Cell 1 Regional Coastal Monitoring Programme Update Report 10: 'Partial Measures' Survey 2018

Northumberland County Council

July 2018

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Authors	
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Abbreviations and Acronyms

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

Water Levels Used in Interpretation of Changes

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

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

Glossary of Terms

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

Preamble

The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire. This coastline is often referred to as 'Coastal Sediment Cell 1' in England and Wales (Figure 1).

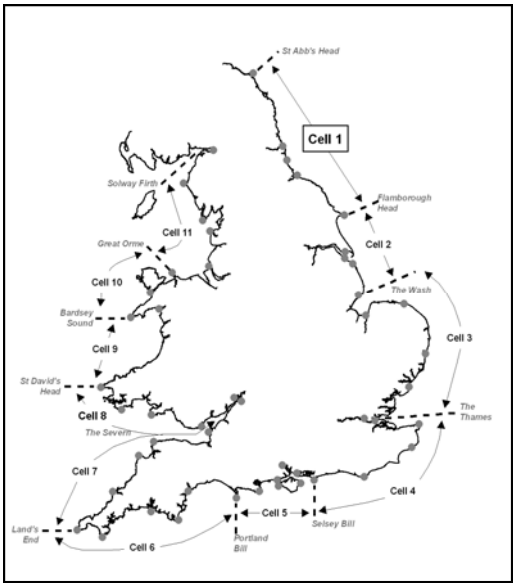


Figure 1 Sediment Cells in England and Wales

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	Sept-Dec 08	May 09	Mar-May 09		-
2	2009/10	Sept-Dec 09	Mar 10	Feb-Mar 10	Jul 10	-
3	2010/11	Aug-Nov 10	Feb 11	Feb-Apr 11	Aug 11	Sept 11
4	2011/12	Oct-Nov 11	Oct 12	Mar-May 12	Feb13	-
5	2012/13	Sept-Nov 12	Mar 13	Mar-Apr 13	Jun 13	-
6	2013/14	Sept-Oct 13	Feb 14	Mar-Apr 14	Jul 14	-
7	2014/15	Sept-Nov 14	Feb 15	Mar-Apr 15	Jul 15	-
8	2015/16	Sept-Dec 15	Feb 16	Mar-May 16	Jul 16	Jun 16
9	2016/17	Aug-Nov 16	Mar 17	Feb-Apr 17	Jul 17	
10	2017/18	Sep-Dec 17	Mar 18		Jul 18 (*)	

(*) The present report is **Update Report 10** and provides an analysis of the 2018 Partial Measures survey for Northumberland County Council's frontage.

1. Introduction

1.1 Study Area

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

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

1.2 Methodology

Along the Northumberland frontage, the following surveying is undertaken:

Full Measures survey annually each autumn comprising:

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

Partial Measures survey annually each spring comprising:

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

Cliff top survey (bi-annually) at:

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

Sand extent survey (bi-annually) at:

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

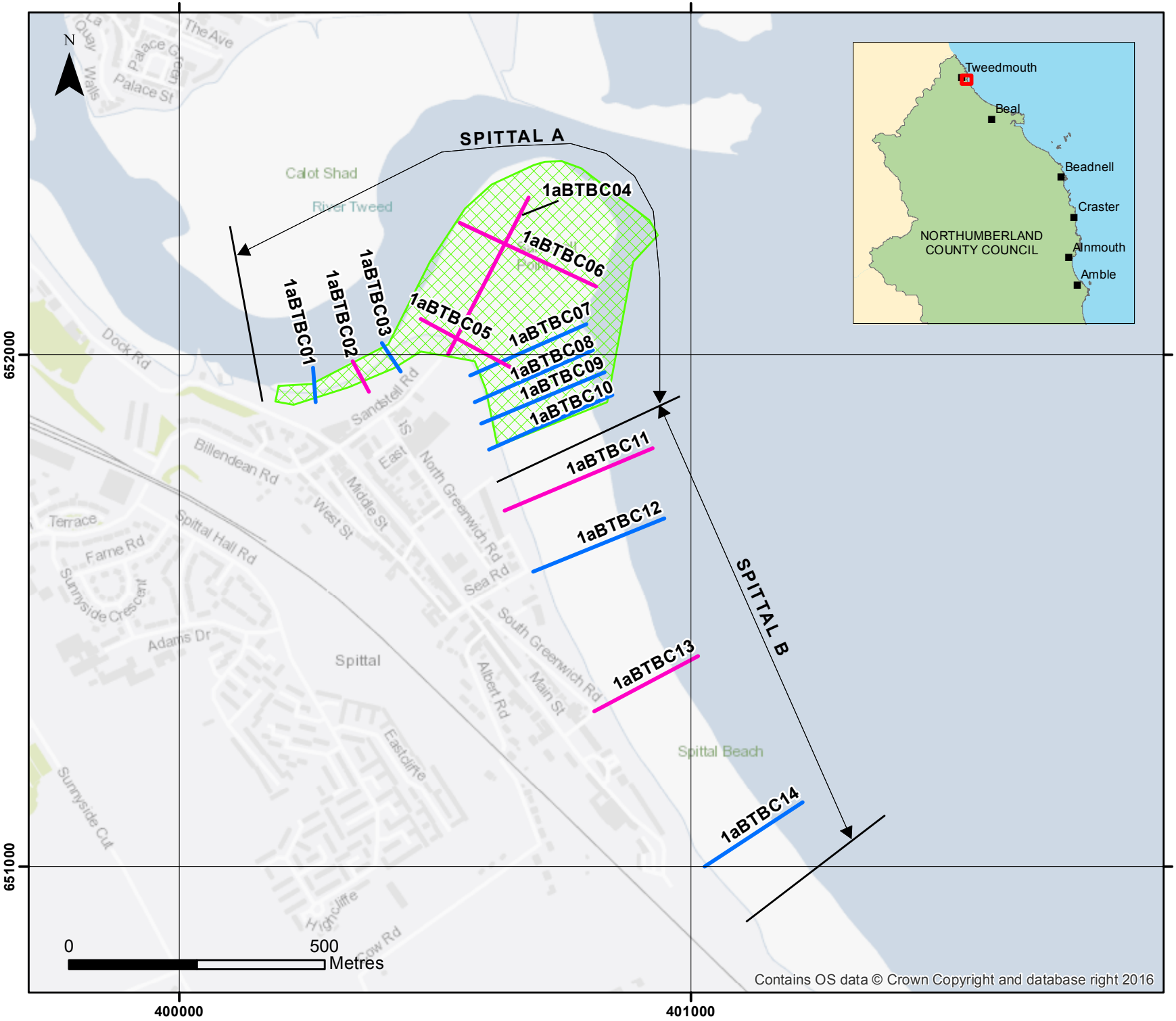
For all cliff-top surveys prior to Full Measures 2011, the data was previously saved in '.kmz' format for plotting and visual comparison in GoogleEarth. This data has been visualised in GIS, which revealed the quality was variable and reliable interpretations of short-term cliff change could not be made.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

The location of these surveys is shown in Figure 2. The Partial Measures survey was undertaken along this frontage between 27th February to 22nd April 2018. During this time weather conditions varied considerably; refer to the survey reports for details of the weather conditions over this survey period.

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
- key conclusions and highlighting of areas of concern (Section 5).

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



Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual

Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 1

Northumberland County Council Frontage

Analytical Report
Topo Surveys

Drawing Scale at A4 1:10,000

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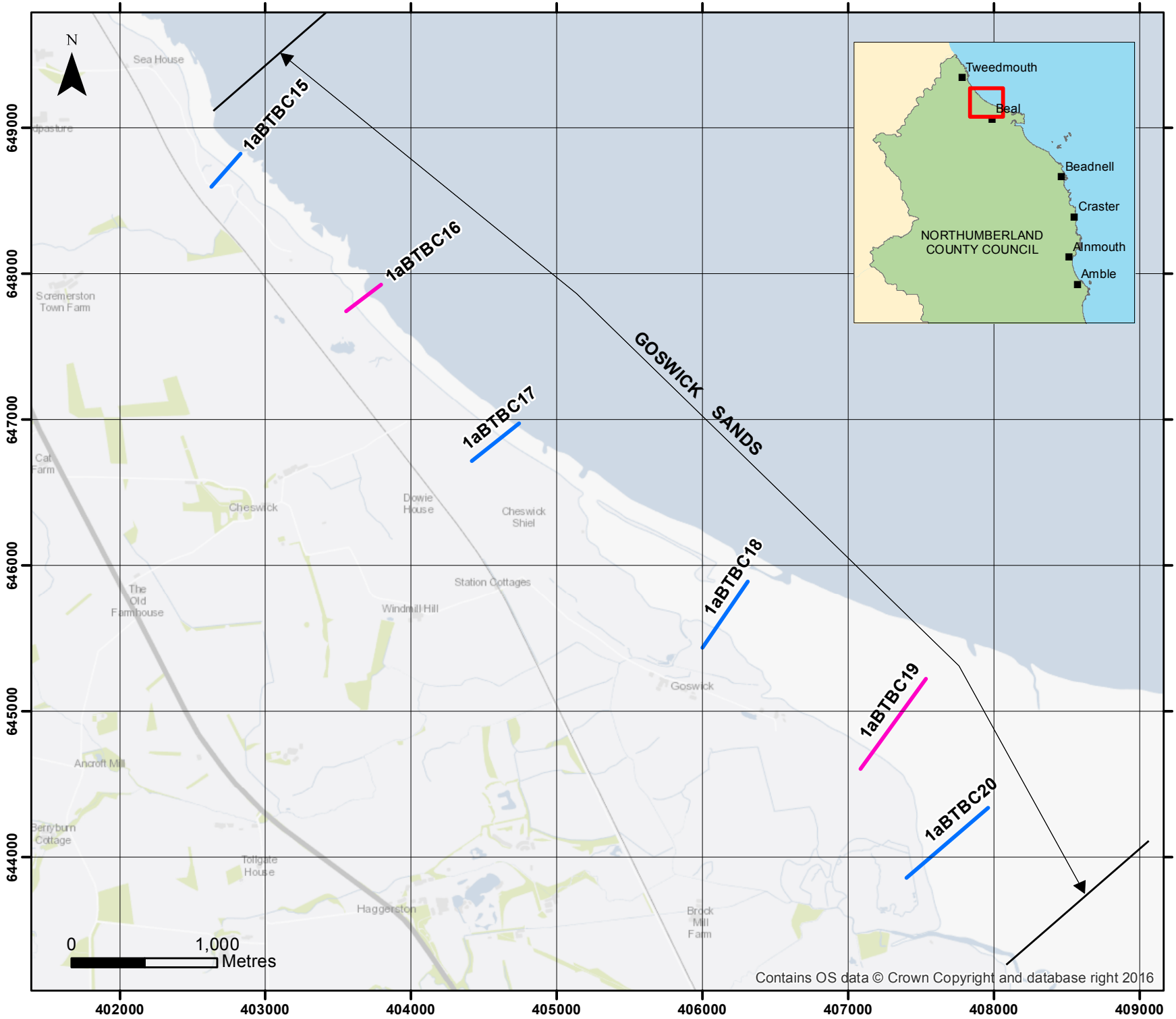

Key

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 2

Northumberland County Council Frontage

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Topo Surveys

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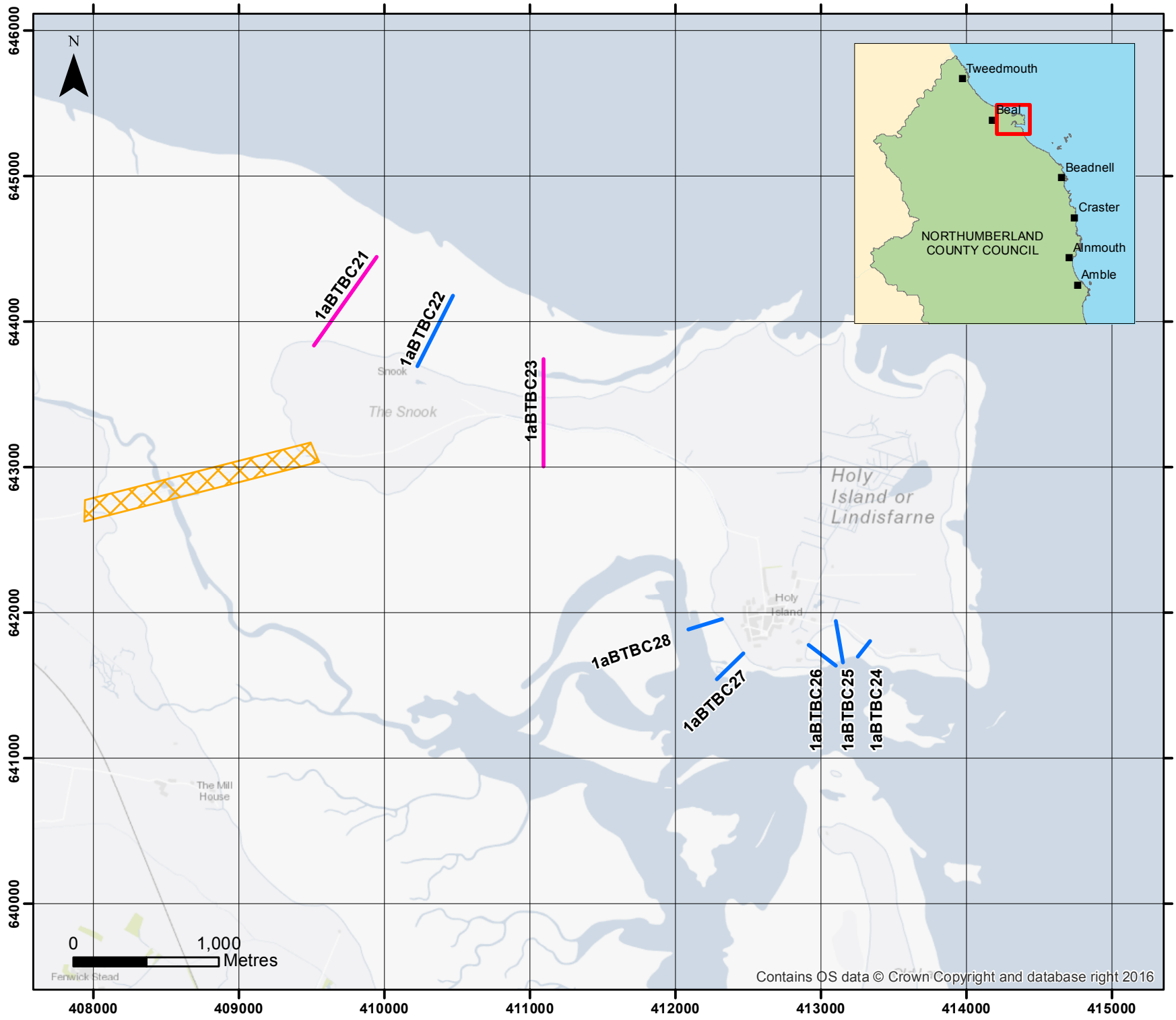

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual

Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

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Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 3

Northumberland County Council Frontage

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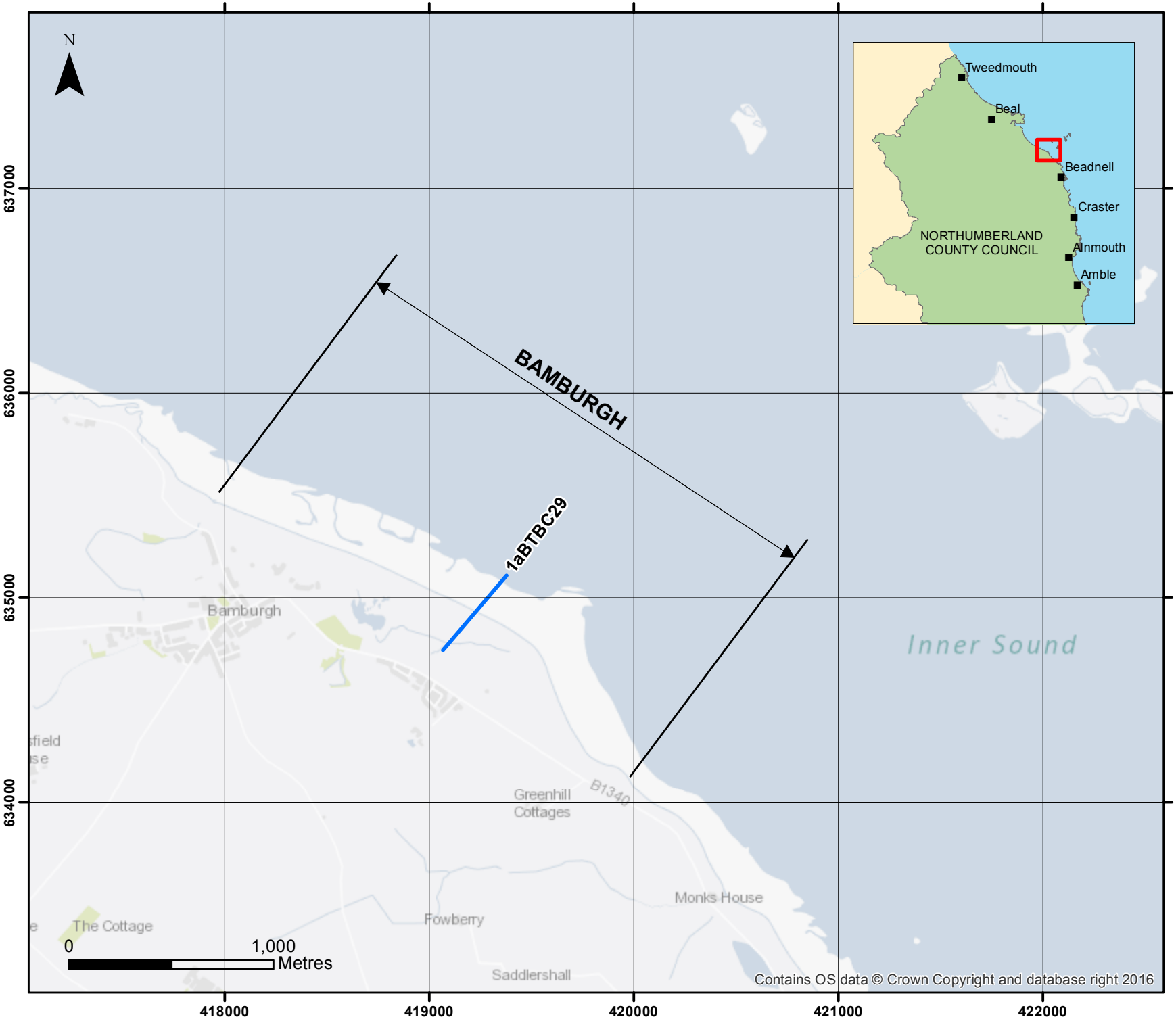

Key

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 4

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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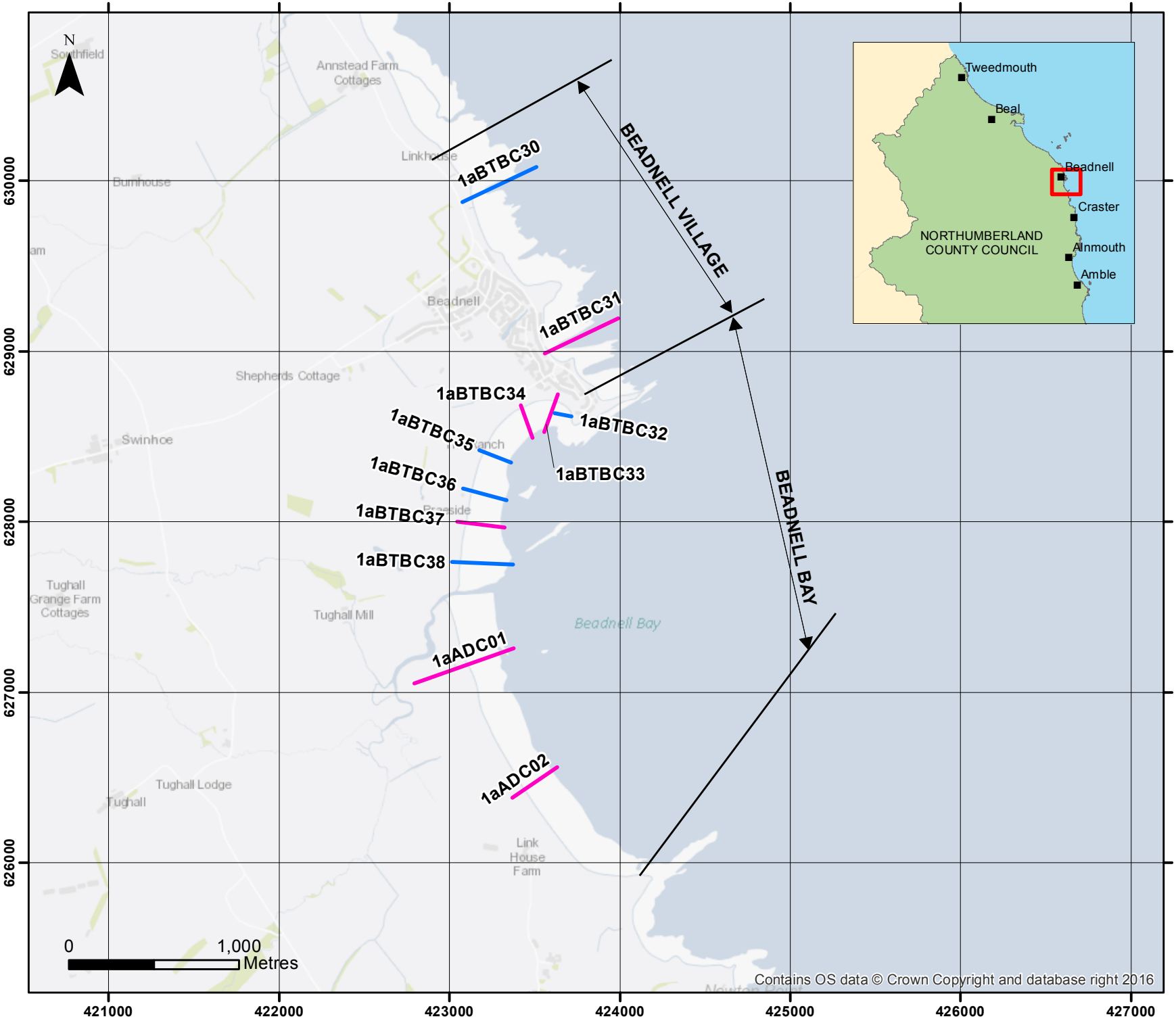

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual

Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 5

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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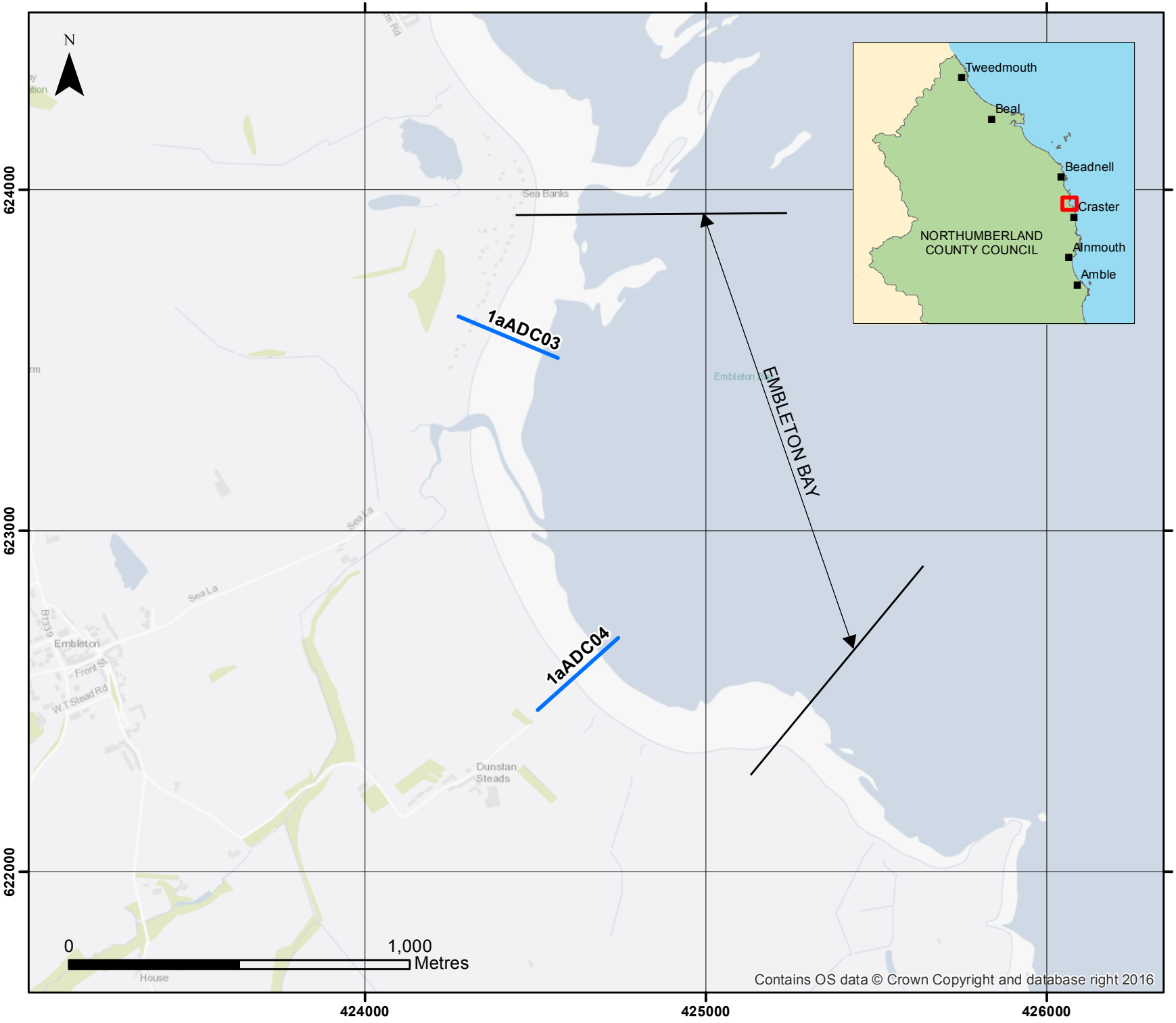

Key

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 6

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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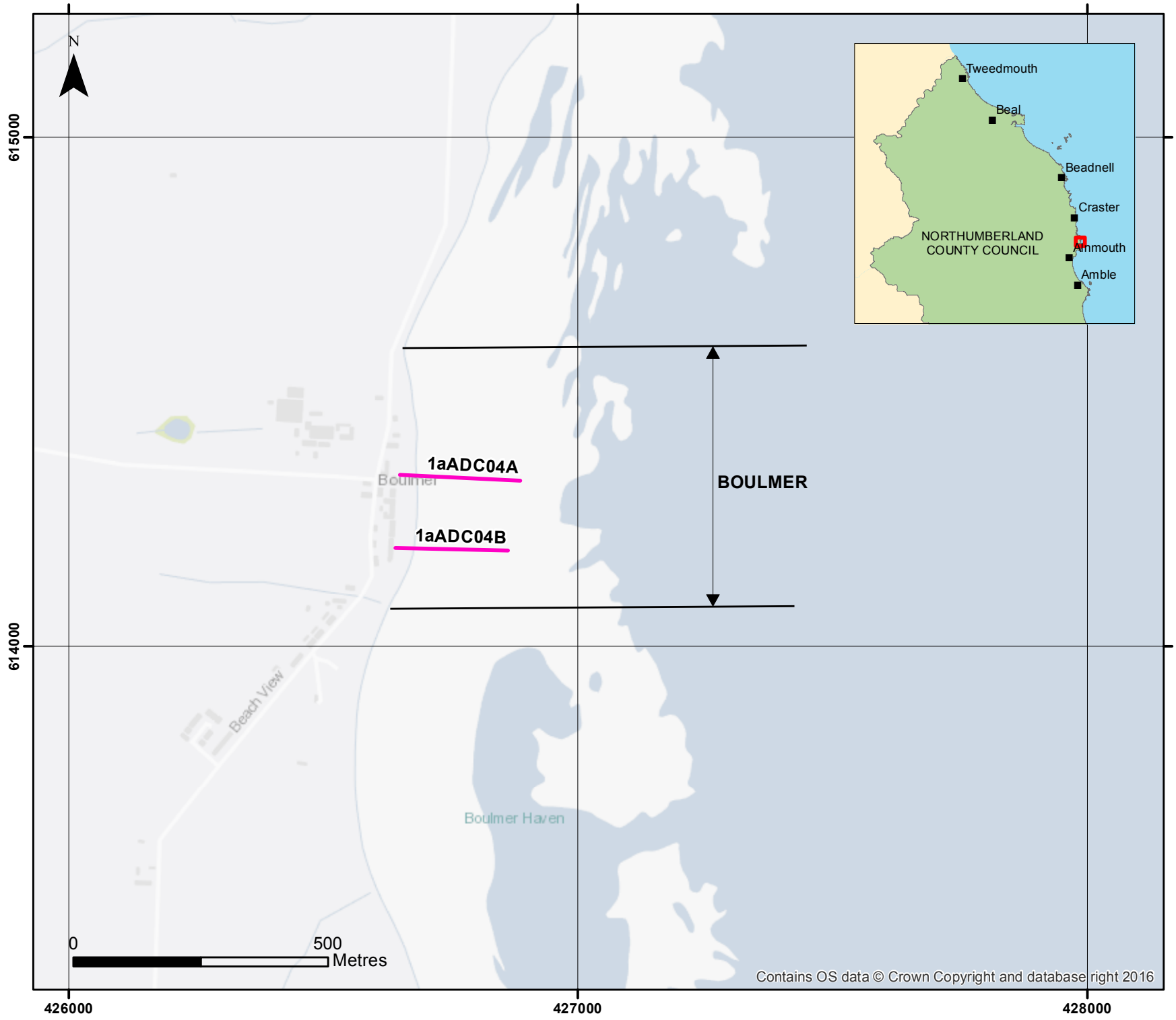

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual

Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 7

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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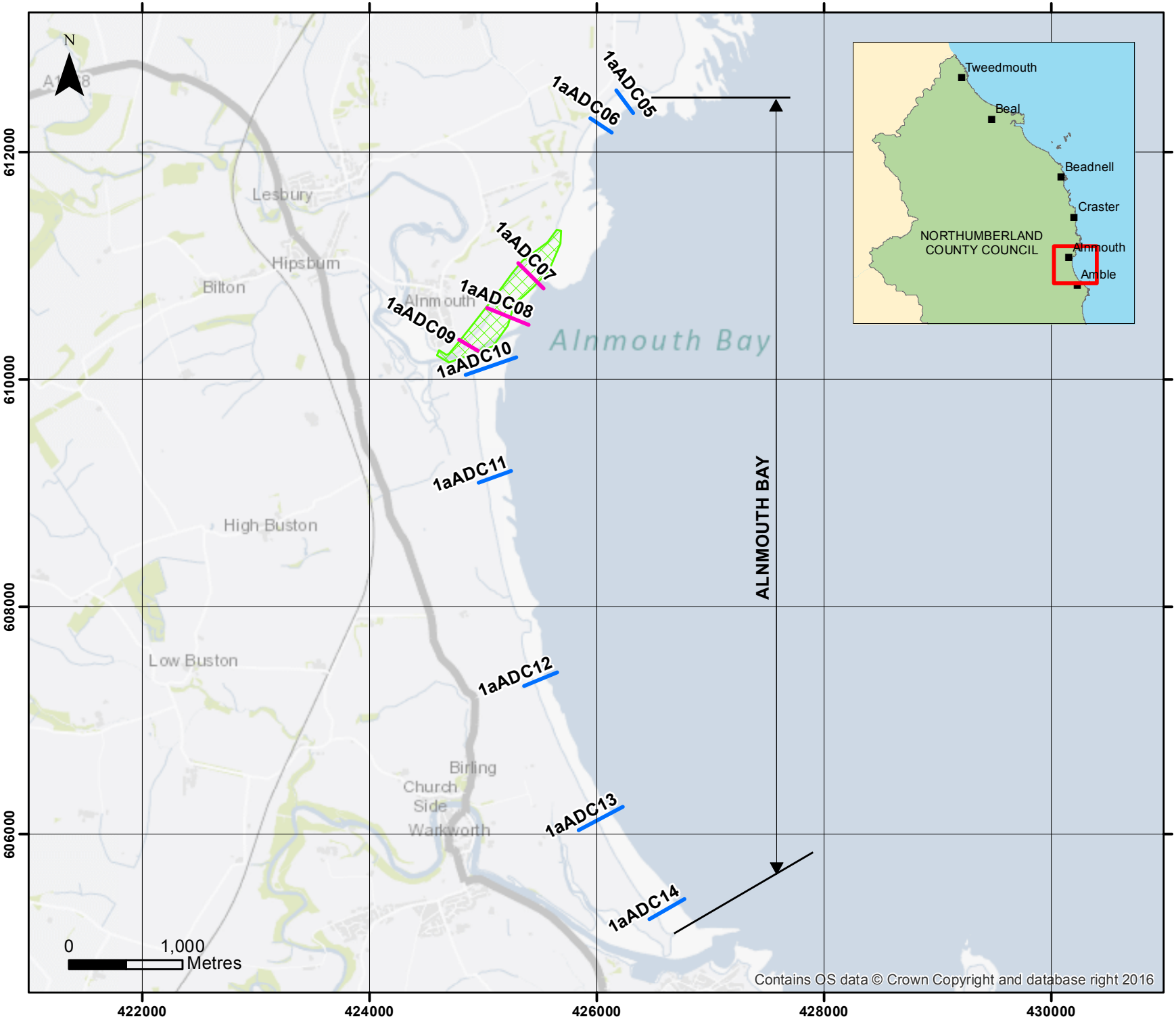

Key

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 8

Northumberland County Council Frontage

Analytical Report
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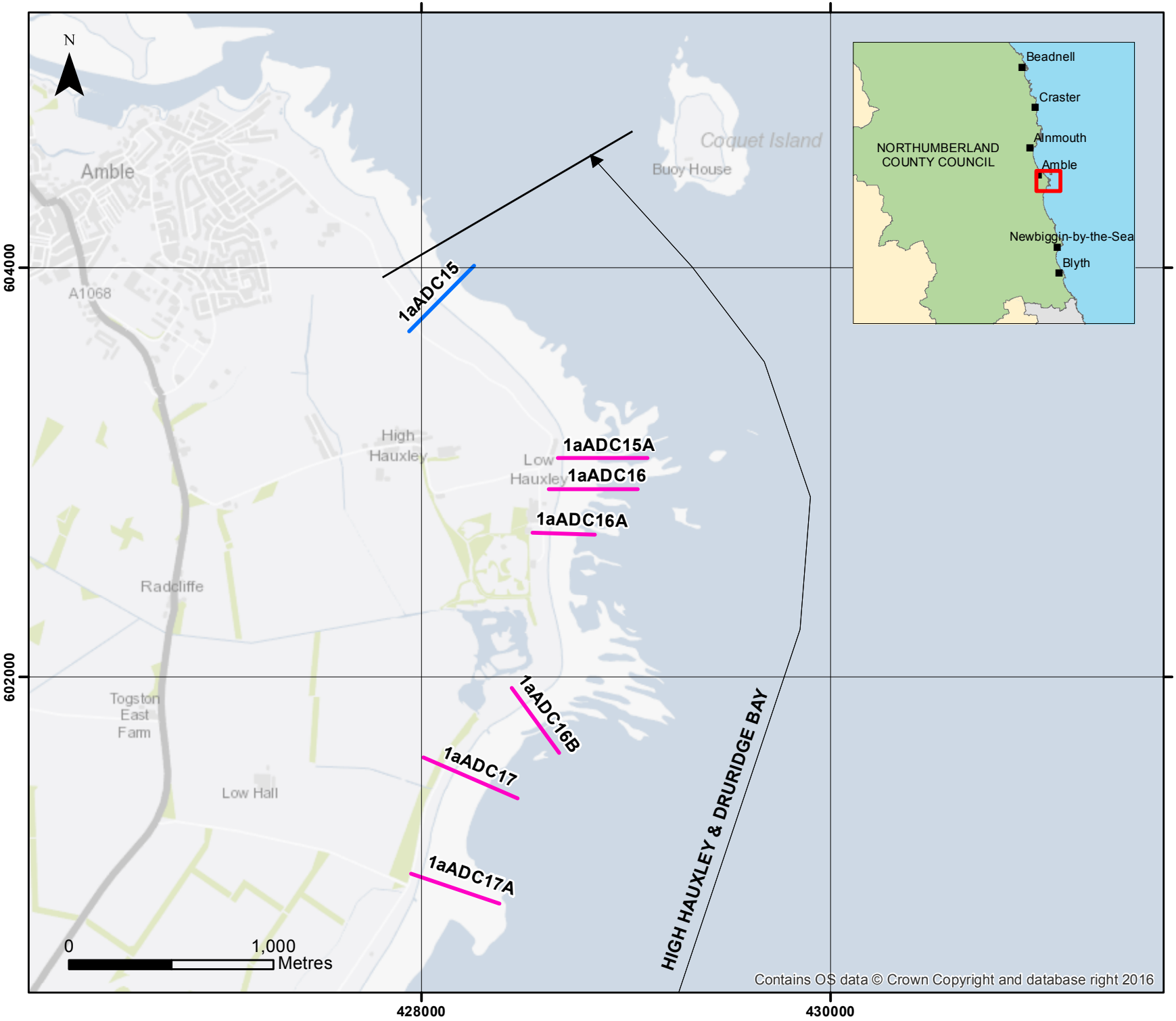

Key

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 9

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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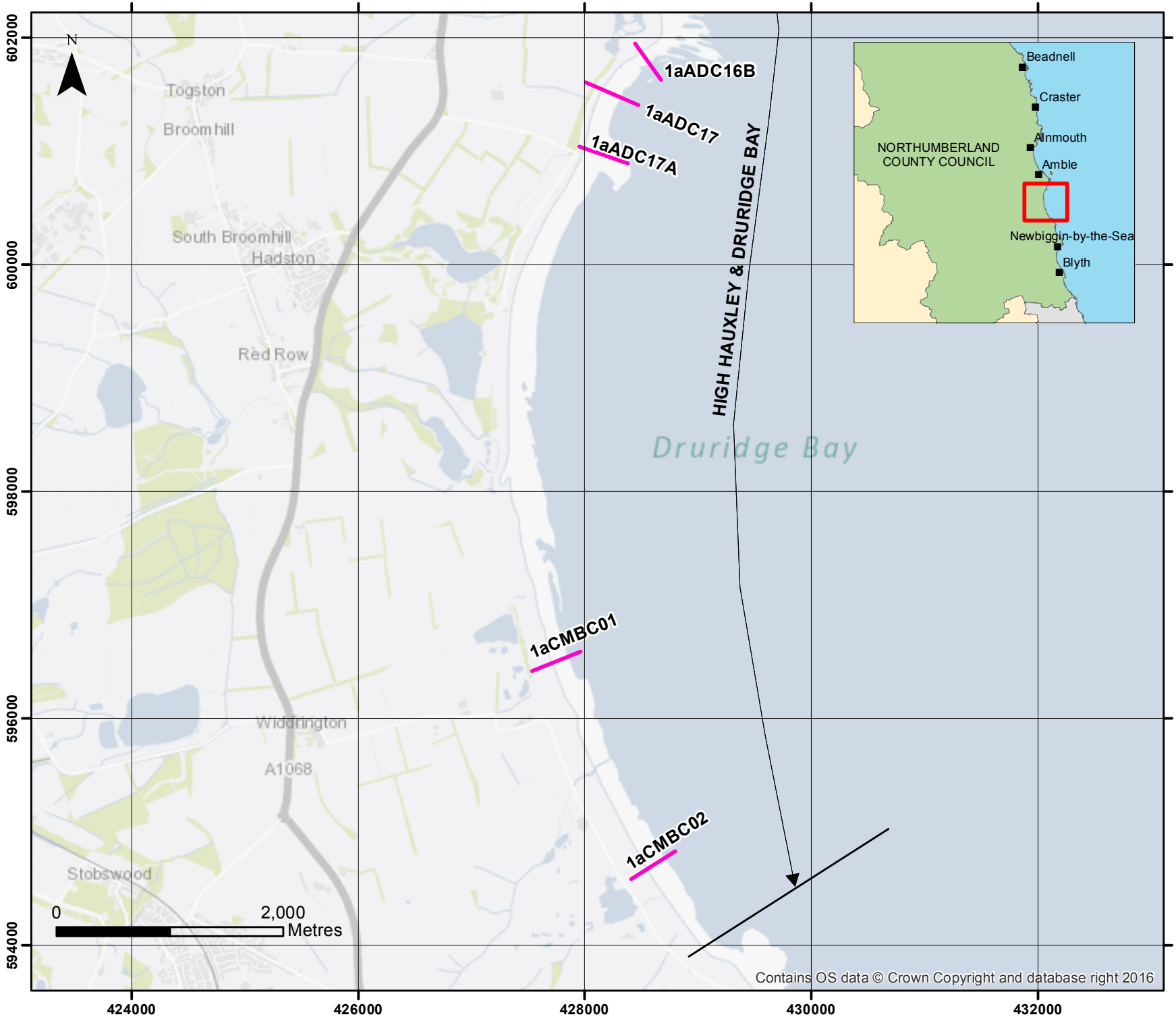

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual

Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 10

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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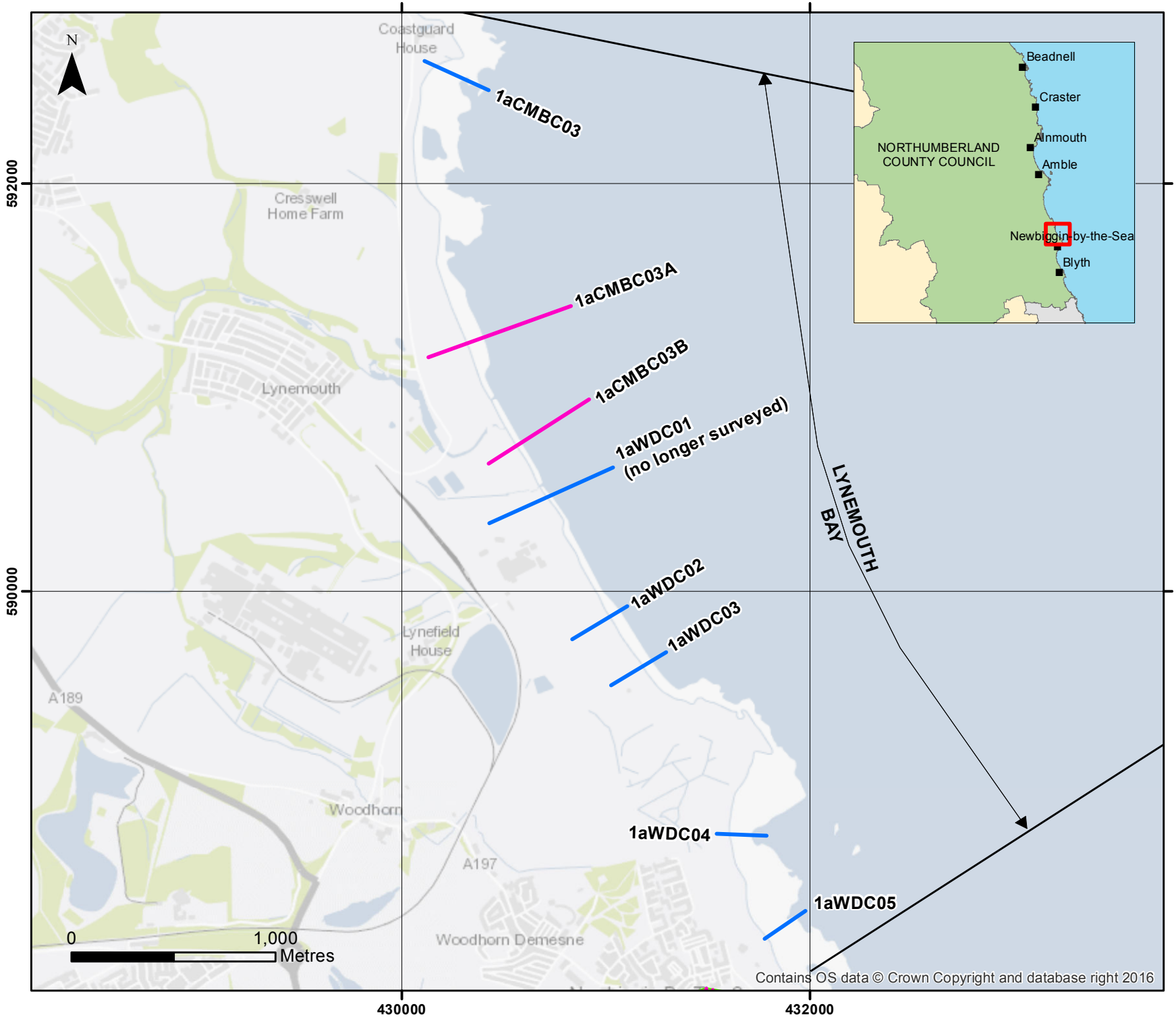

Key

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 11

Northumberland County Council Frontage

Analytical Report
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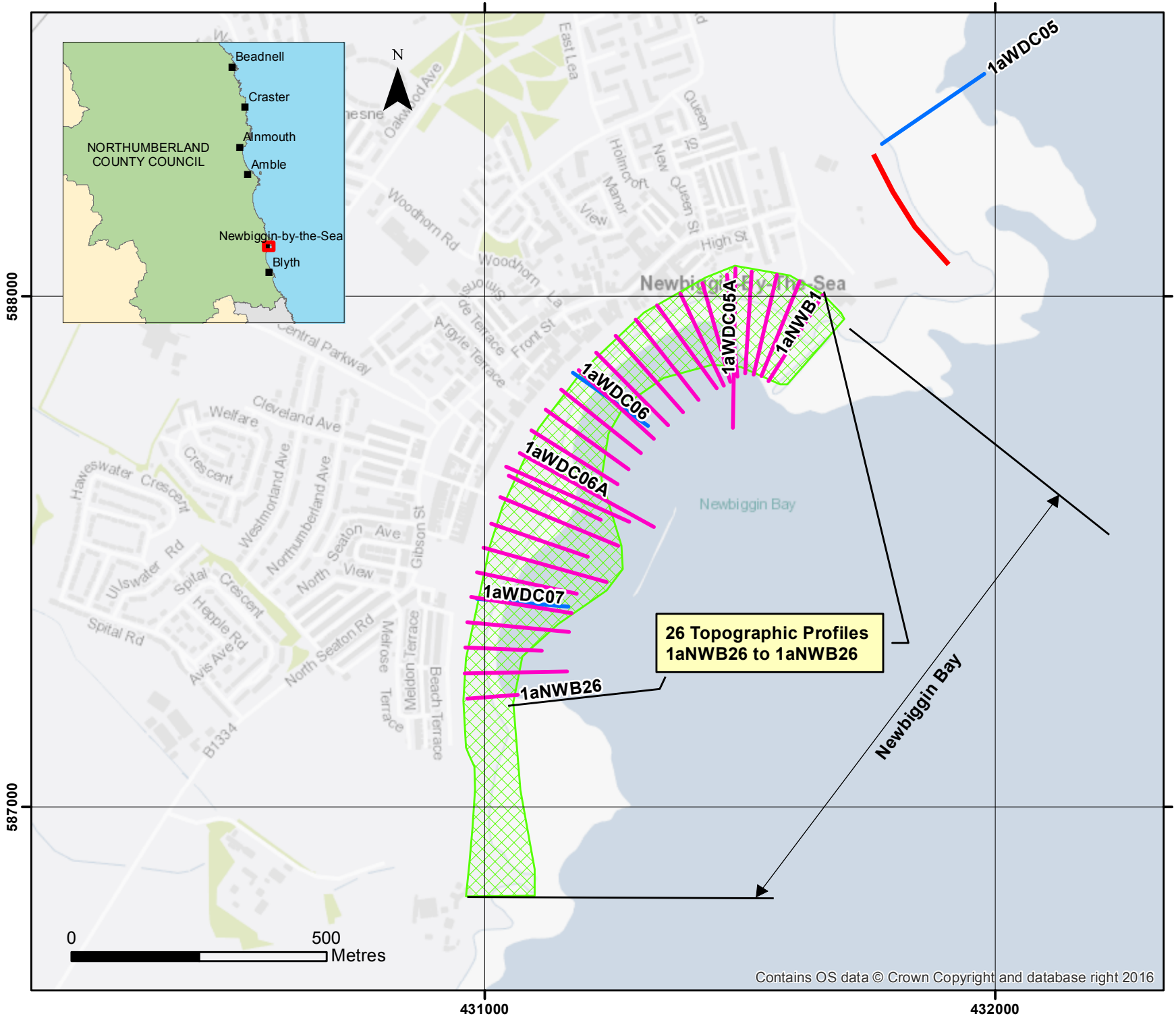

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual

Topographic Surveys

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

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 12

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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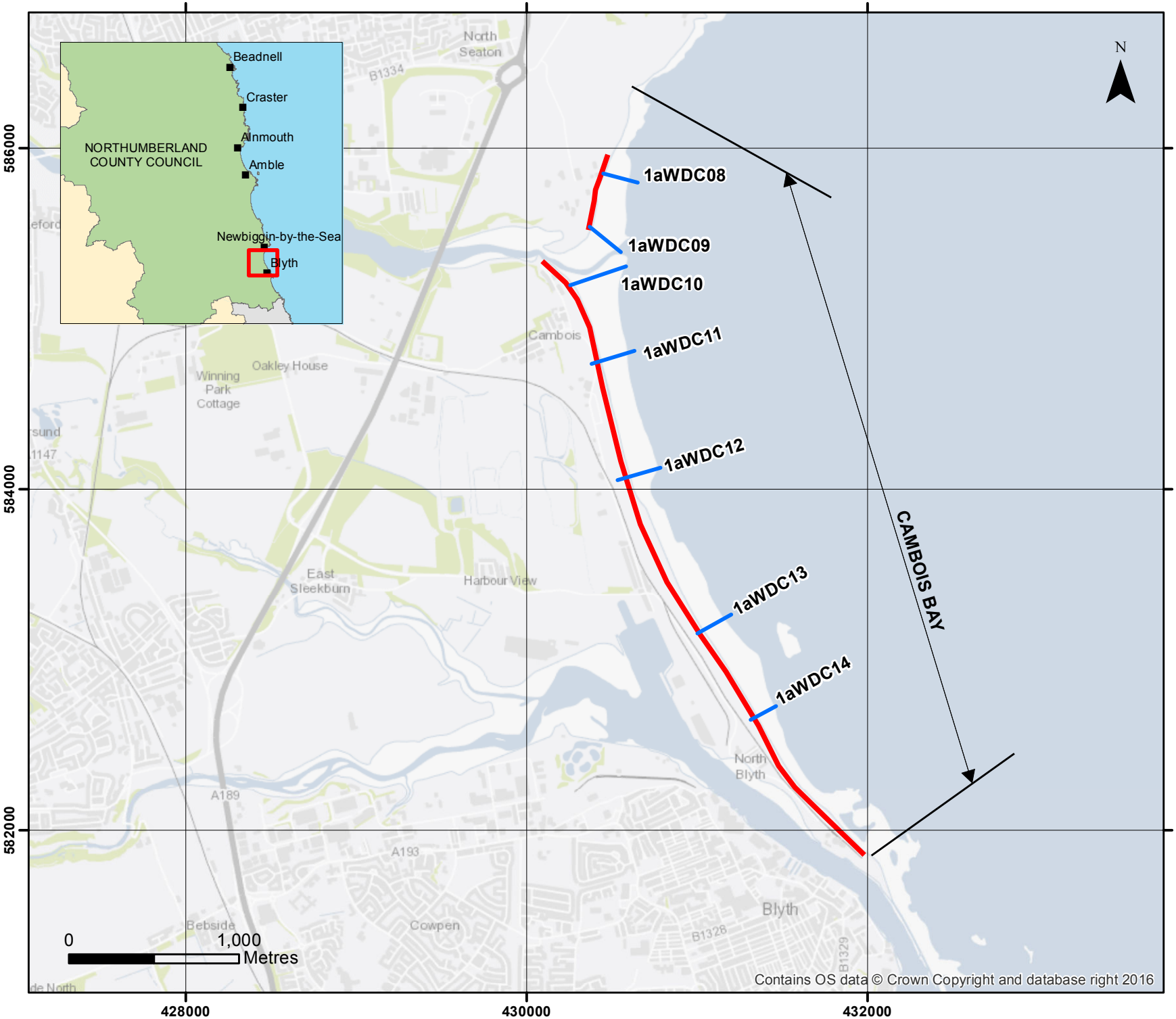

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual
- Cliff Top Edge Survey

Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 13

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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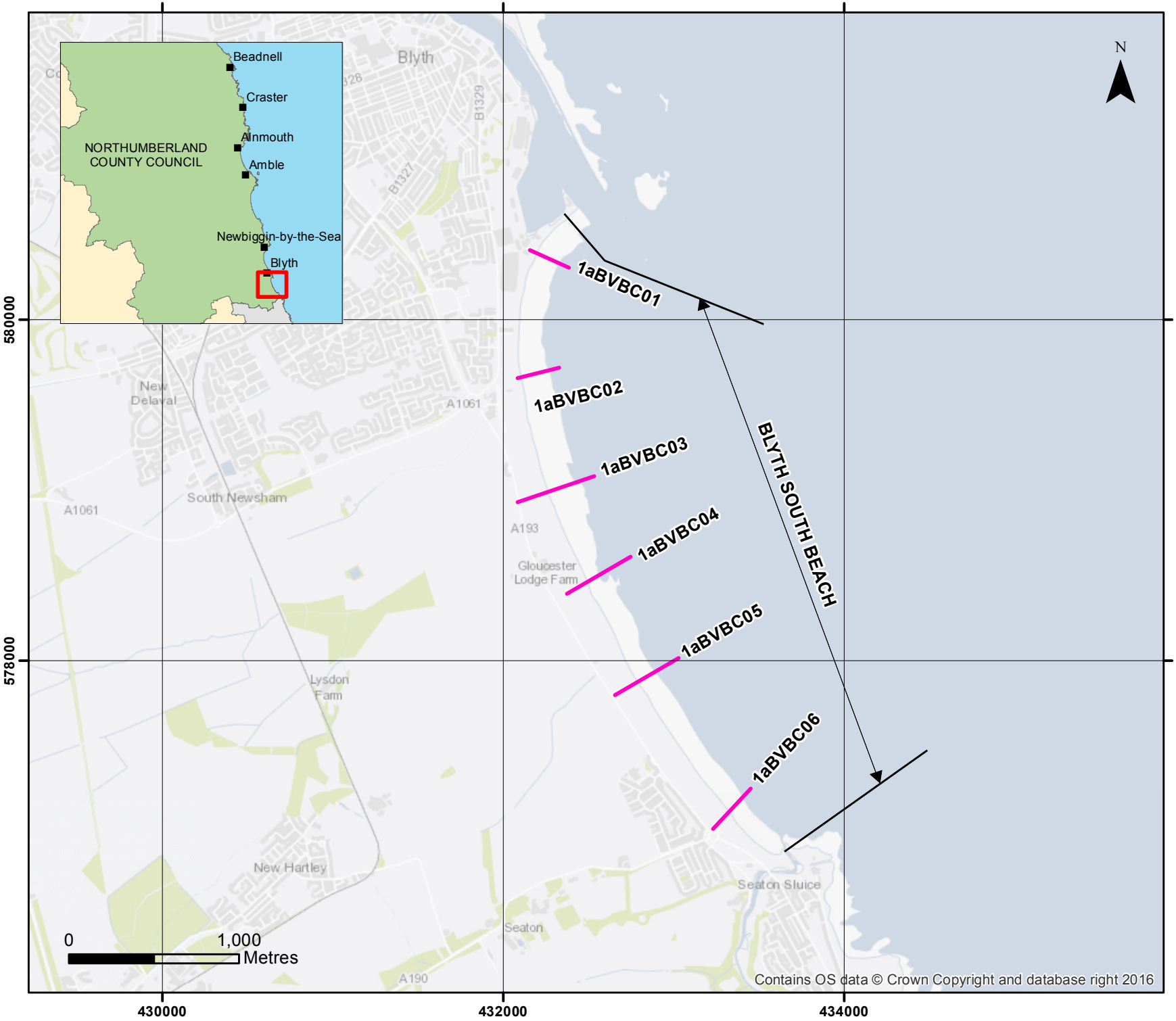

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual
- Cliff Top Edge Survey

Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 14

Northumberland County Council Frontage

Analytical Report
Topo Surveys

Drawing Scale at A4 1:30,000

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2. Analysis of Survey Data

2.1 Sandstell Point (Spittal A)

Survey Date	Description of Changes Since Last Survey	Interpretation
22nd April 2018	**Beach Profiles:** Sandstell Point is covered by four beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2017. Profile **1aBTBC02** is located on the southern bank of the inner Tweed estuary. The dunes have remained stable with no changes in height or position. There has been very little change in the beach levels, ±0.1m from the dune front at chainage 41m to the end of the profile. Overall the profile is at a medium-low level compared to the range recorded from previous surveys. Profiles **1aBTBC04** (longitudinal section) and **1aBTBC05** and **1aBTBC06** (both cross-sections) cover the spit at Sandstell Point. Profile **1aBTBC04** shows that the berm previously recorded at chainage 220m has moved landwards by around 100m and dropped in height by 0.4m. The end of the spit from chainage 300m has accreted, increasing in height by 0.6m and extending seawards by around 50m. Overall the profile is at a relatively medium level compared to the range recorded from previous surveys, with the end of the spit being relatively high. Profiles **1aBTBC05** and **1aBTBC06** are transects across the spit, with the open sea on the left-hand side of the plot and the river channel to the right. At **1aBTBC05**, the spit has increased in height by up to 1.7m creating a smoother, more rounded cross-sectional profile. The river-side face of the spit has moved seawards by c.10m. Overall the profile is within the middle of its range recorded from previous surveys, both in terms of height and position. At **1aBTBC06** the spit profile shows movement towards the riverward side, with both berms decreasing in height and moving riverwards. The smaller berm previously recorded at chainage 130m has moved around 5m riverwards and decreased in height by 0.3m. The main berm (crest of spit) previously recorded at chainage 230m has moved riverwards by around 40m and decreased in height by 1.4m. The riverward face of the spit has moved riverwards by around 50m.Overall the profile is within the	Since the last survey, the dunes along the south bank of the River Tweed have remained stable. There have been considerable changes to the profiles around the mouth of the River Tweed on Sandstell Point. The spit has been particularly dynamic, rotating around the headland in an anti-clockwise direction. **Longer term trends:** The small change in dune profile is within the bounds of previous surveys that indicate they have remained stable over the past 11 years. The beach profiles show that the form of the spit is generally within the range of past observations. The wide variation in profile forms over time is indicative of this being one of the most dynamic systems on the north east coast.

Survey Date	Description of Changes Since Last Survey	Interpretation
	middle of its range recorded from previous surveys, both in terms of height and position. The combination of movement observed at 1aBTBC05 and 1aBTBC06 suggests the river channel has migrated, pushing the base of the spit seawards slightly and rotating the head of spit in an anti-clockwise direction.	
April 2018	**Topographic Survey:** Due to the significant changes that have been observed from the beach profiles along the spit at Sandstell Point and the three dimensional nature of these changes, a topographic survey was introduced to the monitoring programme in 2011. The previous survey was undertaken for the Full Measures survey in autumn 2017. Data from the most recent topographic survey (Partial Measures, spring 2018) have been used to create a digital ground model (DGM) (Appendix B – Map 1a) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 1b) produced from the last produced topographic survey and the present survey. In particular, the difference plot shows: (i) little change in the dunes on the south bank of the River Tweed; (ii) decrease in the beach elevation along the northwest edge of the survey area just off the edge of the land; (iii) three wide bands of alternating accretion and erosion across the spit running north-south parallel to the main coastline, with accretion closest to the coastline. The magnitude of the accretion and erosion increases towards the north; (iv) a patch of elevation decrease in the north east of the survey area.	The findings of the topographic survey show similar trends to the profile survey. This appears to show migration of both the river channel and the spit in an anti-clockwise direction around the headland.

2.2 Spittal (Spittal B)

Survey Date	Description of Changes Since Last Survey	Interpretation
22nd April 2018	**Beach Profiles:** Spittal B is covered by two beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2017. Profile **1aBTBC11** is located to the north of Spittal Beach and shows alternating areas of accretion and erosion. From the edge of the dunes at chainage 10m to chainage 55m there has been accretion of up to 0.8m. Between chainage 55m and 110m there has been erosion of 0.4m. Between chainage 110m and 190m there has been accretion of up to 0.8m. Seawards of chainage 190m there has been erosion on the lower beach of up to 0.3m, moving the toe of the beach landwards by c.25m. Overall the profile is at a relatively high level compared to the range recorded from previous surveys with the section between chainage 110m and 170m having its highest recorded levels. Profile **1aBTBC13** is located towards the centre of Spittal Beach. The upper beach to chainage 40m shows erosion of up to 0.8m. Between chainage 40m and 120m there has been accretion of up to 0.6m. From chainage 120m seawards there has been erosion of up to 0.2m, moving the toe of the beach landwards by around 15m. Overall the profile is at a medium level compared to the range recorded from previous surveys, with the upper beach being slightly more low level.	Since the last survey, the changes in beach level have been variable indicating a redistribution of sediment throughout the profiles, with erosion particularly dominant at the toe of the beach. **Longer term trends:** At both profile locations along Spittal Beach, the changes observed from the present survey are generally within the bounds of previous surveys.

2.3 Goswick Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
20th April 2018	**Beach Profiles:** Goswick Sands are covered by two beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2017. Profile **1aBTBC16** is located to the north of Goswick Sands, between Far Skerr and Cheswick Black Rocks. The dune has remained stable since the last survey. The beach at the toe of the dune to chainage 165m has dropped by 0.4m. Seawards of chainage 165m there has been significant accretion across the rest of the beach of up to 1.8m, with the toe of the beach moving seawards by around 85m, creating a shallower gradient to the lower beach. Overall the profile is at a medium-high level compared to the range recorded from previous surveys, particularly the lower beach berm which is highest level on record between chainage 200m and the end of survey at chainage 290m. Profile **1aBTBC19** is located to the south of Goswick Sands. The dunes have remained largely stable since the last survey, with changes restricted to ±0.1m. Beach levels show very little change to chainage 550m, at the start of the berm. The berm shows accretion of up to 0.2m. The present survey extends c.300m further than the previous survey, indicating that sediment has accumulated in the lower beach, similar to previous spring surveys. Beach levels are at a relatively medium level compared to the range recorded from previous surveys, with the berm between chainage 460m and 820m having its highest recorded levels.	Beach levels have fallen at the toe of the dunes but risen over the rest of the profile in the north at Goswick Sands, whilst there has been little change in the south. **Longer term trends:** Both profiles are within the range recorded from previous surveys. However, the range of variation on record is limited compared to beaches elsewhere along the north east coast.

2.4 Holy Island

Survey Date	Description of Changes Since Last Survey	Interpretation
20th April 2018	**Beach Profiles:** Holy Island is covered by two beach profile lines for the Partial Measures surveys (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2017. **1aBTBC21** and **1aBTBC23** are located on the north-west side of the island, along The Snook. At profile **1aBTBC21** the dunes have remained stable since the last survey, with accretion of up to 0.2m on the dune face between chainage 38m and 55m. Beach levels have experienced accretion of up to 0.2m as far as 500m chainage, with the accretion the greatest at the toe of the dunes. The profile extends 100m further than the previous survey, with the final 10m of overlap between the two surveys suggesting the toe of the beach has undergone erosion. The beach is at a relatively medium level compared to the range recorded from previous surveys on the upper beach, but is at a relatively low level on the lower beach, with the section seawards of chainage 500m being the lowest on record. Profile **1aBTBC23** shows that the dunes and beach have remained stable since the last survey. The seaward face of the dunes shows accretion of 0.1m, and progression of around 1m. The seawards beach shows minor accretion of up to 0.1m. Overall the beach levels seaward of The Snook are at their highest recorded level, whilst the beach on the south side of the island is at a relatively low level compared to the range recorded from earlier surveys.	The dunes, sandy foreshore and sand flats around The Snook have remained stable in both form and position since the last survey. **Longer term trends:** The minor changes observed since the last survey are within the bounds of previous surveys.

2.5 Beadnell Village

Survey Date	Description of Changes Since Last Survey	Interpretation
19th April 2018	**Beach Profiles:** Beadnell Village is covered by one beach profile line for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2017. **1aBTBC31** is in Nacker Hole and extends across the promenade and seawall. Since the last survey, the beach profile has remained relatively stable. There has been accretion of up to 0.2m of shingle across the upper beach from the seawall to chainage 26m. From chainage 26m seawards there are pockets of accumulated sand and pebbles in between rocks, increasing levels by 0.2m. Overall the profile is at a medium-high level compared to the range recorded from the previous surveys.	The beach to the south of Beadnell Village has generally remained stable. **Longer term trends:** The changes observed since the last survey are within the bounds of previous surveys.

2.6 Beadnell Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
19th April 2018	**Beach Profiles:** Beadnell Bay is covered by five beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2017. Profiles **1aBTBC33** and **1aBTBC34** are located in Beadnell Harbour to the north of Beadnell Bay. Profile **1aBTBC37** is located further south towards the outfall of Brunton Burn/Long Nanny. At **1aBTBC33**, the beach profile shows accretion of 0.2m on the front face of the dunes. However, the survey report notes that the middle of the dunes were not surveyed due to access difficulties created by vegetation. The beach shows accretion of up to 0.4m across its profile. The profile is at a relatively high level compared to the range recorded from previous surveys, with the section between chainage 80m and 170m being the highest on record. At profile **1aBTBC34**, the dunes show growth of up to 0.2m. Between the dune toe and chainage 125m, there has been erosion of up to 0.4m, exposing areas of boulders and rocks between chainage 40m and 110m. Seaward of chainage 125m there has been accretion of up to 0.7m. The upper beach is at a low level compared to the range recorded from previous surveys, whilst the lower beach is at its highest recorded level. At **1aBTBC37**, the dunes have remained mostly stable since the last survey; however the toe has retreated by around 8m, with levels dropping by 0.8m. Between the dune toe and chainage 200m there has generally been erosion of up to 0.4m. Seawards of chainage 200m there has been accretion of 0.4m, extending the toe of the beach seawards by around 20m. Overall the profile is at a medium-low level compared to the range recorded from previous surveys, with the exception of the lower beach between chainage 200m and 240m being the highest on record. Profiles **1aADC01** and **1aADC02** are located along the frontage to the south of the outfall of Brunton Burn/Long Nanny. The dunes at 1aADC01 and 1aADC02 have not changed form or position. At **1aADC01** the dune has remained stable with some accretion of 0.1m on the landward side. There has been accretion at the toe of the dune of up to 0.6m. Between chainage 310m and 420m there has been erosion of up to 0.4m. Seawards of chainage 420m there has been very little change. Overall the	Along the length of Beadnell Bay, the dunes have remained largely stable since the last survey, with some signs of growth. In general the profiles show erosion on the upper beach and accretion on the lower beach, with the exception of profile 1aBTBC33 which shows accretion across the whole beach. **Longer term trends:** Along the length of Beadnell Bay, the dunes are of a similar form to those observed in the past. The changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys, with the toe of the beach being the highest on record on most of the profiles.

Survey Date	Description of Changes Since Last Survey	Interpretation
	profile is at a medium level compared to the range recorded from previous surveys. At profile **1aADC02** the dunes have increased in height by up to 0.6m. There has been erosion of up to 0.4m from the dune toe to chainage 220m. Seawards of chainage 220m there has been accretion of 0.8m, forming a berm on the lower beach. Overall the profile is at a relatively low level compared to the range recorded from previous surveys with several sections being the lowest on record (chainage 45m-80m, 105m-130m, and 165m-220m), the exception being the berm which shows the highest recorded levels for the toe of the beach.	

2.7 Boulmer

Survey Date	Description of Changes Since Last Survey	Interpretation
21st March 2018	**Beach Profiles:** Boulmer is covered by two beach profile lines for the Partial Measures survey (Appendix A). These were added to the programme in October 2007. The previous survey was undertaken for the Full Measures survey in autumn 2017. At profile **1aADC04A** there has been very little change on the upper beach. From chainage 25m to 50m there has been erosion of up to 0.3m. The rock platform is exposed from chainage 50m to the end of profile as in the previous survey. Overall the profile is at a medium level compared to the range recorded from previous surveys. At profile **1aADC04B** the backshore (now rock armour) has remained stable since the last survey. There has been very little change on the upper beach to chainage 18m. Between chainage 18m and 45m there has been accretion of up to 0.2m. Between chainage 45m and the exposed rock platform at chainage 70m there has been erosion of up to 0.3m. Seawards of chainage 70m the rock platform is exposed over the rest of the profile, as it was in the previous survey. The profile is at a relatively high level at the toe of the rock armour, and at a more medium level over the rest of the profile compared to the range recorded from previous surveys.	The dune cliff backshore at Boulmer is now fixed in position by the rock armour at both profiles. Beach levels at both locations in Boulmer have experienced quite limited change since the last survey, with very little change at the toe of the rock armour and erosion across the rest of the profile to the exposed rock platform. **Longer term trends:** The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys. The sandy part of the upper beach remains near its highest level on record, and the rocky shore platform continues to be exposed in the lower foreshore.

2.8 Alnmouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
21st March 2018	**Beach Profiles:** Alnmouth Bay is covered by three beach profile lines during the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2017. The three profiles are located to the north of Alnmouth Bay between Marden Rocks and the mouth of the River Aln Estuary. At profile **1aADC07** the overall position of the dunes has remained stable since the last survey. The beach level at the toe of the dunes has dropped by 0.4m. The erosion, of up to 0.3m, continues to chainage 100m. Between chainage 100m and 200m there has been accretion of up to 0.5m. Seawards of chainage 200m there has been erosion of up to 0.3m, removing the lower beach berm previously recorded at chainage 210m. The overall effect is a smoother profile. The upper beach is at a relatively low level compared to the range recorded from previous surveys, whilst the mid and lower beach are at a more medium level. At profile **1aADC08** the dunes have remained largely stable since the last survey, however the dune toe has retreated by around 1m. Beach levels have fallen across the entire profile by varying amounts; ranging from 0.1m to 1.2m. The berm previously recorded at chainage 75m has been removed. A shallow 0.3m depression has formed at chainage 190m, with a 0.3m lower beach berm at chainage 240m. Overall the profile is generally at a low level compared to the range recorded from previous surveys, with the sections between chainage 15m and 85m and 155m and 195m having lowest recorded levels. The exception is the lower beach in the vicinity of the berm which has relatively medium-high levels. At profile **1aADC09** the dunes have remained stable since the last survey. From chainage 25m to 105m there has been erosion of up to 1.1m, but more typically 0.5m. The toe of the beach seawards of chainage 105m shows accretion of up to 0.5m, which has resulted in a shallower gradient and the toe moving around 50m seawards. Overall the profile is at a relatively low-medium level compared to the range recorded from previous surveys, with the toe at a relatively middle position (reflecting the movement of the river channel).	The dunes have remained largely stable since the last survey. Beach level change has been generally dominated by erosion. The continued migration of the river channel is the most notable change. **Longer term trends:** The dunes show long-term stability. The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys, although change in the position of the river channel has substantially curtailed profile 1aADC09 and therefore no information is available about beach elevations on the opposite bank of this channel along this profile alignment (this been the case since 2015).

Survey Date	Description of Changes Since Last Survey	Interpretation
March 2018	**Topographic Survey:** The northern part of Alnmouth Bay (to the north of the River Aln estuary) is covered by bi-annual topographic survey, which commenced in April 2005. Data from the most recent topographic survey (Partial Measures, spring 2018) have been used to create a DGM (Appendix B – Map 2a) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 2b) produced from the last produced topographic survey (Full Measures, autumn 2017) and the present survey. The difference plot shows a mixed pattern of erosion and accretion. In the south of the survey area erosion is dominant across most of the beach, with some small areas of accretion on the upper and toe of the beach in the section opposite the properties. To the north of the car park area the pattern is more scattered and less consistent. In general the upper beach is dominated by erosion, with accretion more dominant in the mid beach, and very scattered patches of both erosion and accretion on the lower beach.	The findings of the topographic survey show a mixture of erosion and accretion, some resulting from winter erosion of the upper beach and consequent accretion in the lower beach (draw down), whereas other changes result from migration of the mouth of the River Aln across the beach.

