

**Cell 1 Regional Coastal Monitoring Programme  
Update Report 12: 'Partial Measures' Survey 2020**

## Contents

Disclaimer .....	i
Abbreviations and Acronyms.....	ii
Water Levels Used in Interpretation of Changes .....	ii
Glossary of Terms.....	iii
Preamble .....	iv
1. Introduction.....	1
1.1 Study Area .....	1
1.2 Methodology.....	1
2. Analysis of Survey Data .....	2
2.1 Whitburn Bay.....	2
2.2 Hendon to Ryhope (incl. Halliwell Banks) .....	3
3. Problems Encountered and Uncertainty in Analysis .....	7
4. Recommendations for ‘Fine-tuning’ the Monitoring Programme .....	7
5. Conclusions and Areas of Concern .....	7

## Appendices

Appendix A	Beach Profiles
Appendix B	Cliff Top Survey

## List of Figures

Figure 1	Sediment Cells in England and Wales
Figure 2	Survey Locations
Figure 3	Cliff Top Survey Locations

## List of Tables

Table 1	Analytical, Update and Overview Reports Produced to Date
Table 2	Sub-division of the Cell 1 Coastline

Authors	
Alix Scullion	Royal HaskoningDHV
Dr Nick Cooper – Review & Approval	Royal HaskoningDHV

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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)
	Souter Point to Chourdon Point
HAT	3.18
MHWS	2.48
MLWS	-1.92

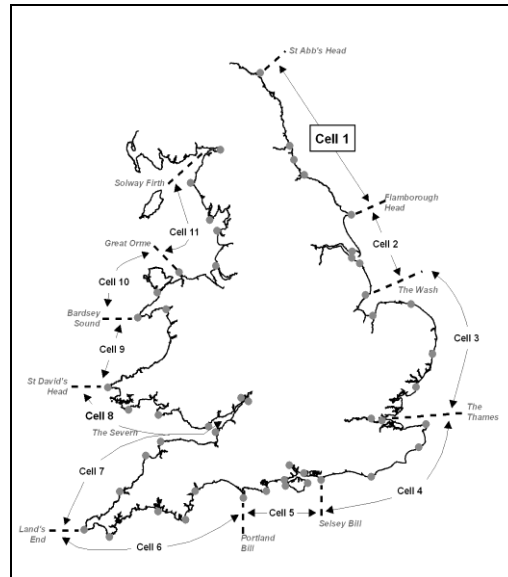
**Source:** *River Tyne to Flamborough Head Shoreline Management Plan 2.*  
Royal Haskoning, February 2007.

## 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).



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

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 every year. Some of these surveys are then repeated the following spring as part of a 'Partial Measures' survey.

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

(\*) The present report is **Update Report 12** and provides an analysis of the 2020 Partial Measures survey for Sunderland City Council's frontage.

## **1. Introduction**

### **1.1 Study Area**

Sunderland City Council's frontage extends from The Bents to Ryhope. For the purposes of this report and for consistency with previous reporting, it has been sub-divided into three areas, namely:

- Whitburn Bay
- Sunderland Harbour and Docks
- Hendon to Ryhope (including Halliwell Banks)

### **1.2 Methodology**

Along Sunderland City Council's frontage, the following surveying is undertaken:

- Full Measures survey annually each autumn comprising:
  - Beach profile surveys along 58 transect lines (commenced 2009)
  - Topographic survey at Whitburn Bay (commenced 2009)
  - Topographic survey at Hendon to Ryhope (including Halliwell Banks) (commenced 2009)
- Partial Measures survey annually each spring comprising:
  - Beach profile surveys along 16 transect lines (commenced 2009)
- Cliff top survey bi-annually at:
  - Hendon to Ryhope (including Halliwell Banks) (commenced 2009)

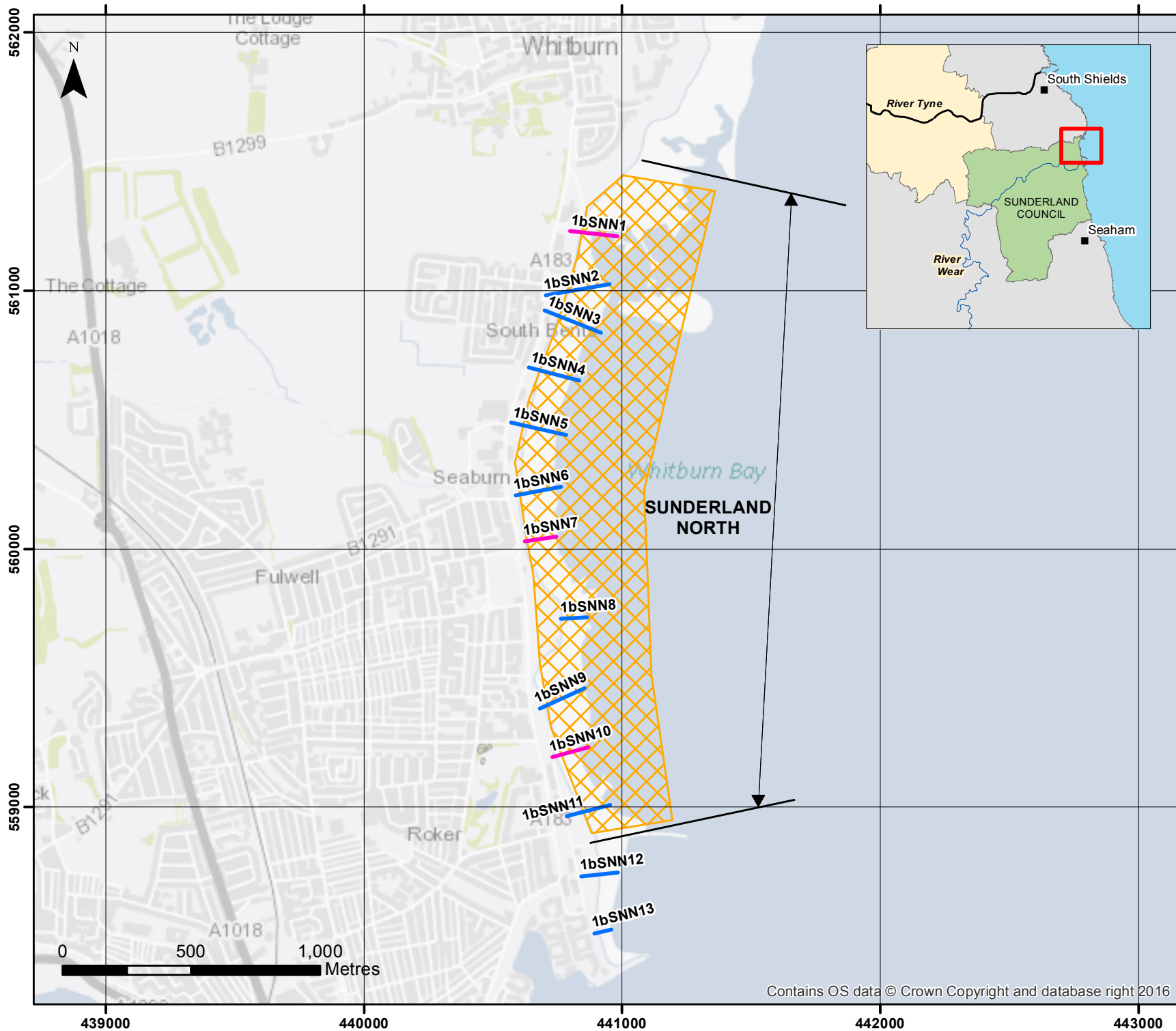
The location of these surveys is shown in Figure 2. The Partial Measures survey was undertaken along this frontage on 8<sup>th</sup> March 2020 (Whitburn Bay), and between 10<sup>th</sup> and 11<sup>th</sup> March 2020 (Hendon to Ryhope, including Halliwell Bank). During this time weather conditions varied, see surveyors reports for details.

The Update Report presents the following:

- 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**

**Sunderland Council Frontage**

Analytical Report  
Topo Surveys

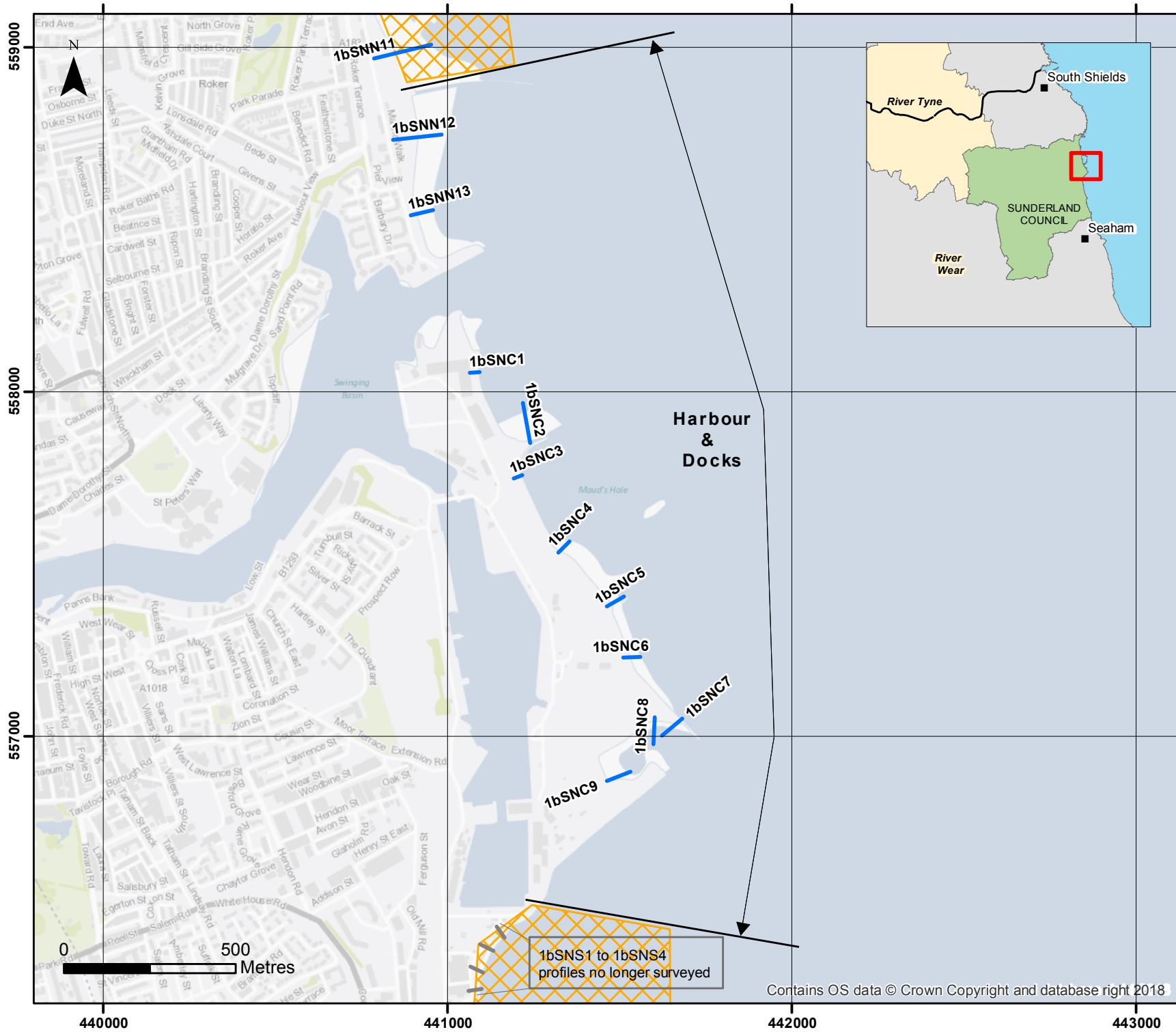
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**WATER**  
 Royal HaskoningDHV  
 Marlborough House  
 Marlborough Crescent  
 Newcastle upon Tyne  
 NE1 4EE

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



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**Key**

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual
- Discontinued

**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  
 Sunderland Council  
 Frontage**

Analytical Report  
 Topo Surveys

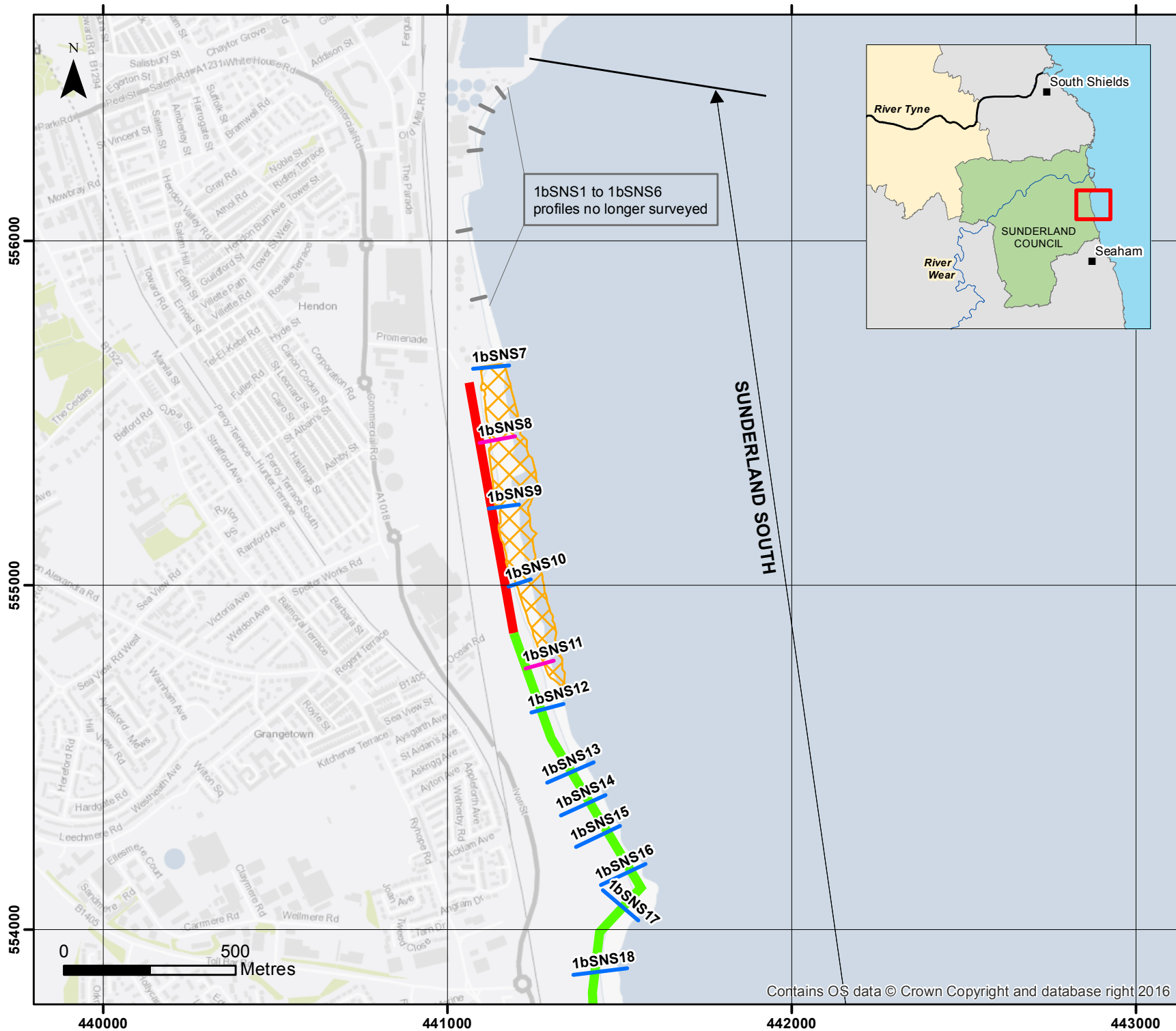
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**WATER**  
 Royal HaskoningDHV  
 Marlborough House  
 Marlborough Crescent  
 Newcastle upon Tyne  
 NE1 4EE

