



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

**North Tyneside Council**



**December 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)
	River Tyne
1 in 200 year	3.7
HAT	3.1
MHWS	2.4
MLWS	-1.9

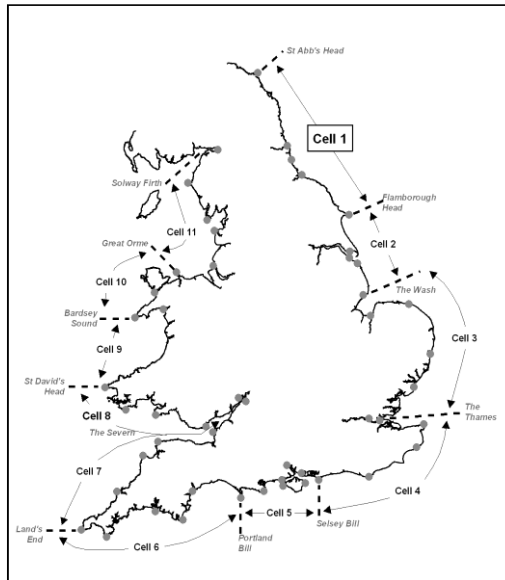
**Source:** *Scottish Border to River Tyne Shoreline Management Plan 2*. Royal Haskoning, May 2009.

## 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 sea bed 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	Jun 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	Feb 13	
5	2012/13	Sep-Oct 12	Mar 13	Mar-Apr 13	Jun 13	
6	2013/14	Sep-Oct 13	Feb 14	Mar-Apr 14	Jul 14	
7	2014/15	Oct-Nov 14	Feb 15	Mar 15	Jul 15	
8	2015/16	Oct-Nov 15	Feb 16	Mar 16	Jul 16	Jun 16
9	2016/17	Sep 16	Feb 17	Mar 17	Jul 17	
10	2017/18	Sep-Oct 17	Feb 18	Mar 18	May 18	
11	2018/19	Sep-Oct 18	Jan 19	Feb-Mar 19	Aug 19	
12	2019/20	Sep-Nov 19	Dec 19 (*)			

(\*) The present report is **Analytical Report 12** and provides an analysis of the 2019 Full Measures survey for North Tyneside 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 sea bed 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

North Tyneside Council's frontage extends from Hartley (just south of Blyth) in the north, to the River Tyne in the south. For the purposes of this report and for consistency with previous reporting, it has been sub-divided into four areas, namely:

- Whitley Sands
- Cullercoats Bay
- Tynemouth Long Sands
- King Edward's Bay

### 1.2 Methodology

Along North Tyneside Council's frontage, the following surveying is undertaken:

- Full Measures survey annually each autumn/early winter comprising:
  - Beach profile surveys along eight transect lines (commenced 2002)
  - Beach profile surveys along an additional two transects (commenced 2010)
  - Topographic survey along Whitley Sands (commenced 2010)
  - Topographic survey along Tynemouth Long Sands (commenced 2011)
- Partial Measures survey annually each spring comprising:
  - Beach profile surveys along all ten transect lines (commenced 2010)

The location of these surveys is shown in Figure 1. The beach profiles and topographic surveys were undertaken between the 27<sup>th</sup> September and 1<sup>st</sup> November 2019. The weather conditions varied throughout the survey, details can be found in the surveyor's reports.

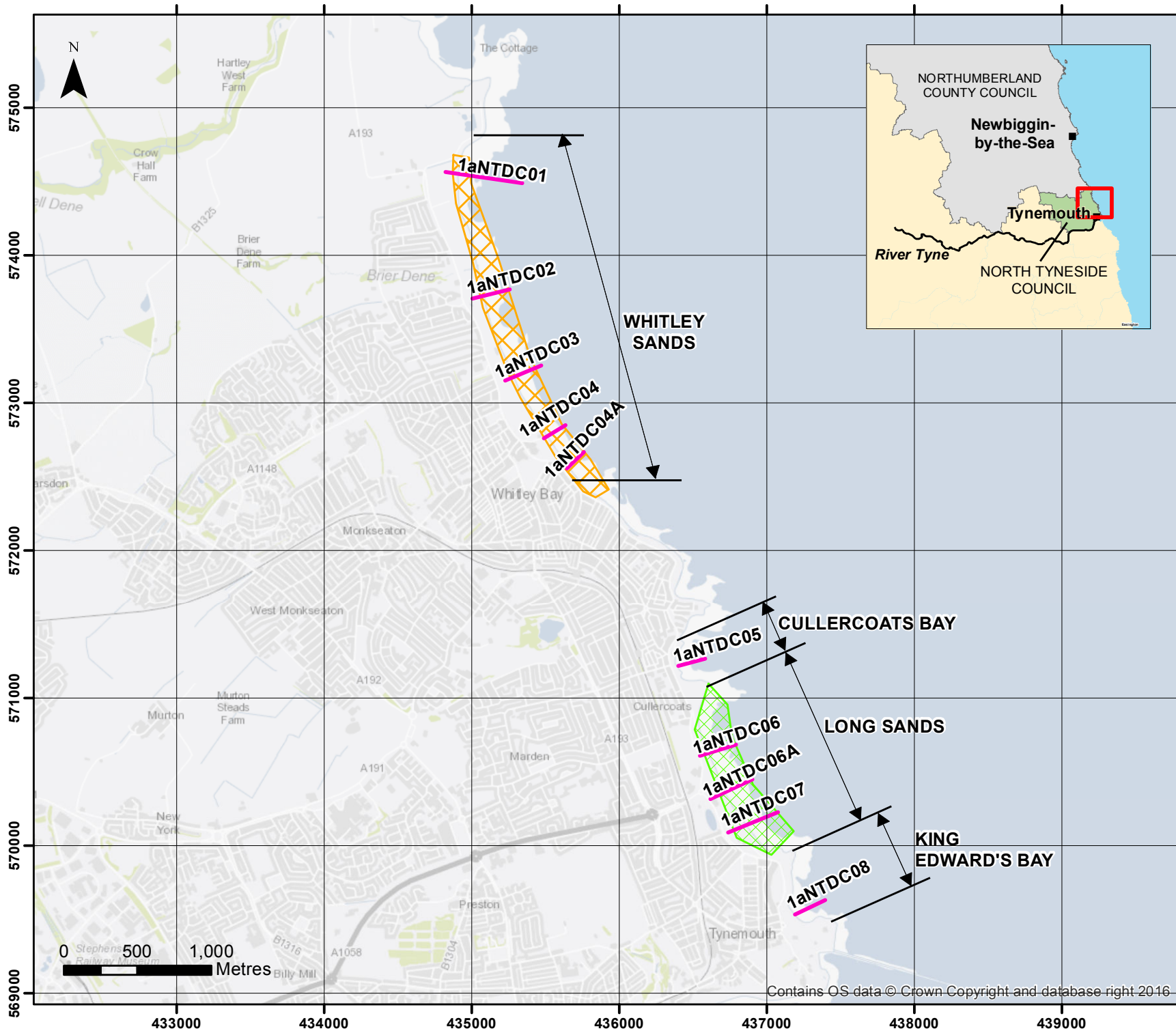
All data have been captured in a manner commensurate with the principles of the Environment Agency's *National Standard Contract and Specification for Surveying Services* and stored in a file format compatible with the software systems being used for the data analysis, namely SANDS and ArcGIS. This data 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's website for storage and availability to others and also 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 (Blue line)
- 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 1**

**North Tyneside Council Frontage**

Analytical Report  
Topo Surveys

Drawing Scale at A4 1:35,000

**WATER**  
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## 2. Analysis of Survey Data

### 2.1 Whitley Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>27<sup>th</sup> September – 30<sup>th</sup> September 2019</p>	<p><b>Beach Profiles:</b></p> <p>Whitley Sands is covered by five beach profile lines for the Full Measures survey (Appendix A). Four of these (1aNTDC01 to 1aNTDC04) were initially surveyed in April 2002 and were surveyed annually to 2009 (Full Measures, autumn 2009) and bi-annually thereafter. From March 2010 (Partial Measures, spring 2010) onwards, an additional beach profile line (NTDC04A) has been surveyed at the southern end of the frontage. All profiles were last surveyed in February 2019 for the Partial Measures survey.</p> <p><b>1aNTDC01</b> is located in the north of Whitley Sands, along the undefended cliffs immediately south of Trinity Road car park. The cliff was not measured due to dangerous access. Beach levels at the toe of cliff to chainage 40m have decreased by 0.5m since the February 2019 survey. The majority of the profile shows an accretion by up to 0.4m on the upper beach, and 0.2m on the middle beach. Seawards of 167m chainage, beach levels have decreased by up to 0.2m, exposing some rocks at the beach toe. Overall the profile is at a relatively medium level compared to the range recorded from previous surveys.</p> <p>Profile <b>1aNTDC02</b> is located in the northern part of Whitley Sands. A seawall is present at the back of the beach. A small amount of accretion up to 0.15m has occurred between the seawall (chainage 50m) and chainage 57m. There has been erosion of up to 0.5m between chainage 57m and 100m. Seaward of chainage 100m there has been an accretion of 0.4m to the rocks, where the profile is similar to the February 2019 survey. The profile is relatively medium across the beach compared with the range recorded from previous surveys.</p> <p>Profile <b>1aNTDC03</b> is located at the centre of Whitley Sands. The survey report notes that construction is complete on the promenade. Accretion of up to 0.4m has occurred between the bottom of the seawall up to chainage 25m. From chainage 25m to 43m there has been erosion of up to 0.2m, switching to accretion seaward of chainage 43m by up to 0.7m, covering up a previously exposed</p>	<p>Since the last survey, there has generally been accretion across the beach profile at all profiles, with the upper beach between chainages 14m and 29m at profile 1aNTDC04 being the highest level recorded.</p> <p><b>Longer term trends:</b> Beach levels are generally within the middle of the range seen in earlier surveys. At profile <b>1aNTDC04</b>, the berm present on the upper beach has migrated further landward over time.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>patch of rocks at chainage 90m. The profile is relatively high in the upper and middle beach compared to the range recorded from previous surveys and at a low level on the lower beach.</p> <p>Profile <b>1aNTDC04</b> is located in the southern part of Whitley Sands. There has been accretion across the majority of the profile. On the upper beach there has been a smoothing of the beach profile, with an accretion of up to 0.5m, however accretion is limited to 0.1m across the rest of the beach profile. The beach toe has eroded by 0.25m. Overall, the upper beach between chainages 14m and 29m is at the highest level recorded. The rest of the profile is at a medium high level compared to the range recorded from previous surveys.</p> <p>Profile <b>1aNTDC04a</b> is located towards the southern end of Whitley Sands. The survey report notes that construction is complete on the promenade. There has been accretion across the beach profile by up to 1.1m to the rock platform at chainage 70m. Overall the profile is a high level compared to the range recorded from previous surveys.</p>	
<p><b>27<sup>th</sup> September 2019</b></p>	<p><b>Topographic Survey:</b></p> <p>Whitley Sands is covered by an annual topographic survey, which commenced in October 2010.</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 GIS. A difference plot has also been produced using the DGM (Appendix B – Map 3) produced from the last produced topographic survey (Full Measures, autumn 2018) and the present survey.</p> <p>The difference plot shows generally shore parallel changes. Overall the south and central part of the bay show a small band of erosion at the toe of the seawall, with accretion across the middle and lower beach. Towards the centre of the bay, accretion dominates across the entire beach profile, with small patches of erosion on the lower foreshore. In the north of the bay, small band of accretion occurs at the toe of the seawall, with erosion across the middle and lower foreshore.</p> <p>This is a comparison of annual surveys, rather than a biannual comparison like the beach profiles, and therefore the changes observed in the detailed profiles differ from this pattern of change in the bay as whole, indicating that much of this change is likely to have happened in the first six months since the previous survey.</p>	<p>In comparison to the previous topographic survey difference plot (Oct 2017 – Sept 2018), the most recent topographic survey difference plot is dominated by accretion. Areas which exhibited erosion from the Full Measure 2018 survey, now exhibit accretion (and vice versa). The topographic survey does not indicate there to have been a net movement of sediment towards either end of the bay, as it has in previous topographic surveys. Although accretion dominates across the entire survey area, there are two significantly large areas of erosion occurring in the mid to lower beach of the northern bay and upper beach of the southern bay. In the autumn 2014 Full Measures survey there was a northerly movement of sediment recorded, suggesting the beach responds to storm directions that dominate over the monitoring period.</p>

