3 Pigeon Mountain Rd, Half Moon Bay
Western Boundary Wall

Preliminary Design and Groundwater Drawdown Assessment Report

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Phone +64 9 216 7330
Mobile +64 27 557 7234
Email njacka@tge.co.nz

27C Waipareira Ave, Henderson 0610
PO Box 27294, Glen Eden 0604
Auckland, New Zealand

WWW.TOTALGROUNDENGINEERING.COM

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Executive Summary

HND HMB Ltd has engaged Total Ground Engineering (TGE) to conduct geotechnical design of the western boundary retaining wall in support of a residential development at 3 Pigeon Mountain Road, which comprises 87 terrace houses.

TGE carried out the initial investigation between 15 and 16 June 2022, which involved eight hand augers and two standpipe piezometer groundwater monitoring wells for the resource consent application. Furthermore, we have also completed the second investigation on 23 August 2023, which comprised two additional piezometers and carried out the groundwater monitoring as requested in the queries from Auckland Council.

We have interpreted the existing and additional investigation data in conjunction with the information provided on the existing timber retaining wall to design the proposed western boundary retaining wall.

This design report has been updated in accordance with the updated architectural plan and civil work plan (updated on 08th April 2024 and 10th April 2024 respectively) and also integrated with the groundwater drawdown analysis. The preliminary design drawings are provided for the resource consent application. A detailed calculation set of predicted deformation at the surrounding structures are also included for supporting WAT 60423590 application. The pile levels and set-out needs to be confirmed in the detailed design stage with an accurate survey of the existing timber retaining wall.

1. Introduction

Total Ground Engineering (TGE) has been engaged by HND HMB Ltd to conduct geotechnical analysis and preliminary design of the western boundary wall at 3 Pigeon Mountain Road, Half Moon Bay. The site, legally described as Lot 1 DP 212125, is trapezoidal in shape covering an area of 1.4073 hectares. The site is located at the intersection of Compass Point Way and Pigeon Mountain Road.

The proposed development includes 87 terrace houses. A site plan of the development is shown in Figure 1.

Figure 1, Development Plan by ASC Architect updated on 08 April 2024.

We have referred to the following updated documents for design and :

- 3 Pigeon Mountain Road – S92 Response Architecture Design by ASC architects, dated 08 April 2024.
- 3 Pigeon Mountain Road Proposed Earthwork Plan by Airey Consultant, 10 April 2024. The cut levels for the building platforms of Lot 85 – 88 along the western boundary retaining wall is increased by 0.5 m and the maximum retaining height is reduced from 5.0 m to 4.5 m.
- 3 Pigeon Mountain Property File from Auckland Council including the existing western boundary retaining wall details.
- 3 Pigeon Mountain Road WAT60423590 application queries from Auckland Council received on 17 November 2023 and 1 December 2023.

During the resource consent review process, we have installed two additional piezometers in the proposed deepest excavation area and carried out the groundwater monitoring as requested in the RC RFI. Based on the monitoring results, the proposed excavation plan indicates a relatively shallow but permanent groundwater drawdown along the western

boundary wall.

During the WAT60423590 application review process, we have added the calculation details of the predicted settlement at the surrounding structures and updated the monitoring scheme in this report.

This report includes the updated geotechnical investigation, updated groundwater monitoring results, updated retaining wall analysis with preliminary design and updated groundwater drawdown assessment for supporting the resource consent and water permit application.

The key provided documents are enclosed in Appendix A.

2. Geotechnical Investigations

2.1 Regional Geology

Reference has been made to the New Zealand Geology Web Map on the GNS website, http://data.gns.cri.nz/geology/, accessed on 10th June 2022 (refer Figure 2). The maps indicate that the site is underlain by Tuff of the Auckland Volcanic Field (AVF, coloured purple in Figure 2). The AVF tuff comprises comminuted pre-volcanic materials with basaltic fragments, and unconsolidated ash and lapilli deposits. These volcanic materials can be spatially variable in terms of material types, often with an abrupt end to ash deposits, with well sorted lapilli, tuff, ash and breccia at the margins.

The map Indicates a geological boundary to the north of the site, mapped As East Coast Bays Formation (ECBF, coloured orange in Figure 2) of the Waitemata Group. The ECBF comprises alternating sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grit beds.

The ECBF typically weathers at the surface forming stiff to very stiff silts and clays which can contain reactive clay mineralogy and be prone to shrinking and swelling due to varying moisture content conditions.

Figure 2. Site Geology Map

2.2 Existing Geotechnical Investigations.

The geotechnical findings by TGE's first investigation on 15th-16th Jun 2022 and second

investigation on 23 August 2023 are consistent with the published Auckland Geomap and Aurecon's initial findings. We have attached the extracts from TGE report "J00538AA Geotechnical Investigation Report_r0" and the two additional hand auger logs (HA09&HA10) in Appendix A.

3. Design Soil Parameters and Ground Water Monitoring

Based on the available data and our experience in the above materials, we have adopted the following soil parameters for retaining wall design:

Table 1. Adopted Soil Properties.

	Unit Weight (kN/m3)	Cohesion c(kPa)	Internal Friction Angles (degrees)	Undrained Shear Strength (kPa)
Existing Fill	17	7	32	70
Puketoka Formation	17	3	30	50
Completely weathered – Highly weathered ECBF	17	7	32	100
Moderately – Slightly Weathered ECBF	18	20	38	400

During TGE's investigation and monitoring from 16 June 2022 to 31 January 2024, we have measured the groundwater in monitoring piezometers HA01, HA07, HA09 and HA10. The groundwater measurement data is updated in Table 2.

The measurements indicate the groundwater level has increased dramatically from -4.9 m at HA01 to -1.4 m during the 2023 Auckland Anniversary Weekend Flood Event and Cyclone Gabrielle. Subsequently, the groundwater level fluctuates around -1.4 m over the winter period and decreases to -2.5 to - 4.0 m over the dry summer period. We have referred to the updated earthwork plan showing that the proposed excavation along the western wall is below the averaged water table. The excavation plan indicates a permanent groundwater drawdown ranging from 0.1 – 2.0 m along the western boundary wall.

Table 2. Ground Water Monitoring Measurements (updated to 20 February 2024)

	Monitoring Dates and Levels (below ground level, m)			
Piezo Location	***16/06/2022 (Installation day)***	***22/02/2023***	***22/03/2023***	***5/04/2023***
HA01	4.9	1.4	2.4	3.0
HA07	3.7	2.1	2.7	2.0
Piezo Location	***23/08/2023 (installation day)***	***25/08/2023***	***1/09/2023***	***11/09/2023***
HA01	/	1.72	1.52	1.50
HA07	Removed			
HA09	1.42	1.58	1.37	1.44
HA10	1.35	1.49	1.32	1.27
Piezo Location	***17/01/2024***	***31/01/2024***	***20/02/2024***	
HA01	2.71	3.27	3.88	
HA09	1.90	2.05	2.28	
HA10	1.66	1.74	1.98	

4. Proposed Western Boundary Wall Analysis and Design

4.1 Existing Western Boundary Timber Retaining Wall

The aerial photo (circa 2006) shown in Figure 3 from Auckland Geomaps indicates that the wall was constructed at about the same time as the school.

Figure 3. Aerial Photo from Auckland Council (2006)

We have reviewed the existing survey conducted by Envivo and the property file information related to the timber retaining wall. The retained height of the existing timber wall ranges from approx. 0.5 m to 2.8 m as shown in Figure 4:

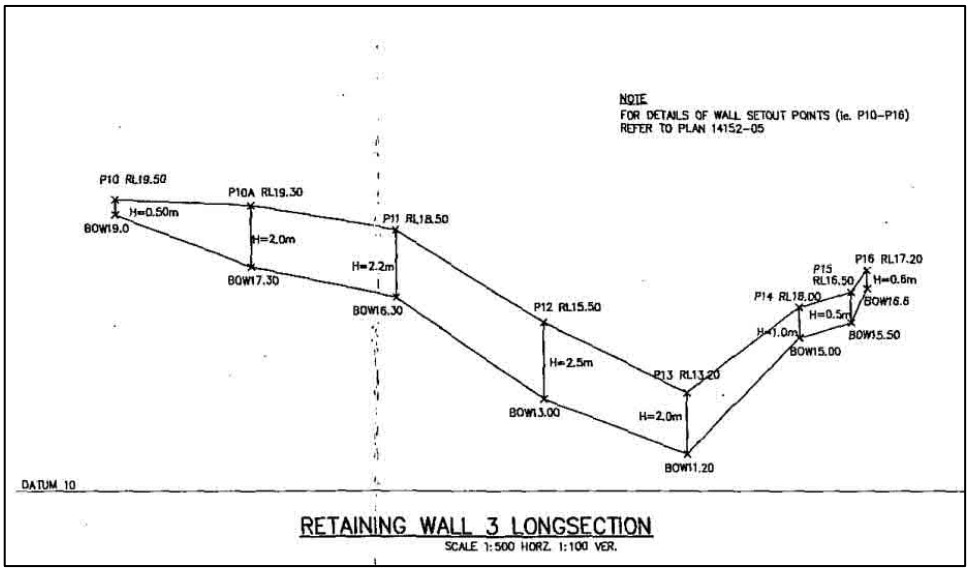

Figure 4 Existing Timber Retaining Wall Design Long Section from Property File (2002)

We have visited the site and carried out measurements of the existing timber retaining wall dimensions including pole size and pole spacing. The provided retaining wall design information indicates the cantilevered height to embedment depth ratio of the existing timber retaining wall is approximate 1:1 which was normally acceptable at that time.

We have tabulated the existing levels and the design finished floor levels with a 550 mm reduction to finished ground levels along the western boundary retaining wall as shown in below Table 3 , extracted from Appendix B.

Table 3. Western Boundary Existing Timber Retaining Wall Information.

Western Boundary Existing Retaining Wall Information updated 2024.04.10												
Eixsting Timber Retaining Wall Wall Top Level (From North to South)	Existing Toe Level	Design Finished Floor Levels	550 mm Sub Excavation Levels	Proposed Excavation Depth (m)	Approximate Groundwater Drawdown Depth (m) (1.4 m bgl interpreted)	Existing Retaining Height (m)	Proposed Design RH (m)	Representative Design RH Range (m)	Covering Lot No #	Deapest Excavation Spot	Nearest corresponding piezo. No	Analysed Sectsion
/	/	/	/	/	/	No EXTG. Retaining Wall	/	/	Lot #1	Fill-up areas without retaining wall		
12.48	11.22	9.71	9.16	2.1	0.7	1.26	3.32	3.0 - 4.5	Lot # 88	Lot 88 Southwestern Corner	HA09	
13.56	12.78	10.70	10.15	2.6	1.2	0.78	3.41					
14.48	13.51	10.70	10.15	3.4	2.0	0.97	4.33					Section 1
16.13	15.09	12.20	11.65	3.4	2.0	1.04	4.48	3.5 - 4.5	Lot # 83 - 86	Lot 85 Southwestern Corner		Section 2
16.29	15.28	13.20	12.65	2.6	1.2	1.01	3.64					
16.84	15.79	13.20	12.65	3.1	1.7	1.05	4.19					
18.40	16.77	14.70	14.15	2.6	1.2	1.64	4.25	4.0 - 4.5	Lot # 79 - 82	Lot 79 Southewestern Corner	HA10	
18.62	17.67	14.70	14.15	3.5	2.1	0.95	4.47					
19.05	18.01	15.10	14.55	3.5	2.1	1.04	4.50					Section 3
18.77	17.74	15.10	14.55	3.2	1.8	1.03	4.22					
19.27	17.87	16.60	16.05	1.8	0.4	1.40	3.22	3.0 - 3.5	Lot # 41- 42			
19.48	18.71	17.00	16.45	2.3	0.9	0.77	3.03					
19.70	17.98	17.00	16.45	1.5	0.1	1.73	3.25			Section 4 (will adopt Section 1 design)		

We have divided the wall into four representative retained height ranges as shown in Table 3 being the critical design sections. The extent of these design sections are shown in Figure 5. The maximum retained height of 4.5 m is beyond the limits of cantilevered timber poles in these soils and would generate ground deformations exceeding the limits commonly required in the resource consent conditions. Therefore, stiffer steel kingpost poles piles are required to minimise retaining wall deflections and settlement of any surrounding structures.

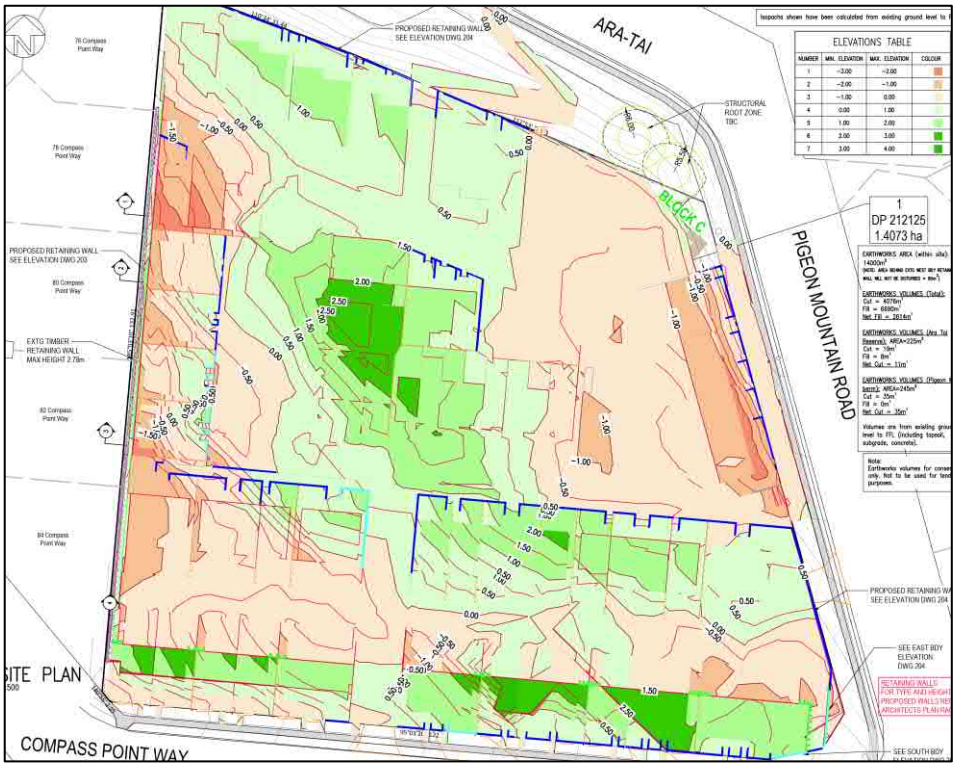

Figure 5. Retaining Wall Plan and Section Position overlying Civil work plan.

We have adopted the above Sections 1-3 for analysis of each retaining height range using the Finite Element software package PLAXIS 2D. Section 4 will adopt the same design as Section 1. The groundwater drawdown is also modelled and analysed to assess the structure deformations, ground settlements and retaining wall internal actions. Analysis of Section 3 with a maximum 4.5 m retained height is presented in detail below. Analysis outputs of the rest of the retaining walls are attached in Appendix C.

4.2 Modelled Construction Sequences.

The critical section for Section 3 as shown in Figure 5 is 4.5 m high and located at approximate wall chainage 46 (drawings included in Appendix D). We have used Plaxis 2D to model the geological profile and the phased construction of the proposed retaining wall. We have also imposed a 10 kPa surcharge to model the neighbouring property.

Figure 6 shows the general arrangement of the Plaxis model at the critical cantilevered phase.

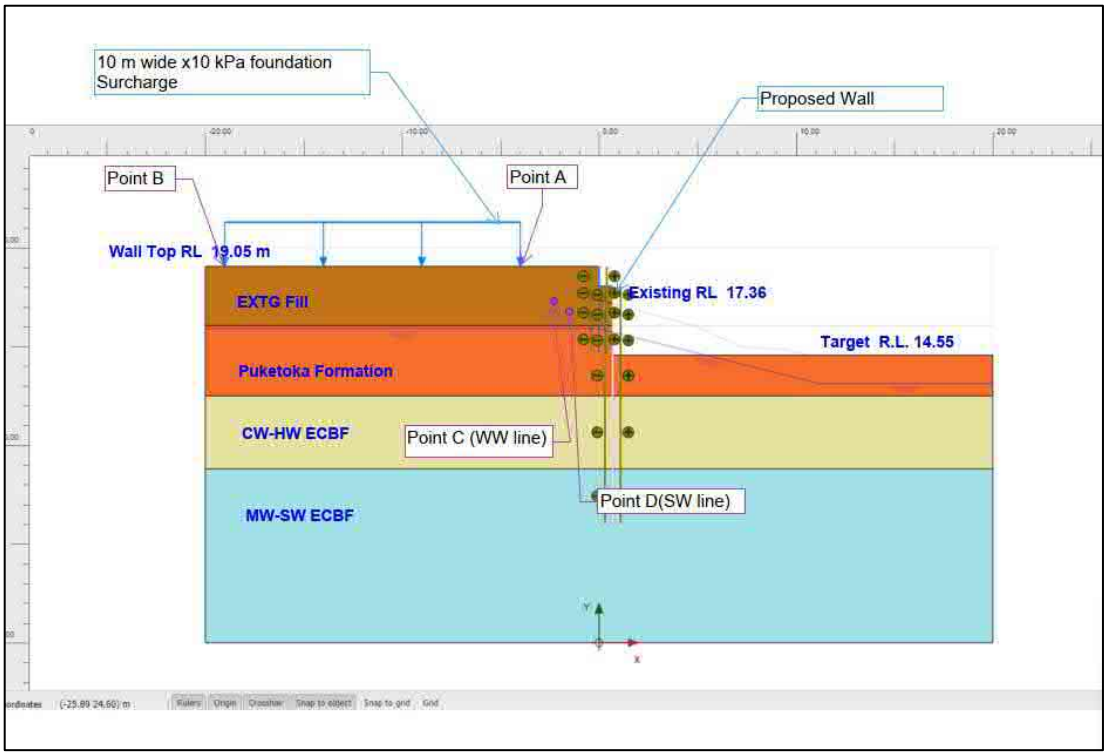

Figure 6. Plaxis Model General Arrangement-Section 3.

The modelling sequence, replicating the proposed construction sequence is as follows:

Analyse Existing Conditions :

Phase 0: Initial Phase (Initializing FEM model)
Phase 1: Install Existing Timber Retaining Wall (school development)

Phase 2: Neighbouring property construction (imposing line loads and add Point A-D for settlement prediction)

Analyse Proposed Wall Construction :
Phase 3: Install proposed retaining wall
Phase 4: Backfill between Existing and New Retaining Wall
Phase 5: Excavate to finished level in front of the Wall (temporary 0.55 m below FFL)
Phase 5.1: Apply worst ground water scenario
Phase 5.2: Apply seismic scenario (K_h = 0.19 g)

To limit wall deflection and ground deformation, we have modelled a 250UC-89.5 for this critical retaining height range.

We have adopted the following configurations and specifications in the analysis model:

- The proposed retaining wall is positioned approximately 1.6 m from the western boundary and a constant 0.7m offset from existing timber retaining wall alignment to avoid clash.
- The proposed retaining wall is 1.0 m lower than the existing timber retaining wall as per architectural and urban design requirements.
- Existing timber retaining wall of 350 mm SED at 1.0 m c/c spacing with 10 kPa surcharge behind.
- 250UC-89.5 kg/m post at 1.0 m c/c. UC stiffness EA = 2.280E+6 kN/m run

- Maximum temporary retaining height is 4.5 m from the existing wall top level.
- Pile length 12.0 m and approximate Pile embedment 8.0 m below FFL .
- Groundwater level -1.4 m bgl (approx. R.L.15.9) and the drawdown to excavation level (550 mm below FFL, approx. R.L. 14.53).

4.3 PLAXIS Model Soil Parameters

For Plaxis analysis we have adopted Mohr-Coulomb soil parameters in general accordance with

Table *1* with additional stiffness and permeability parameters as shown in Table 4.

Table 4. Soil Parameters adopted in Plaxis Analyses

Parameters / Soil Strata	Cohesion c (kPa)	Phi Φ (Degrees)	Stiffness E (MPa)	Poisson Ratio v	Permeability kv = kh (m/s)
Existing Fill	7	32	10	0.3	1.0 E-07
Puketoka Formation	3	30	7	0.3	1.0 E-07
Completely weathered – Highly weathered ECBF	7	32	15	0.3	1.0 E-07
Moderately – Slightly Weathered ECBF	20	38	50	0.3	1.0 E-08

4.4 Retaining Wall Analyses Results

4.4.1 Ground Settlement

The analyses indicate that maximum ground settlement immediately behind the wall is 16.7 mm occurring at Phase 5 as shown in Figure 7.

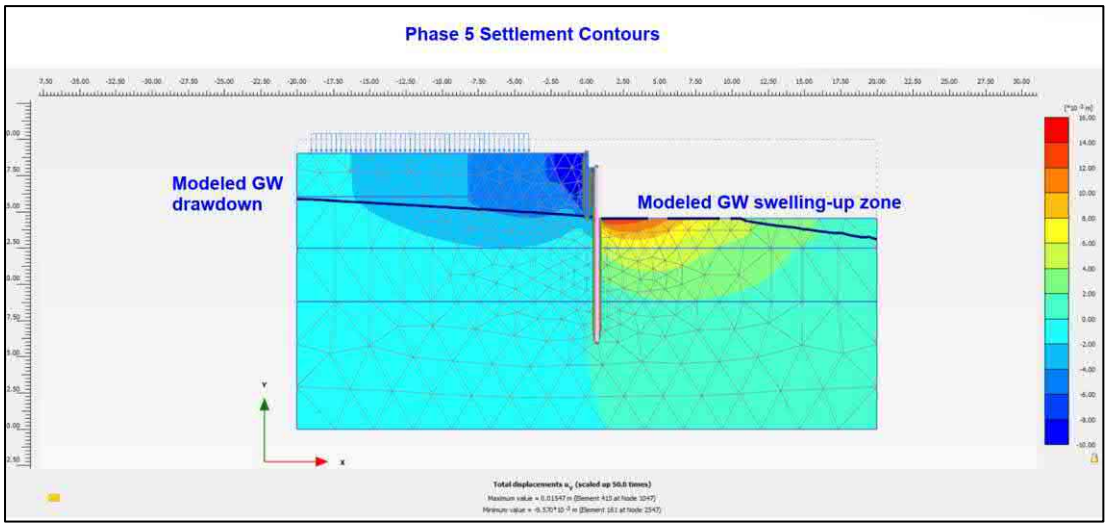

Figure 7. Phase 5 Settlement Contours.

The predicted settlements at the monitoring point A-B are –5.14 mm and -1.48 mm respectively (minus indicates settlements). We have also summarized the potential groundwater drawdown influence on the existing services and structures behind the wall and discuss these in the following chapter.

4.4.2 Wall Lateral Deflection

We have extracted wall deflection profiles at several important phases. Figure 8 shows a maximum lateral displacement of 16.7 mm after Phase 5. This deflection represents a ratio of wall-height upon deflection (H/d) of 270 which is acceptable.

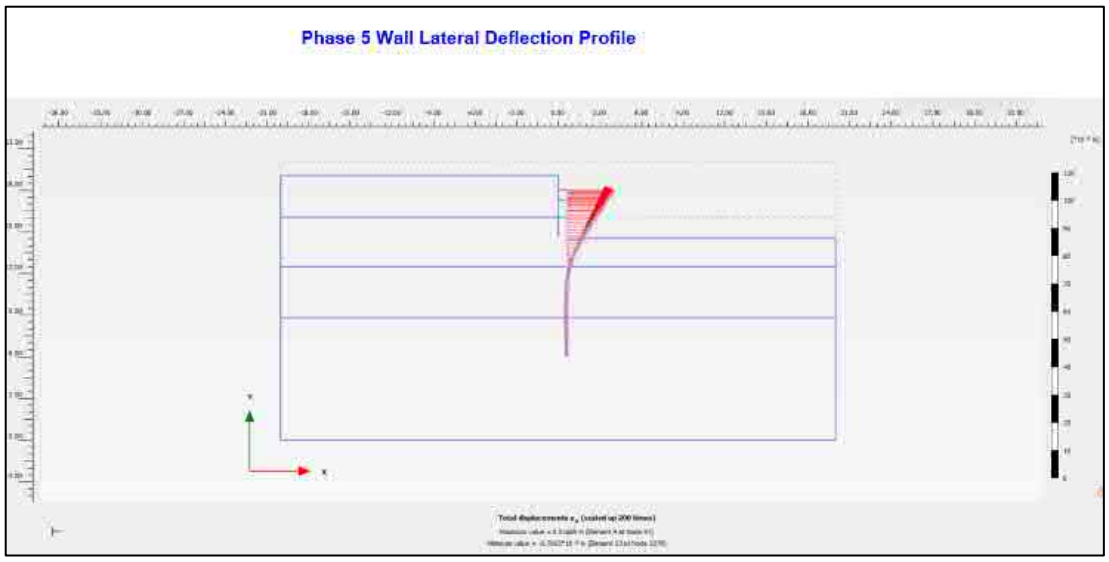

Figure 8. Phase 5 Lateral Deflection.

The detailed wall analysis outputs for all of the sections are enclosed in Appendix C.

4.4.3 Internal Forces Results

Wall internal forces have been extracted from the analysis. The wall shear forces and bending moments at Phase 5 are shown in Figure 9 and Figure 10.

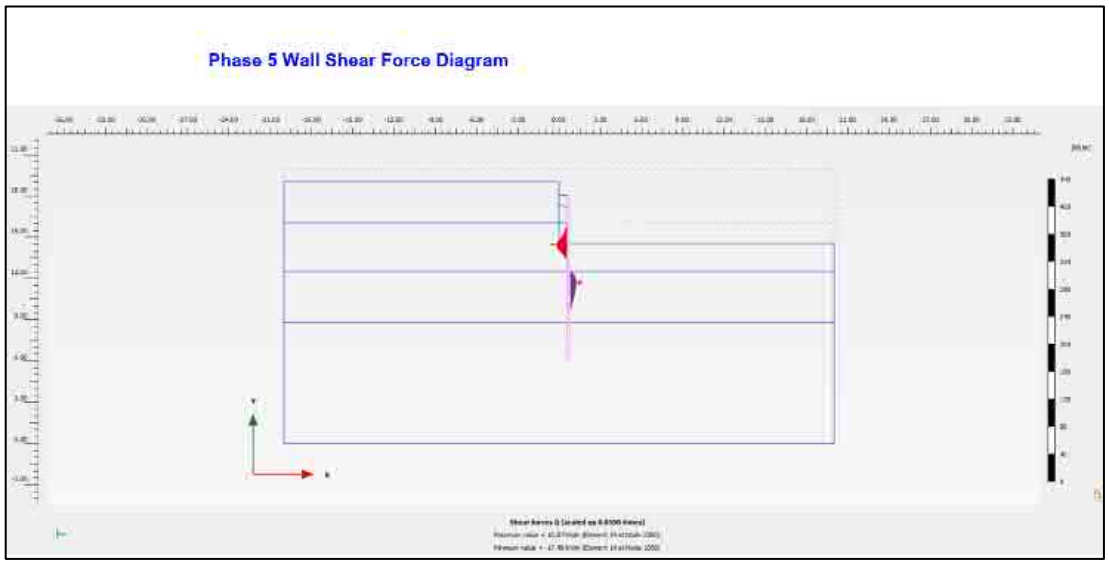

Figure 9. Shear Force Diagram- Phase 5.

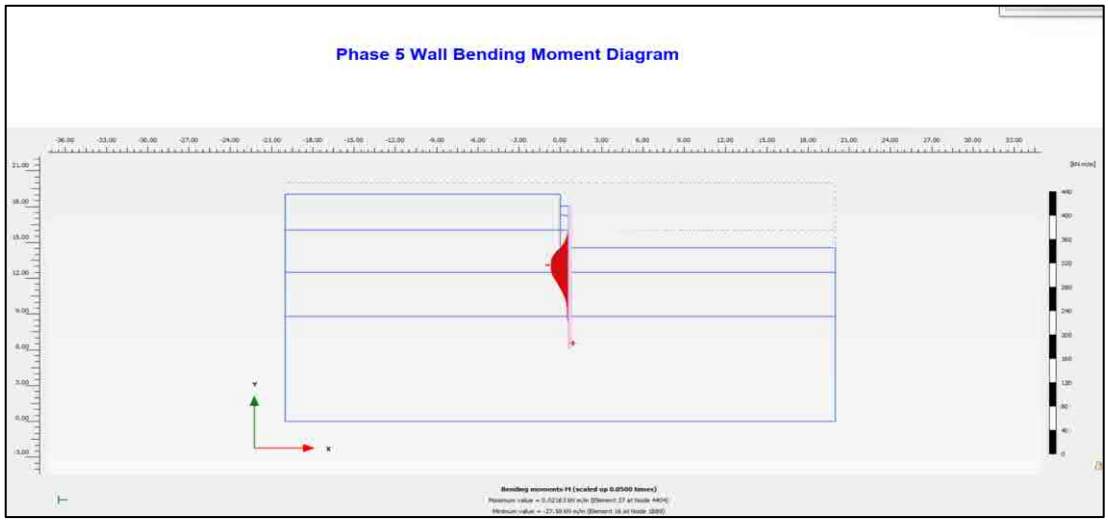

Figure 10. Bending Moment Diagram- Phase 5.

The outputs for the rest of the walls are attached in Appendix C. All factored internal actions are less than the design capacity of the structural elements.

4.4.4 Factor of Safety Analysis Results

Table 5 shows the global stability criteria adopted in general accordance with Auckland Council's Code of Practice for Land Development and Subdivision (v2.0), Section 2.6.8.

Table 5: Design Criteria

Loading Condition	Minimum Factor of safety (FS)
Normal Groundwater Condition	1.5
Worst Credible Groundwater	1.3
Pseudo-static seismic (ULS PGA)	1.0

We have carried out a global factor of safety analysis for both static and seismic cases for Phase 5. Figure 11 indicates the retaining wall provides a factor of safety 1.68 under static conditions exceeding the normally accepted minimum requirement 1.5 for the normal ground water scenario.

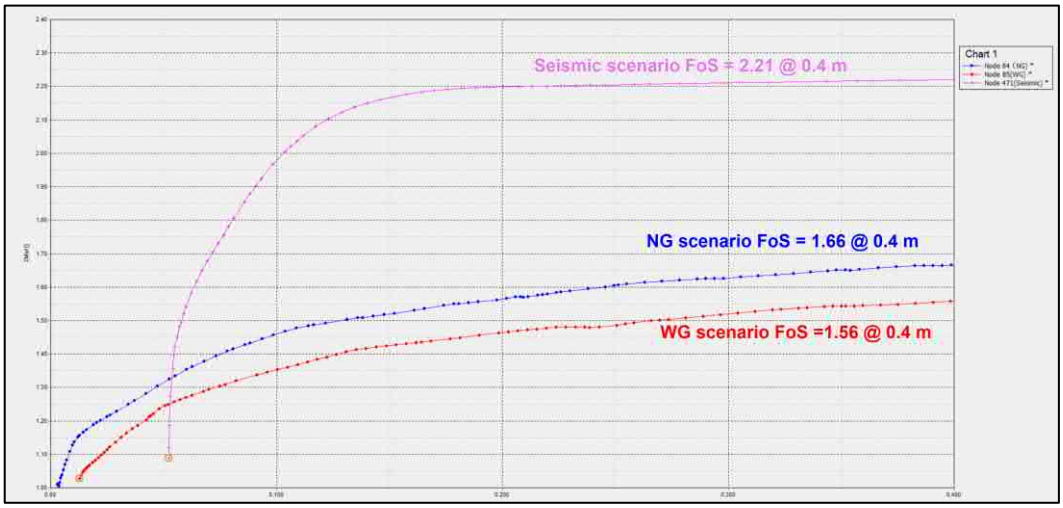

Figure 11. FoS under three design scenarios.

For the worst-case groundwater, we have increased the water level to R.L.17.4. This results in a factor of safety of FS = 1.65 as shown in Figure 11, exceeding the minimum requirement of 1.3.

The factor of safety (FoS) is 2.60 under a seismic horizontal acceleration 0.19 g as shown in Figure 11, exceeding the minimum requirement 1.0 suggested in the Auckland Council guidance for slope instability under seismic conditions.

We have summarised the key analysis results of Sections 1 to 3 and the design details in Table 6.

Table 6. Wall Analyses Summary.

Section No.	Retention Pile Size	c/c spacing (m)	Pile Length (m)	Modelled Retained Height (m)	Long-Term Factor of Safety (Normal Ground Water)	Short-Term Factor of Safety (Worst Ground Water)	Seismic Factor of Safety
Section 1	250 UC-89.5	1.0	12.0	4.33 (3.78 permanent)	1.66@ 0.4 m	1.56 @ 0.4 m	2.21 @ 0.4 m
Section 2	250 UC-89.5	1.0	12.0	4.48 (3.93 permanent)	1.85@ 0.4 m	1.83 @ 0.4 m	3.60 @ 0.4 m
Section 3	250 UC-89.5	1.0	12.0	4.50 (3.95 permanent)	1.68@ 0.4 m	1.65 @ 0.4 m	2.60ss @ 0.4 m

5. Design

Both short-term and long-term analyses are considered when determining the critical design actions for the structural member design. All structural elements have been designed in accordance with the NZS1170 – Design Actions suit of standards. The steel piles have been designed in accordance with NZS3404 “Steel Structures Standard” and timber lagging has been sized in accordance with NZS3603 “Timber Structures Standard”. An earth load factor of 1.5 has been adopted on all analysis output loads to give the Ultimate Limit State (ULS) design actions.

Wall Section 3 extracted from the drawings is shown in Figure 12. We have assumed a nominal maximum retained height of 4.5 m. The proposed retaining wall comprises 12.0 m long, 250UC89 steel piles encased in concrete at 1.0 m spacings. 150 x 50mm timber lagging supports the retained ground between the piles.

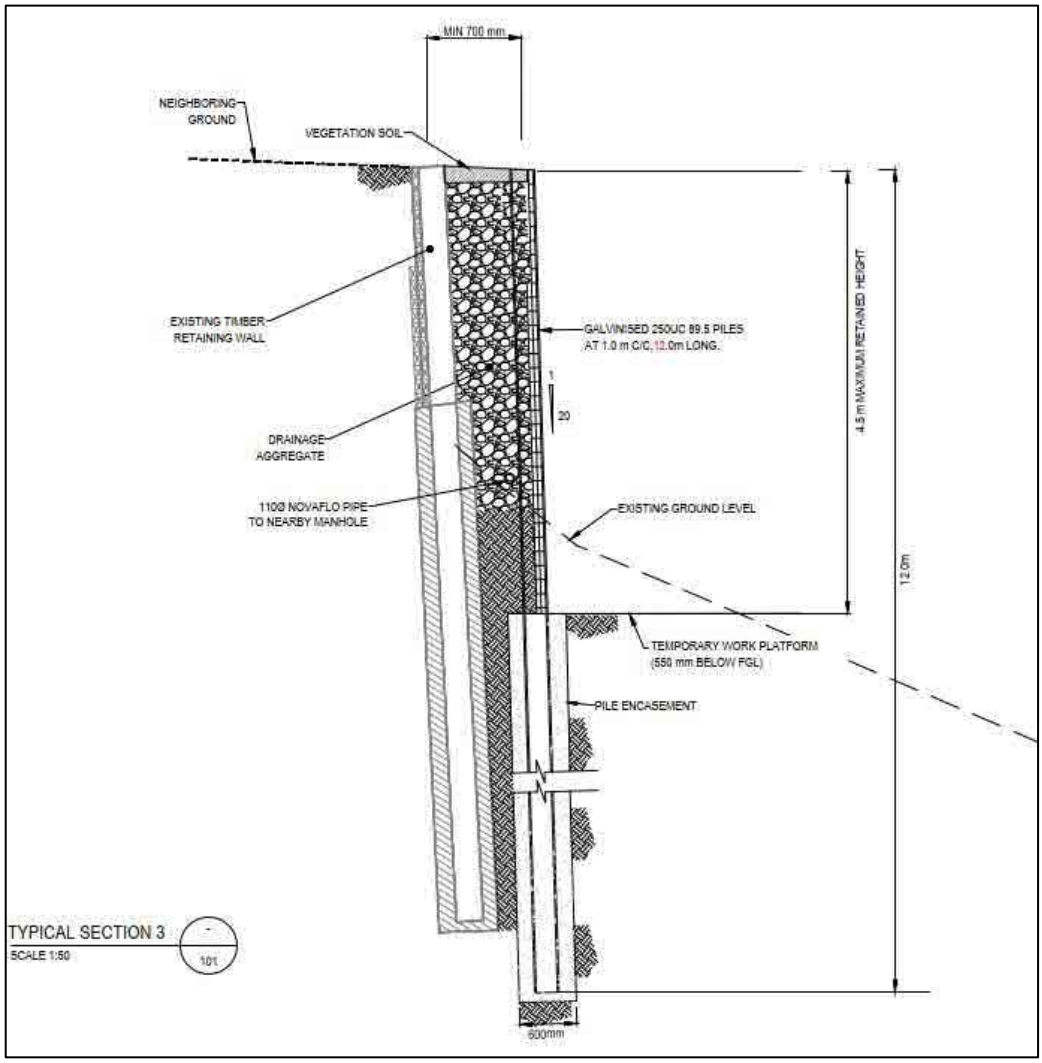

Figure 12; Typical Cross Section 3.

We have specified a minimum wall offset 700 mm to avoid clashes with the existing pile encasement which needs to be confirmed by detailed survey during the detailed design stage.

6. Groundwater Drawdown and Excavation Effect on Nearby Structures

We have undertaken further assessment and groundwater drawdown analyses to address the queries raised by Auckland Council on 11 August. The groundwater drawdown and associated aggregate settlements (mechanical plus consolidation) with the excavation are assessed using Plaxis 2D Flow Module.

The predicted settlements on the environment, adjacent buildings, structures and public services are discussed and summarized in following sections.

6.1 Settlement Prediction within Neighbouring Properties

In order to calculate the maximum predicted differential settlement under the house footprint as requested in WAT queries, we have extracted the information of interim points between A (house start point) and B (house end point) as shown in Figure 13. The settlement prediction of each point are summarised in Table 7.

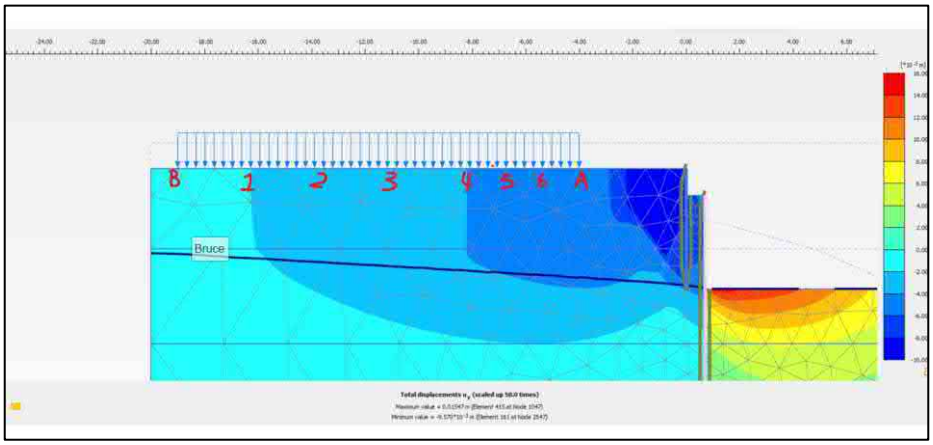

Figure 13. Interim Points Numbering for Section 3.

Table 7. Interim points settlement results Summary.

Section 1 Model								
Point Name	B	1	2	3	4	5	6	A
Model Coordinates	(-18.7,14.48)	(-16.9,14.48)	(-14.9,14.48)	(-12.9,14.48)	(-10.8,14.48)	(-8.58,14.48)	(-6.2,14.48)	(-3.7,14.48)
Predicted settlement (mm)	-3.38	-3.46	-4.04	-4.83	-5.55	-6.08	-6.14	-5.50
Section 2 Model								
Point Name	B	1	2	3	4	5	6	A
Model Coordinates	(-23,16.13)	(-20.1,16.13)	(-17.3,16.13)	(-14.4,16.13)	(-11.6,16.13)	(-8.7,16.13)	(-5.89,16.13)	(-3,16.13)
Predicted settlement (mm)	-0.74	-1.07	-1.38	-1.72	-2.08	-2.48	-2.89	-3.37
Section 3 Model								
Point Name	B	1	2	3	4	5	6	A
Model Coordinates	(-19,19.05)	(-16.2,19.05)	(-13.6,19.05)	(-10.8,19.05)	(-8.07,19.05)	(-6.72,19.05)	(-5.37,19.05)	(-4,19.05)
Predicted settlement (mm)	-1.48	-2.0	-2.61	-3.34	-4.03	-4.35	-4.70	-5.14

On basis of the above settlement predictions, we have calculated the differential settlements of each point pairs and tabulated the maximum settlements in below Table 8:

Table 8. Maximum differential Settlement Summary.

Property Address (Compass Point Way)	Corresponding Nearest Analysed Section	Max. Settlement (mm)	Critical Point Pair	Settlement Difference (mm)	Point Pair Distance (m)	Maximum Differential Settlement Calculation
#76	Section 1	< -6.1	(2,3)	<0.78 *	2.01	0.78/2010 ≈ 1:2576
#78	Section 1	-6.1	(2,3)	0.78	2.01	< 0.78/2010 ≈ 1:2576
#80	Section 2	-3.37	(6,A)	0.48	2.89	0.22/2600 ≈ 1:6020
#82	Section 3	5.14	(6,A)	0.45	1.37	0.45/1370 ≈ 1:3044
#84	Section 3	< 5.14	(6,A)	< 0.45 *	1.37	< 0.45/1370 ≈ 1:3044

*: *The maximum retaining heights at #76 and #84 are less than at #78 and #82 respectively. Thus the settlements are expected to less than the predicted settlement difference.*

6.1.1 Settlement of structures

The maximum differential settlement gradient is approximately 1V:2576H (0.0388%) between Point 2 & 3 near Section 1 (CH60). We have compared the predicted settlements and the maximum differential settlement with widely used building damage assessment criteria in Table 9. The results indicate the description of the degree of damage is “Negligible”.

Table 9. Building Damage Assessment Criteria.

Building Damage Classification after Burland (1995), and Mair et al (1996)			Approx. equivalent ground settlement and slopes (after Rankin 1988)	
Category of Damage	**Description of degree of damage**	**Limiting Tensile Strain %**	**Max. Slope of Ground**	**Max. Settlement of Building (mm)**
0	Negligible	Less than 0.05		
1	Very Slight	0.05 to 0.075	Less than 1:500	Less than 10
2	Slight	0.075 to 0.15	1:500 to 1:200	10 to 50
3	Moderate	0.15 to 0.3	1:200 to 1:50	50 to 75
4	Severe	Greater than 0.3	1:200 to 1:50	Greater than 75
5	Very Severe		Greater than 1:50	Greater than 75

Although analysis indicates no significant adverse effects on the adjacent structures, we propose a detailed monitoring and contingency plan as a prudent measure during the construction. This is discussed further in the following sections in accordance with the review feedbacks from WAT application.

6.1.2 *Settlement of Public Services*

The provided civil cross sections indicate a public 150 mm wastewater sewer and a 300 mm stormwater sewer running through the backyard of neighbouring properties # 76 – 84 compass point way. We have tabulated the coordinates of service points in each analysed section as shown in Table 10.

Table 10. Monitoring Point Positions refer to Figure 6.

Relative Location / Points	Section 1 (m)	Section 2 (m)	Section 3 (m)
Point C (WW Line)	(-3.47,12.68)	(-3.7,14.12)	(-3.6,17.36)
Point D (SW Line)	(-2.0,11.7)	(-2.1,13.17)	(-2.1,-17.0)

For the 150mm WW pipe, the analysis predicts 5.1 mm settlement as shown in Figure 14. Assuming that the 5.1 mm of settlement occurs over a transition length of 5 m to 8.5 m the gradient would range from 1:1000 to 1:1700. Adopting Rankine's description of damage as shown in Table 9 would classify the effect as "Negligible". to "Very Slight".

For the 300 mm SW pipe, the analysis predicts 5.8 mm settlement as shown in Figure 15. Assuming that the 5.8 mm of settlement occurs over a transition length of 5 m to 8.5 m the gradient would range from 1:862 to 1:1465. Adopting Rankine's description of damage as shown in Table 9 would classify the effect as "Negligible". to "Very Slight".

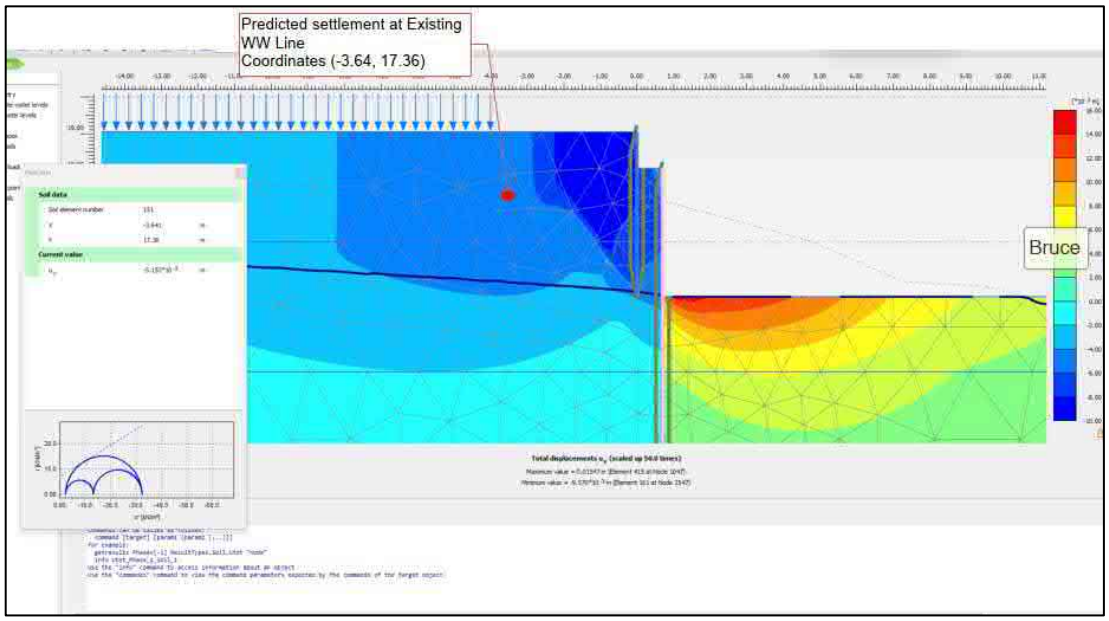

Figure 14. Predicted WW Line Settlement at Section 3.

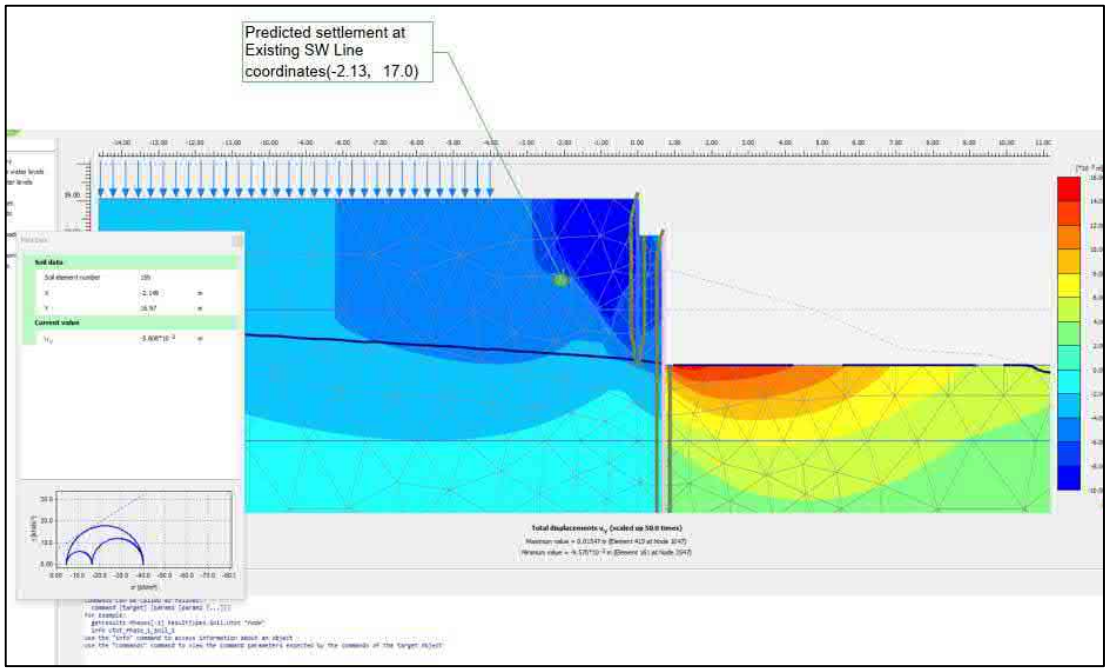

Figure 15. Predicted SW Line Settlement at Section 3.

