



Cell 1 Regional Coastal Monitoring Programme Analytical Report 13: 'Full Measures' Survey 2020

North Tyneside Council



December 2020

Contents

Disclaimer	i
Abbreviations and Acronyms.....	ii
Water Levels Used in Interpretation of Changes	ii
Glossary of Terms.....	iii
Preamble	iv
1. Introduction.....	9
1.1 Study Area	9
1.2 Methodology.....	9
2. Analysis of Survey Data	10
2.1 Whitley Sands	10
2.2 Cullercoats Bay	13
2.3 Tynemouth Long Sands	14
2.4 King Edward's Bay	16
3. Problems Encountered and Uncertainty in Analysis	17
4. Recommendations for 'Fine-tuning' the Monitoring Programme	17
5. Conclusions and Areas of Concern	17

Appendices

Appendix A	Beach Profiles
Appendix B	Topographic Survey

List of Figures

Figure 1	Sediment Cells in England and Wales
Figure 2	Survey Locations

List of Tables

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

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Abbreviations and Acronyms

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

Water Levels Used in Interpretation of Changes

Water Level Parameter	Water Level (m AOD)
	River Tyne
1 in 200 year	3.7
HAT	3.1
MHWS	2.4
MLWS	-1.9

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

Glossary of Terms

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

Preamble

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

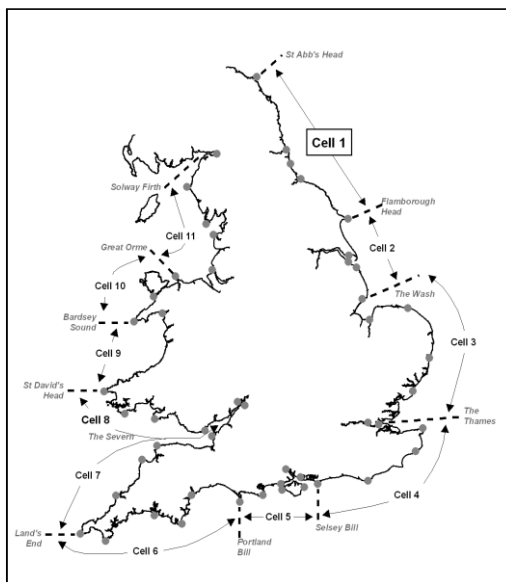


Figure 1 Sediment Cells in England and Wales

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



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

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

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

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

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

To date the following reports have been produced:

Table 1 Analytical, Update and Overview Reports Produced to Date

Year		Full Measures		Partial Measures		Cell 1 Overview Report
		Survey	Analytical Report	Survey	Update Report	
1	2008/09	Sep-Dec 08	May 09	Mar-May 09	Jun 09	
2	2009/10	Sep-Dec 09	Mar 10	Feb-Mar 10	Jul 10	
3	2010/11	Aug-Nov 10	Feb 11	Feb-Apr 11	Aug 11	Sep 11
4	2011/12	Oct-Nov 11	Oct 12	Mar-May 12	Feb 13	
5	2012/13	Sep-Oct 12	Mar 13	Mar-Apr 13	Jun 13	
6	2013/14	Sep-Oct 13	Feb 14	Mar-Apr 14	Jul 14	
7	2014/15	Oct-Nov 14	Feb 15	Mar 15	Jul 15	
8	2015/16	Oct-Nov 15	Feb 16	Mar 16	Jul 16	Jun 16
9	2016/17	Sep 16	Feb 17	Mar 17	Jul 17	
10	2017/18	Sep-Oct 17	Feb 18	Mar 18	May 18	
11	2018/19	Sep-Oct 18	Jan 19	Feb-Mar 19	Aug 19	
12	2019/20	Sep-Nov 19	Dec 19	Mar 20	Mar 20	
13	2020/21	Sep 20	Nov 20 (*)			

(*) The present report is **Analytical Report 13** and provides an analysis of the 2020 Full Measures survey for North Tyneside Council's frontage.

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

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

Table 2 Sub-divisions of the Cell 1 Coastline

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

1. Introduction

1.1 Study Area

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

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

1.2 Methodology

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

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

The location of these surveys is shown in Figure 1. The beach profiles and topographic surveys were undertaken between the 4th and 23rd September 2020. The weather conditions varied throughout the survey; further details can be found in the surveyor's reports.

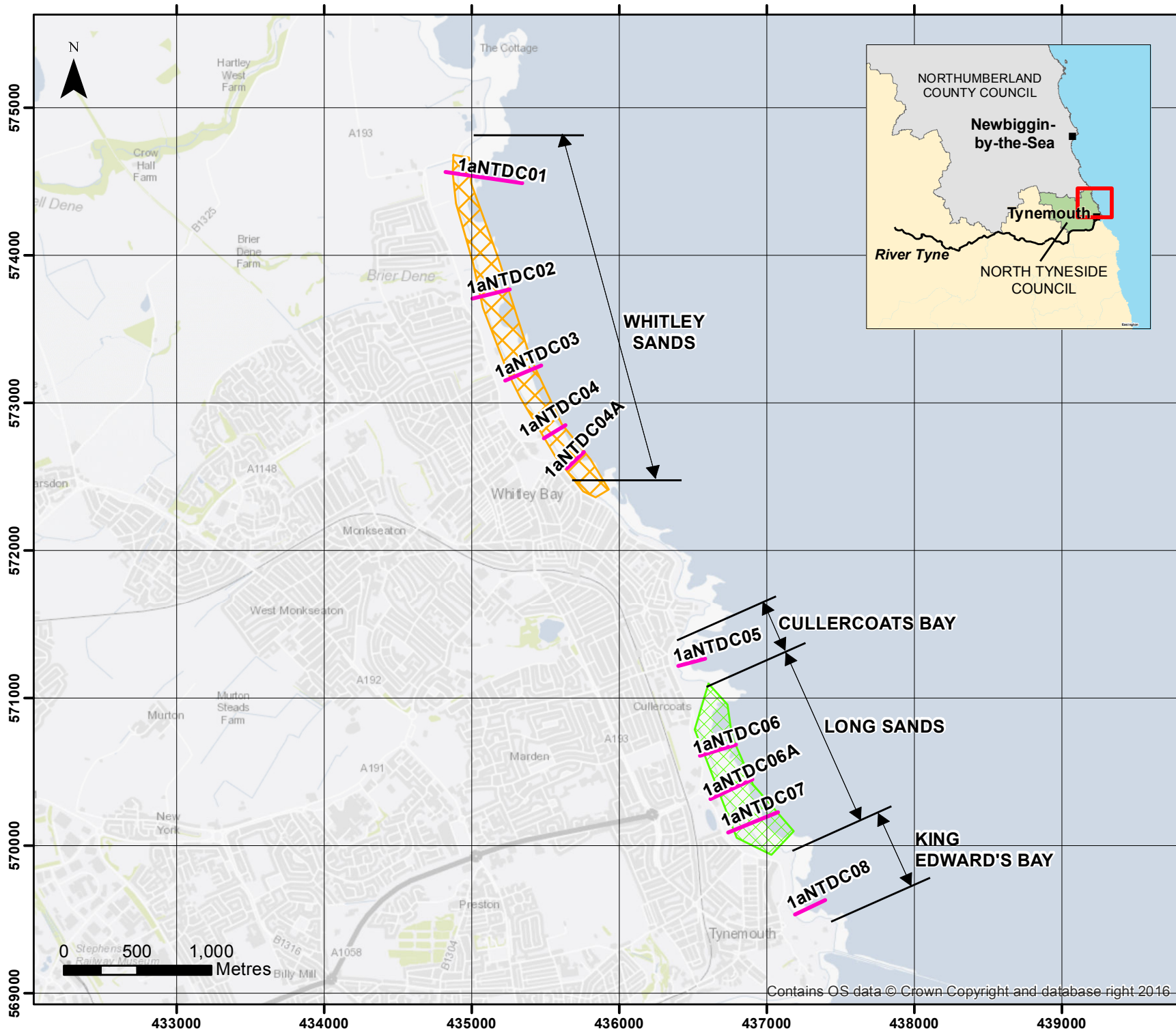
All data have been captured in a manner commensurate with the principles of the Environment Agency's *National Standard Contract and Specification for Surveying Services* and stored in a file format compatible with the software systems being used for the data analysis, namely SANDS and ArcGIS. This data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

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

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

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

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



Key

SURVEY LOCATIONS

Topographic Profiles

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

Topographic Surveys

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

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Figure 2 - Map 1

North Tyneside Council Frontage

Analytical Report
Topo Surveys

Drawing Scale at A4 1:35,000

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2. Analysis of Survey Data

2.1 Whitley Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
21 st September	<p>Beach Profiles:</p> <p>Whitley Sands is covered by five beach profile lines for the Full Measures survey (Appendix A). Four of these (1aNTDC01 to 1aNTDC04) were initially surveyed in April 2002 and were surveyed annually to 2009 (Full Measures, autumn 2009) and bi-annually thereafter. From March 2010 (Partial Measures, spring 2010) onwards, an additional beach profile line (NTDC04A) has been surveyed at the southern end of the frontage. All profiles were last surveyed in March 2020 for the Partial Measures survey.</p> <p>1aNTDC01 is located in the north of Whitley Sands, along the undefended cliffs immediately south of Trinity Road car park. The cliff was not measured due to dangerous access. Since the previous survey there has been accretion of up to 0.3m of material at the toe of the cliff between chainage 30m and 40m. Across the remainder of the upper beach, from chainage 40m to chainage 100m there has been lowering by up to 0.6m. The mid beach between chainages 100m and 140m has experienced less significant lowering, typically between 0.1m and 0.2m. Seawards of chainage 140m the lower beach has experienced some accretion of up to 0.2m, however for much of the lower beach remains unchanged with the rock outcrops on the foreshore exposed. Overall the upper beach profile is at a medium level, whilst the mid and lower beach profile is at a low level when compared to the range recorded from previous surveys.</p> <p>Profile 1aNTDC02 is located in the northern part of Whitley Sands. A seawall is present at the back of the beach. On the upper beach, between the seawall at chainage 50m and chainage 90m there has been lowering by up to 1m. From chainage 90m to chainage 140m there has been accretion of up to 0.6m. This movement of material has caused the beach profile gradient to reduce and a wide shallow berm is beginning to form across the mid-beach. The lower beach from chainage 140m until the end of the survey at chainage 185m remains largely unchanged and the rocky foreshore remains exposed. The profile is generally at a medium level when compared with the range recorded from previous surveys.</p>	<p>Since the last survey, there has generally been lowering on the upper beach with accretion across the mid and lower beach, indicating a seaward drawdown of material. The trend appears to increase in prominence from the north to south with mid-beach berms having formed in the southernmost profiles.</p> <p>Longer term trends: Beach levels are generally within the middle of the range seen in earlier surveys. At profile 1aNTDC03, 1aNTDC04 and 1aNTDC05, the crest of the berm feature is the highest on record.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>Profile 1aNTDC03 is located at the centre of Whitley Sands. Beach lowering by up to 0.5m has occurred between the seawall at chainage 12m and chainage 40m. From chainage 40m to 90m there has been accretion of up to 0.8m. The seaward movement of material is similar to that experienced in the profiles to the north, and a wide shallow mid-beach berm is forming. A rock outcrop at chainage 90m is exposed as in previous surveys. Seawards of this point until the end of the survey at chainage 130m there is between 0.1 and 0.2m of accretion. The profile is at a medium level the upper and lower reaches whilst the mid-beach is at a high level compared to the range recorded from previous surveys. The crest of the developing berm feature between chainage 51m and 68m is the highest on record.</p> <p>Profile 1aNTDC04 is located in the southern part of Whitley Sands. There has been lowering by up to 1m across the upper beach (between chainage 17m and 60m). Seawards from this point accretion has dominated across the remainder of the profile. From chainage 60m to the end of the survey at chainage 160m accretion of up to 0.6m has formed a wide shallow berm and advanced the toe of the profile seawards by approximately 20m from the previous survey. Overall, the upper and mid beach is at a medium level whereas the lower beach is at a high level when compared with the range recorded in previous surveys.. The section of beach between chainage 68m and 88m is the highest on record.</p> <p>Profile 1aNTDC04a is located towards the southern end of Whitley Sands. There has been beach lowering at the toe of the seawall by 1.6m, with the amount of lowering diminishing with progression across the upper beach to chainage 20m. Seawards from this point until the end of the survey at chainage 132m accretion by up to 1m in level has covered the mid and lower beach, including the rocky platform around chainage 80m which was exposed during the previous survey. Overall, the profile is at a high level compared to the range recorded from previous surveys. With the section between chainage 44m and 95m being the highest on record.</p>	
<p>21st September 2020</p>	<p>Topographic Survey:</p> <p>Whitley Sands is covered by an annual topographic survey, which commenced in October 2010.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2020) have been used to create a digital ground model (DGM) (Appendix B – Map 1) using a GIS. A difference plot has also been produced using the DGM (Appendix B – Map 3) produced from the last produced topographic survey (Full Measures, autumn 2019) and the present survey.</p>	<p>The most recent topographic survey difference plot shows a mixed picture of lowering and accretion with neither process being clearly dominant.</p> <p>The topographic survey does indicate a potential movement of material towards the south of the bay,</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>The difference plot shows generally lowering on the upper beach, with a shore parallel band of accretion on the upper mid-beach. Towards the south of the bay the effect is more pronounced with a wider band of deeper lowering on the upper beach and a wider band of greater accretion across the mid and lower beach. The magnitude of change is generally less in the north of the bay. Some pockets of lowering on the mid and lower beach are present around the centre of the bay whilst the southern end of the bay experiences more pronounced lowering and accretion. This is a comparison of annual surveys, rather than a biannual comparison like the beach profiles. Despite this the changes observed in the detailed profiles broadly align with the pattern of change observed within the annual difference plot, indicating ongoing seasonal migrations of berm features within the bay.</p>	<p>evidenced here by the greater levels of accretion on the lower beach.</p> <p>Two areas of erosion which occur in the mid to lower beach of the northern bay and upper beach of the southern bay appear to be present in the current comparison plot as has been the case in previous surveys.</p>

