Vine Street Manchester

Temporary Works Slope Stability Assessment (November 2024)

Prepared for Earthwork Support Specialist (CE) Ltd

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Appendix 1: Project Drawings
Appendix 2: Slope Stability Report

1 Introduction

Key GeoSolutions Ltd (KGS) has been commissioned by Earthwork Support Specialist (CE) Ltd to undertake a slope stability assessment for temporary works for installation of retaining sheet pile walls at Vine Street in Gorton in Manchester in order to ascertain the impact of the pilling works on adjacent Network Rail slope and railway. Furthermore, the predicted Peal Particle Velocity (PPV) values of piling works based on historic data and applicable standards is assessed and provided.

1.1 Objectives

The objectives of the report are:

- To assess the effect of the pilling works on the adjacent Network Rail slope and railway.
- To recommend mitigation and monitoring to verify assessment.
- To determine the risks associated with the proposed works.
- To provided predicted PPV values during temporary works.

1.2 Information

The following ground investigation and design information is available:

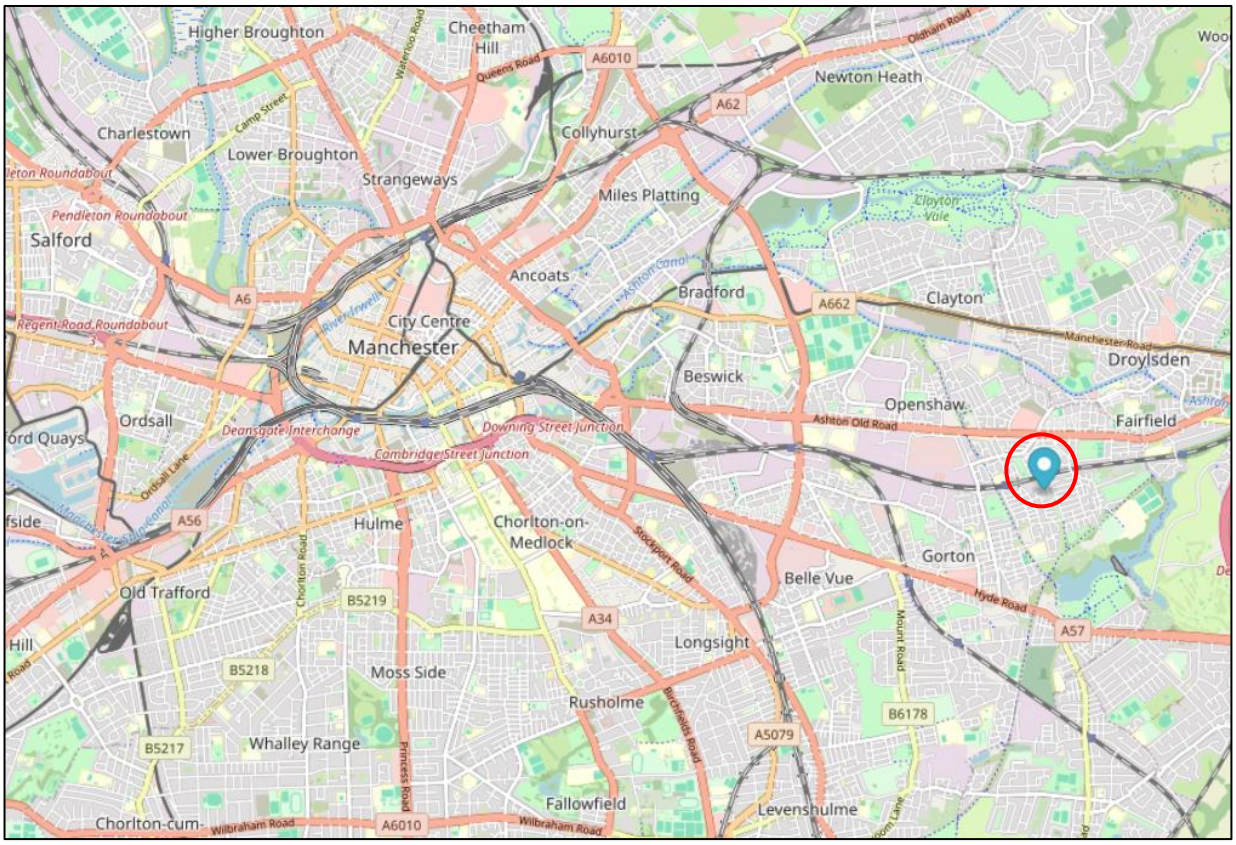
- Phase II Geoenvironmental Site Assessment – 14-944-R1-2 dated 11th January 2022
- Topographical Land Survey – S18-442 dated 29th May 2018
- Embankment Retaining Wall Proposal – 23042-001 dated 5th July 2023
- Sheet Pile Retaining Wall Design Calculations- Vine Street Manchester – 2664 dated 24th October 2023
- Sheet Piled Wall for Slope Stability Technical Note – E11417/PW01 TN01 dated 24th March 2022
- Vine Street Gorton Conventional Sheet Piling Method Statement dated 12th May 2023
- Proposed Finished Levels – VSG-RDG-XX-XX-DR-C-0001-P02 dated 14th April 2023
- Earthworks Cut and Fill Isopachytes – VSG-RDG-XX-XX-DR-C-0002-P04 dated 4th May 2023
- Proposed Levels Cross Sections - Sheet 1- VSG-RDG-XX-XX-DR-C-0004_P06 dated 5th May 2023
- Proposed Levels Cross Sections - Sheet 2- VSG-RDG-XX-XX-DR-C-0005_P06 dated 5th May 2023
- Proposed Levels Cross Sections - Sheet 3- VSG-RDG-XX-XX-DR-C-0006_P06 dated 5th May 2023
- Proposed Levels Cross Sections - Sheet 4- VSG-RDG-XX-XX-DR-C-0007_P05 dated 5th May 2023
- Proposed Levels Cross Sections - Sheet 5- VSG-RDG-XX-XX-DR-C-0008_P05 dated 5th May 2023

2 Site Overview

2.1 Site Location and Description

The site is located at the Gorton, Manchester and is located at National Grid Reference 389283mE, 396973mN and is shown on Figure 2.1-1. The closest postcode for the site is M18 8YB. The site is currently a fenced empty lot.

Figure 2.1-1: Site Location



3 Slope Stability

3.1 Slope Stability Assessment Objectives

The objectives of the slope stability assessment were to:

- Determine the stability of the Network Rail slope during temporary piling works.
- Assess whether the proposed piling works are appropriate
- Determine monitoring criteria and mitigation measures

3.2 Slope Stability Assessment Methodology

The following was undertaken as part of the design assessment:

1. Review the Ground Model and ground parameters based on data and reports provided.

2. Conduct slope stability analysis for Design Section 1 and Design Section 2 as presented in Sheet Pile Retaining Wall Design Calculations- Vine Street Manchester – 2664 dated 24th October 2023

3. Conduct slope stability analysis considering dynamic loading to account for piling works.

4. Define criteria for on-site monitoring of vibration.

5. Recommend possible mitigation measure at site during the works

6. Verify the slope behaviour and response during site monitoring.

3.3 Ground Model

British Geological Survey (BGS) maps indicated mapped superficial soil at the site is Till. This stratum is described as unsorted and unstratified drift, general over consolidated. It consists of a heterogenous mixture of clay, sand, gravel and boulders varying widely in size and shape. The mapped bedrock is the Manchester Marls Formation – Mudstone which are described as red marl (calcareous mudstone and siltstone) with think beds of fossiliferous marine limestone and dolomite; locally green; sandy in places.

From the earliest map edition (1948), the site is shown to have been largely undeveloped and part of an open field, until a railway line is shown in the western portion from the 1890s. Cutting of the site appears to have taken place at several stages, associated with the development of the railway line and in the 1940s/50s, likely relating to adjacent infrastructure / developments. Unknown structures were present during the 1950s, likely relating to the railway, and remaining until c. 2000; Filling of the railway cutting is understood to have taken place following dismantling of the railway in c. 2000, which is also collaborated by available aerial imagery at this time.

Made Ground associated infilling of the railway cutting, is expected but not recorded in BGS records.

Two ground investigations have been produced for the application site by Cooper Associated (2006) and REC Ltd (2013). Latest ground investigation was undertaken by e3p in January 2022 and comprised of the following exploratory holes:

- 4 No. cable percussive boreholes to a maximum of 15.5m.
- 6 No. windowless sampler boreholes to a maximum depth of 3.9m.
- 8 No. machine excavated trial pits to a maximum depth of 2.7m.

Made Ground was encountered in all exploratory holes with a thickness between 7.5m and 11.0m and is typically described as dark brown/grey clayey sandy gravel. Gravel is fine to coarse angular to subrounded of mudstone, sandstone, brick, glass, ash, ceramic, and concrete.

Till is encountered in all exploratory holes that penetrated the Made Ground and both clay and sand were recorded in this layer.

Figure 3.3-1: Mapped Superficial Soils

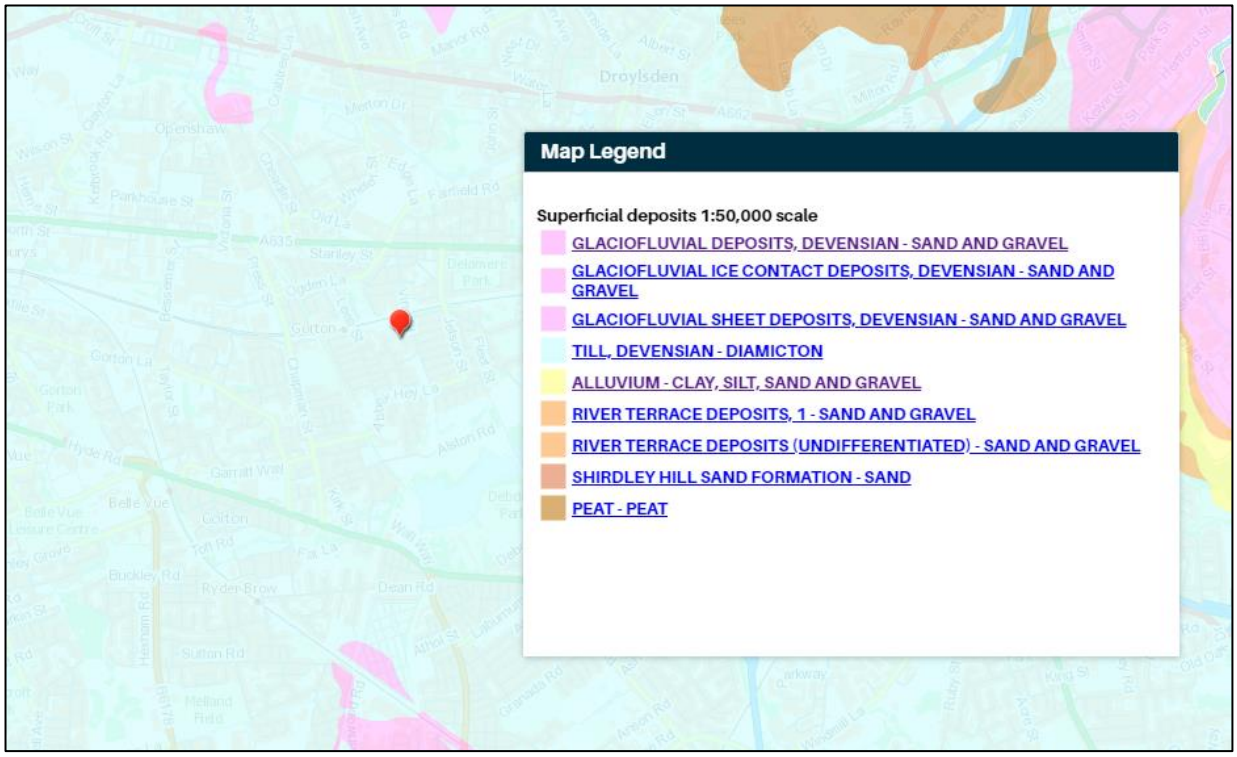


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Figure 3.3-2: Mapped Bedrock

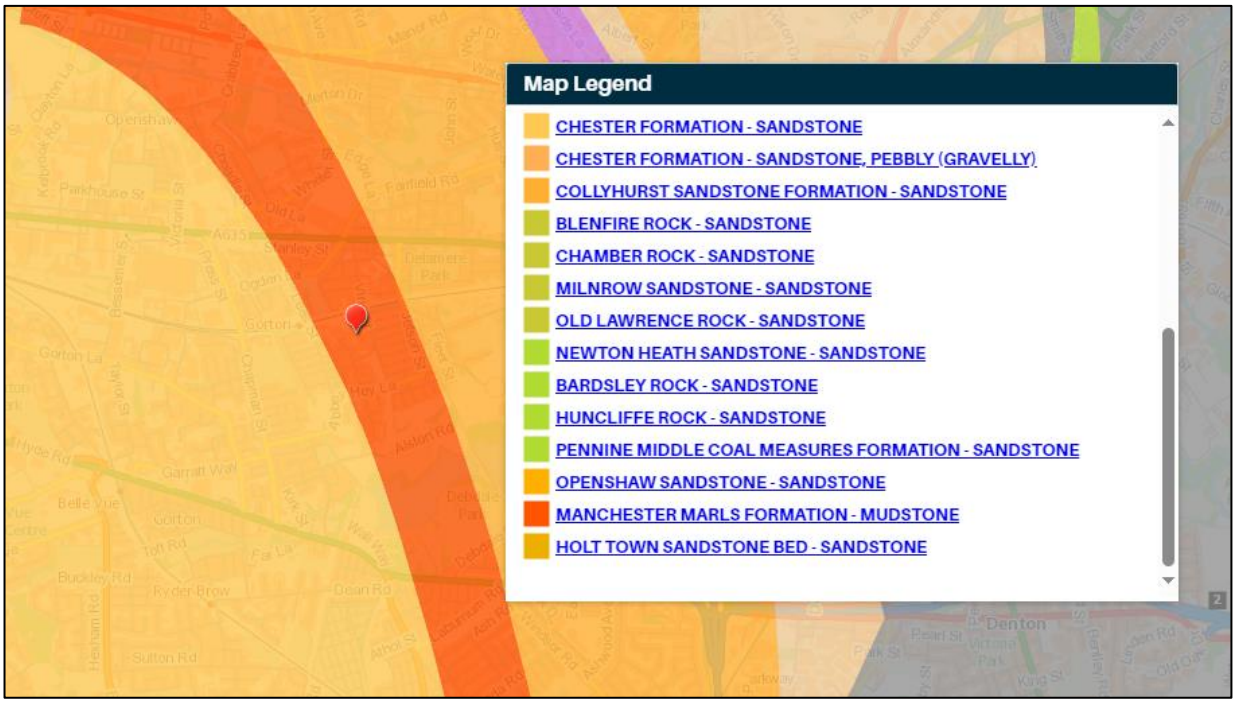

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Figure 3.3-3: 1914 Ordnance Survey Map Superimposed on satellite Photograph

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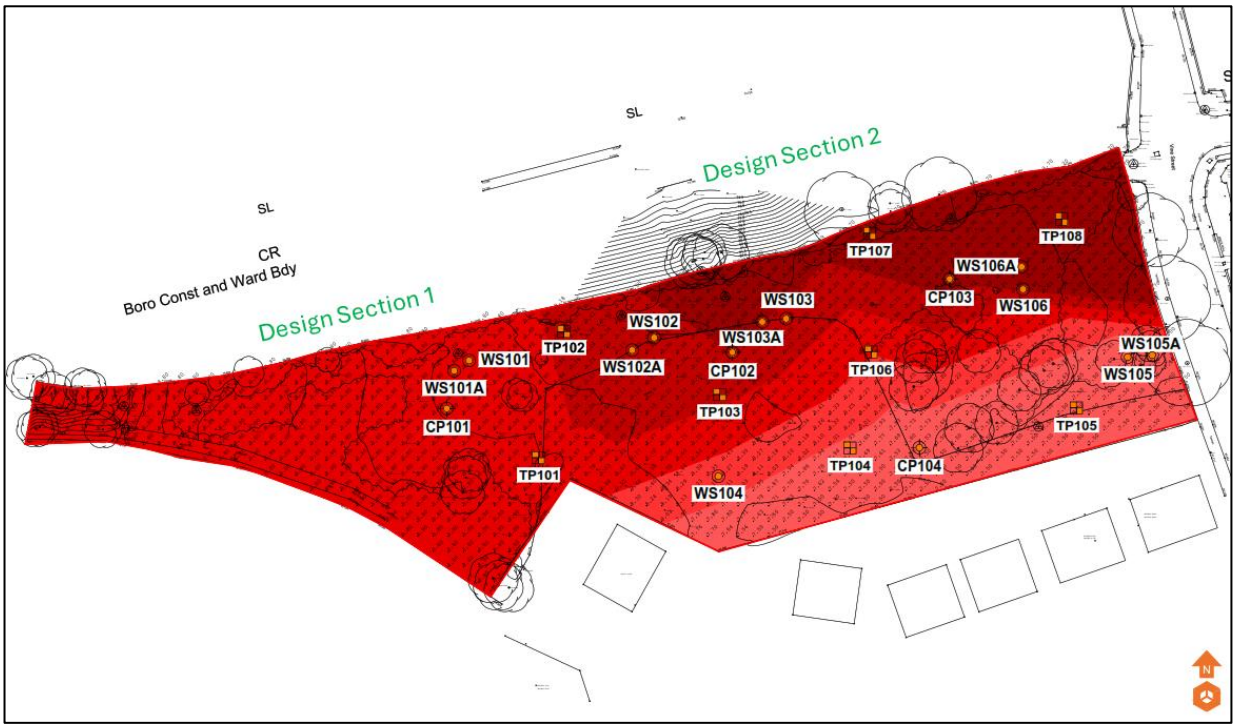
Figure 3.3-4: Exploratory holes plan Superimposed on 1946 RAF Photograph

Figure 3.3-5: Exploratory Holes Locations



The following ground model was used for analysis based on the available information:

Table 3.3-1: Ground Model

Top Level (mOD)	Base Level (mOD)	Thickness (m)	Strata	Description
Design Section 1				
81.5	72.2	9.3	Made Ground	Loose to dense granular
72.2	-	-	Till	Stiff to very stiff clay
Design Section 2				
82.0	71.0	11.0	Made Ground	Loose to dense granular
71.0	-	-	Till	Stiff to very stiff clay

The soil parameters and groundwater information used in the slope stability assessment are based on site-specific ground investigations and historical data. The soil primarily consists of Made Ground, which is loose to dense granular material with thicknesses ranging from 9.3 meters in Design Section 1 and 11 meters in Design Section 2, overlaying Till, a stiff to very stiff clay. Table below presents geotechnical parameters used for the slope stability assessment:

Table 3.3-2: Soil Parameters

Material description	Thickness (m)	Unit weight (kN/m3)	Cohesion (kPa)	Friction angle (deg)
Made Ground	9.3	18.0	4	36
Till	20+	20.0	100	-

The groundwater information from cable percussive data was used at approximately 7.5m below the top level of the embankment. However, during the temporary works, if water-related issues such as seepage or excessive groundwater accumulation are observed, it may be necessary to implement a temporary dewatering system. This system would help to control the water levels, ensuring that excess pore water pressure does not negatively impact the stability of the slope or hinder the installation of the sheet pile retaining walls.