Section 3 is the critical section and the settlement prediction of the rest of the analysis sections are included in Appendix C and also tabulated in Table 11.

Table 11. Predicted Settlement after Phase 5.

Analysed Section	Modelled Temporary Retained Height (m)	Wall Static Lateral Deflect-ion (mm)	Neighbouring Property Corner Distance to New Wall (m)	Predicted Settlement at wall-behind 150 WW line Point C (mm)	Predicted Settlement at wall-behind 300 SW line Point D(mm)
Section 1	4.33 (3.78 permanent)	13.4	3.6	-5.45	-4.66
Section 2	4.48 (3.93 permanent)	16.0	3.0	-3.22	-3.09
Section 3	4.50 (3.95 permanent)	16.7	4.0	-5.15	-5.81

6.2 Groundwater Discharge Rate

We have also estimated groundwater discharge rate over the excavation platform length of 10.0 m. Figure 16 shows the total discharge rate is 1.686E-3 m³/day per m run. The outputs for the rest sections are summarized in Table 12.

Figure 16.Long-term Groundwater Discharge Rates.

Table 12. Groundwater Discharge Rates Summary.

Analysed Section	Original GWL (mRL)	Change in Water Head(m)	Excavation Platform Length (m)	Long-term Discharge Rate (m^3/day/m run)
Section 1	12.11	1.96	10.0	1.313E-3
Section 2	12.72	1.07	10.0	1.347E-3
Section 3	15.90	1.35	10.0	1.686E -3

The above analysis indicates that long-term groundwater flows are estimated as 1.686 $x10^{-2}$ m^3/day, which is approximately 0.012 litres/min. This indicates a slow trickle of groundwater discharged for the subsoil drains.

7. Monitoring and Contingency Plan

To monitor the excavation and groundwater drawdown influence on the neighbouring property & public services, we proposed a schedule of horizontal deflection marks (DM1-9) at the top of the proposed retaining wall. DM 8 and DM 9 are placed on the existing timber retaining wall to monitor its deflection during the construction.

We have also planned a set of building settlement marks BS1-20 around the neighbouring properties to monitor the potential ground deformation and its differential settlements during the construction.

Figure 17. Updated Monitoring Plan.

Alert Level is commonly defined as the situation where monitoring reaches a level close to where damage may occur unless movement continues unchecked and requires review of available monitoring information (plus other information) to assess the future trend. Alarm Level is commonly defined as the situation where monitoring reaches a level where damage may occur and requires immediate action including the cessation of ground dewatering and other construction activities that may have an effect on ground deformation. Alert level is usually set as 70 % of Alarm level.

We have developed the following monitoring Table 13 to reflect the specific levels for each monitoring point:

Table 13. Monitoring Points Alert/ Alarm Level.

Monitoring Points	Alert Level (mm)	Alarm Level (mm)	Differential Settlement Alert Level	Differential Settlement Alarm Level	Monitoring Frequency
DM 1-3	11.7	16.7	/	/	Weekly
DM 4-5	11.2	16.0	/	/	Weekly
DM 6-7	9.4	13.4	/	/	Weekly
DM8-9	11.7	16.7	/	/	Weekly
BS1-20	7	10	1:700	1:500	Weekly

The monitoring frequency should be a minimum of weekly and at each 1.0 metre depth of excavation.

We propose the following actions as a consequence of monitoring points exceeding the alert or alarm levels.

- Alert level exceeded. Construction may continue and a report to be provided by the geotechnical engineer summarising the wall movements and recommending any remedial actions.
- Alarm level exceeded. Construction affecting the retaining wall to be paused while a report is provided by the geotechnical engineer summarising the wall movements and recommending any remedial actions.

We also recommend that a dilapidation/ condition survey of each of the neighbouring residential properties be carried out by a building surveyor or inspector following building consent approval and before any physical works onsite.

In order for the monitoring and contingencies to be clearly understood by all parties, we recommend that a stand-alone, concise, Monitoring and Contingency Plan be developed prior to the construction stage , to be followed by the Contractor during construction.

8. Conclusion

The proposed development includes 87 terrace houses. The site is underlain by Tuff of the Auckland Volcanic Field (AVF), Puketoka Formation and East Coast Bays Formation (ECBF) of the Waitemata Group. The site is within a residential area of Auckland with Half Moon Bay Marina to the north.

The design report have been updated in accordance with the revised architectural plan, updated civil work plan and also integrated with WAT queries. The proposed retaining wall should provide adequate factors of safety and capacity during the construction and restrain the wall deflection as well as ground settlement within the permitted limits. A preliminary monitoring and contingency plan have been provided for resource consent and water permit application.

We trust this letter meets your requirements. Please contact the undersigned if you have any questions.

Prepared by:

Bruce Li

Geotechnical Engineer

MEng, MSc, MICE, EPENZ

Total Ground Engineering

Reviewed and Authorised by:

Neil Jacka
Principal Geotechnical Engineer
BE(Hons), CMEngNZ, IntPE

Total Ground Engineering

Appendices

Limitations

This report has been prepared by Total Ground Engineering for our client's use in accordance with the proposed development plan and agreed scope of work. Any use or reliance by any other person, to which Total Ground Engineering has not given its prior written consent, is at that person's own risk.

The findings, recommendations and comments presented in this report are based on common methods of site investigation. The site investigation has been undertaken at discrete locations and ground conditions away from these locations could vary.

Appendix A
Reference Information

updated Archi set on 08/04/2024
updated Civil set on 10/04/2024

HND HMB Limited

3 PIGEON MOUNTAIN ROAD

3 PIGEON MOUNTAIN ROAD, HALF MOON BAY

CONTAIN WITHIN THIS PACKAGE

RESOURCE CONSENT SHEET LIST		
Sheet Number	Sheet Name	Current Revision
RA0000	COVER PAGE	G
RA0052	SITE PLAN ANALYSIS	A
RA0053	SITE PLAN ANALYSIS	G
RA0080	EXISTING SITE PLAN	G
RA0100	PROPOSED SITE PLAN	G
RA0101	PROPOSED LOT LAYOUT	G
RA0103	PROPOSED PLATFORM LEVEL PLAN	G
RA0104	PROPOSED RETAINING WALL PLAN	G
RA0110	PLATFORM LEVEL 3D	G
RA0111	OVERALL SITE 3D	G
RA0120	PROPOSED WASTE COLLECTION PLAN	G
RA0150	PROPOSED BASEMENT FLOOR PLAN	G
RA0151	PROPOSED GROUND LEVEL FLOOR PLAN	G
RA0152	PROPOSED LEVEL 1 FLOOR PLAN	G
RA0153	PROPOSED ROOF PLAN	G
RA0155	PROPOSED DECK LEVELS	G
RA0200	SITE PLANNING AREA (BUILDING COVERAGE)	G
RA0201	SITE PLANNING AREA (IMPERVIOUS AREA)	G
RA0202	SITE PLANNING AREA (LANDSCAPED AREA)	G
RA0203	SITE PLANNING AREA (FRONT YARDS LANDSCAPE AREA)	G
RA0204	SITE PLANNING AREA (OUTDOOR LIVING AREAS)	G
RA0205	OUTLOOK PLANS (LEVEL 00)	G
RA0206	OUTLOOK PLANS (LEVEL 01)	G
RA1300	SITE ELEVATIONS - OVERALL	G
RA1301	BLOCK ELEVATIONS - BLOCK A	G
RA1302	BLOCK ELEVATIONS - BLOCK B	G
RA1303	BLOCK ELEVATIONS - BLOCK C	G
RA1304	BLOCK ELEVATIONS - BLOCK D	G
RA1305	BLOCK ELEVATIONS 1 - BLOCK E	G
RA1306	BLOCK ELEVATIONS 2 - BLOCK E	G
RA1307	BLOCK ELEVATIONS - BLOCK F	G
RA1308	BLOCK ELEVATIONS - BLOCK G	G
RA1309	BLOCK ELEVATIONS 1 - BLOCK H	G
RA1310	BLOCK ELEVATIONS 2 - BLOCK H	G
RA1311	BLOCK ELEVATIONS - BLOCK I	G
RA1312	BLOCK ELEVATIONS - BLOCK J	G
RA1313	BLOCK ELEVATIONS - BLOCK K	G
RA1314	BLOCK ELEVATIONS - BLOCK L	G
RA1316	ELEVATION - RETAINING WALL	G
RA1317	ELEVATION - RETAINING WALL	G
RA1318	ELEVATION - RETAINING WALL	G
RA1319	ELEVATION - RETAINING WALL	G
RA1320	AVERAGE GROUND LEVEL	G
RA1400	SITE SECTIONS - OVERALL	G

RESOURCE CONSENT SHEET LIST		
Sheet Number	Sheet Name	Current Revision
RA1401	SITE SECTIONS - WESTERN RETAINING WALL	G
RA1402	SITE SECTIONS - WESTERN RETAINING WALL	G
RA1700	SUN SHADING - SPRING EQUINOX	G
RA1701	SUN SHADING - SPRING EQUINOX	G
RA1702	SUN SHADING - SUMMER SOLSTICE	G
RA1703	SUN SHADING - SUMMER SOLSTICE	G
RA1704	SUN SHADING - WINTER SOLSTICE	G
RA1705	SUN SHADING - WINTER SOLSTICE	G
RA1706	SUN SHADING - SPRING EQUINOX	G
RA1707	SUN SHADING - SPRING EQUINOX	G
RA1900	HIRB DIAGRAM	A
RA1901	PLANNING SUMMARY	A
RA2000	PERSPECTIVE RENDER	G
RA2001	PERSPECTIVE RENDER	G
RA2002	PERSPECTIVE RENDER	G
RA2003	PERSPECTIVE RENDER	G
RA2004	PERSPECTIVE RENDER	G
RA2005	PERSPECTIVE RENDER	G
RA2006	PERSPECTIVE RENDER	G
RA2007	PERSPECTIVE RENDER	G
RA2008	PERSPECTIVE RENDER	G
RA2100	LOOK AND FEEL	A
RA2101	LOOK AND FEEL	A
RA3000	UNIT TYPOLOGY - TYPE A1 INT	G
RA3001	UNIT TYPOLOGY - TYPE A1 CORNER	G
RA3001.1	UNIT TYPOLOGY - TYPE A_1 CORNER	G
RA3002	UNIT TYPOLOGY - TYPE A2 INT	G
RA3003	UNIT TYPOLOGY - TYPE A2 CORNER	G
RA3004	UNIT TYPOLOGY - TYPE B1 INT	G
RA3005	UNIT TYPOLOGY - TYPE B1 CORNER	G
RA3006	UNIT TYPOLOGY - TYPE C1 CORNER	G
RA3007	UNIT TYPOLOGY - TYPE C1.1 CORNER	G
RA3008	UNIT TYPOLOGY - TYPE C2 INT	G
RA3009	UNIT TYPOLOGY - TYPE C2	G
RA3010	UNIT TYPOLOGY - TYPE C2.1 CORNER	G
RA3011	UNIT TYPOLOGY - TYPE C3 INT	G
RA3012	UNIT TYPOLOGY - TYPE C3 CORNER	G
RA3013	UNIT TYPOLOGY - TYPE D1 INT & CORNER	G
RA3014	UNIT TYPOLOGY - TYPE D2 CORNER	G
RA3015	UNIT TYPOLOGY - TYPE D3 CORNER	B
RA3016	UNIT TYPOLOGY - TYPE D4	G
RA3017	UNIT TYPOLOGY - TYPE E1	G

GRAND TOTAL: 86

LOCATION PLAN

asc architects
17 MAIDSTONE STREET, PONSONBY, AUCKLAND 1021
PO BOX 5736, AUCKLAND 1141, NEW ZEALAND
p. +64 9 377 5332 w. www.ascarchitects.co.nz

S92 RESPONSE

PROJECT # : JOB NO. 22924

DATE:08/04/2024

Legend

Site | Major Retail and Commercial | Primary Arterial Roads | Secondary Arterial Roads | Collector Roads | Community/ Sports Amenities | Education | Greenspace

S92 RESPONSE

asc architects

3 PIGEON MOUNTAIN ROAD

SITE PLAN ANALYSIS

N

Project No. :	JOB NO. 22924
Scale:	@ A1
Date:	10/05/2023
Revison:	A

RA0052

S92 RESPONSE

asc architects

3 PIGEON MOUNTAIN ROAD

SITE PLAN ANALYSIS

N

Project No. :	**JOB NO. 22924**
Scale:	**1 : 500@ A1**
Date:	**08/04/2024**
Revison:	**G**

RA0053

HND HMB LTD
3 Pigeon Mountain Rd, Half Moon Bay

Resource Consent 2024

Job: 220571-1

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Sheet Number	Sheet Title
100	SITE PLAN - OVERALLL 1:500
200	SITE PLAN - EARTHWORKS CUT-FILL 1:500
201a	SITE PLAN - SEDIMENT CONTROL & EARTHWORKS STAGE 1
201b	SITE PLAN - SEDIMENT CONTROL & EARTHWORKS STAGE 2
201c	SITE PLAN - SEDIMENT CONTROL & EARTHWORKS STAGE 3
201d	SITE PLAN - SEDIMENT CONTROL & EARTHWORKS STAGE 4
202	SITE PLAN - PROPOSED LEVELS 1:500
202a	SITE PLAN - PROPOSED LEVELS JOAL 1 1:250
202b	SITE PLAN - PROPOSED LEVELS JOAL 2 1:250
202c	SITE PLAN - PROPOSED LEVELS JOAL 3 1:250
203	RETAINING WALL ELEVATIONS - WEST BOUNDARY
204	RETAINING WALL ELEVATIONS - NORTH & EAST BOUNDARY
204a	RETAINING WALL ELEVATIONS - SOUTH BOUNDARY
205	CROSS-SECTIONS THROUGH SITE
206	CROSS-SECTIONS THROUGH WEST BDY RETAINING WALL
206a	CROSS-SECTIONS THROUGH WEST BDY RETAINING WALL
207	SITE PLAN - PROPOSED CONTOURS 1:500
208	SITE PLAN - RETAINING WALL ELEVATION CHAINAGES
210	SEDIMENT CONTROL DETAILS
211	STABILISED CONTRUCTION ENTRANCE DETAIL
212	SEDIMENT CONTROL - CATCHPIT PROTECTION
213	SEDIMENT CONTROL - DEB DETAIL
220	RETAINING WALL ELEVATIONS
221	RETAINING WALL ELEVATIONS
222	RETAINING WALL ELEVATIONS

	ACCESSWAY
300	SITE PLAN - ACCESSWAY CHAINAGES 1:500
301	SITE PLAN - VEHICLE CROSSING 1:250
302	SITE PLAN - ACCESSWAY LOTS 32-34
303	SITE PLAN - ACCESSWAY LOTS 48-50
310	ACCESSWAY LONGSECTION JOAL 5 & 4
311	ACCESSWAY LONGSECTION JOAL 1 & 2, & 3
312	FOOTPATH LONGSECTION
313	ACCESSWAY CROSS-SECTIONS
314	ACCESSWAY CROSS-SECTIONS
315	ACCESSWAY CROSS-SECTIONS
316	PARKING SPACES LONGSECTIONS - LOTS 48-50
317	GARAGE LONGSECTIONS - LOT 32-34
318	GARAGE LONGSECTIONS - LOT 35-40
319	GARAGE LONGSECTIONS - LOT 24-31
320	STANDARD DETAILS - VEHICLE CROSSING & ACCESSWAY
321	STANDARD DETAILS - MOUNTABLE KERB,RAISED FOOTPATH
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410	STORMWATER LONGSECTION 1 & 2
411	STORMWATER LONGSECTION 3 & 4
412	STORMWATER LONGSECTION 5, 6 & 7
500	SITE PLAN - WASTEWATER 1:500
510	WASTEWATER LONGSECTION 1 & 2
511	WASTEWATER LONGSECTION 3 & 4
512	WASTEWATER LONGSECTION 5 & 6
513	WASTEWATER LONGSECTION 7 & 8
520	SITE PLAN - WATER SUPPLY, SERVICES 1:500

OTHER CONSENTS REQUIRED:

ALL PROPOSED PUBLIC DRAINAGE REQUIRES ENGINEERING APPROVAL.

ALL PRIVATE DRAINAGE, DETENTION TANKS & RETAINING WALLS REQUIRE BUILDING CONSENT.

PROPOSED VEHICLE CROSSINGS REQUIRES VEHICLE CROSSING APPROVAL.

WATERCARE WORKS OVER APPROVAL REQUIRED FOR WORKS WITHIN 2m OF WATERCARE ASSETS

NOTES

ALL WORK TO BE CARRIED OUT TO AUCKLAND COUNCIL & WATERCARE SERVICES ENGINEERING STANDARDS & STAMPED APPROVED PLANS.

CONTRACTOR TO LOCATE ALL SERVICES PRIOR TO COMMENCEMENT OF WORK.

NO DEVIATION FROM THESE ENGINEERING PLANS WITHOUT PRIOR WRITTEN APPROVAL FROM THE DESIGN ENGINEER.

STORMWATER, WASTEWATER AND WATERMAIN CONNECTIONS SHALL BE INSTALLED BY AN AUCKLAND COUNCIL & WATERCARE SERVICES APPROVED LICENSED CONTRACTOR AT THE APPLICANTS EXPENSE.

CONTRACTOR TO CONFIRM ALL DIMENSIONS ON SITE.

BOTH CONTRACTORS AND CONSULTANTS ARE TO TAKE ALL NECESSARY CARE AND PRECAUTION AT THE CONSTRUCTION SITE TO AVOID ACCIDENT AND INJURY FROM FALLING INTO EXCAVATIONS, CRUSHING BY SUBSIDING EXCAVATIONS AND THE MOVEMENT OF PLANT AND MATERIALS ON THE SITE.

THE CONTRACTOR SHALL PROVIDE SAFETY SHIELD OR EQUIVALENT SAFETY MEASURES FOR WORKS AREA DEEPER THAN OR EQUAL TO 1.5m TO COMPLY WITH WORKSAFE NEW ZEALAND.

CONTOURS AND MEASUREMENTS HAVE BEEN PROVIDED FOR ENGINEERING PURPOSES ONLY AND SHOULD NOT BE USED FOR TOWN PLANNING PURPOSES.

PILOT ALL SERVICES AND EXISTING DRAINAGE LINES PRIOR TO INSTALLATION OF NEW DRAINAGE LINES.

ANY DRAINAGE LINES ENCOUNTERED ON SITE DURING CONSTRUCTION NOT SHOWN ON THE ENGINEERING PLANS MUST BE REFERRED TO THE DESIGN ENGINEER.

LEVELS IN TERMS OF LANDS & SURVEY DATUM 1946.

ALL PUBLIC WASTEWATER MANHOLES TO BE 1050Ø RC WITH 600Ø HINGED LID AND SAFETY GRILLE UNLESS SHOWN OTHERWISE.

ALL PUBLIC STORMWATER MANHOLES TO BE 1050Ø RC WITH 600Ø HINGED LID UNLESS SHOWN OTHERWISE.

ALL PRECAST CONCRETE WASTEWATER MANHOLES TO BE THICKWALLED (WITH A 25mm SACRIFICIAL LAYER) OR HAVE APPROVED PE/PVC LINING AS PER WATERCARE MATERIAL SUPPLY STANDARD 14.8.4(H).

ALL SW & WW CONNECTIONS TO BE 100Ø uPVC SN16 UNLESS SHOWN OTHERWISE.

ALL 100Ø WW LOT CONNECTIONS TO BE FACTORY WYE JUNCTIONS (SN16 RATING).

ALL 100Ø WW LOT CONNECTIONS TO BE INSTALLED AT MIN. 30° INCOMING ANGLE FROM HORIZONTAL (MAX. 60°) PER WW15. INSTALL PLAIN BEND AT END OF WYE JUNCTION IF NECESSARY.

Airey
CIVIL, STRUCTURAL AND FIRE ENGINEERS

AIREY CONSULTANTS LTD
TEL: (09) 534 6523 www.aireys.co.nz
TAKAPUNA **BOTANY** QUEENSTOWN

CLIENT:

HND HMB LTD

JOB TITLE:

3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
6	WEST BDY RET WALL REVISED	10/04/2024	LP
5	LOT 2 BDY REV, DWG 208 ADDED	09/04/2024	LP
4	LOT 15 & 16 F'PATH ADDED	30/03/2024	LP
3	S92 REVISIONS - 87 DWELLINGS	26/03/2024	LP
2	S92 REVSIONS - 88 LOTS	05/02/2024	LP
1	S92 REVISIONS	20/10/2023	LP

DRAWING STATUS:

FINAL

ISSUE PURPOSE:

RESOURCE CONSENT

DESIGN:	SW
DRAWN:	LP
CHECKED:	RT
DATE:	22/05/23
SCALE:	NTS @ A3

DO NOT SCALE FROM DRAWINGS

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ORIGINAL SIZE:

5 0 5 10 15 20 25

DRAWING TITLE:

COVER SHEET

JOB No:	SHEET No:	REV:
220571-1	000	6

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SITE PLAN

1:500

Airey

CIVIL, STRUCTURAL AND FIRE ENGINEERS

AIREY CONSULTANTS LTD
TEL: (09) 534 6523 www.aireys.co.nz

TAKAPUNA **BOTANY** QUEENSTOWN

CLIENT:

HND HMB LTD

JOB TITLE:

3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
5	LOT 2 BDY REVISED	09/04/2024	LP
4	LOT 15 & 16 F'PATH ADDED	30/03/2024	LP
3	S92 REVISIONS - 87 DWELLINGS	26/03/2024	LP
2	S92 REVSIONS - 88 LOTS	05/02/2024	LP
1	S92 - LAYOUT REVISED	20/10/2023	LP

DRAWING STATUS:

FINAL

ISSUE PURPOSE:

RESOURCE CONSENT

DESIGN:	SW
DRAWN:	LP
CHECKED:	RT
DATE:	22/05/23
SCALE:	1:500 @ A3

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ORIGINAL SIZE:

5 0 5 10 15 20 25

DRAWING TITLE:

SITE PLAN
OVERALL

JOB No:	SHEET No:	REV:
220571-1	100	5

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Isopachs shown have been calculated from existing ground level to FFL

ELEVATIONS TABLE			
NUMBER	MIN. ELEVATION	MAX. ELEVATION	COLOUR
1	−3.00	−2.00	
2	−2.00	−1.00	
3	−1.00	0.00	
4	0.00	1.00	
5	1.00	2.00	
6	2.00	3.00	
7	3.00	4.00	

76 Compass Point Way

78 Compass Point Way

80 Compass Point Way

82 Compass Point Way

84 Compass Point Way

PROPOSED RETAINING WALL
SEE ELEVATION DWG 203

EXTG TIMBER RETAINING WALL
MAX HEIGHT 2.78m

PROPOSED RETAINING WALL
SEE ELEVATION DWG 204

ARA-TAI

STRUCTURAL ROOT ZONE TBC

R6.00

R5.50

BLOCK C

PIGEON MOUNTAIN ROAD

1
DP 212125
1.4073 ha

EARTHWORKS AREA (within site):
14000m²
(NOTE: AREA BEHIND EXTG WEST BDY RETAINING WALL WILL NOT BE DISTURBED = 80m²)

EARTHWORKS VOLUMES (Total):
Cut = 4076m³
Fill = 6690m³
Net Fill = 2614m³

EARTHWORKS VOLUMES (Ara Tai Reserve): AREA=225m²
Cut = 19m³
Fill = 8m³
Net Cut = 11m³

EARTHWORKS VOLUMES (Pigeon Mt berm): AREA=245m²
Cut = 35m³
Fill = 0m³
Net Cut = 35m³

Volumes are from existing ground level to FFL (including topsoil, subgrade, concrete).

Note:
Earthworks volumes for consent only. Not to be used for tender purposes.

PROPOSED RETAINING WALL
SEE ELEVATION DWG 204

SEE EAST BDY ELEVATION DWG 204

RETAINING WALLS:
FOR TYPE AND HEIGHT OF PROPOSED WALLS REFER ARCHITECTS PLAN RA0104

SEE SOUTH BDY ELEVATION DWG 204a

SITE PLAN
1:500

COMPASS POINT WAY

Airey
CIVIL, STRUCTURAL AND FIRE ENGINEERS

AIREY CONSULTANTS LTD
TEL: (09) 534 6523 www.aireys.co.nz
TAKAPUNA **BOTANY** QUEENSTOWN

CLIENT:
HND HMB LTD

JOB TITLE:
3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
6	WEST BDY RET WALL REVISED	10/04/2024	LP
5	RET WALL SYMBOLS TO MATCH ARCH	09/04/2024	LP
4	S92 REVISIONS - 87 DWELLINGS	26/03/2024	LP
3	SECTION 3 RELOCATED	08/02/2024	JC
2	S92 REVISIONS - 88 LOTS	05/02/2024	LP
1	S92 - LAYOUT/LEVELS REVISED	20/10/2023	LP

DRAWING STATUS:
FINAL

ISSUE PURPOSE:
RESOURCE CONSENT

DESIGN:	SW
DRAWN:	LP
CHECKED:	RT
DATE:	22/05/23
SCALE:	1:500 @ A3

DO NOT SCALE FROM DRAWINGS

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ORIGINAL SIZE:
5 0 5 10 15 20 25

DRAWING TITLE:
SITE PLAN
EARTHWORKS

JOB No:	SHEET No:	REV:
220571-1	200	6

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17 November 2023

Campbell Brown Planning Limited
PO Box 147001
Ponsonby
Auckland 1144

Attention: Yujie Gao

Dear Yujie,

Resource consent application – Further information request

Application number(s):	WAT60423590
Applicant:	HND HMB Limited
Address:	3 Pigeon Mountain Road, Half Moon Bay
Proposed activity(s):	Groundwater diversion arising from earthworks proposed by application BUN60419132

This letter is a request for further information that will help me better understand your proposal, including its effect on the environment and the ways any adverse effects might be mitigated.

Requested information

1. Please provide the predicted maximum total settlement for each dwelling of the dwellings located at 76 to 84 Compass Point Way.

2. Please provide the calculations for the predicted maximum differential settlement for each dwelling of the dwellings at 76 to 84 Compass Point Way.

3. Clarification is required for the total number of Deflections marks.

   Note: Seven markers are shown on the proposed retaining wall on the monitoring plan as DM1 to DM7. However, the trigger level Table in the report (page 18) indicates eight markers as DM1-8.

4. Specific alert and alarm trigger levels are required for the DM's - which reflect the predicted the wall deflection and 70% of the deflection e.g DM3 appears to be located in the vicinity of Section 3 where 12m long 750mm diameter RC piles at 1.5m c/c spacing are proposed hence the alert trigger level should by 70% of 21mm (see Table 8) i.e 15mm and the alarm trigger level should be 21mm. Please confirm.

5. Please confirm any monitoring required for the existing retaining walls located at the western boundary. If not, justification is required.

6. Council would expect to see pre and post construction detailed condition surveys of the dwellings at 76 to 84 Compass Point Way and pre and post construction detailed condition CCTV of the 150mm diameter uPVC sewer pipe and the 300mm diameter concrete stormwater pipe in the rear gardens of 76 to 84 Compass Point Way. Please confirm.

Providing the information

Please provide this information in writing within 15 working days[1] (before 8 December 2023). If you will not be able to provide the information by that date, please contact me before then to arrange an alternative time. We will not work on your application any further until either you provide this information, or you state that you refuse to provide it.

Note: If you will require more than 15 working days to provide this further information, I will seek that you agree to an extension of time under section 37 of the Resource Management Act 1991 (the RMA). This will enable appropriate time for me to undertake the necessary review of the information once provided.

Refusing to provide the information

If you refuse to provide the information, or if you do not submit the information to us within 15 days (or by another other agreed time), the RMA requires that we publicly notify your application.[2]

If this happens, you will be required to pay the notification fee of $20,000 in full before we proceed with the notification of your application.[3]

Next steps

Once you have provided the requested information, I will review what you have provided to make sure it adequately addresses all of the points of this request.

In the application acceptance letter, I described the statutory timeframe for our decision on your application. The time for you to respond to this further information request will be excluded from this timeframe[4]. I will be able to give you an updated forecast on a decision date on request once you have provided the information requested above.

If you have any queries, please contact me at aaron@civilplan.co.nz and quote the application number above.

Yours sincerely,

Aaron Grey
Consultant Planner

[1] Section 92A(1) of the RMA
[2] Section 95C of the RMA
[3] Section 36AAB(2) of the RMA
[4] Section 88C(2) of the RMA

Geotechnical Reference Information
from J00538 AA Geotechnical Investigation Report
updated 22.09.2023

TOTAL GROUND ENGINEERING

27C WAIPAREIRA AVENUE
HENDERSON

PH: 027 557 7234
njacka@tge.co.nz

PROJECT
3 PIGEON MOUNTAIN
HALF MOON BAY
AUCKLAND

DRAWING TITLE
INVESTIGATION PLAN

Date:	JUL 2022
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
B	22.09.2023	ISSUED FOR RC APPLICATION	BL
A	07.04.2022	ISSUED FOR INFORMATION	BL

Check all dimensions and levels on site before commencing construction.
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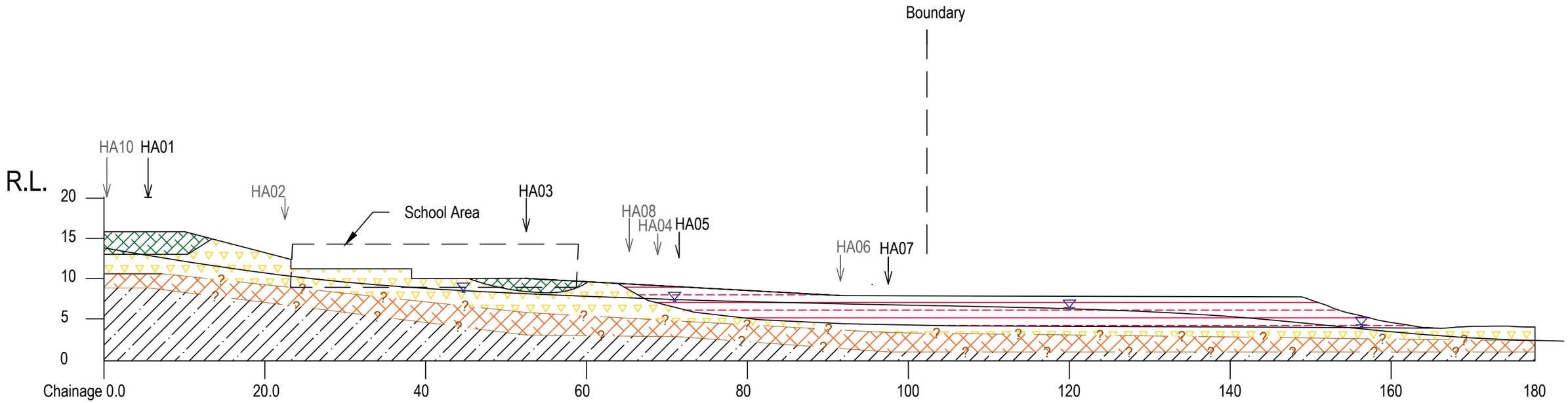
PAPER SIZE	A3	JOB No.	DWG No.	REV
SCALE	1:800	J00538	100	B



SECTION AA

Geologic Unit:

- Puketoka Formation
- Fill
- AVF
- CW-HW ECBF
- MW-SW ECBF
- Ground Water Level
- Material Interface —— ? ——

NOTES:

Locations of features approximate only
Original sheet size A3
Levels refer to provided survey data
Survey information are based on the Auckland Geomaps

TOTAL GROUND ENGINEERING
27C WAIPAREIRA AVENUE
HENDERSON
PH: 027 557 7234
njacka@tge.co.nz

PROJECT
3 PIGEON MOUNTAIN
HALF MOON BAY
AUCKLAND

DRAWING TITLE
GEOLOGICAL SECTION AA

Date:	JUL 2022
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
B	22.09.2023	ISSUED FOR RC APPLICATION	BL
A	07.04.2022	ISSUED FOR INFORMATION	BL

Check all dimensions and levels on site before commencing construction.
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PAPER SIZE	A3	JOB No.	DWG No.	REV
SCALE	1:500	J00538	101	B

TOTAL GROUND ENGINEERING

Client:	HND HMB Ltd	Augerhole No.	HA01
Project:	Geotechnical Investigation for Proposed Residential Development	Sheet No.	1 of 1
Address:	3 Pigeon Mountain Road, Half Moon Bay, Auckland		

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769285.17 N5916423.99	Shear Vane No:	2982
Date Started:	15-Jun-22	Ground Conditions:	Slightly sloping, Grass	Calibration Factor:	1.571
Date Finished:	15-Jun-22	Groundwater Level (m):	Not Encountered (15-Jun-22)	Calibration Date:	18-Sep-20

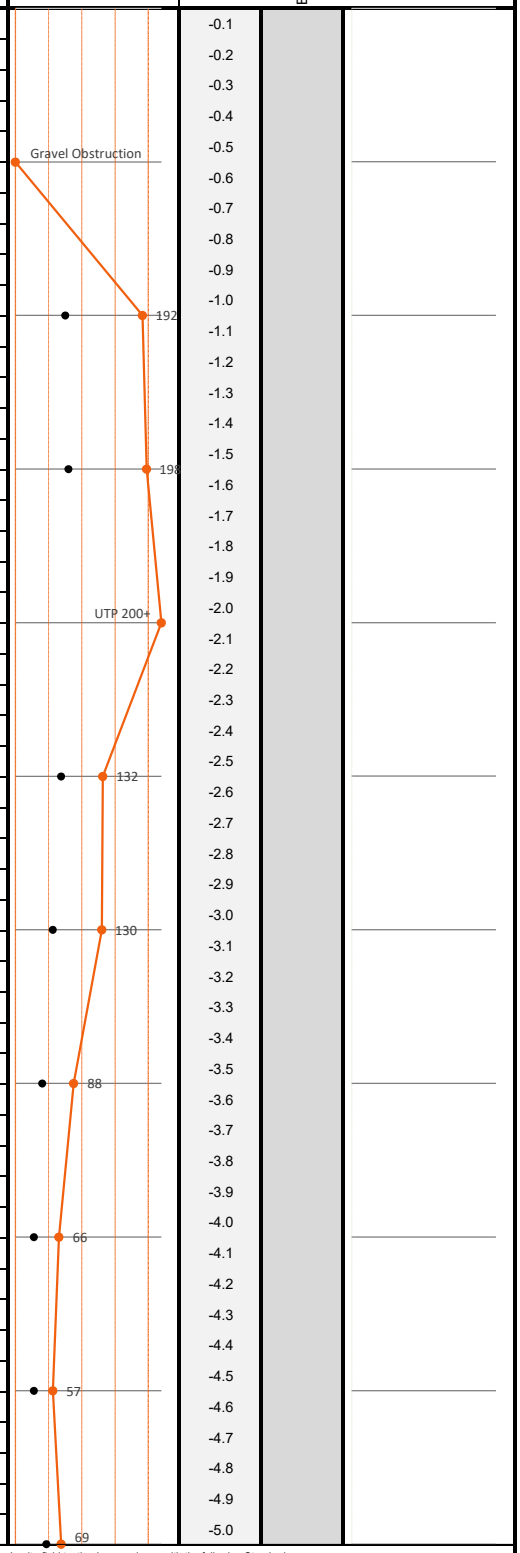
Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
FILL	0.5		SILT, minor fine to coarse sand, minor fine sub-angular gravel, brown and brownish orange intermixed, stiff, moist, non-plastic [FILL]
AUCKLAND VOLCANIC FIELD	1.0		SILT, minor to some clay, some fine to medium sand, brownish-orange with grey bands, very stiff, moist, slightly plastic [TUFF]
			no clay, hard, non-plastic
	1.5		trace clay, light grey with orange and black mottles
	2.0		
PUKETOKA FORMATION	2.5		Clayey SILT, trace fine sand, light grey with dark orange bands, very stiff, moist, moderately to highly plastic [PUKETOKA FORMATION]
	3.0		
	3.5		minor fine to medium sand
	4.0		
	4.5		
	5.0		End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): Not Encountered

In-situ Field Testing

Shear Strength (kPa) — Peak: ● Remoulded: ○ — 0 50 100 150 200

Dynamic Cone (Scala) Penetrometer — Depth (m) | Blow Count | Scala Blow Count / 100mm — 0



In-situ field testing in accordance with the following Standards:

Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer

Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

Total Ground Engineering Ltd. 27C Waipareira Ave, Henderson, 0610
PO Box 27294, Glen Eden, 0604, Auckland, New Zealand
Phone: +64 9 216 7330
Website: www.totalgroundengineering.com

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

Augerhole No. HA02
Sheet No. 1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769250.13 N5916486.75	Shear Vane No:	2982
Date Started:	16-Jun-22	Ground Conditions:	Near level, Grass	Calibration Factor:	1.571
Date Finished:	16-Jun-22	Groundwater Level (m):	Not Encountered (16-Jun-22)	Calibration Date:	18-Sep-20

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
TOPSOIL/FILL	0.5		SILT, trace fine to coarse sand, minor clay, dark brown, stiff, moist, slightly plastic [TOPSOIL/FILL]
PUKETOKA FORMATION	1.0		Silty CLAY, trace fine sand, light grey with light orange streaks, stiff, moist, highly plastic [PUKETOKA FORMATION]
	1.5		SILT, some clay, some fine to medium sand, light grey with orange streaks, stiff, moist, slightly plastic
	2.0		minor clay
	2.5		orange with light grey bands
EAST COAST BAYS FORMATION	3.0		Fine to medium sandy SILT, light grey with orange bands, very stiff, moist, non to slightly plastic [EAST COAST BAYS FORMATION]
	3.5		grey
	4.0		
	4.5		
	5.0		SILT, some clay, trace fine sand, dark grey, hard, moist, slightly plastic
			End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): Not Encountered

In-situ Field Testing

Shear Strength (kPa) — Peak: ● Remoulded: ○ — 0 50 100 150 200

Depth (m)	Peak	Remoulded
0.5	85	
1.0	101	
1.5	101	
2.0	101	
2.5	123	
3.0	135	
3.5	167	
4.0	182	
4.5	116	
5.0	UTP 200+	

Dynamic Cone (Scala) Penetrometer

Depth (m)	Blow Count	Scala Blow Count / 100mm
-0.1		0
-0.2		
-0.3		
-0.4		
-0.5		
-0.6		
-0.7		
-0.8		
-0.9		
-1.0		
-1.1		
-1.2		
-1.3		
-1.4		
-1.5		
-1.6		
-1.7		
-1.8		
-1.9		
-2.0		
-2.1		
-2.2		
-2.3		
-2.4		
-2.5		
-2.6		
-2.7		
-2.8		
-2.9		
-3.0		
-3.1		
-3.2		
-3.3		
-3.4		
-3.5		
-3.6		
-3.7		
-3.8		
-3.9		
-4.0		
-4.1		
-4.2		
-4.3		
-4.4		
-4.5		
-4.6		
-4.7		
-4.8		
-4.9		
-5.0		

In-situ field testing in accordance with the following Standards:
Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer
Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

TOTAL GROUND ENGINEERING

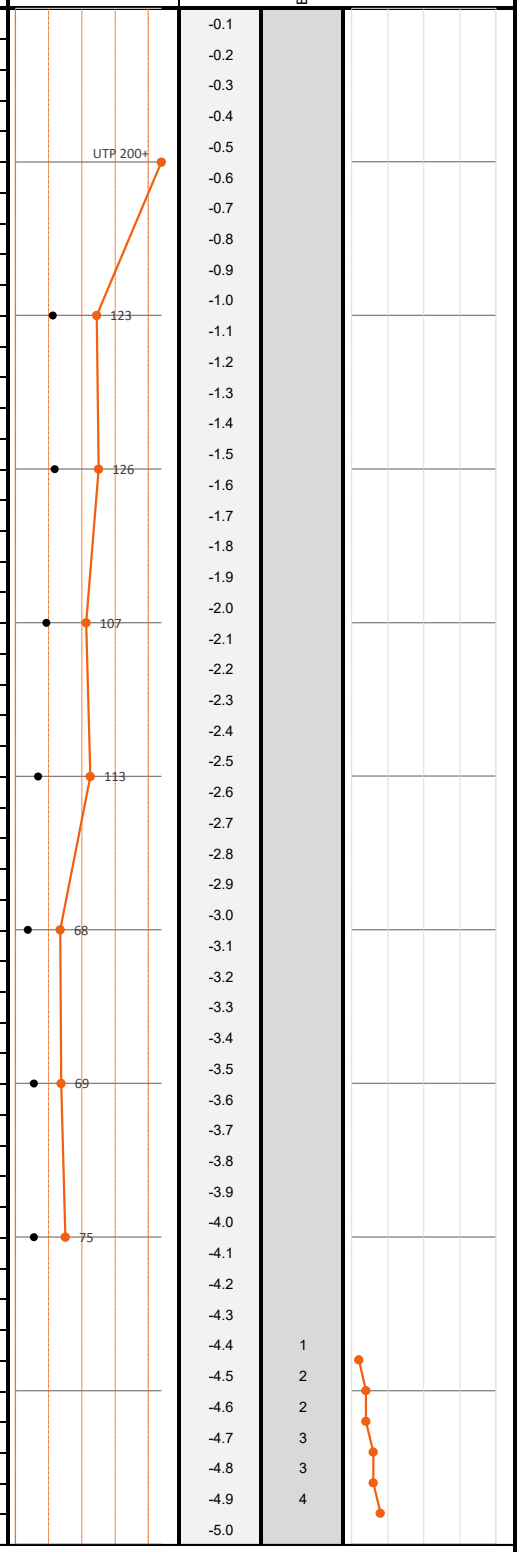
Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

Augerhole No. HA03
Sheet No. 1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769323.22 N5916452.24	Shear Vane No:	2982
Date Started:	15-Jun-22	Ground Conditions:	Near level, Grass	Calibration Factor:	1.571
Date Finished:	15-Jun-22	Groundwater Level (m):	3.0m (15-Jun-22)	Calibration Date:	18-Sep-20

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
TS/FILL	0		SILT, minor fine sand, trace clay, brown, stiff, moist, non-plastic [TOPSOIL/FILL]
AUCKLAND VOLCANIC FIELD	0.5		SILT, some fine sand, trace clay, orange with grey bands, hard, dry, non-plastic [TUFF]
PUKETOKA FORMATION	1.0		Clayey SILT, minor fine to medium sand, light grey with orange streaks, very stiff, moist, slightly to moderately plastic [PUKETOKA FORMATION] trace decomposed organic mottles
	1.5		
	2.0		
	2.5		
	3.0		Fine to medium sandy SILT, minor clay, light grey with orange streaks, stiff, moist, moderately plastic
	3.5		
	4.0		Silty fine to medium SAND, light grey, loose, saturated
	4.5		
	5.0		End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): GW = 3.0m (15-Jun-22)



In-situ field testing in accordance with the following Standards:
Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer
Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

Augerhole No. HA04
Sheet No. 1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769362.55 N5916428.41	Shear Vane No:	2982
Date Started:	15-Jun-22	Ground Conditions:	Near level, Grass	Calibration Factor:	1.571
Date Finished:	15-Jun-22	Groundwater Level (m):	Not Encountered (15-Jun-22)	Calibration Date:	18-Sep-20

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
FILL	0.0		SILT, minor clay, minor fine to coarse sand, trace fine sub-angular gravel, brown, grey and orange intermixed, stiff, moist, non to slightly plastic [FILL]
	0.5		
AUCKLAND VOLCANIC FIELD	1.0		SILT, trace clay, minor fine to coarse sand, greyish brown with light orange mottles, very stiff, dry, non-plastic [TUFF]
			dark orange and greyish orange intermixed
	1.5		
	2.0		some fine to medium sand
PUKETOKA FORMATION	2.5		Silty CLAY, trace fine sand, grey, very stiff, moist, highly plastic [PUKETOKA FORMATION]
			light whitish grey
	3.0		
	3.5		Clayey SILT, minor fine to medium sand, light whitish-grey with yellow streaks, very stiff, moist, moderately to highly plastic
			some fine to medium pumiceous sand
	4.0		
	4.5		
	5.0		End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): Not Encountered

In-situ Field Testing

Shear Strength (kPa) — Peak: ● Remoulded: ○ — 0 50 100 150 200

Depth (m)	Shear Strength (kPa)
0.5	110
1.0	159
1.5	UTP 200+
2.0	107
2.5	110
3.0	110
3.5	107
4.0	91
4.5	96
5.0	91

Dynamic Cone (Scala) Penetrometer

Depth (m)	Blow Count	Scala Blow Count / 100mm
-0.1		0
-0.2		
-0.3		
-0.4		
-0.5		
-0.6		
-0.7		
-0.8		
-0.9		
-1.0		
-1.1		
-1.2		
-1.3		
-1.4		
-1.5		
-1.6		
-1.7		
-1.8		
-1.9		
-2.0		
-2.1		
-2.2		
-2.3		
-2.4		
-2.5		
-2.6		
-2.7		
-2.8		
-2.9		
-3.0		
-3.1		
-3.2		
-3.3		
-3.4		
-3.5		
-3.6		
-3.7		
-3.8		
-3.9		
-4.0		
-4.1		
-4.2		
-4.3		
-4.4		
-4.5		
-4.6		
-4.7		
-4.8		
-4.9		
-5.0		

In-situ field testing in accordance with the following Standards:
Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer
Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

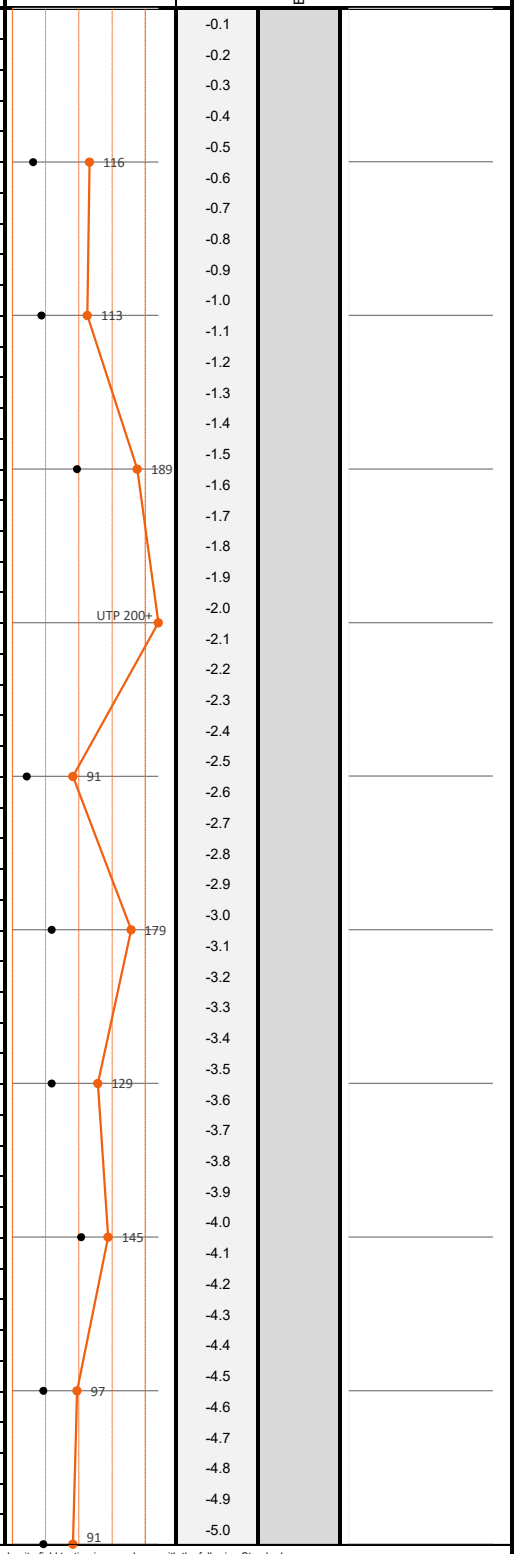
Augerhole No. HA05
Sheet No. 1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769315.7 N5916485.41	Shear Vane No:	2982
Date Started:	16-Jun-22	Ground Conditions:	Near level, Grass	Calibration Factor:	1.571
Date Finished:	16-Jun-22	Groundwater Level (m):	Not Encountered (16-Jun-22)	Calibration Date:	18-Sep-20

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
TS/F			SILT, trace clay, minor fine to coarse sand, brown, stiff, moist, non-plastic [TOPSOIL/FILL]
FILL	0.5		Clayey SILT, minor fine to coarse sand, trace fine to medium sub-angular gravel, light brown, grey and orange intermixed, stiff, moist, moderately plastic [FILL]
	1.0		
	1.5		SILT, some clay, minor fine to coarse sand, trace fine sub-angular gravel, brownish-orange and light grey intermixed, very stiff, moist, slightly to moderately plastic, trace rootlet inclusions
	2.0		no clay, no gravel, no rootlet inclusions, orange
	2.5		Silty CLAY, trace fine sand, light grey with orange streaks, stiff, wet, highly plastic
	3.0		light grey with black and dark orange mottles, trace rootlet inclusions
	3.5		Clayey SILT, minor fine to medium sand, bluish grey, grey and orange intermixed, stiff, moist, moderately plastic, trace rootlet inclusions
	4.0		
PUKETOKA FORMATION	4.5		Silty CLAY, minor fine to medium sand, light bluish grey with orange streaks, very stiff, wet, highly plastic [PUKETOKA FORMATION]
	5.0		
			End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): Not Encountered