## 2.2 Cullercoats Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>27<sup>th</sup> September – 30<sup>th</sup> September 2019</p>	<p><b>Beach Profiles:</b></p> <p>Cullercoats Bay is covered by one beach profile line for the Full Measures survey (Appendix A). This was surveyed annually each autumn between 2002 and 2009. From spring 2010 onwards, it has been surveyed bi-annually.</p> <p>At profile 1aNTDC05 the survey report notes that the cliff was not measured due to dangerous access. There has been erosion from chainage 25m to 49m of up to 0.3m. A shallow berm has formed across the middle beach between chainages 49m and 97m, with an accretion of up to 0.5m. Seaward of chainage 0.6m there has been an erosion of up to 0.5m. The September 2019 profile is at a low level on the upper beach compared to the range recorded from previous surveys, the highest on record in the middle beach (chainage 62m to 86m) and at a relatively medium level at the toe of the beach.</p>	<p>As in previous surveys access to the cliff has not been possible.</p> <p>The data shows only limited change related to short-term patterns of sediment movement.</p> <p><b>Longer term trends:</b> The amount of change is within the past range, except between chainage 49m to 97m where the berm has reached its highest recorded level on the middle beach. The upper beach is at a low level and the lower beach is at a medium range.</p>

## 2.3 Tynemouth Long Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>27<sup>th</sup> September – 30<sup>th</sup> September 2019</p>	<p><b>Beach Profiles:</b></p> <p>Tynemouth Long Sands is covered by three beach profile lines for the Full Measures survey (Appendix A). Profiles 1aNTDC06 and 1aNTDC07 were initially surveyed annually each autumn between 2002 and 2009. A third profile, 1aNTDC06A, was then added in the centre of the frontage. From spring 2010 (Partial Measures) onwards, all profiles have been surveyed bi-annually.</p> <p><b>1aNTDC06</b> is located approximately 150m south of the access ramp towards the north of the bay. The top of the cliff has not changed since the last survey however, the remainder of the cliff profile cannot be reviewed due to lack of data points in the profile plot as the survey report notes '<i>no access to middle of section 6 due to seed protection fences</i>'. The beach profile starts at c.35m chainage and shows accretion on the upper beach of up to 0.6m to 115m chainage. From chainage 115m to the end of the profile, this switches to erosion of up to 0.8m on the mid to lower beach. Overall the profile is generally at a high level in the upper beach, medium level on the middle beach and a low level on the lower beach compared to the range recorded from previous surveys.</p> <p>At profile <b>1aNTDC06A</b>, the dune-cliff face has not significantly changed in form or position. As with section 6, the survey report notes '<i>no access to middle of section 6a due to seed protection fences</i>'. There has been accretion across the beach profile, ranging from 0.4m on the upper beach, 0.15m on the middle beach and 0.4m on the lower beach. Overall the September 2019 profile is at a relatively medium to high level compared to the range recorded from the previous surveys.</p> <p>Profile <b>1aNTDC07</b> is located approximately 50m south of the access route through the dunes towards the southern end of the bay. The dune-cliff has not significantly changed in form or position since the last survey. As with section 6 and 6a, the survey report notes '<i>no access to middle of section 7 due to seed protection fences</i>'. Additionally, the survey report notes construction work being carried out at the south of the beach at Crusoe's Café. There has been a small amount of accretion across the beach profile of up to 0.3m, with small sections of erosion between chainages 214m to 234m and 295m to 33m of up to 0.15m. Overall the September 2019 profile is at a high level compared to the range recorded from the previous surveys, with the section between chainages 92m and 106m being the highest on record.</p>	<p>Since the last survey the dunes have retained the same form and position. The profiles generally show accretion across the profiles, except at profile <b>1aNTDC06</b> which shows erosion seaward of chainage 116m. The section between chainages 92m and 106m at profile <b>1aNTDC07</b> has accreted to its highest level since records began.</p> <p><b>Longer term trends:</b> Overall, the beaches have retained a similar form and are in the medium range of previous surveys, with the exception of the middle beach at profile <b>1aNTDC06</b> which is at its lowest level since May 2002.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>1<sup>st</sup> November 2019</b></p>	<p><b>Topographic Survey:</b></p> <p>The first survey was undertaken for the Full Measures survey in October 2010.</p> <p>Data from the current topographic survey have been used to create a digital ground model (DGM) (Appendix B – Map 2) using a Geographical Information System (GIS). A difference plot has also been produced by comparing the current DGM (Appendix B – Map 4) with that produced from the last topographic survey in March 2019.</p> <p>The bay is dominated by low levels of accretion and large areas of little change i.e. 0 – 0.1m erosion. Erosion is concentrated in the centre-north half of the bay on the lower foreshore (corroborated by profile 1aNTDC06) and the upper beach of the northern end of the bay. Accretion is concentrated across the beach profile in the centre and south of the bay, and the lower foreshore of the northern end of the bay. The area close to the rocky foreshore in the south displays varying patches of erosion and accretion. The magnitude of change is relatively small for both the accretion and erosion across most of the bay with most of it less than <math>\pm 0.75\text{m}</math>.</p>	<p>The pattern shown in the difference plot supports the patterns identified in the profiles.</p>

## 2.4 King Edward's Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>27<sup>th</sup> September – 30<sup>th</sup> September 2019</p>	<p><b>Beach Profiles:</b></p> <p>King Edward's Bay is monitored by one beach profile line for the Full Measures survey (Appendix A). This was surveyed annually between 2002 and 2009. From spring 2010 onwards, it has been surveyed bi-annually.</p> <p>At profile <b>1aNTDC08</b>, an upper beach berm has moved landward by 10m to its most landward position recorded, increasing in height by 1m. There are varying amounts of erosion and accretion from chainage 32m to 92m of <math>\pm 0.2</math>m. Seaward of chainage 92m there has been an accretion of 0.5m, extending the beach toe by 50m. A shallow berm has formed on the lower foreshore and a rock is exposed at chainage 245m. The upper beach profile is at a high level and the lower beach is at a medium level, however the middle beach between chainages 56m to 92m is at its lowest level recorded.</p>	<p>Since the last survey, the upper beach at King Edward's Bay has steepened since the February 2019 survey with material appearing to be moved up the beach.</p> <p><b>Longer term trends:</b> The upper profile is at the high range of previously observed profiles at this location, with the lower beach at a medium range. The middle is experiencing its lowest beach level since records began. Changes between the spring 2019 and autumn 2019 survey are in line with previous surveys, showing seasonal movement of sediment up the beach in the form of a berm.</p>



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

#### **Individual Profiles**

- The surveyor noted that construction on the promenade was complete at profiles 1aNTDC03 and 1aNTDC04A.
- At profile 1aNTDC05 the cliff was not measured due to access problems. Access to this profile is noted to have been dangerous in previous Partial Measures and Full Measures reports, and it is recommended that the beach profile should start at the cliff toe and that the cliff be monitored using the aerial survey data.
- At Whitley Sands (profile 1aNTDC01) the cliff was not measured due to access problems.
- At Tynemouth Long Sands (profiles 1aNTDC06, 1aNTDC06A and 1aNTDC07) there was no access to the dunes in the middle of the profile due to seed protection fences. This means it has not yet been possible to monitor the effectiveness of the dune stabilisation scheme.

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

It is recommended that the beach profile at 1aNTDC05 in Cullercoats Bay should start at the cliff toe and that the cliff be monitored using the aerial survey data.

It is recommended that access to the stabilised dunes at Tynemouth Long Sands be attempted in future surveys to monitor the effectiveness of the stabilisation fences.

### **5. Conclusions and Areas of Concern**

- At Whitley Sands there has generally been accretion across all beach profiles. For the most part, the beach is at a medium level in the range recorded from previous surveys. The topographic survey does not exhibit a clear pattern of sediment movement between the two surveys at Whitley Sands and is dominated by mid to low levels of accretion across the bay. Erosion is concentrated in the middle to lower beach of the north of the bay and upper beach of the south of the bay.
- At Cullercoats Bay, at profile 1aNTDC05, there has been little change and there are no causes for concern.
- At Tynemouth Long Sands, the majority of recorded profiles are within the previously recorded range with berm building processes dominating. The section between chainages 92m and 106m at profile 1aNTDC07 was recorded at its lowest level since May 2002, however, in previous occasions of lowering, the beach has subsequently recovered after the end of the winter. Therefore, the profiles present no cause for concern. The topographic survey is dominated by low levels of accretion, particularly in the centre and southern end of the bay, with erosion concentrated on the lower foreshore of the centre-north bay and the upper beach of the northern end of the bay.
- At King Edward's Bay, there appears to have been movement of sediment up the beach in berms. There are 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: 1aNTDC02

Date: 27/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

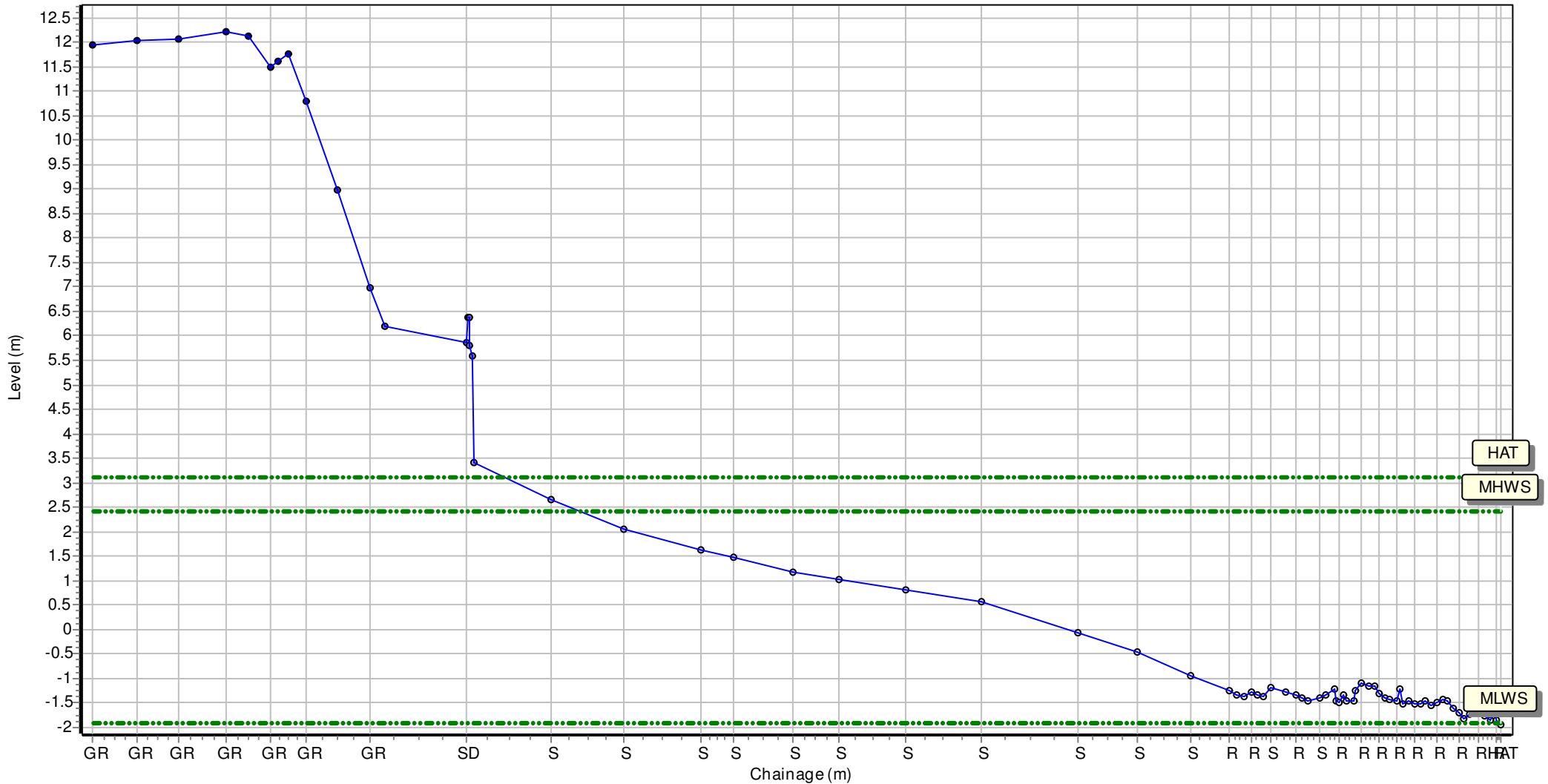
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 435030.395 Northing: 573704.317 Profile Bearing: 76 ° from North