3.4 Slope Stability Analysis

The following information is available for the retaining sheet pile walls design and has been used in the slope stability assessment:

Design Section 1:

- This section is located at the western end of the site and covers approximately 74m of the wall.
- The retaining sheet pile walls are formed of Arcelor Mittal AZ18-700 grade S355 GP steel.
- The overall height of the embankment slope is 9m and the closest piling activity for the proposed houses is approximately 2m behind the wall and the slope crest.
- The existing slope angle to the horizontal is 40 degrees
- Network railway line is located at approximately 72.5mOD at a cutting at the toe of the slope
- The 2316 vibratory hammer will be utilised to drive the sheet piles to specified depth
- Surcharge of 273kPa with width of 1.48m is considered to account for pilling works at the top of the slope

Design Section 2:

- This section is located at the eastern end of the site and covers the remaining 91m of the wall
- The retaining sheet pile walls are formed of Arcelor Mittal AZ18-700 grade S355 GP steel.
- The height of the embankment slope varies in this section and the closest piling activity for the proposed houses is approximately 5m behind the wall and 8m behind the slope crest.
- Network railway line is located at approximately 72.5mOD at a cutting at the toe of the slope
- The 2316 vibratory hammer will be utilised to drive the sheet piles to specified depth
- Surcharge of 273kPa with width of 1.48m is considered to account for pilling works at the top of the slope

The following information is assumed for the slope stability assessment:

- The retaining sheet pile walls design is adequate and will not fail.
- A Peak Particle Velocity (PPV) of 5.1 to 50.8 mm/s has been assumed in the slope stability analysis with reference to recommendations provided by Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual dated September 2018 and BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration.
- A Peak Ground Acceleration of 0.1g-0.2g is assumed with reference to available publications for ground vibrations cause by pile driving by I.A. Hosking et al. (1988), C.H. Dowding (1966), P.B. Attewell et al. (1973) and R.A.P. Bement (1996).
- Based on aerial and satellite imagery of site, existence of loose to dense vegetation and trees are observed on the slope. With reference to G0054B A4 Guidance Earth Structures and S1054 A5 Standard Category 1 Civil Engineering Earth Structures, roots of vegetations and trees can significantly contribute to stability of slopes. Therefore, root cohesion of up to 7kPa is assumed with this assessment up to 1m depth of slope.

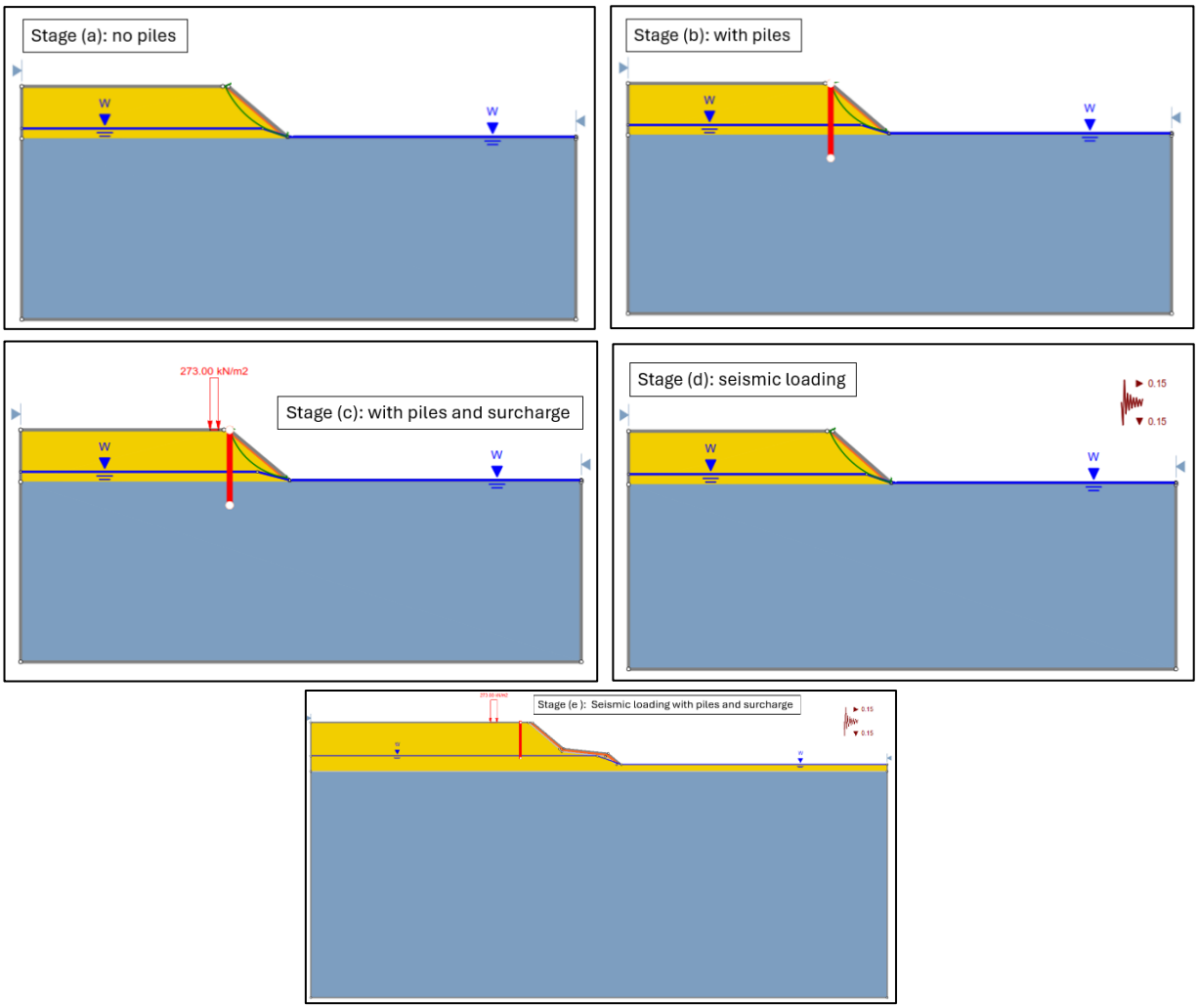
3.4.1 Slope Stability Procedure

The slope stability analysis was undertaken to assess the impact of temporary works pile installation on existing slope and adjacent Network Rail line.

The summary of structural analysis is provided below, and full report is included in Appendix 1:

- Slope stability assessment was undertaken using 2D Slope Stability Software Slide2.
- Slope stability analysis was undertaken for 2 Design Sections as explained in the previous section of this report.
- Each analysis comprises of several stages comprising of stability checks with no piles, with piles, with surcharge loading and under seismic conditions as presented below.

Figure 3.4-1: Slope Stability Assessment Stages



(a) No piles 1, (b) With piles, (c) With piles and surcharge loading, (d) Seismic loading, (e) Seismic loading with piles and surcharge

Factor of safety for each stage was calculated and is presented in the below table.

Table 3.4-1: Factory of safety for each stage

Stage	Design Section 1			Design Section 2		
	DA1-C1	DA1-C2	Seismic*	DA1-C1	DA1-C2	Seismic*
No piles	1.25	1.07	-	1.54	1.30	-
With piles	1.31	1.12	-	1.54	1.31	-
With piles and surcharge	1.31	1.12	-	1.54	1.31	-
Seismic loading	-	-	1.04	-	-	1.24
Seismic loading with piles	-	-	1.10	-	-	1.24

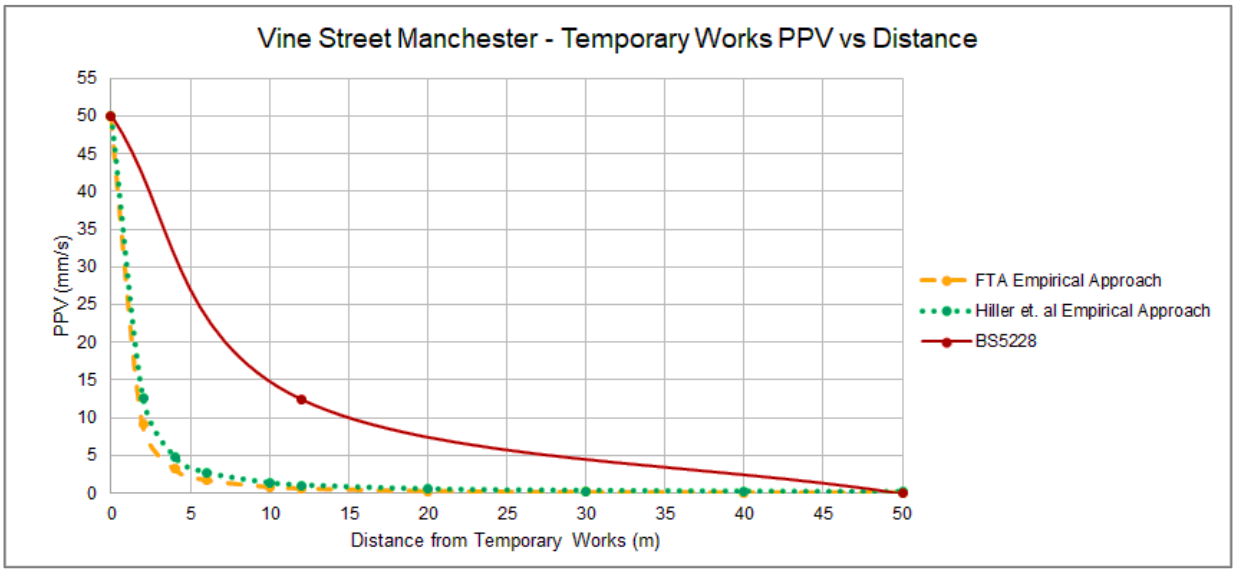
*Partial factor of 1.0 used for actions and materials.

3.5 Peak Particle Velocity (PPV)

The predicted PPV values during temporary piling works are calculated based on available literature, historic data, and applicable standards such as BS5228 and BS 785. However, actual PPV values can only be confirmed by monitoring at site.

With reference to empirical approaches of vibrations predictions of foundation installation activities proposed by Hiller and Crabb (2000), historic case data on vibrations levels measured for similar piling works in the Manchester area in BS5228 and BS7385, the below predicted PPV values are anticipated.

Figure 3.5-1: Predicted PPV Values due to temporary piling works



The predicted PPV values were calculated using two established empirical correlations, with a reference PPV value of 50.8 mm/s at the temporary piling location (distance = 0). Additionally, an upper and lower bound of 50.8 mm/s at the piling location (distance = 0) and 12.5 mm/s at the railway line (approximately 12m away) was considered as a worst-case scenario. This is based on historical data on vibration levels measured for similar piling works in the Manchester area and guidance provided in BS5228 and BS7385.

The actual PPV values are anticipated to fall within this range, however, verification through on-site monitoring is required to confirm the predictions.

3.6 Monitoring and Mitigation Works

Based on slope stability analysis, monitoring PPV values are recommended at site to verify slope stability and behaviour and establish mitigation and monitoring response in case of variant than expected conditions at site.

3.6.1 Mitigation Measures

It is recommended that the temporary pilling works commence from Design Section 2, as this section has a lower slope height, a lower bench and a higher factory of safety for slope stability which suggests a safer starting point for the piling activities. It is recommended that the PPV values are monitored at this section and any potential slope failure at this section would be distal from the railway due to the presence of the lower bench in this section, reducing immediate risk and limiting the impact of any potential shallow failures on the adjacent Network Rail asset.

Based on observations and findings during the pile installation at Section 2, further control measures will be implemented as necessary. These may include using alternative driving equipment or adjusting the pile installation method to ensure safety and stability.

4 Summary and Conclusions

Key GeoSolutions Ltd (KGS) was commissioned by Earthwork Support Specialist (CE) Ltd to perform a slope stability assessment for the temporary works associated with installing retaining sheet pile walls at Vine Street, Gorton, Manchester. The purpose of the assessment is to evaluate the impact of the piling works on the adjacent Network Rail slope and railway. This report assessed potential risks, mitigation measures, and established monitoring works for the slope stability during the works.

The analysis considered the potential dynamic effects of the piling works, with specific focus on the use of the 2316 vibratory hammer for sheet pile driving. The assessment involved several stages, including slope stability checks without piles, with piles, with surcharge loading, and under seismic conditions.

Results of the stability assessment showed acceptable factors of safety under the various conditions examined. The seismic loading conditions resulted in the lowest but acceptable FOS values suggesting slope stability during pile driving works. In addition to the slope stability assessment, monitoring and mitigation measures were proposed to ensure slope stability during the works, and additional considerations were made regarding the potential stabilising effects of vegetation roots on the slope.

The predicted PPV values during temporary piling works were calculated using empirical correlations, historical case data, and standards such as BS5228 and BS7385. A reference PPV value of 50.8 mm/s at the piling location (distance = 0) was assumed, with an upper and lower bound ranging from 50.8 mm/s at the piling location to 12.5 mm/s at the railway line (approximately 12 m away) as a worst-case scenario.

It is recommended that the temporary piling works begin at Design Section 2, as it presents a safer starting point due to its lower slope height, lower bench, and higher factor of safety for slope stability. This approach minimises immediate risks and limits the impact of potential shallow failures on the nearby Network Rail assets. It is recommended that the PPV is monitored, and based on the findings during pile installation, further control measures, such as adjusting the equipment or installation method, will be implemented as needed to ensure continued safety and stability.

5 Summary of Geotechnical Risks

5.1 Risk Assessment

Table 5.1-1: Risk Classification Matrix

Likelihood		Severity				
		1 Minor	2 Moderate	3 Serious	4 Major	5 Catastrophic
1	Extremely Unlikely	1	2	3	4	5
2	Unlikely	2	4	6	8	10
3	Likely	3	6	9	12	15
4	Extremely Likely	4	8	12	16	20
5	Almost Certain	5	10	15	20	25

Table 5.1-2: Risk Classification Definitions

Risk Classification	
Low (1 to 8)	Ensure assumed control measures are maintained and reviewed as necessary.
Medium (9 to 19)	Additional control measures needed to reduce risk rating to a level that is equivalent to a test of “reasonably required” for.
High (20 to 25)	Activity not permitted. Hazard to be avoided or risk to be reduced to a tolerable level.