2.9 High Hauxley & Druridge Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
18th April 2018	**Beach Profiles:** High Hauxley to Druridge Bay is covered by eight beach profile lines during the Partial Measures survey (Appendix A). Four of these (with A or B suffixes) were added to the programme in October 2007. The previous survey was undertaken for the Full Measures survey in autumn 2017. **1aADC15A**, **1aADC16** and **1aADC16A** are located around Hauxley Haven. Dunes at these three profiles have remained stable since the last survey. At profile **1aADC15A**, the toe of the dunes have retreated by around 1m. There has been alternating bands of erosion and accretion across the beach profile. From the dunes to chainage 40m there has been erosion of up to 0.4m, removing the small berm previously recorded at chainage 25m. Between chainage 40m and 70m there has been accretion of up to 0.2m. Chainage 70m to 125m shows erosion of 0.2m. Seawards of chainage 125m there has been accretion of up to 0.5m. Rocks are exposed from at the toe of the beach from chainage 185m. Overall the profile is at a low level relative to the range recorded from previous surveys, particularly between chainage 70m and 110m which has the lowest recorded levels for that section. At profile **1aADC16** there has been a similar pattern to 1aADC15A. There has been erosion of up to 0.7m from the dunes to chainage 95m, removing the small berm previously recorded at chainage 78m. There has been accretion of up to 0.3m between chainage 95m and 120m. Erosion of up to 0.3m between chainage 120m and 155m has removed the berm previously recorded at chainage 125m. Seawards of chainage 155m there has been accretion of up to 0.5m, extending the toe of the beach around 15m seawards. Overall the beach is at a low-medium level relative to the range recorded from previous surveys. The survey report notes '*gaps in section due to bushes'* which appear to be in the dune part of the section. Profile **1aADC16A** shows erosion of up to 0.6m between the sea defences at chainage 80m and chainage 135m, removing the small upper beach berm previously recorded at chainage 112m. Seawards of chainage 135m there has been accretion of 0.3m. The rock platform is exposed from chainage 210m as in previous surveys. Overall the profile is at a medium level relative to the range recorded from previous surveys, except for the lower beach where the rock platform is exposed.	At Hauxley Haven, the dunes have remained stable since the last survey. Beach levels have varied and are generally at low levels but largely remain within the bounds of previous surveys. In most of Druridge Bay the dunes and low cliff at their toe, where present, have experienced little change. However the beaches have varied with erosion tending to dominate, however all profiles are largely at a medium-low level compared to the range recorded from previous surveys. **Longer term trends:** At Hauxley Haven and Druridge Bay, the dunes have demonstrated a long-term trend of stability. The changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys.

Survey Date	Description of Changes Since Last Survey	Interpretation
	1aADC16B, **1aADC17** and **1aADC17A** are located to the north of Druridge Bay, between Bondi Carrs and Hadston Carrs and extend seawards from Togston Links. At profile **1aADC16B** there has been erosion of up to 0.5m between chainage 80m and 145m, exposing more areas of rock. Between chainage 145m and 185m the rock platform remains exposed. Seaward of chainage 185m there has been erosion of 0.1m. Overall the beach is at a medium-low level relative to the range recorded from previous surveys. At profile **1aADC17** there has been a small drop in beach levels at the toe of the dunes of 0.2m. From chainage 40m to 55m there has been accretion of 0.4m. Between chainage 55m and 160m there has been erosion of up to 0.3m. Seawards of chainage 170m there has been accretion of up to 0.3m, extending the toe of the beach seawards by around 30m. The profile is generally at a medium level compared to the range recorded from previous surveys, with the lower beach being high. At profile **1aADC17A** the dunes have remained stable. The upper beach shows erosion of up to 0.3m from the dunes to chainage 45m. The remainder of the beach profile shows accretion of up to 0.3m, with the mid section between chainage 110m and 135m showing very little change. The rock platform at the toe of the beach previously exposed from chainage 200m has been covered to chainage 230m. Overall the profile is at a medium level relative to the range recorded from previous surveys. **1aCMBC01** and **1aCMBC02** are located in the southern section of Druridge Bay. At profile **1aCMBC01**, the dunes appear to have remained stable, with small amount of accretion up to 0.1m. There has been erosion on the upper beach of up to 1.6m removing the berm previously recorded at chainage 200m. Between chainage 225m and 275m there has been accretion of up to 0.4m. Seawards of chainage 275m there has been erosion of up to 0.5m, moving the toe of the beach landwards by around 20m. The profile is generally at a medium level compared to the range recorded from previous surveys. At profile **1aCMBC02**, the dunes have remained stable. The upper beachhas been eroded by up to 1.3m between the dunes and chainage 230m.. There has been a small amount of accretion between chainage 230m and 330m of up to 0.4m. Seawards of chainage 330m beach levels have dropped by up to 1.0m, with the toe of the beach moving landwards by around 40m. Compared to the range recorded from previous surveys the upper beach is at its lowest recorded level to chainage 215m, the mid beach is at a low level, and the lower beach is at a medium level.	

2.10 Lynemouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
17th April 2018	**Beach Profiles:** Lynemouth is covered by two beach profile lines during the Partial Measures survey (Appendix A). Profiles 1aCMBC03A and 1aCMBC03B were added to the programme in October 2007. The previous survey was undertaken for the Full Measures survey in autumn 2017. **1aCMBC03A** is located c.450m north of the mouth of the River Lyne and extends across the extensive slag banks before reaching the foreshore. The profile of the slag bank has not experienced any change since the last survey. The beach levels show erosion across the profile of up to 0.8m. The beach levels are at their lowest recorded level. **1aCMBC03B** is located to the north of Lynemouth Power Station and extends across the extensive slag banks before reaching the foreshore. The process of slag bank erosion has been progressing for some years. Since the last survey, the slag bank has not shown any movement however. The beach shows an increase in levels of up to 1.2m forming a berm at chainage -3m. Seawards of chainage 20m there has been erosion of up to 1.2m. Overall the beach is low compared to earlier surveys, reflecting the ongoing landward recession of the artificial shoreline at this point in the bay.	North of the mouth of the River Lyne, the slag bank has remained stable. The beach has experienced erosion and is at its lowest recorded level. To the north of the power station, the slag bank has remained stable. The beach has accreted across the upper beach, but eroded at the toe. **Longer term trends:** North of the mouth of the River Lyne, the slag bank has demonstrated a long term trend of stability. To the north of the power station, the slag bank has continued to retreat, demonstrating parallel retreat of the artificial shoreline.
March 2018	**Cliff-top Survey:** Cliff top survey data collected for baseline survey (autumn, 2008), the previous Full Measures survey (autumn 2017) and the present Partial Measures survey (spring 2018) is presented in this report. The cliff top survey is carried out as a continuous cliff edge line survey at the Newbiggin Caravan Park at Newbiggin Point. The results from the cliff top monitoring are anticipated to have an accuracy of ±0.2m due to the technique used. Furthermore, problems in precisely locating the cliff top, due to vegetation growth or the indistinct form of the cliff top, have also affected the data quality. There has been numerous small areas of erosion of up to 0.3m along the survey length. There are three areas of more significant erosion; c.5m length of erosion of up to 1.3m roughly a quarter of the way down the survey area, c.4m length of erosion of up to 1.4m at the end of the first section of caravans, c.4m length of erosion of up to 1m approximately three-quarters of the way down the survey area.	Since the last survey, there have been several small areas of erosion of up to 0.3m, with three areas 4-5m lengths of more significant erosion of 1.0-1.4m of erosion.. **Longer term trends:** Since surveys began in October 2008, cliff movement has been greatest in the north of the survey area with up to 3.4m of cliff top retreat, whilst the central and southern parts of the survey area have shown less movement with retreat of up to 1.4m.

2.11 Newbiggin-by-the-Sea

Survey Date	Description of Changes Since Last Survey	Interpretation
20th March 2018	**Beach Profiles:** Newbiggin-by-the-Sea is covered by four beach profile lines during the Partial Measures survey (Appendix A). Two of these (with an 'A' suffix) were added to the programme in October 2007 specifically to help assess the performance of the capital scheme involving beach replenishment and construction of an offshore breakwater. It should be noted that an extended series of profiles and a topographic survey are also recorded via the Cell 1 Regional Coastal Monitoring Programme for purposes of post-project evaluation of this capital scheme. These profiles are not analysed here, however, the findings of the topographic survey are presented below. The previous survey was the Full Measures assessment undertaken in autumn 2017. **1aWDC05A** is in the north of Newbiggin Bay. There has been accretion of up to 0.6m across the profile to chainage 110m where the rock platform remains exposed. The profile is at a high level relative to the range recorded from previous surveys, with the section between chainage 75m and 105m being the highest on record. **1aWDC06** is located in the centre of the northern part of Newbiggin Bay, between the two breakwaters. There has been erosion of up to 0.9m of material at the base of the seawall, exposing more of the structure. From chainage 40m to the end of the profile at chainage130m there has been accretion of up to 1.2m. The upper beach is at a relatively medium level compared to the range recorded from previous surveys, whilst the lower beach is at its highest recorded levels from chainage 80m. **1aWDC06A** is located in the centre of Newbiggin Bay, behind the offshore breakwater. The front face of the upper beach berm has been eroded and moved landwards by around 20m. There has been erosion across the beach from the berm to chainage 270m of up to 0.3m. Seawards of chainage 270m to the end of the profile at chainage 295m there has been accretion of up to 0.2m. Overall the profile is at a medium-high level relative to the range recorded from previous surveys, with the exception of the face of the upper beach berm being in a relatively landward position and the lower beach between chainage 235m and 265m being the lowest on record.	Since the last survey, the beach at Newbiggin-by-the-Sea shows accretion at either end but erosion in the centre of the bay, with all profiles at a medium-high level compared to the range recorded from previous surveys. **Longer term trends:** Data collected since the start of monitoring in May 2002 reflects the change in beach width resulting from the beach nourishment scheme implemented at Newbiggin-by-the-Sea. This change is also reflected in the beach profile plot in Appendix A. The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys.

Survey Date	Description of Changes Since Last Survey	Interpretation
	1aWDC07 is located towards the south of Newbiggin Bay. There has been accretion of up to 0.4m across the beach profile to chainage 70m. Seawards of chainage 70m the beach levels have dropped by up to 0.4m, moving the toe of the beach landwards by around 40m . Overall the profile is at a medium level compared to the range recorded from previous surveys.	
April 2018	**Topographic Survey:** Newbiggin-by-the-Sea is covered by bi-annual topographic survey, which commenced in September 2010 to assess the performance of the capital scheme constructed in 2007. Prior to incorporation in the programme, these surveys were undertaken on occasions between 2007 and 2010 as part of the scheme development. The previous survey was the Full Measures assessment undertaken in autumn 2017. Data from the most recent topographic survey (Partial Measures, spring 2018) have been used to create a digital ground model (DGM) (Appendix B – Map 3a) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 3b) produced from the previous and present surveys. The topographic survey shows patchy accretion and erosion. The tombolo behind the central breakwater shows erosion on both of its sides with a wide shore parallel band of erosion in the mid beach which continues northwards on to the upper beach to the north of the breakwater. The mid-lower beach to the north of the breakwater shows the largest and most continuous area of accretion. South of the breakwater the pattern is patchy with generally low magnitude changes, particularly on the lower beach. The survey report notes that sand was covering most of the revetment rocks at the back of the beach.	The topographic survey shows variable change across the bay, with most change occurring in the tombolo behind the central breakwater. The southern end of the bay show a much more patchy distribution. This suggests there may have been movement away from the centre of the bay.

Survey Date	Description of Changes Since Last Survey	Interpretation
April 2018	**Sand Extent Survey**: Spital Carrs is located to the south of Newbiggin Bay and is covered by a bi-annual sand extent survey, which commenced in 2011. The survey was designed to address concerns that the beach recharge scheme undertaken in Newbiggin Bay may impact on the Spital Carrs SSSI and SPA. The sand extent survey therefore identifies the boundary of the sand beach on the rock platform. Data from the most recent sand extent survey (Partial Measures, spring 2018) has been plotted onto aerial imagery (refer to Appendix D – Map 1). The plot shows some variation of the extent of sand between the autumn 2017 and the spring 2018 survey. There has generally been between 4m and 15m of seaward advance of sand across the shore platform over the whole survey area, but this is within the range of changes seen in previous surveys.	Since the last survey, there has been advance of the edge of the sand across the survey area. **Longer term trends:** sand extent surveys for the past 11 surveys shows oscillation of the edge of the beach with no net trend. Recent changes are within the range of changes seen previously.

12.12 Cambois Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
March 2018	**Cliff-top Survey:** Cliff top survey data collected for baseline survey (spring, 2009), the previous Full Measures survey (autumn 2017) and the present Partial Measures survey (spring 2018) is presented in this report. The cliff top survey is carried out as a continuous cliff edge line survey in two locations within Cambois Bay; at Sandy Bay Caravan Park to the north of the River Wansbeck estuary, and Cambois Bay from south of the River Wansbeck to the breakwater at the southern end of the bay. The results from the cliff top monitoring are anticipated to have an accuracy of ±0.2m due to the technique used. Furthermore, problems in precisely locating the cliff top, due to vegetation growth or the indistinct form of the cliff top, have also affected the data quality. There has been very little change in the position of the cliff top at Sandy Bay Caravan Park since the previous survey in autumn 2017 along the majority of the survey length. The exceptions are a short 2m section at the northern end of the survey limit which shows erosion of 0.6m, and in the south there has been more significant stretches of erosion. The most significant is up to 1.8m of erosion over a distance of around 22m towards the end of the caravans, with some shorter additional sections of erosion towards the southern end of the survey limit (1m erosion over 8m length, 1.3m over 10m length, and 0.8m over a 5m length).. The dunes on the southern bank of the River Wansbeck show very little change, except for a 7m section in the middle of the dune survey area which appears to show around 1.7m of retreat. There has been variable amounts of erosion along the survey length in Cambois Bay, typically less than 0.3m, but with numerous short sections (<10m length) of erosion up to 1.0m, and a few areas of more severe erosion; the most notable area is in the south of the survey area: • Consistent erosion of 0.2m to 0.6m over a 450m length opposite the main quay of the tidal basin (between profiles 1aWDC13 and 1aWDC14).	Since the last survey in Autumn2017, there has been erosion of 1-2m over short sections in the south of the Sandy Bay Caravan Park survey area. In Cambois Bay the erosion is generally localised small sections, with the most consistent length of erosion being in the south of the bay opposite the tidal basin. **Longer term trends:** At Sandy Bay Caravan Park the cliff top retreat has been more significant in the southern part of the survey area with up to 10m of erosion since 2007, whilst the northern part has eroded by c.1-3m. In Cambois Bay, the area of greatest cliff top retreat since the surveys began in 2009 is in the centre of the bay opposite Ridley Terrace, Cambois, where up to 12m of erosion has occurred. The north and south of the bay have more typical retreats of c.3-7m. .

2.13 Blyth South Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
5th March 2018	**Beach Profiles:** Blyth South Beach is covered by six beach profile lines for the Partial Measures survey (Appendix A). The previous survey was the Full Measures assessment undertaken in autumn 2017. **1aBVBC01** is located towards the north of South Beach, in front of the land owned by the Port of Blyth. The dunes have remained stable. The upper beach has dropped in level by up to 0.4m. The middle beach between chainage 75m and 110m shows accretion of up to 0.2m. Between chainage 110m and 165m there has been accretion of up to 0.4m. Seawards of chainage 165m there has been accretion of up to 0.5m. The overall effect has been to smooth out the profile. Overall the profile is at a medium-high level compared to the range recorded from previous surveys. At profile **1aBVBC02**, there has been varying levels of erosion and accretion across the profile. At the base of the seawall there has been erosion of up to 0.8m. Erosion of up to 0.8m has also occurred at the toe of the beach seawards of chainage 60m. Accretion of up to 0.5m has occurred between chainage 35m and 60m. The overall effect has been to smooth out the profile. Overall the profile is at a medium-low level compared to the range recorded from previous surveys. At profile **1aBVBC03**, there have been no significant changes to the position and form of the dune crests or the upper part of the dune front since the last survey. The profile has been smoothed out compared to the previous survey. On the upper beach there has been accretion of up to 0.2m between the dune toe and chainage 90m, and chainage 115m and 160m. Between chainage 90m and 115m there has been erosion of up to 0.6m, removing the berm previously recorded at chainage 95m. The lower beach seawards of chainage 160m shows erosion of up to 0.7m. Overall the profile is at a medium level compared to the range recorded from previous surveys. At profile **1aBVBC04**, up to 0.4m of accretion has taken place on the dune crest and 0.2m on the sloping dune face, pushing the dunes around 1m forward. The upper beach shows erosion of up to 1.4m to chainage 85m, removing the berm previously recorded at chainage 60m. Between chainage 85m and 105m the depression recorded on the previous survey has been infilled by up to 0.7m. Between chainage 105m and 150m there has been erosion of up to 0.3m. Accretion of up to 0.3m	Since the last survey, the dune crests at Blyth South Beach have remained stable, generally retaining the same form and position with some minor advances. There have been variable amounts of erosion and accretion across the profiles, with a general trend of flattening and smoothing out of the profiles. All the profiles with the exception of BVBC05 and BVBC06 are at a medium level compared to the range recorded from previous surveys. The upper beach at these two profiles are however at their lowest recorded levels. **Longer term trends:** At Blyth South Beach, the dunes have generally demonstrated a long-term trend of stability. The profiles are mostly at a medium level.

Survey Date	Description of Changes Since Last Survey	Interpretation
	between chainage 150m and 185m. Seawards of chainage 185m there has been erosion of up to 0.6m, moving the toe of the beach landwards by around 45m.The overall effect is a smoothing and flattening of the profile. Overall the profile is at a medium level compared to the range recorded from previous surveys, though the toe of the beach is in a fairly landwards position. At profile **1aBVBC05**, the dunes have remained stable. Between chainage 65m and 115m there has been erosion of up to 2.2m. Between chainage 115m and 175m there has been accretion of up to 0.8m. Seawards of chainage 175m there has been erosion of up to 0.4m. The effect has been to create a smoother flatter profile. Overall the profile is at its lowest recorded level on the upper beach to chainage 110m and at a more medium level across the lower beach compared to the range recorded from previous surveys. **1aBVBC06** is located at the southern end of the beach, towards Seaton Sluice. The dunes have remained stable, with minor accretion advancing the sloping dune face by around 0.5m. There has been erosion of up to 1.6m between chainage 100m and 130m. Between chainage 130m and 195m there has been accretion of up to 1.0m. Between chainage 195m and the end of the profile at 210m the beach level has dropped by 0.3m. Whilst the upper beach is at its lowest recorded level to chainage 115m, the rest of the profile is at a more relatively medium level compared to the range recorded from previous surveys.	

3. Problems Encountered and Uncertainty in Analysis

Individual Profiles

- Profiles 1aBTBC19, 1aBTBC21, and 1aBTBC23 all end at drains.
- At profile 1aBTBC33, the middle of the dunes was not measured due to the presence of dense vegetation. Care is therefore needed when interpreting the interpolated data.
- At profiles 1aADC08 and 1aADC09, the profiles end at the River Aln channel due to quicksand.
- At Profile 1aADC16 there are gaps in the section due to bushes, and no access to resident's gardens.
- At profile ADC16B a 'new' fence has been installed at the start of the profile (around the time of the Partial Measures survey, spring 2014). This fence is now the new profile start point.
- At profile CMBC02 the first part of the section was not able to be surveyed due to flooding in the field.

Topographic Surveys

- At Newbiggin-by-the Sea, the topographic survey report notes that sand was covering most of the revetment rocks at the back of the beach, and that the concrete steps were exposed for long stretches at the back of the beach.
- There was beach re-nourishment ongoing at Newbiggin during the survey on the 20/3/2018.
- At Berwick the surveyors noted that quicksand near the water's edge was noticeable

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 margins of error of the surveying technique, and that any indication of an advancing cliff line is error.

Surveying the cliff top along Cambois Bay is more difficult than the similar surveys at Newbiggin Caravan Park and Sandy Bay Caravan Park because the cliff edge is less distinct and hard to precisely define due to vegetation coverage and its smooth, degraded form.

The surveyors noted that there was very thick dense vegetation at the north end of Cambois cliff top which hindered the survey of the line.

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

No changes to the monitoring programme are recommended at this time.

5. Conclusions and Areas of Concern

- At Sandstell Point (Spittal A), the recorded profiles and topographic survey present no causes for concern, with the spit in the middle of its range.
- At Spittal (Spittal B), the recorded profiles present no causes for concern, with the beach being at a medium-high level.
- At Goswick Sands, the recorded profiles present no causes for concern, with the beach being at a medium-high level.
- At Holy Island, the recorded profiles present no causes for concern, with the beach being at a medium-low level.
- At Beadnell Village, the beach is at a medium-high level compared to the range recorded from previous surveys and presents no causes for concern.

- At Beadnell Bay, the recorded profiles present no causes for concern, with the upper beach being at a medium-low level and the lower beach being at a high level.
- At Boulmer the recorded profiles present no causes for concern, with the beach being at a medium level.
- At Alnmouth Bay, the recorded profiles and topographic surveys present no causes for concern, with the beach being at a low-medium level.
- At High Hauxley & Druridge Bay, the beach levels are at a low to medium level but remain within the range recorded from previous surveys.
- At Lynemouth Bay, to the north of the Power Station (profile 1aCMBC03B), the slag bank has remained stable. To the north of the River Lyne (profile 1aCMBC03A) the beach levels are at recorded low level.
- At Newbiggin Bay, the severe storm in March 2018 has caused movement of sand away from the centre of the bay to the ends. All the profiles remain within the range previously recorded except for the lower beach immediately behind the offshore breakwater which is the lowest on record.
- At Cambois Bay, the cliff top survey shows short sections of 1-2m of erosion in the south of the survey area at Sandy Bay Caravan Park. Along the Cambois Bay survey length there has been little change in the north, but consistent erosion of 0.2-0.6m along 450m of the central section opposite the tidal basin.
- At Blyth South Beach, the profiles have generally flattened and been smoothed out, and beach levels are generally at medium levels compared to the range recorded from previous surveys, except in the south where the upper beach is the lowest on record.
- The effects of the March 2018 storm, known as the ‘Beast from the East’ are most noticeable in the surveys carried out at Newbiggin Bay. It is likely that elsewhere within the Northumberland County Council area any effects of the storm were already starting to recover by the time the 2018 Partial Measures surveys were carried out.

