Royal HaskoningDHV
Enhancing Society Together

Cell 1 Regional Coastal Monitoring Programme
Update Report 11: 'Partial Measures' Survey 2019

South Tyneside Council

South Tyneside Council
May 2019

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 5
2.1 Littlehaven Beach 5
2.2 Herd Sands 7
2.3 Trow Quarry (incl. Frenchman's Bay) 8
2.4 Marsden Bay 10
3. Problems Encountered and Uncertainty in Analysis 11
4. Recommendations for 'Fine-tuning' the Monitoring Programme 11
5. Conclusions and Areas of Concern 11

Appendices

Appendix A Beach Profiles
Appendix B Topographic Survey
Appendix C 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

Disclaimer

Royal HaskoningDHV has prepared this report in accordance with the instructions of our client Scarborough Borough Council (SBC) for the client's sole and specific use. Any other persons who use any information contained herein do so at their own risk. Royal HaskoningDHV has used reasonable skill, care and diligence in the interpretation of data provided to them and accepts no responsibility for the content, quality or accuracy of any Third party reports, monitoring data or further information provided either to them by SBC or, via SBC from a Third party source, for analysis under this term contract.

Data and reports collected as part of the Cell 1 Regional Coastal Monitoring Programme are available to download via the North East Coastal Observatory via the webpage: www.northeastcoastalobservatory.org.uk.

The North East Coastal Observatory does not "license" the use of images or data or sign license agreements. The North East Coastal Observatory generally has no objection to the reproduction and use of these materials (aerial photography, wave data, beach surveys, bathymetric surveys, reports), subject to the following conditions:

1. North East Coastal Observatory material may not be used to state or imply the endorsement by North East Coastal Observatory or by any North East Coastal Observatory employee of a commercial product, service, or activity, or used in any manner that might mislead.

2. North East Coastal Observatory should be acknowledged as the source of the material in any use of images and data accessed through this website, please state "Image/Data courtesy of North East Coastal Observatory". We recommend that the caption for any image and data published includes our website, so that others can locate or obtain copies when needed. We always appreciate notification of beneficial uses of images and data within your applications. This will help us continue to maintain these freely available services. Send e-mail to Robin.Siddle@scarborough.gov.uk

3. It is unlawful to falsely claim copyright or other rights in North East Coastal Observatory material.

4. North East Coastal Observatory shall in no way be liable for any costs, expenses, claims, or demands arising out of the use of North East Coastal Observatory material by a recipient or a recipient's distributees.

5. North East Coastal Observatory does not indemnify nor hold harmless users of North East Coastal Observatory material, nor release such users from copyright infringement, nor grant exclusive use rights with respect to North East Coastal Observatory material.

6. North East Coastal Observatory material is not protected by copyright unless noted (in associated metadata). If copyrighted, permission should be obtained from the copyright owner prior to use. If not copyrighted, North East Coastal Observatory material may be reproduced and distributed without further permission from North East Coastal Observatory.

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 to Frenchman's Bay	Frenchman's Bay to Souter Point
HAT	2.85	2.88
MHWS	2.15	2.18
MLWS	-2.15	-2.12

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).

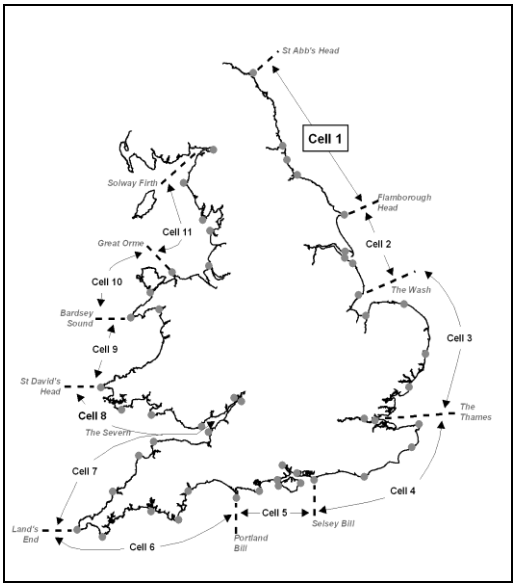


Figure 1 Sediment Cells in England and Wales

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

(*) The present report is **Update Report 11** and provides an analysis of the 2019 Partial Measures survey for South Tyneside Council's frontage.

1. Introduction

1.1 Study Area

South Tyneside Council's frontage extends from the mouth of the River Tyne Estuary to the outfall south of Whitburn. For the purposes of this report and for consistency with previous reporting, it has been sub-divided into four areas, namely:

- Littlehaven Beach
- Herd Sands
- Trow Quarry (incl. Frenchman's Bay)
- Marsden Bay

1.2 Methodology

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

- Full Measures survey annually each autumn comprising:
    - Beach profile surveys along 17 transect lines (commenced 2008)
    - Topographic survey along Littlehaven Beach (commenced 2010)
    - Topographic survey along Herd Sands (commenced 2008
    - Topographic survey along Trow Quarry (commenced 2008). Note the 2008 surveys at profiles 1bSS11, 1bSS12 and 1bSS13 were undertaken at a different location to subsequent surveys and have therefore been removed from the analysis presented here

- Partial Measures survey annually each spring comprising:
    - Beach profile surveys along 11 transect lines (commenced 2008)
    - Topographic survey along Littlehaven Beach (commenced 2010)
    - Since 2014, Partial Measures survey has also included 2 additional profiles at Littlehaven. These are measured to record the new defence and beach profiles following completion of the sea defence works.

- Cliff top survey bi-annually at:
    - Cliff top survey at Trow Quarry (incl. Frenchman's Bay) (commenced 2008)

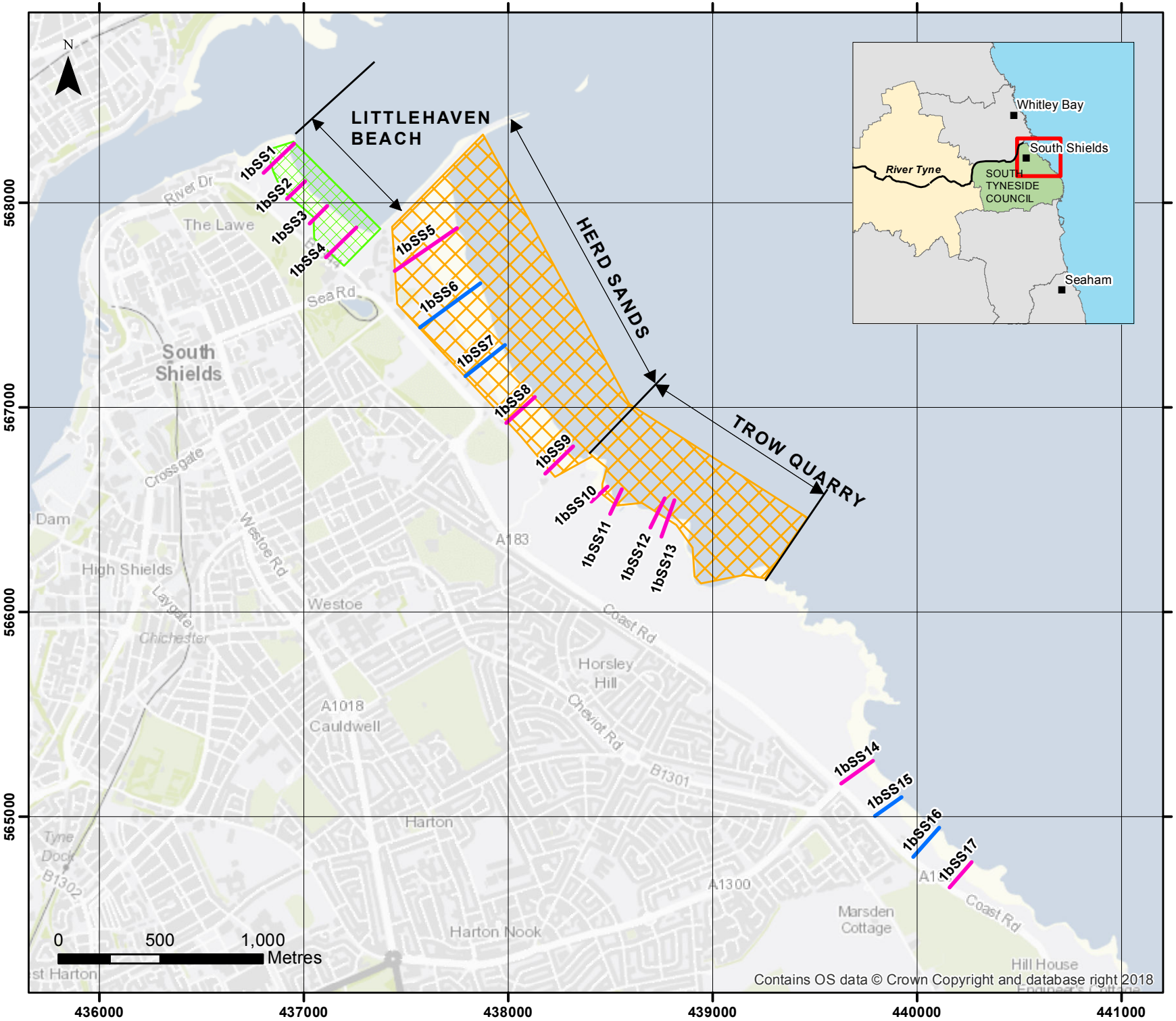
For all cliff-top surveys prior to Full Measures 2011, data was reported separately in Trow Quarry Coastal Defence Scheme - Monitoring Plan Year 2 (available from South Tyneside Council). The data was saved in '.kmz' format for plotting and comparison in GoogleEarth. For the present survey report, this data has been visualised in GIS, which revealed the quality was variable and reliable interpretations of cliff change could not be made. For this reason, the 'kmz' files are not presented or analysed as part of the present report. Therefore, cliff top survey data collected from Full Measures survey (autumn 2011) going forward is presented in this report. The location of these surveys is shown in Figure 2.

The Partial Measures survey was undertaken along this frontage between 19th February 2019 and 20th February 2019. During this time weather conditions were variable; refer to the survey reports for details of the weather conditions over this survey period.

This 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.



Contains OS data © Crown Copyright and database right 2018

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

South Tyneside Council Frontage

Analytical Report
Topo Surveys

Drawing Scale at A4 1:25,000

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

2. Analysis of Survey Data

2.1 Littlehaven Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
19-20th February 2019	**Beach Profiles:** Littlehaven Beach is covered by four beach profile lines for the Partial Measures surveys, distributed between South Groyne and South Pier (1bSS1, 1bSS2, 1bSS3 and 1bSS4). The previous survey was the Full Measures survey undertaken in November 2018 and the previous Partial Measures survey was undertaken in April 2018. Profiles 1bSS1 and 1bSS3 were last surveyed during the Partial Measures spring survey 2018. Profiles 1bSS2 and 1bSS4 were last surveyed during the Full Measures autumn survey 2018. Profile **1bSS1** is located towards the north of Littlehaven Beach, in the lee of a rocky outcrop and harbour wall. The dunes have changed little, with <0.1m accretion / erosion over the dune crest. There has been varying sections of erosion / accretion between the toe of the dunes and chainage 77m of up to ±0.3m. Between chainages 77m and 131m there has been accretion of 0.3m. Between chainage 131m and the beginning of the exposed rock at chainage 150m, there is erosion of 0.4m. Overall the dunes are high and the rest of the beach profile is at a medium level compared to the range recorded from previous surveys. Profiles **1bSS2 to 1bSS4** extend seawards from the new sea wall that was completed in 2014. At profile **1bSS2** the beach levels at the toe of the seawall have increased by up to 0.2m, up to chainage 14m. Between chainage 14m and 39m there has been a slight erosion of up the upper beach berm of up to 0.2m. Between chainages 39m and 89m, there has been accretion of up to 0.3m. Seawards of chainage 89m there has been erosion of the beach by 0.15m. The beach profile is at a medium - low level compared to the range recorded from previous surveys. At profile **1bSS3** there has been a small section of accretion between the new defences and -31m chainage of 0.15m. Between chainage -31m and 21m there has been erosion of up to 0.2m. There has been accretion on the middle beach between chainage 21m and 40m, switching to erosion seaward of chainage 40m. Changes are limited to ±0.2m. The beach profile is at a medium level compared with the	Overall there has been alternating bands of erosion and accretion across the beach. Accretion occurs at the toe of the seawall and across the middle beach, whilst erosion occurs on the upper and lower beach. Longer term trends: When compared with previous profile surveys, profiles **1bSS1** to **1bSS4** are generally at a medium level and within the bounds of previous surveys, indicating normal seasonal behaviour with no clear trend.

Survey Date	Description of Changes Since Last Survey	Interpretation
	range recorded from previous surveys. At profile **1bSS4** there has been little change, <0.1m erosion, to the upper beach between the seawall and the rock outcrop at chainage 75m. There has been erosion of up to 0.4m between the rock outcrop and chainage 94m, switching to a small section of accretion (0.15m) between chainages 94m and 111m. Seaward of chainage 111m, the beach has eroded by up to 0.1m. Overall the beach is at a relatively low level compared to the range recorded from previous surveys.	
Feb 2019	**Topographic Survey:** Littlehaven Beach is covered by bi-annual topographic survey between the South Groyne and the South Pier, which commenced in March 2010. Data from the most recent topographic survey (Partial Measures, spring 2019) have been used to create a DGM (Appendix B – Map 1) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 2) produced from the last produced topographic survey (Full Measures, autumn 2018) and the present survey. The difference plot shows a clear a pattern of change across the beach, which reflects the beach profile data. The plots show, in general terms, alternating bands of change, which extend from north to south, and comprise: (i) a band of little change / accretion parallel to the new defences; (ii) a narrow band of erosion in the upper beach; (ii) a wide band of accretion in the middle beach; and (iii) a narrow band of little change in the lower beach, progressing to a patch of erosion in the south of the beach. The pattern of alternating bands of erosion and accretion suggests cross-shore movements of sediment. The dunes at the northern end of the bay generally remained stable.	The pattern of beach elevation change observed from the topographic difference plot indicates distinct areas of erosion and accretion, associated with migration of sand bars across the beach face.

2.2 Herd Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
19-20th February 2019	**Beach Profiles:** Herd Sands is covered by three beach profile lines for the Partial Measures survey (Appendix A). The previous survey was the Full Measures survey undertaken in autumn 2018. Profile **1bSS5** is located towards the northern end of Herd Sands, in the lee of the breakwater. Sand fences were constructed on the dunes in 2012 to encourage accretion and stabilisation. Overall, the dunes showed very little change, however there was an accumulation of up to 0.4m infilling the hollow between chainage 88m and 96m. Between chainages 96m and 149m there was erosion of up to 0.2m across the upper beach. A berm has formed on the middle beach at chainage 160m, with an accumulation of up to 0.8m of sediment, however there is very little change up to chainage 220m. Seaward of chainage 220m, there is erosion across the lower beach by up to 0.6m. The dunes remain at a high level, whilst the rest of the beach is at a medium-low level compared to the range recorded from previous surveys. Profile **1bSS8** is located to the south of Herd Sands. The beach elevation has increased by up to 0.6m between the seaward edge of the tarmac promenade at 4m chainage and 45m chainage. Between 45m and 132m chainage the level of the beach face has reduced by up to 0.4m, creating a steeper profile. Seaward of 132m the beach toe appears to have experienced accretion of up to 0.4m. The beach profile is at a medium level compared to the range recorded from previous surveys. Profile **1bSS9** is located to the south of Herd Sands where dunes have remained stable since the previous survey. There has been erosion at the toe of the dunes to chainage 31m of up to 1.4m. The upper beach (chainages 31m to 64m) and lower beach (201m to 166m) have undergone accretion by up to 0.5m. In the middle beach, there has been erosion of 0.1m. Overall the dunes are at a high level, except at the toe which is at its most landward position recorded. The upper and middle beach is at a medium level, whilst the lower beach is at a high level compared to the range recorded from previous surveys.	Since the last survey, the dunes at Herd Sands have, on the whole remained stable, with some accretion. To the north of Herd Sands, the upper and lower beach has eroded, with a berm forming on the middle beach. The dunes have remained stable. To the south of Herd Sands, the upper beach and lower beach has accreted, whilst the middle beach has eroded. The dune toe at profile 1bSS9 is at its most landward position recorded. **Longer term trends:** On the whole, the beach is within the range of levels seen in earlier surveys.

