



**Cell 1 Regional Coastal Monitoring Programme  
Update Report 1: 'Partial Measures' Survey 2009**

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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
m	metres
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MLWS	Mean Low Water Neap
MLWS	Mean Low Water Spring
MSL	Mean Sea Level
ODN	Ordnance Datum Newlyn

## Water Levels Used in Interpretation of Changes

Water Level Parameter	Water Level (mODN)		
	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	Water Level (mODN)		
	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 Northumbrian Coastal Authorities Group (NCAG<sup>1</sup>) Monitoring Programme began in April 2002 with a survey of eighty-six profile lines along various sections of the coastline between Berwick-upon-Tweed and the River Tyne. These were fully repeated in September 2002 and since then annual surveys of all profiles have been 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.

At various times, additional beach profile lines have been added and topographic surveys at Holy Island and Alnmouth, and cliff top surveys at Newbiggin Caravan Park, Sandy Bay Caravan Park and Cambois Bay have been introduced.

In September 2008 the monitoring became incorporated within the wider Cell 1 Regional Coastal Monitoring Programme. This 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.

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

- beach profile surveys (as before for Northumberland)
- topographic surveys (as before for Northumberland)
- cliff top recession surveys (as before for Northumberland)
- real-time wave data collection
- bathymetric and sea bed characterisation surveys south of the River Tyne
- aerial photography
- walk-over surveys

To date the following reports have been produced since incorporation within the Cell 1 Regional Coastal Monitoring Programme:

**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	April 09	Mar 09	June 09 <sup>(*)</sup>	-

<sup>(\*)</sup> The present report is **Update Report 1** and provides an analysis of the 2009 Partial Measures survey for Northumberland County Council's frontage. It is intended as a brief update of the key findings from this survey to maintain an understanding of ongoing changes.

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<sup>1</sup> NCAG become part of the wider North East Coastal Group (NECG) in September 2008.

## 1. Introduction

### 1.1 Study Area

Northumberland County Council's frontage extends from the Scottish Border in the north to Hartley in the south. For the purposes of this report, it has been sub-divided into fifteen areas, namely:

- Sandstell Point
- Spittal
- Goswick Sands
- Holy Island
- Bamburgh
- Beadnell Village
- Beadnell Bay
- Embleton Bay
- Boulmer
- Alnmouth
- Hauxley & Druridge Bay
- Lynemouth
- Newbiggin-by-the-Sea
- Cambois
- Blyth

### 1.2 Methodology

Along Northumberland County Council's frontage, the following surveying is undertaken:

- Full Measures survey annually each autumn/early winter comprising:
  - Beach profile surveys along 88 no. transect lines (78 no. since April 2002, with 10 no. added since Full Measures 2007)
  - Topographic survey along Holy Island (since Full Measures 2004)
  - Topographic survey along Alnmouth Bay (since Partial Measures 2005)
- Partial Measures survey annually each spring comprising:
  - Beach profile surveys along 39 no. transect lines (29 no. since April 2002, with 10 no. added since Full Measures 2007)
  - Topographic survey along Alnmouth Bay (since Partial Measures 2005)
- Cliff top survey (bi-annually) at:
  - Newbiggin Caravan Park (since Full Measures 2007)
  - Sandy Bay Caravan Park (since Full Measures 2007)
  - Cambois (since Partial Measures 2009)

The location of these surveys is shown in Figure 1. Also enclosed on the accompanying CD-rom is a file which can be opened in Google Earth showing the locations of the surveys.

The Partial Measures survey was undertaken along this frontage in March 2009, when weather conditions were generally fine and the sea state was mostly calm.

The Update Report presents the following:

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

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

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

(Indicative Survey Extents shown)

**Client:** North East Coastal Group

**Project:** Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 1  
Northumberland County  
Council Frontage**

Update Report 1  
'Partial Measures' Survey 2009

Drawing Scale 1:10,000 at A4

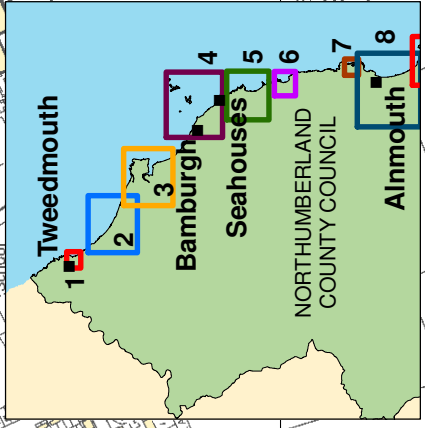
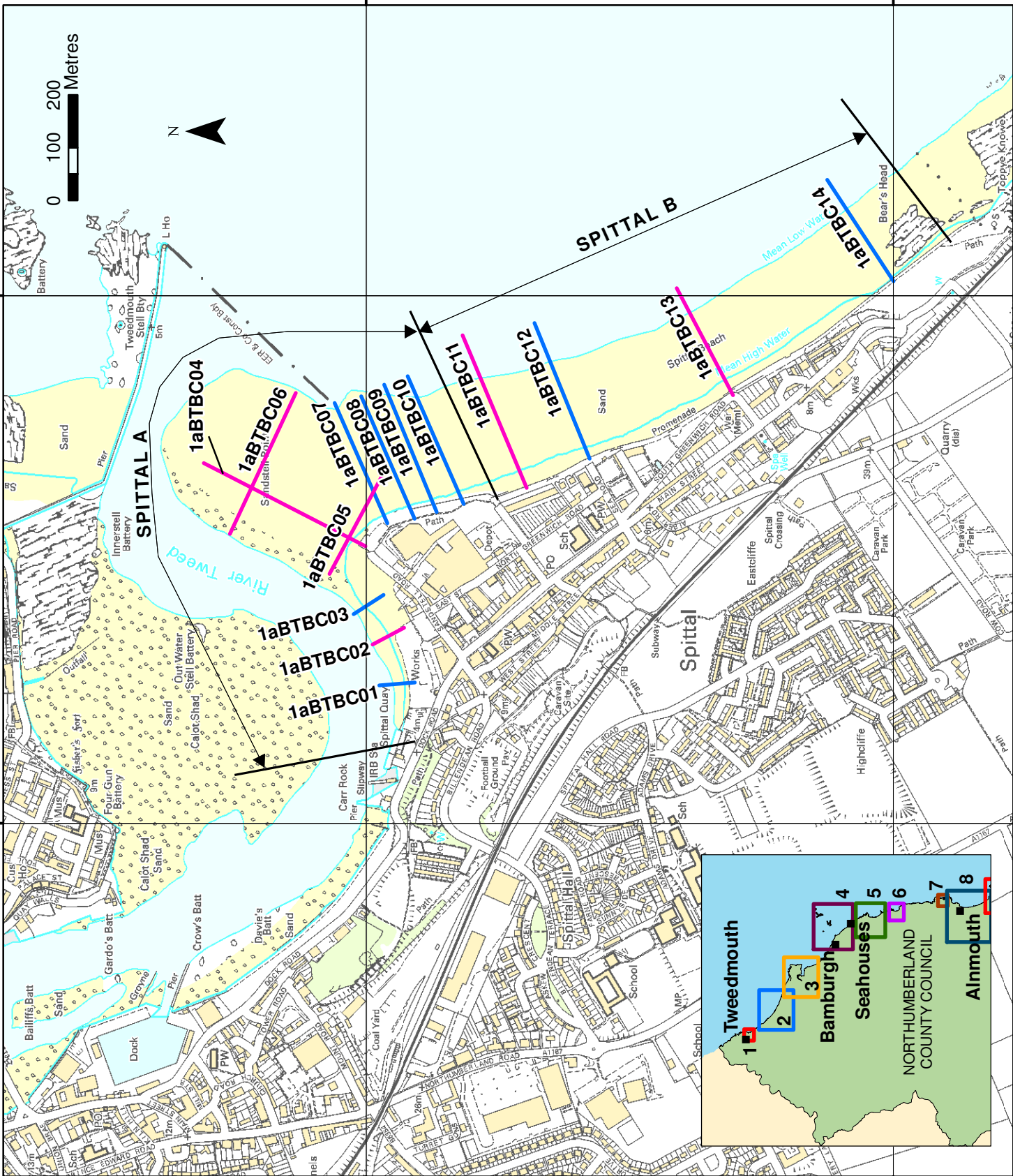
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### SURVEY LOCATIONS

#### Topographic Profiles

- Annual
- Bi-Annual

#### Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

#### Cliff Top Monitoring Pegs

- @ 50 centres
- @ 100 centres
- @ 300 centres

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

## Figure 1 - Map 2 Northumberland County Council Frontage

Update Report 1  
'Partial Measures' Survey 2009

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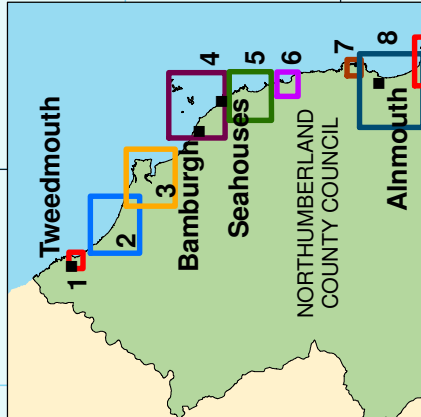
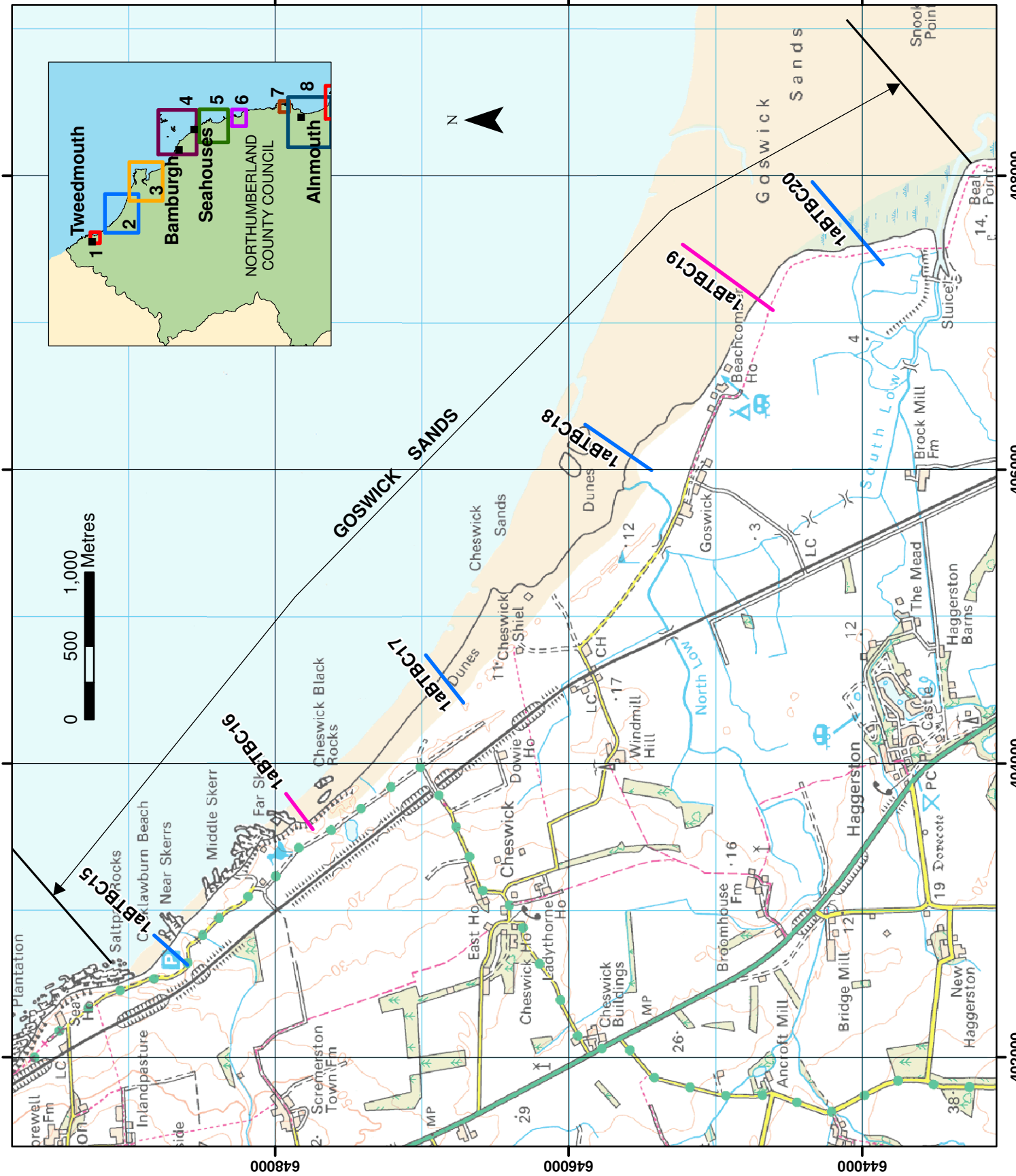
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

*(Indicative Survey Extents shown)*

**Client:** North East Coastal Group

**Project:** Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 3**  
**Northumberland County Council Frontage**

Update Report 1  
 'Partial Measures' Survey 2009

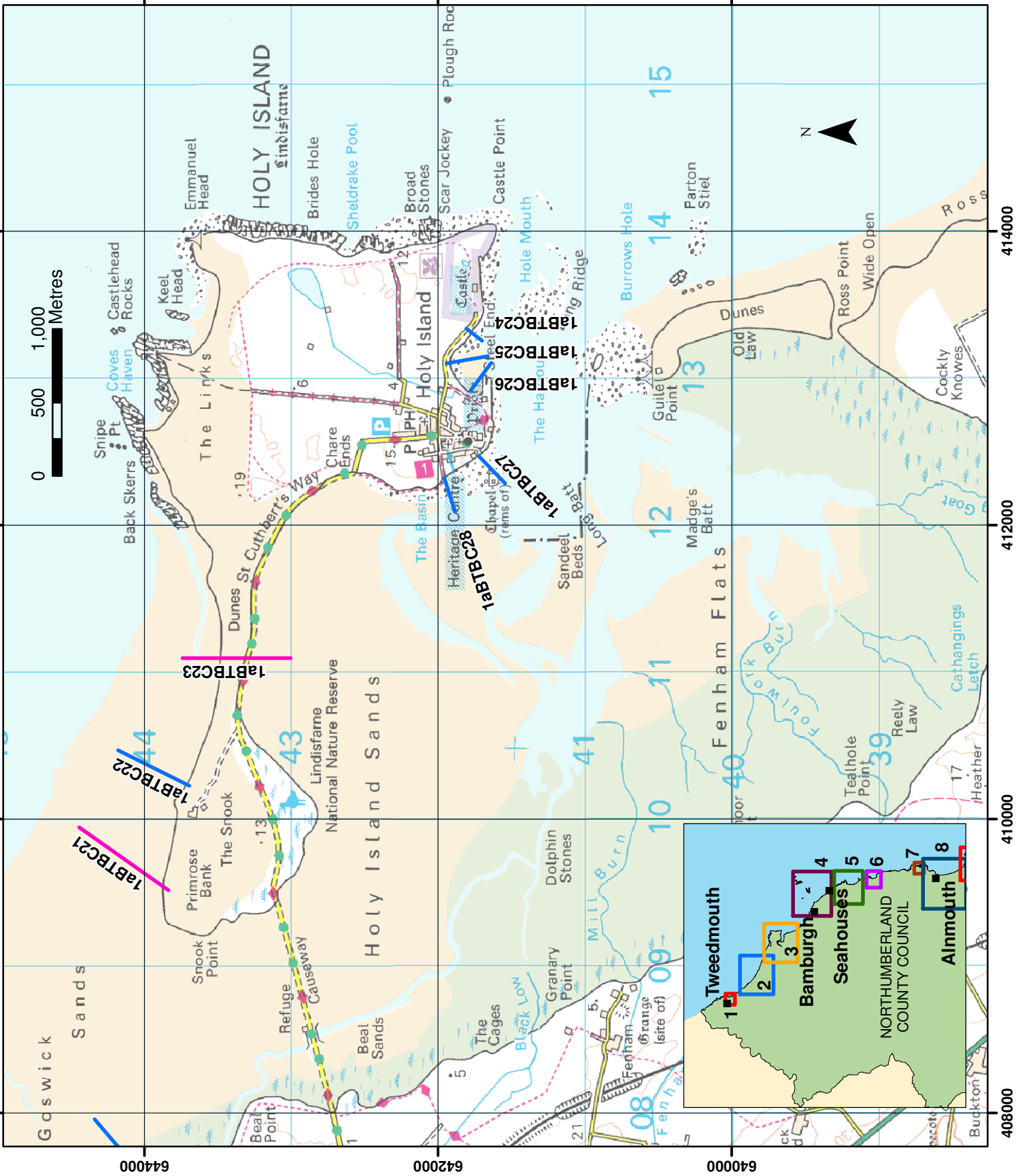
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

*(Indicative Survey Extents shown)*

**Client:** North East Coastal Group

**Project:** Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 4**  
**Northumberland County Council Frongate**

Update Report 1  
 'Partial Measures' Survey 2009

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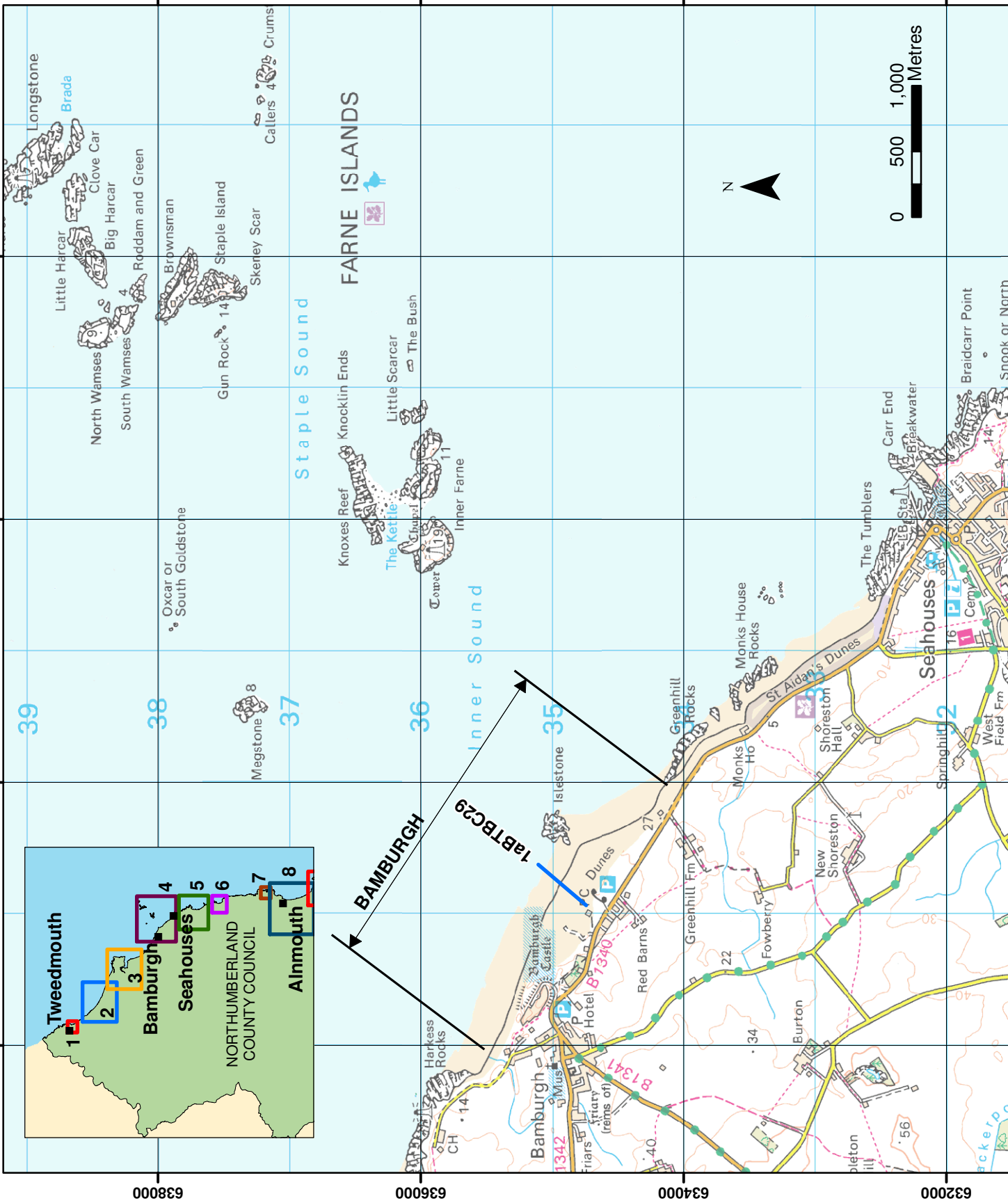
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 5  
Northumberland County  
Council Frontage**

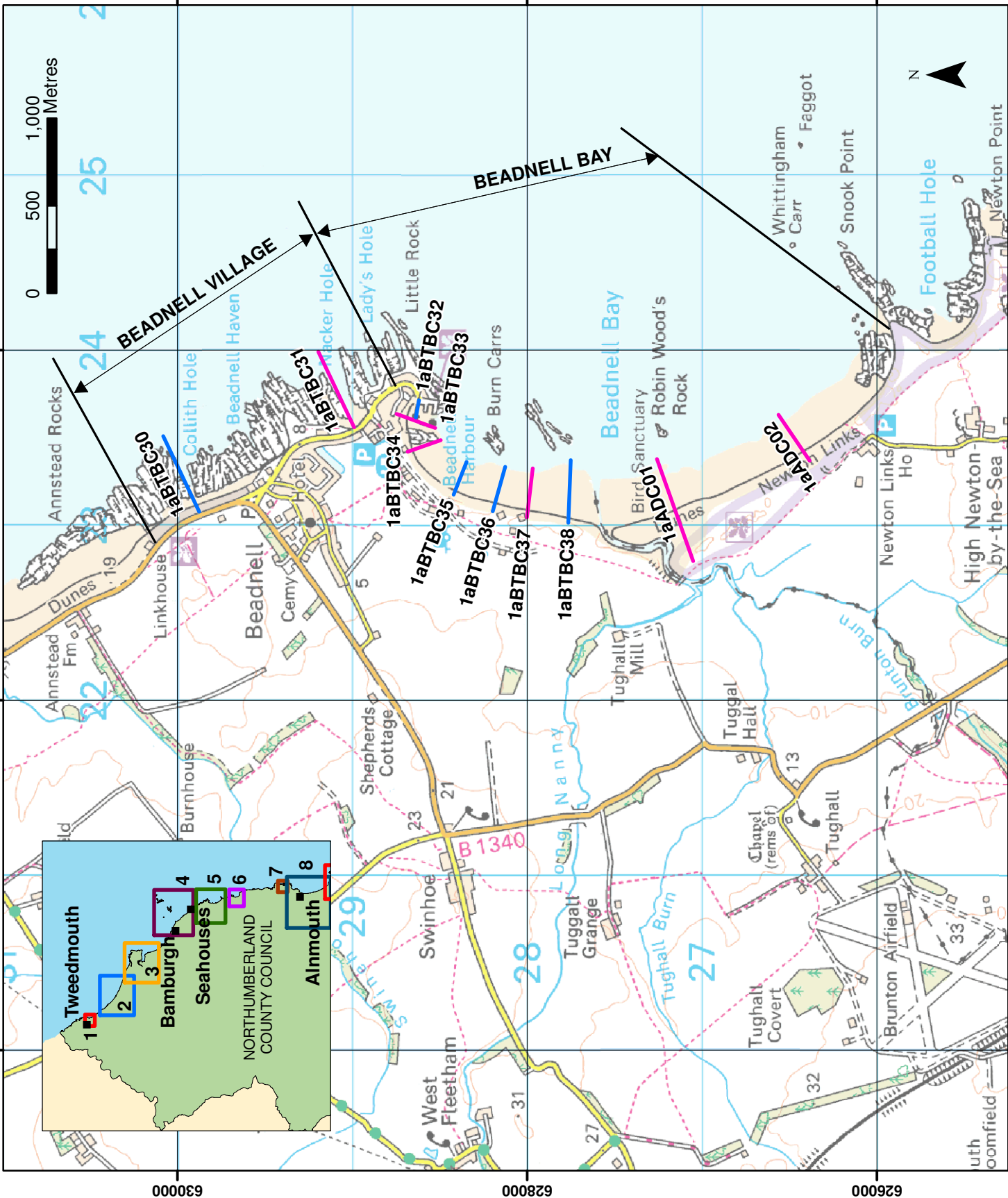
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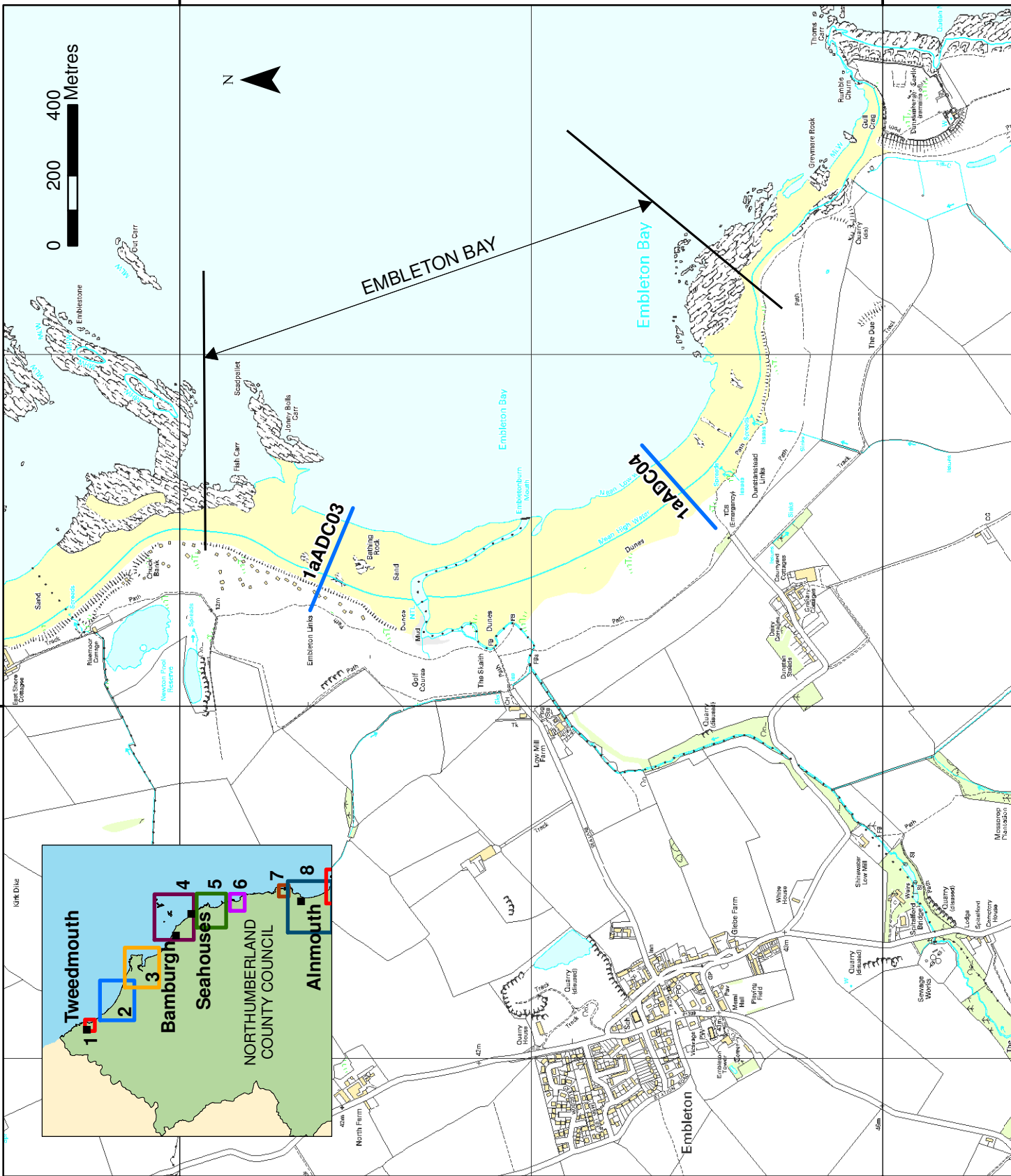
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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