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



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**Key**

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual
- Discontinued

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 100
- @ 300

*(Indicative Survey Extents shown)*

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

**Figure 2 - Map 3  
 Sunderland Council  
 Frontage**

Analytical Report  
 Topo Surveys

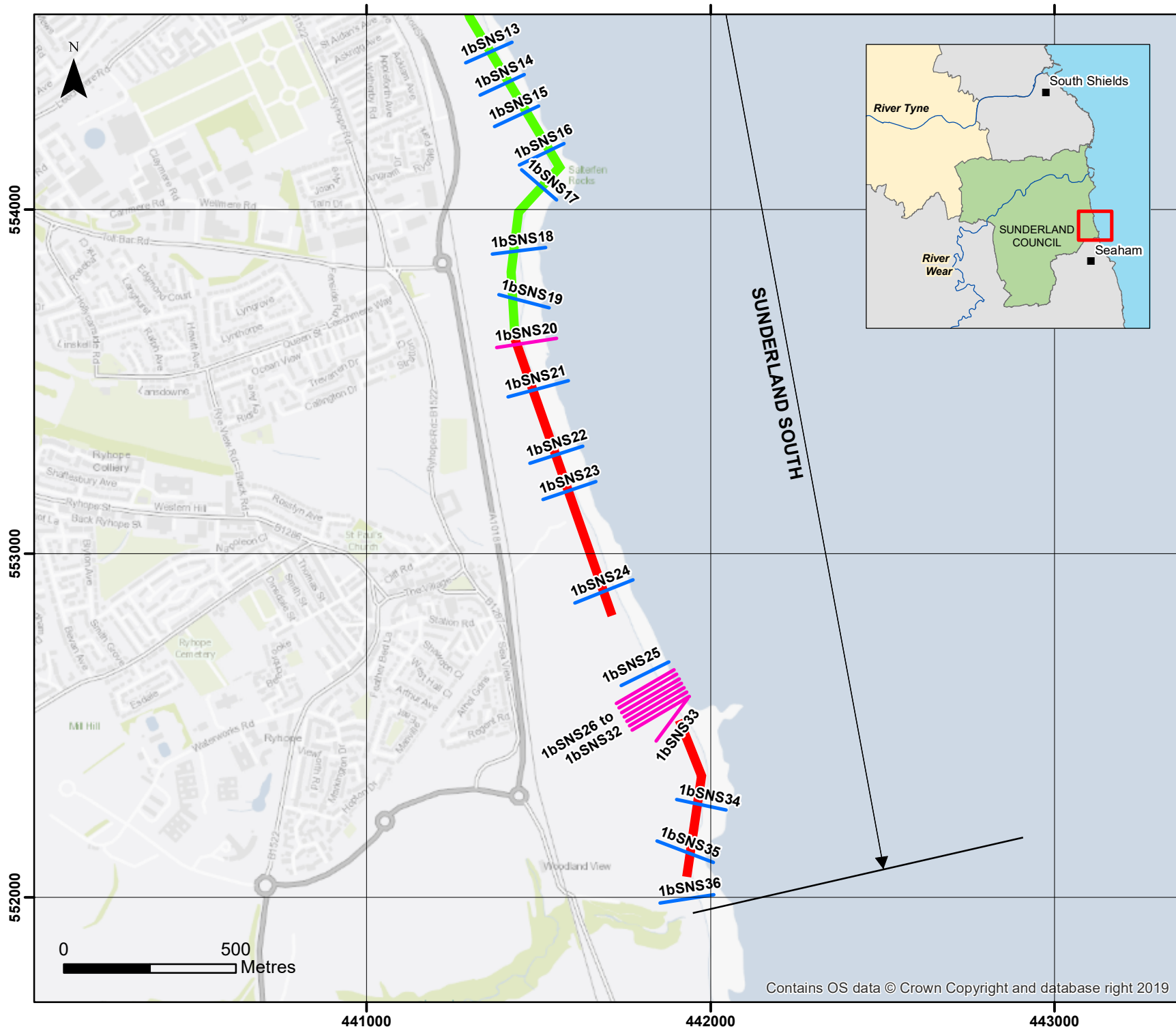
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**WATER**  
 Royal HaskoningDHV  
 Marlborough House  
 Marlborough Crescent  
 Newcastle upon Tyne  
 NE1 4EE

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







Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Cliff Top Monitoring Pegs**

- @ 100
- @ 300

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 4**

**Sunderland Council Frontage**

Analytical Report  
Topo Surveys

Drawing Scale at A4 1:15,000

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

Tel: +44 (0)191 211 1300  
 Fax: +44 (0)191 211 1313  
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## 2. Analysis of Survey Data

### 2.1 Whitburn Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>8<sup>th</sup>-11<sup>th</sup> March 2020</p>	<p><b>Beach Profiles:</b></p> <p>Whitburn Bay is covered by three beach profile lines for the Partial Measures survey (Appendix A). The last survey was Full Measures, undertaken in Autumn 2019.</p> <p><b>1bSNN1</b> is just to the south of Sunderland City Council's northern boundary. Since the last survey the backshore above HAT has changed little, with small sections of accretion of up to 0.1m. From chainage 45m to 50m there has been infilling of a hollow by up to 0.3m. From chainage 50m to 71m, there has been erosion of an upper beach berm by up to 0.6m. There has been uniform accretion across the middle and lower beach of up to 0.8m. Seawards of chainage 170m, the beach toe has eroded by 0.5m. The upper and middle beach are at a relatively high level compared to the range recorded from previous surveys, particularly between chainages 85m and 117m which is at its highest level recorded. The beach toe is recorded at a low level compared to the range recorded from previous surveys.</p> <p><b>1bSNN7</b> is at Seaburn, north of Parson's Rock. Beach levels in front of the seawall have risen by up to 0.3m to chainage 14m, where a small level of erosion occurred to chainage 28m by up to 0.1m. The profile from chainage 28m to 148m shows accretion by up to 0.3m on the middle beach and 0.1m on the lower beach. Seaward of chainage 148m the beach toe has eroded by 0.6m and migrated landward by 28m. Overall the upper and middle beach profile is at a high level compared to the range recorded from previous surveys., whilst the lower beach is at a medium level.</p> <p><b>1bSNN10</b> is located mid-way between Parson's Rock and Roker Pier. There has been accretion on the upper beach from the seawall to chainage 41m of up to 0.7m. Between chainages 41m and 60m there has been a small amount of erosion of up to 0.1m, switching to accretion across the middle beach between chainages 60m and 121m by up 0.2m. Seaward of chainage 121m the lower beach erodes by 0.4m and the beach toe has migrated landward by 16m. Overall, the beach profile has steepened compared to the previous survey. The profile across the upper, middle and lower beach is at a medium level compared to the range recorded from previous surveys.</p>	<p>Along the length of Whitburn Bay beaches have accreted across the upper and middle beach profile, whilst the beach toe has eroded at all profiles and moved landward since the previous survey.</p> <p><b>Longer term trends:</b> Profiles in Whitburn Bay are generally within the bounds of previous surveys, however chainage 85-117m at profile 1bSNN1 is now at its highest level recorded.</p>

## 2.2 Hendon to Ryhope (incl. Halliwell Banks)

Survey Date	Description of Changes Since Last Survey	Interpretation
8 <sup>th</sup> -11 <sup>th</sup> March 2020	<p><b>Beach Profiles:</b></p> <p>Hendon to Ryhope is covered by twelve beach profile lines for the Partial Measures survey (Appendix A). The last survey was Full Measures, undertaken in Autumn 2019.</p> <p>Profile <b>1bSNS8</b> extends across the seawall, rock revetment, and sandy beach. Beach levels between the toe of the rock revetment and 65m chainage have accreted by up to 0.8m. Seaward of 65m chainage, the elevation of the beach has reduced by 0.3m. The toe of the beach has extended seawards by 24m. The beach profile is at a high level compared to the range recorded from previous surveys, particularly between chainages 36m and 49m which is at its highest level recorded.</p> <p>Profile <b>1bSNS11</b> starts at the coastal slope backing the sea wall and extends over the rock armour and beach. Beach levels have decreased from the toe of the rock armour to chainage 76m by up to 0.8m. The beach toe seaward of chainage 76m has accreted by up to 0.4m and extended seaward by 27m. Overall the profile is at a medium-high level compared to the range recorded from previous surveys.</p> <p>Profile <b>1bSNS20</b> is located at Shirley Banks. According to the survey report, “<i>significant erosion has occurred</i>” at this profile. The profile and survey photos show a cliff face collapse has occurred since the previous survey, with a 5m landward recession of the cliff top by 5m and an 8m seaward movement of the cliff toe. There has been a small amount of erosion on the upper beach by up to 0.2m to chainage 68m. The previously exposed rock patch from chainage 70-135m has been covered by sediment by up to 0.6m. The upper beach is at a low level compared to the range recorded from previous surveys, whilst the middle beach is at a high level, particularly between chainages 74-106m which is at its highest level recorded. The beach toe is at a high level compared to the range recorded from previous surveys.</p> <p>Profile <b>1bSNS25</b> is located at Halliwell Banks. The top of the cliffs, cliff face and cliff toe have not changed since the last survey. There has been erosion of up to 0.6m from the toe of the cliff to chainage 79m. Between chainage 79m and 112m there has been accretion by up to 0.4m. Seawards of chainage 112m, there has been erosion of up to 0.2m. The upper and middle beach is at a low level compared to the range recorded from previous surveys, whilst the lower beach is at a medium level.</p> <p>Profiles <b>1bSNS26 to 1bSNS33</b> are located on Halliwell Banks to assess erosion of a former land fill site.</p>	<p>At South Hendon (1bSNS8 and 1bSNS11), there has been accretion on the upper beach and erosion on the middle and lower beach in the northernmost profile (1bSNS8). The opposite pattern was seen in the southern profile(1bSNS11). At profile 1bSNS20, there has been a 5m landward movement of the cliff top, with material slumping down the cliff face to the toe since the previous survey.</p> <p>Profile 1bSNS25 has experienced a decrease in beach levels on the upper beach since the previous survey.</p> <p>At the landfill site (profiles 1bSSN26 to 1bSSN33) the cliff there has seen erosion of the cliff top and toe across the majority of profiles. Generally, the profiles are dominated by erosion across the upper and lower beach, with some low levels of accretion across the middle beach.</p> <p><b>Longer term trends:</b> In general, the profile change along the Hendon to Ryhope frontage is within the bounds of previous surveys.</p> <p>At the landfill site, profiles 1bSSN25 to 1bSSN33 continue to show recession of the cliff toe. Overall the upper beach levels are at a low level compared to past surveys, whilst the middle and lower beaches are a medium level.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>Cliff tops are between 26m and 27mOD.</p> <p>At profiles <b>1bSNS26</b>, there has been apparent recession of the cliff toe by c.3.0m, which is now at its most landward position since records began. Between the cliff toe and chainage 119m there has been erosion of up to 0.4m. There has been accretion by up to 120m across the middle beach between chainages 119m and chainage 155m. The beach toe has eroded by up to 0.2m. Overall the profile is at a relatively low level compared to the range recorded from previous surveys.</p> <p>At <b>1bSNS27</b> there has been no change in the position of the top of the cliff or cliff face, however the toe of the cliff has receded by 2m. From the toe of the cliff to chainage 120m there has been erosion of the upper beach by up to 0.8m. On the middle beach between chainages 120m and 144m there has been accretion by up to 0.4m. Seaward of 144m there has been erosion of the beach toe by up to 0.3m. The upper beach is at a low level compared to the range recorded from previous surveys, particularly between chainages 104-113m which is at its lowest level recorded. The rest of the beach profile is at a medium level compared to the range recorded from previous surveys.</p> <p>At <b>1bSSN28</b>, the toe of the cliff has eroded by 0.6m, which continues across the upper beach to chainage 121m. There has been accretion of up to 0.4m on the middle beach between chainages 121-142m, covering a previously exposed rock patch. Seaward of chainage 142m there has been erosion of the beach toe by 0.5m. Overall the upper beach profile is at a low level compared to the range recorded from previous surveys, whilst the middle and lower beach are at a medium level.</p> <p>At profiles <b>1bSNS29</b>, between the cliff toe and chainage 122m there has been erosion of up to 0.8m. Between chainages 122m and 132m there has been accretion of up to 0.3m. On the lower beach, there has been erosion by up to 0.2m to chainage 166m. The beach toe has accreted by up to 0.5m and extended seaward by 17m. The upper beach profile is at a low level compared to the range recorded from previous surveys, particularly between chainages 108m and 118m which is at its lowest level recorded. The middle and lower beach are at a medium level.</p> <p>At <b>1bSNS30</b>, there has been a retreat of the cliff toe by up to 4m to its most landward position recorded. There has been erosion on the upper beach by up to 0.6m to chainage 125m. A small amount of accretion has occurred between chainages 125m and 136m of up to 0.2m. Between chainages 136m and 172m erosion has occurred by up to 0.2m. The beach toe has accreted by 0.1m and extended seaward by 14m. Overall the upper beach profile is at a low level compared to the range recorded from</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>previous surveys, whilst the middle and lower beach are at a medium level.</p> <p>Profile <b>1bSNS31</b> shows an apparent erosion of the cliff face and toe by c.2.0m. The upper beach has eroded by up to 0.5m to chainage 126m. The middle beach shows a small amount of accretion by up to 0.2m to chainage 144m. Seaward of chainage 144m there has been an erosion of up to 0.2m, whilst the beach toe has extended seaward by 13m. Overall the profile is at a low-medium level compared to the range recorded from previous surveys.</p> <p>At <b>1BSNS32</b> the cliff shows apparent recession of 1.2m at the toe, which is now at its most landward position recorded. There has been erosion across the upper beach by 0.6m to chainage 148m. Seaward of chainage 148m there has been negligible change in the order of <math>\pm 0.1</math>m. The beach toe has extended by 10m. Overall the upper beach profile is at a low level compared to the range recorded from previous surveys, whilst the middle and lower beach is at a medium level.</p> <p>At <b>1bSNS33</b>, the cliff shows apparent recession of the cliff toe of c.1.0m. The upper beach eroded by 0.8m to chainage 95m. There is accretion of up to 0.6m across the middle beach between chainages 95-120m. The beach toe has accreted by 0.2m and extended by 14m. Overall the upper beach profile is at a low level compared to the range recorded from previous surveys, whilst the middle and lower beach is at a medium level.</p>	
<p><b>8<sup>th</sup> -11<sup>th</sup> March 2020</b></p>	<p><b>Cliff-top Survey:</b></p> <p>32 ground control points (numbered 1-32) were established along the cliff top between Hendon and Ryhope in March 2009, with a further three (28A, 28B and 28C) added in September 2009 (Figure 3). Note: the numbering of ground control points is not intended to correlate with that of the beach profile lines.</p> <p>Measurements are taken from each ground control point along a fixed bearing to the edge of the cliff top. These cliff top surveys are undertaken bi-annually and are intended to inform on erosion rates of the sea cliffs extending from the defended industrial areas at Hendon southwards along the undefended cliffs to Ryhope Dene.</p> <p>The results from the cliff top monitoring are anticipated to have an accuracy of <math>\pm 0.2</math>m due to the technique used. These cliff top surveys are undertaken bi-annually and are intended to inform on erosion rates of the sea cliffs extending from the defended industrial areas at Hendon southwards along</p>	<p>Since the last survey, the cliffs at Points 4, 6, 9, 11, 13, 14, 20, 21, 23, 25, 26, 28, 28B, 29, 30 and 32 have eroded, with very little change elsewhere. Point 26 shows the greatest amount of erosion of 7.5m.</p> <p><b>Longer term trends:</b> Since 2009, the majority of the points south of the sea defences have eroded. The greatest erosion has occurred at points 10, 21, 25, 26, 27, 31 and 32 where between 7.07m and 11.16m have been lost.</p>



Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>the undefended cliffs to Ryhope Dene. Appendix B – Table B1 provides results from the March 2009 cliff top survey, showing the position from the ground control point to the edge of the cliff top along a defined bearing. Also shown is the change in measurement since the original (March 2009) and previous (November 2019) cliff top surveys.</p> <p>Results show that since the last survey, three locations have shown erosion greater than the anticipated survey error; Point 21 by 3.73m, Point 23 by 0.28m, Point 25 by 3.26m and Point 26 by 7.5m.</p> <p>Since surveys began in March 2009 (or September 2009 for 28A, 28B, and 28C) erosion greater than the survey error has occurred at around 80% of the ground control points, where total losses are 11.16m (at location 25) at their greatest, and more typically less than 5m. The long-term erosion rates are up to 1.01m/yr (location 25 and location 27), with up to 0.5m/yr being more typical.</p>	

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

#### **Individual Profiles**

- Significant erosion was encountered at Section 20 of this survey.

#### **Cliff Top Surveys**

- Significant erosion was encountered at VMP's 21, 25 and 26.

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

- No changes are recommended at the present time.

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

- At Whitburn Bay, the recorded profiles present no causes for concern, with upper and middle beach levels being at a high level compared to the range recorded from previous surveys.
- At Hendon to Ryhope (incl. Halliwell Banks), the greatest amount of erosion recorded to have taken place between March 2009 and March 2020 was 11.16m at point 25 which is along the border of the landfill site. Since the last survey in November 2019, the greatest erosion has been at Point 26 (north of Pincushion Rocks at the southern extent of the cliff top survey) where the cliff edge has receded by 7.5m.
- Elsewhere at Hendon to Ryhope, the recorded profiles and cliff top surveys show no cause for concern, with profiles in the north showing accretion on the upper beach and erosion across the middle and lower beach, whilst the opposite trend is seen in the south. Beach levels are at a medium-high level compared to the range recorded from previous surveys. Cliff top erosion at the landfill site in Halliwell Banks is ongoing, with several points recording erosion greater than the survey error. In particular, VMP21, VMP25 and VMP 26 showed 3.73m, 3.26m and 7.5m erosion (respectively) since the previous survey following a cliff face slumping event (see Table B1 in Appendix B) which may require further investigation and potentially intervention.

