



# **Cell 1 Regional Coastal Monitoring Programme Analytical Report 16: 'Full Measures' Survey 2023**

**South Tyneside Council**



**November 2023**

## Contents

Disclaimer .....	i
Abbreviations and Acronyms.....	ii
Water Levels Used in Interpretation of Changes .....	ii
Glossary of Terms.....	iii
Preamble .....	iv
1. Introduction .....	1
1.1 Study Area .....	1
1.2 Methodology.....	1
2. Analysis of Survey Data .....	3
2.1 Littlehaven Beach.....	3
2.2 Herd Sands .....	5
2.3 Trow Quarry (incl. Frenchman’s Bay) .....	7
2.4 Marsden Sands .....	9
3. Problems Encountered and Uncertainty in Analysis .....	10
4. Recommendations for ‘Fine-tuning’ the Monitoring Programme .....	10
5. Conclusions and Areas of Concern .....	10

## Appendices

Appendix A	Beach Profiles
Appendix B	Topographic Survey
Appendix C	Cliff Top Survey

## List of Figures

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

## 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 to Marsden Bay
HAT	3.1
MHWS	2.4
MHWN	1.3
MLWN	-0.8
MLWS	-1.9

**Source:** UKHO Admiralty Tide Tables, 2020

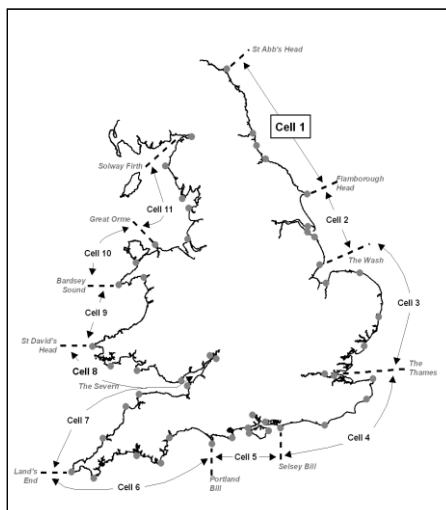


## Glossary of Terms

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 programme commenced in its present guise in September 2008<sup>1</sup> and is managed by Scarborough Borough Council on behalf of the North East Coastal Observatory. It is funded by the Environment Agency, working in partnership with the following organisations:



<sup>1</sup> Prior to 2008, coastal monitoring was undertaken on a consistent basis across Northumberland and North Tyneside as part of the (then) Northumbrian Coastal Authorities Group's monitoring programme which commenced in 2002, whilst several authorities between the River Tyne and Flamborough Head undertook their own local monitoring programmes.

Royal HaskoningDHV has been appointed to provide Analytical Services in relation to the present phase of the Cell 1 Regional Coastal Monitoring Programme, between 2016 - 2027.

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 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		-
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	Nov 12	Mar 13	Mar 13	Jun 13	
6	2013/2014	Nov 13	Feb 14	Apr 14	Jul 14	
7	2014/15	Nov 14	Feb 15	Apr 15	Jul 15	
8	2015/16	Nov 15	Feb 16	Mar 16	Jul 16	Jun 16
9	2016/17	Oct-Nov 16	Feb 17	Mar 17	Jul 17	
10	2017/18	Oct 17	Feb 18	Apr 18	Jun 18	
11	2018/19	Nov 18	Jan 19	Feb 19	May 19	
12	2019/20	Sep 19	Nov 19	May 20	Jun 20	
13	2020/21	Sep 20	Oct 20	May 21	Jun 21	Aug 21
14	2021/22	Sep 21	Nov 21	Mar 22	Jul 22	
15	2022/23	Oct 22	Jan 23	Mar 23	Apr 23	
16	2023/24	Sep 23	Nov 23(*)			

(\*) The present report is **Analytical Report 16** and provides an analysis of the 2023 Full Measures survey for South 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**

<b>Authority</b>	<b>Zone</b>
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)
	Staithes
Scarborough Borough Council	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

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

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

## 1.2 Methodology

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

- Full Measures survey annually each autumn comprising:
  - Beach profile surveys along 17 transect lines (commenced 2008)
  - Topographic survey along Littlehaven Beach (commenced 2010)
  - Topographic survey along Herd Sands (commenced 2008)
  - Topographic survey along Trow Quarry (commenced 2008)
- Partial Measures survey annually each spring comprising:
  - Beach profile surveys along 11 transect lines (commenced 2008)
  - Topographic survey along Littlehaven Beach (commenced 2010)
- Cliff top survey bi-annually at:
  - Cliff top survey at Trow Quarry (incl. Frenchman's Bay) (commenced 2008)

In addition to the above, laserscan surveys of the cliffs in Marsden Bay have been undertaken on several occasions. These are reported separately to South Tyneside Council.

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

The location of these surveys is shown in Figure 2. The Full Measures survey was undertaken along this frontage between 6<sup>th</sup> September 2023 and 15<sup>th</sup> September 2023. During this time, the weather and sea state varied greatly, for details of the survey conditions refer to the Academy Geomatics survey report.

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.





**SURVEY LOCATIONS**

**Topographic Profile**

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

**Topographic Area**

- 6 monthly (Green)
- yearly (Yellow)
- 5 yearly (Purple)

- Cliff Top Survey Points (Red dots)

(refer to Figure 3 for details)

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

Title:

**Figure 2 - Map 1**

**LITTLEHAVEN BEACH to MARSDEN BAY**

**South Tyneside Council Frontage**

Report:

Survey Report

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	n/a	TC	NJC	A4	1:25,000

Co-ordinate system: British National Grid




© HaskoningDHV UK Ltd. World Imagery: Maxar, Microsoft Hybrid Reference Layer: Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS OpenStreetMap: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri





**SURVEY LOCATIONS**  
 ● Cliff Top Survey Points

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 Aerial photography 2019 courtesy of North East Coastal Observatory.  
 OpenStreetMap: Map data © OpenStreetMap contributors, Microsoft, Esri  
 Community Maps contributors, Map layer by Esri

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

Title:  
**Figure 3 - Map 1**  
**TROW QUARRY**  
**South Tyneside Council Frontage**

Report:  
 Survey Report

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	n/a	TC	NJC	A4	1:1,500

Co-ordinate system: British National Grid



## 2. Analysis of Survey Data

### 2.1 Littlehaven Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
6 <sup>th</sup> – 15 <sup>th</sup> Sept 2023	<p><b>Beach Profiles:</b></p> <p>Littlehaven Beach is covered by four beach profile lines for the Full Measures survey, spaced between South Groyne and South Pier (Appendix A). The previous survey was the Partial Measures survey undertaken in March 2023 and the previous Full Measures survey was undertaken in October 2022. Profiles 1bSS1 and 1bSS3 were last surveyed during the Partial Measures spring survey, 2022. Profiles 1bSS2 and 1bSS4 were last surveyed during the Full Measures autumn survey, 2021. Profile <b>1bSS1</b> is located to the north of Littlehaven beach, in the lee of a rocky outcrop and South Groyne. The dunes have lowered by 0.1m since the last survey on the back dunes and dune face. Beach levels on the dune toe have lowered since the previous survey (between chainages 60-64m) by up to 0.2m. The upper and middle beach between chainages 64-96m has risen by up to 0.2m, switching to erosion on the lower beach by up to 0.5m to chainage 138m. The boulder patch seaward of chainage 144m remains exposed with slight changes in position of boulders since the previous survey. The profile is at a high level on the dunes and upper-middle beach, and at a low level on the lower beach compared to the range recorded from previous surveys.</p> <p>Profiles <b>1bSS2 to 1bSS4</b> extend seawards from the new sea wall that was completed since the Full Measures survey in April 2014.</p> <p>At profile <b>1bSS2</b>, beach levels have dropped at the toe of the seawall by up to 0.2m to chainage 15m. The upper to middle beach between chainages 15-66m has risen by up to 0.8m, switching to lowering on the lower beach between chainage 66m and 104m by 0.3m. Overall the beach profile is at a low level at the toe of the seawall, a high level on the upper and middle beach, dropping to a low level on the lower beach compared to the range recorded from previous surveys.</p> <p>At profile <b>1bSS3</b>, there has been minor erosion of less than 0.1m at the toe of the seawall to chainage -16m. An upper beach berm has lowered by up to 0.2m and moved seaward by up to 12m. The upper beach has risen by up to 0.6m, before switching to erosion on the lower beach at chainage 40m by up to 0.6m to the end of the survey. Overall, the beach profile is at a low level at the toe of the</p>	<p>The beach at Littlehaven has had some time to adjust since construction of the realigned seawall in April 2014. All profiles generally show a seaward movement of berms and have generally risen on the upper half and lowered on the lower half of the beach. The profiles range from a high-low level compared to the range recorded from previous surveys, with a small section on the upper beach at profile 1bSS4 at its lowest recorded level.</p> <p><b>Longer term trends:</b> The beach profiles are at variable positions relative to past levels. In general, they are within the boundaries of previous surveys indicating the new seawall has not adversely affected sediment movements.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>seawall, a high level on the upper beach and a medium-high level on the middle-lower beach compared to the range recorded from previous surveys.</p> <p>At profile <b>1bSS4</b>, the beach level at the toe of the seawall has risen by less than 0.1m to chainage 40m. The upper beach berm has lowered by up to 0.3m and moved seaward by up to 11m. The middle beach has risen by up to 0.6m to chainage 126m. The lower beach has lowered by up to 0.2m to the end of the survey. Overall, the profile is generally at a medium-low level compared to the range recorded from previous surveys, except between chainages 60-76m which is at its lowest level recorded.</p>	
September 2023	<p><b>Topographic Survey:</b></p> <p>Littlehaven Beach is covered by a bi-annual topographic survey between the South Groyne and the South Pier, which commenced in March 2010.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2023) have been used to create a DGM (Appendix B – Map 1) using GIS. A difference plot has also been produced using the DGM (Appendix B – Map 3) produced from the last topographic survey (Partial Measures, spring 2023) and the present survey.</p> <p>The topographic survey shows a wide, continuous shore-parallel band of accretion (+0.5-1.75m) across the upper-middle beach across Littlehaven. A continuous band of erosion (-1.0m) is present on the lower beach, and on the middle-upper beach in the southern part of the bay. Between these bands of erosion/accretion the beach has experienced little change (<math>\pm 0.1</math>m). North of the seawall, the pattern on the upper beach is patchy; showing a mix of accretion (up to +1.0m) and little change (<math>\pm 0.1</math>m) with isolated patches of erosion (-0.5m).</p>	<p>Comparison of the present topographic survey with the previous Partial Measures (spring, 2023) shows that the beach is generally stable with shore-parallel bands of elevation change which reflect seasonal redistributions of material throughout across the beach as bars.</p>



## 2.2 Herd Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>6<sup>th</sup> – 15<sup>th</sup> Sept 2023</p>	<p><b>Beach Profiles:</b></p> <p>Herd Sands is covered by five beach profile lines for the Full Measures survey (Appendix A). Profiles 1bSS5, 1bSS8 to 1bSS9 were last surveyed during the Partial Measures spring survey, 2023. Profiles 1bSS6 and 1bSS7 were last surveyed during the Full Measures autumn survey 2022.</p> <p>Profile <b>1bSS5</b> is located to the north of Herd Sands and is in the lee of the South Pier. The survey report notes that '<i>new sand fences to the south of the existing dunes have been removed since the last measure</i>'. These sand fences were constructed on these dunes in 2012 to encourage accretion. The dunes have largely retained a similar form to the previous survey, with some dune crests showing a reduction in height by up to 0.2m since the previous survey. The hollow between the dunes at chainages 87m and 97m has remained stable since the previous survey with less than 0.1m erosion. Seaward of this point, the berm present at chainage 158m has lowered by up to 0.3m. The upper to middle beach between chainage 170-330m has lowered by up to 0.2m. The last 35m of the survey has risen by up to 0.5m. Overall, the crest of the foredune and upper beach berm crest are at a medium-high level compared to the range recorded from previous surveys. The rest of the beach profile is at a medium level compared to the range recorded from previous surveys.</p> <p>At profile <b>1bSS6</b>, the dunes have remained stable, with only minor erosion occurring on the back dunes by up to 0.1m. The toe of the foredune has eroded landward by up to 2.0m. The rest of the beach profile has alternated between erosion and accretion by up to ±0.5m. Overall, the dunes are at one of their highest levels recorded. The rest of the beach profile is at a medium level compared to the range recorded from previous surveys.</p> <p>At profile <b>1bSS7</b>, located at the centre of Herd Sands, has similarly alternated between erosion and accretion across the beach profile. Erosion is limited to 0.2m and accretion limited to 0.1m. Overall, the beach profile is at a medium level compared to the range recorded from previous surveys.</p> <p>At profile <b>1bSS8</b>, between the toe of the seawall and chainage 20m the beach has lowered by up to 0.5m. The upper and middle beach between chainage 20-200m has risen by up to 0.3m, with a small berm forming at chainage 165m by up to 0.7m. Seaward of chainage 200m, the beach has</p>	<p>Profiles have generally shown alternating bands of erosion and accretion across the beach. Change is limited to ±0.5m, except at profile 1bSS8 where a small berm has formed seaward of chainage 200m with the accumulation of up to 0.7m of sediment.</p> <p><b>Longer term trends:</b> Beach and dune levels remain generally stable and are at medium to high levels compared to earlier surveys.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>lowered by up to 0.7m. Overall, the upper and middle beach is at a medium level, whilst the lower beach is at a high level compared to the range recorded from previous surveys, particularly between chainage 130-200m which is at its highest level recorded.</p> <p>Profile <b>1bSS9</b> is located at the southern end of Herd Sands. There has been a small amount of lowering on the landward side of the dunes by up to 0.2m. The crest of the dune has risen by up to 0.1m. The majority of the rest of the profile has alternated between erosion and accretion limited to <math>\pm 0.1</math>m to chainage 165m. Seaward of chainage 165m, the beach has risen by up to 0.5m. Overall, the dunes fronting the car park remain at a high level and the beach is at a medium-high level compared to the range recorded from previous surveys.</p>	
<p><b>September 2023</b></p>	<p><b>Topographic Survey:</b></p> <p>Herd Sands is covered by an annual topographic survey between the South Pier and Trow Point, which commenced in November 2008.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2023) have been used to create a DGM (Appendix B – Map 1) using GIS. A difference plot has also been produced using the DGM (Appendix B – Map 2) produced from the last topographic survey (Full Measures, autumn 2022) and the present survey.</p> <p>The difference plot shows that change across the dunes is patchy, with no clear pattern of change. There appears to be more patches of erosion at the toe of the dunes. The beach consists of long bands of erosion and accretion generally limited to <math>\pm 1.25</math>m. The middle-lower beach in the south of the bay is dominated by low-level accretion (+1.25m), with some smaller bands of accretion in the central – northern bay.</p>	<p>Comparison of the present topographic survey with the previous Full Measures (autumn, 2022) generally shows alternating bands of erosion / accretion across the bay.</p> <p>Change within the dunes is variable with no clear trend from the previous surveys.</p>

## 2.3 Trow Quarry (incl. Frenchman’s Bay)

Survey Date	Description of Changes Since Last Survey	Interpretation
6 <sup>th</sup> – 15 <sup>th</sup> Sept 2023	<p><b>Beach Profiles:</b></p> <p>Trow Quarry is covered by four beach profile lines for the Full Measures survey (Appendix A), two in Graham’s Sand and two in Southern Bay. The previous survey was the Partial Measures survey undertaken in March 2023.</p> <p>Profiles <b>1bSS10</b> and <b>1bSS11</b> are located in Graham’s Bay.</p> <p>At profile <b>1bSS10</b> the backshore has remained stable. The beach between chainage 24-46m has lowered by up to 0.3m, switching to accretion seaward of chainage 46m by up to 0.8m. The autumn 2023 survey has continued a further 30m seaward compared to the spring 2023 survey. Overall, the profile is at a relatively medium-low level on the upper to middle beach, and at a medium-high level on the lower beach compared with the range recorded from previous surveys.</p> <p>At profile <b>1bSS11</b>, there has been a movement of rocks, however the profile is generally in the same position as the previous survey in March 2023. The survey extends a further 58m compared to the spring 2023 survey. Overall, the profile is at a low level on the upper and middle beach, and a medium level on the lower beach compared with the range recorded from previous surveys.</p> <p>Profile <b>1bSS12</b> and <b>1bSS13</b> are located in Southern Bay. At both locations the beach profile has remained stable since the previous survey. Apparent changes in the profile likely derive from minor movement of cobbles or differences in the exact placement of survey points.</p>	<p>At both Graham’s Bay and Southern Bay, the cliff and rock revetment have remained stable.</p> <p>At Graham’s Bay the beach (only represented at profile 1bSS10) has lowered on the upper-middle beach and risen on the lower beach. There has been very little change across profiles 1bSS11 – 1bSS13</p> <p>At Southern Bay, the rocky foreshore has generally retained the same form and position.</p> <p><b>Longer term trends:</b> Overall, the beach at Graham’s Bay and Southern Bay has generally retained the same form and position since November 2008/March 2009 when surveys began.</p>
September 2023	<p><b>Topographic Survey:</b></p> <p>Trow Quarry is covered by an annual topographic survey within Graham’s Sand, Southern Bay and Frenchman’s Bay, which commenced in November 2008.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2023) have been used to create a DGM (Appendix B – Map 1) using GIS. A difference plot has also been produced using the DGM (Appendix B – Map 2) produced from the last topographic survey (Full Measures, autumn 2022) and the present survey.</p>	<p><b>Topographic Survey:</b></p> <p>The difference plot indicates that accretion has been more dominant across the survey area, changes elsewhere display no discernible pattern.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>The difference plot shows that there has been patchy change across the beach, which is dominated by accretion across the bay. There are very few patches of erosion across the bay, mostly found in the north of the bay.</p>	
<p><b>September 2023</b></p>	<p><b>Cliff-top Survey:</b></p> <p>Cliff top survey data collected for baseline survey (autumn, 2011) and bi-annual surveys since then, including the present Full Measures survey (autumn, 2023) is presented in this report.</p> <p>Six ground control points (numbered points 1 to 6) were established along the cliff top at Trow Point in 2008 to monitor cliff erosion at the site of a former landfill. Note: the numbering of ground control points is not intended to correlate with that of the beach profile lines and reference should be made to Appendix C – Map 1 for the location of ground control points.</p> <p>Measurements are taken from each ground control point along a fixed bearing to the edge of the cliff top. The results from the cliff top monitoring are anticipated to have an accuracy of <math>\pm 0.2\text{m}</math> due to the technique used.</p> <p>The results from the cliff top survey are presented in Appendix C – Table C1, showing the position from the ground control point to the edge of the cliff top along a defined bearing.</p> <p>Results show that no points experienced erosion greater than the anticipated survey since the previous survey, with all points showing erosion <math>&lt; 0.2\text{m}</math>. No erosion rate greater than the survey error has been recorded at any points over the longer term.</p>	<p>Results show no change recorded is greater than the survey error. It can be concluded that minimal recession has taken place at the Trow Rocks headland over the survey period.</p>

## 2.4 Marsden Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
6 <sup>th</sup> – 15 <sup>th</sup> Sept 2023	<p><b>Beach Profiles:</b></p> <p>Marsden Sands is covered by four beach profile lines for the Full Measures survey (Appendix A). The previous survey was the Partial Measures survey in March 2023 and prior to that the Full Measures survey was completed in October 2023. Profiles 1bSS14 and 1bSS17 were last surveyed during the Partial Measures spring survey, 2023. Profiles 1bSS15 and 1bSS16 were last surveyed during the Full Measures autumn survey, 2022.</p> <p>Profile <b>1bSS14</b> is located to the north of the bay and covers the cliff and the former lifeguard station adjacent to the Redwell Steps. The survey report notes that the start of this section was inaccessible due to ongoing works to remove former structures in the area. The beach has risen across the survey profile by up to 0.4m on the upper beach, 0.6m on the middle beach and 0.1m on the lower beach. Overall, the profile is at a medium level compared to the range recorded by previous surveys.</p> <p>At profile <b>1bSS15</b>, there has been a landward recession of the cliff toe by approximately 1.5m since the previous survey. The upper and middle beach between the cliff toe and chainage 94m has lowered by up to 0.2m. There has been changes in position of the rock and boulders seaward of chainage 94m since the previous survey. Overall, the profile is at a medium to high level compared to the range recorded by previous surveys.</p> <p>At profile <b>1bSS16</b>, the cliff top profile has receded a further 0.8m since the previous survey. The upper beach profile from the cliff toe has risen by up to 0.3m to chainage 78m. The berm on the upper beach has been removed with up to 1.0m to chainage 83m and up to 0.5m on the middle beach to the rock patch at chainage 104m. The profile is at a medium-high level compared with the range recorded from previous surveys.</p> <p>Profile <b>1bSS17</b> is located to the south of the bay. The cliff toe has retreated landward by up to 1.0m. The upper beach between chainages 61 – 71m has risen by up to 0.1m to the rocky platform at chainage 71m. The profile crosses a rocky platform and boulders, which has not changed since the previous survey. Overall, the profile is at a low level compared with the range recorded from previous surveys.</p>	<p>Changes are minimal across most profiles at Marsden Sands. The cliff toe at 1bSS15 and cliff top at 1bSS16 has continued to retreat since the previous survey.</p> <p><b>Longer term trends:</b> The profiles are generally at a medium-high level across the bay except profile 1bSS17 which is at a low level compared to previous surveys.</p>



### 3. Problems Encountered and Uncertainty in Analysis

- The survey report notes that the new sand fences to the south of the existing dunes (in proximity to profiles 1BSS6 and 1BSS7) have been removed since the last measure.
- The survey report notes that part of Profile **1bSS14** was inaccessible due to unsafe conditions (a former survey report noted the removal of former structures in the area).