(Indicative Survey Extents shown)

**Client:** North East Coastal Group

**Project:** Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 6  
Northumberland County  
Council Frontage**

Update Report 1  
'Partial Measures' Survey 2009

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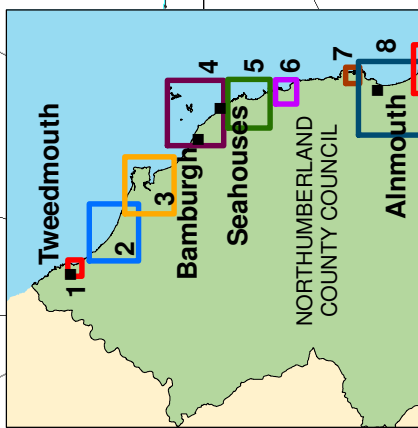
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### SURVEY LOCATIONS

#### Topographic Profiles

- Annual
- Bi-Annual

#### Topographic Surveys

- 6 monthly
- yearly
- 5 yearly

#### Cliff Top Monitoring Pegs

- @ 50 centres
- @ 100 centres
- @ 300 centres

(Indicative Survey Extents shown)

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

## Figure 1 - Map 7 Northumberland County Council Frontage

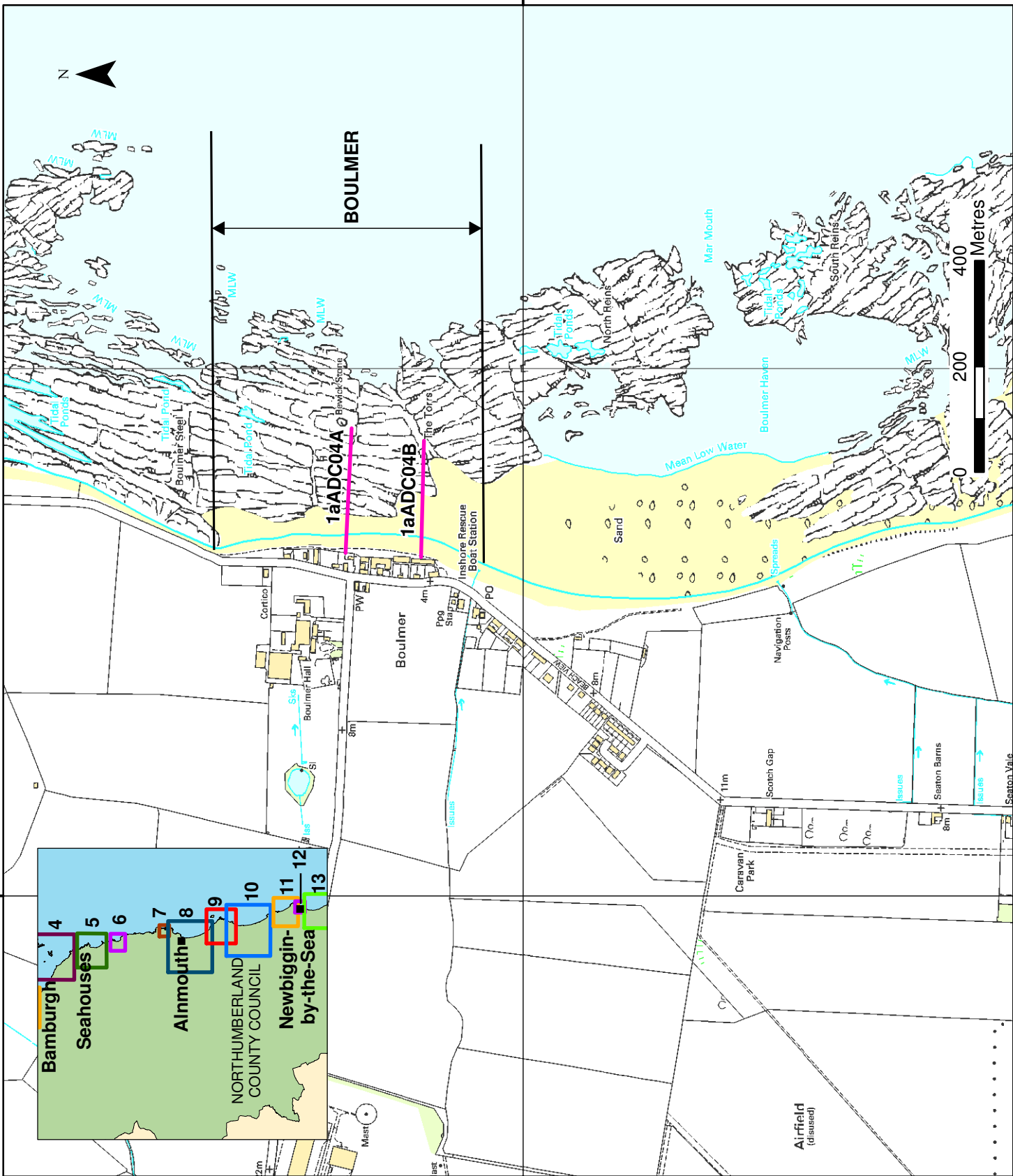
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614000

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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

*(Indicative Survey Extents shown)*

**Client:** North East Coastal Group

**Project:** Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 8**  
**Northumberland County Council Frongate**

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 'Partial Measures' Survey 2009

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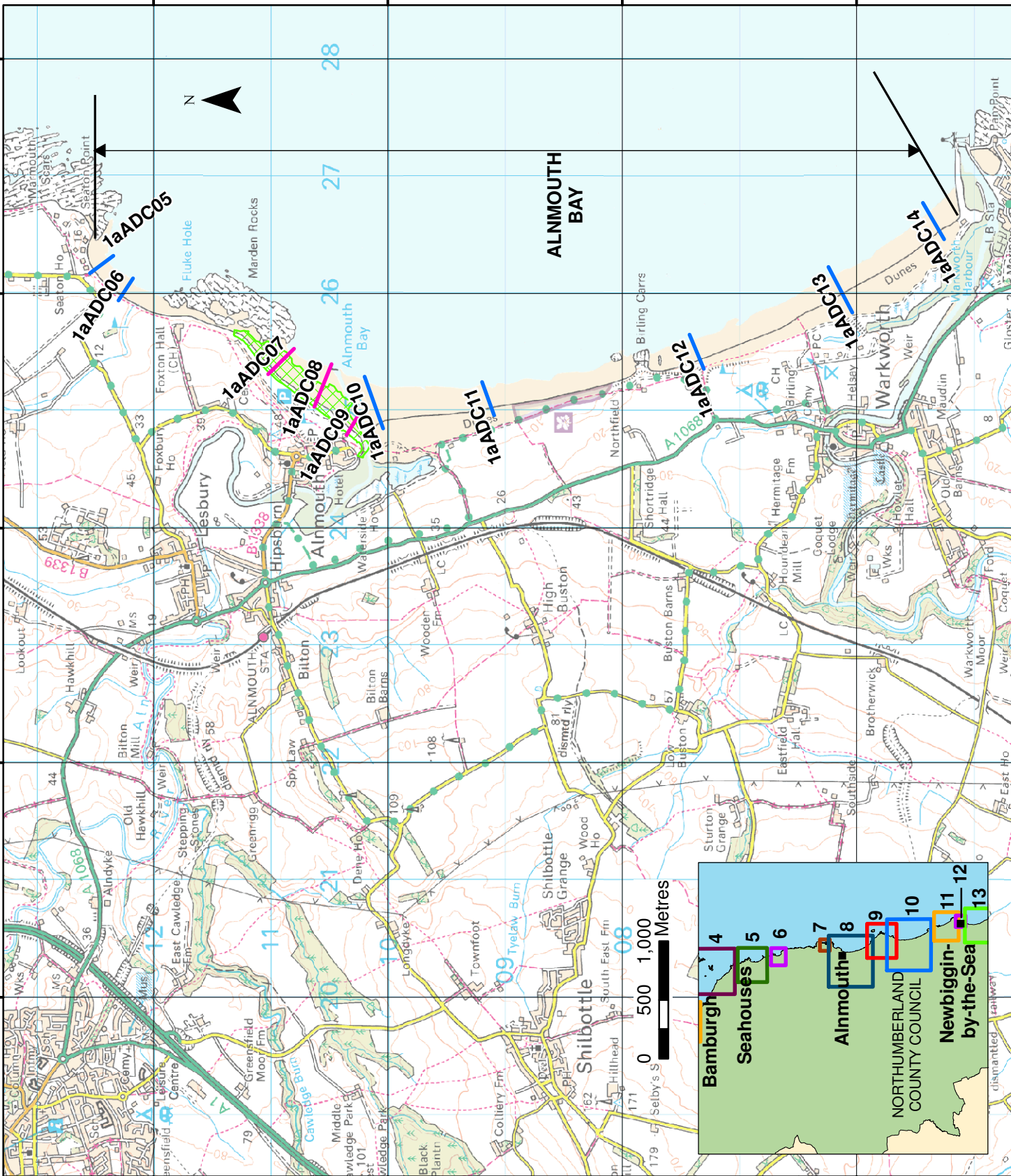
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612000 610000 608000 606000

428000 426000 424000 422000 420000

612000 610000 608000 606000

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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 9  
Northumberland County  
Council Frontage**

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'Partial Measures' Survey 2009

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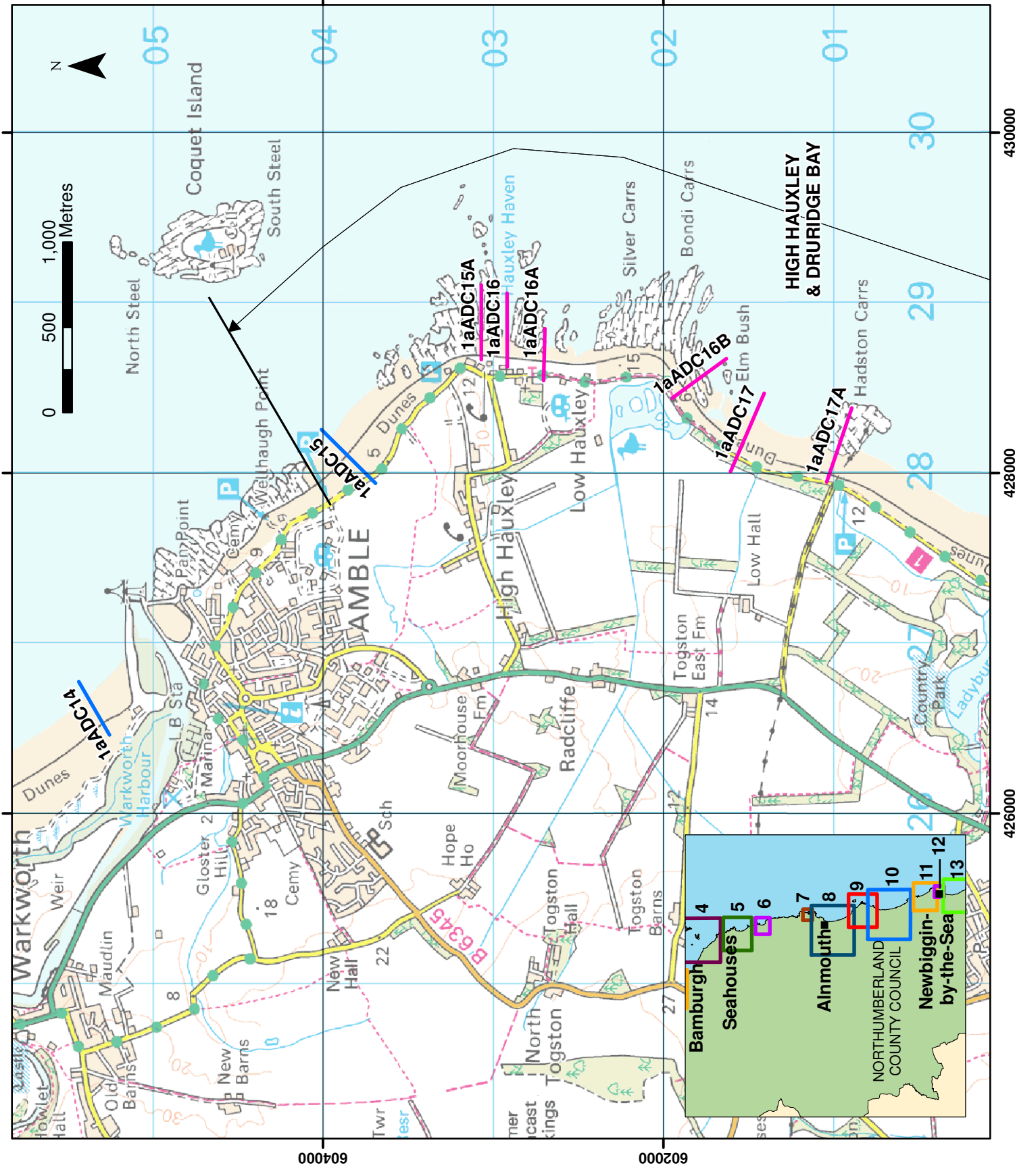
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430000

428000

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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres

*(Indicative Survey Extents shown)*

**Client:** North East Coastal Group

**Project:** Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 10**  
**Northumberland County**  
**Council Frontage**

Update Report 1  
 'Partial Measures' Survey 2009

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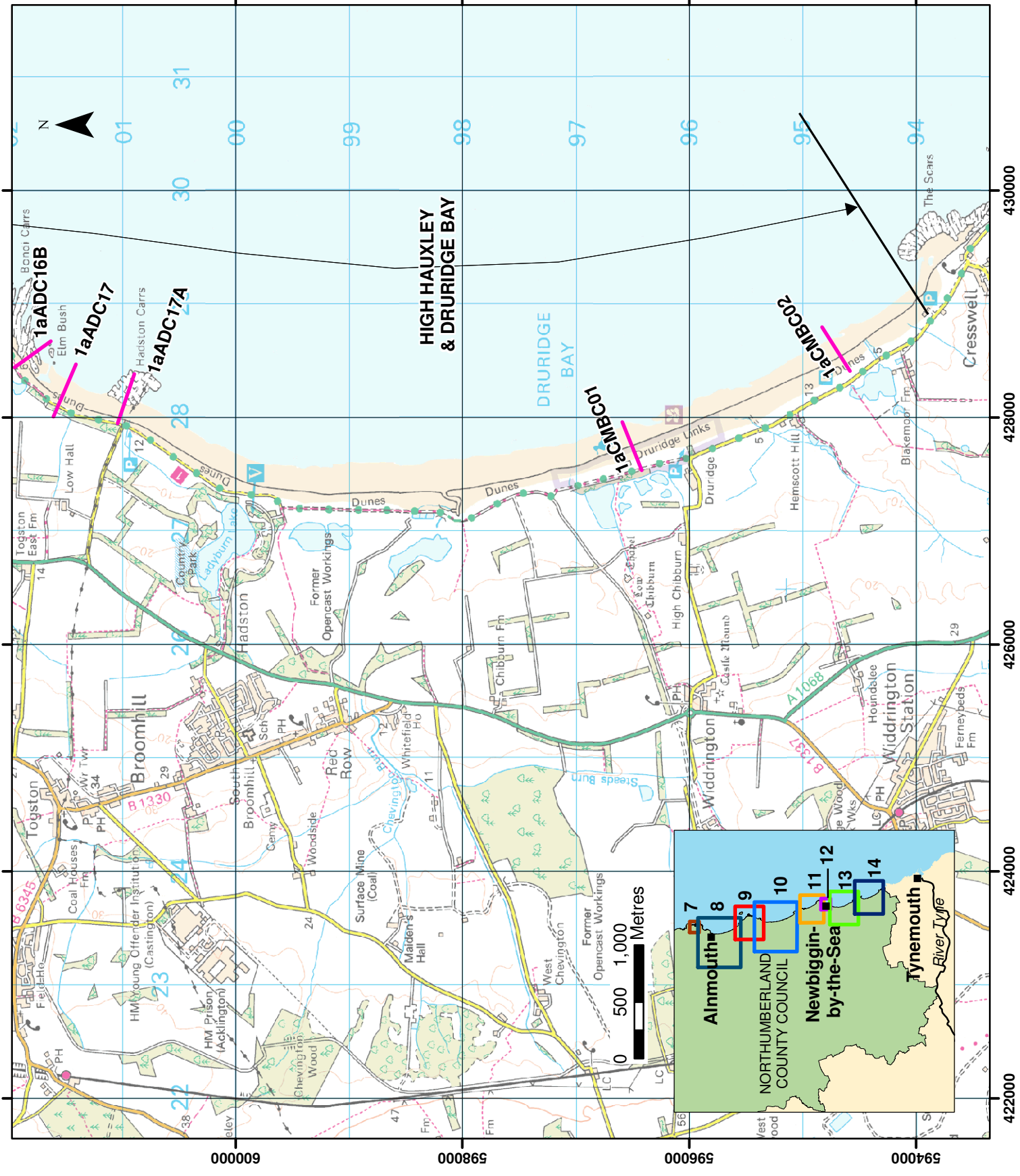
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422000  
424000  
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428000  
430000

594000  
596000  
598000  
600000



**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres
- Cliff Top Edge Survey

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 11  
Northumberland County  
Council Frontage**

Update Report 1  
'Partial Measures' Survey 2009

Drawing Scale 1:25,000 at A4

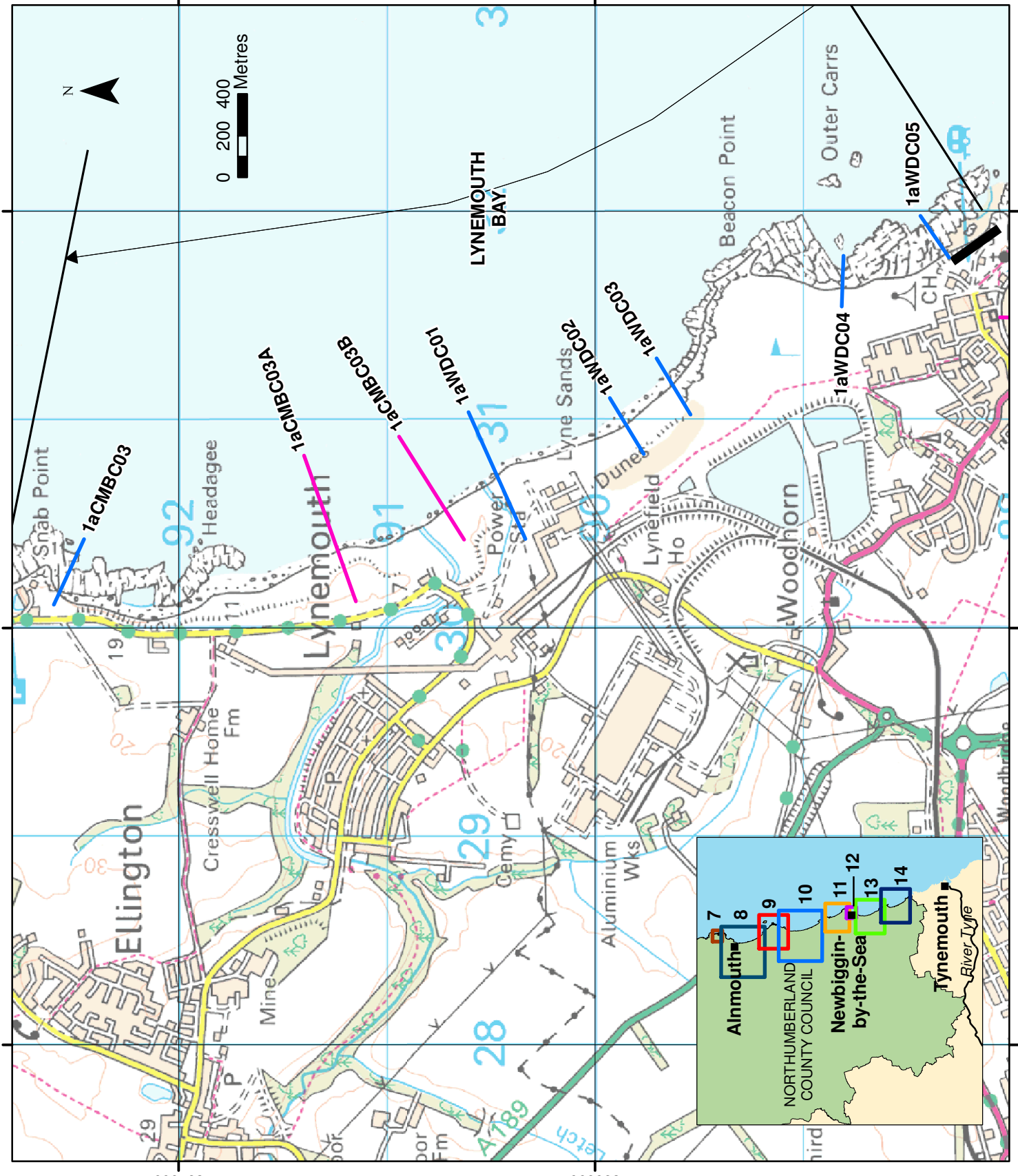
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592000

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**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres
- Cliff Top Edge Survey

*(Indicative Survey Extents shown)*

**Client:** North East Coastal Group

**Project:** Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 12  
Northumberland County  
Council Frontage**

Update Report 1  
'Partial Measures' Survey 2009

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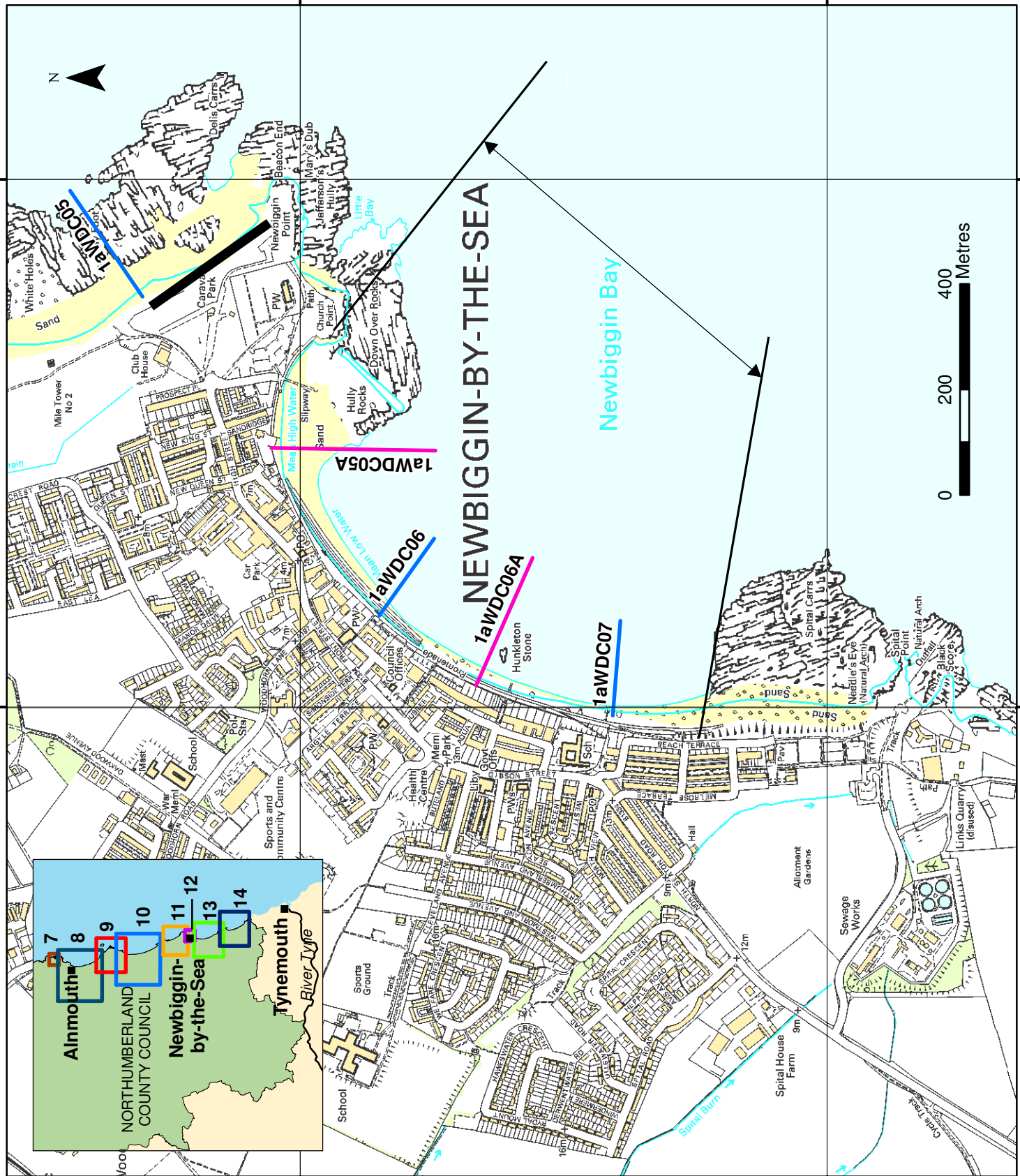
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432000

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587000





**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

**Cliff Top Monitoring Pegs**

- @ 50 centres
- @ 100 centres
- @ 300 centres
- Cliff Top Edge Survey

(Indicative Survey Extents shown)

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

**Figure 1 - Map 13  
 Northumberland County  
 Council Frontage**

Update Report 1  
 'Partial Measures' Survey 2009

Drawing Scale 1:30,000 at A4  
 Drawn by: TC Date: 17/06/2009  
 Checked by: NC Date: 17/06/2009  
 Approved by: NC Date: 17/06/2009

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**SURVEY LOCATIONS**

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**Cliff Top Monitoring Pegs**

- @ 50 centres
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- @ 300 centres
- Cliff Top Edge Survey

