



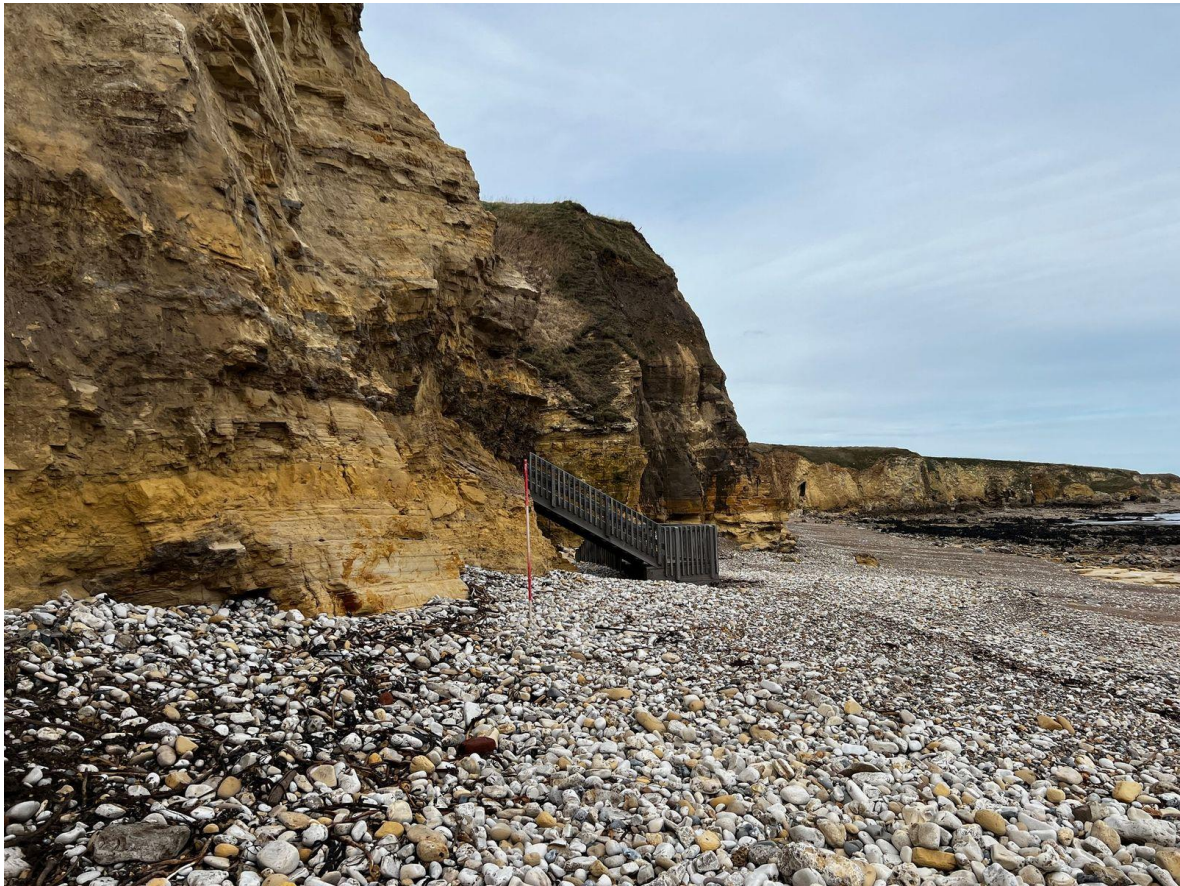
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Cell 1 Regional Coastal Monitoring Programme Update Report 16: 'Partial Measures' Survey 2024



South Tyneside Council

South Tyneside Council
April 2024

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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.

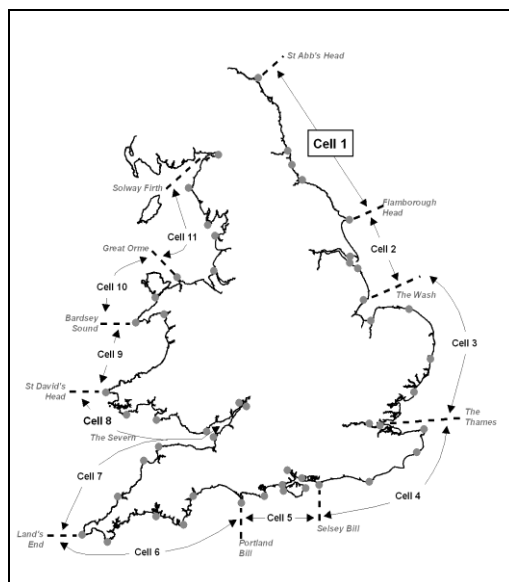


Figure 1 Sediment Cells in England and Wales

The programme commenced in its present guise in September 2008¹ and is managed by North Yorkshire Council on behalf of the North East Coastal Observatory. It is funded by the Environment Agency, working in partnership with the following organisations:



¹ 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	Oct 12	
5	2012/13	Nov 12	Mar 13	Mar 13	Jun 13	
6	2013/14	Nov 13	Feb 14	Apr 14	Jul 14	
7	2014/15	Nov 14	Feb 15	Apr 15	Jul 15	
8	2015/16	Nov 15	Feb 16	Mar 16	Jul 16	Jun 16
9	2016/17	Nov 16	Feb 17	Mar 17	Jul 17	
10	2017/18	Oct 17	Feb 18	Apr 18	Jun 18	
11	2018/19	Nov 18	Jan 19	Feb 19	May 19	
12	2019/20	Sep 19	Nov 19	May 20	Jun 20	
13	2020/21	Sep 20	Oct 20	Apr 21	May 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	Feb 24	Apr 24 (*)	

(*) The present report is **Update Report 16** and provides an analysis of the 2024 Partial Measures survey for South Tyneside Council's frontage.

1. Introduction

1.1 Study Area

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

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

1.2 Methodology

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

- Full Measures survey annually each autumn comprising:
 - Beach profile surveys along 17 transect lines (commenced 2008)
 - Topographic survey along Littlehaven Beach (commenced 2010)
 - Topographic survey along Herd Sands (commenced 2008)
 - Topographic survey along Trow Quarry (commenced 2008). Note the 2008 surveys at profiles 1bSS11, 1bSS12 and 1bSS13 were undertaken at a different location to subsequent surveys and have therefore been removed from the analysis presented here
- Partial Measures survey annually each spring comprising:
 - Beach profile surveys along 11 transect lines (commenced 2008)
 - Topographic survey along Littlehaven Beach (commenced 2010)
 - Since 2014, Partial Measures survey has also included 2 additional profiles at Littlehaven. These are measured to record the new defence and beach profiles following completion of the sea defence works.
- Cliff top survey bi-annually at:
 - Cliff top survey at Trow Quarry (incl. Frenchman's Bay) (commenced 2008)

For all cliff-top surveys prior to Full Measures 2011, data was reported separately in Trow Quarry Coastal Defence Scheme - Monitoring Plan Year 2 (available from South Tyneside Council). The data was saved in '.kmz' format for plotting and comparison in 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 Partial Measures survey was undertaken along this frontage between 28th-29th February 2024. During this time weather conditions were variable; refer to the survey reports for details of the weather conditions over this survey period.

This Update Report presents the following:

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

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



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

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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
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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
<p>29th February 2024</p>	<p>Beach Profiles:</p> <p>Littlehaven Beach is covered by four beach profile lines for the Partial Measures surveys, distributed between South Groyne and South Pier (1bSS1, 1bSS2, 1bSS3 and 1bSS4). All four profiles were last surveyed in September 2023.</p> <p>Profile 1bSS1 is located towards the north of Littlehaven Beach, in the lee of a rocky outcrop and harbour wall. The rear dunes have experience low level accretion limited to +0.2m. At chainage 57m, erosion has caused cliffing, 1m in height, of the foredune. This has retreated the toe of the foredune by 4m. Between chainage 61m and 94m, the beach has dropped in level by up to 0.25m, before alternating to accretion of up to 0.6m to chainage 154m. Seawards of chainage 154m, the rocky foreshore is exposed.</p> <p>Profiles 1bSS2 to 1bSS4 extend seawards from the new sea wall that was completed in 2014.</p> <p>At profile 1bSS2, sediment has overtopped the stepped revetment resulting in accretion up against the rear seawall of 0.2m. Some 0.8m of accretion has occurred at the toe of the stepped revetment, burying all but the top step. This accretion is very local and tapers to no change by chainage 8m. Between chainage 8m and 75m, the beach has undergone significant erosion up to 1.2m. Seawards of chainage 75m, low level accretion has again occurred (+0.3m). When compared to the range of the previous surveys the upper beach is at the highest level on record whilst a section of the mid beach is at the lowest.</p> <p>At profile 1bSS3, sediment has overtopped the stepped revetment resulting in accretion on the promenade of 0.1m. Accretion has also completely submerged the stepped revetment (+0.8m) and continues across the upper beach, tapering to no change by chainage -2m. Between chainage -2m and chainage 54m, significantly erosion has occurred (up to -1m). Seawards of chainage 56m, the change again alternates to accretion, where an increase in level of up to 0.3m has occurred. When compared to the range of the previous surveys the upper beach is at the highest level on record whilst a section of</p>	<p>Since the previous survey in September 2023, Littlehaven Beach has experienced notable change. The three most southern profiles have all demonstrate significant erosion (lowering) in middle of the beach, with the partial re-distribution of this material to the upper and lower sections of the beach. This change has resulted in the profiles extending beyond the envelope of previous surveys, with the middle beach at the lowest level on record and the upper beach at the highest. This beach change is a response to the particularly stormy winter 2023/24. It is expected that the beach levels would start to recover given a period of calmer weather.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>the mid beach is at the lowest.</p> <p>At profile 1bSS4, there has been no change across the promenade and the seawall until chainage 29m. At the toe of the seawall, beach levels have accreted by 0.5m. This accretion extends across the upper beach, tapering to no change by chainage 66m. Between chainage 66m and 125m, the beach has been significantly eroded, dropping in level by a maximum of 1.6m (at chainage 88m). Seawards of chainage 125m, minor accretion is again observed. When compared to the range of the previous surveys the upper beach is at the highest level on record whilst the mid beach is at the lowest.</p>	
<p>February 2024</p>	<p>Topographic Survey:</p> <p>Littlehaven Beach has been covered by bi-annual topographic surveys between the South Groyne and the South Pier since March 2010.</p> <p>Data from the most recent topographic survey (Partial Measures, February 2024) has been used to create a DGM using a Geographical Information System (GIS). This DGM has been compared against the DGM from the previous survey (Full Measures, September 2023) to create a difference plot (Appendix B – Map 2).</p> <p>The figure shows an intense, well defined, shoreline parallel band of erosion extending across the middle of the beach. The magnitude of change is greater in the centre and south of the bay (-1.75m) compared to the north (-0.5m). The band of erosion is abutted on both sides by a band of, comparably, low magnitude accretion.</p>	<p>The pattern of change indicated by the difference plot highlights an overall net loss of material from the bay since Sept 2023. This is not surprising given the number and severity of storms over winter 2023/2024.</p>

2.2 Herd Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
29 th February 2024	<p>Beach Profiles:</p> <p>Herd Sands is covered by three beach profile lines for the Partial Measures survey (Appendix A). The previous survey was the Full Measures survey undertaken in autumn 2023.</p> <p>Profile 1bSS5 is located towards the northern end of Herd Sands, in the lee of the breakwater. Sand fences were constructed on the dunes in 2012 to encourage accretion and stabilisation. Since the previous survey the dune system has largely remained stable, with change limited to low level accretion (+0.1m). Between chainage 82m and 96m, on the access track, beach levels have risen by 0.65m. Accretion (of up to 0.45m) has also occurred fronting the foredune, between chainages 102m and 130m. Seawards of chainage 130m, the profile has been dominated by lowering. This is initially by up to 1.2m, where a berm previously observed has been removed, before gradually reducing in magnitude towards the seaward end of the profile. Between chainage 130m and 175m, the profile is at the lowest level on record when compared to the range of the previous surveys.</p> <p>Profile 1bSS8 is located to the south of Herd Sands, adjacent to South Shields Surf School. At the toe of the seawall, between chainage 4m and 7m, beach levels have accreted by up to 0.7m. It is clear when interrogating the surveying photos that this is as a result of sand that has overtopped onto the promenade being swept back onto the beach. Seawards of this artificial accretion, the profile has been dominated in its entirety by lowering. The magnitude of lowering peaks at 1m at chainage 167m. When compared the range of the previous surveys, the upper beach is at a low level whilst the lower beach is at a medium level.</p> <p>Profile 1bSS9 is most southernly profile on Herd Sands and is located fronting the Water's Edge Car Park near Trow Quarry. The start of the profile, between chainage 4m and 23m, is covered by a narrow dune system. Since the previous survey, the dunes have remained stable. At the toe of the dunes, beach levels have dropped by up to 1m, creating a small cliff in the foredune toe. This erosion continues across the profile up to chainage 140m. Between chainage 143m and 178m, a shallow berm has formed resulting in increase in level of up to 0.25m. When compared to the range of the previous surveys, the upper beach is at a low level whilst the lower beach is at a medium level.</p>	<p>Over winter 2023/24, the profiles show that Herd Sands beach has experienced notable lowering. This is particularly evident on the upper beach, where a drop in level of up to 1.2m is observed. It is apparent that a small portion of this material has been drawn down the profile, with Profile 1bSS9 experiencing minor accretion on the lower beach.</p> <p>Despite this change in the fronting beach, the dunes have largely remained stable except the drop of level at the toe of the foredune.</p> <p>This loss of beach material is a typical profile response (lowering) to storm conditions. The recovery of material in calmer summer months should be monitored closely.</p> <p>Longer term trends:</p> <p>The dunes backing Herd Sands in the North have been gradually accreting since the interventions in 2012. The narrow dunes in the south have also accreted since the monitoring began in 2010, albeit at a smaller magnitude. Beach levels show more variance, with no clear long term pattern of either accretion or erosion. The profile appears to be modified by seasonal fluctuations.</p>