## **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: 1bSNN1

Date: 08/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

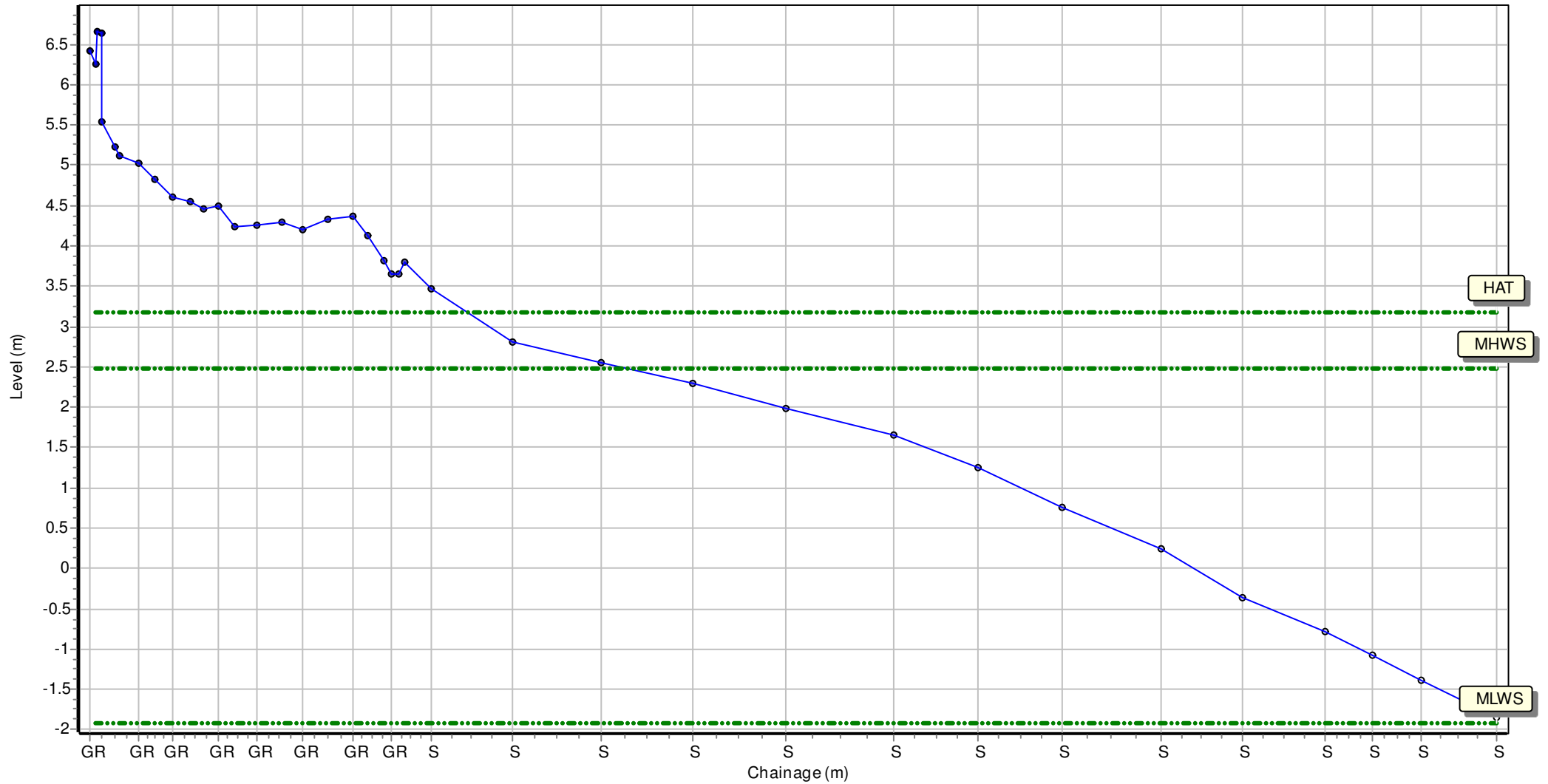
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 440797.428 Northing: 561231.249 Profile Bearing: 97 ° from North



# Beach Profile

Location: 1bSNN7

Date: 08/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

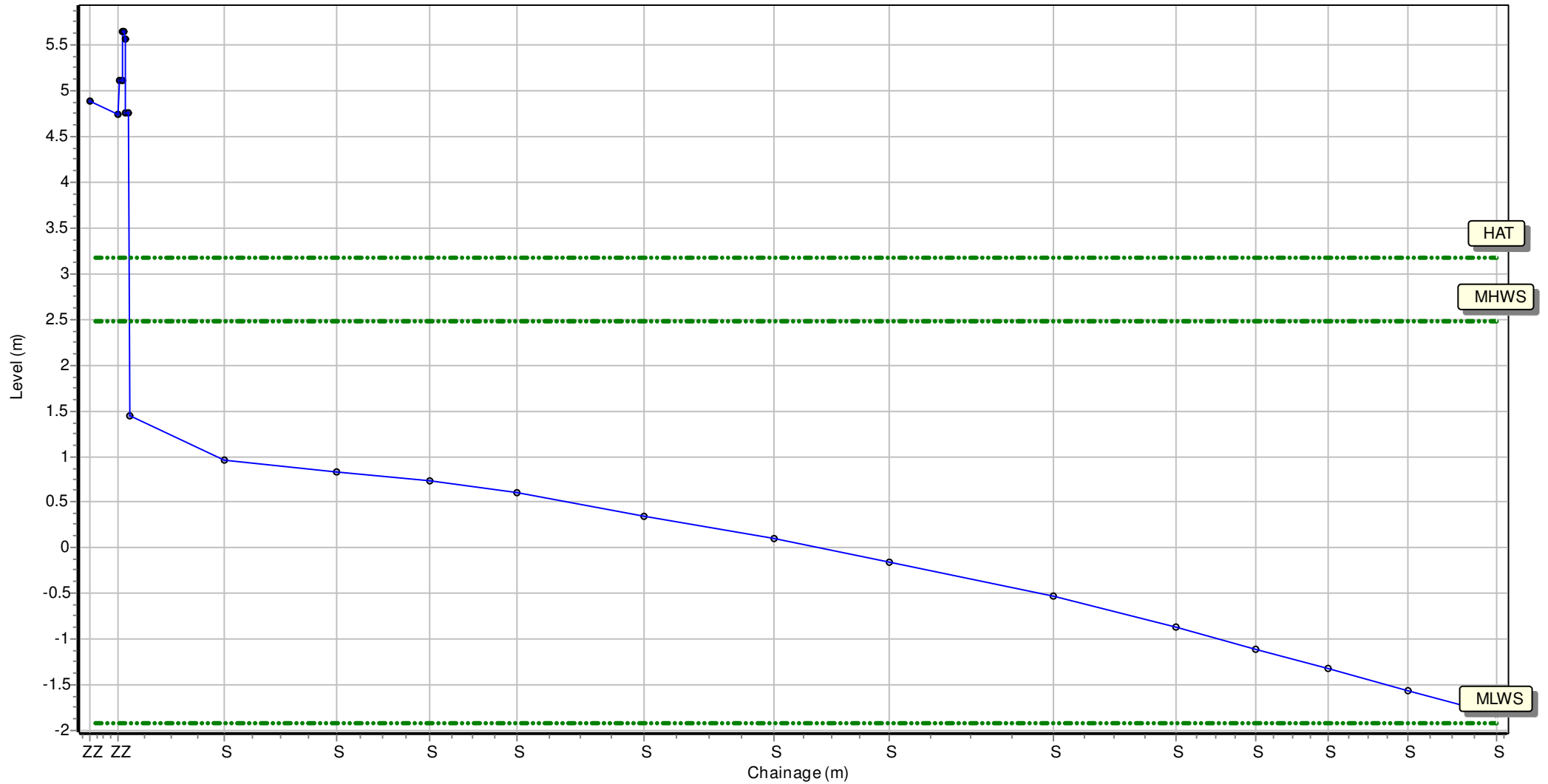
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 440623.795 Northing: 560029.932 Profile Bearing: 81 ° from North



# Beach Profile

Location: 1bSNN10

Date: 08/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

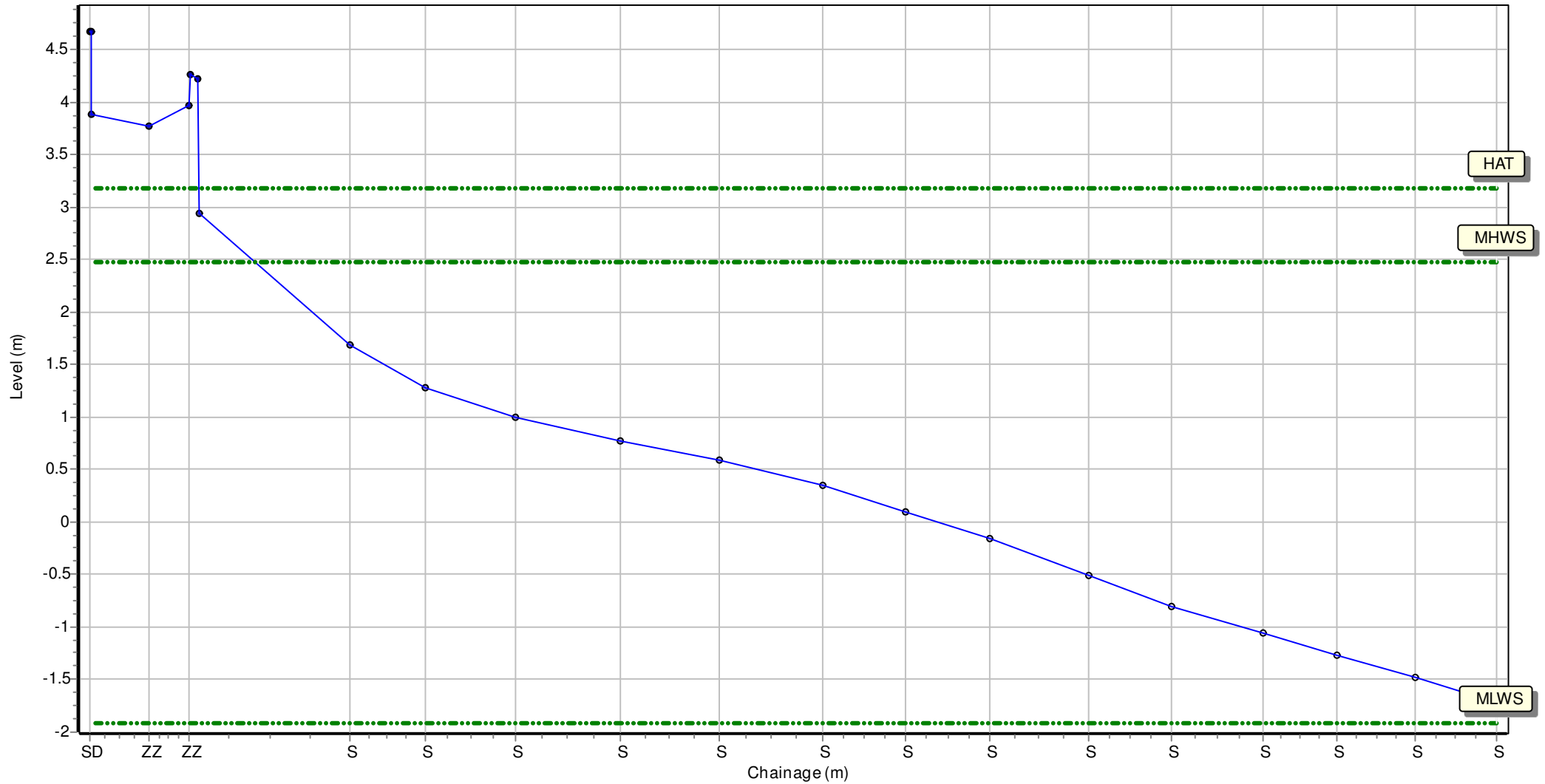
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 440728.714 Northing: 559193.372 Profile Bearing: 74 ° from North





# Beach Profile

Location: 1bSNS8

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

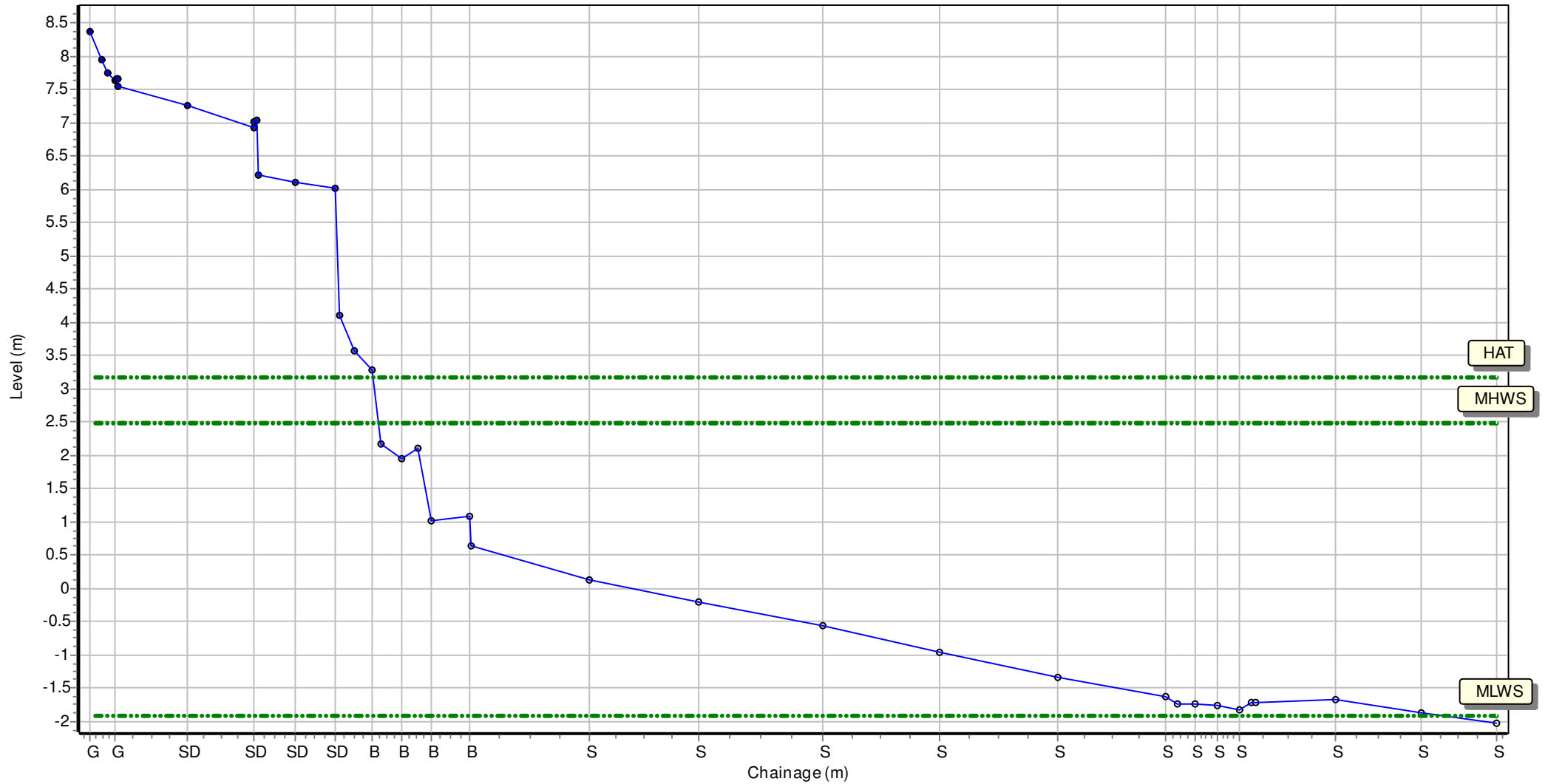
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441092.263 Northing: 555414.414 Profile Bearing: 80 ° from North