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

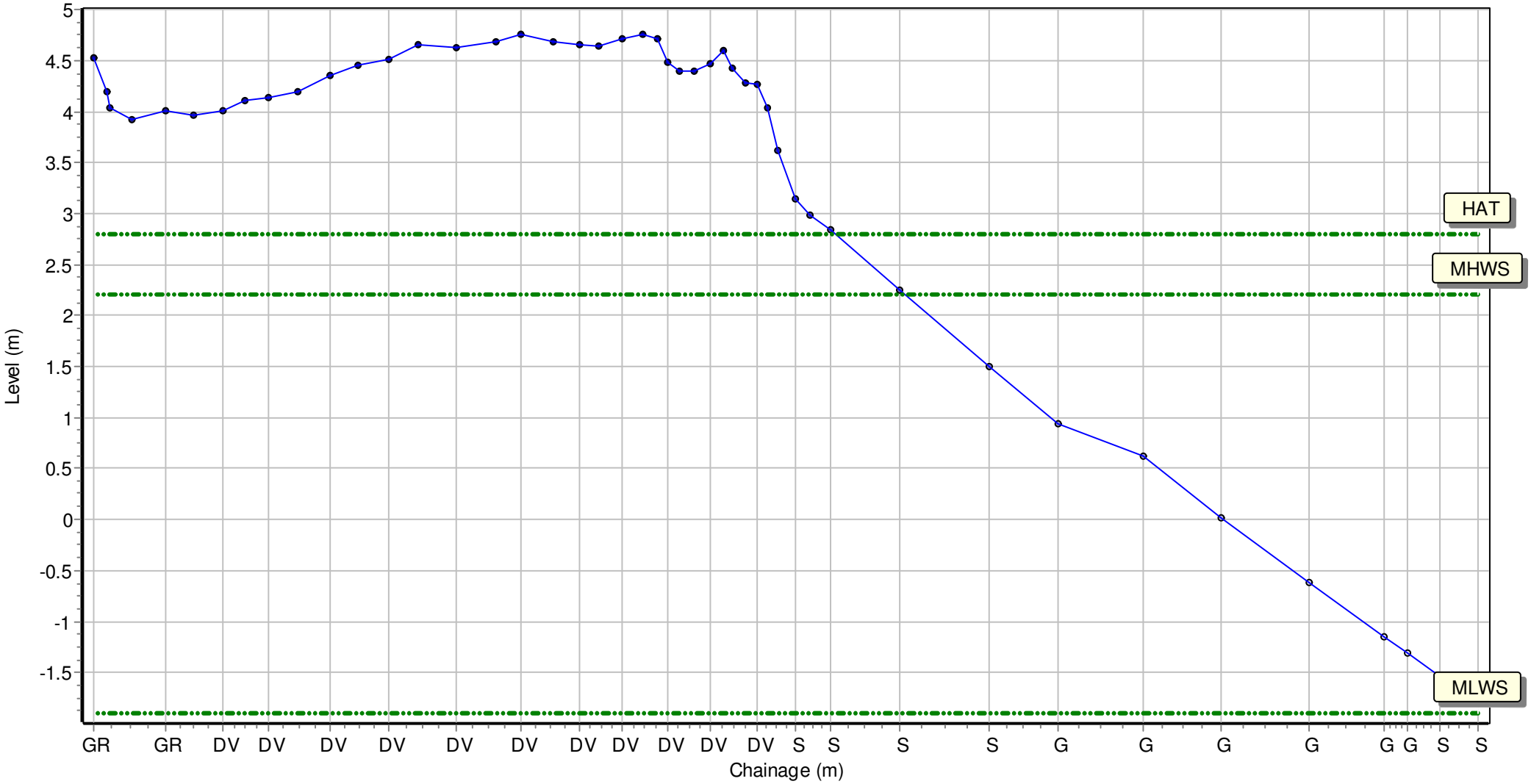
Location: **1aBTBC02**

Date: 22/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

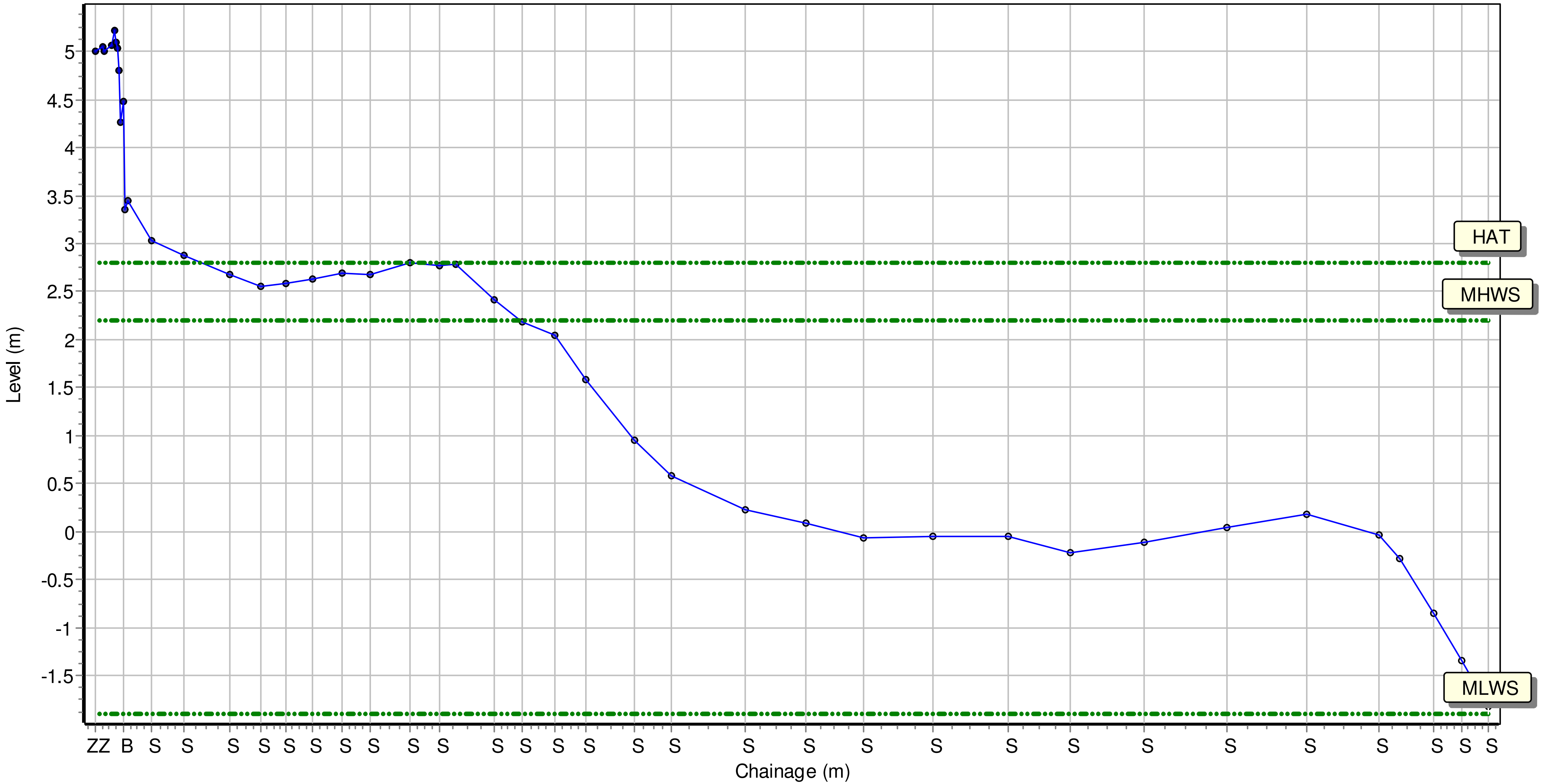
Location: 1aBTBC04

Date: 22/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



http://www.sandsuser.com

SANDS

Beach Profile

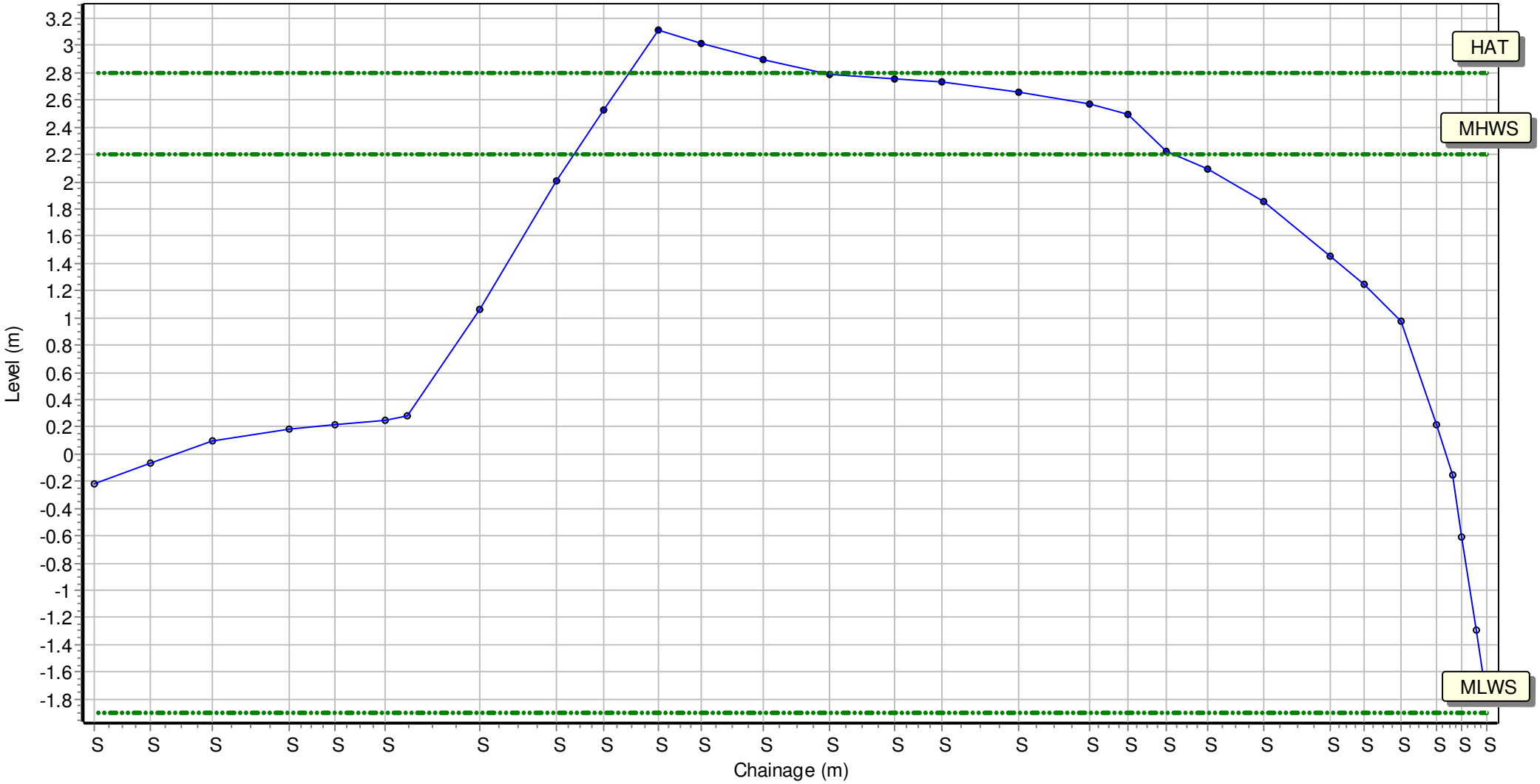
Location: **1aBTBC05**

Date: 22/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

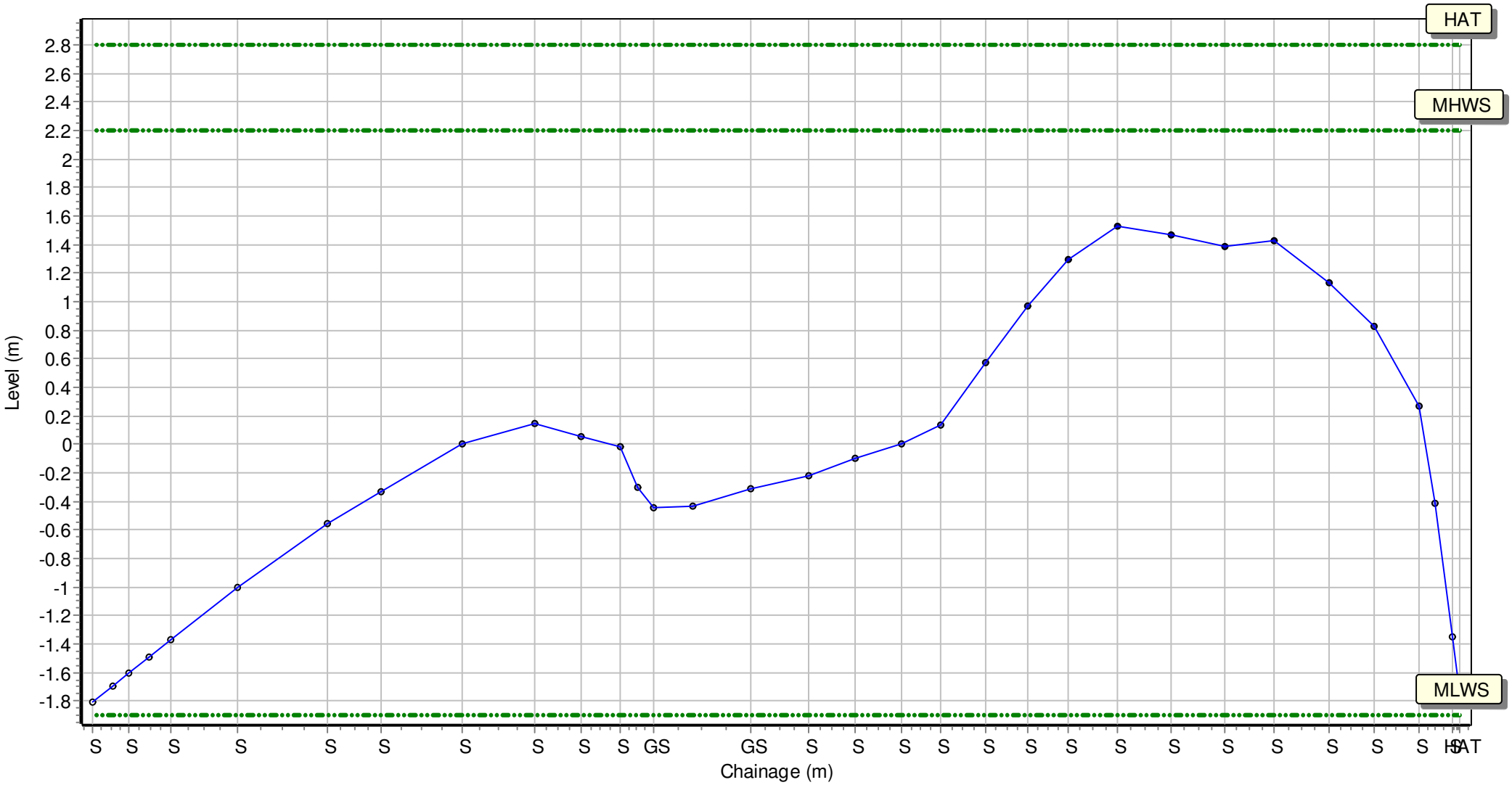
Location: **1aBTBC06**

Date: 22/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

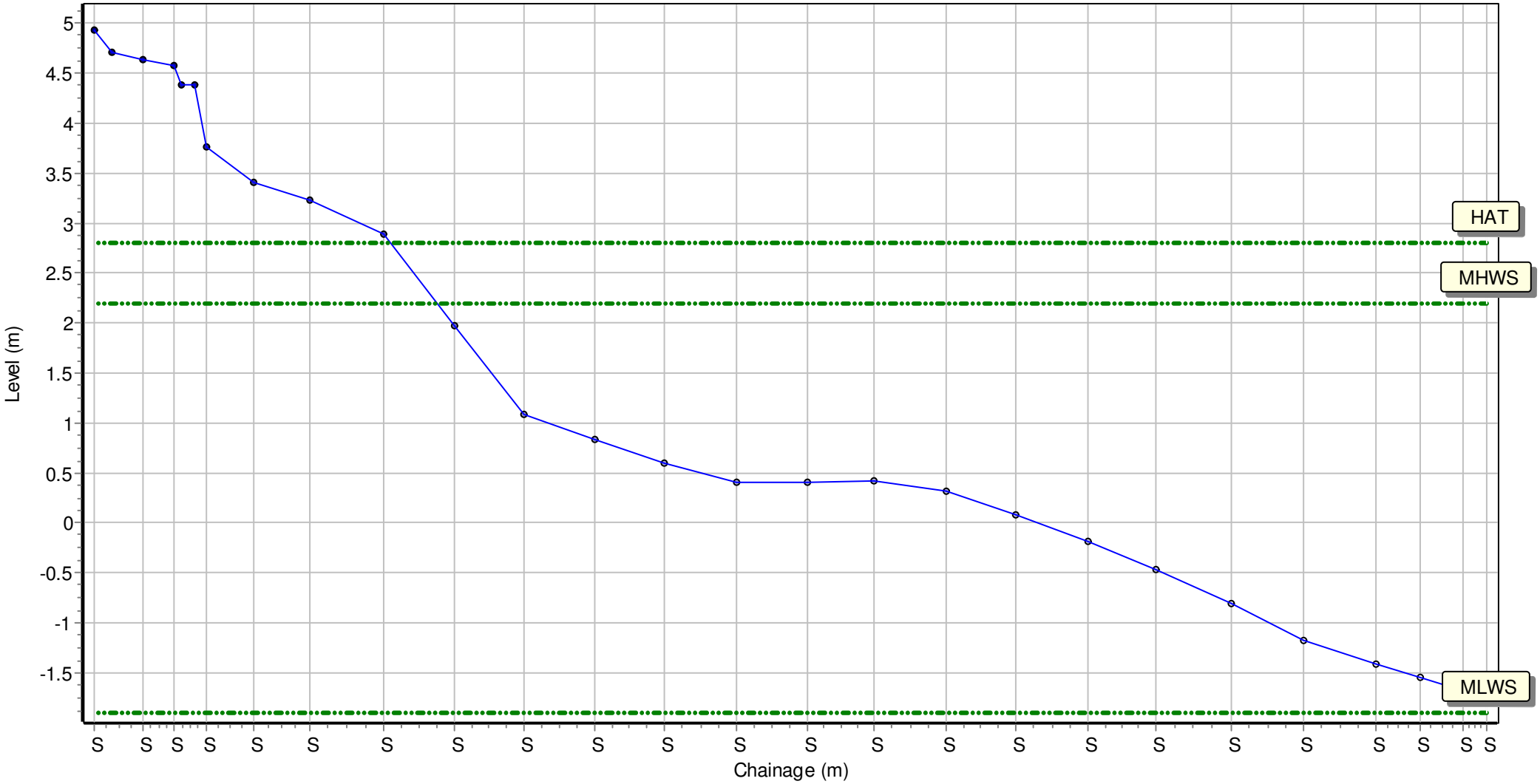
Location: **1aBTBC11**

Date: 22/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

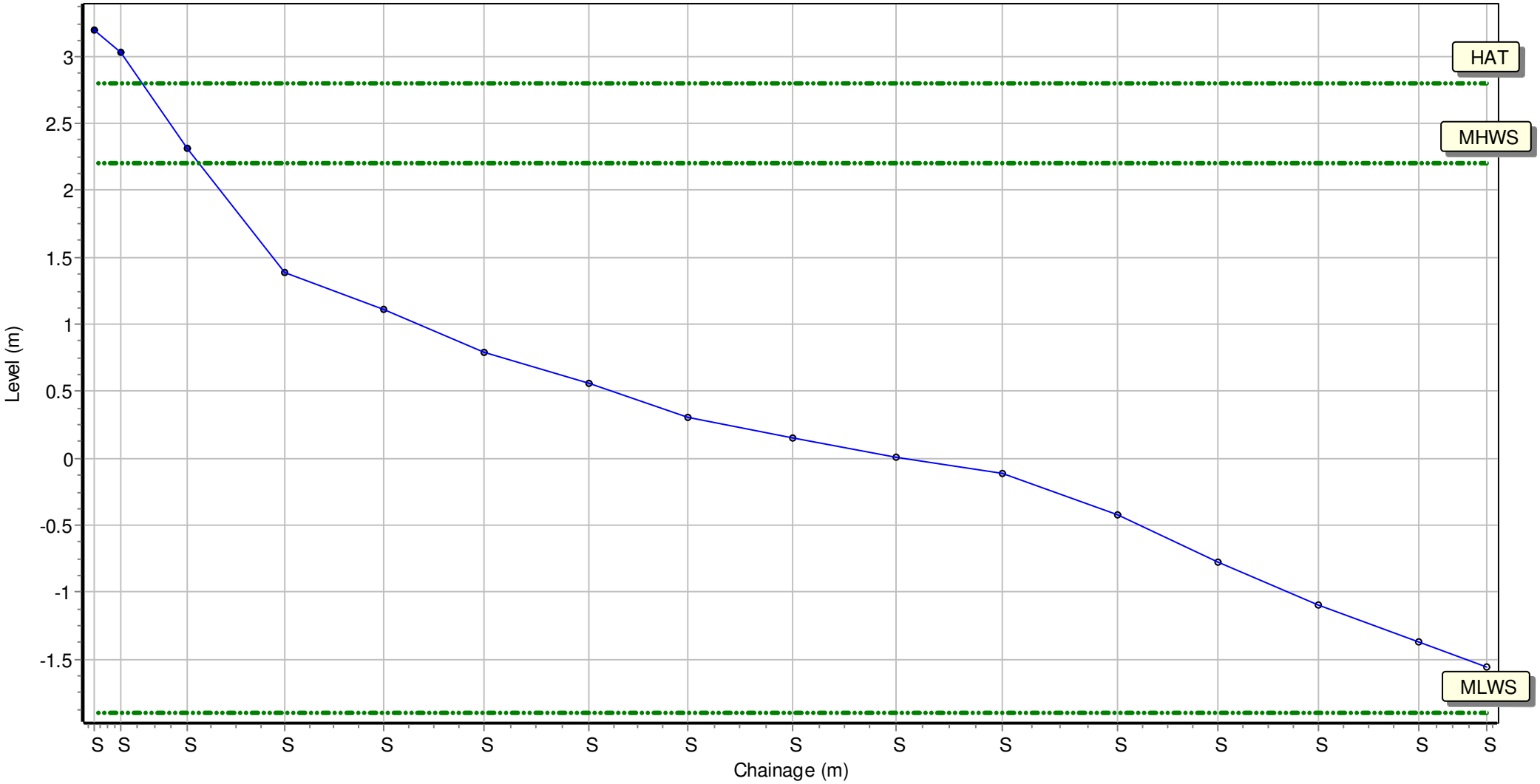
Location: **1aBTBC13**

Date: 22/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

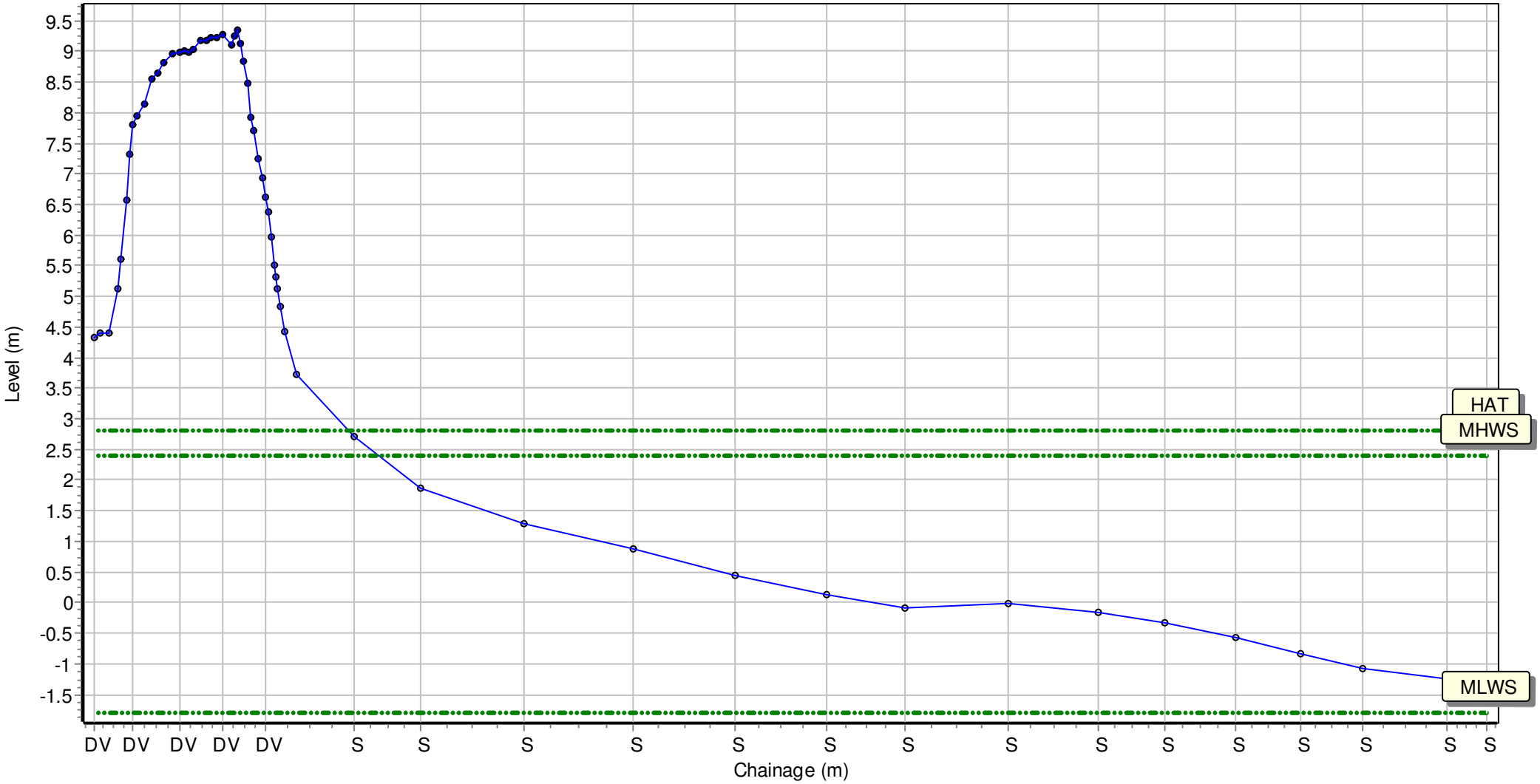
Location: **1aBTBC16**

Date: 20/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

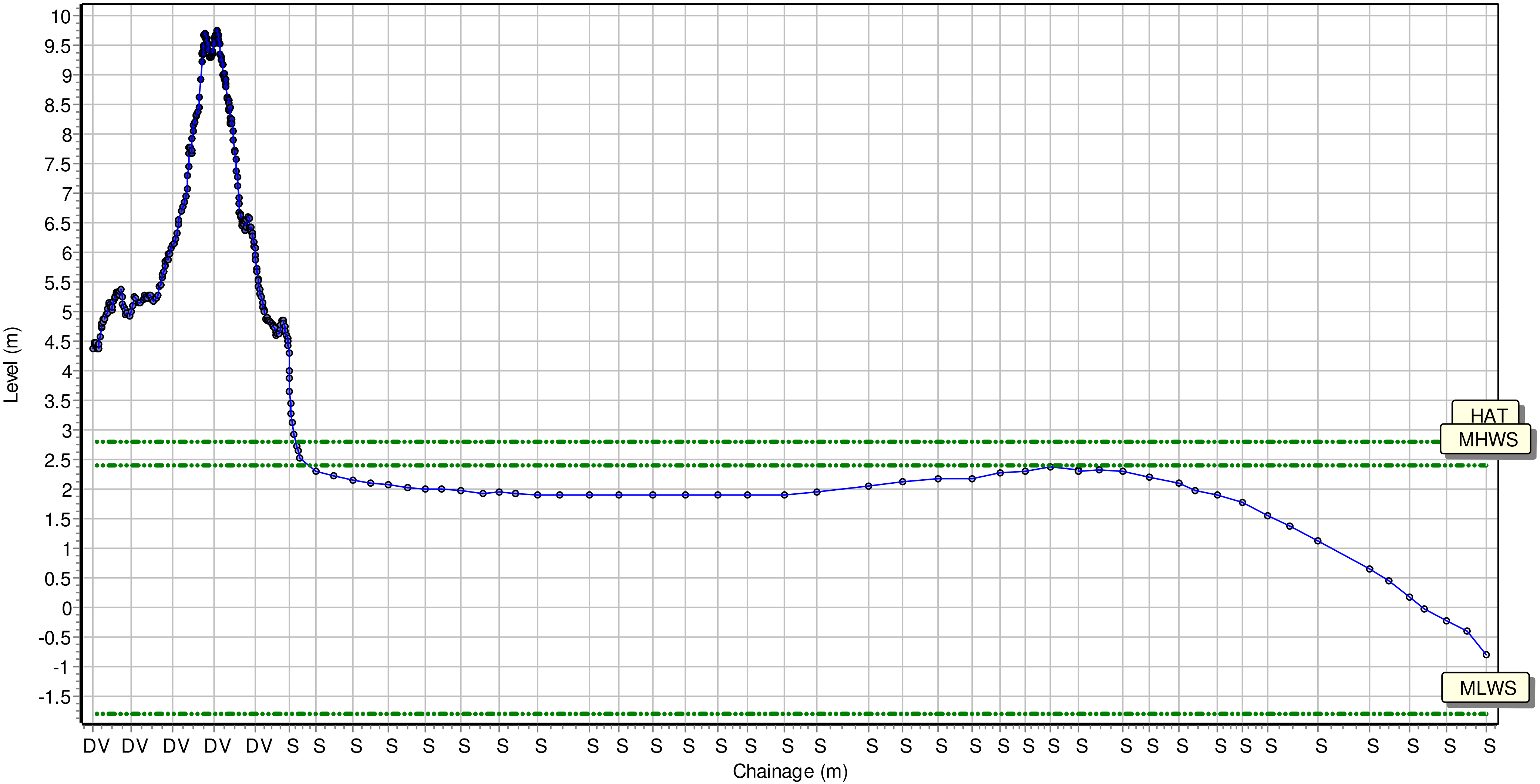
Location: **1aBTBC19**

Date: 20/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

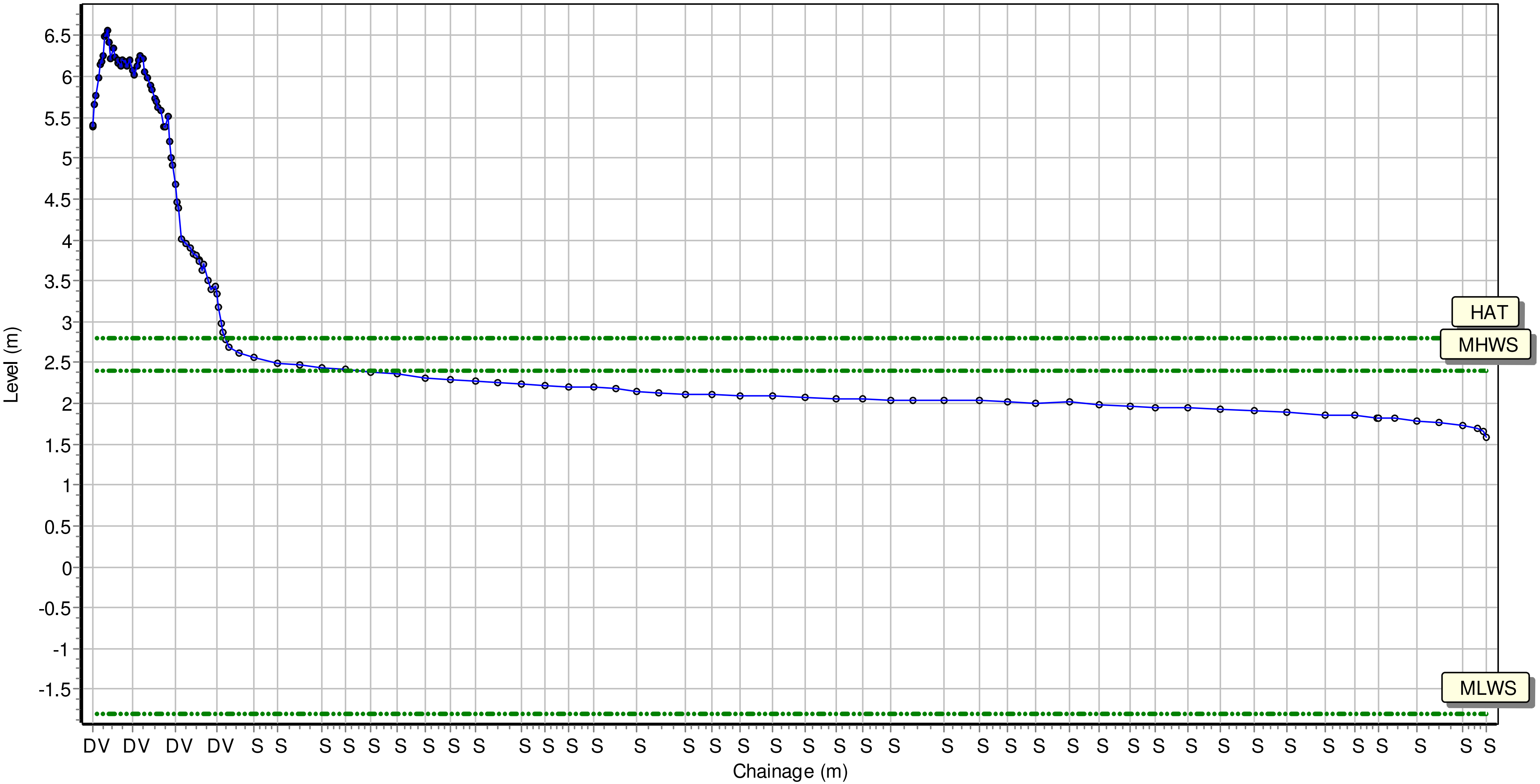
Location: **1aBTBC21**

Date: 20/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



http://www.sandsuser.com

SANDS

Beach Profile

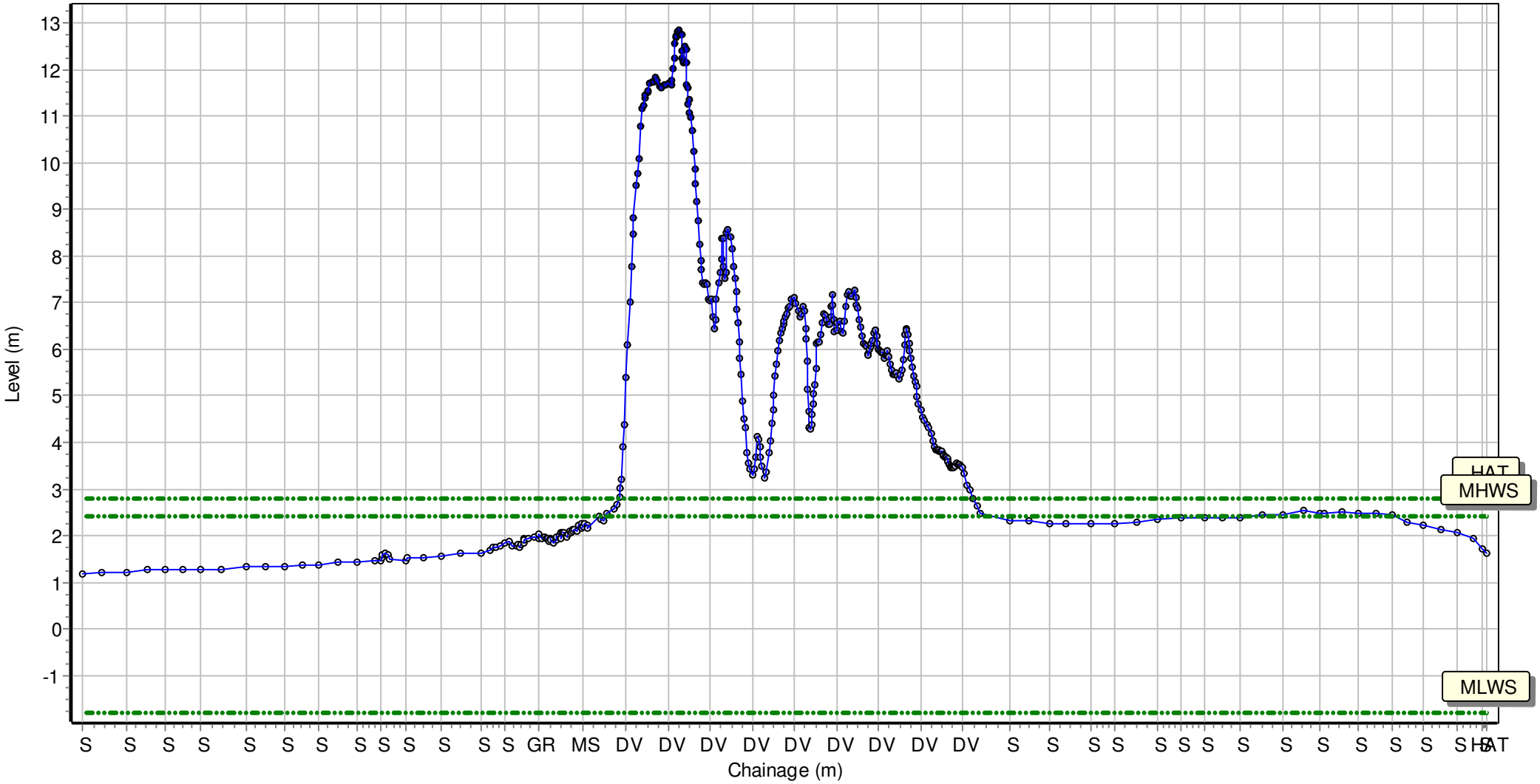
Location: **1aBTBC23**

Date: 20/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

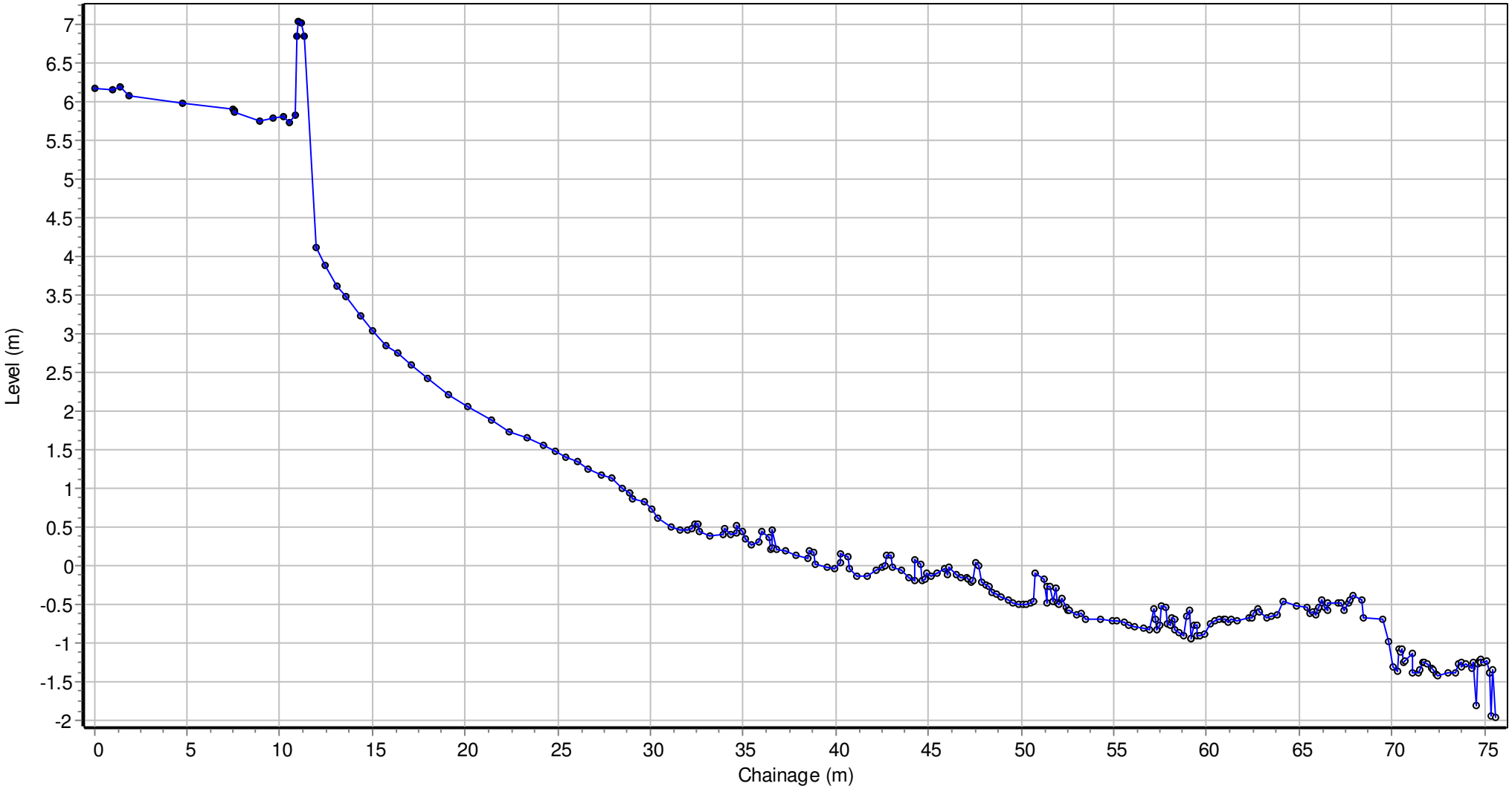
Location: **1aBTBC31**

Date: 19/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

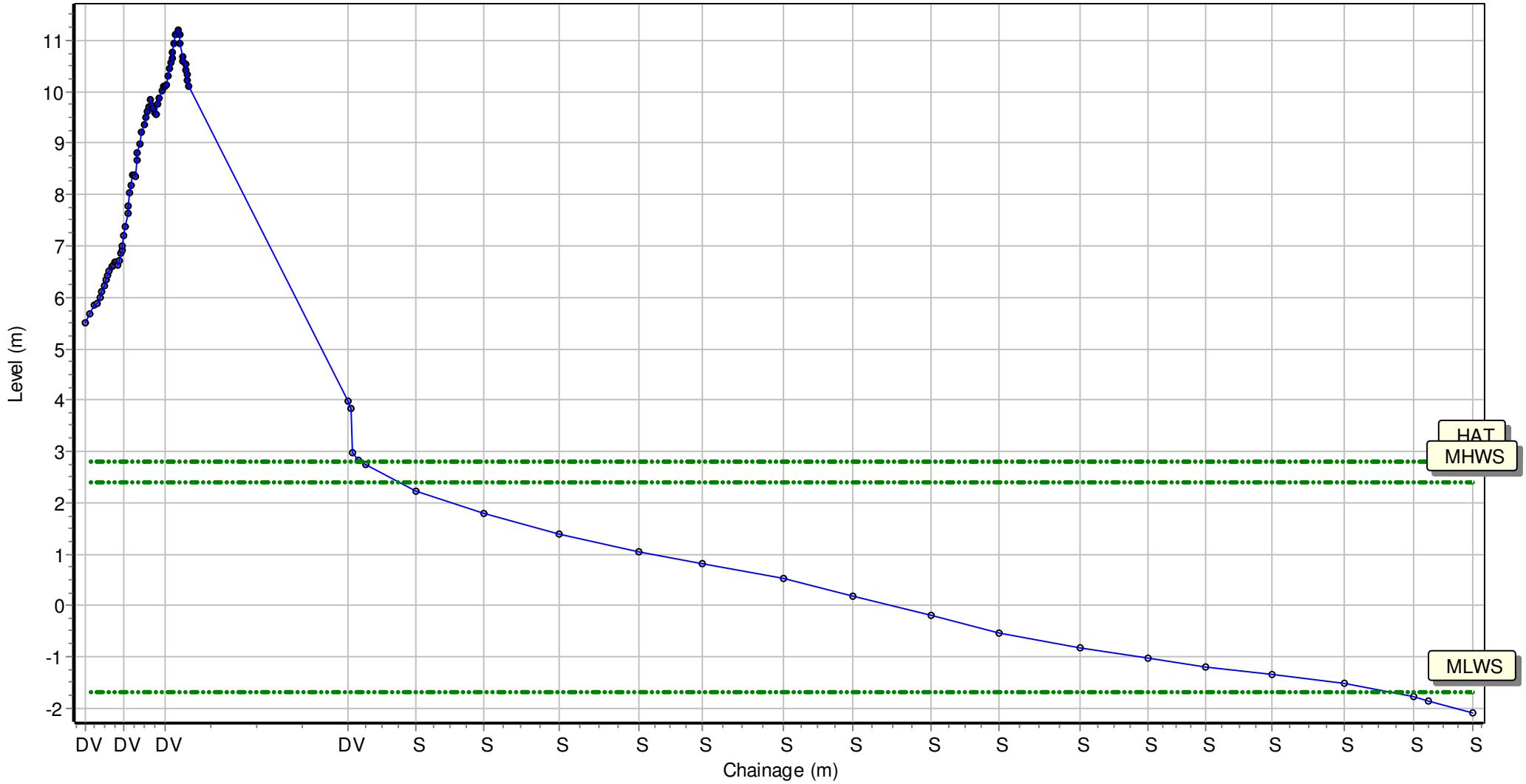
Location: **1aBTBC33**

Date: 19/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

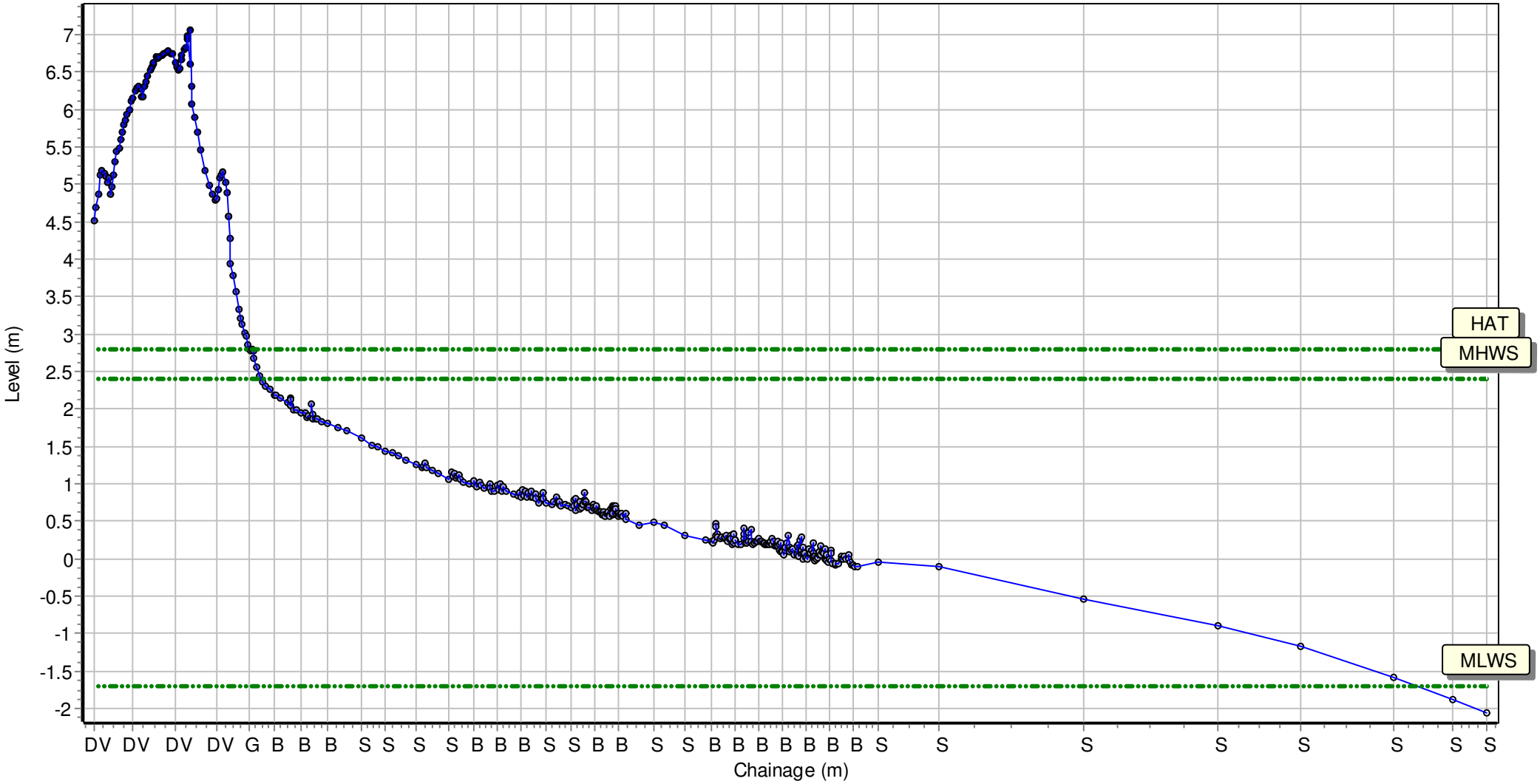
Location: **1aBTBC34**

Date: 19/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

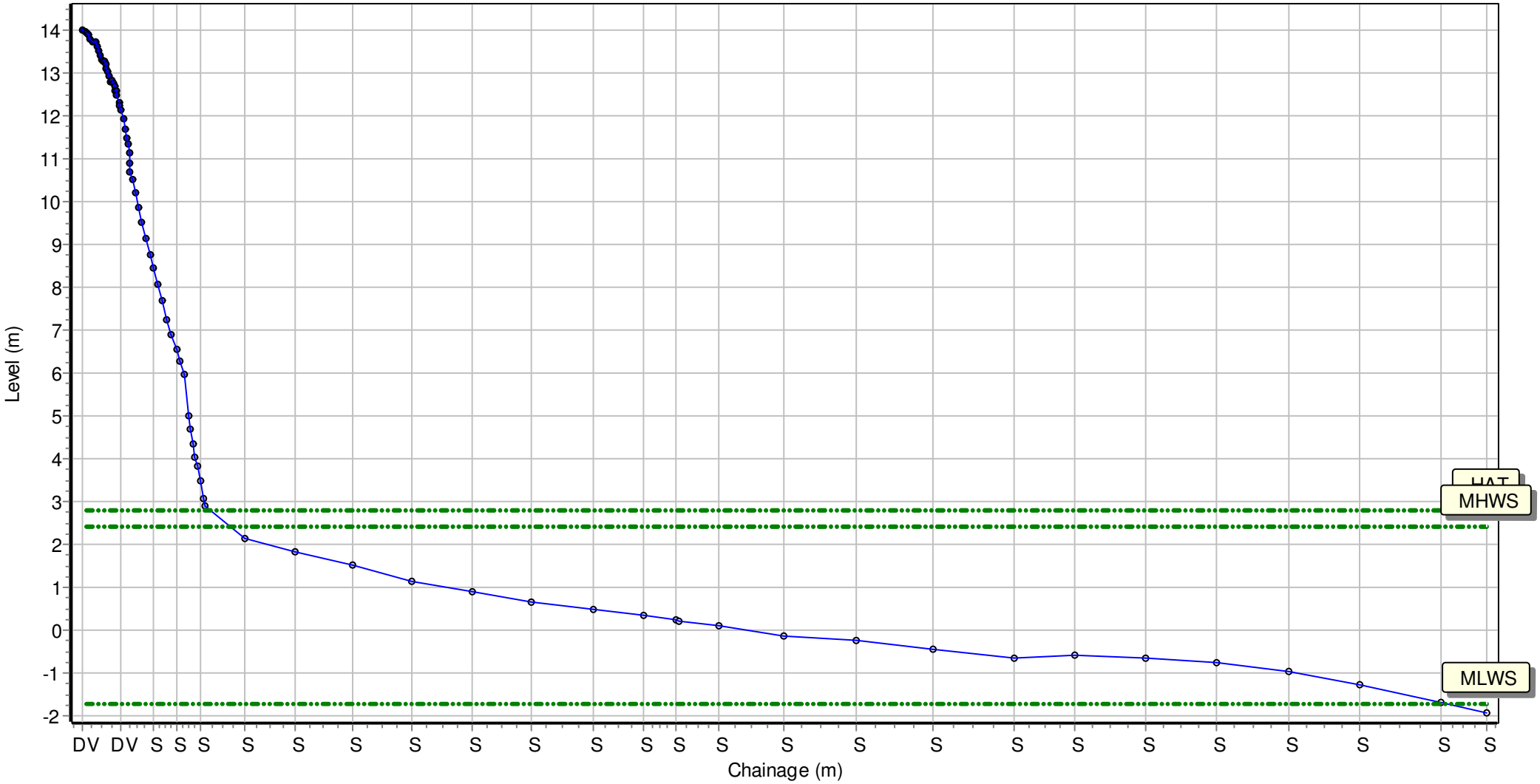
Location: **1aBTBC37**

Date: 19/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

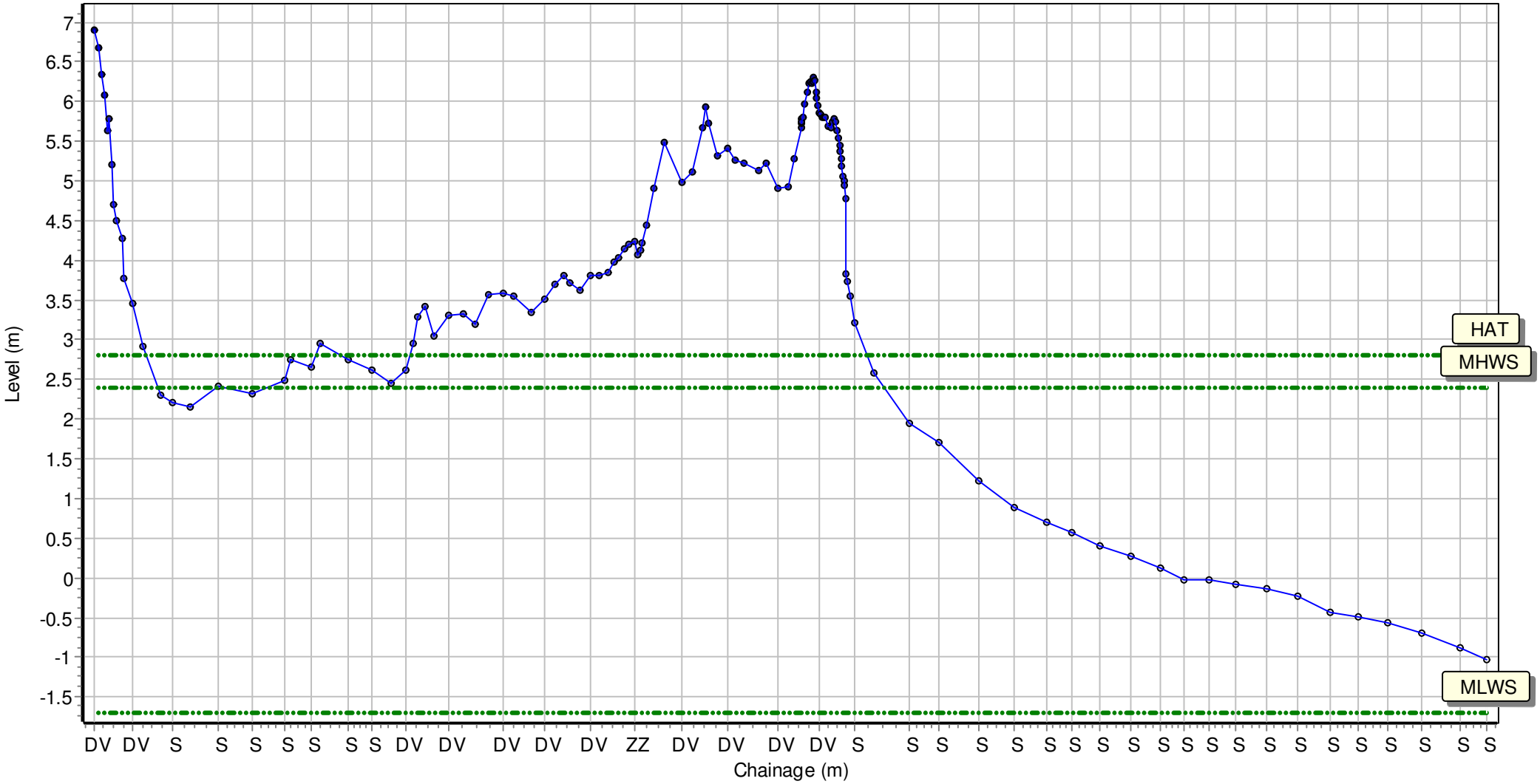
Location: **1aADC01**

Date: 19/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

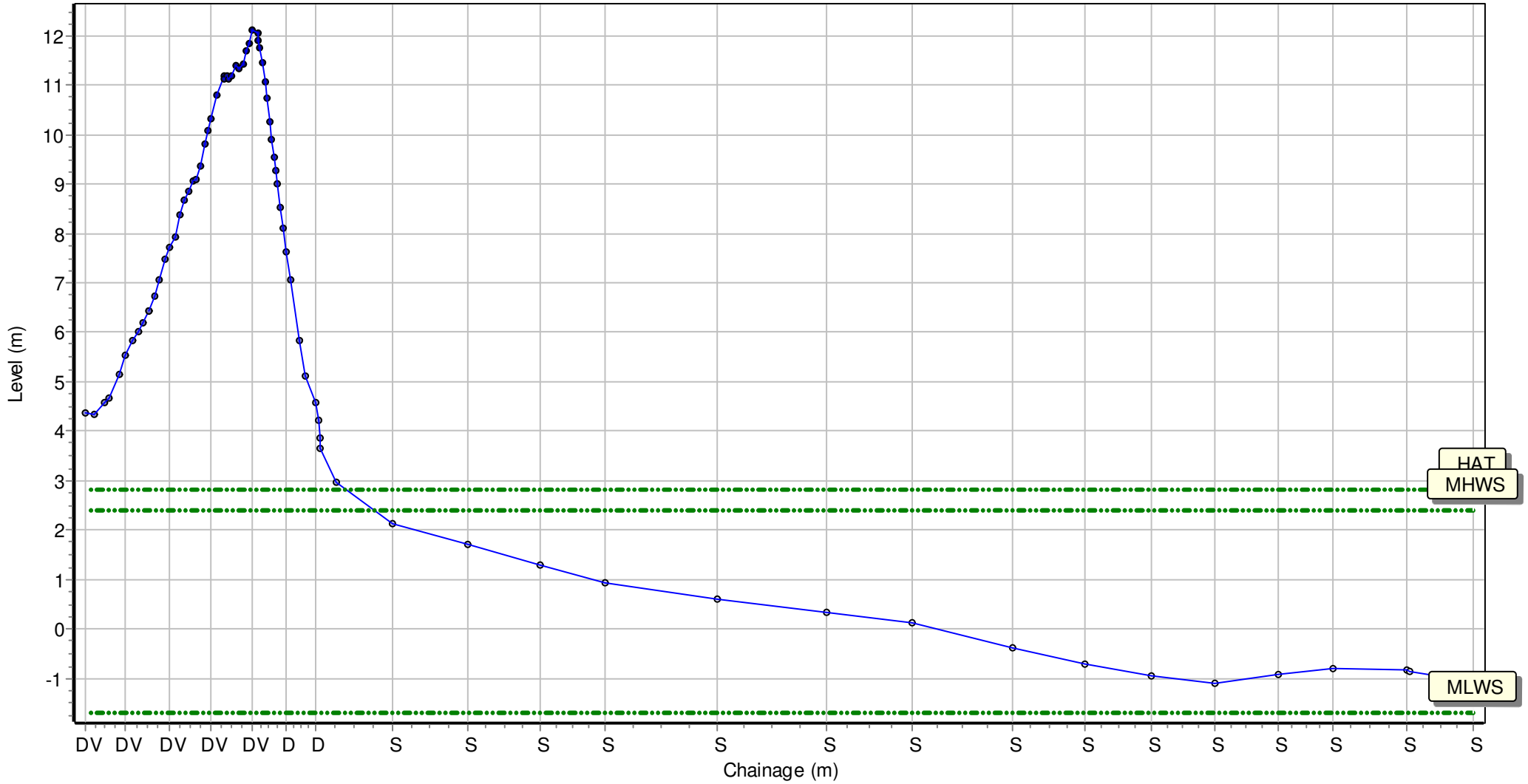
Location: **1aADC02**

Date: 19/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

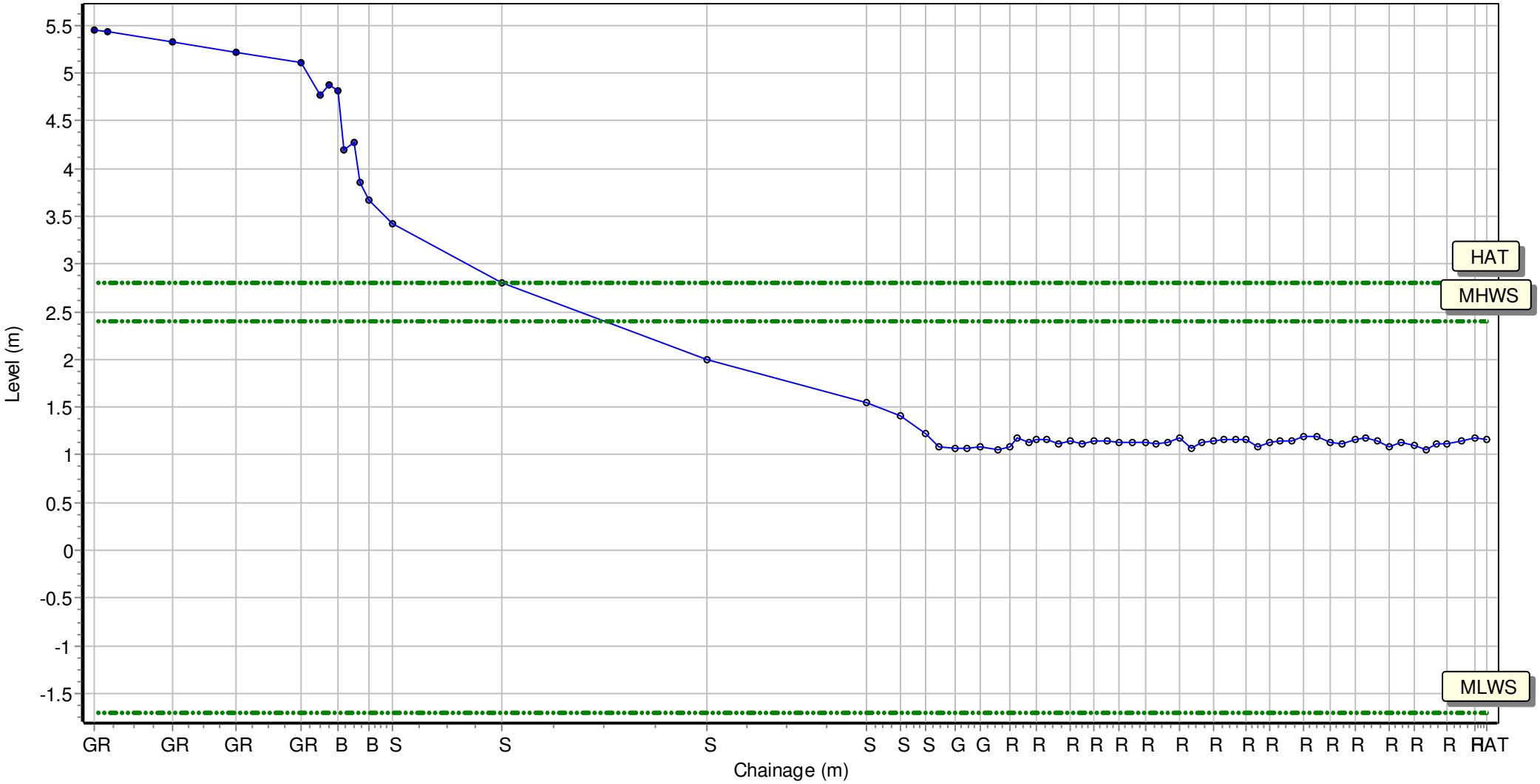
Location: **1aADC04A**

Date: 21/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

Easting: 426649.592 **Northing:** 614336.9 **Profile Bearing:** 93 ° from North



Beach Profile

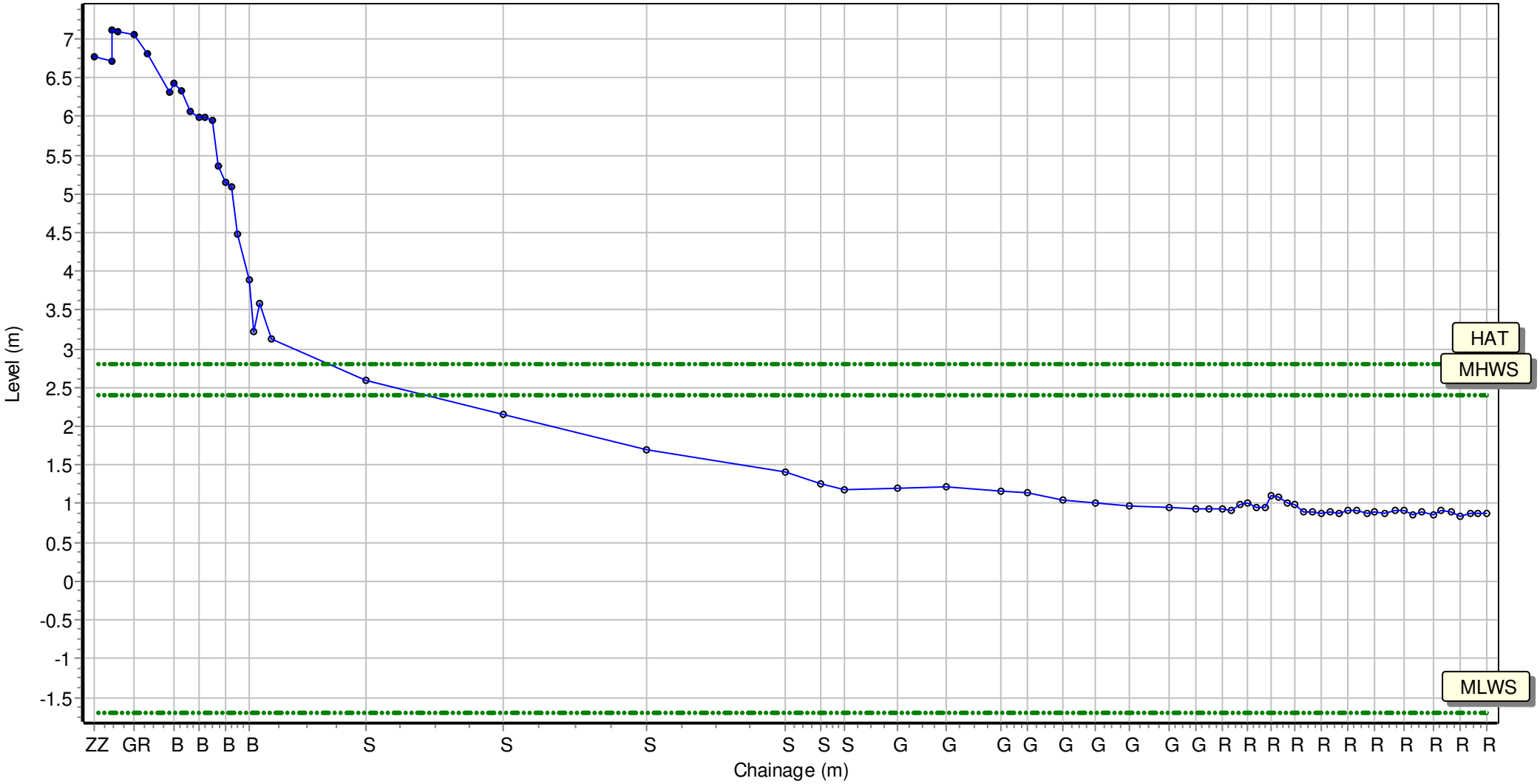
Location: **1aADC04B**

Date: 21/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

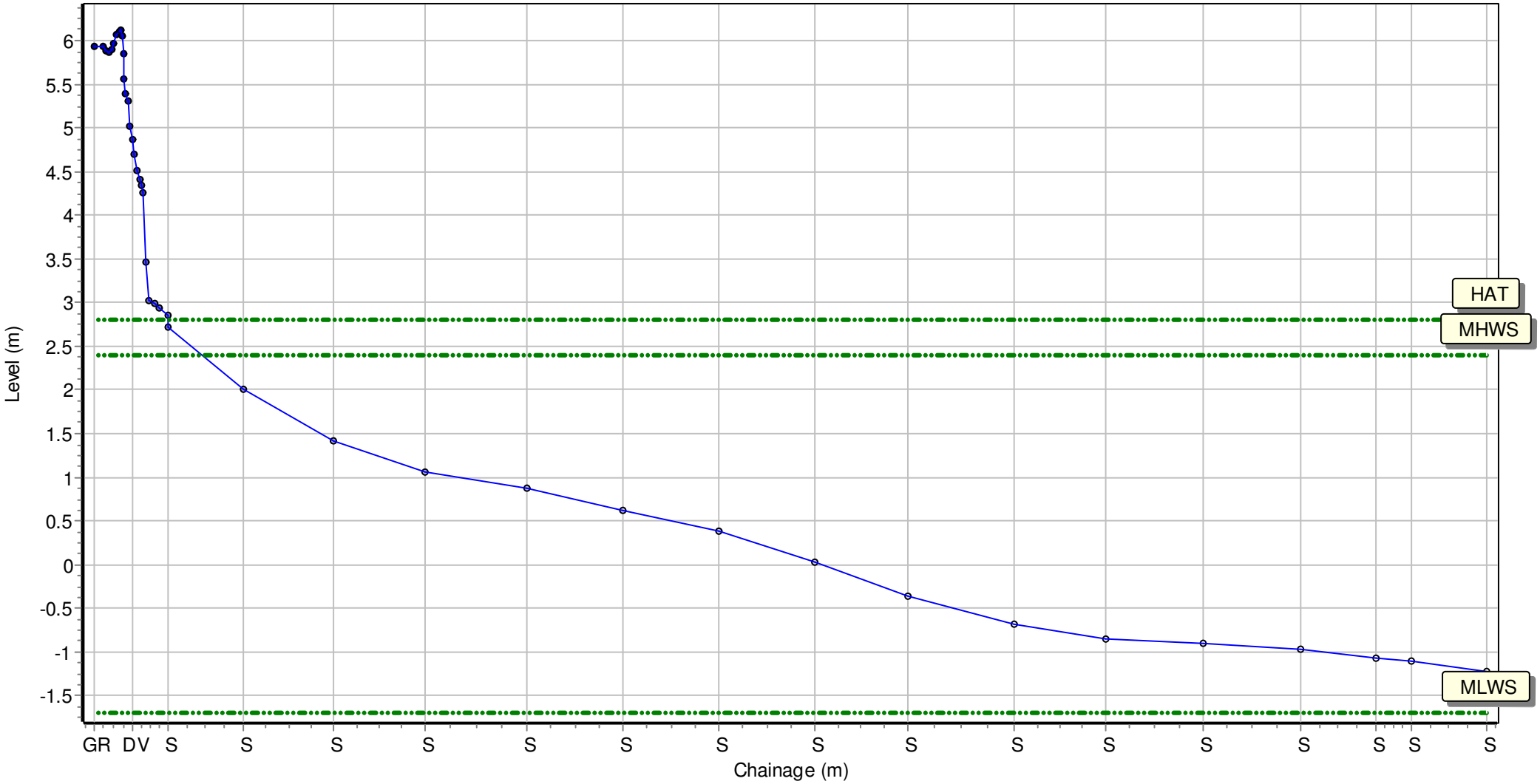
Location: **1aADC07**

Date: 21/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

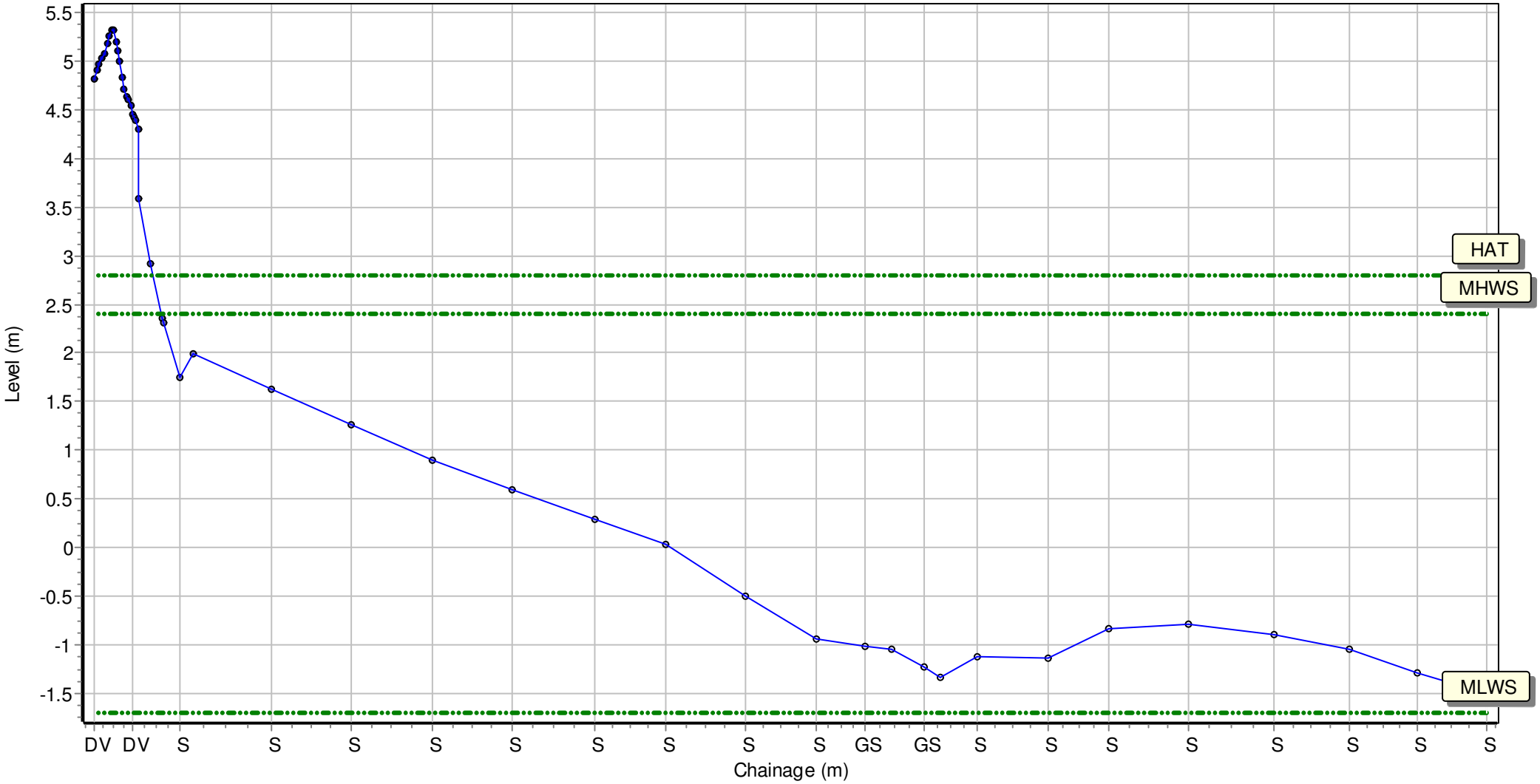
Location: **1aADC08**

Date: 21/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

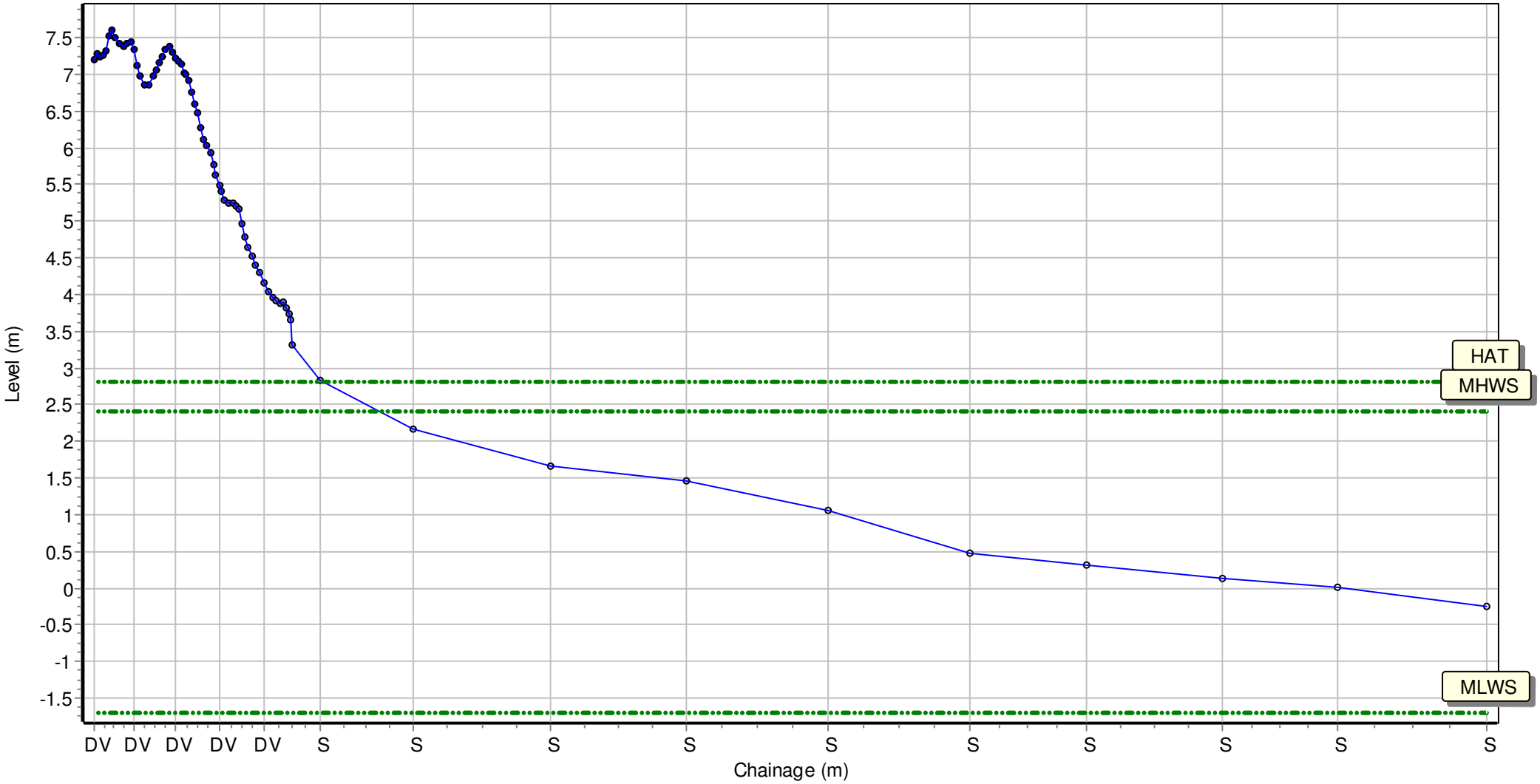
Location: **1aADC09**

Date: 21/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

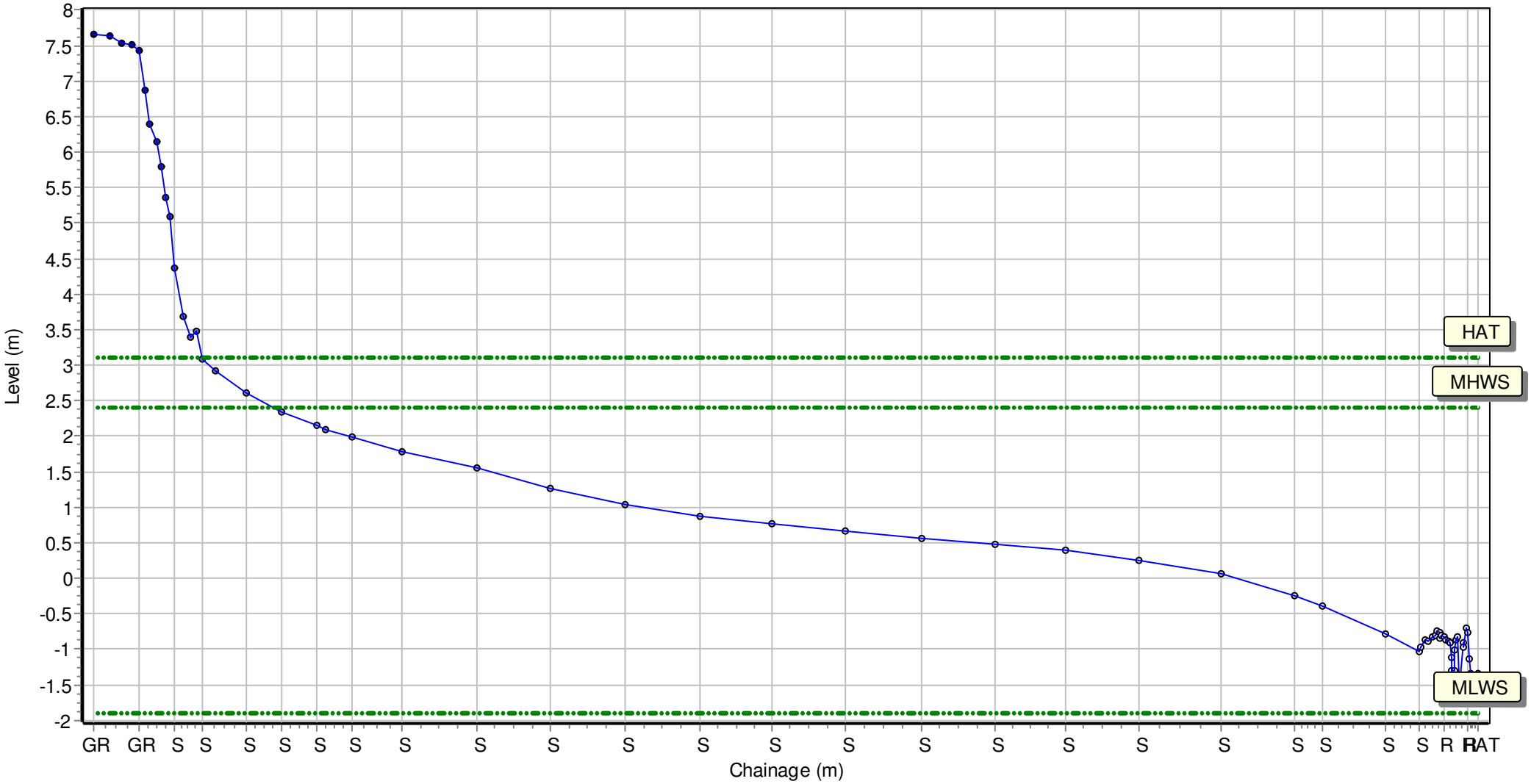
Location: **1aADC15A**

Date: 18/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

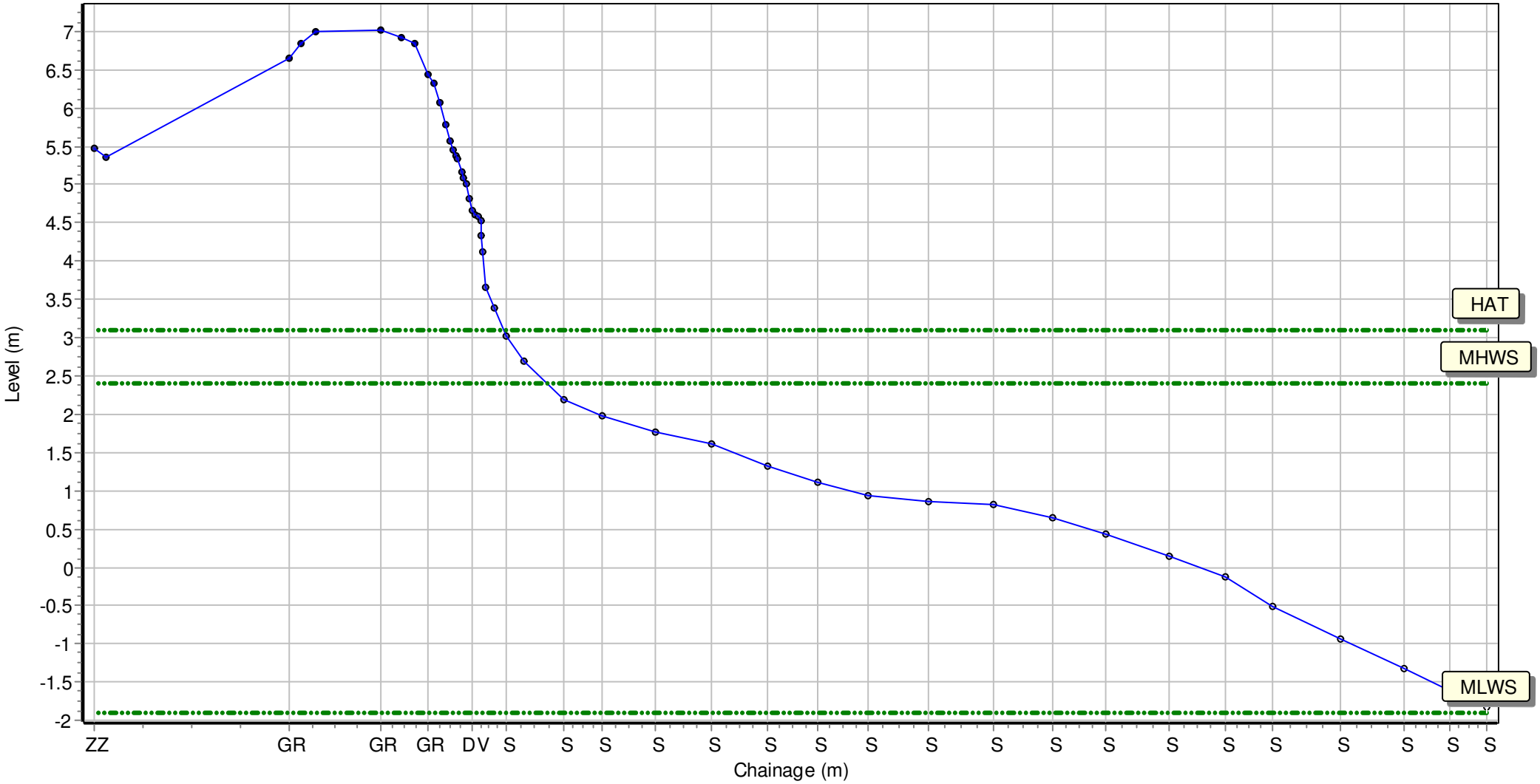
Location: **1aADC16**

Date: 18/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

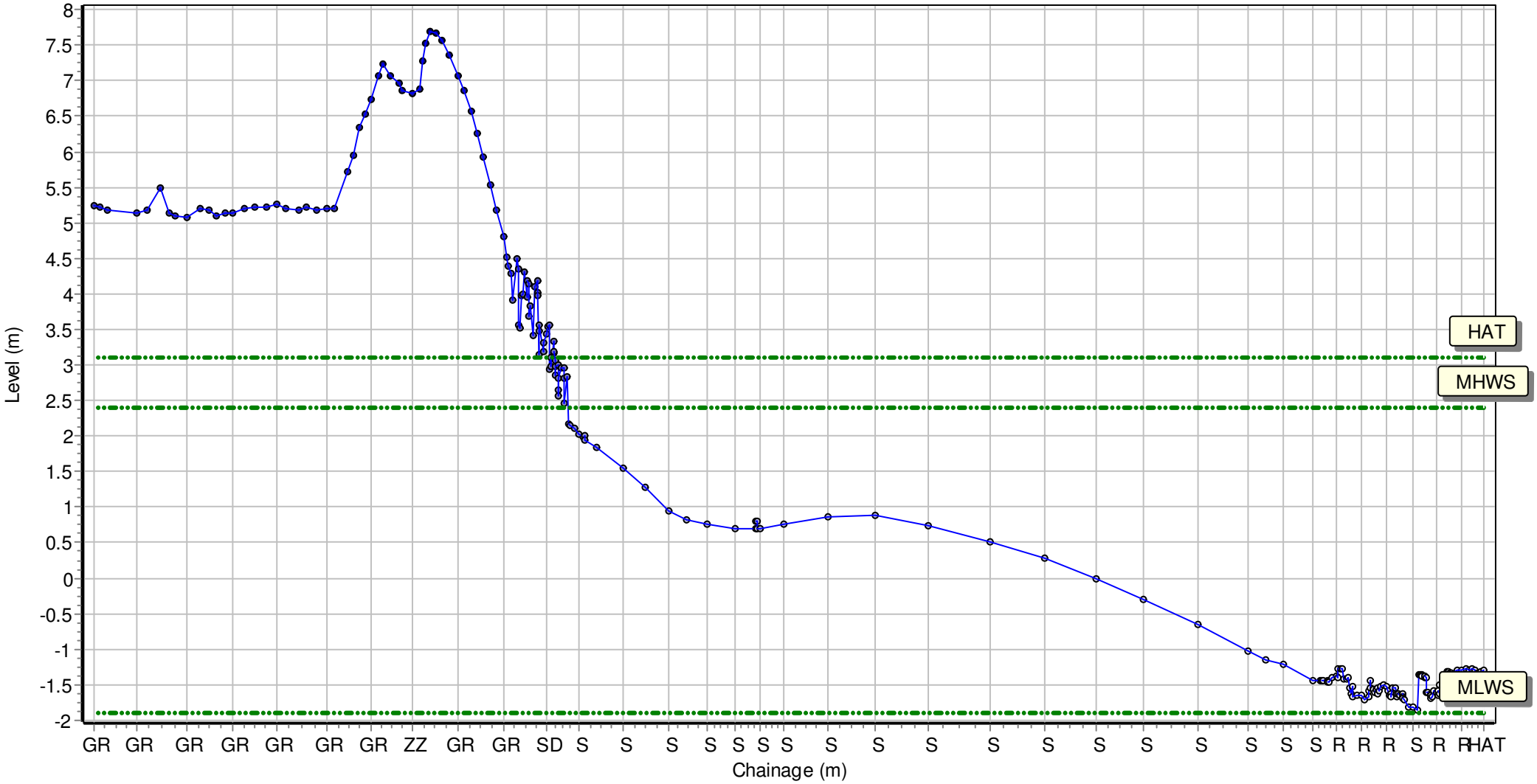
Location: **1aADC16A**

Date: 18/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

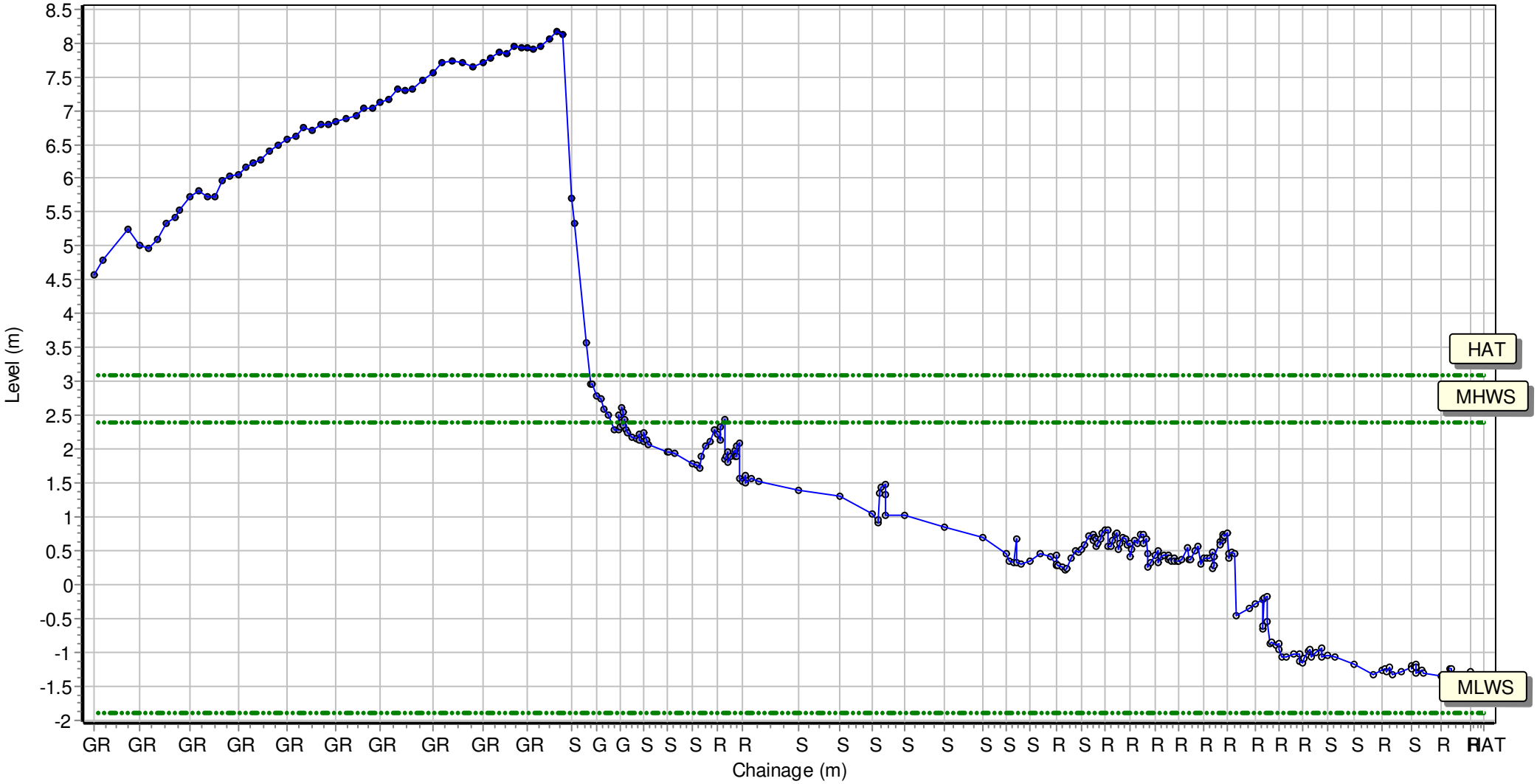
Location: **1aADC16B**

Date: 18/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

Easting: 428440.457 **Northing:** 601948.341 **Profile Bearing:** 144 ° from North



Beach Profile

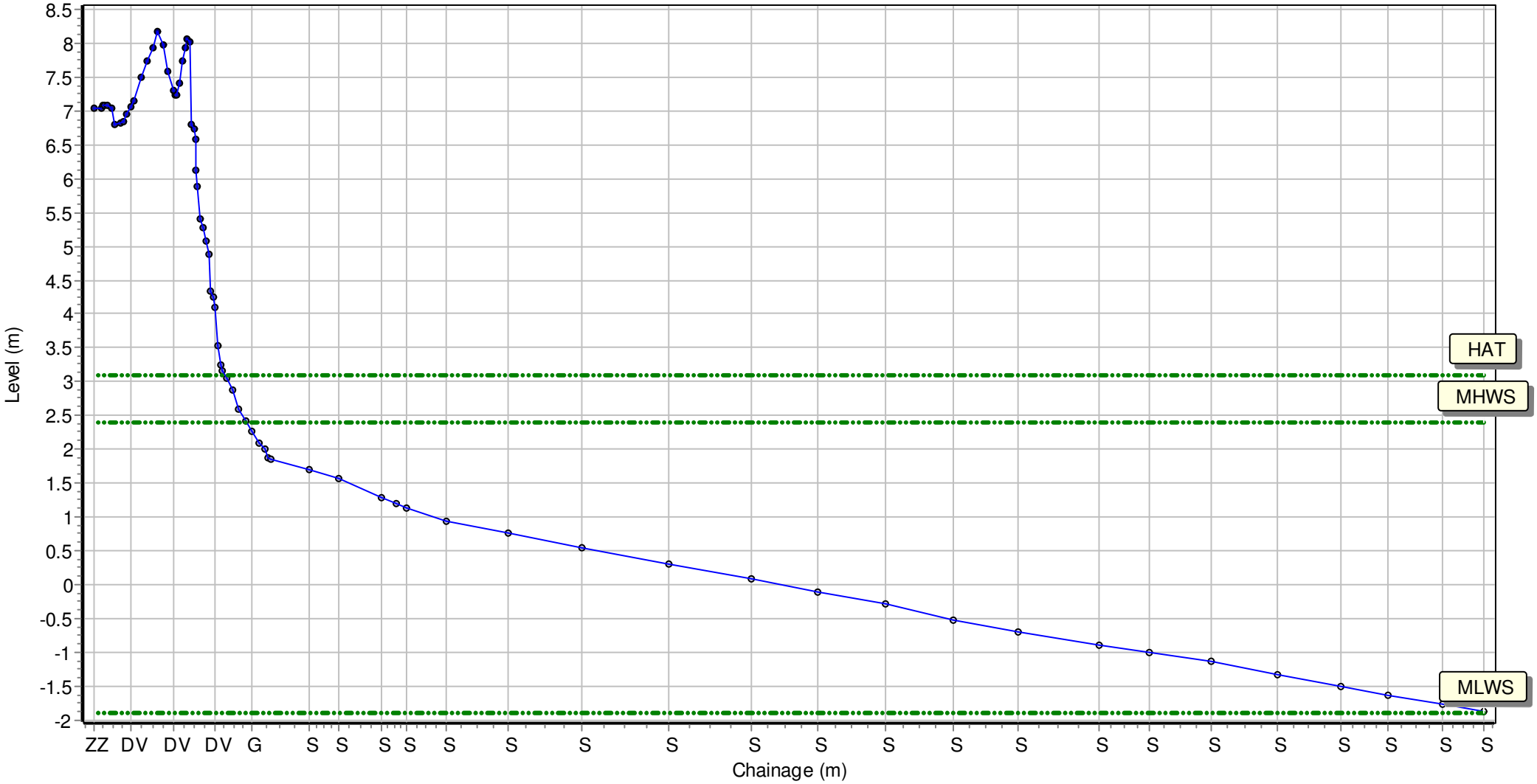
Location: **1aADC17**

Date: 18/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

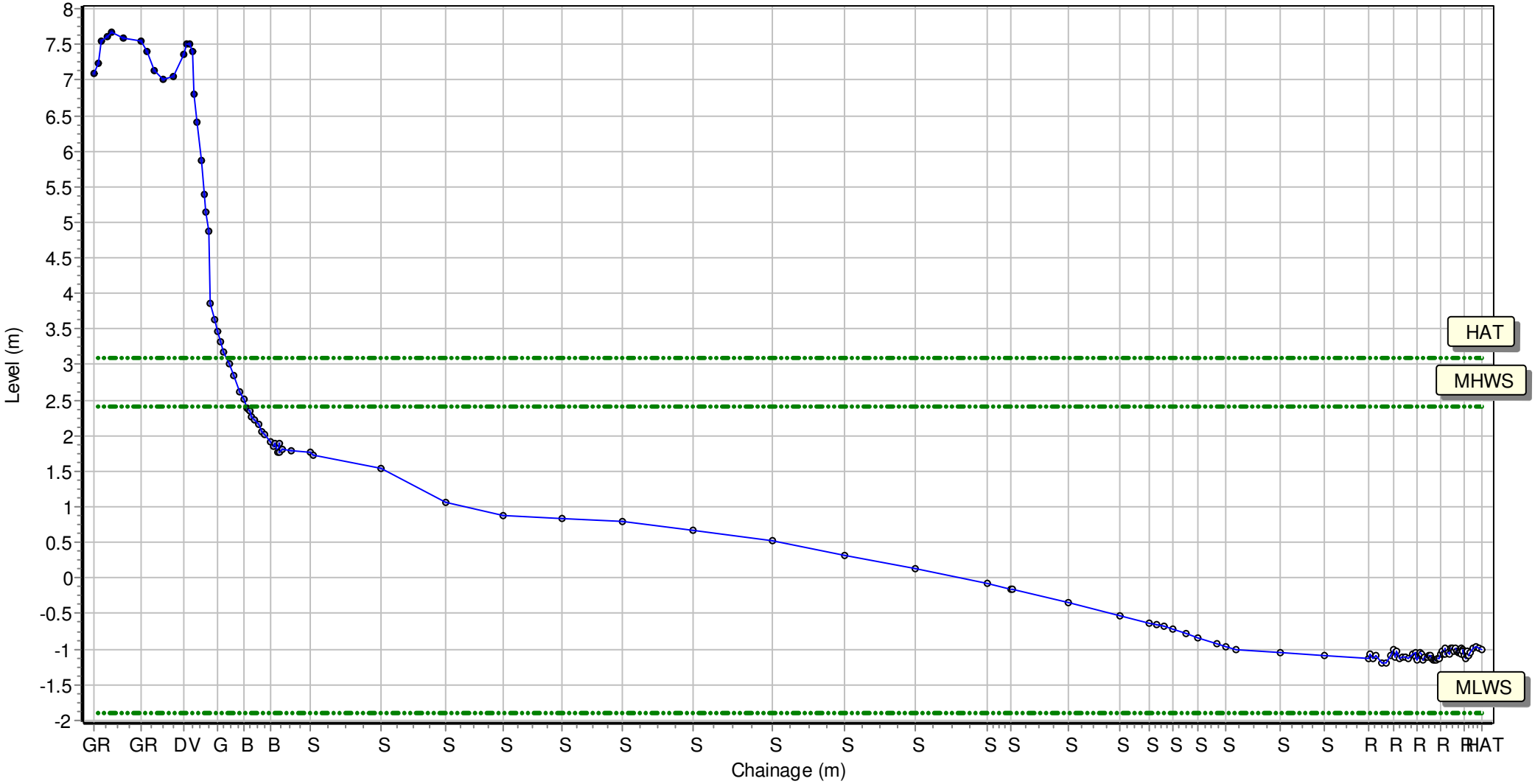
Location: **1aADC17A**

Date: 18/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

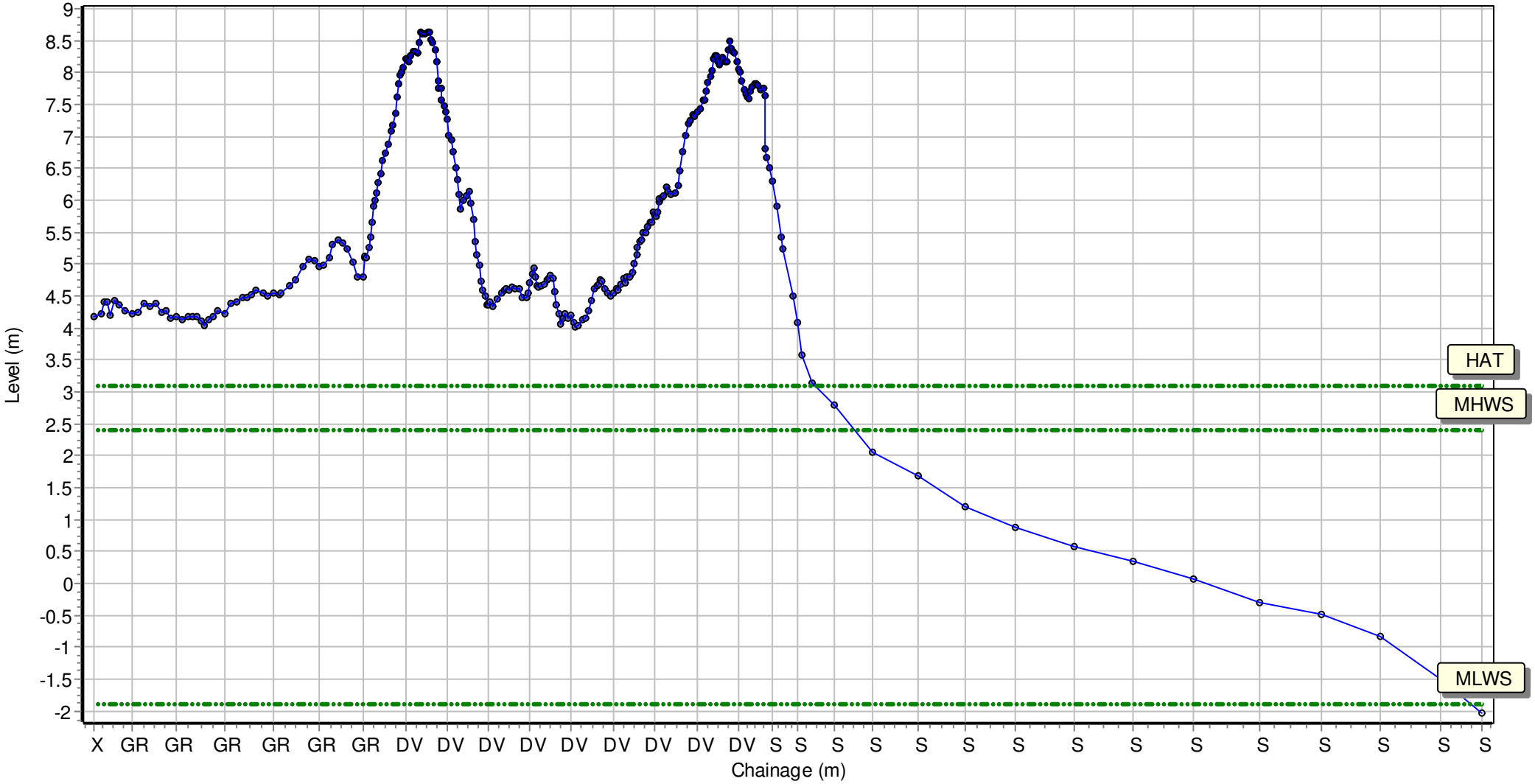
Location: **1aCMBC01**

Date: 17/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

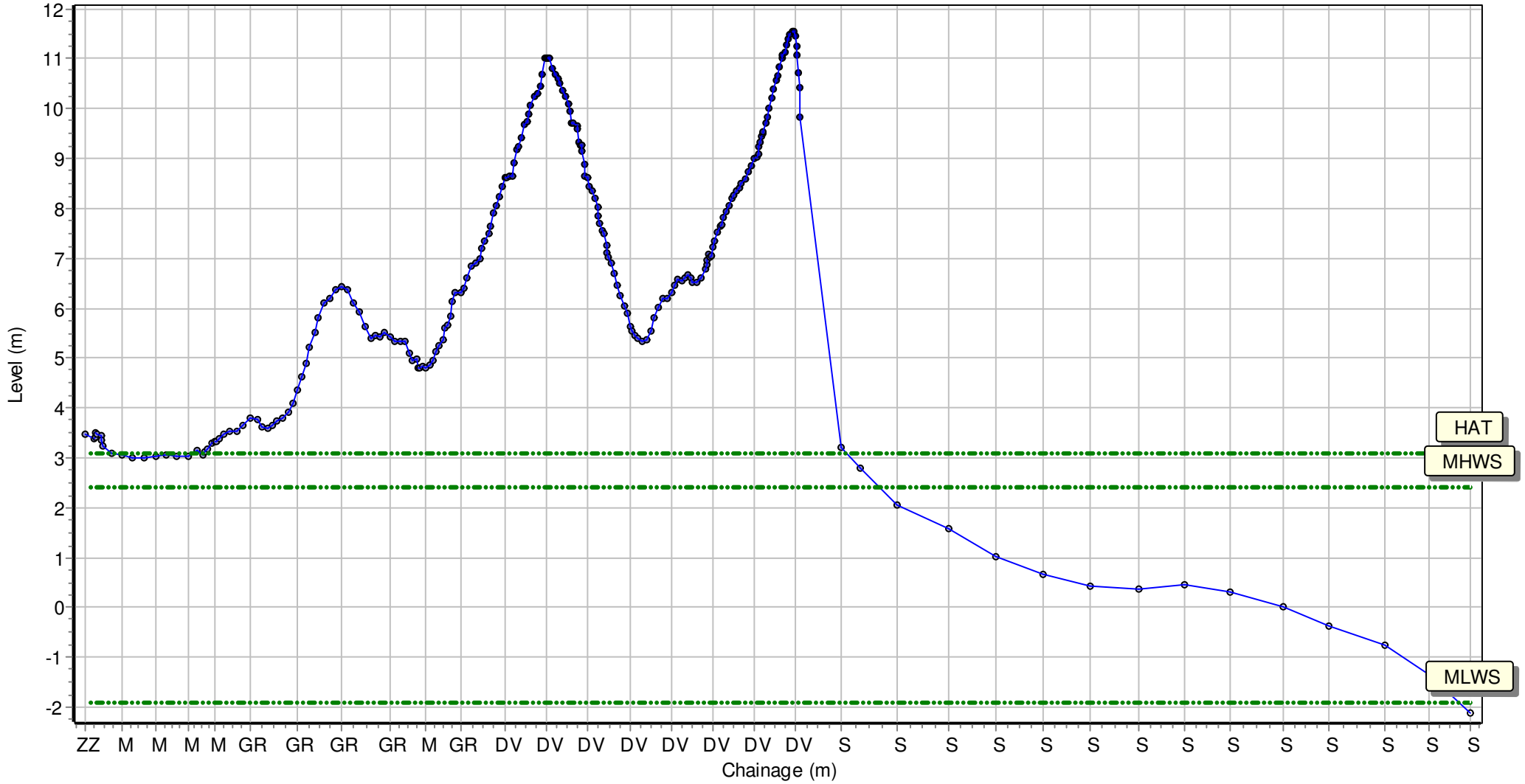
Location: **1aCMBC02**

Date: 17/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

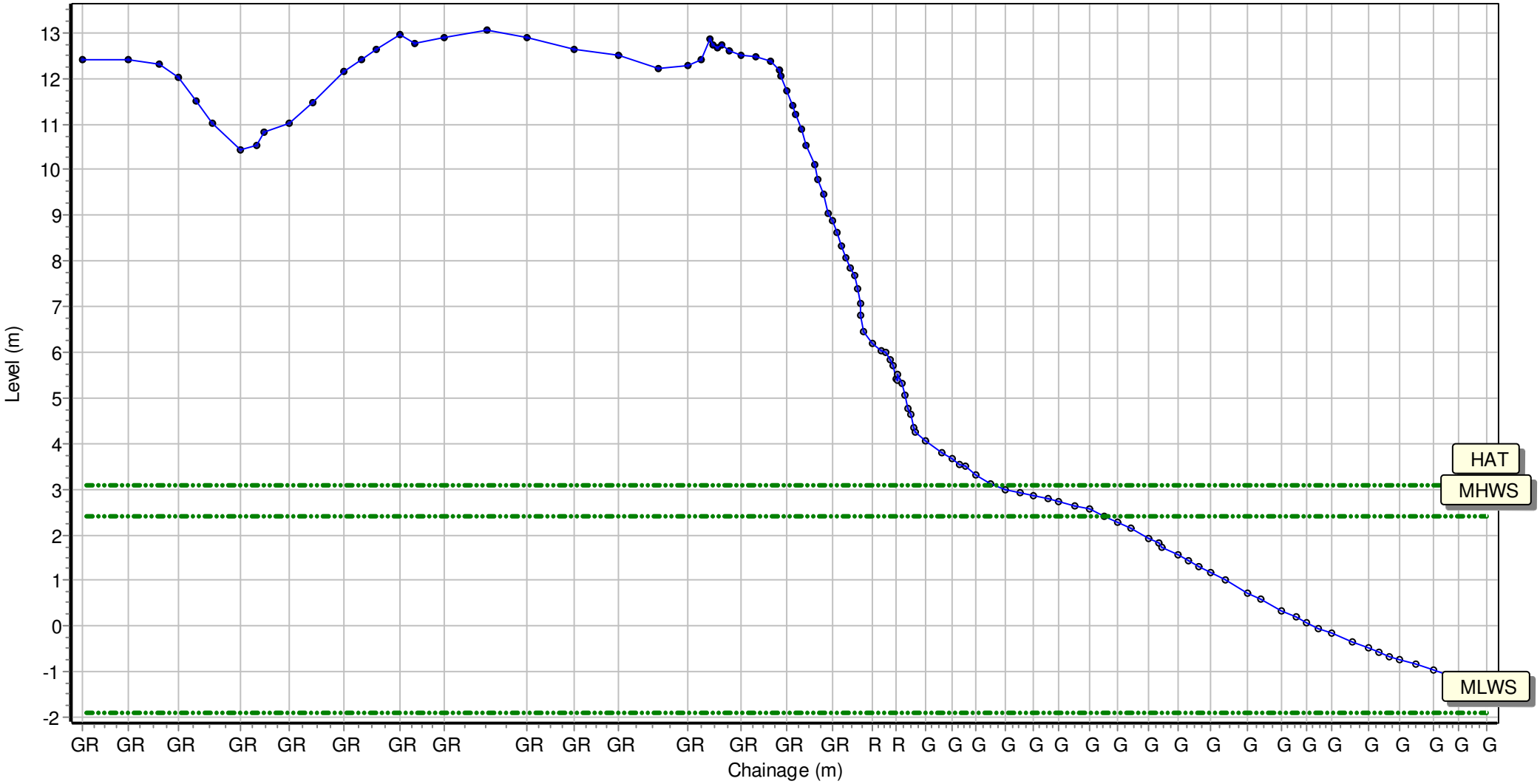
Location: **1aCMBC03A**

Date: 17/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

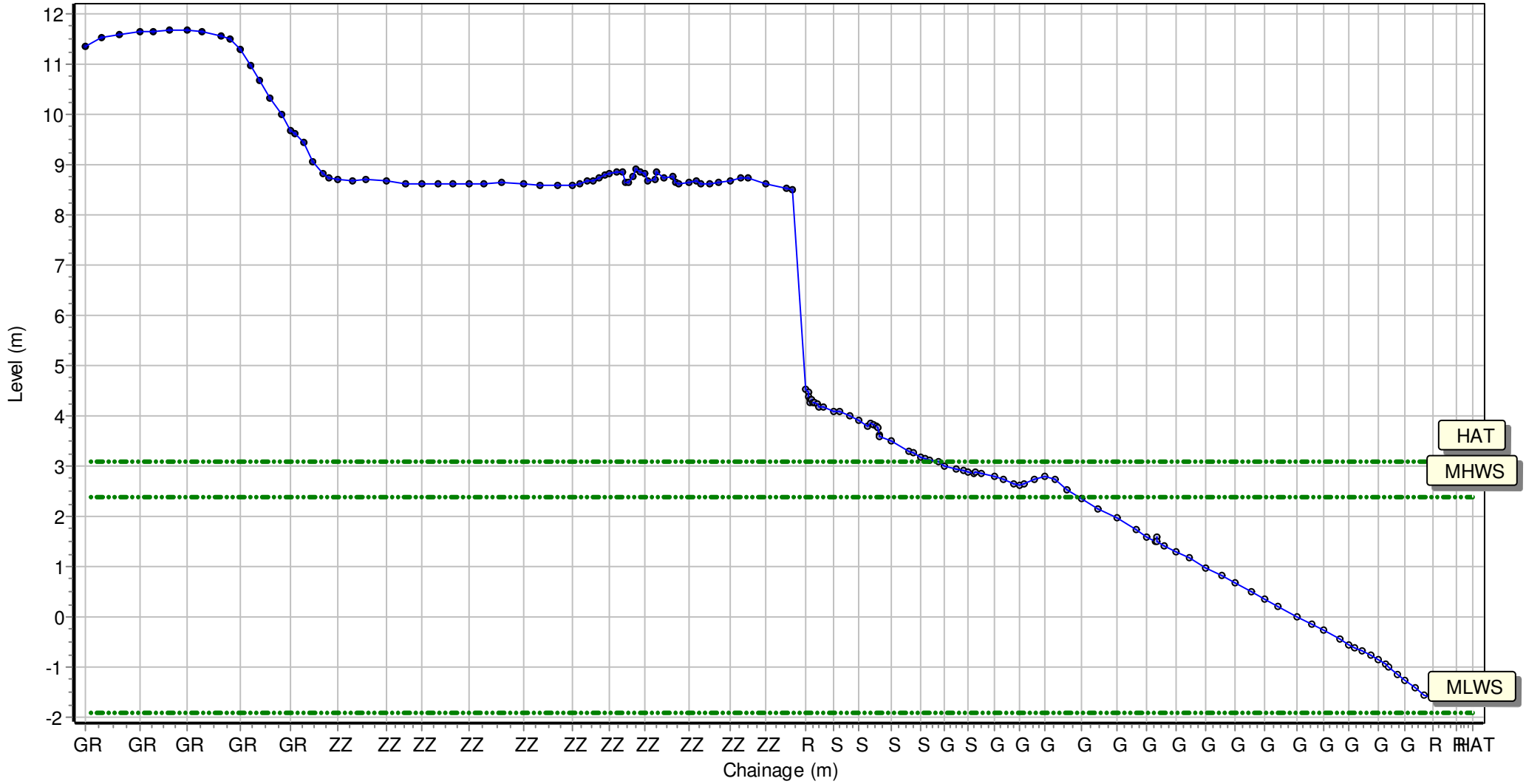
Location: **1aCMBC03B**

Date: 17/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

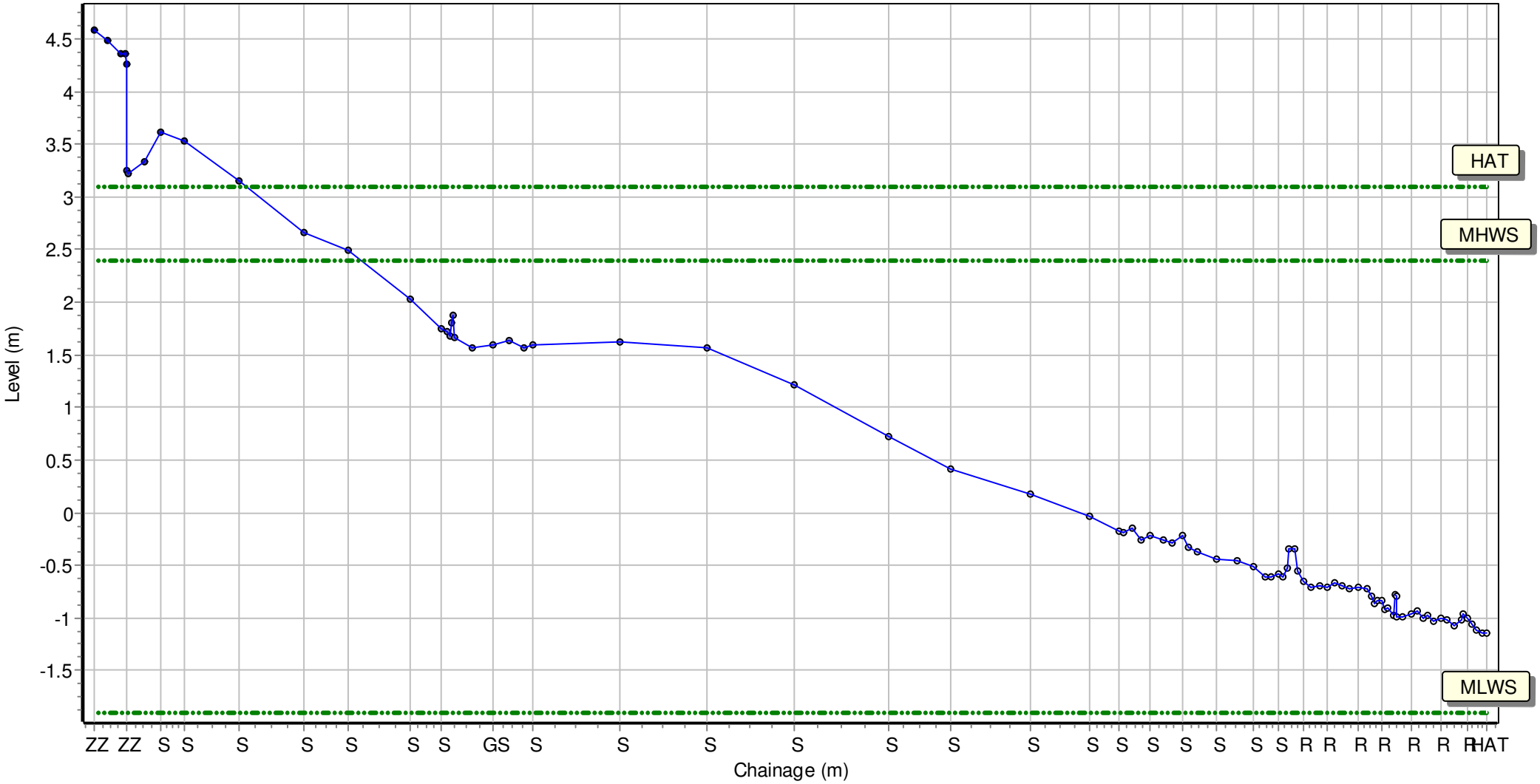
Location: **1aNWB1**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