2.3 Trow Quarry (incl. Frenchman’s Bay)

Survey Date	Description of Changes Since Last Survey	Interpretation
29 th February 2024	<p>Beach Profiles:</p> <p>Trow Quarry is covered by four beach profile lines for the Partial Measures survey (Appendix A), two in Graham’s Sand and two in Southern Bay. The previous survey was the Full Measures survey undertaken in autumn 2022.</p> <p>Profiles 1bSS10 and 1bSS11 are located in Graham’s Bay.</p> <p>Profile 1bSS10 has remained stable until the toe of the rock revetment at chainage 26m. Seawards of this point, beach levels have dropped. Initially this lowering is modest (up to 0.2m until chainage 60m), before increasing in magnitude to a drop in level of 1m at the seaward end of the profile at chainage 71m. As a result of the erosion, the rocky foreshore / boulder field has been exposed over a greater length than in the previous survey. At the crest of the revetment (chainage 15m), minor erosion of the coastal slope has exposed a geotextile. The beach profile is at a very low level when compared to the range of the previous surveys and, in places, at the lowest on record.</p> <p>Profile 1bSS11, is located in the southern half of Graham’s Bay. Since the previous survey, the profile has remained stable with change limited to the local movement of larger cobbled material, particularly between chainages 24m and 32m. The profile remains at a very low level when compared to the range of the previous surveys.</p> <p>Profiles 1bSS12 and 1bSS13 are located in Southern Bay. As per Graham’s Bay, the profiles consist of a rock revetment protecting an historical landfill site. The rock revetment is fronted by the exposed rocky fore shore with intermittent large cobbles. At both locations the beach profile has remained stable since the previous survey, with change limited to the movement of cobbles on the foreshore.</p>	<p>The profiles at Grahams Bay and southern Bay have remained stable across the backing hinterland and protecting rock revetment since the previous survey. Where beach material was present, it has dropped in level, exposing a greater length of rocky foreshore.</p>
February 2024	<p>Cliff-top Survey:</p> <p>Six ground control points (numbered 1 – 6) were established along the cliff top at Trow Point in 2011 to monitor cliff erosion at the headland adjacent to the site of a former landfill. Note: the numbering of ground control points is not intended to correlate with that of the beach profile lines and reference should be made to Appendix C – Map 1 for the location of ground control points.</p>	<p>Longer term trends: The greatest annual erosion rate since the first survey in September 2011 is Point 4 with annual retreat of only 0.03m/yr. This suggests that cliff is presently stable.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>These cliff top surveys are undertaken bi-annually. Measurements are taken from each ground control point along a fixed bearing to the edge of the cliff top. The results from the cliff top monitoring are anticipated to have an accuracy of $\pm 0.2\text{m}$ due to the technique used. The results from the cliff top survey are presented in Appendix C – Table C1, showing the position from the ground control point to the edge of the cliff top along a defined bearing.</p> <p>The results show that between September 2023 and February 2024, only Point 5 recorded a change greater than the margin of error, with a retreat of 0.29m. All five of the other control points were either unchanged or suggested an apparent advancement in the cliff line which highlights the limitations of the technique. The greatest annual erosion rate since the first survey in September 2011 is Point 4 with annual retreat of only 0.03m/yr. This suggests that cliff is presently stable.</p>	

2.4 Marsden Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>29th February 2024</p>	<p>Beach Profiles:</p> <p>Marsden Bay is covered by two beach profile lines for the Partial Measures survey (Appendix A). The previous survey was the Full Measures survey undertaken in September 2023.</p> <p>Profile 1bSS14 is located to the north of the bay and covers the cliffs and former lifeguard station adjacent to the Redwell Steps. The survey report again notes that '<i>a section of cliff face could not be measured due to ground conditions being unsafe</i>' which explains the discrepancies the cliff face. At the toe of the cliff, at chainage 100m, the upper beach has accreted by up to 1.4m in level tapering to no change by chainage 123m. Seawards of chainage 123m, the change alternates to lowering gradually increasing in magnitude down the profile (limited to -0.7m) . Between chainage 130m and 162m, the erosion has exposed the rocky foreshore. Compared to the range of the survey, the upper beach is at a very high level whereas the lower beach is at the lowest level on record.</p> <p>Profile 1bSS17 is located to the south of the bay. There is no change across the profile up to the toe of the cliff at chainage 58m. Beach levels at the toe of the cliff have accreted by 0.7m, this accretion tapers to no change at chainage 71m. Seawards of chainage 71m, the rocky foreshore remains exposed. Beach levels at the toe of the cliff are at a relatively high level when compared to the range of the previous survey, with the exposed rocky foreshore naturally at a low level.</p>	<p>Both profiles at Marsden Bay highlight notable accretion of cobbly material at the toe of the cliffs This build of larger material above the HAT water mark is a typical response to severe storm condition where liberated material is deposited above the normal elevation.</p>

3. Problems Encountered and Uncertainty in Analysis

Individual Profiles / Topographic Survey

- As reported previously, a section of cliff face could not be surveyed at profile 1bSS14 due to ground conditions being unsafe.

Cliff Top Surveys

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

4. Recommendations for ‘Fine-tuning’ the Monitoring Programme

- No changes are recommended at the present time.

5. Conclusions and Areas of Concern

- Littlehaven Beach has experienced notable change since the previous survey in September 2023. The three most southern profiles have all demonstrate a pattern of significant lowering in middle of the beach with the partial re-distribution of this material to the upper and lower sections of the beach. This change has resulted in the profiles extending beyond the envelope of previous change, with the middle beach at the lowest level on record and the upper beach at the highest. This beach change is a response to the particularly stormy winter 2023/24. It is expected that the beach levels would start to recover given a period of calmer weather.
- Over winter 2023/24, the profiles show that Herd Sands beach has experienced notable lowering. This is particularly evident on the upper beach, where a drop in level of up to 1.2m is observed. It is apparent that a small portion of this material has been drawn down the profile, with Profile 1bSS9 experiencing minor accretion on the lower beach. Despite this beach lowering, the backing dunes (where present in the north and south of the bay) have largely remained stable except the drop of level at the toe of the foredune. The lowering of the fronting beach is a typical response to storm conditions. The recovery of material in calmer summer months should be monitored closely.
- The profiles at Graham’s Bay and Southern Bay at Trow Quarry have remained stable across the backing hinterland and protecting rock revetment since the previous survey. Where beach material was present, it has dropped in level, exposing a greater length of rocky foreshore.
- At Marsden Bay, both profiles highlight notable accretion of cobbly material at the toe of the cliffs. This build of larger material above the HAT water mark is again a typical response to severe storm conditions where liberated material is deposited above the normal elevation.

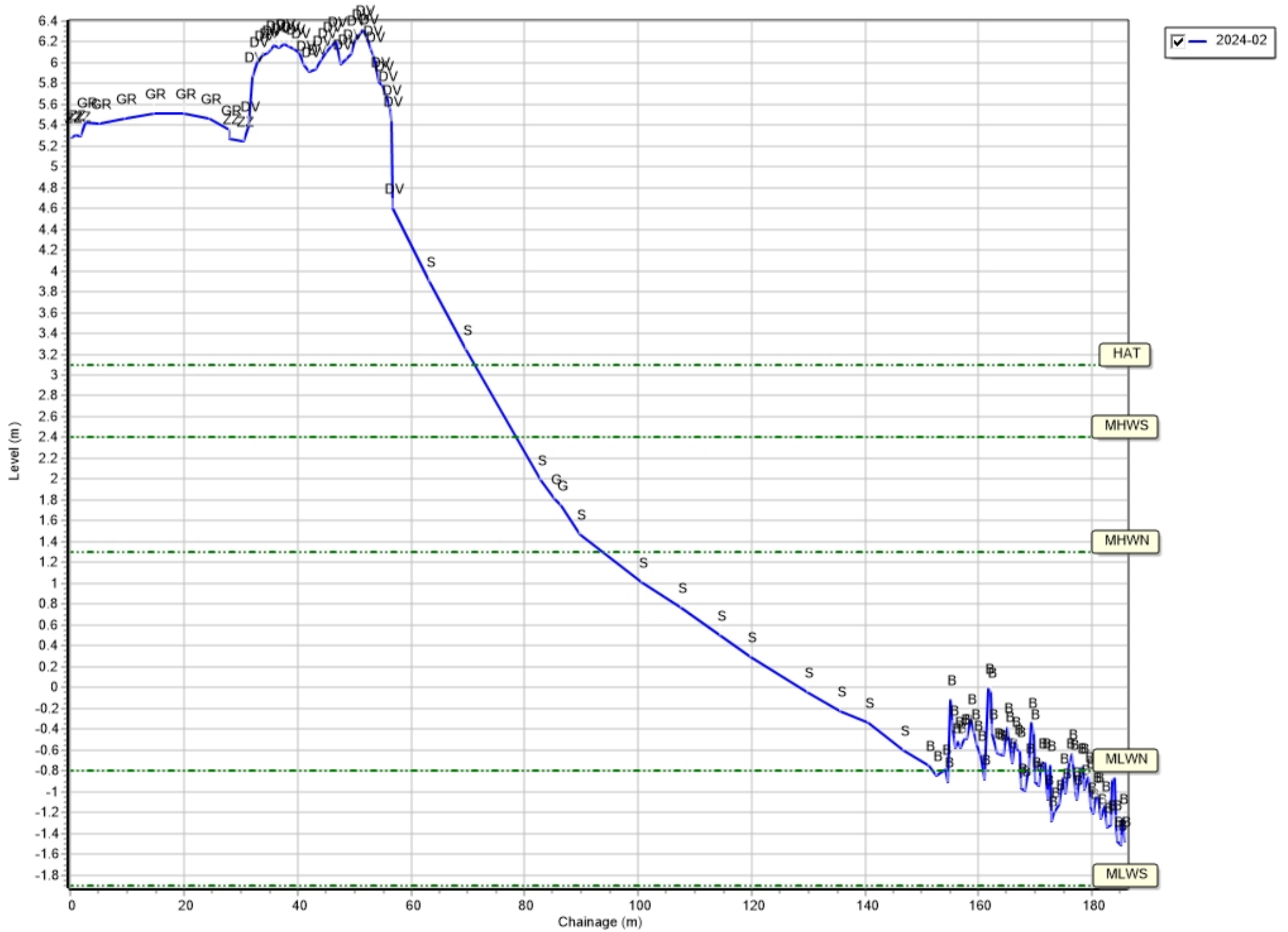
Appendices

Appendix A
Beach Profiles

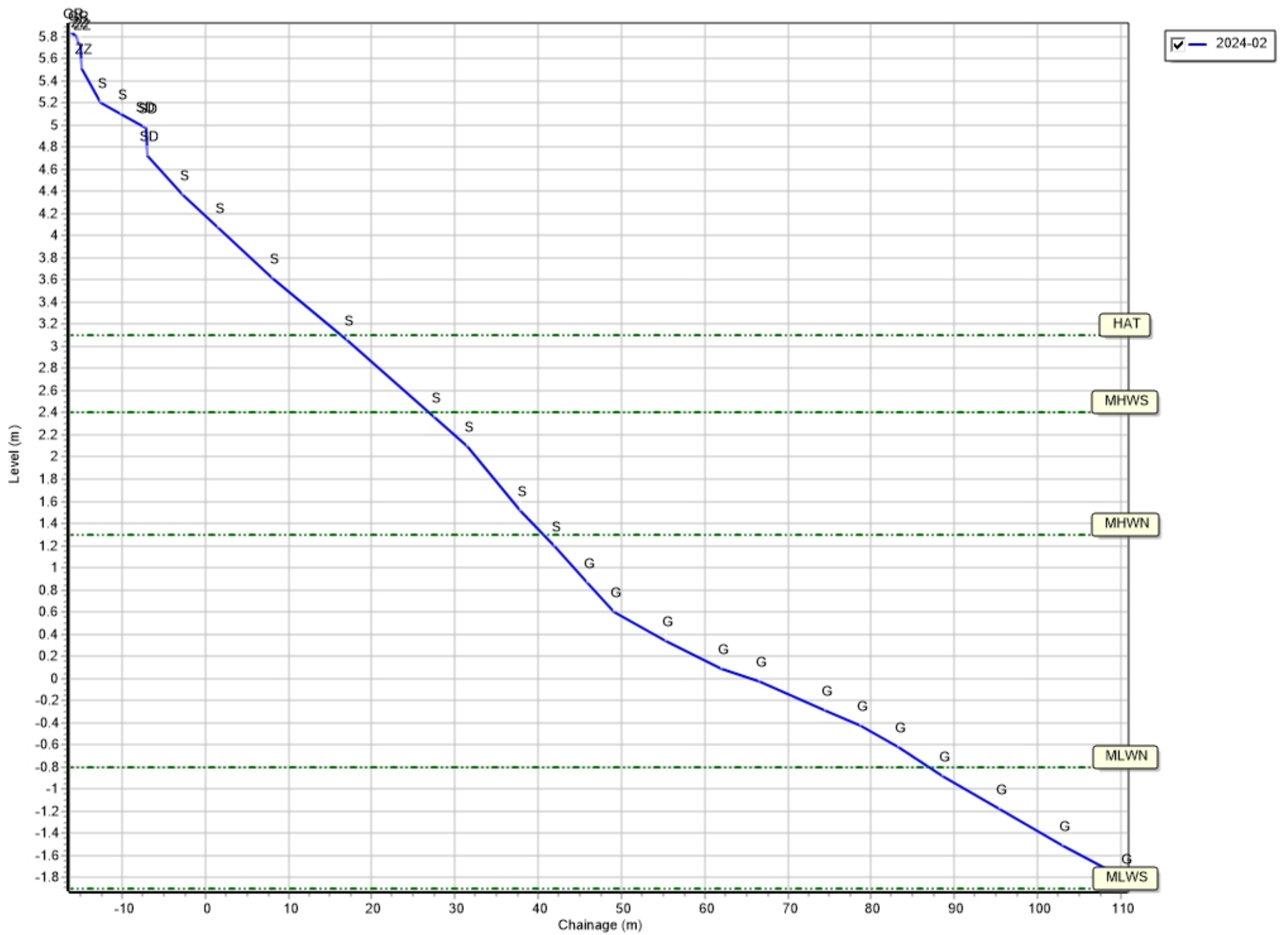
The following sediment feature codes are used on some profile plots:

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

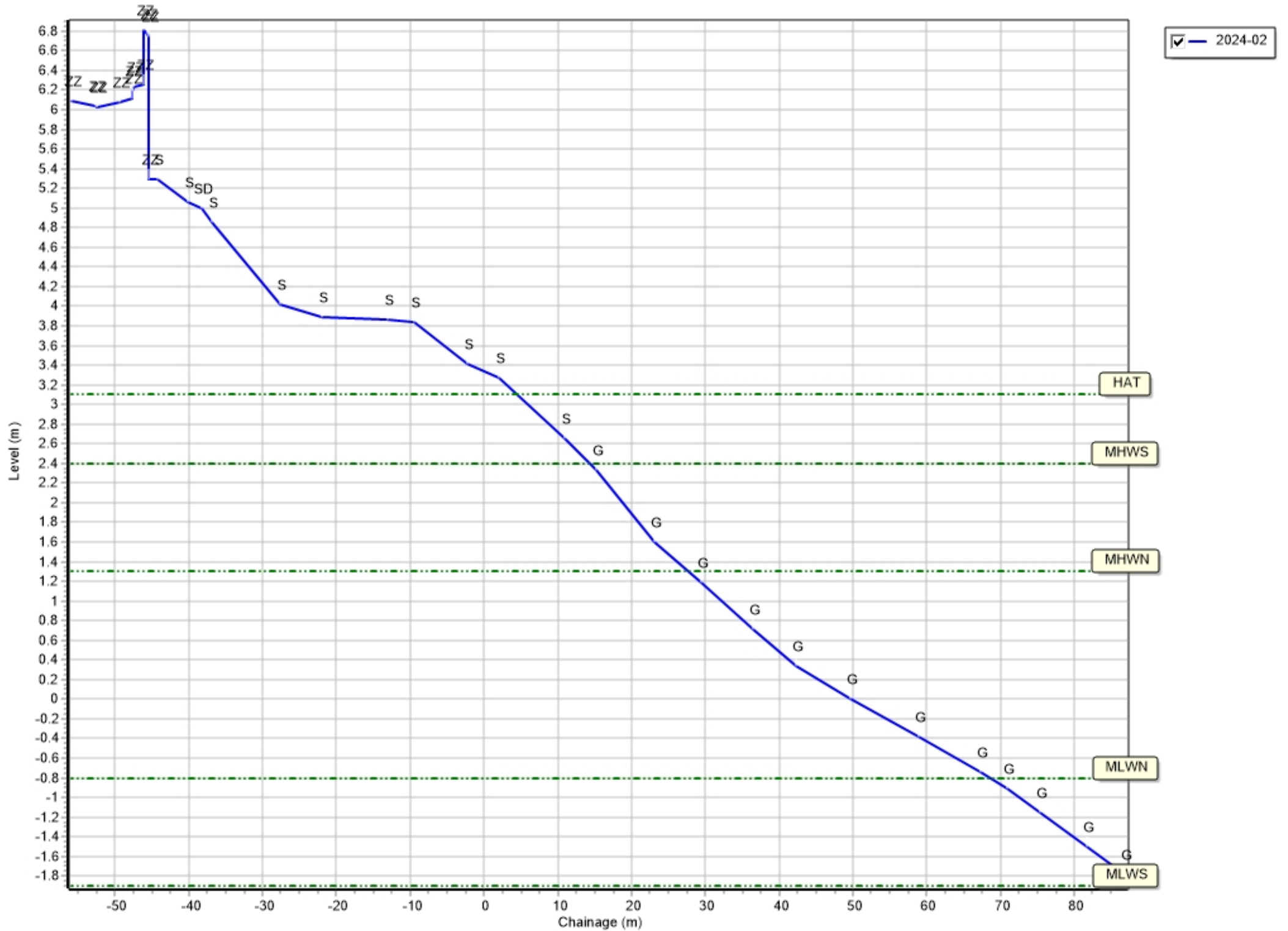
Profiles: 1bSS1



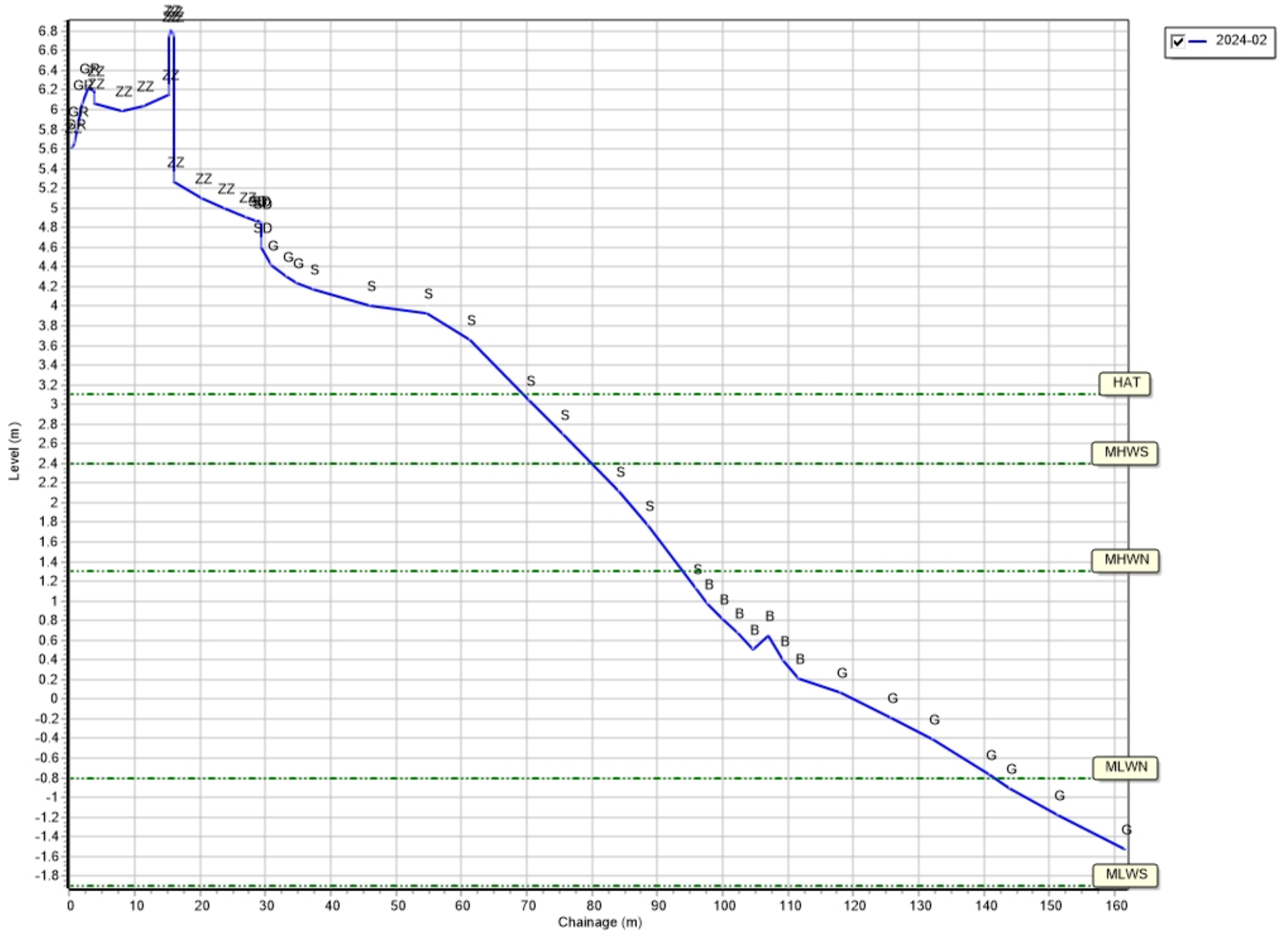
Profiles: 1bSS2



Profiles: 1bSS3



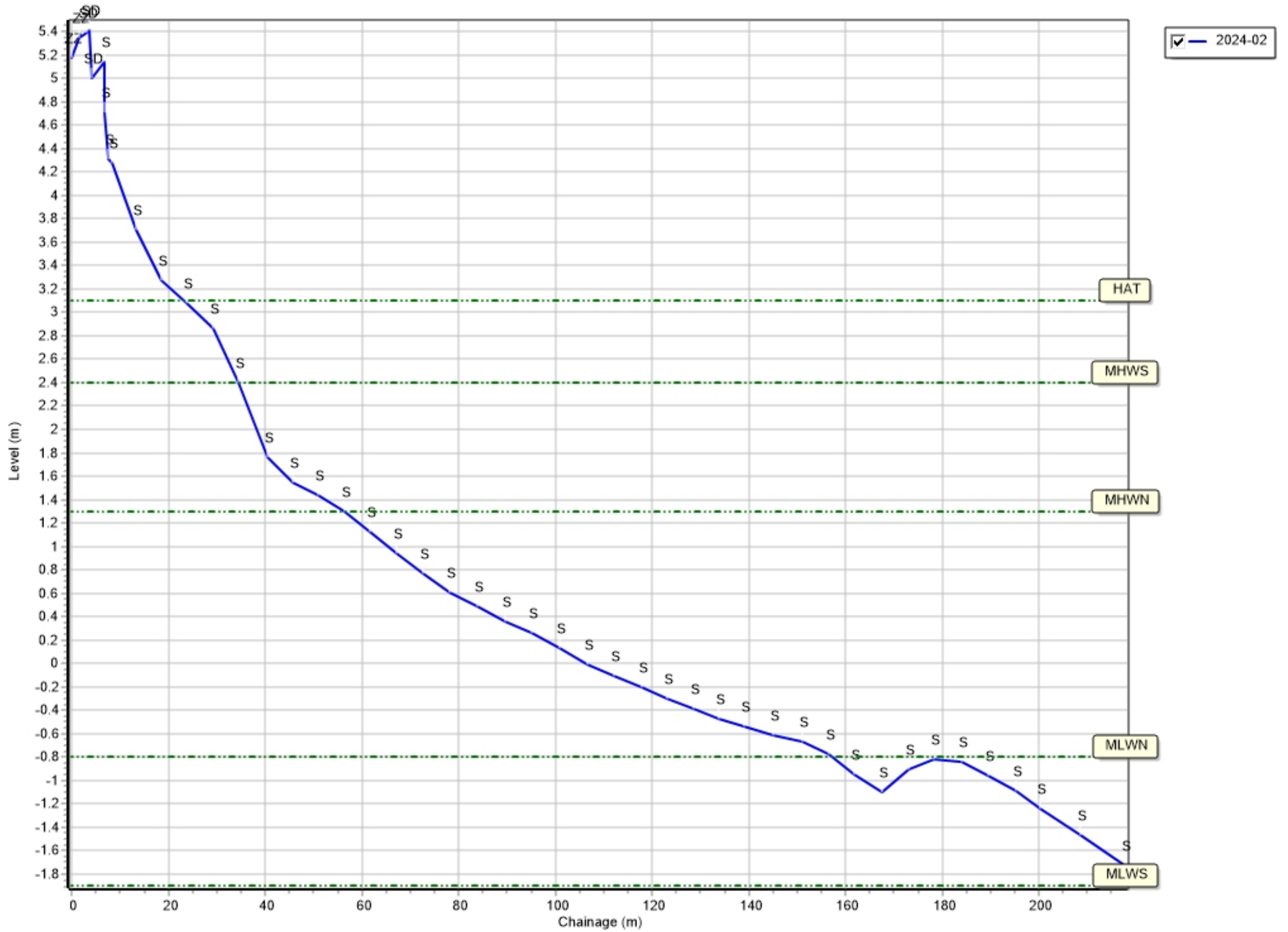
Profiles: 1bSS4



