

APPENDIX E

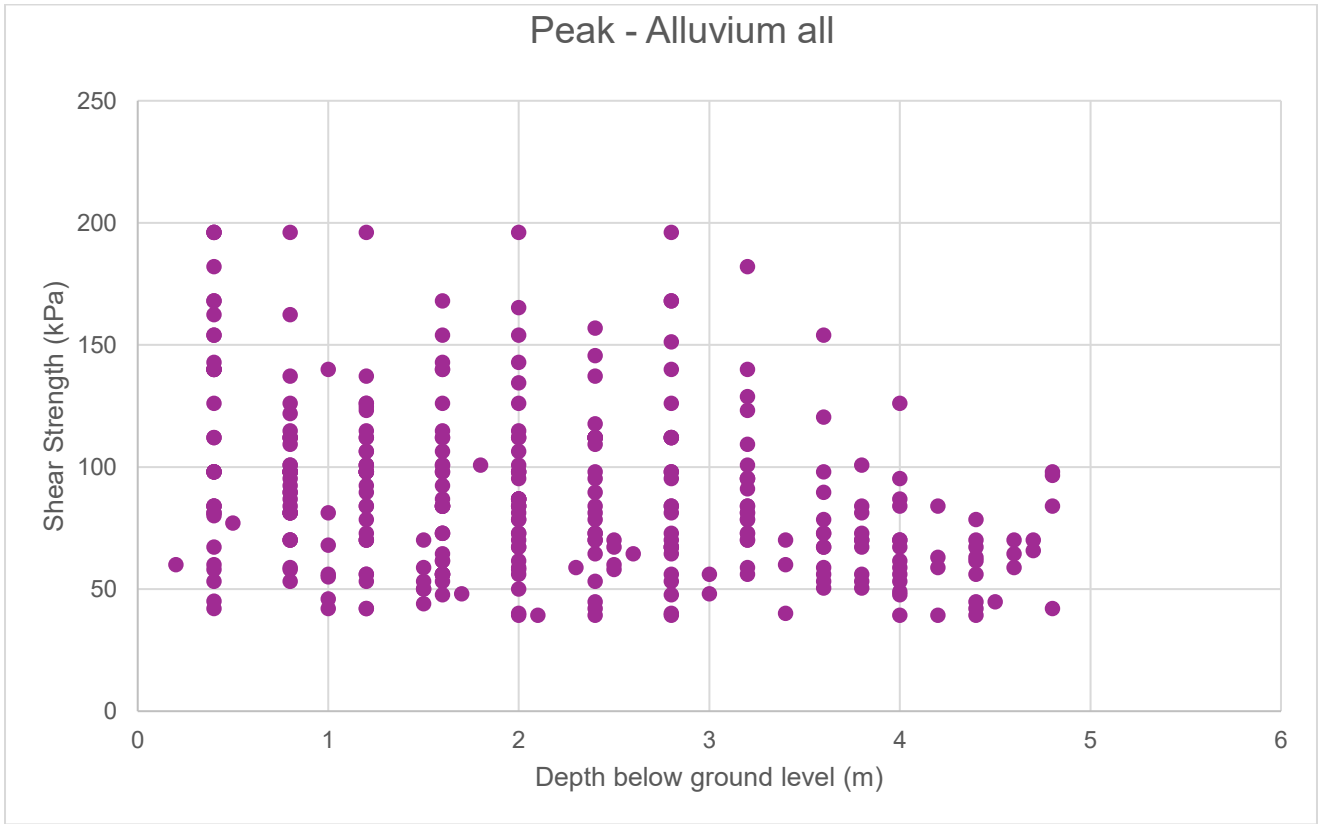
Parameter Derivation

GEOTECHNICAL PARAMETER DERIVATION

Undrained Shear Strength

To determine characteristic shear stress strength parameters for the alluvium, shear vane testing in test pits, machine boreholes and CPT correlations was carried out. An average shear strength was taken from CPT correlations; these typically appear to be lower bound when compared to the shear vane shear strength testing. An NKT of 15 was adopted as recommended in Holtrigter 2017.

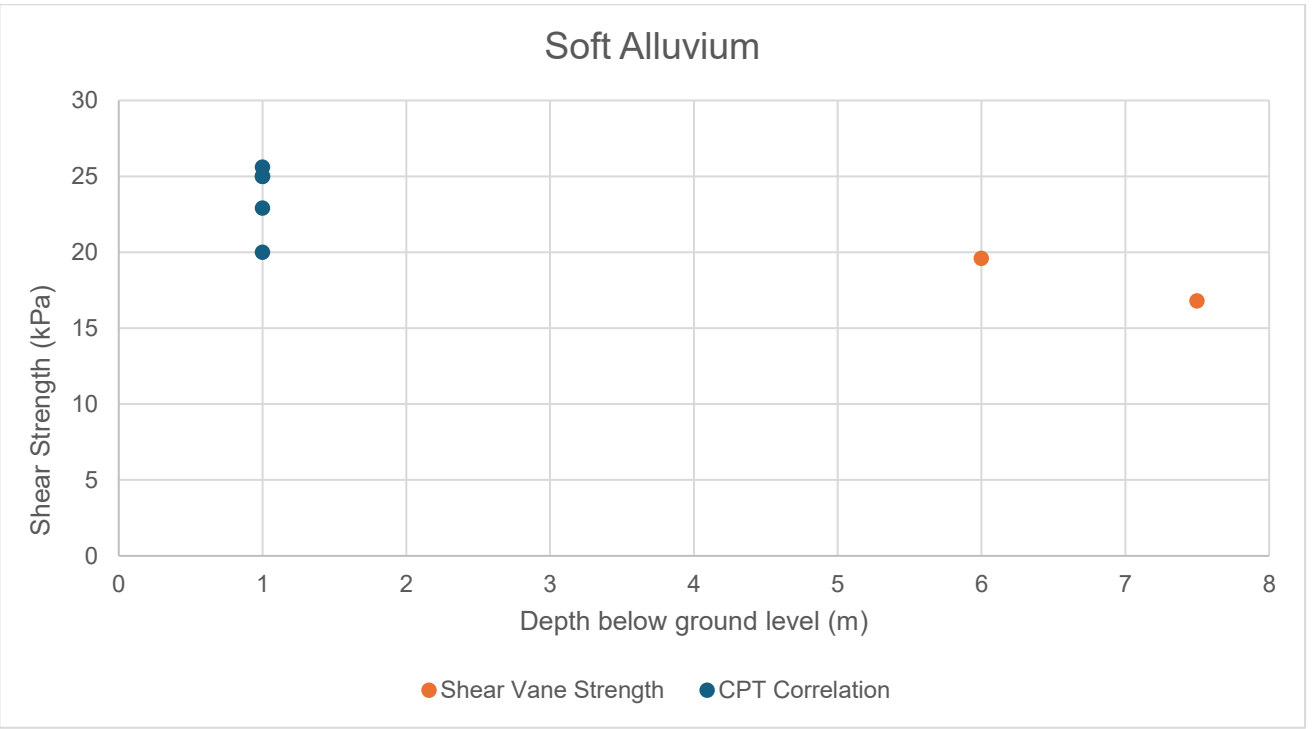
All data alluvium



Peak shear vane testing shows a distribution from firm to very stiff. Therefore it was interpreted that three different alluvium units are present on site, noted in the tables below.

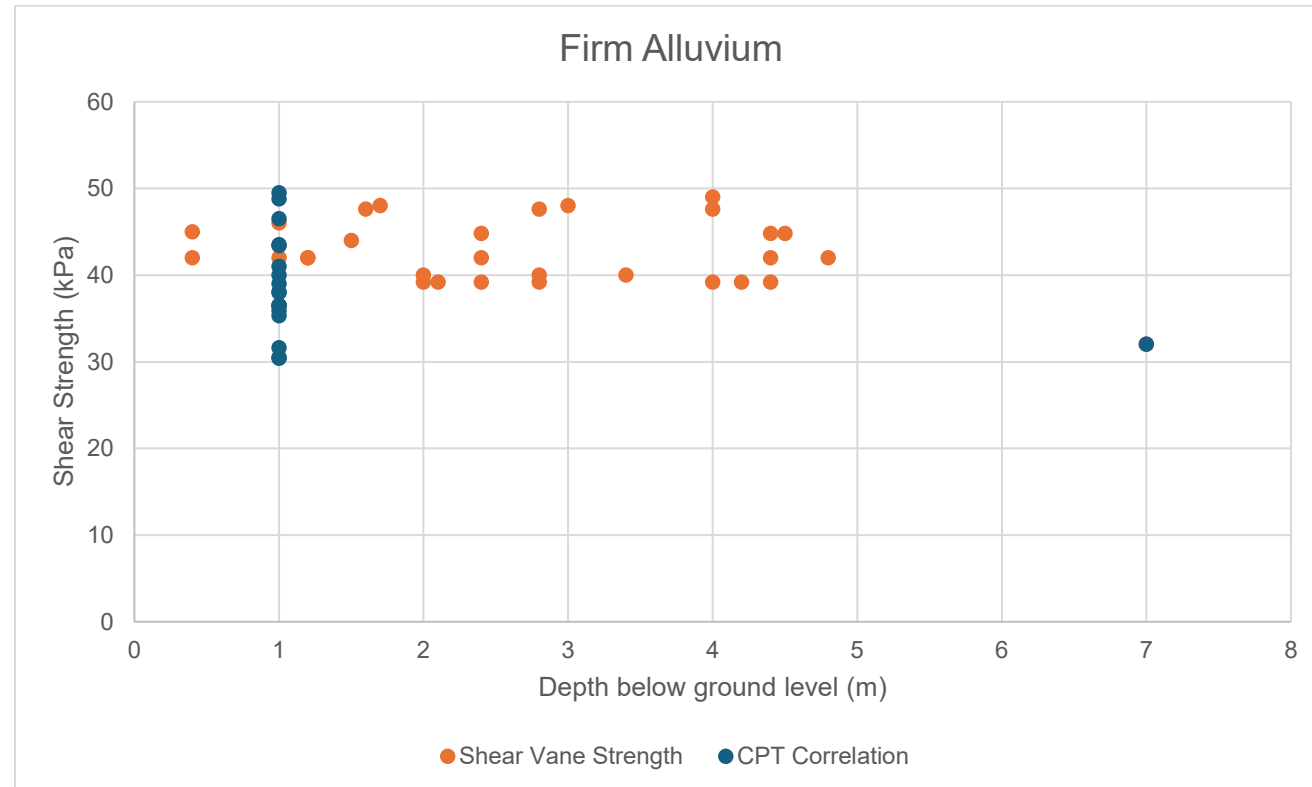
Soft Alluvium

No.	Shear Strength (kPa)				
	Range	Median	Mean	1STDev	Characteristic
7	17 – 25	23	23	3	20



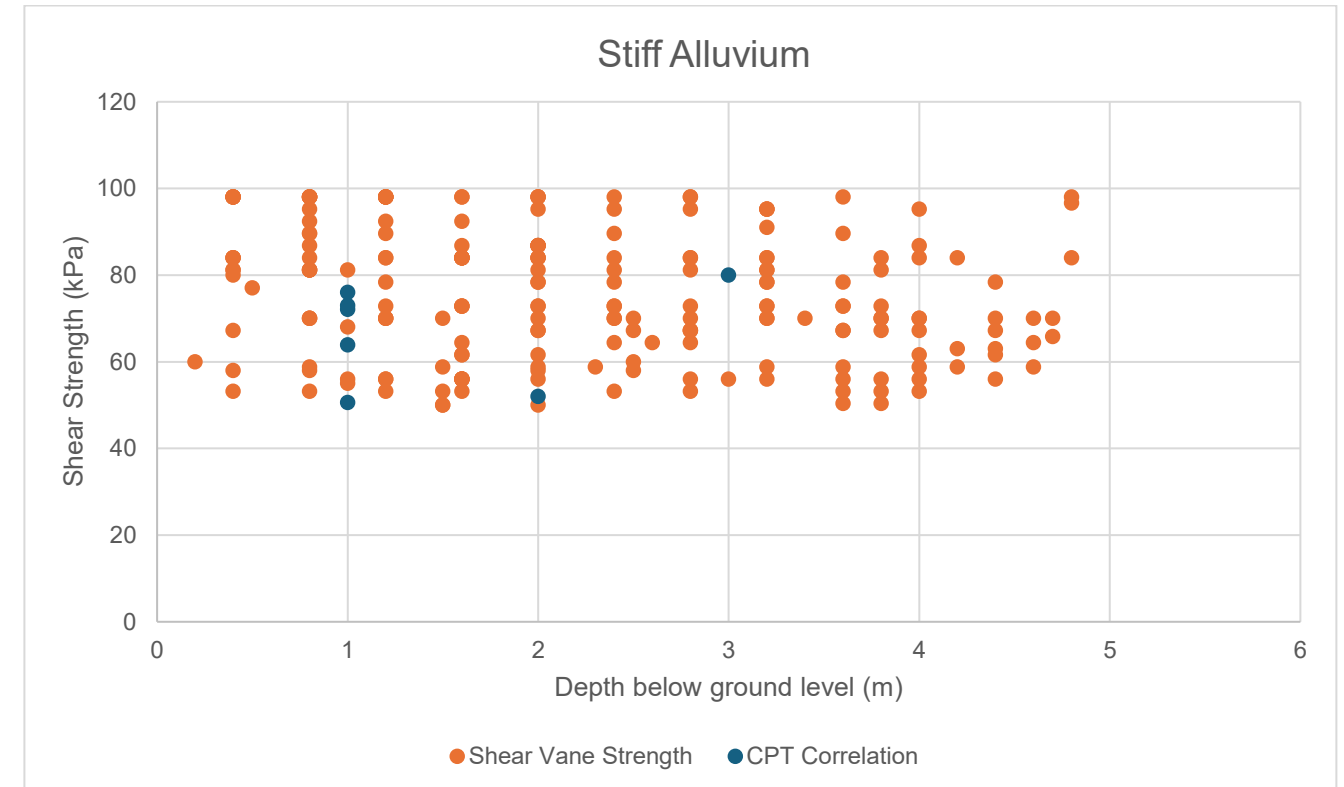
Firm Alluvium

No.	Shear Strength (kPa)				
	Range	Median	Mean	1STDev	Characteristic
48	30 - 50	41	41	5	38



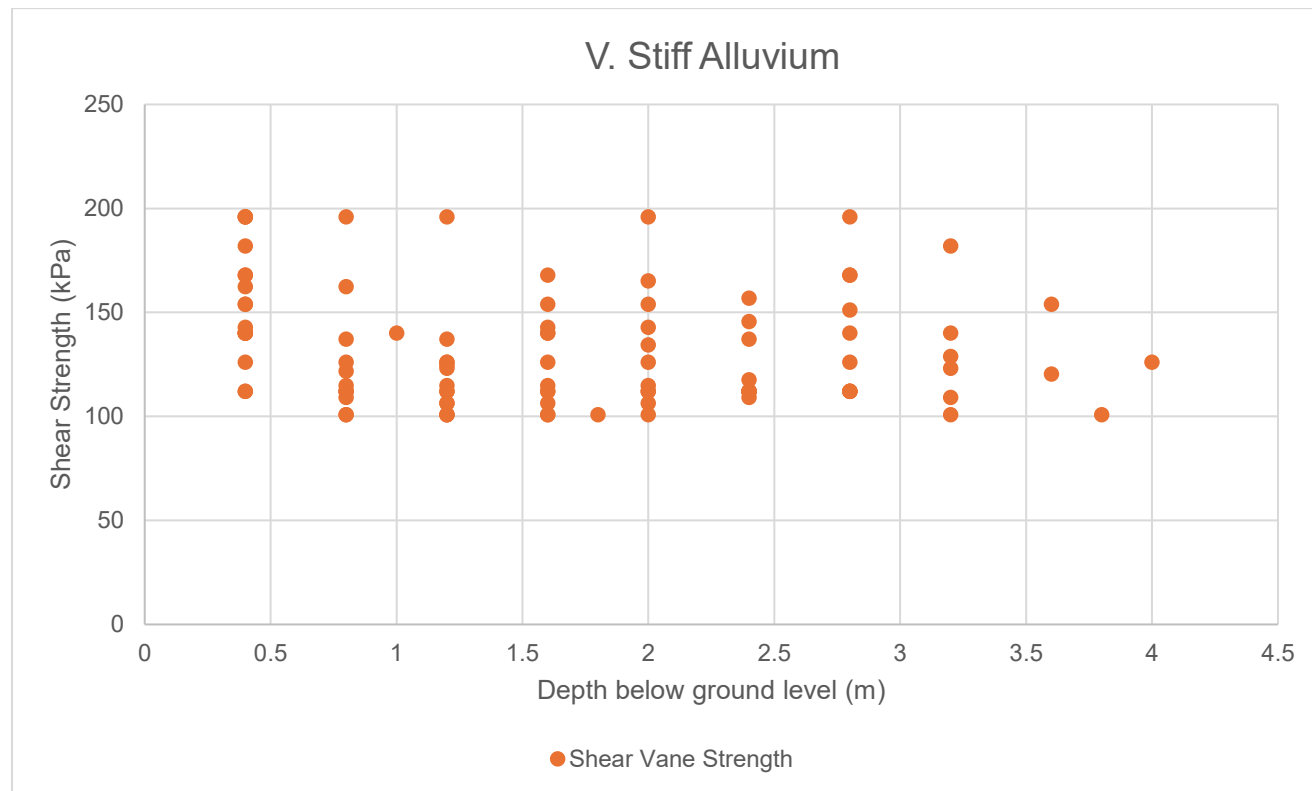
Stiff to Very Stiff Alluvium

No.	Shear Strength (kPa)				
	Range	Median	Mean	1STDev	Characteristic
216	50 - 100	73	75	15	60