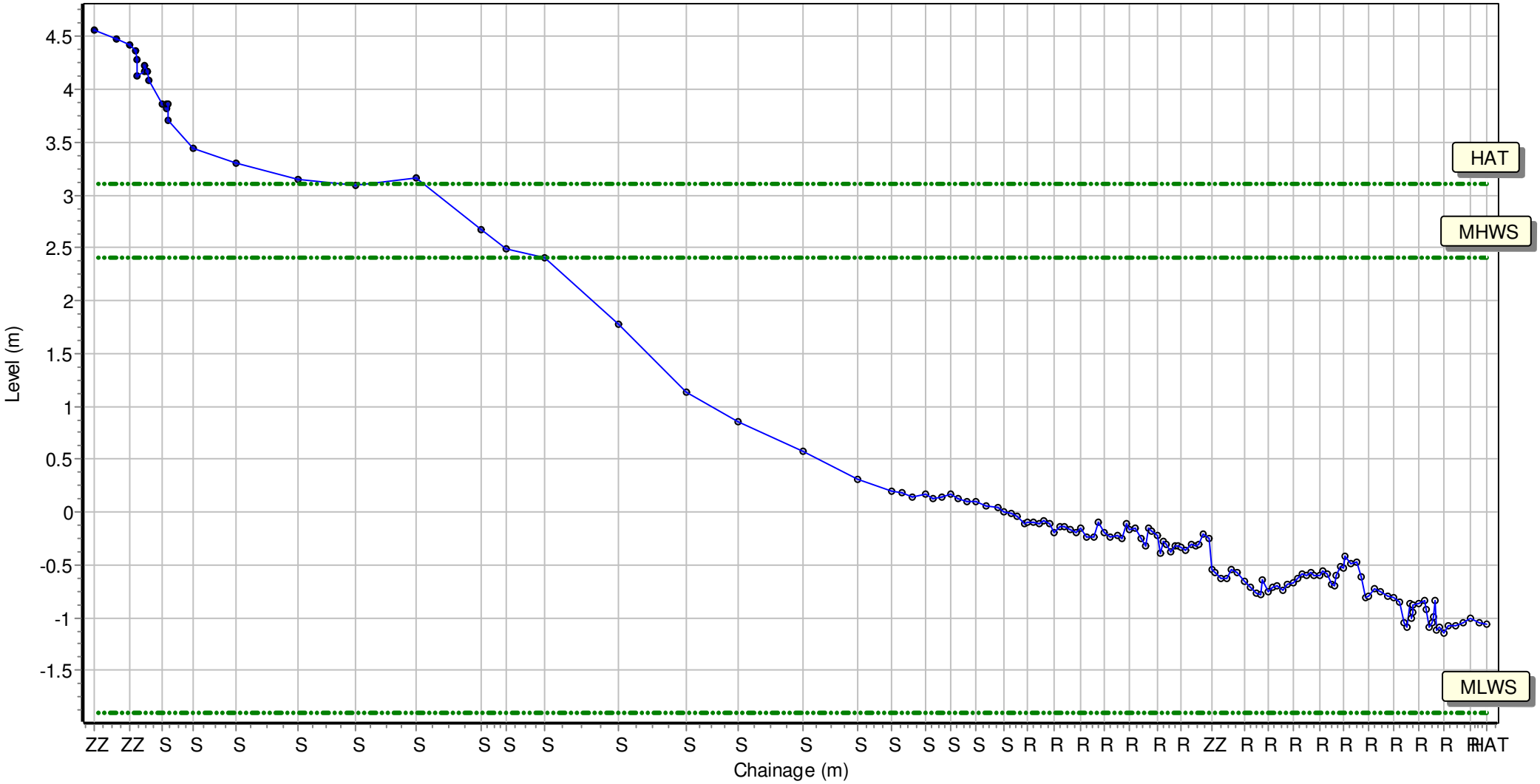
Location: **1aNWB2**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

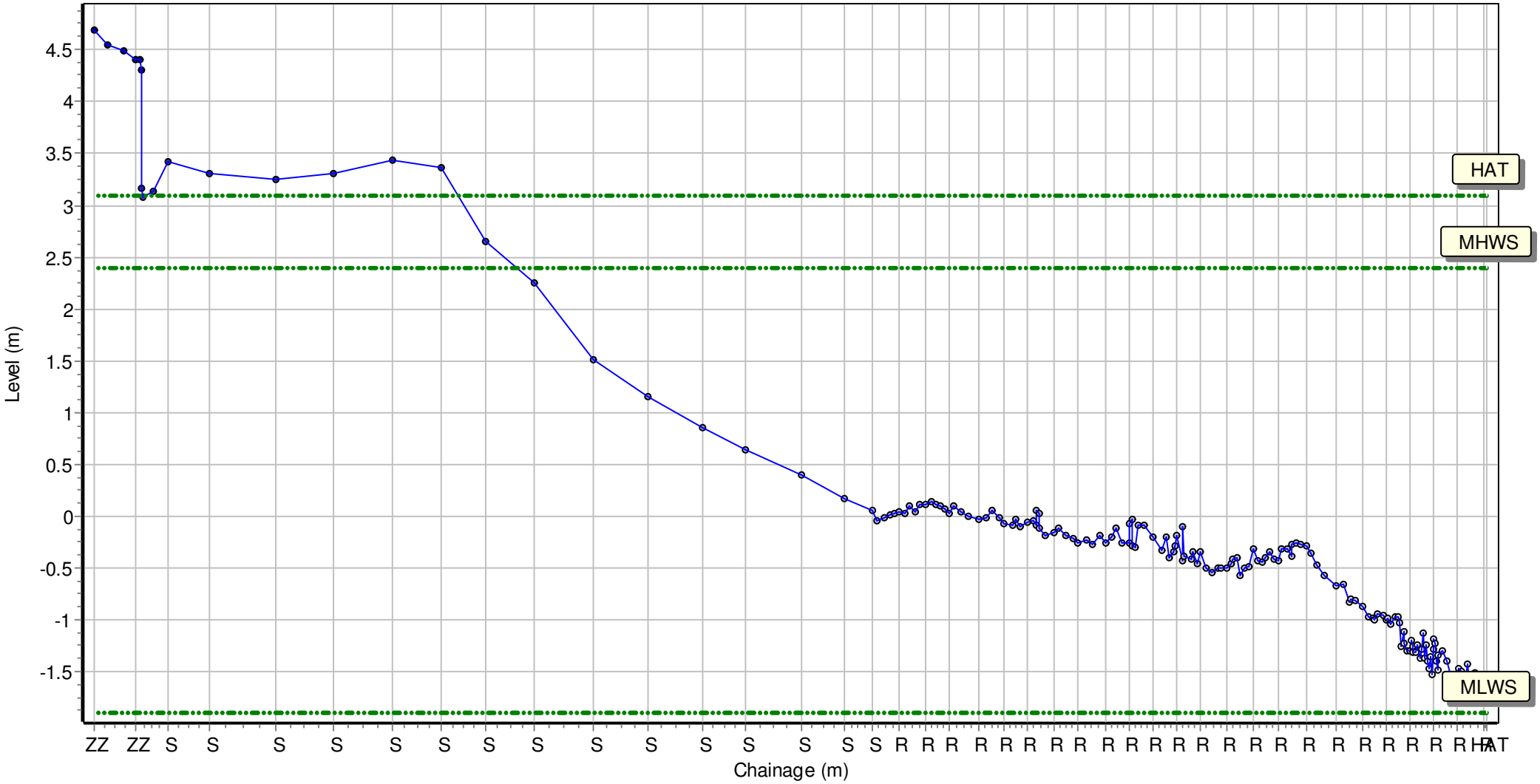
Location: **1aNWB3**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

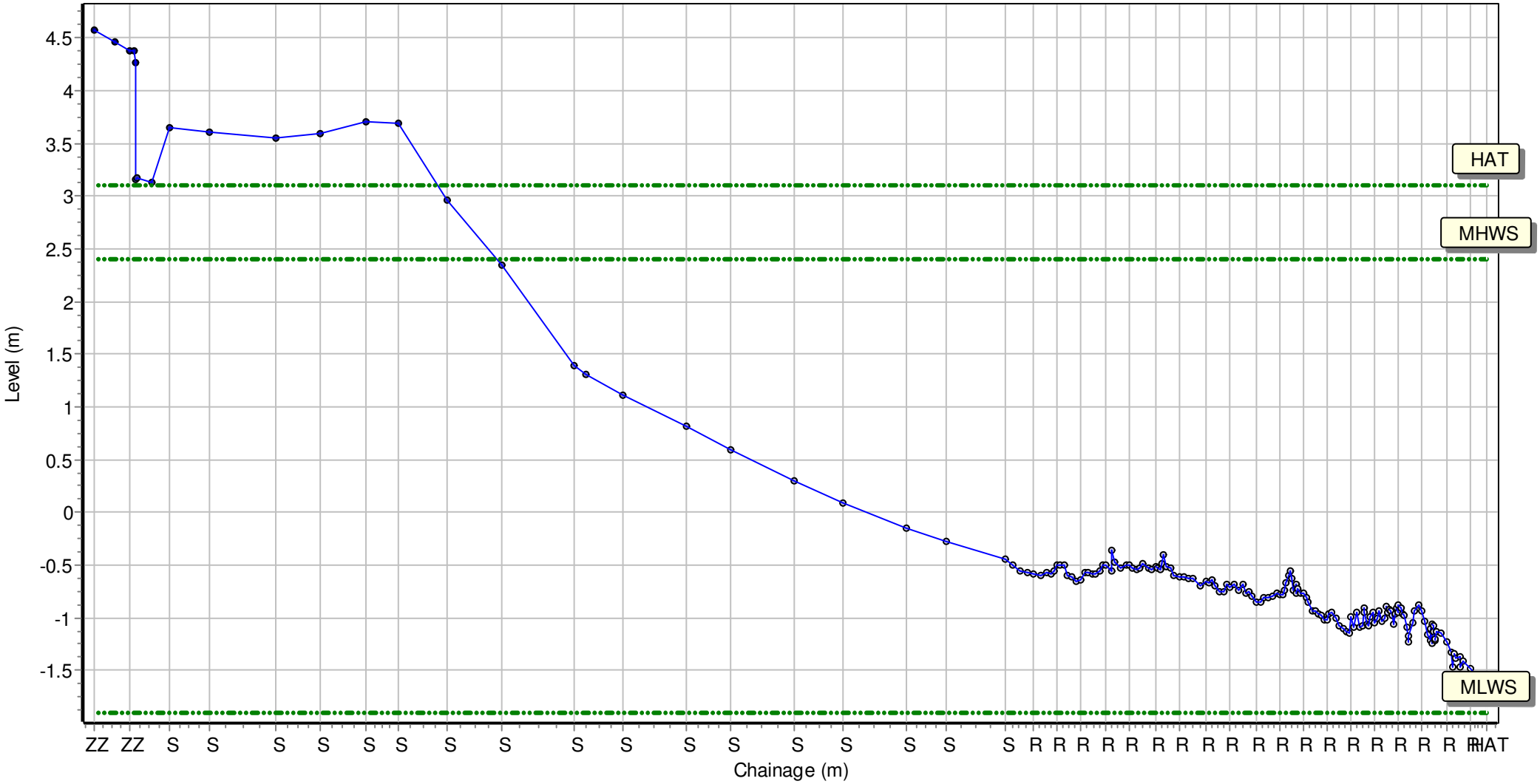
Location: **1aNWB4**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

Easting: 431523.116 **Northing:** 588054.727 **Profile Bearing:** 184 ° from North



Beach Profile

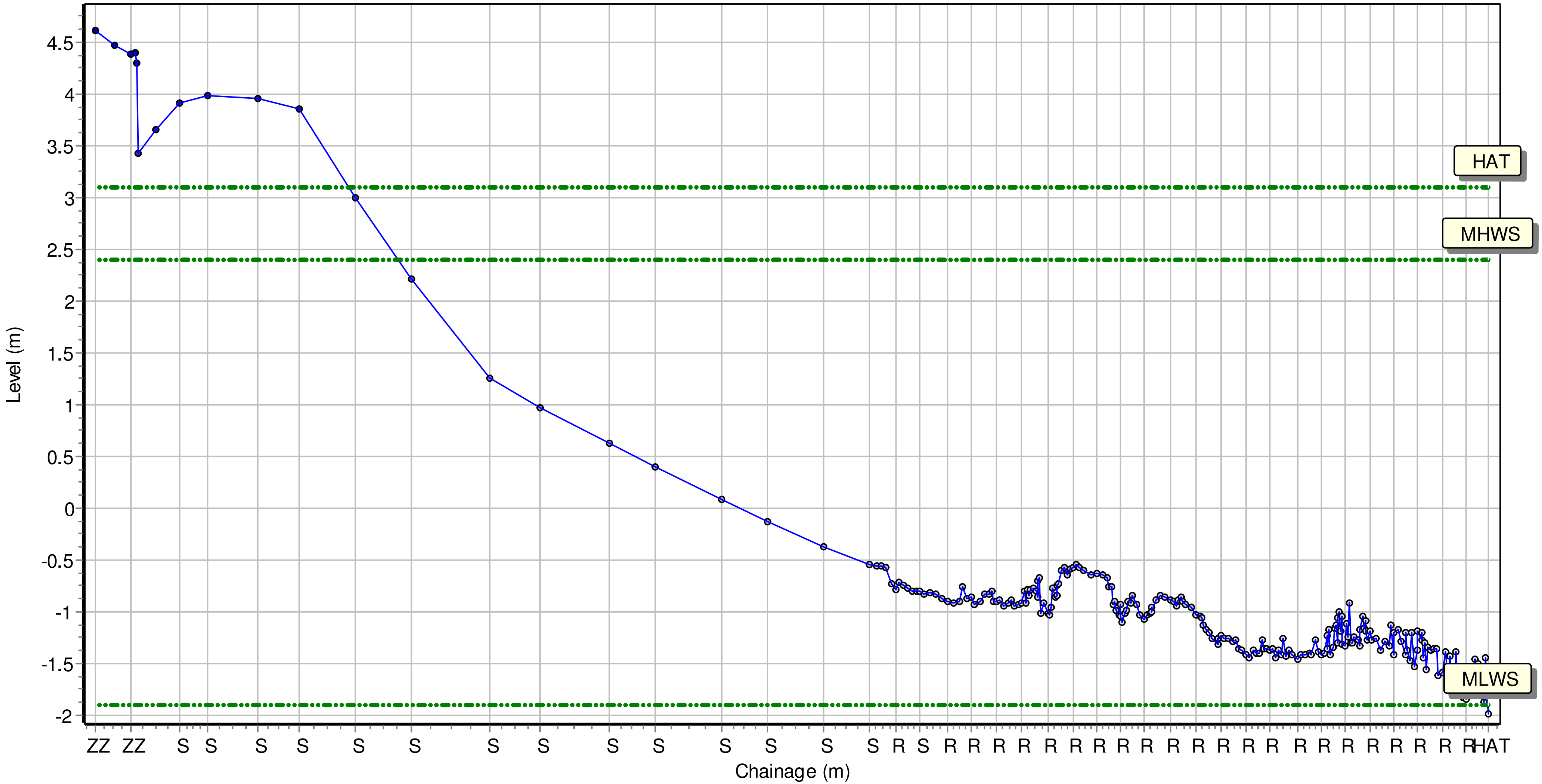
Location: **1aNWB5**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

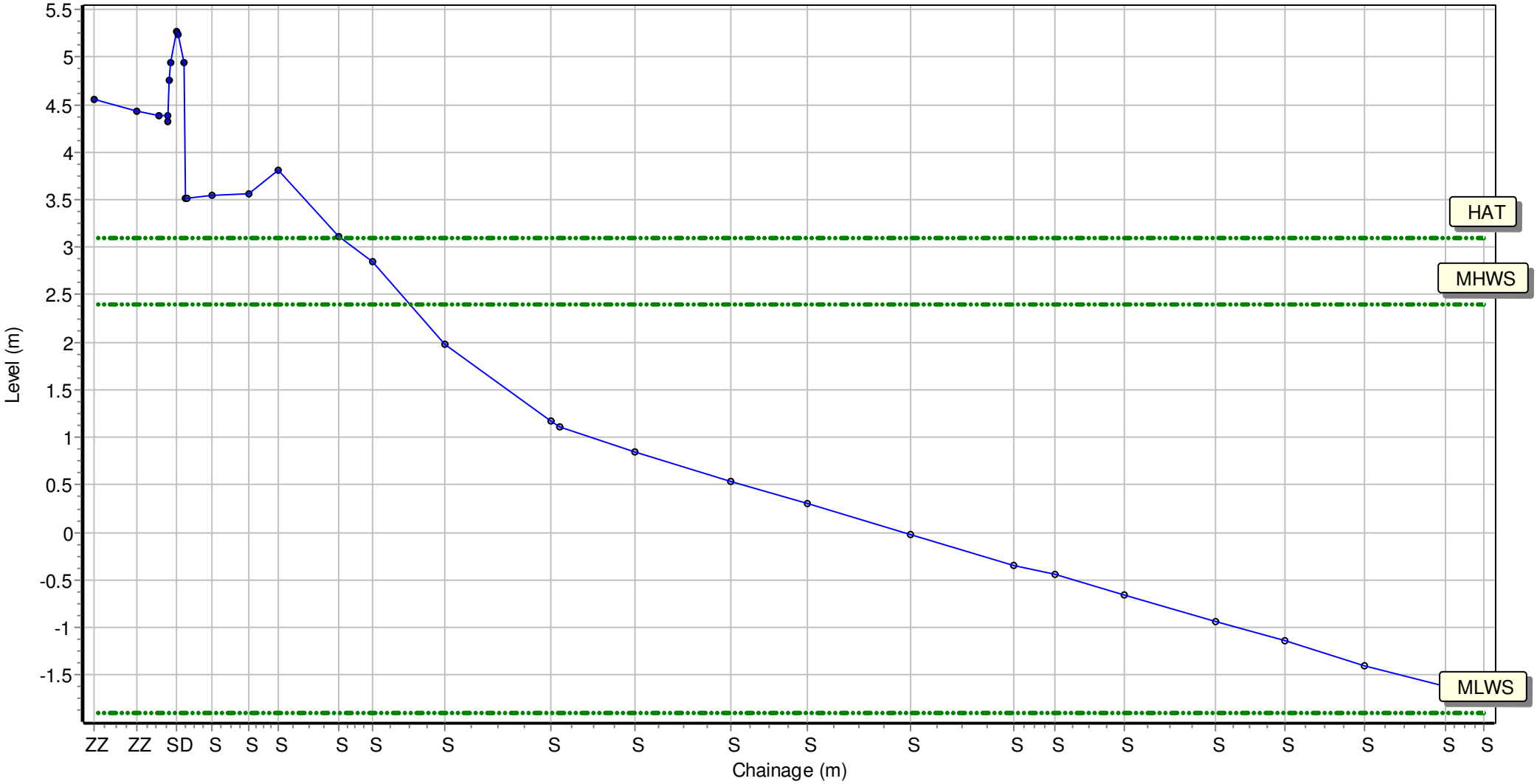
Location: **1aNWB6**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

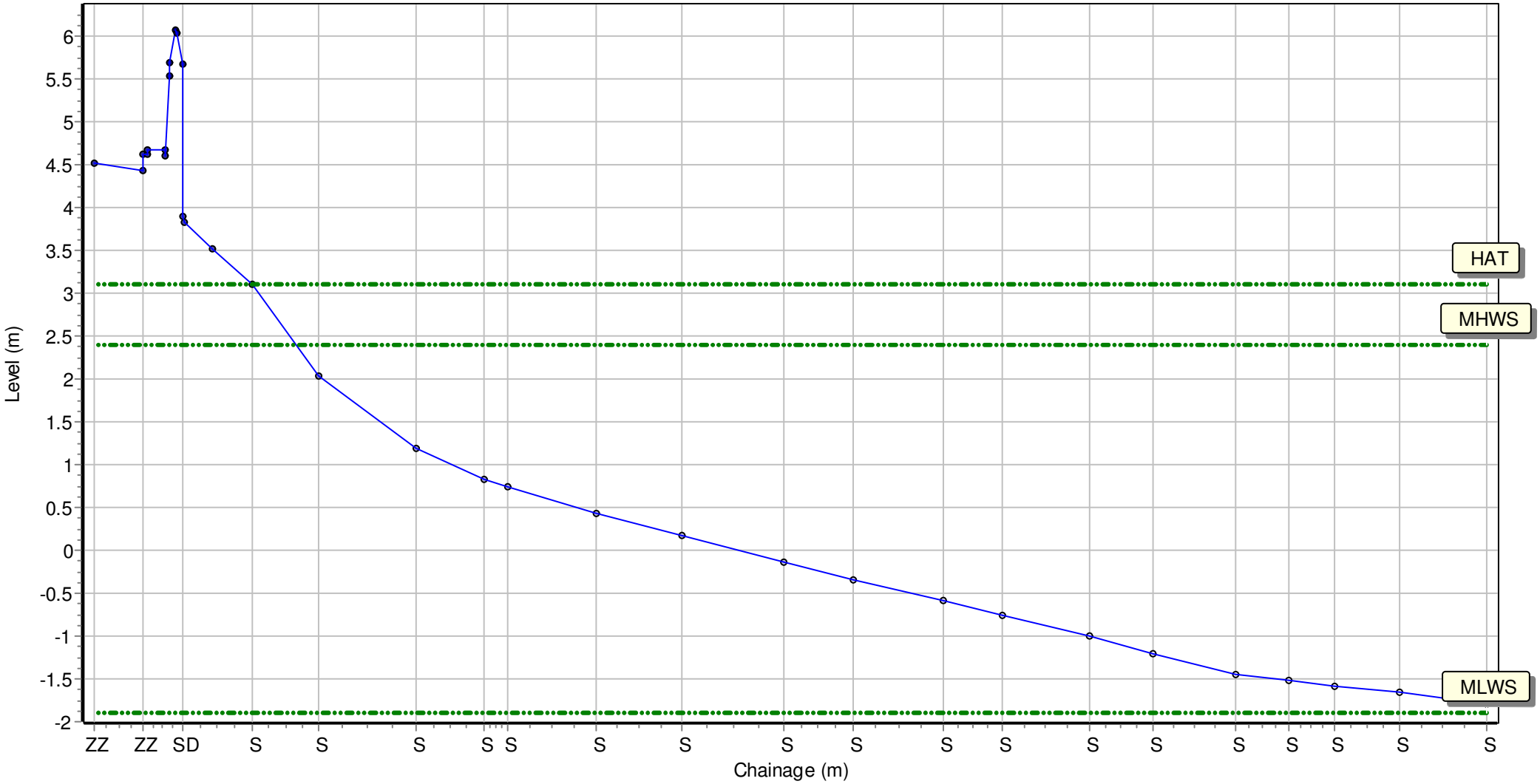
Location: **1aNWB7**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

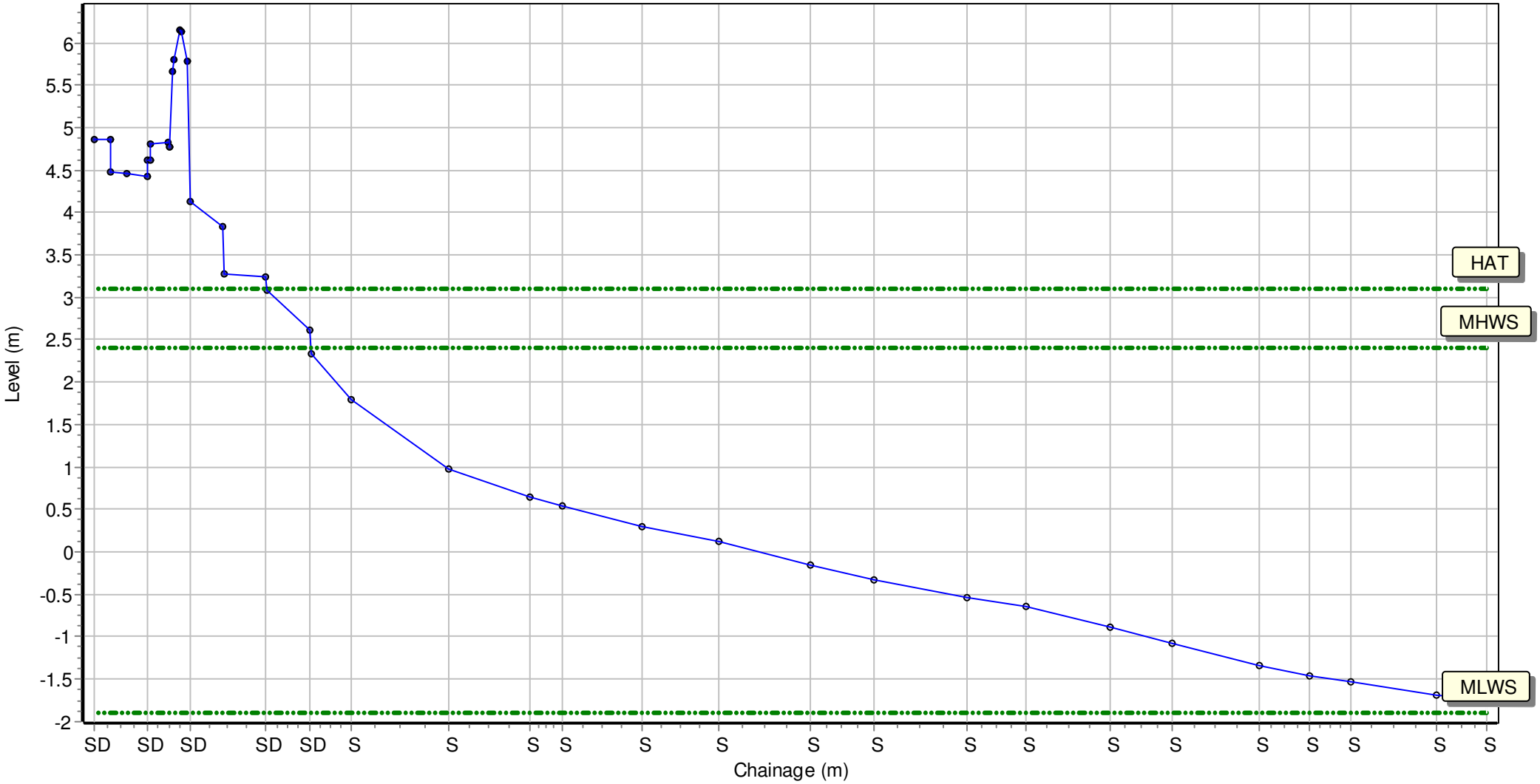
Location: **1aNWB8**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

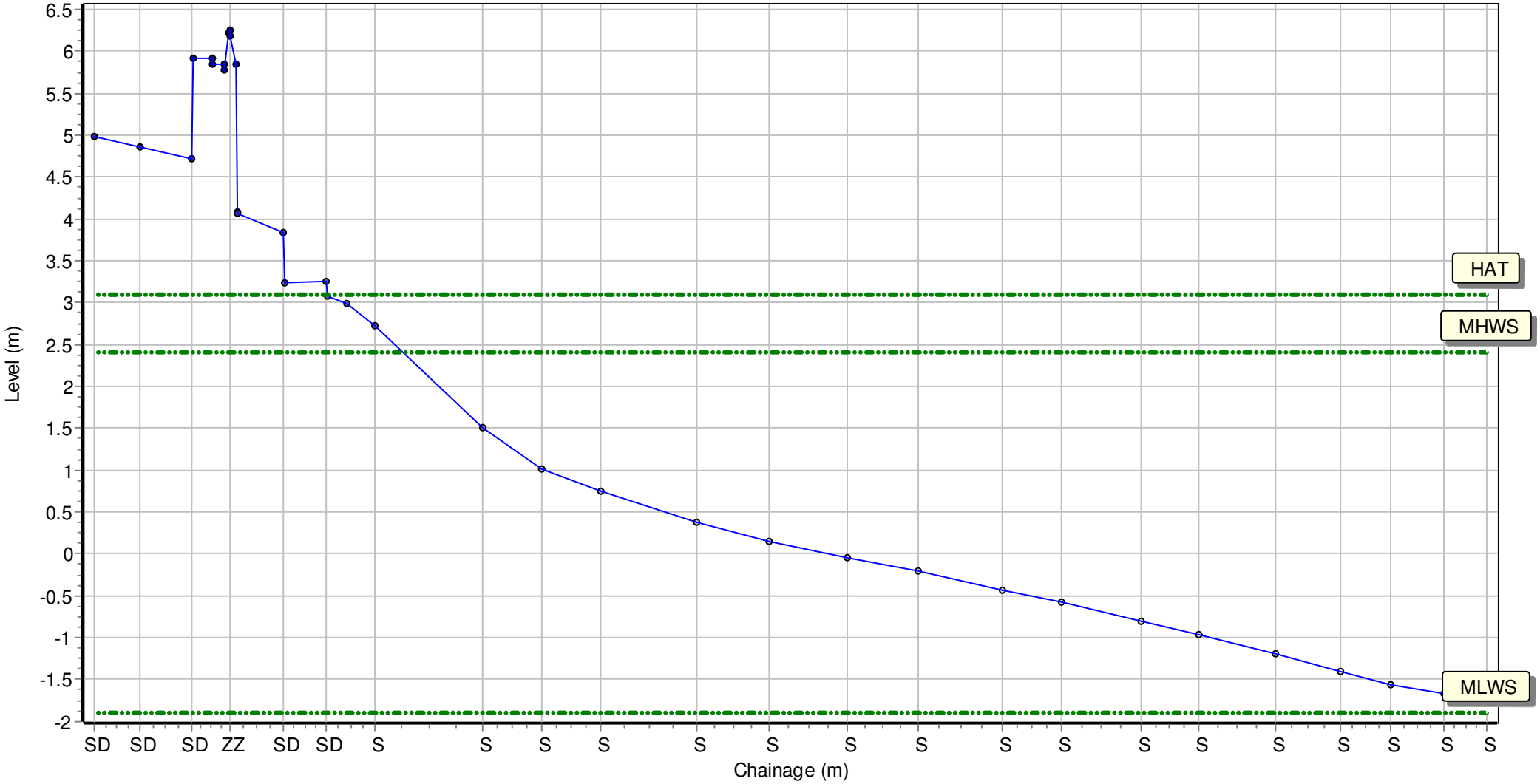
Location: **1aNWB9**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

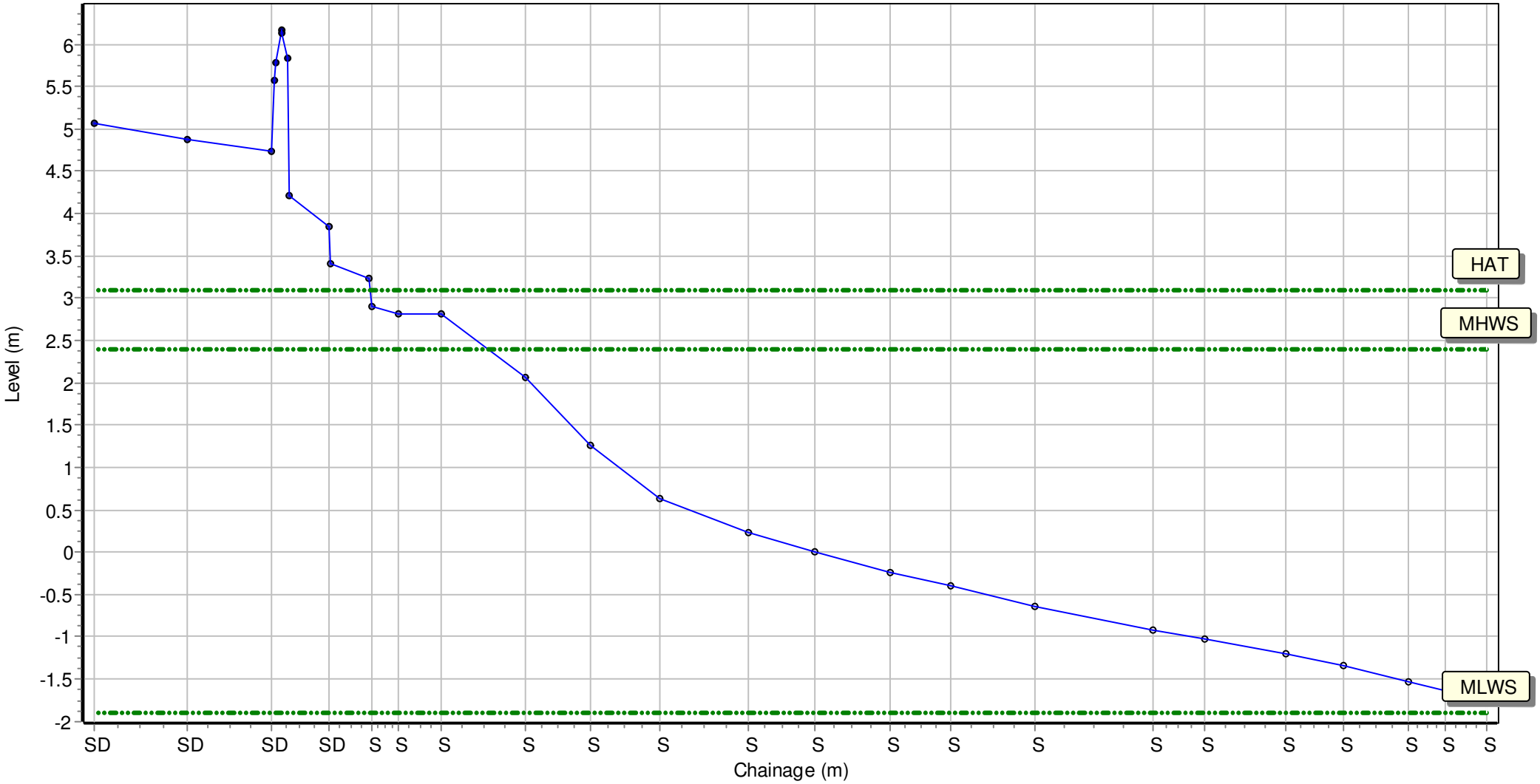
Location: **1aNWB10**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

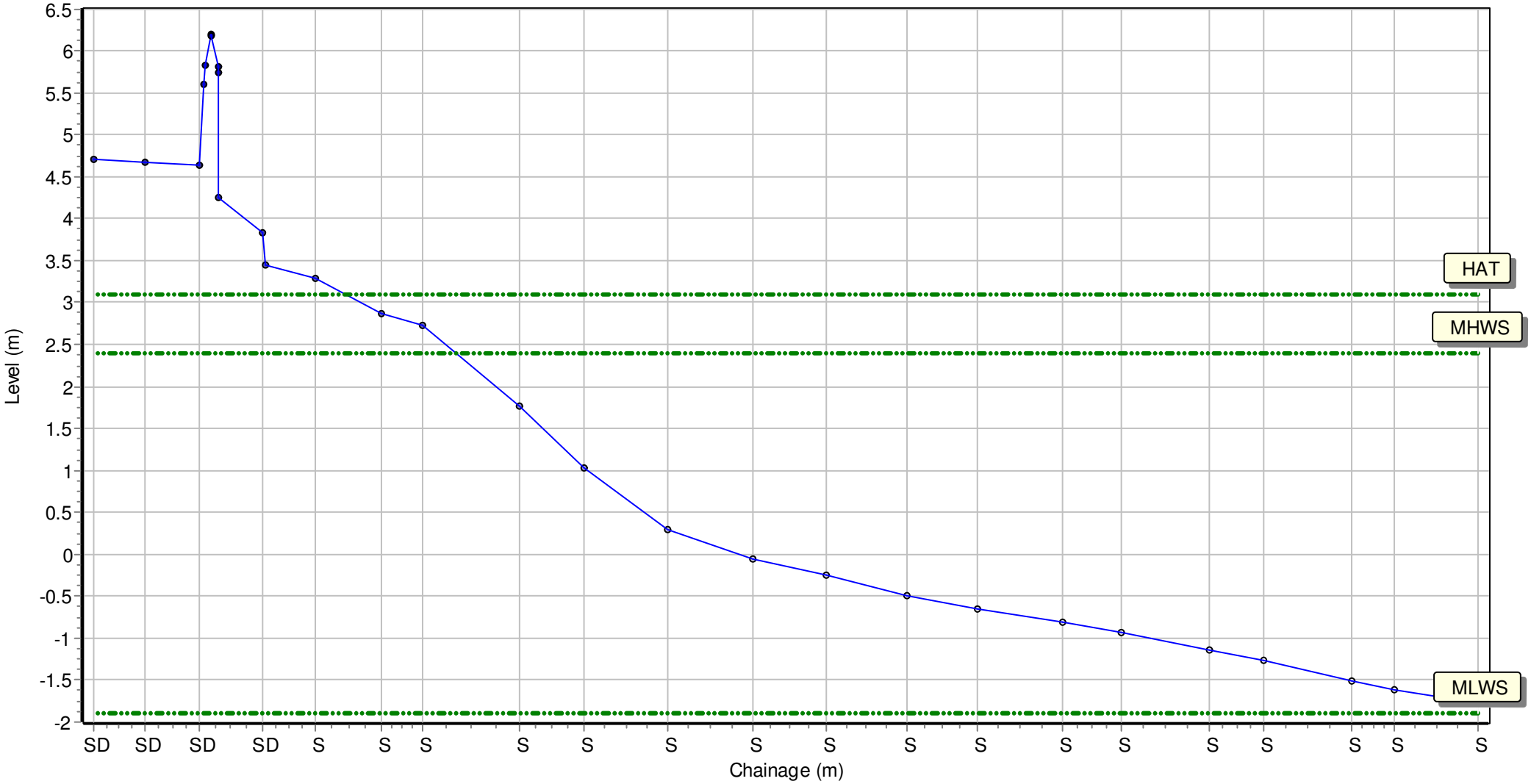
Location: **1aNWB11**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

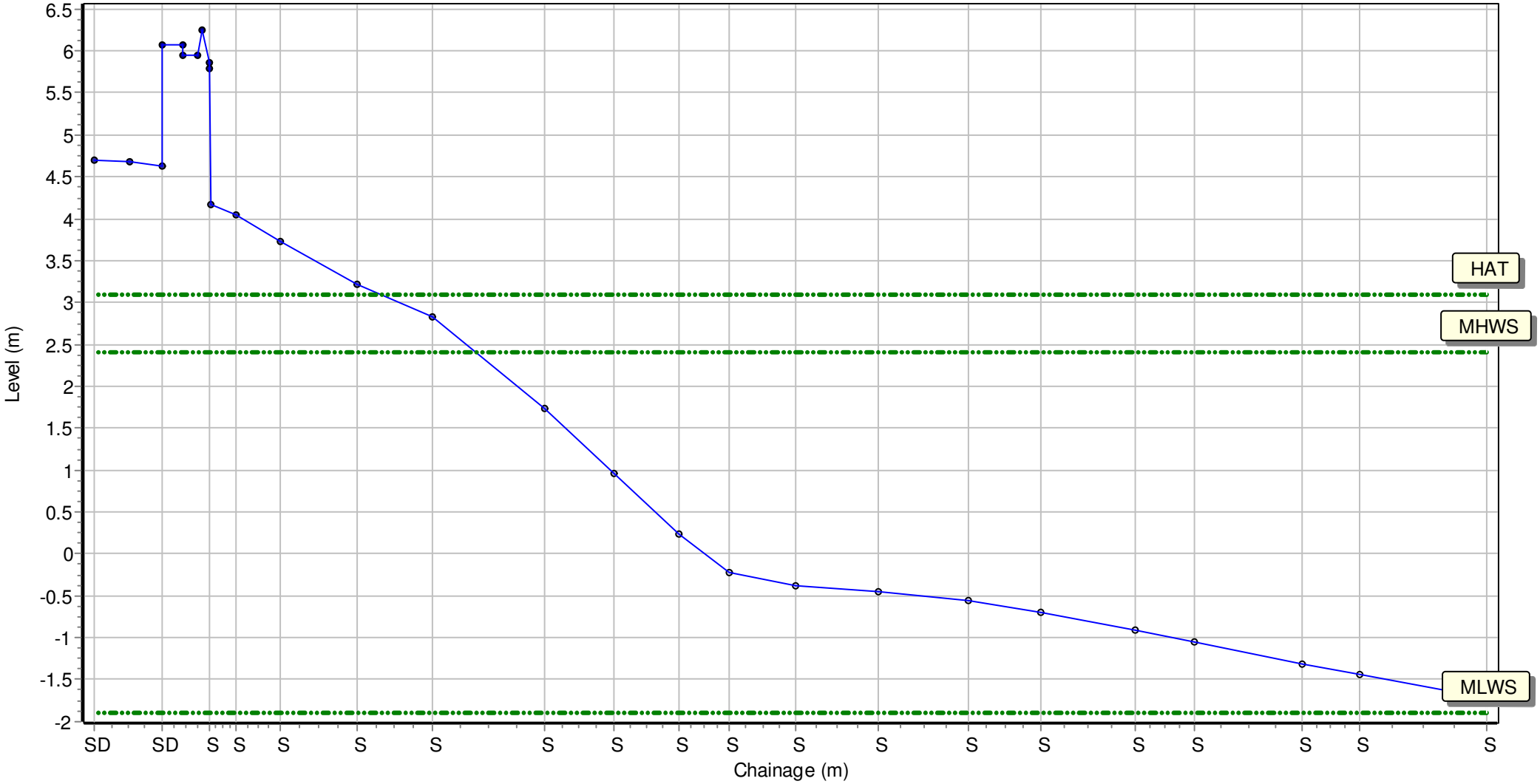
Location: **1aNWB12**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

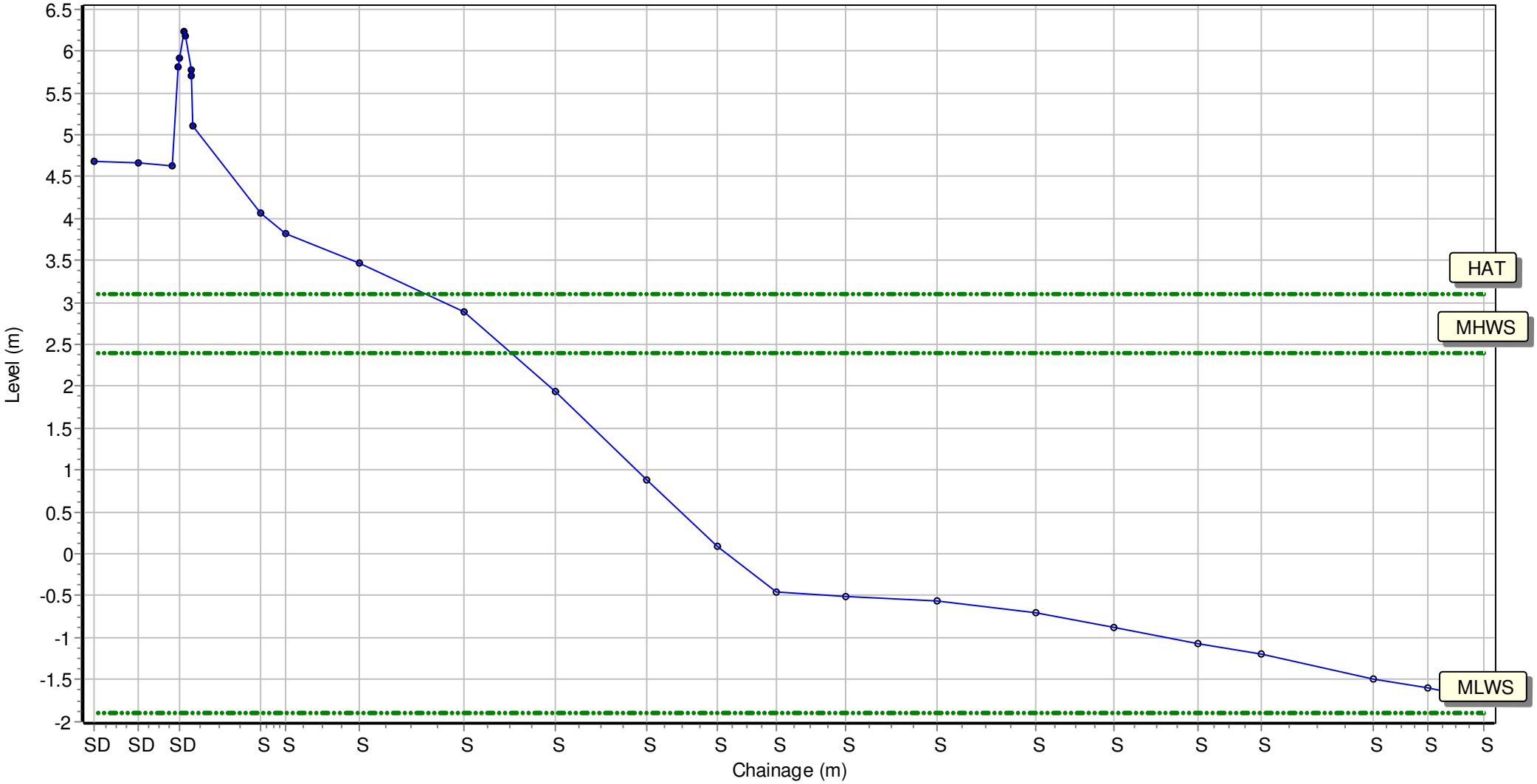
Location: **1aNWB13**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

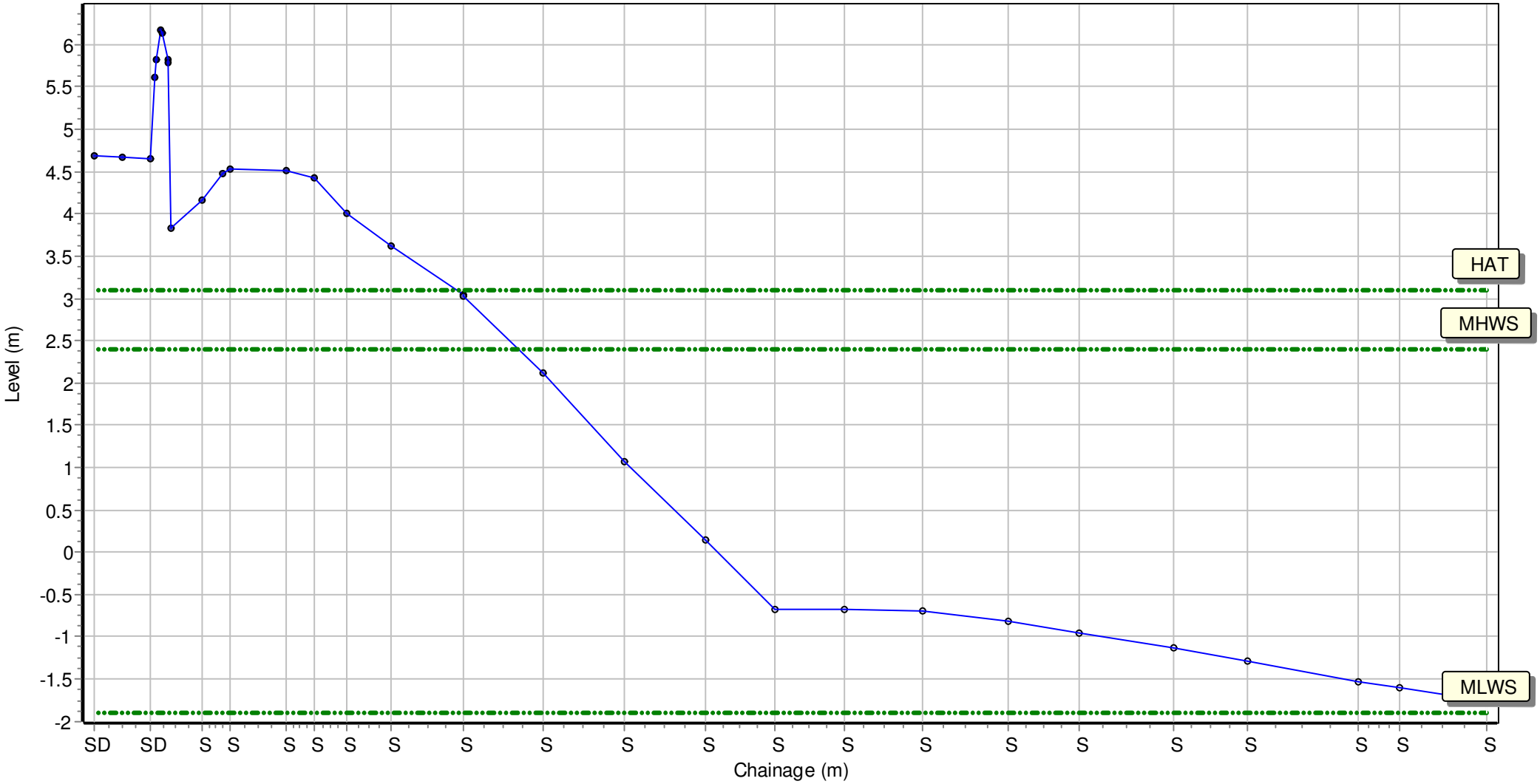
Location: **1aNWB14**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

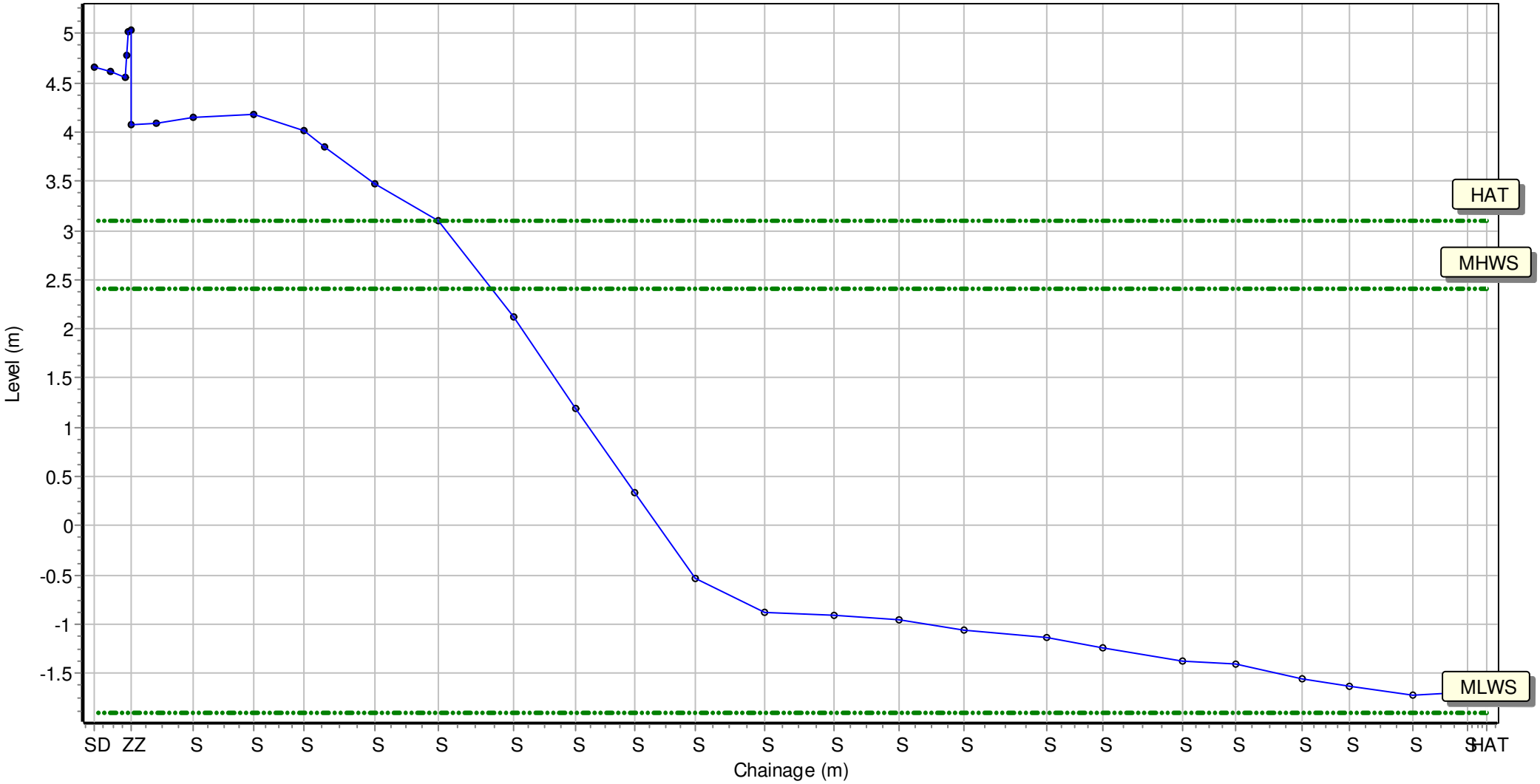
Location: **1aNWB15**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

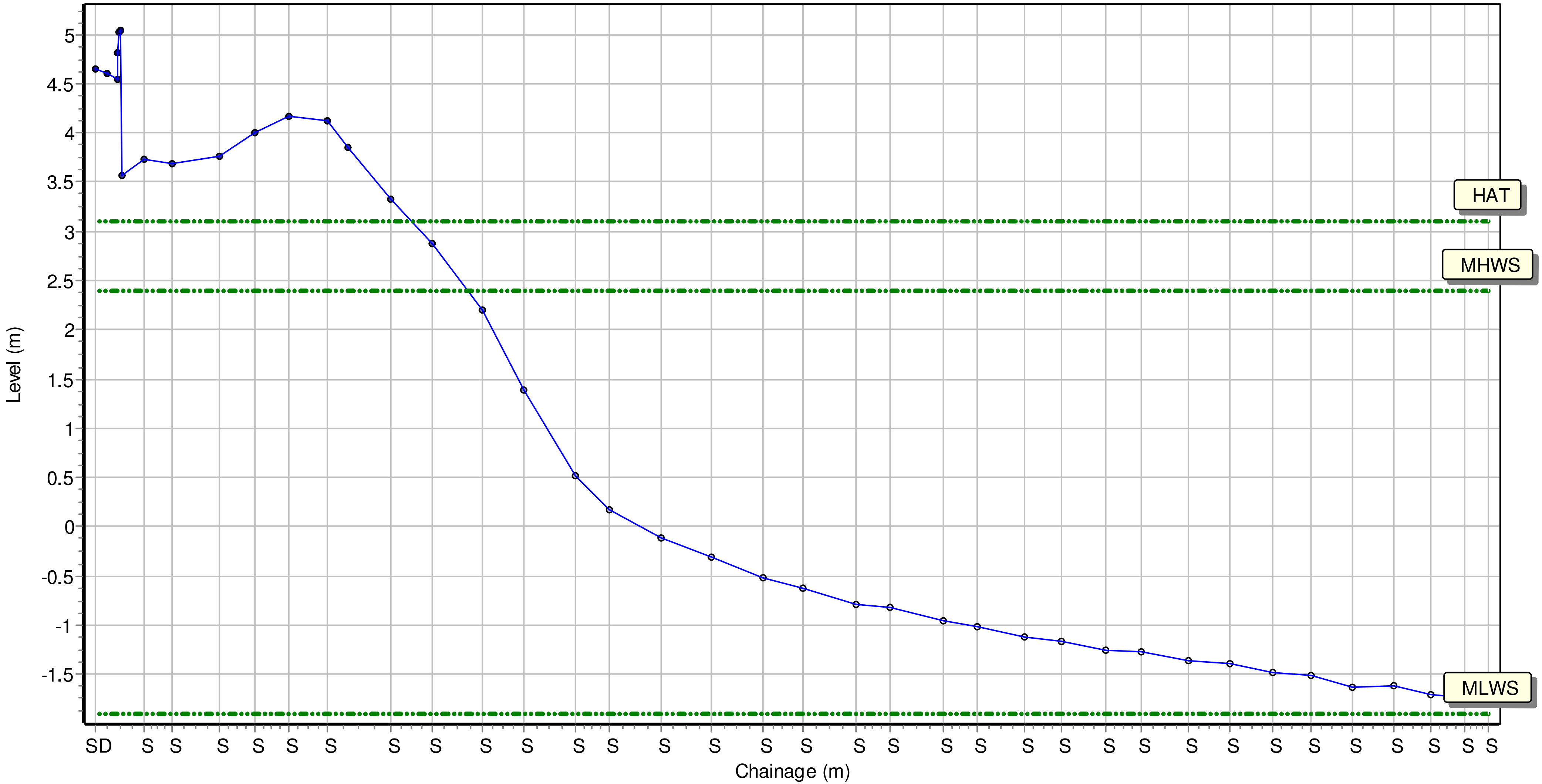
Location: **1aNWB16**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

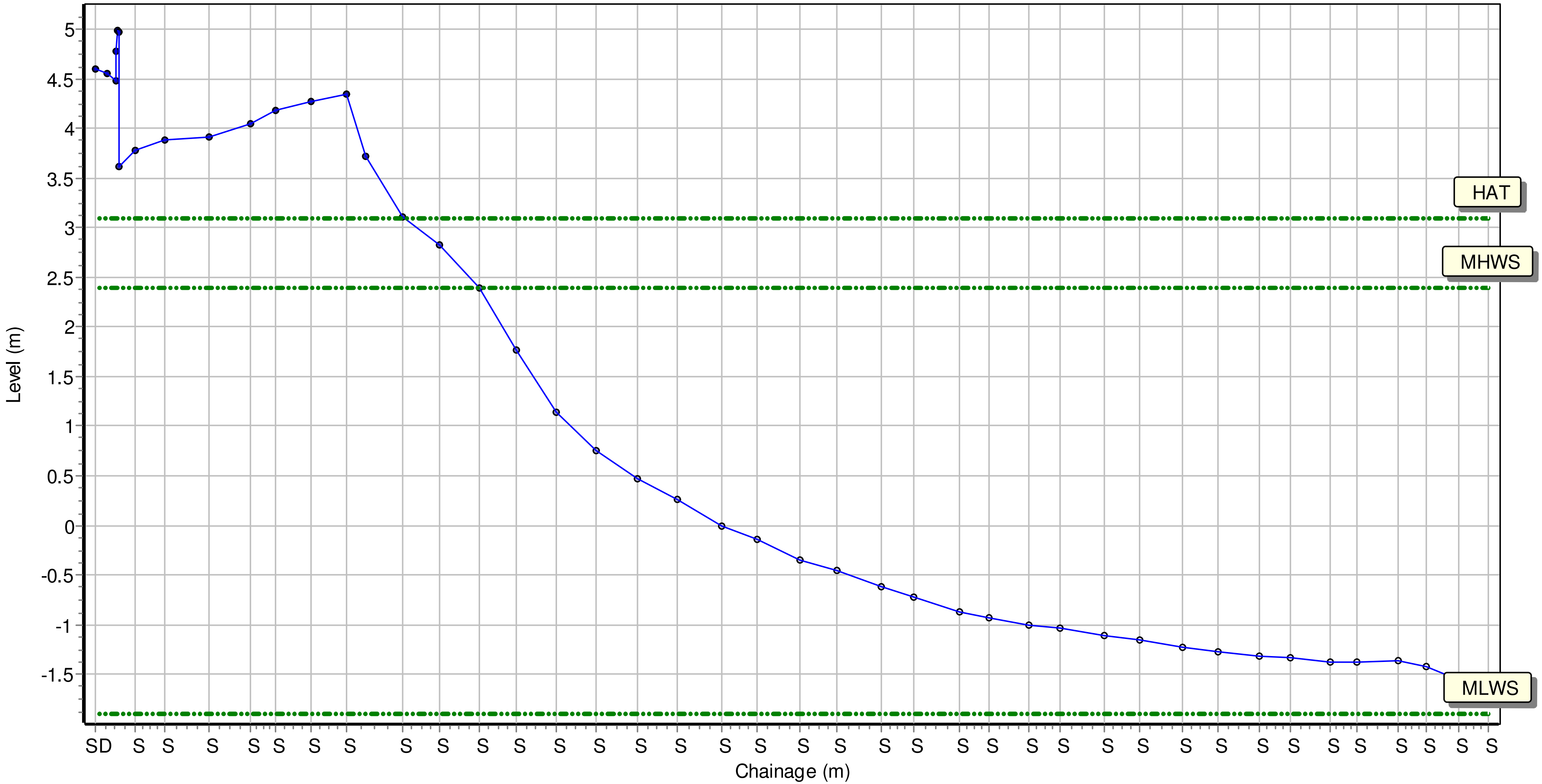
Location: 1aNWB17

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

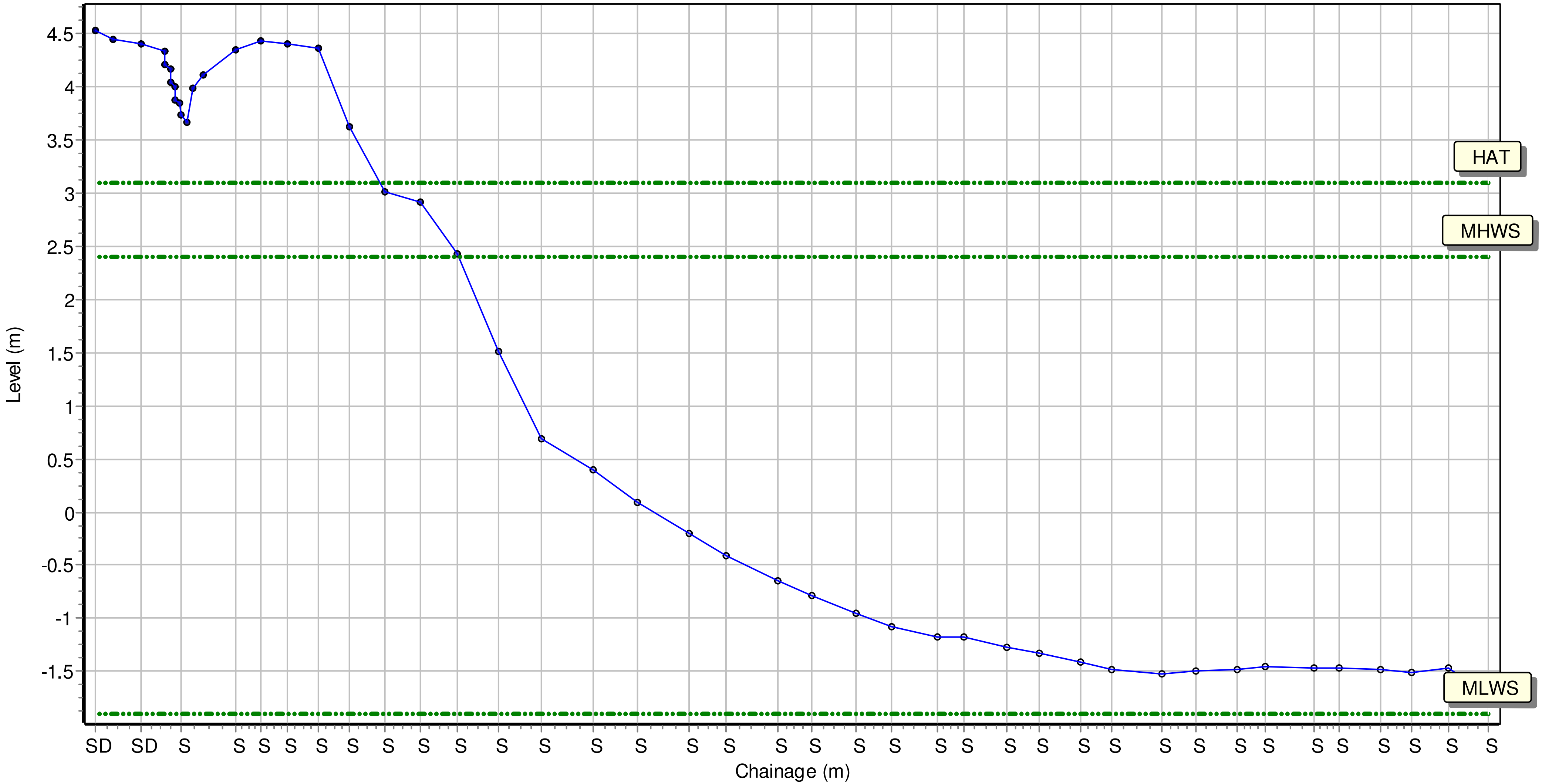
Location: **1aNWB18**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

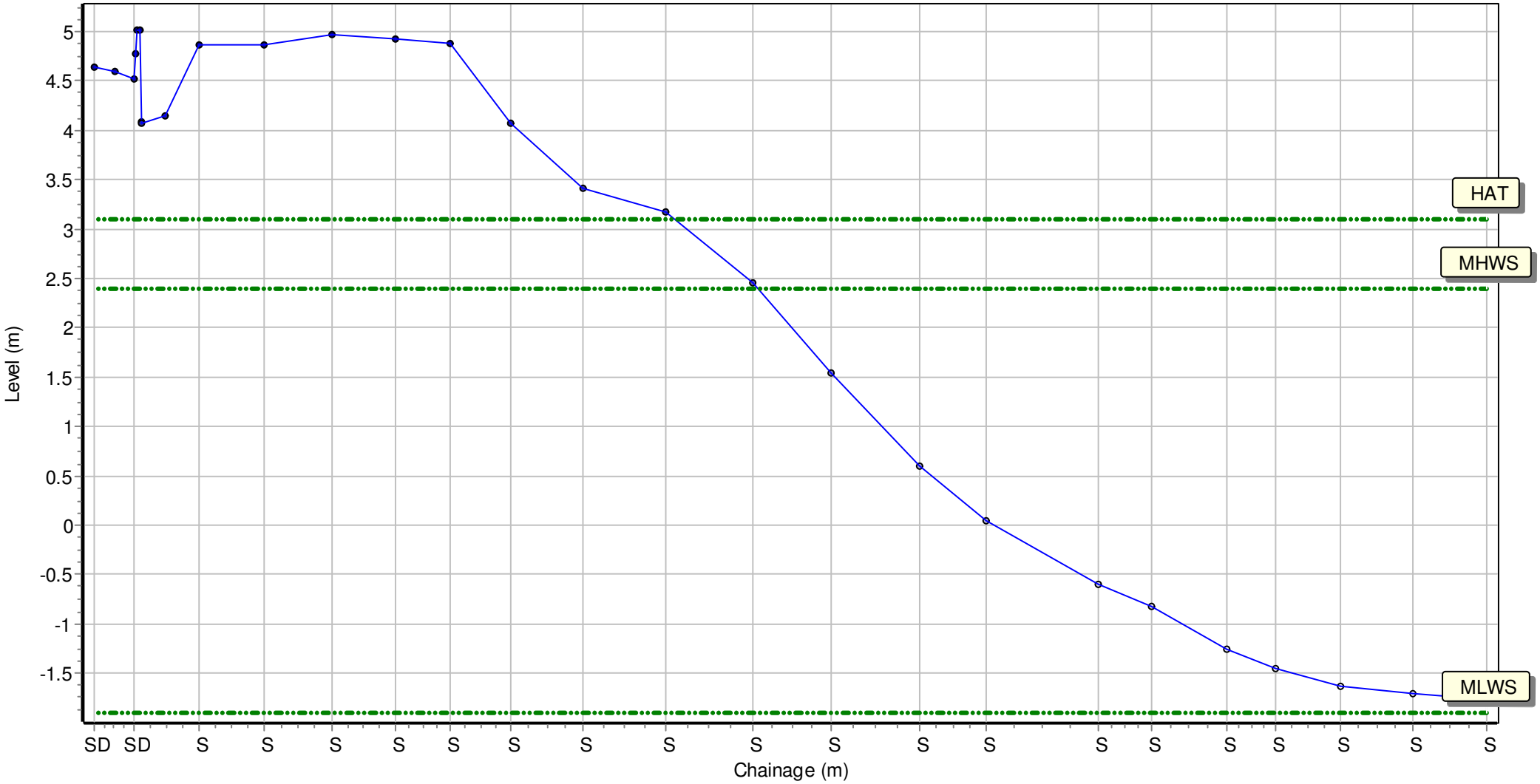
Location: **1aNWB19**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

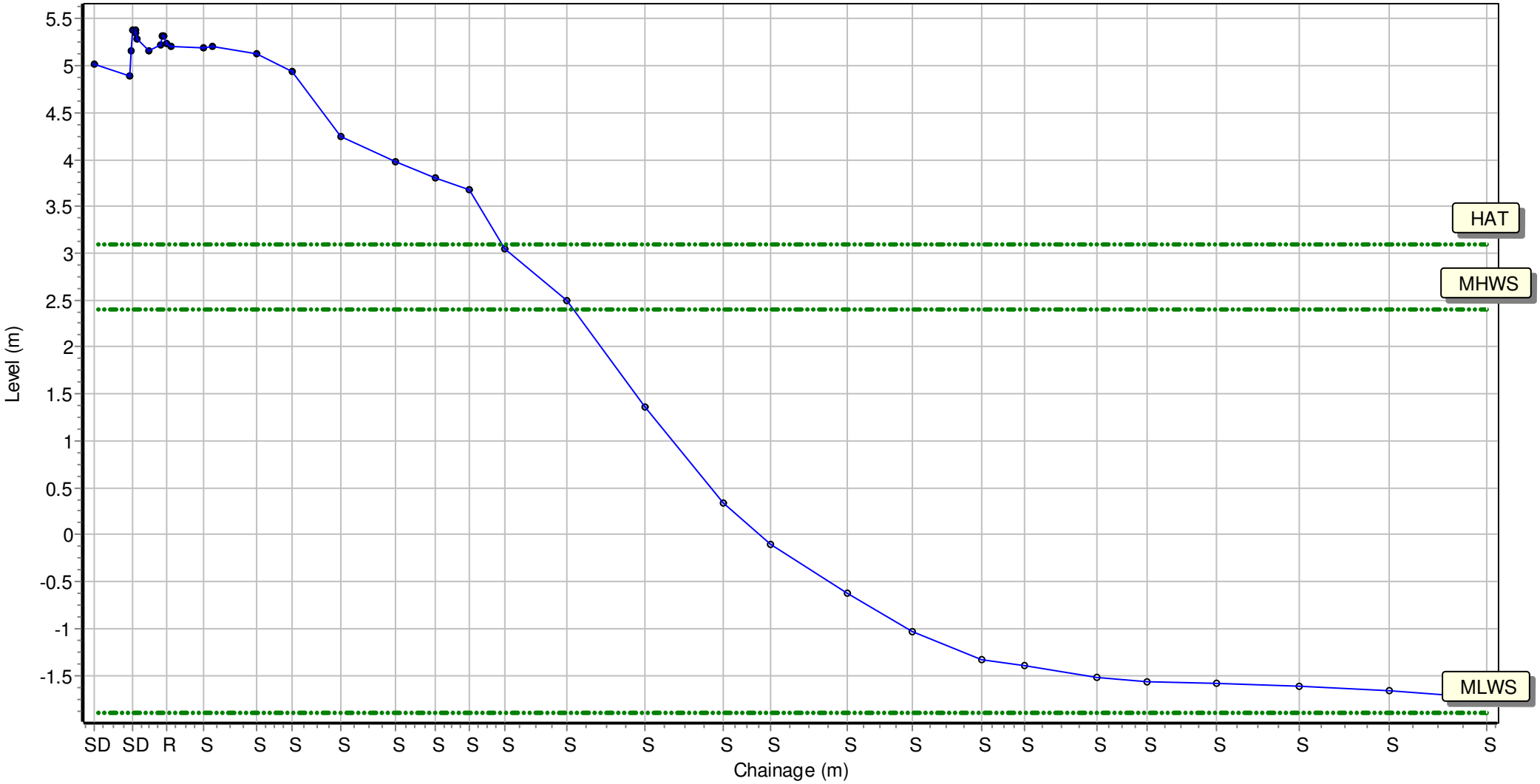
Location: **1aNWB20**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

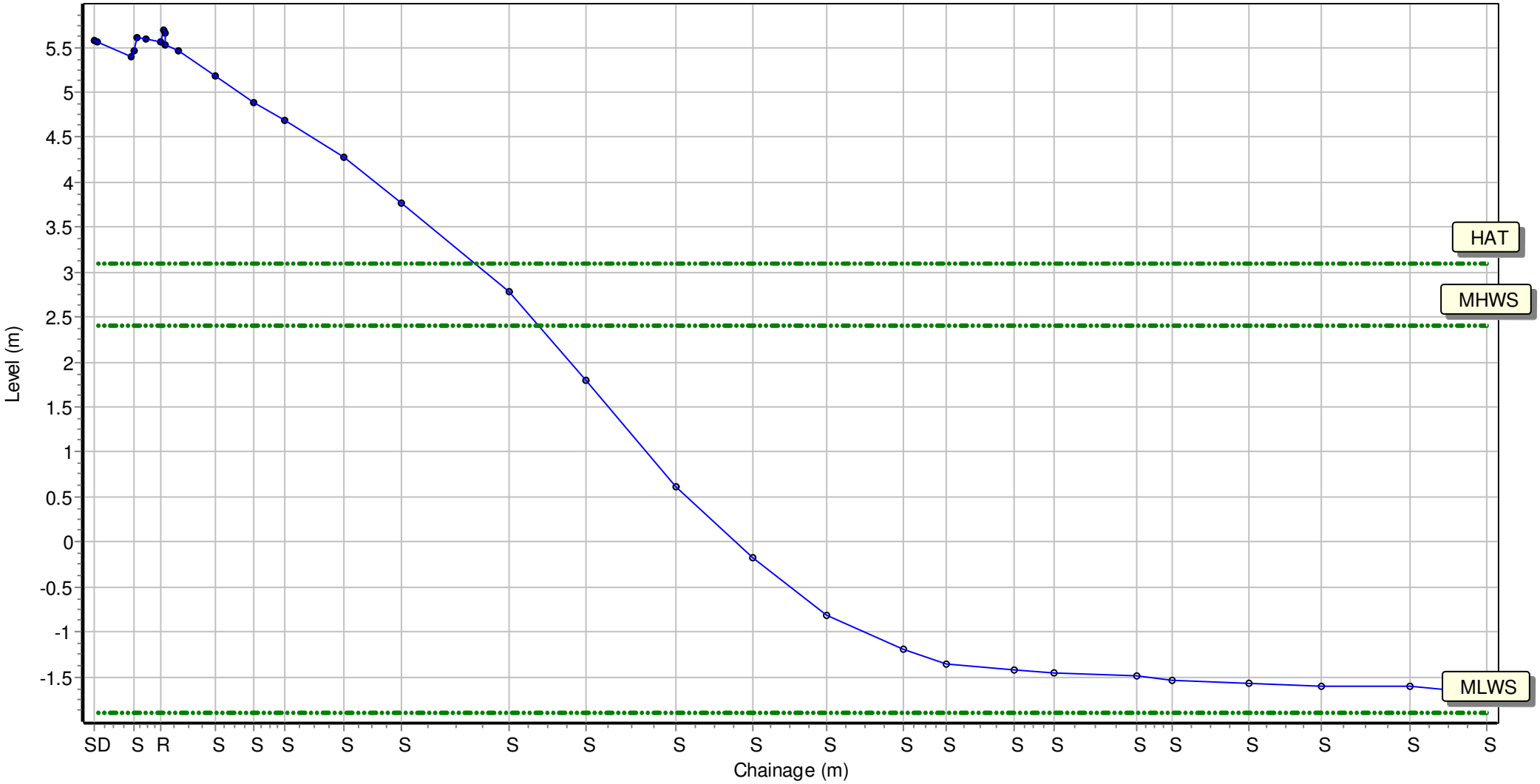
Location: **1aNWB21**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

