



3 Pigeon Mountain Rd, Half Moon Bay  
Western Boundary Wall  
Preliminary Design and Groundwater  
Drawdown Assessment Report

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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 62 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 is the eight revision of the preliminary design report updated in accordance with the updated architectural plan and civil work plan (updated in February to April 2026) 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 updated and 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 62 terrace houses. A site plan of the proposed development is shown in Figure 1.



Figure 1, Development Plan by Shape Architect updated on 7<sup>th</sup> April 2026.

We have referred to the following updated documents for design:

- 3 Pigeon Mountain Road - Architecture Design by Shape Architects Ltd, project reference 207, dated 7 April 2026.
- 3 Pigeon Mountain Road – Civil Engineering Plans by Eighty6, dated February 2026. The cut earthworks for the building platforms of Lot 59 – 63 along the western boundary retaining wall are changed into two levels (Upper and Lower Platforms).
- 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.
- Topographic surveys 1-9 Pigeon Mountain Road, project reference 34948, Aerial Site Plan revision A by Envivo, dated 12 December 2025.

During the initial resource consent review process, we 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 latest proposed excavation plan indicates a relatively shallow but permanent groundwater drawdown along the western boundary wall.

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

This report now includes the latest updated retaining wall analysis with preliminary design and updated groundwater drawdown assessment for supporting the resource consent and water permit application based on the revised development proposal.

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 10<sup>th</sup> 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 volcanoclastic 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.

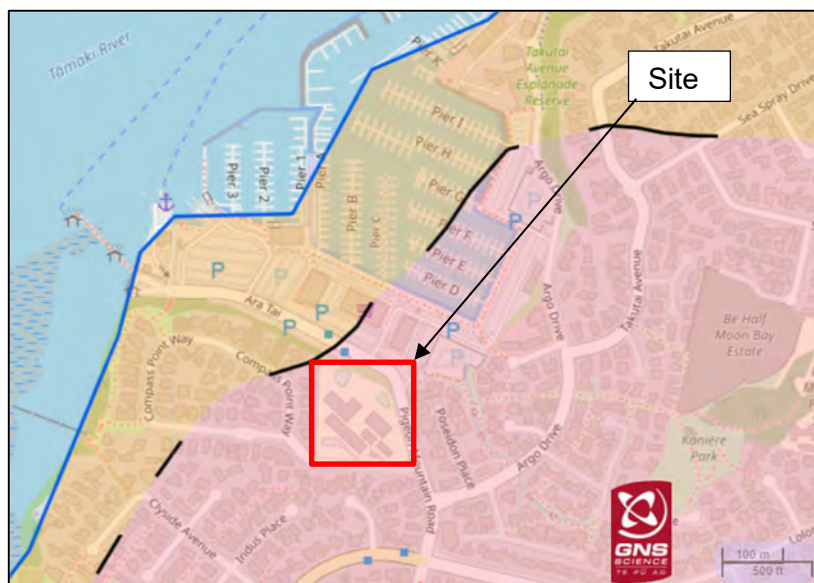


Figure 2. Site Geology Map

## 2.2 Existing Geotechnical Investigations.

The geotechnical findings by TGE's first investigation on 15<sup>th</sup>-16<sup>th</sup> 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. Ground Water Monitoring

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

Table 1. Adopted Soil Properties.

	Unit Weight (kN/m <sup>3</sup> )	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	70
Moderately – Slightly Weathered ECBF	18	20	38	400

During TGE's investigation and monitoring from 16 June 2022 to 31 January 2024, we 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 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 earthworks 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 – 2.5 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)				
<i>Piezo Location</i>	<i>16/06/2022 (Installation day)</i>	<i>22/02/2023</i>	<i>22/03/2023</i>	<i>5/04/2023</i>
HA01	4.9	1.4	2.4	3.0
HA07	3.7	2.1	2.7	2.0
<i>Piezo Location</i>	<i>23/08/2023 (installation day)</i>	<i>25/08/2023</i>	<i>1/09/2023</i>	<i>11/09/2023</i>
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
<i>Piezo Location</i>	<i>17/01/2024</i>	<i>31/01/2024</i>	<i>20/02/2024</i>	
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:

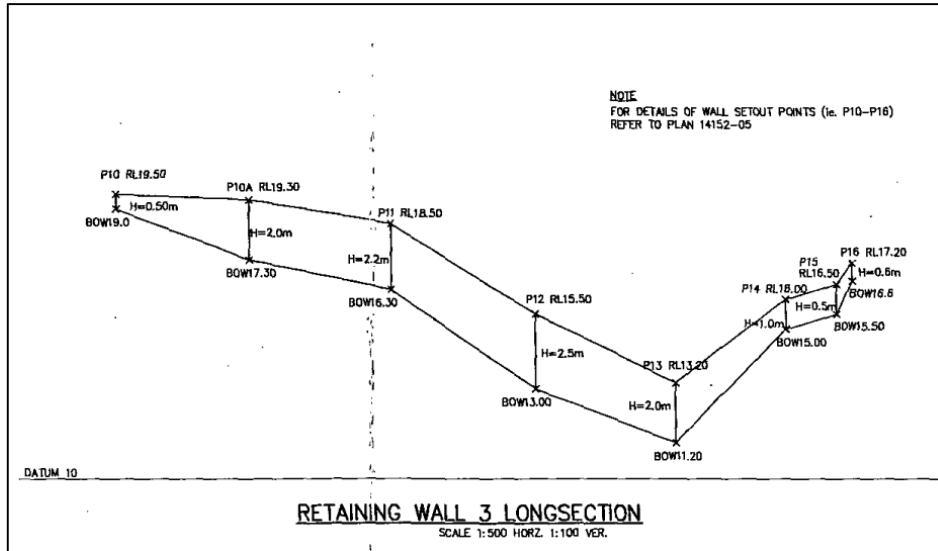


Figure 4 Existing Timber Retaining Wall Design Long Section from Property File (2002)

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.

The existing timber retaining wall top levels and toe levels are adopted from “Topographic surveys 1-9 Pigeon Mountain Road”, project reference 34948, Aerial Site Plan revision A by Envivo, dated 12 December 2025.

The designed finished levels of upper and lower platforms are extracted from “3 Pigeon Mountain Road - Architecture Design” by Shape Architects Ltd, project reference 207, dated 4 April 2026. These depict the finished, permanent ground levels.

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 below in Table 3 , extracted from Appendix B.

Table 3. Proposed Retaining Wall Analysed Section Levels Summary.

Proposed Retaining Wall Analysed Sections Summary updated in Jan 2026															
Analysed Section	Existing Timber Retaining Wall - Wall Top Level	Toe level of the existing timber retaining wall	Existing ground level at 8.0m away from the boundary	Design Finished Floor Level of Upper Platform	Design Finished Floor Level of Lower Platform	550 mm Sub Excavation Levels from Upper FFL	550 mm Sub Excavation Levels from Lower FFL	Proposed Max Excavation Depth at Upper Platform FFL (m)	Proposed Max Excavation Depth at Lower Platform FFL (m)	Approximate Groundwater Drawdown Depth (m)	Retaining Height of the existing retaining wall (m)	Prelim proposed retaining wall height (m)	Prelim. Proposed Retaining Height (m) (inc 550mm excavation)	Coordinate of SW (Top level of EXTG RW as the reference point)	Coordinate of WW (Top level of EXTG RW as the reference point)
Section 1	12.56	11.35	10.75	-	9.80	-	9.25	2.10	1.5	0.1	1.21	2.76	3.31	(-1.4, 9.5)	(-3, 10.5)
Section 2	16.08	13.64	13.00	14.74	12.03	14.19	11.48	-0.55	1.5	0.1	2.44	1.34	1.89	(-1.6, 14.5)	(-3.2, 15.0)
Section 3	18.81	17.31	17.00	15.85	13.19	15.30	12.64	2.01	4.4	3.0	1.50	3.0	3.51	(-1.7, 17.0)	(-3.2, 17.1)

We have divided the wall into three representative retained height ranges as shown in Table 3 and Section 3 is the critical design section. The extent of these design sections is shown in Figure 5. The maximum retained height of 3.51m 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 piles are required to minimise retaining wall deflections and settlement of any surrounding structures.



Figure 5. Architecture plan.

We have used the following provided documents for analysis of the retaining wall using the Finite Element software package PLAXIS 2D:

- Architecture Design by Shape Architects Ltd, project reference 207, April 2026.
- Topographic surveys 1-9 Pigeon Mountain Road, project reference 34948, Aerial Site Plan revision A by Envivo, dated 12 December 2025.

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 3.51 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 3.51 m high (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 dwellings.

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

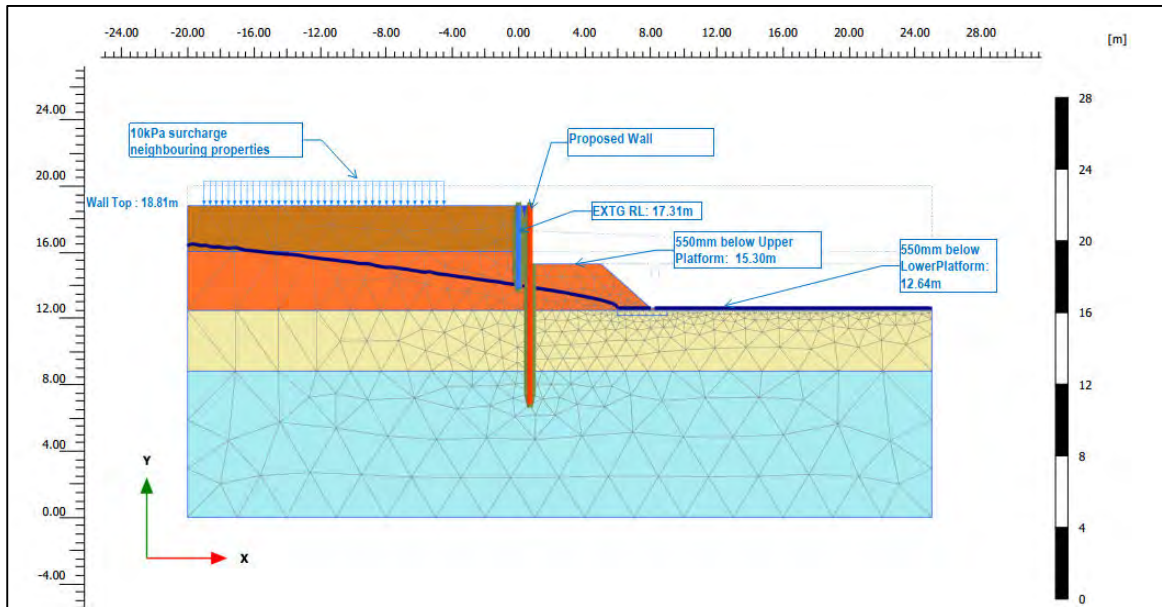


Figure 6. Plaxis Model General Arrangement-Section 3.

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

Analyse Existing Conditions:

- Phase 0: Initial Phase (Initializing the FEM model)
- Phase 1: Neighbouring Property Surcharge

Analyse Proposed Wall Construction:

- Phase 2: Install the new retaining wall
- Phase 3: Backfill between the Existing and New Retaining Wall
- Phase 4: Excavation/Fill of the Upper Platform in front of the Wall (temporary 550mm below FFL)
- Phase 5: Excavation of the Lower Platform (temporary 550 mm below FFL)
  - Phase 5.1: Apply worst ground water scenario
  - Phase 5.2: Apply seismic scenario ( $K_n = 0.2 g$ )

To limit wall deflection and ground deformation, we have modelled a 310UC-158 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 top of proposed retaining wall is levelled with 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.
- 310UC-158 kg/m post at 1.0 m c/c. UC stiffness  $EA = 4.02E+06kN/m$  run
- Maximum temporary retaining height is 3.51 m from the top level of the existing wall.
- Pile length 12.0 m and approximate Pile embedment of 8.5 m below FFL.
- Groundwater level -1.4 m bgl (approx. R.L.15) and the drawdown to excavation level (550 mm below FFL of the lower platform, approx. R.L. 12.64).

### 4.3 PLAXIS Model Soil Parameters

For Plaxis analysis we have adopted the Hardening soil model 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*

General	Material Name	FIB	Puketoka Formation	CW - MW ECBF	ECBF Rock
		Material Model	Hardening Soil	Hardening Soil	Hardening Soil
	Unsaturated unit weight, $\gamma_{unsat}$ (kN/m <sup>3</sup> )	16	16	17	20
	Saturated unit weight, $\gamma_{sat}$ (kN/m <sup>3</sup> )	18	18	18	22
Parameters	Secant stiffness in standard drained triaxial test, $E_{50}^{ref}$ (kN/m <sup>2</sup> )	15000	7,000	25,000	50,000
	Tangent stiffness for primary oedometer loading, $E_{oed}^{ref}$ (kN/m <sup>2</sup> )	12000	5600	20000	35000
	Unloading/reloading stiffness, $E_{ur}^{ref}$ (kN/m <sup>2</sup> )	45000	21000	75000	150000
	Power for stress-level dependency of stiffness, m	0.55	0.55	0.55	0.55
	Initial void ratio, $e_0$	0.5	0.5	0.50	0.5
	Compression index, $C_c$	0.04317	0.07196	0.01727	0.00863
	Swelling index, $C_s$	0.02041	0.03198	0.00816	0.00858
	Effective cohesion, $c'_{ref}$ (kN/m <sup>2</sup> )	7	3	7	50
	Effective angle of internal friction, $\phi'$ (°)	32	30	32	40
	Dilatancy angle, $\psi$ (°)	0	0	0	0
	Poisson's ratio for unloading/reloading, $\nu_{ur}$	0.25	0.25	0.25	0.2
	Reference stress for stiffnesses, $p^{ref}$ (kN/m <sup>2</sup> )	100	100	100	100
	Coefficient of lateral stress in normal consolidation, $K_0^{ref}$	0.4701	0.5000	0.4701	0.3572
	Failure ratio $q_u/q_w$ , $R_f$	0.9	0.9	0.9	0.9
Tensile strength, $\sigma_{tension}$ (kN/m <sup>2</sup> )	0	0	0	0	
Increase of cohesion, $c_{13c}$ (kN/m <sup>2</sup> )	0	0	0	0	
Interfaces	Reduction factor for soil-structure interface, $R_{vred}$	0.7	0.7	0.7	0.7
Initial	Coefficient of lateral stress, $K_0$	Automatic	Automatic	Automatic	Automatic
	Isotropic overconsolidation ratio, OCR	1	1	1	1
	Isotropic preconsolidation pressure, POP (kN/m <sup>2</sup> )	-	-	-	-

### 4.4 Proposed Retaining Wall Analyses Results

#### 4.4.1 Ground Settlement

The analyses indicate that maximum ground settlement immediately behind the wall is 11 mm occurring at Phase 5 as shown in *Figure 7*.

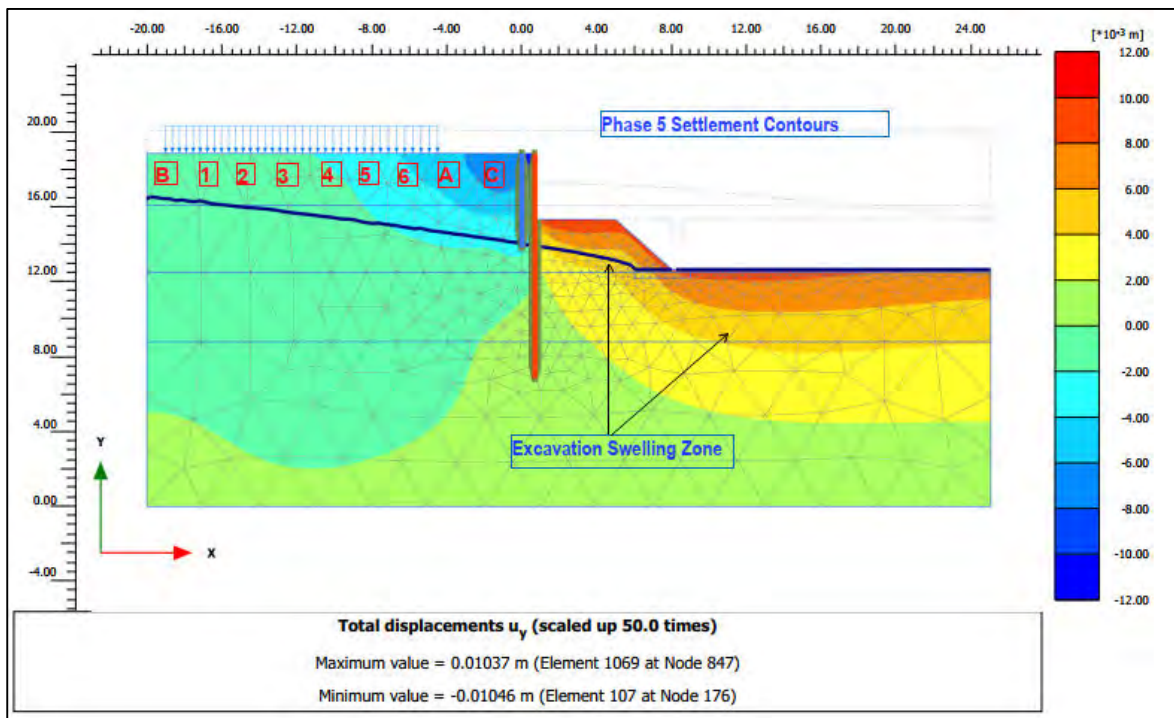


Figure 7. Phase 5 Settlement Contours.

The predicted settlements at the monitoring point A-B are  $-5.2$  mm and  $-1.1$  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 17.27 mm after Phase 5. This deflection represents a ratio of wall-height upon deflection ( $H/d$ ) of 600 which is acceptable.

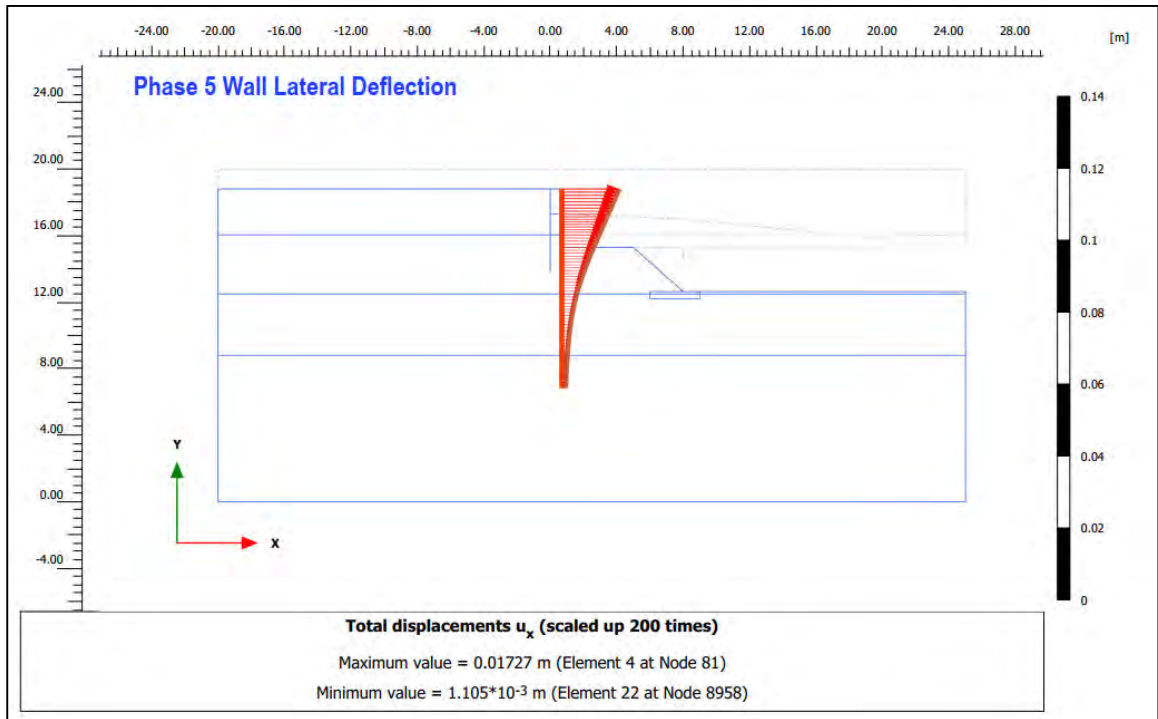


Figure 8. Phase 5 Lateral Deflection.

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.

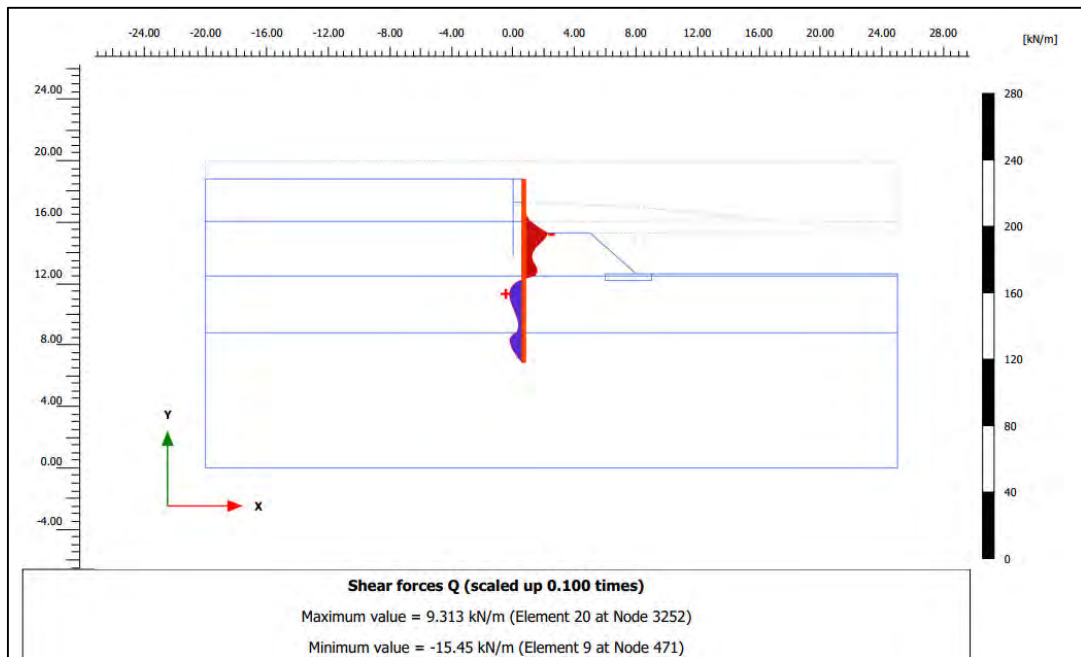


Figure 9. Shear Force Diagram- Phase 5.

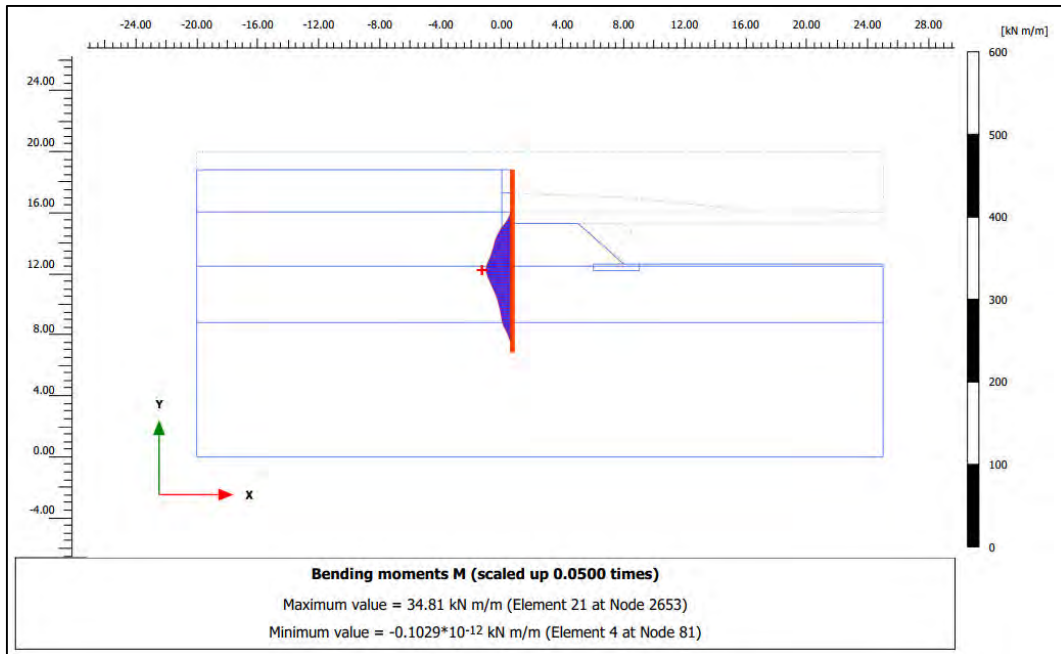


Figure 10. Bending Moment Diagram- Phase 5.

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 1.98 under static conditions exceeding the normally accepted minimum requirement 1.5 for the normal ground water scenario.

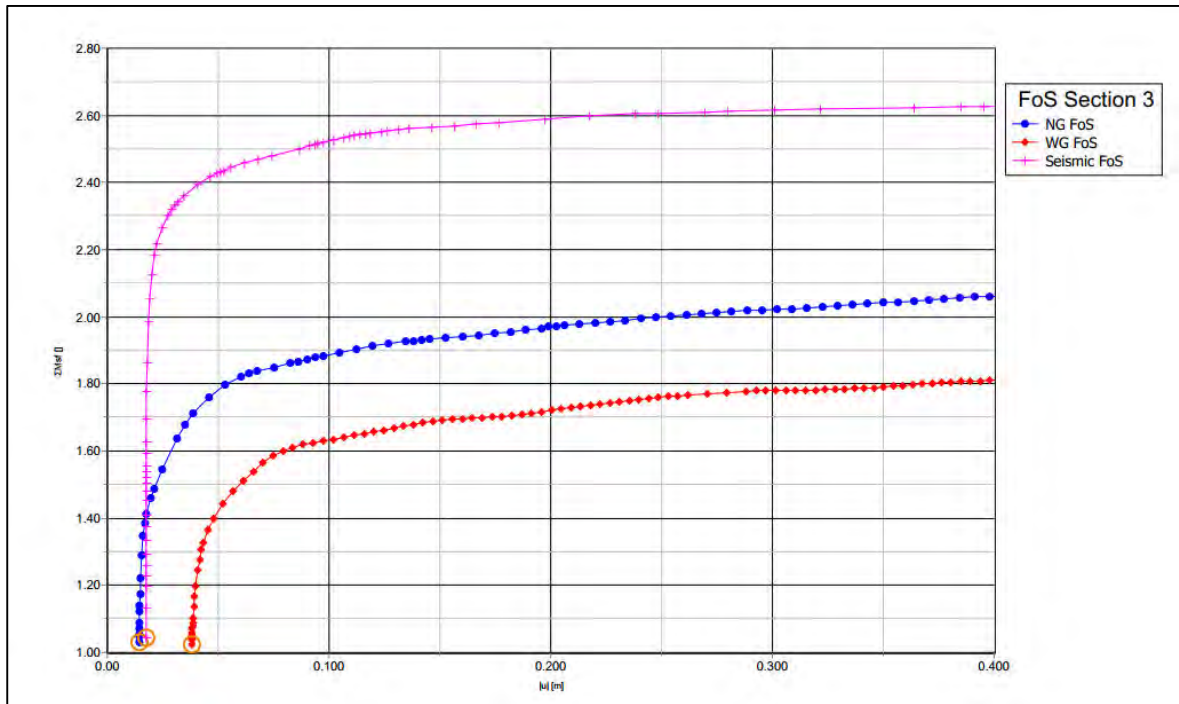


Figure 11. FoS under three design scenarios.

For the worst-case groundwater, we have increased the water level to R.L.18.0. This results in a factor of safety of FS = 1.8 as shown in Figure 11, exceeding the minimum requirement of 1.3.

The factor of safety (FoS) is 2.6 under a seismic horizontal acceleration 0.2g 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	9.0	3.27	2.15	1.95	2.25
Section 2	350SED	1.0	9.0	1.89	2.1	2.5	3.1
Section 3	310 UC-158	1.0	12.0	3.51	2.05	1.8	2.6

#### 4.5 Existing Retaining Wall Analyses Results

The deflection of the existing timber wall is extracted from the output. Figure 12 below shows the deflection of the existing wall analysed in Section 3.

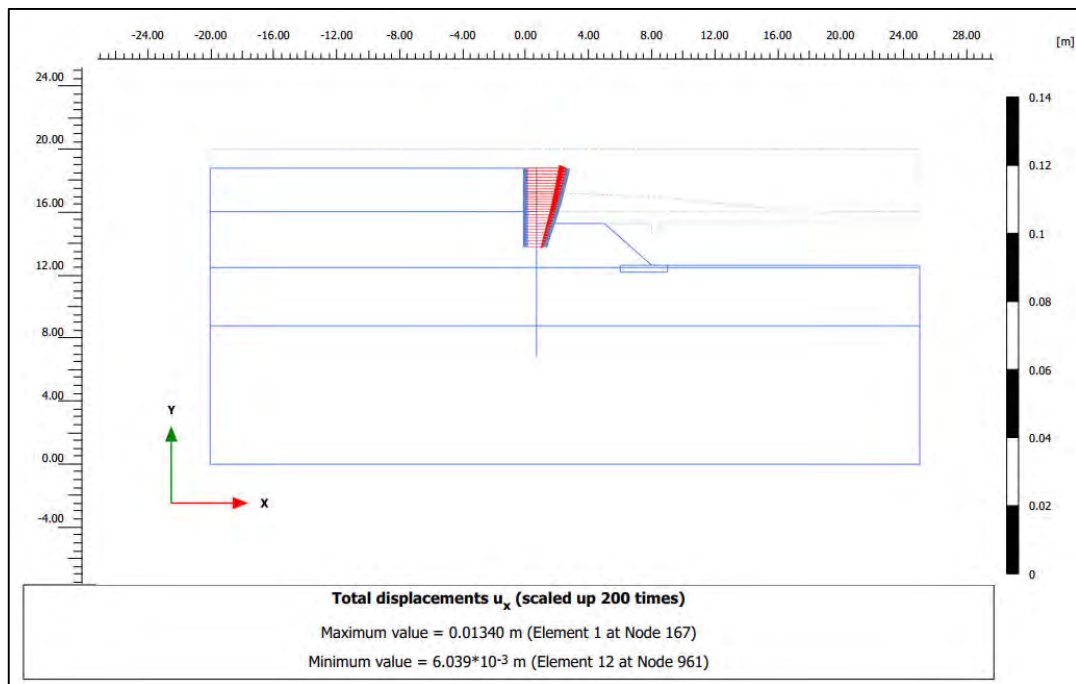


Figure 12. Existing Wall Deflection - Phase 5.

Full outputs results are attached in Appendix C.

## 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 13. We have assumed a nominal maximum retained height of 4.0 m. The proposed retaining wall comprises 12.0 m long, 310UC158 steel piles encased in concrete at 1.0 m spacings. 150 x 50mm timber lagging supports the retained ground between the piles.

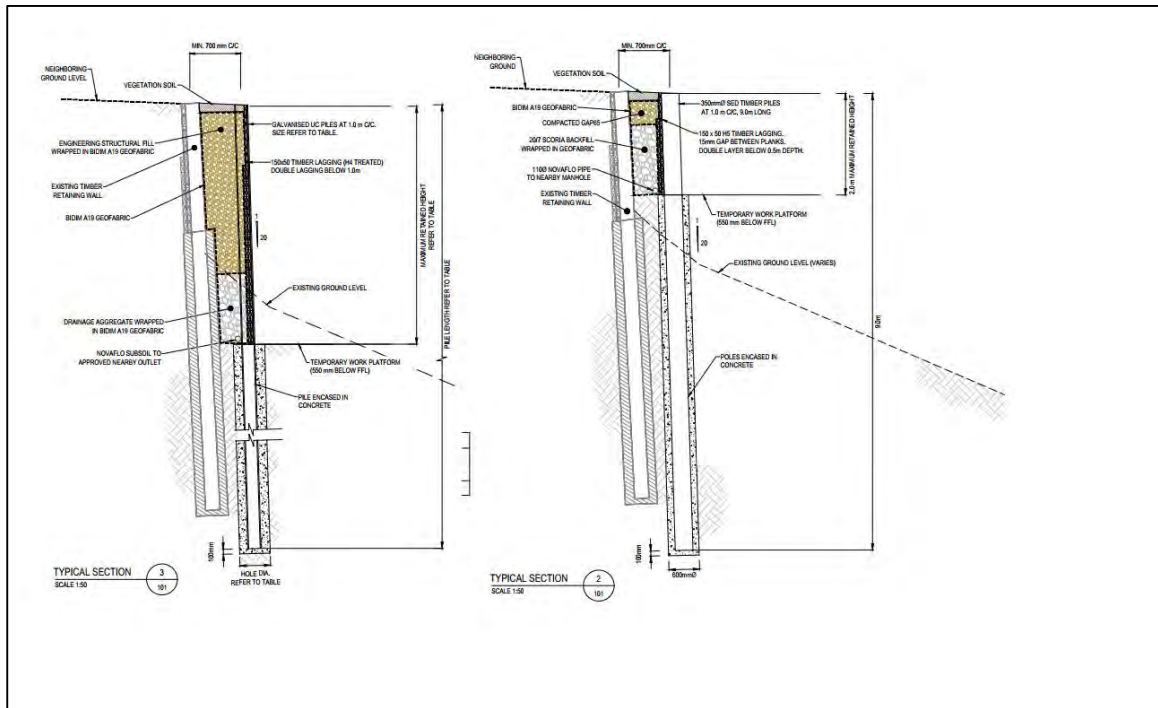


Figure 13; Typical Cross Sections for Steel and Timber Wall.

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 updated the 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 the following sections.

### 6.1 Settlement Prediction within Neighbouring Properties

In order to calculate the maximum predicted differential settlement under the house footprint, and between the existing dwelling and the existing timber wall as requested, we have extracted the information of interim points between A (house start-point) and B (house-end point), and between point B to point C (behind existing timber wall) as shown in Figure 14. The settlement prediction of each point is summarised in Table 7.

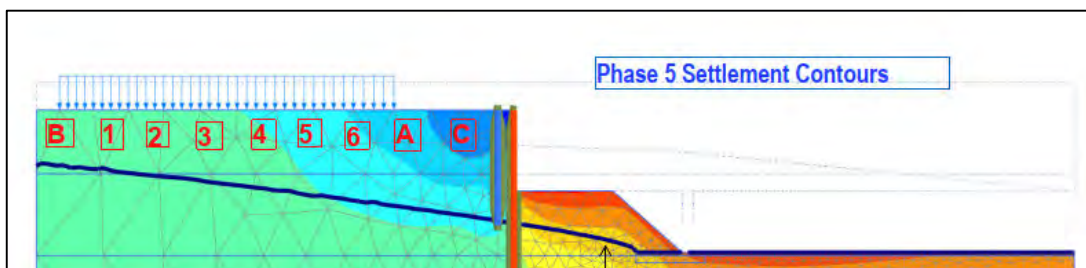


Figure 14. Interim Points Numbering for Section 3.

Table 7. Interim points settlement results Summary.

Section 1 Model									
Point Name	B	1	2	3	4	5	6	A	C
Model Coordinates	(-18.3,12)	(-16.19,12)	(-14.08,12)	(-11.97,12)	(-9.86,12)	(-7.75,12)	(-5.64,12)	(-3.5,12)	(-1.5,12)
Predicted settlement (mm)	-2.65	-2.82	-2.95	-3.15	-3.33	-3.54	-3.72	-3.81	-4.5
Section 2 Model									
Point Name	B	1	2	3	4	5	6	A	
Model Coordinates	(-23,16)	(-20.15,16)	(-17.3,16)	(-14.45,16)	(-11.6,16)	(-8.75,16)	(-5.9,16)	(-3,16)	(-1.2,16)
Predicted settlement (mm)	-0.4	-0.51	-0.6	-0.82	-1.12	-1.46	-2.1	-3.1	-3.3
Section 3 Model									
Point Name	B	1	2	3	4	5	6	A	
Model Coordinates	(-19,18.8)	(-16.86,18.8)	(-14.72,18.8)	(-12.58,18.8)	(-10.44,18.8)	(-8.3,18.8)	(-6.16,18.8)	(-4,18.8)	(-0.5,18.8)
Predicted settlement (mm)	-1.1	-1.32	-1.5	-1.75	-2.5	-3	-4.3	-5.2	-7.5

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

Table 8. Maximum differential Building Settlement Summary (between point A and B).

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	< -3.81*	(4,5)	<0.21*	2.11	< 0.21/2110 ≈ 1:10047
#78	Section 1	-3.1	(4,5)	0.21	2.11	0.21/2110 ≈ 1:10047
#80	Section 2	-3.1	(6,A)	1.00	2.85	1.00/2850 ≈ 1:2850
#82	Section 3	< -5.2*	(5,6)	<1.30*	2.14	< 1.30/2140 ≈ 1:1646
#84	Section 3	-5.2	(5,6)	1.30	2.14	1.30/2140 ≈ 1:1646

\*: 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.

The ground settlement between the existing dwellings and the existing timber wall (between point B and point C) is summarised in Table 10 below:

Table 9. Ground Settlement between Existing Dwellings and Existing Wall Summary (Point C).

Property Address (Compass Point Way)	Corresponding Nearest Analysed Section	Ground Settlement (mm)
#76	Section 1	< -4.5*
#78	Section 1	< -4.5
#80	Section 2	-3.3
#82	Section 3	< -7.5*
#84	Section 3	-7.5

The maximum retaining heights at #76 and #84 are less than at #78 and #82 respectively. Thus, the settlements are expected to be less than the predicted settlements.

### 6.1.1 Settlement of structures

The maximum differential settlement gradient is approximately 1V:1646H (0.061%) between Point 5 & 6 near Section 3. We have compared the predicted settlements and the maximum differential settlement with widely used building damage assessment criteria in Table 10. The results indicate the description of the degree of damage is “Very Slight”.

Table 10. 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 feedback from the previous 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 11.

Table 11. Monitoring Point Positions refer to Figure 6.

Points \ Relative Location	Section 1 (m)	Section 2 (m)	Section 3 (m)
(WW Line)	-3, 10.5	-3.2, 15.0	-3.2, 17.10
(SW Line)	-1.4, 9.5	-1.6, 14.5	-1.7, 17.0

For the 150mm WW pipe, the analysis predicts 5.24 mm settlement in Section 3 as shown in Figure 15. Assuming that the 5.24 mm of settlement occurs over a transition length of 10m to 12m the gradient would range from 1: 1908 to 1:1908. Adopting Rankine’s description of damage as shown in Table 10 would classify the effect as “Negligible”. to “Very Slight”.

For the 300 mm SW pipe, the analysis predicts 7.7 mm settlement as shown in Figure 16. Assuming that the 7.7 mm of settlement occurs over a transition length of 10 m to 12 m the gradient would range from 1:1298 to 1:558. Adopting Rankine’s description of damage as shown in Table 10 would classify the effect as “Negligible”. to “Very Slight”.

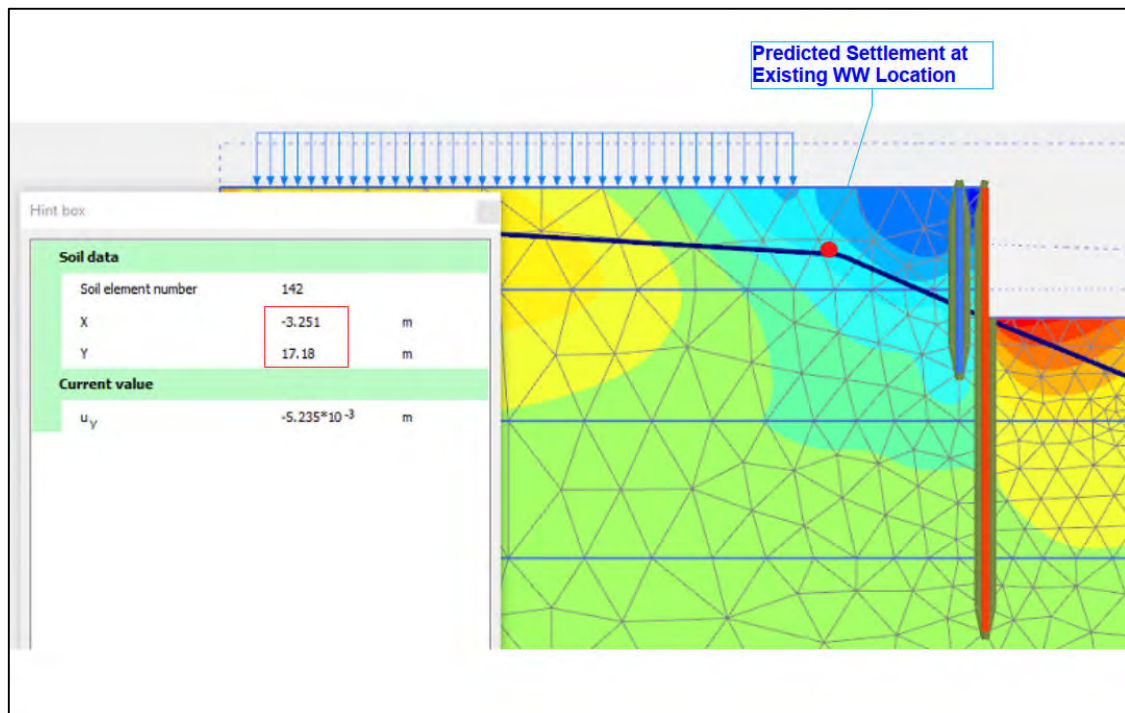


Figure 15. Predicted WW Line Settlement at Section 3.

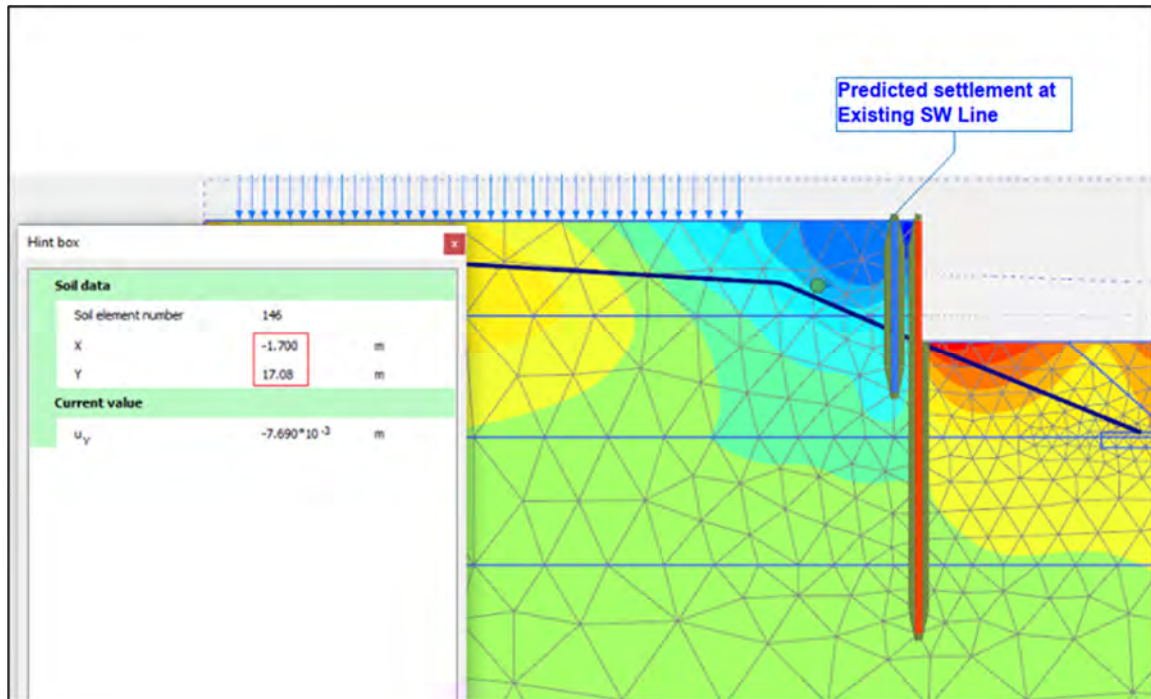


Figure 16. Predicted SW Line Settlement at Section 3.

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 12.

Table 12. Predicted Services Settlement after Phase 5.

Analysed Section	Modelled Temporary Retained Height (m)	Proposed Wall Static Lateral Deflection (mm) (Long-term Normal Groundwater)	Neighbouring Property Corner Distance to New Wall (m)	Existing Wall Lateral Deflection (Long-term Normal Groundwater) (mm)	Predicted Settlement at wall-behind 150 WW line (mm)	Predicted Settlement at wall-behind 300 SW line (mm)
Section 1	3.27	6.19	6.0	2.95	-1.64	-1.12
Section 2	1.89	10.44	3.7	3.33	-1.52	-0.55
Section 3	3.51	17.27	5.2	13.40	-5.24	-7.69

## 6.2 Groundwater Discharge Rate

We have also estimated the groundwater discharge rate over the excavation platform length of 10.0 m. Figure 17 shows the max total discharge rate is  $1.986E-3 \text{ m}^3/\text{day}/\text{m}$  run in Section 3. The outputs for the rest sections are summarized in Table 13.

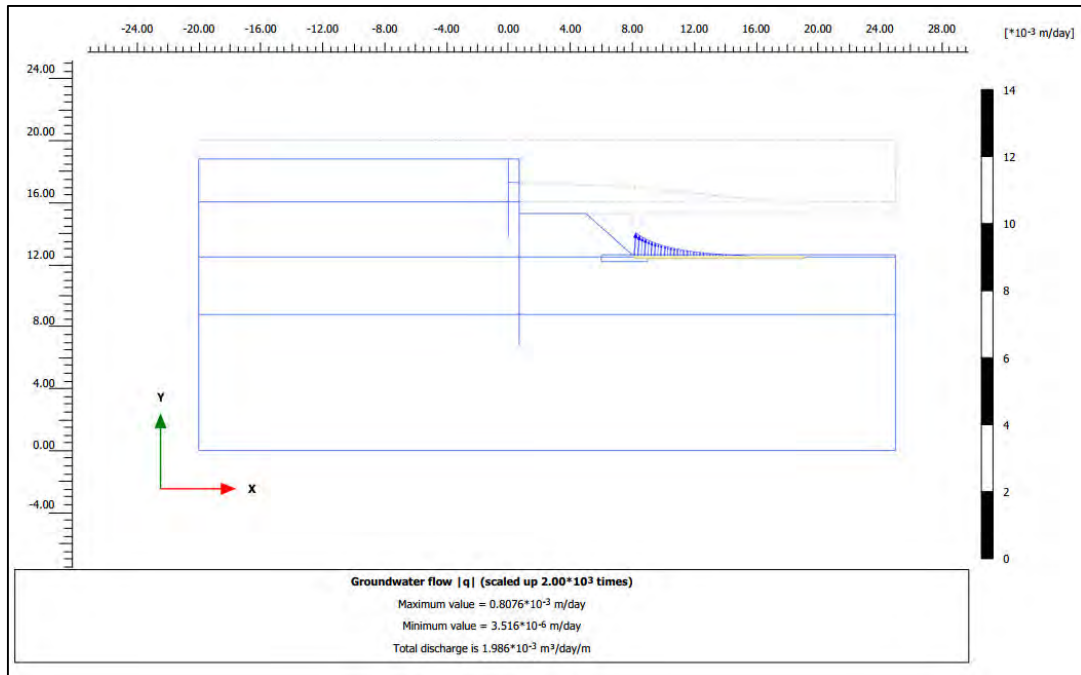


Figure 17. Long-term Groundwater Discharge Rates in Section 3.

Table 13. Groundwater Discharge Rates Summary.

Analysed Section	Original GWL (mRL)	Change in Water Head(m)	Excavation Platform Length (m)	Long-term Discharge Rate (m <sup>3</sup> /day/m run)
Section 1	9.00	0.50	10.0	4.2E-3
Section 2	14.00	2.00	10.0	1.522E-3
Section 3	16.20	4.0	10.0	1.9286E -3

The above analysis indicates that long-term groundwater flows are estimated as  $1.986 \times 10^{-2} \text{ m}^3/\text{day}$ , which is approximately 0.004 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 to DM13 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.

Ground settlements points GS1-GS9 are placed between the neighbouring properties and the existing wall to monitor the settlements during construction.

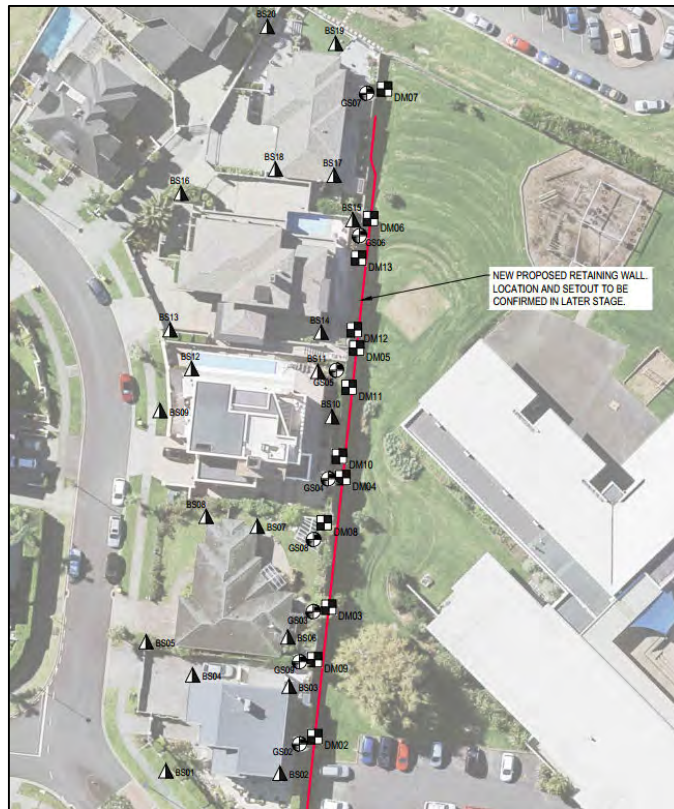


Figure 18. Updated Monitoring Plan.

Alert Level is commonly defined as the situation where monitoring reaches a level close to where damage may occur if 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 affect ground deformation. Alert level is usually set as 70 % of Alarm level.

