



## Cell 1 Regional Coastal Monitoring Programme Analytical Report 12: 'Full Measures' Survey 2019

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## Abbreviations and Acronyms

Acronym / Abbreviation	Definition
AONB	Area of Outstanding Natural Beauty
DGM	Digital Ground Model
HAT	Highest Astronomical Tide
LAT	Lowest Astronomical Tide
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MLWS	Mean Low Water Neap
MLWS	Mean Low Water Spring
m	metres
ODN	Ordnance Datum Newlyn

## Water Levels Used in Interpretation of Changes

Water Level Parameter	Water Level (m AOD)		
	Berwick upon Tweed	Holy Island	North Sunderland
1 in 200 year	3.4	3.4	3.5
HAT	2.8	2.8	2.8
MHWS	2.2	2.4	2.4
MLWS	-1.9	-1.8	-1.7
Water Level Parameter	Water Level (m AOD)		
	Amble	Blyth	River Tyne
1 in 200 year	3.5	3.6	3.7
HAT	3.1	3.1	3.1
MHWS	2.4	2.4	2.4
MLWS	-1.9	-1.8	-1.9

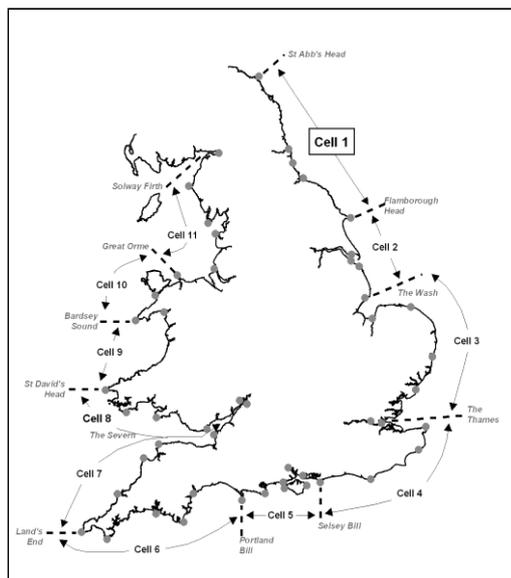
**Source:** *Scottish Border to River Tyne Shoreline Management Plan 2.*  
Royal Haskoning, May 2009.

## Glossary of Terms

Term	Definition
Beach nourishment	Artificial process of replenishing a beach with material from another source.
Berm crest	Ridge of sand or gravel deposited by wave action on the shore just above the normal high-water mark.
Breaker zone	Area in the sea where the waves break.
Coastal squeeze	The reduction in habitat area which can arise if the natural landward migration of a habitat under sea level rise is prevented by the fixing of the high-water mark, e.g. a sea wall.
Downdrift	Direction of alongshore movement of beach materials.
Ebb-tide	The falling tide, part of the tidal cycle between high water and the next low water.
Fetch	Length of water over which a given wind has blown that determines the size of the waves produced.
Flood-tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone between the high water and low water marks, also known as the intertidal zone.
Geomorphology	The branch of physical geography/geology which deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water, etc.
Groyne	Shore protection structure built perpendicular to the shore; designed to trap sediment.
Mean High Water (MHW)	The average of all high waters observed over a sufficiently long period.
Mean Low Water (MLW)	The average of all low waters observed over a sufficiently long period.
Mean Sea Level (MSL)	Average height of the sea surface over a 19-year period.
Offshore zone	Extends from the low water mark to a water depth of about 15 m and is permanently covered with water.
Storm surge	A rise in the sea surface on an open coast, resulting from a storm.
Swell	Waves that have travelled out of the area in which they were generated.
Tidal prism	The volume of water within the estuary between the level of high and low tide, typically taken for mean spring tides.
Tide	Periodic rising and falling of large bodies of water resulting from the gravitational attraction of the moon and sun acting on the rotating earth.
Topography	Configuration of a surface including its relief and the position of its natural and man-made features.
Transgression	The landward movement of the shoreline in response to a rise in relative sea level.
Updrift	Direction opposite to the predominant movement of longshore transport.
Wave direction	Direction from which a wave approaches.
Wave refraction	Process by which the direction of approach of a wave changes as it moves into shallow water.

## Preamble

The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire. This coastline is often referred to as 'Coastal Sediment Cell 1' in England and Wales (Figure 1). Within this frontage, the coastal landforms vary considerably, comprising low-lying tidal flats with fringing salt marshes, hard rock cliffs that are mantled with glacial sediment to varying thicknesses, softer rock cliffs and extensive landslide complexes.



**Figure 1 Sediment Cells in England and Wales**

The work commenced with a three-year monitoring programme in September 2008 that was managed by Scarborough Borough Council on behalf of the North East Coastal Group. This initial phase has been followed by a five-year programme of work, which started in October 2011. The work is funded by the Environment Agency, working in partnership with the following organisations:



The main elements of the Cell 1 Regional Coastal Monitoring Programme involve:

- beach profile surveys
- topographic surveys
- cliff top recession surveys
- real-time wave data collection
- bathymetric and seabed characterisation surveys
- aerial photography
- LiDAR Surveys
- walk-over cliff and coastal defence asset surveys

The beach profile surveys, topographic surveys and cliff top recession surveys are undertaken as a 'Full Measures' survey in autumn/early winter every year. Some of these surveys are then repeated the following spring as part of a 'Partial Measures' survey.

Each year, an Analytical Report is produced for each individual authority, providing a detailed analysis and interpretation of the 'Full Measures' surveys. This is followed by a brief Update Report for each individual authority, providing ongoing findings from the 'Partial Measures' surveys.

Annually, a Cell 1 Overview Report is also produced. This provides a region-wide summary of the main findings relating to trends and interactions along the entire Cell 1 frontage. To date the following reports have been produced:

**Table 1 Analytical, Update and Overview Reports Produced to Date**

Year		Full Measures		Partial Measures		Cell 1 Overview Report
		Survey	Analytical Report	Survey	Update Report	
1	2008/09	Sep-Dec 08	May 09	Mar-May 09		-
2	2009/10	Sep-Dec 09	Mar 10	Feb-Mar 10	Jul 10	-
3	2010/11	Aug-Nov 10	Feb 11	Feb-Apr 11	Aug 11	Sep 11
4	2011/12	Oct-Nov 11	Oct 12	Mar-May 12	Feb13	-
5	2012/13	Sep-Nov 12	Mar 13	Mar-Apr 13	Jun 13	
6	2013/2014	Sep-Oct 13	Feb 14	Mar-Apr 14	Jul 14	
7	2014/2015	Sep-Nov 14	Feb 15	Mar-Apr 15	Jul 15	
8	2015/2016	Sep-Dec 15	Feb 16	Mar-May 16	Jul 16	Jun 16
9	2016/2017	Aug-Nov 16	Mar 17	Feb-Apr 17	Jul 17	
10	2017/18	Sep-Dec 17	Mar 18	Feb-Apr 18	Jul 18	
11	2018/19	Sep-Dec 18	Feb 19	Feb-Apr 19	Jul 19	
12	2019/20	Aug-Dec 19	Mar 20 (*)			

(\*) The present report is **Analytical Report 12** and provides an analysis of the 2019 Full Measures survey for Northumberland County Council's frontage.

In addition, separate reports are produced for other elements of the programme as and when specific components are undertaken, such as wave data collection, bathymetric and seabed sediment data collection, aerial photography, and walk-over visual inspections.

For purposes of analysis, the Cell 1 frontage has been split into the sub-sections listed in the Table 2.

**Table 2 Sub-divisions of the Cell 1 Coastline**

<b>Authority</b>	<b>Zone</b>
Northumberland County Council	Spittal A
	Spittal B
	Goswick Sands
	Holy Island
	Bamburgh
	Beadnell Village
	Beadnell Bay
	Embelton Bay
	Boulmer
	Alnmouth Bay
	High Hauxley and Druridge Bay
	Lynemouth Bay
	Newbiggin Bay
	Cambois Bay
Blyth South Beach	
North Tyneside Council	Whitley Sands
	Cullercoats Bay
	Tynemouth Long Sands
	King Edward's Bay
South Tyneside Council	Littehaven Beach
	Herd Sands
	Trow Quarry (incl. Frenchman's Bay)
	Marsden Bay
Sunderland Council	Whitburn Bay
	Harbour and Docks
	Hendon to Ryhope (incl. Halliwell Banks)
Durham County Council	Featherbed Rocks
	Seaham
	Blast Beach
	Hawthorn Hive
	Blackhall Colliery
Hartlepool Borough Council	North Sands
	Headland
	Middleton
	Hartlepool Bay
Redcar & Cleveland Borough Council	Coatham Sands
	Redcar Sands
	Marske Sands
	Saltburn Sands
	Cattersty Sands (Skinningrove)
	Staithes
Scarborough Borough Council	Staithes
	Runswick Bay
	Sandsend Beach, Uppang Beach and Whitby Sands
	Robin Hood's Bay
	Scarborough North Bay
	Scarborough South Bay
	Cayton Bay
	Filey Bay

## **1. Introduction**

### **1.1 Study Area**

Northumberland County Council's frontage extends from the Scottish border in the north to Hartley, just south of Blyth, in the south. For the purposes of this report and for consistency with previous reporting, it has been sub-divided into 15 areas, namely:

- Sandstell Point (Spittal A)
- Spittal (Spittal B)
- Goswick Sands
- Holy Island
- Bamburgh
- Beadnell Village
- Beadnell Bay
- Embleton Bay
- Boulmer
- Alnmouth Bay
- High Hauxley and Druridge Bay
- Lynemouth Bay
- Newbiggin-by-the-Sea
- Cambois
- Blyth South Beach

### **1.2 Methodology**

Along the Northumberland frontage, the following surveying is undertaken:

Full Measures survey annually each autumn comprising:

- Beach profile surveys along 78 transect lines (commenced 2002)
- Beach profile surveys along an additional ten transect lines (commenced 2007)
- Beach profile surveys along an additional 26 transect lines (commenced 2010)
- Topographic survey along Holy Island (commenced 2004)
- Topographic survey along Alnmouth Bay (commenced 2005)
- Topographic survey along Sandstell Point (commenced 2009)
- Topographic survey along Newbiggin Bay (commenced 2010)

Partial Measures survey annually each spring comprising:

- Beach profile surveys along 29 transect lines (commenced 2002)
- Beach profile surveys along an additional ten transect lines (commenced 2007)
- Beach profile surveys along an additional one transect line (commenced 2010)
- Beach profile surveys along an additional two transect lines (commenced 2011)
- Topographic survey along Alnmouth Bay (commenced 2005)
- Topographic survey along Sandstell Point (commenced 2009)
- Topographic survey along Newbiggin Bay (commenced 2010)

Cliff top survey (bi-annually) at:

- Cliff top survey at Lynemouth Bay (commenced 2008)
- Cliff top survey at Cambois Bay (Sandy Bay) (commenced 2008)
- Cliff top survey at Cambois Bay (Cambois) (commenced 2009)

Sand extent survey (bi-annually) at:

- Edge of sand survey at Newbiggin Bay, Spittal Carrs, (commenced 2011 to determine potential adverse impact on foreshore SSSI of the Newbiggin beach recharge scheme)

In addition to the above, laserscan surveys of the cliffs in Lynemouth have been undertaken on several occasions. These are reported separately to Northumberland County Council.

For all cliff-top surveys prior to Full Measures 2011, the data was previously saved in '.kmz' format for plotting and visual comparison in Google Earth. This data has been visualised in GIS, which revealed the quality was variable and reliable interpretations of short-term cliff change could not be made. For the present and future surveys, the data will be plotted in GIS and change will be qualified along a series of pre-defined transect lines. The resulting data on amount and rate of change is presented in tables and the survey results are compared.

The location of these surveys is shown in Figure 2. The Full Measures survey was undertaken on various dates along this frontage between 29<sup>th</sup> August and 29<sup>th</sup> November 2019. During this time, weather conditions varied considerably; refer to the survey reports for details of the weather conditions over this survey period.

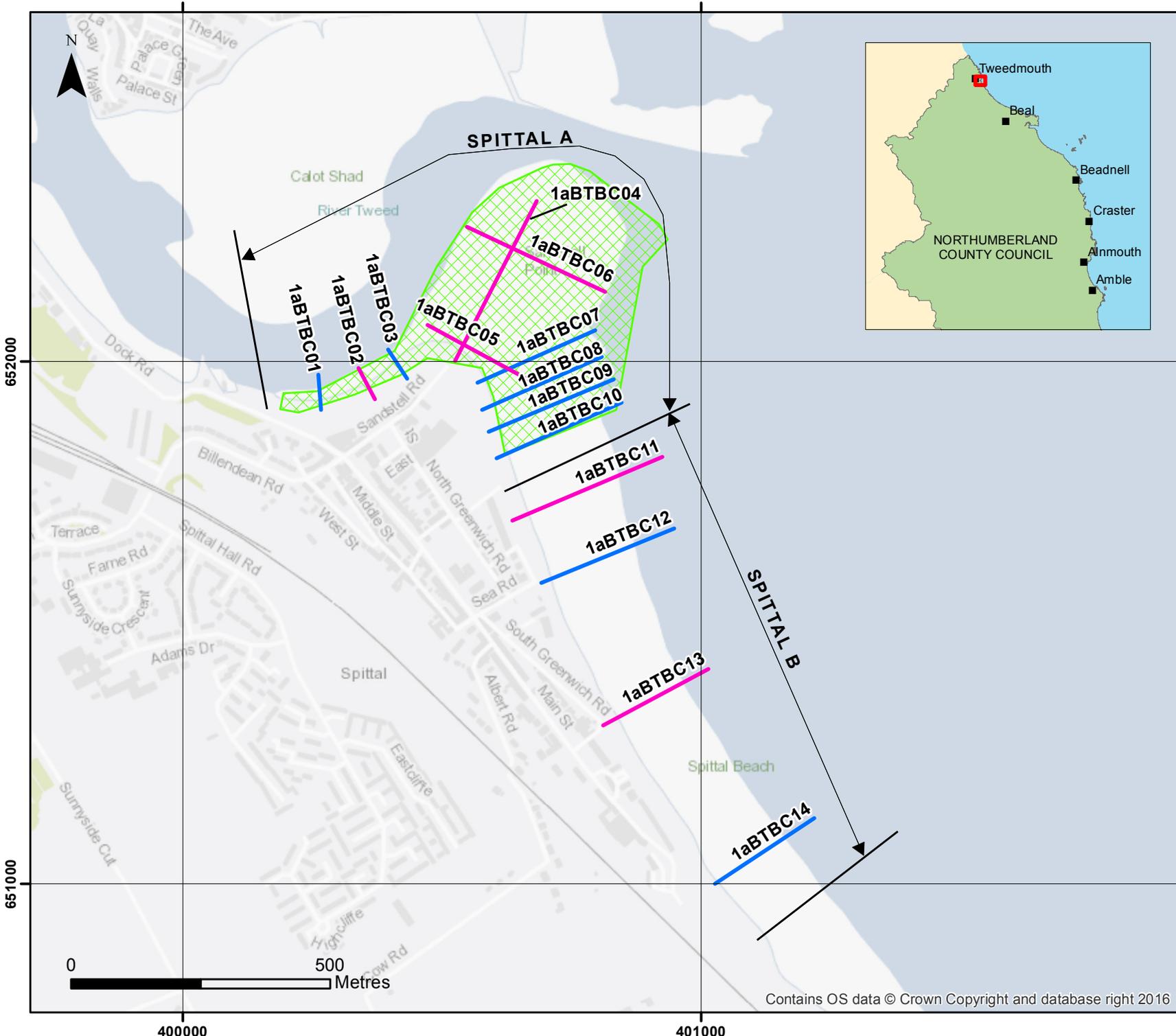
All data have been captured in a manner commensurate with the principles of the Environment Agency's *National Standard Contract and Specification for Surveying Services* and stored in a file format compatible with the software systems being used for the data analysis, namely SANDS and ArcGIS. This data collection approach and file format is comparable to that being used on other regional coastal monitoring programmes, such as in the South East and South West of England.

Upon receipt of the data from the survey team, they are quality assured and then uploaded onto the programme website for storage and availability to others and input to SANDS and GIS for subsequent analysis.

The Analytical Report is then produced following a standard structure for each authority. This involves:

- description of the changes observed since the previous survey and an interpretation of the drivers of these changes (Section 2);
- documentation of any problems encountered during surveying or uncertainties inherent in the analysis (Section 3);
- recommendations for 'fine-tuning' the programme to enhance its outputs (Section 4); and
- providing key conclusions and highlighting any areas of concern (Section 5).

Data from the present survey are presented in a processed form in the Appendices.



Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 1**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

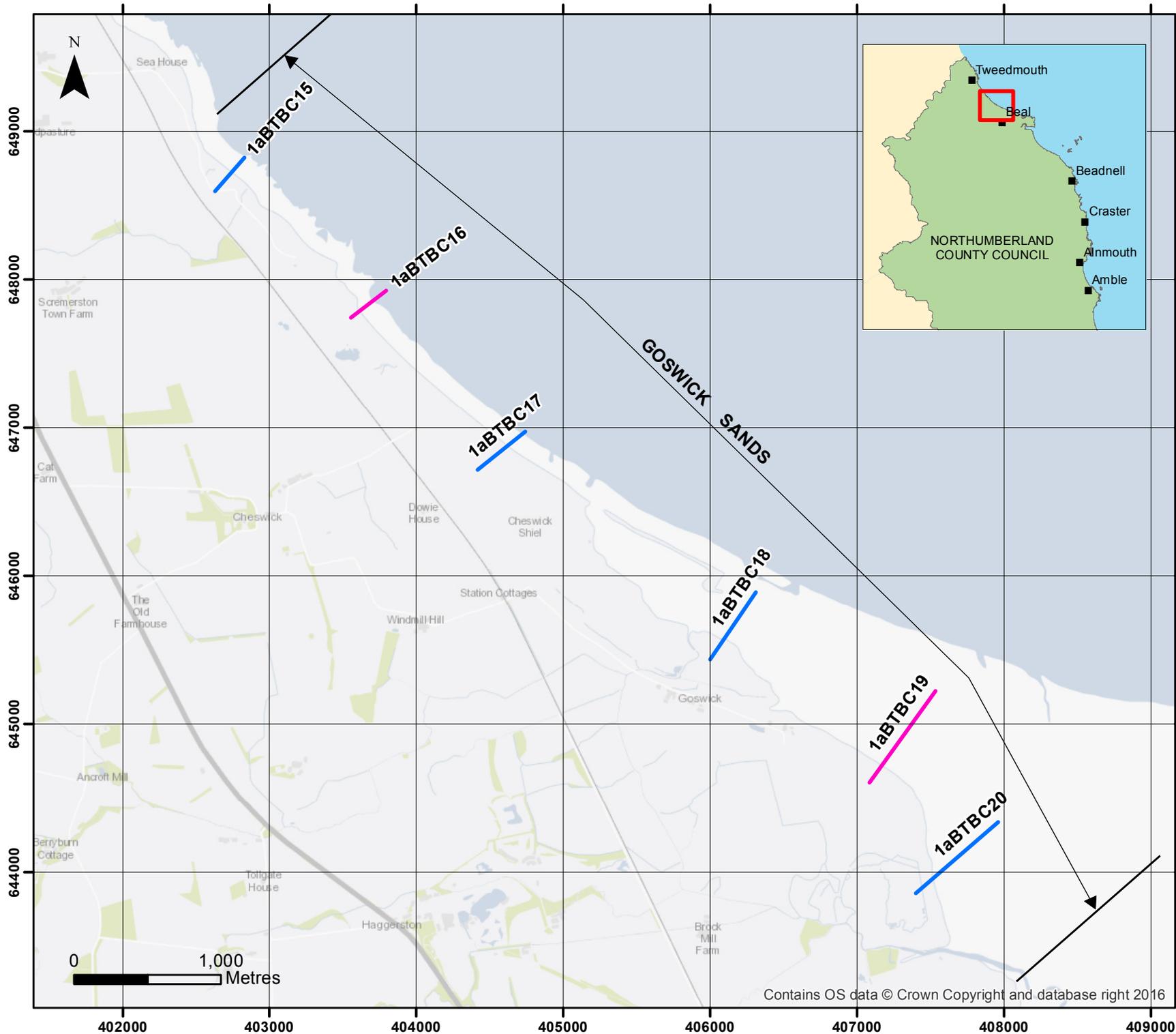
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 2**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

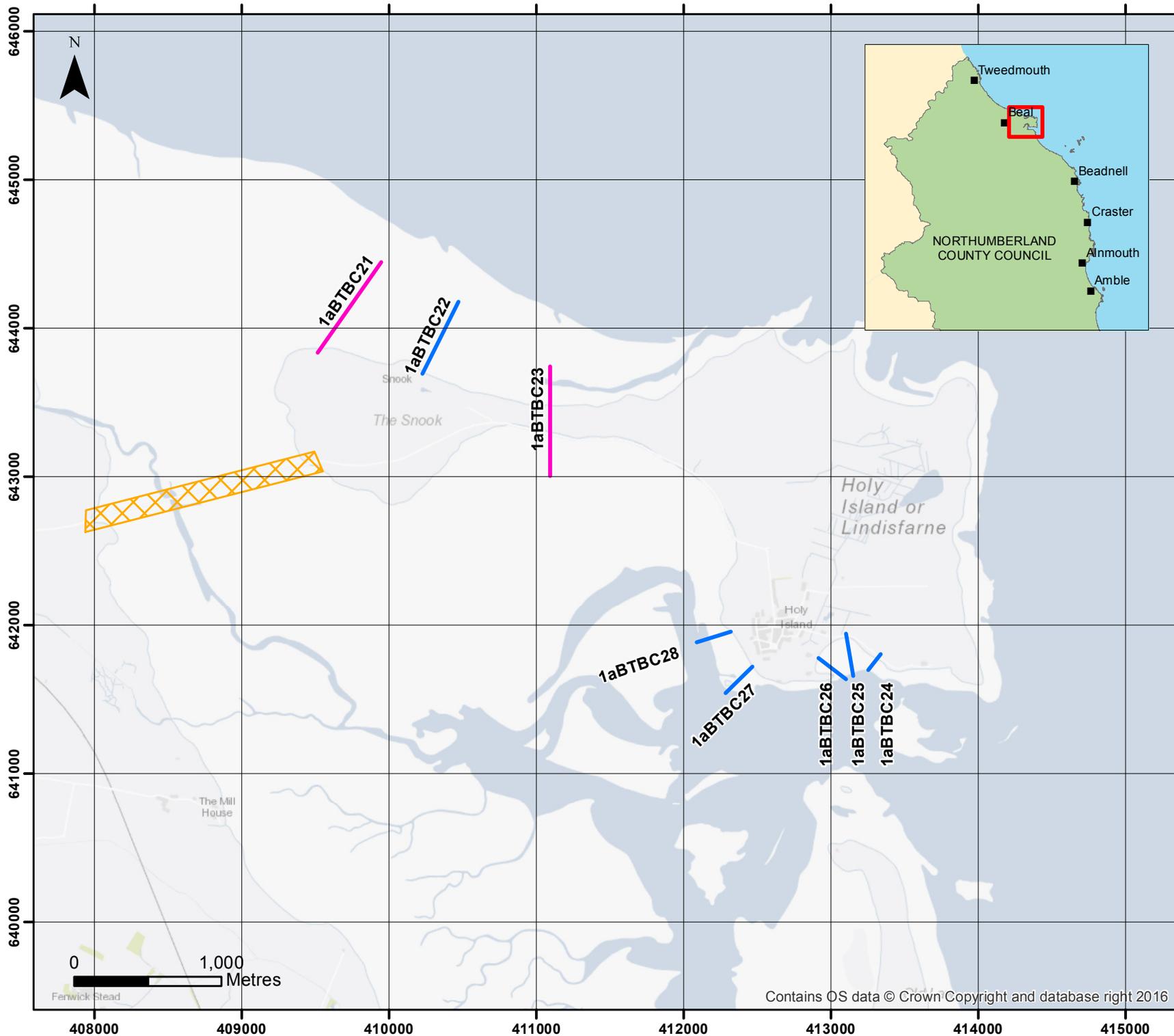
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual (Blue line)
- Bi-Annual (Pink line)

**Topographic Surveys**

- 6 monthly (Green hatched)
- yearly (Yellow hatched)
- 5 yearly (Brown hatched)

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 3**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

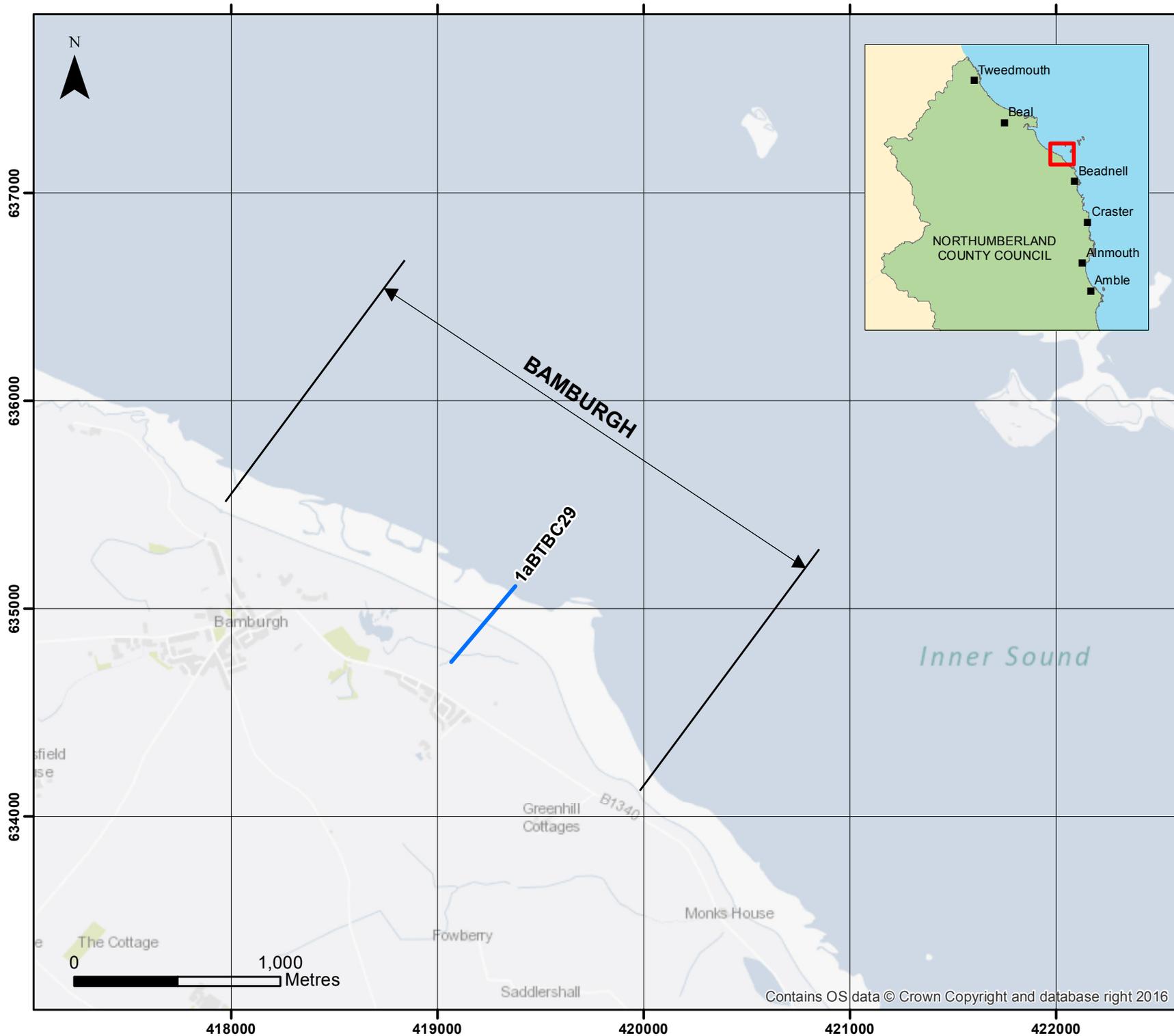
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 4**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

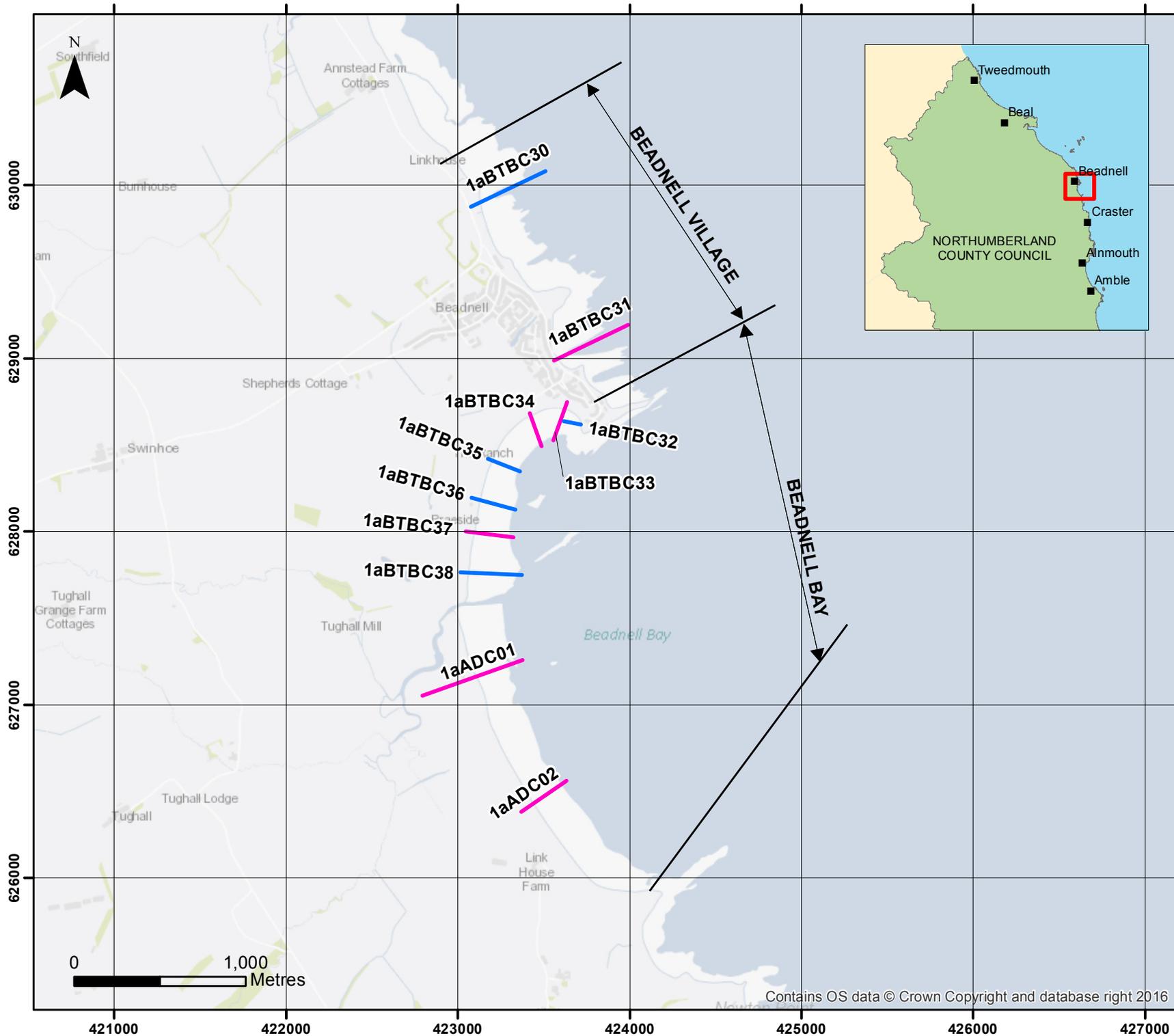
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**Topographic Profiles**

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- Bi-Annual (Pink line)

**Topographic Surveys**

- 6 monthly (Green cross-hatch)
- yearly (Orange cross-hatch)
- 5 yearly (Brown cross-hatch)

*(Indicative Survey Extents shown)*

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 5**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

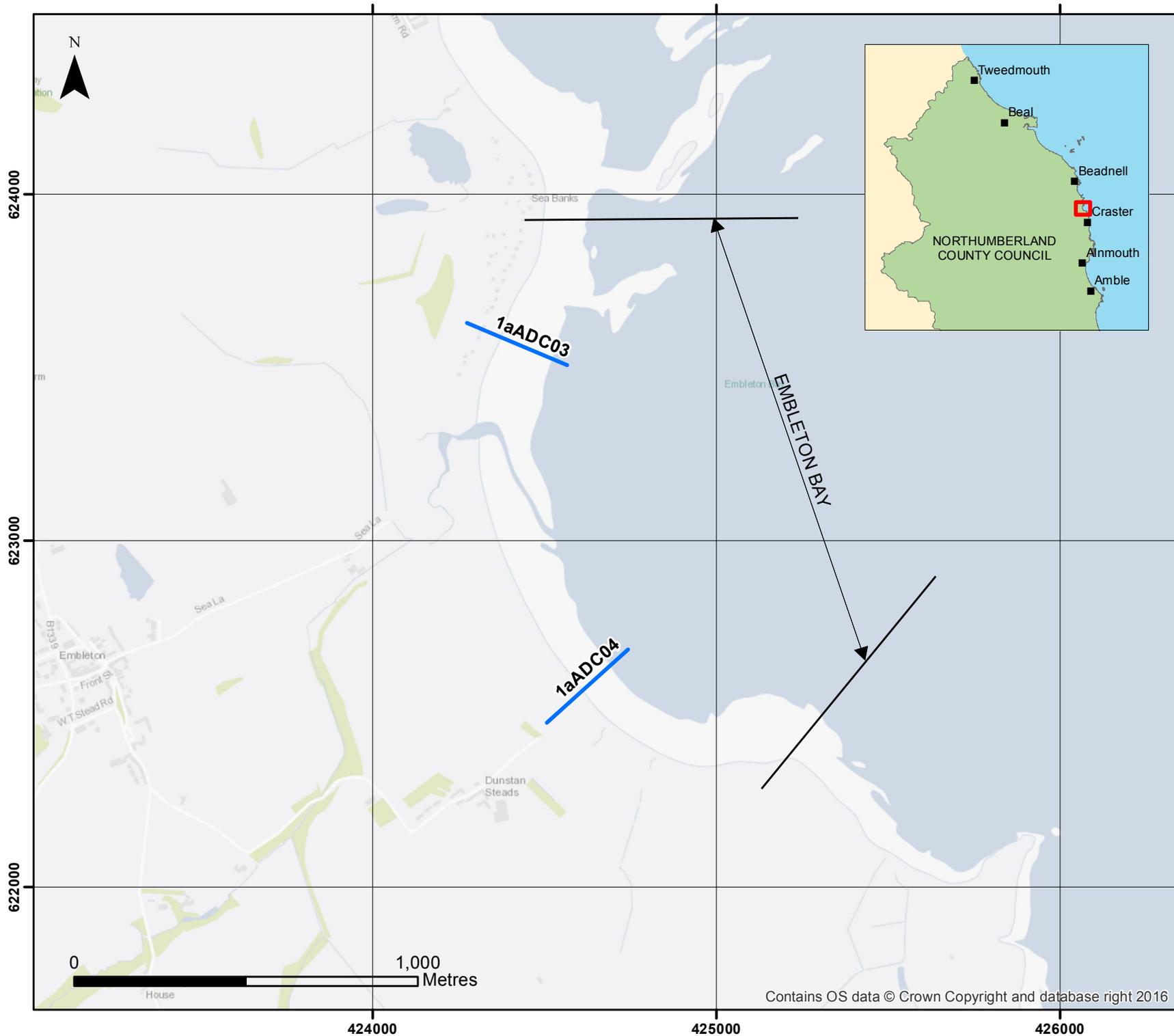
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 6**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

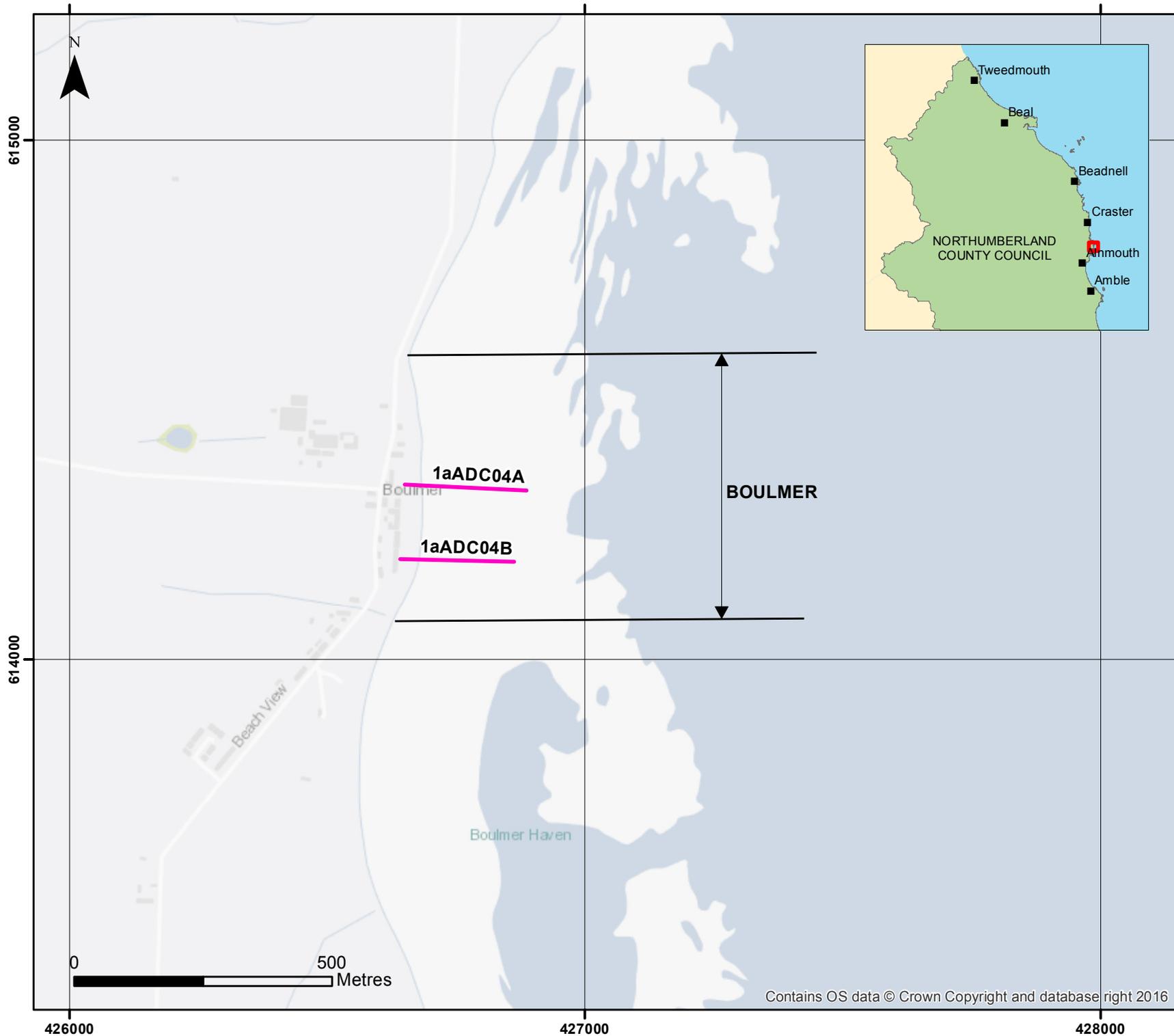
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Key

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**Topographic Profiles**

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**Topographic Surveys**

- 6 monthly (Green cross-hatch)
- yearly (Orange cross-hatch)
- 5 yearly (Brown cross-hatch)

*(Indicative Survey Extents shown)*

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 7**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

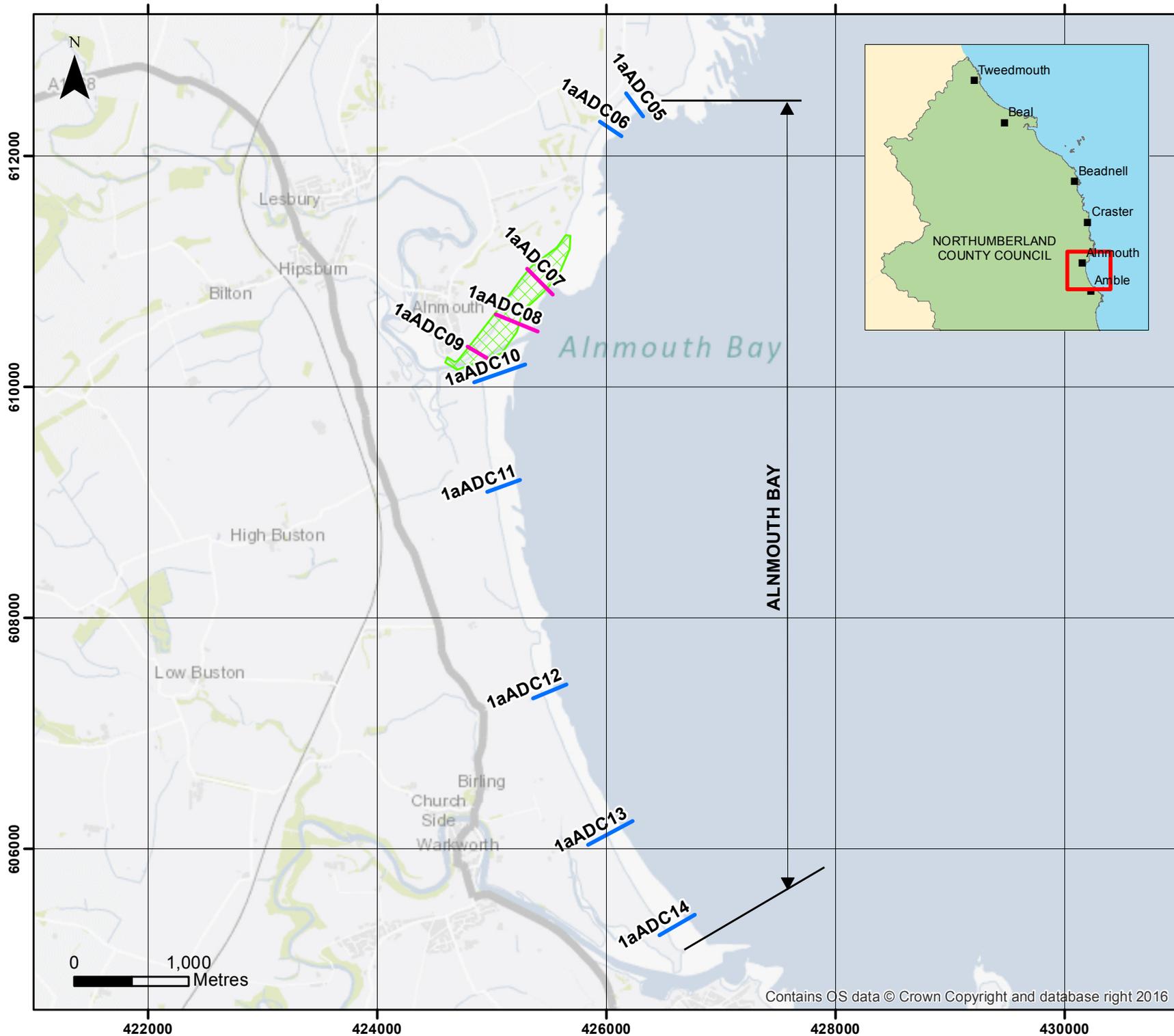
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 8**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

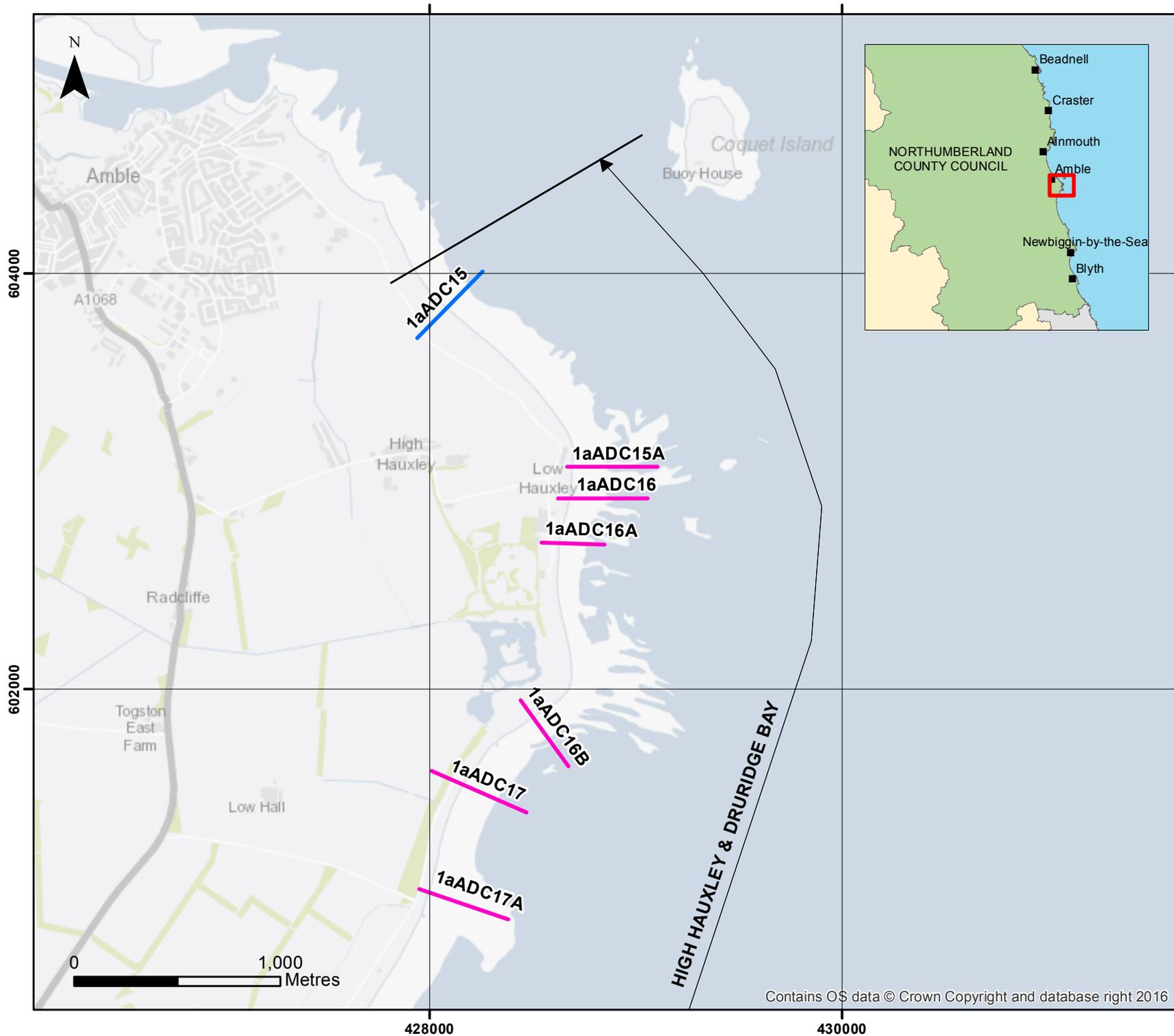
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**Topographic Profiles**

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**Topographic Surveys**

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- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 9**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

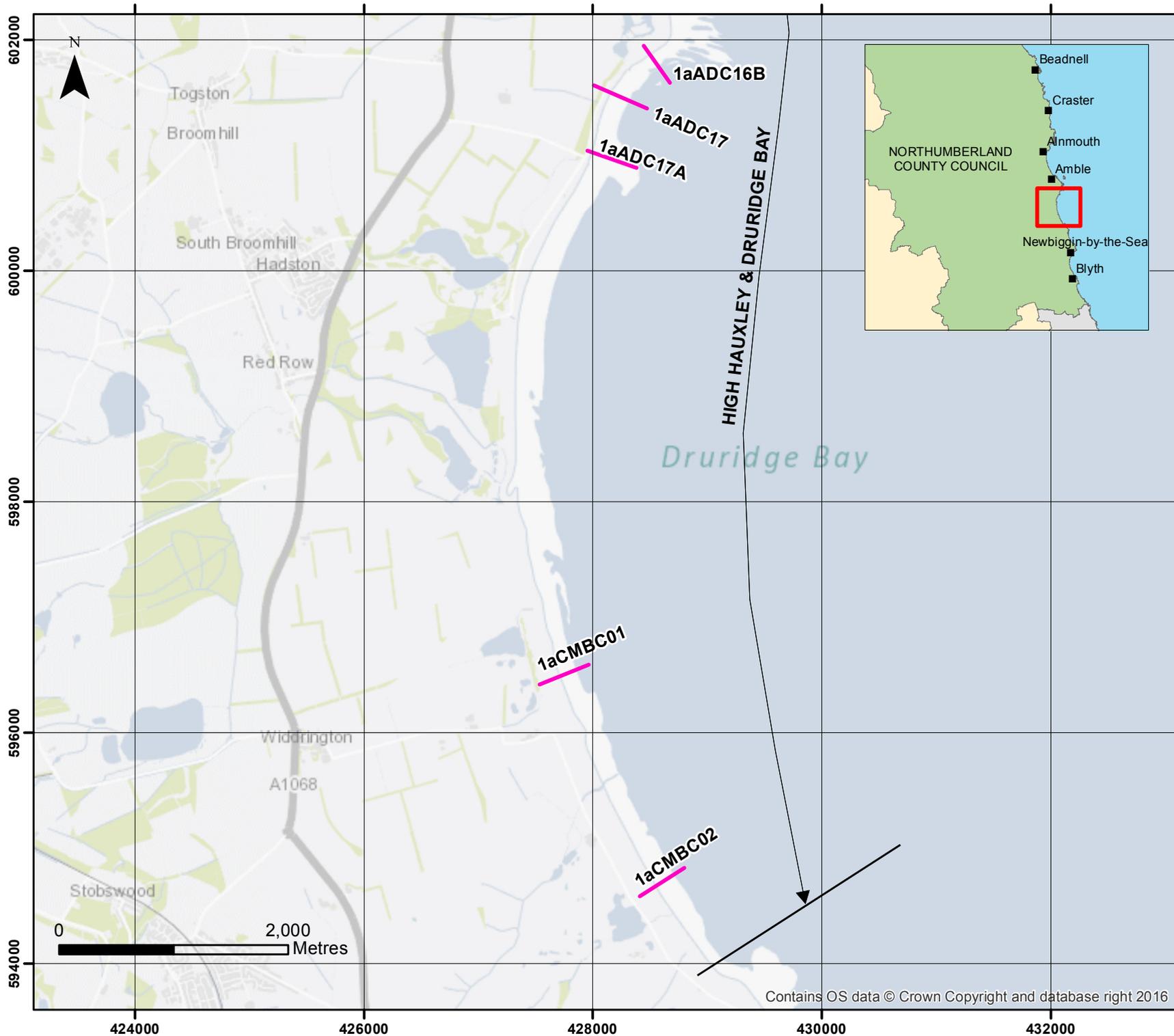
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**Topographic Surveys**

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- yearly (Orange cross-hatch)
- 5 yearly (Brown cross-hatch)

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 10**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

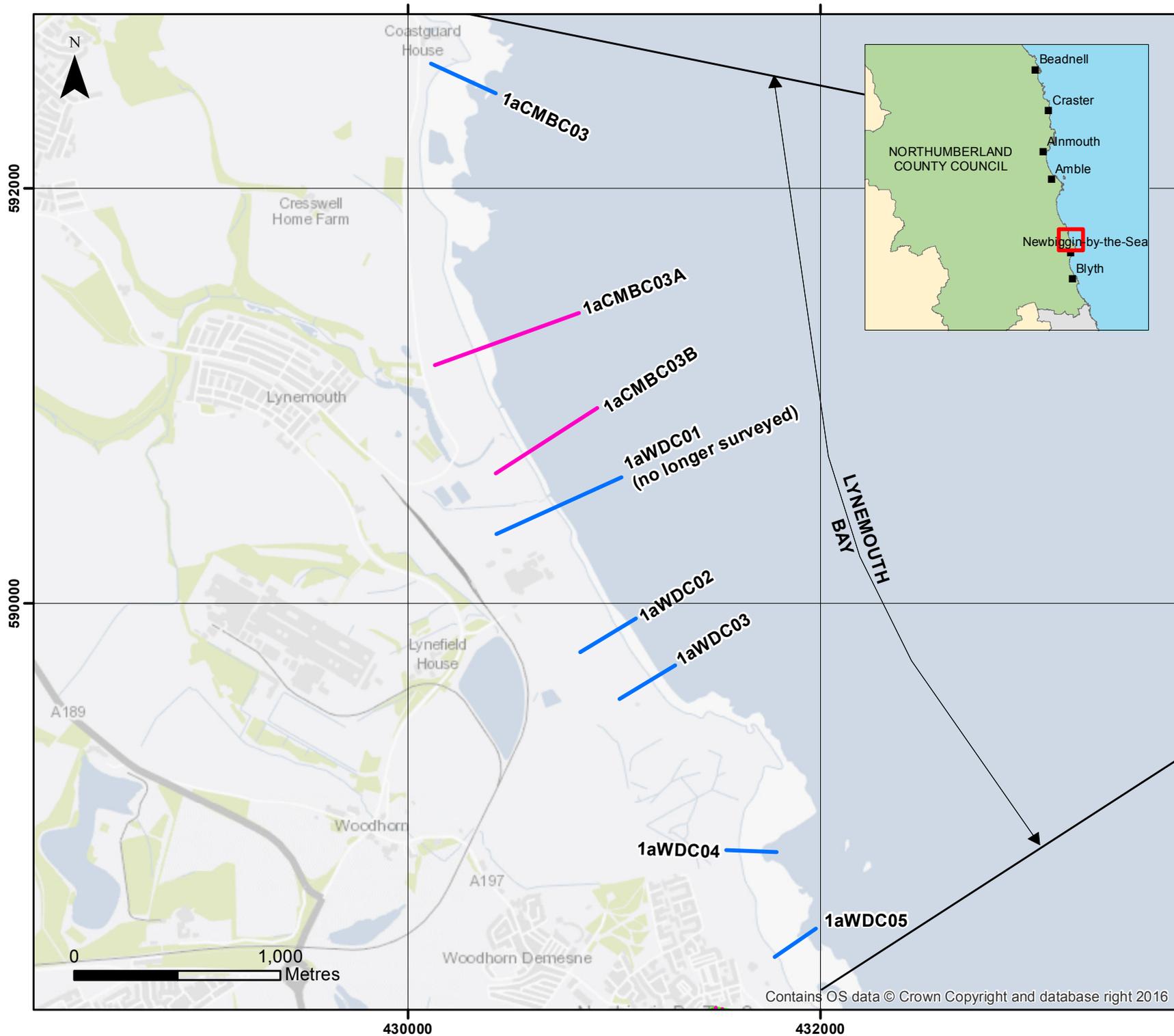
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**Topographic Surveys**

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- yearly (Orange cross-hatch)
- 5 yearly (Brown cross-hatch)

*(Indicative Survey Extents shown)*

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 11**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

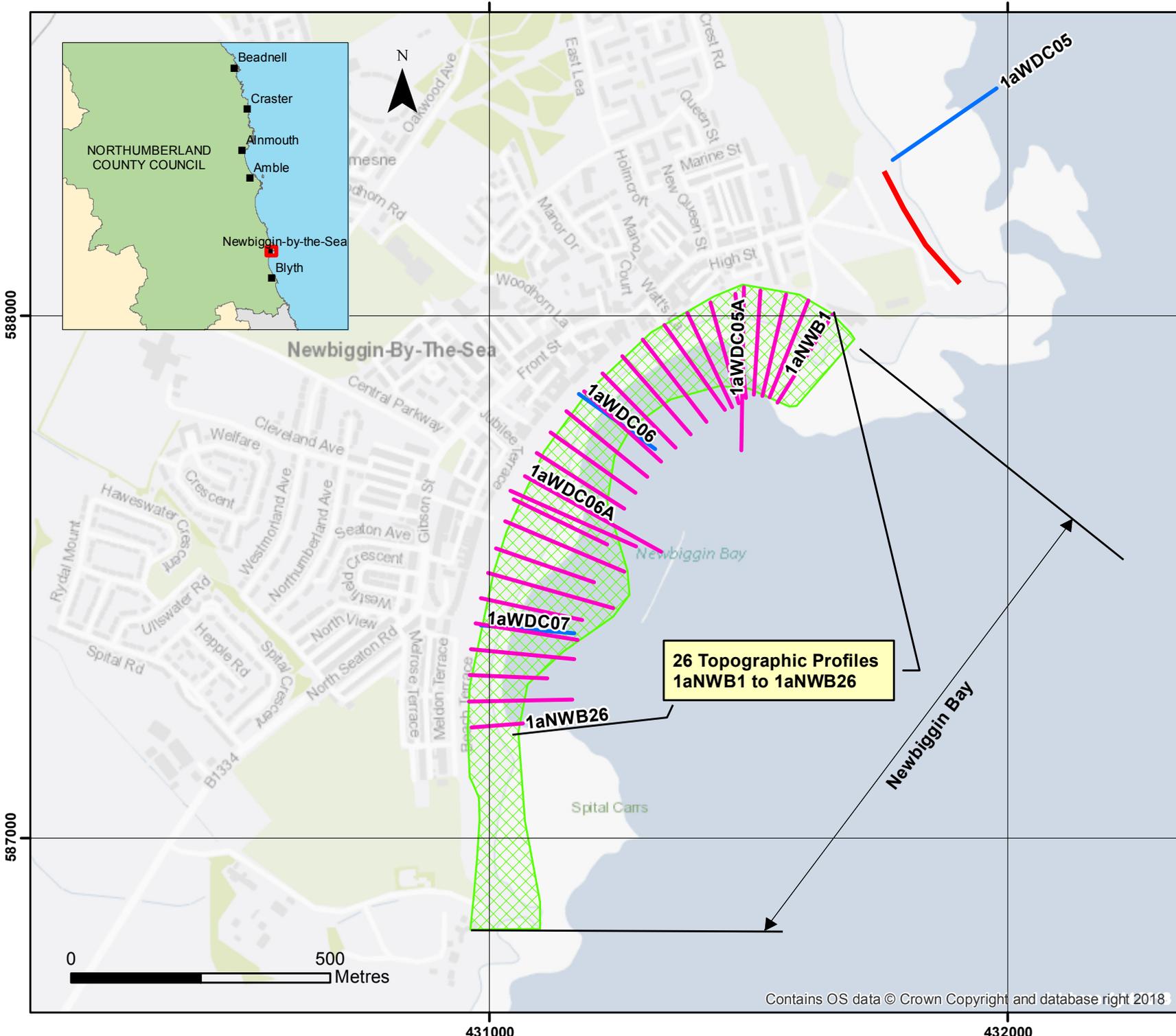
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly
- Cliff Top Edge Survey

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 12**

**Northumberland County Council Frontage**

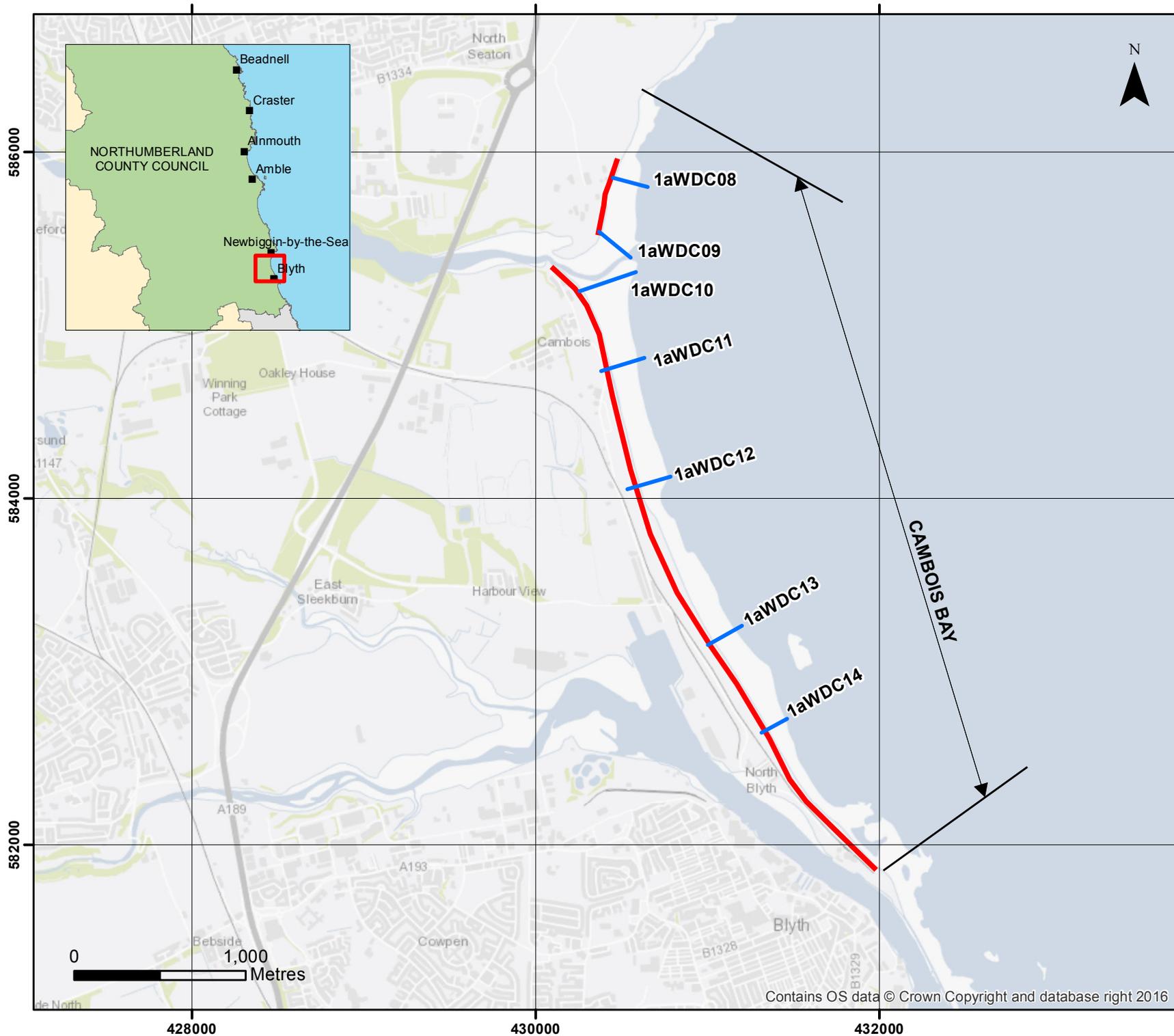
Analytical Report  
Topo Surveys

Drawing Scale at A4 1:10,000

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**Topographic Surveys**

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- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 13**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

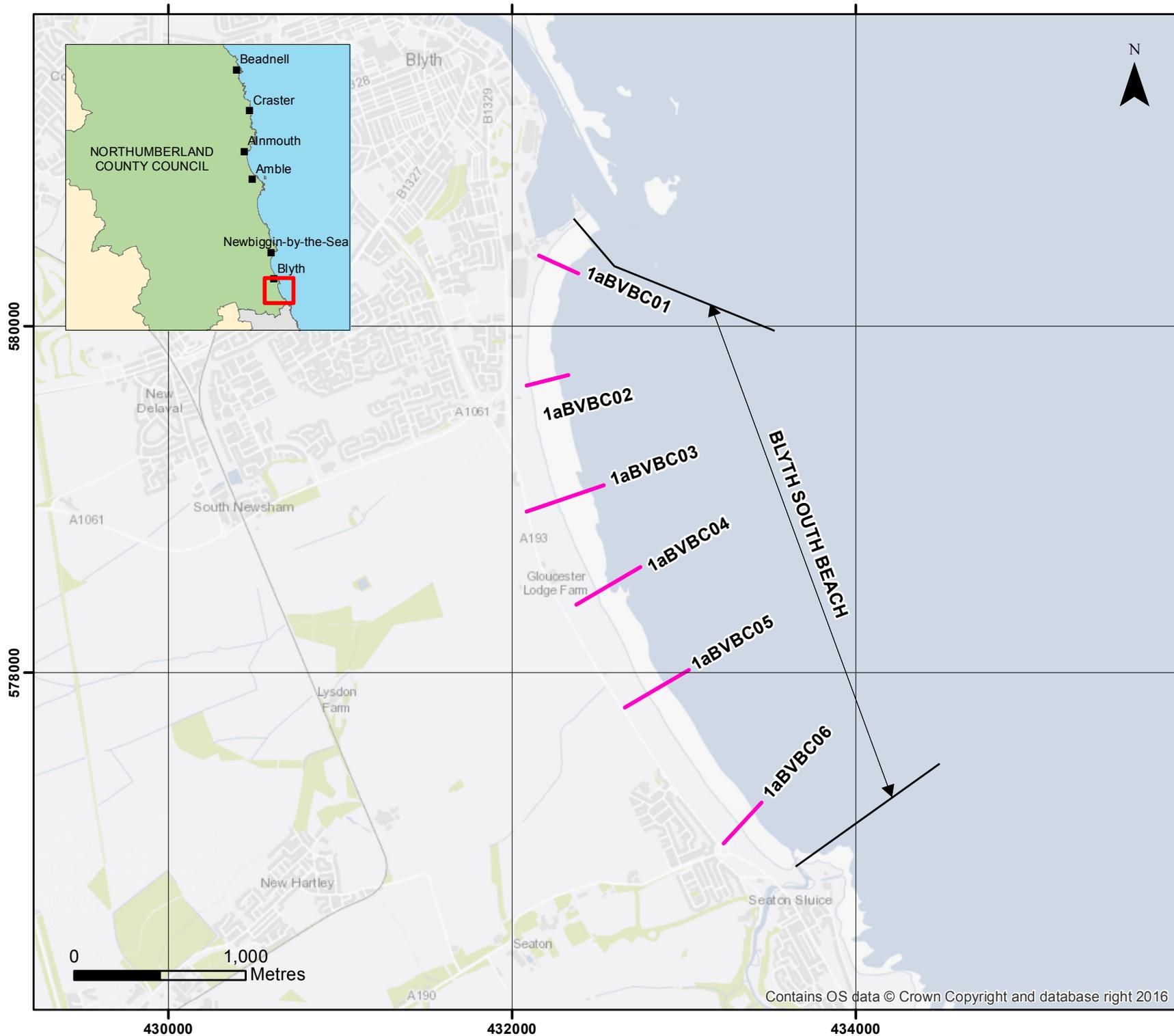
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual
- Cliff Top Edge Survey

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 14**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

Drawing Scale at A4 1:30,000

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## 2. Analysis of Survey Data

### 2.1 Sandstell Point (Spittal A)

Survey Date	Description of Changes Since Last Survey	Interpretation
15 <sup>th</sup> October 2019	<p><b>Beach Profiles:</b></p> <p>Sandstell Point is covered by ten beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC02, 1aBTBC04, 1aBTBC05, and 1aBTBC06 were last surveyed during the Partial Measures Spring survey, 2018. Profiles 1aBTBC01, 1aBTBC03, and 1aBTBC7 to 10 were last surveyed during the Full Measures autumn survey 2018.</p> <p>Profiles <b>1aBTBC01</b> to <b>1aBTBC03</b> are located on the southern bank of the River Tweed in front of the dunes.</p> <p>At <b>1aBTBC01</b>, the dunes have remained mostly stable. From chainage 43m to the end of the survey at chainage 71m there has been minor erosion of up to 0.1m. Overall, the profile is at a medium level on the upper beach and a low level on the mid and lower beach when compared to the range recorded from previous surveys. The toe of the beach from chainage 65m to 69m is at its lowest recorded level.</p> <p>At profile, <b>1aBTBC02</b> there has been little change in the dunes with accretion or erosion <math>\leq 0.1</math>m. On the upper to mid beach between chainages 41m and 66m, there has been accretion of up to 0.2m. There is negligible change from chainage 66m to the end of the survey. The upper and mid-beach is at a high level compared to the range recorded from previous surveys, however the lower beach is at a relatively low level.</p> <p>At profile <b>1aBTBC03</b>, there has been some minor accretion of up to 0.2m at the crest of the foredune between chainage 56m and 63m. Between chainage 63m and 68m there has been no change. However, at chainage 68m the seaward face of the dune is shown to have receded by around 1m. Seawards of this point, for the remainder of the profile the beach has experienced a consistent low level of erosion of up to 0.2m from chainage 68m to the end of the survey at chainage 96m. Overall, the dunes are at a high level compared to the range recorded from previous surveys, particularly</p>	<p>Since the last survey, the dunes on south bank of River Tweed have remained stable and relatively unchanged., except at profile <b>1aBTBC03</b> where the dune face is found to have receded by around 1.0m. The beach sections of the profile generally show minor accretion and erosion and are generally at low to medium levels.</p> <p>There has been alternating sections of erosion and accretion across the spit however the profile remains relatively unchanged at the landward end but a significantly taller, narrower profile at the distal end of the spit. Changes are similar to those seen between November 2018 and March 2019, albeit slightly greater in magnitude.</p> <p>The pattern in the profiles along the open coast are all generally similar, showing accretion at the toe of the rock revetment, erosion of the upper to middle beach and the formation of a berm along the lower beach, suggesting a movement of material offshore.</p> <p><b>Longer term trends:</b> The dunes have remained stable over the past 12 years, and along the south bank of the River Tweed the seaward face of the dunes is the highest since surveys began (April 2002).</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>between chainages 54m and 64m where they reach their highest level recorded. The rest of the profile is at a medium level compared to the range recorded from previous surveys.</p> <p>Profiles <b>1aBTBC04</b> (longitudinal section) and <b>1aBTBC05</b> and <b>1aBTBC06</b> (both cross-sections) cover the spit at Sandstell Point.</p> <p>At profile <b>1aBTBC04</b>, there has been accretion of 0.2m at the toe of the rock armour (chainage 10 – 90m). Between chainage 90m and 110m there has been erosion of up to 0.4m, which has caused the crest of the berm to retreat from chainage 101m to 88m. Between chainages 110m and 158m, there has been accretion of up to 0.6m. Seawards of this point, the profile is dominated by erosion. From chainage 158m until the end of the survey at chainage 422m there has been up to 0.7m of erosion. Although, a shallow berm has formed towards the toe of the spit between chainage 280m and 360m. The toe of the spit has retrograded by 9.0m from chainage 432m to 423m. The most landward portion of the profile is at a relatively high level compared to the range recorded from previous surveys, but the central portion and beach toe between chainage 160m and 423m is at a medium level.</p> <p>Profiles <b>1aBTBC05</b> and <b>1aBTBC06</b> are transects across the spit, with the open sea on the right-hand side of the plot and the river channel to the left.</p> <p>At <b>1aBTBC05</b>, the spit has increased in height by up to 0.2m, creating a marginally narrower cross-sectional profile. The riverside of the spit has experienced movement of material down the profile, with an accretion of up to 0.8m between chainage -90m and -20m and an associated loss of material of up to 0.6m between chainage -20m and the crest of the spit at chainage 110m. There has been little change to the seaward face of the spit. With the exception of some erosion between chainage 192m and 202m. Overall the profile is broadly within the middle of its range recorded from previous surveys, both in terms of height and position.</p> <p>At profile <b>1aBTBC06</b>, the entire spit structure has become narrower and increased in height since the previous spring 2019 survey. A shallow platform has formed at the riverside toe of the spit between chainage 40m and 100m. This has caused accretion at the landward edge and some erosion at the seaward edge of this platform, although these changes are limited to <math>\pm 0.1</math>m. From chainage 100m to chainage 174m there has been a landward movement of the spit face, caused by the accumulation of up to 0.3m of material at the base of the spit. From chainage 174m to the spit crest at chainage 275m the cross section has become narrower and taller, with a concave profile on the riverside face and slightly convex profile on the seaward face. The crest of the spit has increased in level by 1.3m and</p>	<p>Changes in beach levels are generally within the bounds of previous surveys.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>moved seawards by 38m to chainage 273m. Overall the spit profile is at a low level on its riverside face and high level on its seawards face. The spit crest lies in a notably seawards position, particularly between chainage 272m and 311m. where the spit face has reached its most seaward position since surveys began in 2002.</p> <p>Profiles <b>1aBTBC07</b> to <b>1aBTBC10</b> are located along the open coast, at the intersection of the southern side of the spit at Sandstell Point and northern end of Spittal Beach.</p> <p>At profile <b>1aBTBC07</b>, between the rock revetment and 130m chainage, there are alternating bands (of approximately 15m in width) of erosion and accretion, although the magnitude of change is limited to <math>\pm 0.2</math>m. The effect of this is that the profile has smoothed across the upper and mid-beach. Seawards of this point, from chainage 130m to 195m the profile has experienced erosion of up to 0.3m, which has caused the loss of two lower beach berms previously recorded in this location. At the toe of the beach, there has been 0.4m of accretion and the profile extends 32m seawards of the previous survey. Overall, the beach is at a medium level compared to the range recorded on previous surveys.</p> <p>At profile <b>1aBTBC08</b>, there has been little change across the upper beach, between chainage 30m and 50m. From chainage 50m to 60m there has been accretion of up to 0.2m, conversely between chainage 60m and 84m there has been erosion of up to 0.4m. The pattern is then reflected with accretion between chainage 85m and 115m of up to 0.2m. The effect of these alternating bands is that the upper beach has remained very similar to the previous survey with the mid-beach becoming shallower. From chainage 115m there has been up to 0.6m of erosion, and a previously recorded berm has moved seawards by approximately 30m. The toe of the profile has experienced some accretion of up to 0.3m, and the profile now extends an additional 20m seawards. Overall, the upper beach is at a high level compared to the range recorded on previous surveys whilst the lower beach is at a medium level.</p> <p>Profile <b>1aBTBC09</b> again shows a similar pattern, with little change in beach levels in front of the rock revetment up to chainage 40m. Similar to the profile to the north there is a slight accumulation of up to 0.2m of material at the toe of the upper beach between chainage 40m and 53m. From chainage 53m to 85m there has been up to 0.4m of erosion causing the loss of a shallow berm previously recorded here. From chainage 85m to 100m there has been no change. The remainder of the profile is dominated by up to 1.0m of erosion. The effect of these changes has been to create a shallower</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>smoother profile. Overall, the upper beach is at a relatively high level compared to the range recorded on previous surveys whilst the mid beach and toe is at a medium level.</p> <p>Profile <b>1aBTBC10</b> again shows a similar pattern, with change on the upper beach from chainage 17m to 42m limited to <math>\pm 0.2</math>m. Seawards of chainage 42m, until the end of the survey at chainage 179m, the profile is dominated by erosion. Across the mid beach from chainage 55m to 120m the level of erosion lies between 0.3m and 0.6m. On the lower beach, from chainage 130m to 179m a shallow berm has formed, although the crest level of this (at chainage 147m) is still 0.2m below the level recorded here in the previous survey. Overall, the upper beach is at a relatively high level compared to the range recorded on previous surveys whilst the middle and lower beach is at a medium level.</p>	
<p><b>March - October 2019</b></p>	<p><b>Topographic Survey:</b></p> <p>Due to the significant changes that have been observed from the beach profiles along the spit at Sandstell Point, and the three-dimensional nature of these changes, a topographic survey was introduced to the monitoring programme in November 2011. The previous survey was undertaken for the Partial Measures survey in spring 2019.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2019) have been used to create a digital ground model (DGM) (Appendix B – Map 1) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 5) produced from the last topographic survey and the present survey.</p> <p>The difference plot for this survey shows; (i) little change in the dunes on the south bank of the River Tweed; (ii) an increase in the beach elevation along the northwest edge of the survey area; (iii) a band of erosion running north south from the tip of the spit along its seaward face, widening in the south of the survey extent; and (iv) a low level of accretion on the foreshore.</p>	<p>The findings of the topographic survey show similar trends to the profile survey. Findings are a reversal of those observed following the previous survey.</p>

## 2.2 Spittal (Spittal B)

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>15<sup>th</sup> October 2019</p>	<p><b>Beach Profiles:</b></p> <p>Spittal B is covered by four beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC11 and 1aBTBC13 were last surveyed during the Partial Measures spring survey, 2019. Profiles 1aBTBC12 and 1aBTBC14 were last surveyed during the Full Measures autumn survey 2018.</p> <p>Profile <b>1aBTBC11</b> is located to the north of Spittal Beach. The upper beach shows accretion at the toe of the seawall to chainage 22m of up to 0.2m, switching to erosion on the upper beach of up to 0.4m until chainage 50m. This has caused a steepening of the seaward face of the upper beach berm. From chainage 50m up to 140m the profile has experienced further erosion of 0.1m on the upper-min beach, increasing to 0.3m on the lower-mid beach. On the lower beach between chainage 145m and 175m a lower beach berm has formed. The berm crest at chainage 154m is 0.45m above the level recorded in this area in the previous survey. Overall, the profile is at a high level on the upper beach and a medium level over the remainder of the profile when compared with the range recorded from previous surveys. Notably the upper beach berm between chainage 11m and 22m is the highest recorded level in this location.</p> <p>Profile <b>1aBTBC12</b> shows accretion of 0.2m immediately at the toe of the seawall, but erosion of up to 0.6m across the upper beach between chainage 8m and 25m, leading to the loss of the upper beach berm recorded in this location previously. From chainage 25m to 30m there is small band of accretion limited to 0.1m. From chainage 30m to 75m there has been up to 0.4m of erosion leading to a steepening of the upper-mid and a slackening of the lower-mid beach. This effect is compounded by accretion and the landward retreat of the lower beach berm. From chainage 75m to 155m there has been accretion of up to 0.6m. Seawards of this point, at the toe of the beach from chainage 155m to</p>	<p>Since the last survey, beach levels along Spittal have fluctuated, generally showing an increase in level immediately at the toe of the seawall with erosion through the mid beach and the formation of a berm at the toe of the beach. Overall, all the profiles show the beach is at a roughly medium level compared to previous surveys, with the uppermost beach at 1aBTBC14 having recovered well since the extreme lows recorded in November 2018.</p> <p><b>Longer term trends:</b> At all profile locations along Spittal Beach, the changes observed from the present survey are within the bounds of previous surveys.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>the end of the survey at 173m there has been 0.3m of erosion. Overall, the profile is at a medium level on the upper beach, and a high level on the mid and lower beach, when compared with the range recorded from previous surveys.</p> <p>Profile <b>1aBTBC13</b> shows an increase in levels of 0.3m at the toe of the seawall, increasing to 0.6m by at chainage 40m. There has been erosion of up to 0.2m between chainage 40m and 65m on the upper mid beach. The remainder of the mid-beach has experienced erosion of up to 0.2m from chainage 65m to 145m. At the toe of the beach the profile resembles profile <b>1aBTBC12</b> with a sharp berm forming between chainage 145m and 190m. Although the previous survey did not extend this far seawards the crest of the dune is 0.4m above the most seaward point recorded on the previous survey. Overall, the profile is at a medium-high level compared with the range recorded from previous surveys, with the lower beach berm between chainage 155m and 185m being the highest recorded level in this location.</p> <p>At profile <b>1aBTBC14</b>, there has been accretion across the entire beach profile, with the exception of chainage 25m to 32m where there has been a low level of erosion (less than 0.2m). At the toe of the seawall, beach levels have increased 2.8m rebounding from the extremely low levels reported in the October 2019 survey. The previously exposed boulder patches have been buried. From chainage 32m the depth of cover increased to a maximum of 0.8m. Overall, the profile is at a medium level compared to the range recorded from previous surveys; with the toe of the beach from chainage 112m to 119m being the highest recorded level in this location. the toe of the seawall to chainage 13m the profile is the lowest recorded.</p>	

## 2.3 Goswick Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
10 <sup>th</sup> October 2019	<p><b>Beach Profiles:</b></p> <p>Goswick Sands are covered by six beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC16 and 1aBTBC19 were last surveyed during the partial measures spring survey, 2019. Profiles 1aBTBC15, 1aBTBC17 to 1aBTBC18, and 1aBTBC20 were last surveyed during the full measures autumn survey, 2018.</p> <p>The profiles along this frontage extend from <b>1aBTBC15</b> to <b>1aBTBC20</b> in a north to south direction. The seaward face of the dunes along the northern and central area of Goswick Sands (profiles 1aBTBC15 to 1aBTBC18) have advanced seaward by c.0.2m, with minor accretion to the top of the dunes. At profile 1aBTBC15, the toe of the dunes has prograded by approximately 2m.</p> <p>At profile <b>1aBTBC15</b>, On the upper beach at the toe of the dunes, there has been erosion of up to 0.5m, switching to a low level of accretion (up to 0.1m) from chainage 115m to 160m. Seawards of this point, across the mid and lower beach, until the end of the survey at chainage 315m between 0.2 and 0.7m of accretion has been experienced. Overall, the profile is generally at a high level compared to the range recorded from previous surveys, with the section from chainage 178m until 315m is the highest on record. Despite this, on the upper beach at the toe of the dune from 100m to 106m being the lowest recorded, meaning that the dune toe in 2019 lies at its most landward recorded position.</p> <p>At profile <b>1aBTBC16</b>, across the upper beach there has been erosion of 0.4m between chainage 50m and 125m, with material apparently moving seaward down the profile. Lower beach between chainage 110m and the end of the survey at chainage 190m is dominated by a lower beach berm which has shown little change in level when compared with the previous survey. Compared with the range recorded from previous surveys, the profile is at a medium to high level. The seaward facing dunes have shown no regression, and their toe remains notably high. The remainder of the profile is at a medium to high level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC17</b>, there has been little change across the dunes. The seaward face of the foredune remains stable and its toe remains high. Between the toe of the dune at chainage 245m until chainage 280m the profile has experienced a low level of erosion, of less than 0.2m. Seaward of this point accretion has dominated, varying between 0.1m and 1.7m in depth. At the most seaward extent</p>	<p>Beach level change has varied along the length of Goswick Sands since the last survey. Greater movement appears to have occurred in the north of the area. Erosion has tended to dominate the upper and middle beach although the magnitude of change has generally been small and within the bounds of previously recorded results. The lower beach has experienced variable change with accretion slightly more prevalent in the north. At the southern end of Goswick Sands, the beach has remained stable with no discernible change to the profile form or position. One notable exception is the formation of the barrier feature in the seaward end of profile 1aBTBC18.</p> <p><b>Longer term trends:</b> The majority of change is a continuation of seasonal behaviour. The notable barrier feature developed further seaward in profile 1aBTBC18 in autumn 2015 had not attained its current height since 2003. Subsequent surveys have shown a gradual reduction in the feature's height; however, the autumn 2019 survey shows the level has stabilised and in fact begun to rise again.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>of the profile a lower beach berm has formed between chainage 360m and the end of the survey at chainage 450m. The dunes remain at their most seaward position since records began. The upper and mid beach are at a medium level compared to the range recorded from previous surveys. The beach toe is at its highest level between chainage 390m and 450m.</p> <p>At profile <b>1aBTBC18</b>, there has been minor change (+/- 0.2m) the foredune, with some material lost from the dune crest having moved down the seaward face of the dune. Across the mid-beach between chainages 210m and 370m there has been a low level of erosion of up to 0.2m. The lower beach is dominated by two berms, both of which were present in the previous survey but have since moved seaward. The upper of the two berms, which lies between the chainages of 400m and 550m, has experienced accretion of up to 0.6m. The lower berm lies between chainage 650m and the end of the survey at chainage 740m. Overall, the seaward dune face remains at its most seaward position recorded, the upper and lower beach and barrier feature profile is at a low level compared to the range recorded from previous surveys. Whilst the profile in the area of the upper berm, between chainages 460m and 525m, is at its highest recorded level.</p> <p>At profile <b>1aBTBC19</b> there has been very little change across the full profile, limited to <math>\pm 0.1</math>m. Overall, the beach is at a medium level compared to the range recorded from previous surveys. Notably, the profile extends an additional 100m seawards when compared with the previous survey (Partial Measures Survey 2019), terminating at chainage 380m, although this remains some 600m short of the profile extent recorded as recently as April 2018.</p> <p>At <b>1aBTBC20</b>, the beach has generally remained stable since the last survey, with accretion / erosion of 0.1m or less. Overall, the beach is at a medium-high level across most of its length compared to the range recorded from previous surveys, particularly between chainages 400m and 420m and between chainages 440m and 460m where the beach has reached its highest recorded position.</p>	

## 2.4 Holy Island

Survey Date	Description of Changes Since Last Survey	Interpretation
3 <sup>rd</sup> September 2019	<p><b>Beach Profiles:</b></p> <p>Holy Island is covered by eight beach profile lines for the Full Measures surveys (Appendix A). Profiles 1aBTBC21 and 1aBTBC23 were last surveyed during the Partial Measures spring survey, 2019. Profiles 1aBTBC22, 1aBTBC24 to 1aBTBC28 were last surveyed during the Full Measures autumn survey, 2018.</p> <p><b>1aBTBC21 to 1aBTBC23</b> are located on the northwest side of the island, along The Snook. <b>1aBTBC24 to 1aBTBC28</b> are located on the south side of the island in the vicinity of the castle and priory. <b>1aBTBC27</b> extends out to and across the small island upon which the remains of a chapel stand.</p> <p>At all profiles on the north side of the island, the dunes have not changed in form or position since the last survey. At profile <b>1aBTBC21</b> there has been a small degree of erosion of around 0.1m over much of the mid beach, from chainage 80m to chainage 380m. Over much of this extent the profile is now at its lowest recorded level when compared with the range from previously recorded surveys. Across the beach at profile <b>1aBTBC22</b> has generally remained stable with some low levels of accretion (less than 0.2m) on the mid beach. The profile is at a medium to high level when compared with the range of previously recorded results.</p> <p>On the whole, the remainder of the beach levels have also remained largely the same since the last survey with only minor erosion / accretion in beach level observed (&lt;±0.1m). Overall, the profiles are at low-medium level compared to the range recorded from previous surveys.</p> <p>On the south of the island, profiles show very little change since the previous survey, with only minor erosion in beach level observed (&lt;0.1m). Overall, the profiles are at a medium-low level compared to the range recorded from previous surveys.</p>	<p>The dunes, sandy foreshore and sand flats around The Snook on Holy Island have remained stable in both form and position since the last survey.</p> <p>On the south side of the island, the backshore and beach have remained stable since the last survey.</p> <p><b>Longer term trends:</b> Generally, the trends observed in the present survey are a continuation of those observed in the past, with the dunes and beach retaining the same form and position. The exception to this is at profile 1aBTBC21, where the dune front and toe have advanced by c.20m through the accumulation of nearly 2m of sand since 2002, and 1aBTBC22 and 1aBTBC23, where the advance of the dune toe is similar but less pronounced.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>November 2018 - September 2019</b></p>	<p><b>Topographic Survey:</b></p> <p>Holy Island causeway and the adjacent sand flats are covered by an annual topographic survey, which commenced in October 2004. The purpose of this survey was to determine whether raising the level of the causeway had any adverse impacts on the adjacent sand flats.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2019) have been used to create a DGM (Appendix B – Map 2) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 6) produced from the last produced topographic survey (Full Measures, autumn 2018) and the present survey.</p> <p>The difference plot shows overall stability with pockets of elevation change in the order of +/-0.5m. There are more patches of minor accretion than erosion, and the main area of change is in the vicinity of the South Low channel.</p>	<p>The topographic survey shows that the causeway has remained stable since the last survey.</p>

## 2.6 Bamburgh

Survey Date	Description of Changes Since Last Survey	Interpretation
3 <sup>rd</sup> September 2019	<p><b>Beach Profiles:</b></p> <p>Bamburgh is covered by one beach profile line for the Full Measures survey (Appendix A). Profile 1aBTBC29 was last surveyed during the Full Measures autumn survey, 2018.</p> <p>Profile <b>1aBTBC29</b> is located approximately 750m south-east of the castle. There have been no changes to the dunes. There has been 0.6m of accretion at the toe of the dunes. The profile is dominated by two berms. The upper berm lies between chainages 425m and 460m whilst the lower berm lies between chainage 480m and 520m. The crest of each berm is approximately 0.3m above the level recorded in the previous survey. Between the berms and at the toe of the beach there has been erosion of up 0.4m. The dunes remain at a medium level, whilst the rest of the profile is at a low level compared to the range recorded from previous surveys. Sections of the profile between chainages; 420m to 430m, 460m to 485m and 525m and 585m are the lowest on record. Conversely the extreme toe of the profile, between chainage 595m and 650m is the highest recorded in this location.</p>	<p>The dunes at Bamburgh have remained stable, and the beach shows a lowering across the profile. It is worth noting that this pattern has occurred previously and recovered over the next few years.</p> <p><b>Longer term trends:</b> The 2019 profile shows that the seaward face of the dune is still near its most eroded position since 2004. The beach is at a low level compared to earlier surveys.</p>

## 2.7 Beadnell Village

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>16<sup>th</sup> October 2019</p>	<p><b>Beach Profiles:</b></p> <p>Beadnell Village is covered by two beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC31 was last surveyed during the Partial Measures spring survey, 2019. Profile 1aBTBC30 was last surveyed during the Full Measures autumn survey, 2018.</p> <p><b>1aBTBC30</b> is around 300m to the north of the village. There has been little change to the top of the dunes, and the seaward dune face has remained stable since the last survey. On the upper beach, at the toe of the dunes there has been up to 0.2m of erosion, with the material moving down the profile somewhat. From chainage 80m to chainage 160m, change has been limited to <math>\pm 0.1</math>m. Overall, the profile is at a low level compared to the range recorded from previous surveys, with the sections between chainages; 45m to 57m and 62m to 78m being the lowest on record.</p> <p><b>1aBTBC31</b> is in Nacker Hole and extends across the promenade and seawall. There has been no change from chainage 0m to chainage 15m. From chainage 15m to 20m there has been a small amount of erosion, limited to 0.2m. Seawards of this point up to chainage 30m there has been 0.3m of accretion. Over the remainder of the profile there has been very little change in beach levels, restricted to <math>\pm 0.1</math>m change. Overall, the profile is at a medium level compared to the range recorded from previous surveys.</p>	<p>The dunes and beach to the south of Beadnell Village have generally remained stable.</p> <p><b>Longer term trends:</b> The changes observed since the last survey are within the bounds of previous surveys albeit at relatively low levels.</p>

## 2.8 Beadnell Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
16 <sup>th</sup> September 2019	<p><b>Beach Profiles:</b></p> <p>Beadnell Bay is covered by nine beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC33 to 1aBTBC34, 1aBTBC37 and 1aADC01 to 1aDC02 were last surveyed during the Partial Measures spring survey, 2019. Profiles 1aBTBC32, 1aBTBC35 to 1aBTBC36 and 1aBTBC38 were last surveyed during the Full Measures autumn survey, 2018.</p> <p><b>1aBTBC32 to 1aBTBC34</b> are located at the northern end of Beadnell Bay, in Beadnell Harbour.</p> <p>At profile <b>1aBTBC32</b>, the dune ridge has eroded since the last survey by 0.1m. The raised feature at chainage 10 appears to be a boulder from the survey photos. The upper beach from chainage 10m to 20m has experienced no change. The remainder of the beach profile from chainage 20m to the end of the survey at chainage 135m has undergone erosion of up to 0.3m. Overall, the profile is at a medium level compared with the range recorded from previous surveys, except at the lower foreshore from chainage 110m seawards showing the lowest recorded levels from this point until the end of the survey at chainage 135m.</p> <p>At profile <b>1aBTBC33</b>, the back of the dunes has remained stable since the last survey. The survey report notes '<i>middle of dunes missing due to dense vegetation</i>', as it did in the previous surveys, so the profile for the dune face has not been analysed any further. On the upper beach, at the toe of the dunes at chainage 55m to chainage 85m there has been up to 0.4m of erosion. Some of this material seems to have been retained on the upper-mid beach between chainage 85m and 110m where there has been up to 0.3m of accretion. Seawards of this point, across the mid beach there has been further erosion of up to 0.4m between the chainages of 110m and 150m, diminishing to 0.1m of erosion by chainage 200m. The lower beach has experienced no significant change from chainage 200m to the end of the survey at chainage 240m. Overall, the profile is at a medium to low level compared with the range recorded from previous surveys. From chainages 65m to 80m where recorded levels are notably low. since records began in spring 2002.</p> <p>At profile <b>1aBTBC34</b>, the dune has undergone sections of erosion and accretion, notably at the dune crest and on seaward face where there has been up to 0.3m of accretion. Typically, change has been limited to <math>\pm 0.1</math>m and the dune face appears stable. The upper beach, between chainage 0m and</p>	<p>Along the length of Beadnell Bay, the dunes have remained stable. Beach levels generally remained stable throughout the bay with minor fluctuations indicating cross shore movement of sediment.</p> <p><b>Longer term trends:</b> Along the length of Beadnell Bay, the majority of the dune and beach form are similar to those observed in the past and the profile form and position is generally within the bounds of previous surveys. However, there are several sections along the north of the bay which exhibit their highest level recorded (1aBTBC32, 1aBTBC33, 1aBTBC34, 1aBTBC35 and 1aBTBC38) and lowest levels in the south of the bay (1aADC02).</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>chainage 40m, has seen accretion up to 0.2m, with the previously exposed boulder patches remaining covered. Between chainage 40m and 75m there has been no change outside the bounds of <math>\pm 0.1</math>m. There has been accretion of up to 0.2m on the mid-beach between chainage 75m and 110m, and on the lower beach from chainage 165m until the end of the survey at chainage 192m. The lower-mid beach experienced a small degree of erosion (less than 0.2m). Overall, the profile is at a medium-high level compared with the range recorded from previous surveys, with the section between -30m and -13m reaching their highest levels since records began in spring 2002. Furthermore, a short section of the upper beach between chainage 25m and 35m is also at its highest recorded level when compared with the range from previously recorded.</p> <p><b>1aBTBC35</b> to <b>1aBTBC38</b> are located between Burn Carrs and the outfall of Brunton Burn/Long Nanny. The dunes along this northern section of coast have remained stable since the last survey.</p> <p>At profile <b>1aBTBC35</b>, the dunes from chainage -13m to 5m have experienced little change. At the toe of the dunes, from chainage 5m to 65m there has been accretion up to 0.5m until chainage 70m. Across the mid-beach, from chainages 75m to 145m, there has been a low level of accretion of up to 0.2m. Seawards of this point, until the end of the survey at chainage 205m there has been erosion of a similar magnitude (up to 0.2m). Overall, the profile is at a medium-high level compared with the range recorded from previous surveys, with the length between chainages 5m and 55mm being the highest levels on record.</p> <p>At profile <b>1aBTBC36</b>, the dunes predominantly remain unchanged, however between chainage 8m and 12m there has been up to 0.2m of erosion. At the toe of the dunes, from chainages 35m up to chainage 220m, there has been very little change. Seawards of this point until the end of the survey at chainage 263m there has been erosion of up to 0.3m the toe of the beach. Overall, the profile is at a low level compared with the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC37</b>, the dunes have remained stable since the last survey. The beach has seen very little change limited to <math>\pm 0.2</math>m, Overall the profile is at a medium level compared with the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC38</b>, there has been accretion of up to 0.2m on the upper beach from chainage 15m to 40m, and up to 0.7m on the mid-beach from chainage 90m to 180m, causing the infilling of previously recorded depression. The lower beach has seen further accretion of up to 0.5m, although more typically 0.2m, between chainage 180m and 290m. At the toe of the beach, seaward of</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>chainage 290m until the end of the survey at chainage 324m, the upper and mid-beach are at a medium level compared with the range recorded from previous surveys, whereas the lower-mid and lower beach is at its highest recorded level between chainages 180m and 290m.</p> <p><b>1aADC01</b> and <b>1aADC02</b> are located south of the outfall of Brunton Burn/Long Nanny. The dunes have not changed form or position.</p> <p>At profile <b>1aADC01</b>, there has been little notable change, all recorded change from chainage 0m until chainage 270m was within the bounds of <math>\pm 0.2</math>m. On the lower face of the foredune between chainages 270m and 280m there has been some minor erosion of up to 0.2m, however the face of the dune remains stable. From chainage 280m to 310m there has been a band of accretion, up to 0.3m at the toe of the dunes. Between chainage 310m and 420m, the mid-beach has eroded by up to 0.9m, meaning a previously recorded mid-beach berm has been lost. The lower beach from chainage 430m to 500m has experienced up to 0.3m of accretion. The remainder of the profile, from chainage 520m until the end of the survey at chainage 540m has remained stable. When compared with the range of previously recorded results, the lower beach and toe are at a relatively high level compared with the range recorded from previous surveys with the section of profile between chainage 490m and 540m being the highest on record. Conversely the remainder of the beach profile is at a low level when compared with the range of previously recorded results, most notably between chainage 310m and 420m where the profile is at its lowest recorded level, save for a small length of approximately 5m seaward of chainage 370m. At profile <b>1aADC02</b>, there has been no notable change to the landward face or crest of the dune, however some erosion to the lower sections and toe of the seaward face has resulted in a steepening of the dune face at around chainage 45m. Across the remainder of the profile accretion has been the dominant process, with between 0.2m and 0.5m of additional material between chainage 70m and chainage 260m. The toe of the beach, from chainage 260m to the end of the survey at chainage 280m has seen an increase of less than 0.2m. Overall, the profile is at a medium to high level compared with the range recorded from previous surveys, despite the loss of material from the dune toe.</p>	

## 2.9 Embleton Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>18<sup>th</sup> October 2019</b></p>	<p><b>Beach Profiles:</b></p> <p>Embleton Bay is covered by two beach profile lines for the Full Measures survey (Appendix A). Profiles 1aADC03 and 1aADC04 were last surveyed during the Full Measures autumn survey, 2018.</p> <p><b>1aADC03</b> is located towards the north of the bay, north of Embleton Burn mouth. <b>1aADC04</b> is located towards the south of the bay.</p> <p>At profile <b>1aADC03</b>, the dunes have remained stable. There has been accretion at the toe of the dunes of up to 0.4m from chainage 70m to 86m. The upper and mid-beach have been dominated by erosion. Between chainage 90m and 130m erosion has been limited to less than 0.2m, whereas from chainage 130m to 200m up to 0.5m of erosion has occurred, leading to the loss of a substantial mid-beach berm. At the toe of the beach, seawards of chainage 200m until the end of the survey at chainage 247m. Overall, the profile is at a low level compared with the range recorded from previous surveys, with sections of the profile between chainages; 88m to 105m, 115m to 133m and 180m to 190m being the lowest recorded levels in these locations.</p> <p>At profile <b>1aADC04</b>, the dune face has remained stable up to chainage 145m. From this point, at the toe of the dune, up to chainage 170m, there has been up to 0.8m of accretion. Between chainage 170m and 200m there has been some erosion of up to 0.2m on the upper beach since the previous survey. On the mid-beach between chainage 200m and 240m there has been up to 0.3m of accretion. Between chainage 240m and 250m, in the location of a berm crest recorded in the previous survey, the profile remains at an unchanged level. Seawards of this point until the end of the survey at chainage 322m there has been up to 0.6m of accretion at the toe of the beach. Overall, the profile is at a medium-high level compared with the range recorded from previous surveys.</p>	<p>The dunes at Embleton Bay are generally stable, with small amount of erosion on the lower dune face.</p> <p>The beach levels have generally decreased slightly at profile 1aADC03, whereas further south, at profile 1aADC04 which shows accretion, possibly as a result of sediment being redistributed across the shoreline.</p> <p><b>Longer term trends:</b> The dunes have remained stable over the longer term and beach levels are within the range of those surveyed since 2002. The beach levels remain at medium-low level.</p>

## 2.10 Boulmer

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>30<sup>th</sup> October 2019</b></p>	<p><b>Beach Profiles:</b></p> <p>Boulmer is covered by two beach profile lines for the Full Measures survey (Appendix A). These were added to the programme in October 2007. Profiles 1aADC04A to 1aADC04B were last surveyed during the Partial Measures spring survey, 2019.</p> <p>At profile <b>1aADC04A</b>, erosion has dominated across the upper beach. Between the rock armour and chainage 15m and 25m erosion has been limited to less than 0.2m. From chainage 25m to 55m there has been further erosion of up to 0.4m. The rock platform remains exposed from chainage 51m and changes in level are most likely related to variations in survey points. The autumn 2019 survey continues seaward along the rock platform to chainage 116m. Overall the profile is at a low level on the upper beach and at a medium-low level on the middle beach compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC04B</b> there has been no change up to chainage 25m. Seawards of this point up to chainage 65m there has been up to 0.2m of accretion, which has caused a shallow depression to be infilled, meaning the profile has a shallower gradient across the upper beach. Seawards of chainage 70m, up to chainage 90m there has been 0.1m of erosion. The remainder of the profile, from chainage 75m to chainage 145m, is dominated by a rock platform which remains exposed following the autumn 2019 survey. Overall, the profile is at a medium level compared to the range recorded from previous surveys.</p>	<p>The changes to beach profile are minimal, predominantly showing erosion at profile <b>1aADC04A</b>. Profile <b>1aADC04B</b> has typically remained more stable with some accretion on the upper beach. Beach levels are generally at a medium to low level when compared to the range recorded from previous surveys.</p> <p><b>Longer term trends:</b> Beach elevations are generally medium in comparison to the long-term record of surveys.</p>

## 2.11 Alnmouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>30<sup>th</sup> October &amp; 31<sup>st</sup> October 2019</b></p>	<p><b>Beach Profiles:</b></p> <p>Alnmouth Bay is covered by ten beach profile lines for the Full Measures survey (Appendix A). Profiles 1aADC07 to 1aADC09 were last surveyed during the Partial Measures spring survey, 2019. Profiles 1aADC05, 1aADC06 and 1aADC10 to 1aADC14 were last surveyed during the Full Measures autumn survey, 2018.</p> <p><b>1aADC05</b> and <b>1aADC06</b> are located in the small pocket beach that is situated between the rock outcrops of Seaton Point and Marden Rocks.</p> <p>At profile <b>1aADC05</b>, the cliffs have remained stable since the last survey. Between the toe of the cliffs at chainage 20m and chainage 115m there has been up to 0.5m of accretion, which has returned the upper beach to a medium – high level compared with the record lows seen in the previous (autumn 2018) survey. Seaward of chainage 115m to 170m there has been up to 0.5m of erosion leading to the loss of a mid-beach berm. This material appears to have moved seawards down the profile evidenced by an accumulation of material between chainage 170m and 200m. At the toe of the beach, from chainage 200m to 260m there has been little change except for some minor erosion of up to 0.2m around chainage 250m. Overall the beach is at a medium to low level across the beach profile, reaching its lowest level recorded between chainages 125m to 150m and 205m to 260m.</p> <p>At profile <b>1aADC06</b> there has been erosion from the toe of the dune to chainage 30m of 0.4m. From chainage 30m to 90m there has been up to 0.5m of accretion, similar to the profile directly the north, this has led to the infilling of a shallow depression, meaning the levels have recovered from the extreme low levels recorded in the previous (autumn 2019) survey. Across the mid-beach between chainage 90m and 160m there has been erosion of up to 0.4m leading to the loss of a previously recorded berm. Seawards of this point until the end of the survey at chainage 250m there has been three small alternating bands of erosion and accretion, however the changes in this location have remained less than <math>\pm 0.2</math>m. The toe of the dunes is at its most landward position at chainage 18m. The upper beach is at a high level, particularly between chainages 38m to 67m which is the remainder of the beach is at a low level, notably between chainages 120m and 150m where it is at its lowest level compared to the range recorded from previous surveys.</p>	<p>To the north of Alnmouth Bay, the dune cliffs and beach levels have remained relatively stable with a limited amount of sediment redistributed across the beach. Two sections at profile 1aADC05 have reached their lowest level recorded, between chainages 125m-150m and 205-260m.</p> <p>At the centre of bay, north of the mouth of the River Aln Estuary, the dunes have remained stable since the last survey. Since the last survey, the beach has shown some mobility with the movement of the bar in the lower foreshore at 1aADC07. Beach levels between chainages 22m and 50m at profile 1aADC08 reached their lowest levels recorded.</p> <p>Immediately south of the mouth of the River Aln, there has predominantly been erosion across the beach profiles, particularly on the upper foreshore. Profile 1aADC13 between chainages 205m and 230m has reached its lowest recorded level. Conversely, the berm on the lower foreshore at profile 1aADC10 and 1aADC11 has again reached its highest level since records began.</p> <p>Varying levels of erosion across the beach profiles has resulted in a series of undulating profiles.</p> <p><b>Longer term trends:</b></p> <p>The cliffs in the far north of the bay have retreated slowly since 2002, by around 1m in total.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p><b>1aADC07</b>, <b>1aADC08</b> and <b>1aADC09</b> are located to the north of Alnmouth Bay between Marden Rocks and the mouth of the River Aln Estuary.</p> <p>At profile <b>1aADC07</b>, the dunes have remained stable since the last survey. The upper beach has increased in level by 0.m from the dunes to chainage 50m. The remainder of the profile is dominated by the movement of a substantial lower beach berm which was recorded between chainage 160m and 300m in the previous survey. This has moved landward and now resides between chainage 120m and 350m. This berm has not substantially changed shape, however there has been some noticeable steepening of its landward face. The seaward face of the berm remains shallower and a short platform between chainage 250m and 270m has been left by the retreating berm. There does not appear to have been a net loss or gain from this profile over the preceding 12 months. Overall the profile is at a; medium level at the toe of the dunes, a low level in the depression to the landward side of the berm, and a medium level on the lower beach. The mid-beach is dominated by the berm, which is at a high level, notably between chainage 140m and 210m where the profile is at its highest recorded level in this location.</p> <p>At profile <b>1aADC08</b>, the dunes have remained stable since the previous survey and there has been varying amounts of accretion and erosion across the profile. There has been erosion of 0.4m on the upper beach from the dunes to chainage 55m and on the mid-beach between chainage 120m and 235m. There is more accretion on the upper mid-beach of up to 0.3m between chainage 55m and 120m. Seawards of chainage 235m there has been accretion of up to 0.5m until the end of the survey at chainage 370m. Overall, the profile is at a low level at the toe of the dunes and a medium-high level across much of the remainder of the profile extent when compared to the range recorded from previous surveys. The profile is at its lowest recorded level between chainage 22m and 50m and its highest recorded level between chainage 235m and 370m.</p> <p>At profile <b>1aADC09</b>, the dunes have remained stable since the previous survey and the profile of the beach is dominated with up to 0.4m of accretion across its entire extent, from chainage 20m to around chainage 120m. At chainage 120m the profile drops off steeply to a similar level, albeit in a slightly more seaward position than the previous (spring 2019) survey. Overall, the profile is at a medium level across its full extent when compared to the range recorded from previous surveys. The Aln channel remains at a relatively landward position.</p>	<p>The dunes have generally demonstrated long-term stability.</p> <p>Changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys, with the majority of profiles being at a medium level, although several profiles exhibit sections of record highs (berm on lower foreshore in the north of the bay) and record lows (varying locations).</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p><b>1aADC10 to 1aADC14</b> are located between the south bank of the River Aln Estuary and the north breakwater of Warkworth Harbour at the mouth of the estuary of the River Coquet.</p> <p>At profile <b>1aADC10</b>, there has been 0.4m of accretion at the toe of the dunes. The upper beach profile has eroded between chainage 50m and 95m by up to 0.4m. From chainage 100m to 180m there has been accretion of up to 0.6m. Seawards of this point the profile in autumn 2019 has a series of three shallow berms each approximately 70m long and approximately 0.4m. The autumn 2019 profile extends some 160m further seawards than the previous survey. Overall the profile is at a medium-high level in its upper reaches, and low level in its lower reaches, when compared to the range recorded from previous surveys. Notably, the sections between chainages; 15m to 27m and 95m to 126m, are the highest on record. Conversely the sections between chainages 338m to 368m and 445m to 465m are the lowest on record.</p> <p>At profile <b>1aADC11</b>, there has been accretion at the toe of the dunes of up to 0.2m to chainage 65m. The dunes themselves have remained stable. The upper beach between chainage 65m and 125m is dominated by accretion of up to 0.5m. The mid-beach has generally experienced erosion of up to 0.5m between chainage 125m and chainage 220m. Seawards of this point until the end of the survey at chainage 270m there has been accretion of up to 0.3m. Between chainage 200m and the end of the survey there is a shallow berm feature which is likely to be previously recorded lower beach berm having moved seaward by approximately 20m. The overall effect of changes recorded over the preceding 12 months is that there has been a smoothing of the undulating profile which was recorded in September 2019. Overall the profile is at a high level compared to the range recorded from previous surveys with the sections between chainages; 42m to 48m, 70m to 110m and 225m to 260m being the highest levels on record.</p> <p>At profile <b>1aADC12</b>, the dune face has remained stable since the previous survey. There has been accretion at the toe of the dunes to chainage 45m of up to 0.6m. From this point until chainage 60m there has been a small amount of erosion (up to 0.2m) which has caused the profile on the upper beach to smooth somewhat, and the small platform feature recorded in the previous survey to be lost. Further accretion of up to 0.6m, across the upper-mid beach from chainage 60m to 110m has caused a previously recorded depression to be infilled Whilst a wide shallow berm on the lower-mid beach has experienced 0.2m of erosion between chainage 110m and 190m. From this point seawards, until the end of the survey at chainage 258m a low level of accretion has lifted the profile by approximately 0.2m. Overall, the beach profile is at a medium level compared to the range recorded from previous surveys,</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>however the toe of the profile is notably high. The profile has smoothed considerably since the previous survey and has a relatively consistent gradient across its full extent.</p> <p>At profile <b>1aADC13</b>, the dunes and dune face have remained stable since the last survey. At the dune toe there has been accretion of 1.8m. From the dune toe (147m) to chainage 205m there has been accretion of up to 0.6m. Seaward of chainage 205m a previously recorded berm has moved seawards by approximately 40m from chainage 205m to 280m it now lies between chainage 250m and the end of the survey at chainage 315m. There does not appear to have been a net loss of material along this profile. Overall the profile is at a medium-low level compared to the range recorded from previous surveys, particularly between chainages 205m and 230m which is at its lowest level recorded.</p> <p>At profile <b>1aADC14</b>, there has been a small amount of accretion (up to 0.2m) across the seaward face of the foredune. At the toe of the dune, from chainage 125m to 170m there has been up to 0.8m of accretion. The remainder of the profile is dominated by erosion. From chainage 170m to 220m erosion has been to 0.2m, whereas as seawards of this point until the end of the survey at chainage 270m this has diminished to less than 0.1m. The crest of the foredunes are at their highest recorded levels, and the seaward face of the foredune is in its most seaward position. However, between chainage 170m and 218m the beach profile is at its lowest level compared to the range recorded from previous surveys.</p>	
<p><b>March – August 2019</b></p>	<p><b>Topographic Survey:</b></p> <p>The northern part of Alnmouth Bay (to the north of the River Aln Estuary) is covered by a bi-annual topographic survey, which commenced in April 2005. Data from the most recent topographic survey (Full Measures, autumn 2019) have been used to create a DGM (Appendix B – Map 3) using GIS. A difference plot has also been produced using the DGM (Appendix B – Map 7) comparing the last produced topographic survey (Partial Measures, Spring 2019) with the present survey.</p> <p>The difference plot shows broadly show parallel bands of erosion and accretion in the centre and towards the north of the survey extent, becoming patchier towards the south and at the northern tip. The upper beach is dominated by a low level of accretion through the full survey extent. Similarly, on the mid-beach in the centre of the bay there has been further accretion. The northern edge of the Aln channel shows the greatest magnitude of change, with erosion being dominant.</p>	<p>The findings of the topographic survey show broadly parallel bands of erosion and accretion across the centre of the bay becoming patchier in the south and at the northern extremity of the survey extent.</p>