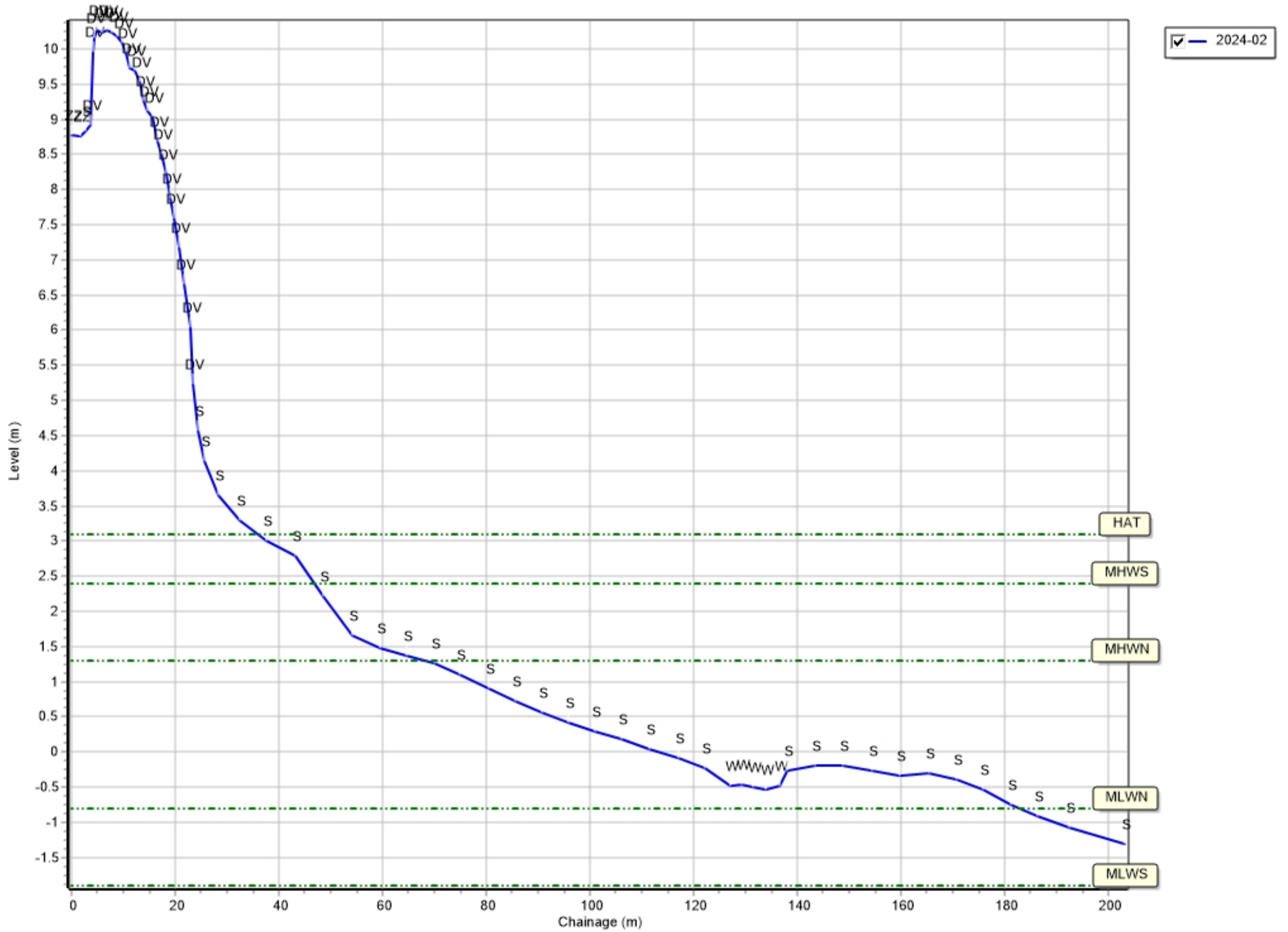
Profiles: 1bSS5



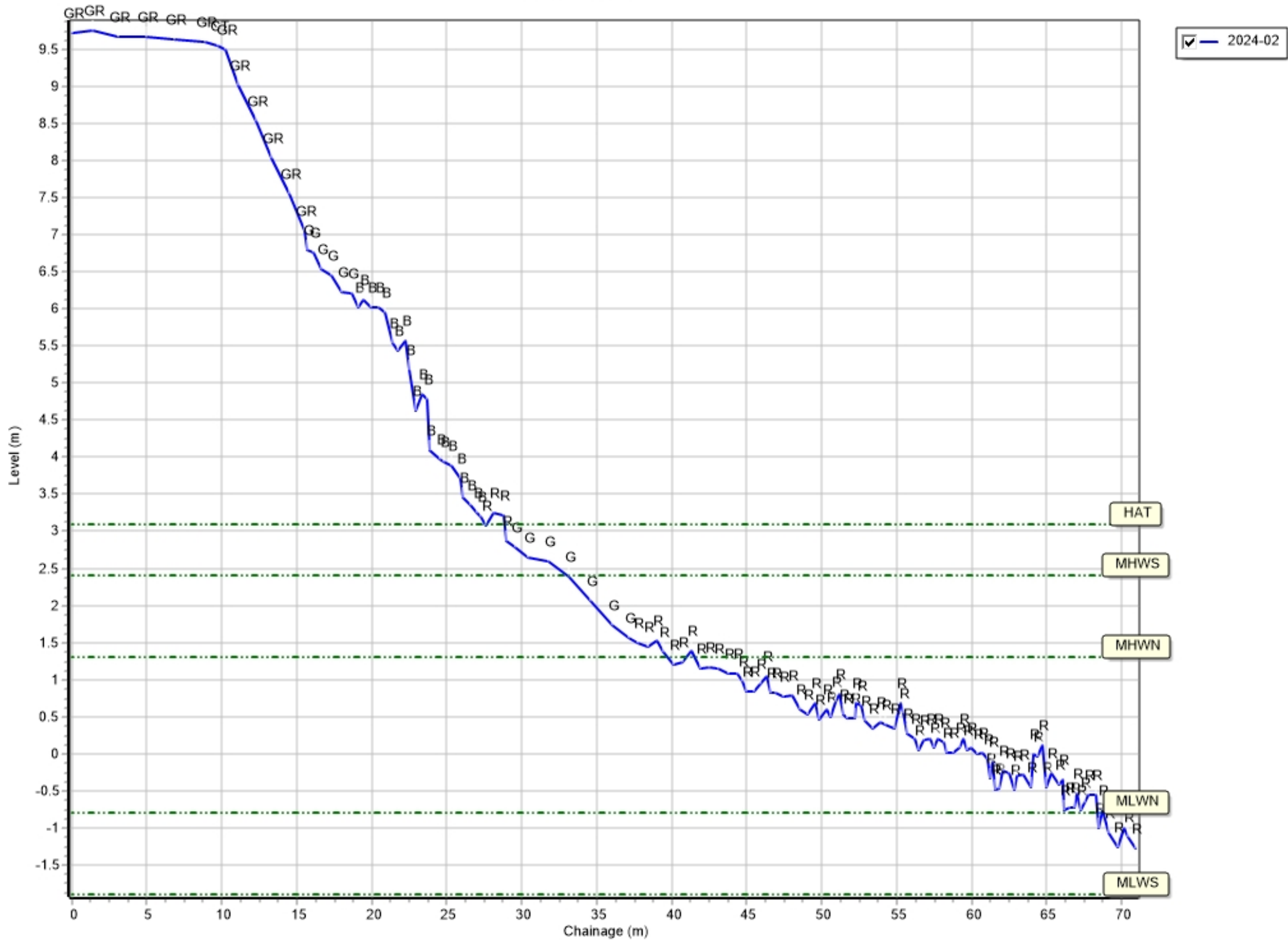
Profiles: 1bSS8



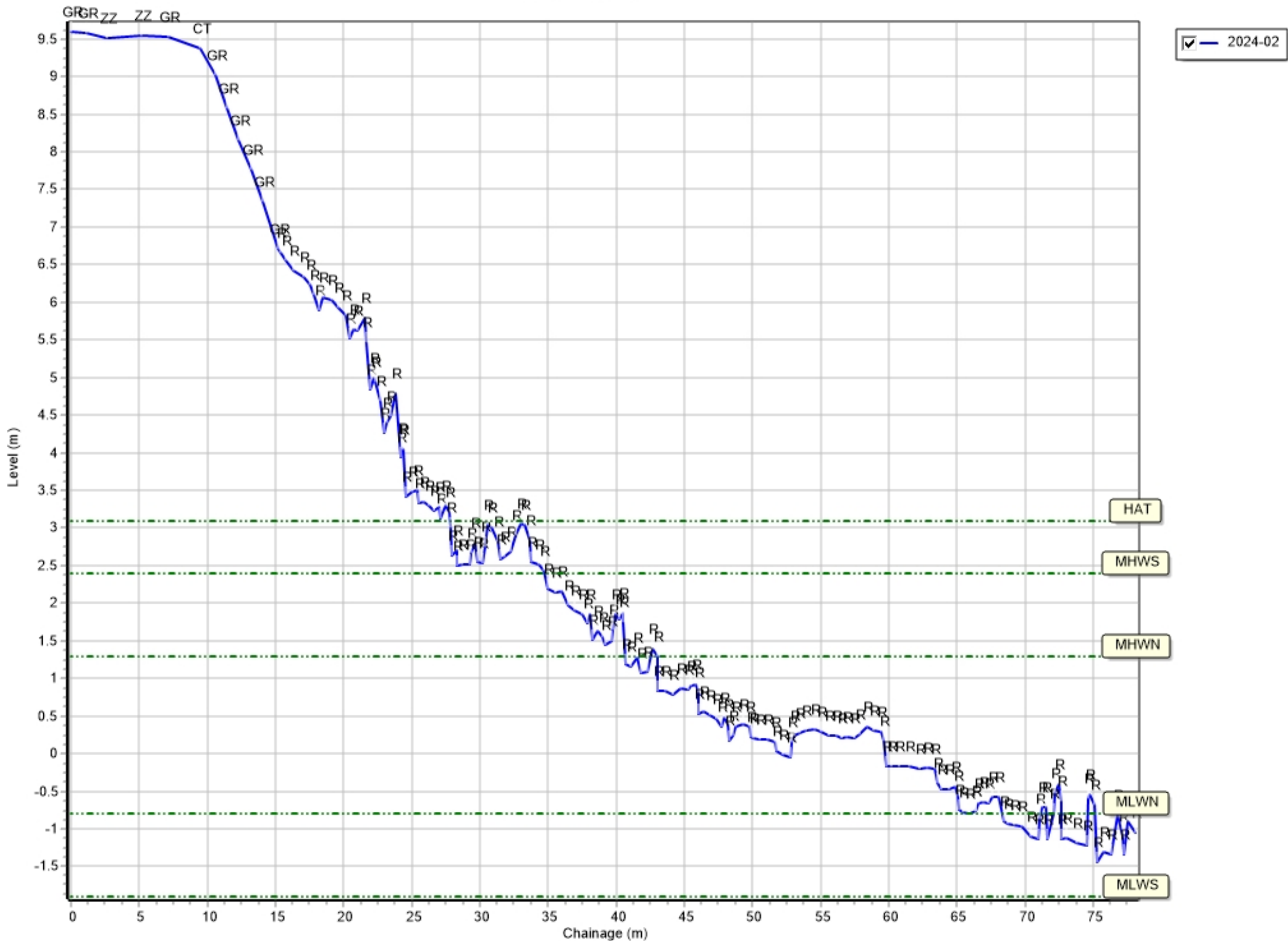
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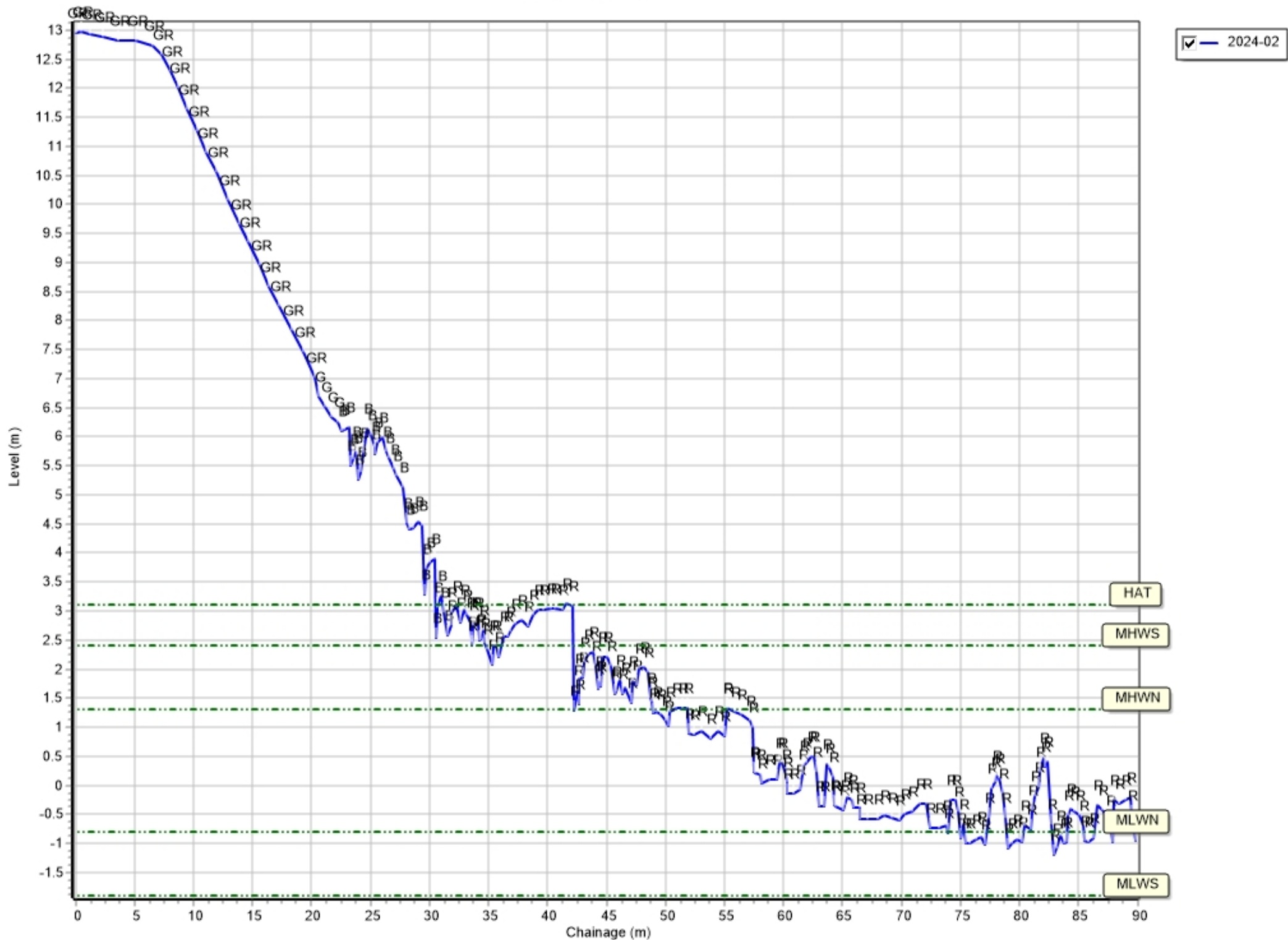
Profiles: 1bSS10