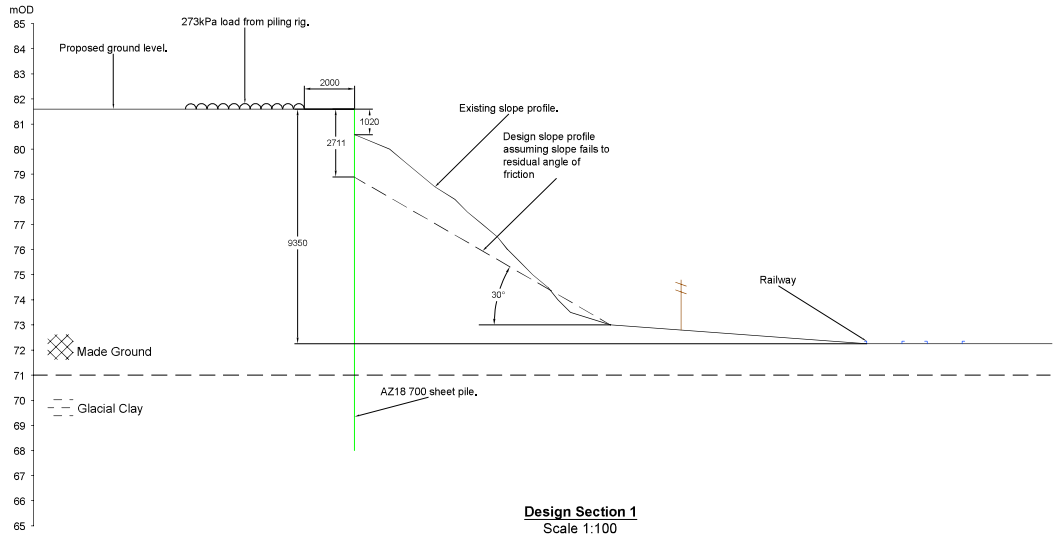
Table 5.1-3: Potential Severity Definitions

Potential Severity of Harm Occurring		
1	Minor	Minor damage or loss (no human injury)
2	Moderate	Moderate damage or loss (slight injury or illness)
3	Serious	Substantial damage or loss (serious injury or illness)
4	Major	Major damage or loss (fatal injury or illness)
5	Catastrophic	Catastrophic loss or damage (multiple fatalities)

Table 5.1-4: Risk Matrix

Risk ID	Hazard	Consequence	(L)	(S)	Risk	Mitigation	(L)	(S)	Residual Risk
1	Ground conditions could be poorer than anticipated.	Slope instability or failure	3	4	12	Monitoring to be established on the slope and stability of slope monitored during piling works.	1	4	4
2	Excessive surcharge	Slope instability or failure	2	4	8	Slope stability assessment undertaken assuming 273kPa surcharge. The contractor to ensure specified surcharge is not exceeded.	1	4	4
3	Failure of retaining sheet piles	Slope instability or failure	2	4	8	Slope stability assessment undertaken assuming pile design is adequate. The contractor to ensure specified pile design is implemented.	1	4	4

Appendix 1: Project Drawings



Design Section 1
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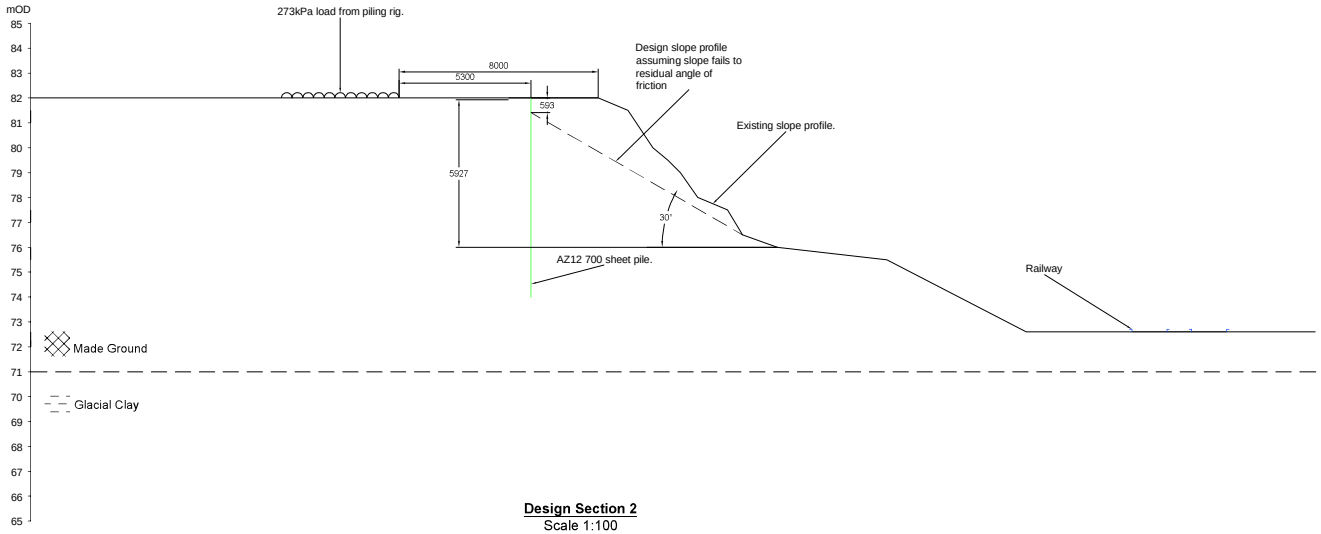

Design Section 2
Scale 1:100

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CDM 2015 :

See Appendix F of calculations

NOTES :

General

1. All dimensions mm UNO
2. All elevations mOD UNO
3. Do not scale, use figured dimensions only

REV.	AMENDMENTS	DRAWN	CHECK	DATE
-	-	-	-	-
A	Addition of second design section	SJ	WF	

Byland engineering limited
Geotechnical Design Engineers

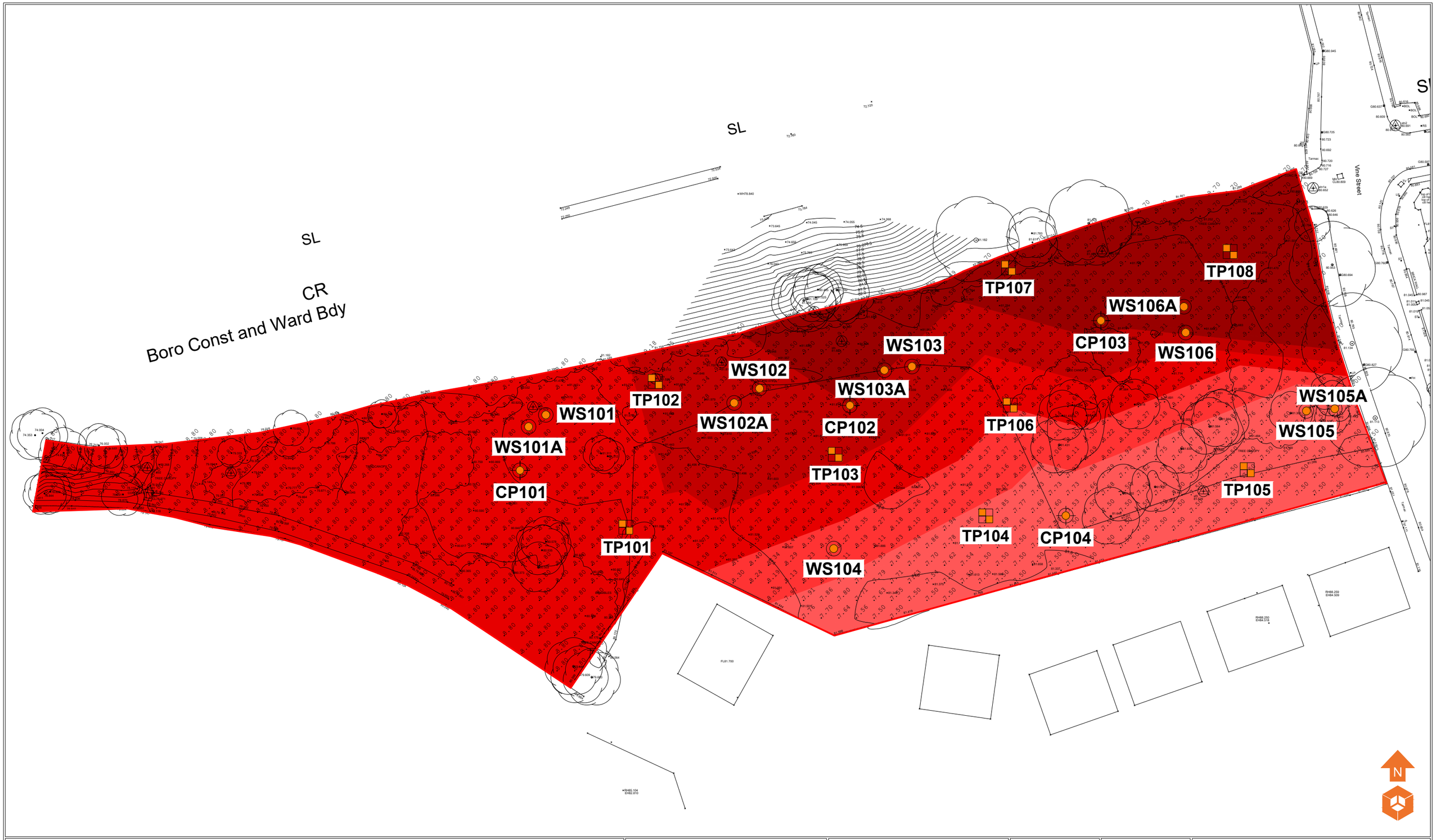
Client :
Kirkland Development Limited

Project :
Vine Street, Manchester

Title :
Sheet Pile Retaining Wall Analysis Section

Drawing Status :
FOR INFORMATION

	INITIALS	DATE	SCALE	DRAWING NUMBER
DRAWN	SJ	22/09/23	1:100	2864 - 001
CHECKED	WF	22/09/23		
DATE : SEPTEMBER 2023			ORIGINAL SHEET SIZE A1	REVISION : 0



Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location

Made Ground Depth (m)

- Depth of Made Ground 7.00 - 7.49m
- Depth of Made Ground 7.50 - 7.99m
- Depth of Made Ground 8.00 - 8.49m
- Depth of Made Ground 8.50 - 8.99m
- Depth of Made Ground 9.00 - 9.50m
- Depth of Made Ground >9.50m

Notes:

Phase	Issue	Date	Drawn	Checked
P1	REVB	09.12.2021	LM	AS
P1	REVA	07.12.2021	EB	AS

Client: Kirkland

Job No: 14-944

Date: 09.12.2021

Drawing No: 006

Scale: NTS@ A3

Job Title: Vine Street, Gorton

Drawing Title: Depth of Made Ground Plan

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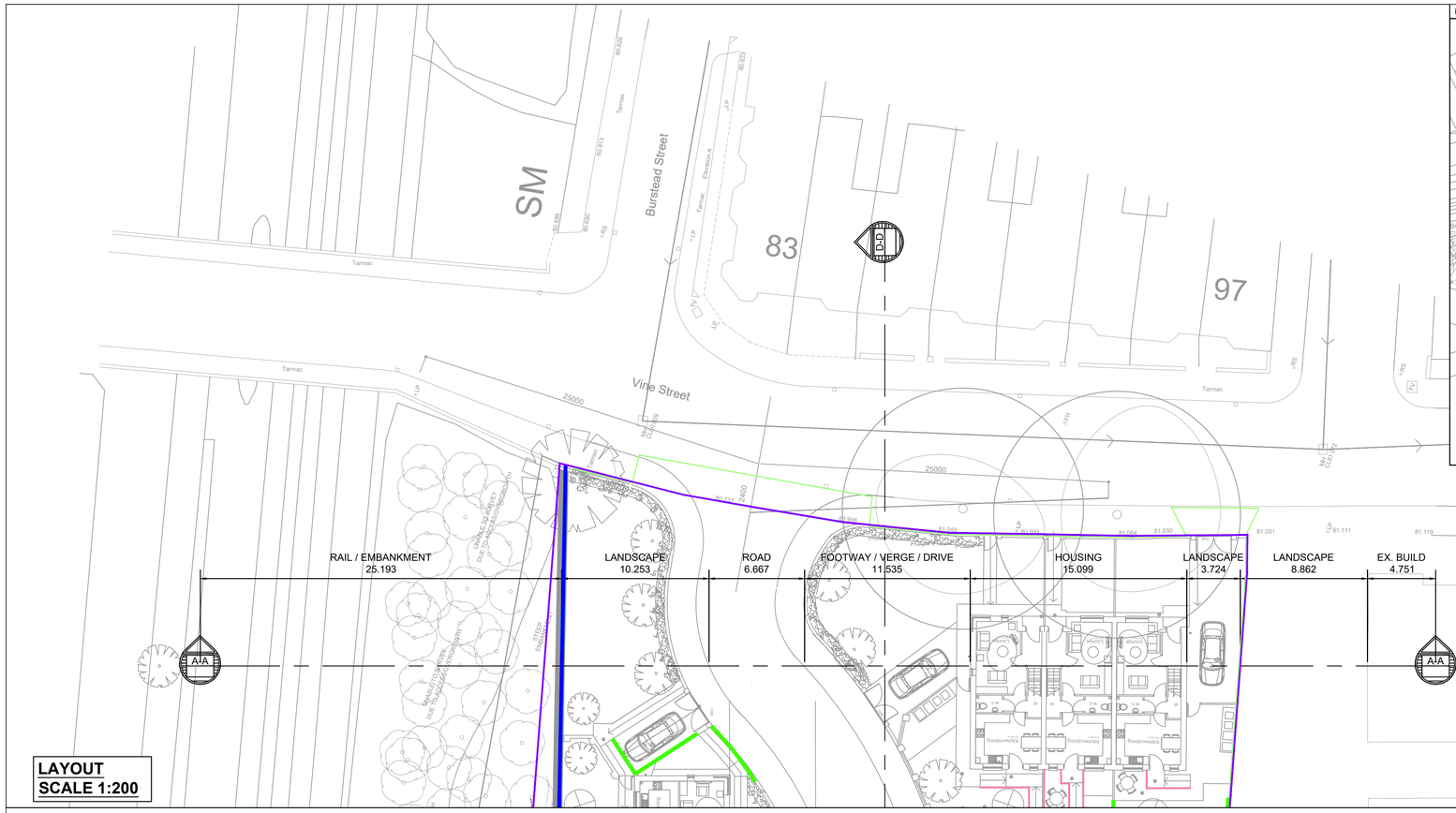
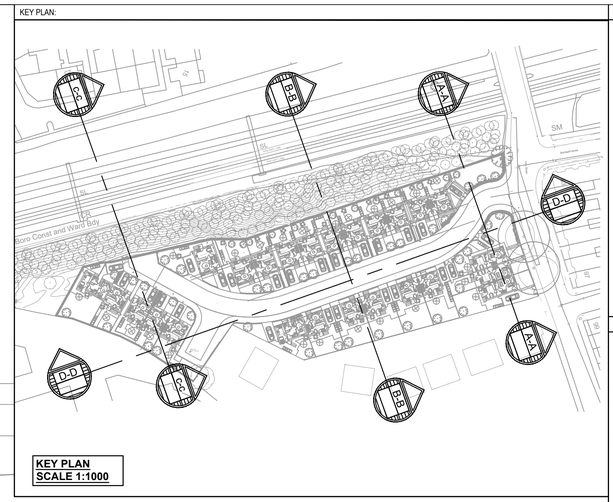


LAYOUT
SCALE 1:200



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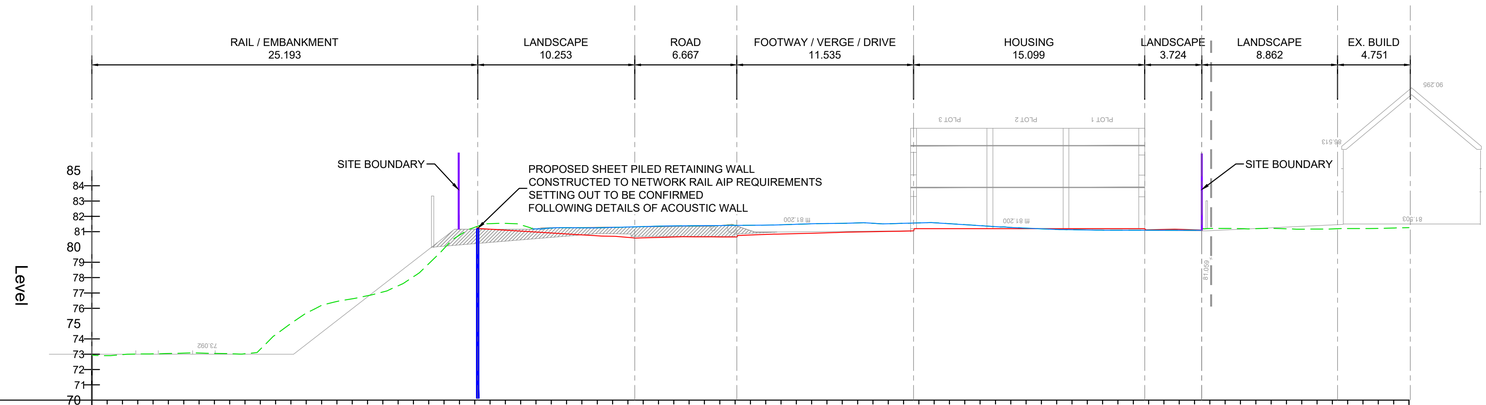
DRAWING NOTES:

- EXISTING GROUND LEVEL / LIDAR PROFILE
- TOPOGRAPHICAL SURVEY REV C LEVEL PROFILE
- PROPOSED FINISHED LEVEL PROFILE
- PROPOSED SHEET PILED RETAINING WALL
- PROPOSED FLAG ON EDGE RETAINING
- SITE BOUNDARY



Chainage	Existing Levels	Proposed Levels
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01.000	72.909	
02.000	72.975	
03.000	73.011	
04.000	73.021	
05.000	73.048	
06.000	73.071	
07.000	73.075	
08.000	73.051	
09.000	73.032	
10.000	73.029	
11.000	73.317	
12.000	74.281	
13.000	75.006	
14.000	75.682	
15.000	76.189	
16.000	76.442	
17.000	76.616	
18.000	76.819	
19.000	77.060	
20.000	77.469	
21.000	78.062	
22.000	78.913	
23.000	79.906	
24.000	80.770	
25.000	81.288	
26.000	81.526	81.164
27.000	81.541	81.102
28.000	81.455	81.039
29.000	81.177	80.976
30.000	81.235	80.913
31.000	81.261	80.851
32.000	81.250	80.789
33.000	81.249	80.732
34.000	81.276	80.701
35.000	81.304	80.624
36.000	81.332	80.597
37.000	81.359	80.624
38.000	81.378	80.654
39.000	81.386	80.668
40.000	81.395	80.662
41.000	81.402	80.657
42.000	81.411	80.653
43.000	81.421	80.781
44.000	81.431	80.818
45.000	81.451	80.851
46.000	81.483	80.875
47.000	81.516	80.899
48.000	81.532	80.927
49.000	81.542	80.956
50.000	81.570	80.977
51.000	81.545	80.996
52.000	81.517	81.014
53.000	81.546	81.036
54.000	81.574	81.200
55.000	81.584	81.200
56.000	81.521	81.200
57.000	81.457	81.200
58.000	81.393	81.200
59.000	81.330	81.200
60.000	81.274	81.200
61.000	81.230	81.200
62.000	81.186	81.200
63.000	81.142	81.200
64.000	81.127	81.200
65.000	81.113	81.200
66.000	81.098	81.200
67.000	81.092	81.200
68.000	81.092	81.200
69.000	81.092	81.120
70.000	81.092	81.145
71.000	81.093	81.153
72.000	81.093	81.123
73.000	81.209	
74.000	81.213	
75.000	81.198	
76.000	81.194	
77.000	81.210	
78.000	81.191	
79.000	81.163	
80.000	81.170	
81.000	81.179	
82.000	81.208	
83.000	81.201	
84.000	81.215	
85.000	81.240	
86.000	81.261	