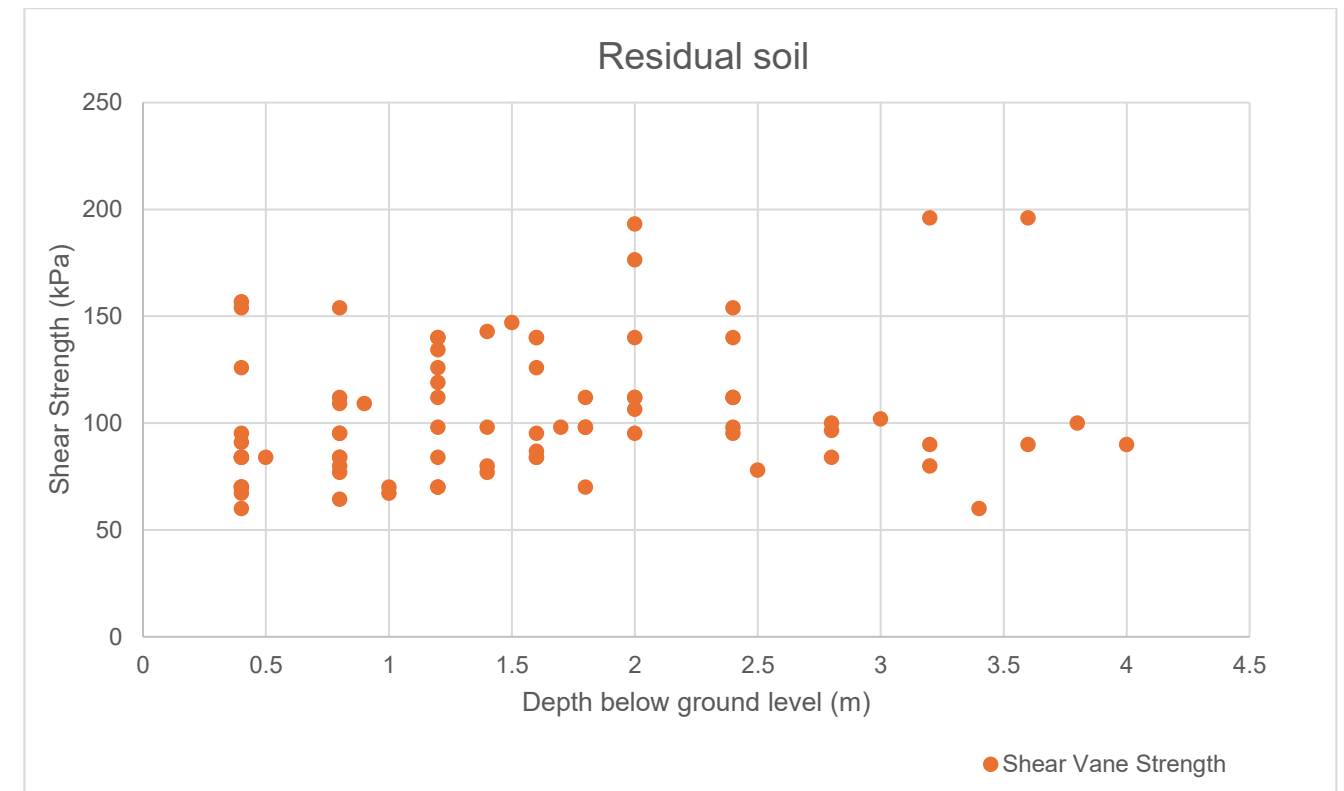
Very Stiff to Hard Alluvium

No.	Shear Strength (kPa)				
	Range	Median	Mean	1STDev	Characteristic
100	100 - 198	126	132	27	Not adopted



Residual Soil (Northland Allochthon)

No.	Shear Strength (kPa)				
	Range	Median	Mean	1STDev	Characteristic
81	60 – 198	97	104	31	80



APPENDIX F

Risk Register

	CLIENT:	FULTON HOGAN LAND DEVELOPMENT LTD	DESIGNER:	CR
	PROJECT:	MILLDALE STAGES 14-17	CHECKED:	SG
	TITLE:	GEOTECHNICAL RISK REGISTER	JOB NO:	AK26-027
			DATE:	23/04/2026
			ISSUED FOR:	GIR

Item	Geotechnical Hazard	Description	Relevant Standards*/Guidance Documents	Area Assessed	Assessment Outcome	Existing Risk of Damage to Land / Structures			Mitigation Measure	Residual Risk of Damage to Land / Structures		
						Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
1	Earthquake	Seismicity	NZGS and MBIE (2021) Earthquake Geotechnical Engineering Practice in New Zealand, Module 1: Overview of the Guidelines Structural design actions - Part 0: General principles, NZS1170.0:2002 Structural design actions - Part 5: Earthquake actions - New Zealand, NZS1170.5:2004	Entire Site	Site subsoil class = Class C or D due to depth of soils SLS PGA = 0.07g, ULS PGA = 0.19g			0				
		Fault Rupture	GNS Science, New Zealand Active Faults Database, retrieved from https://data.gns.cri.nz/af/	Entire Site	Nearest active fault = Wairoa North Fault, approximately 60km from the site. Recurrence interval of 13,000 years.	2	4	8	Not required	2	4	8
		Liquefaction	MfE and MBIE (2017), Planning and engineering guidance for potentially liquefaction-prone land NZGS and MBIE (2021) Earthquake Geotechnical Engineering Practice in NZ, Module 1: Overview of the Guidelines NZGS and MBIE (2021) Earthquake Geotechnical Engineering Practice in NZ, Module 2: Geotechnical Investigations for Earthquake Engineering NZGS and MBIE (2021) Earthquake Geotechnical Engineering Practice in NZ, Module 3: Identification, assessment and mitigation of liquefaction hazards MBIE (2012) Repairing and rebuilding houses affected by the Canterbury earthquakes, Part A: Technical Guidance Robertson, P. K. (2015) Comparing CPT and Vs Liquefaction Triggering Methods, J. Geotech. Geoenviron. Eng. Bray, J. D. & Macedo, J. (2017) Simplified procedure for estimating liquefaction-induced building settlement Auckland Council Geomaps	Soft to Firm Alluvium	Maps show the site is within a very low to unlikely hazard zone for liquefaction vulnerability. Intrusive investigations including laboratory testing suggests the underlying soils are generally cohesive and therefore at low risk of liquefaction. Specific analysis using CLIQ software suggests low liquefaction risk and associated settlements are expected to be low (maximum 40mm ULS). Refer to Section 8.3 of the report.	2	4	8	Mitigation not required.	2	4	8
		Lateral Spread	NZGS and MBIE (2021) Earthquake Geotechnical Engineering Practice in NZ, Module 3: Identification, assessment and mitigation of liquefaction hazards MBIE (2012) Repairing and rebuilding houses affected by the Canterbury earthquakes, Part A: Technical Guidance	Area adjacent to Orewa River and Waterloo stream	No lateral spread anticipated as no liquefaction expected.	1	4	4	Mitigation not required.	1	4	4
		Cyclic Softening	NZGS and MBIE (2021) Earthquake Geotechnical Engineering Practice in NZ, Module 3: Identification, assessment and mitigation of liquefaction hazards	Area adjacent to Orewa River and Waterloo stream	Cyclic shear strength of 80% of peak shear strength for firm and soft alluvium. Refer to Section 8.5 for stability analysis considering softening.	2	3	6	Mitigation not required.	2	3	6
		Global Instability	Auckland Council (2023), The Auckland Code of Practice for Land Development and Subdivision, Chapter 2: Earthworks and Geotechnical, Version 2	Entire site	Target Min. FOS = 1.5, 1.3 and 1.0 for prevailing, worst credible and seismic conditions. Results show that proposed landforms for Sections B, C, D and M do not achieve target factors of safety. Refer Section 8.5 for calculation package and detailed results.	4	4	16	We recommend that a combination of shear keys, reinforced earth slopes with fill buttresses and drainage are implemented to achieve requisite factor of safety requirements. Refer to Section 9.2 for details.	1	4	4

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2	Slope Instability / Landslide	Soil Creep		1V:2H Slopes	Soil creep anticipated within Hukerenui mudstone on slopes steeper than 1V:4H within upper 1m of ground surface.	4	3	12	Use of reinforced earth slopes to limit creep. Set back requirements in GCR.	4	1	4
		Cut / Fill Batter Stability		Entire site	Refer to global stability analysis in respect to steep cut and fill batter slopes.	4	4	16	We recommend that a combination of shear keys, reinforced earth slopes with fill buttresses and drainage are implmented to achieve requisitic factor of safety requirements. Refer to Section 9.2 for details.	1	4	4
		Stream bank instability and erosion		Slopes adjacent to Waterloo Stream and Orewa River	Refer to global stability analysis in respect to development near Orewa River and Waterloo Stream. Stability models meet factor of safety requirements.	1	4	4	Mitigation not required	1	4	4
3	Problematic Soils	Pumice Soil Exposure	N/A	Not in this geology								
		Rockmass Exposure	N/A	Cemetery Road, Endesley Rise Blocks	Earthworks will expose weathered hukerenui rock at design subgrade level. Bedrock unit with open defects have high rates of permeabilities and are susceptible to rapid erosion and contributing to land instability.	4	3	12	Where exposed cap rock units with 0.85m clay capping, refer to 9.4.1.	2	2	4
		Expansive Soils	MBIE (2021) Acceptable Solutions and Verification Methods For New Zealand Building Code Clause B1 Structure, Amendment 20 NZS 3604:2011 AS 2870-2011 NZS 4402:1998 Test 2.1, 2.4 and 2.6 Fraser Thomas Ltd, Brown, B.J., Goldsmith, P.R., Shorten, J.P.M. & Henderson, L (2003) Soil Expansivity in the Auckland Region. BRANZ, Study Report SR 120	Entire Site	Experience on previous stages of Milldale suggest that expansive soil class will be between M and H1	4	4	16	Specific foundation design to be undertaken by structural engineer in accordance with AS 2870-2011. Final expansive class to be determined on a lot by lot basis during GCR stage.	4	1	4
		Sensitive Soils	NZGS Field Description of Soil and Rock (NZGS, 2005)	Entire Site	Hand shear vane testing suggests that natural soils are unlikely to be sensitive.	3	1	3	Mitigation not required.	1	3	3
		Acid Sulphate Soils		Not in this geology								
		Collapsible / Dispersible Soils	N/A	Not in this geology								
		Uncontrolled Fill	N/A	Areas specific in GIR	Suspect uncontrolled fill in areas found in Section 4.3 of GIR	4	4	16	Uncontrolled fill is to be excavated and replaced during construction.	1	4	4
		Contamination	Ministry for the Environment (2021) Contaminated land management guidelines	Entire Site	By others							

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4	Settlement	Compressible Soils	Mesri G, Kwan Lo D, Feng T (1994) Settlement of Embankments on Soft Clays, Chapter of Vertical and Horizontal Deformation of foundations and Embankments, A.T.Yeung & G.Y.Felio, ASCE, New York, 8-56 Mesri G, Ajlouni N (2007) Engineering Properties of Fibrous Peats, Journal of Getotechnical and Geoenvironmental Engineering, Vol. 133:7. ASCE	Firm and soft alluvium	Primary (t90) settlements of 210mm to 780mm predicted. Post-construction settlements of 130mm to 350mm predicted within firm and soft alluvium area. Differential settlements expected to be beyond building code limits in this geology without specific mitigation. Refer to Section 8.6 in GIR for details	5	3	15	Proposed mitigation is by use of a preload and surcharge. Refer to 9.3 in GIR.	2	3	6
		Bearing Capacity	MBIE (2021) Acceptable Solutions and Verification Methods For New Zealand Building Code Clause B1 Structure, Amendment 20, B1/VM4	Entire Site	Bearing capacity assessment shows preliminary geotechnical ultimate bearing capacity (GUBC) of 300kPa is available with corresponding settlements of 25mm anticipated over design life in engineered fill, stiff alluvium and hukerenui units, Lower bearing capacities likely in firm to soft alluvium without further mitigation,	5	3	15	Undercut recommended for firm and soft alluvium to achieve 300kPa GUBC, refer to 9.4.2	2	3	6
		Effects of Dewatering			By Others.							
		Settlement Behind Retaining Wall – Boundary Effects			No boundary walls in scheme							
		Tomos		Entire Site	Not observed in this geology							
7	Geothermal activity	Formation of geysers, hot springs, fumaroles, mud pools	Auckland Council GeoMaps (Geothermal overlay)	Entire Site	Not in this geology							
9	Construction Risks	Excavatability	Transit New Zealand (1997) Specification for Earthworks Construction TNZ F/1:1997	Entire Site	Given the stiffness and sheared fabric of the soil/rock units that will be encountered, excavation is expected to be readily achieved with normal earthworks plant.							
		Sediment Retention Ponds	N/A	Sloping areas of site	SRP locations unknown, any SRPs on slopes may cause slope instability due to base seepage or placement of earthbund.	3	4	12	Geotechnical Engineer to have input on the locations of these when situated on slopes. May require structural design including key and compaction specifications, subgrade inspections and QA of embankment materials.	1	4	4
		Stockpile locations	N/A	Orewa River and Waterloo Stream	Stockpile locations are currently unknown, any near the Orewa River or Waterloo Creek on soft to firm alluvium ground must be reviewed by the Geotechnical Engineer due to the potential of slope instability caused by rapid filling.	4	3	12	The location of all temporary stockpiles must be approved by the Geotechnical Engineer prior to placement. Where stockpiles cannot be avoided above sloping ground they should be placed over a wide area with the height restricted under the direction of the Geotechnical Engineer.	2	3	6
		Subgrade Preparation	N/A	Firm to soft alluvium	Soft to firm alluvium may be difficult to work on due to punching of subgrade and wet conditions	4	2	8	Consider leaving topsoil in place in reserve areas, undercut and replacement to create bridging layer during earthworks	2	2	4
		Service Trenches (trench collapse / long term settlement)	N/A	Firm to soft alluvium	Unsupported trench collapse is likely in the soft and firm alluvial soils, particularly when beneath the groundwater table. The contractor must consider these soils as “complex” and consider trench support or battering in this area.	4	4	16	The contractor must consider these soils as “complex” and consider trench support or battering in this area.	2	4	8
		Land Instability as a Result of General Works		Sloping ground, endsley road and cemetery road	Slope instability during the works on sloping ground	4	4	16	In sloping ground consider: - Constructing shear keys early in the programme - Limiting the amount of shear key excavation open at any time, plan works around weather - Installing drainage prior to excavations. - monitor the works for signs of slope movement, alert geotechnical engineer if suspected.	2	4	8

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RISK ASSESSMENT GUIDE - ACCOPS						
Risk Matrix		CONSEQUENCE				
		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
RISK CATEGORIES	Health & Safety and Disruption (Including staff, sub-contractors or the public, injury or illness)	No significant community (e.g. sociological or cultural) issues.	Local community (e.g. sociological or cultural) concerns that can be dealt with.	Injury or illness likely.	Injury or permanent disability likely.	Fatality likely.
		Localized short term reversible disruption to the community, resulting in no noticeable damage.	Localized minor reversible damage and disruption to the community, with no potential public safety issues or long-term effect.	Significant community (e.g. sociological or cultural) concerns causing delays and modifications to plans.	Widespread significant community (e.g. sociological or cultural) causing significant delays and modifications to plans.	Major community (e.g. sociological or cultural) concerns causing major re-think or complete failure of plans. Localized or widespread damage and disruption to the community (any duration), with potential for loss of life.
	Environment (Including air quality and noise, water contamination or sedimentation, soil contamination, impact on others, protected areas or species.)	Small localized and reversible environmental impact: • Slight, short term damage to use of land and/or water	Contained and reversible (minimal) environmental impact. OR Localized minor reversible damage to (use of) land and/or water	Measurable damage to the environment; significant corrective action. OR Localized, medium term reversible damage to land and/or water ecosystems	Irreversible localised damage (major) to the environment OR Widespread, long term reversible damage to land and/or water ecosystems	Extensive irreversible damage (widespread) to the environment. OR Widespread, irreversible damage to land and/or water ecosystems.
		• Slight short-term damage to land and/or water ecosystems	Localized minor reversible damage to land and/or water ecosystems.	Moderate reduction in one or more species	Significant reduction in one or more species	Permanent loss of one or more species.
		• No noticeable species reduction	Temporary reduction in one species	Moderate erosion and/or damage to property. Recovery time up to 6 months.	Severe erosion and/or damage to property. Recovery time exceeding 6 months.	Destruction of property / widespread flooding. Recovery time exceeding 6 months.
		• Occasional inconsistency with the intent of legislation, Auckland Plan	Minor erosion and/or damage to property.	Repeated inconsistency with the intent of legislation, Auckland Plan.	Repeated and significant inconsistency with the intent of legislation, Auckland Plan.	No recognition of the intent of legislation, Auckland Plan.
	Assets and Economy	Economic loss <\$0.5M OR Damage / loss of a minor asset worth <\$5k OR Assets not useable / available for short defined period	Economic loss 0.5M-\$1M OR asset damage <\$10K OR assets not useable / available for short undefined period	Economic loss \$1M-\$10M OR asset damage <\$50k OR assets not useable / available for the medium term	Economic loss \$10M-\$100M OR asset damage <\$500k OR Assets not useable / available for the long term	Economic loss >\$100M OR asset damage >\$1M OR Total loss of asset that cannot be replaced
LIKELIHOOD	5 Almost Certain (greater than 90% chance of occurring during period of exposure)	Medium 5	High 10	Very High 15	Extreme 20	Extreme 25
	4 Event Likely to Occur (50% to 90% chance of occurring during period of exposure)	Low 4	Medium 8	High 12	Very High 16	Extreme 20
	3 Event May Occur (25% to 50% chance of occurring during period of exposure)	Low 3	Medium 6	Medium 9	High 12	Very High 15
	2 Event Unlikely to Occur (10% to 25% chance of occurring during period of exposure)	Very Low 2	Low 4	Medium 6	Medium 8	High 10
	1 Event Rarely Occurs (less than 10% chance of occurring during period of exposure)	Very Low 1	Very Low 2	Low 3	Low 4	Medium 5