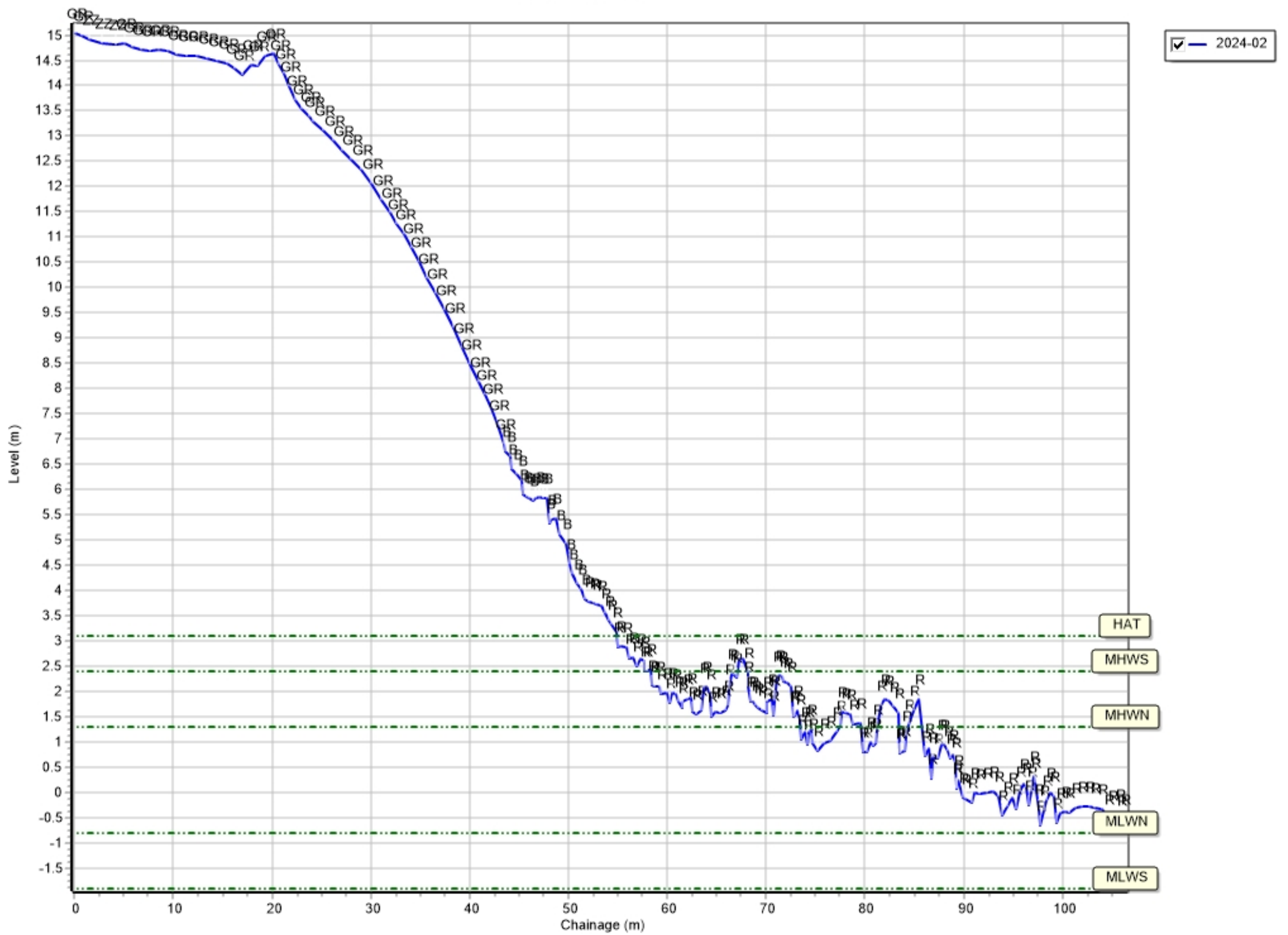
Profiles: 1bSS11



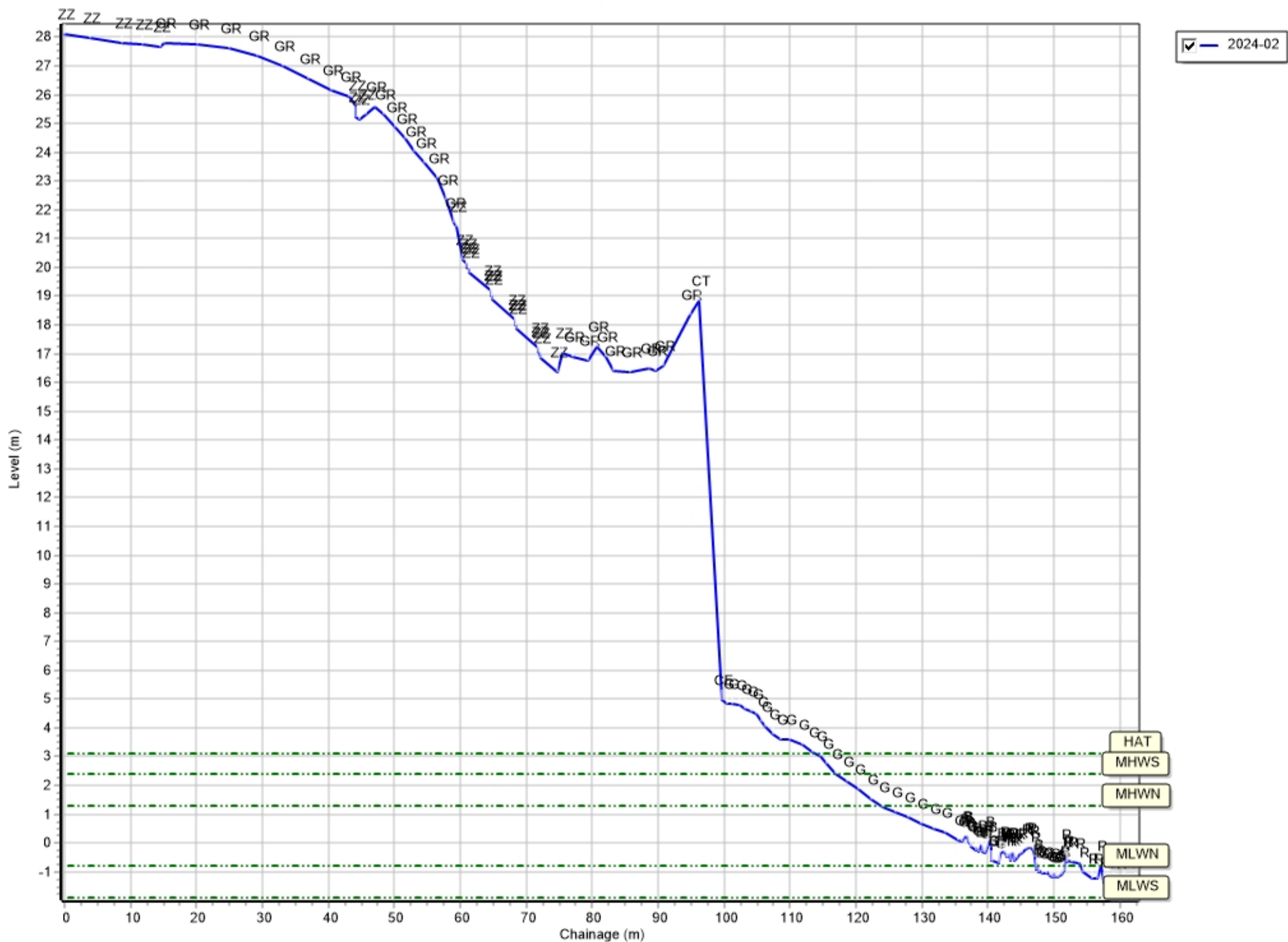
Profiles: 1bSS12



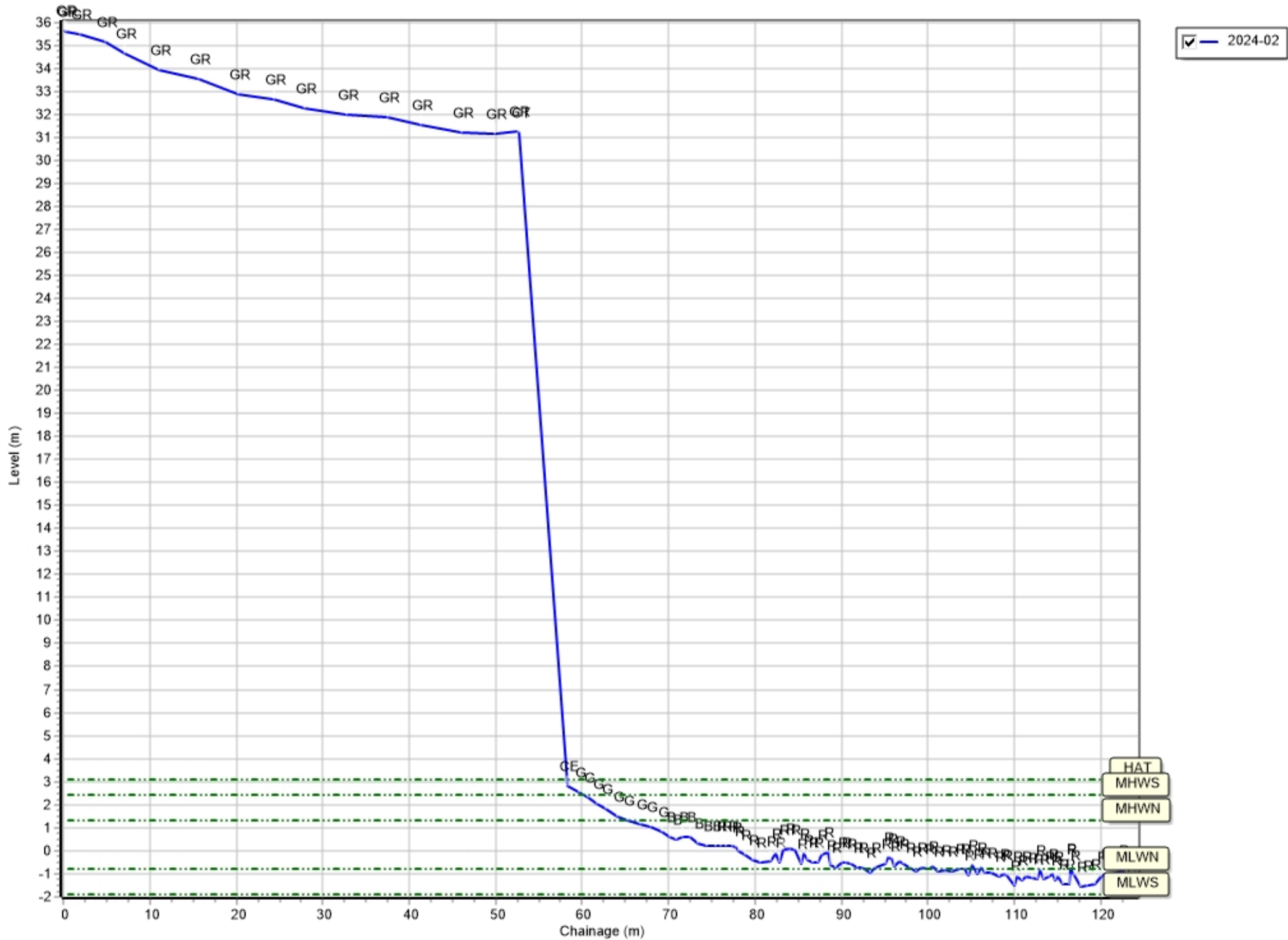
Profiles: 1bSS13



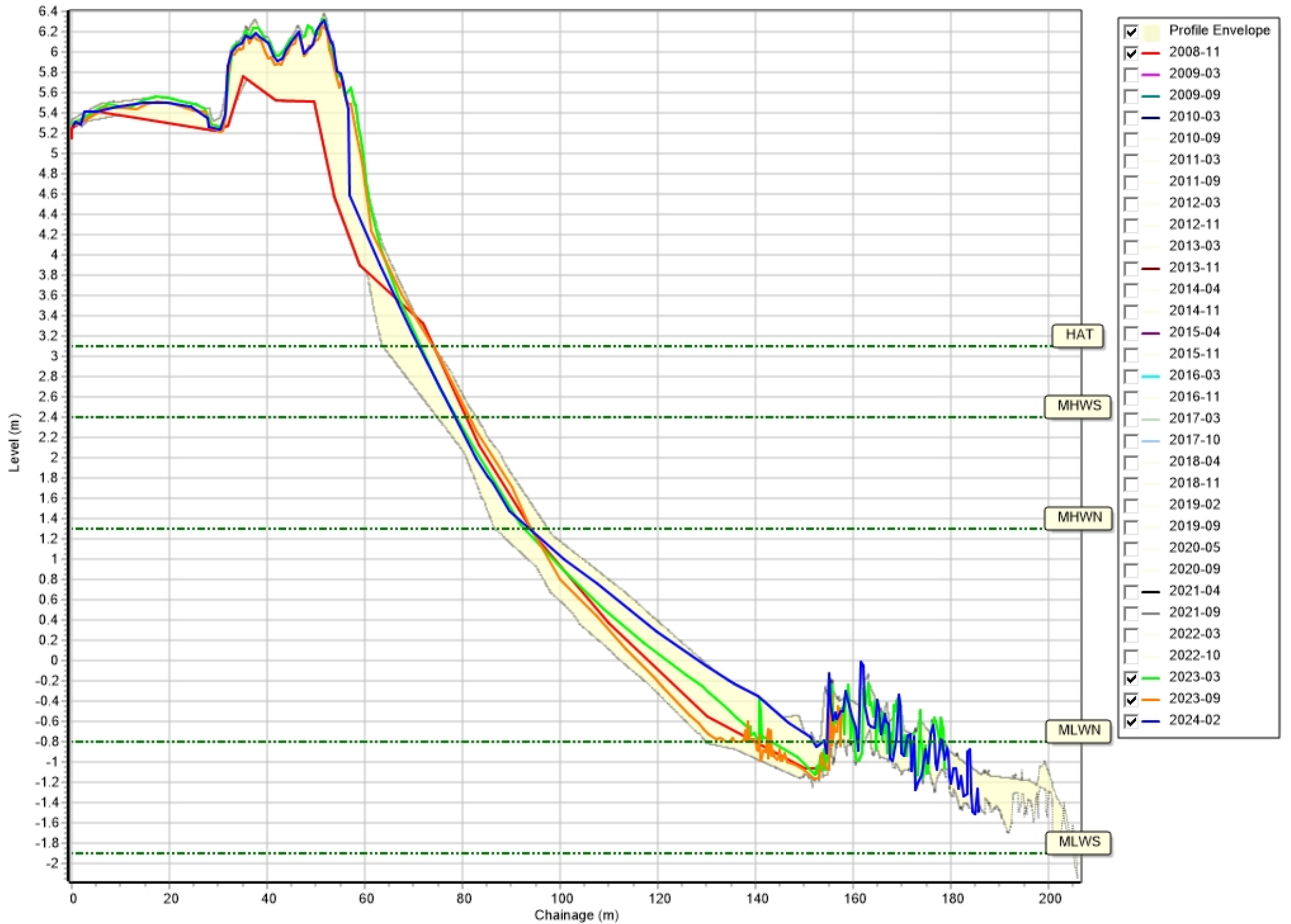