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 14  
Northumberland County  
Council Frontage**

Update Report 1  
'Partial Measures' Survey 2009

Drawing Scale 1:30,000 at A4

Drawn by: TC Date: 17/06/2009  
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## 2. Analysis of Survey Data

### 2.1 Sandstell Point

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Sandstell Point is covered by four beach profile lines during the Partial Measures survey, one along the inner estuary foreshore and three across the spit itself (Appendix A).</p> <p>Profile BTBC02 along the inner estuary showed further <b>notable landward retreat</b> across the entire profile length. This resulted in <b>cut-back of the seaward face of the dunes</b> by a further 1.4m and <b>lowering of the beach</b> between the toe of the dunes and a beach level of around 1.0mODN. At its greatest, this foreshore lowering was around 4.0m.</p> <p>Profile BTBC04 runs along the length of the spit and showed <b>significant change</b>, with slight accretion on the seaward face of the dunes, and <b>very major accretion</b> seaward of a chainage of 120m. This resulted in the formation of notable berms above MSL.</p> <p>Profiles BTBC05 and BTBC06 extend perpendicularly across BTBC04, starting at low water on the coastal side, moving across the spit and dropping steeply down into the estuary channel (i.e. west is on the right hand side of these plots).</p> <p>BTBC05, at the landward end of the spit, has <b>reduced very significantly in level</b> and extended slightly into the estuary channel as a consequence of this overwash flattening from seaward.</p> <p>BTBC06 experienced major eastward migration between April 2008 and October 2008, but moved slightly westward again by March 2009, although the position is still considerably further more east than on other previous surveys. The profile also experienced <b>major accretion along its seaward face</b>, to record new record high levels seaward of the main bank crest.</p>	<p><b>Notable changes continue to occur around Sandstell Point. There has been huge variation in the morphology at this location since the surveying began, as demonstrated by the very wide envelope of surveyed profiles.</b></p> <p>There has now been <b>cut-back totalling some 3.5m in the position of the seaward face of the dunes</b> along BTBC02 between the October 2007 and March 2009 surveys. Corresponding with this has been <b>progressive and notable foreshore lowering.</b></p> <p>The accretion on the seaward face of the dunes along BTBC04 is believed to be an artefact of the washover process which seems to have occurred at the landward end of the spit. Along BTBC05, the previously high and relatively stable dune crest (notwithstanding historic changes on the seaward slope of the dunes) has been significantly flattened and moved landward, with a corresponding westward movement into the main estuary channel.</p> <p>Along the distal end of the spit, however, the channel has migrated eastwards, further eroding into the western face of the bank (and causing the accretion noted lower down the profile on BTBC04).</p> <p><b>Changes along the spit are resulting in an ever increasing sinuosity in form of the estuary channel and corresponding sinuosity in spit form. This may be a prelude to a channel breaching through the spit, as has been observed historically.</b></p>

## 2.2 Spittal

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Spittal is covered by two beach profile lines during the Partial Measures survey (Appendix A).</p> <p>BTBC11 experienced minor accretion over a distance of around 8m from the toe of the wall, where previously levels were very low. Beach lowering occurred between chainages of 10m and 65m, however, setting low levels along this section. At its greatest, this lowering resulting in a drop in levels of up to 0.8m. Seaward of 65m chainage, however, accretion of up to 0.5m occurred.</p> <p>BTBC13 experienced accretion along its entire length. In places beach levels were up to 1.0m than recorded on the previous survey, and at the toe of the wall the level was 0.6m greater.</p>	<p>Profile changes along the Spittal frontage were quite large and appear linked with changes in channel and bank configuration around Sandstell Point.</p>

## 2.3 Goswick Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Goswick Sands is covered by two beach profile lines during the Partial Measures survey (Appendix A).</p> <p>BTBC16 experienced minor erosion at the toe of the dunes but more notable accretion along the length of the profile below MHWS, especially below MSL.</p> <p>BTBC19 experienced very modest changes, with minor accretion along the lower foreshore.</p>	<p>Both profiles experienced changes within the previous bounds of behaviour. BTBC16 recovered from the previous beach lowering. Both profiles are relatively stable.</p>

## 2.4 Holy Island

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Holy Island is covered by two beach profile lines during the Partial Measures survey (Appendix A).</p> <p>BTBC21 experienced minor accretion along the length of the foreshore profile. At the very seaward end of the profile new record high levels were recorded.</p> <p>BTBC23 extends across the foreshore on the southern side of Holy Island across the dunes to the foreshore on the northern side. There was insignificant change in the profile.</p>	<p>These profiles remain very stable and in a healthy condition.</p>

## 2.5 Beadnell Village

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Beadnell Village is covered by one beach profile line during the Partial Measures survey (Appendix A).</p> <p>BTBC31 experienced accretion of up to 0.35m at the toe of the wall, a very modest amount of lowering between HAT and MHWN, and then modest accretion along the rest of the profile.</p>	<p>The profile remains relatively stable, with changes being within previously recorded bounds of behaviour.</p>

## 2.6 Beadnell Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Beadnell Bay is covered by five beach profile lines during the Partial Measures survey (Appendix A).</p> <p>Beach levels along BTBC33 increased by around 0.15m. Although modest, this resulted in new record high beach levels along the profile at around MSL.</p> <p>BTBC34 experienced lowering seaward of 30m chainage, with the drop in levels seaward of around MSL resulting in new record low levels here. The changes along the mid and lower beach did not affect upper beach levels where changes involved modest redistribution of sediment.</p> <p>Very little change was observed along BTBC37.</p> <p>The material that had accreted at and above MHWS on the seaward face of the dunes at the time of the last survey along ADC01 had been redistributed, with mobilised material being deposited along the beach between chainages of 290m and 360m. The seaward face of the dunes still remains in a healthier condition, however, than recorded during any survey previous to the one in October 2008.</p> <p>ADC02 experienced modest accretion, of the order of 0.15m, along much of the mid and lower profile.</p>	<p>BTBC33 and BTBC34 are closely located to each other at the northern end of Beadnell Bay. Despite this, they exhibited opposing behaviour. This suggests that material may have been mobilised from BTBC34 and transported to BTBC33 resulting in modest accretion.</p> <p>Elsewhere in Beadnell Bay the measured profiles experienced modest accretion and remained relatively stable.</p>

## 2.7 Boulmer

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Boulmer is covered by two beach profile lines during the Partial Measures survey (Appendix A). These were introduced to the programme during the Full Measures survey of 2007.</p> <p>ADC04A experienced some accretion across the dune face and minor redistribution of sediment from around HAT, although this did not significantly reduce levels and was along only a narrow cross-shore width. Further down the profile, notable accretion occurred, setting new record high levels between chainages of 30m and 55m and between chainages of 70m and 85m.</p> <p>ADC04B experienced minor lowering at the dune toe, but no change in dune position. Seaward of MHWS to a chainage of around 85m there was accretion resulting in levels increasing by around 0.4m, in places setting new record high values.</p>	<p>Continued accretion of sediment resulting in rising of beach levels along much of each profile. Both, however, experienced (very minor) lowering directly at the dune toe. If such lowering were to coincide with a time when beach levels were lower (e.g. as recorded during the April 2008 survey), then this might result in landward retreat of the dune face and this needs to continue to be monitored.</p>

## 2.8 Alnmouth

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Alnmouth is covered by three beach profile lines during the Partial Measures survey (Appendix A). These are all located in the area of beach to the north of the River Aln estuary.</p> <p>ADC07 experienced increases in beach levels at the toe of the dunes by up to 0.5m, setting new record high values down to MHWS. Seaward of here to a chainage of around 80m was a very modest lowering of levels, but thereafter the profile changed considerably. The berm identified on the previous survey, peaking in level at a chainage of around 165m, had apparently been pushed up the profile by some 45m. There was then a notable runnel around the location of where the berm crest previously was recorded (around 160m to 185m chainage). A smaller second berm ridge was then seaward of this runnel.</p> <p>ADC08 also experienced accretion at the toe of the dunes, raising beach levels by around 0.15m. In places between the toe of the dunes and around HAT, this set new record high levels. Accretion of up to 0.2m in level occurred in two distinct sections lower down the beach profile, but these changes remained within the bounds of previous envelopes of change.</p> <p><b>ADC09 experienced significant change.</b> Previously along this section, upper beach levels remained relatively stable but in October 2008 major beach lowering beyond MHWS occurred, linked with closer migration to the shore of the outlet channel of the River Aln estuary. By the time of the March 2009 survey, this trend continued, with a <b>massive lowering of beach levels</b> across the entire profile length and the <b>total wash-out of the pioneer dune line</b>, to be replaced by gravel. The position of the main dune ridge did not change, but beach levels at the toe are now some 1.0m lower and the protective pioneer dune ridges are now absent. At the greatest point of change (at a chainage of around 70m, which was around the position that MHWS would have reached on the previously recorded profile), beach levels were some 1.5m lower.</p>	<p><b>Significant change occurred in the vicinity of the outfall channel of the River Aln estuary, resulting in some concern for dune management.</b> It is envisaged that if the channel migrates further towards the shore then the main dune ridge may start to become eroded.</p> <p>The deposition of gravel across the area of the former pioneer dune vegetation at the toe of the main dune crest suggests that a high energy event has occurred. It may be apparent from further surveys that the channel will stabilise following this event, but alternatively evidence of a continuing migratory trend would be of concern.</p>



Survey Date	Description of Changes Since Last Survey	Interpretation
	<p><b>Topographic Survey:</b></p> <p>The northern part of Alnmouth Bay (to the north of the River Aln estuary) is covered by a bi-annual topographic survey which commenced in April 2005. Data have been used to create a DGM (Appendix B – Map 1a) which has been compared against the previous survey (Appendix B – Map 1b).</p> <p>The topographic survey shows <b>considerable erosion towards the south</b> of the surveyed area, where the channel of the River Aln estuary is still in a northerly alignment. Further towards the north of the bay, erosion has occurred along the upper and lower beaches, with accretion along the mid beach.</p>	<p>As suggested by the beach profile surveys, a major event appears to have affected the upper beach and dune toe at the southern end of the bay, causing notable erosion. Despite this, some accretion has still occurred at the very southern tip.</p> <p>Elsewhere, sediment has been redistributed across the profile.</p>

## 2.9 High Hauxley and Druridge Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>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.</p> <p>Profile ADC15A experienced major accretion along almost its entire length, typically resulting in increases in level by around 0.4m but in places by up to 0.6m.</p> <p>Along ADC16, the berm which had accreted near the dune toe (around HAT) during the previous survey had flattened, with a small amount of material pushed up-profile to accrete directly at the dune toe and the remainder drawn down-profile to result in accretion near MHWN.</p> <p>ADC16A experienced notable lowering close to the toe of the revetment, between chainages of 90m and 140m. Here, new record low levels were set and boulders were identified at this point on the beach profile. Seaward of here, however, the profile accreted.</p>	<p>Along the Hauxley frontage there was not a consistent trend in profile behaviour, showing the complexities in the area. Whilst accretion generally occurred just south of Beacon Hill, there was a notable lowering close to the revetment fronting the southern part of Low Hauxley village.</p> <p>Around Silver Carrs into the northern section of Druridge Bay, beaches exhibited some changes, particularly around mid and lower foreshore levels. Changes were within previous envelopes of change and do not present concern. All profiles exhibited stability at the upper foreshore levels and in the position of the dune crest.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>ADC16B experienced lowering, especially between the rock outcrops on the upper and lower beach. Levels dropped by as much as 0.5m in places.</p> <p>ADC17 exhibited no change in the position of the main dune crest or upper beach profile, but lowering of around 0.15m in level occurred between chainages of around 60m and 190m. This remained within the bounds of previously observed behaviour.</p> <p>Upper beach levels were relatively stable along ADC17A, and further down the profile only modest redistribution of sediment occurred, with a berm being flattened. Changes were within previously observed envelopes.</p> <p>The berm previously identified at the very seaward end of the survey along profile CMBC01 had been pushed up-profile and was located at around a chainage of 300m. A smaller berm had also formed around MHWS, resulting in beach level increases at the dune toe.</p> <p>Similarly, the berm previously identified along CMBC02 at a chainage of around 300m remained intact, but was pushed up-profile by around 40m.</p>	<p>In the southern section of Druridge Bay, seasonal behaviour continues to dominate, with regular berm formation, migration and flattening continue to occur in response to changing forcing conditions.</p>

## 2.10 Lynemouth

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Lynemouth is covered by two beach profile lines during the Partial Measures survey (Appendix A). Both of these were added to the programme in October 2007.</p> <p>The slag bank along CMBC03A remains in a constant position and form, although foreshore levels near the toe, between chainages of 93m and 104m dropped by up to 0.5m as the upper beach cut back. There now remains an upper beach width of <b>only around 6m</b> before the toe of the bank would start to become cut into.</p> <p>Profile CMBC03B is located to the north of the recent revetment extension and is continuing to experience <b>notable foreshore lowering and landward retreat of the slag bank.</b></p>	<p>Onset of erosion at the toe of the slag bank along CMBC03A could rapidly result in landward retreat of this feature through a successive of toe erosion events followed by upper bank slumping.</p> <p>This irreversible process is already occurring along profile CMBC03B.</p>

## 2.11 Newbiggin-by-the-Sea

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Newbiggin-by-the-Sea is covered by two beach profile lines during the Partial Measures survey (Appendix A). Both of these are located directly within Newbiggin Bay and were added to the programme in October 2007.</p> <p>WDC05A experienced a little further accretion above HAT and a little further deposition just seaward of MSL, but the previous dramatic changes along the main beach face (due to, and following, the recharge operations) have now ceased.</p> <p>Following a degree of recovery in beach levels along WDC06A during the last survey, the steep seaward face of the recharged beach retreated landwards once again, although only by around 2m seaward of MHWS. Around HAT level, the cut-back was greater; being around 10m, but some of this material was redistributed to the beach crest where levels increased marginally.</p>	<p>Profile changes appear to be settling somewhat as the initial changes following beach recharge occurred over the first year or so following the scheme. Beach morphology now appears more attuned to the prevailing wave conditions, which of course are significantly modified by the new offshore breakwater built to help retain the recharged beach.</p>
03-2009	<p><b>Cliff Top Survey:</b></p> <p>This survey was introduced to the monitoring programme in September 2007 and covers the cliffs in front of Newbiggin Caravan Park, located to the immediate north of Newbiggin Point.</p> <p>The northern part of this frontage (approximately 70m in length) is unprotected by defences. This survey shows relatively little change since the previous survey of October 2008, although one length of around 3.5m cut back by around 0.4m.</p> <p>The central section of this frontage (approximately 125m in length) is protected by concrete blocks and rubble. Due to this, most of the frontage is relatively stable although at a distance of around 55m along the defended length a single event has caused cut-back by up to 1m over a 4m frontage.</p> <p>The southern section of surveyed cliff (around 80m in length) is fronted by rocky shore platform. This section also mostly appeared relatively stable since the previous survey.</p>	<p>The cliff top fronting Newbiggin Caravan Park has shown more stability than previously recorded, with recession confined to two locations. Here cut back has occurred along short lengths only.</p>

## 2.12 Cambois

Survey Date	Description of Changes Since Last Survey	Interpretation
03/2009	<p><b>Cliff Top Survey (Sandy Bay Caravan Park):</b></p> <p>This survey was introduced to the monitoring programme in September 2007 and covers the cliffs in front of Sandy Bay Caravan Park, located to the immediate north of the mouth of the River Wansbeck estuary.</p> <p>Since the last survey in October 2008, the cliff top position has cut back in twelve discrete areas. Mostly this involves relatively modest cut-backs (0.15m to 0.3m) along short lengths (&lt;5m) but in one instance involved around 1m of cut back over a 4m length.</p> <p><b>Cliff Top Survey (Cambois):</b></p> <p>This survey was introduced to the monitoring programme in April 2009 and covers the cliffs along Cambois, extending between the mouth of the River Wansbeck estuary (south bank) and the East Pier at Blyth harbour.</p> <p>This survey provides the baseline against which future surveys will be compared.</p>	<p>The cliffs along Sandy Bay Caravan Park continue to exhibit local and relatively small-scale cut back in a number of discrete locations. This seems to be an ongoing trend. However, in total only around 30m of 440m the frontage was active since the last survey.</p> <p>The area exhibiting greatest cut back was at the south-eastern end of the park where there is a row of five caravans (as shown on the 2006 Google Earth imagery used in the interpretation). The changes observed since the last survey are just to the south of the cut-back that was experienced between April and October 2008, although that previously active zone did not change further up to the present survey.</p>

## 2.13 Blyth South Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2009	<p><b>Beach Profiles:</b></p> <p>Blyth South Beach is covered by six beach profile lines during the Partial Measures survey (Appendix A).</p> <p>BVBC01 experienced modest lowering, of up to 0.1m between generally MHWN and MLWN, with modest accretion to both landward and seaward.</p> <p>Beach levels directly at the toe of the sea wall dropped along BVBC02 by around 0.4m, but remained within previous bounds of behaviour. Material was redistributed elsewhere along the profile, with general accretion on foreshore.</p> <p>Upper beach levels along BVBC03 remained stable and healthy, as did the position of the dunes. Notable accretion occurred seaward of a chainage of around 110m.</p> <p>The berm previously identified just seaward of the toe of the dunes along BVBC04 became flattened, with material pushed up-profile directly to the dune toe where beach levels increased by around 0.15m. Seaward of HAT, beach levels increased due to sediment accretion.</p> <p>Similarly, the berm previously identified just above HAT on profile BVBC05 became flattened with material pushed up-profile to accumulate directly at the dune toe. Seaward of a chainage of 115m, however, beach levels lowered by around 0.8m.</p> <p>Profile BVBC06 experienced accretion, with changes remaining within previous envelopes of change.</p>	<p>In general, beach changes along Blyth South Beach were within previous envelopes of change. There was generally modest redistribution of sediment across the foreshore, with berm flattening and accumulation elsewhere along many profiles.</p> <p>One notable finding, however, is the foreshore lowering along the seaward sections of BVBC05, despite generally healthy and accreting conditions along adjacent profiles to both the north and south. This further supports previous evidence that this is a particularly vulnerable section of frontage.</p>

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

Major changes have been observed throughout the monitoring period in the profiles around Sandstell Point. This is demonstrated by the huge envelope of change in the relevant profile plots in Appendix A. Clearly this frontage is part of a very dynamic system and it remains necessary to better understand causes / consequences of this (as recommended in the SMP2). This is especially important given the development proposals in the area and the high nature conservation values of the estuary, both of which could be affected by ongoing natural changes. Such further investigations could usefully re-examine the profile changes since 2002 in the light of other evidence, such as a review of historic maps and aerial photographs, to better understand historic changes.

The cliff top survey along the Cambois frontage extends from the mouth of the River Wansbeck estuary (south bank) to the East Pier at Blyth Harbour. At the northern end of this frontage, around Cambois House, the cliff edge is quite indistinct as it bevels in shape. Here, access to the bevelled edge is also quite difficult in places due to hedgerow growth. Despite these constraints, the cliff edge has been surveyed as much as is practicable and as accurately as possible in this corner. Further south of Cambois House the cliff edge is far more distinct and accessible.

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

Given the rates and types of change occurring at Sandstell Point, it is recommended that full topographic surveys are undertaken bi-annually along the inner estuary beach, around Sandstell Point, and south along the Spittal coastal frontage.

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

- There has been huge variation in the morphology of the channels, spit, inner estuary foreshore and open coast beaches around Sandstell Point throughout the course of the monitoring. Between the October 2007 and March 2009 surveys there has been cut-back in the position of the seaward face of the dunes along the inner estuary totalling some 3.5m. Corresponding with this has been progressive and notable foreshore lowering. In addition, washover processes seem to have occurred at the landward end of the spit that extends from Spittal Point towards Sandstell Point. The previously high and relatively stable dune crest (notwithstanding historic changes on the seaward slope of the dunes) has been significantly flattened and moved landward, with a corresponding westward movement into the main estuary channel. Along the distal end of the spit, however, the channel has migrated eastwards, further eroding into the western face of the bank. These changes along the spit are resulting in an ever increasing sinuosity in form of the estuary channel and corresponding sinuosity in spit form. This may be a prelude to a channel breaching through the spit, as has been observed historically.
- Along the Spittal coastal frontage, profile changes were quite large and appear linked with changes in channel and bank configuration around Sandstell Point.
- Profiles along Goswick Sands, Holy Island, Beadnell Village and much of Beadnell Bay experienced changes within the previous bounds of behaviour. At the northern end of Beadnell Bay, however, material seems to move to the north where it is accreted, although changes remained modest in magnitude.
- At Boulmer accretion of sediment continued, resulting in rising of beach levels along much of each profile. Very minor lowering occurred along both transects, however, directly at the dune toe. If such lowering were to coincide with a time when beach levels were lower (e.g. as recorded during the April 2008 survey), then this might result in landward retreat of the dune face and this needs to continue to be monitored.

- Significant change occurred in the vicinity of the outfall channel of the River AIn estuary, resulting in some concern for dune management. It is envisaged that if the channel migrates further towards the shore then the main dune ridge may start to become eroded. The deposition of gravel across the area of the former pioneer dune vegetation at the toe of the main dune crest suggests that a high energy event has been the initiator of this change. It may be apparent from further surveys that the channel will stabilise following this event, but alternatively evidence of a continuing migratory trend would be of concern.
- Along the Hauxley and Druridge Bay frontages there was not a consistent trend in profile behaviour, showing the complexities in the area. Whilst accretion generally occurred just south of Beacon Hill, there was a notable lowering close to the revetment fronting the southern part of Low Hauxley village. Around Silver Carrs into the northern section of Druridge Bay, beaches exhibited some changes, particularly around mid and lower foreshore levels. Changes were within previous envelopes of change and do not present concern. All profiles exhibited stability at the upper foreshore levels and in the position of the dune crest. In the southern section of Druridge Bay, seasonal behaviour continues to dominate, with regular berm formation, migration and flattening continue to occur in response to changing forcing conditions.
- At Lynemouth the onset of erosion at the toe of the slag bank further north of the Power Station could rapidly result in landward retreat of this feature through a successive of toe erosion events followed by upper bank slumping. This irreversible process is already occurring along profiles just to the north of the defended section.
- The cliff top fronting Newbiggin Caravan Park has shown more stability than previously recorded, with recession confined to two locations. Here cut back has occurred along short lengths only.
- In Newbiggin Bay, beach changes appear to be settling somewhat as the initial changes following beach recharge occurred over the first year or so following the scheme. Beach morphology now appears more attuned to the prevailing wave conditions, which of course are significantly modified by the new offshore breakwater built to help retain the recharged beach.
- The cliffs along Sandy Bay Caravan Park continue to exhibit local and relatively small-scale cut back in a number of discrete locations. This seems to be an ongoing trend. However, in total only around 30m of 440m the frontage was active since the last survey. The area exhibiting greatest cut back was at the south-eastern end of the park where there is a row of five caravans (as shown on the 2006 Google Earth imagery used in the interpretation). The changes observed since the last survey are just to the south of the cut-back that was experienced between April and October 2008, although that previously active zone did not change further up to the present survey.
- Beach changes along Blyth South Beach were generally within previous envelopes of change. There was generally modest redistribution of sediment across the foreshore, with berm flattening and accumulation elsewhere along many profiles. One notable finding, however, is the foreshore lowering along the seaward sections of parts of the beach where the sand-filled geotextile bags have been installed, despite generally healthy and accreting conditions along adjacent profiles to both the north and south. This further supports previous evidence that this is a particularly vulnerable section of frontage.