A-A - CROSS SECTION
SCALE: H 1:200,V 1:200. DATUM: 70.000

1 0 1 2 3 4 5
SCALE 1:100 m

REV	DESCRIPTION	DATE	BY	CHKD
P06	REVISED TO SUIT ARCHITECTS COMMENTS	05.05.23	LWP	PB
P05	REVISED TO SUIT ARCHITECTS COMMENTS	28.04.23	LWP	PB
P04	REVISED TO SUIT ARCHITECTS COMMENTS	19.04.23	LWP	PB
P03	REVISED TOPO SURVEY PROFILE ADDED	18.04.23	LWP	PB
P02	CROSS SECTIONS EXTENDED	18.04.23	LWP	PB
P01	ISSUED FOR COMMENT	14.04.23	LWP	PB

ORIGINATOR:

RIDGE

5TH FLOOR
BELVEDERE HOUSE
12 BOOTH STREET
MANCHESTER, M2 4AW
TEL: 0161 833 9579
WWW.RIDGE.CO.UK

CLIENT:
KIRKLAND DEVELOPMENT LTD

IN ASSOCIATION WITH:

PROJECT:
VINE STREET
GORTON

TITLE:
PROPOSED FINISHED LEVELS
CROSS SECTIONS
SHEET 1

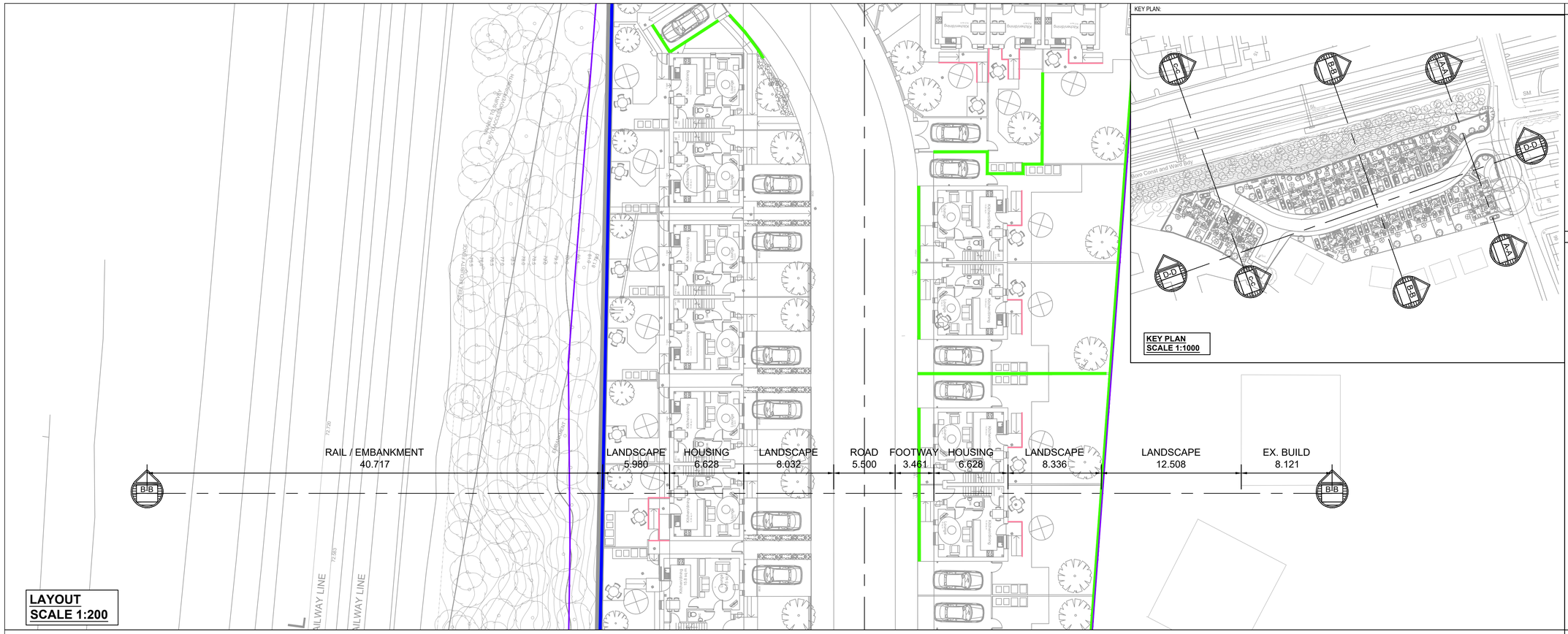
ENG/TECH:	CSE:	ICSE:	SCALE: 1:200 @ A1
LWP	PB	PB	STATUS ISSUEPRELIMINARY

STATUS: PRELIMINARY

UNLESS ISSUED FOR CONSTRUCTION - WORKS AT CLIENT/CONTRACTORS RISK

SUITABILITY: S0 - Initial Status or WIP

PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
VSG	RDG	XX	XX	DR	C	0004	P06



KEY PLAN:

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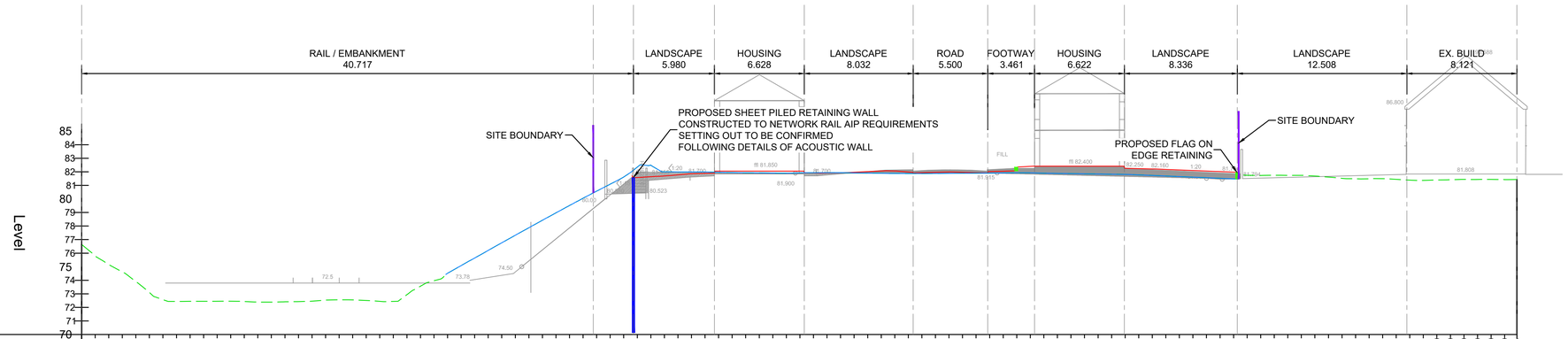
DRAWING NOTES:

- EXISTING GROUND LEVEL / LIDAR PROFILE
- TOPOGRAPHICAL SURVEY REV C LEVEL PROFILE
- PROPOSED FINISHED LEVEL PROFILE
- PROPOSED SHEET PILED RETAINING WALL
- PROPOSED FLAG ON EDGE RETAINING
- SITE BOUNDARY



Chainage	Existing Levels	Proposed Levels
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01.000	75.801	
02.000	75.166	
03.000	74.622	
04.000	73.910	
05.000	73.100	
06.000	72.571	
07.000	72.443	
08.000	72.447	
09.000	72.450	
10.000	72.453	
11.000	72.453	
12.000	72.432	
13.000	72.394	
14.000	72.392	
15.000	72.411	
16.000	72.428	
17.000	72.458	
18.000	72.537	
19.000	72.561	
20.000	72.554	
21.000	72.512	
22.000	72.444	
23.000	72.442	
24.000	72.935	
25.000	73.561	
26.000	73.964	
27.000	74.516	
28.000	75.083	
29.000	75.642	
30.000	76.202	
31.000	76.761	
32.000	77.321	
33.000	77.875	
34.000	78.426	
35.000	78.973	
36.000	79.515	
37.000	80.050	
38.000	80.574	
39.000	81.087	
40.000	81.621	
41.000	82.347	81.582
42.000	82.499	81.637
43.000	81.999	81.696
44.000	81.991	81.774
45.000	81.992	81.858
46.000	81.993	81.883
47.000	81.965	82.050
48.000	81.943	82.050
49.000	81.932	82.050
50.000	81.921	82.050
51.000	81.910	82.050
52.000	81.902	82.050
53.000	81.925	82.050
54.000	81.936	81.921
55.000	81.937	81.918
56.000	81.937	81.939
57.000	81.920	81.970
58.000	81.904	82.014
59.000	81.886	82.058
60.000	81.877	82.056
61.000	81.874	81.981
62.000	81.871	81.934
63.000	81.879	81.959
64.000	81.886	81.984
65.000	81.894	81.964
66.000	81.902	81.939
67.000	81.909	82.018
68.000	81.917	82.043
69.000	81.924	82.268
70.000	81.925	82.398
71.000	81.902	82.410
72.000	81.886	82.410
73.000	81.871	82.410
74.000	81.855	82.410
75.000	81.840	82.410
76.000	81.824	82.410
77.000	81.809	82.259
78.000	81.774	82.235
79.000	81.732	82.211
80.000	81.691	82.173
81.000	81.649	82.133
82.000	81.608	82.093
83.000	81.568	82.054
84.000	81.524	82.014
85.000	81.480	81.975
86.000	81.744	
87.000	81.730	
88.000	81.748	
89.000	81.740	
90.000	81.739	
91.000	81.686	
92.000	81.611	
93.000	81.522	
94.000	81.482	
95.000	81.482	
96.000	81.492	
97.000	81.444	
98.000	81.386	
99.000	81.368	
100.000	81.398	
101.000	81.417	
102.000	81.437	
103.000	81.435	
104.000	81.441	
105.000	81.427	
105.994	81.429	

B-B -CROSS SECTION
SCALE: H 1:200,V 1:200. DATUM: 70.000

1 0 1 2 3 4 5
SCALE 1:100 m

REV	DESCRIPTION	DATE	BY	CHKD
P06	REVISED TO SUIT ARCHITECTS COMMENTS	05.05.23	LWP	PB
P05	REVISED TO SUIT ARCHITECTS COMMENTS	28.04.23	LWP	PB
P04	REVISED TO SUIT ARCHITECTS COMMENTS	19.04.23	LWP	PB
P03	REVISED TO SUIT ARCHITECTS COMMENTS	19.04.23	LWP	PB
P02	REVISED TOPO SURVEY PROFILE ADDED	18.04.23	LWP	PB
P01	ISSUED FOR COMMENT	18.04.23	LWP	PB

ORIGINATOR:

RIDGE

5TH FLOOR
BELVEDERE HOUSE
12 BOOTH STREET
MANCHESTER, M2 4AW
TEL: 0161 833 9579
WWW.RIDGE.CO.UK

CLIENT:
KIRKLAND DEVELOPMENT LTD

IN ASSOCIATION WITH:

PROJECT:
VINE STREET
GORTON

TITLE:
PROPOSED FINISHED LEVELS
CROSS SECTIONS
SHEET 2

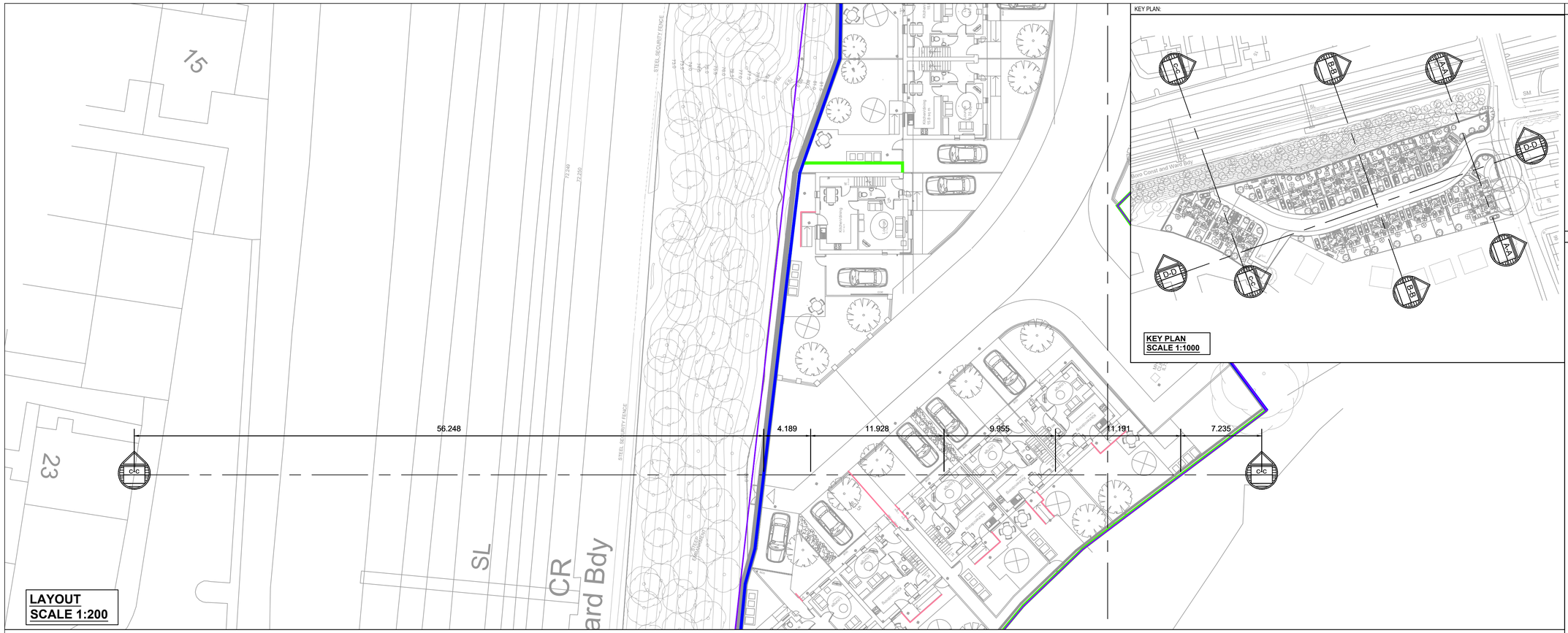
ENG/TECH:	CSE:	ICSE:	SCALE: 1:200 @ A1
LWP	PB	PB	STATUS ISSUEPRELIMINARY

STATUS: PRELIMINARY

UNLESS ISSUED FOR CONSTRUCTION - WORKS AT CLIENT/CONTRACTORS RISK

SUITABILITY: S0 - Initial Status or WIP

PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
VSG	RDG	XX	XX	DR	C	0005	P06



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DRAWING NOTES:

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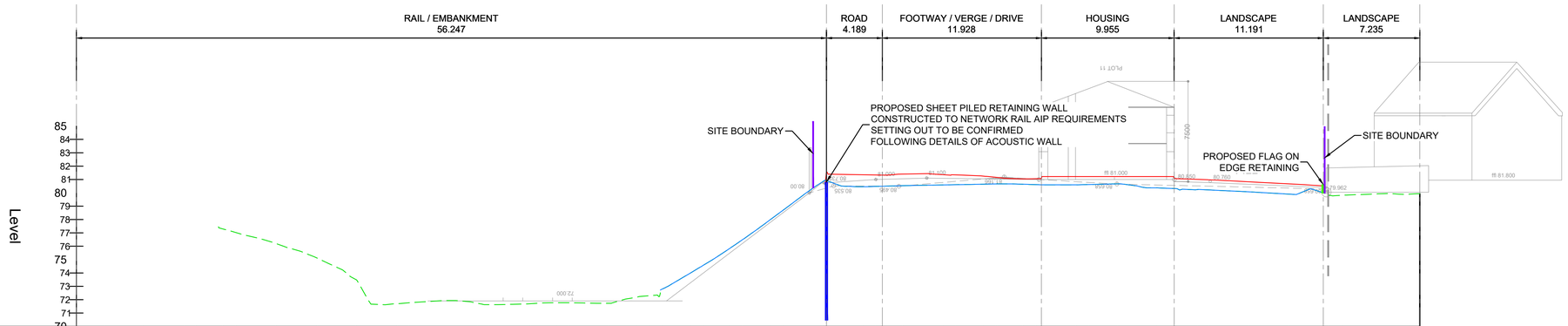
- TOPOGRAPHICAL SURVEY REV C LEVEL PROFILE
- PROPOSED FINISHED LEVEL PROFILE
- PROPOSED SHEET PILED RETAINING WALL
- PROPOSED FLAG ON EDGE RETAINING
- SITE BOUNDARY