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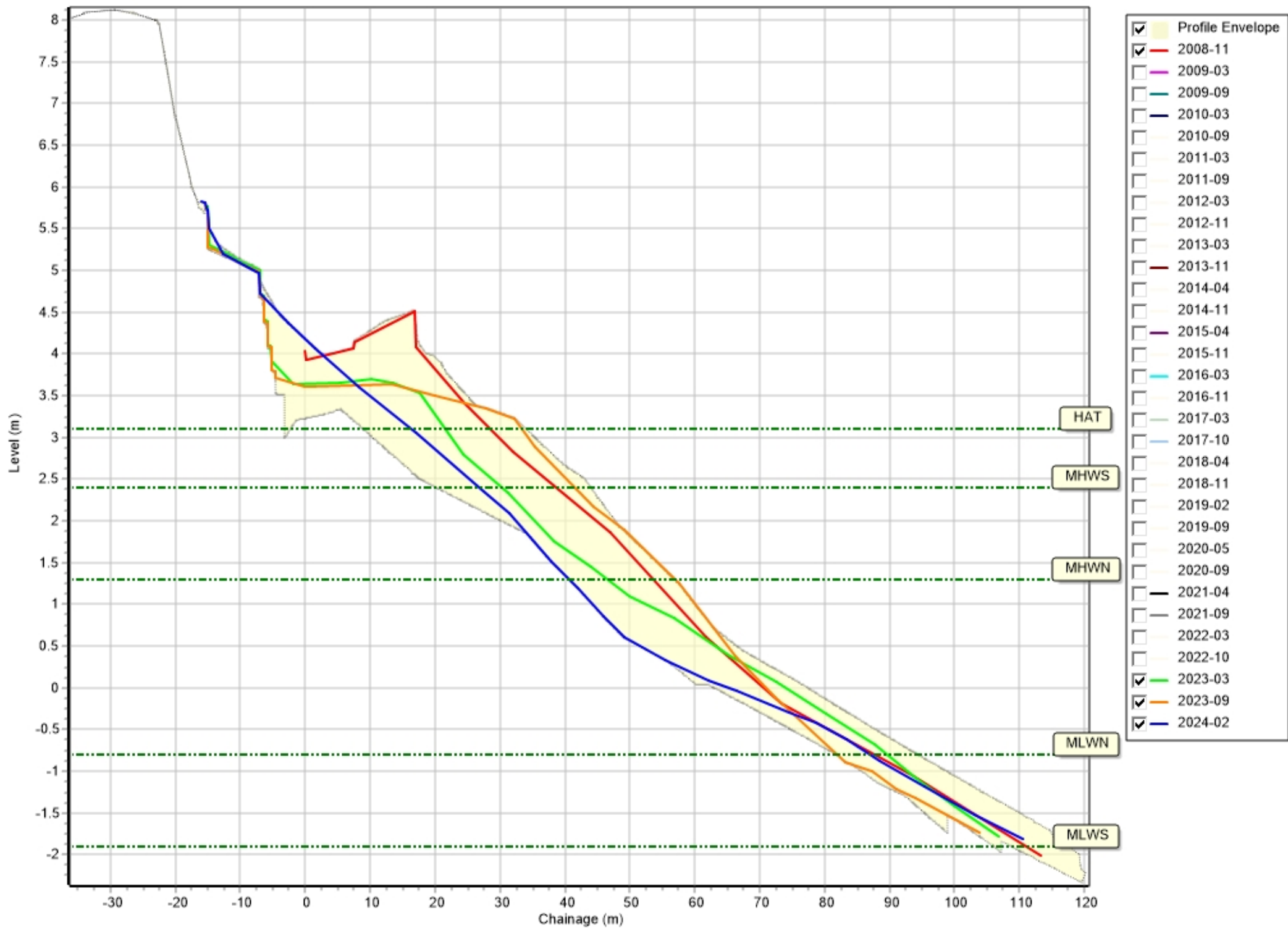
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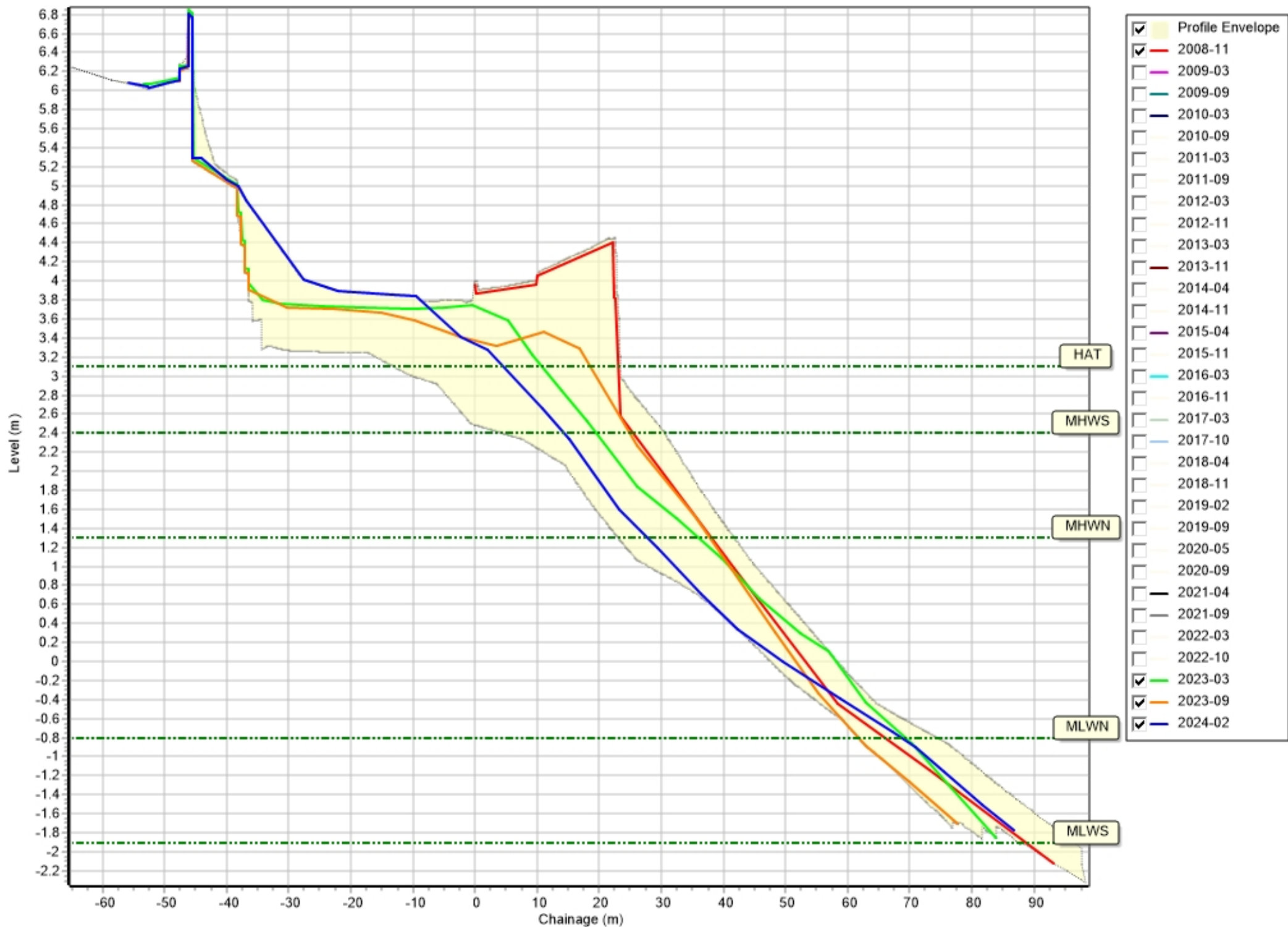
Profiles: 1bSS1