## 2.12 High Hauxley & Druridge Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>1<sup>st</sup> and 11<sup>th</sup> November 2019</b></p>	<p><b>Beach Profiles:</b></p> <p>High Hauxley to Druridge Bay is covered by nine beach profile lines for the Full Measures survey (Appendix A). Four of these (with 'A' or 'B' suffixes) were added to the programme in October 2007. All except 1aADC15 are resurveyed every 6-months.</p> <p>Profile <b>1aADC15</b> extends across the extensive dunes at Amble Links and foreshore. There has been some minor accretion and erosion across the dunes, within the range of <math>\pm 0.2\text{m}</math>. Generally, however the dunes have remained stable. The seaward face of the foredune has experienced no change up to chainage 108m. Seawards from this point until chainage 150m there has been erosion of up to 0.3m. Between chainage 150m and 170m there has been some minor accretion of up to 0.2m, the beach profile then continues at a consistent gradient until the end of the survey at chainage 215m. This has caused a lower beach berm present in the previous survey to be eroded. Overall, the profile is at a low to medium level on the upper and middle beach and at a low level on the lower beach compared to the range recorded from previous surveys. The toe of the beach is notably low, with the section between chainage 190m and 215m being the lowest on record.</p> <p><b>1aADC15A</b>, <b>1aADC16</b> and <b>1aADC16A</b> are located around Hauxley Haven. At all locations, the dunes have remained stable since the last survey (Partial Measures, Spring 2019).</p> <p>At profile <b>1aADC15A</b>, there has been 0.8m of erosion from the toe of the dune at chainage 20m. From chainage 20m to 40m the level of erosion has diminished to 0m. Over the entire mid-beach, from chainage 40m to 150m there has been a low level of accretion (up to 0.1m). Between chainage 150m and 180m the lower beach berm feature has experienced minor erosion of around 0.1m. Overall, the profile is at a low level compared to the range recorded from previous surveys, most notably at the toe of the dunes between chainages 18m and 40m where the profile is at its lowest recorded level. At profile <b>1aADC16</b>, the start of the survey is missing due to access restrictions. Erosion and accretion have occurred at the toe of the dune between chainages 65m and 85m, Seawards of this point, until chainage 140m there has been 0.2m of accretion. There appears to be no change between 140m and 160m, and only a slight erosion seaward of 160m which increases to a maximum of 0.4m at the toe of the beach. The upper beach is at a medium level compared to the</p>	<p>At High Hauxley (profile 1aADC15), the dunes have remained stable and there has been some accretion at the toe of the dunes, however the remainder of the profile has been dominated by a low level of erosion.</p> <p>At Hauxley Haven (profiles 1aADC15A to 1aADC16A), the dunes have remained stable since the last survey. Overall, beach levels generally show low levels of accretion across the mid-beach with some erosion at the toe of the beach. The magnitude of changes recorded is low.</p> <p>In Druridge Bay, changes in beach levels in the north were generally limited and are at a medium level compared to the range recorded from previous surveys, except for the lower beach at profile 1aADC17 between chainage 170m and 180m, which has the lowest recorded levels since surveys began. In the south of the bay, there has generally been accretion across the profiles, except at the toe of 1aCMBC01 which has experienced some minor erosion.</p> <p><b>Longer term trends:</b> At High Hauxley, Hauxley Haven and north and south Druridge Bay, the dunes have remained stable except for limited changes at the dune toe. The beach levels are mostly within the bounds of previous surveys.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>range recorded from previous surveys, whilst the profile from chainage 140m seawards is at a low level.</p> <p>At profile <b>1aADC16A</b>, the start of the survey is missing due to dense vegetation. There has been accretion at the toe of the rock revetment from chainage 80m to 145m of 0.5m. Over the remainder of the profile, seawards from chainage 145m till the end of the survey at chainage 200m there has been up to 0.2m of erosion. The profile is at a high level on the upper beach and low level on the lower beach when compared to the range recorded from previous surveys. Between chainage 80m and 120m the profile is at its highest level, whereas between chainage 145m to 200m the profile is at its lowest recorded level.</p> <p><b>1aADC16B</b>, <b>1aADC17</b> and <b>1aADC17A</b> are located to the north of Druridge Bay, between Bondi Carrs and Hadston Carrs and extend seawards from Togston Links. At all locations, the dunes have remained stable since the last survey (Partial Measures, spring 2019).</p> <p>At profile <b>1aADC16B</b>, there has been varying sections of minor erosion / accretion of up to 0.1m between some of the rock exposures. Overall, the profile is at a medium to low level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC17</b>, there has been little change across the dunes and across to chainage 38m. Seaward of chainage 38m, there has been 0.2m of accretion up to chainage 130m. However, from chainage 130m to 210m there has been a similar level of erosion. Between chainage 200m and 230m a shallow lower beach berm has formed. Overall, the profile is at a medium level compared to the range recorded from previous surveys, except for a short section on the lower beach between chainage 170m and 180m which has the lowest recorded levels.</p> <p>At profile <b>1aADC17A</b>, the upper beach has experienced accretion of up to 0.2m on the upper beach between chainage 30m and 80m. On the mid-beach between chainage 80m and 160m there has been 0.6m of accretion forming a mid-beach berm. Seawards of the this point, up to the end of the survey at chainage 220m there has been erosion of up to 0.4m, exposing the rocky foreshore from chainage 195m. Overall, the profile is at a high level on the upper beach, and medium – high level on the mid beach and low level on the lower beach, when compared to the range recorded from previous surveys.</p> <p><b>1aCMBC01</b> and <b>1aCMBC02</b> are located in the southern section of Druridge Bay.</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>At profile <b>1aCMBC01</b>, the dunes appear to have experienced minor erosion / accretion of 0.1m. At the toe of the dunes from chainage 185m to 220m there has been an accretion of up 0.2m. Seawards of this point the profile has smoothed significantly, caused by an accretion of 0.8m between chainage 220m and 285m. The lower beach has experienced some minor erosion between chainage 285m up to the end of the survey at chainage 310m although this is limited to less than 0.2m. The toe of the dunes is at a high level, whereas the remainder of the profile is at a medium level when compared to the range recorded from previous surveys.</p> <p>At profile <b>1aCMBC02</b>, the dune has remained stable since the previous survey. At the toe of the foredune there has been accretion of 0.6m from chainage 192m to 205m; whilst from chainage 205m to 220m there has been erosion of up to 0.3m, meaning that the upper beach profile has steepened somewhat since the previous survey. The remainder of the profile is dominated by two shallow berms. The upper berm is formed from up to 0.75m of accretion and lies between chainage 220m and 290m. The lower berm lies between 290m and the end of the survey at chainage 380m and is generally shallower at around 0.4m above the beach levels recorded in the previous (Spring 2019) survey. Overall, the profile is at a medium level compared to the range recorded from previous surveys and appears to have recovered from the drawdown experienced over the winter of 2019.</p>	

### 2.13 Lynemouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>3<sup>rd</sup> October &amp; 28<sup>th</sup> November 2019</b></p>	<p><b>Beach Profiles:</b></p> <p>Lynemouth Bay is covered by six beach profile lines for the Full Measures survey (Appendix A). Profiles CMBC03A and CMBC03B were added to the programme in October 2007.</p> <p>Profiles 1aCMBC03a to 1aWDC01 were last surveyed during the Partial Measures spring survey, 2019. Profiles 1aCMBC01 and 1aWDC02 to 1aWDC05 were last surveyed during the Full Measures autumn survey, 2018.</p>	<p>To the south of Snab Point, the shoreline has not changed in form or position since the last survey. Opposite Lynemouth, the slag bank has generally remained stable, with some erosion to its seaward face. Across the remainder of the profile erosion has been the dominant process and the beach is at its lowest recorded level over much of its extent.</p> <p>To the north of the power station, the slag bank has remained largely stable at the points of profile</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p><b>1aCMBC03</b> is located just to the south of Snab Point. The profile extends across the cliff and the rock platform below. The profile has not changed since the last survey indicating a stable cliff and rocky foreshore.</p> <p><b>1aCMBC03A</b> is located opposite Lynemouth and extends across the extensive slag banks before reaching the foreshore. Generally, the slag banks from chainage 0m have not experienced any change since the last survey (Partial Measures, spring 2019) however, the most seaward slag bank has an eroding face which has retreated by approximately 1m to chainage 86m. Across the remainder of the profile there has been a relatively consistent level of erosion between 0.2m and 0.6m. Overall, most of the profile is at a low level compared to the range recorded from previous surveys, between chainage 86m and the end of the survey at chainage 150m the profile is at its lowest recorded level when compared with the range from previous surveys.</p> <p><b>1aCMBC03B</b> is located to the north of Lynemouth Power Station and extends across the extensive slag banks before reaching the foreshore. The process of slag bank erosion has been progressively ongoing for some years. Since the last survey, the top of the slag bank has remained stable and not retreated, although it remains at its most landward position since records began. There has been accretion across the remainder of the profile from chainage -25m to 19m of up to 0.5m. Seawards of chainage 19m there has been no change. Overall, the profile is at a low level compared to the range recorded from previous surveys, although the retreat of the slag bank has been slowed somewhat.</p> <p>Profile <b>1aWDC01</b> extends from seaward of the rock revetment down to low water across the extensive slag banks. This profile is no longer measured.</p> <p><b>1aWDC02</b> is located to the south of the Power Station. The dunes up to chainage 110m remain largely unchanged. The crest of the upper beach face has advanced from chainage 122m to 135m. between chainage 140m and 185m there has been a consistent erosion of 0.7m. Seaward of this point until the end of the survey at chainage 205m the level of erosion has diminished. The profile of the beach crest is at a high level, being at its highest recorded level between chainage 115m and 135m. In contrast, much of the remainder of the beach profile is at a low level, most notably between chainage 140m and the end of the survey, where the profile is at its lowest recorded level when compared with the range from previous surveys.</p> <p><b>1aWDC03</b> is located to the south of the Power Station and to the north of Beacon Point. On the landward side of the berm, from chainage 36m to the berm crest at chainage 97m there has been a</p>	<p>measurement (being protected by the fronting spoil beach). At these locations, the beach has undergone accretion of up to 0.5m but remains at a relatively low level. The autumn 2019 survey did not extend to the lower beach berm.</p> <p>It has been observed that between profile 1aCMBC03A and the River Lyne, and also along the riverbanks around the mouth of the river, the slag bank has eroded, exposing a considerable quantity of waste material, including rubber tubing, plastics, construction waste and the like. This material has always been known to be present, but recently appears more exposed in the face of the slag banks at these locations.</p> <p>To the south of the power station, between Lyne Sands and Beacon Point, 1aWDC02 has generally eroded whilst 1aWDC03 has accreted slightly indicating a possible southwards movement of sediment.</p> <p>Between Beacon Point and Newbiggin Point there has generally been accretion across the profiles, with a reasonable length of profile 1aWDC04 reaching its highest level since records began.</p> <p><b>Longer term trends:</b></p> <p>To the south of Snab Point, the changes observed from the present beach profiles are within the bounds of previous surveys.</p> <p>Opposite Lynemouth, the slag bank has demonstrated a long-term trend of stability. The</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>consistent accretion of between 0.1m and 0.2m. The crest of the berm has moved landwards by approximately 10m since the previous survey, and now lies at its most landward position when compared with the range of previously recorded results. On the upper reaches of the seaward face the profile has experienced a low level of erosion, limited to less than 0.1m. From chainage 125m until the end of the survey there has been a low-level accretion of up to 0.2m. The landward crest of the berm is at the highest recorded level, whilst the upper seawards face is at its most landward position. Due to the low level of accumulation recorded over the summer of 2019 the lower reaches of the seawards face have advanced slightly when compared to the range recorded from previous surveys.</p> <p><b>1aWDC04</b> and <b>1aWDC05</b> are located between Beacon Point and Newbiggin Point.</p> <p>At profile <b>1aWDC04</b>, the dunes have remained generally stable, with small sections of minor erosion limited to less than 0.1m. The profile shows the dune face remains steep. There has been accretion at the toe of the dunes with the accumulation of up to 0.8m, to chainage 46m. Seawards of this point to chainage 65m erosion of up to 0.6m has led to a general smoothing of the profile. There has been negligible change between chainages 65m and 95m. However, from this point until chainage 138m a lower beach berm has formed, with up to 0.6m of accretion on the foreshore. The remainder of the profile up to chainage 195m is unchanged with the rocky foreshore exposed. Overall, the profile is at a medium-high level compared to the range recorded from previous surveys, with the sections of profile between chainages; 39m to 42m and 110 to 135m being the highest on record when compared with the range of previously recorded results.</p> <p>At <b>1aWDC05</b>, the cliffed section has remained stable. On the upper beach between chainage 10m and 45m there has been up to 0.6m of accretion. Seawards of this point the rock platform remains exposed and the profile is largely unchanged. Overall, the profile is at a medium level compared to the range recorded from previous surveys, with the upper beach having recovered from the low levels recorded in the 2018 survey.</p>	<p>changes in beach profile form and position observed since the last survey are at the lower end of the range recorded from previous surveys. Notably from chainage 86m until the end of the survey at chainage 150m where the profile is at its lowest recorded level.</p> <p>To the north of the power station, the slag bank and much of the profile has remained stable with little recorded change. Despite this, beach levels remain low.</p> <p>To the south of the power station, the prominent berm crest has maintained a similar height, but has migrated seaward by 11m, with beach levels dropping by up to 0.7m across the mid-beach.</p> <p>At the southern end of the bay, between Beacon Point and Newbiggin Point, the changes in beach profile form and position observed place the current beach levels at medium level relative to earlier surveys dating back to 2002.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>September - 2019</b></p>	<p><b>Cliff-top Survey:</b></p> <p>Cliff top survey data collected for baseline survey (autumn, 2008), the previous Partial Measures survey (spring 2019) and the present Full Measures survey (autumn, 2019) is presented in this report.</p> <p>The cliff top survey is carried out as a continuous cliff edge line survey at the Newbiggin Caravan Park at Newbiggin Point. The results from the cliff top monitoring are anticipated to have an accuracy of <math>\pm 0.2\text{m}</math> due to the technique used. Furthermore, problems in precisely locating the cliff top, due to vegetation growth or the indistinct form of the cliff top, have also affected the data quality.</p> <p>There has been very little change in the position of the cliff top since the previous survey in Spring 2019 and the present Full Measures survey in Autumn 2019. Up to 1.0m of retreat has been noted at the cliff edge directly above the northernmost tip of the concrete armour blocks, approximately 130m south east of the northern end of the survey extent.</p>	<p>Since the last survey there has been no significant movement recorded.</p> <p><b>Longer term trends:</b> Since surveys began in October 2008, cliff movement has been greatest in the north of the survey area with up to 2.7m of cliff top retreat, whilst the central and southern parts of the survey area have shown less movement with retreat of less than 1m.</p>

## 2.14 Newbiggin-by-the-Sea

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>3<sup>rd</sup> October 2019</p>	<p><b>Beach Profiles:</b></p> <p>Newbiggin-by-the-Sea is covered by four beach profile lines for the Full Measures survey (Appendix A). Two of these, profiles WDC05A and WDC06A, were added to the programme in October 2007 specifically to help assess the performance of the capital scheme involving beach replenishment and construction of an offshore breakwater. Profiles 1aWDC05A and 1aWDC06A were last surveyed during the Partial Measures spring survey, 2019. Profiles 1aWDC06 and 1aWDC07 were last surveyed during the Full Measures autumn survey, 2018.</p> <p>In addition, a further 26 profiles (1aNWB1 to 1aNWB26) have been surveyed since September 2010 as part of a topographic survey of Newbiggin Bay. These profiles are not individually described.</p> <p>Beach profiling works were completed here in September 2012. Four areas were re-profiled; 2 sections to the east of profile <b>1aWDC05A</b>, one section at <b>1aWDC06A</b> and a narrow section at the top of <b>1aWDC07</b>.</p> <p><b>1aWDC05A</b> is in the north of Newbiggin Bay. There has been erosion at the toe of the seawall (chainage 7m) to chainage 12m of 0.2m. Seaward of chainage 12m to chainage 37m there has been low levels of accretion and erosion limited to the range <math>\pm 0.1</math>m. Across the upper beach from chainage 37m to chainage 65m further accretion of up to 0.2m has raised the beach levels. However, from chainage 65m to 112m erosion, of up to 0.4m, has dominated the lower beach. There is limited change across the exposed rock from chainage 115m, with minor erosion / accretion of 0.1m. In a similar trend to 2018, the 2019 autumn survey extends a further 32m seawards when compared with the spring 2019 survey. The beach profile is at a high level across the upper beach and a medium level across the rest of the profile when compared to the range recorded from previous surveys.</p> <p><b>1aWDC06</b> is located in the centre of the northern part of Newbiggin Bay, between the two breakwaters. There has been no change outside the range <math>\pm 0.1</math>m from the toe of the seawall to chainage 26m. Seawards of chainage 26m, the mid-beach has eroded since the previous survey by up to 0.2m, resulting in a marginally steeper beach profile. On the lower beach, from chainage 55m to chainage 100m there is a more sustained band of erosion of up to 0.3m. At the toe of the beach, from chainage 100m to 125m a shallow berm has formed through accretion of up to 0.2m. Overall, the</p>	<p>Since the last survey, erosion has been the more dominant process on the beach at Newbiggin-by-the-Sea. The upper and mid-beach has tended to be more stable, whereas the lower beach has suffered more erosion. The exceptions to this being the toe of profile <b>1aWDC06</b> and <b>1aWDC06A</b> where a lower beach berm is at a notably high level. Profiles in the north of the bay have tended to be more stable than those in the south, however the changes have tended to be within the range of previously recorded results.</p> <p><b>Longer term trends:</b> Data since monitoring began in May 2002 reflects the change in beach width resulting from the beach nourishment scheme implemented at Newbiggin-by-the-Sea. This change is also reflected in the beach profile plot in Appendix A.</p> <p>The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys. Compared to the record of earlier surveys, the beaches are at medium/high levels, with the upper beach being particularly high, indicating that there is a net transfer of sediment towards the back of the beach.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>profile is at a medium level in its upper, mid and extreme lower reaches, and low level in its lower mid reaches. The lower beach is at its lowest level between chainage 60m and 88m, conversely the toe of the beach is at its highest level from chainage 106, to 125m, when compared to the range recorded from the previous surveys.</p> <p><b>1aWDC06A</b> is located in the centre of Newbiggin Bay, behind the offshore breakwater. There has been very little change from the seawall to the berm at chainage 55m. The crest of the berm (chainage 57m to 80m) has accreted by up to 0.3m. Seawards of this point, across the seaward face of the berm, from chainage 80m to 140m has eroded by up to 0.8m, which has caused a retreat of up to 0.6m. Changes between chainage 140m and 220m are limited to less than <math>\pm 0.2</math>m. Seawards of chainage 220m there has been accretion of up to 0.2m, forming a shallow lower beach berm at chainage 245m. Overall the profile is generally at a medium-low level, with the exception of the lower beach berm which is at a high level, when compared to the range recorded from previous surveys. <b>1aWDC07</b> is located towards the south of Newbiggin Bay. There are four alternating bands of erosion and accretion across the beach profile from chainage 7m to 70m. Each band is approximately 25-30m in length and the magnitude of change is less than <math>\pm 0.2</math>m. Between chainage 70m and 80m there has been accretion of up to 0.4m, which has partially infilled a wide shallow channel present in this location in the previous survey. The lower beach berm appears to have migrated landwards by approximately 25m, and now lies between chainages 80m and the end of the survey at chainage 114m. Overall, the profile is at a low level across much of its extent, with the exception of the toe of the beach which is at a medium-high level, despite being in a relatively landward position.</p>	
<p><b>April - August 2019</b></p>	<p><b>Topographic Survey:</b></p> <p>Newbiggin-by-the-Sea is covered by bi-annual topographic survey, which commenced in September 2010. The surveys are planned to help assess the performance of a capital scheme constructed in 2007, which involved beach replenishment and construction of an offshore breakwater. Prior to incorporation in the programme, these surveys were undertaken on occasions between 2007 and 2010 as part of the scheme development.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2019) have been used to create a DGM (Appendix B – Map 4) using a GIS. A difference plot has also been produced using the</p>	<p>The topographic survey shows areas of both gain and loss across the beach of generally low magnitude. Overall there are more areas of accretion than erosion.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>DGM (Appendix B – Map 8) produced from the last produced topographic survey (Partial Measures, spring 2019) and the present survey.</p> <p>The topographic survey shows patchy areas of both erosion and accretion across the beach; however, the magnitude of the changes is generally low. Overall accretion is more dominant than erosion. The largest area of accretion is in the lee, and perpendicular to the central breakwater. The largest area of erosion also occurs in the lee of the breakwater; however, it is located in a more landward position and forms a short shore-parallel band. Changes at Spital Carrs in the south is patchy, with no discernible pattern.</p>	
<p><b>29<sup>th</sup> August 2019</b></p>	<p><b>Sand Extent Survey:</b></p> <p>Spital Carrs is located to the south of Newbiggin Bay and is covered by a bi-annual sand extent survey, which commenced in 2012. The survey was designed to address concerns that the beach recharge scheme undertaken in the Newbiggin Bay may have impacts on the Spital Carrs SSSI and SPA if sand from the recharge scheme moves to the south. The sand extent survey therefore identifies the boundary of the sand beach on the rock platform.</p> <p>Data from the most recent sand extent survey (Full Measures, autumn 2019) has been plotted onto aerial imagery (refer to Appendix C – Map 1). The plot shows that there is variable advance and retreat of the limit of sand cover between the spring 2019 and the autumn 2019 survey. There has been some advance in the north and centre, with some retreat in the south relative to the spring 2019 survey. Changes are limited to <math>\pm 10.0\text{m}</math>.</p>	<p>Since the last survey, there has been some movement of the sand extent across the survey extent, although the magnitude of changes has generally been low. Since 2014, there has been a general trend in the south of the survey area for advance in the summer and retreat in the winter. The autumn 2019 survey does not fit this general trend in the south, however elsewhere the surveyed extent has advanced.</p> <p><b>Longer term trends:</b> Review of the sand extent surveys shows the sand front has oscillated by a small amount with no net trend.</p>

## 2.15 Cambois Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
2 <sup>nd</sup> October 2019	<p><b>Beach Profiles:</b></p> <p>Cambois Bay is covered by seven beach profile lines for the Full Measures survey (Appendix A). Profiles. All profiles are resurveyed every 12-months.</p> <p><b>1aWDC08</b> and <b>1aWDC09</b> are located to the north of the River Wansbeck estuary in front of Sandy Bay Caravan Park.</p> <p><b>1aWDC08</b> extends from the cliff across the rock revetment onto the foreshore. There has been accretion of up to 1.0m at the toe of the revetment from chainage 43m. The depression which previously ran between the revetment and the crest of the berm has now been fully infilled. The beach profile has a consistent gradient across its full extent. At the toe of the berm, from chainage 125m there has been erosion of up to 0.5m This has caused the seaward toe of the beach to retreat by approximately 10m. Overall, the profile is at a low level on the upper beach compared to the previous surveys, with the middle and lower foreshore at a medium – high level compared to the range recorded from previous surveys. The exception being that from chainage 135m to 148m the profile is at its lowest recorded level.</p> <p><b>1aWDC09</b> extends from the cliffs at the very southern end of the Caravan Park. The cliff top has remained stable; however, the lower face of the cliff has retreated by up to 1.7m since the previous survey, causing a general steepening of the cliff face. There has been erosion at the toe of the boulders by up to 0.5m. The mid beach berm appears to have retreated, with an associated steepening of its rear face. The berm retreat has caused an increase in levels on the mid-beach, between chainage 85m and 180m. Seawards of this point there have been varying levels of erosion between 0.1 and 0.4m from chainage 180m to 290m. The toe of the beach is dominated by a lower beach berm formed through accumulation of 1m of material, between chainage 290m and 425m. Overall, the cliff top has reached its most landward position and the cliff toe is at its lowest recorded level since surveys began in spring 2002. The upper beach profile is at a low level; however, the retreating berm has lifted the beach level to its highest recorded level between chainage 110m and 140m. Similarly, the lower beach berm between chainage 290m and the end of the survey at</p>	<p>To the north of the River Wansbeck, the cliff top has remained stable, however the lower cliff face has receded by 1.7m and reached its most landward position at profile 1aWDC09. Overall, beach levels have lowered since the previous survey, reaching low levels on the upper beach and medium levels on the middle and lower foreshore compared to earlier surveys.</p> <p>To the south of the Wansbeck Estuary, there has been some minor movements on the face of the dune cliffs. Beach levels have shown a mixture of erosion and accretion, attributed to movement of beach berms from the previous survey. Beach levels remain at a medium-high level compared to earlier surveys.</p> <p>At the centre of Cambois Bay, the cliff top has remained stable and beach levels have generally shown little change or accretion on the upper reaches with some erosion experienced on the lower beach. The profiles are at a medium-high level compared to the range recorded from previous surveys.</p> <p>At the southern extent of Cambois Bay, beach levels have generally dropped on the upper beach but remained stable elsewhere, with some accretion experienced between rocks and boulders. The cliff</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>chainage 425m is at its highest recorded level, compared to the range recorded from previous surveys.</p> <p>Profiles <b>1aWDC10</b> to <b>1aWDC14</b> are all located along Cambois Bay, between the River Wansbeck and River Blyth estuaries.</p> <p><b>1aWDC10</b> is located on the southern side of the Wansbeck Estuary, just to the south of Cambois House. There appears to have been some minor movement on the cliff face, though it has not affected the position of the cliff edge. At the toe of the cliff to chainage 22m there has been up to 0.3m of accretion. The majority of the mid-beach profile has eroded by up to 0.2m., However on the lower beach, the profile has flattened somewhat leading to a slight increase of up to 0.2m between chainage 145m and 183m. At the toe of the beach seawards of chainage 183m the profile has experienced 0.5m of erosion. Overall, the profile is at a medium level compared to the range recorded from previous surveys.</p> <p><b>1aWDC11</b> extends across the rock revetment fronting the now disused foundry. There has been erosion across the upper beach profile, between chainage 44m to 95m, of up to 0.4m. From this point, across the mid-beach there has been up to 0.4m of accretion. Seawards of this point until the end of the survey at chainage 200m there has been no change to the beach levels. The profile is at a medium to high level over the compared to the range recorded from previous surveys.</p> <p><b>1aWDC12</b> is situated approximately mid-way along Cambois Bay. Since the last survey (Full Measures, autumn 2018), the crest of the cliff has increased by 0.1m. The cliff edge position has remained unchanged. However, from the toe of the cliff at chainage 25m up to chainage 105m there has been a general increase in levels of between 0.4m and 0.6m. Around chainage 105m there is a narrow area where the level remains unchanged. Seawards of this point, from chainage 110m, there is a substantial accretion, of up to 1.2m which has advanced the toe of the beach by 30m. Overall, the profile is at a medium-high level compared to the range recorded from previous surveys. Notably, between chainage 66m and 77m the beach is at its highest recorded level.</p> <p>At <b>1aWDC13</b> is located to the centre-south of Cambois Bay. There has been no change to the dune cliff face. Between the toe of the dunes and chainage 35m there has been erosion of 1.5m, reaching its lowest level recorded since spring 2002 between these chainages. Seawards of this point, across the mid-beach to chainage 107m there has been up to 0.6m of accretion. The lower beach is dominated by erosion of up to 1.0m from 107m until the end of the survey at chainage 138m. The</p>	<p>toe at profiles 1aWDC13 and 1aWDC14 are at their lowest levels recorded.</p> <p><b>Longer term trends:</b> Beach profiles in the north of the survey area are at higher levels compared to those in the south, suggesting a north-south movement of sediment or a greater input of sediment (possibly from the River Wansbeck) in the north of the survey area. The till and dune cliffs show progressive erosion.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>upper and lower beach is at a low level, whilst the mid-beach is at a medium level when compared with the range of previously recorded results. The sections of profile from chainages 20m to 35m and 107m to 138m are the lowest on record.</p> <p><b>1aWDC14</b> is located to the south of Cambois Bay, at North Blyth. There has been a low level of erosion (less than 0.2m) across the cliff face to chainage 10m. Across the remainder of the profile there has generally been negligible change, with erosion to 0.1m, and some areas of accretion of up to 0.3m between rocks / boulders. Most notably between chainage 25m and 33m and 85m and 115m. Overall, the profile is at a low level compared to the range recorded from previous surveys, particularly at the toe of the cliff which is at its lowest level recorded since surveys began in spring 2002.</p>	
<p><b>October 2019</b></p>	<p><b>Cliff-top Survey:</b> Cliff top survey data collected for baseline survey (spring, 2009), the previous Partial Measures survey (Spring 2019) and the present Full Measures survey (autumn, 2019) is presented in this report.</p> <p>The cliff top survey is carried out as a continuous cliff edge line survey in two locations within Cambois Bay; at Sandy Bay Caravan Park to the north of the River Wansbeck estuary, and Cambois Bay from south of the River Wansbeck to the breakwater at the southern end of the bay. The results from the cliff top monitoring are anticipated to have an accuracy of <math>\pm 0.2\text{m}</math> due to the technique used. Furthermore, problems in precisely locating the cliff top, due to vegetation growth or the indistinct form of the cliff top, have also affected the data quality.</p> <p>There has been very little change in the position of the cliff top at Sandy Bay Caravan Park since the previous survey in Spring 2019 along the majority of the survey length. There appears to have been a low level of erosion of less than 1.0m in the northern half of the survey extent, north of the slipway. The remainder of the northern length (north of the Wansbeck) has remained unchanged, with changes with the bounds of <math>\pm 0.2\text{m}</math>. , During December 2019 it was noted that a slip in the cliff top had occurred to the north of the survey area at Sandy Bay Caravan Park. The location of the slip is thought to be approximately 100m north of the northernmost corner of the caravan park. The slippage has encroached onto the public footpath in this area. It was noted that the slippage had already been taped off in December 2019, with signs placed by Northumberland County Council</p>	<p>Since the last survey in spring 2019, there has been very little change in cliff top position recorded for Sandy Bay Caravan Park. Cambois Bay appears to have been relatively stable along its full frontage with only one area of retreat of up to 5m.</p> <p><b>Longer term trends:</b> At Sandy Bay Caravan Park the cliff top retreat has been more significant in the southern part of the survey area with up to 10m of erosion since 2007, whilst the northern part has eroded by c.1-3m.</p> <p>During December 2019 it was noted that a slippage to the north of the survey area had occurred. The slippage has encroached onto the footpath. This area should be monitored to ensure the safety of footpath users.</p> <p>In Cambois Bay, the area of greatest cliff top retreat since the surveys began in 2009 is the centre of the bay opposite Ridley Terrace, Cambois, where up to</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>alerting footpath users to the unstable cliff edge. It is recommended that this slip and the wider area is monitored to ensure public safety along this popular coastal footpath.</p> <p>Along the Cambois Bay frontage the cliff tops have remained relatively stable along much of the northern half of this section. There are some areas of apparent erosion recorded directly fronting the car park at Debdon House, however it appears these may be attributed to survey error, as the magnitude of change is small. The only notable area of erosion lies to the west of the rock armour, on the section of cliff fronting West Bridge Street. Between 2.0m and 5.0m of erosion has been experienced over an approximately 120m long stretch of undefended cliff line.</p>	<p>17m of erosion has occurred. The north and south of the bay have retreat more typically c.1-5m.</p>

## 2.16 Blyth South Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
1 <sup>st</sup> October 2019	<p><b>Beach Profiles:</b></p> <p>Blyth South Beach is covered by six beach profile lines for the Full Measures survey (Appendix A). All profiles are resurveyed every 6-months.</p> <p><b>1aBVBC01</b> is located towards the north of South Beach, in front of the area of land owned by Port of Blyth. There have been some minor changes to the form of the dunes, limited to <math>\pm 0.2\text{m}</math>, but their position remains unchanged since the last survey (Partial Measures, spring 2019). The seawards face of the foredune from chainage 30m to 32m has experienced some minor erosion of up to 0.2m. This material appears to have moved down the face as accretion, of up to 0.32, has been experienced on the on the lower face and at the toe of the dune between chainages 32m and 43m. Between chainage 43m and 47m the lip of a small lower beach berm has eroded by 0.1m. Seawards of this point until chainage 63m there has been up to 0.4m of accretion. To toe of the beach from chainage 63m until the end of the survey at chainage 66m has experienced up to 0.2m of erosion. The result of these changes is the smoothing of the profile from the crest of the foredune to the toe of the beach. Overall, the profile is at a medium-high level compared to the range recorded from previous surveys, with the section between 35m and 37m being the highest level on record.</p> <p>There has been varying amounts of erosion and accretion across the profile at <b>1aBVBC02</b>. The upper beach has accreted by up to 0.2m from the seawall to chainage 40m. There has been erosion of up to 0.3m between chainage 40m and 55m. Between chainages 60m and 165m there has been accretion of up to 0.6m. Seaward of chainage 165m until the end of the survey at chainage 200m a shallow berm has formed through accretion up to 0.2m. Overall, the profile is generally at a medium level across its full extent with the exception of the section between chainages 41m and 50m where it is at its lowest level recorded.</p> <p>At <b>1aBVBC03</b> there have been no significant changes to the position and form of the dunes since the last survey (Partial Measures, spring 2019), which remain at their most landward extent since 2002. There has been erosion of 1.0m at the toe of the dune complex and across the upper beach between chainage 80m and 120m. Seawards of chainage 120m, to 260m, there has been accretion of between 0.2m and 0.5m. A previously recorded berm has been partially buried, albeit by a only a thin veneer of</p>	<p>Since the last survey, the dunes and dune face at Blyth South Beach have remained largely stable, retaining the same form and position.</p> <p>Beach profiles have changed somewhat, there has been variable accretion and erosion, with a general trend for accretion on the upper and lower beach, with erosion across the middle beach. The profiles are all generally at a relatively medium level, however some sections do reach their lowest levels since records began in the autumn 2019 survey.</p> <p><b>Longer term trends:</b> At Blyth South Beach, the dunes have generally demonstrated a long-term trend of stability.</p> <p>The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys, however the upper beach at profile 1aBVBC02 is at its lowest recorded level. Conversely the upper beach at profile 1aBVBC01 and the lower beach at profile 1aBVBC03 are at their highest level since records began.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>up to 0.2m which has accreted on the lower beach, between chainage 260m and the end of the survey at chainage 337m. Overall, the upper beach is at a medium level compared to the range recorded from previous surveys. The mid and lower beach is high, reaching its highest recorded level between chainage 210m and 270m.</p> <p>At <b>1aBVBC04</b>, there have been no significant changes to the position and form of the dunes since the last survey (Partial Measures, spring 2019). Between chainage 38m and 60m there has been up to 0.6m of accretion, causing a smoothing of the profile across the upper beach. From chainage 60m to 70m the narrow crest of a previously recorded berm has been eroded by 0.1m. Seawards of this point up to chainage 120m there has been up to 0.4m of accretion causing a further smoothing of the profile in this area. This lower beach is dominated by the landward movement of a berm, additionally there has been a general accretion of up to 0.5m between chainage 120m and 220m which has compounded the effect of the berm progression. At the toe of the beach there is some minor erosion of up to 0.1m, caused by the retreat of the berm face. Overall, upper beach profile is at medium level compared to the range recorded from previous surveys.</p> <p>At <b>1aBVBC05</b>, there has been little change at the toe of the dunes since the last survey (Partial Measures, spring 2019) However the upper beach berm has moved landward by around 20m and now lies between chainage 62m and 120m. The crest level of the dune has increased by 1.0m. Seawards of 120m there has been up to 1.0m of erosion, which has caused a hollowing of the lower beach up to chainage 180m. From this point until the end of the survey there has been up to 0.5m of accretion which has seen the toe of the beach move seawards by 22m. The upper beach is at a medium level whilst the mid and lower beach is at a low level, when compared to the range recorded from previous surveys. At profile <b>1aBVBC06</b>, there has been no significant change to the position or form of the dunes since the last survey (Partial Measures, Spring 2019). There has been accretion of up to 1.2m at the toe of the dunes, forming an upper beach platform from chainage 100m to 110m. From chainage 110m to 122m the level of accretion has diminished, such that from chainage 122m to 140m there is no change on the spring 2019 levels. Seawards of this point, until the end of the survey at chainage 285m there has been a varying level of accretion between 0.2m and 0.5m. The upper beach is at a relatively high level, whilst the lower beach is at a relatively low level when compared to the range recorded from previous surveys. The autumn 2019 survey extends seawards over the rocks from chainage 170m however a shallow veneer of up to 0.5m is present in the autumn 2019 survey meaning they are no longer fully exposed.</p>	

## **4. Problems Encountered and Uncertainty in Analysis**

### **Individual Profiles**

- At profiles BTBC19 and BTBC20, the survey report states that the offshore extent of the survey is limited by a drain. This drain is likely a runnel which separates the barrier feature in the lower foreshore from the rest of the beach.
- At profile BTBC33, there are gaps in the section (at the location of the middle of dunes) due to dense vegetation. This needs to be taken into account when assessing the profile data as the levels in these measurement gaps will not be reliable.
- At profile ADC05 and ADC06 there was unsafe loose material which prevented the survey of the cliff face.
- At profile ADC09, the profile ends at the river.
- At profile ADC16B, the section starts at new fence.
- Profile WDC01 is no longer measured.
- At profile WDC09, there was unsafe loose material which prevented the survey of the cliff face.
- Profiles WDC09 and WDC10 terminate at a river.
- At profile CMBC02 the surveyors were unable to measure an area at the start of the section due to thick mud / water.

### **Topographic Survey**

The surveyors report notes that the concrete steps of the seawall toe were exposed in a couple of places to the rear of the beach at Newbiggin-by-the-Sea.

### **Cliff Top Surveys**

Cambois, Newbiggin, and Sandy Bay cliff tops have now been combined into one survey area.

North of Sandy Bay Caravan Park in December 2019 a slippage was recorded along the cliff top. The slip has encroached upon the coastal footpath. It is recommended that this slip and the wider area is monitored to ensure public safety along this popular footpath.

At Cambois Bay, the surveyors noted that very thick dense vegetation at north end of the cliffs hindered surveying. This was also noted in all previous reports.

## **5. Recommendations for 'Fine-tuning' the Monitoring Programme**

No changes are recommended at the present time.

## 6. Conclusions and Areas of Concern

- At Sandstell Point (Spittal A), the recorded profiles and topographic survey present no causes for concern.
- At Spittal (Spittal B), the recorded profiles present no causes for concern.
- At Goswick Sands, the recorded profiles present no causes for concern. The barrier feature in the seaward end of profile 1aBTBC18 shows movement and is likely to be a cyclical feature.
- At Holy Island, the recorded profiles and topographic survey present no causes for concern.
- At Bamburgh, the recorded profiles present no causes for concern.
- At Beadnell Village, the recorded profiles present no causes for concern.
- At Beadnell Bay, the recorded profiles present no causes for concern.
- At Embleton Bay, the recorded profiles present no cause for concern
- At Boulmer, the recorded profiles present no cause for concern.
- At Alnmouth Bay, the northern profiles have remained stable, with some low levels on the mid and lower reaches of these profiles. Towards the centre of the bay profiles generally exhibit lower levels on the upper beach. Similarly, in the south, profiles are at a low level on the upper and mid beach, with higher levels on the lower beach. The recorded profiles present no cause for concern.
- At High Hauxley & Druridge Bay, the Hauxley Haven profiles have shown a mixture of erosion and accretion since the previous survey and remain at medium to low levels. The recorded profiles present no cause for concern. The profiles in Druridge Bay present no cause for concern.
- At Lynemouth Bay, the recorded profiles and cliff top survey present no causes for concern. However, site observations show that between profile 1aCMBC03A and the River Lyne, and along the riverbanks around the mouth of the river, the face of the slag bank has eroded, exposing a considerable quantity of waste material, including rubber tubing, plastics, construction waste and the like. This material has always been known to be present (and visible), but recently appears more exposed in the face of the slag banks at these locations
- At Newbiggin-by-the-Sea, profile remain at medium-high levels and there have been no adverse impacts on the SSSI at Spital Carrs.
- During December 2019 it was noted that a slip in the cliff top had occurred to the north of the survey area at Sandy Bay Caravan Park. It was noted that the slippage had already been taped off in December 2019, with signs placed by Northumberland County Council alerting footpath users to the unstable cliff edge. It is recommended that this slip and the wider area is monitored to ensure public safety along this popular coastal footpath.
- At Cambois Bay, the beach and cliffs have remained stable and there are no causes for concern.
- At Blyth South Beach, the profiles are generally at a medium-low level. The dune toe at profile 1aBVBC05 has remained stable and has not continued to migrate landward. The remaining recorded profiles present no causes for concern.

## **Appendices**

**Appendix A**  
**Beach Profiles**

The following sediment feature codes are used on some profile plots:

<b>Code</b>	<b>Description</b>
S	Sand
M	Mud
G	Gravel
GS	Gravel & Sand
MS	Mud & Sand
B	Boulders
R	Rock
SD	Sea Defence
SM	Saltmarsh
W	Water Body
GM	Gravel & Mud
GR	Grass
D	Dune (non-vegetated)
DV	Dune (vegetated)
F	Forested
X	Mixture
FB	Obstruction
CT	Cliff Top
CE	Cliff Edge
CF	Cliff Face
SH	Shell
ZZ	Unknown

# Beach Profile

Location: 1aBTBC01

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

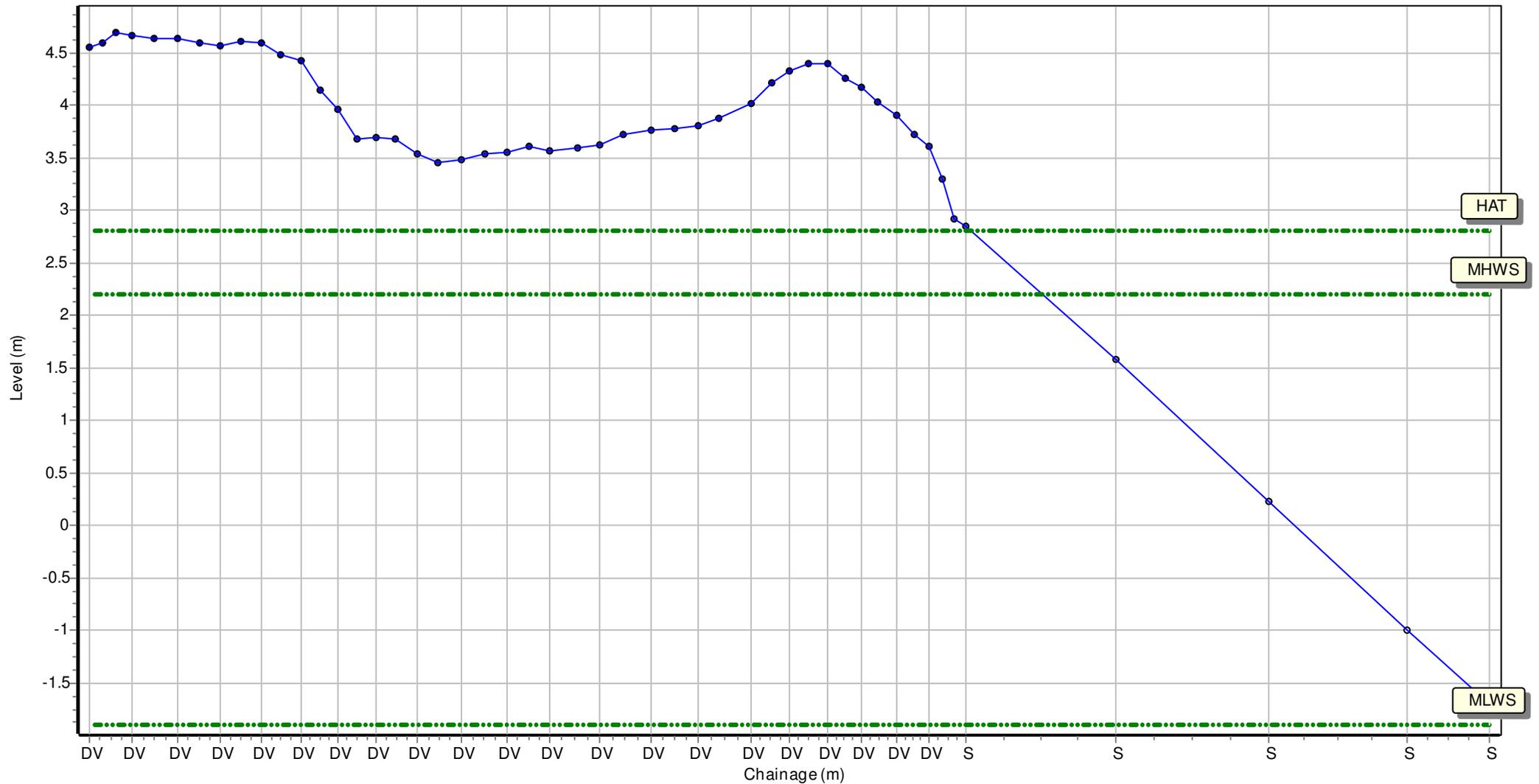
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400275.192 Northing: 651875.262 Profile Bearing: 347 ° from North



# Beach Profile

Location: 1aBTBC02

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

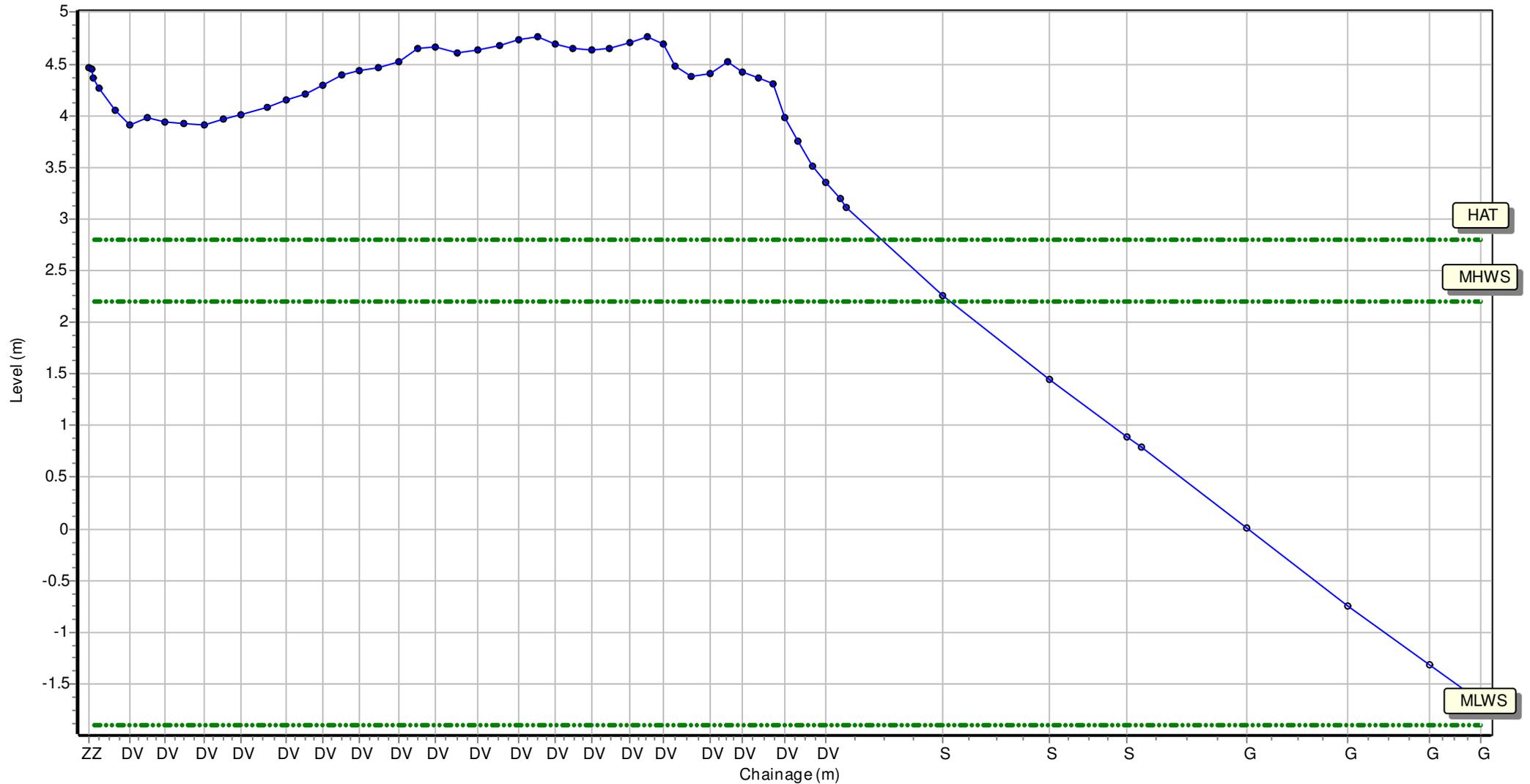
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400388.132 Northing: 651916.302 Profile Bearing: 334 ° from North



# Beach Profile

Location: 1aBTBC03

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

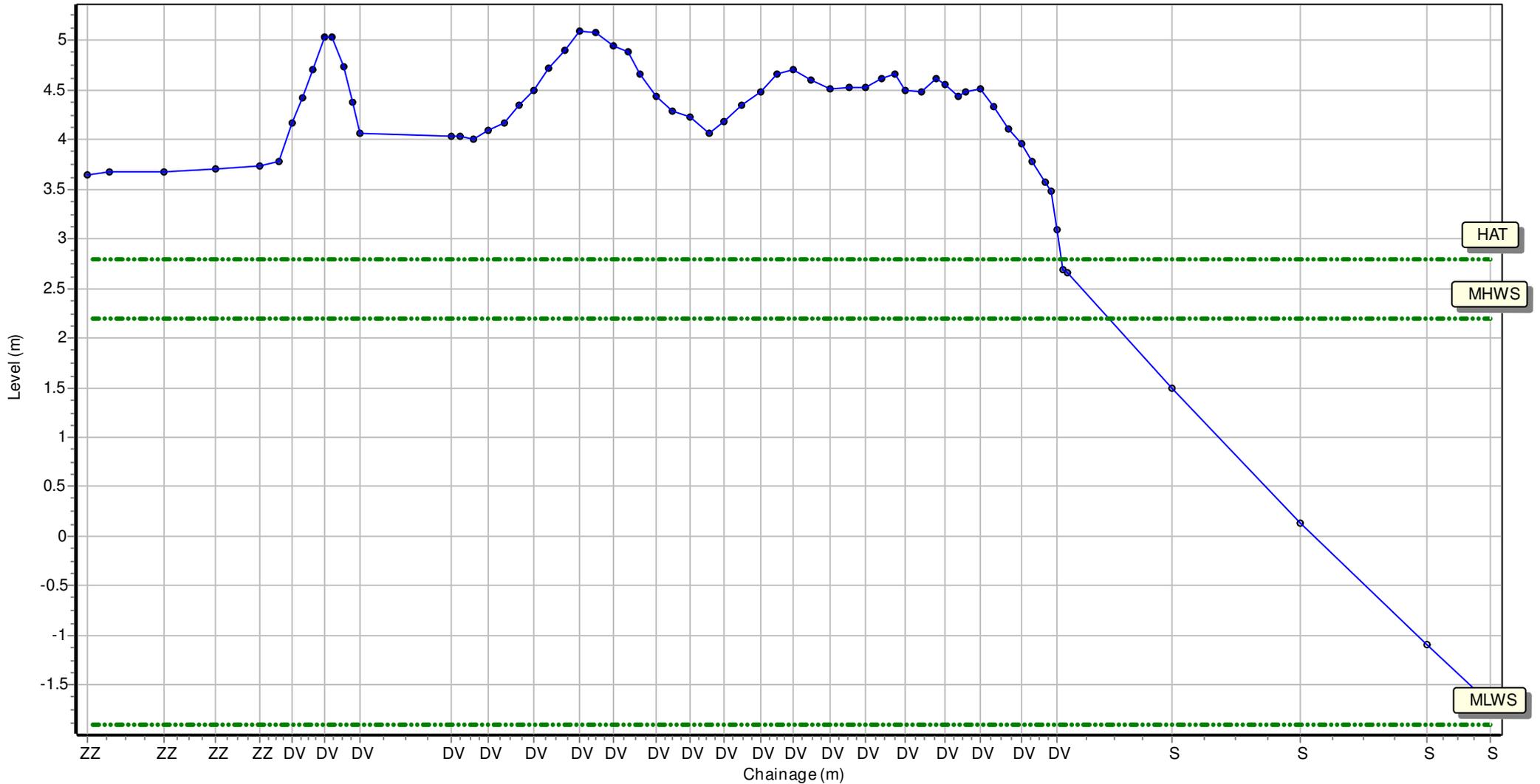
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400455.187 Northing: 651937.742 Profile Bearing: 330 ° from North



# Beach Profile

Location: 1aBTBC04

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

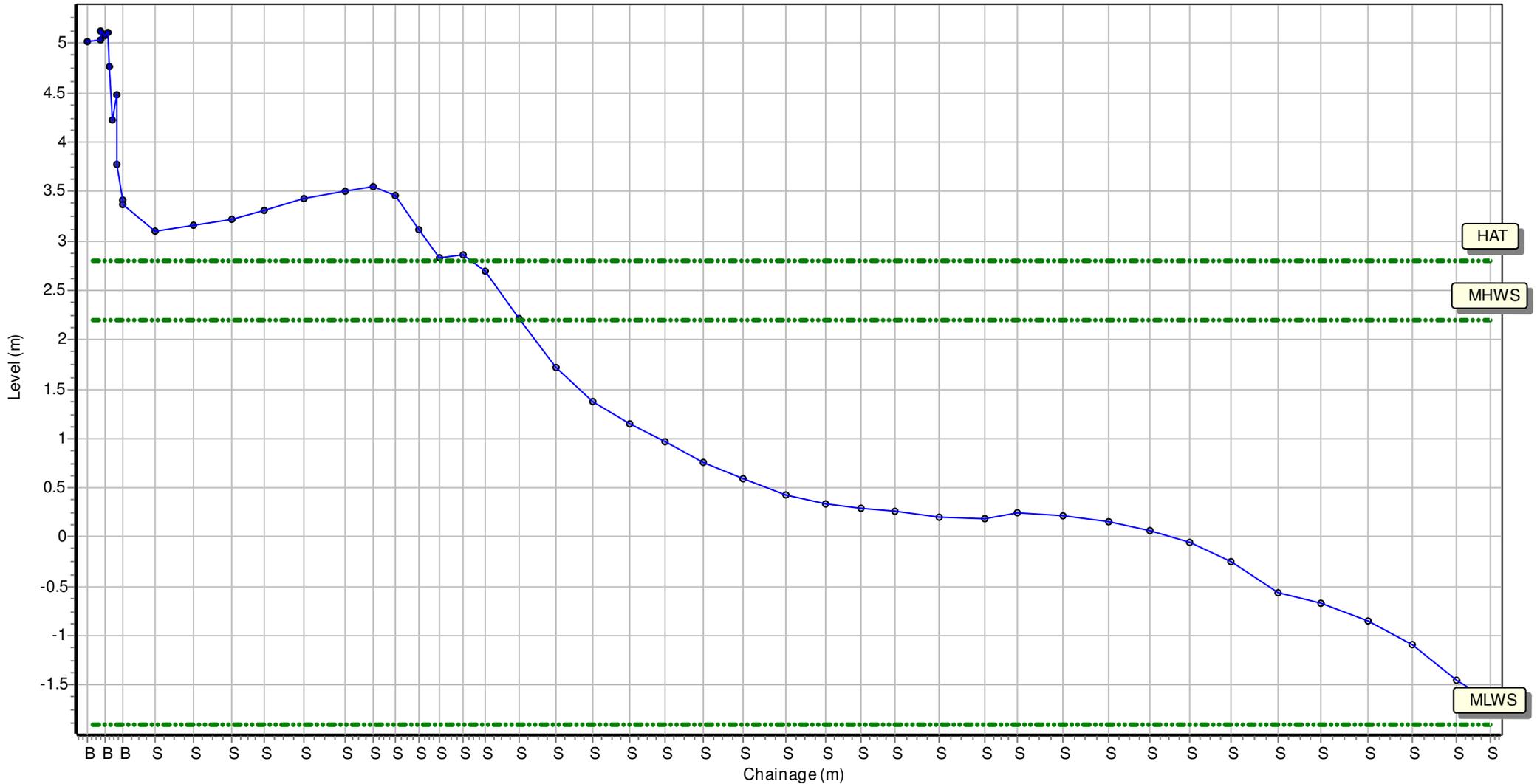
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400531.615 Northing: 652001.966 Profile Bearing: 27 ° from North



# Beach Profile

Location: 1aBTBC05

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

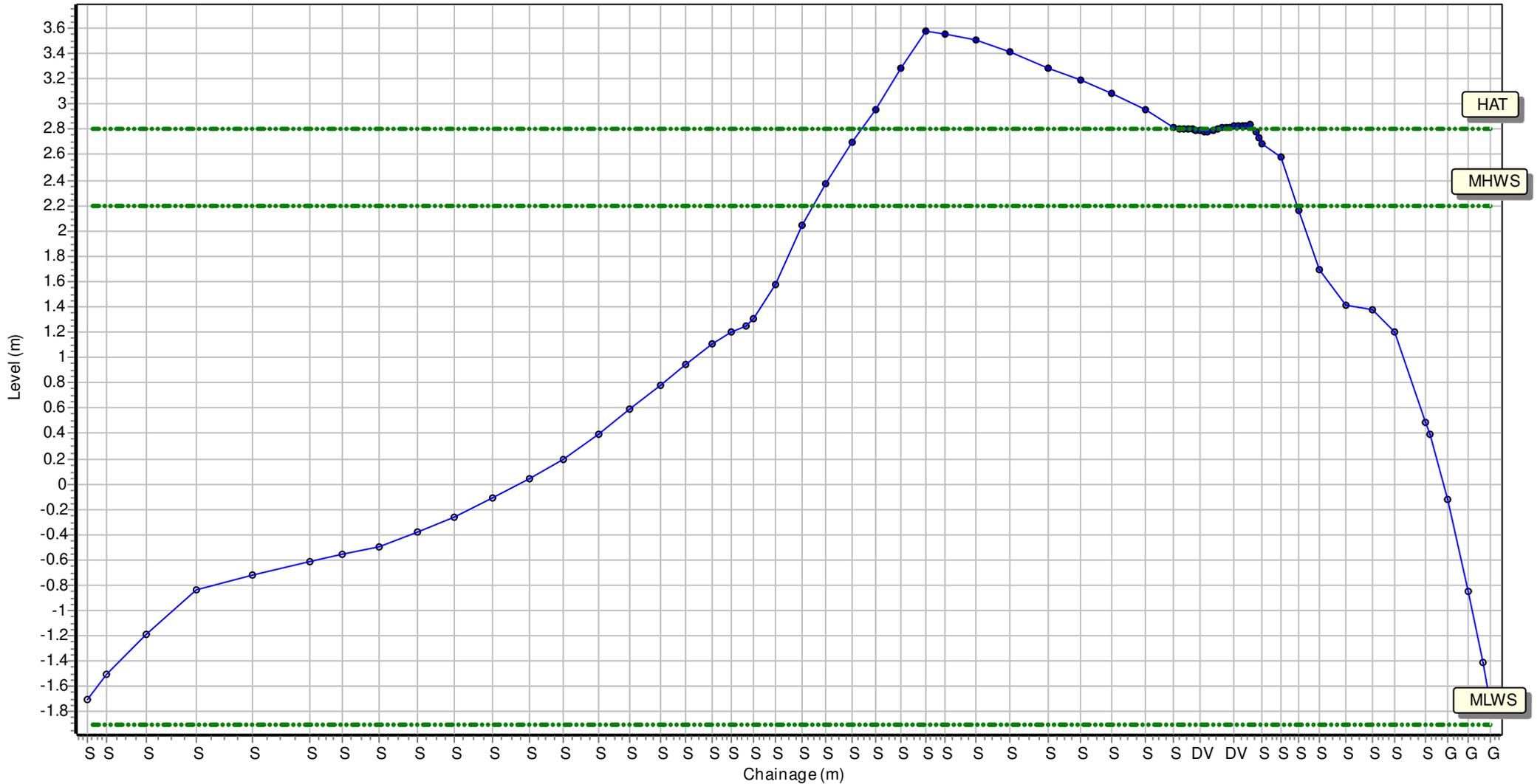
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400678.665 Northing: 651969.27 Profile Bearing: 298 ° from North



# Beach Profile

Location: 1aBTBC06

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

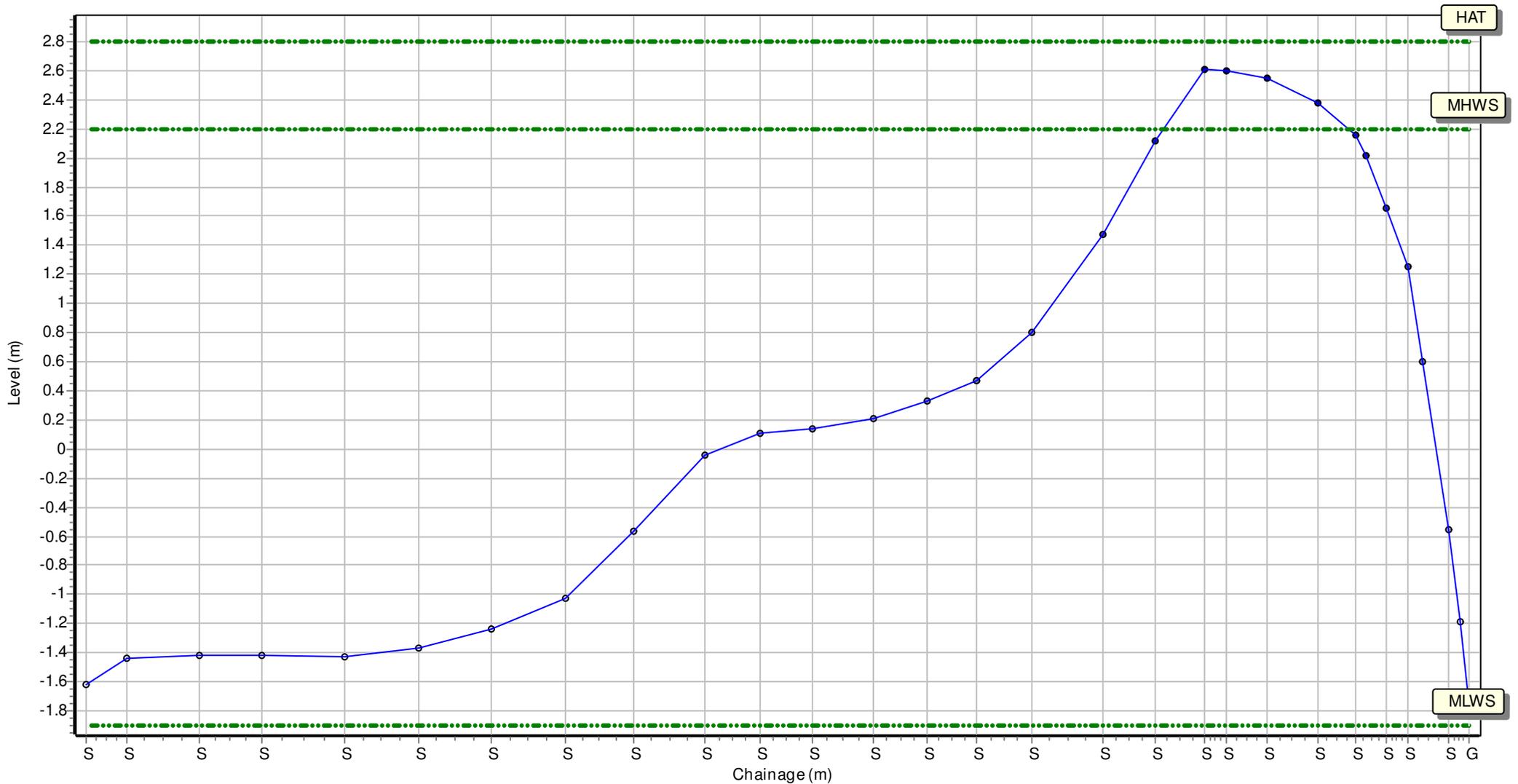
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400825.582 Northing: 652135.224 Profile Bearing: 295 ° from North





# Beach Profile

Location: 1aBTBC08

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

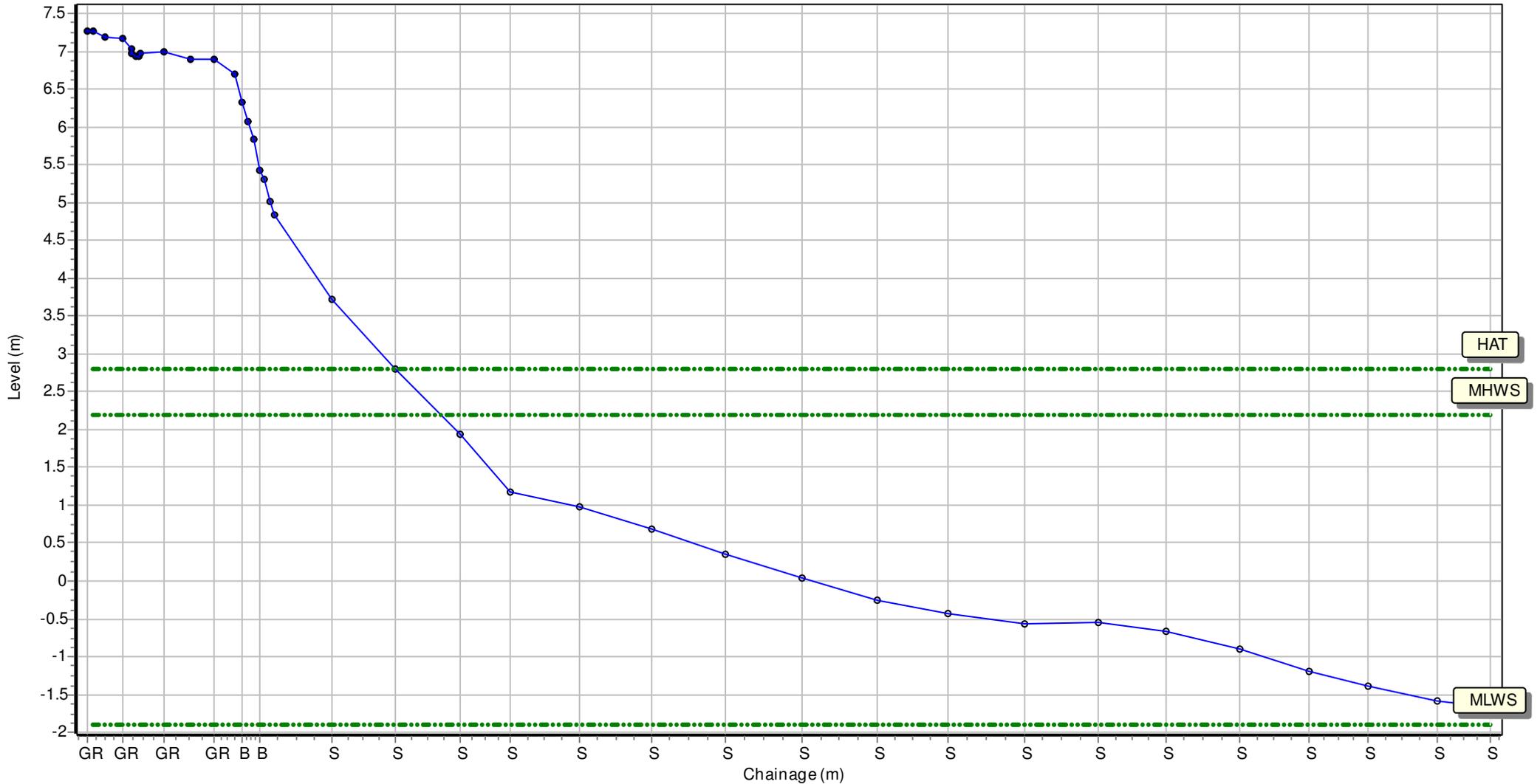
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400568.995 Northing: 651908.786 Profile Bearing: 68 ° from North



# Beach Profile

Location: 1aBTBC09

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

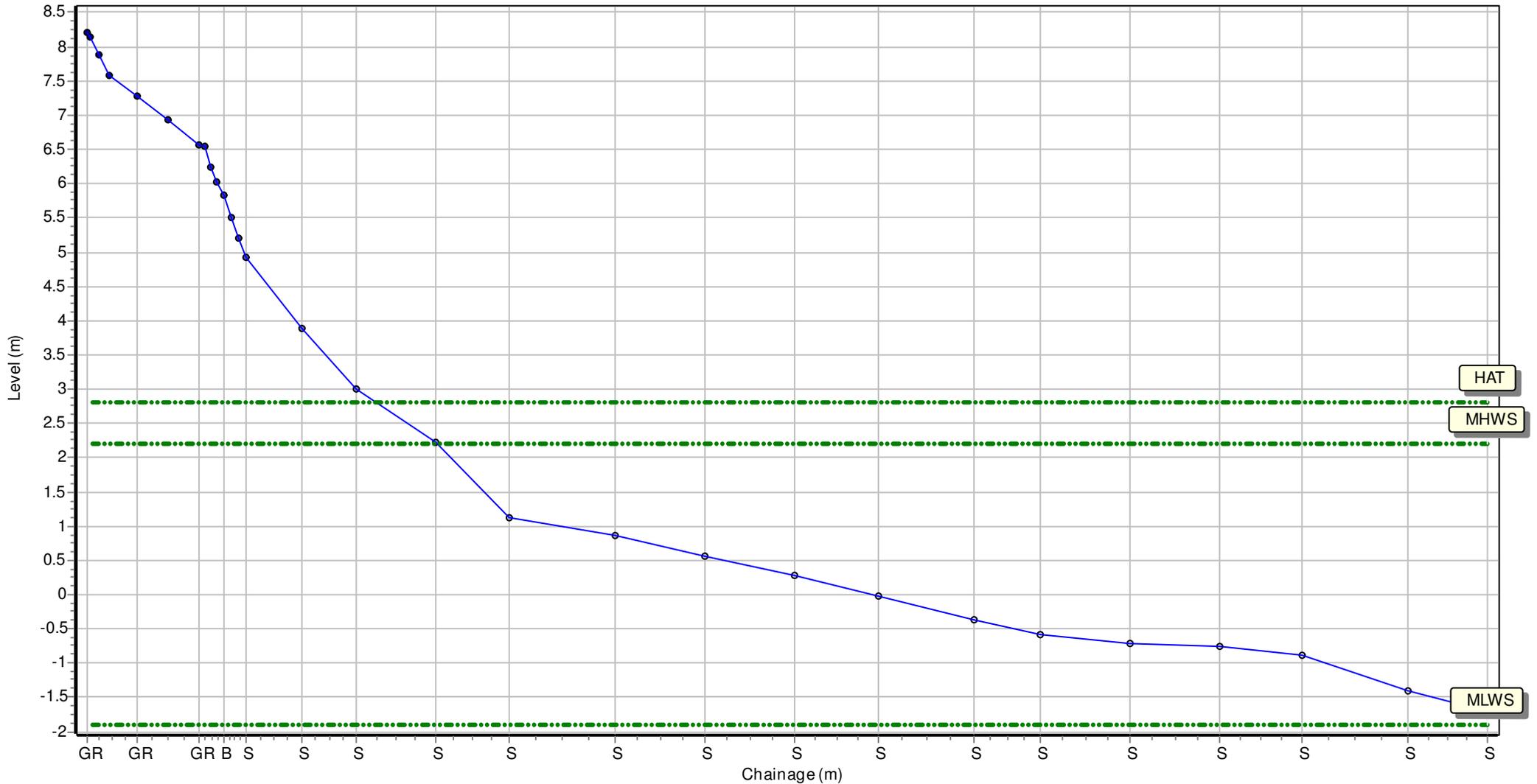
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400587.135 Northing: 651868.576 Profile Bearing: 70 ° from North



# Beach Profile

Location: 1aBTBC10

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

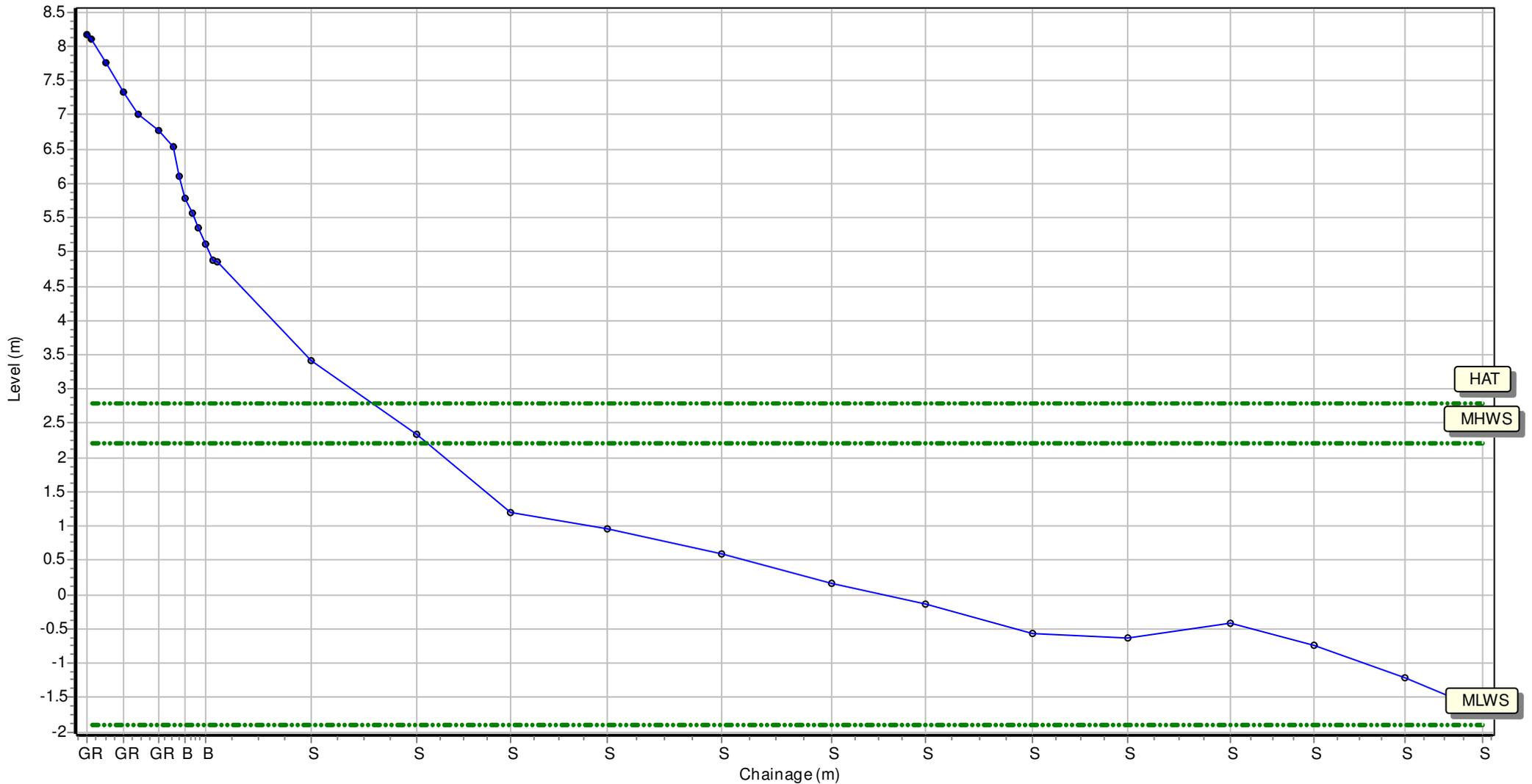
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400603.233 Northing: 651816.609 Profile Bearing: 69 ° from North



# Beach Profile

Location: 1aBTBC11

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

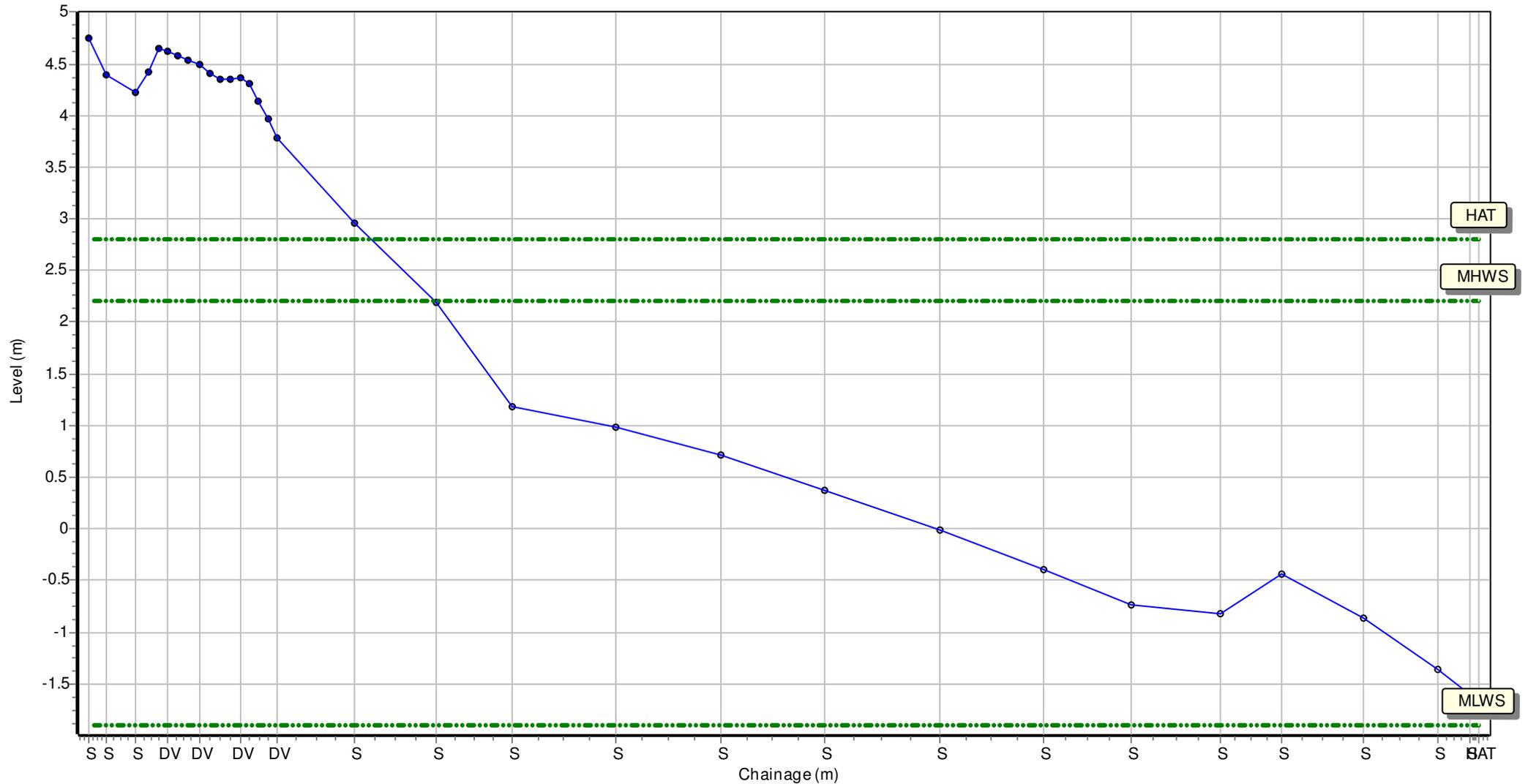
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400638.037 Northing: 651699.812 Profile Bearing: 66 ° from North



# Beach Profile

Location: 1aBTBC12

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

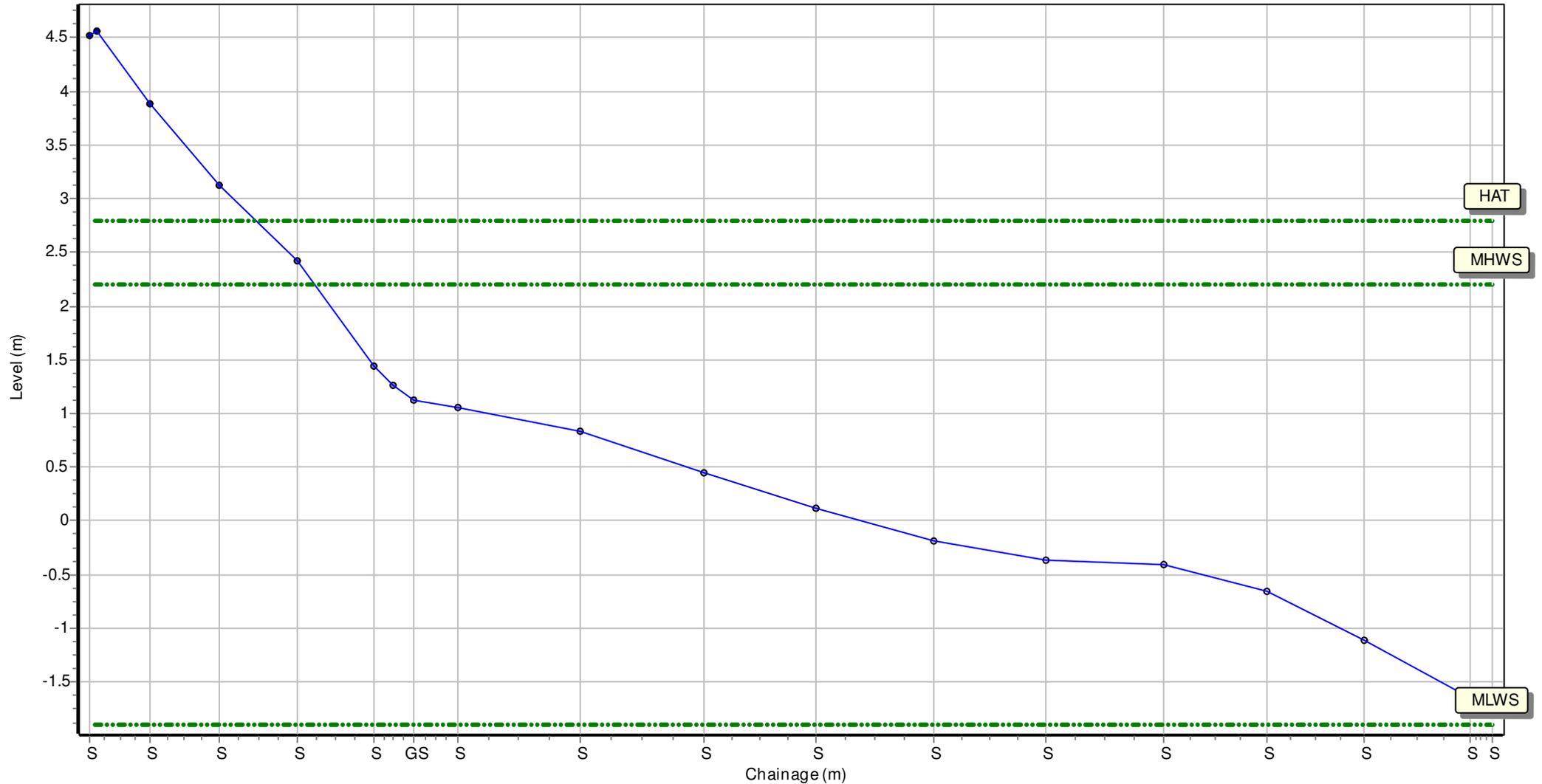
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400693.518 Northing: 651579.795 Profile Bearing: 63 ° from North



# Beach Profile

Location: 1aBTBC13

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

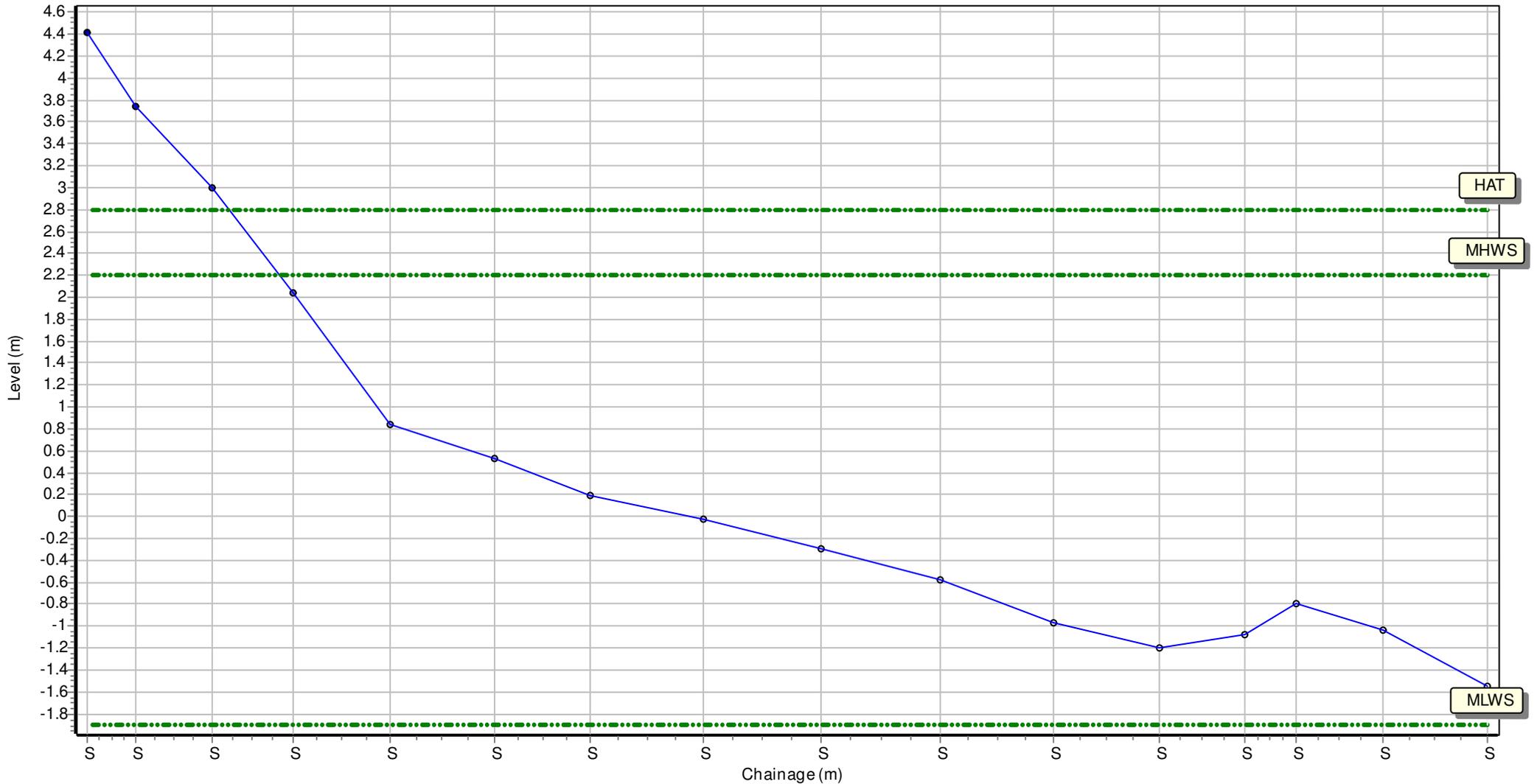
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 400820.787 Northing: 651312.459 Profile Bearing: 65 ° from North



# Beach Profile

Location: 1aBTBC14

Date: 15/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

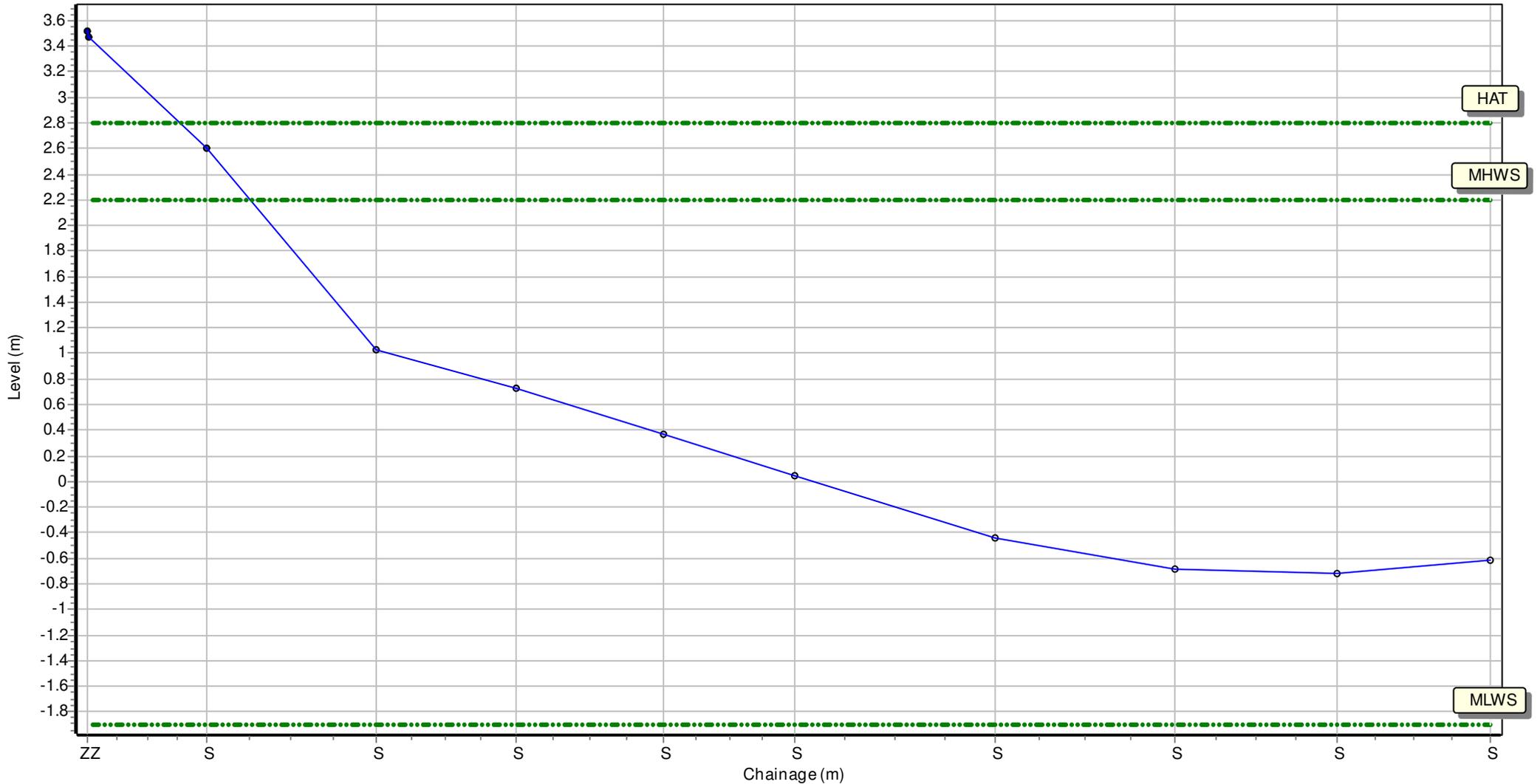
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 401030.513 Northing: 651003.409 Profile Bearing: 60 ° from North

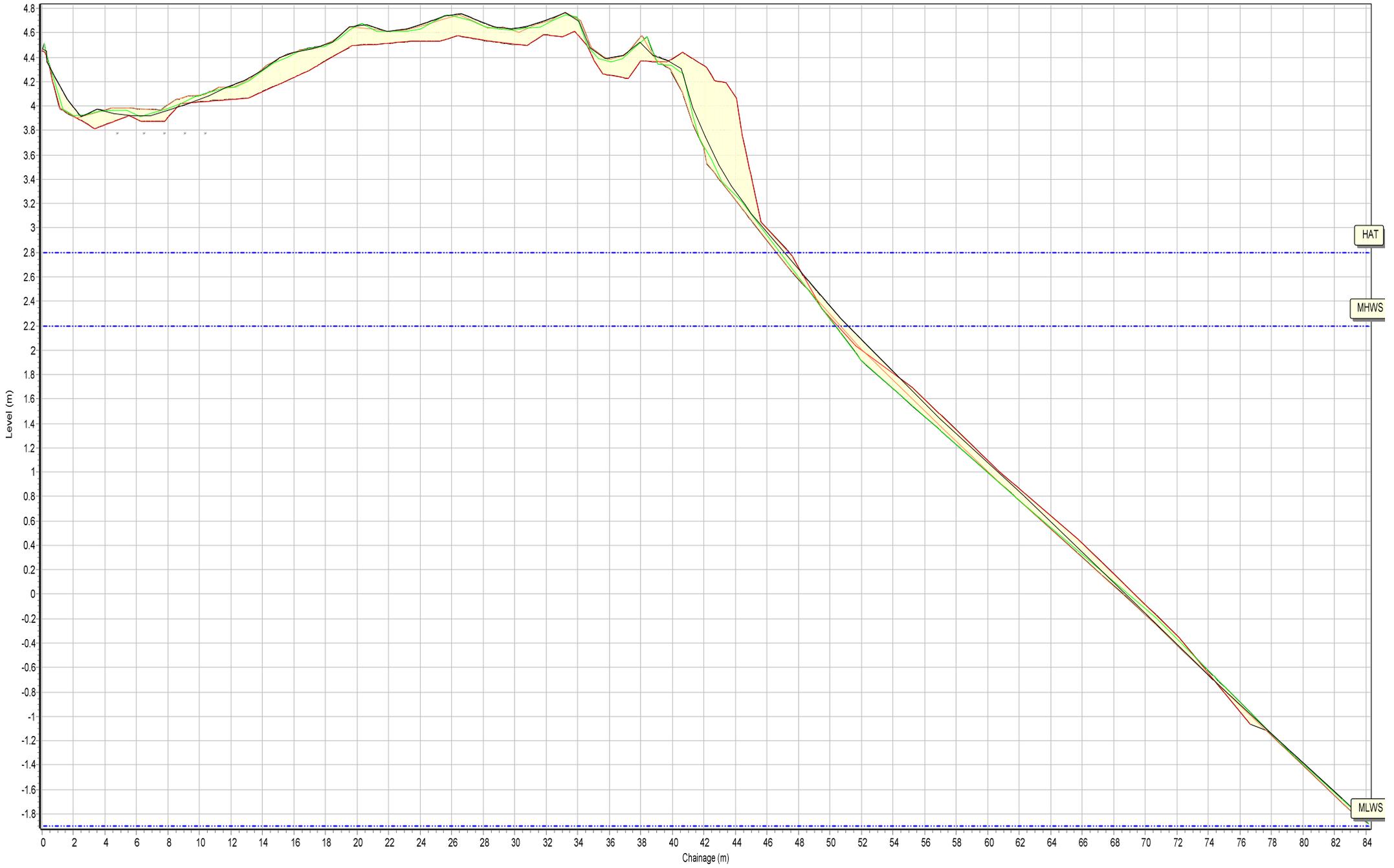


Beach Profiles: 1aBTBC01



Profiles Envelope 01/10/2006 06/10/2017 27/11/2018 15/10/2019

# Beach Profiles: 1aBTC02



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC03



Profiles Envelope 01/10/2006 06/10/2017 27/11/2018 15/10/2019

HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC04



Profiles Envelope 01/04/2006 27/11/2018 25/03/2019 15/10/2019

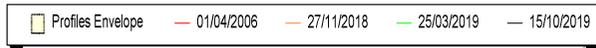
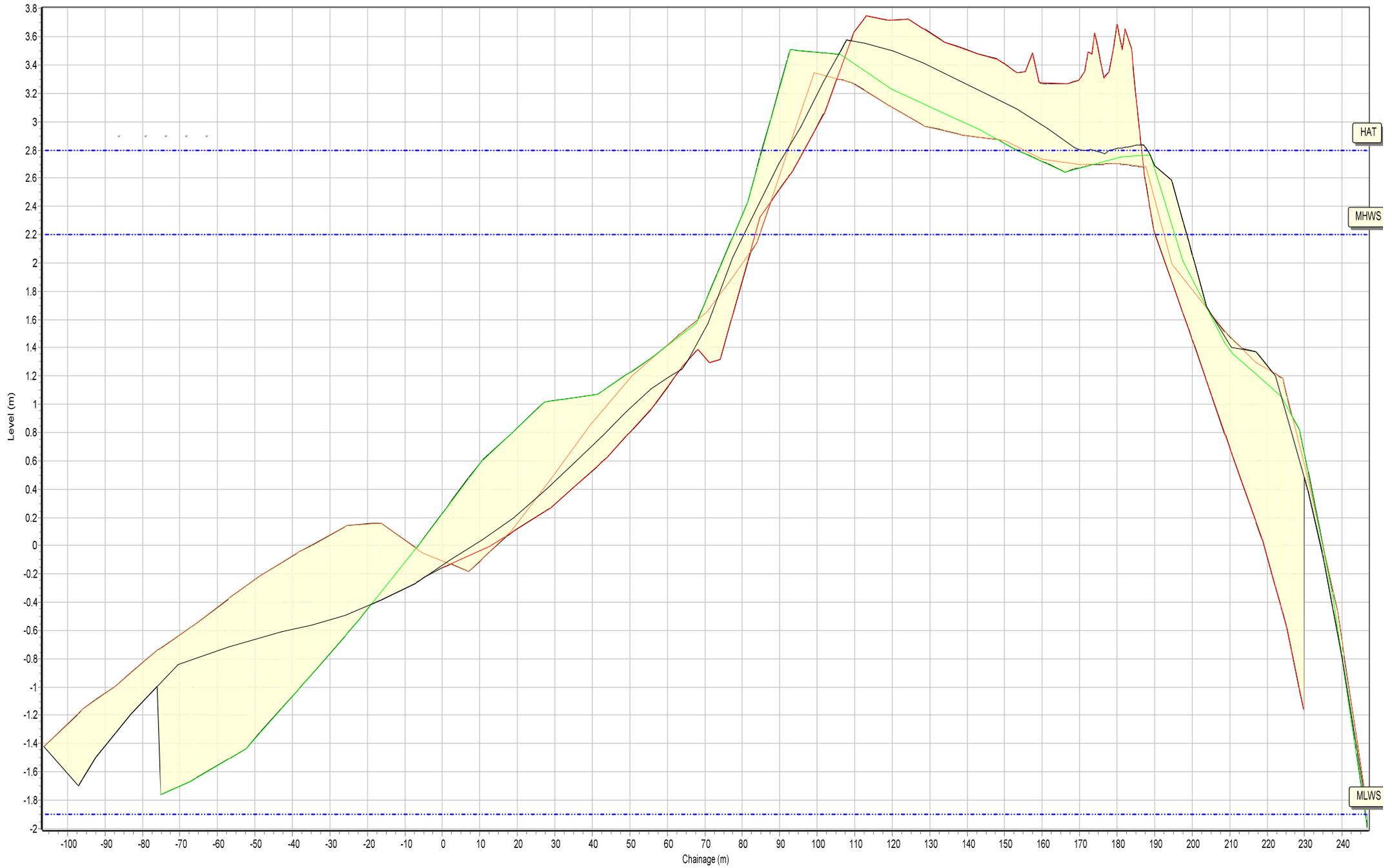
SANDS

HAT

MHWS

MLWS

Beach Profiles: 1aBTBC05



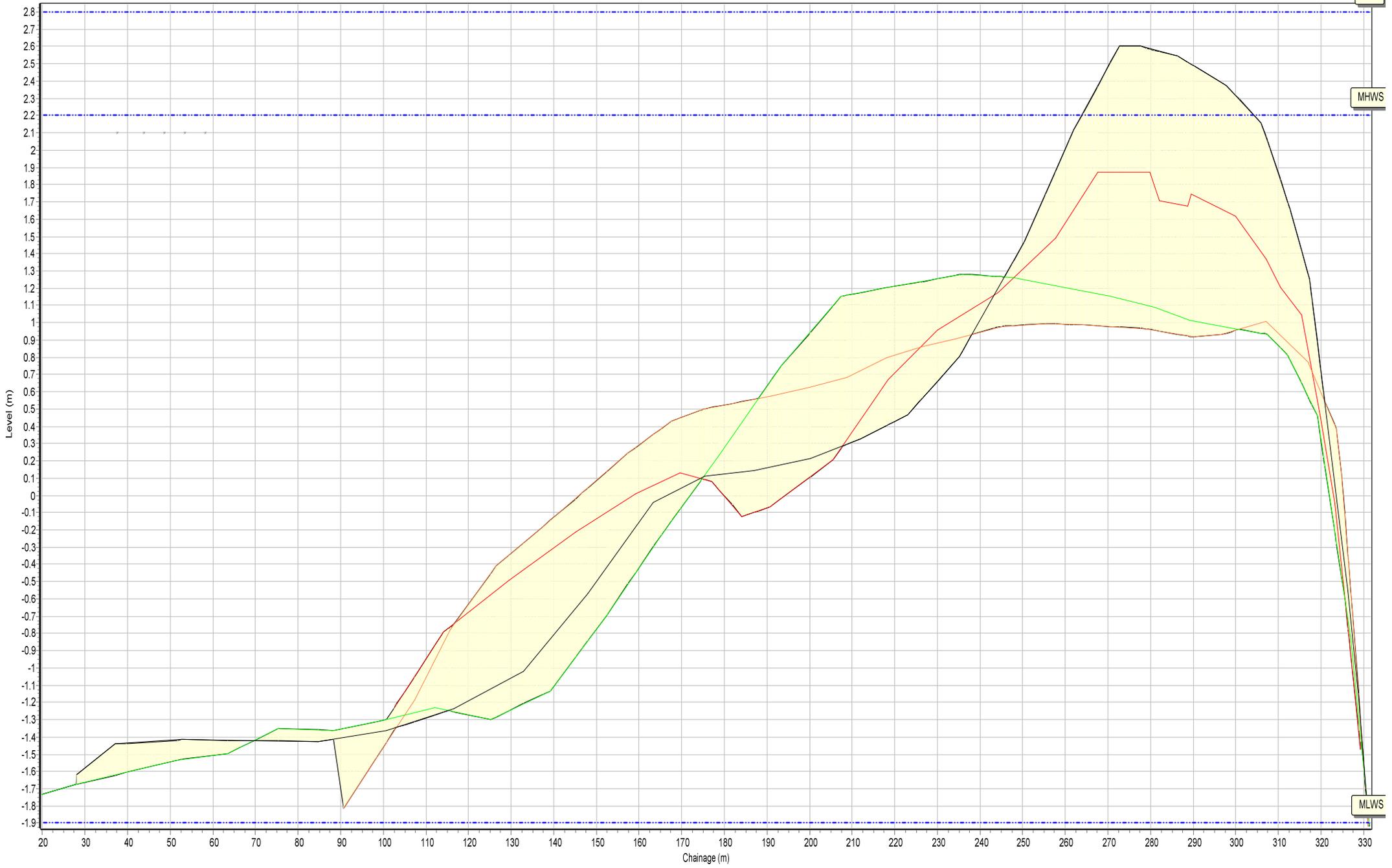
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC06



Profiles Envelope 01/04/2006 27/11/2018 25/03/2019 15/10/2019

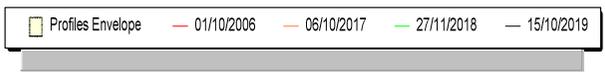
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC07



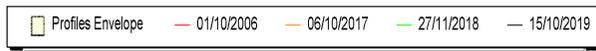
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC08



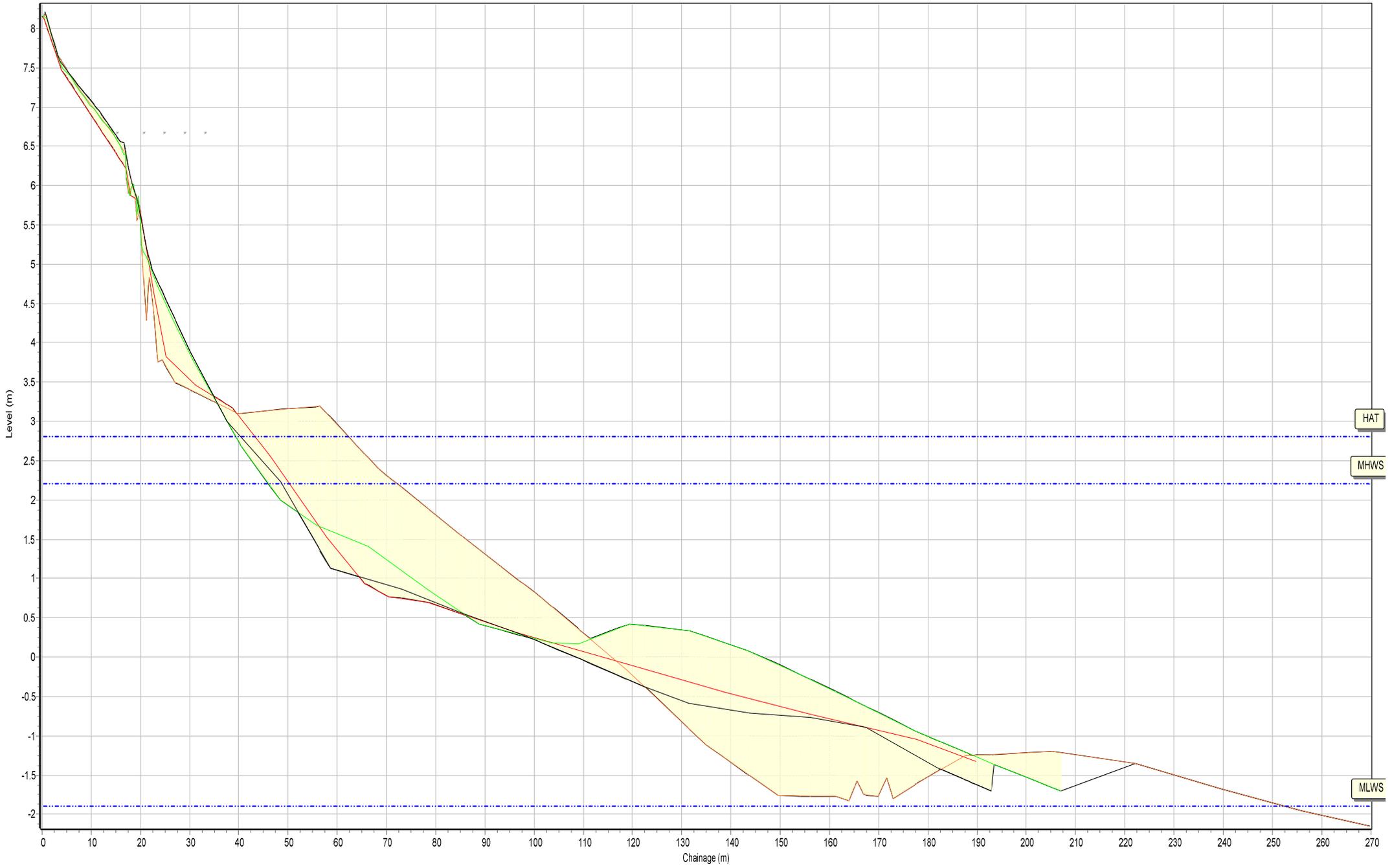
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC09