2.2 Cullercoats Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
4 th September	<p>Beach Profiles:</p> <p>Cullercoats Bay is covered by one beach profile line for the Full Measures survey (Appendix A). This was surveyed annually each autumn between 2002 and 2009. From spring 2010 onwards, it has been surveyed bi-annually.</p> <p>At profile 1aNTDC05 the survey report notes that the cliff was not measured due to dangerous access. There has been beach lowering from chainage 25m to 42m of up to 0.3m. A shallow berm has formed across the middle beach between chainages 49m and 97m, with an accretion of up to 0.3m. From chainage 42m to 74m accretion of up to 0.4m has formed an upper beach berm. Seaward of this point until the end of the survey at chainage 130m there has been lowering by up to 0.2m. The September 2020 profile is at a medium level except on the upper beach where it is at a high level compared to the range recorded from previous surveys. The profile is at its highest level for a short section between chainage 57m and 59m.</p>	<p>As in previous surveys access to the cliff has not been possible and it has been agreed with the surveyor that attempts should not be made to survey the cliff top.</p> <p>The data shows only limited change related to short-term patterns of sediment movement.</p> <p>Longer term trends: The amount of change is within the past range, except between chainage 57m to 59m where the berm has reached its highest recorded level on the middle beach. The vast majority of the profile is at medium level compared with previous surveys.</p>

2.3 Tynemouth Long Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
4 th September	<p>Beach Profiles:</p> <p>Tynemouth Long Sands is covered by three beach profile lines for the Full Measures survey (Appendix A). Profiles 1aNTDC06 and 1aNTDC07 were initially surveyed annually each autumn between 2002 and 2009. A third profile, 1aNTDC06A, was then added in the centre of the frontage. From spring 2010 (Partial Measures) onwards, all profiles have been surveyed bi-annually.</p> <p>1aNTDC06 is located approximately 150m south of the access ramp towards the north of the bay. The top of the cliff has not changed since the last survey however, the remainder of the cliff profile cannot be reviewed due to lack of data points in the profile plot as the survey report notes '<i>no access to middle of section 6 due to seed protection fences</i>'. The beach profile starts at c.35m chainage and shows no change up to chainage 45m. From chainage 45m to 74m an upper beach berm has formed, with accretion of 1m recorded at its crest.. From chainage 74m to 126m there has been up to 0.4m of erosion, causing the upper beach berm to have a steep seaward face. The trend is reversed from chainage 126m to 170m where has been a small amount of accretion of up to 0.2m. The seaward toe of the profile from chainage 170m to the end of the survey at chainage 183m has experienced erosion of up to 1m. This has caused the toe of the beach to move in a landward direction by approximately 40m. Overall the profile is generally at a medium level when compared with the range from previous surveys with the crest of the upper beach berm being the highest recorded level between chainage 59m and 74m. The landward recession of the beach toe means that between chainage 171m and 183m the profile is briefly at its lowest recorded level.</p> <p>At profile 1aNTDC06A, the dune-cliff face has not significantly changed in form or position. As with section 6, the survey report notes '<i>no access to middle of section 6a due to seed protection fences</i>'. There has been accretion on the upper beach of 0.2m between chainage 95m and 111m forming a small upper beach berm. Across the mid-beach profile, from chainage 111m to 185m, there has been lowering by around 0.1m. The remainder of the profile from chainage 185m to the end of the survey at chainage 285m has been dominated by a low level of erosion between 0m and 0.2m. Overall the September 2020 profile is at a medium level compared to the range recorded from the previous surveys.</p>	<p>Since the last survey the dunes have retained the same form and position.</p> <p>The profiles generally show accretion on the upper beach particularly in the northern profiles, most notably on the upper beach at 1aNTDC06 which recorded its highest levels between chainage 59m and 74m.</p> <p>Much of the remainder of the profiles has experienced a low level of erosion with most changes falling well within the range recorded from previous surveys.</p> <p>Longer term trends: Overall, the beaches have retained a similar form and are in the medium range of previous surveys, with the exception of the upper beach at profile 1aNTDC06 which is at its highest level since May 2002.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>Profile 1aNTDC07 is located approximately 50m south of the access route through the dunes towards the southern end of the bay. The dune-cliff has not significantly changed in form or position since the last survey. As with section 6 and 6a, the survey report notes '<i>no access to middle of section 7 due to seed protection fences</i>'. There has been a small amount of lowering by up to 0.3m across the majority of the beach profile. The exception to this trend is between chainage 155m and 190m where there has been no change. Overall the September 2020 profile is at a medium to high level compared to the range recorded from the previous surveys.</p>	
<p>23rd September 2020</p>	<p>Topographic Survey:</p> <p>The first survey was undertaken for the Full Measures survey in October 2010.</p> <p>Data from the current topographic survey have been used to create a digital ground model (DGM) (Appendix B – Map 2) using a Geographical Information System (GIS). A difference plot has also been produced by comparing the current DGM (Appendix B – Map 4) with that produced from the last topographic survey in March 2020.</p> <p>The bay is dominated by low levels of accretion and erosion with further large areas of little change i.e. 0 – 0.1m erosion. Accretion is centred on the upper beach in the northern half of the bay, whilst erosion is concentrated on the lower beach in the northern half of the bay and across the full beach in the southern half of the bay. In the southern half of the bay the most prominent area of erosion is in the upper beach although the magnitude of change generally remains low. The area close to the rocky foreshore in the south displays patchy erosion and accretion as it has done in previous surveys. The magnitude of change is relatively small for both the accretion and erosion with most changes limited to $\pm 0.75\text{m}$.</p>	<p>The pattern shown in the difference plot supports the patterns identified in the profiles.</p>

2.4 King Edward's Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
4 th September	<p>Beach Profiles:</p> <p>King Edward's Bay is monitored by one beach profile line for the Full Measures survey (Appendix A). This was surveyed annually between 2002 and 2009. From spring 2010 onwards, it has been surveyed bi-annually.</p> <p>At profile 1aNTDC08, drawdown on the upper beach (between chainage 2m and 70m) has led to the seaward movement of an upper beach berm by 15m. This has resulted in a drop in the beach level of up to 0.5m between chainage 15m and 40m. From chainage 70m to 170m a fairly consistent accretion of 0.3m is recorded. The seaward end of the profile between chainage 170m and the end of the survey at 178m has experienced some erosion of up to 0.2m. The beach profile is at a medium level when compared with the range recorded from previous surveys.</p>	<p>Since the last survey, the upper beach at King Edward's Bay has experienced drawdown since the March 2020 survey with material appearing to be moved in a seaward direction.</p> <p>Longer term trends: The profile is at a medium level compared with the range of previously observed surveys at this location. Changes between the spring 2020 and autumn 2020 survey show a seasonal movement of sediment across the beach in the form of a berm.</p>

3. Problems Encountered and Uncertainty in Analysis

Individual Profiles

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

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

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

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

5. Conclusions and Areas of Concern

- At Whitley Sands there has generally been erosion on the upper beach and accretion on the mid and lower beach across the beach profiles. For the most part, the beach is at a medium level in the range recorded from previous surveys. The topographic survey does not exhibit a clear pattern of sediment movement between the two surveys at Whitley Sands and is dominated by a mixture of low level accretion and erosion across the bay. Increased accretion on the lower beach in the southern half of the bay indicates a potential movement of material southwards. Elsewhere, erosion on the upper beach and accretion on mid beach indicates a potential drawing down of material.
- At Cullercoats Bay, at profile 1aNTDC05, there has accretion on the upper beach and a low level of erosion across the remainder of the beach. The results fall within the range of previously recorded results and there are no causes for concern.
- At Tynemouth Long Sands, the majority of recorded profiles are within the previously recorded range with berm building processes dominating. The section between chainages 59m and 74m at profile 1aNTDC06 was recorded at its highest level since May 2002. The profiles present no cause for concern. The topographic survey results demonstrate a low level of accretion and erosion with changes more pronounced in the northern half of the bay.
- At King Edward's Bay, there appears to have been some seaward movement of sediment down the beach. There are no causes for concern and the results fall within the range recorded in previous surveys.

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: 1aNTDC02

Date: 21/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

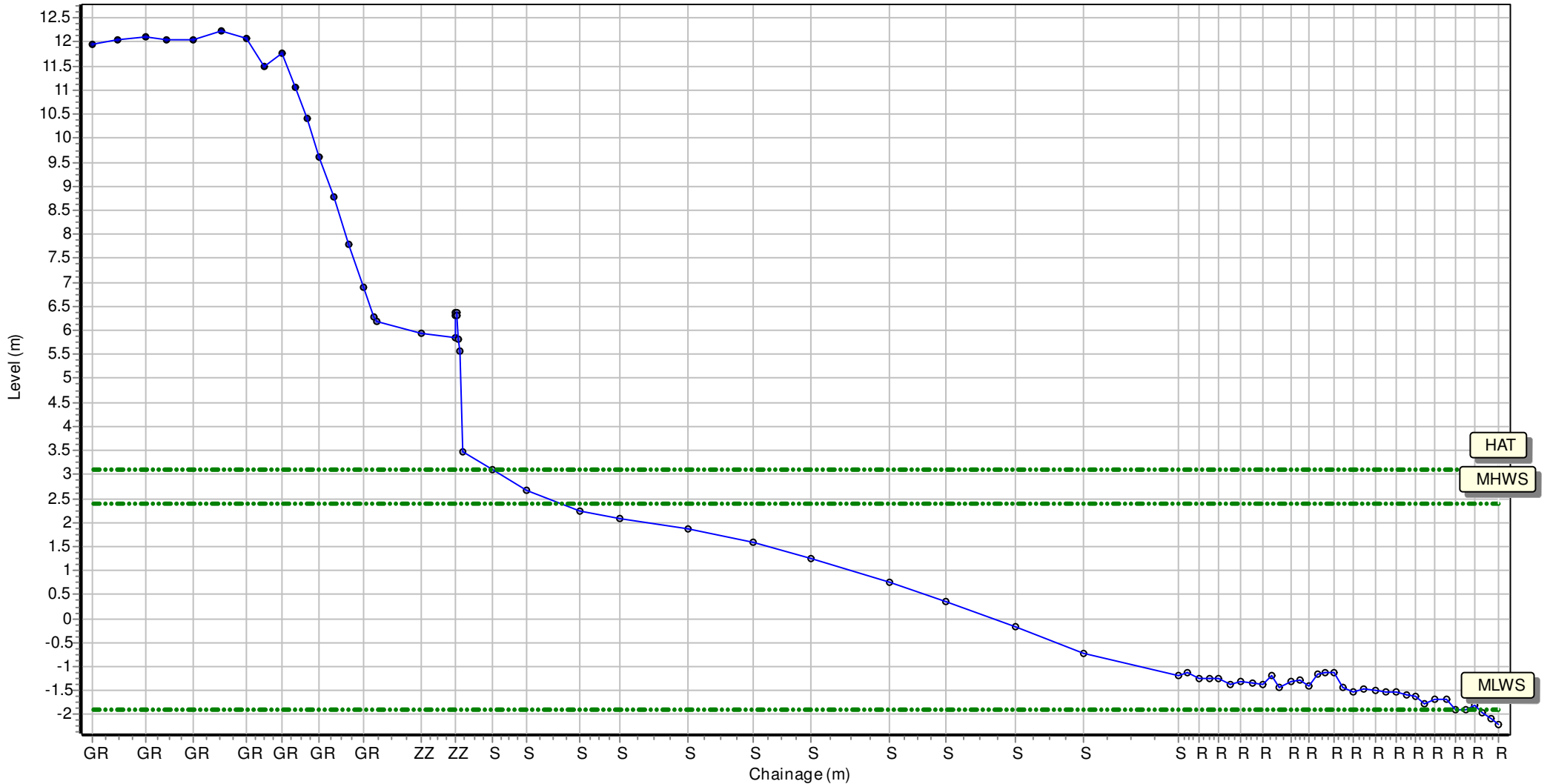
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC03