# Beach Profile

Location: 1bSNS11

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

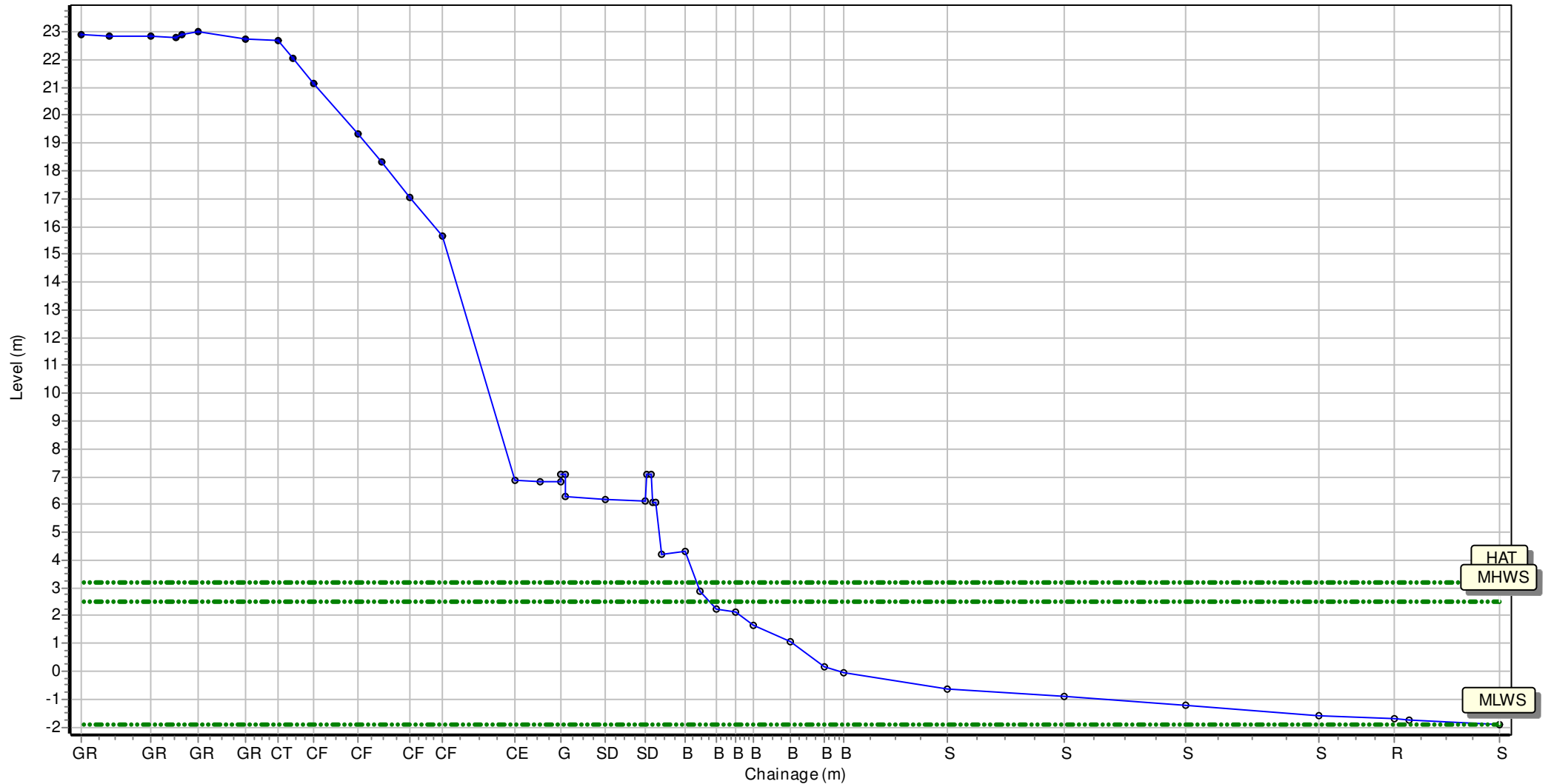
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441225.182 Northing: 554759.021 Profile Bearing: 75 ° from North



# Beach Profile

Location: 1bSNS20

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

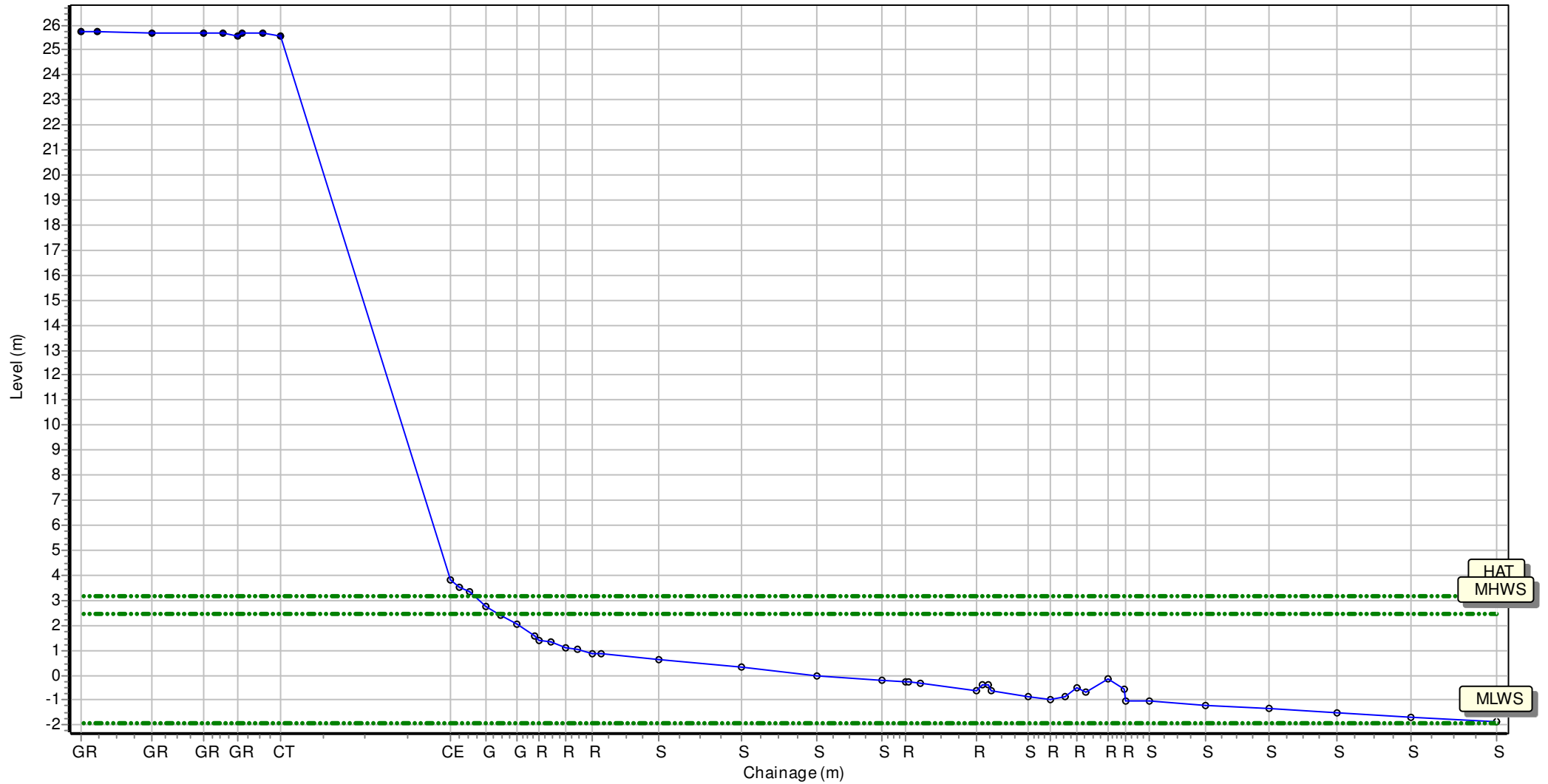
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441378.054 Northing: 553599.123 Profile Bearing: 81 ° from North



# Beach Profile

Location: 1bSNS26

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

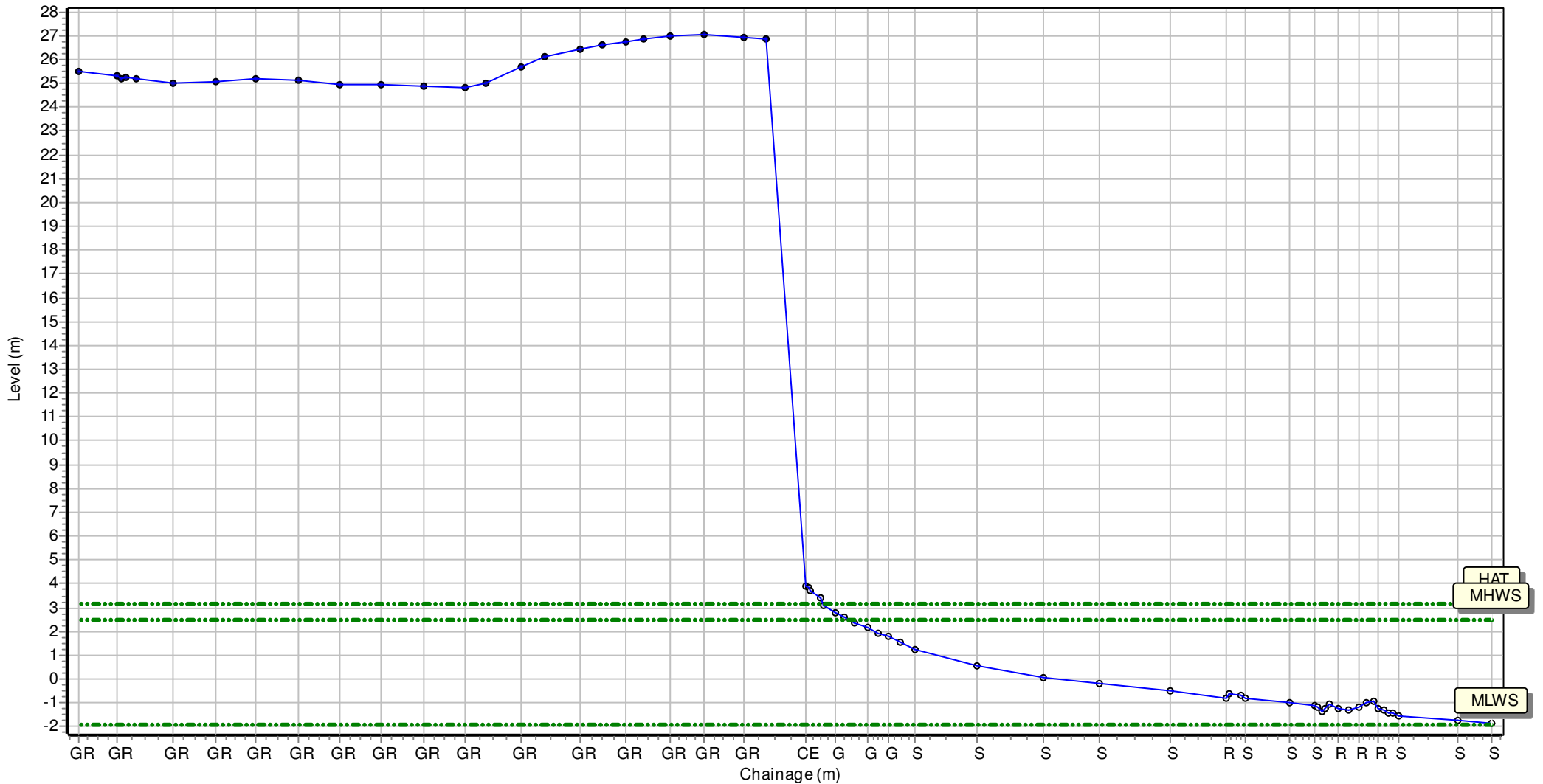
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441726.053 Northing: 552563.41 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1bSNS27

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

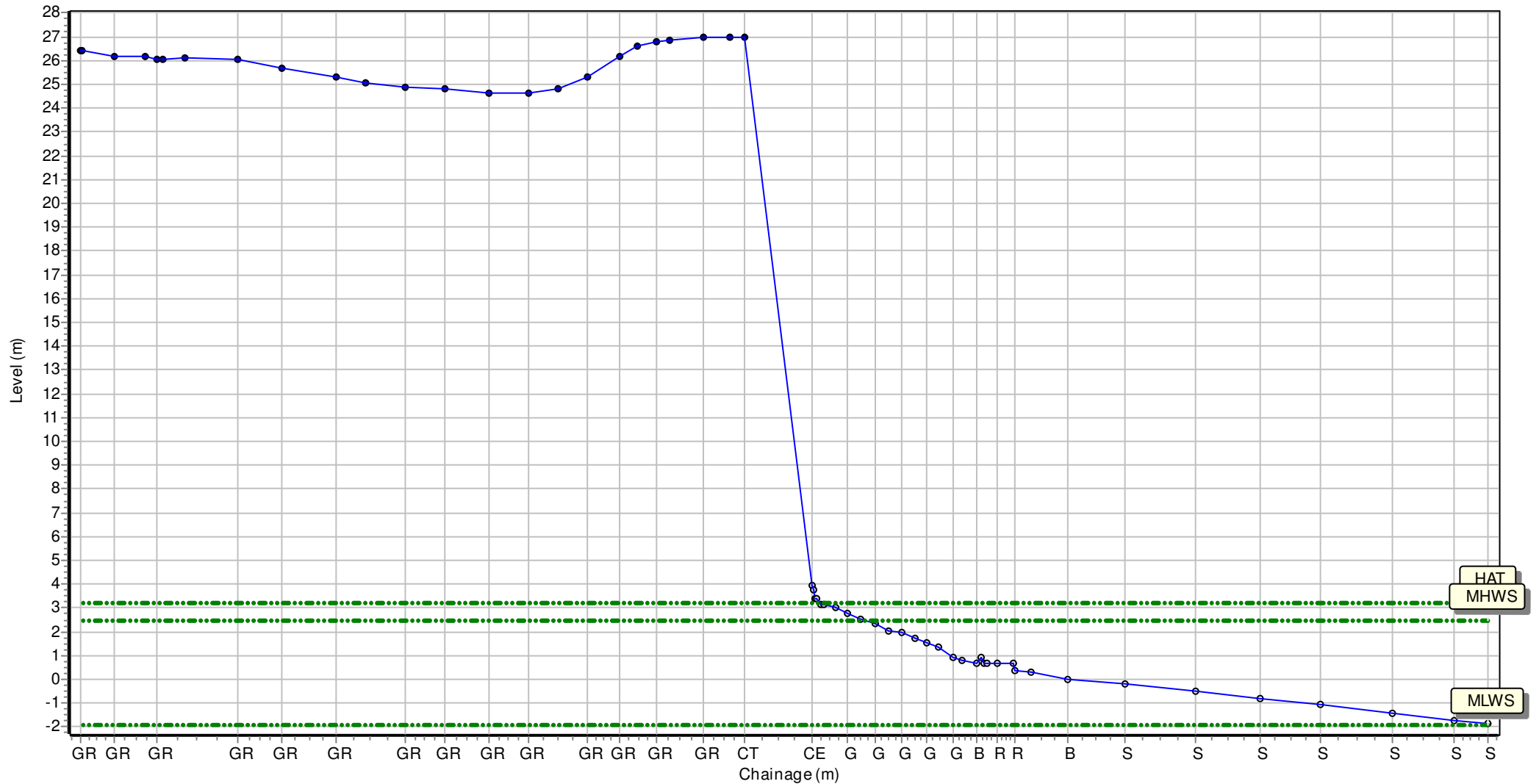
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441733.63 Northing: 552550.463 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1bSNS28

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

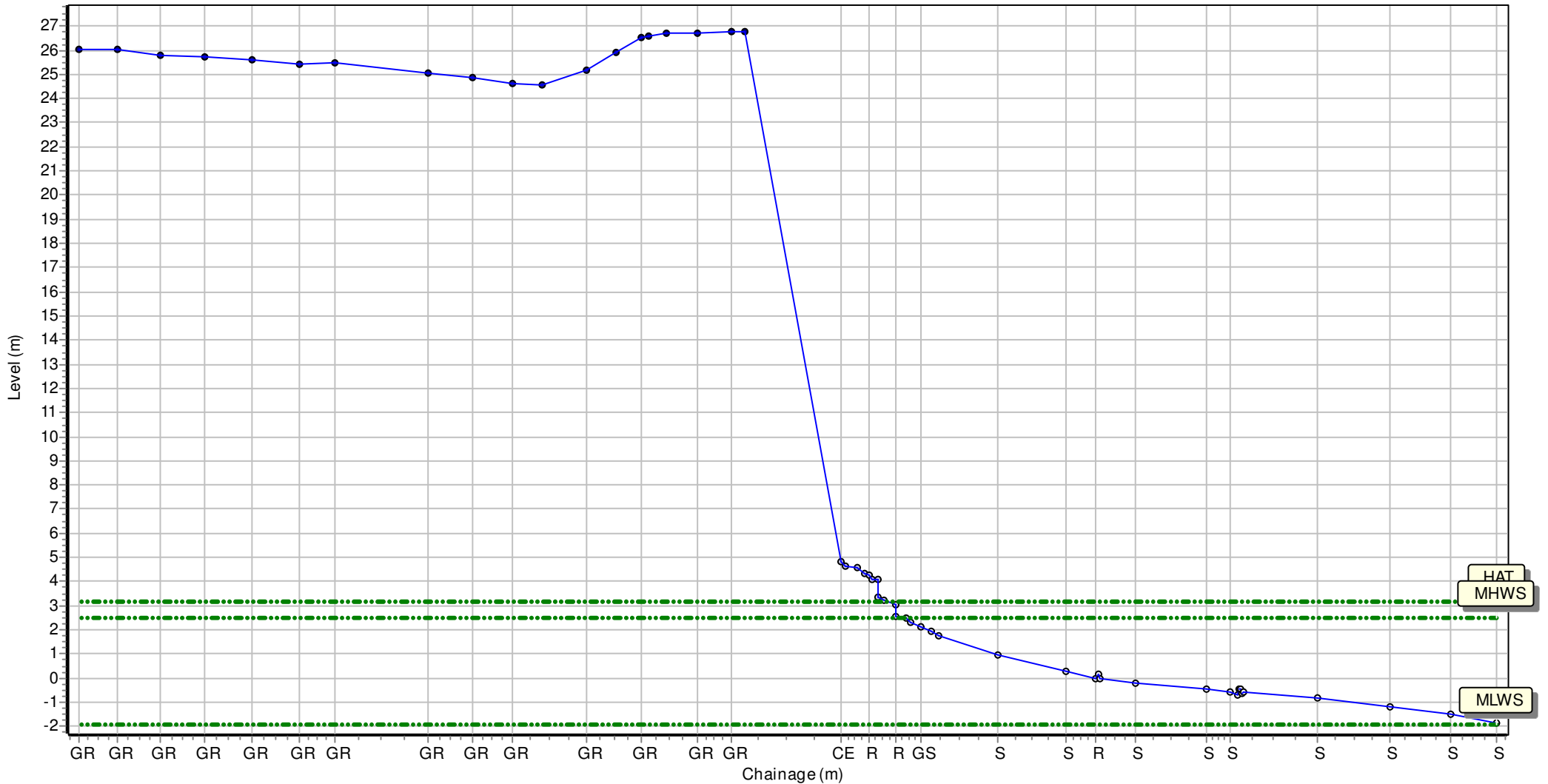
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441741.207 Northing: 552537.517 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1bSNS29