Chainage	Existing Levels	Proposed Levels
00.000		
01.000		
02.000		
03.000		
04.000		
05.000		
06.000		
07.000		
08.000		
09.000		
10.000		
11.000	77.287	
12.000	77.010	
13.000	76.748	
14.000	76.503	
15.000	76.189	
16.000	75.850	
17.000	75.543	
18.000	75.136	
19.000	74.684	
20.000	74.195	
21.000	73.485	
22.000	71.794	
23.000	71.627	
24.000	71.696	
25.000	71.770	
26.000	71.835	
27.000	71.902	
28.000	71.885	
29.000	71.745	
30.000	71.626	
31.000	71.634	
32.000	71.660	
33.000	71.695	
34.000	71.751	
35.000	71.773	
36.000	71.769	
37.000	71.750	
38.000	71.731	
39.000	71.728	
40.000	71.992	
41.000	72.186	
42.000	72.299	
43.000	72.827	
44.000	73.378	
45.000	73.969	
46.000	74.588	
47.000	75.182	
48.000	75.842	
49.000	76.522	
50.000	77.226	
51.000	77.963	
52.000	78.705	
53.000	79.451	
54.000	80.187	
55.000	80.859	
56.000	80.642	81.386
57.000	80.487	81.369
58.000	80.455	81.352
59.000	80.483	81.336
60.000	80.512	81.343
61.000	80.538	81.407
62.000	80.556	81.425
63.000	80.574	81.422
64.000	80.593	81.359
65.000	80.611	81.343
66.000	80.630	81.303
67.000	80.650	81.252
68.000	80.671	81.159
69.000	80.669	81.075
70.000	80.643	81.043
71.000	80.611	81.059
72.000	80.601	81.215
73.000	80.600	81.215
74.000	80.599	81.215
75.000	80.622	81.215
76.000	80.647	81.215
77.000	80.672	81.215
78.000	80.587	81.215
79.000	80.411	81.215
80.000	80.371	81.215
81.000	80.333	81.215
82.000	80.270	81.042
83.000	80.237	81.010
84.000	80.214	80.973
85.000	80.167	80.934
86.000	80.121	80.880
87.000	80.072	80.826
88.000	80.014	80.774
89.000	79.956	80.722
90.000	79.898	80.671
91.000	80.084	80.618
92.000	80.168	80.554
93.000	79.813	
94.000	79.819	
95.000	79.864	
96.000	79.899	
97.000	79.937	
98.000	79.911	
99.000	79.904	
100.000	79.934	
100.745		

C-C - CROSS SECTION
SCALE: H 1:200,V 1:200. DATUM: 70.000

1 0 1 2 3 4 5
SCALE 1:100 m

REV	DESCRIPTION	DATE	BY	CHKD
P04	REVISED TO SUIT ARCHITECTS COMMENTS	05.05.23	LWP	PB
P03	REVISED TO SUIT ARCHITECTS COMMENTS	28.04.23	LWP	PB
P02	UPDATED TO SUIT REVISED LEVELS	21.04.23	LWP	PB
P01	ISSUED FOR COMMENT	19.04.23	LWP	PB

ORIGINATOR:

RIDGE

5TH FLOOR
BELVEDERE HOUSE
12 BOOTH STREET
MANCHESTER, M2 4AW
TEL: 0161 833 9579
WWW.RIDGE.CO.UK

CLIENT:
KIRKLAND DEVELOPMENT LTD

IN ASSOCIATION WITH:

PROJECT:
VINE STREET
GORTON

TITLE:
PROPOSED FINISHED LEVELS
CROSS SECTIONS
SHEET 3

ENG/TECH:	CSE:	ICSE:	SCALE: 1:200 @ A1
LWP	PB	PB	STATUS ISSUEPRELIMINARY

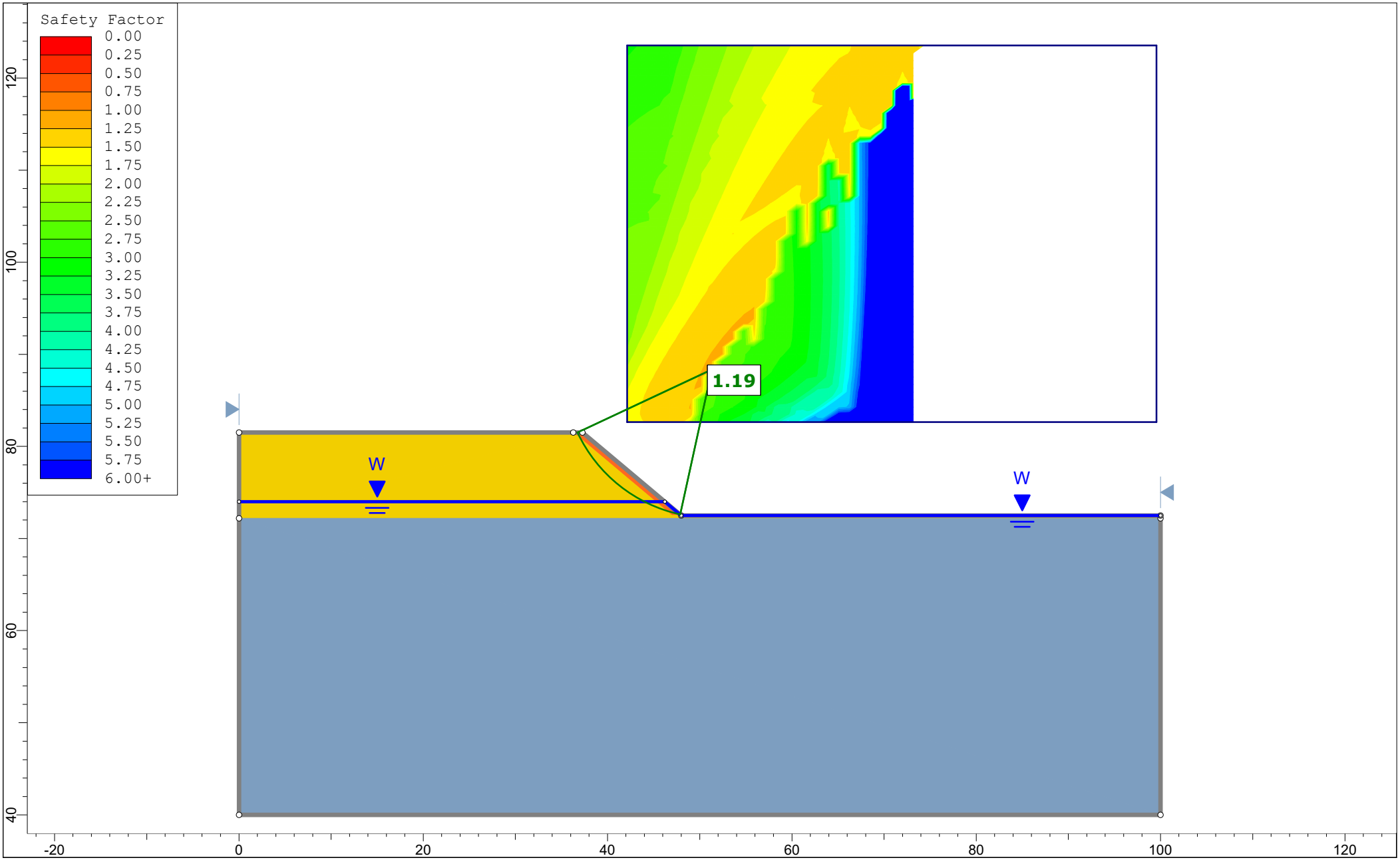
STATUS: PRELIMINARY

UNLESS ISSUED FOR CONSTRUCTION - WORKS AT CLIENT/CONTRACTORS RISK

SUITABILITY: S0 - Initial Status or WIP

PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
VSG	RDG	XX	XX	DR	C	0006	P04

