

COPPERAS HILL (BOUNDARY WITH COPELAND) TO WORKINGTON**Baseline Information****Start co-ordinate:** 298365, 523972 **Finish co-ordinate:** 298315, 529573**Total length:** 5.5km **Defended length:** 1.7km**Seawall:** 1.2km **Rock Armour:** 0.5km**Artificial cliff:** 3.8km**Environmental designations:**

- None

Monitoring carried out:

- 21 beach profiles
- Coastal defence inspection

Site overview:

The historic position of the shoreline within this section has been influenced by construction of the Cumbrian coast railway; Harrington harbour and tipping of waste south of Harrington and between Harrington and Workington

At the southern end of the frontage, from the Copeland boundary to south of Harrington harbour, the shoreline position is fixed by the railway line. The railway line was opened in 1844 and was defended by vertical masonry walls. Over time toe extensions have been added to the walls, the latest toe extensions were added in 2009.

In 1760 a quay was built at Harrington on the south side of the River Wyre to export coal and limestone. In the 1930s industry reduced in the area leading to the harbour being sealed up. During WWII it was used as a reservoir for a nearby Magnesium works. In the 1960s the harbour was successfully reopened by the local community. A rock groyne extends the masonry breakwater at the mouth of the harbour, acting as a barrier to upper beach longshore drift.

In 1856 the Workington Haematite Iron Company began producing pig iron from locally sourced haematite ore. A Bessemer furnace was built at Moss bay in 1877 to produce steel rails. In 1974 steel production was transferred to Scunthorpe but rails were still produced at Moss Bay. In 2005 rail production at Moss Bay ceased.

In the late 19th to early 20th century industrial slag waste which was a by product of the steel industry was tipped on the shoreline to the south of the harbour. This extended the shoreline seaward by up to 100m. Historical reclamation also took place to the north of the harbour. Between Derwent Howe and the River Derwent at Workington, 200 metres of land was reclaimed due to tipping during the late 19th and early 20th centuries. In an attempt to hold material and reduce erosion a series of groynes and breakwaters have been constructed in this section over the past 100 years.

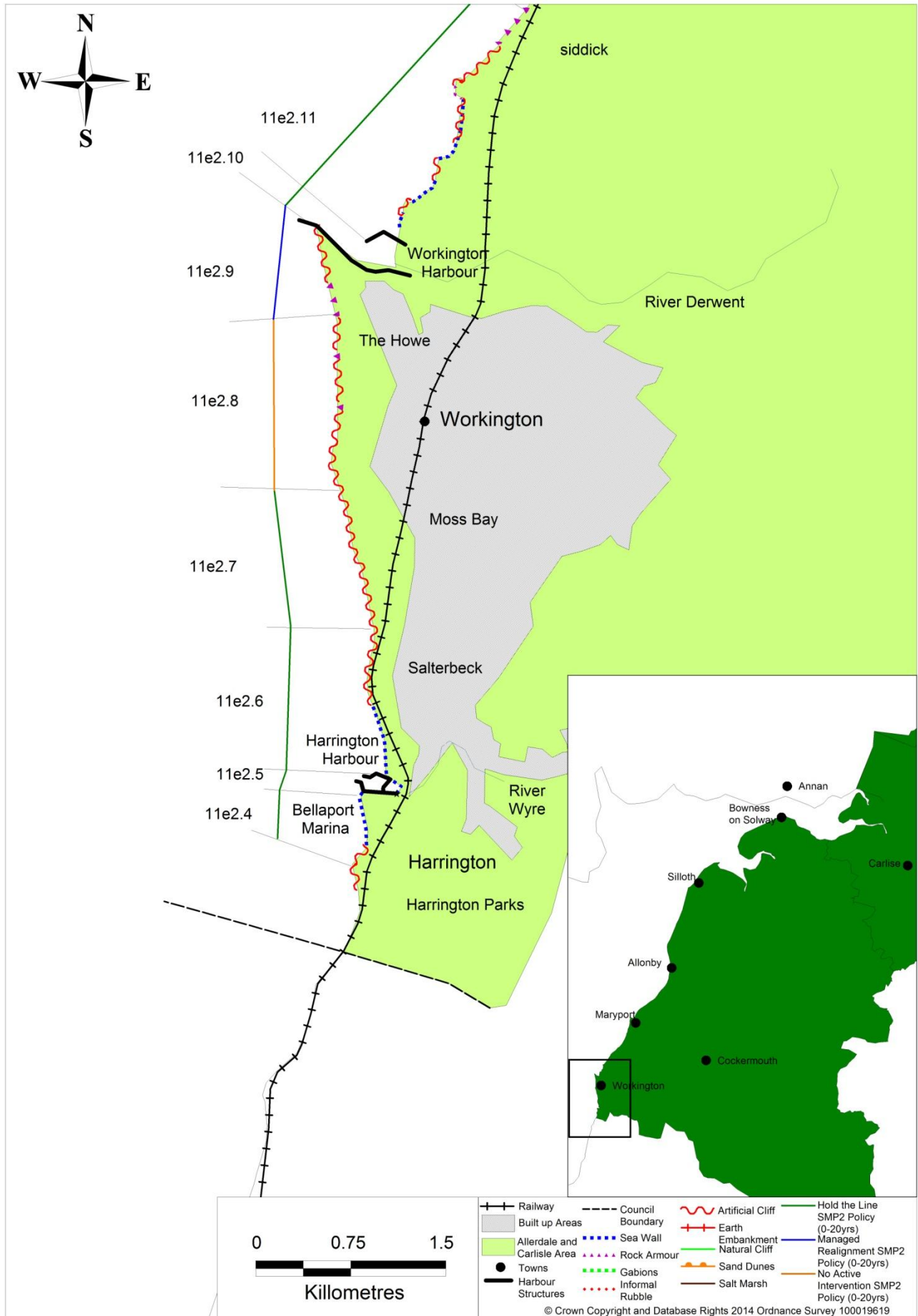
The shoreline in this frontage is eroding, with the section of the slag bank south of Workington harbour vulnerable to undercutting. Open cast mining of the slag takes place just south of Workington harbour. This has weakened the formation which is now at a greater risk of breaching.