In-situ Field Testing



In-situ field testing in accordance with the following Standards:

Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer

Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

Total Ground Engineering Ltd. 27C Waipareira Ave, Henderson, 0610
PO Box 27294, Glen Eden, 0604, Auckland, New Zealand
Phone: +64 9 216 7330
Website: www.totalgroundengineering.com

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

Augerhole No. HA06
Sheet No. 1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769355.93 N5916465.98	Shear Vane No:	2982
Date Started:	16-Jun-22	Ground Conditions:	Sloping, Grass	Calibration Factor:	1.571
Date Finished:	16-Jun-22	Groundwater Level (m):	Not Encountered (16-Jun-22)	Calibration Date:	18-Sep-20

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005	Groundwater Level (m)	Depth (m)	In-situ Field Testing: Shear Strength (kPa) (Peak / Remoulded; 0 50 100 150 200)	In-situ Field Testing: Dynamic Cone (Scala) Penetrometer: Depth (m)	Blow Count	Scala Blow Count / 100mm (0)
FILL			SILT, minor fine to medium angular gravel, trace clay, dark brown, stiff, moist, non-plastic [FILL]				-0.1		
							-0.2		
							-0.3		
							-0.4		
	0.5		End of Augerhole 0.4m		0.5		-0.5		
			[GRAVEL OBSTRUCTION]				-0.6		
							-0.7		
							-0.8		
							-0.9		
	1.0				1.0		-1.0		
							-1.1		
							-1.2		
							-1.3		
							-1.4		
	1.5				1.5		-1.5		
							-1.6		
							-1.7		
							-1.8		
							-1.9		
	2.0				2.0		-2.0		
							-2.1		
							-2.2		
							-2.3		
							-2.4		
	2.5				2.5		-2.5		
							-2.6		
							-2.7		
							-2.8		
							-2.9		
	3.0				3.0		-3.0		
							-3.1		
							-3.2		
							-3.3		
							-3.4		
	3.5				3.5		-3.5		
							-3.6		
							-3.7		
							-3.8		
							-3.9		
	4.0				4.0		-4.0		
							-4.1		
							-4.2		
							-4.3		
							-4.4		
	4.5				4.5		-4.5		
							-4.6		
							-4.7		
							-4.8		
							-4.9		
	5.0				5.0		-5.0		

In-situ field testing in accordance with the following Standards:

Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer

Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

Augerhole No. HA07
Sheet No. 1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769333.95 N5916508.07	Shear Vane No:	2982
Date Started:	16-Jun-22	Ground Conditions:	Near level, Grass	Calibration Factor:	1.571
Date Finished:	16-Jun-22	Groundwater Level (m):	Not Encountered (16-Jun-22)	Calibration Date:	18-Sep-20

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
FILL	0.5		SILT, minor clay, some fine to coarse sand, trace fine sub-rounded gravel, brown, very stiff, moist, non-plastic [FILL]
	1.0		Clayey SILT, minor fine to coarse sand, trace fine sub-angular gravel, brownish grey, light grey and orange intermixed, very stiff, moist, moderately plastic
	1.5		
	2.0		
	2.5		
	3.0		
	3.5		orange with brownish-grey bands, trace rounded limonite gravel
PUKETOKA FORMATION	4.0		Fine to medium sandy SILT, some clay, light grey with minor decomposed silt inclusions as black bands, stiff, wet, slightly plastic
	4.5		trace medium angular basalt gravel
	5.0		End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): Not Encountered

In-situ Field Testing

Depth (m)	Shear Strength (kPa) (Peak / Remoulded; 0 50 100 150 200)	Dynamic Cone (Scala) Penetrometer: Depth (m)	Blow Count	Scala Blow Count / 100mm (0)
0.5	145	-0.1 to -0.5		
1.0	110	-0.6 to -1.0		
1.5	140+	-1.1 to -1.5		
2.0	UTP 200+	-1.6 to -2.0		
2.5	148	-2.1 to -2.5		
3.0	110	-2.6 to -3.0		
3.5	132	-3.1 to -3.5		
4.0	85	-3.6 to -4.0		
4.5	85	-4.1 to -4.5		
5.0	115	-4.6 to -5.0		

In-situ field testing in accordance with the following Standards:
Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer
Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

Augerhole No. HA08
Sheet No. 1 of 1

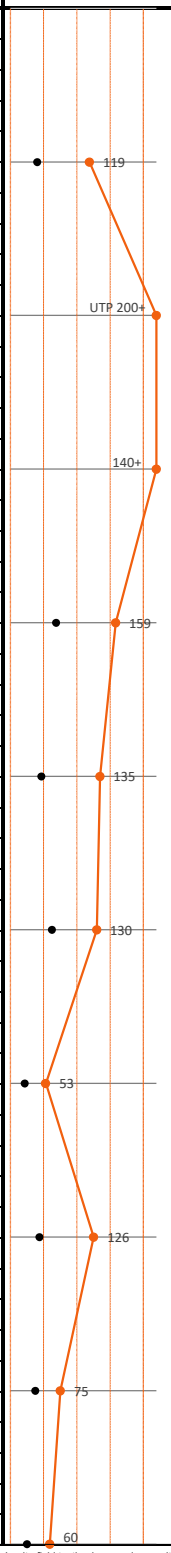
Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769257.06 N5916543.39	Shear Vane No:	2982
Date Started:	16-Jun-22	Ground Conditions:	Slightly sloping, Grass	Calibration Factor:	1.571
Date Finished:	16-Jun-22	Groundwater Level (m):	1.0m (16-June-22)	Calibration Date:	18-Sep-20

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
FILL	0.0		SILT, minor clay, trace fine to coarse sand, trace fine sub-angular gravel brownish-grey with orange mottles, stiff, moist, non-plastic [FILL]
	1.0		saturated
	1.5		some clay, orange with light grey bands, hard, saturated, slightly to moderately plastic, trace charcoal inclusions
	2.0		minor fine to coarse sand, trace fine angular gravel, brown, brownish orange and dark grey intermixed
PUKETOKA FORMATION	2.5		Silty CLAY, minor fine to medium sand, light grey with light orange streaks, trace fine sub-rounded limonite gravel, very stiff, saturated, highly plastic [PUKETOKA FORMATION]
	3.0		SILT, some clay, minor fine to coarse sand, trace fine sub-rounded gravel, grey, blue, brown and orange intermixed, very stiff, wet, moderately plastic
	3.5		Organic SILT, some clay, trace fine sand, black, stiff, saturated, moderately plastic [AMORPHOUS PEAT]
	4.0		Fine to coarse sandy SILT, minor silty clay bands, trace shell fragments to 20mm, trace fine to medium sub-rounded gravel, grey, brown, green and orange intermixed, stiff, saturated, slightly plastic [MARINE DIPOSITS]
	5.0		End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): GW = 1.0m (16-June-22)

In-situ Field Testing

Shear Strength (kPa) — Peak: ● Remoulded: ○



Dynamic Cone (Scala) Penetrometer

Depth (m)	Blow Count	Scala Blow Count / 100mm
-0.1		
-0.2		
-0.3		
-0.4		
-0.5		
-0.6		
-0.7		
-0.8		
-0.9		
-1.0		
-1.1		
-1.2		
-1.3		
-1.4		
-1.5		
-1.6		
-1.7		
-1.8		
-1.9		
-2.0		
-2.1		
-2.2		
-2.3		
-2.4		
-2.5		
-2.6		
-2.7		
-2.8		
-2.9		
-3.0		
-3.1		
-3.2		
-3.3		
-3.4		
-3.5		
-3.6		
-3.7		
-3.8		
-3.9		
-4.0		
-4.1		
-4.2		
-4.3		
-4.4		
-4.5		
-4.6		
-4.7		
-4.8		
-4.9		
-5.0		

In-situ field testing in accordance with the following Standards:

Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer

Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

Scala Penetrometer Testing

Date tested: 16-June-2022 Tested By: JH

Test ID	HA01	Cont…	HA02	HA03	HA04	Cont…	HA05	HA07	Cont…	
Test from (m)	5.0	7.0	5.0	5.0	5.0	7.0	5.0	5.0	7.0	
Depth (m)	Blows/100mm penetration									
0.1	1	20	3	5	3	17	1	1	16	
0.2	1	20+	5	6	3	16	2	2	18	
0.3	1		8	6	4	16	4	2	20	
0.4	3		9	8	5	17	5	4	20+	
0.5	4		12	8	6	17	6	3		
0.6	4		17	8	7	18	7	4		
0.7	4		20	10	9	17	8	5		
0.8	4		20+	10	8	17	9	7		
0.9	6			9	9	20	10	6		
1.0	6			9	9	20+	13	4		
1.1	6			15	9		13	5		
1.2	8			14	10		15	9		
1.3	7			14	9		18	7		
1.4	8			15	11		23	11		
1.5	10			15	13		20+	12		
1.6	12			18	13			13		
1.7	13			19	14			13		
1.8	15			20	14			15		
1.9	14			20+	14			14		
2.0	14				14			12		
Test depth (m)	7.0	7.2	5.8	6.9	7.0	8.0	6.5	7.0	7.4	

In-situ field testing in accordance with Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer

TOTAL GROUND ENGINEERING

Client:	HND HMB Ltd
Project:	Geotechnical Investigation for Proposed Residential Development
Address:	3 Pigeon Mountain Road, Half Moon Bay, Auckland

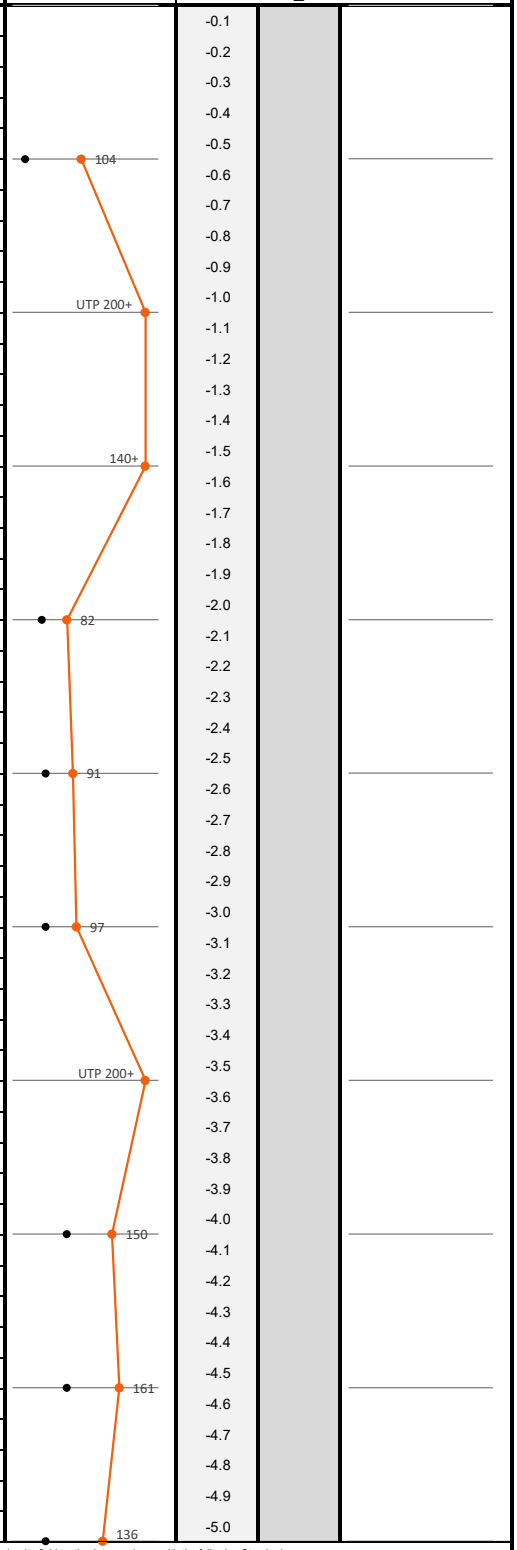
Augerhole No.	HA09
Sheet No.	1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769249.41 N5916531.58	Shear Vane No:	2982
Date Started:	23-Aug-23	Ground Conditions:	Slightly sloping, Grass	Calibration Factor:	1.790
Date Finished:	23-Aug-23	Groundwater Level (m):	3.0m (23-Aug-23) [Piezo screen 1.0m-5.0m]	Calibration Date:	18-Jan-23

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
TOPSOIL/FILL			SILT, trace fine to coarse sand, trace clay, dark brown, stiff, moist, slightly plastic [TOPSOIL/FILL]
FILL	0.5		Silty CLAY, trace fine sand, trace fine to medium rounded gravel, brownish orange with light grey streaks, stiff, moist, highly plastic [FILL]
	1.0		SILT, minor to some clay, trace fine to coarse sand, trace fine angular sub-rounded gravel, dark grey with brown mottles, hard, moist, slightly plastic
	1.5		orange grey and brown intermixed
	2.0		Silty CLAY, trace fine to coarse sand, light grey with orange streaks, stiff, moist, highly plastic
	2.5		SILT, some fine to coarse sand, minor fine rounded gravel, minor to some clay, light grey and reddish brown intermixed, stiff, moist, non to slightly plastic groundwater seepage
	3.0		Silty CLAY, trace fine to coarse sand, light grey with orange streaks, stiff, wet, highly plastic
	3.5		SILT, minor fine to coarse sand, minor clay, dark grey, dark greenish grey and brown intermixed, hard, wet, slightly plastic
	4.0		
	4.5		minor fine to medium sand, dark greyish brown, slightly plastic, trace while speckles
PUKEFORM	5.0		SILT, some clay, minor fine to coarse sand, light grey, stiff, wet, moderately plastic [PUKETOKA FORMATION]
			End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): GW = 3.0m (23-Aug-23)

In-situ Field Testing



In-situ field testing in accordance with the following Standards:

Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer

Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

TOTAL GROUND ENGINEERING

Client: HND HMB Ltd
Project: Geotechnical Investigation for Proposed Residential Development
Address: 3 Pigeon Mountain Road, Half Moon Bay, Auckland

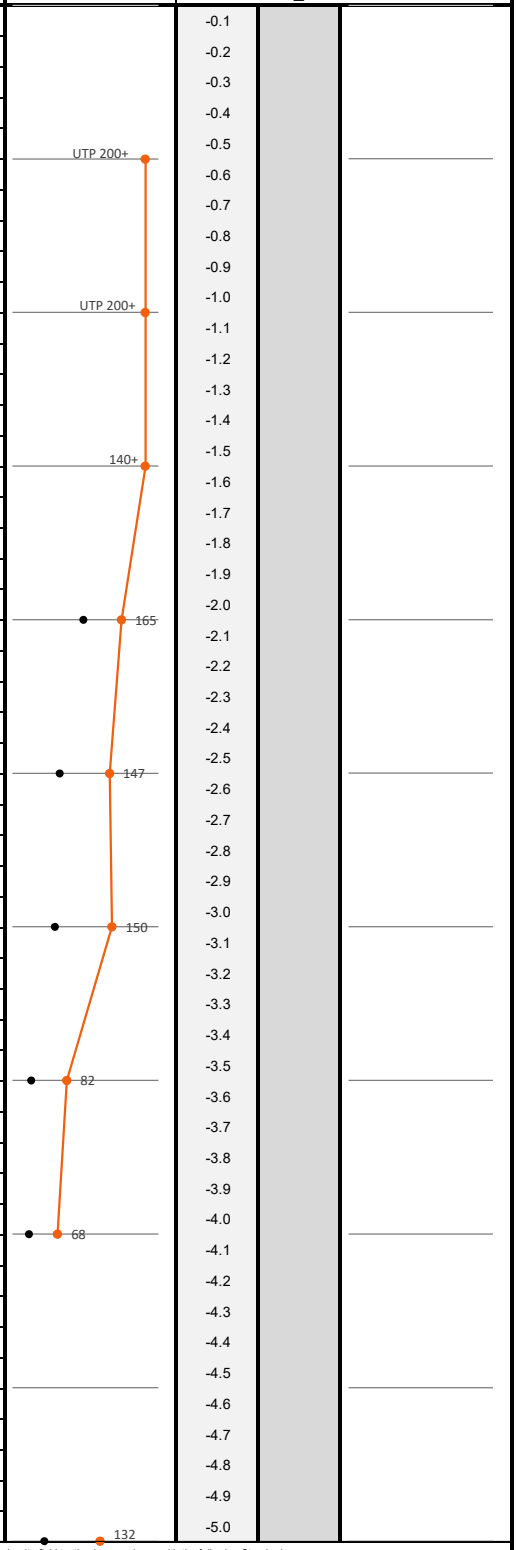
Augerhole No. HA10
Sheet No. 1 of 1

Drill Type:	50mmØ Hand Auger	Project No:	J00538	Logged By:	JH
Drilled By:	JH	Coordinates:	NZTM2000 E1769245.15 N5916467.04	Shear Vane No:	2982
Date Started:	24-Aug-23	Ground Conditions:	Slightly sloping, Grass	Calibration Factor:	1.790
Date Finished:	24-Aug-23	Groundwater Level (m):	4.0m (23-Aug-23) [Piezo screen 1.0m-5.0m]	Calibration Date:	18-Jan-23

Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with *Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*, NZ Geotechnical Society Inc., 2005
FILL	0.0		SILT, minor clay, trace fine to medium angular gravel, brown and brownish orange intermixed, stiff, hard, moist, slightly plastic [FILL]
	0.5		dark greyish brown with brown mottles
	1.0		
PUKETOKA FORMATION	1.5		SILT, some clay, minor fine to medium sand, light grey with dark orange and black mottles, hard, moist, slightly plastic [PUKETOKA FORMATION]
	2.0		Clayey SILT, trace fine to medium sand, light grey with orange streaks hard, moist, moderately plastic
	2.5		
	3.0		
	3.5		SILT, some fine to medium sand, minor clay, light grey with orange and red streaks, stiff, moist, non to slightly plastic
	4.0		Fine to medium sandy SILT, light grey with light red bands, stiff, moist, non-plastic
	4.5		Silty fine to medium SAND, light grey and reddish orange, loose to medium dense, moist
	5.0		SILT, some clay, trace fine to medium sand, light yellowish orange, stiff, moist, highly plastic
			End of Augerhole 5.0m [TARGET DEPTH]

Groundwater Level (m): GW = 4.0m (23-Aug-23)

In-situ Field Testing



In-situ field testing in accordance with the following Standards:
Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer
Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

Existing Western Boundary Retaining Wall Details from Provided Property File

ROAD CENTRE LINE SETOUT COORDINATES

POINTS	EASTING	NORTHING
TP1	312146.020	699423.476
TP2	312008.498	699434.050
TP3	311996.818	699436.693
TP4	311990.821	699437.224
TP5	311985.742	699438.062
TP6	311978.789	699442.887
TP7	311982.805	699483.134
TP8	311938.537	699476.317
TP9	311982.055	699516.089
TP10	311961.676	699526.123
TP11	311956.836	699535.684
TP12	311953.722	699544.245
TP13	311946.648	699551.274
TP14	311941.966	699554.395
TP15	311864.296	699598.514
TP16	311858.700	699600.544
TP17	311858.256	699601.402
TP18	311844.981	699603.376
TP19	311820.123	699607.727
TP20	311810.405	699608.454
TP21	311800.501	699607.209
TP22	311791.048	699604.003
TP23	311782.43	699598.965
TP24	311774.996	699592.300
TP25	311769.026	699584.28
TP26	311764.842	699575.231
TP27	311762.532	699565.52
TP28	311762.267	699563.074
TP29	311757.705	699508.268
TP30	311757.641	699505.732
TP31	311780.173	699496.147
TP32	311766.64	699488.633
TP33	311775.742	699464.704
TP34	311777.783	699484.427
TP35	311880.311	699475.352
TP36	311910.192	699472.707
TP37	311940.072	699470.062

RETAINING WALL SETOUT COORDINATES

POINTS	EASTING	NORTHING
P1	311770.524	699516.409
P2	311796.210	699514.270
P3	311797.051	699521.040
P4	311820.631	699518.952
P5	311849.554	699516.392
P6	311873.195	699514.300
P7	311893.733	699512.482
P8	311952.054	699506.318
P9	311950.374	699487.322
P10	311992.457	699481.680
P10A	311994.394	699483.564
P11	311998.464	699507.002
P12	311998.317	699530.229
P13	312000.559	699553.322
P14	311982.208	699554.945
P15	311976.151	699560.832
P16	311969.548	699563.077
P17	311971.491	699585.383
P18	311970.928	699571.249
P19	311954.491	699586.377
P20	311950.646	699580.080
P21	311973.465	699532.828
P22	311974.548	699508.941
P23	311964.074	699427.083
P24	311939.084	699428.307
P25	311921.154	699430.898
P26	311903.224	699432.489
P27	311885.295	699434.080
P28	311757.833	699445.810
P29	311756.695	699468.854
P30	311859.318	699556.325
P31	311841.304	699568.594
P32	311833.388	699552.652
P33	311834.636	699568.013
P34	311820.12	699574.617
P35	311810.71	699568.805
P36	311806.79	699562.082
P37	311800.891	699551.914
P38	311800.125	699545.754
P39	311911.26	699510.73
P40	311930.21	699508.05
P41	311813.58	699440.40
P42	311831.51	699438.85
P43	311848.45	699437.46
P44	311867.15	699435.89
P45	311948.39	699483.95

ARA-TAI DRIVE

PAKURANGA HEALTH CAMP

PIGEON MOUNTAIN ROAD

PROPOSED TIMBER RETAINING WALL 1

PROPOSED TIMBER RETAINING WALL 2

PROPOSED TIMBER RETAINING WALL 3

TIMBER WALL 1

TIMBER WALL 2

TIMBER WALL 3

TIMBER WALL 5

TIMBER WALL 6

ACCESS LOT

X 4/12/02

CONSENT ISSUE

SURVEYED BY:	DRAWN BY:	ADP
DATE SURVEYED:	DATE PLOTTED:	13.11.02
SCRIMAP REF:	CAD REFERENCE:	14152-RD.SET.DWG
	CAD XREF'S:	
DESIGNED: ADP	APPROVED:	JCT
CHECKED: AMB		

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HARRISON GRIERSON HG

CONSULTING ENGINEERS SURVEYORS PLANNERS

PROJECT:

ST JUST ENTERPRISES LTD
COMPASS POINT SUBDIVISION
HALF MOON BAY

TITLE:

ROAD CENTRE LINE LAYOUT AND RETAINING WALL SETOUT PLAN

REF	AMENDMENTS	BY	DATE
A	CONSENT ISSUE	ADP	13.11.02

PROJECT No: 09.14152.1
DRAWING No: 14152-05 REV A
ORIGINAL SCALE: 1:750
REDUCED SCALE: 1:1500(A3)
A1

NOTES:

1. ALL PROPOSED PAVEMENT WORKS ARE TO BE TO NCC STANDARDS.
2. PROPOSED PAVEMENT ARE DESIGNED BASED ON A MINIMUM SUBGRADE STRENGHT OF CBR 3.0. SHOULD SUBGRADE STRENGHTS BE FOUND TO BE LOWER, THE CONTRACTOR MUST INFORM THE ENGINEER AND AN ALTERNATIVE PAVEMENT DESIGN WILL BE PROVIDED.
3. THE " SITE WORKS " CONTRACT INVOLVES CONSTRUCTION OF FINAL GROUND LEVELS TO TOP OF SUBBASE LEVEL. ALL UNDERCHANNEL DRAINS WILL ALSO BE INSTALLED DURING PLACEMENT OF SUBBASE MATERIAL AND ARE TO BE CONNECTED TO A SUITABLE CATCHPIT.
4. THE CONTRACTOR IS RESPONSIBLE FOR LIAISING DIRECTLY WITH NCC AND OBTAINING THE NECCESSARY CONSENTS/ APPROVALS FOR ANY WORKS WITHIN THE COUNCIL ROAD BERM.

SURVEYED BY:		DRAWN BY:	AMB
DATE SURVEYED:		DATE PLOTTED:	08.02.02
SOIRMAP REF:		CAD REFERENCE:	D:\LANDDEV\13177-PAV\
		CAD XREFS:	BASE-REF; CONT-XREF
DESIGNED:	AMB 10/01	APPROVED:	JCT
CHECKED:	JCT		

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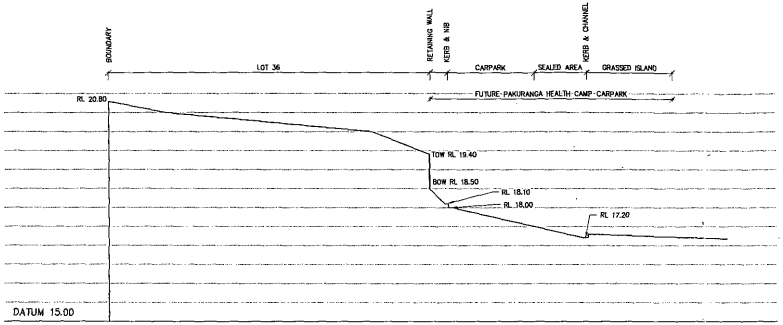
HARRISON GRIERSON
HG
CONSULTING ENGINEERS SURVEYORS PLANNERS

PROJECT: CHILDRENS HEALTH CAMP OF NEW ZEALAND PAKURANGA

TITLE: PROPOSED PAVEMENT PLAN 2

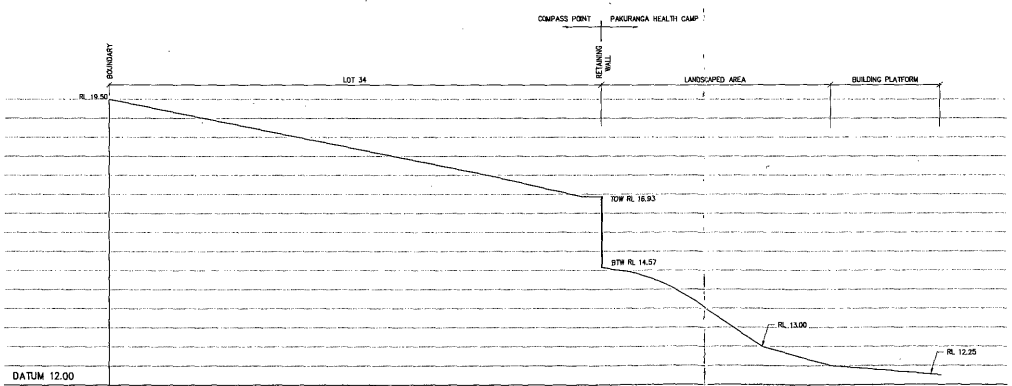
REF	AMENDMENTS	BY	DATE
A	DRAFT ISSUE	AMB	24.10.01

PROJECT No: 09.13177.1
DRAWING No: 13177-PAV2
REV
ORIGINAL SCALE: 1:100
REDUCED SCALE: 1:200
A1



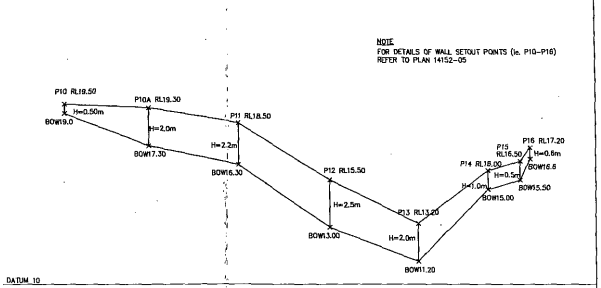
CROSS-SECTION A-A

SCALE 1:100 VER, 1:150 HOR



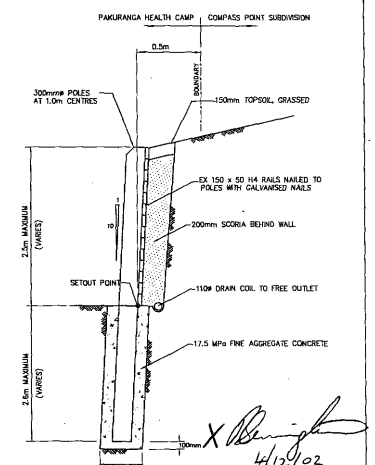
CROSS-SECTION B-B

SCALE 1:100 VER, 1:150 HOR



RETAINING WALL 3 LONGSECTION

SCALE 1:500 HORZ. 1:100 VER.



4/12/02

TYPICAL TIMBER POLE RETAINING WALL DETAIL

NOT TO SCALE

SURVEYED BY:	DRAWN BY: ARS	HARRISON GRIERSON HG	PROJECT: ST JUST ENTERPRISES LIMITED COMPASS POINT SUBDIVISION HALF MOON BAY
DATE SURVEYED:	DATE PLOTTED: 19.11.02	CONSULTING ENGINEERS SURVEYORS PLANNERS	TITLE: RETAINING WALL DETAILS AT BOUNDARY OF HEALTH CAMP (WALL 3)
SURVEY REF:	CAD REFERENCE 14152-CROSS-SEC.dwg		PROJECT No: 99.14152.1
	CAD XREF'S:		DRAWING No: 14152-WALL REV
DESIGNED:	APPROVED:		ORIGINAL SCALE: AS SHOWN A1
CHECKED:			REVISIONS: BY DATE REDUCED SCALE:

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Appendix B
Critical Sections with Long Sections from Civil Engineer Aireys

Marked on Latest civil set dated 10 April 2024

Isopachs shown have been calculated from existing ground level to FFL

ELEVATIONS TABLE			
NUMBER	MIN. ELEVATION	MAX. ELEVATION	COLOUR
1	−3.00	−2.00	
2	−2.00	−1.00	
3	−1.00	0.00	
4	0.00	1.00	
5	1.00	2.00	
6	2.00	3.00	
7	3.00	4.00	

76 Compass Point Way

78 Compass Point Way

80 Compass Point Way

82 Compass Point Way

84 Compass Point Way

PROPOSED RETAINING WALL
SEE ELEVATION DWG 203

EXTG TIMBER RETAINING WALL
MAX HEIGHT 2.78m

PROPOSED RETAINING WALL
SEE ELEVATION DWG 204

ARA-TAI

STRUCTURAL ROOT ZONE TBC

R6.00

R5.50

BLOCK C

PIGEON MOUNTAIN ROAD

1
DP 212125
1.4073 ha

EARTHWORKS AREA (within site):
14000m²
(NOTE: AREA BEHIND EXTG WEST BDY RETAINING WALL WILL NOT BE DISTURBED = 80m²)

EARTHWORKS VOLUMES (Total):
Cut = 4076m³
Fill = 6690m³
Net Fill = 2614m³

EARTHWORKS VOLUMES (Ara Tai Reserve): AREA=225m²
Cut = 19m³
Fill = 8m³
Net Cut = 11m³

EARTHWORKS VOLUMES (Pigeon Mt berm): AREA=245m²
Cut = 35m³
Fill = 0m³
Net Cut = 35m³

Volumes are from existing ground level to FFL (including topsoil, subgrade, concrete).

Note:
Earthworks volumes for consent only. Not to be used for tender purposes.

PROPOSED RETAINING WALL
SEE ELEVATION DWG 204

SEE EAST BDY ELEVATION DWG 204

RETAINING WALLS:
FOR TYPE AND HEIGHT OF PROPOSED WALLS REFER ARCHITECTS PLAN RA0104

SEE SOUTH BDY ELEVATION DWG 204a

SITE PLAN
1:500

COMPASS POINT WAY

Airey
CIVIL, STRUCTURAL AND FIRE ENGINEERS

AIREY CONSULTANTS LTD
TEL: (09) 534 6523 www.aireys.co.nz
TAKAPUNA **BOTANY** QUEENSTOWN

CLIENT:
HND HMB LTD

JOB TITLE:
3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
6	WEST BDY RET WALL REVISED	10/04/2024	LP
5	RET WALL SYMBOLS TO MATCH ARCH	09/04/2024	LP
4	S92 REVISIONS - 87 DWELLINGS	26/03/2024	LP
3	SECTION 3 RELOCATED	08/02/2024	JC
2	S92 REVISIONS - 88 LOTS	05/02/2024	LP
1	S92 - LAYOUT/LEVELS REVISED	20/10/2023	LP

DRAWING STATUS:
FINAL

ISSUE PURPOSE:
RESOURCE CONSENT

DESIGN:	SW
DRAWN:	LP
CHECKED:	RT
DATE:	22/05/23
SCALE:	1:500 @ A3

DO NOT SCALE FROM DRAWINGS

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ORIGINAL SIZE:
5 0 5 10 15 20 25

DRAWING TITLE:
SITE PLAN
EARTHWORKS

JOB No:	SHEET No:	REV:
220571-1	200	6

A:\220000\220571 3 Pigeon Mountain Rd\CAD\WORKING DRAWINGS\3 PIGEON MOUNTAIN RD 220571-1 EW_November 23_recover.dwg, 10/04/2024 3:47:32 pm, DWG To PDF.pc3

Airey
CIVIL, STRUCTURAL AND FIRE ENGINEERS

AIREY CONSULTANTS LTD
TEL: (09) 534 6523 www.aireys.co.nz

TAKAPUNA **BOTANY** QUEENSTOWN

CLIENT:

HND HMB LTD

JOB TITLE:

3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
6	WEST BDY RET WALL REVISED	10/04/2024	LP
5	LOT 2 BDY REVISED	09/04/2024	LP
4	LOT 15 & 16 F'PATH ADDED	30/03/2024	LP
3	S92 REVISIONS - 87 DWELLINGS	26/03/2024	LP
2	S92 REVISIONS - 88 LOTS	05/02/2024	LP
1	S92 - LAYOUT/LEVELS REVISED	20/10/2023	LP

DRAWING STATUS:

FINAL

ISSUE PURPOSE:

RESOURCE CONSENT

DESIGN:	SW
DRAWN:	LP
CHECKED:	RT
DATE:	22/05/23
SCALE:	1:500 @ A3

DO NOT SCALE FROM DRAWINGS

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ORIGINAL SIZE:

5 0 5 10 15 20 25

DRAWING TITLE:

SITE PLAN
PROPOSED LEVELS

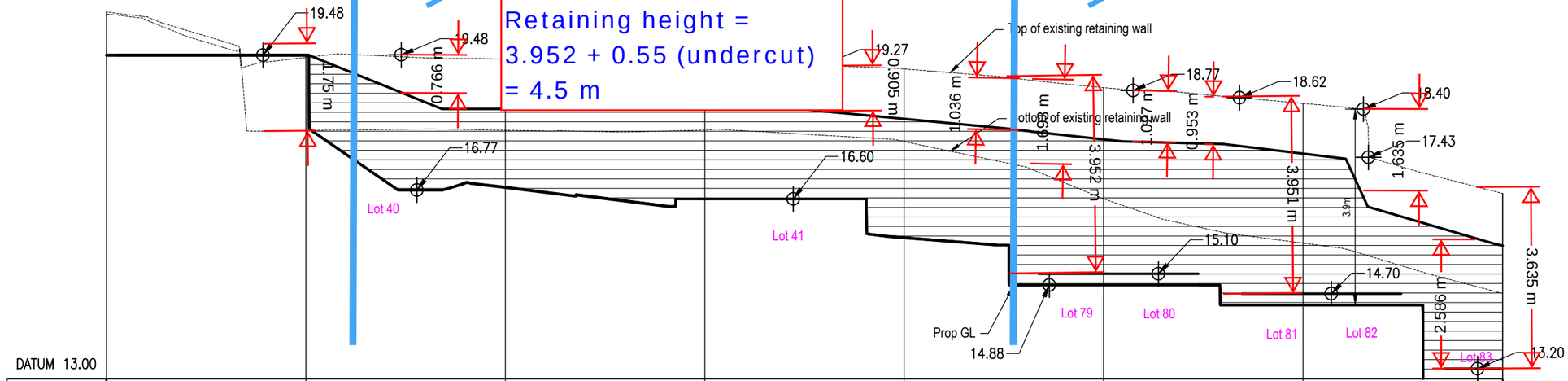
JOB No:	SHEET No:	REV:
220571-1	202	6

J:\220000\220571 3 Pigeon Mountain Rd\CAD\WORKING DRAWINGS\3 PIGEON MOUNTAIN RD 220571-1 EW_November 23_recover.dwg, 10/04/2024 3:46:52 pm, DWG To PDF.pc3

Section 4

Section 3 with HA 10

Retaining height =
3.952 + 0.55 (undercut)
= 4.5 m

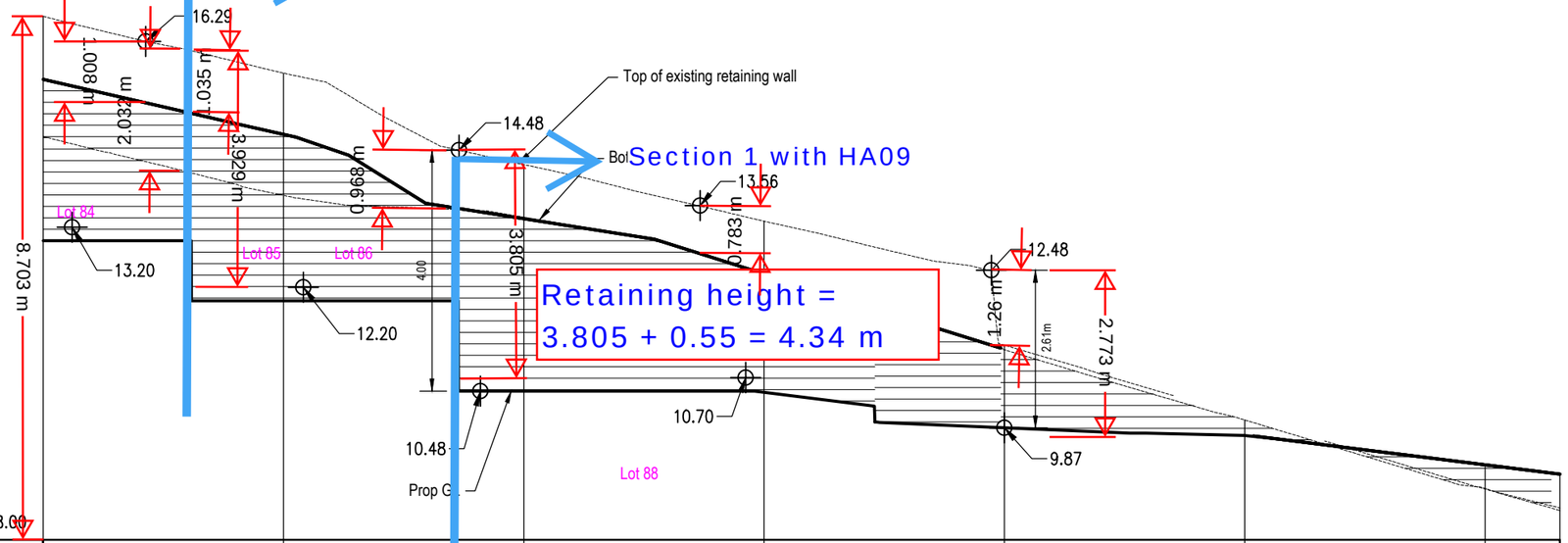


DATUM 13.00								
EX GL	20.30	17.97	17.98	17.98	17.75	16.60	15.71	14.71
F GL	19.48	19.48	16.84	16.60	15.82	14.88	14.48	12.98
HT(m)	-0.83	1.50	-1.14	-1.38	-1.92	-1.73	-1.24	-1.73
DIST	0.00	10.00			40.00	50.00	60.00	**70.00**

Retaining height =
3.929 + 0.55 = 4.48 m

WEST BDY RETAINING WALL 1 ELEVATION

VERT 1:100
HORIZ 1:250



DATUM 8.00								
EX GL	14.71	13.73	13.37	12.43	11.16	9.99	8.86	8.49
F GL	12.98	11.98	10.48	10.46	9.87	9.74	9.25	
HT(m)	-1.73	-1.75	-2.89	-1.97	-1.30	-0.26	0.39	
DIST	0.00	10.00	20.00	30.00	40.00	50.00	60.00	63.11

WEST BDY RETAINING WALL 2 ELEVATION

VERT 1:100
HORIZ 1:250

Airey
CIVIL, STRUCTURAL AND FIRE ENGINEERS

AIREY CONSULTANTS LTD
TEL: (09) 534 6523 www.aireys.co.nz
TAKAPUNA **BOTANY** QUEENSTOWN

CLIENT:
HND HMB LTD

JOB TITLE:
3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
4	LOT 40 REVISION	09/04/2024	LP
3	S92 REVISIONS - 87 DWELLINGS	26/03/2024	LP
2	S92 REVSIONS - 88 LOTS	05/02/2024	LP
1	S92 - RETAINING WALL REVISION	20/10/2023	LP

DRAWING STATUS:
FINAL

ISSUE PURPOSE:
RESOURCE CONSENT

DESIGN: SW
DRAWN: LP
CHECKED: RT
DATE: 22/05/2023
SCALE: 1:250 @ A3

DO NOT SCALE FROM DRAWINGS

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ORIGINAL SIZE:
5 0 5 10 15 20 25

DRAWING TITLE:
RETAINING WALL ELEVATIONS

JOB No:	SHEET No:	REV:
220571-1	203	4

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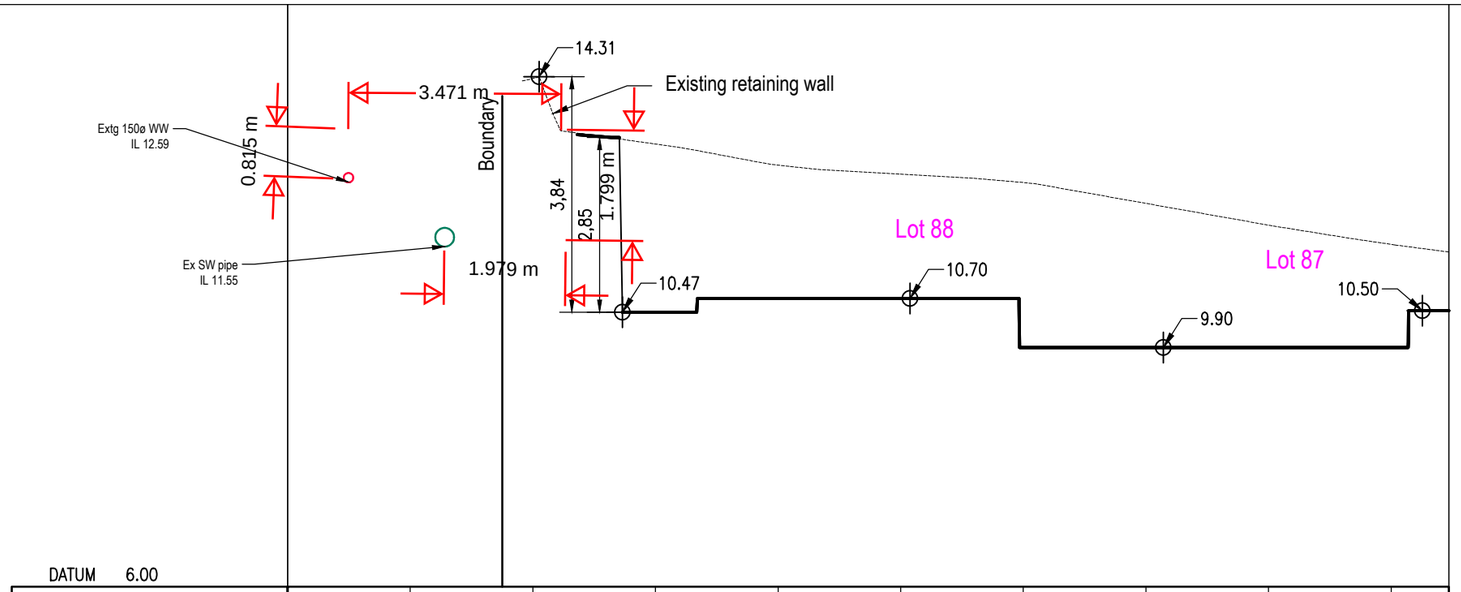
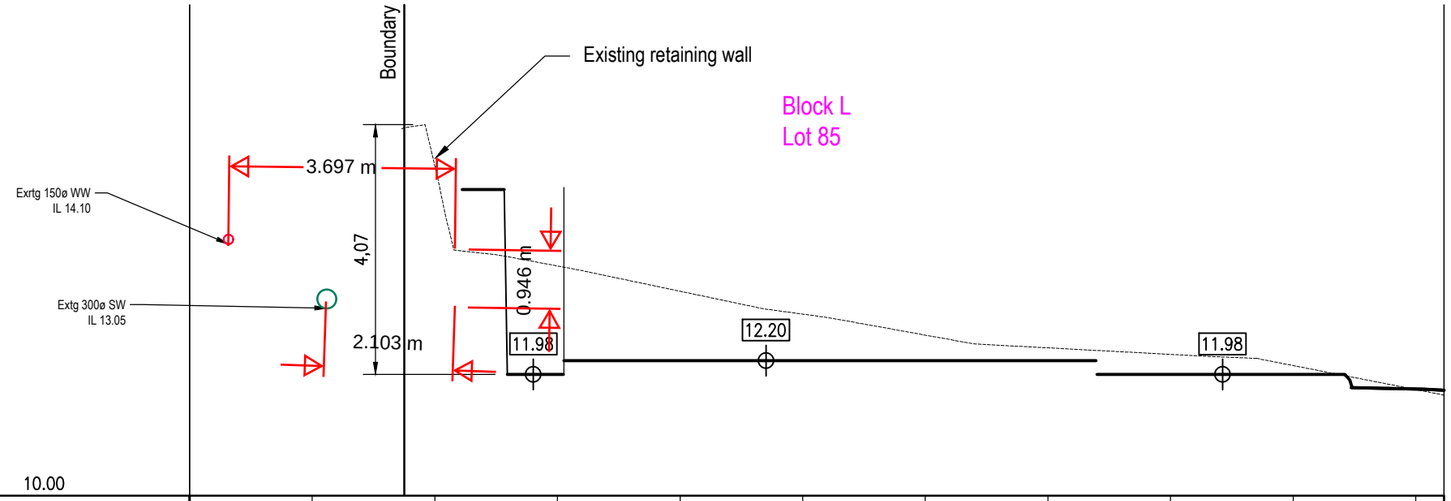


DATUM 6.00

EXISTING LEVEL		14.29	13.22	12.87	12.72	12.59	12.25	11.89	11.58	11.46
DISTANCE (m)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	18.94

SECTION 1



DATUM 10.00

EXISTING LEVEL		15.37	13.74	13.33	12.96	12.62	12.41	12.30	12.12	11.73	11.64
DISTANCE (m)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	20.46

SECTION 2

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TAKAPUNA **BOTANY** QUEENSTOWN

CLIENT:

HND HMB LTD

JOB TITLE:

3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
3	S92 REVISIONS - 87 DWELLINGS	26/03/2024	LP
2	S92 REVSIONS - 88 LOTS	05/02/2024	LP
1	S92 - RETAINING WALL REVISION	20/10/2023	LP

DRAWING STATUS:

FINAL

ISSUE PURPOSE:

RESOURCE CONSENT

DESIGN:	SW
DRAWN:	LP
CHECKED:	RT
DATE:	22/05/2023
SCALE:	1:100 @ A3

DO NOT SCALE FROM DRAWINGS

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ORIGINAL SIZE:

5 0 5 10 15 20 25

DRAWING TITLE:

CROSS-SECTIONS THROUGH
WEST BDY RETAINING WALL

JOB No:	SHEET No:	REV:
220571-1	206	3

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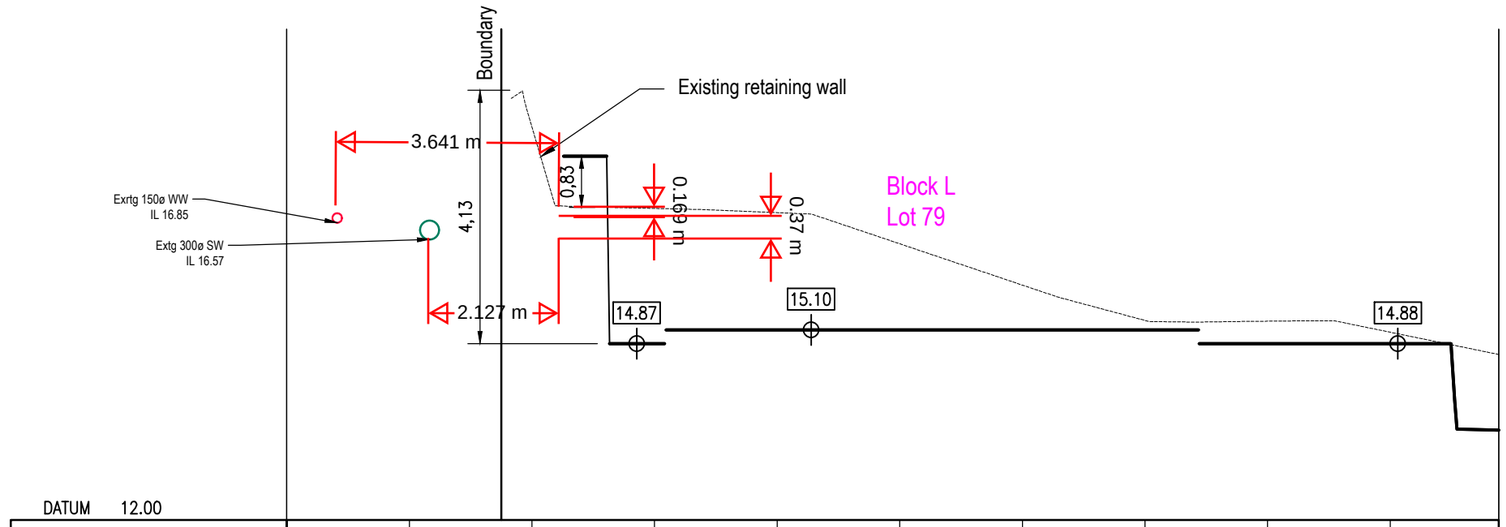
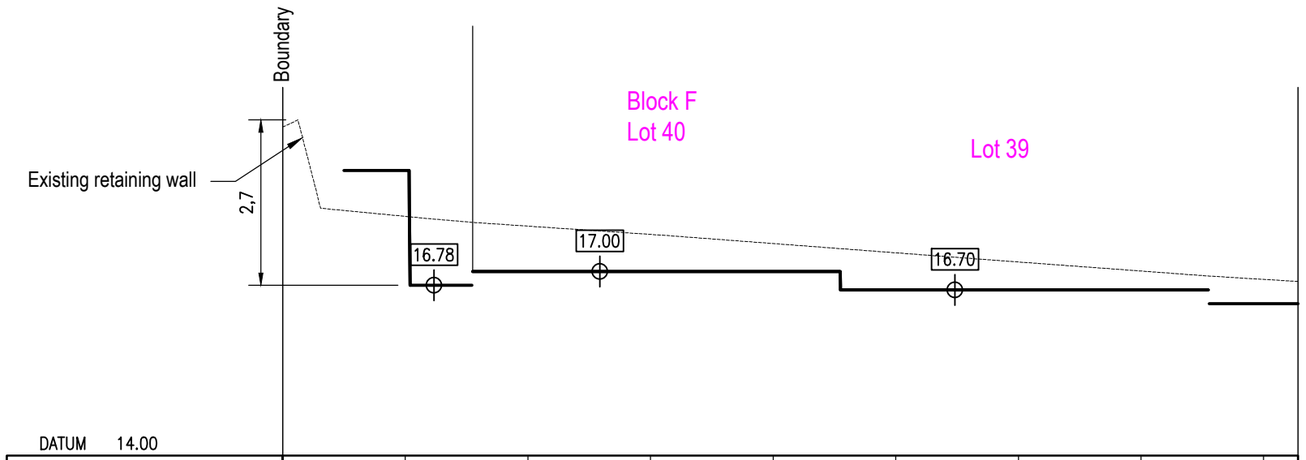


DATUM 12.00										
EXISTING LEVEL		18.40	17.08	17.01	16.50	15.83	15.25	15.24	15.06	14.70
DISTANCE (m)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	19.77

SECTION 3



DATUM 14.00										
EXISTING LEVEL	19.36	17.90	17.74	17.60	17.46	17.31	17.16	17.01	16.87	16.84
DISTANCE (m)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	16.56

SECTION 4

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CLIENT:

HND HMB LTD

JOB TITLE:

3 PIGEON MOUNTAIN ROAD
HALF MOON BAY

NOTES:

REV	AMENDMENT	DATE	BY
3	SECTION 3 RELOCATED	08/02/2024	JC
2	S92 REVISIONS - 88 LOTS	05/02/2024	LP
1	S92 - RETAINING WALL REVISION	20/10/2023	LP

DRAWING STATUS:

FINAL

ISSUE PURPOSE:

RESOURCE CONSENT

DESIGN:	SW
DRAWN:	LP
CHECKED:	RT
DATE:	22/05/2023
SCALE:	1:100 @ A3

DO NOT SCALE FROM DRAWINGS

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ORIGINAL SIZE:

5 0 5 10 15 20 25

DRAWING TITLE:

CROSS-SECTIONS THROUGH
WEST BDY RETAINING WALL

JOB No:	SHEET No:	REV:
220571-1	206a	3

J:\220000\220571 3 Pigeon Mountain Rd\CAD\WORKING DRAWINGS\3 PIGEON MOUNTAIN RD 220571-1 Drainage .dwg, 26/03/2024 9:28:36 am, DWG To PDF.pc3

Appendix C
Analysis Outputs and Design Calcs
- Retaining wall information summary updated on 05 Feb 2024

Western Retaining Wall Information Summary

Western Boundary Existing Retaining Wall Information updated 2024.04.10												
Eixsting Timber Retaining Wall Wall Top Level (From North to South)	Existing Toe Level	Design Finished Floor Levels	550 mm Sub Excavation Levels	Proposed Excavation Depth (m)	Approximate Groundwater Drawdown Depth (m) (1.4 m bgl interpreted)	Existing Retaining Height (m)	Proposed Design RH (m)	Representative Design RH Range (m)	Covering Lot No #	Deapest Excavation Spot	Nearest corresponding piezo. No	Analysed Sectsion
/	/	/	/	/	/	No EXTG. Retaining Wall	/	/	Lot #1	Fill-up areas without retaining wall		
12.48	11.22	9.71	9.16	2.1	0.7	1.26	3.32	3.0 - 4.5	Lot # 88	Lot 88 Southwestern Corner	HA09	
13.56	12.78	10.70	10.15	2.6	1.2	0.78	3.41					
14.48	13.51	10.70	10.15	3.4	2.0	0.97	4.33					Section 1
16.13	15.09	12.20	11.65	3.4	2.0	1.04	4.48	3.5 - 4.5	Lot # 83 - 86	Lot 85 Southwestern Corner		Section 2
16.29	15.28	13.20	12.65	2.6	1.2	1.01	3.64					
16.84	15.79	13.20	12.65	3.1	1.7	1.05	4.19					
18.40	16.77	14.70	14.15	2.6	1.2	1.64	4.25	4.0 - 4.5	Lot # 79 - 82	Lot 79 Southewestern Corner	HA10	
18.62	17.67	14.70	14.15	3.5	2.1	0.95	4.47					
19.05	18.01	15.10	14.55	3.5	2.1	1.04	4.50					Section 3
18.77	17.74	15.10	14.55	3.2	1.8	1.03	4.22					
19.27	17.87	16.60	16.05	1.8	0.4	1.40	3.22	3.0 - 3.5	Lot # 41- 42			
19.48	18.71	17.00	16.45	2.3	0.9	0.77	3.03					
19.70	17.98	17.00	16.45	1.5	0.1	1.73	3.25			Section 4 (will adopt Section 1 design)		

File: J00538 - Western Boundary Wall Design Calcs r01.xlsx
Tab: Existing

TOTAL GROUND ENGINEERING

Plaxis Material Properties

Input

Project; 3 Pigeon Mountain Road
Number; J00538
Job; Western Boundary Retaining Wall

Analysed Sections			Section 1 - Existing Wall	Section 2 - Existing Wall	Section 3 - Existing Wall	Section 4 - Existing Wall
	Existing Retaining Height		1.0 m	2.0 m	2.8 m	1.5 m
Input Wall Properties	Timber Pole Category		Normal	Normal	Normal	Normal
	Unit Weight of Timber Pole	γ_p	5.3955	5.3955	5.3955	5.3955
	Unit Weight of Soil	γ_s	17	17	17	17
	Diameter of Pile	d	0.2	0.25	0.35	0.2
	Radius	r	0.1	0.125	0.175	0.1
	Pile Spacing	s	1.2	1.1	1.0	1.2
Output Wall Properties	Area	A	0.0261799	0.0446249	0.0962113	0.0261799
	Modulus of Elasticity	E	8.7	8.7	8.7	8.7
			8.70E+06	8.70E+06	8.70E+06	8.70E+06
	Second Moment of Area	I	6.545E-05	0.0001743	0.0007366	6.545E-05
	Plaxis Virtual Depth	d	0.1731	0.2168	0.3031	0.2598
	Plaxis Virtual Width of Pile	b_p	0.1512417	0.2058344	0.3174242	0.1007696
	Virtual width of soil between piles	b_s	0.8487583	0.7941656	0.6825758	0.8992304
	Weighted average unit weight of wall	γ_w	15.244916	14.611395	13.316451	15.830619
Plaxis Input Parameters	Axial Stiffness	EA	**2.28E+05**	**3.88E+05**	**8.37E+05**	**2.28E+05**
	Flexural Stiffness	EI	**5.69E+02**	**1.52E+03**	**6.41E+03**	**5.69E+02**
	Weight of Wall	w	**0**	**0**	**0**	**0**

Date: 18/04/2023

Adopted Analysis Soil Parameters

Layer Numbering System	Strata Name	Material Analysis Model	Unit Weight, γ (kN/m^3)	Effective Cohesion, c' (kPa)	Effective Friction Angle, ϕ' (°)	Undrained Shear Strength, s_u (kPa)	Effective Young's Modulus, E' (MPa)	Permeability kv = kh (m/s)
①	**Fill**	Mohr-Coloumb	17	7	32	70	10	1.0E-07
②	**Puketoka Formaiton**	Mohr-Coloumb	17	3	30	50	7	1.0E-07
③	**CW - HW ECBF**	Mohr-Coloumb	17	7	32	100	15	1.0E-07
④	**MW - SW ECBF**	Mohr-Coloumb	18	20	38	400	50	1.0E-08

Page 1

UC wall Plaxis 2D properties

TOTAL GROUND ENGINEERING

Plaxis Material Properties

Date: 8/02/2024 — Input

Project; 3 Pigeon Mountain Road

Number; J00538

Job; Western Boundary Retaining Wall

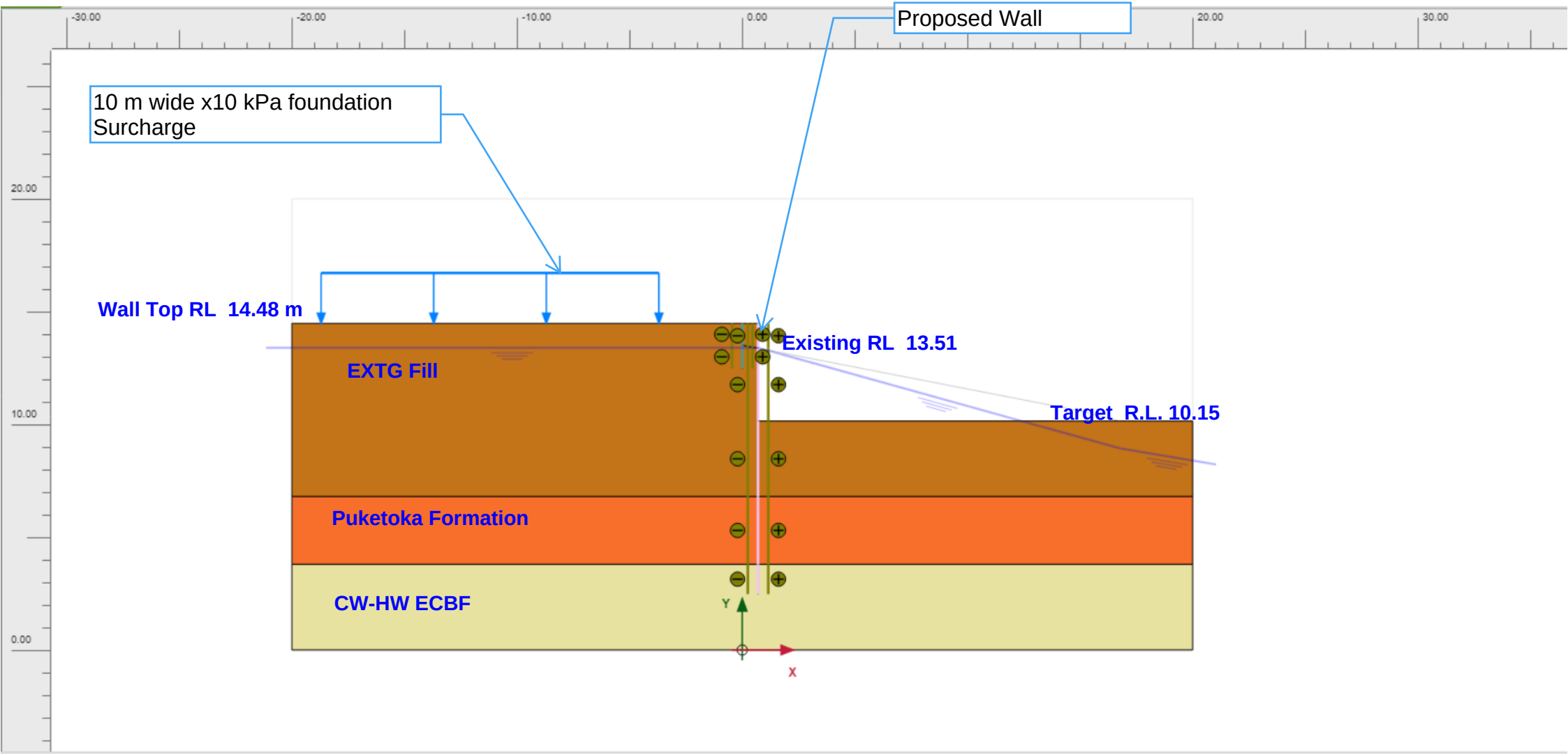
Information	Analysed Section		Section 1	Section2	Section3
Input Wall Properties	Steel Pile Designation		250UC89.5	250UC89.5	250UC89.5
	Unit Weight of Steel	γ_{st}	77	77	77
	Unit Weight of Soil	γ_s	17	17	17
	Pile Spacing	s	1.0	1.0	1.0
Output Wall Properties	Area	A	11400	11400	11400
			0.0114	0.0114	0.0114
			0.0114	0.0114	0.0114
	Modulus of Elasticity	E	200	200	200
			2.00E+08	2.00E+08	2.00E+08
	Second Moment of Area	I	143,000,000	143,000,000	143,000,000
			0.000143	0.000143	0.000143
			0.000143	0.000143	0.000143
	Plaxis Virtual Depth	d	0.388	0.388	0.388
	Plaxis Virtual Width of Pile	b_p	0.02938	0.02938	0.02938
	Virtual width of soil between piles	b_s	0.97062	0.97062	0.97062
	Weighted average unit weight of wall	γ_w	18.76	18.76	18.76
Plaxis Input Parametrs	Axial Stiffness	EA	**2.28E+06**	**2.28E+06**	**2.28E+06**
	Flexural Stiffness	EI	**2.86E+04**	**2.86E+04**	**2.86E+04**
	Weight of Wall	w	**0.214**	**0.214**	**0.214**
Design Strength of Piles					
ULS Design Actions	Plaxis Pile Moment	M	60.0	60.0	60.0
	Plaxis Pile Shear	V	60.0	60.0	60.0
	Pile Spacing	s	1.0	1.0	1.0
	Earth Load Factor		1.5	1.5	1.5
	Deisgn Moment	**M***	**90.0**	**90.0**	**90.0**
	Design Shear	**V***	**90.0**	**90.0**	**90.0**
Section Properties	Strength Reduction Factor for Bending and Shear	ϕ	0.9	0.9	0.9
	Yield Strength	f_y	500	500	500
	Second Moment of Area at Critical Depth	Z	1,100,000	1,100,000	1,100,000
	Web Shear Area	A_w	2362.5	2362.5	2362.5
Section Capacity Checks	Design Bending Moment	M*	90.0	90.0	90.0
	Design Bending Strength	ϕM	495.0	495.0	495.0
	Pile ok for Bending	M*/ϕM	**18%**	**18%**	**18%**
	Design Shear Force	V*	90.0	90.0	90.0
	Design Shear Strength	ϕV	637.9	637.9	637.9
	Pile ok for Shear	V*/ϕV	**14%**	**14%**	**14%**

Section 1
Design Spreadsheets Calculations and Plaxis Analysis Outputs

Section 1 Plaxis Analysis Phases

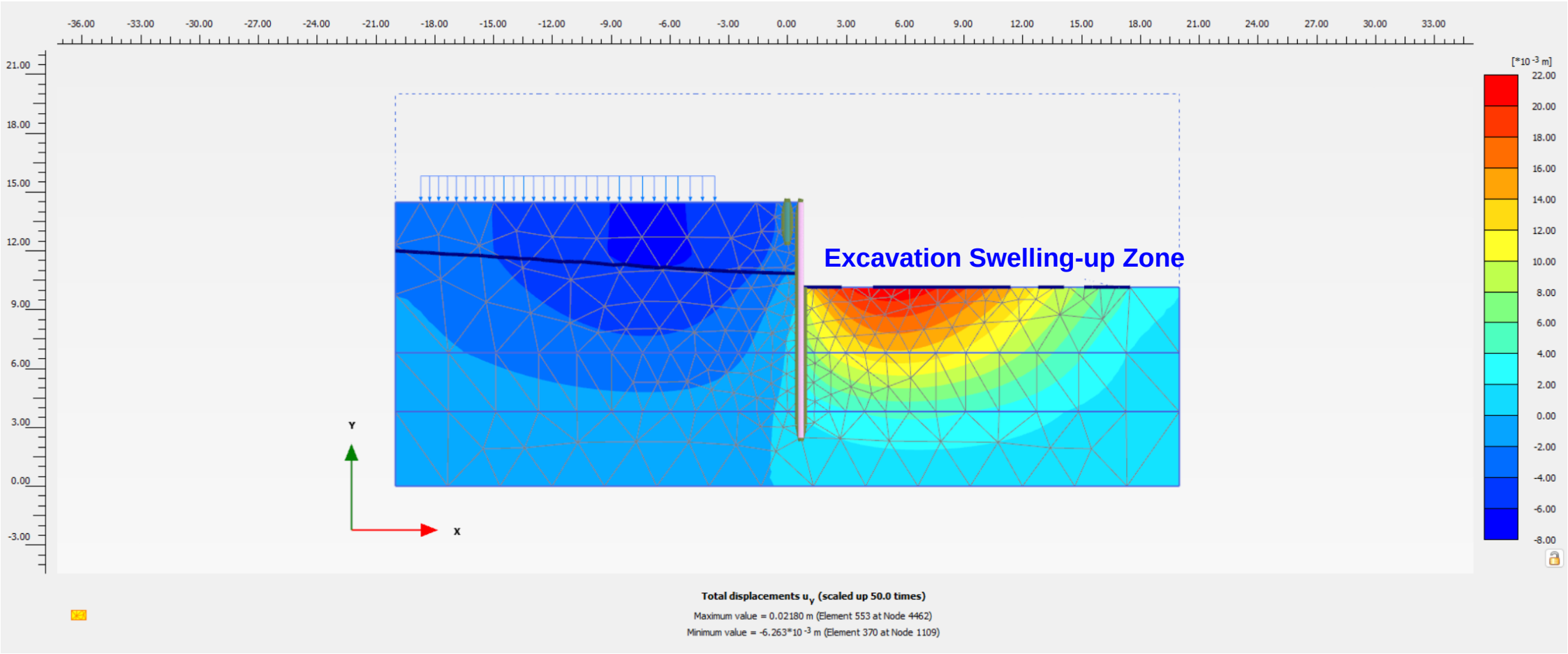
Phase 0: Initial Phase (Initialize the model)
Phase 1: School Development and Western Timber Retaining Wall Installation (Assumed 1V: 1H cantilever to embedement ratio)
Phase 2: Neighboring Property Construction (Imposing Line loads)
Phase 3: Install Proposed Retaining Wall (Previous phase displacement reset)
Phase 4: Backfilling the gaps between two walls
Phase 5: Excavation to target level (550 mm below FGL)
(Steady state groundwater drawdown analysis)
Phase 5.1: Worst Ground Water Scenario
Phase 5.2: Seismic Scenario

Section 1 Ground Profile

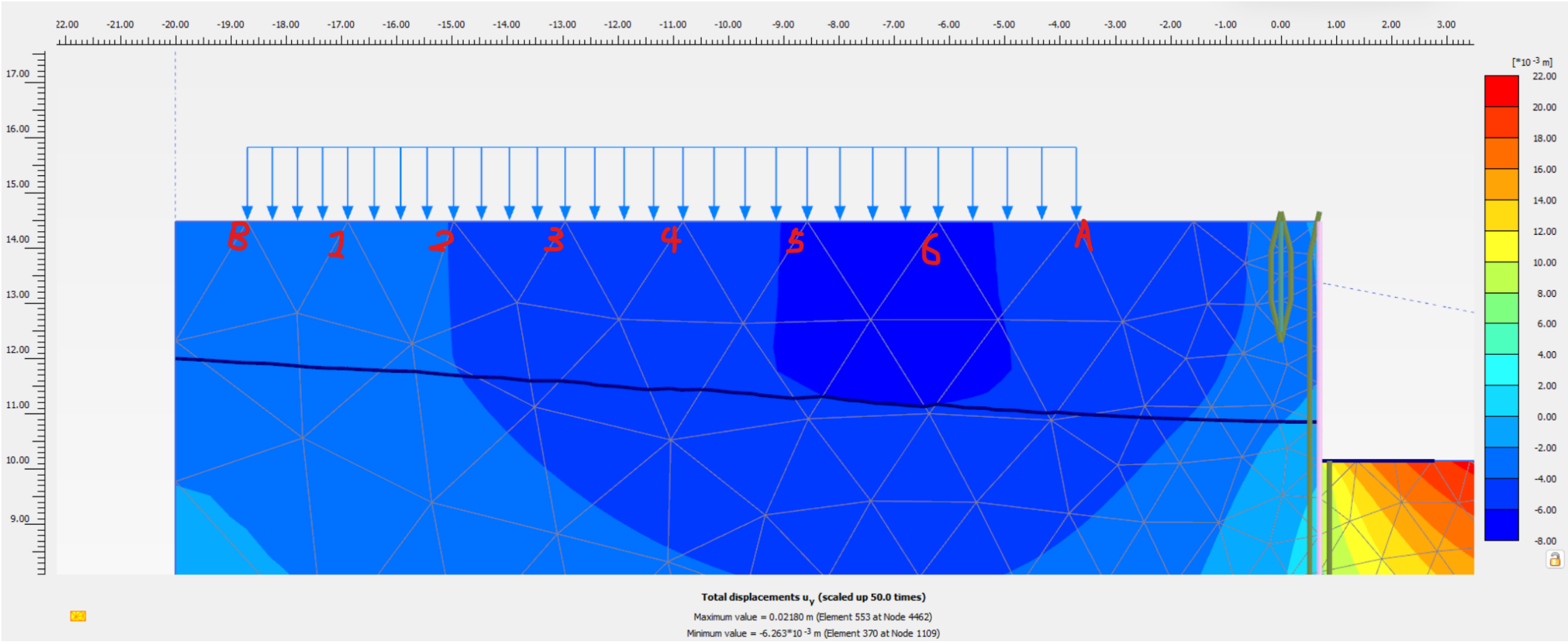

Proposed Wall
10 m wide x10 kPa foundation Surcharge
Wall Top RL 14.48 m
Existing RL 13.51
Target R.L. 10.15
EXTG Fill
Puketoka Formation
CW-HW ECBF
Y
X
-30.00
-20.00
-10.00
0.00
20.00
30.00
20.00
10.00
0.00
Coordinates
(-30.19 22.77) m
Rulers
Origin
Crosshair
Snap to object
Snap to grid
Grid

Section 1 Analysis Ground Settlement Contours

Phase 5 Settlement Contours



Phase 5 Settlements at different interval points for calculating differential settlement

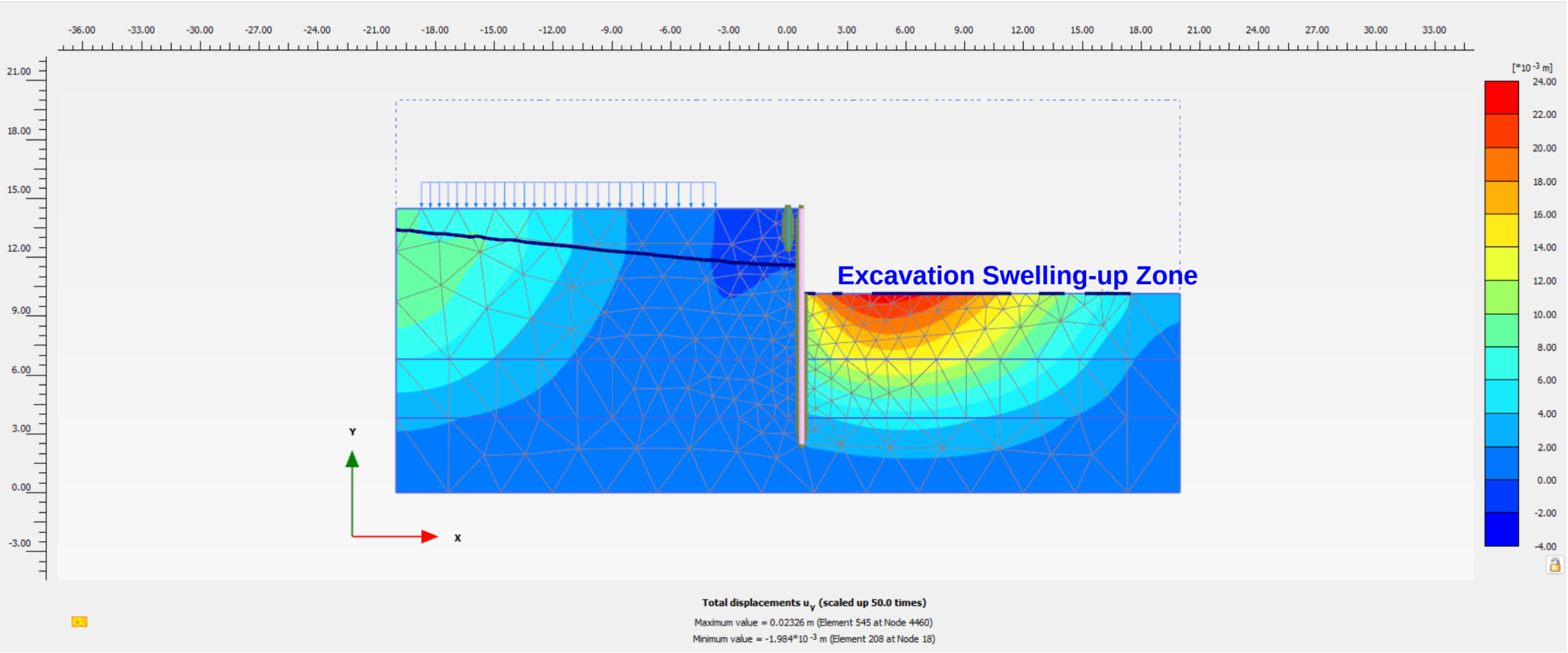


Phase 5 differential Settlements at different interval points calculation details

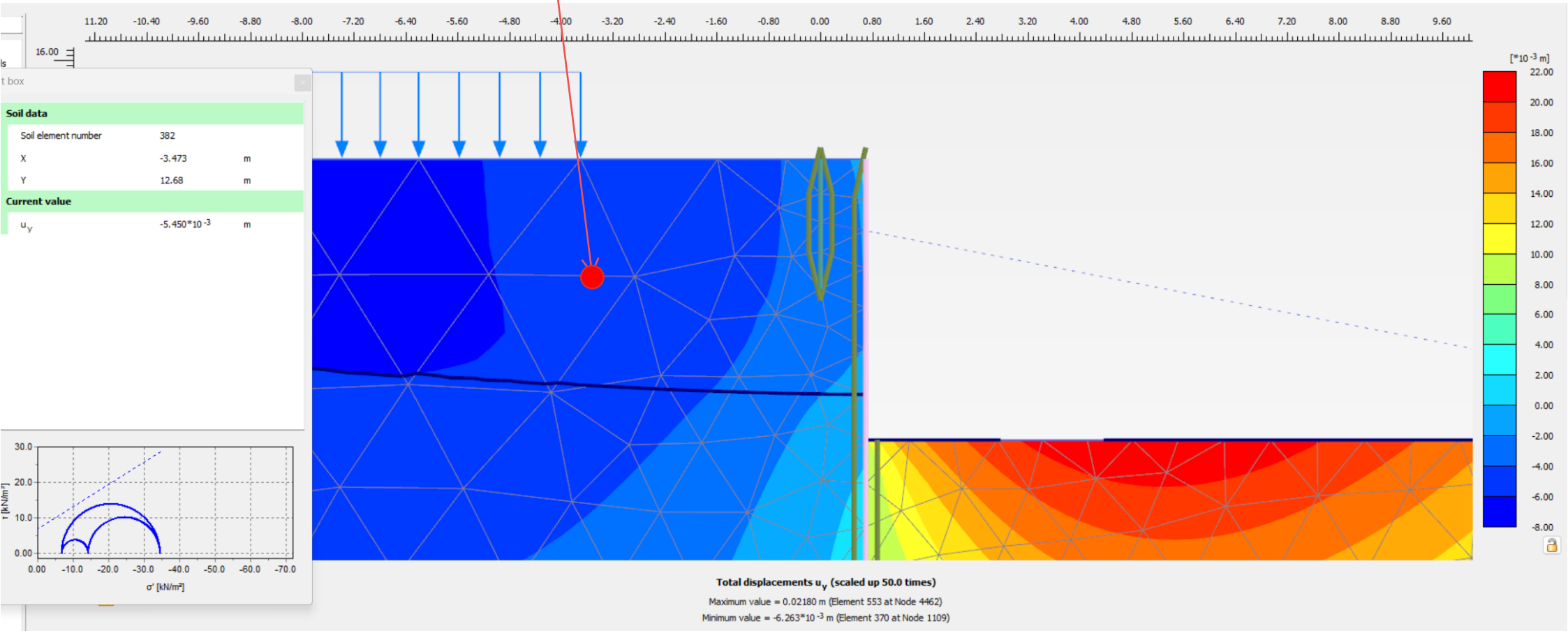
Section 1	Coordinates		Settlement
	x (m)	y (m)	u_y (mm)
B	-18.71	14.48	-3.378
1	-16.88	14.48	-3.463
2	-14.96	14.48	-4.044
3	-12.95	14.48	-4.827
4	-10.83	14.48	-5.55
5	-8.58	14.48	-6.08
6	-6.2	14.48	-6.14
A	-3.7	14.48	-5.5

Pair	x difference	uy difference	Settlement change rate (m/m)
B to 1	-1.83	0.085	-21529.41176
B to 2	-3.75	0.666	-5630.630631
B to 3	-5.76	1.449	-3975.15528
B to 4	-7.88	2.172	-3627.992634
B to 5	-10.13	2.702	-3749.074759
B to 6	-12.51	2.762	-4529.326575
B to A	-15.01	2.122	-7073.515551
1 to 2	-1.92	0.581	-3304.64716
1 to 3	-3.93	1.364	-2881.231672
1 to 4	-6.05	2.087	-2898.89794
1 to 5	-8.3	2.617	-3171.570501
1 to 6	-10.68	2.677	-3989.54053
1 to A	-13.18	2.037	-6470.29946
2 to 3	-2.01	0.783	-2567.049808
2 to 4	-4.13	1.506	-2742.363878
2 to 5	-6.38	2.036	-3133.595285
2 to 6	-8.76	2.096	-4179.389313
2 to A	-11.26	1.456	-7733.516484
3 to 4	-2.12	0.723	-2932.226833
3 to 5	-4.37	1.253	-3487.629689
3 to 6	-6.75	1.313	-5140.898705
3 to A	-9.25	0.673	-13744.42793
4 to 5	-2.25	0.53	-4245.283019
4 to 6	-4.63	0.59	-7847.457627
4 to A	-7.13	-0.05	142600
5 to 6	-2.38	0.06	-39666.66667
5 to A	-4.88	-0.58	8413.793103
6 to A	-2.5	-0.64	3906.25
		Max Ratio	2567.049808

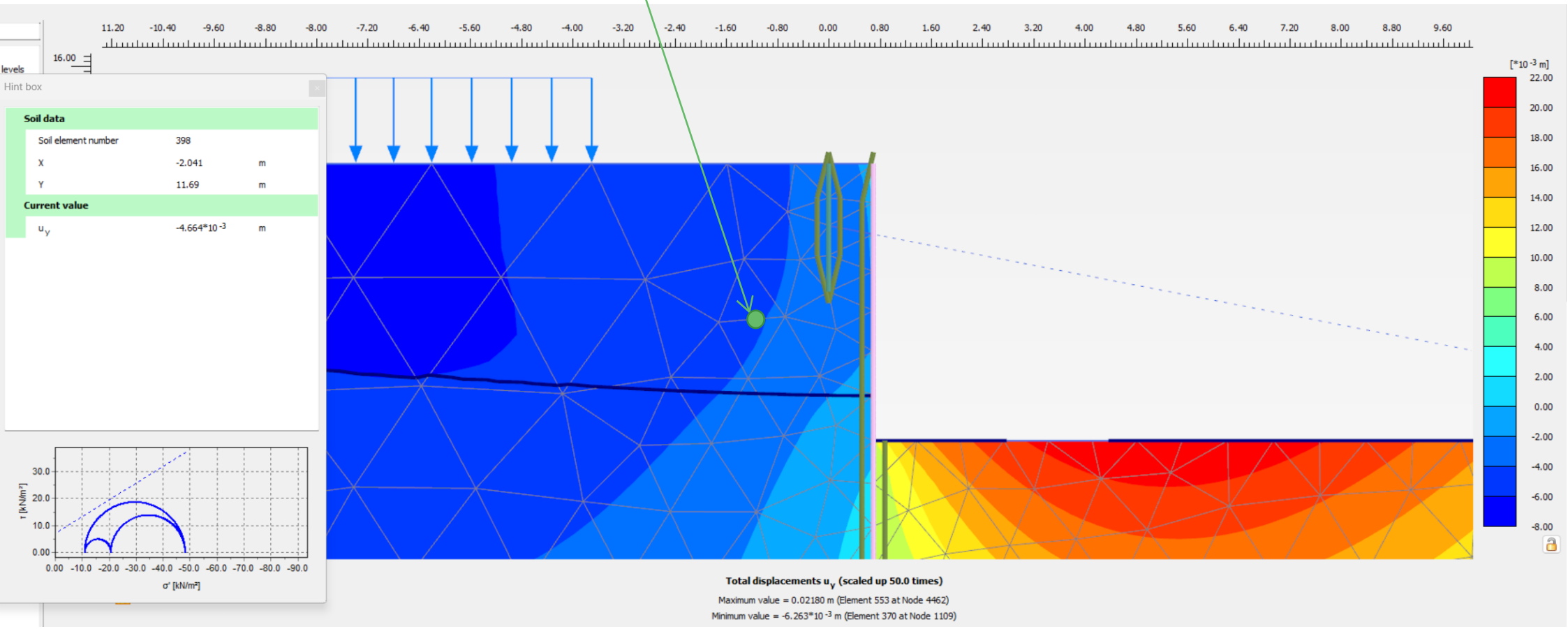
Phase 5.1 Settlement Contours



Predicted settlement at Existing WW Line Coordinates (-3.47, 12.68)

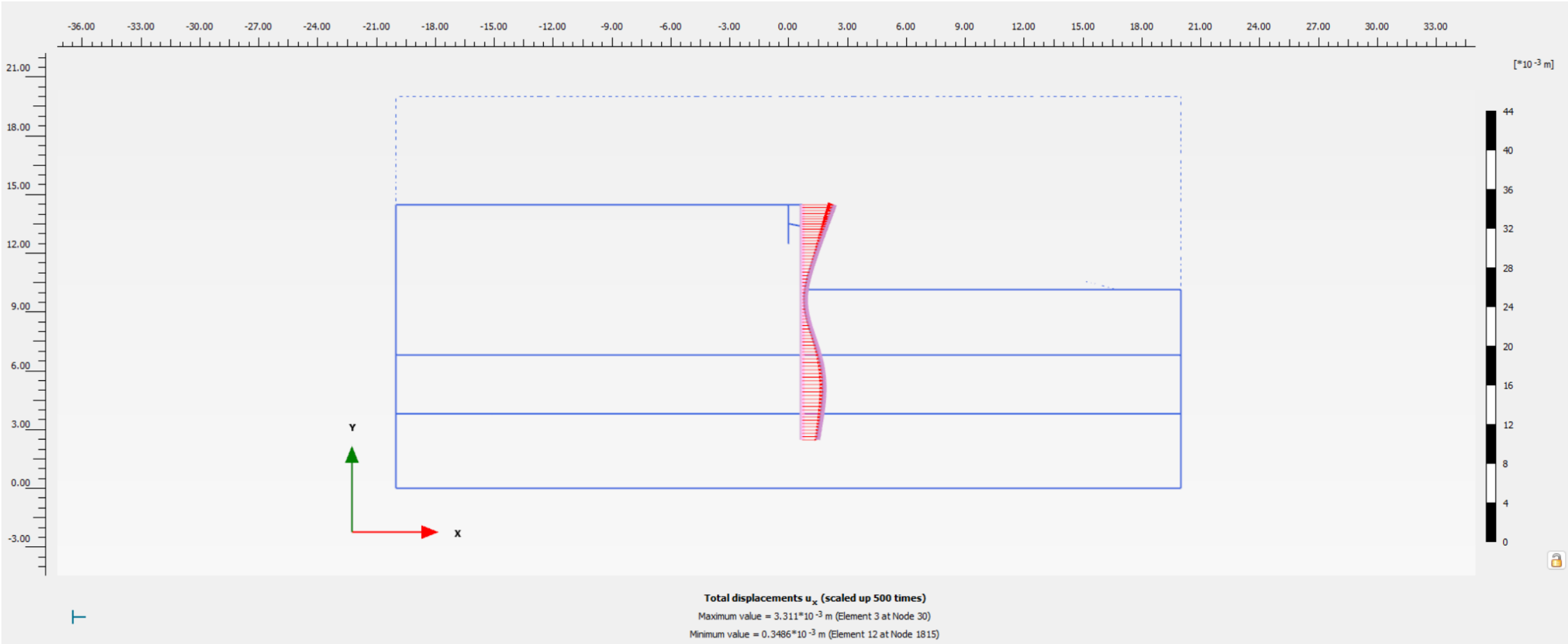


Predicted settlement at Existing SW Line coordinates(-2.0, 11.7)