# Beach Profile

Location: 1aNTDC03

Date: 27/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

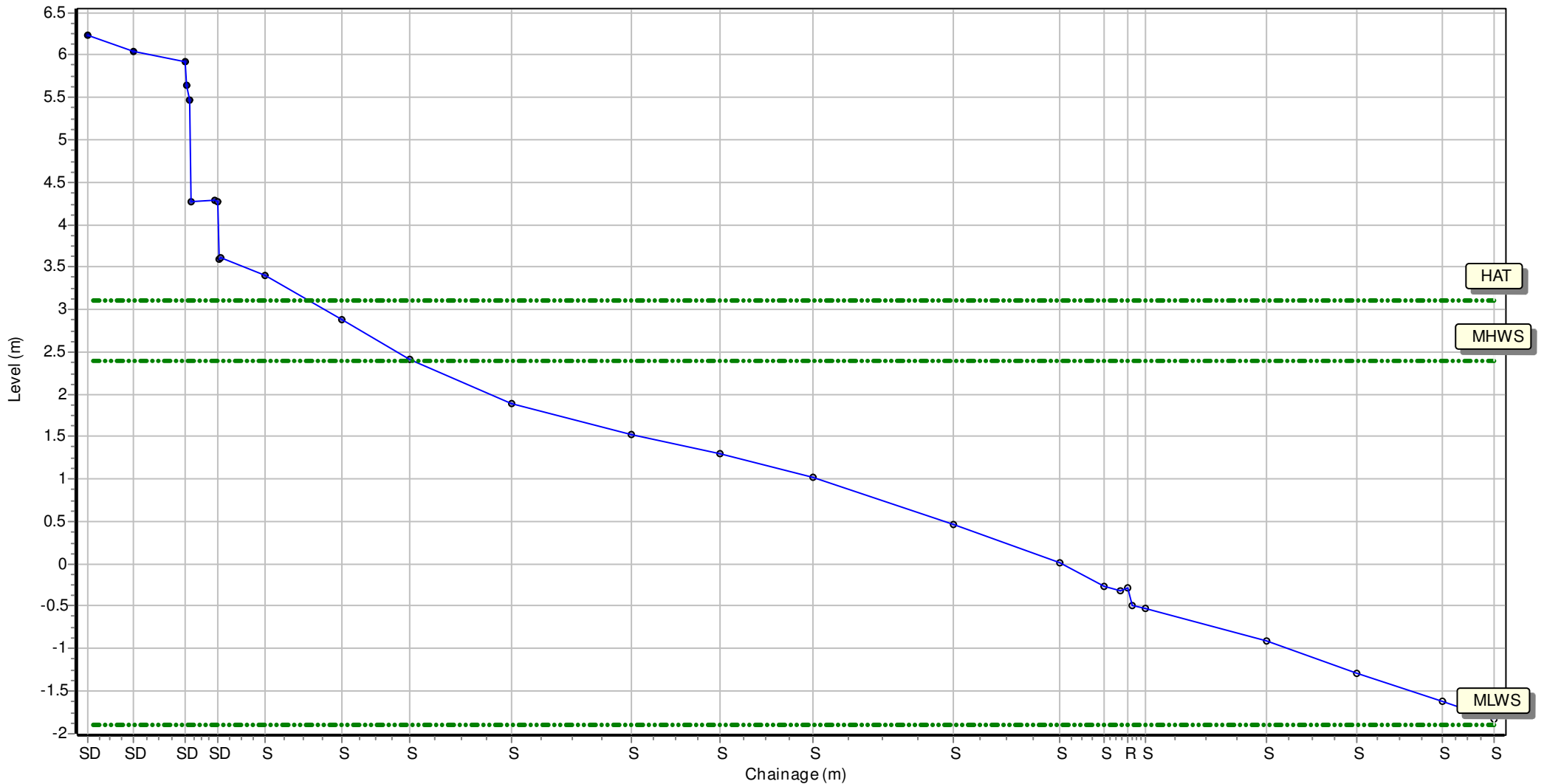
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 435270.865 Northing: 573151.795 Profile Bearing: 70 ° from North



# Beach Profile

Location: 1aNTDC04

Date: 27/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

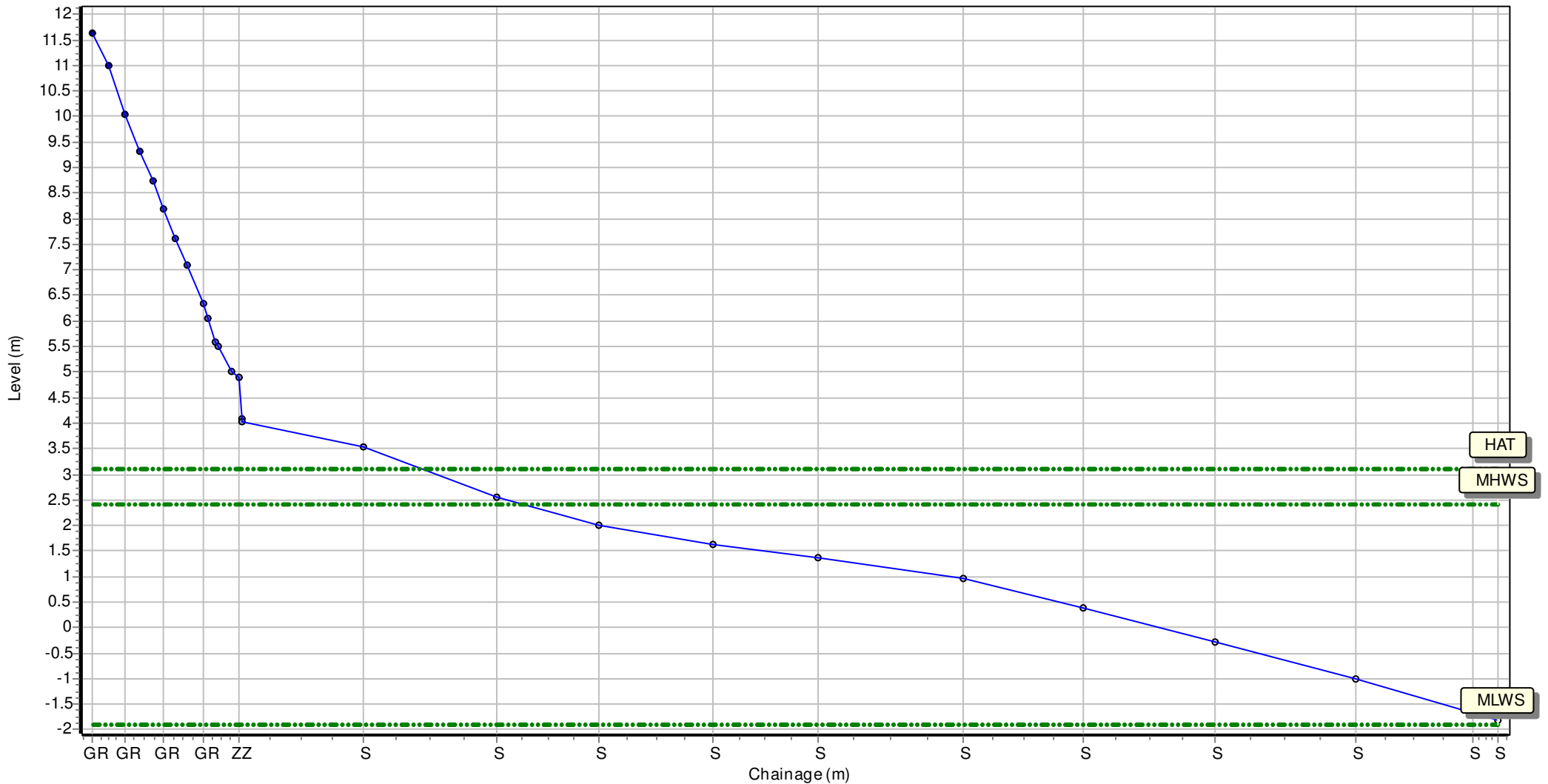
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 435490.594 Northing: 572746.234 Profile Bearing: 60 ° from North





# Beach Profile

Location: 1aNTDC04A

Date: 27/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

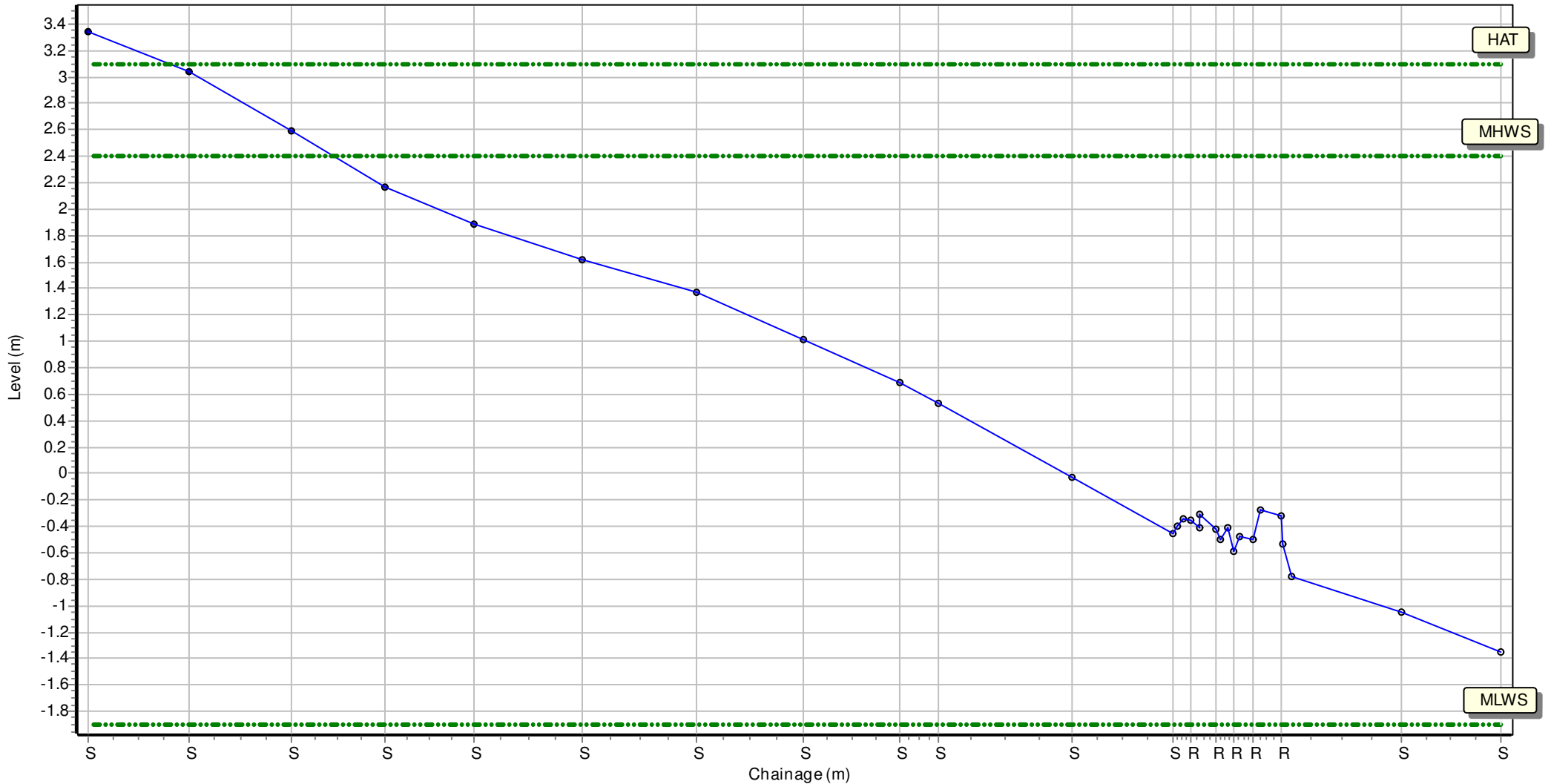
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 435645.554 Northing: 572557.615 Profile Bearing: 46 ° from North