The defences to the railway embankment in the southern part of this section are in fair condition. The seawalls at Bellport Marina are in good condition although there are missing planks in the groynes. At Salterbeck the artificial cliff is in poor condition with large gaps and erosion identified. At the Howe the defences are in fair condition. However a drainage tunnel in this section has collapsed.

The Current (SMP2) Policy:

- **Harrington Parks to Harrington Harbour:** Hold the Line in the short term (0-20yrs), No Active Intervention in medium term (20-50yrs) and long term (50-100yrs);
- **Harrington Harbour to Steel Works:** Hold the Line in the short term (0-20yrs), medium term (20-50yrs) and long term (50-100yrs);
- **Steel Works to the Howe:** No Active Intervention in the short term (0-20yrs), medium term (20-50yrs) and long term (50-100yrs); and
- **The Howe to Workington Harbour:** 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

In this section waves approach the shoreline obliquely driving sediment northwards, although the highest waves approach closer to normal. The variable nature of this predominantly artificial shoreline with its minor promontories of more resistant slag together with intermittent groynes and breakwaters creates localised embayments and locally influences the drift behaviour. Lower beach/sub-tidal drift is maintained longshore to the north.

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

Offshore Wave Climate:

Historic wave data from the Met Office (St Bees):

- Approximately 70% of waves are < 1 metres high and approximately 1.5% of waves are > 3 metre high.

Wind Climate:

Historic wind data from the Met Office (St Bees) identifies:

- 40-45% of winds are greater than 9 metres per second (Force 5 and above) & 45% of wind comes from offshore directions (SW to N)

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; and
- The following predicted extreme tide levels apply (m ODN):