HAT

MLWS

MLWS

SANDS

Beach Profiles: 1aBTC10



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC11



HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aBTBC12



HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aBTC13



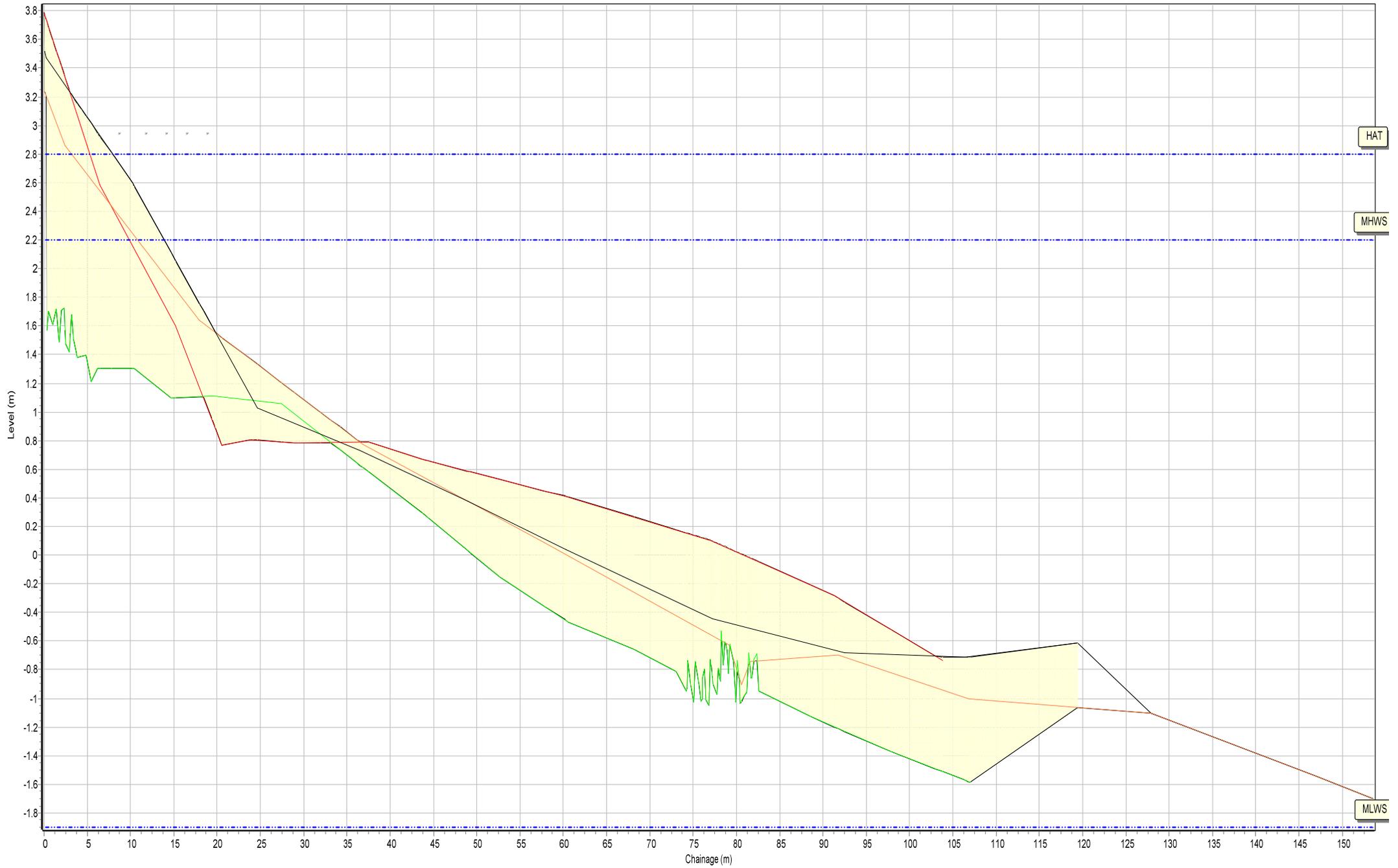
HAT

MLWS

MLWS

SANDS

# Beach Profiles: 1aBTC14



HAT

MHWS

MLWS

SANDS

# Beach Profile

Location: 1aBTBC15

Date: 17/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

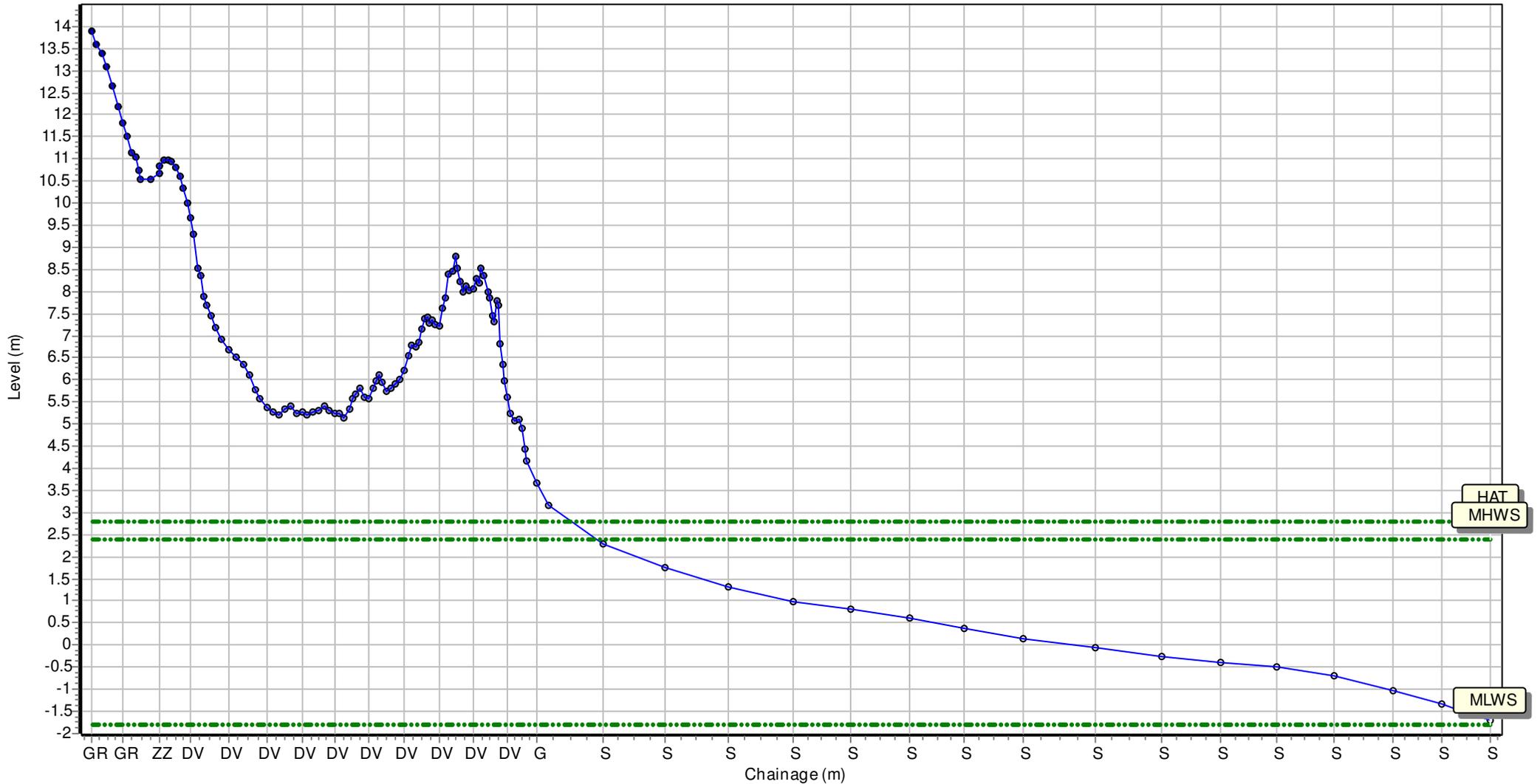
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 402663.736 Northing: 648593.739 Profile Bearing: 40 ° from North



# Beach Profile

Location: 1aBTBC16

Date: 17/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

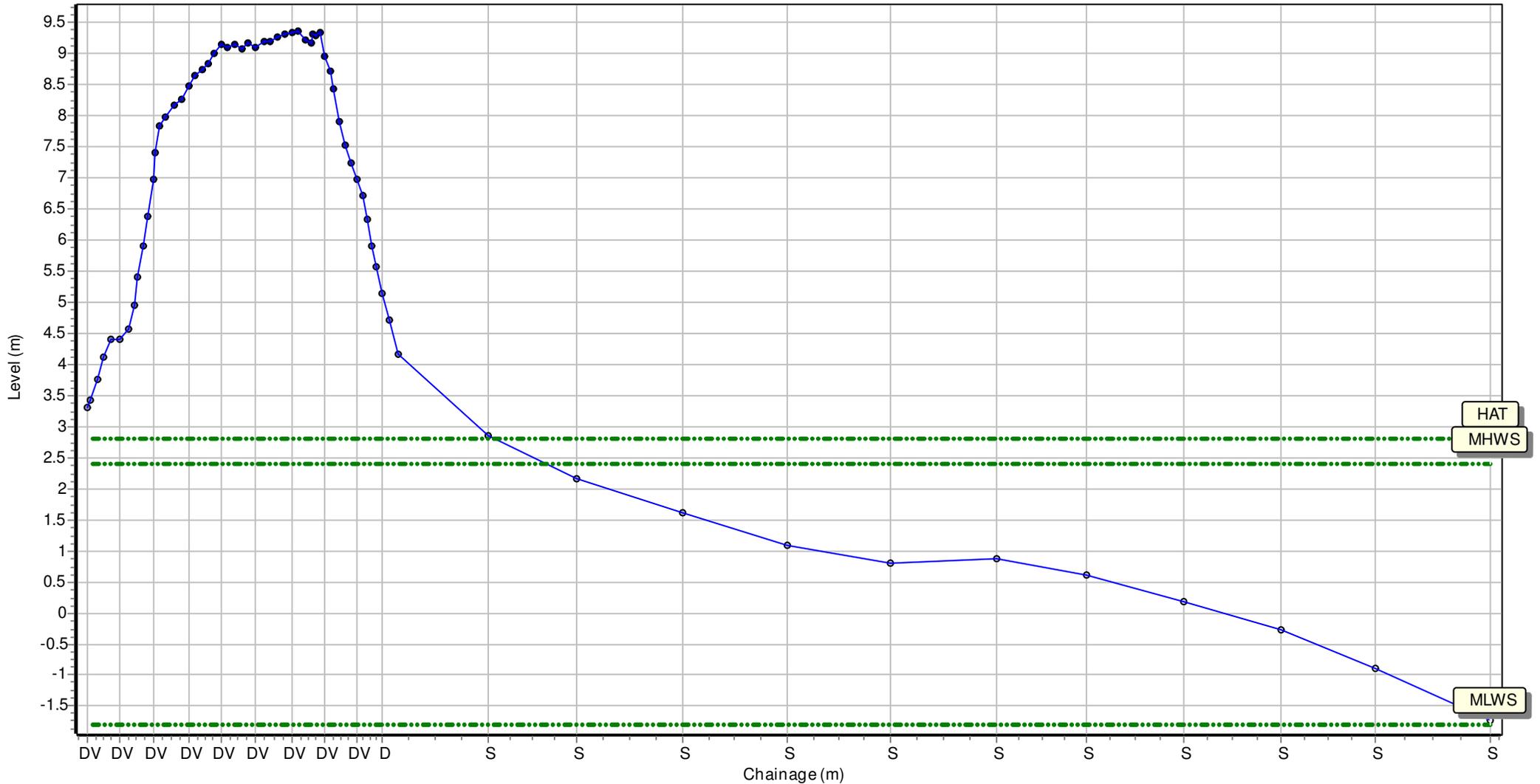
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 403565.671 Northing: 647735.833 Profile Bearing: 53 ° from North



# Beach Profile

Location: 1aBTBC17

Date: 17/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

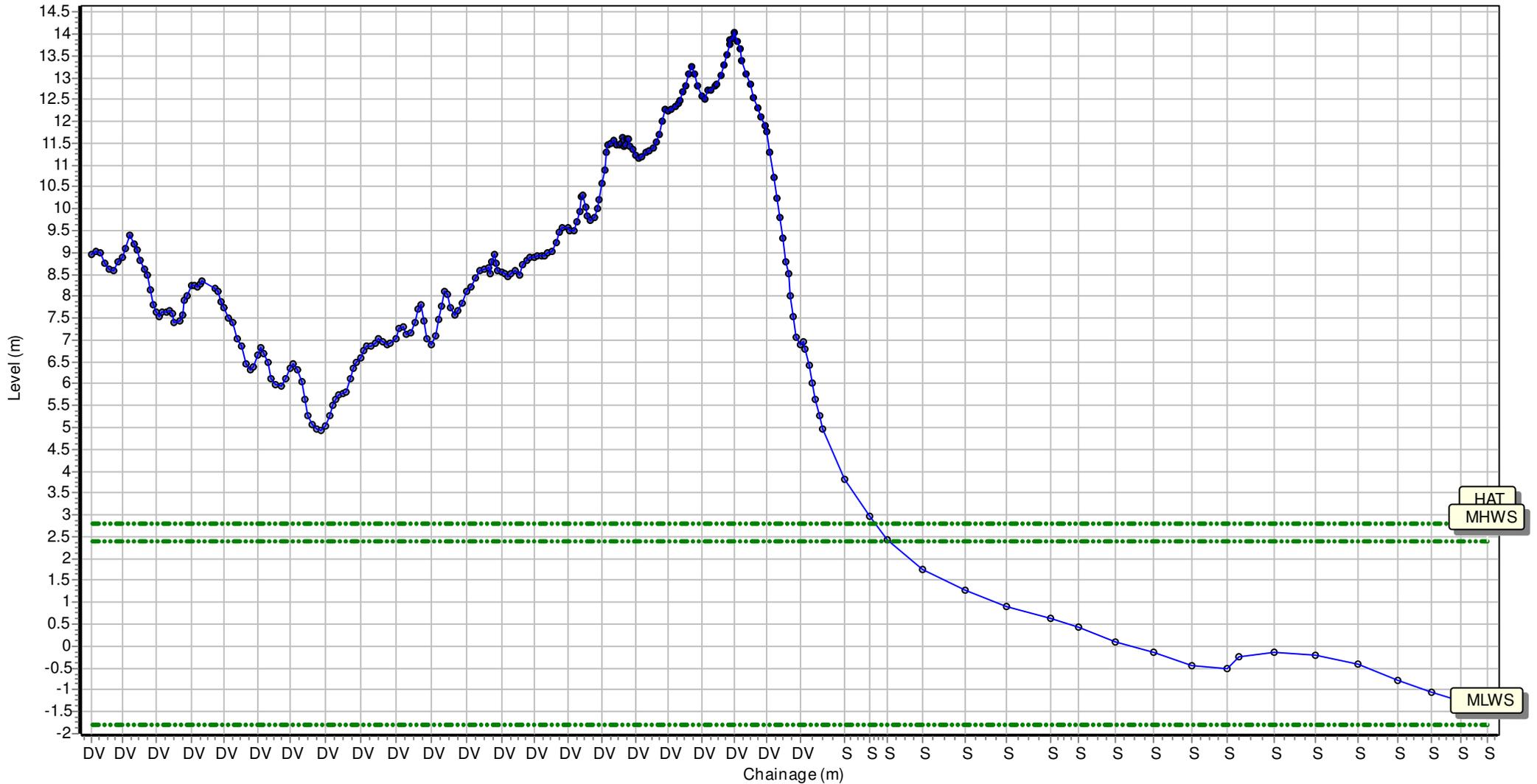
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 404433.939 Northing: 646713.965 Profile Bearing: 51 ° from North



# Beach Profile

Location: 1aBTBC18

Date: 17/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

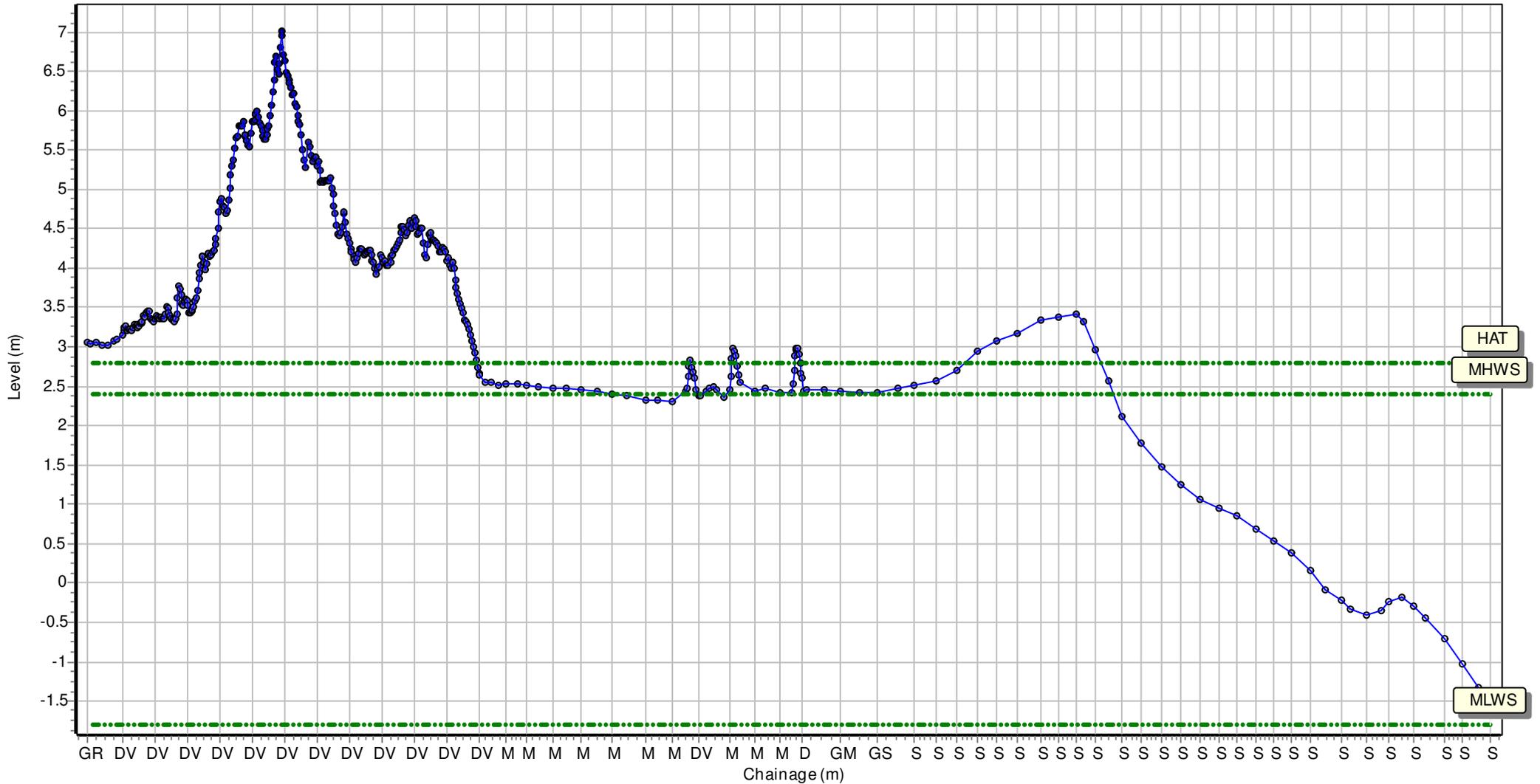
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 405985.759 Northing: 645466.297 Profile Bearing: 38 ° from North



# Beach Profile

Location: 1aBTBC19

Date: 17/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

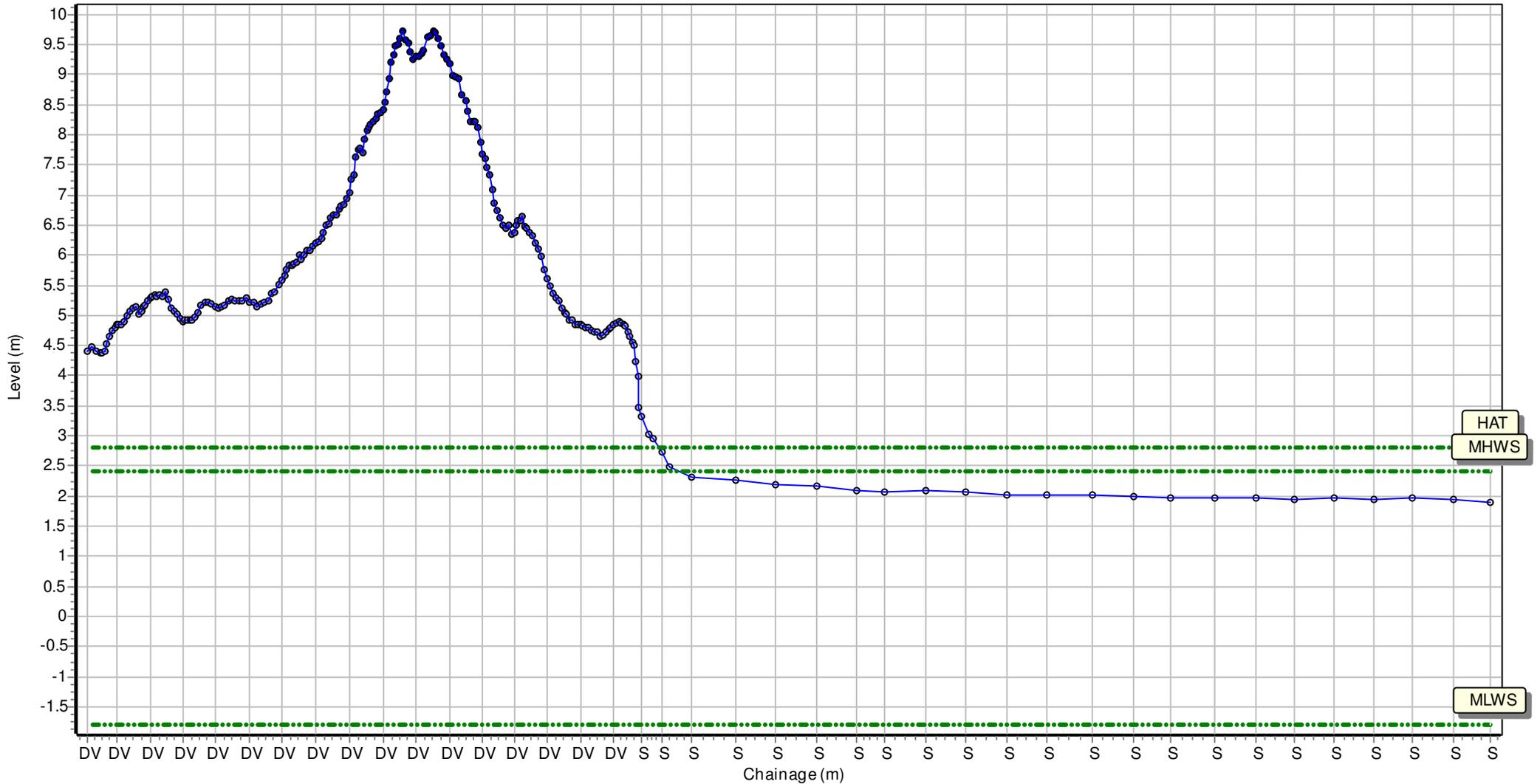
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 407091.566 Northing: 644616.133 Profile Bearing: 34 ° from North



# Beach Profile

Location: 1aBTBC20

Date: 17/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

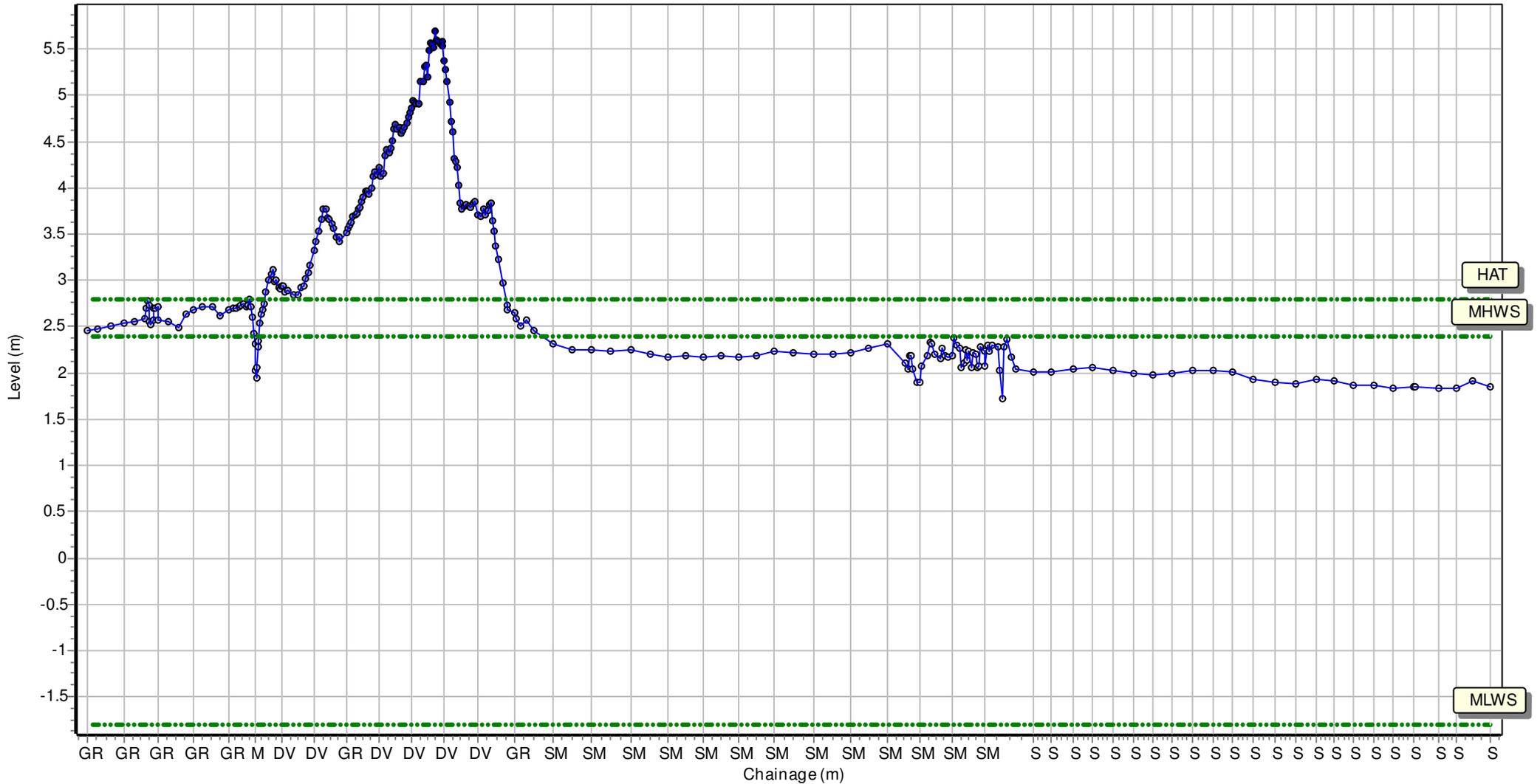
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 407390.255 Northing: 643841.768 Profile Bearing: 45 ° from North



Beach Profiles: 1aBTBC15



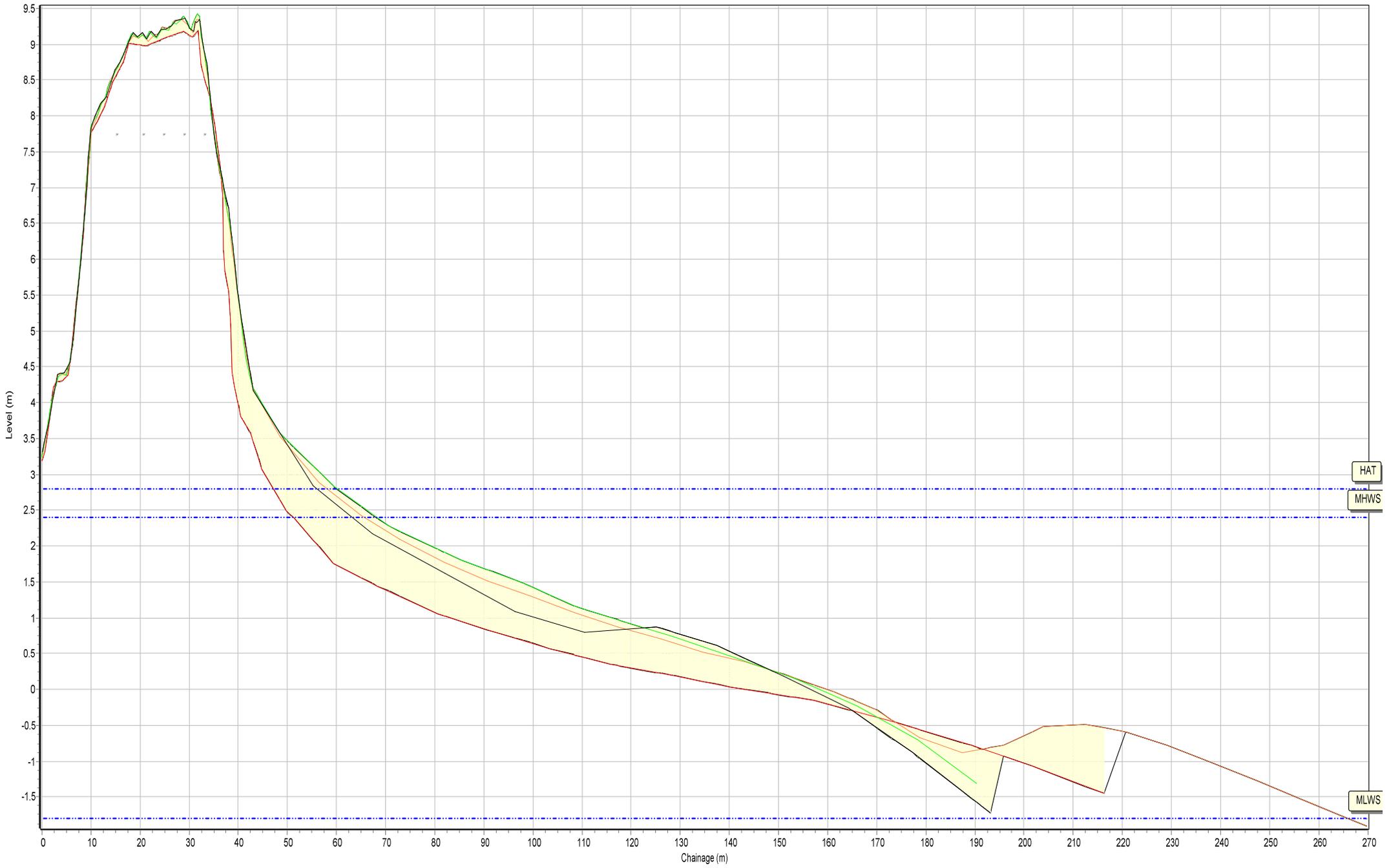
Profiles Envelope 01/10/2006 05/11/2017 26/11/2018 17/10/2019

HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC16



Profiles Envelope 01/04/2006 26/11/2018 08/03/2019 17/10/2019

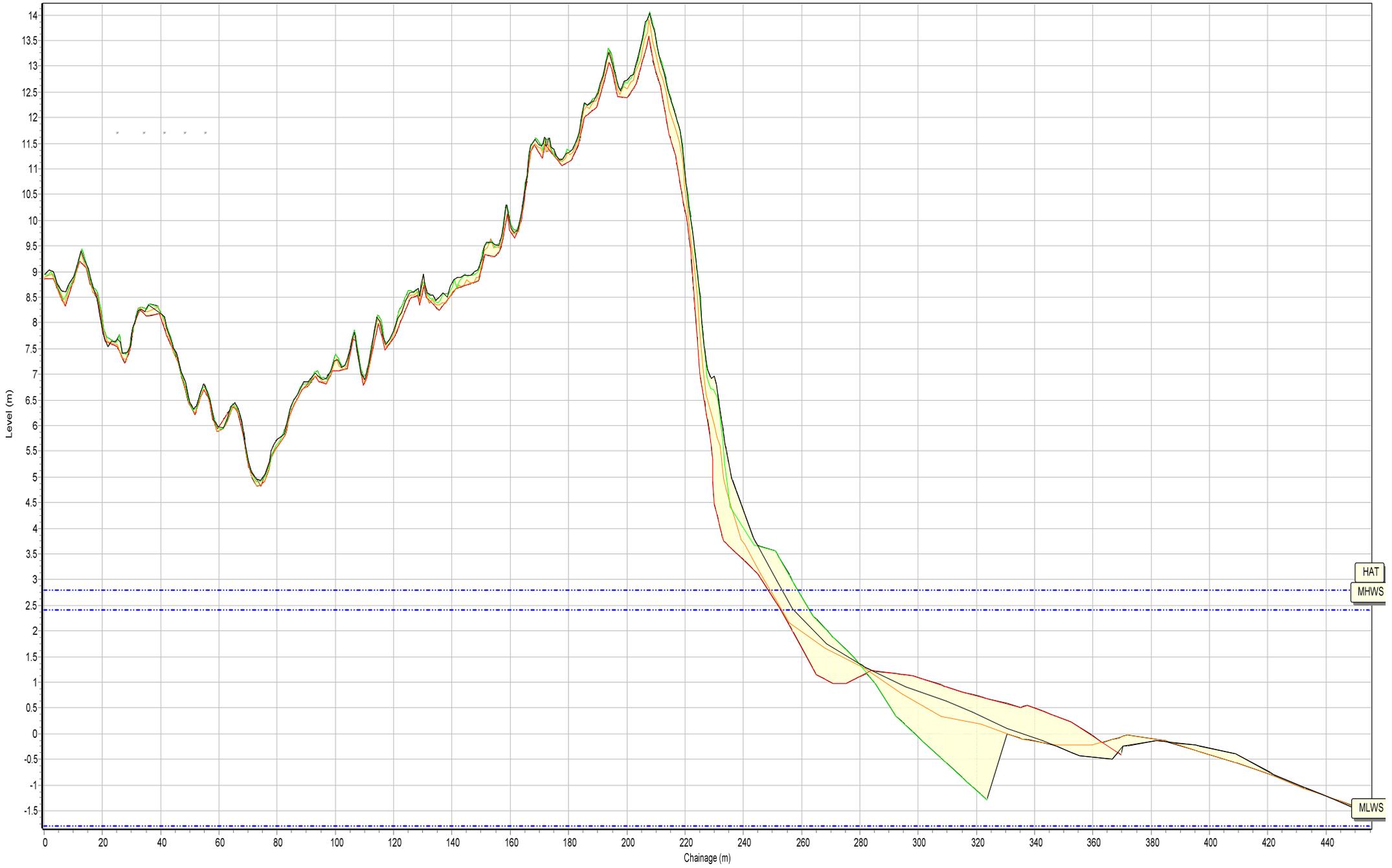
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC17



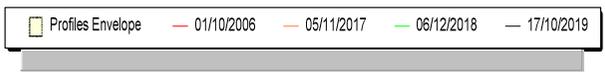
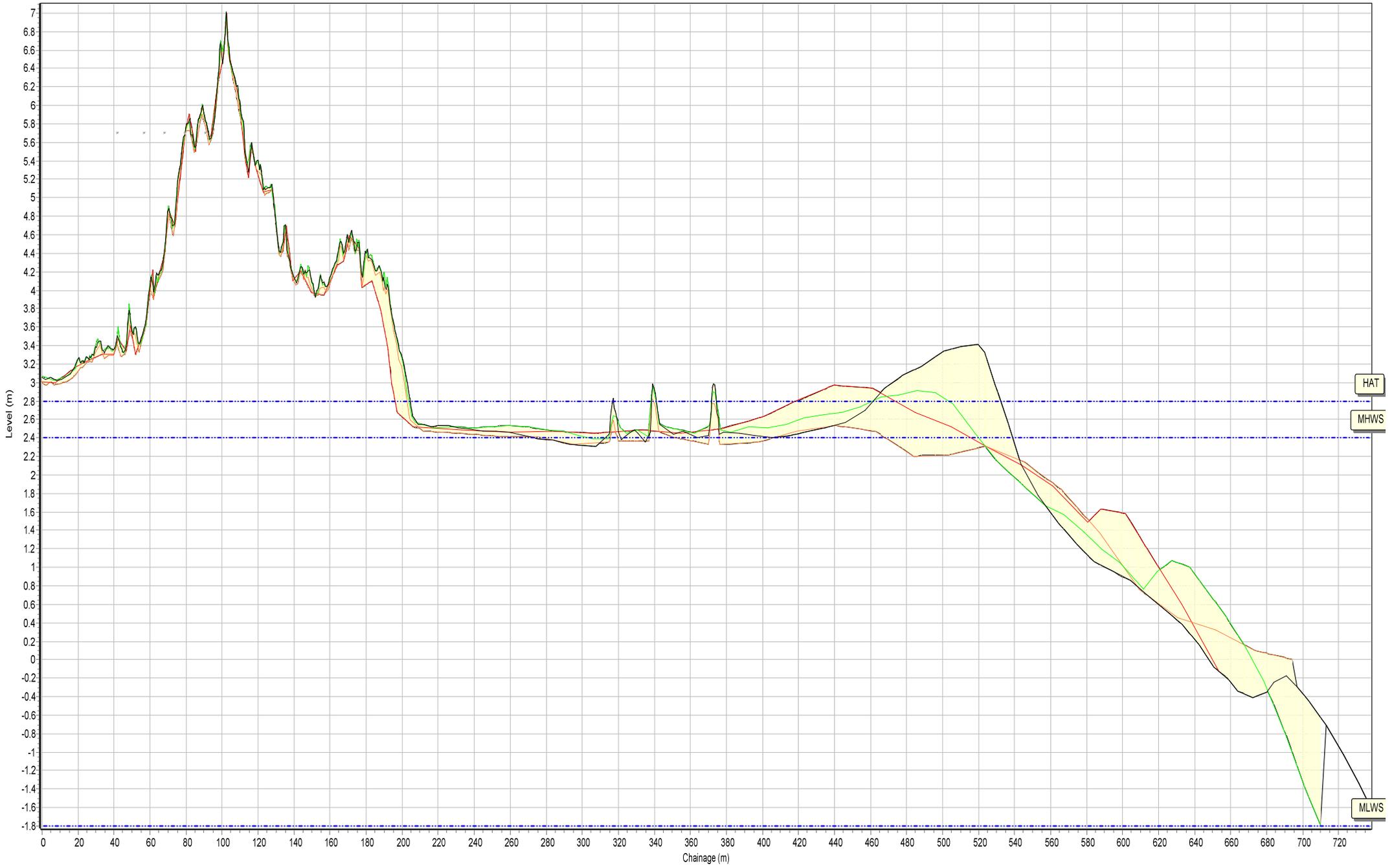
Profiles Envelope 01/10/2006 05/11/2017 26/11/2018 17/10/2019

HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC18



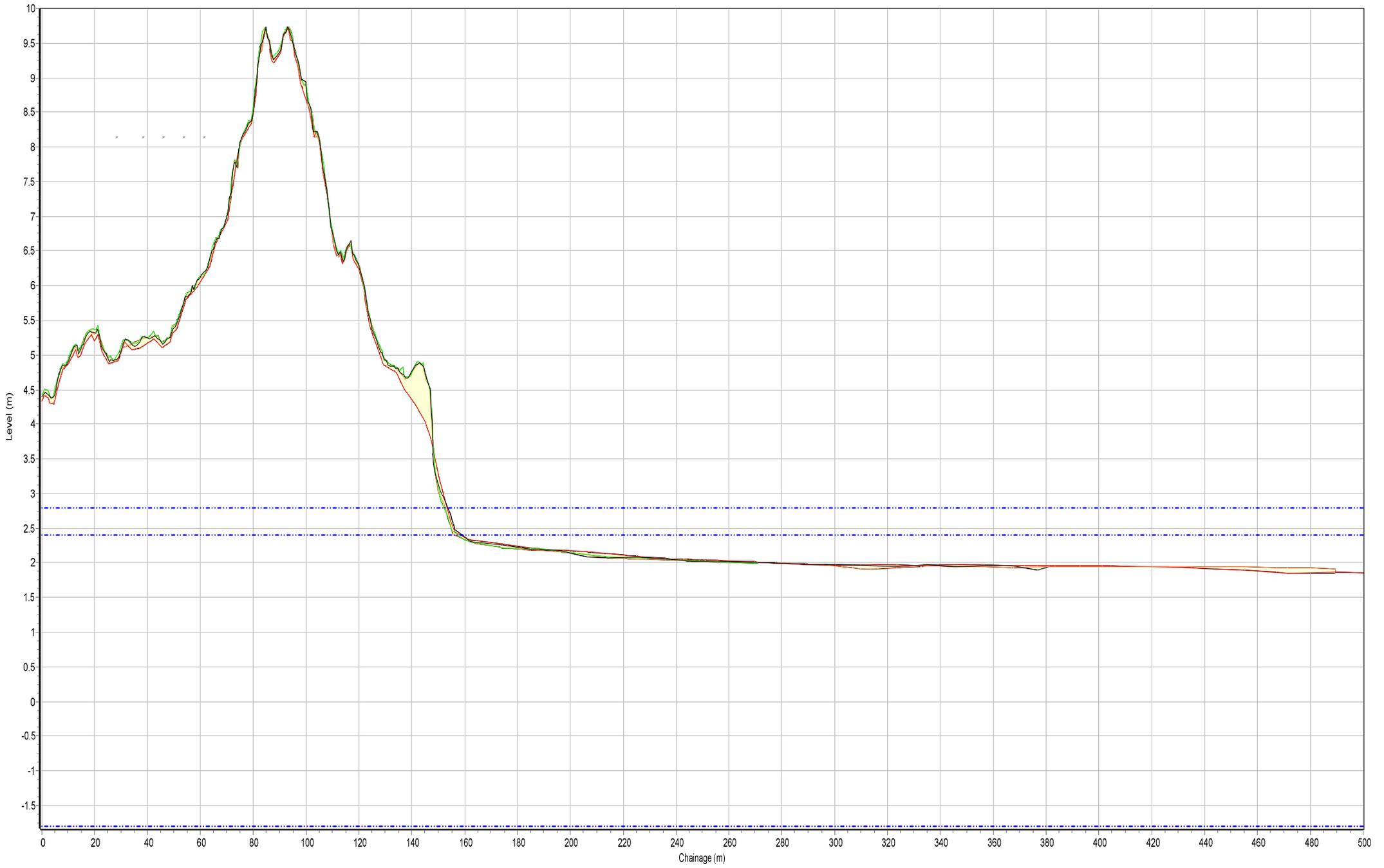
HAT

MHWS

MLWS

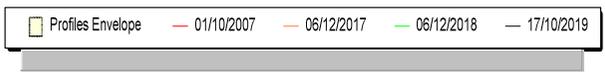
SANDS

Beach Profiles: 1aBTBC19



Profiles Envelope 01/04/2006 06/12/2018 08/03/2019 17/10/2019

Beach Profiles: 1aBTBC20



# Beach Profile

Location: 1aBTBC21

Date: 03/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

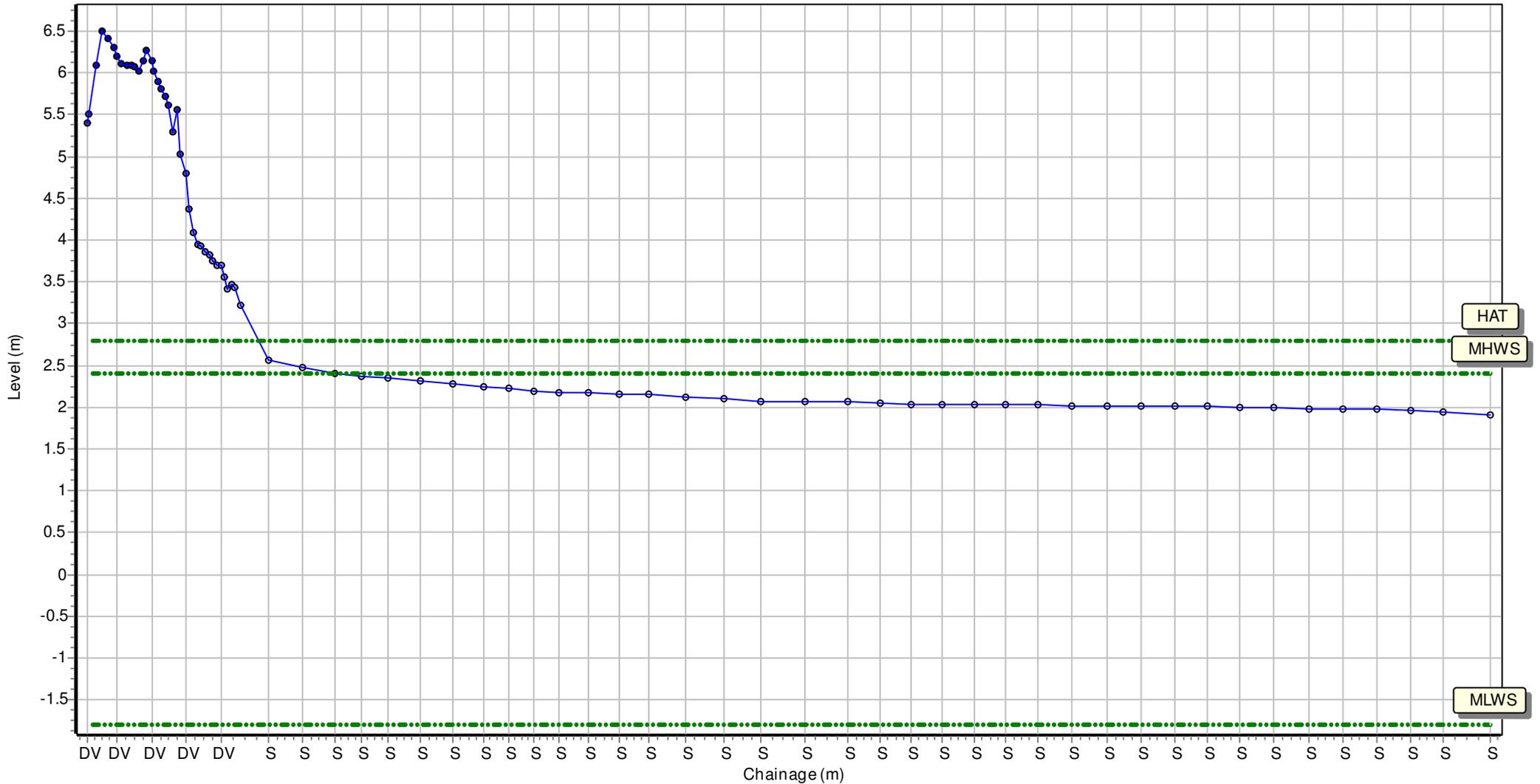
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 409501.341 Northing: 643847.61 Profile Bearing: 33 ° from North



# Beach Profile

Location: 1aBTBC22

Date: 03/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

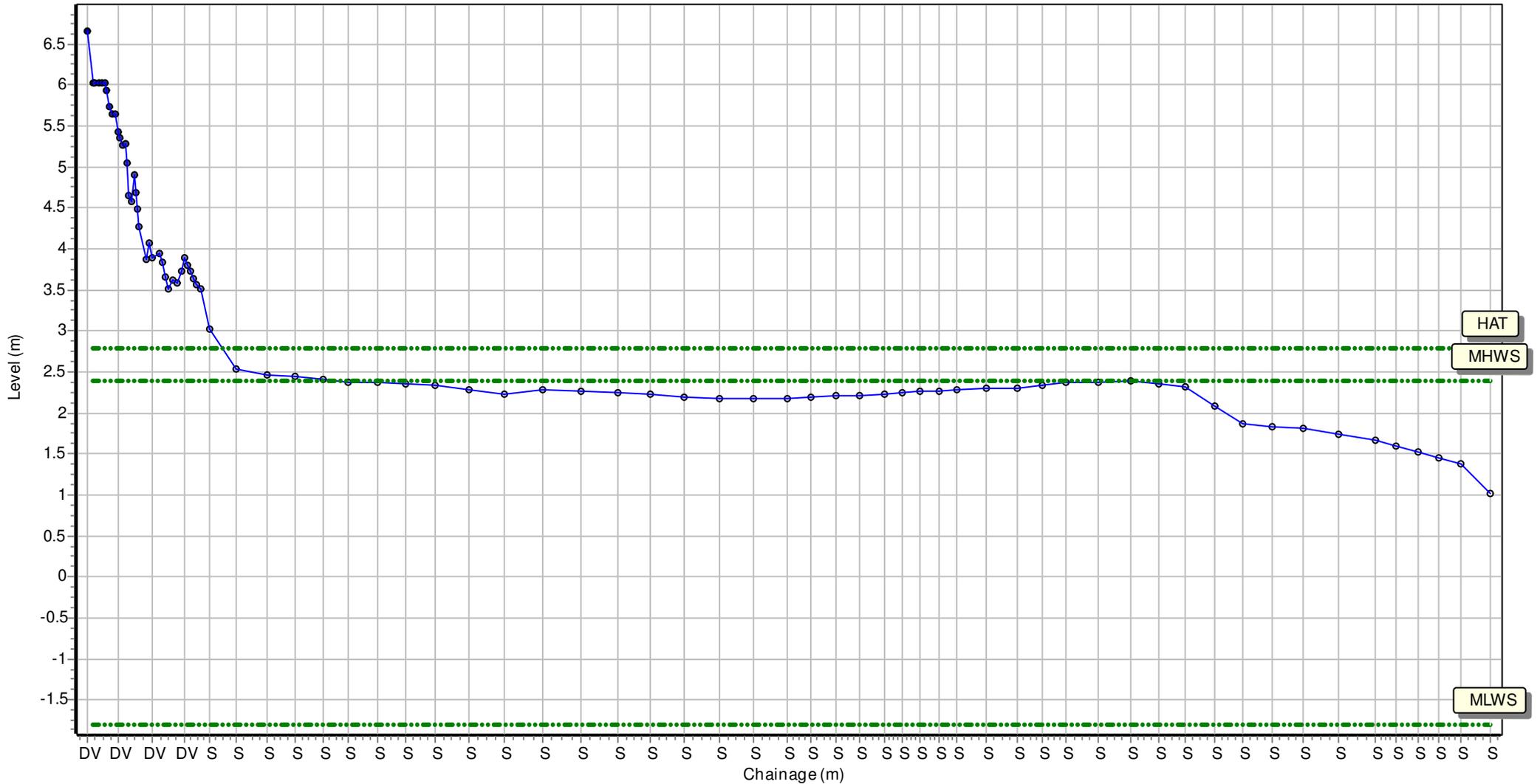
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 410213.981 Northing: 643697.867 Profile Bearing: 27 ° from North



# Beach Profile

Location: 1aBTBC23

Date: 01/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

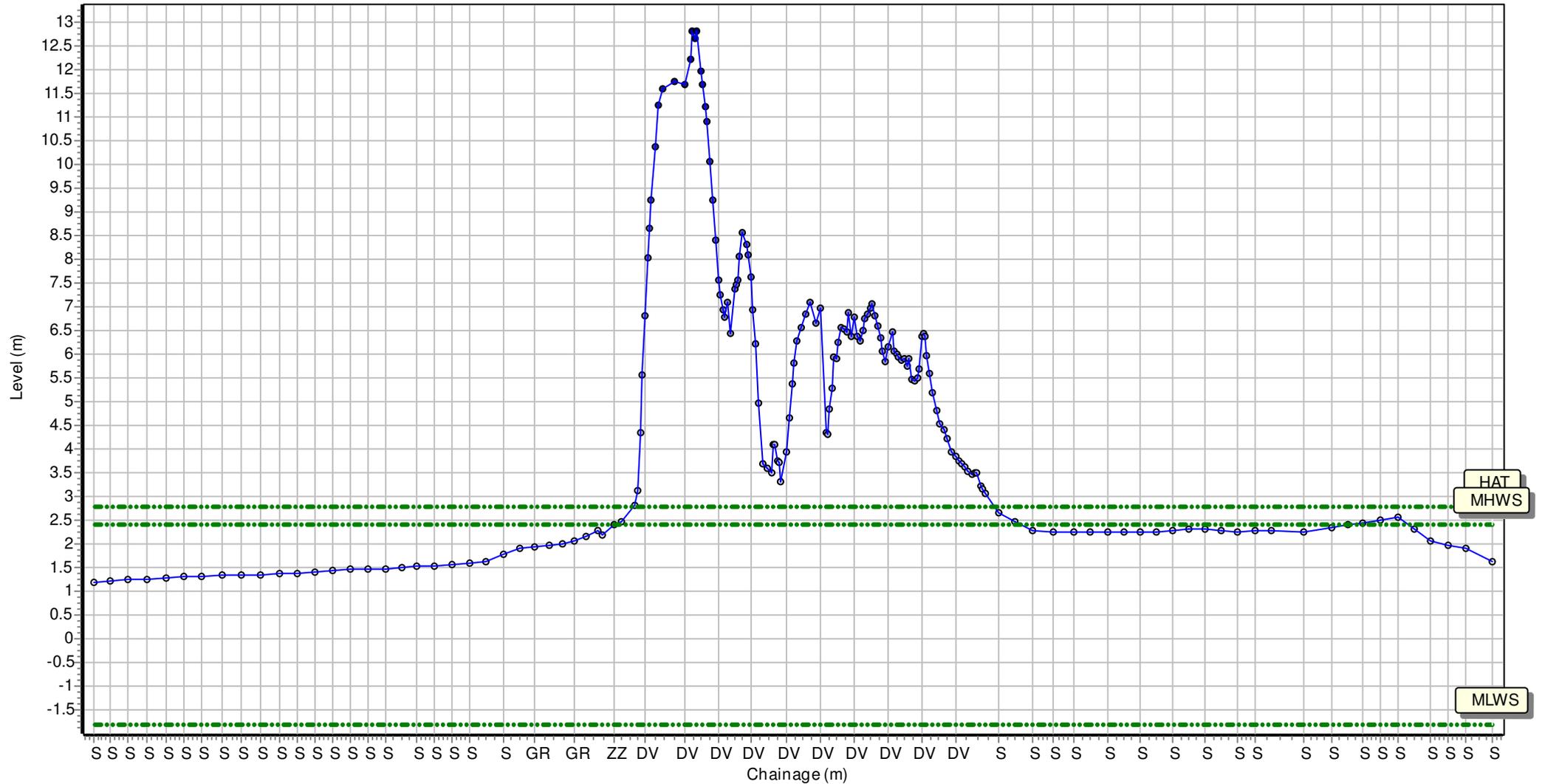
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 411084.123 Northing: 643008.731 Profile Bearing: 0 ° from North



# Beach Profile

Location: 1aBTBC24

Date: 01/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

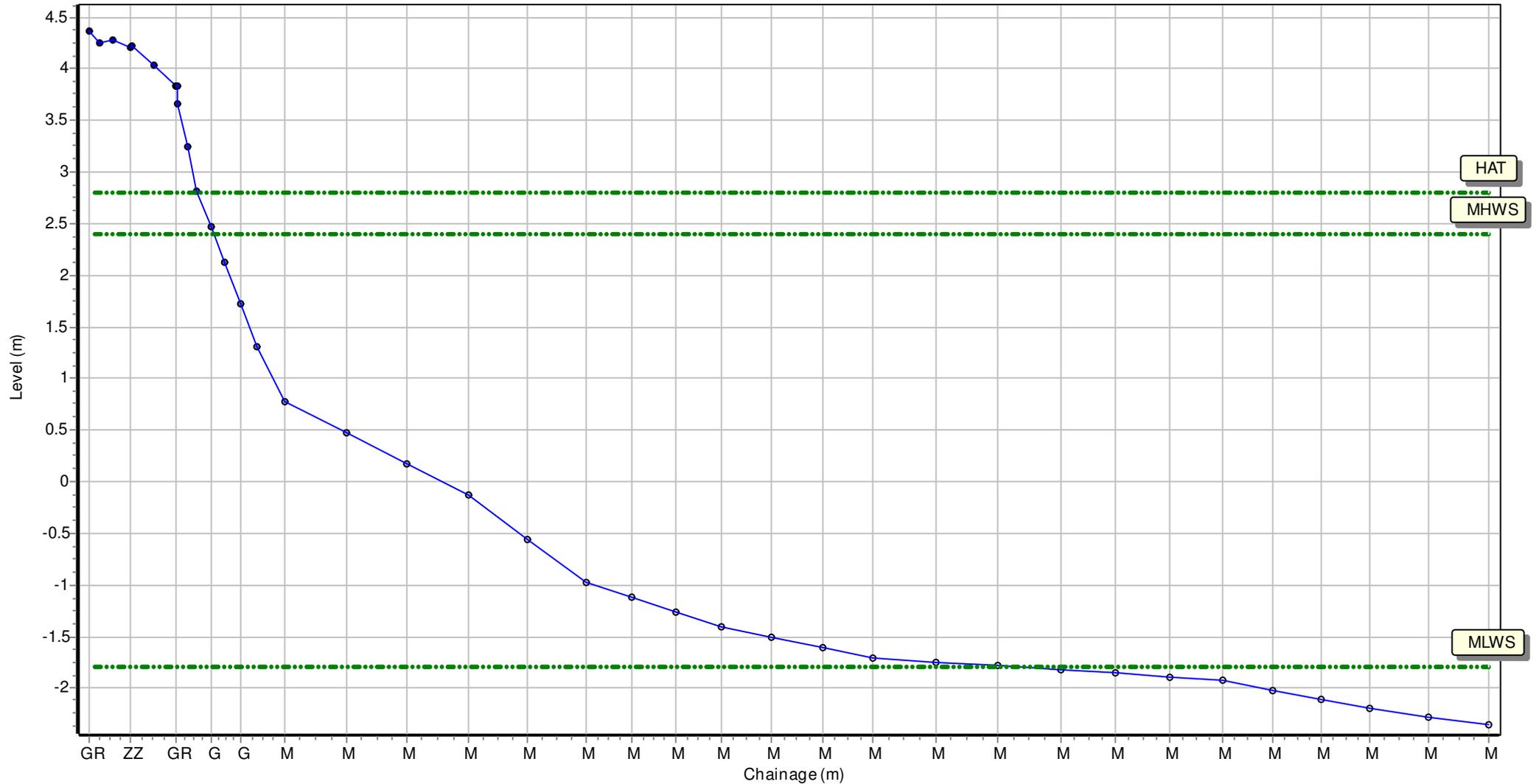
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 413330.108 Northing: 641794.909 Profile Bearing: 227 ° from North





# Beach Profile

Location: 1aBTBC26

Date: 01/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

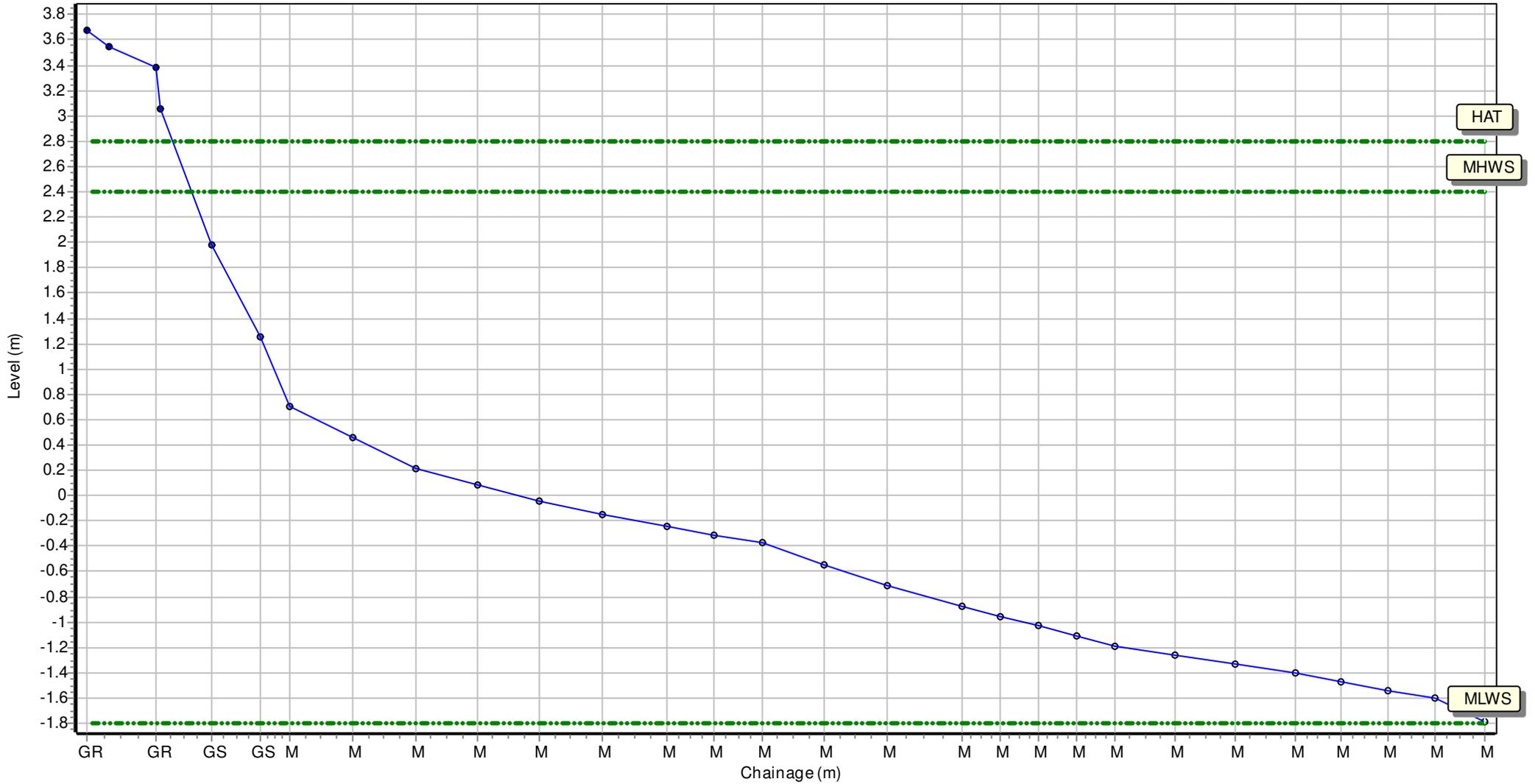
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

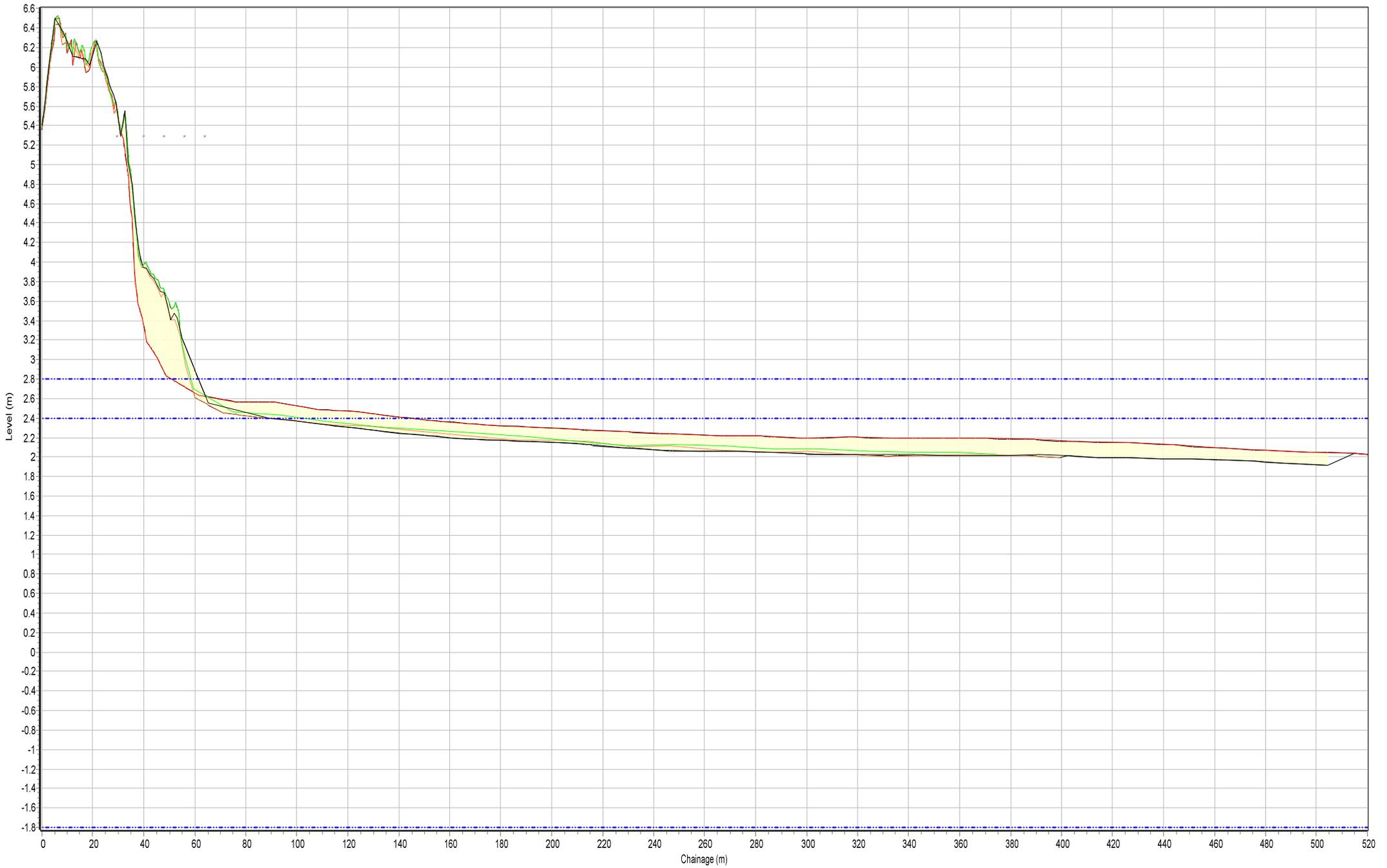
Easting: 412895.322 Northing: 641784.343 Profile Bearing: 122 ° from North



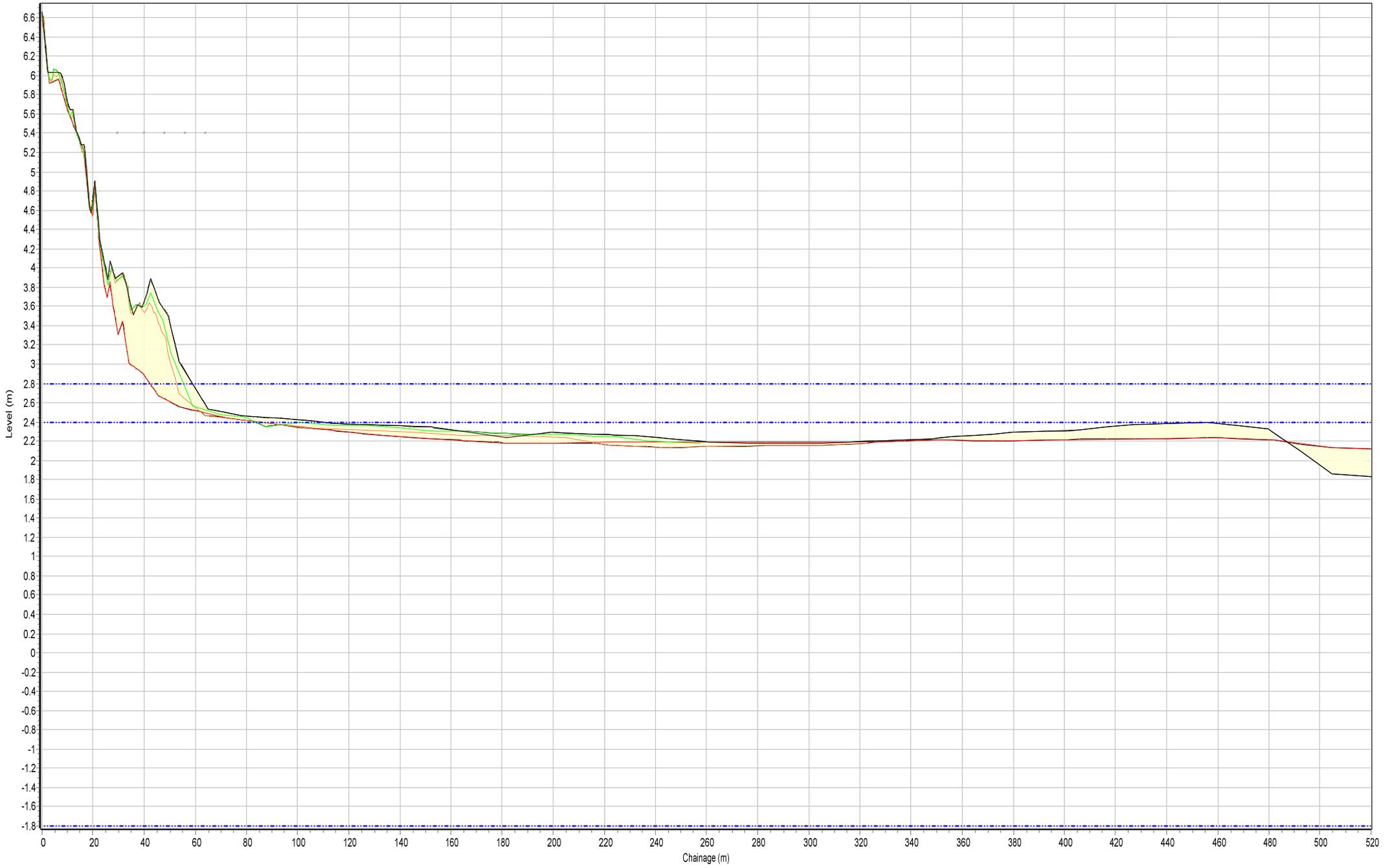




Beach Profiles: 1aBTC21

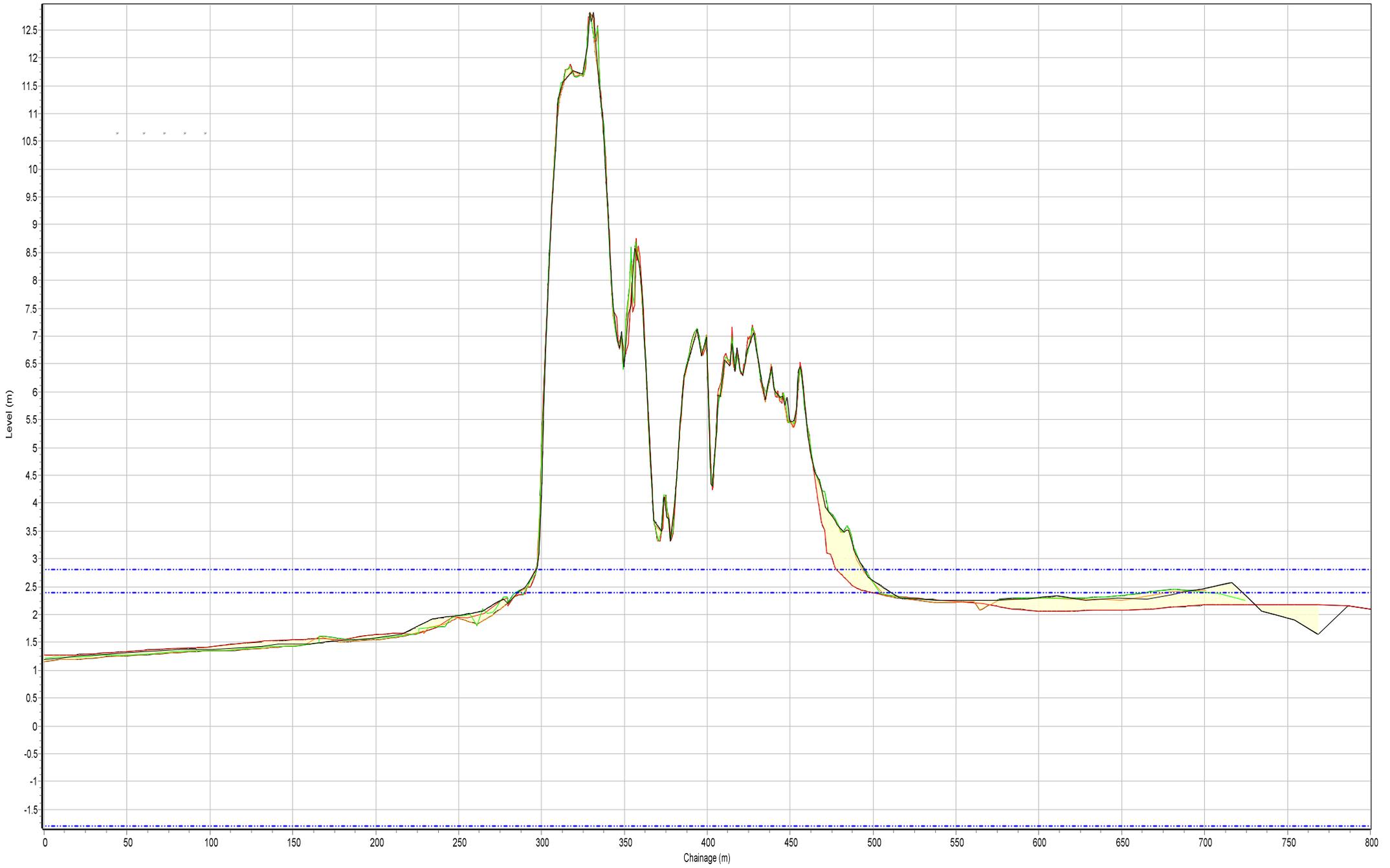


Beach Profiles: 1aBTBC22

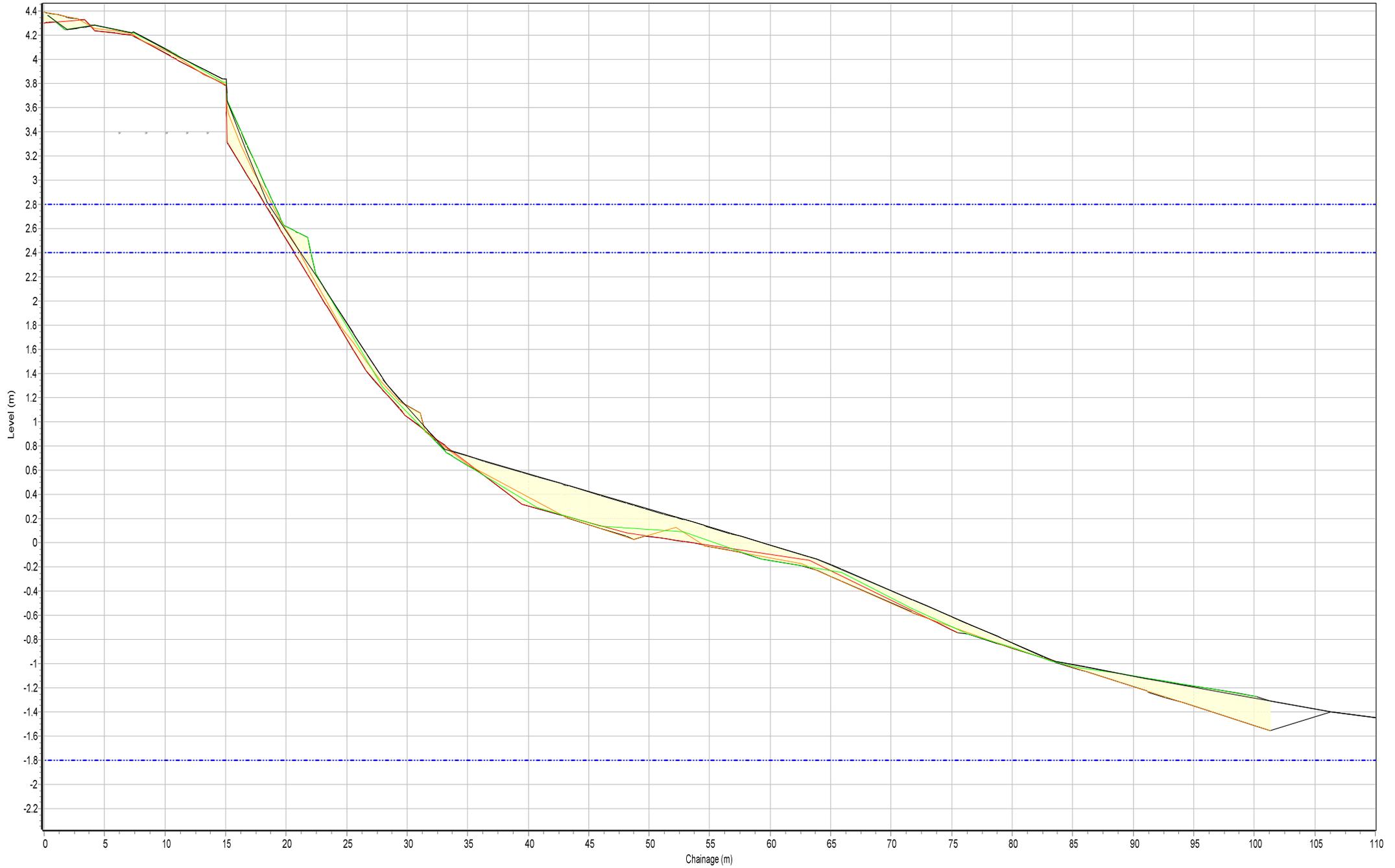


Profiles Envelope 01/10/2006 09/10/2017 25/11/2018 03/09/2019

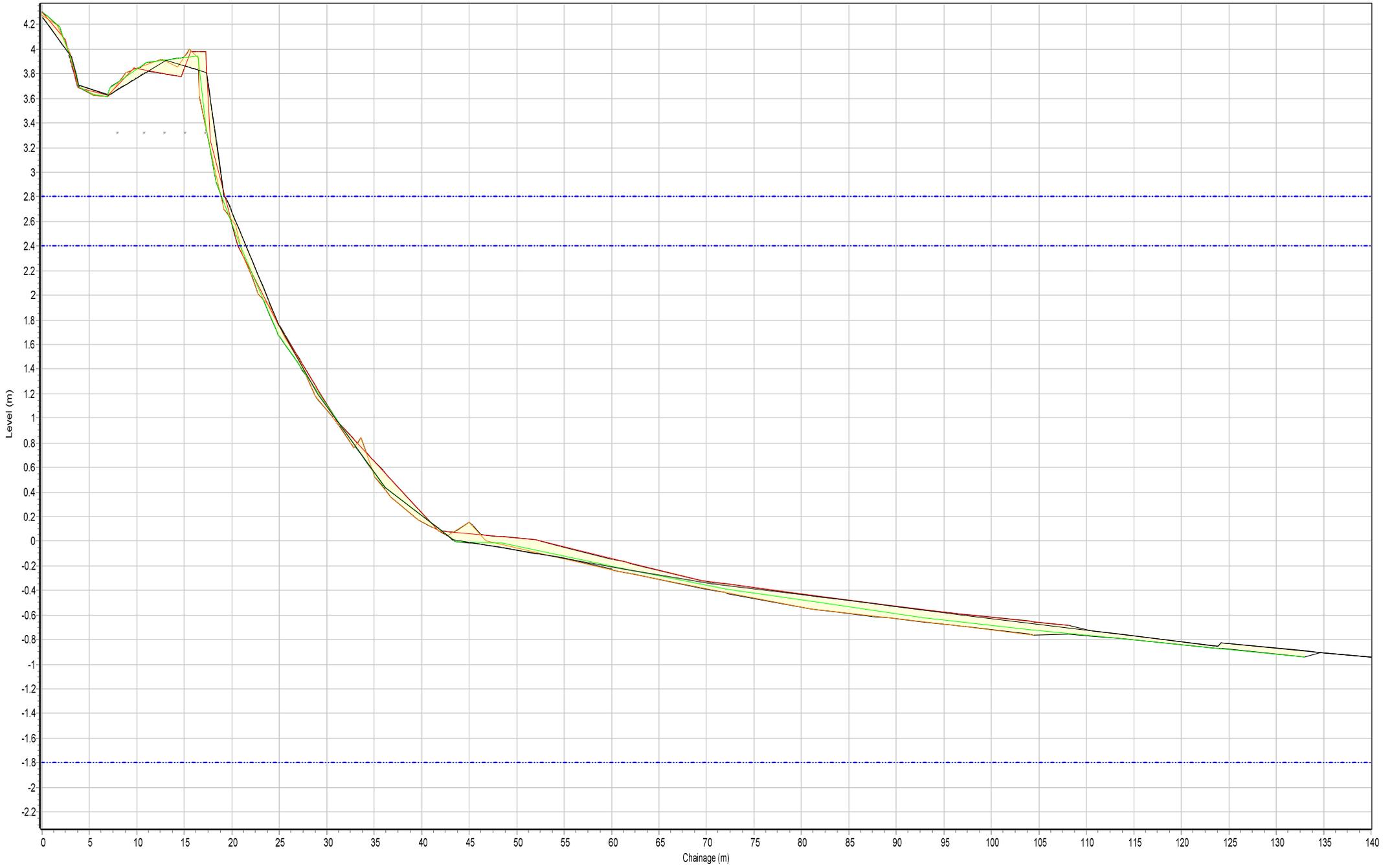
Beach Profiles: 1aBTBC23



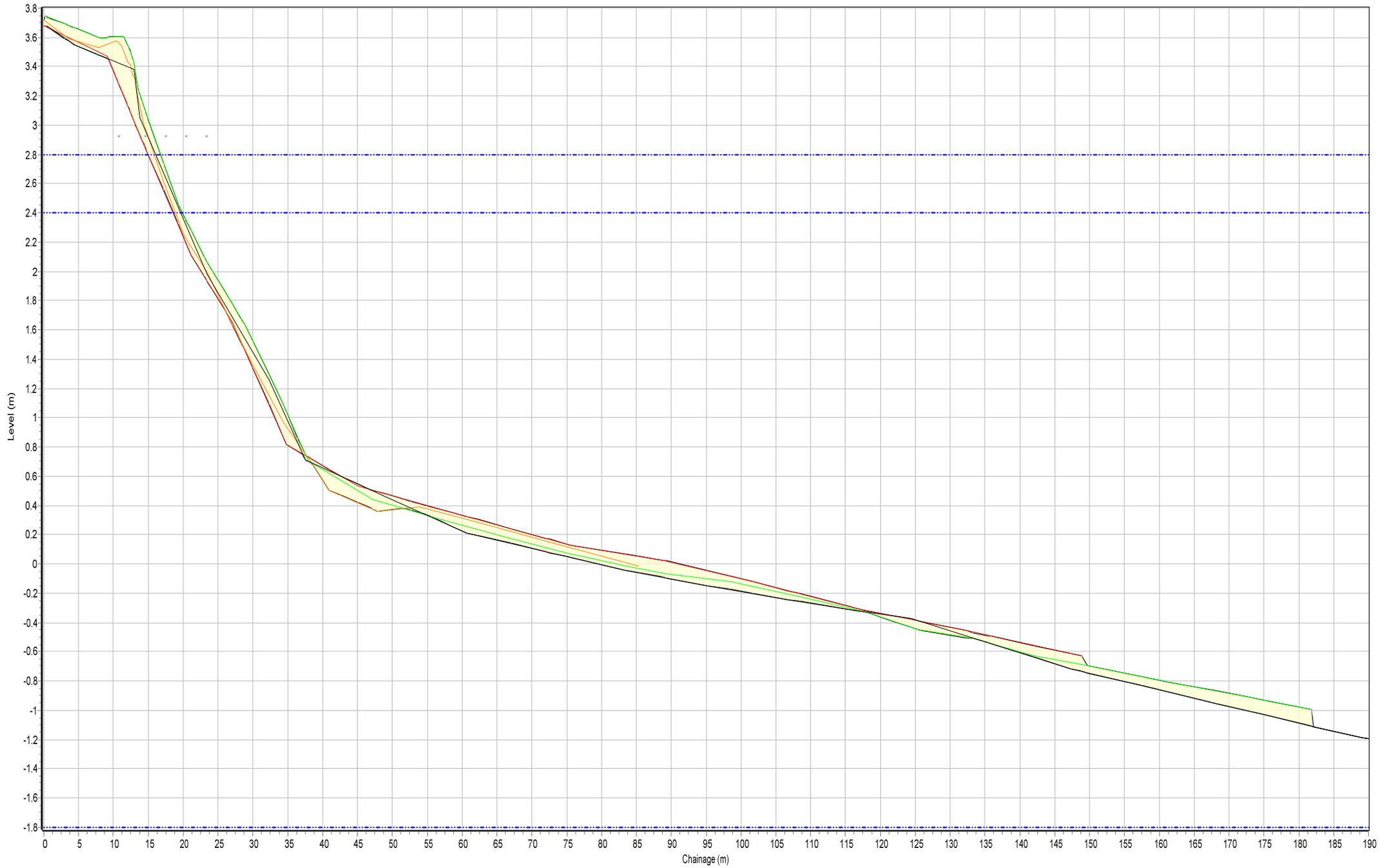
Beach Profiles: 1aBTBC24



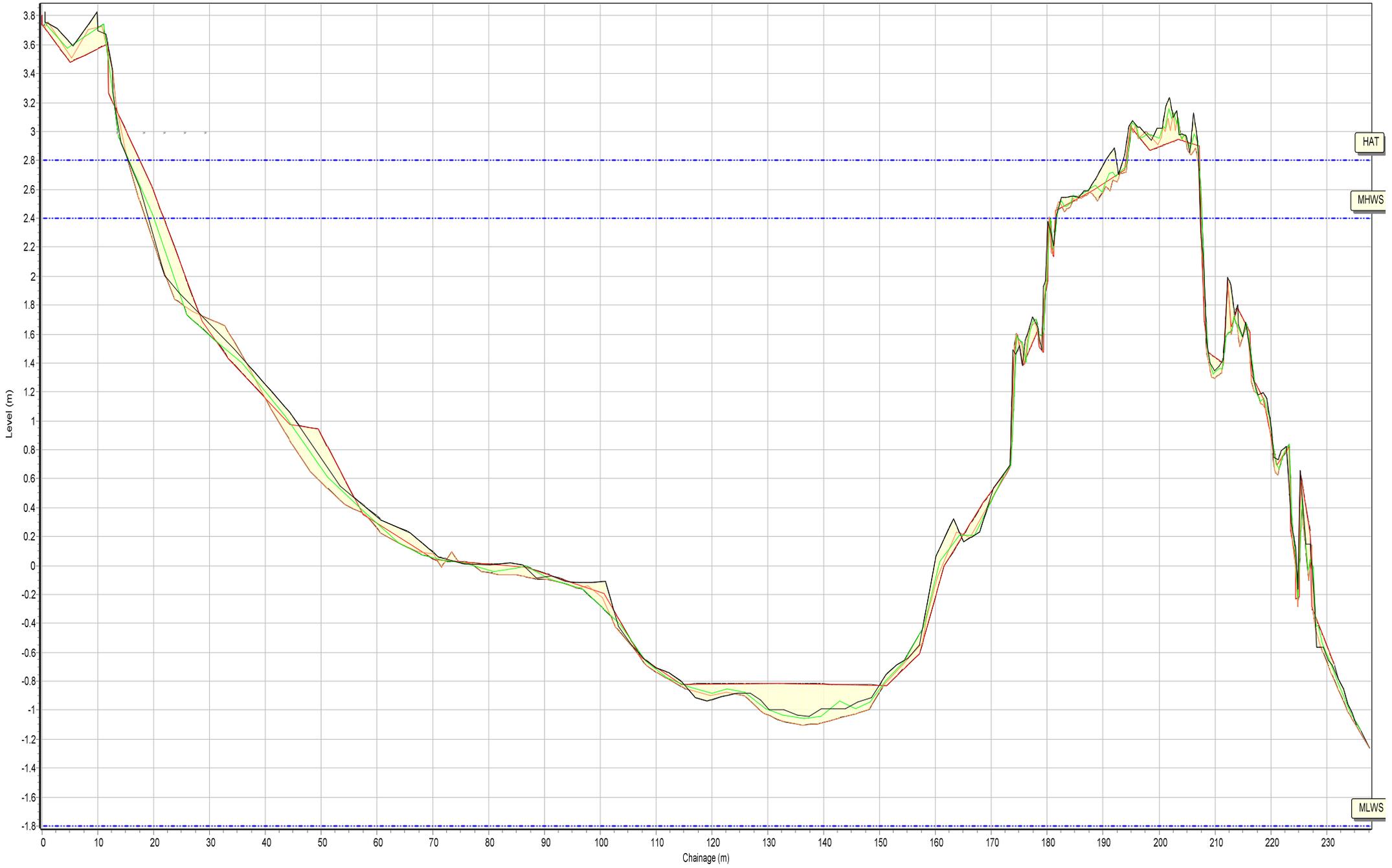
Beach Profiles: 1aBTBC25



Beach Profiles: 1aBTBC26



Beach Profiles: 1aBTC27



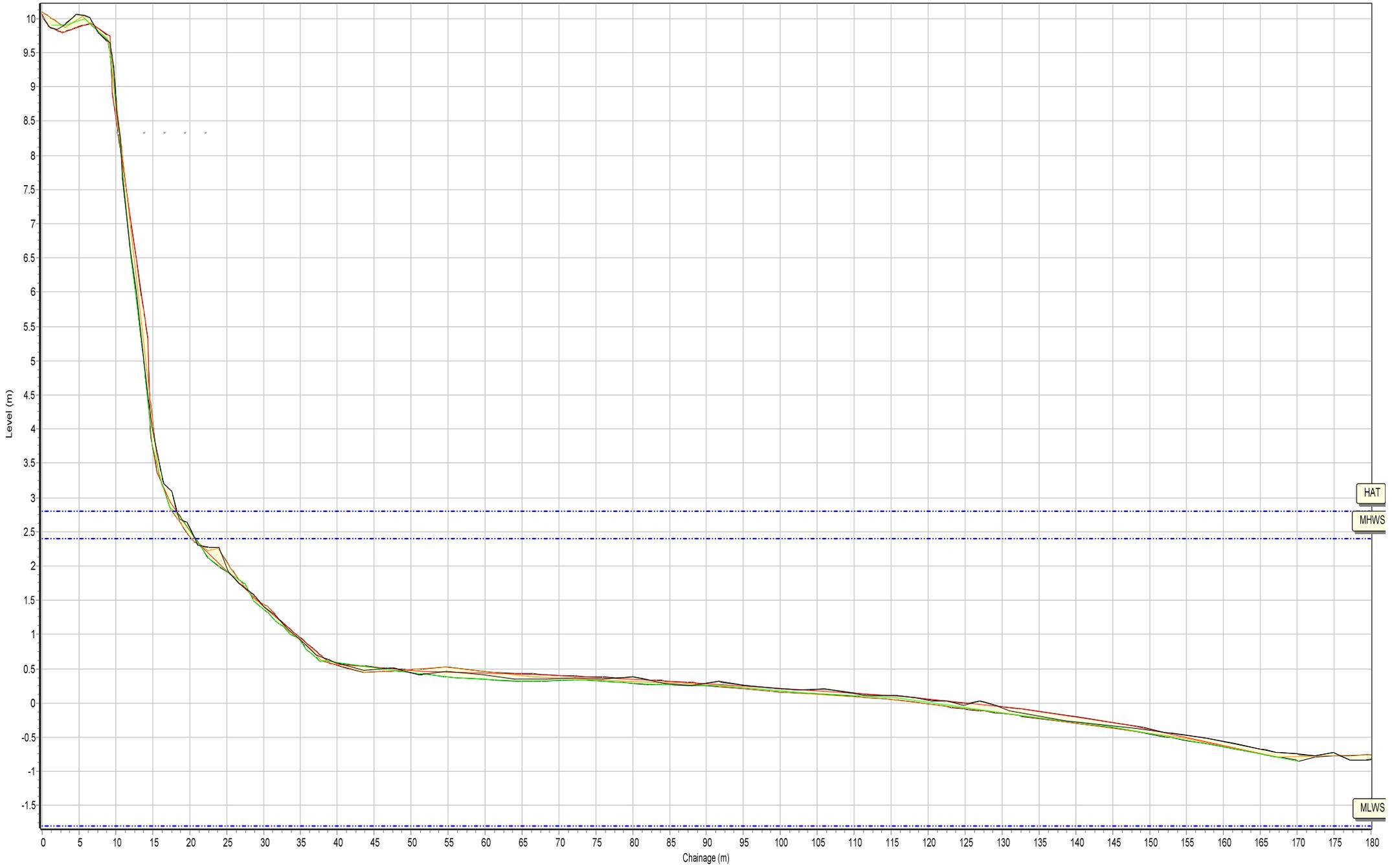
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC28



HAT

MHWS

MLWS

SANDS

# Beach Profile

Location: 1aBTBC29

Date: 03/09/2019 Inspector: AG

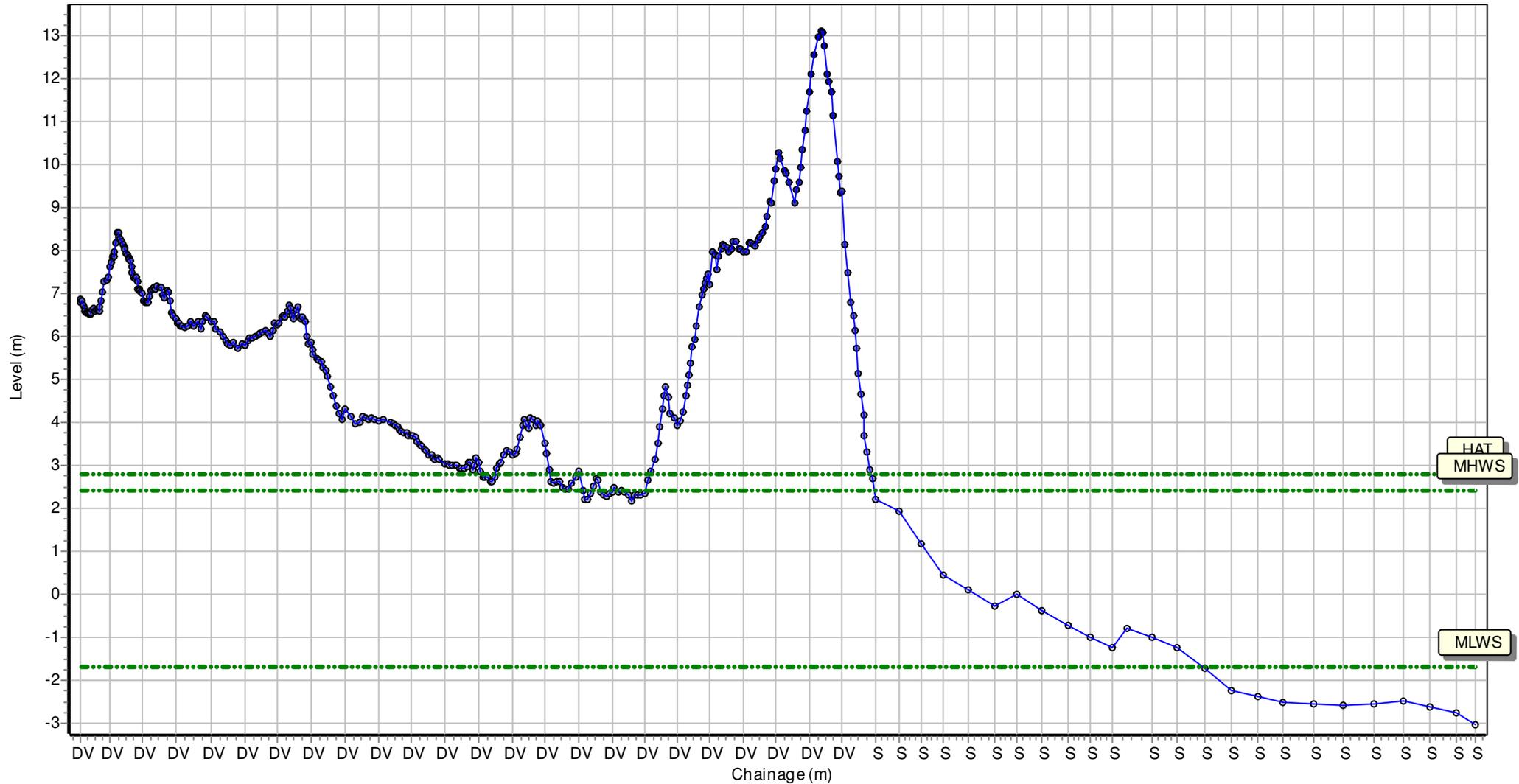
Low Tide: Low Tide Time:

Wind Sea State:

Visibility: Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 418972.296 Northing: 634628.46 Profile Bearing: 31 ° from North





# Beach Profile

Location: 1aBTBC31

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

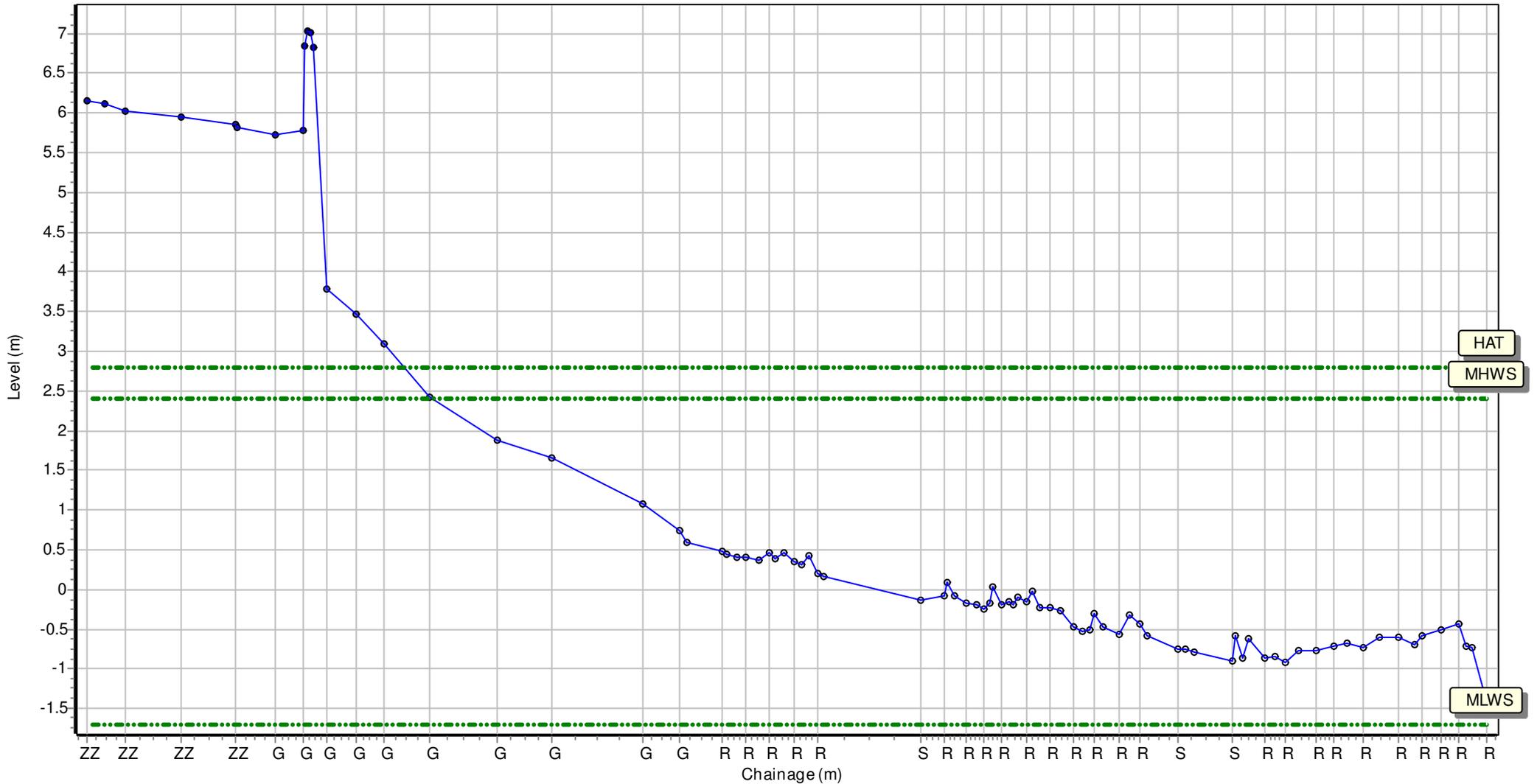
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423579.204 Northing: 628973.295 Profile Bearing: 56 ° from North



# Beach Profile

Location: 1aBTBC32

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

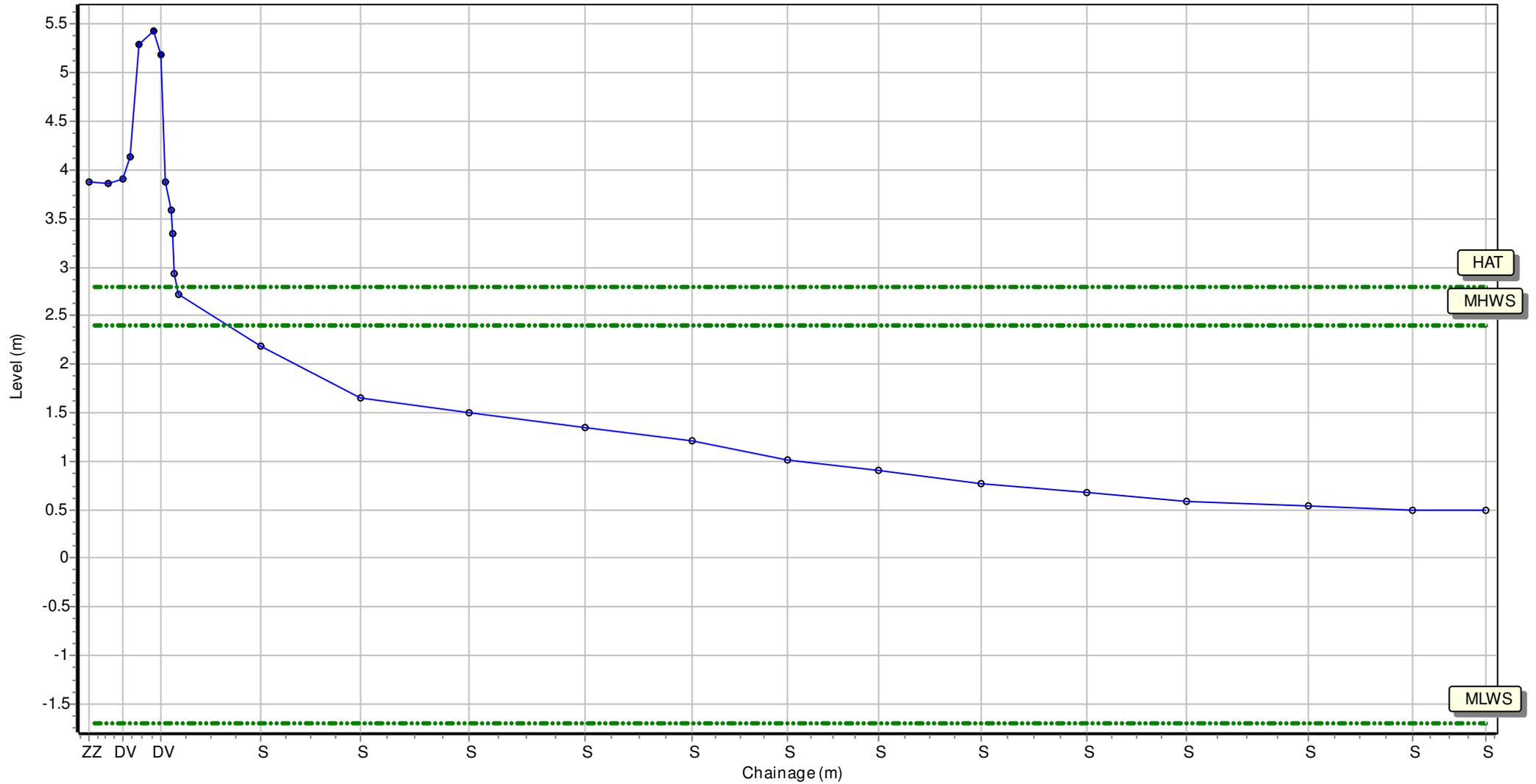
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423738.386 Northing: 628624.99 Profile Bearing: 279 ° from North



# Beach Profile

Location: 1aBTBC33

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

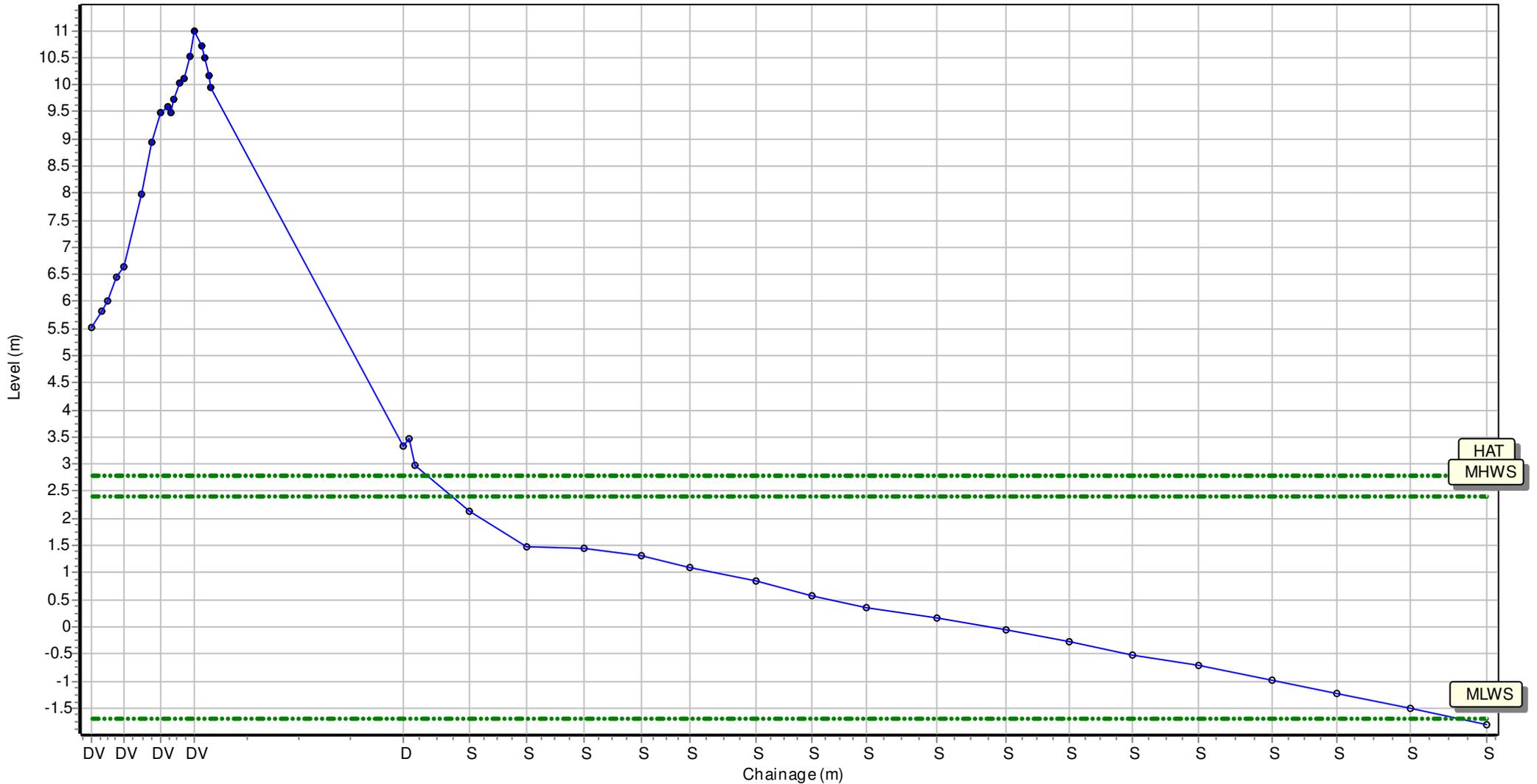
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423672.571 Northing: 628761.646 Profile Bearing: 204 ° from North



# Beach Profile

Location: 1aBTBC34

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

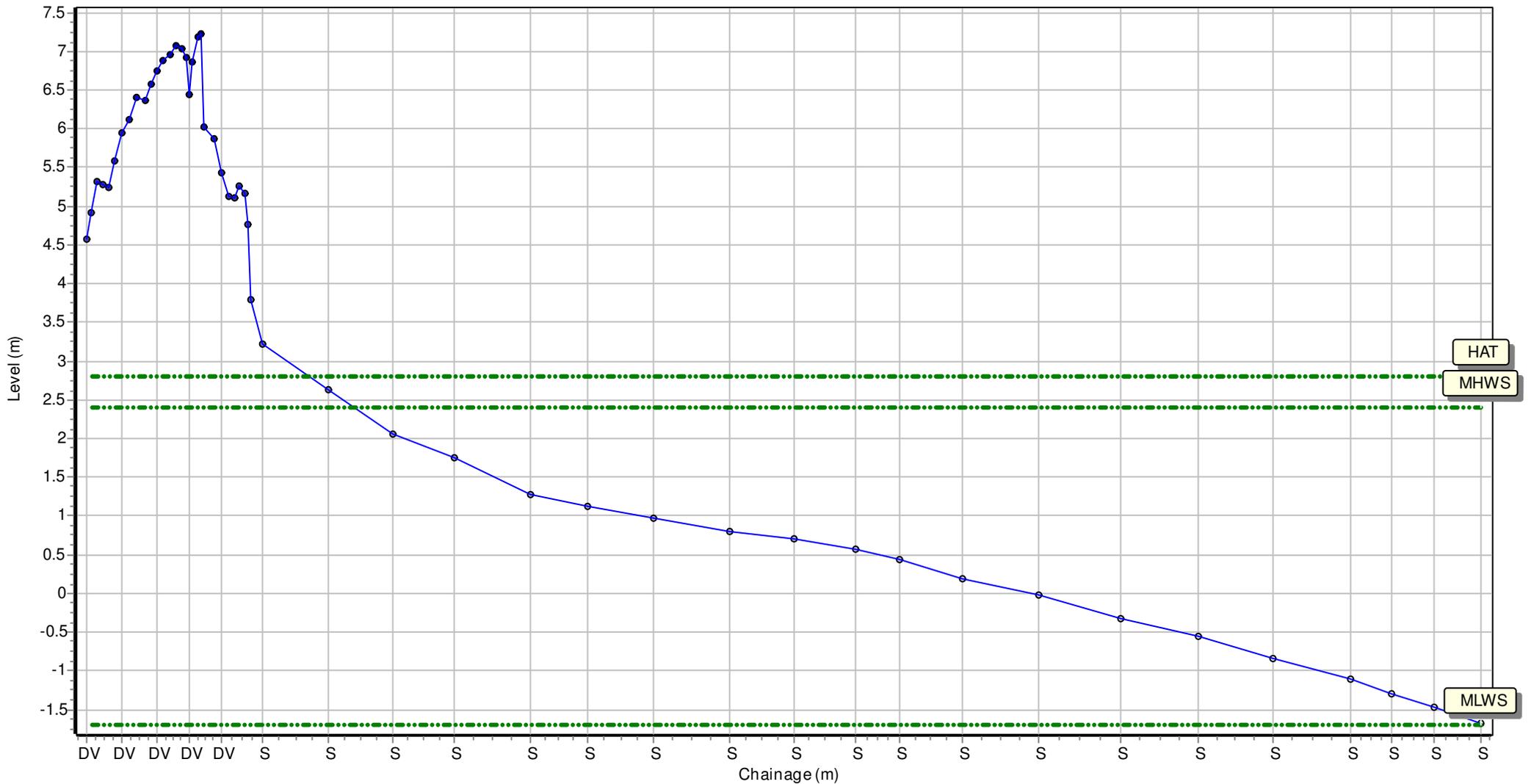
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423434.960 Northing: 628693.15 Profile Bearing: 160 ° from North