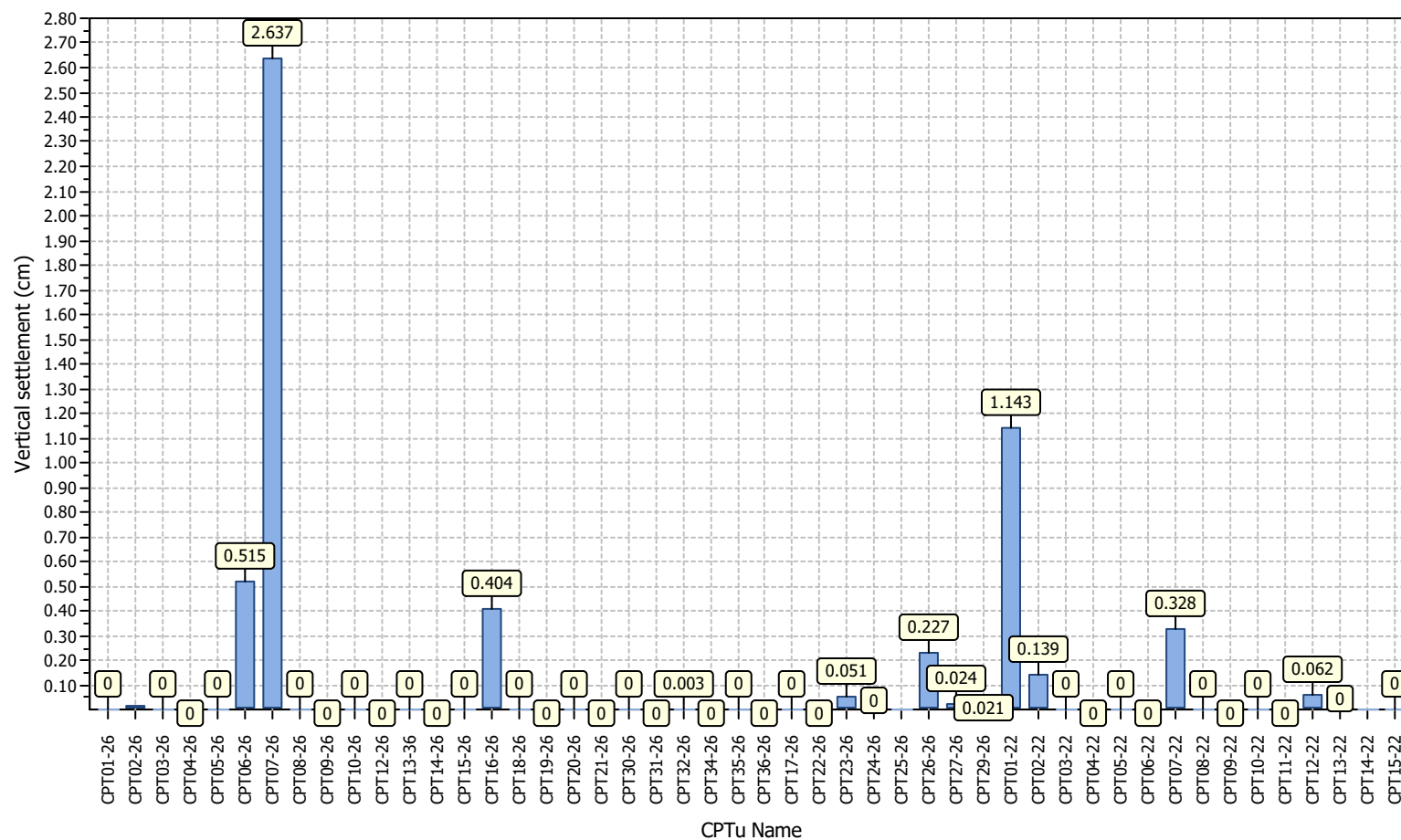
APPENDIX G

CLIQ Outputs

Project title : Milldale North

Location : Wainui NZ

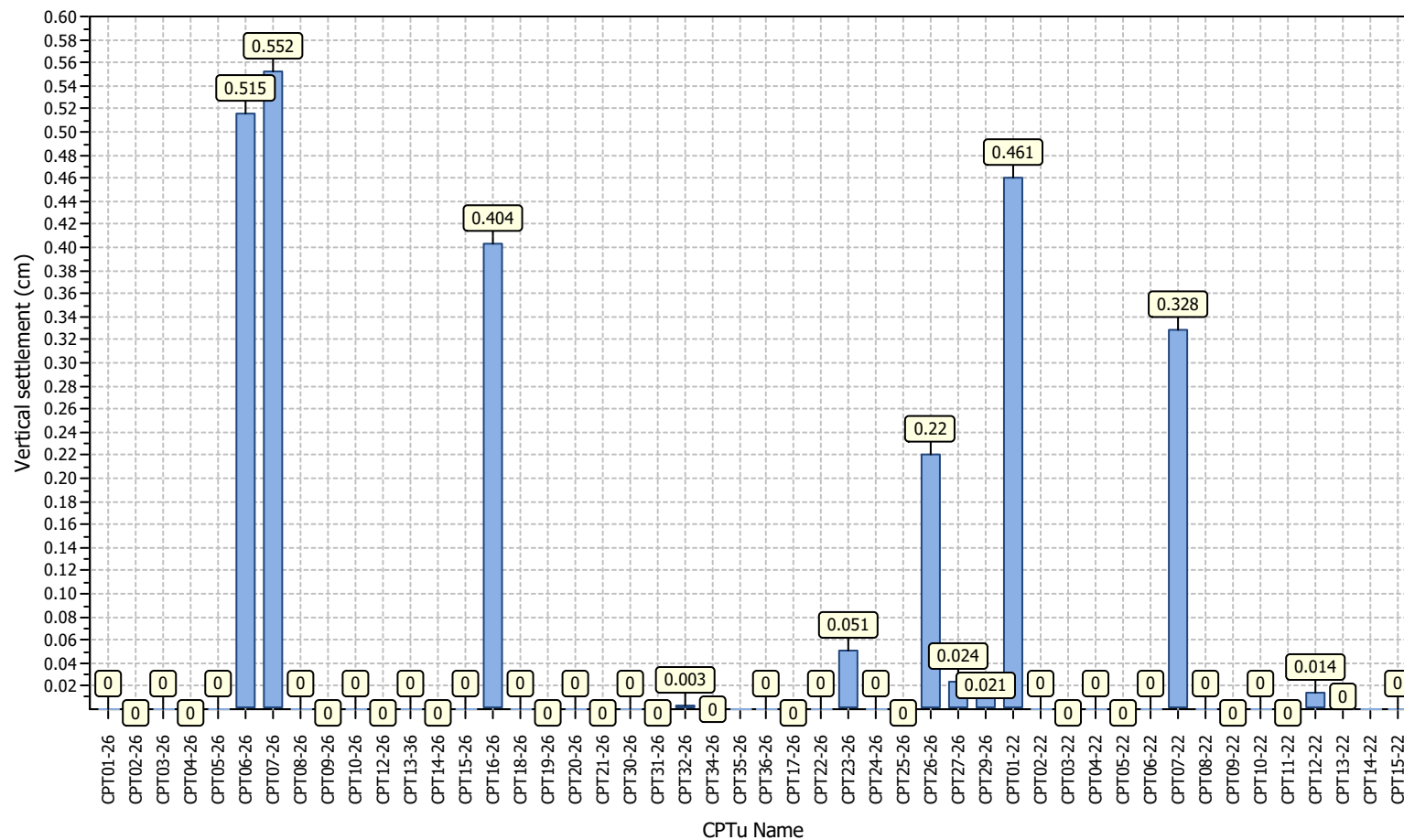
Overall vertical settlements report



Project title : Milldale North

Location : Wainui NZ

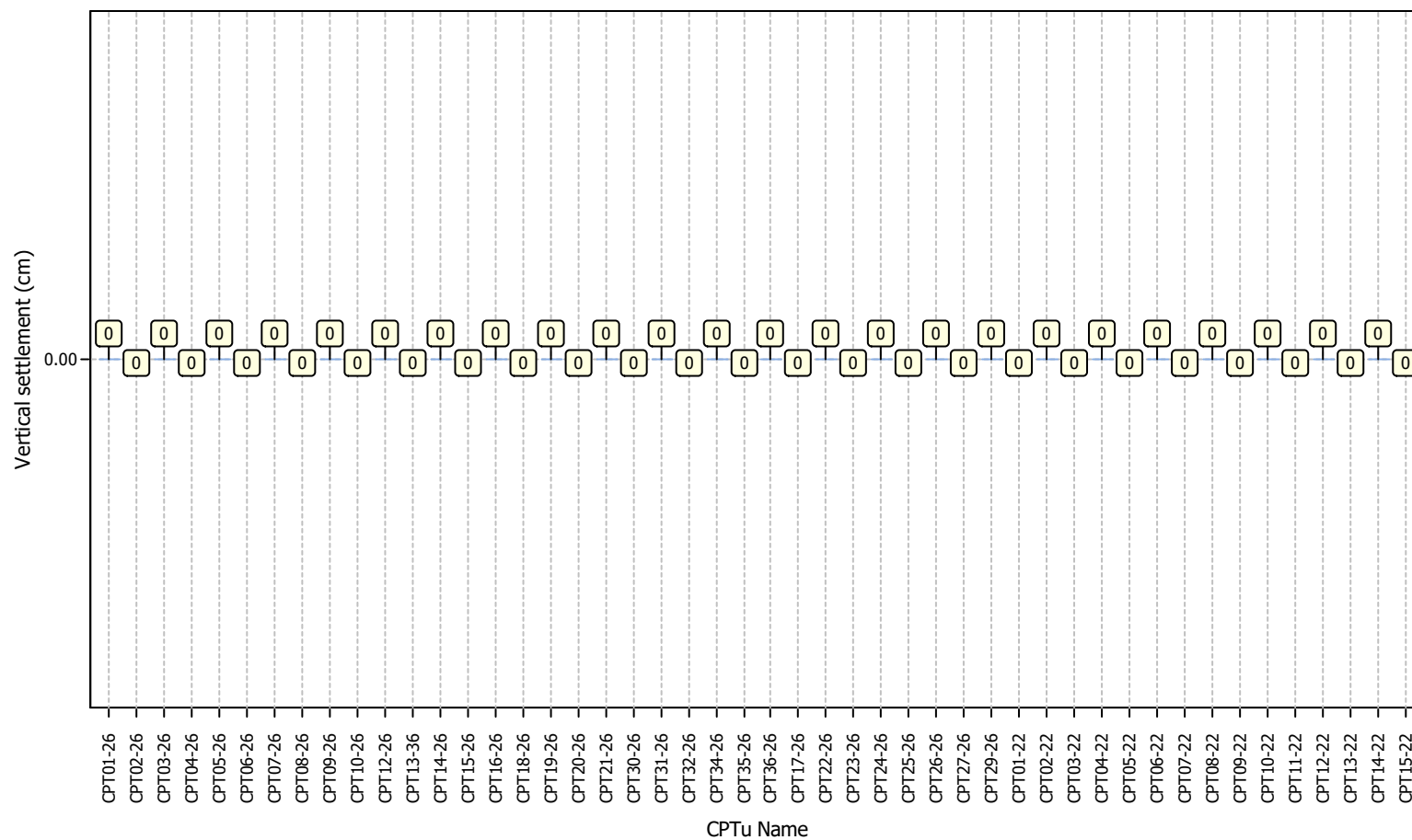
Overall vertical settlements report



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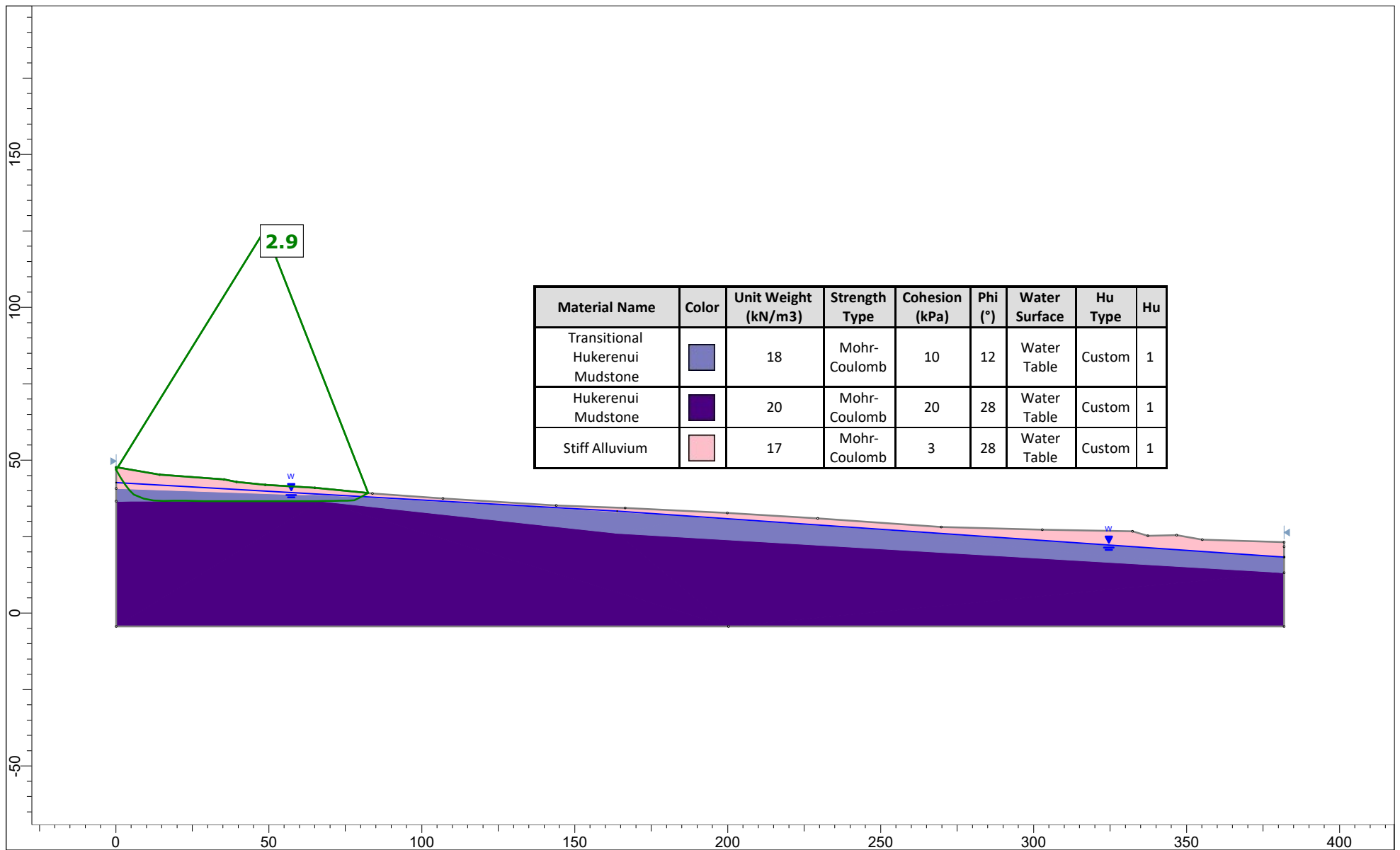
Location : Wainui NZ