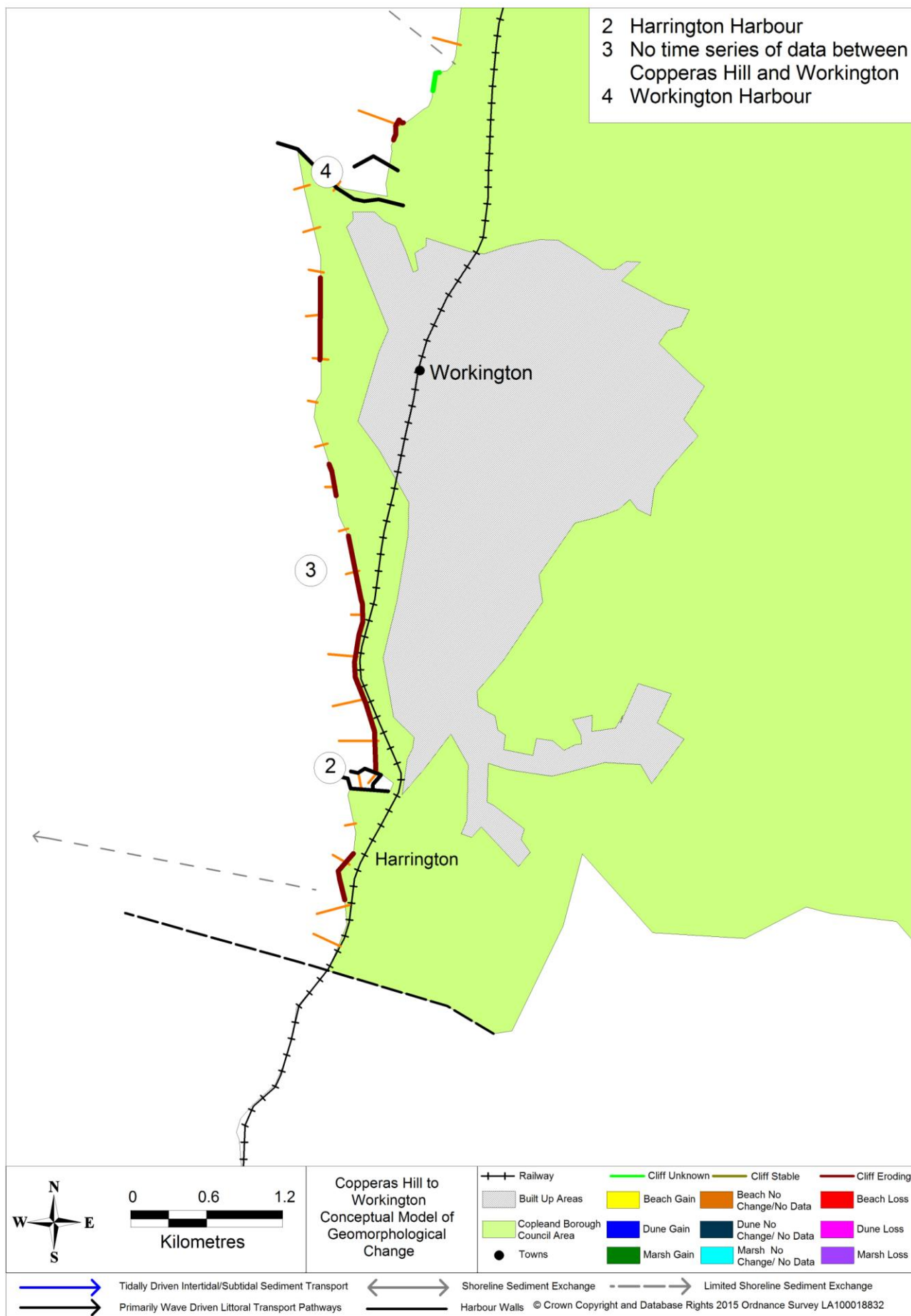
Return Period (years)	Workington	Harrington
10	5.49	5.41
100	5.84	5.76
1000	6.18	6.11

Foreshore & Shoreline Changes:

- Profile data has only been recorded twice in 2010 and in 2014.
- Only 6 out of 21 profiles available for comparison;
- Beach generally stable. Profile change: 16% – accretion, 0% – erosion, 84% – no change (includes those profiles were comparison not carried out – denoted as no change).

The monitoring data is insufficient to identify trends in change for this section. Conceptual understanding of 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;
- Breaching of artificial coastal defences, causing erosion of the shoreline; and
- Erosion of undefended natural and man made cliffs.

The primary consequences of this behaviour are:

- Damage to and/or loss of infrastructure and potentially property

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.

Copperas Hill (Boundary with Copeland) to Workington Overall Risk Rating					
Policy Unit (11e)	Section of Frontage	Exposure	Probability Index	Consequence Index	Overall Risk Rating
2.5	Harrington Parks to Harrington Harbour	High	Low	Medium	Low
2.6	Harrington Harbour	High	Low	Medium/High	Medium
2.7	Harrington to Steel Works Site	High	Medium	Medium/High	Medium
2.8	Steel Works Site	High	Medium	Medium/High	Medium
2.9	Steel Works to The Howe	High	Low	Medium	Low
2.10	The Howe to Workington Harbour South Breakwater	High	Low	Medium	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 2014 but not in 2015, so no comparison possible.

Uncertainties & Issues

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

- Only two years of beach profile changes recorded;
- Quantities of sediment arriving on the beach from offshore;
- Wave conditions occurring directly in front of shore currently unknown;
- Definition of flood risk; and
- Cliff erosion rates.

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 railway; and
- Decision making process in relation to development planning control.

As no new monitoring data was collected in 2015, a conceptual map has not been produced for current behaviour between Copperas Hill and Workington.