#### Cliff Top Surveys

- Surveying any cliff top is difficult due to the need for a consistent interpretation of the cliff edge in successive surveys, which can be challenging, especially when vegetation is thick. For these reasons, it has been assumed that any changes of  $\pm 0.2\text{m}$  may be considered as being within margin of error of the surveying technique and that any indication of an advancing cliff line is error.
- Results from the cliff survey at Trow Quarry show that since the last survey, no points experienced erosion greater than the survey error. Over the long term (September 2011-2023) it was concluded that minimal recession has taken place at the Trow Rocks headland and there is no cause for concern.

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

No changes are recommended at the present time.

### 5. Conclusions and Areas of Concern

- At Littlehaven Beach, the recorded profiles generally show a seaward movement of berms, with accretion on the upper beach and erosion on the lower beach. Profiles are generally within the boundaries of previous surveys, ranging from a low-high level. Therefore, the beach profiles present no cause for concern. The short-term picture indicates seasonal redistribution of sand within the bay, and the long-term picture a general movement of sediment northwards.
- At Herd Sands the profiles show alternating bands of erosion and accretion. The recorded profiles present no causes for concern, and beach profiles remain at medium to high levels. The short-term difference plot indicates that the beach has undergone alternating bands of erosion / accretion with patchy change visible in the dunes.
- At Trow Quarry, the foreshore has generally maintained the same form since surveys began in 2009. The beach has generally lowered on the upper – middle beach and risen on the lower beach. The recorded profiles show no cause for concern. The cliffs at Trow Point appear to have been stable and the data does not indicate cause for concern.
- At Marsden Bay, profiles have generally undergone little change, however the cliff toe at 1bSS15 and cliff top at 1bSS16 have continued to retreat since the previous survey. This survey was carried out a month before a cliff fall took place at Marsden Bay (October 30<sup>th</sup> 2023) and so the Partial Measures survey is expected to show continued retreat of the cliff top. Extreme caution should be exercised during any future surveys in this location.

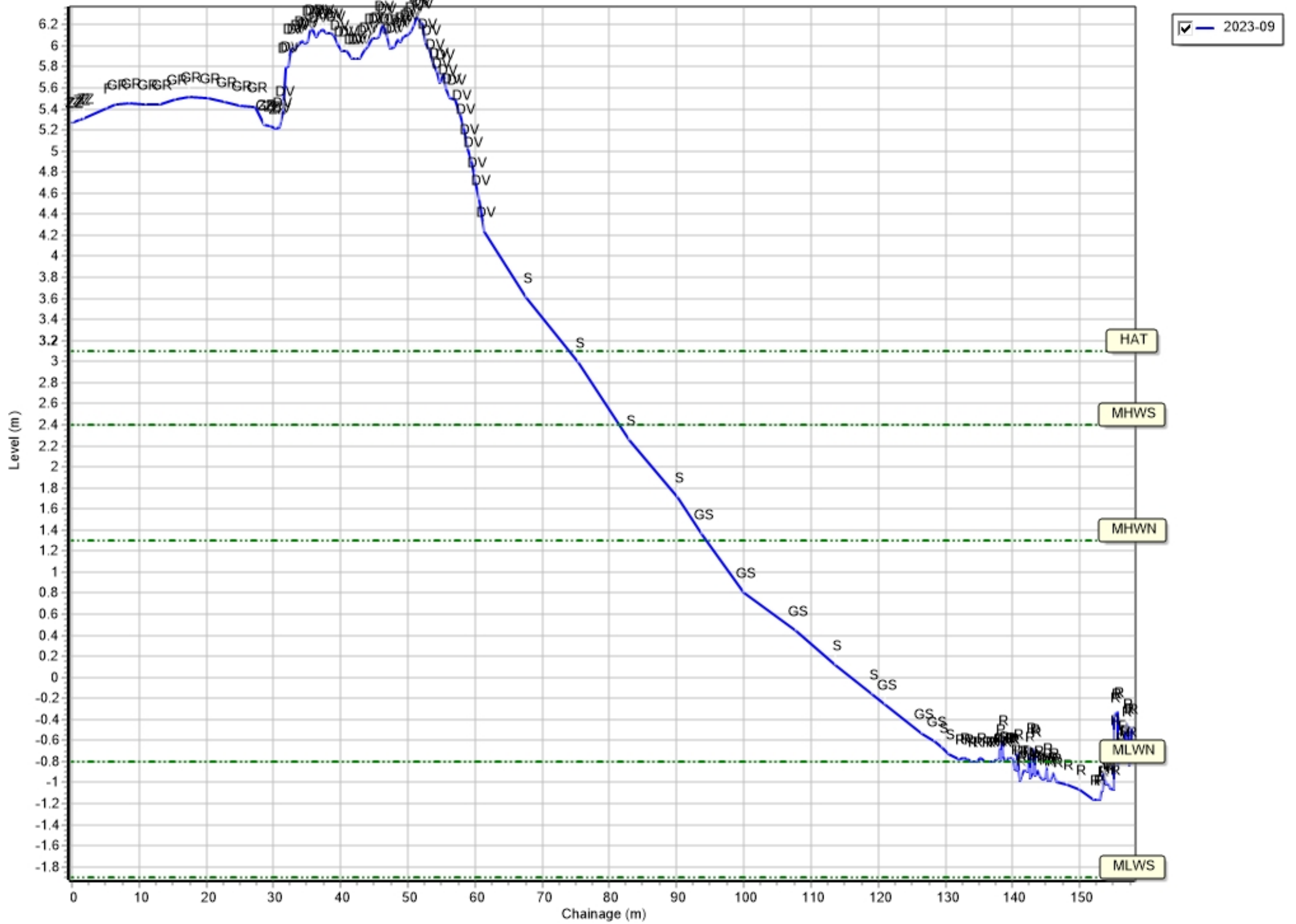
## **Appendices**

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

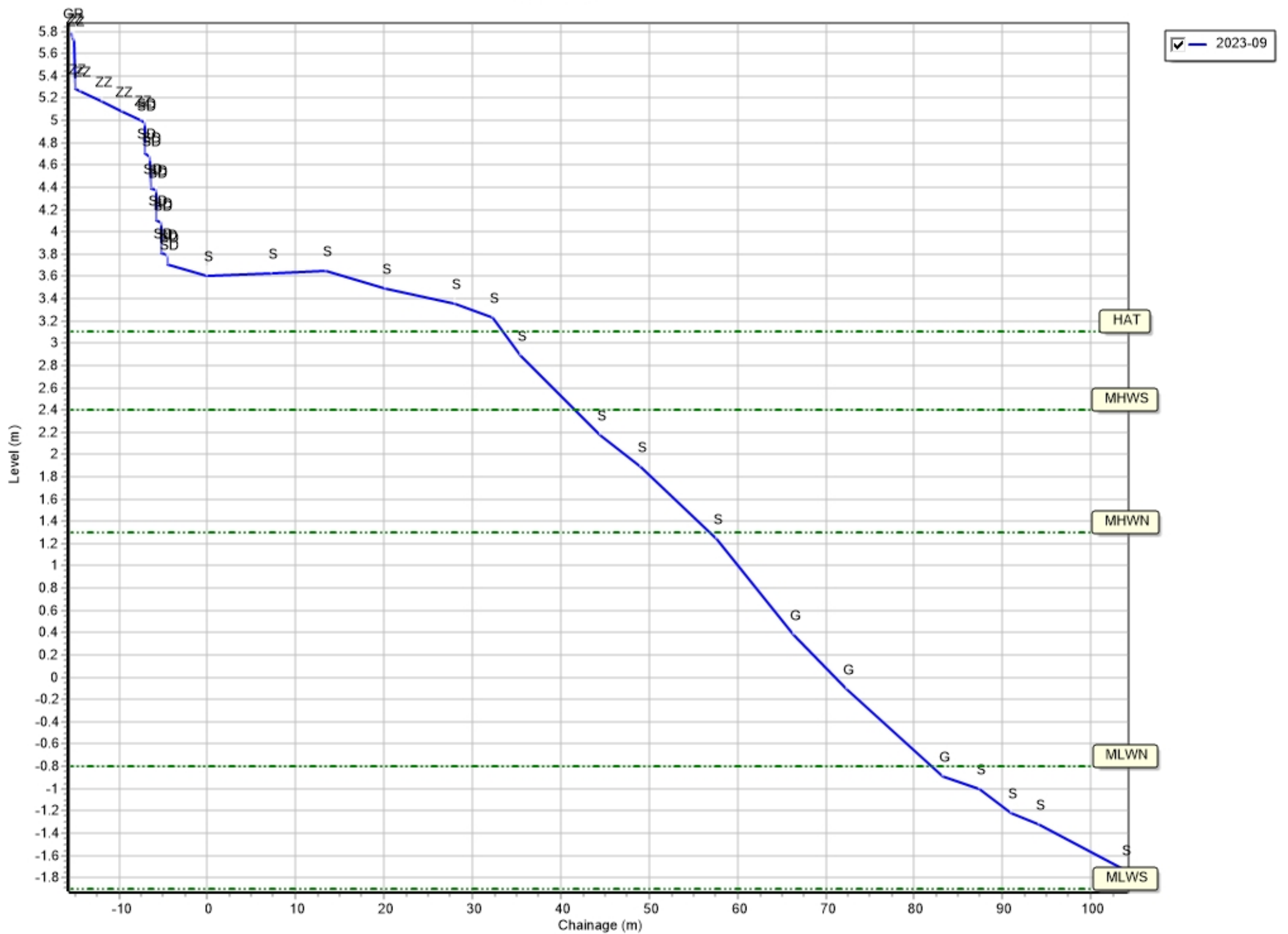
The following sediment feature codes are used on some profile plots:

<b>Code</b>	<b>Description</b>
S	Sand
M	Mud
G	Gravel
GS	Gravel & Sand
MS	Mud & Sand
B	Boulders
R	Rock
SD	Sea Defence
SM	Saltmarsh
W	Water Body
GM	Gravel & Mud
GR	Grass
D	Dune (non-vegetated)
DV	Dune (vegetated)
F	Forested
X	Mixture
FB	Obstruction
CT	Cliff Top
CE	Cliff Edge
CF	Cliff Face
SH	Shell
ZZ	Unknown

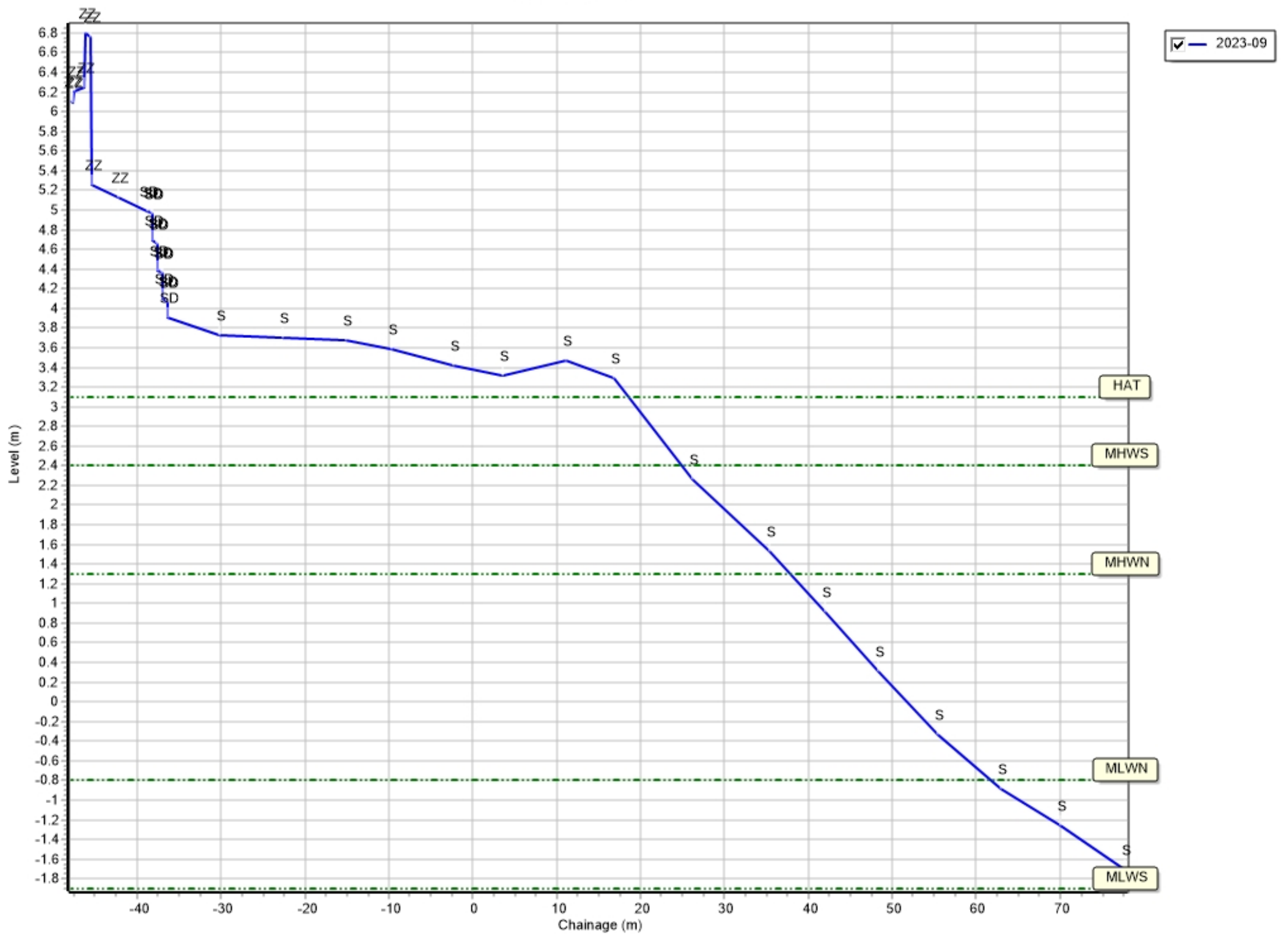
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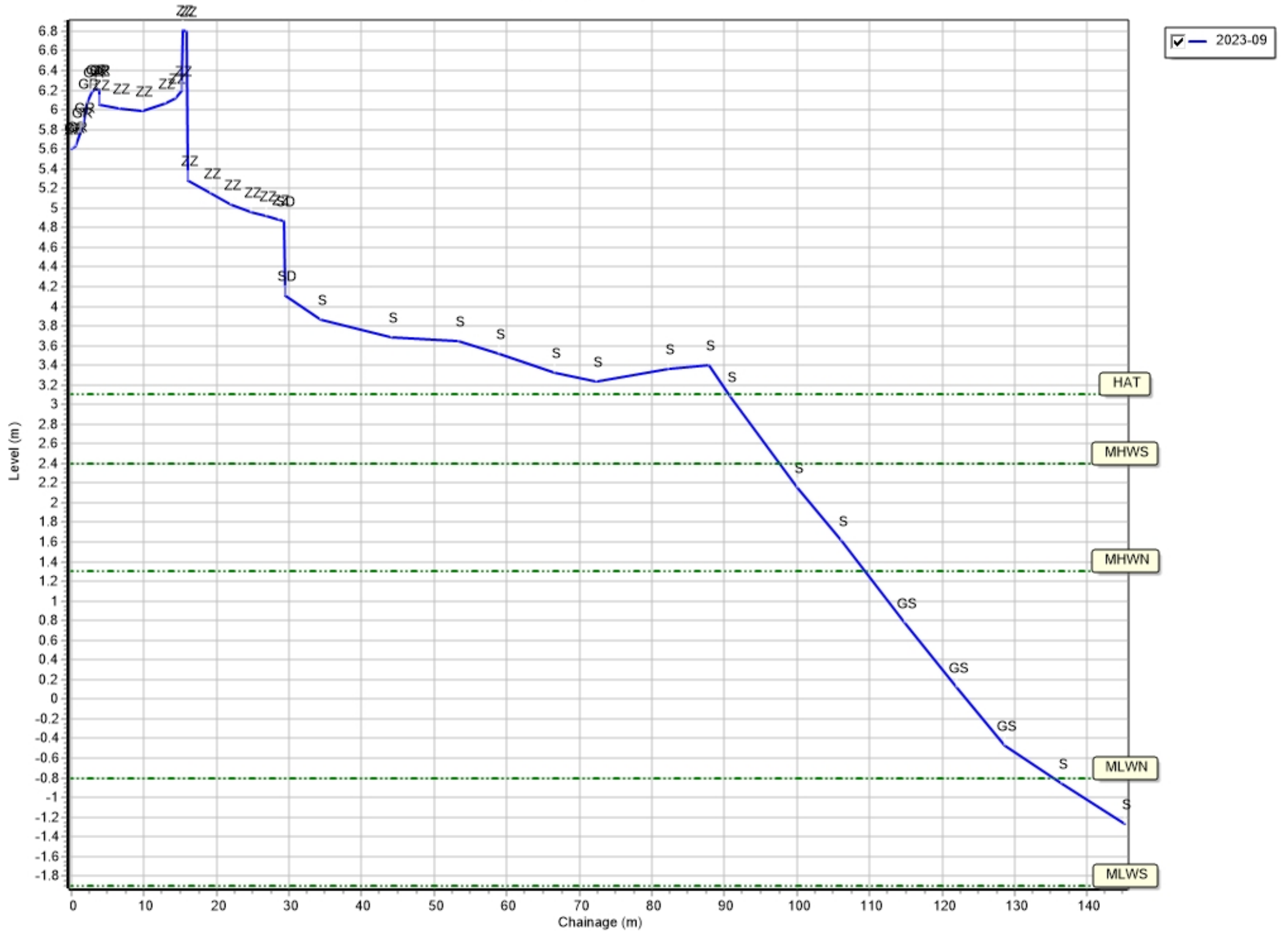
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Profiles: 1bSS3