# Beach Profile

Location: 1aNTDC05

Date: 30/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

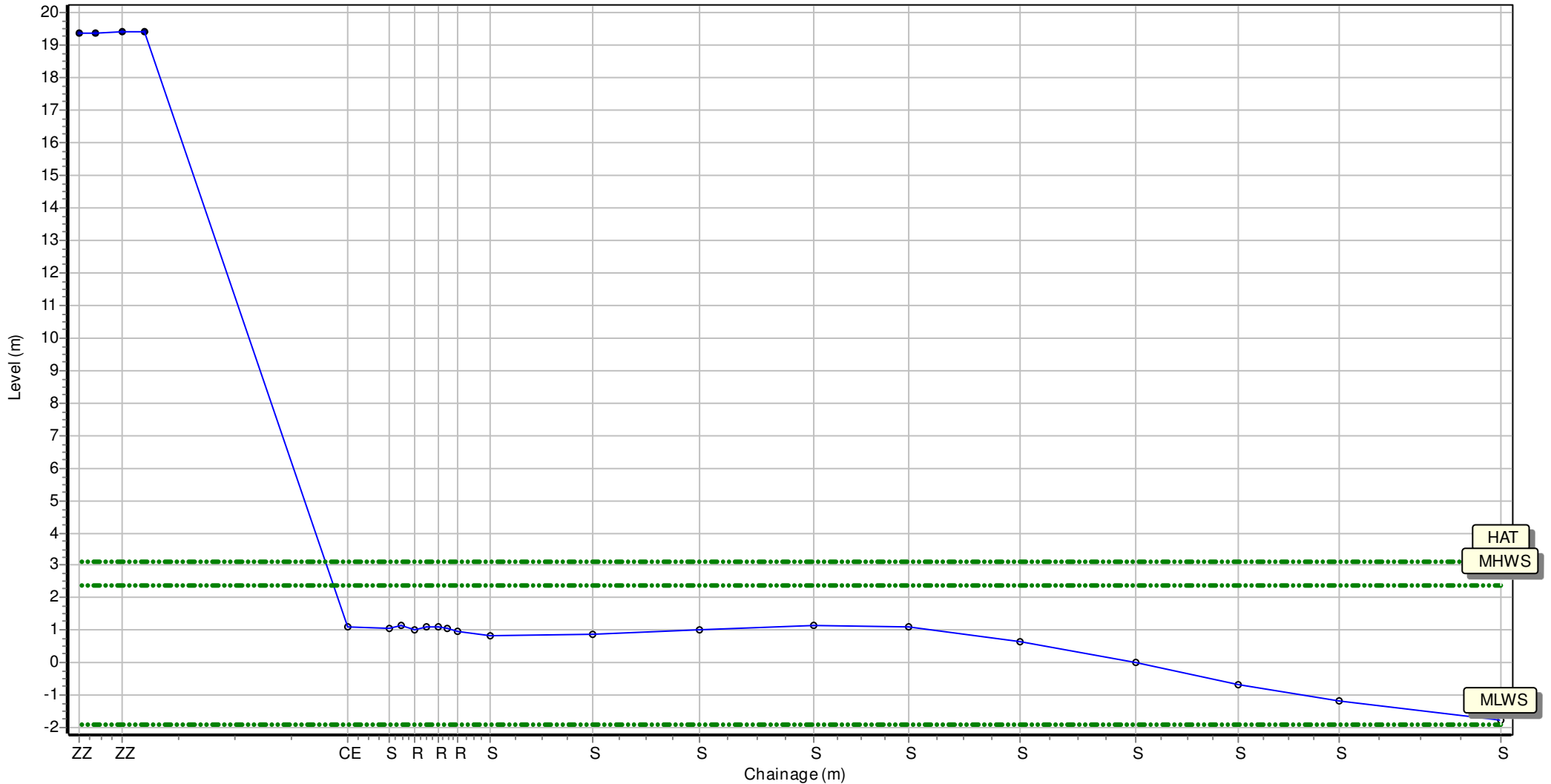
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 436365.005 Northing: 571217.518 Profile Bearing: 77 ° from North



# Beach Profile

Location: 1aNTDC06

Date: 30/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

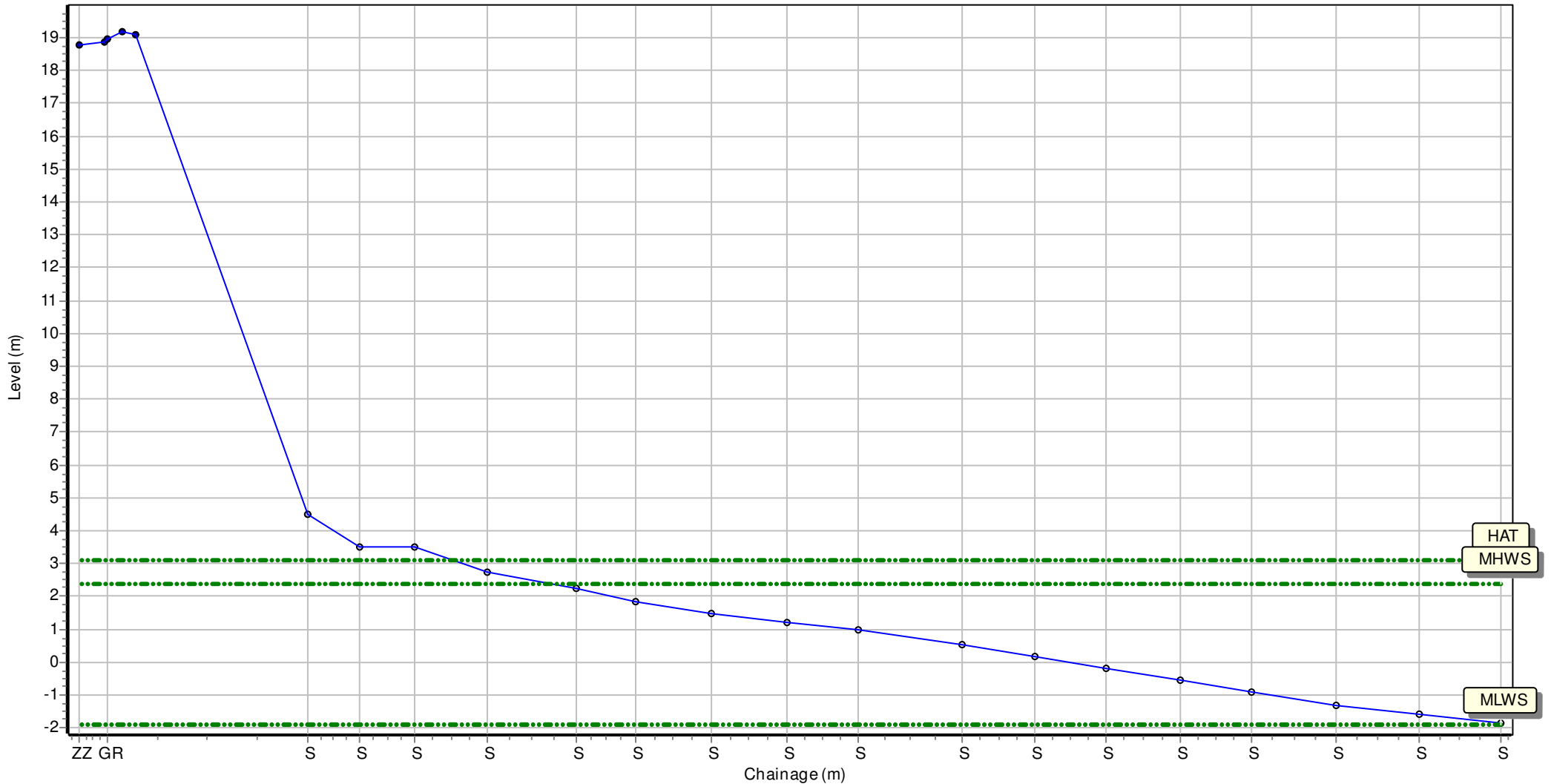
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 436550.6 Northing: 570613.529 Profile Bearing: 77 ° from North



# Beach Profile

Location: 1aNTDC06A

Date: 30/09/2019 Inspector: AG

Low Tide:

Low Tide Time:

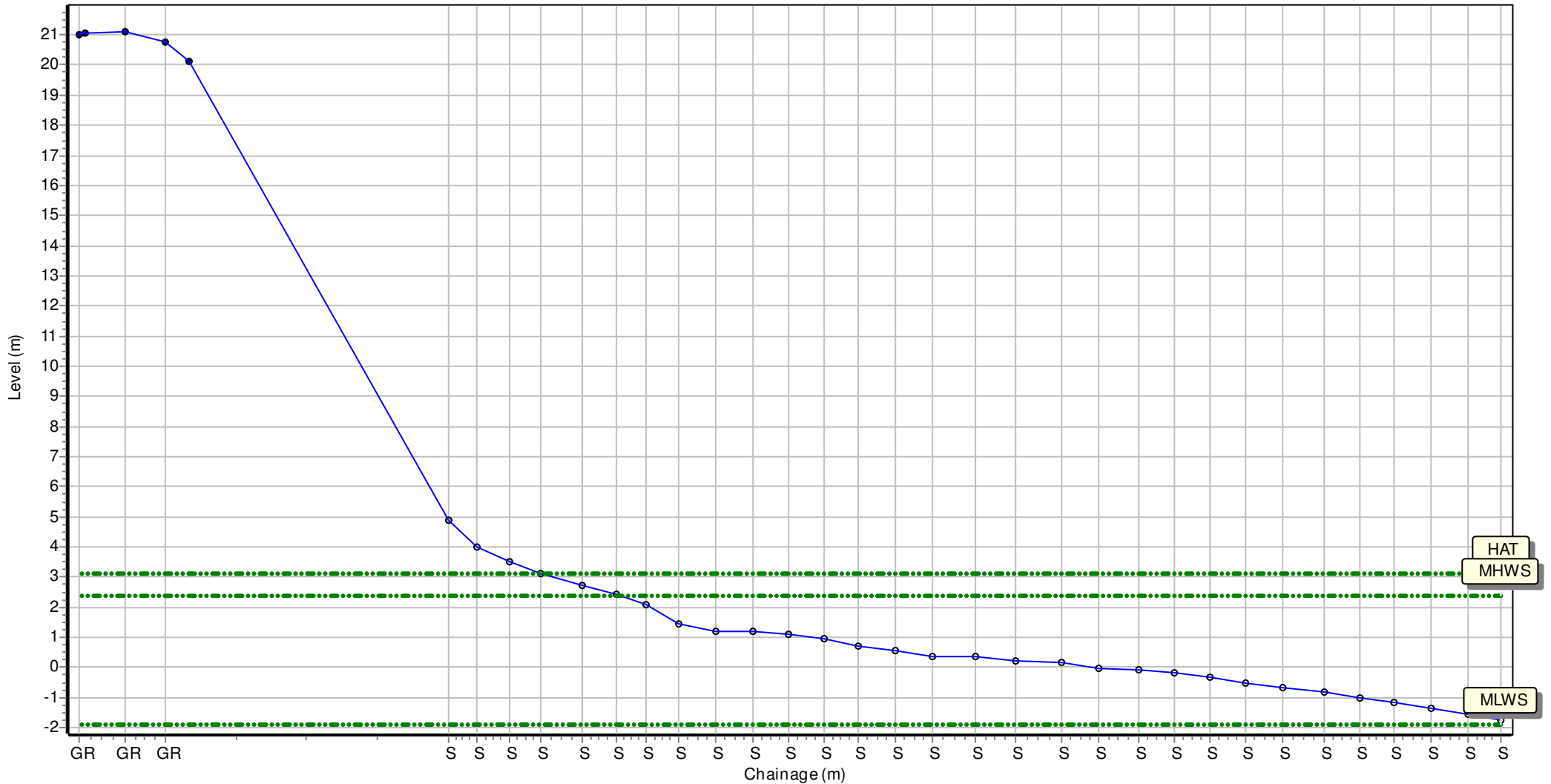
Wind Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 436620.512 Northing: 570317.533 Profile Bearing: 65 ° from North