Overall vertical settlements report



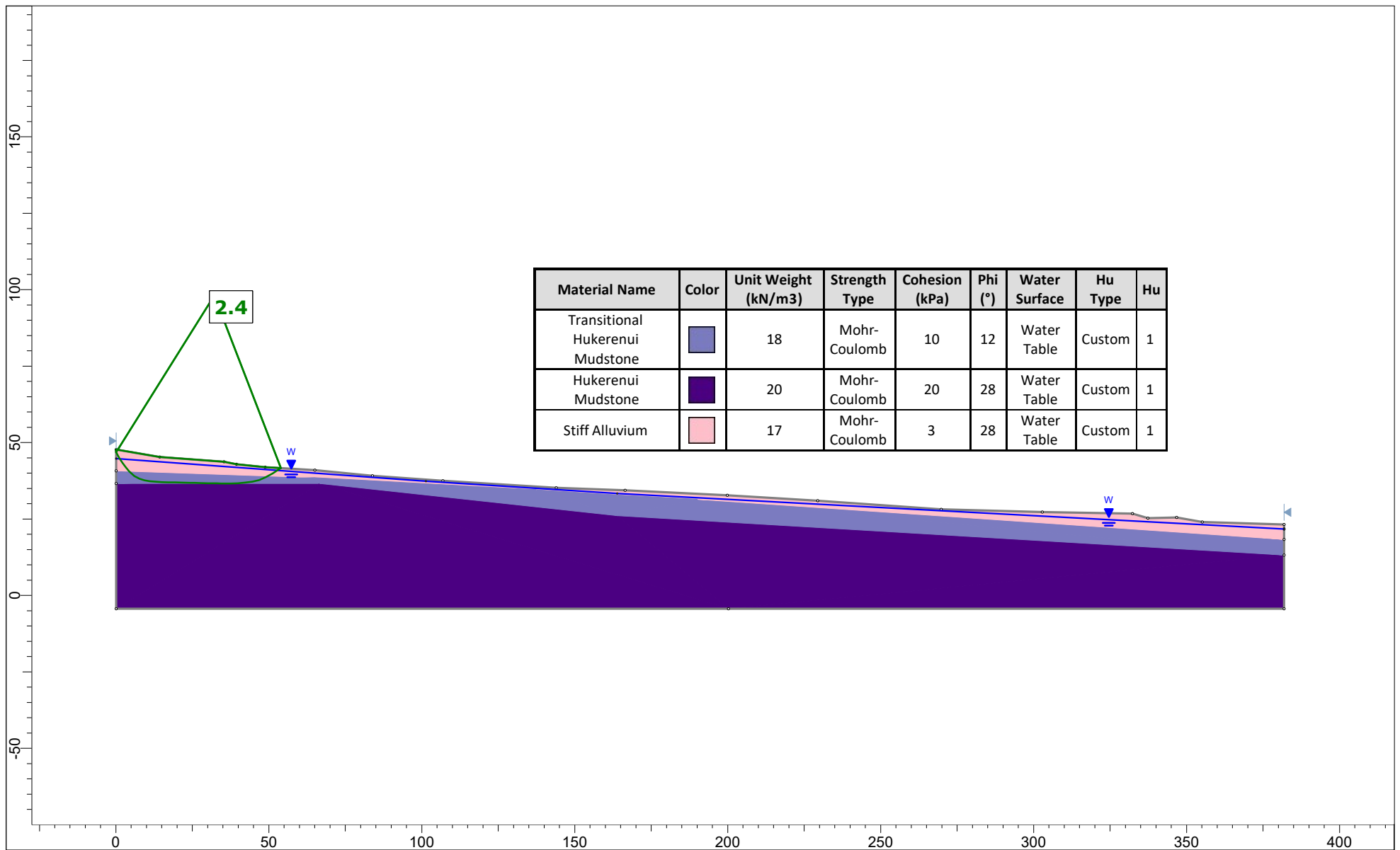
APPENDIX H

Slope Stability Analysis



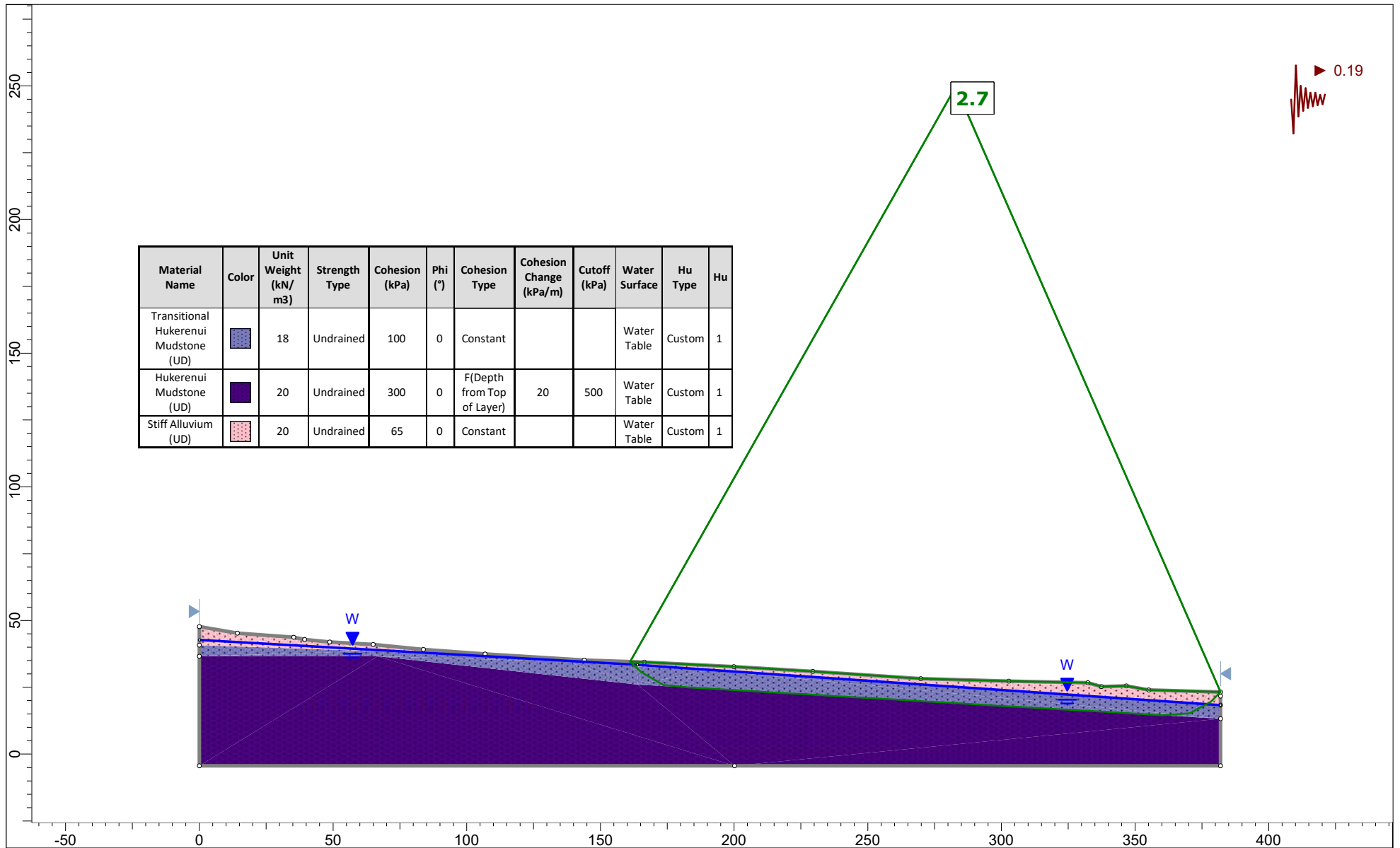
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section A - Existing		Scenario		Existing NGW	
ST		CR		Company		Gibb Ritchie Geotechnical Engineers	
Date		20/07/2026, 10:02:44 am		File Name		XS A.slm	



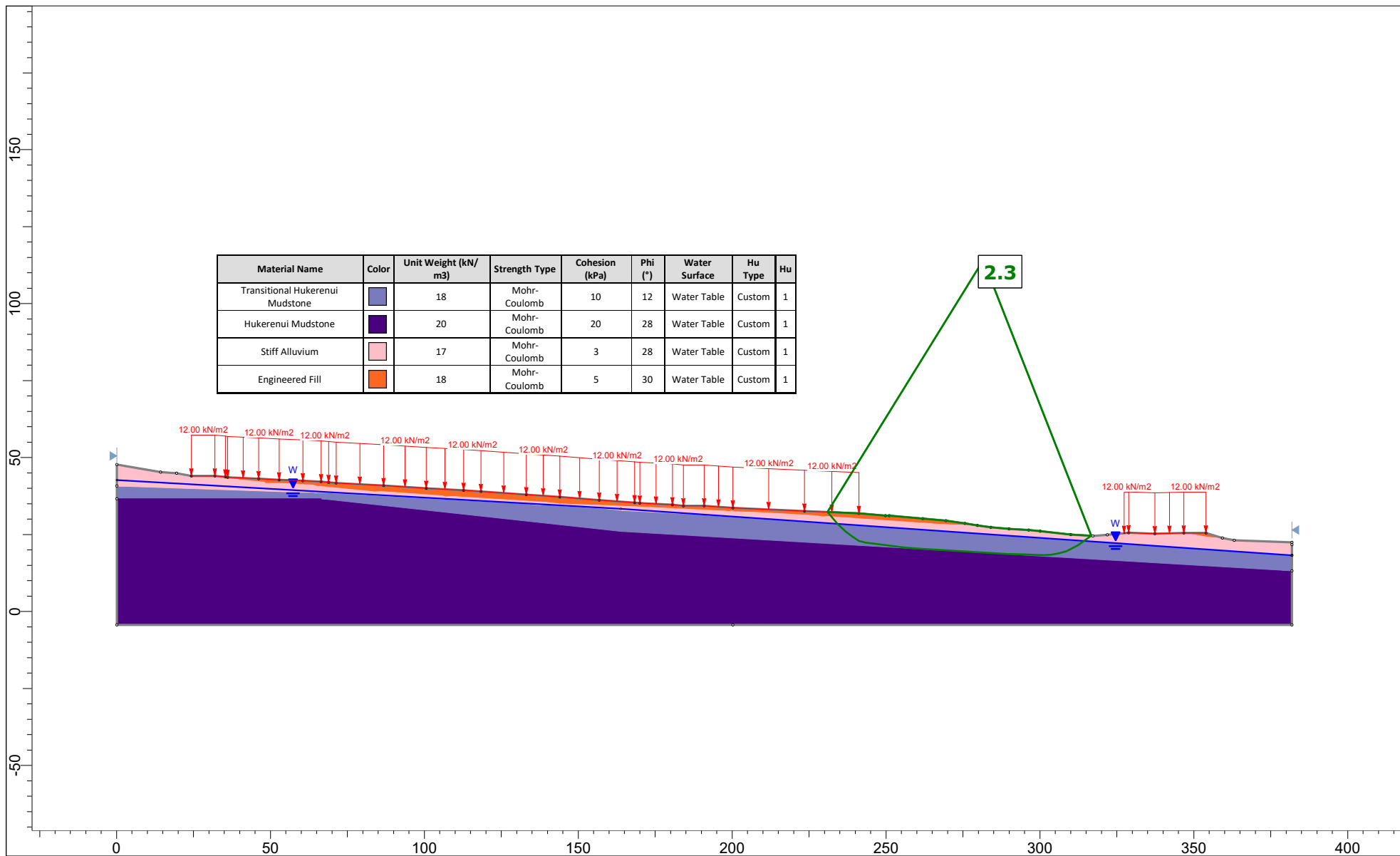
SLIDEINTERPRET 9.038

Project			
Milldale North Stages 14-17			
Group	Section A - Existing		Scenario
			Existing HGW
ST	CR		Company
			Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am		File Name
			XS A.slmd



SLIDEINTERPRET 9.038

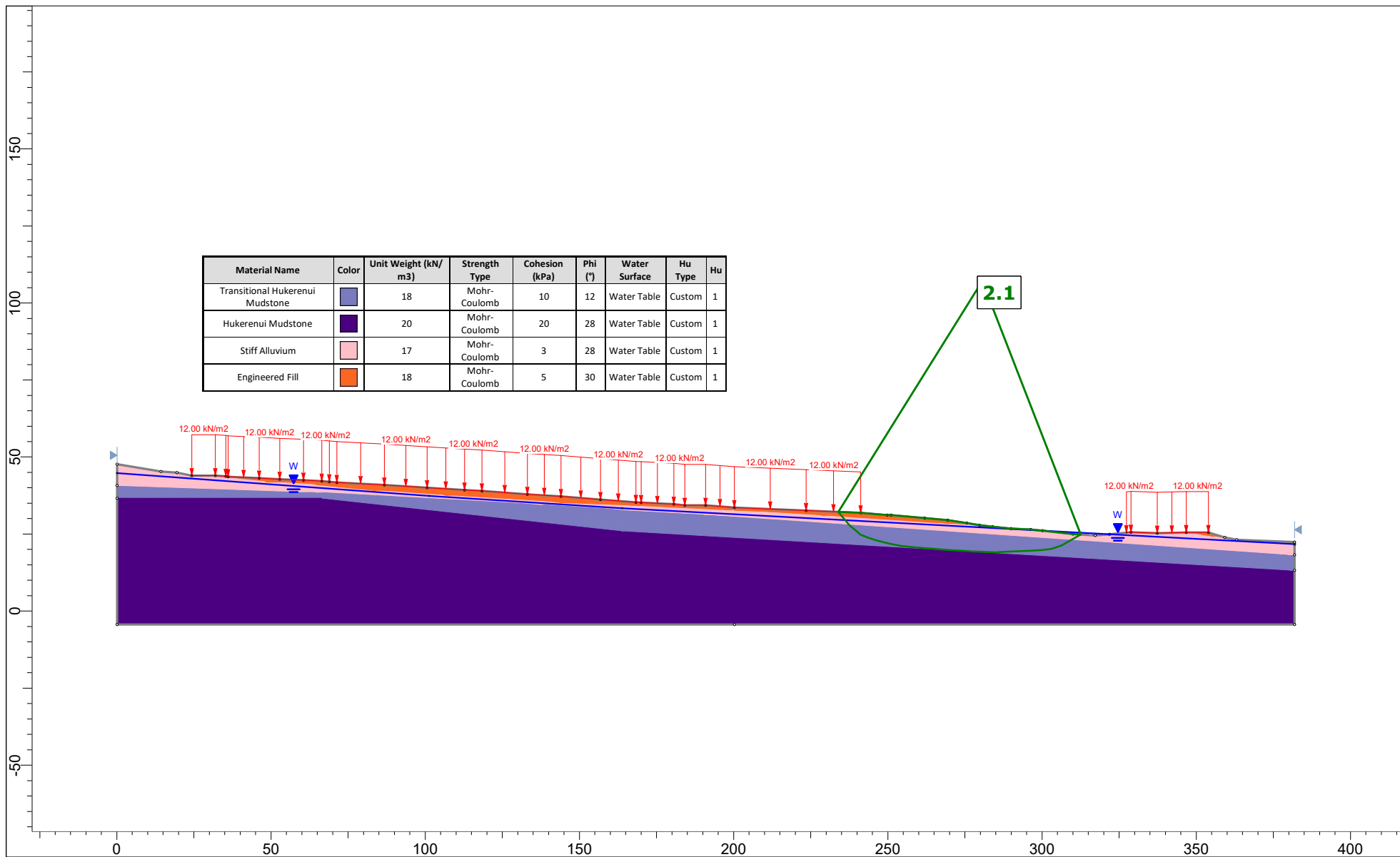
Project		Milldale North Stages 14-17	
Group	Section A - Existing	Scenario	Existing Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
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SLIDEINTERPRET 9.038