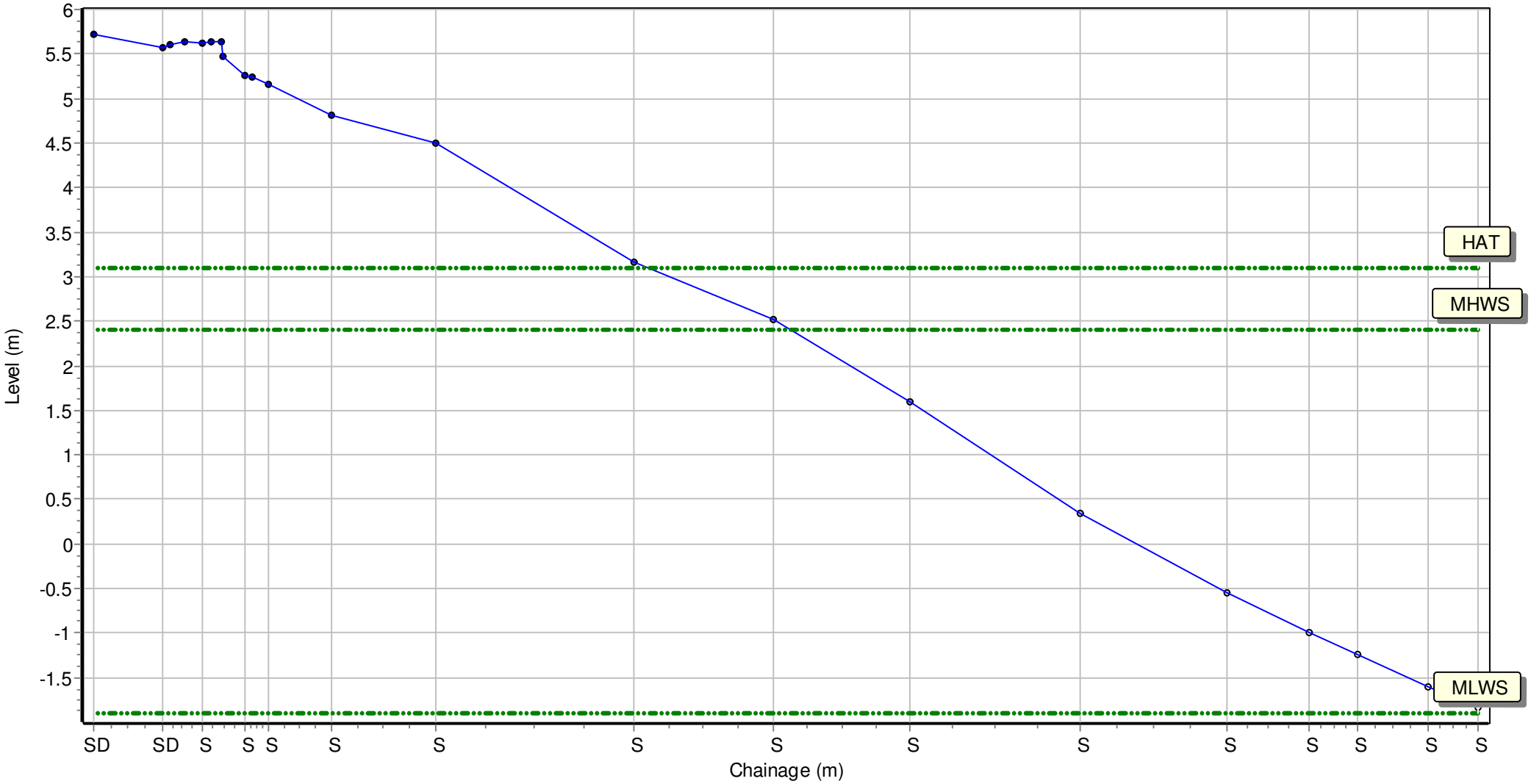
Location: **1aNWB22**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

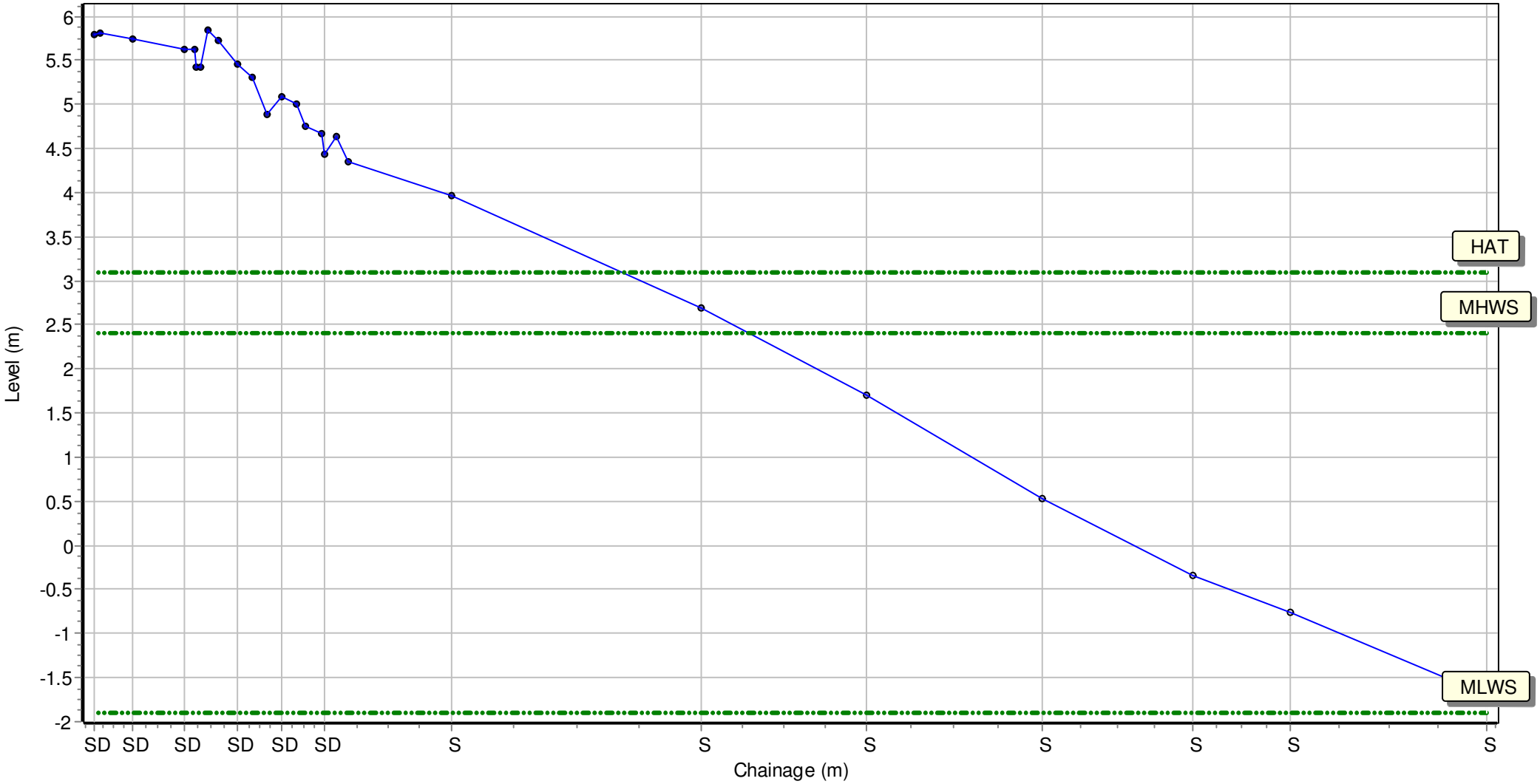
Location: **1aNWB23**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

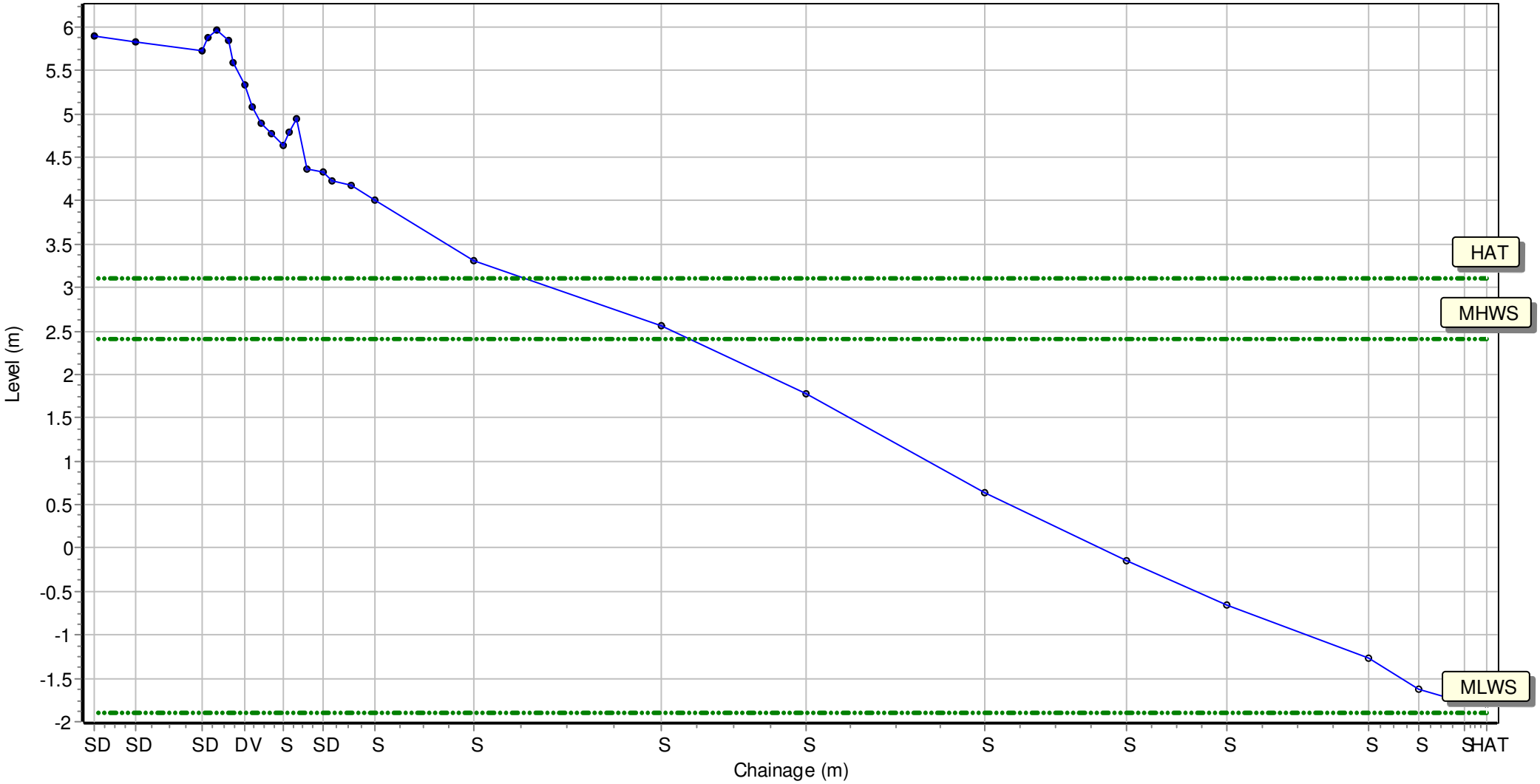
Location: **1aNWB24**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

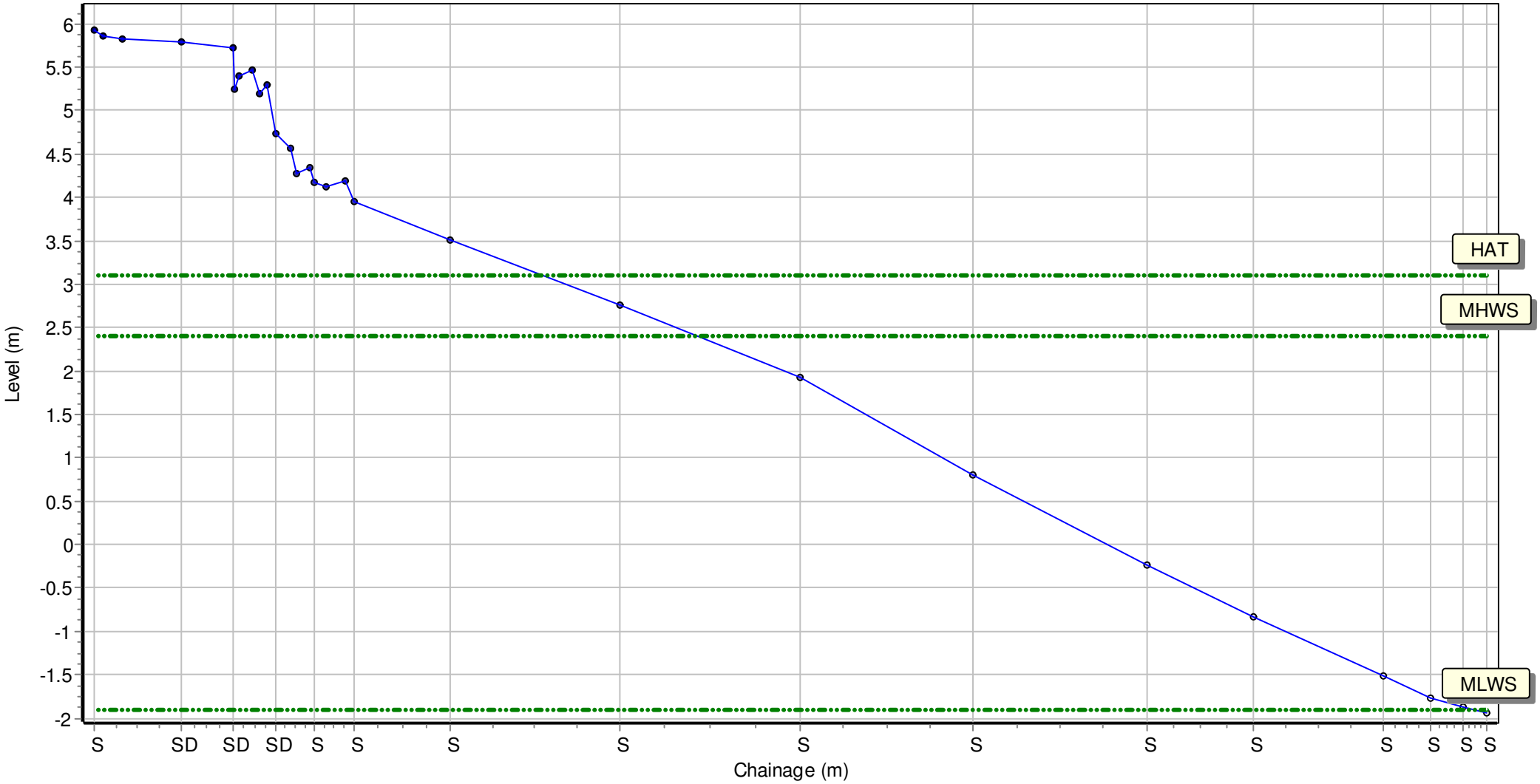
Location: **1aNWB25**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

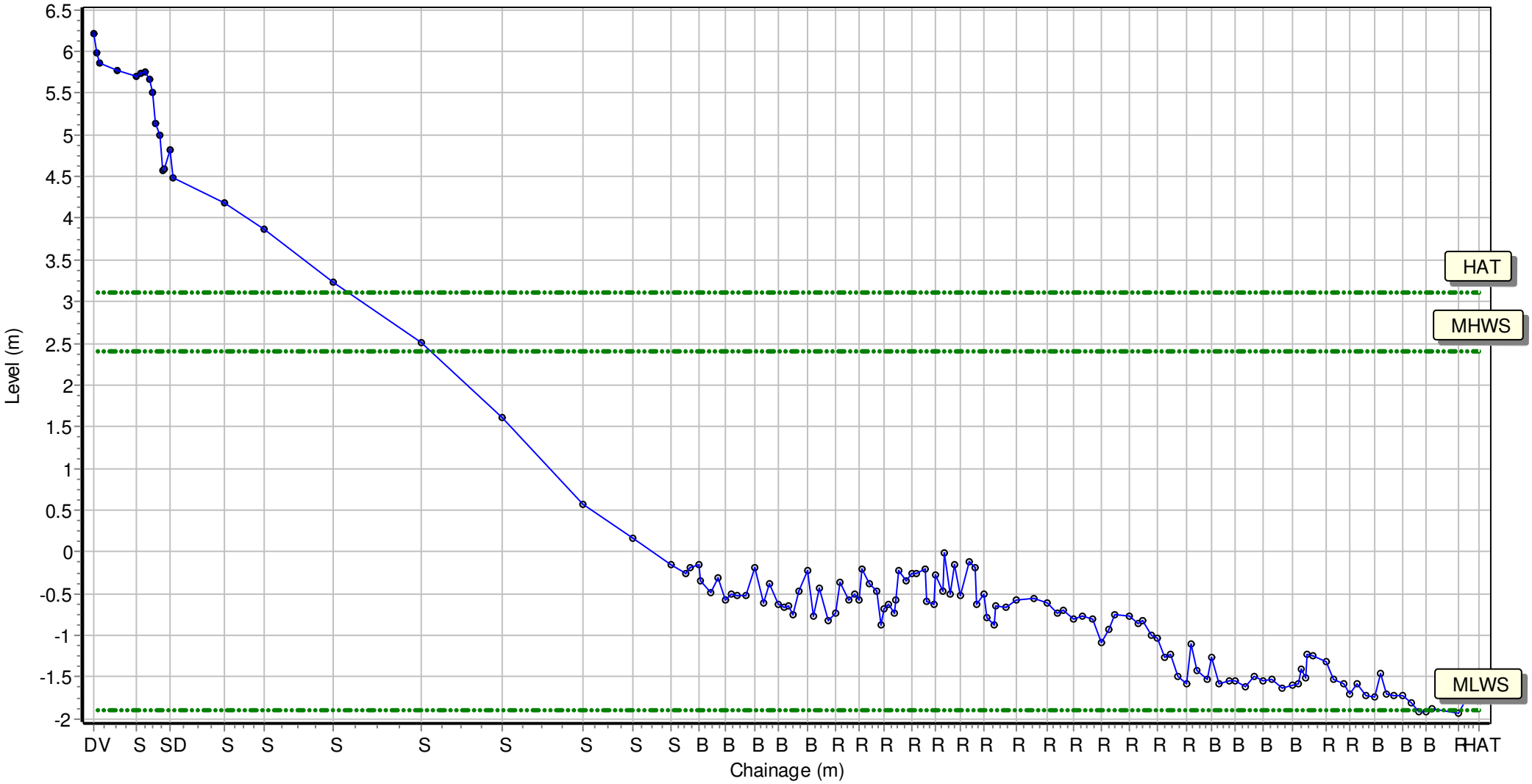
Location: **1aNWB26**

Date: 16/04/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

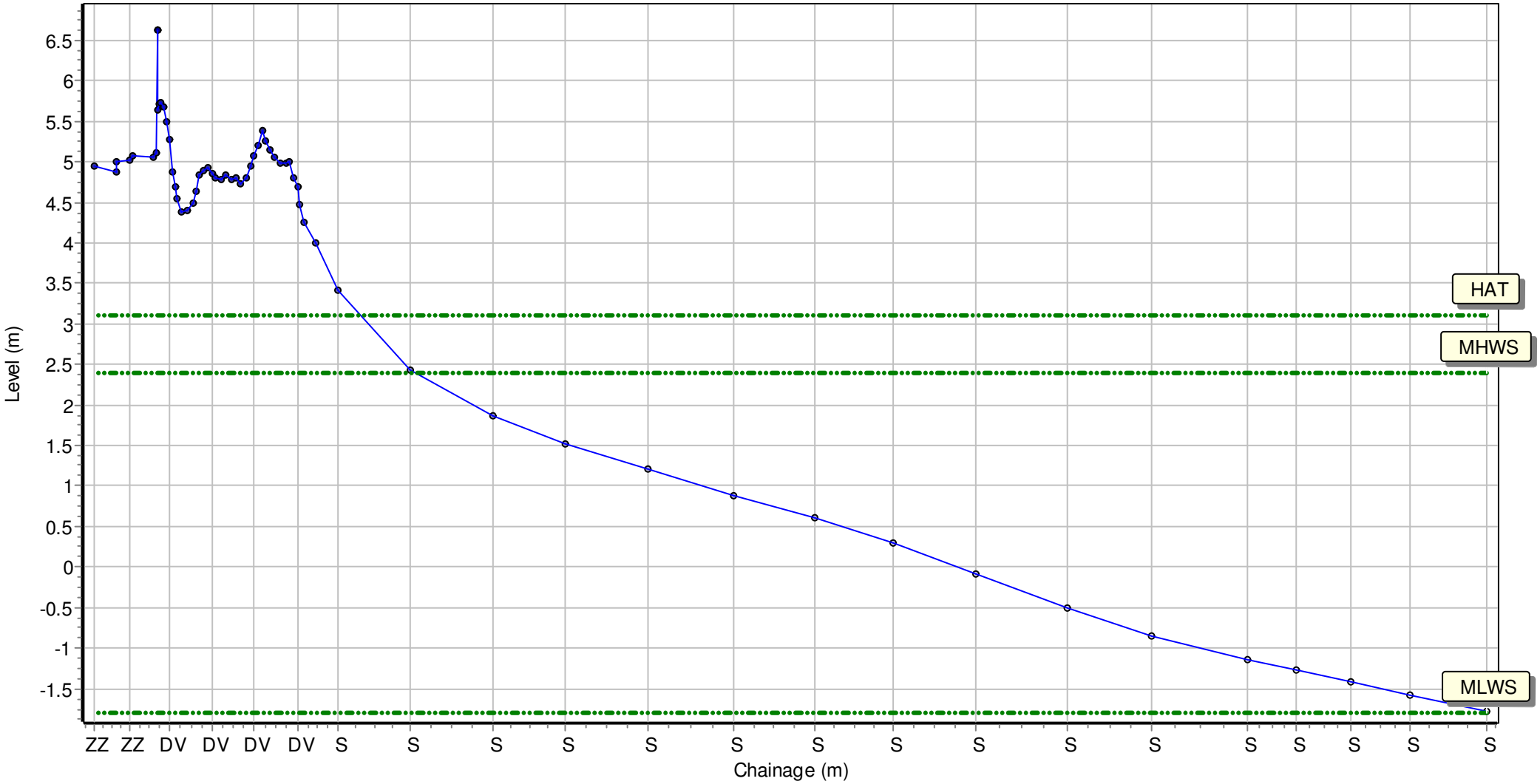
Location: **1aBVBC01**

Date: 05/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

Easting: 432171.107 **Northing:** 580411.515 **Profile Bearing:** 113 ° from North



Beach Profile

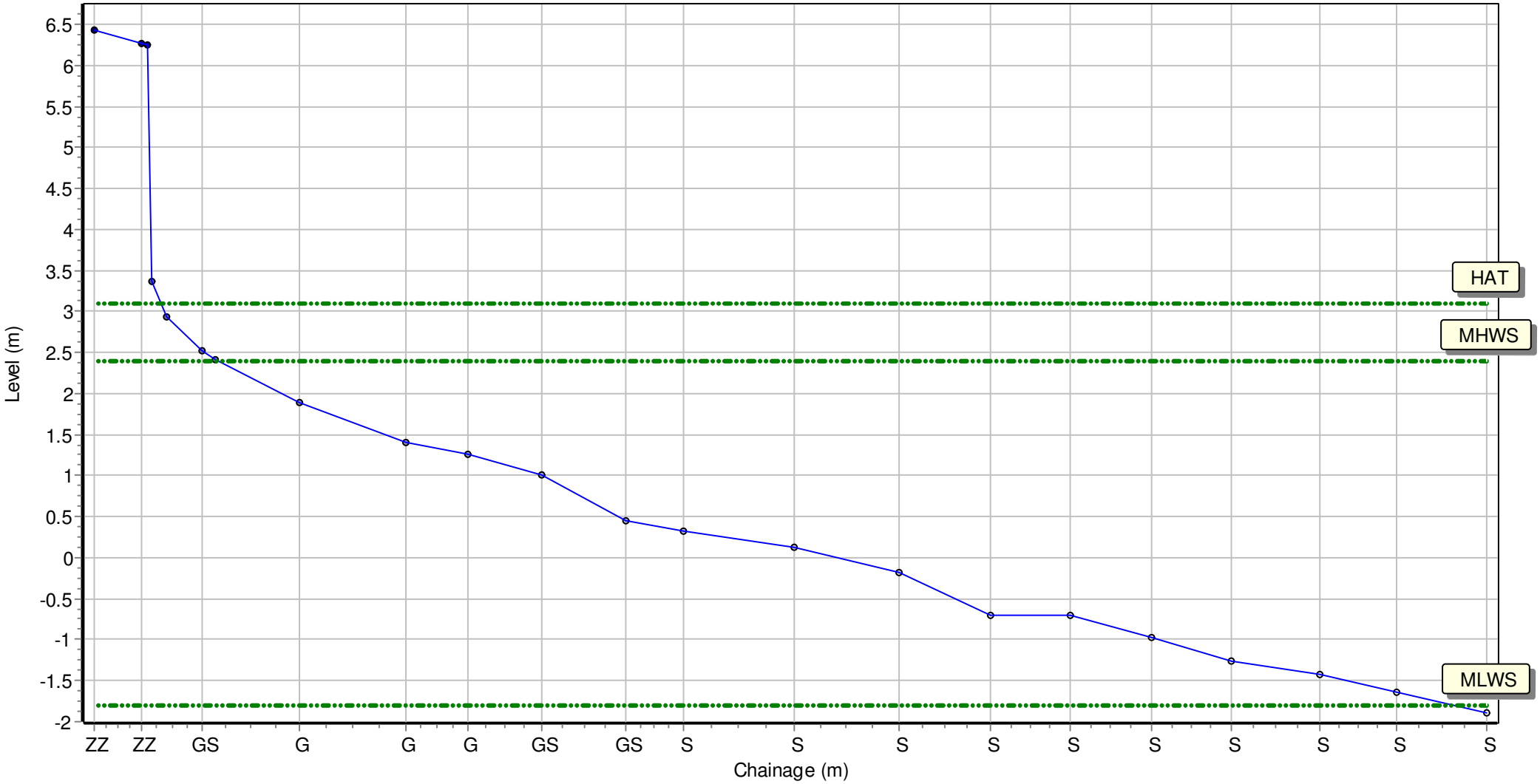
Location: **1aBVBC02**

Date: 05/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

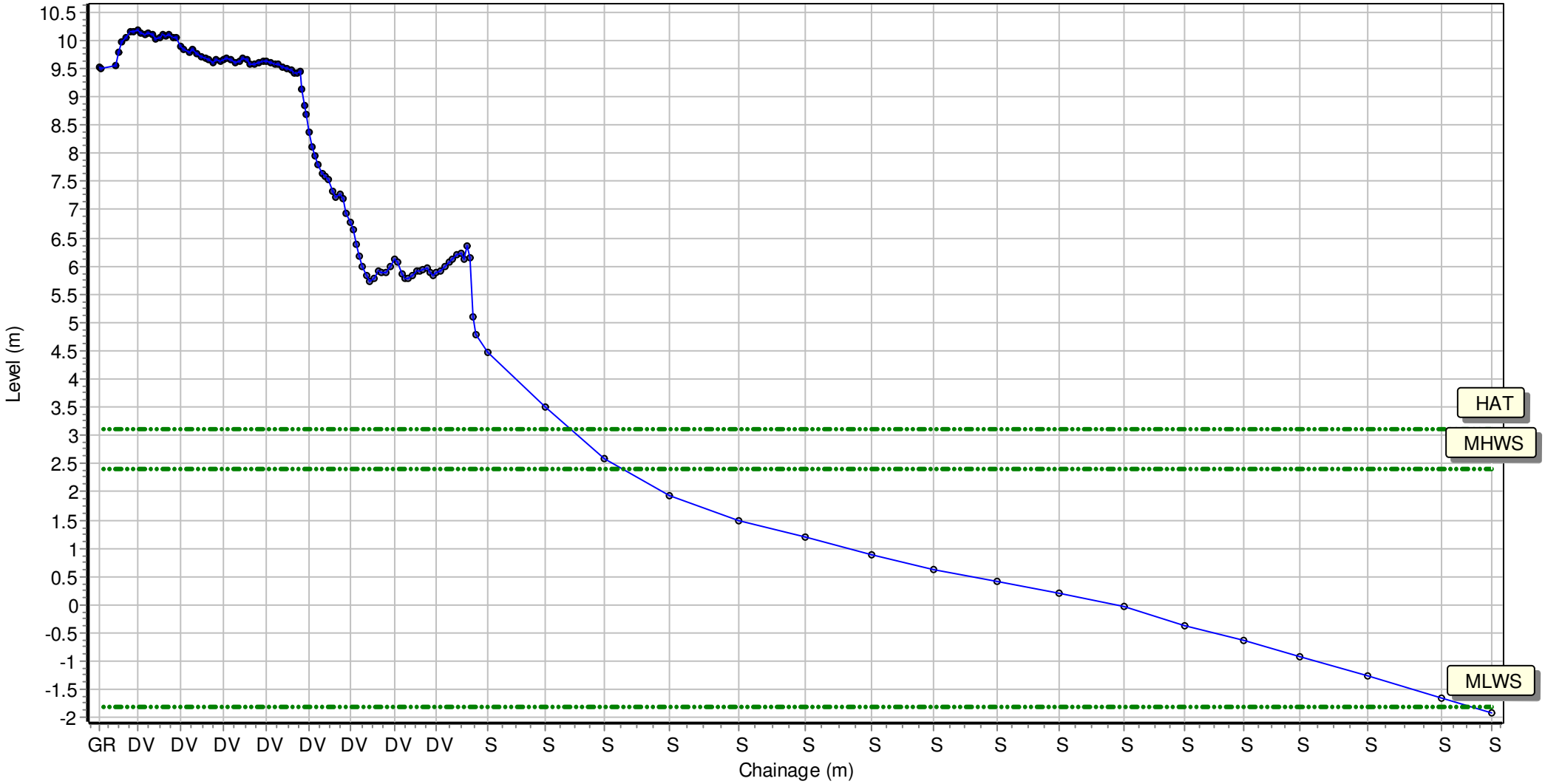
Location: **1aBVBC03**

Date: 05/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

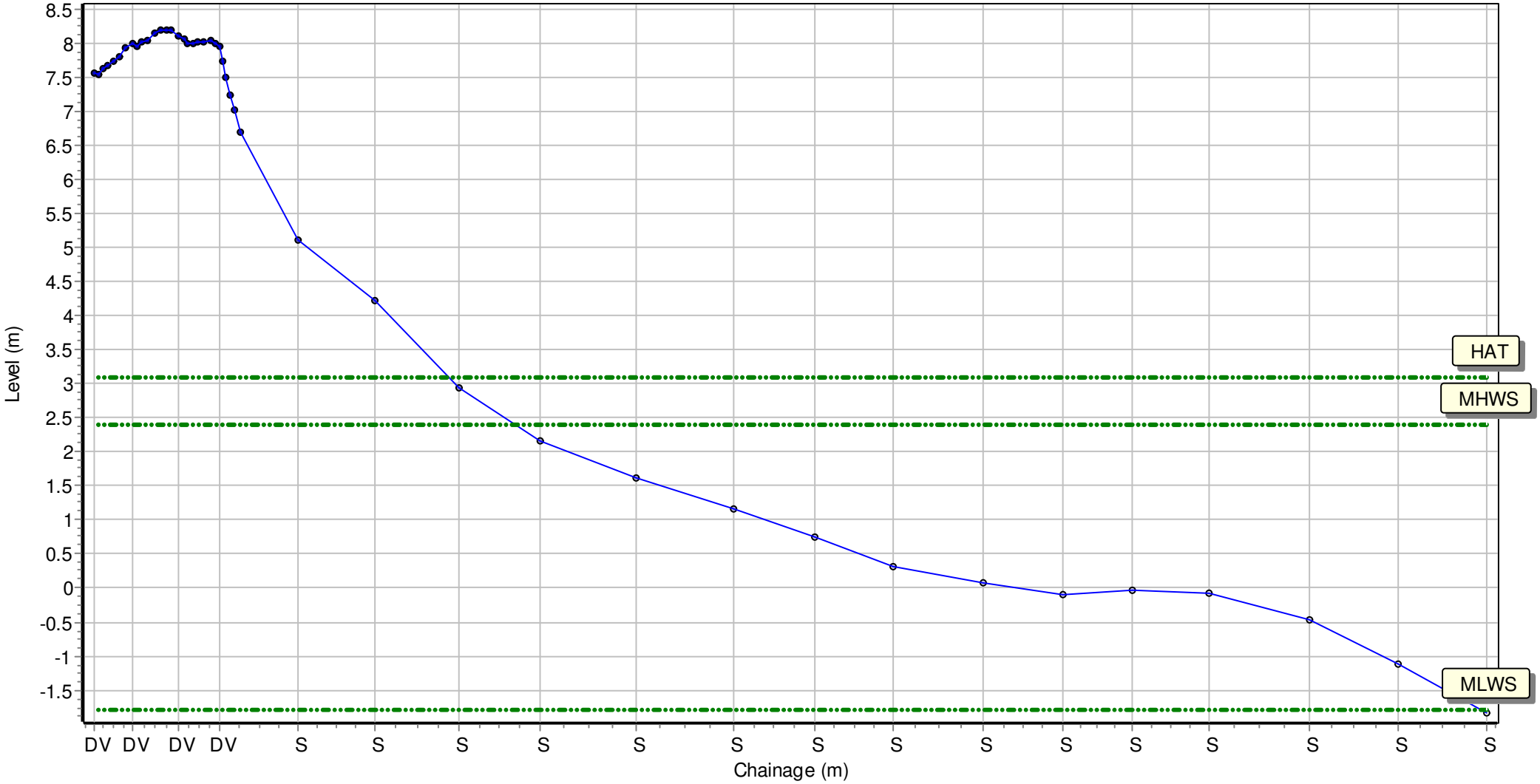
Location: **1aBVBC04**

Date: 05/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

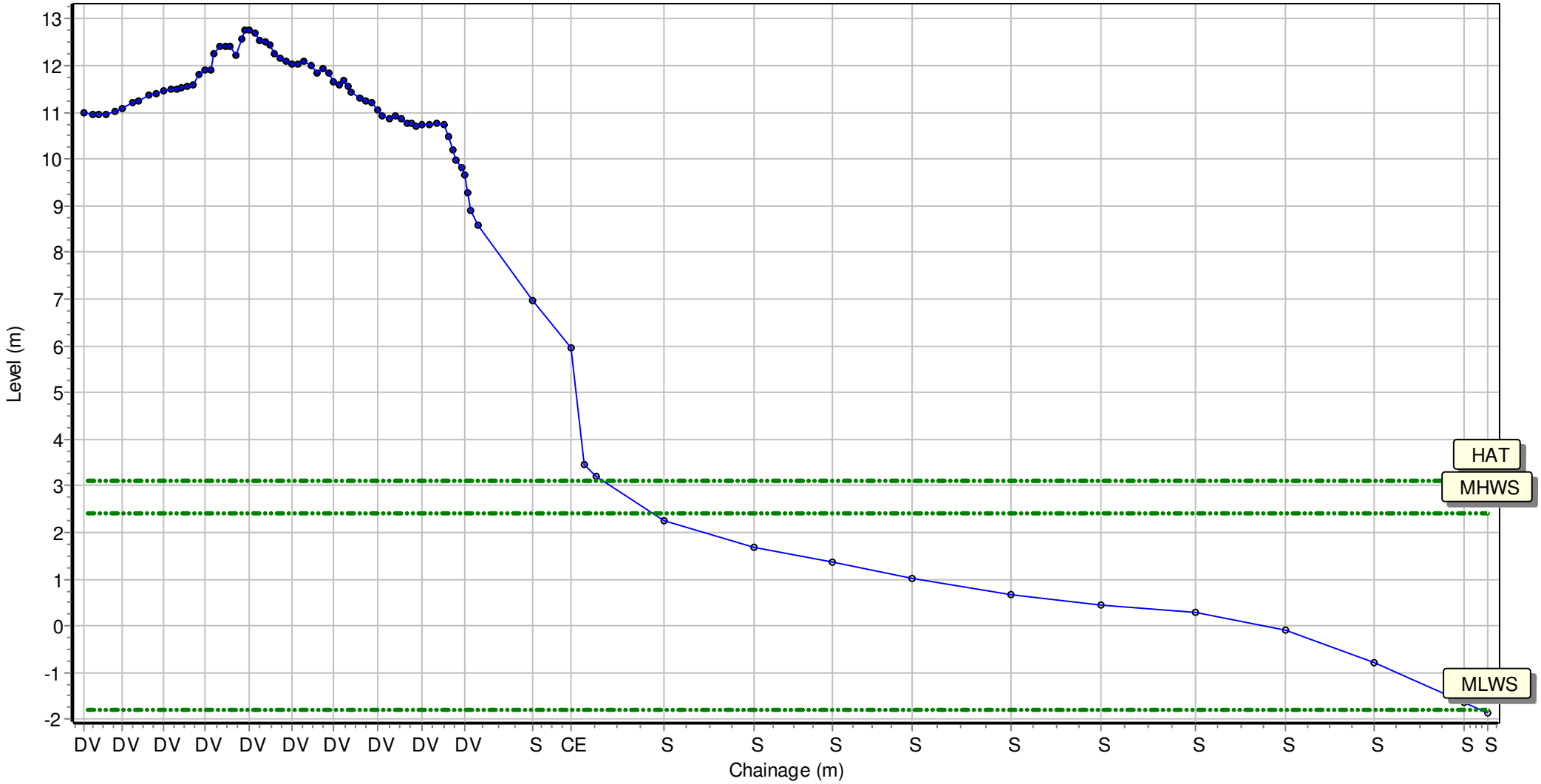
Location: **1aBVBC05**

Date: 05/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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



Beach Profile

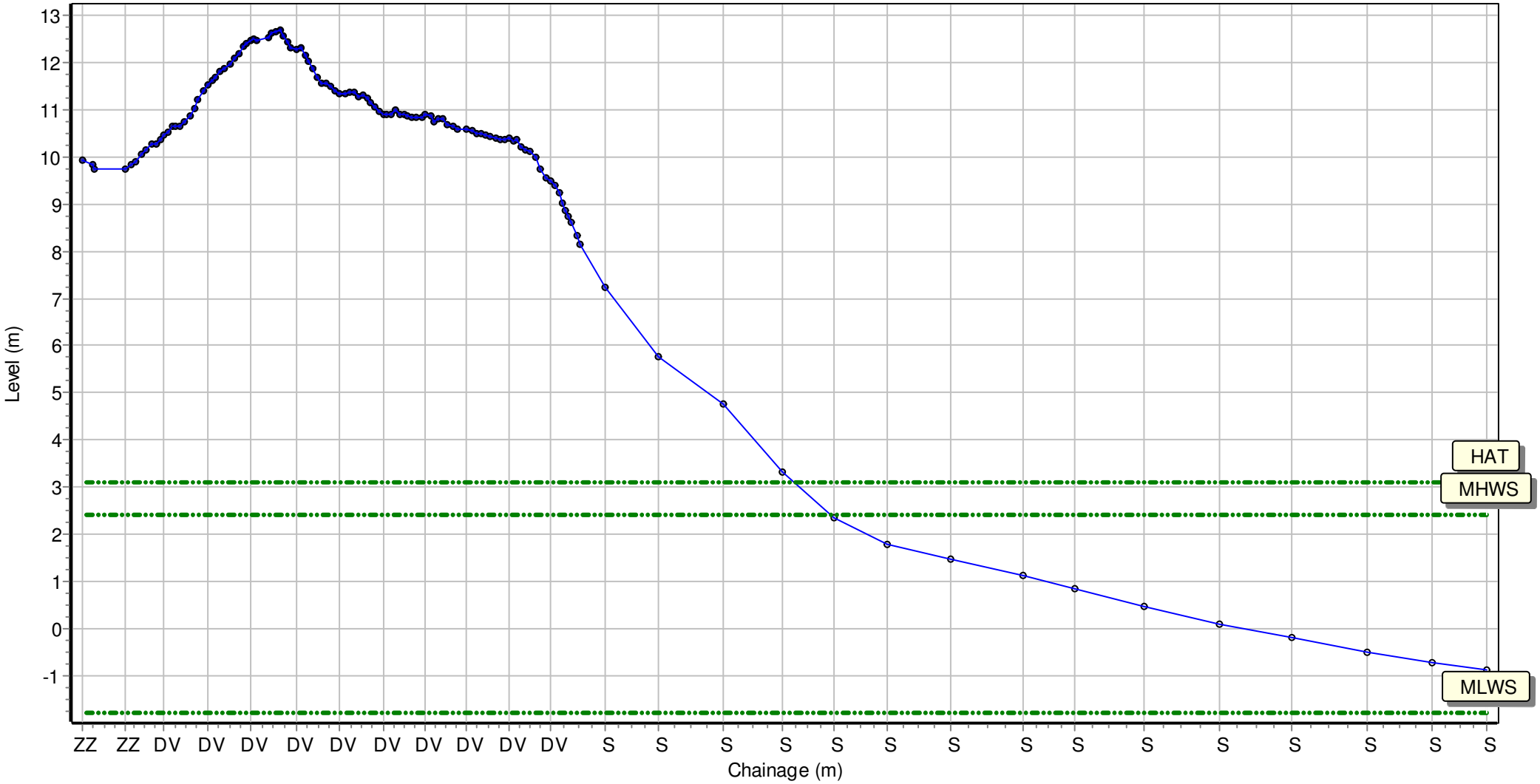
Location: **1aBVBC06**

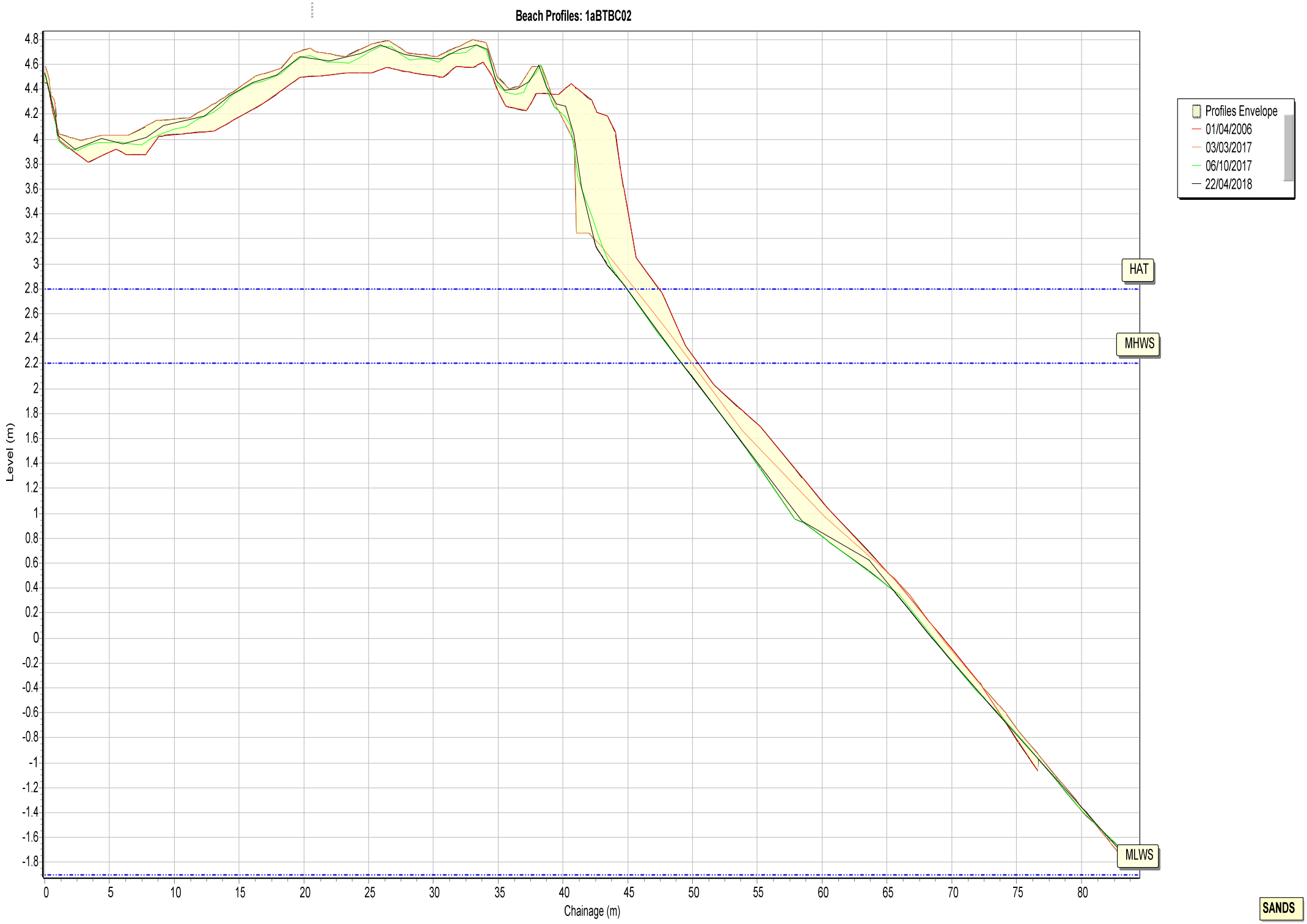
Date: 05/03/2018 **Inspector:** AG **Low Tide:** **Low Tide Time:**

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

Summary: 2018 Partial Measures Topo Survey

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




Beach Profiles: 1aBTBC02
Profiles Envelope
01/04/2006
03/03/2017
06/10/2017
22/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
0
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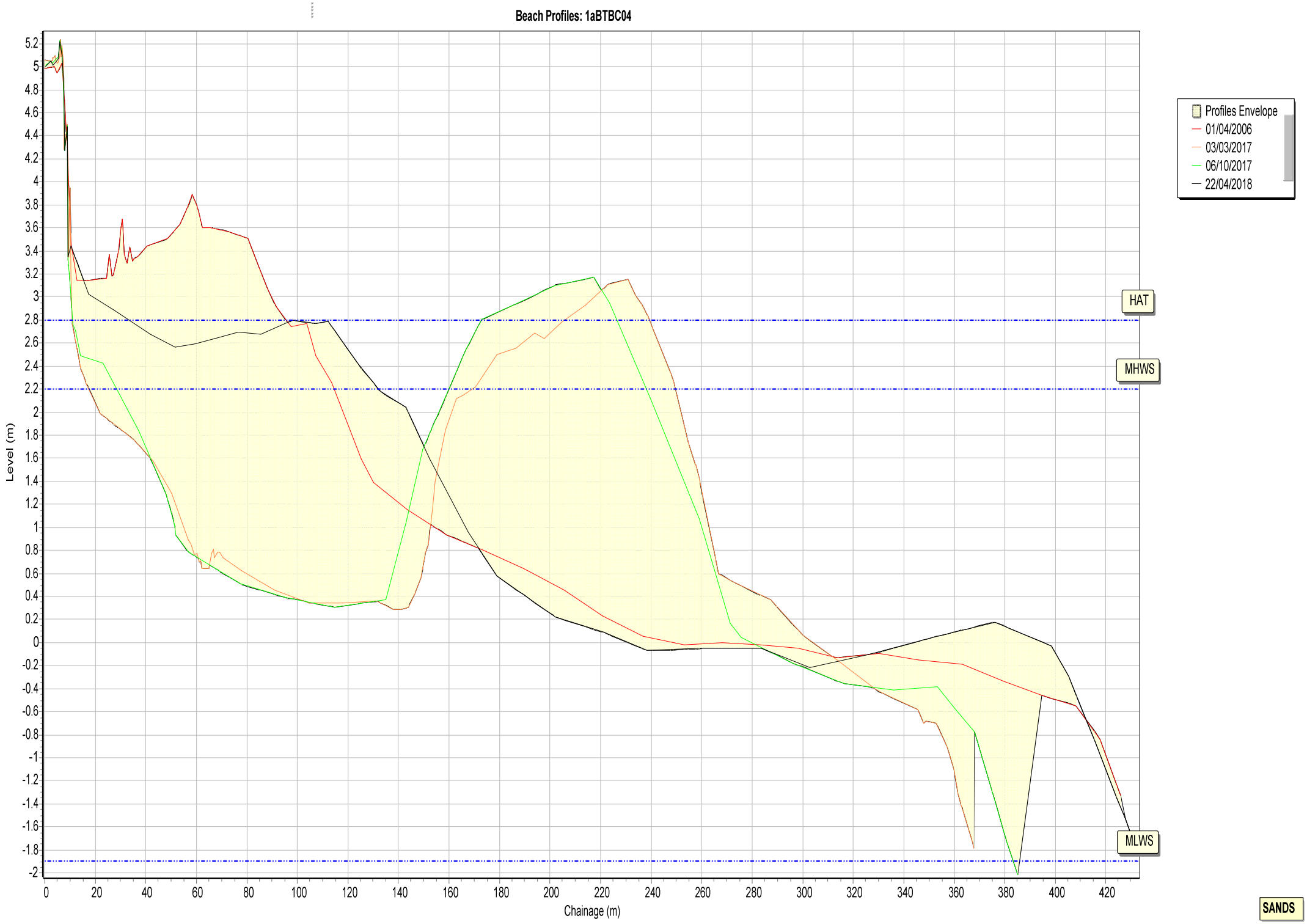
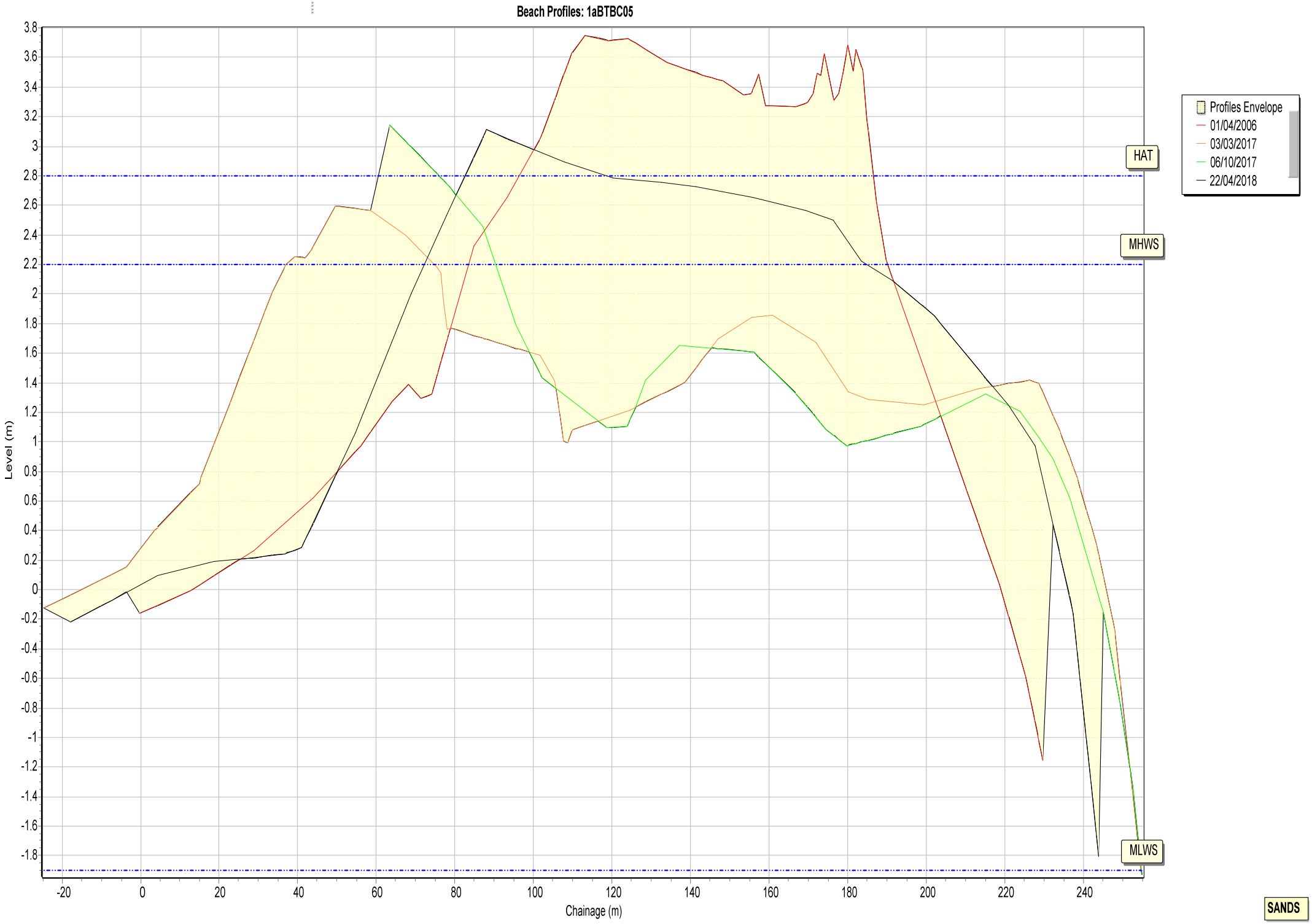
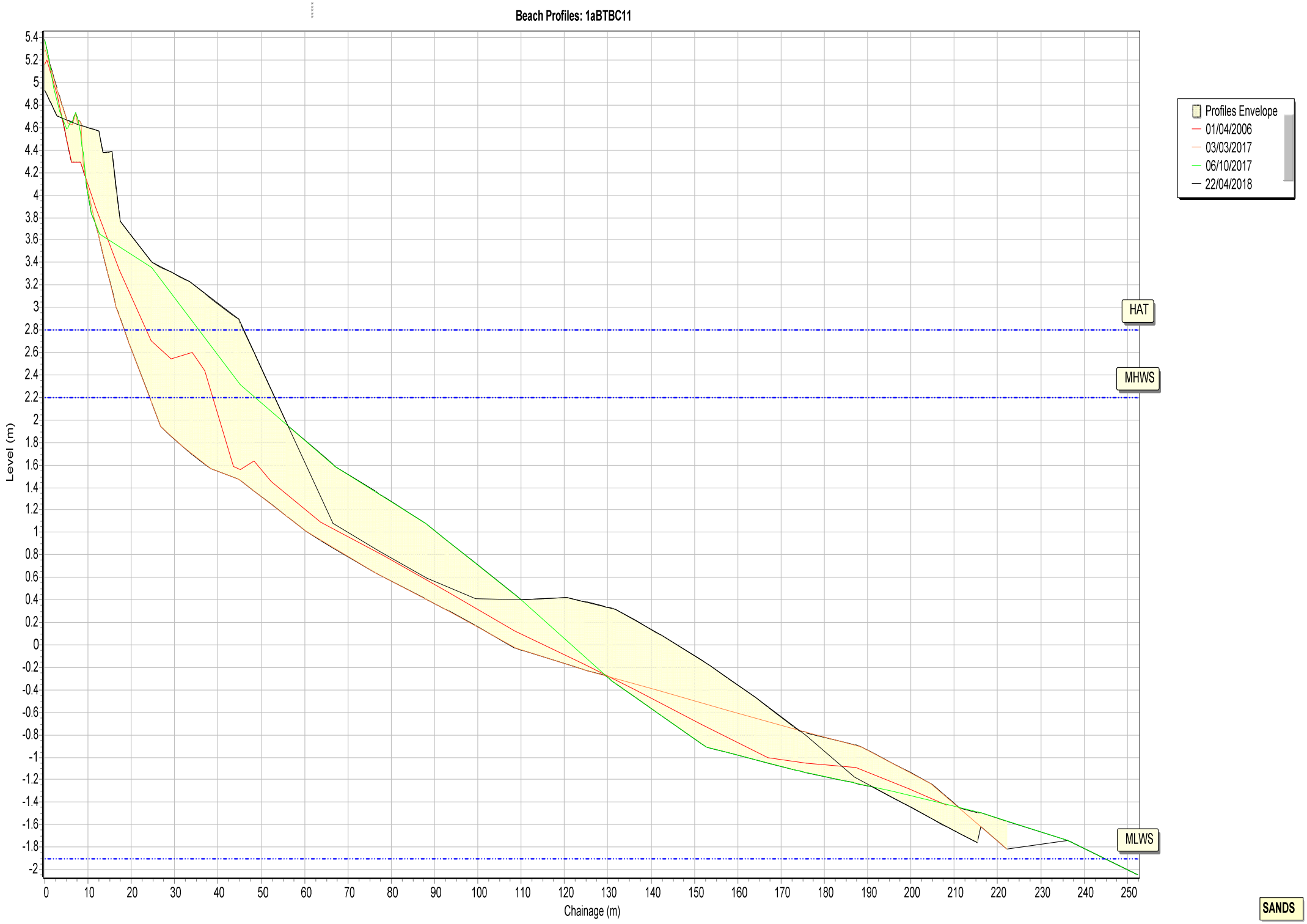
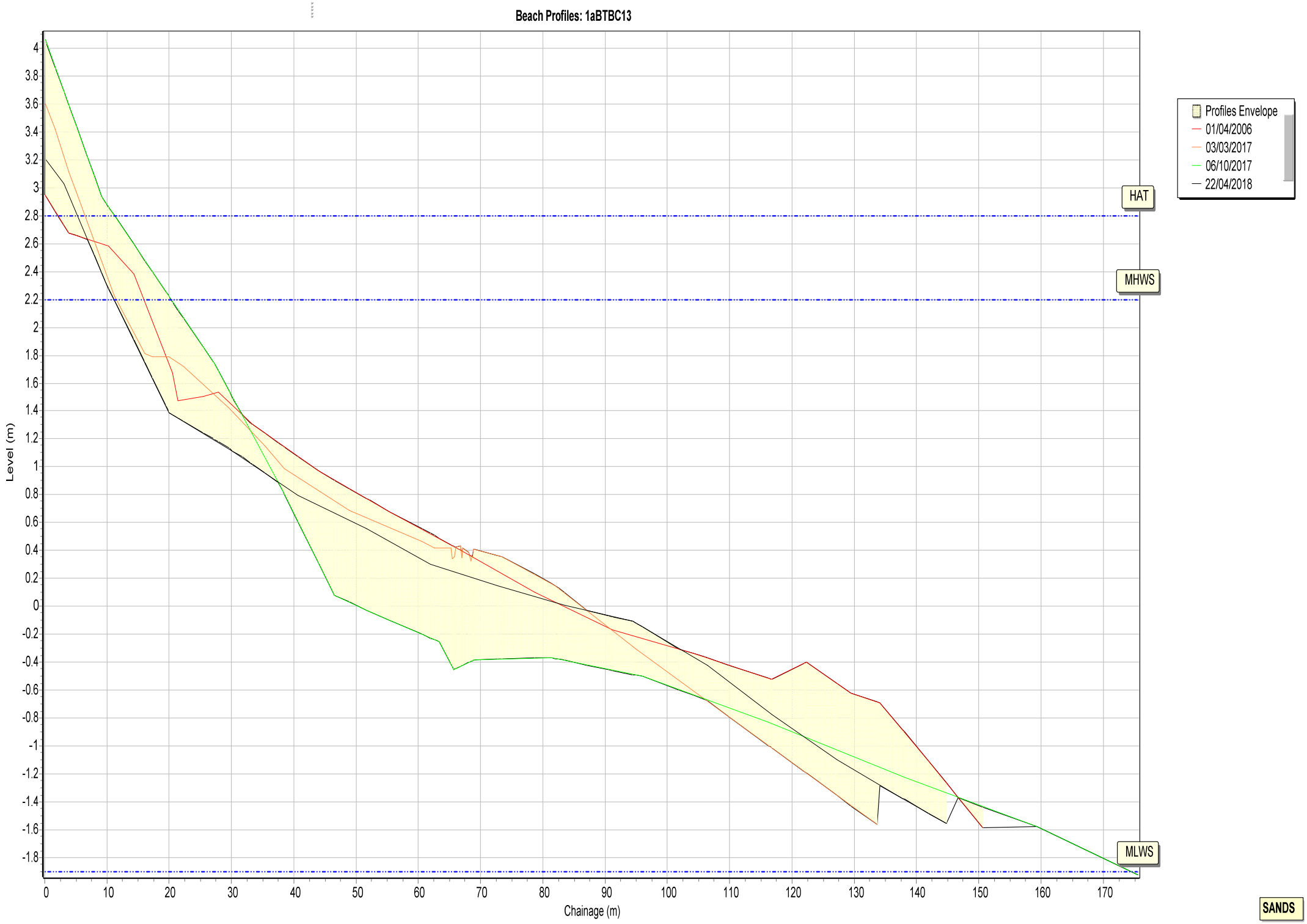
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
SANDS


Beach Profiles: 1aBTBC04
Profiles Envelope
01/04/2006
03/03/2017
06/10/2017
22/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aBTBC05
Profiles Envelope
01/04/2006
03/03/2017
06/10/2017
22/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aBTBC06
HAT
MHWS
MLWS
Profiles Envelope
01/04/2006
03/03/2017
06/10/2017
22/04/2018
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aBTBC11
Profiles Envelope
01/04/2006
03/03/2017
06/10/2017
22/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aBTBC13
Profiles Envelope
01/04/2006
03/03/2017
06/10/2017
22/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
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60
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100
110
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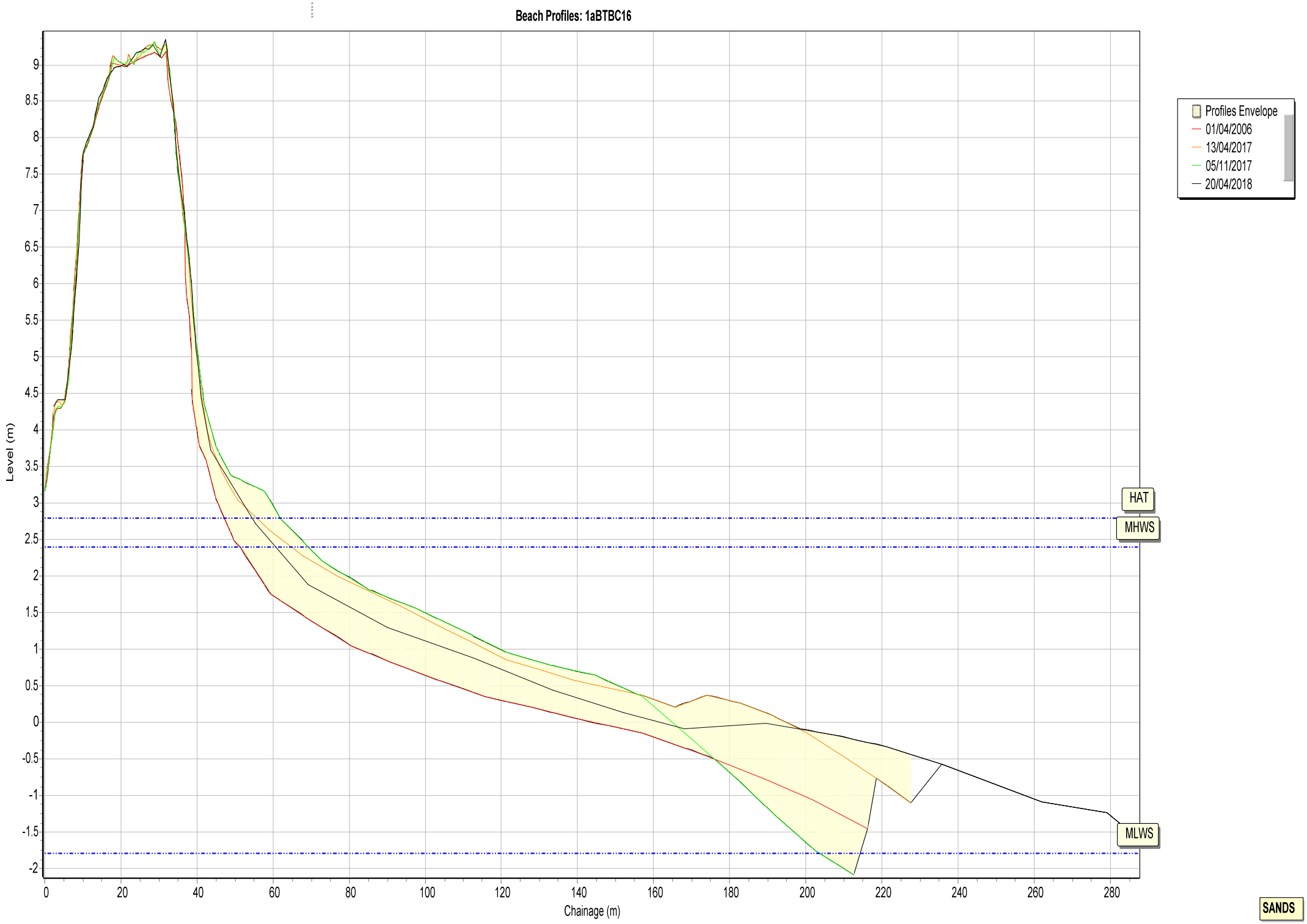
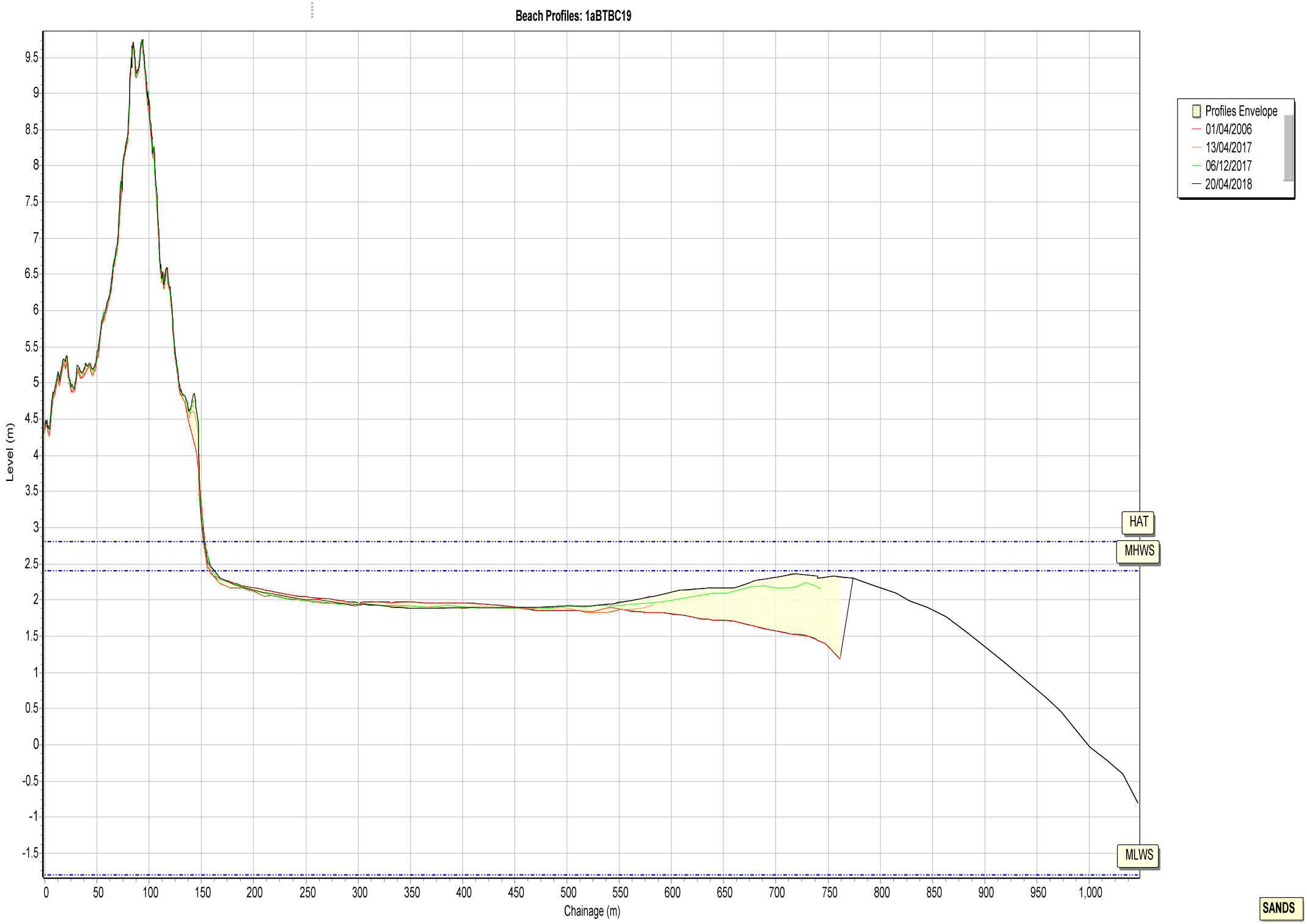
140
150
160
170