# Beach Profile

Location: 1aNTDC07

Date: 30/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

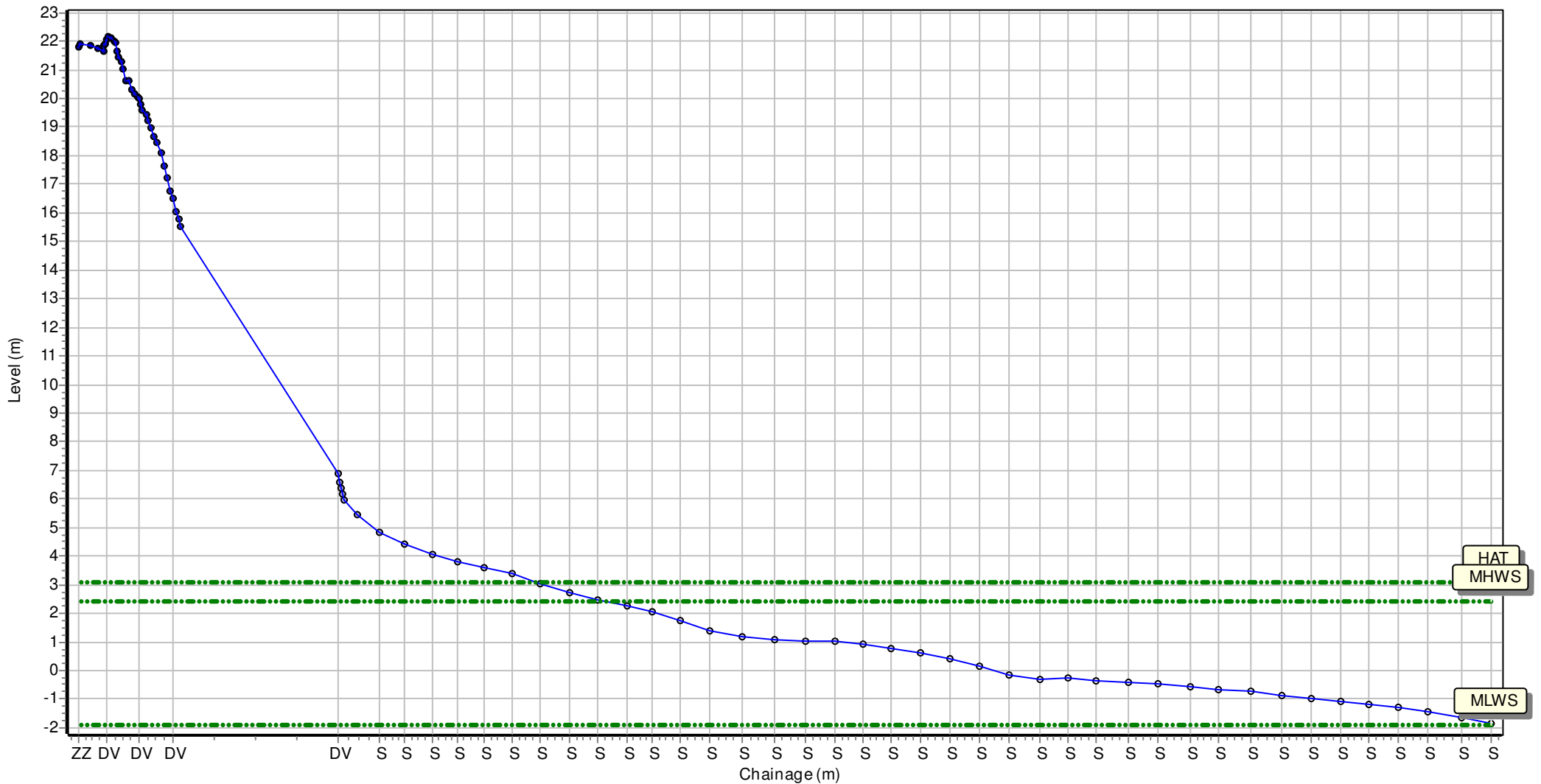
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 436742.221 Northing: 570082.97 Profile Bearing: 74 ° from North



# Beach Profile

Location: 1aNTDC08

Date: 30/09/2019

Inspector: AG

Low Tide:

Low Tide Time:

Wind

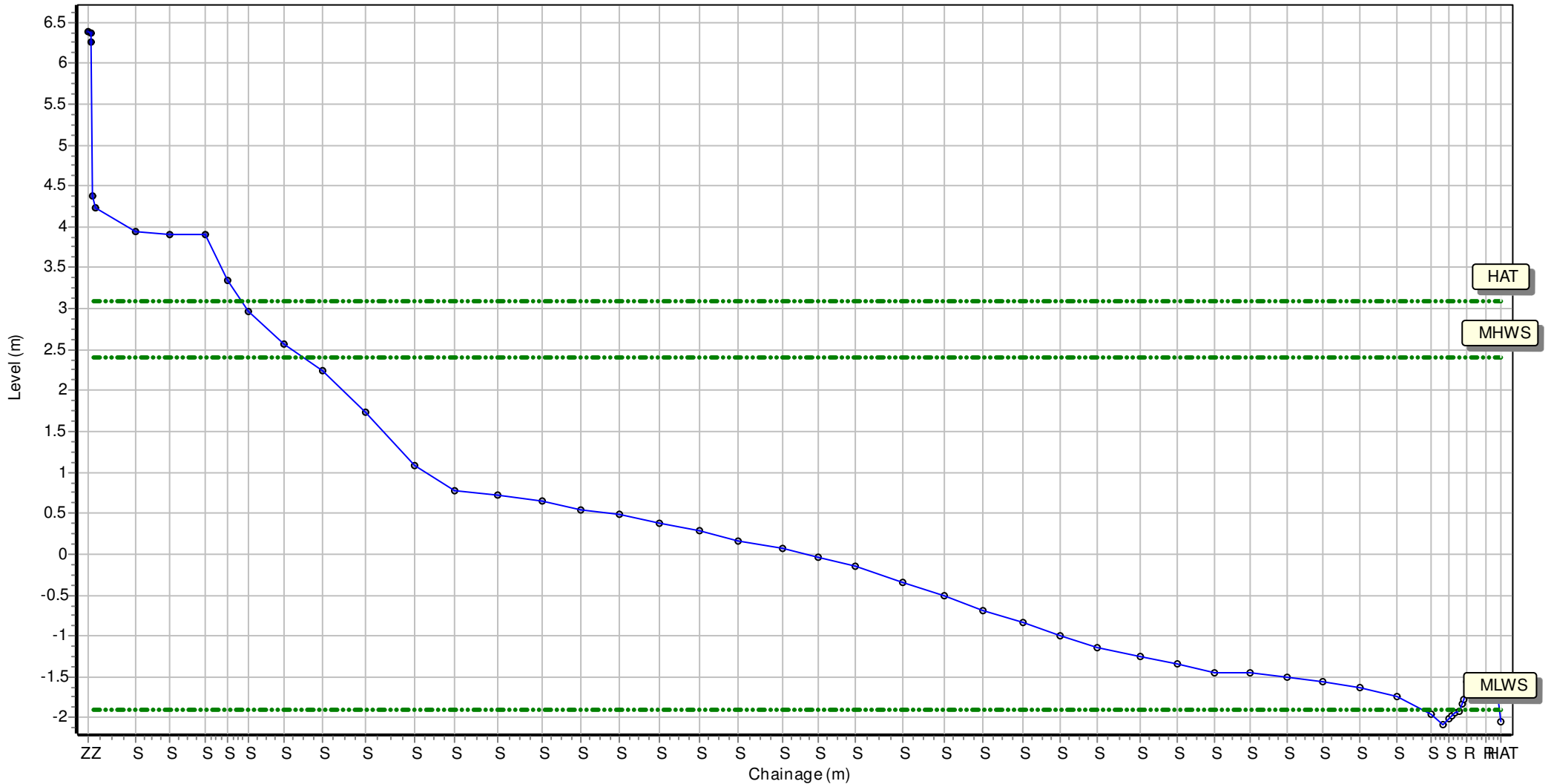
Sea State:

Visibility:

Rain:

Summary: 2019 Full Measures Topo Survey

Easting: 437142.187 Northing: 569510.828 Profile Bearing: 67 ° from North



Beach Profiles: 1aNTDC01



Profiles Envelope 01/10/2006 11/09/2018 19/02/2019 27/09/2019

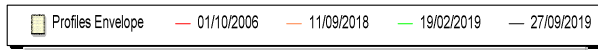
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aNTDC02