2.3 Trow Quarry (incl. Frenchman's Bay)

Survey Date	Description of Changes Since Last Survey	Interpretation
19-20th February 2019	**Beach Profiles:** Trow Quarry is covered by four beach profile lines for the Partial Measures survey (Appendix A), two in Graham's Sand and two in Southern Bay. The previous survey was the Full Measures survey undertaken in autumn 2018. Profiles **1bSS10** and **1bSS11** are located in Graham's Bay. At profile **1bSS10,** there has been very little change across the profile, with a small amount of erosion seaward of chainage 89m (0.15m). Overall the profile is at a low level compared to the range recorded from previous surveys, particularly at the toe of the beach seaward of chainage 89m which is at its lowest level recorded. At profile **1bSS11**, the beach profile has remained stable since the previous survey. Profiles **1bSS12** and **1bSS13** are located in Southern Bay. At both locations the beach profile has remained stable since the previous survey.	Since the last survey at Graham's Bay and Southern Bay the cliff, rock revetment and upper boulder/cobble rocky beach have, on the whole, remained stable. However, there has been a decrease in elevation of the beach toe at 1bSS10. In Southern Bay, there is no change evident from the profiles, but the presence of cobble-sized beach material in the gaps between rock armour blocks (evident in the survey photographs) indicates sufficient wave energy to move this material. **Longer term trends:** At both Graham's Bay and Southern Bay the beach levels are within the range of levels seen in previous surveys, indicating changes are within typical seasonal variation.
Feb 2019	**Cliff-top Survey:** Cliff top survey data collected for the baseline survey (autumn, 2011), Full Measures survey (autumn, 2018) and the present Partial Measures survey (spring, 2019) is presented in this report. Six ground control points (numbered 1-6) were established along the cliff top at Trow Point in 2011 to monitor cliff erosion at the headland adjacent to the site of a former landfill. Note: the numbering of ground control points is not intended to correlate with that of the beach profile lines and reference should be made to Appendix C – Map 1 for the location of ground control points. These cliff top surveys are undertaken bi-annually. Measurements are taken from each ground control point along a fixed bearing to the edge of the cliff top. The results from the cliff top monitoring are anticipated to have an accuracy of ±0.2m due to the technique used. The results from the cliff top survey are presented in Appendix C – Table C1, showing the position from the ground control point to	Since the last survey, point 5 experienced erosion greater than the survey error, with 0.35m of erosion recorded. **Longer term trends:** Very limited change has been detected since surveys began in November 2011.

Survey Date	Description of Changes Since Last Survey	Interpretation
	the edge of the cliff top along a defined bearing. Results show that since the last survey in November 2018, only one point (5) experienced erosion greater than the survey error (0.35m). No change greater than the survey error has been recorded over the long term.	

2.4 Marsden Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
19-20th February 2019	**Beach Profiles:** Marsden Bay is covered by two beach profile lines for the Partial Measures survey (Appendix A). The previous survey was the Full Measures survey undertaken in autumn 2017. Profile **1bSS14** is located to the north of the bay and covers the cliffs and former lifeguard station adjacent to the Redwell Steps. The cliff top section could not be surveyed due to unsafe ground conditions. There has been a small amount of accretion at the base of the steps of 0.4m. Seaward of chainage 117m there has been erosion of up to 0.8m, exposing rocks between chainage 146m and 157m. Overall the upper and middle beach profile is at a medium level compared to the range recorded from previous surveys, whilst the lower beach is relatively low. Profile **1bSS17** is located to the south of the bay. There has been apparent recession of 2.0m at the cliff toe where the cliff is undercut, although it is possible that this is an artefact of the survey techniques. The upper beach between the cliff toe and 80m chainage has decreased in elevation by up to 0.4m. Seaward of 80m chainage the rocky beach and shore platform has not changed. Overall the profile is at a low level compared to the range recorded from previous surveys.	At profiles **1bSS14** the beach has steepened in response to winter/spring storm conditions. The beach at profile **1bSS17** shows 2.0m of recession at the cliff toe. However, this result should be treated with caution as it may relate to redistribution of sediment from the undercut cliff toe **Longer term trends:** At profile **1bSS14** and **1bSS17** the beach levels are within the bounds of previous changes, indicating fluctuating seasonal or interannual behaviour with no particular trend.

3. Problems Encountered and Uncertainty in Analysis

Individual Profiles / Topographic Survey

- A section of cliff face could not be surveyed at profile 1bSS14 due to ground conditions being unsafe.

Cliff Top Surveys

- Surveying any cliff top is difficult due to the need for a consistent interpretation of the cliff edge in successive surveys, which can be challenging, especially when vegetation is thick. For these reasons, it has been assumed that any changes of ±0.2m may be considered as being within the accuracy of the surveying technique and that any indication of an advancing cliff line is error.

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

No changes are recommended at the present time.

5. Conclusions and Areas of Concern

- At Littlehaven Beach, the recorded profiles and topographic survey present no causes for concern. Overall the upper and lower beach has eroded, whilst the middle beach has accreted. There has also been accretion at the toe of the seawall at all profiles except 1bSS4. The profiles present no cause for concern.
- At Herd Sands, profile 1bSS5 in the north undergoes erosion on the upper and lower beach, with accretion on the middle beach. To the south, profiles 1bSS8 and 1bSS9 undergo accretion on the upper and lower beach (except at the toe of the dunes at profile 1bSS9, which is at its most landward position recorded), and erosion across the middle beach. The recorded profiles present no causes for concern.
- At Trow Quarry, the recorded profiles present no causes for concern. The cliffs to the north west of Trow Headland appear to have been generally stable, however at point 5 there has been erosion greater than the survey error recorded (0.35m). The data does not indicate cause for concern.
- At Marsden Bay, the recorded profiles present no causes for concern.

Appendices

Appendix A

Beach Profiles

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

Code	Description
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

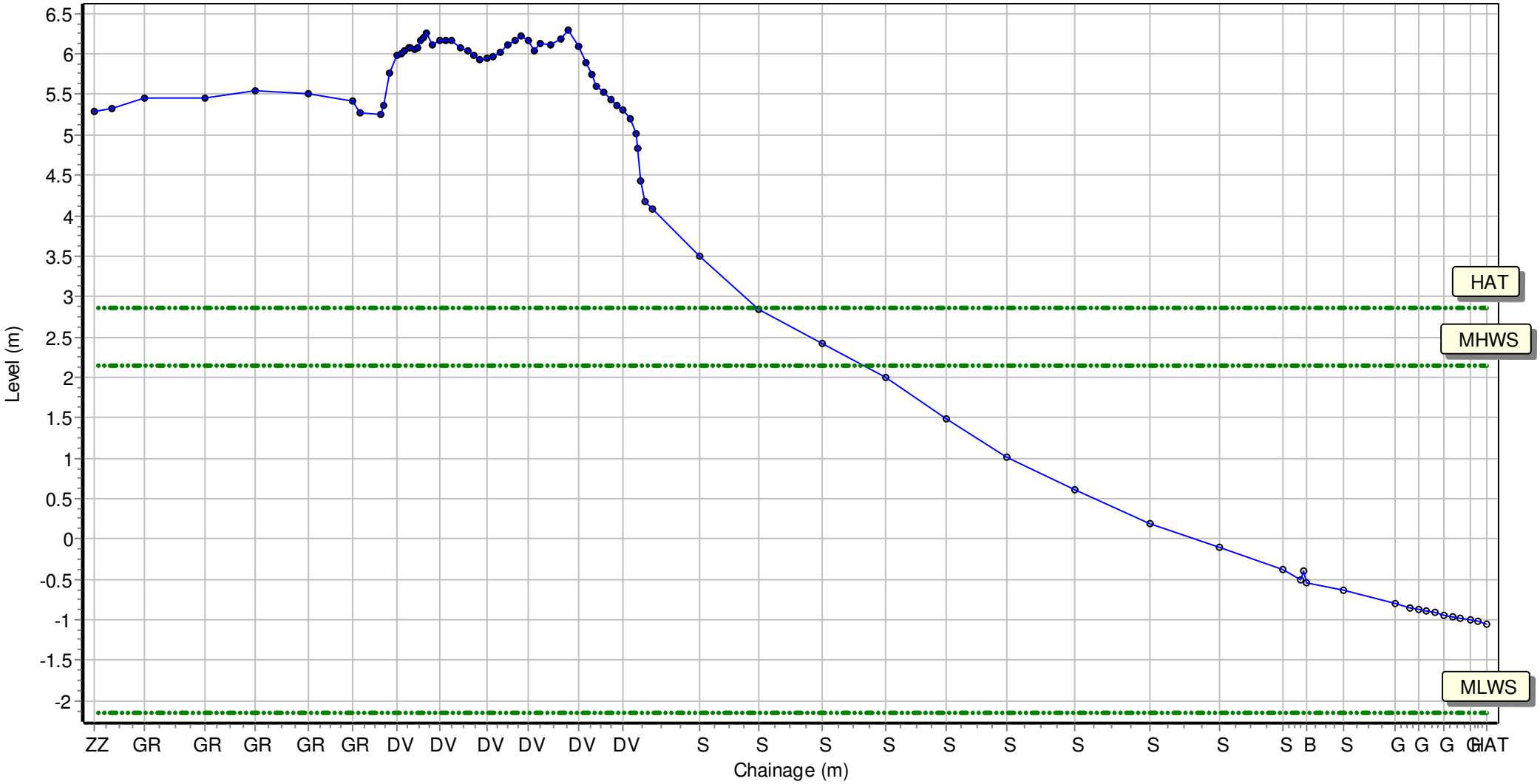
Location: **1bSS1**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 436810.004 **Northing:** 568148.06 **Profile Bearing:** 45 ° from North



Beach Profile

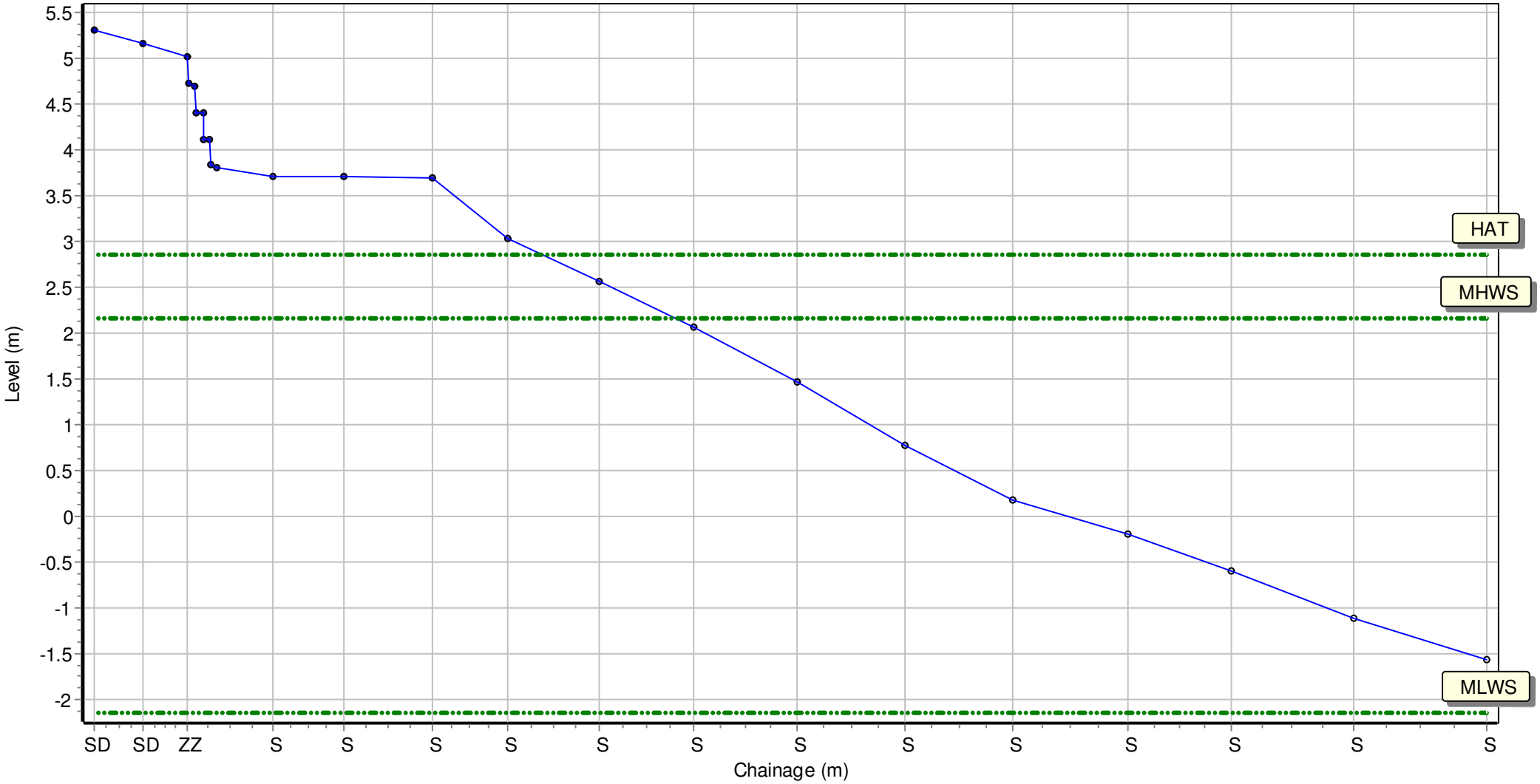
Location: **1bSS2**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 436919.706 **Northing:** 568022.387 **Profile Bearing:** 46 ° from North



Beach Profile

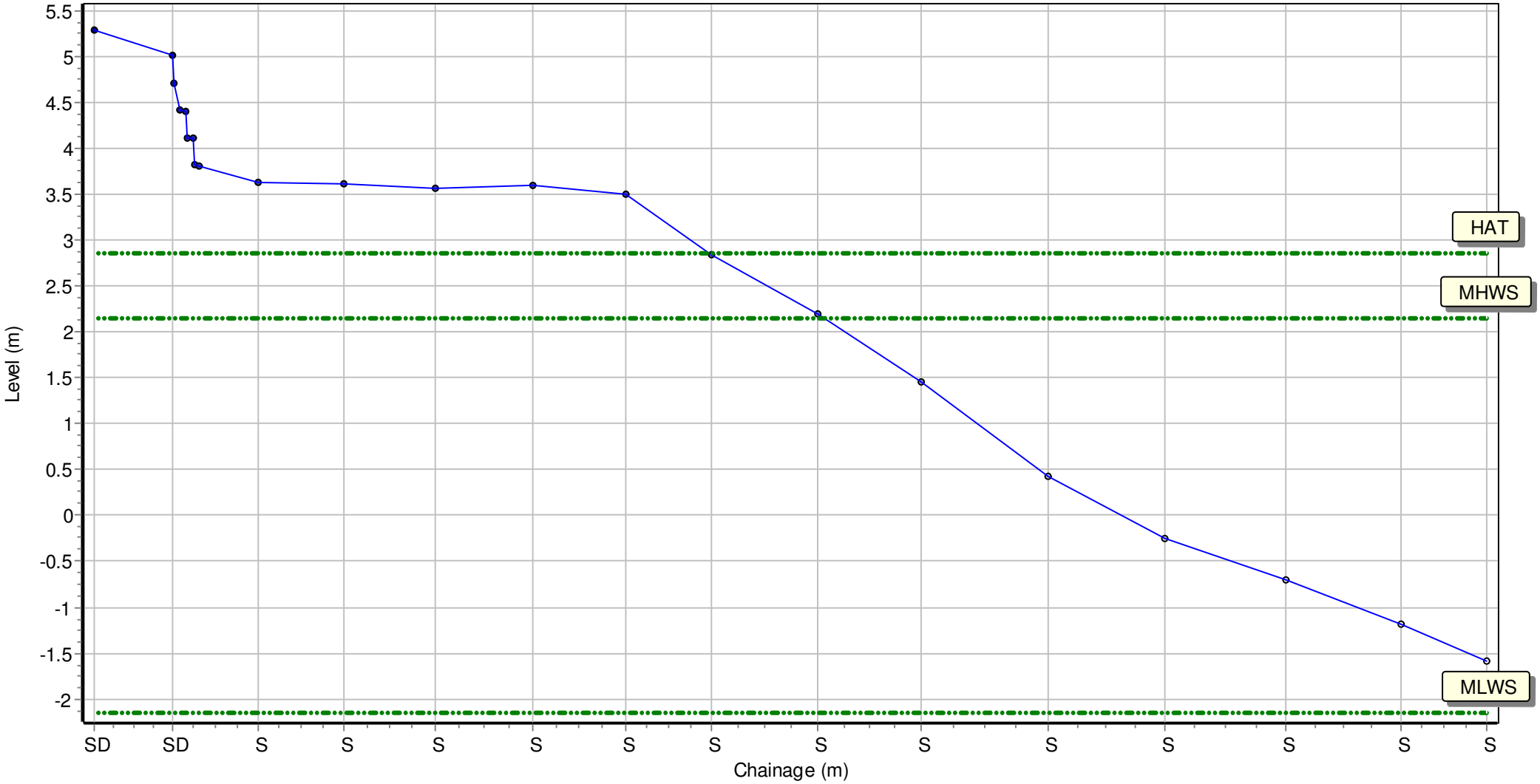
Location: **1bSS3**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 437034.005 **Northing:** 567902.485 **Profile Bearing:** 46 ° from North