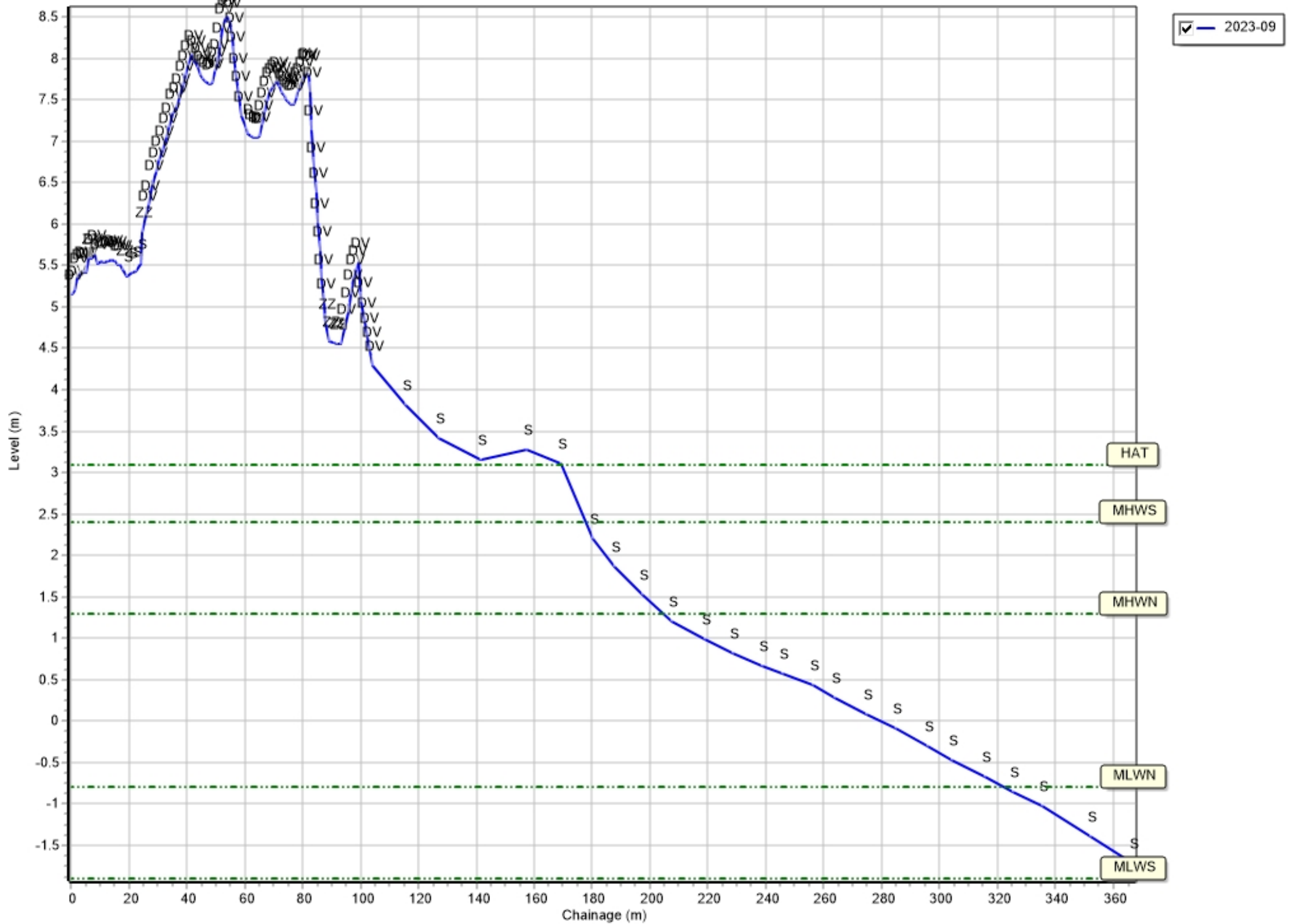


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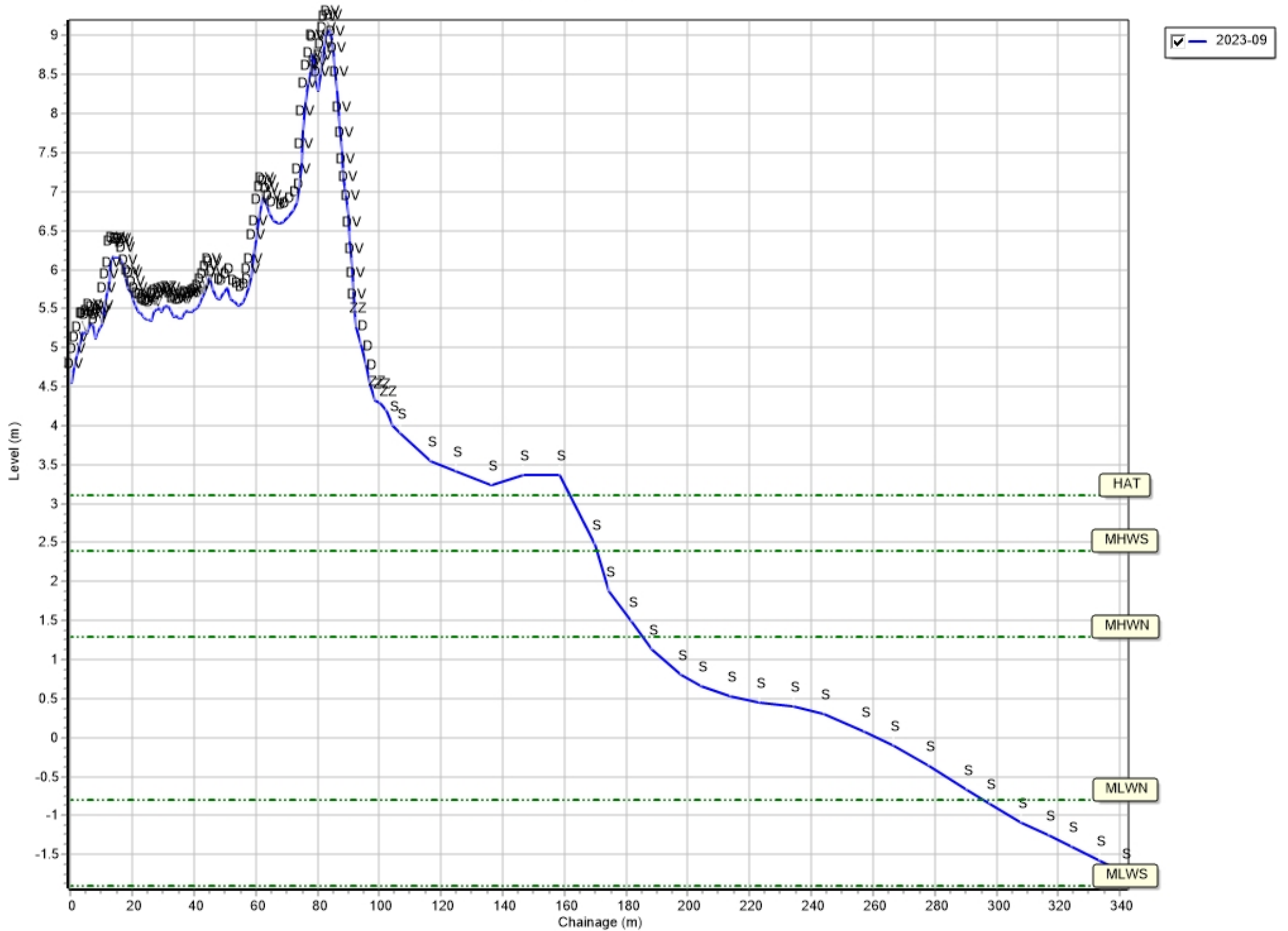




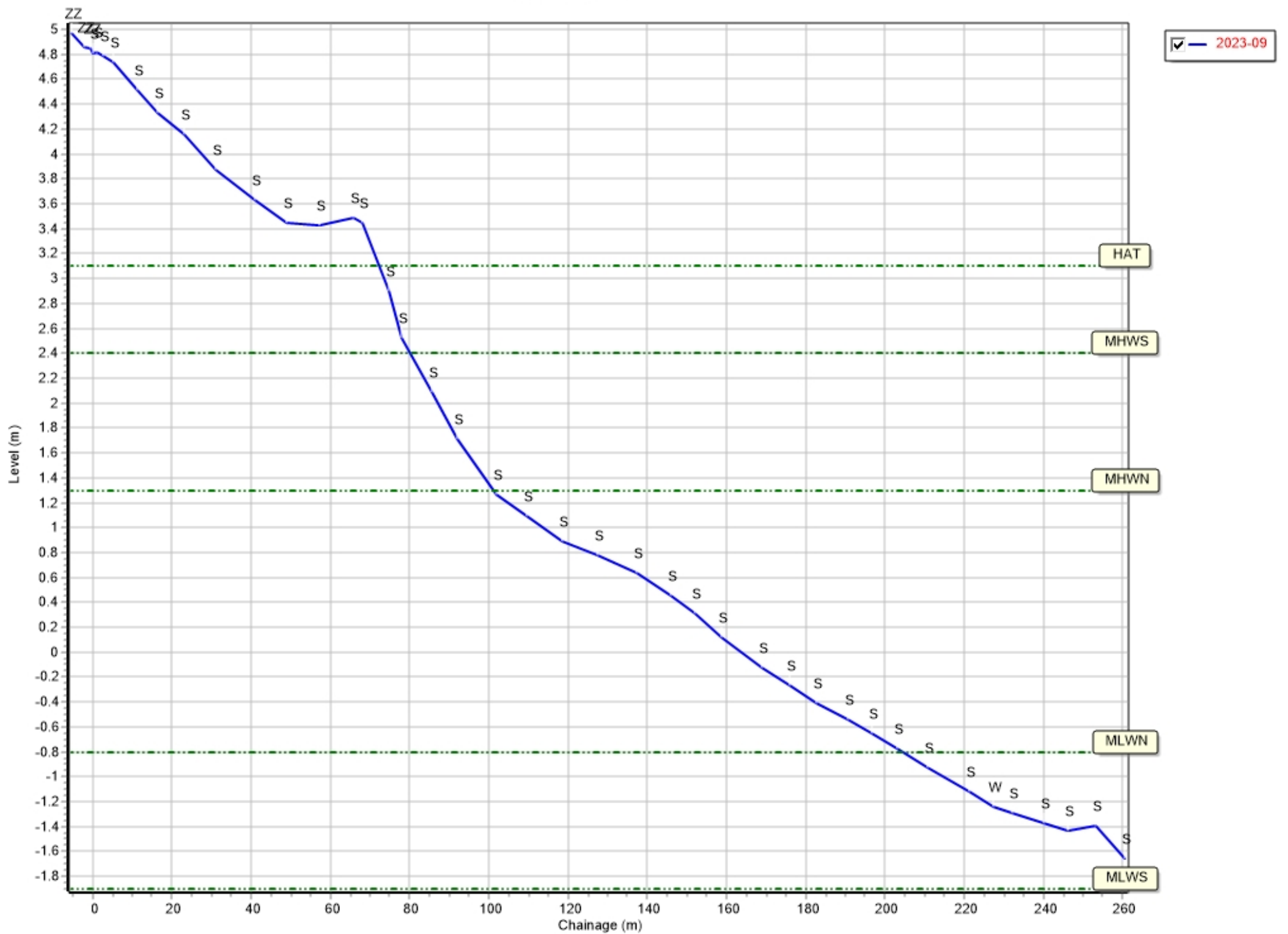
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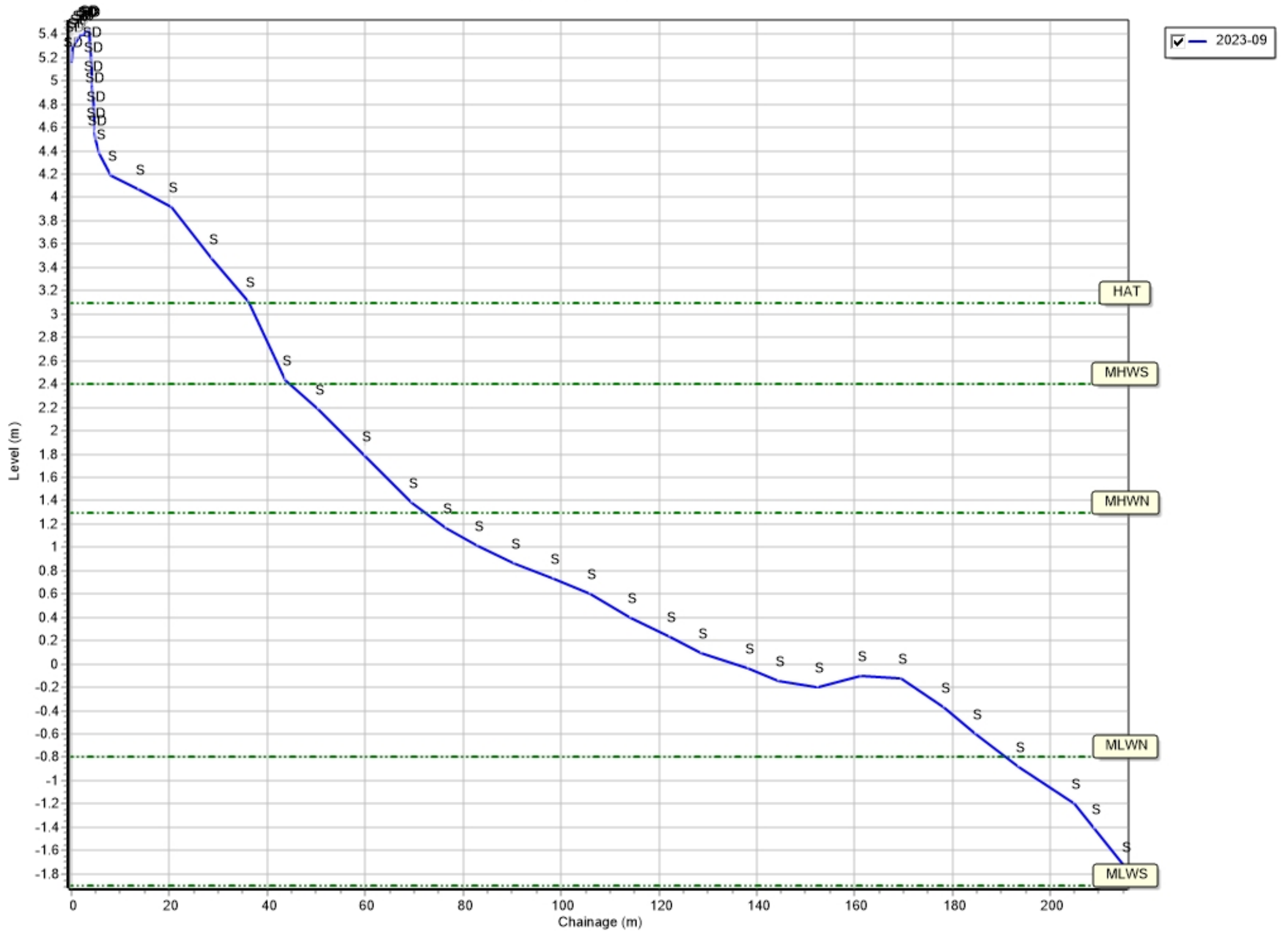
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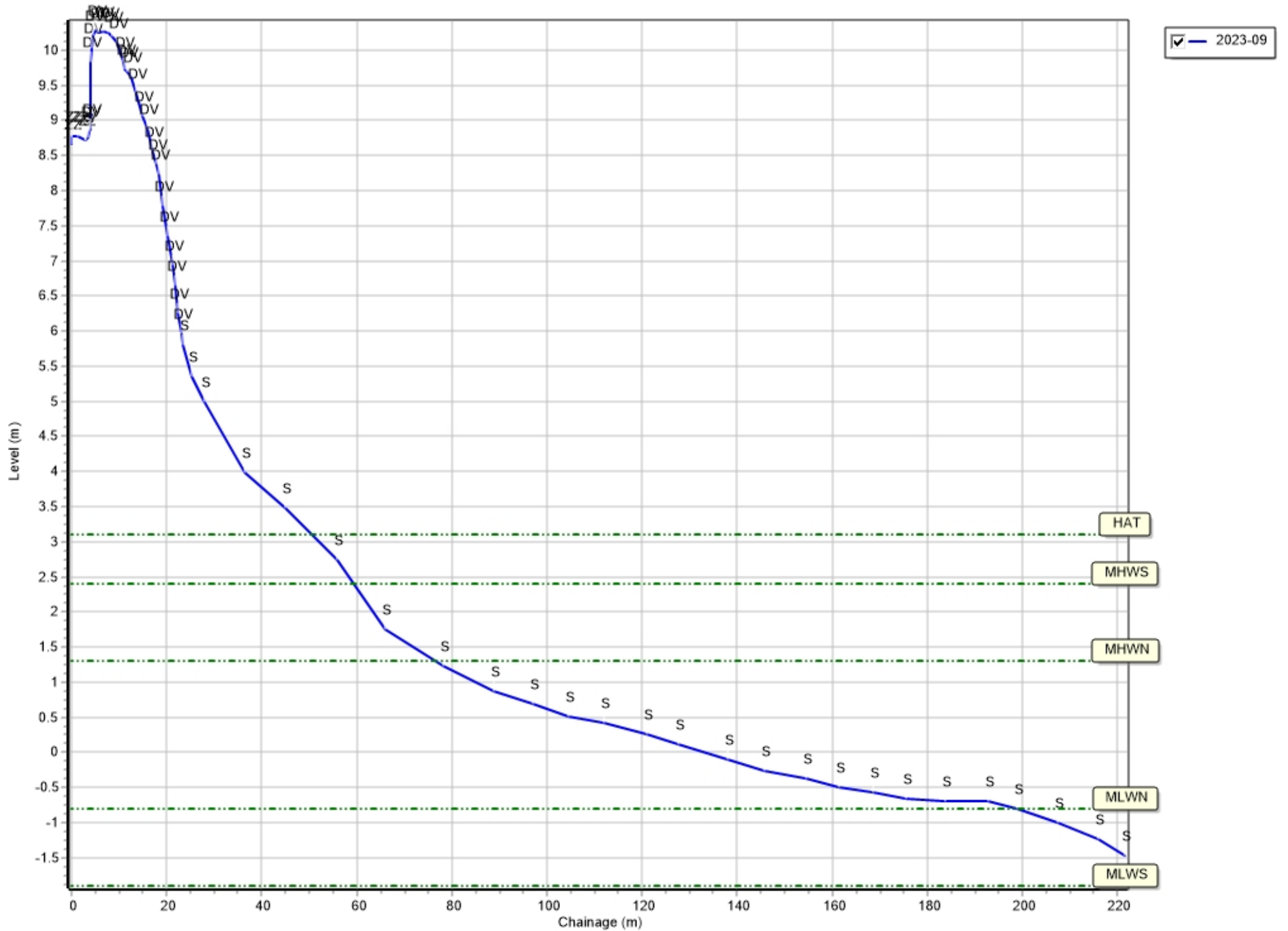
Profiles: 1bSS7