We have developed the following monitoring Table 14 to reflect the specific levels for each monitoring point:

Table 14. Settlement 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	17*	/	/	Weekly
DM 4-5	7	10*	/	/	Weekly
DM 6-7	4	6*	/	/	Weekly
DM8-9	8	14**	/	/	Weekly
DM10-12	3	4**	/	/	Weekly
DM13	2	3**	/	/	Weekly
BS1-20	4	6***	1:700	1:500	Weekly
GS1-9	6	8****	/	/	Weekly

\*: Based on Proposed wall deflections (Table 12)

\*\* : Based on Existing wall deflections (Table 12)

\*\*\*: Based on Maximum differential settlements under existing dwellings footprint (Table 8)

\*\*\*\*: Based on ground settlements between existing dwellings and existing timber wall (Table 9)

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 62 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 has been updated in accordance with the revised architectural plan, updated civil work plan, and also integrated with the previous WAT and s92 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:

Ryan Kieu

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BE(Hons), MEngNZ  
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Reviewed and Authorised by:

N. K. Jacka

Neil Jacka  
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BE(Hons), CEngNZ, IntPE  
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### Appendices

- Appendix A Reference Information
- Appendix B Existing Retaining Wall Details
- Appendix C Analysis Outputs and Design Calculations
- Appendix D Preliminary Design Drawings
- Appendix E Monitoring and Contingency Plan

### 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 in April/2026**
- Updated Civil set in February/2026**
- Topo survey November/2025**



### Typology Legend

<span style="color: blue;">■</span> A1	<span style="color: brown;">■</span> C1-Q
<span style="color: blue;">■</span> A2	<span style="color: lightgrey;">■</span> C1-Q2
<span style="color: purple;">■</span> A2-M	<span style="color: red;">■</span> C1-R1
<span style="color: lightblue;">■</span> A3	<span style="color: brown;">■</span> C1-R2
<span style="color: purple;">■</span> A4	<span style="color: orange;">■</span> C2
<span style="color: lightblue;">■</span> A5	<span style="color: pink;">■</span> C3
<span style="color: green;">■</span> B1	<span style="color: yellow;">■</span> D1
<span style="color: lightgreen;">■</span> B2-A	<span style="color: yellow;">■</span> D2
<span style="color: green;">■</span> B2-B	<span style="color: cyan;">■</span> E1
<span style="color: lightgreen;">■</span> B3-A	<span style="color: cyan;">■</span> E2
<span style="color: teal;">■</span> B3-B	<span style="color: lightgrey;">■</span> F1
<span style="color: darkgreen;">■</span> B4	

### Bedroom Quantity Schedule

Bedroom Quantity	Type	Unit Quantity
3	E1	3
	E2	2
		Total: 5

Bedroom Quantity	Type	Unit Quantity
4.5	B2-A	4
	B3-A	2
		Total: 6

Bedroom Quantity	Type	Unit Quantity
3.5	B2-B	2
	B3-B	2
	B4	2
	F1	6
		Total: 12

Bedroom Quantity	Type	Unit Quantity
5	A3	1
	A5	1
	B1	1
	D1	4
	D2	1
		Total: 8

Bedroom Quantity	Type	Unit Quantity
4	A1	2
	A2	4
	A2-M	2
	A4	1
	C1-Q	4
	C1-Q2	1
	C1-R1	12
	C1-R2	3
	C2	1
	C3	1
		Total: 31

### Property Schedule

Block A		
Lot	Type	Site Area
Lot 19	B2-A	143m <sup>2</sup>
Lot 20	B2-A	151m <sup>2</sup>
Lot 21	B2-B	151m <sup>2</sup>
Lot 22	B2-B	151m <sup>2</sup>
Lot 23	B2-A	151m <sup>2</sup>
Lot 24	B2-A	221m <sup>2</sup>
Block A: 6		968m <sup>2</sup>

Block D		
Lot	Type	Site Area
Lot 34	C1-R2	143m <sup>2</sup>
Lot 35	C1-R2	142m <sup>2</sup>
Lot 36	C1-R2	142m <sup>2</sup>
Lot 37	C1-R1	142m <sup>2</sup>
Lot 38	C1-R1	142m <sup>2</sup>
Lot 39	C1-R1	142m <sup>2</sup>
Lot 40	C1-R1	142m <sup>2</sup>
Lot 41	C2	253m <sup>2</sup>
Block D: 8		1248m <sup>2</sup>

Block K		
Lot	Type	Site Area
Lot 1	A5	363m <sup>2</sup>
Lot 2	A1	180m <sup>2</sup>
Lot 3	A1	183m <sup>2</sup>
Lot 4	A2	187m <sup>2</sup>
Lot 5	A2	188m <sup>2</sup>
Lot 6	A2	188m <sup>2</sup>
Lot 7	A2	211m <sup>2</sup>
Block K: 7		1500m <sup>2</sup>

Block B		
Lot	Type	Site Area
Lot 12	B1	278m <sup>2</sup>
Lot 13	B4	126m <sup>2</sup>
Lot 14	B4	144m <sup>2</sup>
Lot 15	B3-B	144m <sup>2</sup>
Lot 16	B3-B	145m <sup>2</sup>
Lot 17	B3-A	145m <sup>2</sup>
Lot 18	B3-A	128m <sup>2</sup>
Block B: 7		1110m <sup>2</sup>

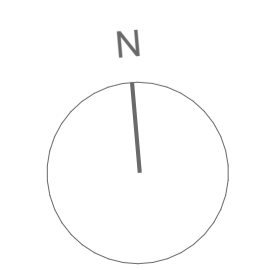
Block H		
Lot	Type	Site Area
Lot 58	D1	205m <sup>2</sup>
Lot 59	D1	207m <sup>2</sup>
Lot 60	D1	207m <sup>2</sup>
Lot 61	D1	207m <sup>2</sup>
Lot 62	D2	240m <sup>2</sup>
Block H: 5		1066m <sup>2</sup>

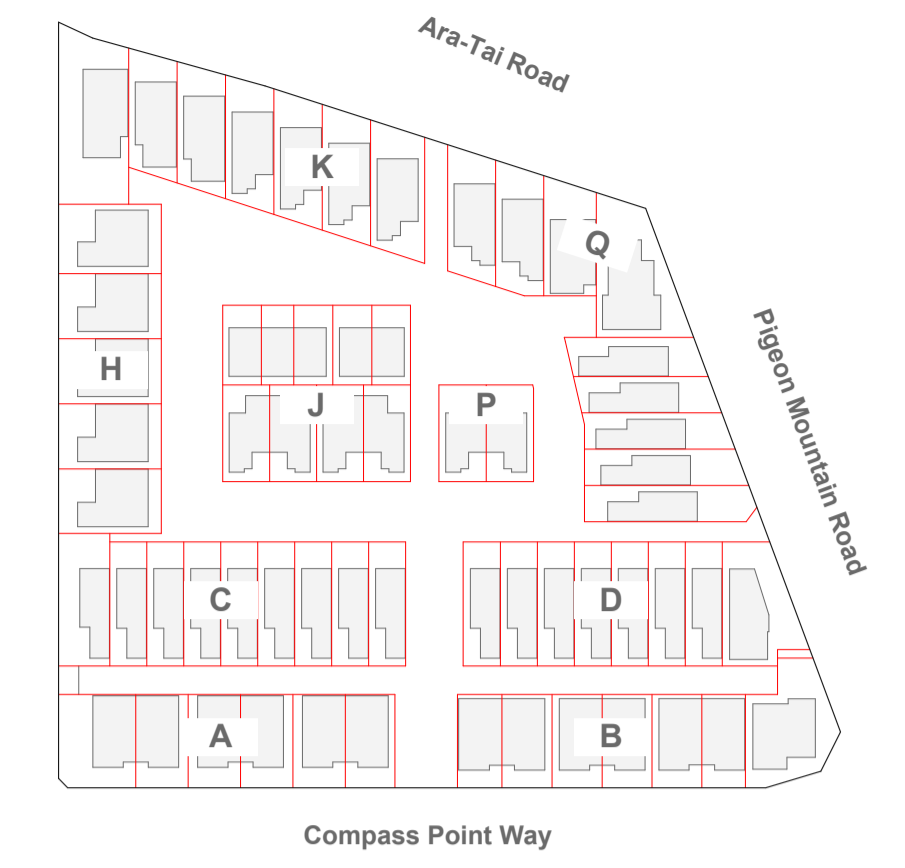
Block P		
Lot	Type	Site Area
Lot 56	F1	147m <sup>2</sup>
Lot 57	F1	147m <sup>2</sup>
Block P: 2		294m <sup>2</sup>

Block C		
Lot	Type	Site Area
Lot 25	C3	210m <sup>2</sup>
Lot 26	C1-R1	142m <sup>2</sup>
Lot 27	C1-R1	142m <sup>2</sup>
Lot 28	C1-R1	142m <sup>2</sup>
Lot 29	C1-R1	142m <sup>2</sup>
Lot 30	C1-R1	142m <sup>2</sup>
Lot 31	C1-R1	142m <sup>2</sup>
Lot 32	C1-R1	142m <sup>2</sup>
Lot 33	C1-R1	142m <sup>2</sup>
Block C: 9		1346m <sup>2</sup>

Block J		
Lot	Type	Site Area
Lot 47	E1	95m <sup>2</sup>
Lot 48	E1	80m <sup>2</sup>
Lot 49	E1	96m <sup>2</sup>
Lot 50	E2	96m <sup>2</sup>
Lot 51	E2	94m <sup>2</sup>
Lot 52	F1	140m <sup>2</sup>
Lot 53	F1	140m <sup>2</sup>
Lot 54	F1	140m <sup>2</sup>
Lot 55	F1	140m <sup>2</sup>
Block J: 9		1022m <sup>2</sup>

Block Q		
Lot	Type	Site Area
Lot 8	A2-M	187m <sup>2</sup>
Lot 9	A2-M	186m <sup>2</sup>
Lot 10	A4	182m <sup>2</sup>
Lot 11	A3	304m <sup>2</sup>
Lot 42	C1-Q2	160m <sup>2</sup>
Lot 43	C1-Q	154m <sup>2</sup>
Lot 44	C1-Q	162m <sup>2</sup>
Lot 45	C1-Q	177m <sup>2</sup>
Lot 46	C1-Q	188m <sup>2</sup>
Block Q: 9		1700m <sup>2</sup>





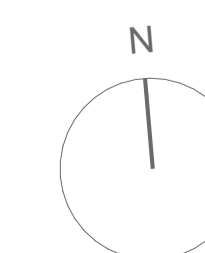
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 Address  
 3 Pigeon Mountain Road, Auckland  
 Client  
 HND HMB Limited

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 Drawing Number  
 A 1.02  
 Scale  
 1:300 AT A1

Project Number  
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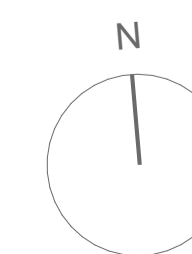
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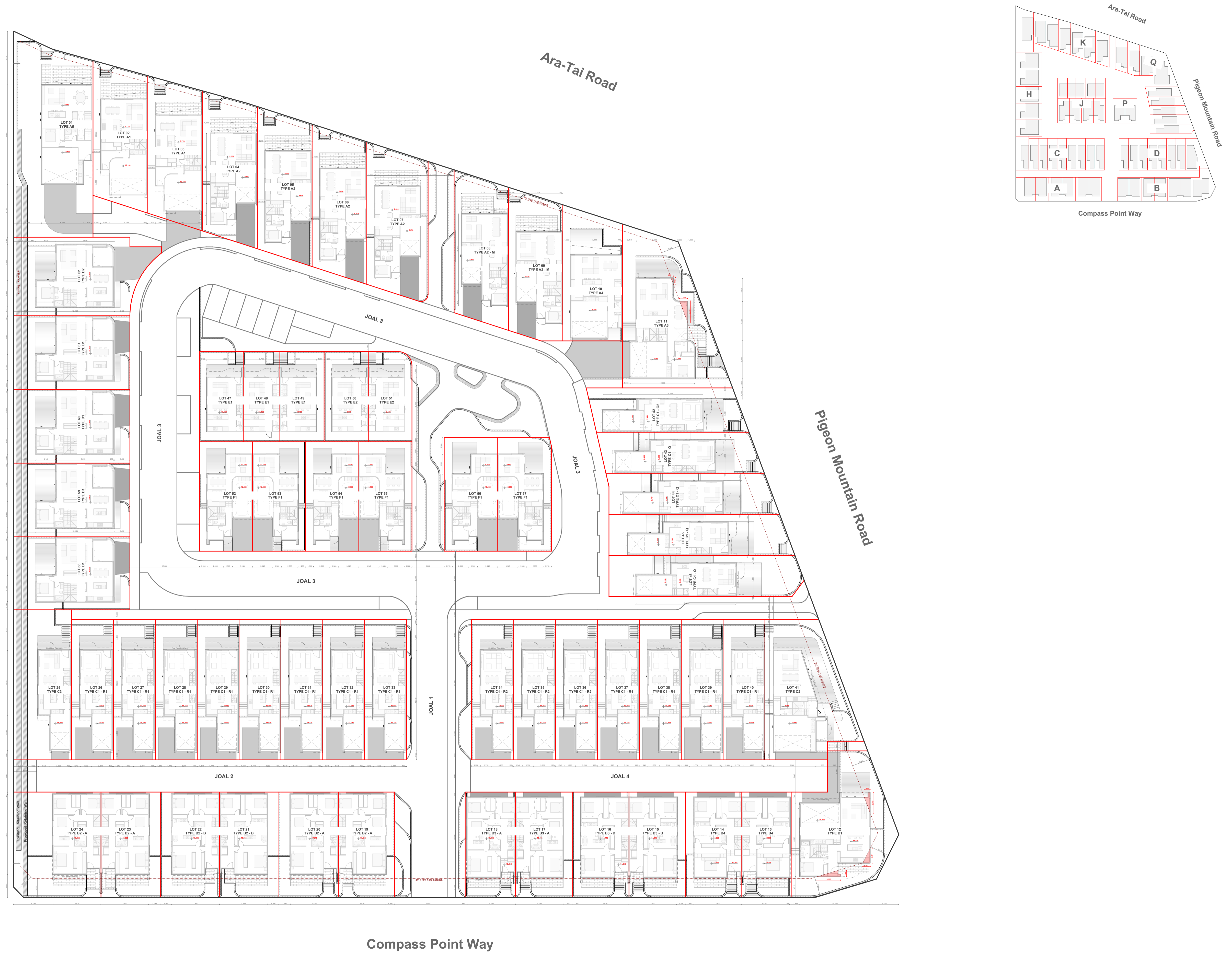
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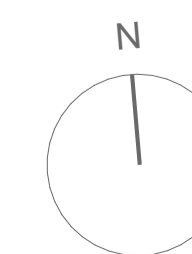
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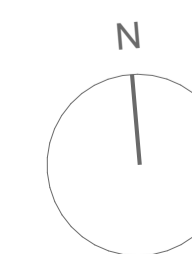
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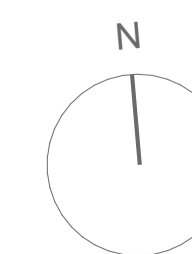
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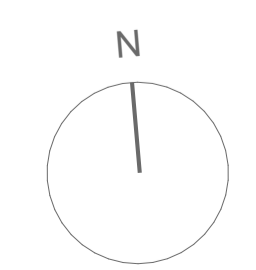
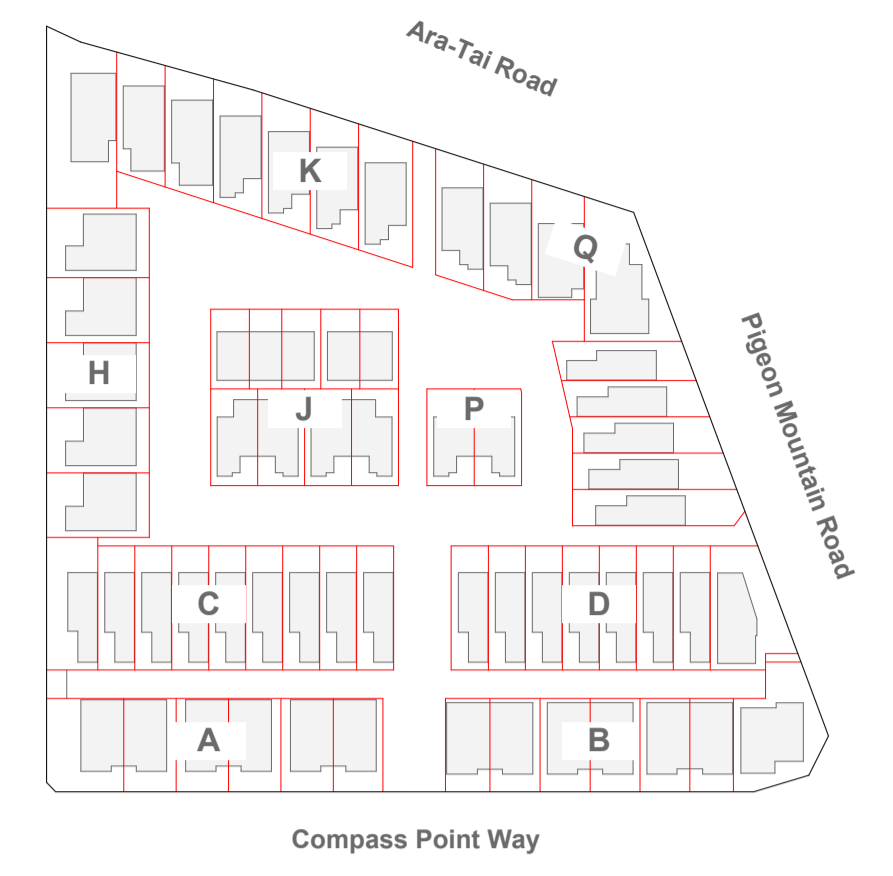
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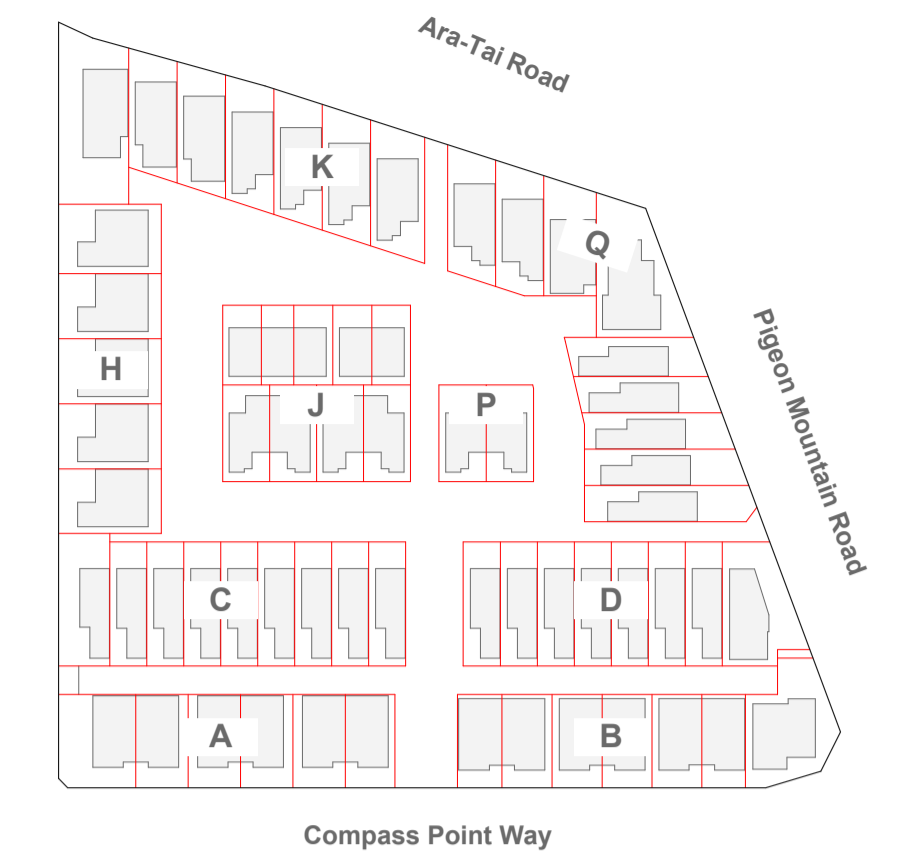
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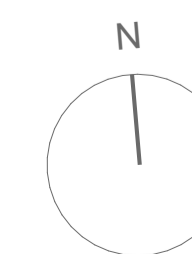
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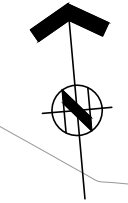
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**NOTES:**

1. ALL WORKS AND MATERIALS ARE TO COMPLY WITH AUCKLAND COUNCIL ENGINEERING STANDARDS .
2. ALL EROSION AND SEDIMENT CONTROL DEVICES TO BE INSTALLED, AS-BUILT AND INSPECTED BY THE ENGINEER / COUNCIL REPRESENTATIVE PRIOR TO COMMENCING THE EARTHWORKS ON THE SITE.
3. PROPOSED CONTOURS SHOWN ARE FINISHED GROUND LEVELS AT 0.5m INTERVAL.
4. THE EARTHWORKS SURFACE MODEL AND DRAINAGE MODEL ARE BASED ON THE TOPOGRAPHICAL PLAN PREPARED BY ENVIVO DATED 20.01.2025, LEVELS ARE IN TERMS OF NZVD 2016.

**LEGEND:**

- FINISHED SURFACE SHOWN AT 0.2m INTERVALS
- EXISTING CONTOURS SHOWN AT 0.5m INTERVALS
- EARTHWORKS BOUNDARY
- BUILDING PLATFORM
- PROPOSED RETAINING WALL



REF	DESCRIPTION	BY	DATE
C	S92	JW	23.03.26
B	S92	YW	09.02.26
A	RESOURCE CONSENT	JW	28.02.25

PROJECT:  
**3 PIGEON MOUNTAIN ROAD  
HALF MOON BAY**

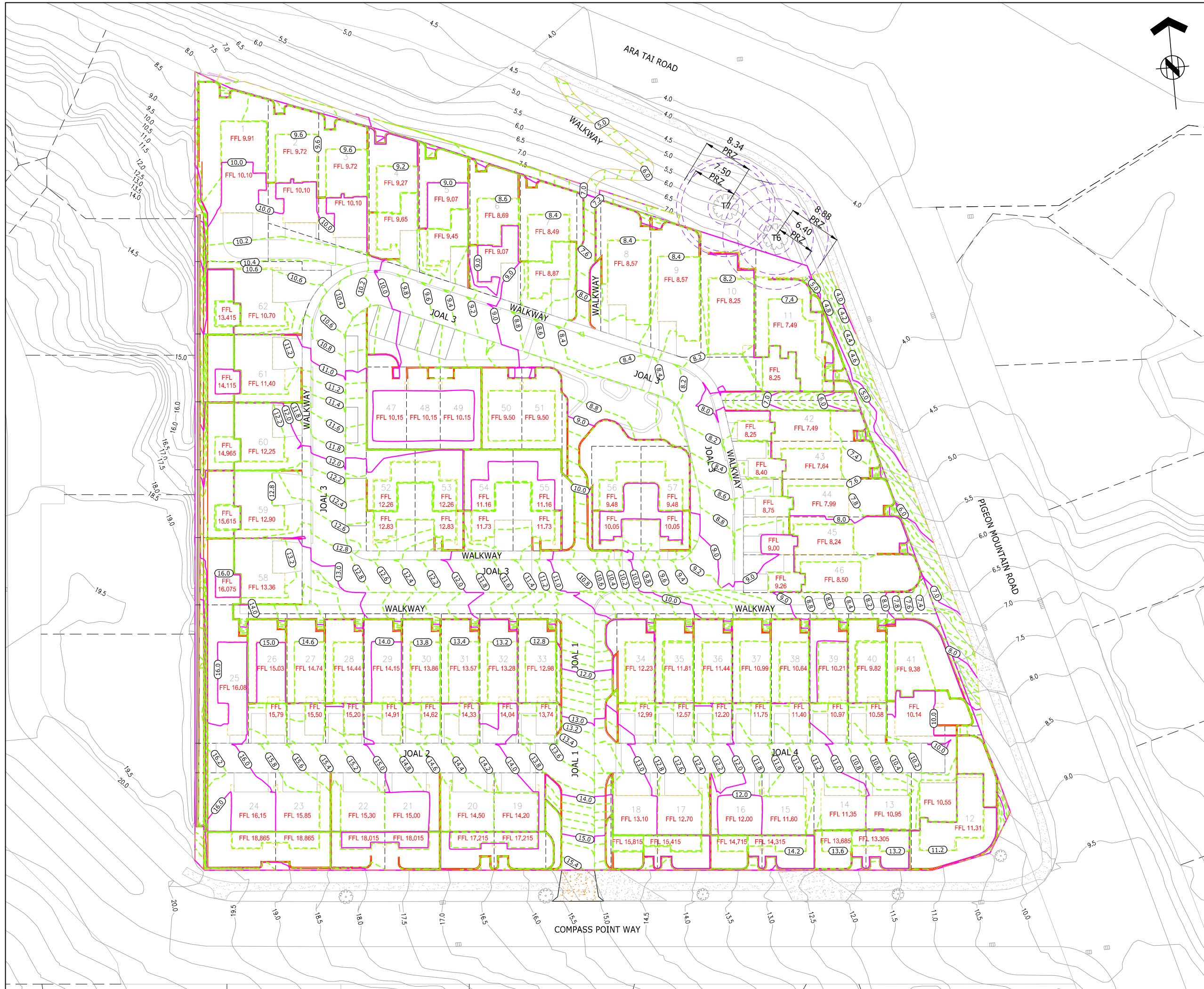
DESCRIPTION:  
**EARTHWORKS  
FINISHED CONTOURS**

DESIGNED:	DATE:	SIGNATURE:	PLOT BY:
JW	17.02.25		
DRAWN:	DATE:	SIGNATURE:	PLOT DATE:
JW	17.02.25		
CHECKED:	DATE:	SIGNATURE:	SURVEY BY:
SX	28.02.25		
APPROVED:	DATE:	SIGNATURE:	SURVEY DATE:
SX	28.02.25		

ISSUE STATUS:  
**RESOURCE CONSENT**

PROJECT No: FP326	SCALES: 1:300-A1 1:600-A3	REV: C
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DRAWING No:  
**FP326-200**



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EARTHWORKS DETAILS - UNADJUSTED:  
(NO ALLOWANCE FOR COMPACTION FACTOR/TOPSOIL STRIPPING & ACCESSWAY PAVEMENT CUTTING)

EARTHWORKS AREA: 14,385m<sup>2</sup>  
CUT: 2,964m<sup>3</sup>  
FILL: 6,827m<sup>3</sup>  
NET (FILL): 3,863m<sup>3</sup>

**LEGEND:**

-  CUT CONTOURS SHOWN AT -0.5m INTERVALS
-  FILL CONTOURS SHOWN AT 0.5m INTERVALS
-  EARTHWORKS BOUNDARY



88 MANUKAU ROAD EPSOM AUCKLAND 1023  
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D	S92	JW	23.03.26
C	S92	YW	09.02.26
B	ADDITIONAL CROSS SECTION ADDED	JW	15.04.25
A	RESOURCE CONSENT	JW	28.02.25
REF	DESCRIPTION	BY	DATE

**3 PIGEON MOUNTAIN ROAD  
HALF MOON BAY**

DESCRIPTION:  
**EARTHWORKS  
CUT AND FILL PLAN**

DESIGNED:	DATE:	SIGNATURE:	PLOT BY:
JW	17.02.25		
DRAWN:	DATE:	SIGNATURE:	PLOT DATE:
JW	17.02.25		
CHECKED:	DATE:	SIGNATURE:	SURVEY BY:
SX	28.02.25		
APPROVED:	DATE:	SIGNATURE:	SURVEY DATE:
SX	28.02.25		

ISSUE STATUS: **RESOURCE CONSENT**

PROJECT No:	SCALES:	REV:
FP326	1:300-A1 1:600-A3	D

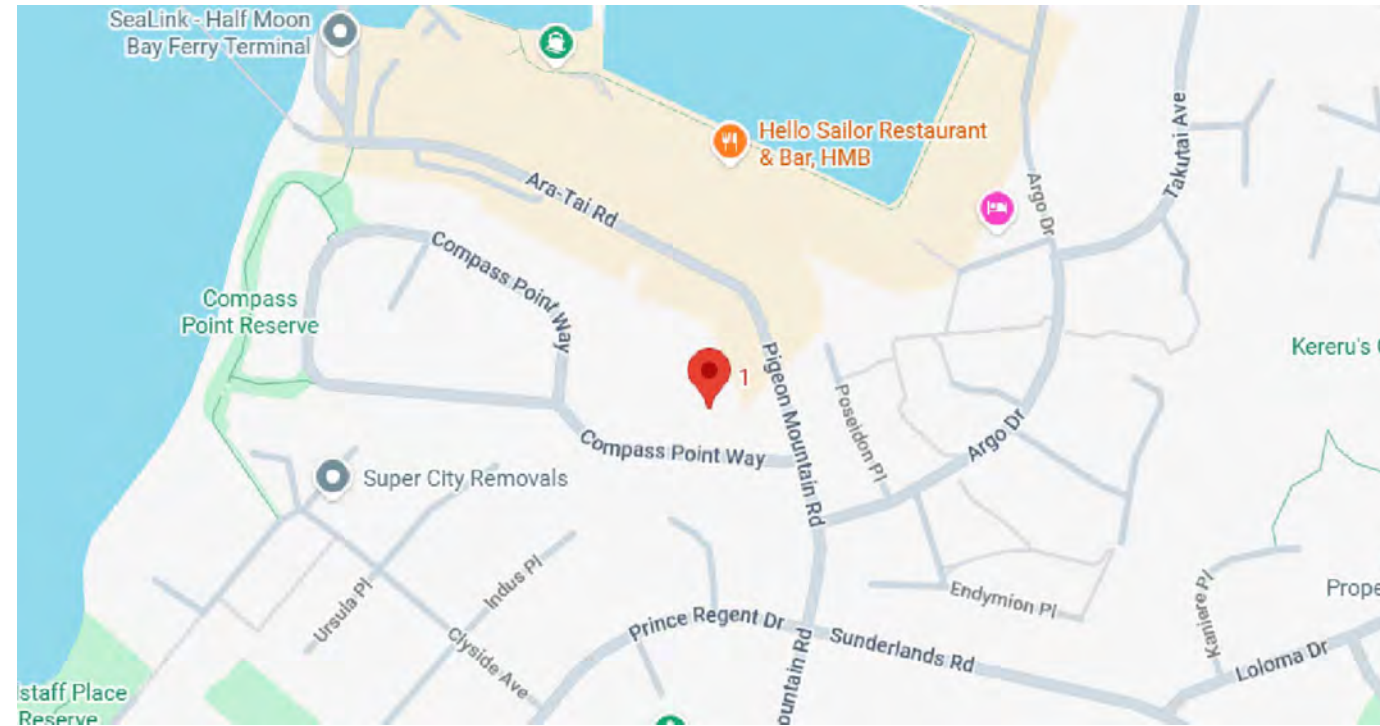
DRAWING No:

**FP326-210**





# 1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY TOPOGRAPHICAL SURVEY



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FOR  
INFORMATION

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120	SITE PLAN
121	AERIAL SITE PLAN
122+	ENLARGEMENTS
200	GRIP MAP DATA
201	RECORD OF TITLE
500	PUBLIC DRAINAGE RECORD
580	ASSET INFORMATION SHEETS
990	SITE PHOTOS AS TAKEN BY OUR SURVEYORS

<p>EXISTING BUILDINGS (EXTERIOR CLADDING)</p> <p>BUILDING DECK</p> <p>BUILDING EAVES (TOP OF GUTTER)</p> <p>BUILDING RIDGES/ROOFLINE</p> <p>BUILDING FLOOR LEVEL</p> <p>BUILDING DOOR LEVEL</p> <p>BUILDING COLUMNS SQUARE</p> <p>BUILDING COLUMNS ROUND</p> <p>EDGE OF CONCRETE</p> <p>EDGE OF KERB</p> <p>EDGE OF CHANNEL</p> <p>EDGE OF SEAL</p> <p>IMPERMEABLE SURFACE</p> <p>FENCES</p> <p>POST/POLE</p> <p>GATE</p> <p>BOLLARD</p> <p>ROAD SIGN</p> <p>ROAD MARKER POST</p> <p>ROAD SIGN SIDE POLE</p> <p>ROAD SIGN DOUBLE</p> <p>ROAD REFLECTOR</p> <p>RUBBISH BIN</p> <p>PARKING METER</p> <p>POST BOX NZ</p> <p>MAIL-BOX</p> <p>GEOTECH SOAK TEST</p> <p>GEOTECH BORE HOLE</p> <p>GEOTECH CONE POINTER</p> <p>GEOTECH AUGER</p> <p>RAIL SWITCH</p> <p>RAIL SIGNAL</p> <p>ROAD MARKING WHITE</p> <p>ROAD MARKING YELLOW</p>	
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<p>GAS METER</p> <p>GAS VALVE</p> <p>GAS DISTRIBUTION BOX</p> <p>GAS CYLINDER</p> <p>GAS END CAP</p> <p>GAS RDCR</p> <p>GAS LINE</p> <p>GAS PIT</p> <p>OIL LINE</p> <p>POWER DISTRIBUTION BOX</p> <p>POWER MANHOLE</p> <p>POWER POLE</p> <p>STREET LIGHT</p> <p>POWER UP LIGHT</p> <p>POWER COMMS POLE LAMP</p> <p>POWER BOLL LAMP</p> <p>POWER BARRIER POST</p> <p>POWER SIGN</p> <p>TRAFFIC LIGHT</p> <p>POWER POLE WITH LAMP</p> <p>POWER POLE ANCHOR</p> <p>POWER INSULATOR</p> <p>POWER END CAP</p> <p>POWER EARTH POINT</p> <p>OVERHEAD POWER LINE</p> <p>HIGH VOLTAGE POWER LINE</p> <p>VECTOR POWER LINE</p> <p>UNDERGROUND POWER LINE</p> <p>COMMUNICATIONS DISTRIBUTION BOX</p> <p>COMMUNICATIONS BOX FIBRE</p> <p>COMMUNICATIONS MANHOLE</p> <p>COMMUNICATIONS MANHOLE FIBRE</p> <p>COMMUNICATIONS LINE</p> <p>FIBRE OPTIC LINE</p> <p>COMMUNICATIONS CELL TOWER</p> <p>COMMUNICATIONS ANTENNA</p> <p>COMMUNICATIONS POLE</p> <p>SATELLITE DISH</p>	
--	--

<p>LOT BOUNDARIES</p> <p>ROAD BOUNDARIES</p> <p>ABUTTAL BOUNDARIES</p> <p>EASEMENT BOUNDARIES</p> <p>MAJOR CONTOURS (1.0m INTERVAL)</p> <p>MINOR CONTOURS (0.2m INTERVAL)</p> <p>MEASUREMENTS (METRES)</p> <p>TREES</p> <p>TRUNK SURVEYED, DRIPLINE ESTIMATED</p> <p>SURVEYED DRIPLINE &amp; TRUNK</p> <p>EDGE OF VEGETATION</p> <p>HEDGE</p> <p>TOP OF TREE</p> <p>TREE STUMP</p> <p>SURFACE DRAIN</p> <p>STREAM/WATERCOURSE</p> <p>TOP OF BANK</p> <p>WATER LEVEL</p> <p>STORM WATER MANHOLE</p> <p>STORM WATER CESSPIT</p> <p>STORM WATER LINE</p> <p>STORM WATER PIPE INVERT</p> <p>KERB OUTLET</p> <p>STORM WATER GRATE</p> <p>DOWN PIPE</p> <p>WASTE WATER MANHOLE</p> <p>GULLY TRAP</p> <p>BUCHAN TRAP</p> <p>WASTE WATER PIPE</p> <p>WASTE WATER STANDING VENT</p> <p>WASTE WATER LINE</p> <p>VALVE</p> <p>WATER METER</p> <p>FIRE HYDRANT</p> <p>FIRE HOSE REEL</p> <p>TAP</p> <p>WATER MAIN LINE</p> <p>UNKNOWN MANHOLE</p>	
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REV	BY	DATE	APP'D	REVISION/ COMMENTS

TITLE  
**COVER SHEET**

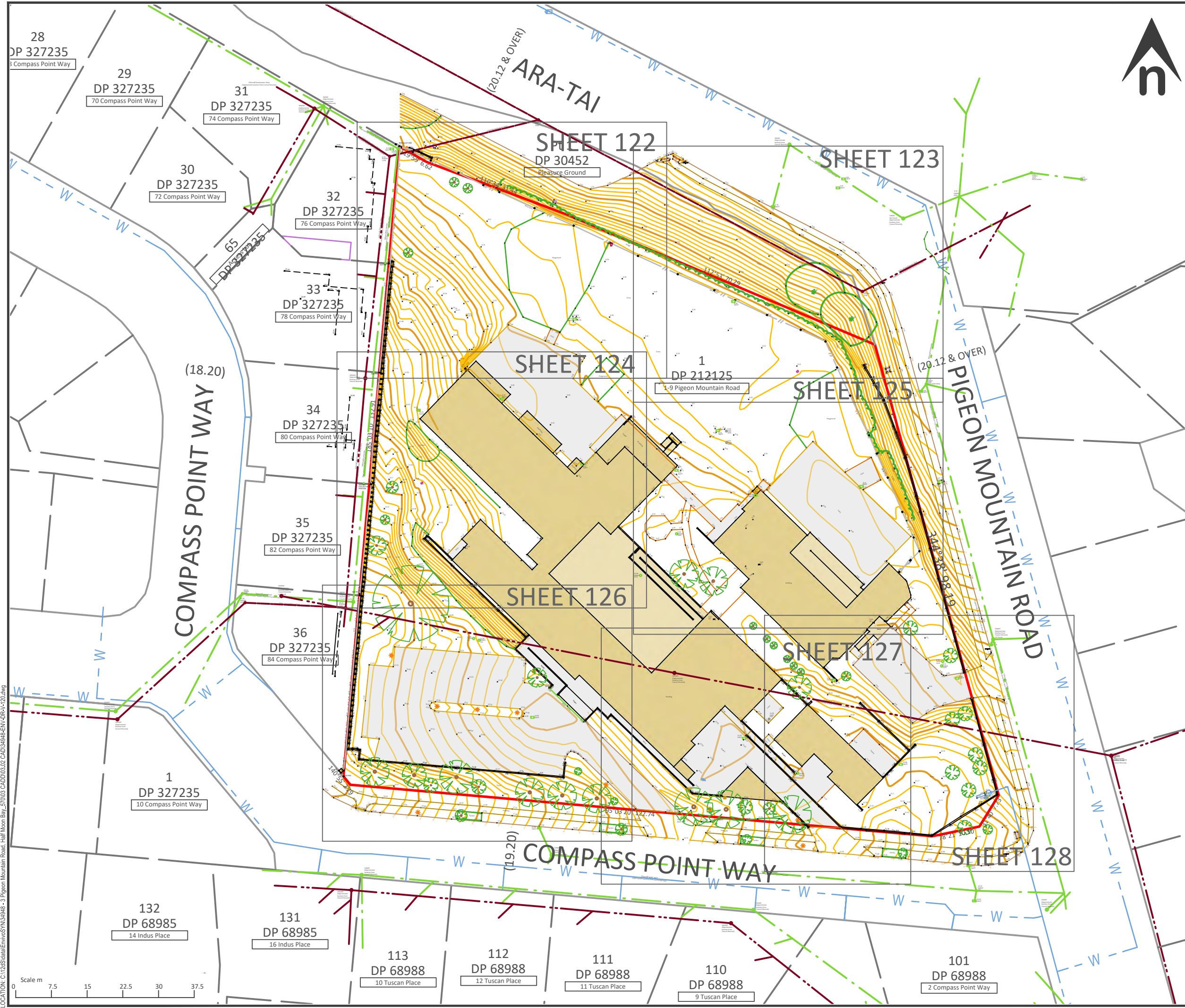
PROJECT/LOCATION  
**1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY**

LEGAL DESCRIPTION  
**LOT 1 DP 212125**

RECORD OF TITLE  
NA140A/266, 1.407 ha

NO	DATE	BY	SCALE	ZONING
1	10/11/25	SC	DATE	DATE
2	12/11/25	DATE	DATE	DATE
3	SCALE @A3	ZONING	MIXED HOUSING SUBURBAN	

PROJECT	ORIG	ZONE	LOC	TYPE	RL	DRG No	SUIT	REV
34948-ENV-00-XX-DR-V-	010	S2	A					



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DATE: 13/11/2025 09:55:13 pm LOGIN NAME: SARAH CAMMICK LOCATION: C:\2525\envivo\34948-3\Pigeon Mountain Road\_half Moon Bay\_57003 CAD\03.02 CAD\34948-ENV-DR-V-120.dwg





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REV	BY	DATE	APP'D	REVISION/ COMMENTS

TITLE								
SITE PLAN								
PROJECT/LOCATION								
1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY								
LEGAL DESCRIPTION								
LOT 1 DP 212125								
RECORD OF TITLE								
NA140A/266, 1.407 ha								
SURVEYED	DRAWN	DESIGNED	APPROVED					
KP	SC	DATE	DATE					
10/11/25	12/11/25							
SCALE @A3	ZONING							
1:750	MIXED HOUSING SUBURBAN							
PROJECT	ORIG	ZONE	LOC	TYPE	RL	DRG No	SUIT	REV
34948-ENV-00-XX-DR-V-	120	S2-	A					



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REV	BY	DATE	APP'D	REVISION/ COMMENTS

**TITLE**  
 AERIAL SITE PLAN

**PROJECT/LOCATION**  
 1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY

**LEGAL DESCRIPTION**  
 LOT 1 DP 212125

**RECORD OF TITLE**  
 NA140A/266, 1.407 ha

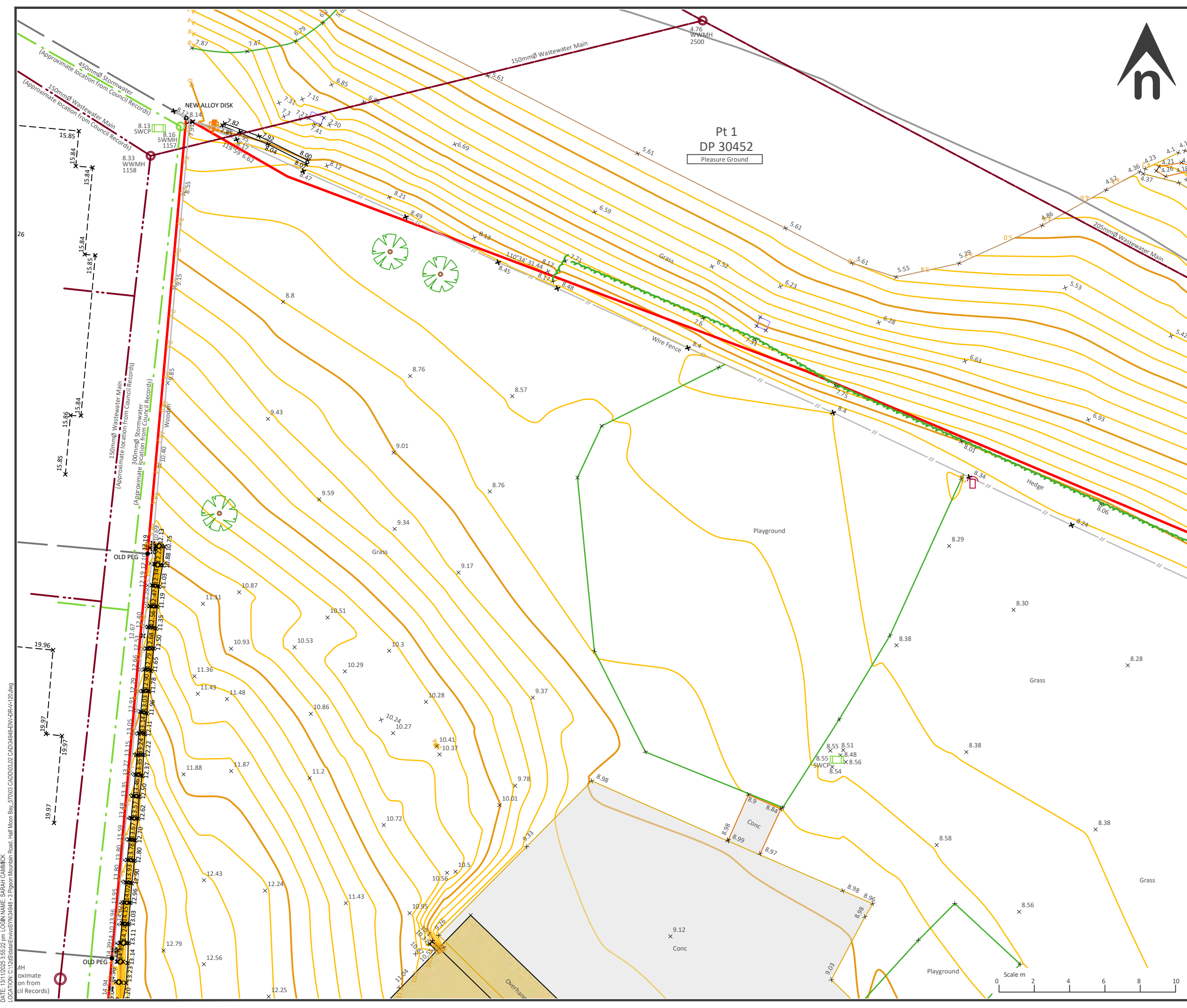
NO	SURVEYED	DRAWN	DESIGNED	APPROVED
CP	SC	DATE	DATE	DATE

SCALE @A3	ZONING
1:750	MIXED HOUSING SUBURBAN

PROJECT	ORIG	ZONE	LOC	TYPE	RL	DRG No	SUIT	REV
34948-ENV-00-XX-DR-V-							121 - S2 - A	


DATE: 13/11/2025 3:55:10 pm LOGIN NAME: SARAH CAMMICK  
 LOCATION: C:\266\34948-ENV-00-XX-DR-V-120.dwg





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REV	BY	DATE	APP'D	REVISION/ COMMENTS

**TITLE** SITE PLAN

**PROJECT/LOCATION** 1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY

**LEGAL DESCRIPTION** LOT 1 DP 212125

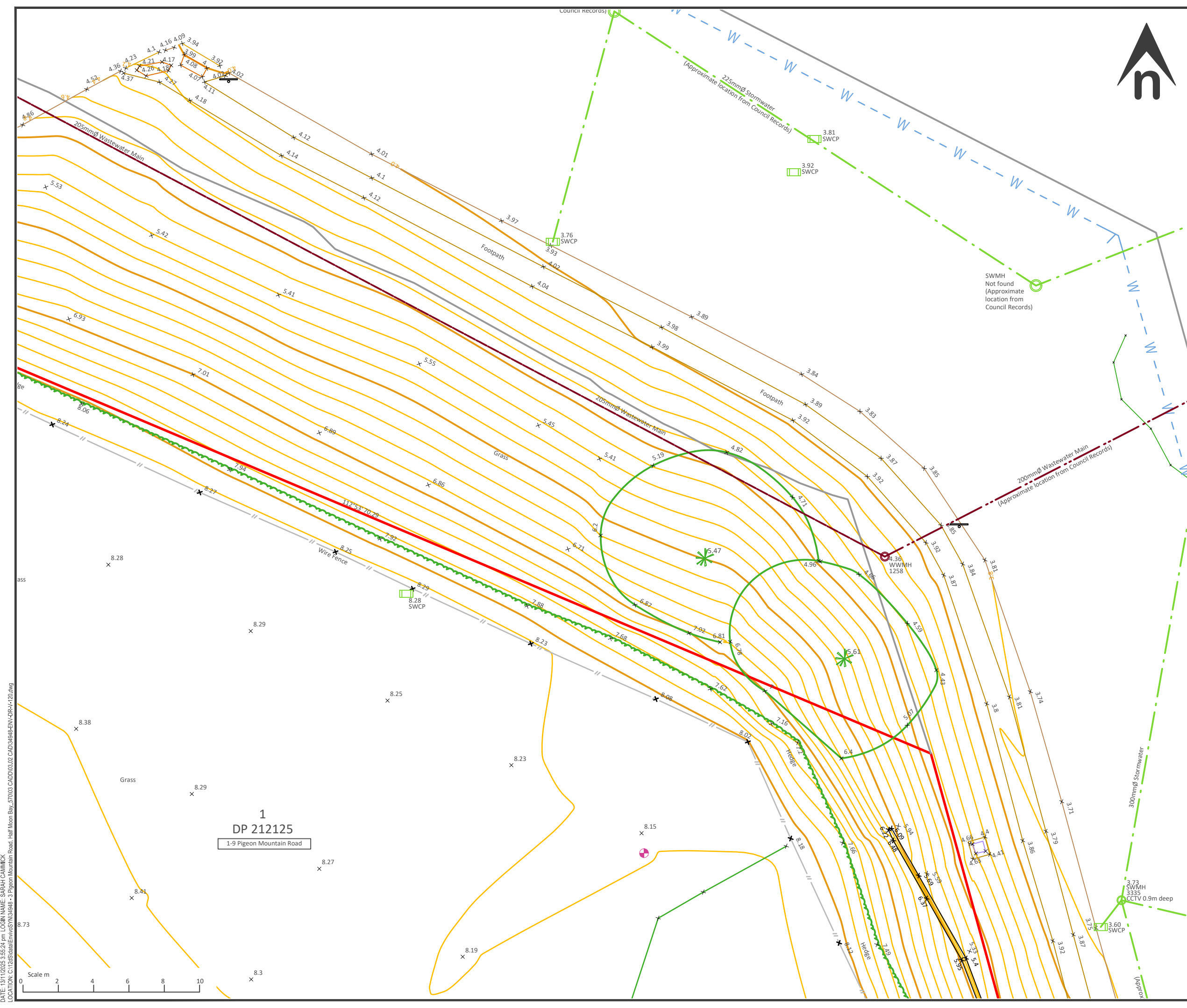
**RECORD OF TITLE** NA140A/266, 1.407 ha

SRVYED	DRWN	DSGN	APPRD
KP	SC	DATE	DATE
10/11/25	12/11/25		

SCALE @A3 ZONING MIXED HOUSING SUBURBAN

PROJECT	ORIG	ZONE	LOC	TYPE	RL	DRG No	SUIT	REV
34948-ENV-00-XX-DR-V-						122	S2-	A

DATE: 13/11/2025 3:55:22 pm LOGIN NAME: SARAH CAMMICK  
 LOCATION: C:\265\envivo\envivo\34948-3 Pigeon Mountain Road, Half Moon Bay\_57003 CAD\03\03.02 CAD\34948-ENV-DR-V-120.dwg



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REV	BY	DATE	APP'D	REVISION/ COMMENTS

**TITLE**  
 SITE PLAN

**PROJECT/LOCATION**  
 1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY

**LEGAL DESCRIPTION**  
 LOT 1 DP 212125

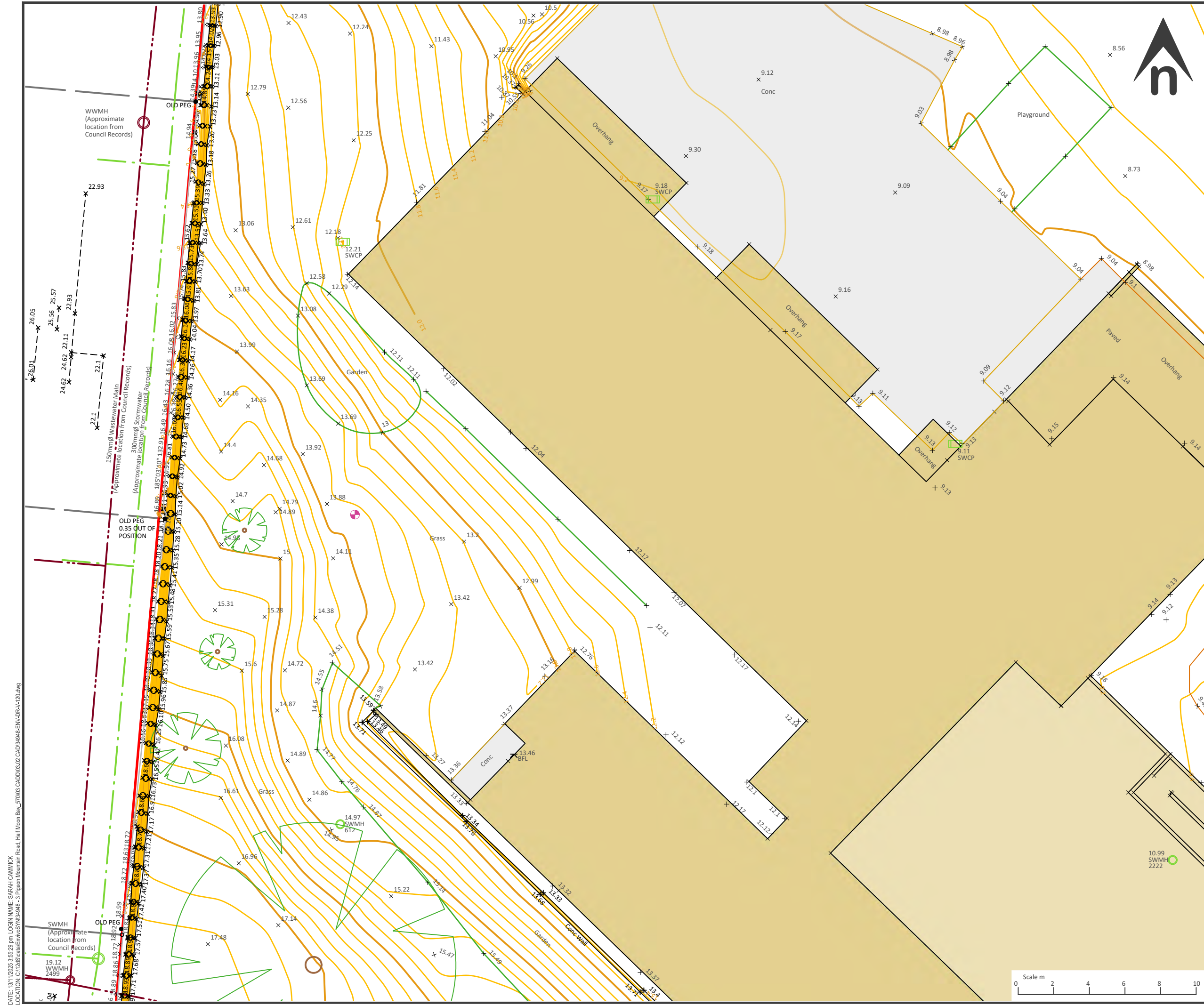
**RECORD OF TITLE**  
 NA140A/266, 1.407 ha

SURVEYED	DRAWN	DESIGNED	APPROVED
KP	SC	DATE	DATE

SCALE @A3 ZONING  
 1:200 MIXED HOUSING SUBURBAN

**PROJECT ORIG** ZONE LOC TYPE RL DRG No SUIT REV  
 34948-ENV-00-XX-DR-V- 123 - S2- A

DATE: 13/11/2025 16:52:04 PM LOGIN NAME: SARAH CAMMICK  
 LOCATION: C:\2625\envivo\34948-3 Pigeon Mountain Road\_half Moon Bay\_577003 CAD\03\03.02 CAD\34948-ENV-DR-V-123.dwg




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DATE: 13/11/2025 16:55:20 pm LOGIN NAME: SARAH CAMMICK  
 LOCATION: C:\265\envivo\envivo\34948-3\Pigeon Mountain Road\_half Moon Bay\_57703 CAD\03\03.02 CAD\34948-ENV-DR-V-120.dwg



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REV	BY	DATE	APP'D	REVISION/ COMMENTS

**TITLE**

SITE PLAN

**PROJECT/LOCATION**

1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY

**LEGAL DESCRIPTION**

LOT 1 DP 212125

**RECORD OF TITLE**

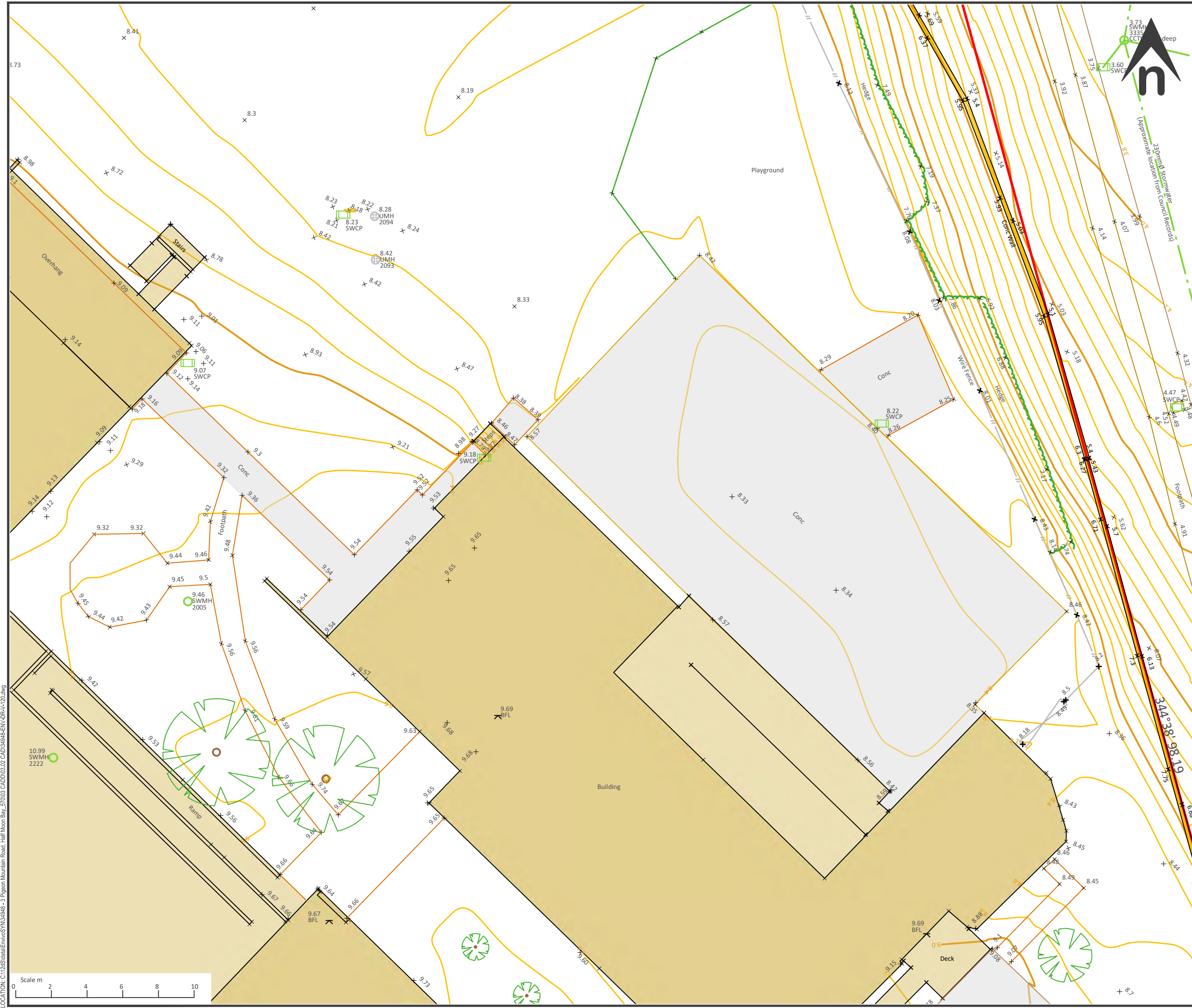
NA140A/266, 1.407 ha

SRVYED	DRWN	DSGN	APPRD
KP	SC	DATE	DATE

SCALE @A3 ZONING 1:200 MIXED HOUSING SUBURBAN

PROJECT	ORIG	ZONE	LOC	TYPE	RL	DRG No	SUIT	REV
34948-ENV-00-XX-DR-V-						124	S2-	A





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REV	BY	DATE	APP'D	REVISION/ COMMENTS