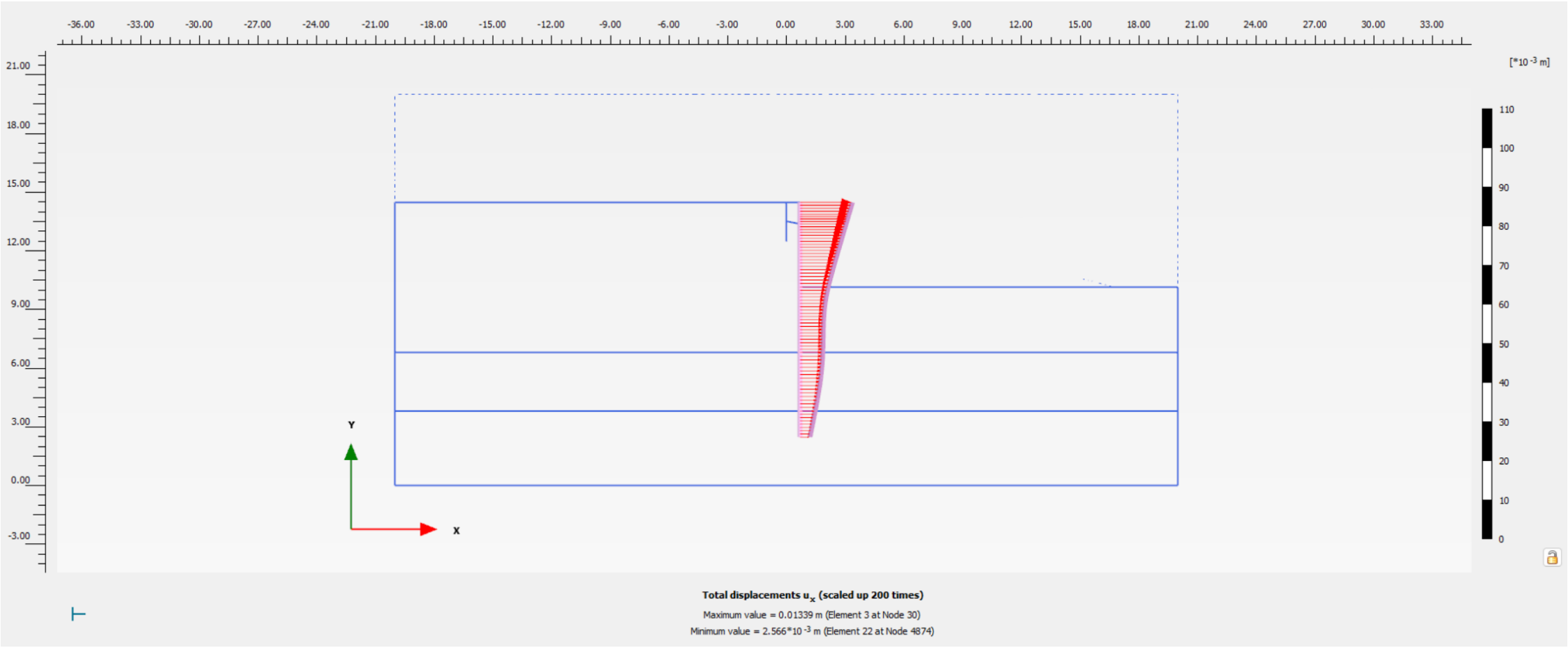


Section 1 Analysis Lateral Deflection

Phase 5 Wall Lateral Deflection Profile

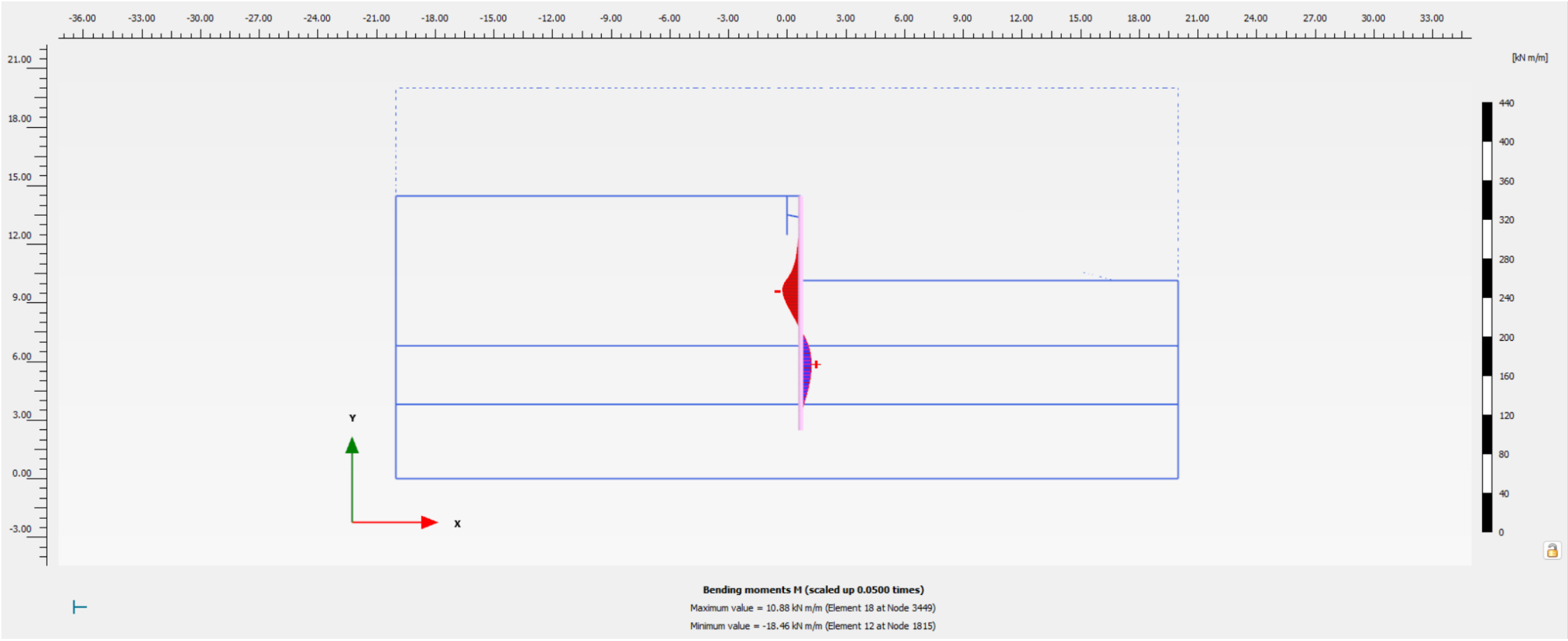


Phase 5.1 Wall Lateral Deflection Profile

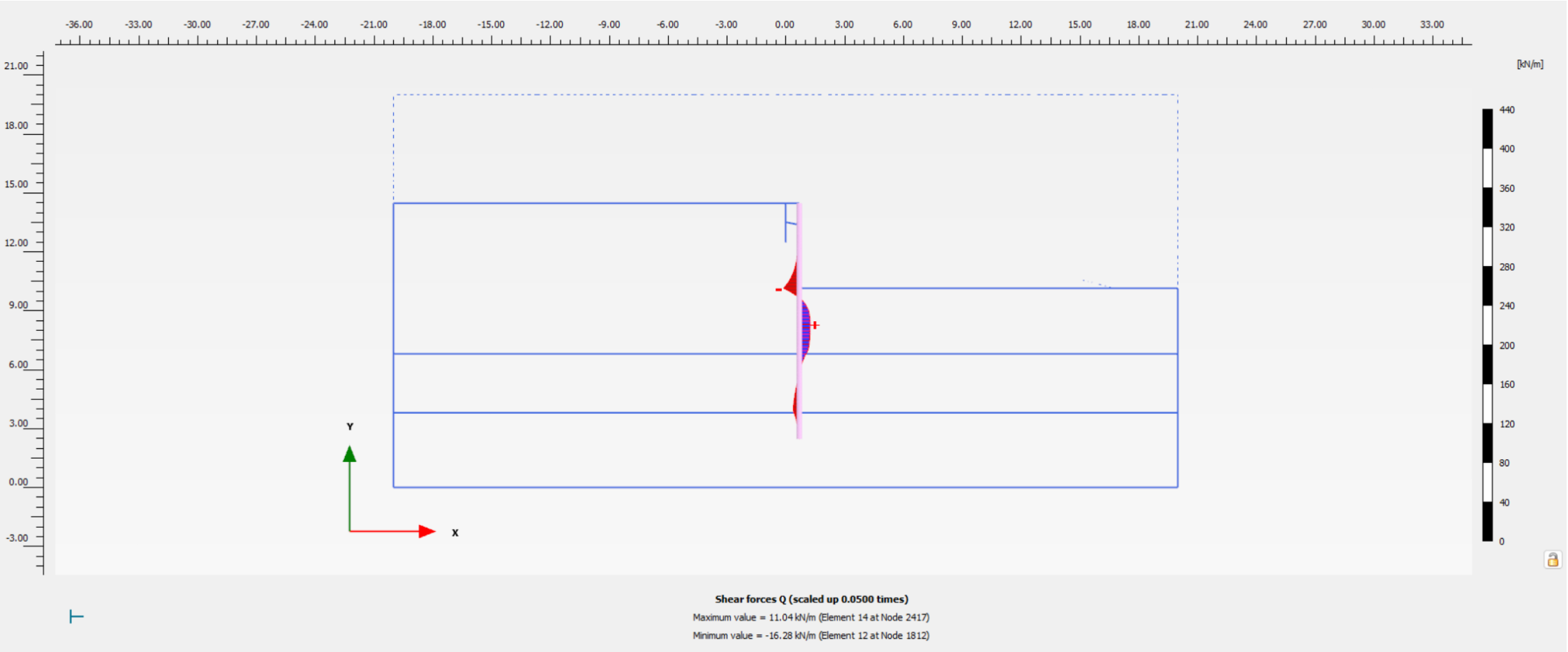


Section 1 Analysis Wall Internal Forces Diagram

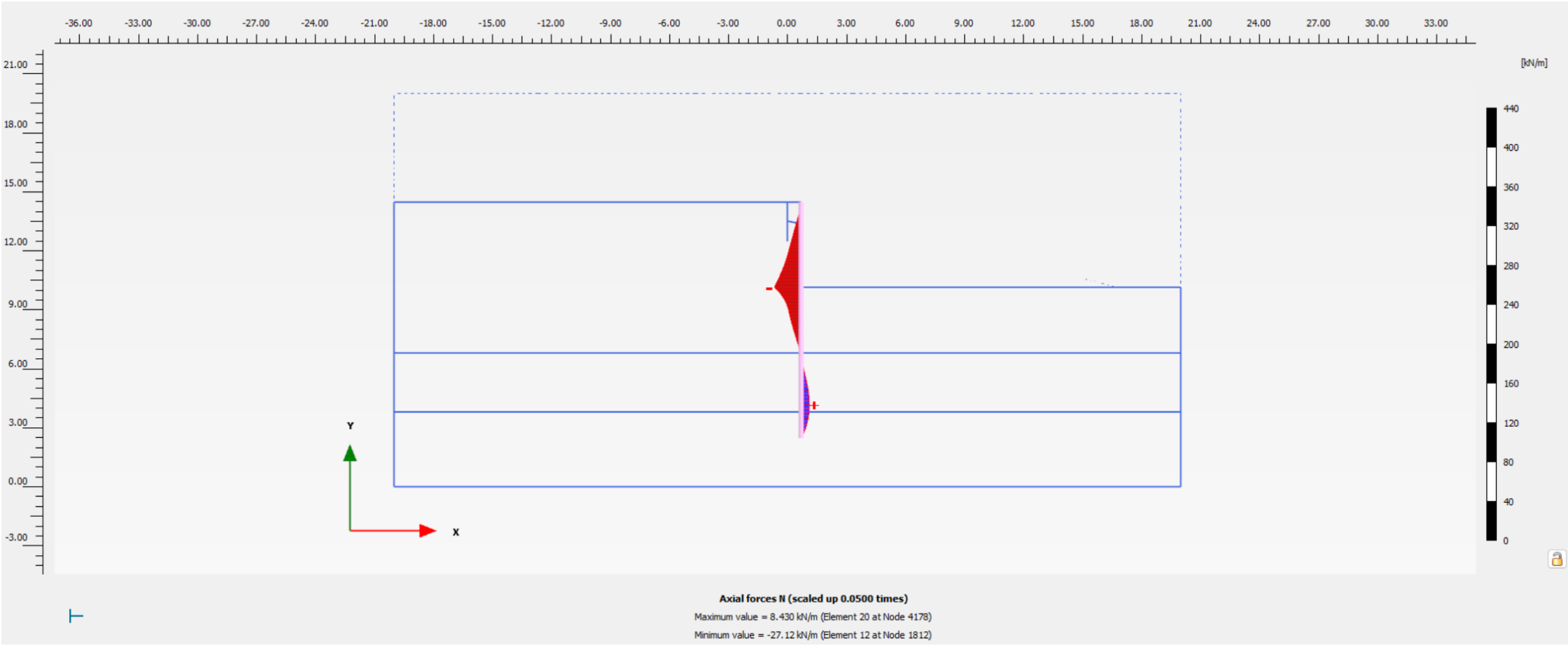
Phase 5 Wall Bending Moment Diagram



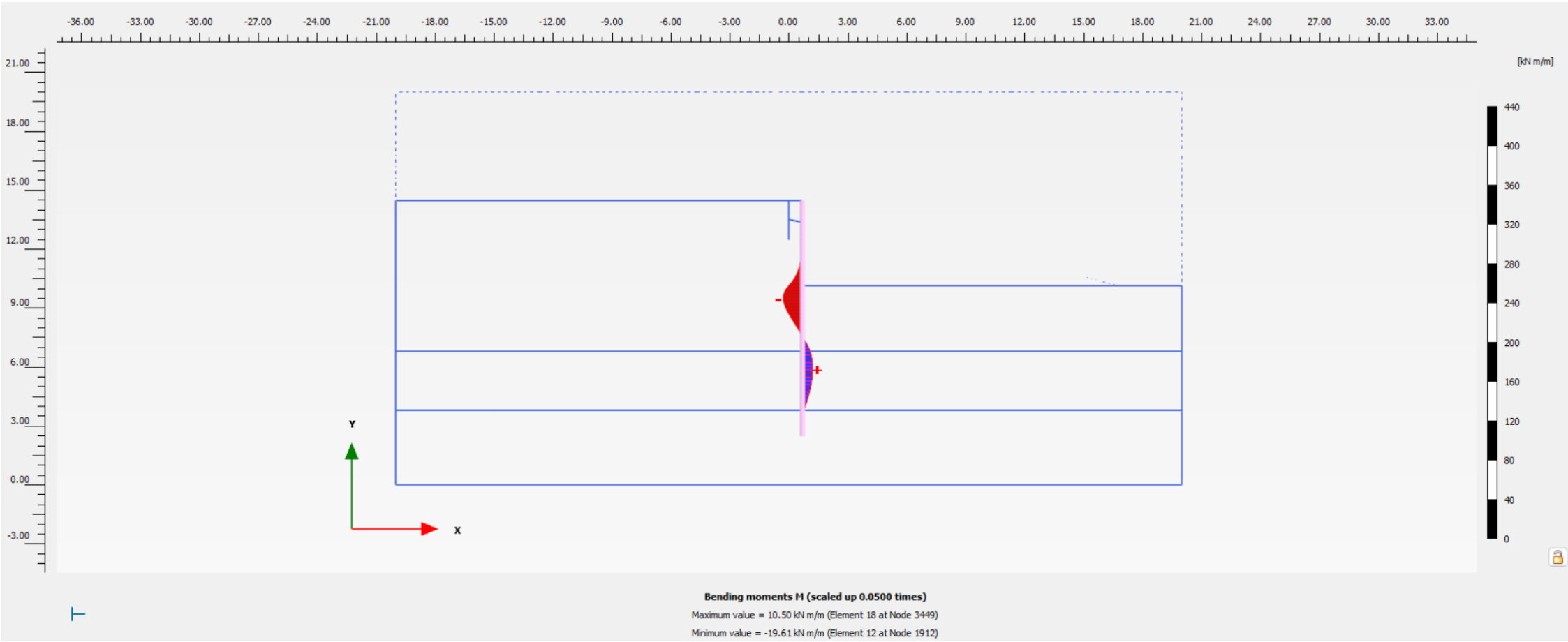
Phase 5 Wall Shear Force Diagram



Phase 5 Wall Axial Force Diagram



Phase 5.1 Wall Bending Moment Diagram

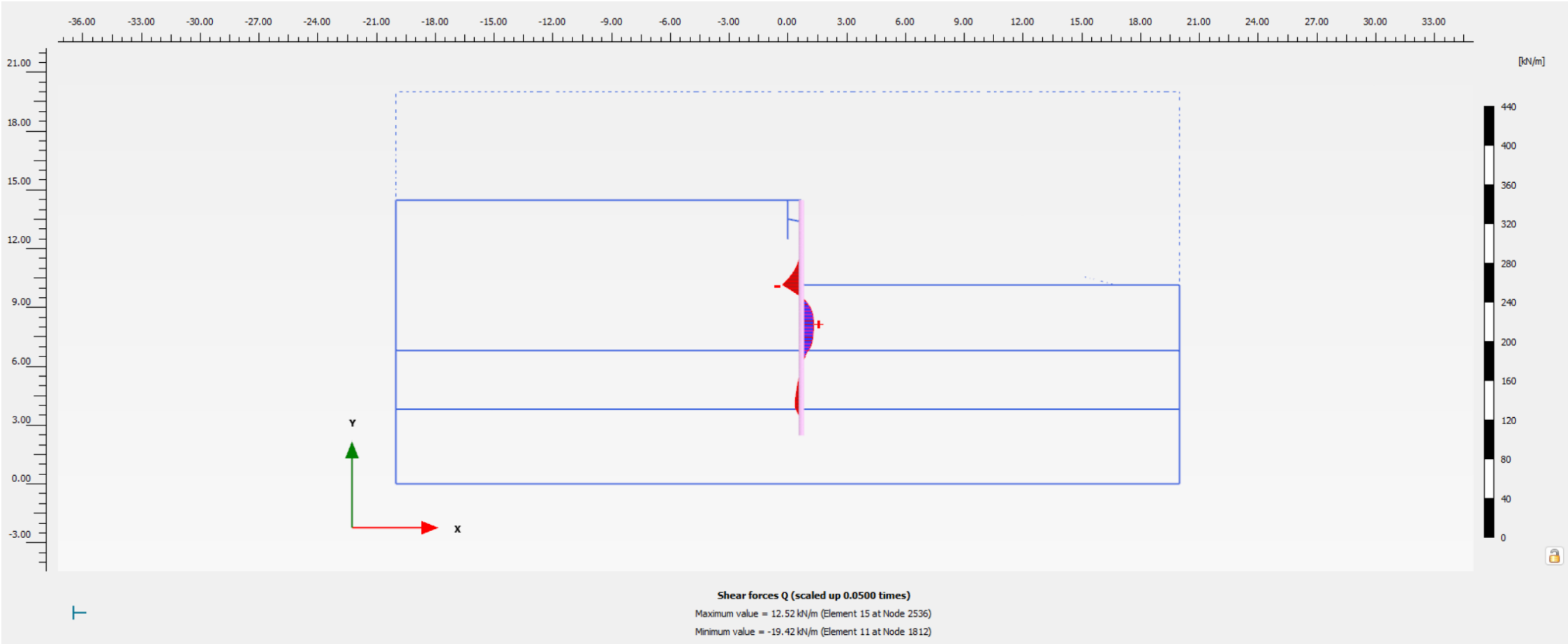


Bending moments M (scaled up 0.0500 times)

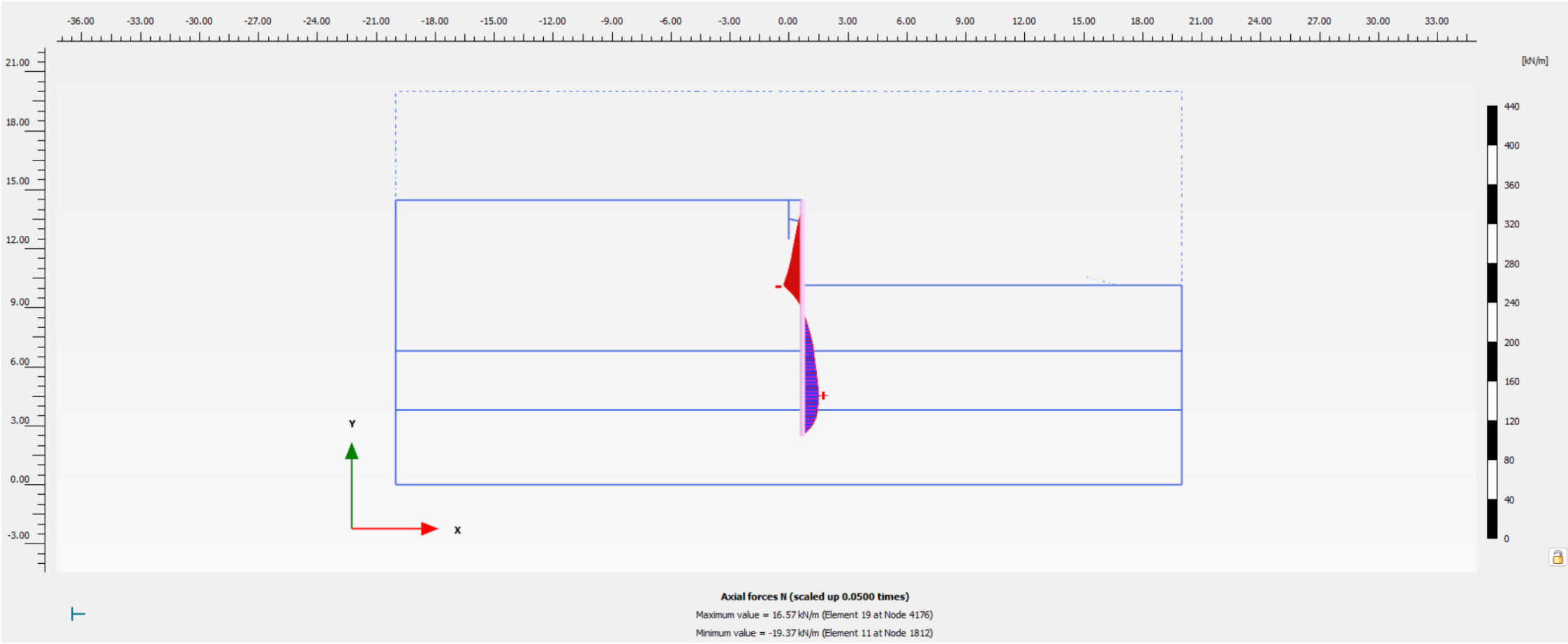
Maximum value = 10.50 kN m/m (Element 18 at Node 3449)

Minimum value = -19.61 kN m/m (Element 12 at Node 1912)

Phase 5.1 Wall Shear Force Diagram



Phase 5.1 Wall Axial Force Diagram

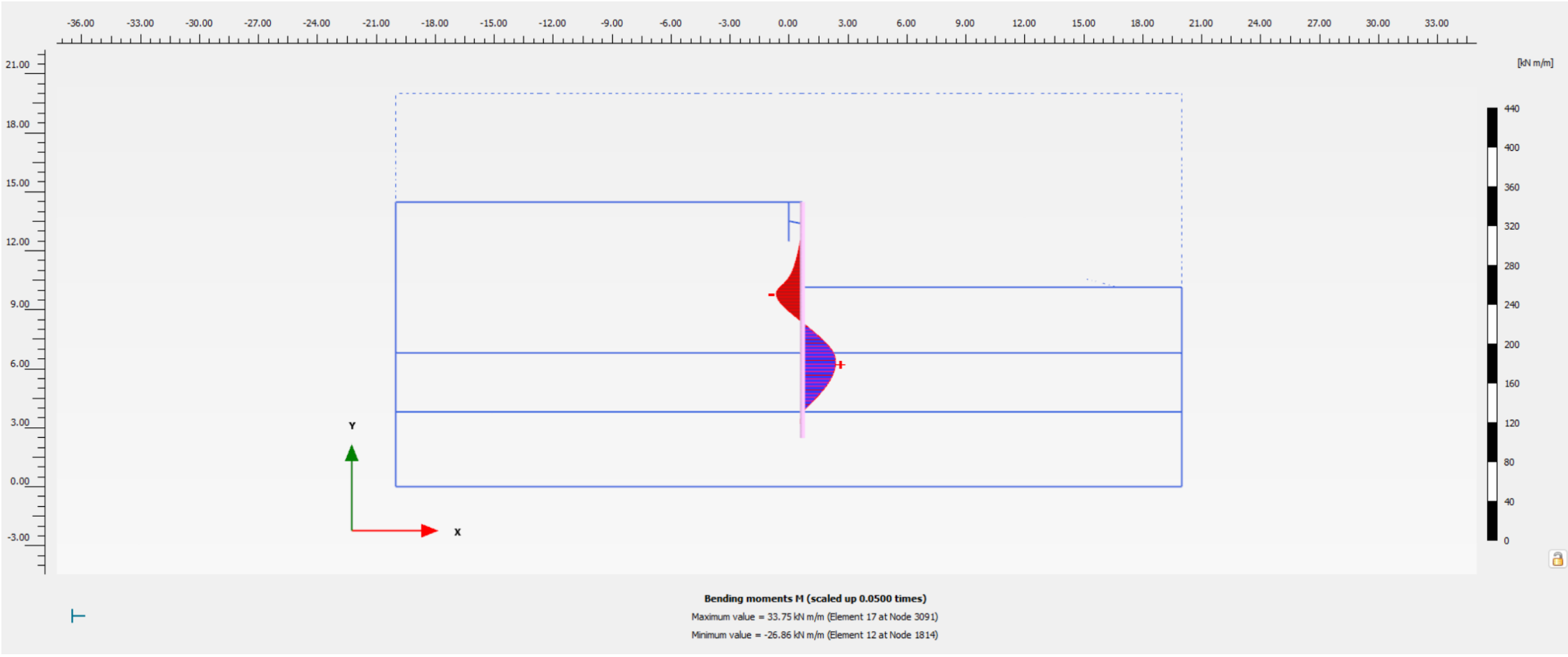


Axial forces N (scaled up 0.0500 times)

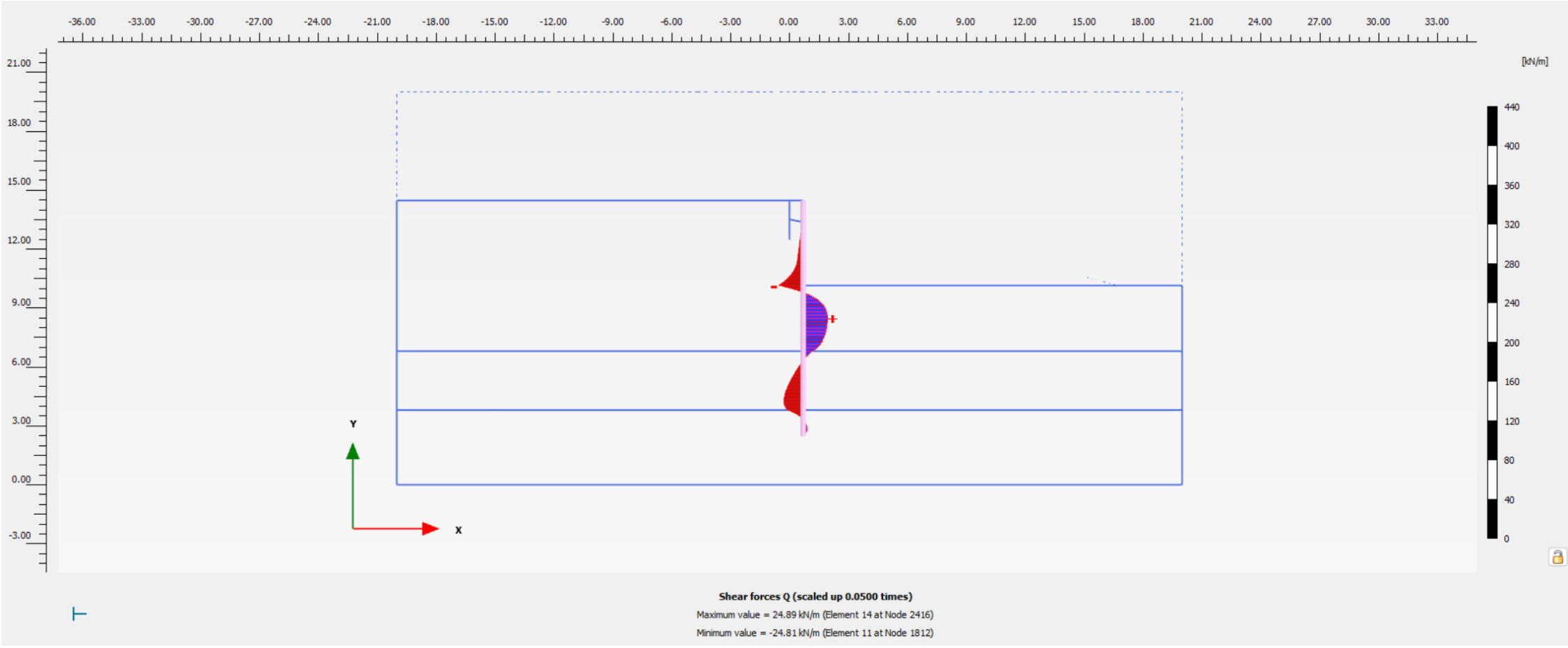
Maximum value = 16.57 kN/m (Element 19 at Node 4176)

Minimum value = -19.37 kN/m (Element 11 at Node 1812)

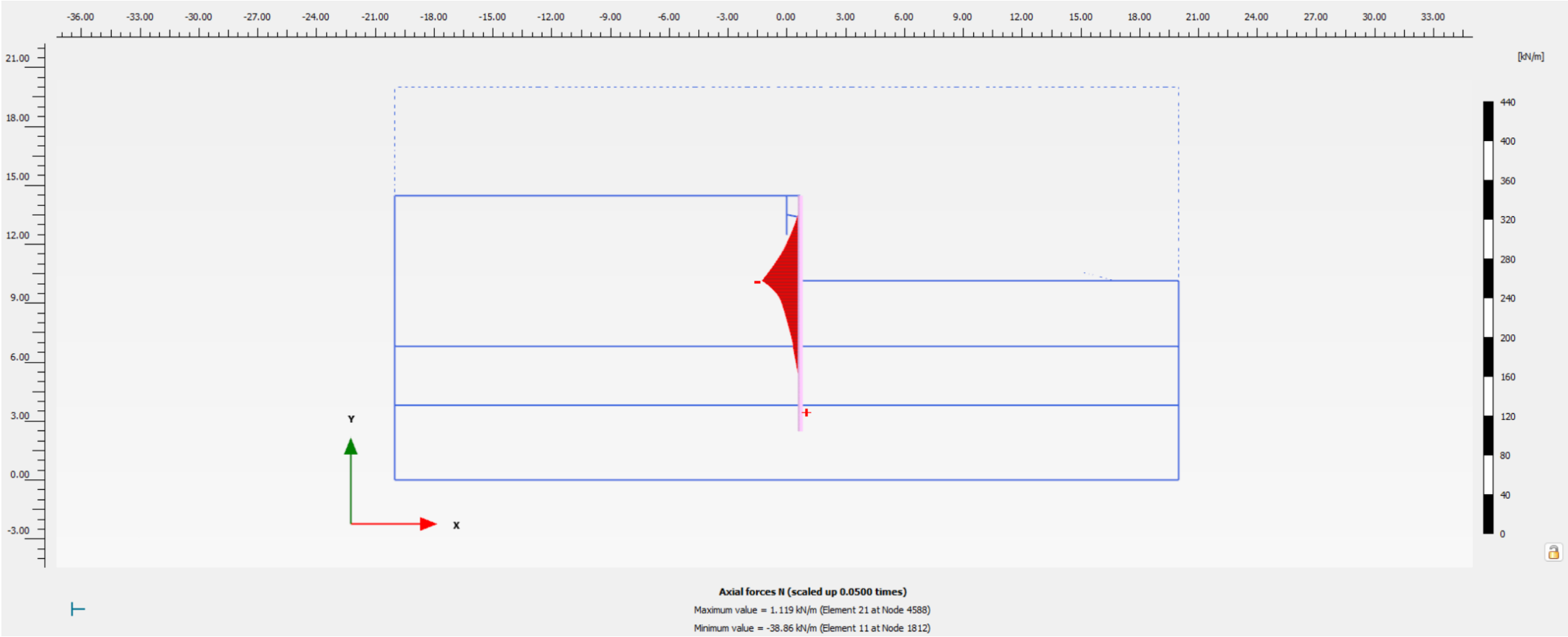
Phase 5.2 Wall Bending Moment Diagram



Phase 5.2 Wall Shear Force Diagram

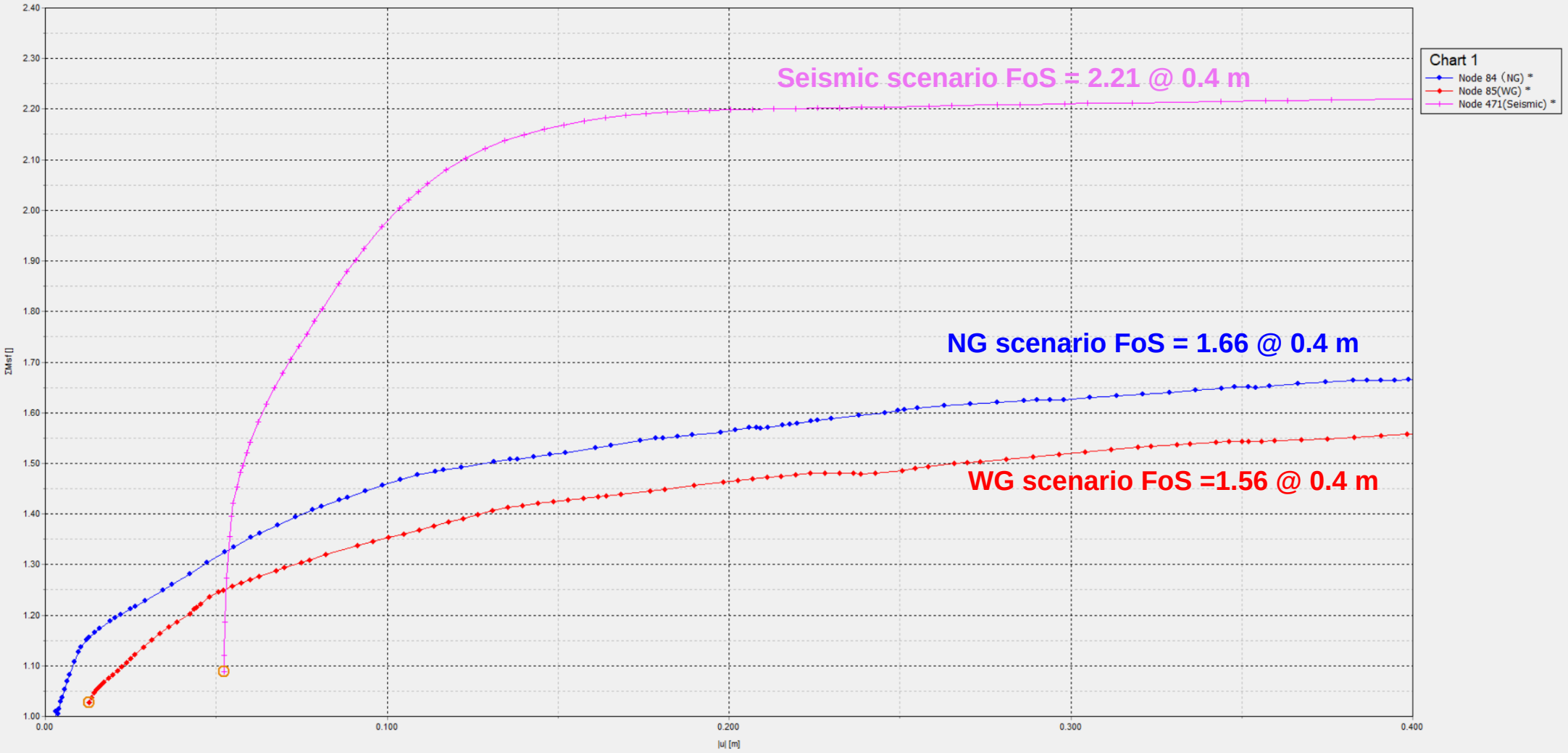


Phase 5.2 Wall Axial Force Diagram

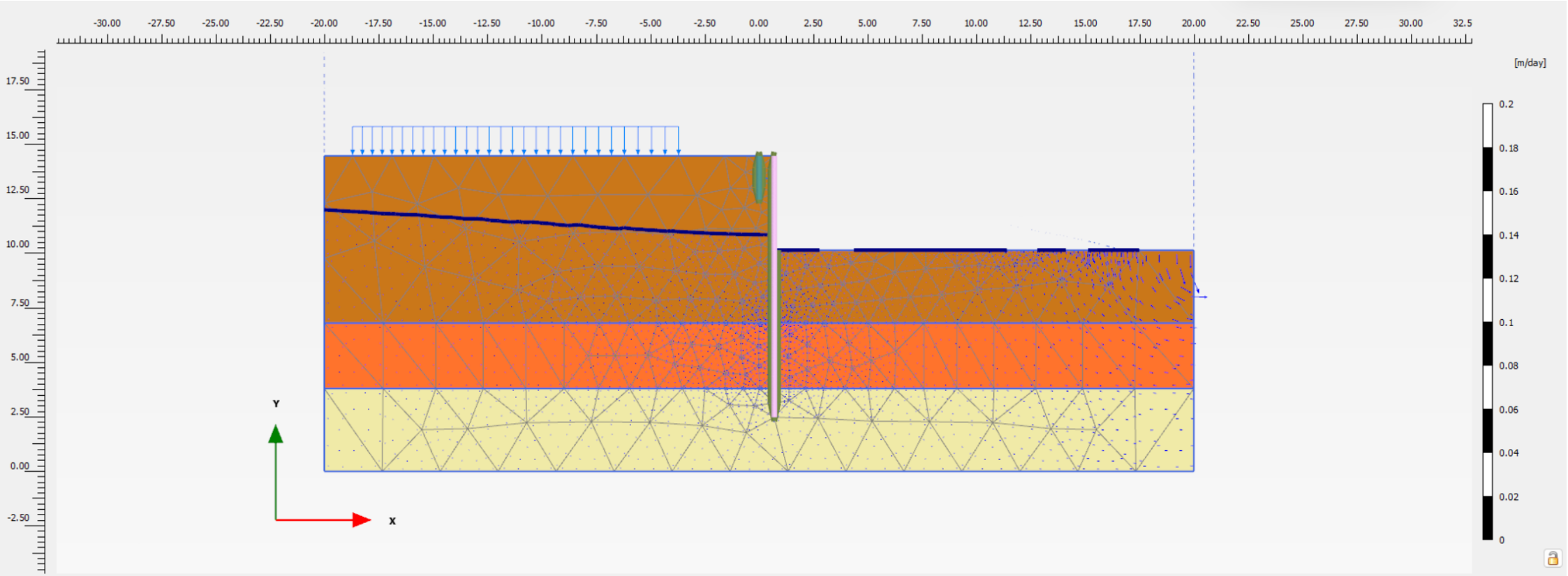


Section 1 Factor of Safety Analysis

Integrated FoS chart



Groundwater flow map

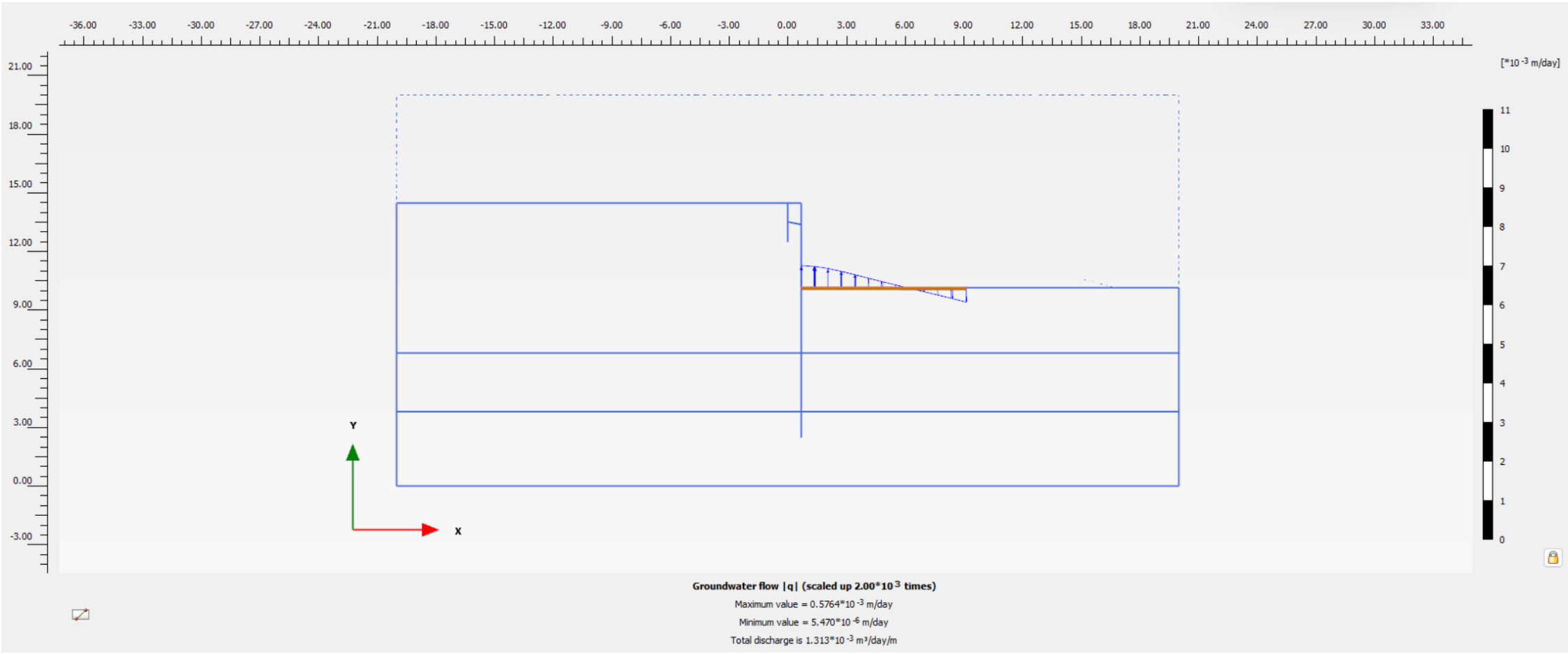


Groundwater flow |q| (scaled up 100 times)

Maximum value = 0.01036 m/day (Element 470 at Stress point 5638)

Minimum value = $1.122*10^{-9}$ m/day (Element 209 at Stress point 2499)

Groundwater discharge rate over excavation length

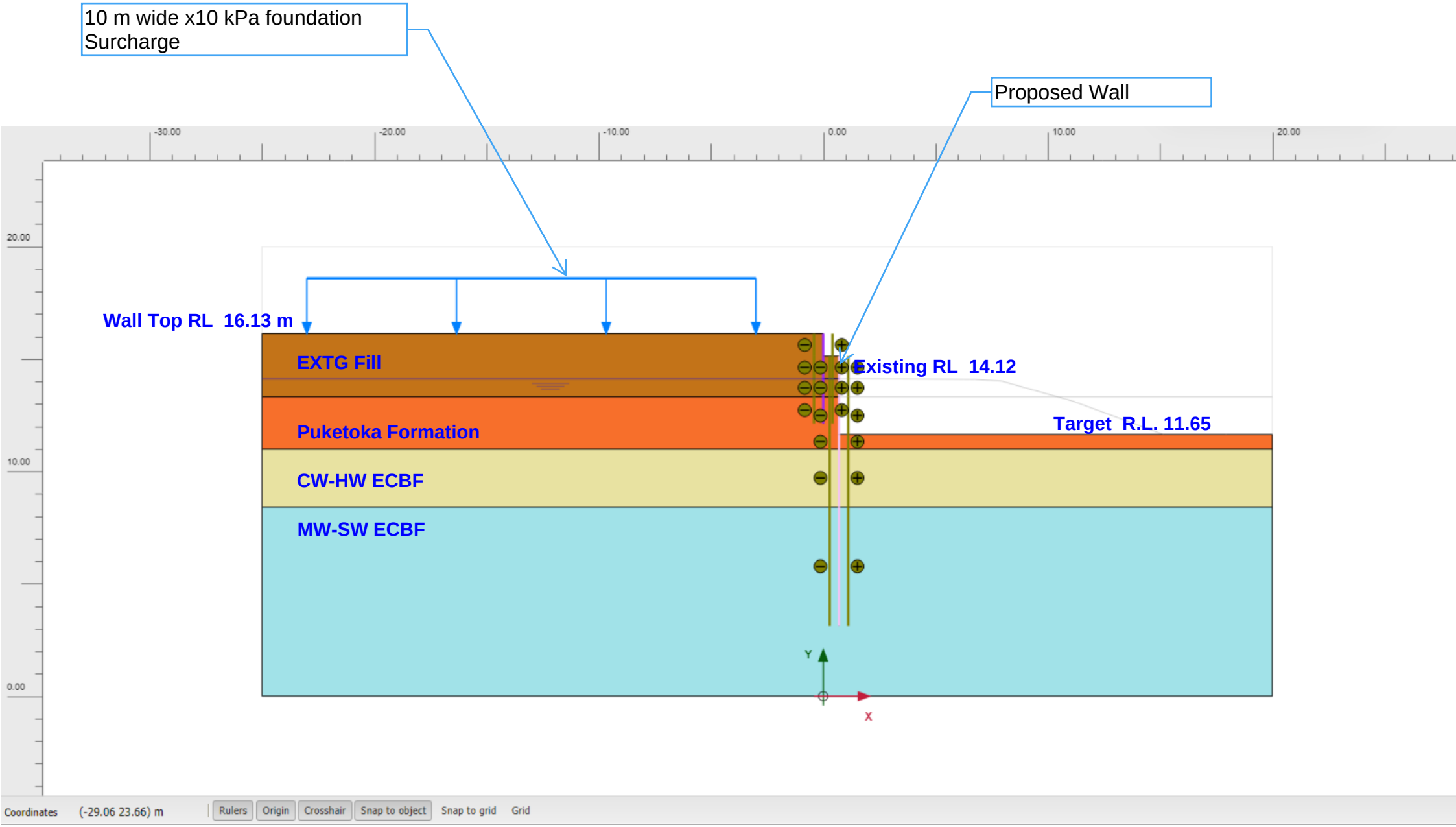


Section 2
Design Spreadsheets Calculations and Plaxis Analysis Outputs

Section 2 Plaxis Analysis Phases

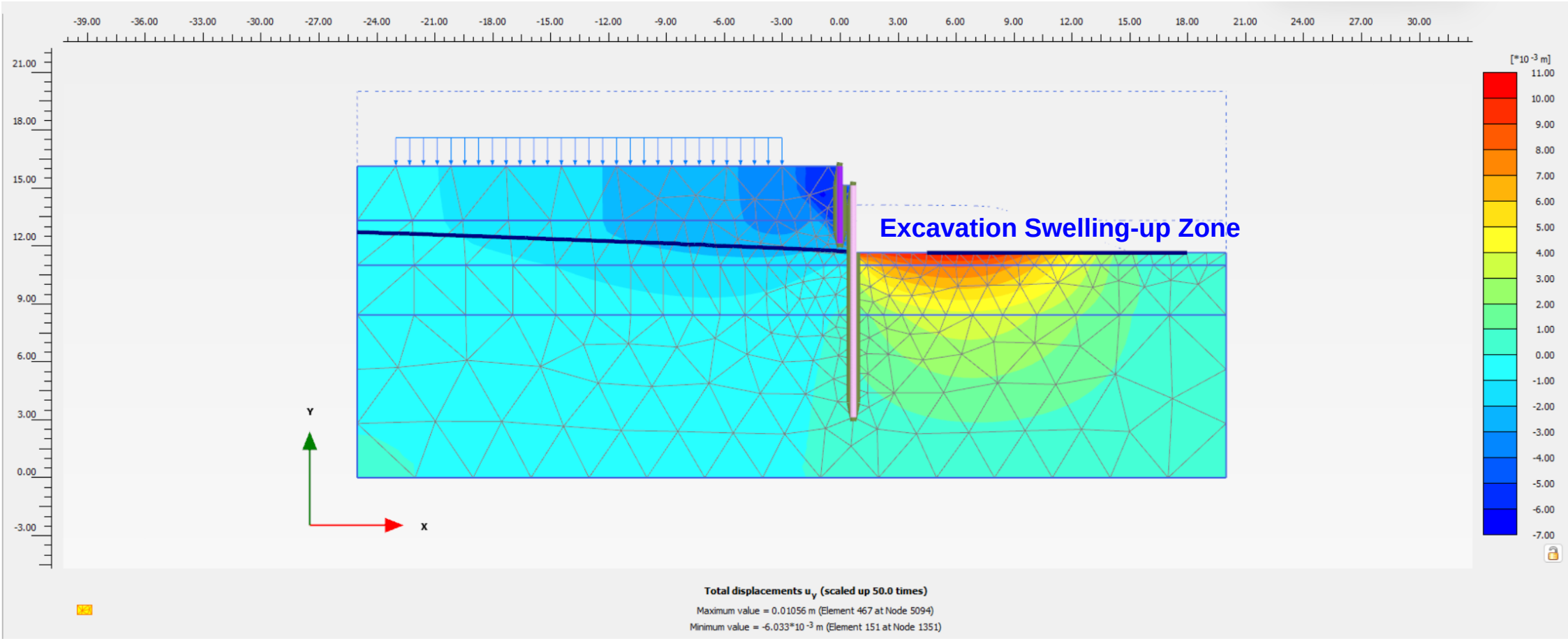
Phase 0: Initial Phase (Initialize the model)
Phase 1: School Development and Western Timber Retaining Wall Installation (Assumed 1: 1 cantilever to embedement ratio)
Phase 2: Neighboring Property Construction (Imposing Line loads)
Phase 3: Install Proposed Retaining Wall (Previous phase displacement reset)
Phase 4: Backfilling the gaps between two walls
Phase 5: Excavation to target level (550 mm below FGL)
(Steady state groundwater drawdown analysis)
- Phase 5.1: Worst Ground Water Scenario
- Phase 5.2: Seismic Scenario

Section 2 Ground Profile

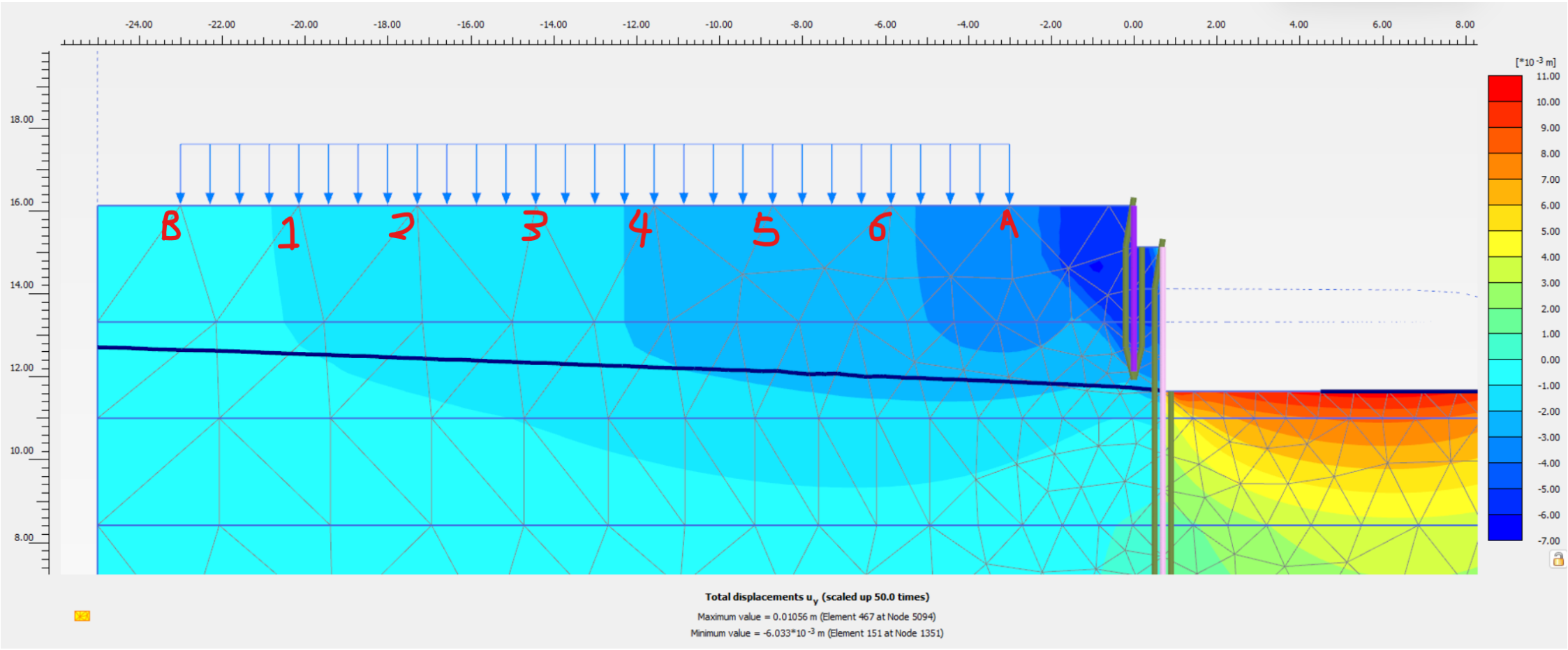

10 m wide x10 kPa foundation Surcharge
Proposed Wall
-30.00
-20.00
-10.00
0.00
10.00
20.00
20.00
10.00
0.00
Wall Top RL 16.13 m
EXTG Fill
Existing RL 14.12
Puketoka Formation
Target R.L. 11.65
CW-HW ECBF
MW-SW ECBF
Y
X
Coordinates
(-29.06 23.66) m
Rulers
Origin
Crosshair
Snap to object
Snap to grid
Grid

Section 2 Analysis Ground Settlement Contours

Phase 5 Settlement Contours



Phase 5 Settlements at different interval points for calculating differential settlement

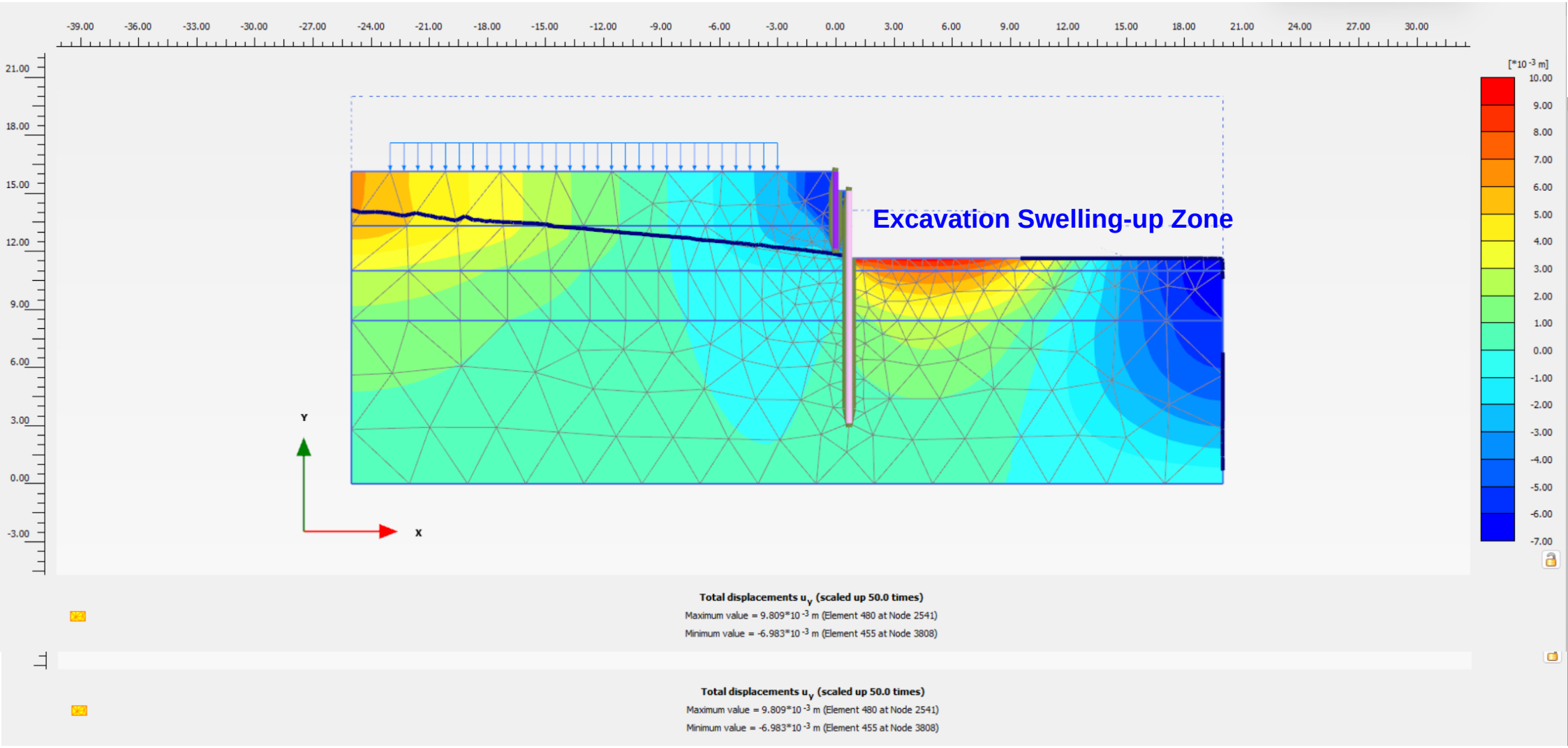


Phase 5 differential Settlements at different interval points calculation details

Section 2	Coordinates		Settlement	
	x (m)	y (m)	u_y (mm)	
B	-23	16.13	-0.7416	(-23,16.13)
1	-20.16	16.13	-1.072	(-20.16,16.13)
2	-17.29	16.13	-1.384	(-17.29,16.13)
3	-14.4	16.13	-1.72	(-14.4,16.13)
4	-11.6	16.13	-2.08	(-11.6,16.13)
5	-8.7	16.13	-2.483	(-8.7,16.13)
6	-5.89	16.13	-2.89	(-5.89,16.13)
A	-3	16.13	-3.37	(-3,16.13)