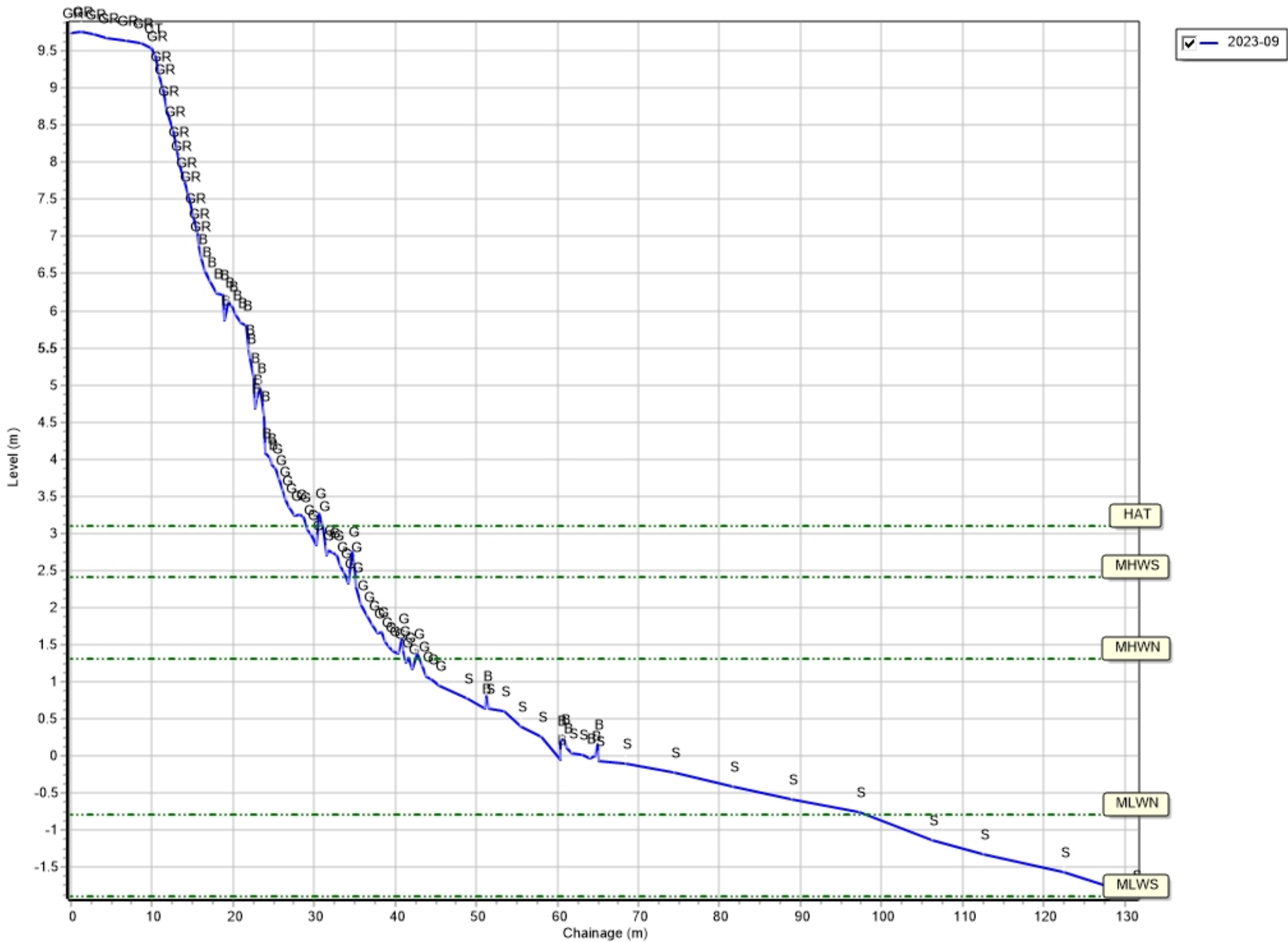
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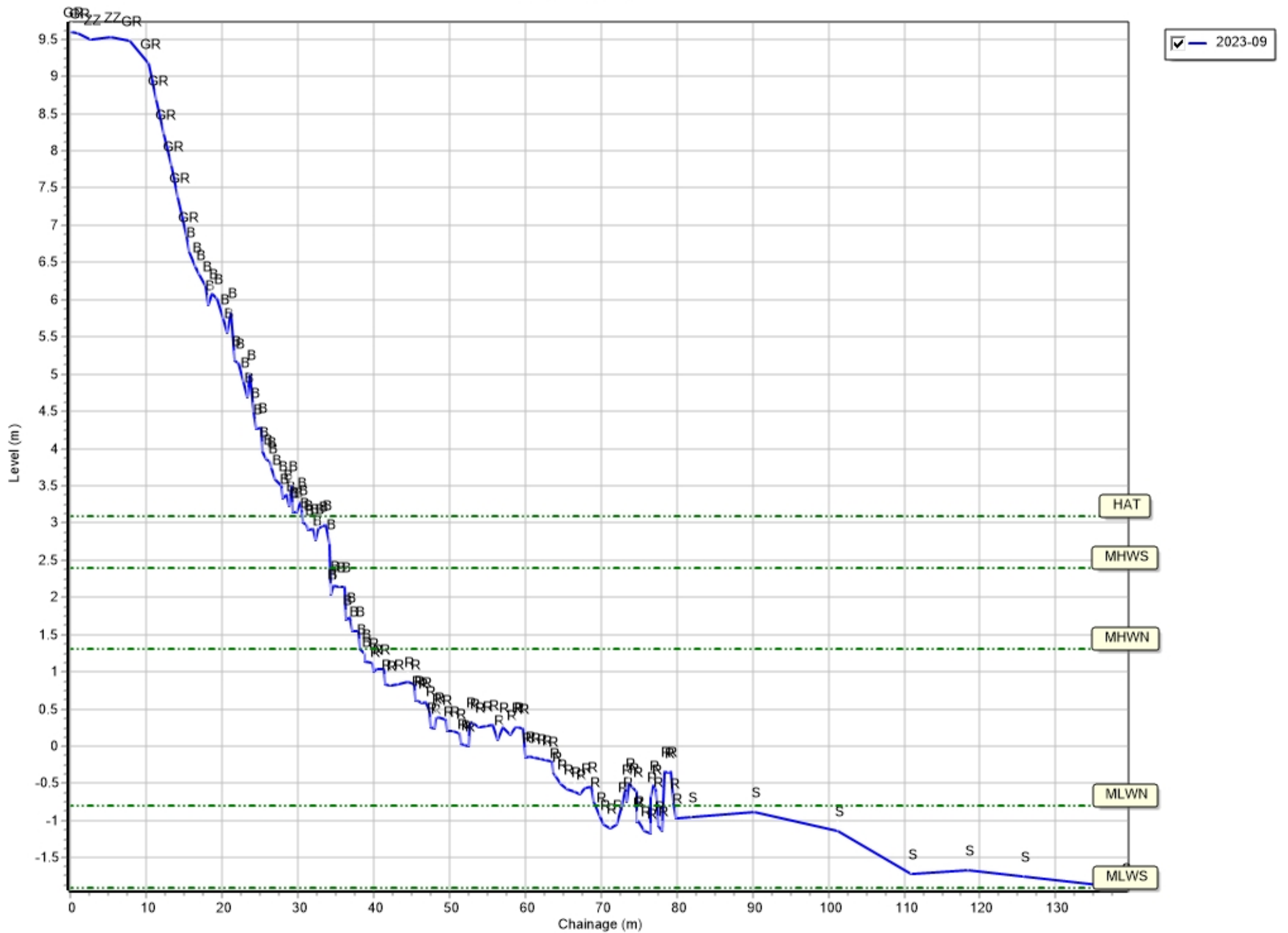
Profiles: 1bSS9



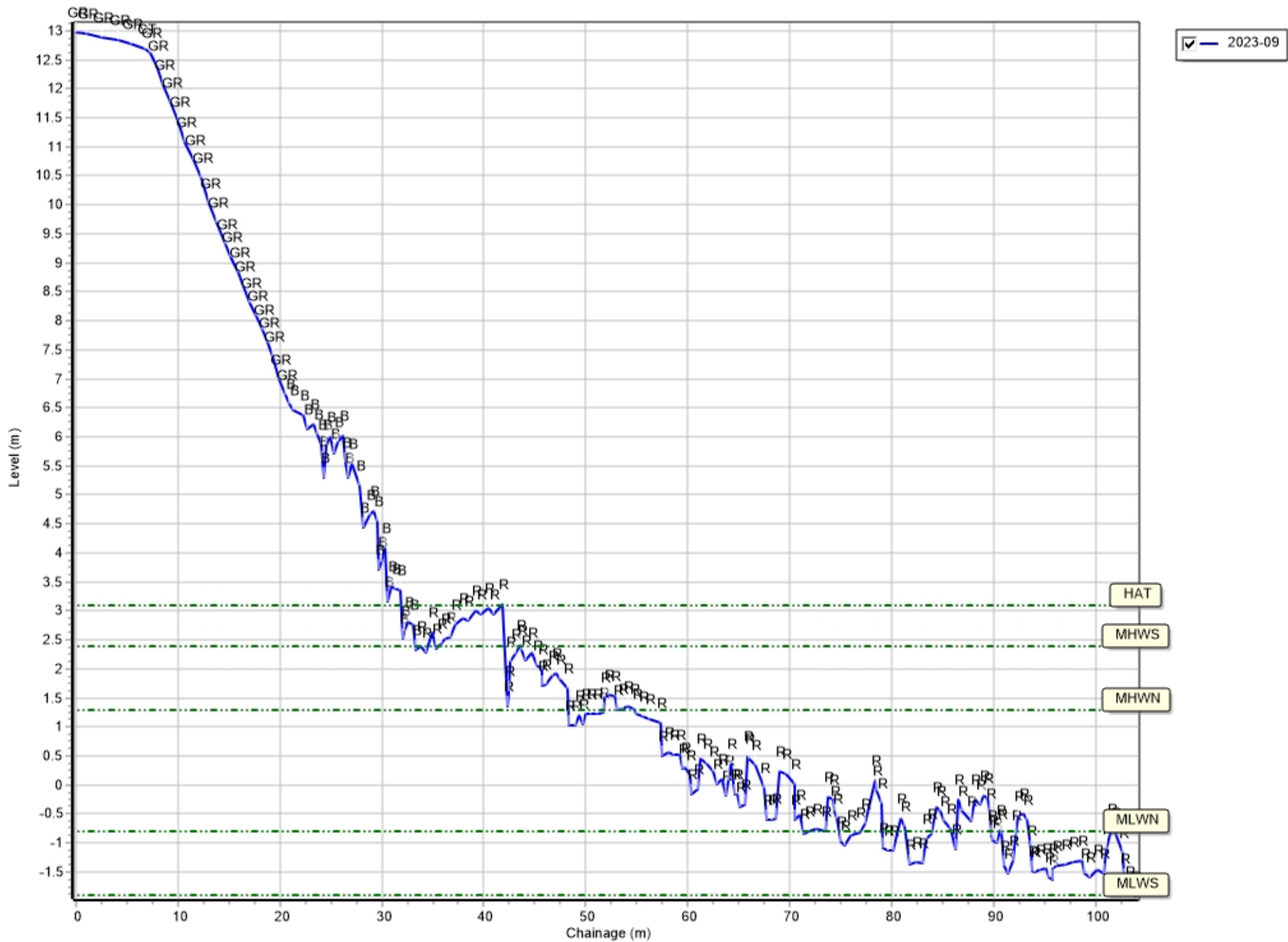
Profiles: 1bSS10



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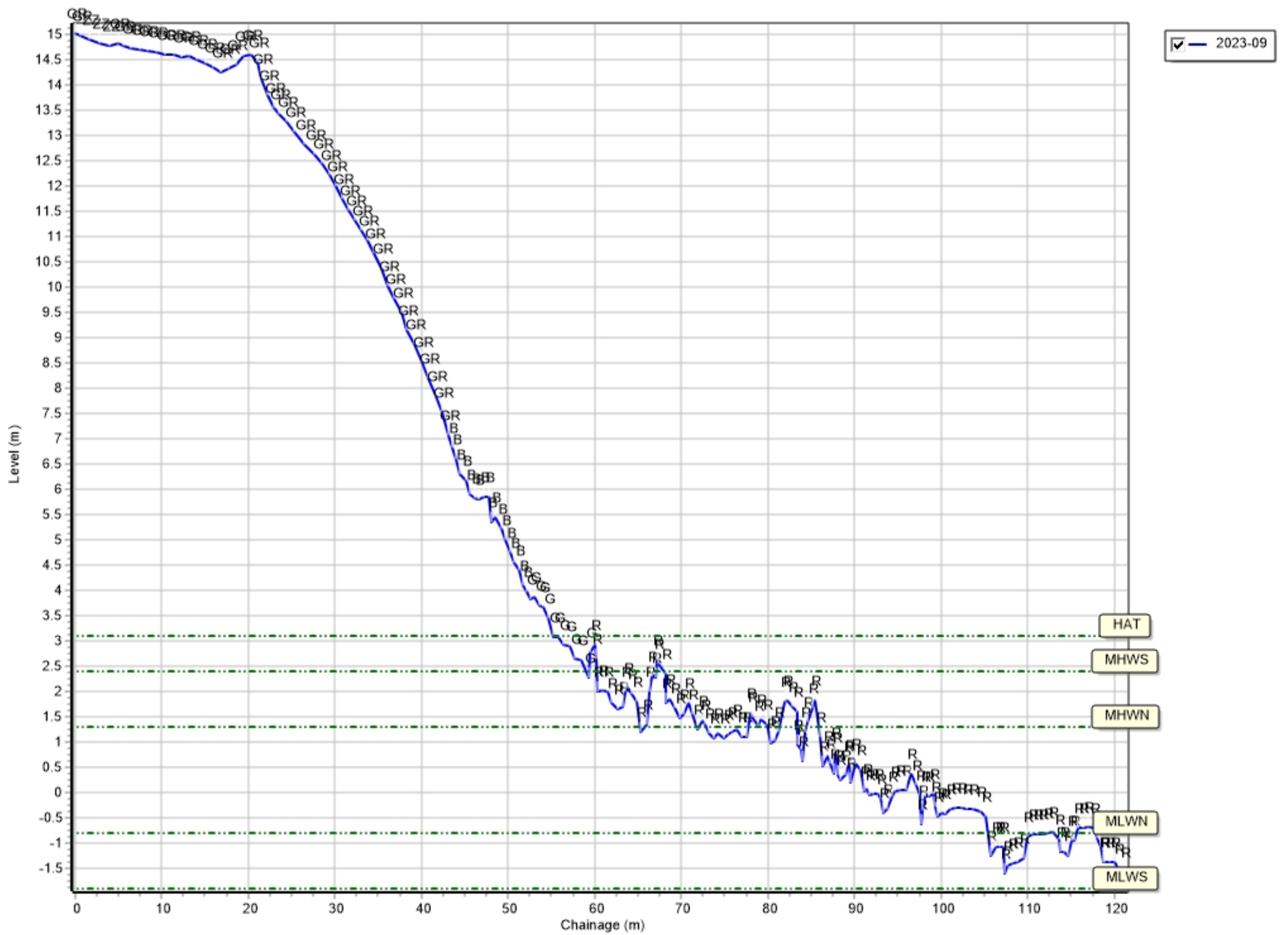


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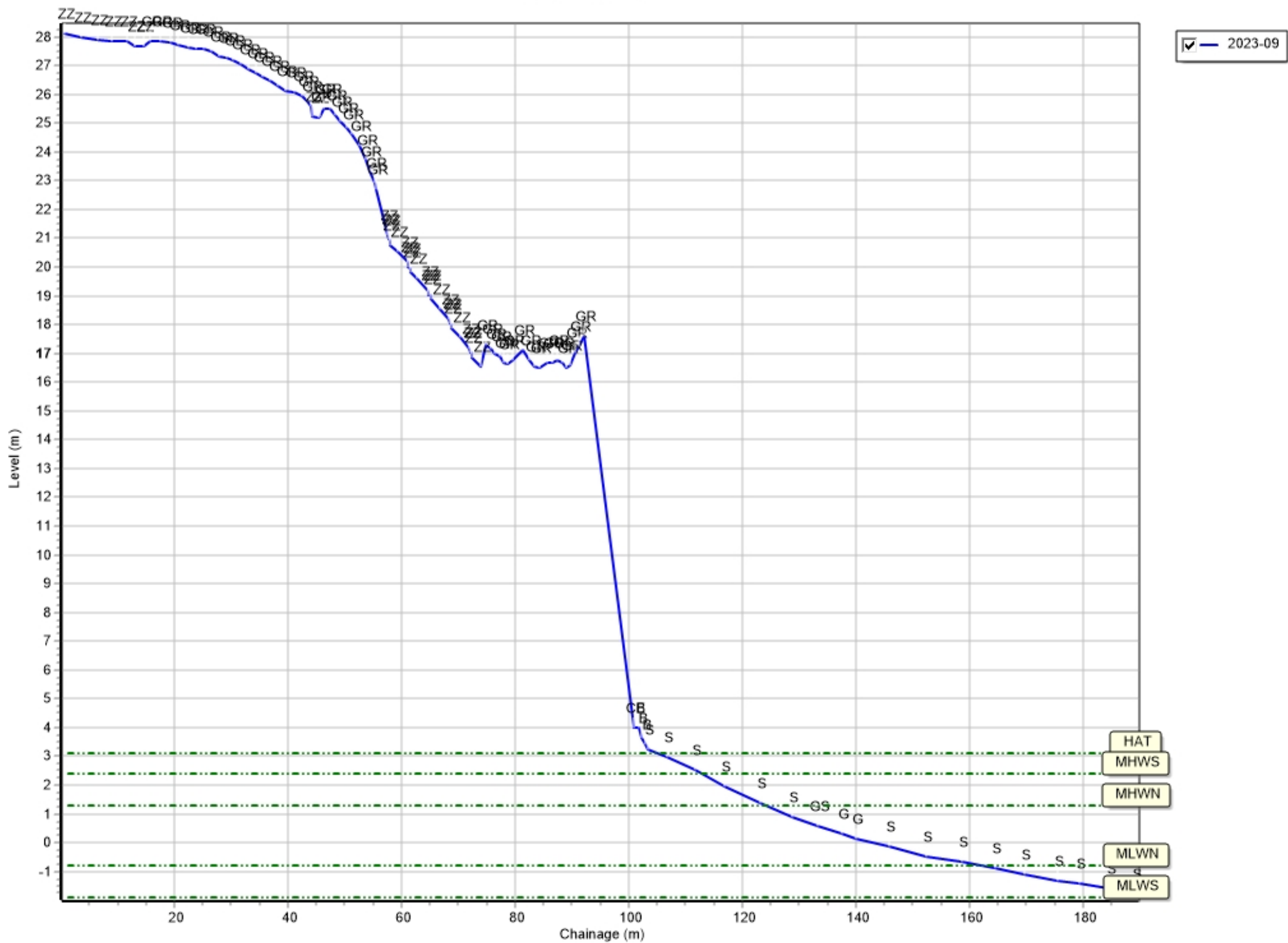