Appendix 2: Slope Stability Report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2.75
3.00
3.25
3.50
3.75
4.00
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4.75
5.00
5.25
5.50
5.75
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W
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100
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80
100
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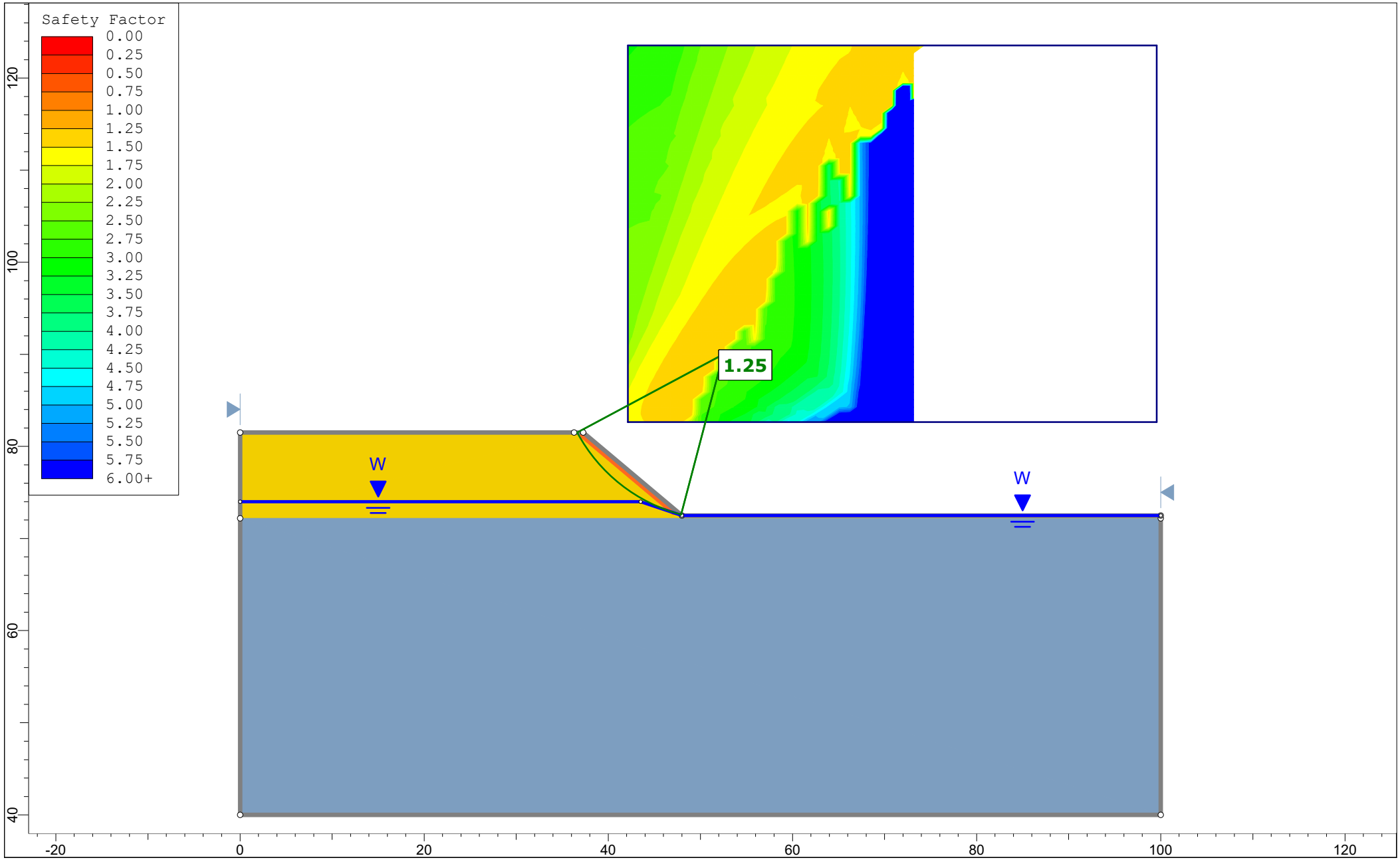
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4.75
5.00
5.25
5.50
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80
100
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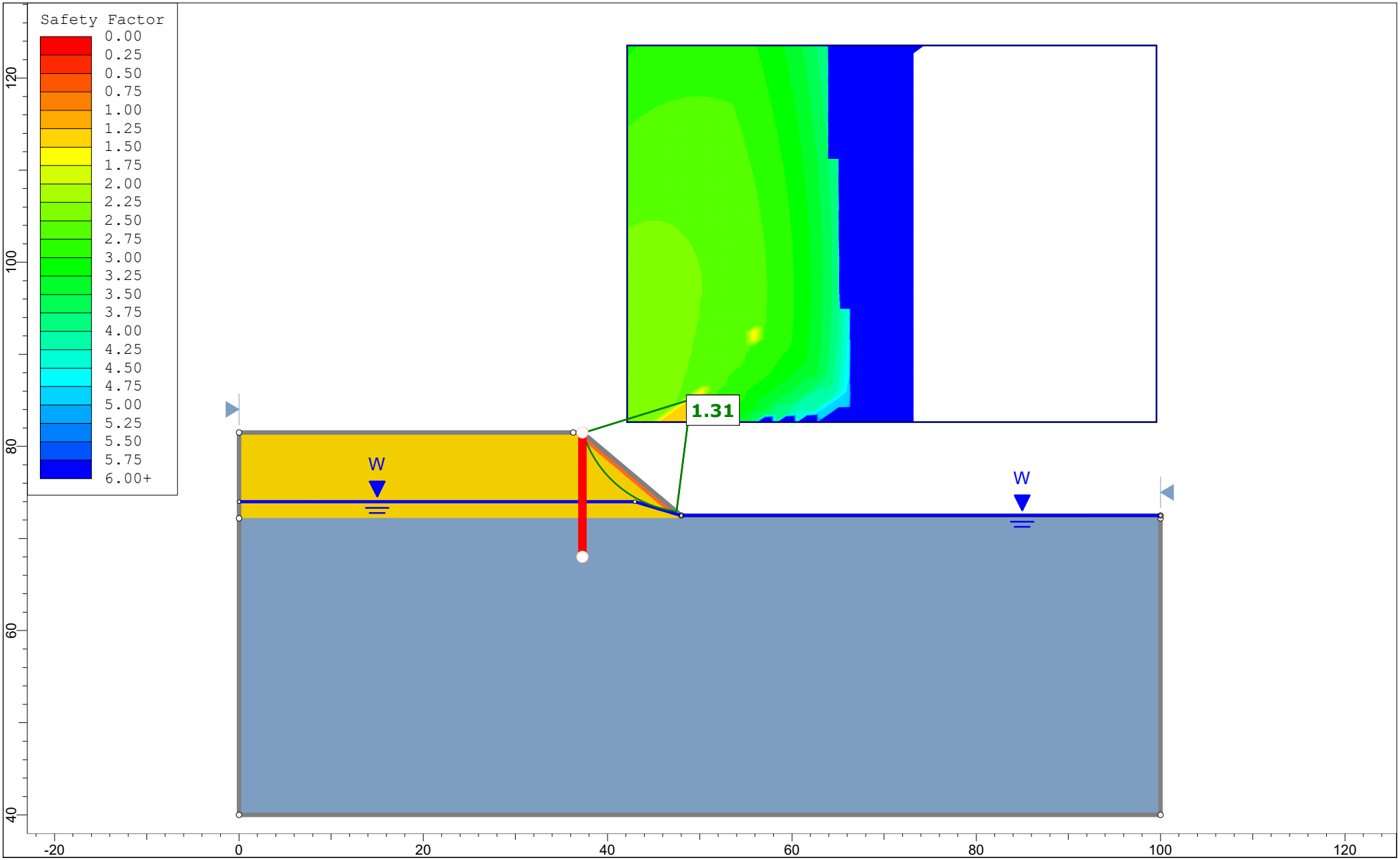
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3.50
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4.00