Beach Profile

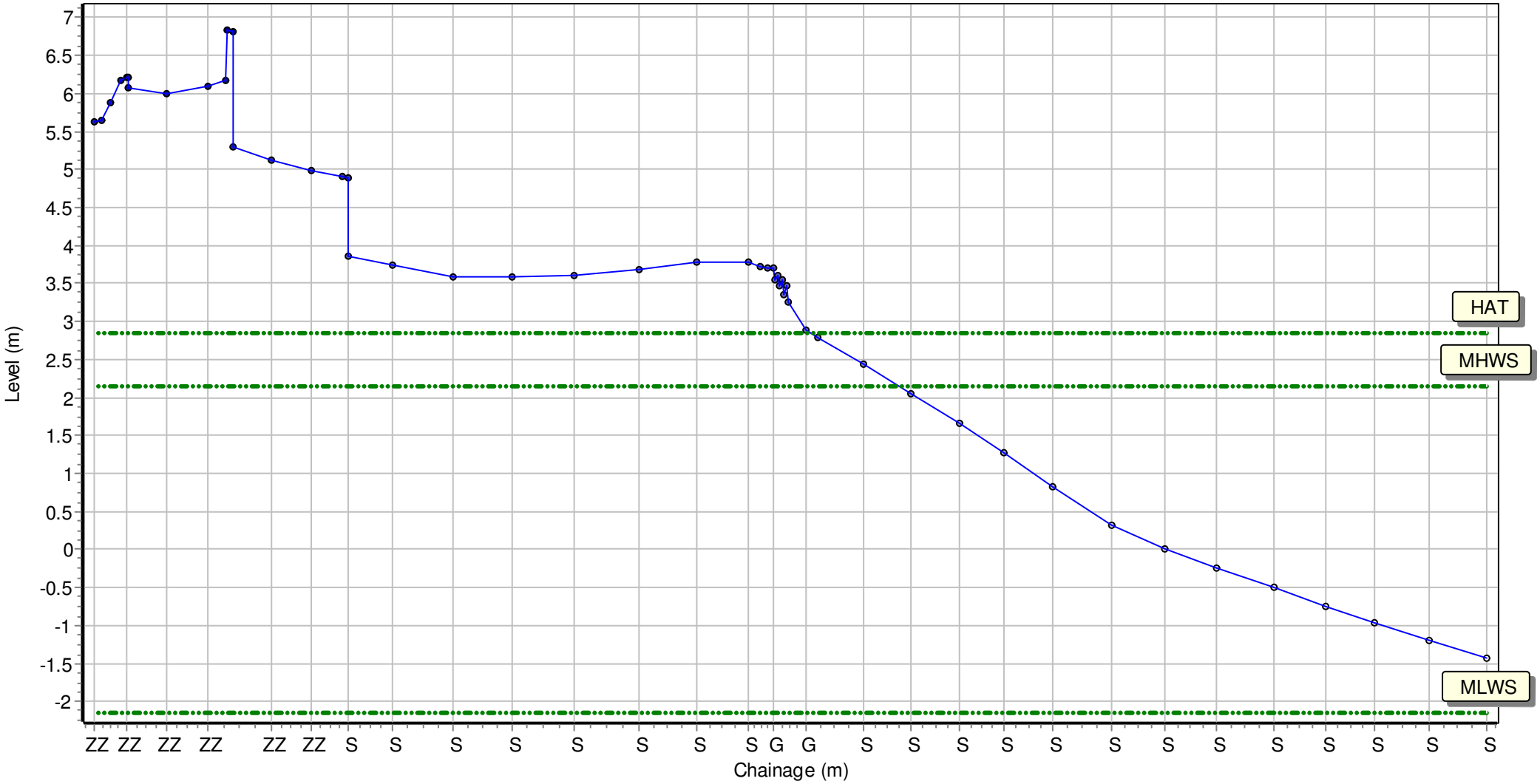
Location: **1bSS4**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 437113.944 **Northing:** 567736.452 **Profile Bearing:** 46 ° from North



Beach Profile

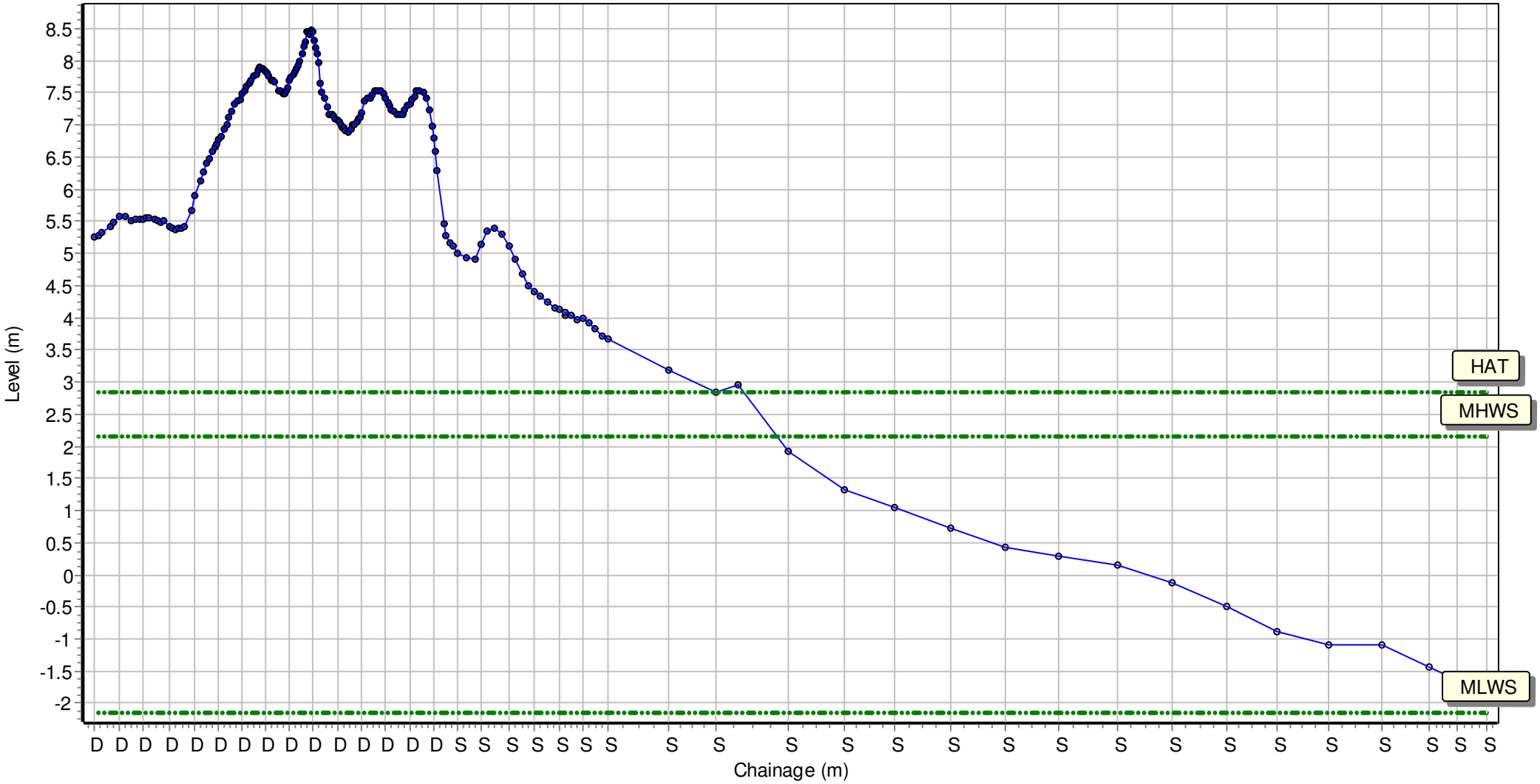
Location: **1bSS5**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 437448.703 **Northing:** 567669.997 **Profile Bearing:** 55 ° from North



Beach Profile

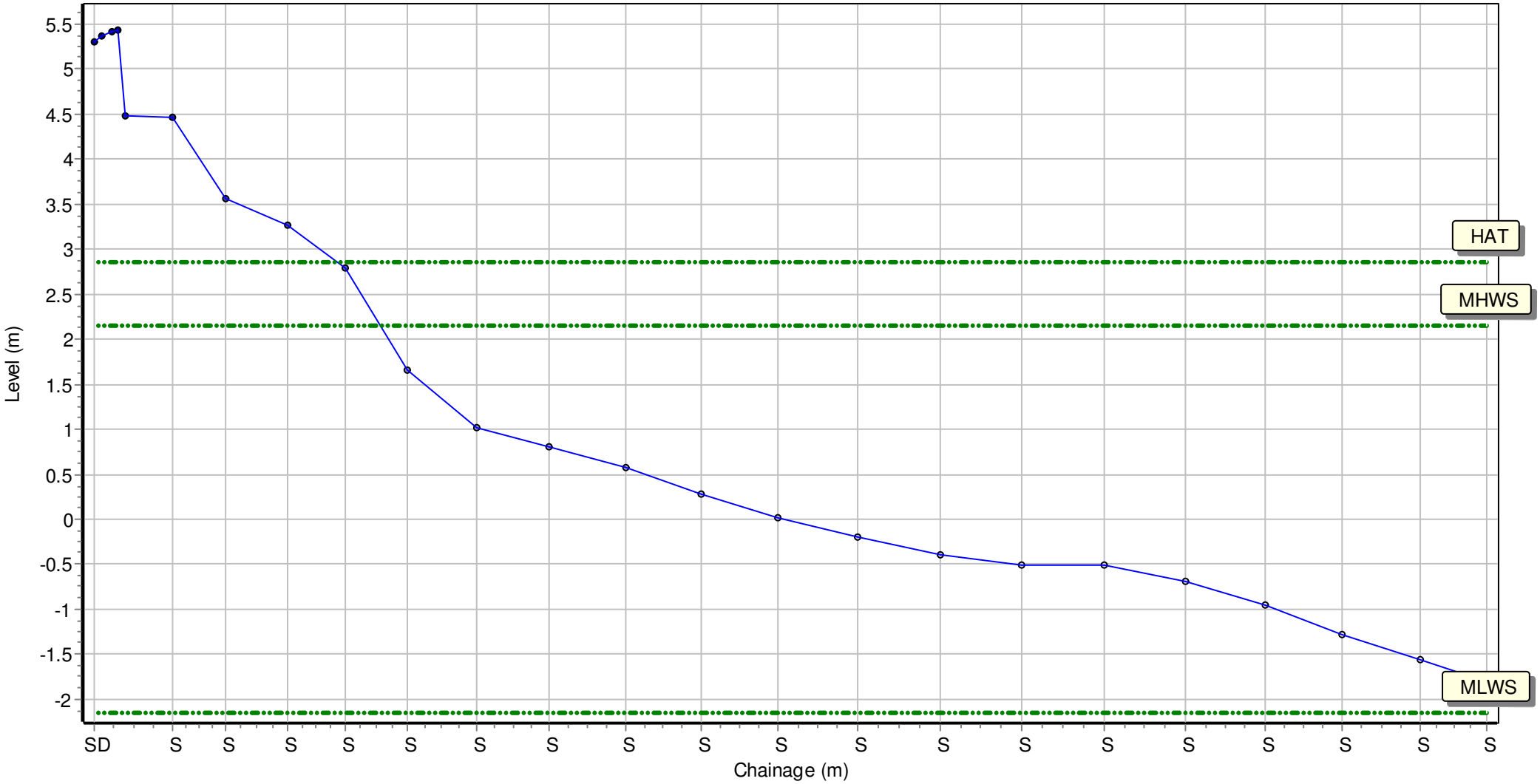
Location: **1bSS8**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 437996.548 **Northing:** 566926.497 **Profile Bearing:** 48 ° from North



Beach Profile

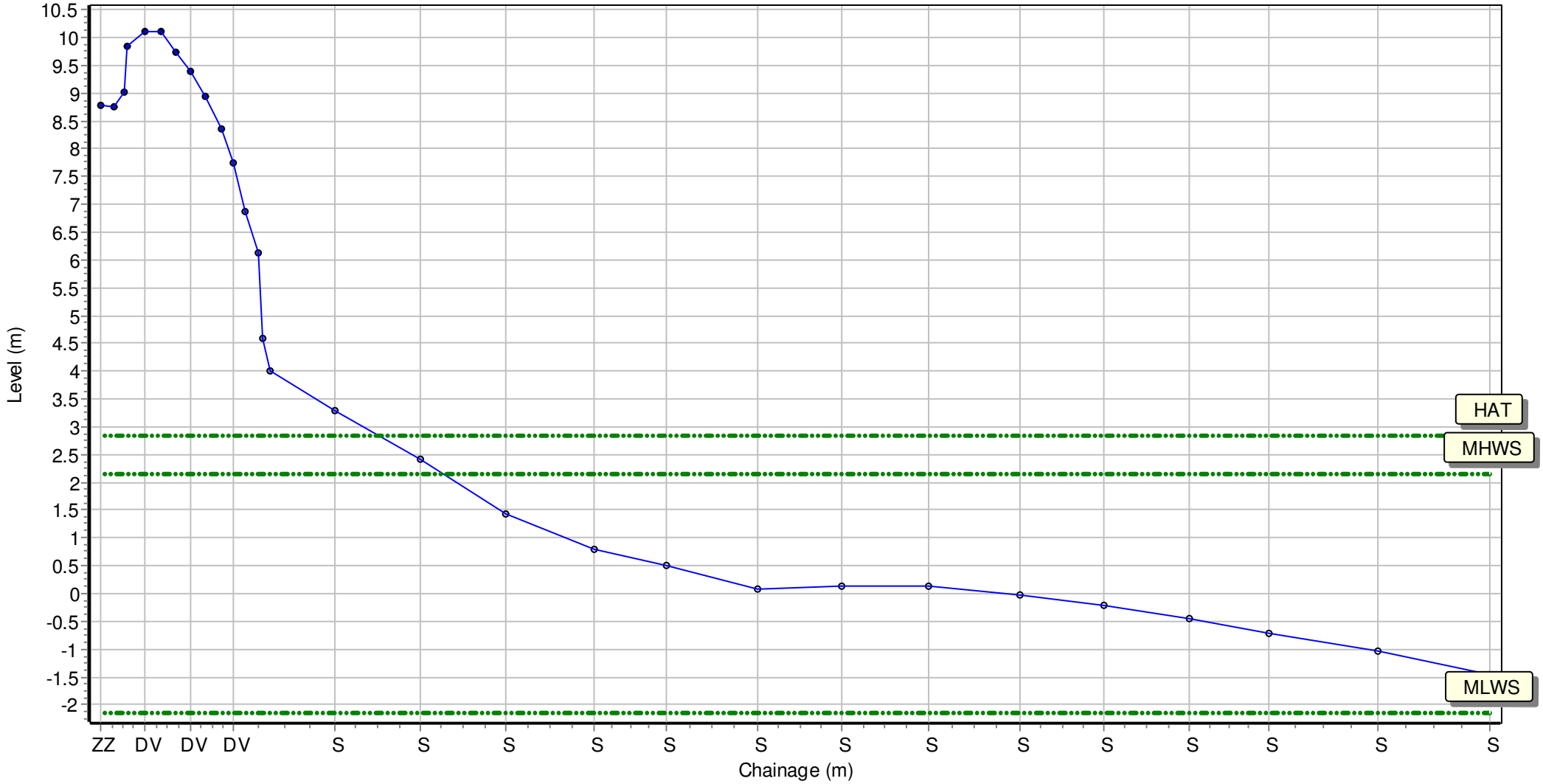
Location: **1bSS9**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 438183.431 **Northing:** 566678.818 **Profile Bearing:** 46 ° from North