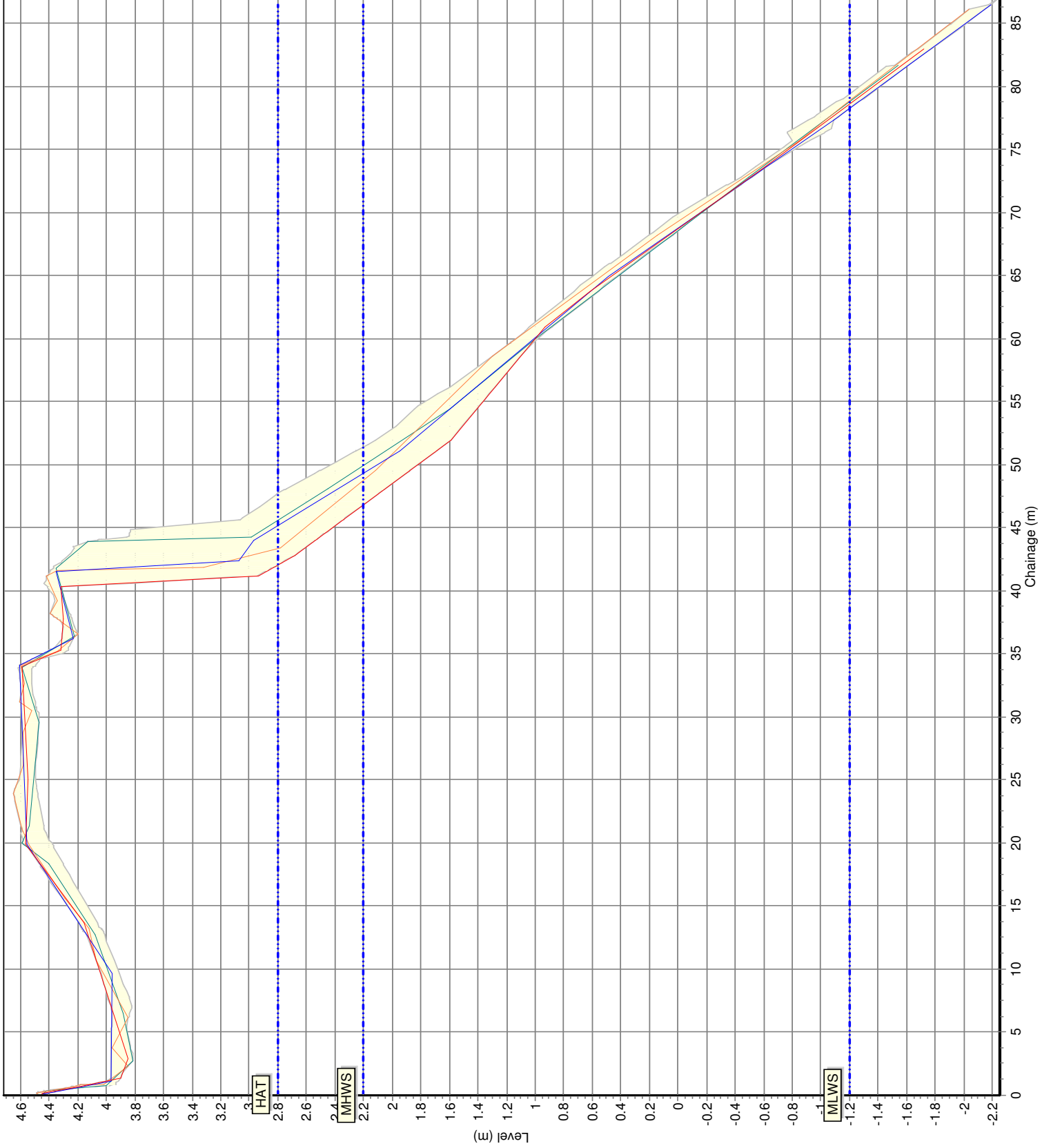
## **Appendices**



**Appendix A**  
**Beach Profiles**

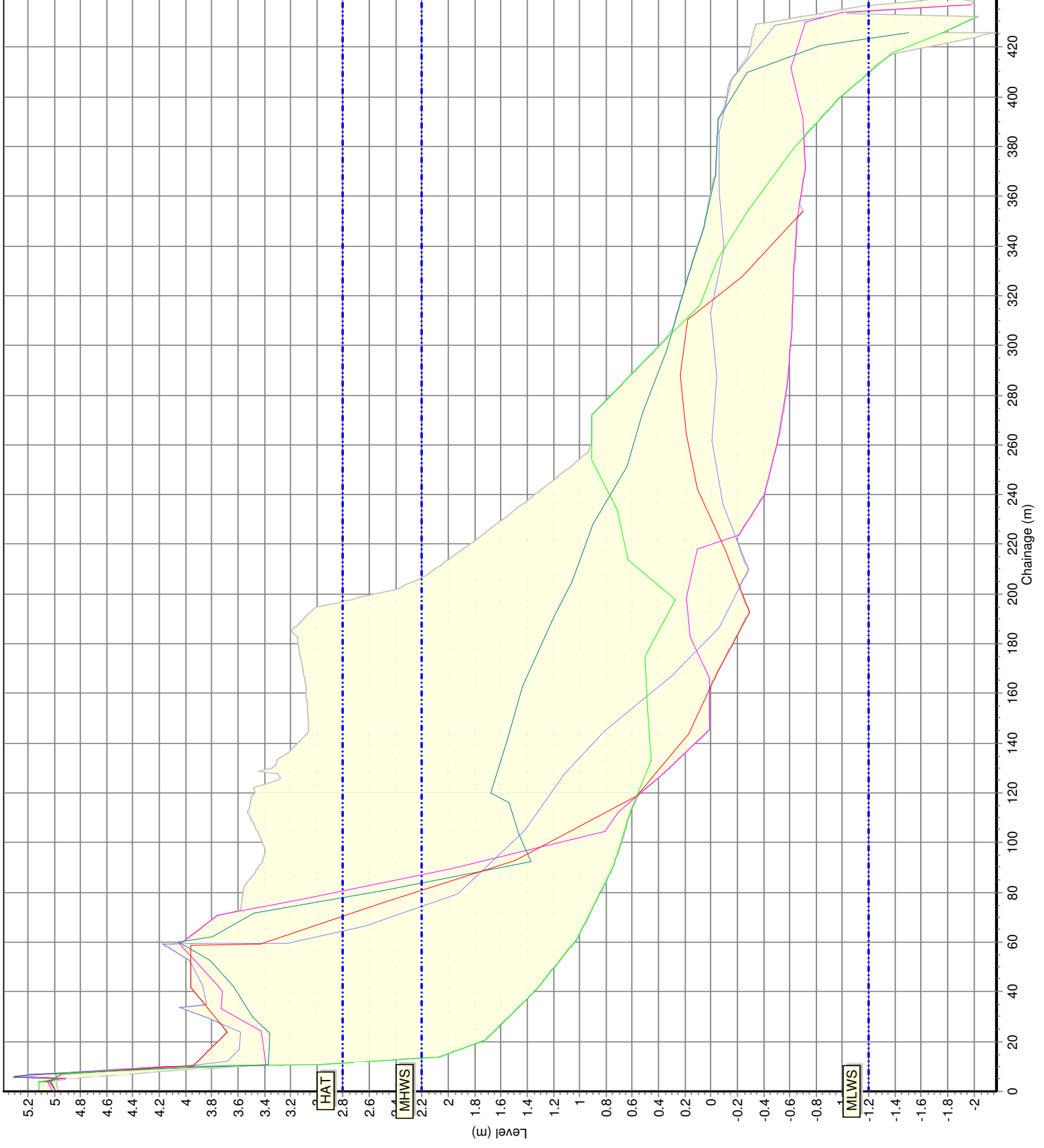


Beach Profiles: 1aBTBC02



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<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	12/03/2009
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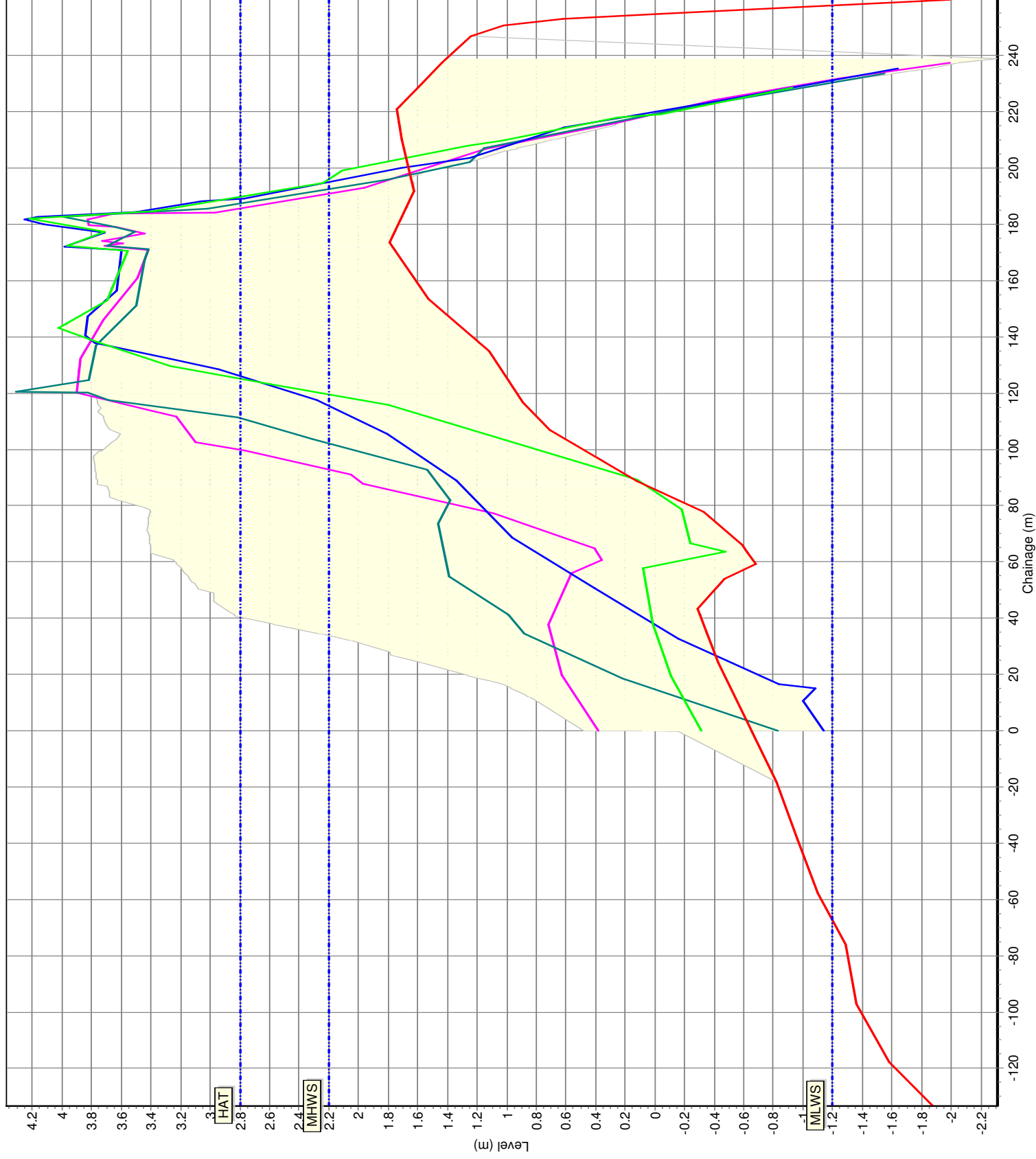
**Beach Profiles: 1aBTBC04**



Profiles Envelope

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<input type="checkbox"/>	15/04/2005
<input type="checkbox"/>	18/10/2005
<input type="checkbox"/>	21/04/2006
<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
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<input checked="" type="checkbox"/>	12/03/2009

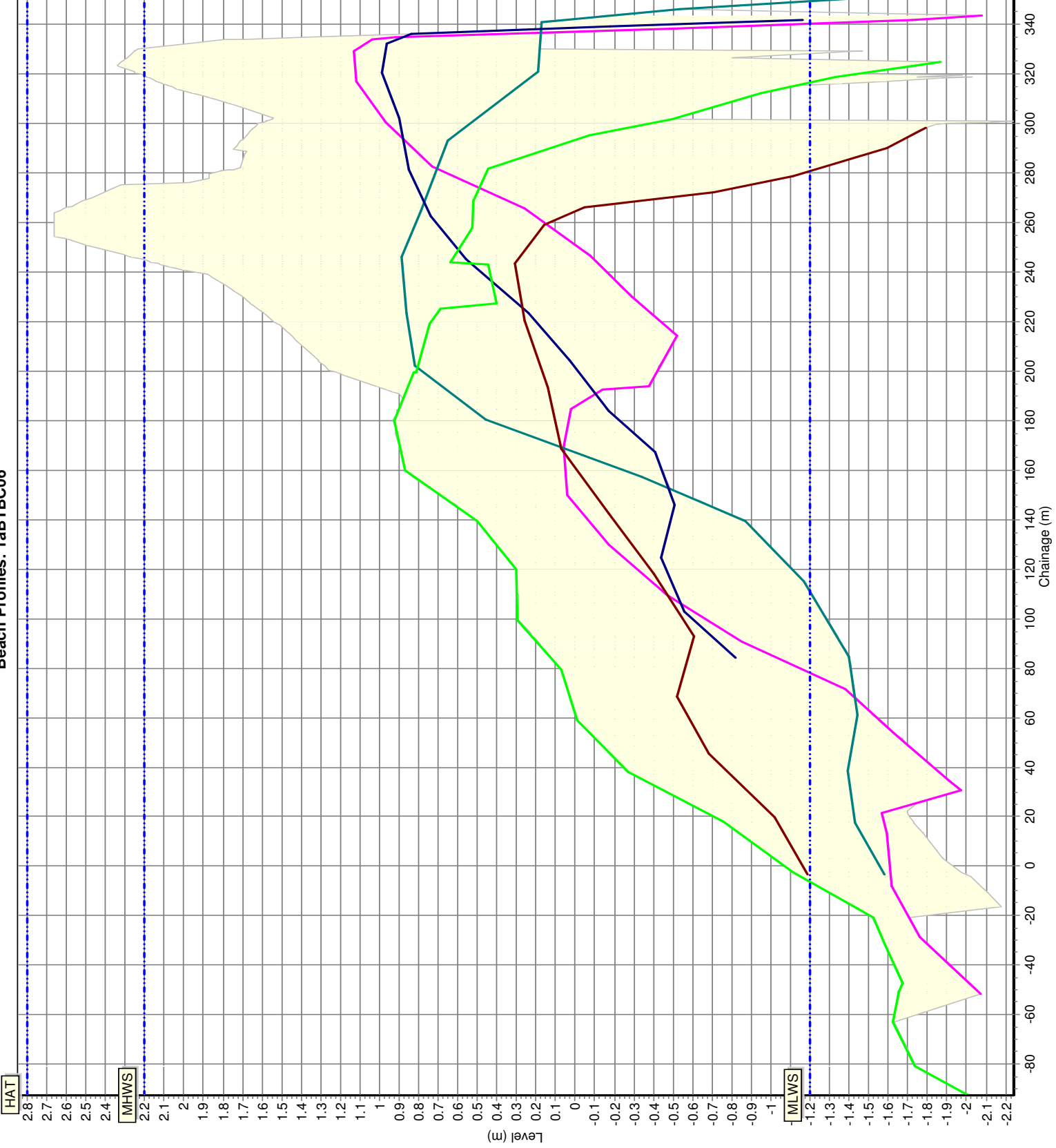
Beach Profiles: 1aBTBC05



Profiles Envelope

- Profiles Envelope
- 15/04/2004
- 15/10/2004
- 15/04/2005
- 18/10/2005
- 21/04/2006
- 10/11/2006
- 04/04/2007
- 15/10/2007
- 30/04/2008
- 21/10/2008
- 12/03/2009

Beach Profiles: 1aBTBC06

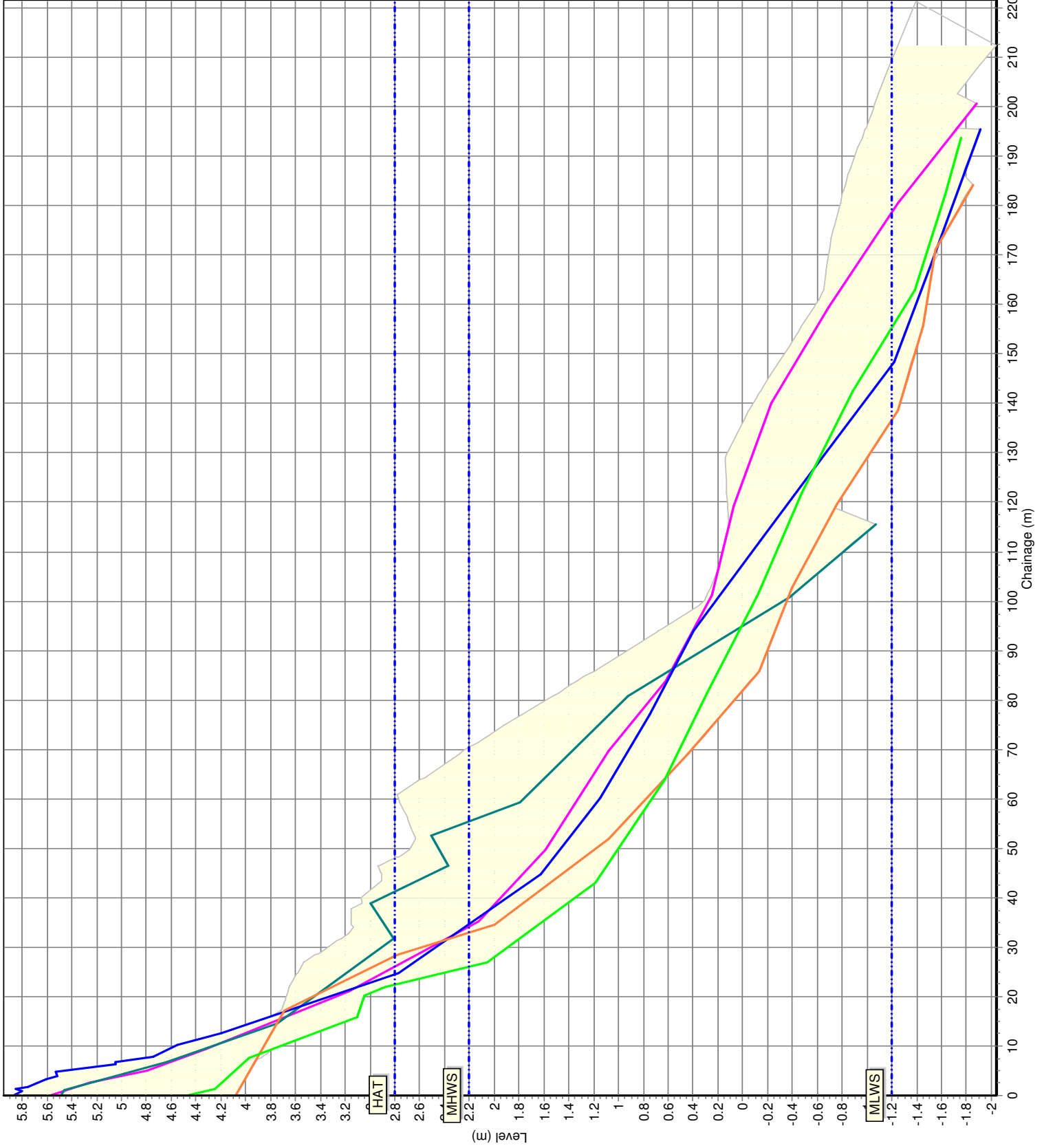


Profiles Envelope

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<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	12/03/2009



Beach Profiles: 1aBTBC11



Profiles Envelope

<input checked="" type="checkbox"/>	15/04/2004
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<input type="checkbox"/>	15/04/2005
<input type="checkbox"/>	18/10/2005
<input type="checkbox"/>	21/04/2006
<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
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<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	12/03/2009

Beach Profiles: 1aBTBC13



Profiles Envelope

<input checked="" type="checkbox"/>	15/04/2004
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<input type="checkbox"/>	15/04/2005
<input type="checkbox"/>	18/10/2005
<input type="checkbox"/>	21/04/2006
<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	12/03/2009

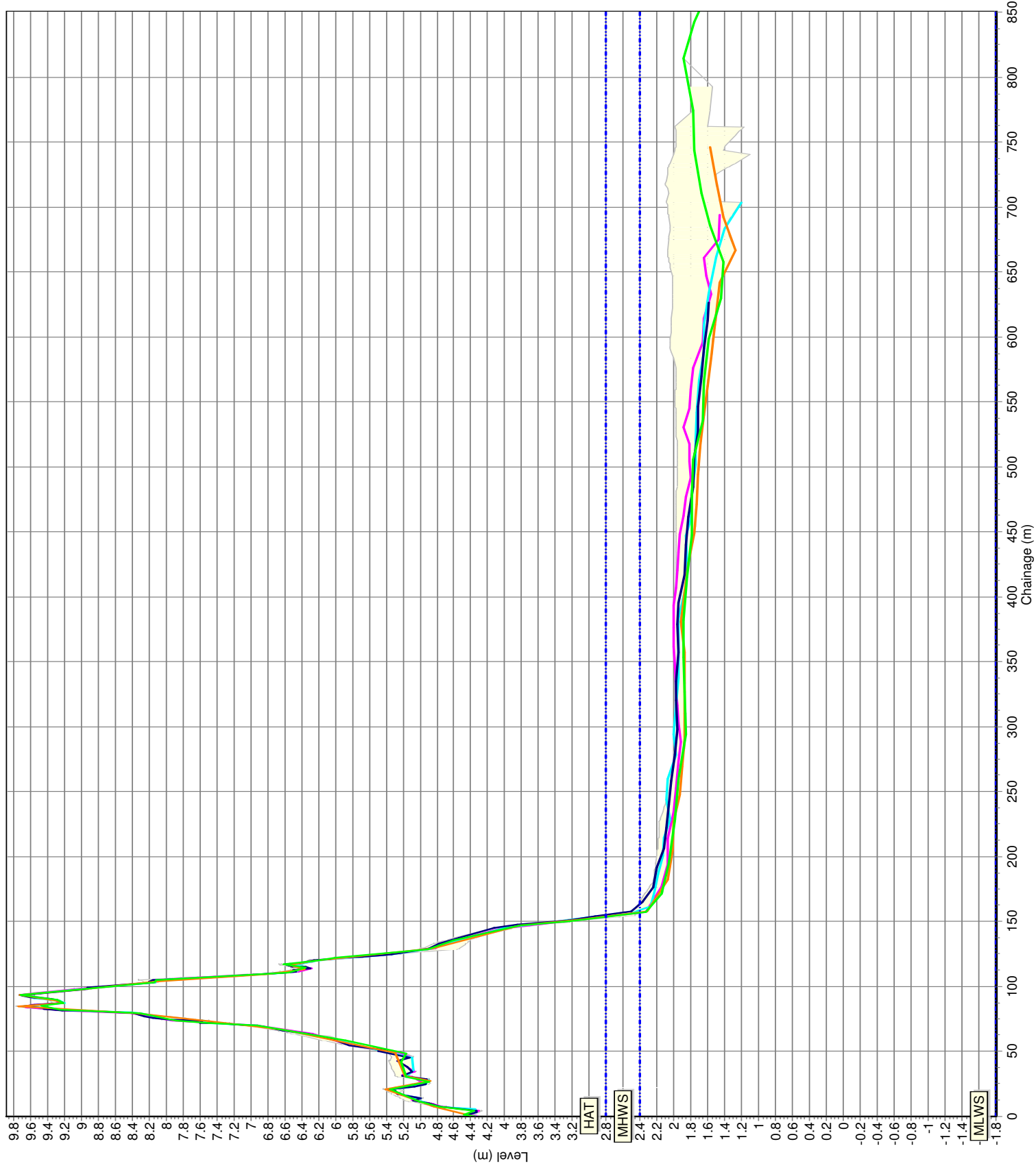
# Beach Profiles: 1aBTBC16



Profiles Envelope

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<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	16/03/2009

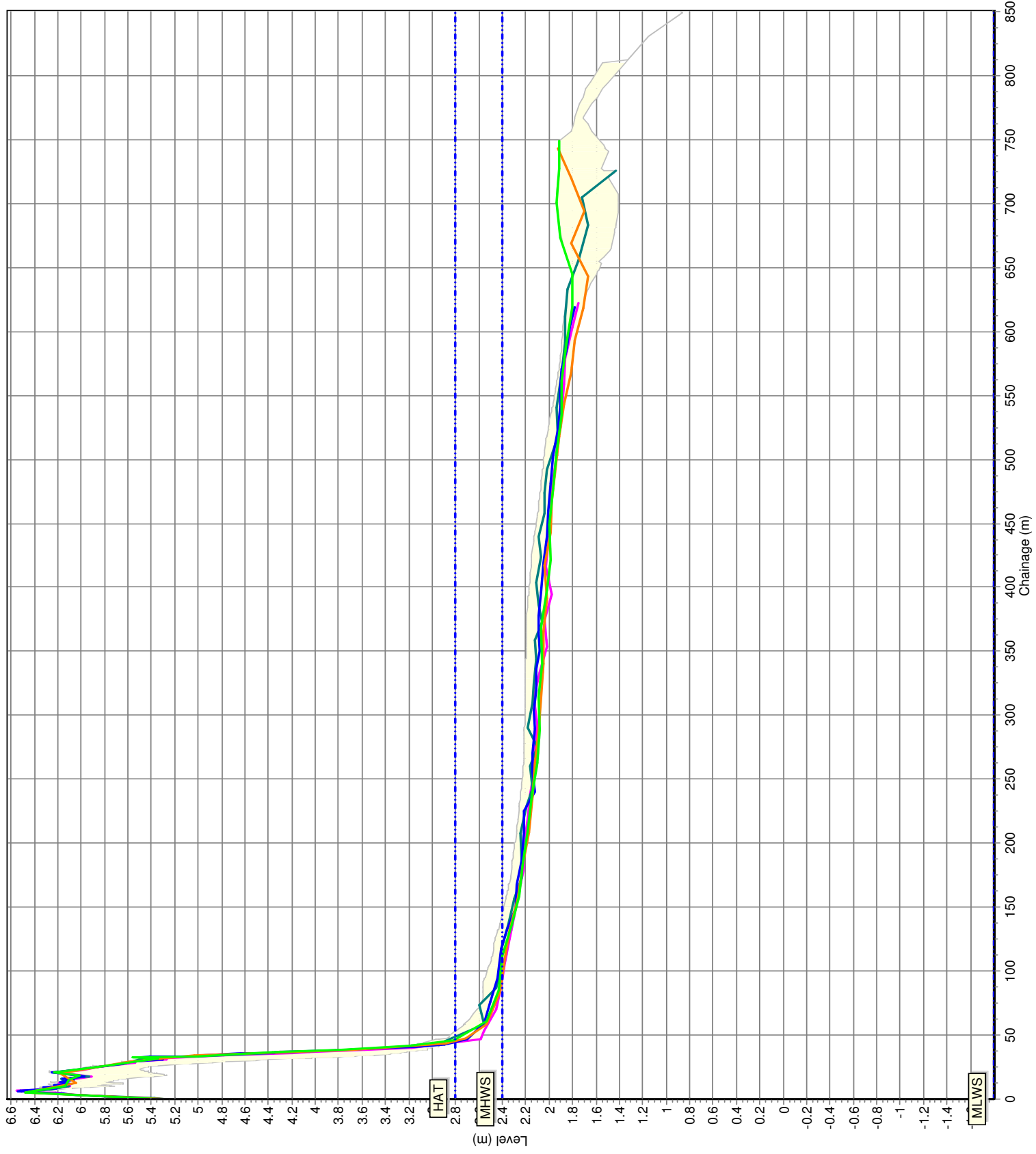
Beach Profiles: 1aBTBC19



Profiles Envelope

- 15/04/2004
- 15/10/2004
- 15/04/2005
- 18/10/2005
- 21/04/2006
- 10/11/2006
- 04/04/2007
- 15/10/2007
- 30/04/2008
- 21/10/2008
- 11/03/2009

Beach Profiles: 1aBTBC21



Profiles Envelope	
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<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	11/03/2009

Beach Profiles: 1aBTBC23



Profiles Envelope	
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<input type="checkbox"/>	15/04/2005
<input type="checkbox"/>	18/10/2005
<input type="checkbox"/>	21/04/2006
<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	11/03/2009

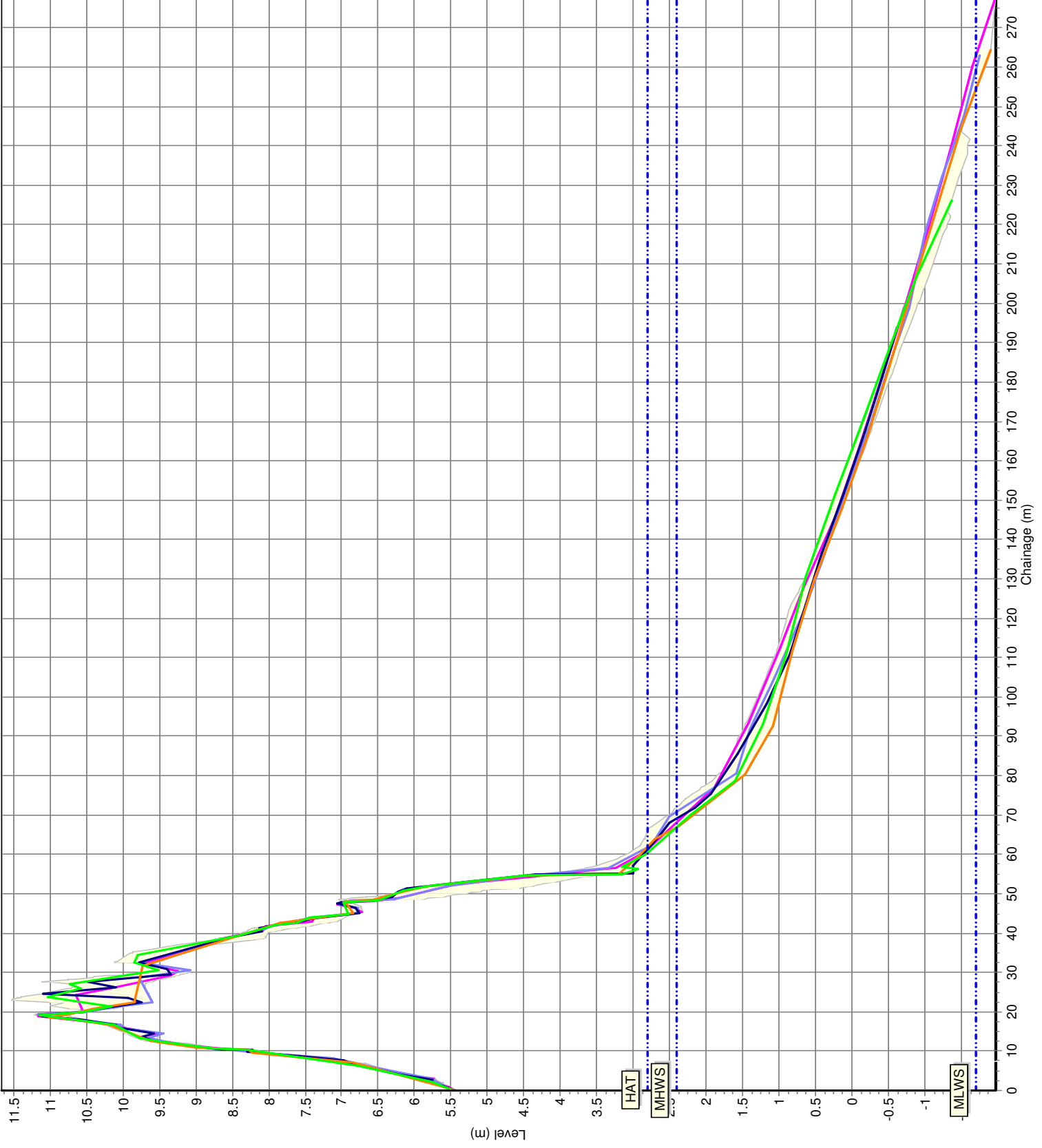
Beach Profiles: 1aBTBC31



Profiles Envelope

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<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	16/03/2009