**TITLE**  
 SITE PLAN

**PROJECT/LOCATION**  
 1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY

**LEGAL DESCRIPTION**  
 LOT 1 DP 212125

**RECORD OF TITLE**  
 NA140A/266, 1.407 ha

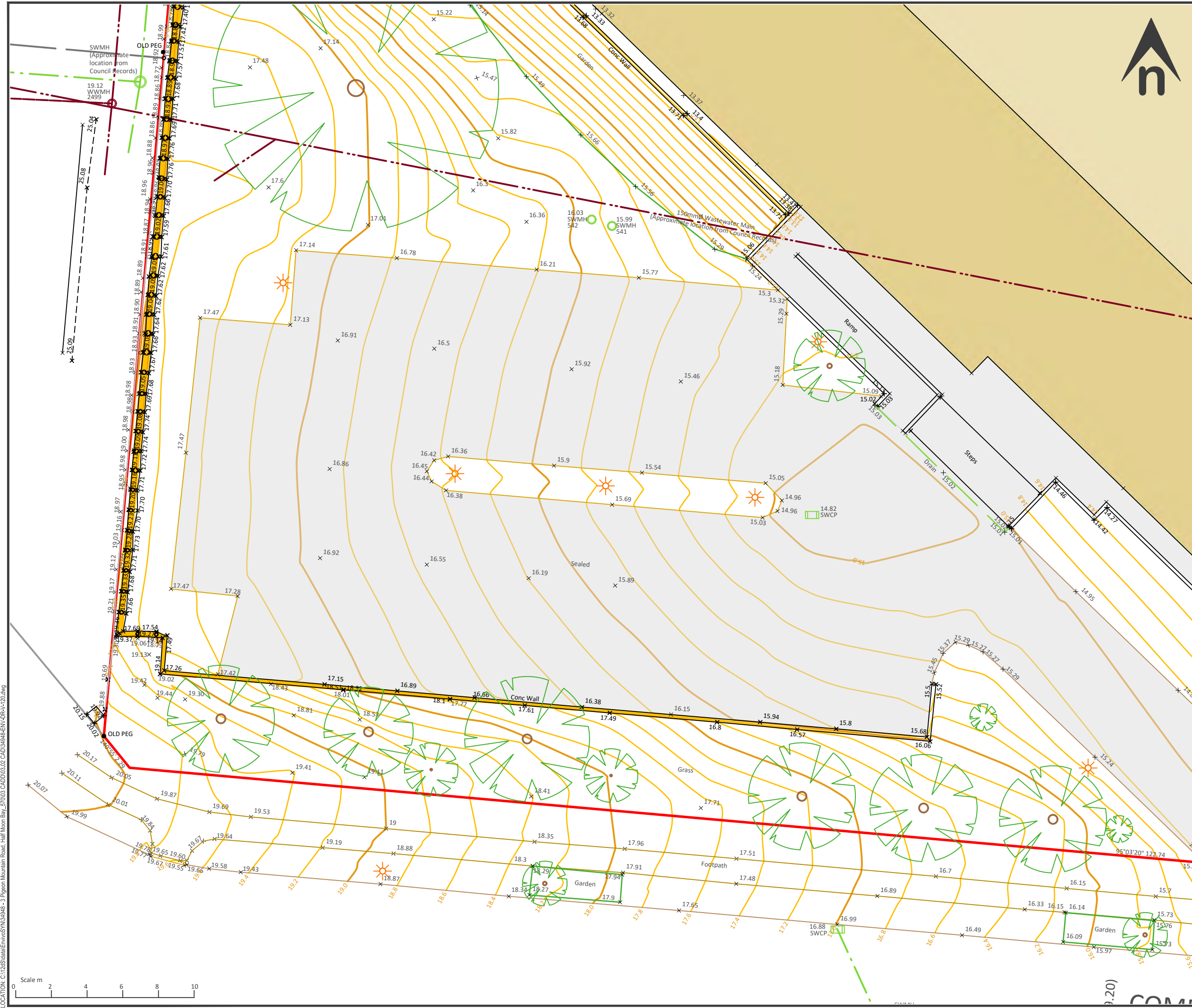
SURVEYED	DRAWN	DESIGNED	APPROVED
KP	SC	DATE	DATE

SCALE @A3 ZONING  
 1:200 MIXED HOUSING SUBURBAN

**PROJECT ORIG** ZONE LOC TYPE RL DRG No SUIT REV  
 34948-ENV-00-XX-DR-V- 125 - S2- A

DATE: 13/11/2025 16:55:33 pm LOGIN NAME: SARAH CAMMICK  
 LOCATION: C:\225\envivo\envivo\34948-3\Pigeon Mountain Road\_half Moon Bay\_57003 CAD\03\02 CAD\34948-ENV-DR-V-125.dwg






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DATE: 13/11/2025 16:55:37 PM LOGIN NAME: SARAH CAMMICK  
 LOCATION: C:\2525\envivo\34948-3 Pigeon Mountain Road, Half Moon Bay\_57003 CAD\03\02 CAD\34948-ENV-DR-V-120.dwg





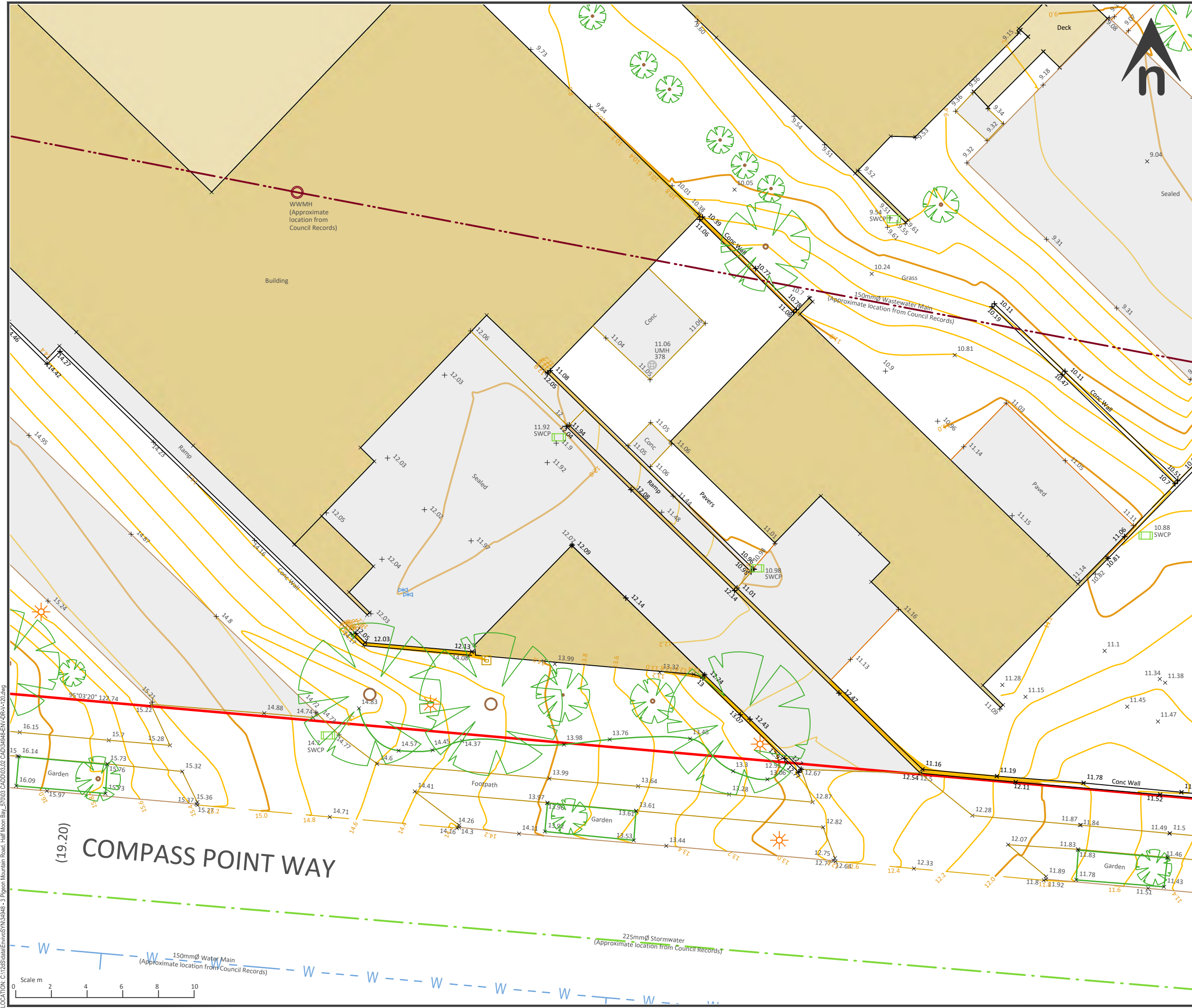
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REV	BY	DATE	APP'D	REVISION/ COMMENTS

<b>TITLE</b>	SITE PLAN							
<b>PROJECT/LOCATION</b>	1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY							
<b>LEGAL DESCRIPTION</b>	LOT 1 DP 212125							
<b>RECORD OF TITLE</b>	NA140A/266, 1.407 ha							
<b>SURVEYED</b>	<b>DRAWN</b>	<b>DESIGNED</b>	<b>APPROVED</b>					
KP	SC	DATE	DATE					
10/11/25	12/11/25							
<b>SCALE @A3</b>	<b>ZONING</b>							
1:200	MIXED HOUSING SUBURBAN							
<b>PROJECT</b>	<b>ORIG</b>	<b>ZONE</b>	<b>LOC</b>	<b>TYPE</b>	<b>RL</b>	<b>DRG No</b>	<b>SUIT</b>	<b>REV</b>
34948-ENV-00-XX-DR-V-	126	S2-	A					

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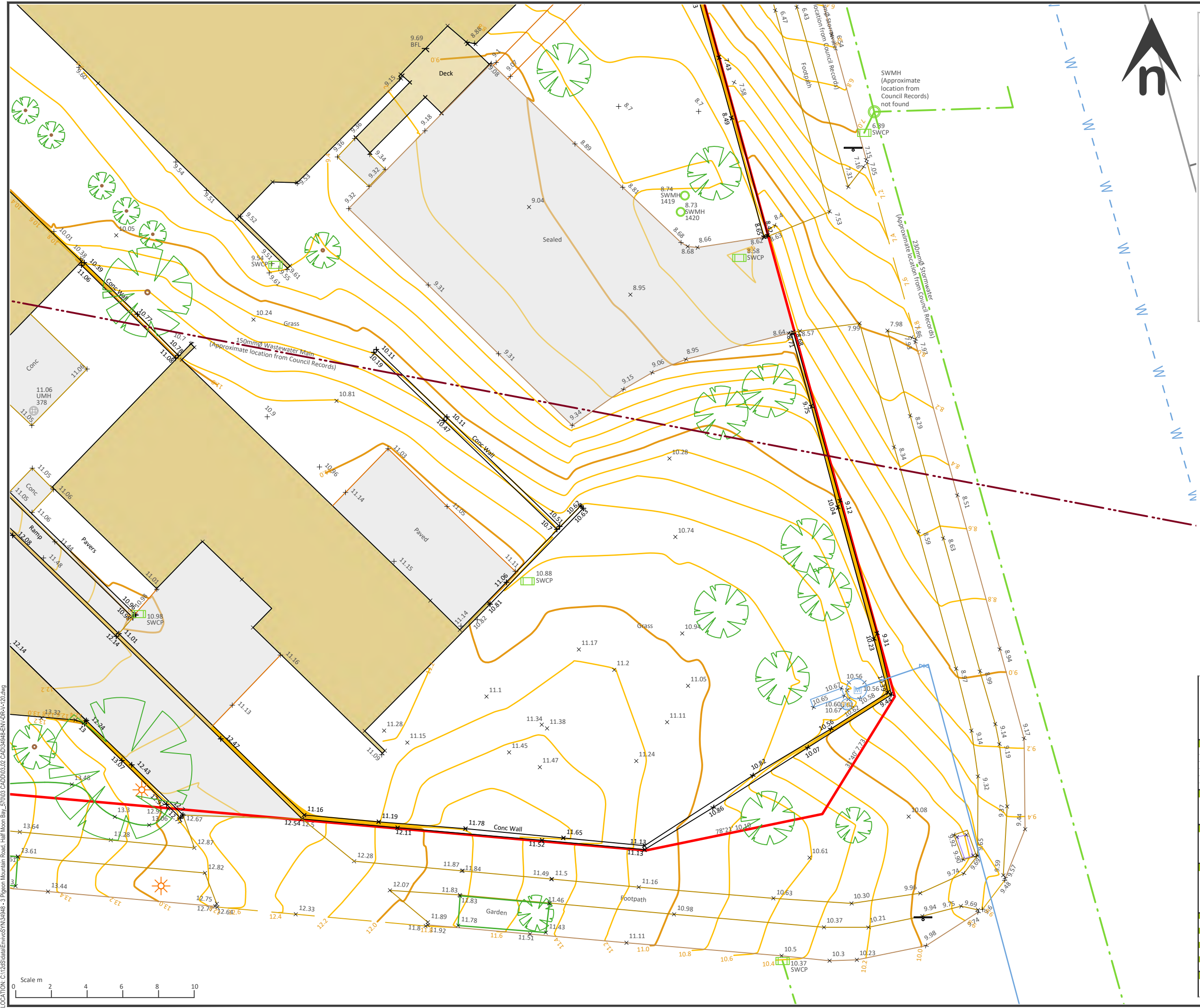


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REV	BY	DATE	APP'D	REVISION/ COMMENTS

<b>TITLE</b>	SITE PLAN								
<b>PROJECT/LOCATION</b>	1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY								
<b>LEGAL DESCRIPTION</b>	LOT 1 DP 212125								
<b>RECORD OF TITLE</b>	NA140A/266, 1.407 ha								
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KP	SC	DESIGNED	APPROVED						
10/11/25	12/11/25								
<b>DATE</b>									
<b>SCALE @A3</b>	1:200								
<b>ZONING</b>	MIXED HOUSING SUBURBAN								
<b>PROJECT ORIG</b>	34948-ENV-00-XX-DR-V- 127 - S2- A								

DATE: 13/11/2025 09:55:41 PM LOGIN NAME: SARAH CAMMICK  
 LOCATION: C:\2626\env\34948-3 Pigeon Mountain Road\_half Moon Bay\_57003 CAD\03\03.02 CAD\34948-ENV-DR-V-127.dwg



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DATE: 13/11/2025 15:53:43 pm LOGIN NAME: SARAH CAMMICK LOCATION: C:\2525\envivo\34948-3\Pigeon Mountain Road - Half Moon Bay\_57003 CAD\0302.CAD\34948-ENV-DR-V-120.dwg



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REV	BY	DATE	APP'D	REVISION/ COMMENTS

**TITLE**  
 SITE PLAN

**PROJECT/LOCATION**  
 1-9 PIGEON MOUNTAIN ROAD, HALF MOON BAY

**LEGAL DESCRIPTION**  
 LOT 1 DP 212125

**RECORD OF TITLE**  
 NA140A/266, 1.407 ha

SRVYED	DRWN	DSGN	APPRD
KP	SC	DATE	DATE
10/11/25	12/11/25		

SCALE @A3 ZONING  
 1:200 MIXED HOUSING SUBURBAN

PROJECT	ORIG	ZONE	LOC	TYPE	RL	DRG No	SUIT	REV
34948-ENV-00-XX-DR-V-						128	S2-	A

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 be 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.

- 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<sup>1</sup> (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.<sup>2</sup>

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.<sup>3</sup>

### **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<sup>4</sup>. I will be able to give you an updated<sup>4</sup> 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](mailto:aaron@civilplan.co.nz) and quote the application number above.

Yours sincerely,

**Aaron Grey**  
**Consultant Planner**

---

<sup>1</sup> Section 92A(1) of the RMA

<sup>2</sup> Section 95C of the RMA

<sup>3</sup> Section 36AAB(2) of the RMA

<sup>4</sup> Section 88C(2) of the RMA

Geotechnical Reference Information  
from J00538 AA Geotechnical Investigation Report  
updated 22.09.2023



27C WAIPAREIRA AVENUE  
HENDERSON

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

PROJECT  
3 PIGEON MOUNTAIN  
HALF MOON BAY  
AUCKLAND

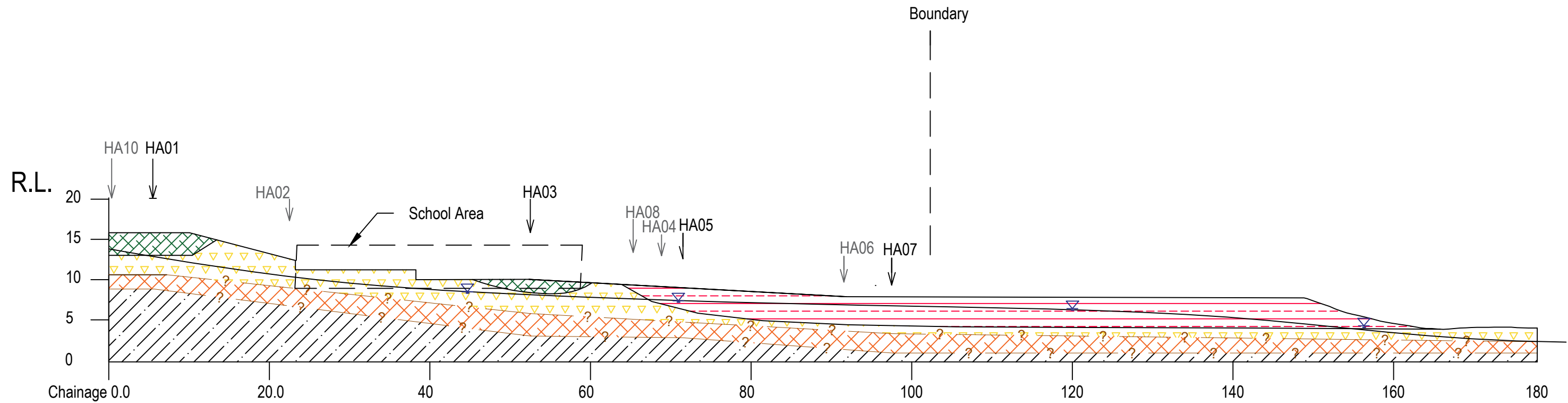
DRAWING TITLE  
INVESTIGATION PLAN

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



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**

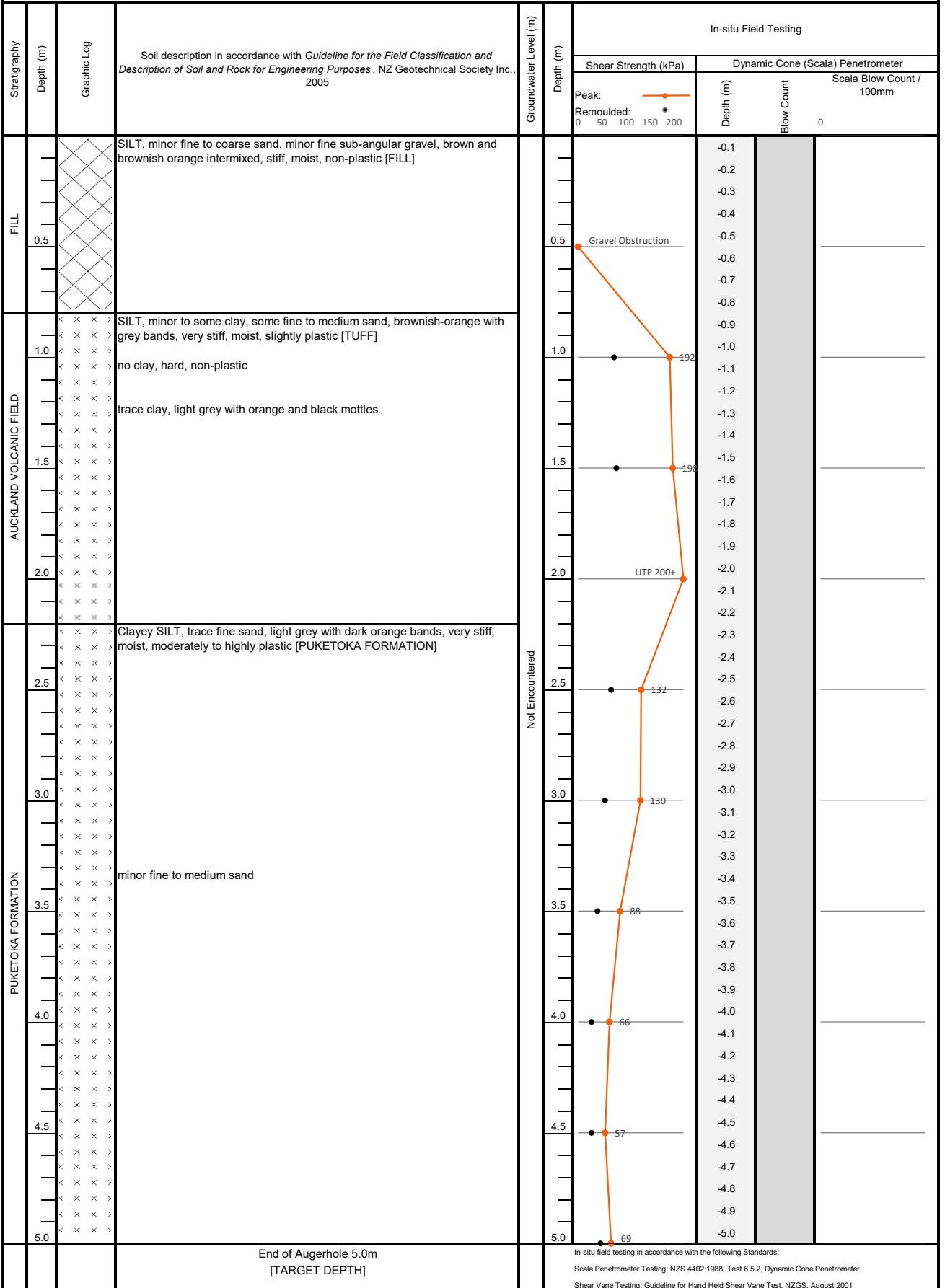
Date:	JUL 2022
Cad Ref:	J00538 r2.dwg
Designed:	BL
Drawn:	BL
Checked:	NJ

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

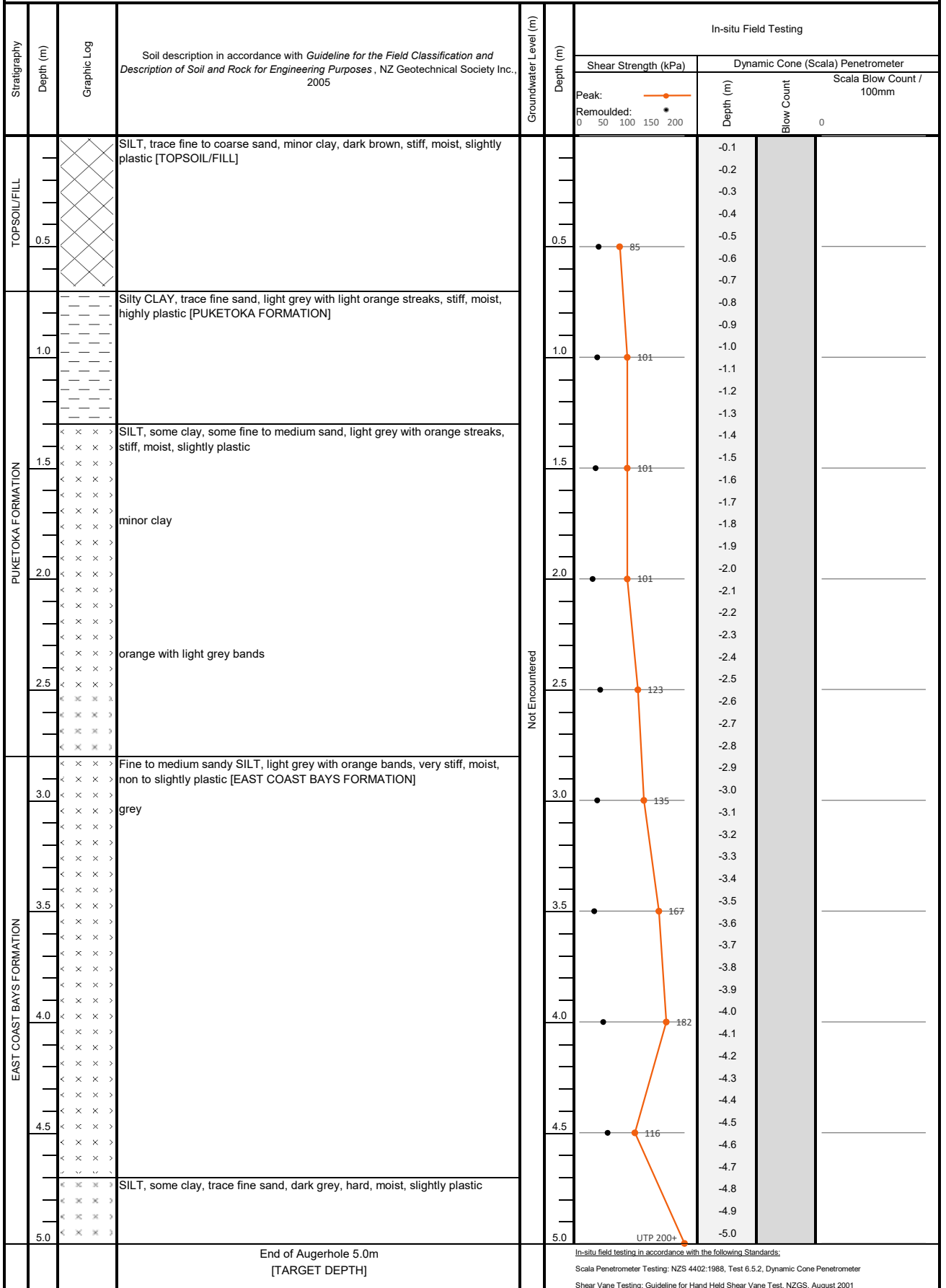
Check all dimensions and levels on site before commencing construction.  
 This drawing and design remains the property of Total Ground Engineering and may not be reproduced without the written permission of Total Ground Engineering.

PAPER SIZE	A3	JOB No.	DWG No.	REV
SCALE	1:500	J00538	101	B

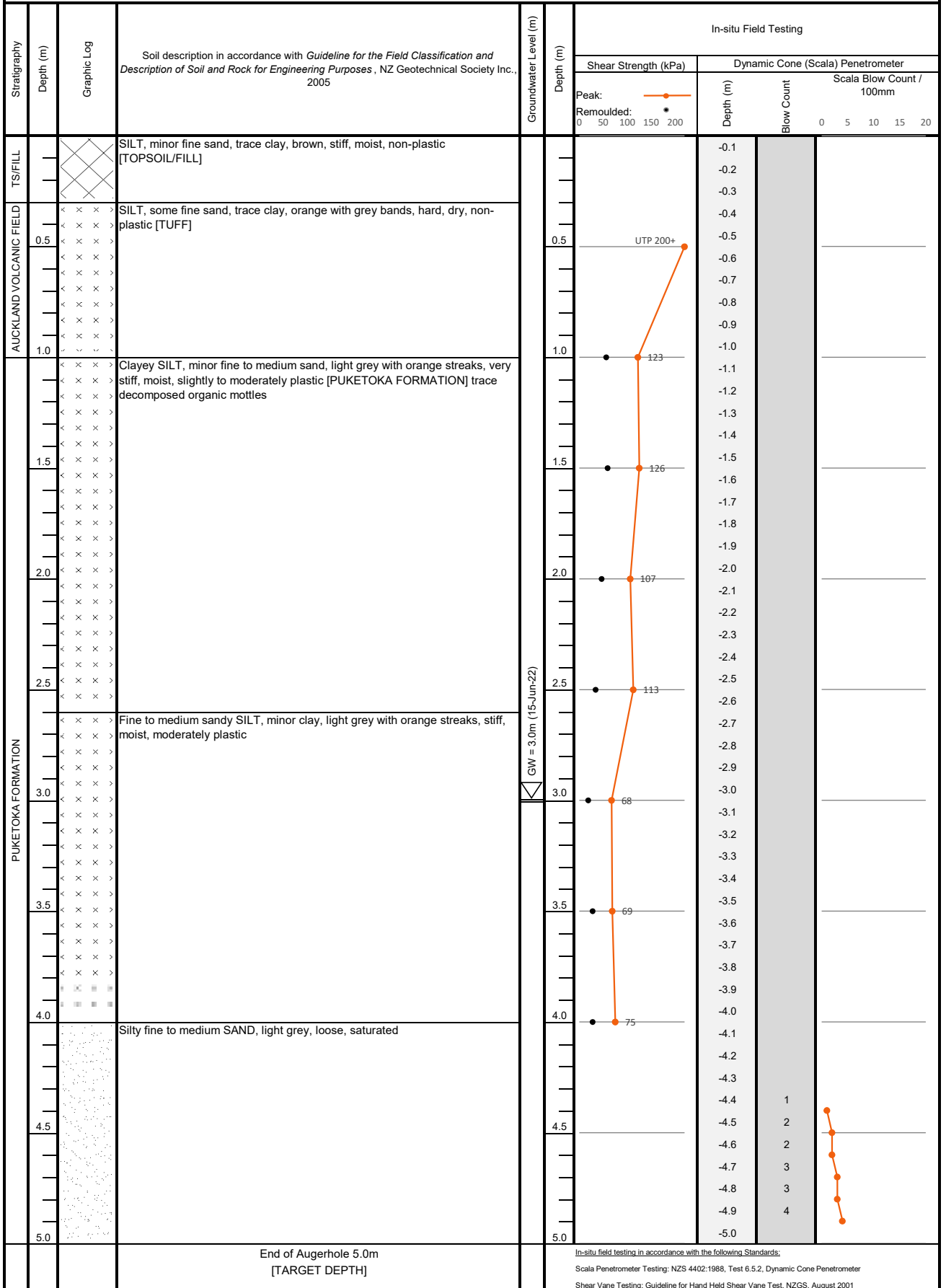
Drill Type: 50mmØ Hand Auger Project No: J00538 Logged By: JH  
 Drilled By: JH Coordinates: NZTM2000 E1769285.17 N5916423.99 Shear Vane No: 2982  
 Date Started: 15-Jun-22 Ground Conditions: Slightly sloping, Grass Calibration Factor: 1.571  
 Date Finished: 15-Jun-22 Groundwater Level (m): Not Encountered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



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



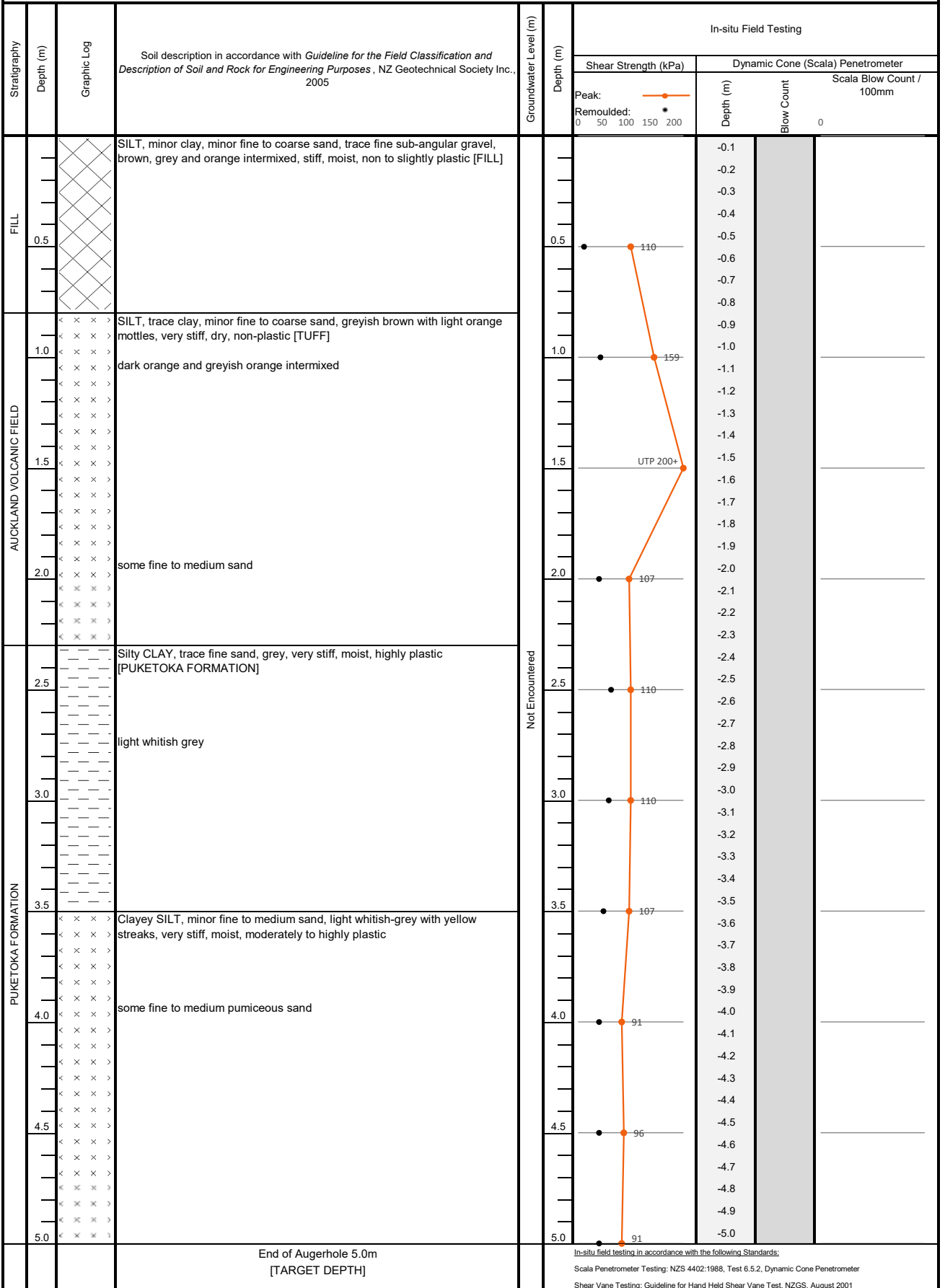
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 Drilled By: JH Coordinates: NZTM2000 E1769323.22 N5916452.24 Shear Vane No: 2982  
 Date Started: 15-Jun-22 Ground Conditions: Near level, Grass Calibration Factor: 1.571  
 Date Finished: 15-Jun-22 Groundwater Level (m): 3.0m (15-Jun-22) Calibration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



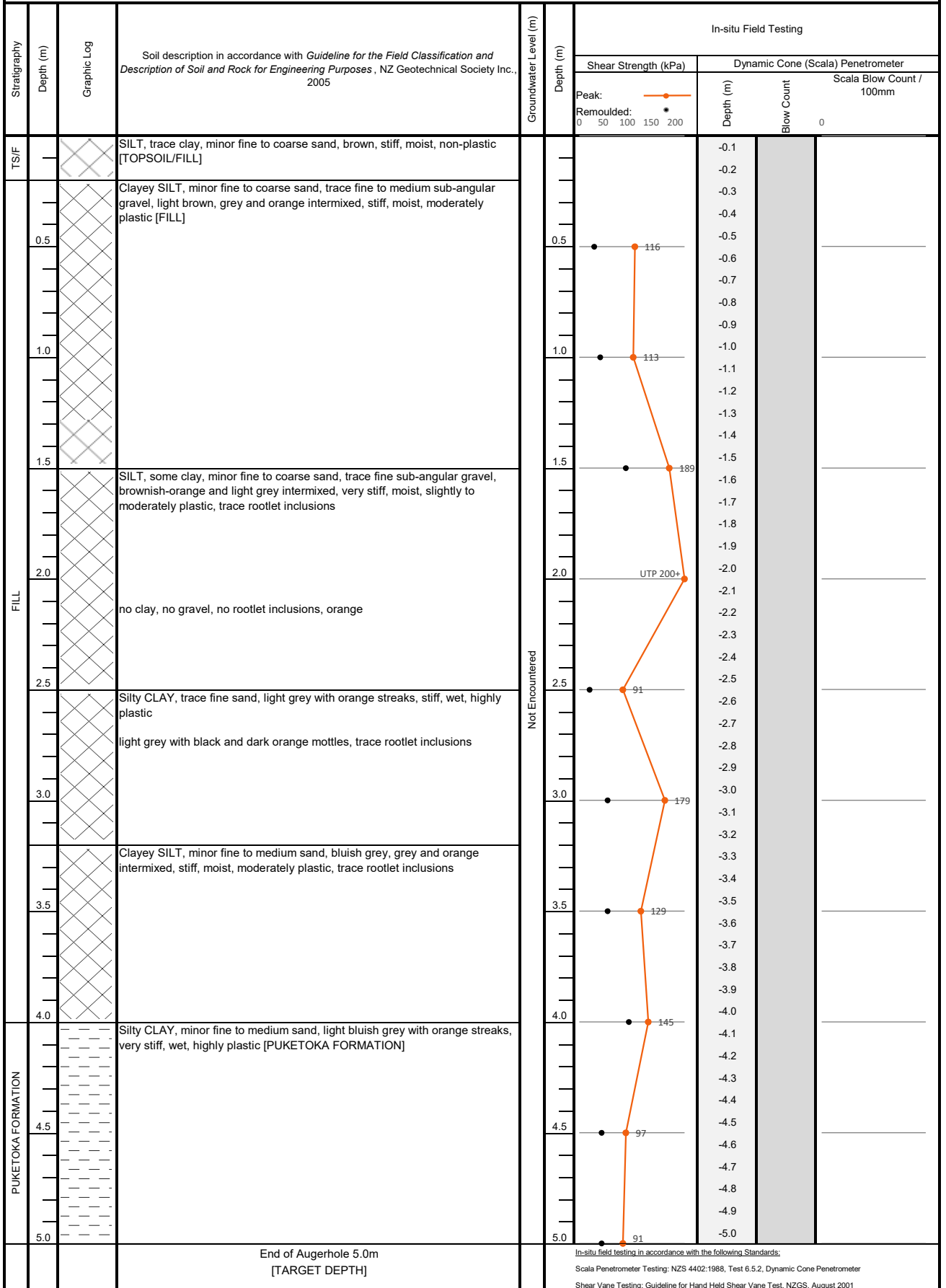
End of Augerhole 5.0m  
 [TARGET DEPTH]

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

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



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

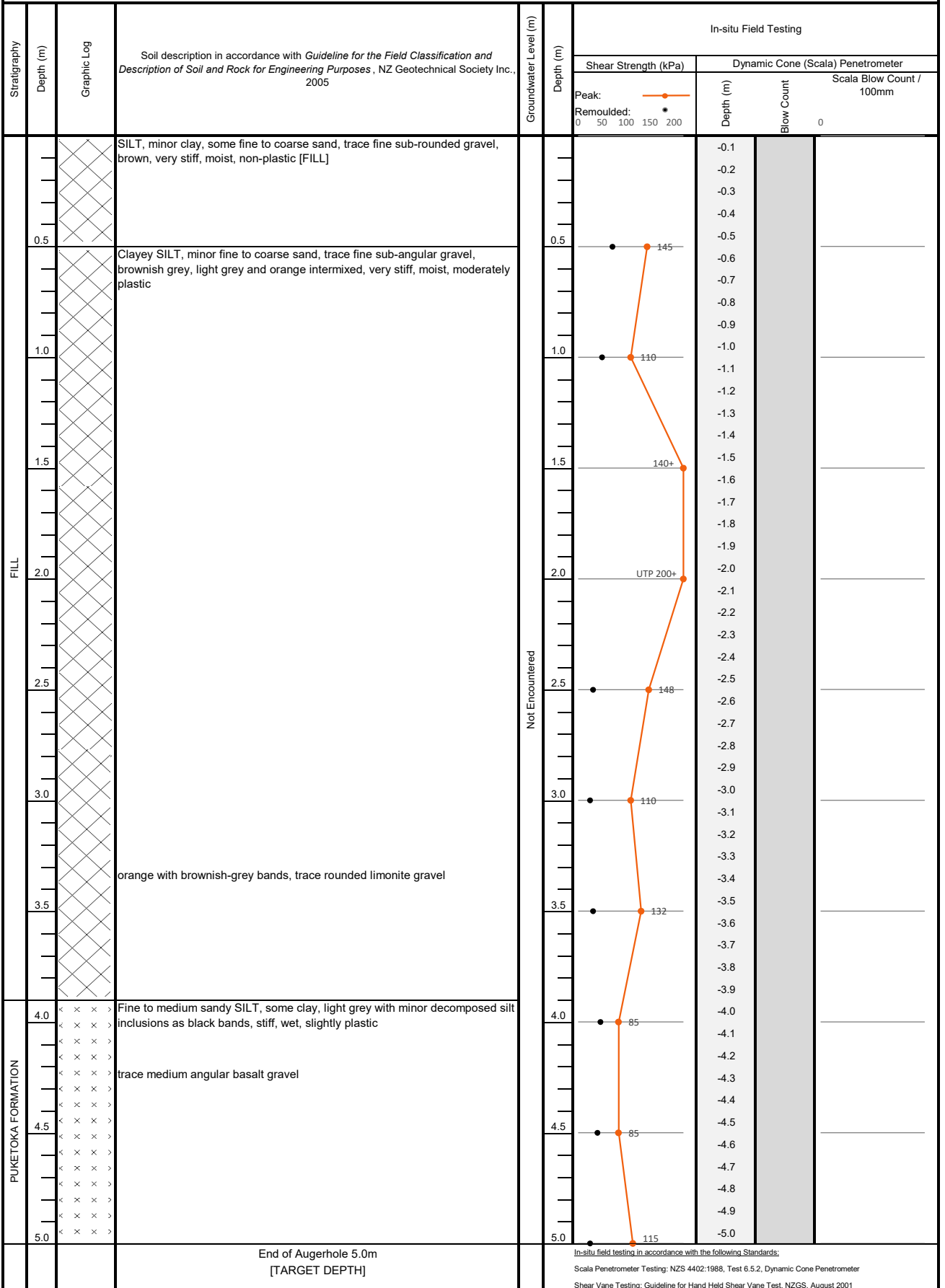


Drill Type: 50mmØ Hand Auger Project No: J00538 Logged By: JH  
 Drilled By: JH Coordinates: NZTM2000 E1769355.93 N5916465.98 Shear Vane No: 2982  
 Date Started: 16-Jun-22 Ground Conditions: Sloping, Grass Calibration Factor: 1.571  
 Date Finished: 16-Jun-22 Groundwater Level (m): Not Encountered (16-Jun-22)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

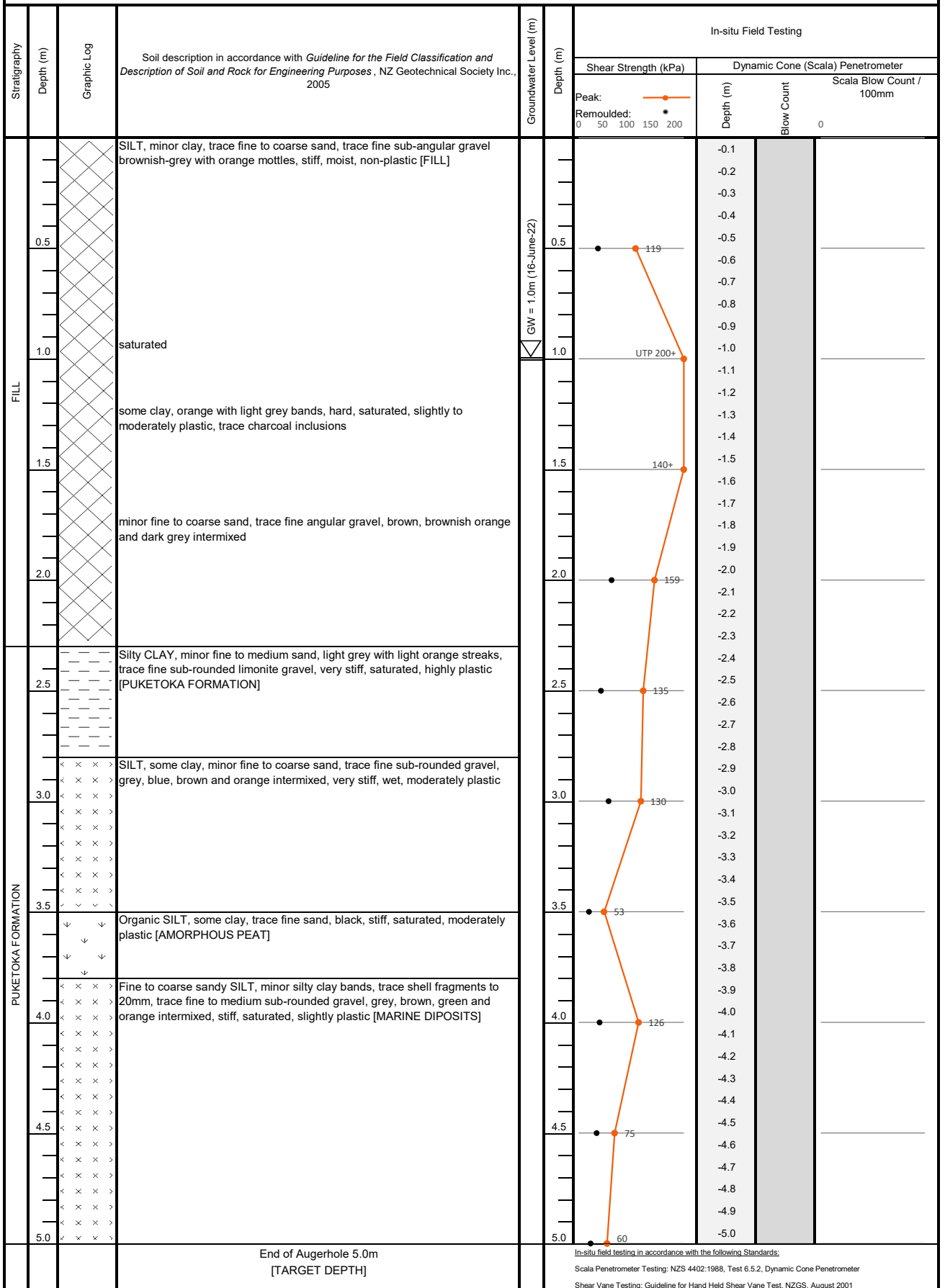
Stratigraphy	Depth (m)	Graphic Log	Soil description in accordance with <i>Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes</i> , NZ Geotechnical Society Inc., 2005	Groundwater Level (m)	Depth (m)	In-situ Field Testing			
						Shear Strength (kPa)		Dynamic Cone (Scala) Penetrometer	
						Peak:	Remoulded:	Depth (m)	Scala Blow Count / 100mm
FILL			SILT, minor fine to medium angular gravel, trace clay, dark brown, stiff, moist, non-plastic [FILL]			0			
	0.5		End of Augerhole 0.4m [GRAVEL OBSTRUCTION]		0.5				
	1.0				1.0				
	1.5				1.5				
	2.0				2.0				
	2.5				2.5				
	3.0				3.0				
	3.5				3.5				
	4.0				4.0				
	4.5				4.5				
	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

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



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



### Scala Penetrometer Testing

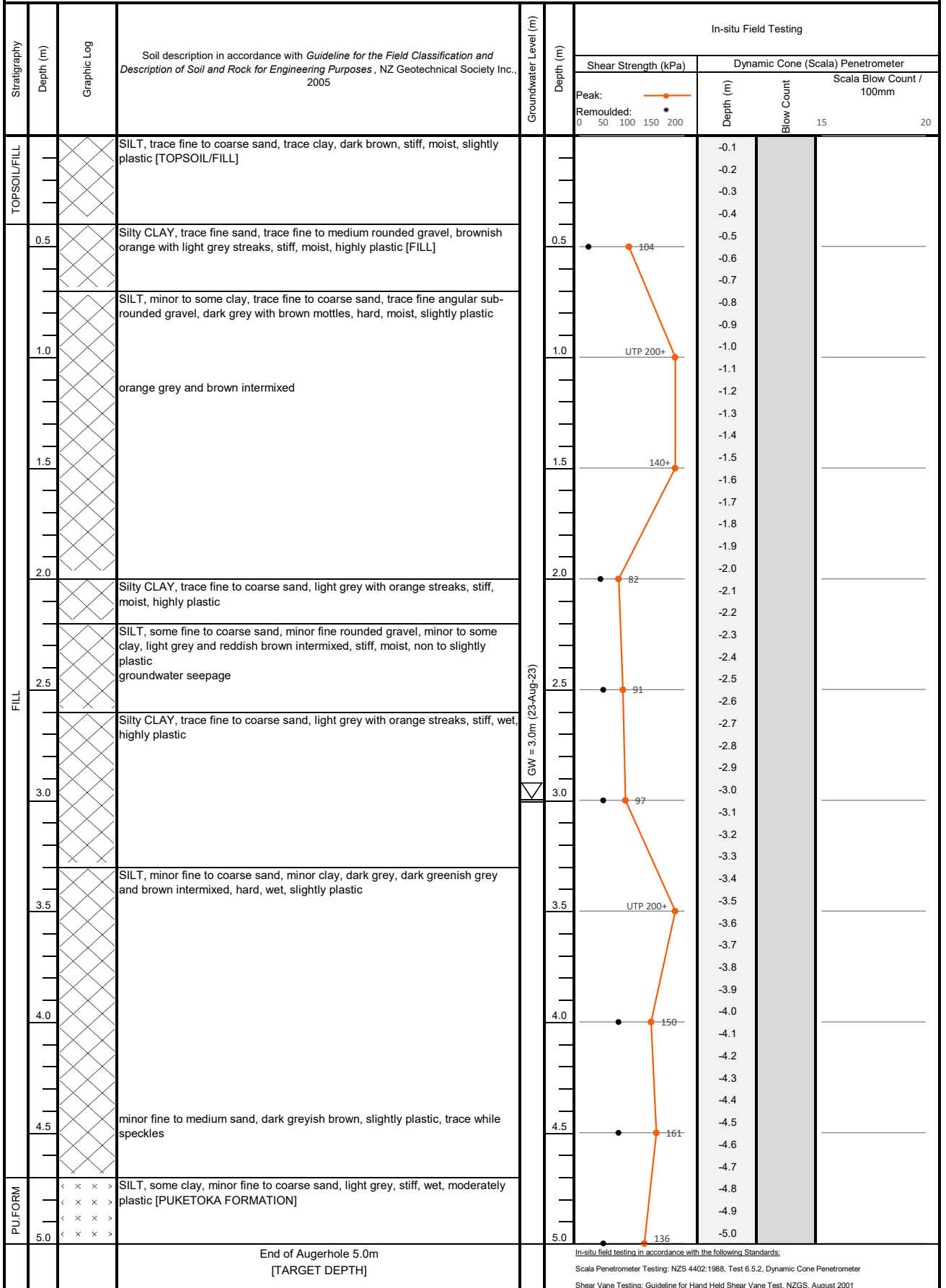
Date tested: 16-June-2022

Tested By: JH

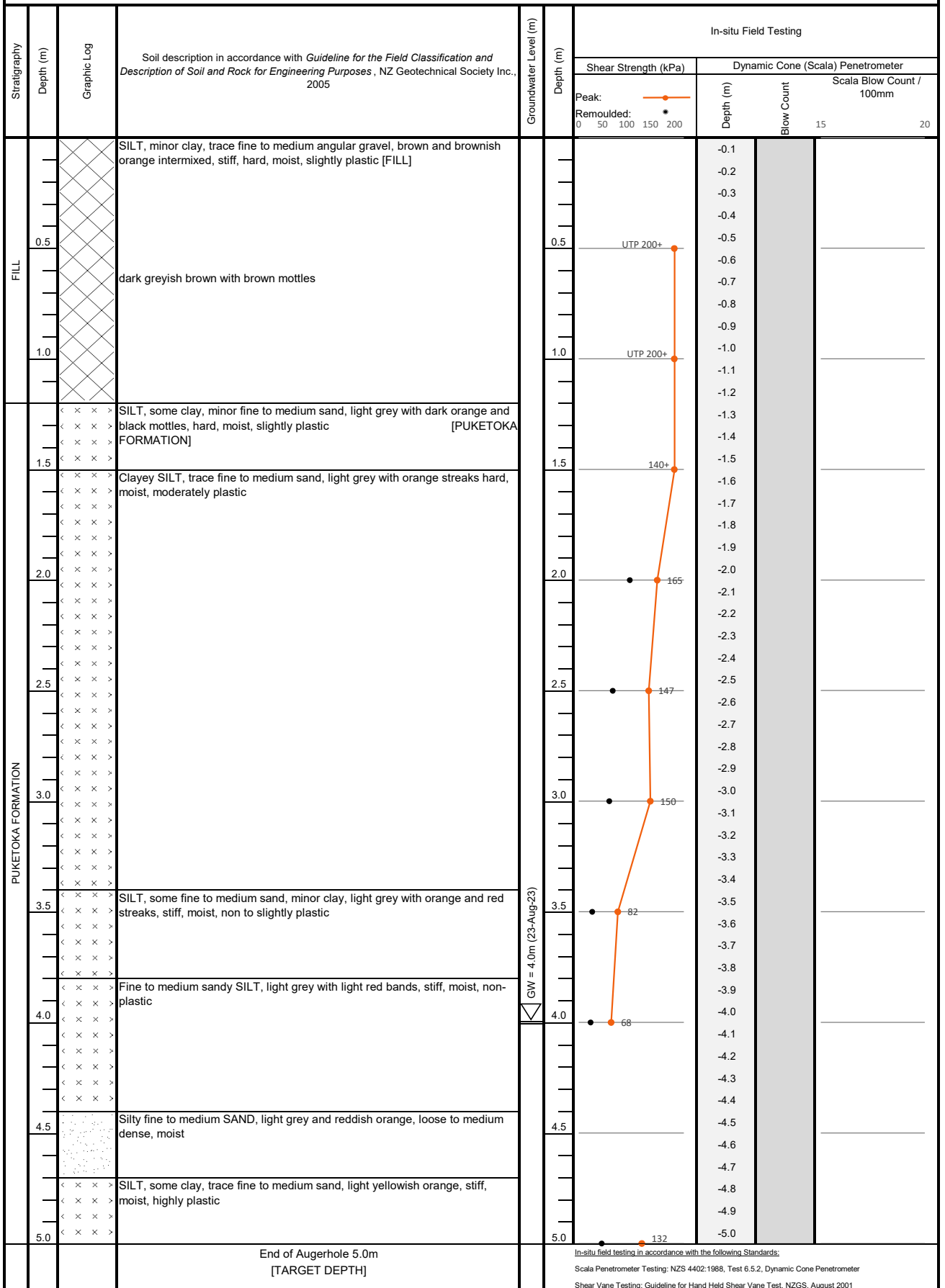
Test ID	HA01	Cont...	HA02	HA03	HA04	Cont...	HA05	HA07	Cont...	
Test from (m)	5.0	7.0	5.0	5.0	5.0	7.0	5.0	5.0	7.0	
Depth (m)	Blows/100mm penetration									
0.1	1	20	3	5	3	17	1	1	16	
0.2	1	20+	5	6	3	16	2	2	18	
0.3	1		8	6	4	16	4	2	20	
0.4	3		9	8	5	17	5	4	20+	
0.5	4		12	8	6	17	6	3		
0.6	4		17	8	7	18	7	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