Beach Profile

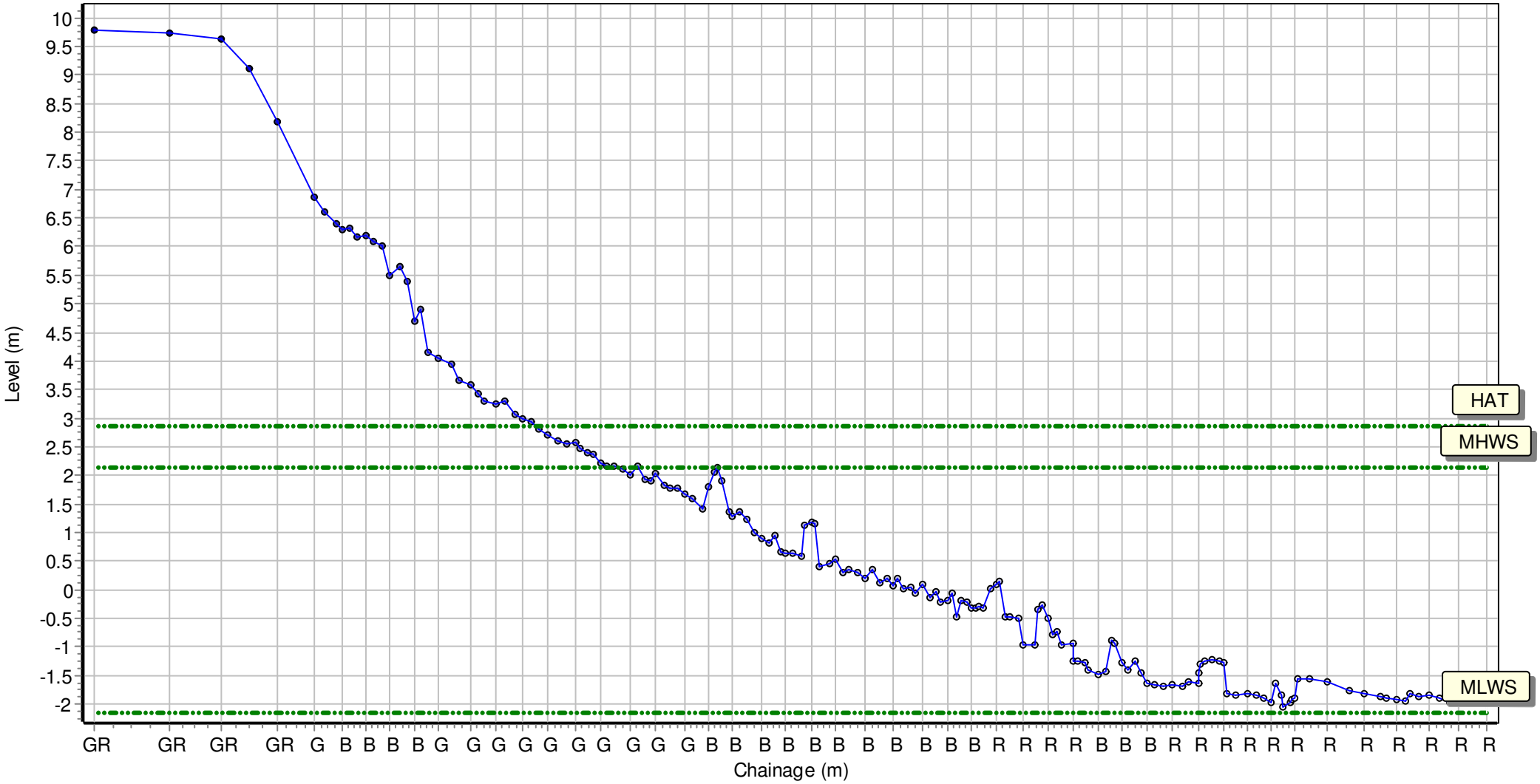
Location: **1bSS10**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 438408.755 **Northing:** 566539.727 **Profile Bearing:** 47 ° from North



Beach Profile

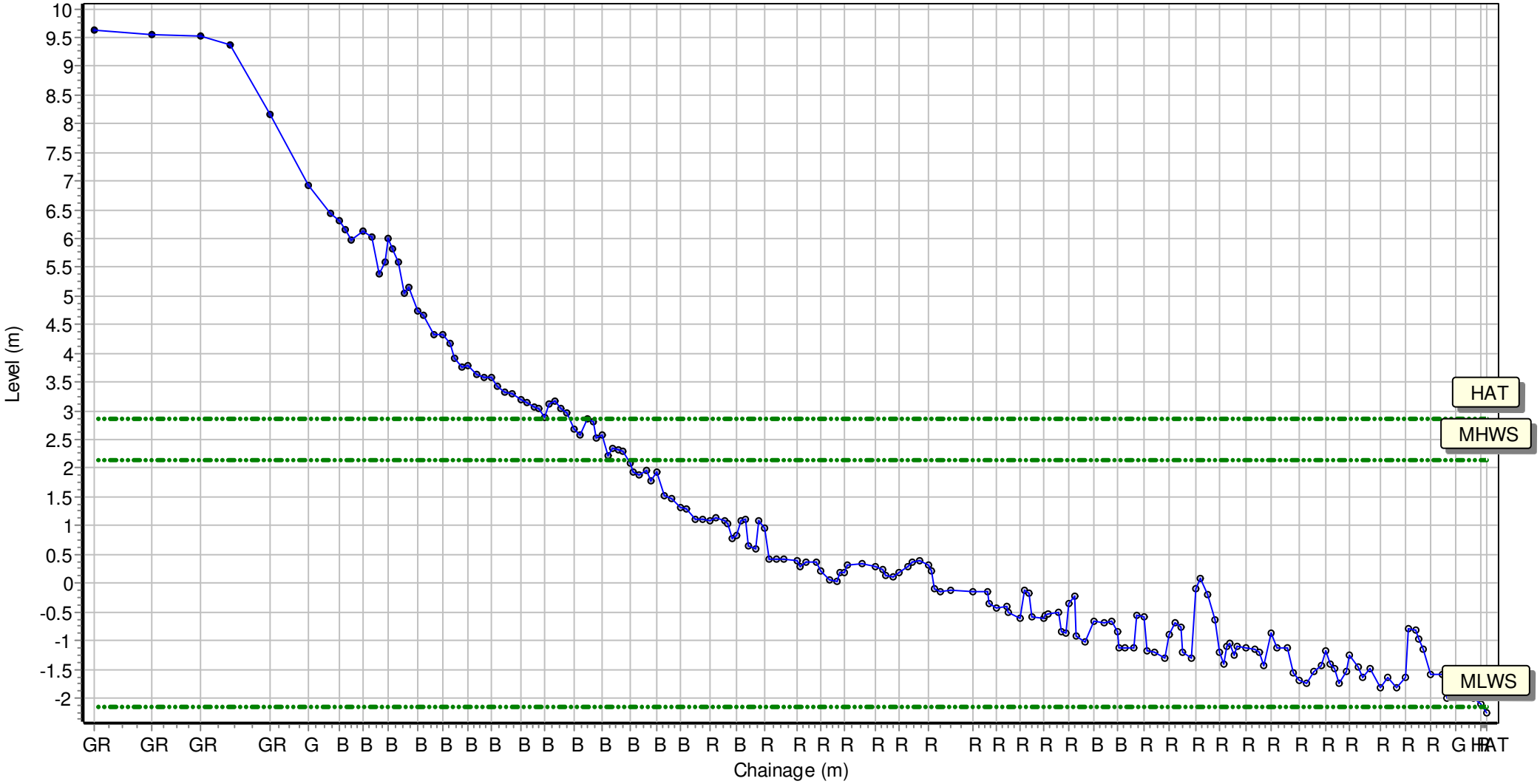
Location: **1bSS11**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 438498.97 **Northing:** 566479.034 **Profile Bearing:** 26 ° from North



Beach Profile

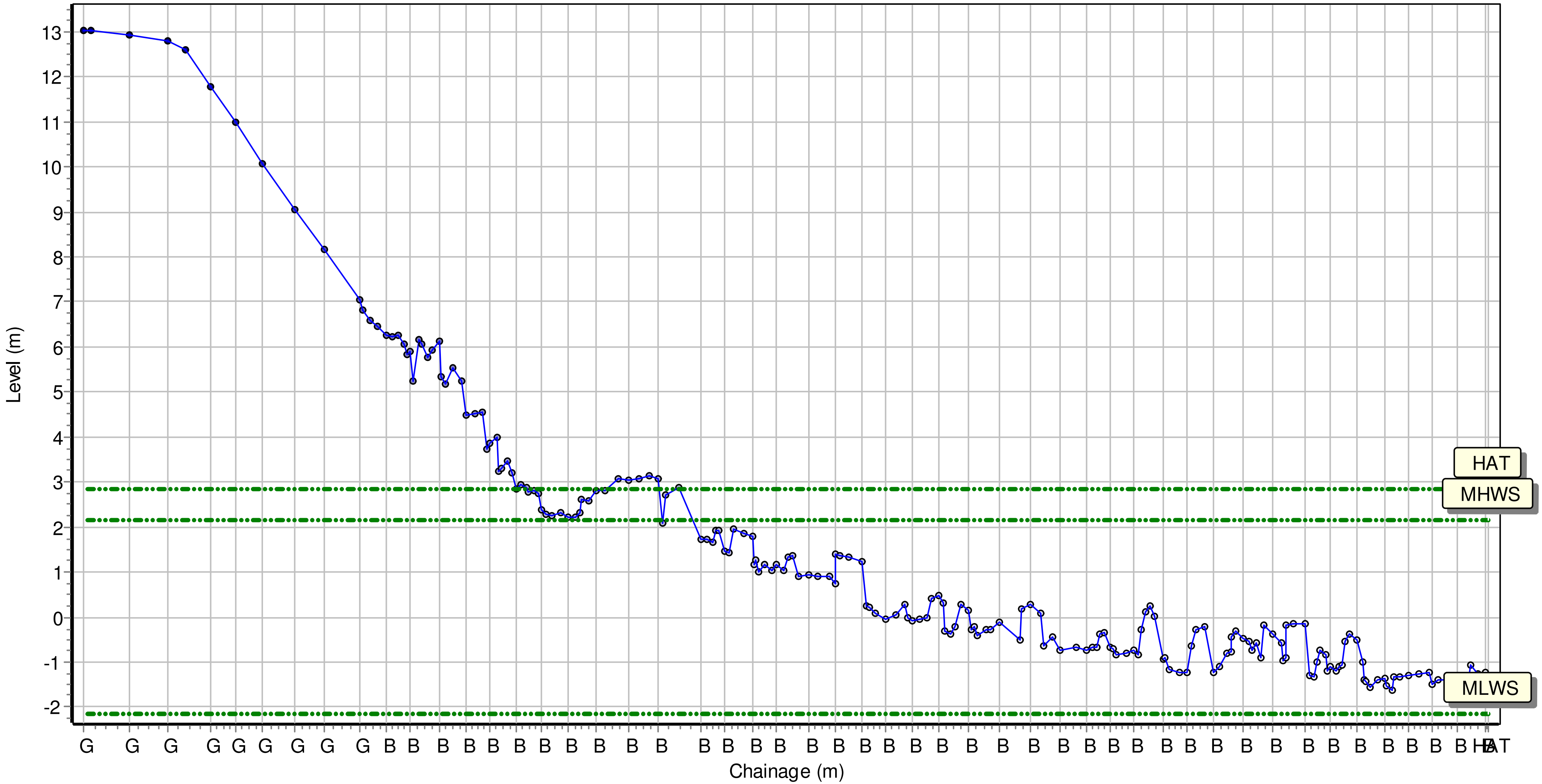
Location: **1bSS12**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 438696.305 **Northing:** 566412.949 **Profile Bearing:** 26 ° from North



Beach Profile

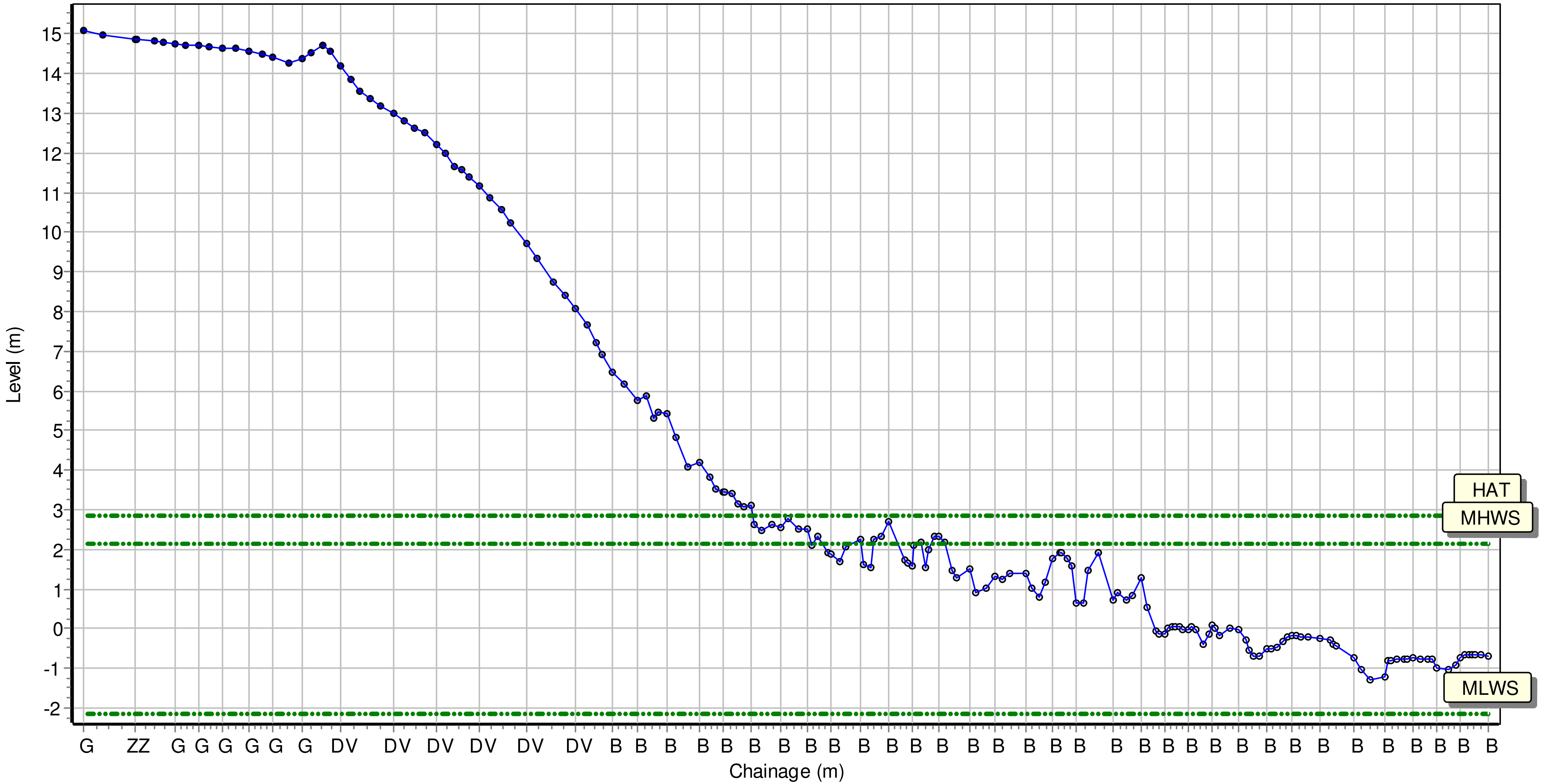
Location: 1bSS13

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 438750.749 **Northing:** 566369.415 **Profile Bearing:** 20 ° from North