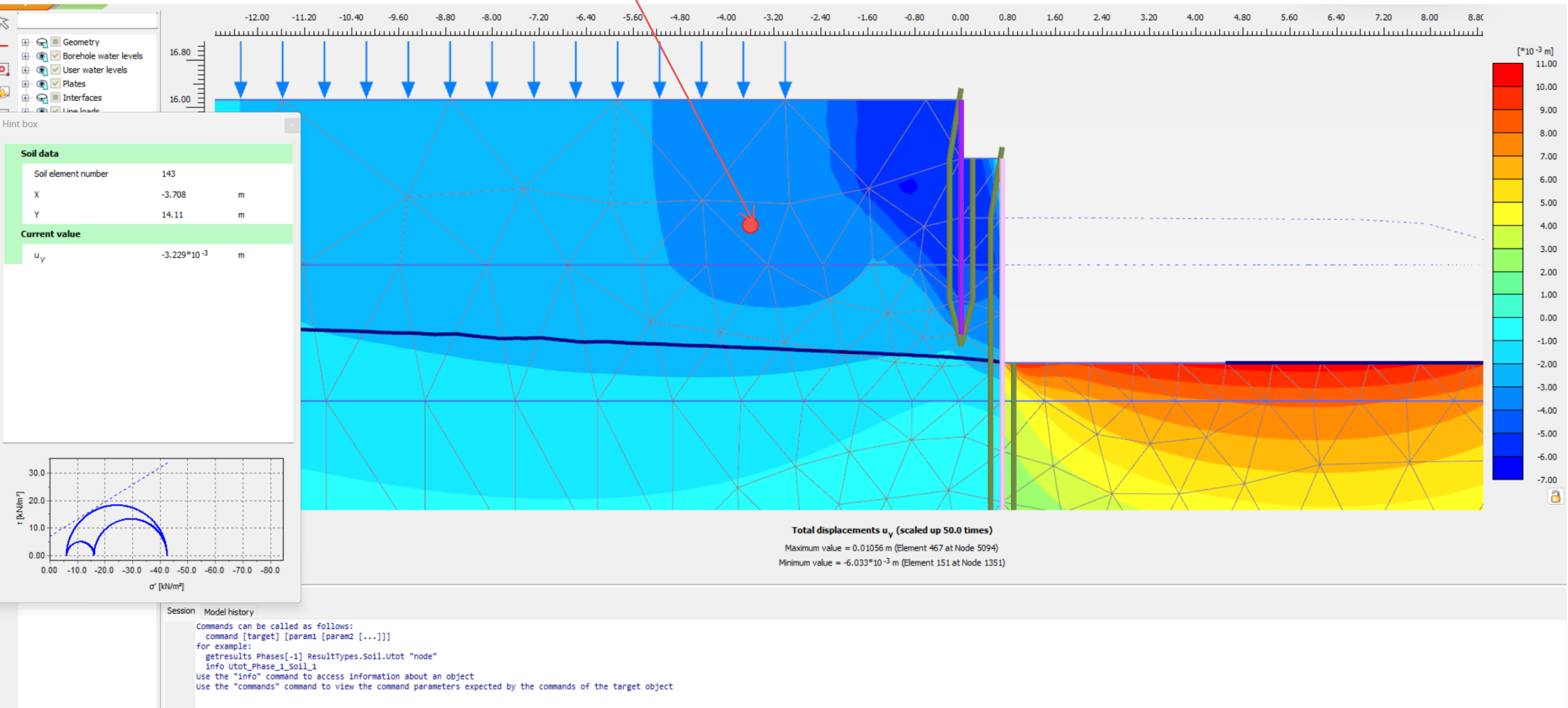
Pair	x difference	uy difference	Settlement change rate (m/m)
B to 1	-2.84	0.3304	-8595.641646
B to 2	-5.71	0.6424	-8888.542964
B to 3	-8.6	0.9784	-8789.860998
B to 4	-11.4	1.3384	-8517.632995
B to 5	-14.3	1.7414	-8211.783622
B to 6	-17.11	2.1484	-7964.066282
B to A	-20	2.6284	-7609.191904
1 to 2	-2.87	0.312	-9198.717949
1 to 3	-5.76	0.648	-8888.888889
1 to 4	-8.56	1.008	-8492.063492
1 to 5	-11.46	1.411	-8121.899362
1 to 6	-14.27	1.818	-7849.284928
1 to A	-17.16	2.298	-7467.362924
2 to 3	-2.89	0.336	-8601.190476
2 to 4	-5.69	0.696	-8175.287356
2 to 5	-8.59	1.099	-7816.196542
2 to 6	-11.4	1.506	-7569.721116
2 to A	-14.29	1.986	-7195.367573
3 to 4	-2.8	0.36	-7777.777778
3 to 5	-5.7	0.763	-7470.51114
3 to 6	-8.51	1.17	-7273.504274
3 to A	-11.4	1.65	-6909.090909
4 to 5	-2.9	0.403	-7196.029777
4 to 6	-5.71	0.81	-7049.382716
4 to A	-8.6	1.29	-6666.666667
5 to 6	-2.81	0.407	-6904.176904
5 to A	-5.7	0.887	-6426.155581
6 to A	-2.89	0.48	-6020.833333
		Max Ratio	6020.833333

Phase 5.1 Settlement Contours

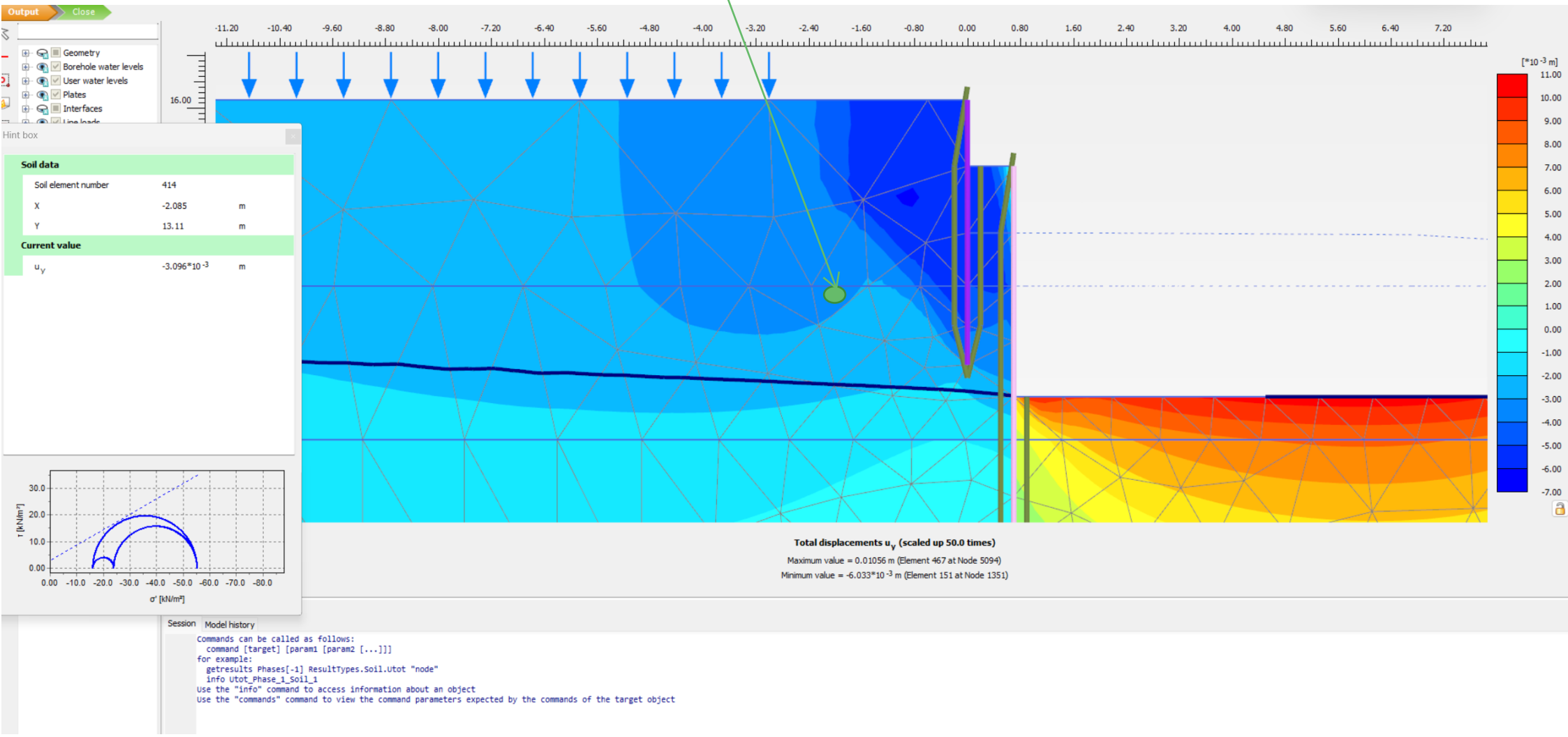


Total displacements u y (scaled up 50.0 times)
Maximum value = 9.809*10 -3 m (Element 480 at Node 2541)
Minimum value = -6.983*10 -3 m (Element 455 at Node 3808)

Predicted settlement at Existing WW Line coordinates (-3.7, 14.12)

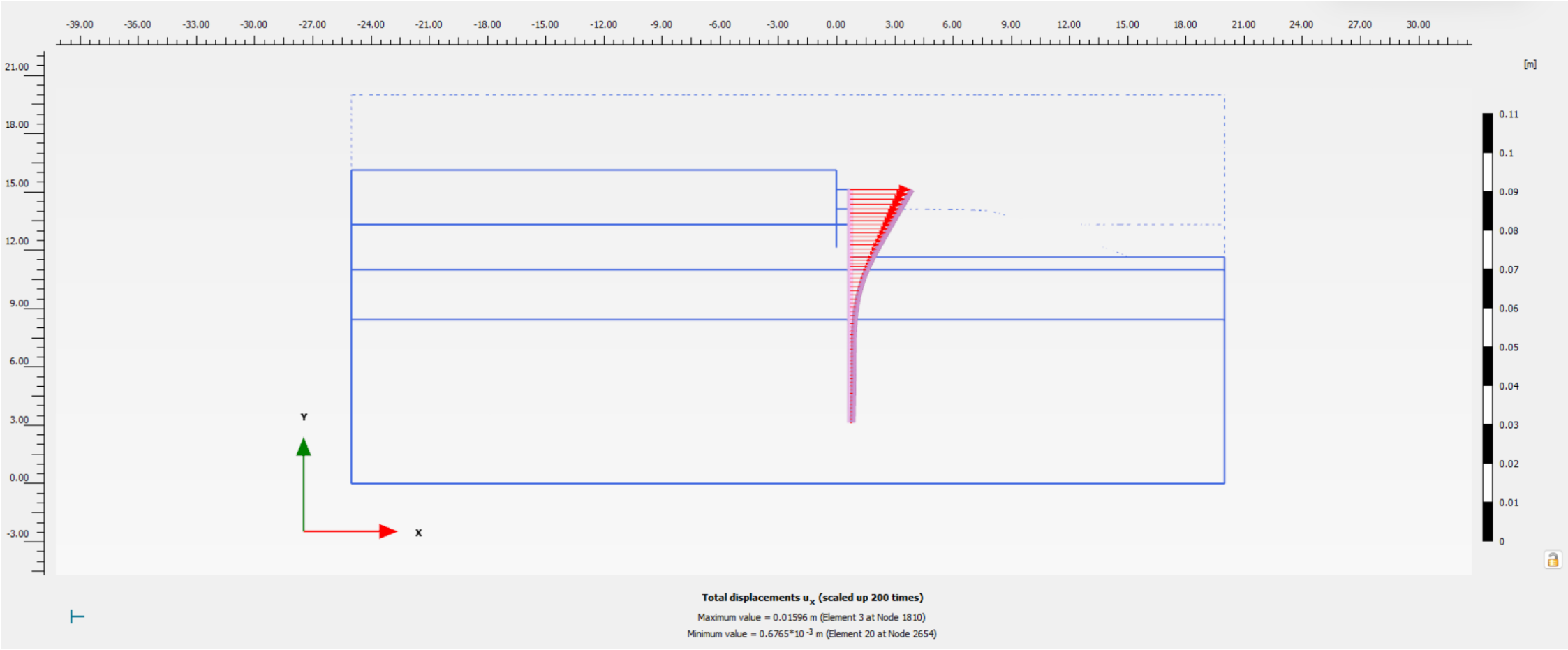


Predicted settlement at Existing SW Line coordinates (-2.1. 13.17)

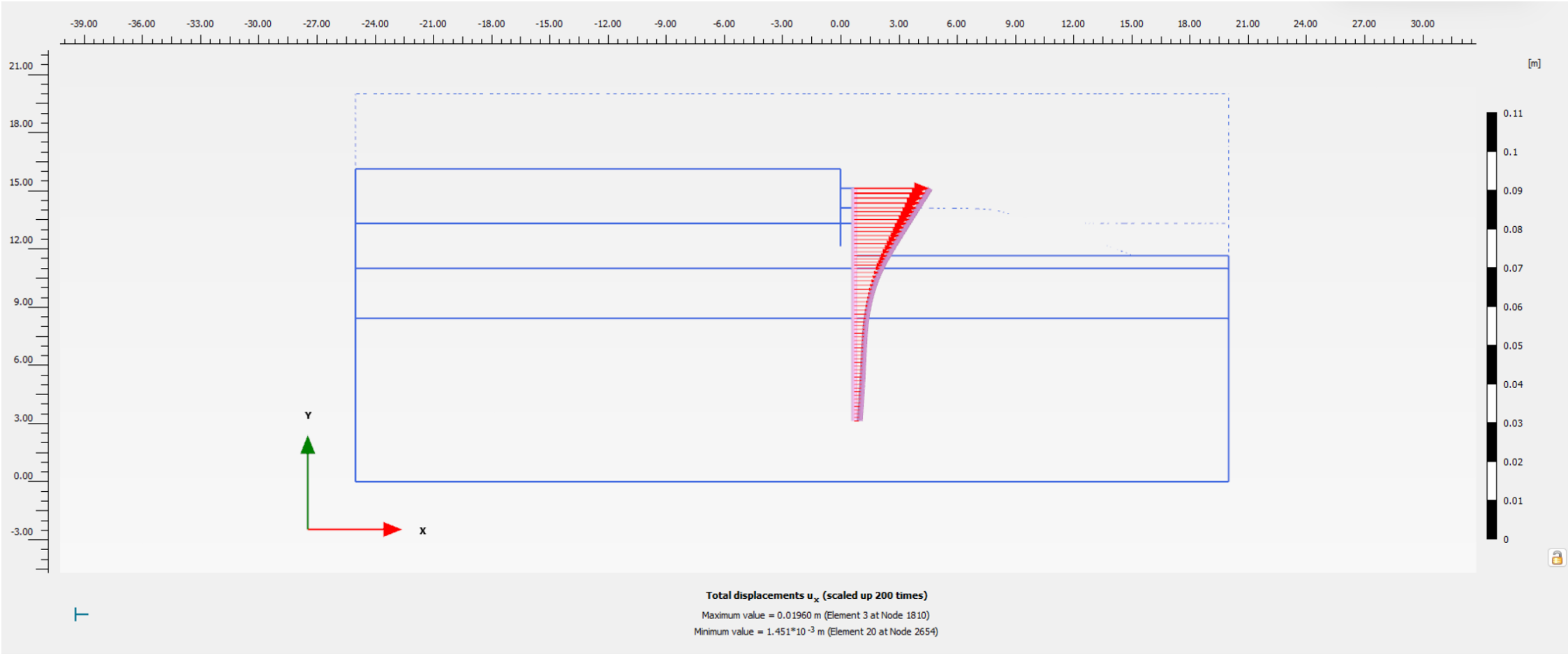


Section 2 Analysis Lateral Deflection

Phase 5 Wall Lateral Deflection Profile

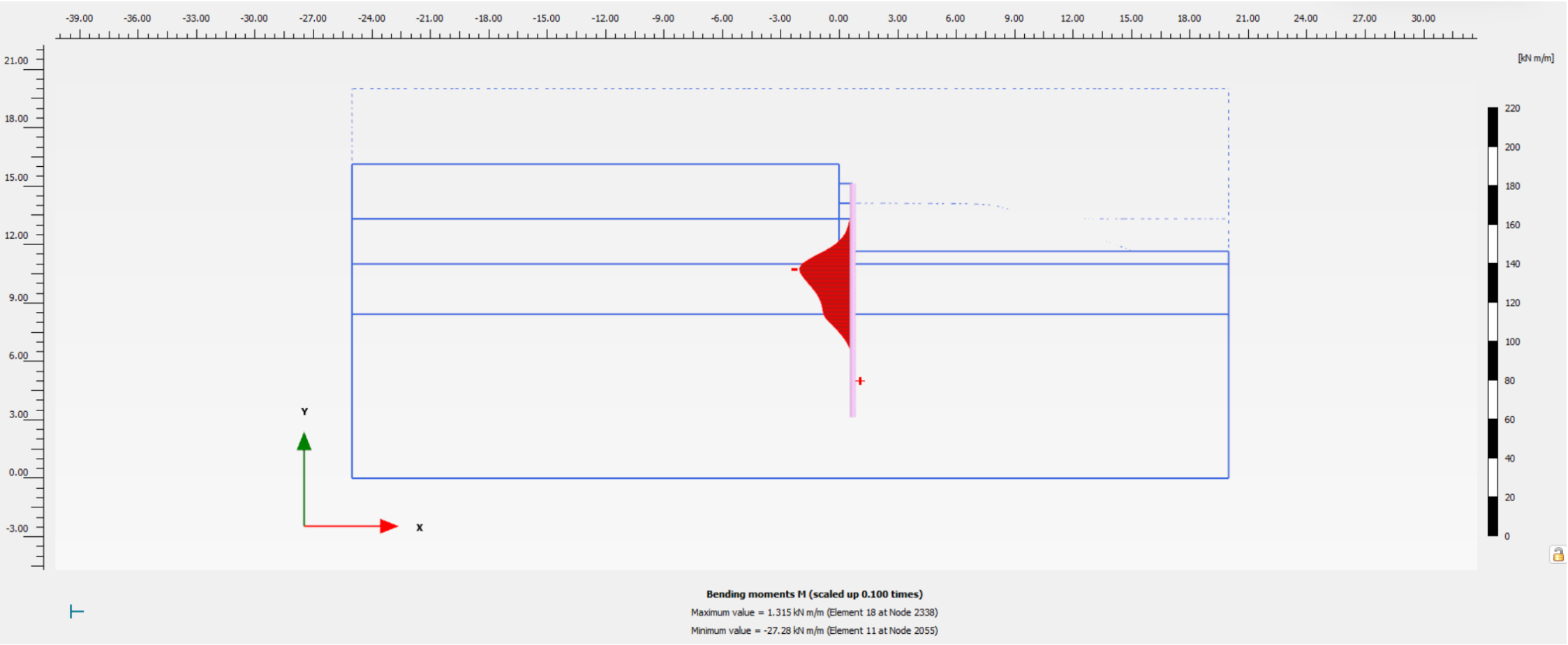


Phase 5.1 Wall Lateral Deflection Profile



Section 2 Analysis Wall Internal Forces Diagram

Phase 5 Wall Bending Moment Diagram

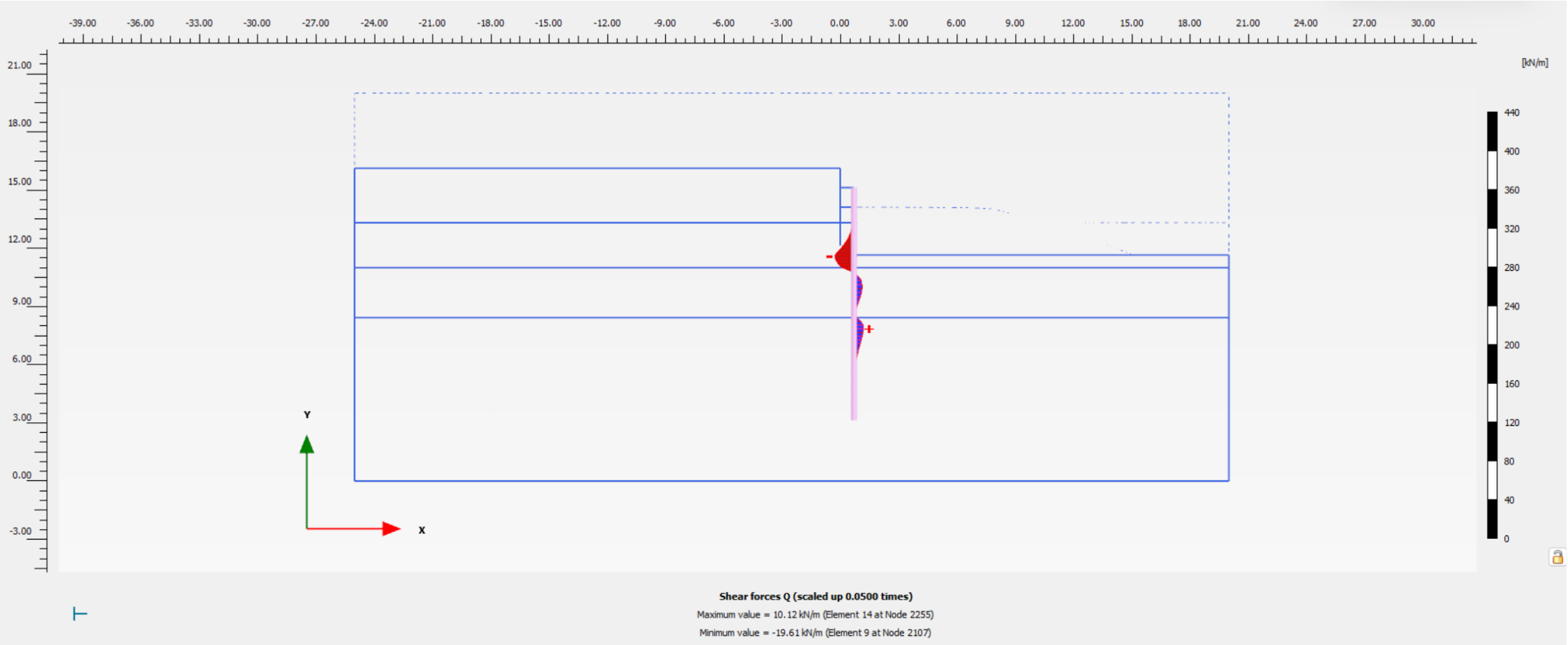


Bending moments M (scaled up 0.100 times)

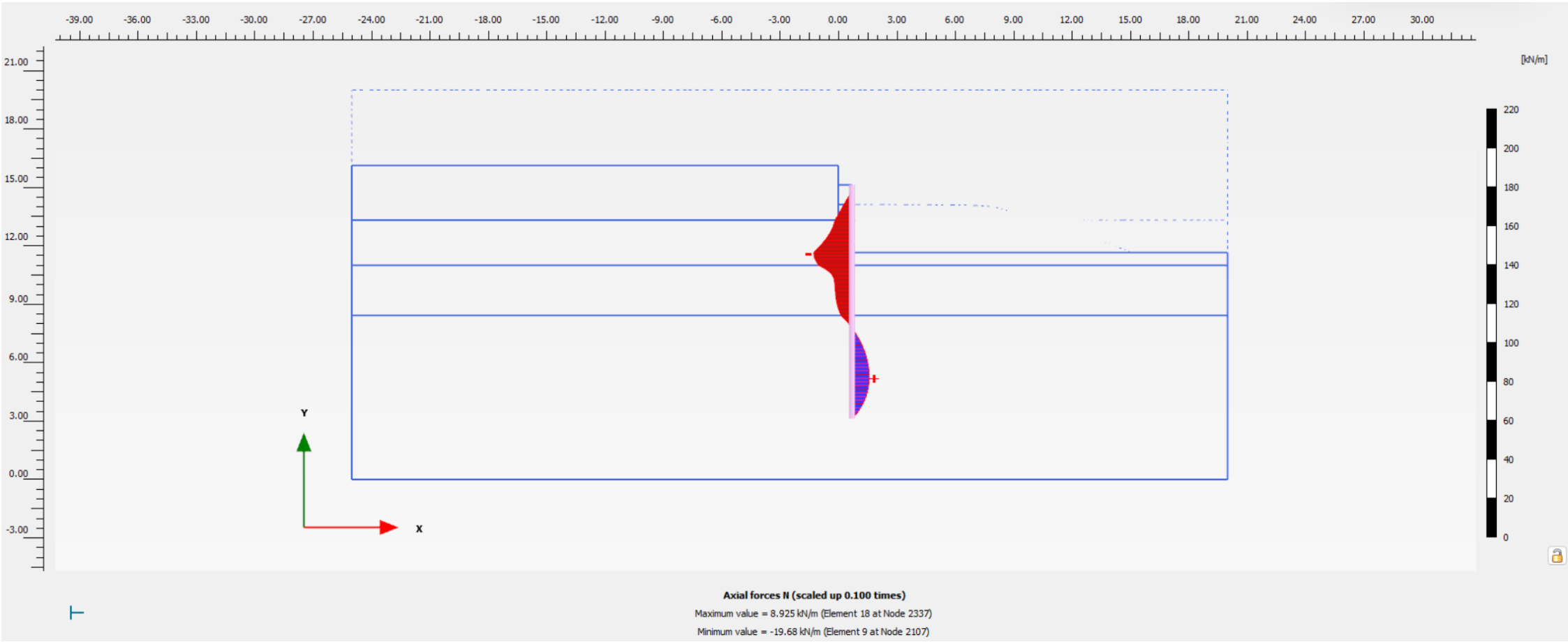
Maximum value = 1.315 kN m/m (Element 18 at Node 2338)

Minimum value = -27.28 kN m/m (Element 11 at Node 2055)

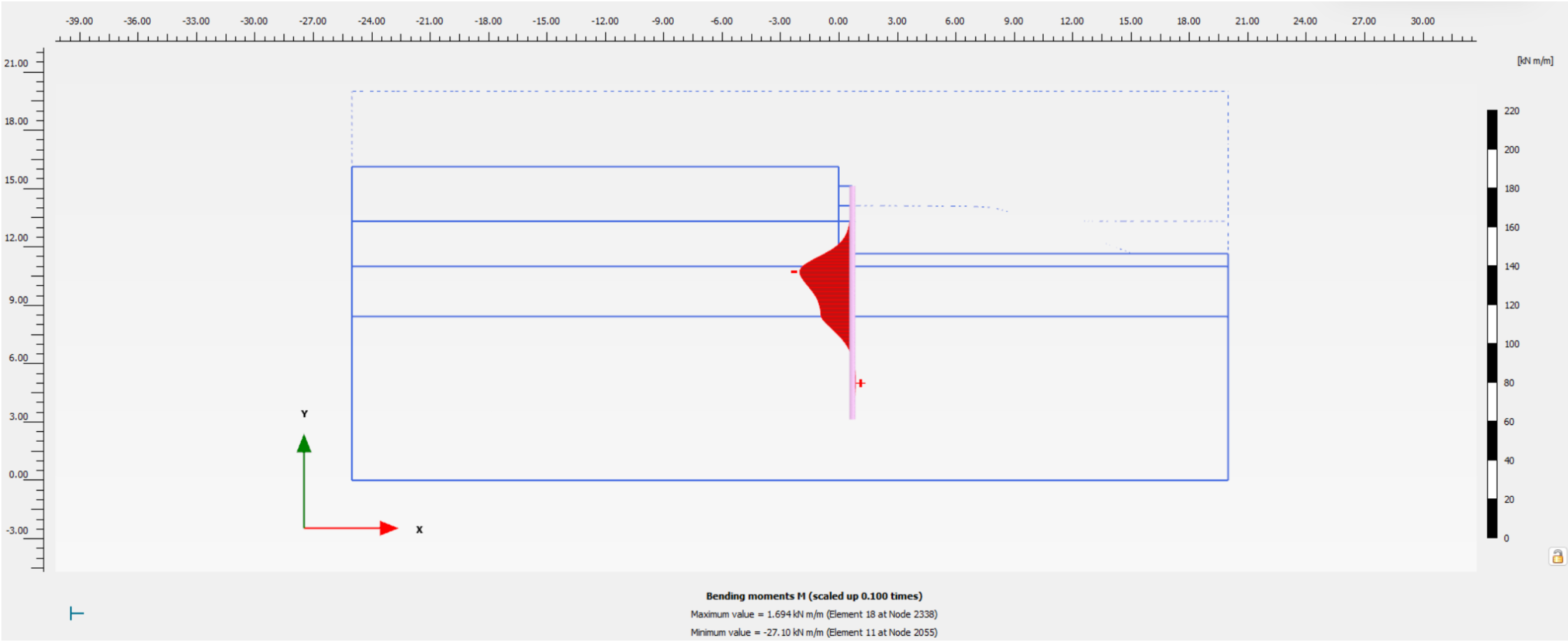
Phase 5 Wall Shear Force Diagram



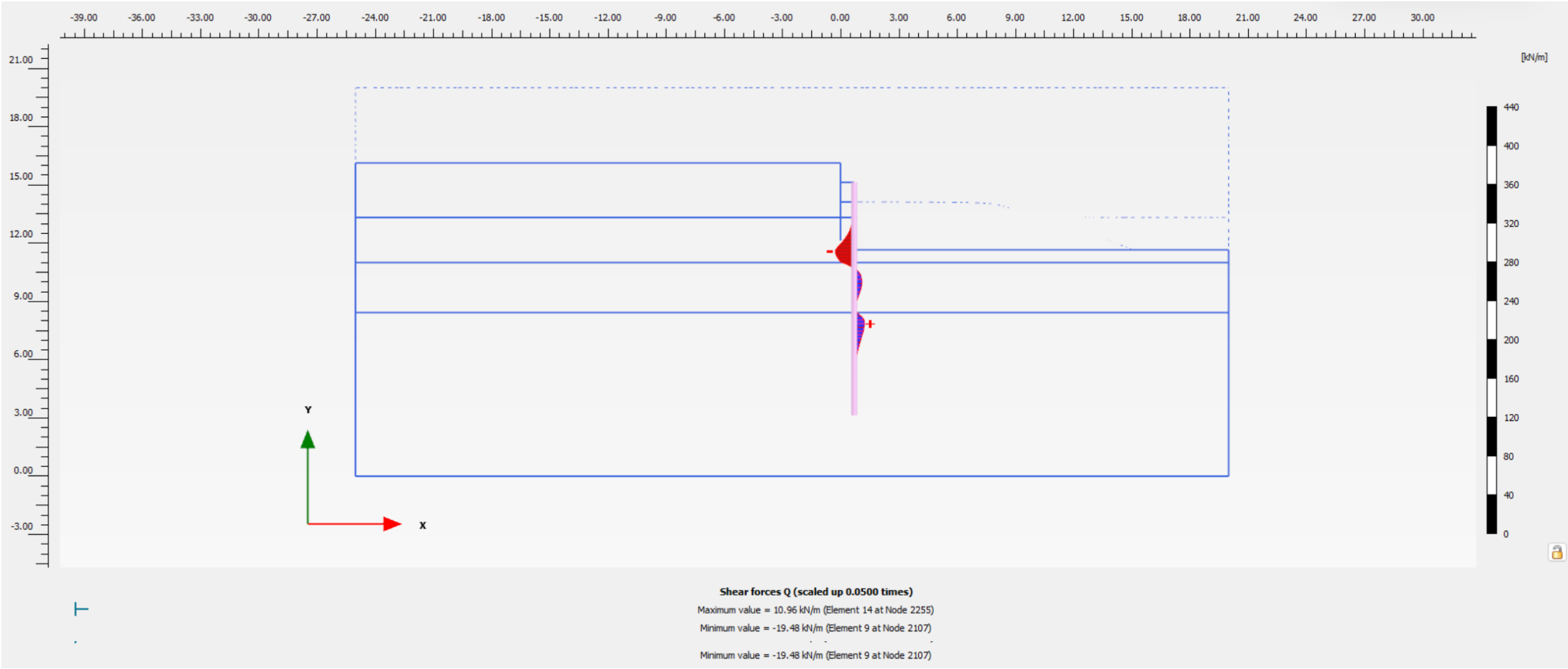
Phase 5 Wall Axial Force Diagram



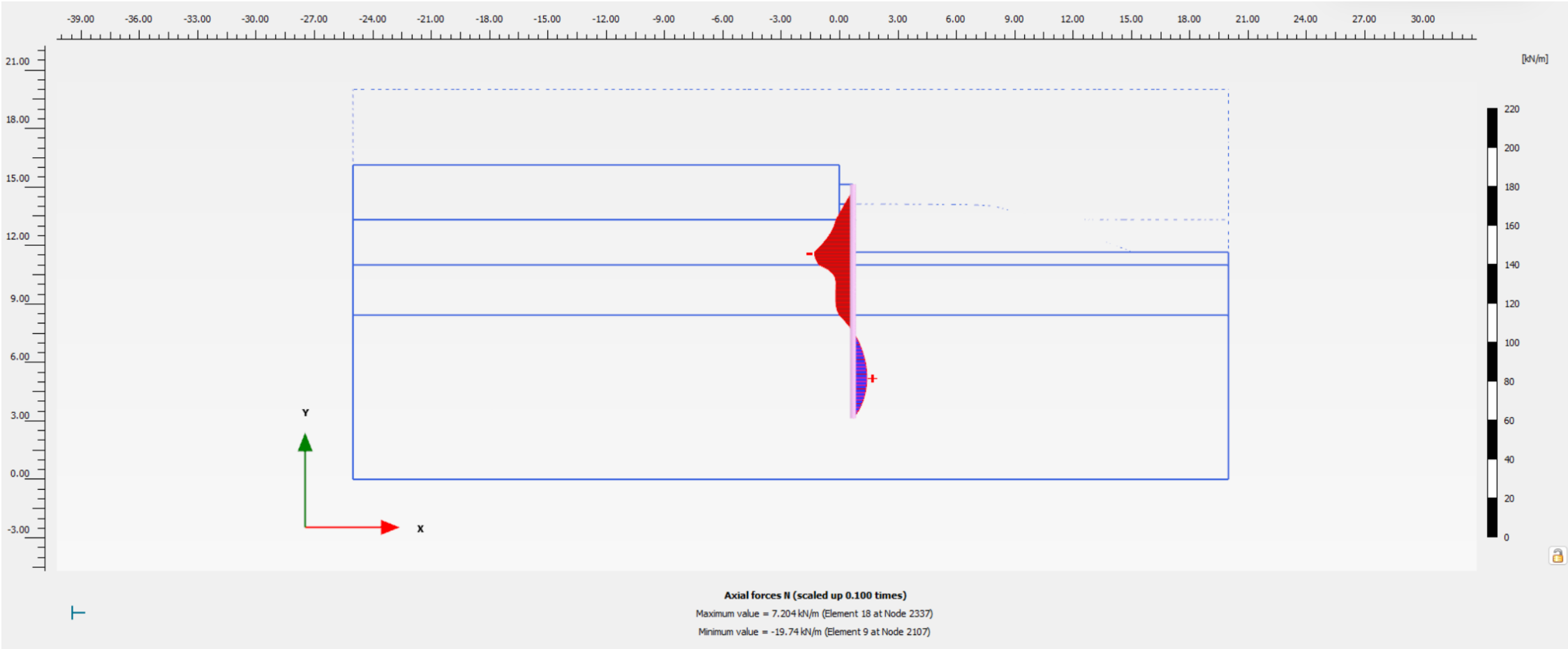
Phase 5.1 Wall Bending Moment Diagram



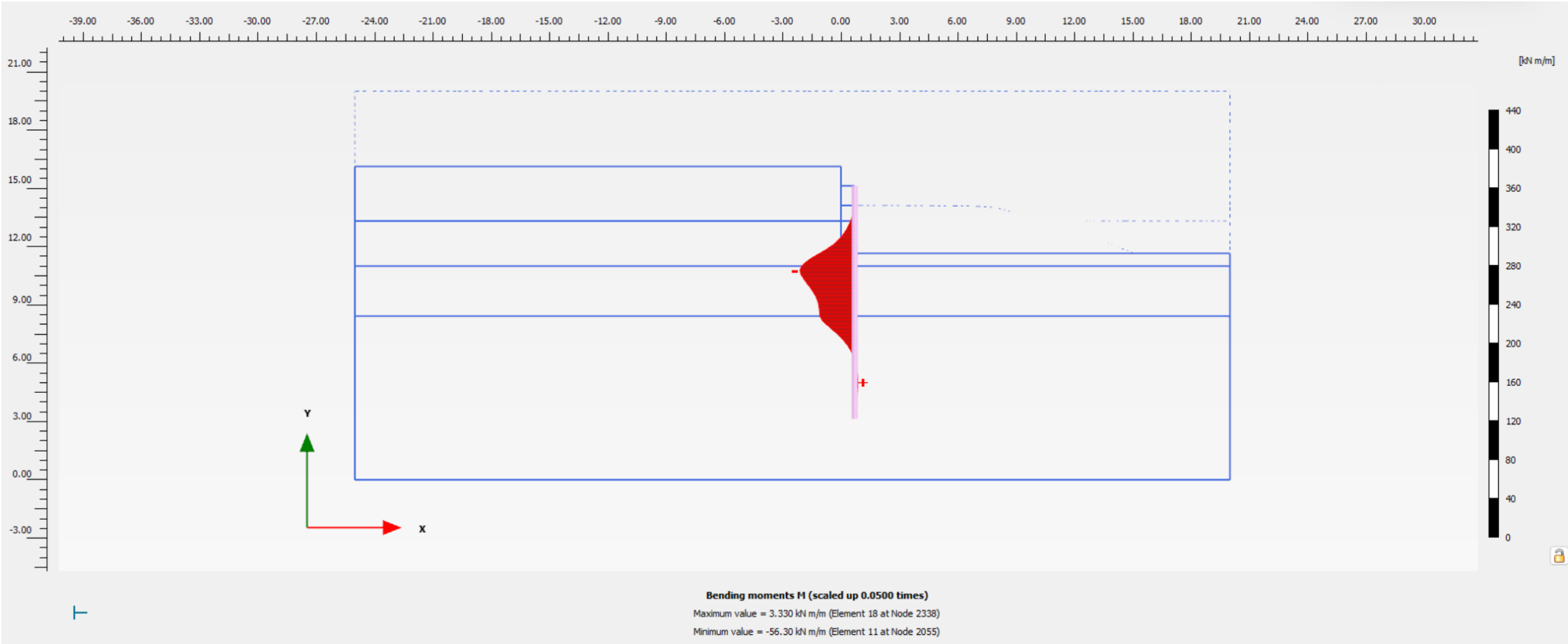
Phase 5.1 Wall Shear Force Diagram



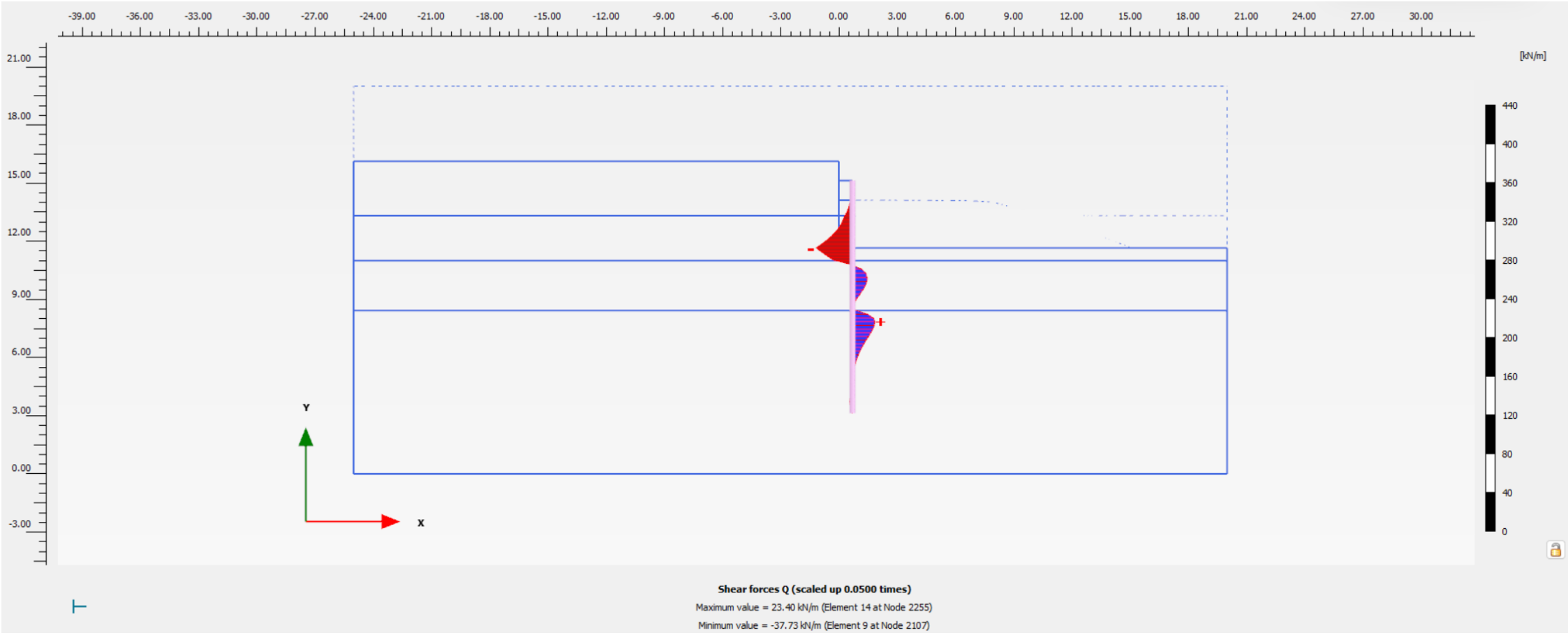
Phase 5.1 Wall Axial Force Diagram



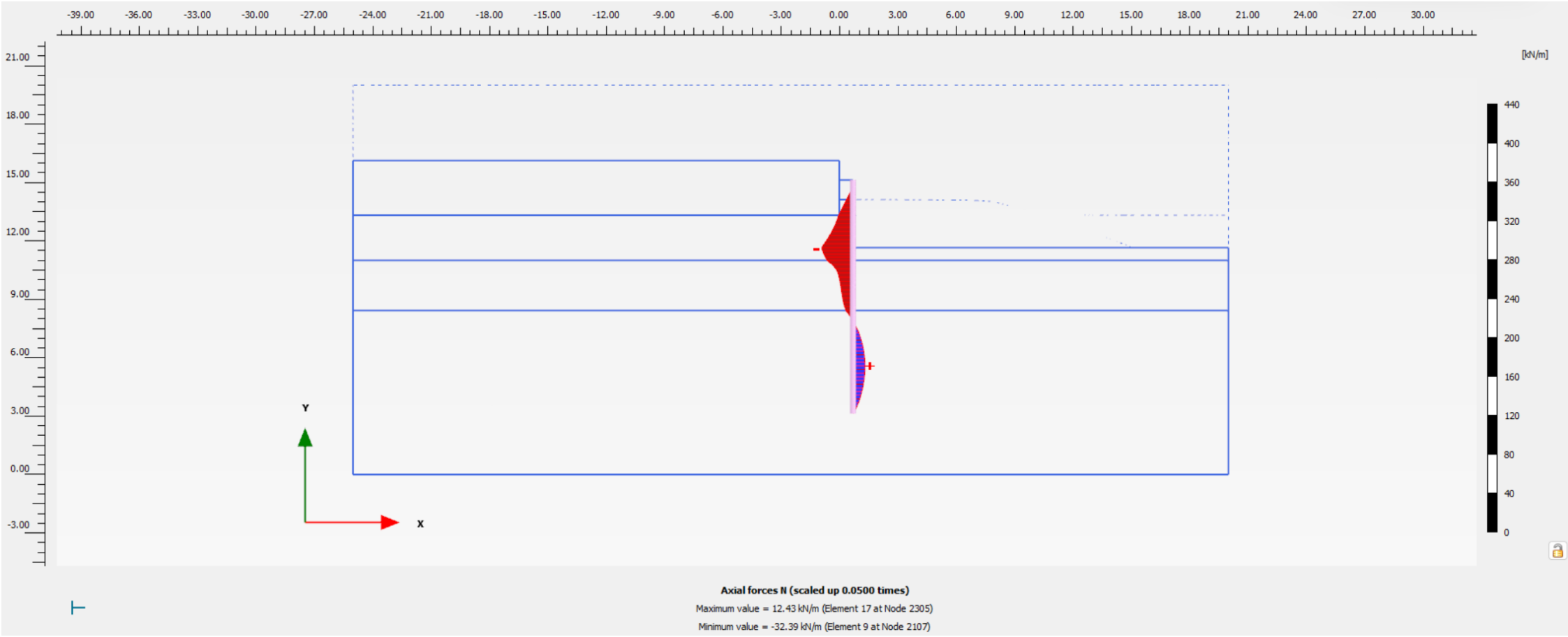
Phase 5.2 Wall Bending Moment Diagram



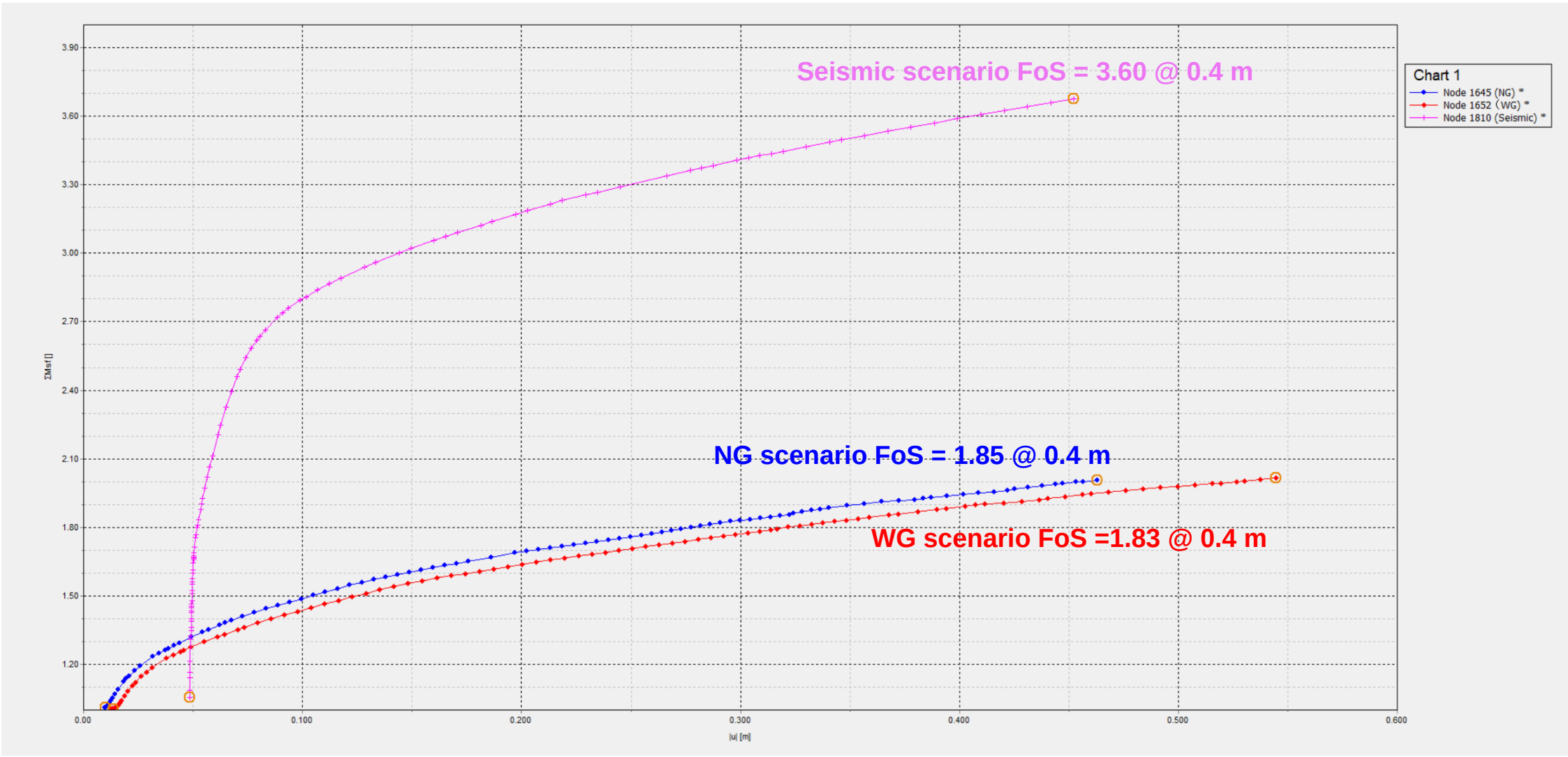
Phase 5.2 Wall Shear Force Diagram



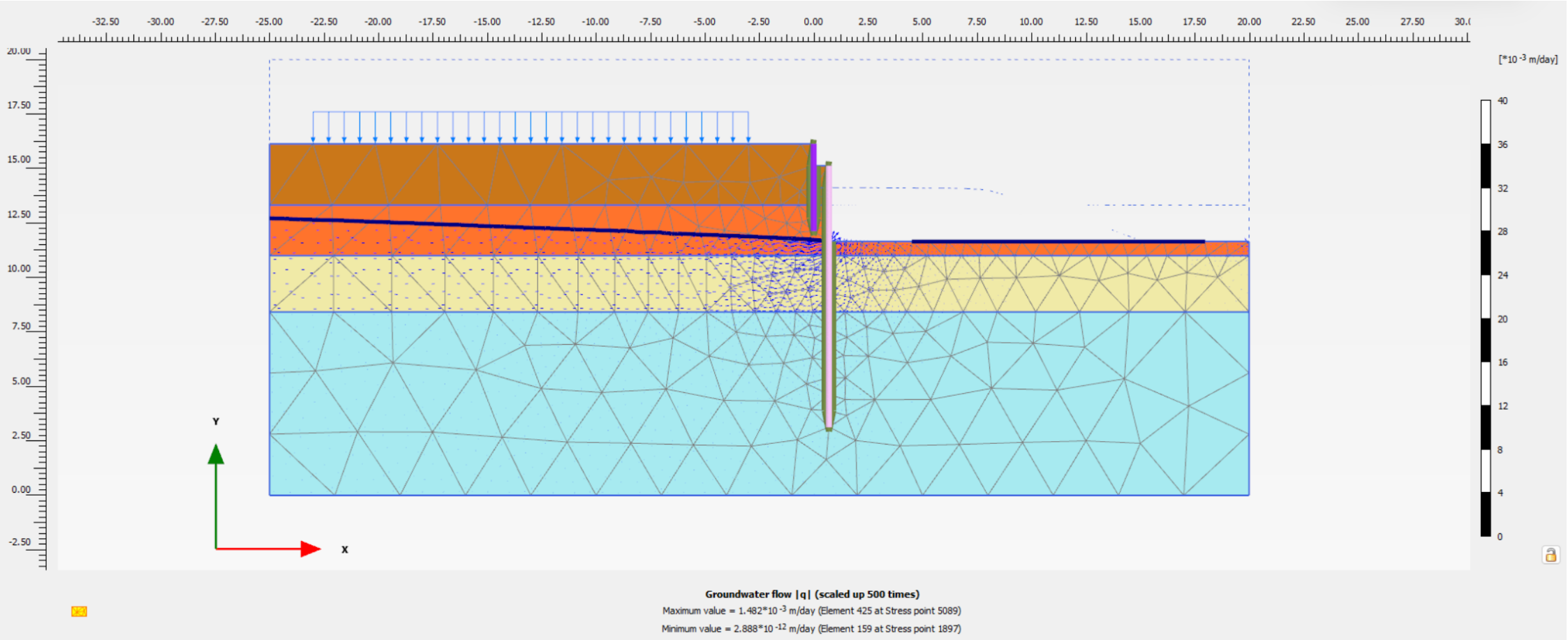
Phase 5.2 Wall Axial Force Diagram



Section 2 Factor of Safety Analysis


Seismic scenario FoS = 3.60 @ 0.4 m
NG scenario FoS = 1.85 @ 0.4 m
WG scenario FoS =1.83 @ 0.4 m
Chart 1
Node 1645 (NG) *
Node 1652 (WG) *
Node 1810 (Seismic) *
ΣMsf []
|u| [m]
3.90
3.60
3.30
3.00
2.70
2.40
2.10
1.80
1.50
1.20
0.00
0.100
0.200
0.300
0.400
0.500
0.600