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



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



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

# **Appendix B**

## **Existing Retaining Wall Details**

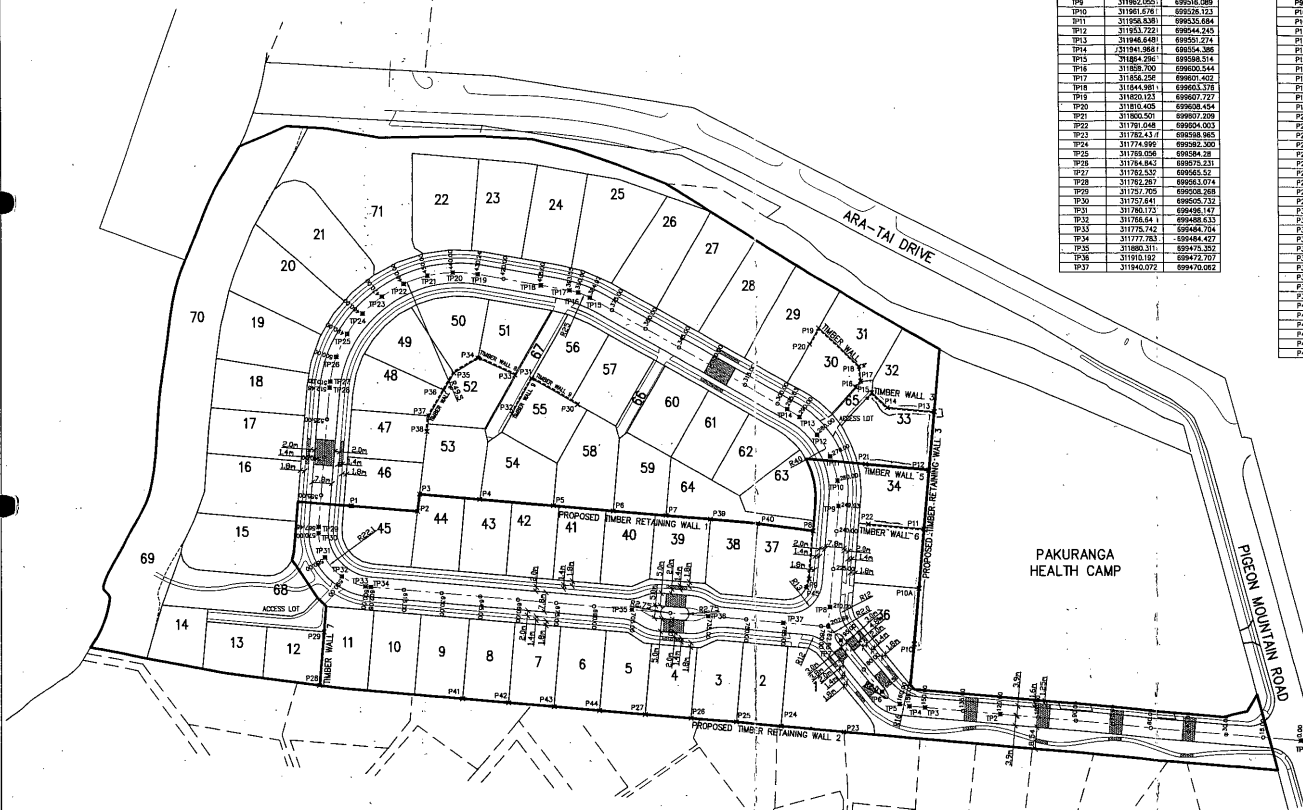


ROAD CENTRE LINE SETOUT COORDINATES

POINTS	EASTING	NORTHING
IP1	312148.020	89943.458
IP2	312026.488	89944.300
IP3	311998.818	89946.863
IP4	311993.821	89947.224
IP5	311985.742	89948.062
IP6	311978.398	89948.787
IP7	311982.805	89948.134
IP8	311988.237	89948.314
IP9	311992.050	89948.089
IP10	311991.678	89938.123
IP11	311988.530	89935.684
IP12	311933.722	89934.245
IP13	311848.481	89931.214
IP14	311841.861	89934.386
IP15	311824.296	89938.814
IP16	311828.700	89935.844
IP17	311858.238	89931.402
IP18	311844.881	89933.338
IP19	311820.123	89930.727
IP20	311810.402	89928.454
IP21	311800.201	89927.208
IP22	311781.948	89924.003
IP23	311782.451	89938.865
IP24	311774.899	89932.300
IP25	311789.026	89934.291
IP26	311784.842	89935.231
IP27	311782.237	89935.52
IP28	311782.237	89935.52
IP29	311782.237	89935.52
IP30	311782.237	89935.52
IP31	311782.237	89935.52
IP32	311782.237	89935.52
IP33	311782.237	89935.52
IP34	311778.742	89948.104
IP35	311777.783	89948.427
IP36	311800.311	89941.268
IP37	311810.182	89942.707
IP38	311840.072	89947.082

RETAINING WALL SETOUT COORDINATES

POINTS	EASTING	NORTHING
P1	311770.234	899316.498
P2	311796.210	899314.270
P3	311772.020	899282.240
P4	311803.830	899316.923
P5	311846.254	899316.392
P6	311812.905	899313.302
P7	311883.733	899312.482
P8	311852.024	899306.318
P9	311825.314	899312.722
P10	311892.427	899461.880
P10A	311884.384	899461.584
P11	311886.464	899307.002
P12	311865.317	899302.228
P13	312000.109	89935.123
P14	311862.208	89934.945
P15	311810.511	89935.834
P16	311869.548	89934.077
P17	31171.481	89935.383
P18	311810.529	89937.443
P19	311854.481	89936.377
P20	311900.848	89936.060
P21	311873.962	89935.828
P22	311874.548	89936.841
P23	311864.074	899427.053
P24	311829.084	899423.207
P25	311921.134	899432.888
P26	311933.224	899432.489
P27	311885.285	899431.080
P28	311752.833	899445.810
P29	311759.895	899445.894
P30	311859.318	89936.325
P31	311841.304	89936.594
P32	311833.986	89935.822
P33	311834.336	89936.013
P34	311802.12	89937.017
P35	311810.31	89937.053
P36	311806.79	89936.062
P37	311800.891	89935.814
P38	311806.125	899345.724
P39	311811.26	89935.273
P40	311830.01	89936.05
P41	311813.58	89940.405
P42	311832.81	89940.85
P43	311848.45	899437.48
P44	311887.15	899438.63
P45	311848.59	899481.95



*Blair*  
X 4/12/02

PAKURANGA HEALTH CAMP

CONSENT ISSUE

SURVEYED BY:	DRAWN BY:	ADP
DATE SURVEYED:	DATE PLOTTED:	13.11.02
SDMAP REF.:	CAD REFERENCE:	14152-05 SET/02
	CAD REF'S:	
DESIGNER:	ADP	APPROVED:
CHECKER:	AMB	JCT

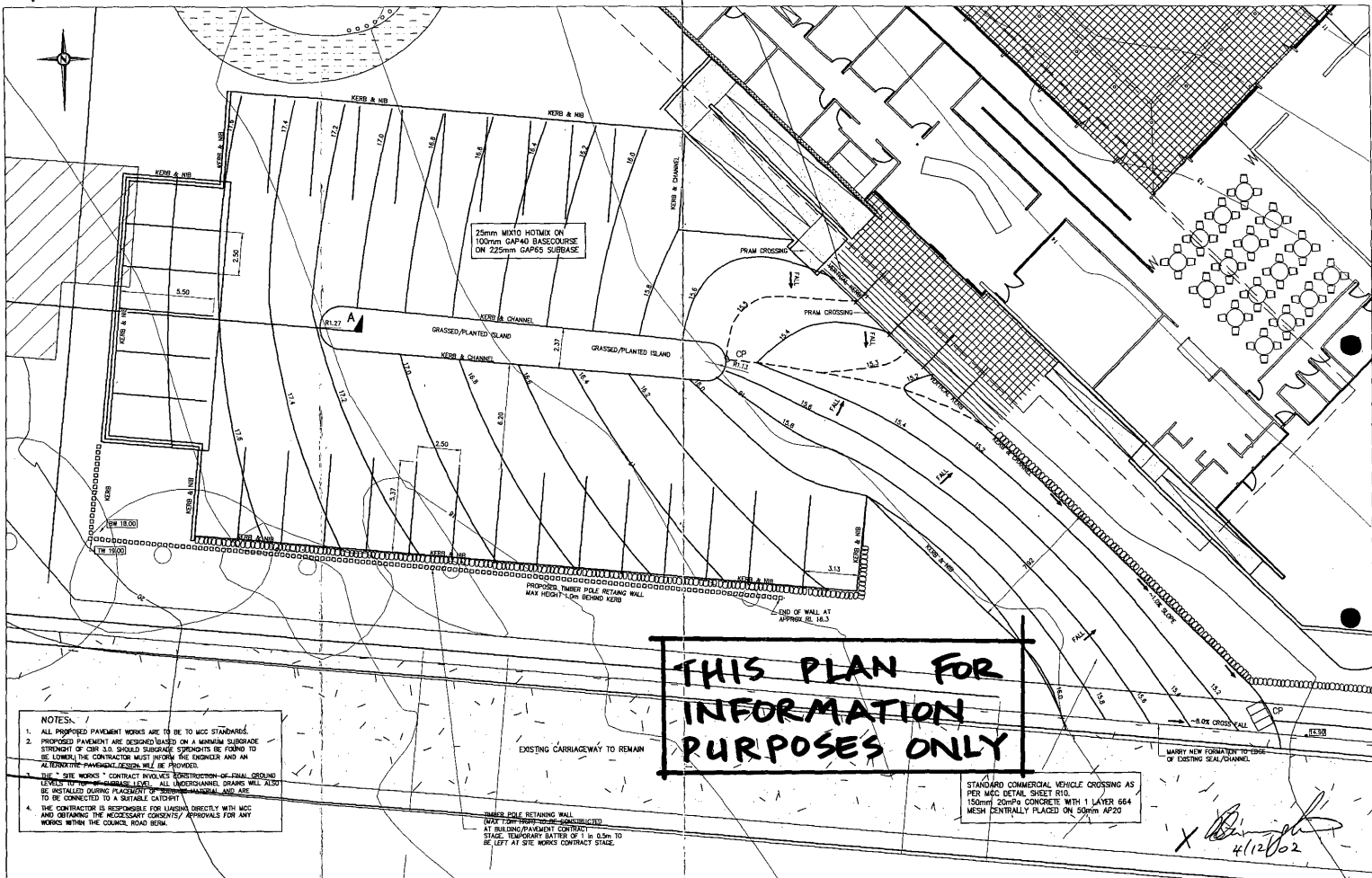
THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED, WITHOUT THE WRITTEN PERMISSION OF HARRISON GRIERSON CONSULTANTS LTD

**HARRISON GRIERSON**  
HG  
CONSULTING ENGINEERS SURVEYORS PLANNERS

ST JUST ENTERPRISES LTD  
COMPASS POINT SUBDIVISION  
HALF MOON BAY

ROAD CENTRE LINE LAYOUT AND  
RETAINING WALL SETOUT PLAN

PROJECT:	FILE:	PROJECT No:	08.14152.1
		DRAWING No:	14152-05 A
		SCALE:	1:750
		REV DATE REVISION:	1:1000(A3)



THIS PLAN FOR  
INFORMATION  
PURPOSES ONLY

- NOTES:
1. ALL PROPOSED PAVEMENT WORKS ARE TO BE TO MCC STANDARDS.
  2. PROPOSED PAVEMENT ARE DESIGNED BASED ON A MAXIMUM SUBGRADE STRENGTH OF 0.8 U.S. SHOULD SUBGRADE STRENGTHS 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 GRADING LEVELS TO FINISH GRADING LEVELS. ALL UNDERDRAINED GRABS WILL ALSO BE INSTALLED DURING PLACEMENT OF SUBGRADE AND ARE TO BE CONNECTED TO A SUITABLE CATCHPIST.
  4. THE CONTRACTOR IS RESPONSIBLE FOR LIAISON DIRECTLY WITH MCC AND OBTAINING THE NECESSARY CONSENTS/ APPROVALS FOR ANY WORKS WITHIN THE CHANNEL ROAD ROW.

THREE PILE RETAINING WALL  
MAY BE LEFT AT SITE WORKS CONTRACT STAGE.  
AT BUILDING PAVEMENT CONTRACT STAGE, DIMENSIONS GRABETS OF 1.0 TO 0.50 TO BE LEFT AT SITE WORKS CONTRACT STAGE.

STANDARD COMMERCIAL VEHICLE CROSSING AS PER MCC DETAIL SHEET R10.  
150mm 20mpa CONCRETE WITH 1 LAYER 664 MESH CENTRALLY PLACED ON 100mm AP20

*[Signature]*  
4/12/02

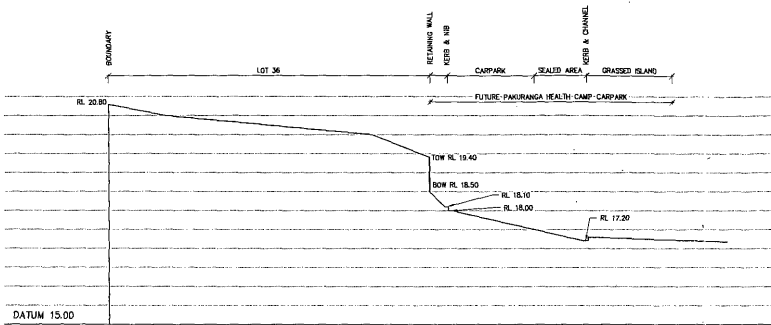
SURVEYED BY:	DATE PLOTTED:	AMB
SCALE SHEET NO:	DATE:	08.02.02
SUBMAP REF:	CAD SYSTEMS/PLANNOV/3177-PAV	
DESIGNED:	APPROVED:	AMB 10/01
CHECKED:		JTT

**HARRISON GRIERSON**  
**HC**  
CONSULTING ENGINEERS SURVEYORS PLANNERS

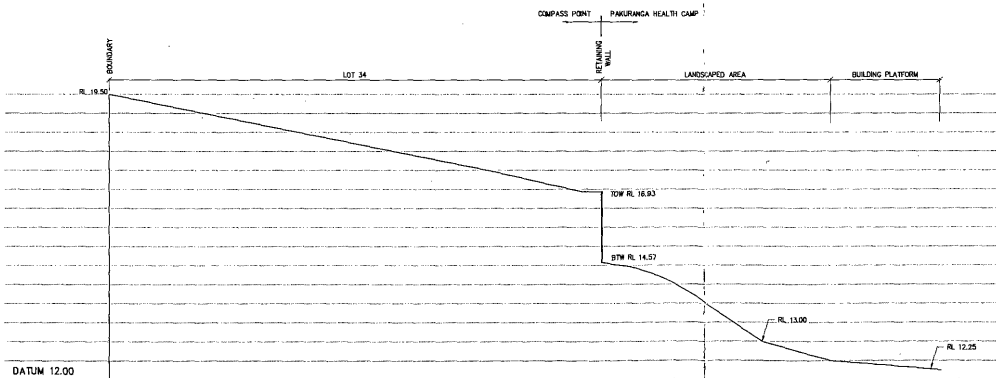
PROJECT: CHILDRENS HEALTH CAMP OF NEW ZEALAND PAKURANGA

TITLE: PROPOSED PAVEMENT PLAN 2

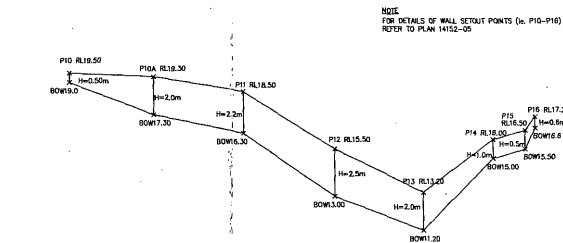
PROJECT No:	09.131.97.1
DRAWING No:	13177-PAV2
A DRAFT ISSUE	AMB 10/01 ORIGINAL SCALE: 1:100
REVISIONS	BY DATE REVISION SCALE: 1:200



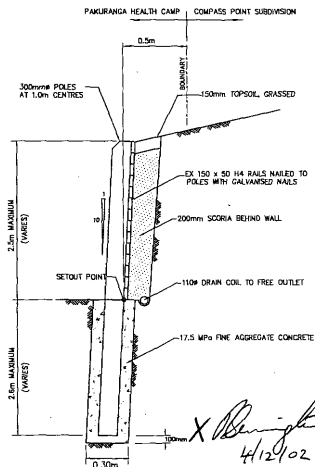
CROSS-SECTION A-A  
SCALE 1:100 VER. 1:150 HOR



CROSS-SECTION B-B  
SCALE 1:100 VER. 1:150 HOR



RETAINING WALL 3 LONGSECTION  
SCALE 1:500 HORZ. 1:100 VER.



TYPICAL TIMBER POLE RETAINING WALL DETAIL  
NOT TO SCALE

SURVEYED BY:	DRAWN BY:	ASD
DATE SURVEYED:	DATE PLOTTED:	18/11/02
SURMAP REF:	CAD REFERENCE/152-CROSS-SEC.AMG	
DESIGNED:	APPROVED:	
CHECKED:		

**HARRISON GRIERSON**  
**HG**

CONSULTING ENGINEERS SURVEYORS PLANNERS

PROJECT: ST JUST ENTERPRISES LIMITED  
COMPASS POINT SUBDIVISION  
HALF MOON BAY

TITLE: RETAINING WALL DETAILS AT BOUNDARY  
OF HEALTH CAMP (WALL 3)

PROJECT No:	DB1453.1
DRAWING No:	14152-WALL
DRAWN SCALE:	AS SHOWN
BY DATE:	REMSZ SCALE:

AT

# **Appendix C**

## **Analysis Outputs and Design Calcs**

### **Retaining wall design information summary**

**- updated in January 2026**

**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 2 - Proposed
	Existing Retaining Height		1.0 m	2.0 m	1.87 m	2.0m
Input Wall Properties	Timber Pole Category		Normal	Normal	Normal	Normal
	Unit Weight of Timber Pole	$\gamma_p$	5.3955	5.3955	5.3955	5.3955
	Unit Weight of Soil	$\gamma_s$	17	17	17	17
	Diameter of Pile	$d$	0.2	0.25	0.35	0.35
	Radius	$r$	0.1	0.125	0.175	0.175
	Pile Spacing	$s$	1.0	1.0	1.0	1.0
Output Wall Properties	Area	$A$	0.0314159	0.0490874	0.0962113	0.0962113
	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	$I$	7.854E-05	0.0001917	0.0007366	0.0007366
	Plaxis Virtual Depth	$d$	0.1731	0.2168	0.3031	0.303
	Plaxis Virtual Width of Pile	$b_p$	0.18149	0.2264178	0.3174242	0.317529
	Virtual width of soil between piles	$b_s$	0.81851	0.7735822	0.6825758	0.682471
Weighted average unit weight of wall	$\gamma_w$	14.893899	14.372534	13.316451	13.315235	
Plaxis Input Parameters	Axial Stiffness	$EA$	2.73E+05	4.27E+05	8.37E+05	8.37E+05
	Flexural Stiffness	$EI$	6.83E+02	1.67E+03	6.41E+03	6.41E+03
	Weight of Wall	$w$	0	0	0	0
<b>Design Strength of Timber Pole</b>						
ULS Design Actions	Plaxis Pile Moment	$M$	-	-	-	7.0
	Plaxis Pile Shear	$V$	-	-	-	9.6
	Depth to Max Plaxis Pile Moment	$l$	-	-	-	3.5
	Assumed Pile Diameter Taper	$t$	-	-	-	8
	Pile Spacing	$s$	1.0	1.0	1.0	1.0
	Earth Load Factor		1.5	1.5	1.5	1.5
	<b>Design Moment</b>	<b><math>M^*</math></b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>10.5</b>
	<b>Design Shear</b>	<b><math>V^*</math></b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>14.4</b>
Timber Design Factors	Strength Reduction Factor for Timber Poles	$\phi$	0.8	0.8	0.8	0.8
	Duration of Load Factor ( <i>permanent earth load</i> )	$k_1$	0.6	0.6	0.6	0.6
	Parallel Support Factor	$k_4$	1.0	1.0	1.0	1.0
	Grid System Factor	$k_5$	1.0	1.0	1.0	1.0
	Stability Factor for Bending and Shear ( $d/b = 1$ )	$k_8$	1.0	1.0	1.0	1.0
	Peeling or Shaving Factor for Bending	$k_{20}$	0.85	0.85	0.85	0.85
	Steaming Factor for Bending	$k_{21}$	0.85	0.85	0.85	0.85
	Peeling or Shaving Factor for Shear	$k_{20}$	1.0	1.0	1.0	1.0
	Steaming Factor for Shear	$k_{21}$	0.9	0.9	0.9	0.9
Dry Use Factor	$k_{22}$	1.0	1.0	1.0	1.0	
Section Properties	Characteristic Bending Strength	$f_b$	38	38	38	38
	Characteristic Shear Strength	$f_s$	3.1	3.1	3.1	3.1
	Second Moment of Area at Critical Depth	$Z$	#VALUE!	#VALUE!	#VALUE!	5,302,434
	Shear Area	$A_s$	20943.951	32724.923	64140.85	64140.85
Section Capacity Checks	Design Bending Moment	$M^*$	#VALUE!	#VALUE!	#VALUE!	10.5
	Design Bending Strength	$\phi M$	#VALUE!	#VALUE!	#VALUE!	69.9
		$M^*/\phi M$	#VALUE!	#VALUE!	#VALUE!	15%
	Design Shear Force	$V^*$	#VALUE!	#VALUE!	#VALUE!	14.4
	Design Shear Strength	$\phi V$	28.0	43.8	85.9	85.9
		$V^*/\phi V$	#VALUE!	#VALUE!	#VALUE!	17%



SHAPE ARCHITECTS LTD  
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 han@shapearchitects.co.nz  
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Project Name  
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 Address  
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 Client  
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Title  
 Proposed Basement Floor Plan  
 Drawing Number  
 A 2.4  
 Scale  
 1:300 AT A1

Project Number  
 207  
 Date  
 1/27/2026  
 Drawn By  
 HC

Issue Status  
 Resource Consent

**LEGENDS:**



**Adopted RL for Lower platform**



All drawings to be read in conjunction with engineers and consultants drawings & report.  
 Report any discrepancy between drawings and written specification to the architect prior to ordering materials or commencing construction.  
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UPDATED 2026

LEGENDS:



Adopted RL for Upper platform



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Title  
Proposed Deck Levels  
Drawing Number  
A 2.8  
Scale  
ATA1

Project Number  
207  
Date  
1/27/2026  
Drawn By  
HC

Issue Status  
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# Proposed Retaining Wall Design Information Summary

Date

19/02/2026

### Proposed Retaining Wall Analysed Sections Summary updated in Jan 2026

Analysed Section	Existing Timber Retaining Wall - Wall Top Level	Toe level of the existing timber retaining wall	Existing ground level at 8.0m away from the boundary	Design Finished Floor Level of Upper Platform	Design Finished Floor Level of Lower Platform	550 mm Sub Excavation Levels from Upper FFL	550 mm Sub Excavation Levels from Lower FFL	Proposed Max Excavation Depth at Upper Platform FFL (m)	Proposed Max Excavation Depth at Lower Platform FFL (m)	Approximate Groundwater Drawdown Depth (m)	Retaining Height of the existing retaining wall (m)	Prelim proposed retaining wall height (m)	Prelim. Proposed Retaining Height (m) (inc 550mm excavation)	Coordinate of SW (Top level of EXTG RW as the reference point)	Coordinate of WW (Top level of EXTG RW as the reference point)
Section 1	12.56	11.35	10.75	-	9.80	-	9.25	2.10	1.5	0.1	1.21	2.76	3.31	(-1.4, 9.5)	(-3, 10.5)
Section 2	16.08	13.64	13.00	14.74	12.03	14.19	11.48	-0.55	1.5	0.1	2.44	1.34	1.89	(-1.6, 14.5)	(-3.2, 15.0)
Section 3	18.81	17.31	17.00	15.85	13.19	15.30	12.64	2.01	4.4	3.0	1.50	3.0	3.51	(-1.7, 17.0)	(-3.2, 17.1)

# Adopted Soil Parameters - Hardening Soil Model

Project Number:	J00538				
Project Name:	3 Pigeon Mt Rd				
Date:	12.2025				
Author	RK				
Revision	-				
General	Material Name	Fill	Puketoka Formation	CW - MW ECBF	ECBF Rock
	Material Model	Hardening Soil	Hardening Soil	Hardening Soil	Hardening Soil
	Unsaturated unit weight, $\gamma_{unsat}$ (kN/m <sup>3</sup> )	16	16	17	20
	Saturated unit weight, $\gamma_{sat}$ (kN/m <sup>3</sup> )	18	18	18	22
Parameters	Secant stiffness in standard drained triaxial test, $E_{50}^{ref}$ (kN/m <sup>2</sup> )	15000	7,000	25,000	50,000
	Tangent stiffness for primary oedometer loading, $E_{oed}^{ref}$ (kN/m <sup>2</sup> )	12000	5600	20000	35000
	Unloading/reloading stiffness, $E_{ur}^{ref}$ (kN/m <sup>2</sup> )	45000	21000	75000	150000
	Power for stress-level dependency of stiffness, $m$	0.55	0.55	0.55	0.55
	Initial void ratio, $e_0$	0.5	0.5	0.50	0.5
	Compression index, $C_c$	0.04317	0.07196	0.01727	0.00863
	Swelling index, $C_s$	0.02041	0.03198	0.00816	0.00858
	Effective cohesion, $c'_{ref}$ (kN/m <sup>2</sup> )	7	3	7	50
	Effective angle of internal friction, $\phi'$ (°)	32	30	32	40
	Dilatancy angle, $\psi$ (°)	0	0	0	0
	Poisson's ratio for unloading/reloading, $\nu_{ur}$	0.25	0.25	0.25	0.2
	Reference stress for stiffnesses, $p_{ref}$ (kN/m <sup>2</sup> )	100	100	100	100
	Coefficient of lateral stress in normal consolidation, $K_0^{nc}$	0.4701	0.5000	0.4701	0.3572
	Failure ratio $q_p/q_d$ , $R_f$	0.9	0.9	0.9	0.9
	Tensile strength, $\sigma_{tension}$ (kN/m <sup>2</sup> )	0	0	0	0
Increase of cohesion, $c_{inc}$ (kN/m <sup>2</sup> )	0	0	0	0	
Interfaces	Reduction factor for soil-structure interface, $R_{inter}$	0.7	0.7	0.7	0.7
Initial	Coefficient of lateral stress, $K_0$	Automatic	Automatic	Automatic	Automatic
	Isotropic overconsolidation ratio, OCR	1	1	1	1
	Isotropic preconsolidation pressure, POP (kN/m <sup>2</sup> )	-	-	-	-

# UC wall Plaxis 2D

File: J00538 - WB Wall 2025\_rev2  
 Tab: 2D Plate -UC



## Plaxis Material Properties

Date: 1/12/2025

Input

Project; 3 Pigeon Mountain Road

Number; J00538

Job; Western Boundary Retaining Wall

Information	Analysed Section		Section 1	Section3		Reference
Input Wall Properties	Steel Pile Designation		250UC89.5	310UC158		
	Unit Weight of Steel	$\gamma_{st}$	77	77	kN/m <sup>3</sup>	
	Unit Weight of Soil	$\gamma_s$	17	17	kN/m <sup>3</sup>	refer Plaxis soil
	Pile Spacing	s	1.0	1.0	m	
Output Wall Properties	Area	A	11400	20100	mm <sup>2</sup>	
			0.0114	0.0201	m <sup>2</sup>	
			0.0114	0.0201	m <sup>2</sup> /m	
	Modulus of Elasticity	E	200	200	GPa	
			2.00E+08	2.00E+08	kN/m <sup>2</sup>	
	Second Moment of Area	I	143,000,000	388,000,000	mm <sup>4</sup>	
			0.000143	0.000388	m <sup>4</sup>	
			0.000143	0.000388	m <sup>4</sup> /m	
	Plaxis Virtual Depth	d	0.3055	0.4813	m	from Plaxis
Plaxis Virtual Width of Pile	$b_p$	0.03732	0.04176	m/m		
Virtual width of soil between piles	$b_s$	0.96268	0.95824	m/m		
Weighted average unit weight of wall	$\gamma_w$	19.24	19.51	kN/m <sup>3</sup>		
Plaxis Input Parameters	Axial Stiffness	EA	2.28E+06	4.02E+06	kN/m	
	Flexural Stiffness	EI	2.86E+04	7.76E+04	kN·m <sup>2</sup> /m	
	Weight of Wall	w	0.219	0.392	kN/m/m	

## Design Strength of Piles

ULS Design Actions	Plaxis Pile Moment	M	21.3	57.3	kNm/m	from Plaxis
	Plaxis Pile Shear	V	20.6	42.7	kN/m	from Plaxis
	Pile Spacing	s	1.0	1.0	m	
	Earth Load Factor		1.5	1.5		
	<b>Design Moment</b>	<b>M*</b>	<b>32.0</b>	<b>86.0</b>	<b>kNm</b>	
	<b>Design Shear</b>	<b>V*</b>	<b>30.9</b>	<b>64.0</b>	<b>kN</b>	
Section Properties	Strength Reduction Factor for Bending and Shear	$\phi$	0.9	0.9		Table 3.3(1)
	Yield Strength	$f_y$	300	300	MPa	
	Second Moment of Area at Critical Depth	Z	1,100,000	2,370,000	mm <sup>3</sup>	
	Web Shear Area	$A_w$	2362.5	4348.9	mm <sup>2</sup>	
Section Capacity Checks	Design Bending Moment	M*	32.0	86.0	kNm	
	Design Bending Strength	$\phi M$	297.0	639.9	kNm	Eq 5.2.1
	<b>Pile ok for Bending</b>	$M^*/\phi M$	<b>11%</b>	<b>13%</b>		
	Design Shear Force	V*	30.9	64.0	kN	
	Design Shear Strength	$\phi V$	382.7	704.5	kN	clause 5.11.4.1
	<b>Pile ok for Shear</b>	$V^*/\phi V$	<b>8%</b>	<b>9%</b>		

# Section 1

## Design Spreadsheets Calculations and Plaxis Analysis Outputs

### **Section 1 Plaxis Analysis Phases**

**Phase 0: Initial Phase (Initialize the model)**

**Phase 1: Neighboring Property Loading and Western Timber Retaining Wall Installation**

**Phase 2: Install Proposed Retaining Wall (Previous phase displacement reset)**

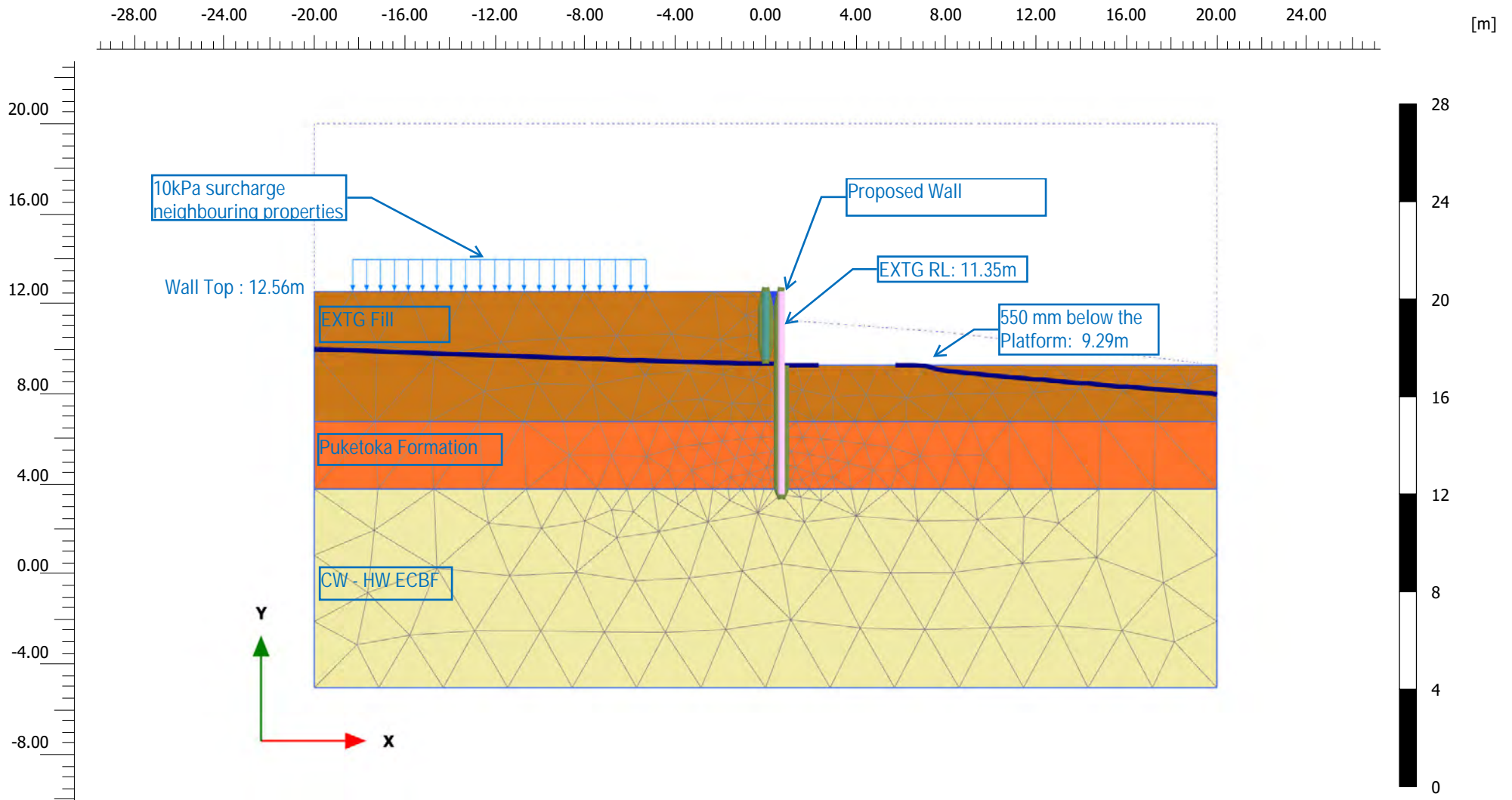
**Phase 3: Backfill behind Proposed Wall**

**Phase 4: Excavation of the Platform in front of the Wall (550mm below FFL) (Steady state groundwater draw-down analysis)**

**Phase 4.1: Worst Ground Water Scenario**

**Phase 4.2: Seismic Scenario**

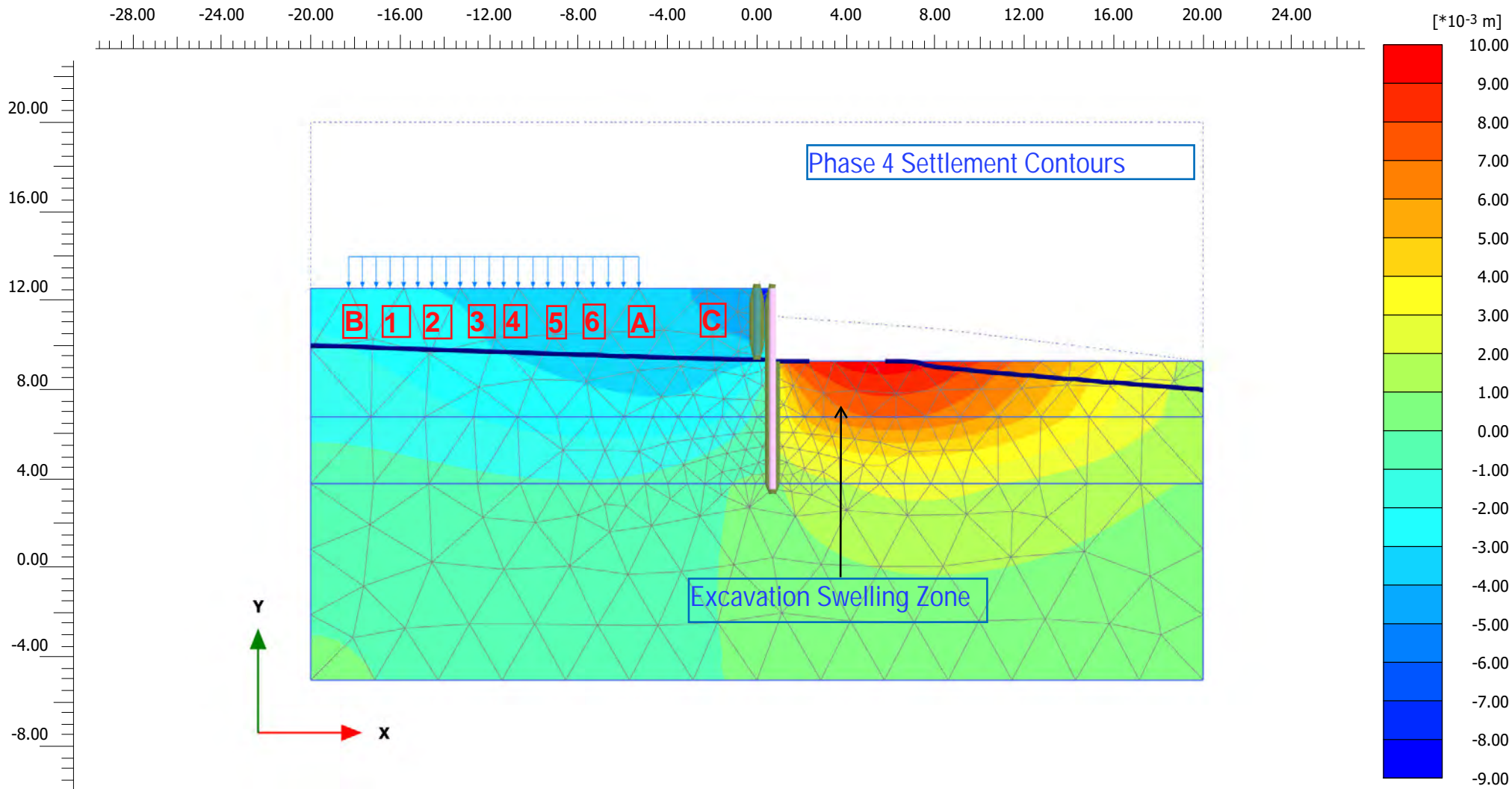
## Section 1 Ground Profile



**Deformed mesh |u| (at true scale)**

Maximum value =  $9.677 \times 10^{-3}$  m (Element 291 at Node 3607)

## Section 1 Analysis Ground Settlement Contours



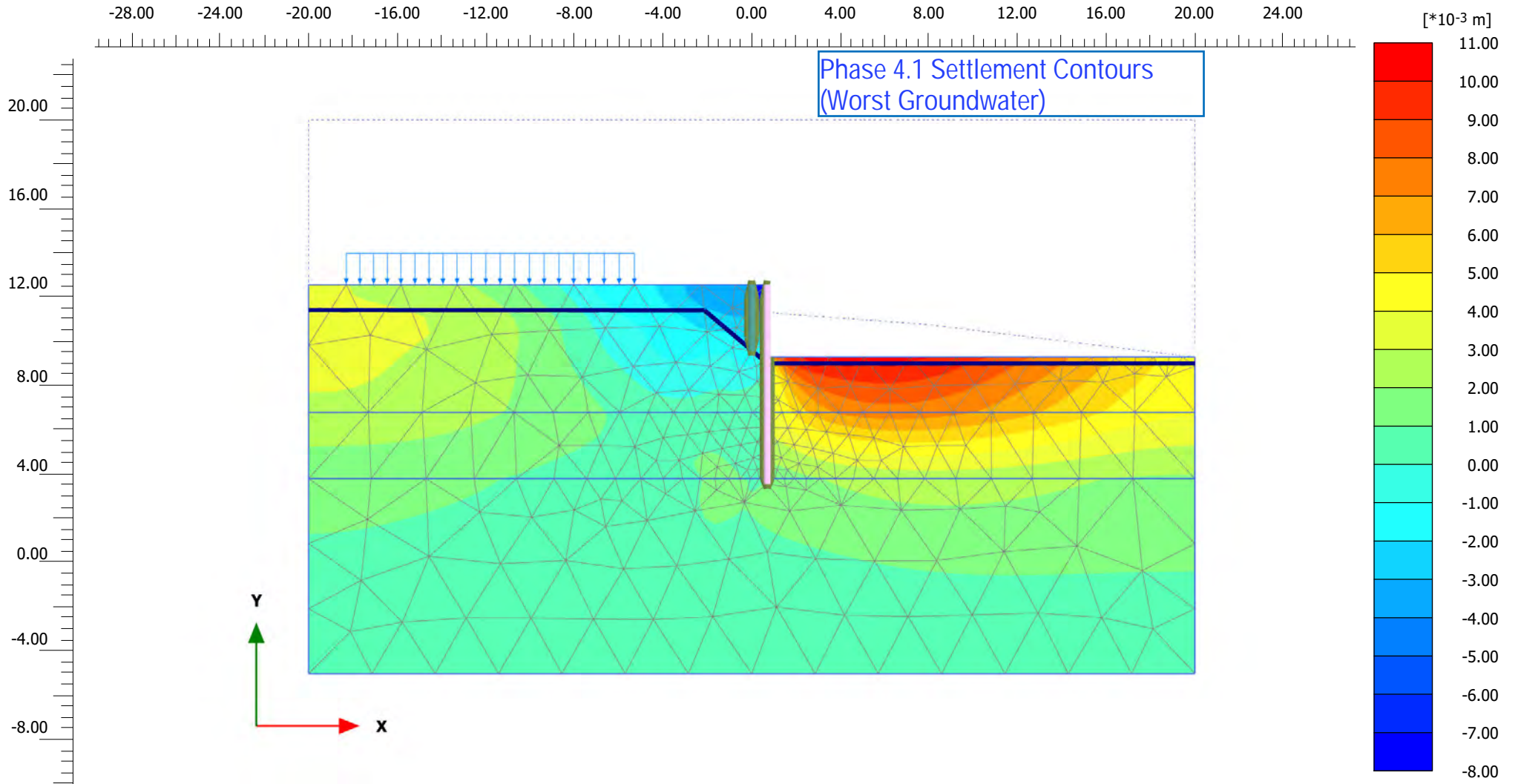
**Total displacements  $u_y$  (scaled up 50.0 times)**

Maximum value =  $9.667 \cdot 10^{-3}$  m (Element 291 at Node 3607)

Minimum value =  $-8.198 \cdot 10^{-3}$  m (Element 158 at Node 1841)

# Phase 4 differential Settlements at different interval points calculation details

Section 1	Coordinates		Settlement				Pair	x difference	uy difference	Settlement change rate (m/m)
	x (m)	y (m)	u <sub>y</sub> (mm)							
B	-18.30	12	-2.65	(-18.3,12)			B to 1	-2.11	0.17	-12411.76471
1	-16.19	12	-2.82	(-16.19,12)			B to 2	-4.22	0.3	-14066.66667
2	-14.08	12	-2.95	(-14.08,12)			B to 3	-6.33	0.5	-12660
3	-11.97	12	-3.15	(-11.97,12)			B to 4	-8.44	0.68	-12411.76471
4	-9.86	12	-3.33	(-9.86,12)			B to 5	-10.55	0.89	-11853.93258
5	-7.75	12	-3.54	(-7.75,12)			B to 6	-12.66	1.07	-11831.7757
6	-5.64	12	-3.72	(-5.64,12)			B to A	-14.8	1.16	-12758.62069
A	-3.50	12	-3.81	(-3.5,12)			1 to 2	-2.11	0.13	-16230.76923
							1 to 3	-4.22	0.33	-12787.87879
							1 to 4	-6.33	0.51	-12411.76471
							1 to 5	-8.44	0.72	-11722.22222
							1 to 6	-10.55	0.9	-11722.22222
							1 to A	-12.69	0.99	-12818.18182
							2 to 3	-2.11	0.2	-10550
							2 to 4	-4.22	0.38	-11105.26316
							2 to 5	-6.33	0.59	-10728.81356
							2 to 6	-8.44	0.77	-10961.03896
							2 to A	-10.58	0.86	-12302.32558
							3 to 4	-2.11	0.18	-11722.22222
							3 to 5	-4.22	0.39	-10820.51282
							3 to 6	-6.33	0.57	-11105.26316
							3 to A	-8.47	0.66	-12833.33333
							4 to 5	-2.11	0.21	-10047.61905
							4 to 6	-4.22	0.39	-10820.51282
							4 to A	-6.36	0.48	-13250
							5 to 6	-2.11	0.18	-11722.22222
							5 to A	-4.25	0.27	-15740.74074
							6 to A	-2.14	0.09	-23777.77778

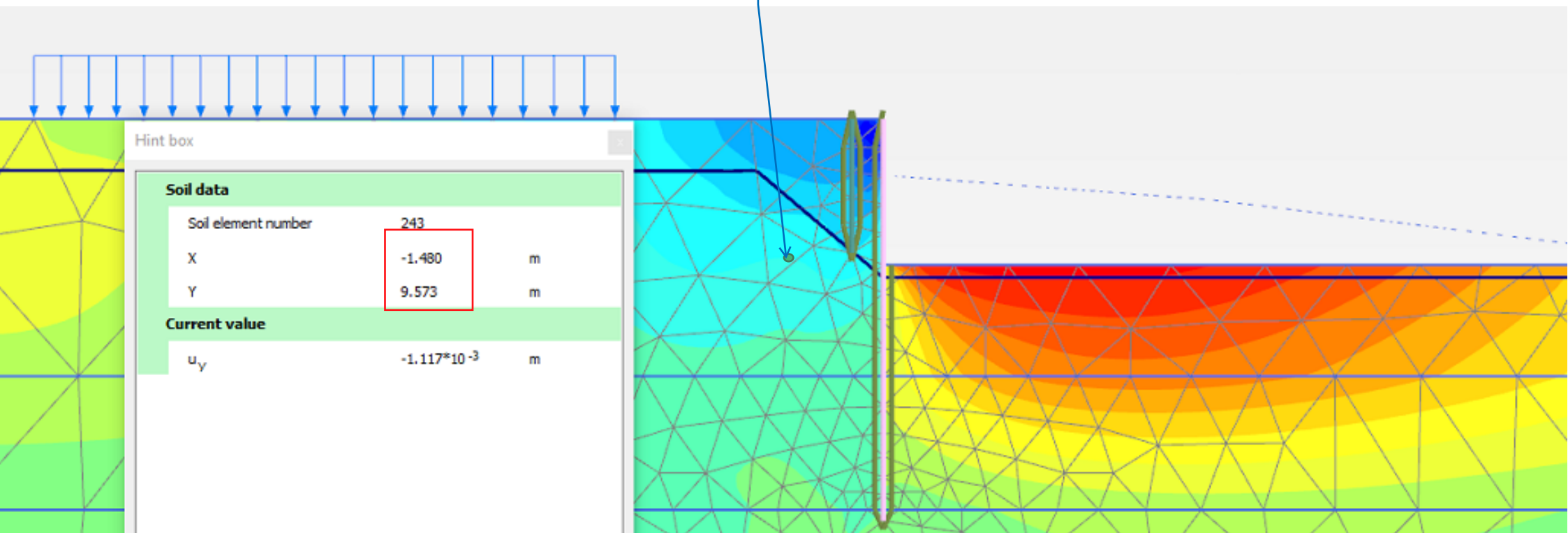


**Total displacements  $u_y$  (scaled up 50.0 times)**

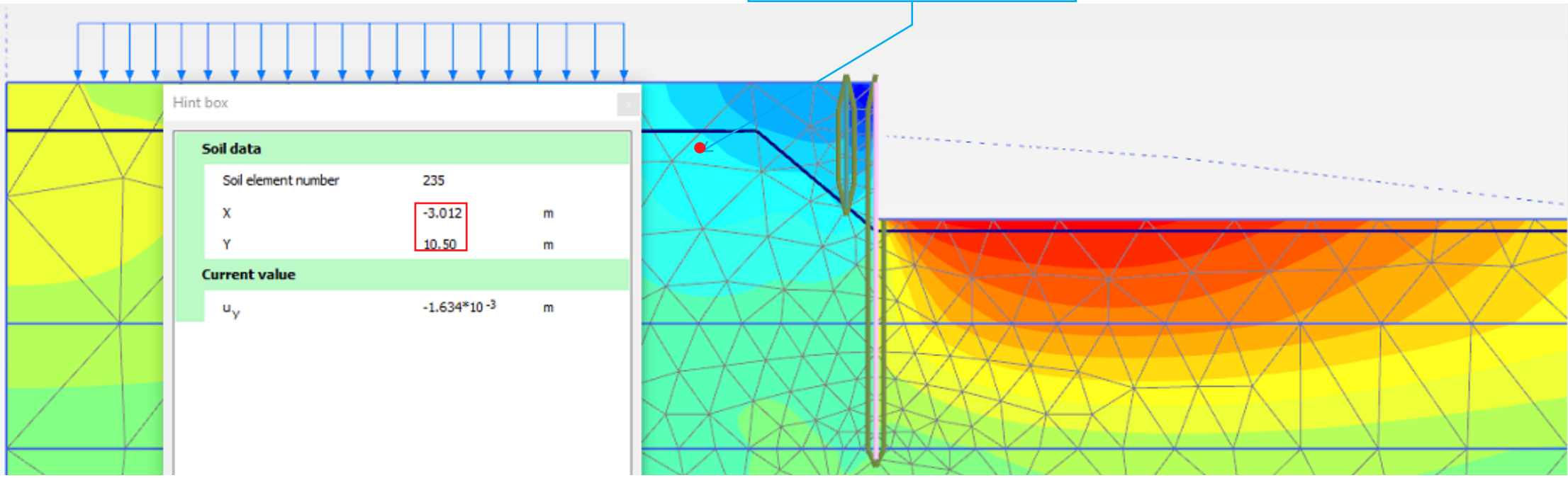
Maximum value = 0.01050 m (Element 308 at Node 3386)

Minimum value =  $-7.552 \times 10^{-3}$  m (Element 158 at Node 1841)