Beach Profiles: 1aBTBC33

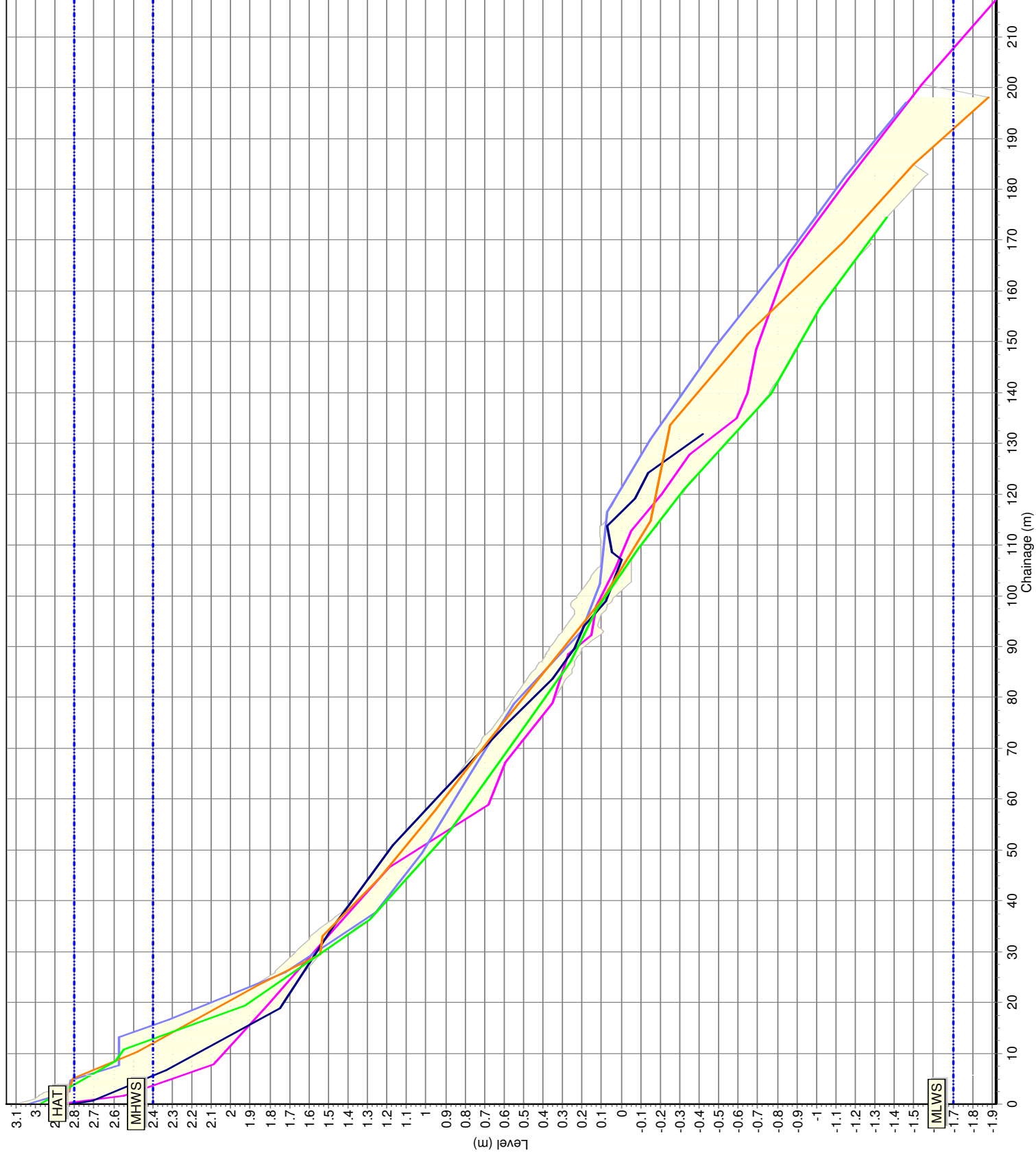


Profiles Envelope

<input checked="" type="checkbox"/>	15/04/2004
<input type="checkbox"/>	15/10/2004
<input type="checkbox"/>	15/04/2005
<input type="checkbox"/>	18/10/2005
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<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	16/03/2009

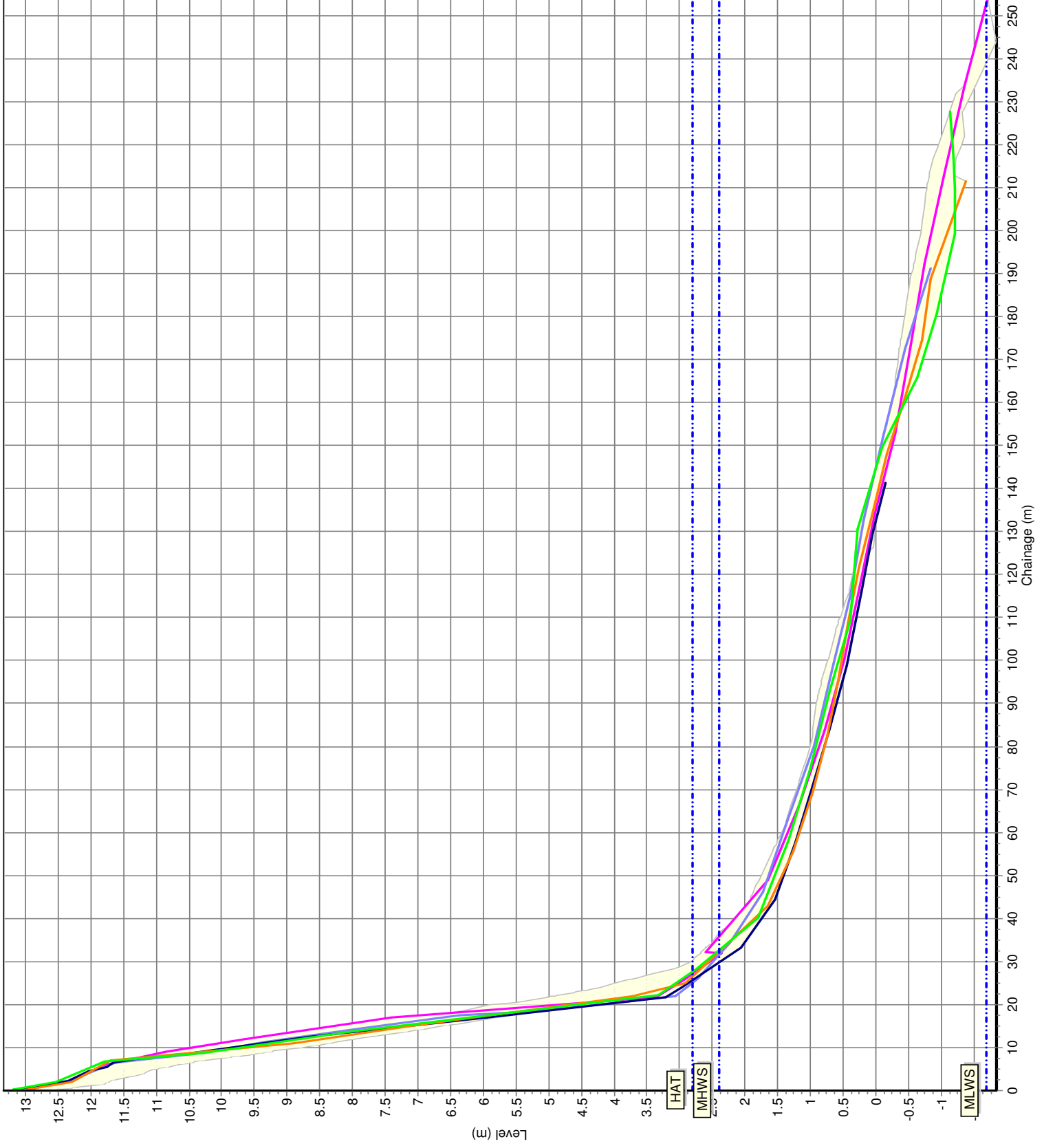


Beach Profiles: 1aBTBC34



Profiles Envelope	
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<input type="checkbox"/>	18/10/2005
<input type="checkbox"/>	21/04/2006
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<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	16/03/2009

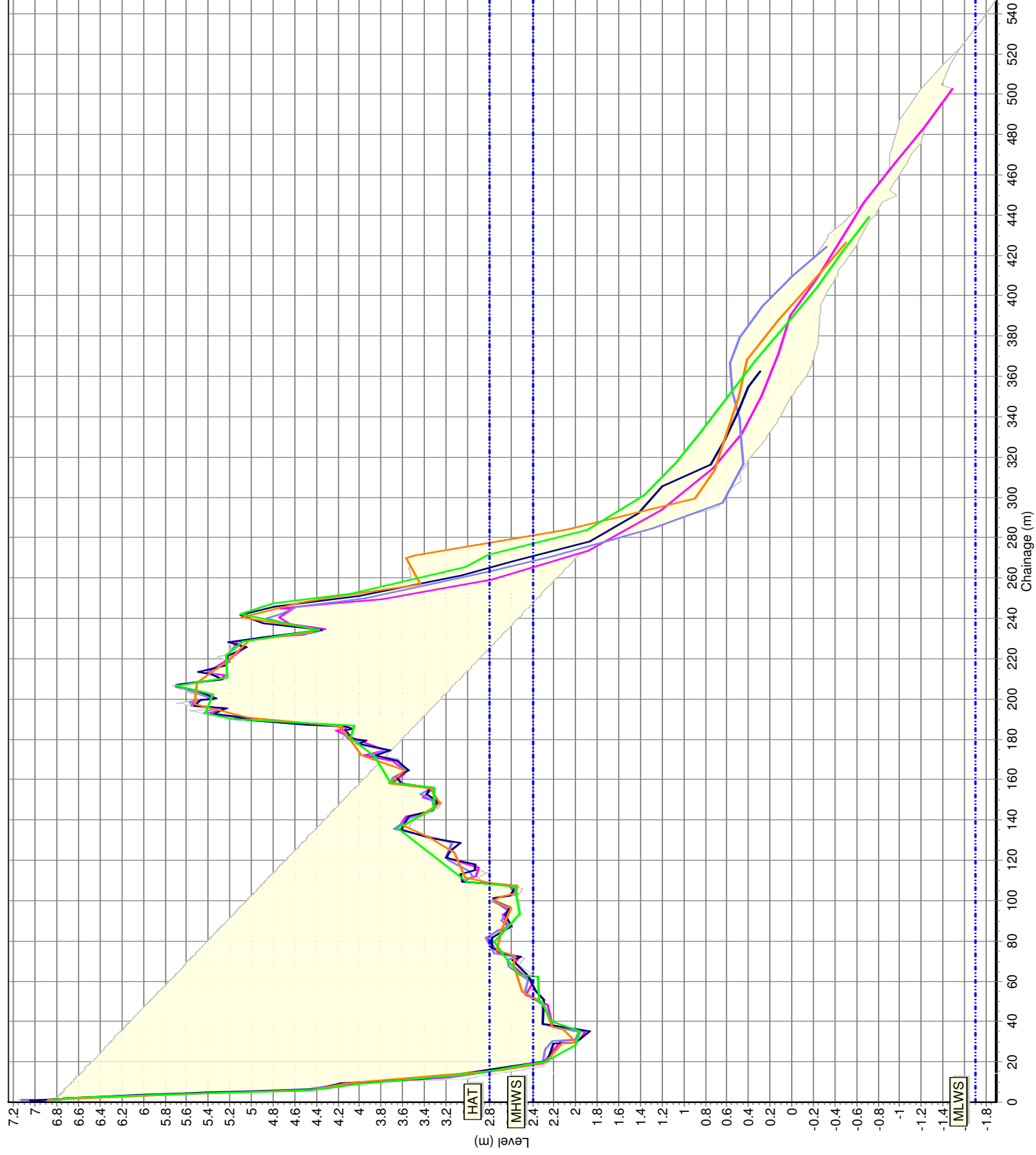
Beach Profiles: 1aBTBC37



Profiles Envelope

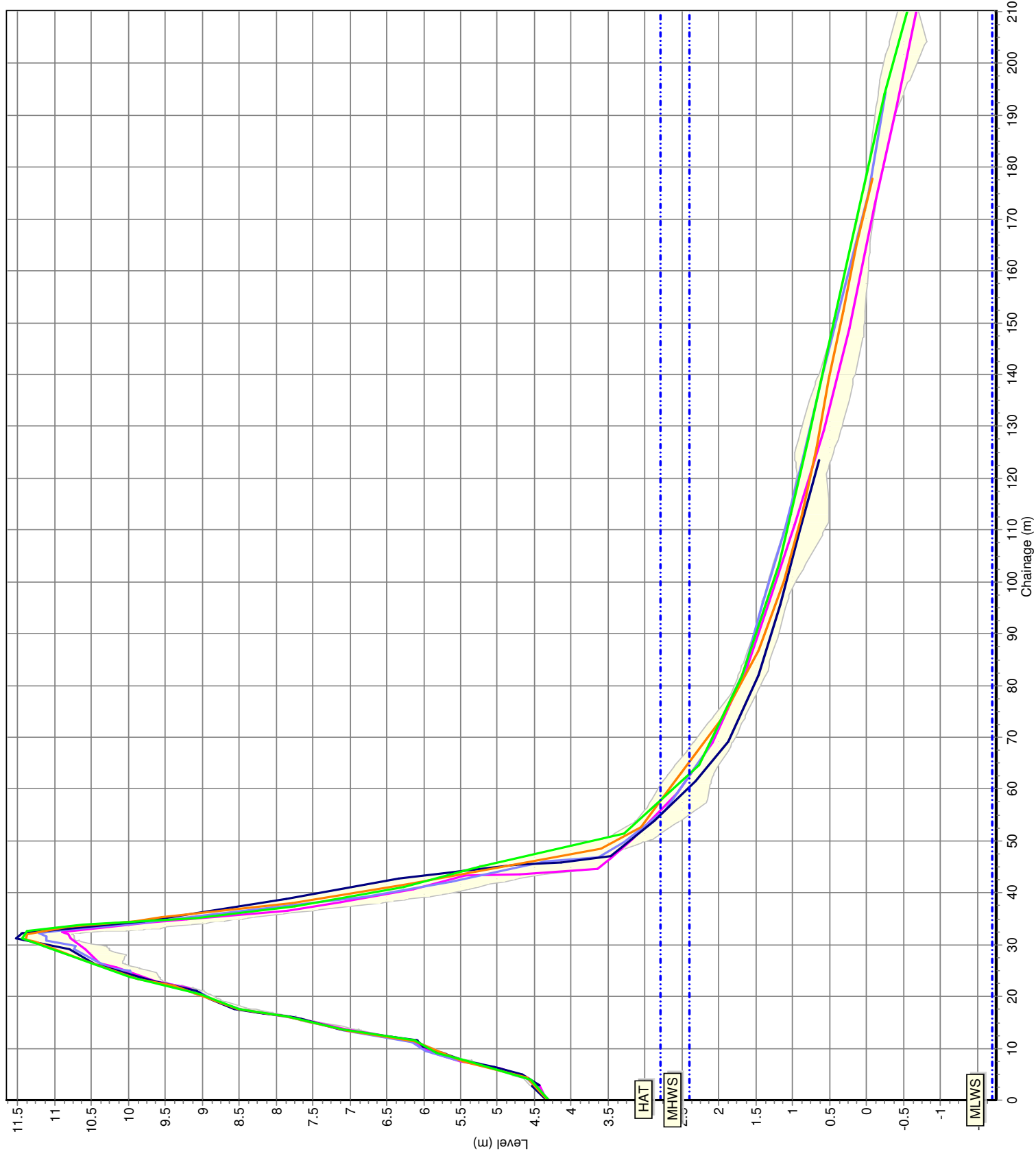
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<input type="checkbox"/>	18/10/2005
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<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	16/03/2009

Beach Profiles: 1aADC01



- Profiles Envelope
- 15/04/2004
- 15/10/2004
- 15/04/2005
- 18/10/2005
- 21/04/2006
- 10/11/2006
- 04/04/2007
- 15/10/2007
- 30/04/2008
- 21/10/2008
- 16/03/2009

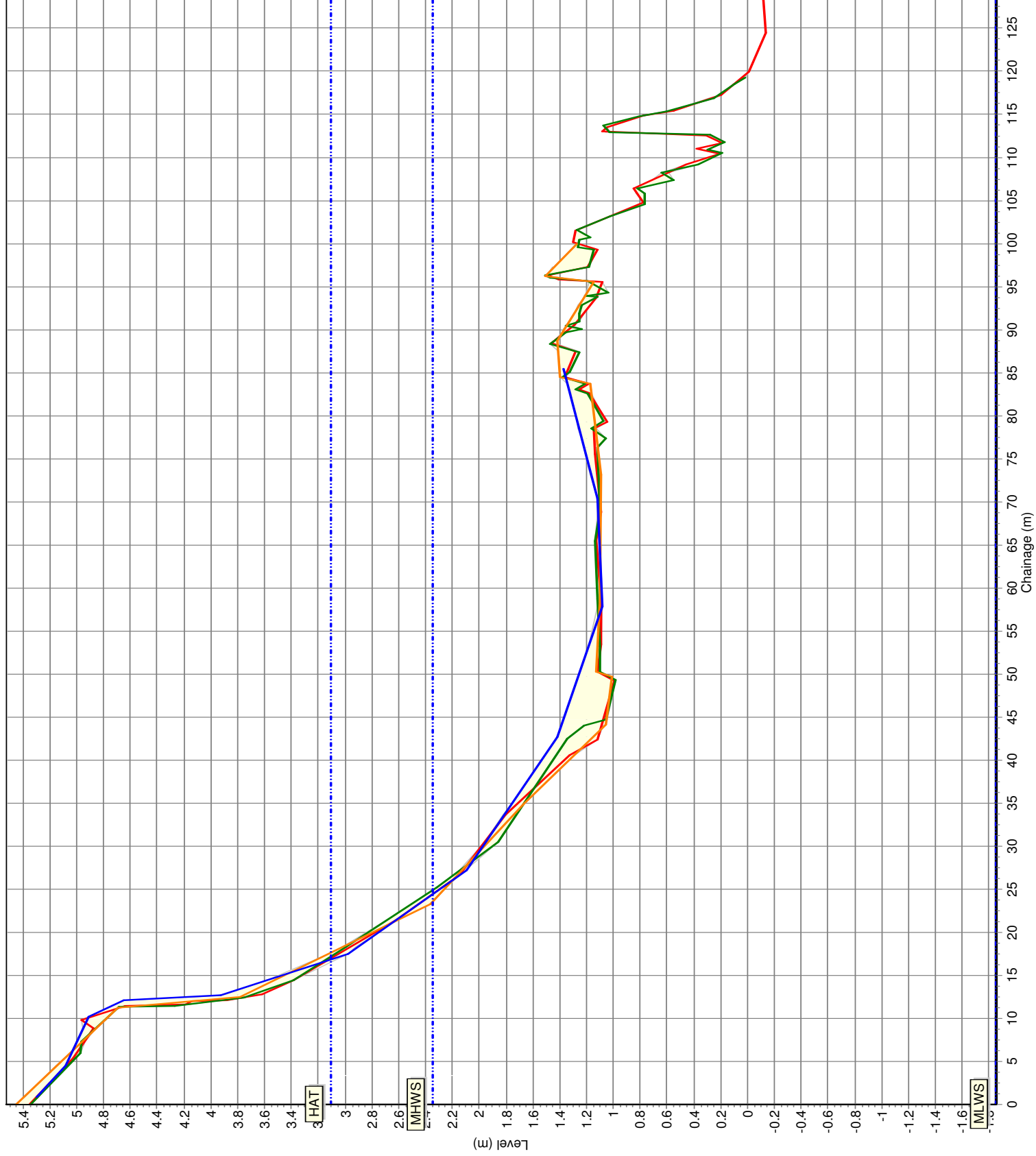
Beach Profiles: 1aADC02



Profiles Envelope

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<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	16/03/2009