Beach Profiles: 1aBTBC16
Profiles Envelope
01/04/2006
13/04/2017
05/11/2017
20/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aBTBC19
Profiles Envelope
01/04/2006
13/04/2017
06/12/2017
20/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (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
0
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350
400
450
500
550
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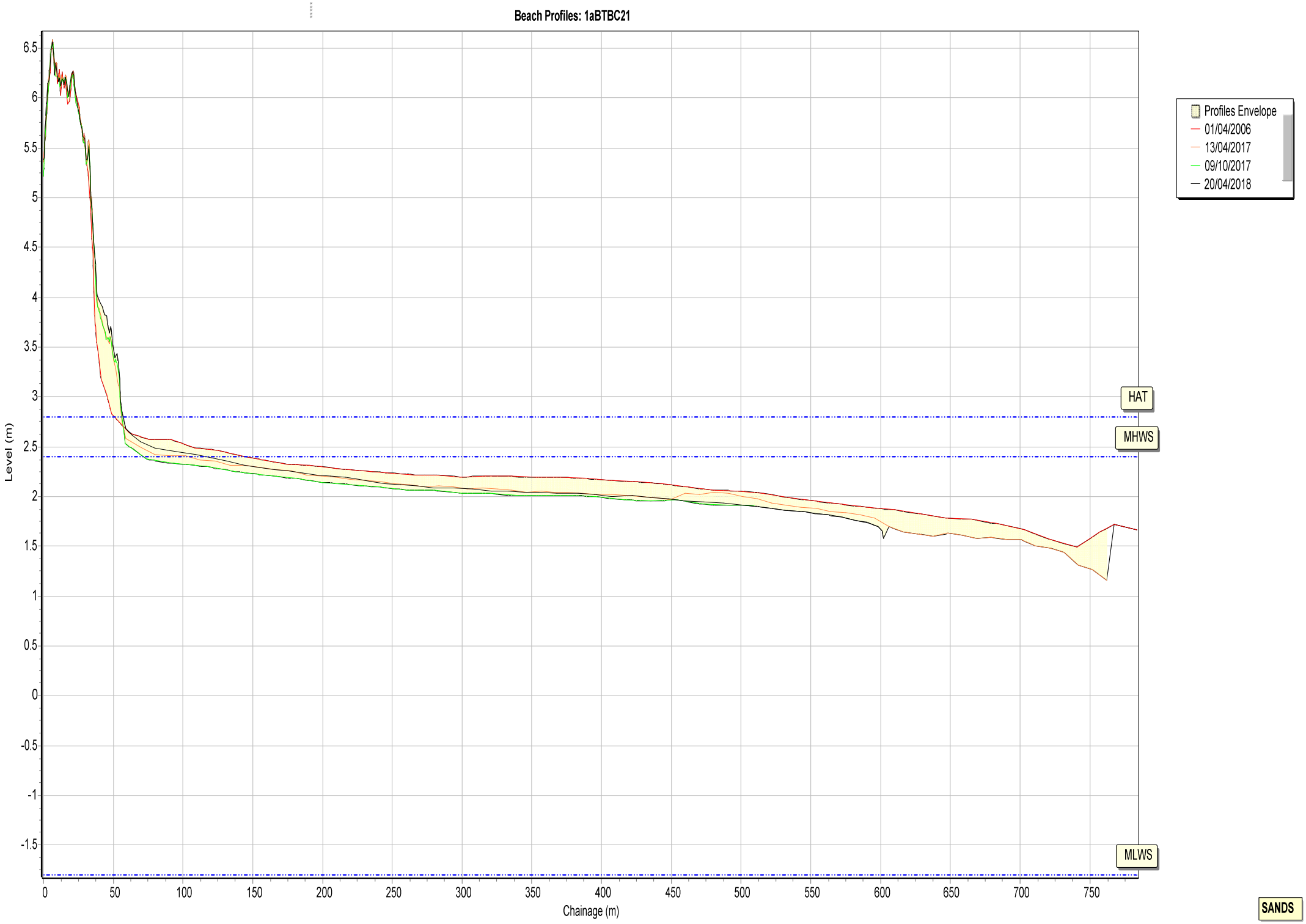
650
700
750
800
850
900
950
1,000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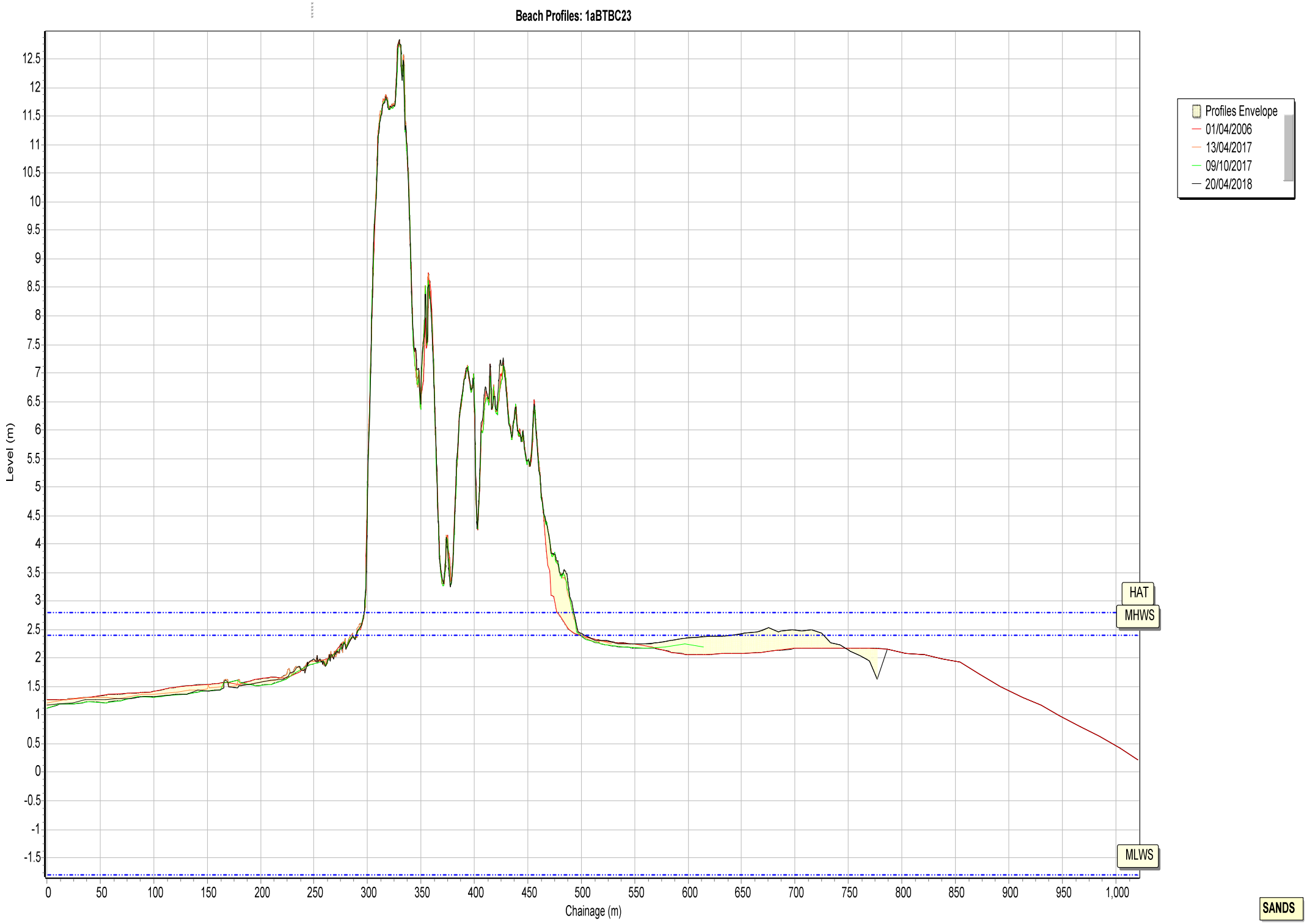
Profiles Envelope
01/04/2006
13/04/2017
09/10/2017
20/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750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Profiles Envelope
01/04/2006
13/04/2017
09/10/2017
20/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
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
0
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350
400
450
500
550
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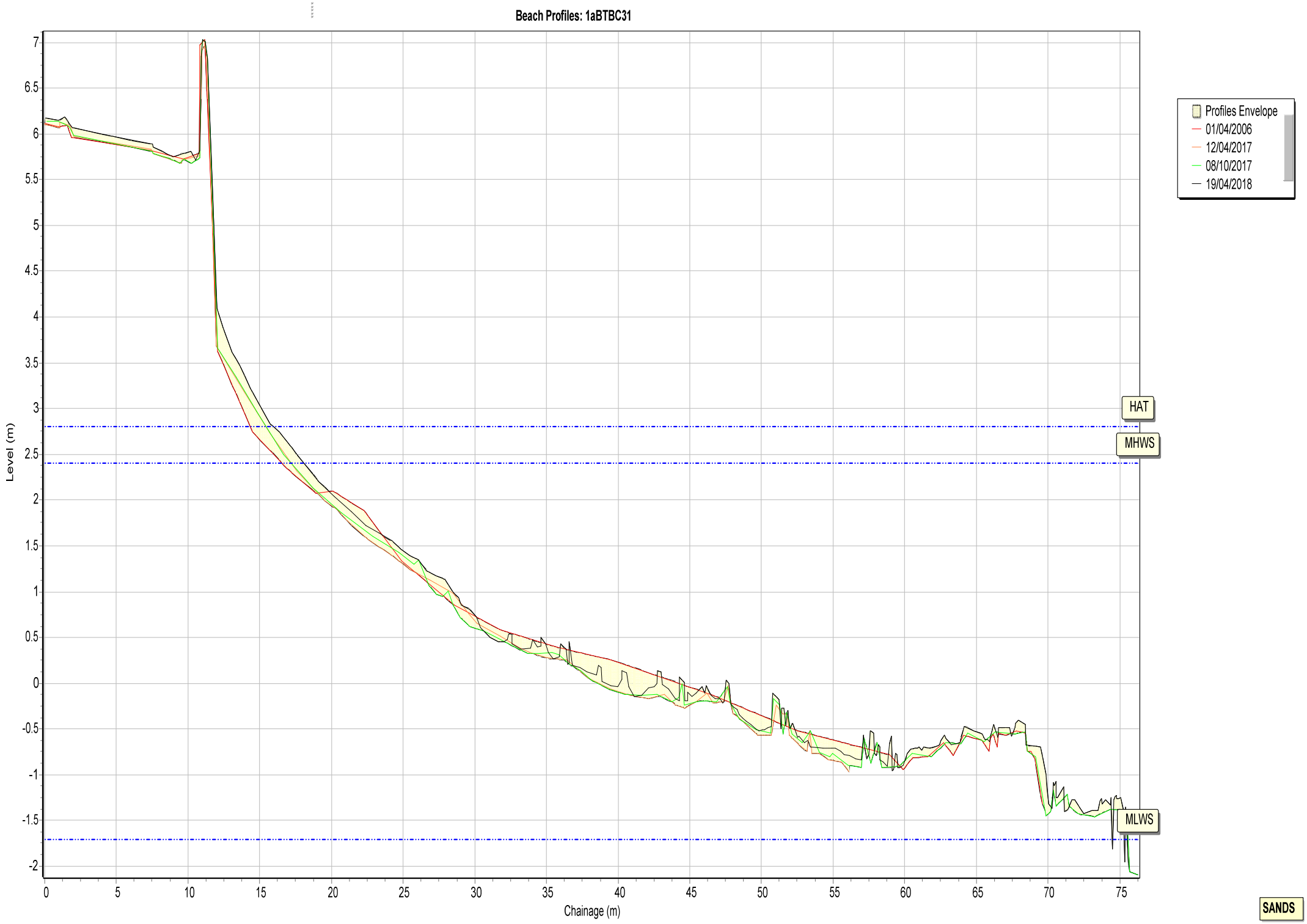
650
700
750
800
850
900
950
1,000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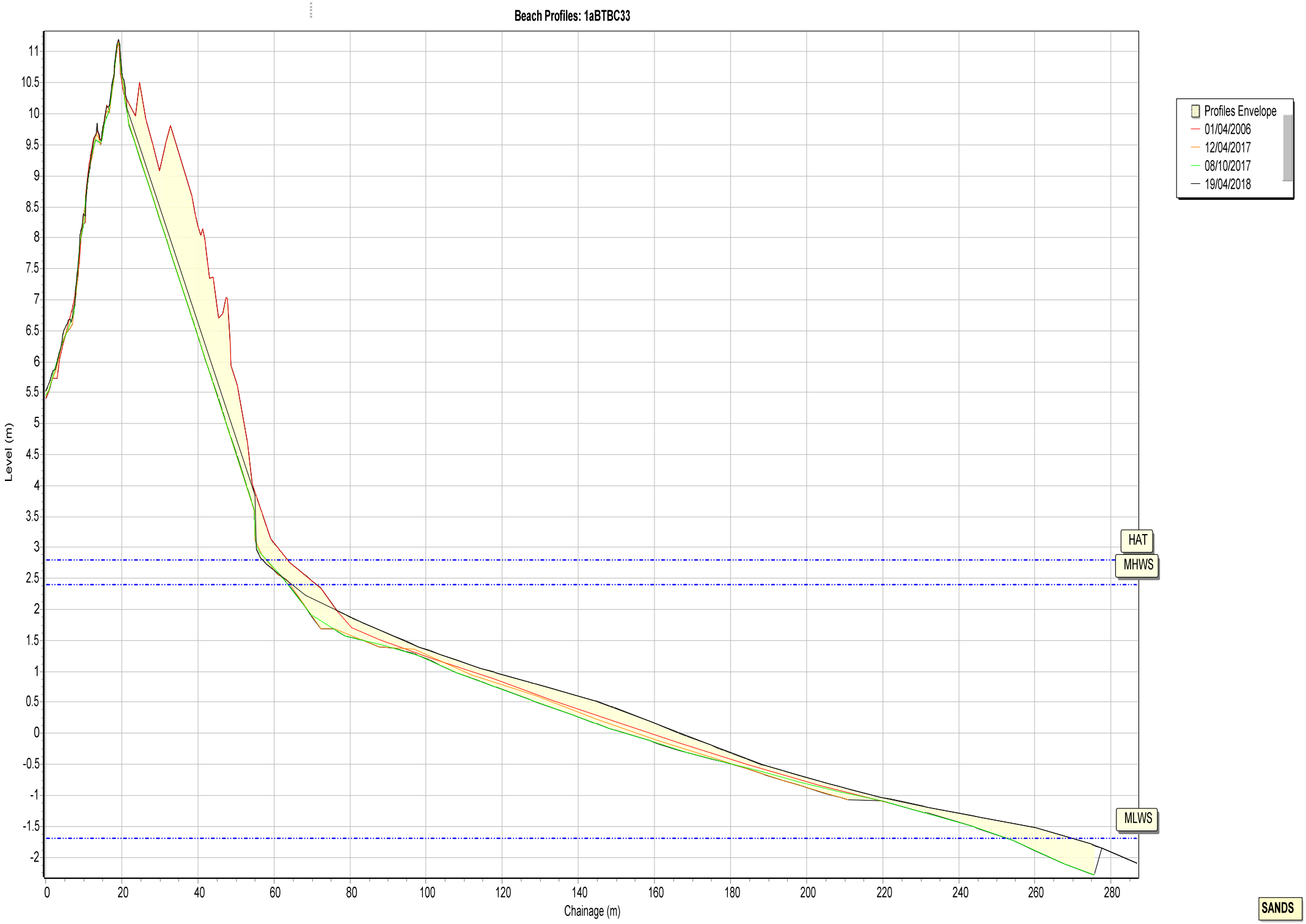
Profiles Envelope
01/04/2006
12/04/2017
08/10/2017
19/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75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Profiles Envelope
01/04/2006
12/04/2017
08/10/2017
19/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
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
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140
160
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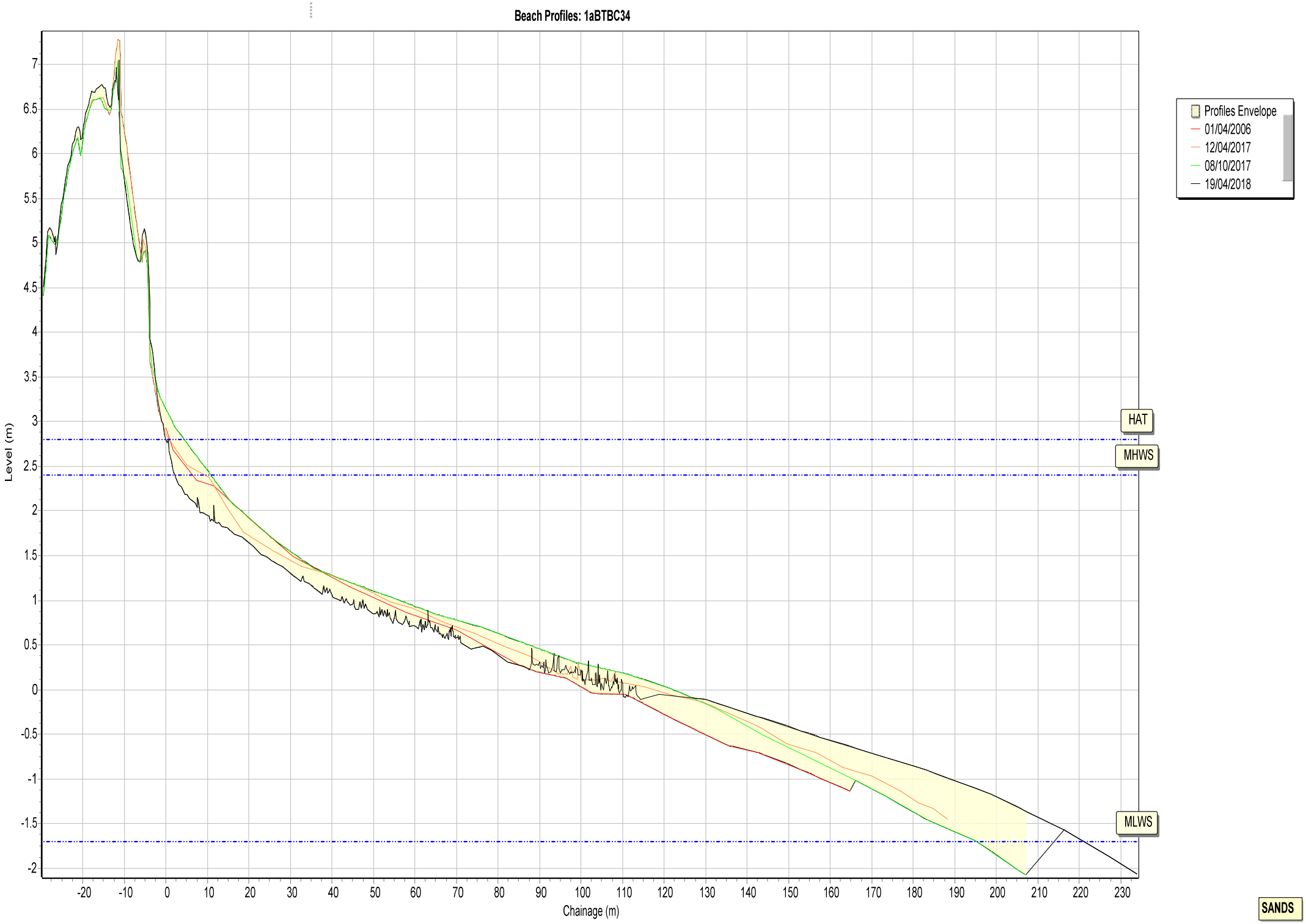
200
220
240
260
280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Profiles Envelope
01/04/2006
12/04/2017
08/10/2017
19/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-20
-10
0
10
20
30
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50
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90
100
110
120
130
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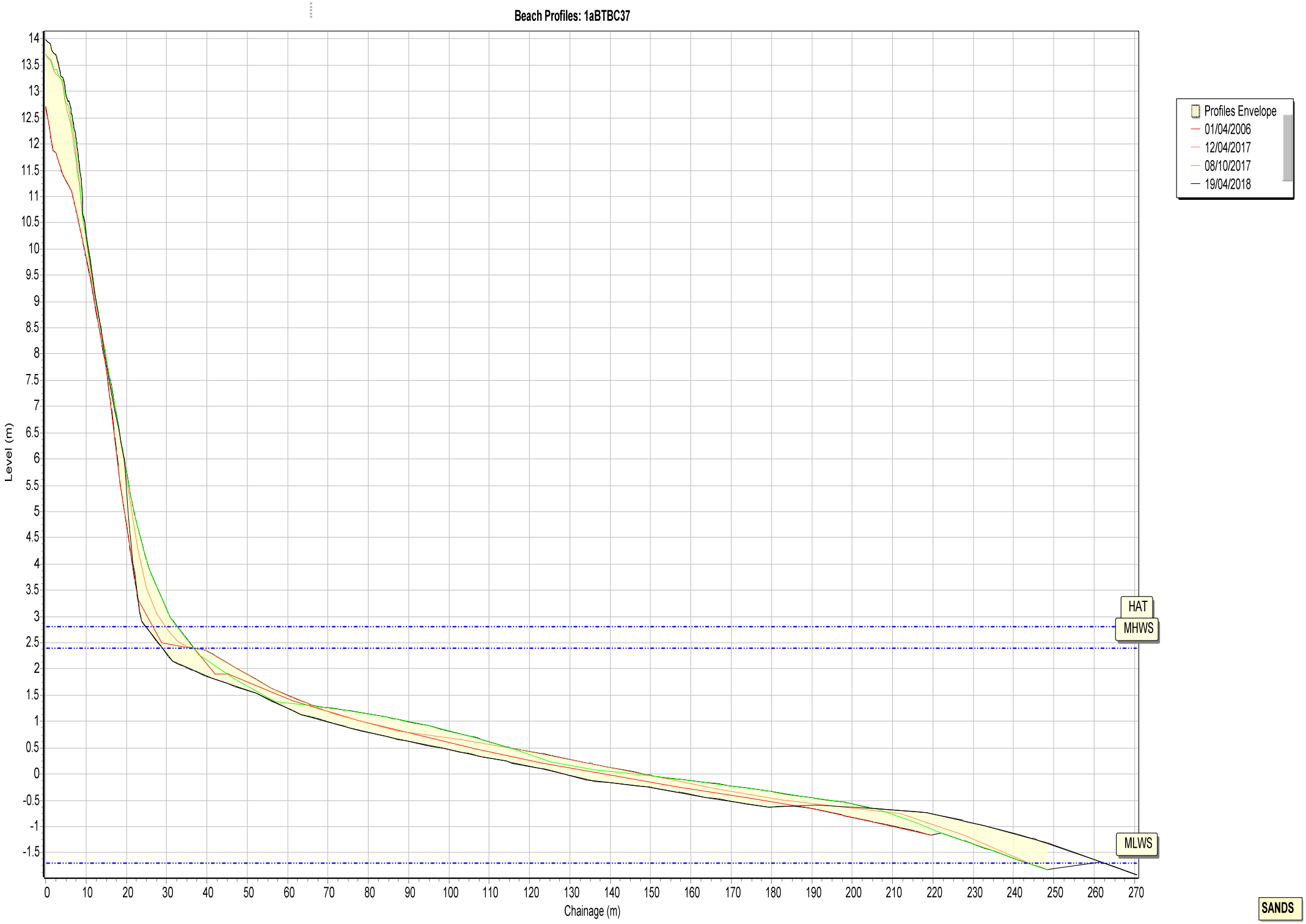
160
170
180
190
200
210
220
230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12/04/2017
08/10/2017
19/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
14
13.5
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
10
20
30
40
50
60
70
80
90
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150
160
170
180
190
200
210
220
230
240
250
260
270


Beach Profiles: 1aADC01
Profiles Envelope
01/04/2006
12/04/2017
08/10/2017
19/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
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
0
20
40
60
80
100
120
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260
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320
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400
420
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520
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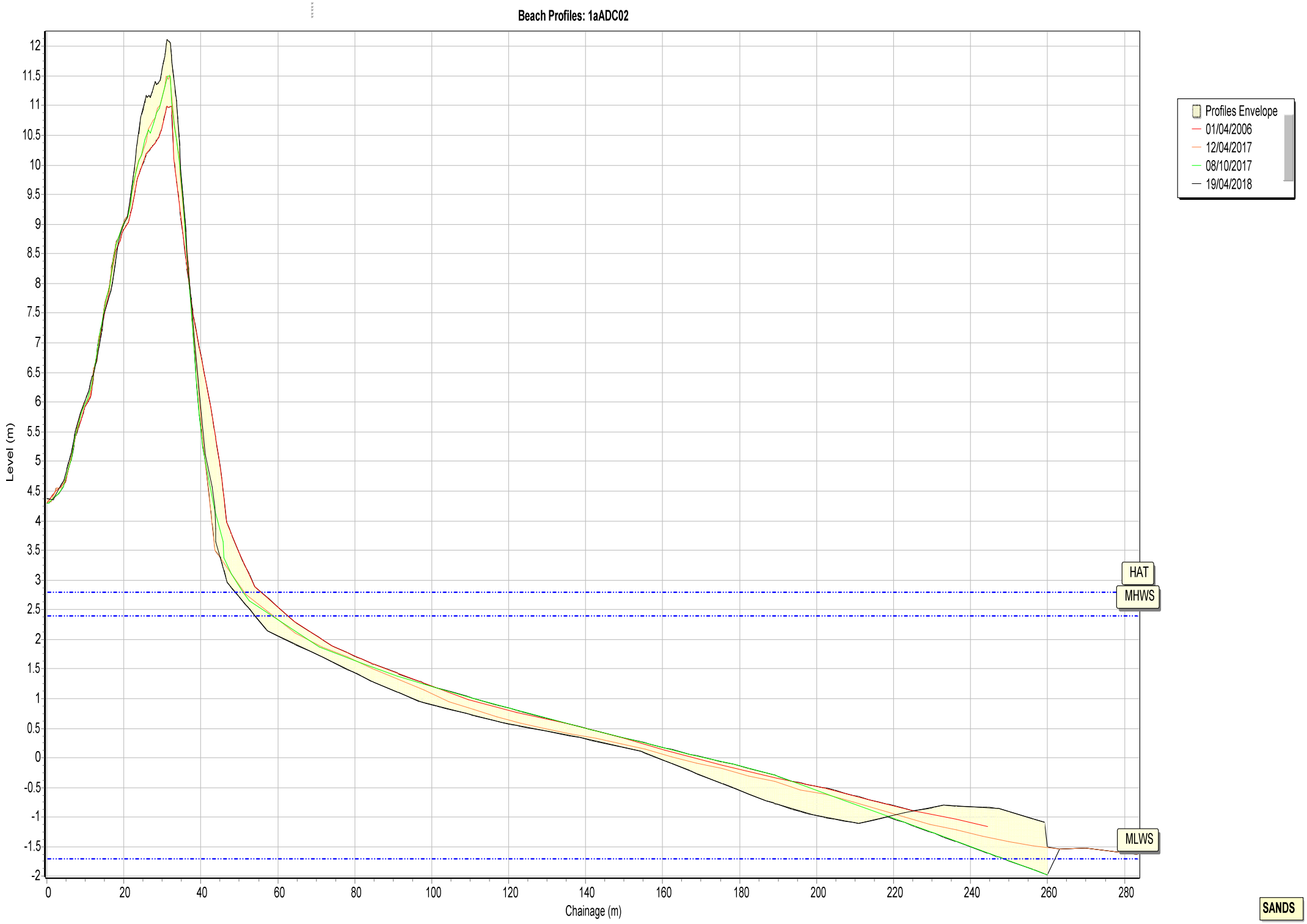
Beach Profiles: 1aADC02
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01/04/2006
12/04/2017
08/10/2017
19/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
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0.5
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-1
-1.5
-2
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60
80
100
120
140
160
180
200
220
240
260
280


Beach Profiles: 1aADC04A
Profiles Envelope
01/10/2007
13/03/2017
11/09/2017
21/03/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
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0.8
0.6
0.4
0.2
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-0.4
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-1.2
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10
15
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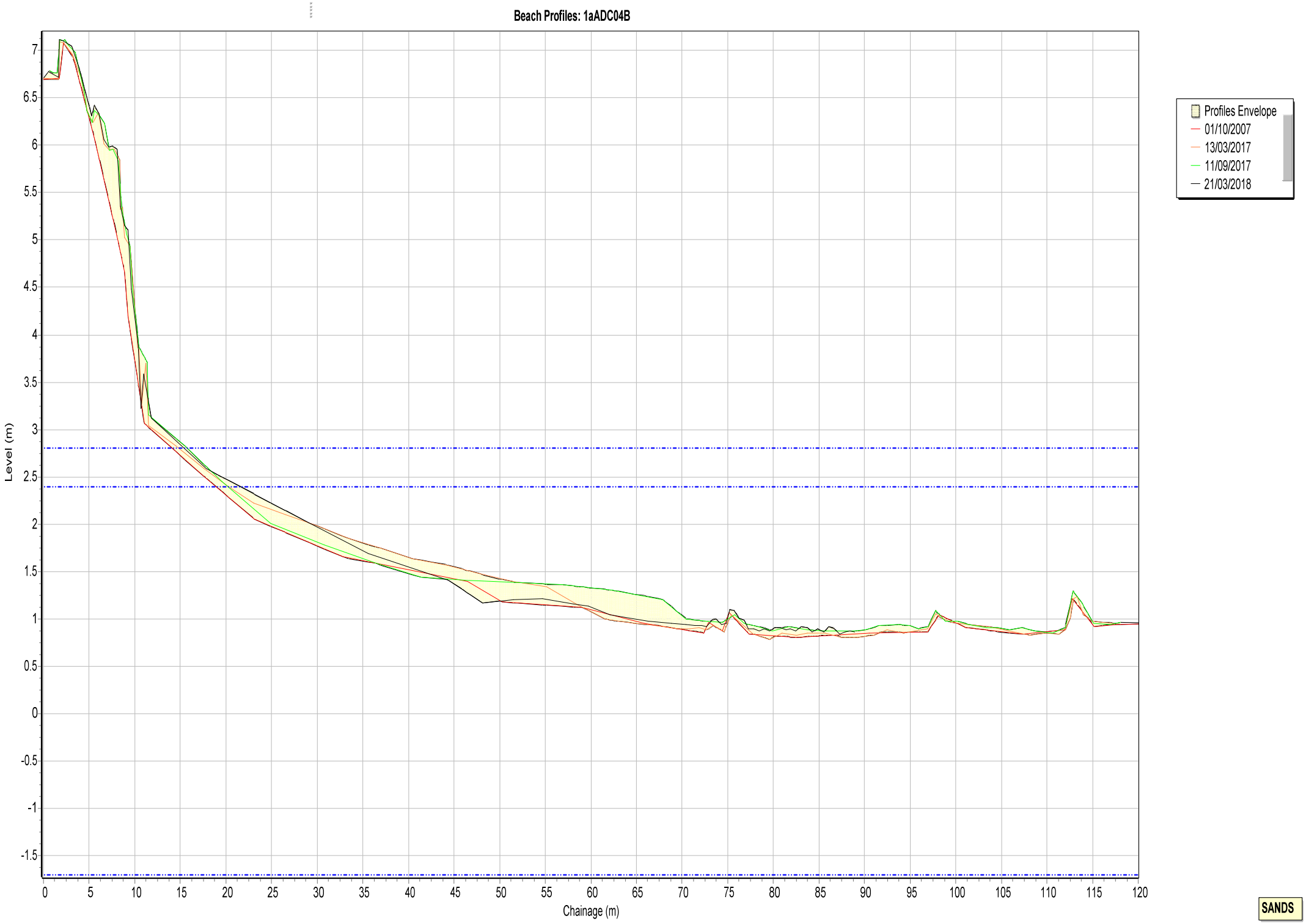
120
125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Profiles Envelope
01/10/2007
13/03/2017
11/09/2017
21/03/2018
Level (m)
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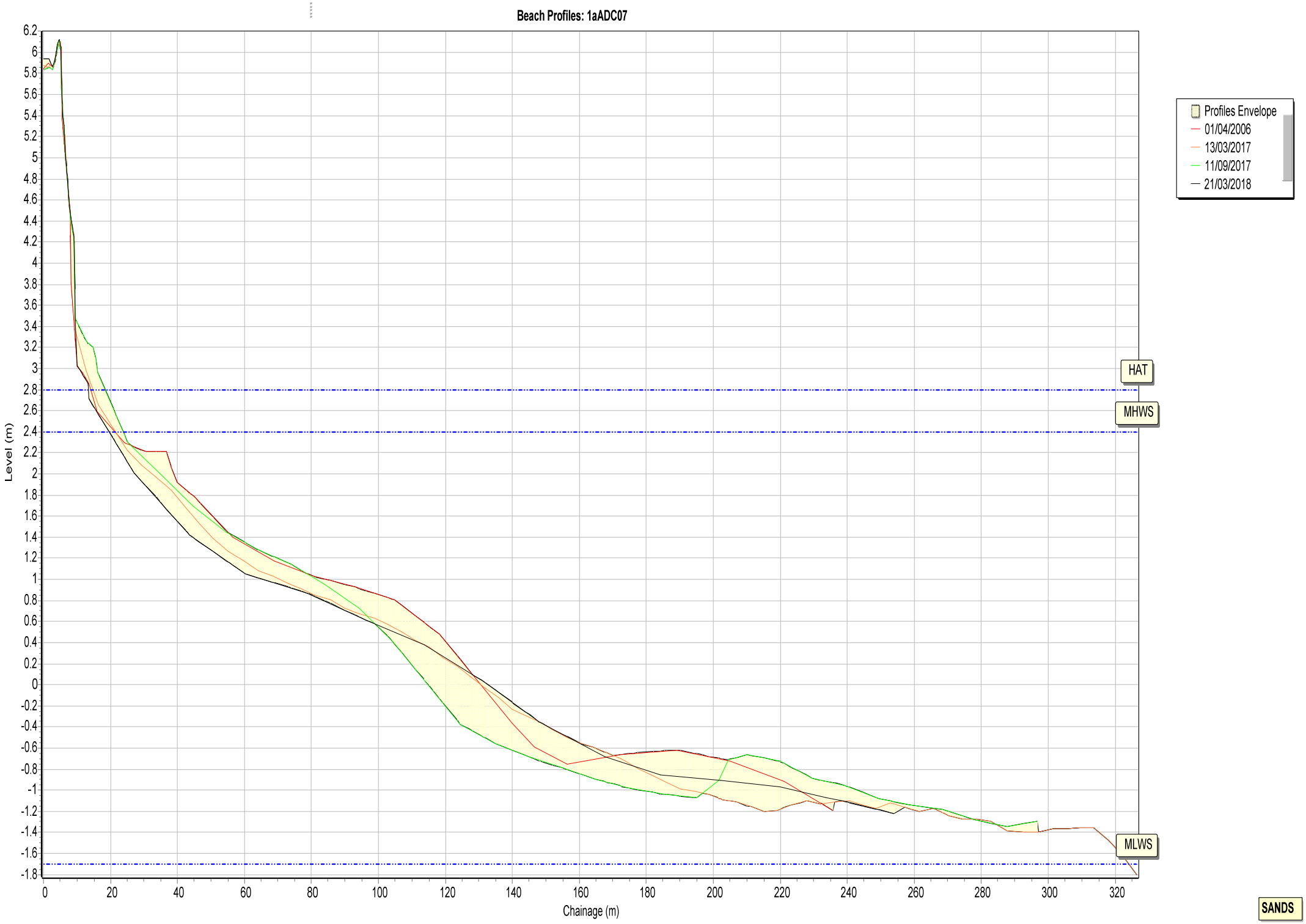
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
Chainage (m)
SANDS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13/03/2017
11/09/2017
21/03/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
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1.6
1.4
1.2
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0.6
0.4
0.2
0
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-0.4
-0.6
-0.8
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-1.4
-1.6
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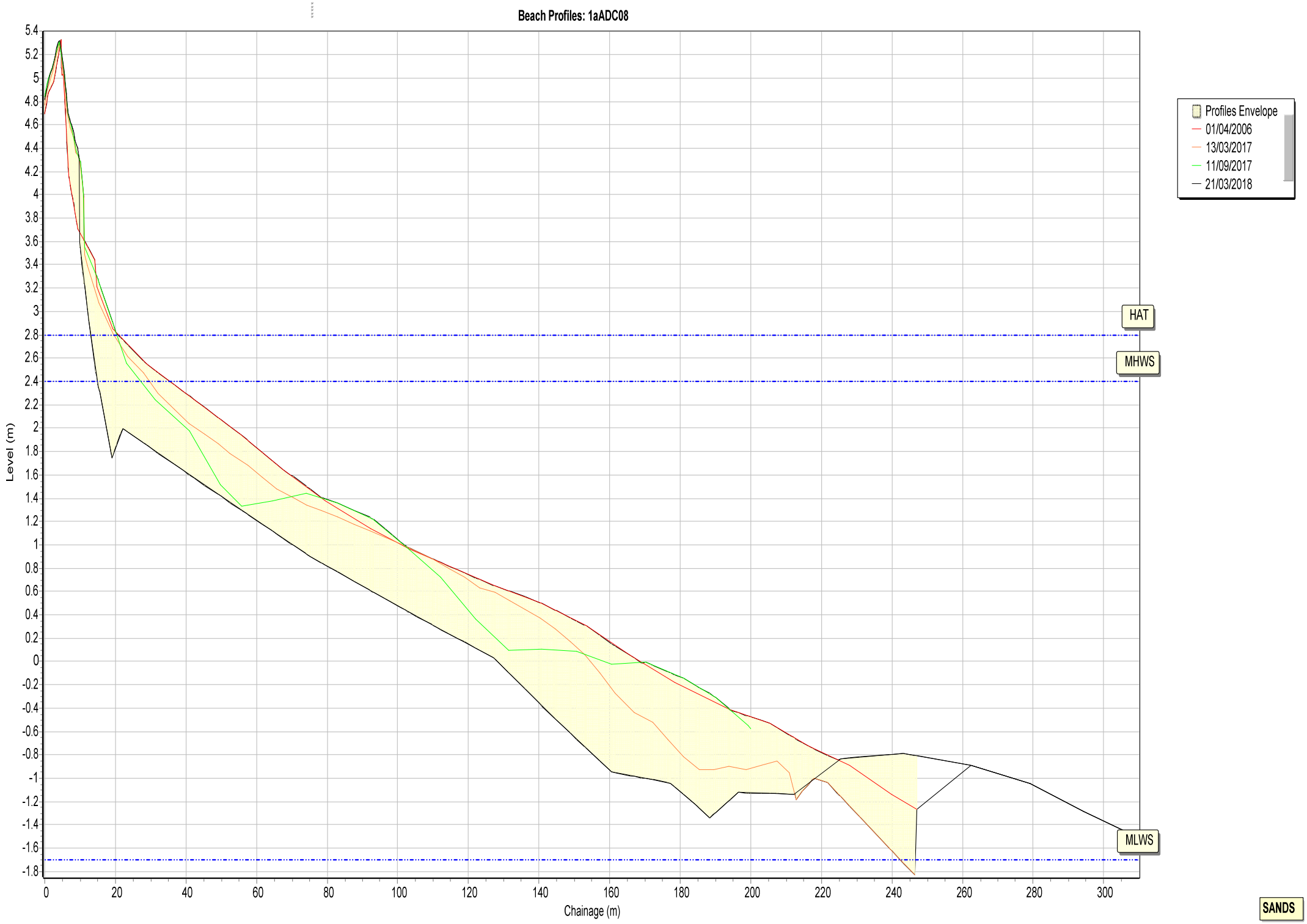
260
280
300
320


Beach Profiles: 1aADC08
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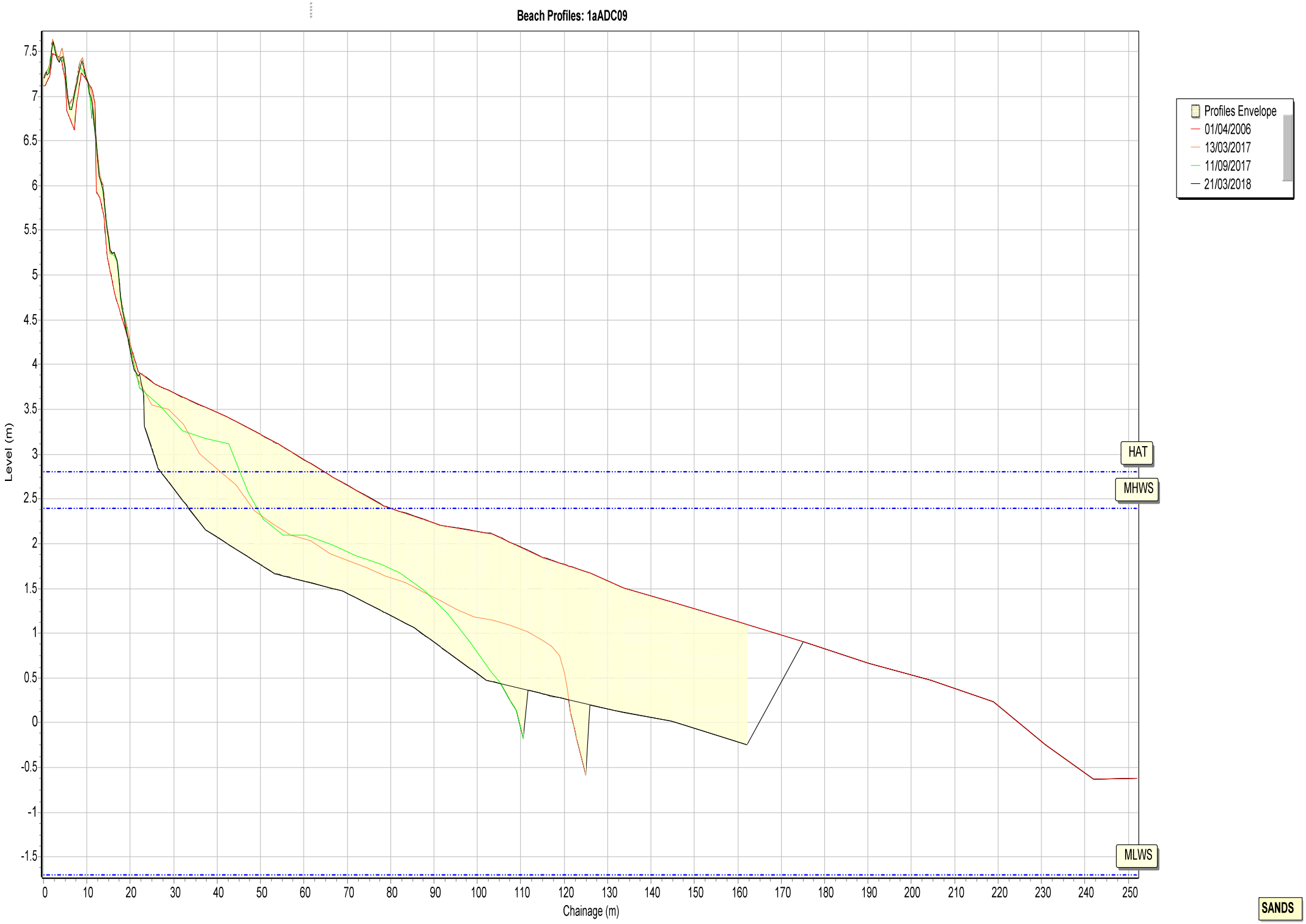
13/03/2017
11/09/2017
21/03/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aADC09
Profiles Envelope
01/04/2006
13/03/2017
11/09/2017
21/03/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
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
0
10
20
30
40
50
60
70
80
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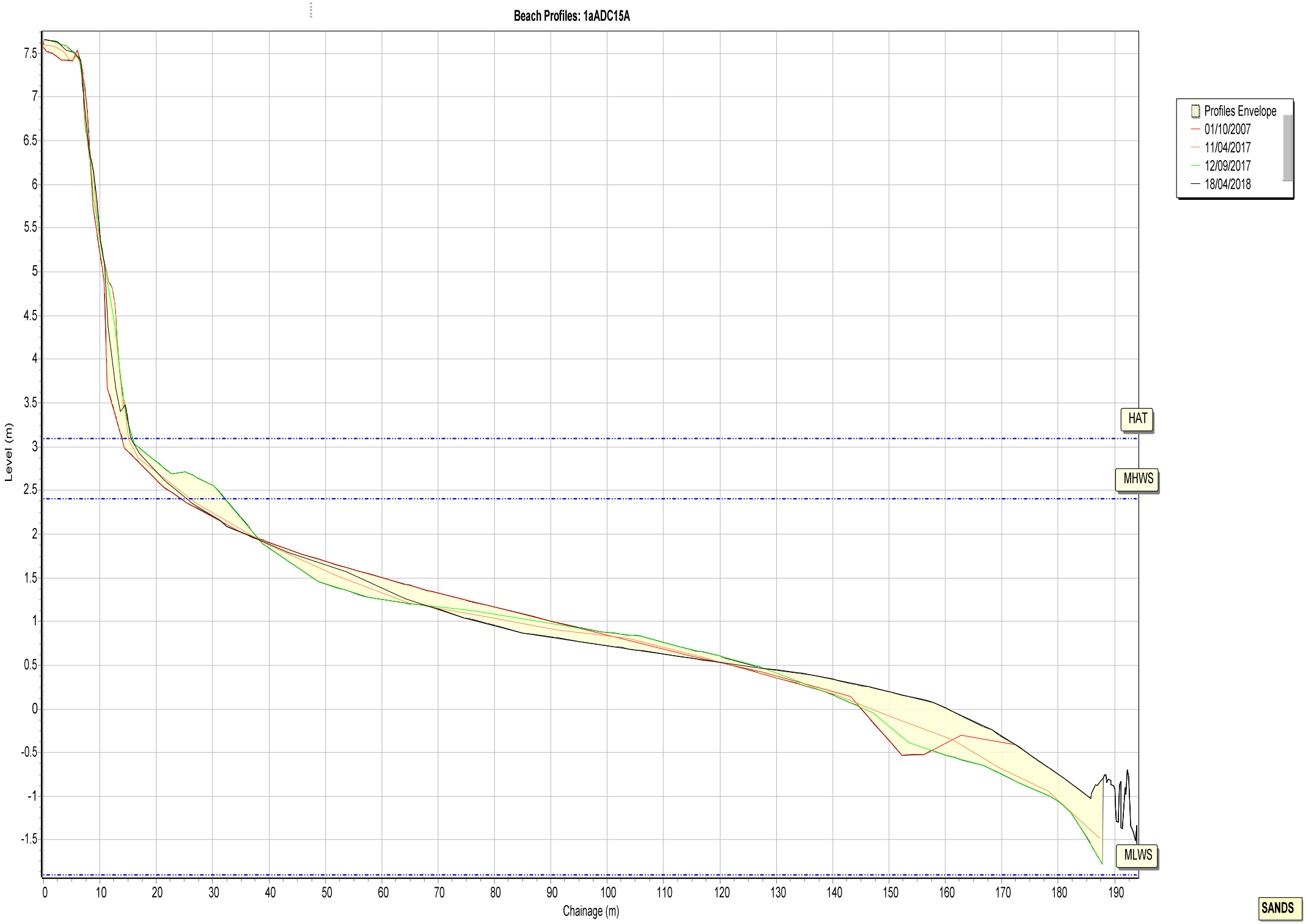
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250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Profiles Envelope
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11/04/2017
12/09/2017
18/04/2018
HAT
MHWS
MLWS
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Chainage (m)
7.5
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
0
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90
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130
140
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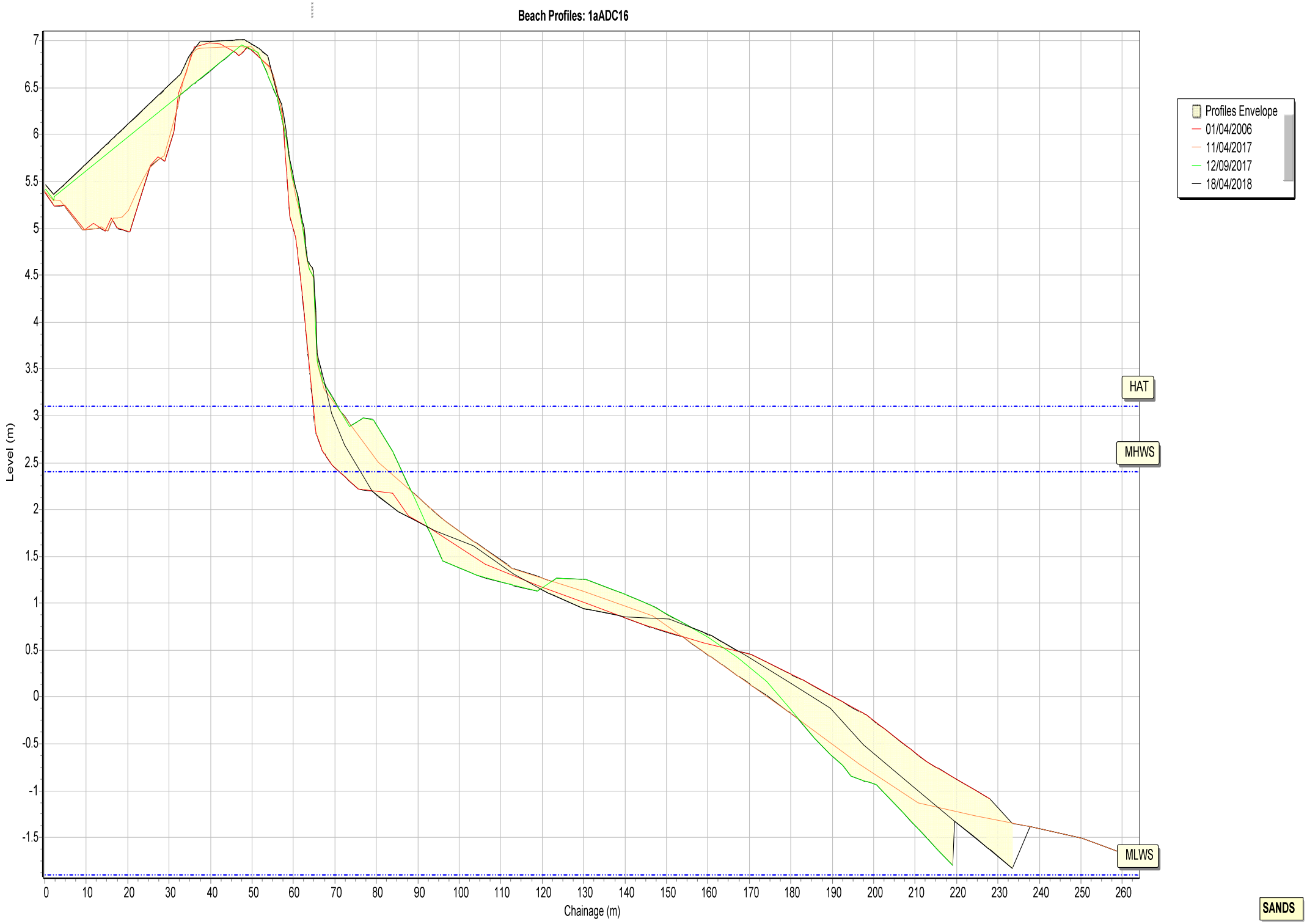
160
170
180
190
SANDS


Beach Profiles: 1aADC16
Profiles Envelope
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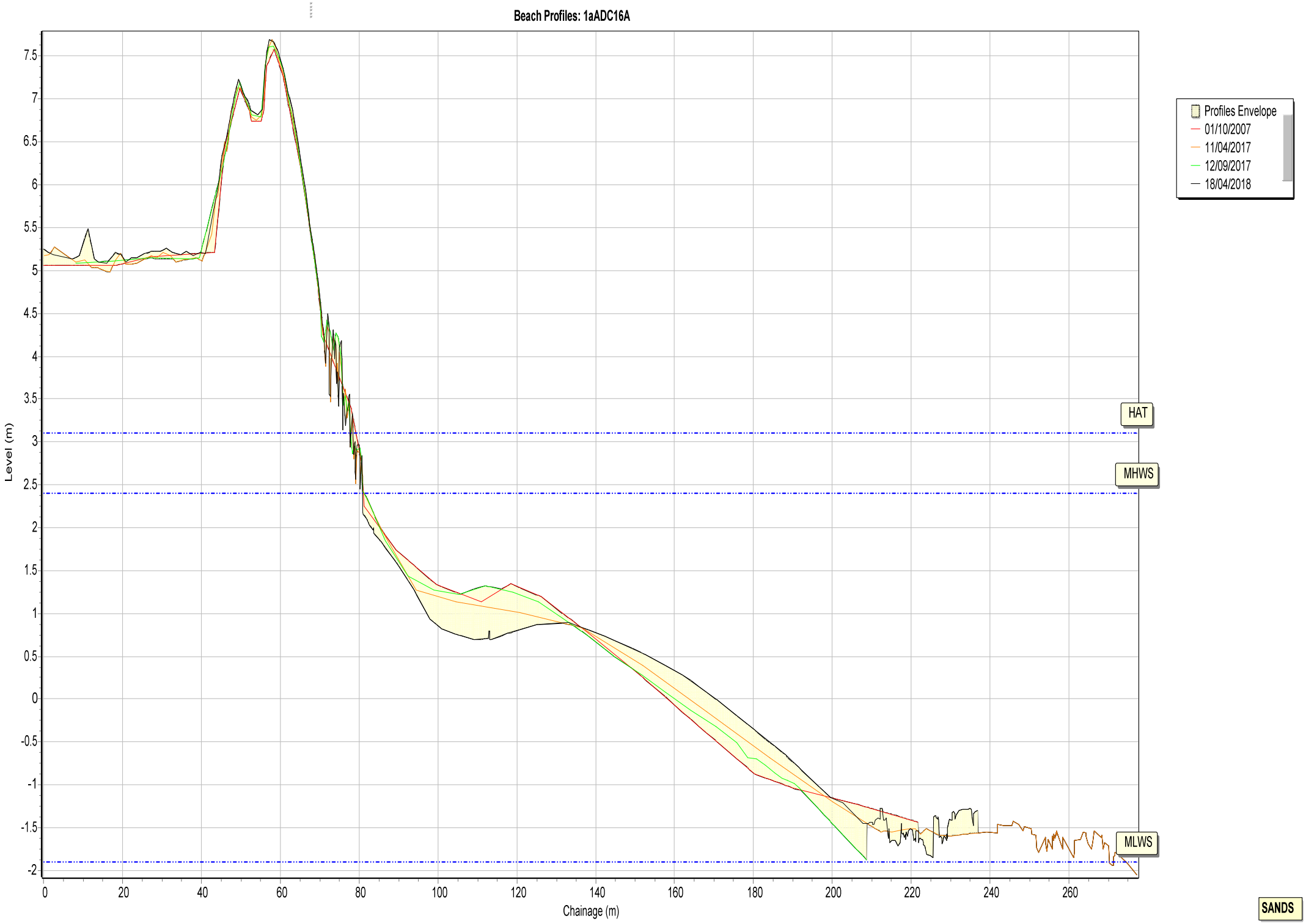
11/04/2017
12/09/2017
18/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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Profiles Envelope
01/10/2007
11/04/2017
12/09/2017
18/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
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120
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240
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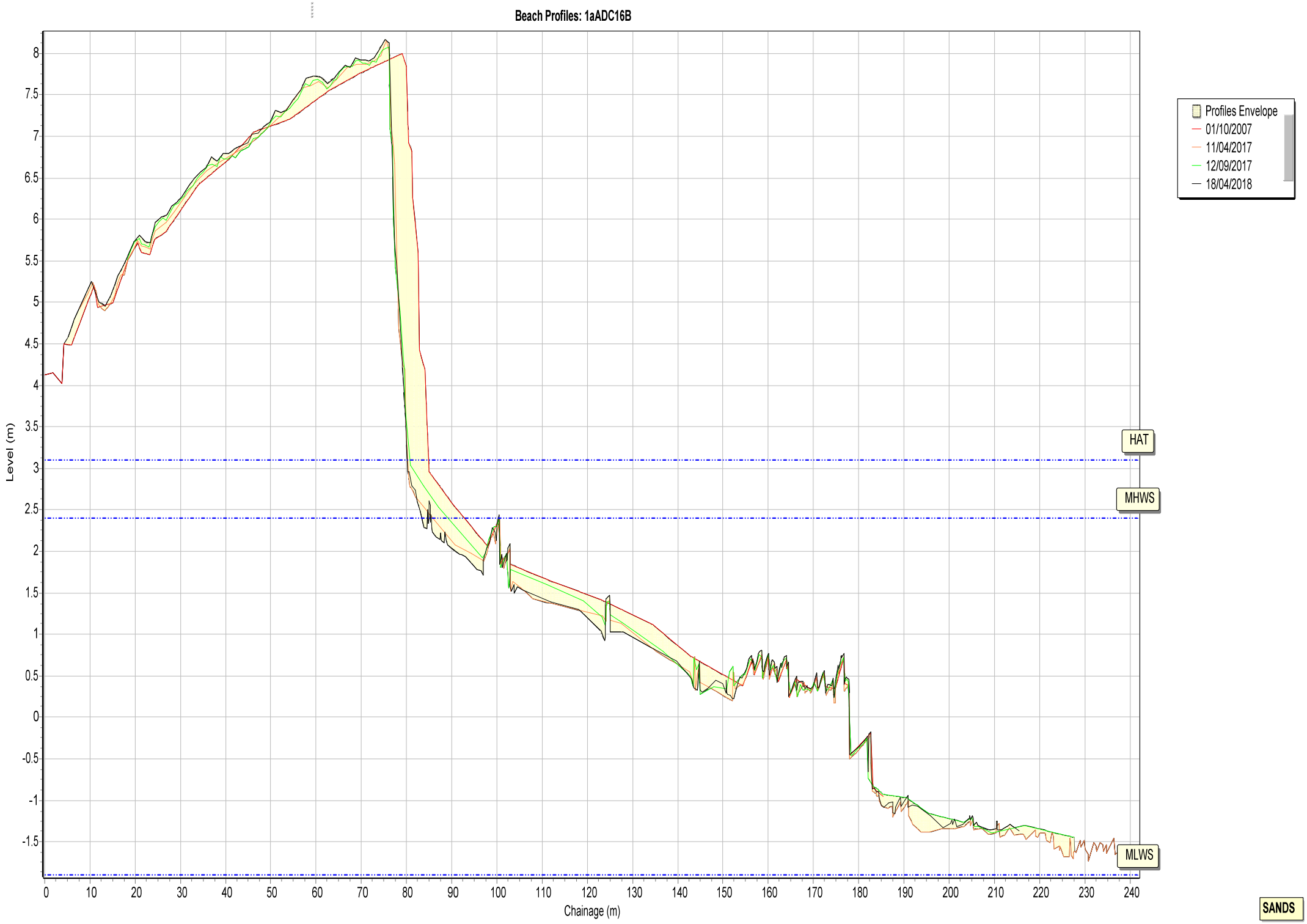
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Profiles Envelope
01/10/2007
11/04/2017
12/09/2017
18/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
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170
180
190
200
210
220
230
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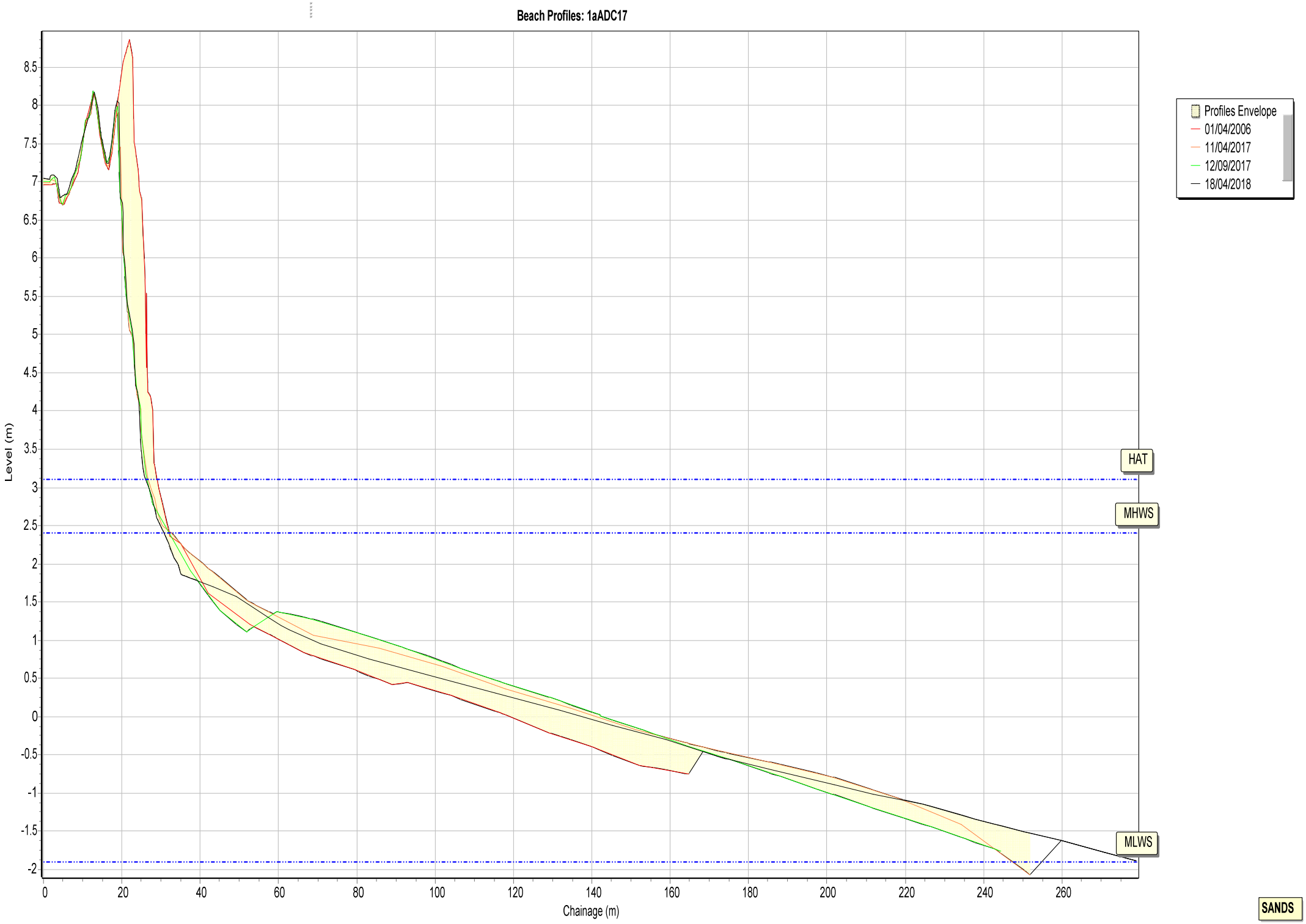
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01/04/2006
11/04/2017
12/09/2017
18/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
20
40
60
80
100
120
140
160
180
200
220
240
260


Beach Profiles: 1aADC17A
Profiles Envelope
01/10/2007
11/04/2017
12/09/2017
18/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
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
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250