Predicted Settlement  
at Existing SW  
Location

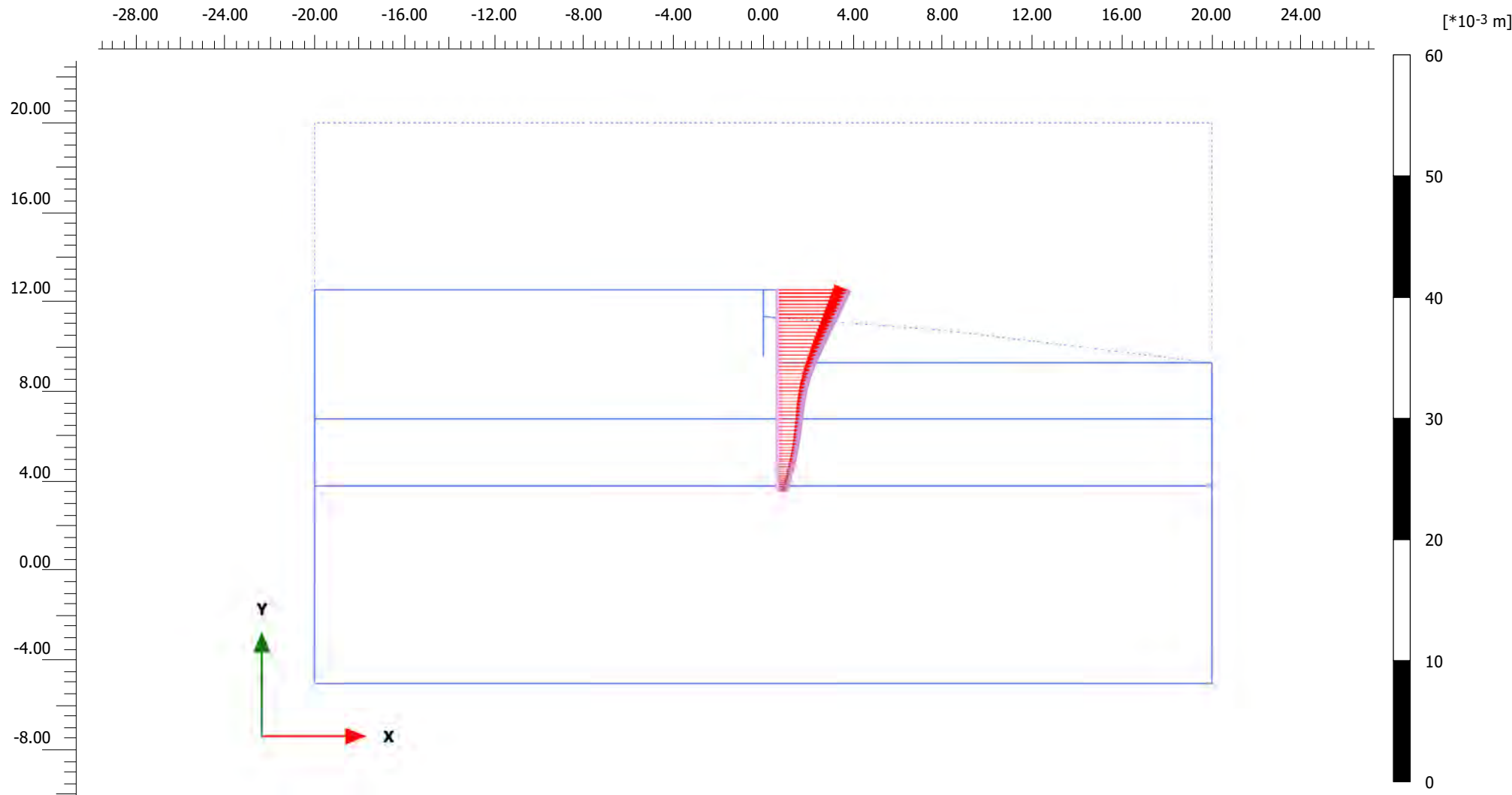


Predicted Settlement at Existing at WW Location



## **SECTION 1 ANALYSIS WALL INTERNAL ACTIONS**

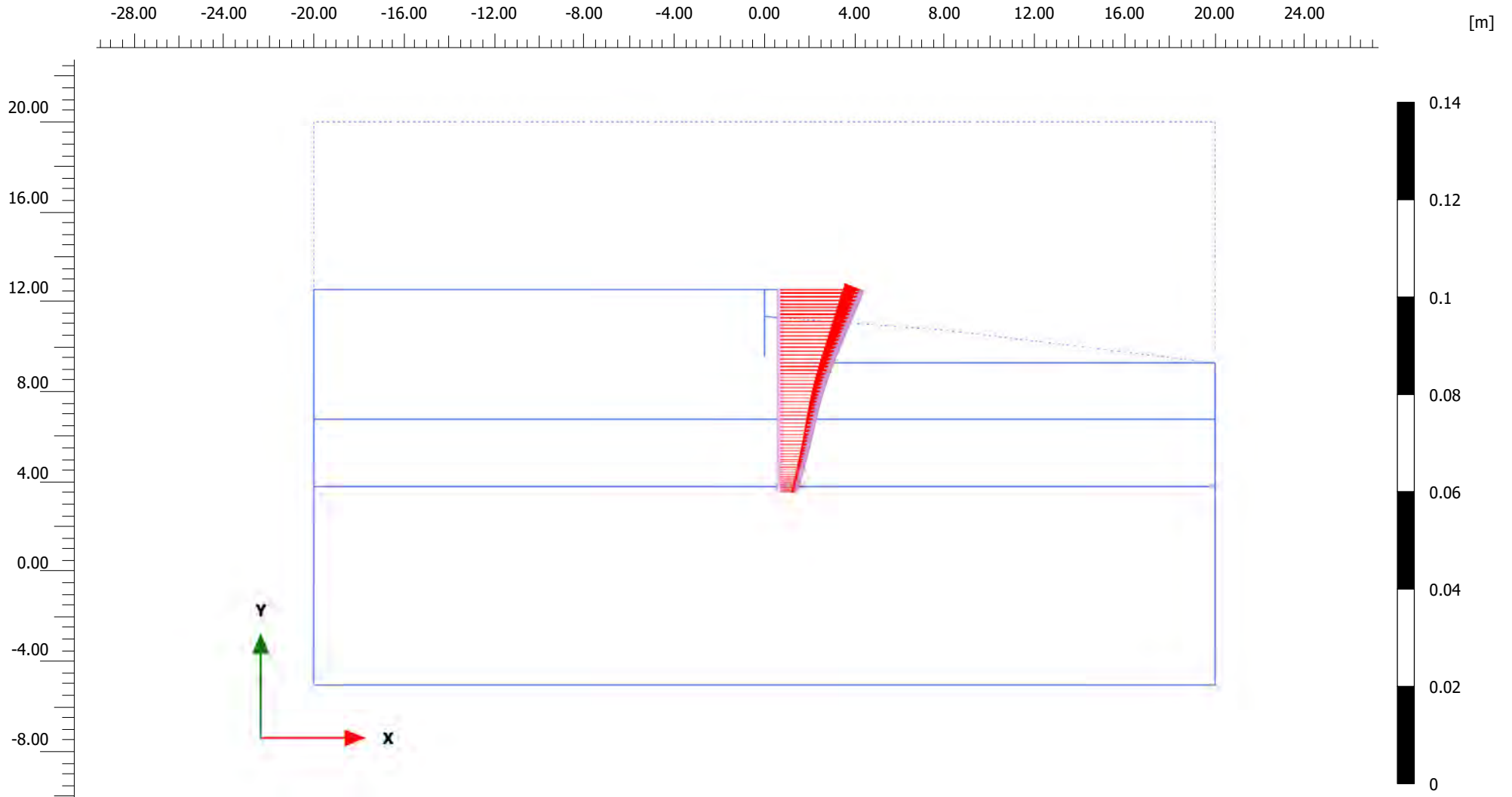
## **SECTION 1 LATERAL DEFLECTIONS**



**Total displacements  $u_x$  (scaled up 500 times)**

Maximum value =  $6.191 \cdot 10^{-3}$  m (Element 4 at Node 1830)

Minimum value =  $0.5290 \cdot 10^{-3}$  m (Element 21 at Node 3194)

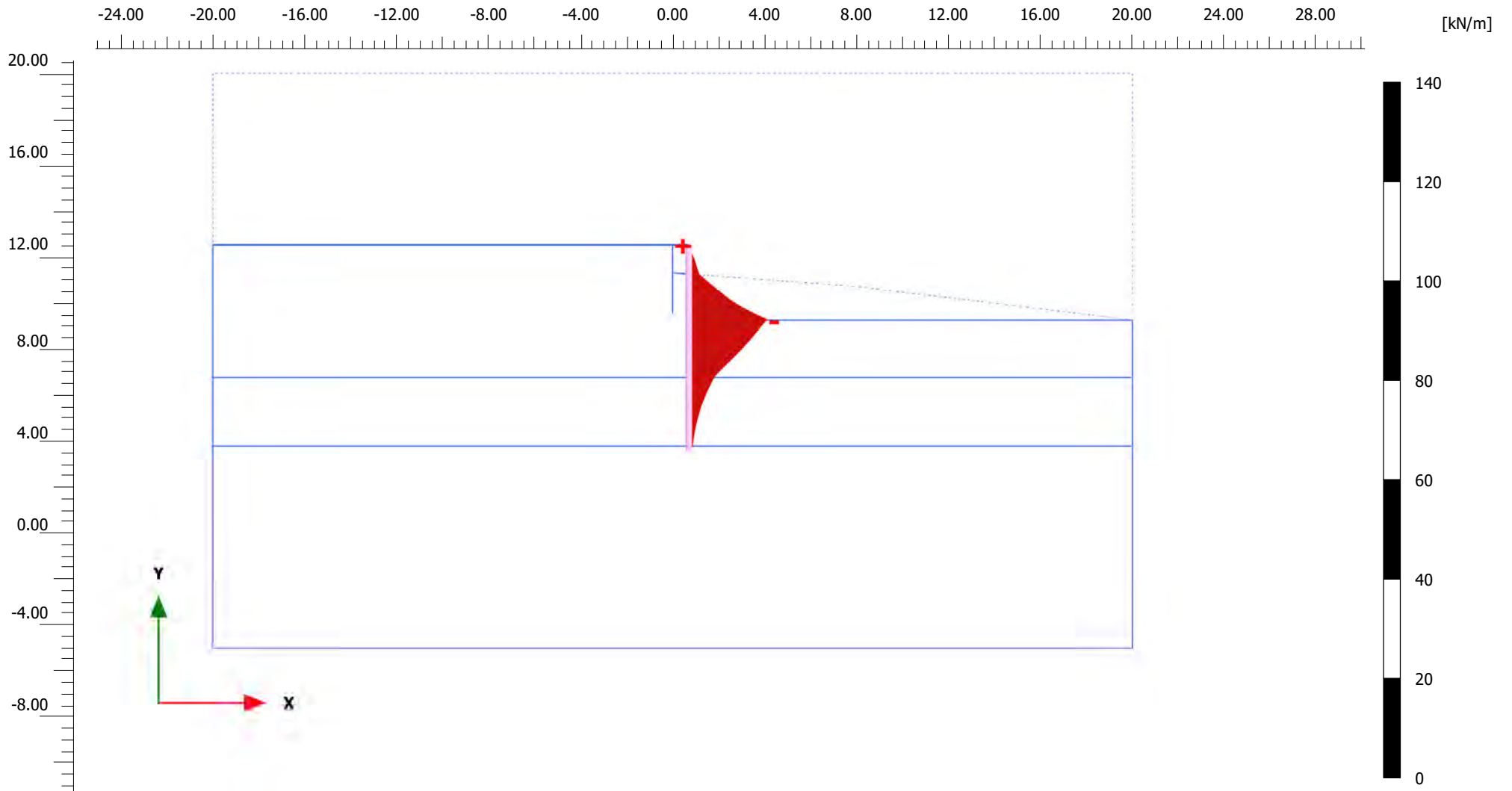


**Total displacements  $u_x$  (scaled up 200 times)**

Maximum value = 0.01802 m (Element 4 at Node 1830)

Minimum value =  $3.152 \times 10^{-3}$  m (Element 21 at Node 3194)

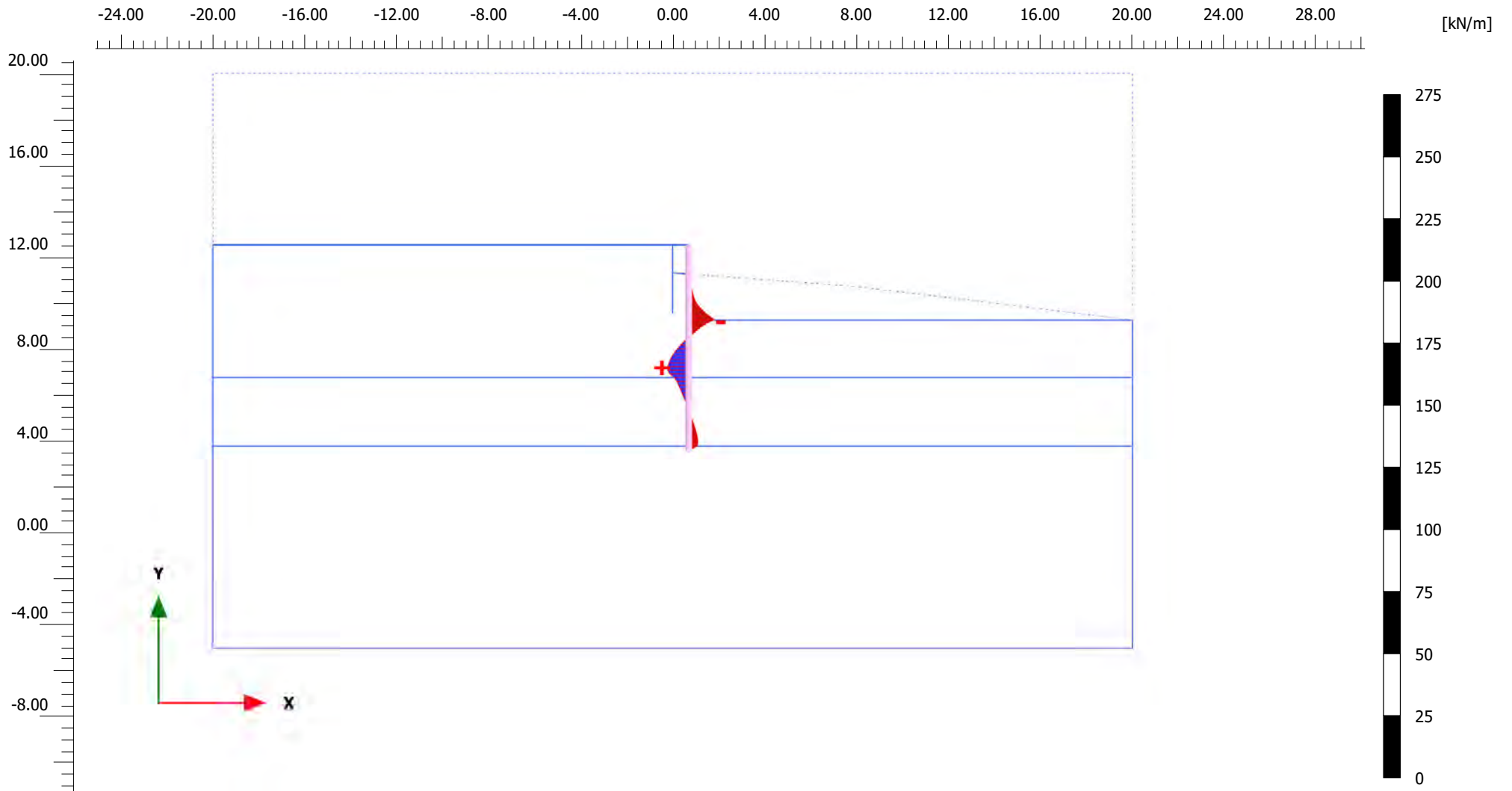
## **SECTION 1 NORMAL GROUNDWATER SCENARIO**



**Axial forces N (scaled up 0.200 times)**

Maximum value = 0.06220 kN/m (Element 4 at Node 1830)

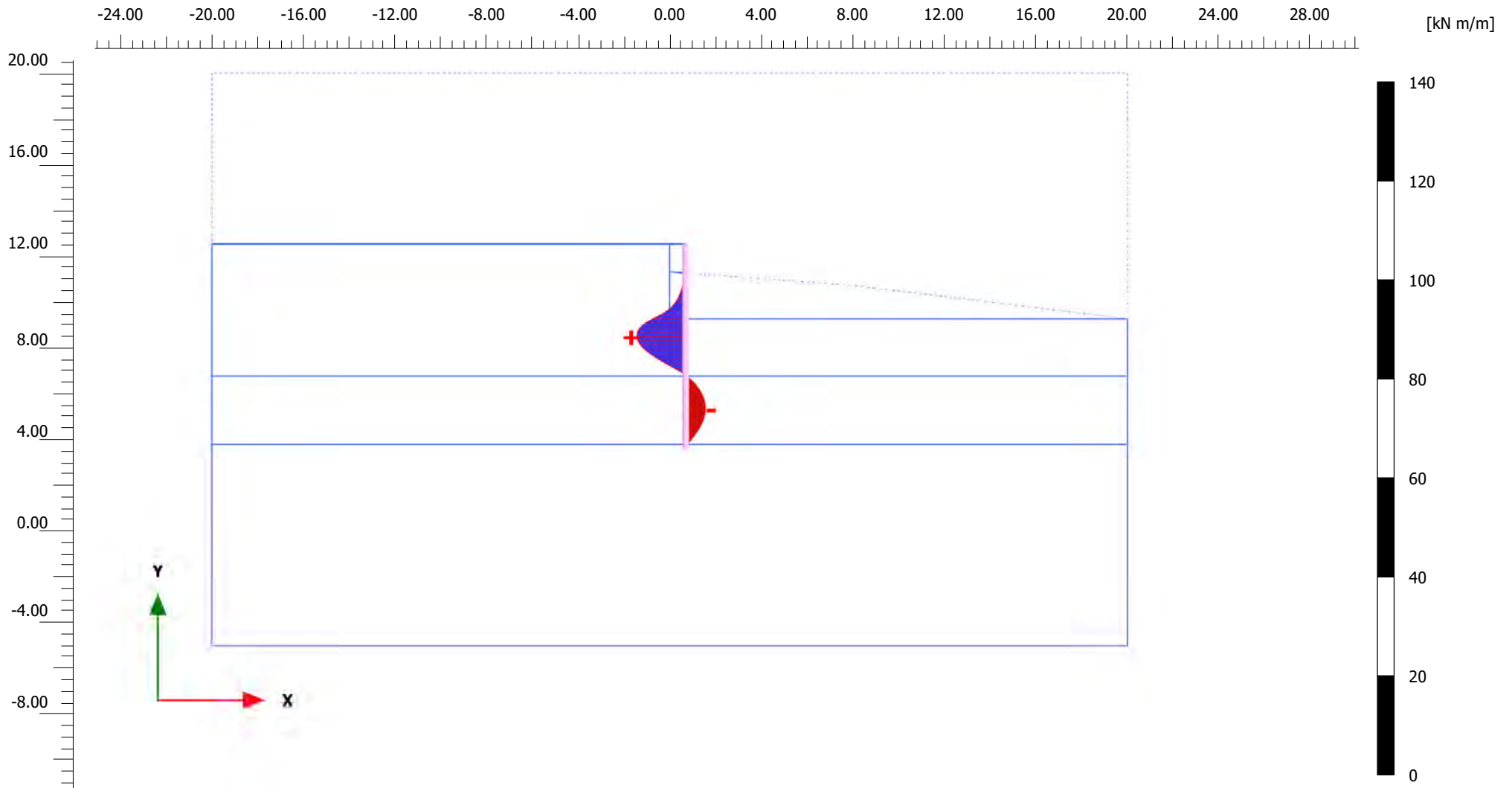
Minimum value = -17.30 kN/m (Element 8 at Node 1445)



**Shear forces Q (scaled up 0.100 times)**

Maximum value = 9.155 kN/m (Element 11 at Node 1532)

Minimum value = -11.34 kN/m (Element 8 at Node 1445)

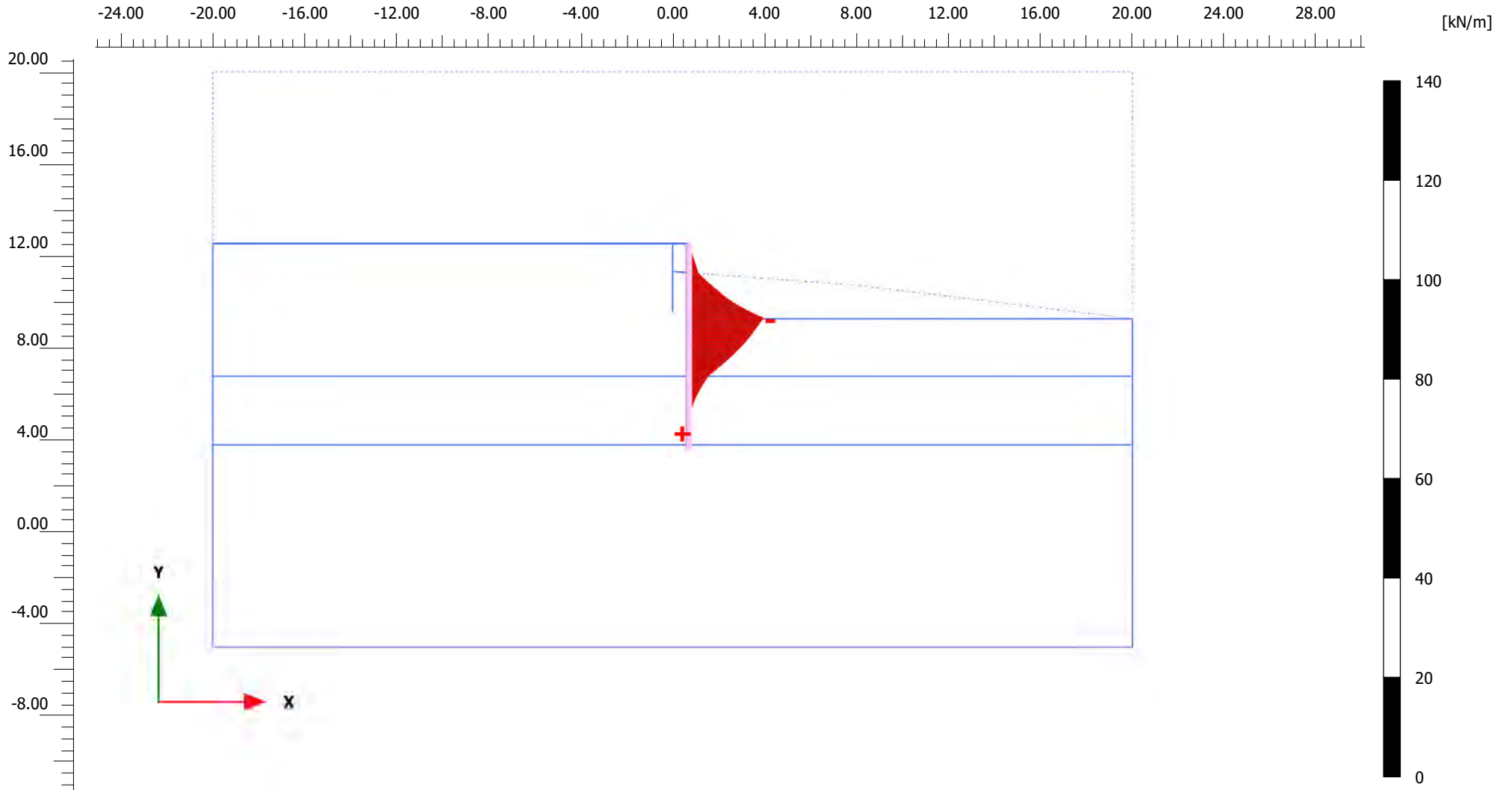


**Bending moments M (scaled up 0.200 times)**

Maximum value = 10.69 kN m/m (Element 13 at Node 1519)

Minimum value = -4.331 kN m/m (Element 18 at Node 1606)

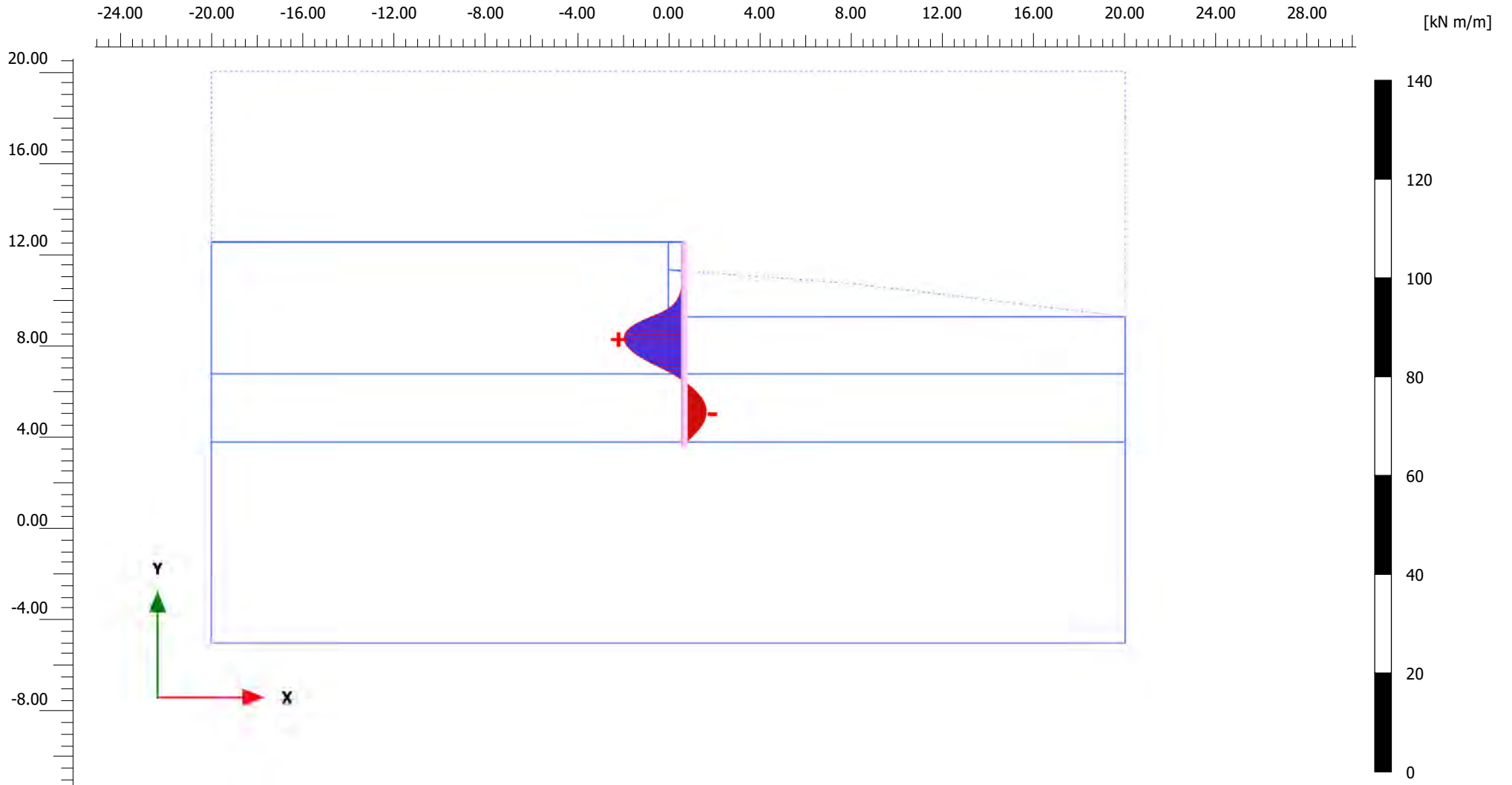
## **SECTION 1 WORST GROUNDWATER SCENARIO**



**Axial forces N (scaled up 0.200 times)**

Maximum value = 0.2445 kN/m (Element 16 at Node 2422)

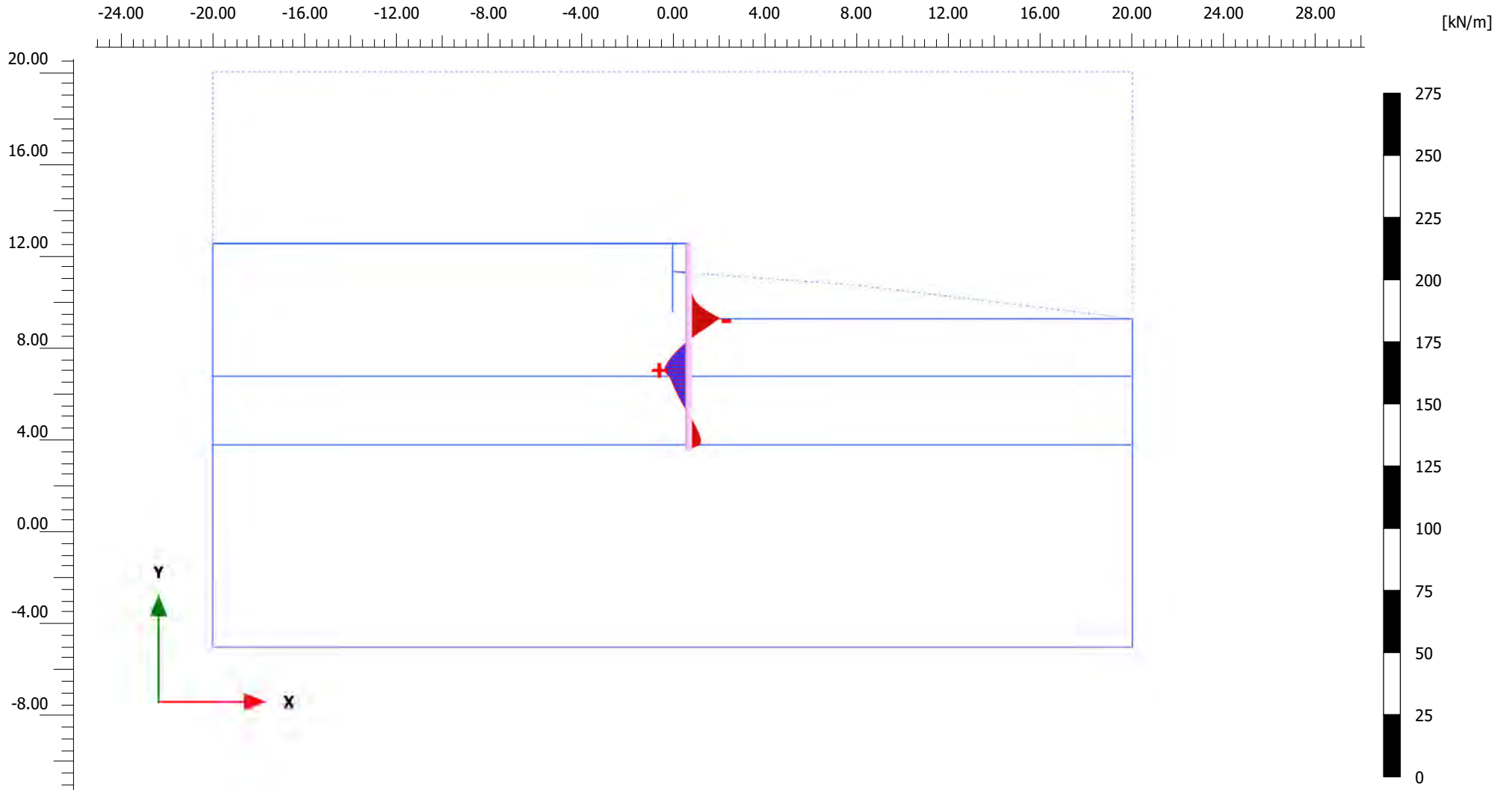
Minimum value = -16.56 kN/m (Element 8 at Node 1445)



**Bending moments M (scaled up 0.200 times)**

Maximum value = 13.20 kN m/m (Element 13 at Node 1520)

Minimum value = -4.833 kN m/m (Element 18 at Node 1608)

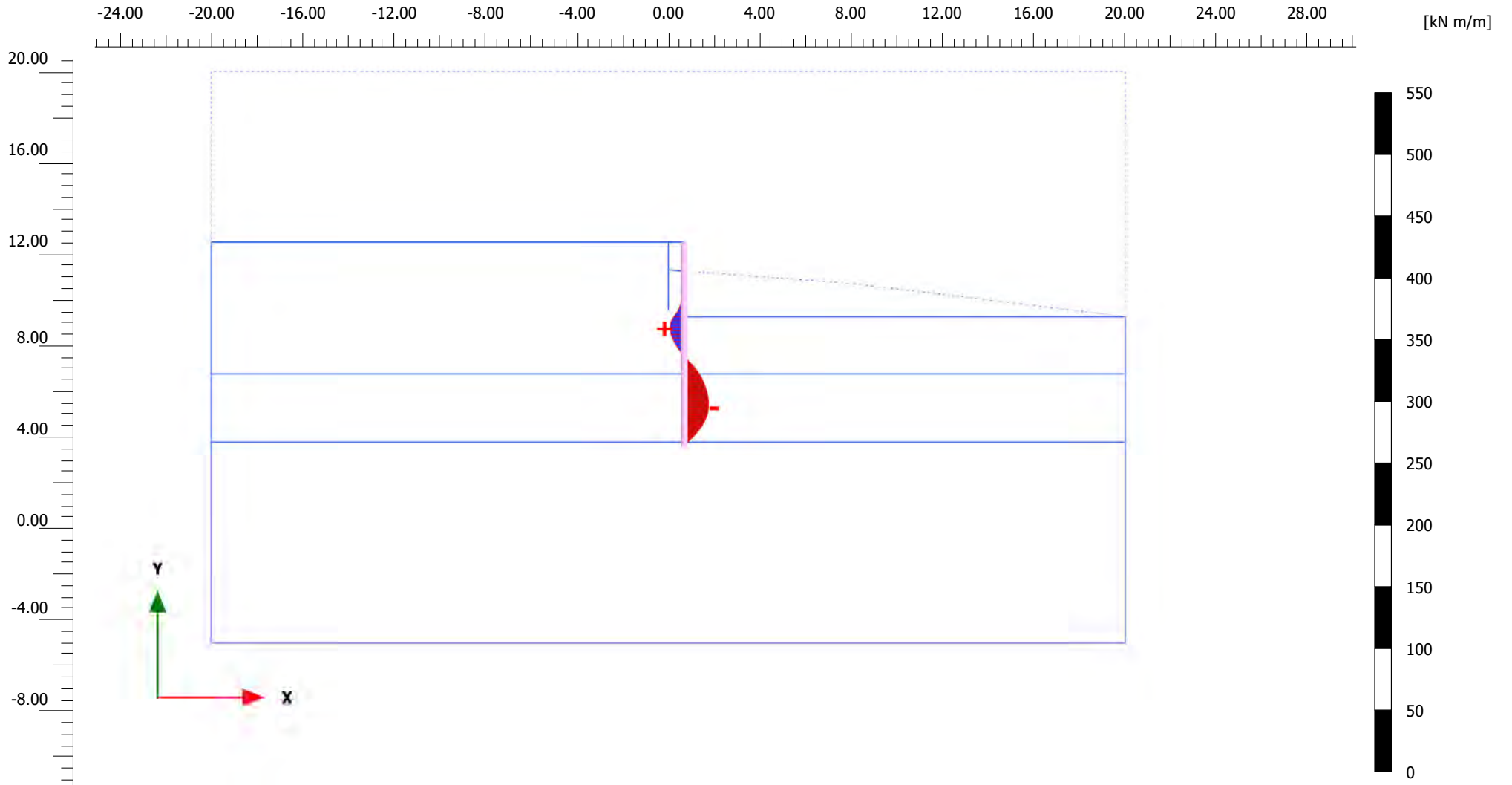


**Shear forces Q (scaled up 0.100 times)**

Maximum value = 10.40 kN/m (Element 11 at Node 1533)

Minimum value = -13.98 kN/m (Element 8 at Node 1445)

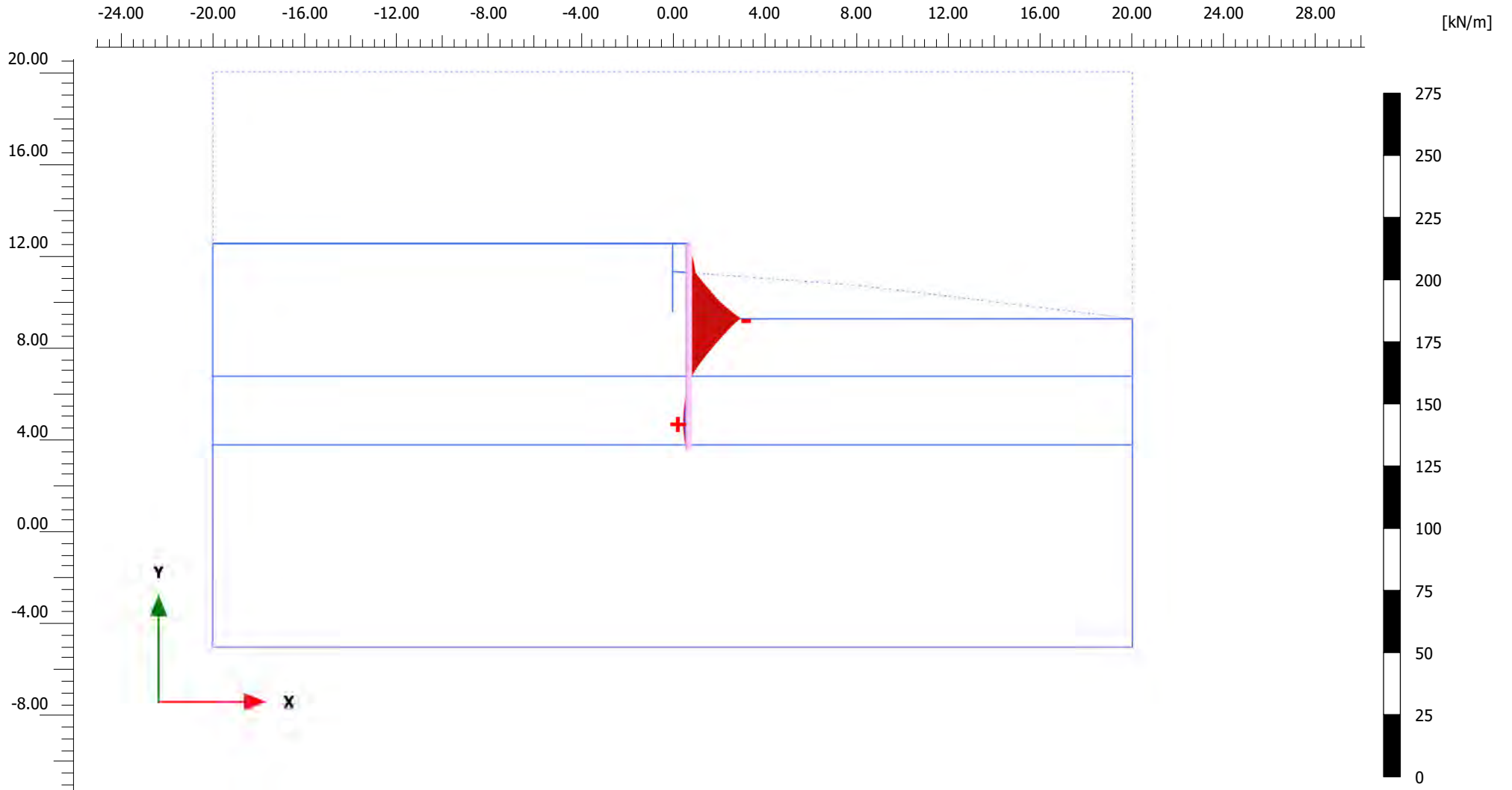
## **SECTION 1 SEISMIC LOADING SCENARIO**



**Bending moments M (scaled up 0.0500 times)**

Maximum value = 12.42 kN m/m (Element 14 at Node 1367)

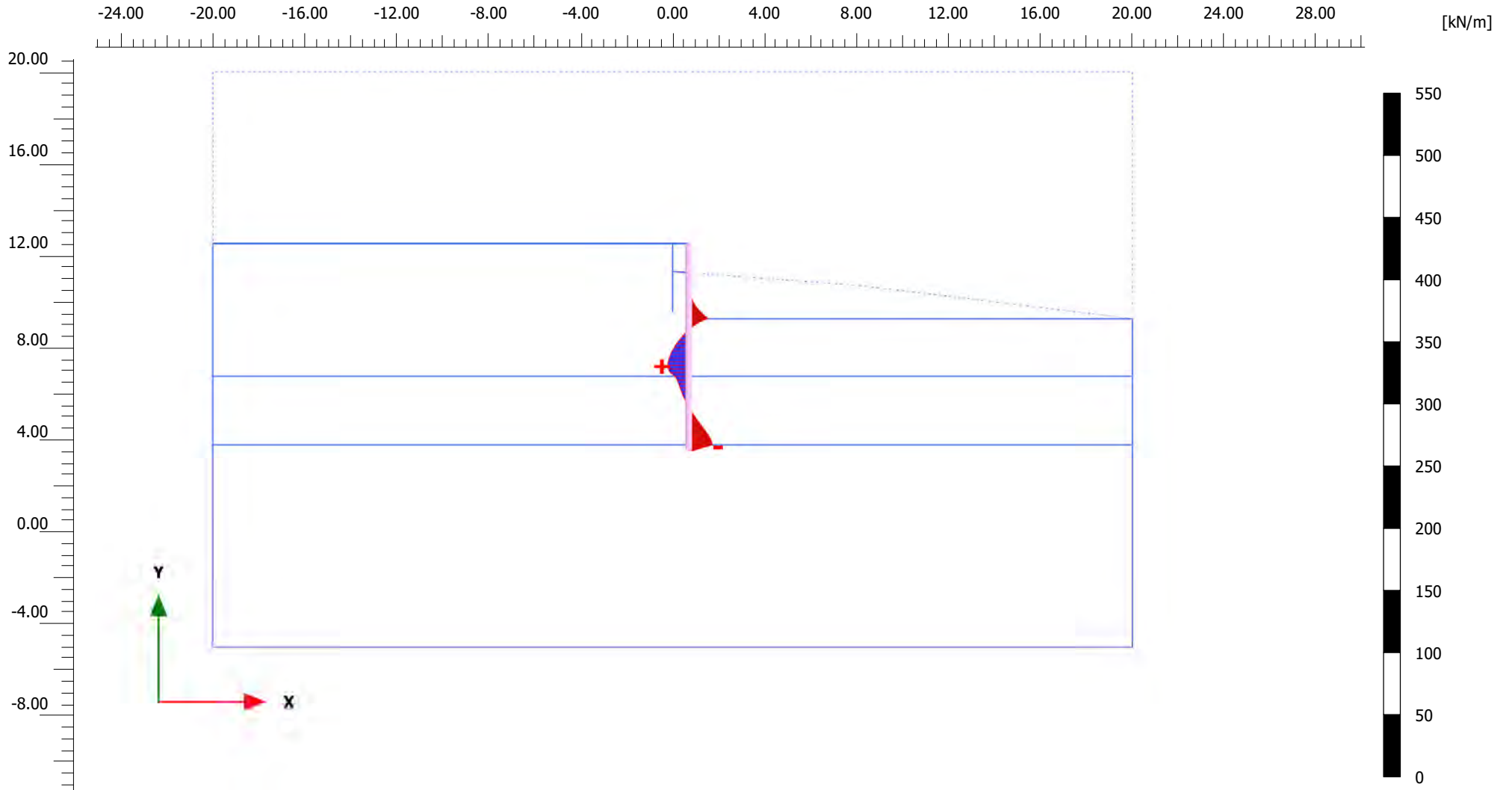
Minimum value = -21.30 kN m/m (Element 18 at Node 1606)



**Axial forces N (scaled up 0.100 times)**

Maximum value = 2.278 kN/m (Element 17 at Node 1978)

Minimum value = -22.59 kN/m (Element 8 at Node 1445)

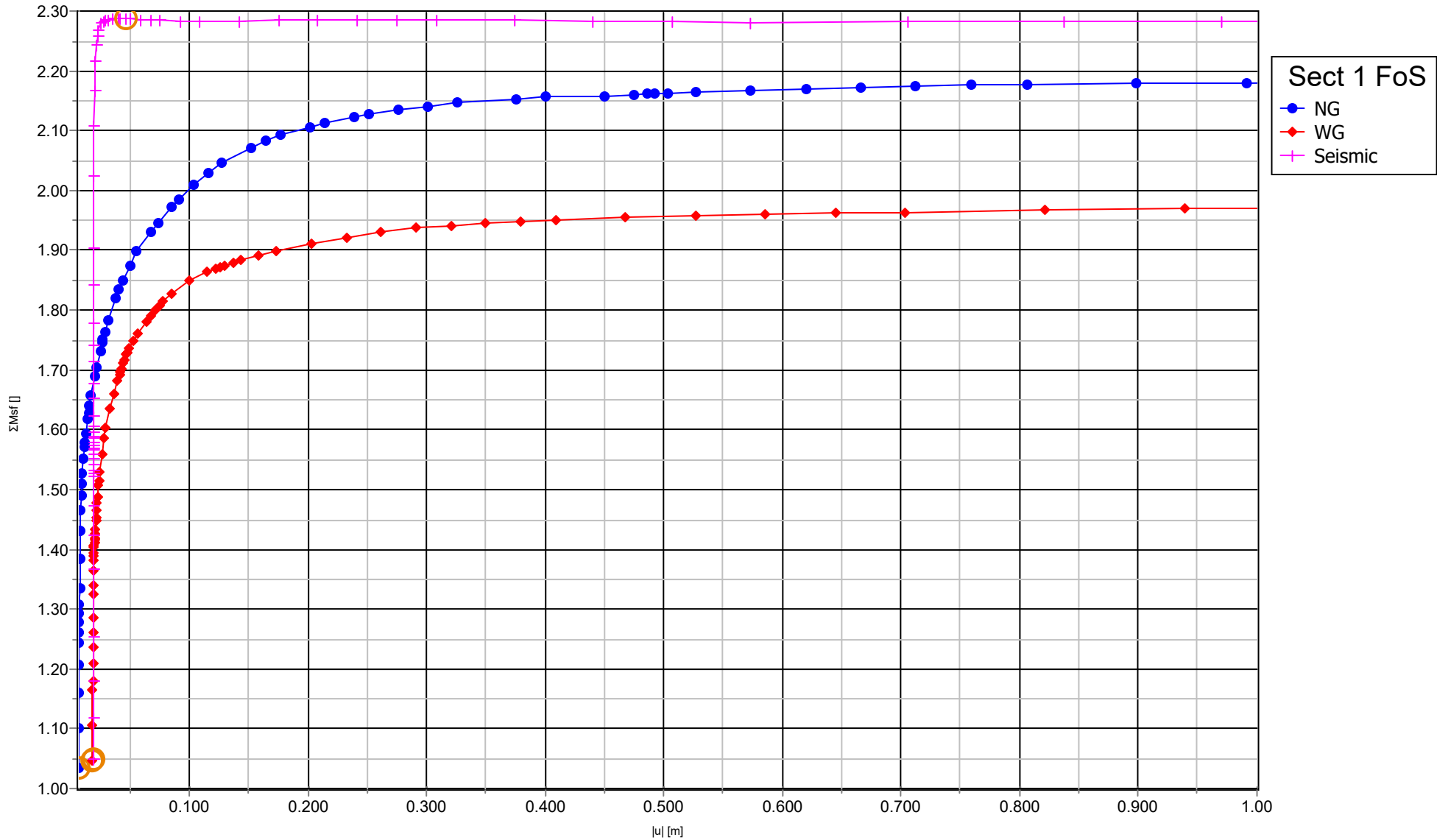


**Shear forces Q (scaled up 0.0500 times)**

Maximum value = 18.43 kN/m (Element 11 at Node 1532)

Minimum value = -20.58 kN/m (Element 21 at Node 3190)

# **SECTION 1 FACTOR OF SAFETY ANALYSIS**



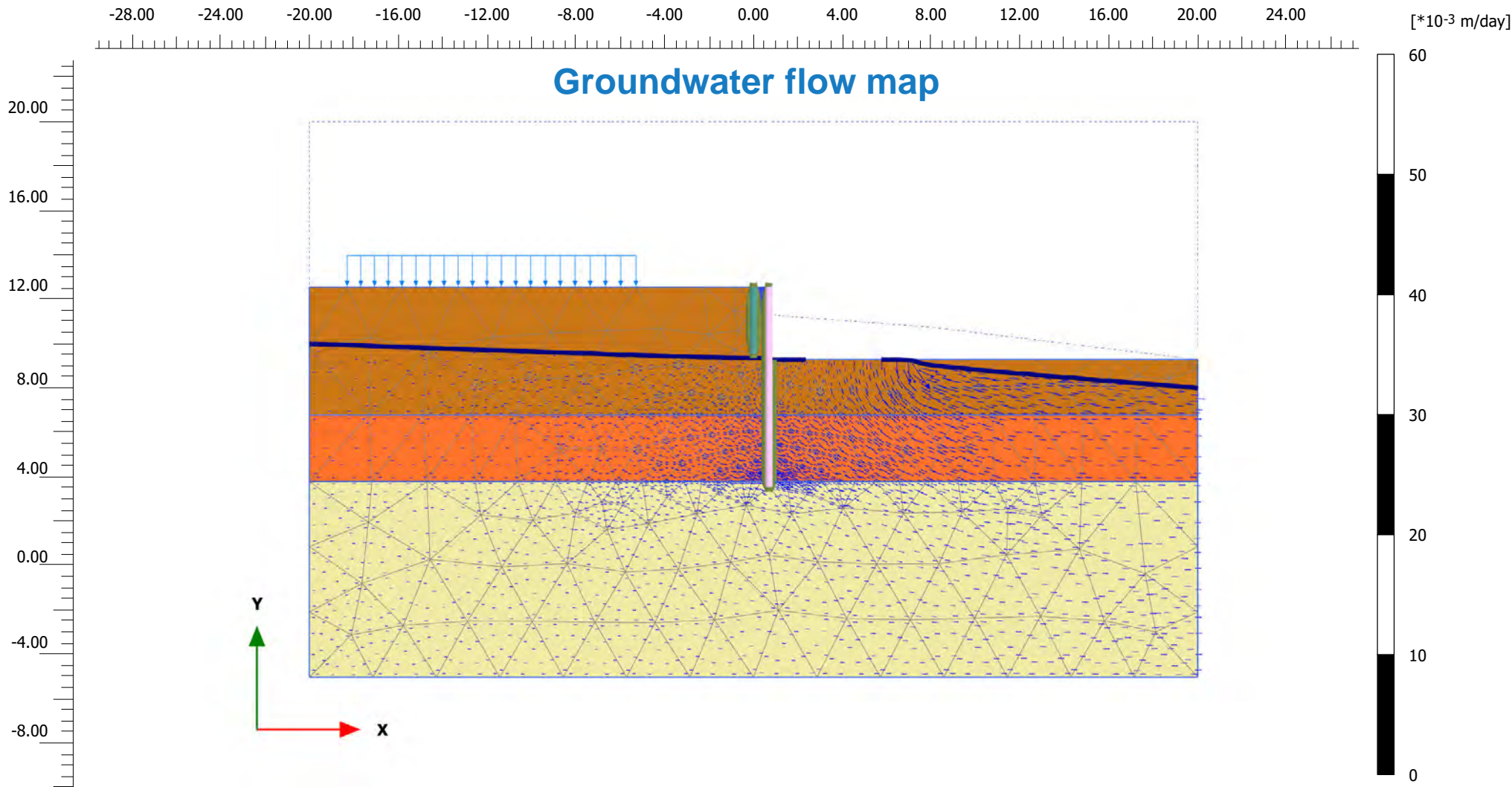
*Project description*  
**J00538 3 Pigeon Mount Rd Sect 1 FOS**

*Date*  
**18/12/2025**

*Project filename*  
**J00538 PMR Section 1\_HS\_ ...**

*Step*  
**108**

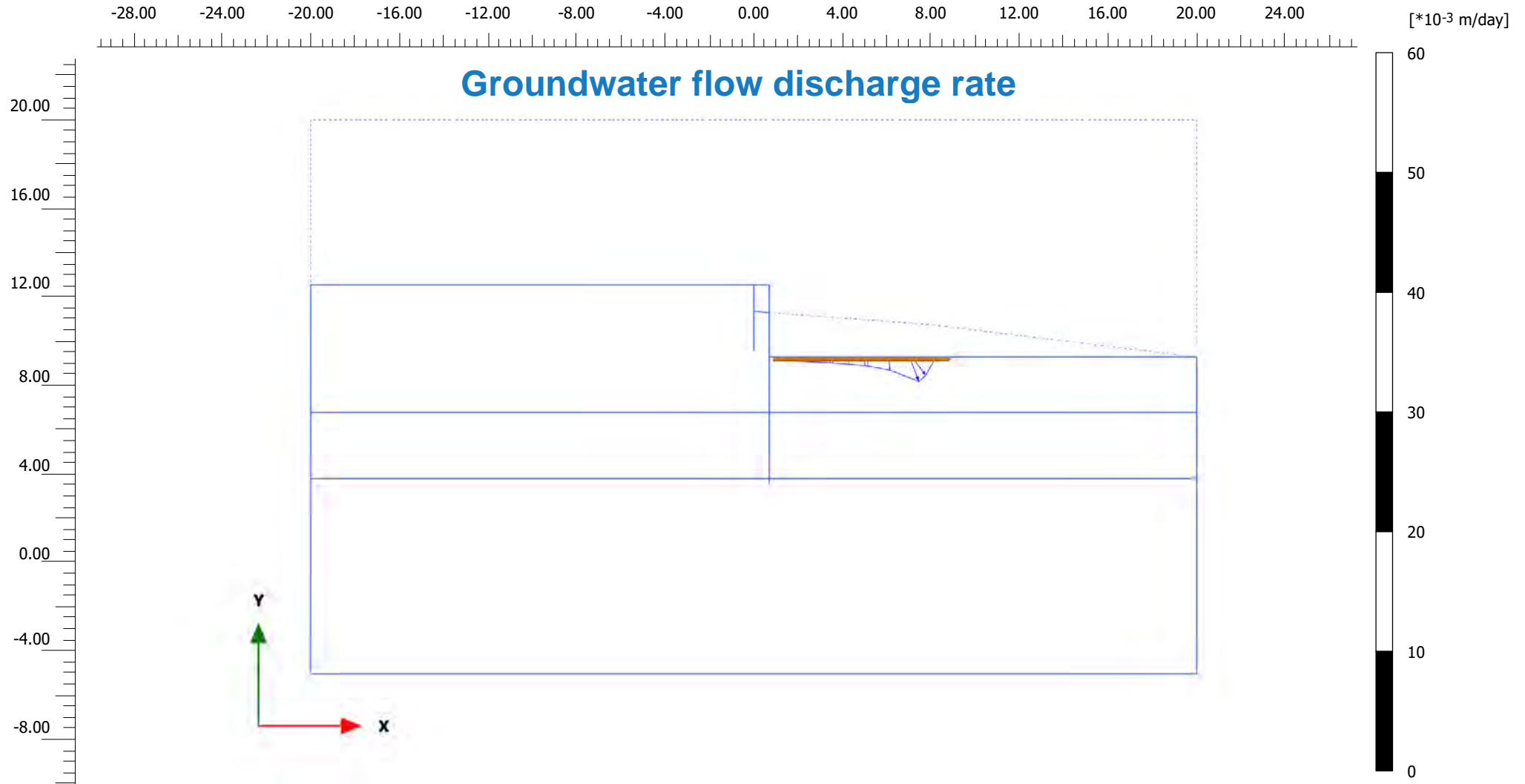
*Company*  
**Total Ground Engineering**



**Groundwater flow |q| (scaled up 500 times)**

Maximum value =  $2.917 \cdot 10^{-3}$  m/day (Element 296 at Stress point 3543)

Minimum value =  $0.8053 \cdot 10^{-9}$  m/day (Element 159 at Stress point 1899)



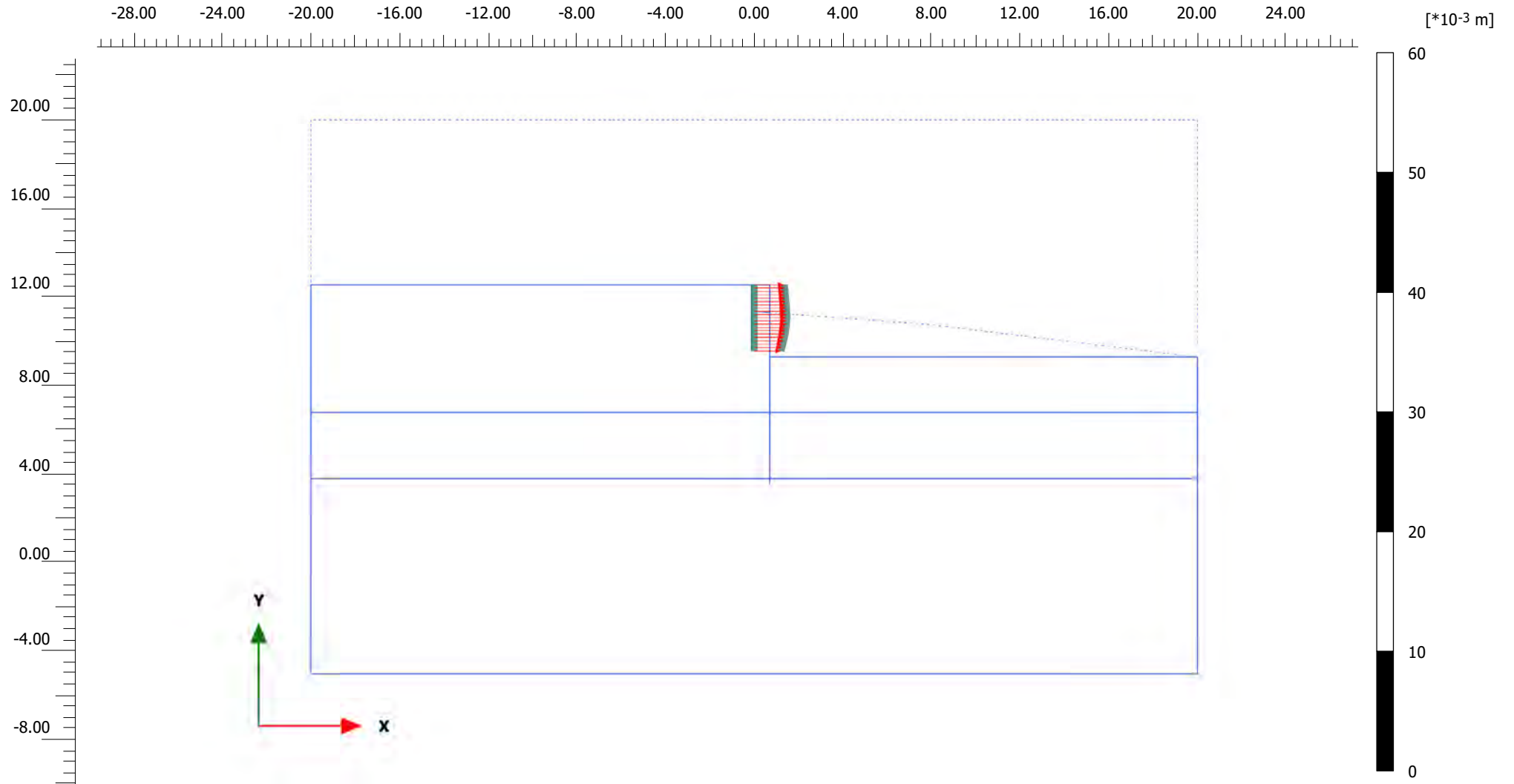
**Groundwater flow |q| (scaled up 500 times)**