# Beach Profile

Location: 1aBTBC35

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

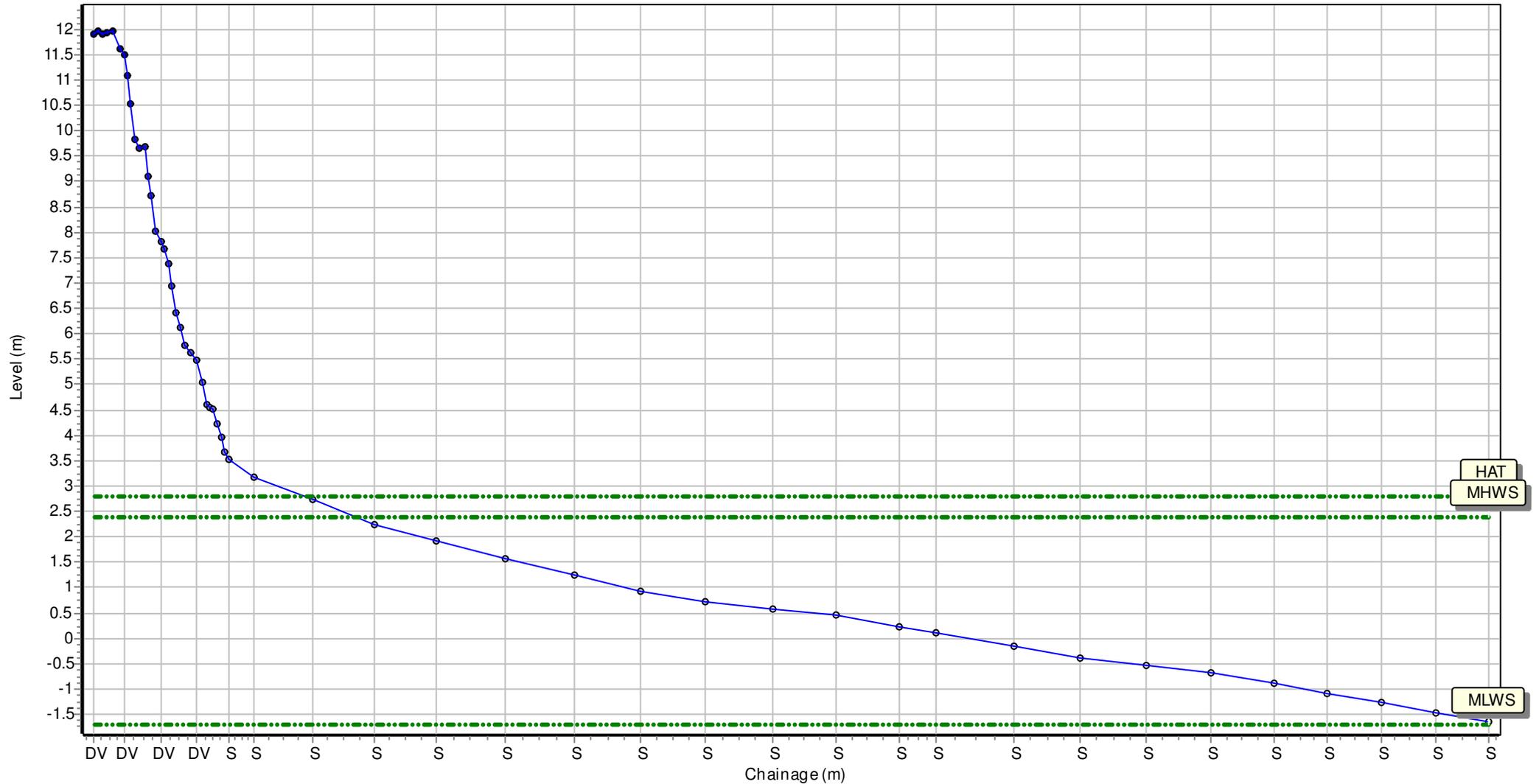
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423171.083 Northing: 628414.273 Profile Bearing: 105 ° from North



# Beach Profile

Location: 1aBTBC36

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

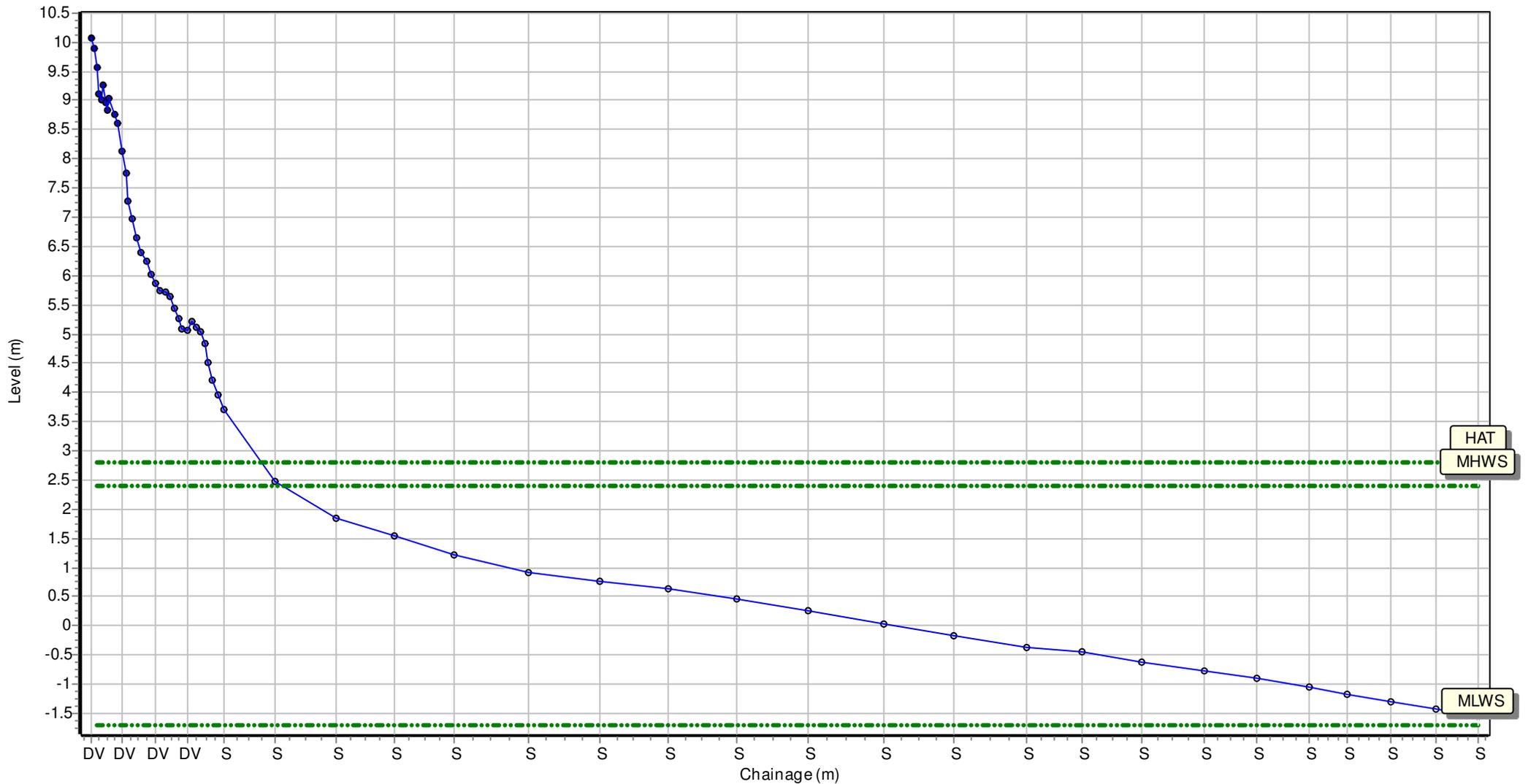
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423094.516 Northing: 628204.644 Profile Bearing: 106 ° from North



# Beach Profile

Location: 1aBTBC37

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

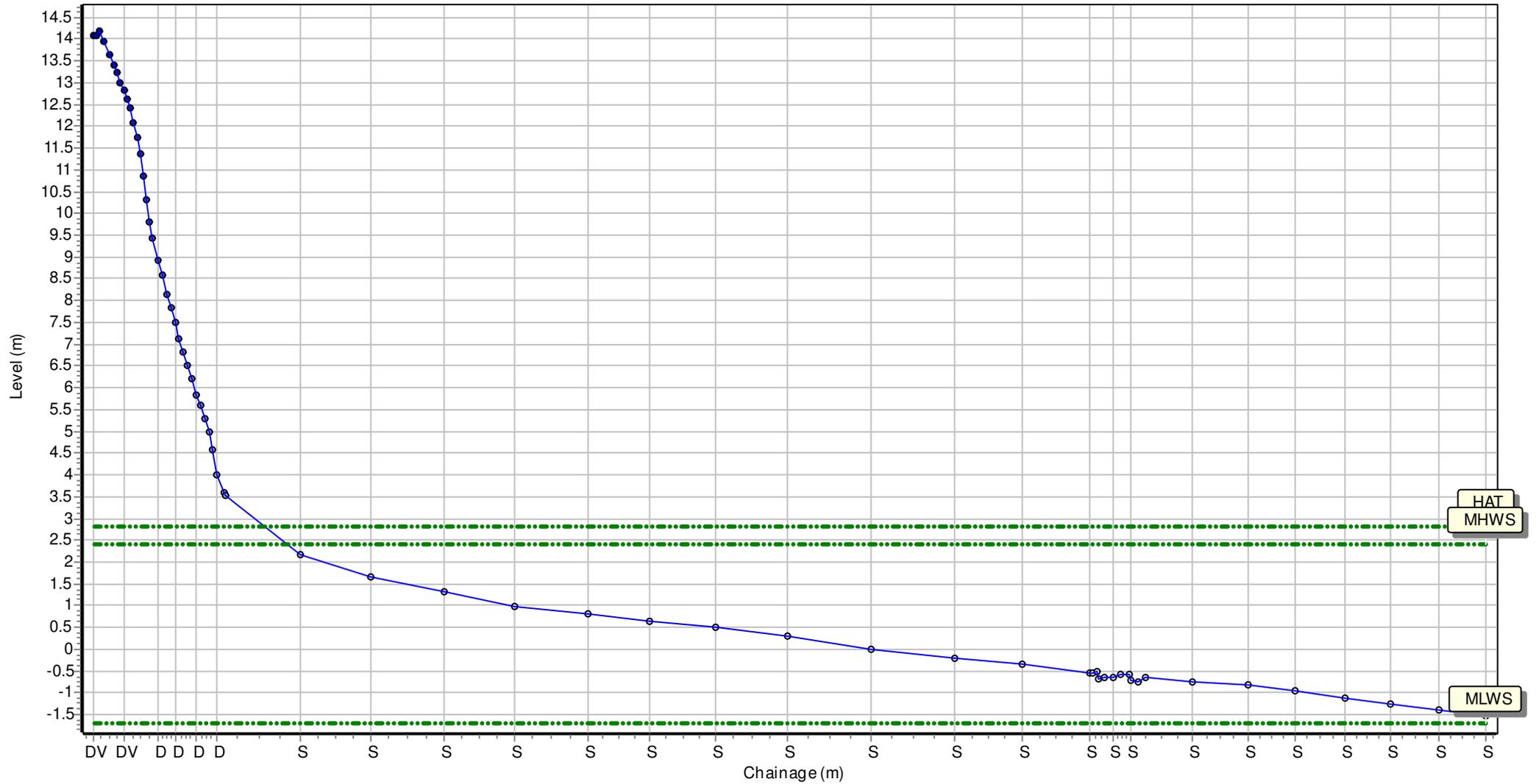
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423060.156 Northing: 628006.169 Profile Bearing: 96 ° from North



# Beach Profile

Location: 1aBTBC38

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

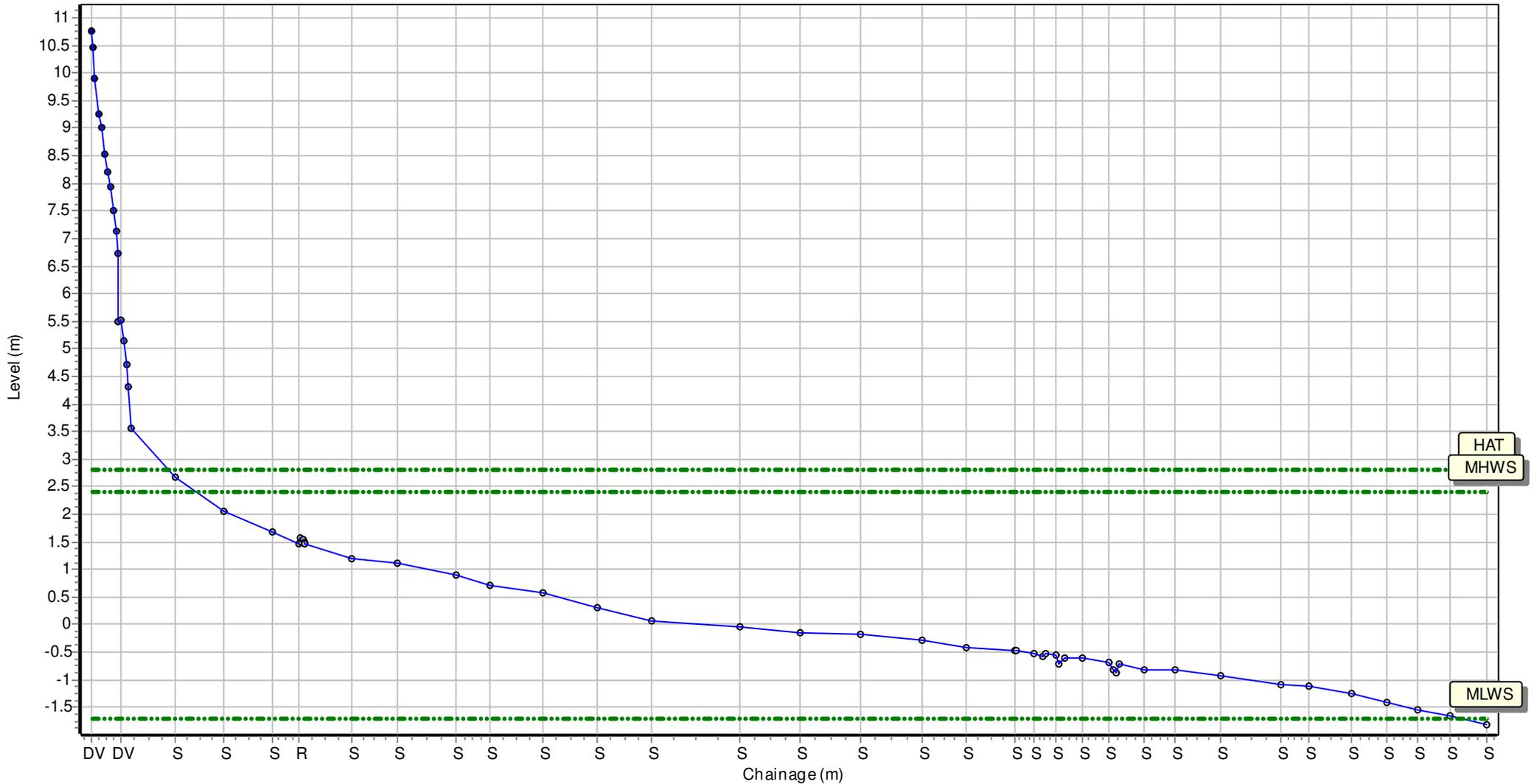
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423022.073 Northing: 627769.195 Profile Bearing: 92 ° from North



Beach Profiles: 1aBTBC29



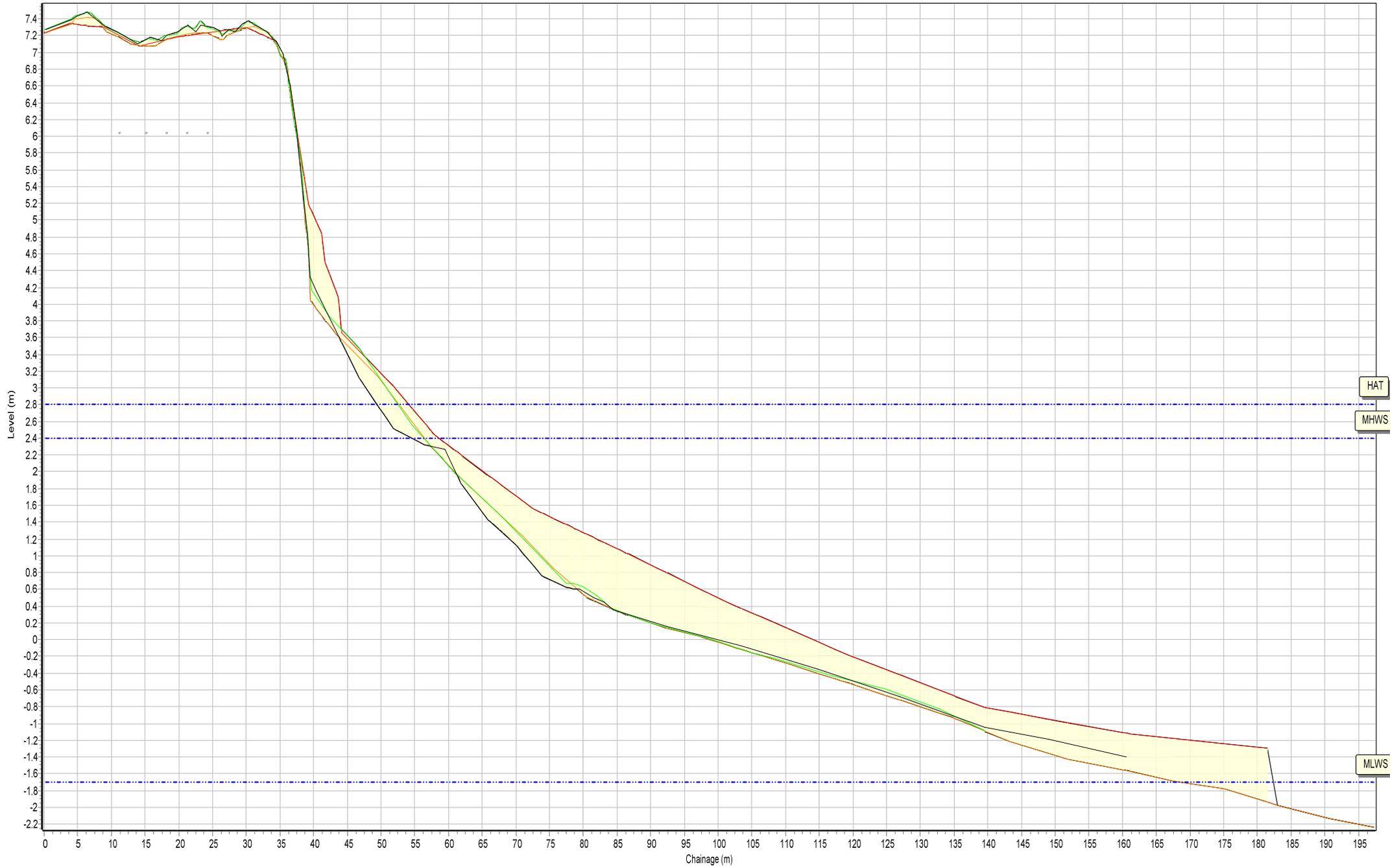
Profiles Envelope 01/10/2006 10/10/2017 10/12/2018 03/09/2019

HAT  
MLWS

MLWS

SANDS

# Beach Profiles: 1aBTC30



Profiles Envelope 01/10/2006 08/10/2017 10/12/2018 16/10/2019

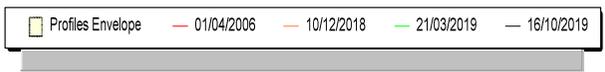
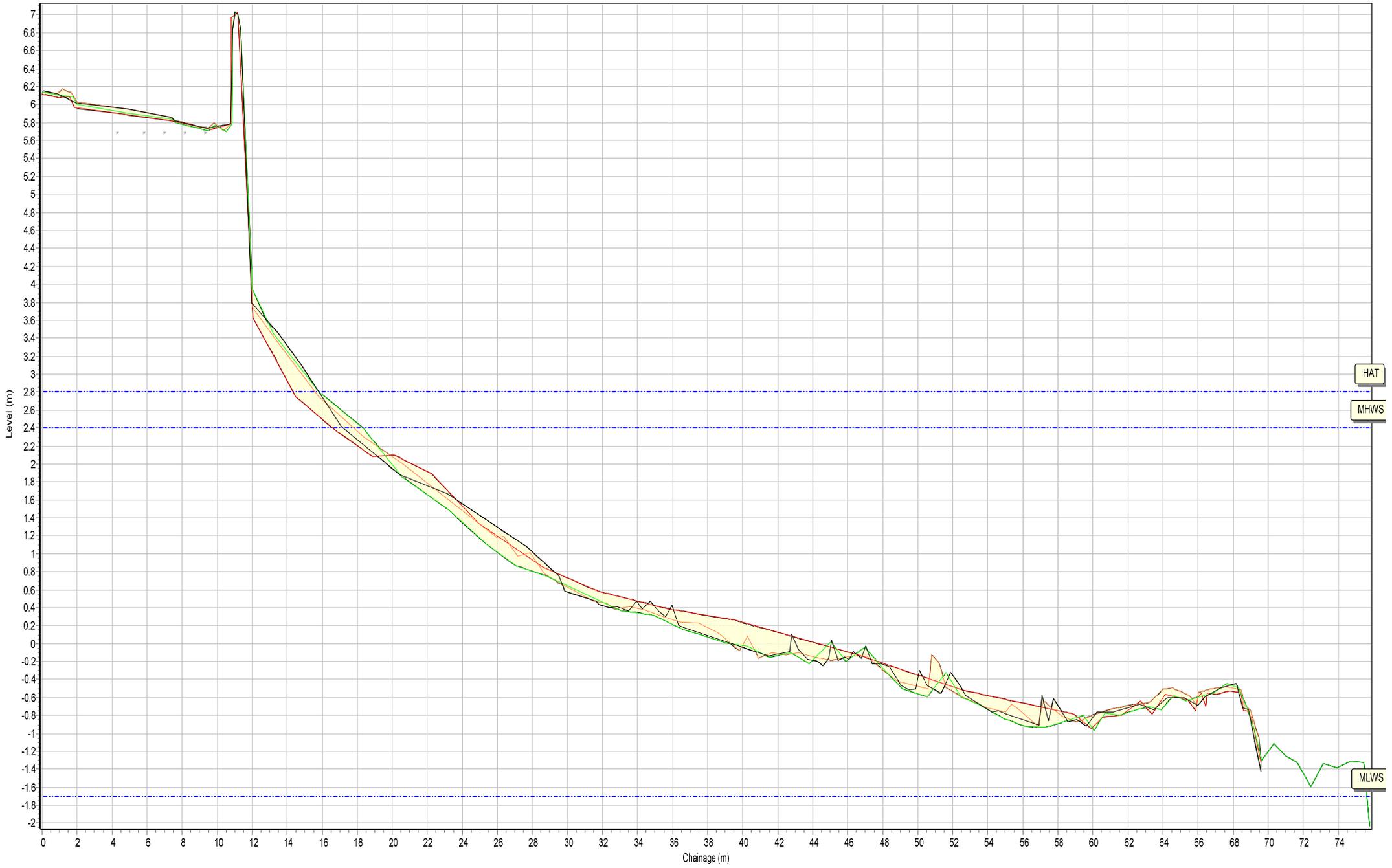
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC31



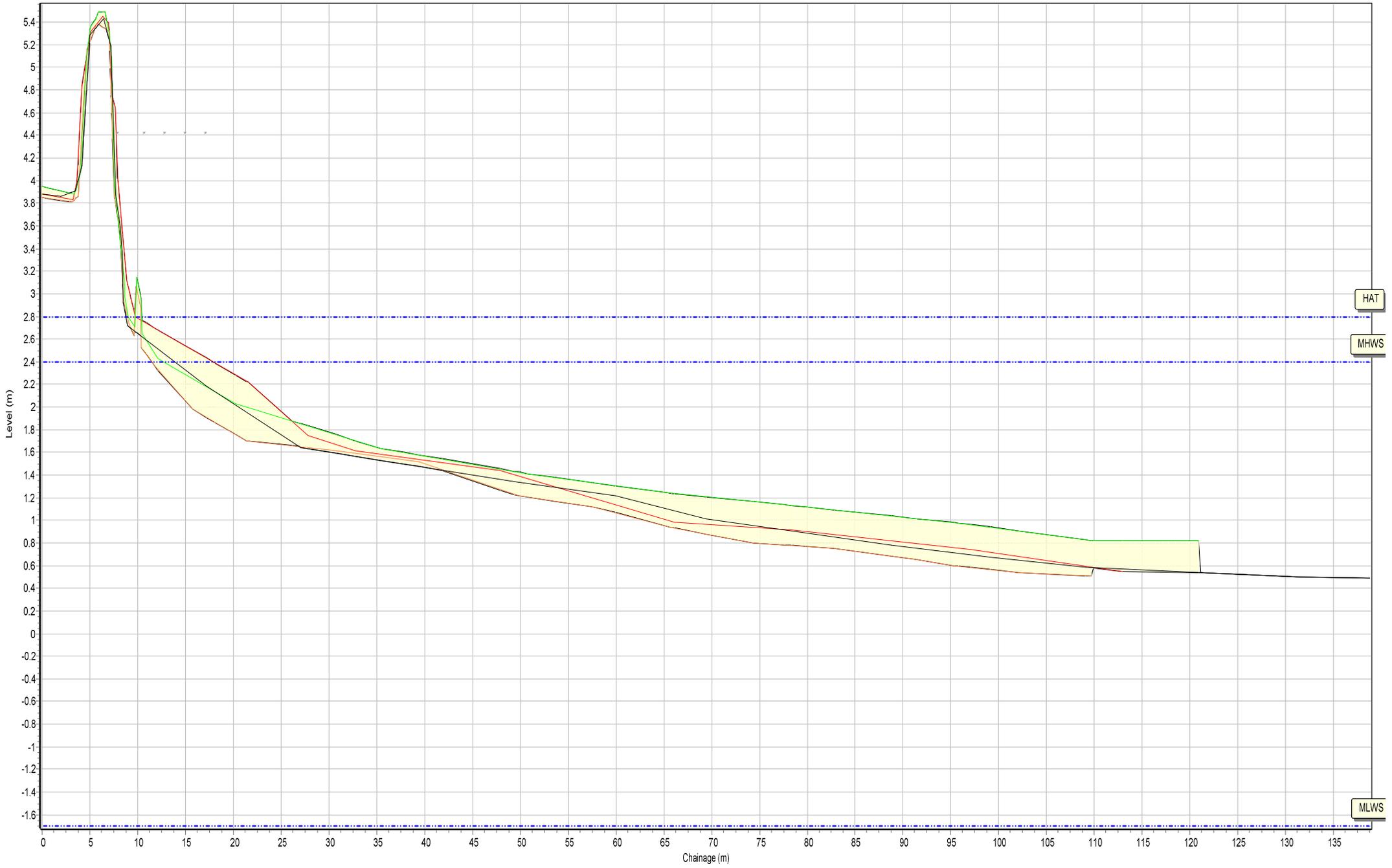
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC32



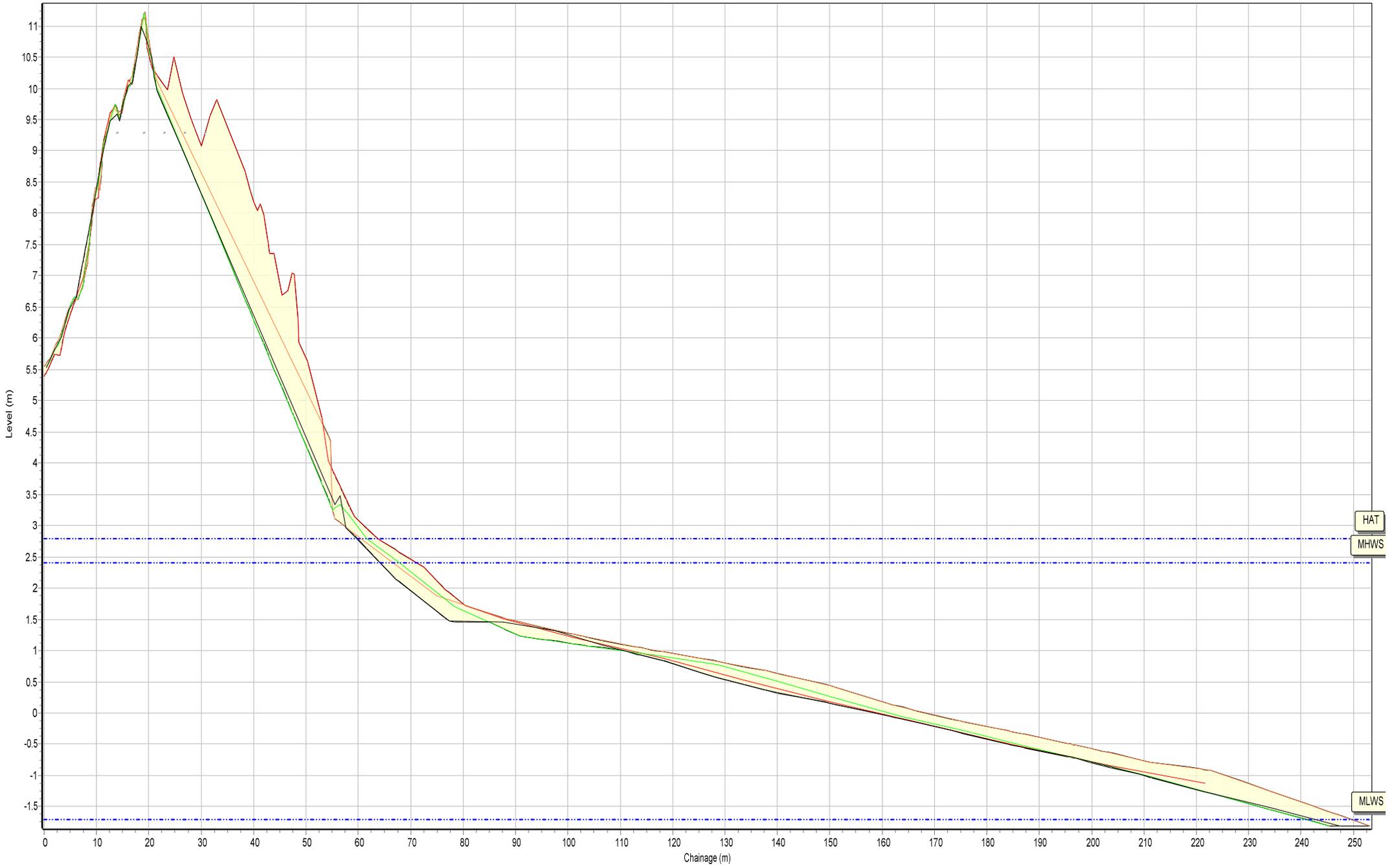
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC33



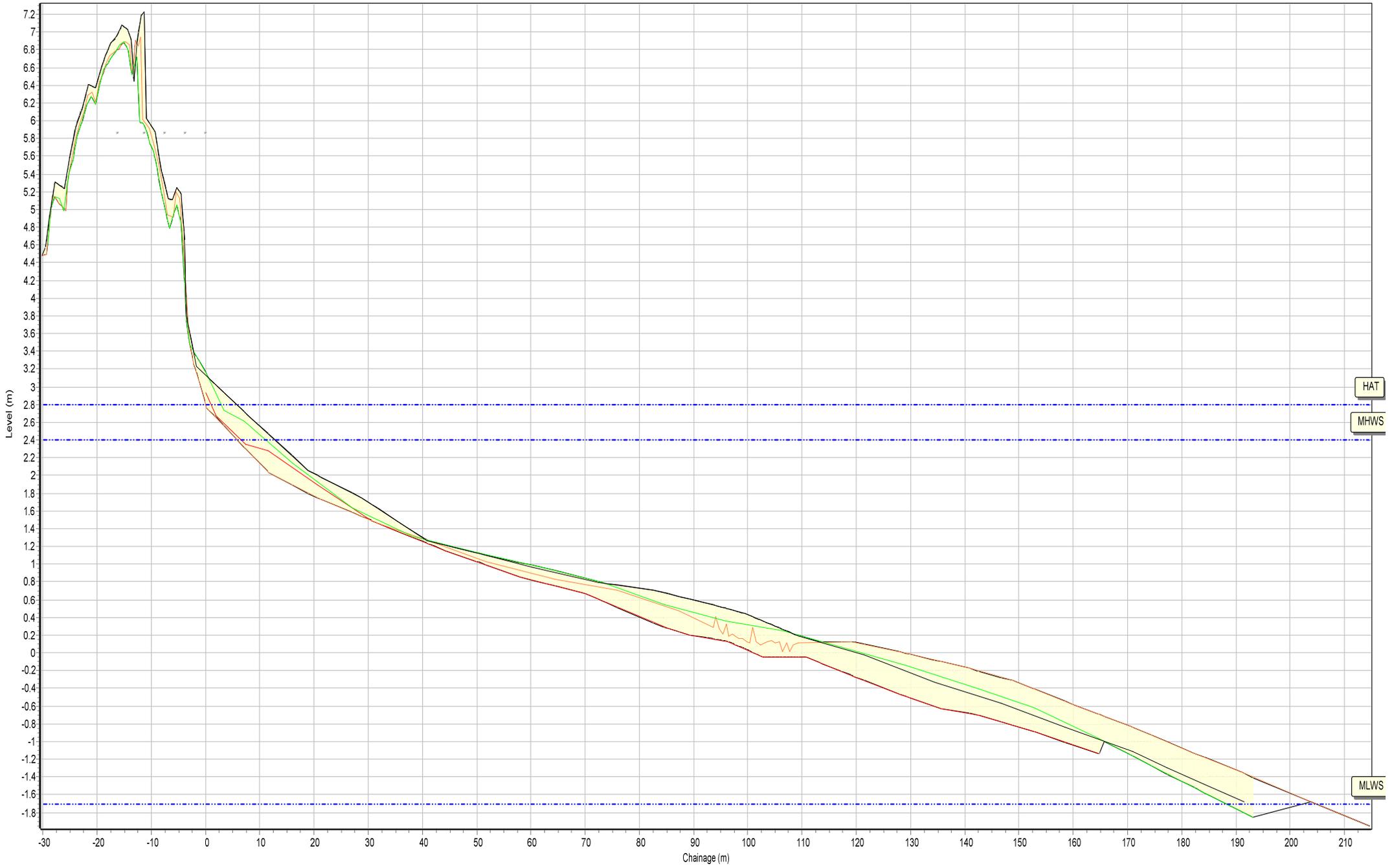
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC34



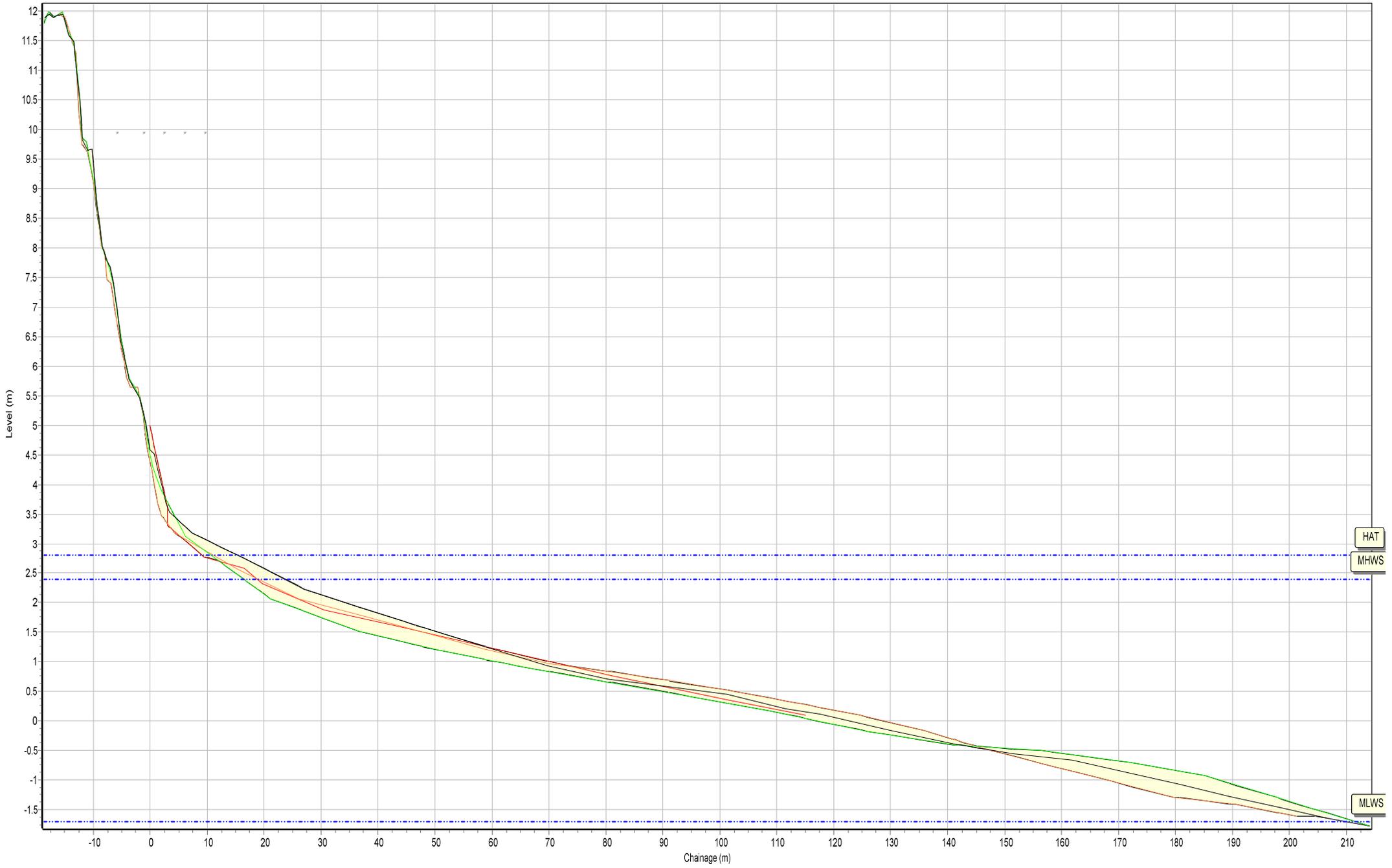
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC35



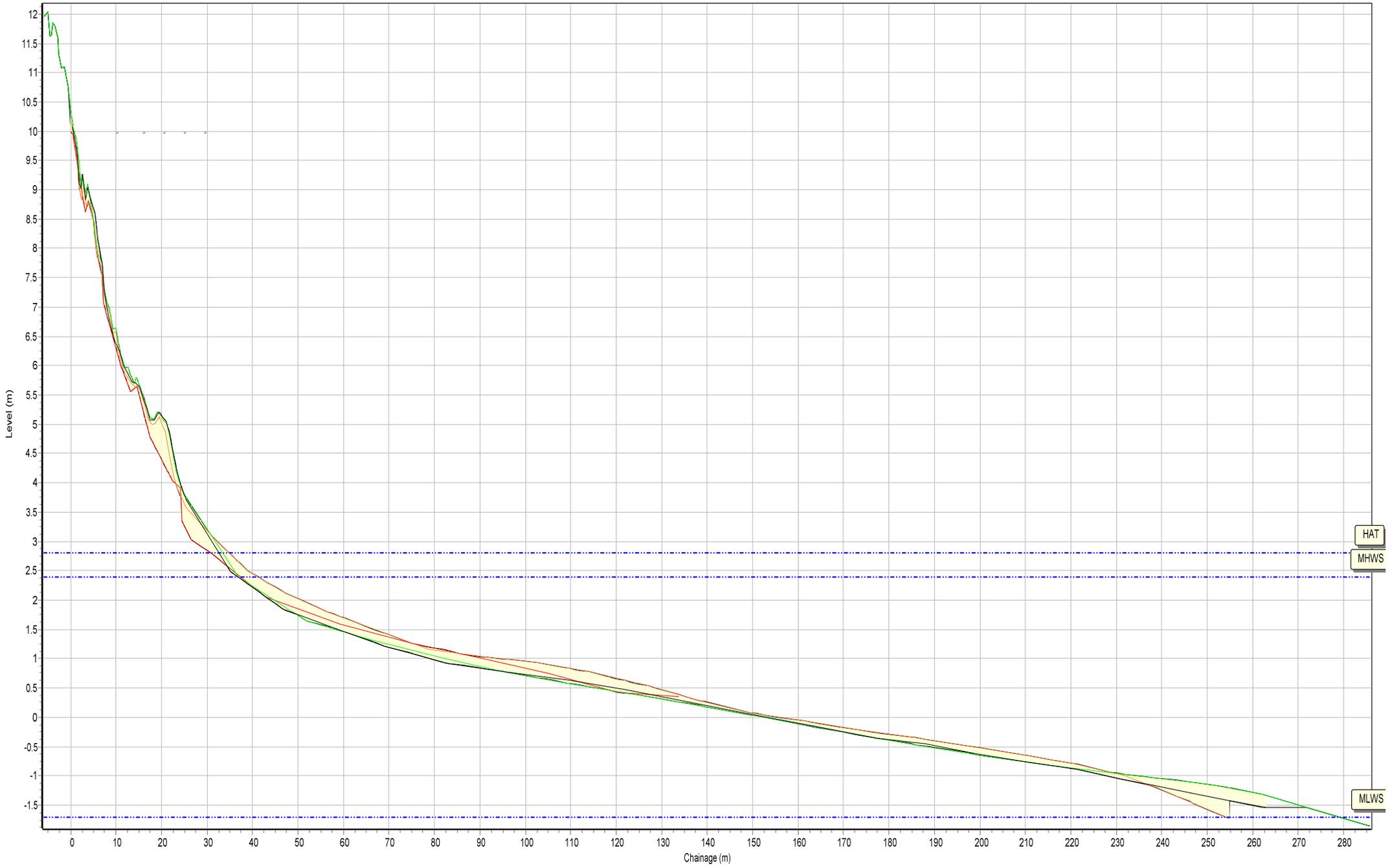
Profiles Envelope 01/10/2006 08/10/2017 07/12/2018 16/10/2019

HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1aBTC36



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC37

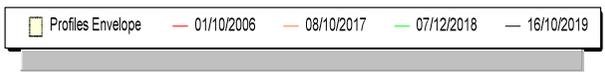
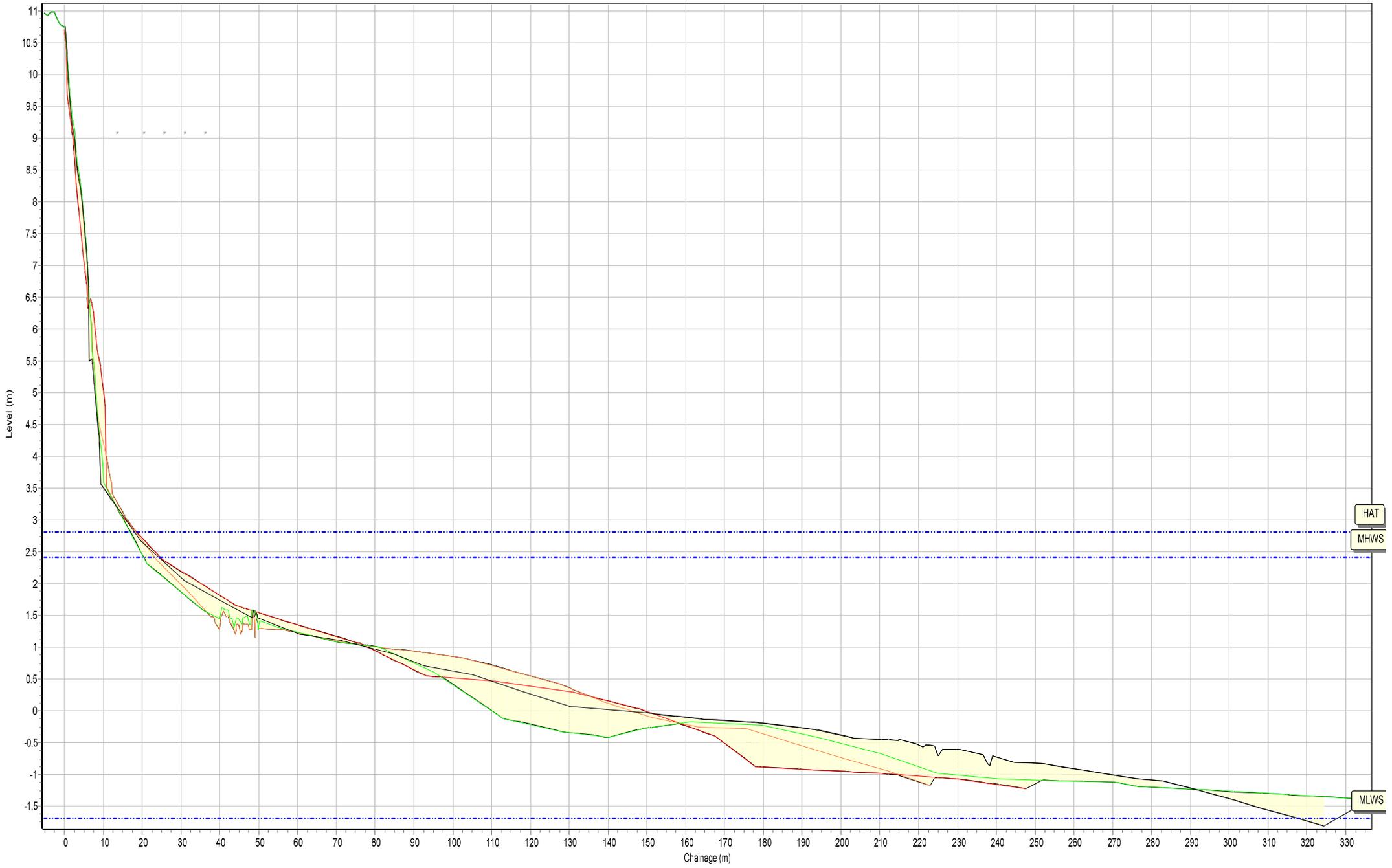


HAT  
MHWS

MLWS

SANDS

# Beach Profiles: 1aBTC38



HAT

MHWS

MLWS

SANDS

# Beach Profile

Location: 1aADC01

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 422824.294 Northing: 627077.805 Profile Bearing: 77 ° from North



# Beach Profile

Location: 1aADC02

Date: 16/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

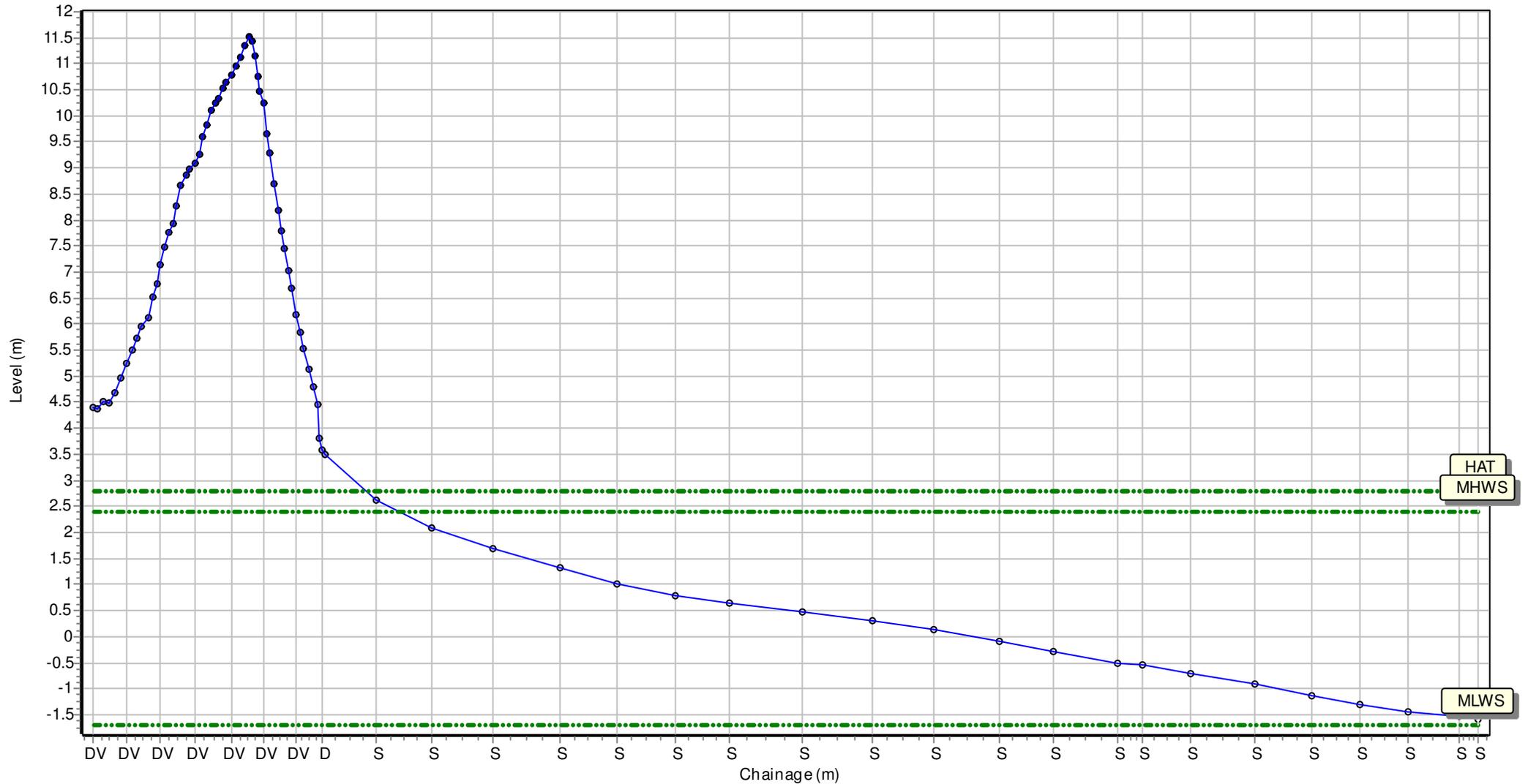
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 423387.925 Northing: 626385.049 Profile Bearing: 56 ° from North



# Beach Profile

Location: 1aADC03

Date: 18/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

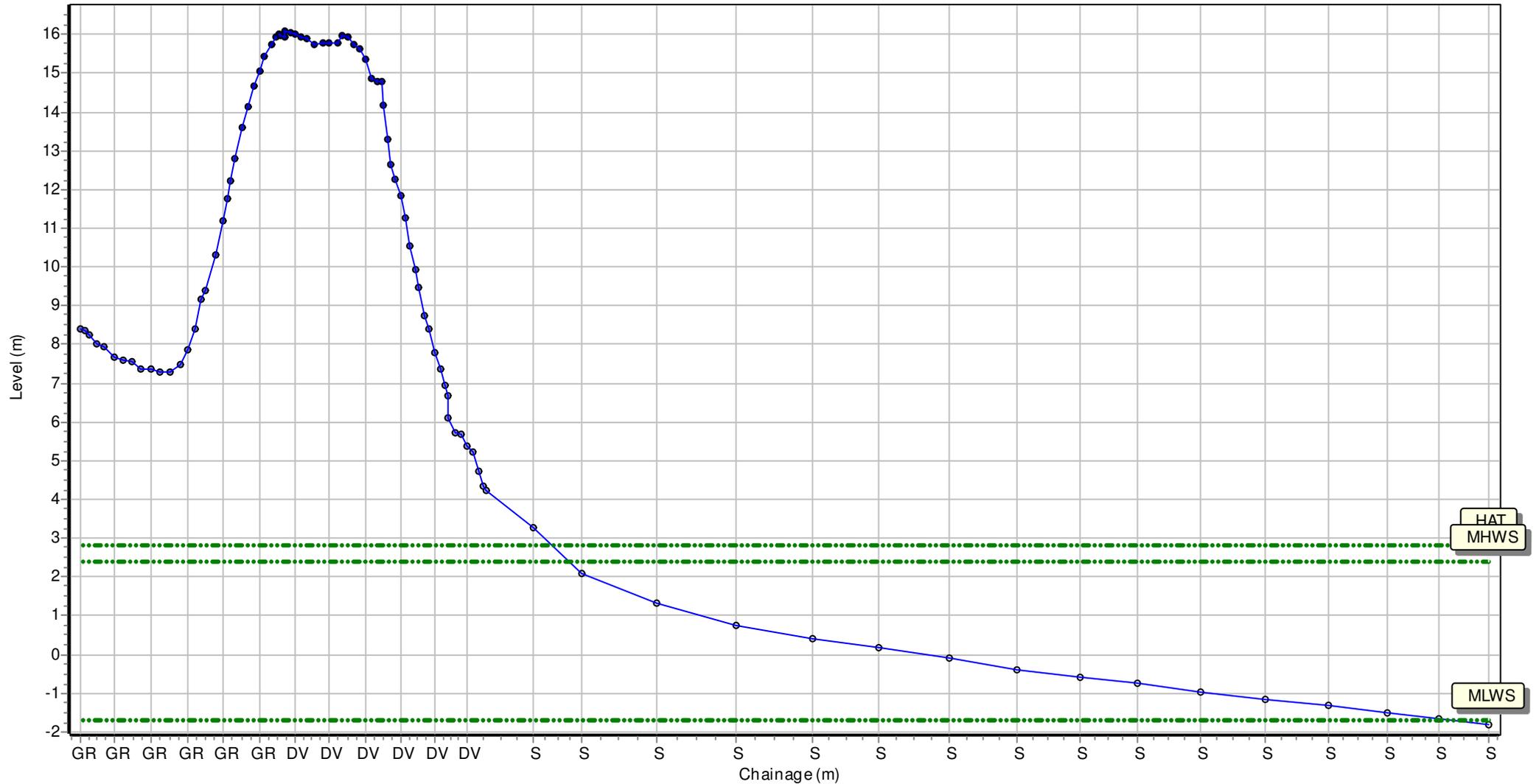
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 424282.669 Northing: 623628.714 Profile Bearing: 112 ° from North







# Beach Profile

Location: 1aADC04B

Date: 30/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

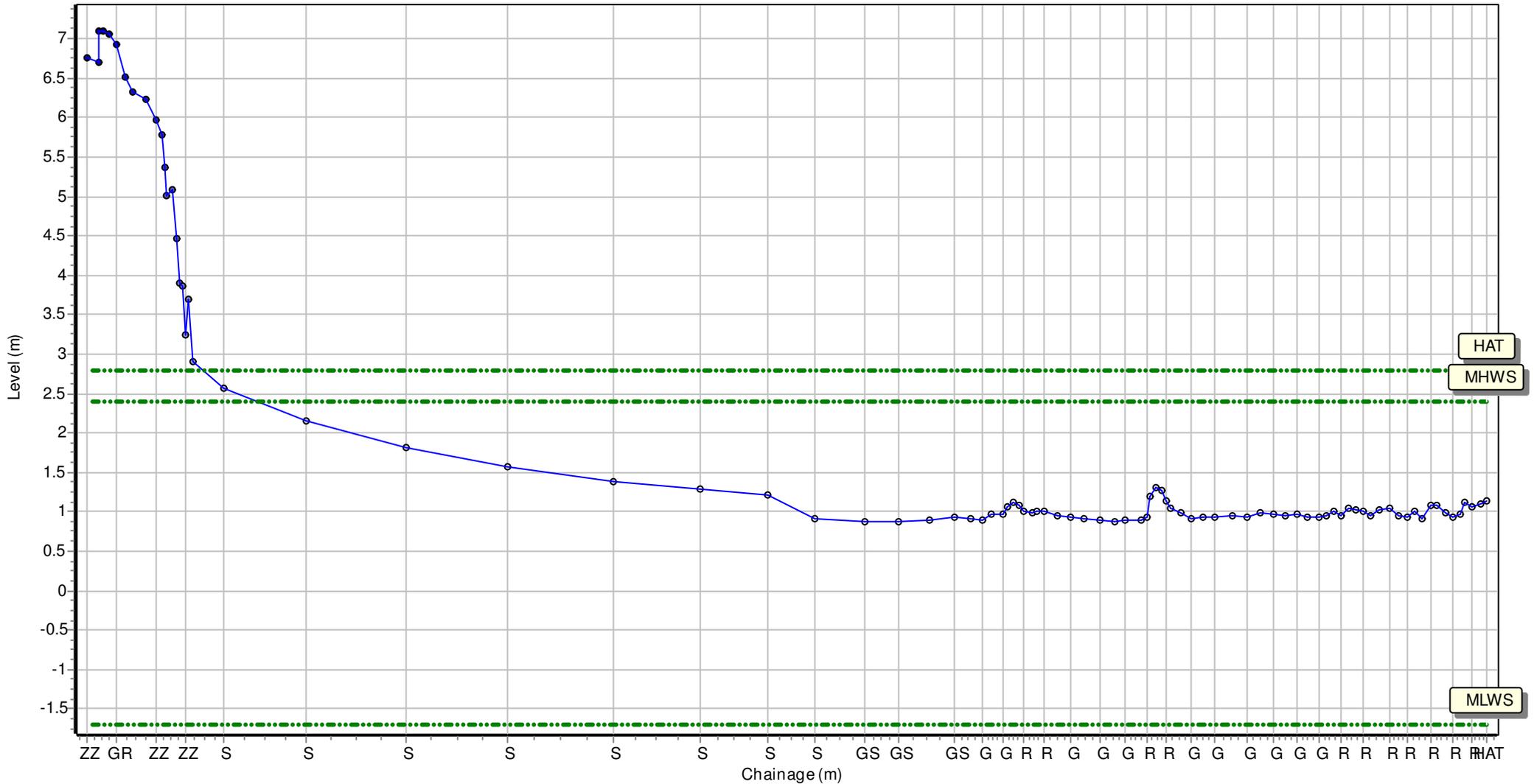
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 426641.642 Northing: 614193.793 Profile Bearing: 91 ° from North



# Beach Profile

Location: 1aADC05

Date: 30/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

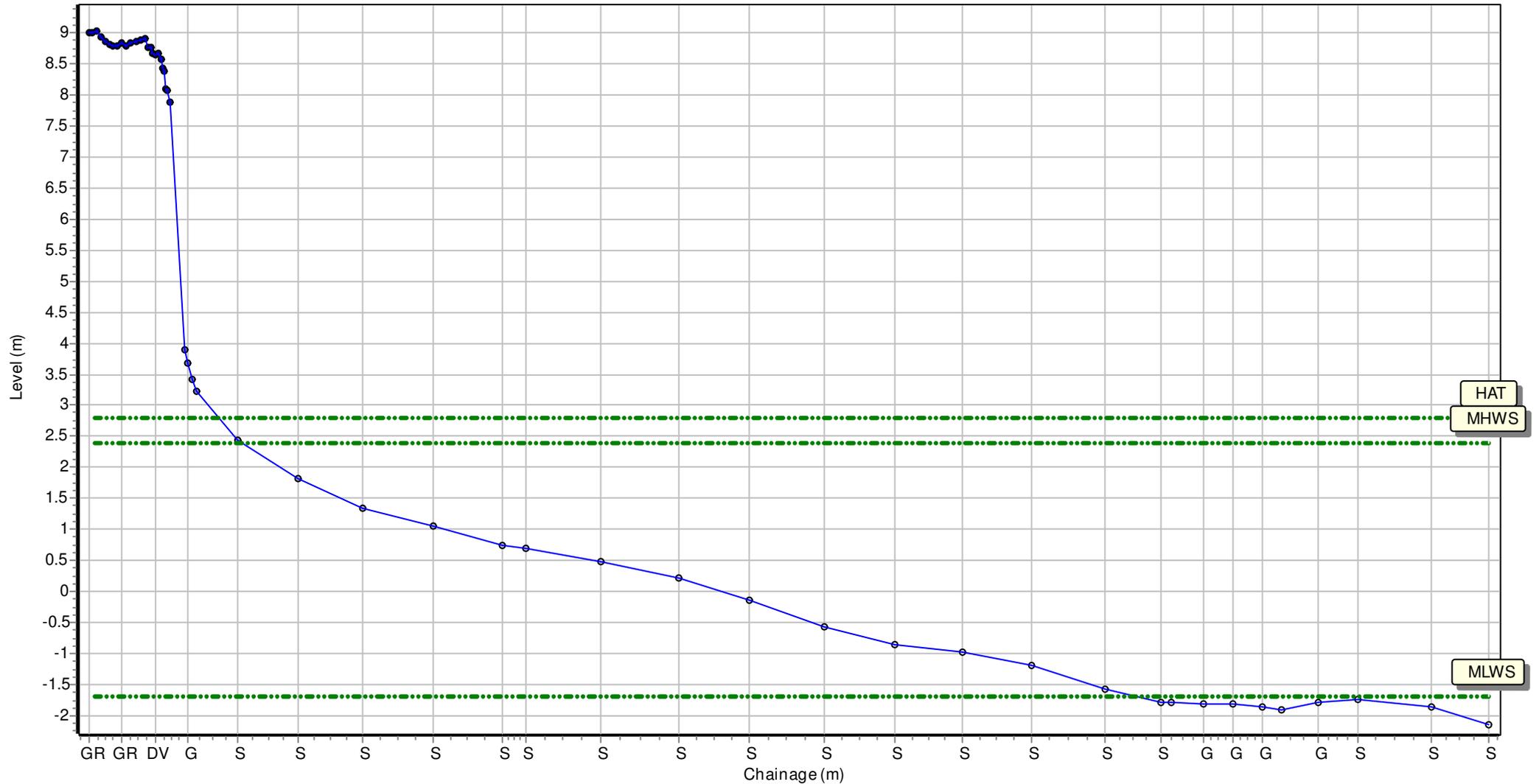
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 426185.186 Northing: 612543.216 Profile Bearing: 142 ° from North



# Beach Profile

Location: 1aADC06

Date: 30/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

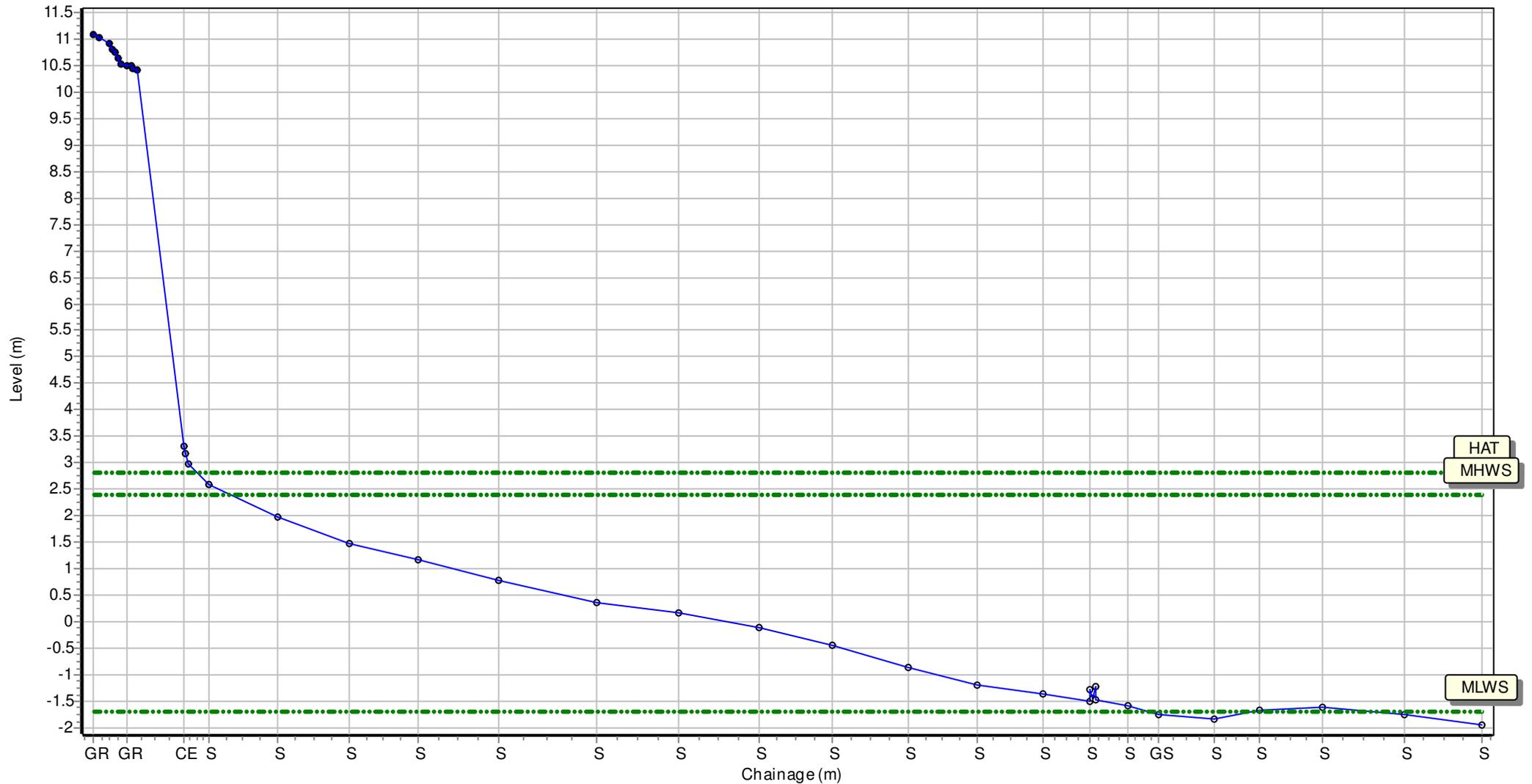
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 425950.4 Northing: 612302.499 Profile Bearing: 122 ° from North



# Beach Profile

Location: 1aADC07

Date: 30/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

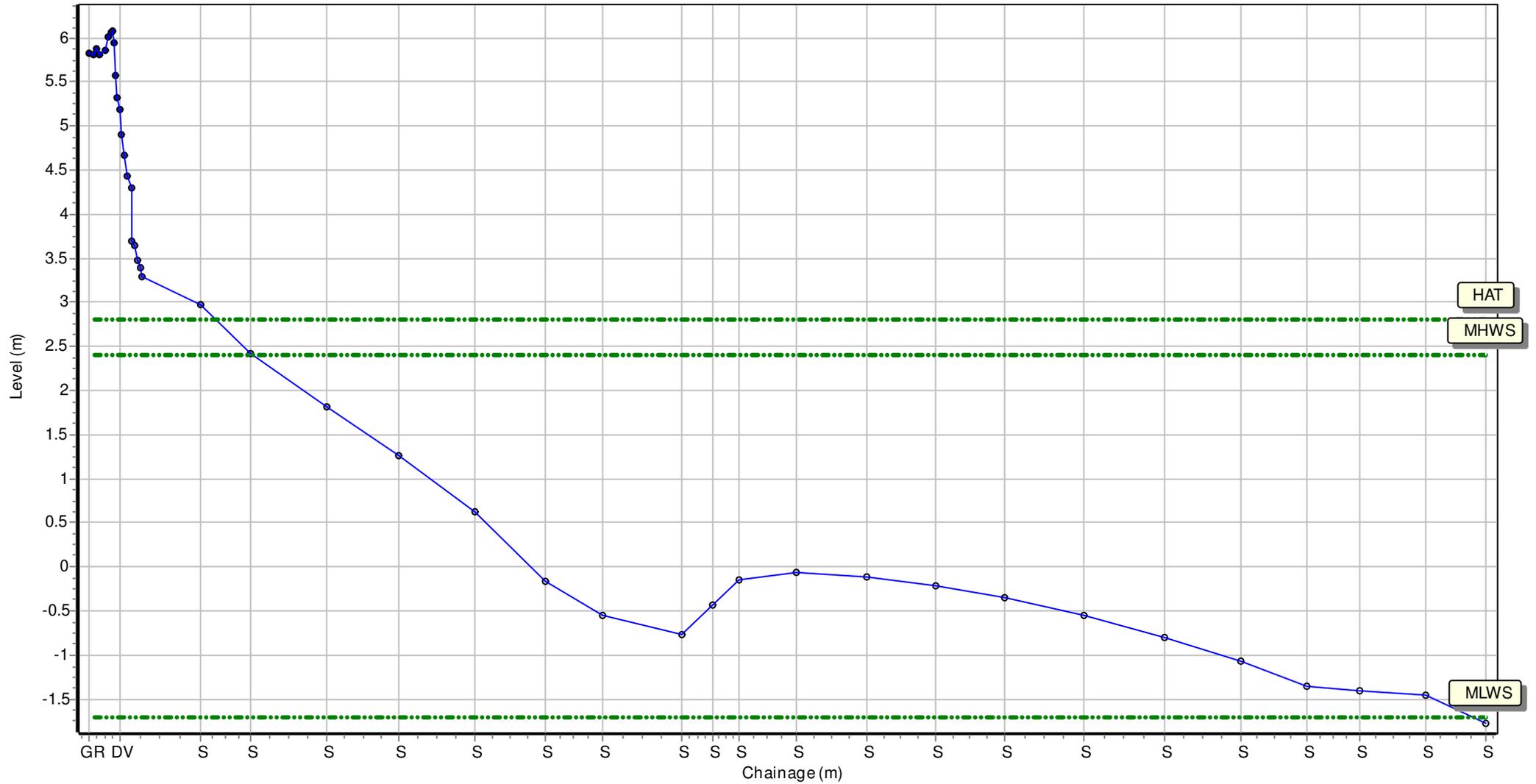
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 425324.445 Northing: 611018.794 Profile Bearing: 134 ° from North



# Beach Profile

Location: 1aADC08

Date: 30/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

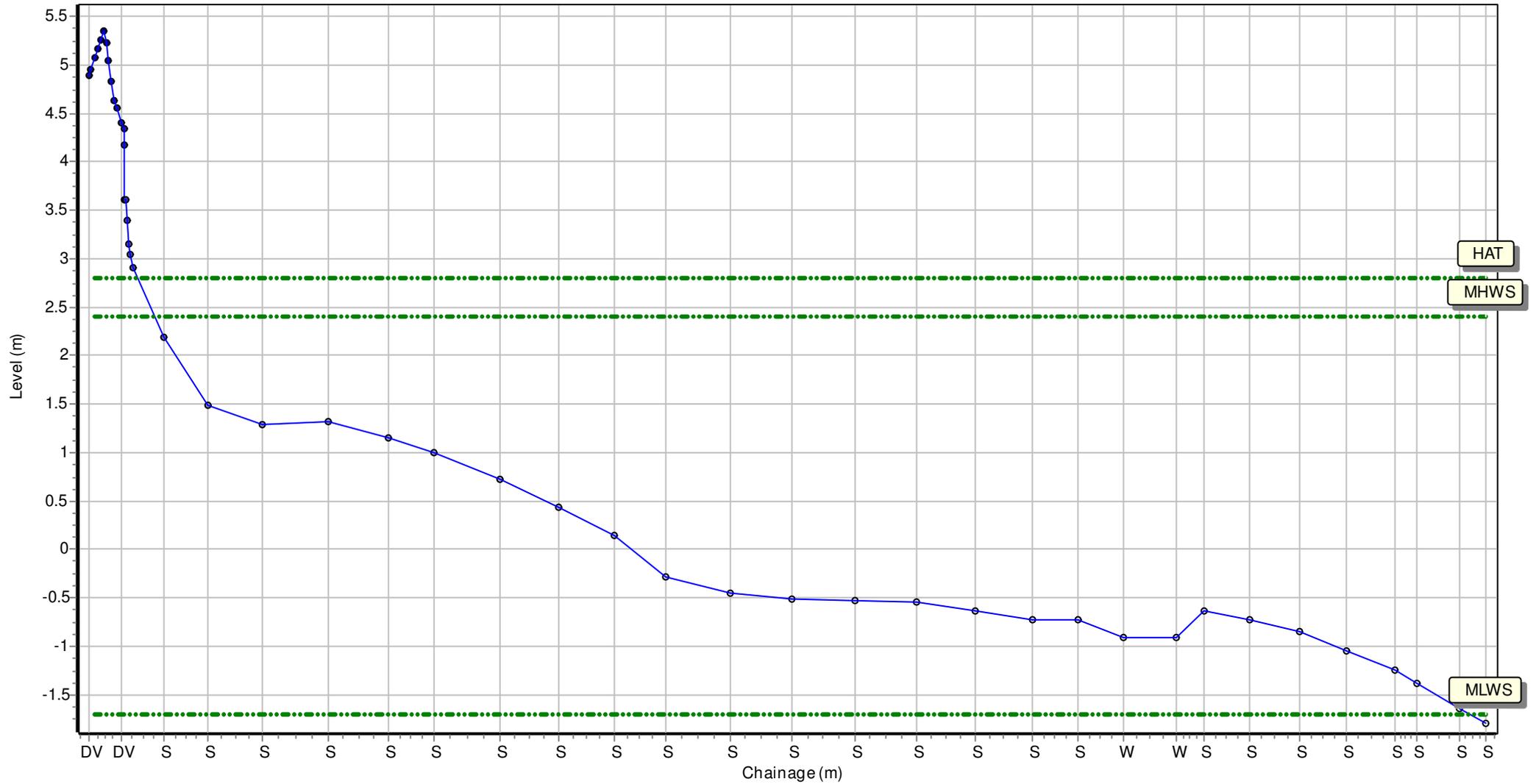
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 425031.727 Northing: 610632.355 Profile Bearing: 112 ° from North



# Beach Profile

Location: 1aADC09

Date: 30/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

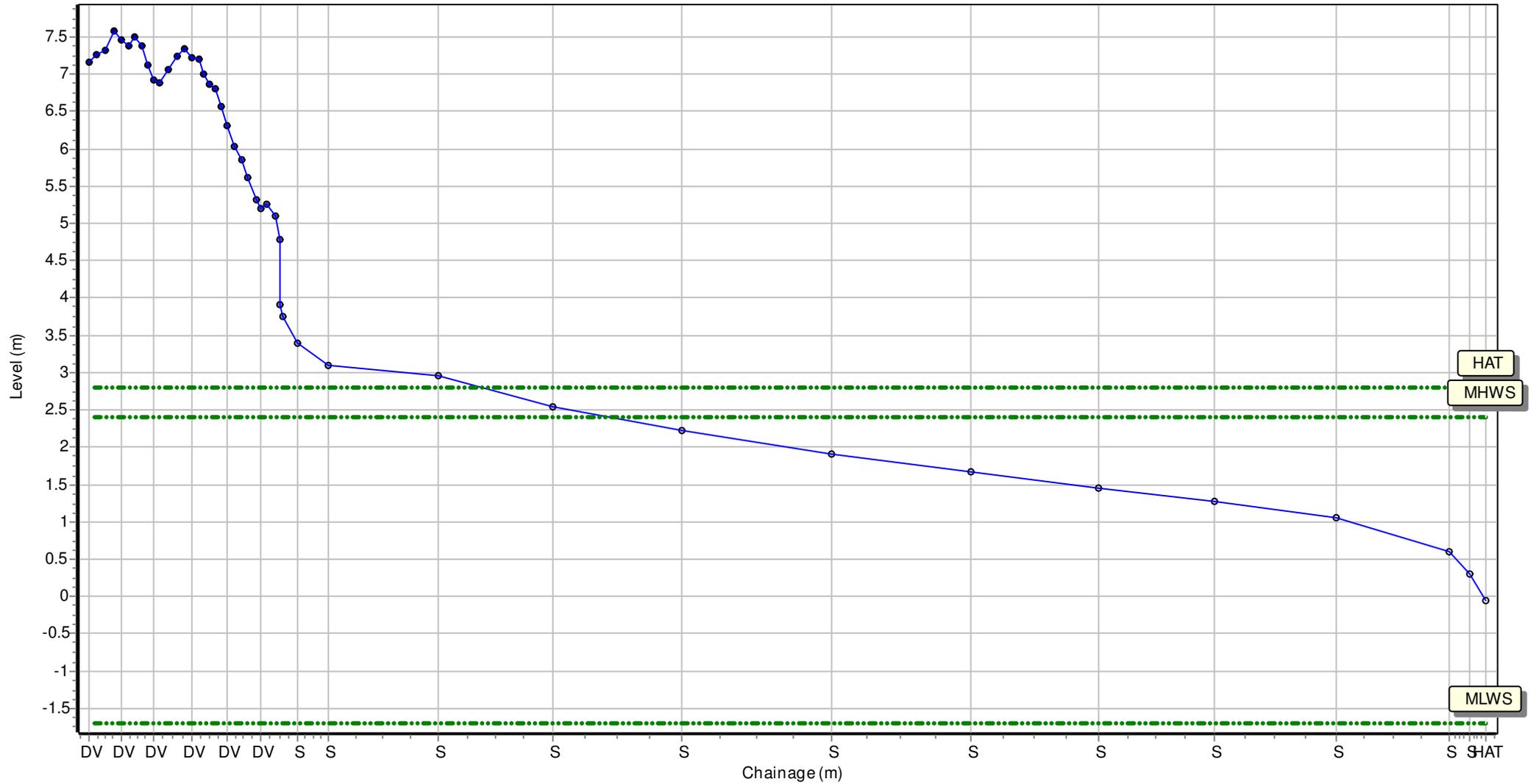
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 424802.33 Northing: 610353.259 Profile Bearing: 120 ° from North



# Beach Profile

Location: 1aADC10

Date: 31/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

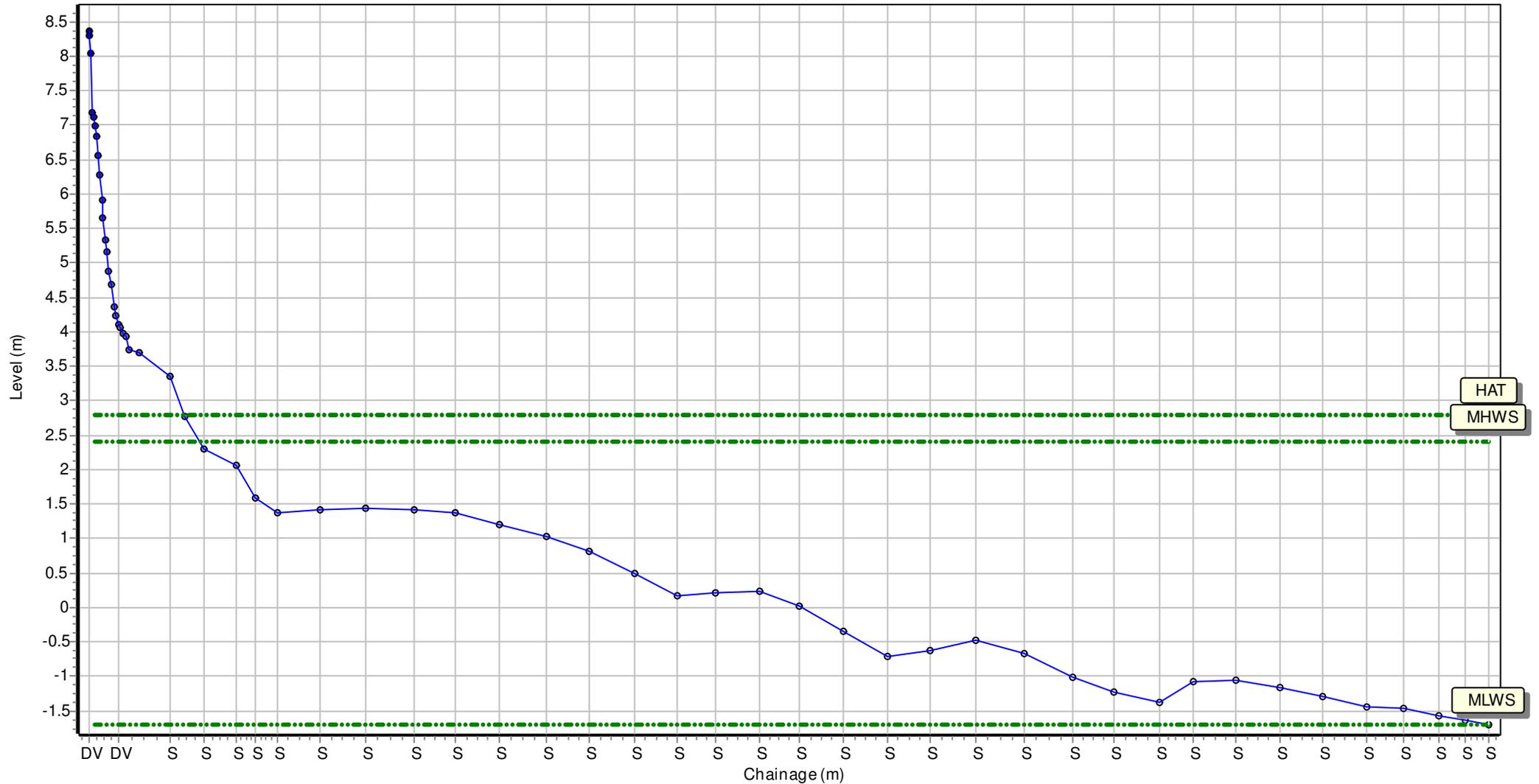
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 424845.495 Northing: 610035.618 Profile Bearing: 70 ° from North



# Beach Profile

Location: 1aADC11

Date: 31/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

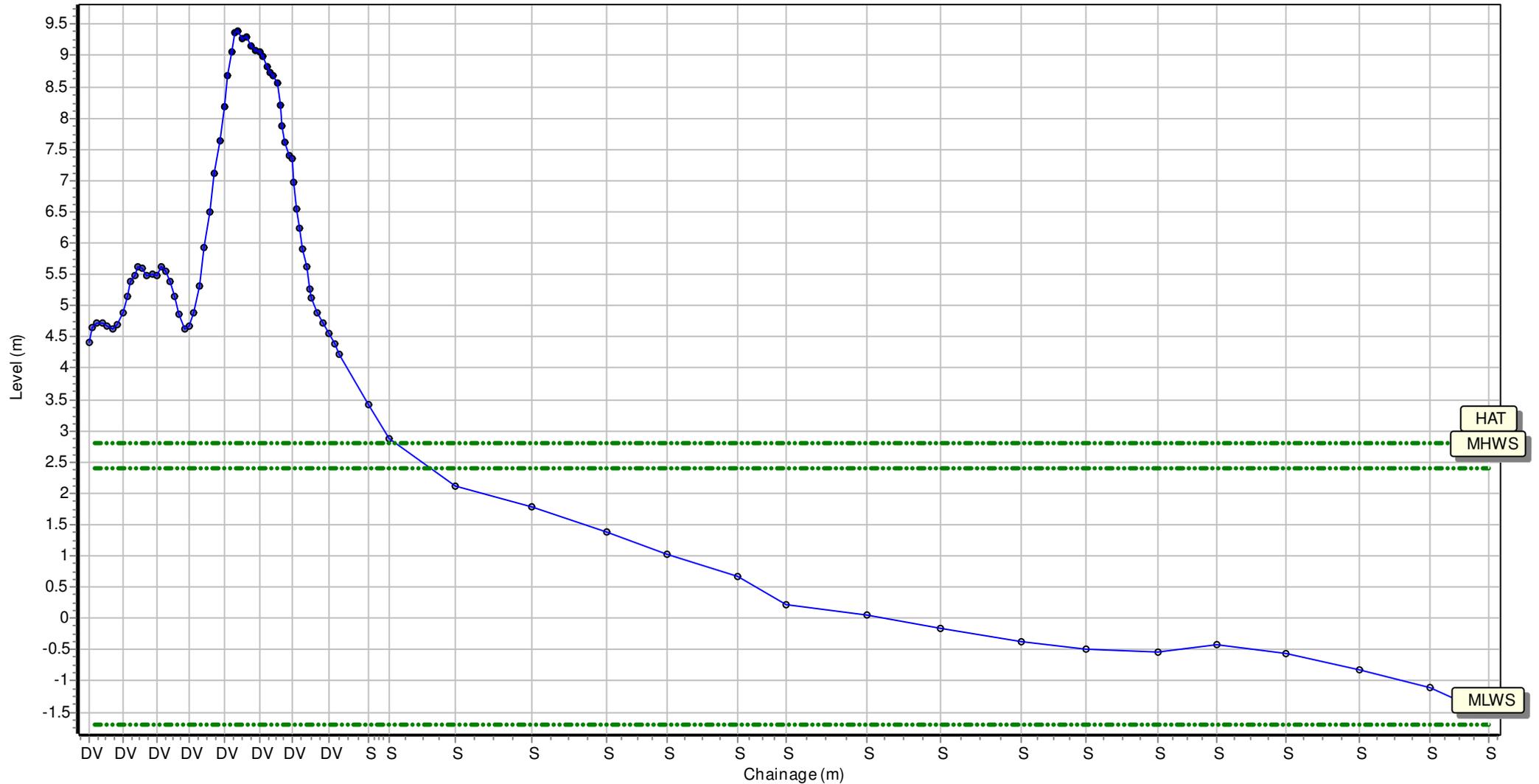
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 424966.878 Northing: 609097.685 Profile Bearing: 71 ° from North



# Beach Profile

Location: 1aADC12

Date: 31/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

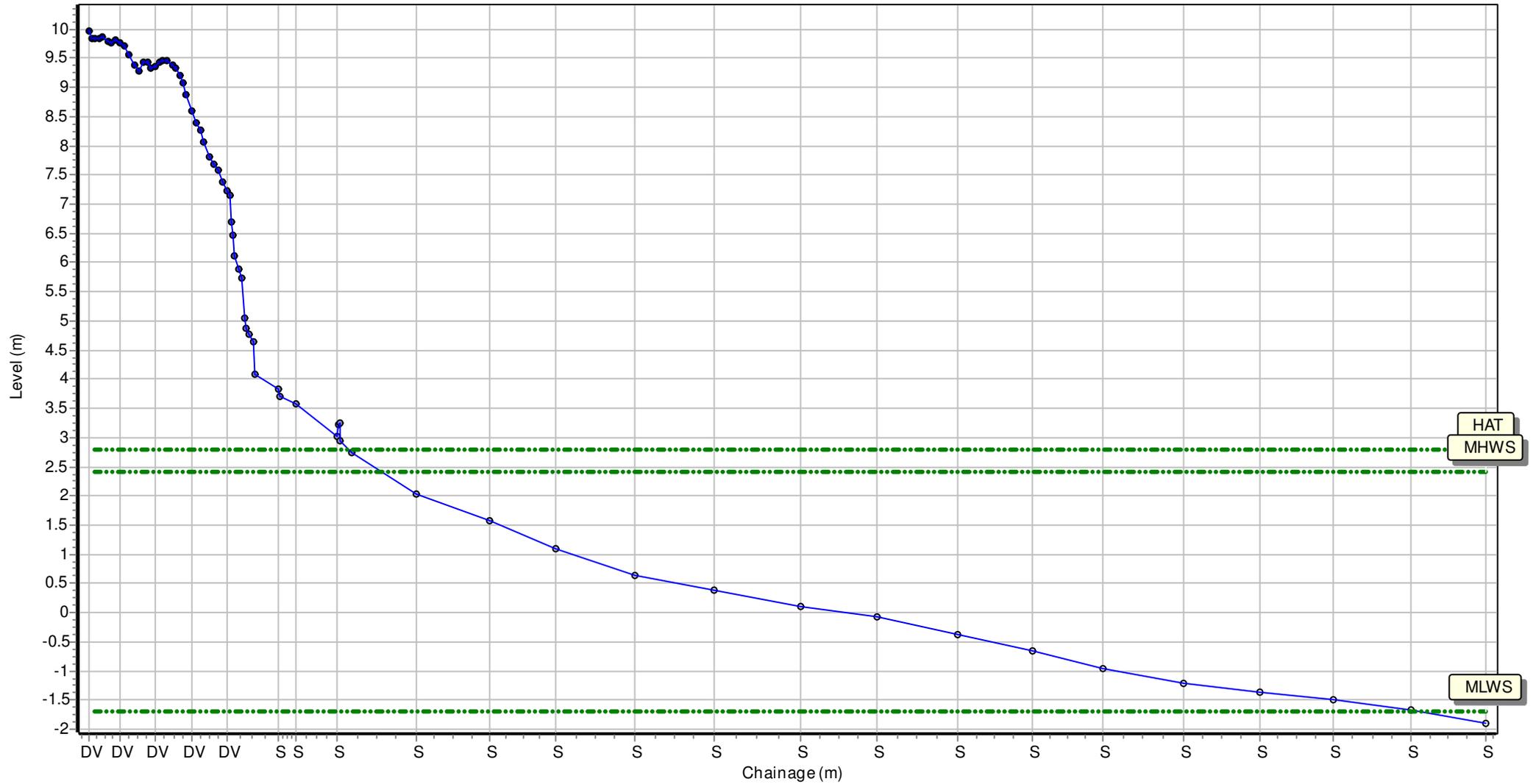
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 425376.479 Northing: 607303.998 Profile Bearing: 67 ° from North



# Beach Profile

Location: 1aADC13

Date: 31/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

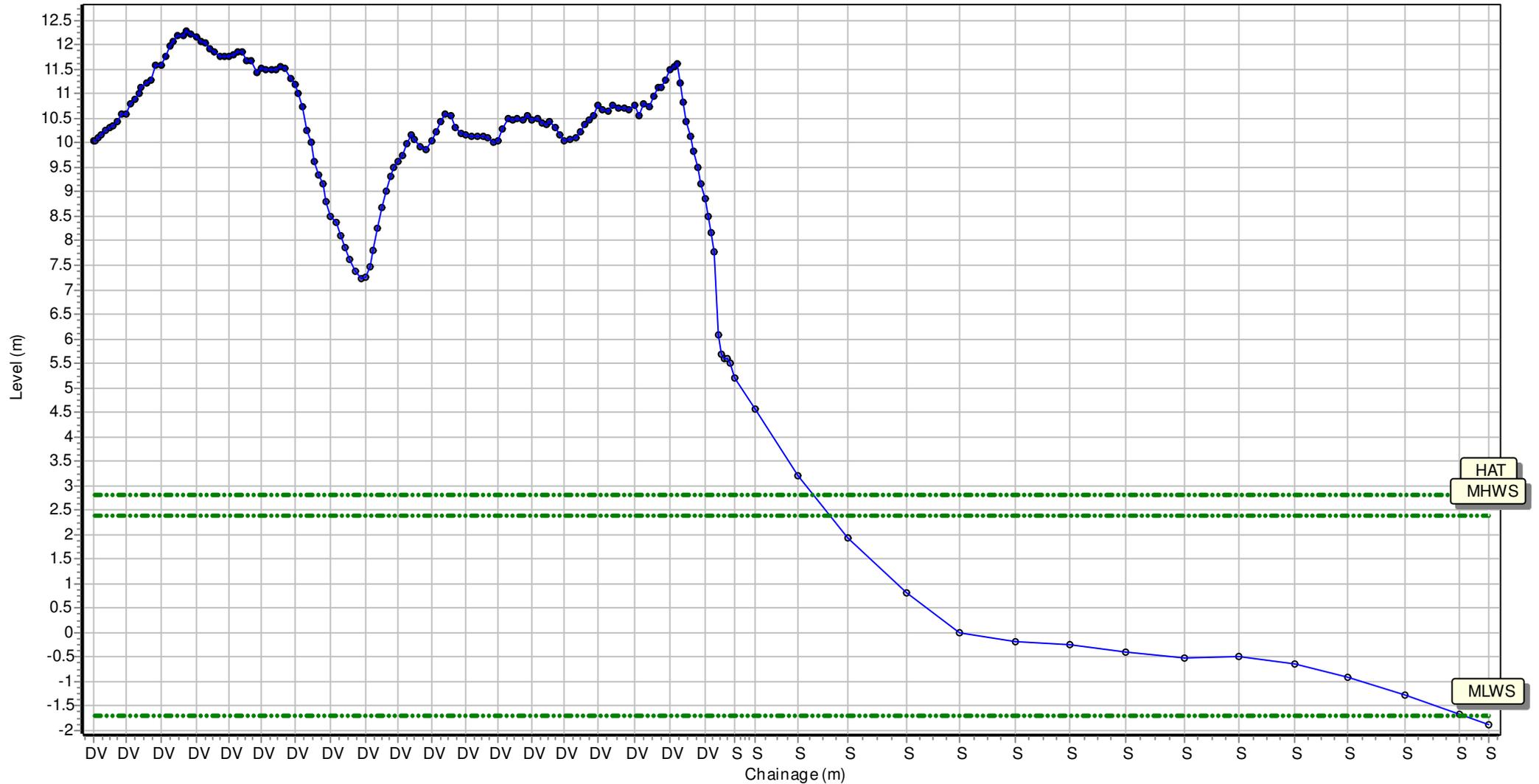
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 425859.769 Northing: 606033.935 Profile Bearing: 63 ° from North



# Beach Profile

Location: 1aADC14

Date: 31/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

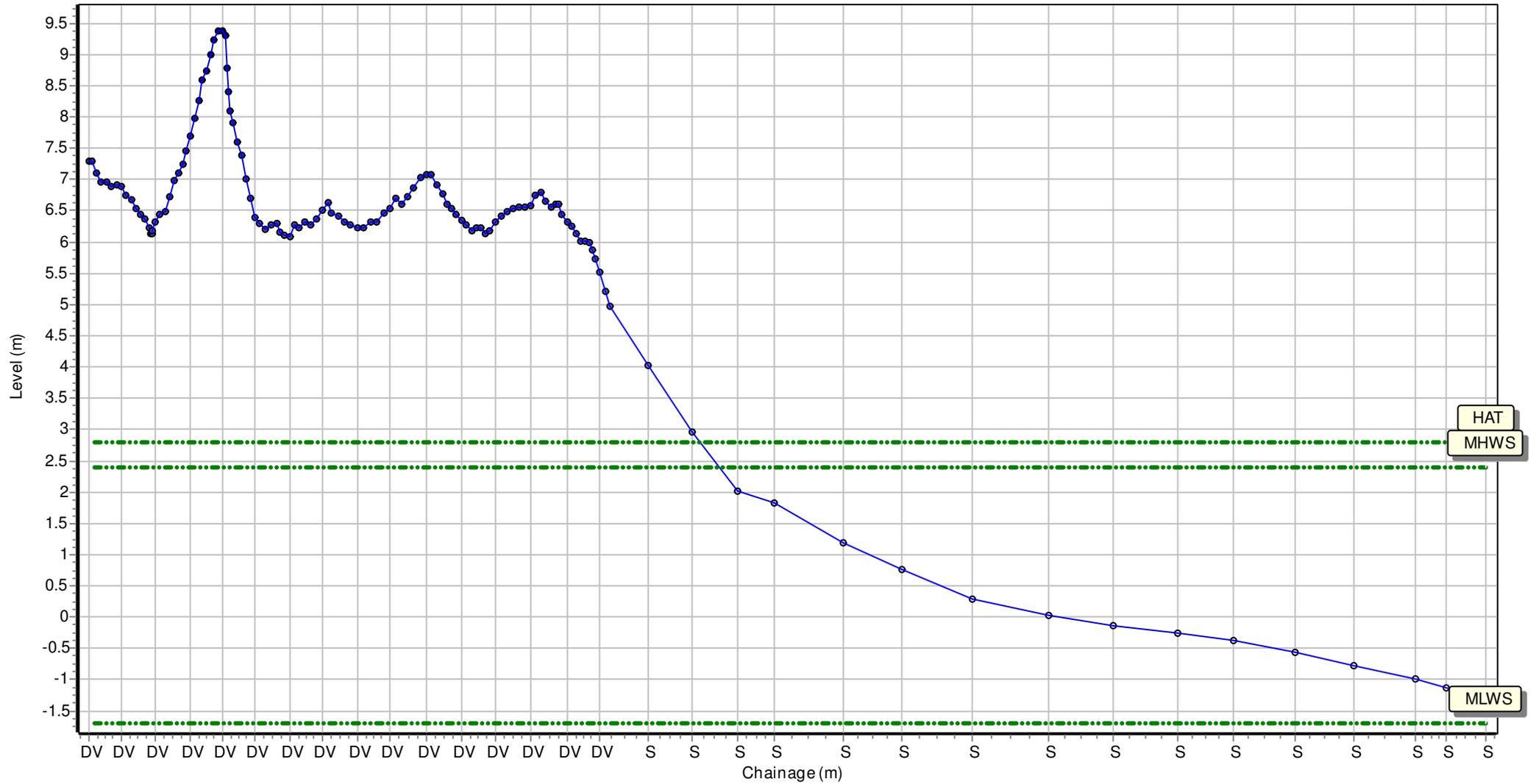
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 426469.136 Northing: 605263.954 Profile Bearing: 59 ° from North



# Beach Profile

Location: 1aADC15

Date: 01/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

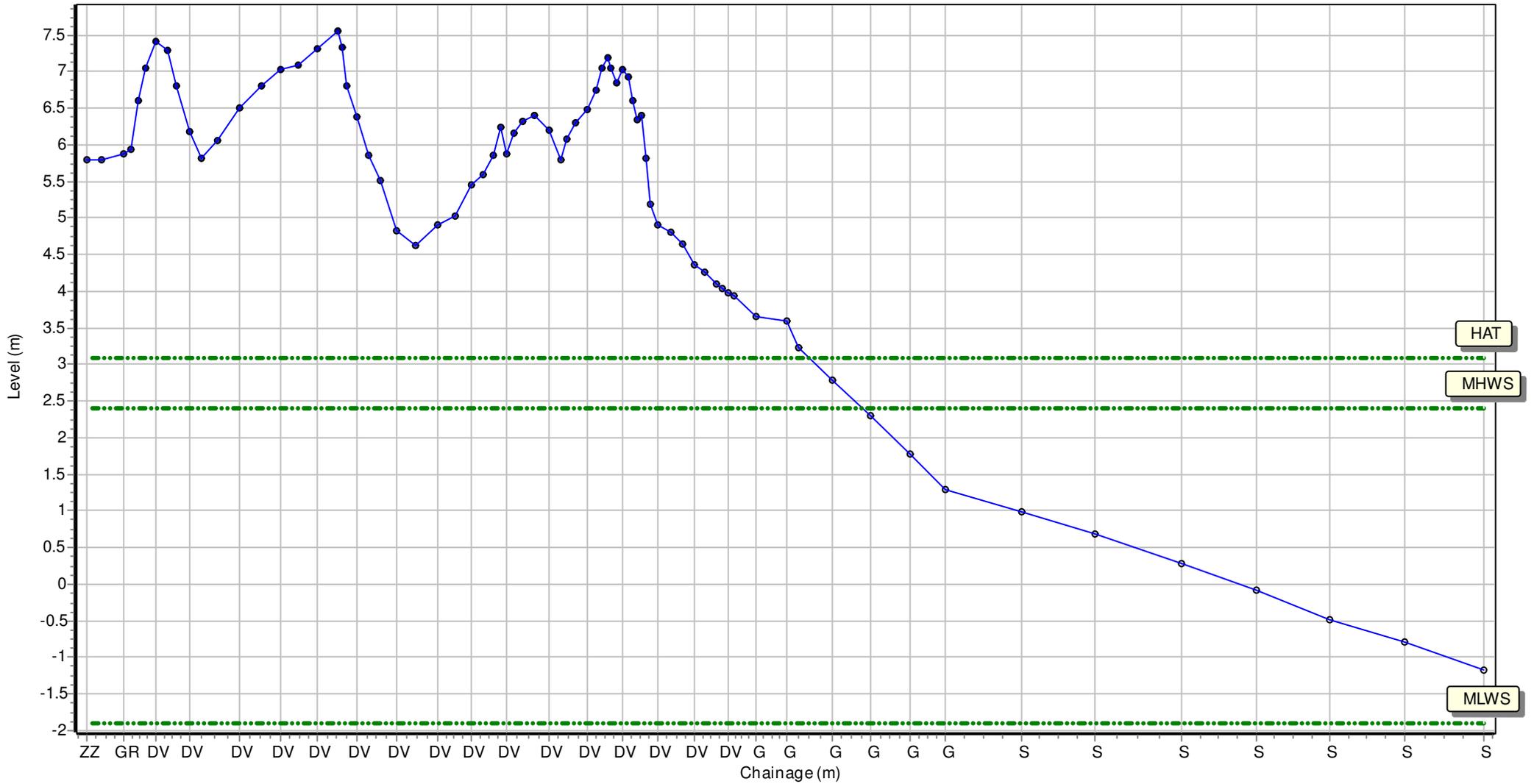
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 427956.742 Northing: 603743.758 Profile Bearing: 46 ° from North



# Beach Profile

Location: 1aADC15A

Date: 01/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

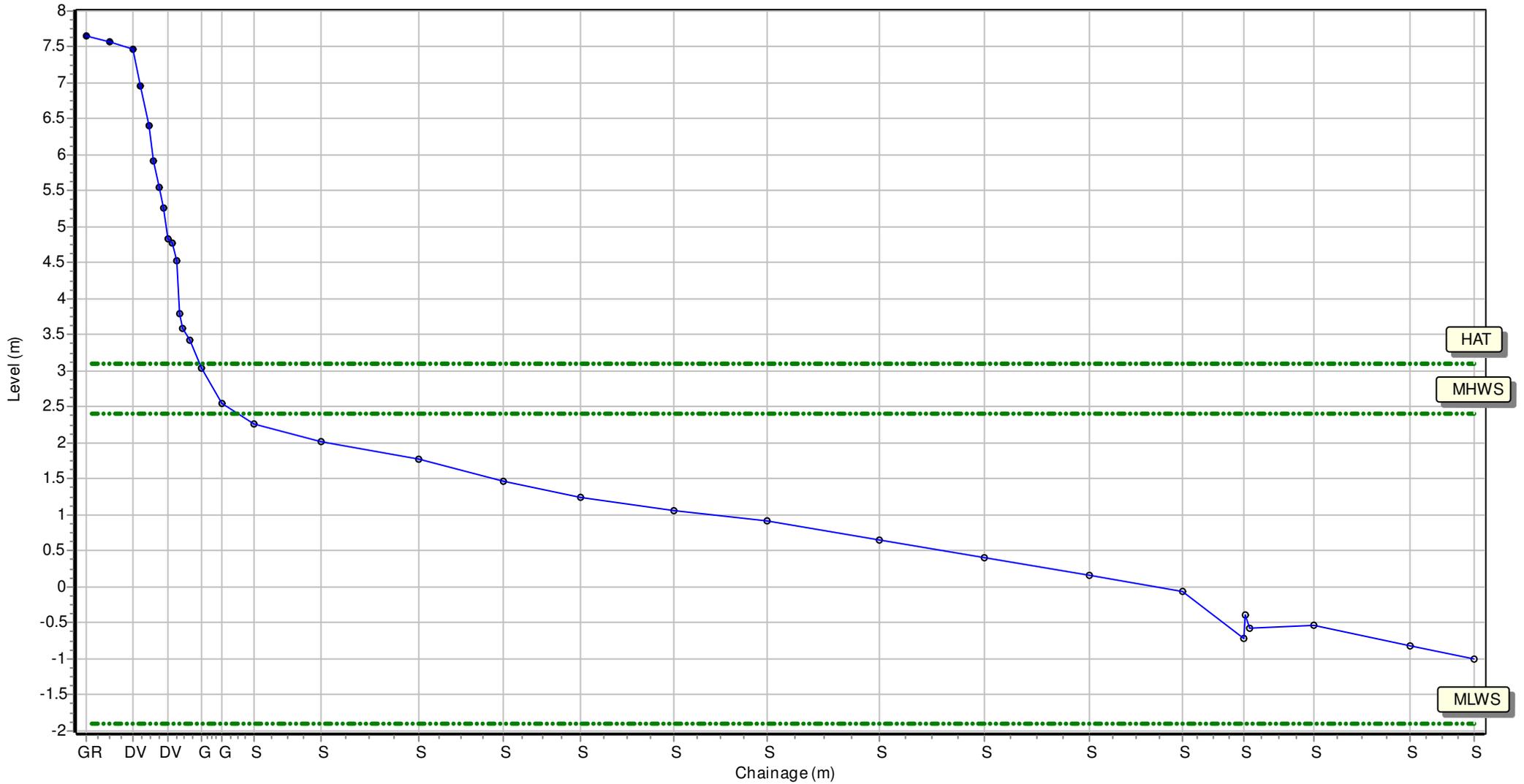
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 428642.365 Northing: 603069.145 Profile Bearing: 90 ° from North



# Beach Profile

Location: 1aADC16

Date: 01/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

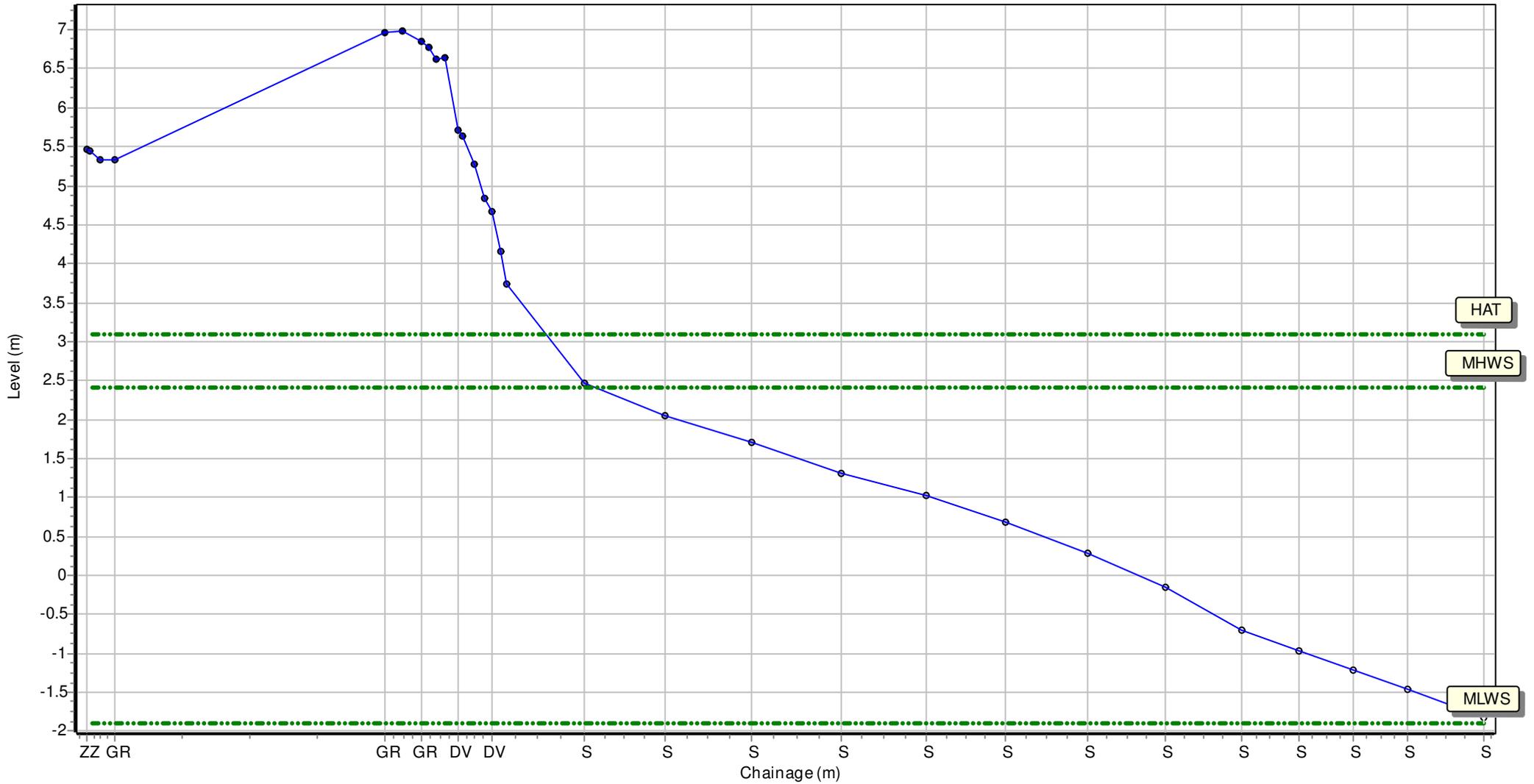
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 428575.092 Northing: 602921.577 Profile Bearing: 93 ° from North