Beach Profiles: 1aCMBC01
Profiles Envelope
01/04/2006
11/04/2017
22/10/2017
17/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (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
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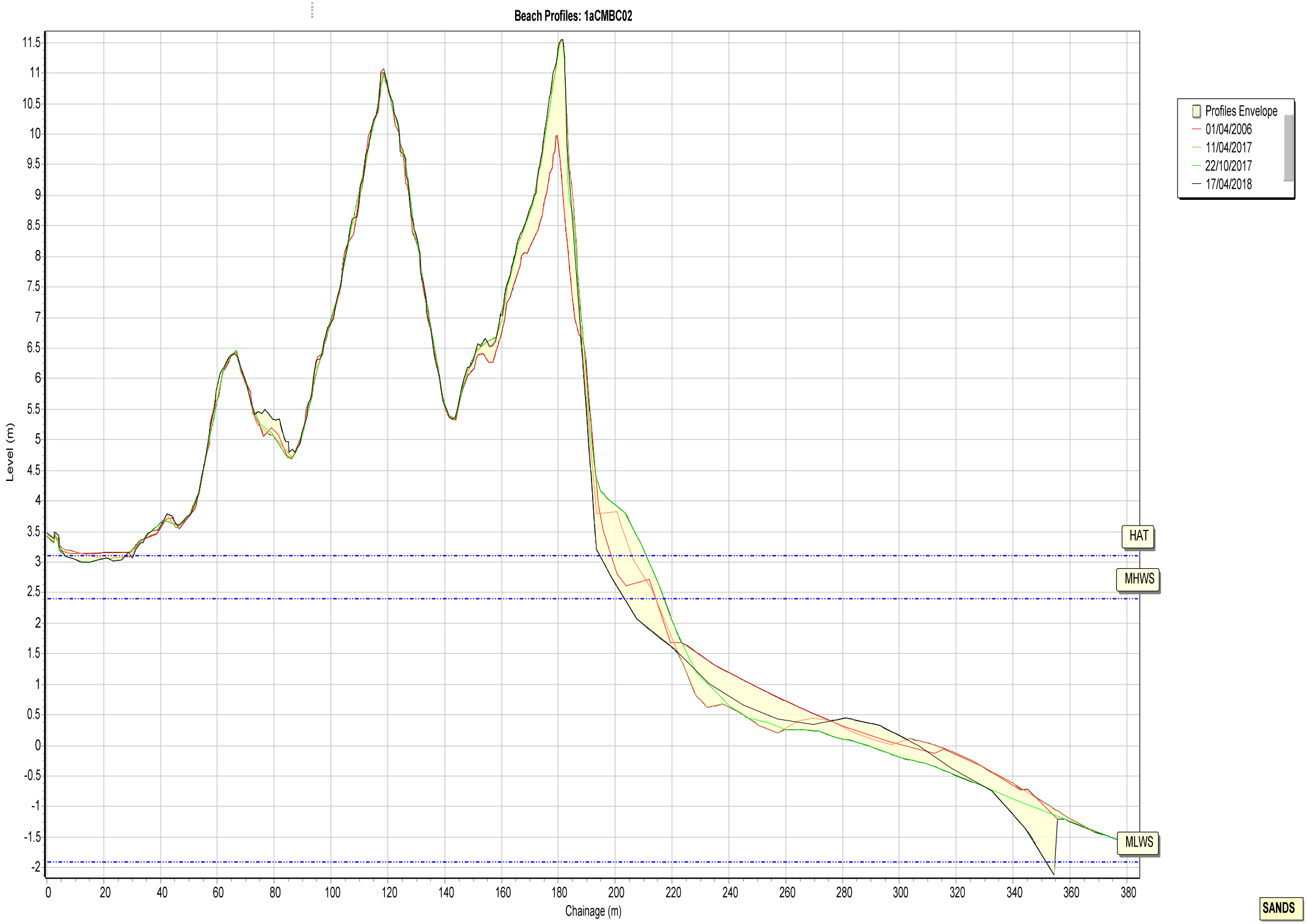
120
140
160
180
200
220
240
260
280
300
320
340
360
380
SANDS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Profiles Envelope
01/04/2006
11/04/2017
22/10/2017
17/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
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80
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140
160
180
200
220
240
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280
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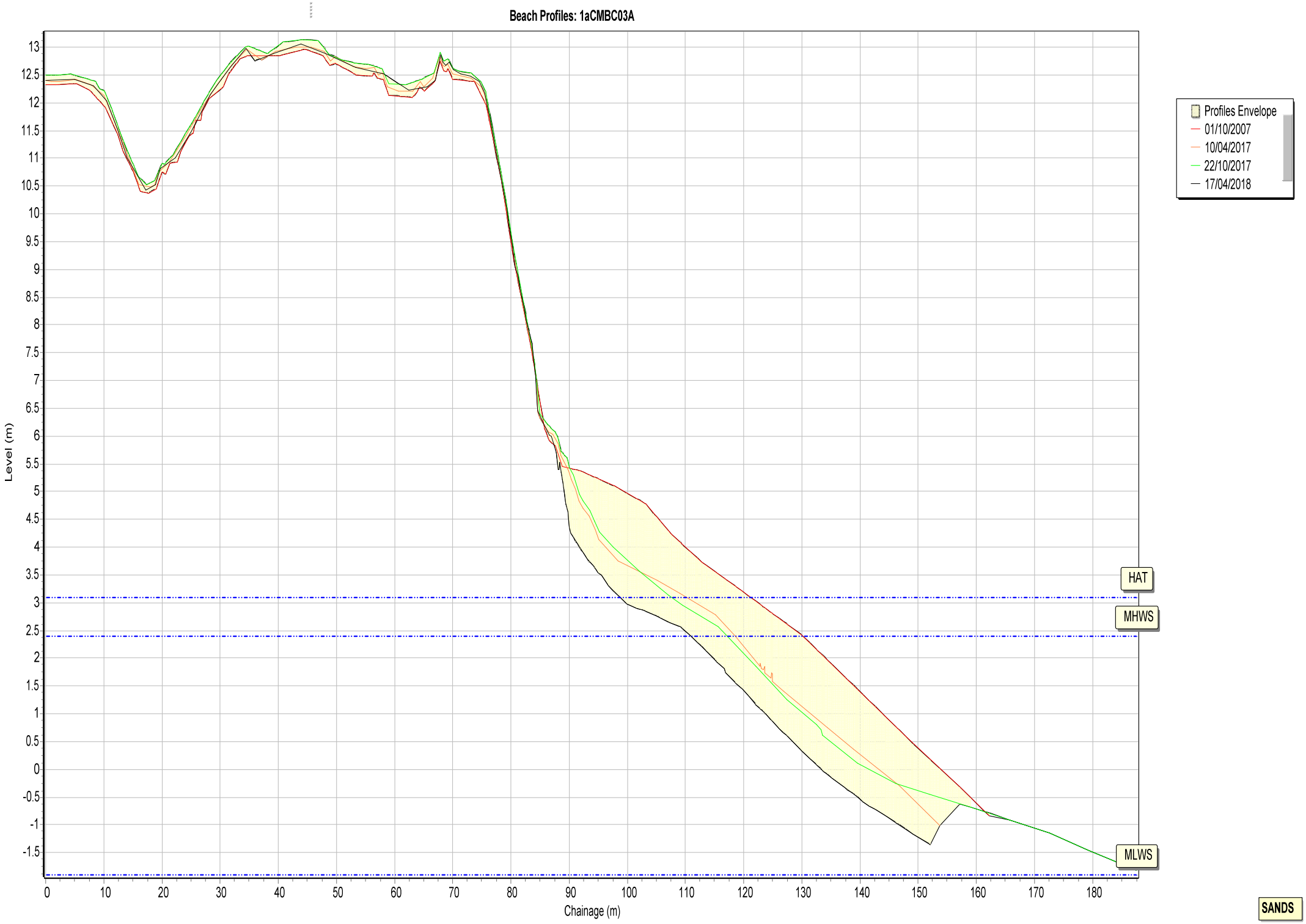
320
340
360
380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Profiles Envelope
01/10/2007
10/04/2017
22/10/2017
17/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
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30
40
50
60
70
80
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110
120
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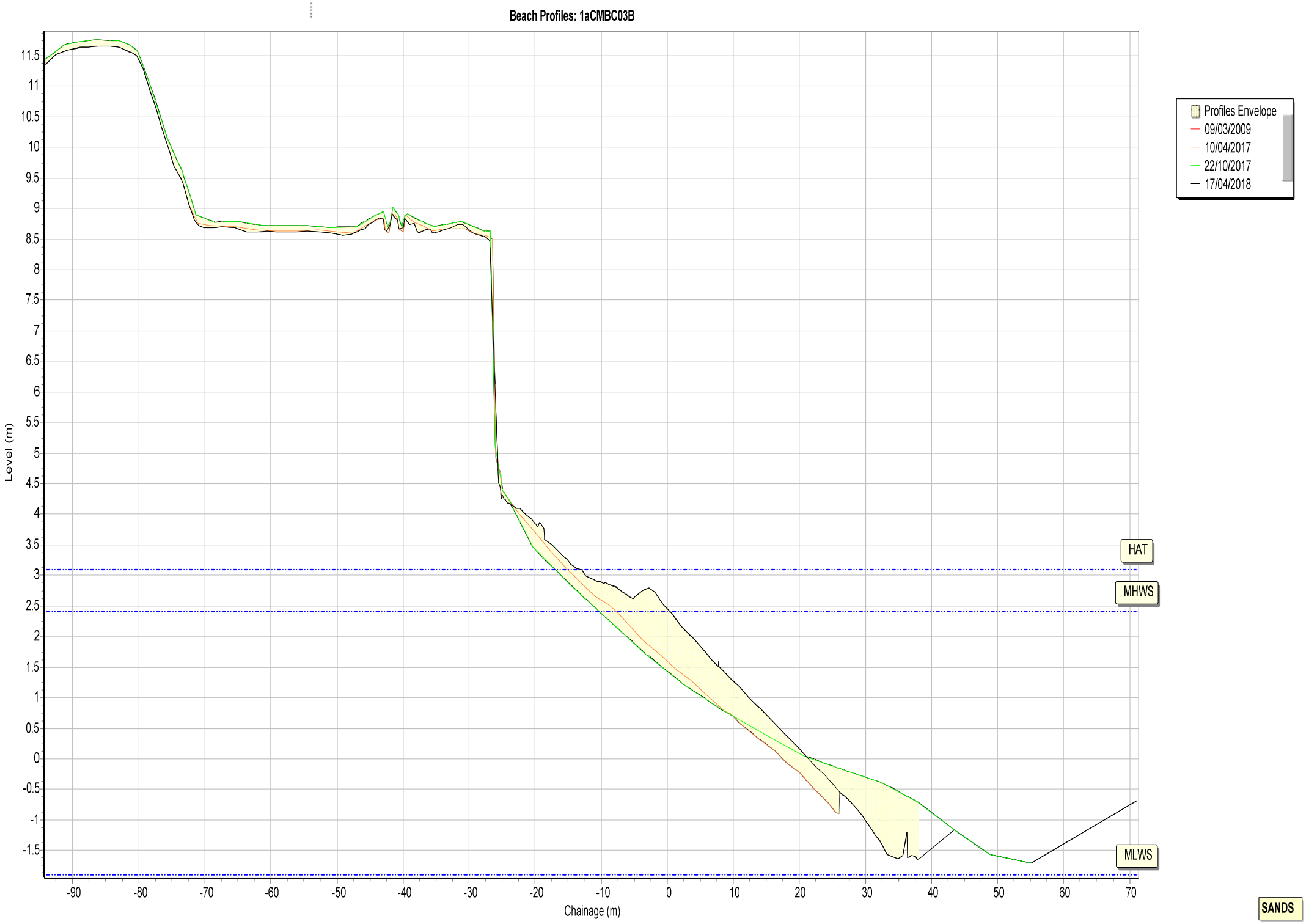
140
150
160
170
180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Profiles Envelope
09/03/2009
10/04/2017
22/10/2017
17/04/2018
HAT
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
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-60
-50
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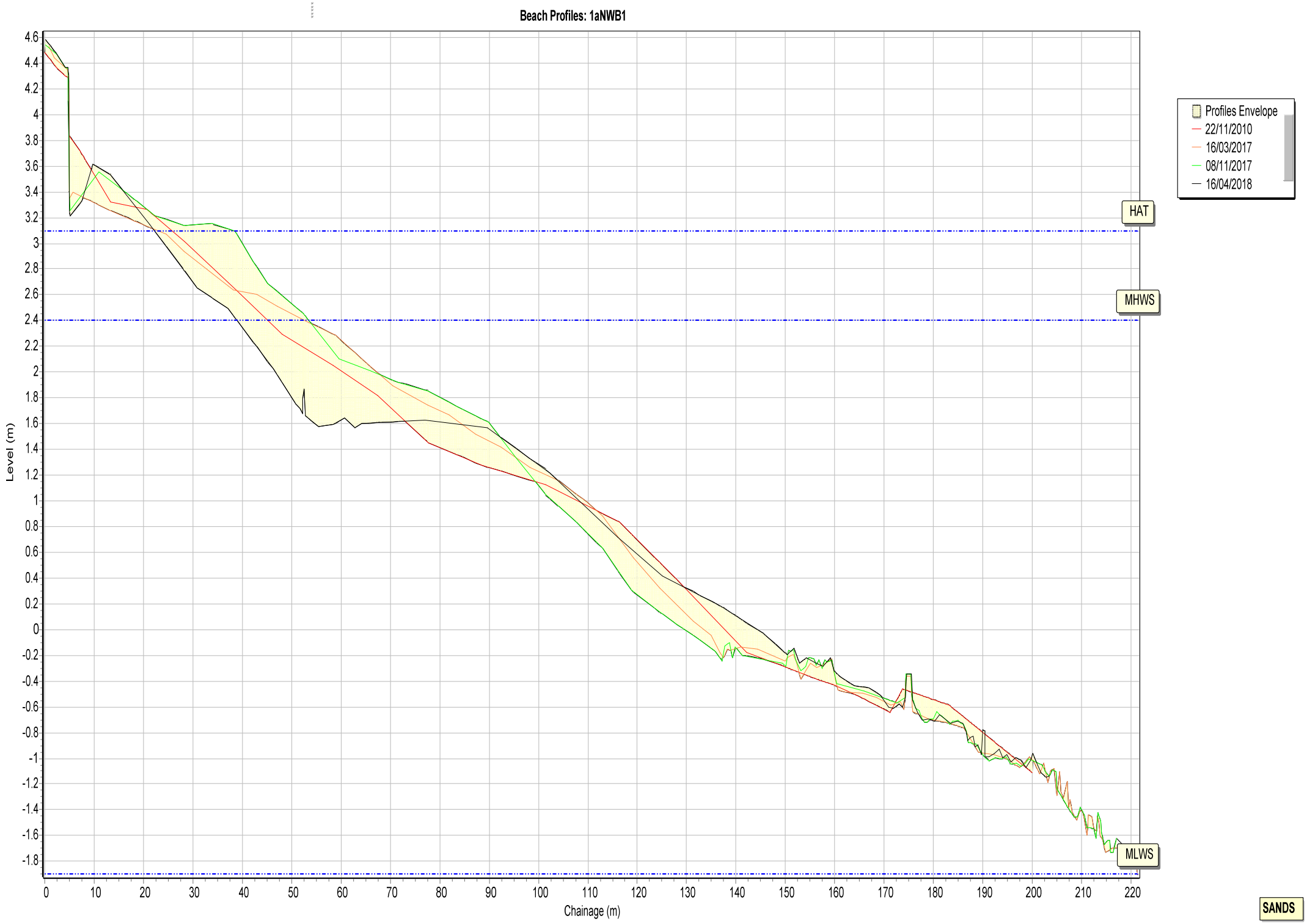
40
50
60
70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Profiles Envelope
22/11/2010
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
0
10
20
30
40
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90
100
110
120
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170
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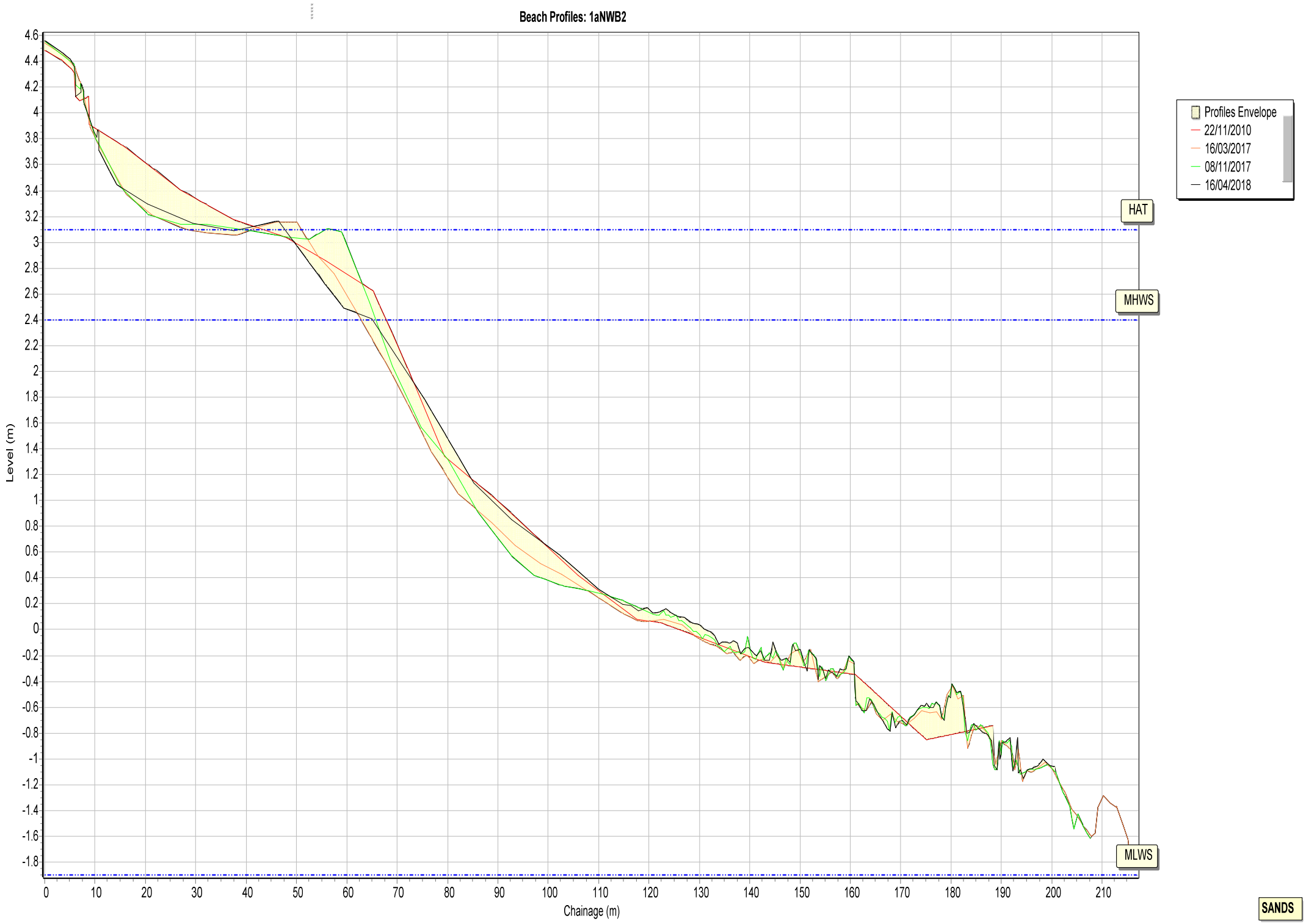
210
220
SANDS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Profiles Envelope
22/11/2010
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
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10
20
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110
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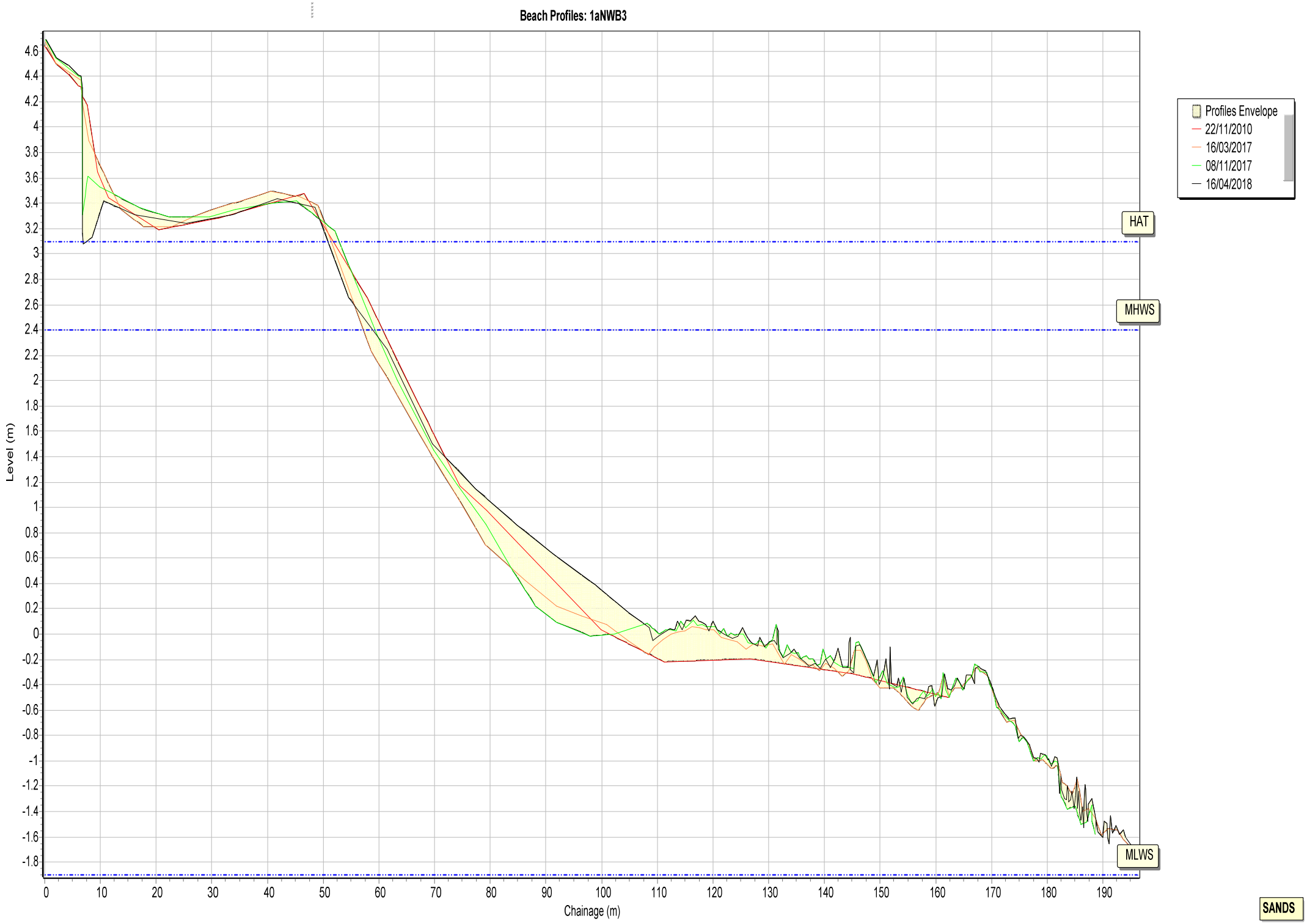
SANDS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Profiles Envelope
22/11/2010
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
0
10
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30
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50
60
70
80
90
100
110
120
130
140
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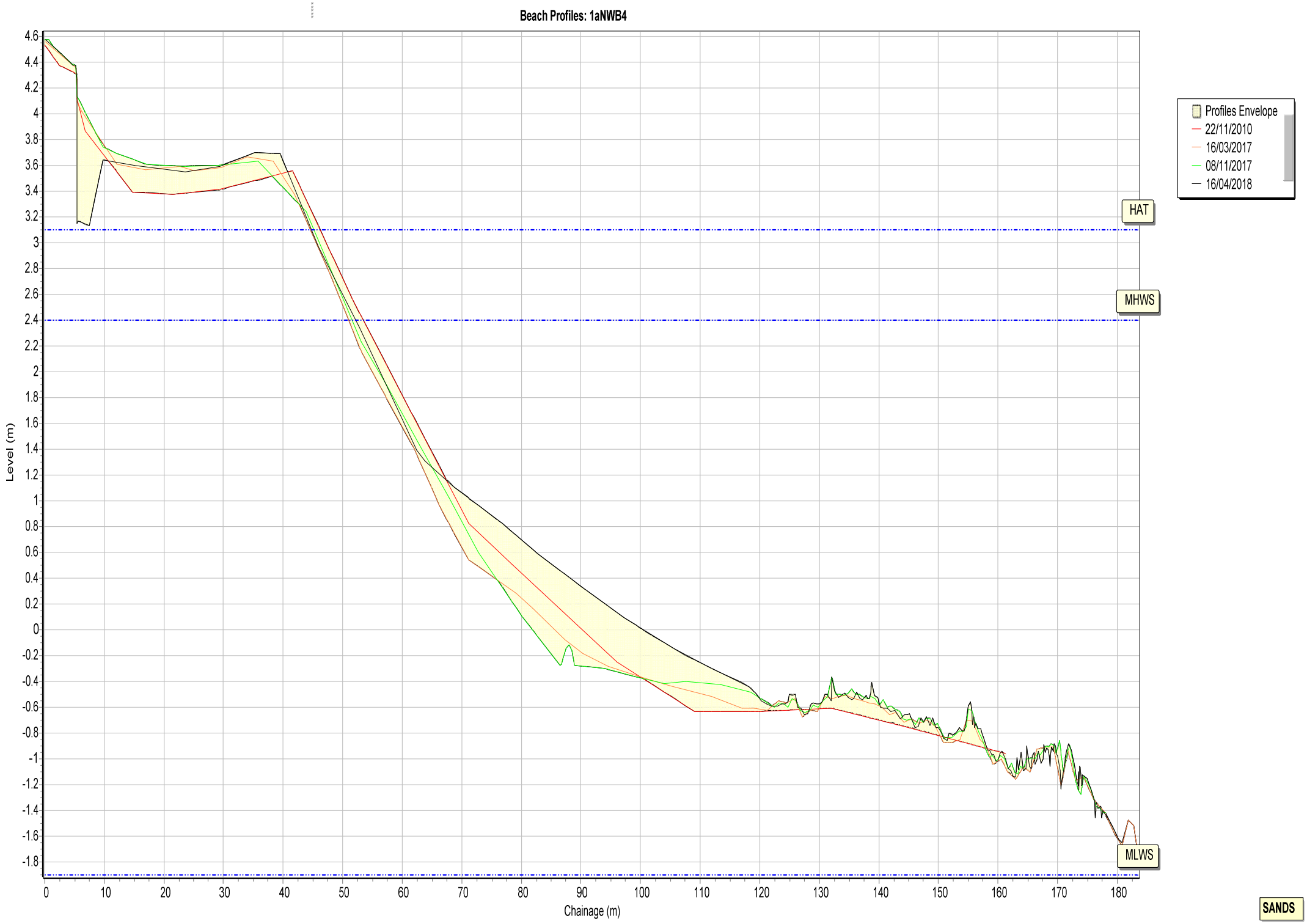
180
190
SANDS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Profiles Envelope
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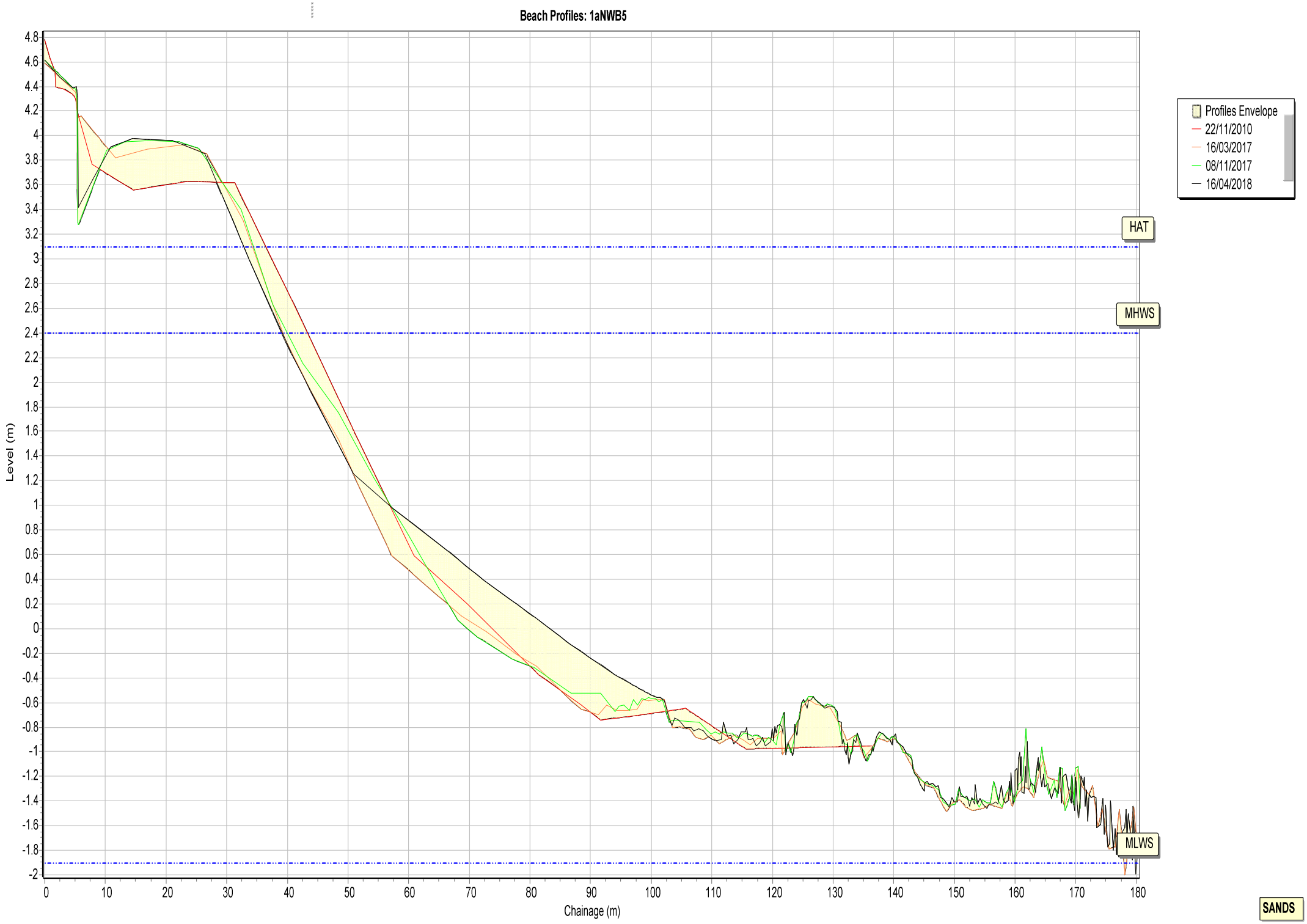
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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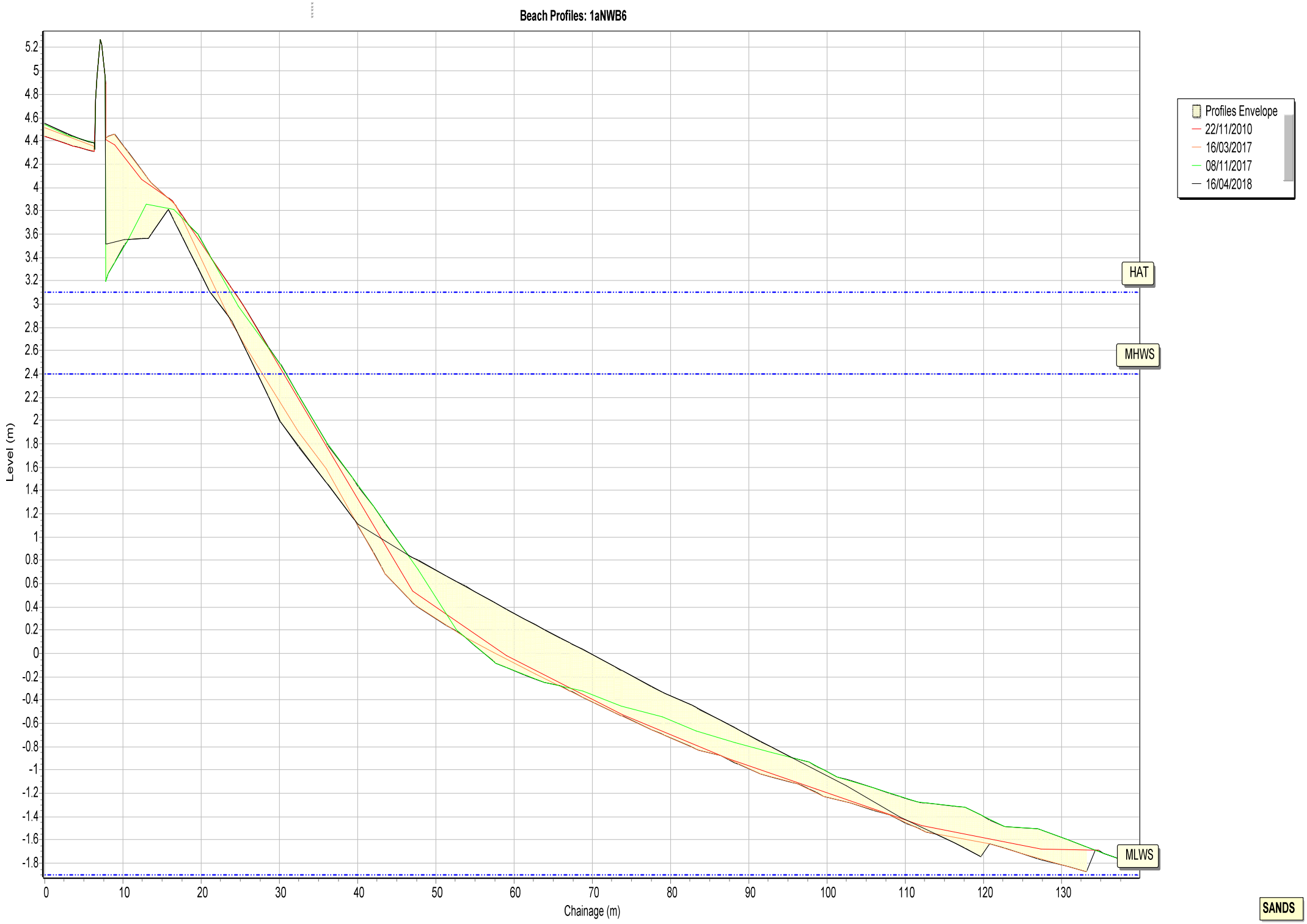
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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Profiles Envelope
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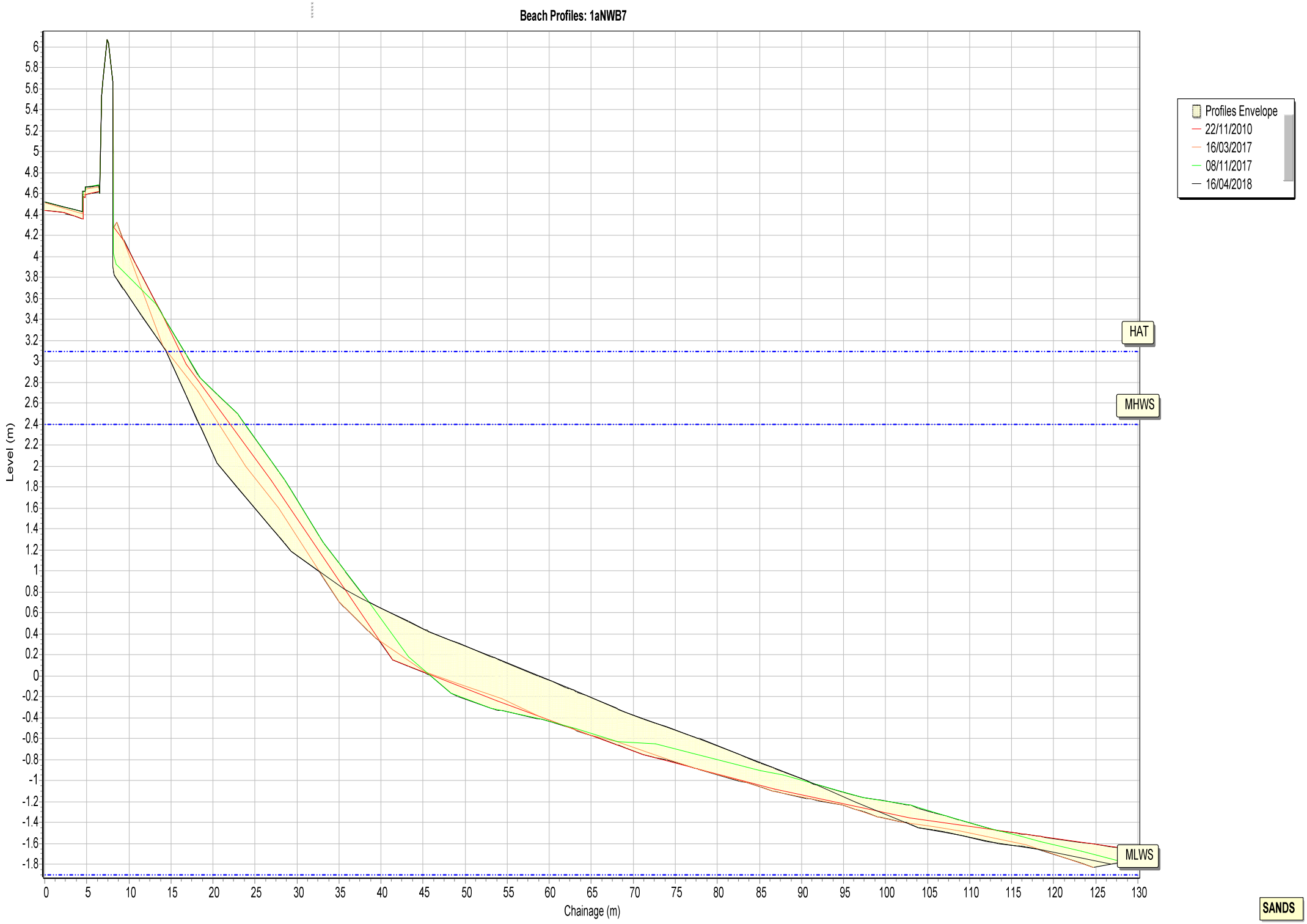
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aNWB7
Profiles Envelope
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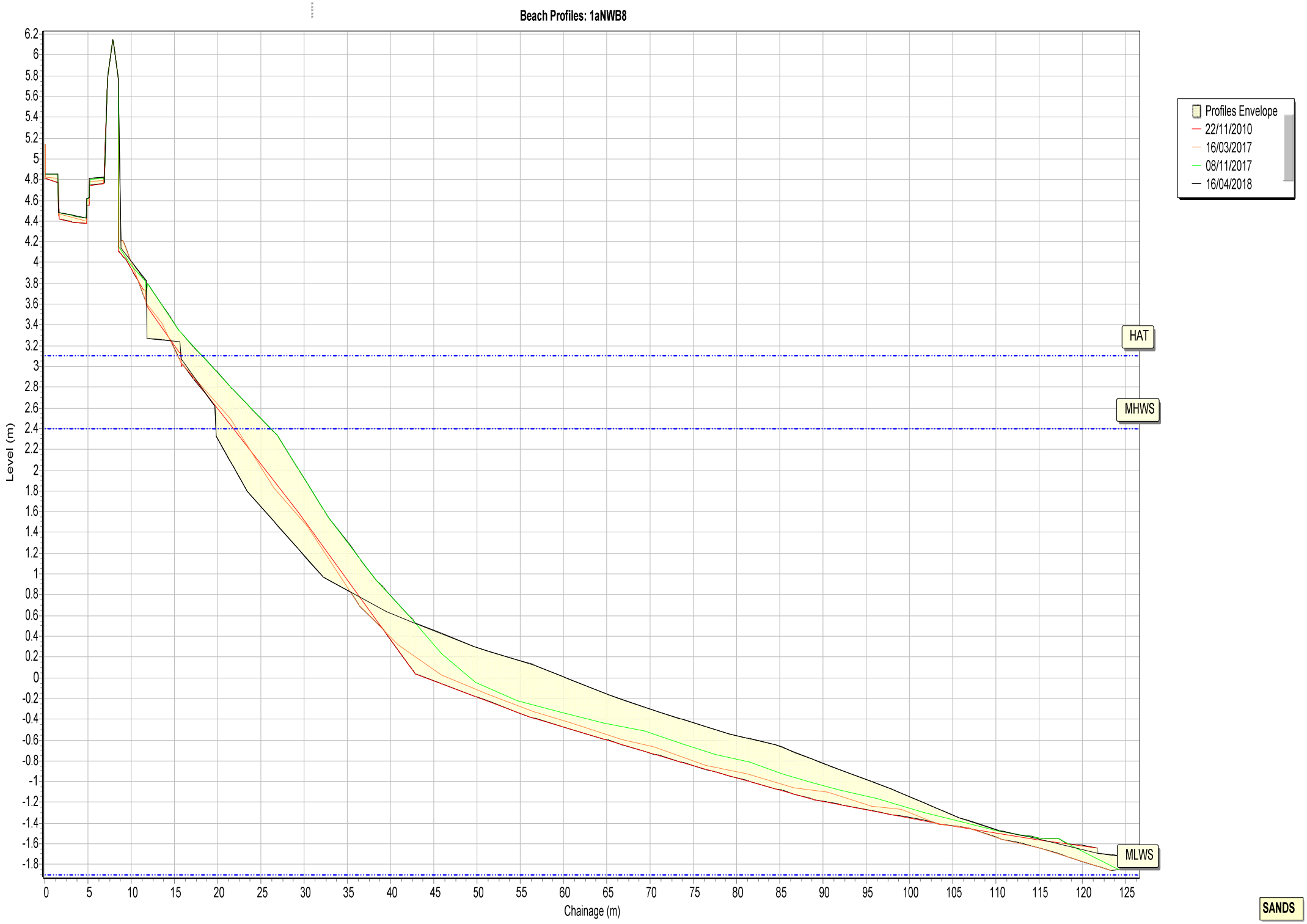
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aNWB8
Profiles Envelope
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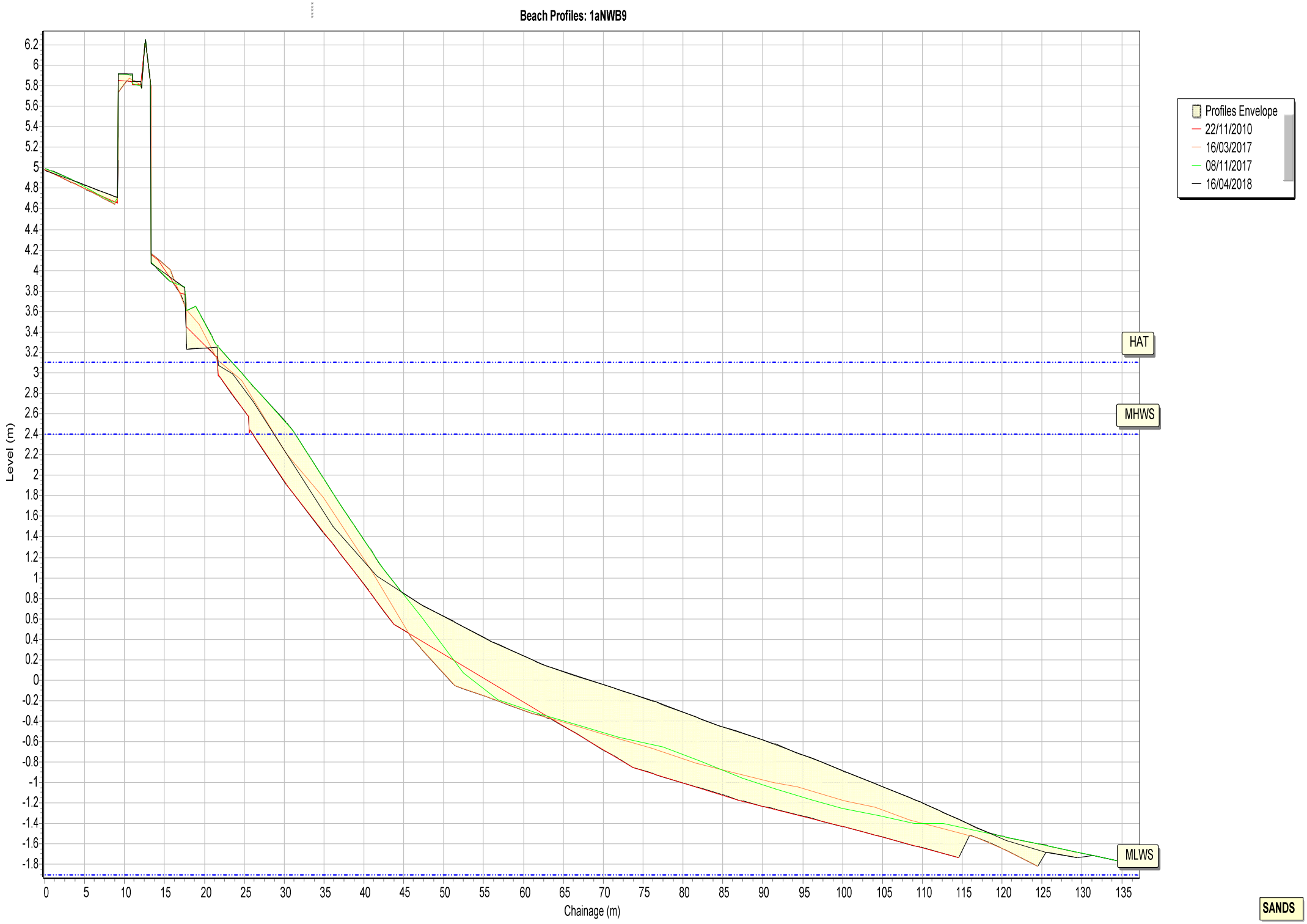
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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08/11/2017
16/04/2018
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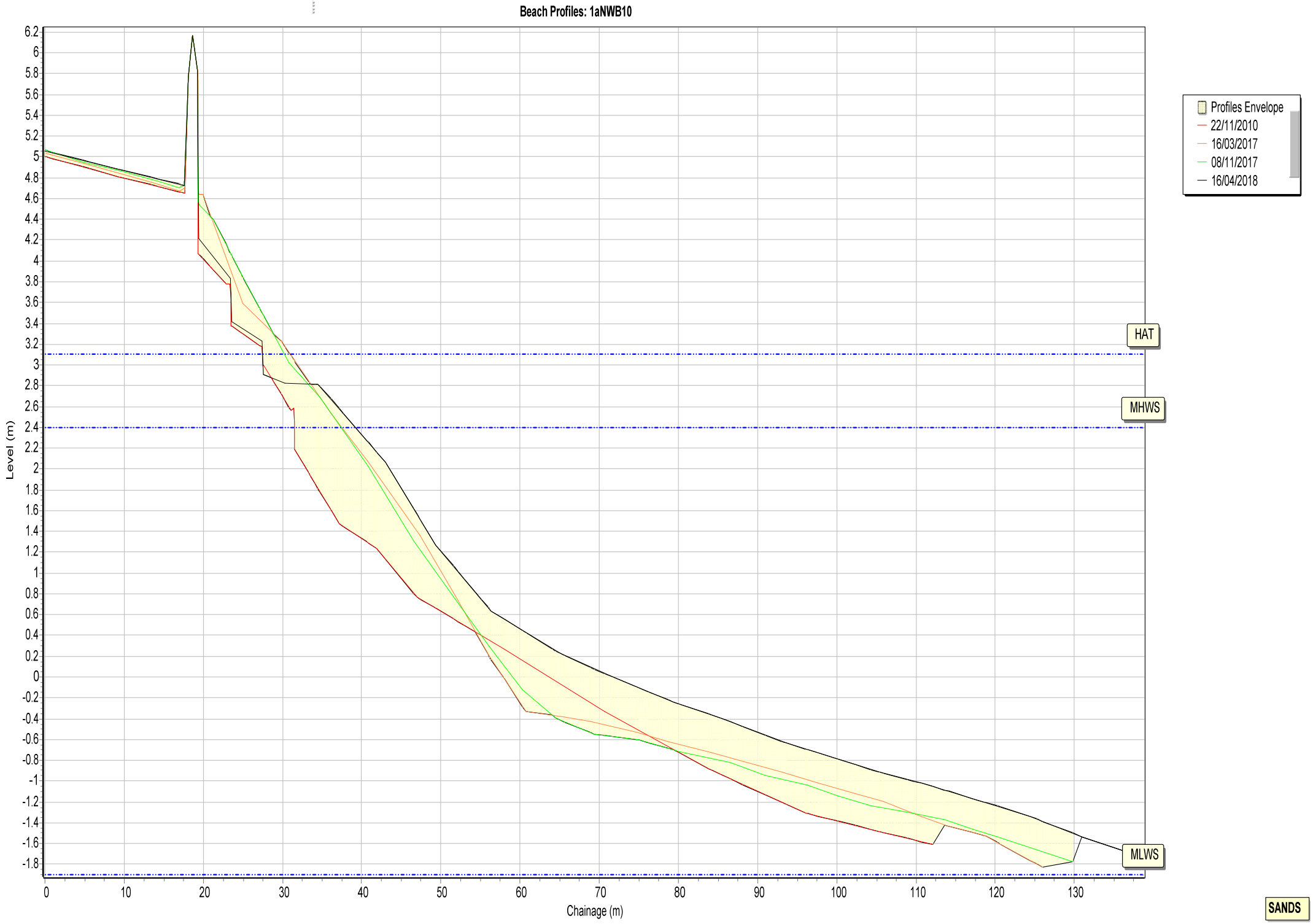
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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Profiles Envelope
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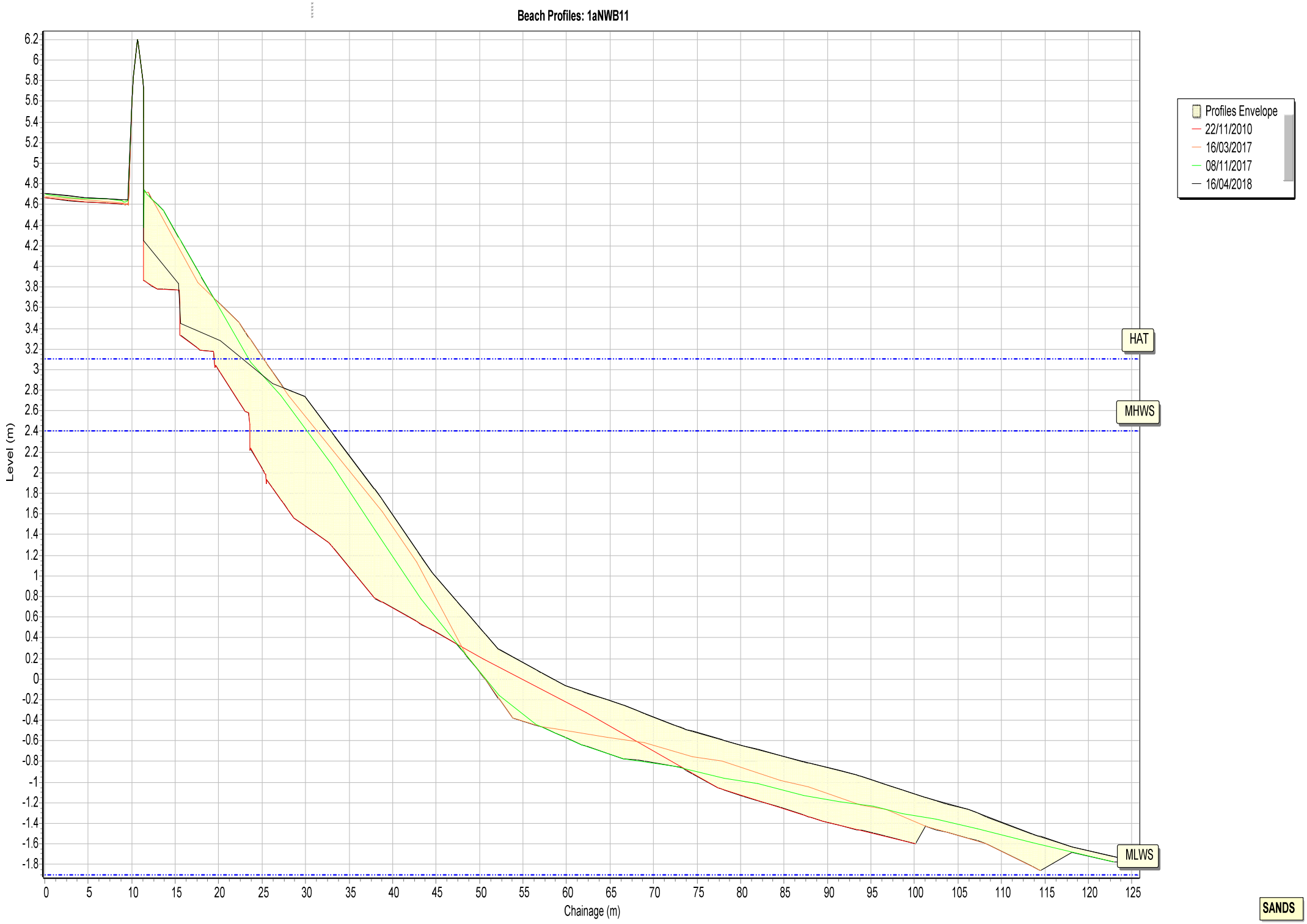
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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Profiles Envelope
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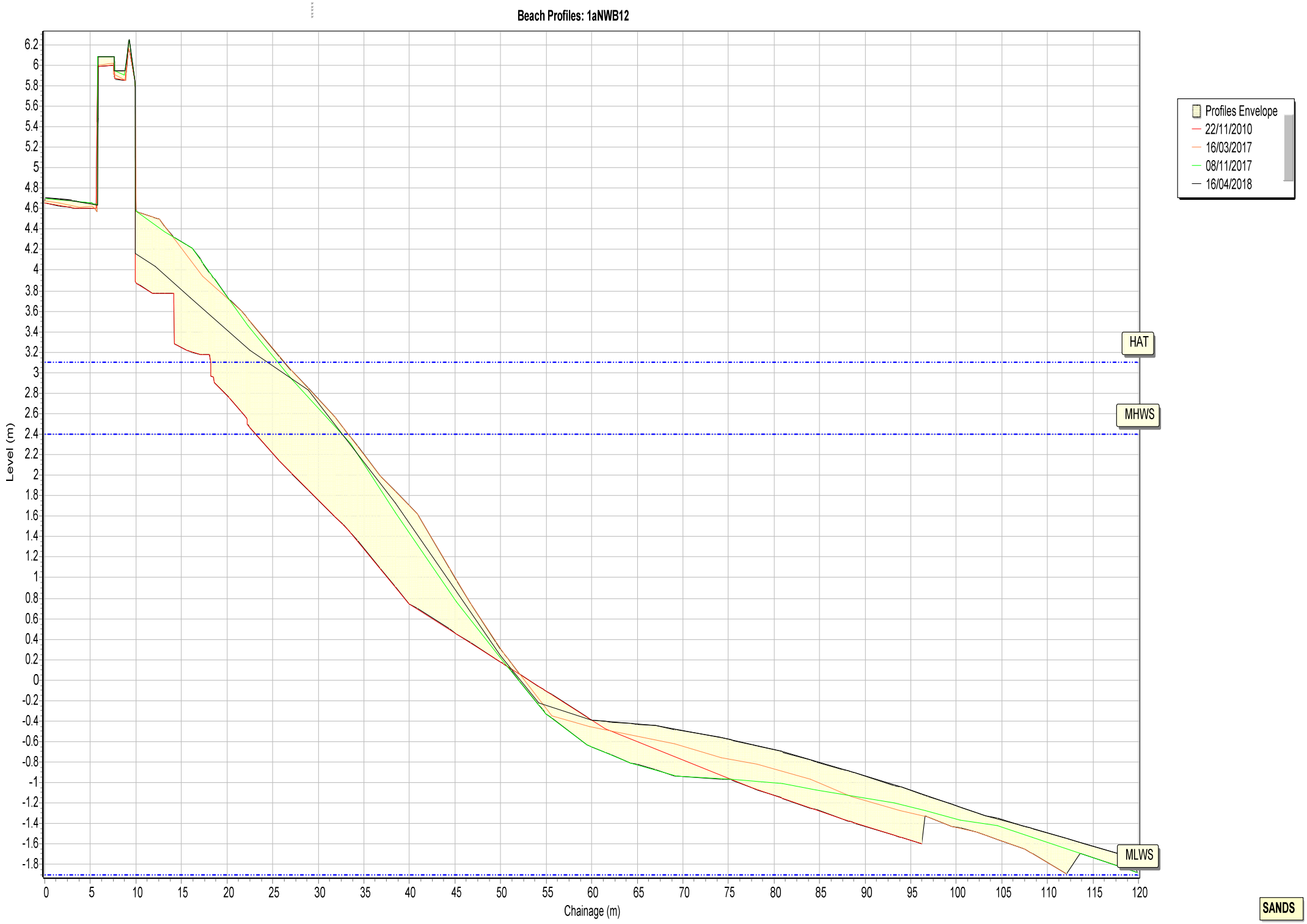
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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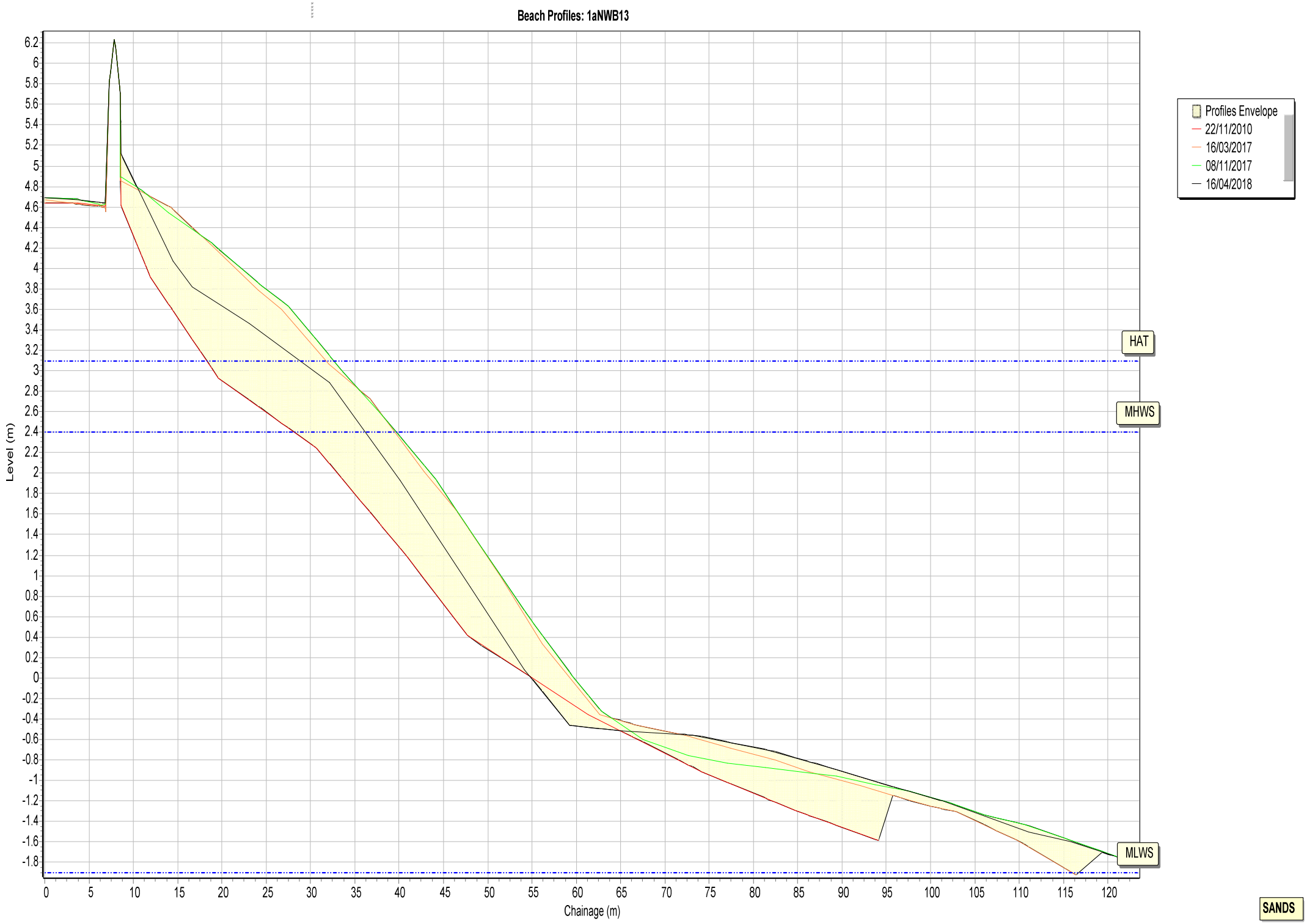
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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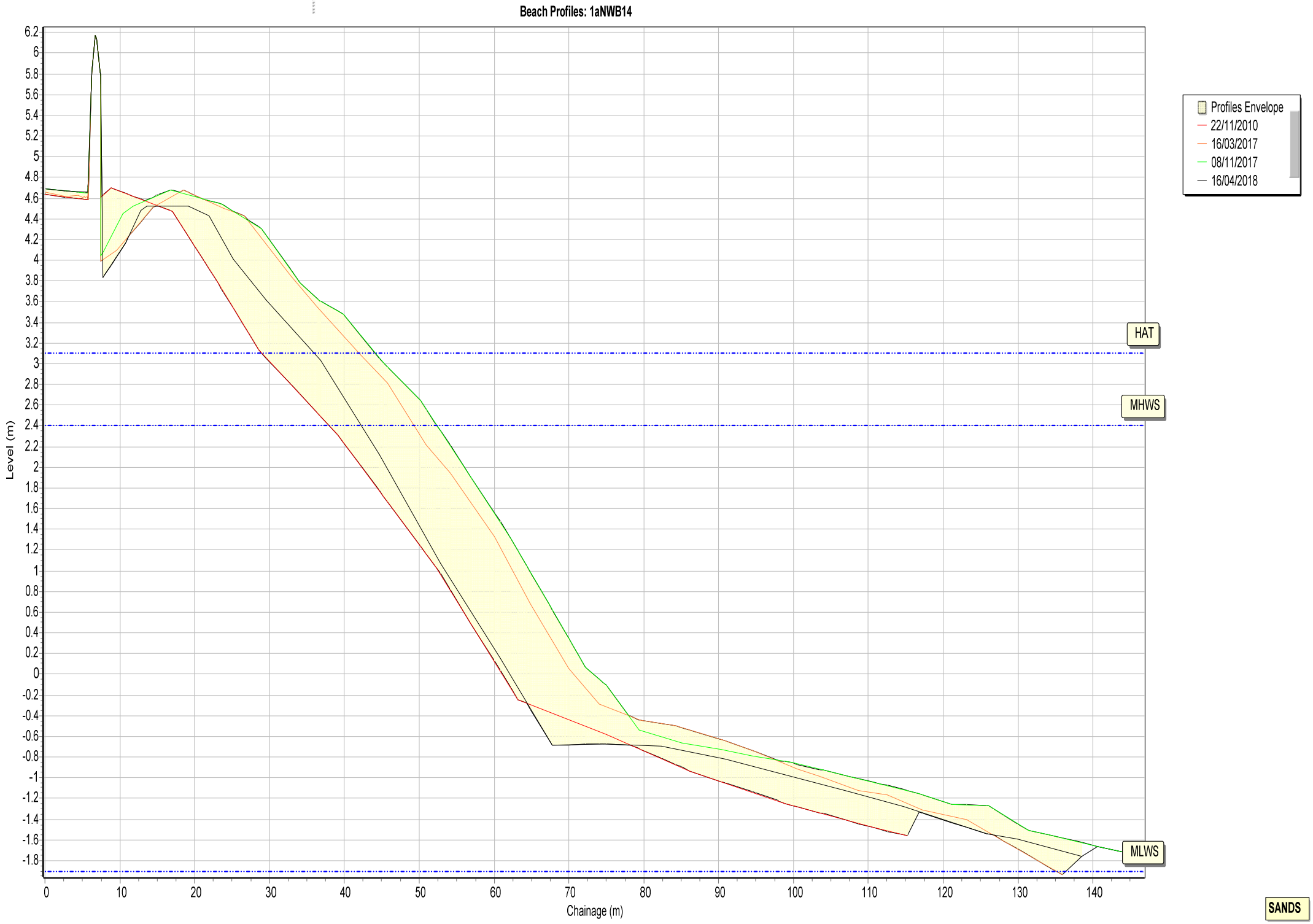
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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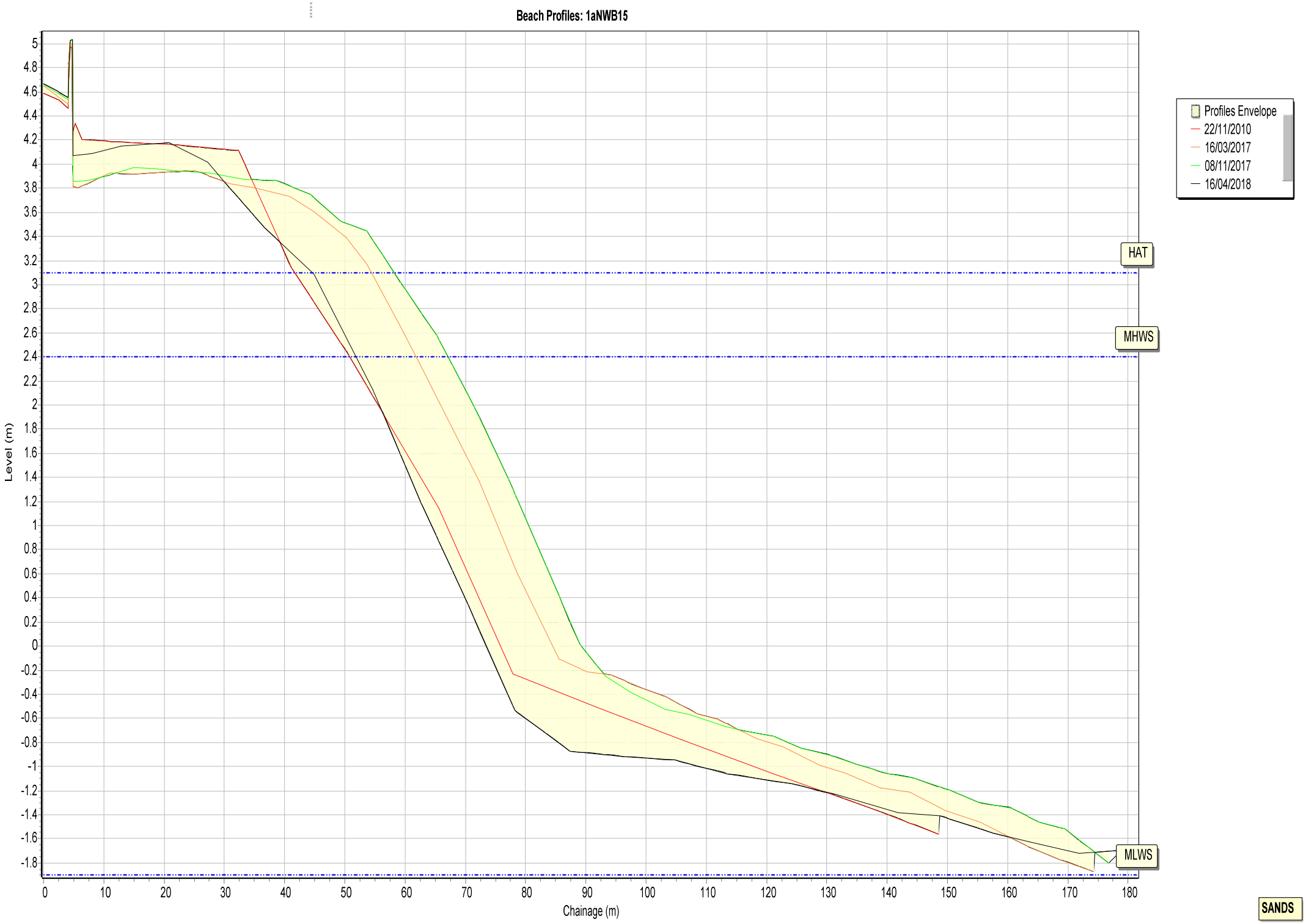
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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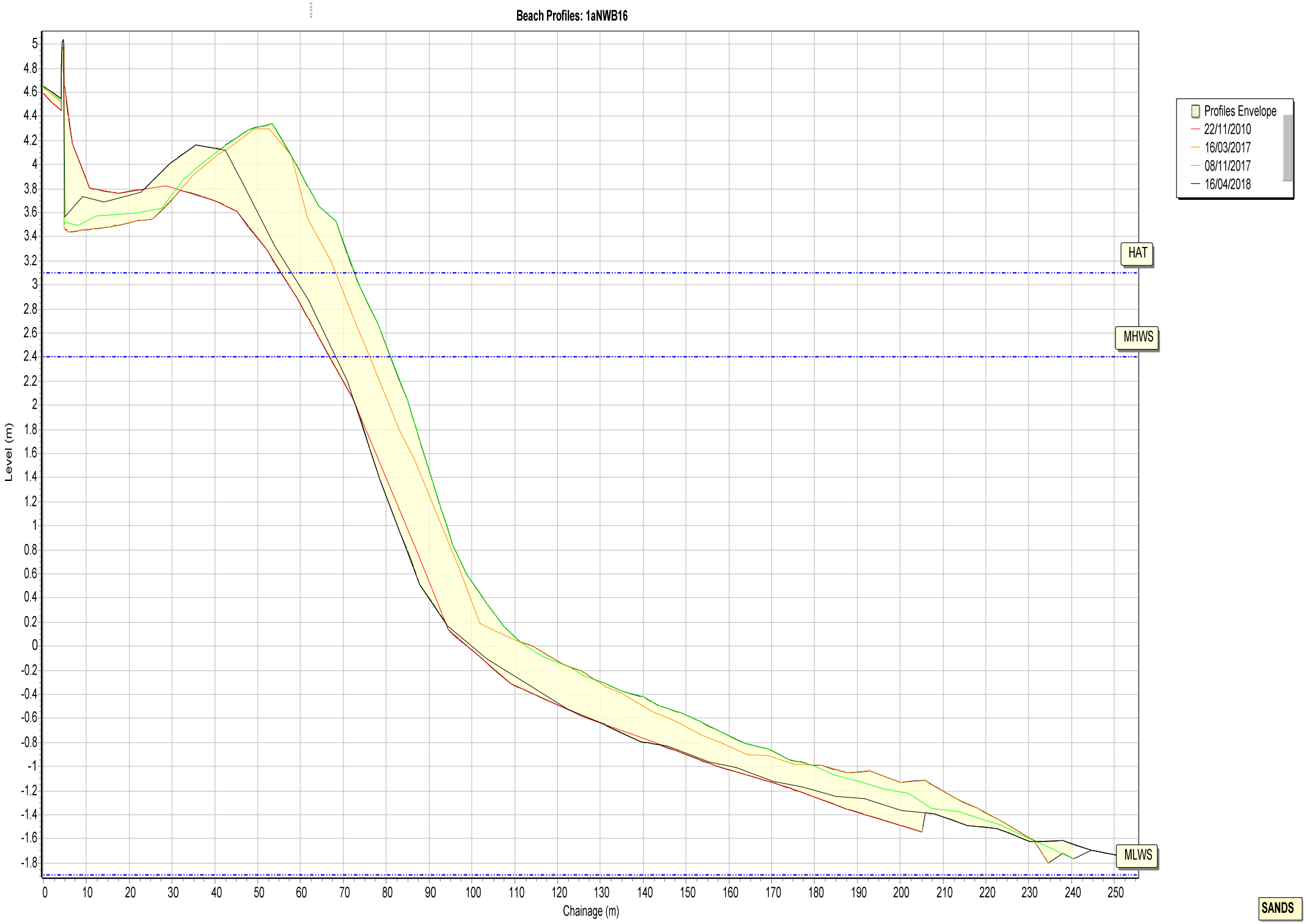
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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08/11/2017
16/04/2018
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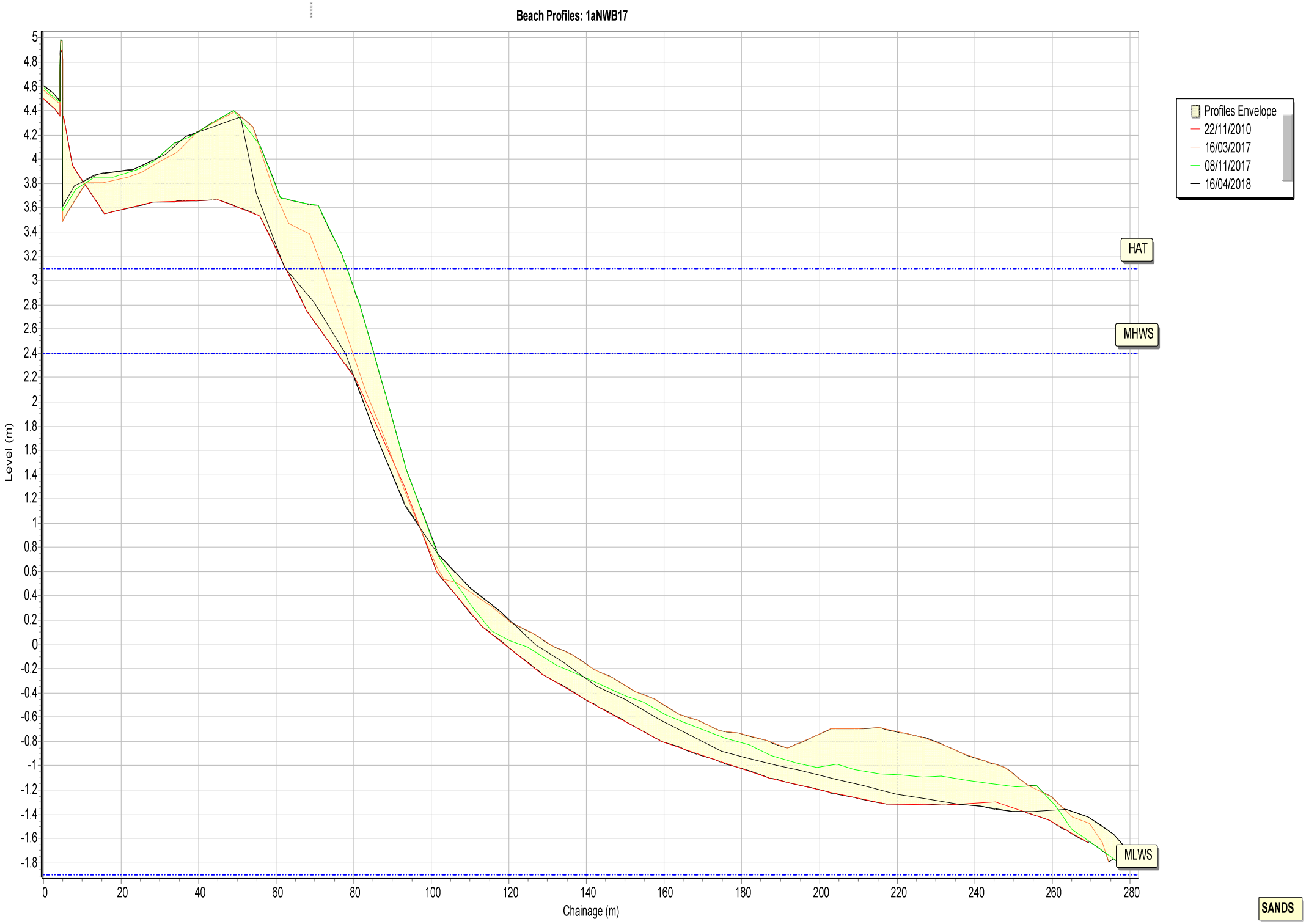
Level (m)
Chainage (m)
SANDS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08/11/2017
16/04/2018
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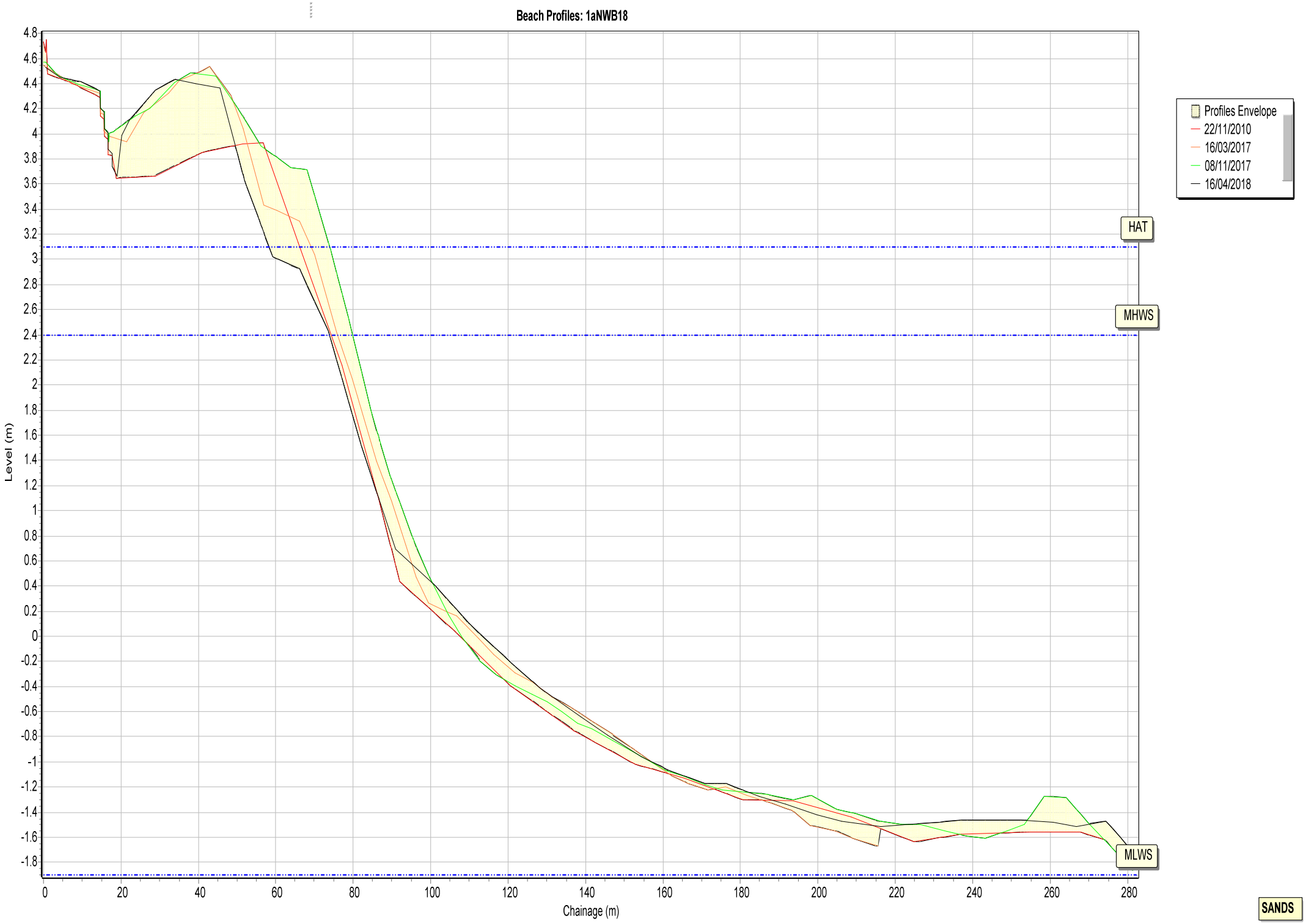
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aNWB18
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22/11/2010
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
SANDS