Maximum value = 2.131\*10<sup>-3</sup> m/day

Minimum value = 0.1330\*10<sup>-3</sup> m/day

Total discharge is -4.204\*10<sup>-3</sup> m<sup>3</sup>/day/m

**SECTION 1 EXISTING WALL DEFLECTION UNDER  
NORMAL GROUNDWATER CONDITION**



**Total displacements  $u_x$  (scaled up 500 times)**

Maximum value =  $2.950 \times 10^{-3}$  m (Element 5 at Node 921)

Minimum value =  $2.421 \times 10^{-3}$  m (Element 7 at Node 953)

## Section 2

Design Spreadsheets Calculations and Plaxis Analysis Outputs

### **Section 2 Plaxis Analysis Phases**

**Phase 0: Initial Phase (Initialize the model)**

**Phase 1: Neighboring Property Loading and Western Timber Retaining Wall Installation.**

**Phase 2: Install Proposed Retaining Wall (Previous phase displacement reset)**

**Phase 3: Backfill behind Proposed Wall**

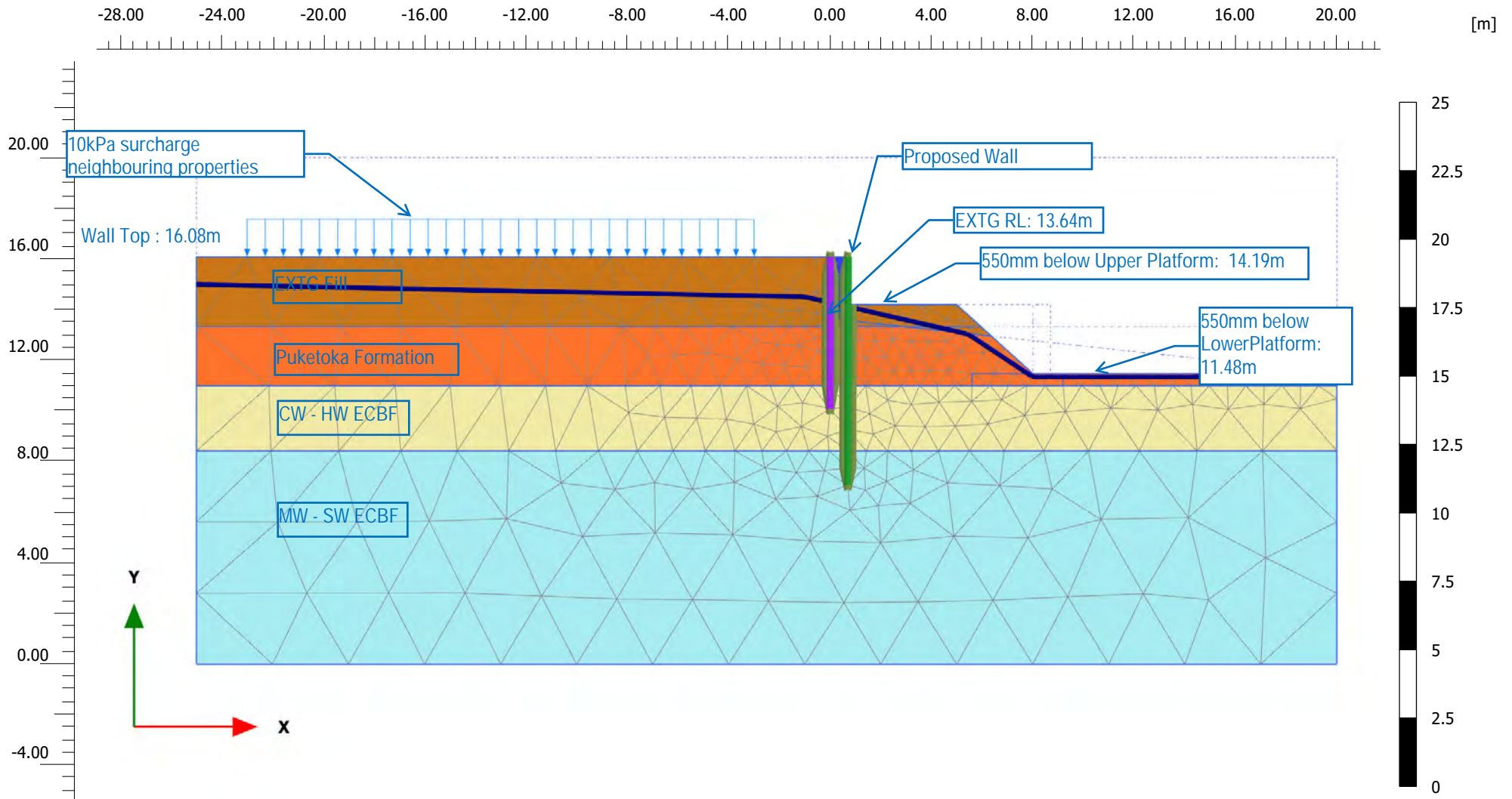
**Phase 4: Earthworks (Fill) of the Upper Platform in front of the Wall (550mm below FFL) Steady state groundwater drawdown analysis)**

**Phase 5: Excavation of the Lower Platform (550 mm below FFL) (Steady state groundwater drawdown analysis)**

**Phase 5.1: Worst Ground Water Scenario**

**Phase 5.2: Seismic Scenario**

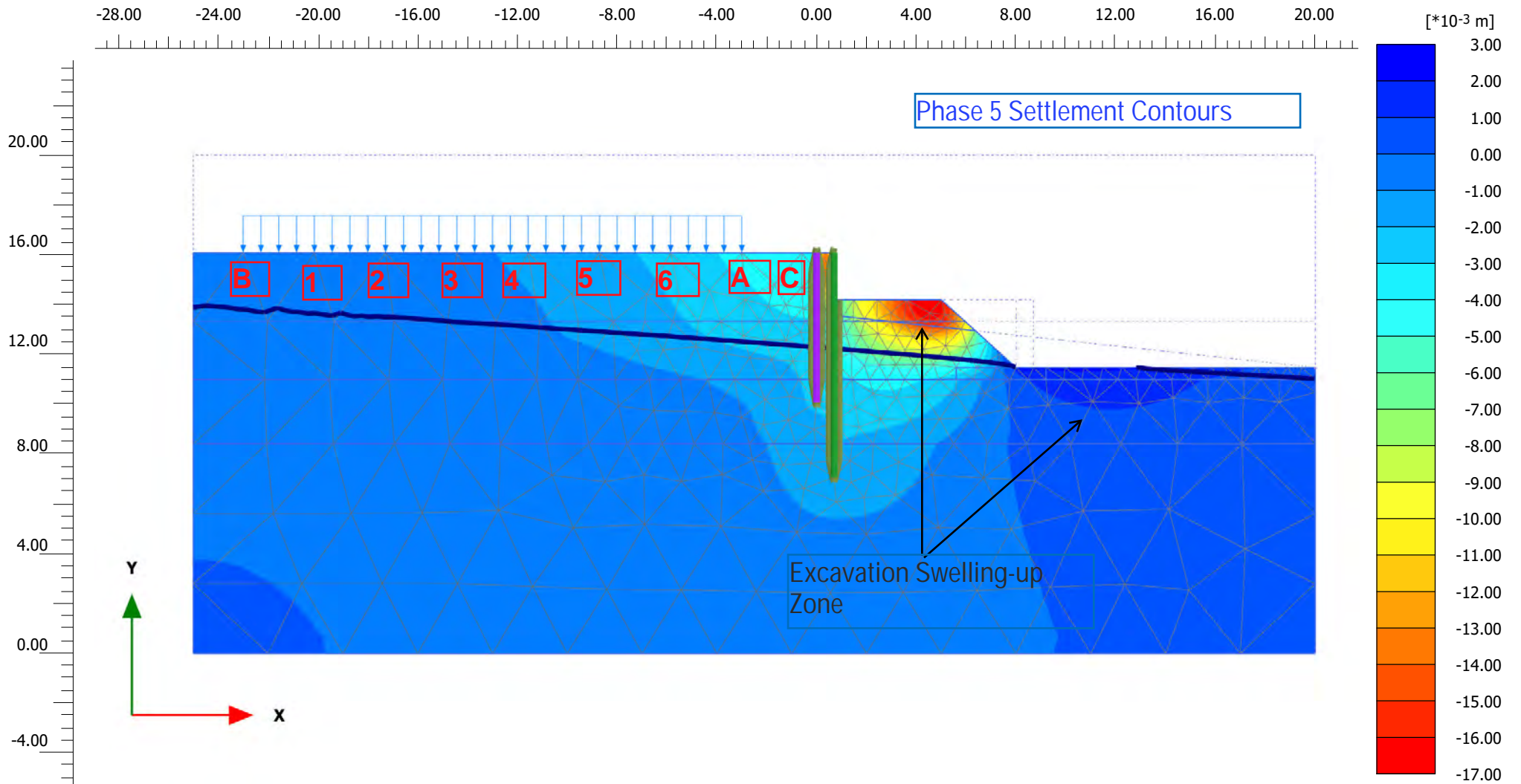
## Section 2 Ground Profile



**Deformed mesh |u| (at true scale)**

Maximum value = 0.02728 m (Element 153 at Node 2108)

## Section 2 Analysis Ground Settlement Contours



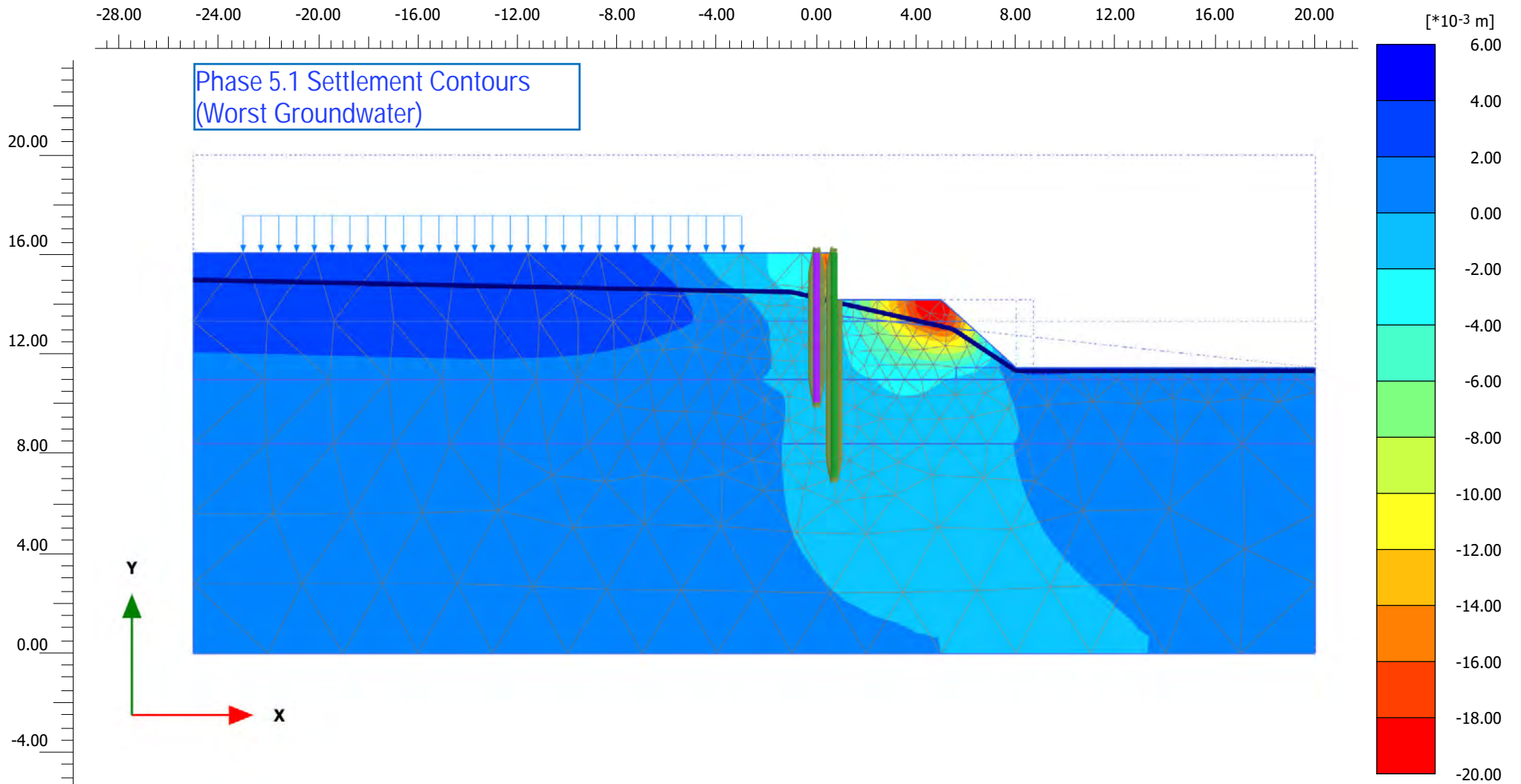
**Total displacements  $u_y$  (scaled up 50.0 times)**

Maximum value =  $2.586 \times 10^{-3}$  m (Element 416 at Node 4811)

Minimum value = -0.01680 m (Element 153 at Node 2113)

**Phase 5 differential Settlements at different interval points - calculation details**

Section 2	Coordinates		Settlement				Pair	x difference	uy difference	Settlement change rate (m/m)
	x (m)	y (m)	u <sub>y</sub> (mm)							
							B to 1	-2.85	0.11	-25909.09091
B	-23	16	-0.4	(-23,16)			B to 2	-5.7	0.2	-28500
1	-20.15	16	-0.51	(-20.15,16)			B to 3	-8.55	0.42	-20357.14286
2	-17.3	16	-0.6	(-17.3,16)			B to 4	-11.4	0.72	-15833.33333
3	-14.45	16	-0.82	(-14.45,16)			B to 5	-14.25	1.06	-13443.39623
4	-11.6	16	-1.12	(-11.6,16)			B to 6	-17.1	1.7	-10058.82353
5	-8.75	16	-1.46	(-8.75,16)			B to A	-20	2.7	-7407.407407
6	-5.9	16	-2.1	(-5.9,16)			1 to 2	-2.85	0.09	-31666.66667
A	-3	16	-3.1	(-3,16)			1 to 3	-5.7	0.31	-18387.09677
							1 to 4	-8.55	0.61	-14016.39344
							1 to 5	-11.4	0.95	-12000
							1 to 6	-14.25	1.59	-8962.264151
							1 to A	-17.15	2.59	-6621.621622
							2 to 3	-2.85	0.22	-12954.54545
							2 to 4	-5.7	0.52	-10961.53846
							2 to 5	-8.55	0.86	-9941.860465
							2 to 6	-11.4	1.5	-7600
							2 to A	-14.3	2.5	-5720
							3 to 4	-2.85	0.3	-9500
							3 to 5	-5.7	0.64	-8906.25
							3 to 6	-8.55	1.28	-6679.6875
							3 to A	-11.45	2.28	-5021.929825
							4 to 5	-2.85	0.34	-8382.352941
							4 to 6	-5.7	0.98	-5816.326531
							4 to A	-8.6	1.98	-4343.434343
							5 to 6	-2.85	0.64	-4453.125
							5 to A	-5.75	1.64	-3506.097561
							6 to A	-2.9	1	-2900

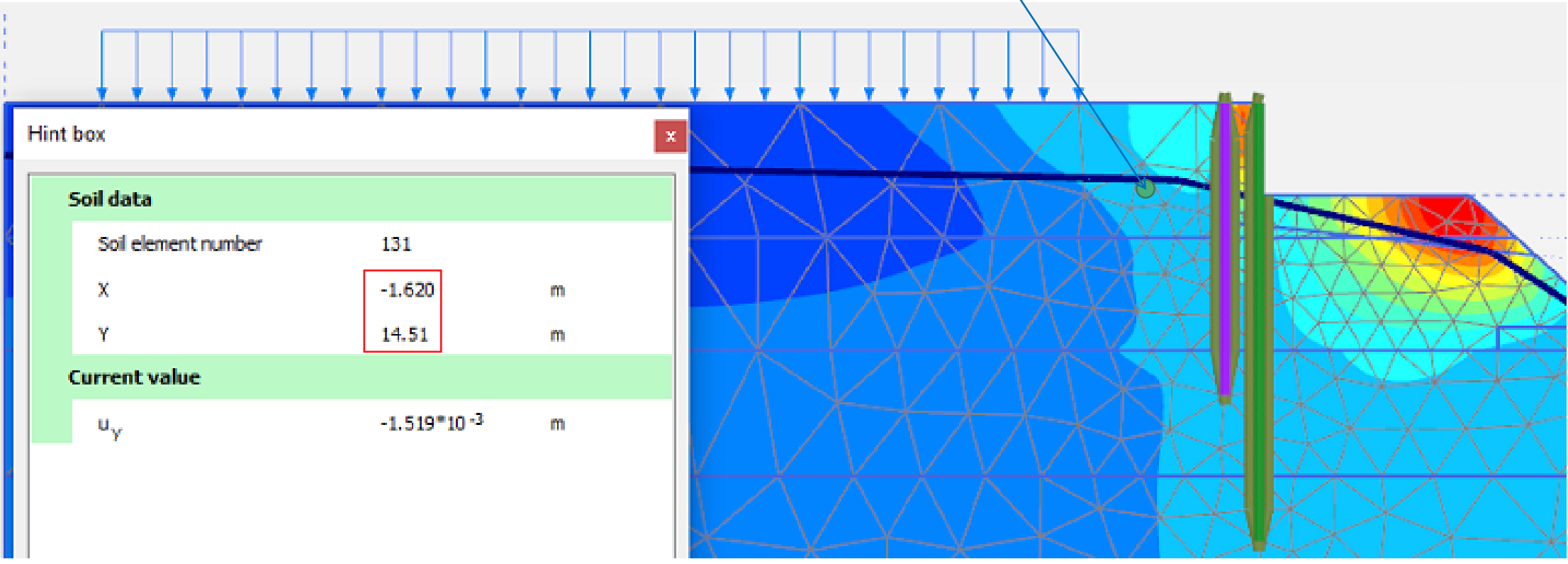


**Total displacements  $u_y$  (scaled up 50.0 times)**

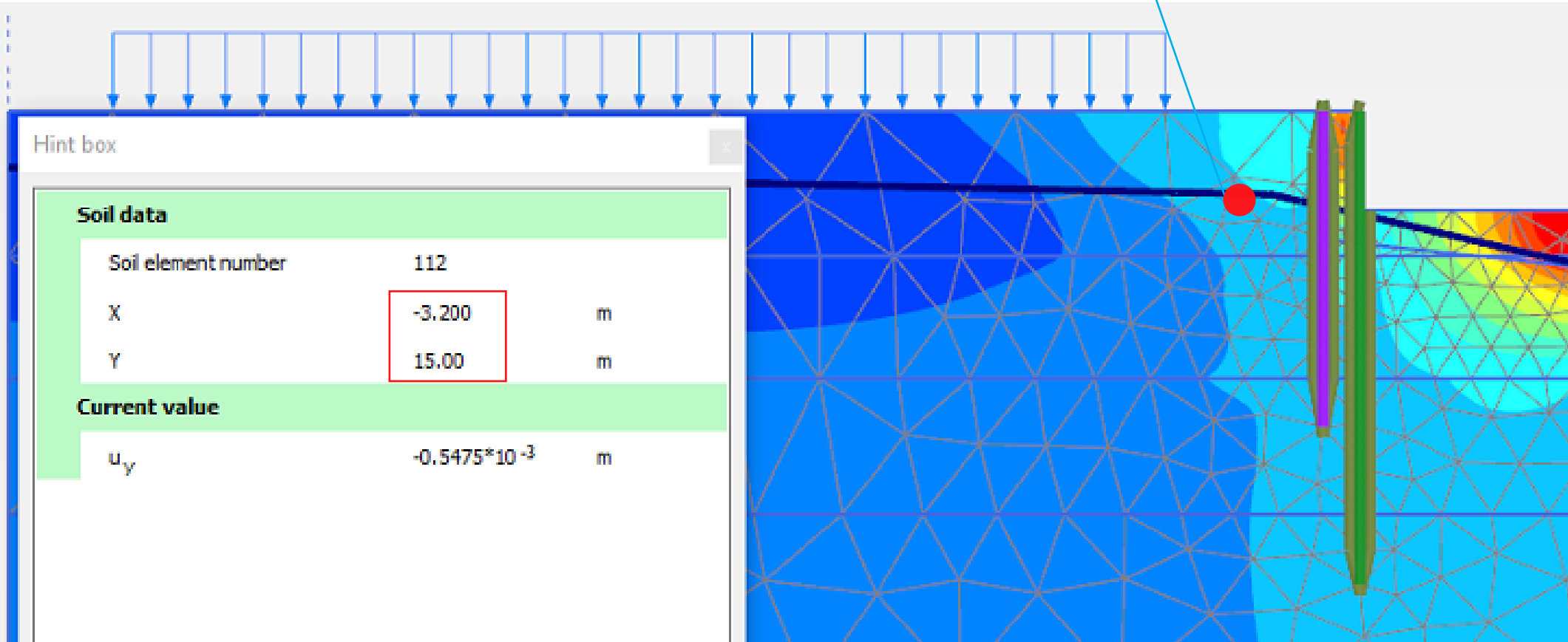
Maximum value =  $4.306 \times 10^{-3}$  m (Element 416 at Node 4811)

Minimum value = -0.01987 m (Element 153 at Node 2113)

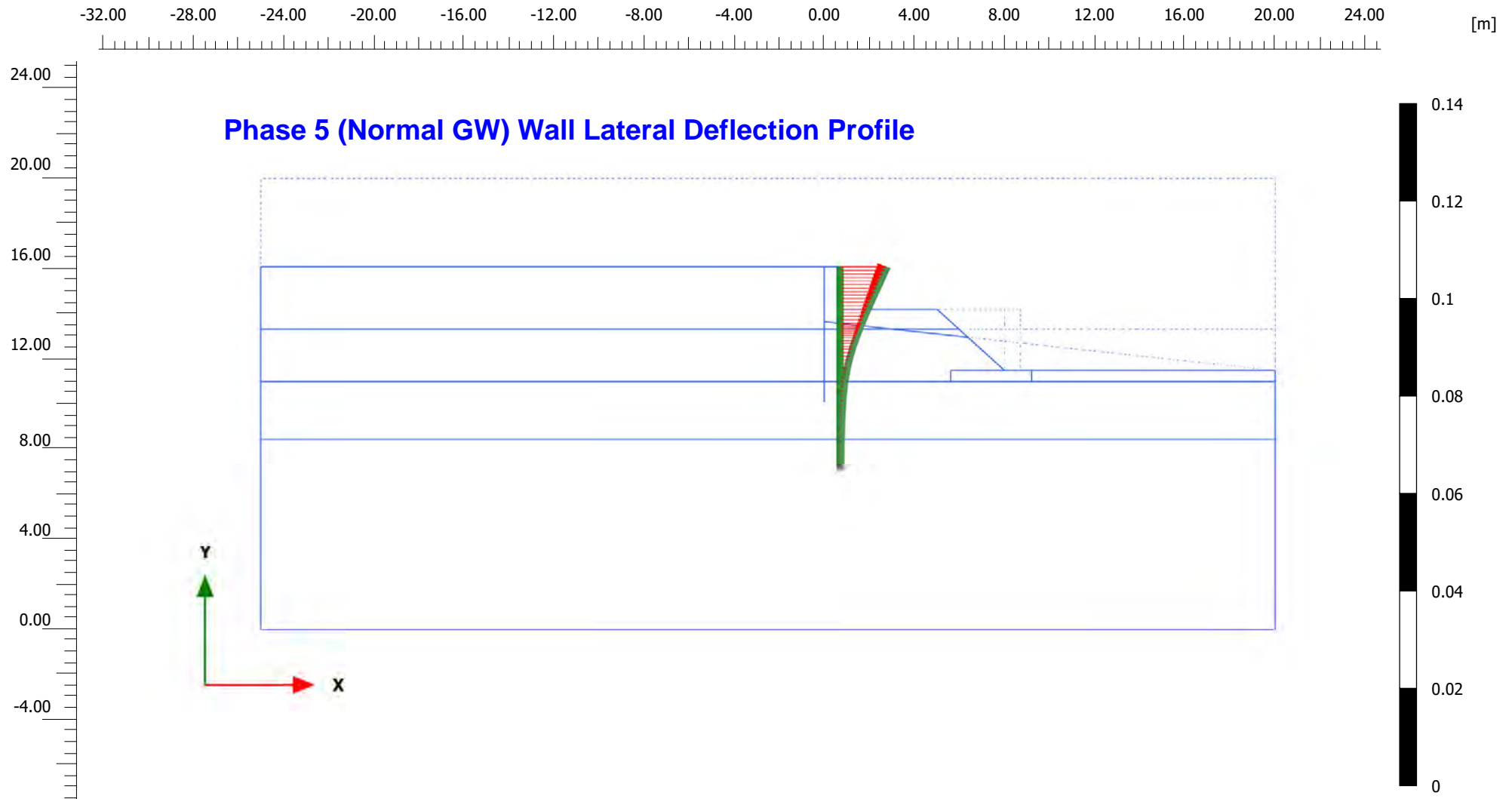
Predicted settlement at Existing SW Line



Predicted Settlement at  
WW Location



## **Section 2 Lateral Deflections**



**Total displacements  $u_x$  (scaled up 200 times)**

Maximum value = 0.01044 m (Element 1 at Node 574)

Minimum value =  $0.1735 \cdot 10^{-3}$  m (Element 24 at Node 3742)



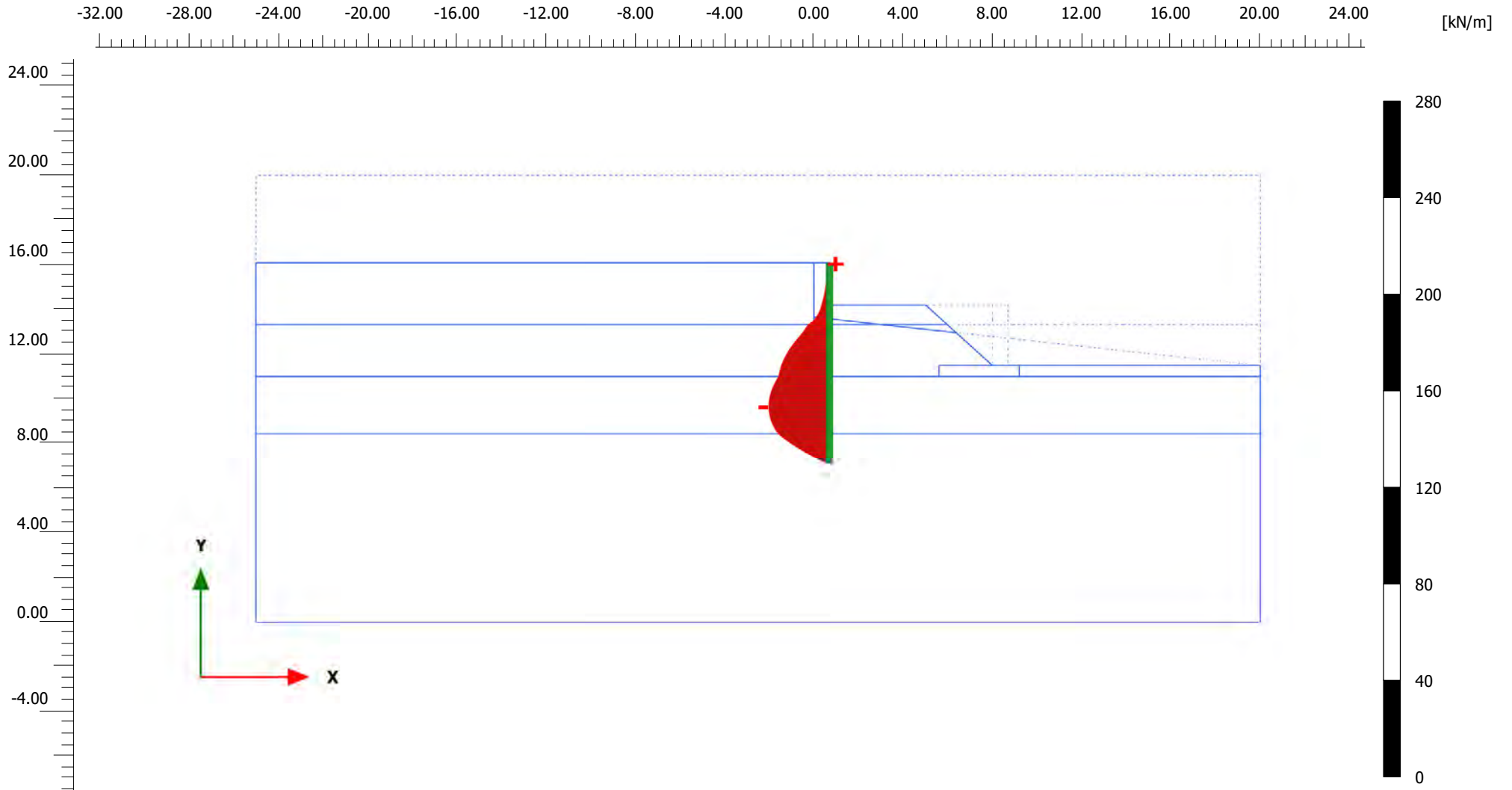
**Total displacements  $u_x$  (scaled up 100 times)**

Maximum value = 0.02177 m (Element 1 at Node 574)

Minimum value =  $1.194 \times 10^{-3}$  m (Element 24 at Node 3742)

## **Section 2 Analysis - Wall Internal Actions**

## **SECTION 2 NORMAL GROUNDWATER SCENARIO**



**Axial forces N (scaled up 0.100 times)**

Maximum value = 0.1198 kN/m (Element 1 at Node 574)

Minimum value = -27.20 kN/m (Element 21 at Node 2452)



**Bending moments M (scaled up 0.500 times)**

Maximum value =  $5.157 \times 10^{-15}$  kN m/m (Element 1 at Node 574)

Minimum value = -4.544 kN m/m (Element 17 at Node 1274)

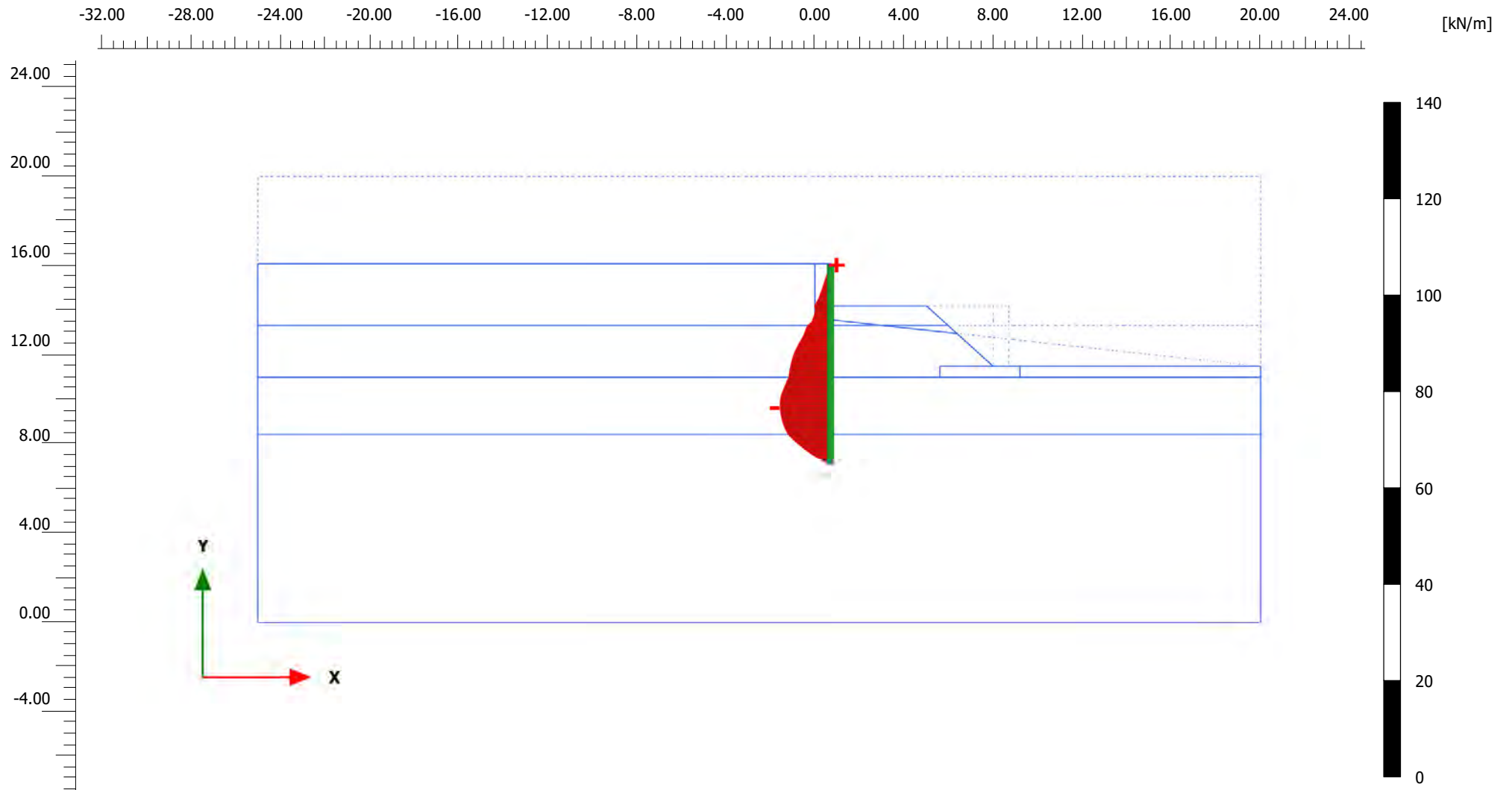


**Shear forces Q (scaled up 0.500 times)**

Maximum value = 2.275 kN/m (Element 20 at Node 2316)

Minimum value = -2.928 kN/m (Element 15 at Node 490)

## **SECTION 2 WORST GROUNDWATER SCENARIO**



**Axial forces N (scaled up 0.200 times)**

Maximum value = 0.1165 kN/m (Element 1 at Node 574)

Minimum value = -11.32 kN/m (Element 21 at Node 2452)



**Bending moments M (scaled up 0.500 times)**

Maximum value =  $0.8334 \times 10^{-15}$  kN m/m (Element 1 at Node 574)

Minimum value = -6.697 kN m/m (Element 18 at Node 2314)

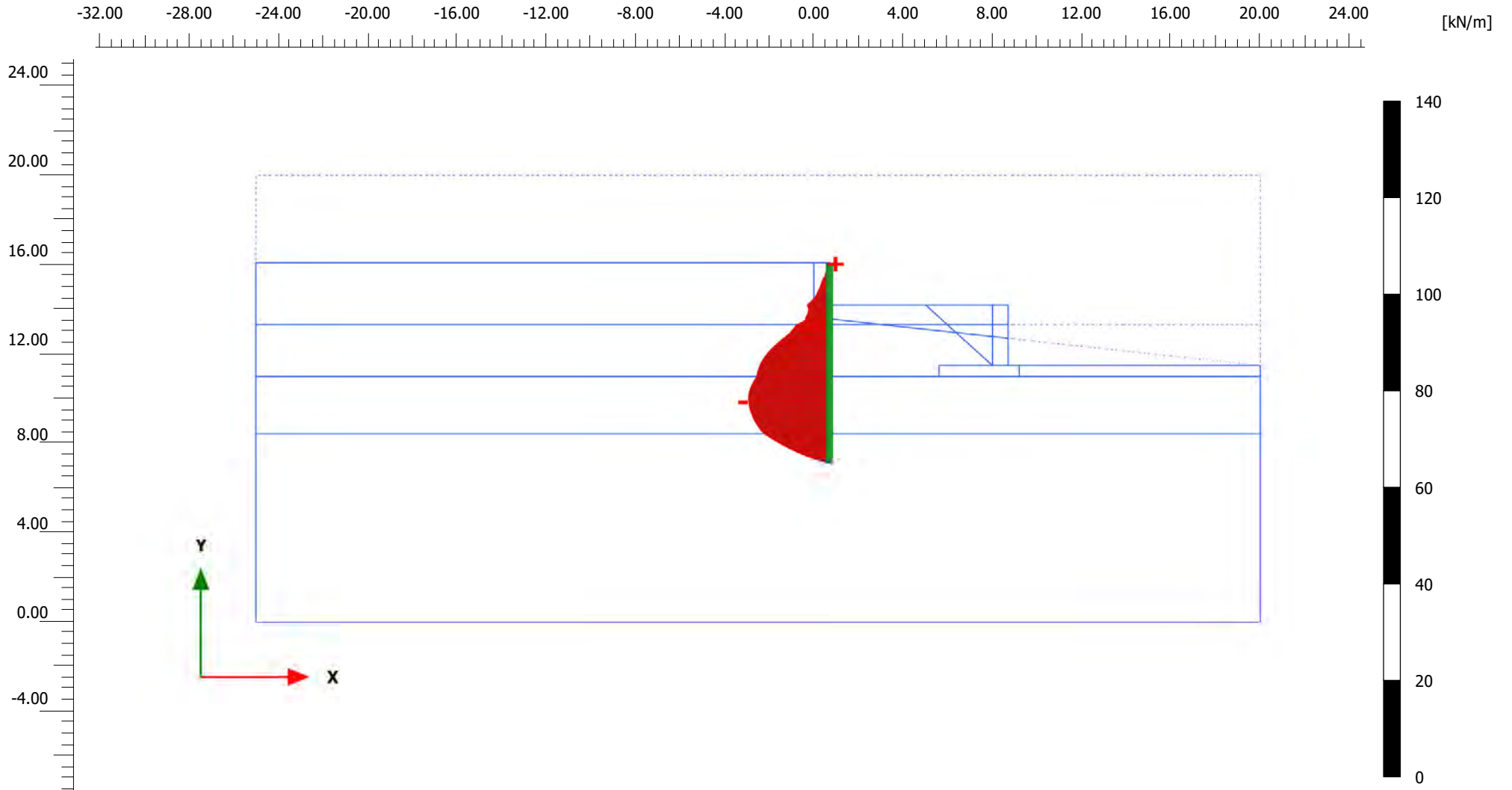


**Shear forces Q (scaled up 0.500 times)**

Maximum value = 2.682 kN/m (Element 23 at Node 3527)

Minimum value = -2.146 kN/m (Element 15 at Node 489)

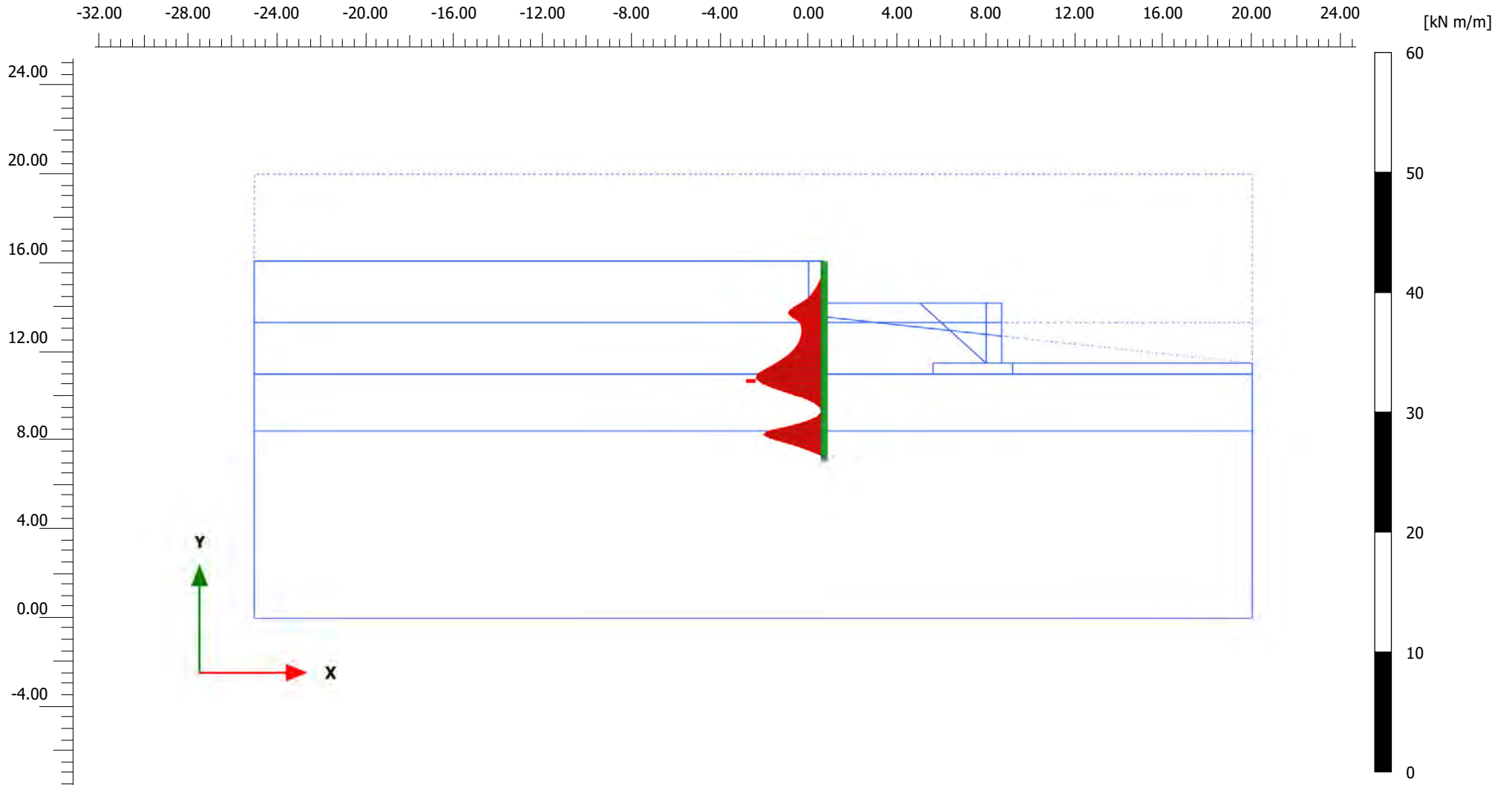
## **SECTION 2 SEISMIC LOADING SCENARIO**



**Axial forces N (scaled up 0.200 times)**

Maximum value = 0.1100 kN/m (Element 1 at Node 574)

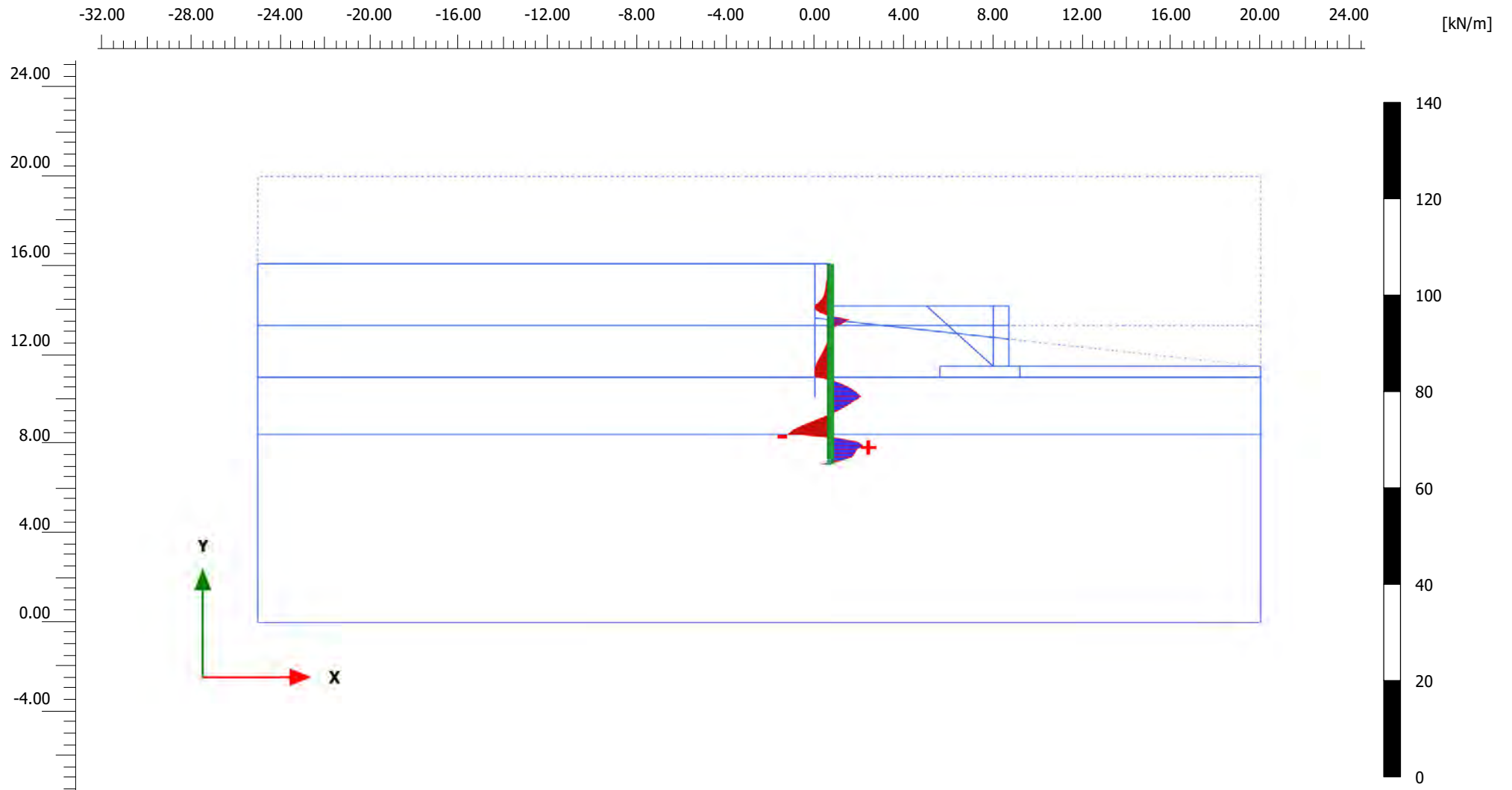
Minimum value = -18.16 kN/m (Element 21 at Node 2451)



**Bending moments M (scaled up 0.500 times)**

Maximum value =  $-0.2671 \cdot 10^{-15}$  kN m/m (Element 24 at Node 3742)

Minimum value = -6.139 kN m/m (Element 20 at Node 2315)

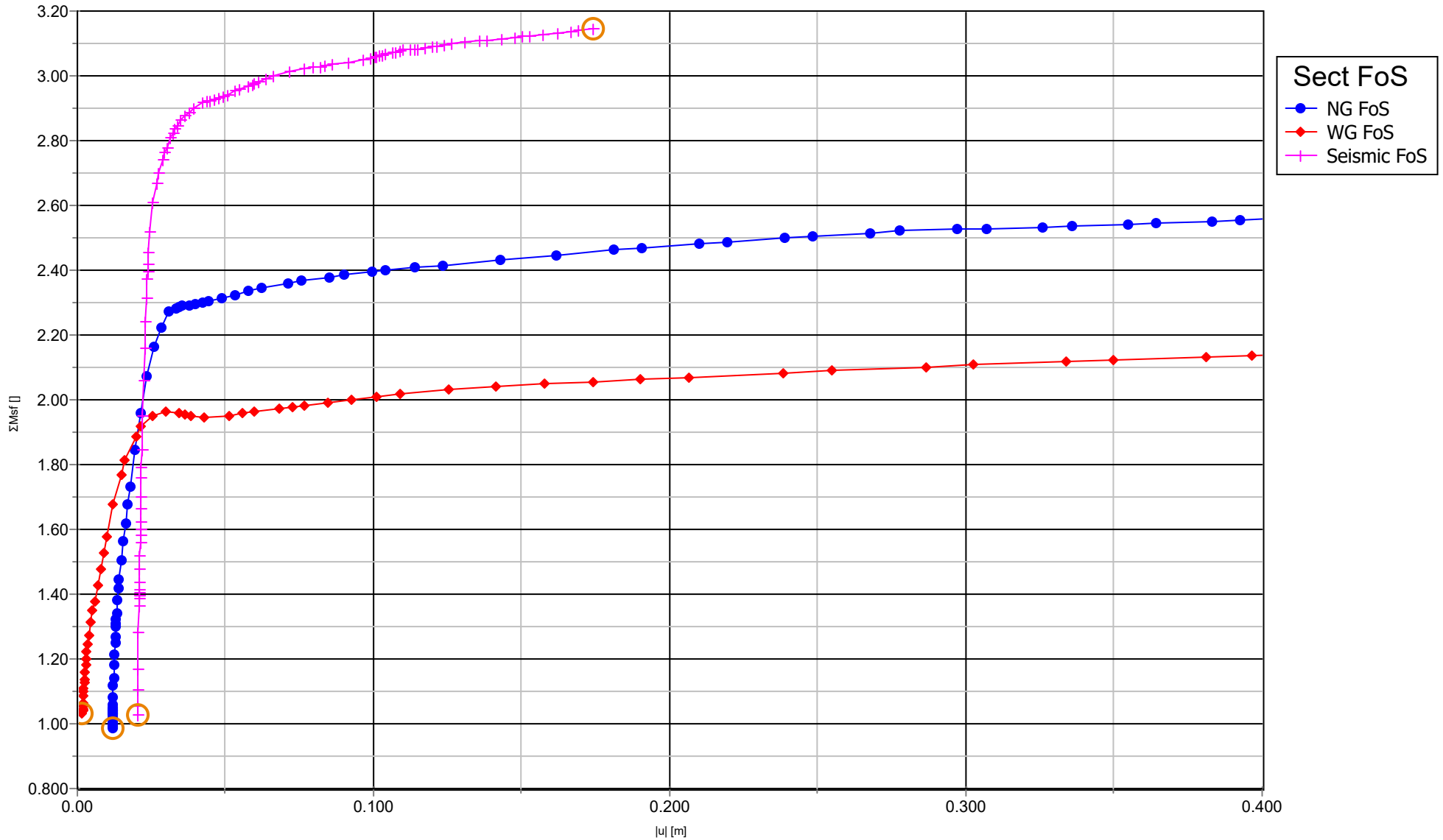


**Shear forces Q (scaled up 0.200 times)**

Maximum value = 7.267 kN/m (Element 23 at Node 3529)

Minimum value = -9.607 kN/m (Element 22 at Node 3526)

## **SECTION 2 FACTOR OF SAFETY ANALYSIS**



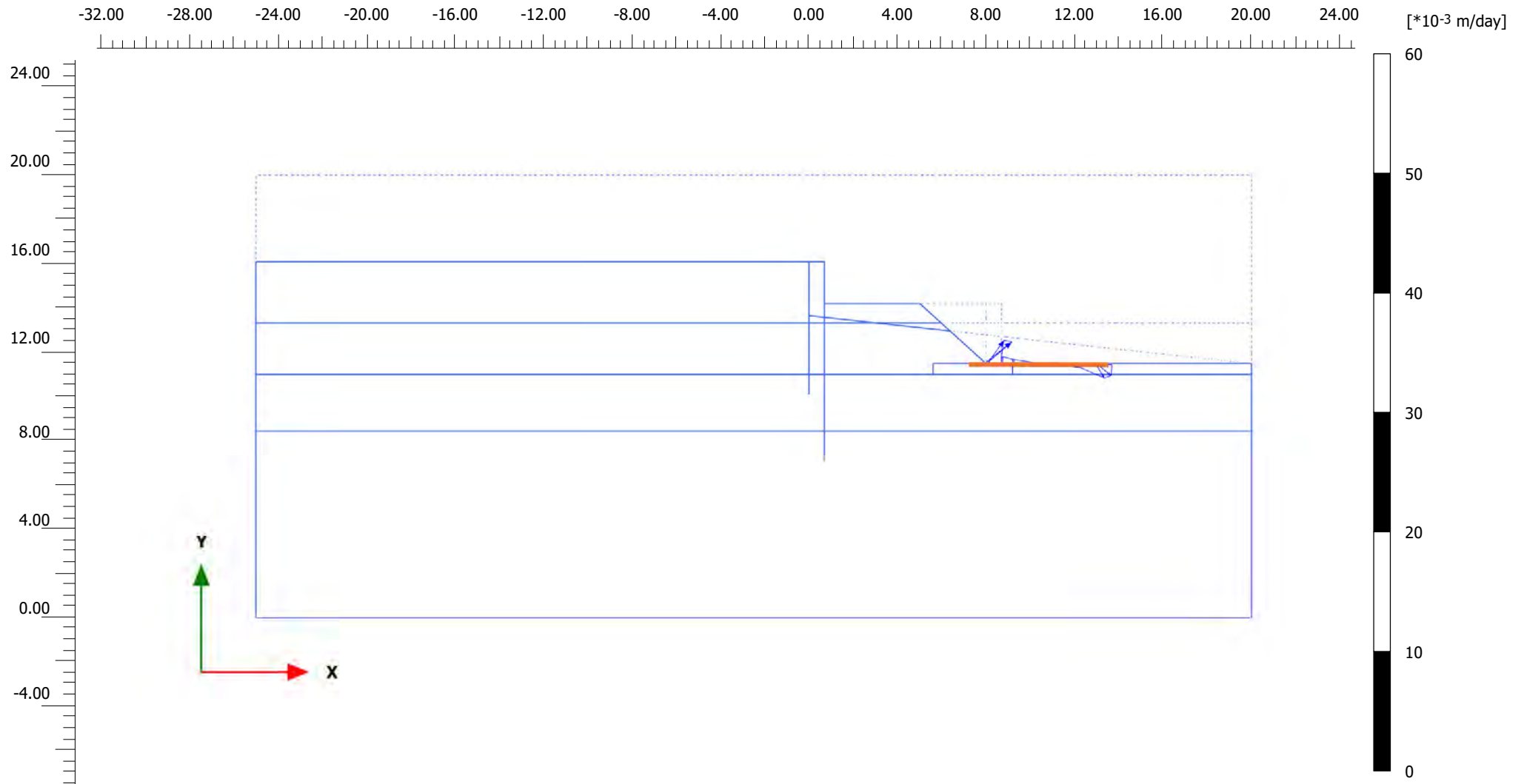
*Project description*  
**J00538 3 Pigeon Mountain Road Sect 2 FoS**