# Beach Profile

Location: 1aADC16A

Date: 01/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

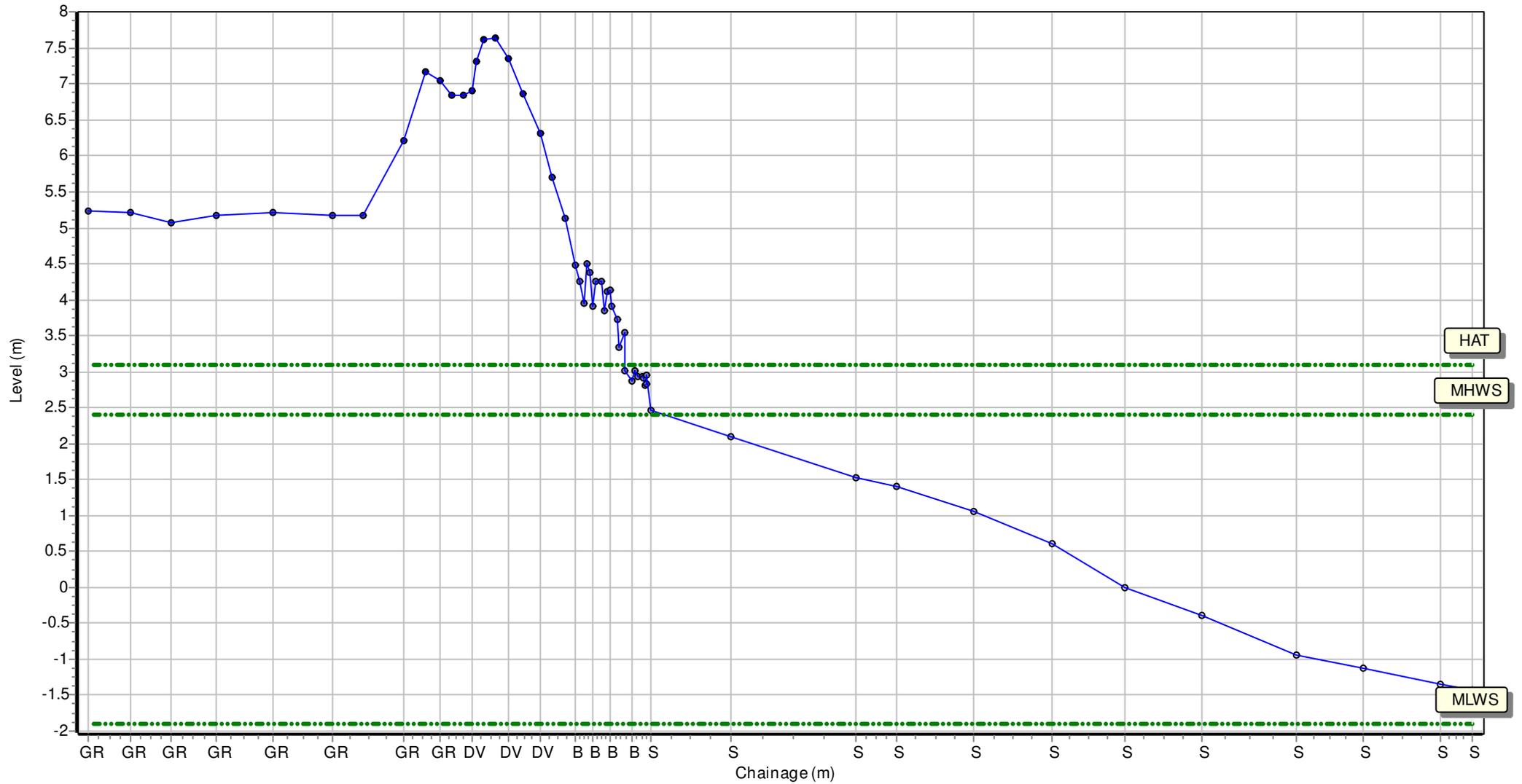
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 428543.525 Northing: 602704.175 Profile Bearing: 92 ° from North





# Beach Profile

Location: 1aADC17

Date: 01/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

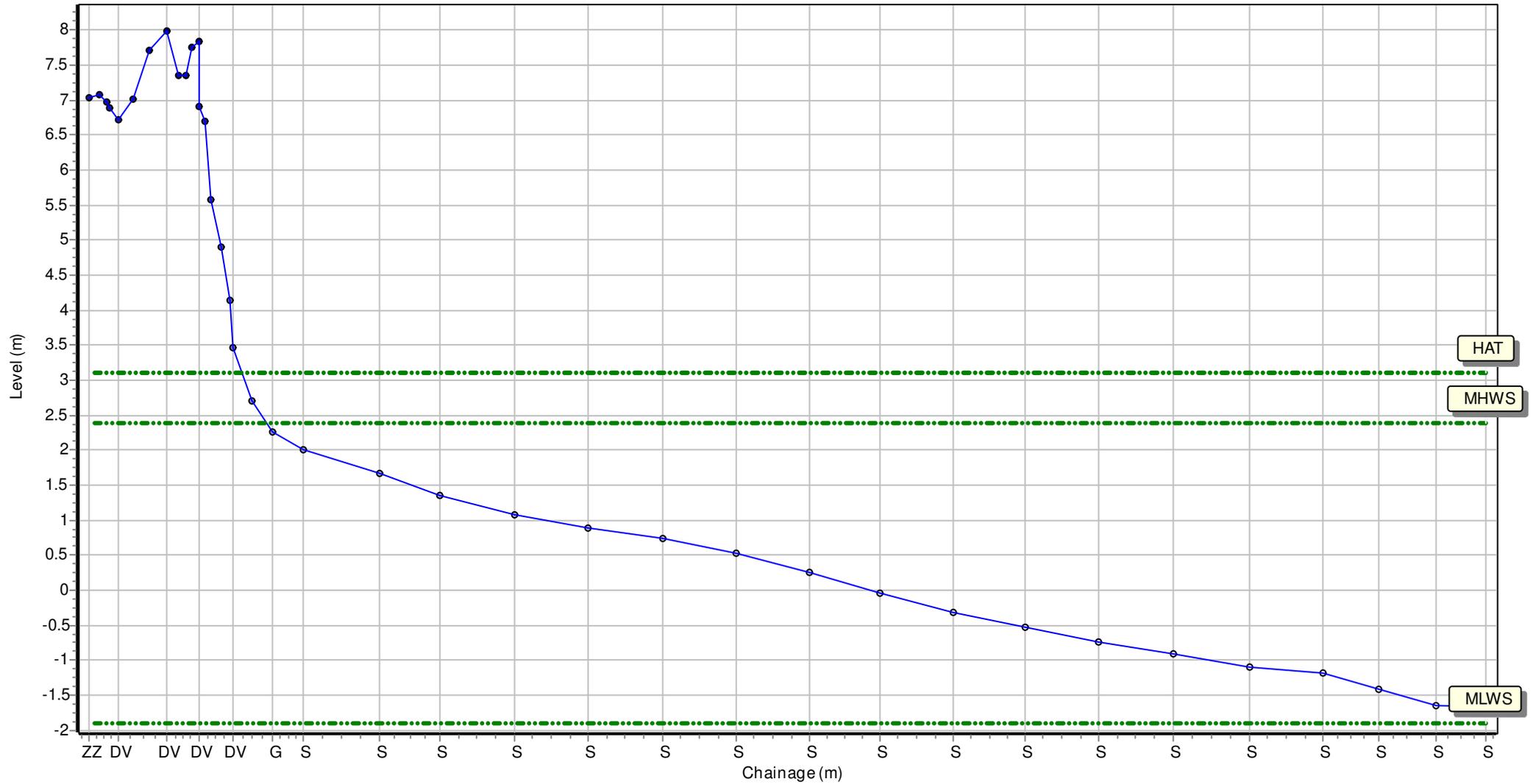
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 428116.847 Northing: 601565.465 Profile Bearing: 114 ° from North



# Beach Profile

Location: 1aADC17A

Date: 01/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

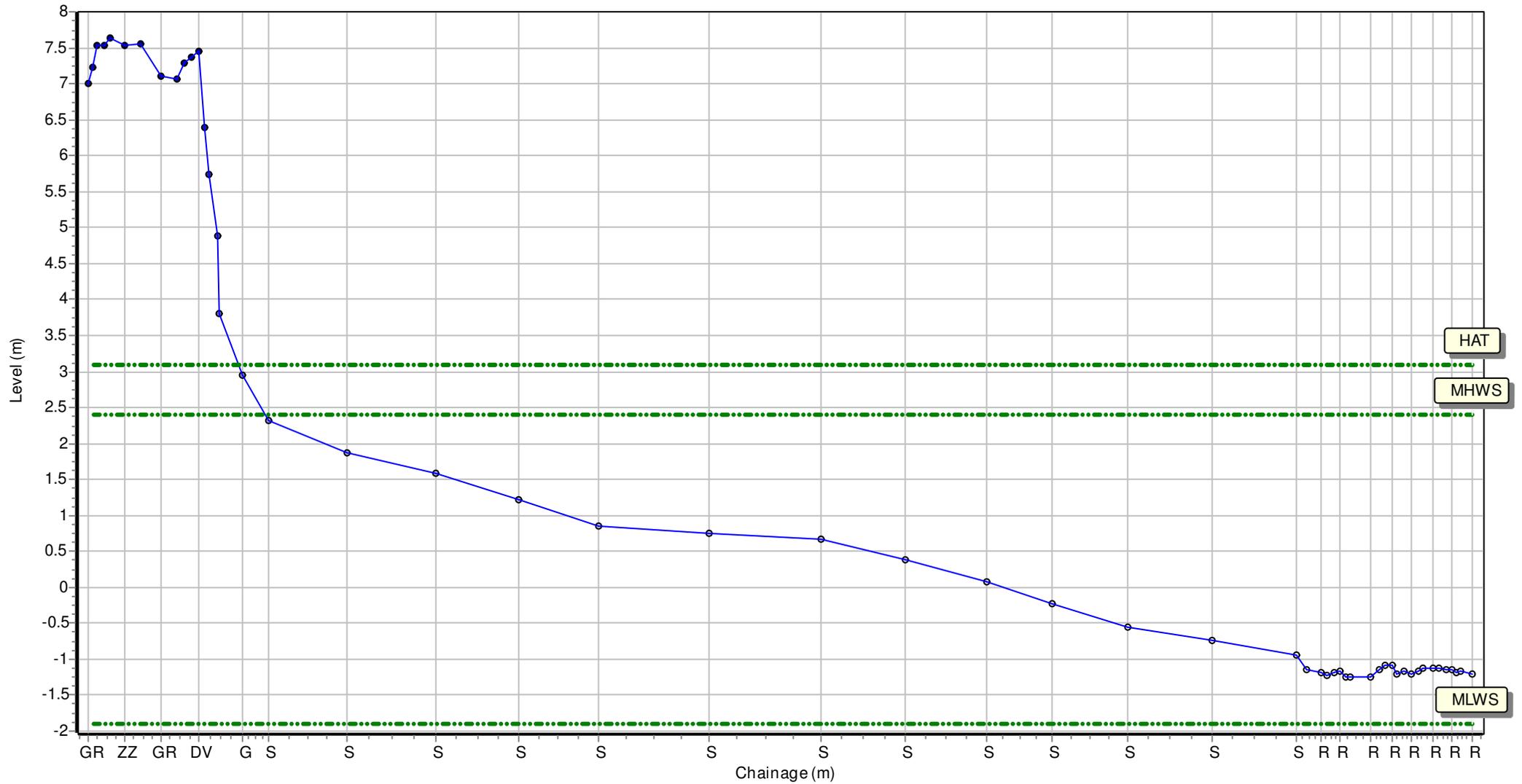
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 427947.662 Northing: 601040.259 Profile Bearing: 109 ° from North



# Beach Profiles: 1aADC01



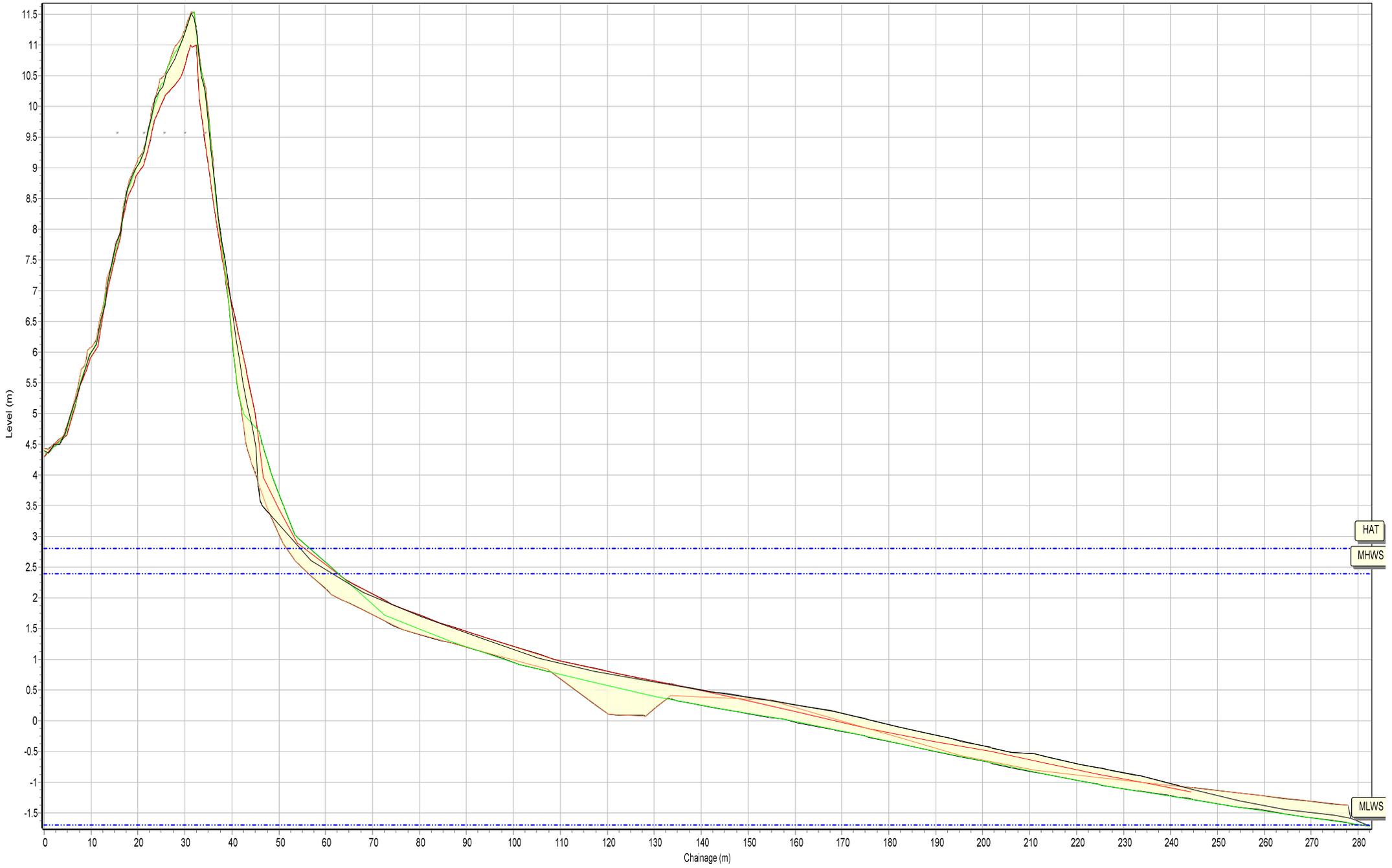
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC02



Profiles Envelope 01/04/2006 07/12/2018 21/03/2019 16/10/2019

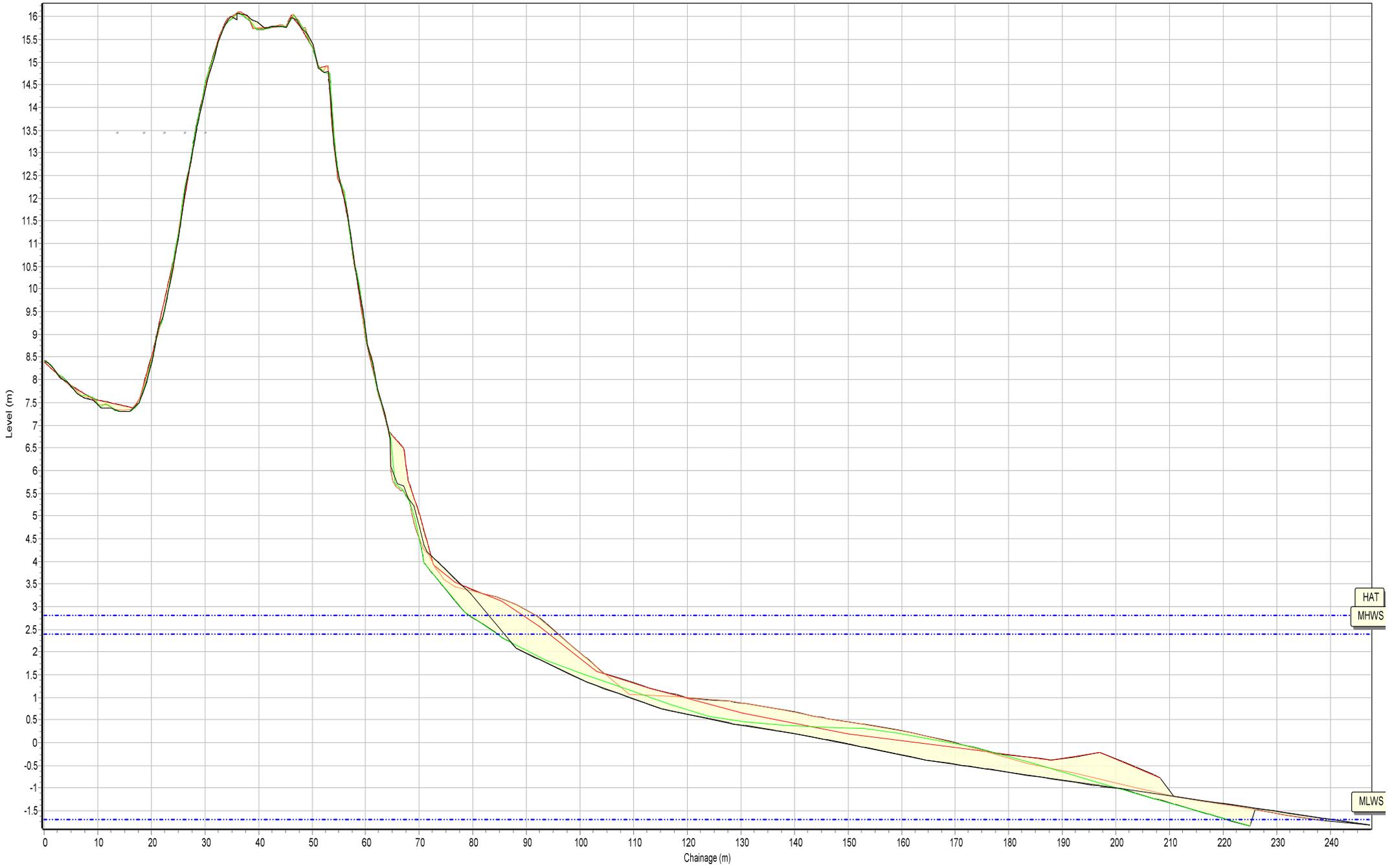
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC03

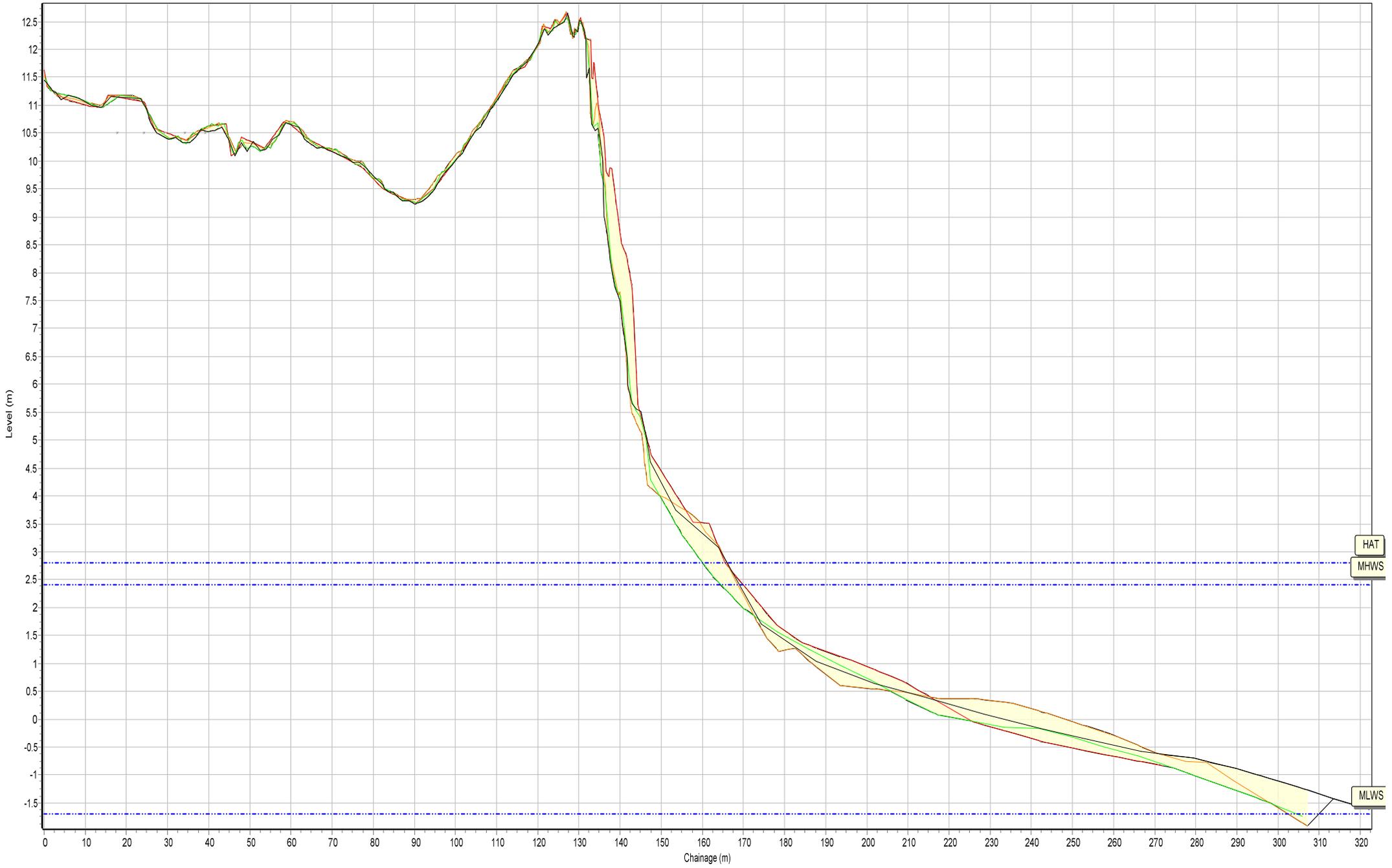


HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1aADC04



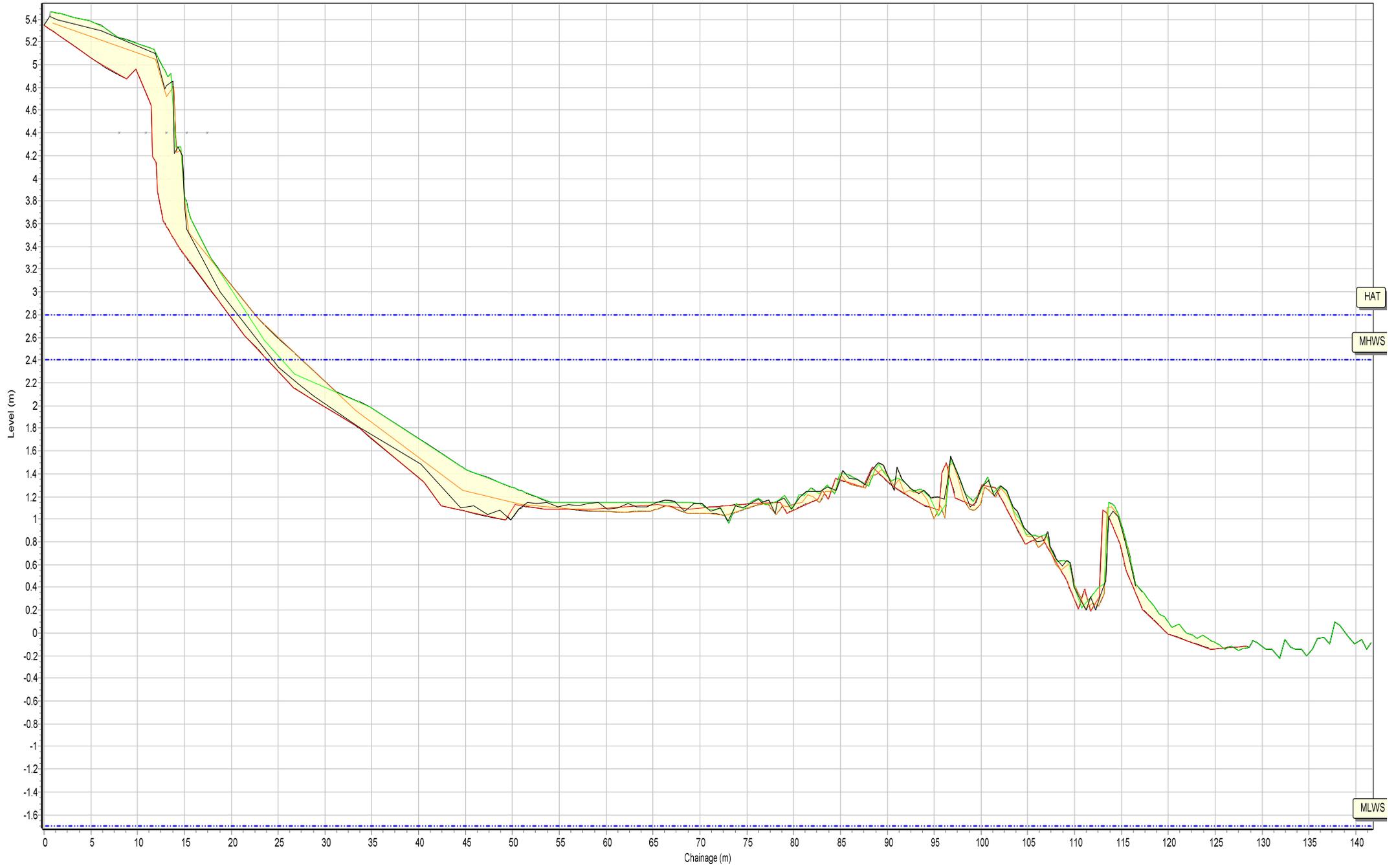
Profiles Envelope 01/10/2006 10/10/2017 28/10/2018 18/10/2019

HAT  
MHWS

MLWS

SANDS

# Beach Profiles: 1aADC04A



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC04B



Profiles Envelope 01/10/2007 28/09/2018 22/02/2019 30/10/2019

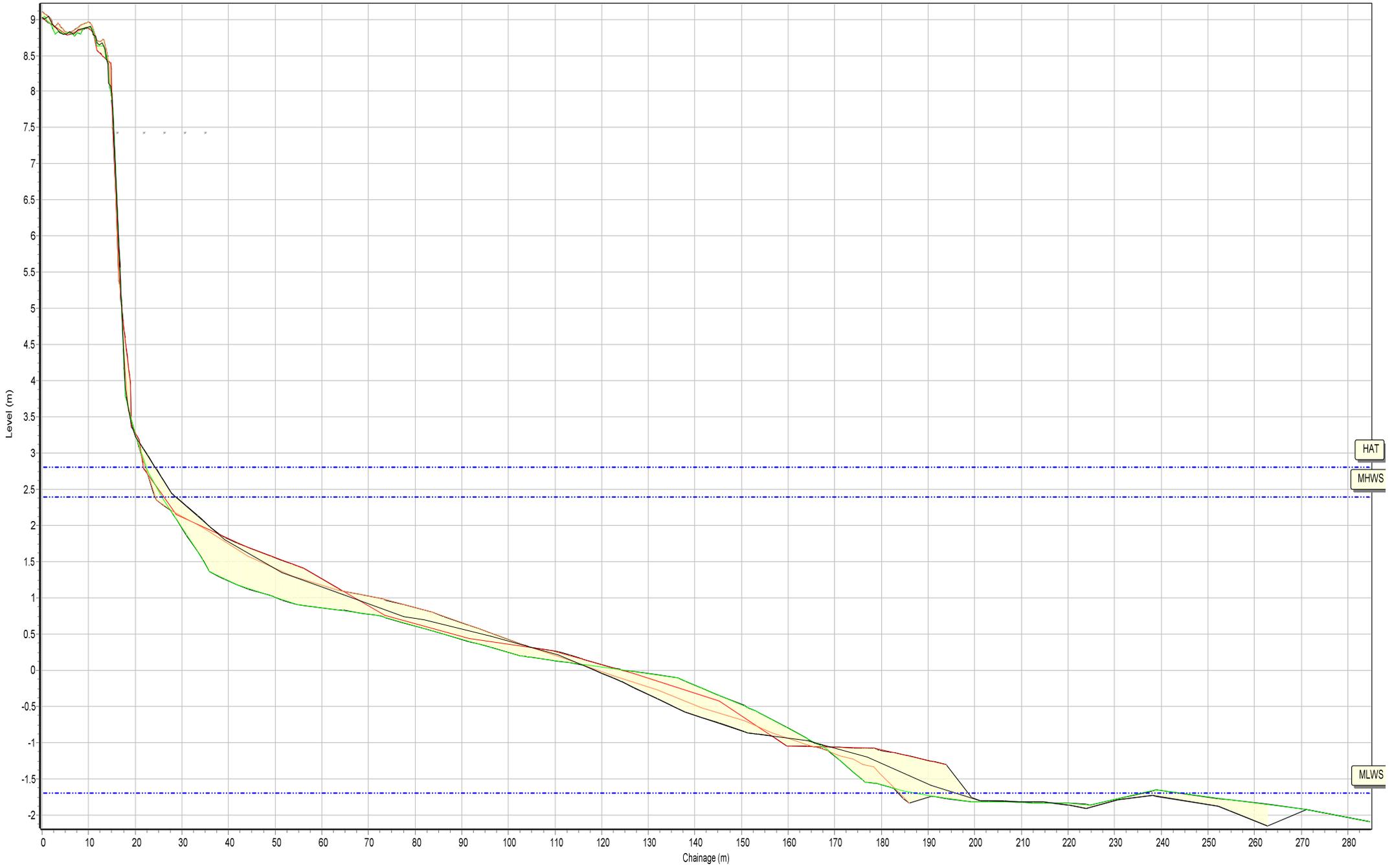
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC05



HAT  
MHWS

MLWS

SANDS

# Beach Profiles: 1aADC06



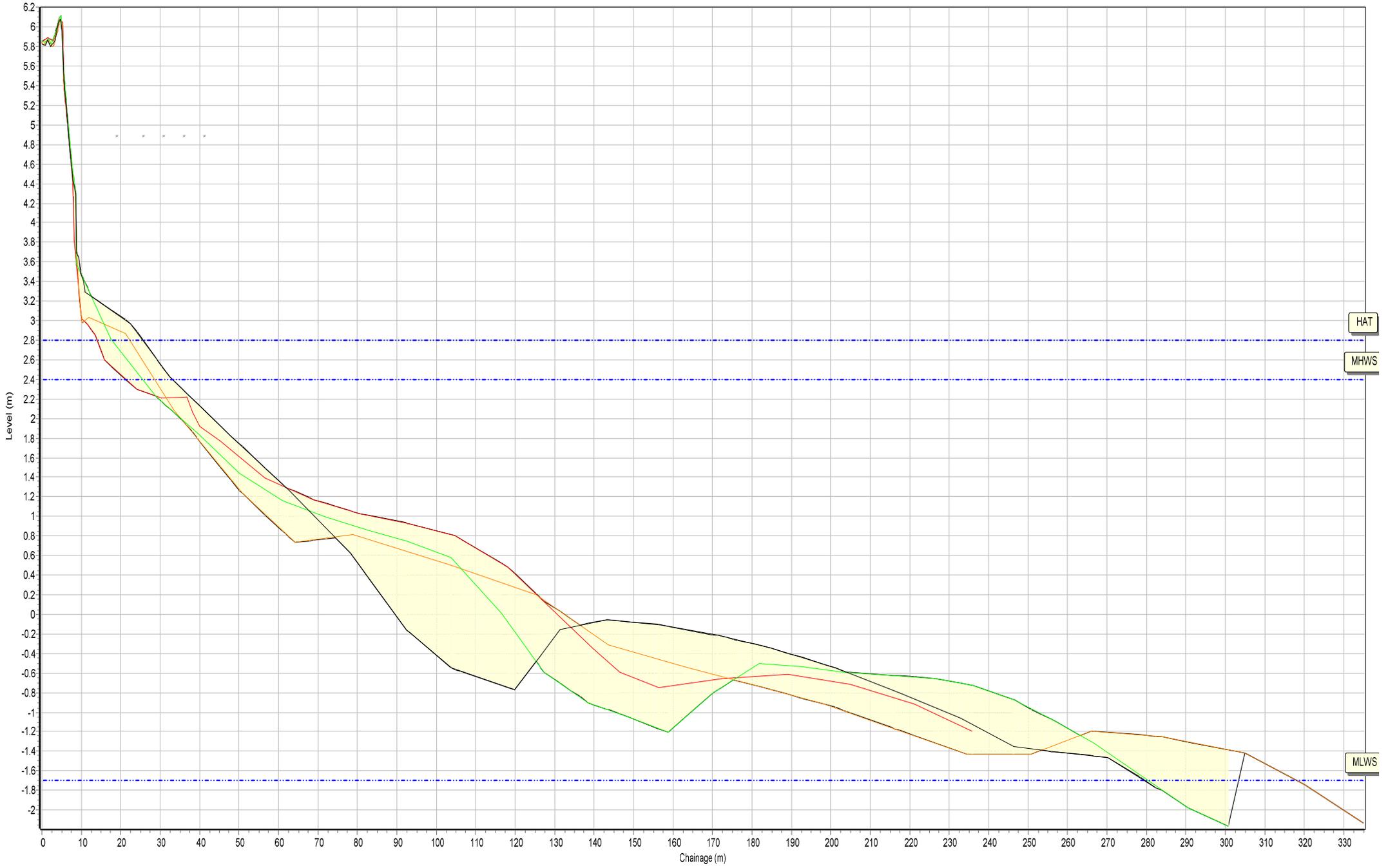
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC07



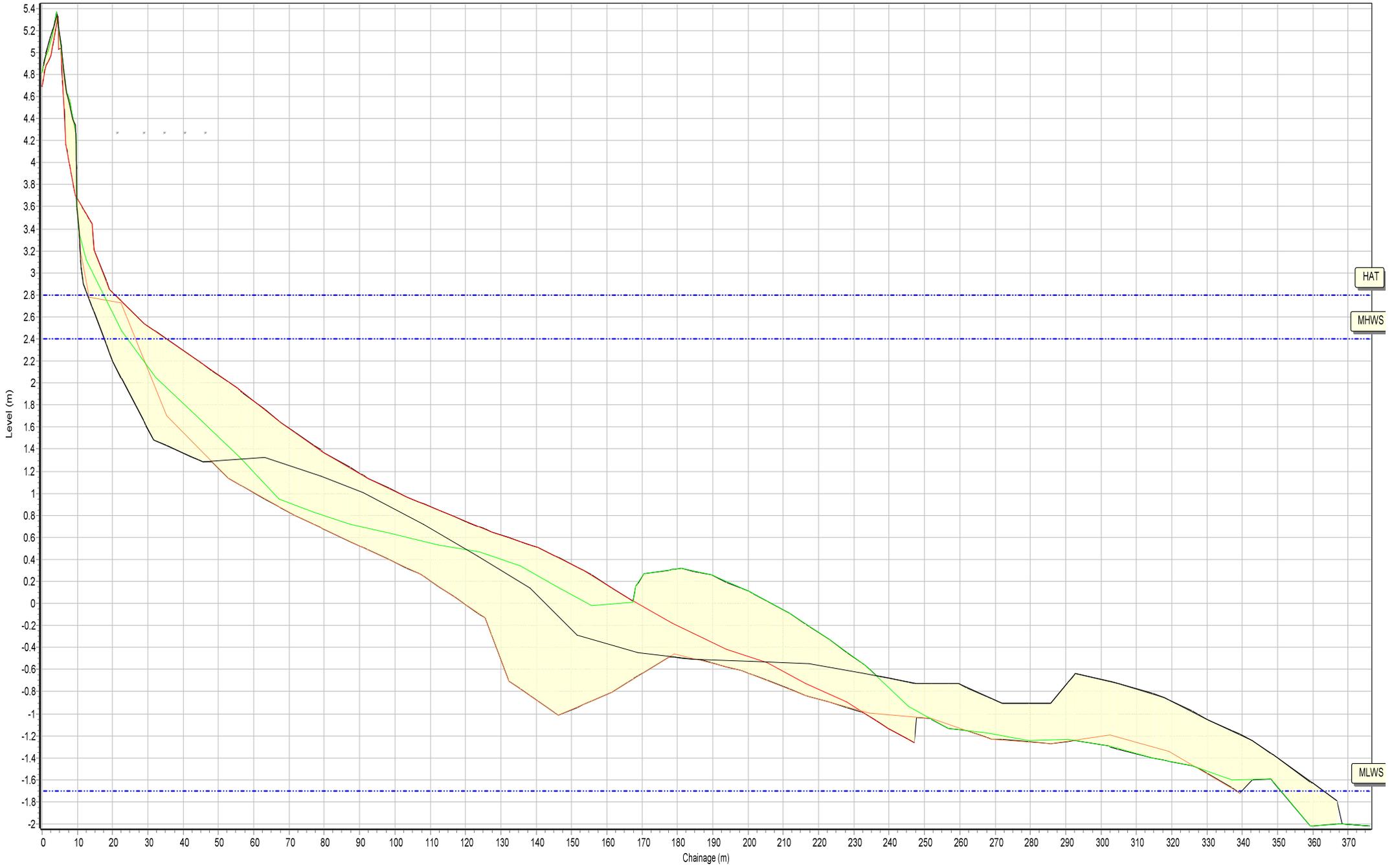
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC08



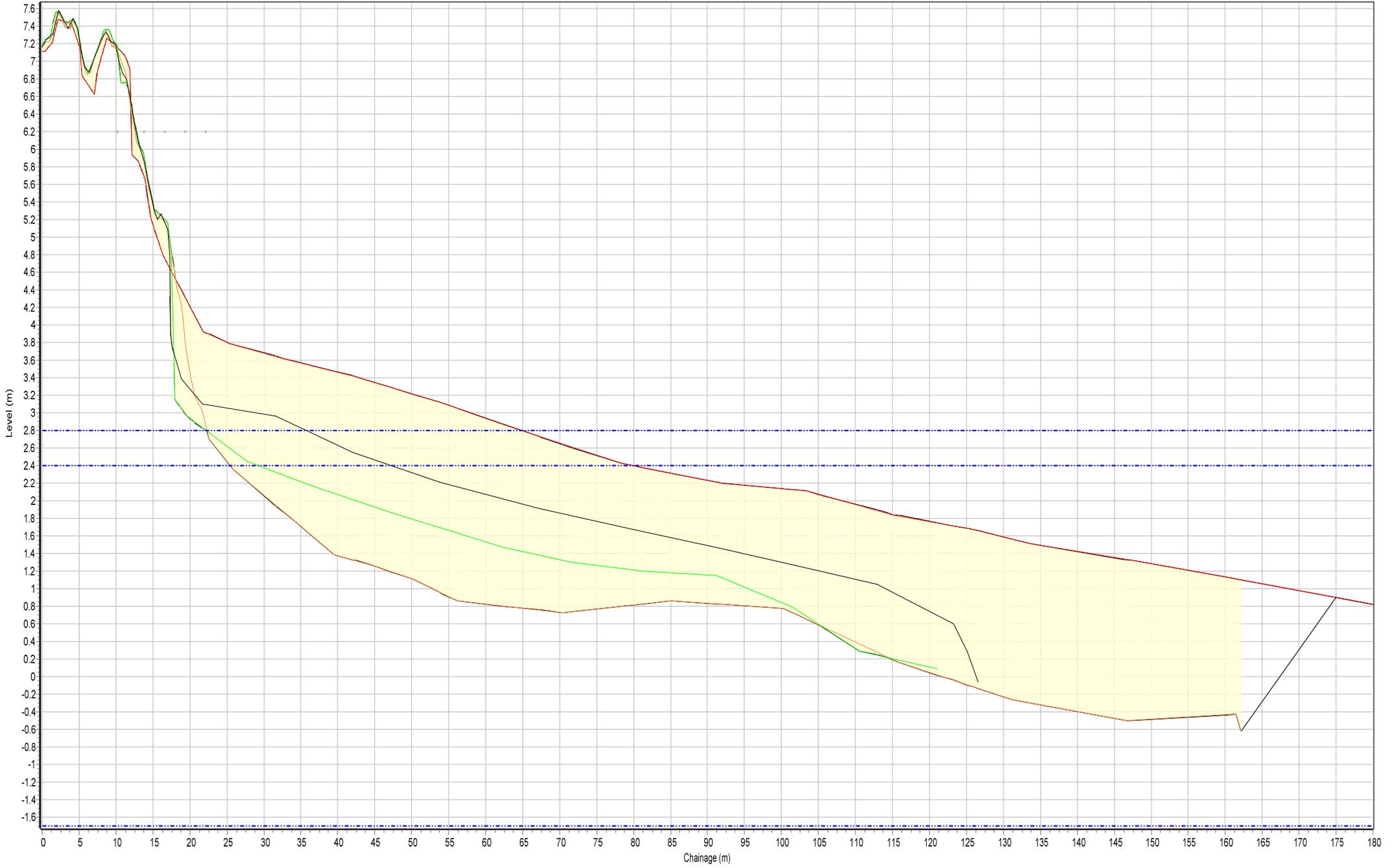
HAT

MHWS

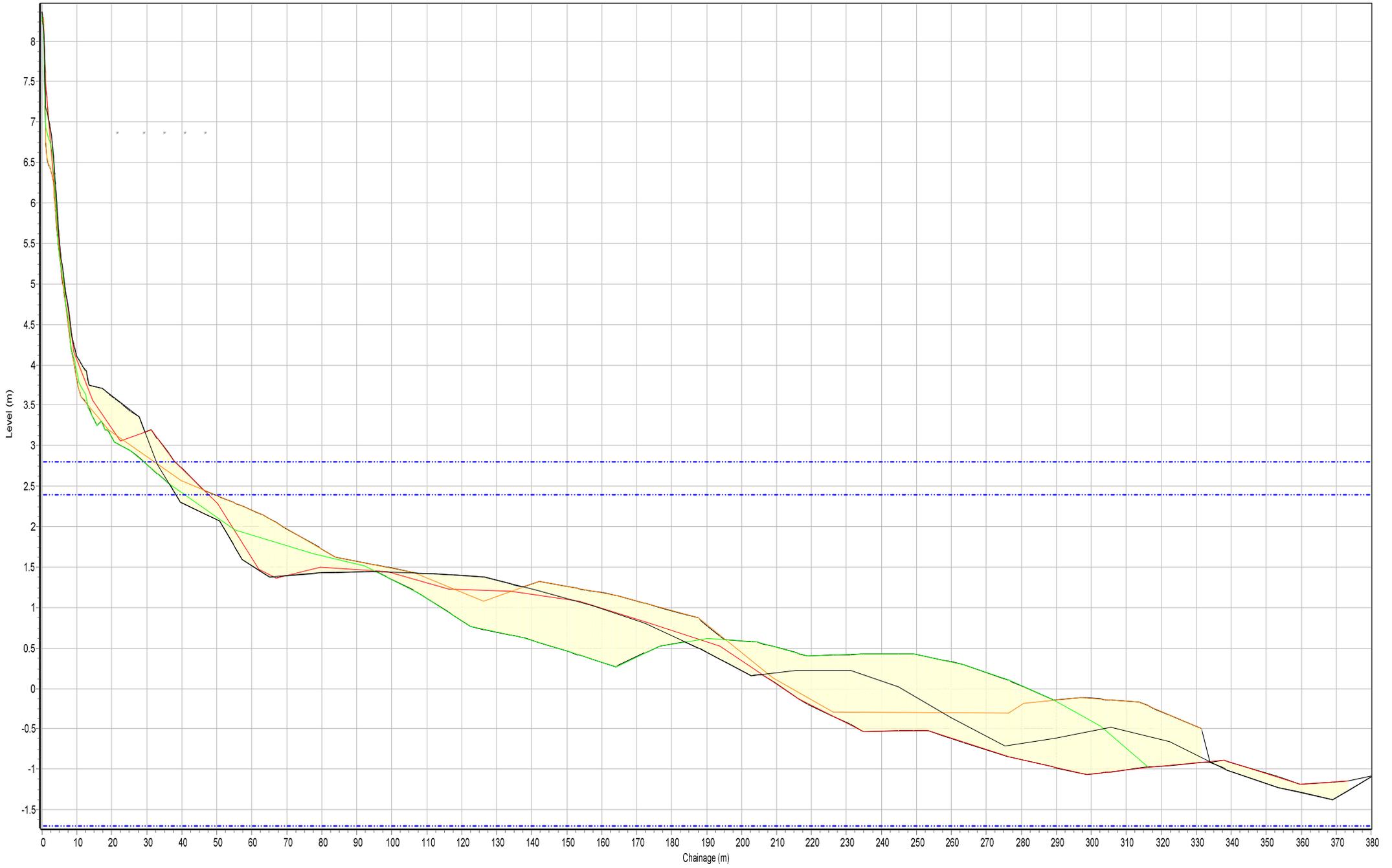
MLWS

SANDS

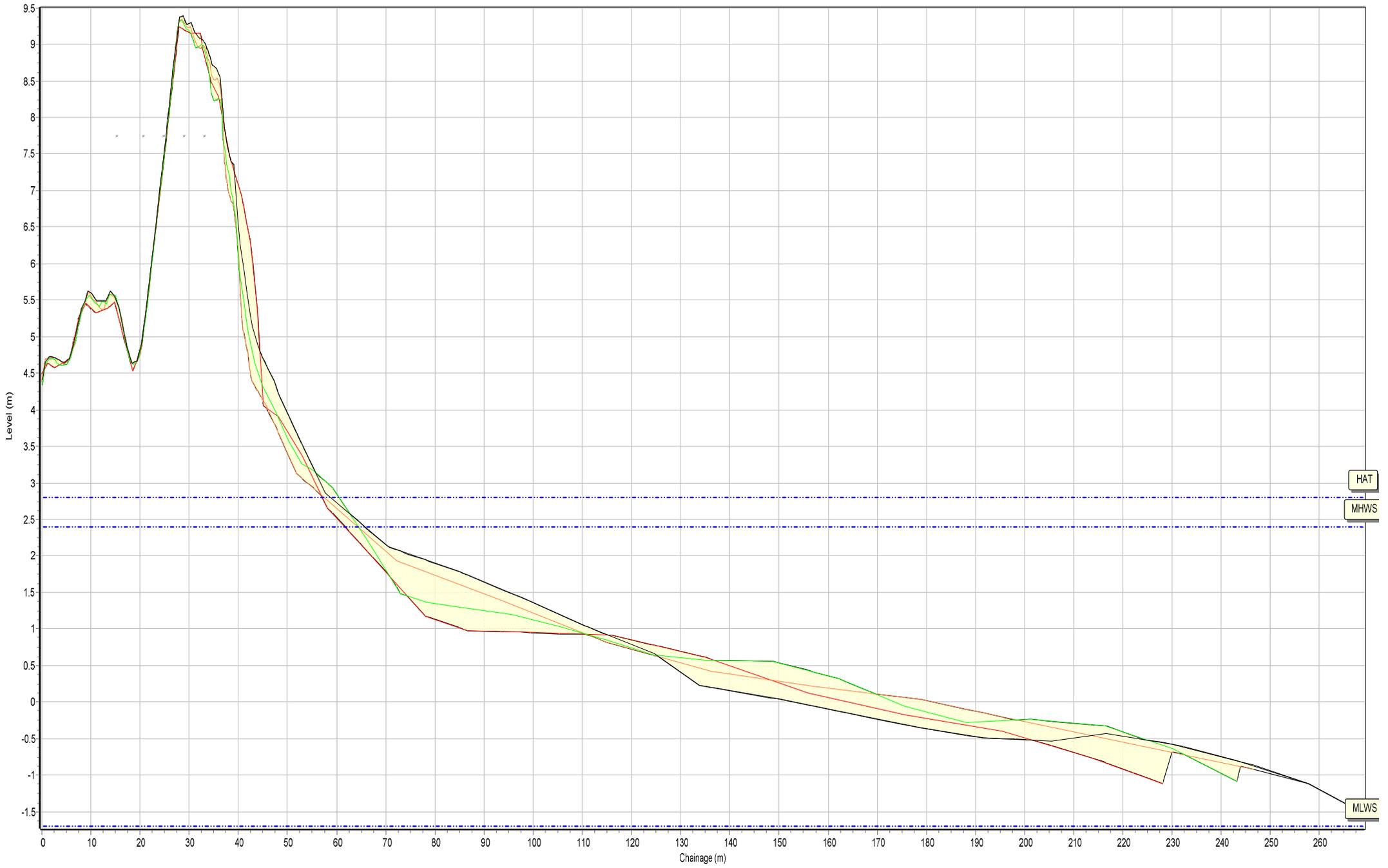
Beach Profiles: 1aADC09



# Beach Profiles: 1aADC10



# Beach Profiles: 1aADC11



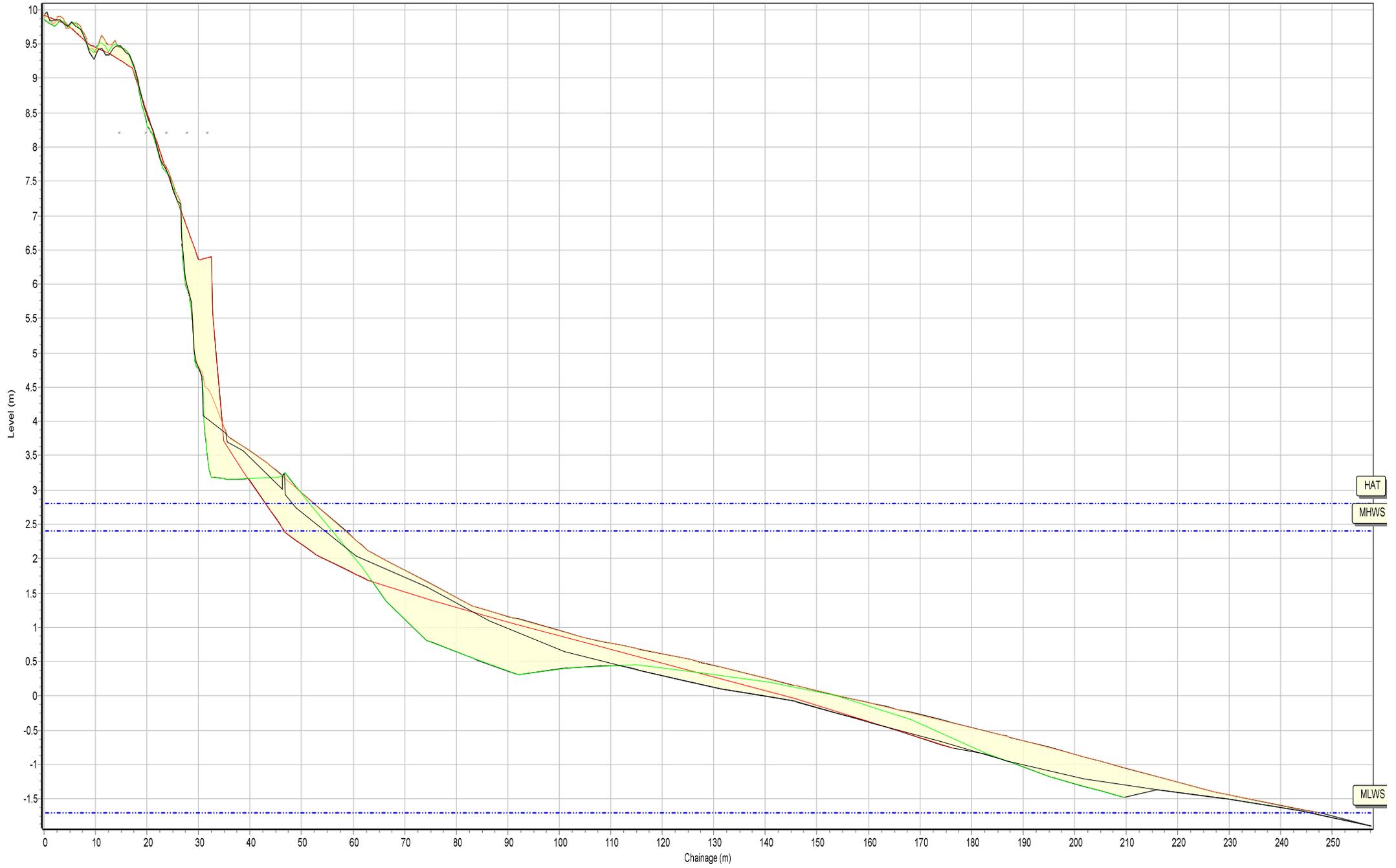
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC12



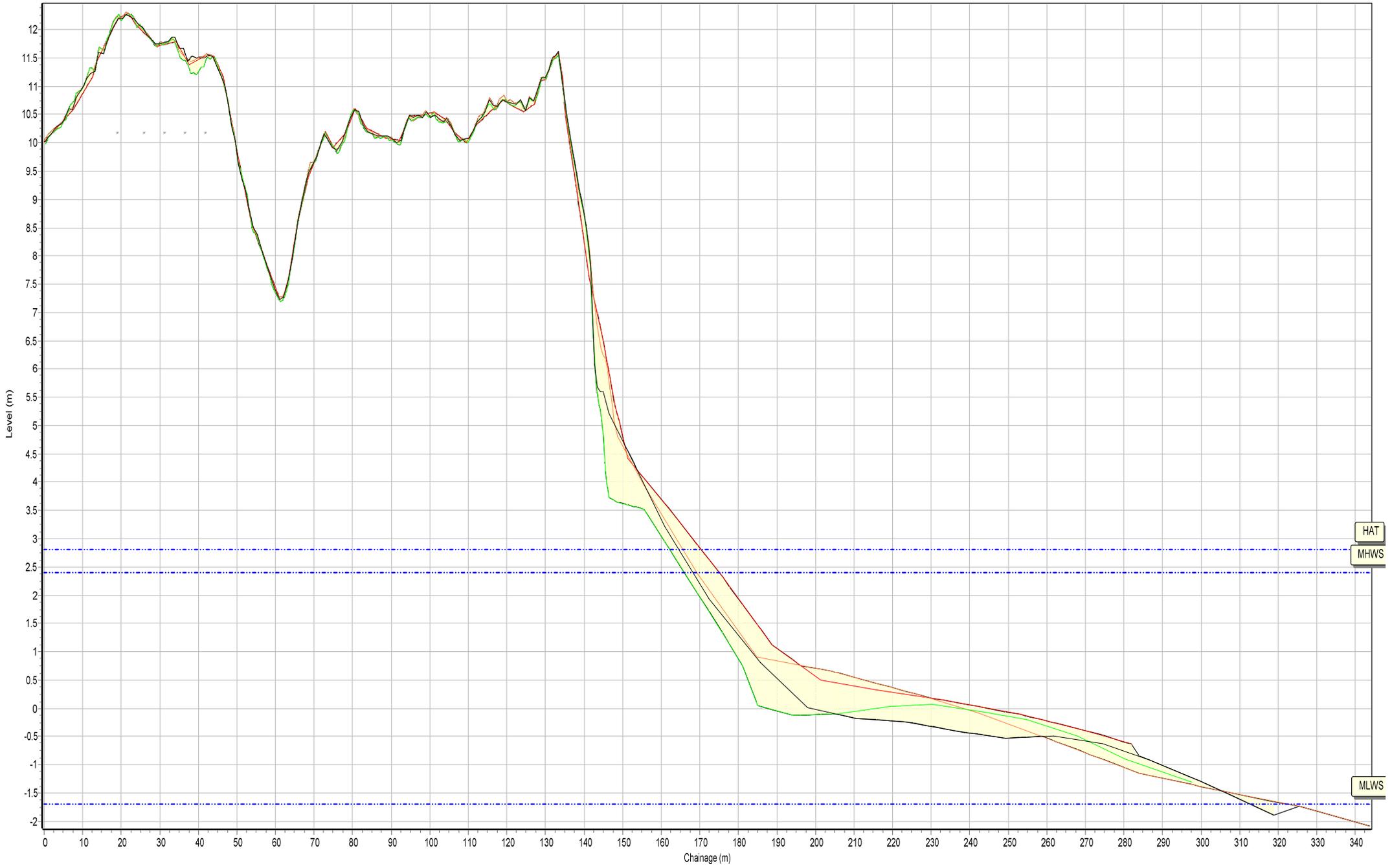
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC13



Profiles Envelope 01/10/2006 21/10/2017 22/09/2018 31/10/2019

HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC14



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC15



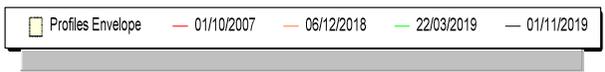
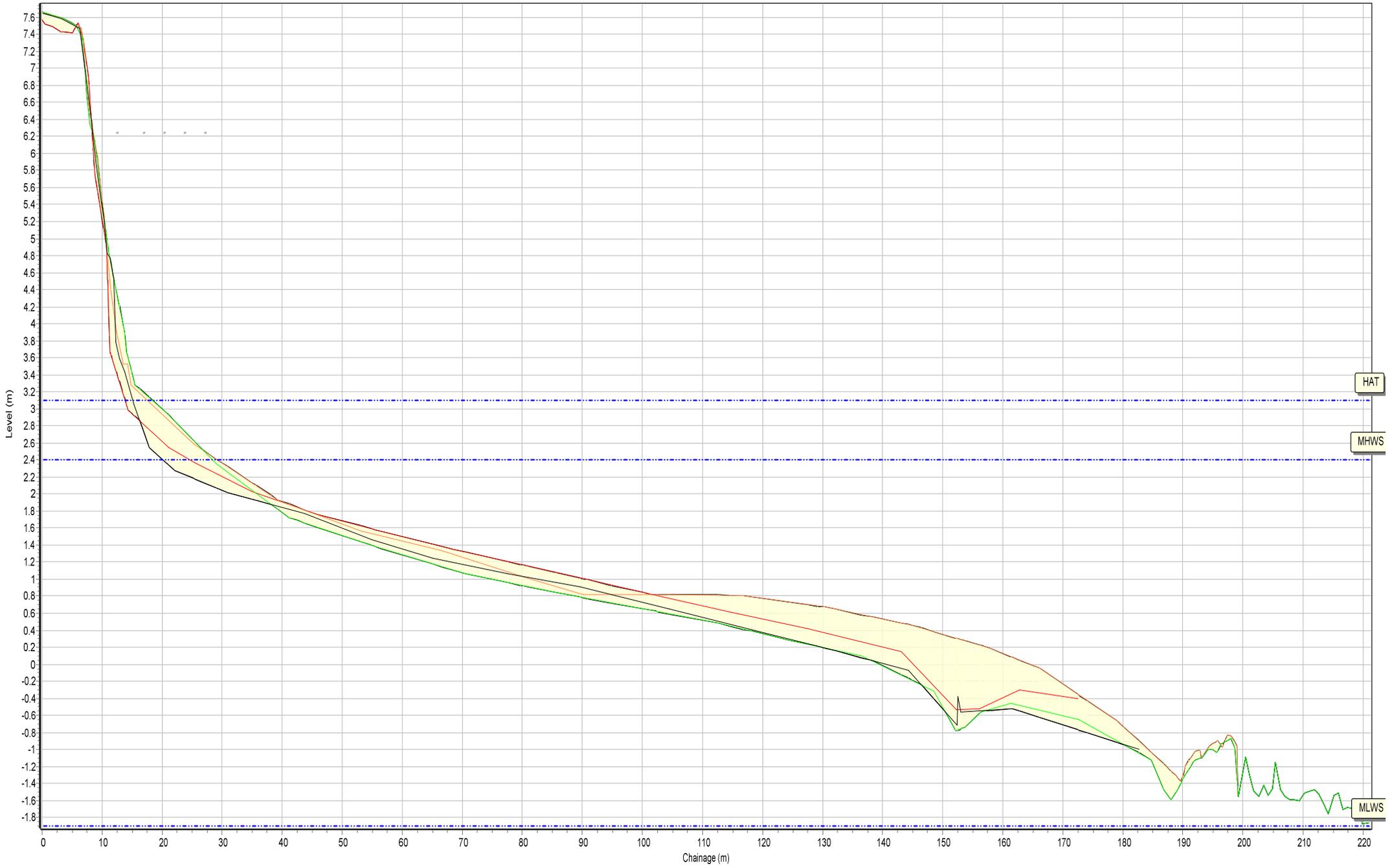
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC15A



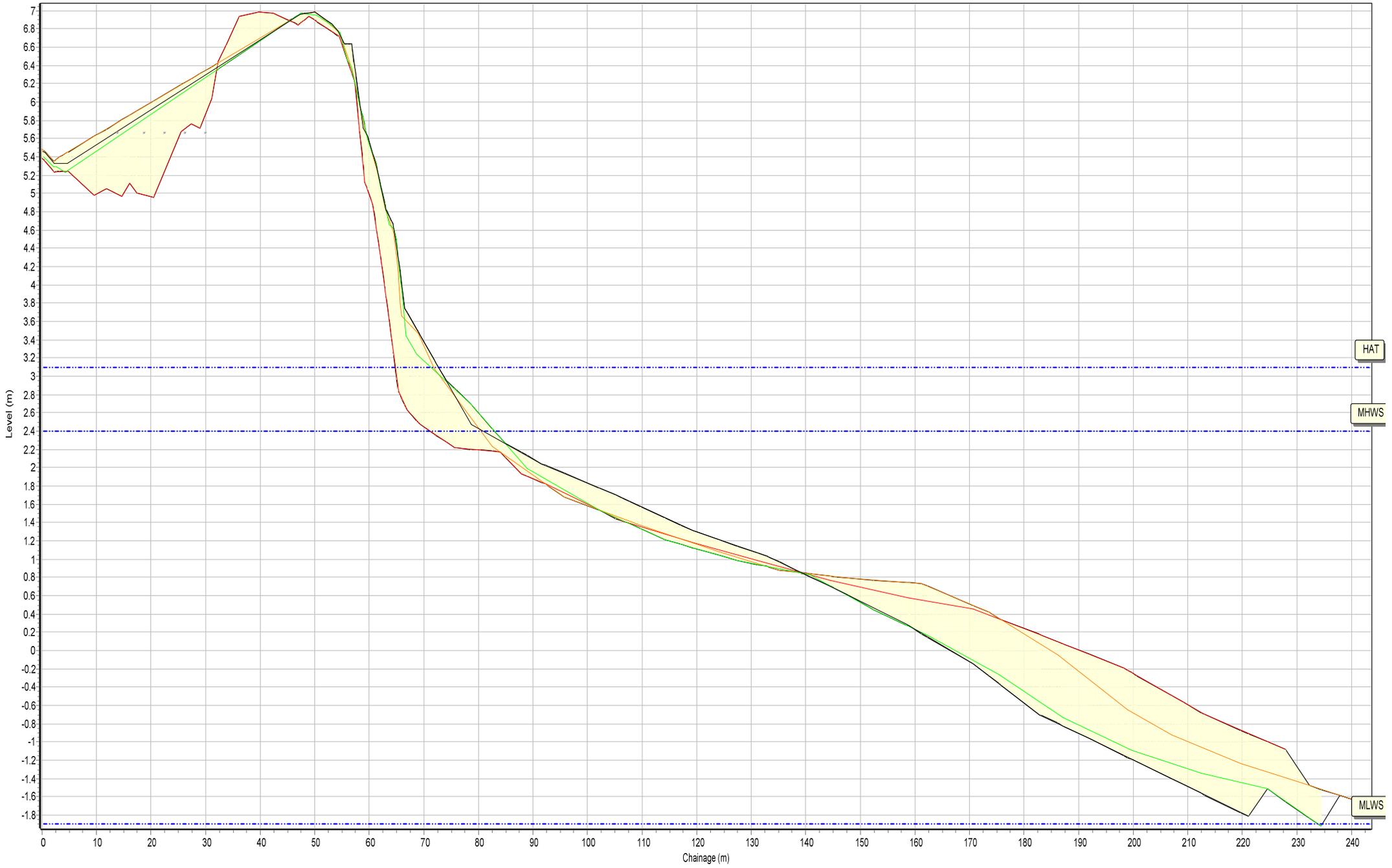
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC16



Profiles Envelope 01/04/2006 06/12/2018 22/03/2019 01/11/2019

SANDS

Beach Profiles: 1aADC16A



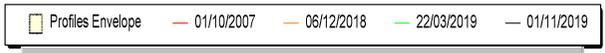
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC16B



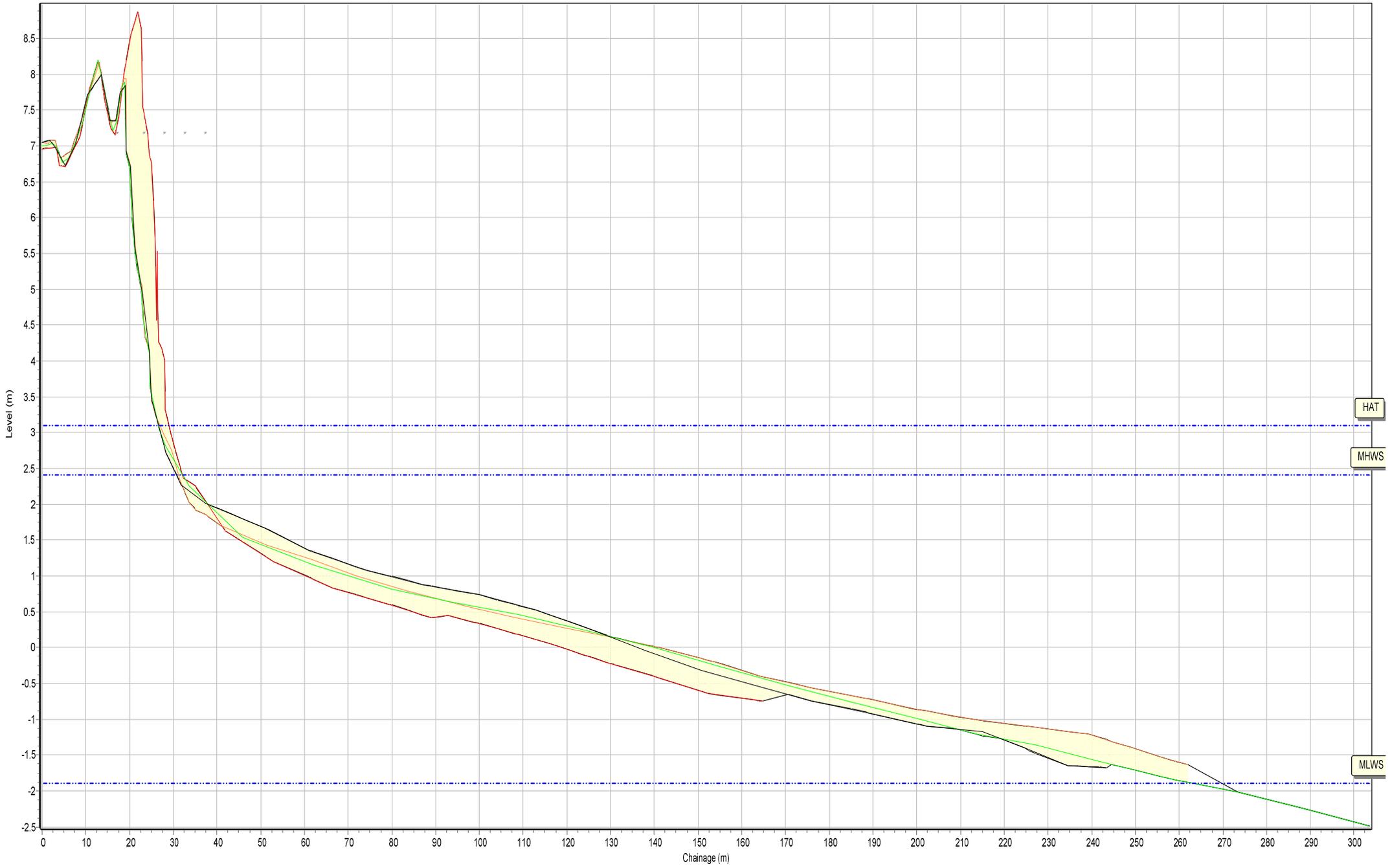
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC17



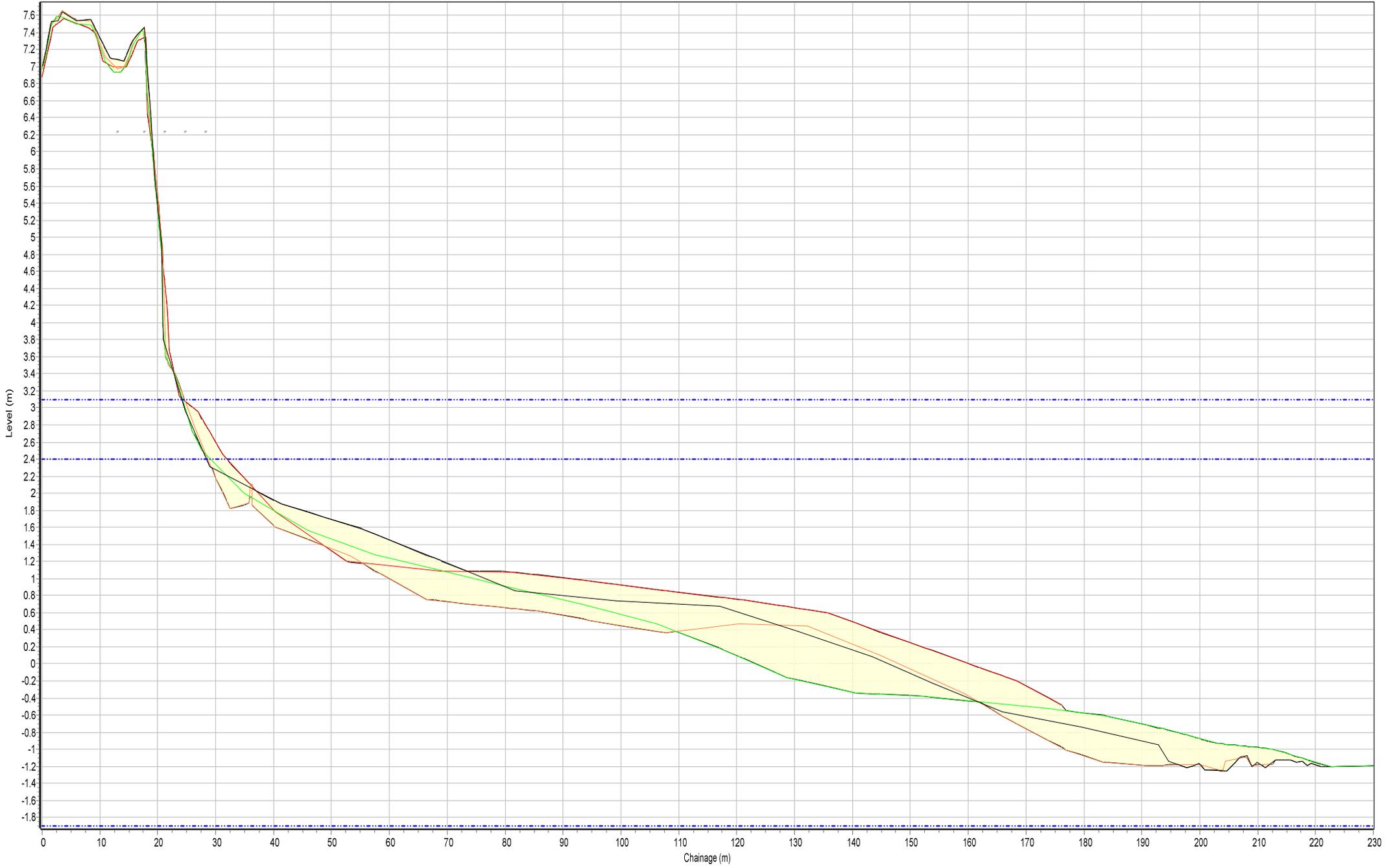
HAT

MHWs

MLWS

SANDS

# Beach Profiles: 1aADC17A



# Beach Profile

Location: 1aCMBC01

Date: 28/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

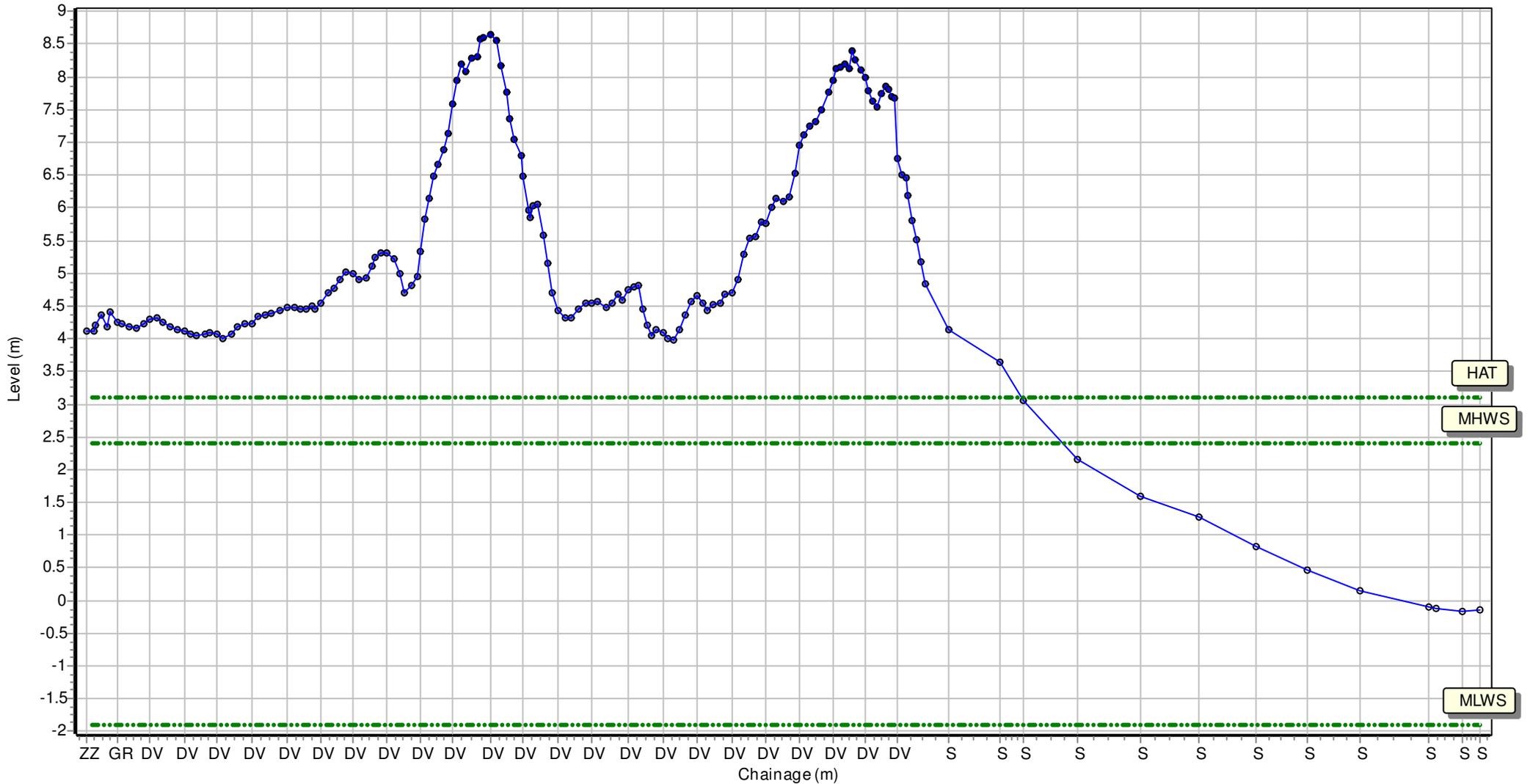
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 427552.578 Northing: 596402.769 Profile Bearing: 59 ° from North



# Beach Profile

Location: 1aCMBC02

Date: 28/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

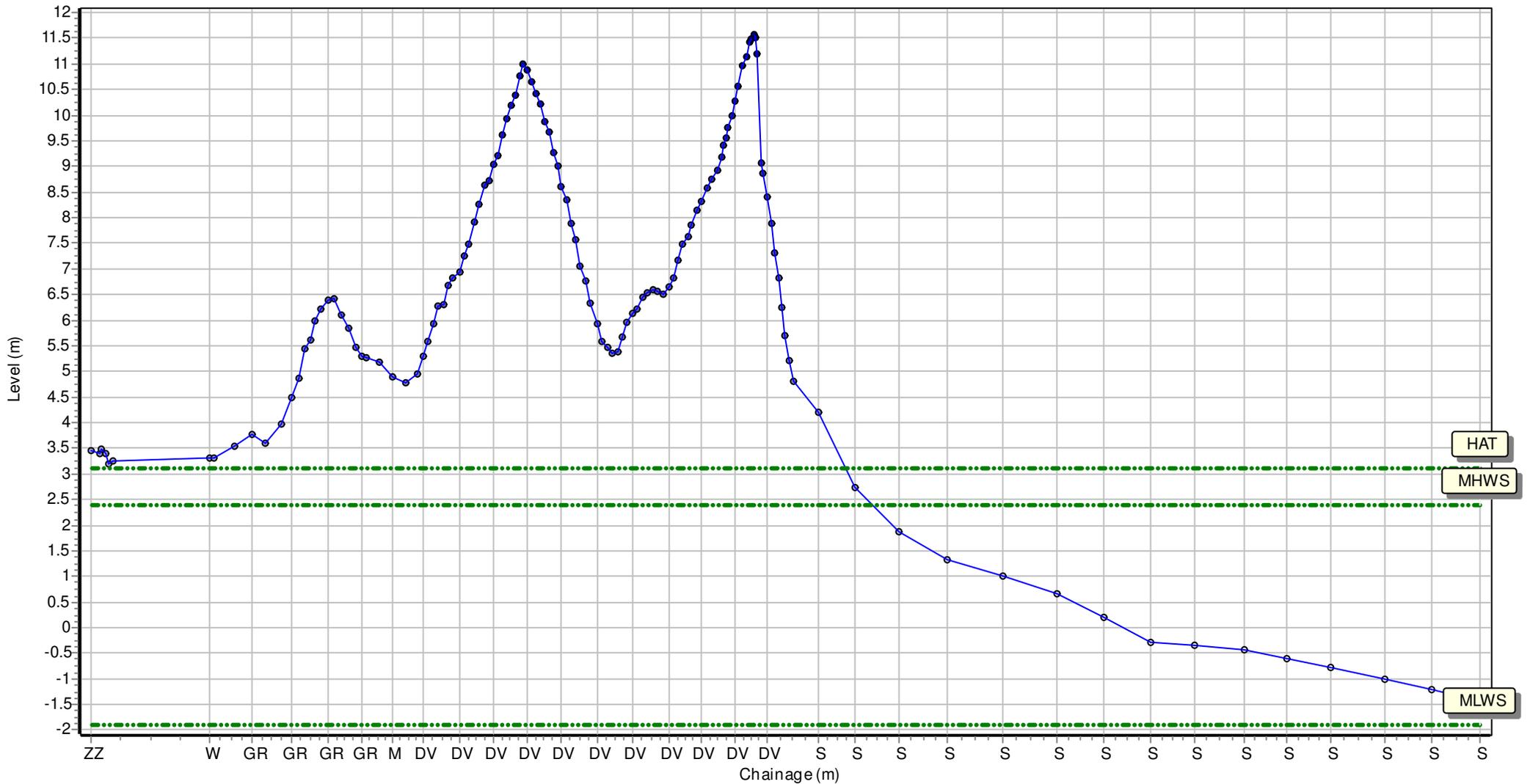
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 428355.916 Northing: 594532.141 Profile Bearing: 56 ° from North





# Beach Profile

Location: 1aCMBC03A

Date: 28/11/2019 Inspector: AG

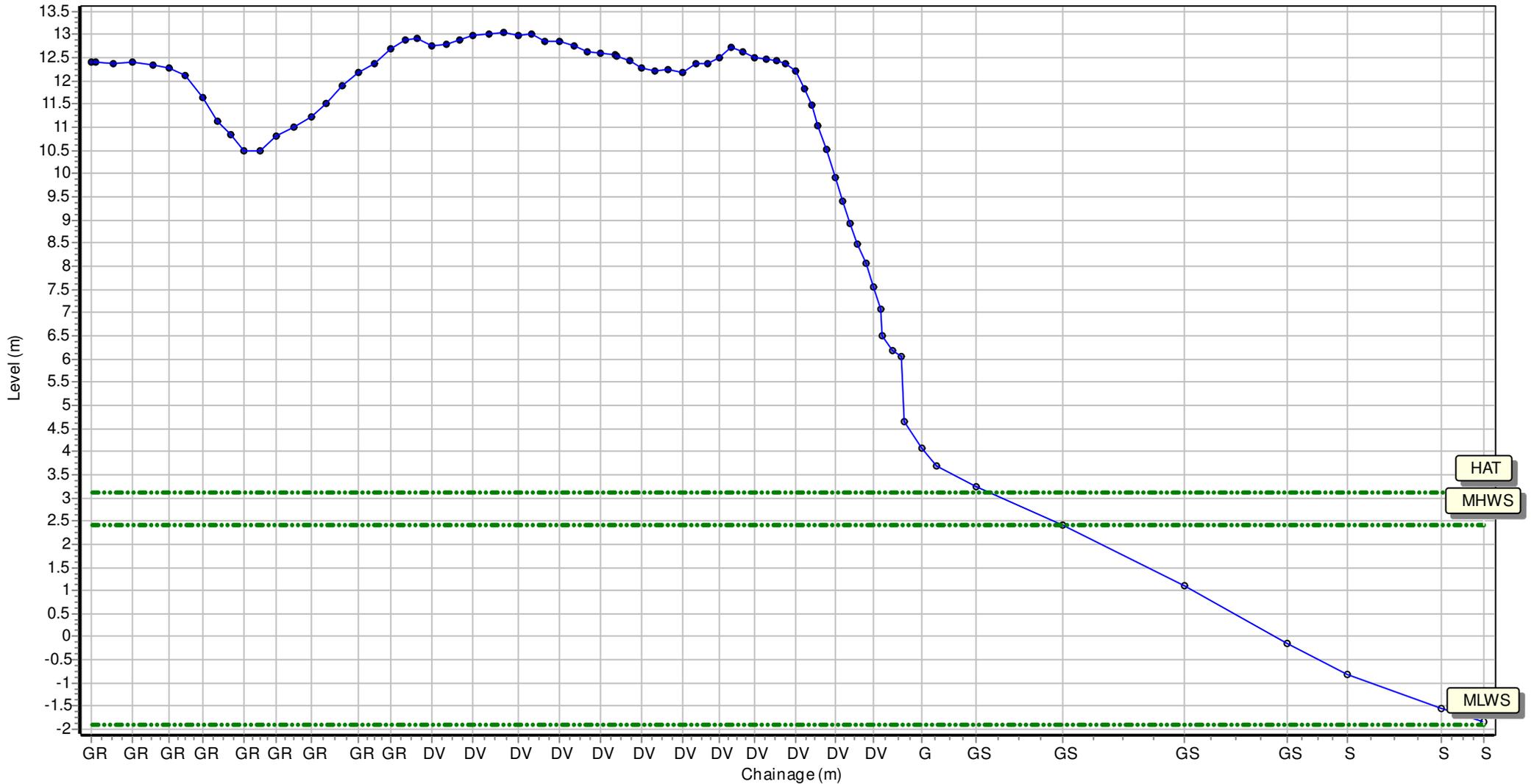
Low Tide: Low Tide Time:

Wind Sea State:

Visibility: Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430128.317 Northing: 591148.463 Profile Bearing: 70 ° from North



# Beach Profile

Location: 1aCMBC03B

Date: 28/11/2019 Inspector: AG

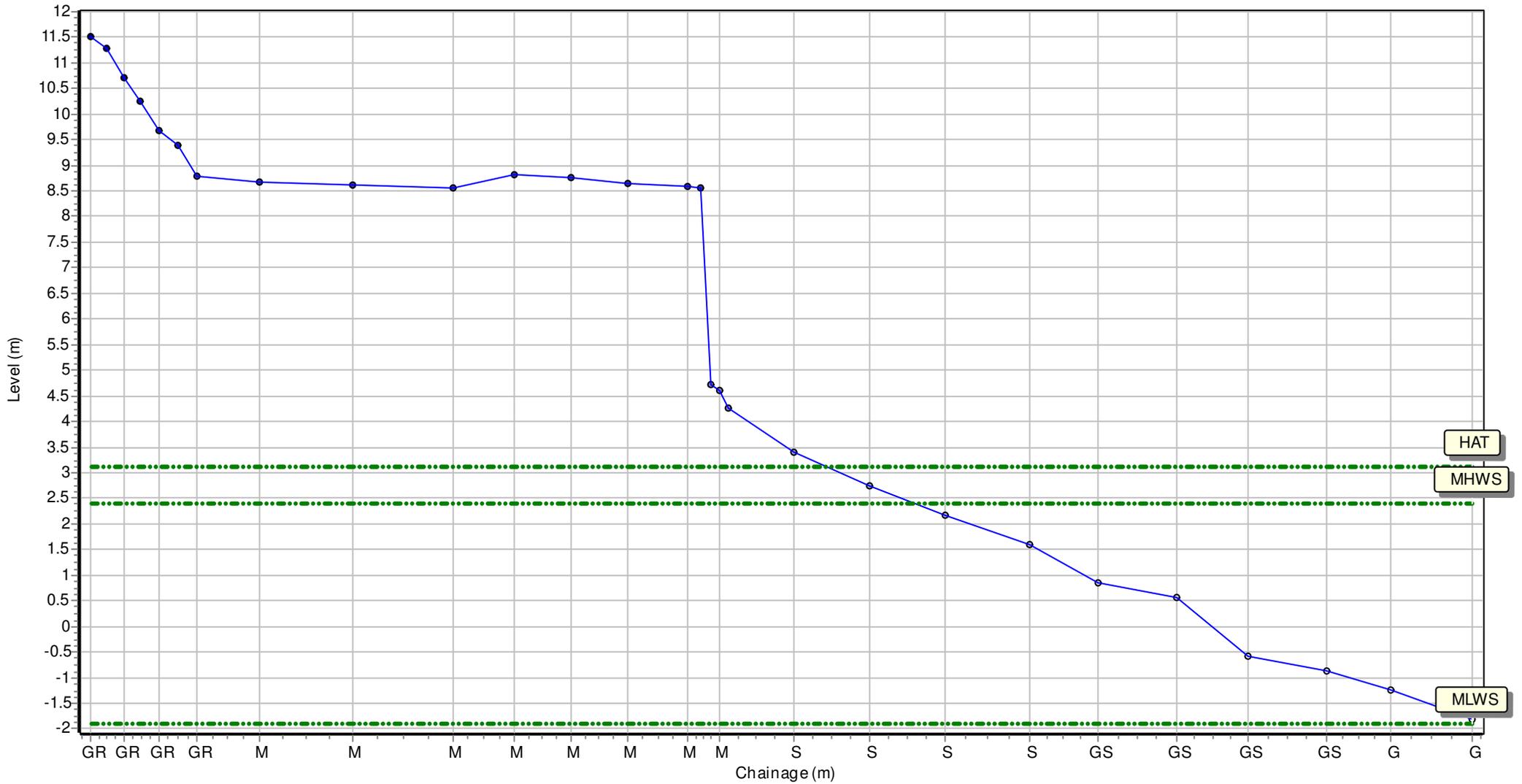
Low Tide: Low Tide Time:

Wind Sea State:

Visibility: Rain:

Summary: 2019 Full Measures Topo Survey

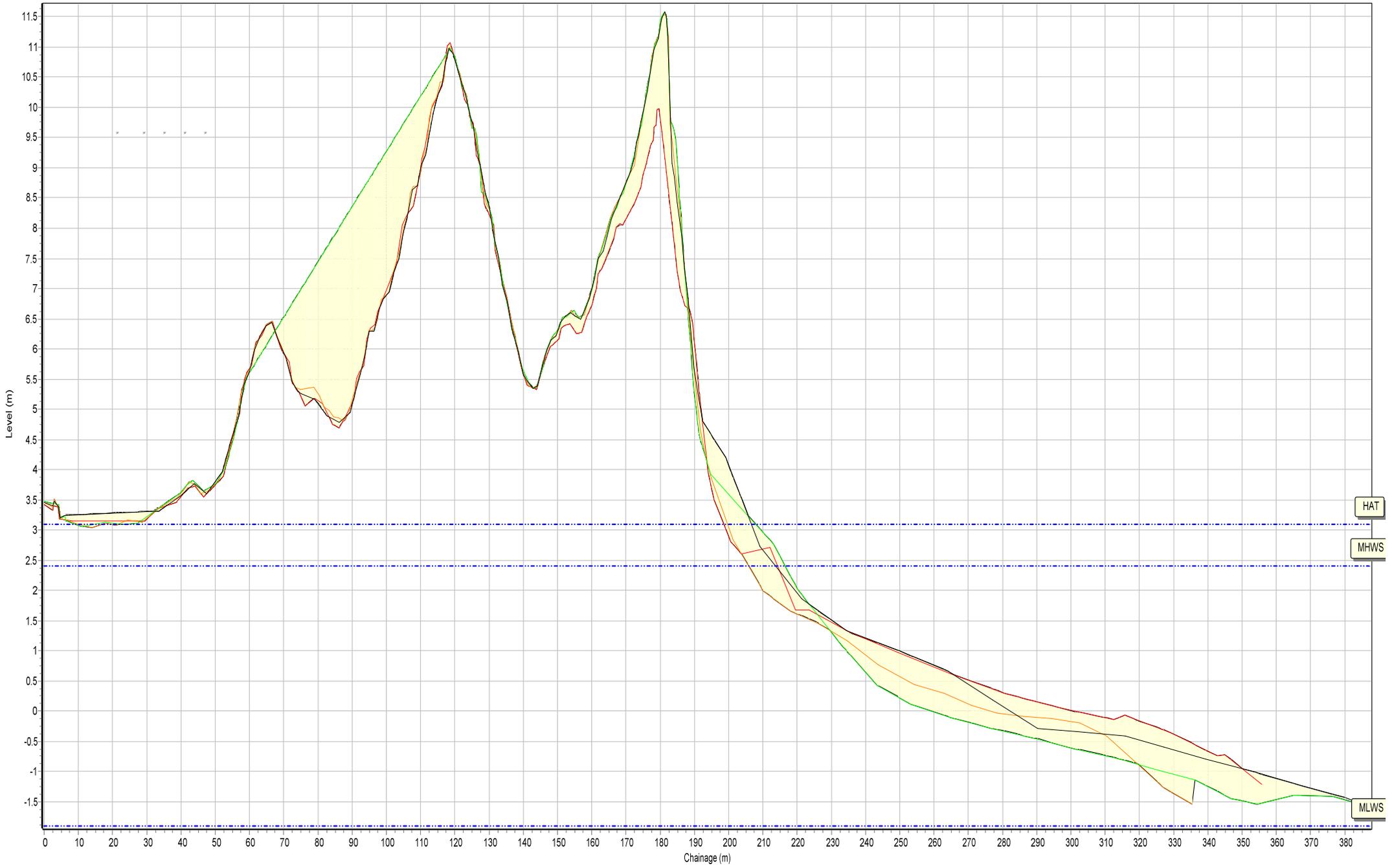
Easting: 430478.518 Northing: 590661.474 Profile Bearing: 58 ° from North



Beach Profiles: 1aCMBC01



Beach Profiles: 1aCMBC02



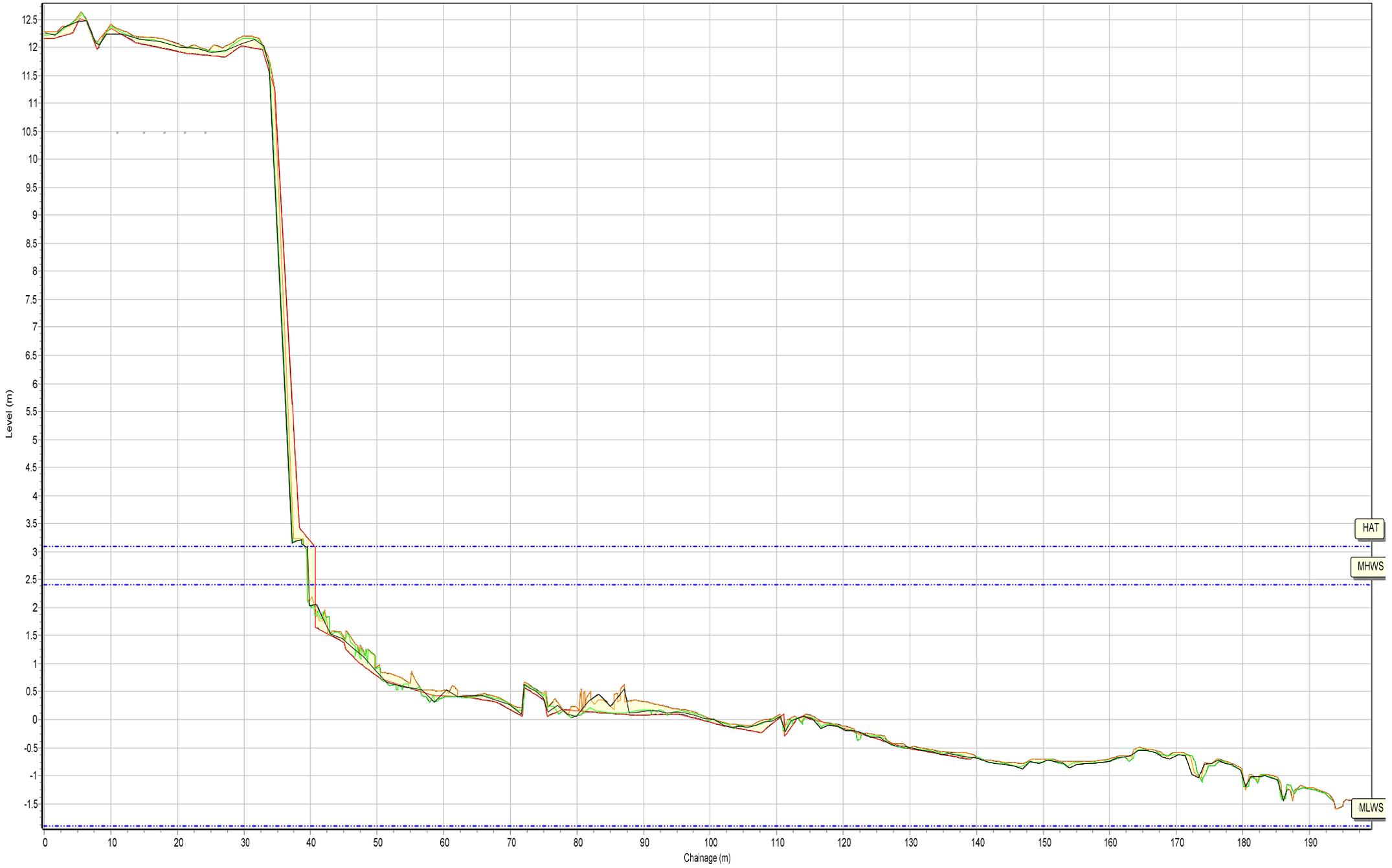
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aCMB03



Profiles Envelope 01/10/2006 06/12/2017 08/09/2018 28/11/2019

HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aCMBC03A



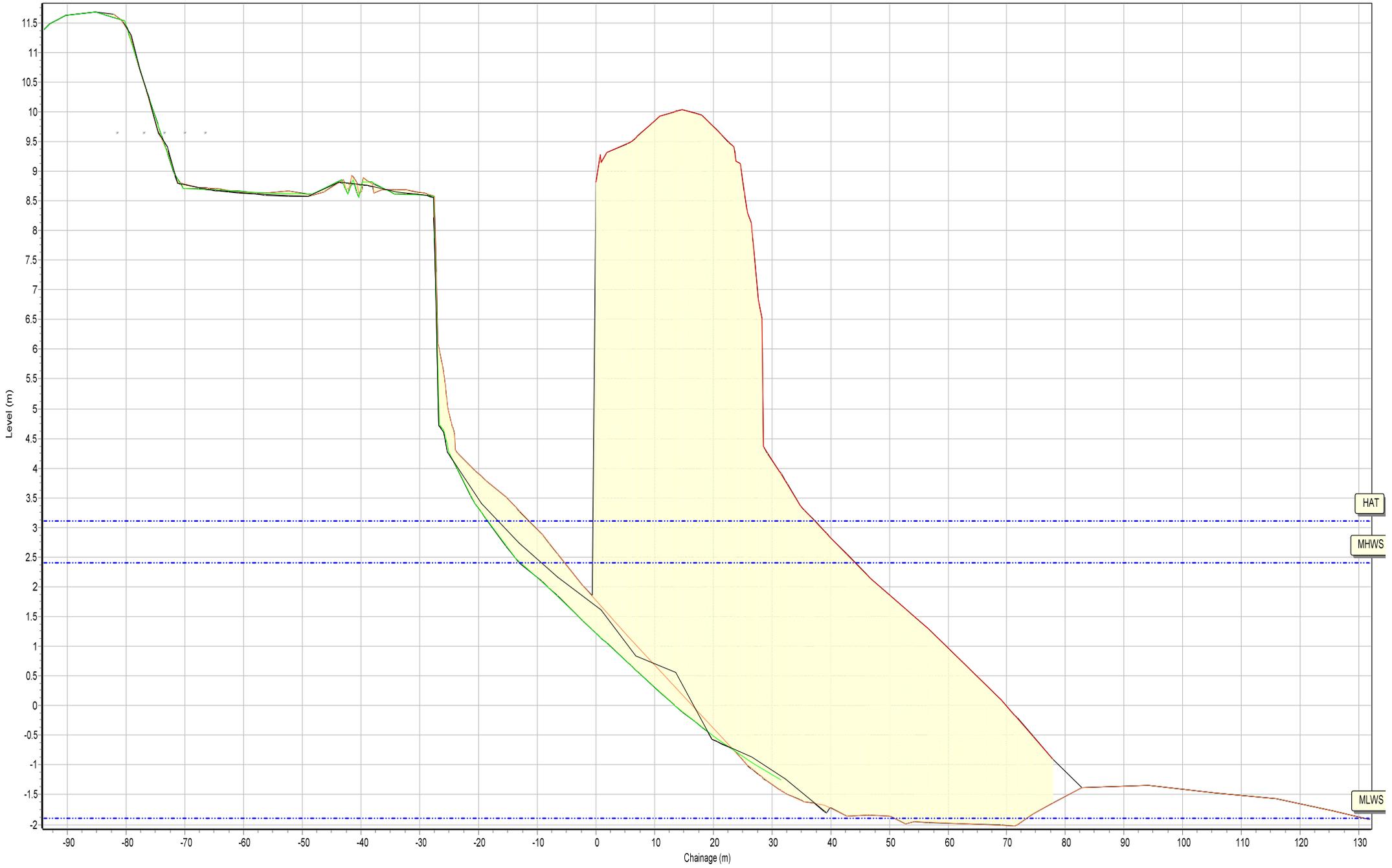
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aCMBC03B



HAT

MHWS

MLWS

SANDS

# Beach Profile

Location: 1aWDC02

Date: 28/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

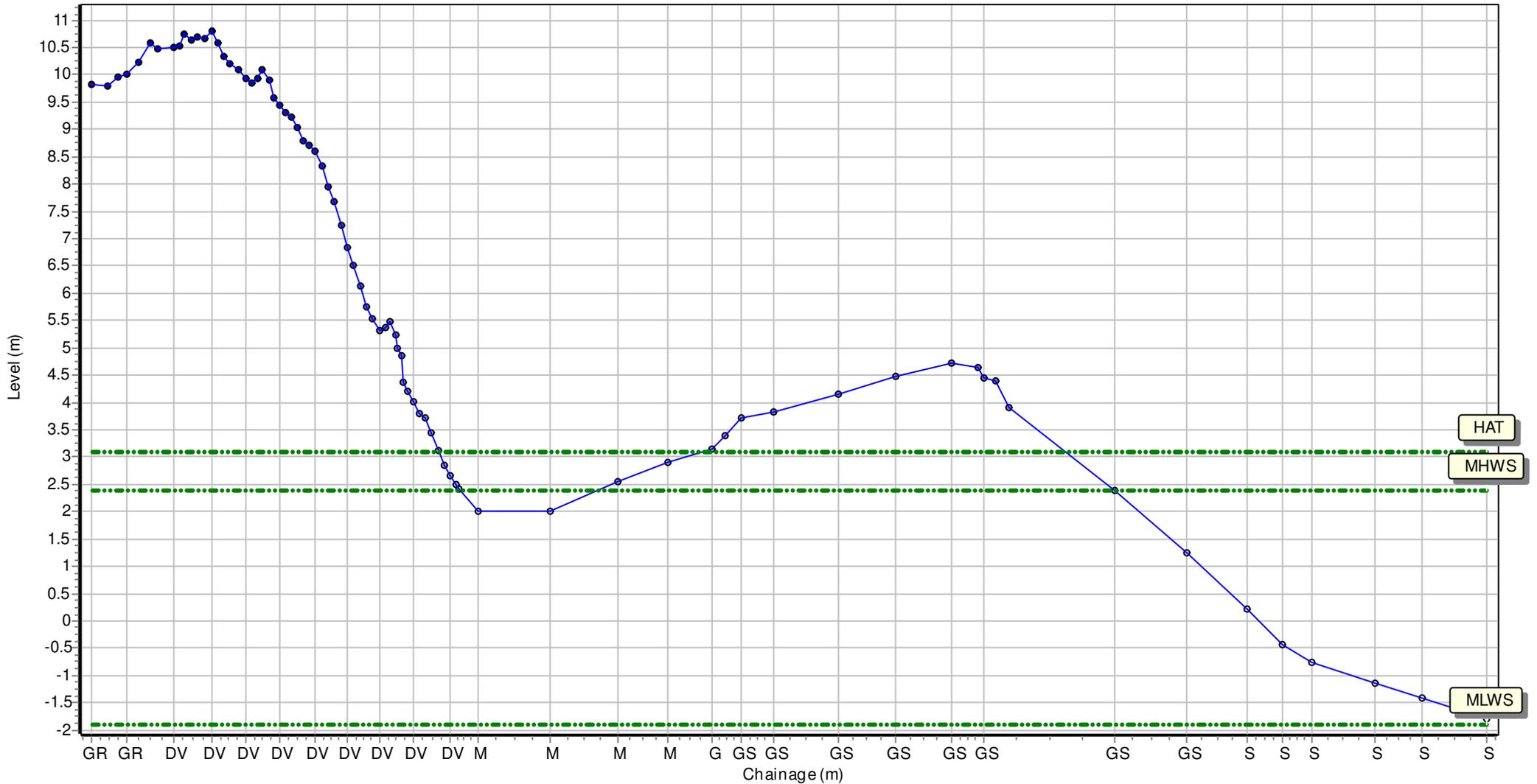
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430807.97 Northing: 589773.192 Profile Bearing: 59 ° from North



# Beach Profile

Location: 1aWDC03

Date: 28/11/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

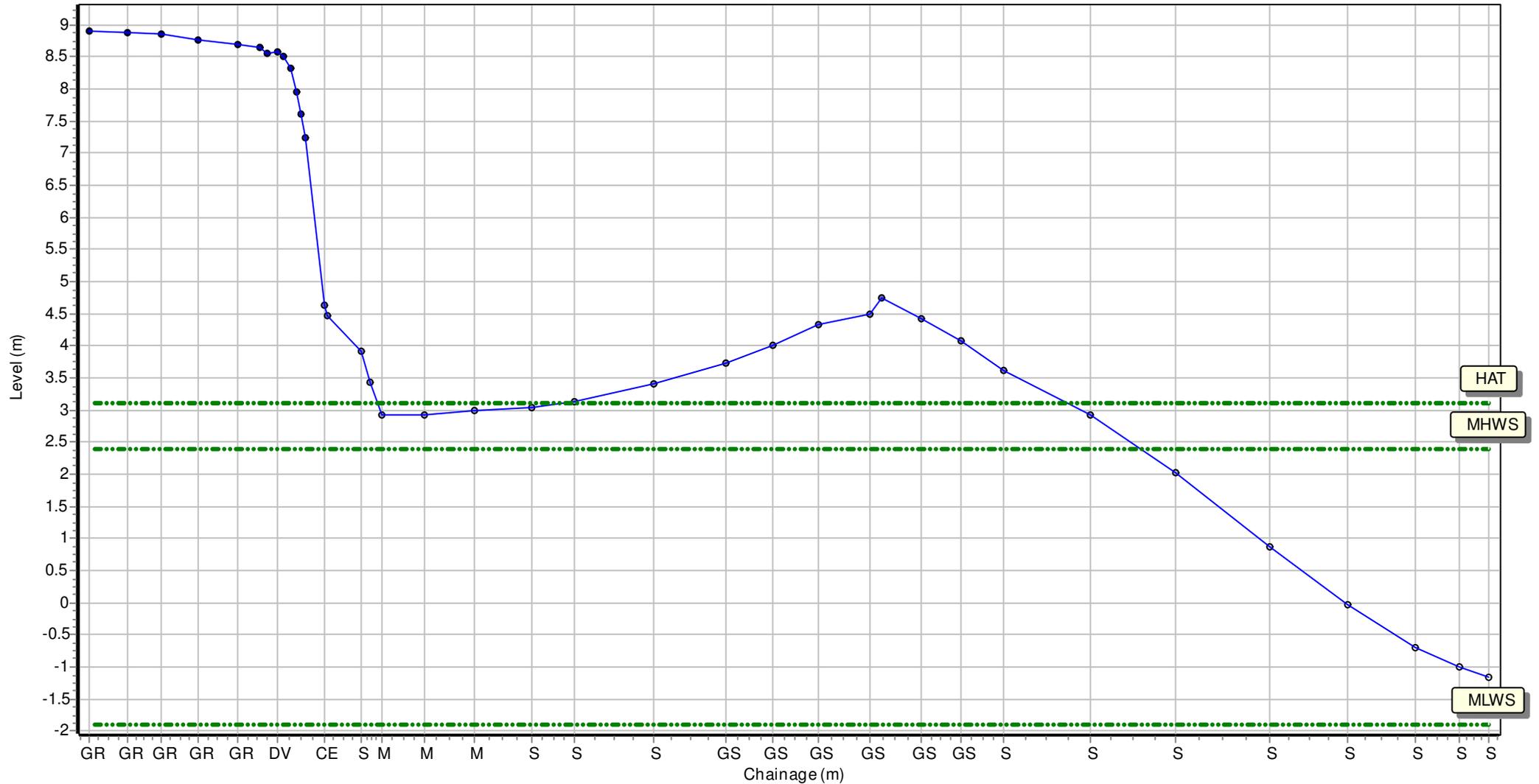
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430998.77 Northing: 589548.265 Profile Bearing: 58 ° from North





# Beach Profile

Location: 1aWDC05

Date: 03/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

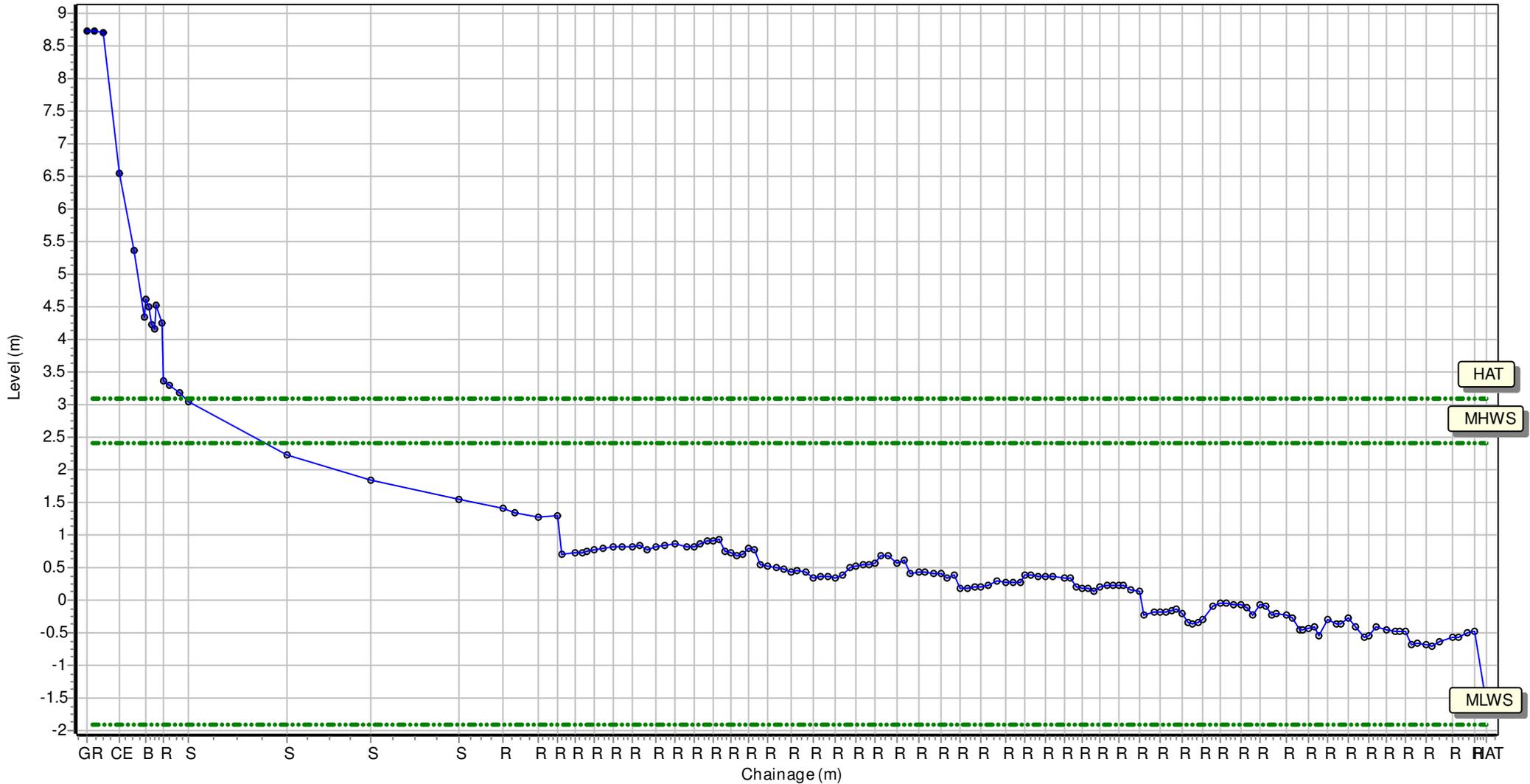
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431750.615 Northing: 588299.035 Profile Bearing: 56 ° from North