HAT

MHWS

MLWS

SANDS



Beach Profiles: 1aNTDC03



HAT

MHWS

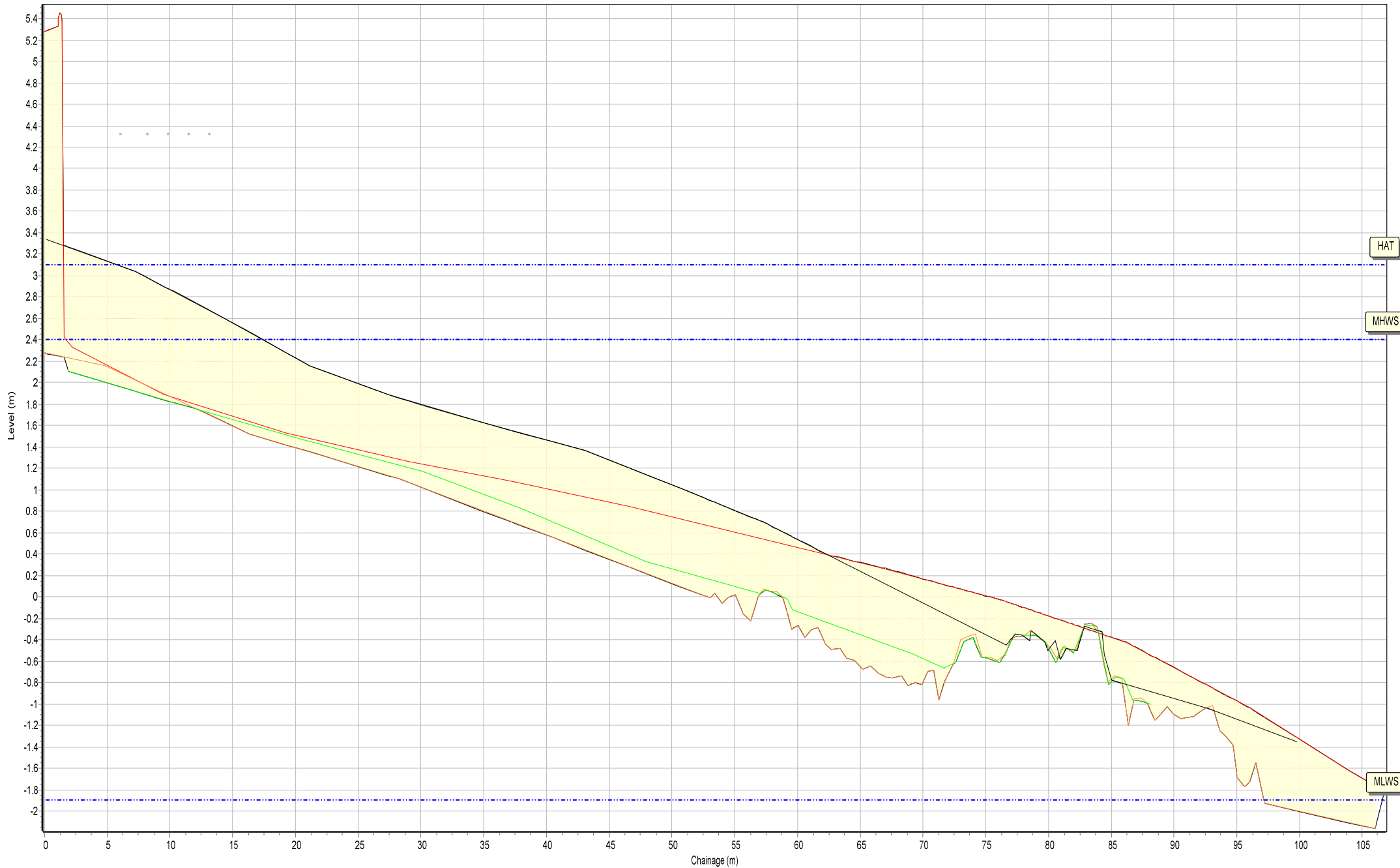
MLWS

SANDS

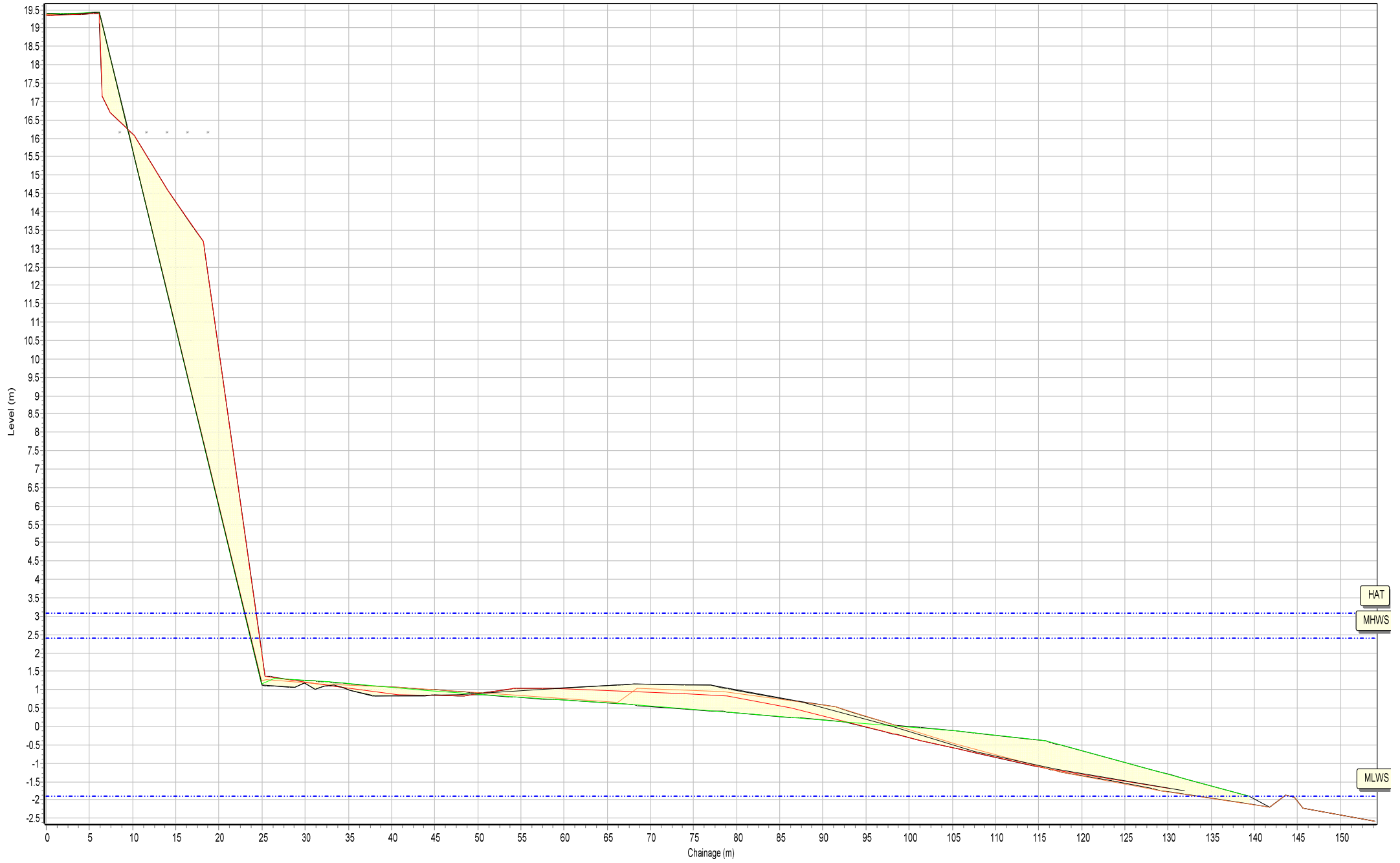
Beach Profiles: 1aNTDC04



Beach Profiles: 1aNTDC04A



# Beach Profiles: 1aNTDC05



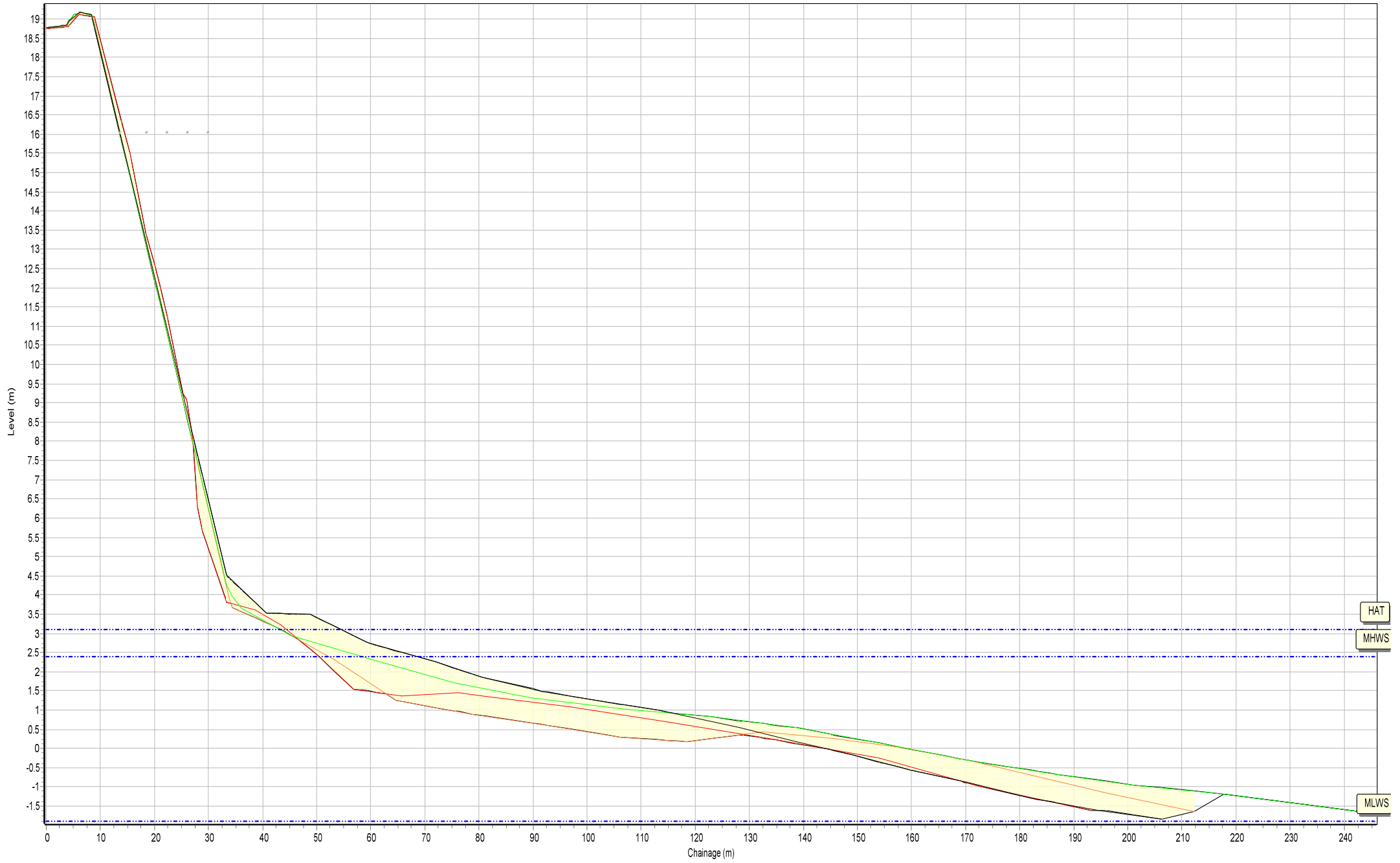
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aNTDC06



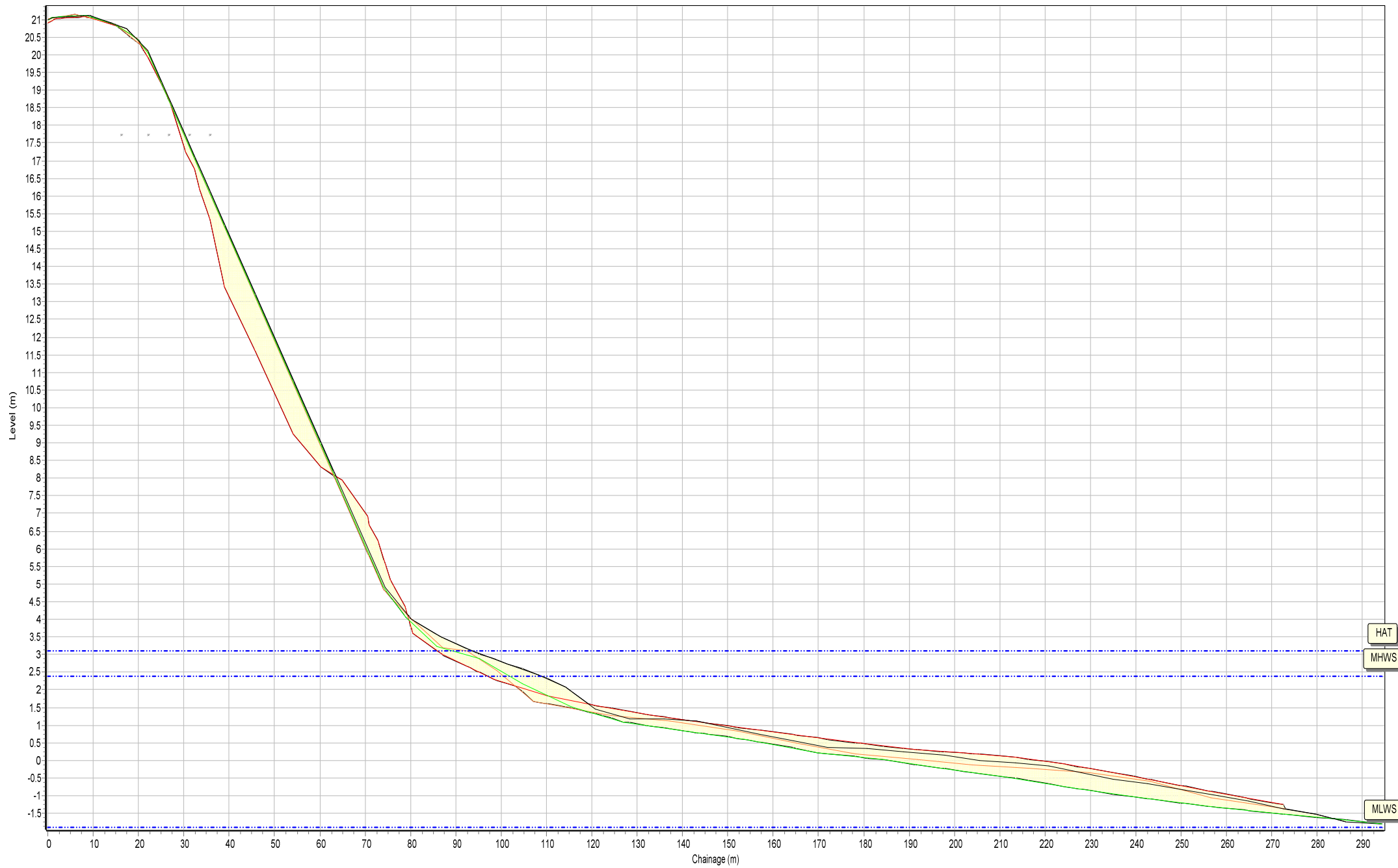
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNTDC06A