Date: 21/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

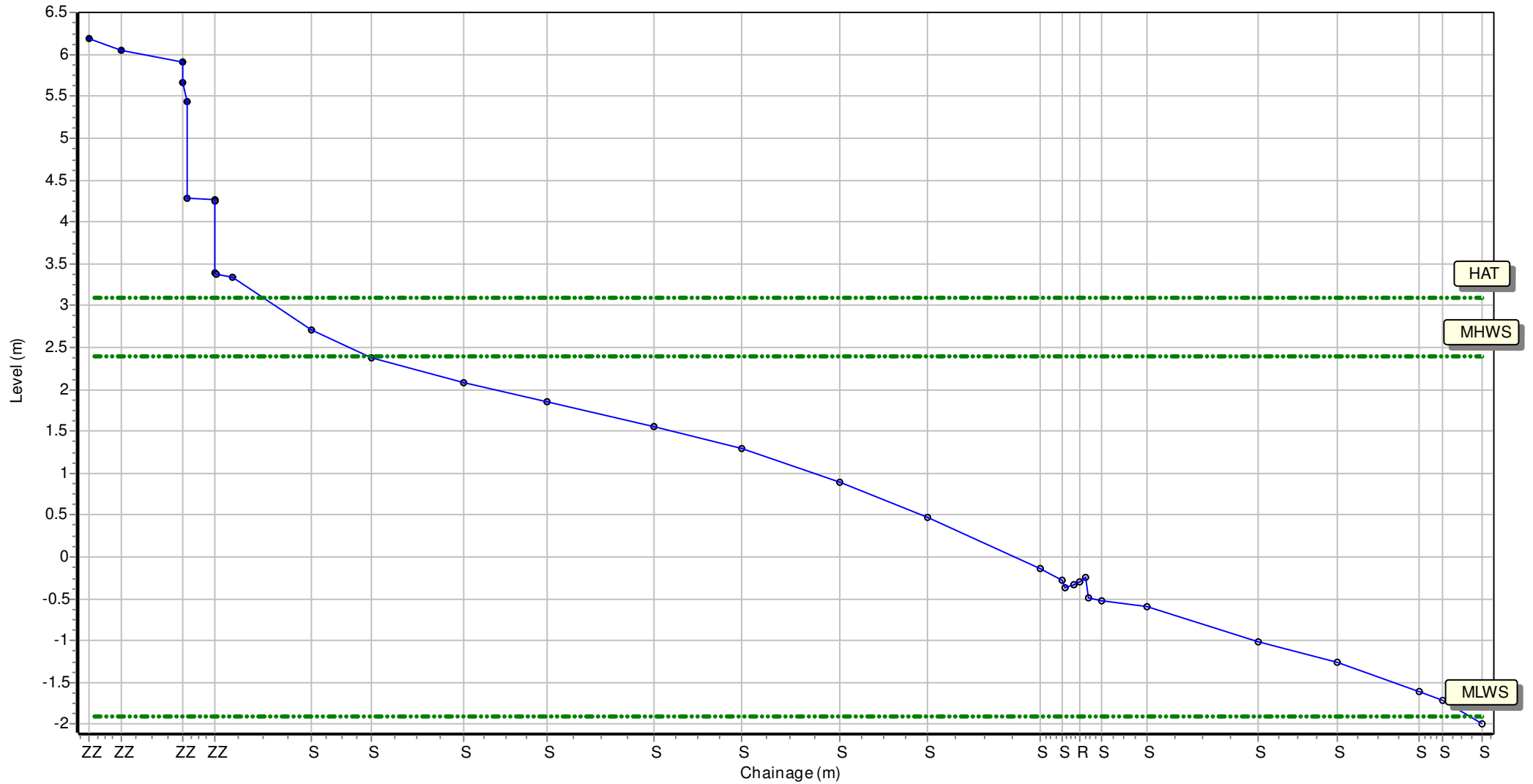
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC04

Date: 21/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

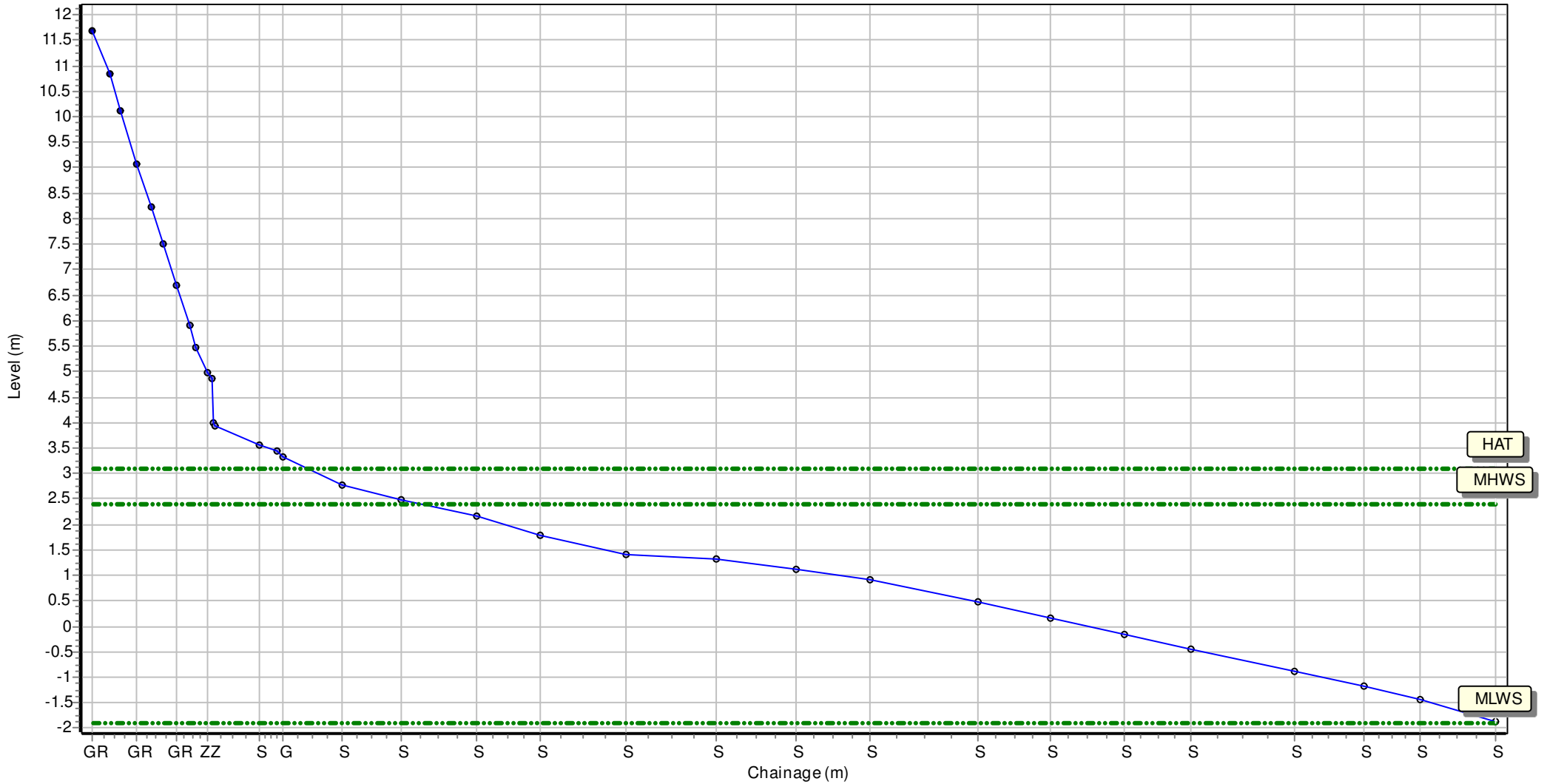
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC04A

Date: 21/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

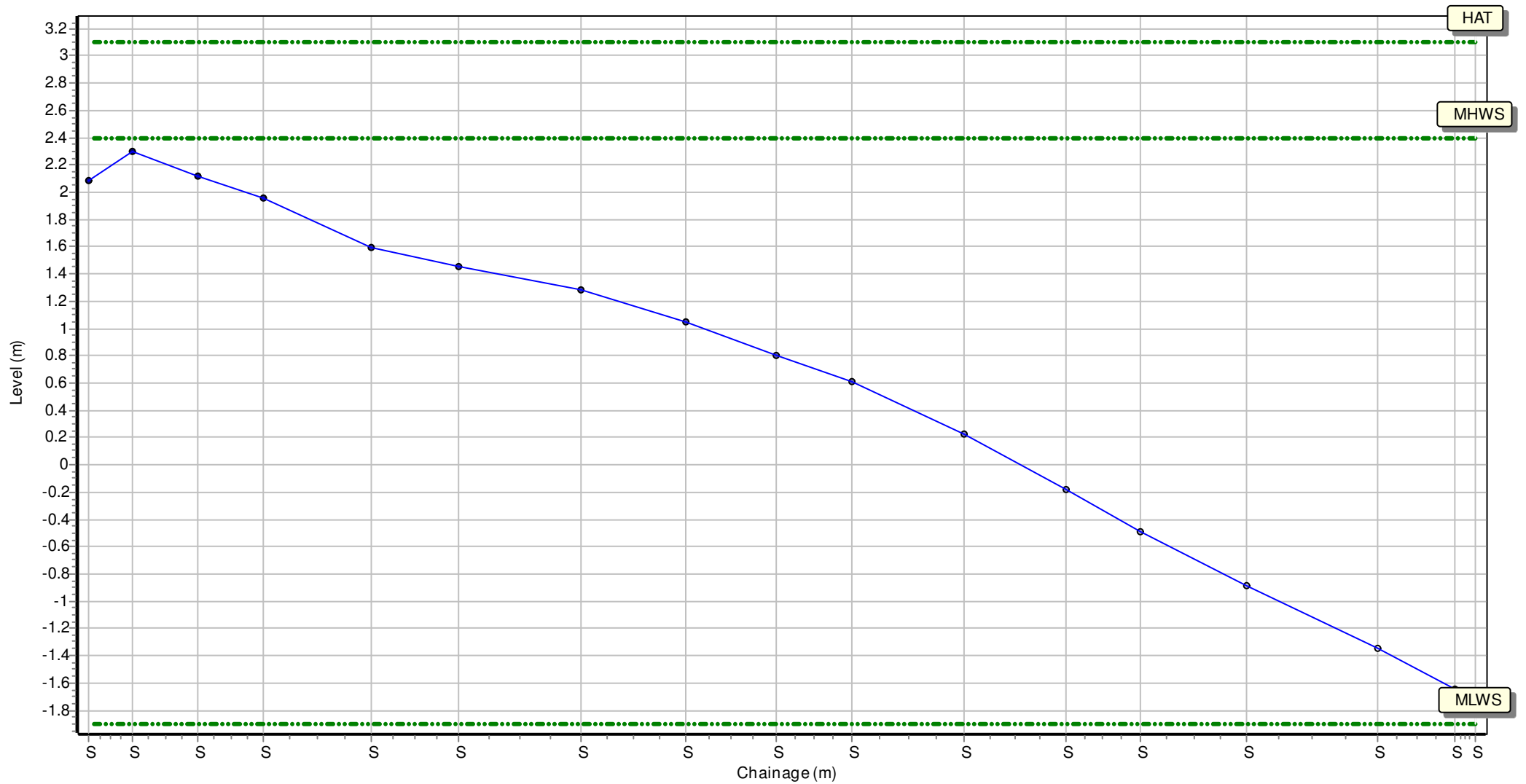
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC05