# Beach Profile

Location: 1aWDC05A

Date: 03/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

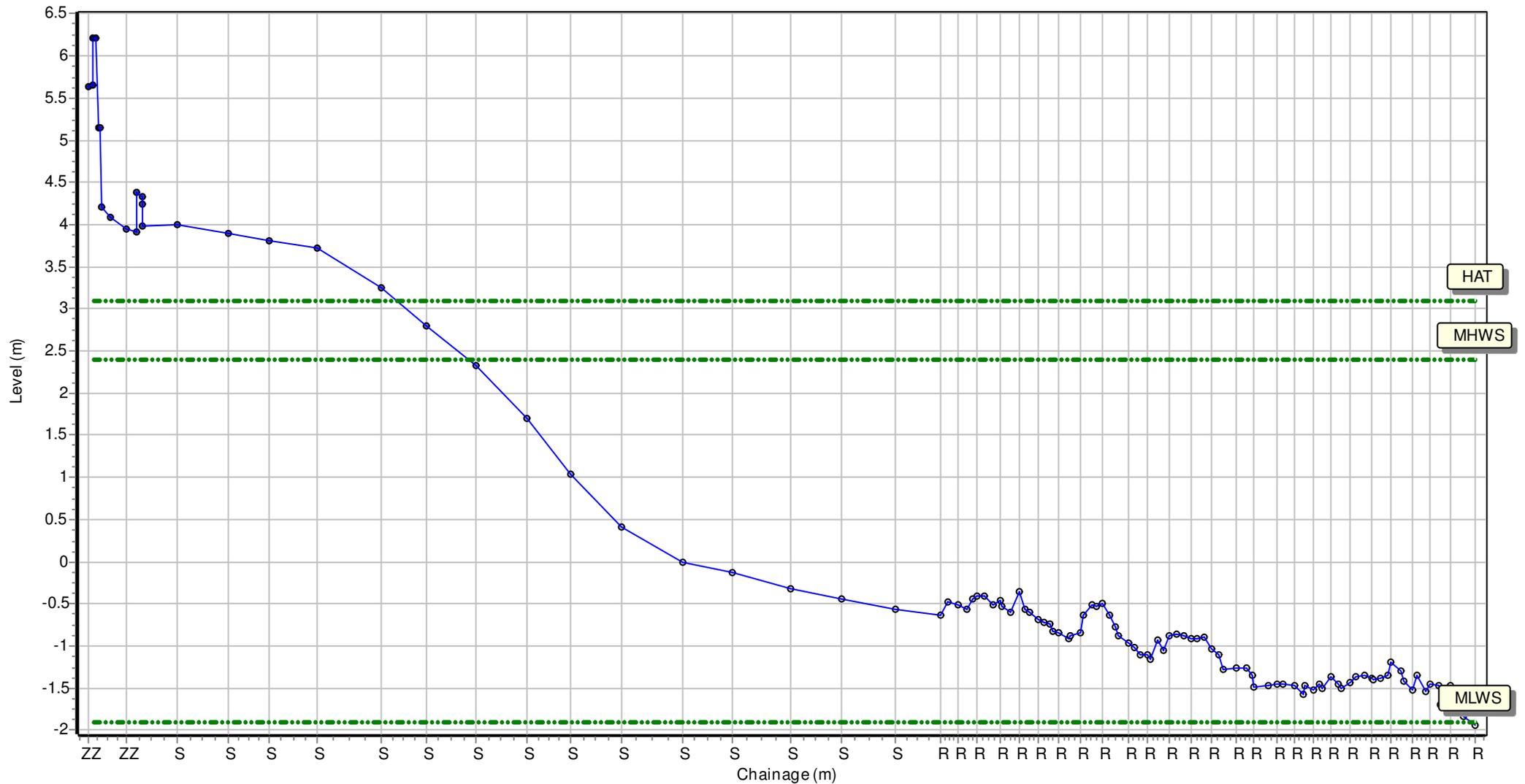
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431490.829 Northing: 588054.668 Profile Bearing: 181 ° from North



# Beach Profile

Location: 1aWDC06

Date: 03/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

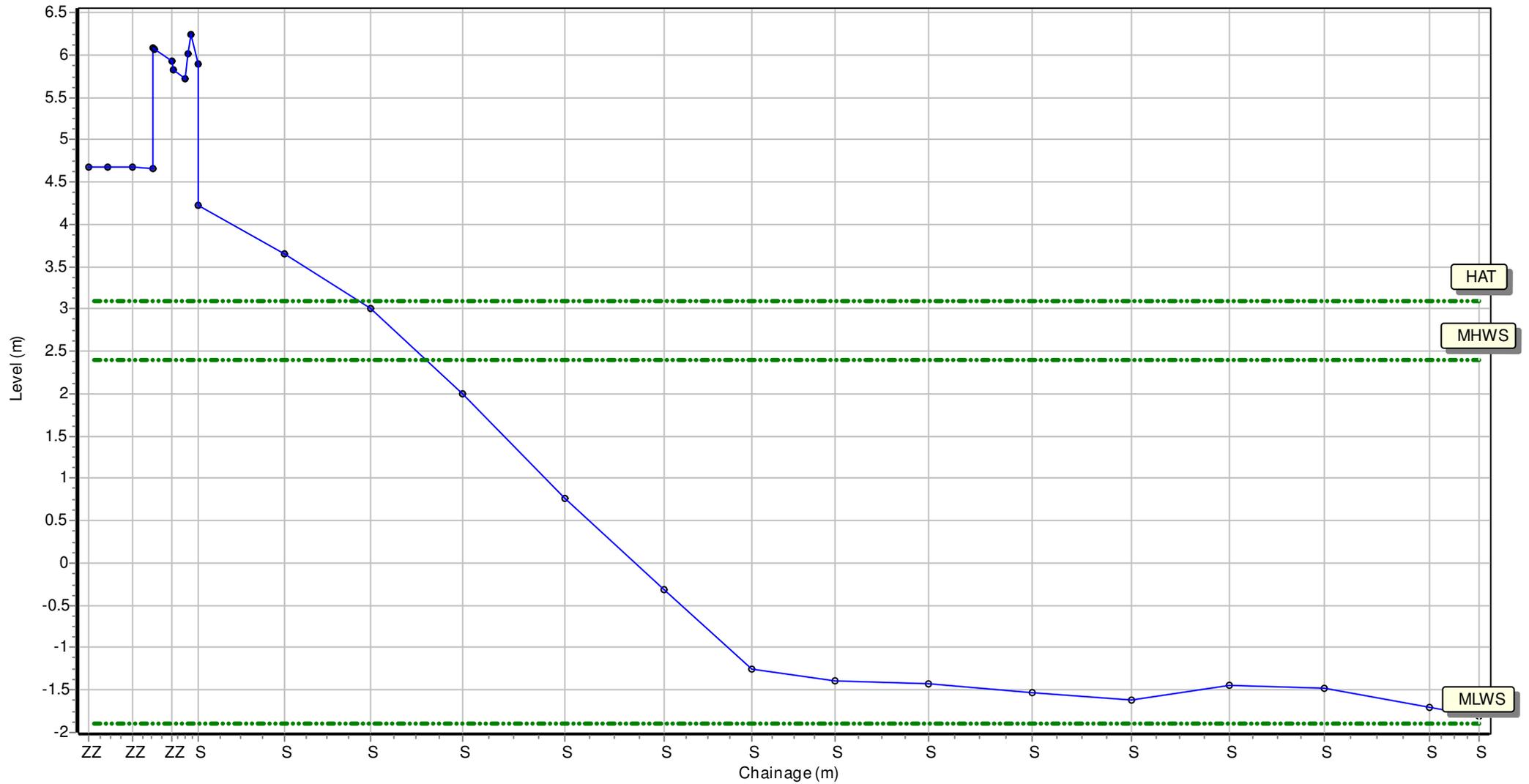
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431176.409 Northing: 587860.146 Profile Bearing: 125 ° from North



# Beach Profile

Location: 1aWDC06A

Date: 03/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

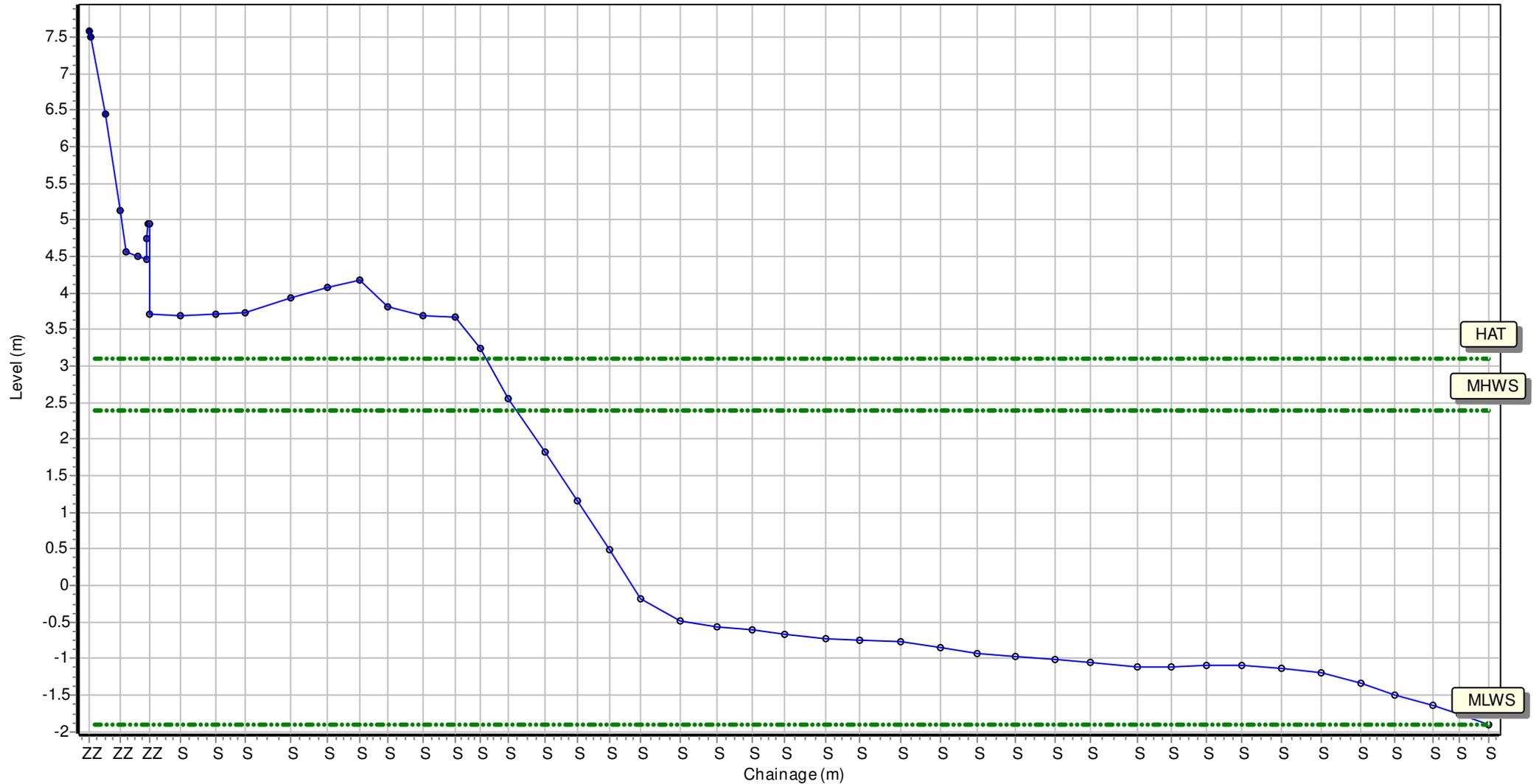
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431040.809 Northing: 587666.014 Profile Bearing: 114 ° from North



# Beach Profile

Location: 1aWDC07

Date: 03/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

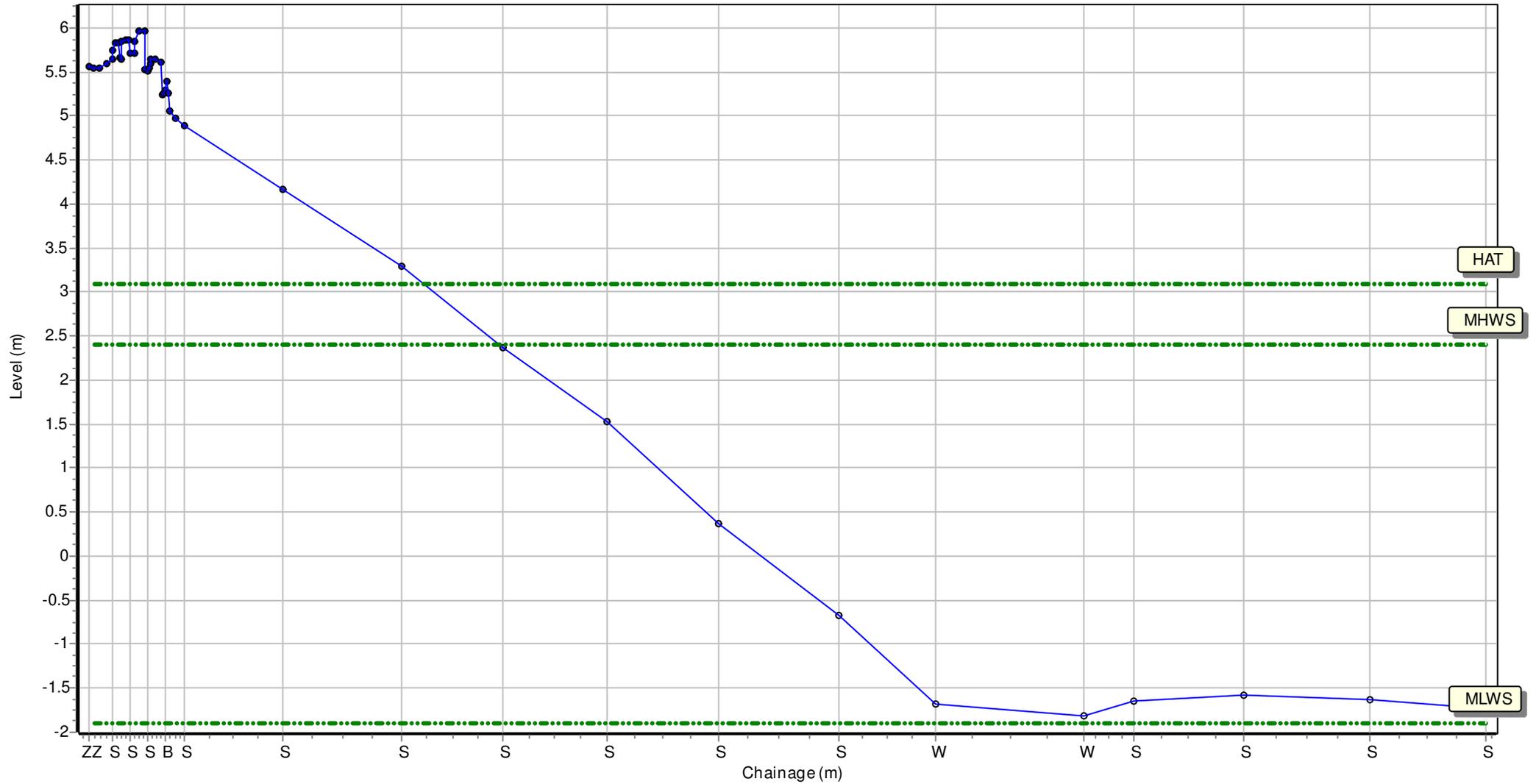
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430972.923 Northing: 587417.667 Profile Bearing: 103 ° from North



# Beach Profile

Location: 1aWDC08

Date: 02/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

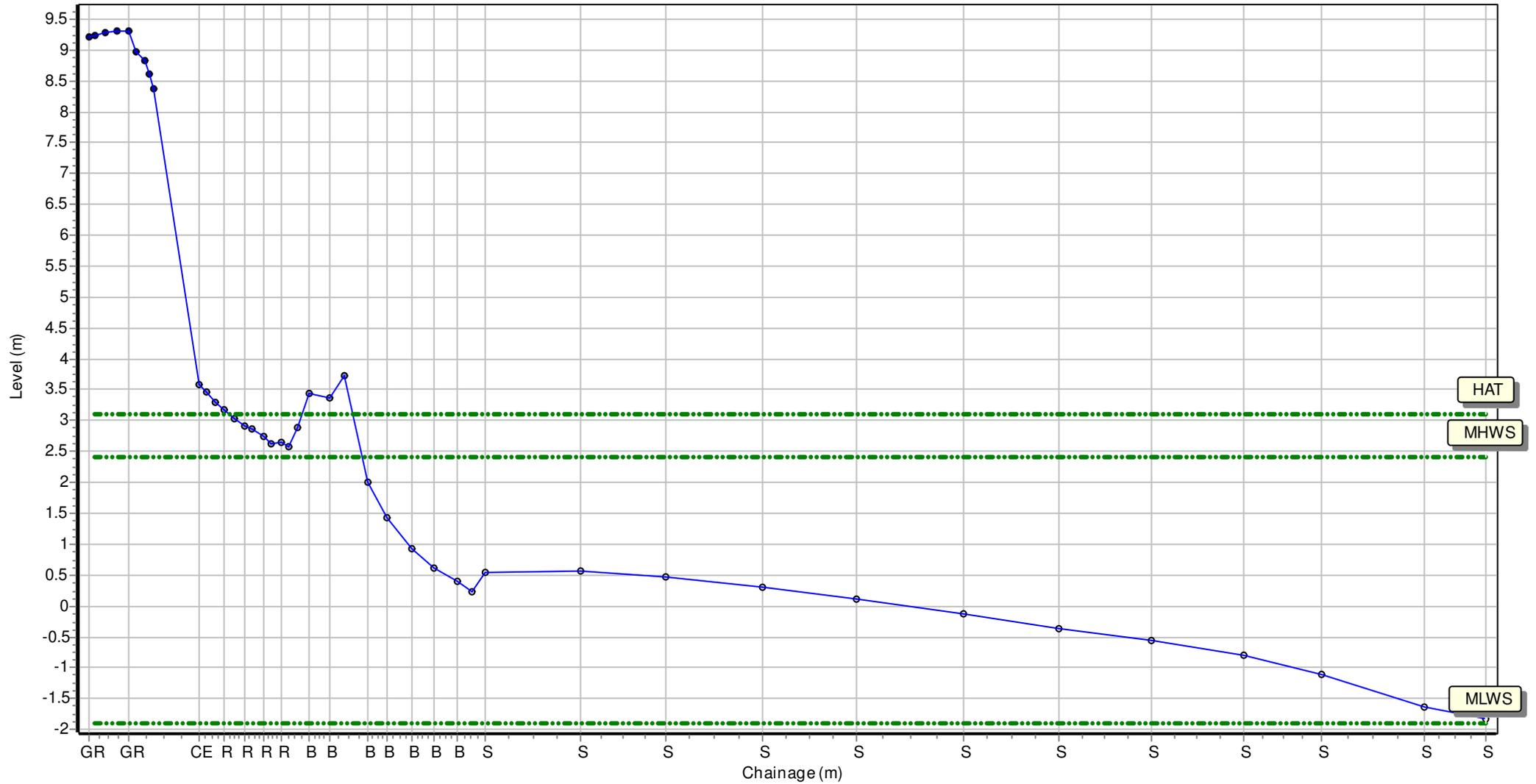
Sea State:

Visibility:

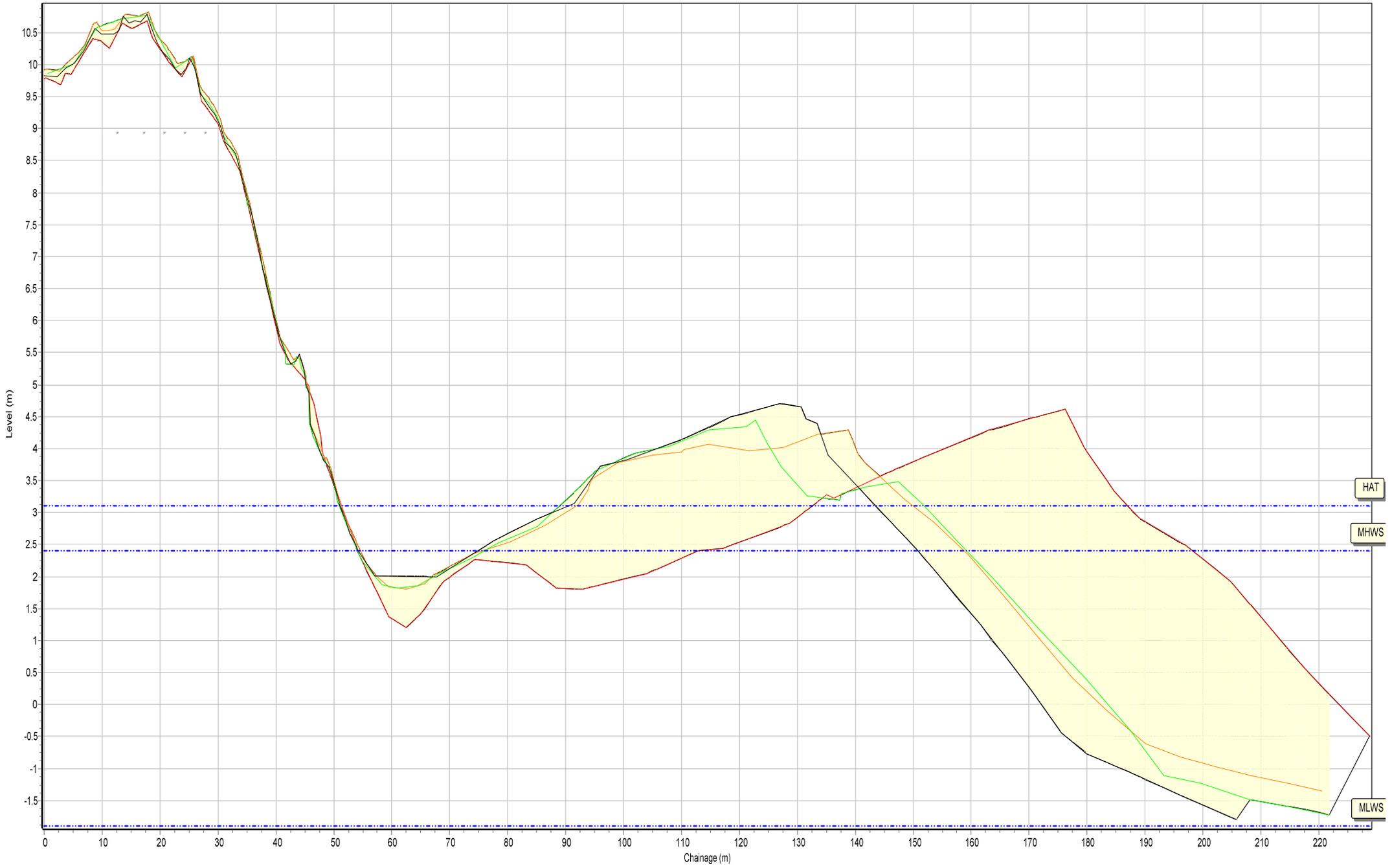
Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430440.056 Northing: 585865.943 Profile Bearing: 105 ° from North



# Beach Profiles: 1aWDC02



Profiles Envelope 01/10/2006 22/10/2017 08/09/2018 28/11/2019

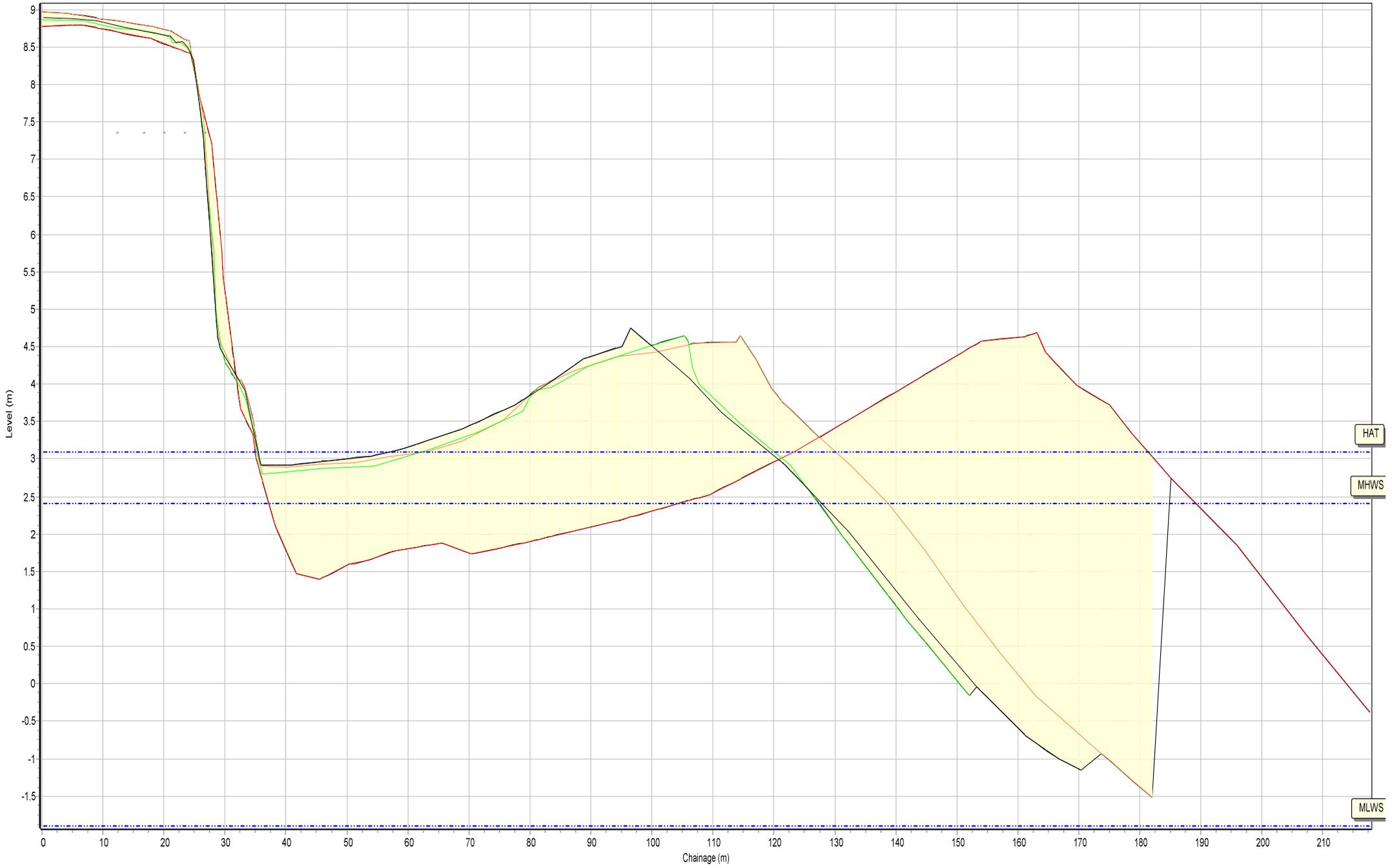
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC03



Profiles Envelope 01/10/2006 22/10/2017 08/09/2018 28/11/2019

Beach Profiles: 1aWDC04



Profiles Envelope 01/10/2006 08/09/2017 26/11/2018 03/10/2019

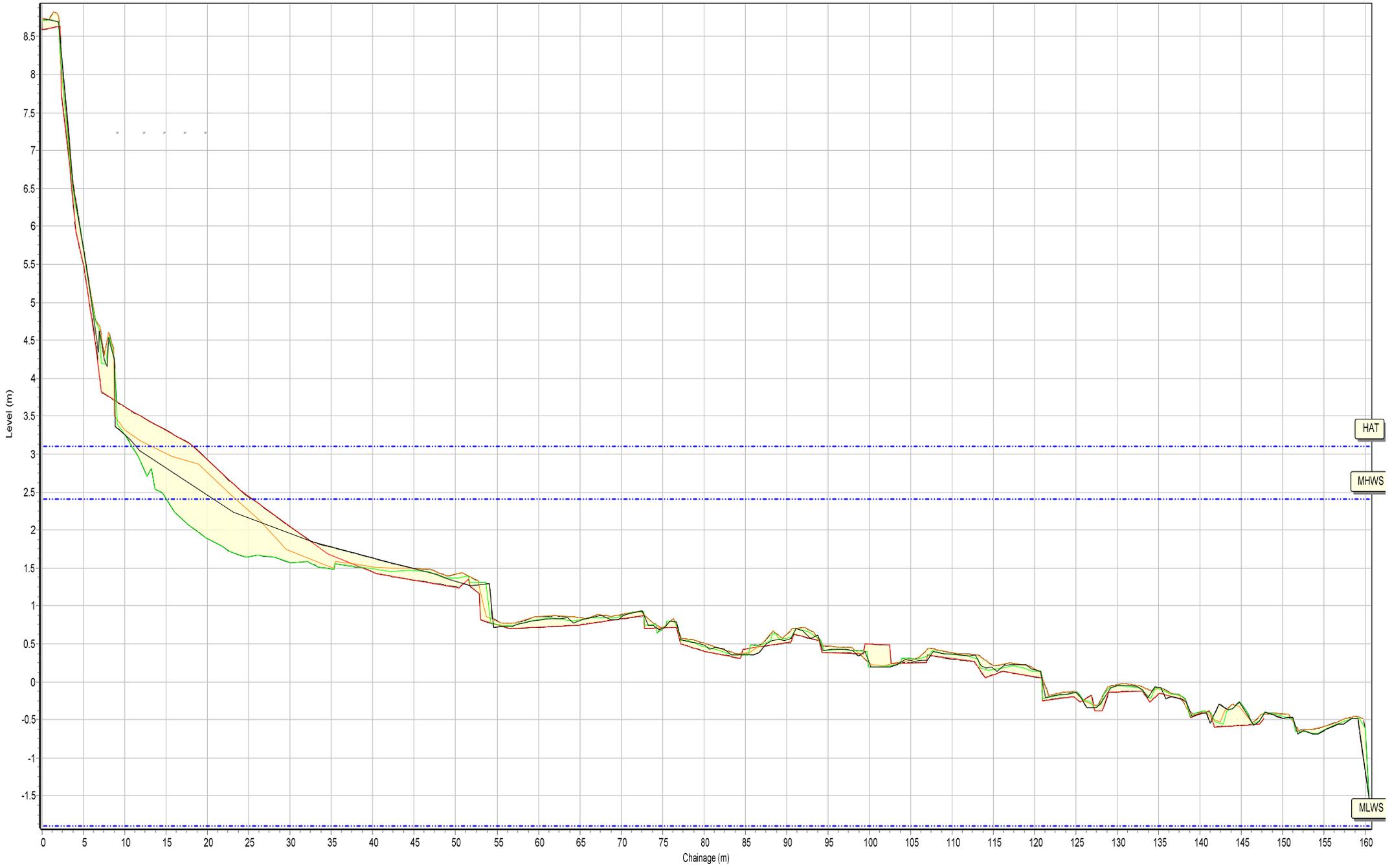
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC05



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC05A



Profiles Envelope 01/10/2007 26/11/2018 21/02/2019 03/10/2019

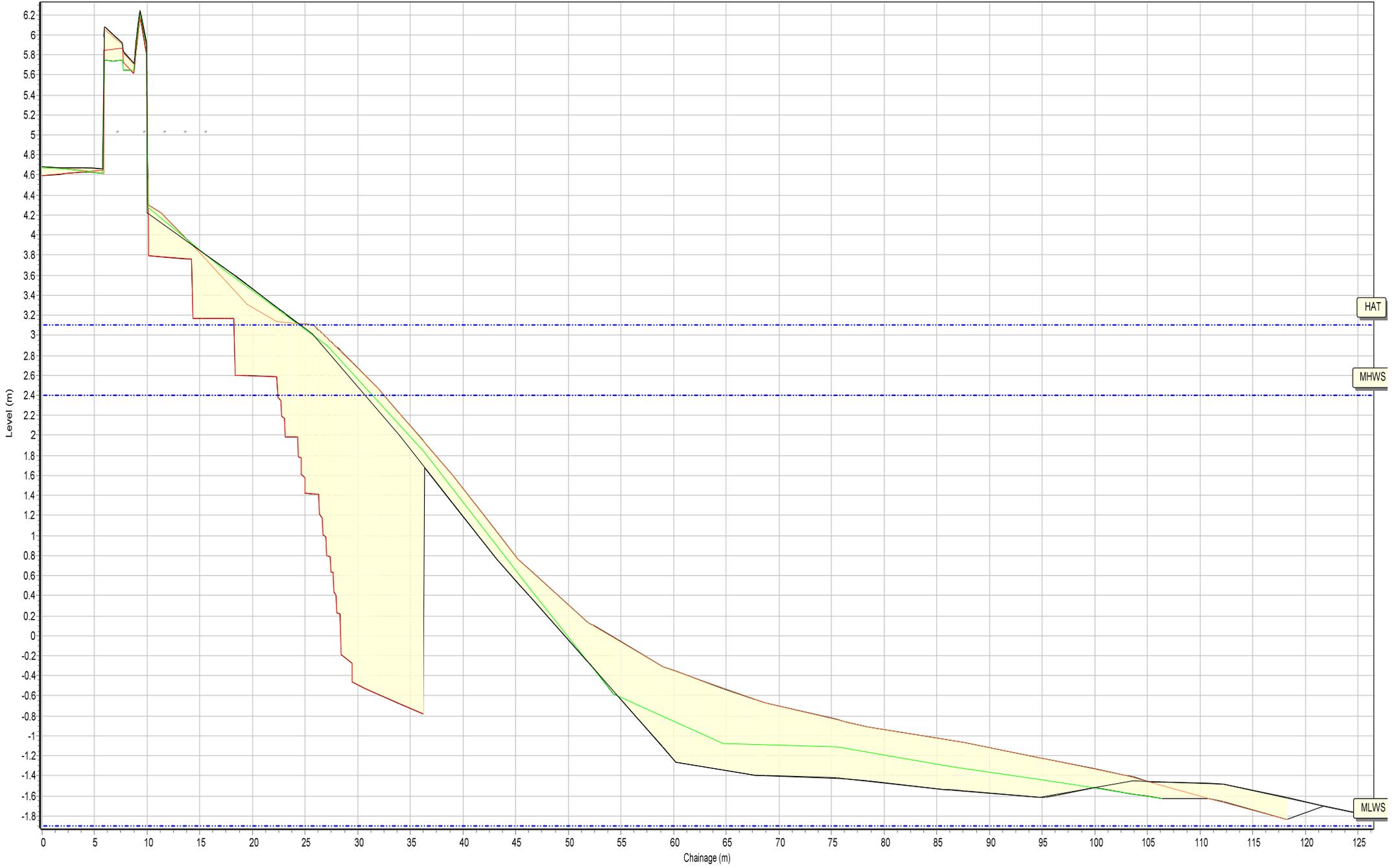
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC06



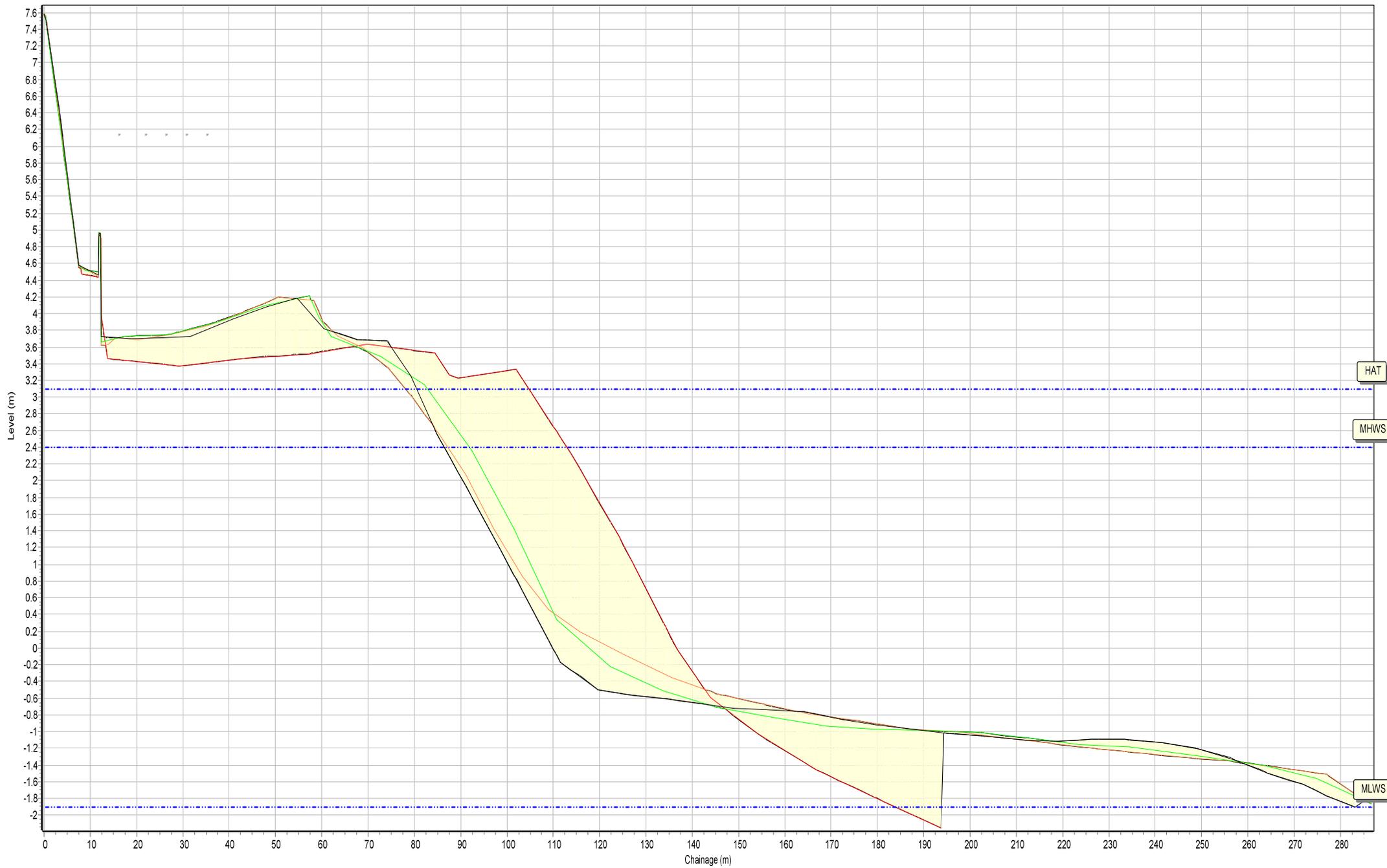
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC06A



Profiles Envelope 01/10/2007 26/11/2018 21/02/2019 03/10/2019

HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC07



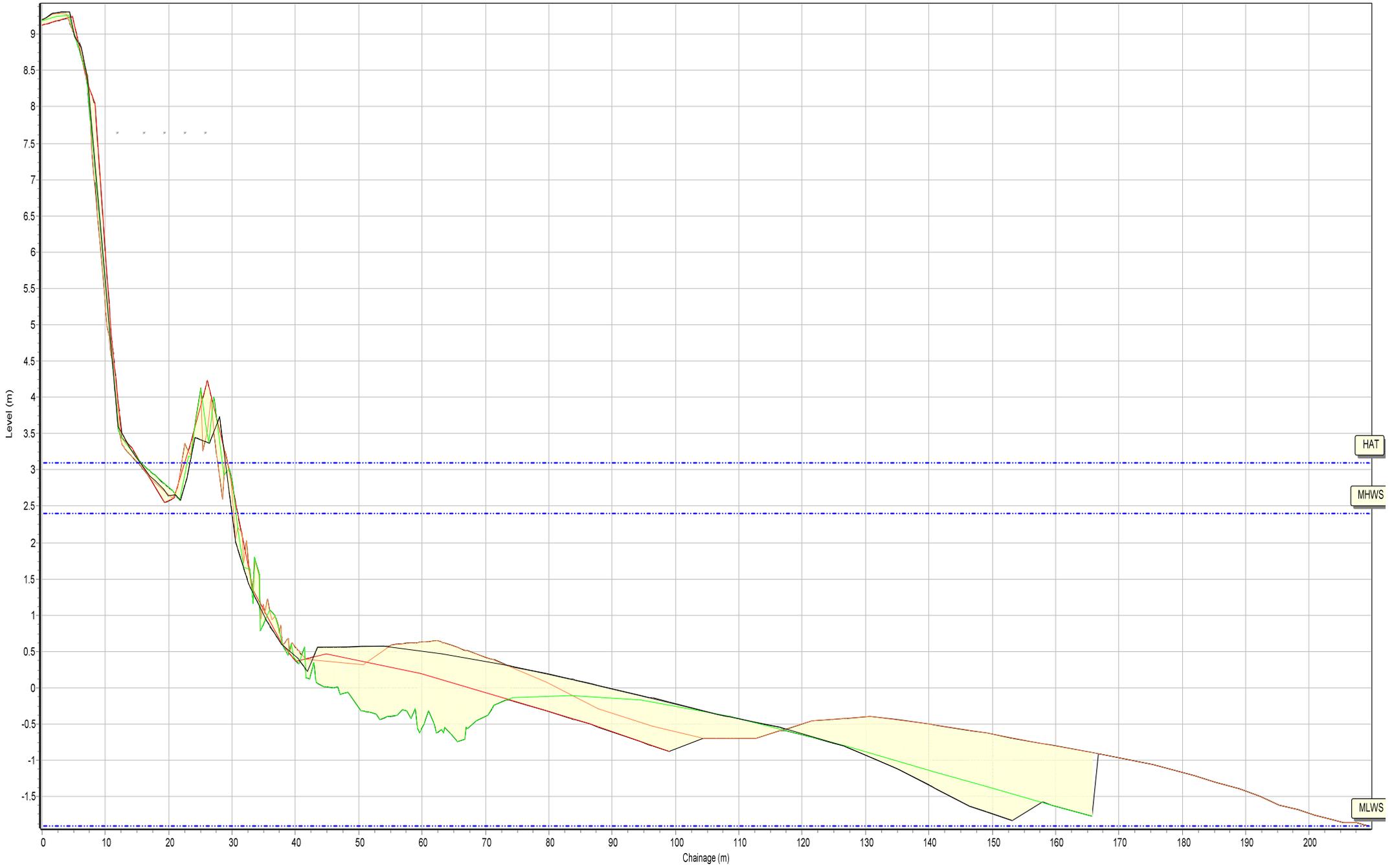
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aWDC08



HAT

MLWS

MLWS

SANDS

# Beach Profile

Location: 1aNWB1

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

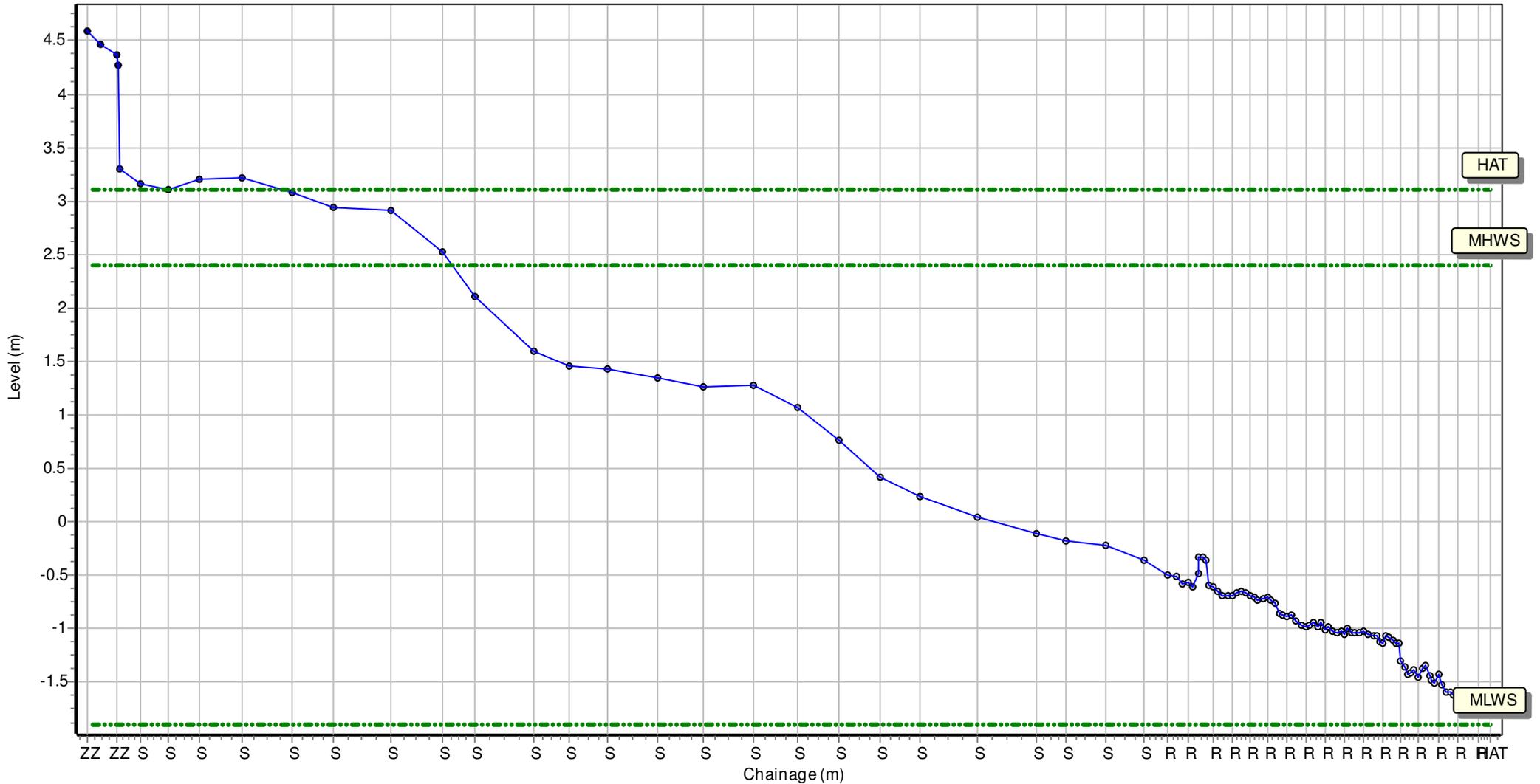
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431665.429 Northing: 588007.636 Profile Bearing: 212 ° from North



# Beach Profile

Location: 1aNWB2

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

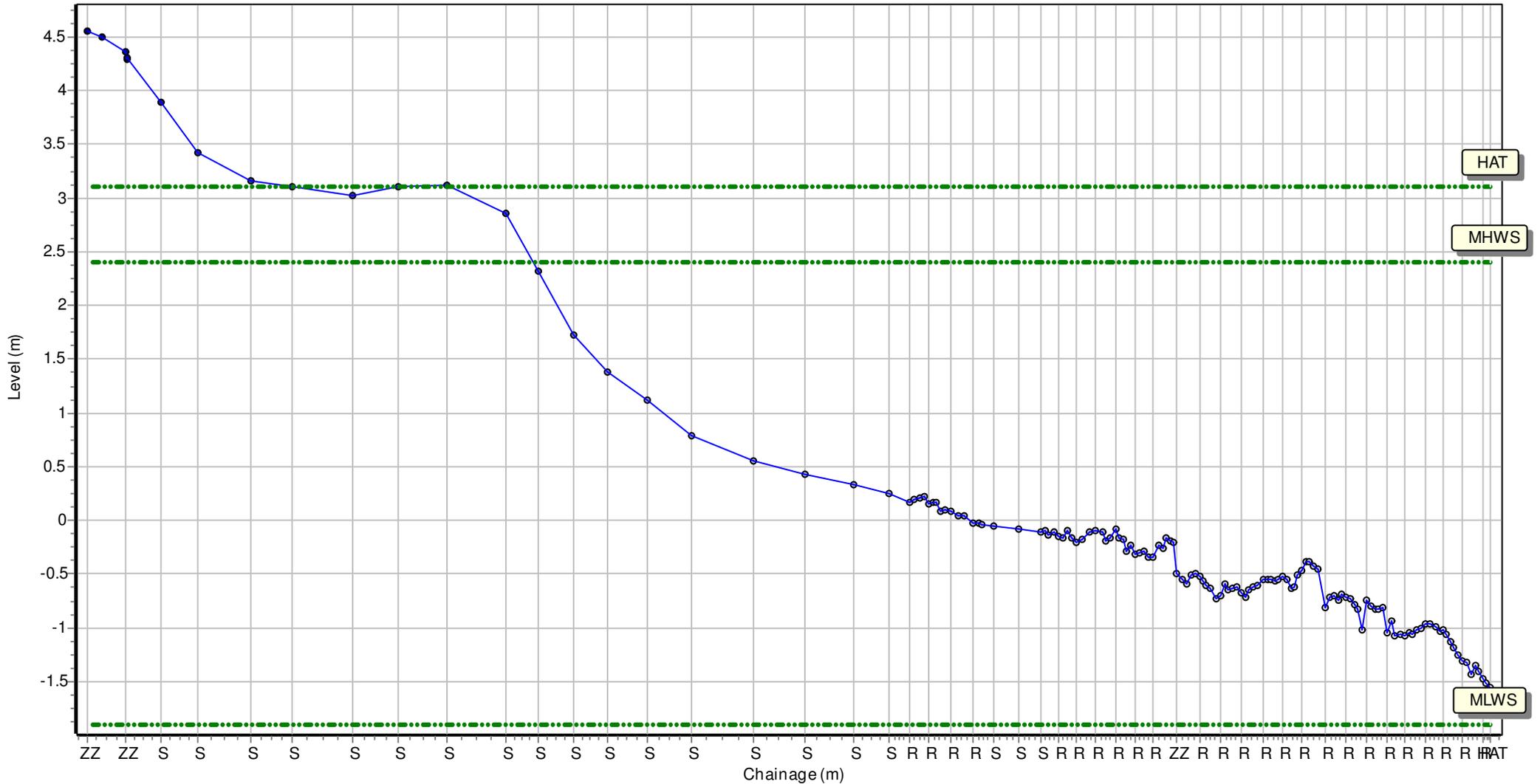
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431618.236 Northing: 588035.356 Profile Bearing: 202 ° from North



# Beach Profile

Location: 1aNWB3

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

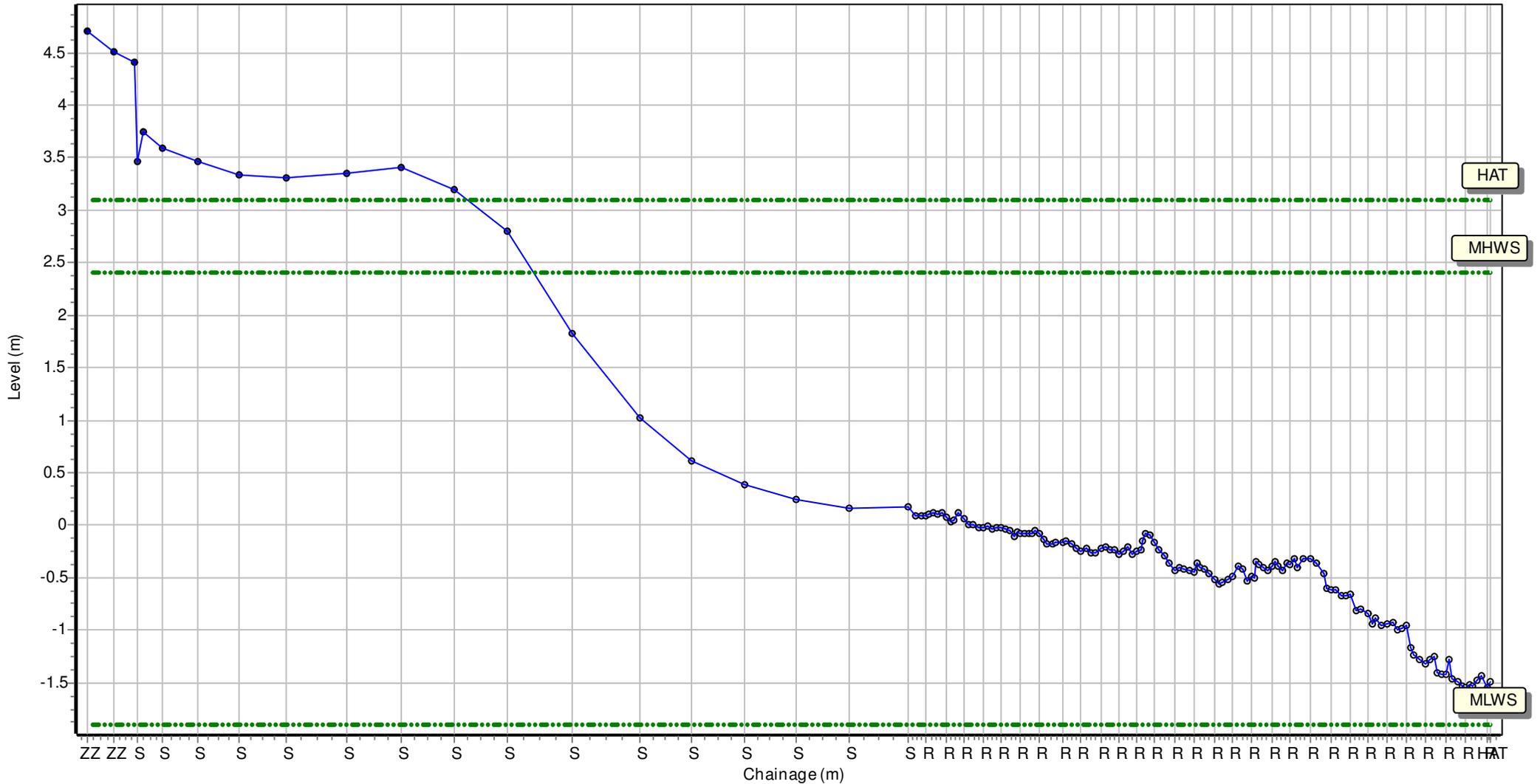
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431573.455 Northing: 588049.149 Profile Bearing: 193 ° from North





# Beach Profile

Location: 1aNWB5

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

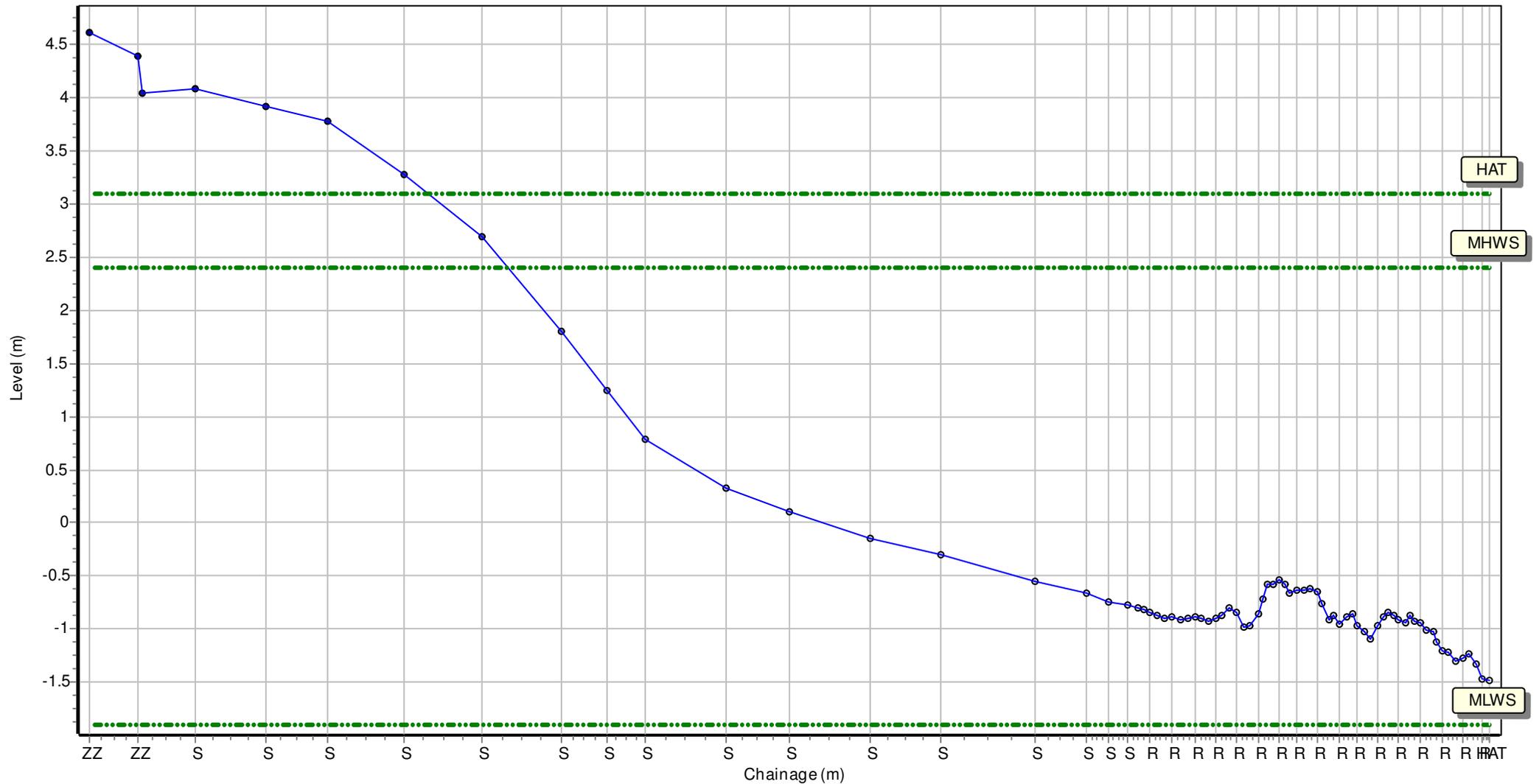
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431473.586 Northing: 588048.504 Profile Bearing: 174 ° from North



# Beach Profile

Location: 1aNWB6

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

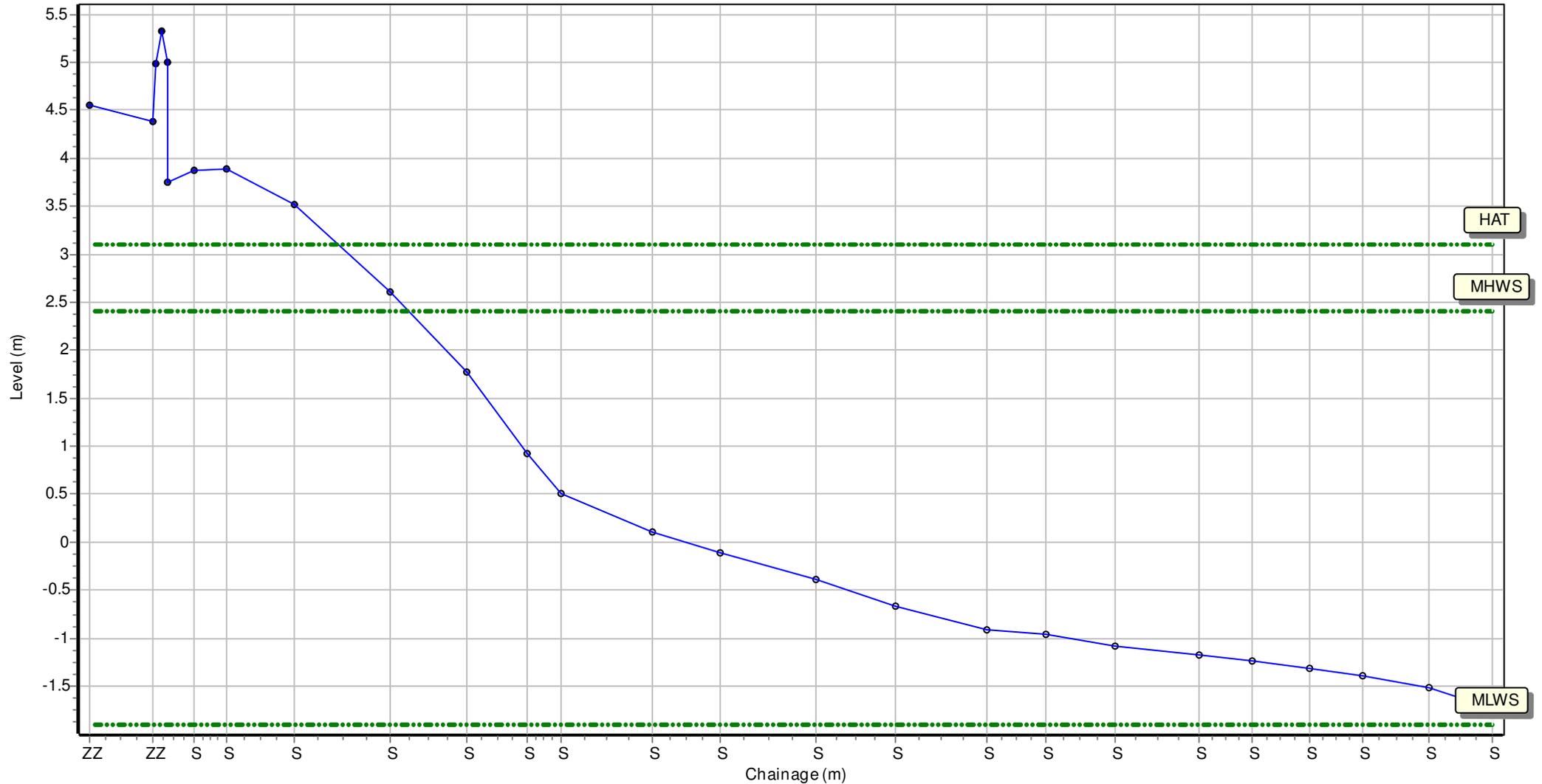
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431424.56 Northing: 588032.268 Profile Bearing: 164 ° from North



# Beach Profile

Location: 1aNWB7

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

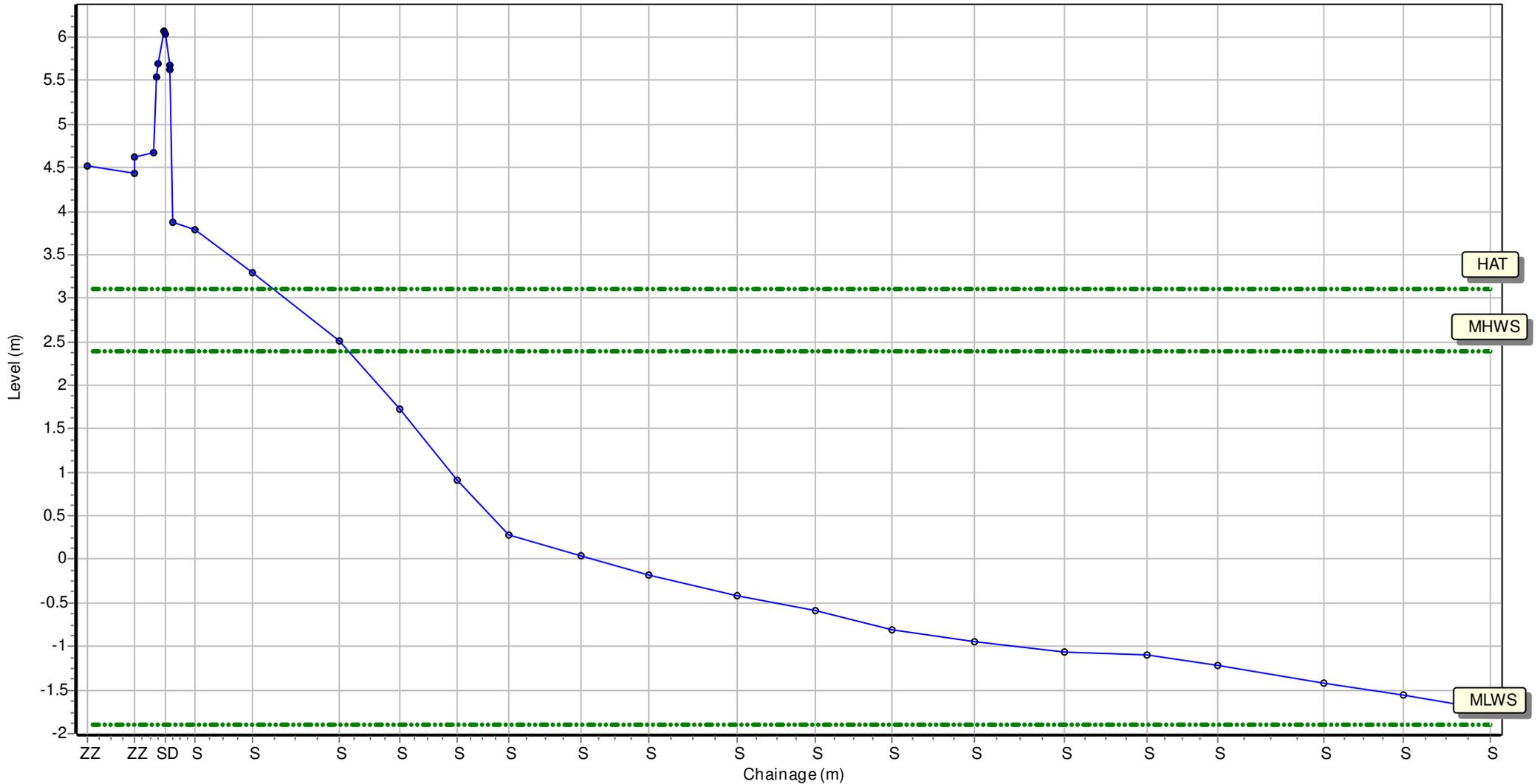
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431379.622 Northing: 588011.712 Profile Bearing: 165 ° from North



# Beach Profile

Location: 1aNWB8

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

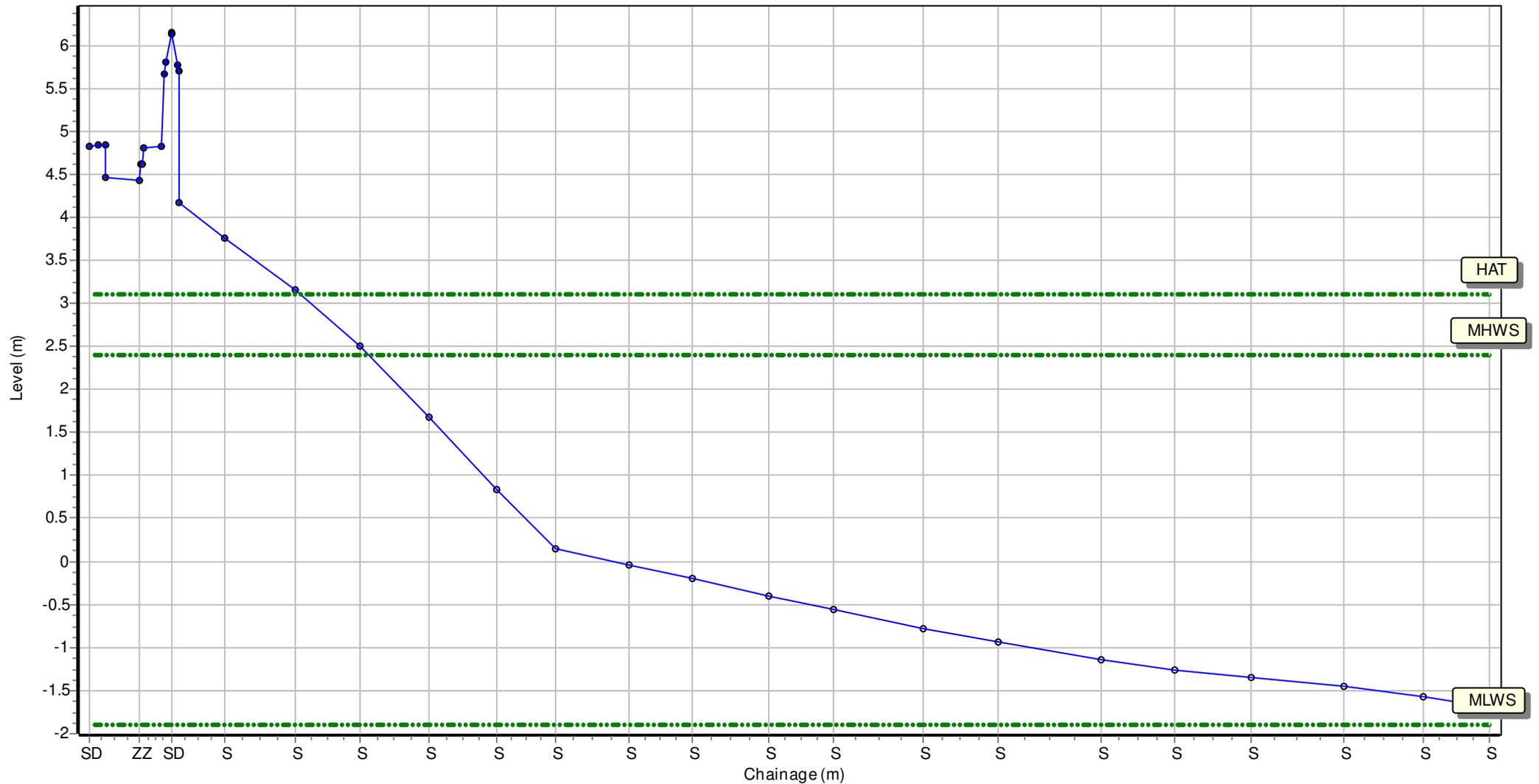
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431332.62 Northing: 587988.039 Profile Bearing: 144 ° from North



# Beach Profile

Location: 1aNWB9

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

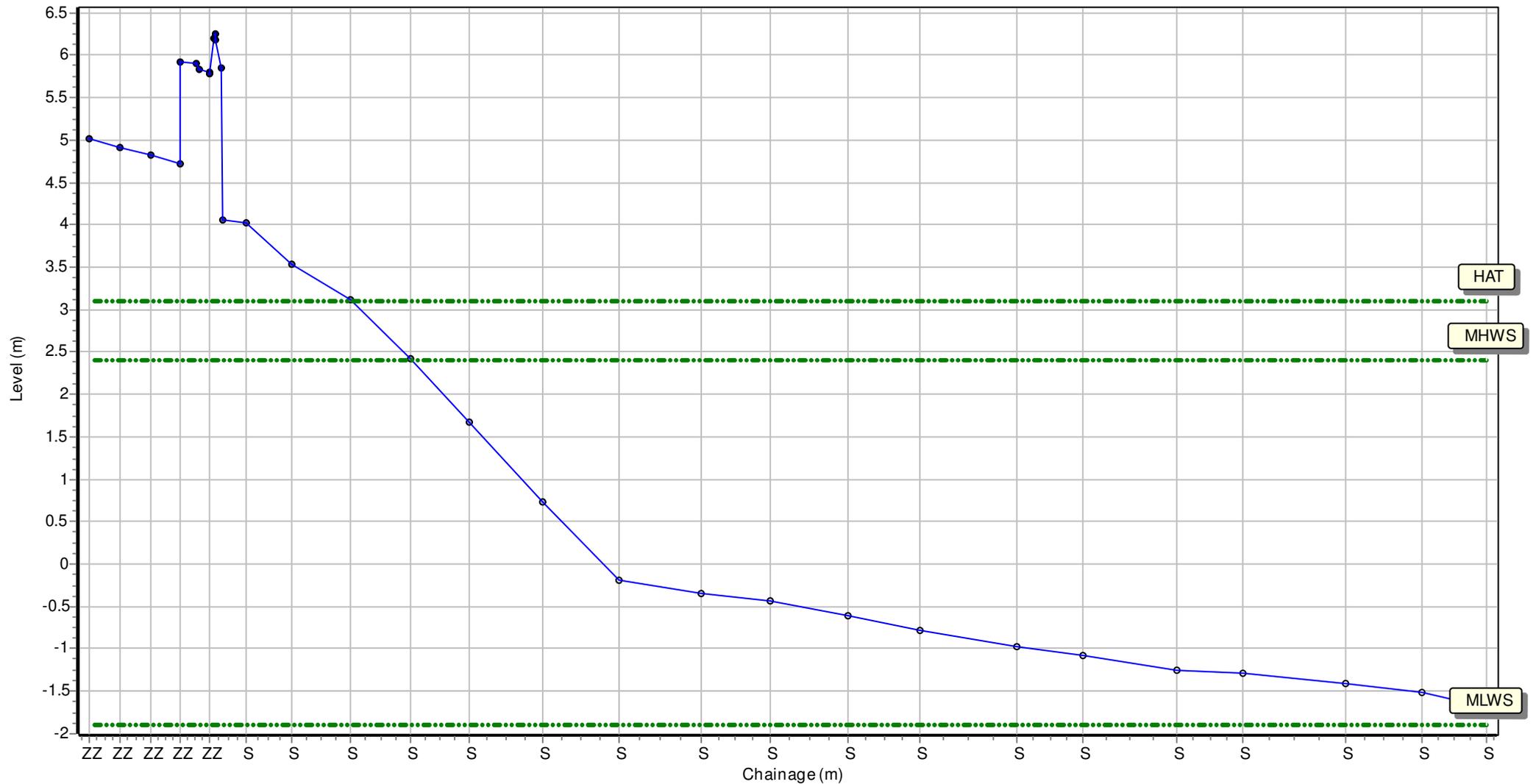
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431288.421 Northing: 587963.979 Profile Bearing: 142 ° from North



# Beach Profile

Location: 1aNWB10

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

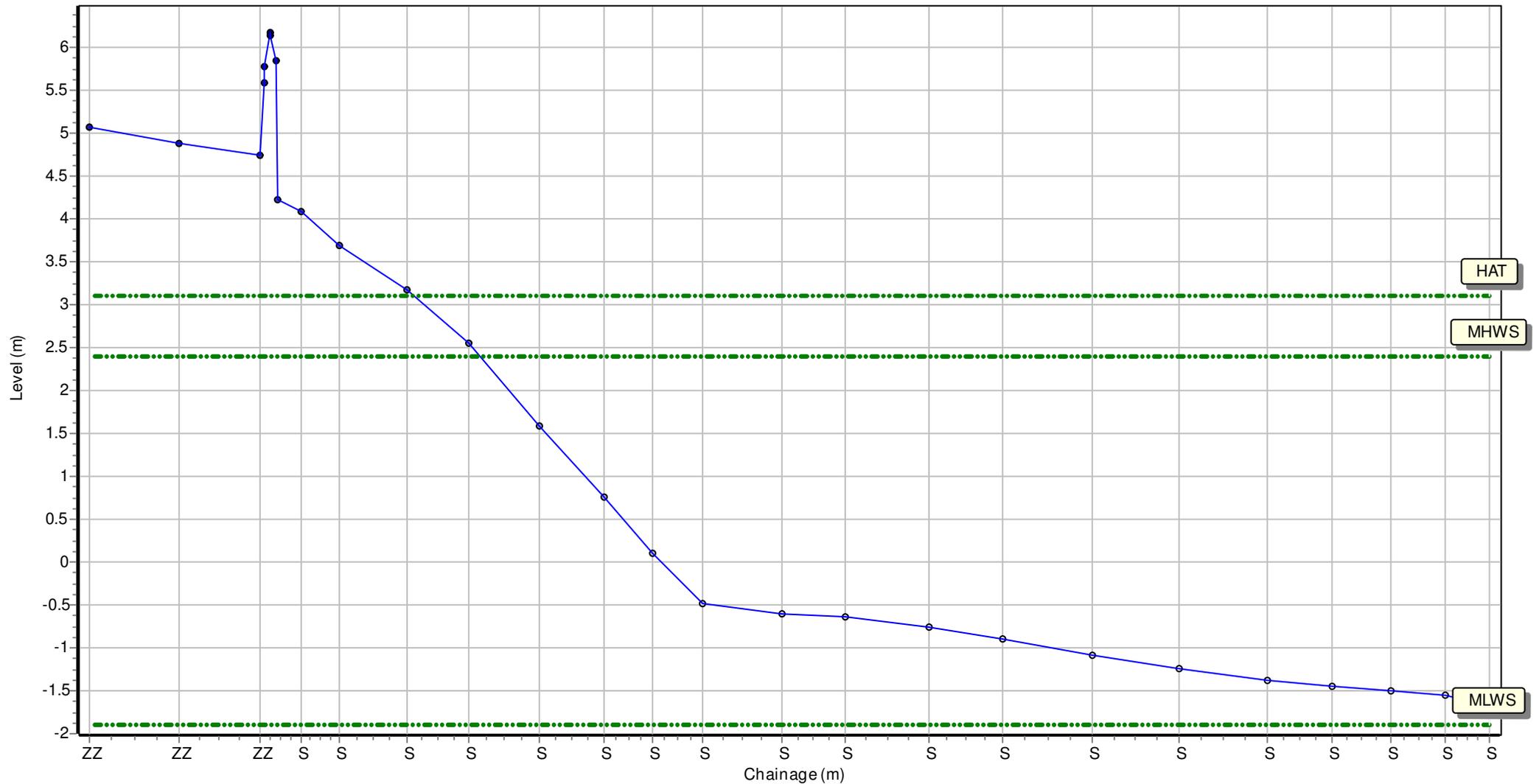
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431244.074 Northing: 587936.575 Profile Bearing: 139 ° from North



# Beach Profile

Location: 1aNWB11

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

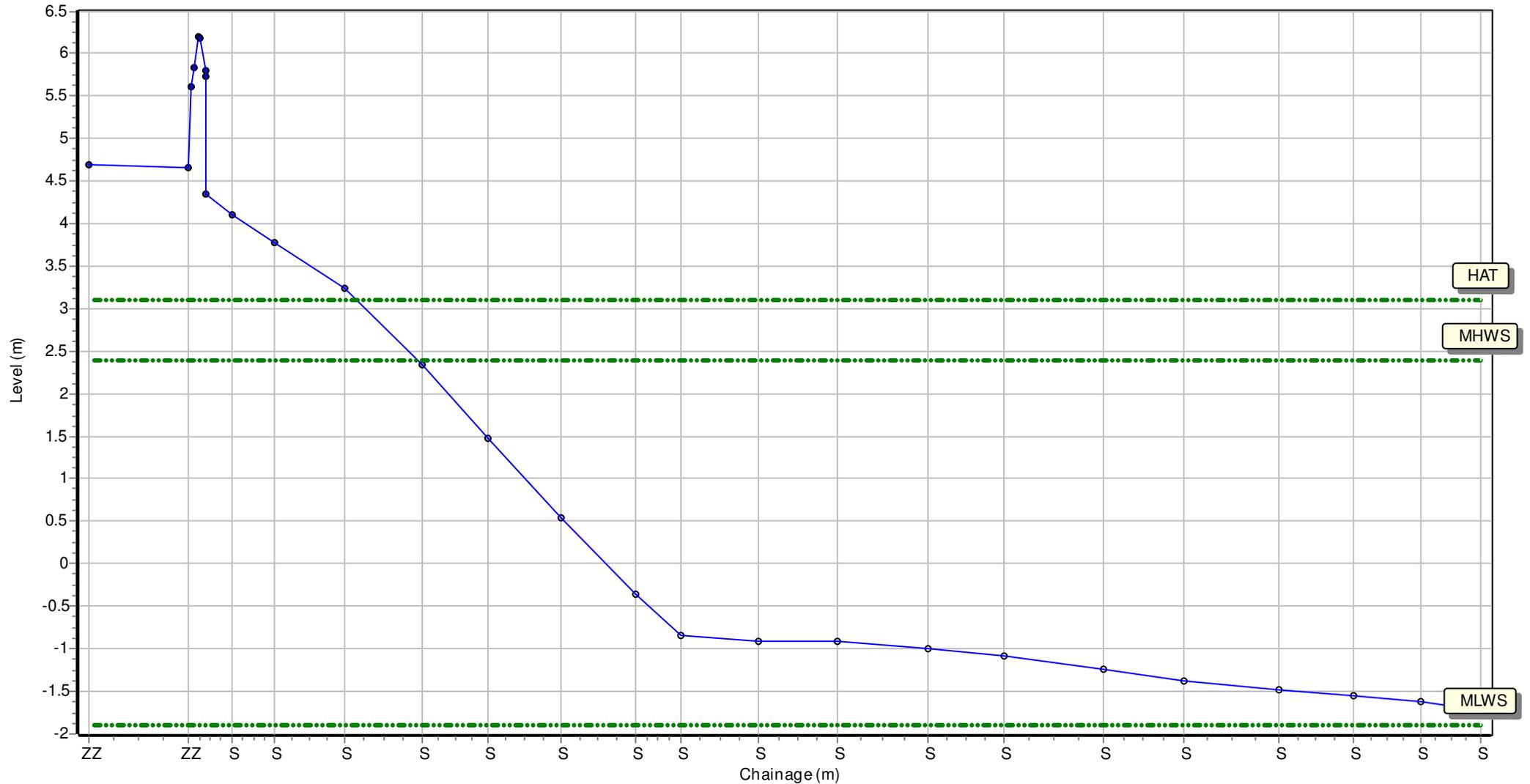
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431211.343 Northing: 587896.891 Profile Bearing: 135 ° from North



# Beach Profile

Location: 1aNWB12

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

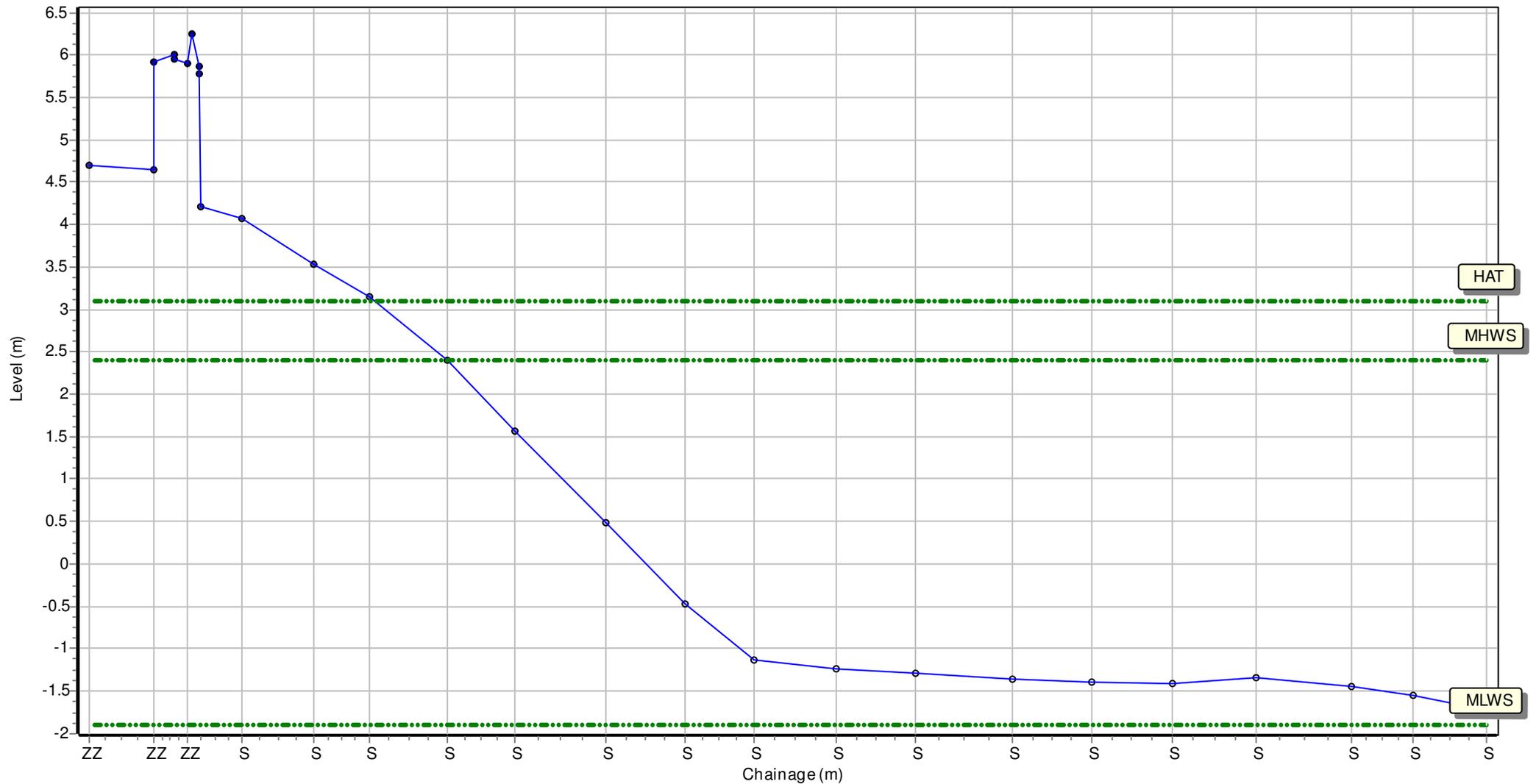
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431176.844 Northing: 587860.651 Profile Bearing: 132 ° from North



# Beach Profile

Location: 1aNWB13

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

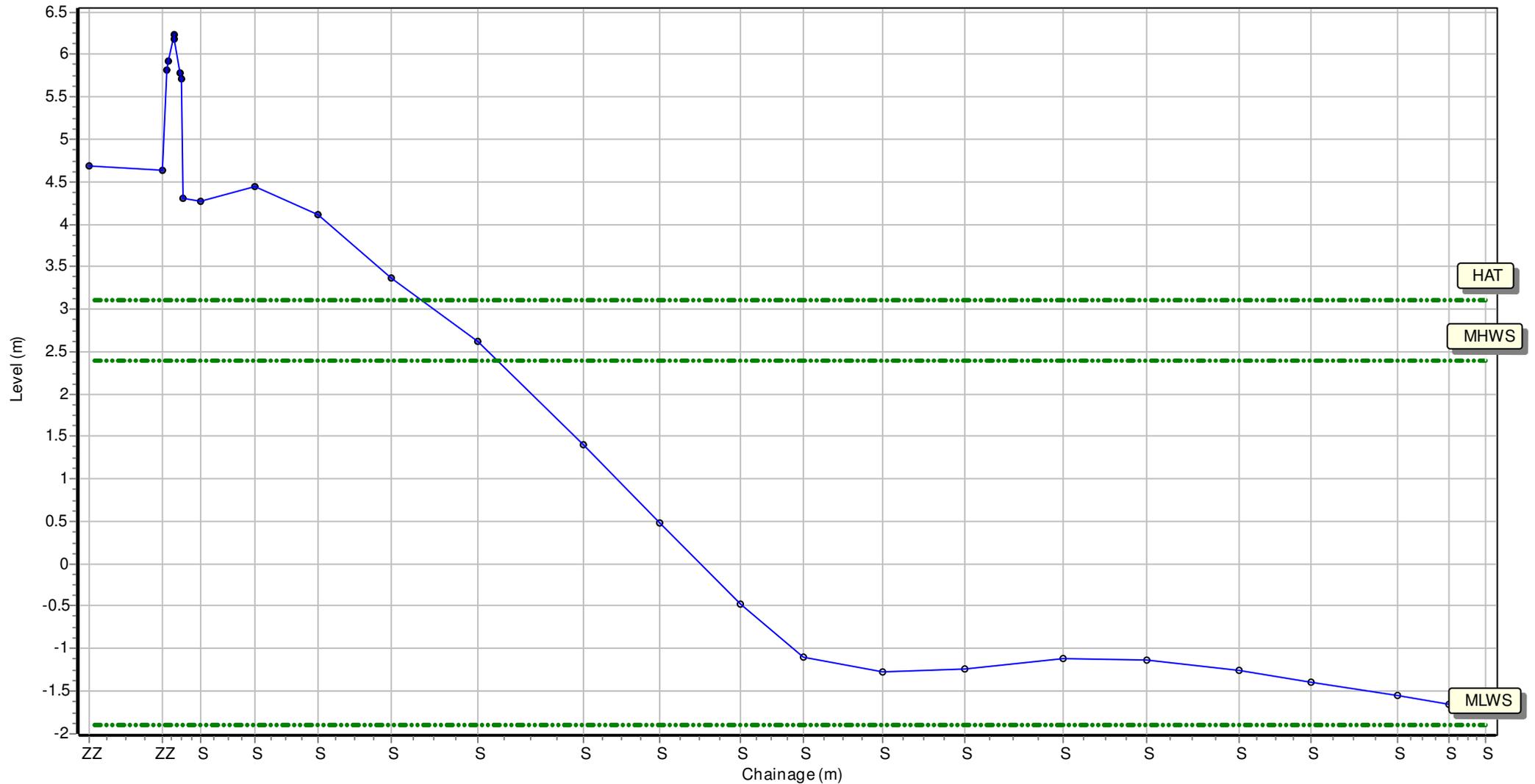
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431143.784 Northing: 587821.594 Profile Bearing: 129 ° from North



# Beach Profile

Location: 1aNWB14

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

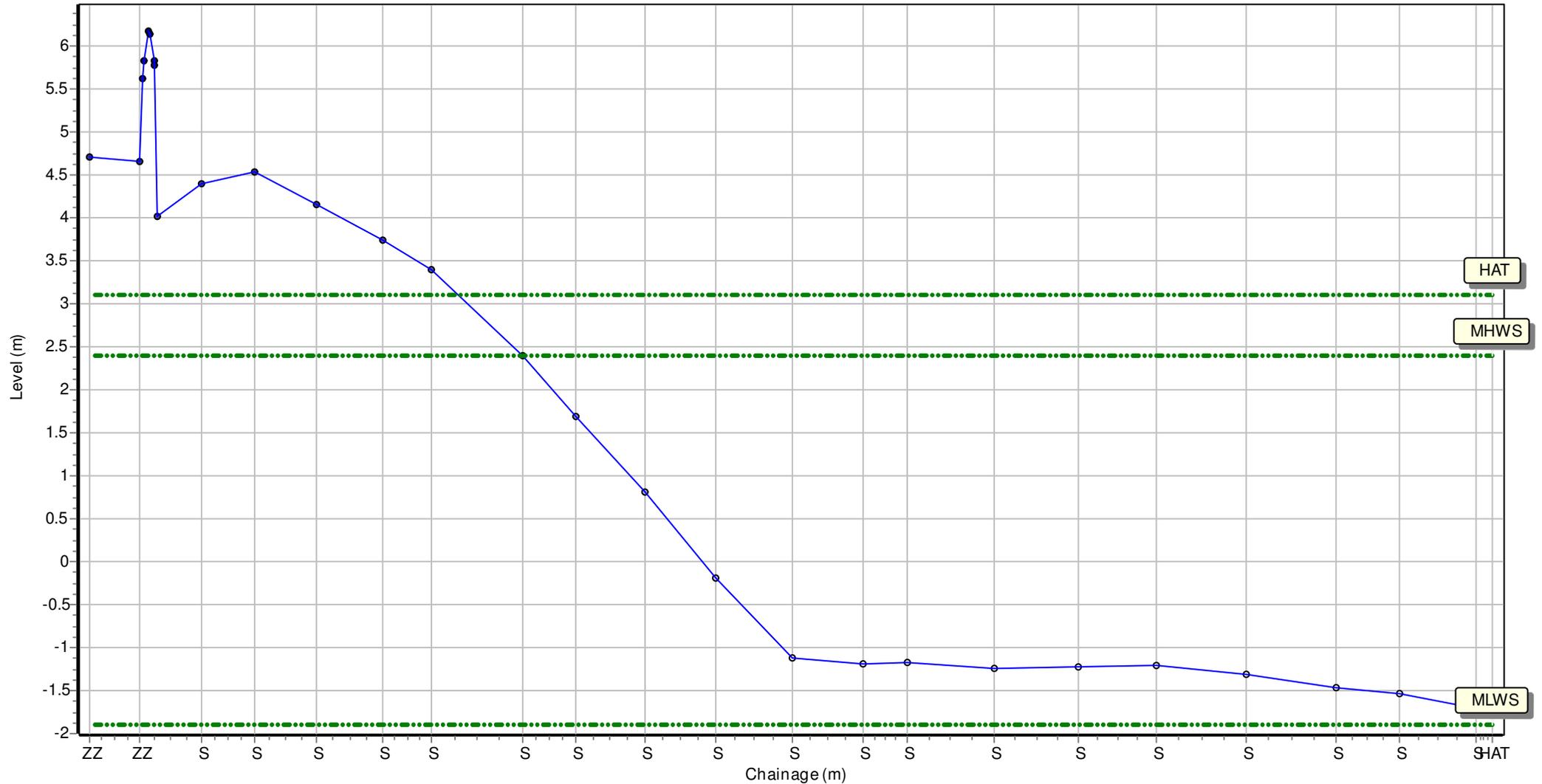
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431113.86 Northing: 587780.727 Profile Bearing: 115 ° from North



# Beach Profile

Location: 1aNWB15

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

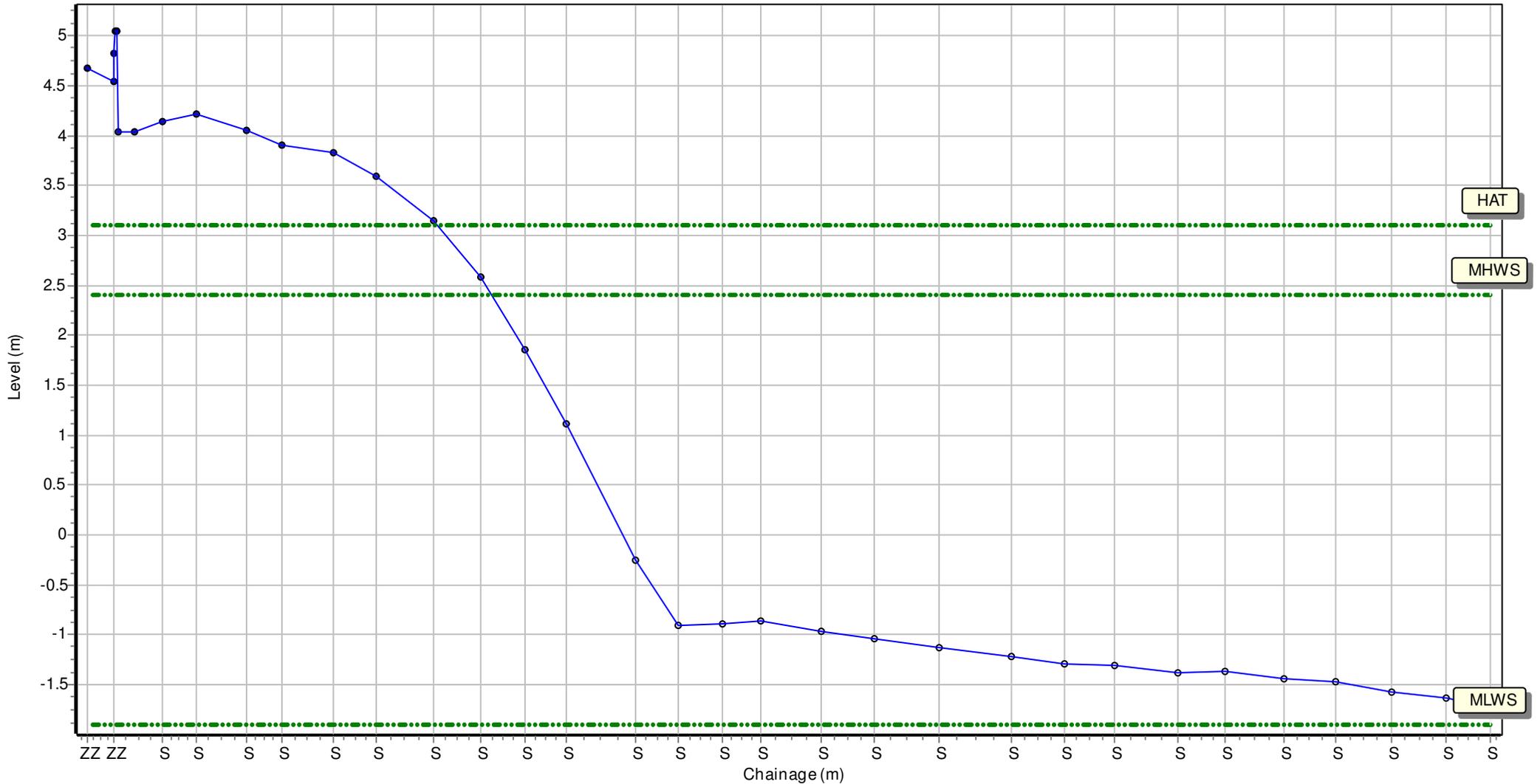
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431088.458 Northing: 587739.577 Profile Bearing: 125 ° from North



# Beach Profile

Location: 1aNWB16

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

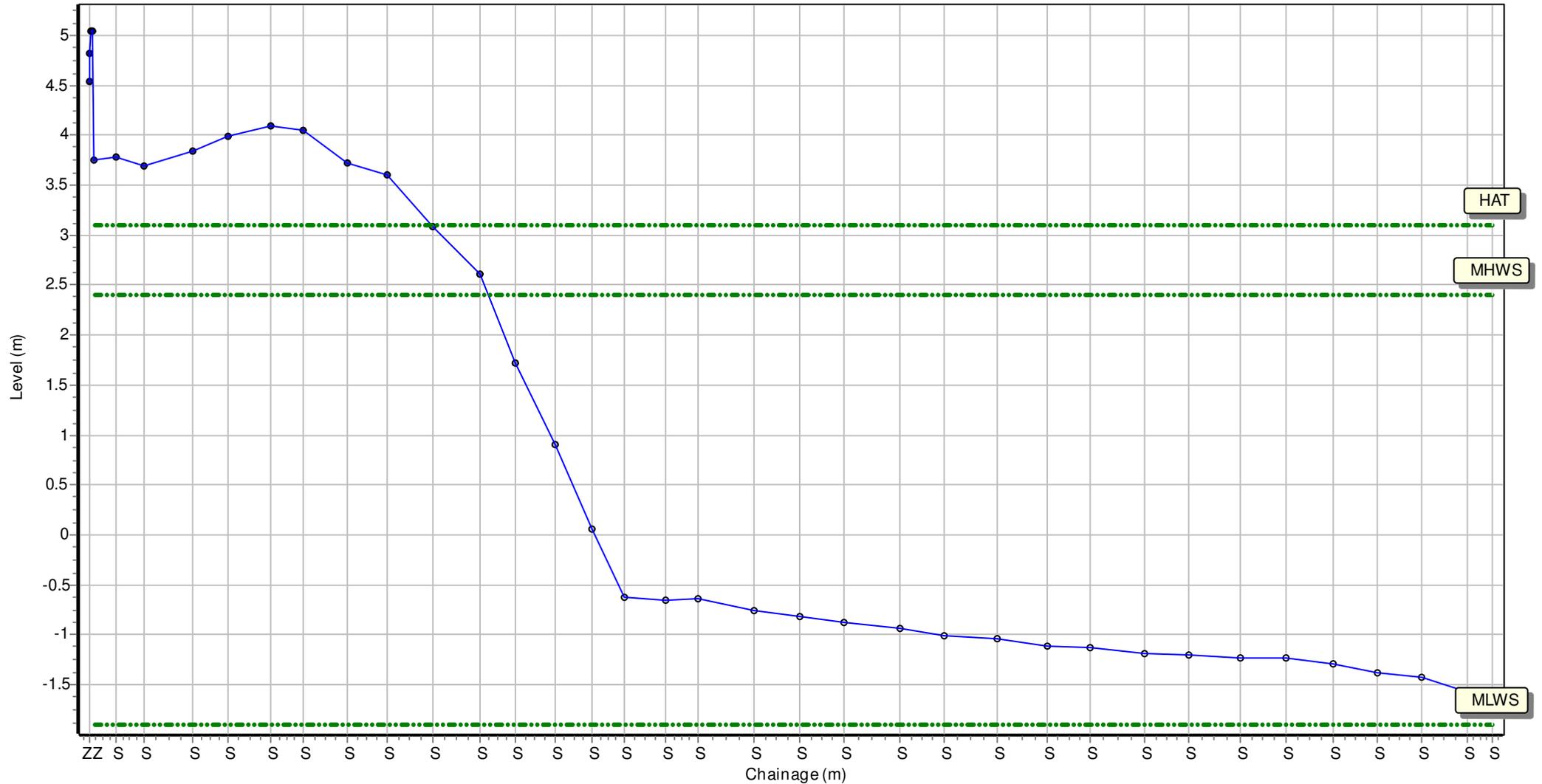
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431063.789 Northing: 587695.893 Profile Bearing: 119 ° from North



# Beach Profile

Location: 1aNWB17

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

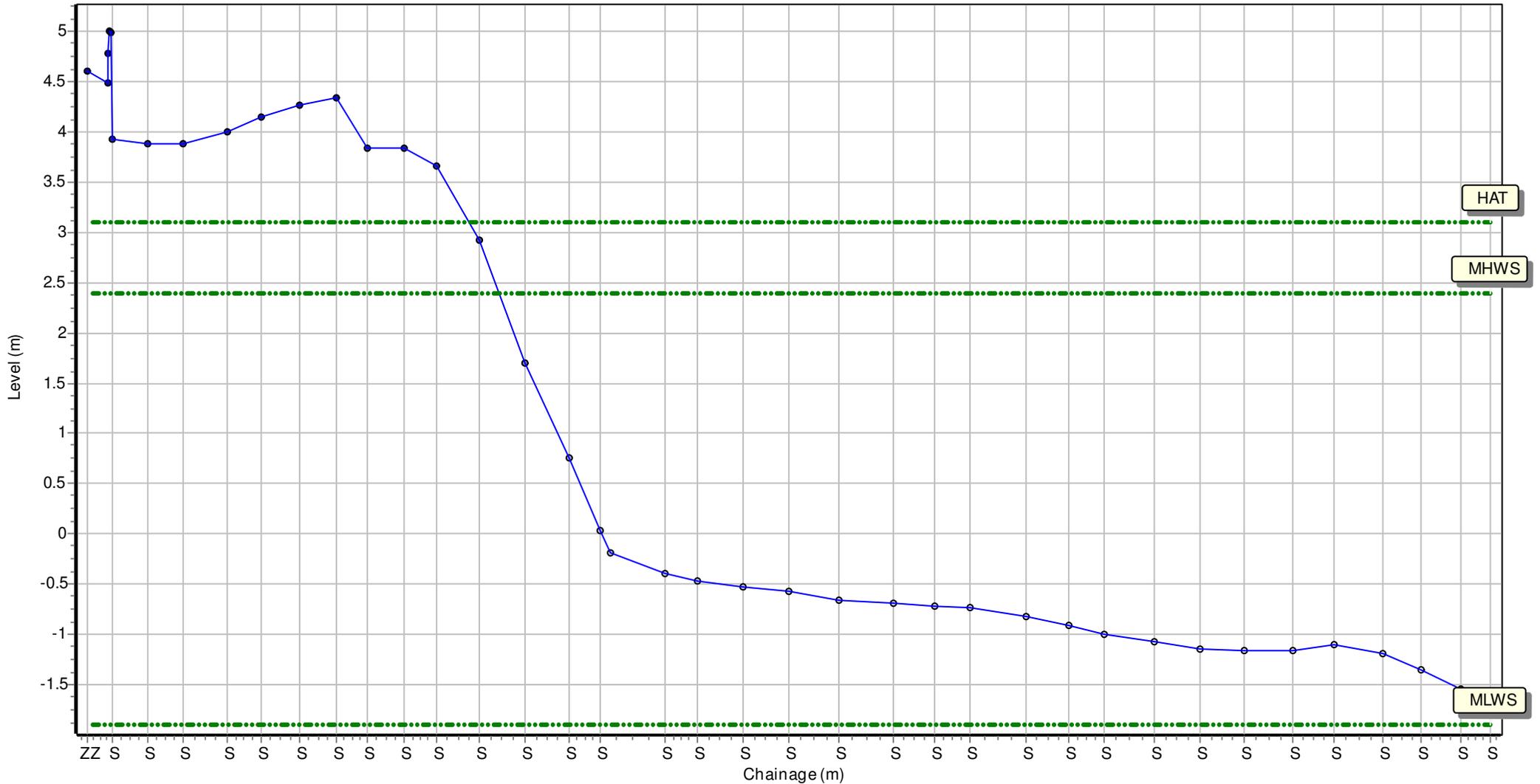
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431042.191 Northing: 587650.627 Profile Bearing: 116 ° from North



# Beach Profile

Location: 1aNWB18

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

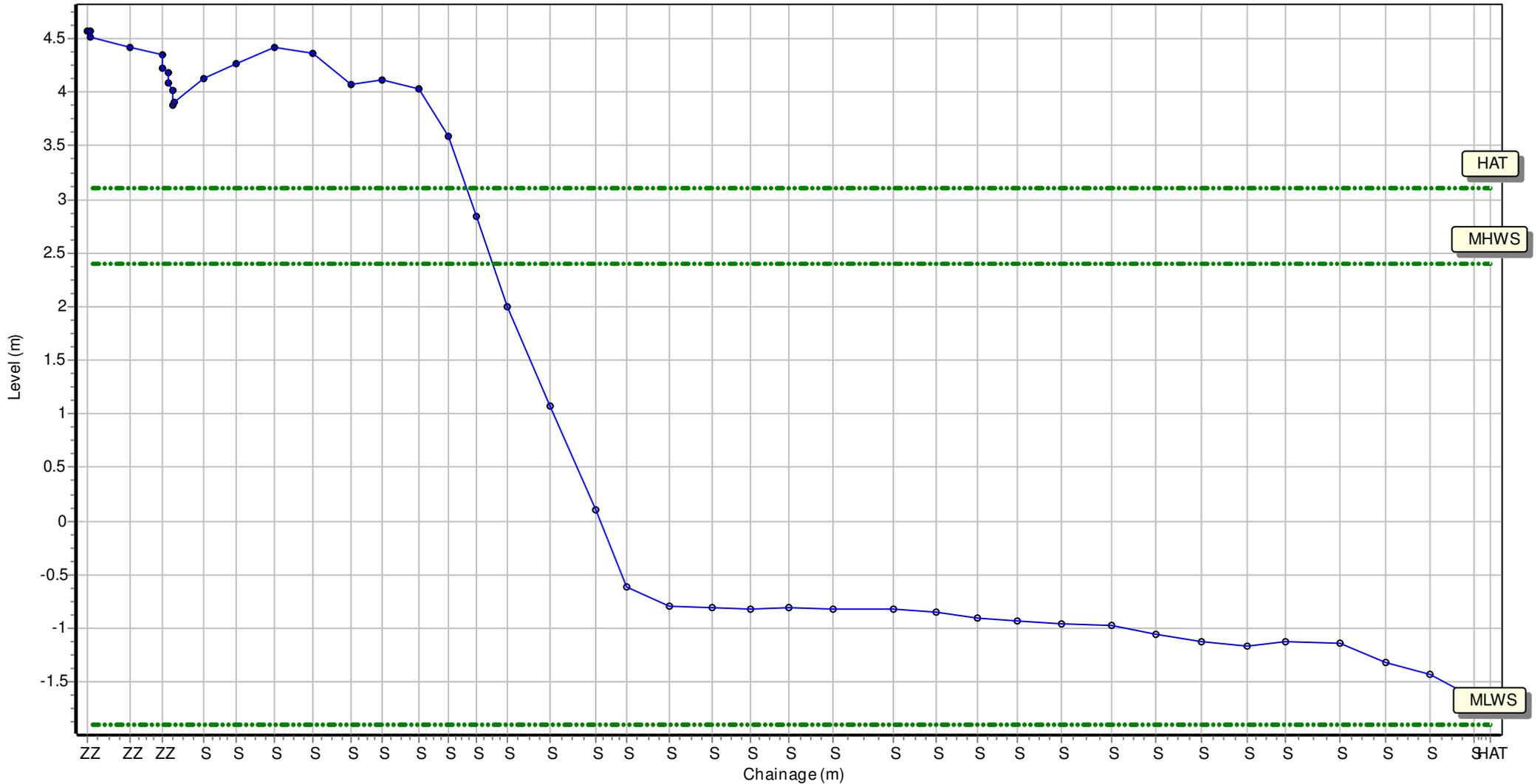
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431024.999 Northing: 587608.929 Profile Bearing: 113 ° from North