Groundwater flow map



Groundwater flow |q| (scaled up 500 times)

Maximum value = 1.482*10 $^{-3}$ m/day (Element 425 at Stress point 5089)

Minimum value = 2.888*10 $^{-12}$ m/day (Element 159 at Stress point 1897)

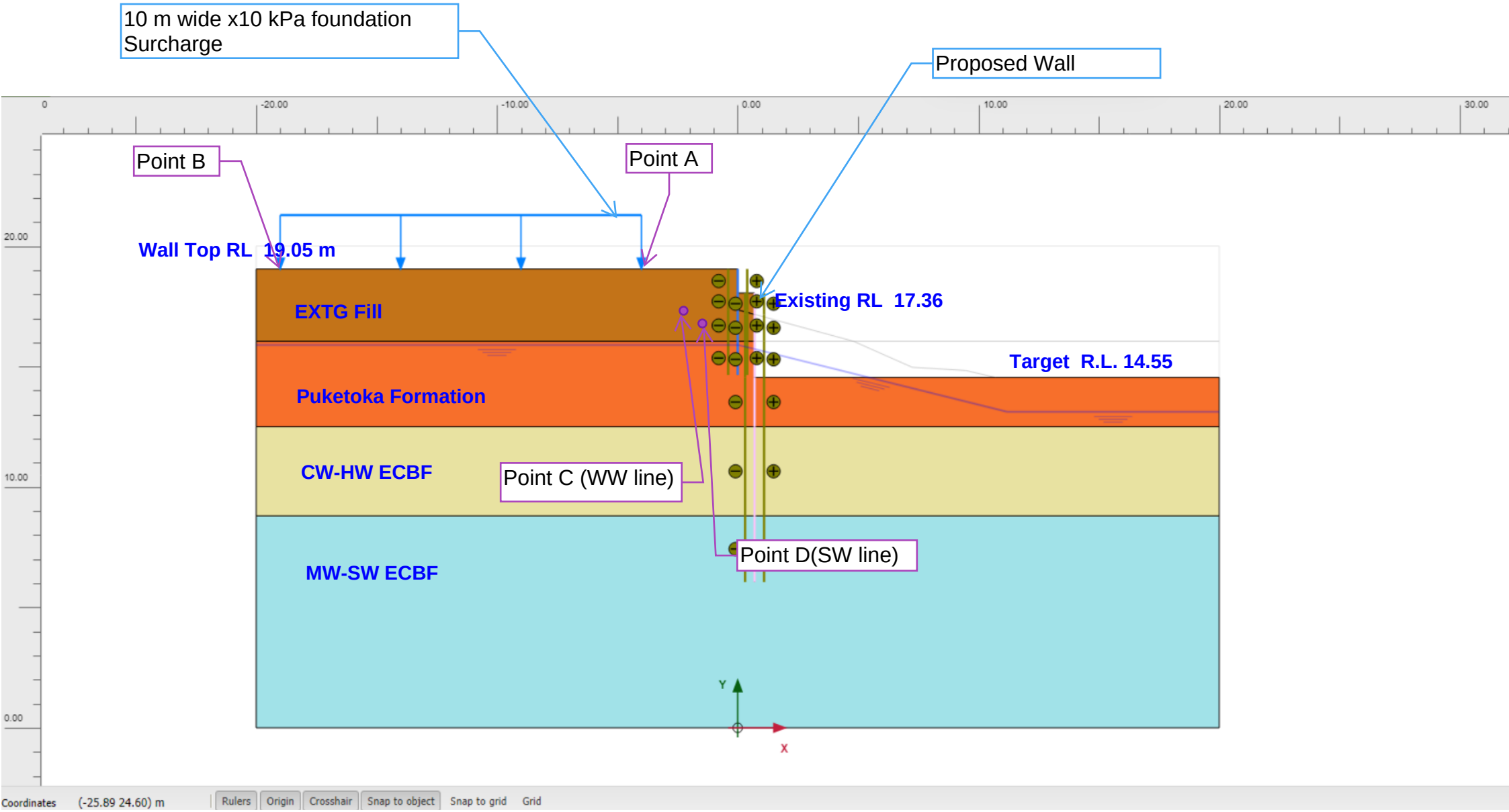
Groundwater discharge rate over excavation length

Section 3
Design Spreadsheets Calculations and Plaxis Analysis Outputs

Section 3 Plaxis Analysis Phases

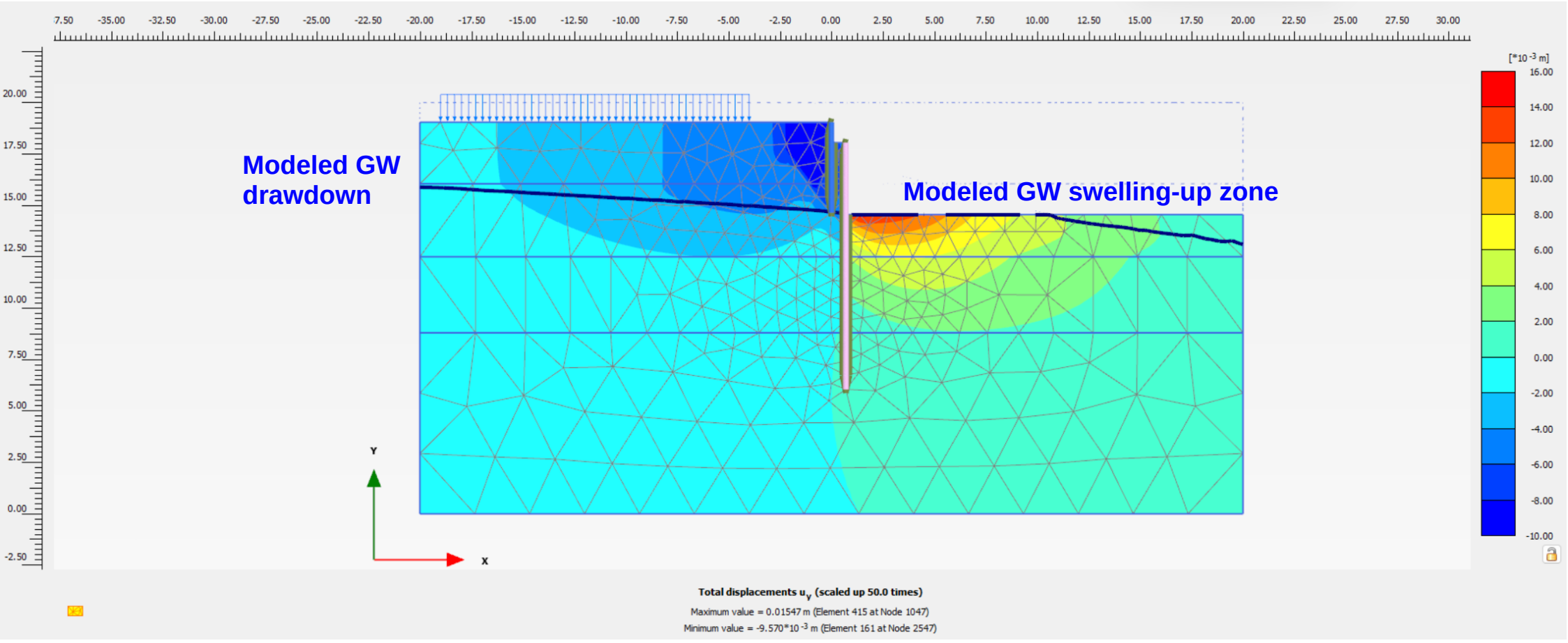
Phase 0: Initial Phase (Initialize the model)
Phase 1: School Development and Western Timber Retaining Wall Installation (Assumed 1V: 1H cantilever to embedement ratio)
Phase 2: Neighboring Property Construction (Imposing Line loads)
Phase 3: Install Proposed Retaining Wall (Previous phase displacement reset)
Phase 4: Backfilling the gaps between two walls
Phase 5: Excavation to target level (550 mm below FGL)
(Steady state groundwater drawdown analysis)
- Phase 5.1: Worst Ground Water Scenario
- Phase 5.2: Seismic Scenario

Section 3 Ground Profile

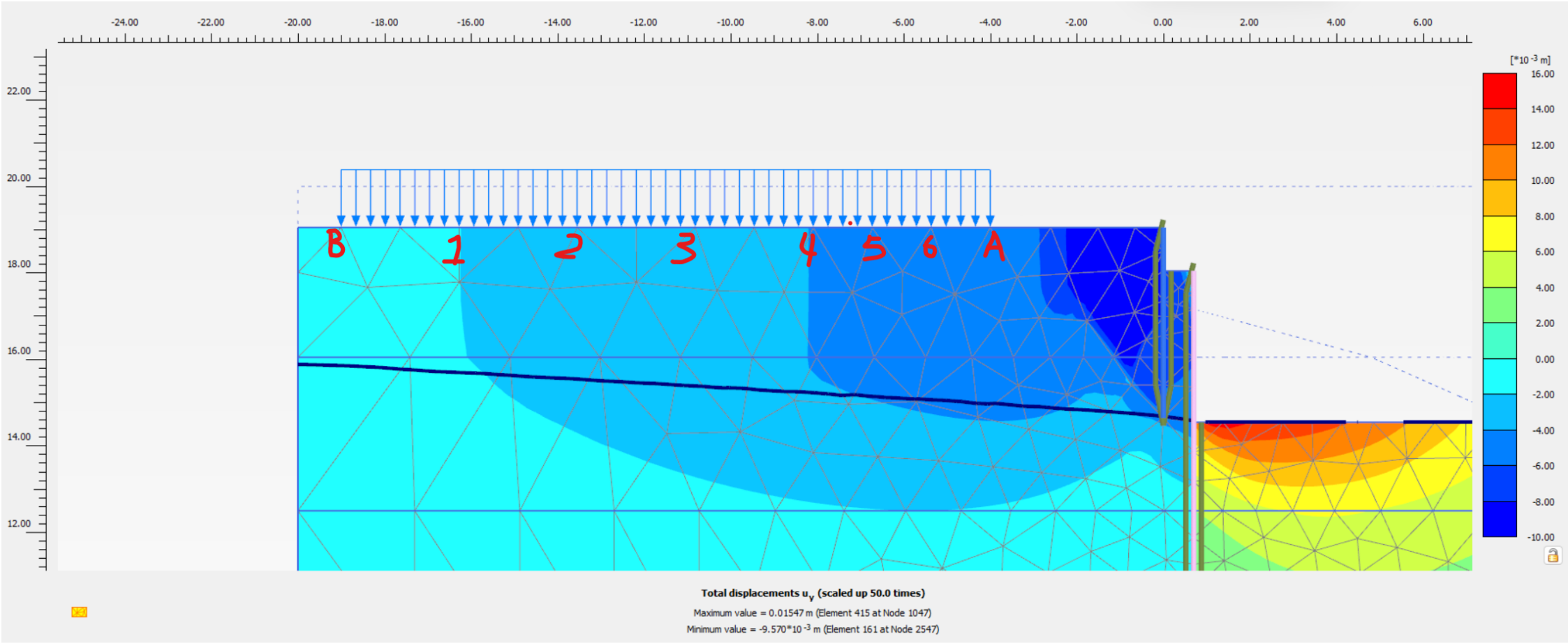

10 m wide x10 kPa foundation Surcharge
Proposed Wall
Point B
Point A
Wall Top RL 19.05 m
EXTG Fill
Existing RL 17.36
Target R.L. 14.55
Puketoka Formation
CW-HW ECBF
Point C (WW line)
Point D(SW line)
MW-SW ECBF
Y
X
0
-20.00
-10.00
0.00
10.00
20.00
30.00
20.00
10.00
0.00
Coordinates
(-25.89 24.60) m
Rulers
Origin
Crosshair
Snap to object
Snap to grid
Grid

Section 3 Analysis Ground Settlement Contours

Phase 5 Settlement Contours



Phase 5 Settlements at different interval points for calculating differential settlement

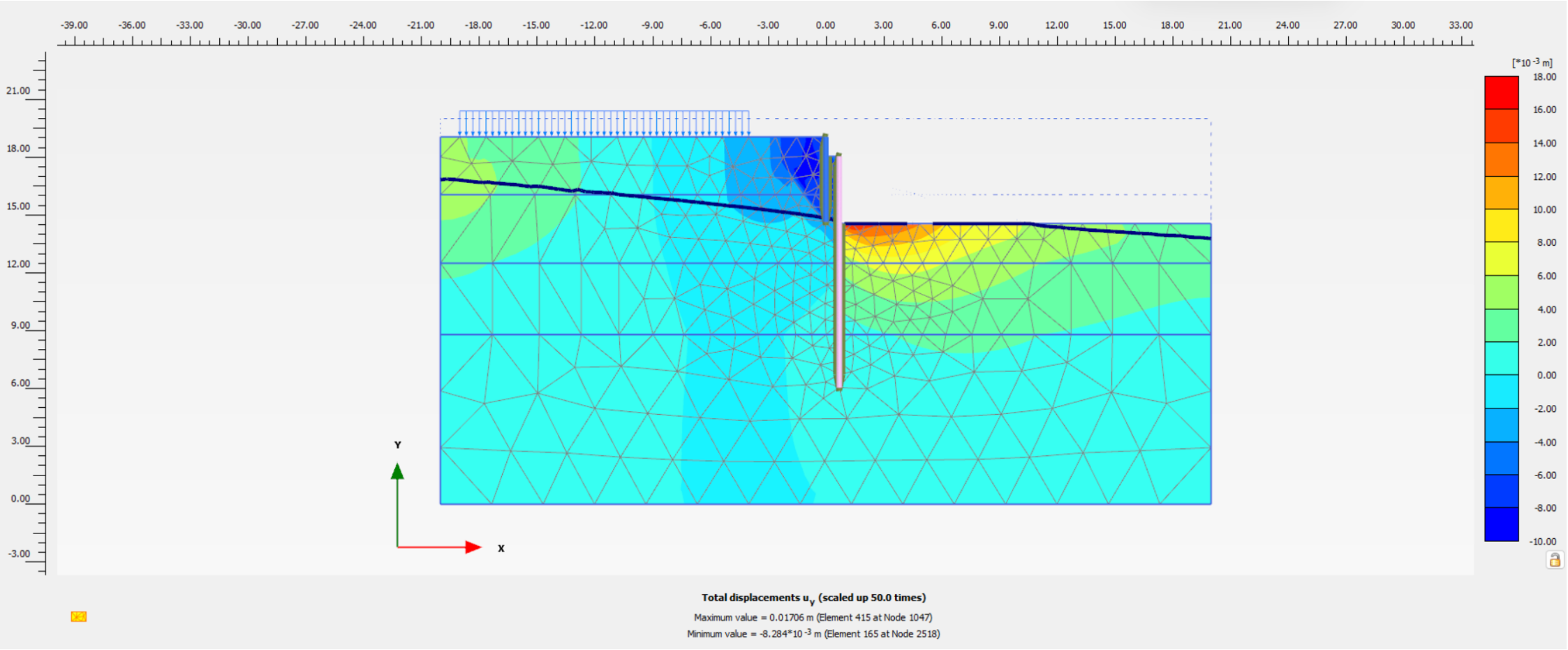


Phase 5 differential Settlements at different interval points calculation details

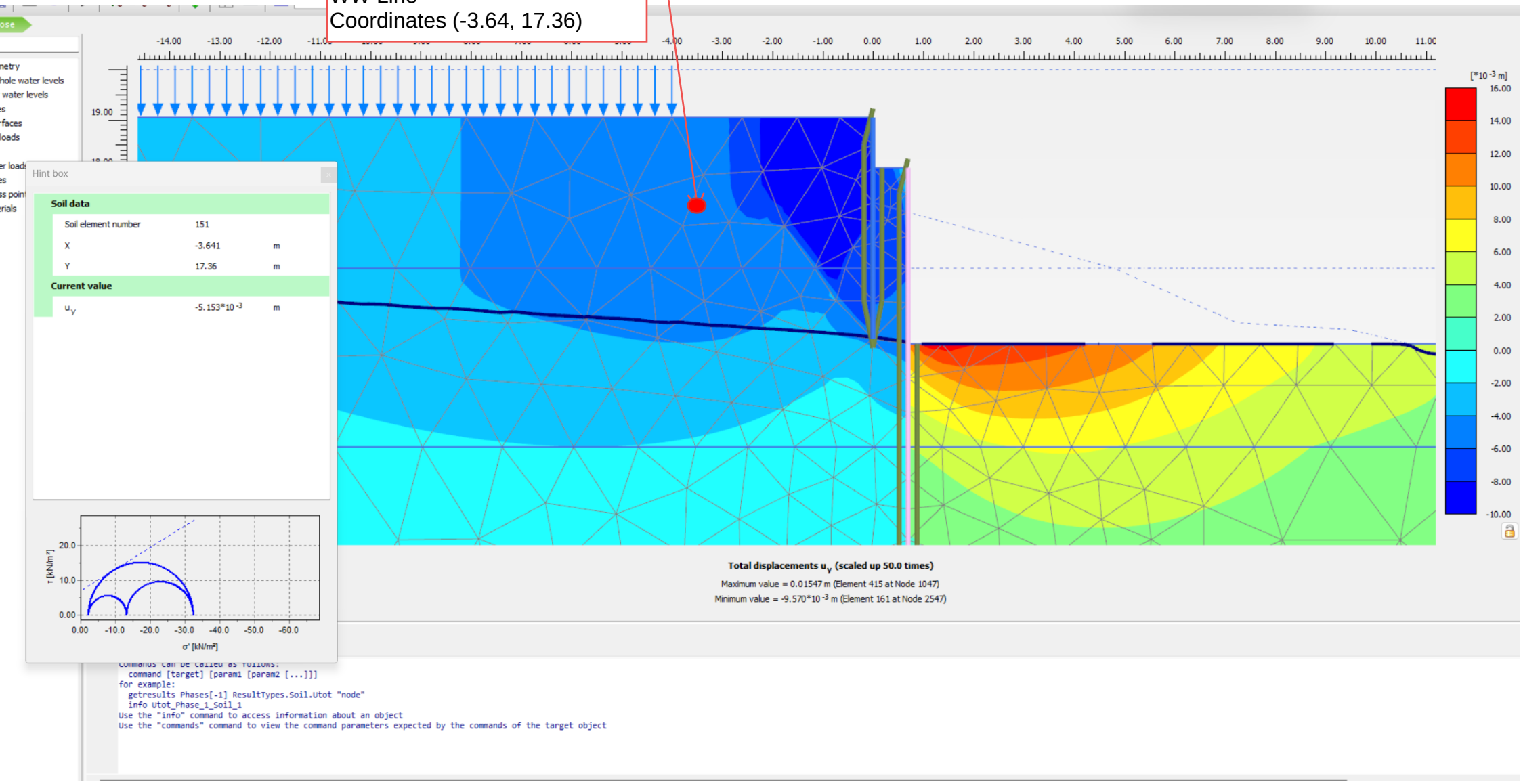
Section 3	Coordinates		Settlement
	x (m)	y (m)	u_y (mm)
B	-19	19.05	-1.481
1	-16.24	19.05	-1.999
2	-13.55	19.05	-2.614
3	-10.8	19.05	-3.34
4	-8.069	19.05	-4.032
5	-6.718	19.05	-4.353
6	-5.367	19.05	-4.696
A	-4	19.05	-5.144

Pair	x difference	uy difference	Settlement change rate (m/m)
B to 1	-2.76	0.518	-5328.185328
B to 2	-5.45	1.133	-4810.238305
B to 3	-8.2	1.859	-4410.973642
B to 4	-10.931	2.551	-4284.98628
B to 5	-12.282	2.872	-4276.462396
B to 6	-13.633	3.215	-4240.435459
B to A	-15	3.663	-4095.004095
1 to 2	-2.69	0.615	-4373.98374
1 to 3	-5.44	1.341	-4056.674124
1 to 4	-8.171	2.033	-4019.183473
1 to 5	-9.522	2.354	-4045.029737
1 to 6	-10.873	2.697	-4031.5165
1 to A	-12.24	3.145	-3891.891892
2 to 3	-2.75	0.726	-3787.878788
2 to 4	-5.481	1.418	-3865.303244
2 to 5	-6.832	1.739	-3928.694652
2 to 6	-8.183	2.082	-3930.355427
2 to A	-9.55	2.53	-3774.703557
3 to 4	-2.731	0.692	-3946.531792
3 to 5	-4.082	1.013	-4029.615005
3 to 6	-5.433	1.356	-4006.637168
3 to A	-6.8	1.804	-3769.40133
4 to 5	-1.351	0.321	-4208.722741
4 to 6	-2.702	0.664	-4069.277108
4 to A	-4.069	1.112	-3659.172662
5 to 6	-1.351	0.343	-3938.77551
5 to A	-2.718	0.791	-3436.156764
6 to A	-1.367	0.448	-3051.339286
		Max Ratio	3051.339286

Phase 5.1 Settlement Contours

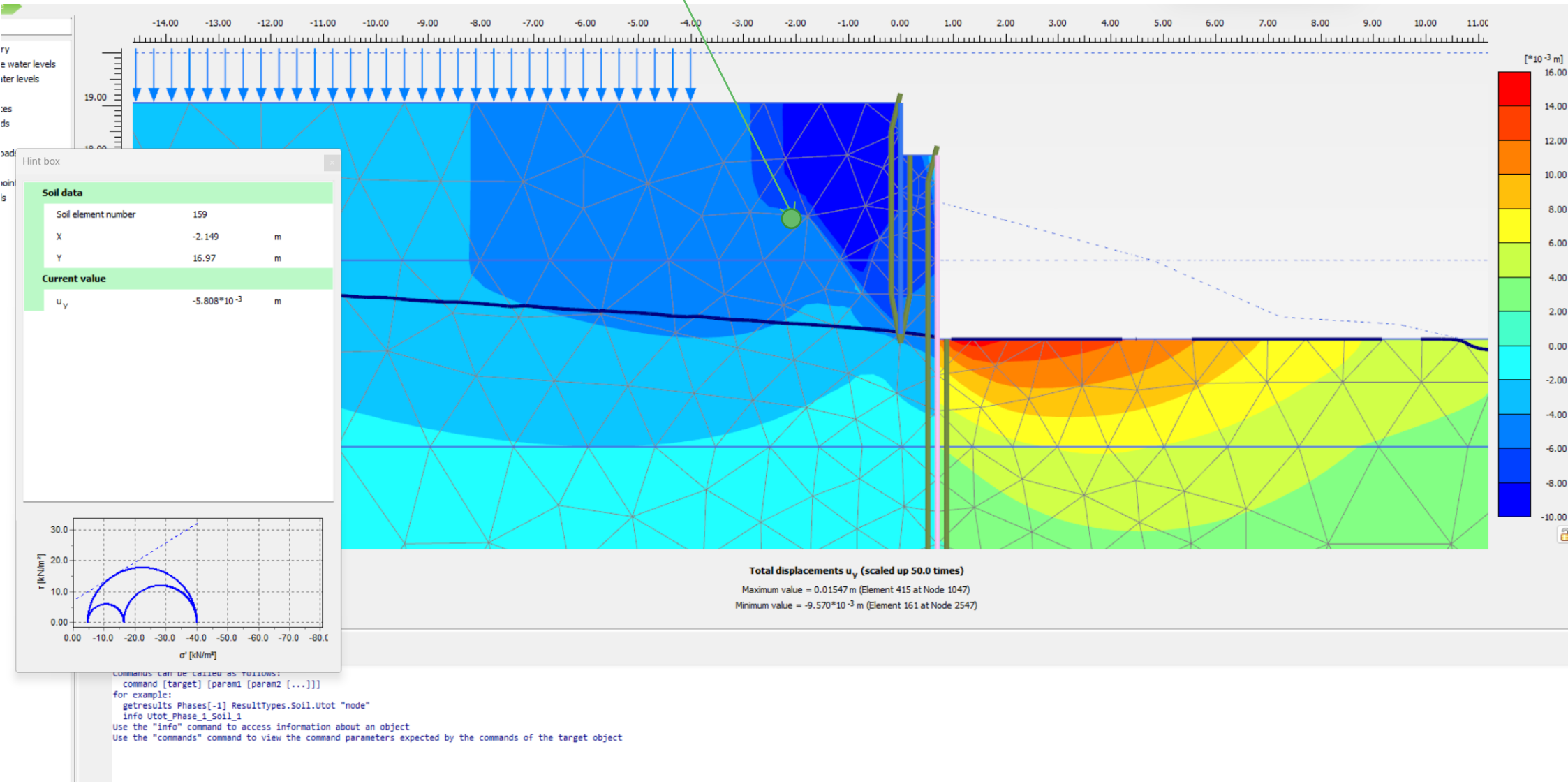


Predicted settlement at Existing WW Line
Coordinates (-3.64, 17.36)




```
  command [target] [param1 [param2 [...]]]
for example:
  getresults Phases[-1] ResultTypes.Soil.Utot "node"
  info Utot_Phase_1_Soil_1
Use the "info" command to access information about an object
Use the "commands" command to view the command parameters expected by the commands of the target object
```

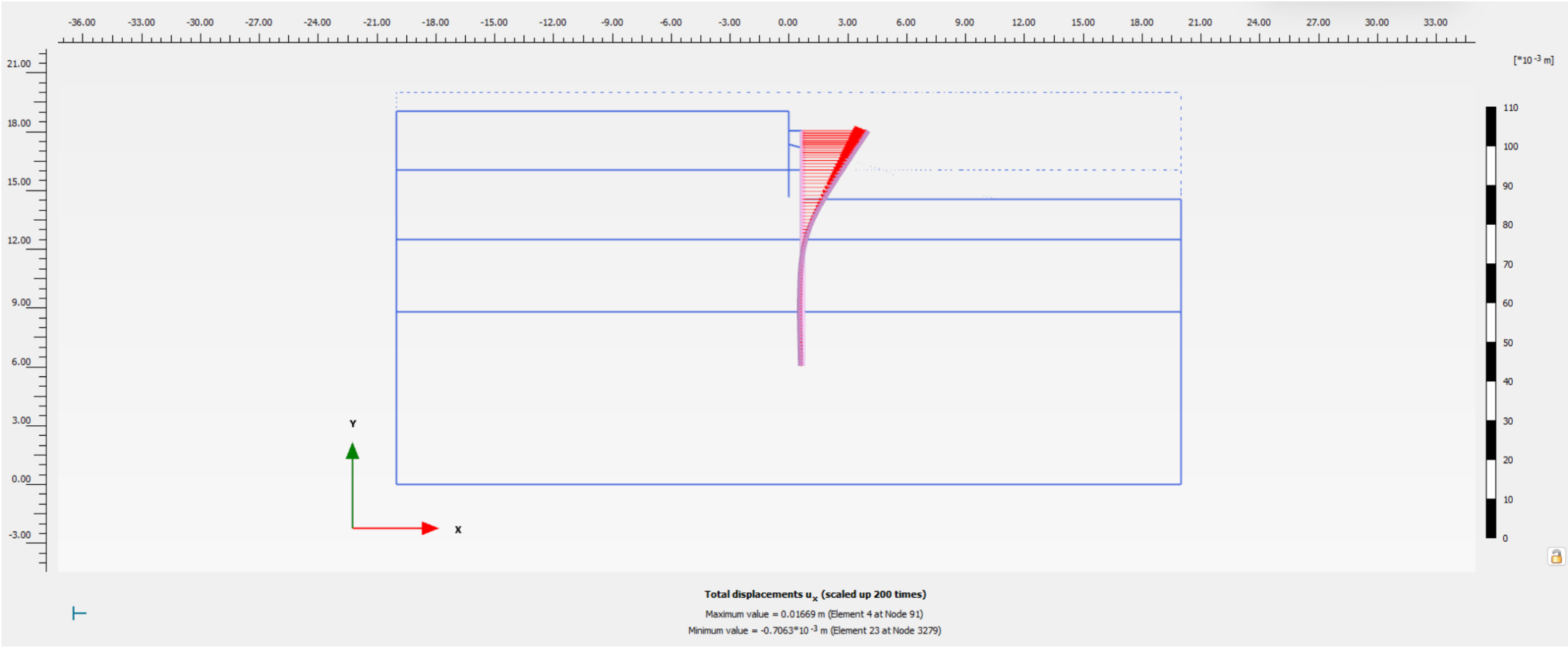
Predicted settlement at Existing SW Line coordinates(-2.13, 17.0)



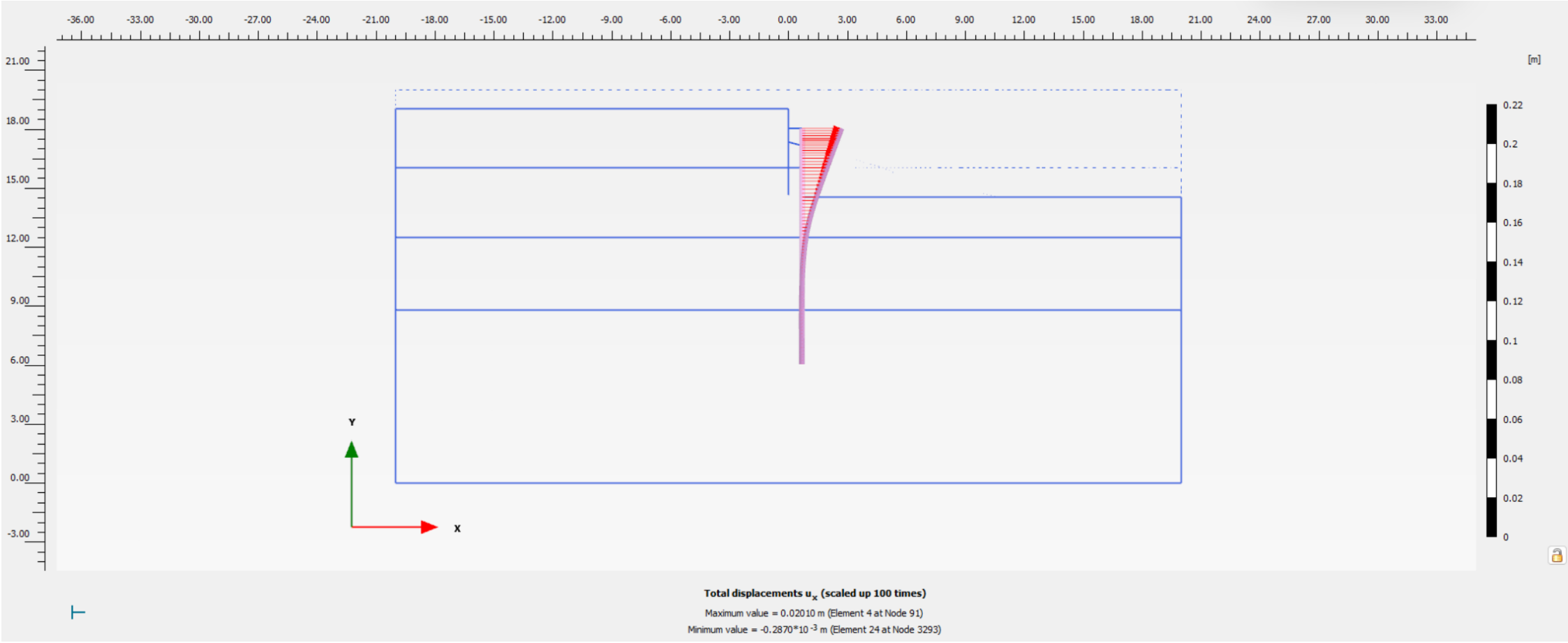

```
Commands can be called as follows:
  command [target] [param1 [param2 [...]]]
for example:
  getresults Phases[-1] ResultTypes.Soil.Utot "node"
  info Utot_Phase_1_Soil_1
Use the "info" command to access information about an object
Use the "commands" command to view the command parameters expected by the commands of the target object
```

Section 3 Analysis Lateral Deflection

Phase 5 Wall Lateral Deflection Profile

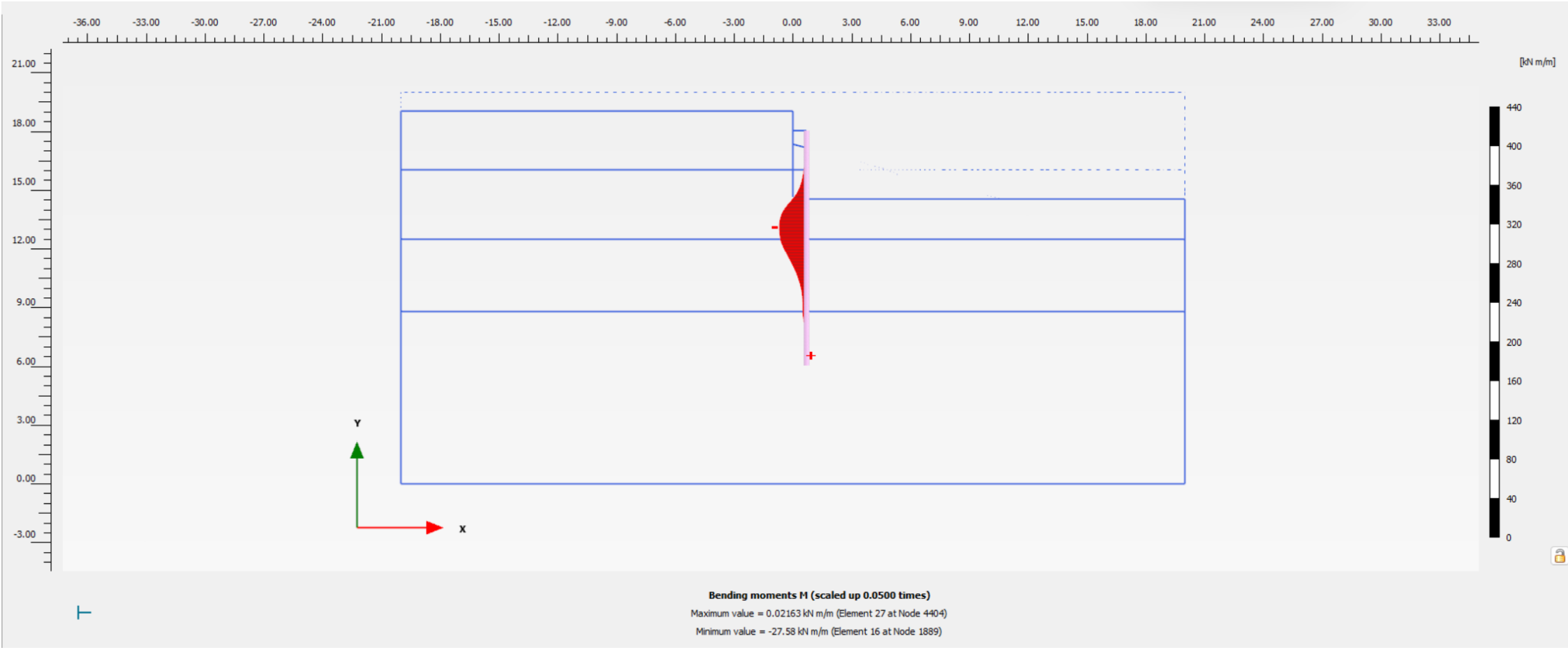


Phase 5.1 Wall Lateral Deflection Profile

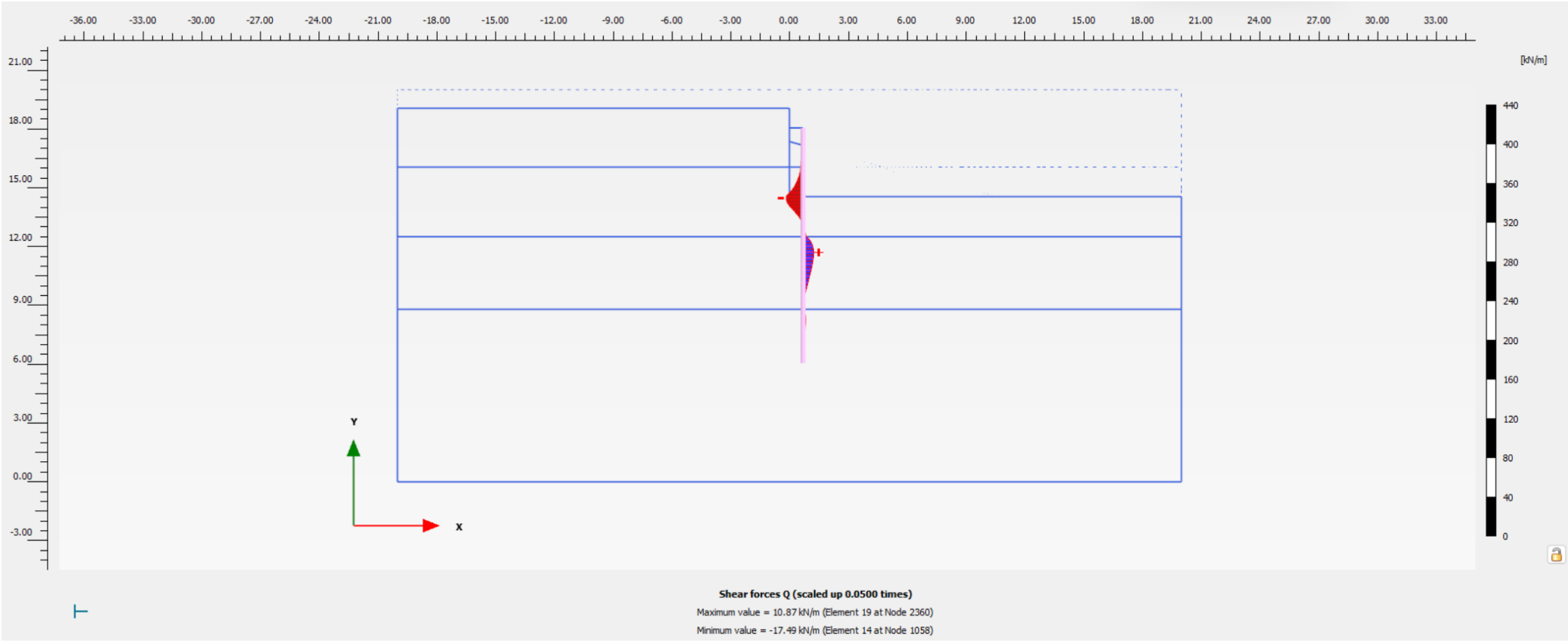


Section 3 Analysis Wall Internal Forces Diagram

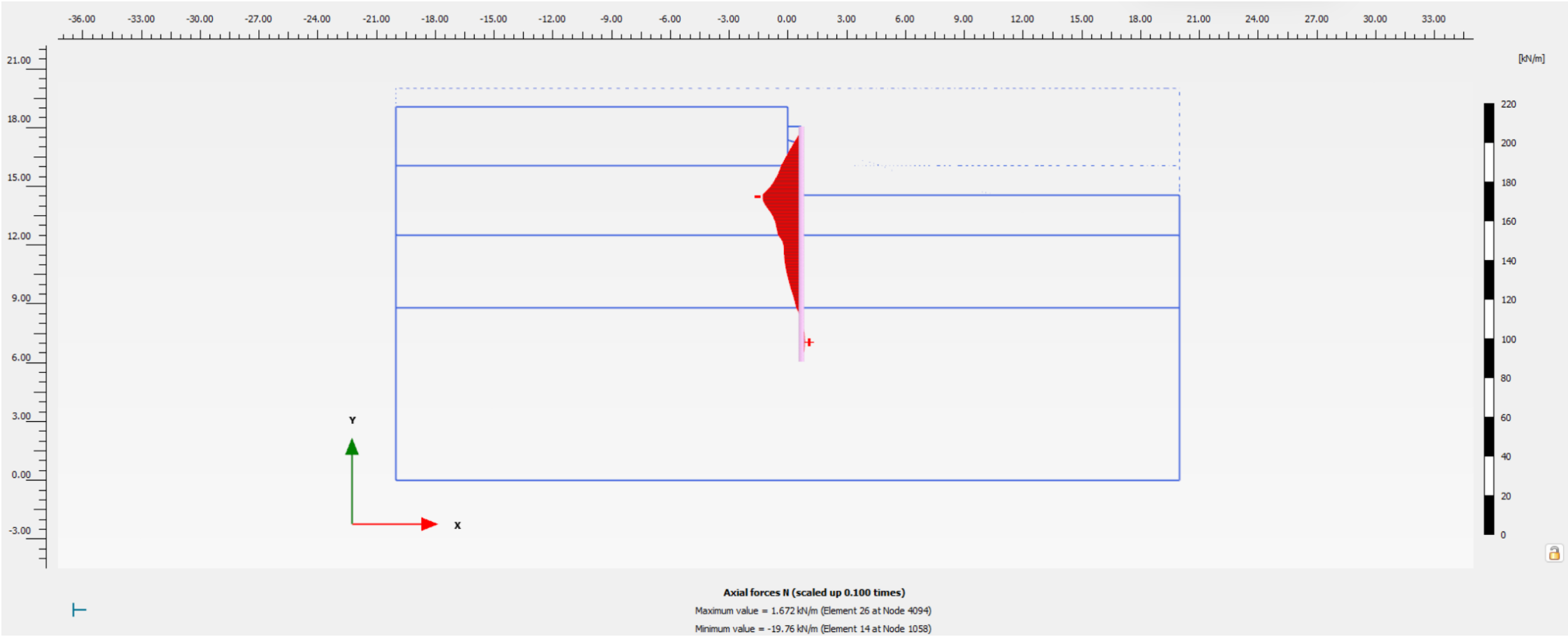
Phase 5 Wall Bending Moment Diagram



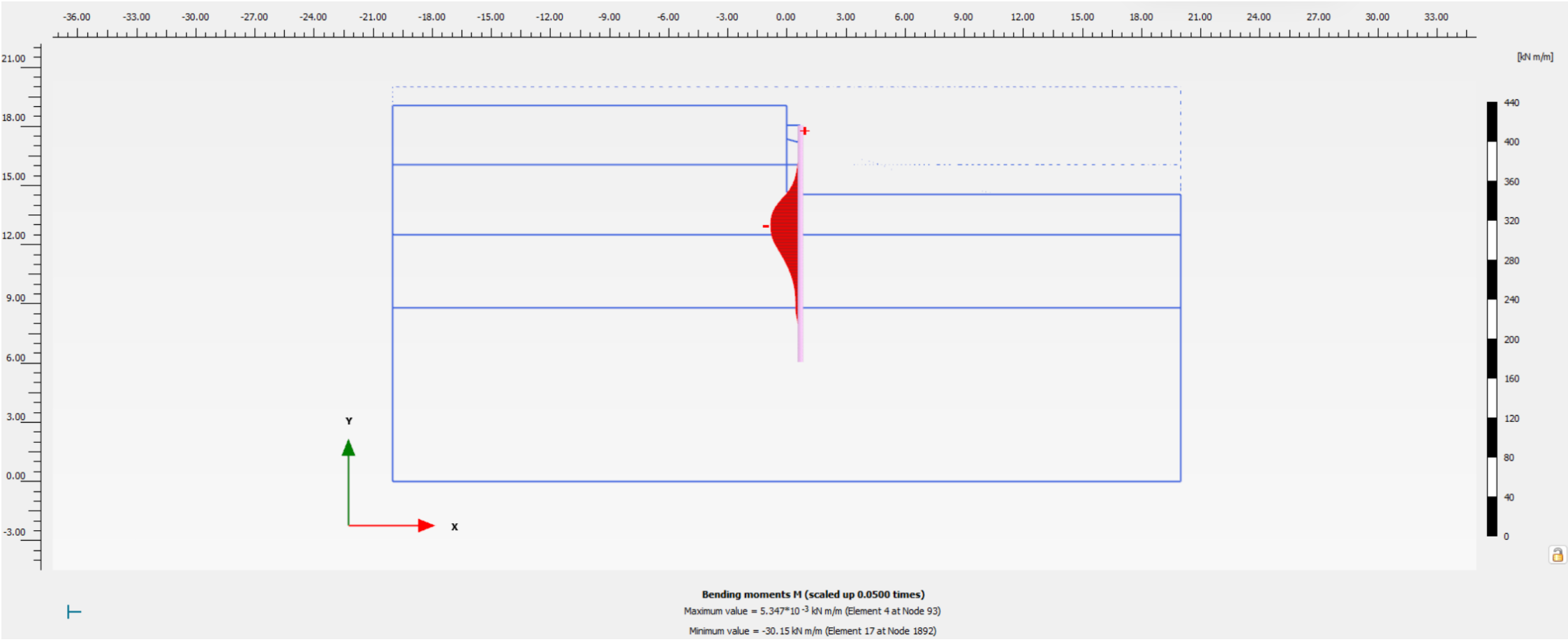
Phase 5 Wall Shear Force Diagram



Phase 5 Wall Axial Force Diagram



Phase 5.1 Wall Bending Moment Diagram

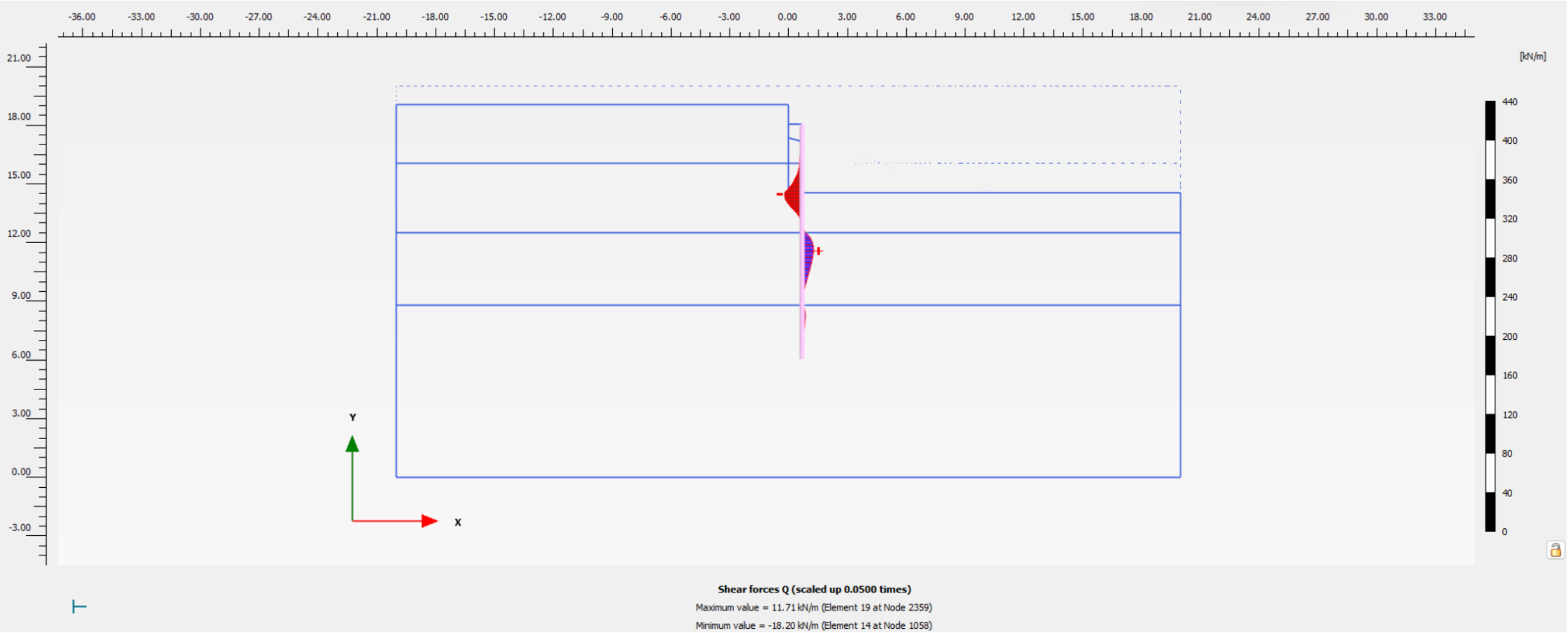


Bending moments M (scaled up 0.0500 times)