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

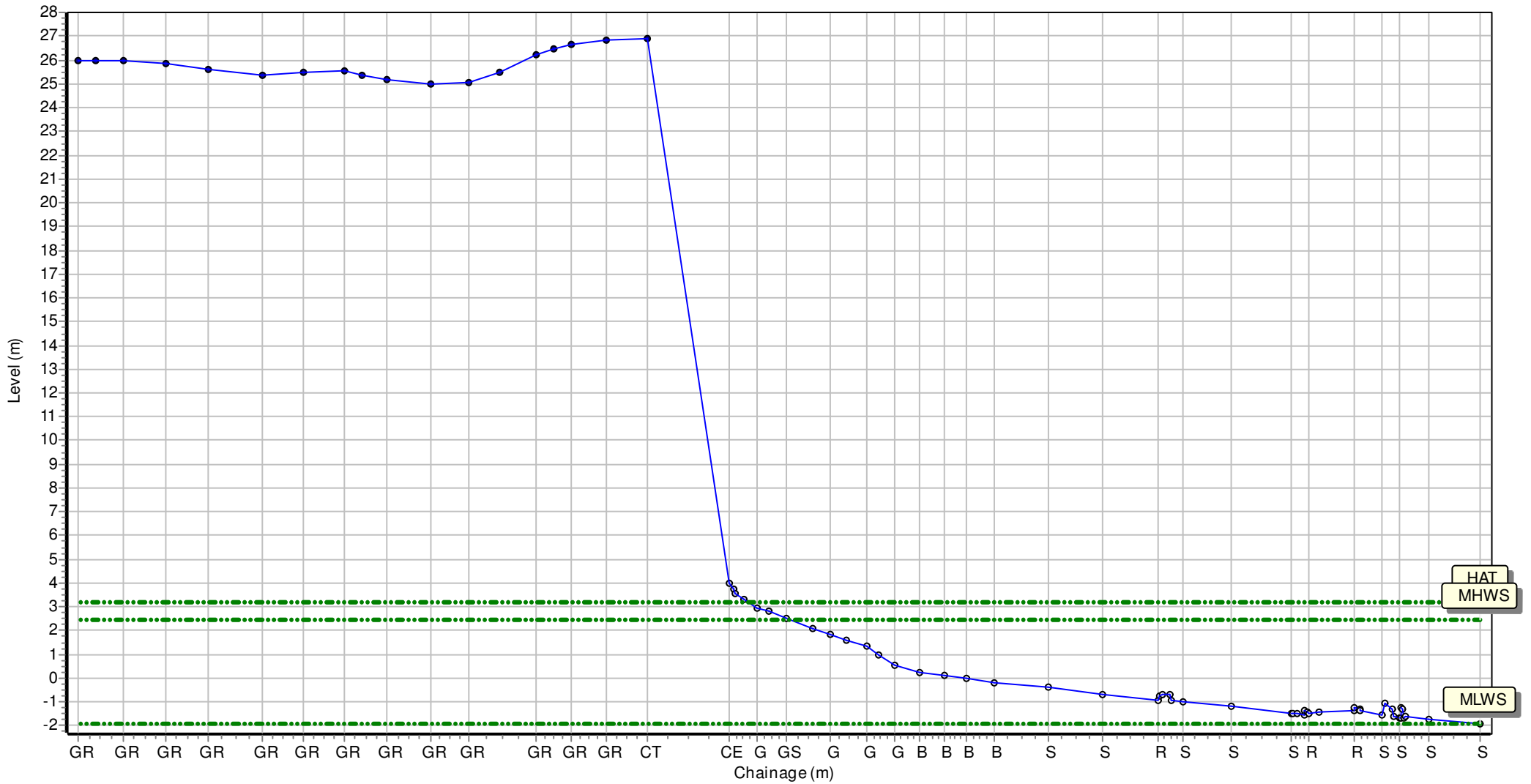
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441748.776 Northing: 552524.571 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1bSNS30

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

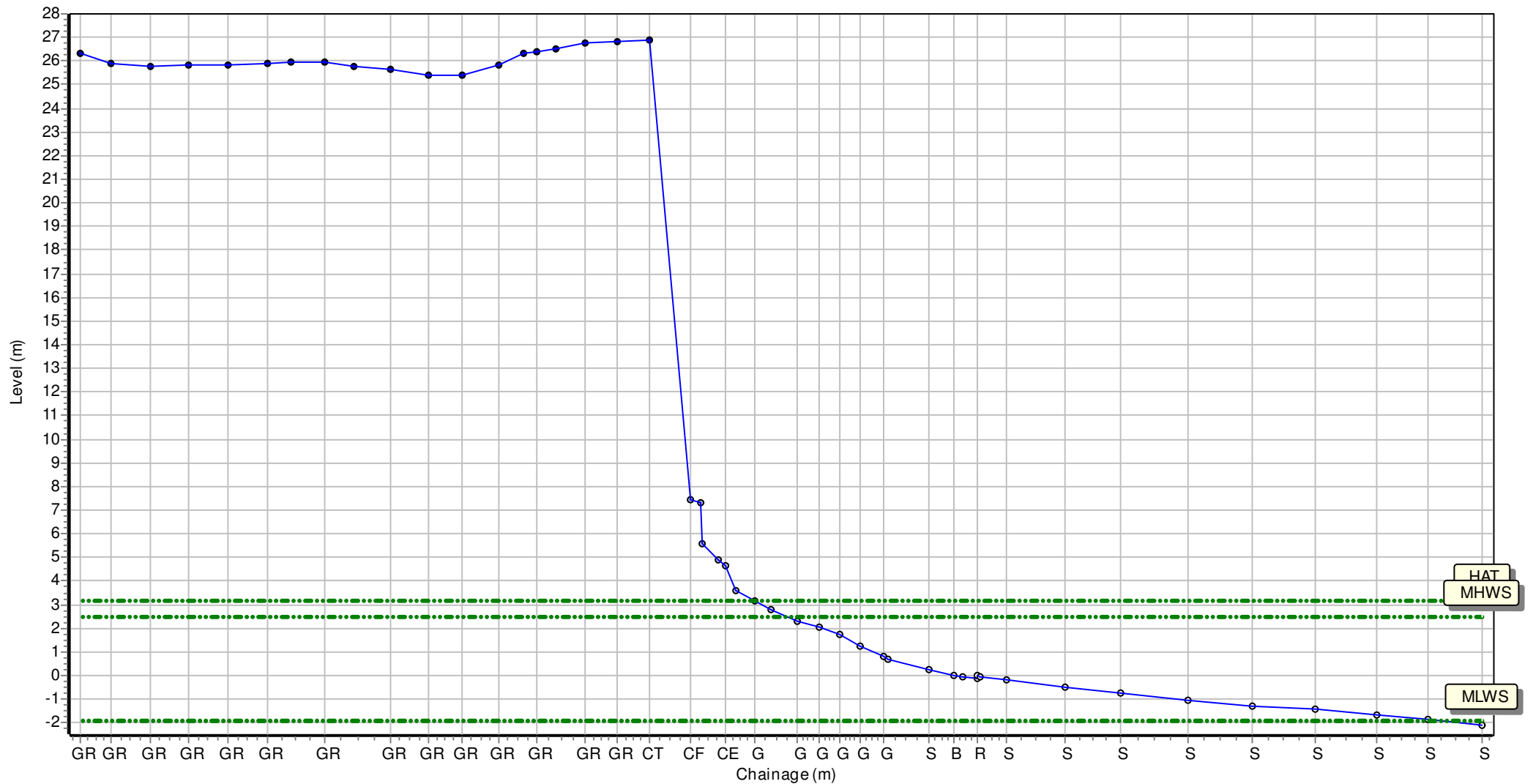
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441756.353 Northing: 552511.624 Profile Bearing: 60 ° from North





# Beach Profile

Location: 1bSNS31

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

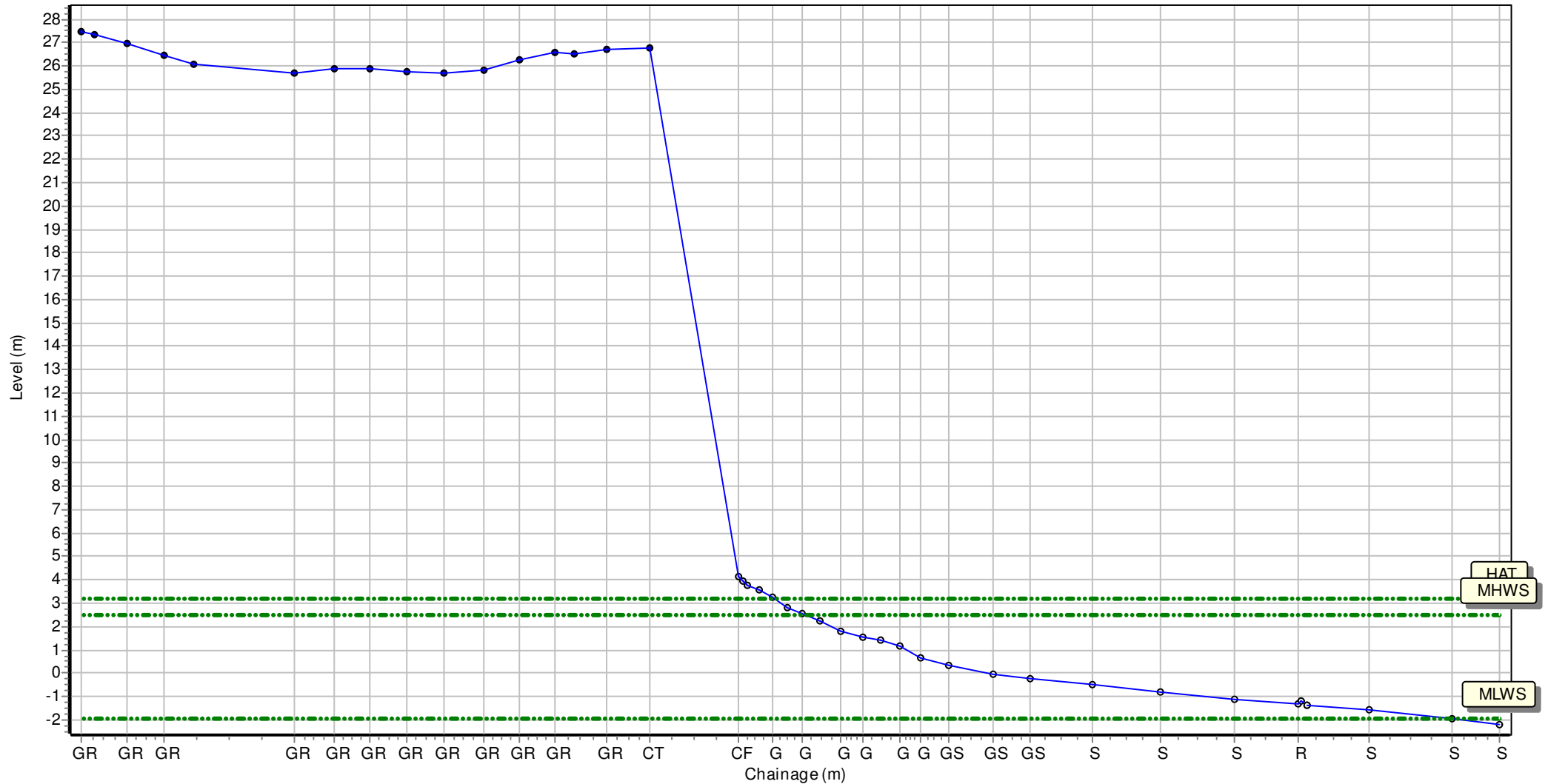
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441763.931 Northing: 552498.678 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1bSNS32

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

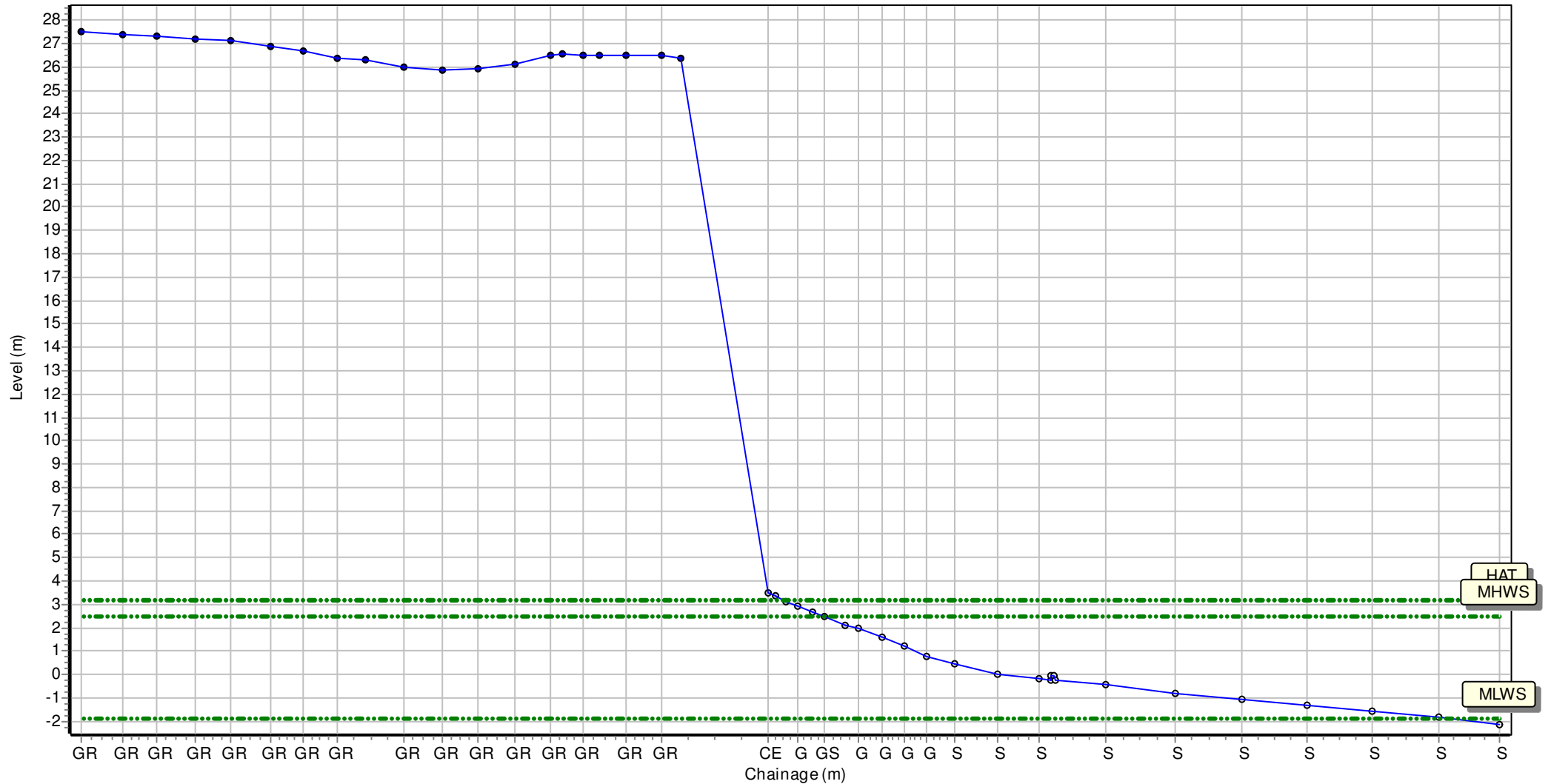
Sea State:

Visibility:

Rain:

Summary: 2020 Partial Measures Topo Survey

Easting: 441771.5 Northing: 552485.732 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1bSNS33