Beach Profiles: 1aNWB19
Profiles Envelope
22/11/2010
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
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10
20
30
40
50
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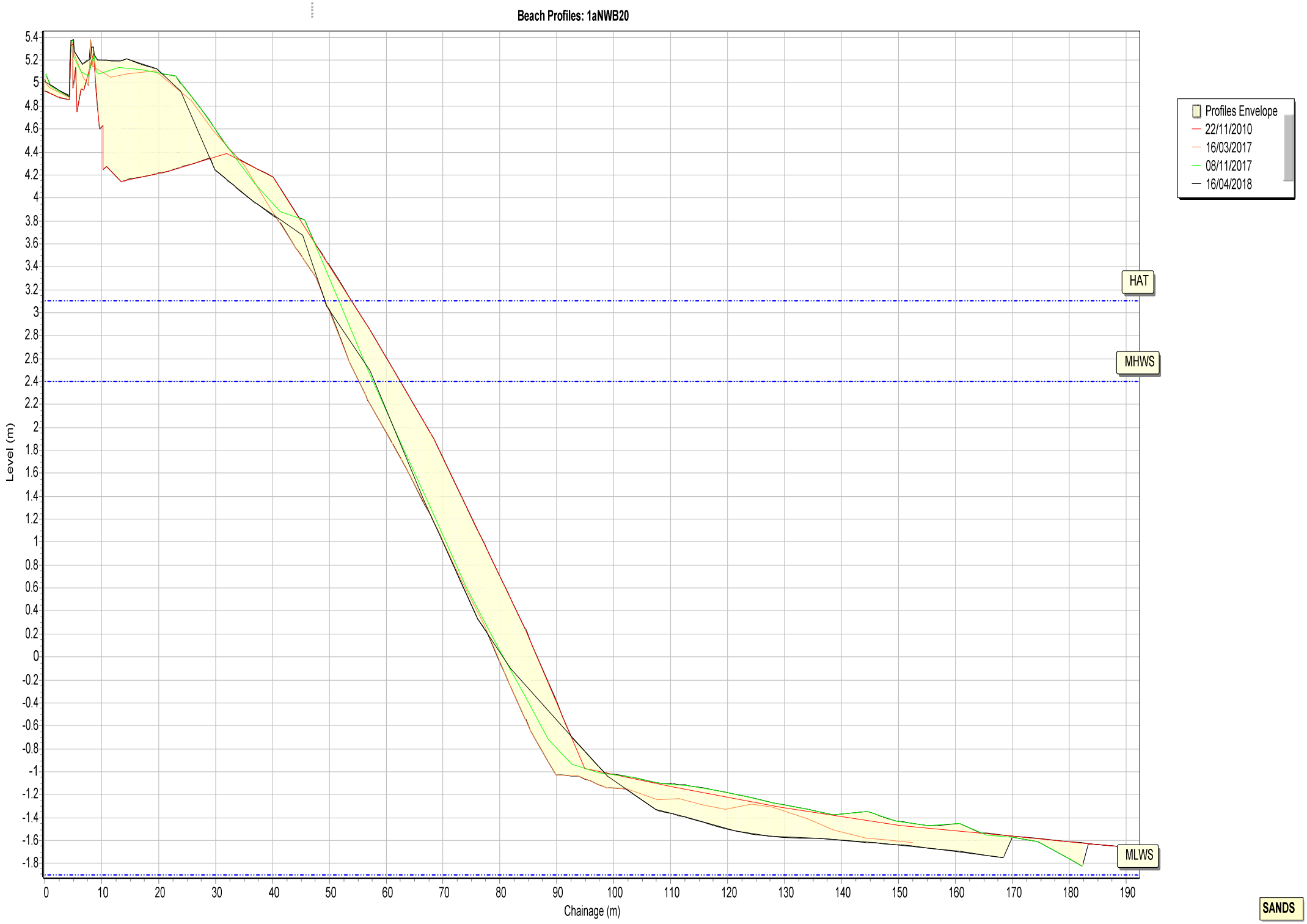
SANDS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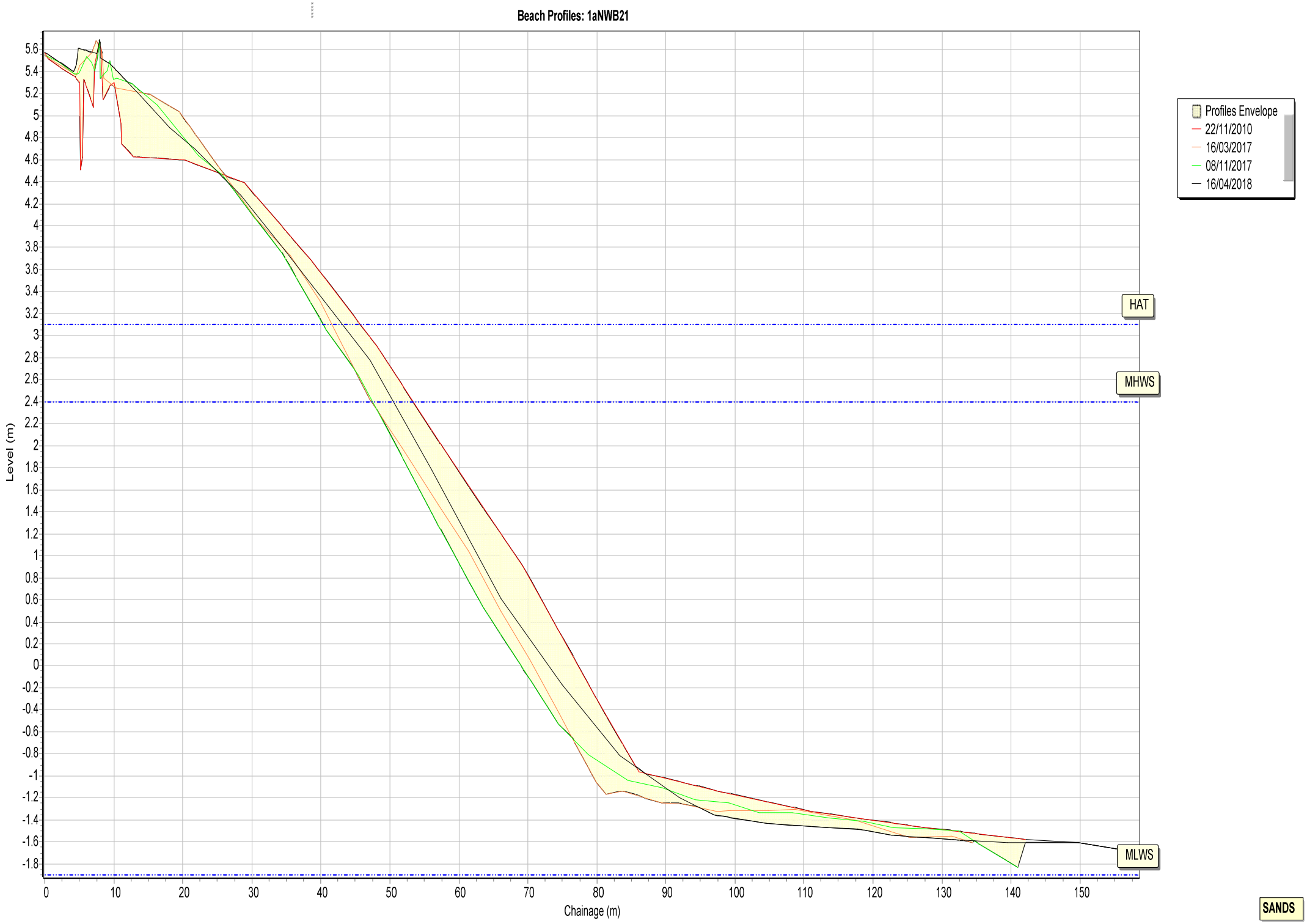
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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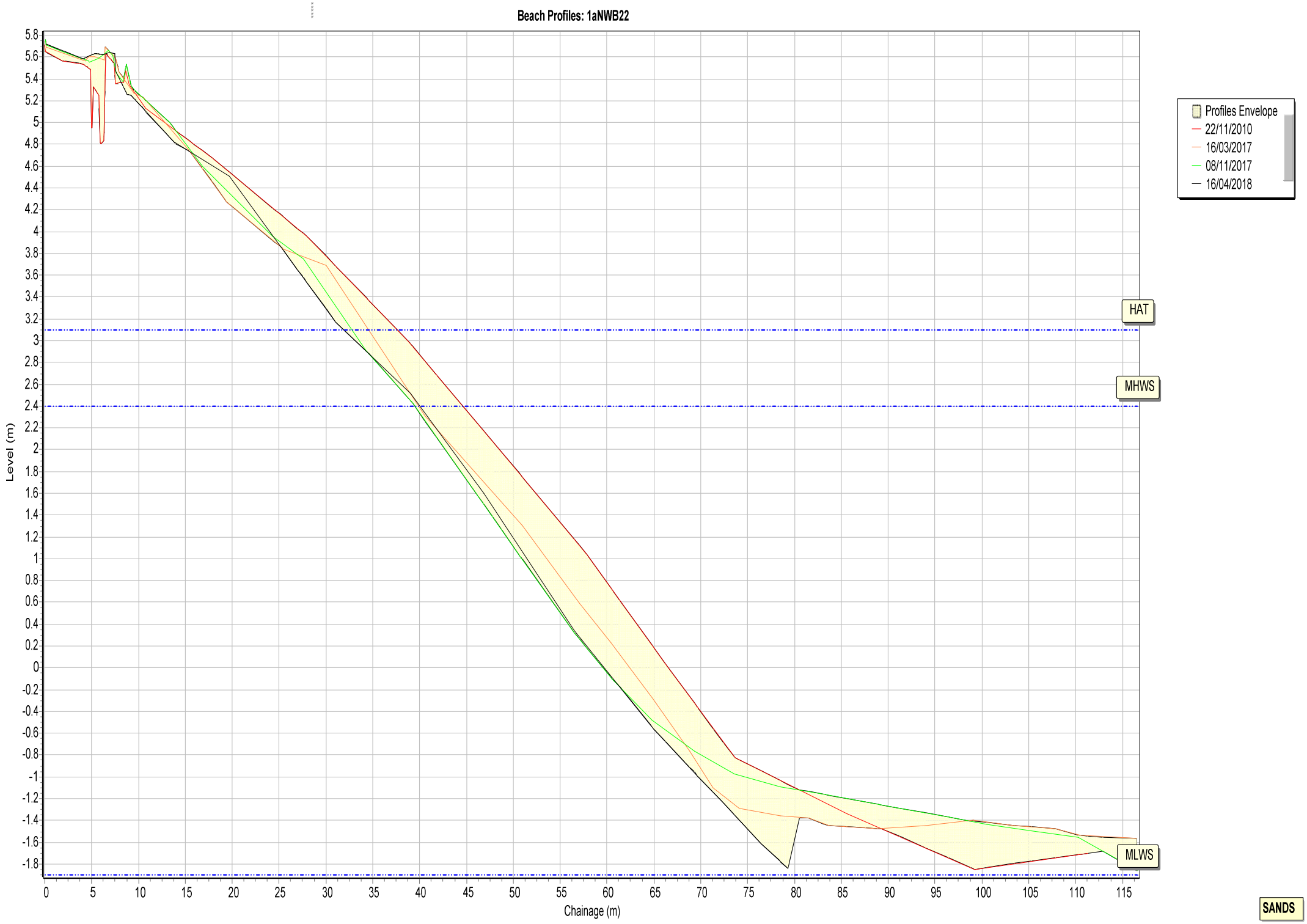
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS


Beach Profiles: 1aNWB22
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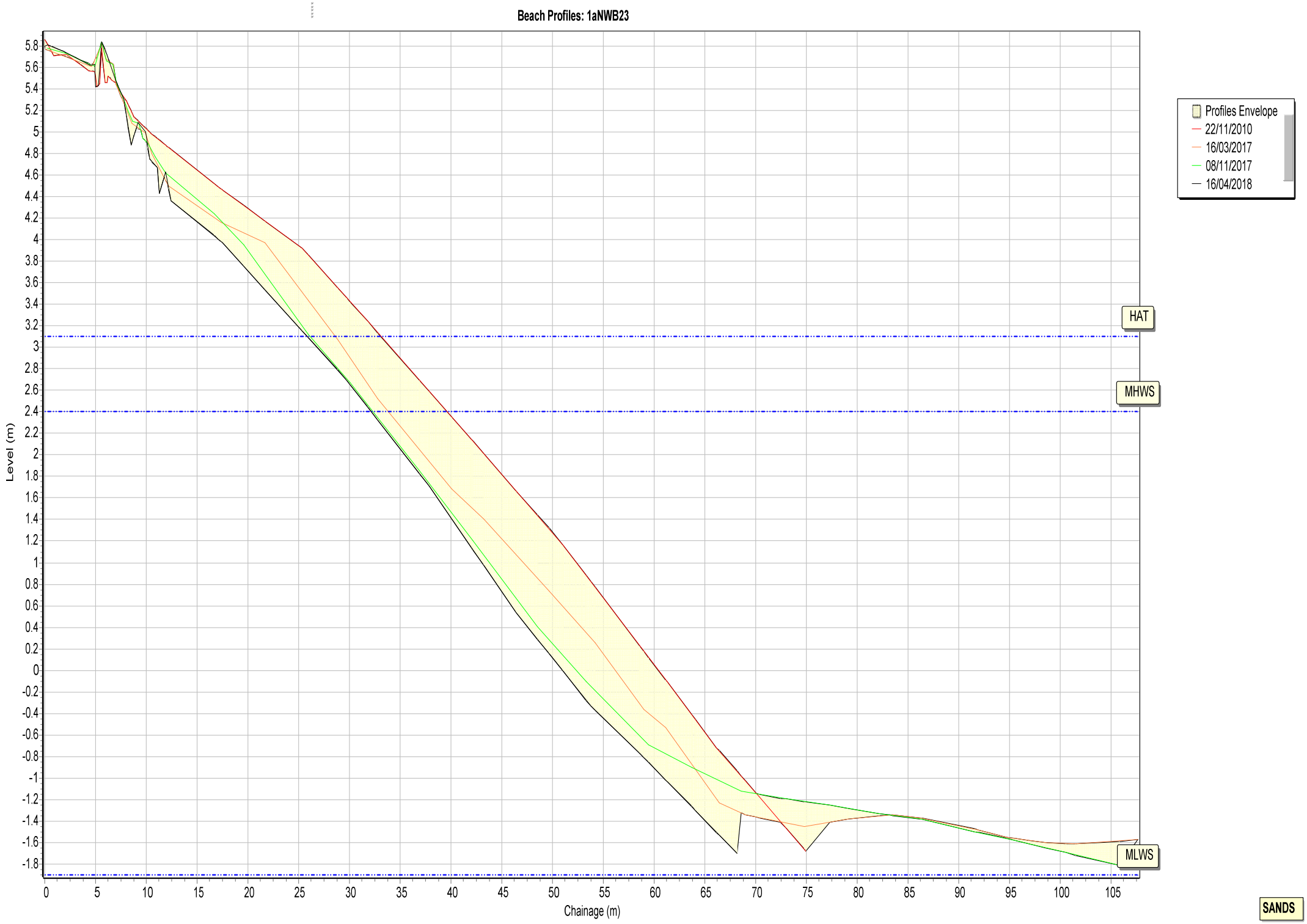
16/03/2017
08/11/2017
16/04/2018
HAT
MHWS
MLWS
Level (m)
Chainage (m)
SANDS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Chainage (m)
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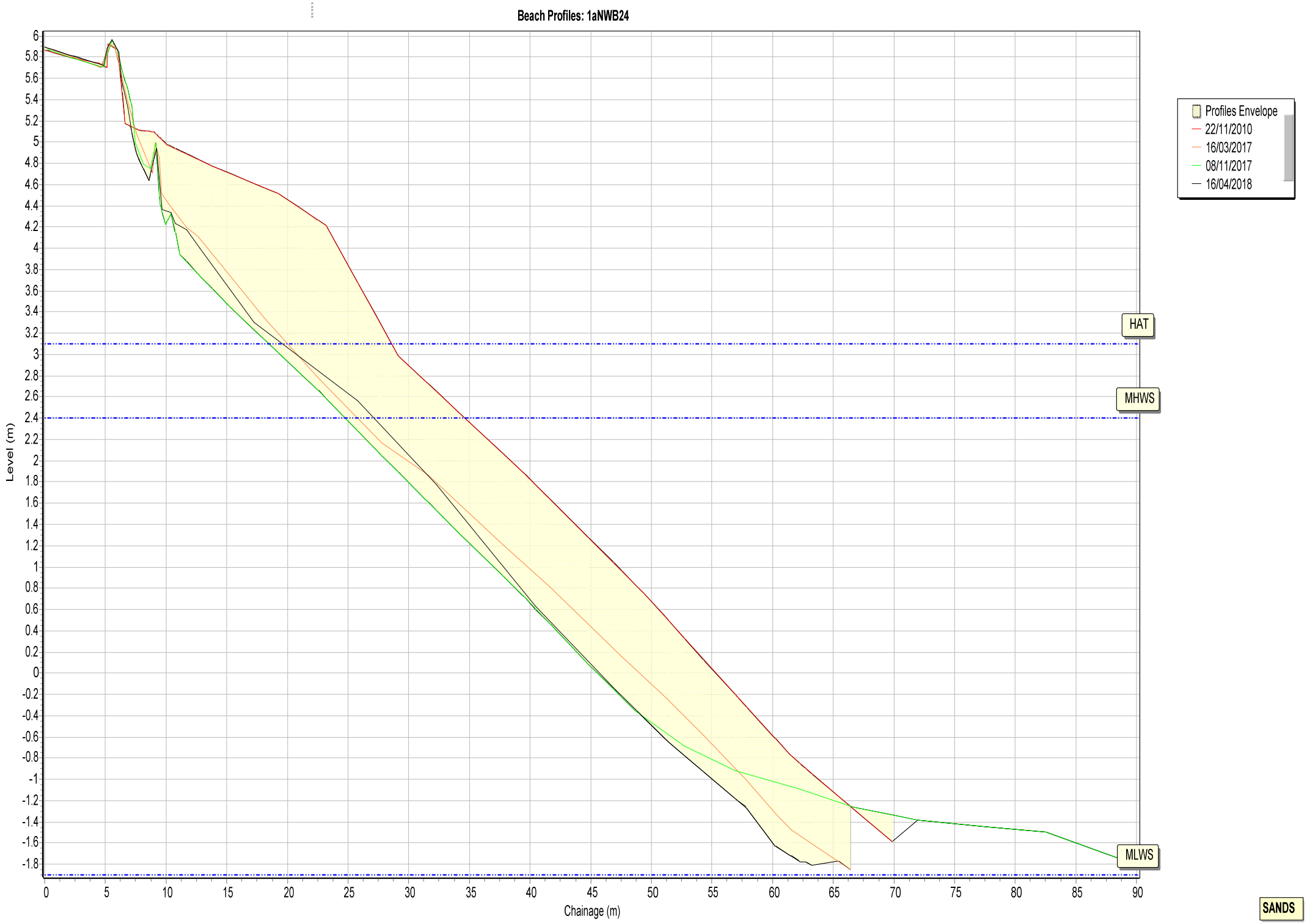
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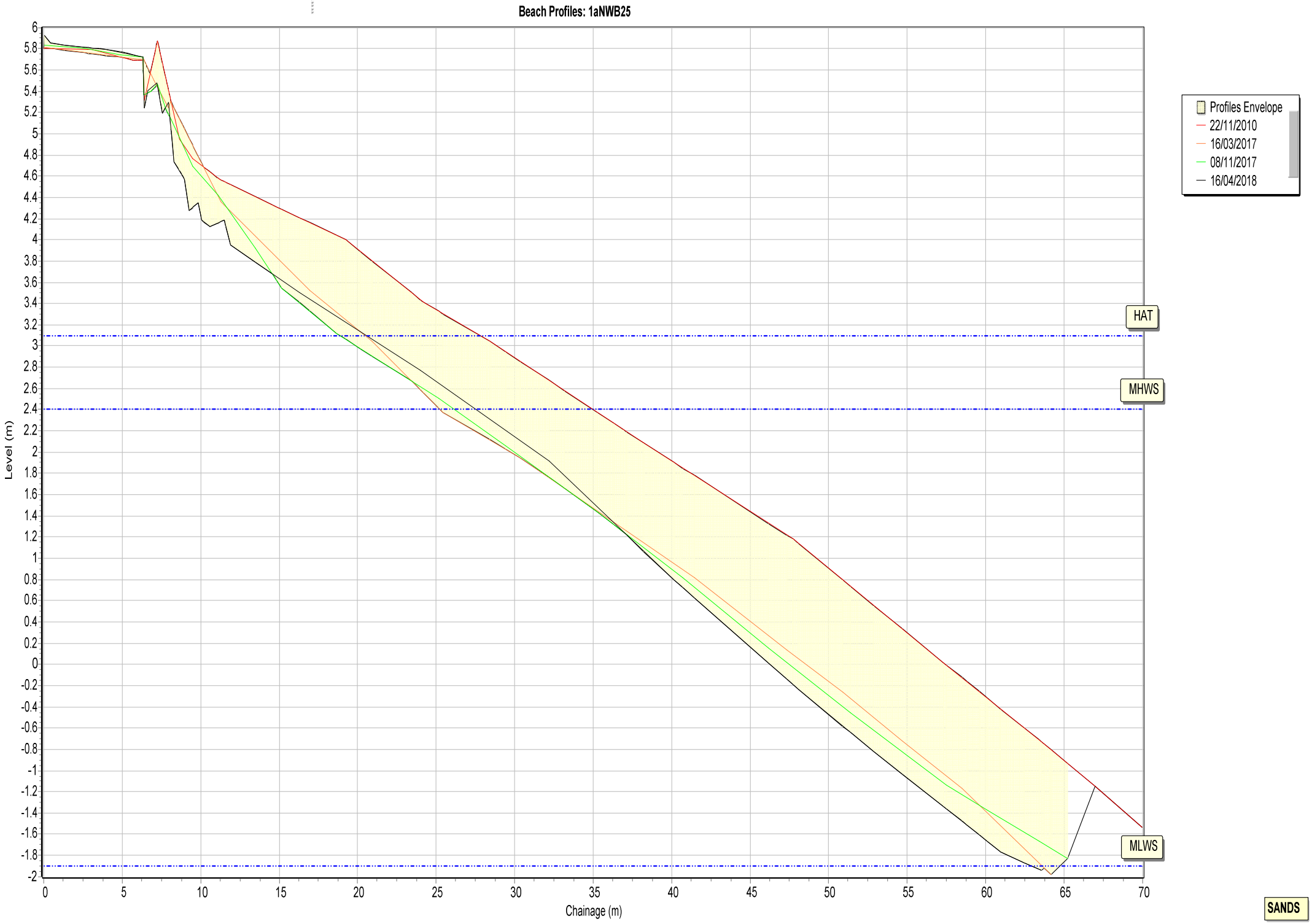
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Chainage (m)
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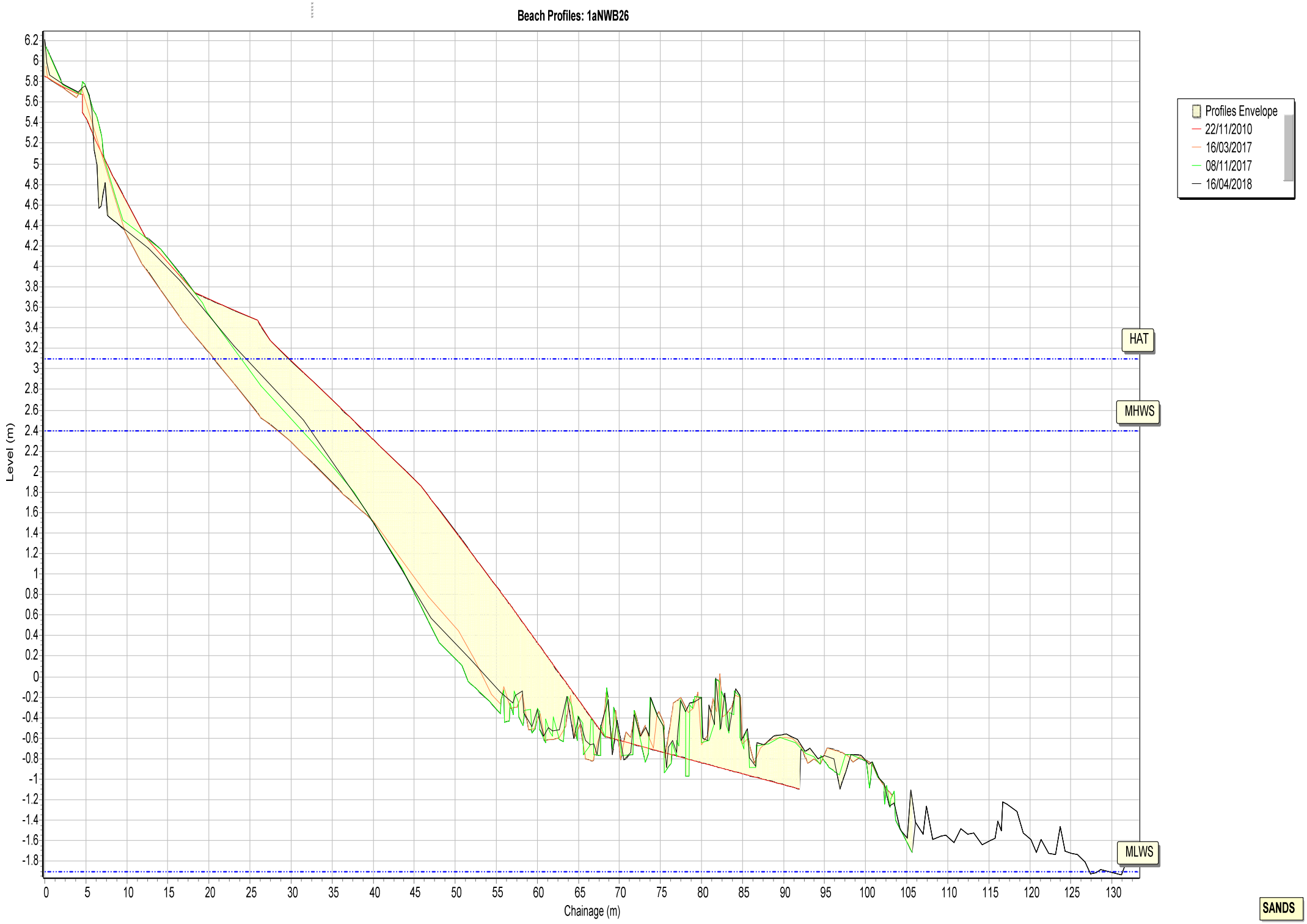
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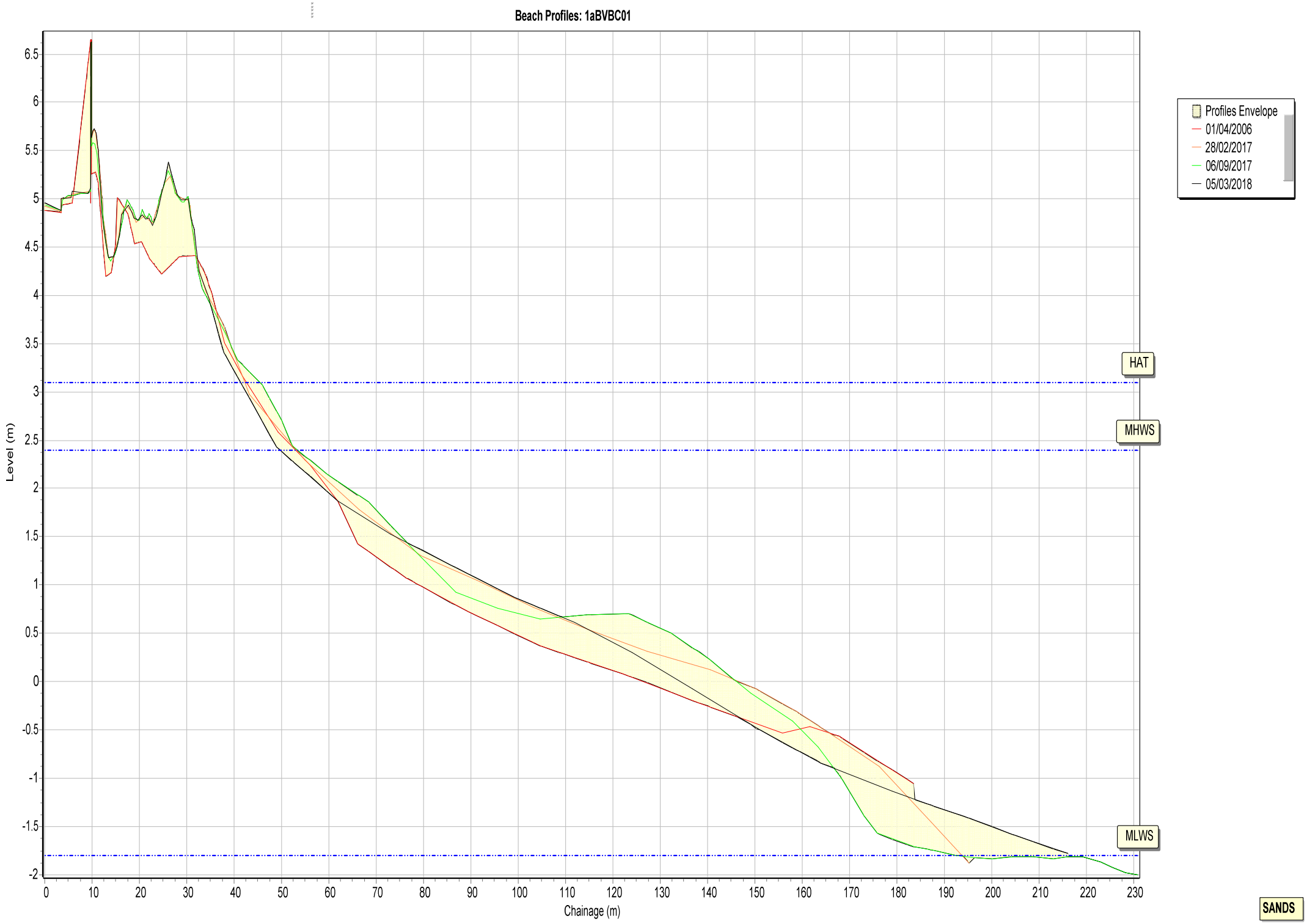
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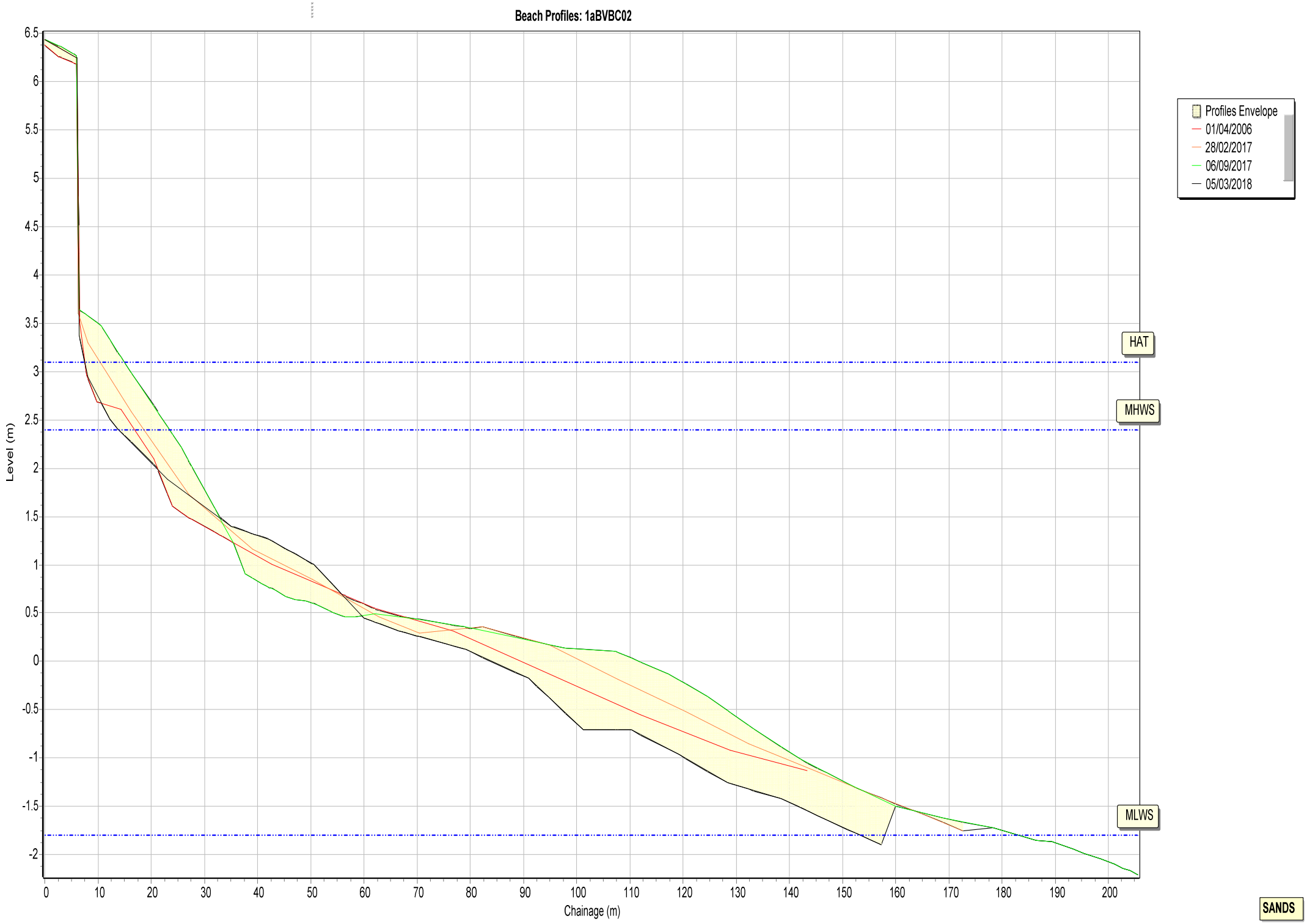
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Chainage (m)
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5.5
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4.5
4
3.5
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2.5
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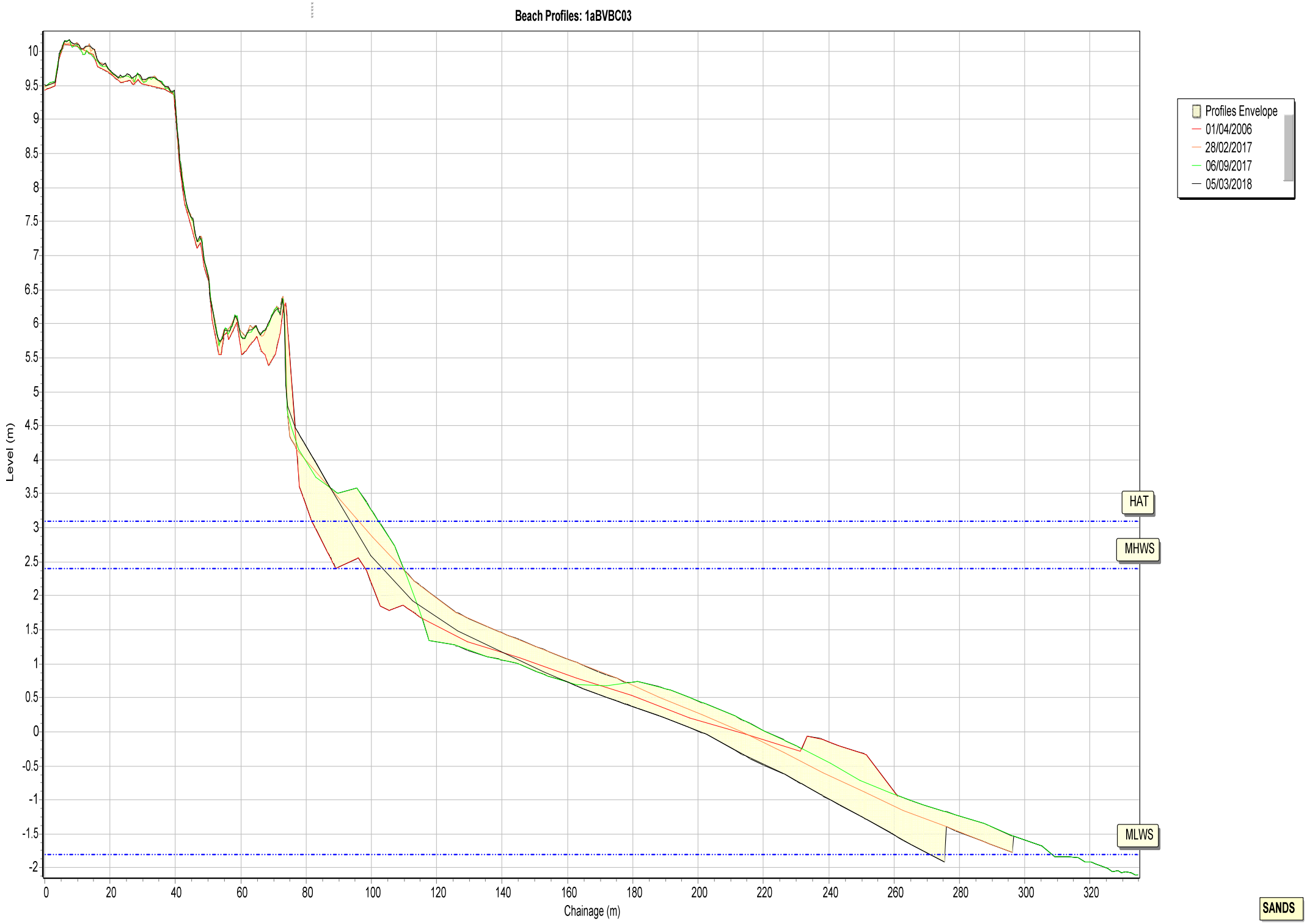
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8.5
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7.5
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4.5
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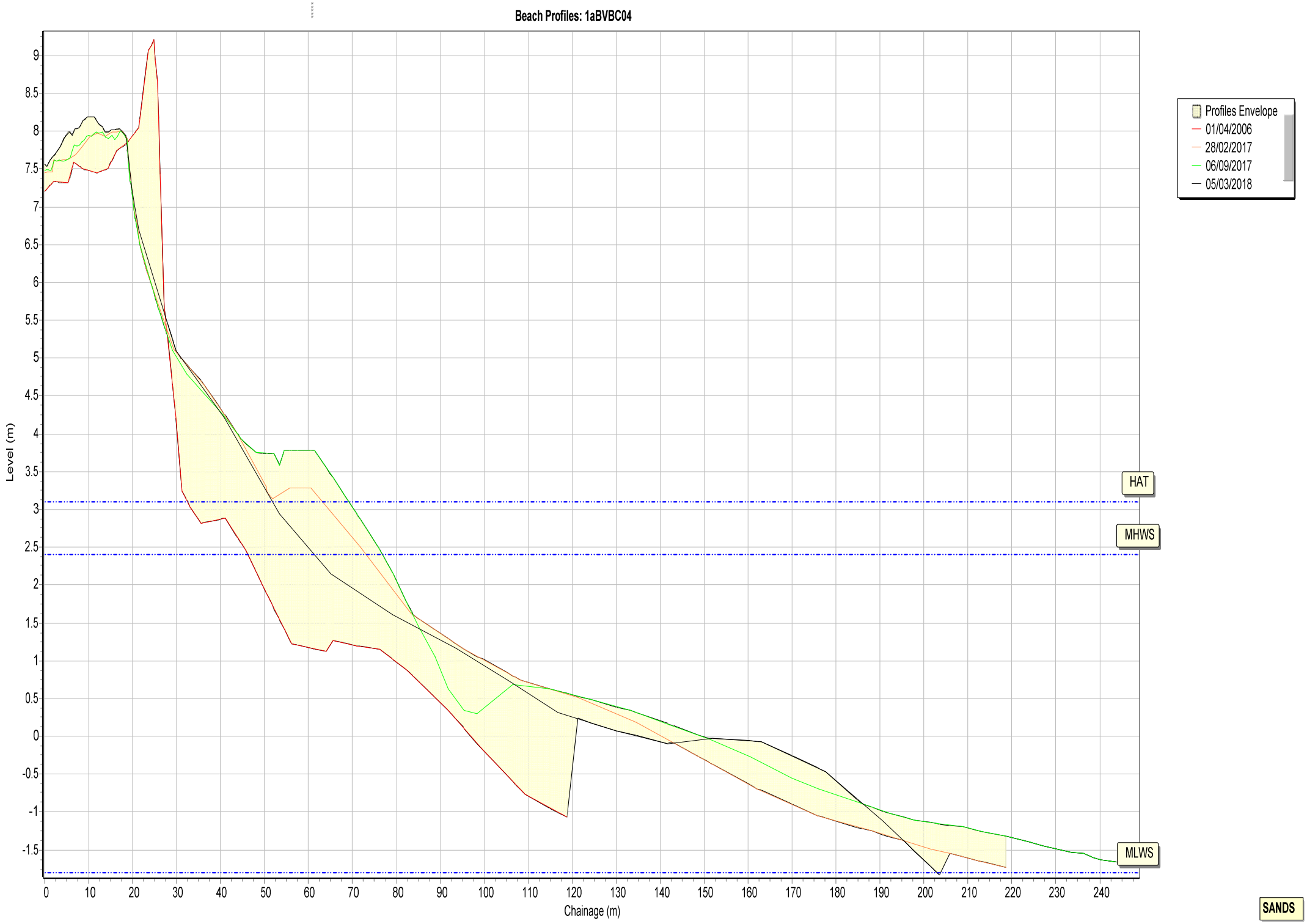
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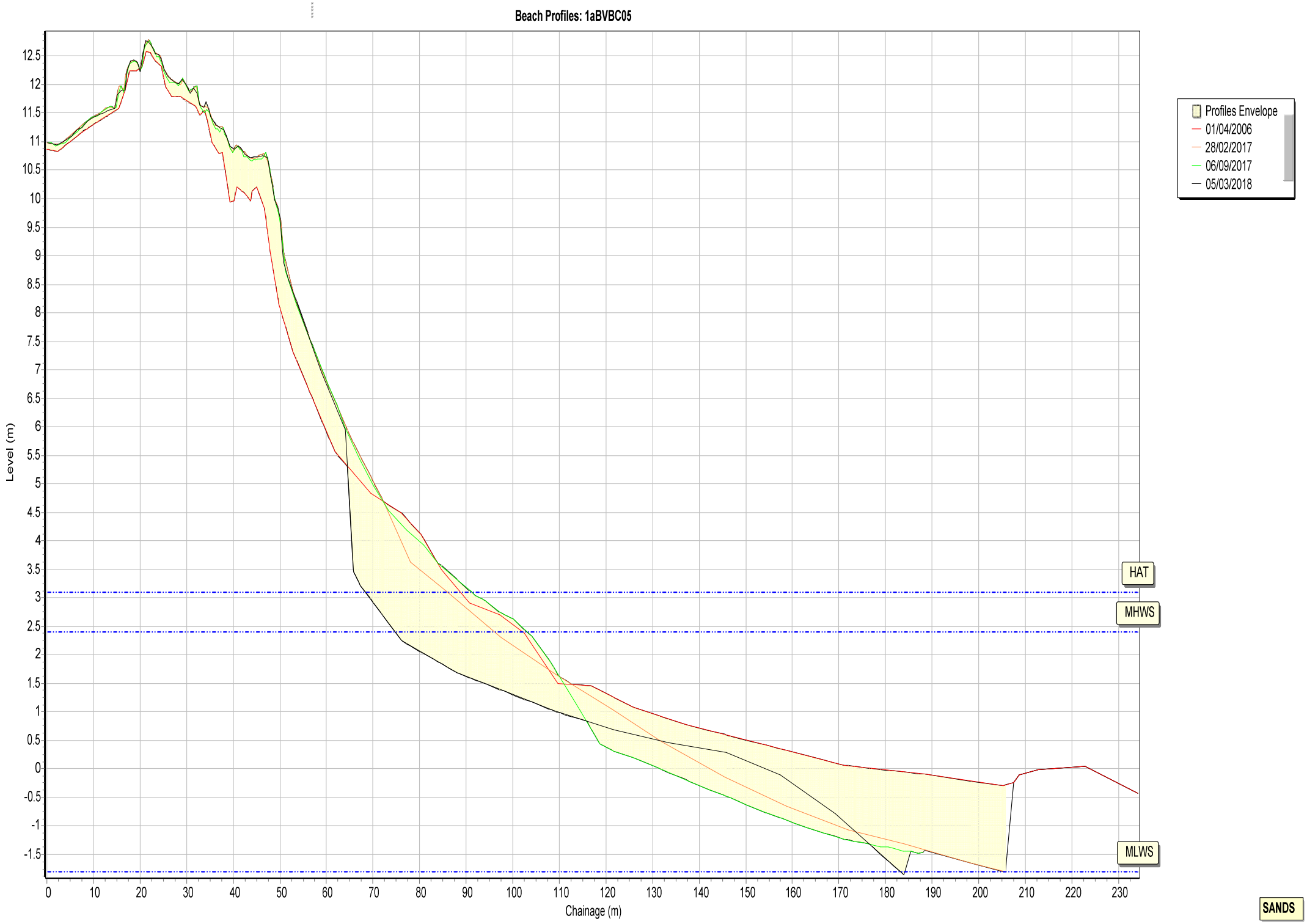
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Chainage (m)
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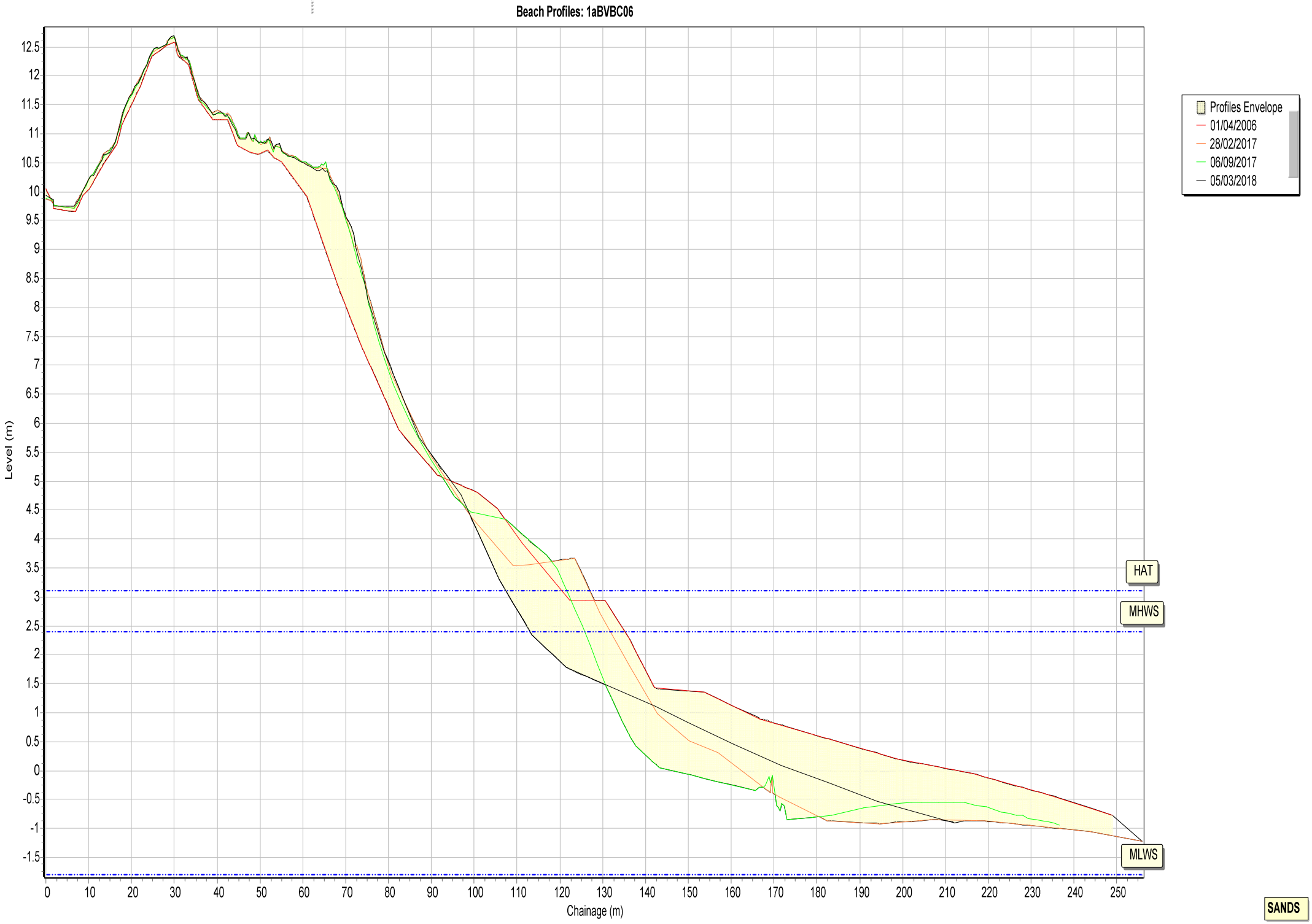
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MLWS
SANDS
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Chainage (m)
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11.5
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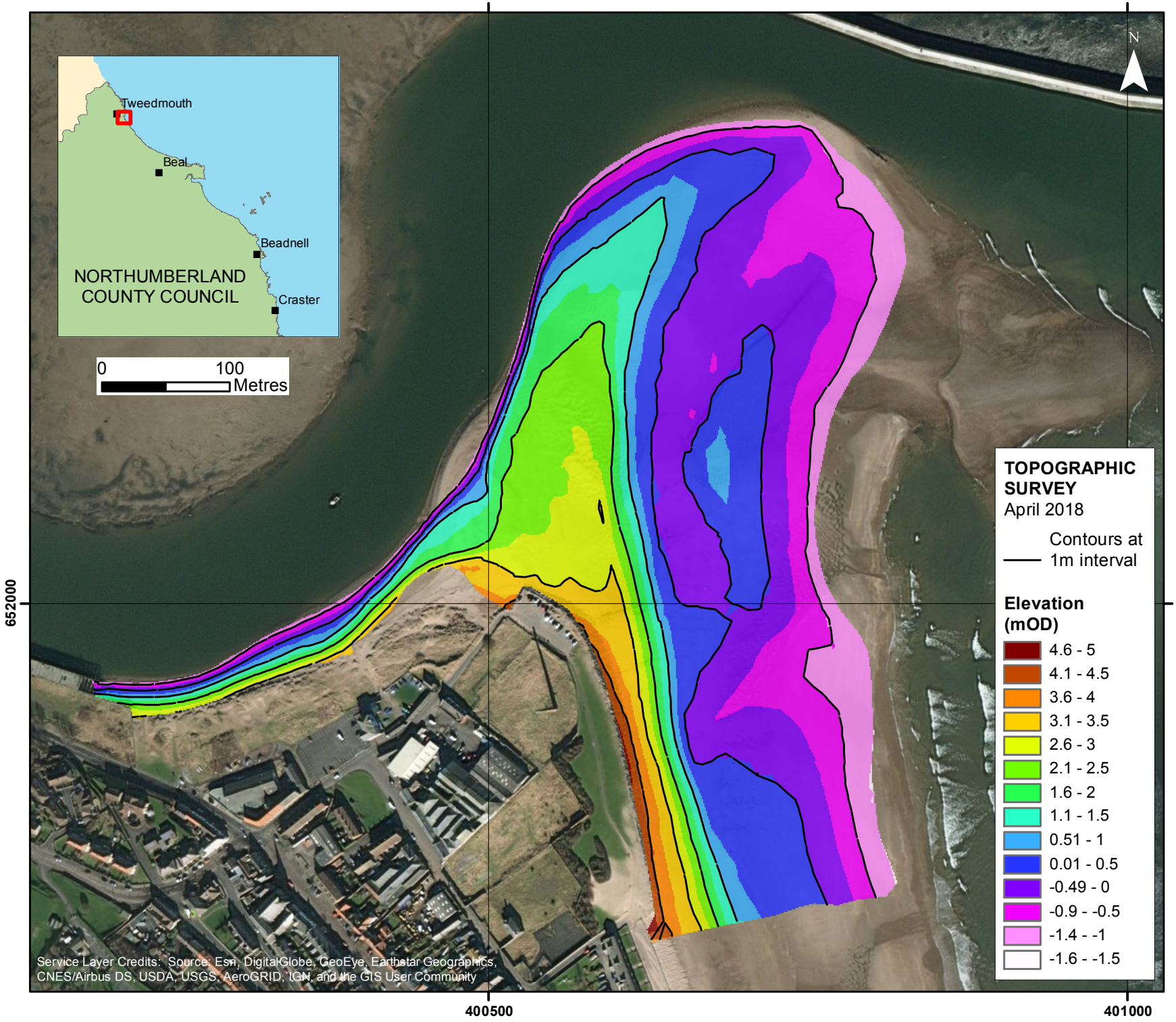
250

Appendix B

Topographic Survey



Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 1

BERWICK

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2018

Drawing Scale at A4 1:4,000

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

Royal HaskoningDHV
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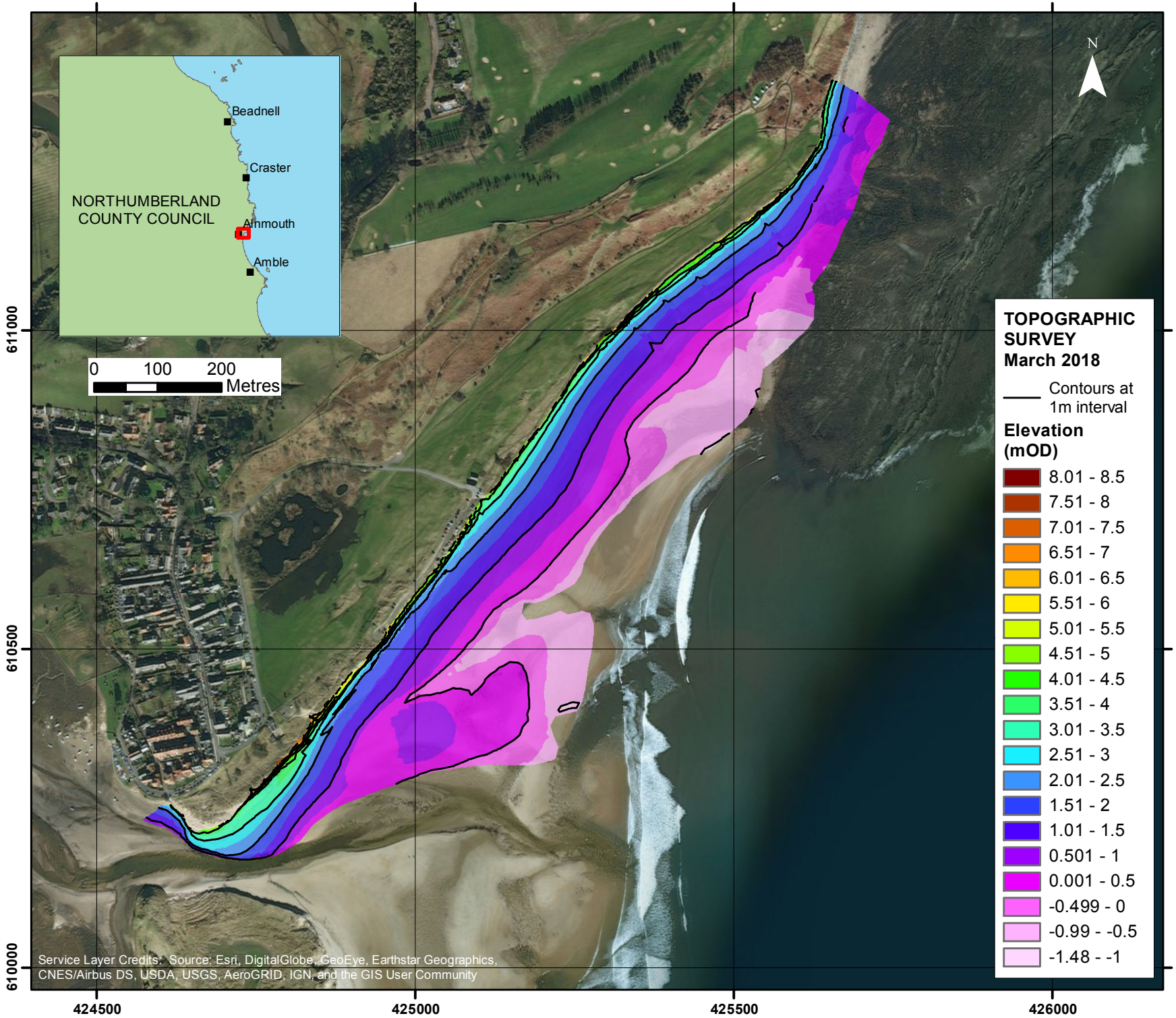

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 2

ALNMOUTH

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2018

Drawing Scale at A4 1:8,000

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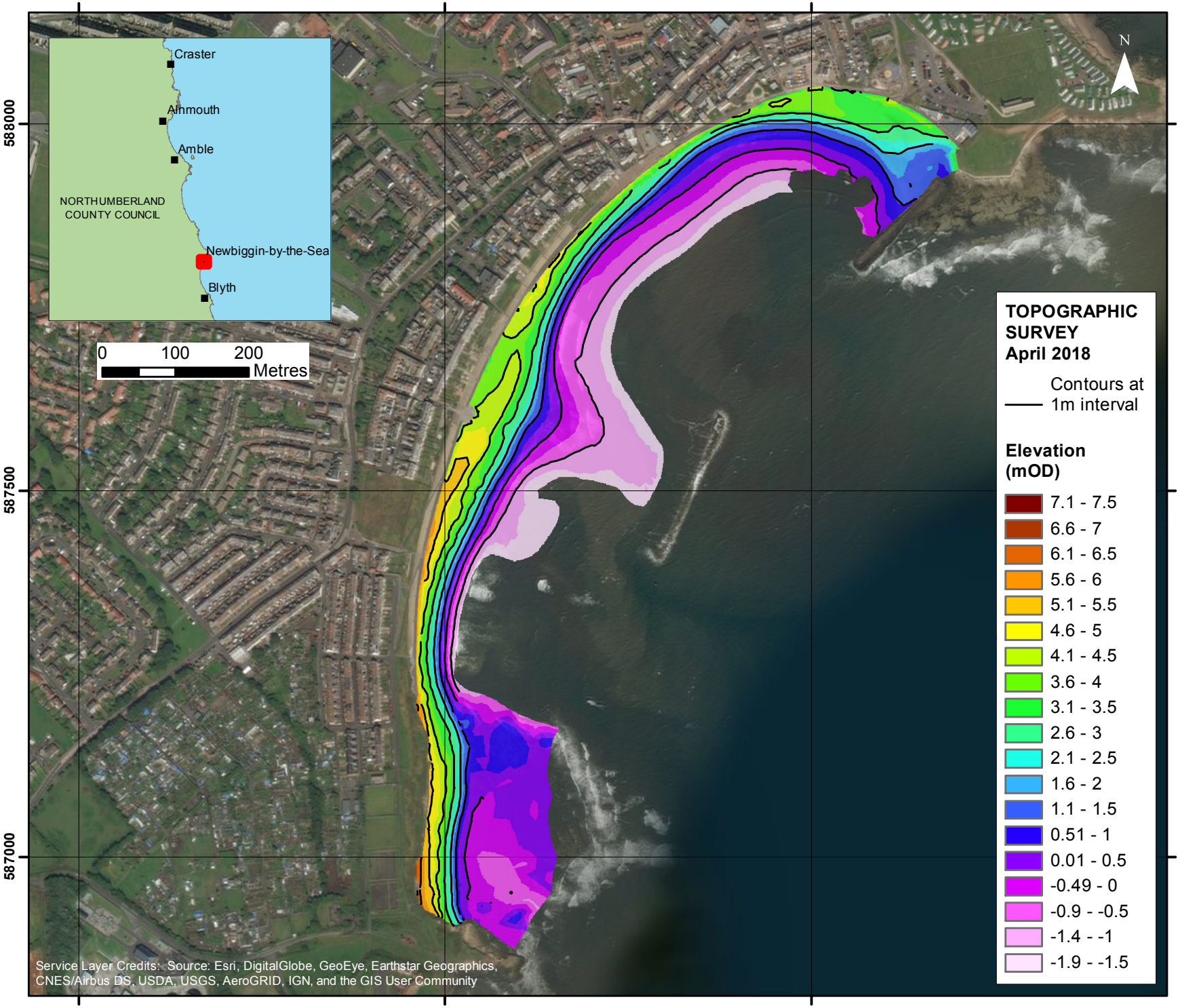

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 3

NEWBIGGIN-BY-THE-SEA

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2018

Drawing Scale at A4 1:7,000

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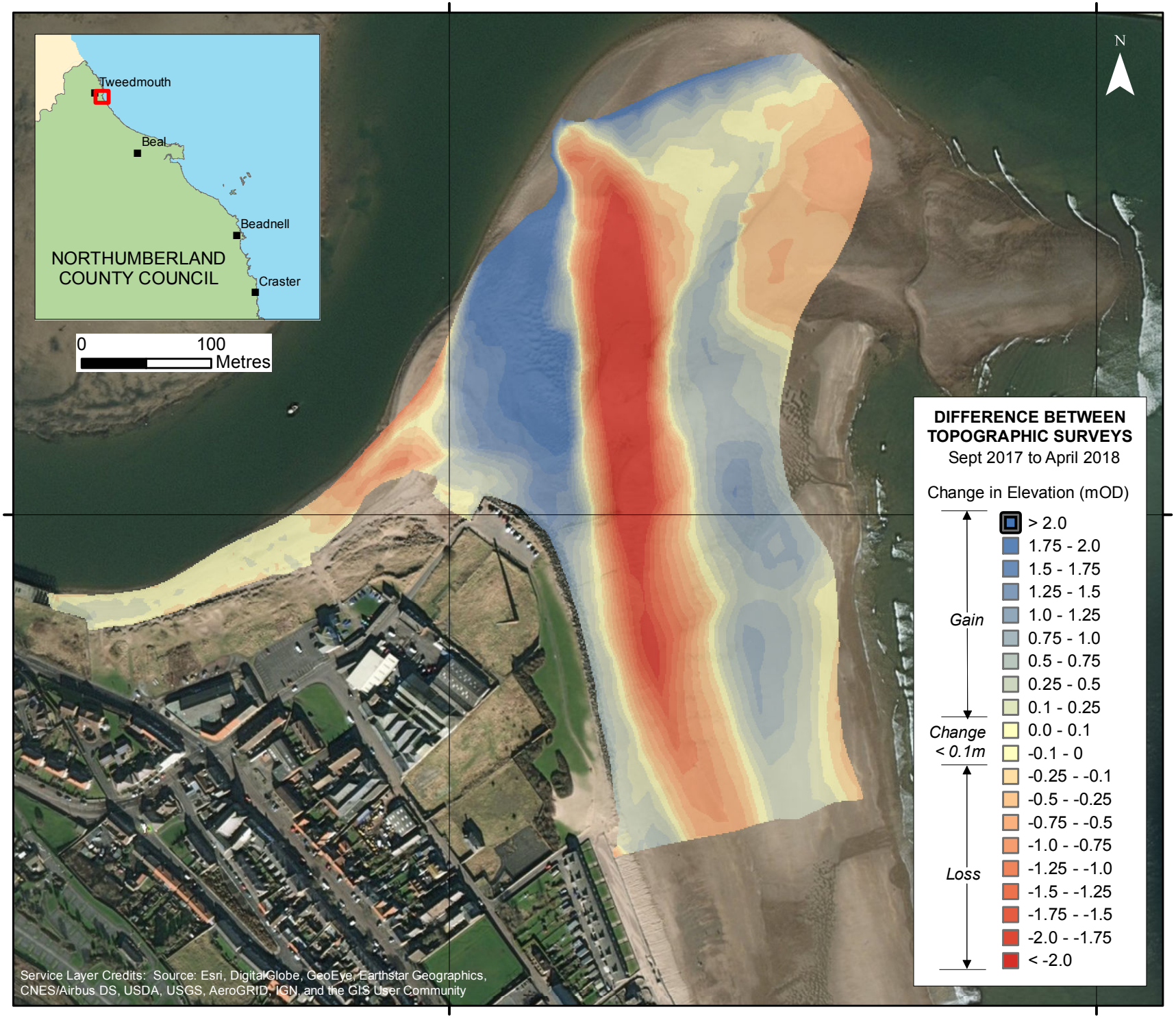

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 4

BERWICK

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2018

Drawing Scale at A4 1:4,000

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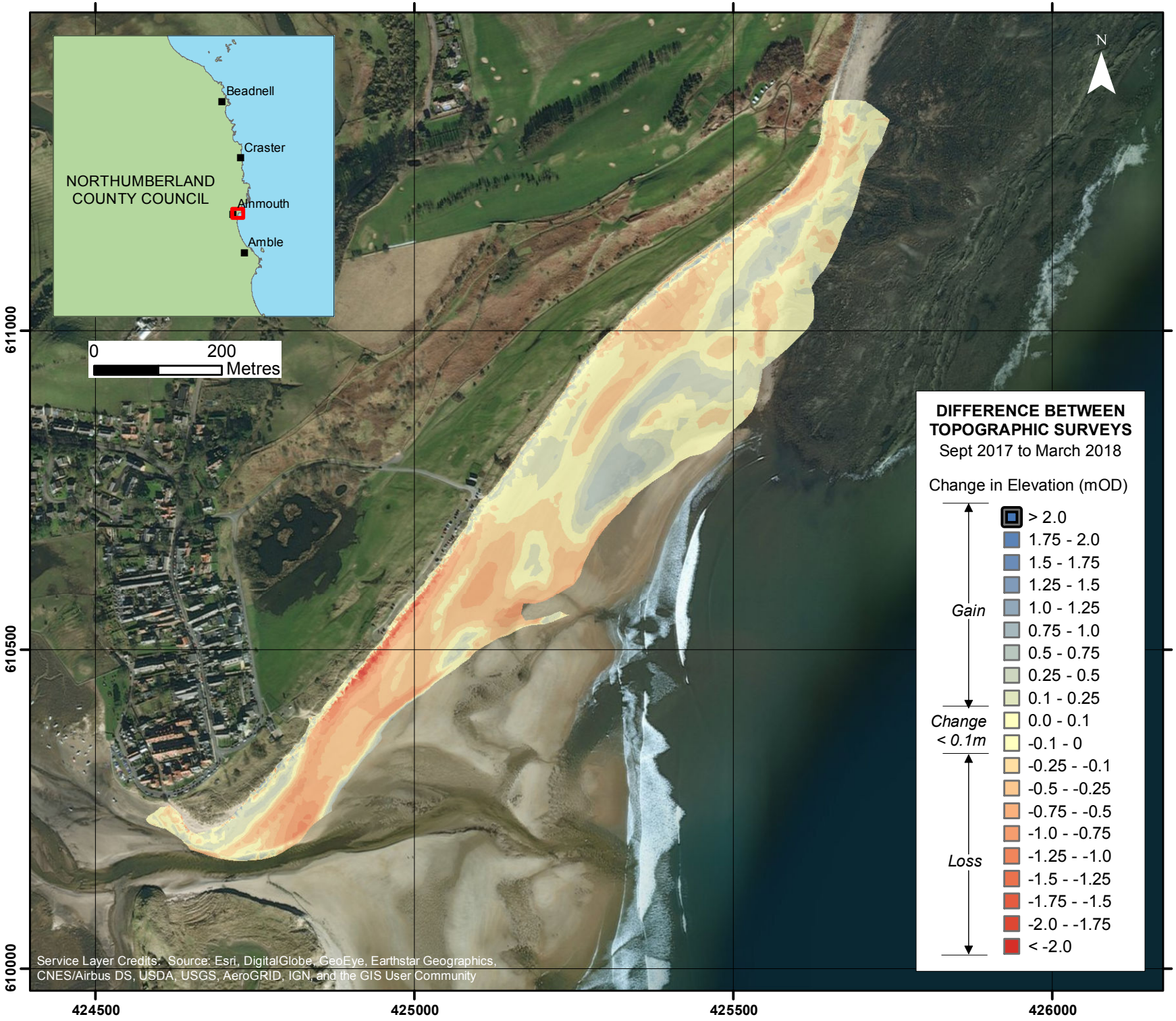

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 5

ALNMOUTH

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2018

Drawing Scale at A4 1:8,000

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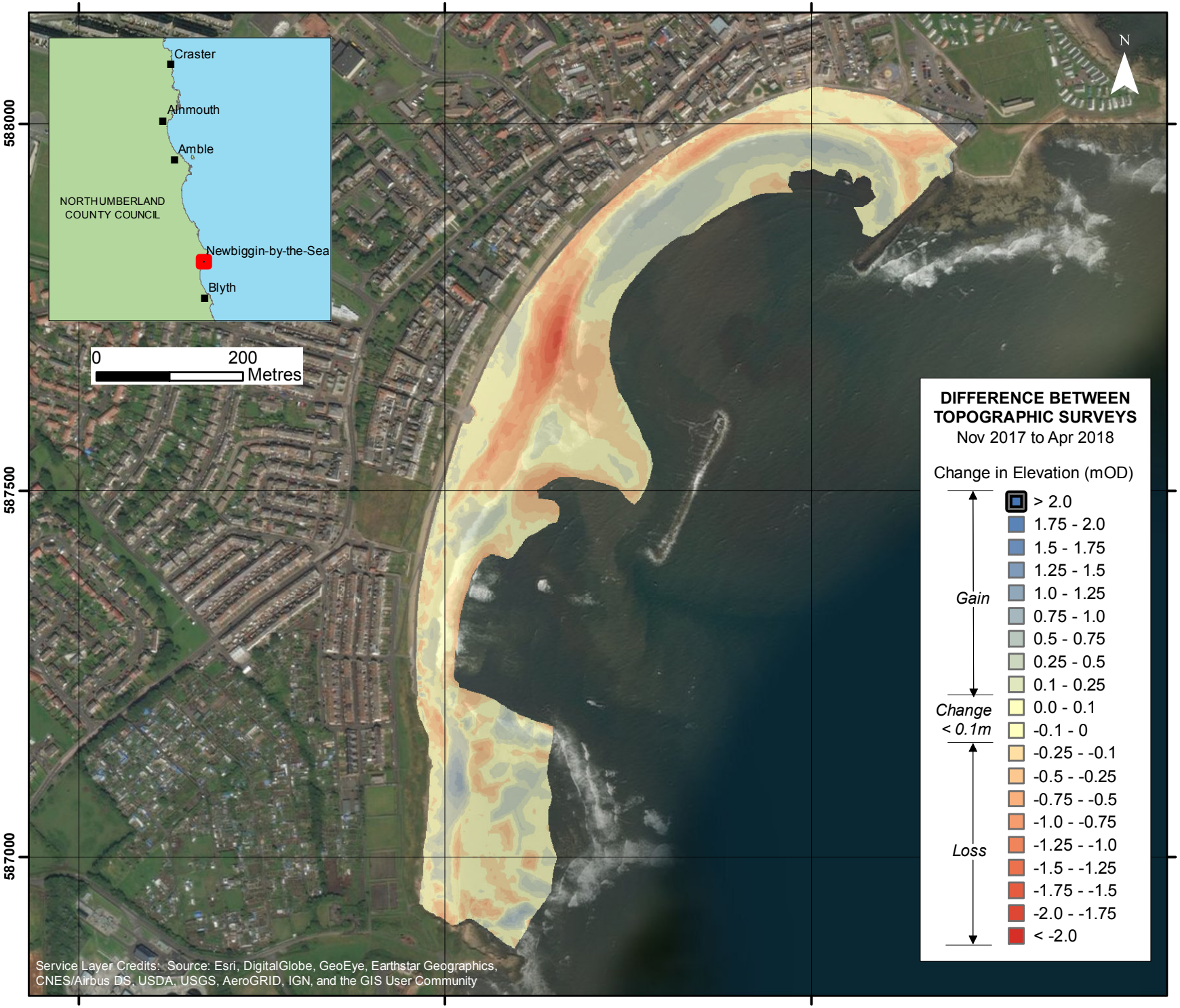

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 6

NEWBIGGIN-BY-THE-SEA

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2018

Drawing Scale at A4 1:7,000

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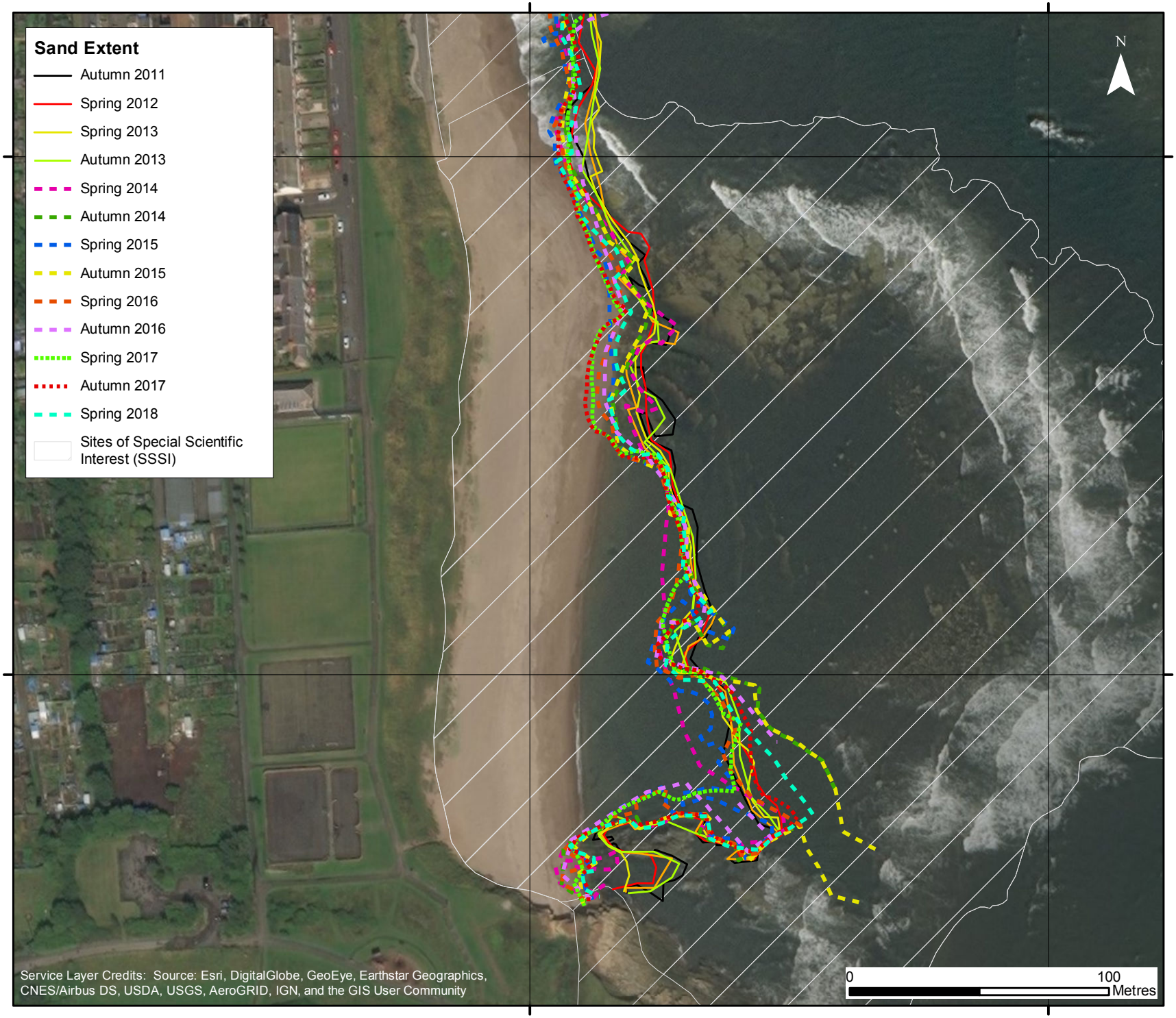
Appendix D

Sand Extent Survey



Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

NEWBIGGIN-BY-THE-SEA SAND EXTENT

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2018

Drawing Scale at A4 1:2,000

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