Date: 04/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

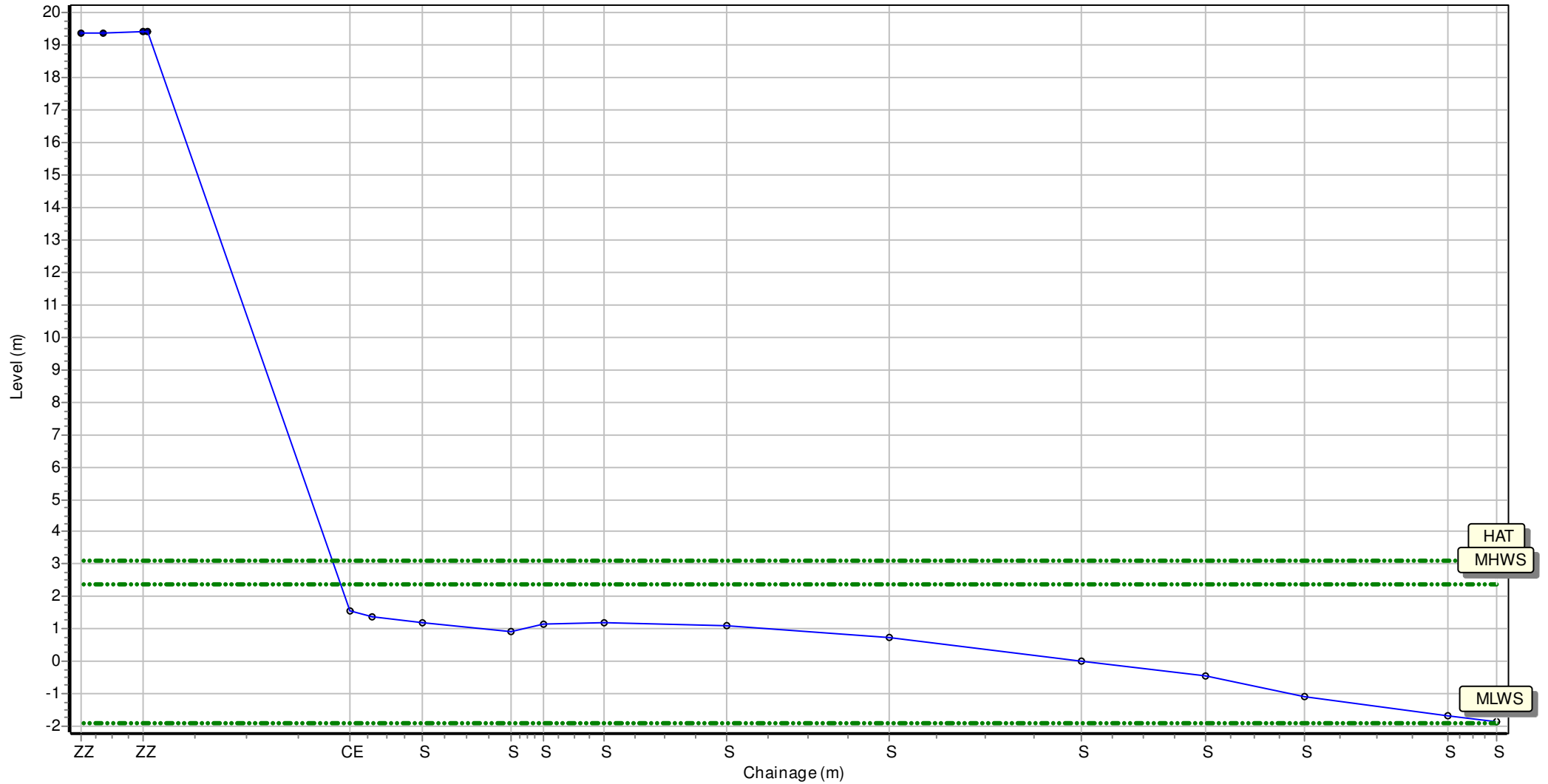
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC06

Date: 04/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

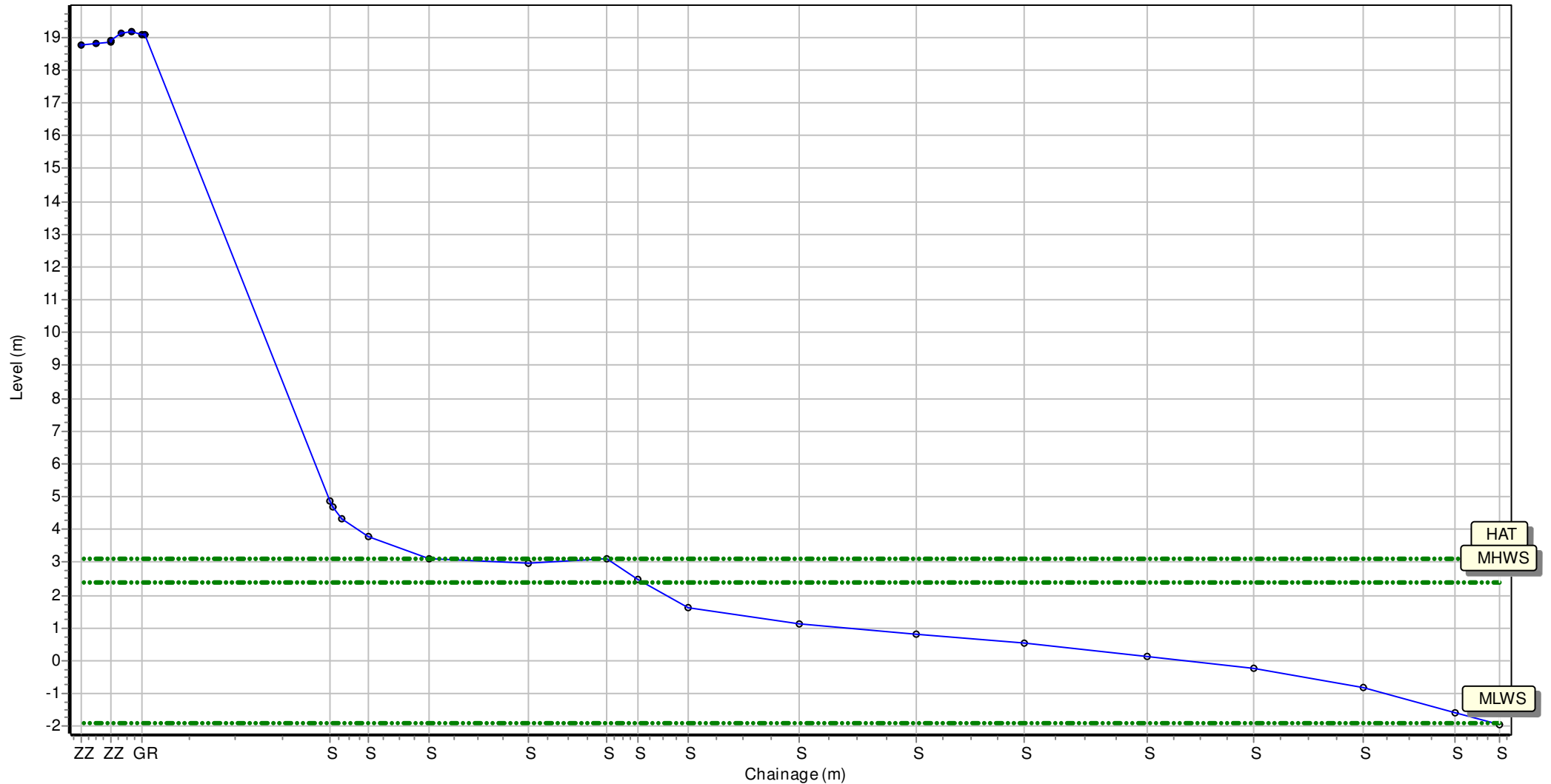
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC06A

Date: 04/09/2020 Inspector: AG

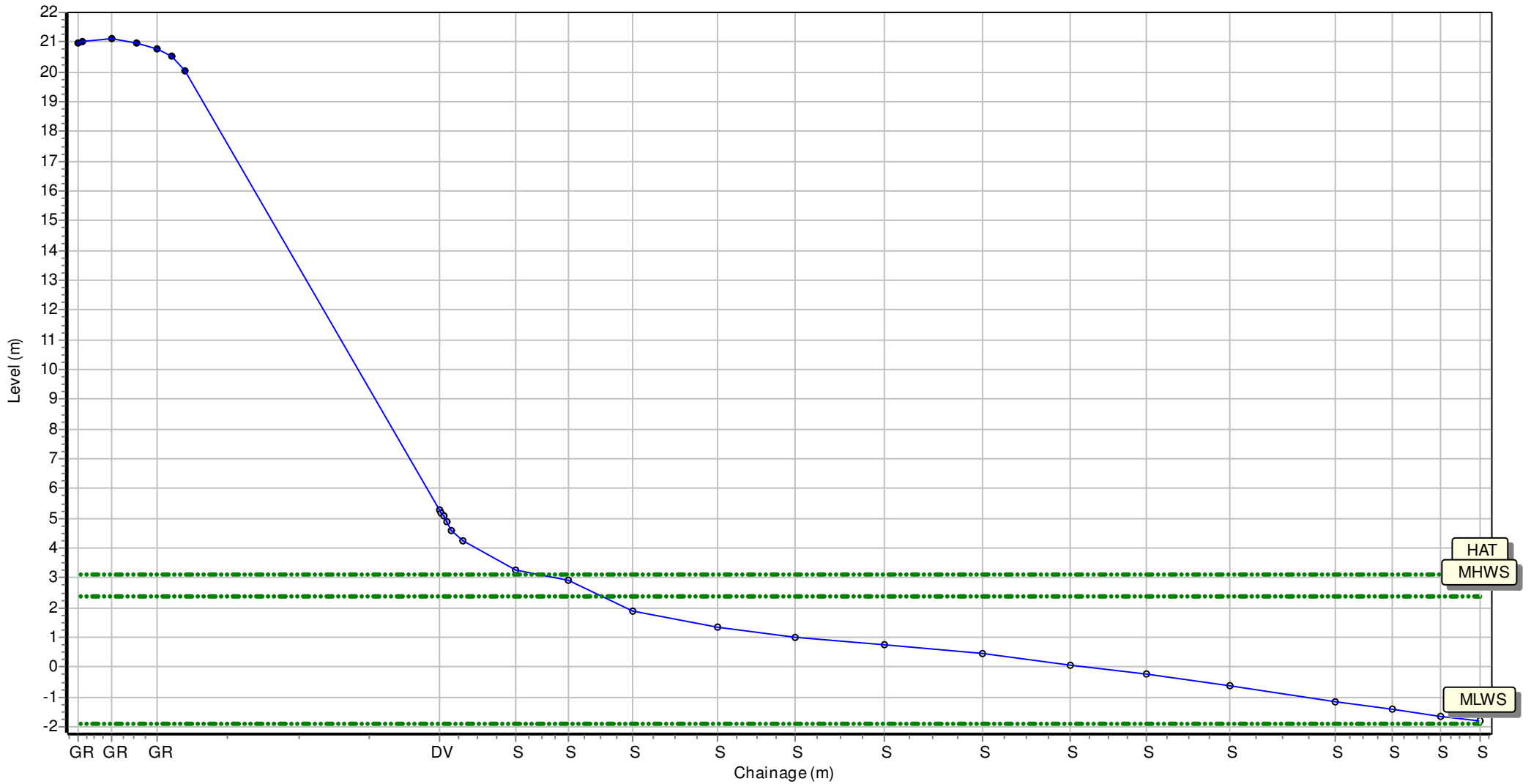
Low Tide: Low Tide Time:

