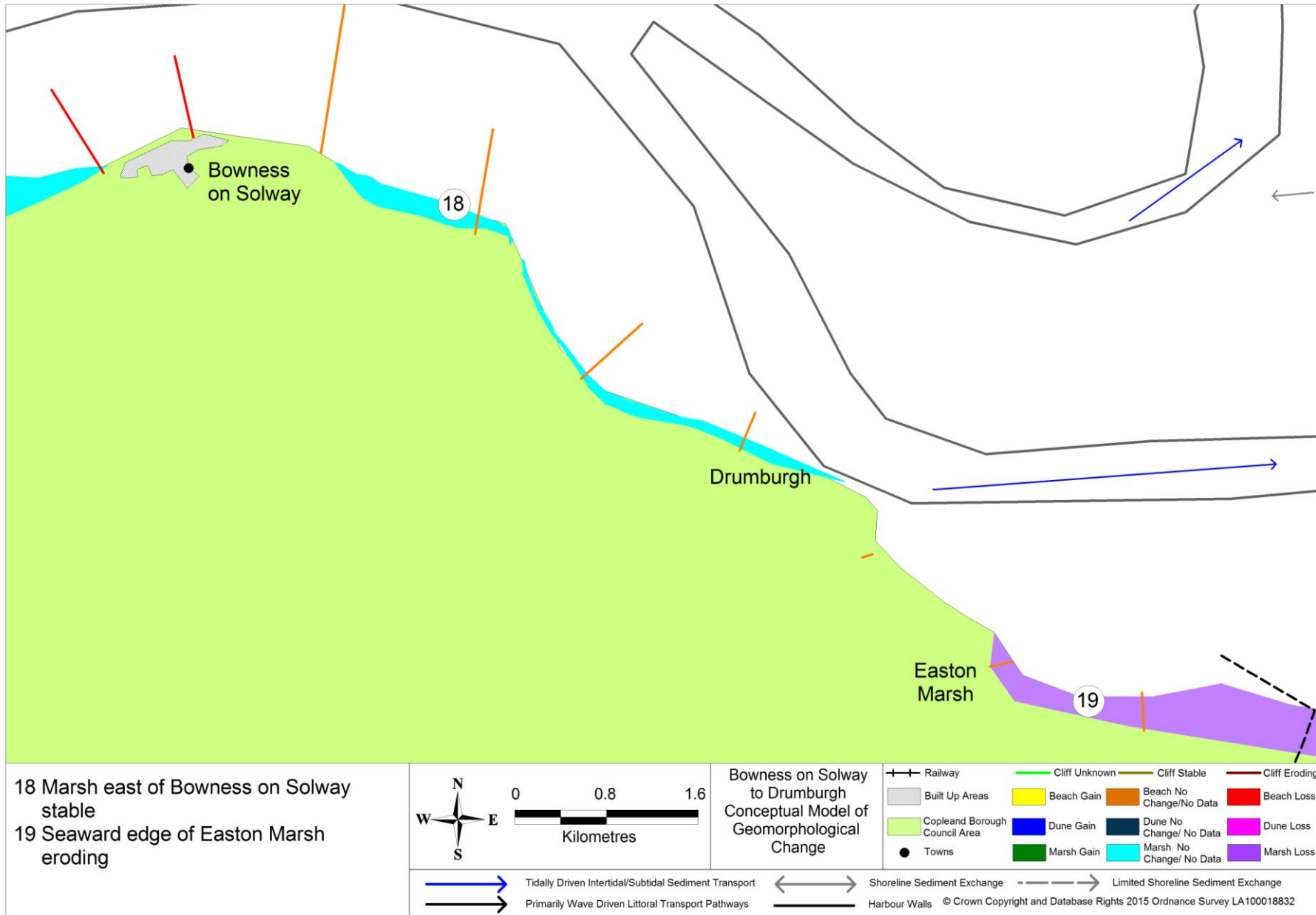
Return Period (years)	Workington	Bowness
10	5.49	6.84
100	5.84	7.67
1000	6.18	8.59

Foreshore & Shoreline Changes:

- 2 No. beach profiles at Bowness, where time series available – 0% – accretion, 100% – erosion, 0% – 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.

This behaviour is illustrated graphically on the plan overleaf.



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;
- Breaching of artificial coastal defences, causing erosion of the shoreline; and
- Erosion of saltmarsh reducing natural protection and loss of habitat.

The primary consequences of this behaviour are:

- Damage to and/or loss of property and infrastructure;
- Damage to and/or loss of agricultural land and associated property and infrastructure; and
- Damage to environmental habitats.

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.

Bowness on Solway to Drumburgh Overall Risk Rating					
Policy Unit (11e)	Section of Frontage	Exposure	Probability Index	Consequence Index	Overall Risk Rating
8.2	Bowness-on-Solway	Medium	Low	Medium	Low
8.3	Bowness-on-Solway to Drumburgh	Low	Low	Medium/High	Low

Current Behaviour

Analysis of the monitoring data collected in 2015 provides the following key points:

Offshore Wave Climate:

- No new data available for analysis.