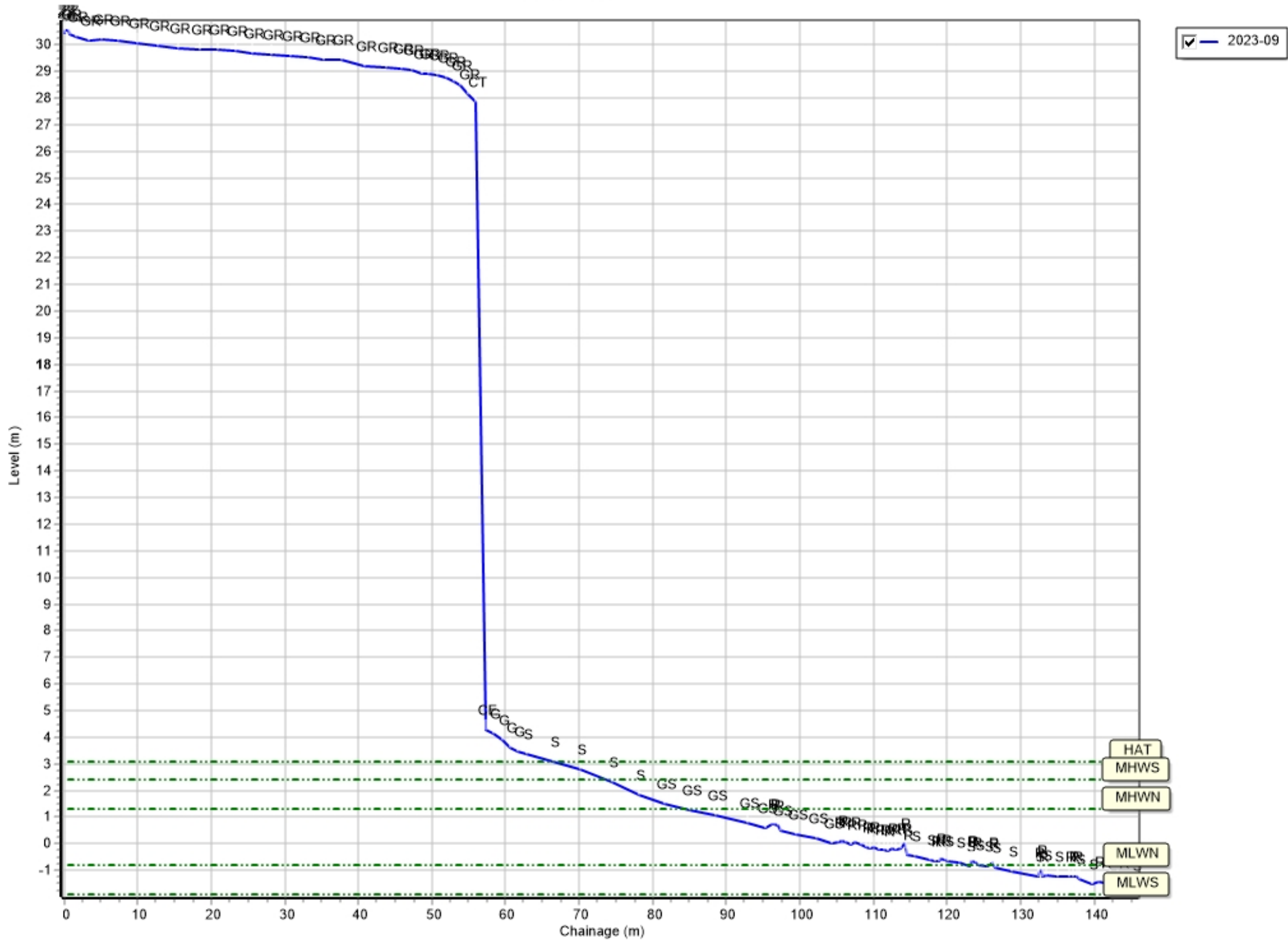
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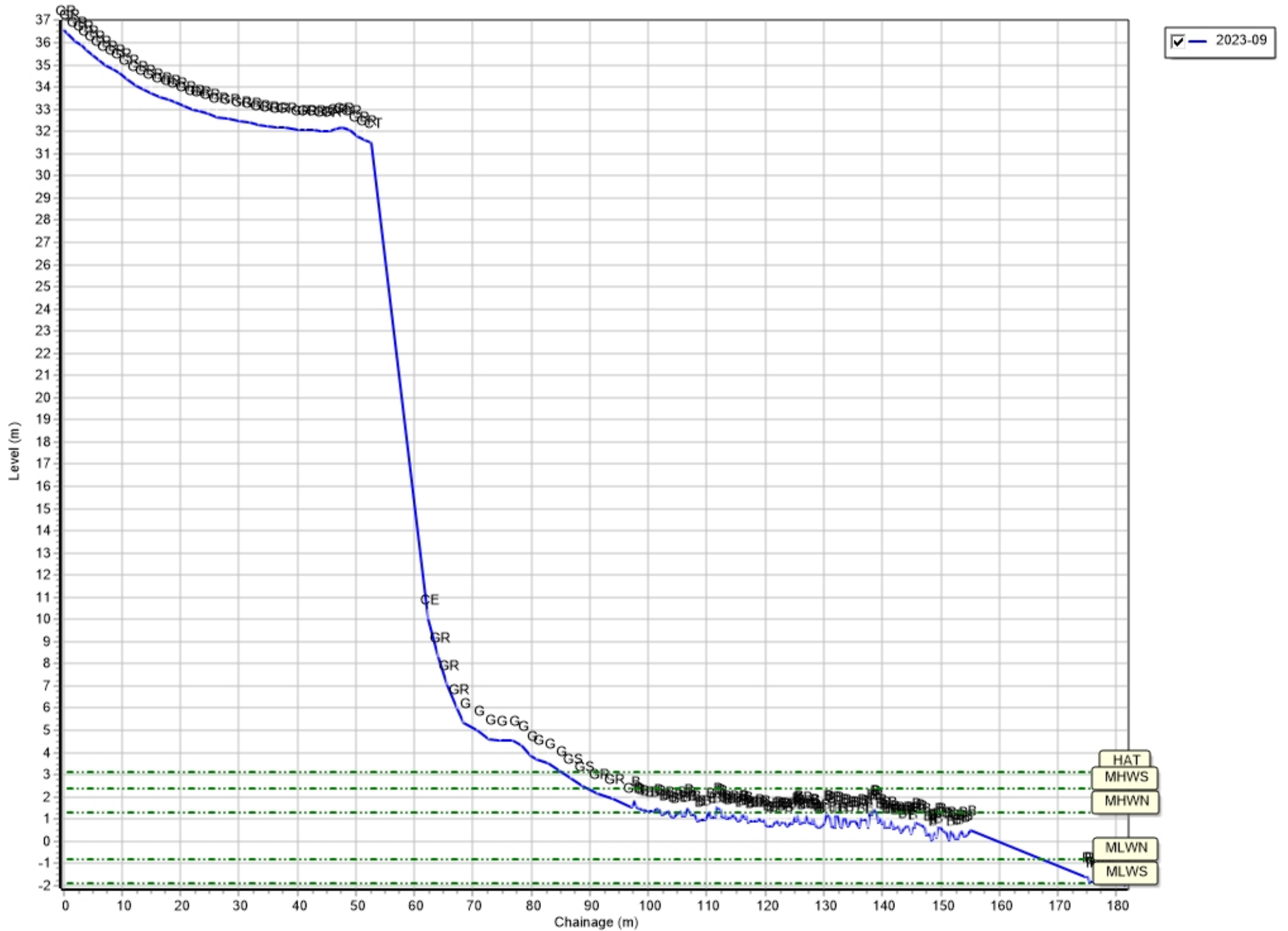
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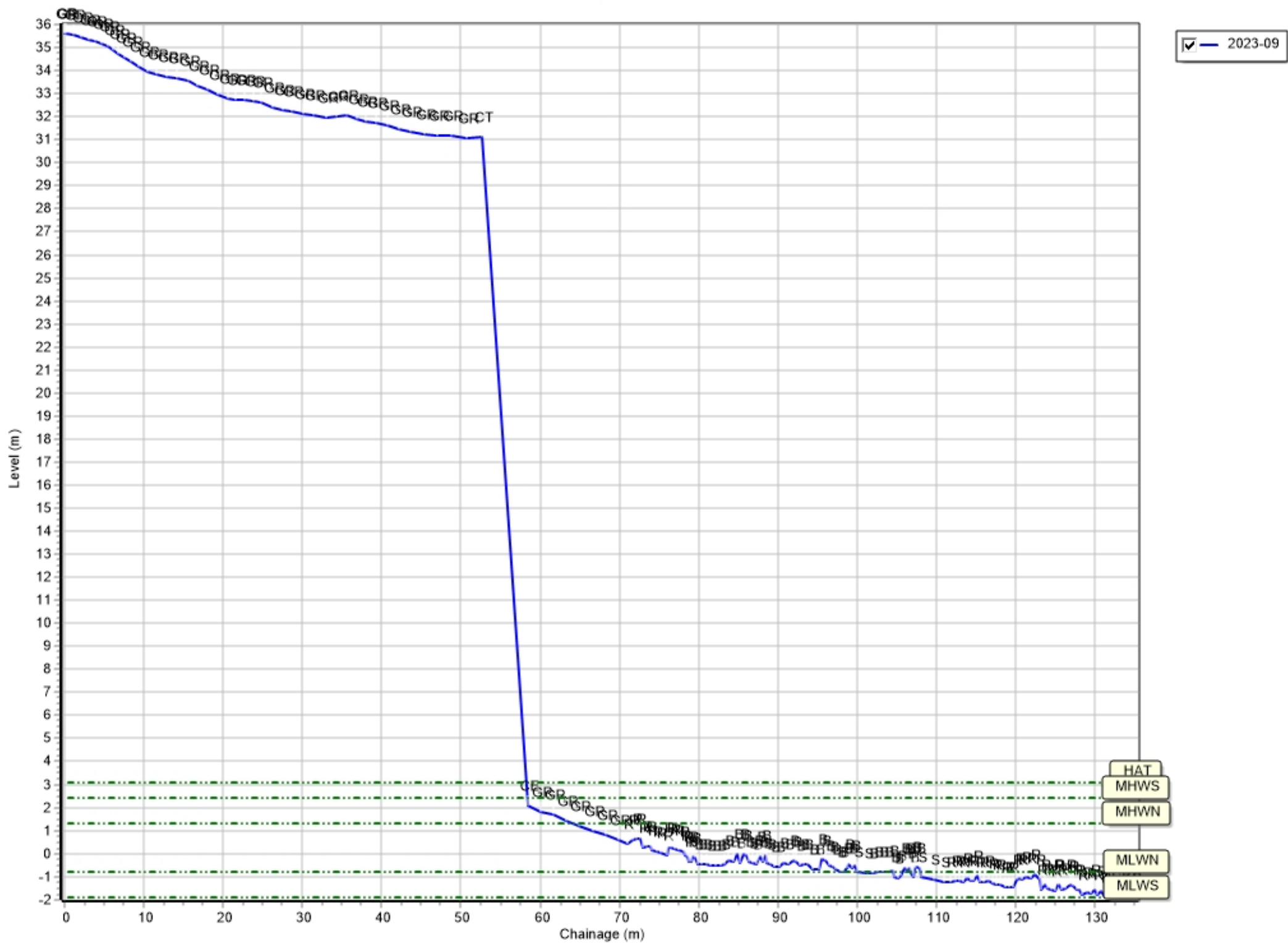
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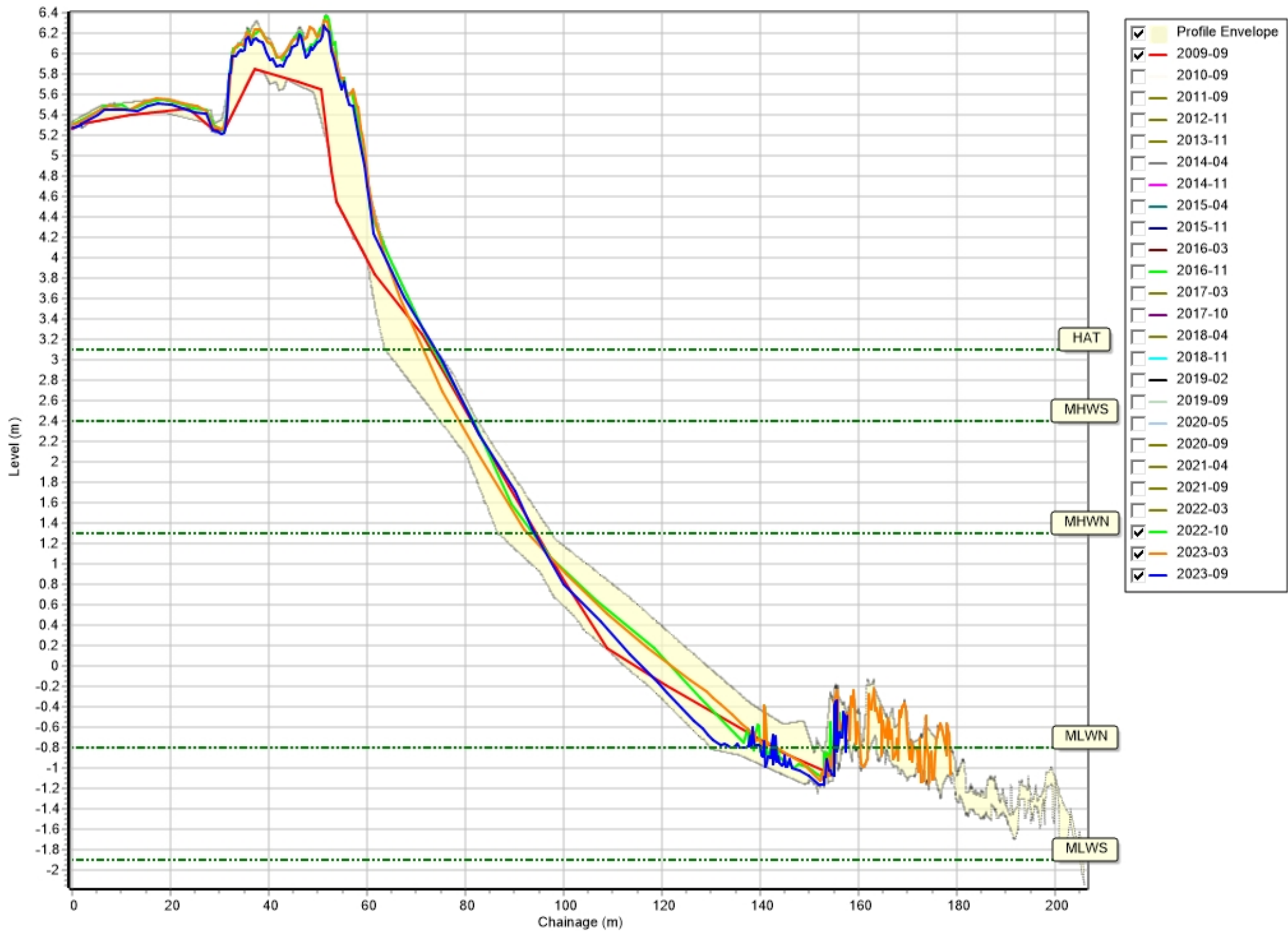
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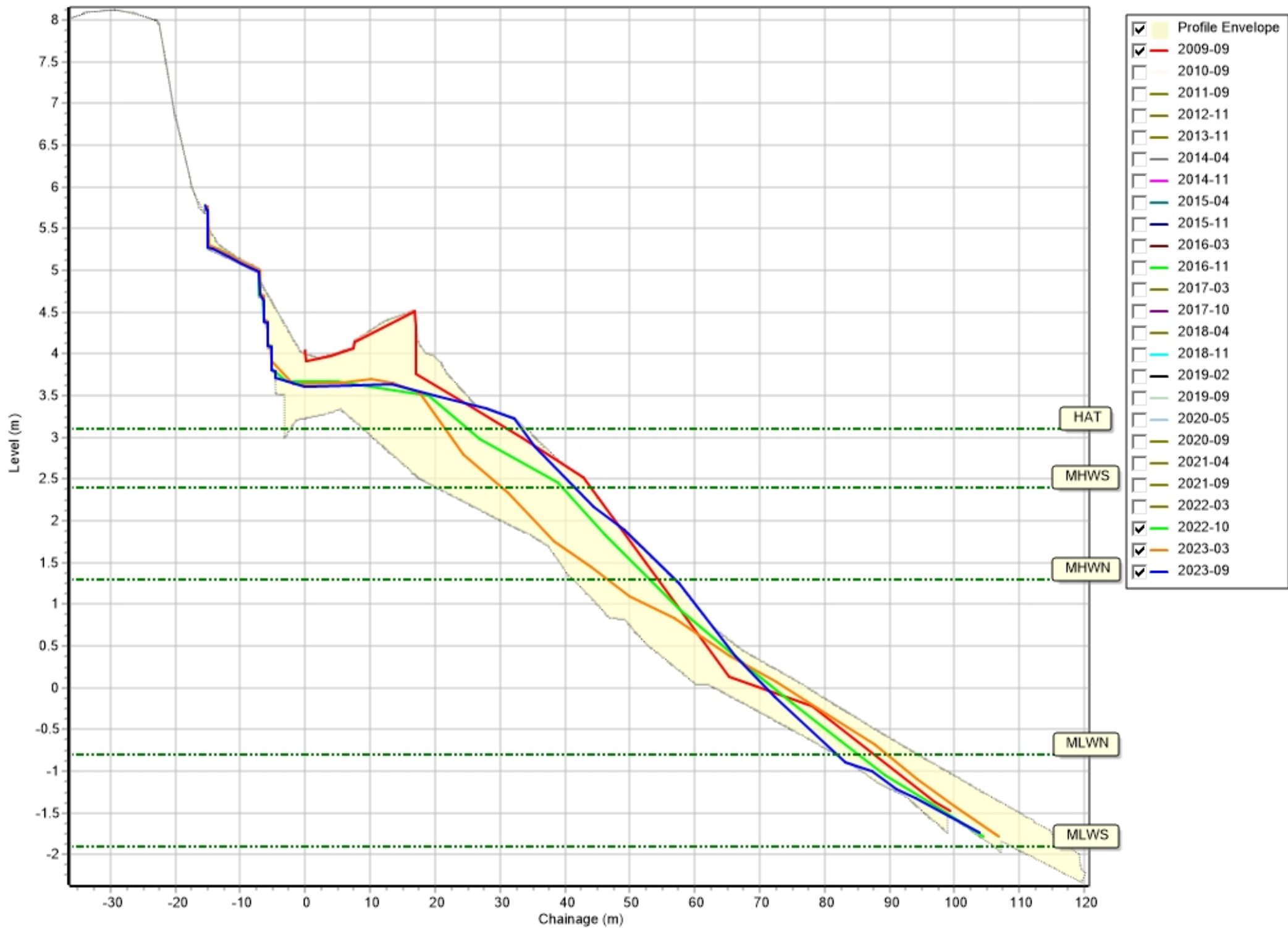
Profiles: 1bSS17