http://www.sandsuser.com

SANDS

Beach Profile

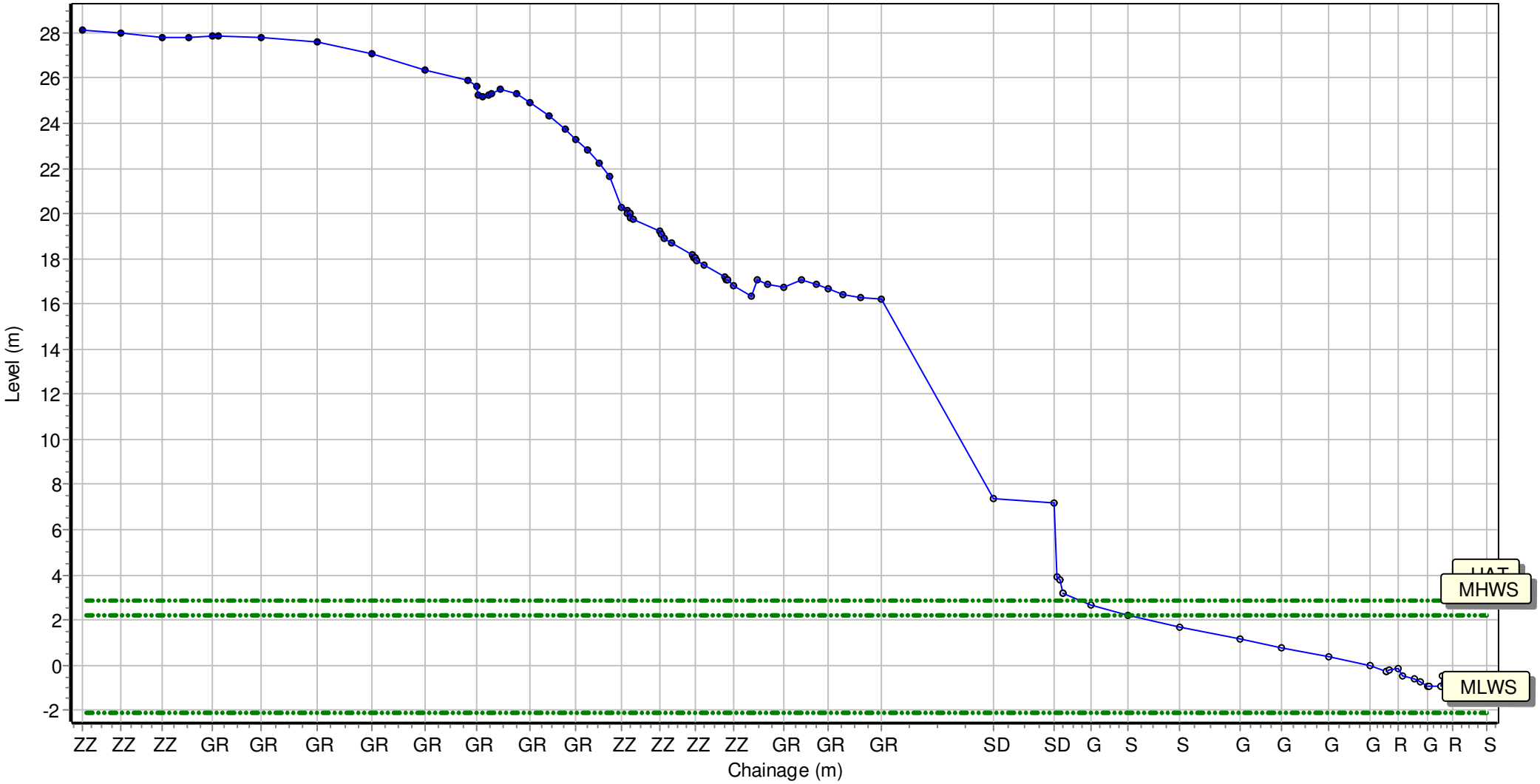
Location: **1bSS14**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 439630.452 **Northing:** 565163.521 **Profile Bearing:** 55 ° from North



Beach Profile

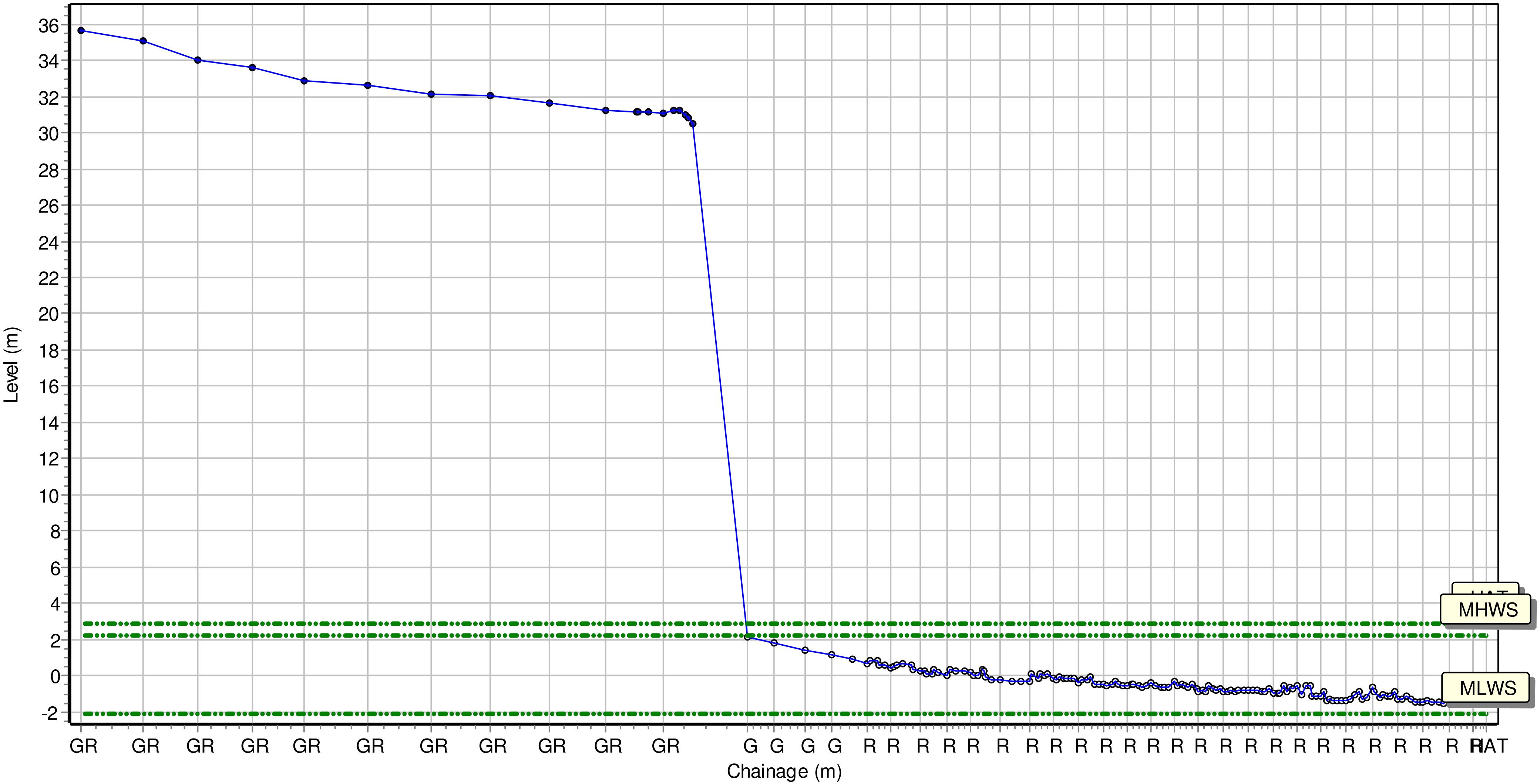
Location: 1bSS17

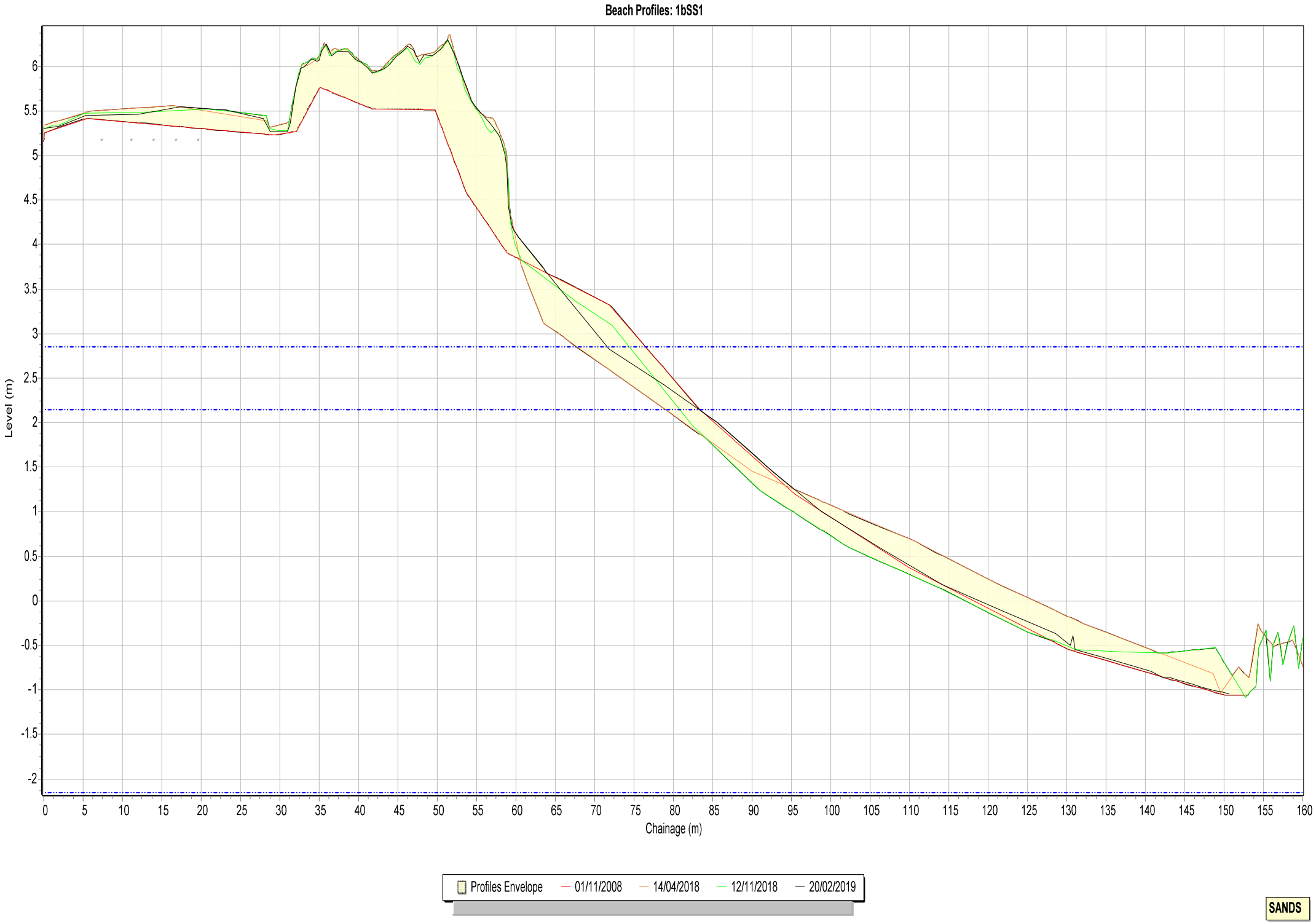
Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

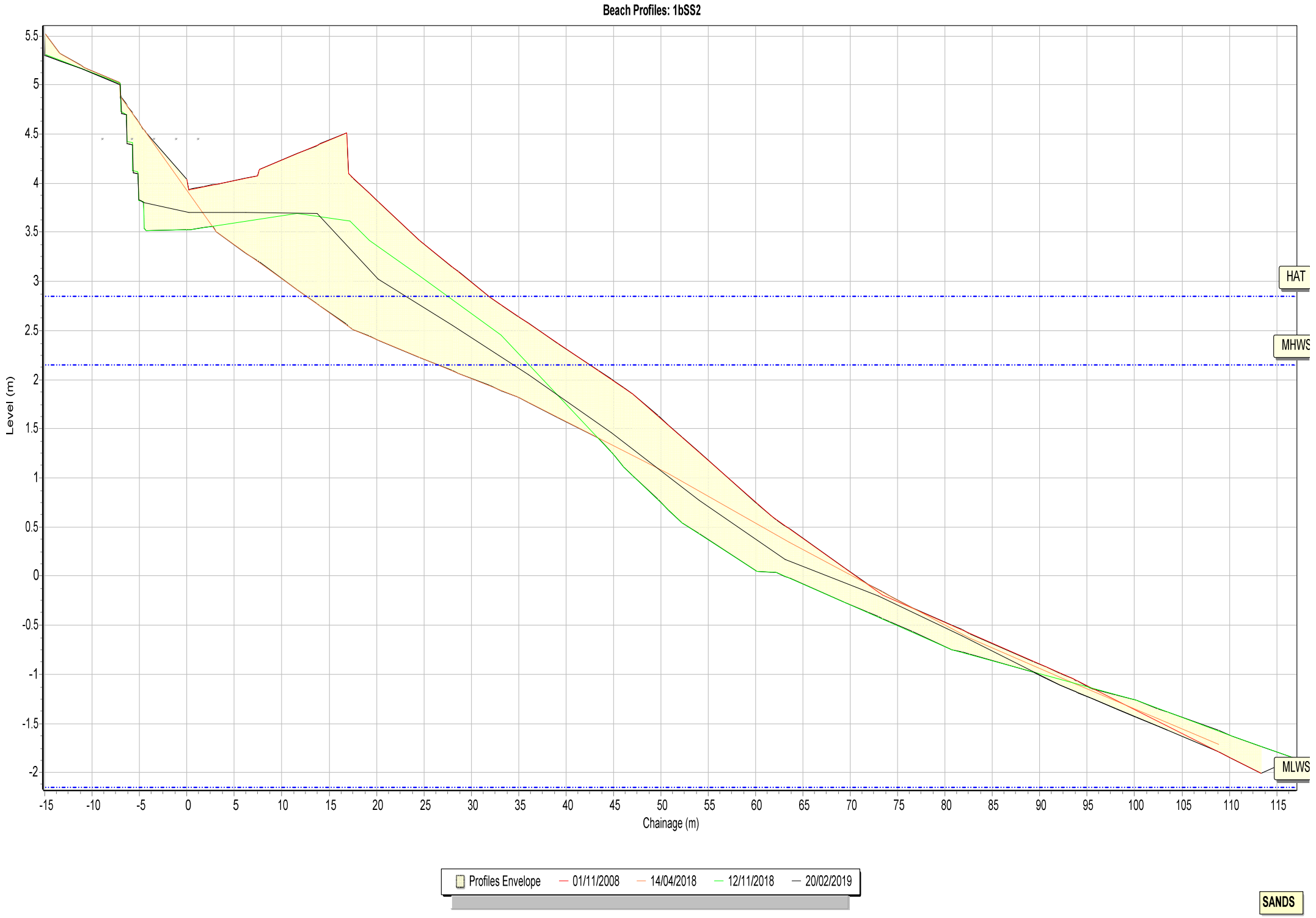
Wind **Sea State:** **Visibility:** **Rain:**