Date: 11/03/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

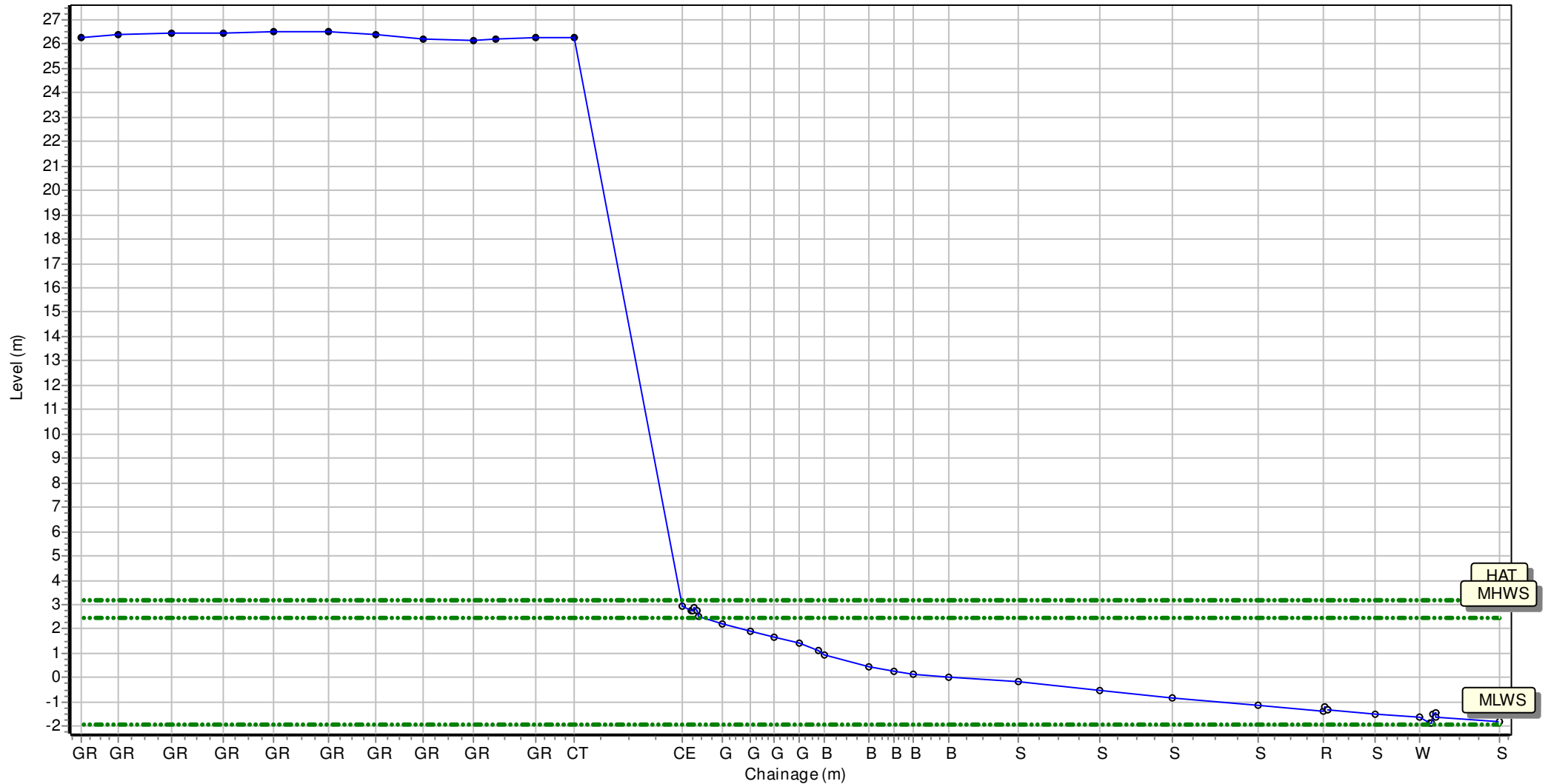
Sea State:

Visibility:

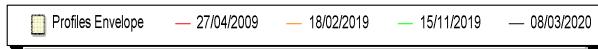
Rain:

Summary: 2020 Partial Measures Topo Survey

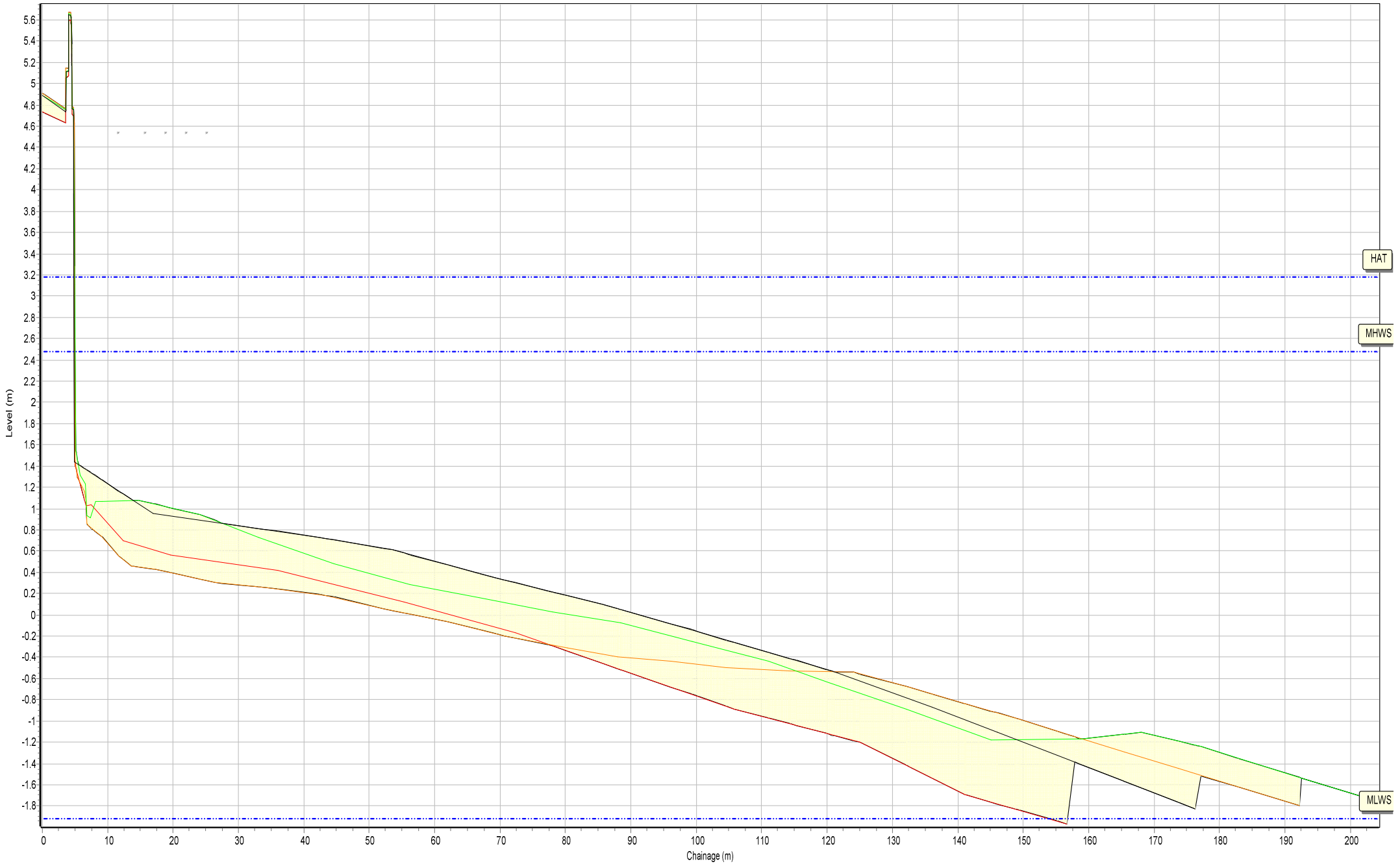
Easting: 441841.104 Northing: 552454.571 Profile Bearing: 37 ° from North



# Beach Profiles: 1bSNN1



# Beach Profiles: 1bSNN7



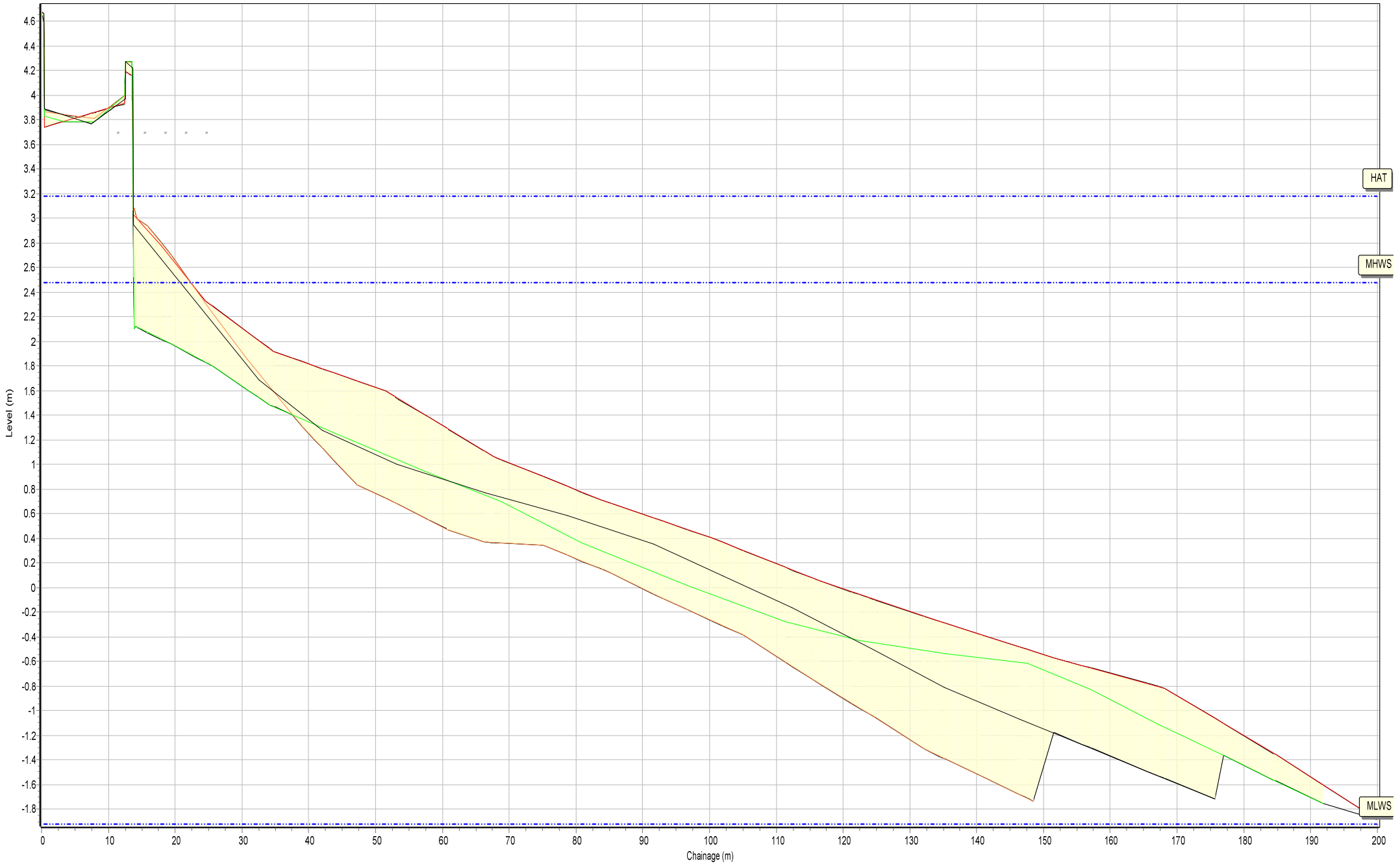
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1bSNN10



Profiles Envelope 27/04/2009 18/02/2019 15/11/2019 08/03/2020

Beach Profiles: 1bSNS8



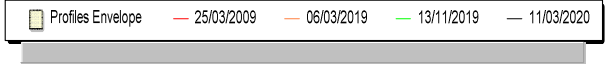
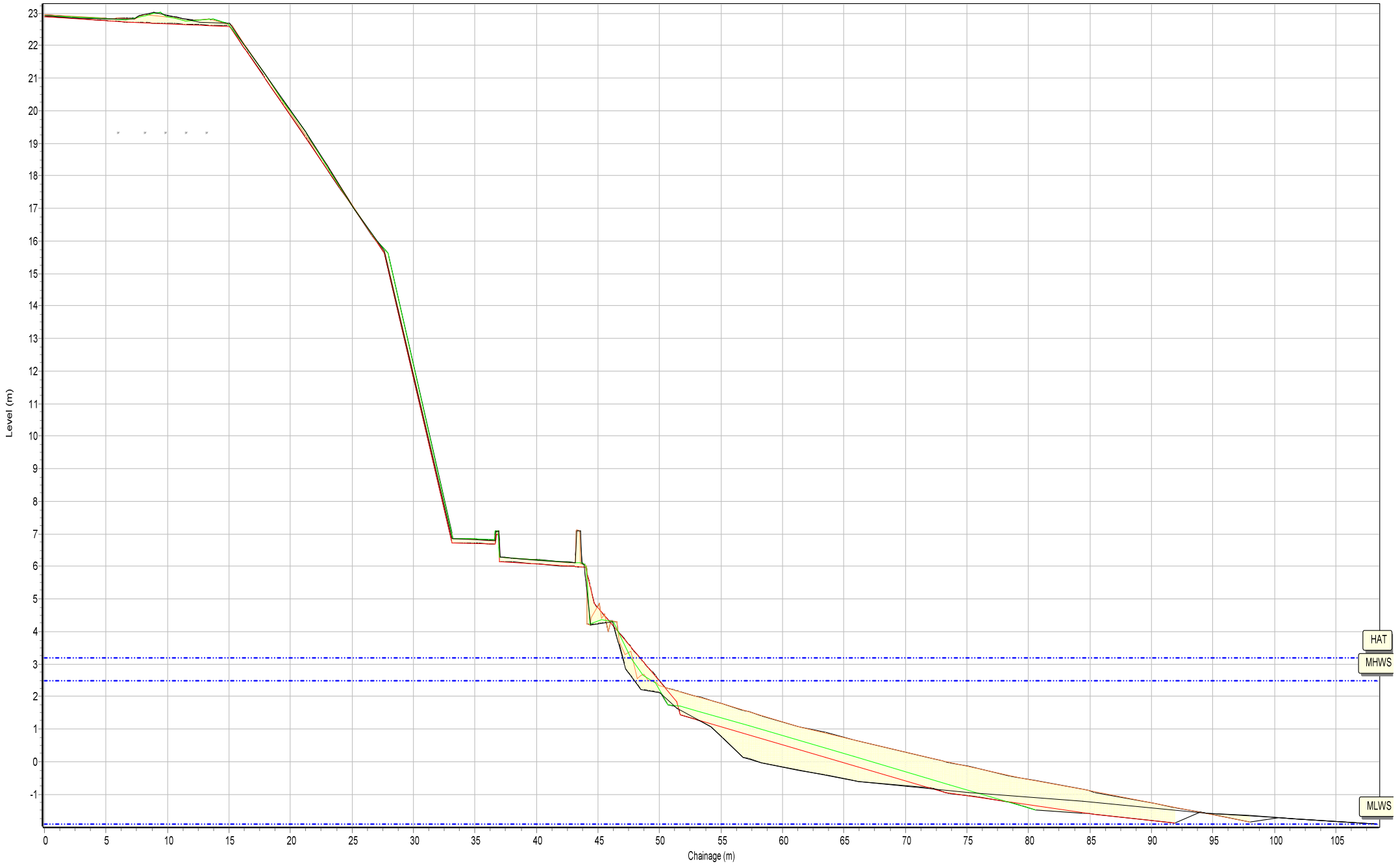
HAT

MHWs

MLWS

SANDS

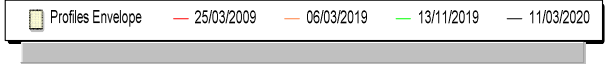
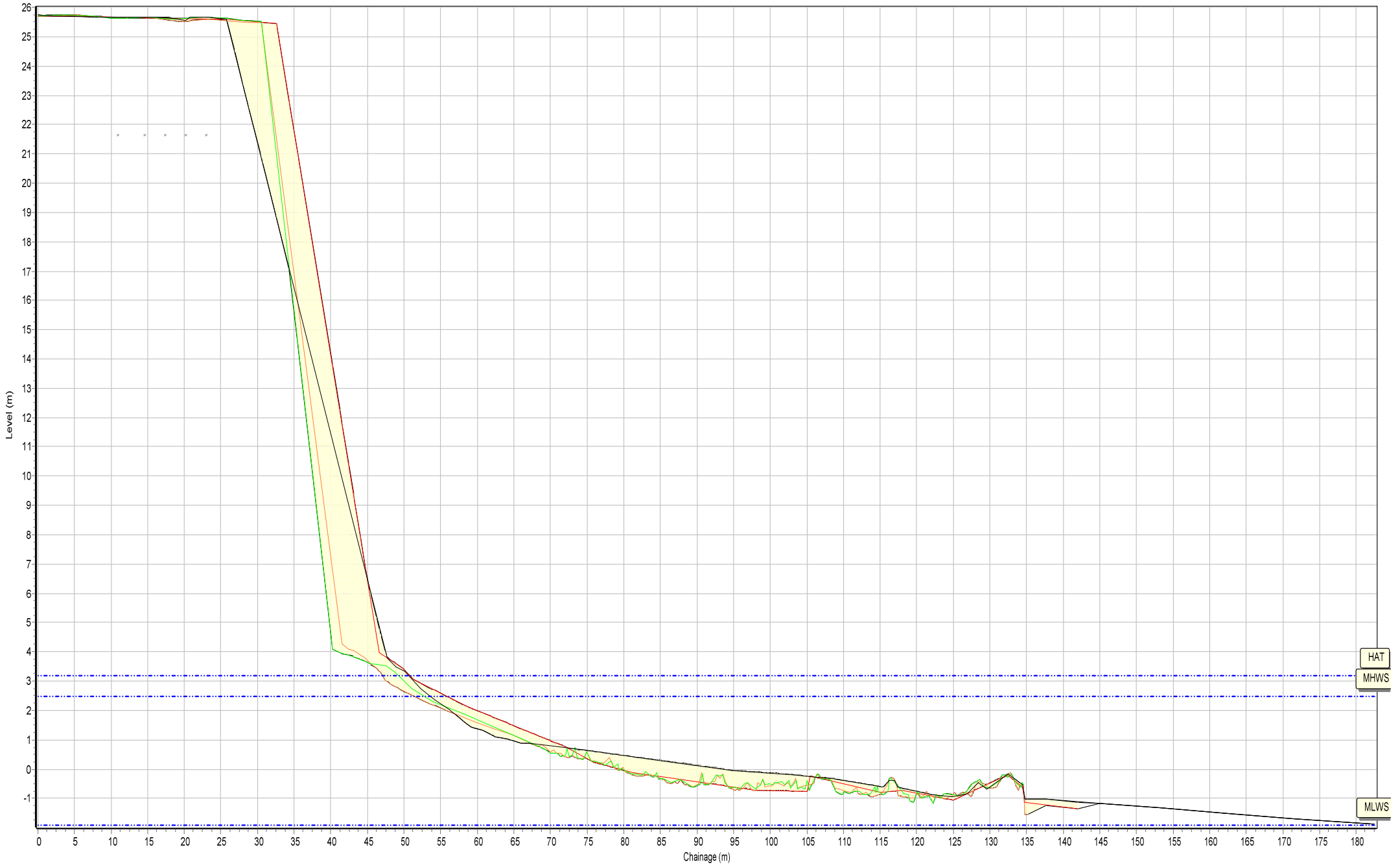
Beach Profiles: 1bSNS11