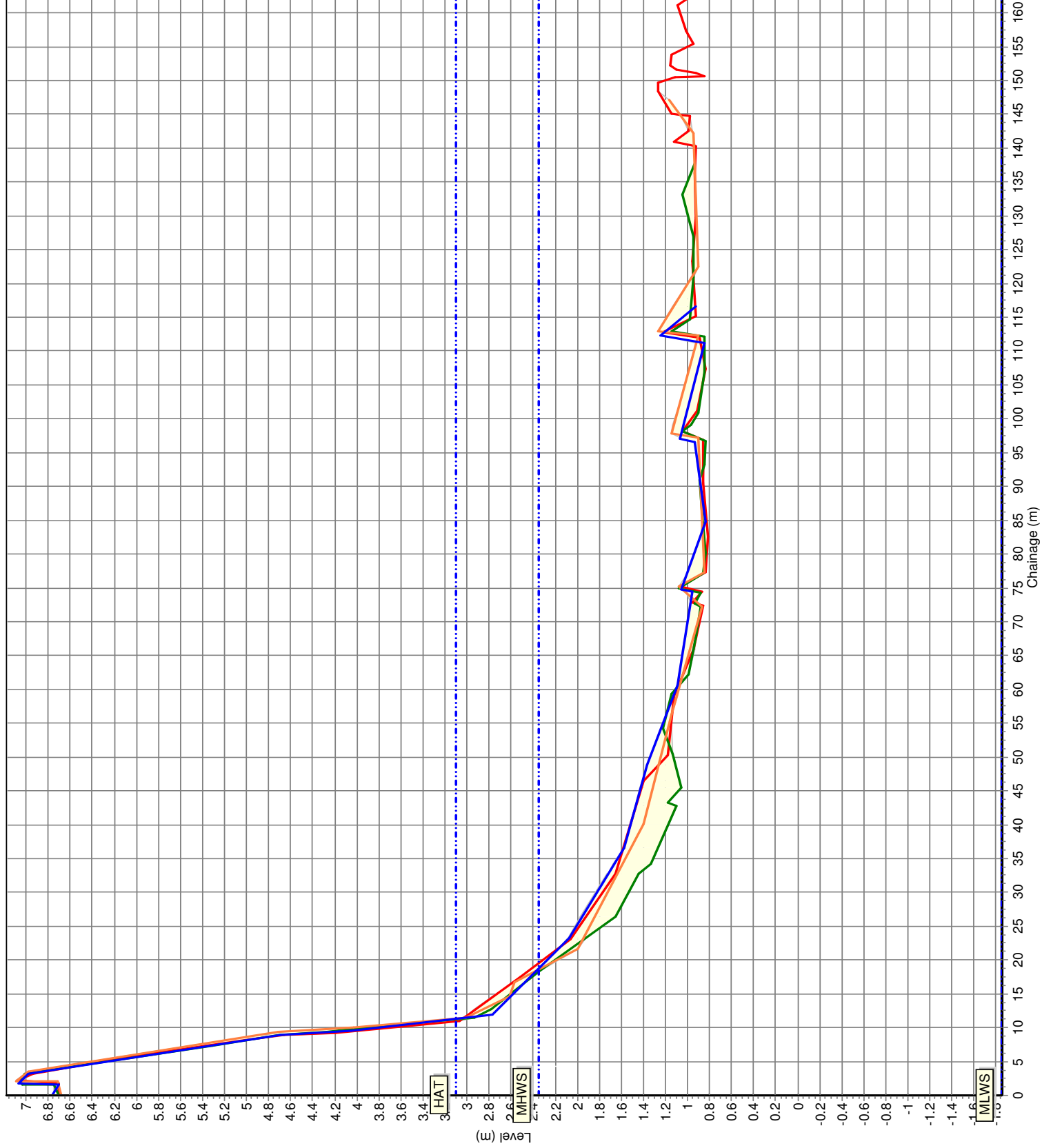
Beach Profiles: 1aADC04A



Profiles Envelope

- 15/10/2007
- 30/04/2008
- 21/10/2008
- 11/03/2009

Beach Profiles: 1aADC04B

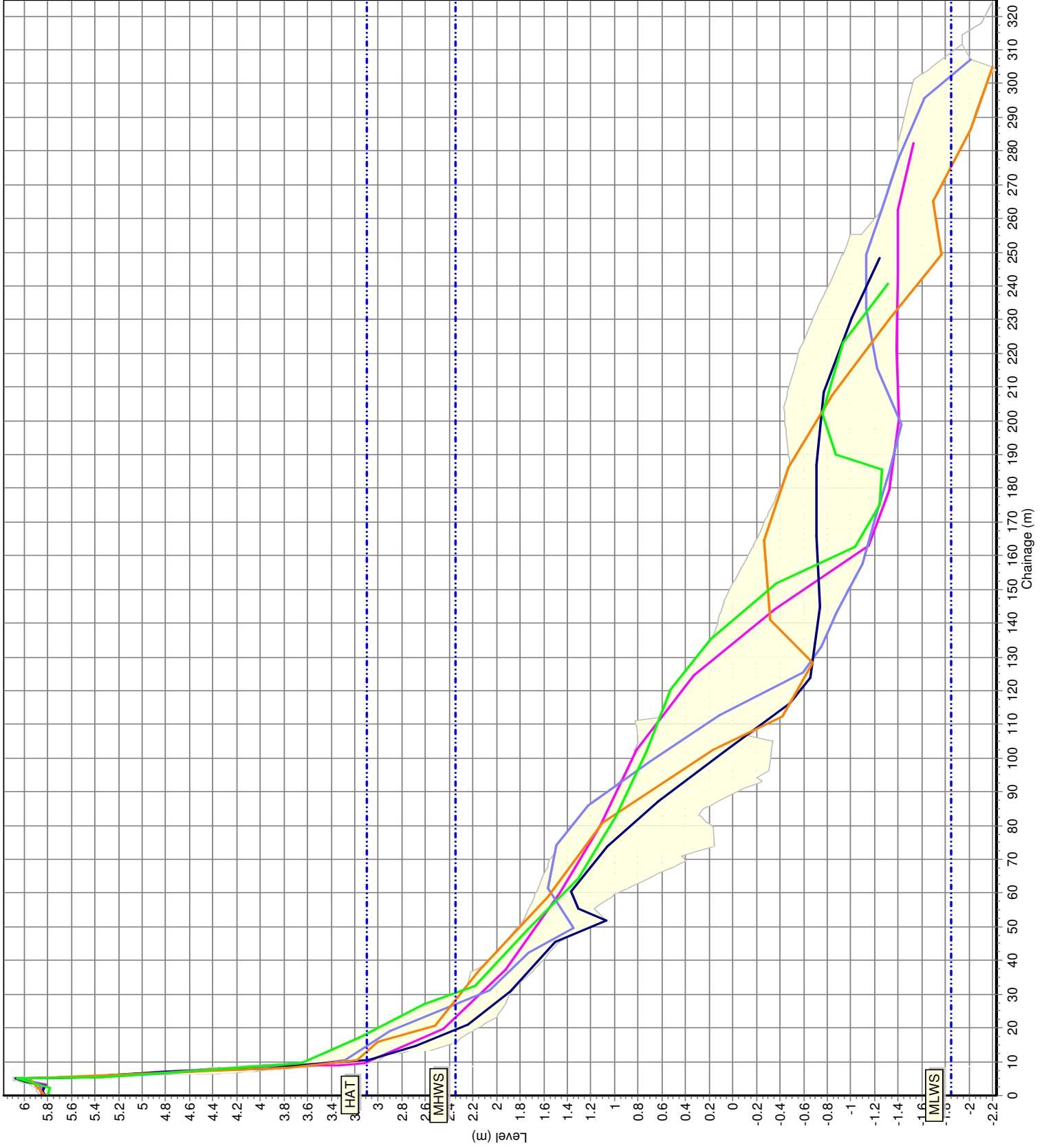


Profiles Envelope

- 15/10/2007
- 30/04/2008
- 21/10/2008
- 11/03/2009



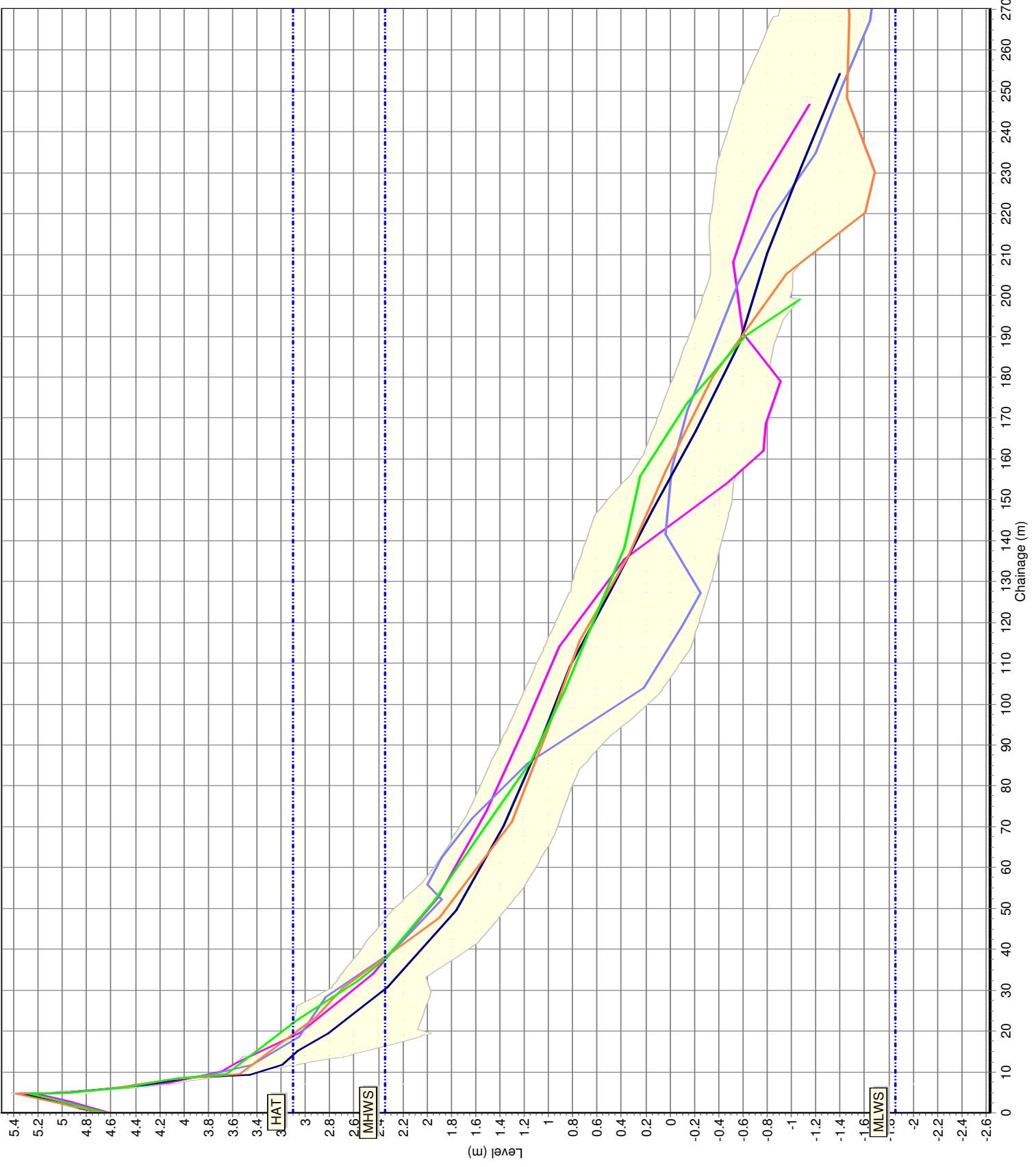
Beach Profiles: 1aADC07



Profiles Envelope

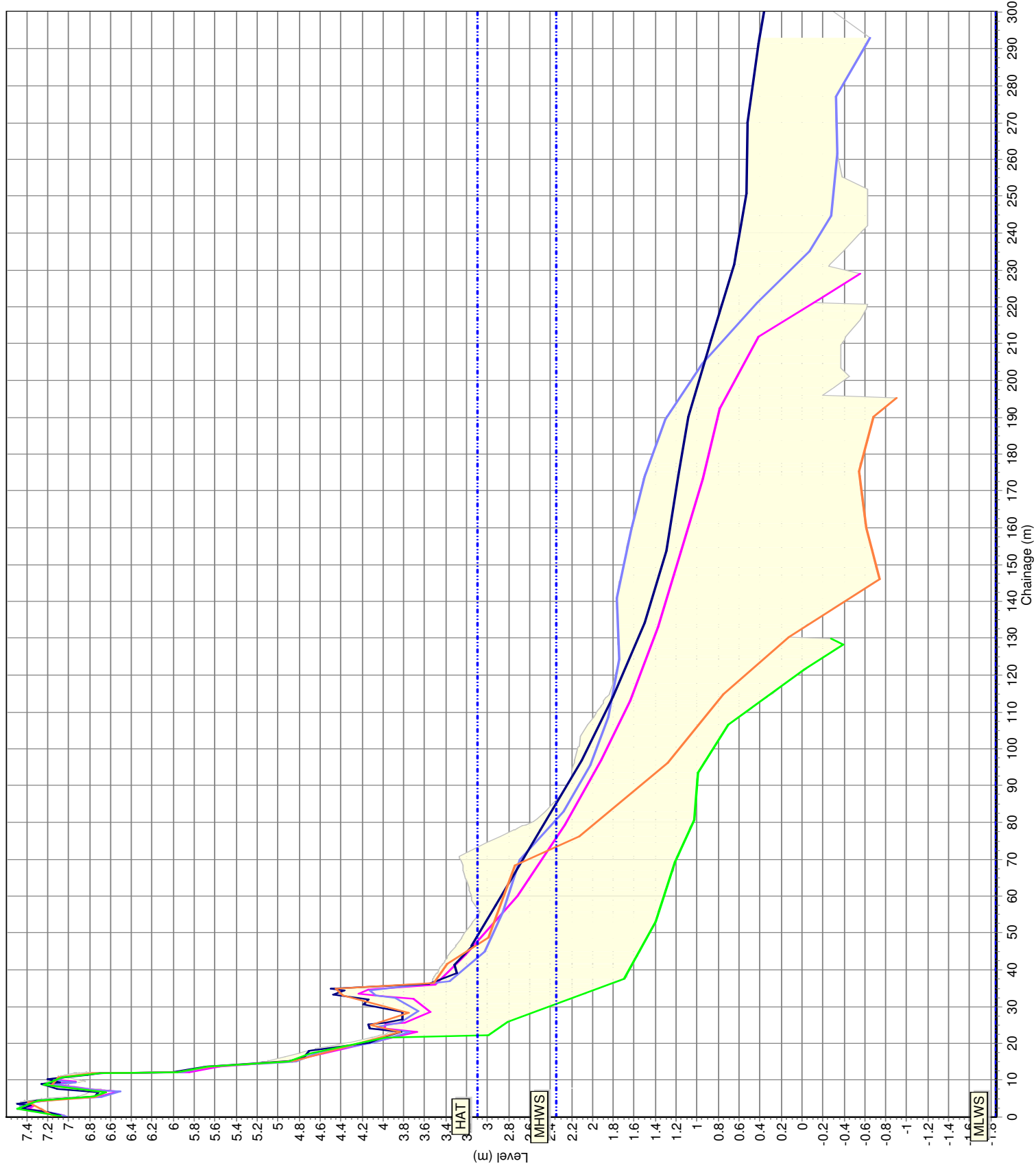
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<input type="checkbox"/>	10/11/2006
<input checked="" type="checkbox"/>	04/04/2007
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<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	11/03/2009

Beach Profiles: 1aADC08



- Profiles Envelope
- 15/04/2004
- 15/10/2004
- 15/04/2005
- 18/10/2005
- 21/04/2006
- 10/11/2006
- 04/04/2007
- 15/10/2007
- 30/04/2008
- 21/10/2008
- 11/03/2009

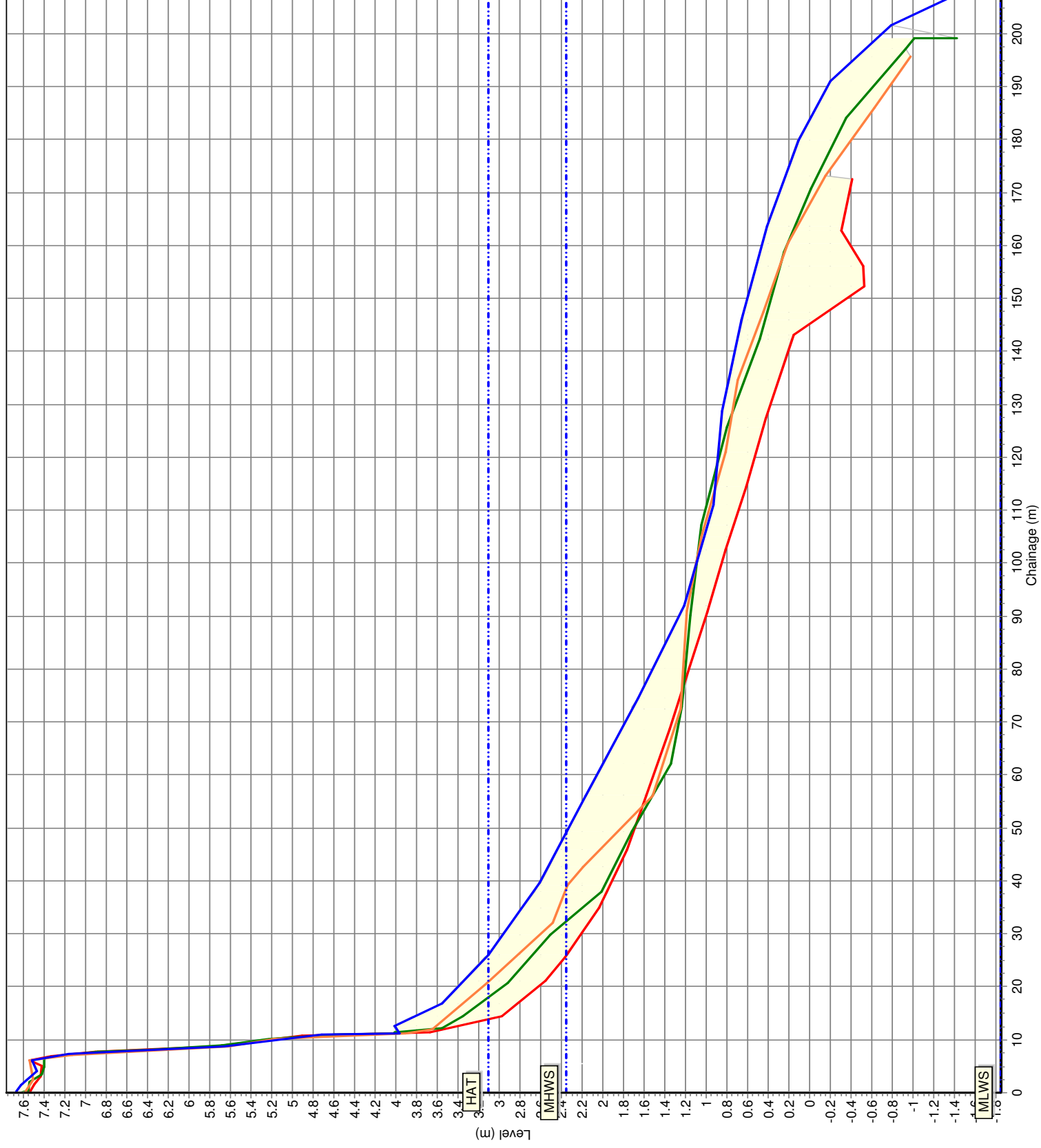
Beach Profiles: 1aADC09



Profiles Envelope

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<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	11/03/2009

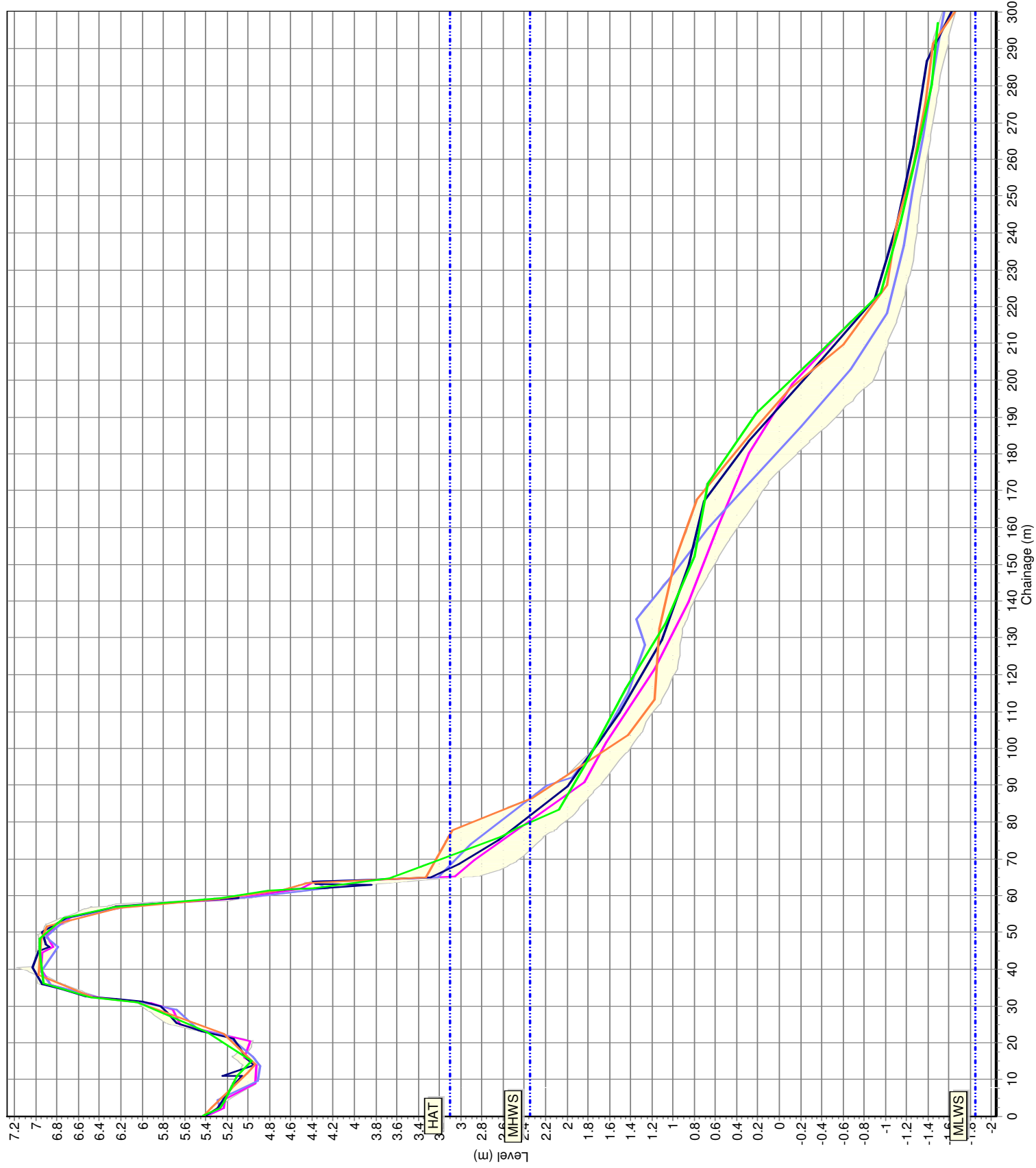
# Beach Profiles: 1aADC15A



Profiles Envelope

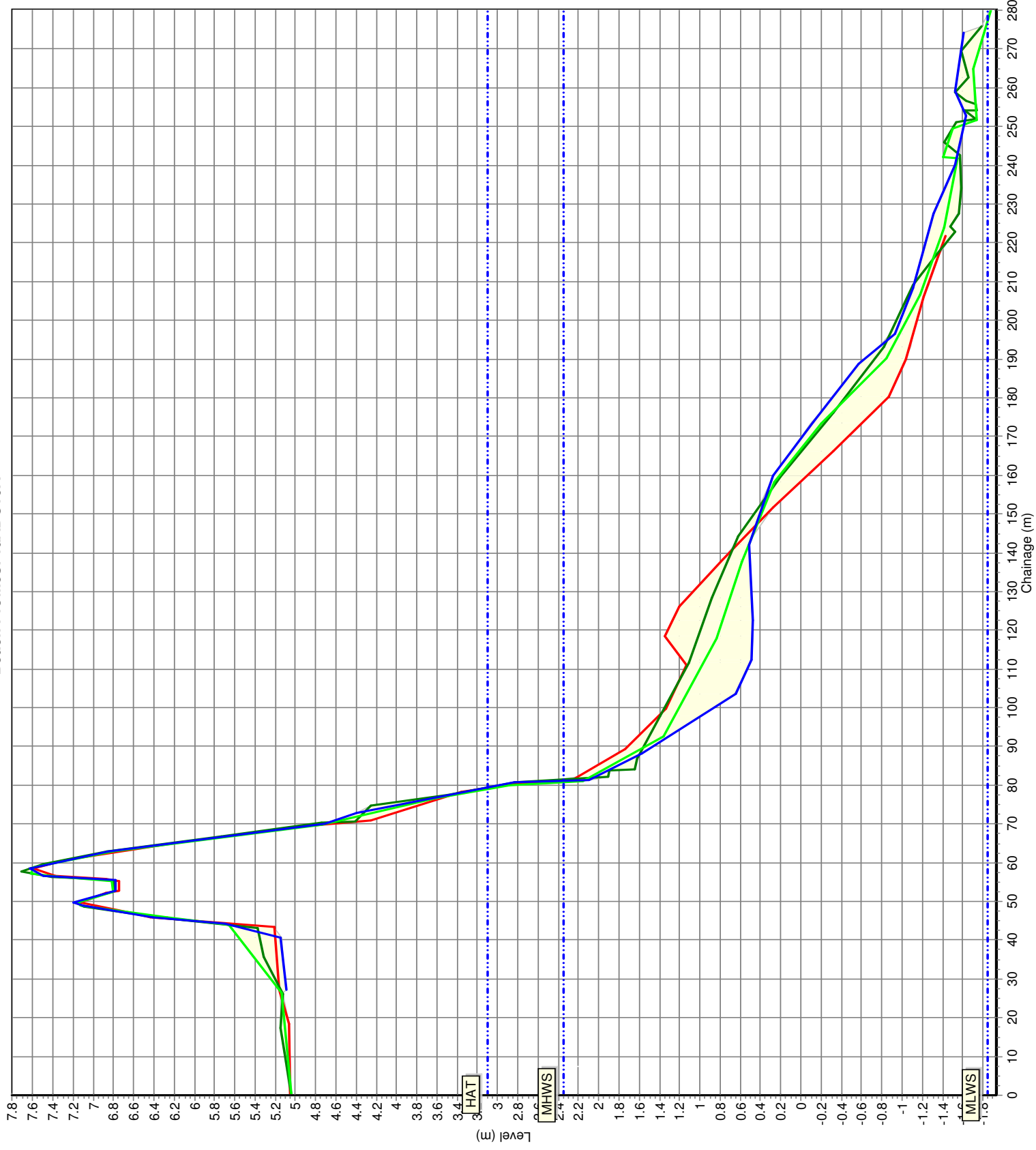
- 15/10/2007
- 30/04/2008
- 21/10/2008
- 10/03/2009

# Beach Profiles: 1aADC16



Profiles Envelope	
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<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	10/03/2009