Profiles: 1bSS1

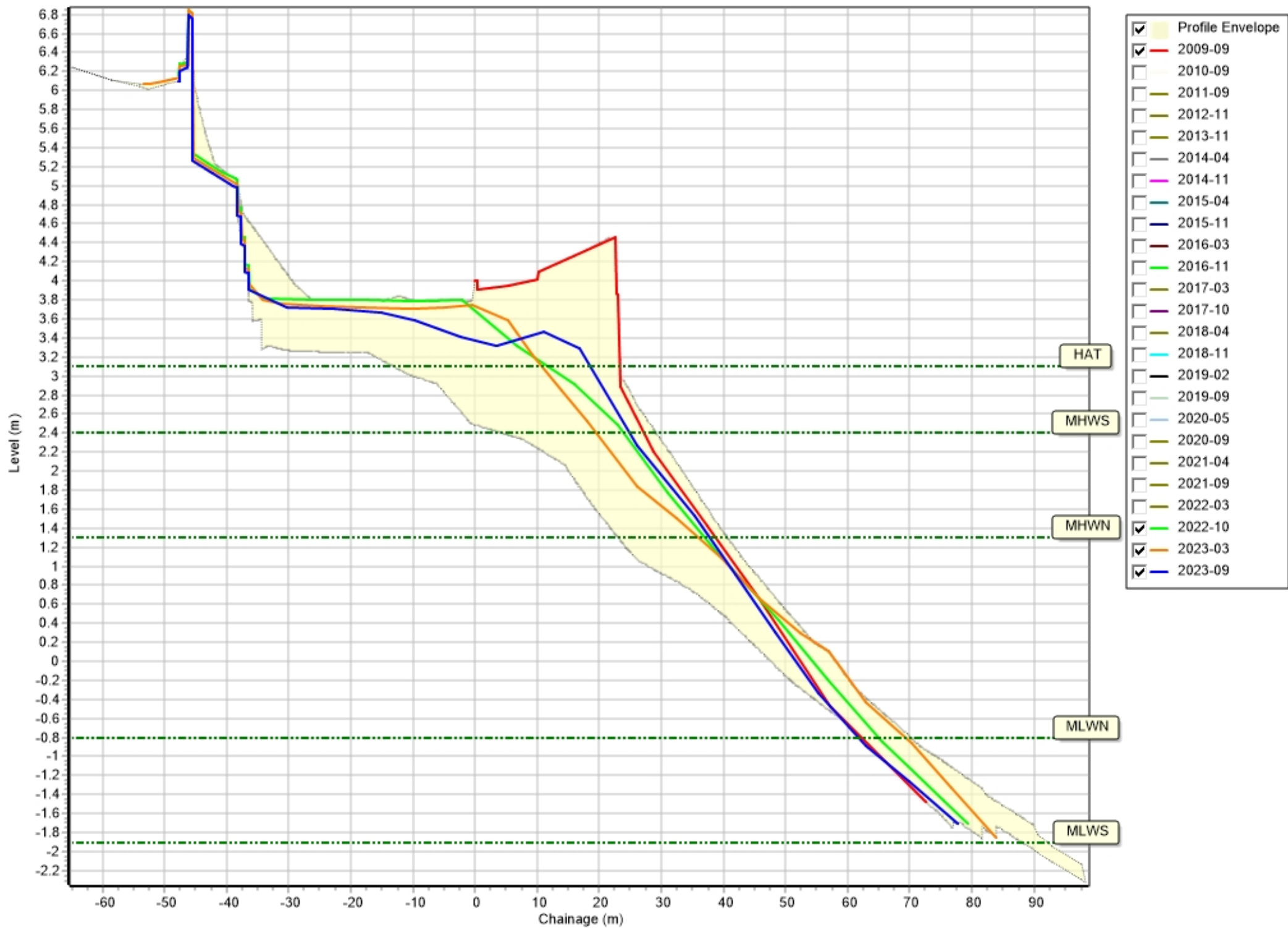


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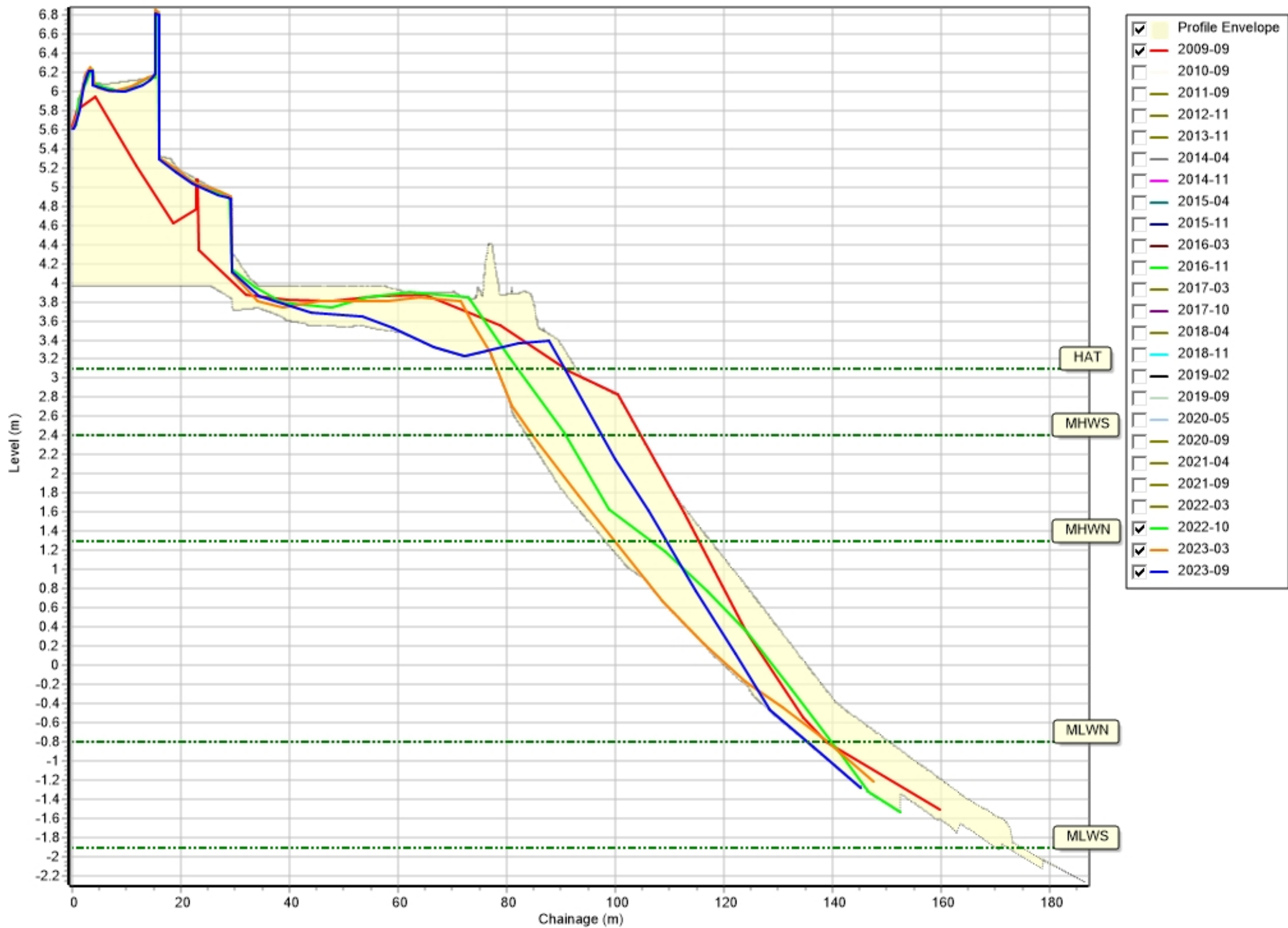


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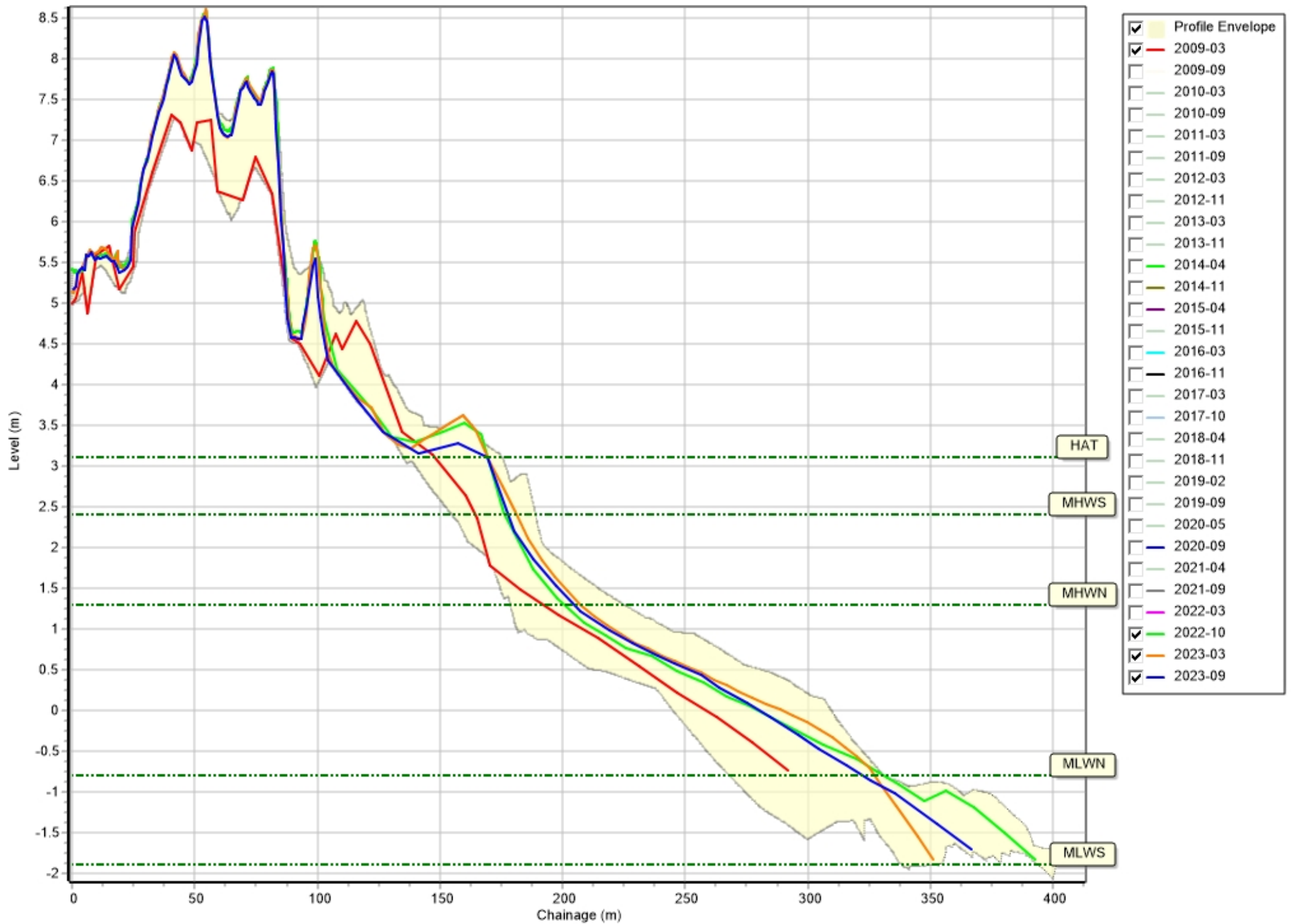