*Date*  
**18/12/2025**

*Project filename*  
**J00538 PMR Section 2 r5\_tim ...**

*Step*  
**484**

*Company*  
**Total Ground Engineering**



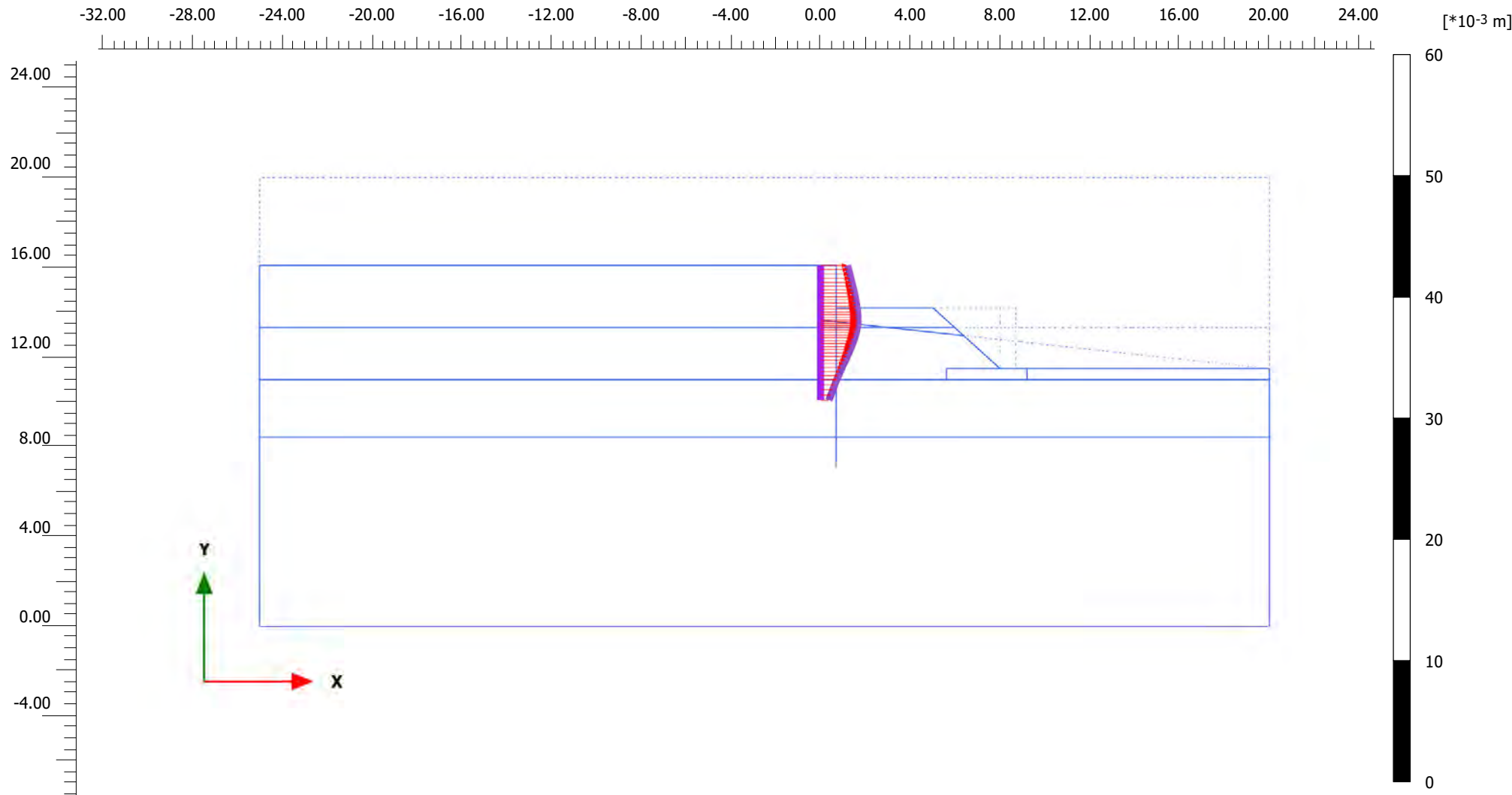
**Groundwater flow |q| (scaled up 500 times)**

Maximum value =  $3.120 \times 10^{-3}$  m/day

Minimum value =  $0.06536 \times 10^{-3}$  m/day

Total discharge is  $1.522 \times 10^{-3}$  m<sup>3</sup>/day/m

**SECTION 2 EXISTING WALL DEFLECTION UNDER  
NORMAL GROUNDWATER CONDITION**



**Total displacements  $u_x$  (scaled up 500 times)**

Maximum value =  $3.331 \times 10^{-3}$  m (Element 9 at Node 134)

Minimum value =  $0.7481 \times 10^{-3}$  m (Element 19 at Node 1869)

## Section 3

Design Spreadsheets Calculations and Plaxis Analysis Outputs

### **Section 3 Plaxis Analysis Phases**

**Phase 0: Initial Phase (Initialize the model)**

**Phase 1: Neighboring Property Loading and Western Timber Retaining Wall Installation.**

**Phase 2: Install Proposed Retaining Wall (Previous phase displacement reset)**

**Phase 3: Backfill behind Proposed Wall**

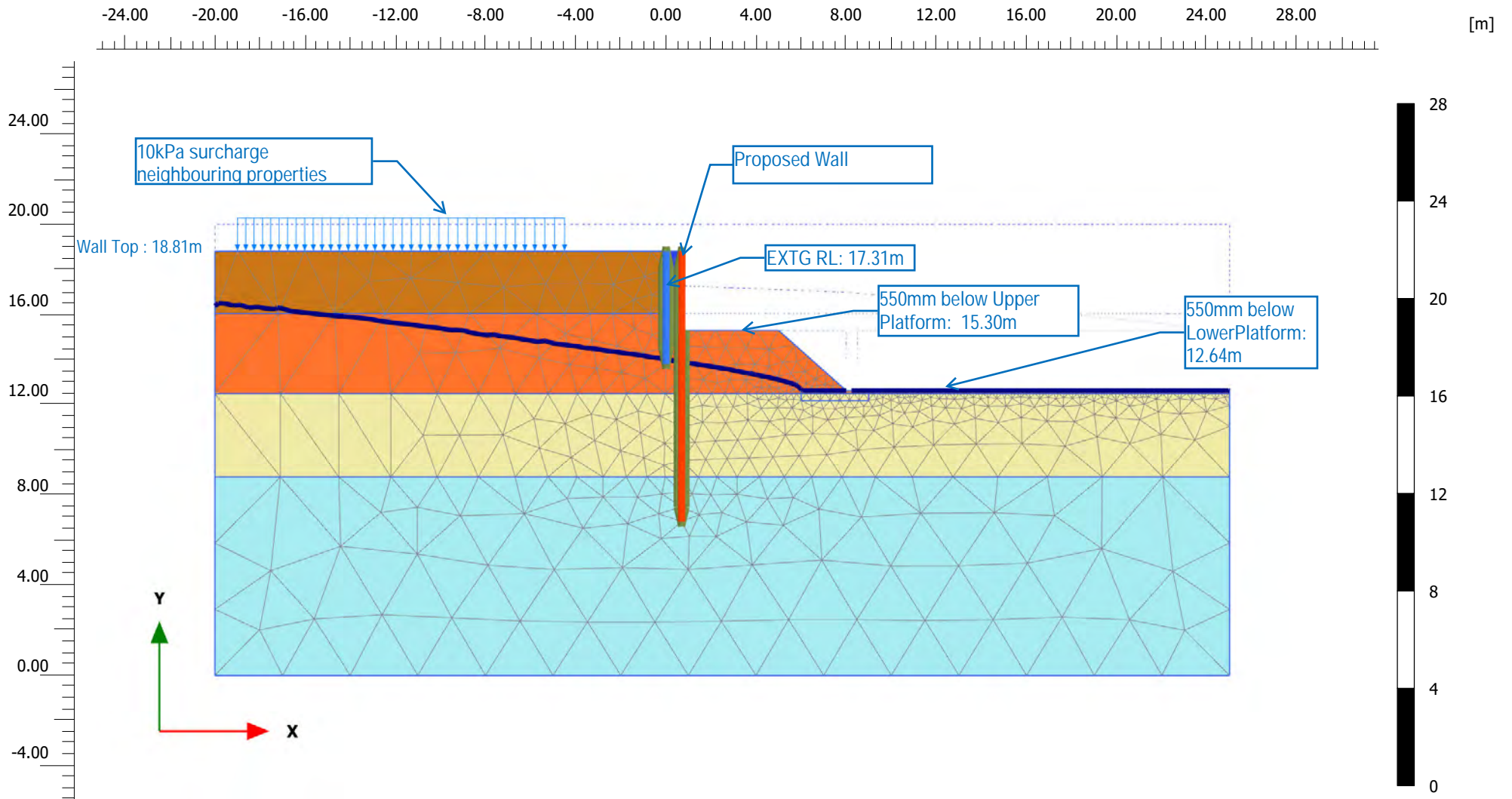
**Phase 4: Excavation of the Upper Platform in front of the Wall (550mm below FFL) Steady state groundwater drawdown analysis)**

**Phase 5: Excavation of the Lower Platform (550 mm below FFL) (Steady state groundwater drawdown analysis)**

**Phase 5.1: Worst Ground Water Scenario**

**Phase 5.2: Seismic Scenario**

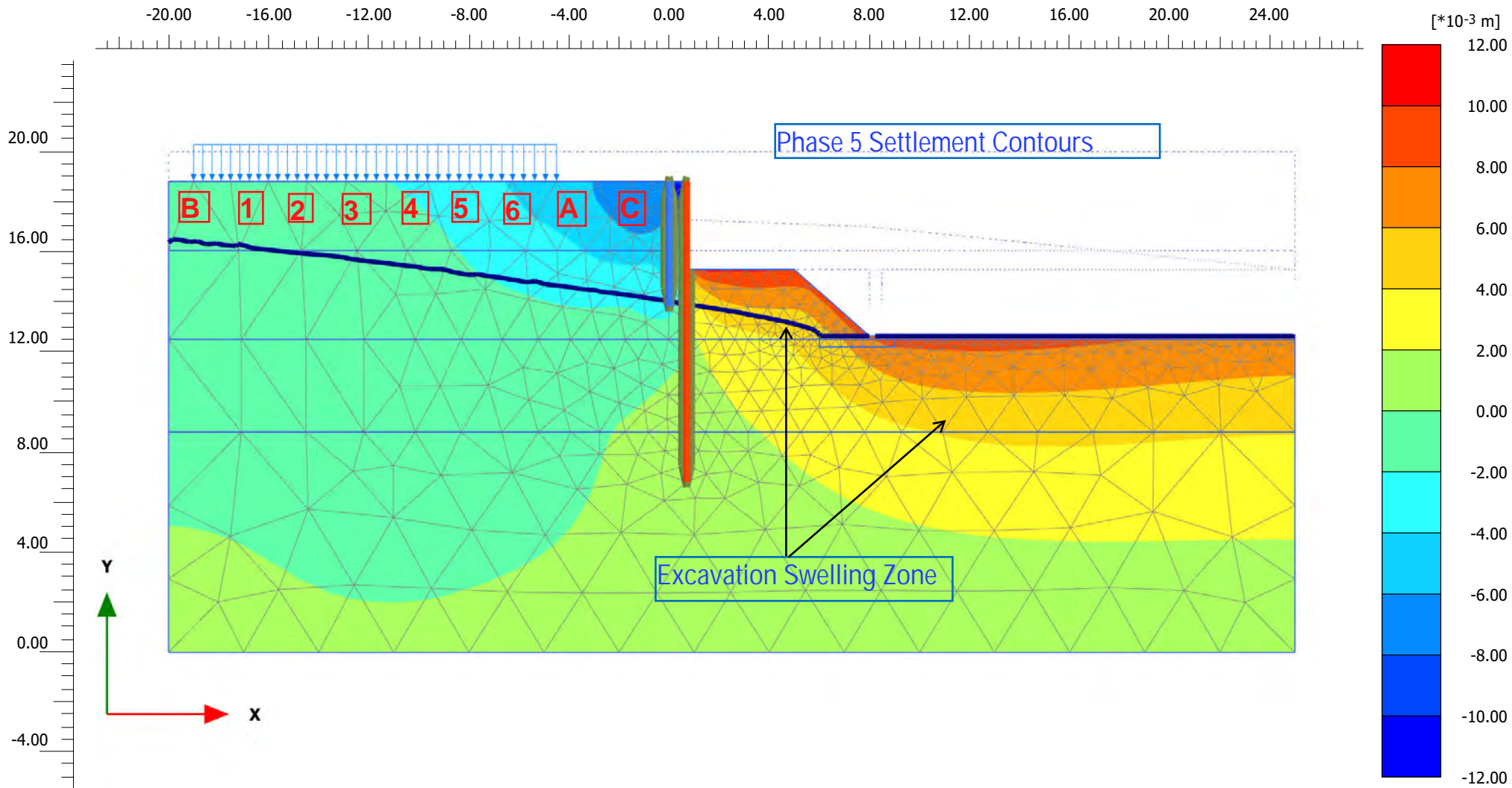
## Section 3 Ground Profile



**Deformed mesh |u| (at true scale)**

Maximum value = 0.01874 m (Element 105 at Node 78)

## Section 3 Analysis Ground Settlement Contours



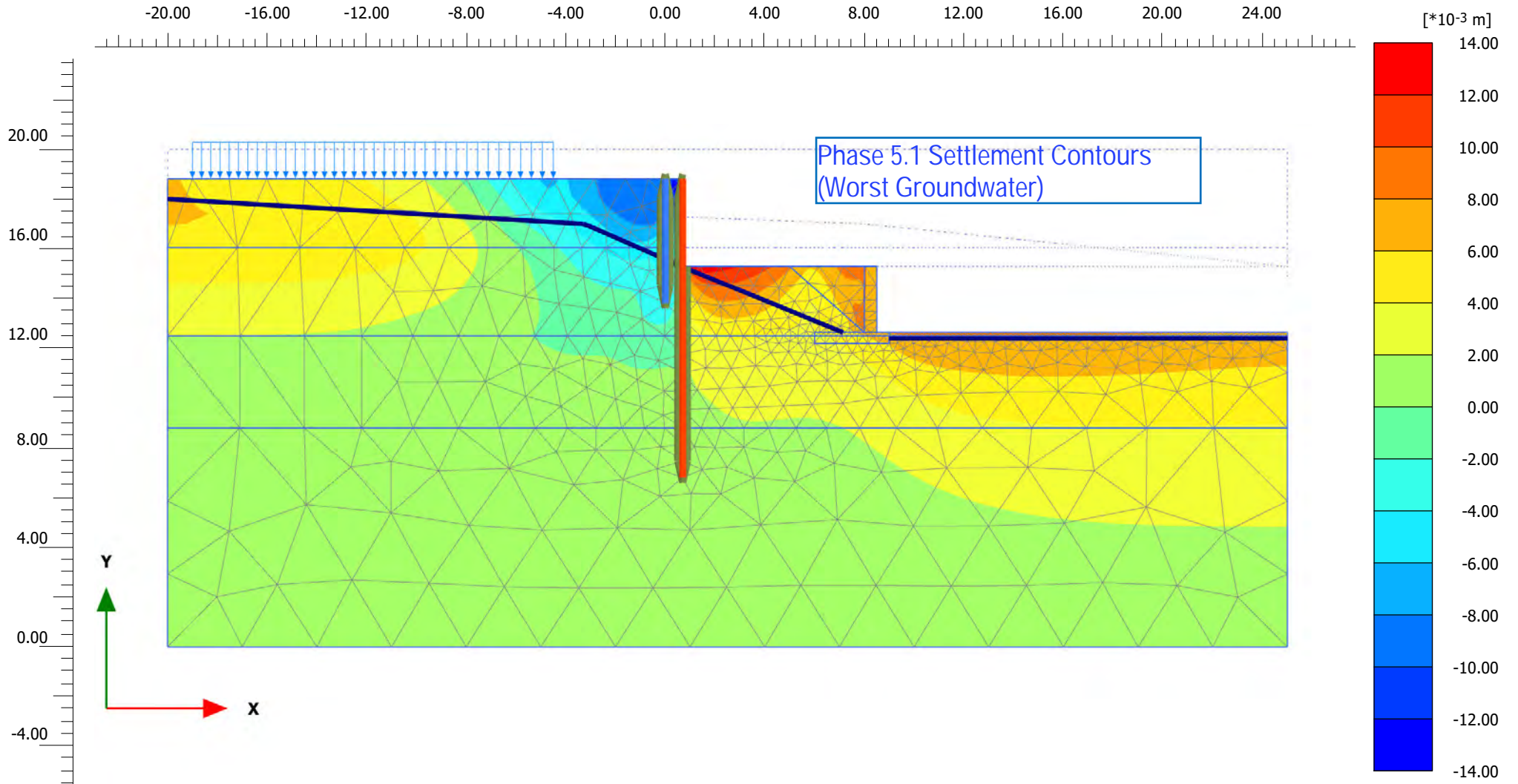
**Total displacements  $u_y$  (scaled up 50.0 times)**

Maximum value = 0.01037 m (Element 1069 at Node 847)

Minimum value = -0.01046 m (Element 107 at Node 176)

## Phase 5 differential Settlements at different interval points calculation details

Section 3	Coordinates		Settlement					Pair	x difference	uy difference	Settlement change rate (m/m)
	x (m)	y (m)	u <sub>v</sub> (mm)								
								B to 1	-2.14	0.22	-9727.272727
B	-19	18.8	-1.1	(-19,18.8)				B to 2	-4.28	0.4	-10700
1	-16.86	18.8	-1.32	(-16.86,18.8)				B to 3	-6.42	0.65	-9876.923077
2	-14.72	18.8	-1.5	(-14.72,18.8)				B to 4	-8.56	1.4	-6114.285714
3	-12.58	18.8	-1.75	(-12.58,18.8)				B to 5	-10.7	1.9	-5631.578947
4	-10.44	18.8	-2.5	(-10.44,18.8)				B to 6	-12.84	3.2	-4012.5
5	-8.3	18.8	-3	(-8.3,18.8)				B to A	-15	4.1	-3658.536585
6	-6.16	18.8	-4.3	(-6.16,18.8)				1 to 2	-2.14	0.18	-11888.88889
A	-4	18.8	-5.2	(-4,18.8)				1 to 3	-4.28	0.43	-9953.488372
								1 to 4	-6.42	1.18	-5440.677966
								1 to 5	-8.56	1.68	-5095.238095
								1 to 6	-10.7	2.98	-3590.604027
								1 to A	-12.86	3.88	-3314.43299
								2 to 3	-2.14	0.25	-8560
								2 to 4	-4.28	1	-4280
								2 to 5	-6.42	1.5	-4280
								2 to 6	-8.56	2.8	-3057.142857
								2 to A	-10.72	3.7	-2897.297297
								3 to 4	-2.14	0.75	-2853.333333
								3 to 5	-4.28	1.25	-3424
								3 to 6	-6.42	2.55	-2517.647059
								3 to A	-8.58	3.45	-2486.956522
								4 to 5	-2.14	0.5	-4280
								4 to 6	-4.28	1.8	-2377.777778
								4 to A	-6.44	2.7	-2385.185185
								5 to 6	-2.14	1.3	-1646.153846
								5 to A	-4.3	2.2	-1954.545455
								6 to A	-2.16	0.9	-2400



**Total displacements  $u_y$  (scaled up 50.0 times)**

Maximum value = 0.01340 m (Element 1076 at Node 478)

Minimum value = -0.01262 m (Element 105 at Node 74)

Predicted settlement at Existing SW Line

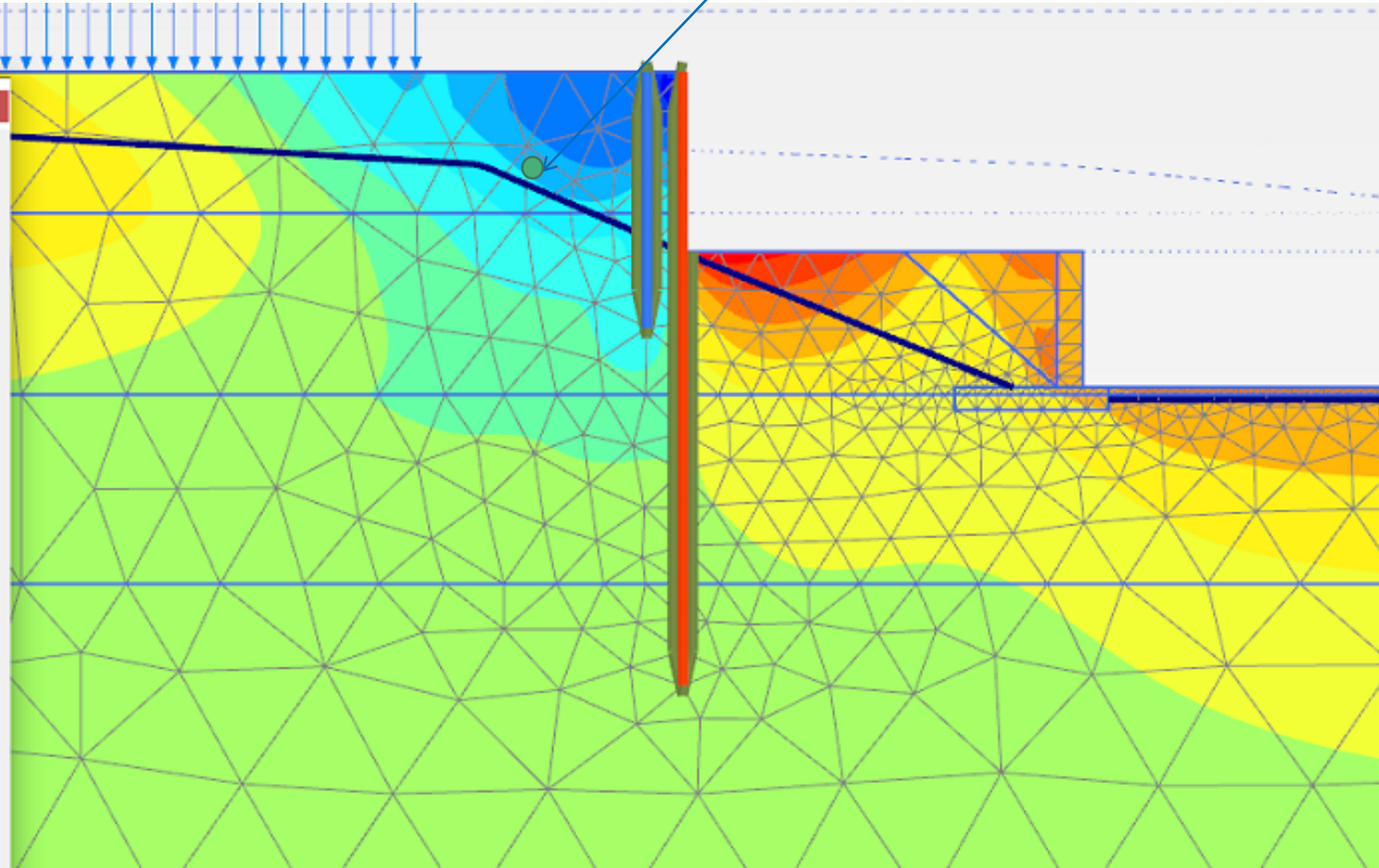
Hint box

Soil data

Soil element number	146	
X	-1.700	m
Y	17.08	m

Current value

$u_y$	$-7.690 \cdot 10^{-3}$	m
-------	------------------------	---



Predicted Settlement at Existing WW Location



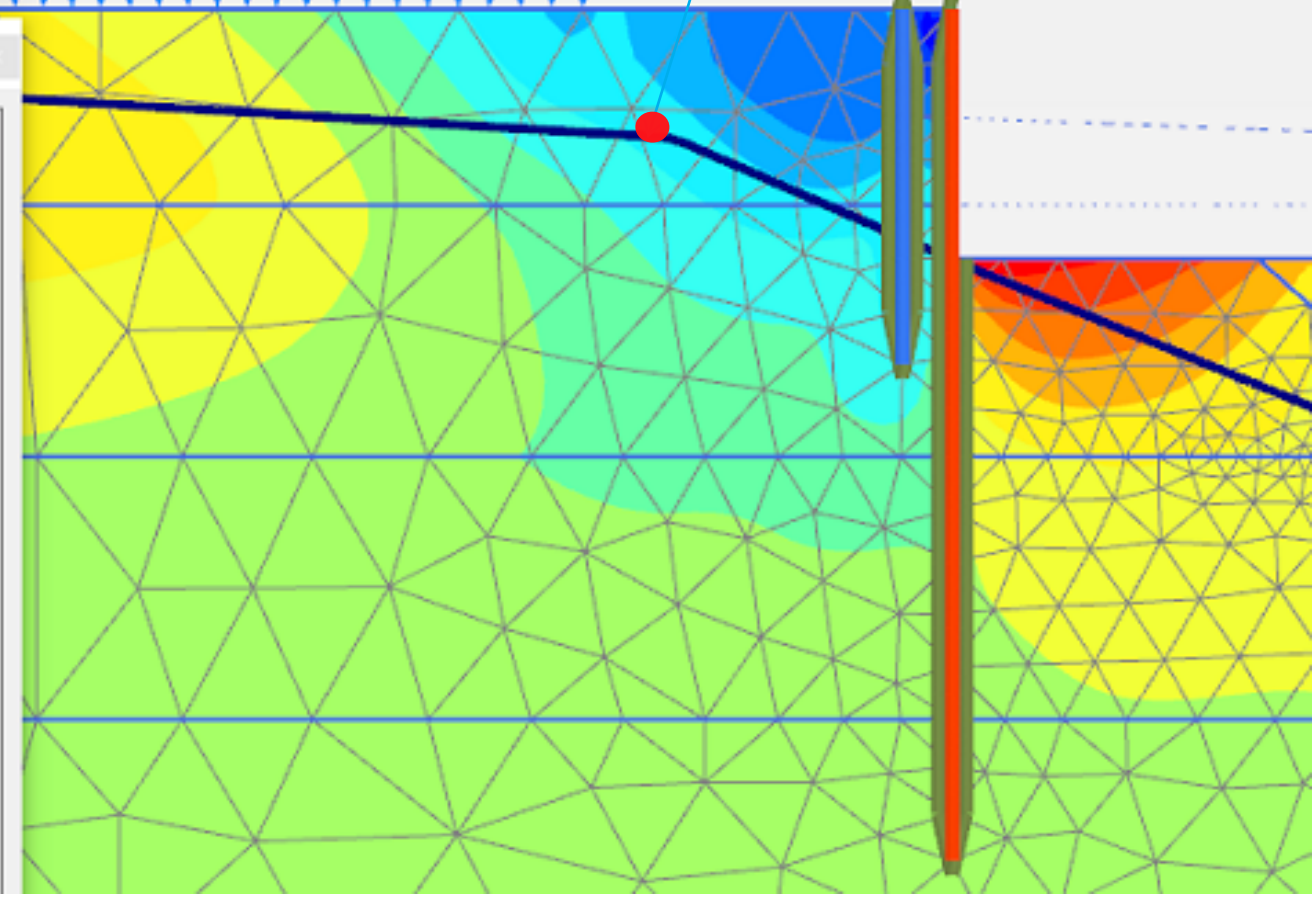
Hint box

**Soil data**

Soil element number	142	
X	-3.251	m
Y	17.18	m

**Current value**

$u_y$	$-5.235 \cdot 10^{-3}$	m
-------	------------------------	---



## **SECTION 3 LATERAL DEFLECTIONS ANALYSIS**



**Total displacements  $u_x$  (scaled up 200 times)**

Maximum value = 0.01727 m (Element 4 at Node 81)  
 Minimum value = 1.105\*10<sup>-3</sup> m (Element 22 at Node 8958)

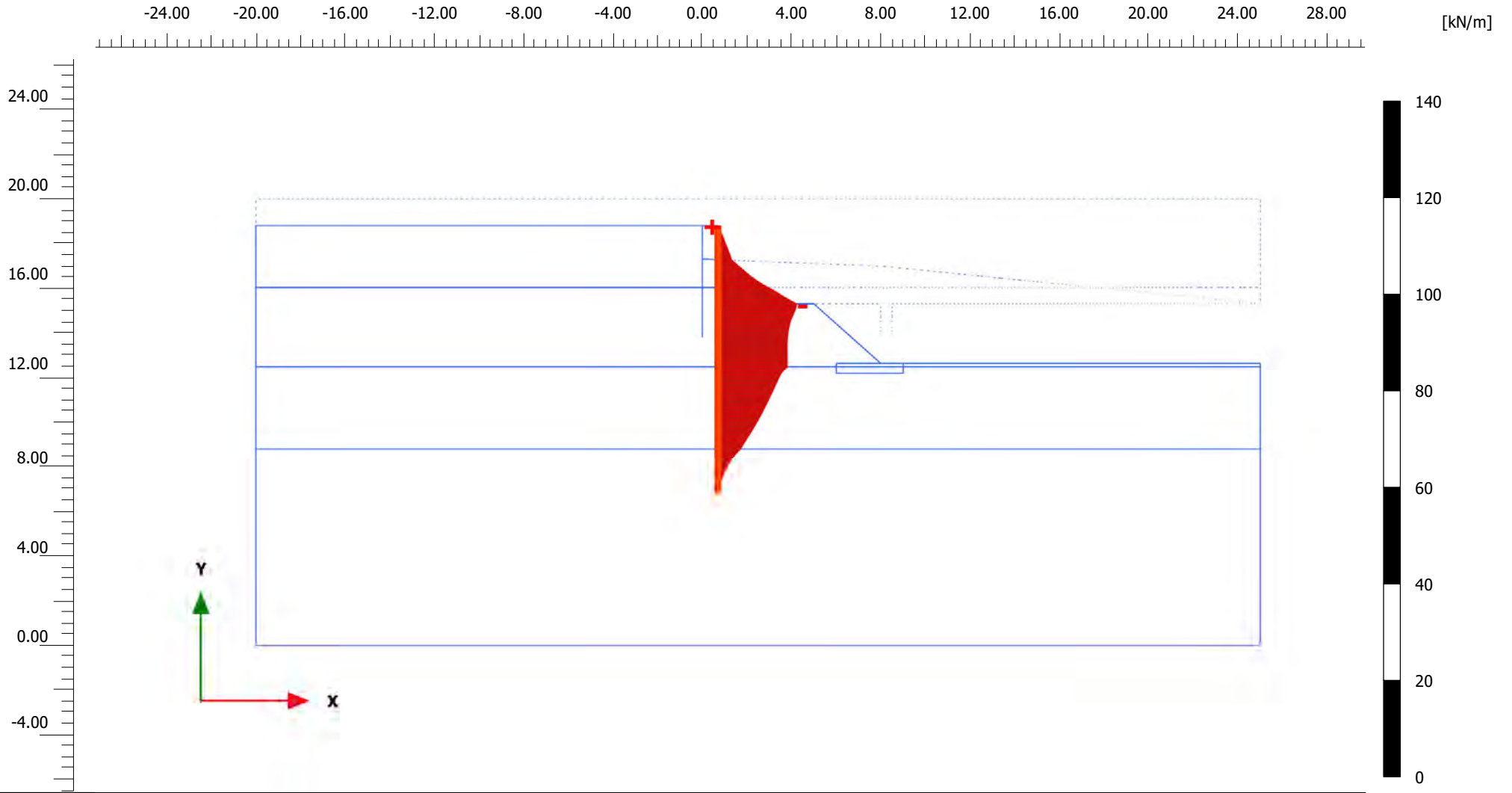


**Total displacements  $u_x$  (scaled up 50.0 times)**

Maximum value = 0.03694 m (Element 4 at Node 81)  
 Minimum value =  $2.573 \times 10^{-3}$  m (Element 22 at Node 8958)

## **SECTION 3 ANALYSIS - WALL INTERNAL ACTIONS**

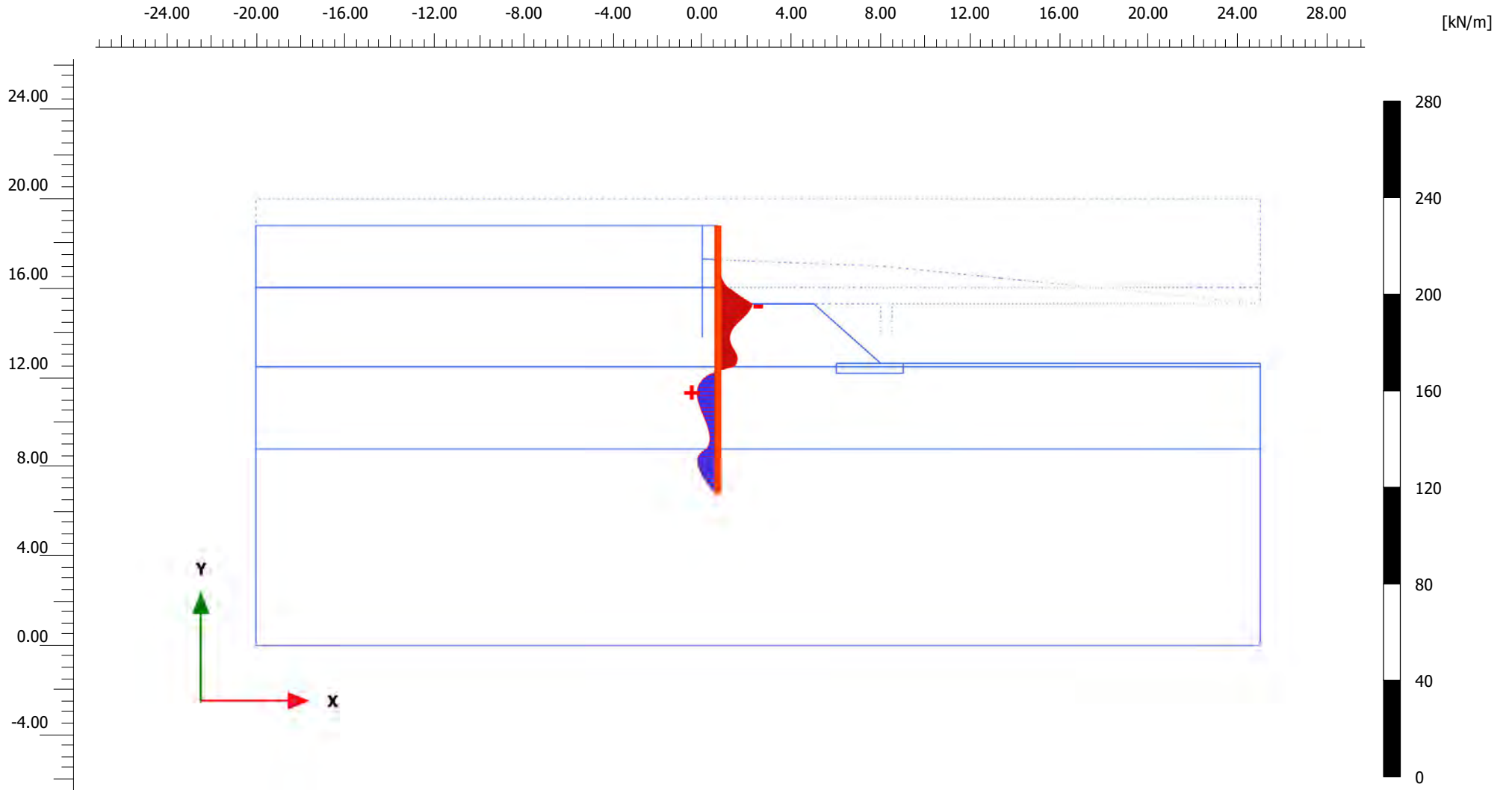
## **SECTION 3 NORMAL GROUNDWATER SCENARIO**



**Axial forces N (scaled up 0.200 times)**

Maximum value = 0.02139 kN/m (Element 4 at Node 81)

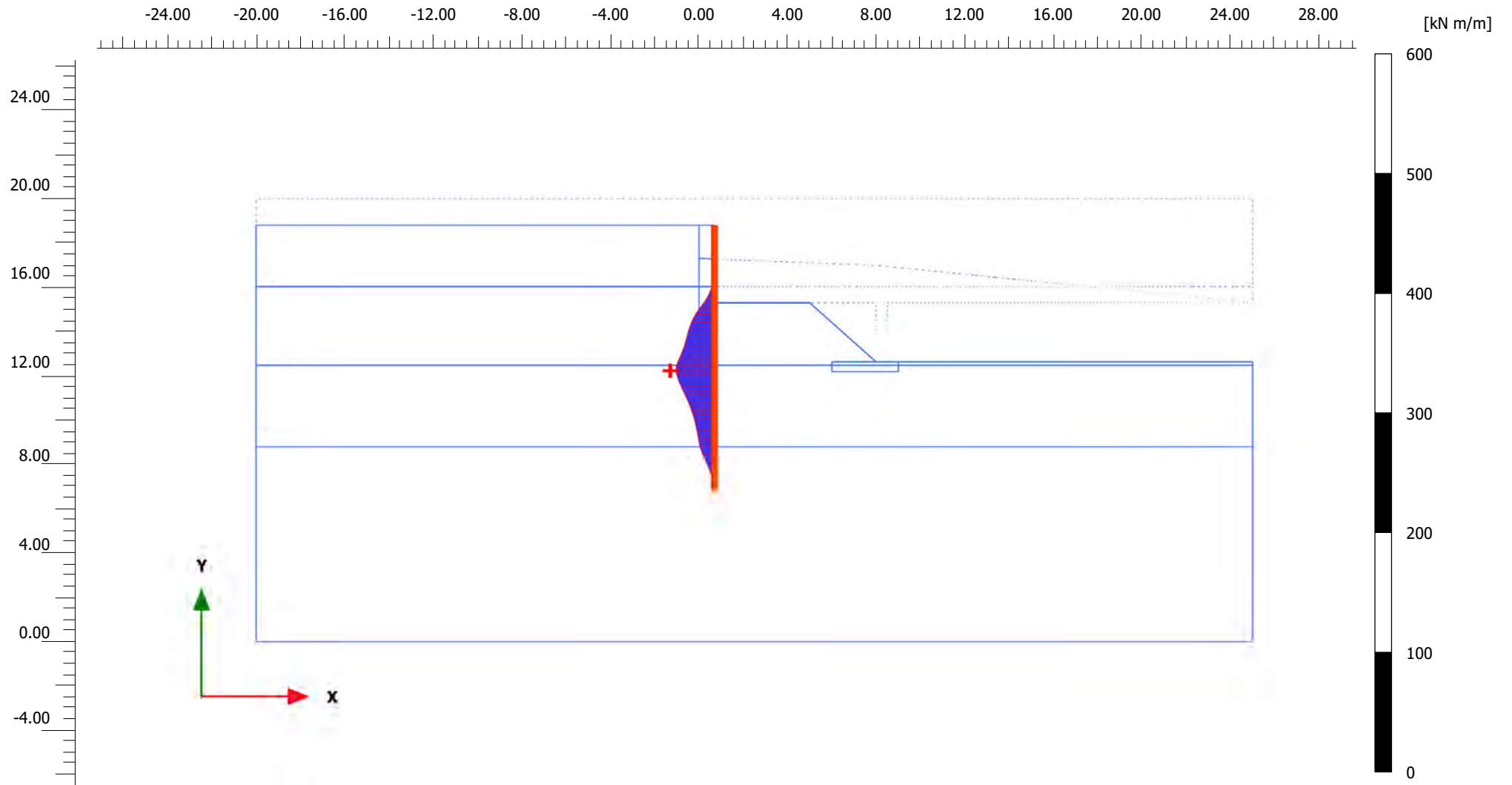
Minimum value = -17.74 kN/m (Element 16 at Node 471)



**Shear forces Q (scaled up 0.100 times)**

Maximum value = 9.313 kN/m (Element 20 at Node 3252)

Minimum value = -15.45 kN/m (Element 9 at Node 471)

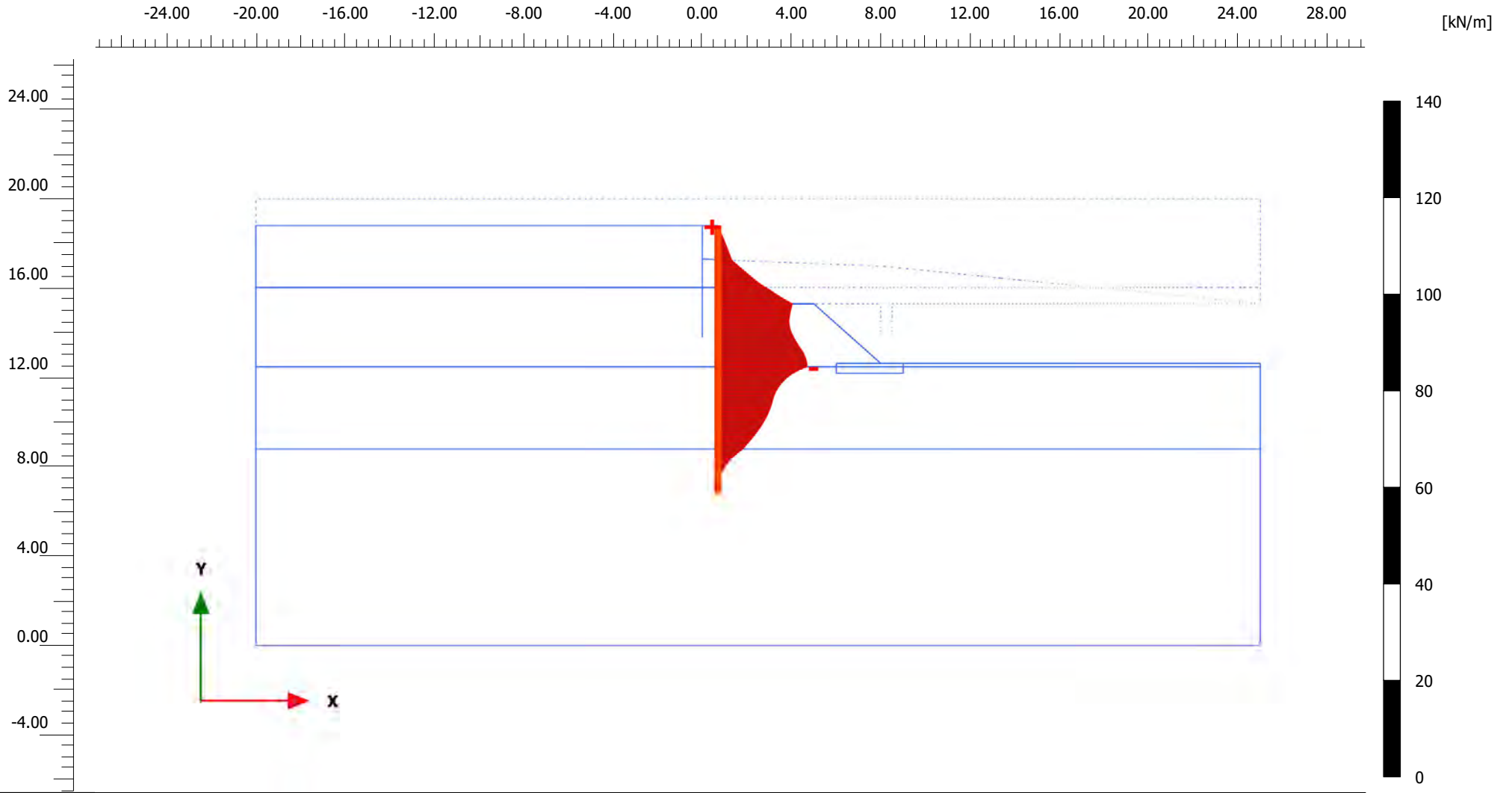


**Bending moments M (scaled up 0.0500 times)**

Maximum value = 34.81 kN m/m (Element 21 at Node 2653)

Minimum value =  $-0.1029 \times 10^{-12}$  kN m/m (Element 4 at Node 81)

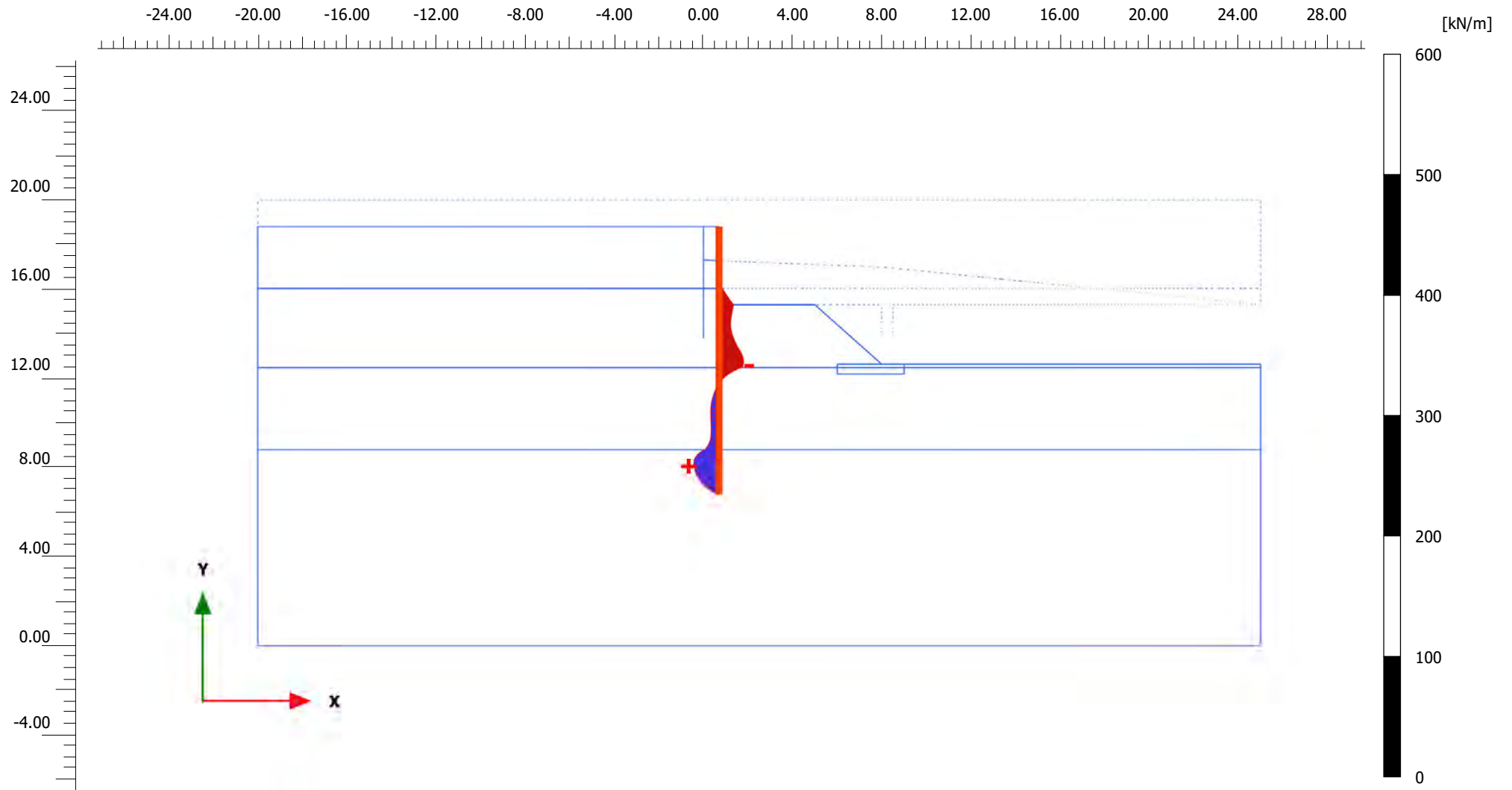
## **SECTION 3 WORST GROUNDWATER SCENARIO**



**Axial forces N (scaled up 0.200 times)**

Maximum value = 0.01711 kN/m (Element 4 at Node 81)

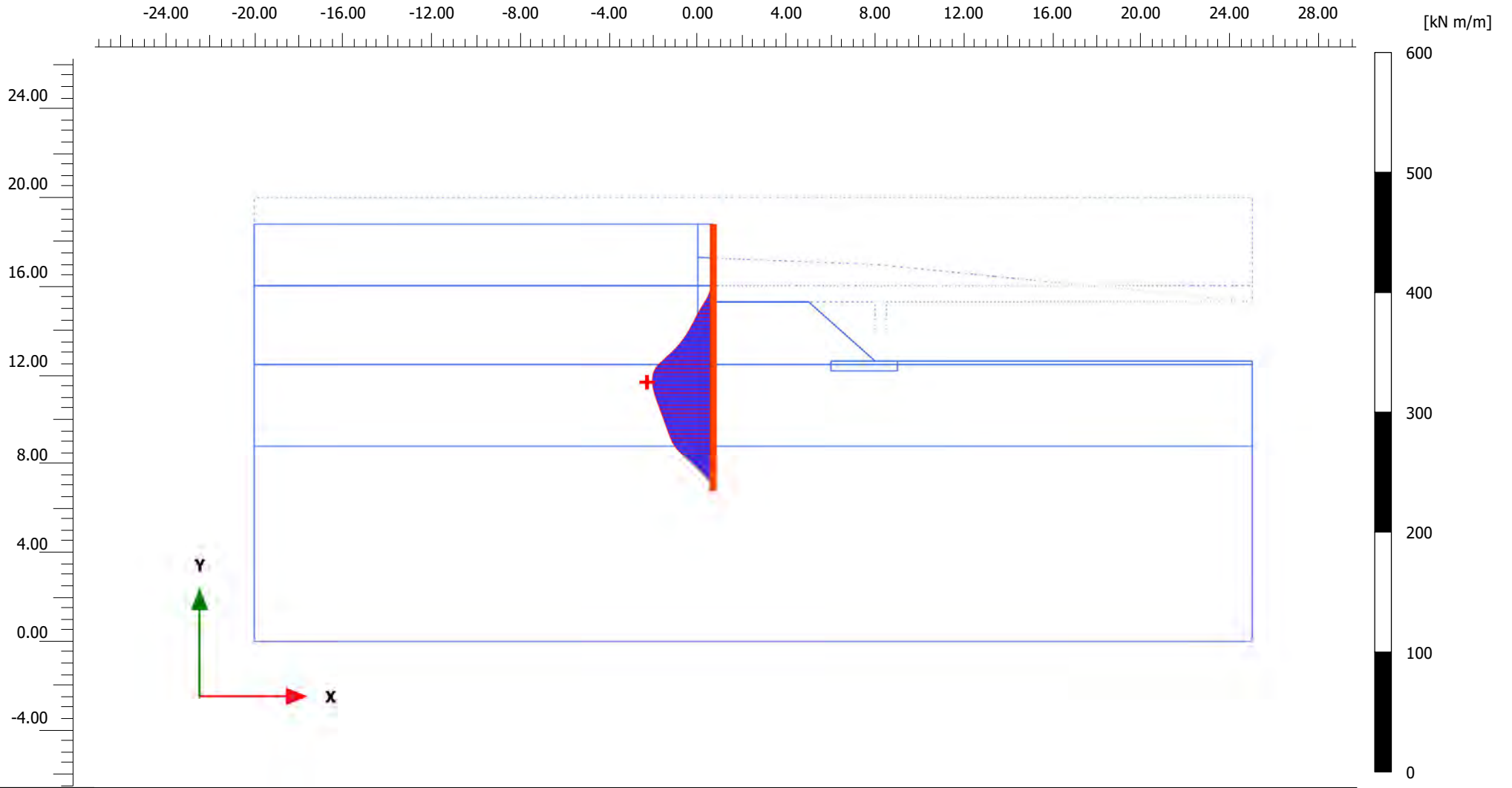
Minimum value = -20.06 kN/m (Element 13 at Node 2652)



**Shear forces Q (scaled up 0.0500 times)**

Maximum value = 22.65 kN/m (Element 23 at Node 7904)

Minimum value = -22.00 kN/m (Element 13 at Node 2227)

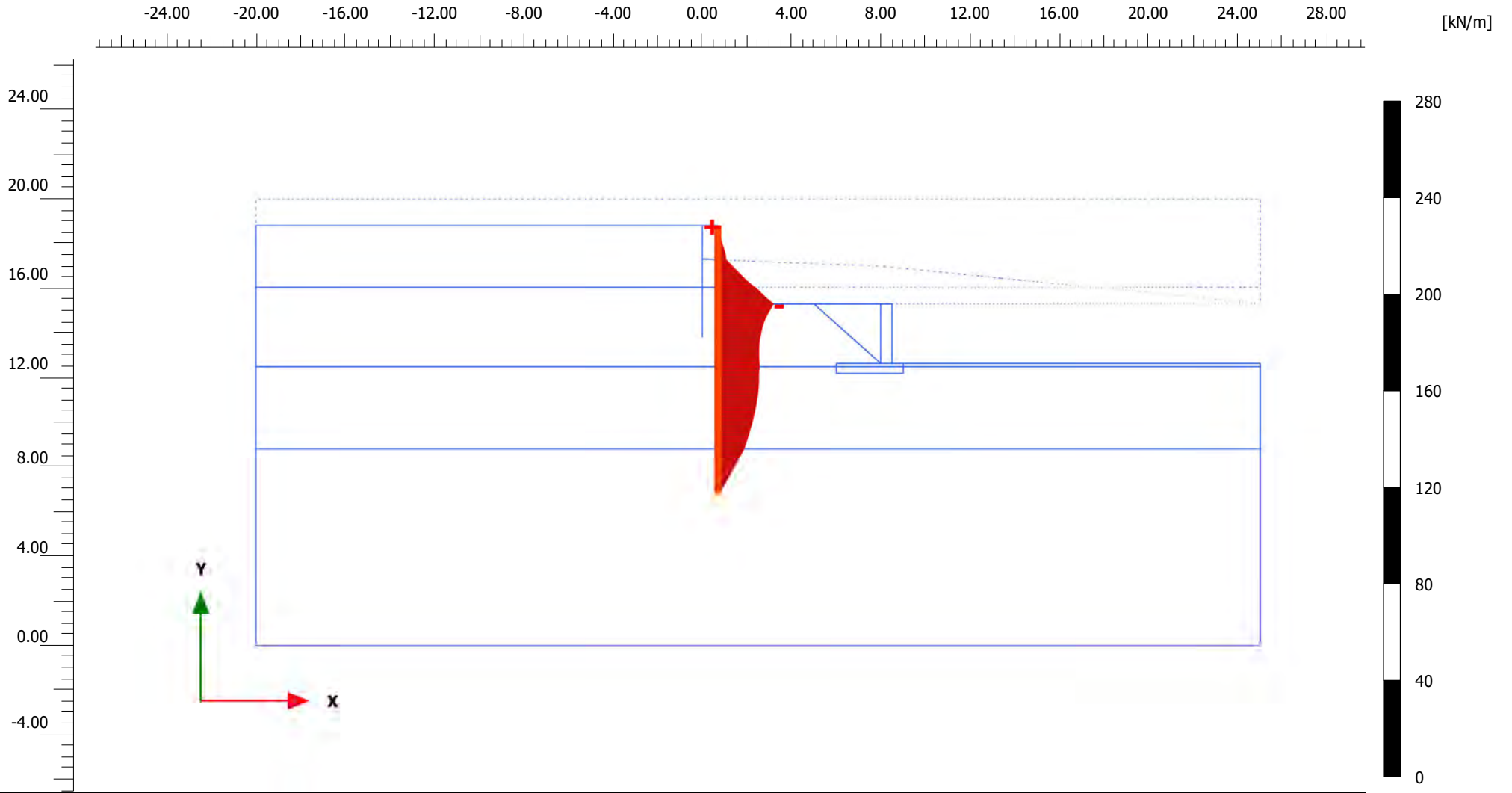


**Bending moments M (scaled up 0.0500 times)**

Maximum value = 54.92 kN m/m (Element 21 at Node 3250)