# Beach Profiles: 1aADC16A

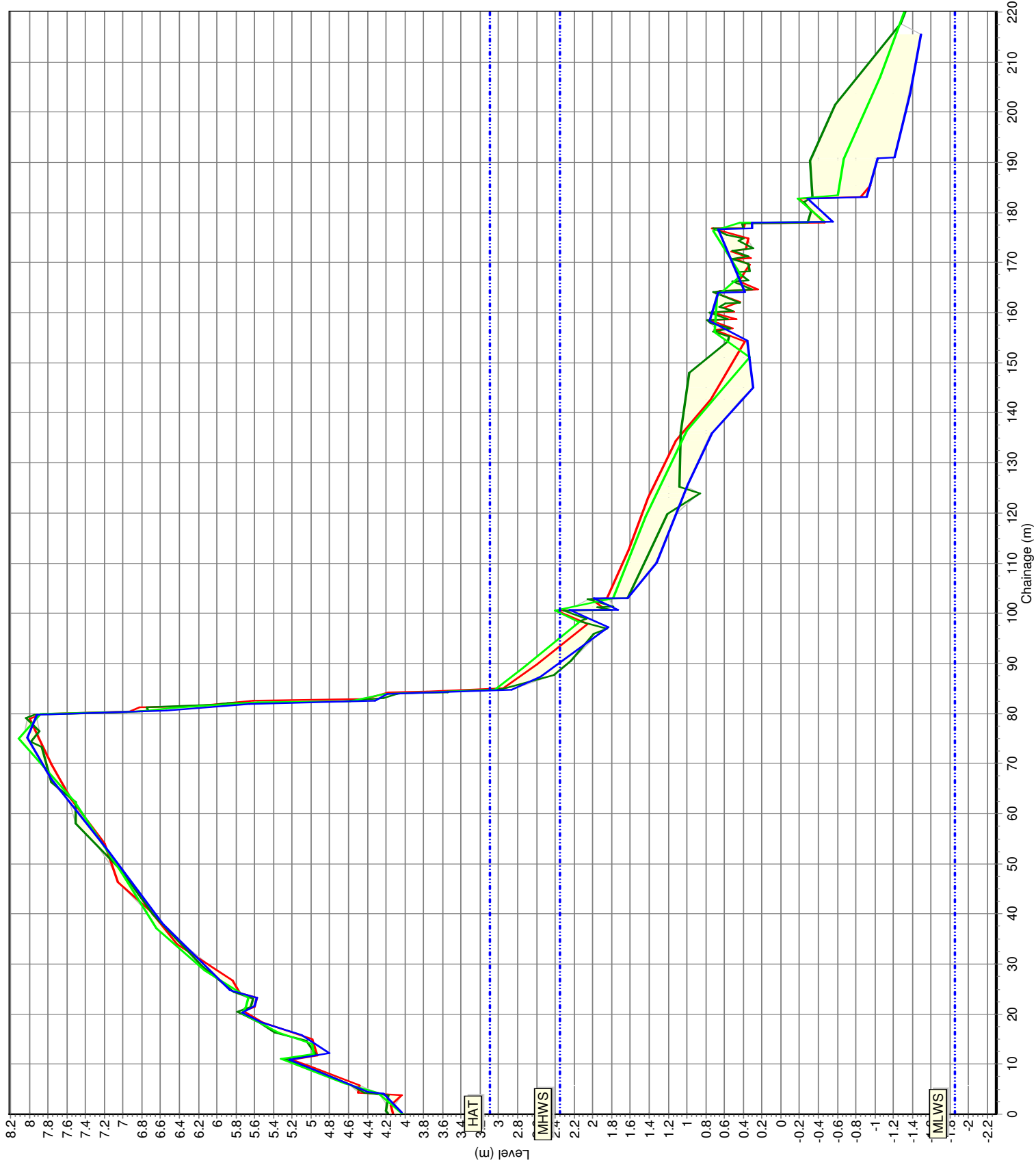


Profiles Envelope

- 15/10/2007
- 30/04/2008
- 21/10/2008
- 10/03/2009



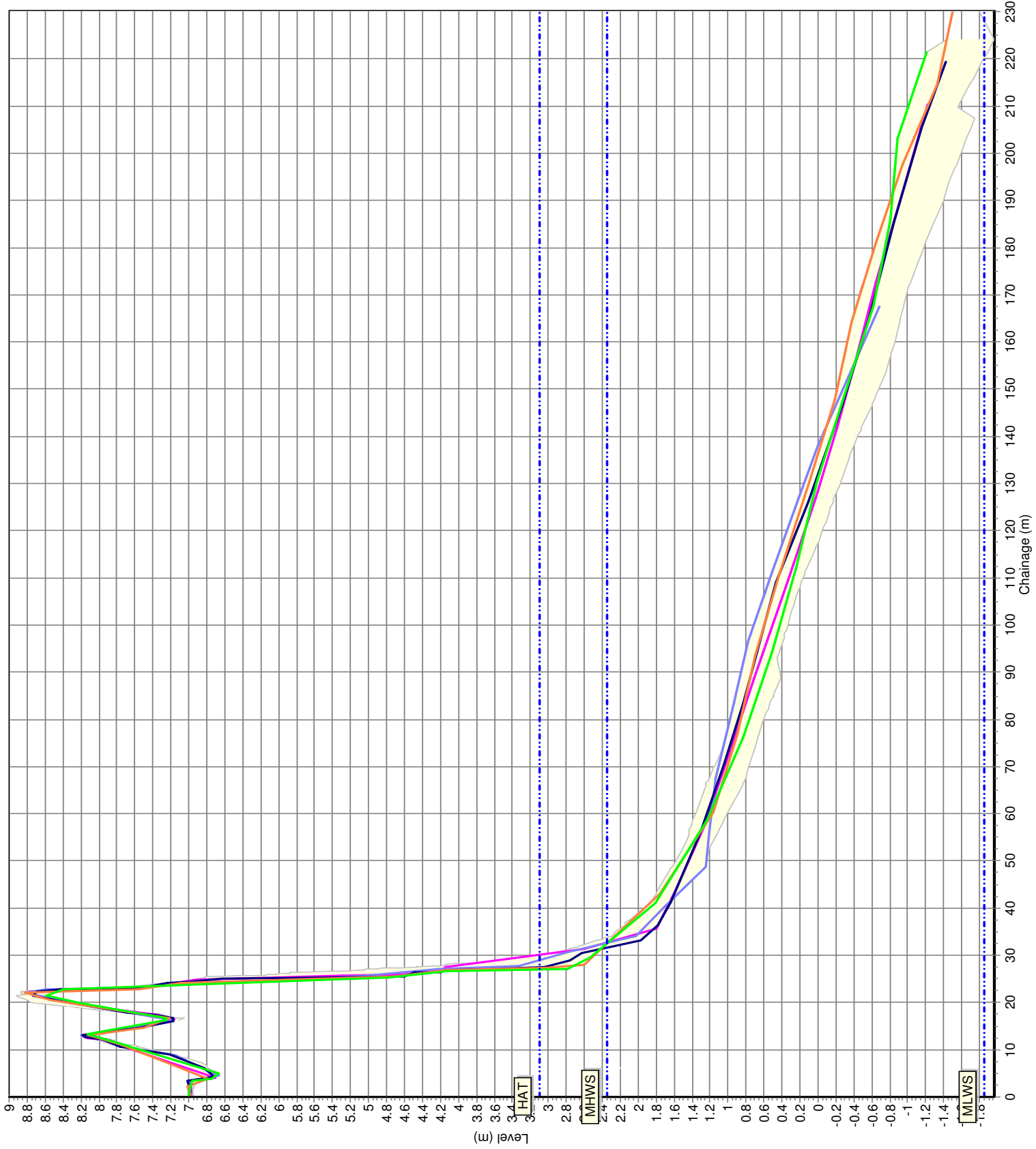
# Beach Profiles: 1aADC16B



Profiles Envelope

- 15/10/2007
- 30/04/2008
- 21/10/2008
- 10/03/2009

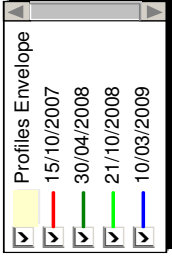
# Beach Profiles: 1aADC17



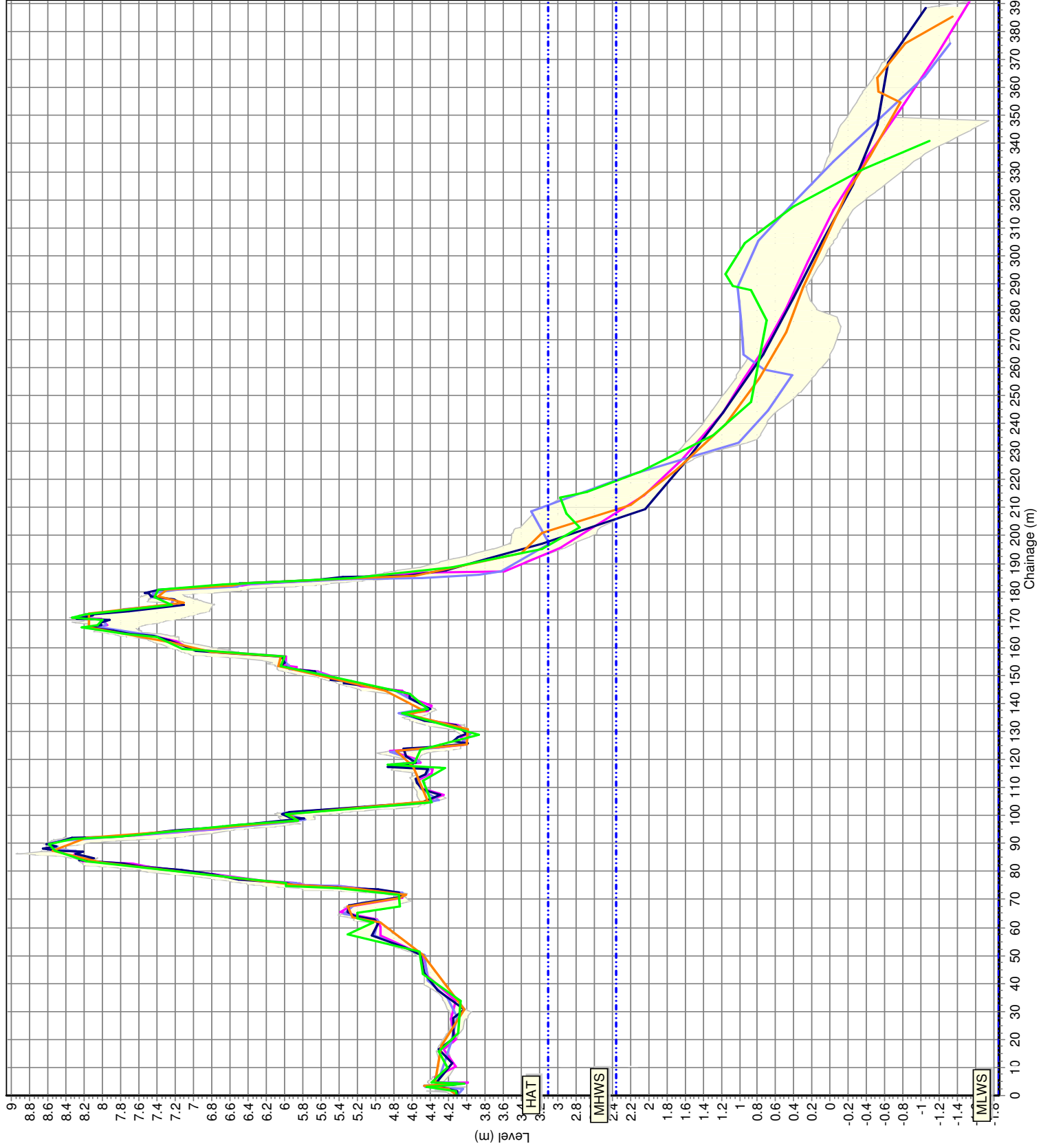
Profiles Envelope

- Profiles Envelope
- 15/04/2004
- 15/10/2004
- 15/04/2005
- 18/10/2005
- 21/04/2006
- 10/11/2006
- 04/04/2007
- 15/10/2007
- 30/04/2008
- 21/10/2008
- 10/03/2009

Beach Profiles: 1aADC17A



Beach Profiles: 1aCMBBC01



Profiles Envelope	
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<input checked="" type="checkbox"/>	15/10/2007
<input checked="" type="checkbox"/>	30/04/2008
<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	10/03/2009

Beach Profiles: 1aCMBC02



Profiles Envelope	
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<input type="checkbox"/>	21/04/2006
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<input checked="" type="checkbox"/>	15/10/2007
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<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	10/03/2009

Beach Profiles: 1aCMBC03A



Profiles Envelope

- 15/10/2007
- 30/04/2008
- 21/10/2008
- 17/03/2009

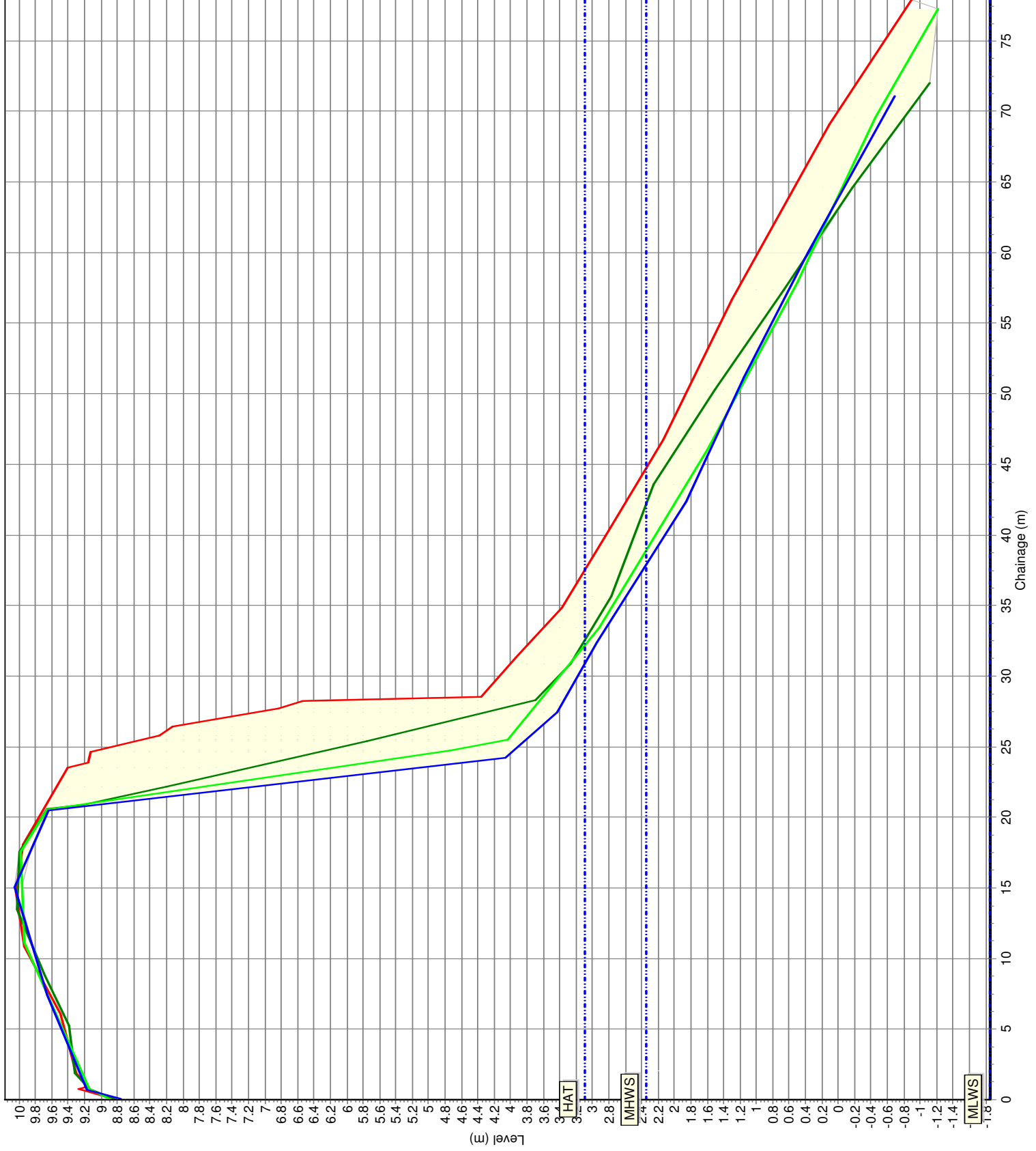
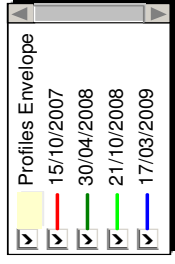
HAT

MHWS

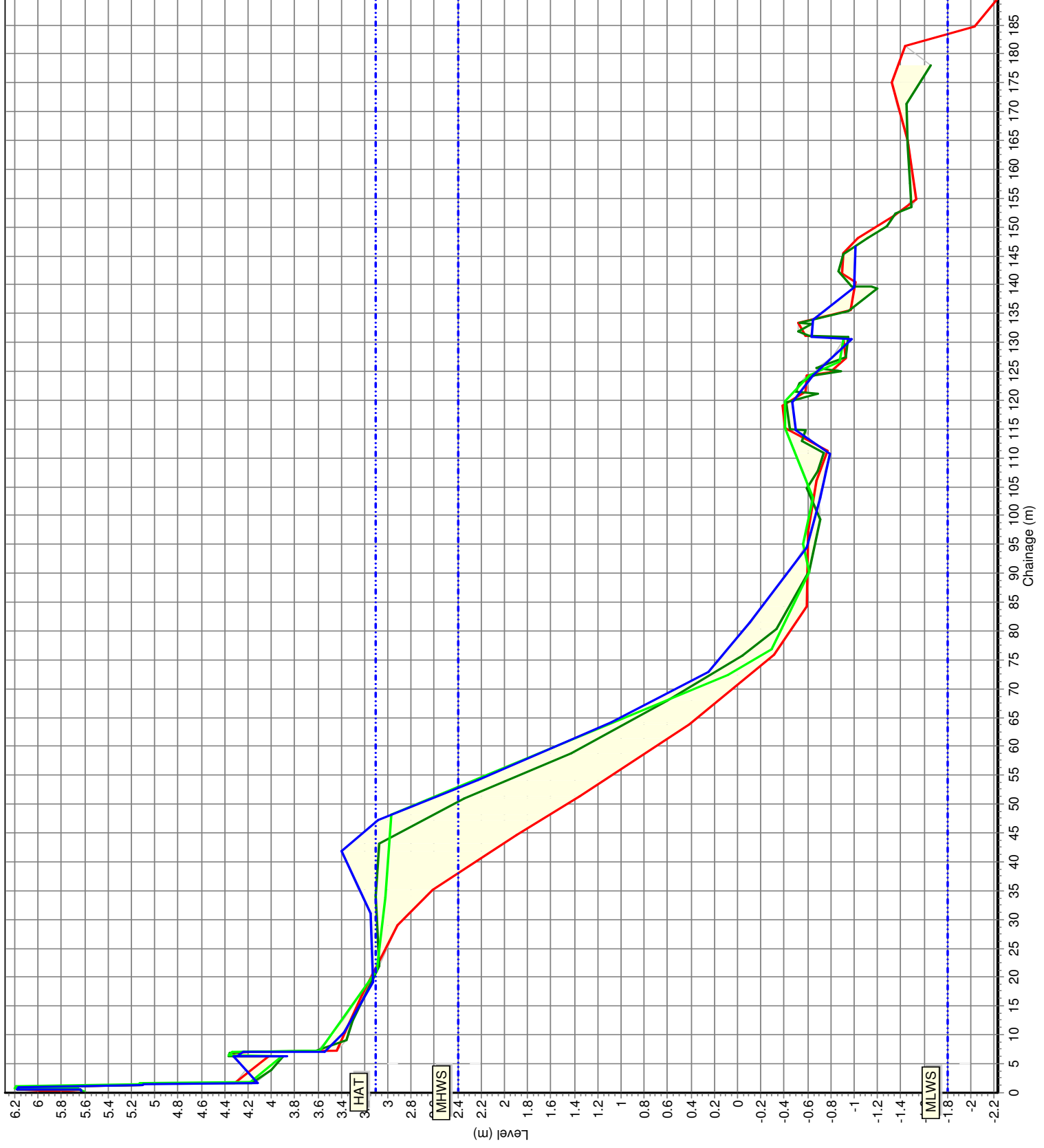
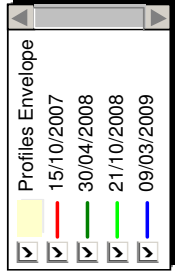
MLWS



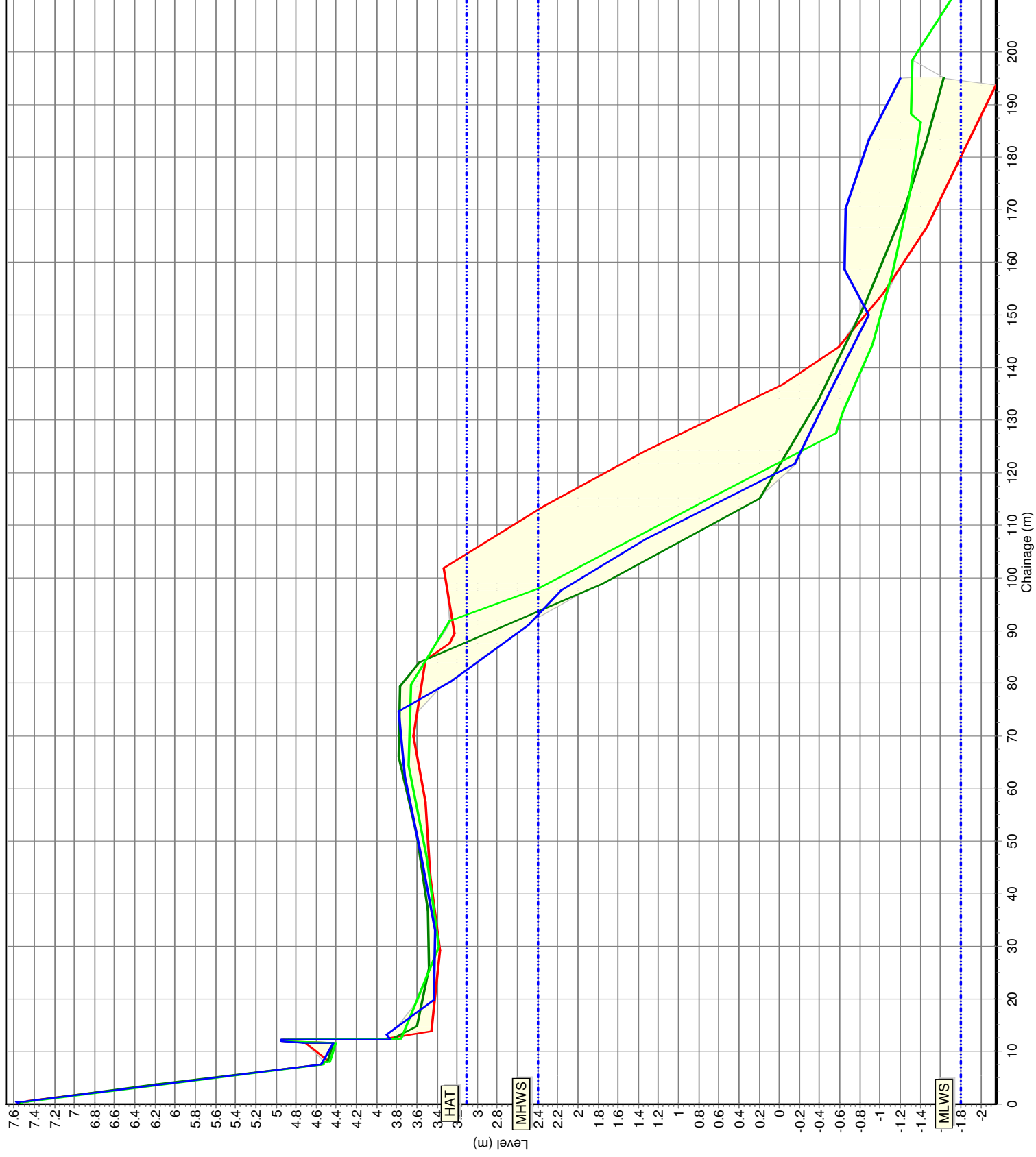
Beach Profiles: 1aCMBBC03B



Beach Profiles: 1aWDC05A



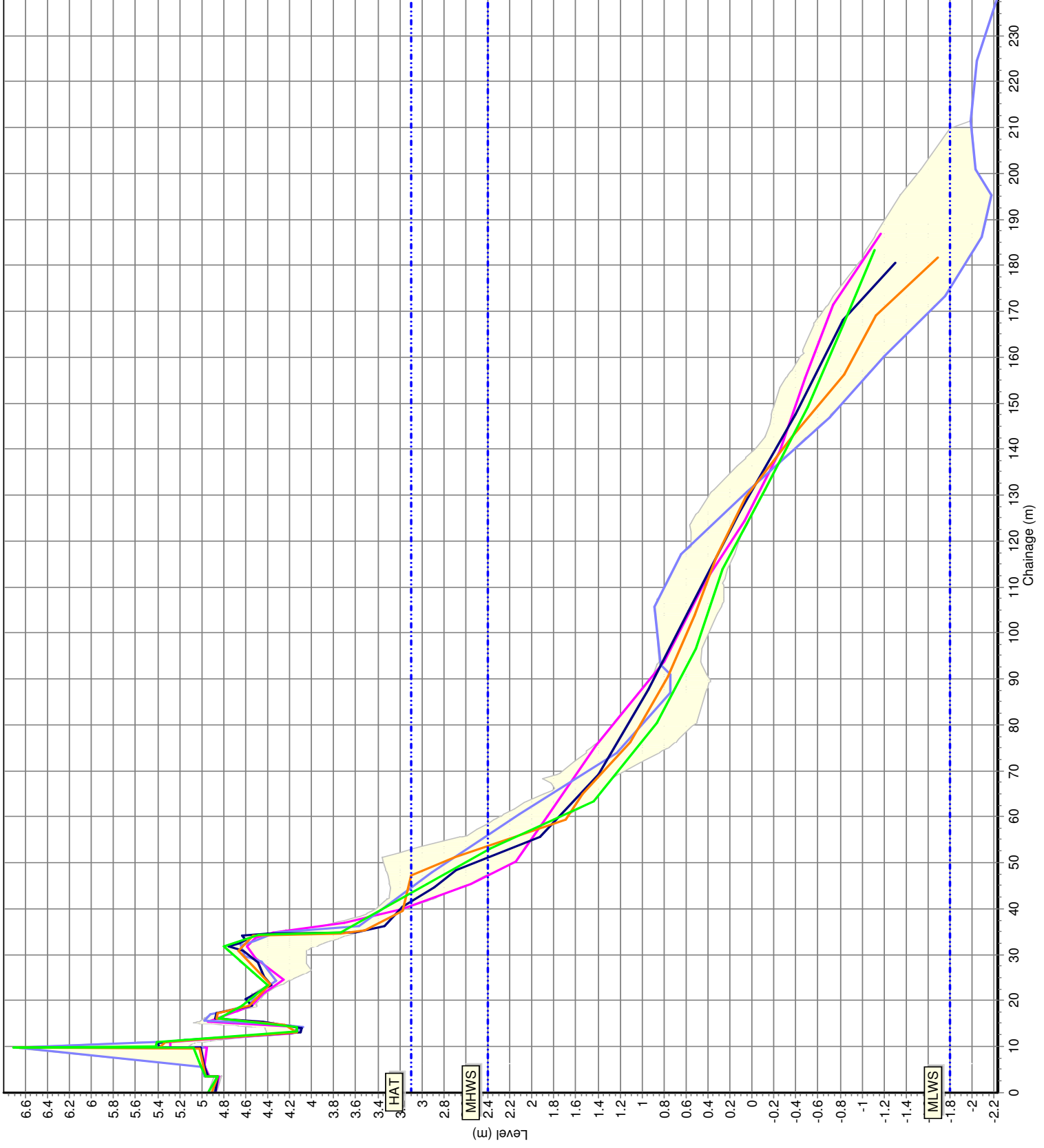
Beach Profiles: 1aWDC06A



Profiles Envelope

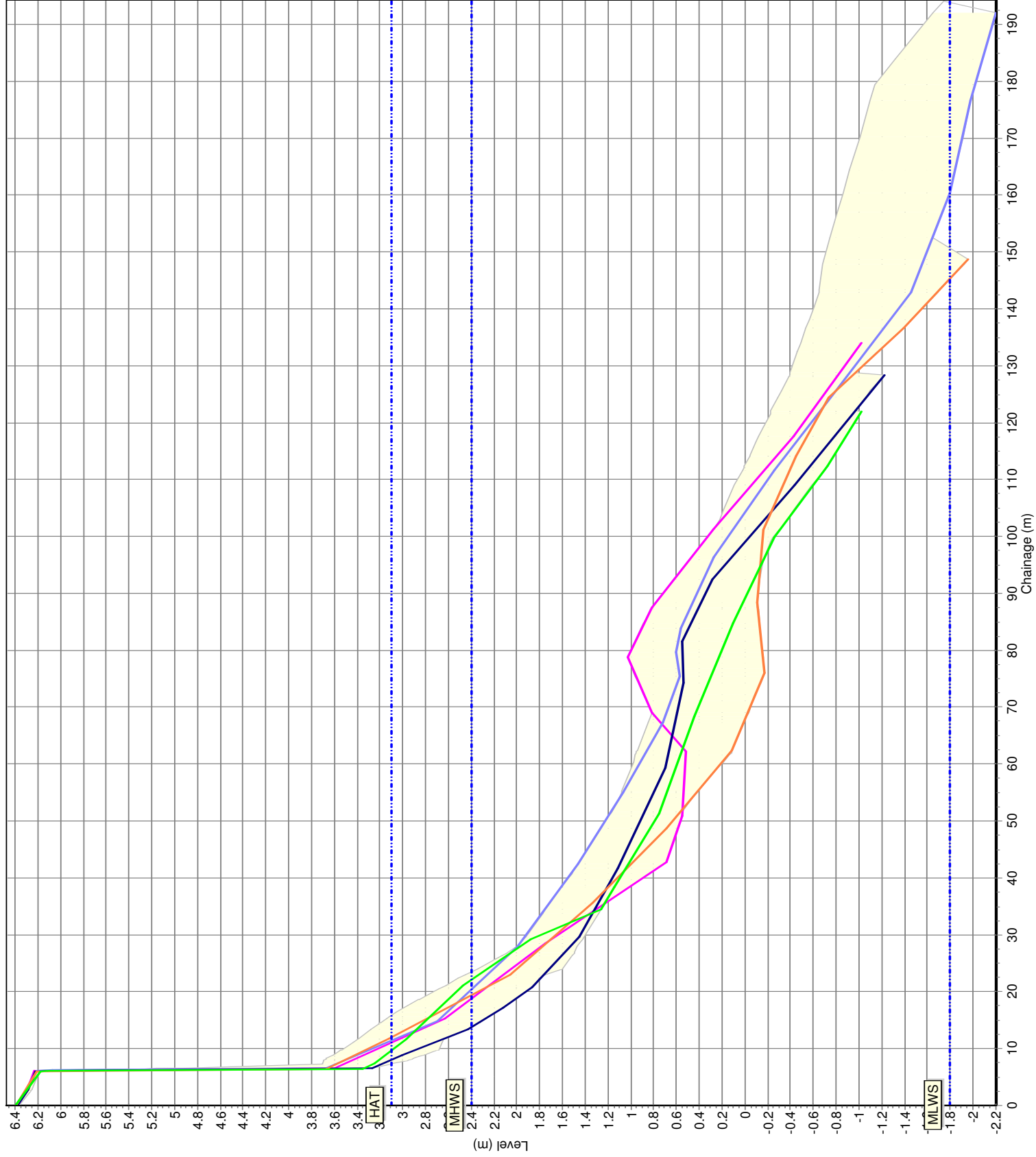
- 15/10/2007
- 30/04/2008
- 21/10/2008
- 09/03/2009