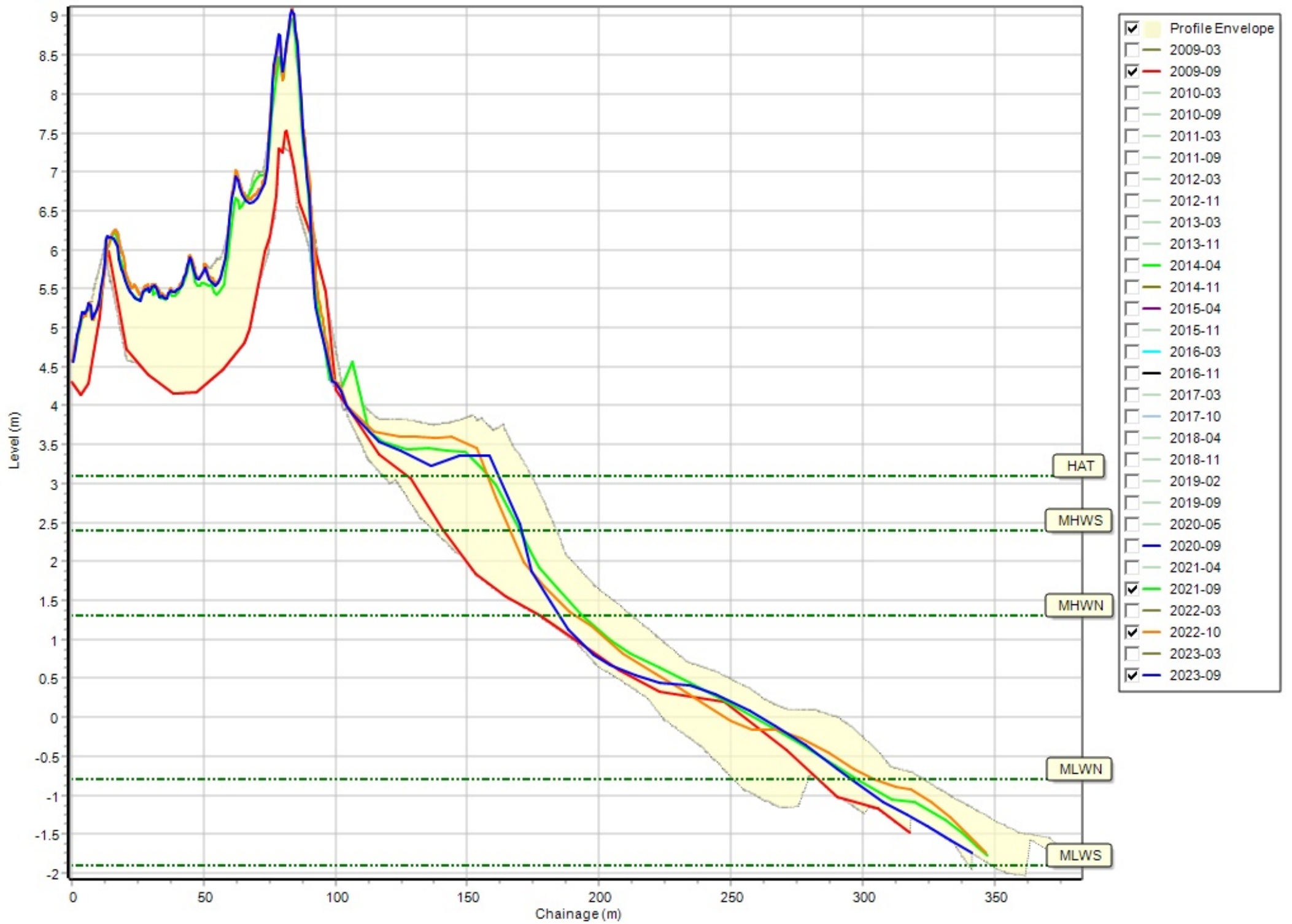
# Profiles: 1bSS4



Profiles: 1bSS5



Profiles: 1bSS6



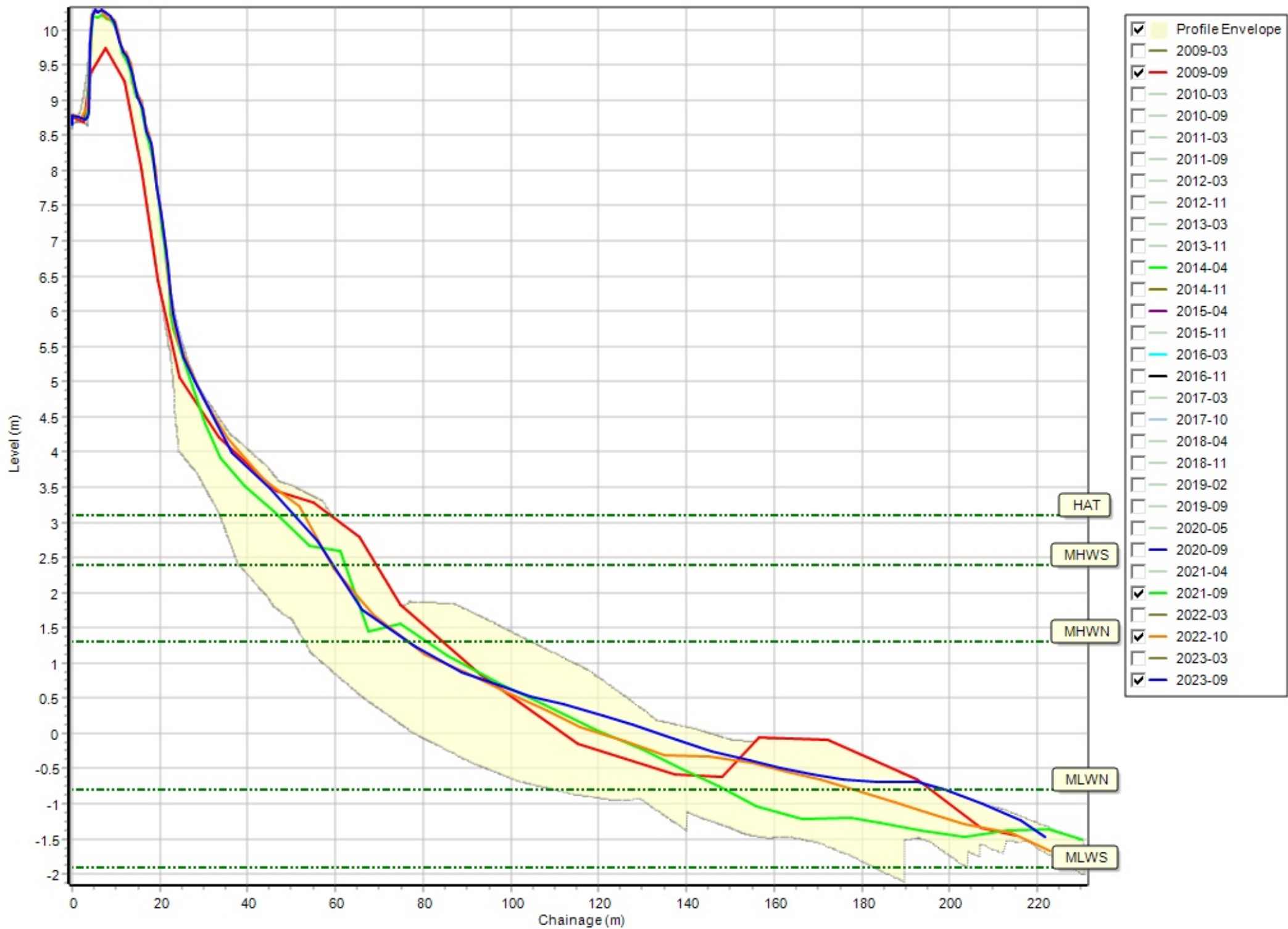




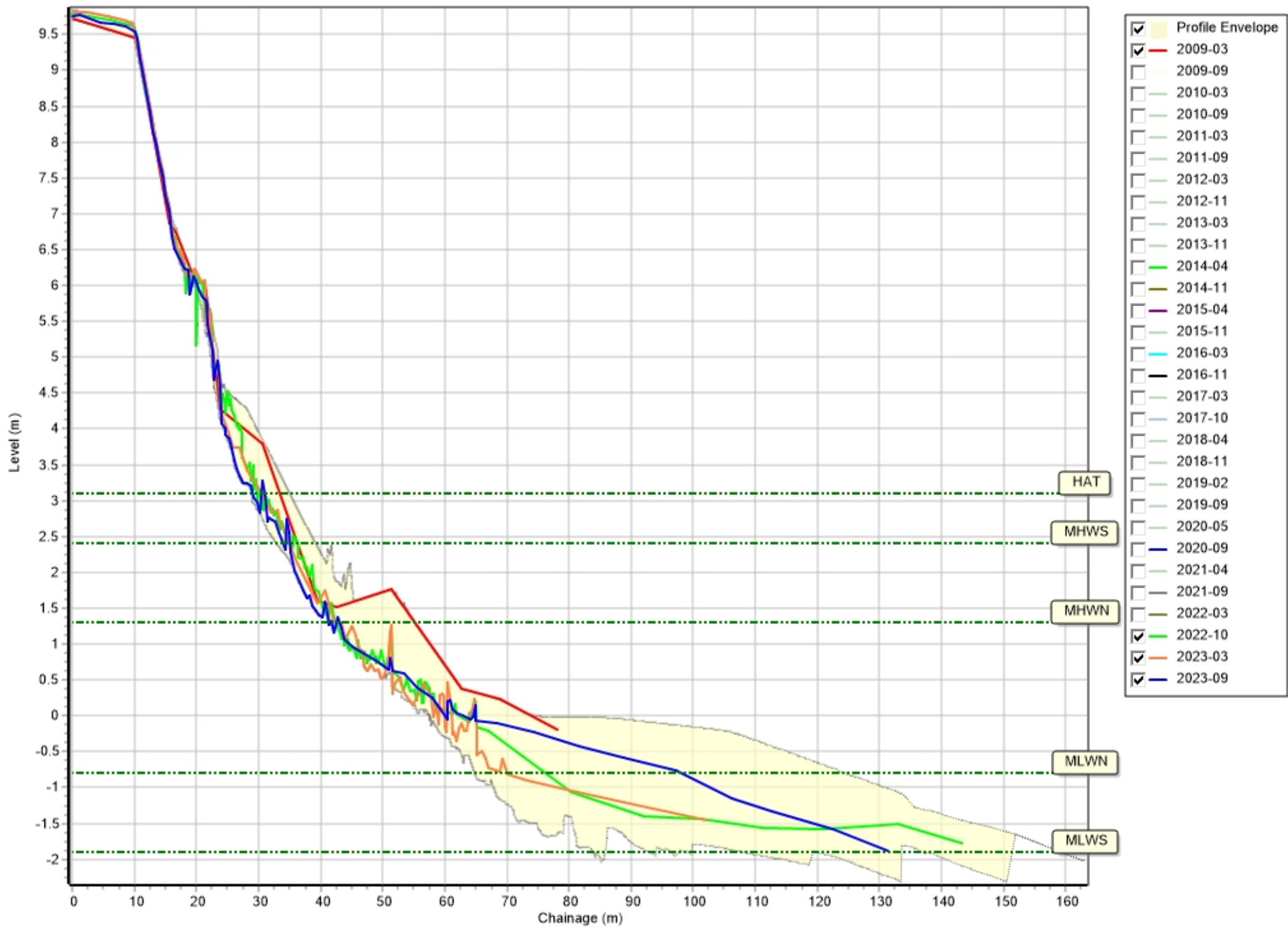
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Profiles: 1bSS9



Profiles: 1bSS10

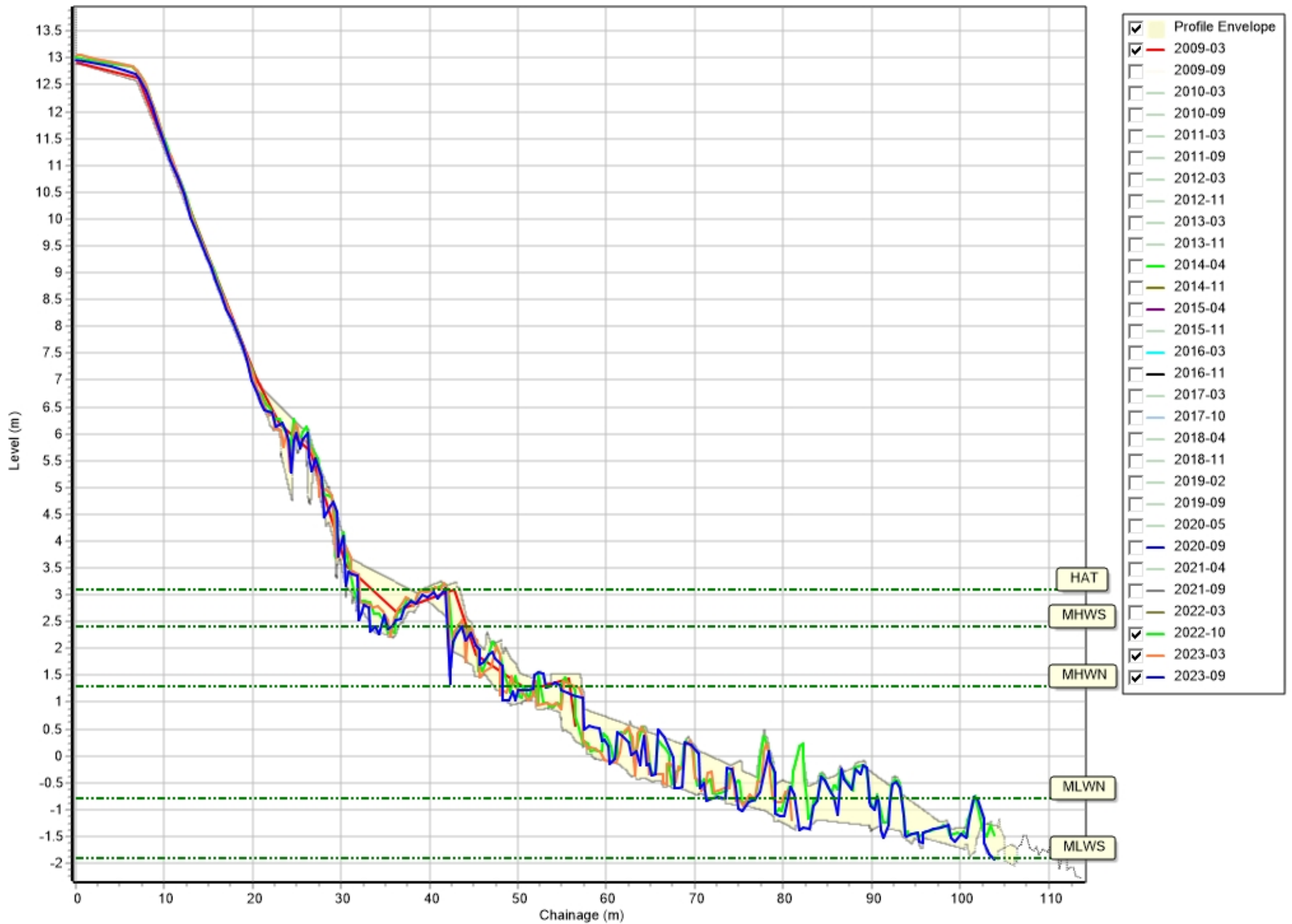


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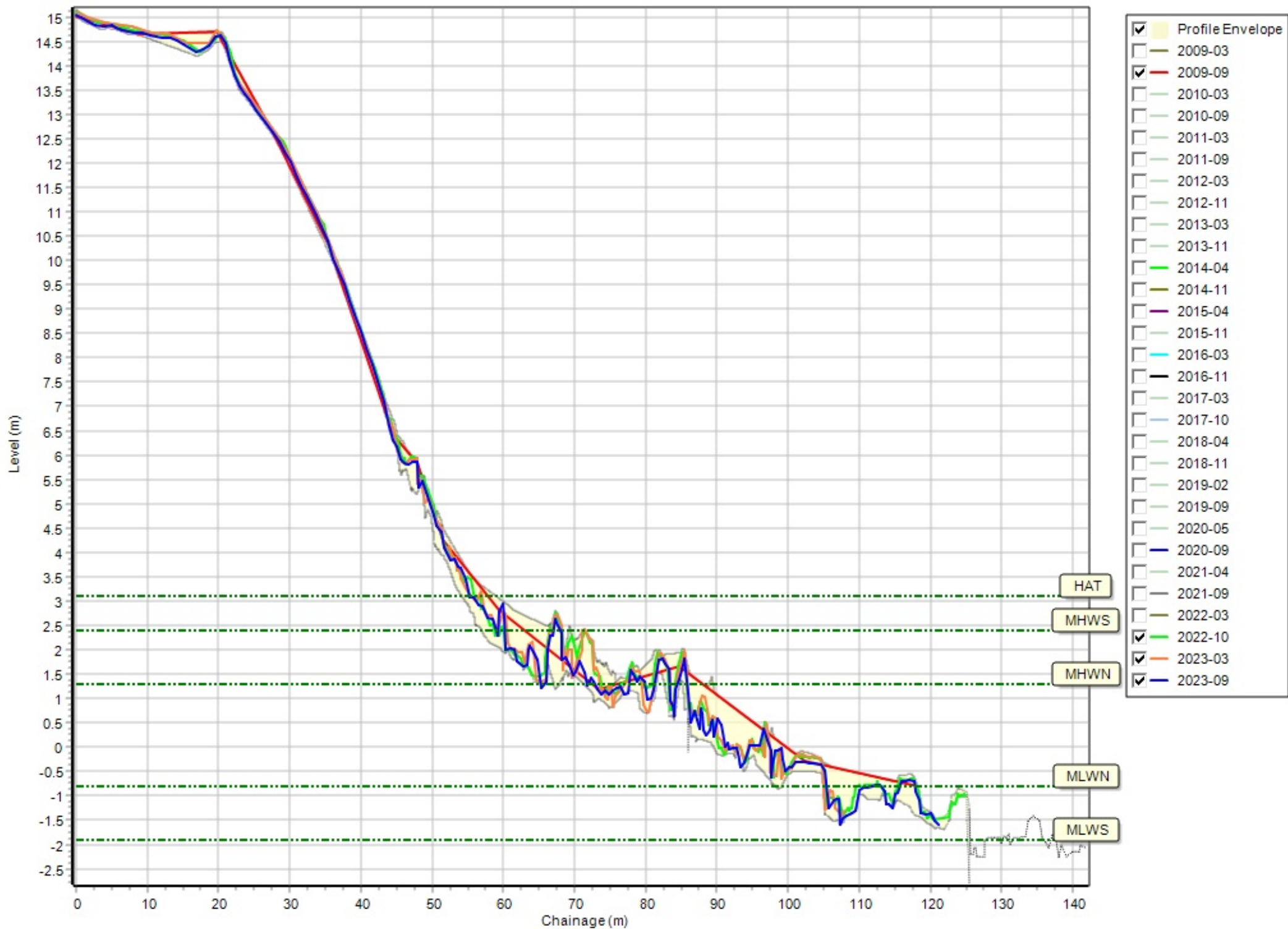