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4.50
4.75
5.00
5.25
5.50
5.75
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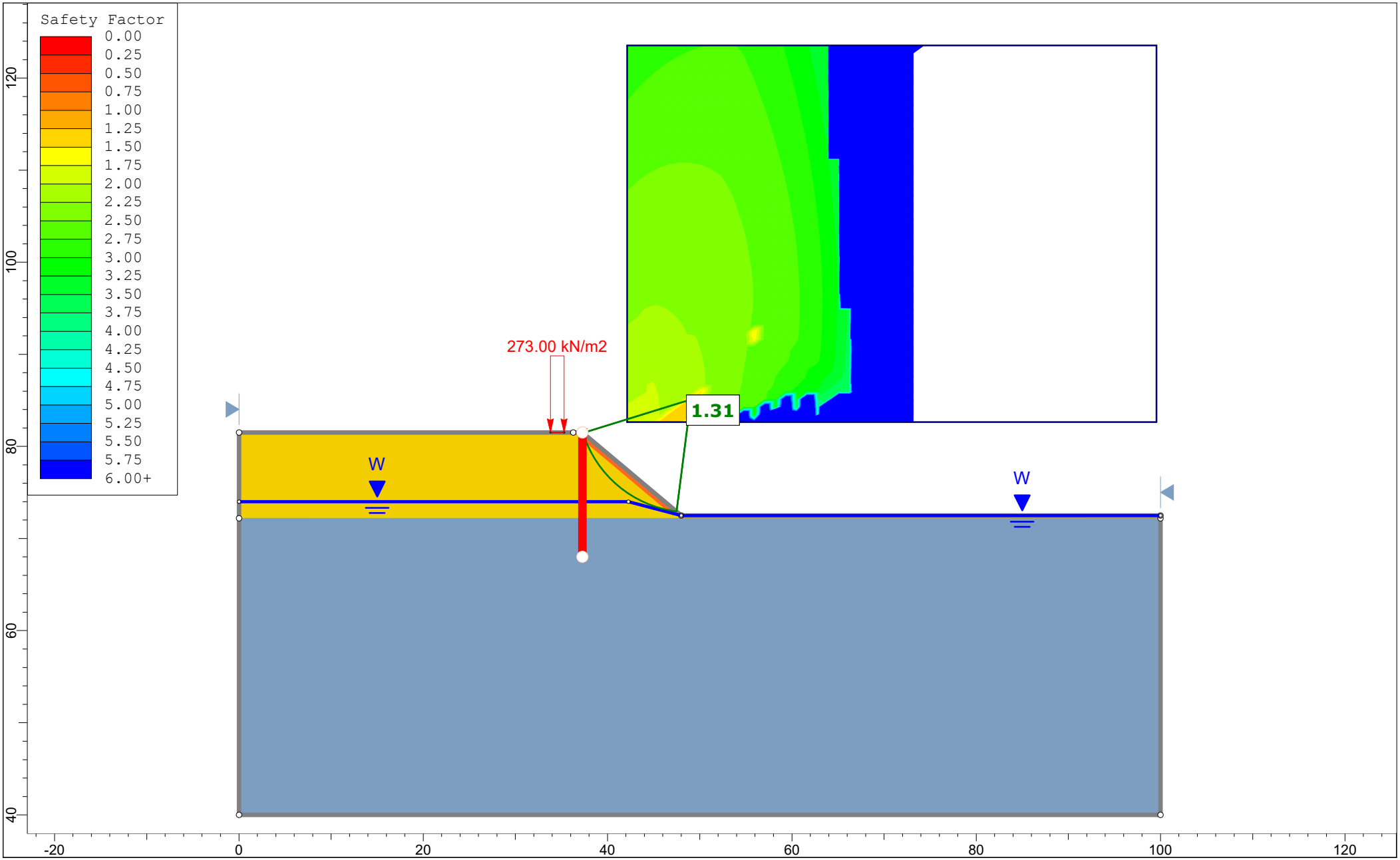
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2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00+
273.00 kN/m2
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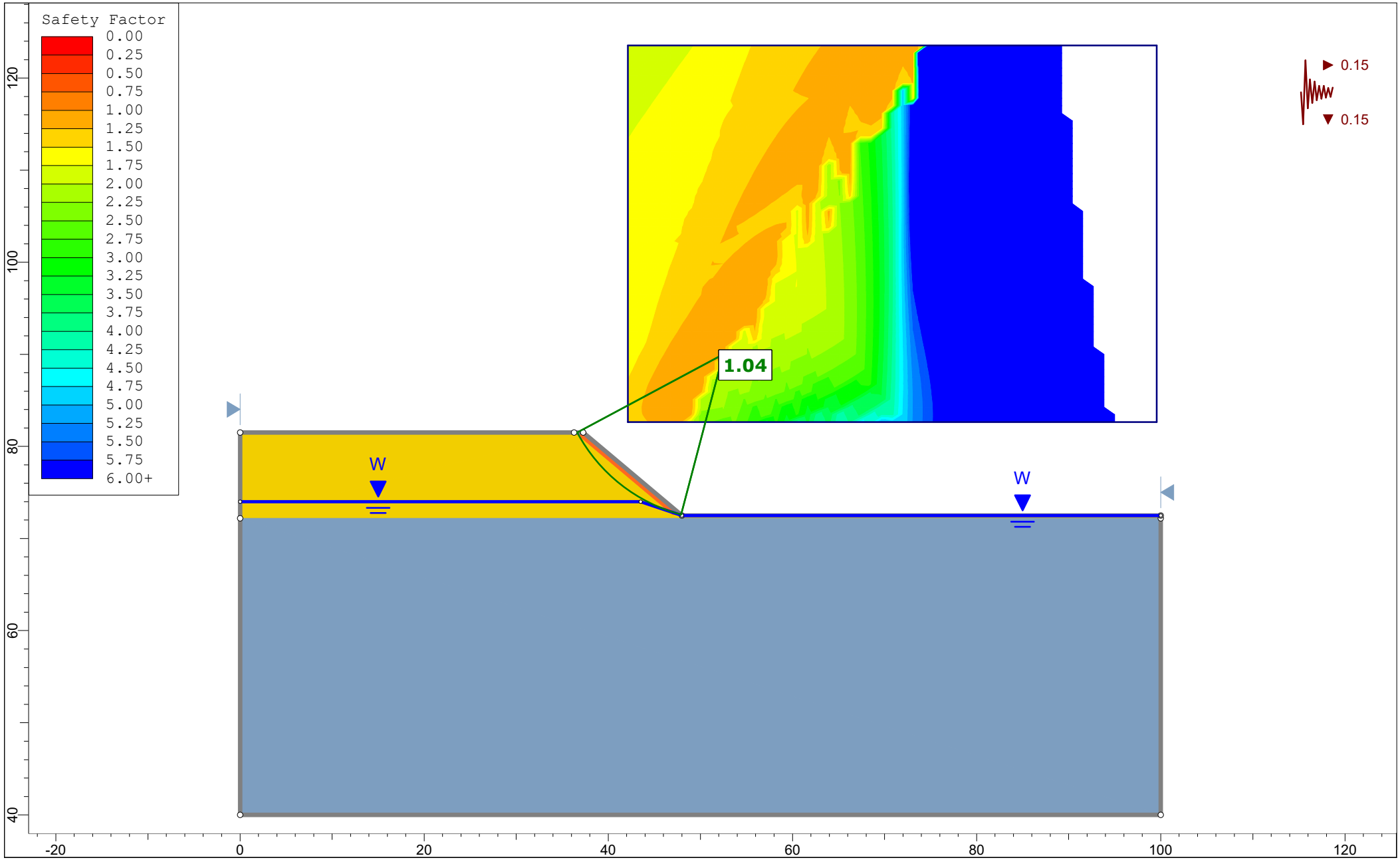
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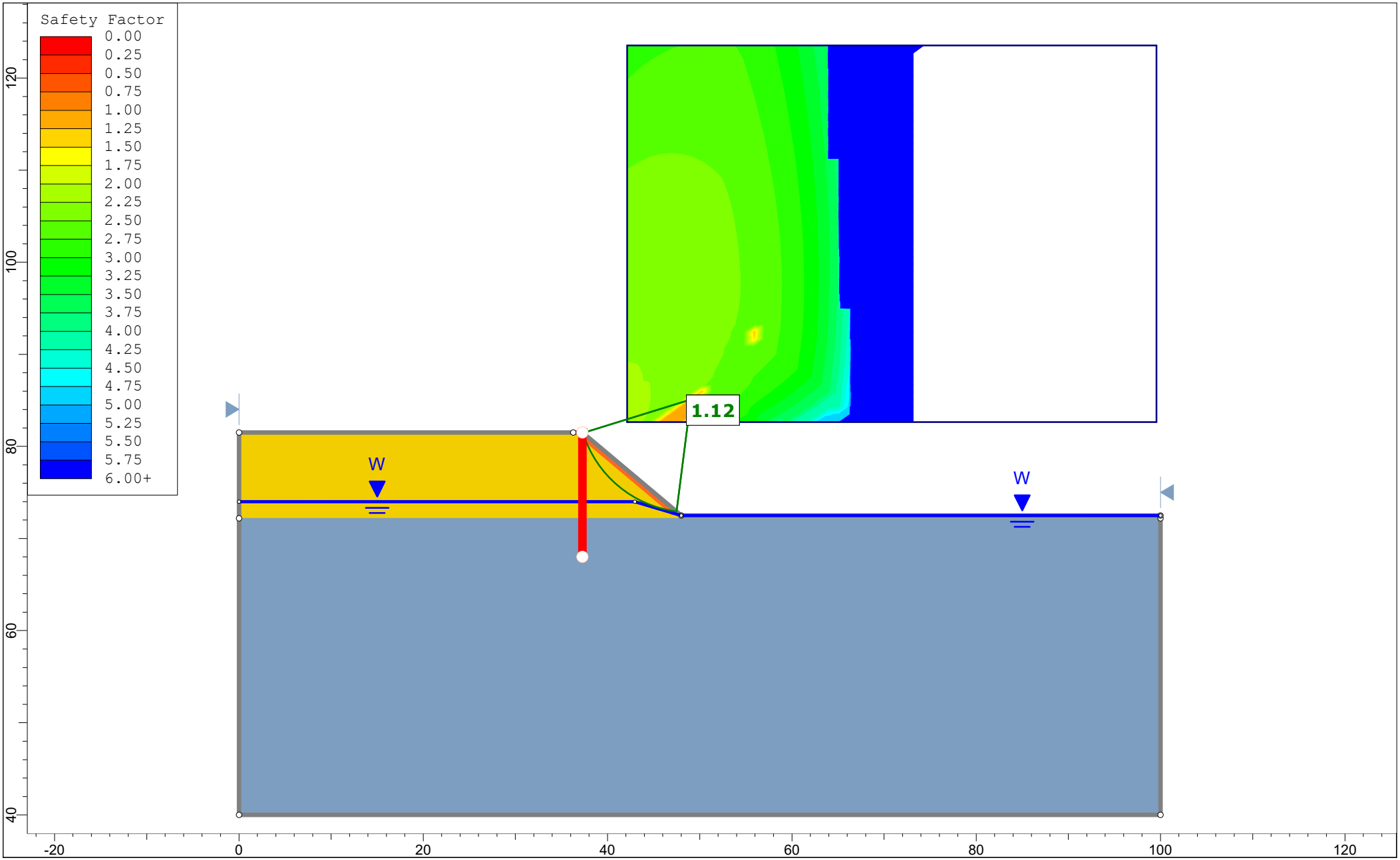
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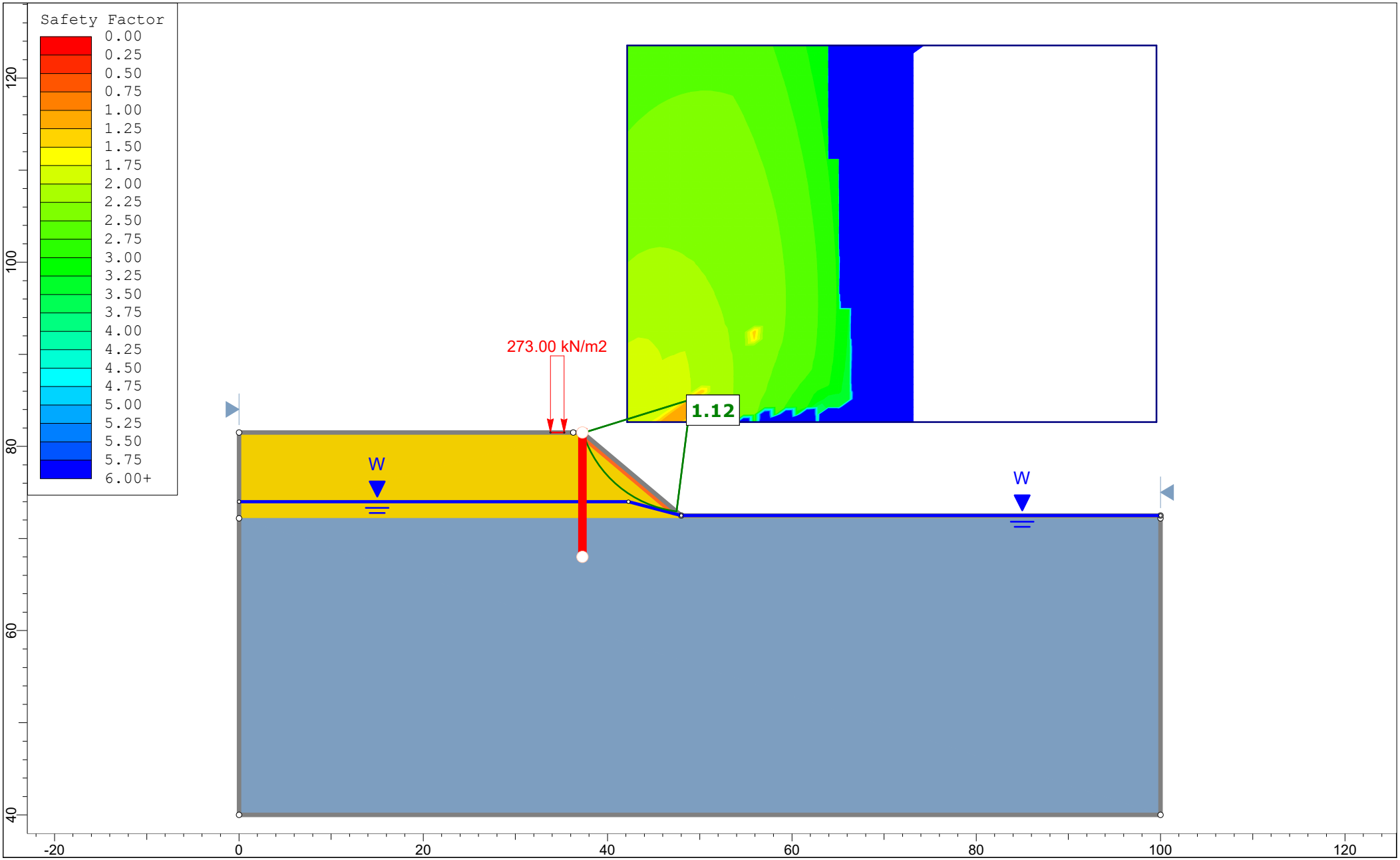
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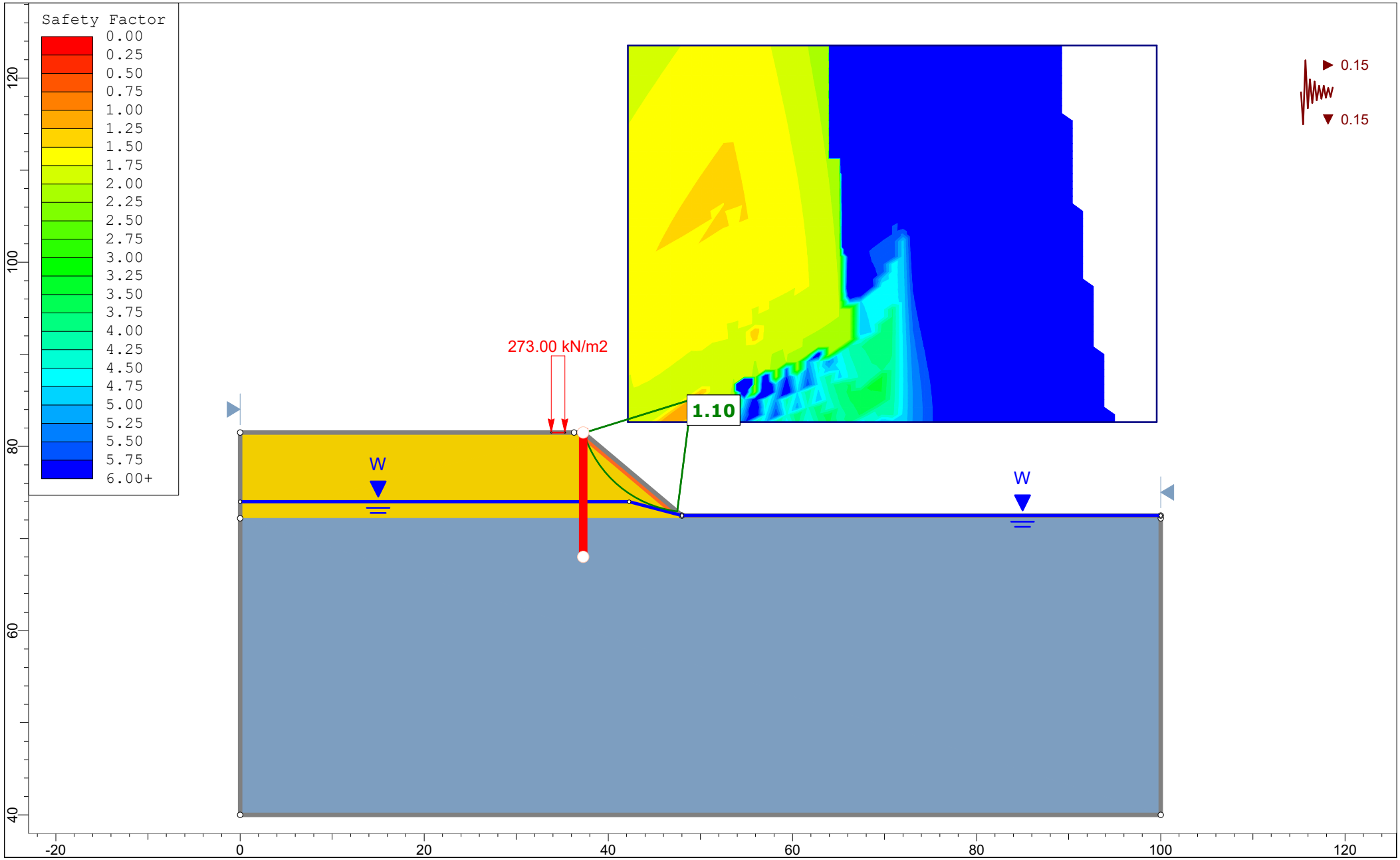
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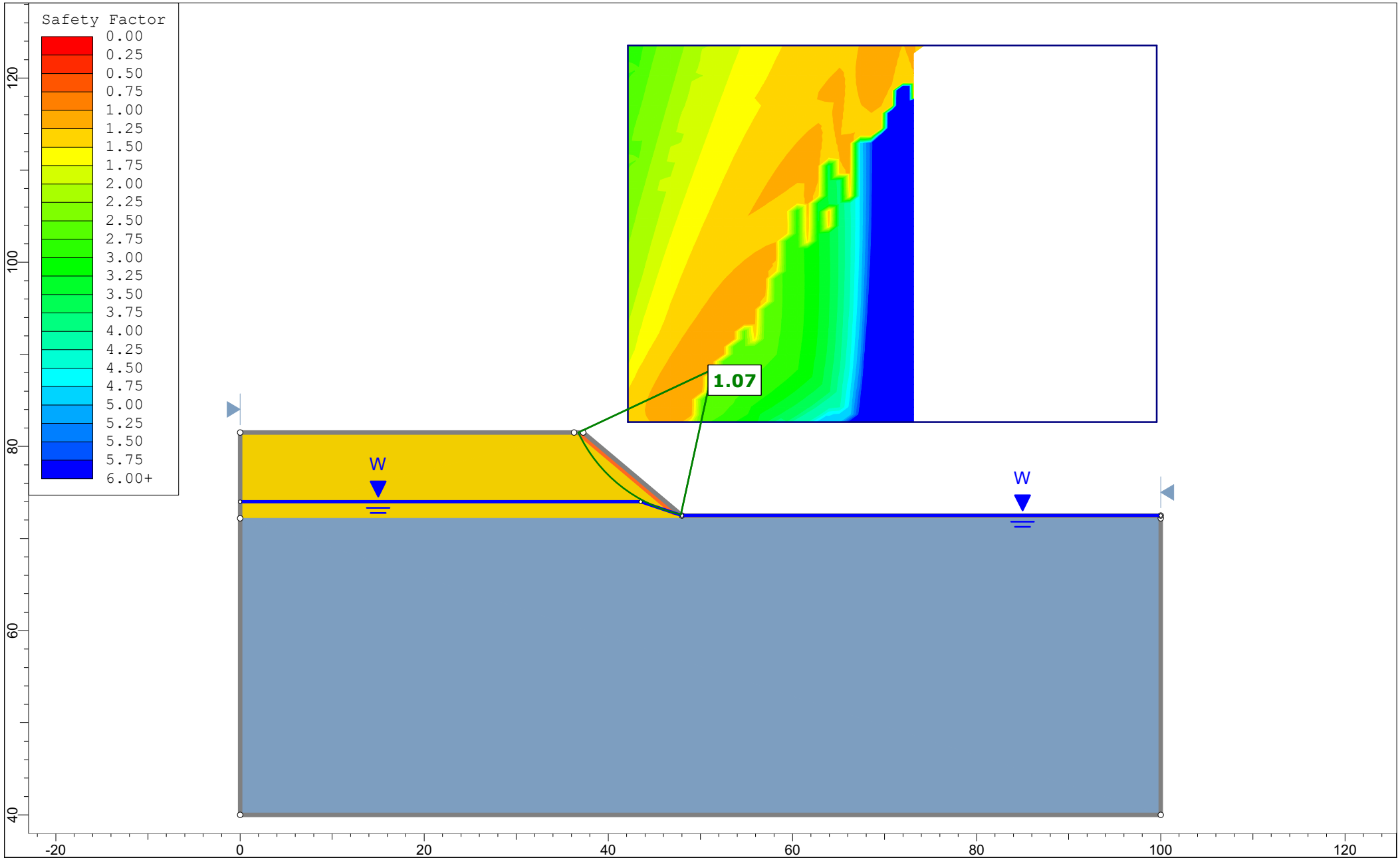
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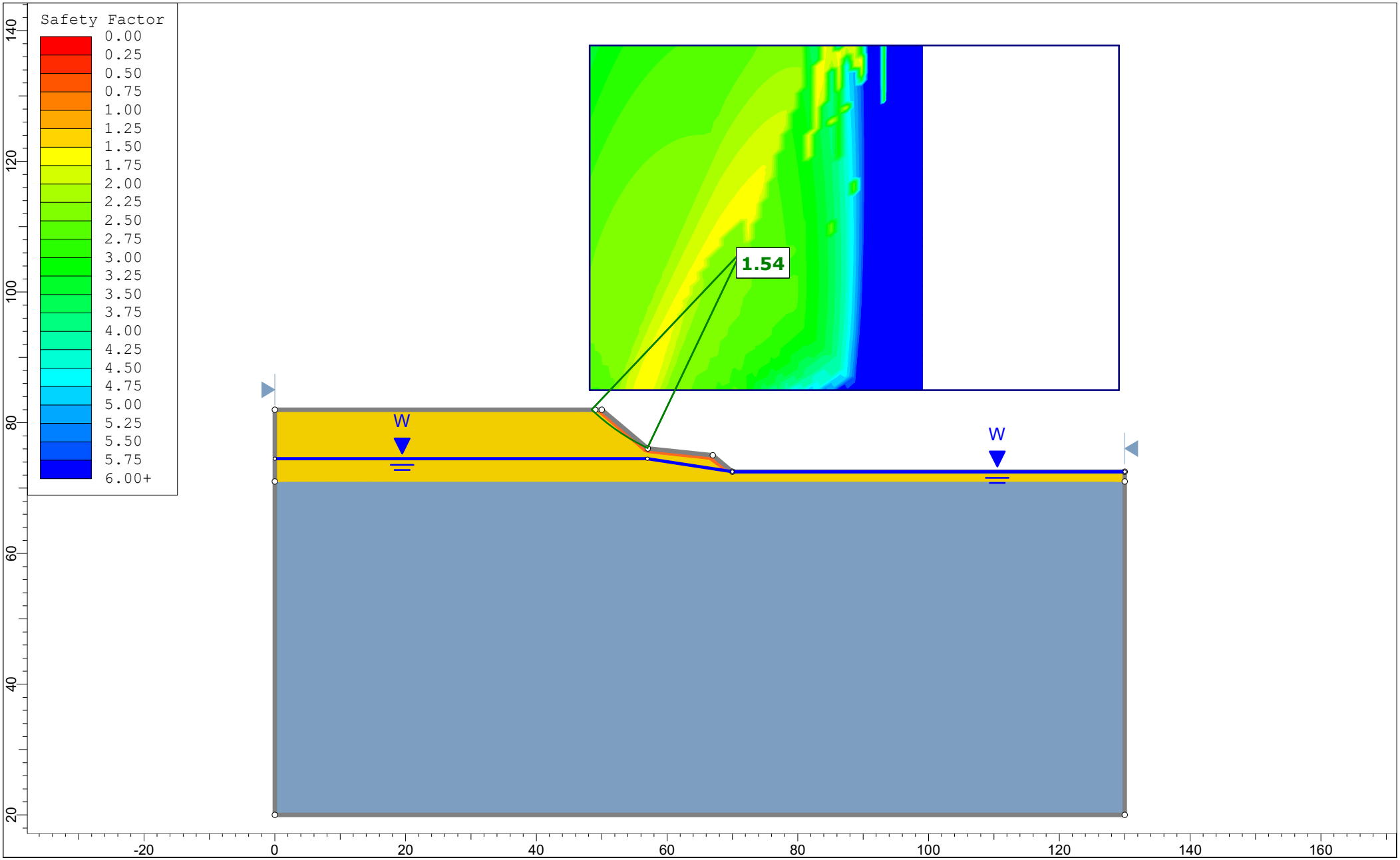