Beach Profiles: 1aBVBC01



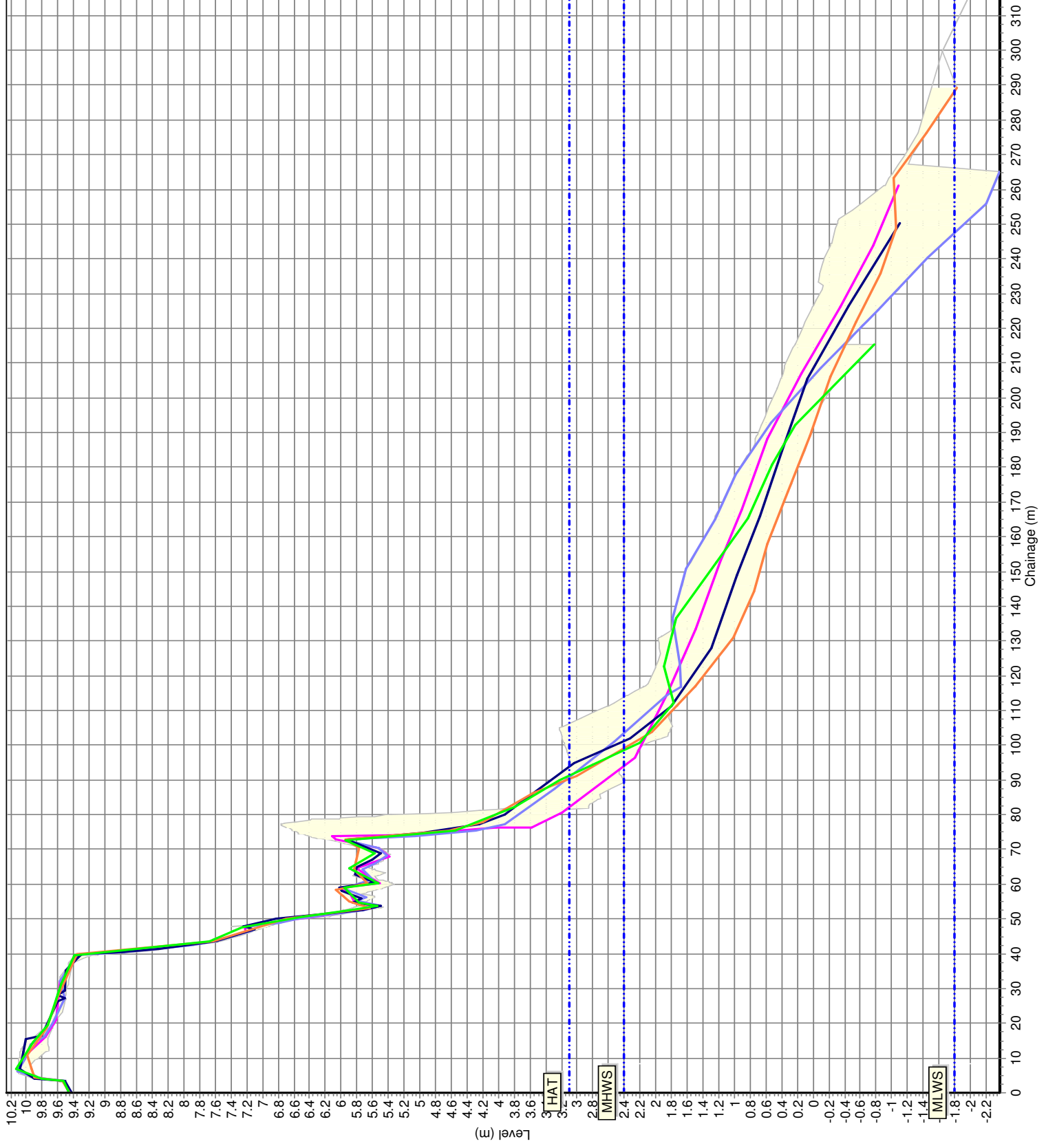
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<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	09/03/2009

Beach Profiles: 1aBVBC02



Profiles Envelope	
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<input checked="" type="checkbox"/>	21/10/2008
<input checked="" type="checkbox"/>	09/03/2009

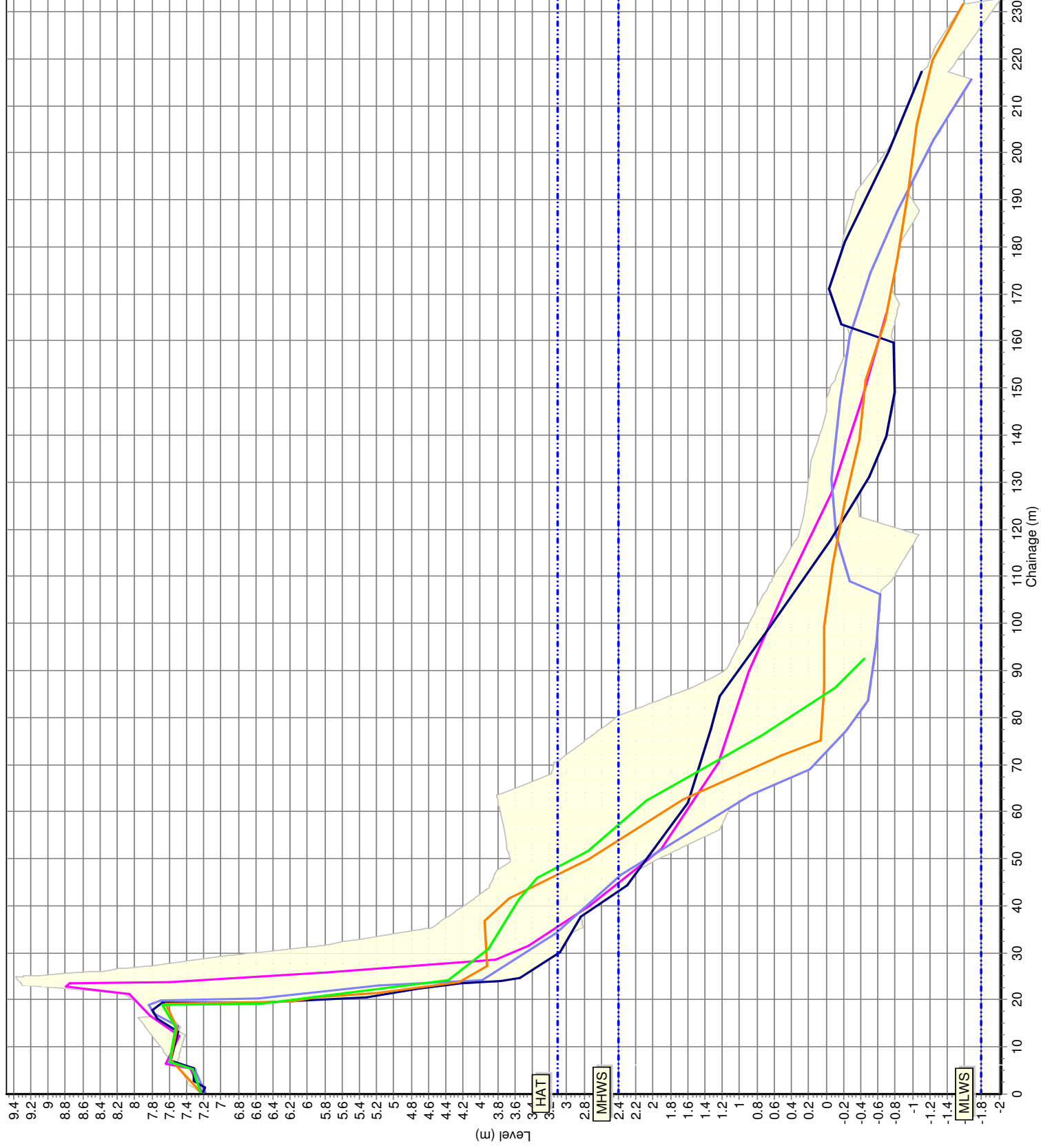
Beach Profiles: 1aBVBC03



Profiles Envelope

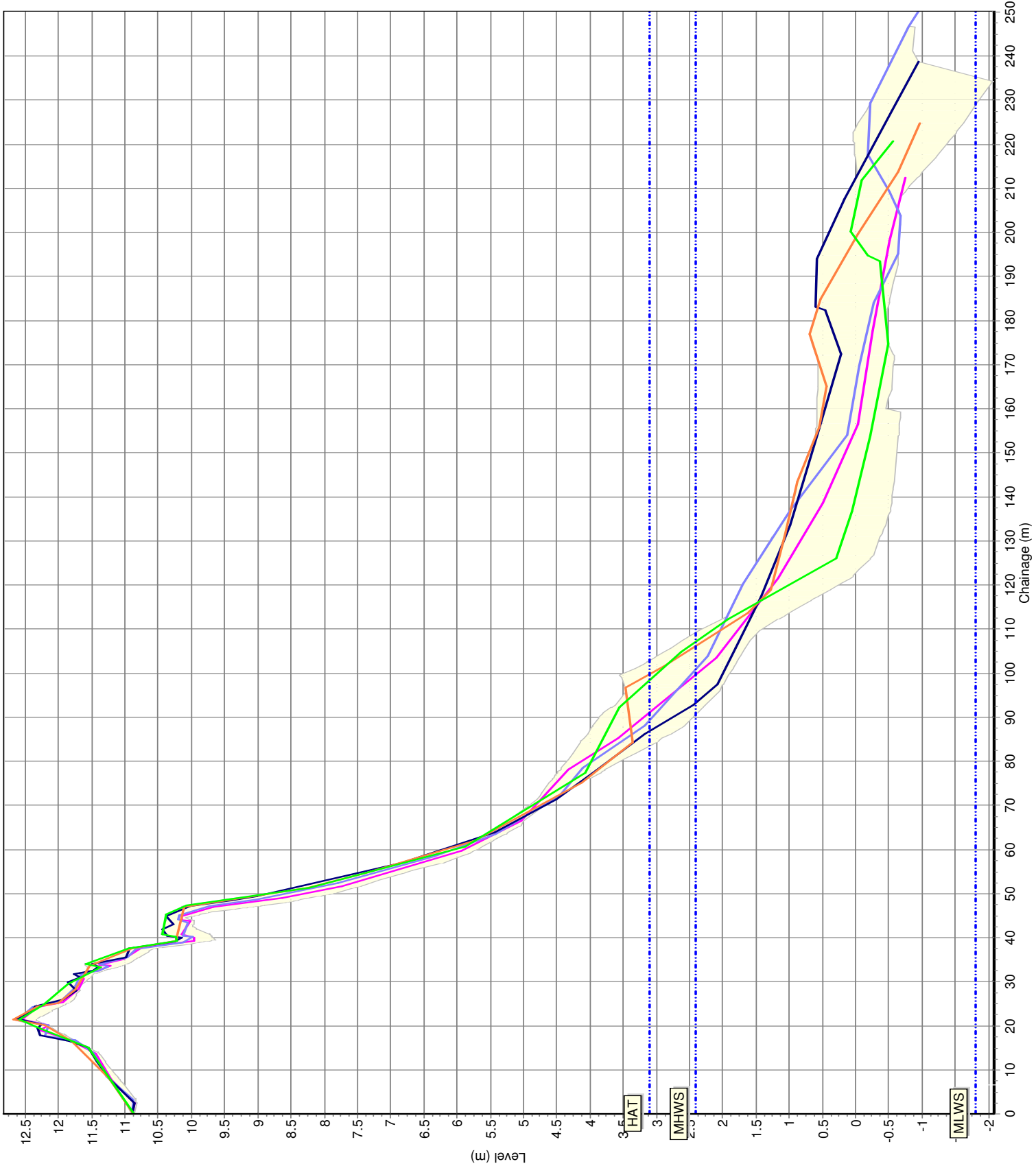
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Beach Profiles: 1aBVBC04



Profiles Envelope	
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<input checked="" type="checkbox"/>	21/10/2008
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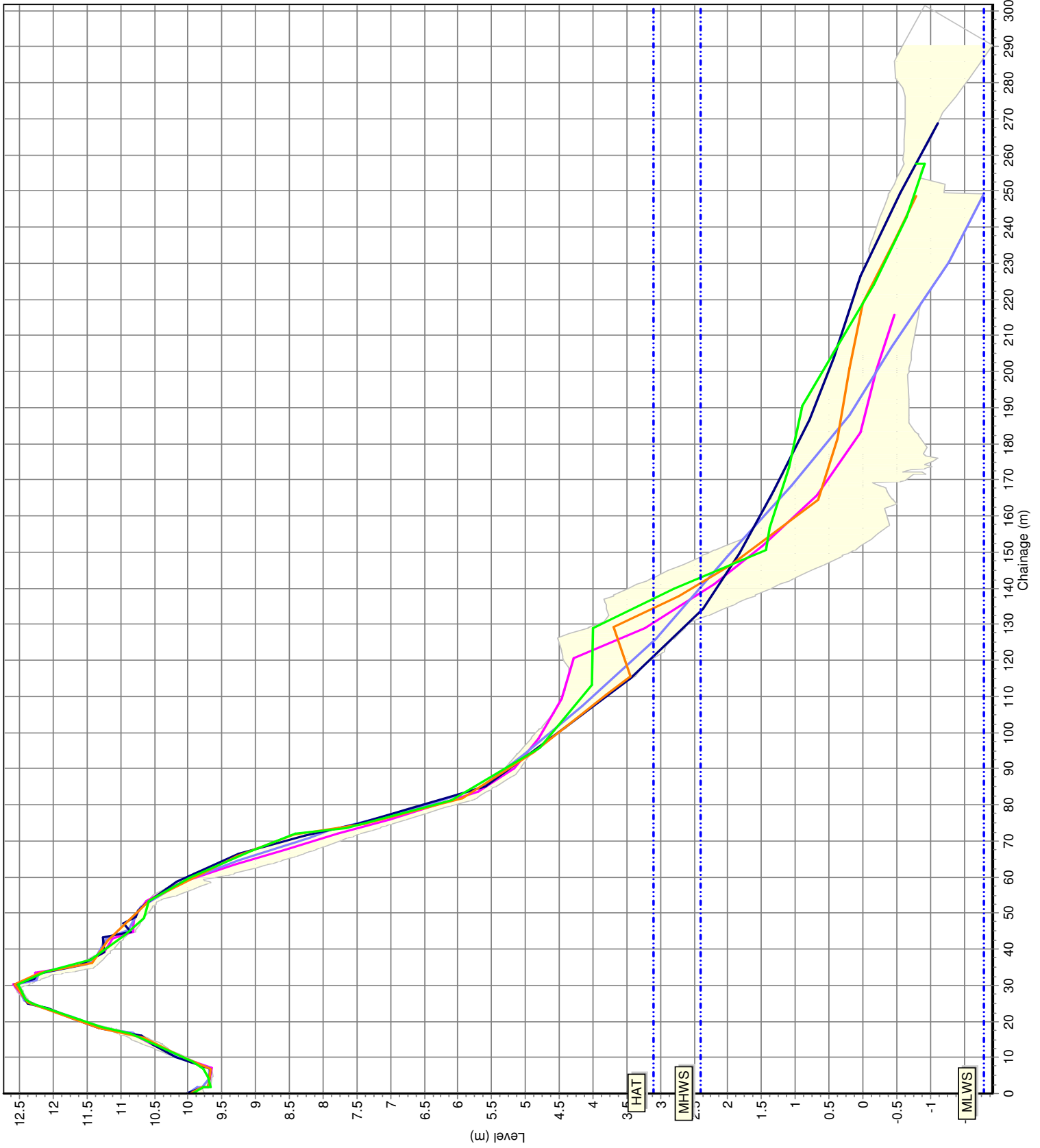
Beach Profiles: 1aBVBC05



Profiles Envelope	
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Beach Profiles: 1aBVBC06



Profiles Envelope

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<input checked="" type="checkbox"/>	30/04/2008
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<input checked="" type="checkbox"/>	09/03/2009



**Appendix B**  
**Topographic Surveys**



— Topographic Contours at 1 metre interval

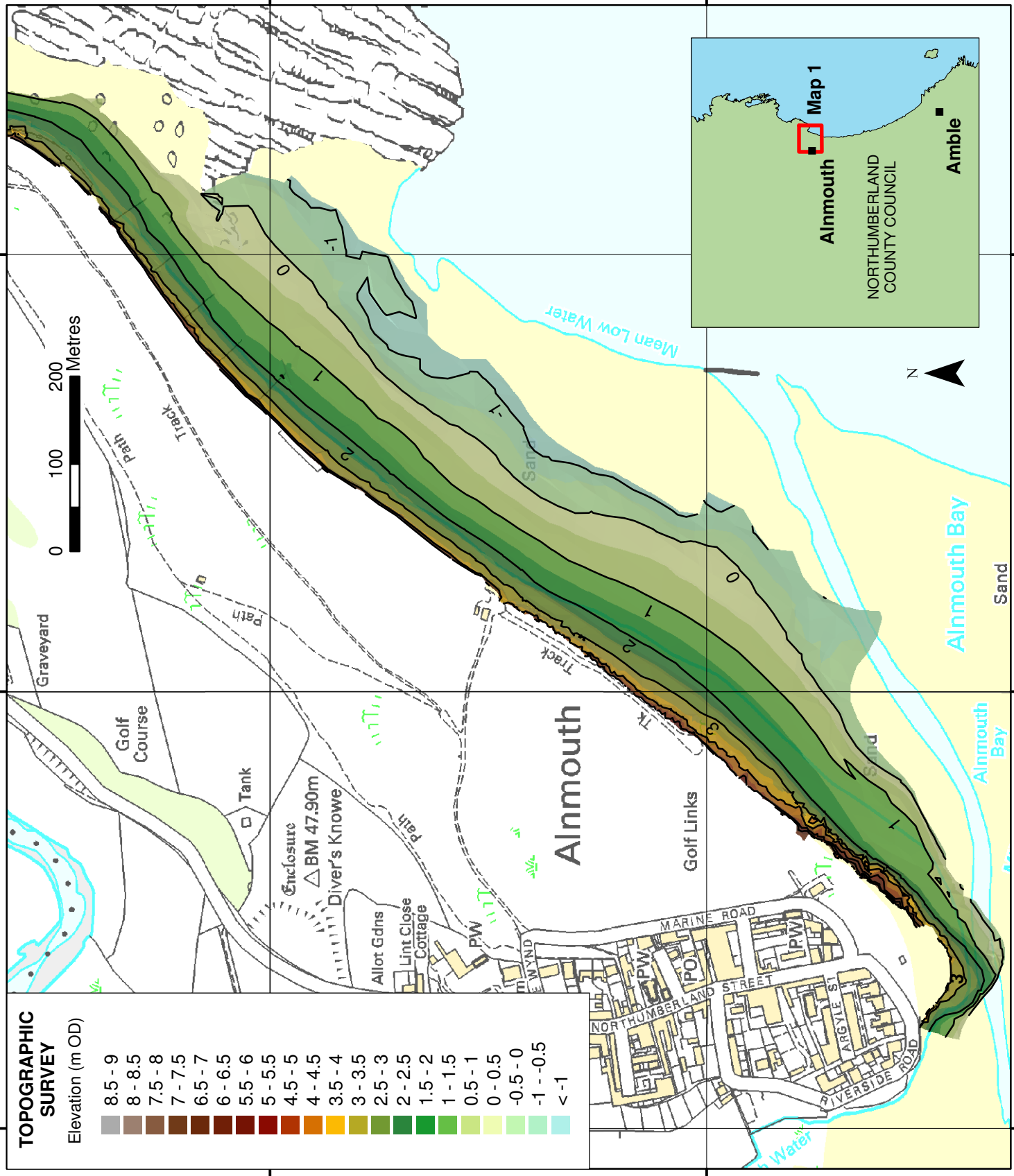
Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 1a**  
**Northumberland County Council Frontage**  
 Update Report 1  
 'Partial Measures' Survey 2009

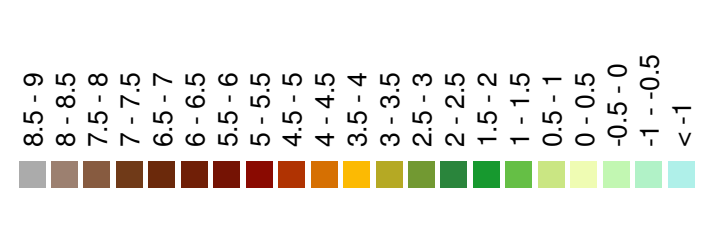
Drawing Scale 1:6,000 at A4  
 Drawn by: TC Date: 01/06/2009  
 Checked by: NC Date: 01/06/2009  
 Approved by: NC Date: 01/06/2009

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**TOPOGRAPHIC SURVEY**  
 Elevation (m OD)



611000

610500

424500

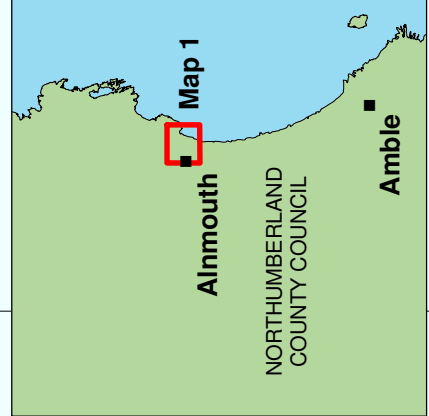
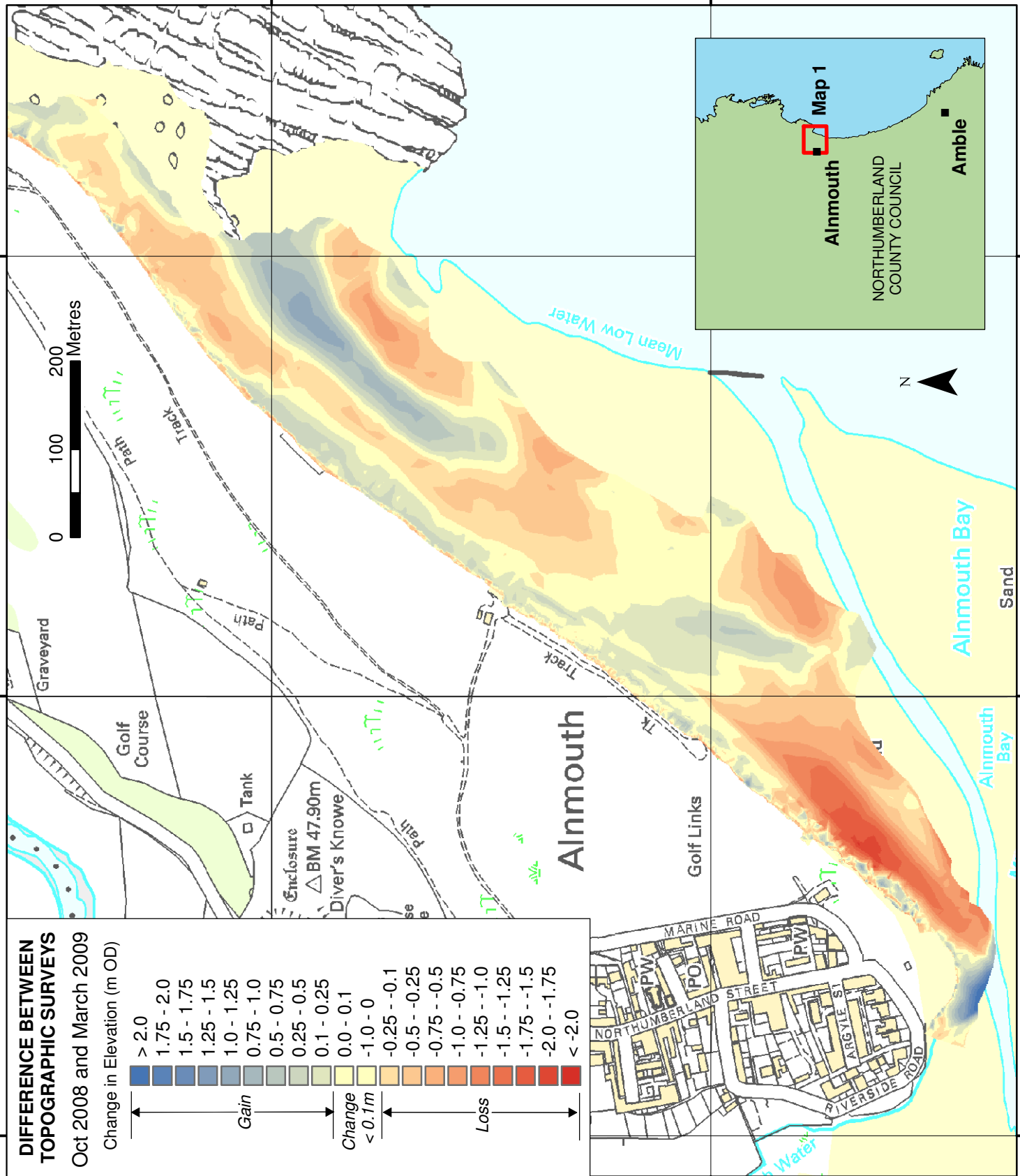
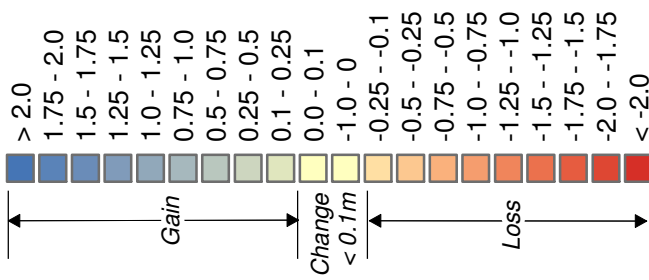
425000

425500

**DIFFERENCE BETWEEN TOPOGRAPHIC SURVEYS**

Oct 2008 and March 2009

Change in Elevation (m OD)



— Topographic Contours at 1 metre interval

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

**Appendix B - Map 1b**  
**Northumberland County Council Frontage**

Update Report 1  
 'Partial Measures' Survey 2009

Drawing Scale 1:6,000 at A4  
 Drawn by: TC Date: 01/06/2009  
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**Appendix C**  
**Cliff Top Surveys**





The Google Earth file which will be provided digitally with the final report will contain individual cliff top position lines for the following surveys:

**Newbiggin Bay Caravan Park**

- September 2007
- April 2008
- October 2008
- March 2009

**Sandy Bay Caravan Park**

- September 2007
- April 2008
- October 2008
- March 2009

**Cambois**

- March 2009