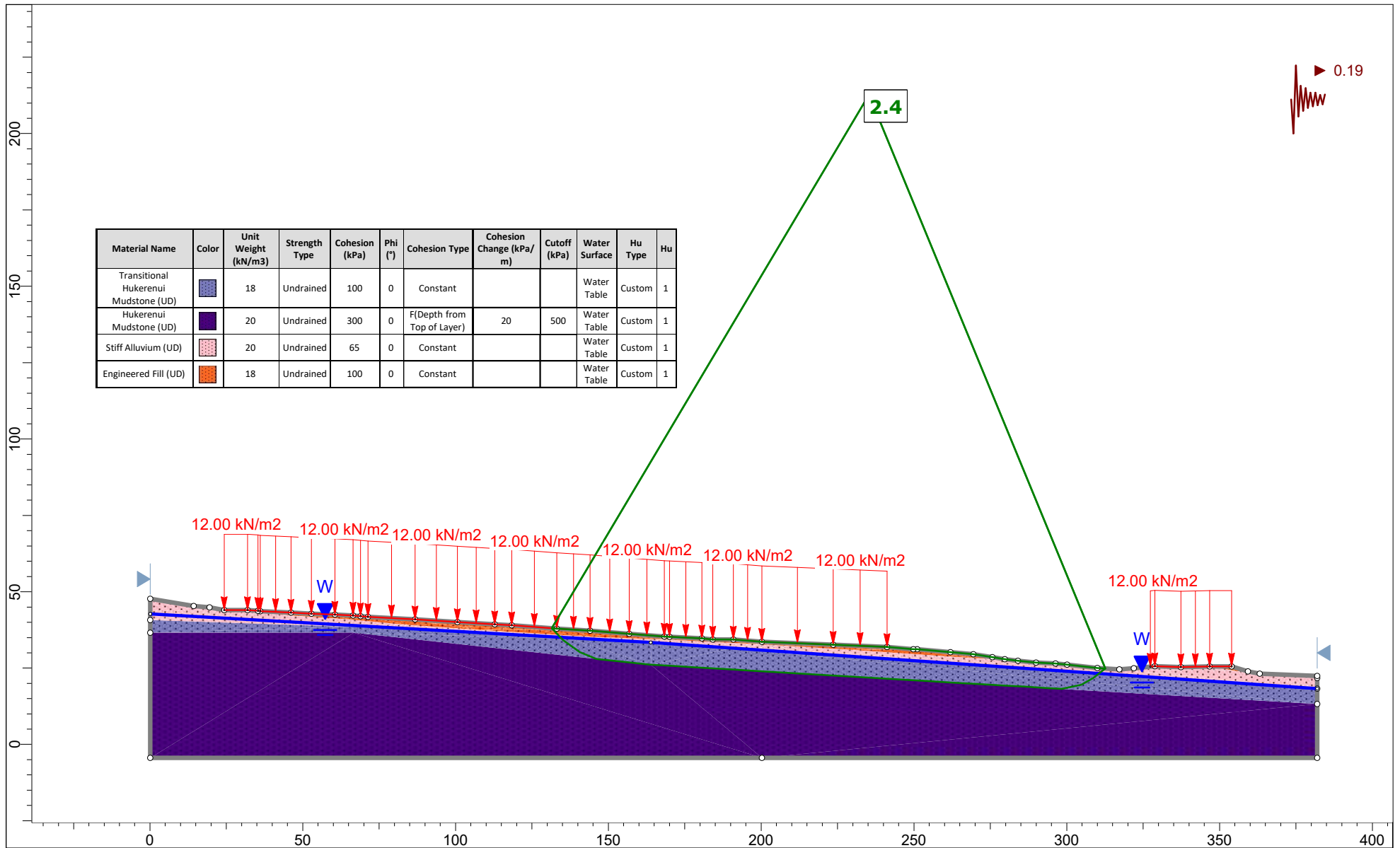
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Milldale North Stages 14-17			
Group	Section A - Proposed		Scenario
ST	CR		Company
Date	20/07/2026, 10:02:44 am		File Name
			XS A.slmd

Proposed NGW
Gibb Ritchie Geotechnical Engineers



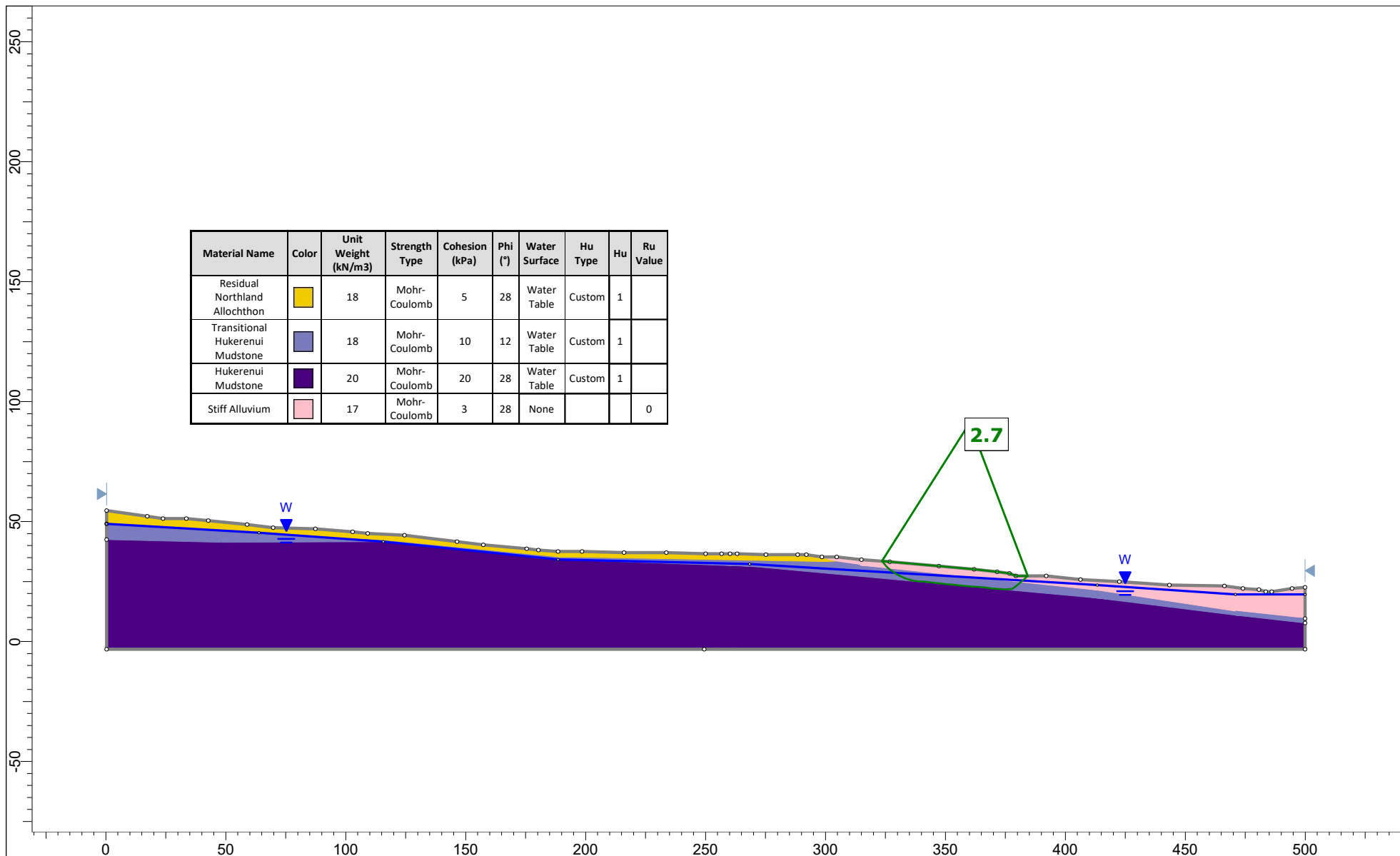
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section A - Proposed		Scenario		Proposed HGW	
ST		CR		Company		Gibb Ritchie Geotechnical Engineers	
Date		20/07/2026, 10:02:44 am		File Name		XS A.slmd	



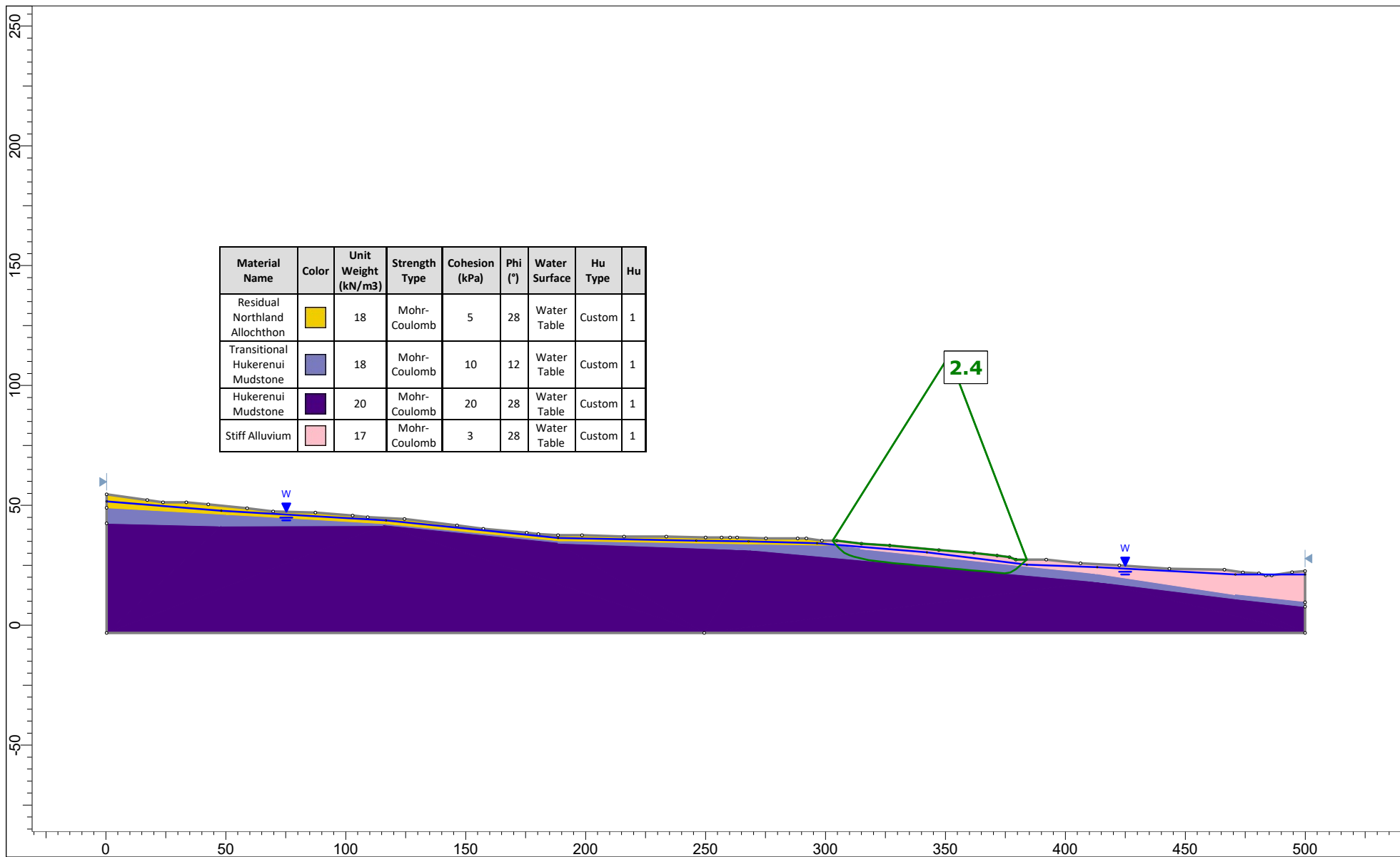
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section A - Proposed	Scenario	Proposed Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS A.slm



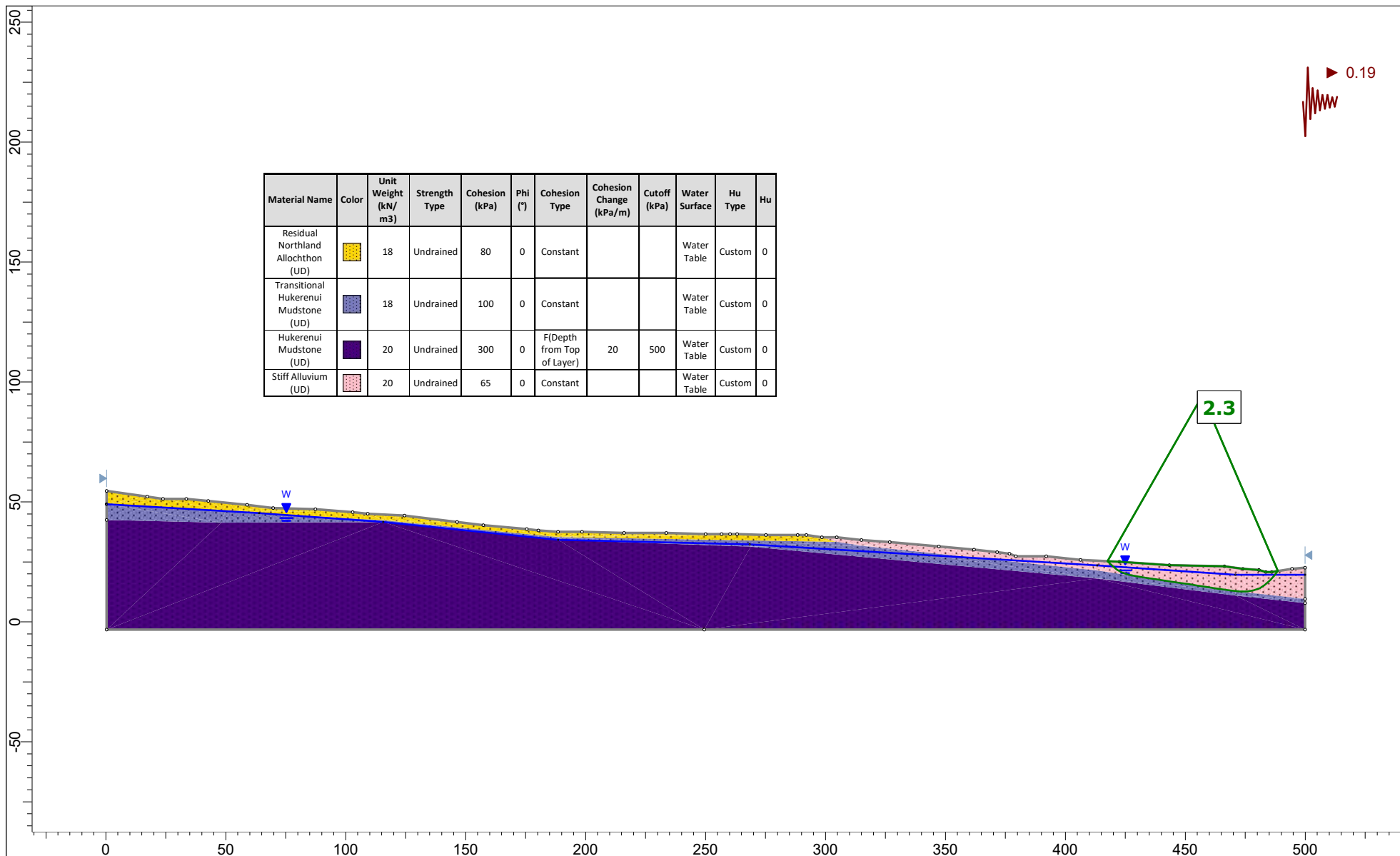
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section B - Existing	Scenario	Existing NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS B.slmd



SLIDEINTERPRET 9.038

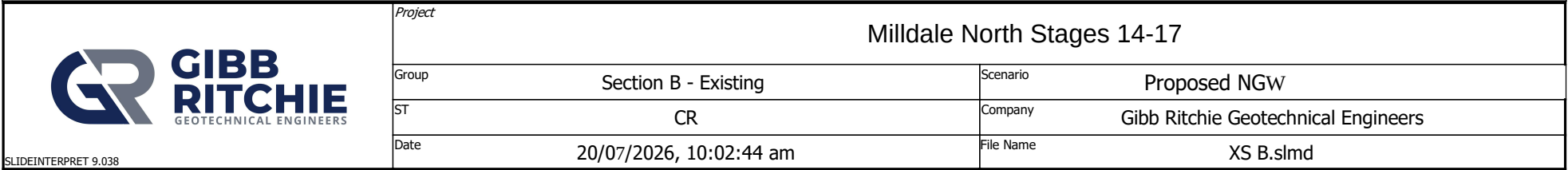
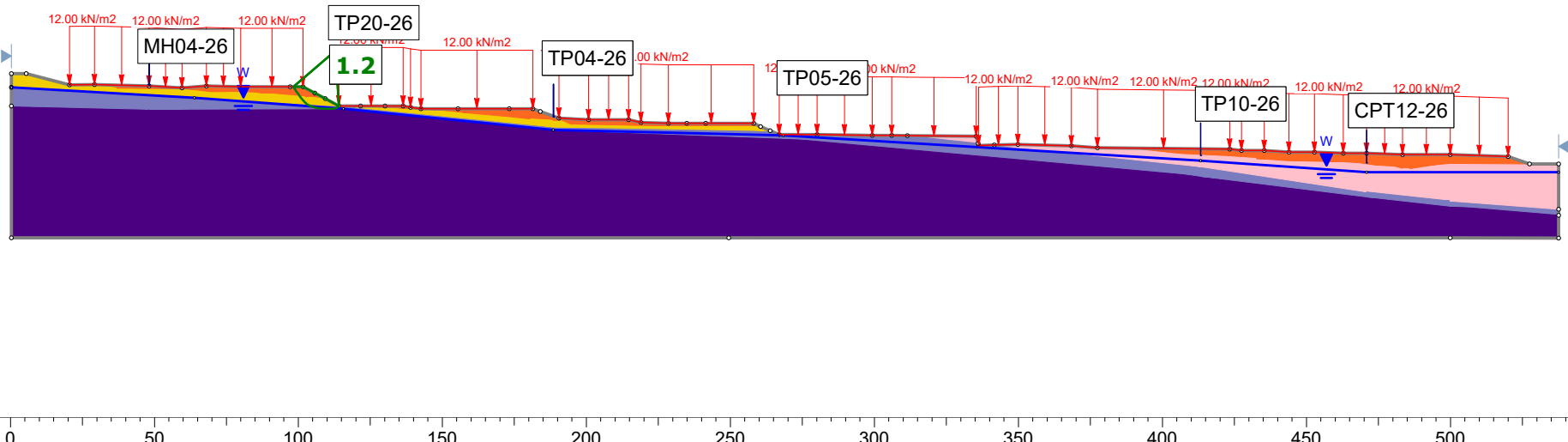
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Group	Section B - Existing	Scenario	Existing HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS B.slmd