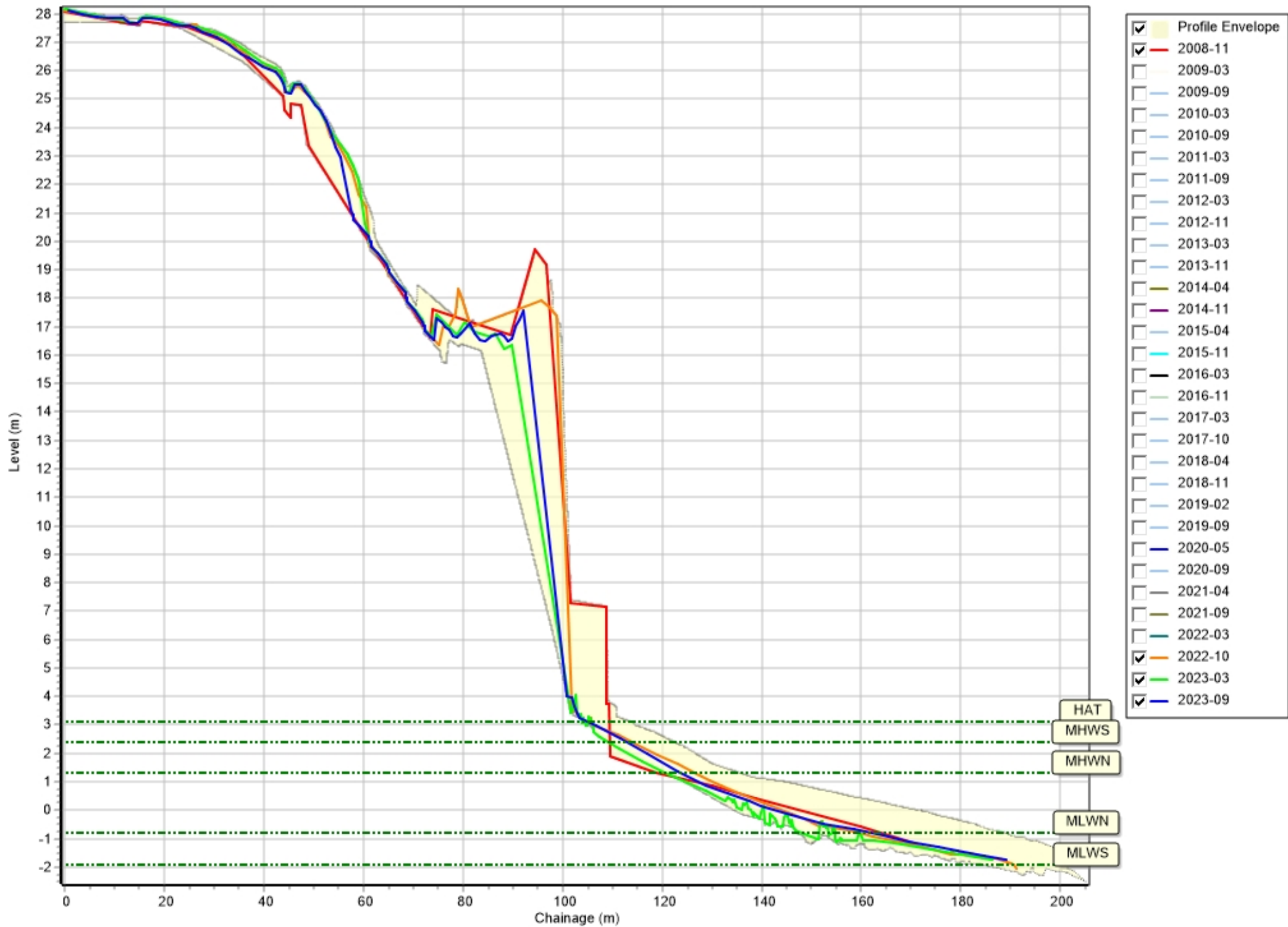
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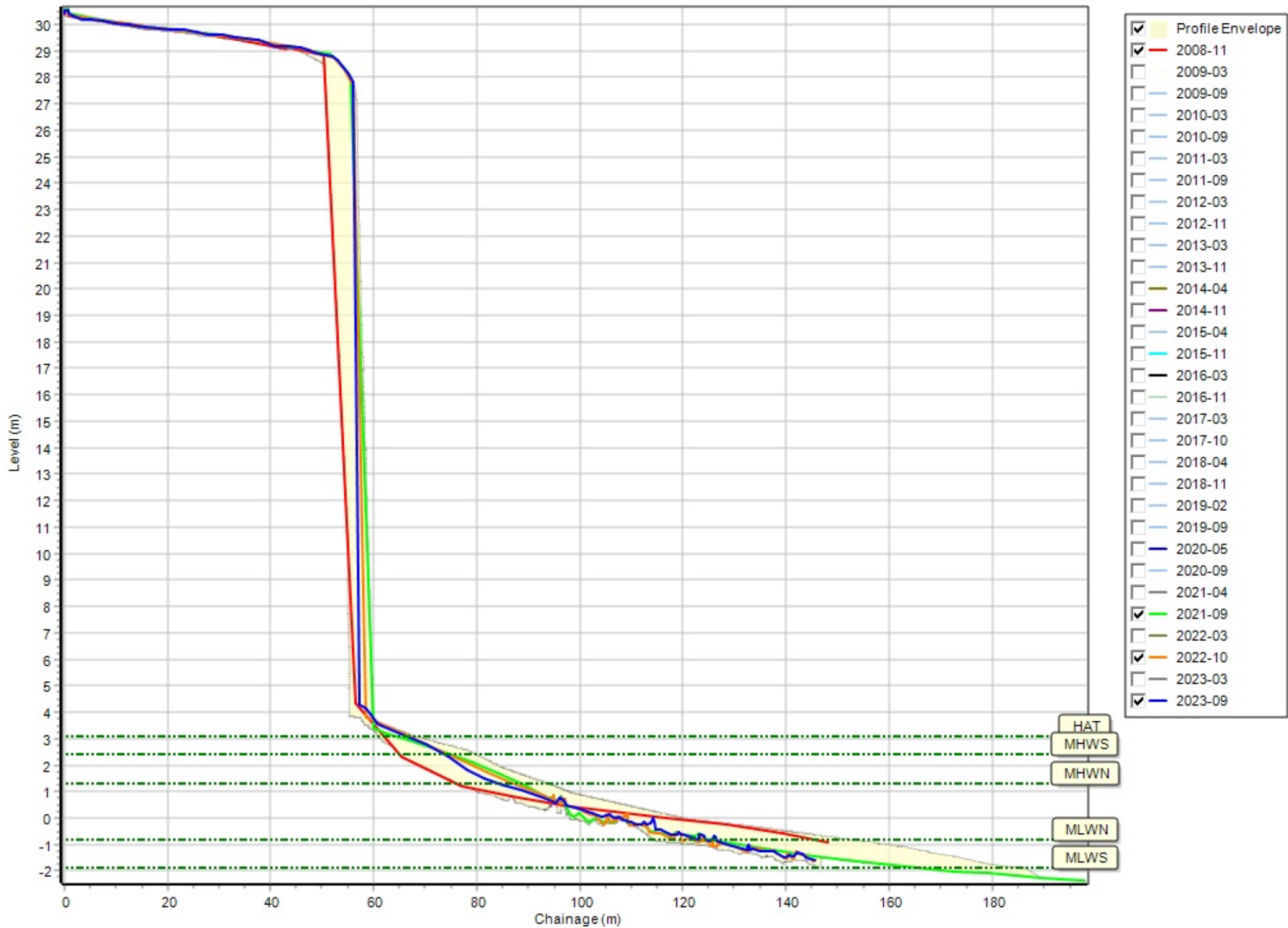
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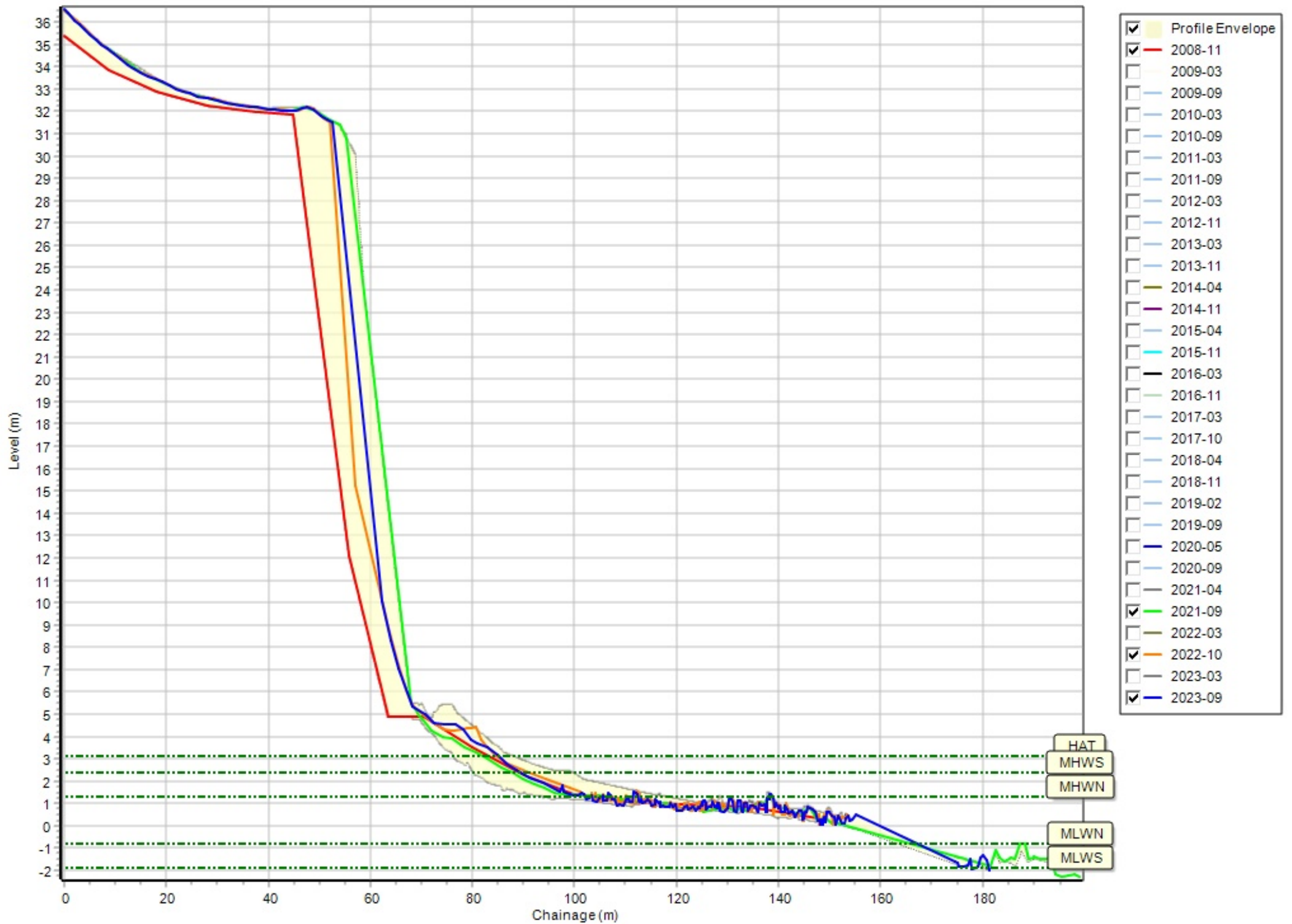
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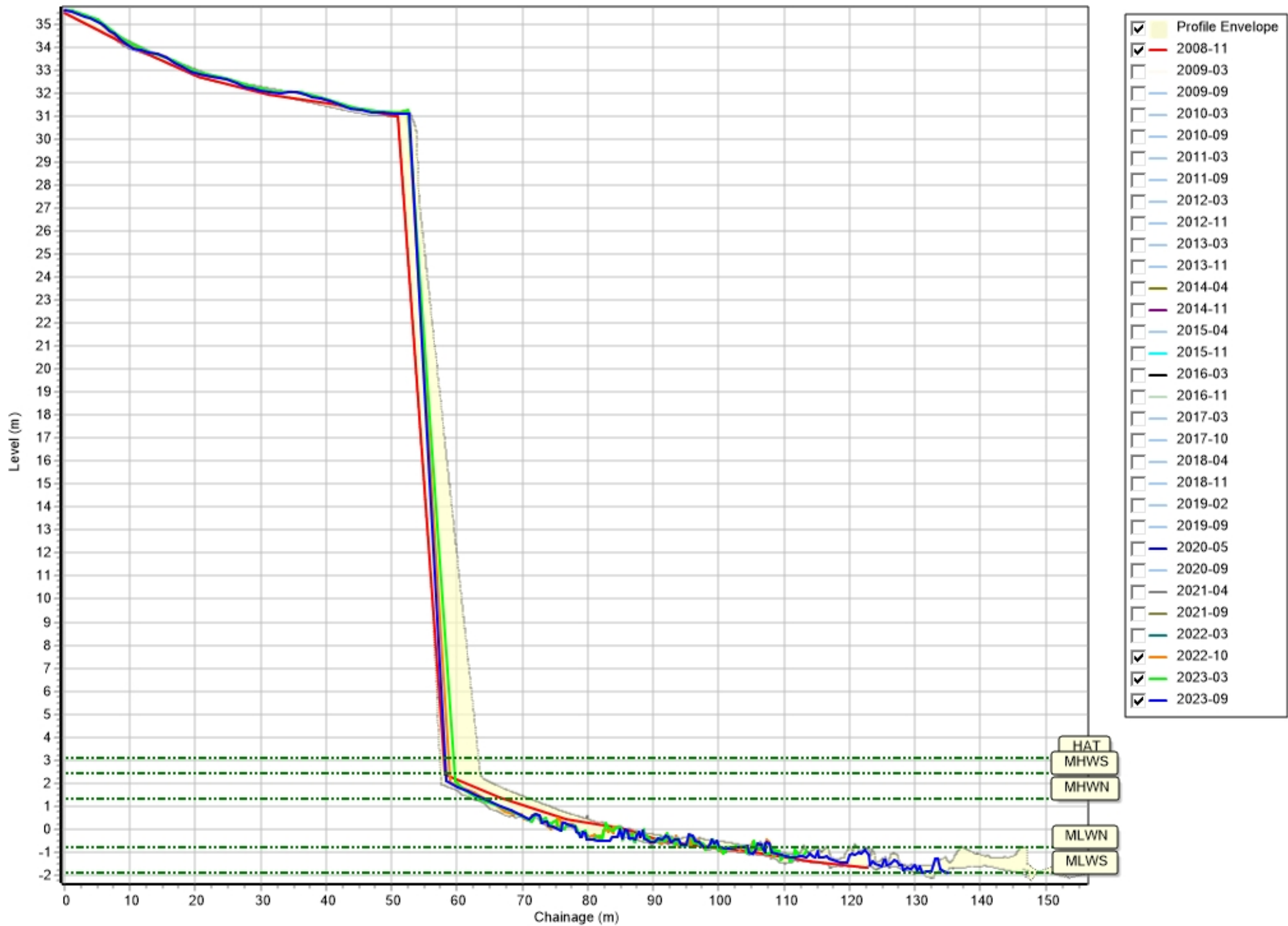


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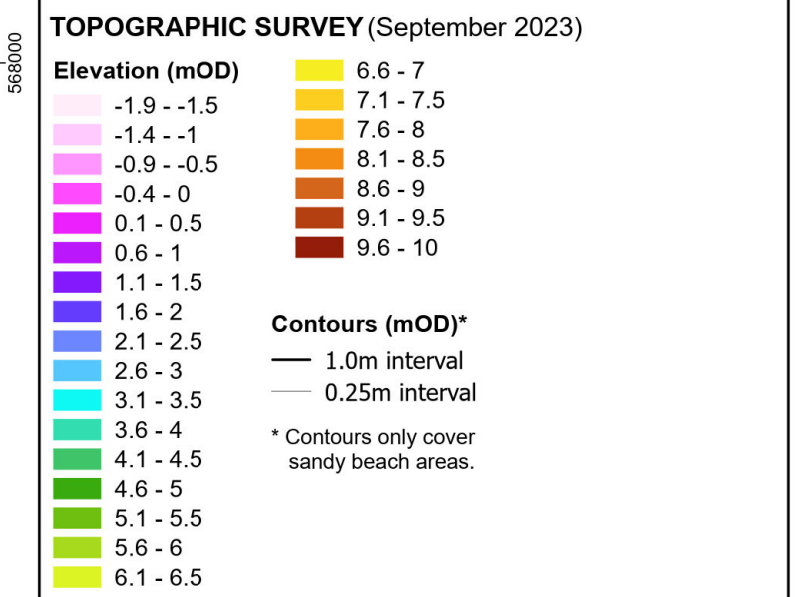
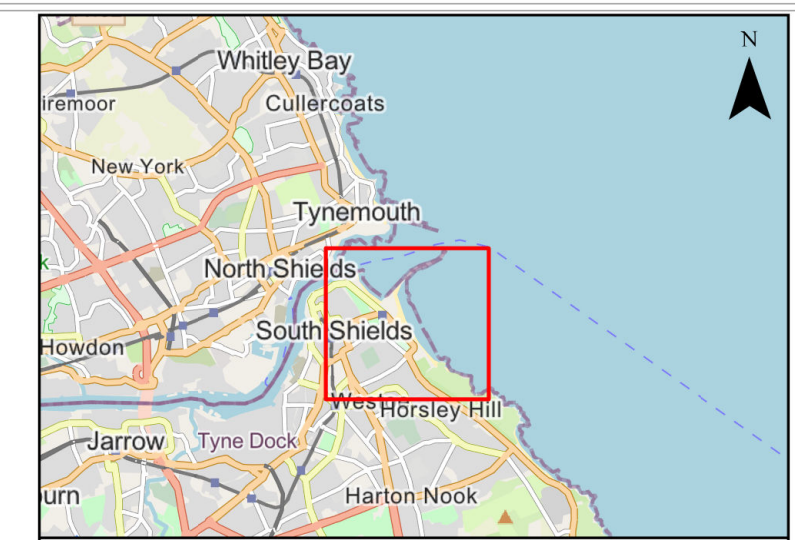


# Profiles: 1bSS17



**Appendix B**  
**Topographic Survey**





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

Title:

**Appendix B - Map 1**

**LITTLEHAVEN BEACH, HERD SANDS, TROW QUARRY**

**South Tyneside Council Frontage**

Report:

Analytical Report  
'Full Measures' Survey 2023

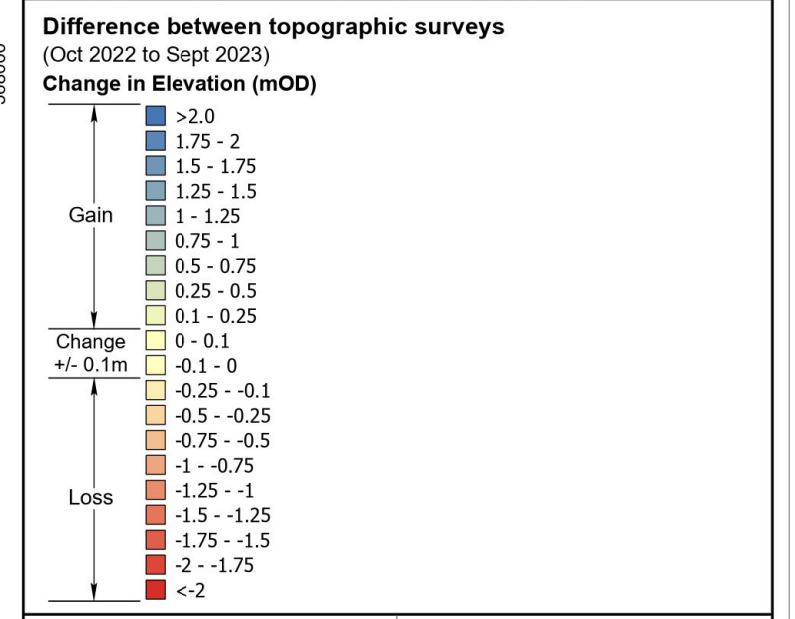
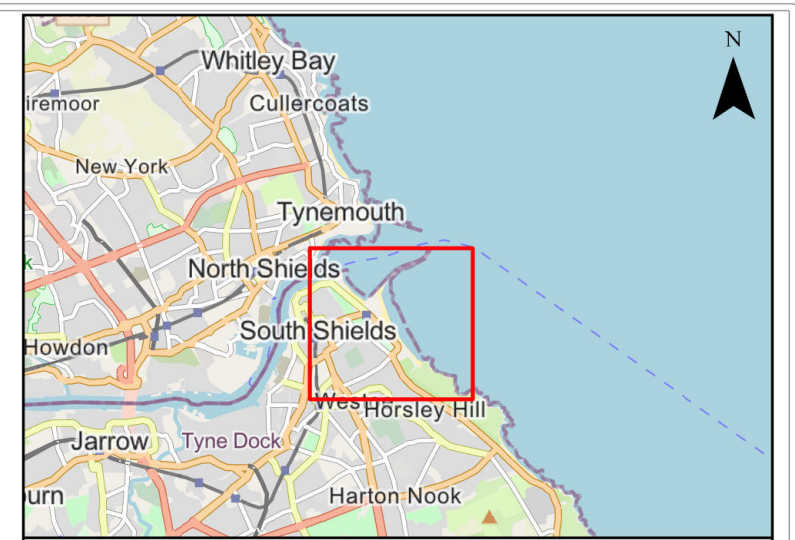
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Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

Title: **Appendix B - Map 2**  
**LITTLEHAVEN BEACH, HERED SANDS, TROW QUARRY**  
**South Tyneside Council Frontage**

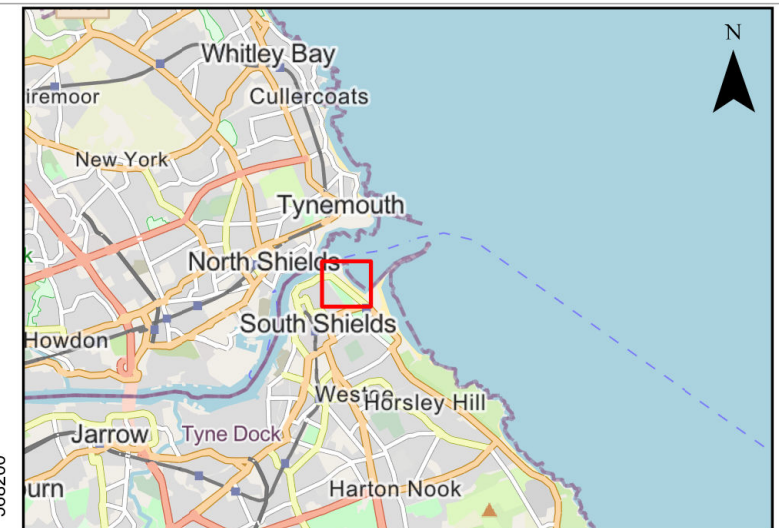
Report: Analytical Report  
 'Full Measures' Survey 2023

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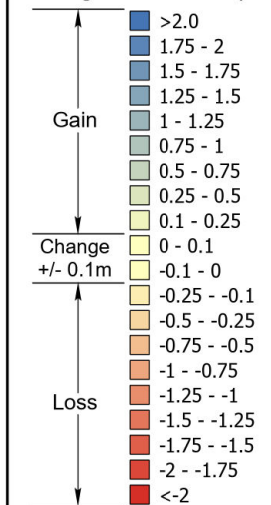






**Difference between topographic surveys**  
(Mar 2023 to Sept 2023)

**Change in Elevation (mOD)**



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

Title:

**Appendix B - Map 3**

**LITTLEHAVEN BEACH**

**South Tyneside Council Frontage**

Report:

Analytical Report  
'Full Measures' Survey 2023

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid



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**Appendix C**  
**Cliff Top Survey**

## Cliff Top Survey

### Trow Quarry

Six ground control points have been established at Trow Quarry (Figure 3 – Map 1). The maximum separation between any two points varies along the coast, reflecting the degree of risk from the erosion.

The cliff top surveys at Trow Quarry are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

Table C1 provides baseline information about these ground control points and results from the 2011 (baseline) survey showing the position from the ground control point to the edge of the cliff top along the defined bearing. Future reports will show results from subsequent surveys and provide a means of assessing erosion since the baseline survey.

**Table C1 – Cliff Top Surveys at Trow Quarry**

Ground Control Points				Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Bearing	Baseline Survey	Previous Survey	Present Survey	Baseline to Present	Previous to Present	Baseline to Present
			(°)	Sep 2011	March 2023	Sept 2023	Sep 2011 - Sep 23	Mar 2023 – Sep 2023	Sep 2011 - Sep 2023
1	438300.3	566674.7	309	7.00	6.58	6.46	-0.54	-0.12	-0.05
2	438338.8	566694.3	312	9.40	9.19	9.12	-0.28	-0.07	-0.02
3	438384.7	566669	33	7.00	6.48	6.46	-0.54	-0.02	-0.05
4	438408.1	566664.8	71	10.50	10.9	10.88	0.38	-0.02	0.03
5	438401.1	566638	120	7.00	7.03	7.02	0.02	-0.01	0.00
6	438392.8	566604.2	110	10.20	9.83	9.83	-0.37	0	-0.03