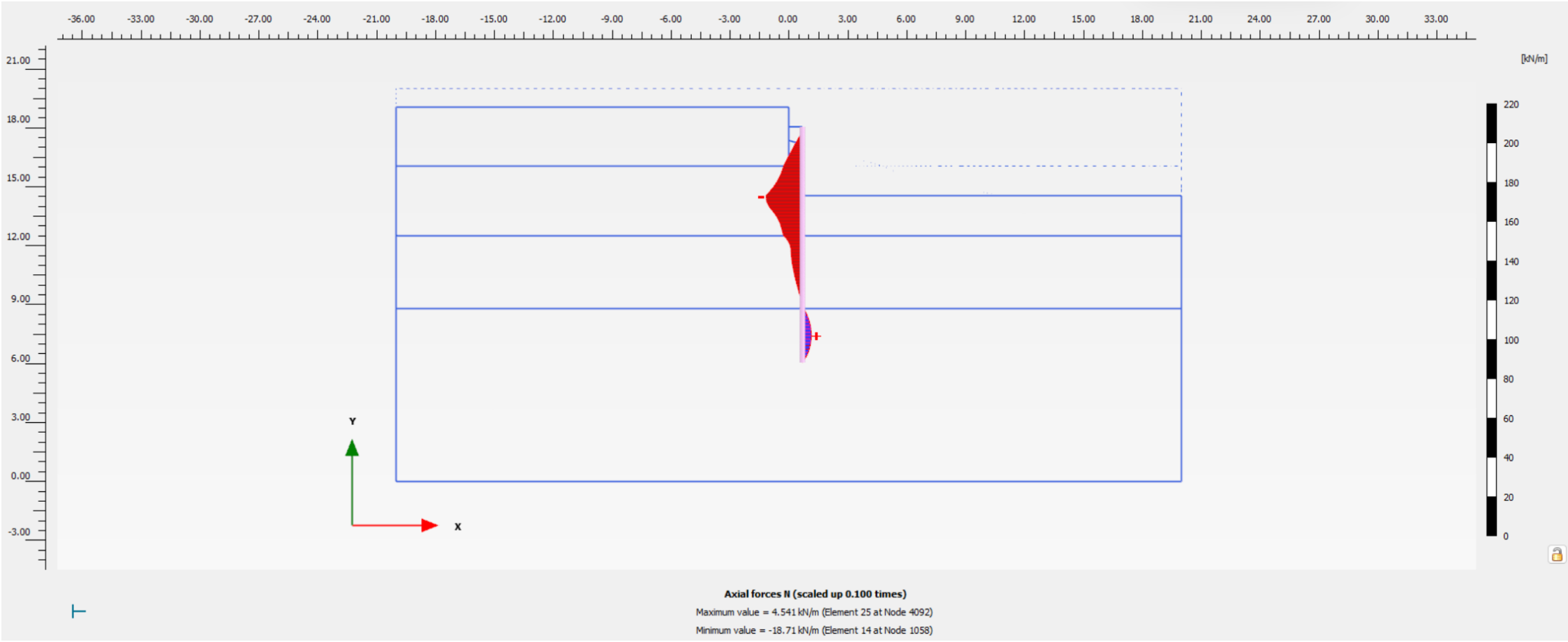
Maximum value = $5.347*10^{-3}$ kN m/m (Element 4 at Node 93)

Minimum value = -30.15 kN m/m (Element 17 at Node 1892)

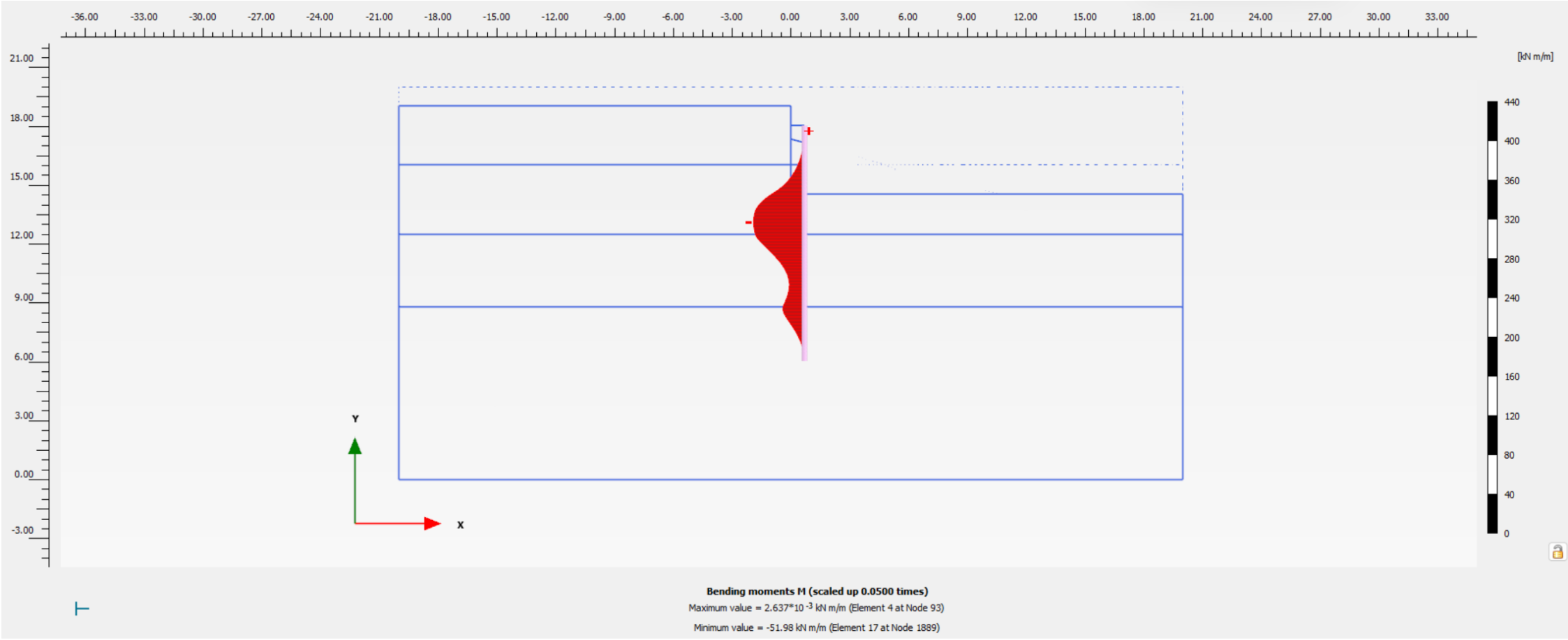
Phase 5.1 Wall Shear Force Diagram



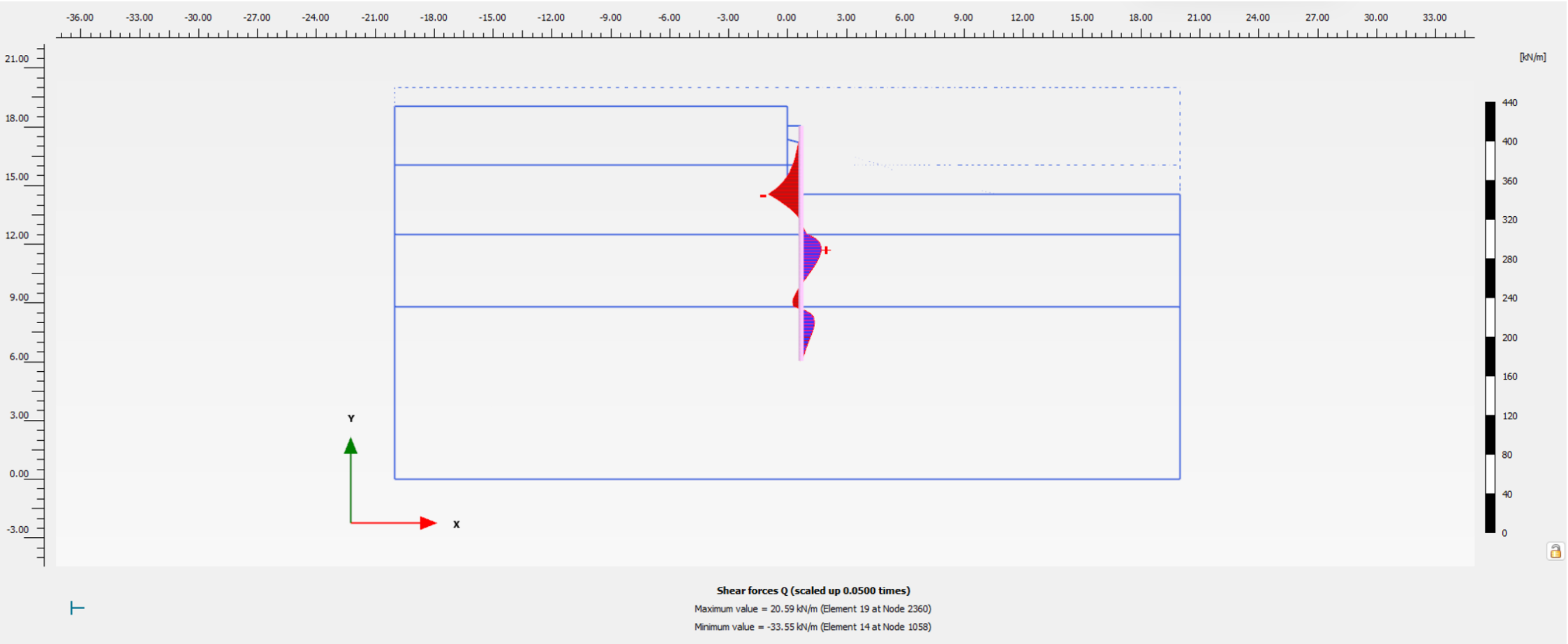
Phase 5.1 Wall Axial Force Diagram



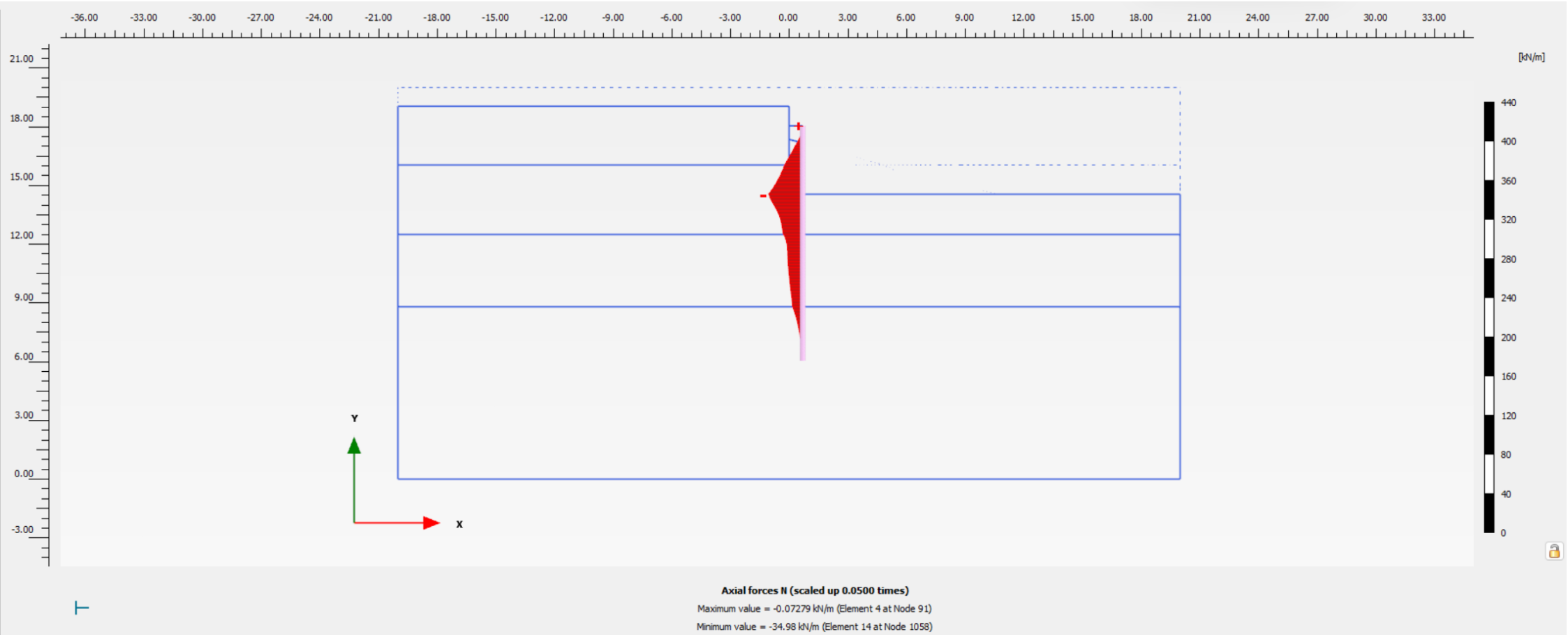
Phase 5.2 Wall Bending Moment Diagram



Phase 5.2 Wall Shear Force Diagram



Phase 5.2 Wall Axial Force Diagram



Section 3 Factor of Safety Analysis

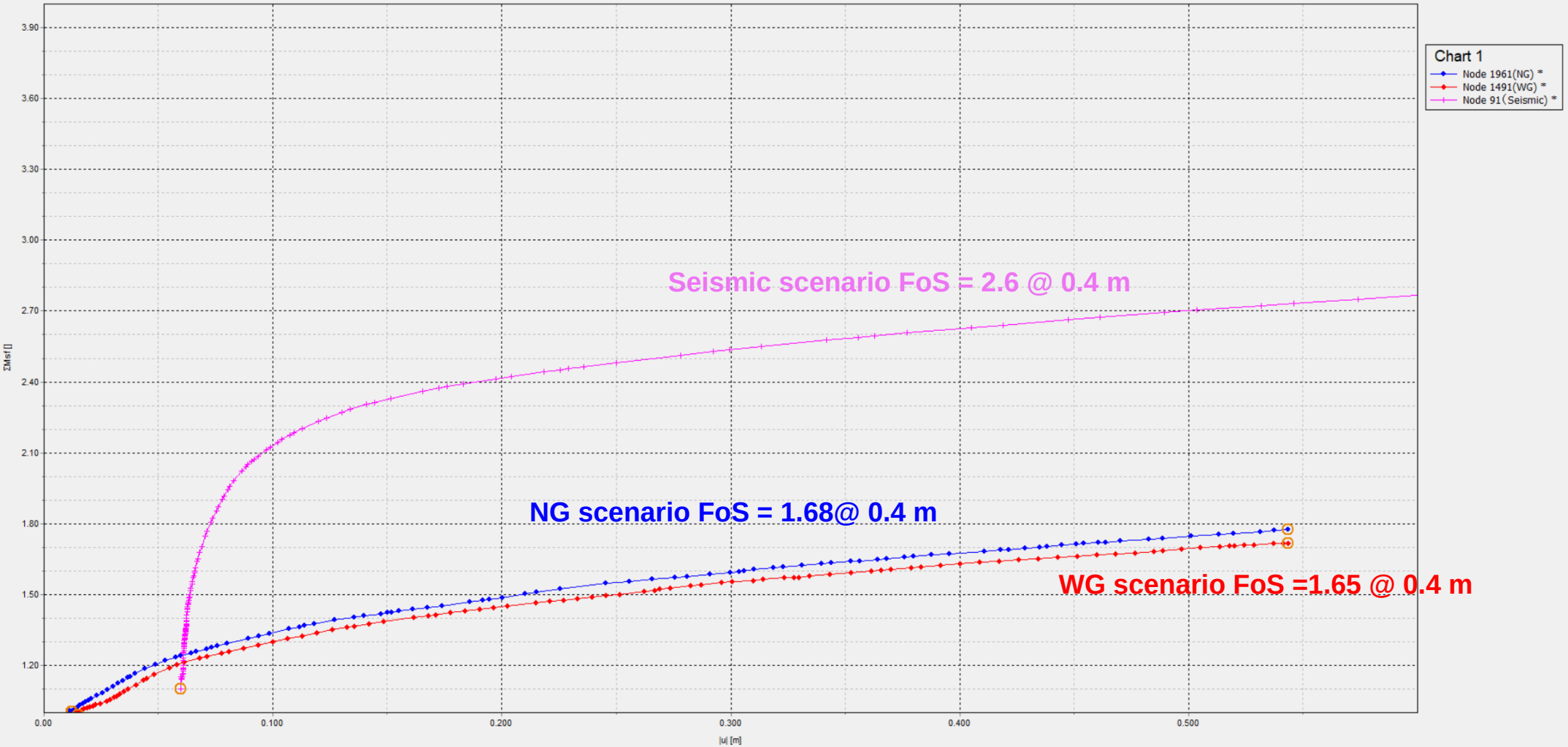
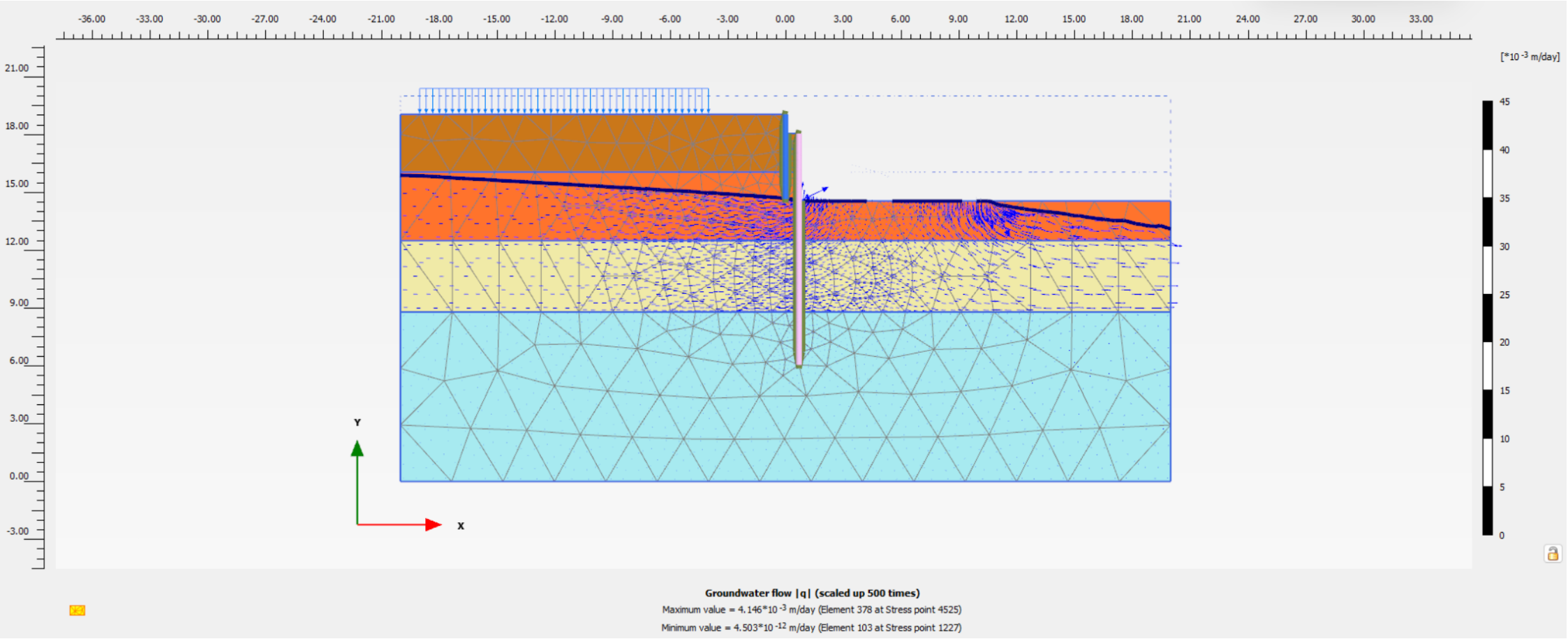
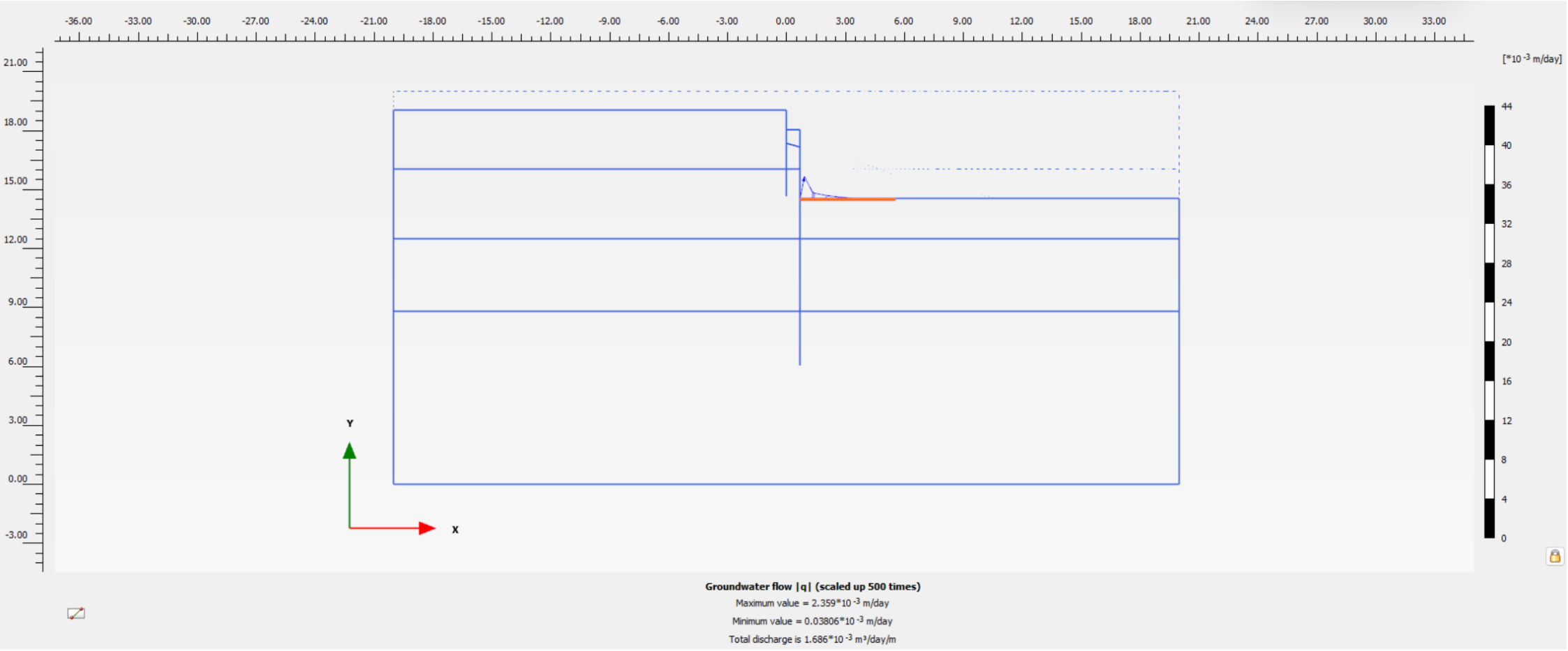


Chart 1
Node 1961(NG) *
Node 1491(WG) *
Node 91(Seismic) *
Seismic scenario FoS = 2.6 @ 0.4 m
NG scenario FoS = 1.68@ 0.4 m
WG scenario FoS =1.65 @ 0.4 m
ΣMsf []
|u| [m]
3.90
3.60
3.30
3.00
2.70
2.40
2.10
1.80
1.50
1.20
0.00
0.100
0.200
0.300
0.400
0.500

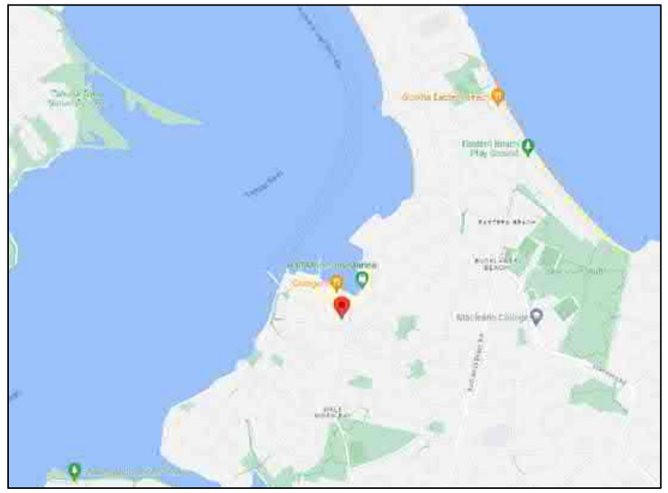
Groundwater flow map



Groundwater discharge rate over excavation length



Appendix D
Preliminary Retaining Wall Design Drawings



LOCALITY PLAN
N.T.S

3 PIGEON MOUNTAIN ROAD HALF MOON BAY AUCKLAND WESTERN BOUNDARY RETAINING WALLS

DRAWING SCHEDULE			
DRAWING NUMBER	DRAWING NAME	SCALE (A3)	ISSUES
001	TITLE SHEET AND DRAWING SCHEDULE	-	3
010	SITE PLAN	1:600	3
100	PILE TYPE DIAGRAM	1:250	3
101	FACE ELEVATION 01	1:250	3
102	FACE ELEVATION 02	1:250	3
201	TYPICAL SECTION DETAILS SECTION 3	1:50	3
300	MONITORING PLAN	1:600	3

TOTAL GROUND ENGINEERING
27C WAIPAREIRA AVENUE
HENDERSON
PH: 027 557 7234
njacka@tge.co.nz

PROJECT
3 PIGEON MOUNTAIN RD
HALF MOON BAY AUCKLAND
DEVELOPMENT

DRAWING TITLE
TITLE SHEET AND
DRAWING SCHEDULE

Date:	APR 2023
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
2	30.09.2023	ISSUED FOR RFI AND RC	BL
1	20.04.2023	ISSUED FOR RC	BL

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SCALE	1:250	J00538	001	3

NOTES:

Locations of features approximate only
Original sheet size A3
Levels refer to provided survey data

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HENDERSON

PH: 027 557 7234
njacka@tge.co.nz

PROJECT
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HALF MOON BAY AUCKLAND
DEVELOPMENT

DRAWING TITLE
SITE PLAN

Date:	APR 2023
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
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1	20.04.2023	ISSUED FOR RC	BL

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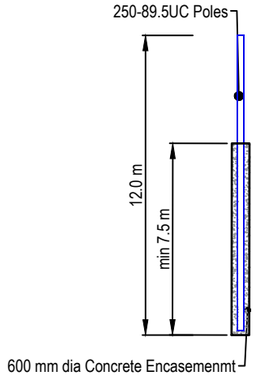
SCALE	1:600	J00538	010	3

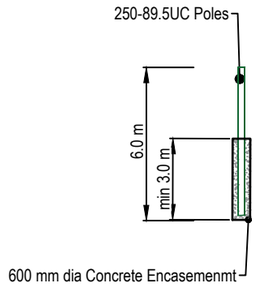
Type B

Typical 3.0 - 4.5 m Retaining Height



Type C

Typical 1.0 - 3.0 m Retaining Height



NOTES:

1, Pile diagrams are indicative only. Refer Sheet 201 and 202 for details.

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PROJECT
3 PIGEON MOUNTAIN RD
HALF MOON BAY AUCKLAND
DEVELOPMENT

DRAWING TITLE
NEW RETAINING WALL
PILE TYPE DIAGRAM

Date:	APR 2023
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
2	30.09.2023	ISSUED FOR RFI AND RC	-
1	20.04.2023	ISSUED FOR RC	BL

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PAPER SIZE	A3	JOB No.	DWG No.	ISSUE
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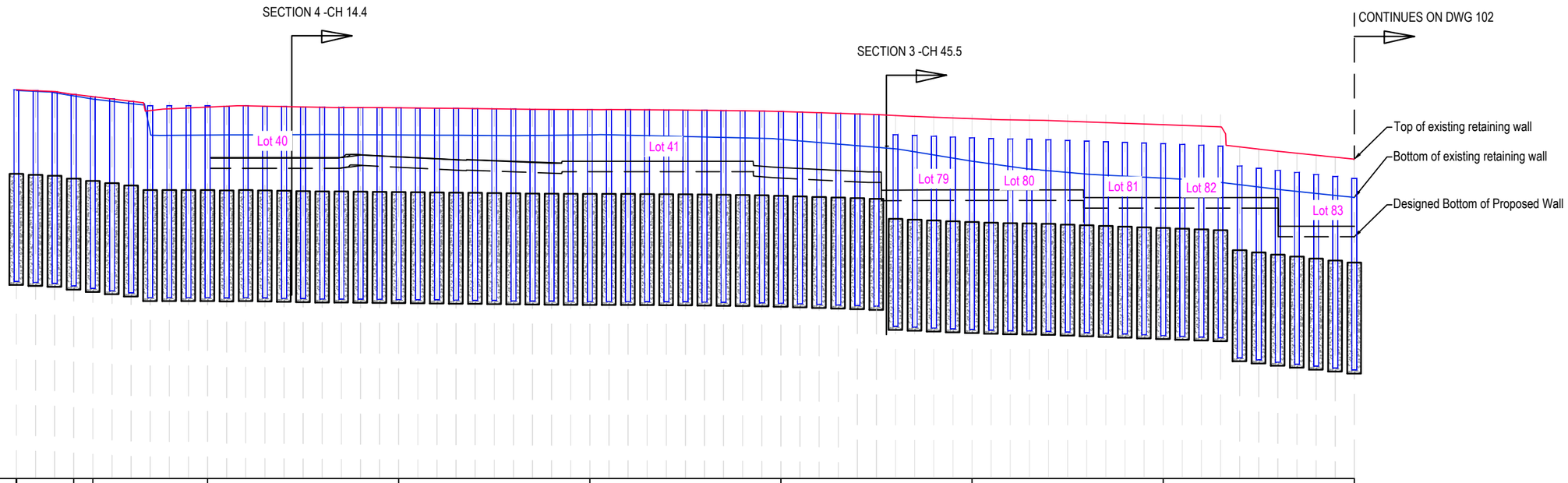

Datum R.L. 0.00

DISTANCE	0.00	TYPICAL 1.0m C/C SPACING 10.00	20.00	30.00	40.00	50.00	60.00	70.00
TOP OF WALL LEVEL	20.34	19.49	19.39	19.29	19.20	17.82	17.51	15.70
TOE OF WALL LEVEL	16.22	16.22	16.28	16.05	15.71	14.55	14.15	12.65
MAX.RETAINED HEIGHT (m) (+550 mm undercut)	3.27	3.27	3.10	3.25	3.48	4.29	4.36	4.06
PILE TYPE	TYPE B PILES							
POLE LENGTH	12.0m							
BASE OF CONCRETE PILE LEVEL	8.34	7.49	7.39	7.29	7.20	5.82	5.51	3.70

NOTES:

1, Pile face elevation to be confirmed in detail design stage with detailed survey information and design levels.

2, Wall alignment to be confirmed in detail design stage.
3, Design top of wall levels from Lot 79 to 86 are 1.0 m lower than the existing timber retaining wall per architecture design.

TOTAL GROUND ENGINEERING
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HENDERSON
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njacka@tge.co.nz

PROJECT
3 PIGEON MOUNTAIN RD
HALF MOON BAY AUCKLAND
DEVELOPMENT

DRAWING TITLE
NEW RETAINING WALL
FACE ELEVATION 1

Date:	APR 2023
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
2	29.09.2023	ISSUED FOR RFI AND RC	BL
1	20.04.2023	ISSUED FOR RC	BL

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PAPER SIZE	A3	JOB No.	DWG No.	ISSUE
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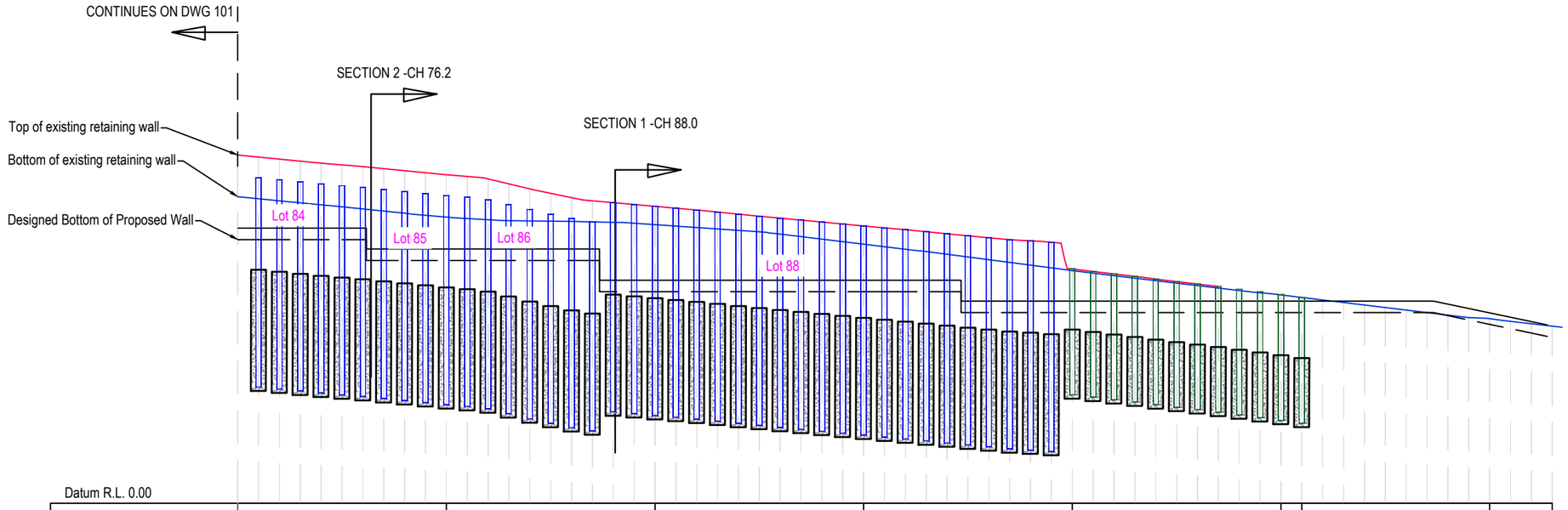

Datum R.L. 0.00

DISTANCE	70.00	80.00	90.00	100.00	110.00	120.00	121.00	130.00	133.00
TOP OF WALL LEVEL	15.70	14.76	14.24	13.30	11.24	9.99	9.87	/	/
TOE OF WALL LEVEL	12.65	11.64	10.14	10.14	9.14	9.14	9.14	/	/
MAX.RETAINED HEIGHT (m) (+550 mm undercut)	4.06	4.11	4.09	3.15	2.09	0.85	0.73	/	/
PILE TYPE	TYPE B PILES					TYPE C PILES			
POLE LENGTH	12.0m					6.0m			
BASE OF CONCRETE PILE LEVEL	3.70	2.76	2.24	1.30	5.24	3.99	3.87	/	/

FACE ELEVATION-2

NOTES:

1, Pile face elevations to be confirmed in detail design stage with detailed survey information and design levels.

2, Wall alignment to be confirmed in detail design stage.
3, Design top of wall levels from Lot 79 - 86 are 1.0 m lower than the existing timber retaining wall per architecture design.

TOTAL GROUND ENGINEERING
27C WAIPAREIRA AVENUE
HENDERSON
PH: 027 557 7234
njacka@tge.co.nz

PROJECT
3 PIGEON MOUNTAIN RD
HALF MOON BAY AUCKLAND
DEVELOPMENT

DRAWING TITLE
NEW RETAINING WALL
FACE ELEVATION 2

Date:	APR 2023
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
2	30.09.2023	ISSUED FOR RFI AND RC	BL
1	20.04.2023	ISSUED FOR RC	BL

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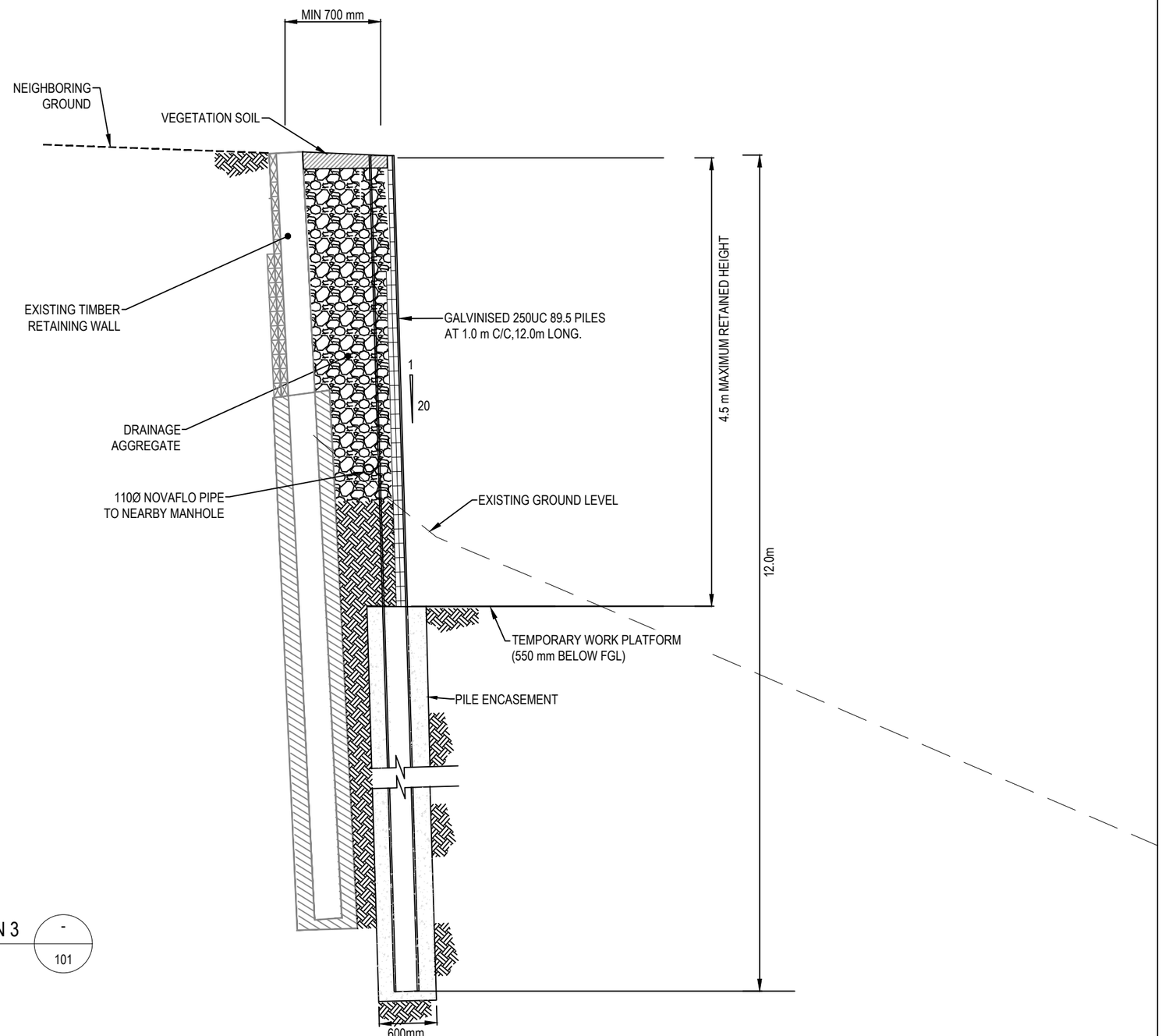
PAPER SIZE	A3	JOB No.	DWG No.	ISSUE
SCALE	1:250	J00538	102	3

1. MATERIAL PROPERTIES

CONCRETE:	CHARACTERISTIC COMPRESSIVE STRENGTH F'C = 30 MPa UNLESS OTHERWISE NOTED.
STEEL UC'S:	GRADE 300 MINIMUM.
TIMBER RAILINGS:	H4 TREATED RADIATA PINE
RAILING FIXINGS:	GALVANISED NAILS
DRAIN COIL:	110mm DIAMETER
GEOFABRIC:	BIDIM A19
DRAINAGE AGGREGATE:	SINGLE/DUAL GRADED (IE. DRAINAGE 40, DRAINAGE 20/40, SGC 25/7) ENCAPSULATED IN BIDIM A19 (OR SIMILAR) FILTER CLOTH OR, SELF FILTERING AGGREGATE (IE. SAP50 EX TAUPO/KAMO)
GALVANISING:	TO AS/NZS4680 GRADE HDG 900

2. MINIMUM CONCRETE COVER TO STEEL POLES IS 75mm WITH A MINIMUM COVER OF 100mm AT THE PILE BASE. THIS WILL REQUIRE EITHER A PACKER OR POURING OF A PUNCH PAD TO ACHIEVE DESIGN.
3. ENDS OF CUT RAILS SHALL BE FLOODED WITH A COPPER NAPTHENATE TYPE WOOD PRESERVATIVE.
4. THE MAXIMUM RETAINING HEIGHT AND SURCHAGE SLOPE SHALL BE AS SPECIFIED ON THE DESIGN AND SHALL NOT BE EXCEEDED UNLESS APPROVED BY THE DESIGN ENGINEER.
5. THE EXTENT OF EXCAVATION REQUIRED SHALL BE MARKED OUT ON THE GROUND HAVING REGARD TO THE POSITIONS OF POLES, WORKING SPACE FOR CONSTRUCTION, BACKFILL AND DRAINAGE PROVISIONS.
6. A PERFORATED SUBSOIL DRAIN WITH FILTER SOCK SHALL BE LAID AND SURROUNDED IN APPROVED DRAINAGE-GRADED AGGREGATE OR SCORIA WITH INVERT BELOW TOE GROUND LEVELS CONNECTED TO A FREE OUTLET AT A POINT OF SAFE DISCHARGE OR CONNECTED TO STORMWATER SYSTEM.
7. THE CONTRACTOR SHALL REFER TO THE DESIGN ENGINEER AS SOON AS POSSIBLE FOR FURTHER INSTRUCTION SHOULD ANY UNFORESEEN CIRCUMSTANCE OR ABNORMAL SITE CONDITION BE ENCOUNTERED DURING CONSTRUCTION.
8. HORIZONTAL ALIGNMENT OF POLES SHALL VARY BY NO MORE THAN 25mm WHEN PLACING A STRAIGHT-EDGE ACROSS THE FRONT FACE OF THREE CONSECUTIVE POLES.
9. W-BEAM GUARD RAIL TO MEET 'BARRIER PERFORMANCE LEVEL 3' STANDARD CRITERIA AS PER NZTA BRIDGE MANUAL, APPENDIX B.



TYPICAL SECTION 3 - 101
SCALE 1:50

TOTAL GROUND ENGINEERING

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HENDERSON

PH: 027 557 7234
njacka@tge.co.nz

PROJECT
3 PIGEON MOUNTAIN RD
HALF MOON BAY AUCKLAND
DEVELOPMENT

DRAWING TITLE
EXISTING RETAINING WALL
TYPICAL SECTION 3

Date:	APR 2023
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
2	30.09.2023	ISSUED FOR RFI AND RC	-
1	20.04.2023	ISSUED FOR RC	BL

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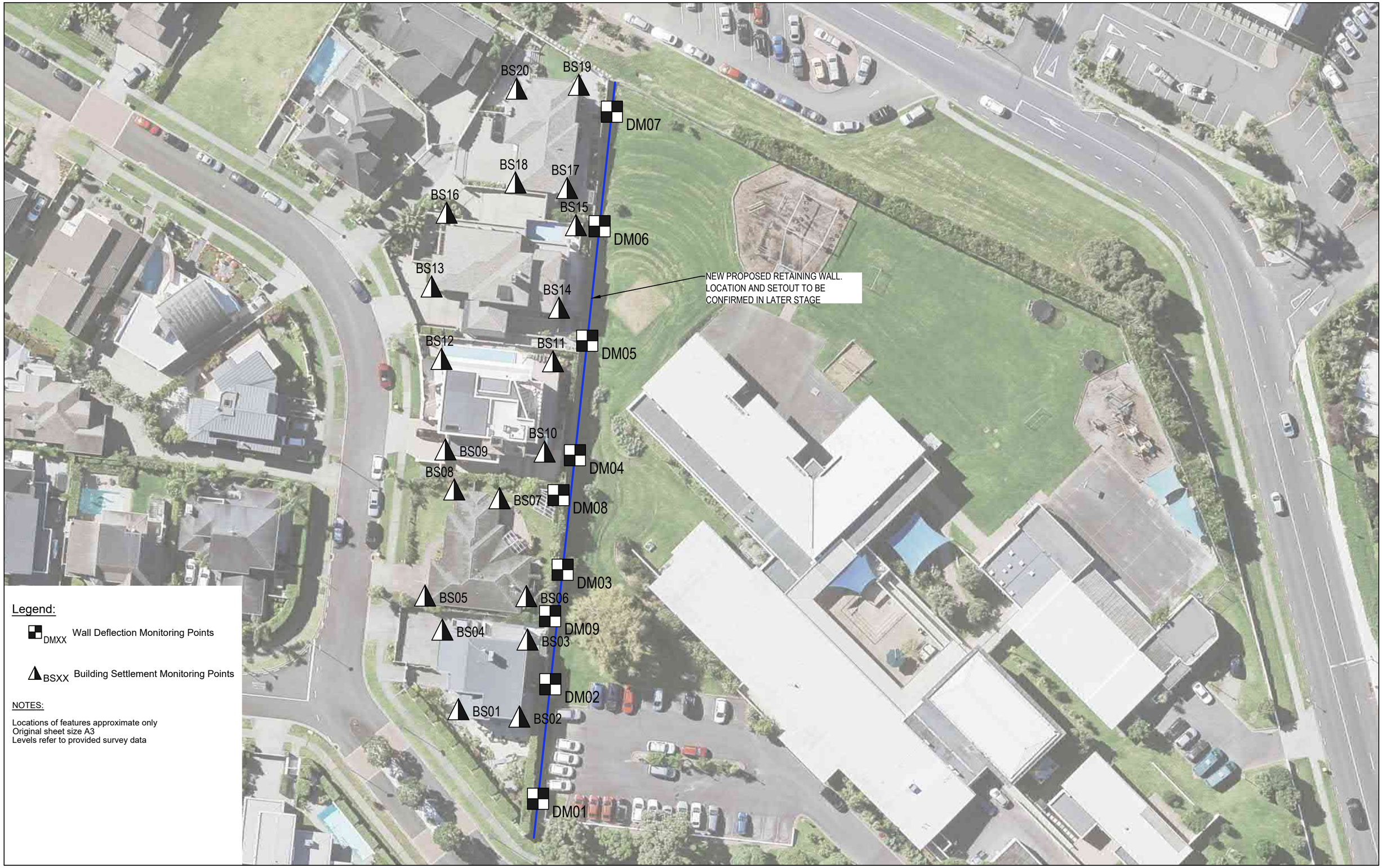

Legend:

DMXX Wall Deflection Monitoring Points

BSXX Building Settlement Monitoring Points

NOTES:

Locations of features approximate only
Original sheet size A3
Levels refer to provided survey data

TOTAL GROUND ENGINEERING

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HENDERSON

PH: 027 557 7234
njacka@tge.co.nz

PROJECT
3 PIGEON MOUNTAIN RD
HALF MOON BAY AUCKLAND
DEVELOPMENT

DRAWING TITLE
MONITORING PLAN

Date:	APR 2023
Cad Ref:	J00538 r2.dwg
Designed	BL
Drawn	BL
Checked	NJ

Issue	Date	Issue Description	By
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
3	24.11.2023	ISSUED FOR RFI AND RC	BL
2	30.09.2023	ISSUED FOR RFI AND RC	BL
1	20.04.2023	ISSUED FOR RC	BL

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PAPER SIZE	A3	JOB No.	DWG No.	ISSUE
SCALE	1:600	J00538	300	3