Wind Sea State:

Visibility: Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC07

Date: 04/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

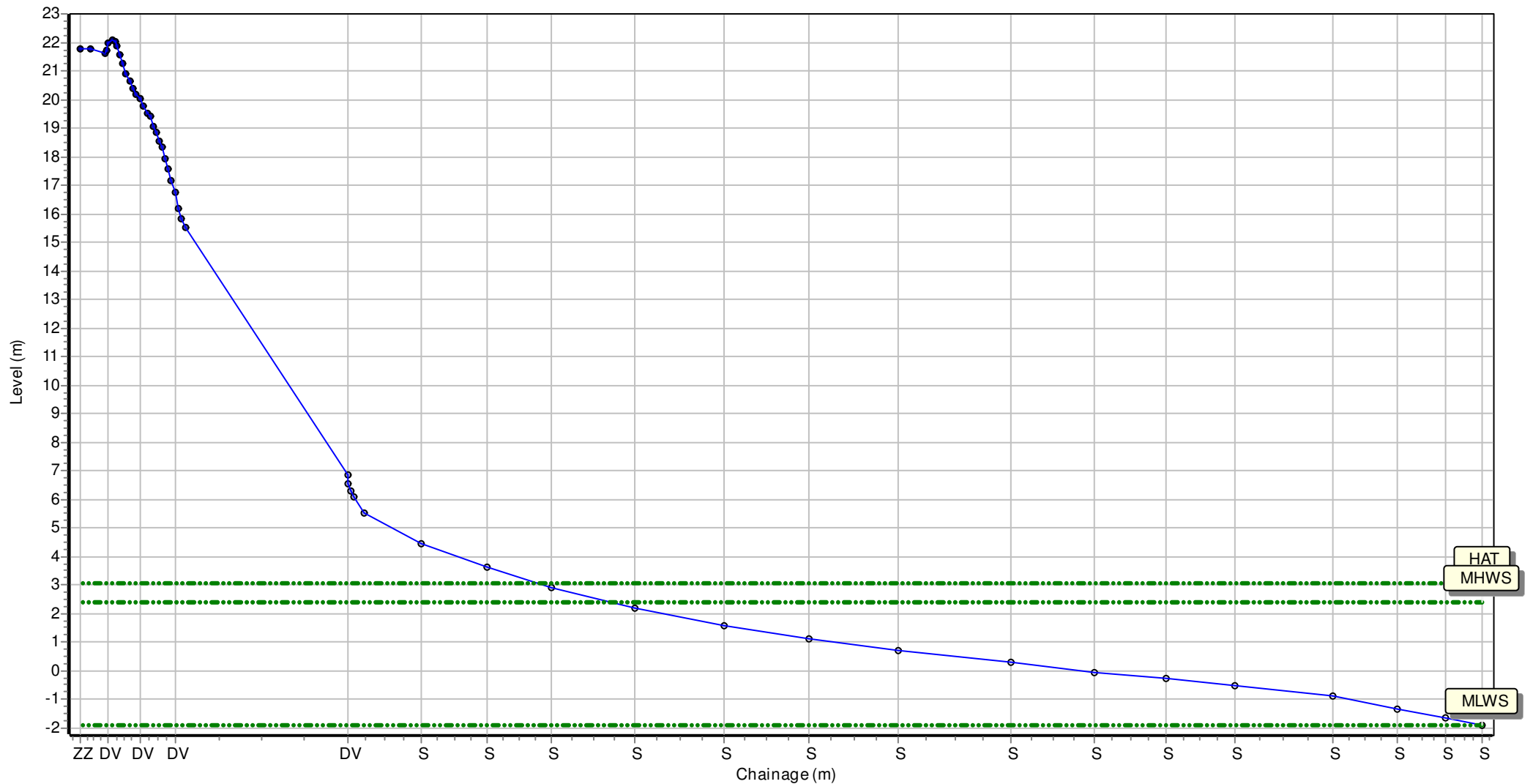
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profile

Location: 1aNTDC08

Date: 04/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

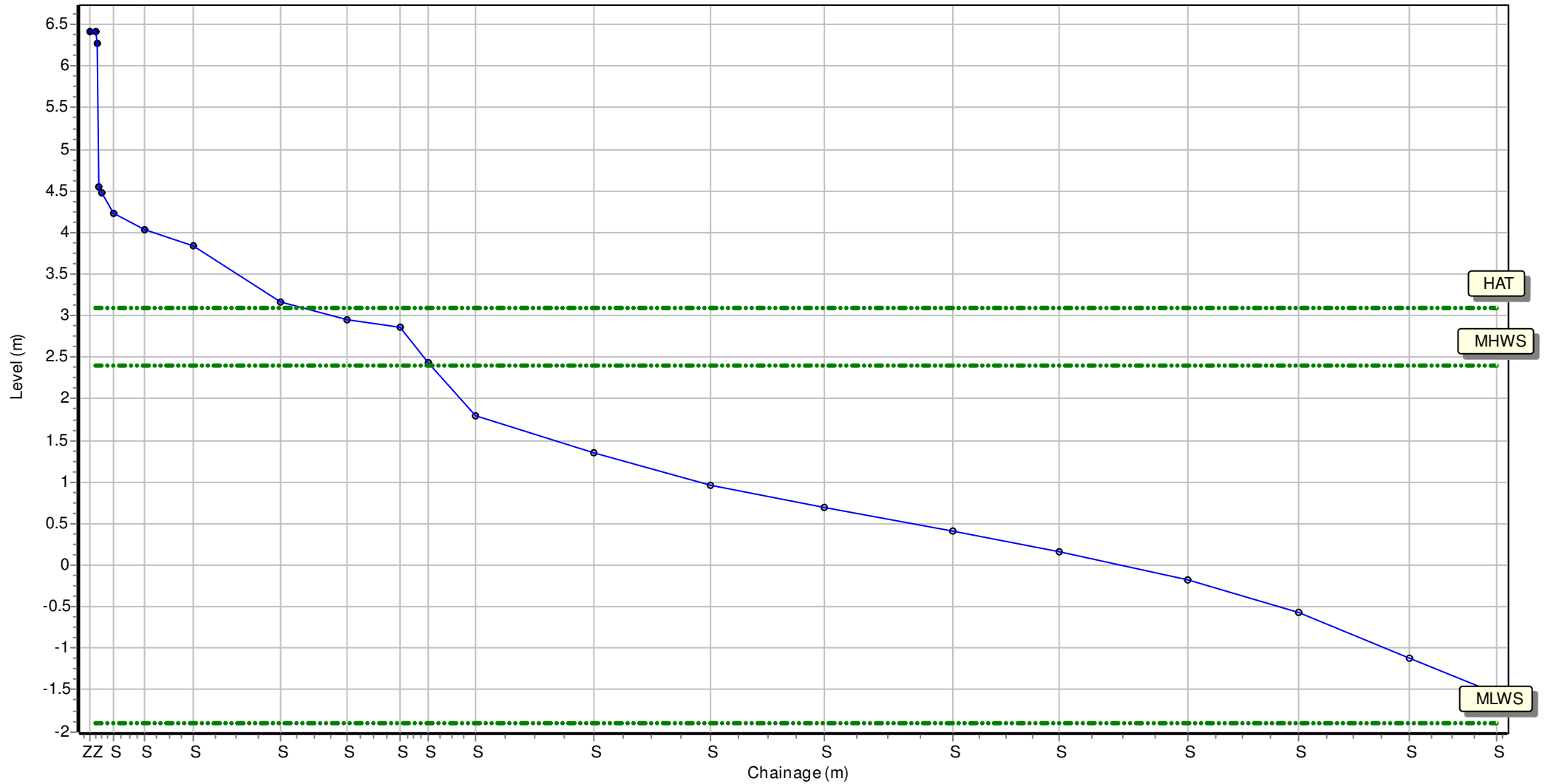
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

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



Beach Profiles: 1aNTDC01



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNTDC02



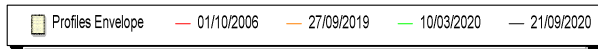
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNTDC03