Wind Climate:

- No new data available for analysis.

Sea Levels:

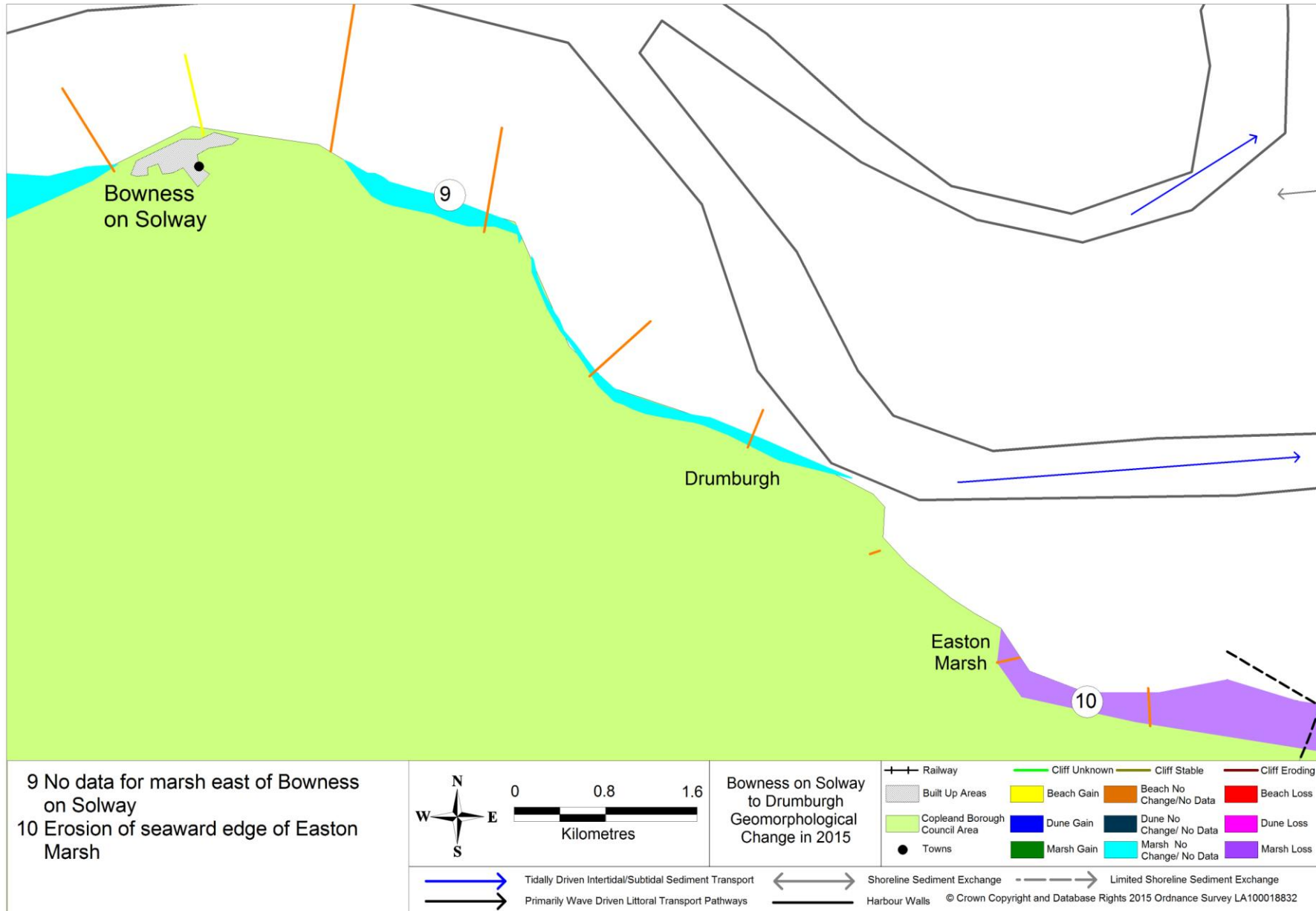
- Maximum tide level recorded on Workington tide gauge = +5.164 (m ODN) on 22nd February 2015, equivalent to a level that would be expected to be exceeded once every 1 to 2 years.

Beach Changes:

- Profile data recorded in 2015 only at Bowness on Solway. 50% – accretion, 0% – erosion, 50% – 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 2015.



Uncertainties & Issues

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

- Quantities of sediment finding its way into this section of the Solway;
- Magnitude and frequency of bank and channel movements;
- Wave conditions occurring directly in front of shore currently unknown; and
- Changes in the overall areas of the saltmarsh.

Future Management Actions

The following monitoring and management actions are recommended:

- Continue current monitoring regime;
- 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;
- Continued maintenance and operation of coastal highway;
- Decision making process in relation to development planning control; and
- Habitat change.