# Beach Profile

Location: 1aNWB19

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

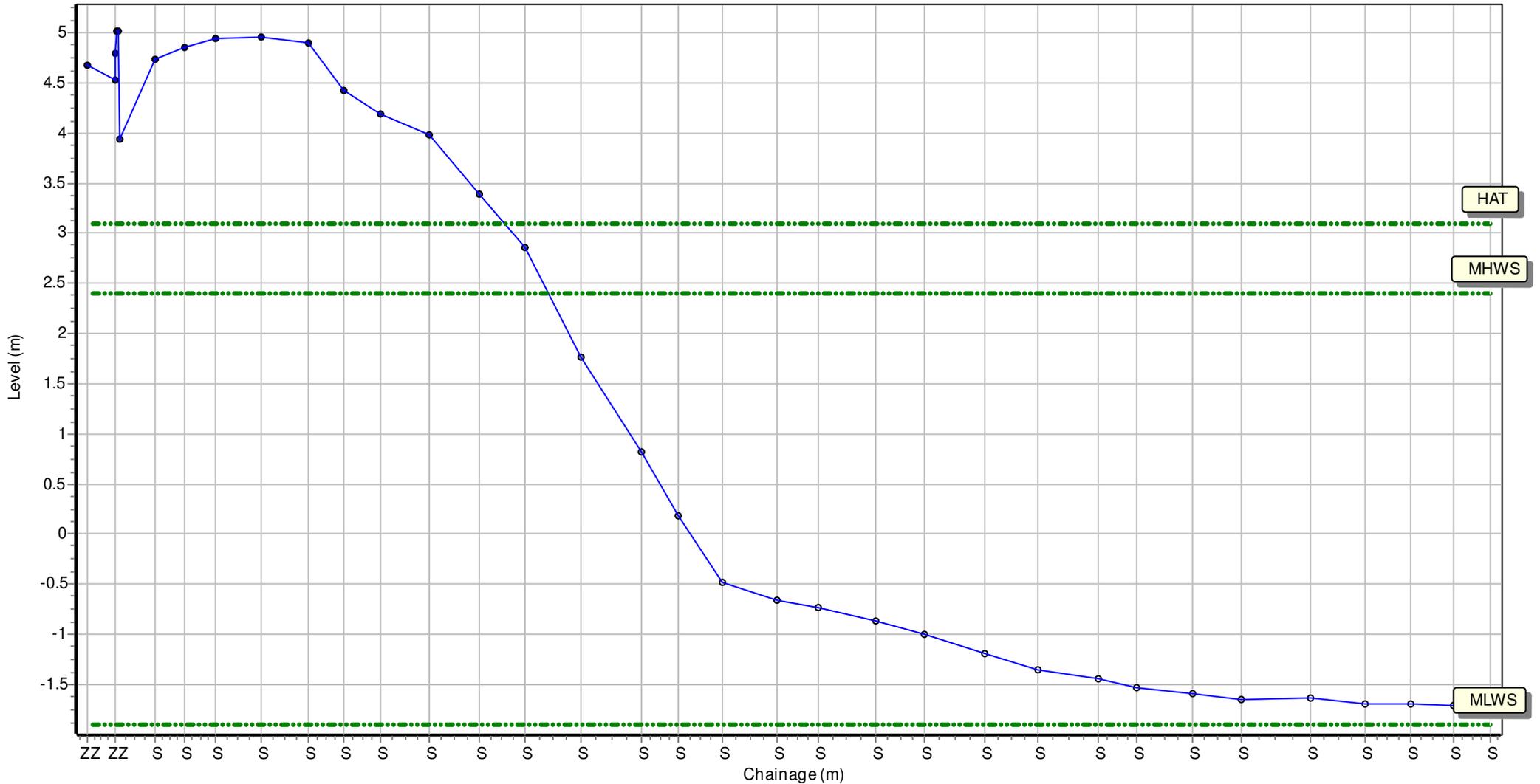
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 431007.485 Northing: 587556.656 Profile Bearing: 109 ° from North



# Beach Profile

Location: 1aNWB20

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

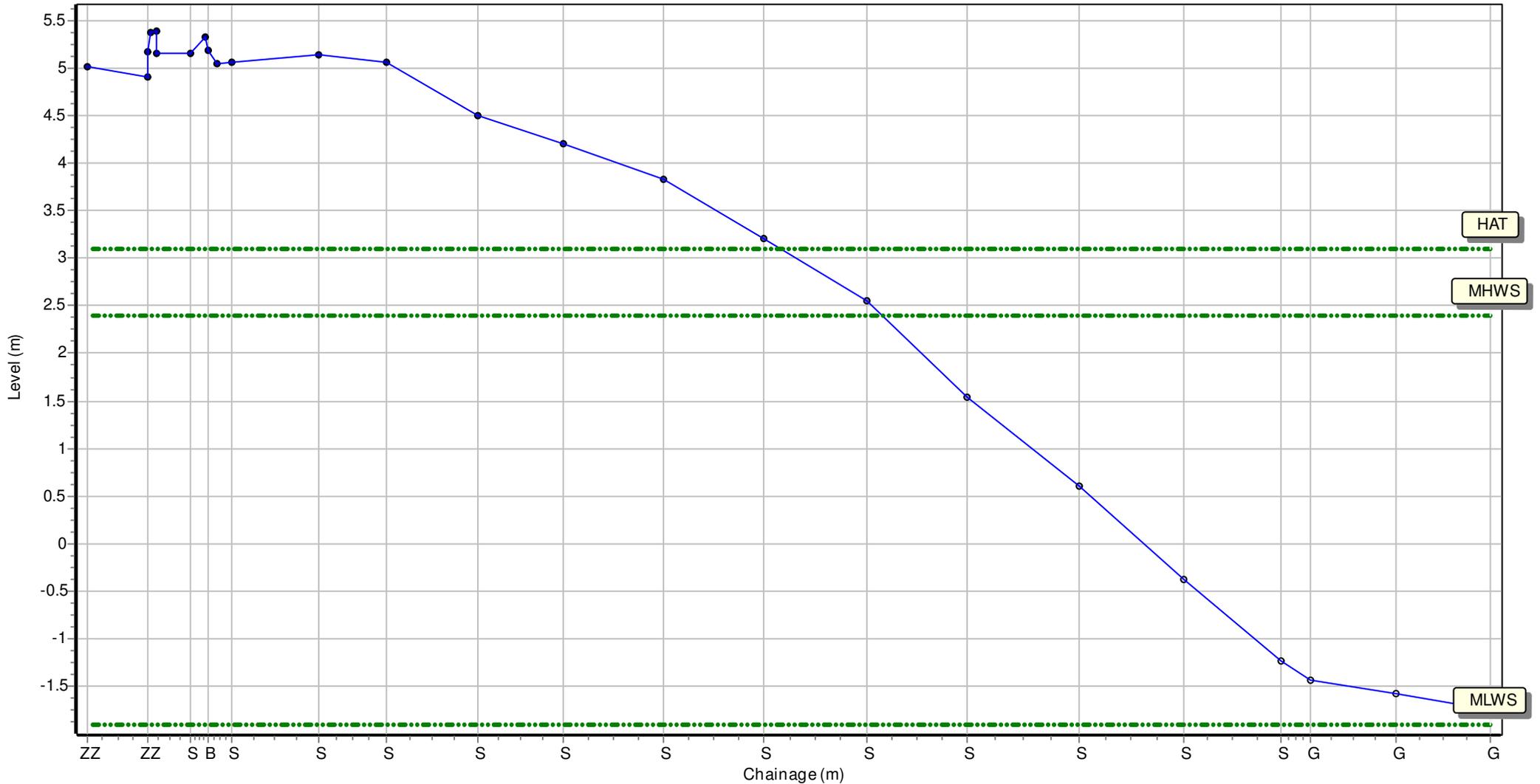
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430992.437 Northing: 587508.87 Profile Bearing: 102 ° from North



# Beach Profile

Location: 1aNWB21

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

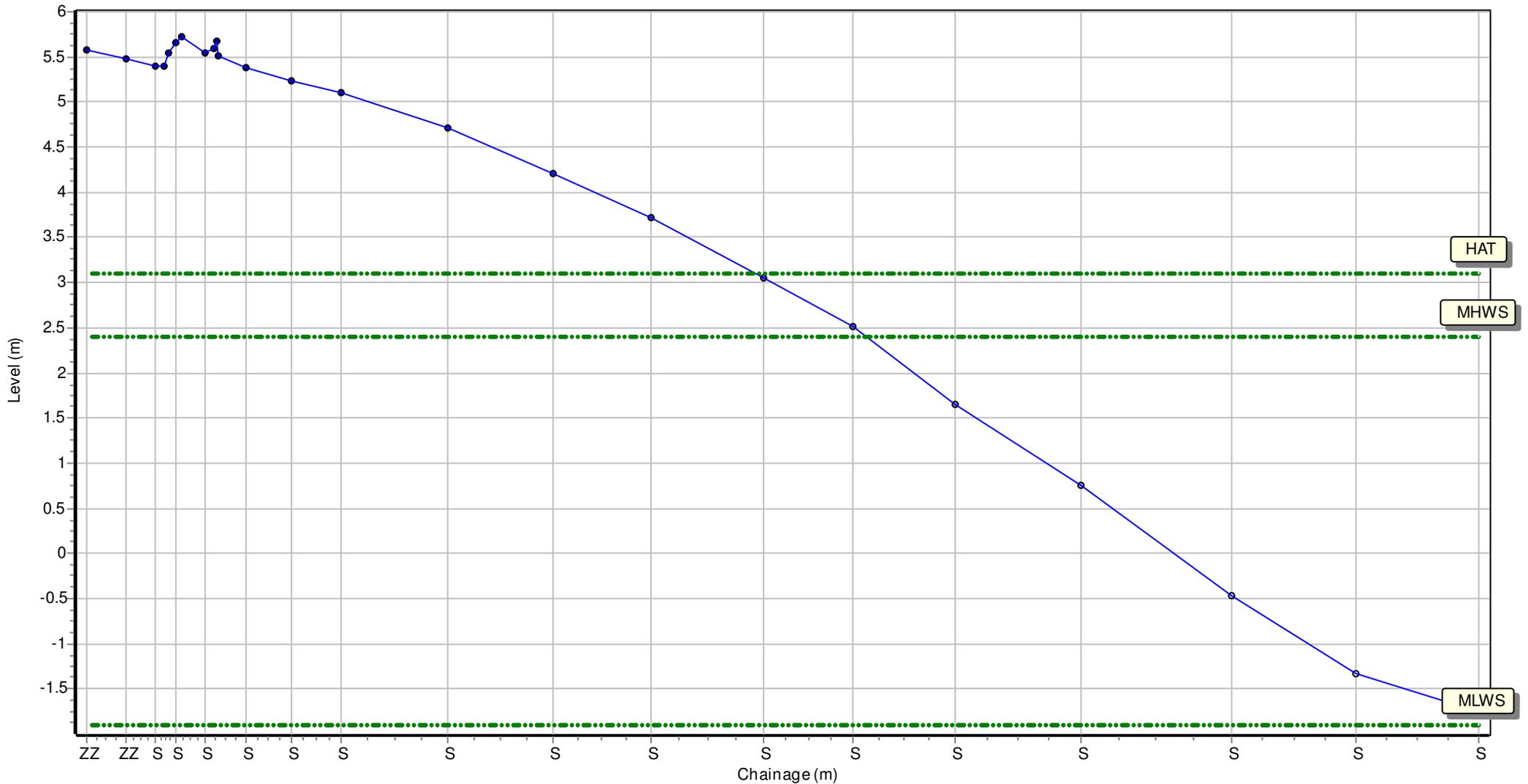
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430978.85 Northing: 587460.577 Profile Bearing: 102 ° from North



# Beach Profile

Location: 1aNWB22

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

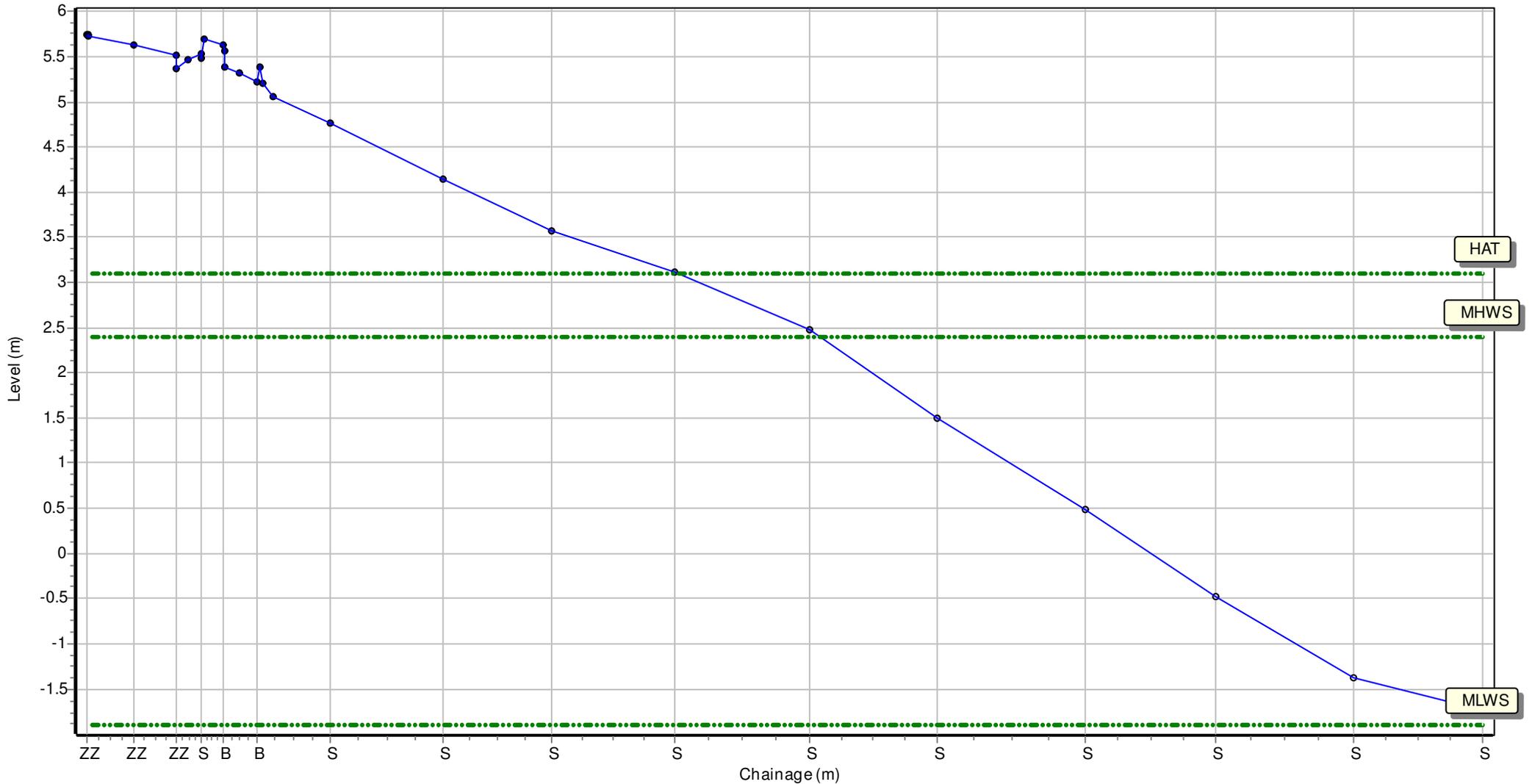
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430967.686 Northing: 587411.684 Profile Bearing: 99 ° from North



# Beach Profile

Location: 1aNWB23

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

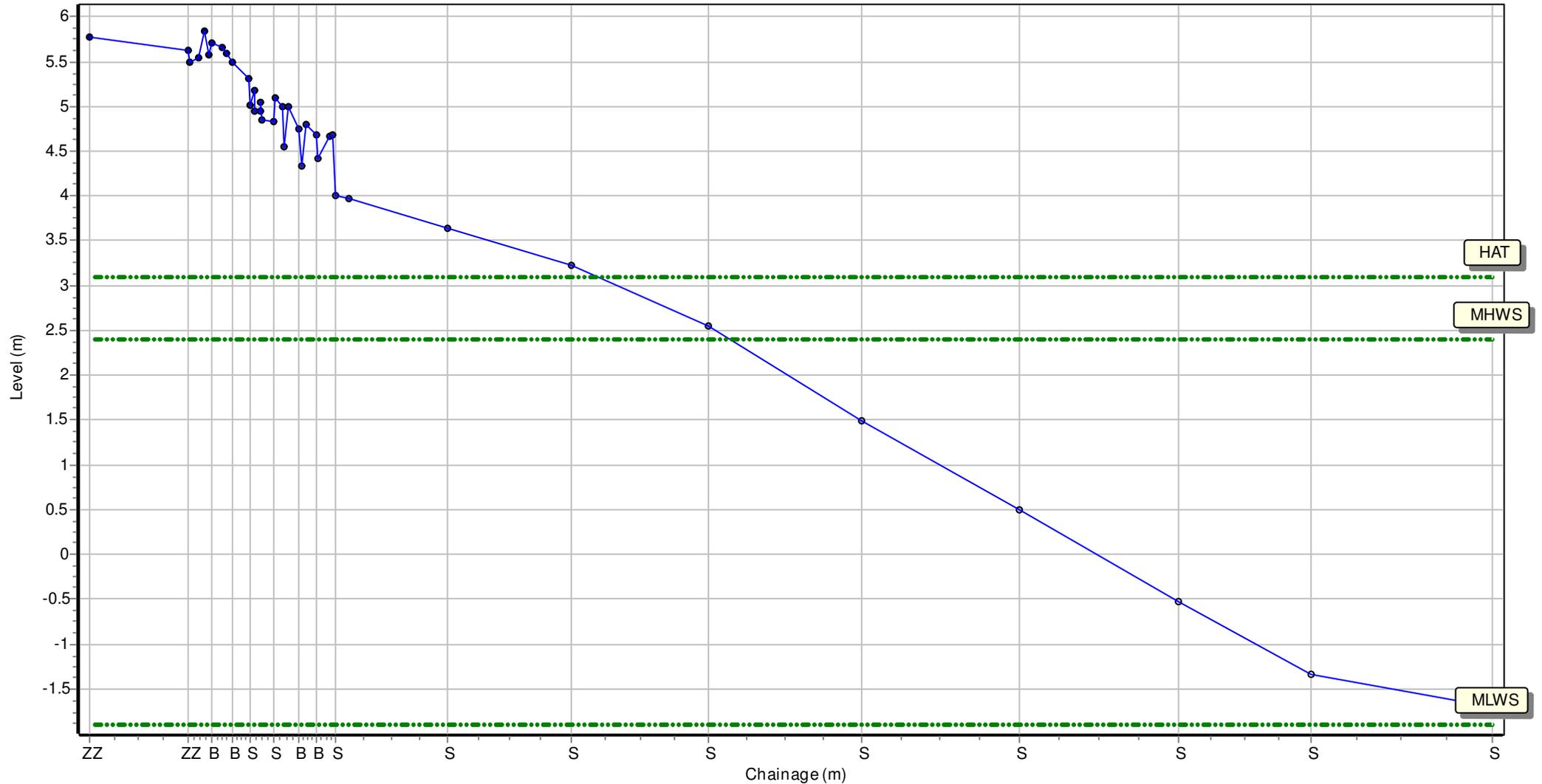
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430959.877 Northing: 587362.168 Profile Bearing: 96 ° from North



# Beach Profile

Location: 1aNWB24

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

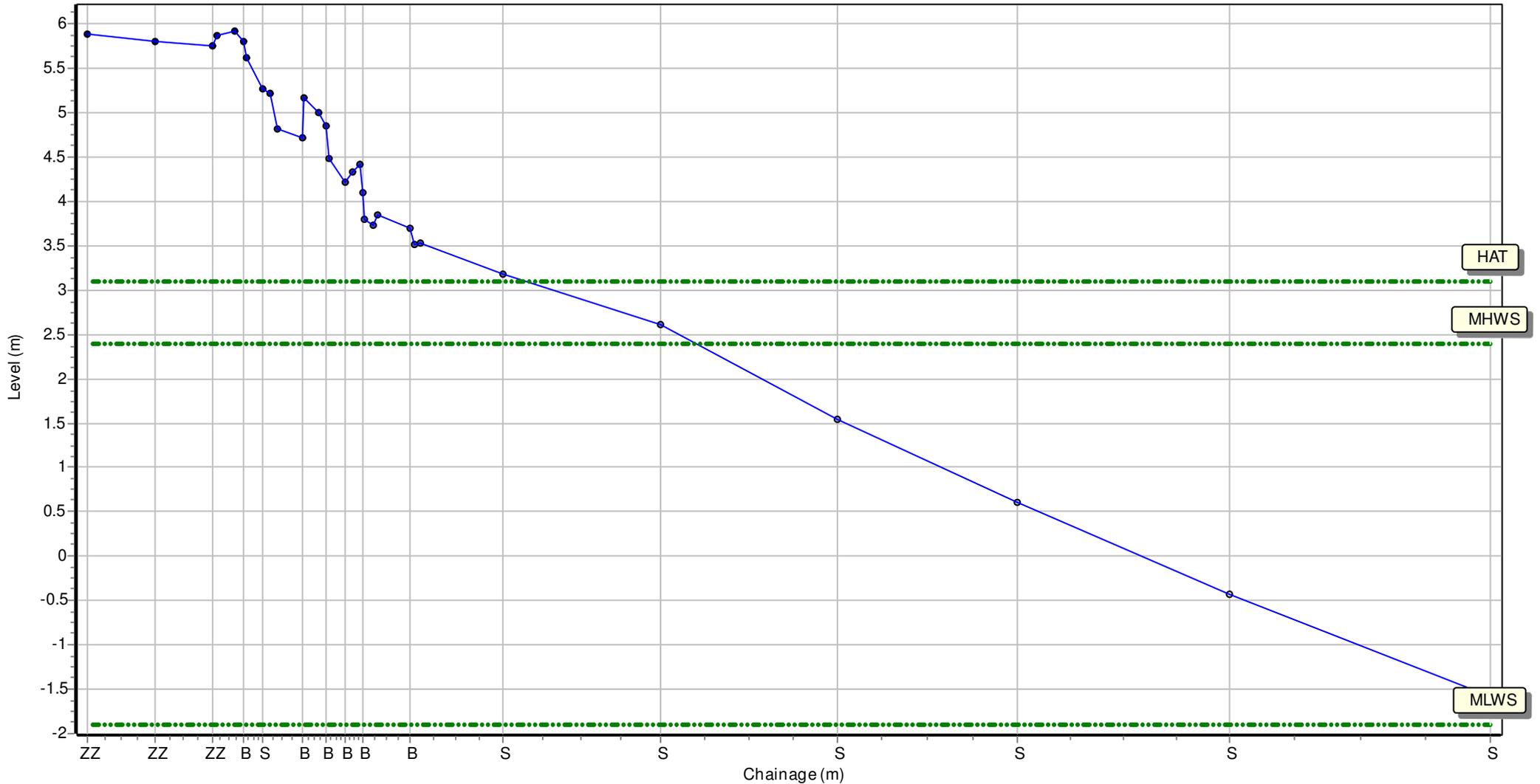
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430956.511 Northing: 587312.153 Profile Bearing: 92 ° from North



# Beach Profile

Location: 1aNWB25

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

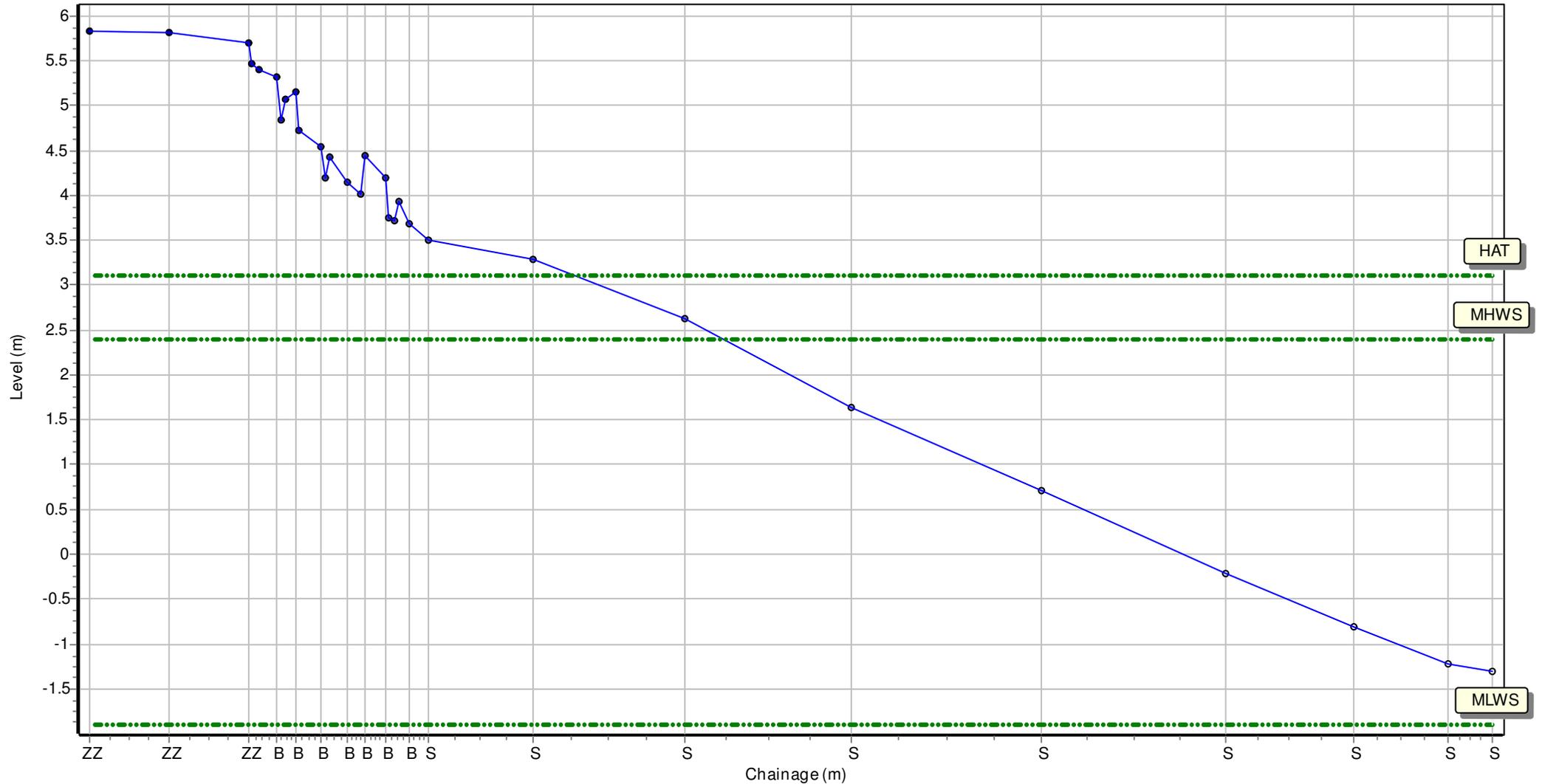
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430953.984 Northing: 587261.982 Profile Bearing: 89 ° from North



# Beach Profile

Location: 1aNWB26

Date: 29/08/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

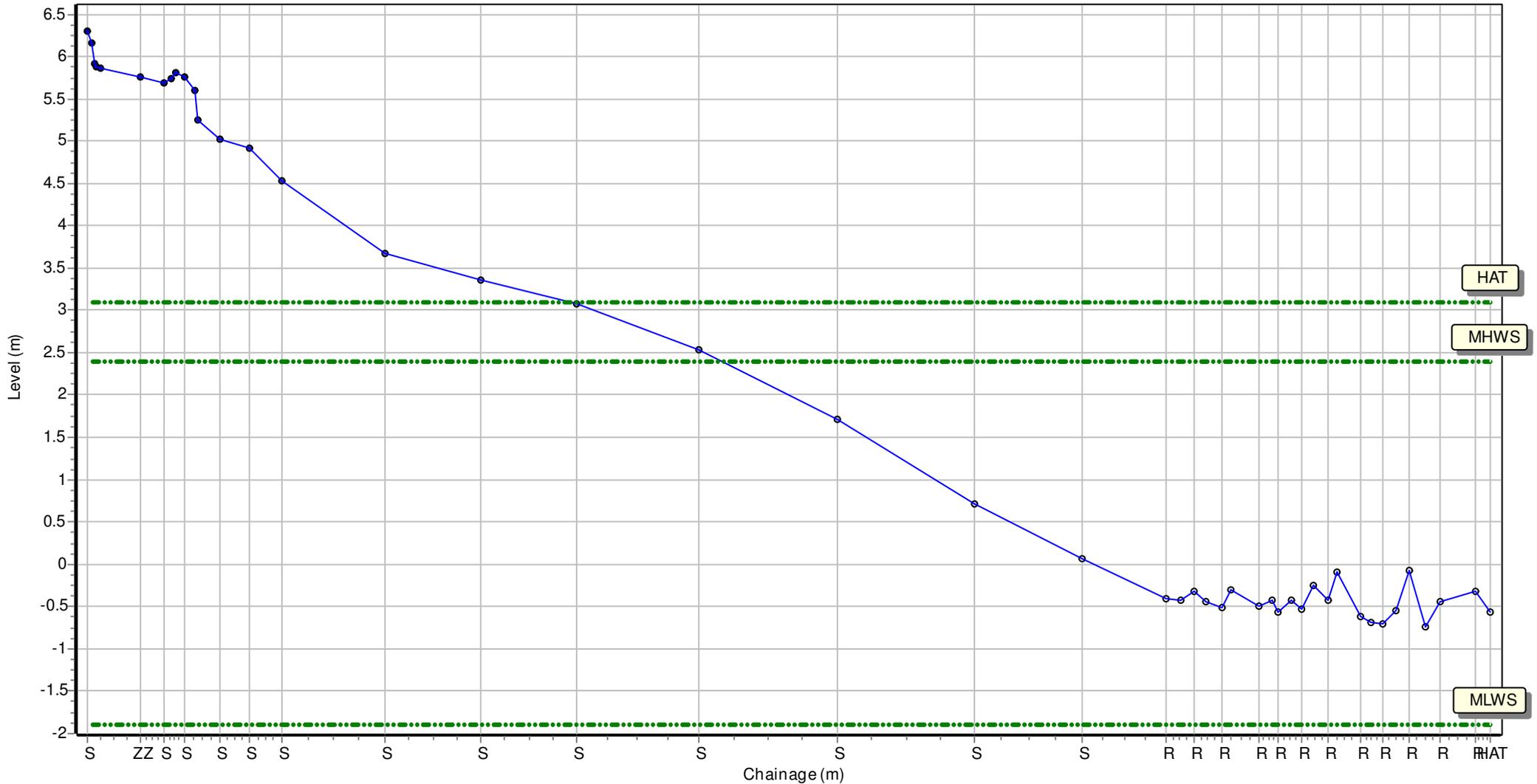
Sea State:

Visibility:

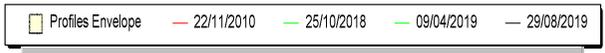
Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430960.828 Northing: 587212.152 Profile Bearing: 86 ° from North



Beach Profiles: 1aNBW1



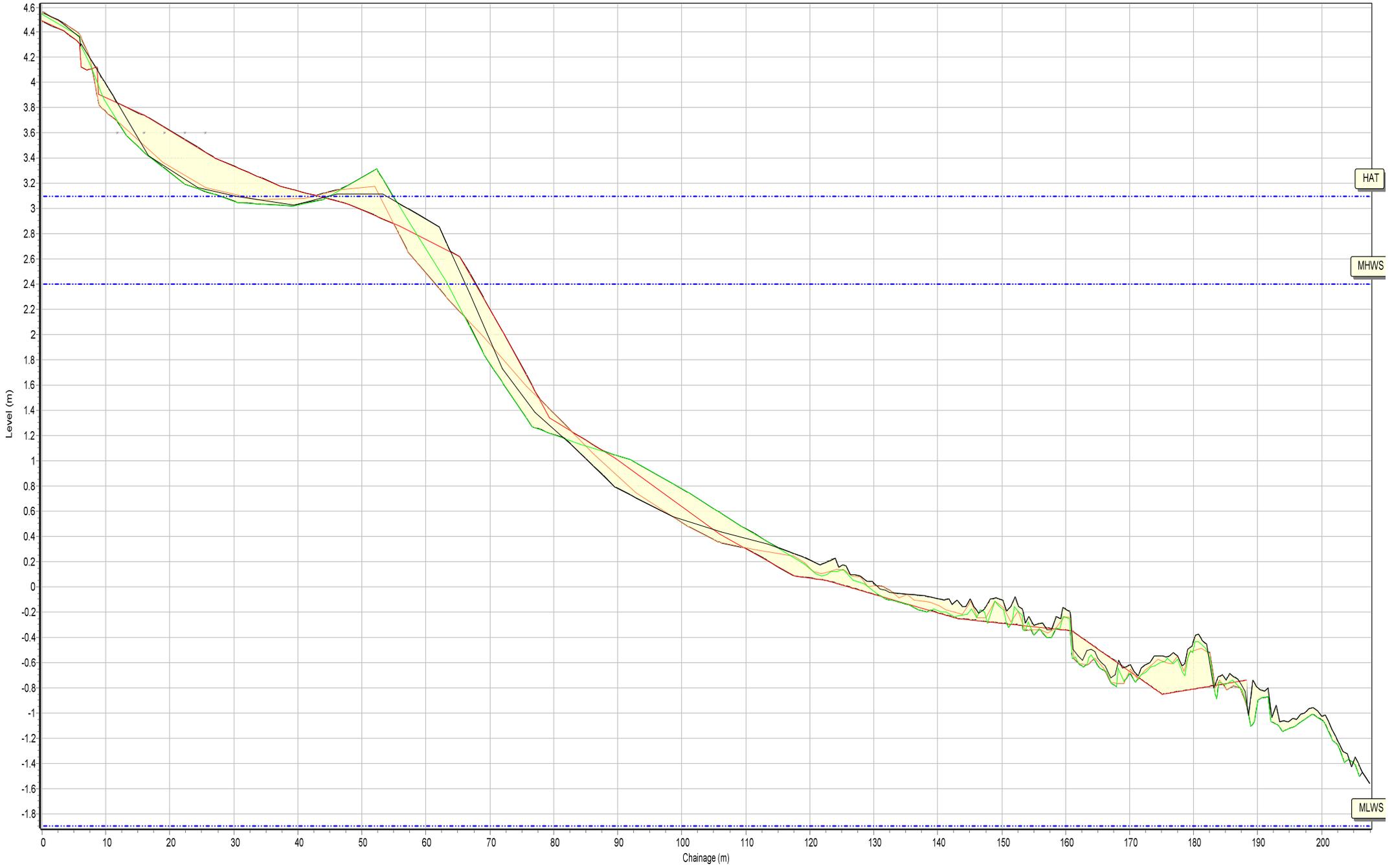
HAT

MHWS

MLWS

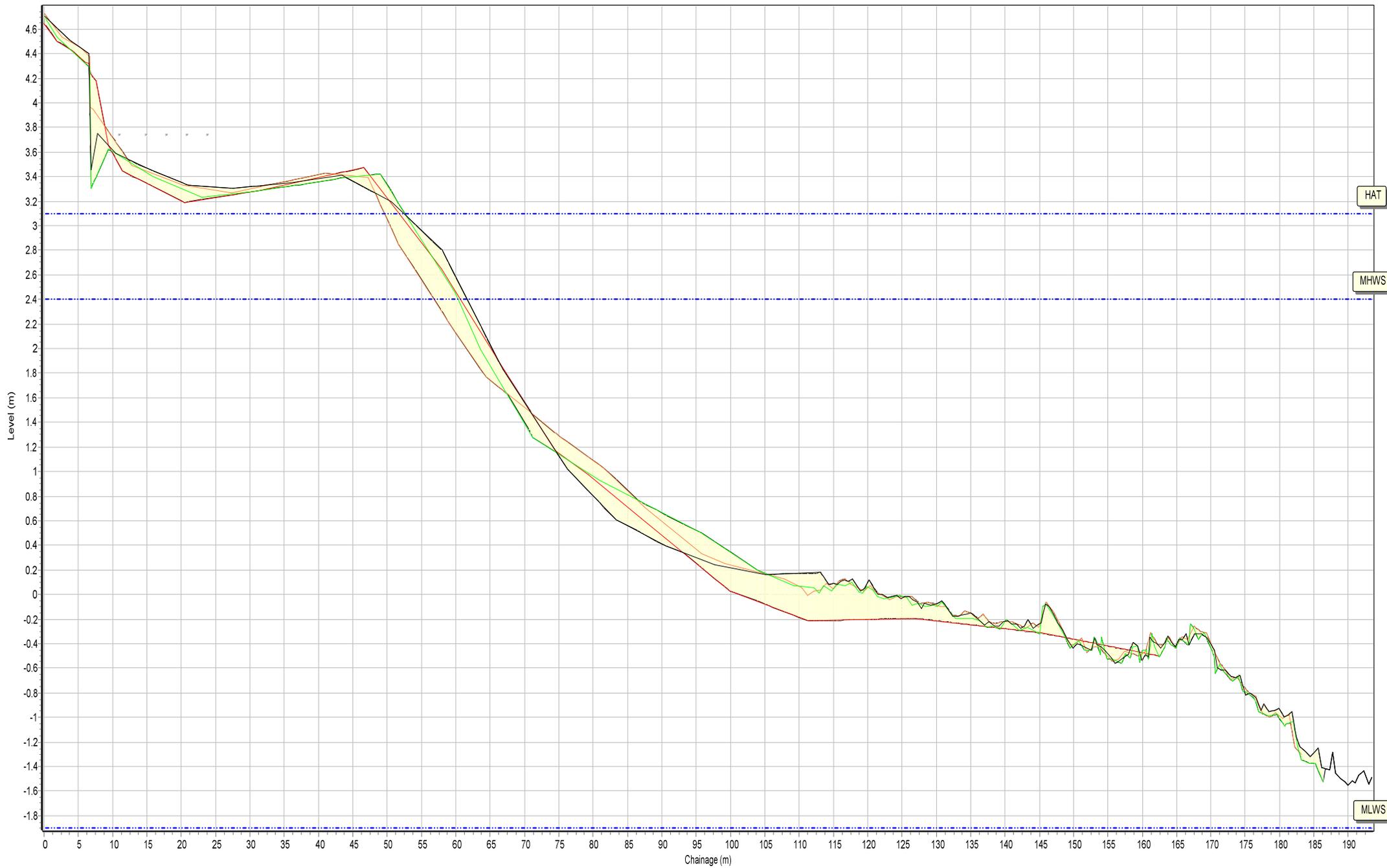
SANDS

Beach Profiles: 1aNWB2



Profiles Envelope 22/11/2010 25/10/2018 09/04/2019 29/08/2019

Beach Profiles: 1aNWB3



HAT

MLWS

MLWS

SANDS

# Beach Profiles: 1aNWB4



Profiles Envelope 22/11/2010 25/10/2018 09/04/2019 29/08/2019

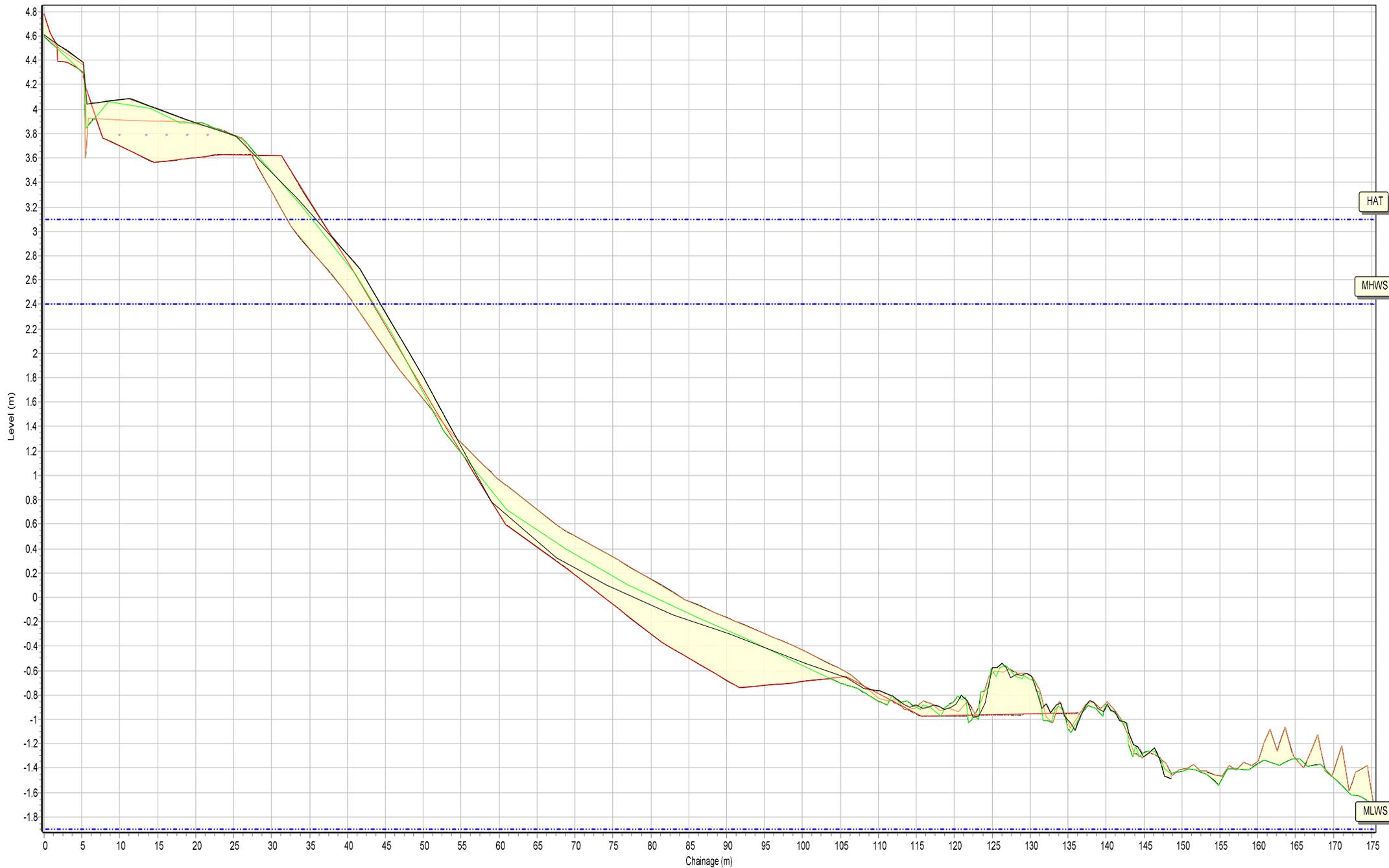
HAT

MHWS

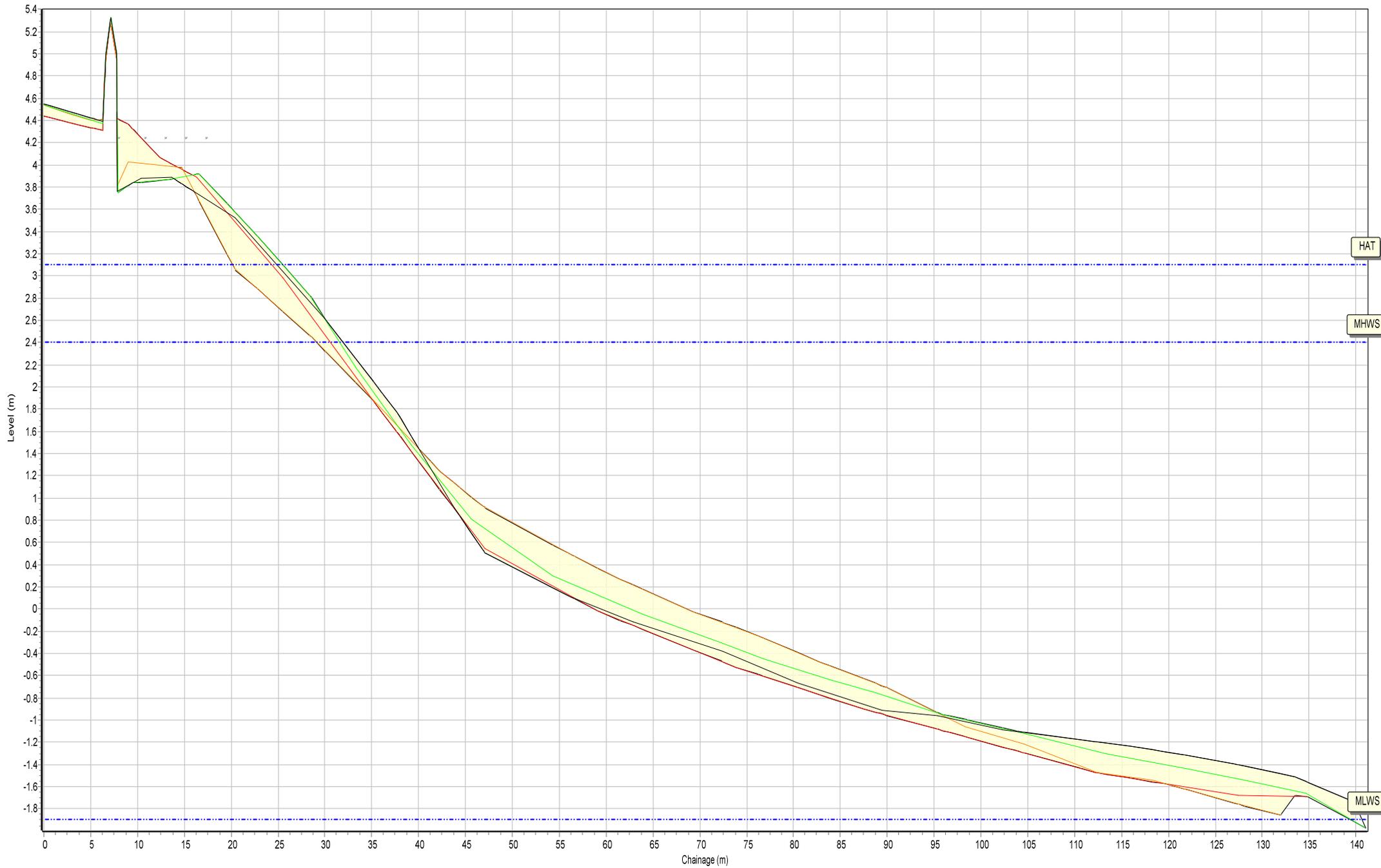
MLWS

SANDS

Beach Profiles: 1aNBW5



Beach Profiles: 1aNWB6



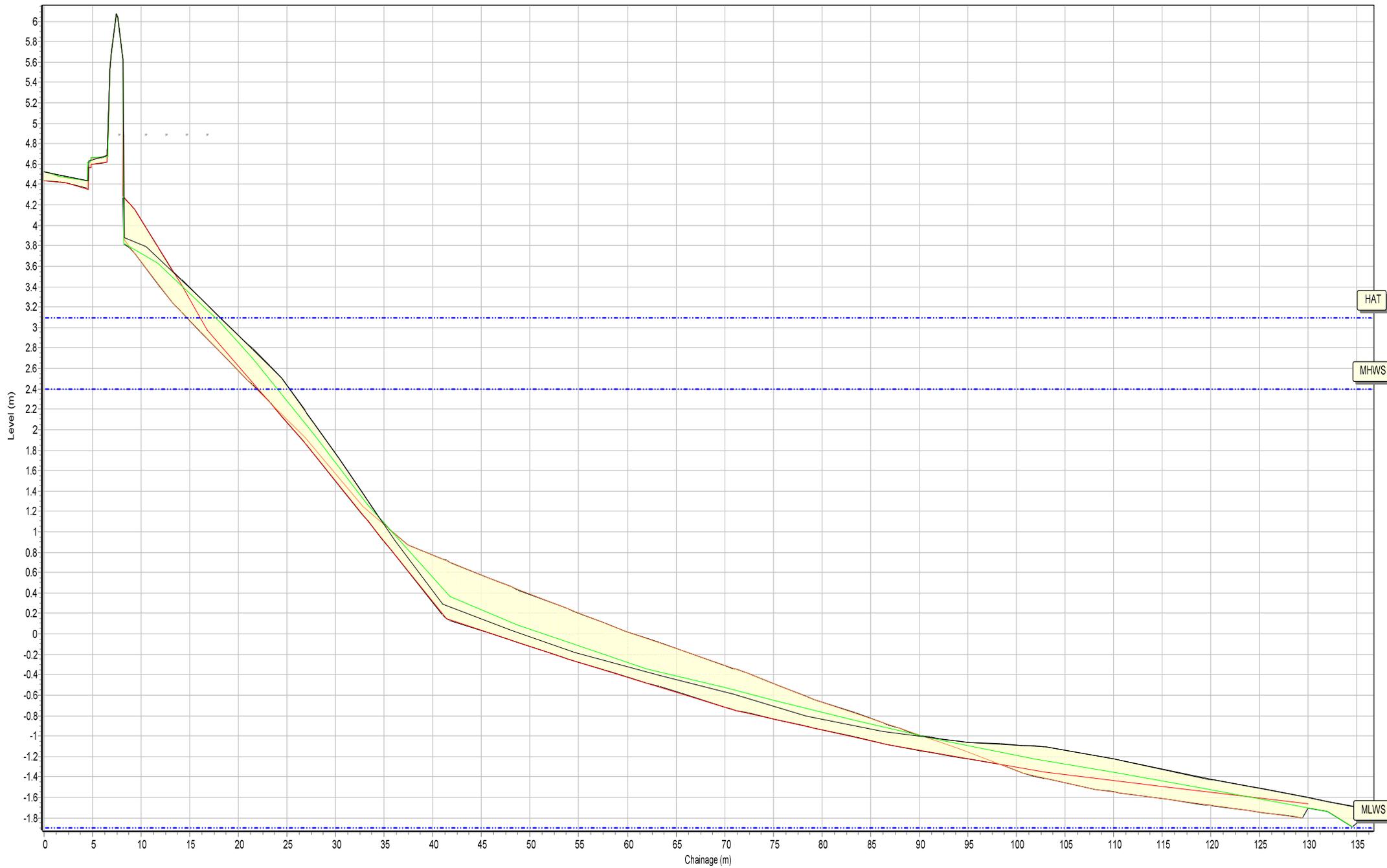
HAT

MHWS

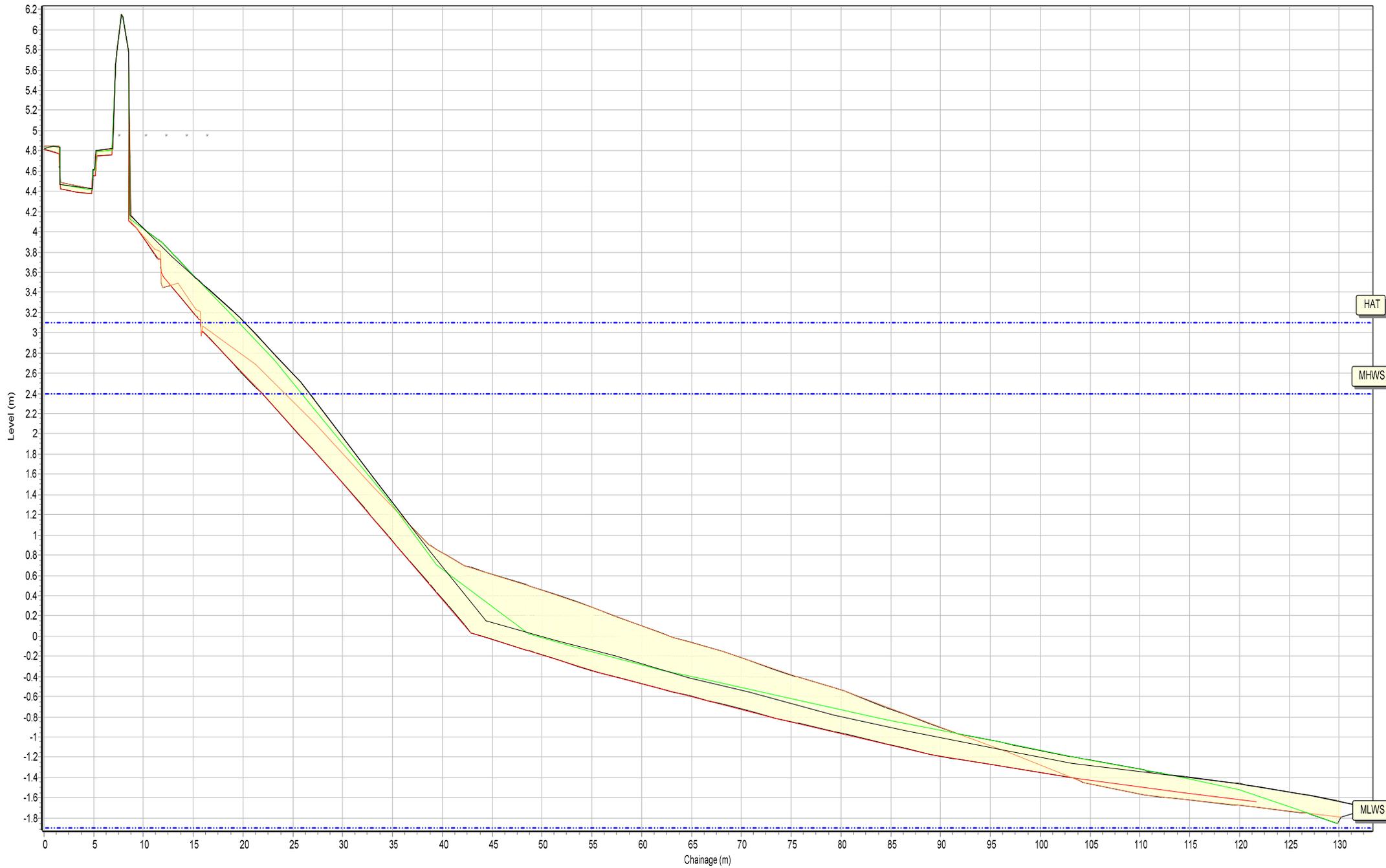
MLWS

SANDS

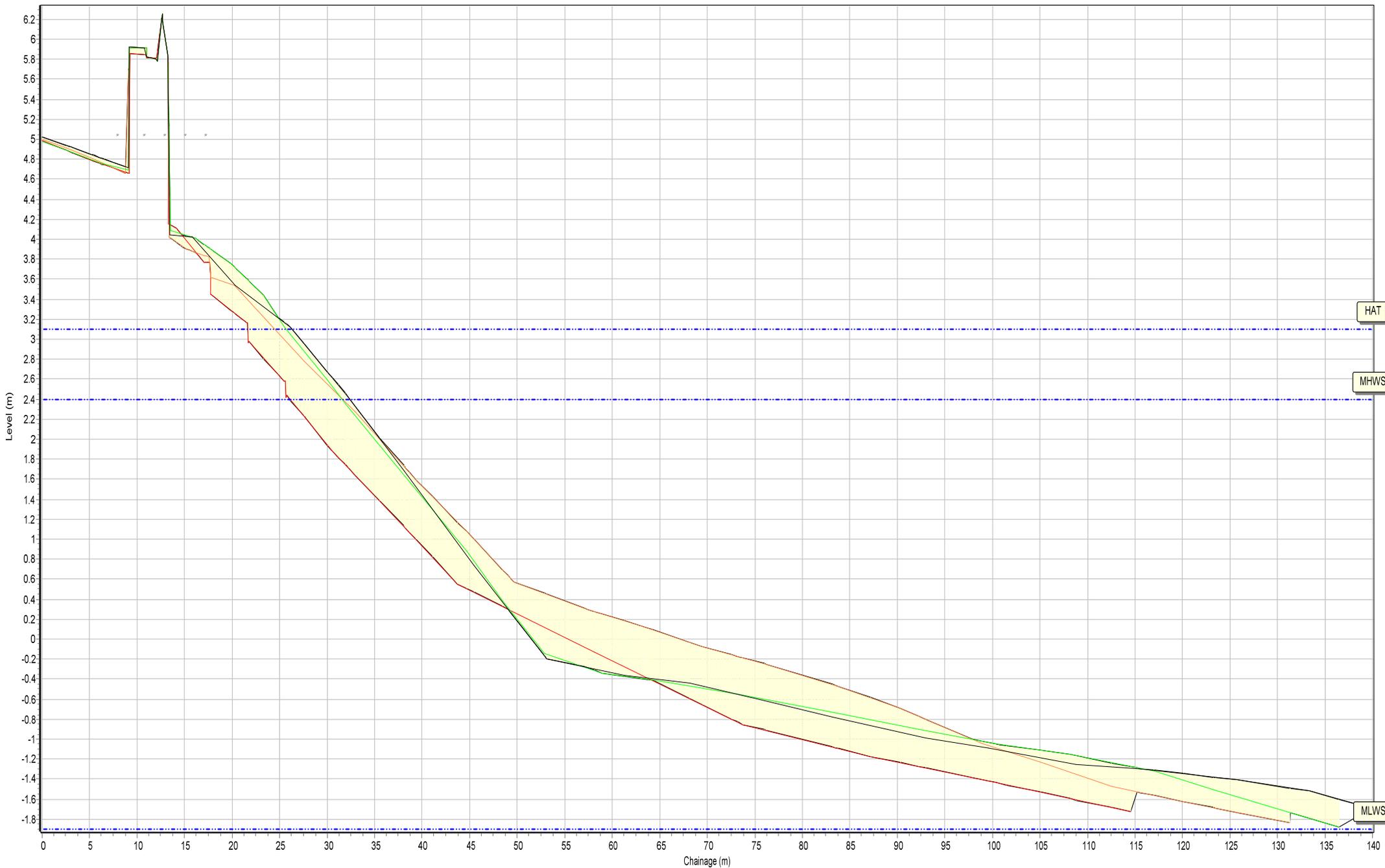
Beach Profiles: 1aNWB7



Beach Profiles: 1aNWB8

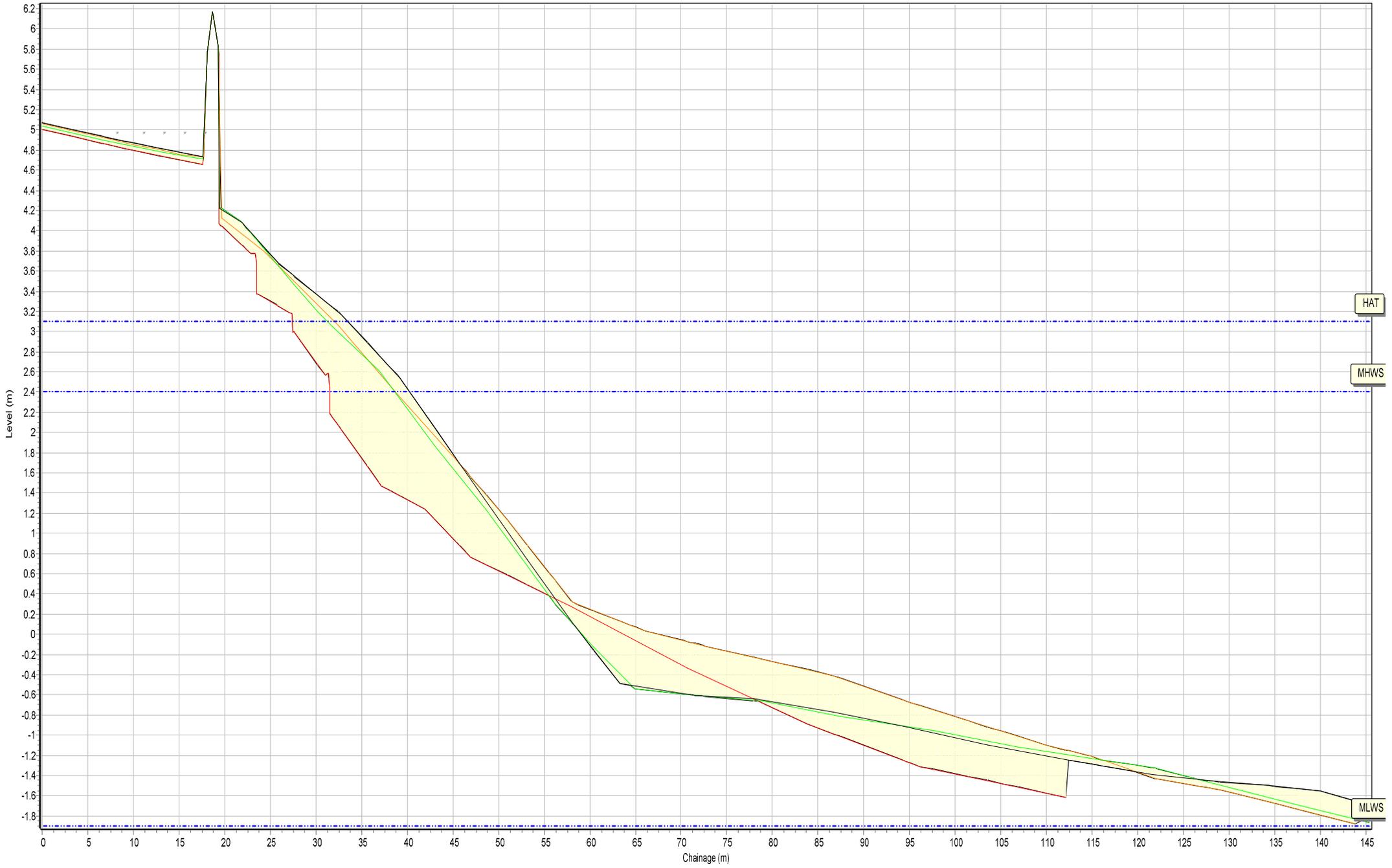


Beach Profiles: 1aNBW9



SANDS

# Beach Profiles: 1aNBW10



Profiles Envelope 22/11/2010 25/10/2018 09/04/2019 29/08/2019

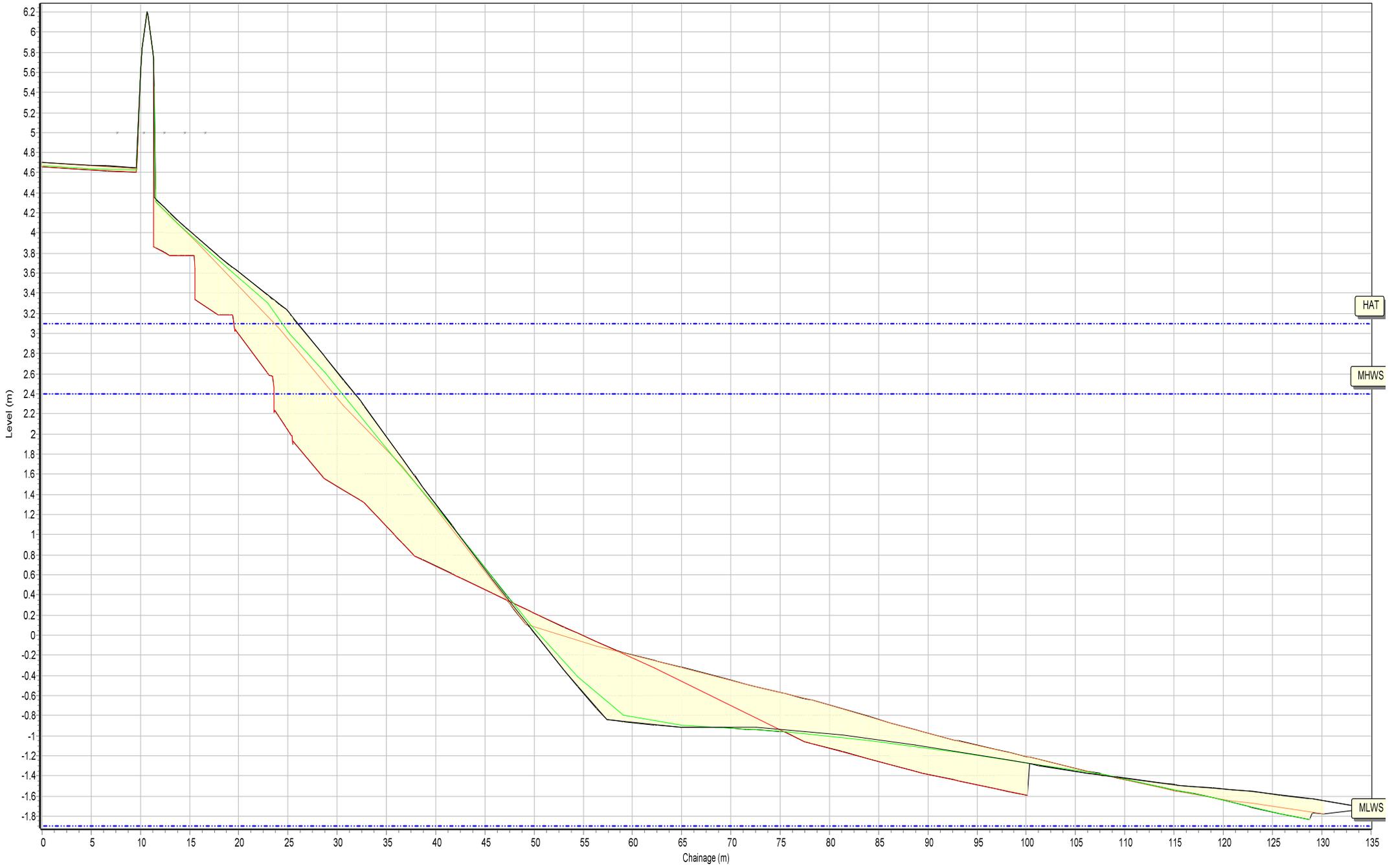
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB11



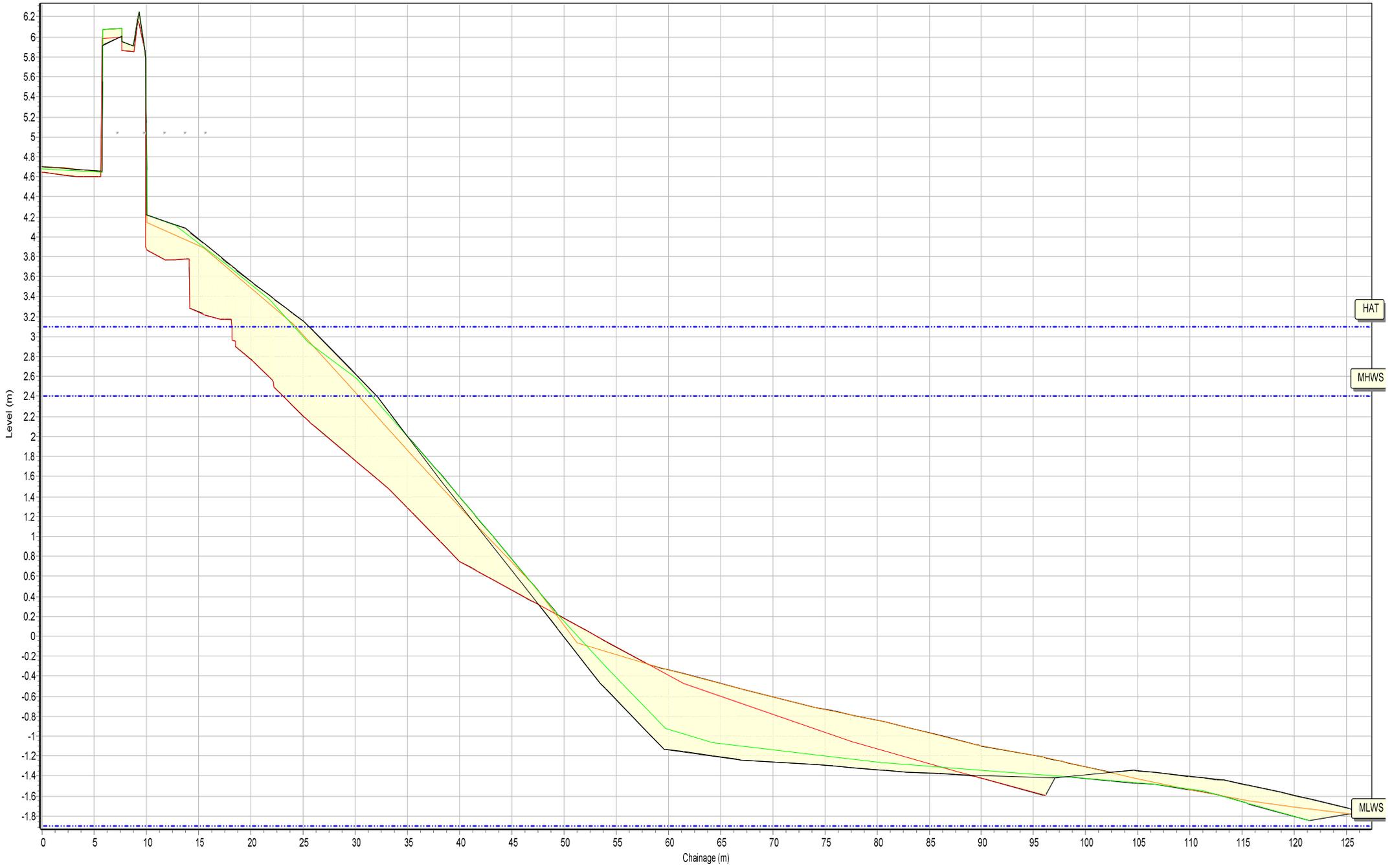
HAT

MHWS

MLWS

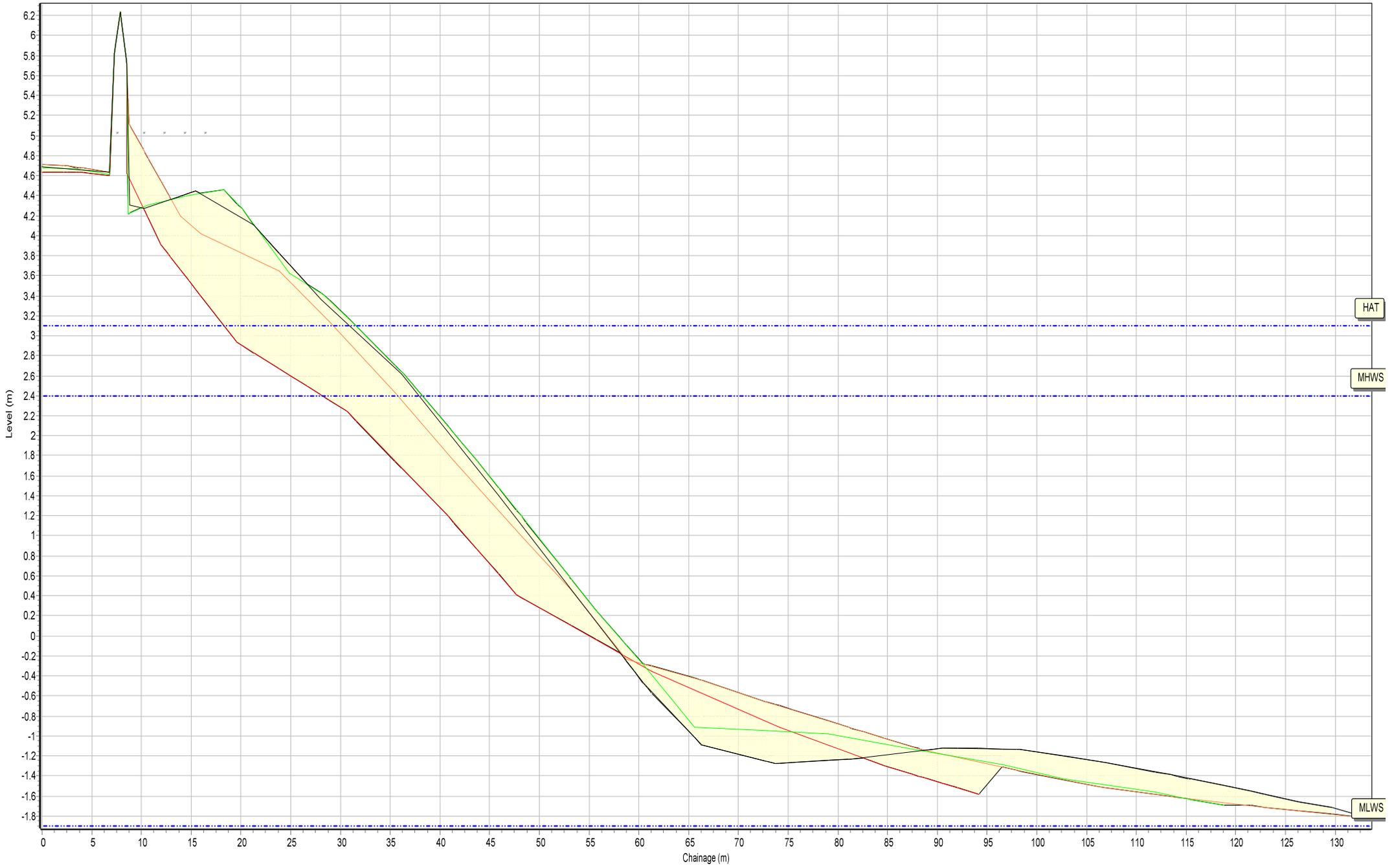
SANDS

# Beach Profiles: 1aNBW12



Profiles Envelope 22/11/2010 25/10/2018 09/04/2019 29/08/2019

# Beach Profiles: 1aNWB13



HAT

MHWS

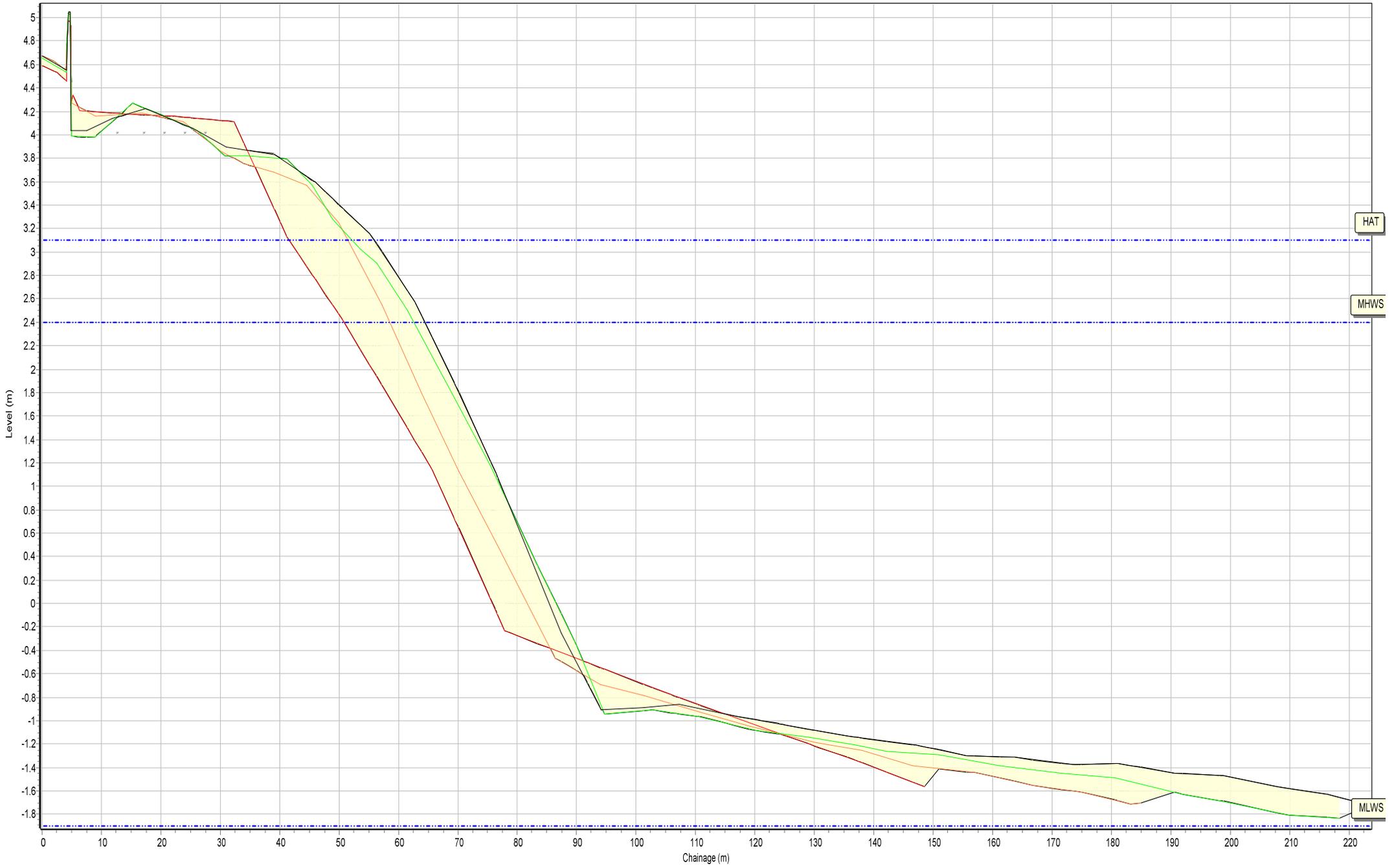
MLWS

SANDS

Beach Profiles: 1aNWB14



# Beach Profiles: 1aNWB15



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB16



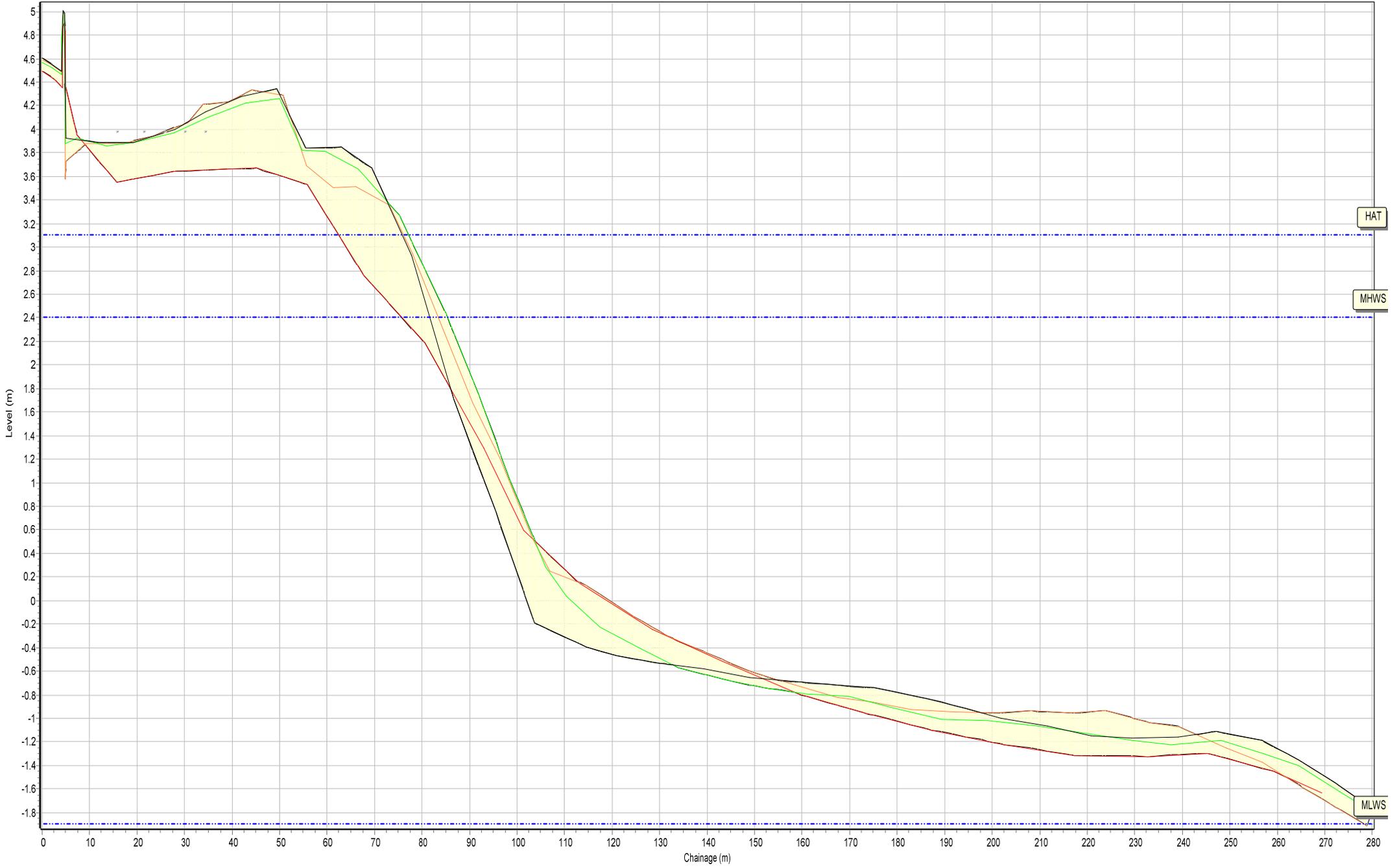
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aNWB17



Beach Profiles: 1aNWB18



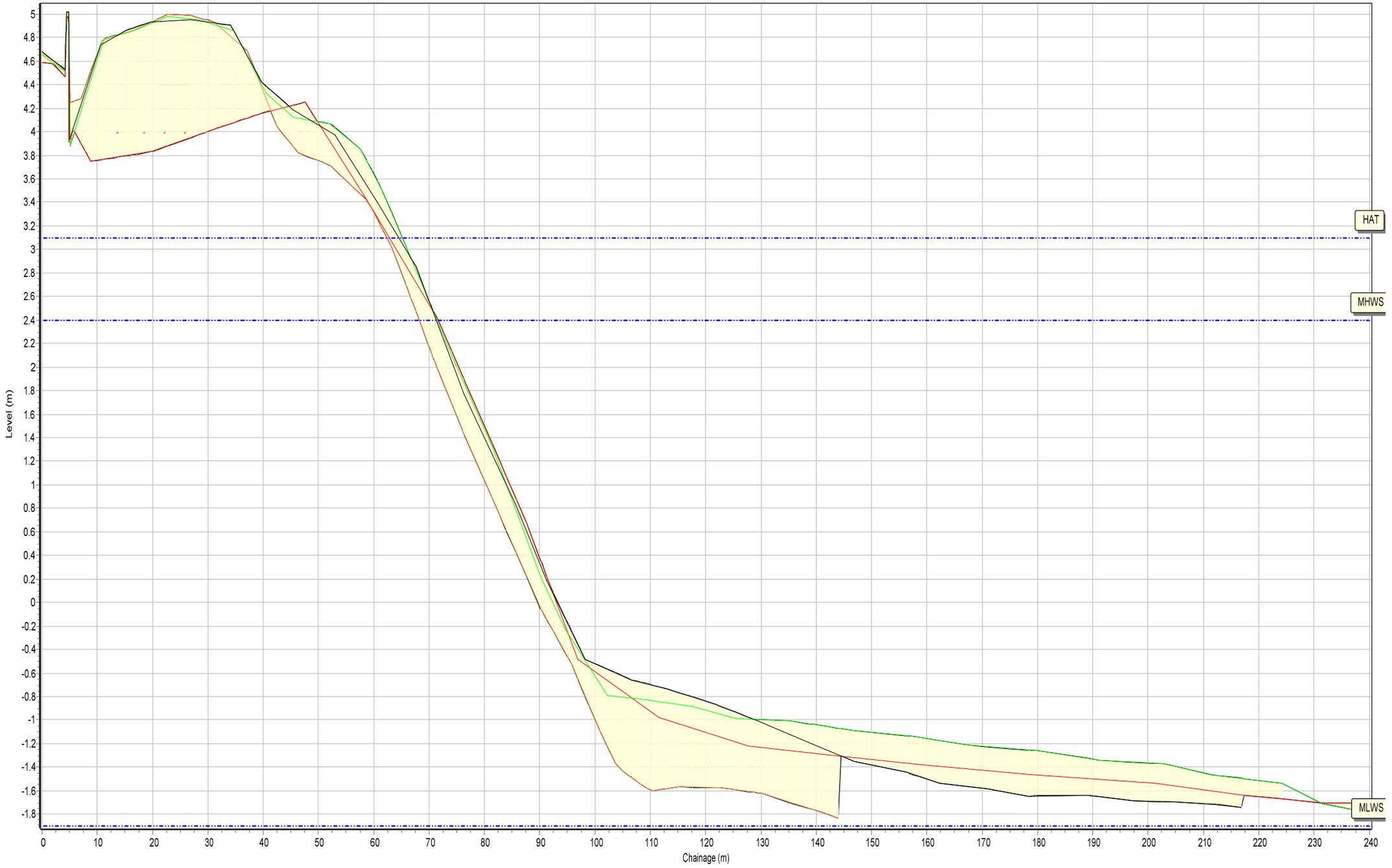
HAT

MLWS

MLWS

SANDS

# Beach Profiles: 1aNWB19



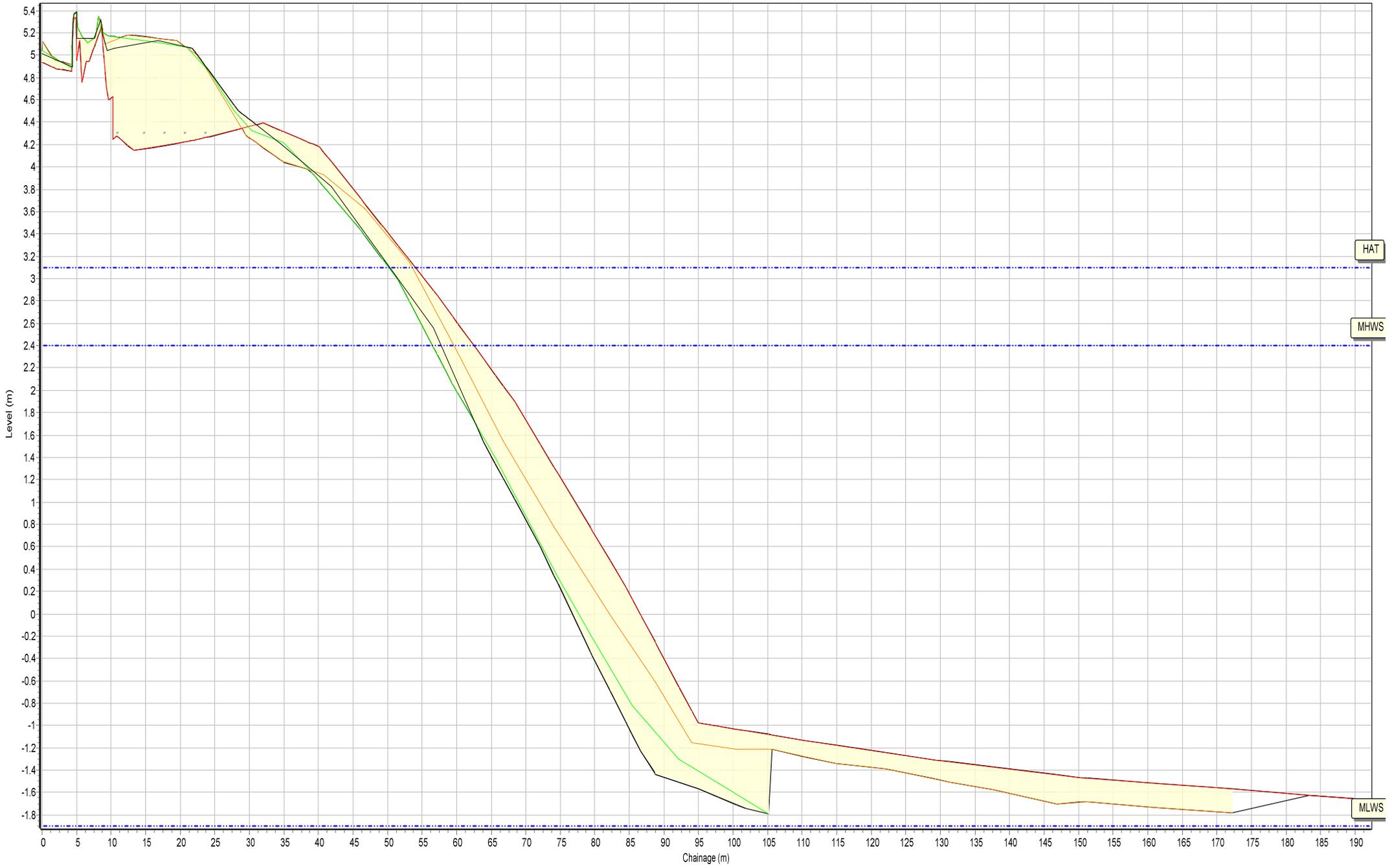
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aNWB20



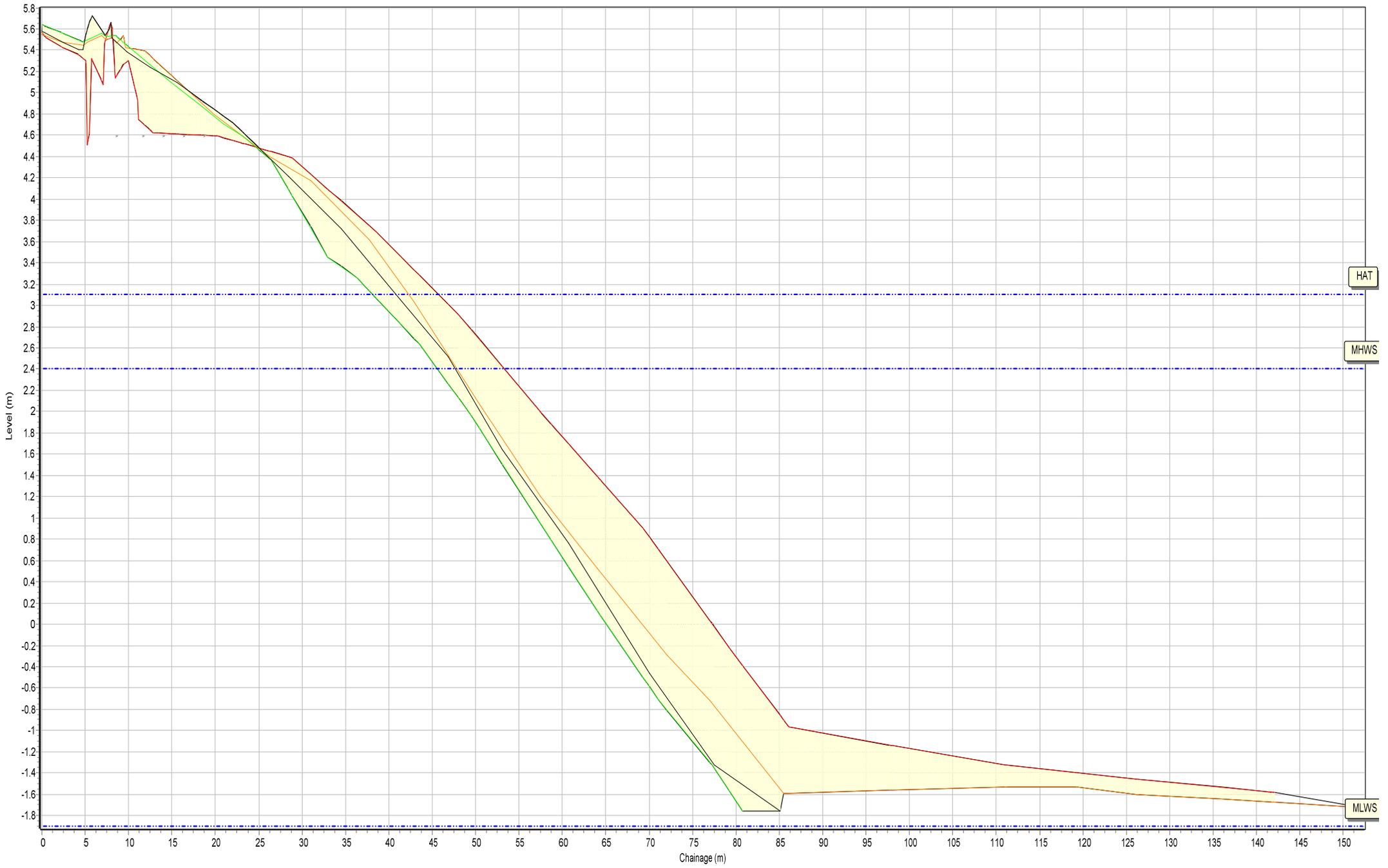
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB21



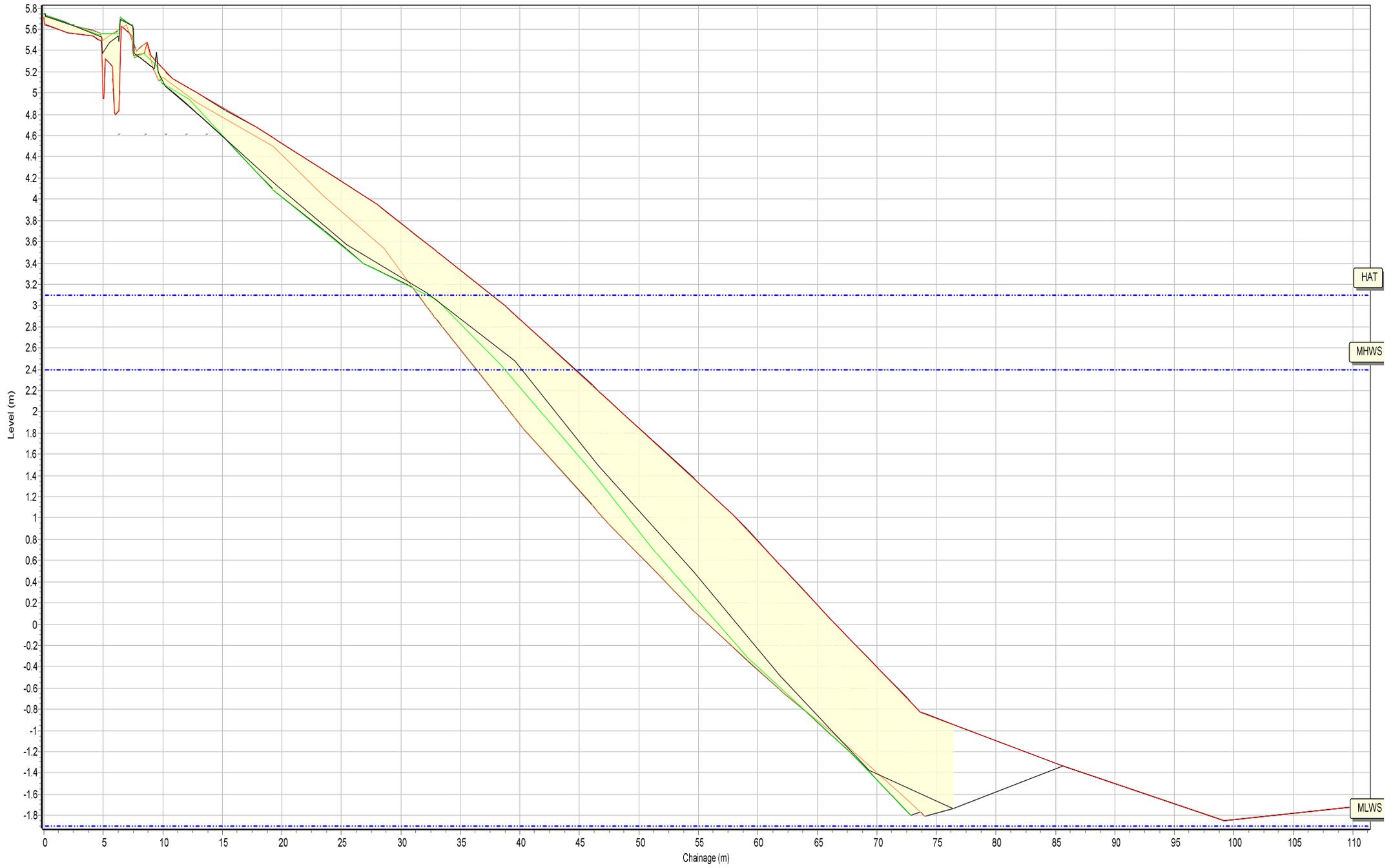
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB22



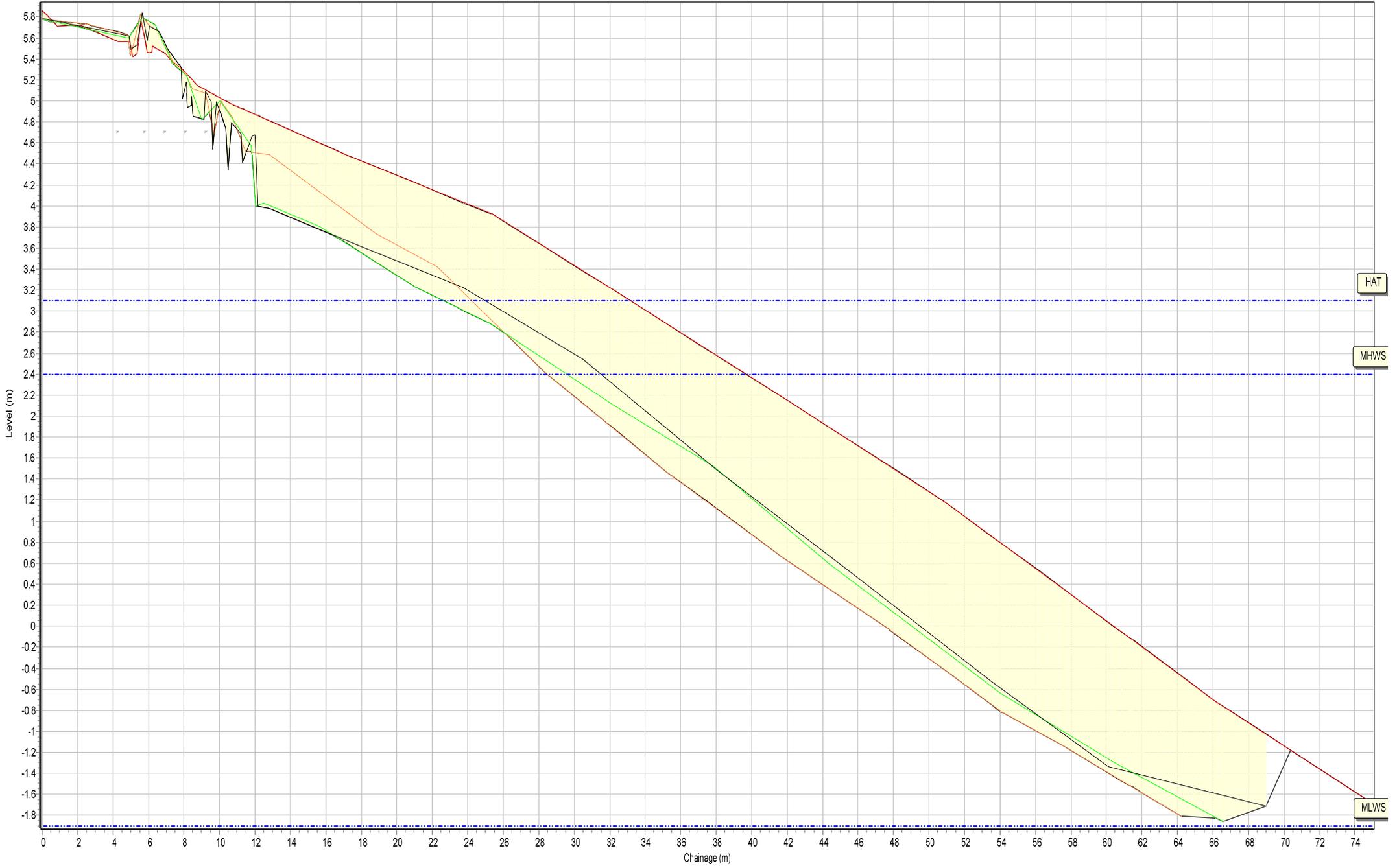
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNBW23



Profiles Envelope 22/11/2010 25/10/2018 09/04/2019 29/08/2019

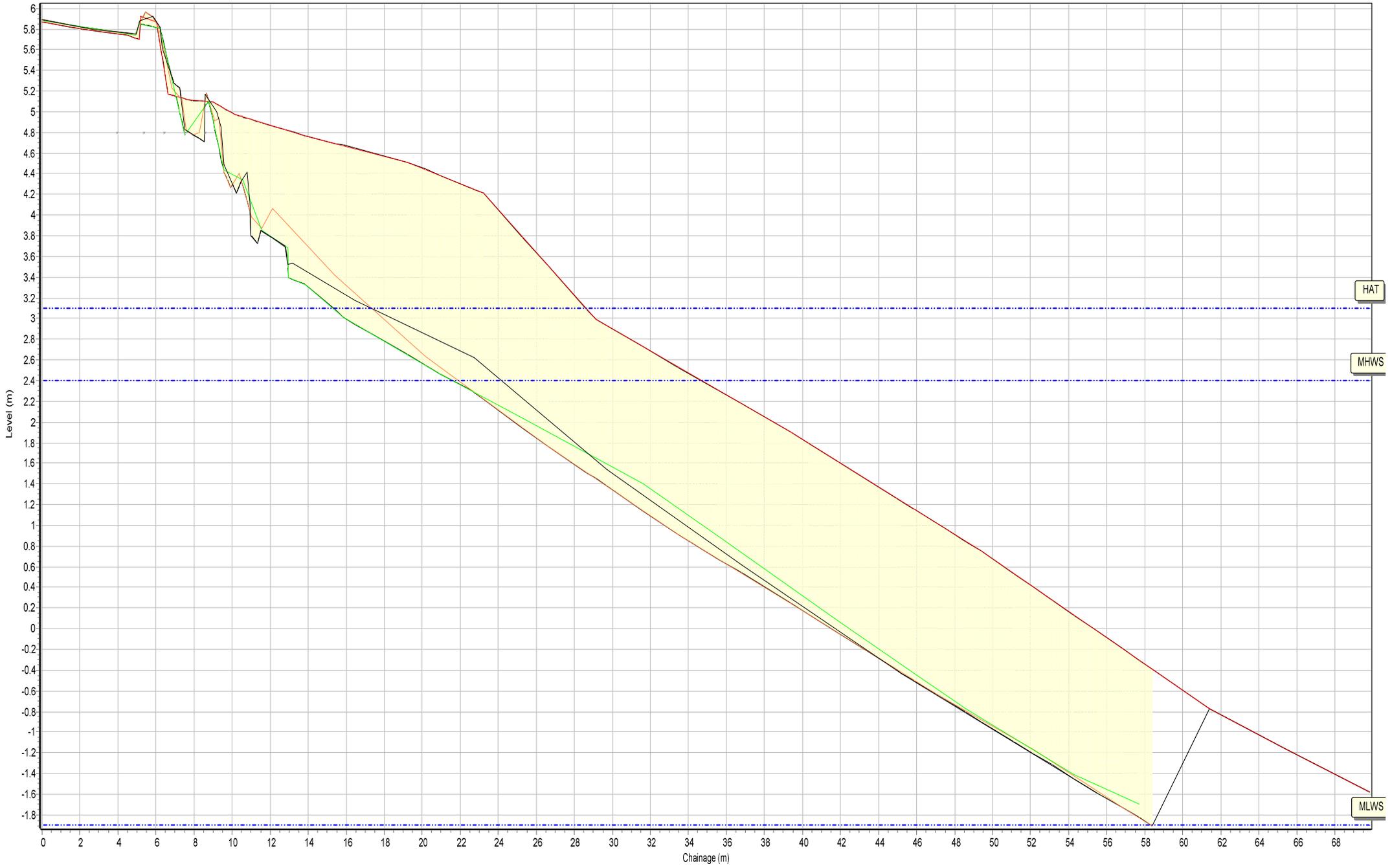
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB24



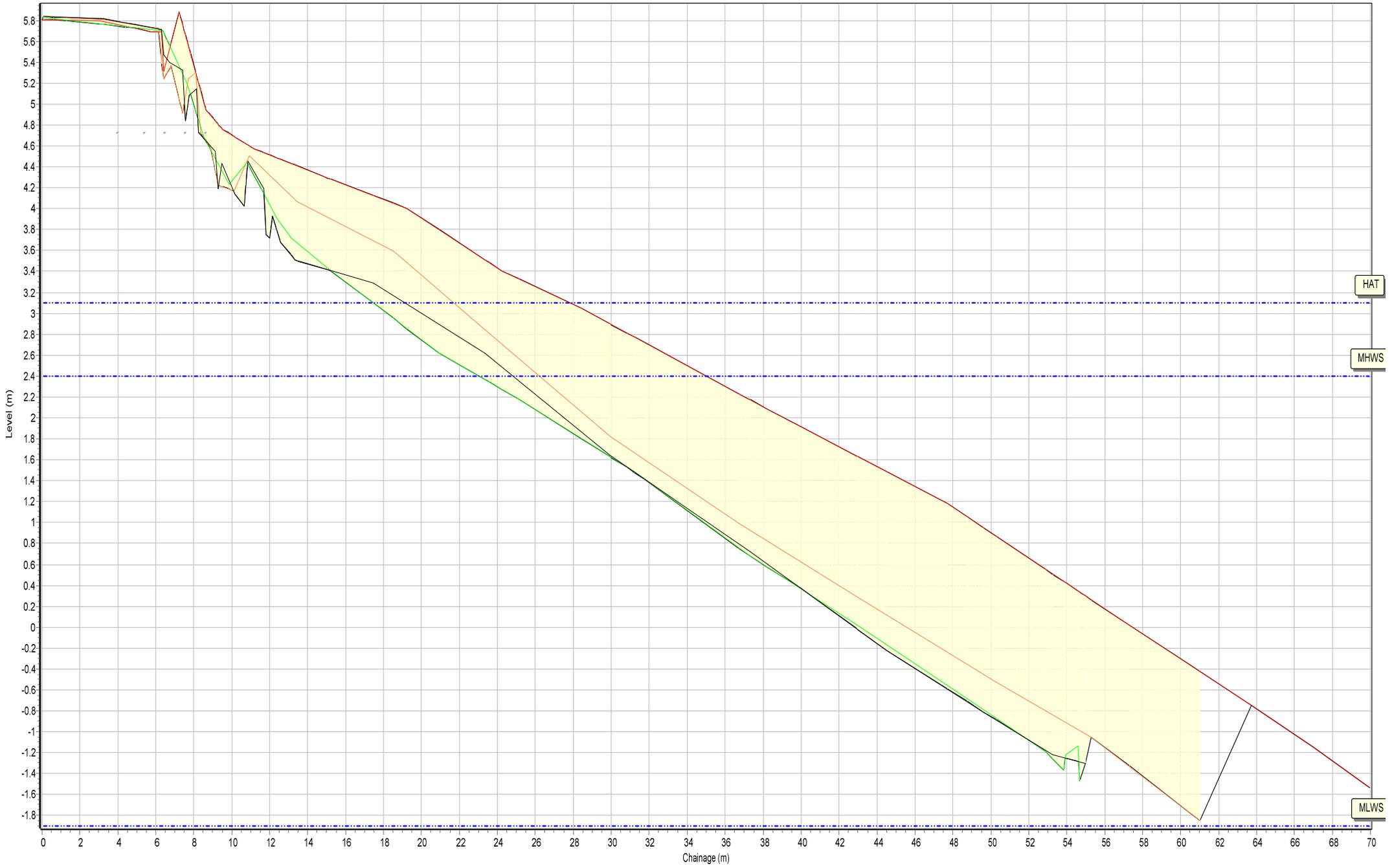
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aNWB25



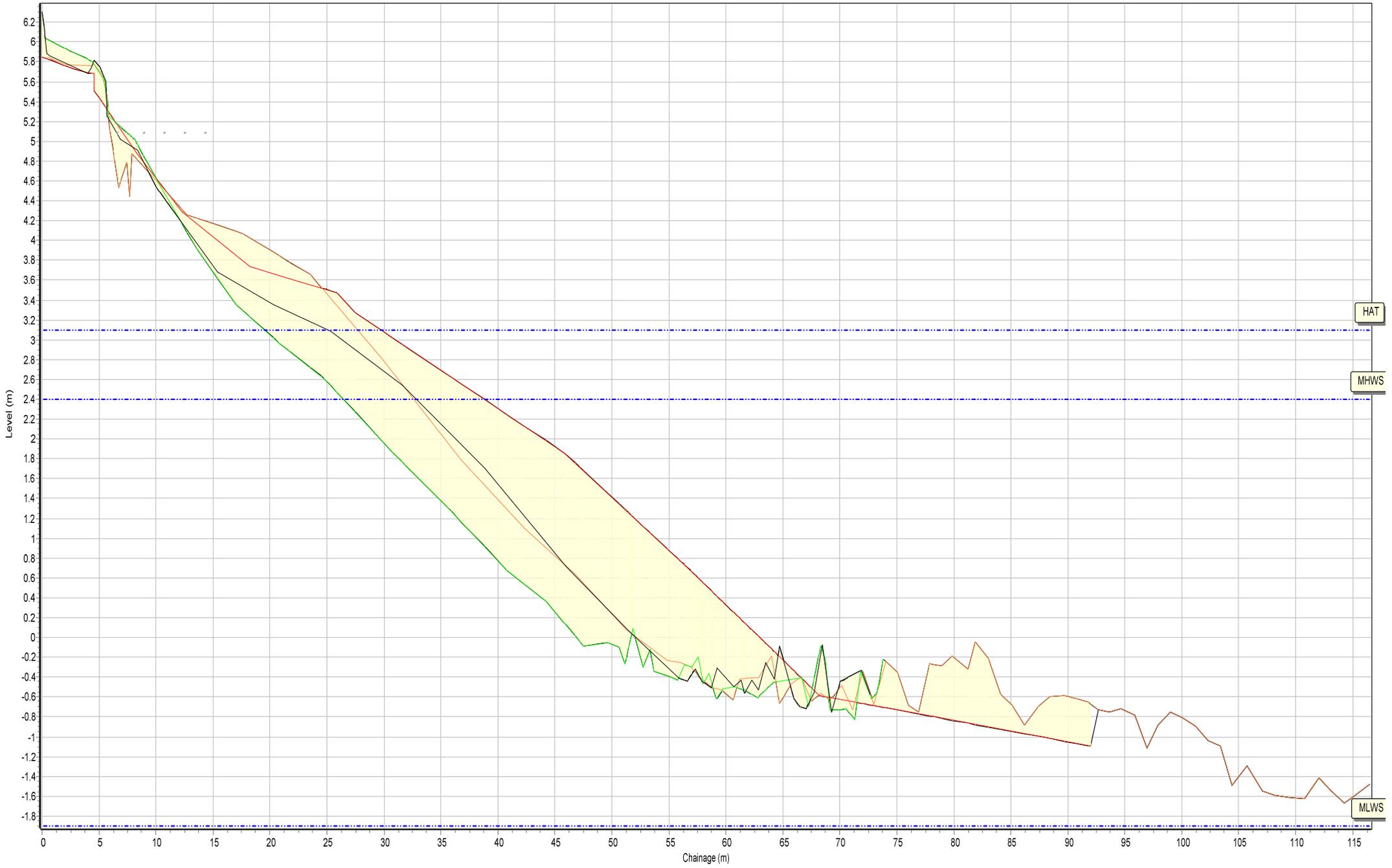
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB26