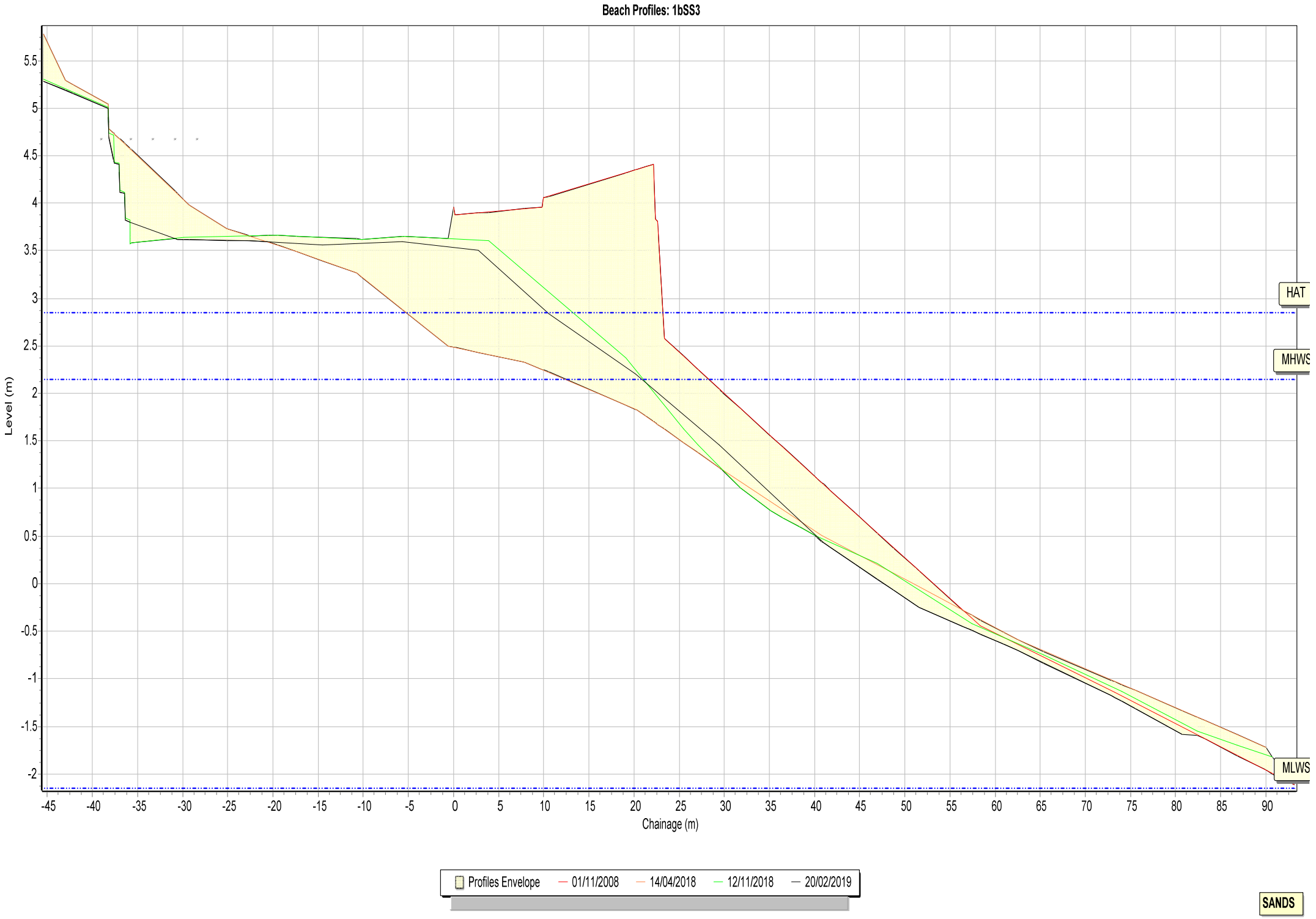
Summary: 2019 Partial Measures Topo Survey

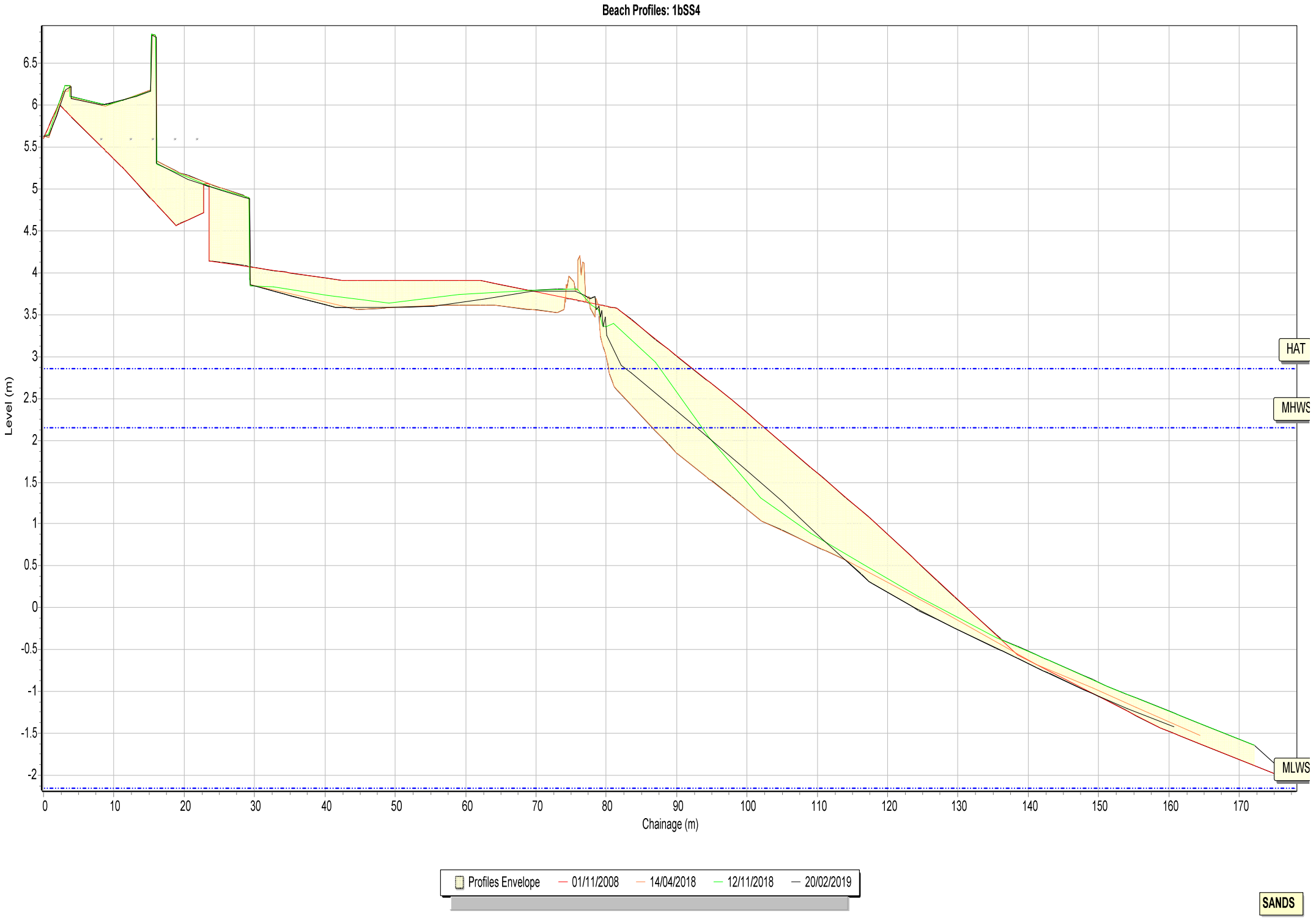
Easting: 440161.831 **Northing:** 564656.791 **Profile Bearing:** 41 ° from North

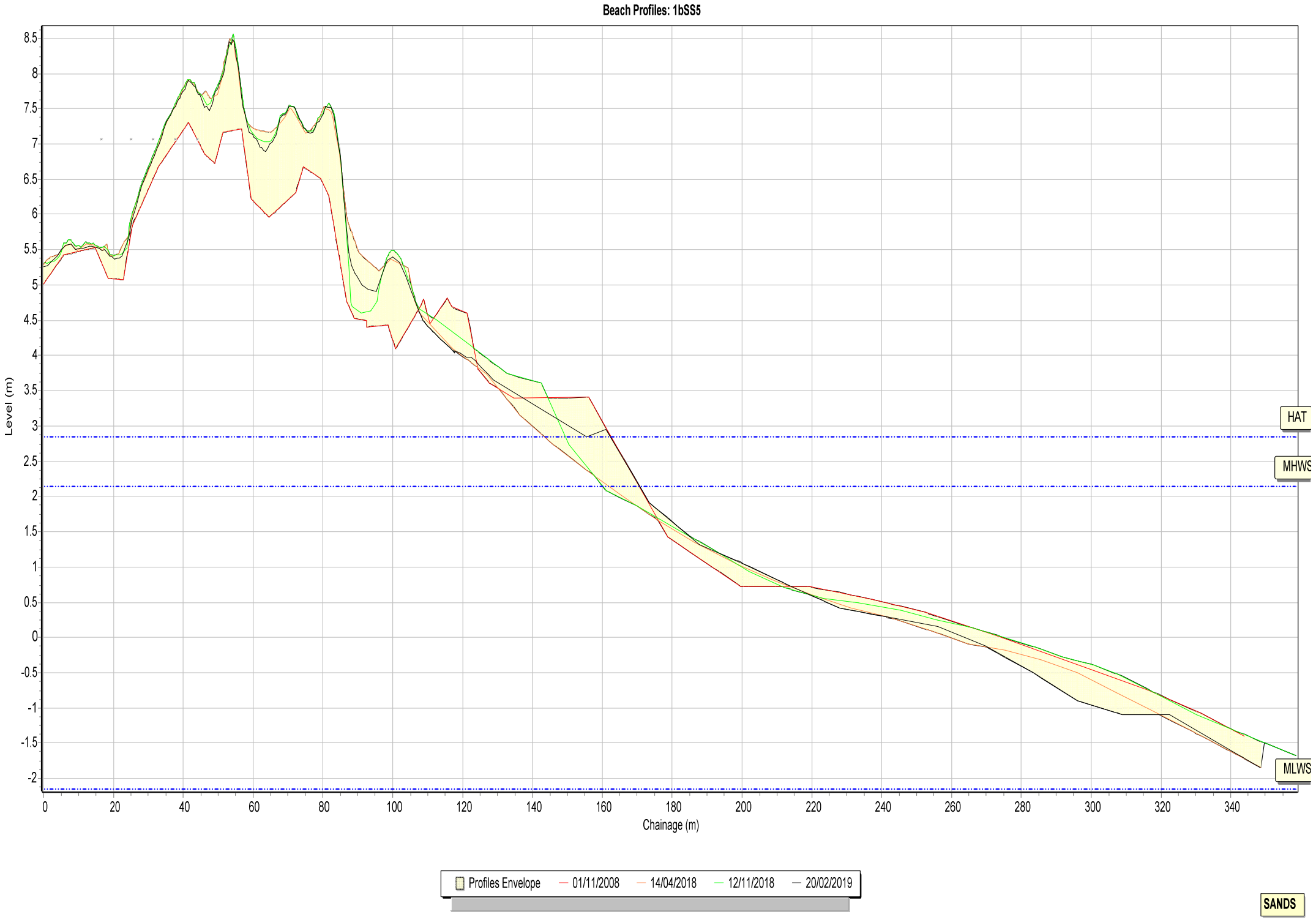


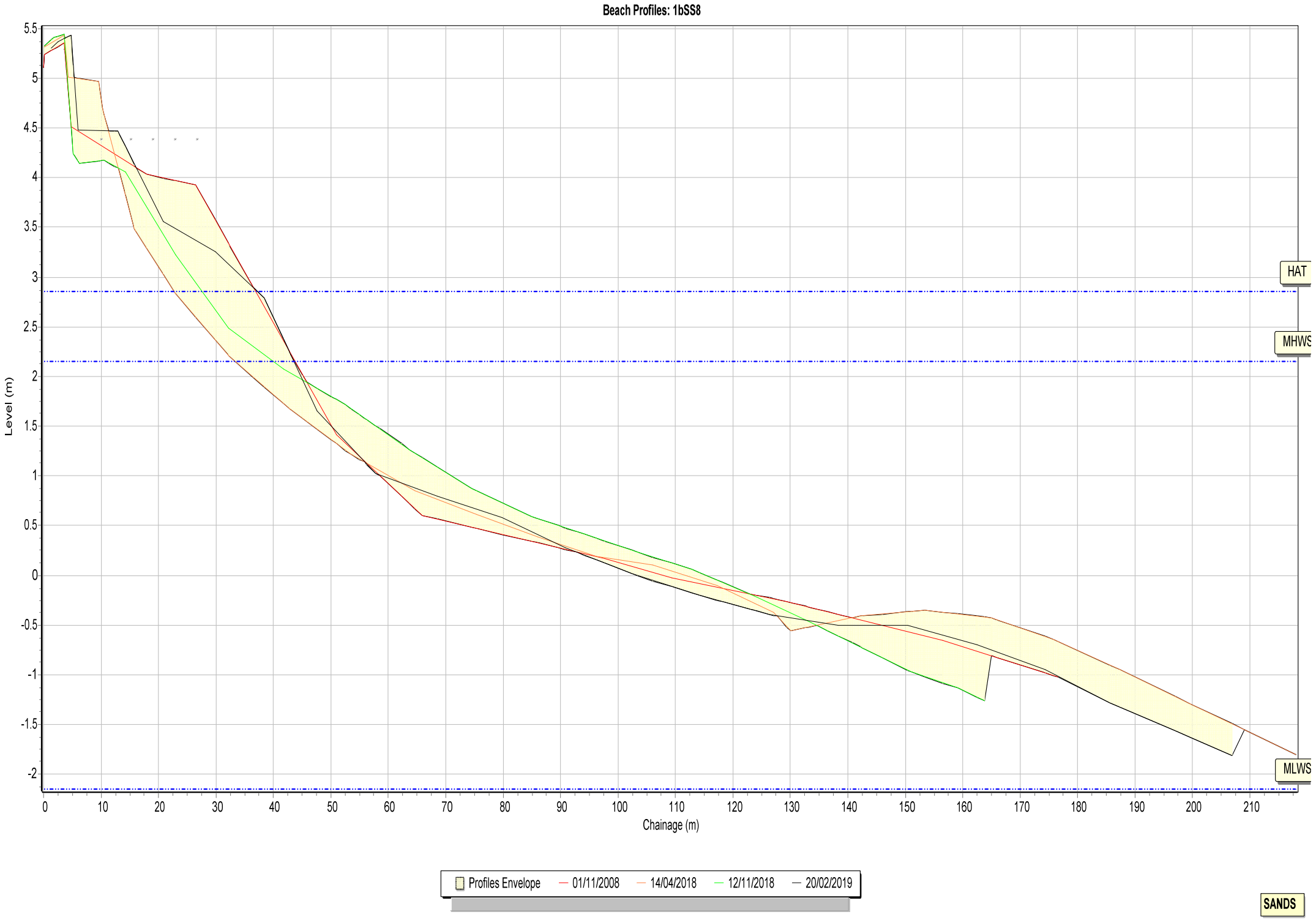

Beach Profiles: 1bSS1
Level (m)
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160
Chainage (m)
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS