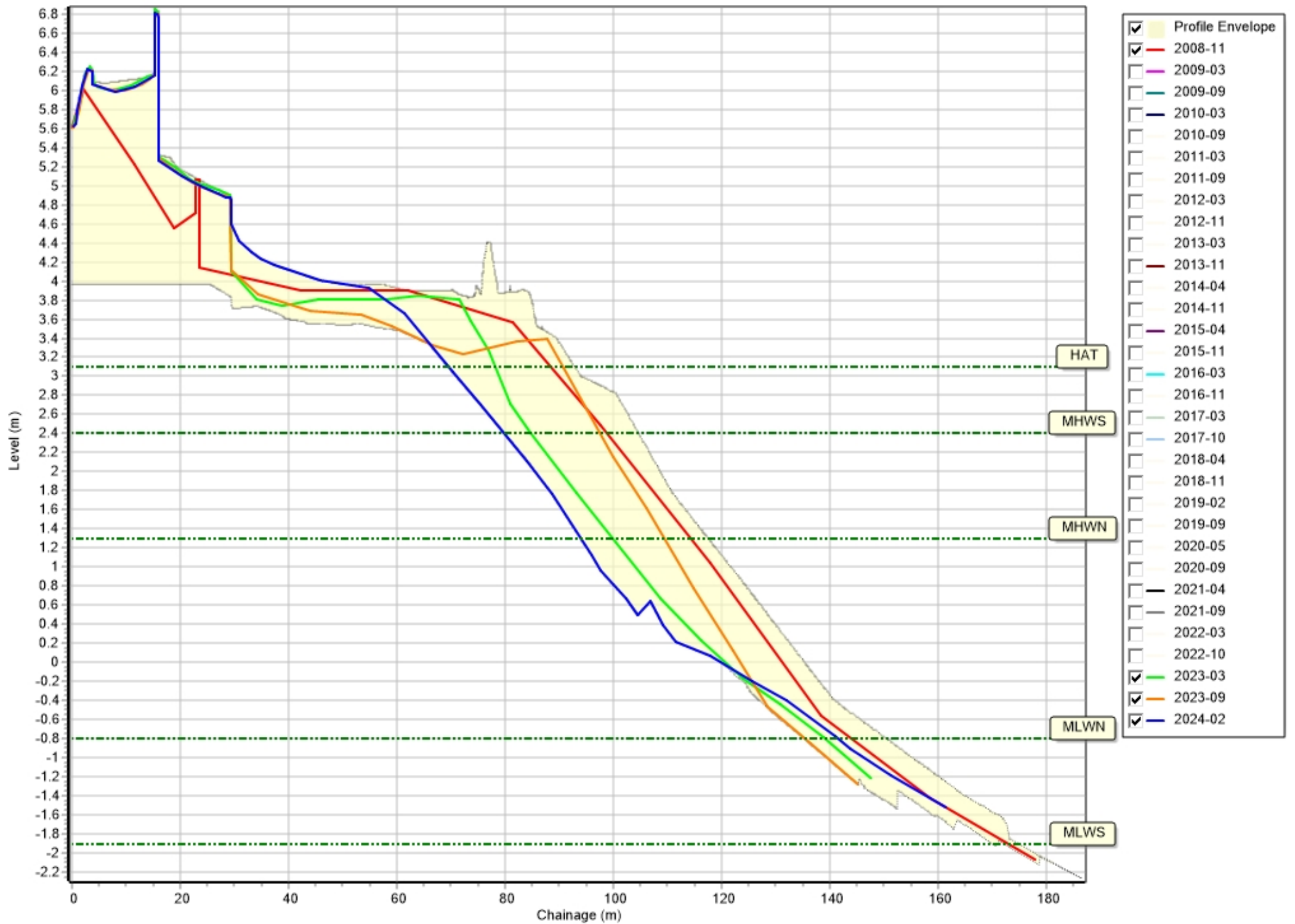
Profiles: 1bSS2



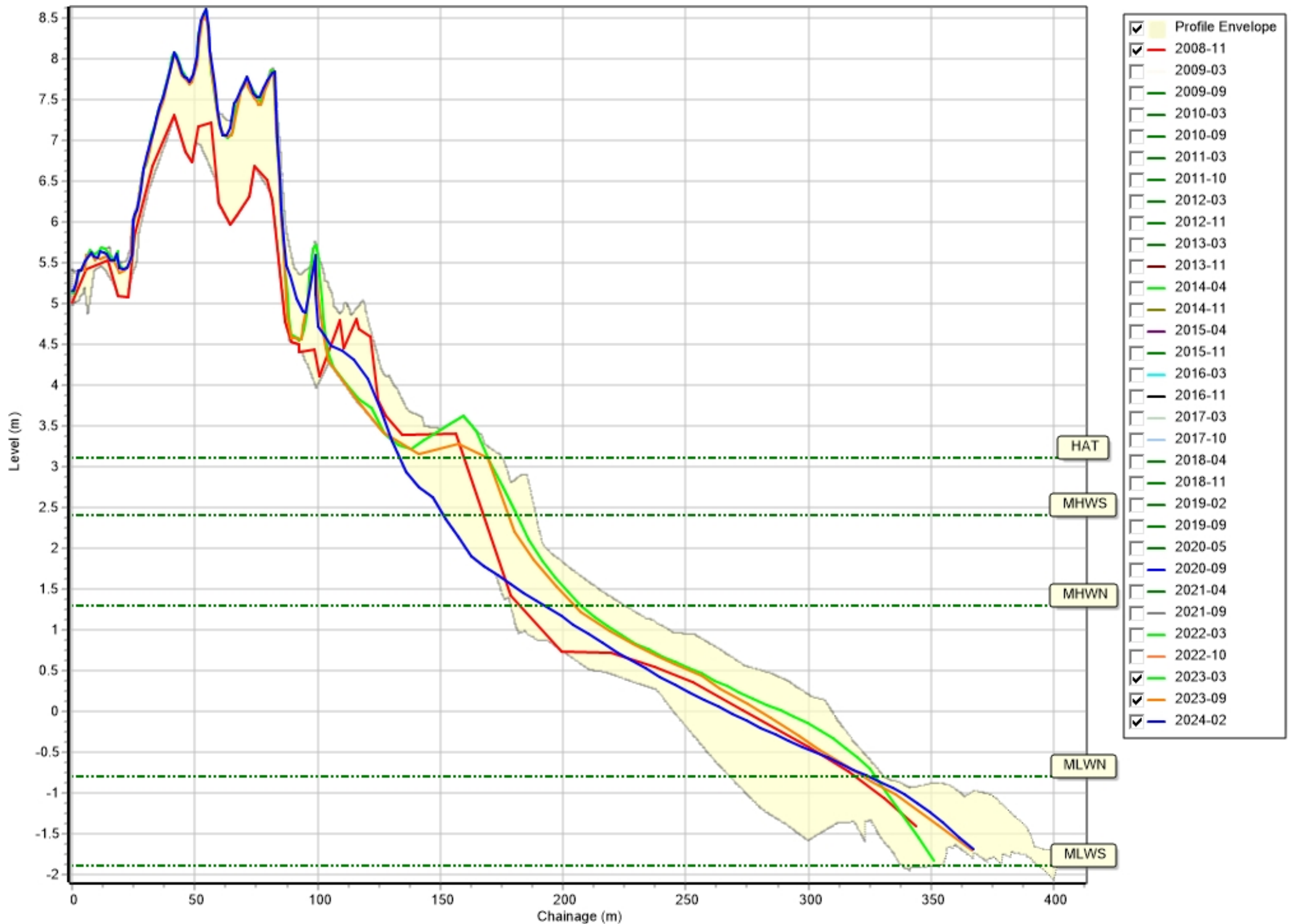
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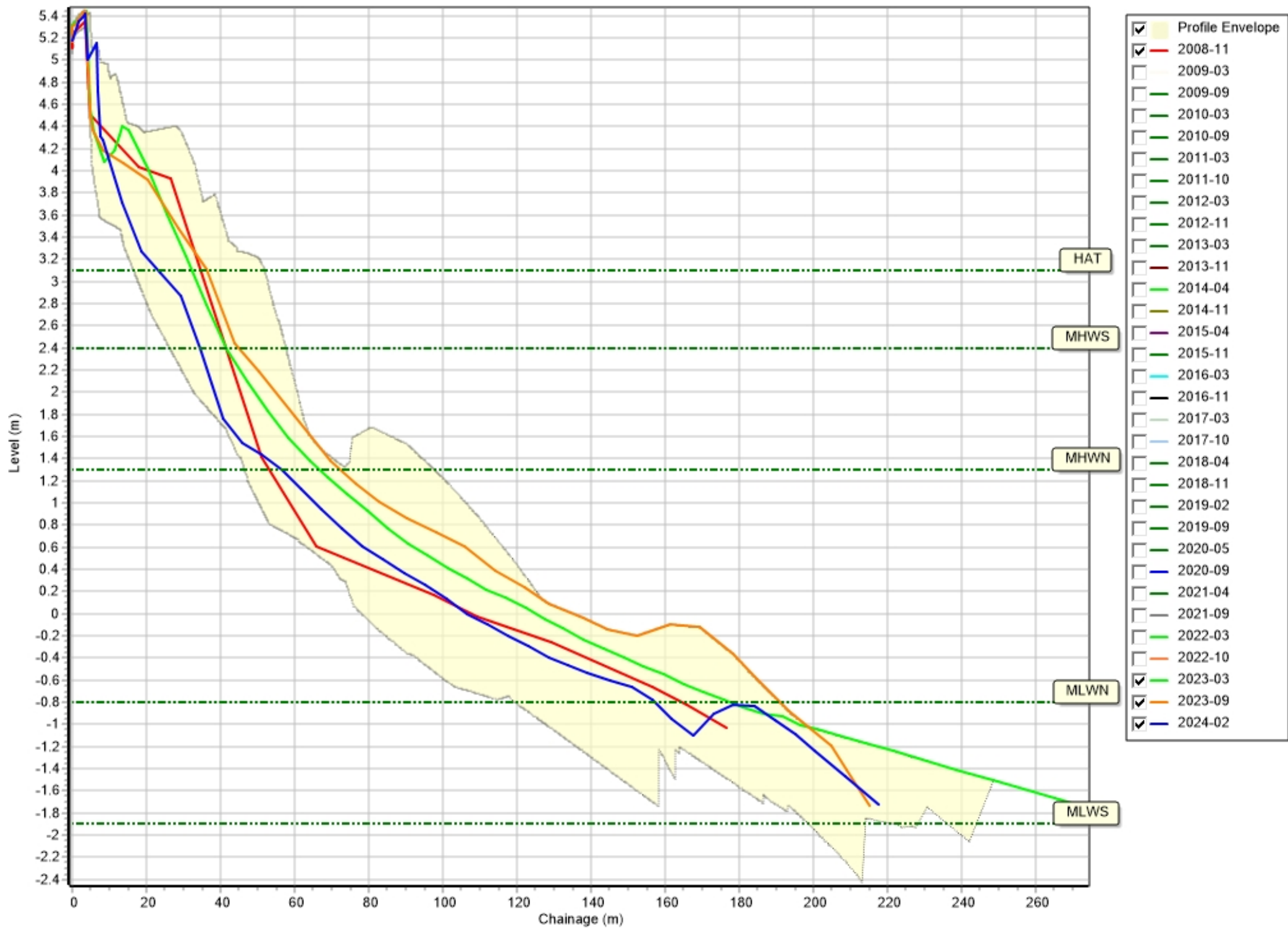
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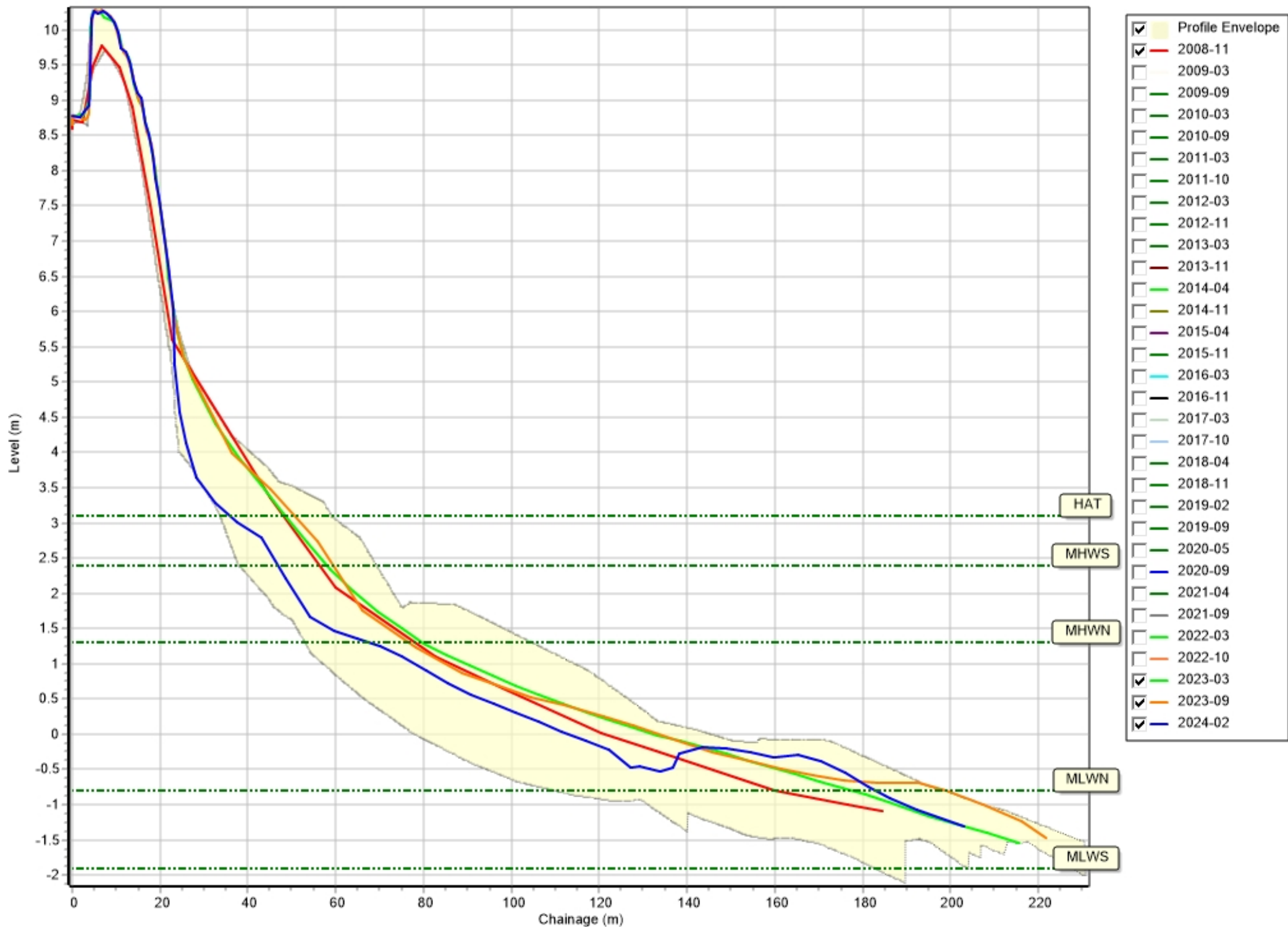
Profiles: 1bSS5