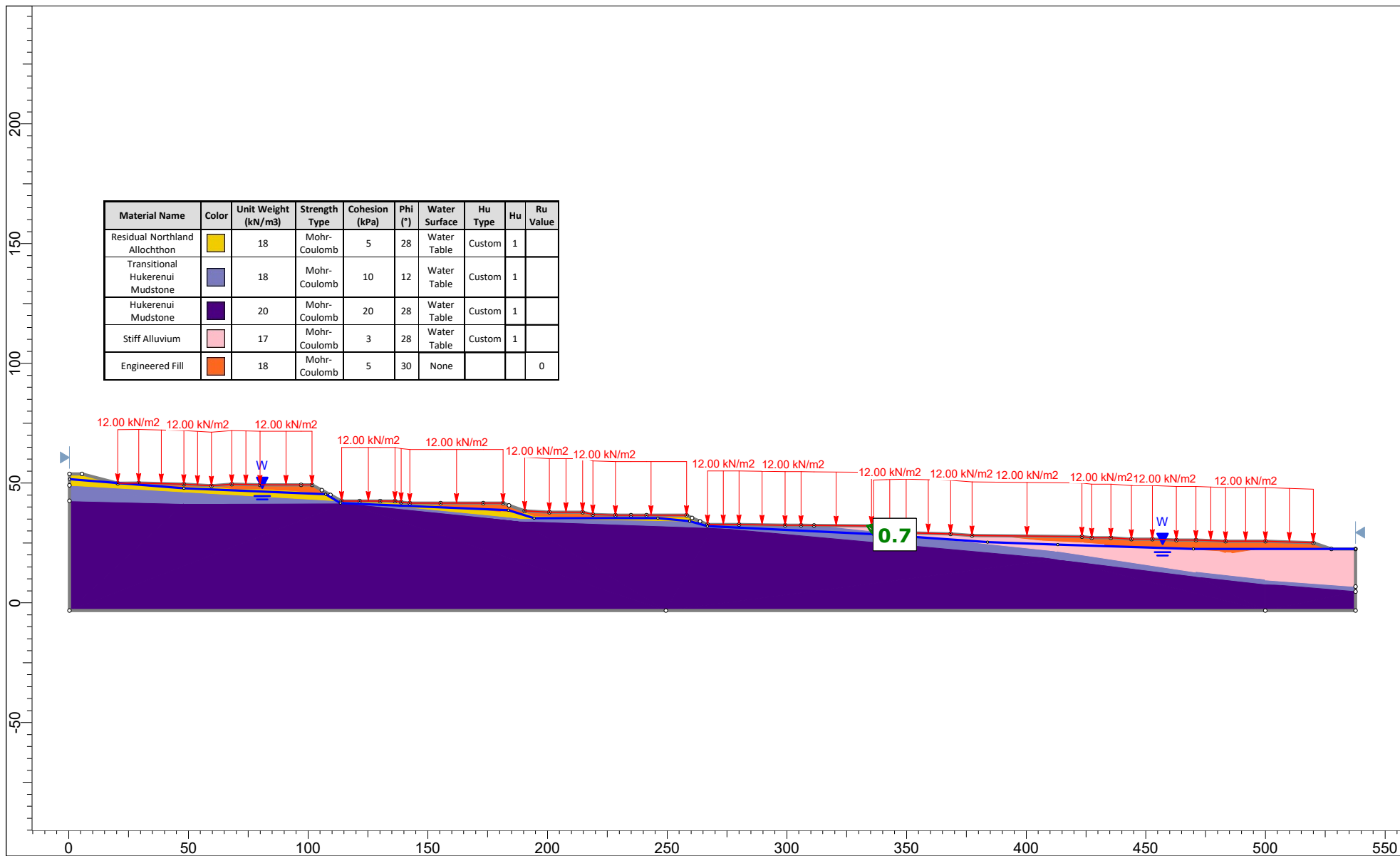


SLIDEINTERPRET 9.038

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Group	Section B - Existing	Scenario	Existing Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS B.slmd

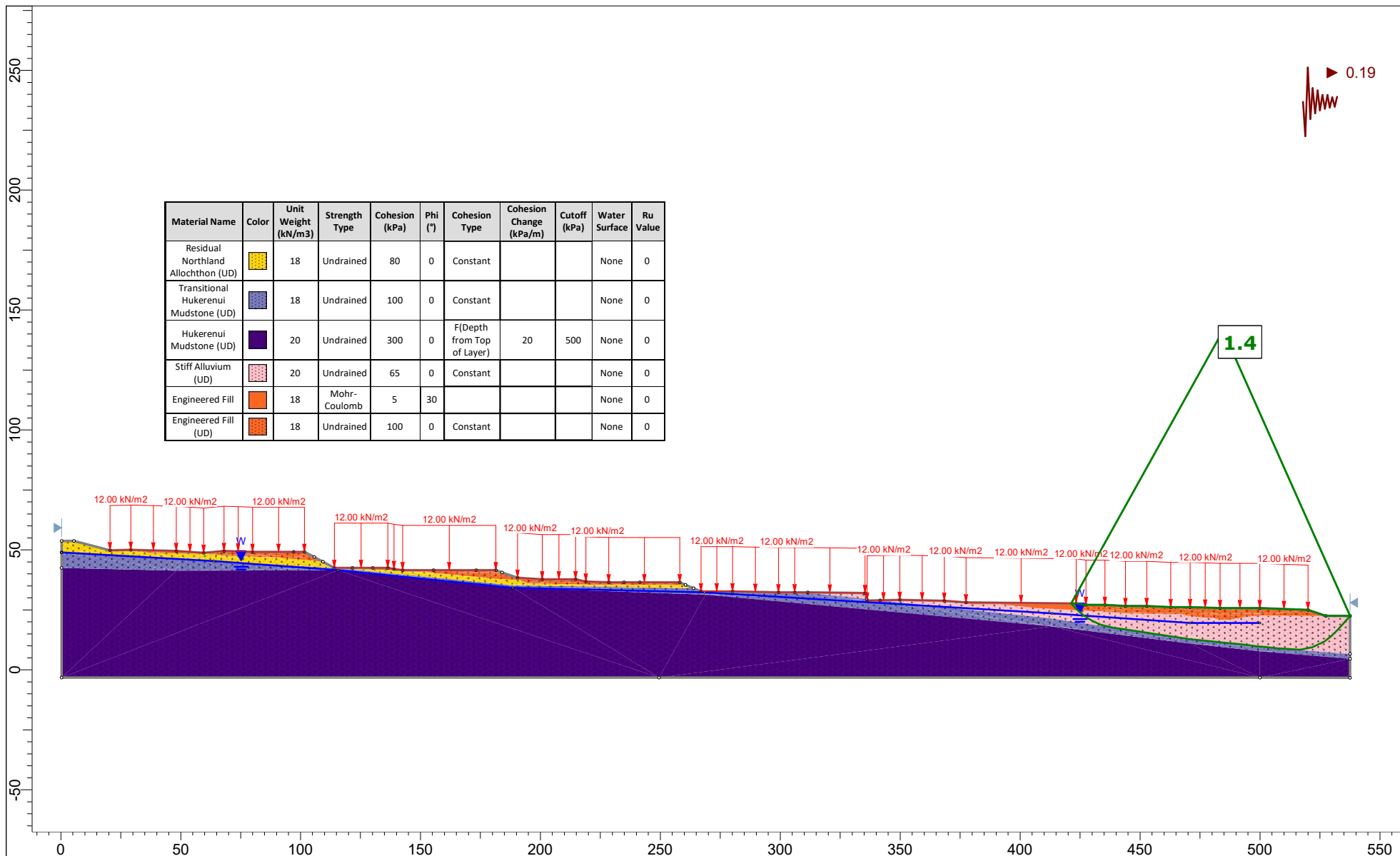
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1





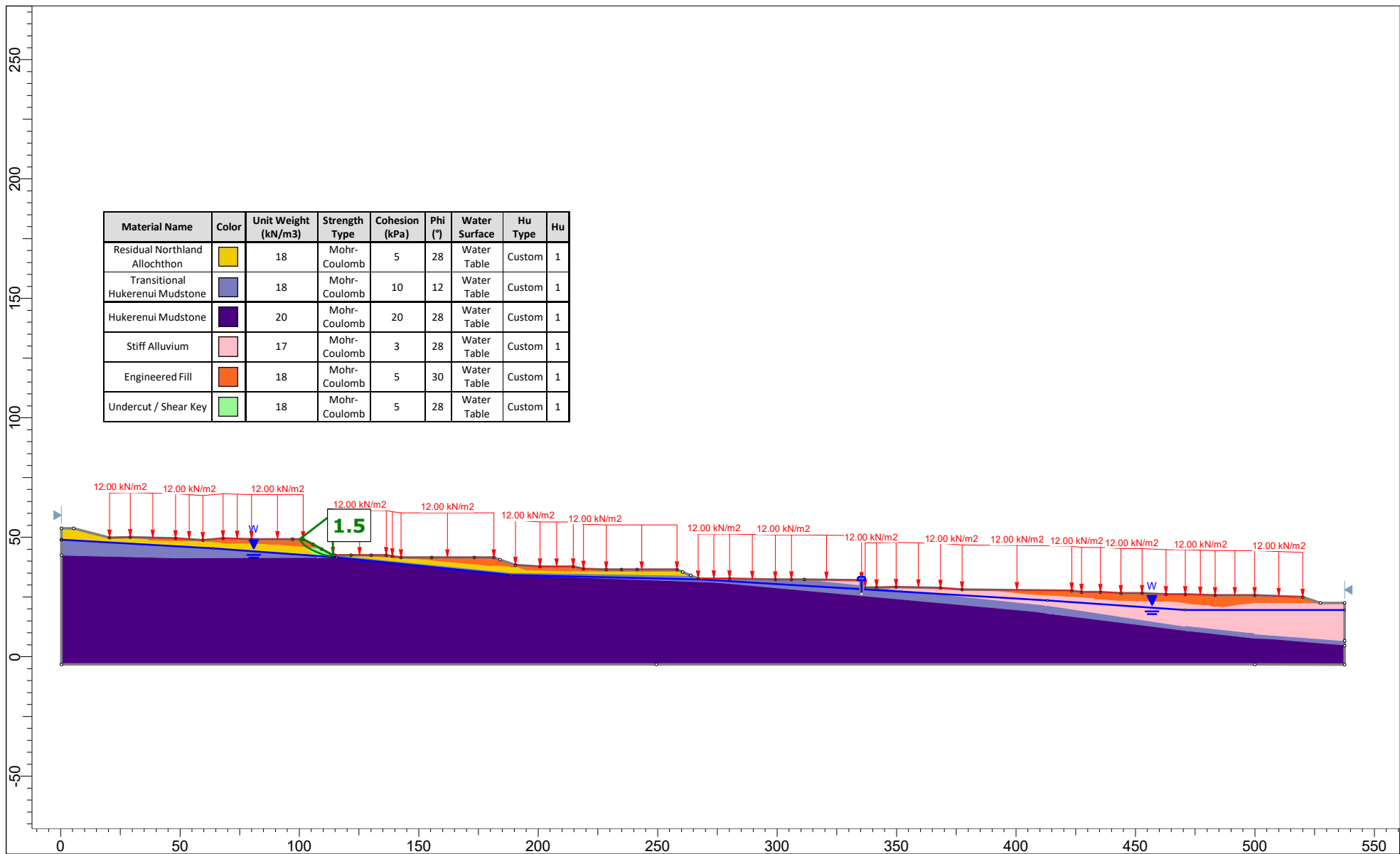
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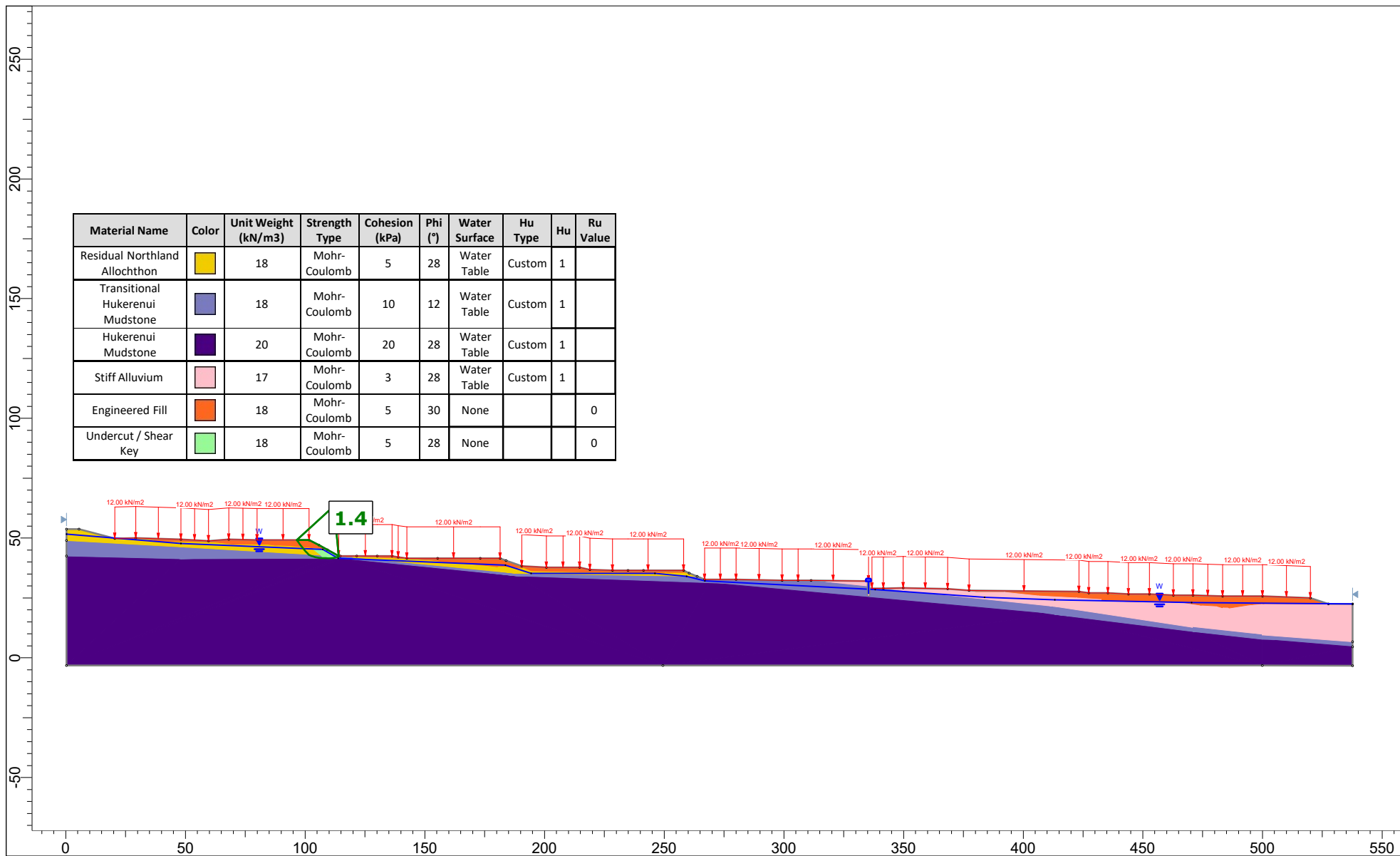
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Date	20/07/2026, 10:02:44 am	File Name	XS B.slm



SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section B - Remediated	Scenario	Remediated NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS B.slmd