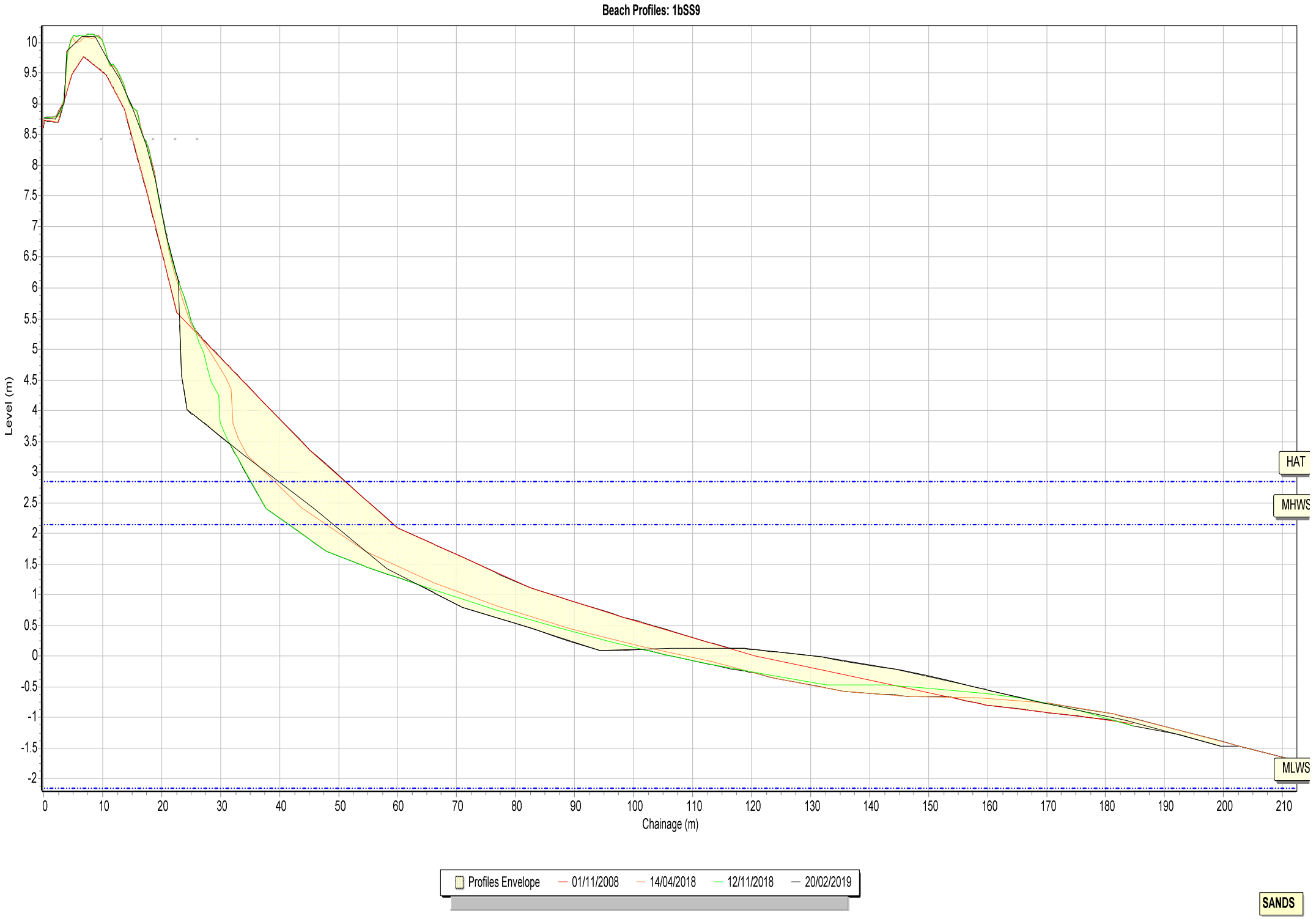

Beach Profiles: 1bSS2
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS


Beach Profiles: 1bSS3
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS

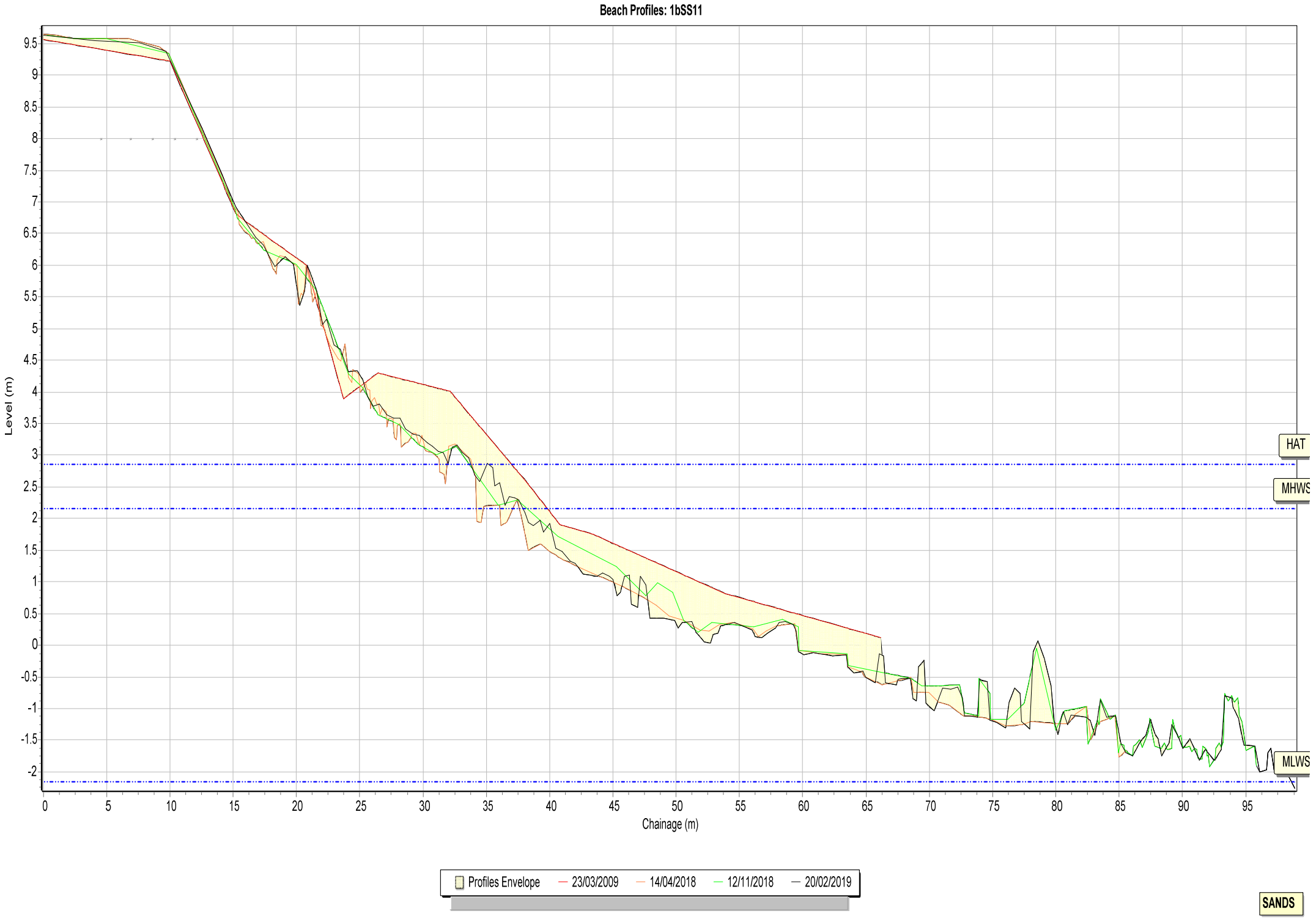

Beach Profiles: 1bSS4
Level (m)
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS

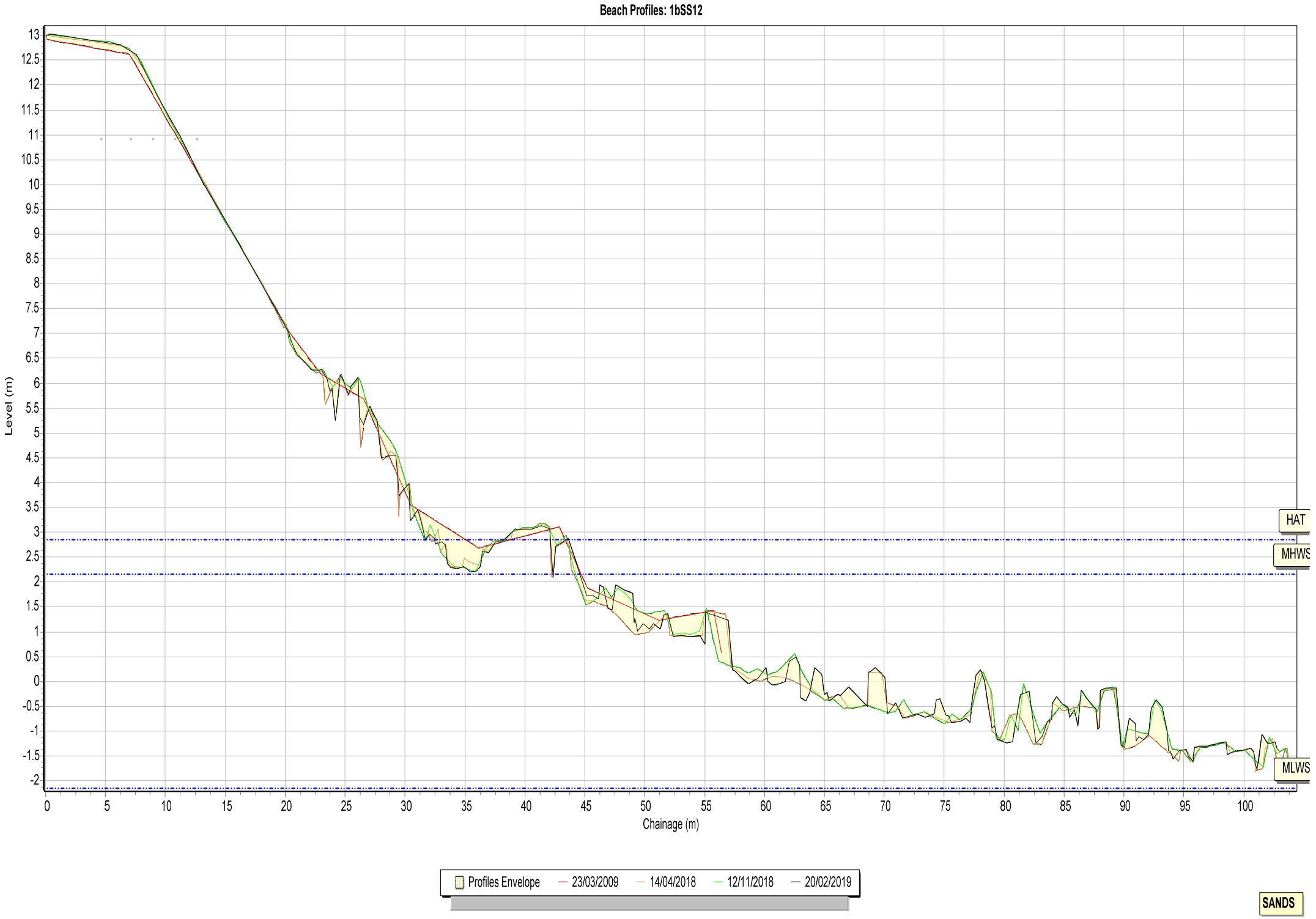

Beach Profiles: 1bSS5
Level (m)
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS