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNTDC04



Profiles Envelope 01/10/2006 27/09/2019 10/03/2020 21/09/2020

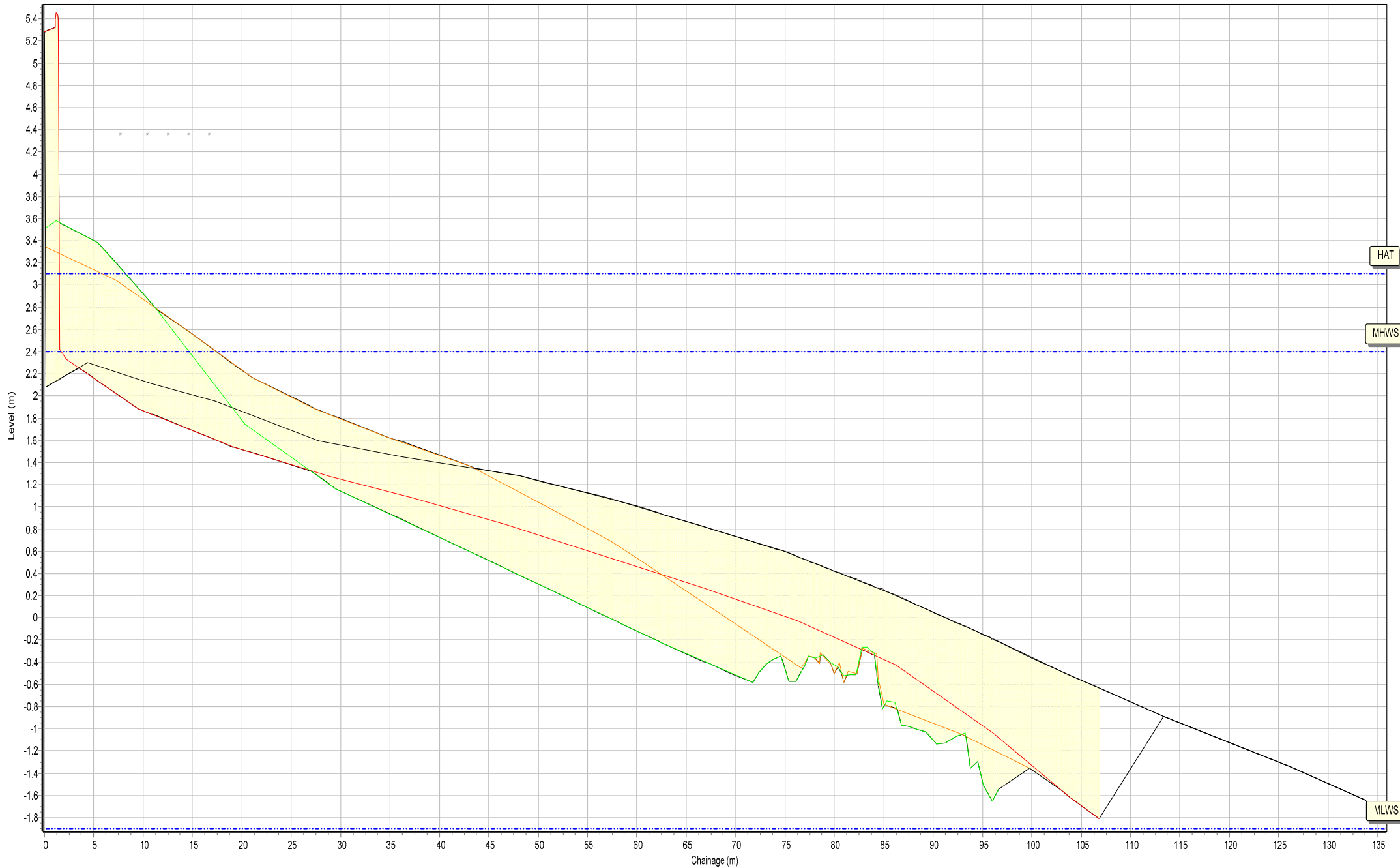
HAT

MHWS

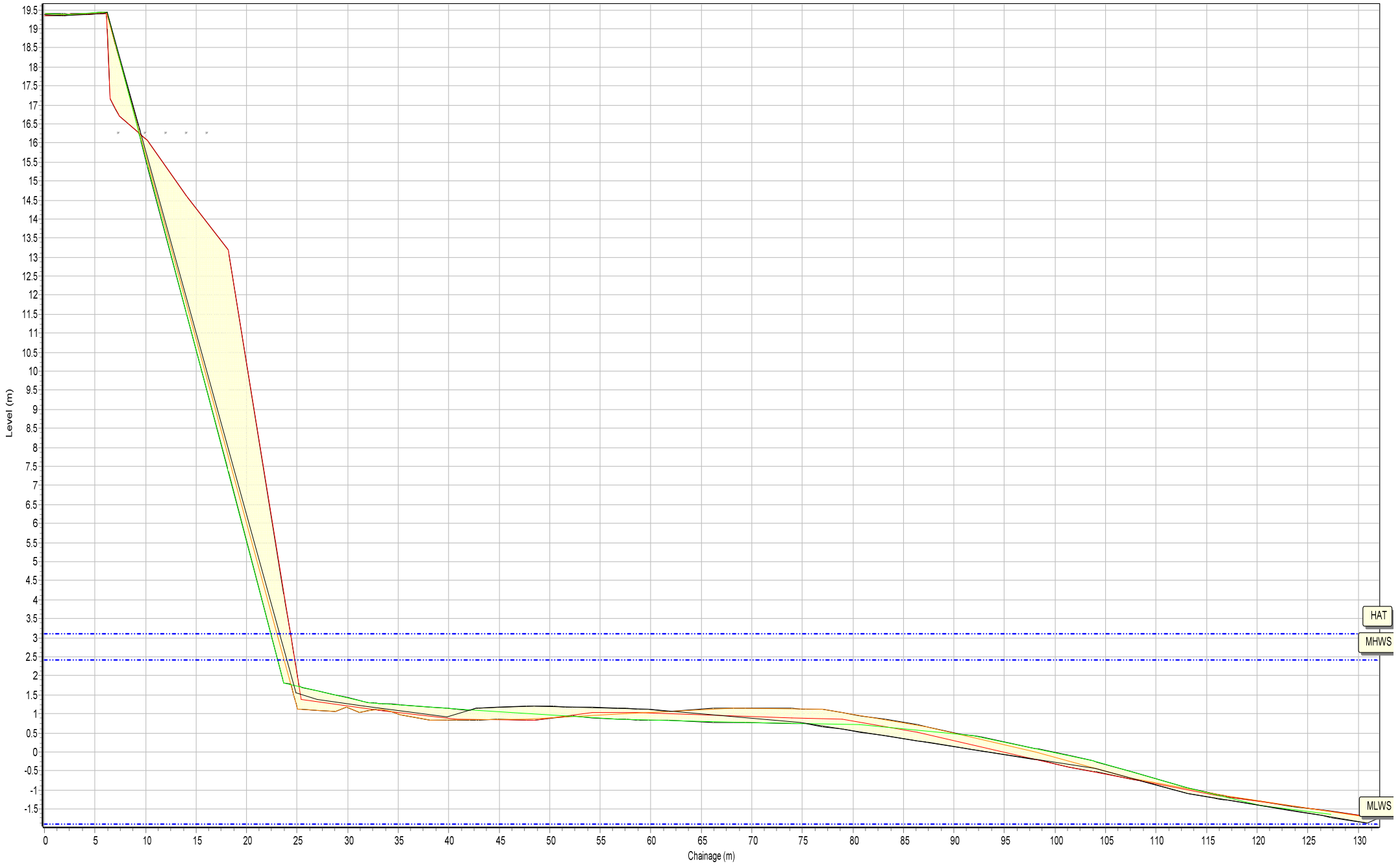
MLWS

SANDS

Beach Profiles: 1aNTDC04A



Beach Profiles: 1aNTDC05



Profiles Envelope 01/10/2006 30/09/2019 09/03/2020 04/09/2020

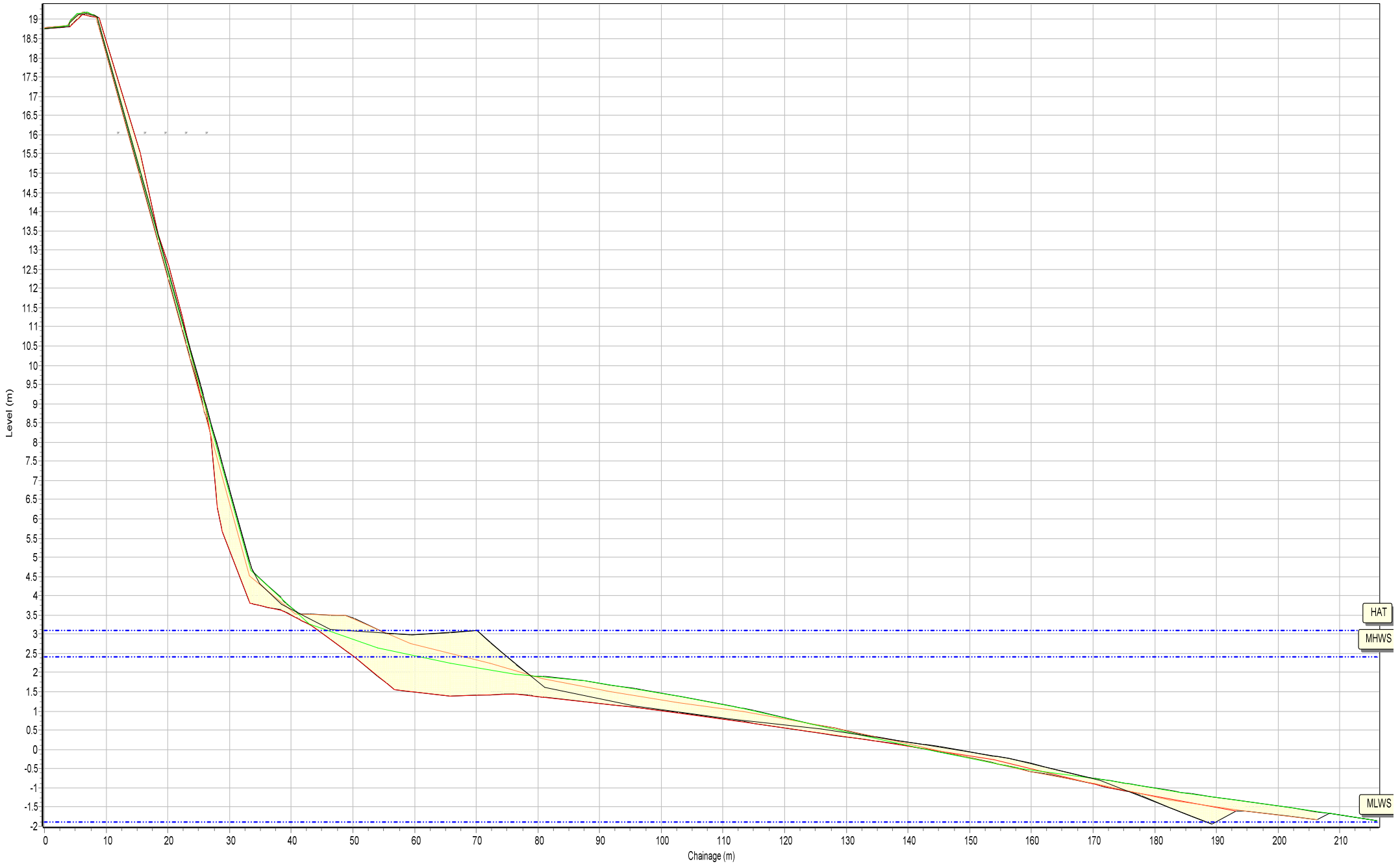
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNTDC06



Profiles Envelope 01/10/2006 30/09/2019 09/03/2020 04/09/2020

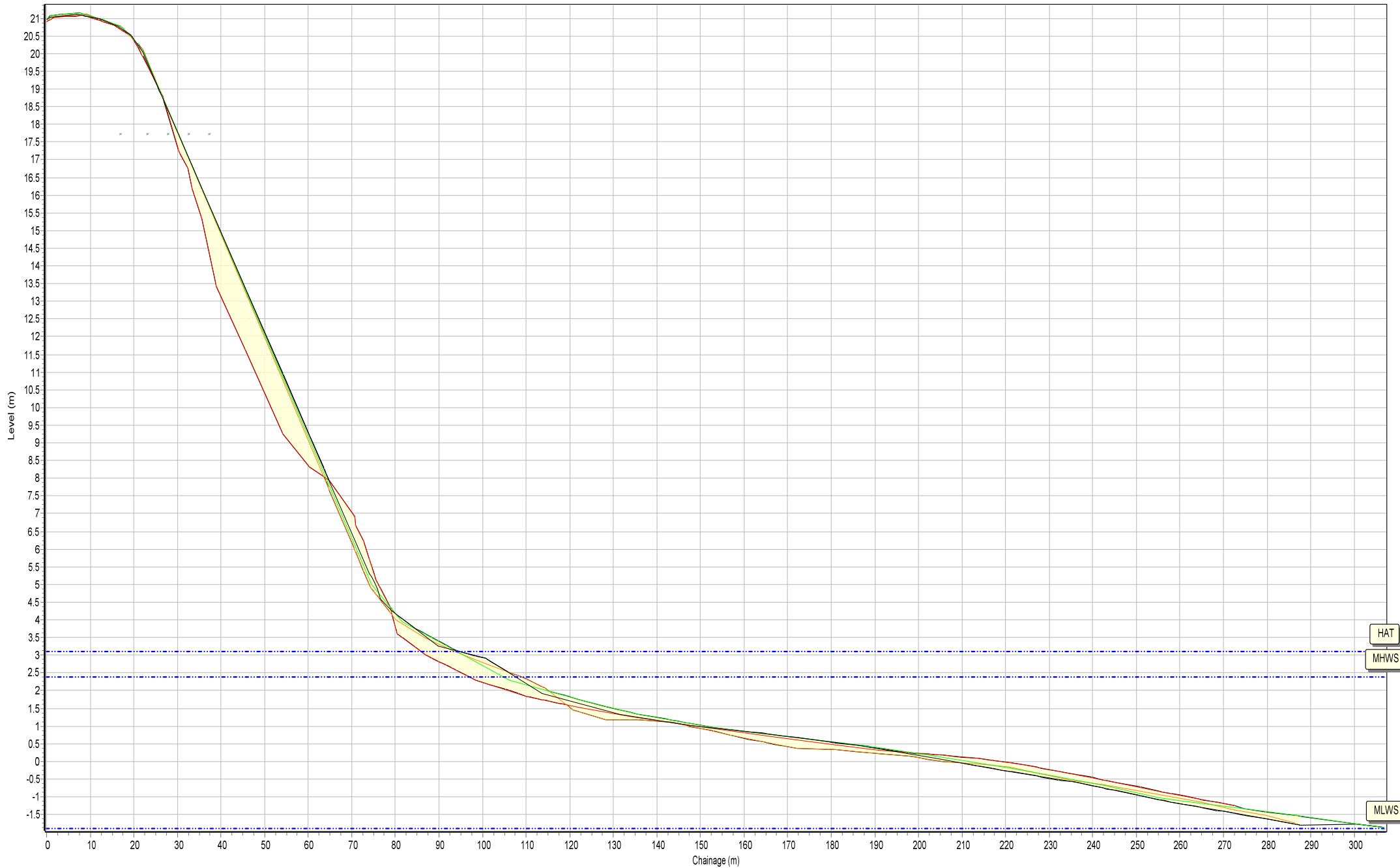
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNTDC06A