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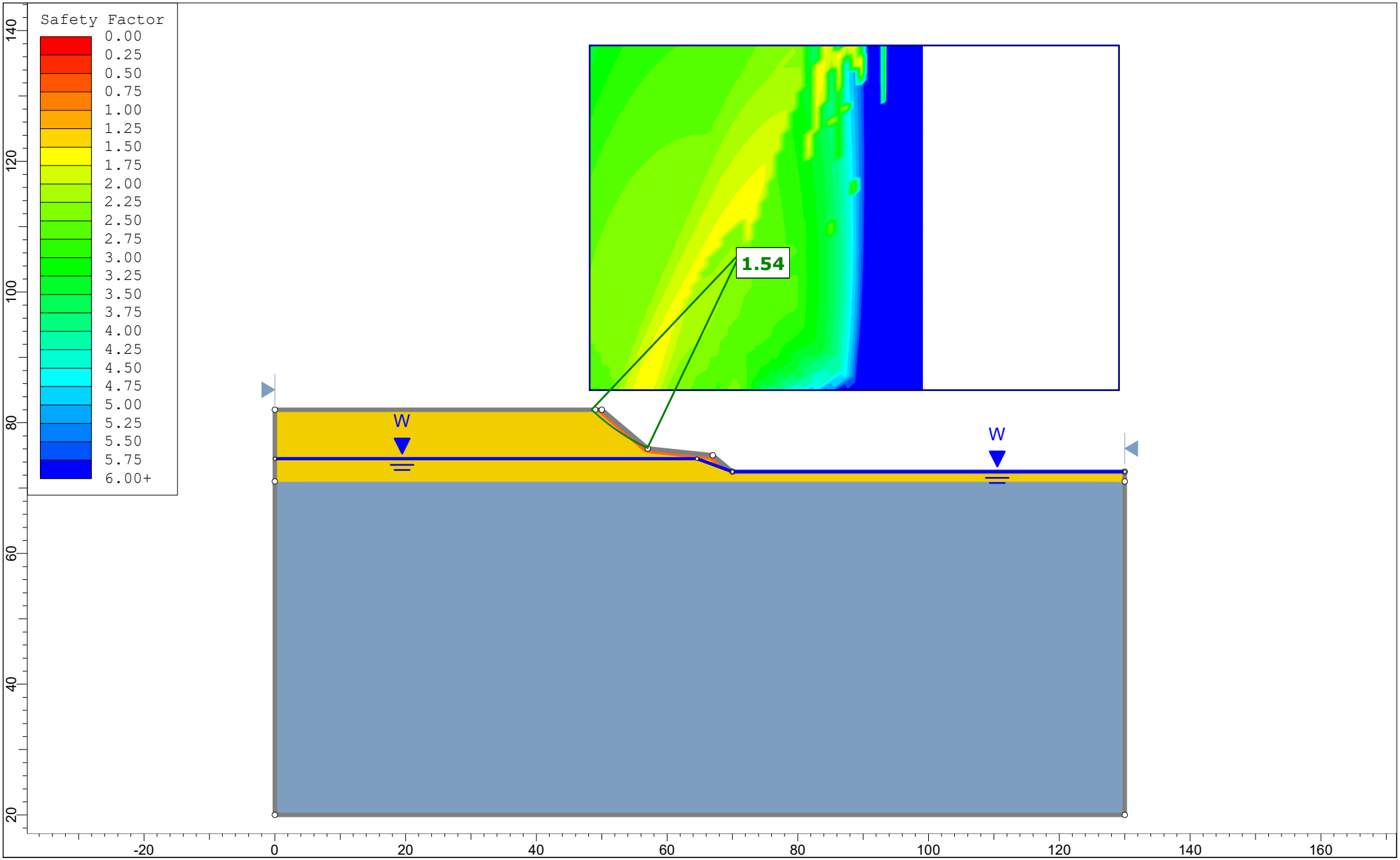
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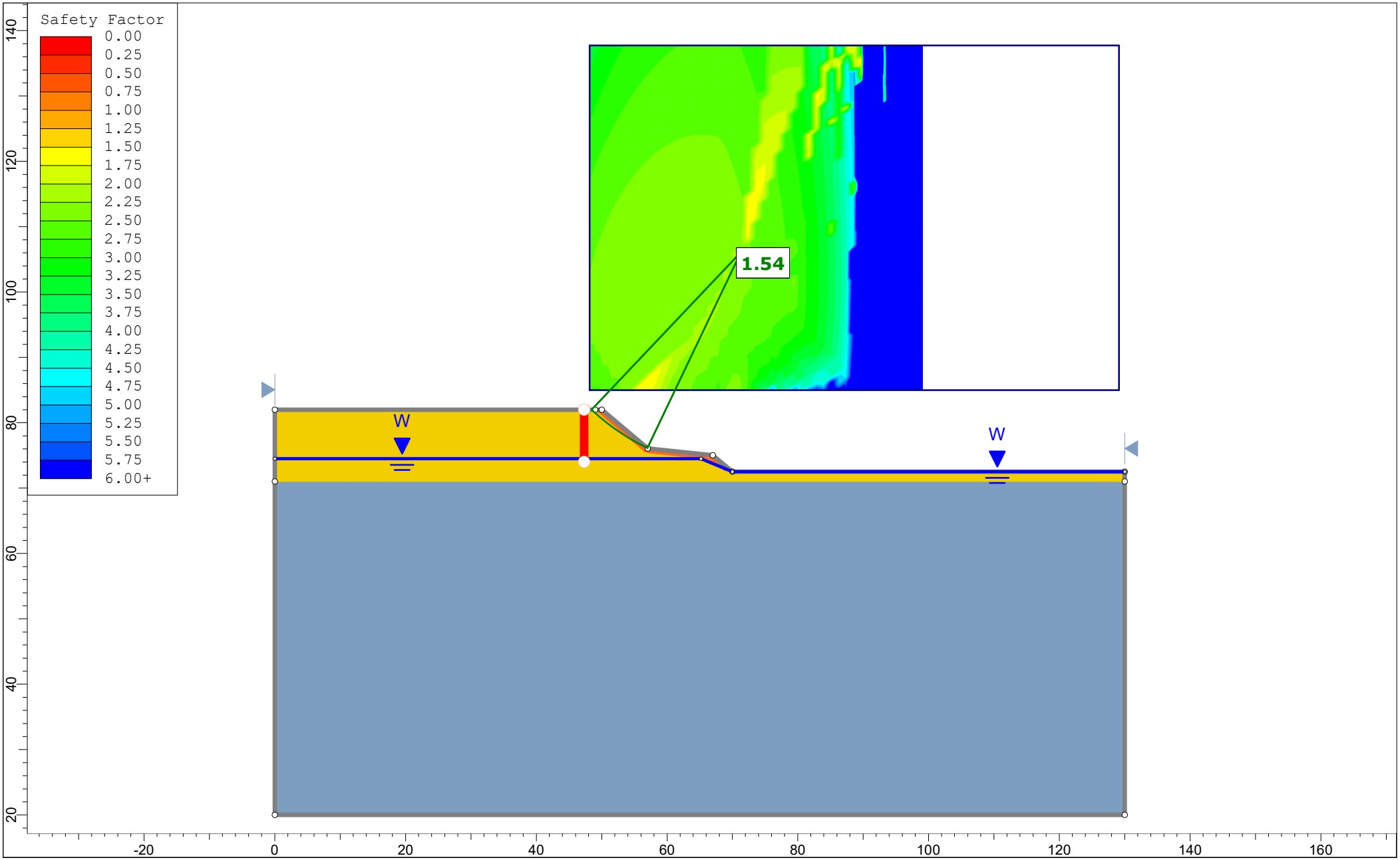
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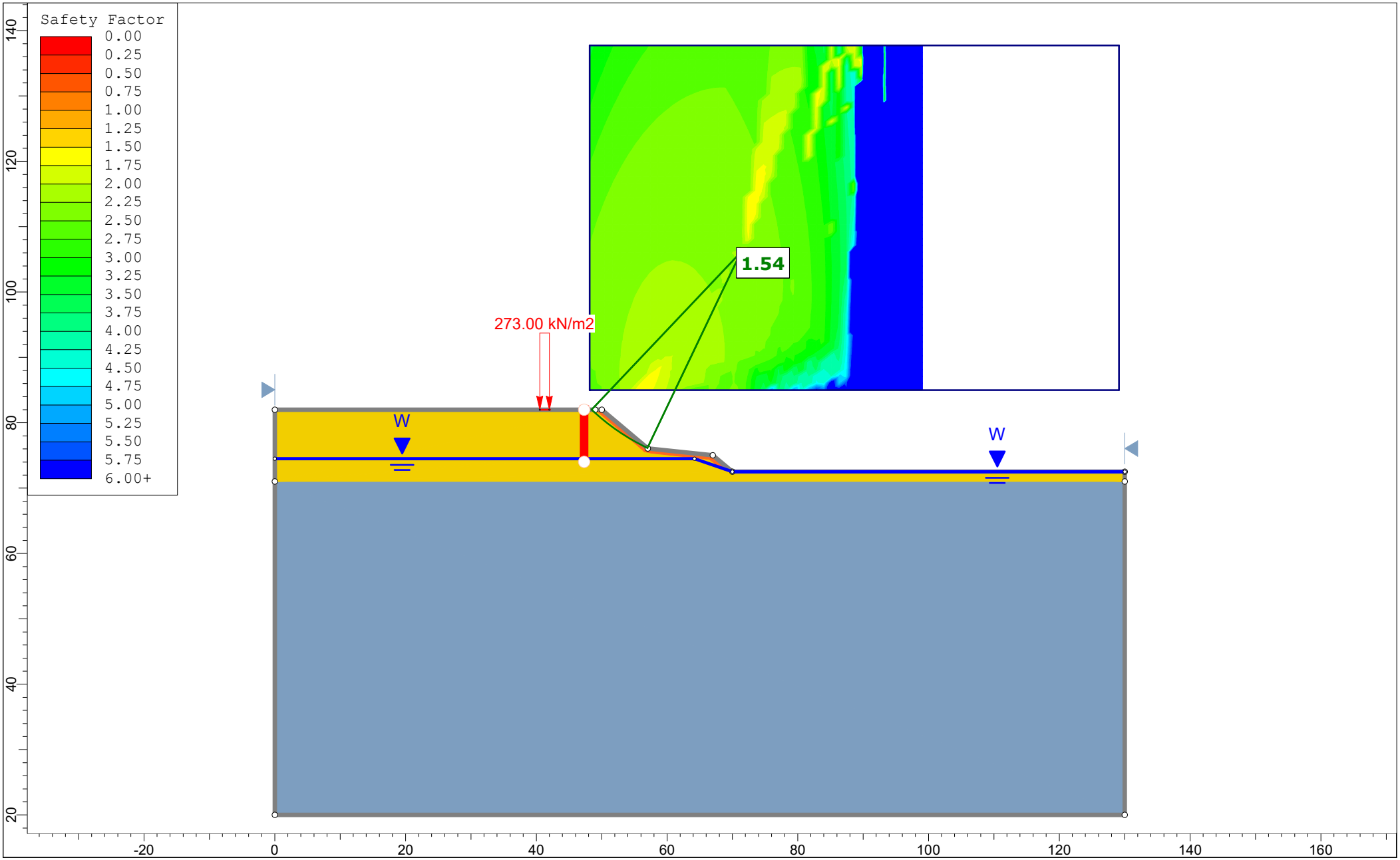
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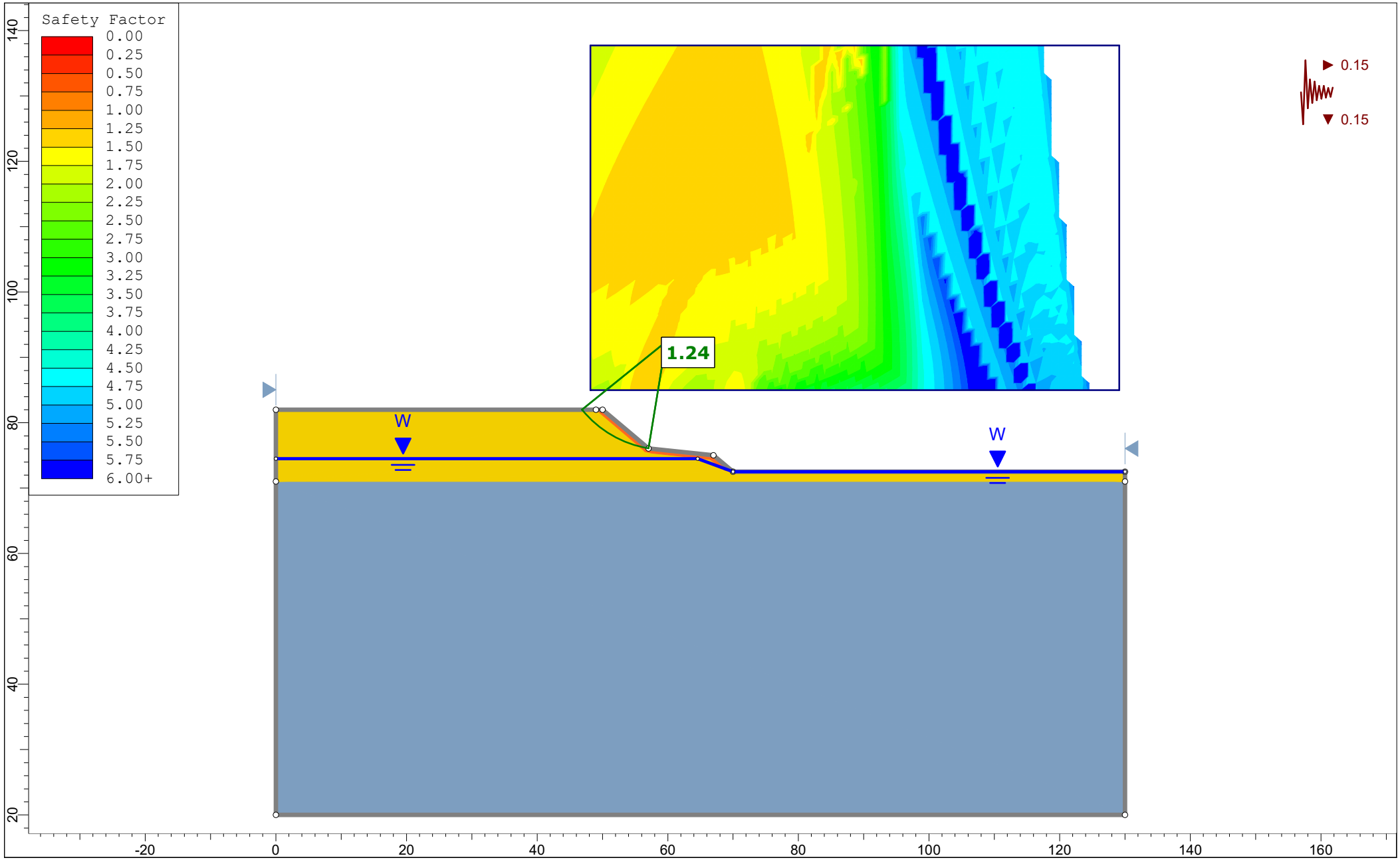
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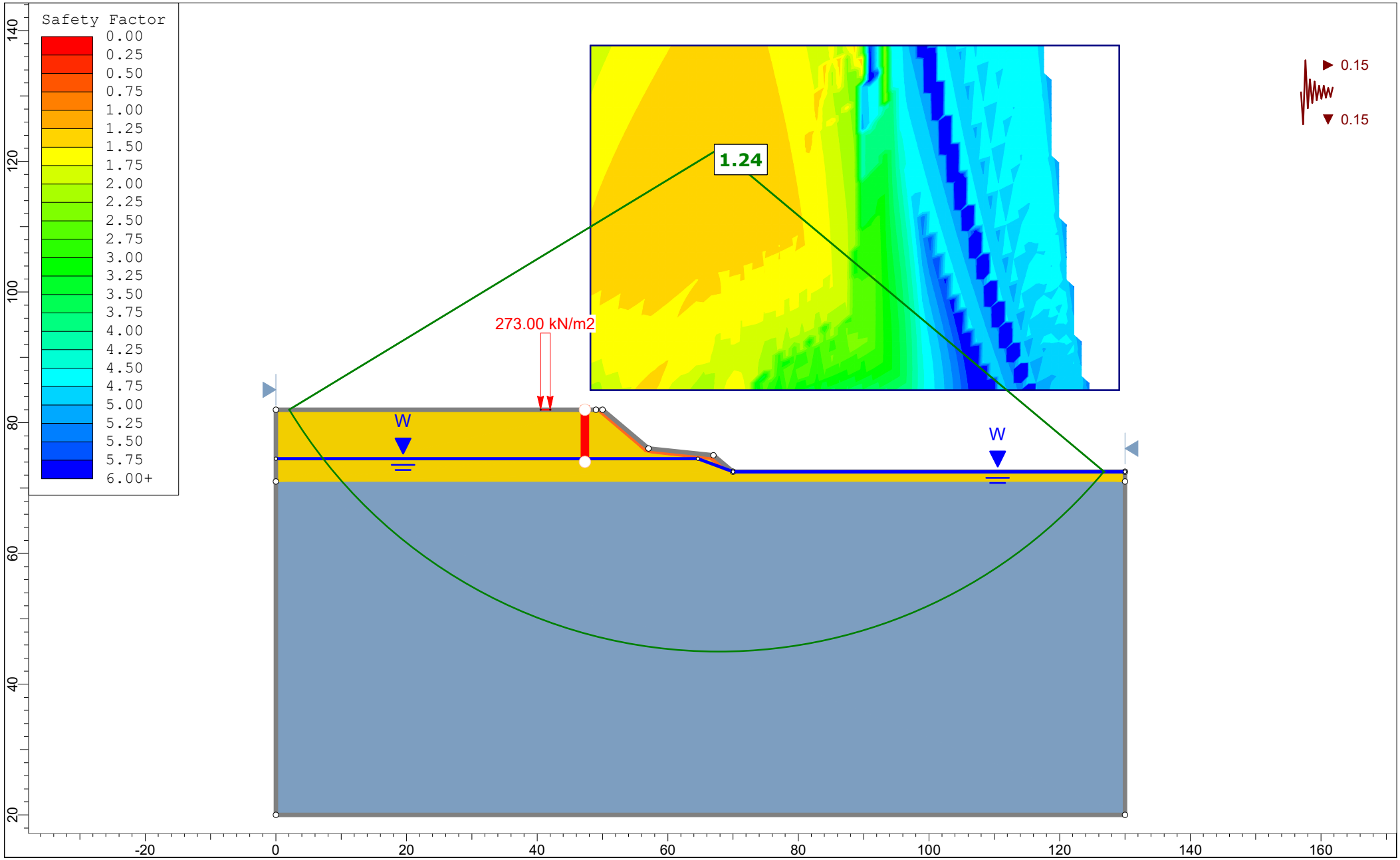
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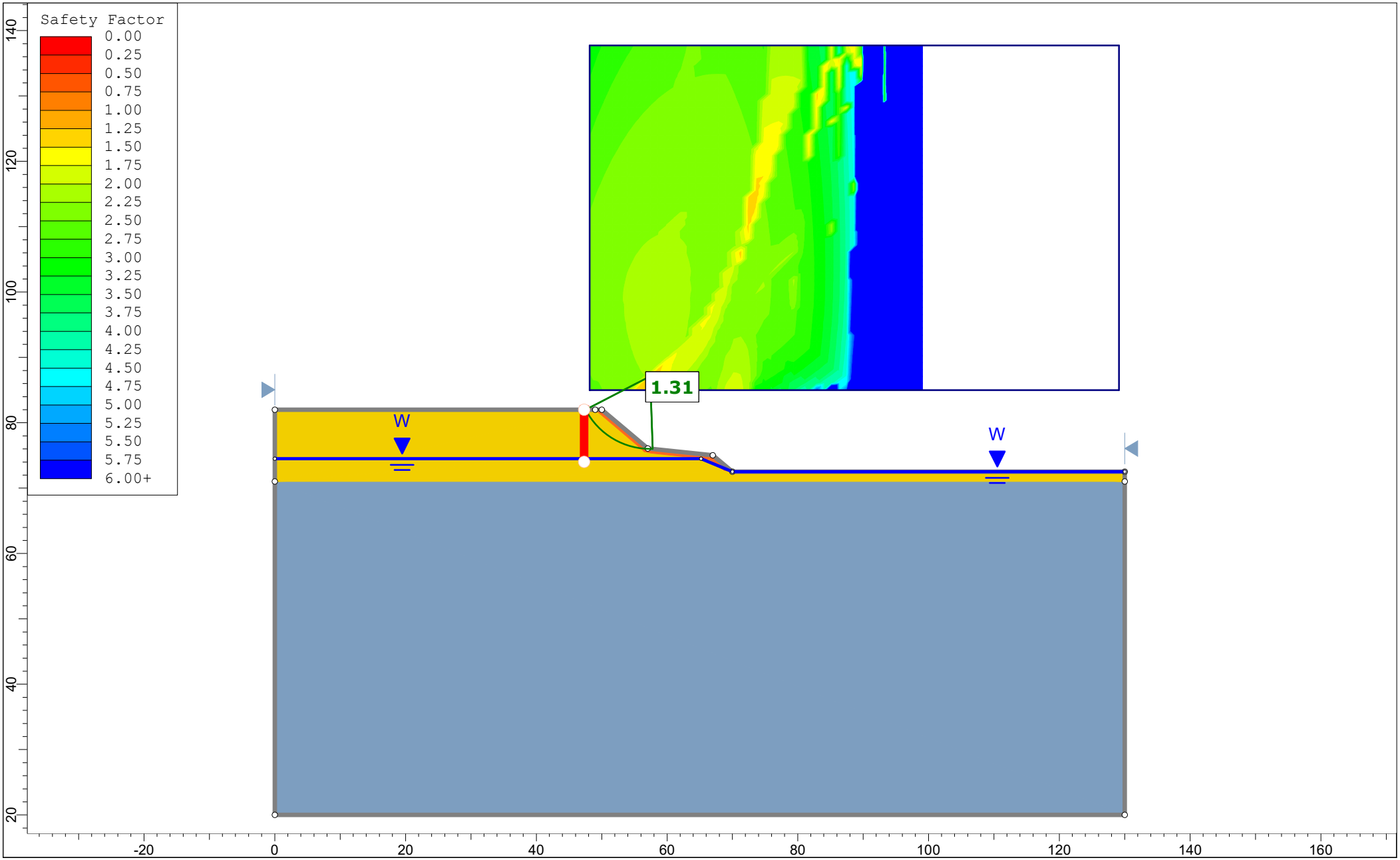
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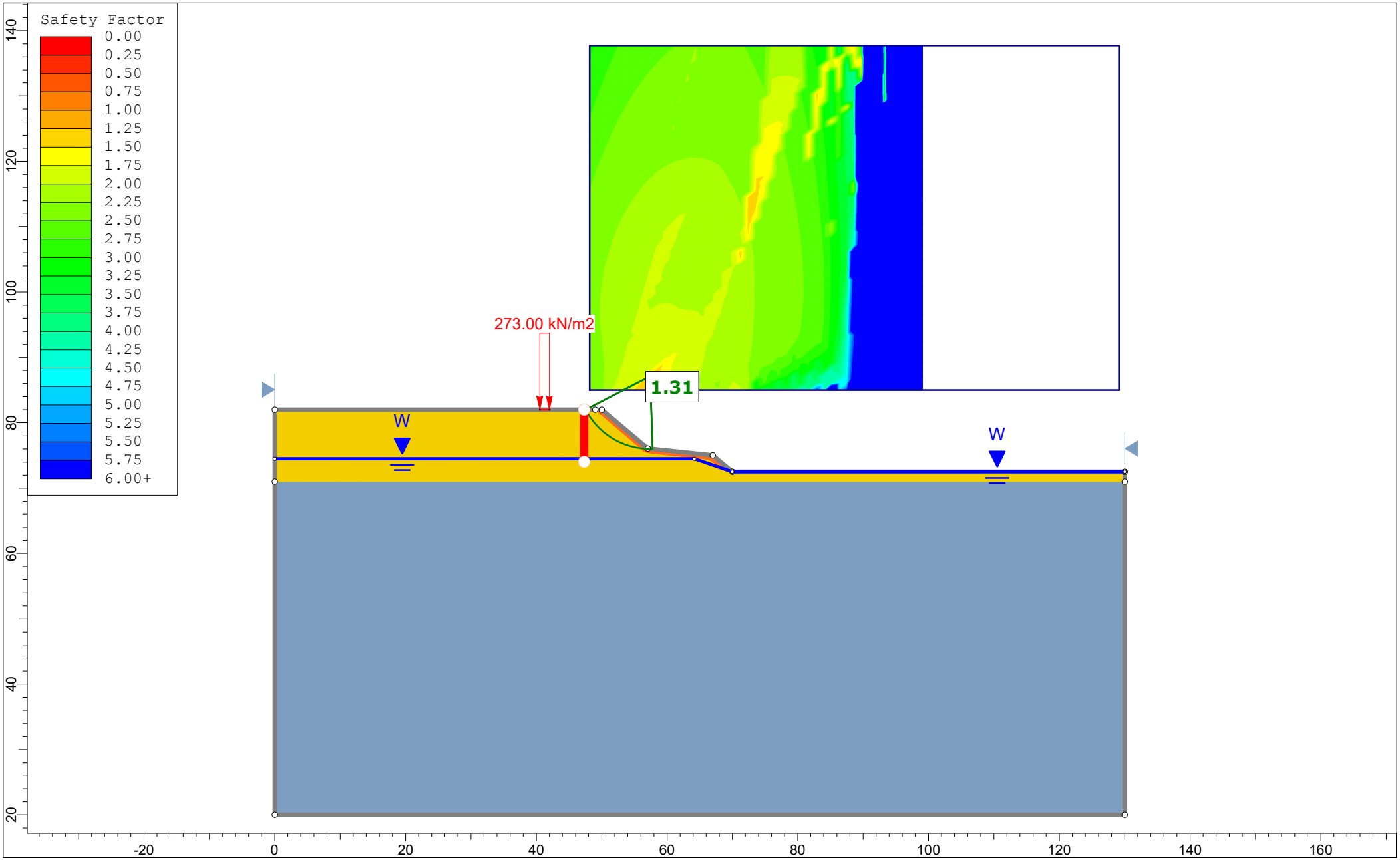
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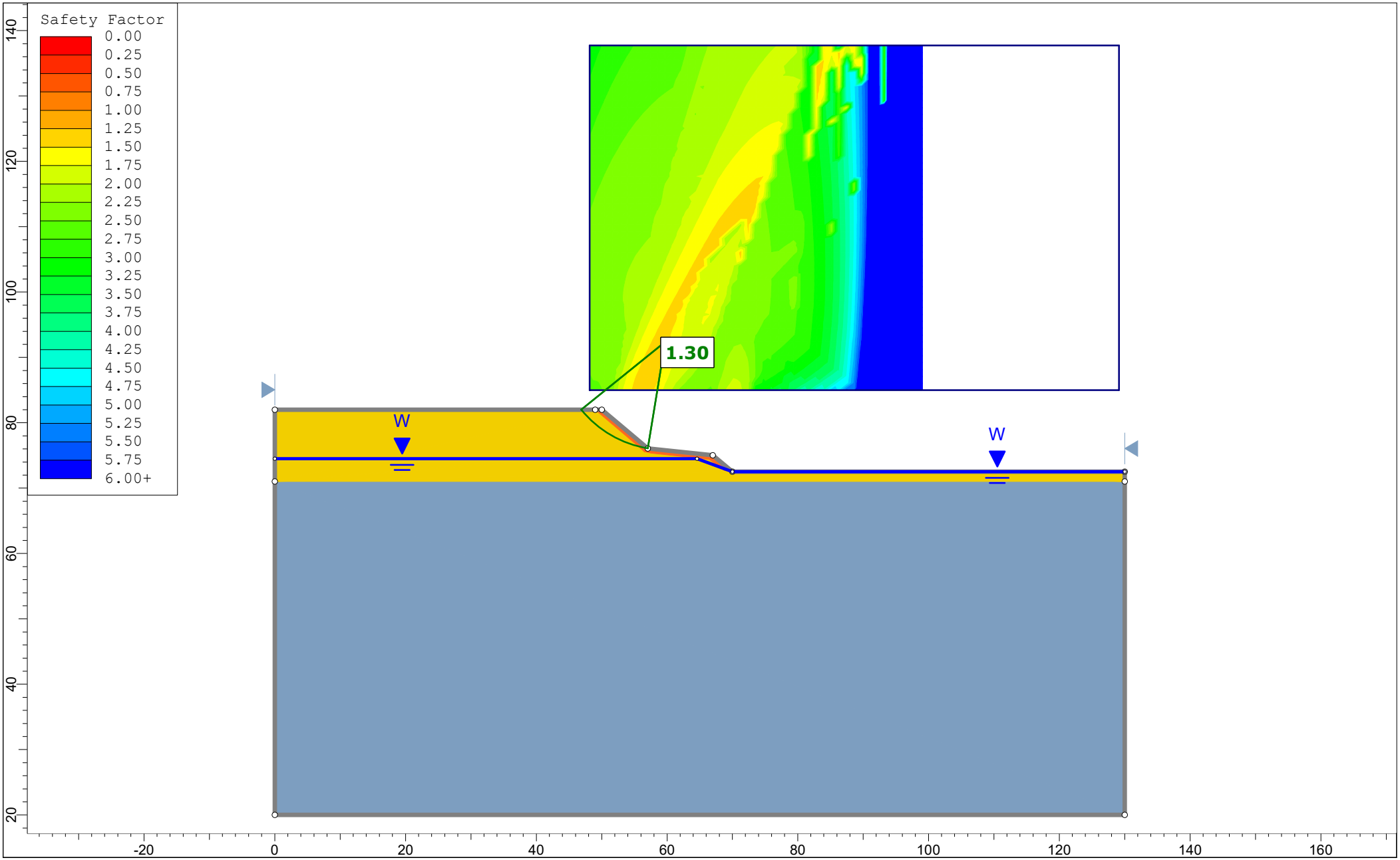
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