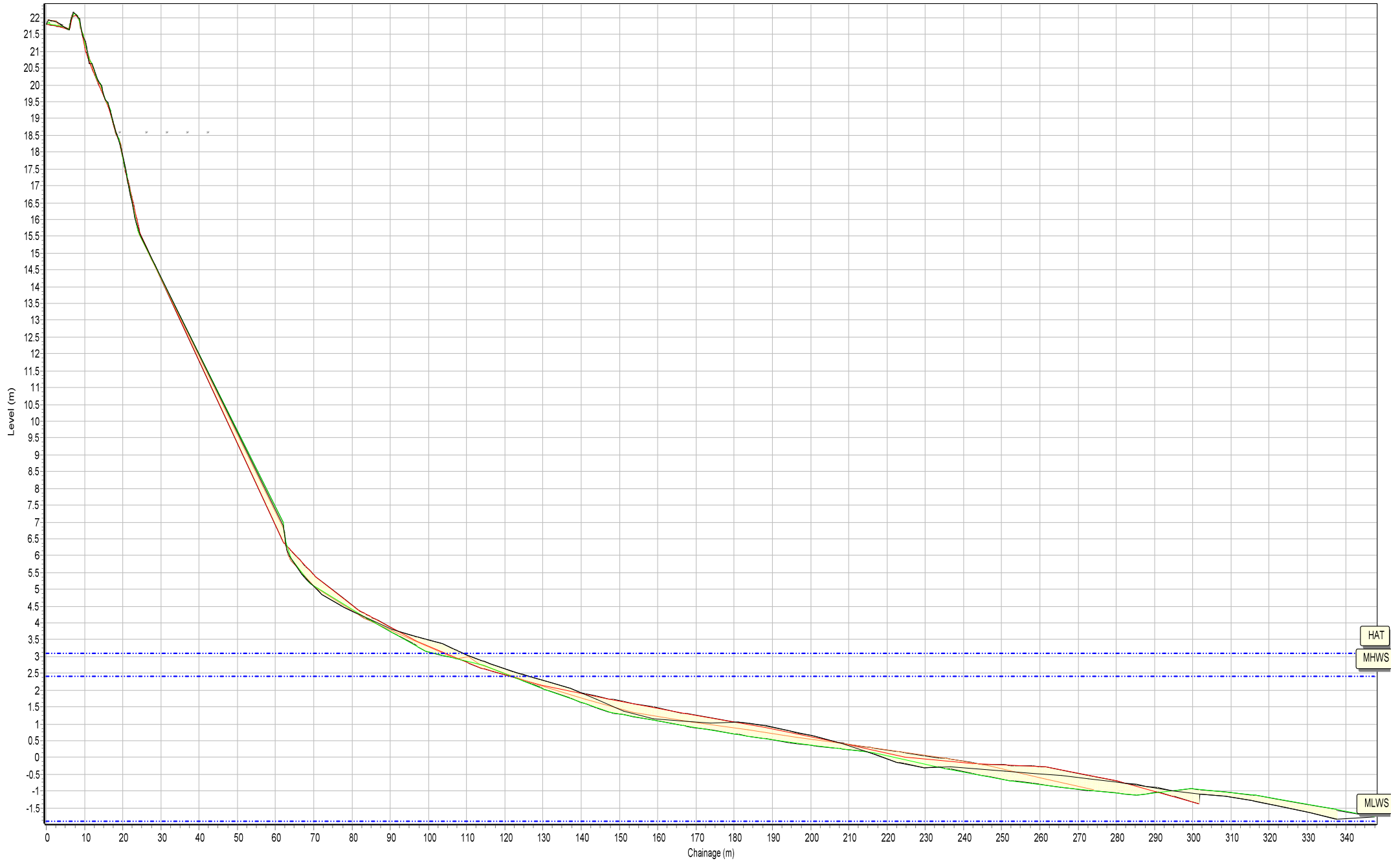
HAT

MHWs

MLWS

SANDS

Beach Profiles: 1aNTDC07

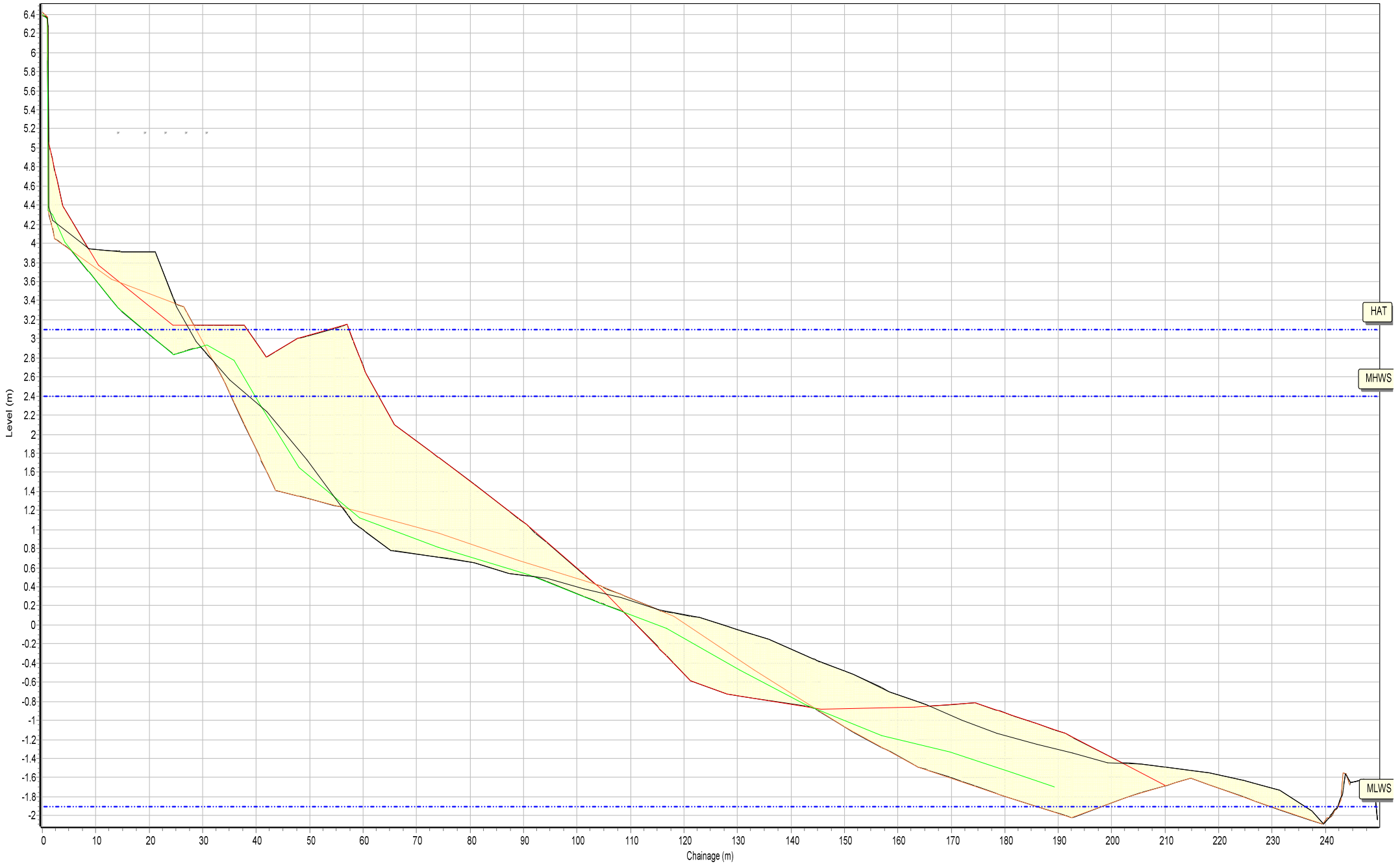


HAT  
MHWS

MLWS

SANDS

# Beach Profiles: 1aNTDC08

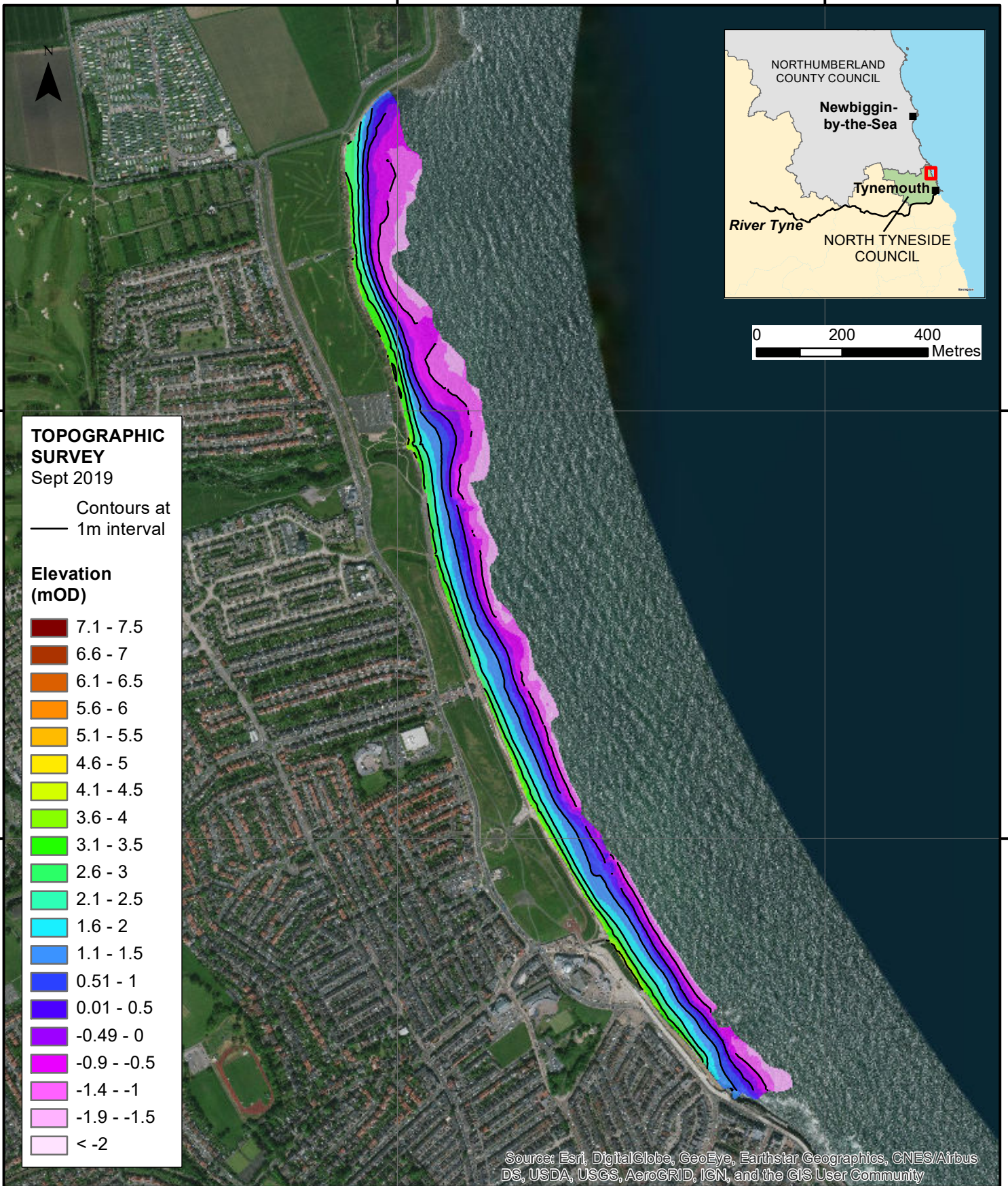




**Appendix B**  
**Topographic Survey**

435000

436000



**TOPOGRAPHIC SURVEY**  
Sept 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
-1.9 - -1.5
< -2



574000

573000

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

**Appendix B - Map 1**

**WHITLEY SANDS**

**North Tyneside Council Frontage**

Analytical Report  
'Full Measures' Survey 2019  
Drawing Scale at A4 1:12,000

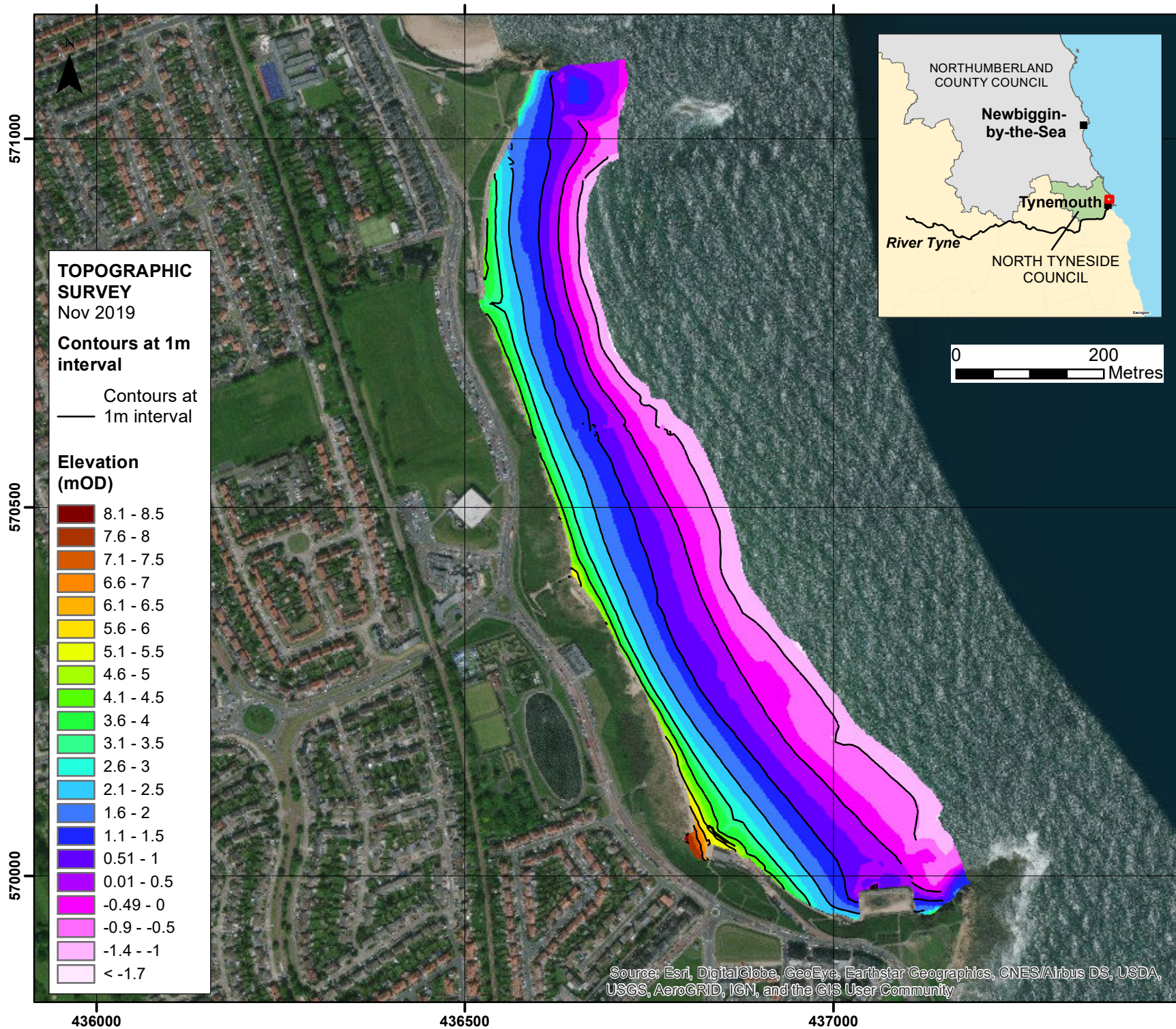
Client:  
North East Coastal Group

Project:  
Cell 1 Regional Coastal Monitoring Programme

**WATER**  
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Marlborough House  
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Fax: +44 (0)191 211 1313  
[www.royalhaskoningdhv.com](http://www.royalhaskoningdhv.com)

**Royal HaskoningDHV**  
Enhancing Society Together



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

**Appendix B - Map 2**

**LONGSANDS**

**North Tyneside Council Frontage**

Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:7,000