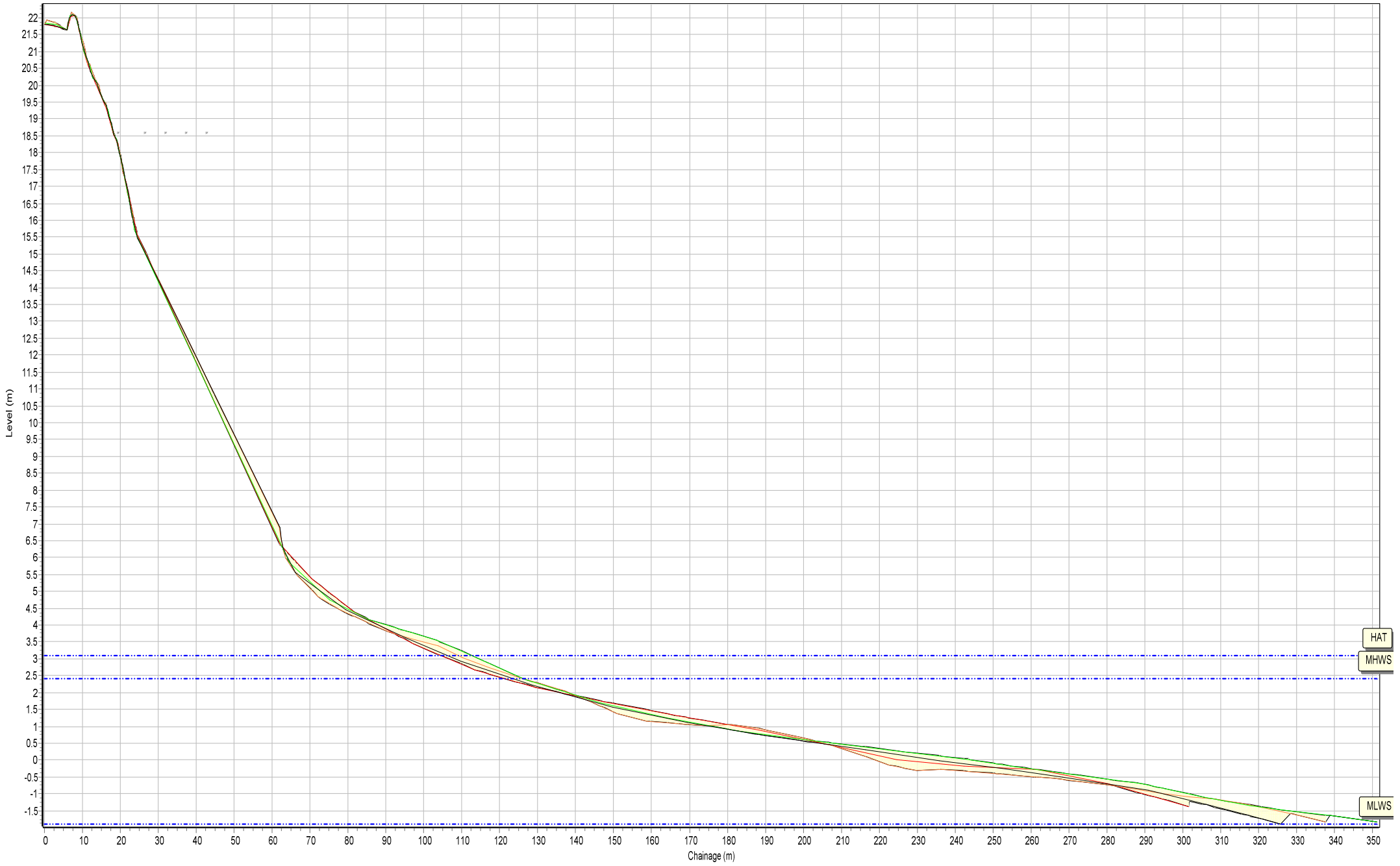
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNTDC07