Minimum value =  $-1.825 \cdot 10^{-15}$  kN m/m (Element 22 at Node 8958)

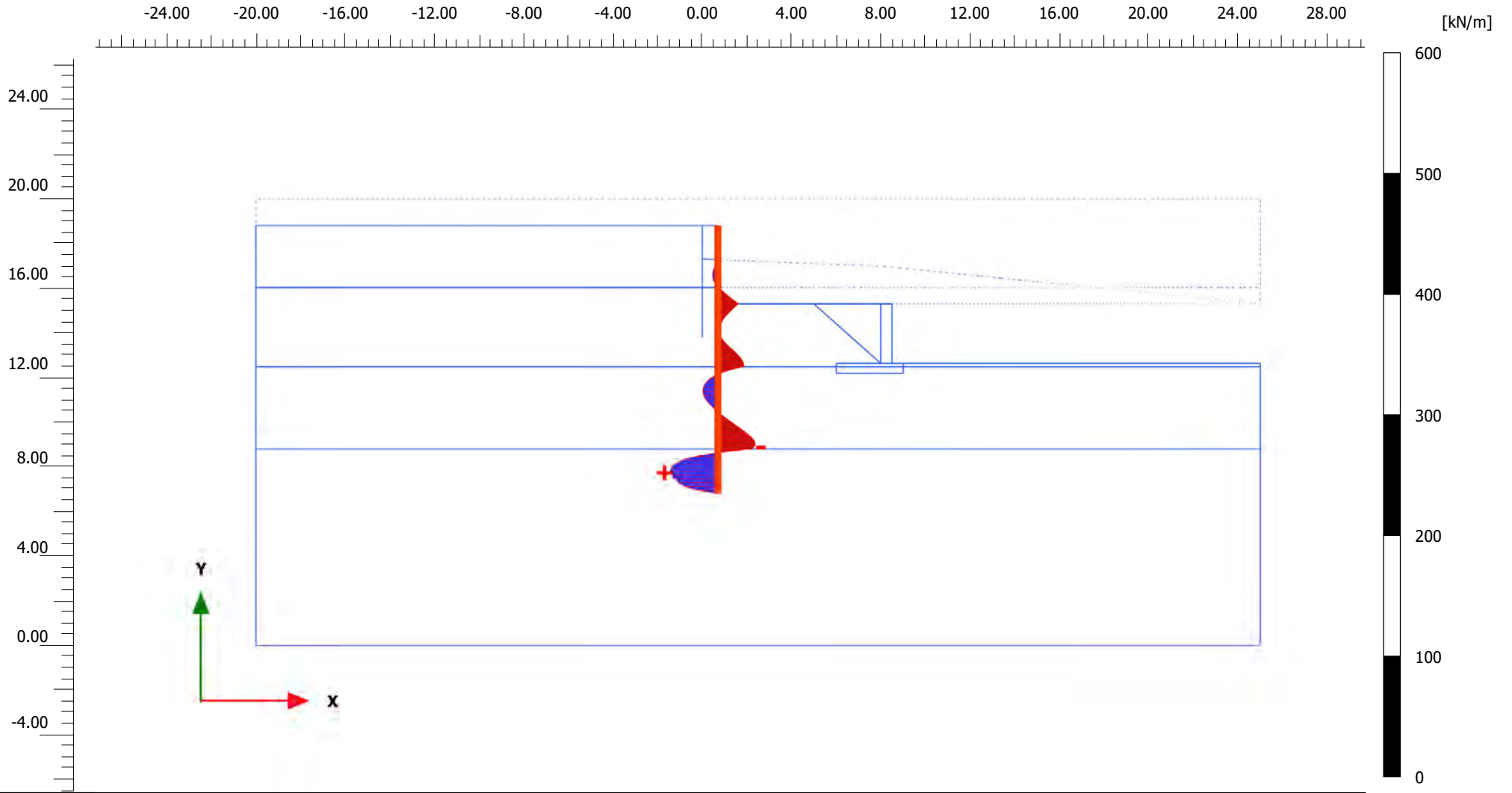
## **SECTION 3 SEISMIC LOADING SCENARIO**



**Axial forces N (scaled up 0.100 times)**

Maximum value = 6.307\*10<sup>-3</sup> kN/m (Element 4 at Node 81)

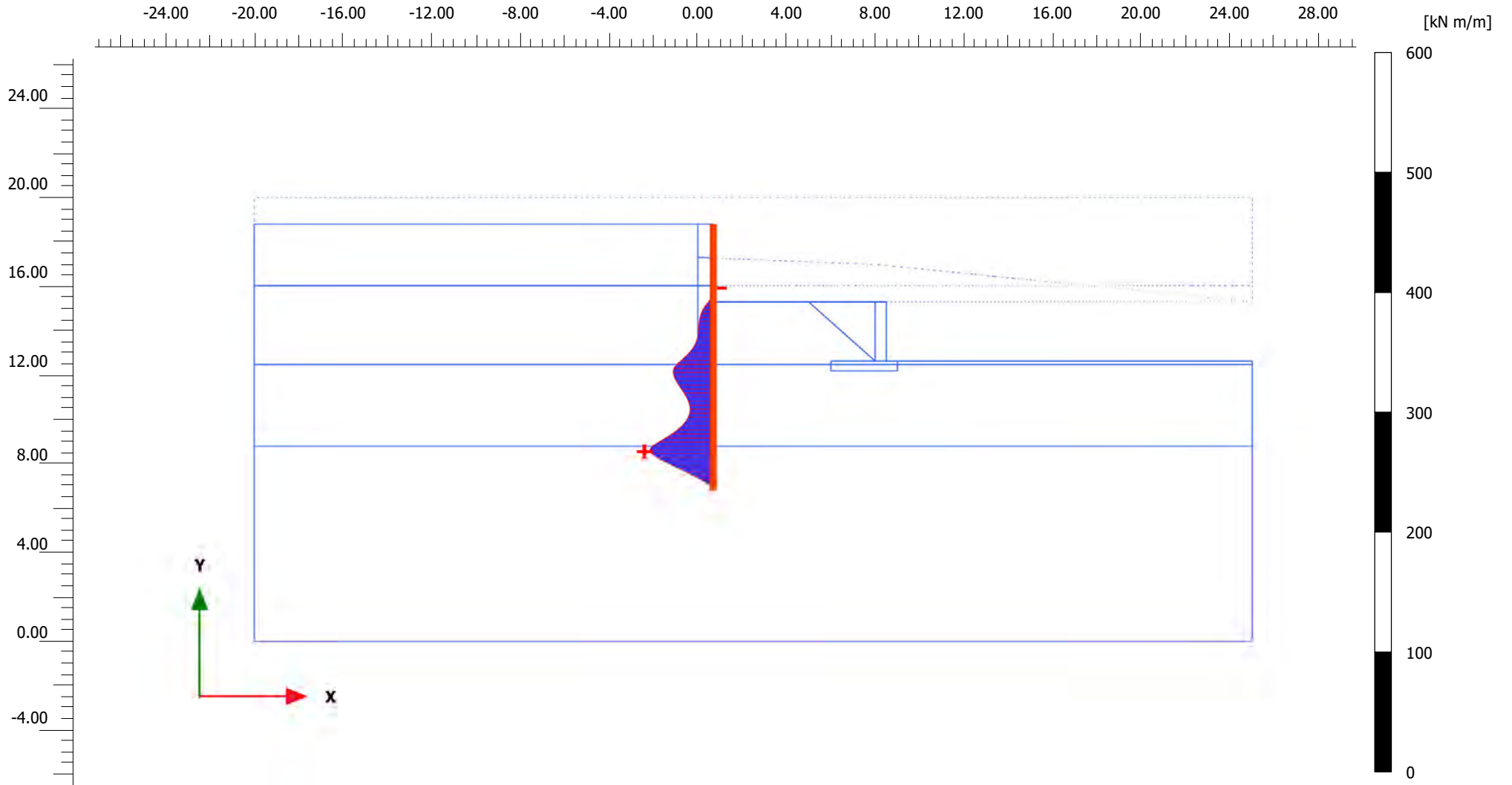
Minimum value = -24.88 kN/m (Element 16 at Node 471)



**Shear forces Q (scaled up 0.0500 times)**

Maximum value = 42.65 kN/m (Element 23 at Node 7906)

Minimum value = -33.45 kN/m (Element 17 at Node 6183)

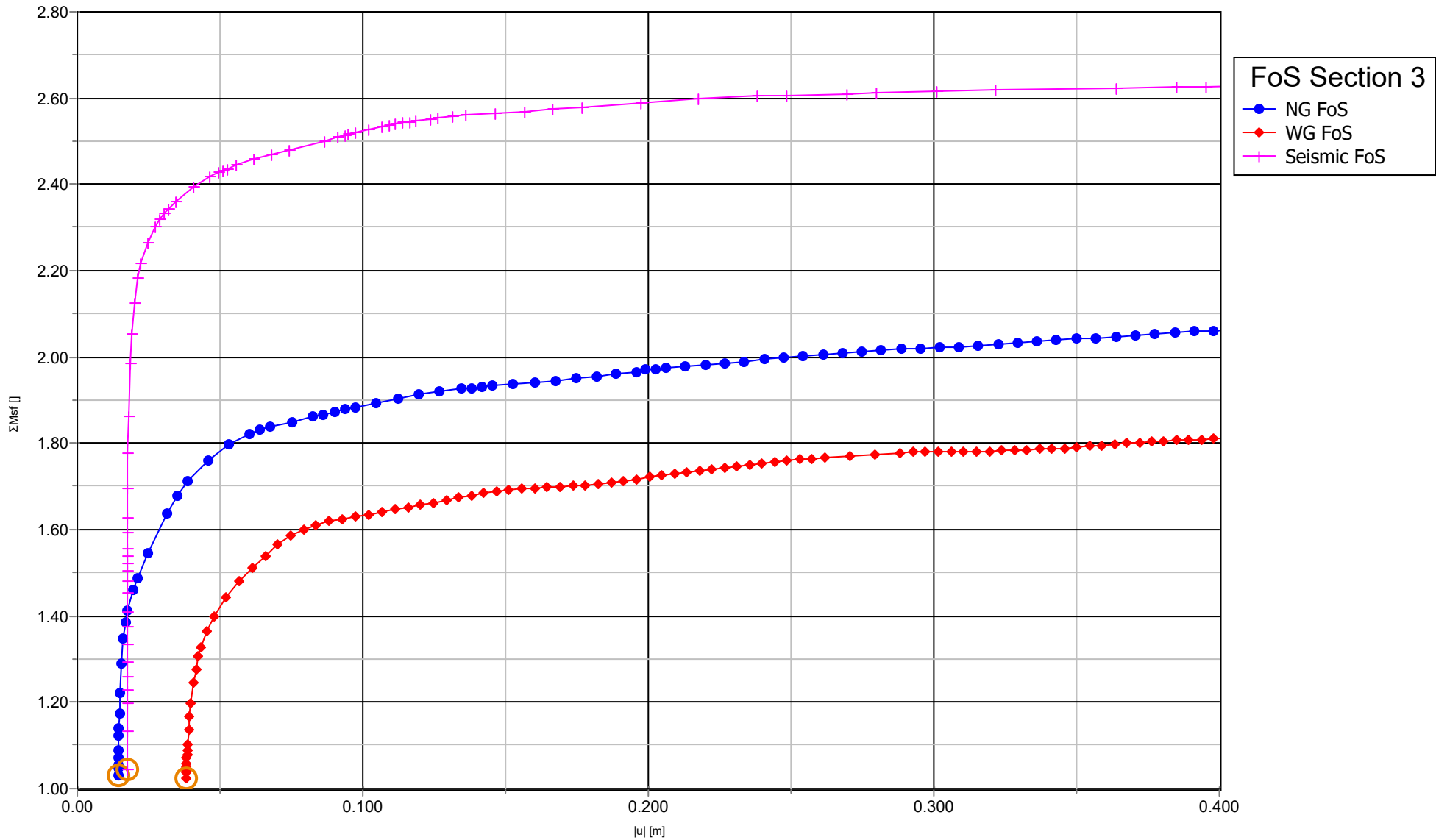


**Bending moments M (scaled up 0.0500 times)**

Maximum value = 57.30 kN m/m (Element 24 at Node 6667)

Minimum value = -2.312 kN m/m (Element 7 at Node 278)

## **SECTION 3 FACTOR OF SAFETY ANALYSIS**



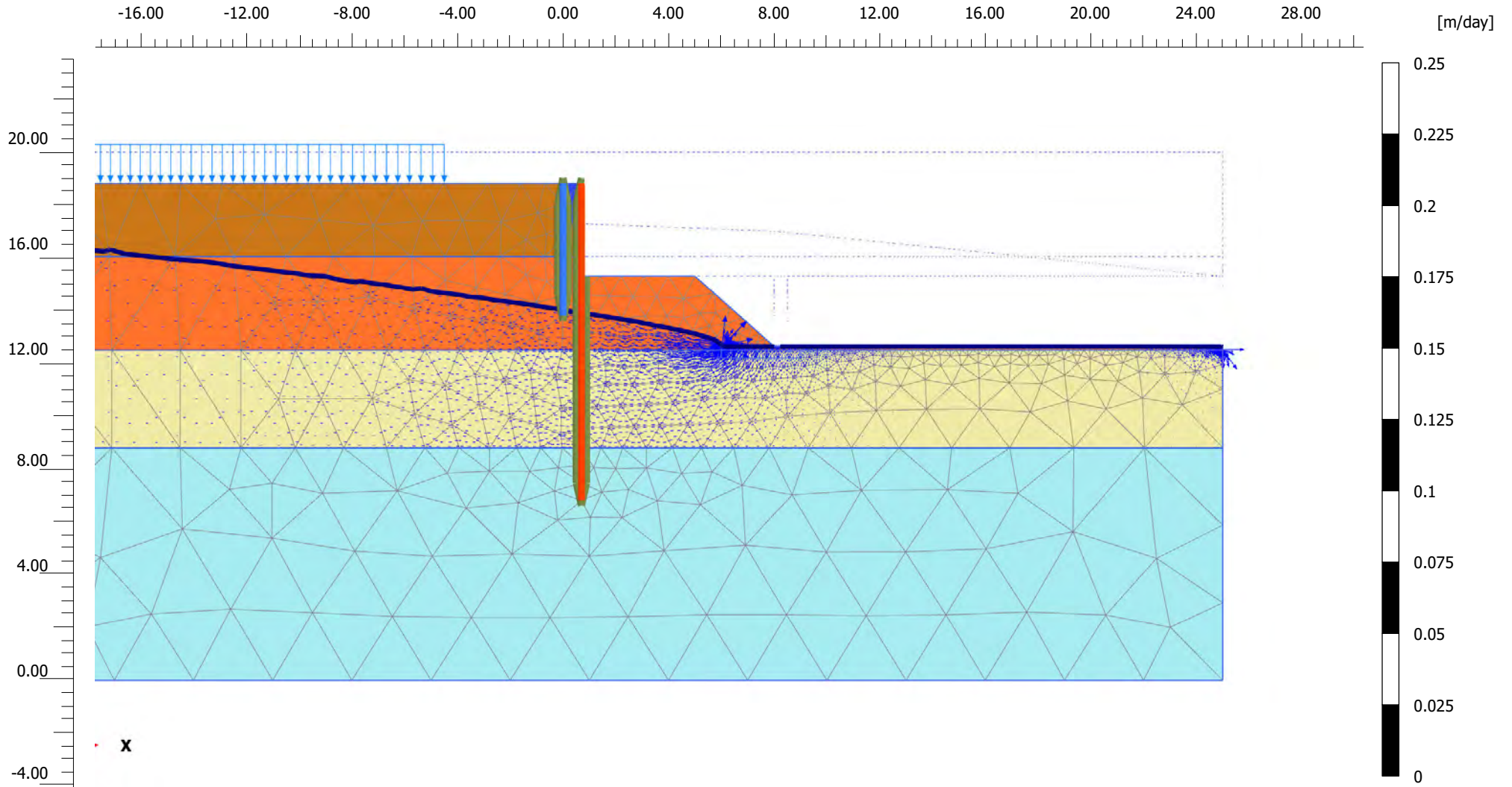
*Project description*  
**J00539 Pigeon Mt Rd Sect 3 FoS**

*Date*  
**18/12/2025**

*Project filename*  
**J00538 PMR Section 3 r12\_U ...**

*Step*  
**427**

*Company*  
**Total Ground Engineering**



**Groundwater flow |q| (scaled up 100 times)**

Maximum value = 0.01418 m/day (Element 1159 at Stress point 13897)  
 Minimum value = 1.743\*10<sup>-9</sup> m/day (Element 1163 at Stress point 13945)

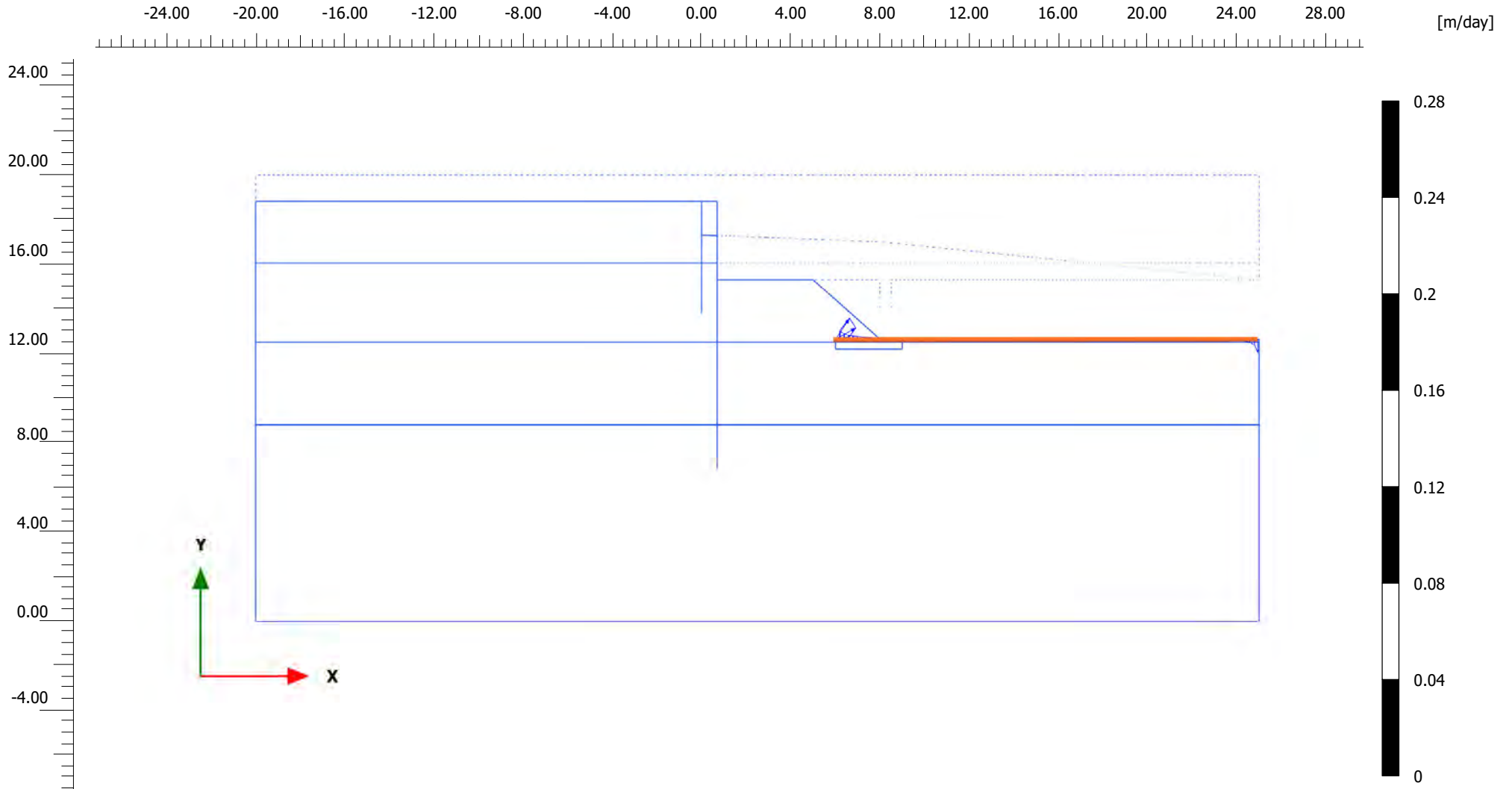


*Project description*  
**J00539 Pigeon Mt Rd Sect 3 - Flow**

*Date*  
**18/12/2025**

*Project filename*  
**J00538 PMR Section 3 r12\_U ... 79**

*Company*  
**Total Ground Engineering**



**Groundwater flow |q| (scaled up 100 times)**

Maximum value = 0.01154 m/day

Minimum value =  $0.9522 \times 10^{-6}$  m/day

Total discharge is  $-4.175 \times 10^{-3}$  m<sup>3</sup>/day/m

**SECTION 3 EXISTING WALL DEFLECTION UNDER  
NORMAL GROUNDWATER CONDITION**

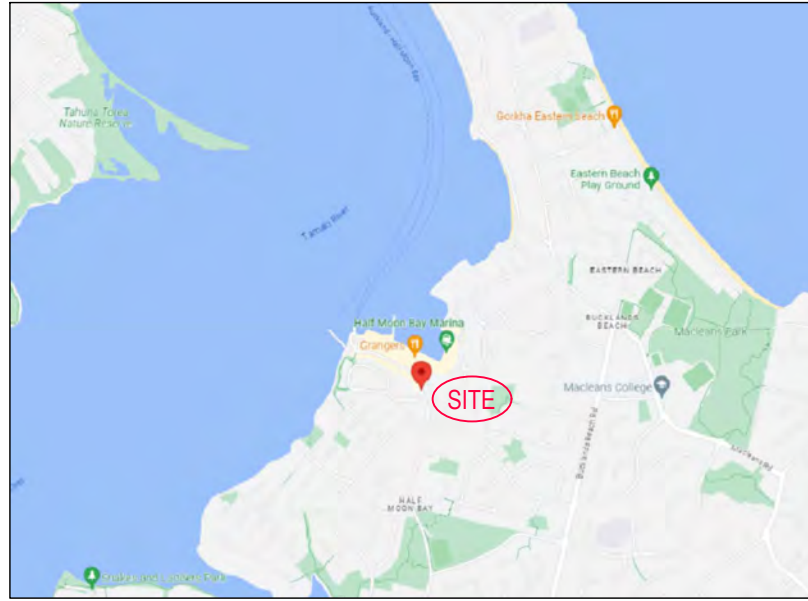


**Total displacements  $u_x$  (scaled up 200 times)**

Maximum value = 0.01340 m (Element 1 at Node 167)

Minimum value =  $6.039 \cdot 10^{-3}$  m (Element 12 at Node 961)

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)	REVISION
001	TITLE SHEET AND DRAWING SCHEDULE	-	6
010	SITE PLAN	1:600	6
100	PILE TYPE DIAGRAM	1:100	6
101	FACE ELEVATION 1 OF 2	1:250	6
102	FACE ELEVATION 2 OF 2	1:250	6
201	TYPICAL SECTION DETAILS SECTION 2	1:50	6
202	TYPICAL SECTION DETAILS SECTION 3	1:50	6
300	MONITORING PLAN	1:600	6



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:	FEB 2026
Cad Ref:	J00538 r6.dwg
Designed:	RK
Drawn:	HY
Checked:	NJ

Issue	Date	Issue Description	By
6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
4	01.05.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
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

Check all dimensions and levels on site before commencing construction.  
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PAPER SIZE	A3	JOB No.	DWG No.	REV.
SCALE	-	J00538	001	6



EXISTING TIMBER  
RETAINING WALL.  
REFER TO TOPO SURVEY  
BY ENVIVO NOV 2025.

INDICATIVE NEW PROPOSED RETAINING WALL.  
ALIGNMENT (700 mm OFFSET FROM EXISTING  
TIMBER RETAINING WALL) PILE LOCATION AND  
SETOUT TO BE CONFIRMED IN DETAIL DESIGN  
STAGE TO AVOID CLASH WITH EXISTING TIMBER  
POLES.

- NOTES:**
1. Locations of features approximate only
  2. Original sheet size A3
  3. Levels refer to provided survey data

**TOTAL GROUND ENGINEERING**

27C WAIPAREIRA AVENUE  
HENDERSON

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njacka@tge.co.nz

PROJECT  
**3 PIGEON MOUNTAIN RD  
HALF MOON BAY AUCKLAND  
DEVELOPMENT**

DRAWING TITLE  
**SITE PLAN**

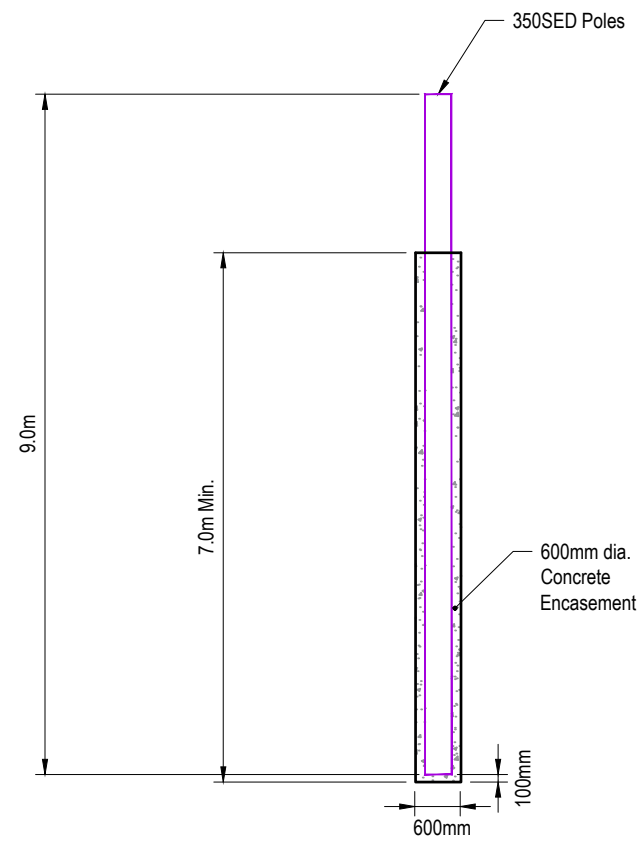
Date:	FEB 2026	6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
Cad Ref:	J00538 r6.dwg	5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
Designed	RK	4	01.05.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
Drawn	HY	3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
Checked	NJ	2	30.09.2023	ISSUED FOR RFI AND RC	BL
		1	20.04.2023	ISSUED FOR RC	BL
		Issue	Date	Issue Description	By

Check all dimensions and levels on site before commencing construction.  
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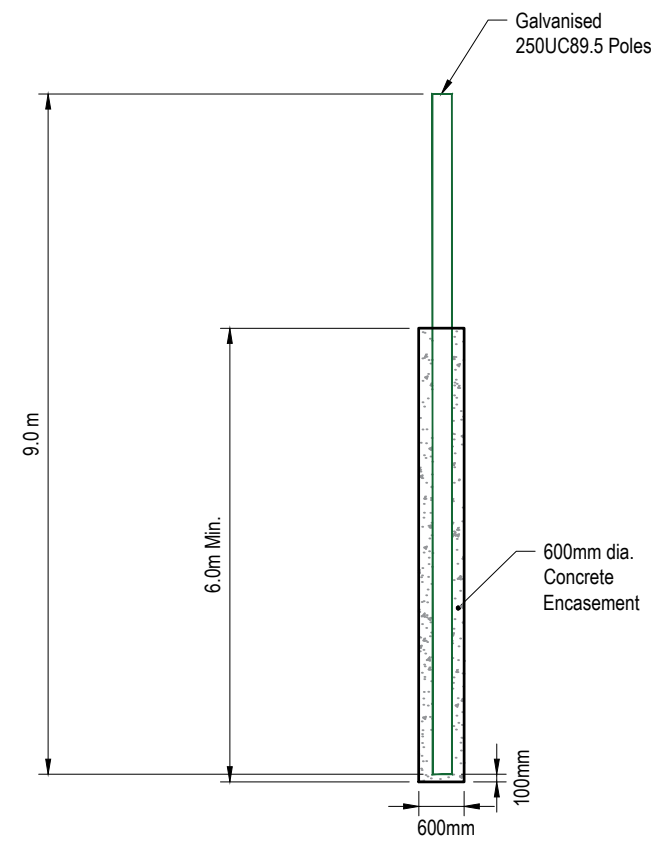
PAPER SIZE	A3	JOB No.	DWG No.	REV.
SCALE	1:600	J00538	010	6

**NOTES:**

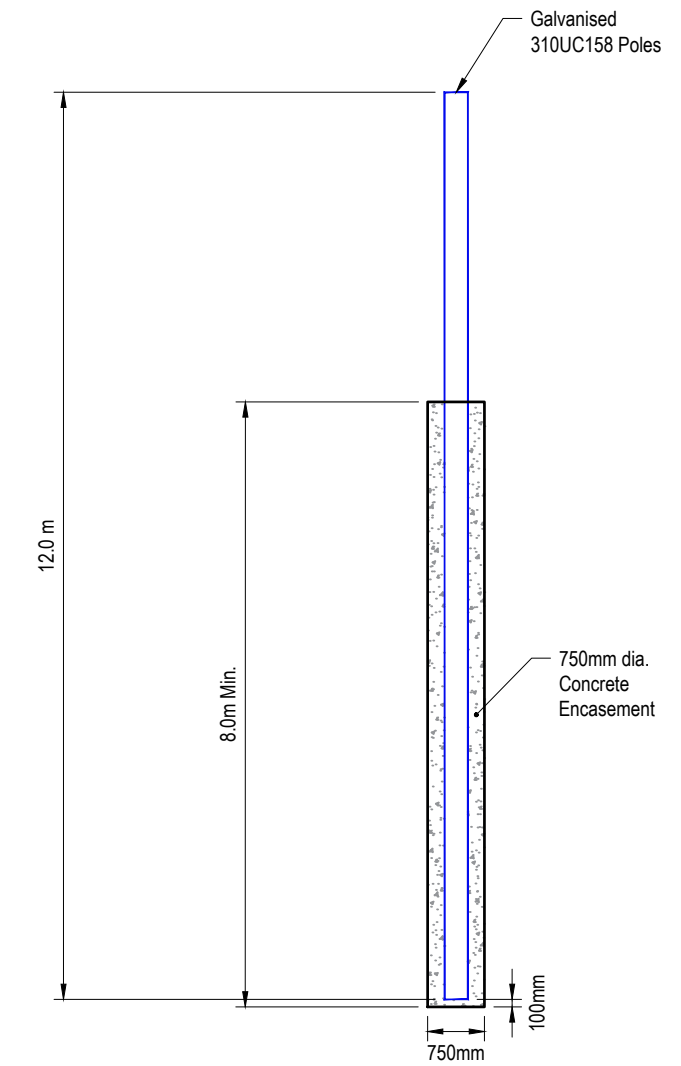
1. Pile diagrams are indicative only (Refer Sheet 201 for details).



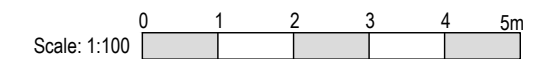
**TYPE A**  
Typical 0 - 2.0 m Retaining Height



**TYPE B**  
Typical 2.0 - 3.0 m Retaining Height



**TYPE C**  
Typical 3.0 - 4.0 m Retaining Height



27C WAIPAREIRA AVENUE  
HENDERSON

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PROJECT  
**3 PIGEON MOUNTAIN RD  
HALF MOON BAY AUCKLAND  
DEVELOPMENT**

DRAWING TITLE  
**NEW RETAINING WALL  
PILE TYPES DIAGRAM**

Date:	FEB 2026
Cad Ref:	J00538 r6.dwg
Designed:	RK
Drawn:	HY
Checked:	NJ

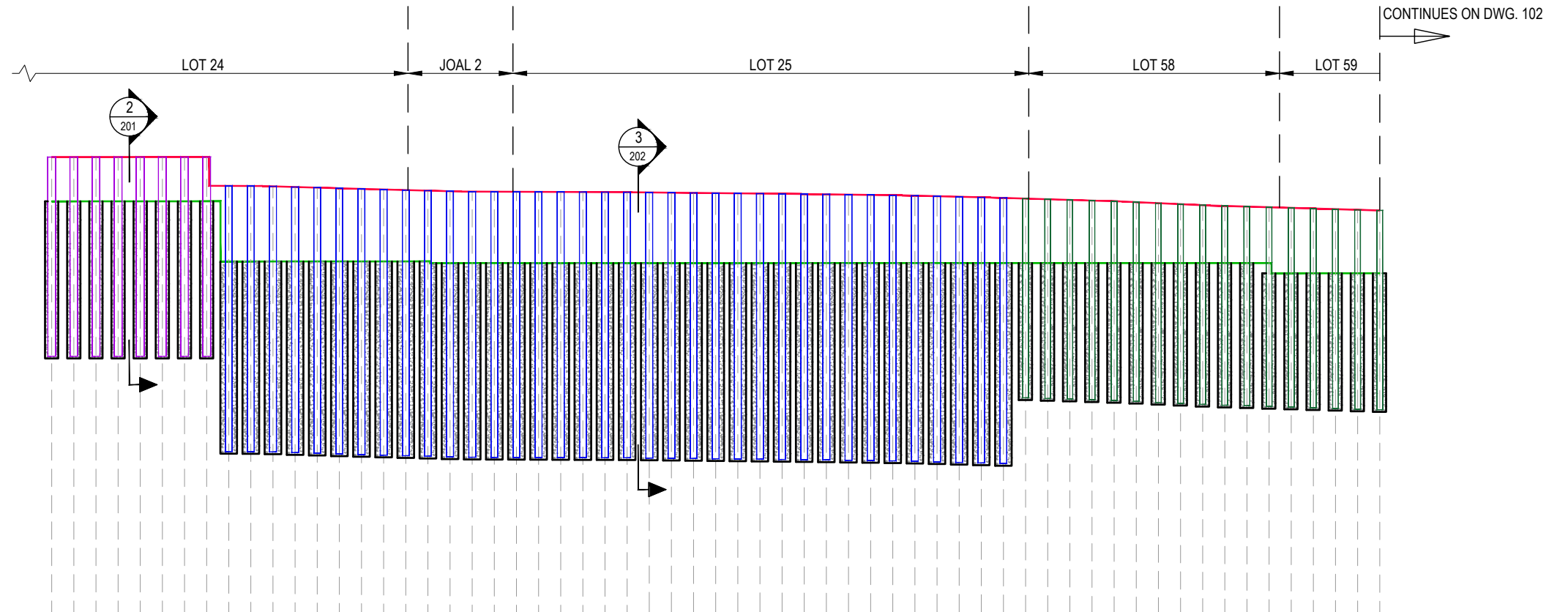
Issue	Date	Issue Description	By
6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
4	01.05.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
2	30.09.2023	ISSUED FOR RFI AND RC	BL
1	20.04.2023	ISSUED FOR RC	BL

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PAPER SIZE	A3	JOB No.	DWG No.	REV.
SCALE	1:100	J00538	100	6

**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.



DISTANCE	0.00	7.00	8.00	10.00	20.00	30.00	4.00	4.30	4.40	50.00	60.00
<u>TOP OF WALL LEVELS (m)</u>	20.64	20.64	19.34	19.32	19.07	19.01	18.87	18.79	18.76	18.56	18.23
<u>TOE OF WALL LEVELS (m)</u>	18.64	18.64	15.93	15.93	15.85	15.85	15.85	15.85	15.85	15.85	15.39
RETAINED HEIGHT (m)	2.00	2.00	3.41	3.39	3.22	3.16	3.02	2.94	2.91	2.71	2.84
PILE TYPE	TYPE A		TYPE C						TYPE B		
POLE LENGTH	9.0m		12.0m						9.0m		

CENTER OF PROP RET WALL LONG SECTION



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PROJECT  
**3 PIGEON MOUNTAIN RD  
HALF MOON BAY AUCKLAND  
DEVELOPMENT**

DRAWING TITLE  
**NEW RETAINING WALL  
FACE ELEVATION 1 OF 2**

Date:	FEB 2026
Cad Ref:	J00538 r6.dwg
Designed:	RK
Drawn:	HY
Checked:	NJ

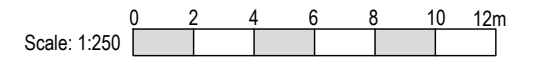
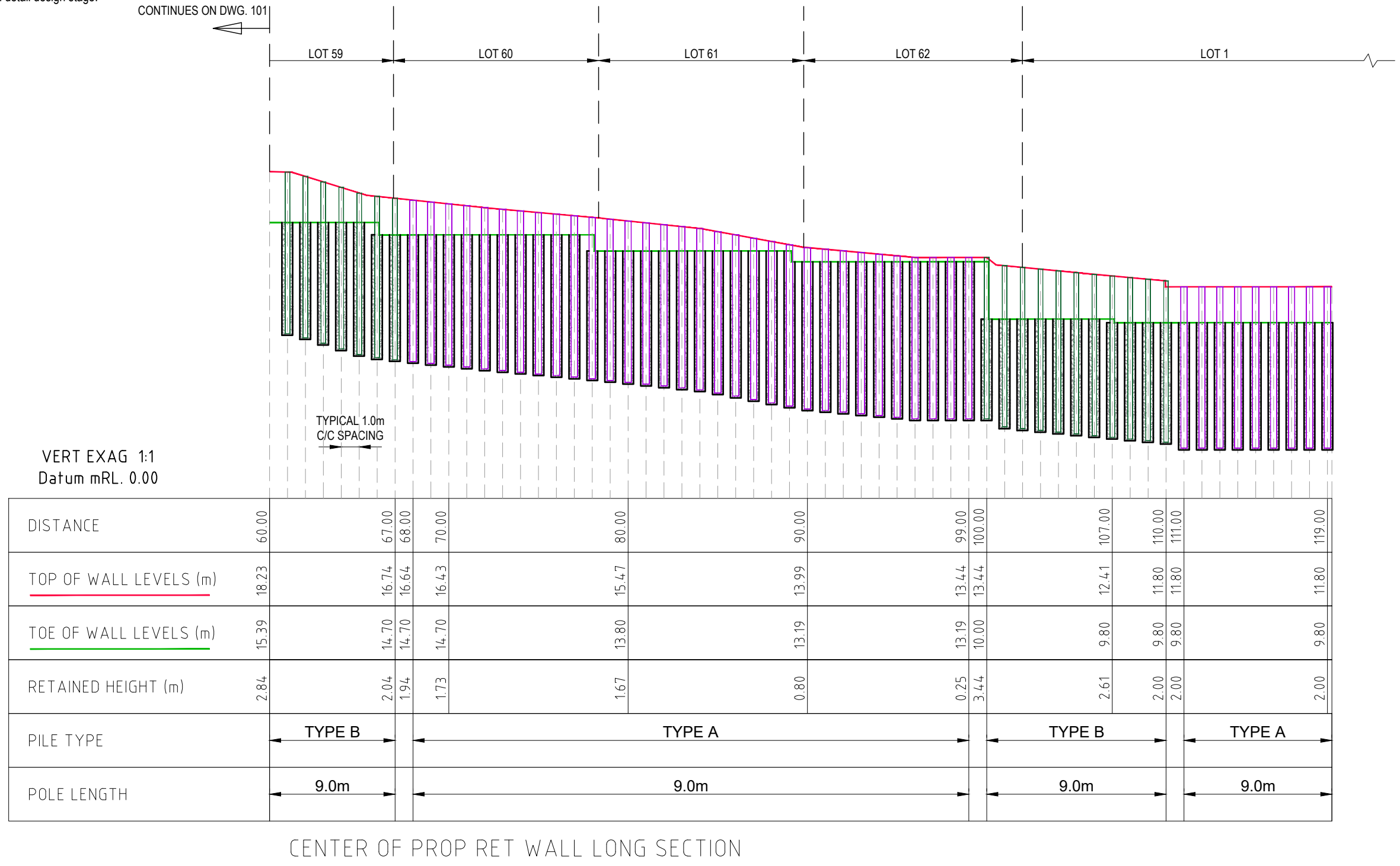
Issue	Date	Issue Description	By
6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
4	01.05.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
2	29.09.2023	ISSUED FOR RFI AND RC	BL
1	20.04.2023	ISSUED FOR RC	BL

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PAPER SIZE	A3	JOB No.	DWG No.	REV.
SCALE	1:250	J00538	101	6

**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.



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PROJECT  
**3 PIGEON MOUNTAIN RD  
HALF MOON BAY AUCKLAND  
DEVELOPMENT**

DRAWING TITLE  
**NEW RETAINING WALL  
FACE ELEVATION 2 OF 2**

Date:	FEB 2026
Cad Ref:	J00538 r6.dwg
Designed:	RK
Drawn:	HY
Checked:	NJ

Issue	Date	Issue Description	By
6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
4	01.05.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
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.	REV.
SCALE	1:250	J00538	102	6

**SPECIFICATION:**

**1. MATERIAL PROPERTIES**

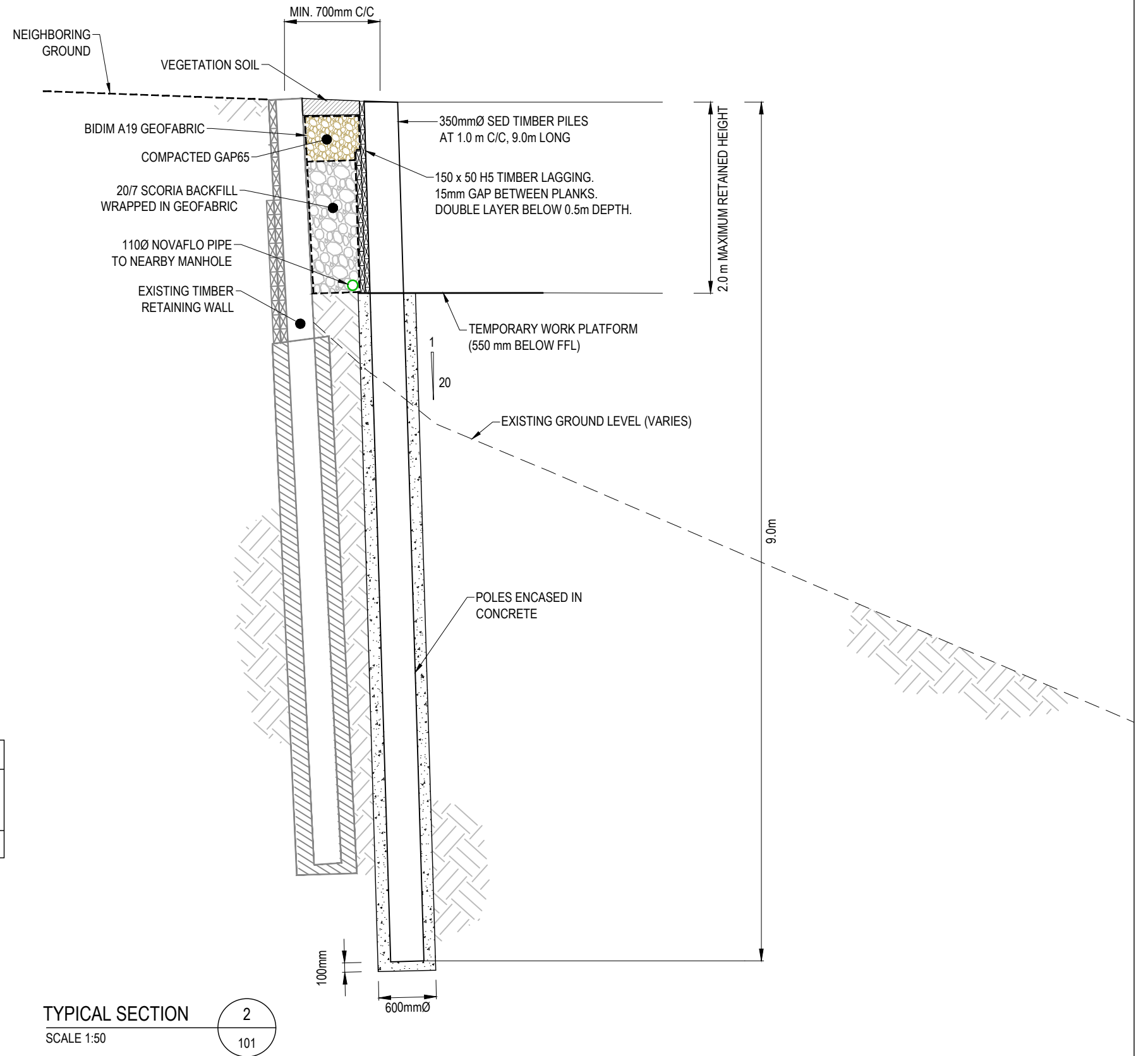
- CONCRETE: CHARACTERISTIC COMPRESSIVE STRENGTH F'C = 30 MPa UNLESS OTHERWISE NOTED.
- DRAIN COIL: 110mm DIAMETER
- GEOFABRIC: BIDIM A19
- DRAINAGE AGGREGATE: SINGLE/DUAL GRADED (IE. DRAINAGE 40, DRAINAGE 20/40, SGC 25/7) ENCAPSULATED IN BIDIM A19 (OR SIMILAR) FILTER CLOTH OR, SELF FILTERING AGGREGATE (IE. SAP50 EX TAUPO/KAMO)

- 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 NAPHTHENATE TYPE WOOD PRESERVATIVE.
- 4. THE MAXIMUM RETAINING HEIGHT AND SURCHARGE 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.

**NOTES:**

**1. TABLE OF PILE SIZE:**

TIMBER PILE						
	HOLE DIA.	SIZE	LENGTH	SPACING	MAX. RETAINED HEIGHT	MIN. EMBEDMENT DEPTH
TYPE A	600mm Ø	350 SED HD	9.0m	1.0m	2.0m	7.0m



**TYPICAL SECTION**

SCALE 1:50



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PROJECT  
**3 PIGEON MOUNTAIN RD  
HALF MOON BAY AUCKLAND  
DEVELOPMENT**

DRAWING TITLE  
**TYPICAL SECTION 2**

Date:	FEB 2026
Cad Ref:	J00538 r6.dwg
Designed:	RK
Drawn:	HY
Checked:	NJ

Issue	Date	Issue Description	By
6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
4	01.05.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
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.	REV.
SCALE	1:50	J00538	201	6

**SPECIFICATION:**

**1. MATERIAL PROPERTIES**

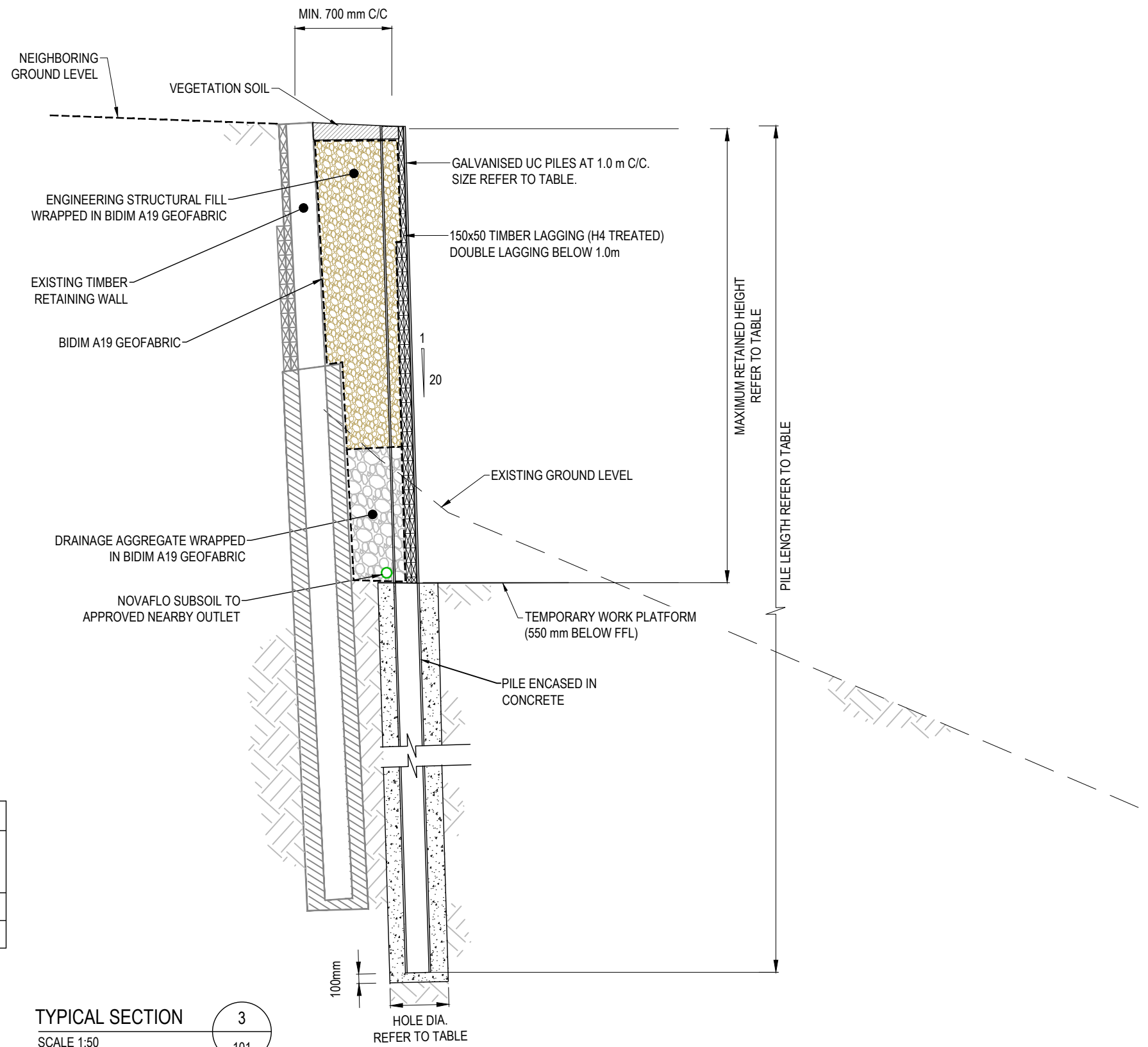
- CONCRETE: CHARACTERISTIC COMPRESSIVE STRENGTH F'C = 30 MPa UNLESS OTHERWISE NOTED.
- STEEL UC'S: GRADE 300 MINIMUM.
- DRAIN COIL: 110mm DIAMETER
- GEOFABRIC: BIDIM A19
- DRAINAGE AGGREGATE: SINGLE/DUAL GRADED (IE. DRAINAGE 40, DRAINAGE 20/40, SGC 25/7) ENCAPSULATED IN BIDIM A19 (OR SIMILAR) FILTER CLOTH OR, SELF FILTERING AGGREGATE (IE. SAP50 EX TAUPO/KAMO)
- GALVANISING: ALL STEEL TO BE GALVANISED 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 NAPHTHENATE TYPE WOOD PRESERVATIVE.
- 4. THE MAXIMUM RETAINING HEIGHT AND SURCHARGE 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.

**NOTES:**

**1. TABLE OF PILE SIZES:**

STEEL UC PILE						
	HOLE DIA.	SIZE	LENGTH	SPACING	MAX. RETAINED HEIGHT	MIN. EMBEDMENT DEPTH
TYPE B	600mm Ø	250UC89.5	9.0m	1.0m	3.0m	6.0m
TYPE C	750mm Ø	310UC158	12.0m	1.0m	4.0m	8.0m



**TYPICAL SECTION**

SCALE 1:50

3  
101



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PROJECT  
**3 PIGEON MOUNTAIN RD  
HALF MOON BAY AUCKLAND  
DEVELOPMENT**

DRAWING TITLE  
**TYPICAL SECTION 3**




Date:	FEB 2026	6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
Cad Ref:	J00538 r6.dwg	5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
Designed	RK	4	01.05.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
Drawn	HY	3	12.02.2024	UPDATED AND ISSUED FOR RFI AND RC	BL
Checked	NJ	2	30.09.2023	ISSUED FOR RFI AND RC	-
		1	20.04.2023	ISSUED FOR RC	BL
		Issue	Date	Issue Description	By

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PAPER SIZE	A3	JOB No.	DWG No.	REV.
SCALE	1:50	J00538	202	6



**LEGEND:**

-  DMxx Wall Deflection Monitoring Points
-  BSxx Building Settlement Monitoring Points
-  GSxx Ground Settlement Monitoring Points

**NOTES:**

1. Locations of features approximate only.
2. Original sheet size A3.
3. Levels refer to provided survey data.
4. Existing dwellings and stormwater pipes to be pre-construction condition surveyed as a baseline report.



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PROJECT  
**3 PIGEON MOUNTAIN RD  
HALF MOON BAY AUCKLAND  
DEVELOPMENT**

DRAWING TITLE  
**MONITORING PLAN**

Date:	FEB 2026
Cad Ref:	J00538 r6.dwg
Designed:	RK
Drawn:	HY
Checked:	NJ

Issue	Date	Issue Description	By
6	17.02.2026	UPDATED AND ISSUED FOR RFI AND RC	HY
5	19.12.2025	UPDATED AND ISSUED FOR RFI AND RC	HY
4	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.	REV.
SCALE	1:600	J00538	300	6