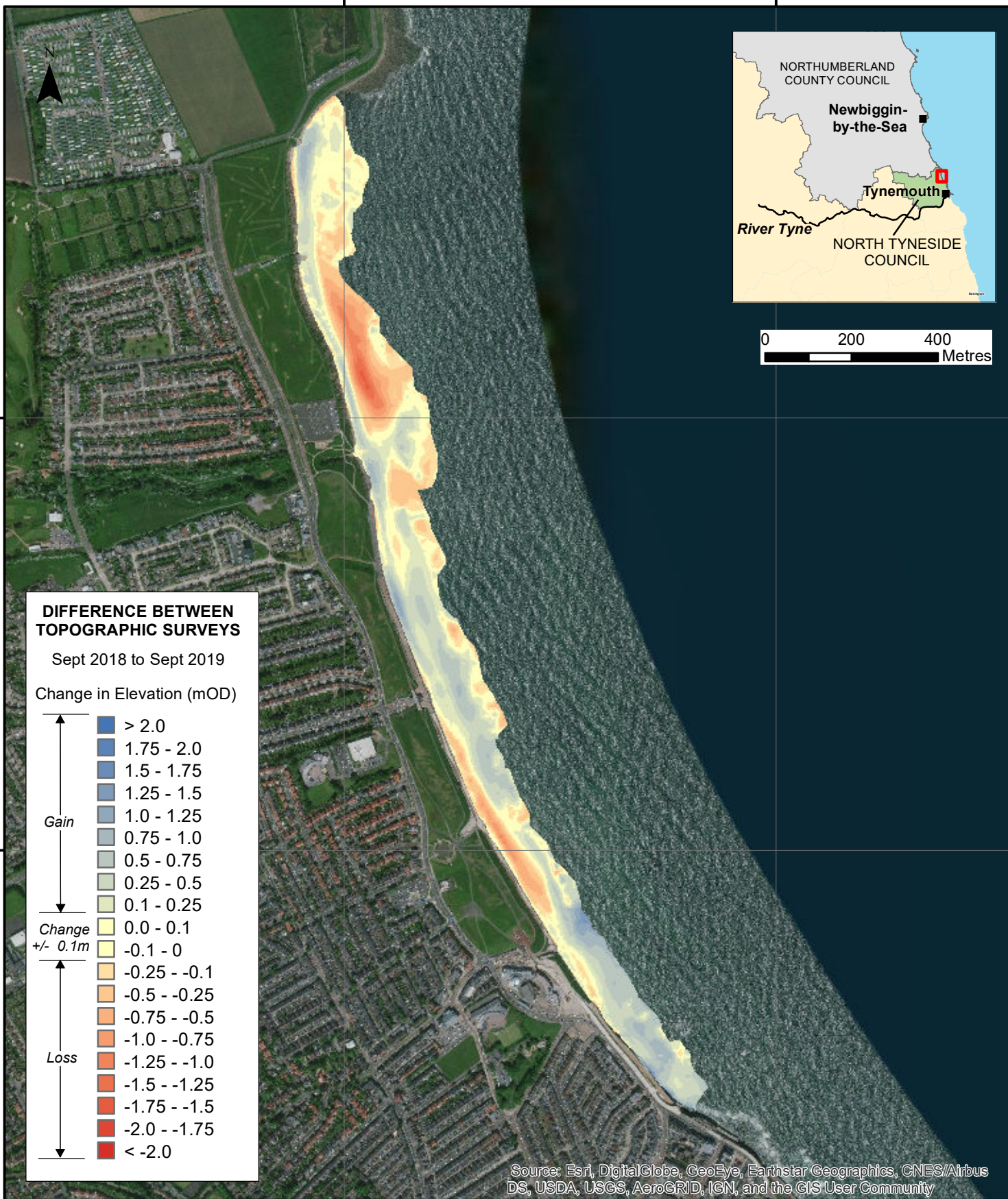
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**DIFFERENCE BETWEEN TOPOGRAPHIC SURVEYS**  
 Sept 2018 to Sept 2019

Change in Elevation (mOD)

Gain	> 2.0
	1.75 - 2.0
	1.5 - 1.75
	1.25 - 1.5
	1.0 - 1.25
	0.75 - 1.0
	0.5 - 0.75
	0.25 - 0.5
	0.1 - 0.25
	0.0 - 0.1
Change +/- 0.1m	-0.1 - 0
	-0.25 - -0.1
	-0.5 - -0.25
	-0.75 - -0.5
	-1.0 - -0.75
	-1.25 - -1.0
	-1.5 - -1.25
	-1.75 - -1.5
	-2.0 - -1.75
	< -2.0
Loss	

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

**Appendix B - Map 3**

**WHITLEY SANDS**

**North Tyneside Council Frontage**

Analytical Report  
 'Full Measures' Survey 2019

Drawing Scale at A4 1:12,000

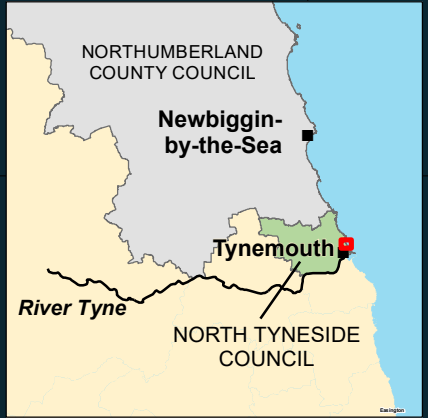
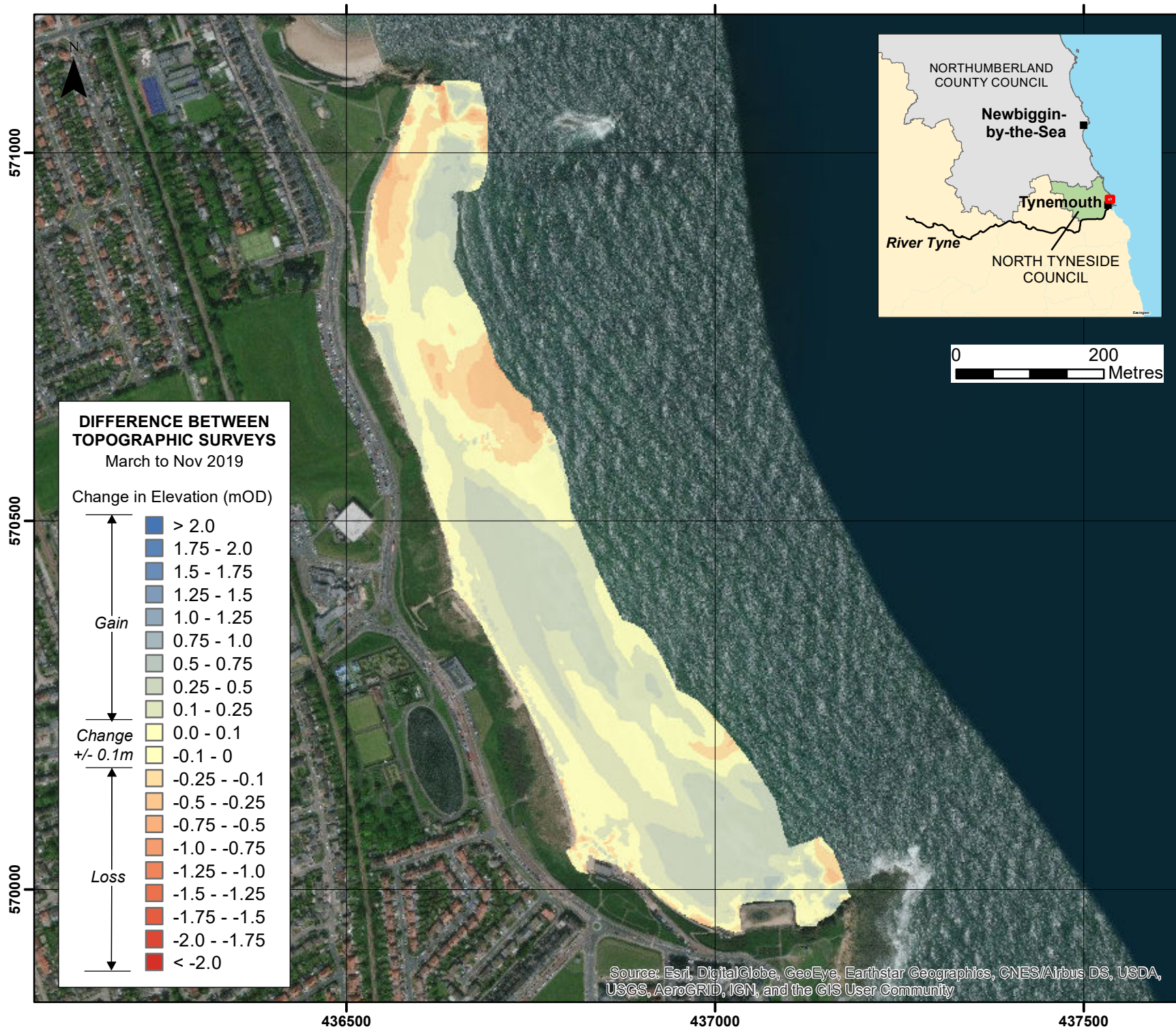
Client:  
 North East Coastal Group

Project:  
 Cell 1 Regional Coastal Monitoring Programme

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

**Appendix B - Map 4**

**LONGSANDS**

**North Tyneside Council Frontage**

Analytical Report  
'Full Measures' Survey 2019

Drawing Scale at A4 1:7,000

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