Profiles Envelope 01/10/2006 30/09/2019 09/03/2020 04/09/2020

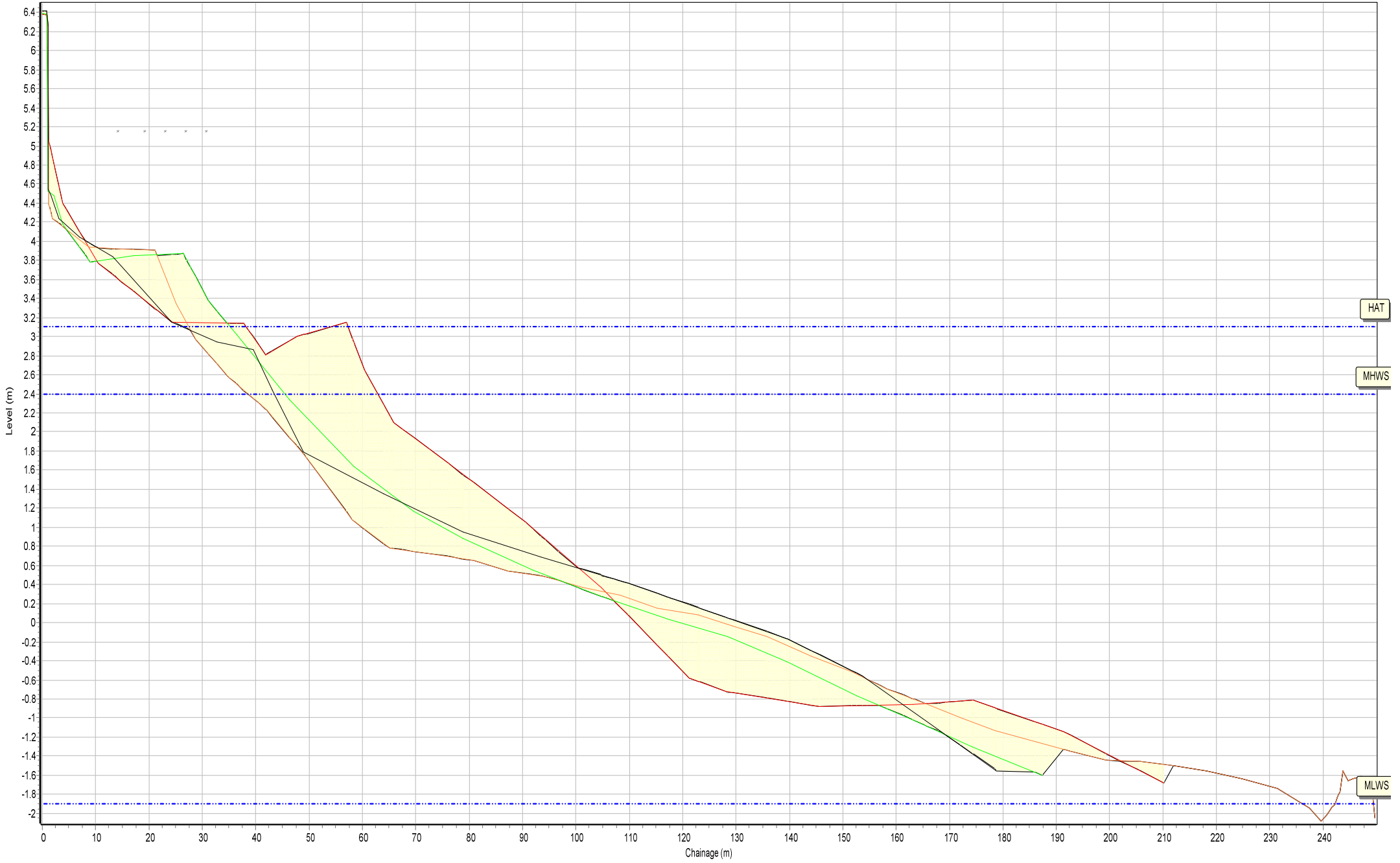
HAT

MHWS

MLWS

SANDS

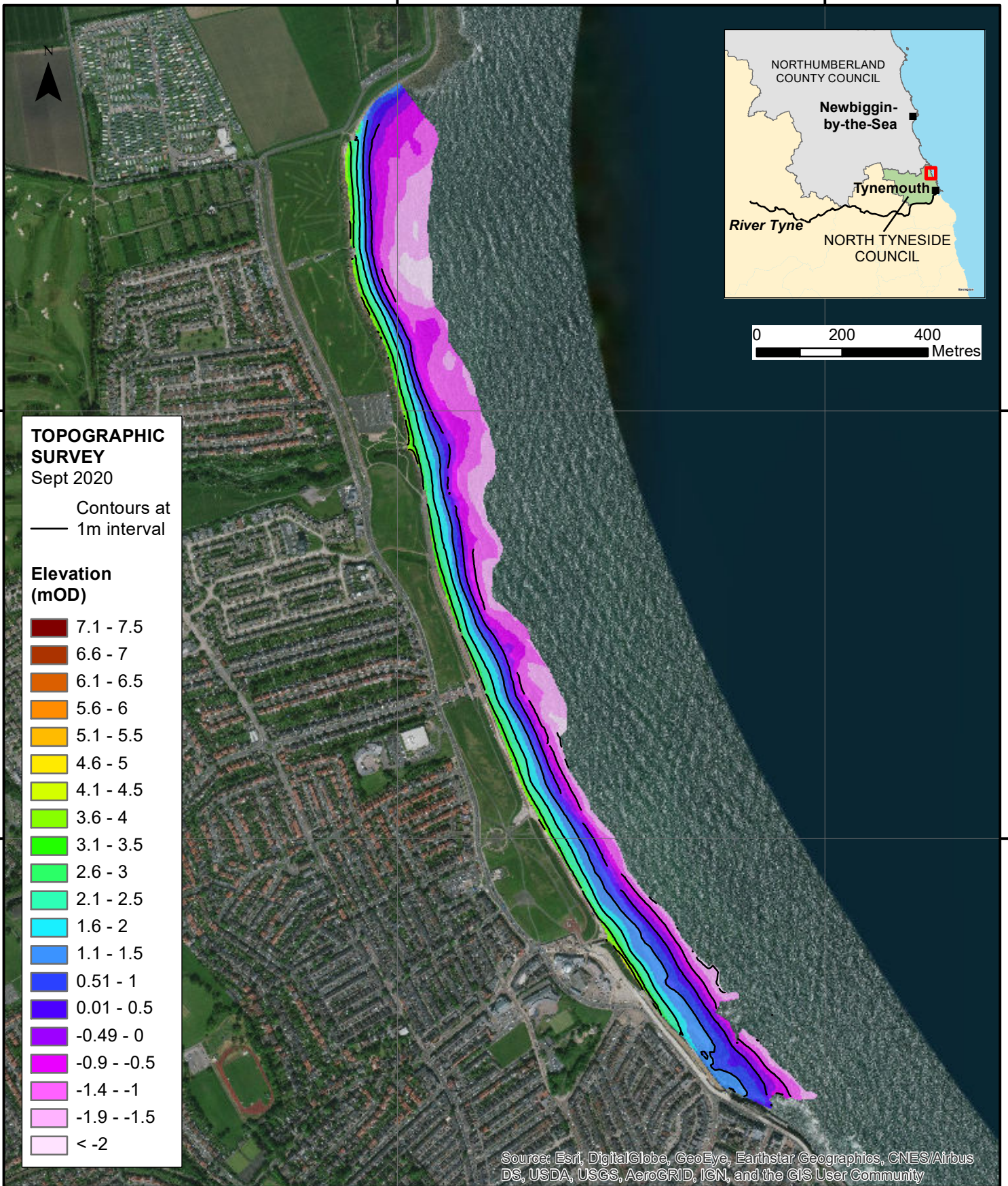
Beach Profiles: 1aNTDC08



Appendix B
Topographic Survey

435000

436000



Appendix B - Map 1

WHITLEY SANDS

North Tyneside Council Frontage

Analytical Report
'Full Measures' Survey 2020

Drawing Scale at A4 1:12,000

Client:
North East Coastal Group

Project:
Cell 1 Regional Coastal Monitoring Programme

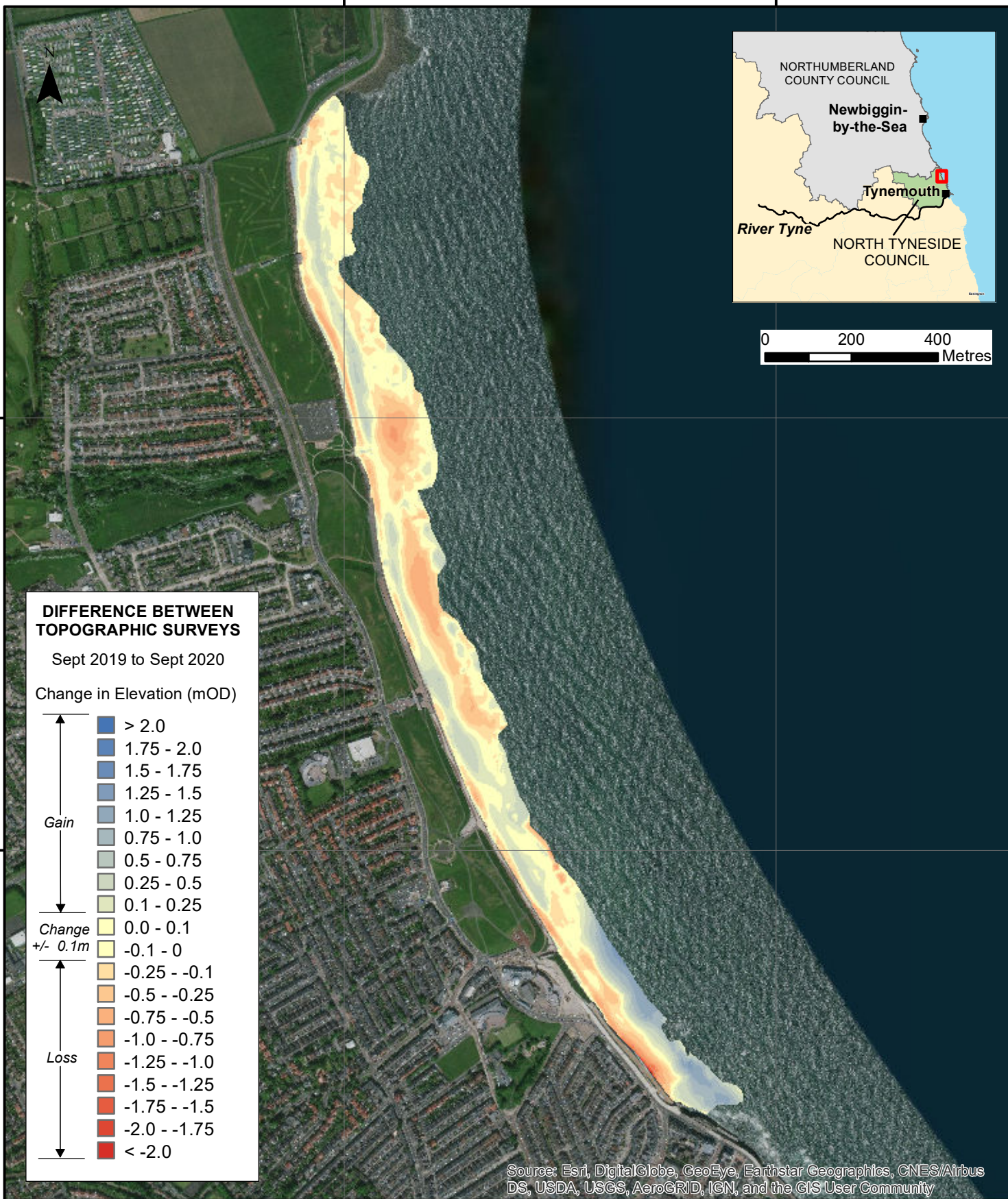
WATER
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Newcastle upon Tyne
NE1 4EE

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



435000

436000



DIFFERENCE BETWEEN TOPOGRAPHIC SURVEYS
 Sept 2019 to Sept 2020

Change in Elevation (mOD)

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

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

Appendix B - Map 3

WHITLEY SANDS

North Tyneside Council Frontage

Analytical Report
 'Full Measures' Survey 2020

Drawing Scale at A4 1:12,000

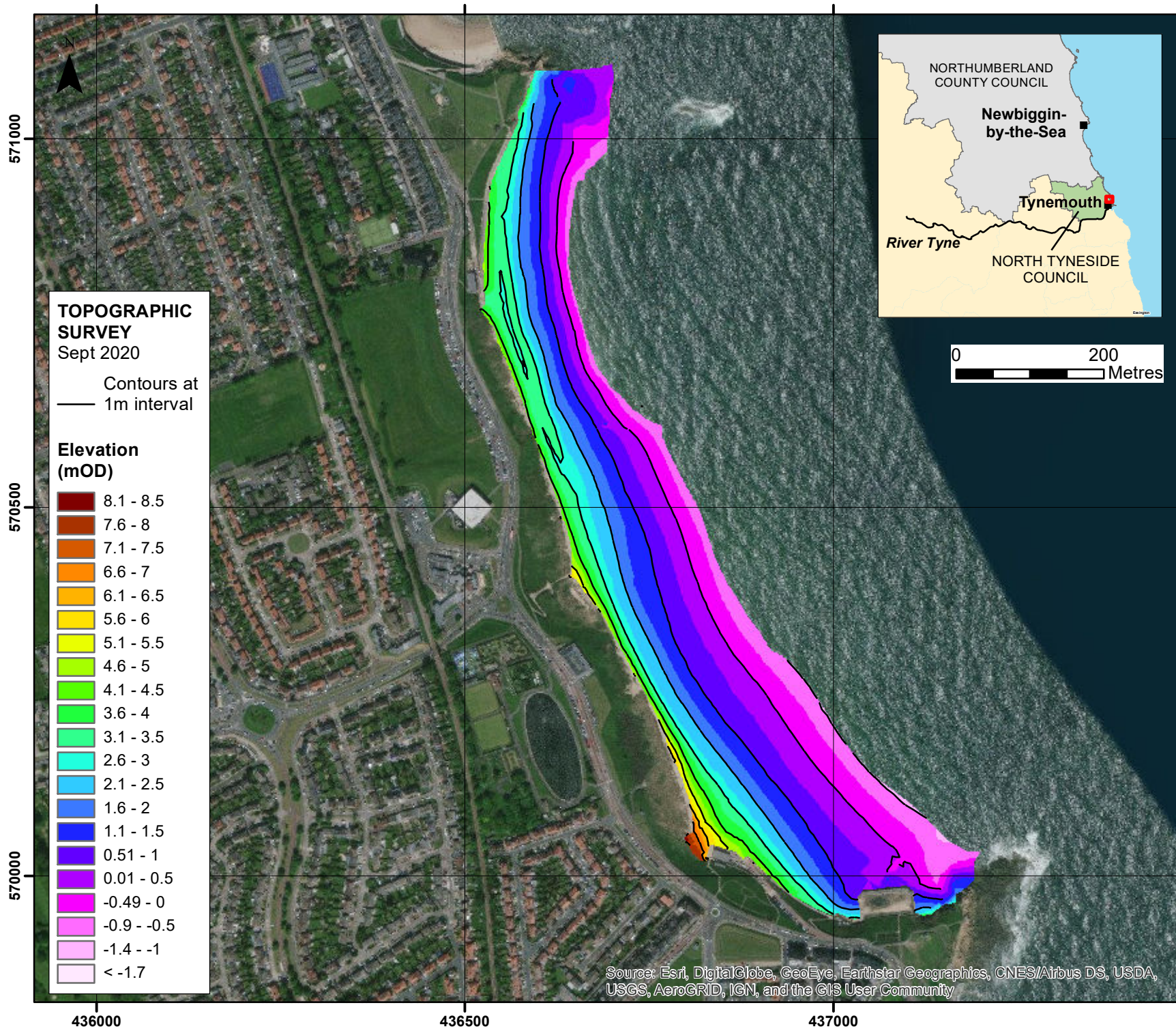
Client:
 North East Coastal Group

Project:
 Cell 1 Regional Coastal Monitoring Programme

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

Appendix B - Map 2

LONGSANDS

North Tyneside Council Frontage

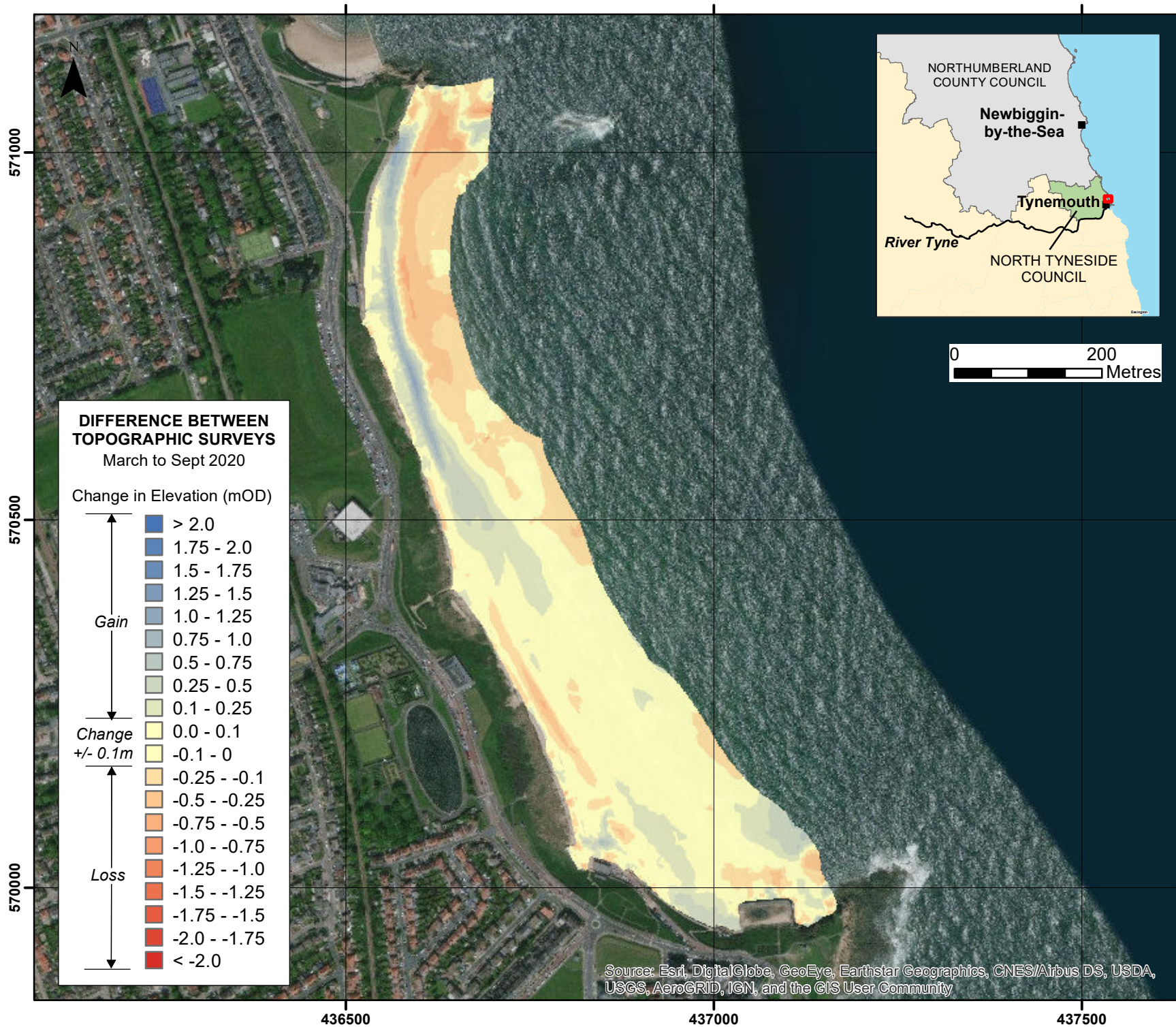
Analytical Report
'Full Measures' Survey 2020

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

LONGSANDS

North Tyneside Council Frontage

Analytical Report
'Full Measures' Survey 2020

Drawing Scale at A4 1:7,000

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