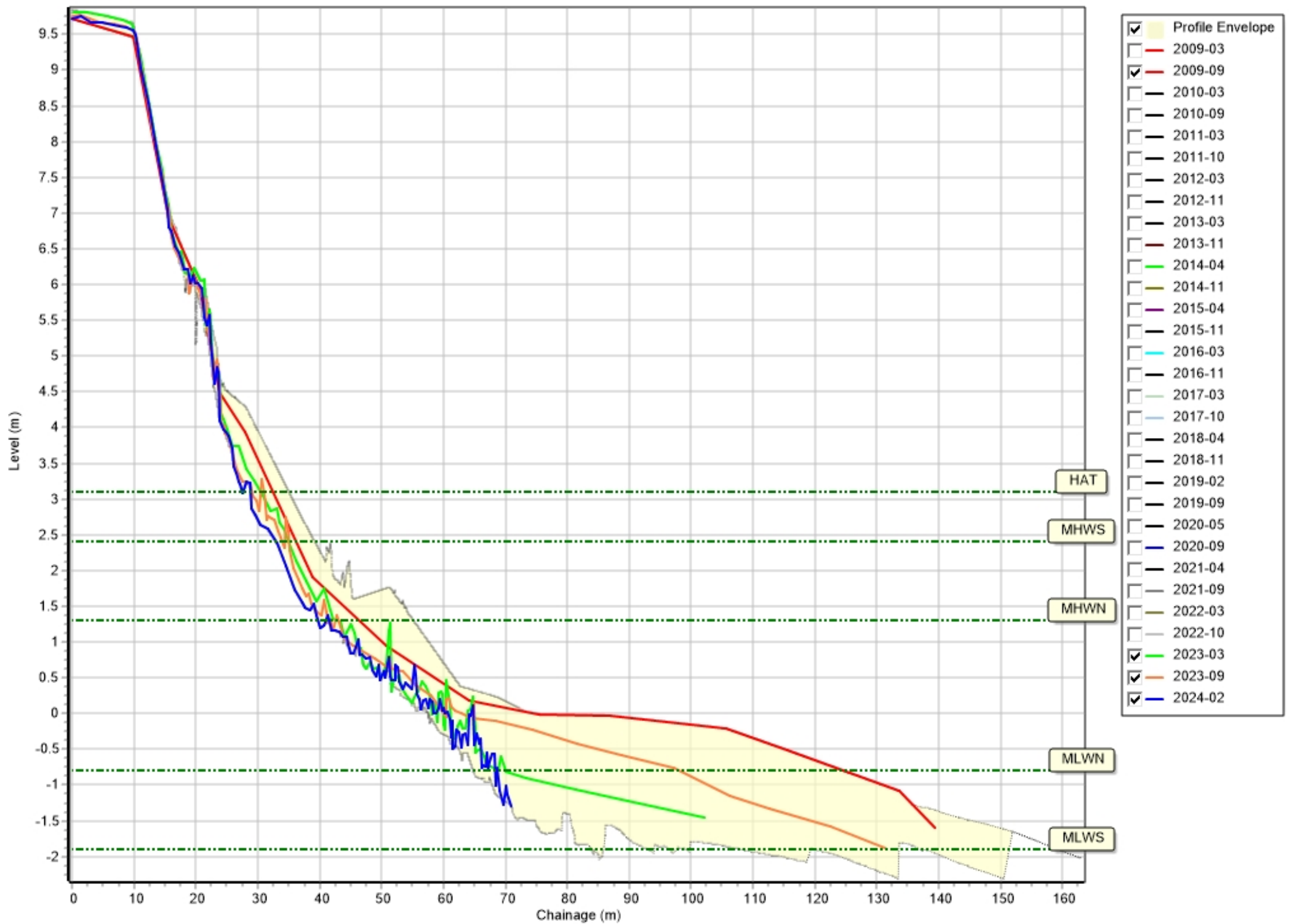
Profiles: 1bSS8



Profiles: 1bSS9



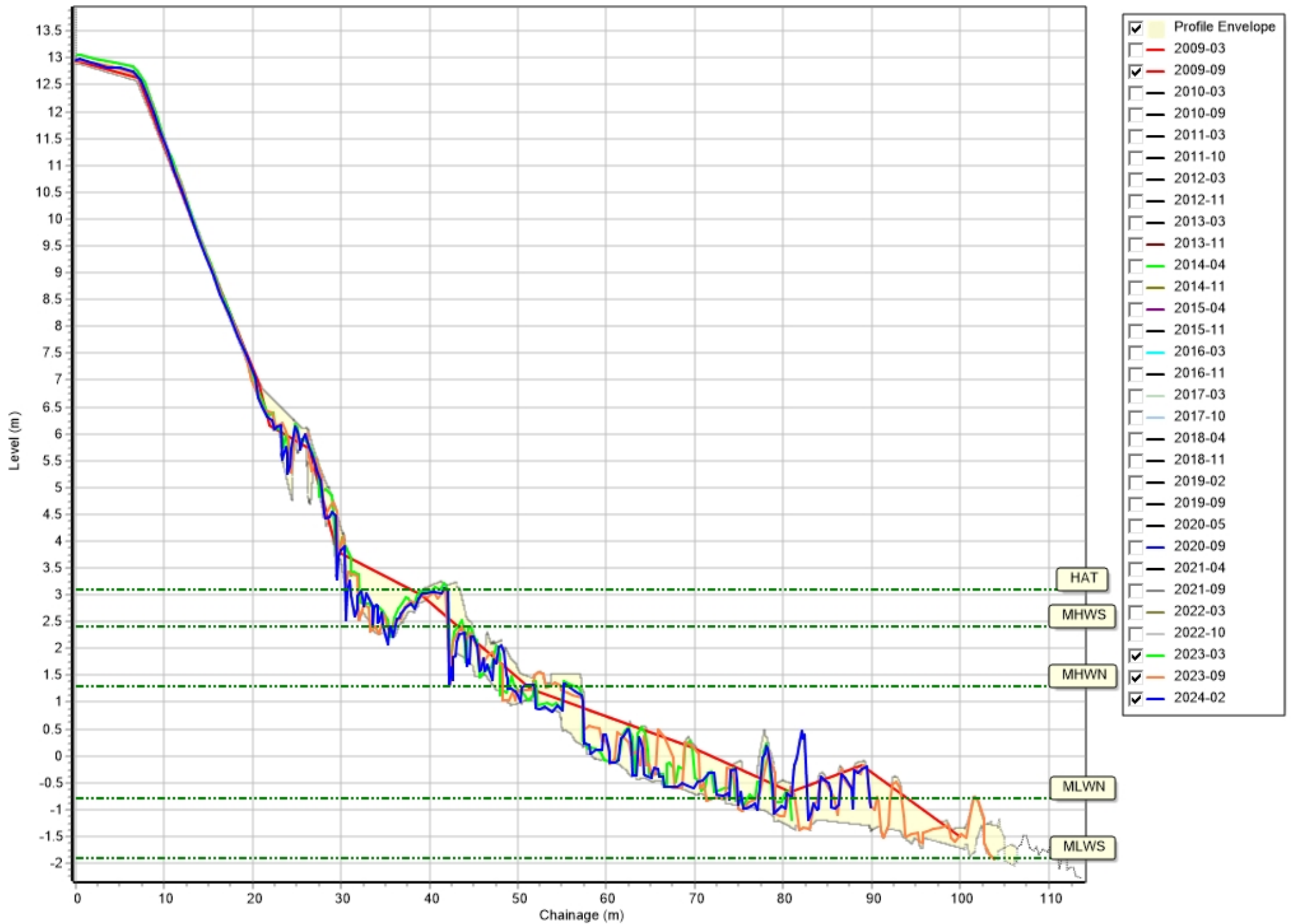
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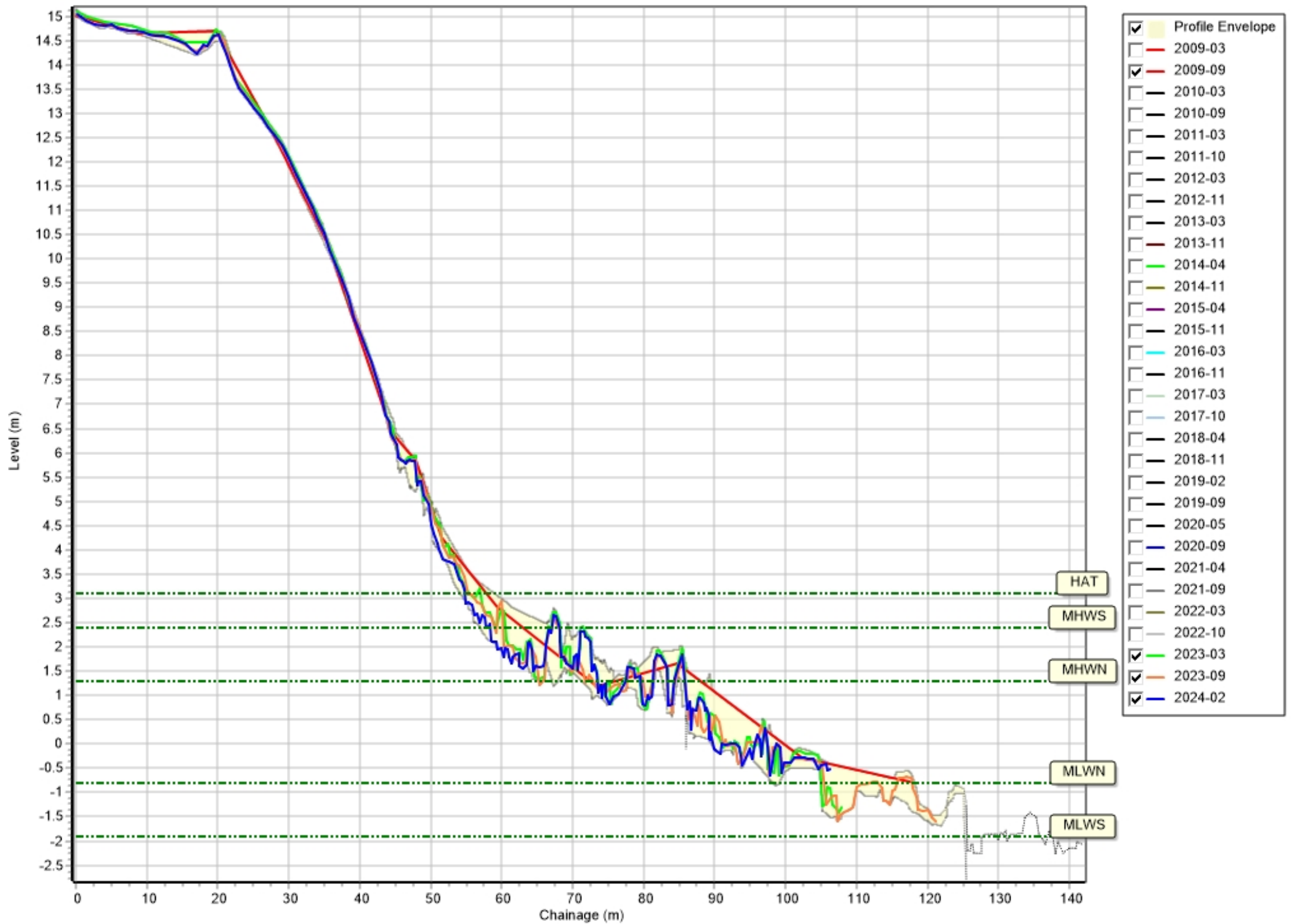
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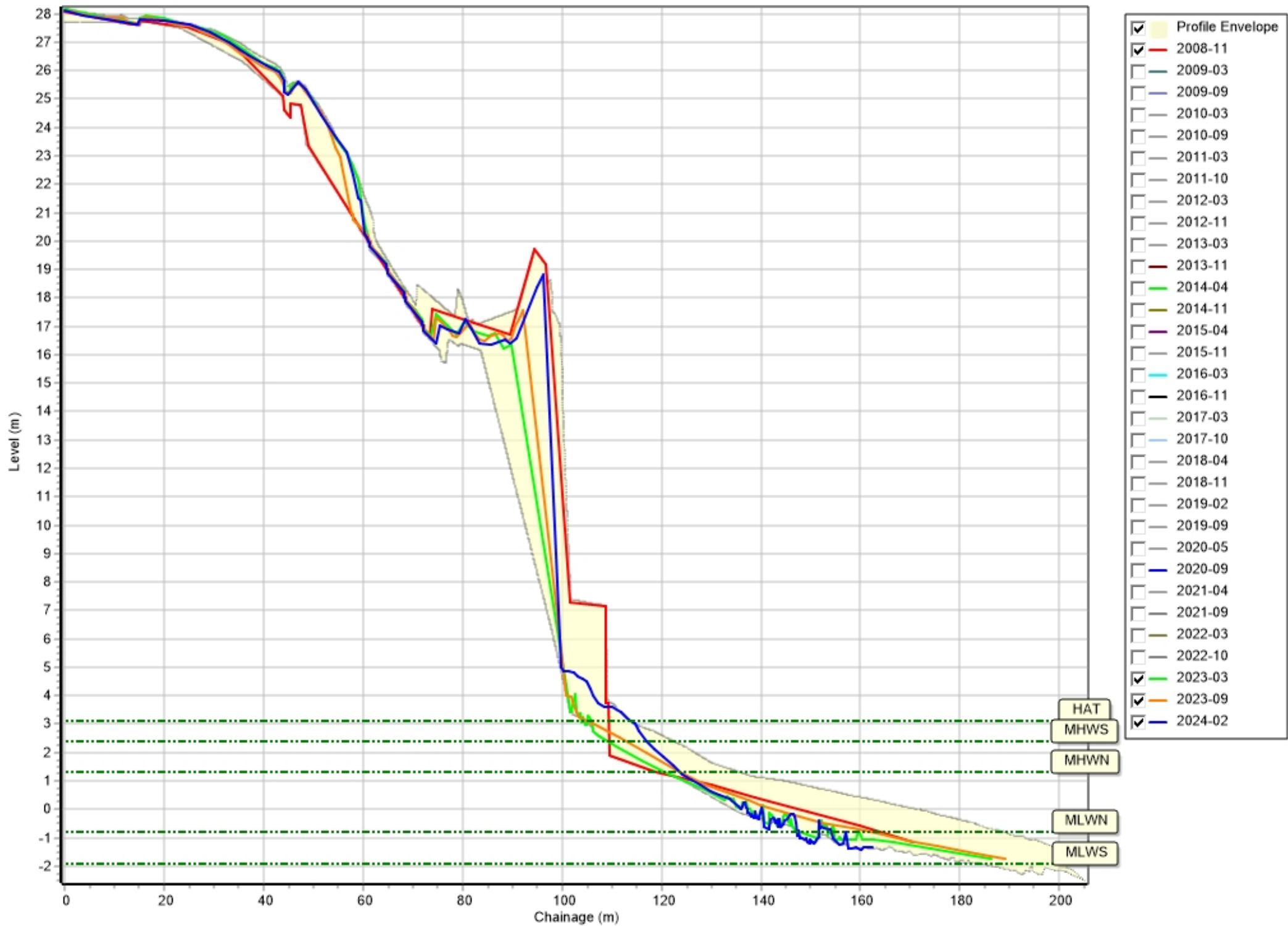
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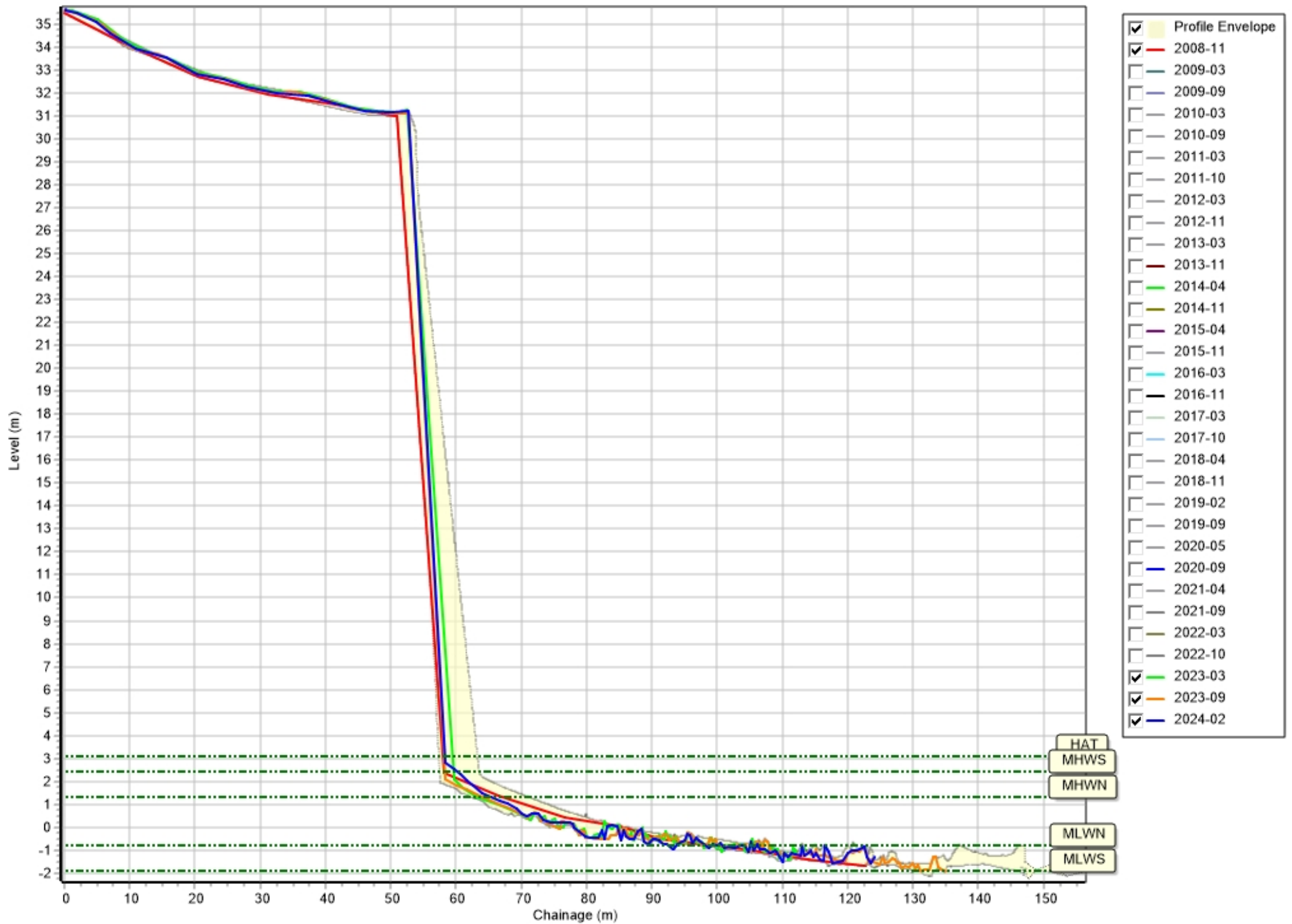
Profiles: 1bSS13



Profiles: 1bSS14



Profiles: 1bSS17

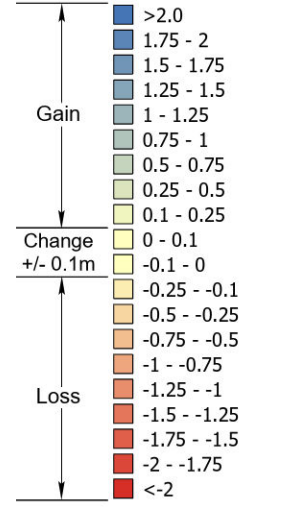


Appendix B
Topographic Survey



Difference between topographic surveys
(Sept 2023 to Feb 2024)

Change in Elevation (mOD)



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

Title:

Appendix B - Map 2

LITTLEHAVEN BEACH

South Tyneside Council Frontage

Report: Update Report
'Partial Measures' Survey 2024

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	27/03/2024	TC	NJC	A3	1:3,000

Co-ordinate system: British National Grid



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Garmin, FourSquare, GeoTechnologies, etc, METI/NASA, USGS

Appendix C
Cliff Top Survey

Cliff Top Survey

Trow Quarry

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

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

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

Table C1 – Cliff Top Surveys at Trow Quarry

Ground Control Points				Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Bearing	Baseline Survey	Previous Survey	Present Survey	Baseline to Present	Previous to Present	Baseline to Present
			(°)	Sep 2011	Sept 2023	Feb-24	Sep 2011 - Feb 2024	Sep 2023 - Feb 2024	Sep 2011 – Feb 2024
1	438300.3	566674.7	309	7	6.46	6.60	0.4	-0.14	-0.05
2	438338.8	566694.3	312	9.4	9.12	9.2	0.2	-0.08	-0.02
3	438384.7	566669	33	7	6.46	6.5	0.5	-0.04	-0.05
4	438408.1	566664.8	71	10.5	10.88	10.92	-0.42	-0.04	0.03
5	438401.1	566638	120	7	7.02	6.73	0.27	0.29	0.00
6	438392.8	566604.2	110	10.2	9.83	9.83	0.37	0.00	-0.03