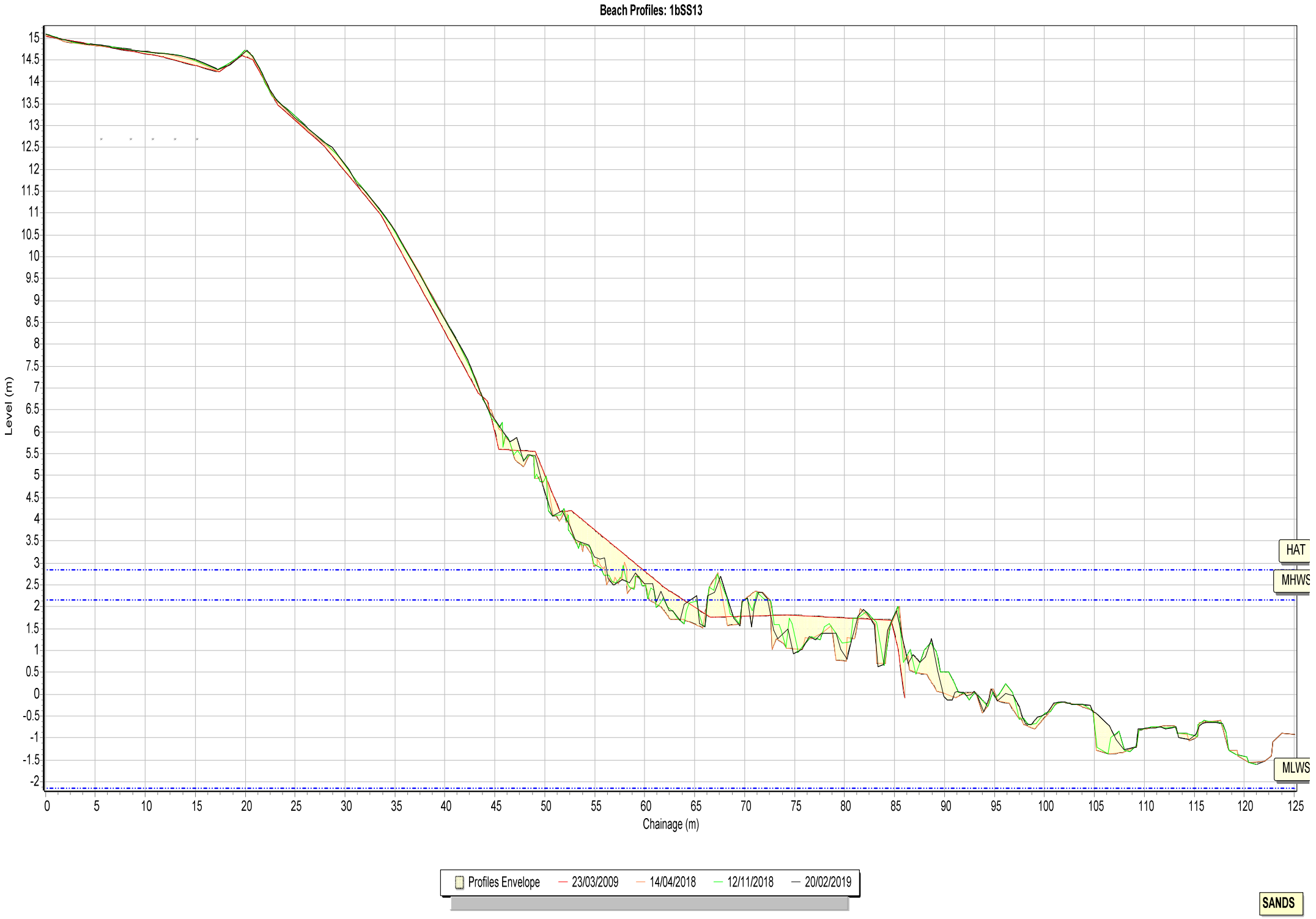

Beach Profiles: 1bSS8
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS

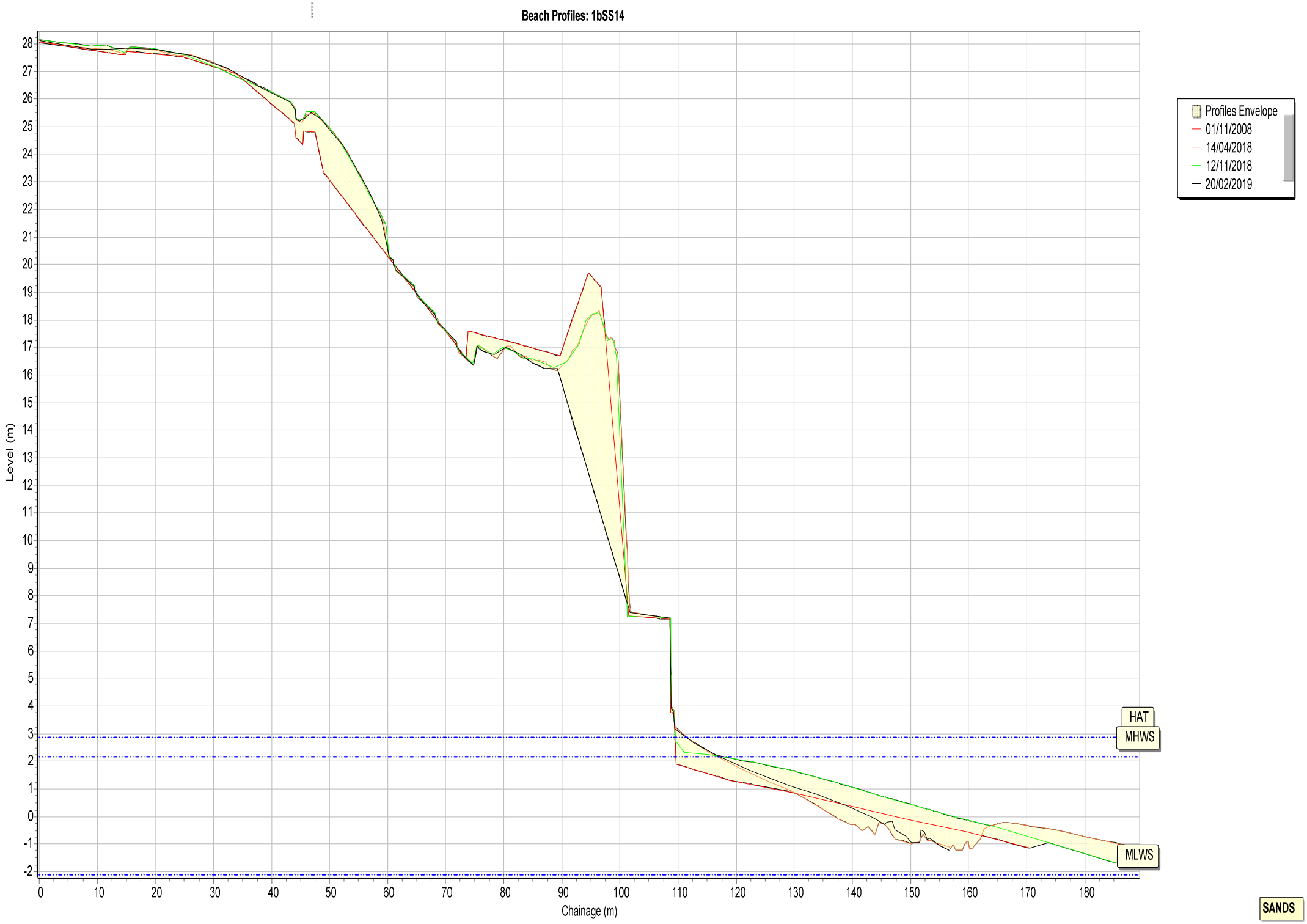

Beach Profiles: 1bSS9
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS

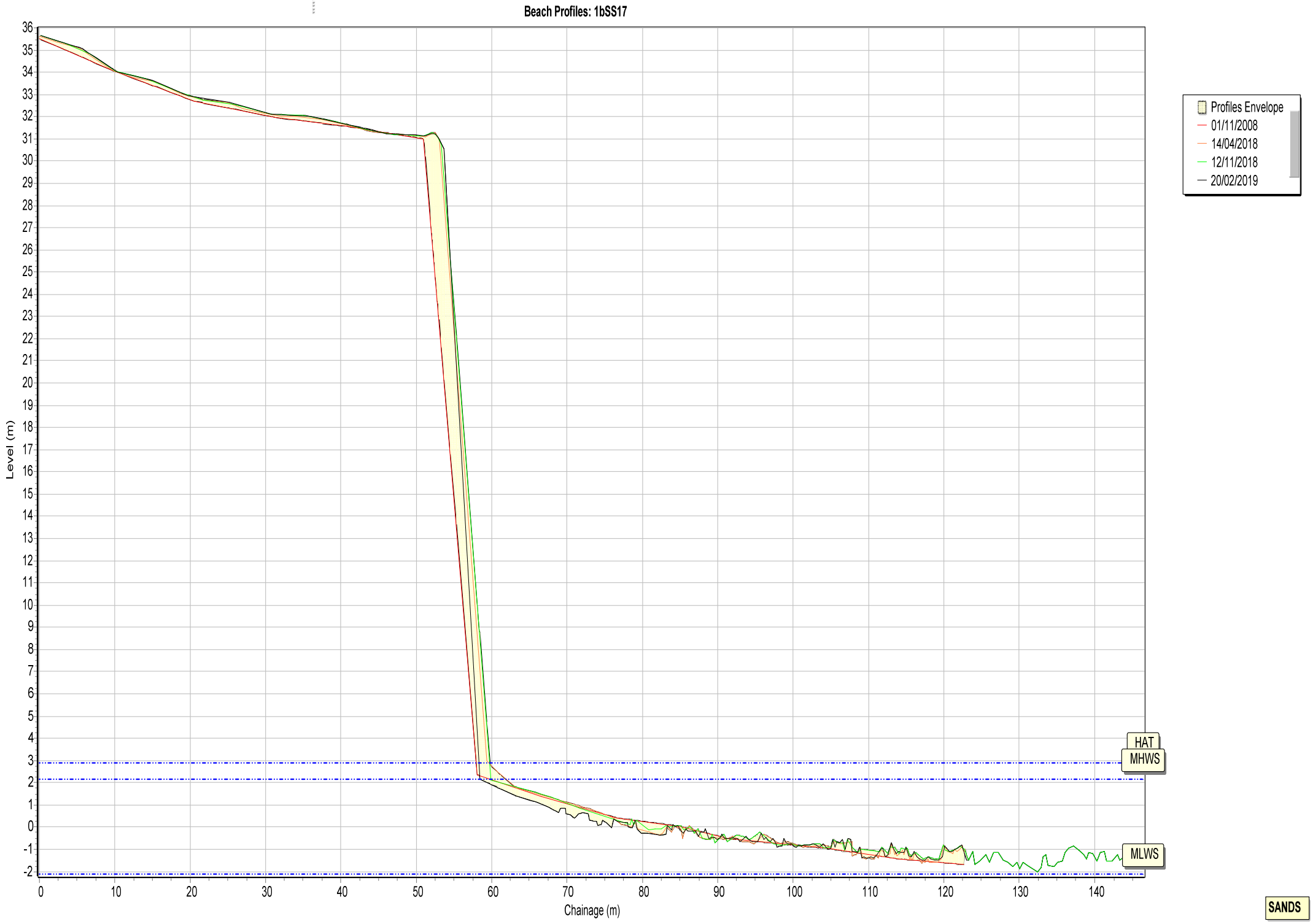

Beach Profiles: 1bSS10
Level (m)
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
SANDS


Beach Profiles: 1bSS11
Level (m)
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
23/03/2009
14/04/2018
12/11/2018
20/02/2019
SANDS


Beach Profiles: 1bSS12
Level (m)
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
23/03/2009
14/04/2018
12/11/2018
20/02/2019
SANDS

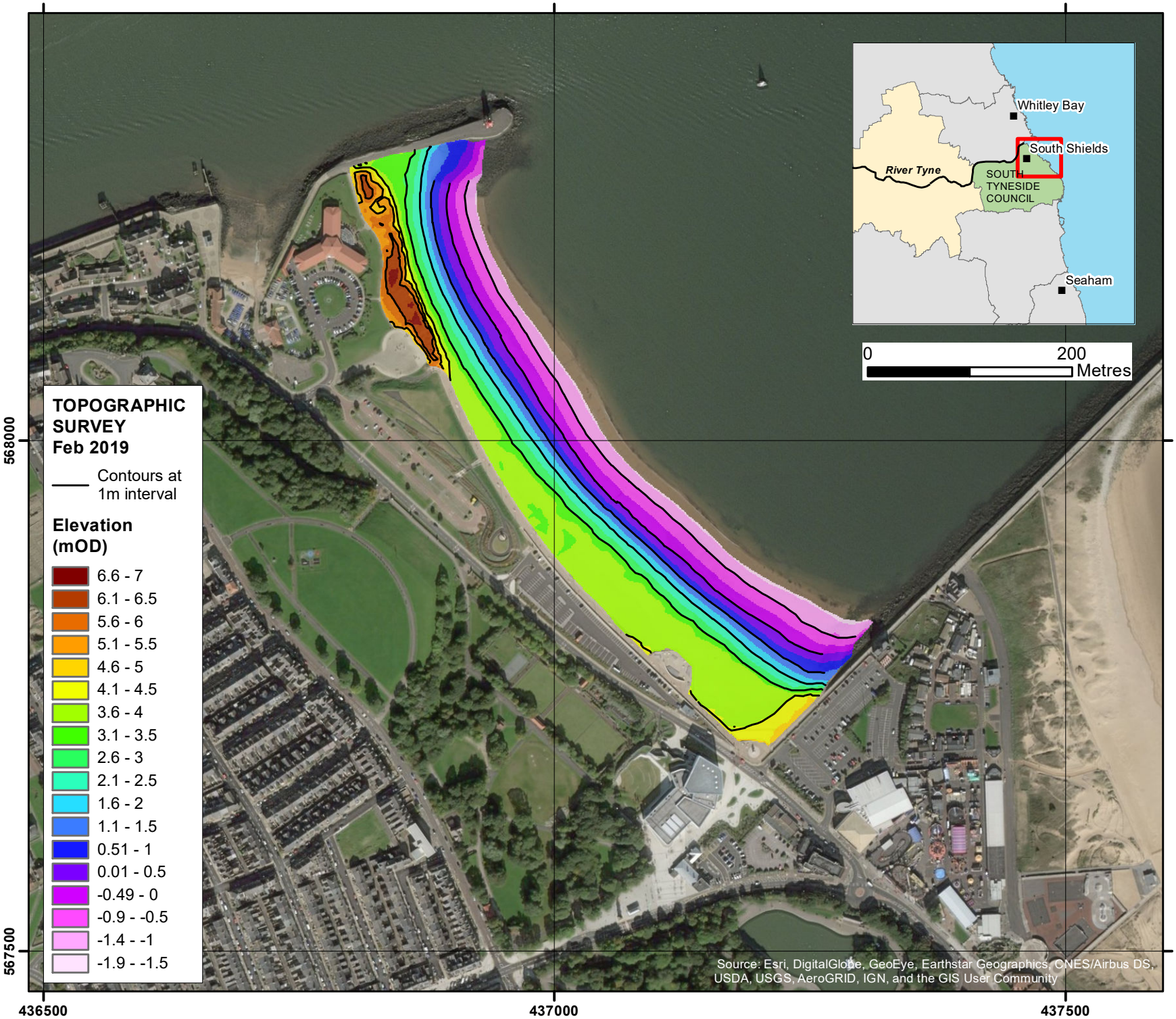

Beach Profiles: 1bSS13
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
23/03/2009
14/04/2018
12/11/2018
20/02/2019
SANDS


Beach Profiles: 1bSS14
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180


Beach Profiles: 1bSS17
Profiles Envelope
01/11/2008
14/04/2018
12/11/2018
20/02/2019
Level (m)
Chainage (m)
HAT
MHWS
MLWS
SANDS

Appendix B

Topographic Survey



Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 1

LITTLEHAVEN BEACH

South Tyneside Council Frontage

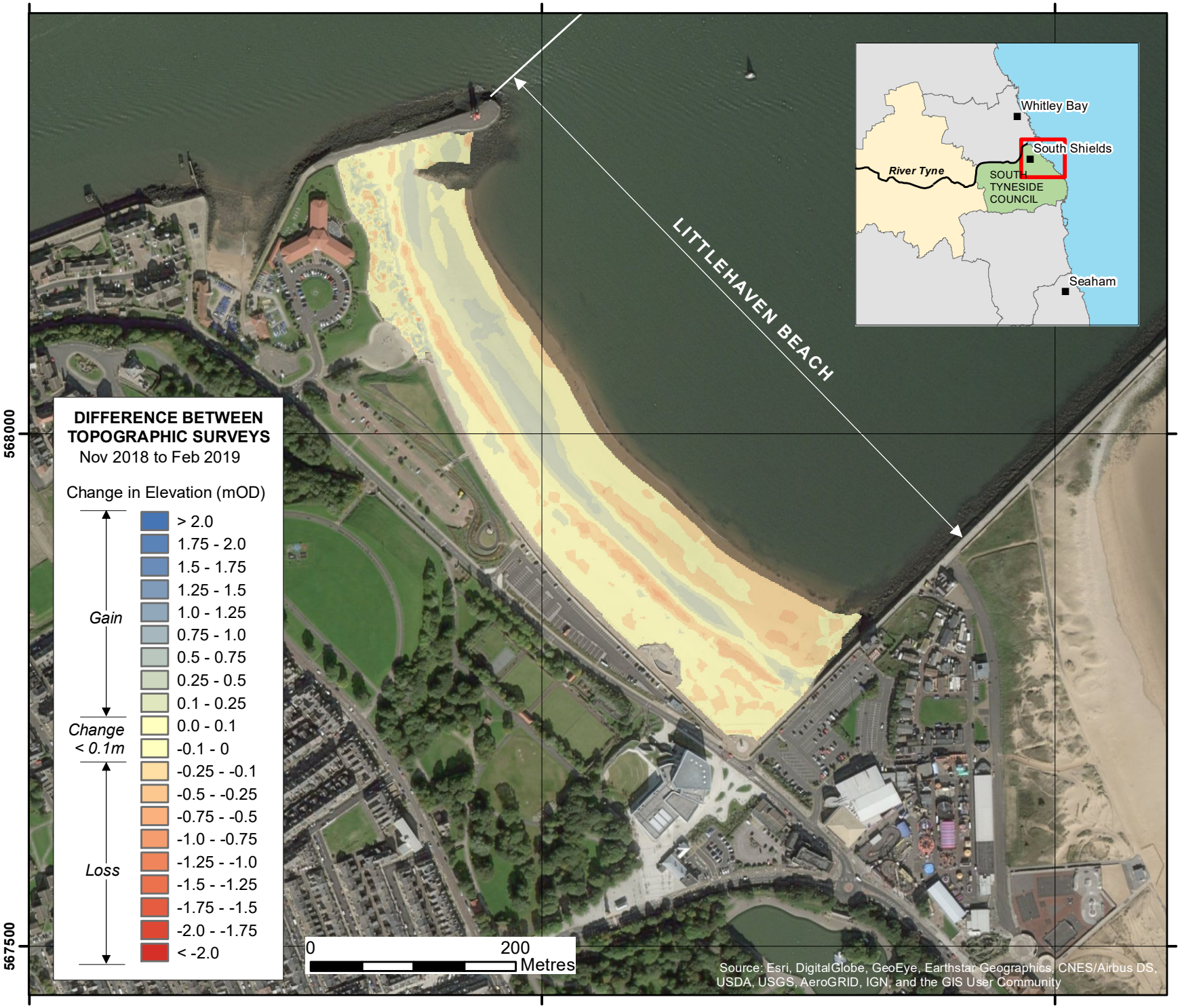
Update Report
'Partial Measures' Survey 2019

Drawing Scale at A4 1:5,000

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



Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 2

LITTLEHAVEN BEACH

South Tyneside Council Frontage

Update Report
'Partial Measures' Survey 2019

Drawing Scale at A4 1:5,000

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

Appendix C

Cliff Top Survey

Key

- Cliff Top Survey Locations

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 3 - Map 1

TROW QUARRY

South Tyneside Council Frontage

Cliff Top Survey Locations

Drawing Scale at A4 1:1,500

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

Cliff Top Survey

Trow Quarry

Six ground control points have been established at Trow Quarry (Figure C1). The maximum separation between any two points varies along the coast, reflecting the degree of risk from the erosion.

The cliff top surveys at Trow Quarry 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 C1 provides baseline information about these ground control points and results from the 2011 (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 C1 – Cliff Top Surveys at Trow Quarry

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
			(°)	Sep 2011	Nov 2018	Feb 2019	Sep 2011 - Feb 2019	Nov 2018 - Feb 2019	Sep 2011 - Feb 2019
1	438300.3	566674.7	309	7.00	7.02	6.91	-0.09	-0.11	-0.01
2	438338.8	566694.3	312	9.40	9.27	9.13	-0.27	-0.14	-0.04
3	438384.7	566669	33	7.00	6.95	6.75	-0.25	-0.2	-0.03
4	438408.1	566664.8	71	10.50	10.45	10.43	-0.07	-0.02	-0.01
5	438401.1	566638	120	7.00	7.38	7.03	0.03	-0.35	0.00
6	438392.8	566604.2	110	10.20	10.02	9.99	-0.21	-0.03	-0.03