HAT  
MHWS  
MLWS



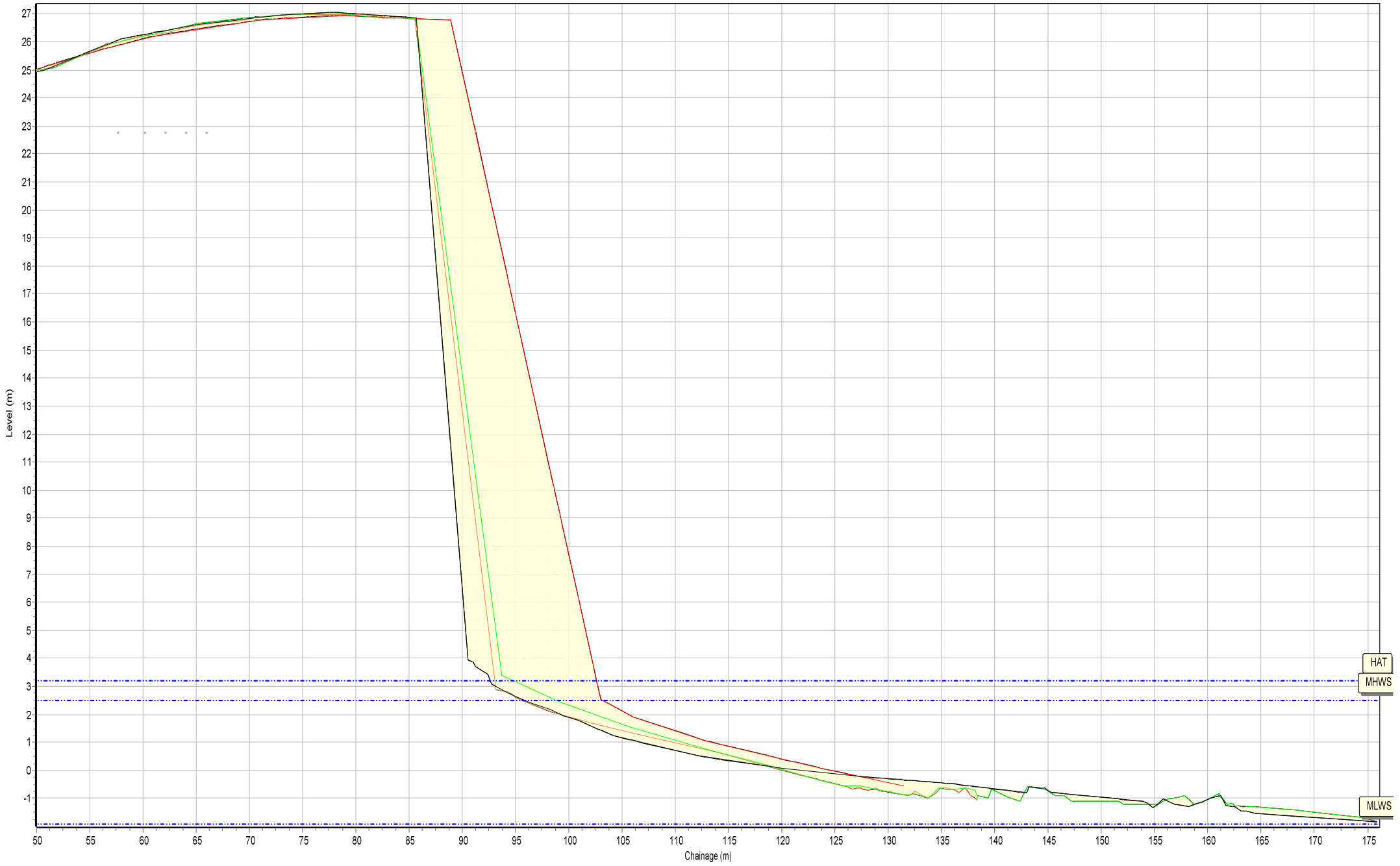
# Beach Profiles: 1bSNS20



HAT  
MHWS  
MLWS

SANDS

Beach Profiles: 1bSNS26



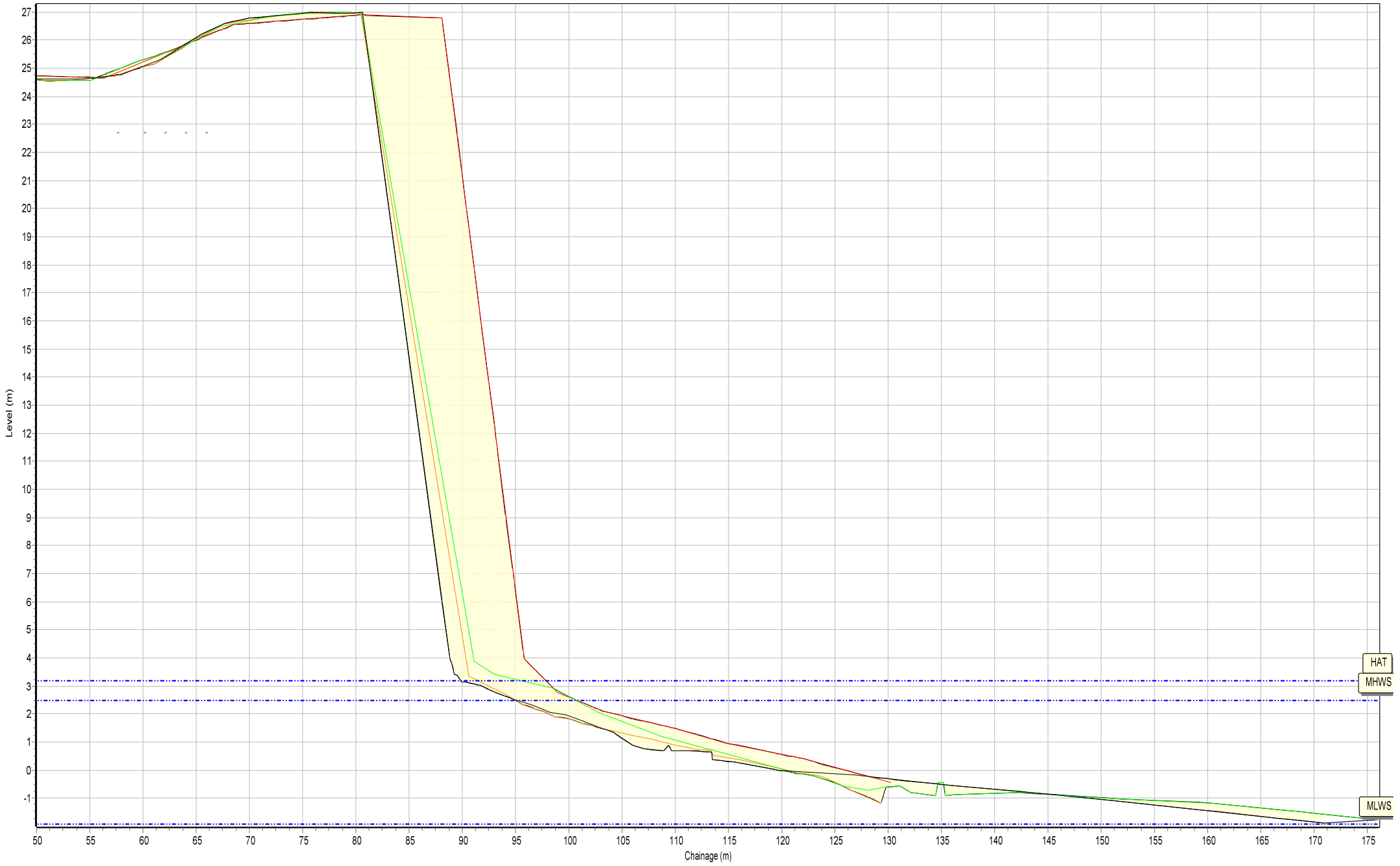
Profiles Envelope 25/03/2009 06/03/2019 13/11/2019 11/03/2020

HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1bSNS27



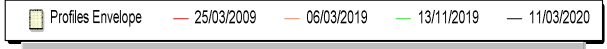
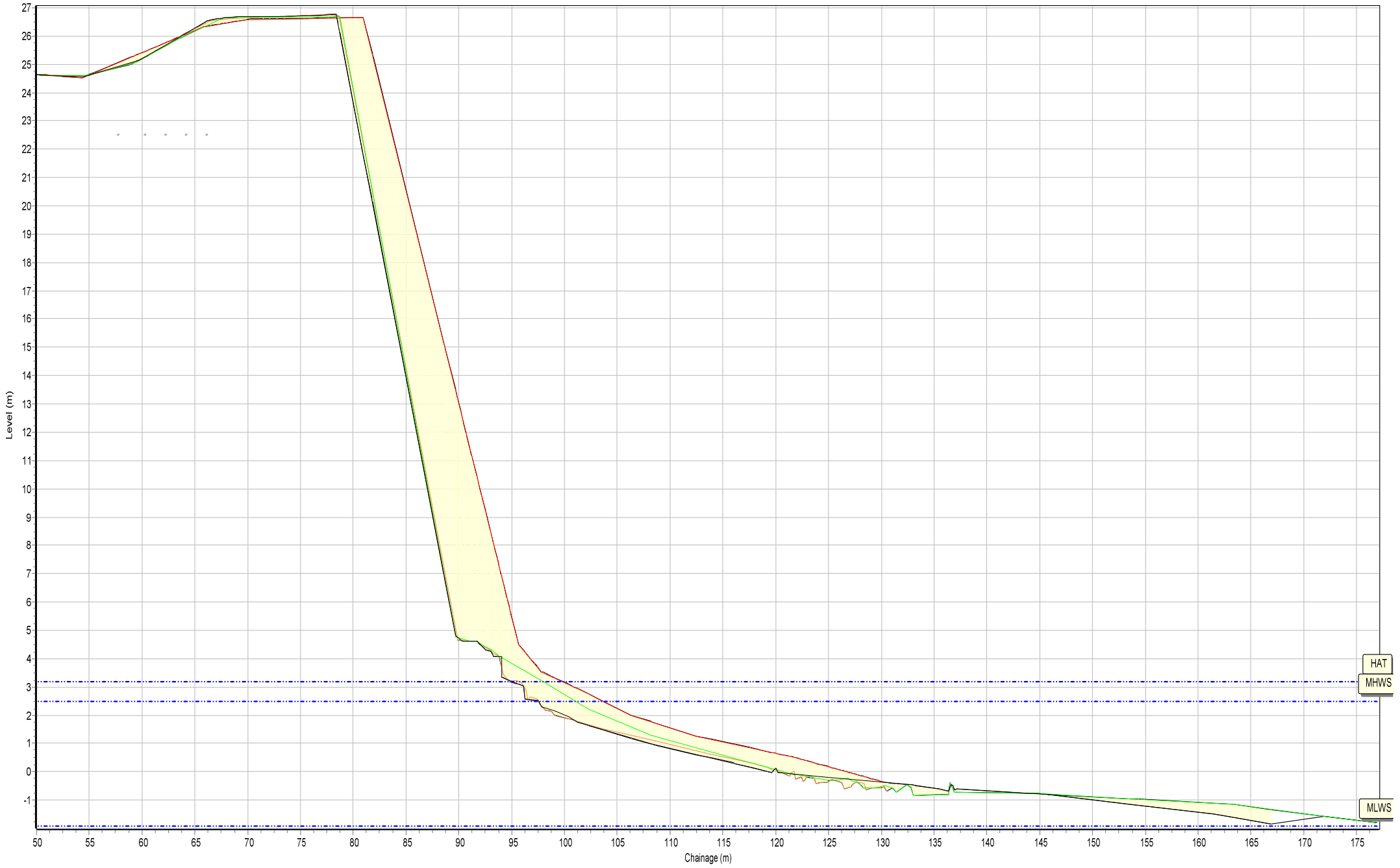
Profiles Envelope 25/03/2009 06/03/2019 13/11/2019 11/03/2020