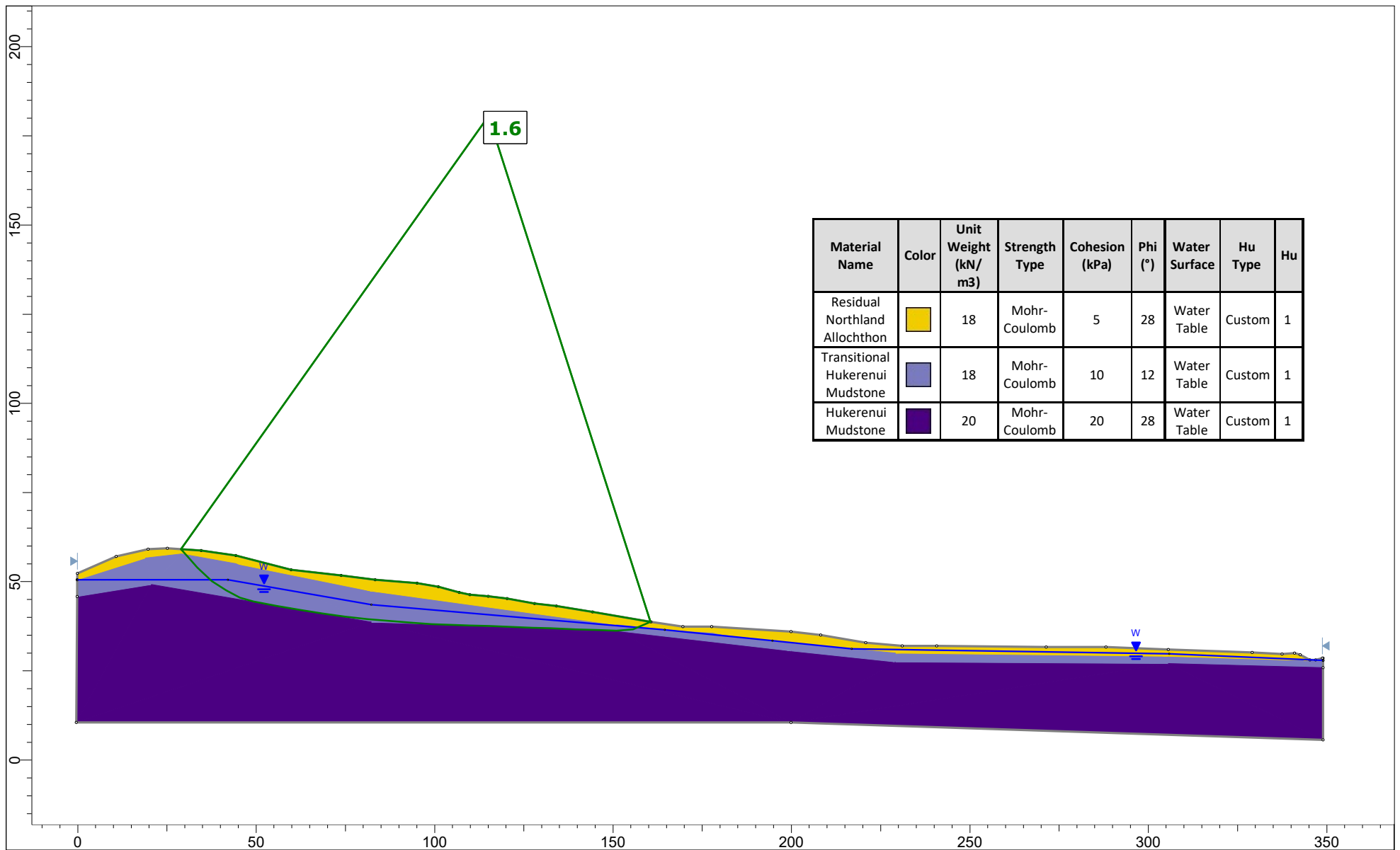


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1	
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1	
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1	
Engineered Fill		18	Mohr-Coulomb	5	30	None			0
Undercut / Shear Key		18	Mohr-Coulomb	5	28	None			0



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Project		Milldale North Stages 14-17	
Group	Section B - Remediated	Scenario	Remediated HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS B.slm

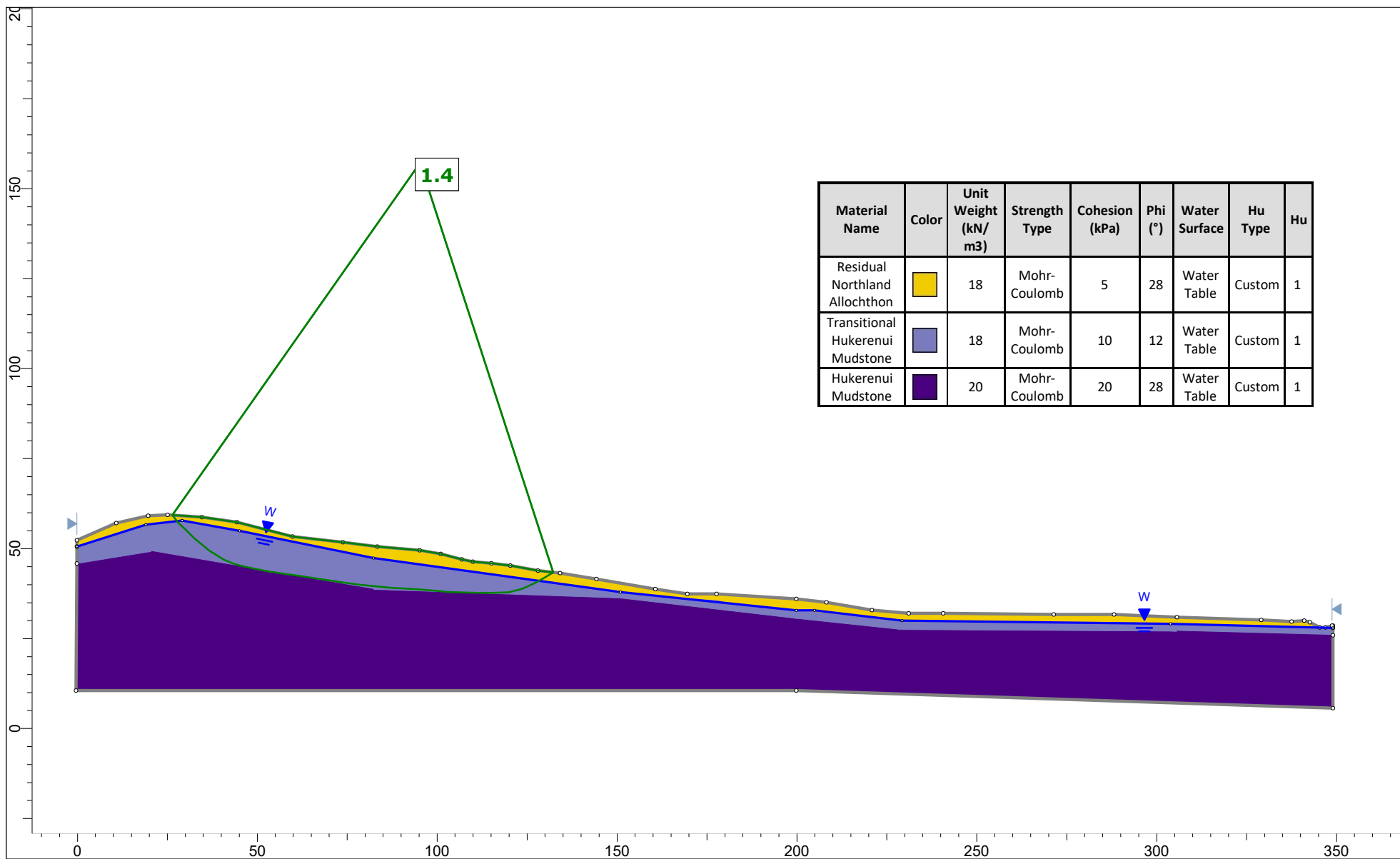


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1



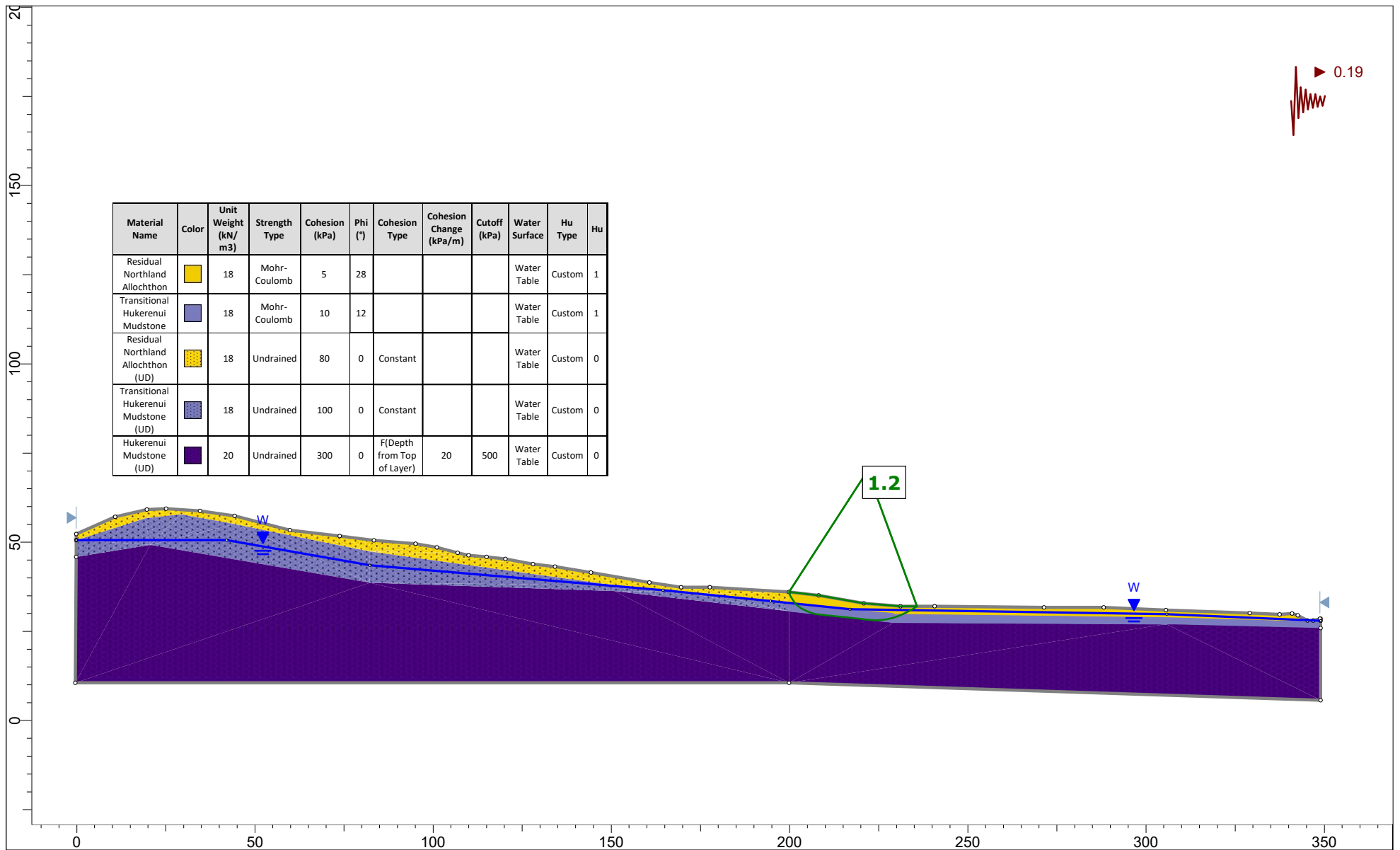
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section C - Existing		Scenario		Existing NGW	
ST		CR		Company		Gibb Ritchie Geotechnical Engineers	
Date		20/07/2026, 10:02:44 am		File Name		XS C.slmd	



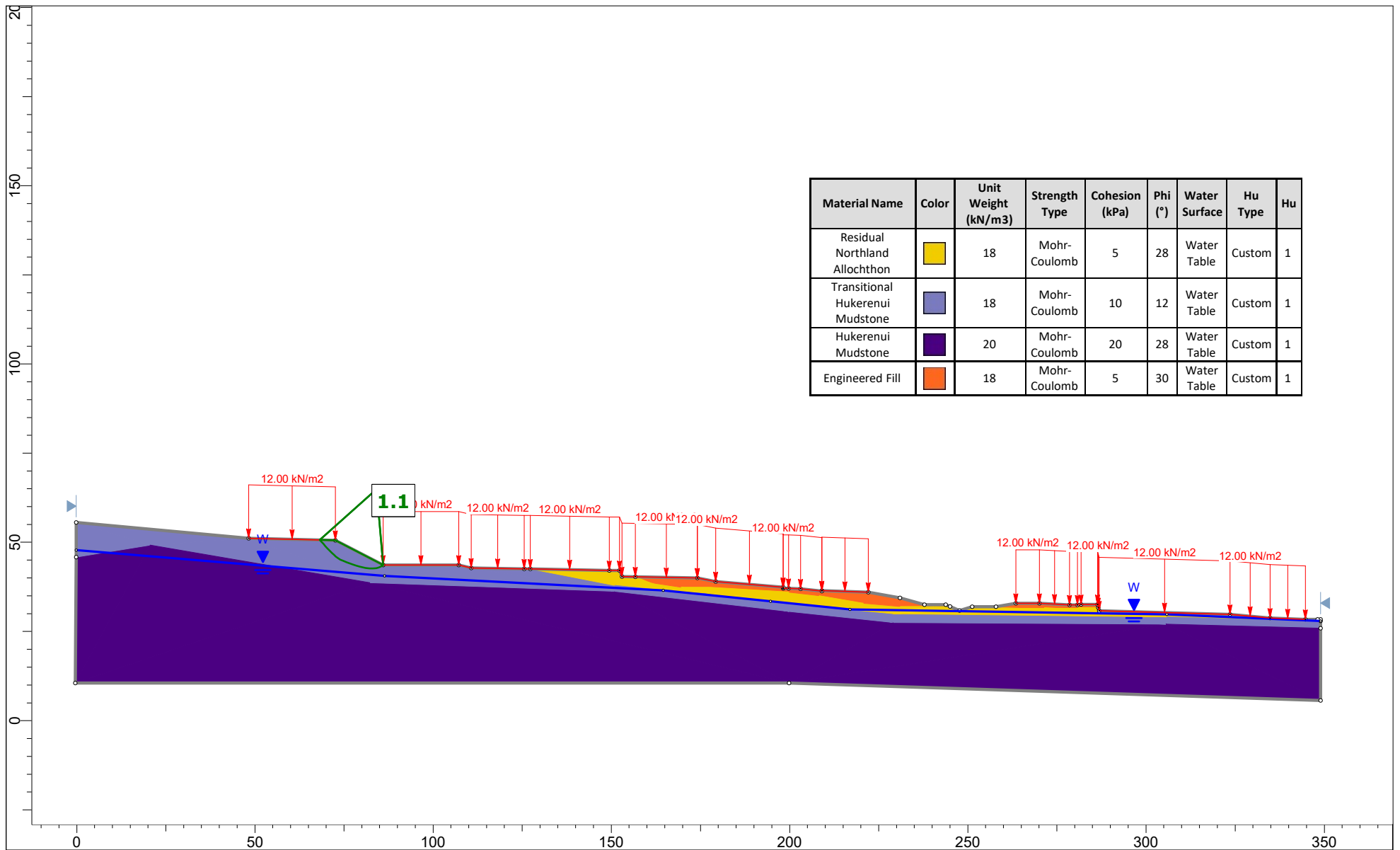
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section C - Existing	Scenario	Existing HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS C.slmd



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Project		Milldale North Stages 14-17	
Group	Section C - Existing	Scenario	Existing Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS C.slm

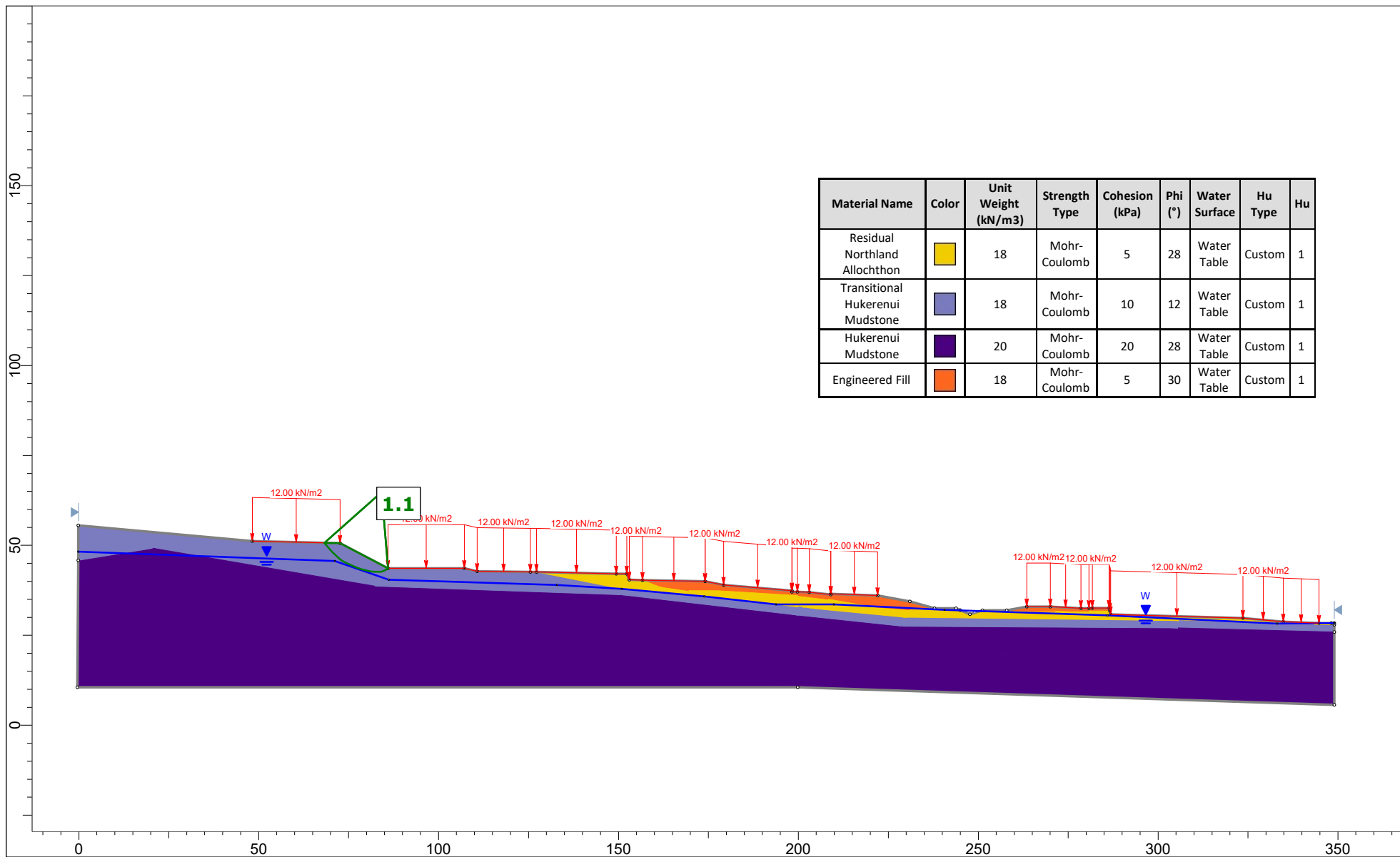


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section C - Proposed	Scenario	Proposed NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS C.slm