HAT

MHWS

MLWS

SANDS

# Beach Profile

Location: 1aWDC09

Date: 02/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

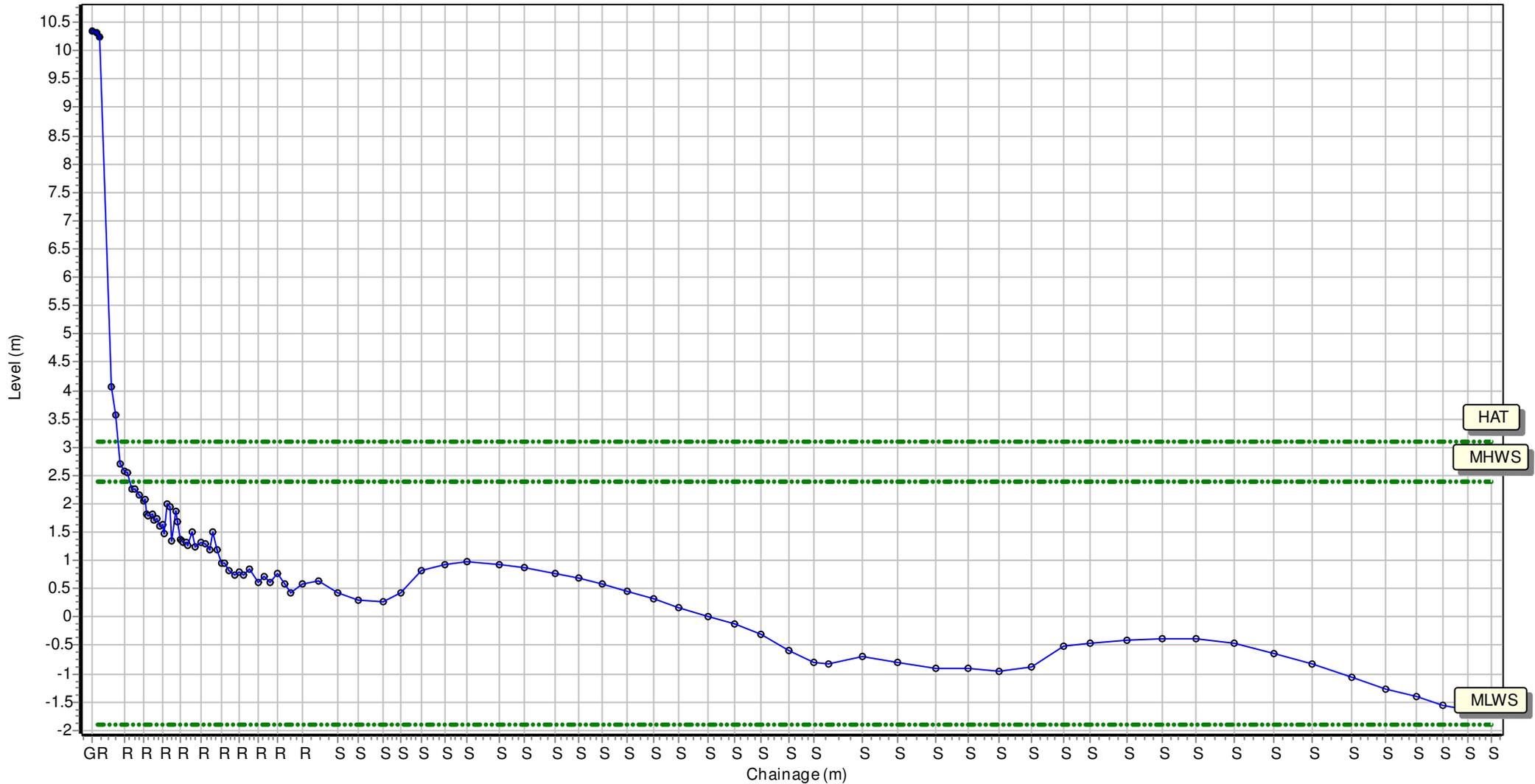
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430361.278 Northing: 585559.12 Profile Bearing: 130 ° from North



# Beach Profile

Location: 1aWDC10

Date: 02/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

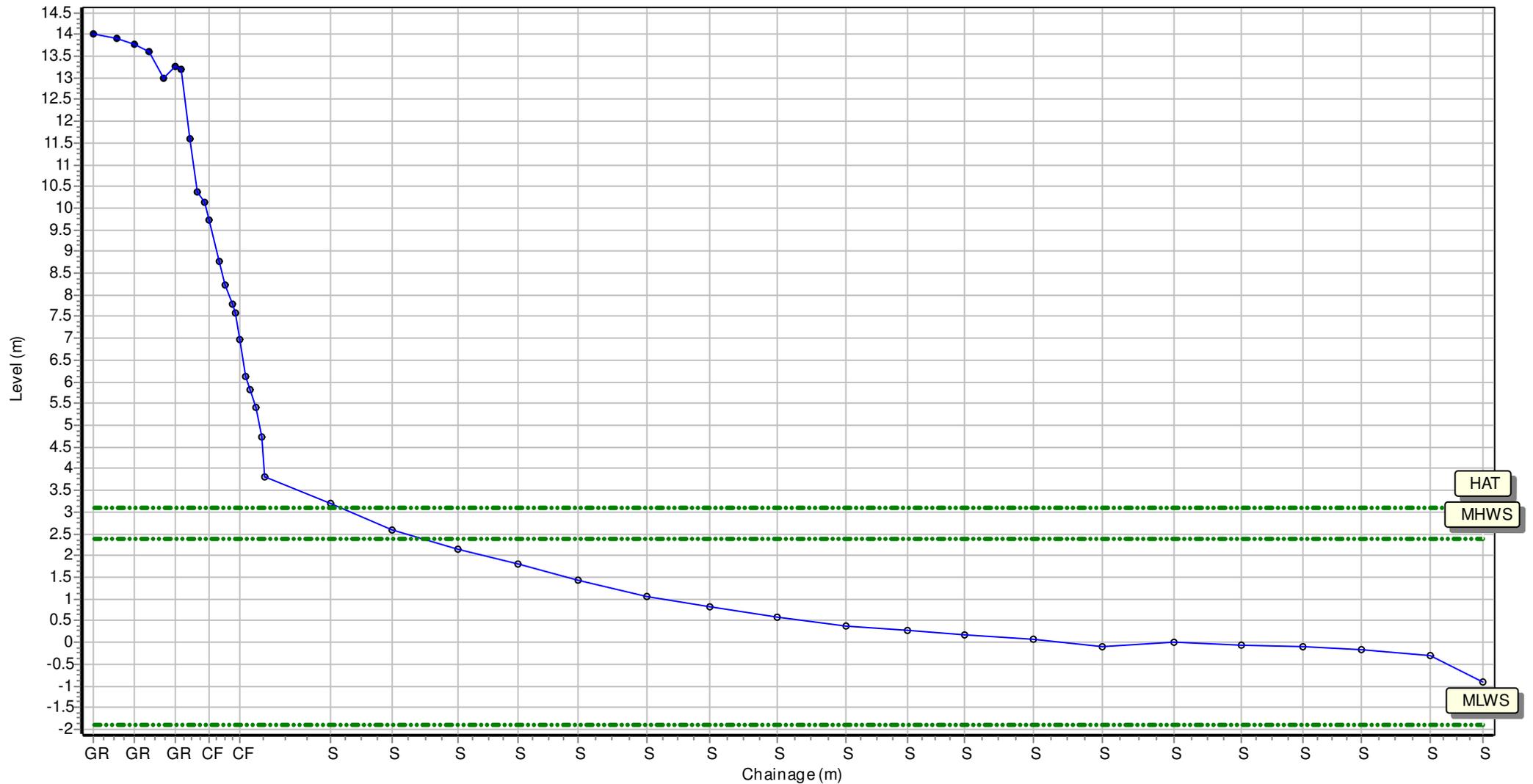
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430247.175 Northing: 585191.003 Profile Bearing: 71 ° from North



# Beach Profile

Location: 1aWDC11

Date: 02/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

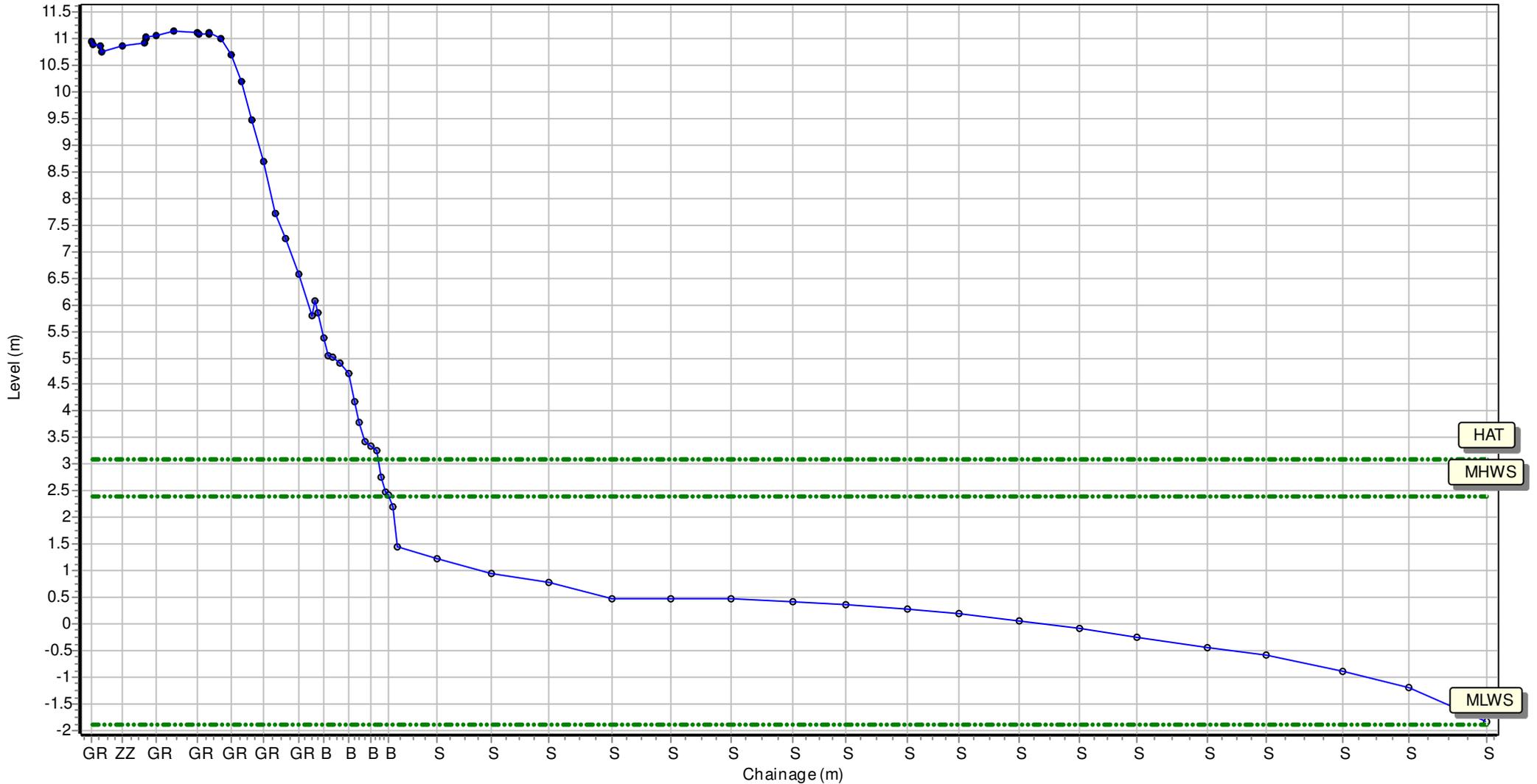
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430397.4 Northing: 584739.609 Profile Bearing: 74 ° from North



# Beach Profile

Location: 1aWDC12

Date: 02/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

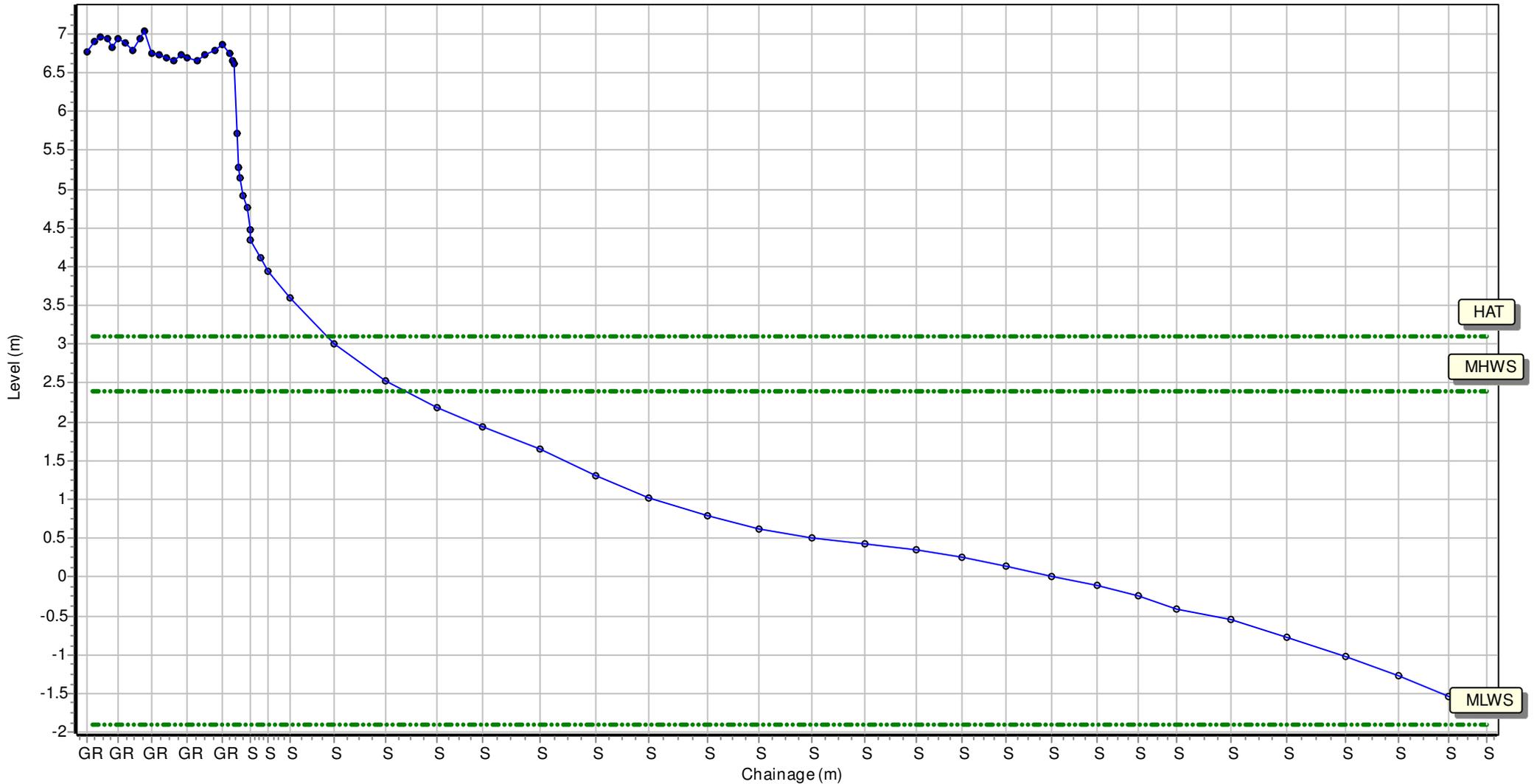
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 430549.164 Northing: 584058.468 Profile Bearing: 73 ° from North



# Beach Profile

Location: 1aWDC13

Date: 02/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

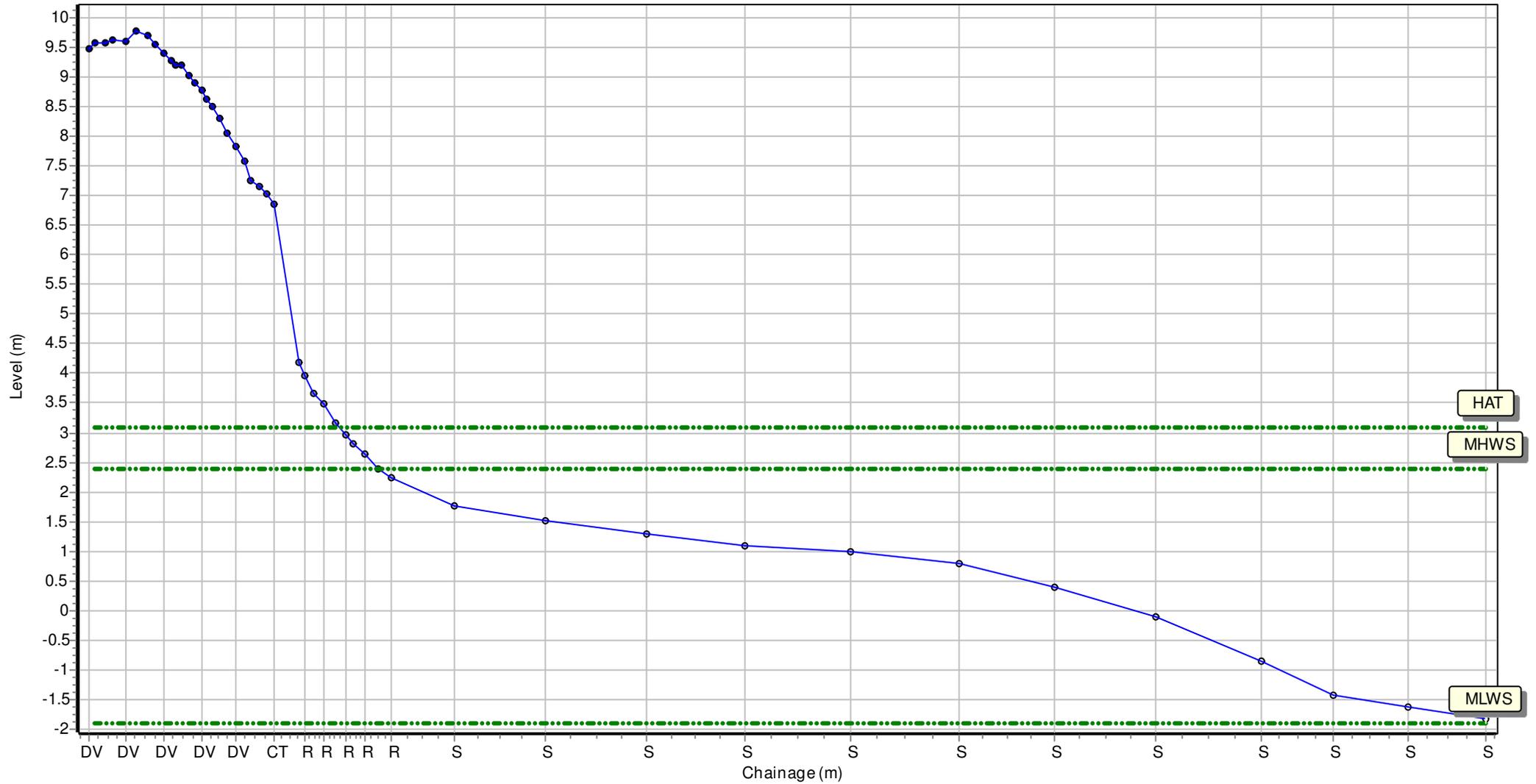
Sea State:

Visibility:

Rain:

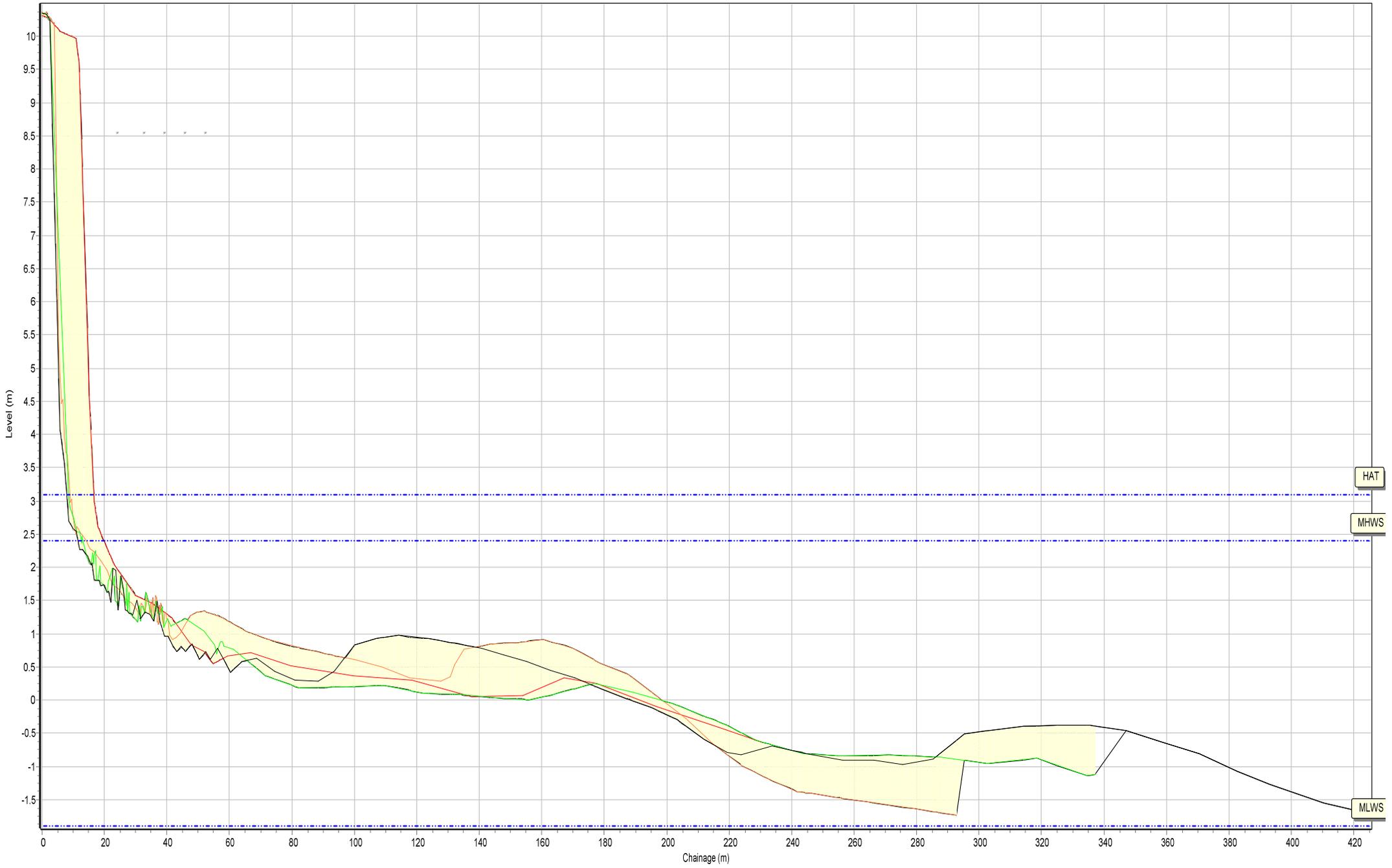
Summary: 2019 Full Measures Topo Survey

Easting: 430983.324 Northing: 583146.489 Profile Bearing: 62 ° from North





Beach Profiles: 1aWDC09



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC10



Profiles Envelope 01/10/2006 07/09/2017 05/12/2018 02/10/2019

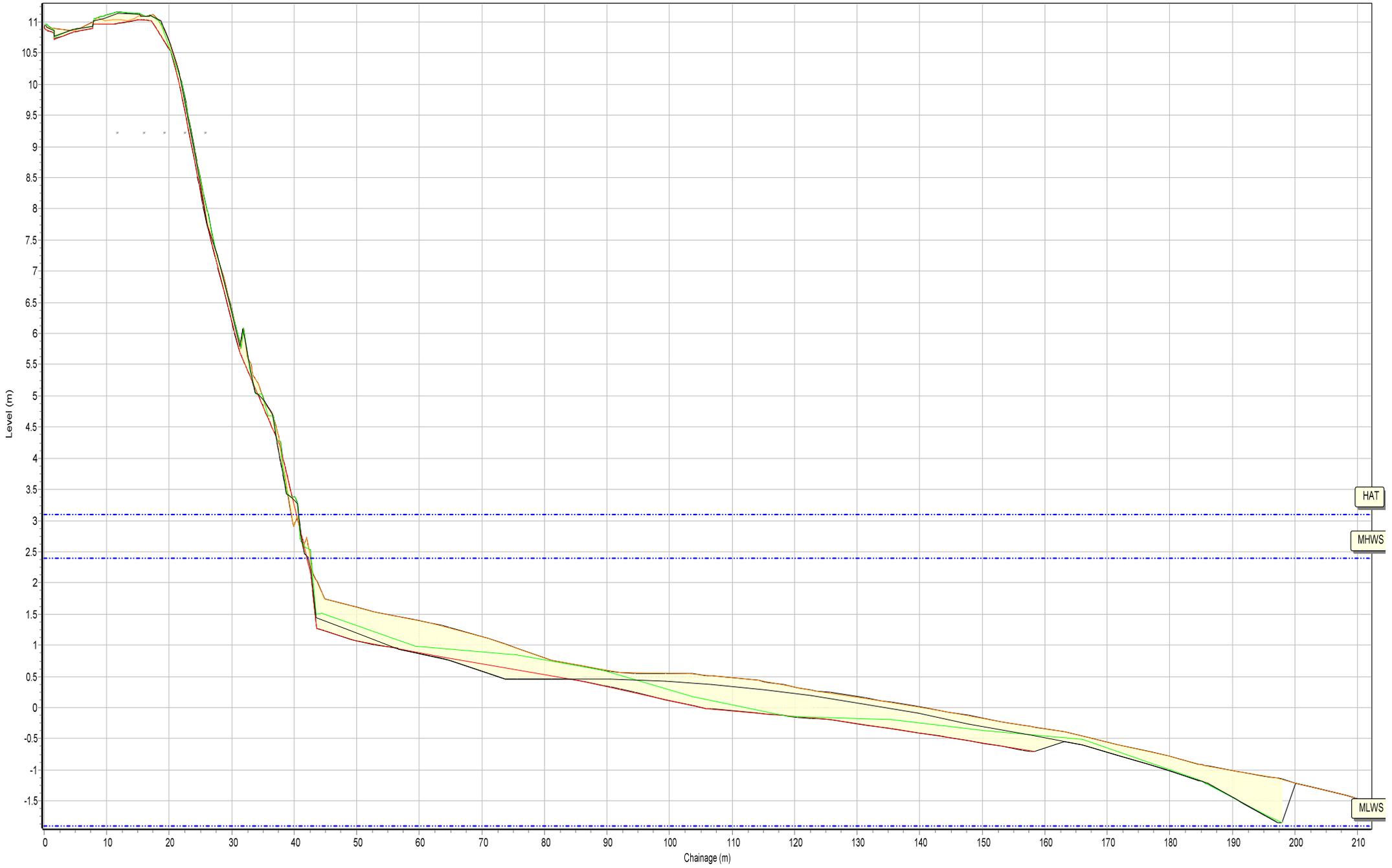
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aWDC11



HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aWDC12



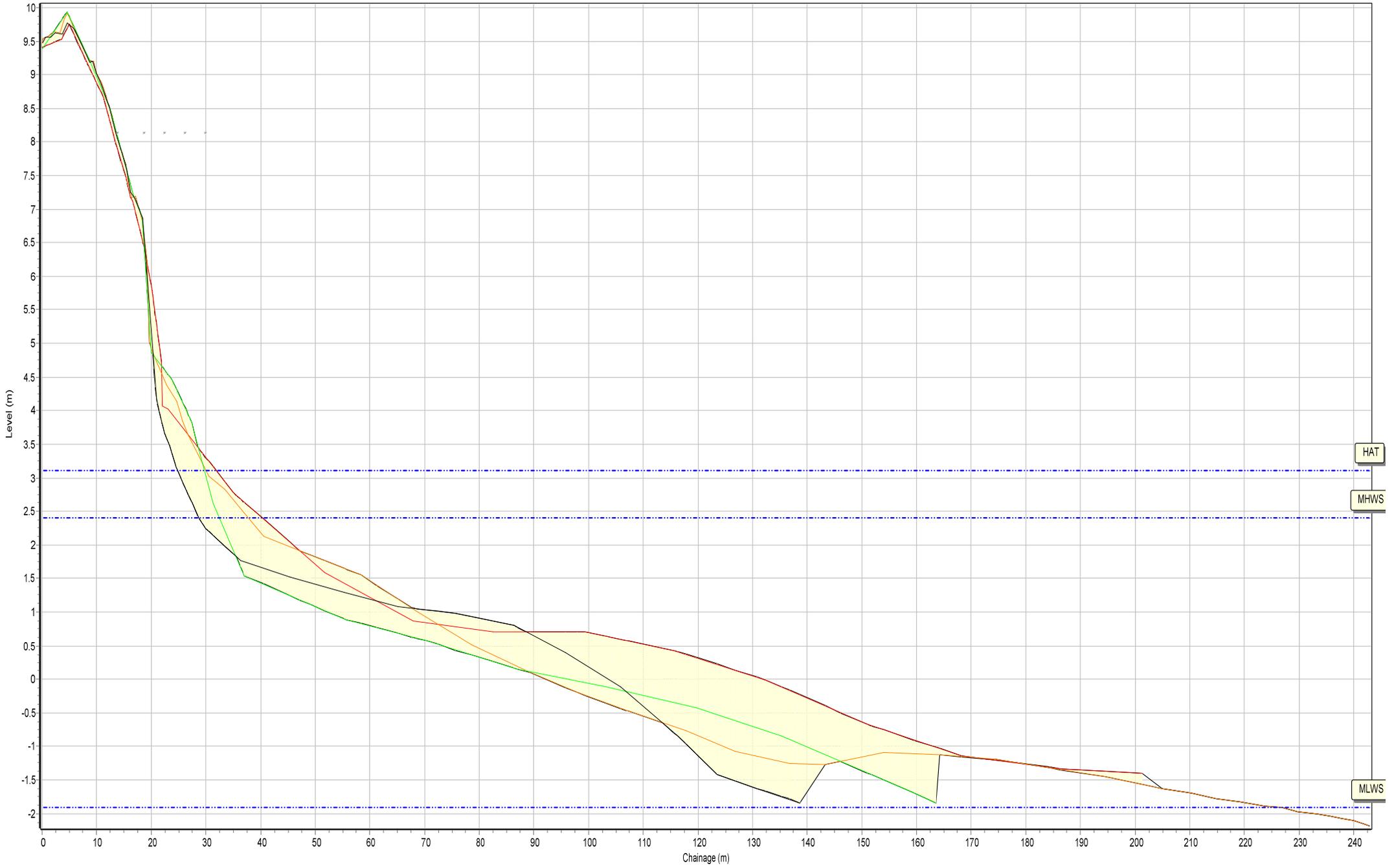
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC13



Profiles Envelope 01/10/2006 07/09/2017 05/12/2018 02/10/2019

HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aWDC14



HAT

MHWS

MLWS

SANDS



# Beach Profile

Location: 1aBVBC02

Date: 01/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

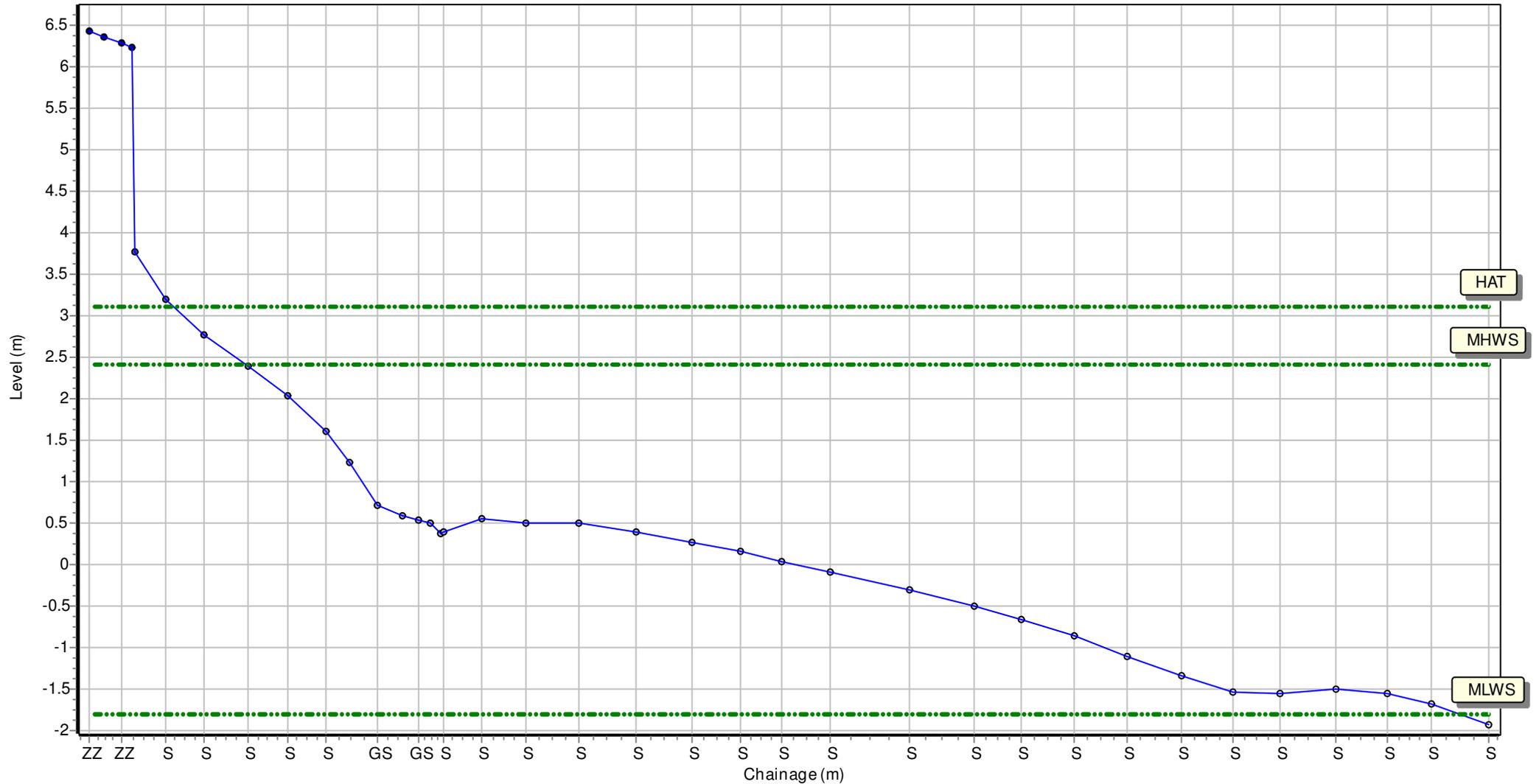
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 432072.788 Northing: 579668.162 Profile Bearing: 77 ° from North



# Beach Profile

Location: 1aBVBC03

Date: 01/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

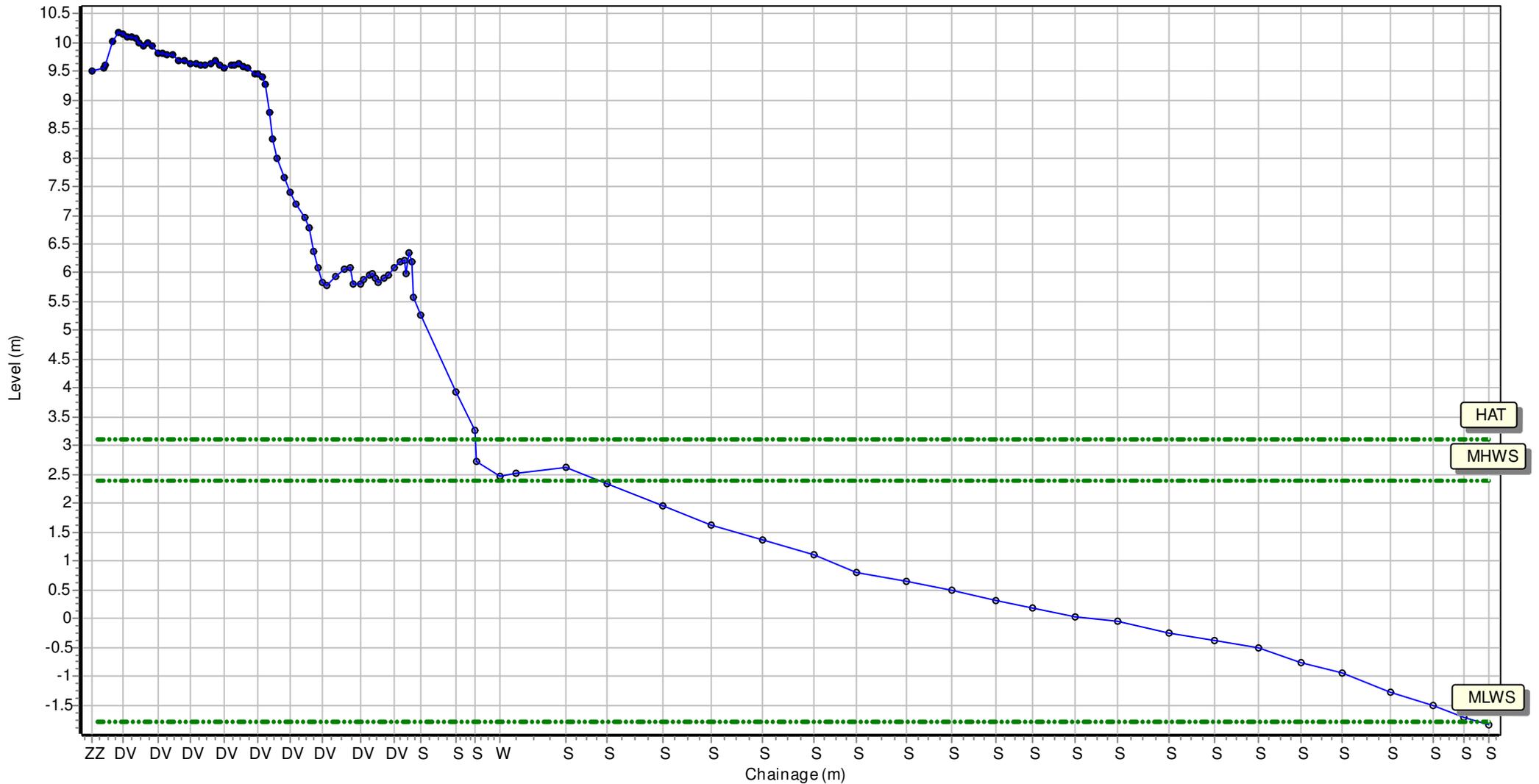
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 432120.659 Northing: 578982.375 Profile Bearing: 71 ° from North



# Beach Profile

Location: 1aBVBC04

Date: 01/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

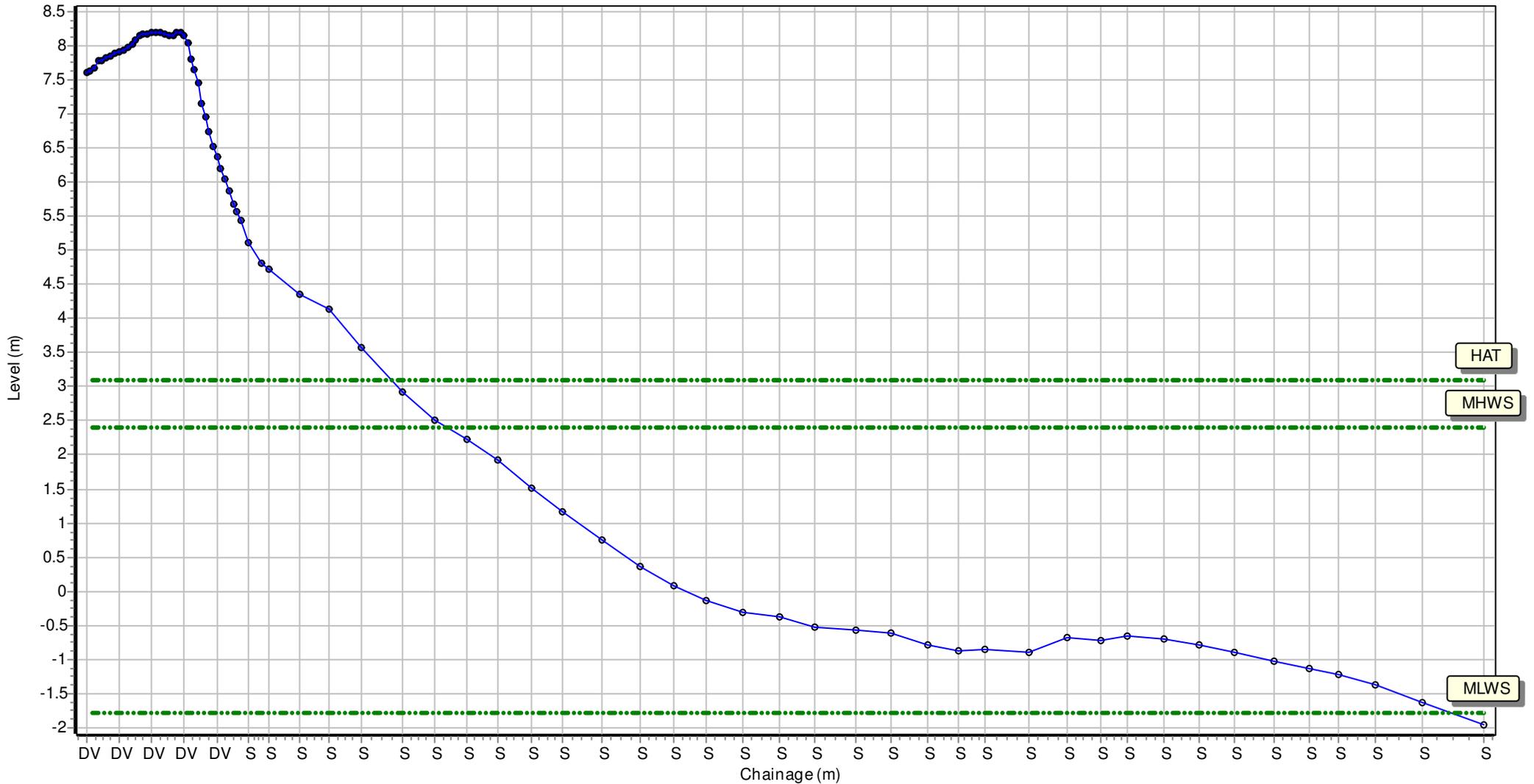
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 432398.19 Northing: 578463.878 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1aBVBC05

Date: 01/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

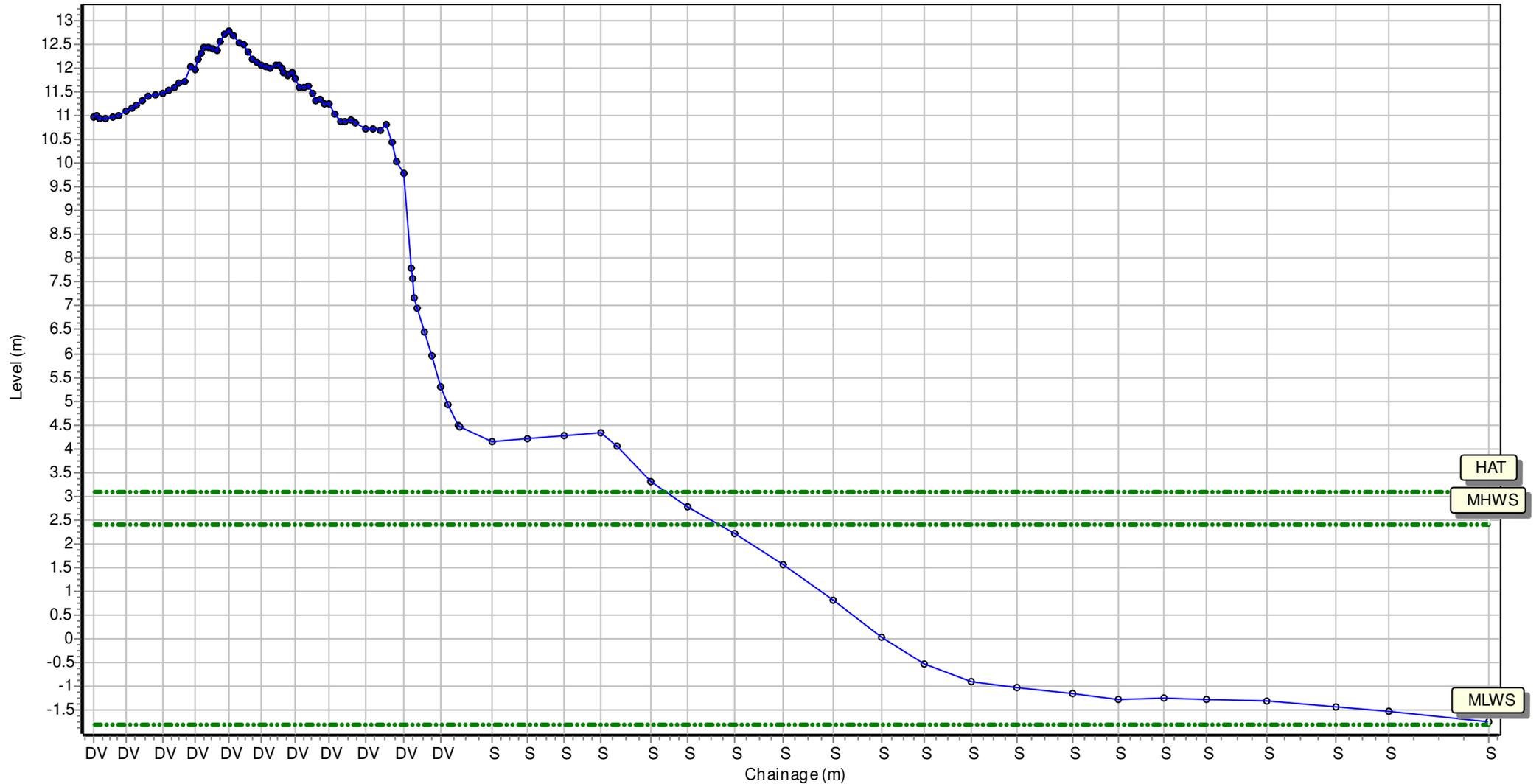
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 432667.046 Northing: 577891.873 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1aBVBC06

Date: 01/10/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

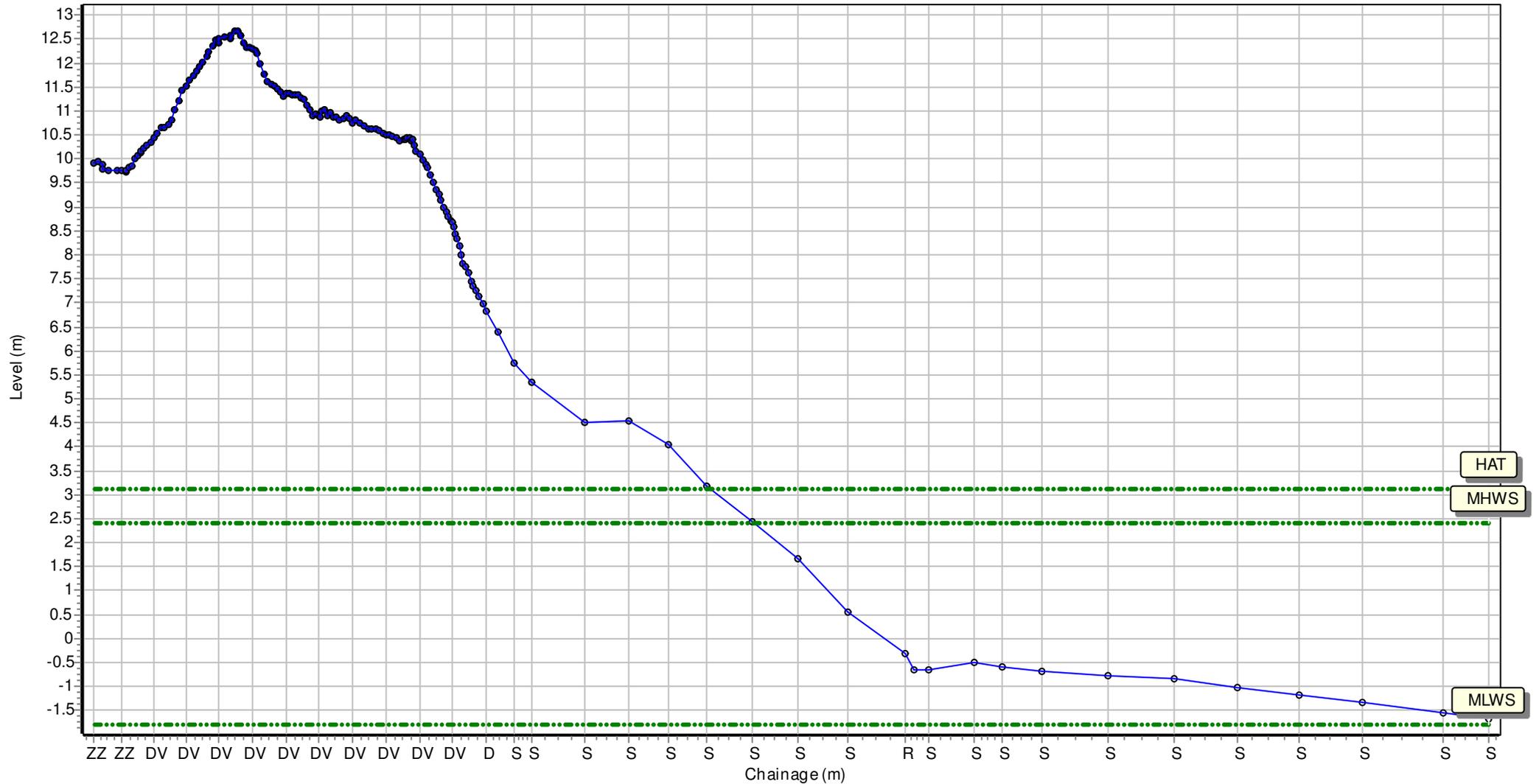
Sea State:

Visibility:

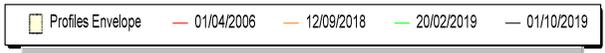
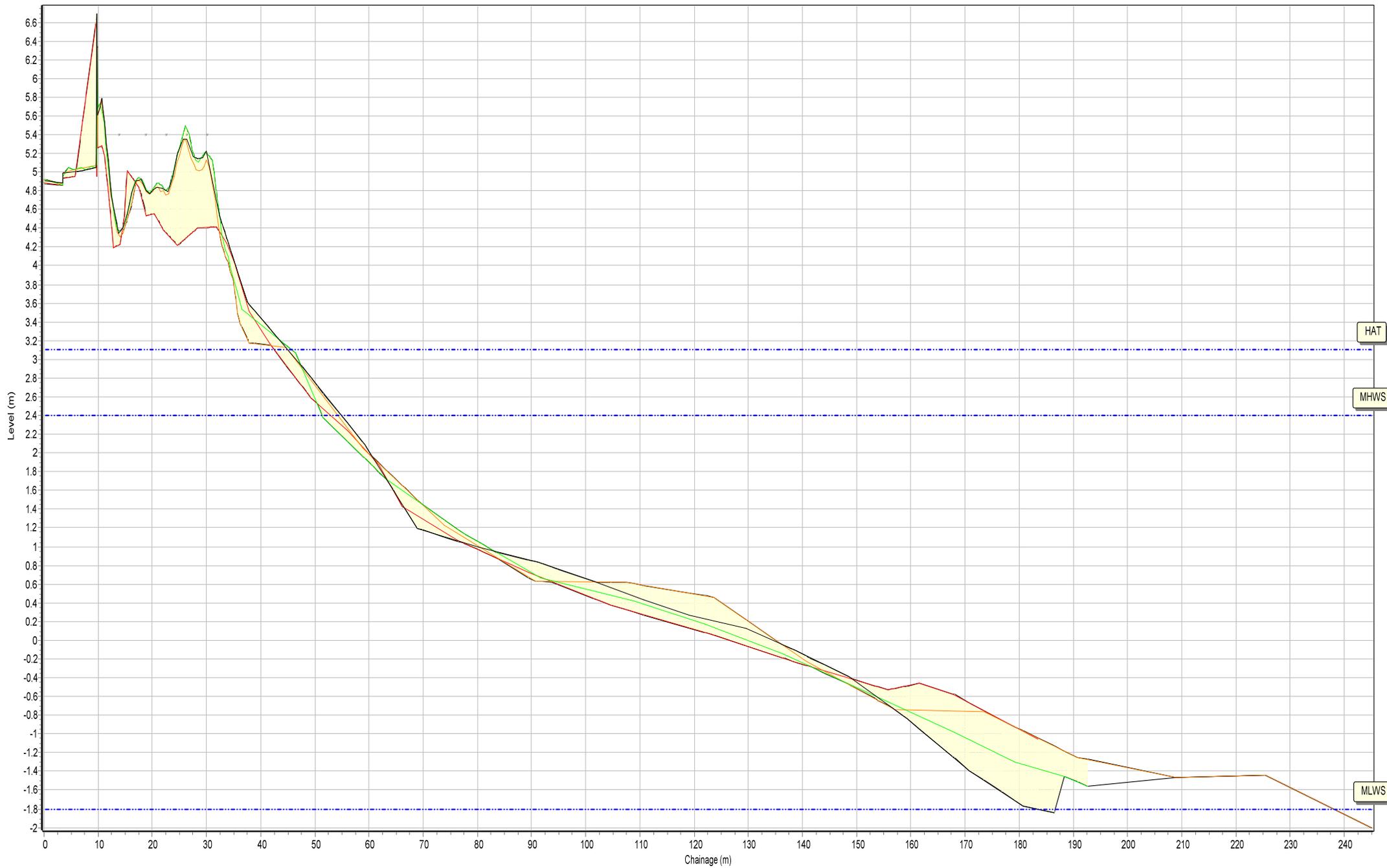
Rain:

Summary: 2019 Full Measures Topo Survey

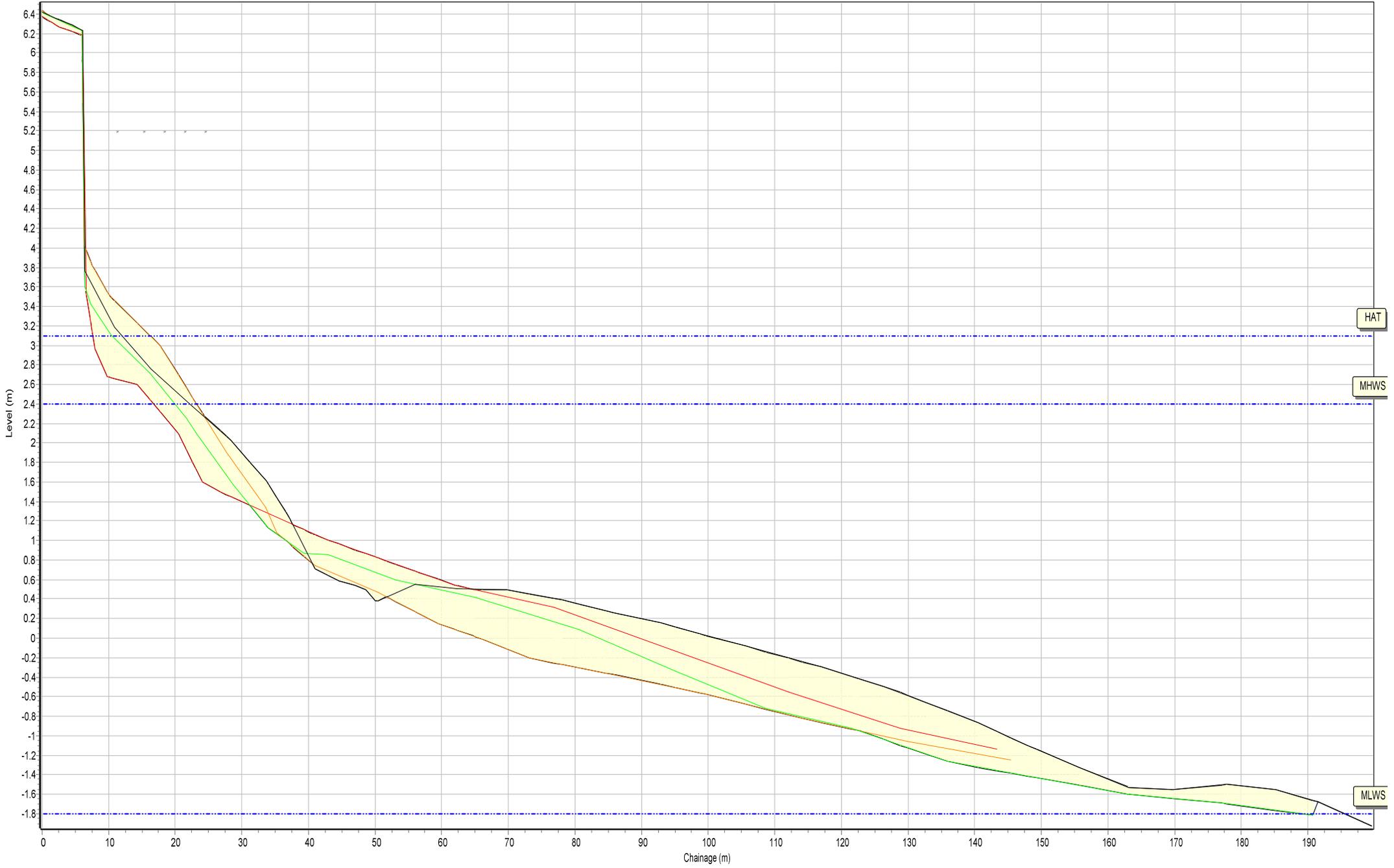
Easting: 433247.516 Northing: 577032.054 Profile Bearing: 53 ° from North



Beach Profiles: 1aBVBC01



Beach Profiles: 1aBVC02



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBVBC03



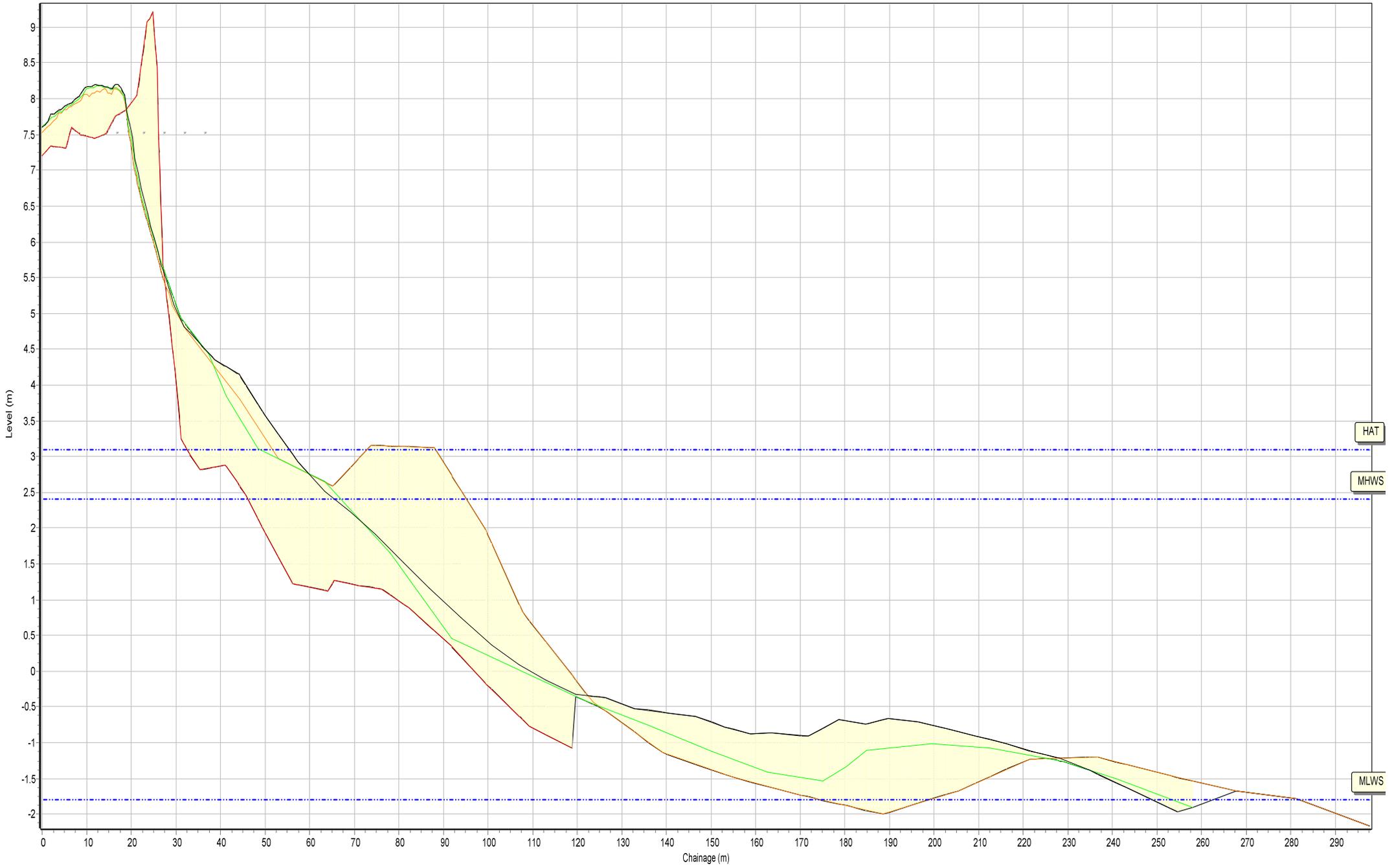
HAT

MHWs

MLWS

SANDS

Beach Profiles: 1aBVBC04



Profiles Envelope 01/04/2006 12/09/2018 20/02/2019 01/10/2019

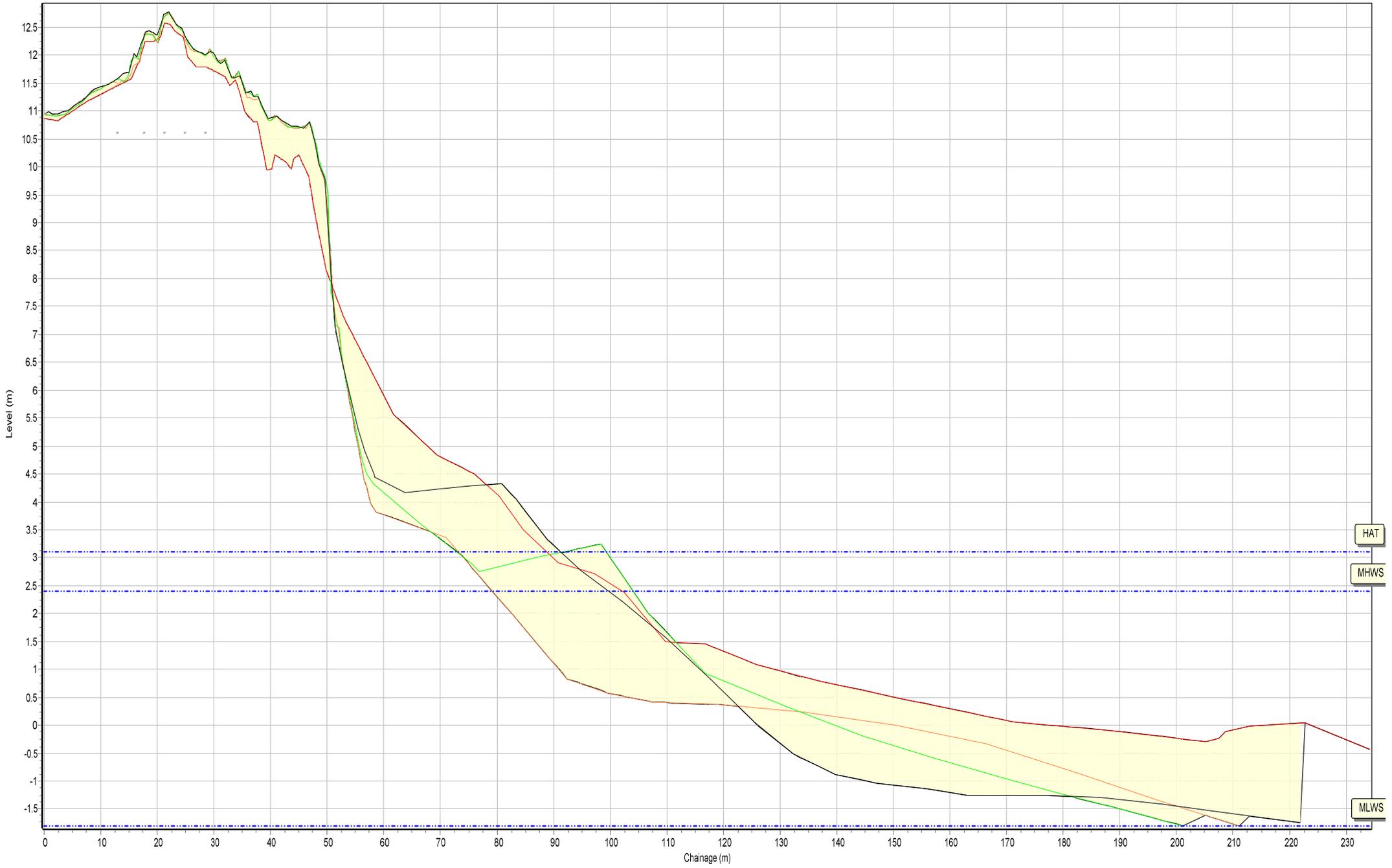
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBVBC05



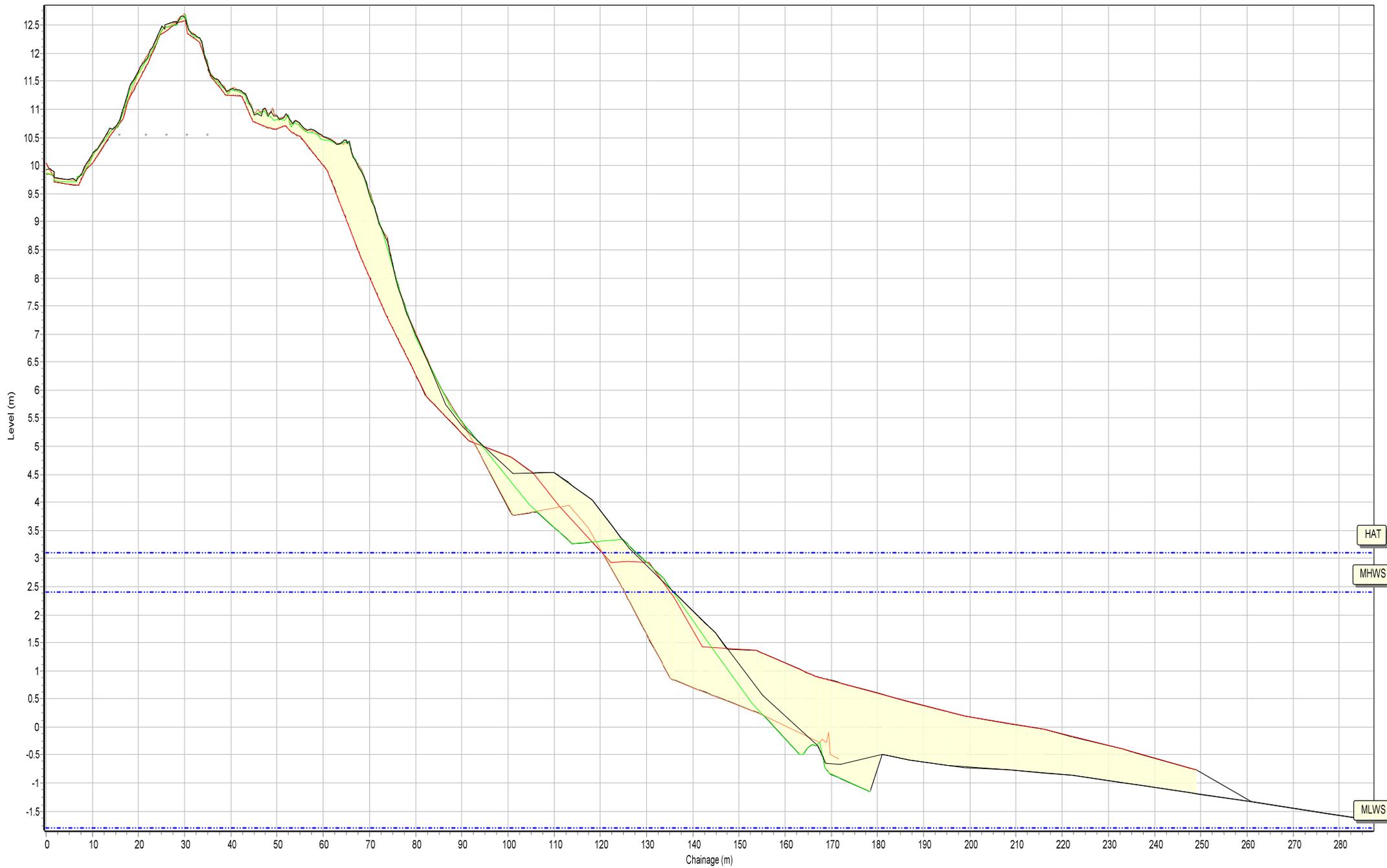
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBVBC06



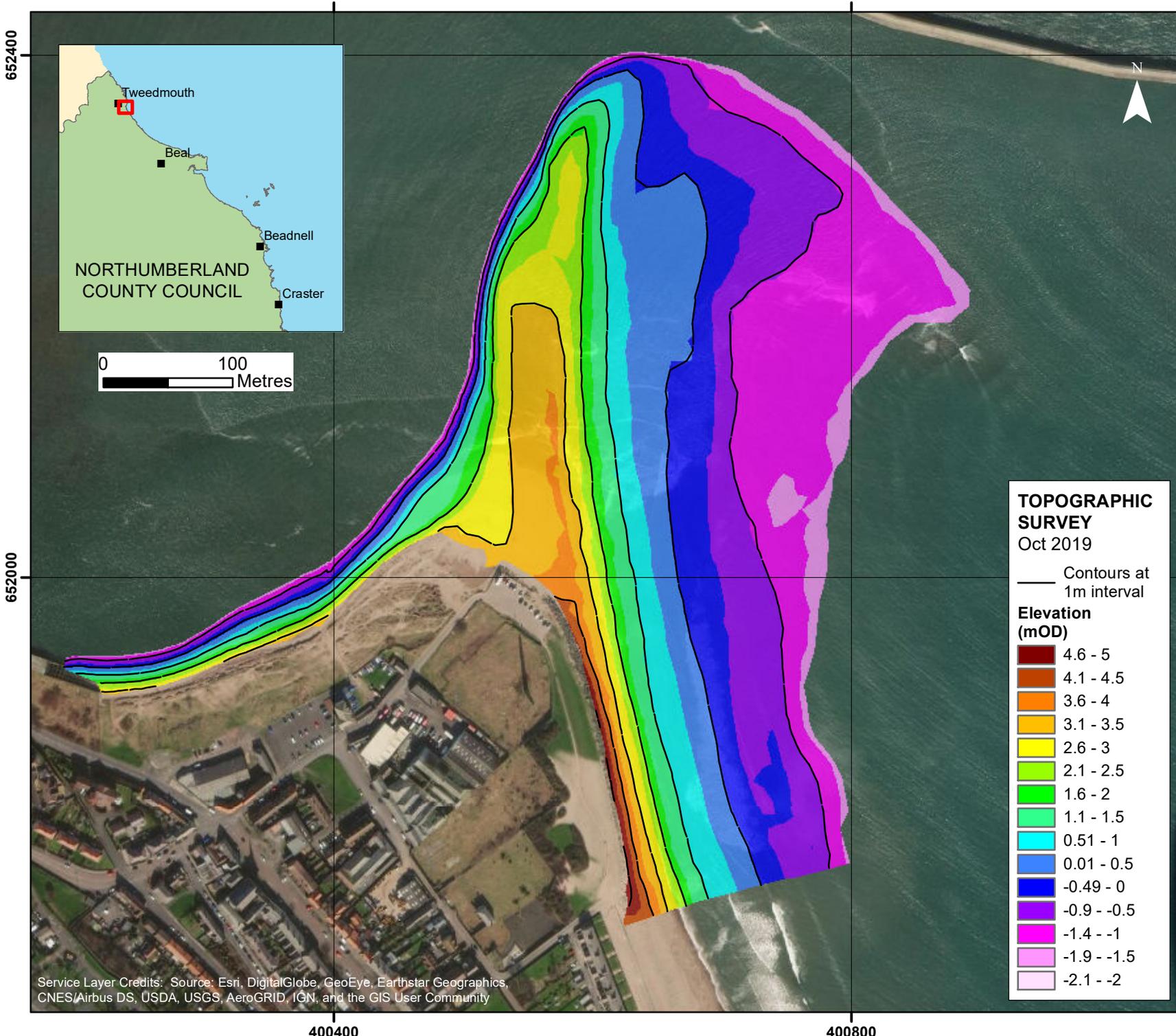
HAT

MHWS

MLWS

SANDS

**Appendix B**  
**Topographic Survey**



**TOPOGRAPHIC SURVEY**  
Oct 2019

— Contours at 1m interval

**Elevation (mOD)**

4.6 - 5
4.1 - 4.5
3.6 - 4
3.1 - 3.5
2.6 - 3
2.1 - 2.5
1.6 - 2
1.1 - 1.5
0.51 - 1
0.01 - 0.5
-0.49 - 0
-0.9 - -0.5
-1.4 - -1
-1.9 - -1.5
-2.1 - -2

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 1**  
**BERWICK**

**Northumberland County Council Frontage**  
Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:4,000

**WATER**  
Royal HaskoningDHV  
Marlborough House  
Marlborough Crescent  
Newcastle upon Tyne  
NE1 4EE

Tel: +44 (0)191 211 1300  
Fax: +44 (0)191 211 1313  
www.royalhaskoningdhv.com

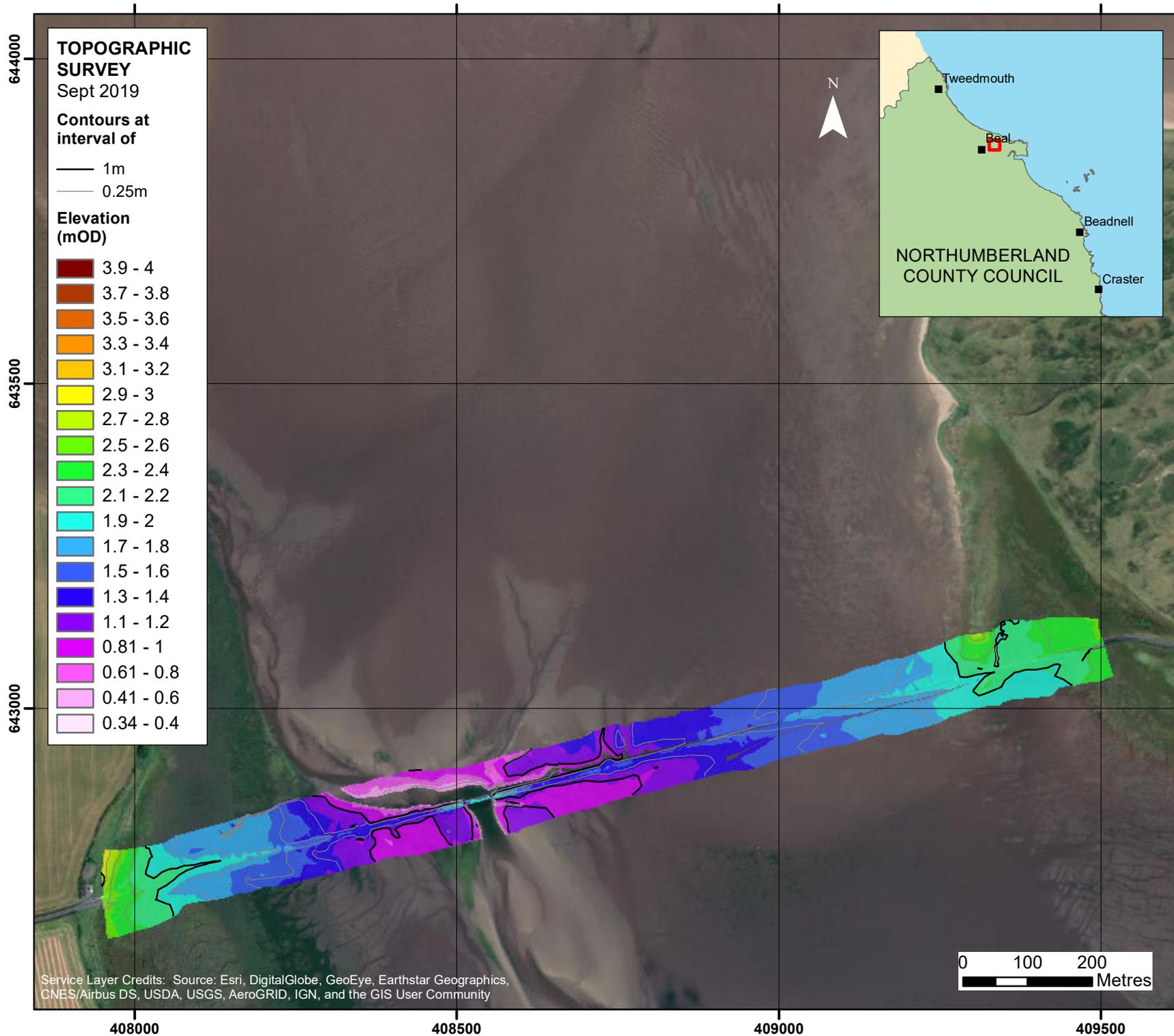


400400

400800

652400

652000



Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 2**

**HOLY ISLAND CAUSEWAY**

**Northumberland County Council Frontage**

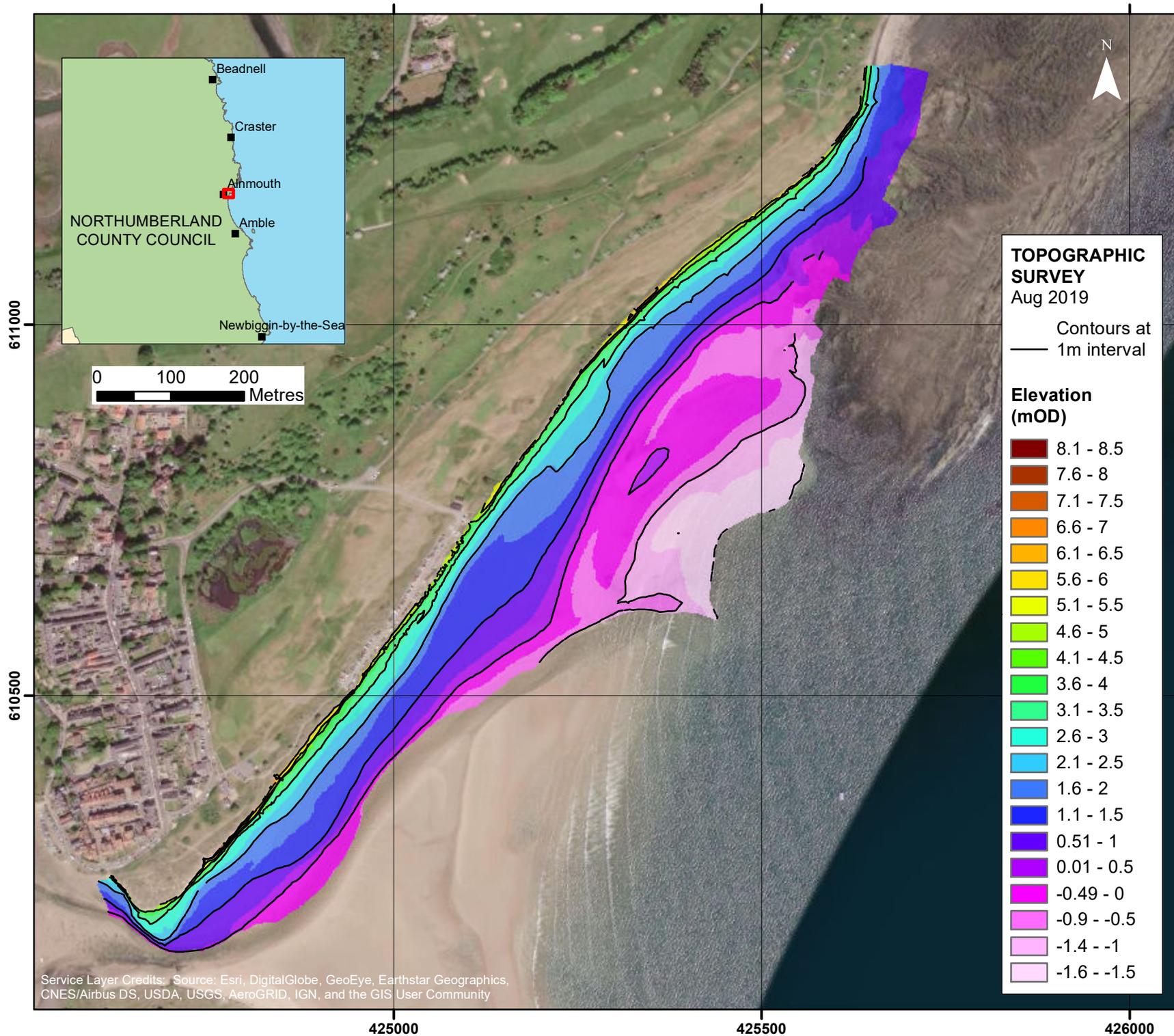
Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:8,000

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Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 3**

**ALNMOUTH**

**Northumberland County Council Frontage**

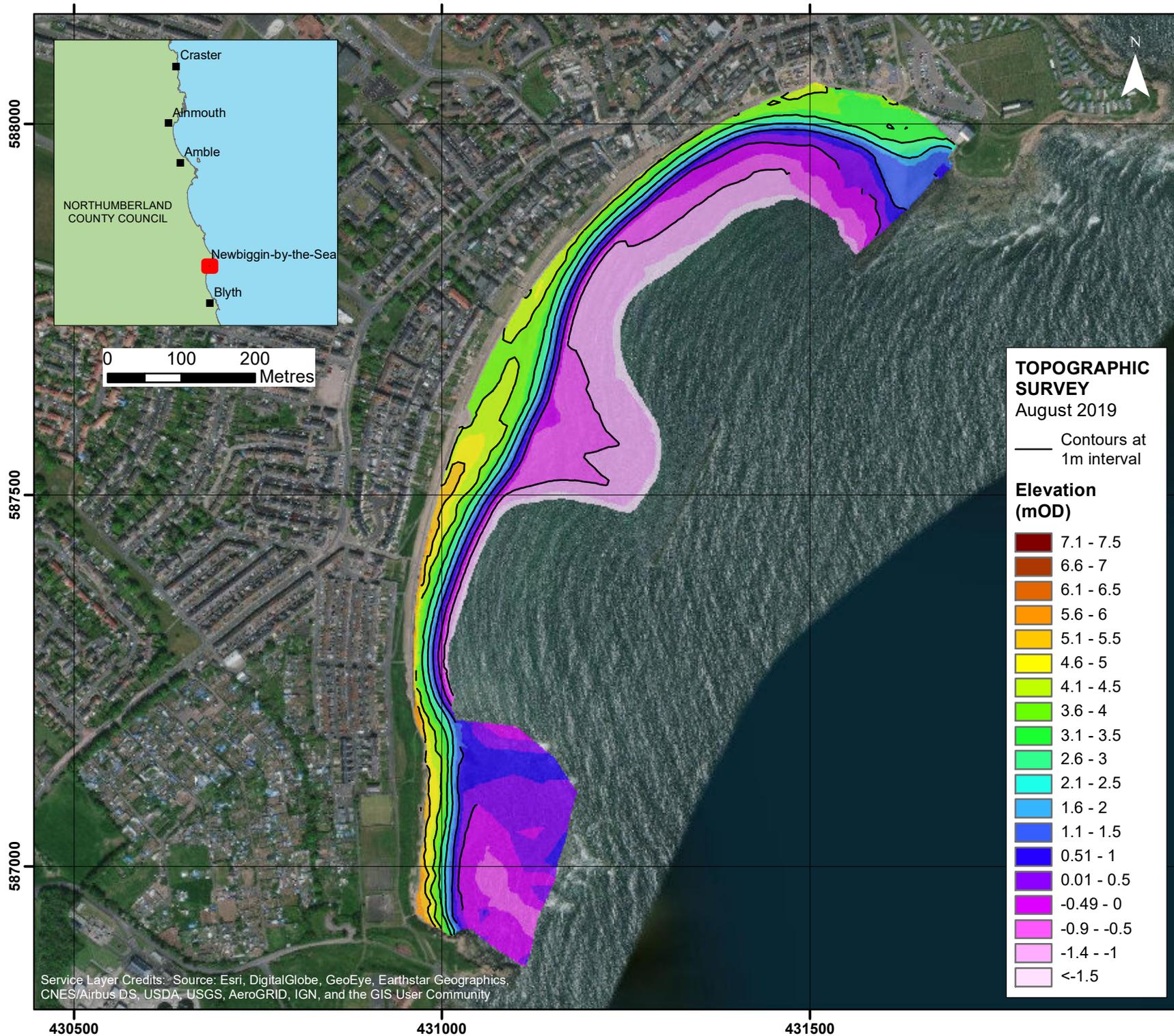
Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:7,000

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**TOPOGRAPHIC SURVEY**

August 2019

— Contours at 1m interval

**Elevation (mOD)**

7.1 - 7.5
6.6 - 7
6.1 - 6.5
5.6 - 6
5.1 - 5.5
4.6 - 5
4.1 - 4.5
3.6 - 4
3.1 - 3.5
2.6 - 3
2.1 - 2.5
1.6 - 2
1.1 - 1.5
0.51 - 1
0.01 - 0.5
-0.49 - 0
-0.9 - -0.5
-1.4 - -1
<-1.5

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 4**  
**NEWBIGGIN-BY-THE-SEA**

**Northumberland County Council Frontage**

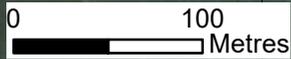
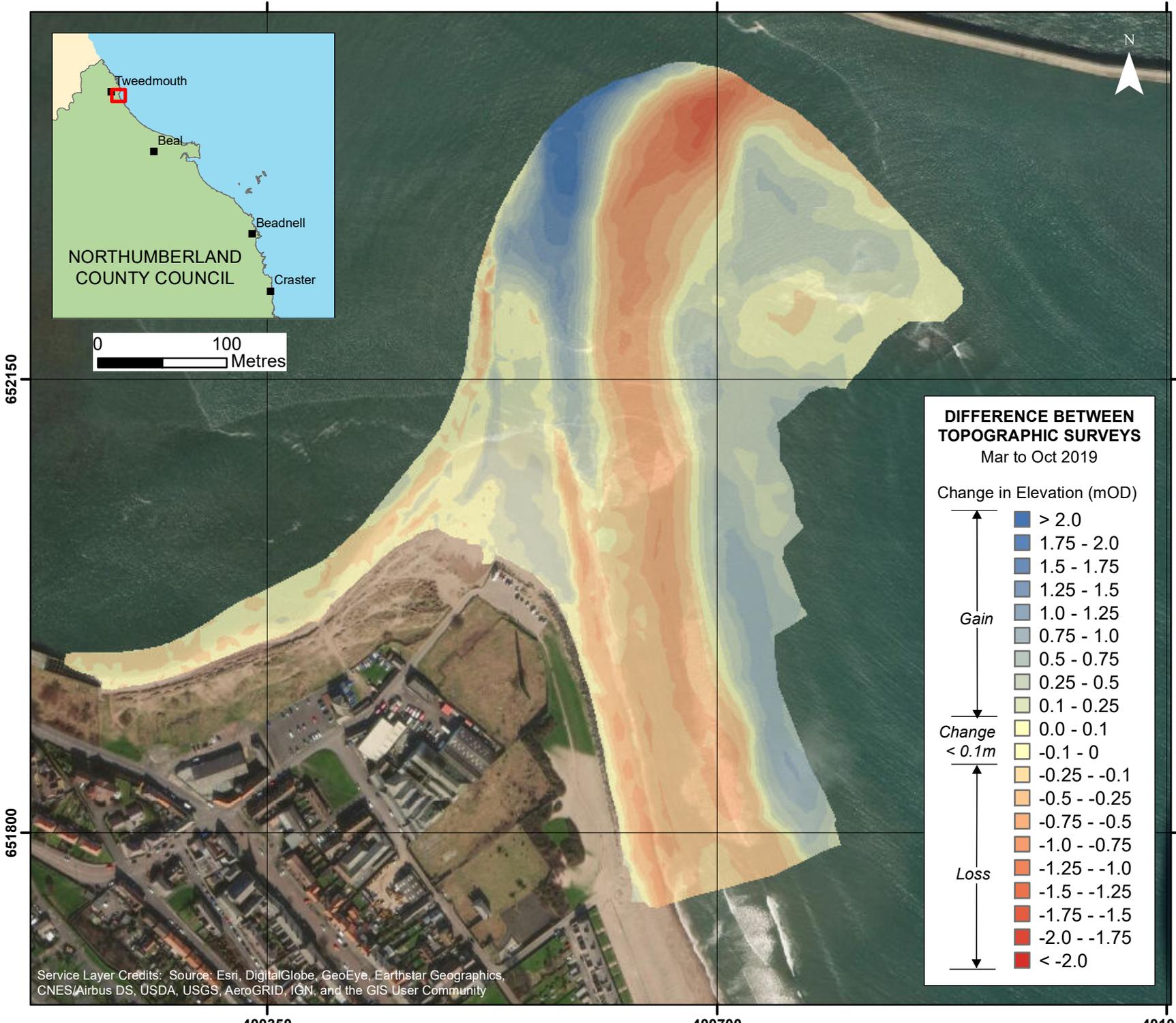
Analytical Report  
 'Full Measures' Survey 2019

Drawing Scale at A4 1:7,000

**WATER**  
 Royal HaskoningDHV  
 Marlborough House  
 Marlborough Crescent  
 Newcastle upon Tyne  
 NE1 4EE

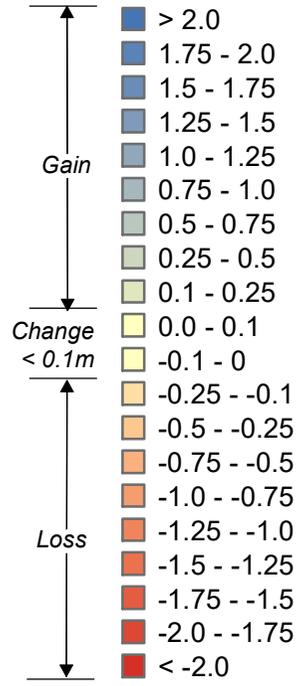
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 Fax: +44 (0)191 211 1313  
 www.royalhaskoningdhv.com





**DIFFERENCE BETWEEN TOPOGRAPHIC SURVEYS**  
Mar to Oct 2019

Change in Elevation (mOD)



Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 5**

**BERWICK**

**Northumberland County Council Frontage**

Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:4,000

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

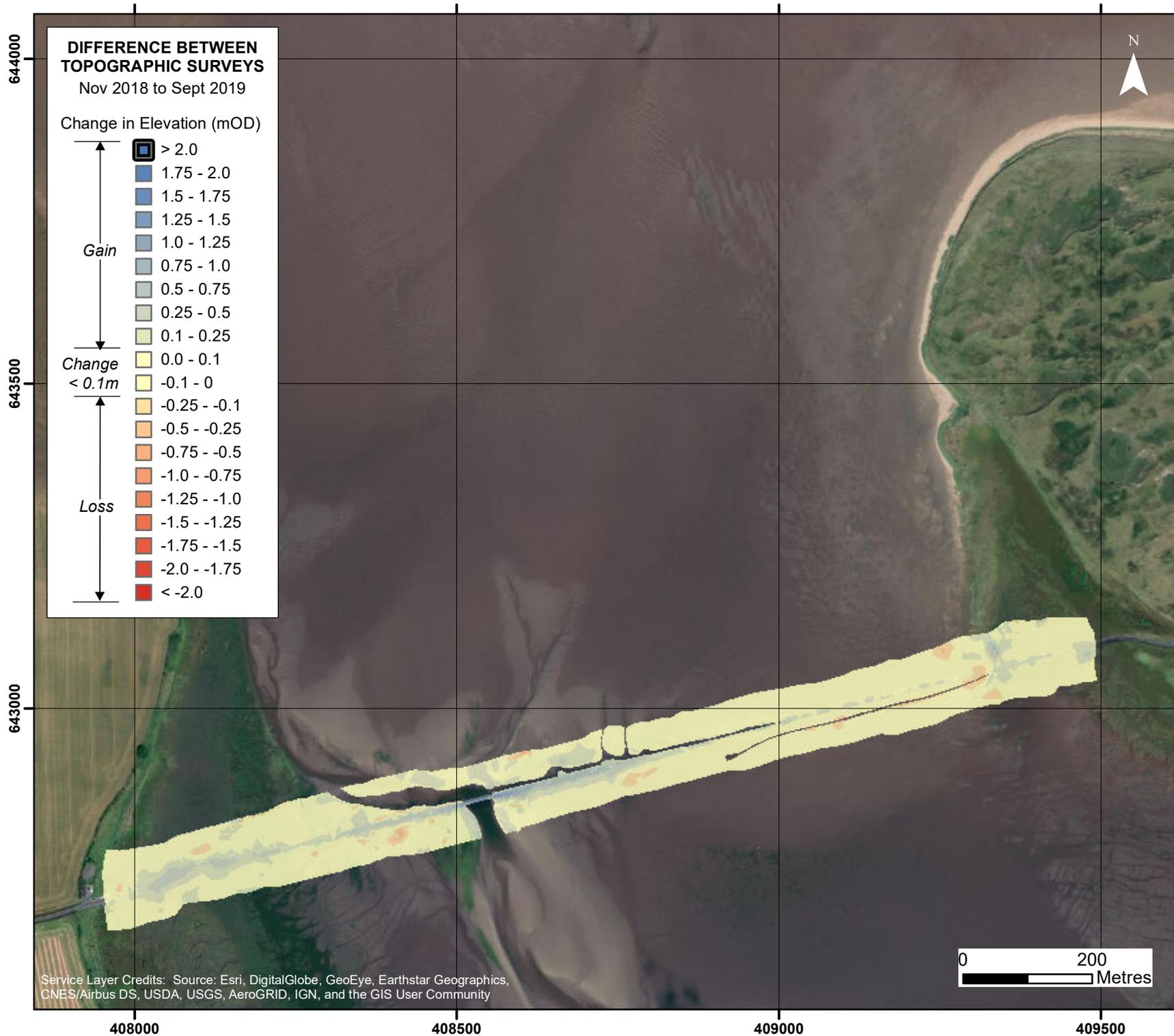
652150

651800

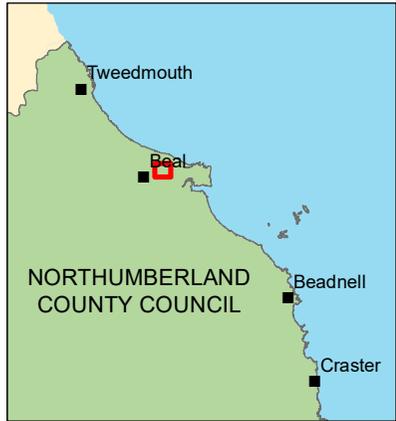
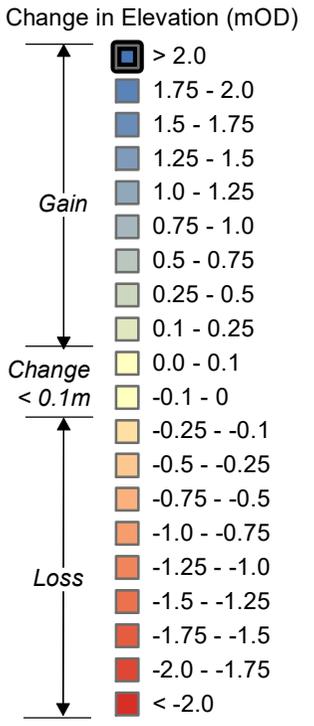
400350

400700

401050



**DIFFERENCE BETWEEN TOPOGRAPHIC SURVEYS**  
Nov 2018 to Sept 2019



Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 6**

**HOLY ISLAND CAUSEWAY**

**Northumberland County Council Frontage**  
Analytical Report  
'Full Measures' Survey 2019

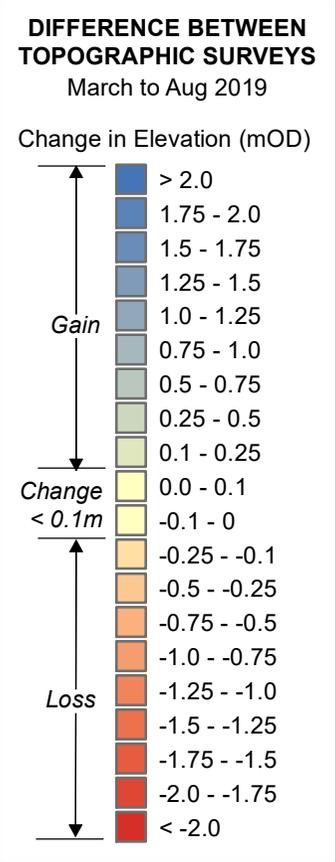
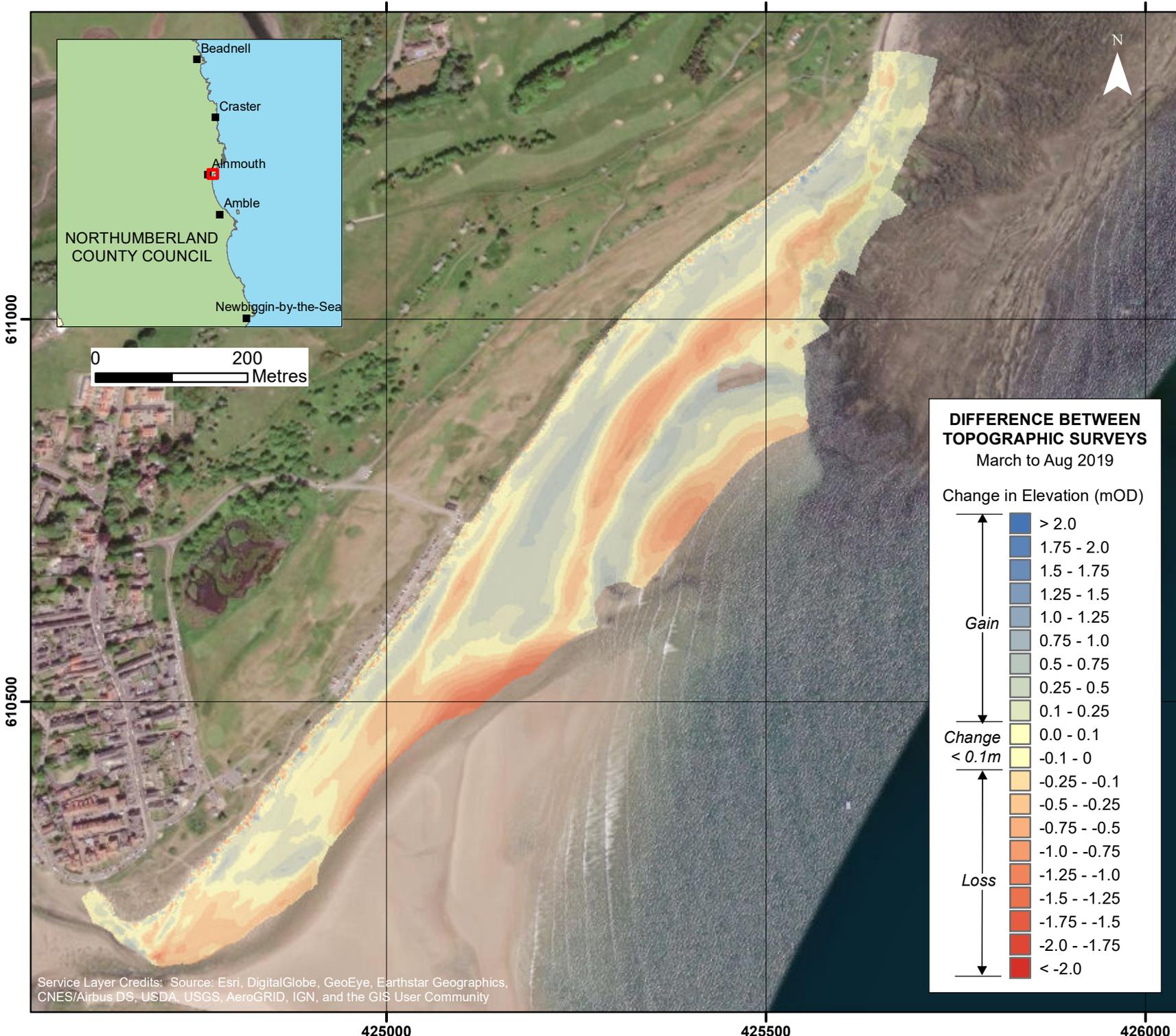
Drawing Scale at A4 1:8,000

**WATER**  
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Marlborough Crescent  
Newcastle upon Tyne  
NE1 4EE

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Fax: +44 (0)191 211 1313  
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 7**

**ALNMOUTH**

**Northumberland County Council Frontage**

Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:6,821

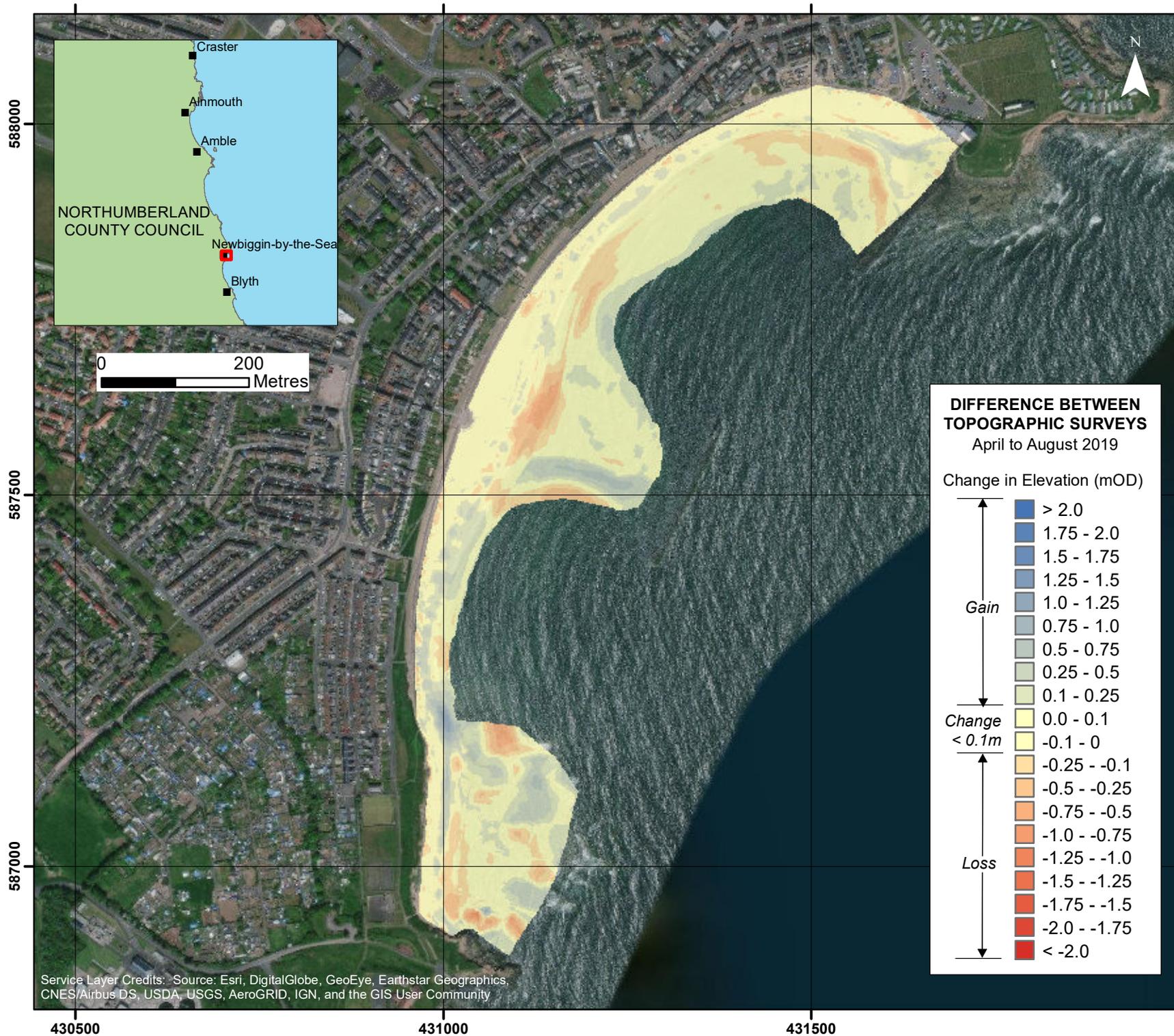
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425000 425500 426000

611000

610500



Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 8**  
**NEWBIGGIN-BY-THE-SEA**

**Northumberland County Council Frontage**  
Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:7,000

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**Appendix C**  
**Sand Extent Survey**

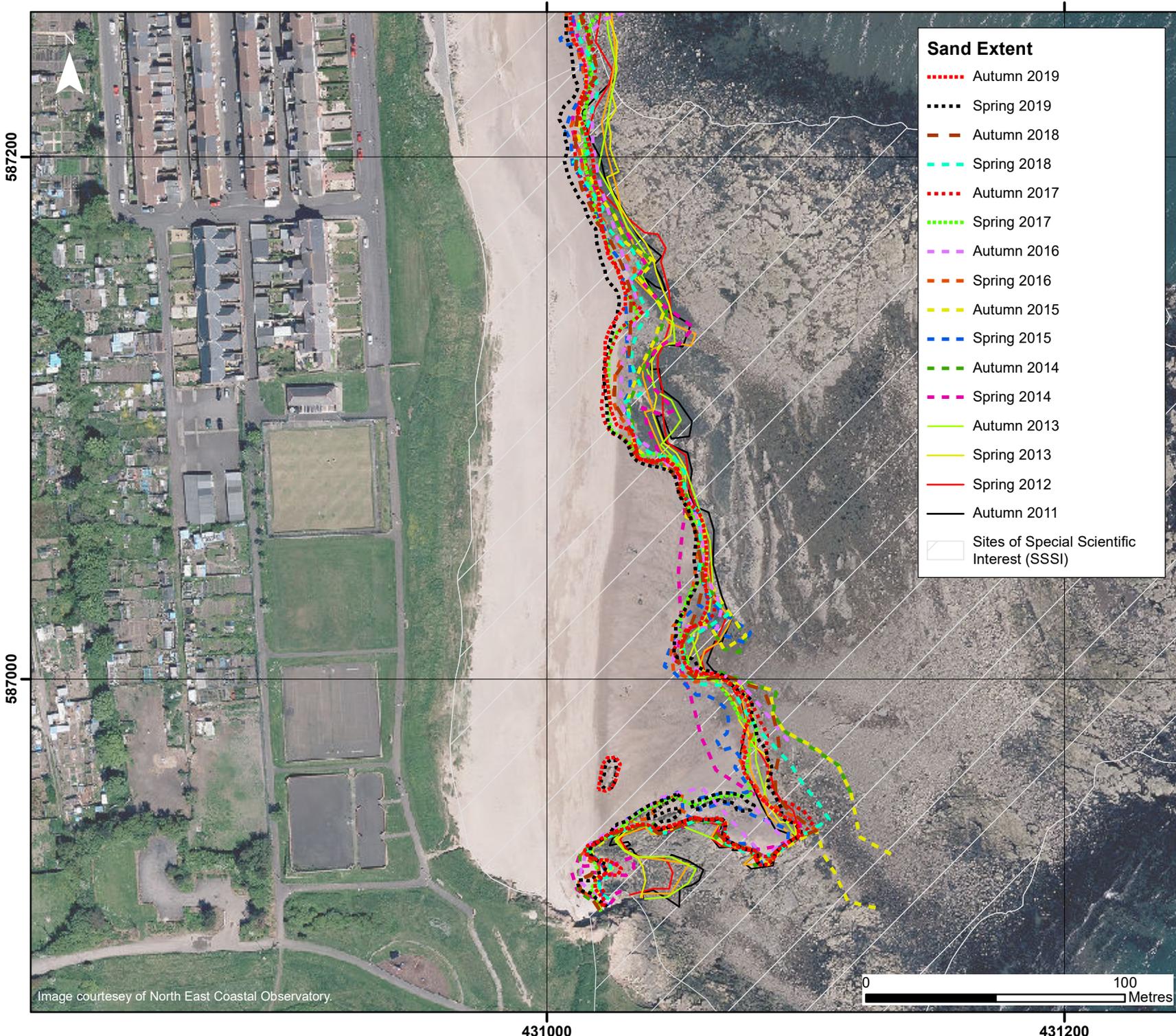


Image courtesy of North East Coastal Observatory.

**Sand Extent**

- ..... Autumn 2019
- ..... Spring 2019
- ..... Autumn 2018
- ..... Spring 2018
- ..... Autumn 2017
- ..... Spring 2017
- ..... Autumn 2016
- ..... Spring 2016
- ..... Autumn 2015
- ..... Spring 2015
- ..... Autumn 2014
- ..... Spring 2014
- ..... Autumn 2013
- ..... Spring 2013
- ..... Autumn 2012
- ..... Spring 2012
- ..... Autumn 2011
- ..... Sites of Special Scientific Interest (SSSI)

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**NEWBIGGIN-BY-THE-SEA SAND EXTENT**

**Northumberland County Council Frontage**

Analytical Report  
 'Full Measures' Survey 2019

Drawing Scale at A4 1:2,000

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