HAT  
MHWS

MLWS

SANDS

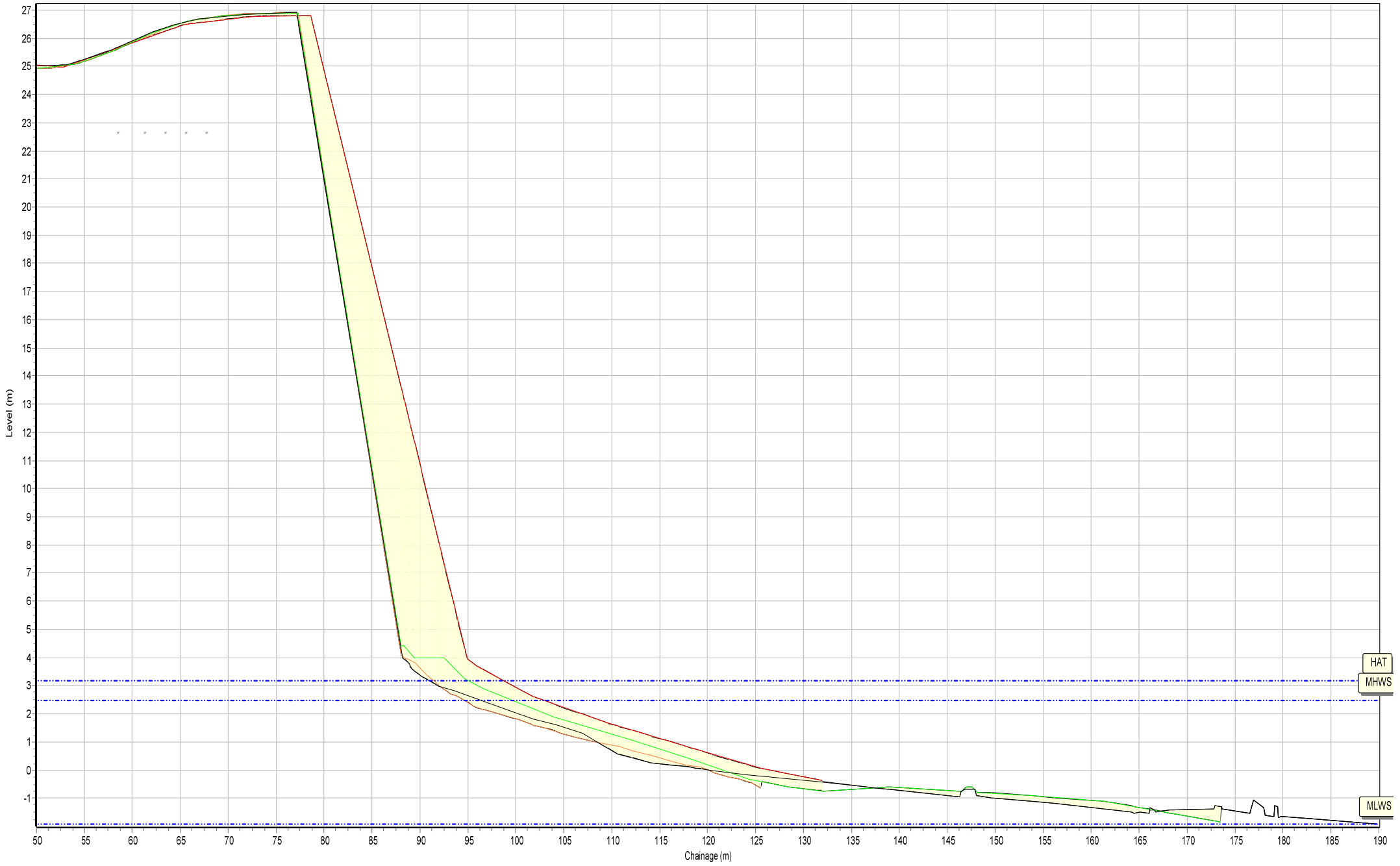
Beach Profiles: 1bSNS28



HAT  
MHWS

MLWS

Beach Profiles: 1bSNS29

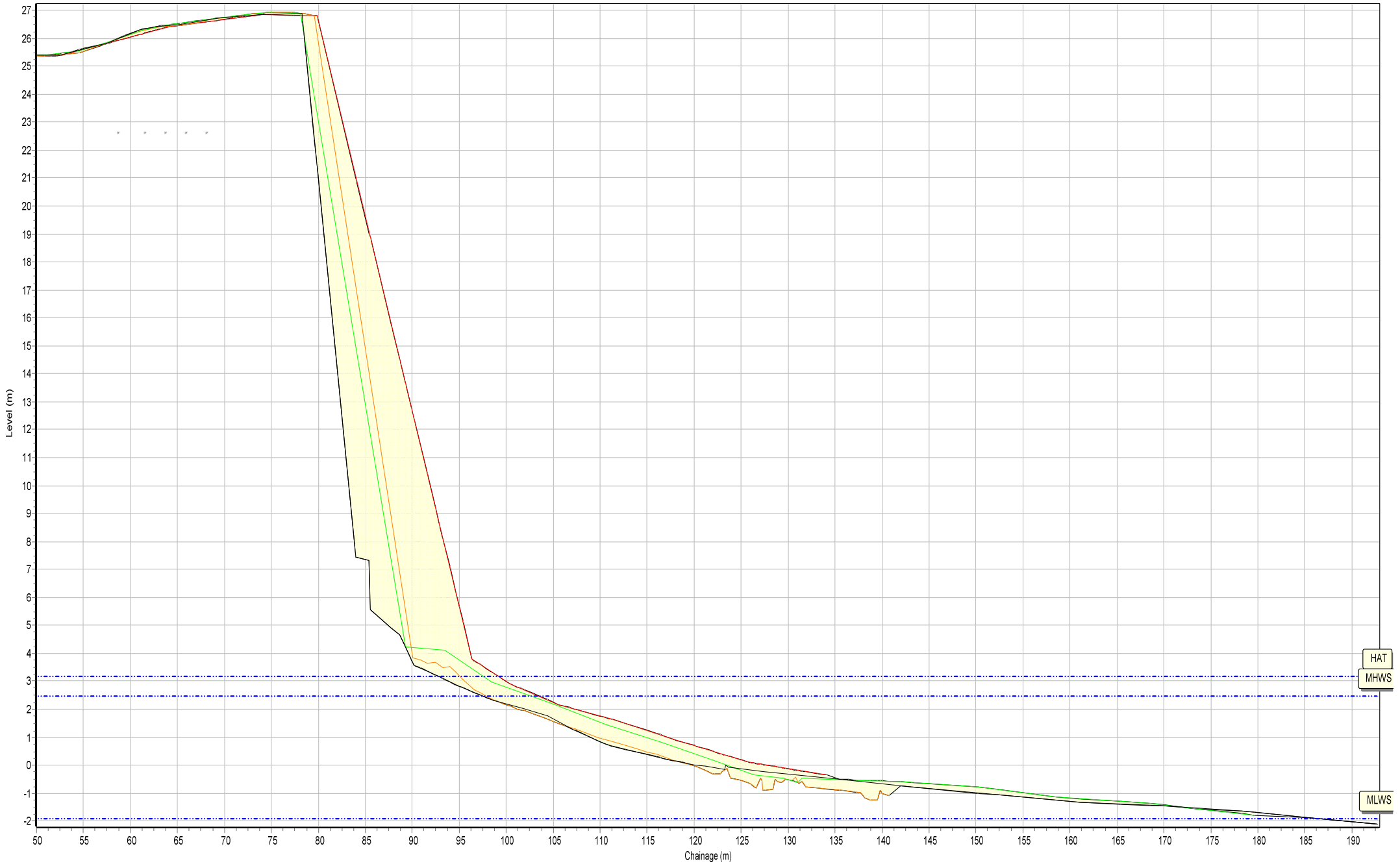


HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1bSNS30

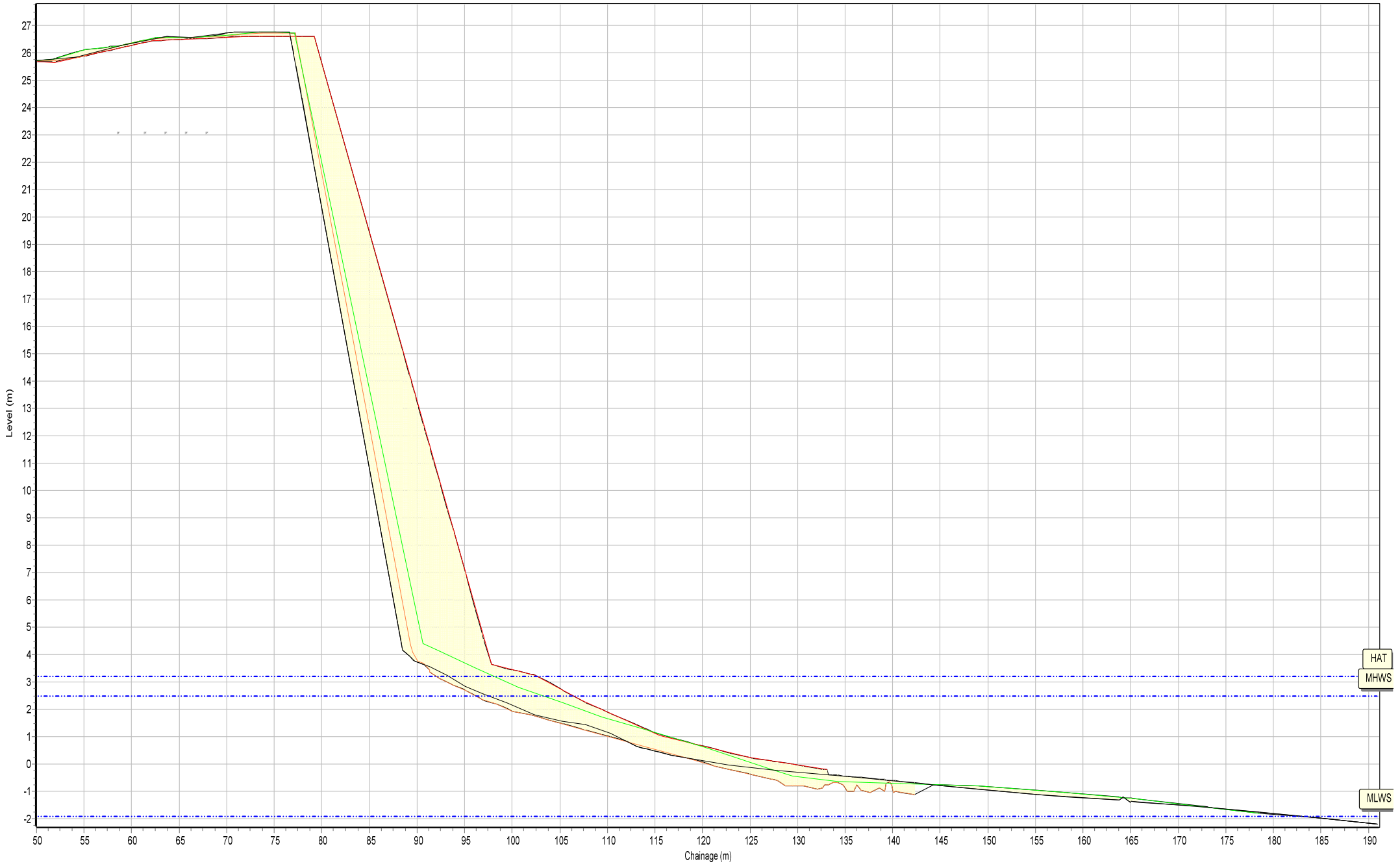


Profiles Envelope 25/03/2009 06/03/2019 13/11/2019 11/03/2020

HAT  
MHWS  
MLWS

SANDS

Beach Profiles: 1bSNS31

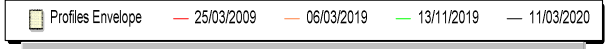


Profiles Envelope 25/03/2009 06/03/2019 13/11/2019 11/03/2020

HAT  
MHWS  
MLWS

SANDS

Beach Profiles: 1bSNS32



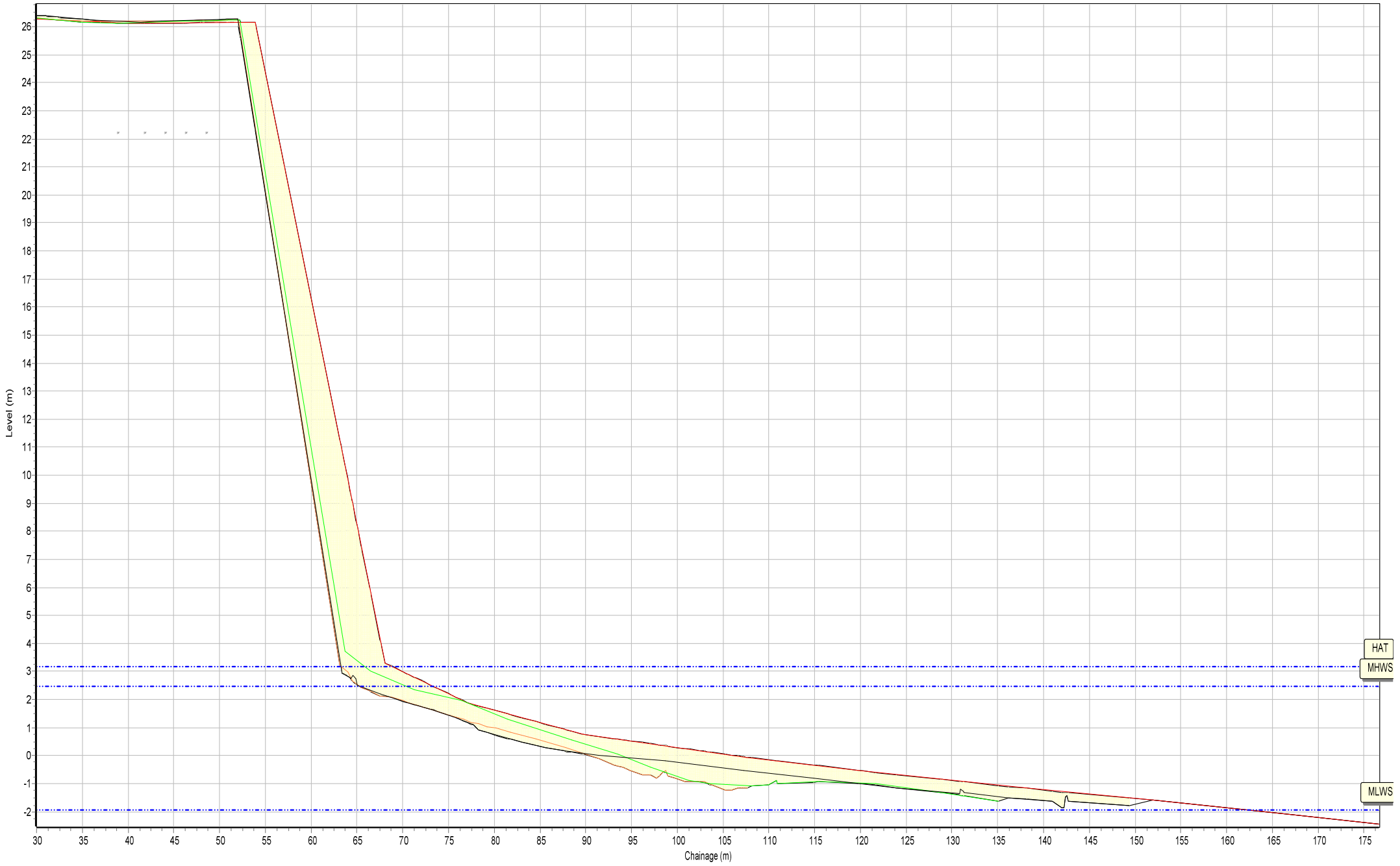
HAT  
MHWS

MLWS

SANDS



Beach Profiles: 1bSNS33



Profiles Envelope 16/09/2009 06/03/2019 13/11/2019 11/03/2020

HAT  
MHWS

MLWS

SANDS

**Appendix B**  
**Cliff Top Survey**



**Key**  
 ● Cliff Top Survey Locations

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

**Figure 3 - Map 1**  
**HENDON TO RYHOPE SOUTH**  
**Sunderland City Council**  
**Council Frontage**  
 Cliff Top Survey Locations

Drawing Scale at A4 1:10,000

**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

**Royal HaskoningDHV**  
*Enhancing Society Together*

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

## Cliff Top Survey

### Hendon and Ryhope

Thirty-two ground control points have been established between Hendon and Ryhope. The maximum separation between any two points varies along the coast, reflecting the degree of risk from the erosion.

The cliff top surveys between Hendon and Ryhope are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

Table B1 provides baseline information about these ground control points and results from the 2009 (baseline) survey showing the position from the ground control point to the edge of the cliff top along the defined bearing. Future reports will show results from subsequent surveys and provide a means of assessing erosion since the baseline survey.

**Table B1 – Cliff Top Surveys between Hendon and Ryhope**

Ground Control Points				Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Bearing	Baseline Survey	Previous Survey	Present Survey	Baseline to Present	Previous to Present	Baseline to Present
			(°)	March 2009	Nov 2019	Mar 2020	Mar 2009 - Mar 2020	Nov 2019- Mar 2020	Mar 2009 - Mar 2020
1	441025.7	555571.1	75	8.16	8.2	8.21	0.05	0.01	0.00
2	441064.4	555355.1	85	7.09	5.31	5.34	-1.75	0.03	-0.16
3	441098	555124	82	10.01	10.29	10.3	0.29	0.01	0.03
4	441174	554938.7	65	10.3	10.54	10.53	0.23	-0.01	0.02
5	441199.1	554861.1	65	7.71	10.89	10.91	3.2	0.02	0.29
6	441224.5	554774.2	71	10.83	10.89	10.86	0.03	-0.03	0.00
7	441248.4	554690.3	74	10.18	10.16	10.19	0.01	0.03	0.00
8	441259.3	554596.6	101	10.08	9.55	9.74	-0.34	0.19	-0.03
9	441275.8	554513.4	66	10.52	5.88	5.87	-4.65	-0.01	-0.42
10	441309.4	554421.3	58	8.77	1.29	1.31	-7.46	0.02	-0.68
11	441354	554346.5	68	8.2	3.63	3.58	-4.62	-0.05	-0.42
12	441400.2	554248.2	56	6.17	5.77	5.79	-0.38	0.02	-0.03
13	441452.3	554174.7	63	11.61	6.39	6.37	-5.24	-0.02	-0.48



14	441472.3	554080.5	127	7.33	6.1	6.09	-1.24	-0.01	-0.11
15	441413	554005.1	122	7.84	7.77	7.78	-0.06	0.01	-0.01
16	441384.8	553913.3	90	9.89	7.39	7.41	-2.48	0.02	-0.23
17	441404.1	553815.5	93	6.32	5.76	5.77	-0.55	0.01	-0.05
18	441404.1	553723.6	119	8.1	3.08	3.11	-4.99	0.03	-0.45
19	441398.5	553632.8	78	8.23	4.15	4.16	-4.07	0.01	-0.37
20	441438.3	553452.9	71	10.09	5.56	5.53	-4.56	-0.03	-0.41
21	441506.1	553256.1	62	8.57	1.38	-2.35	-10.92	-3.73	-0.99
22	441550.1	553158.7	103	6.57	3.24	3.3	-3.27	0.06	-0.30
23	441585.2	553076.5	64	8.11	4.73	4.45	-3.66	-0.28	-0.33
24	441624.4	552870.7	69	7.53	3.02	3.02	-4.51	0	-0.41
25	441689.1	552758	70	14.58	6.68	3.42	-11.16	-3.26	-1.01
26	441715	552713.3	54	12.87	10.37	2.87	-10	-7.5	-0.91
27	441749.2	552674.4	62	14.56	3.3	3.42	-11.14	0.12	-1.01
28	441776.6	552629.9	57	8.62	4.18	3.99	-4.63	-0.19	-0.42
28A	441798.6	552586.3	56	13.63	6.11	6.12	-7.51	0.01	-0.68
28B	441817.4	552542.4	64	12.3	9.43	9.41	-2.89	-0.02	-0.26
28C	441852.2	552502.6	52	13.11	12.42	12.42	-0.69	0	-0.06
29	441880.1	552471.6	83	15.46	15.13	15.1	-0.36	-0.03	-0.03
30	441921.4	552269	97	8.55	5.08	5.05	-3.5	-0.03	-0.32
31	441853.1	552094	75	11.2	2.39	2.36	-8.84	-0.03	-0.80
32	441883.3	551988.5	96	9.82	2.74	2.75	-7.07	0.01	-0.64

\*Note that 28a-c baseline is September 2009.