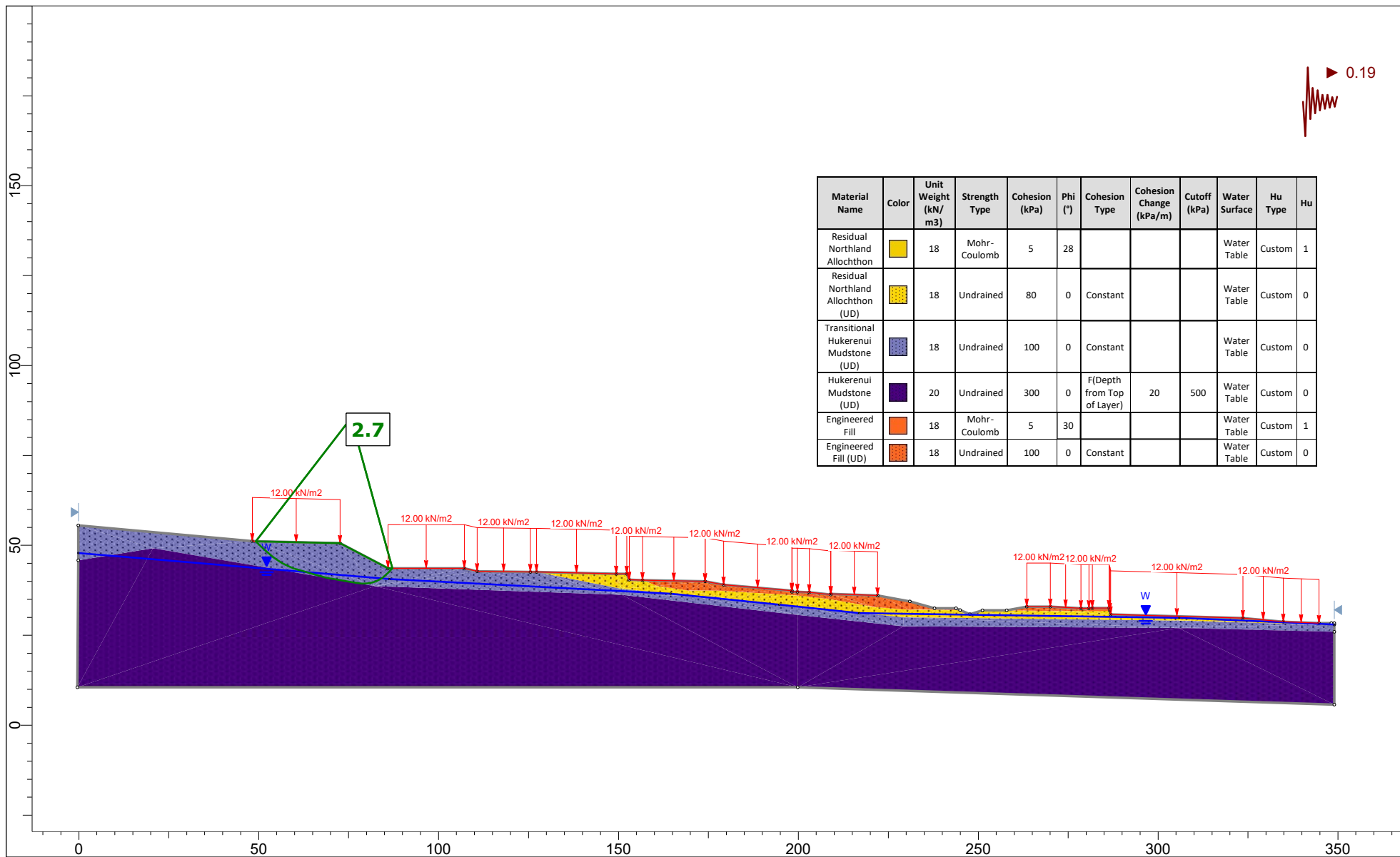


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section C - Proposed	Scenario	Proposed HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS C.slmd

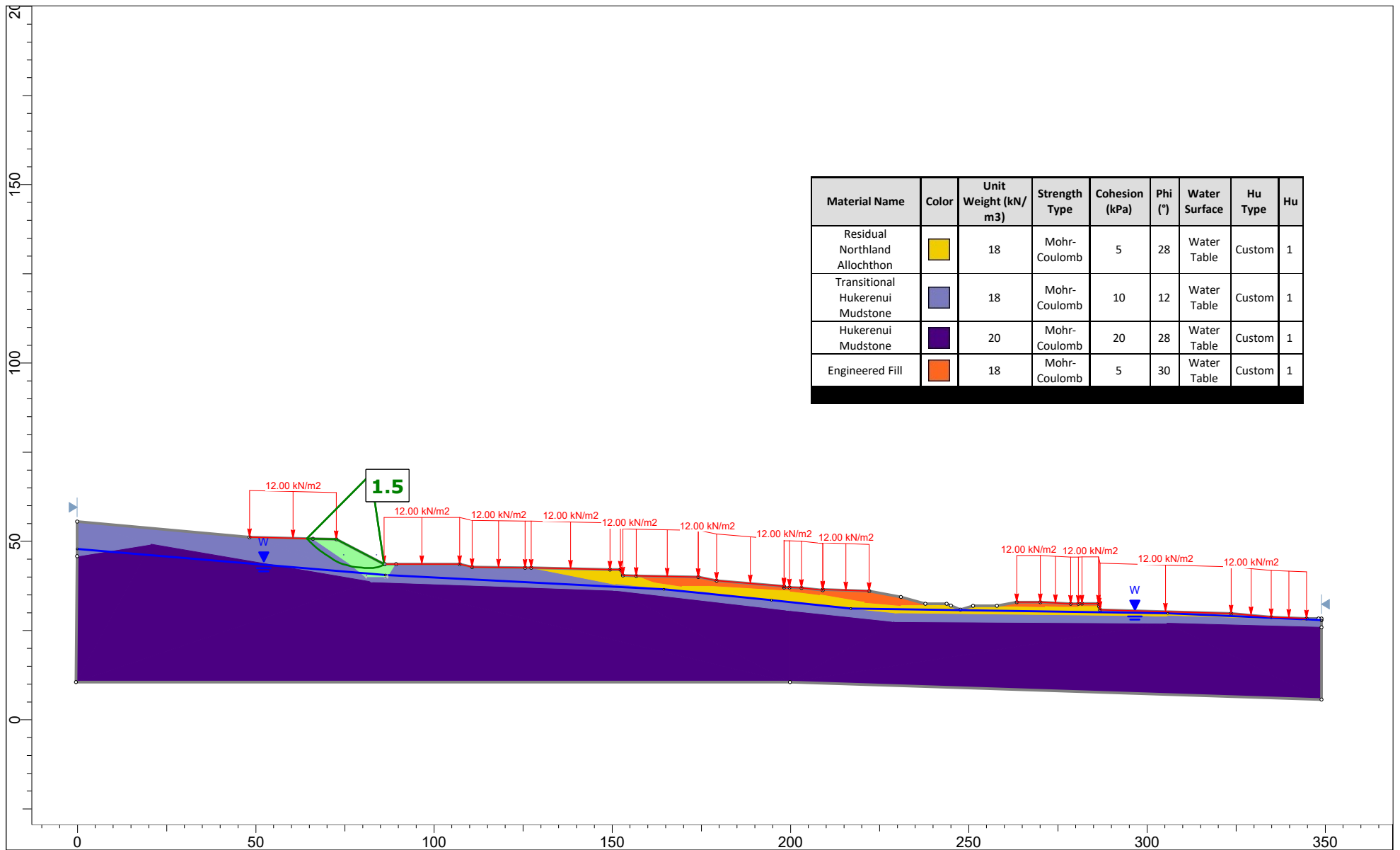


Material Name	Color	Unit Weight (kN/m³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28				Water Table	Custom	1
Residual Northland Allochthon (UD)		18	Undrained	80	0	Constant			Water Table	Custom	0
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	Water Table	Custom	0
Engineered Fill		18	Mohr-Coulomb	5	30				Water Table	Custom	1
Engineered Fill (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0



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Project		Milldale North Stages 14-17	
Group	Section C - Proposed	Scenario	Proposed Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS C.slm

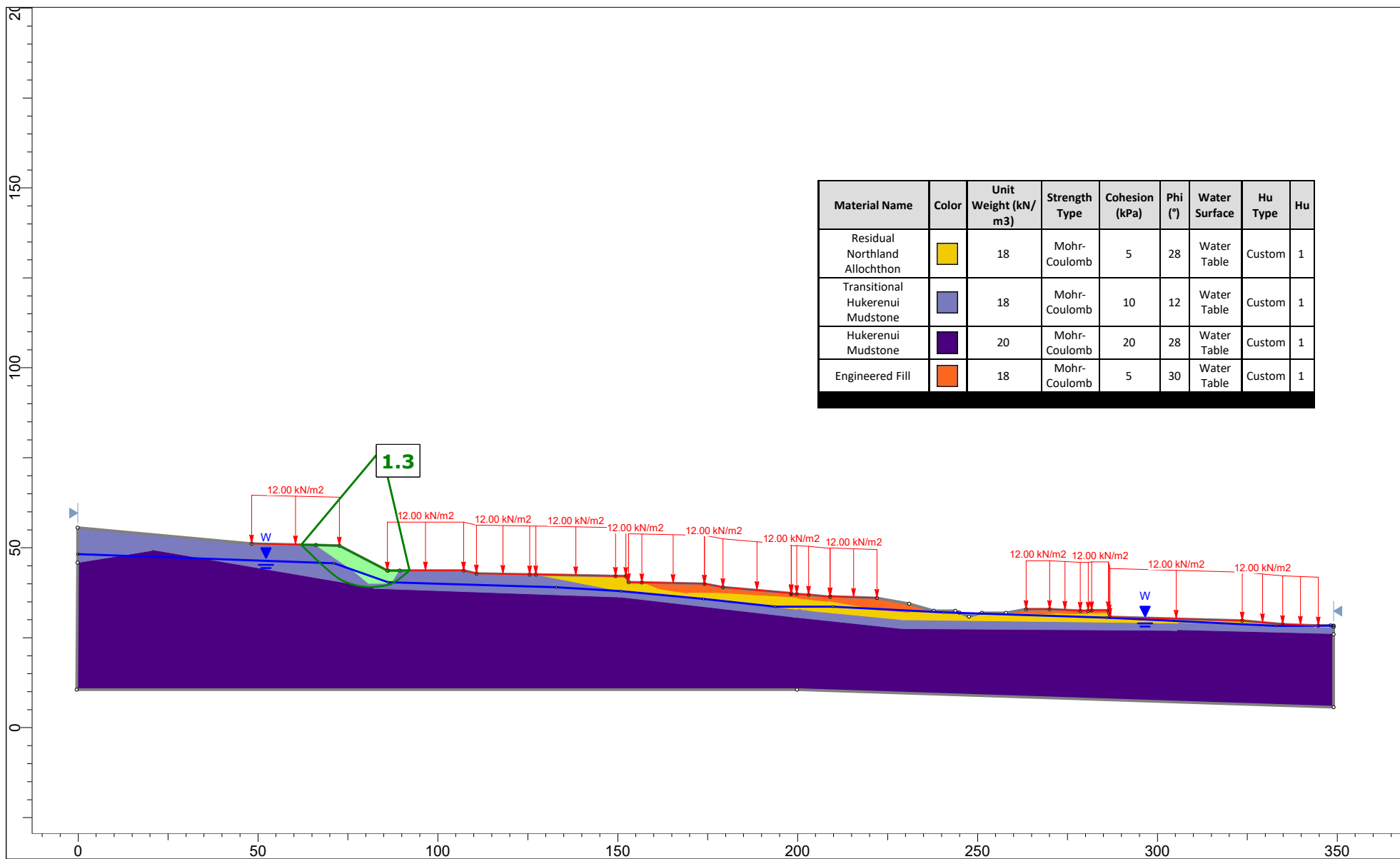


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section C - Remediated	Scenario	Remediated NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS C.slmd

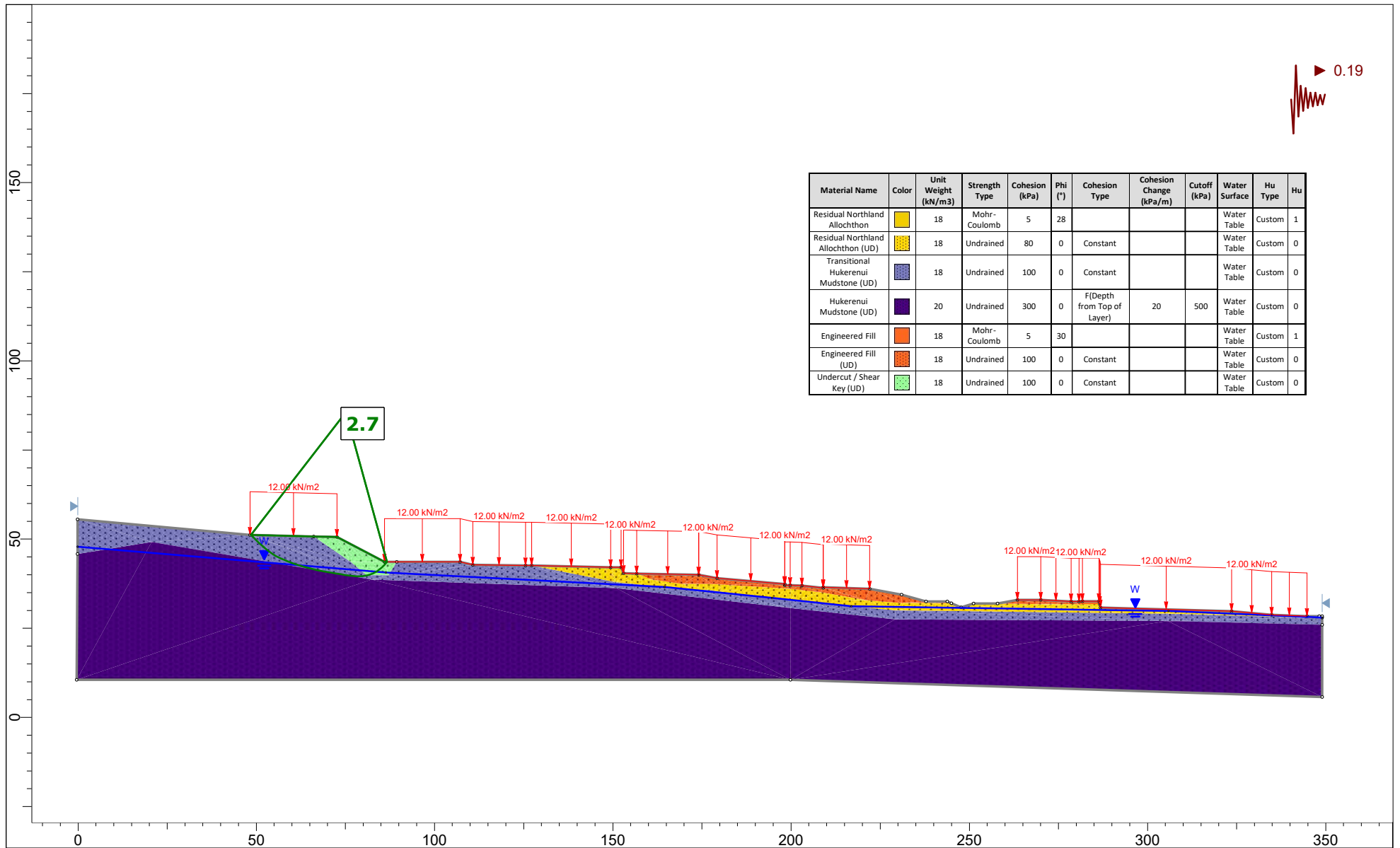


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section C - Remediated	Scenario	Remediated HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS C.slmd

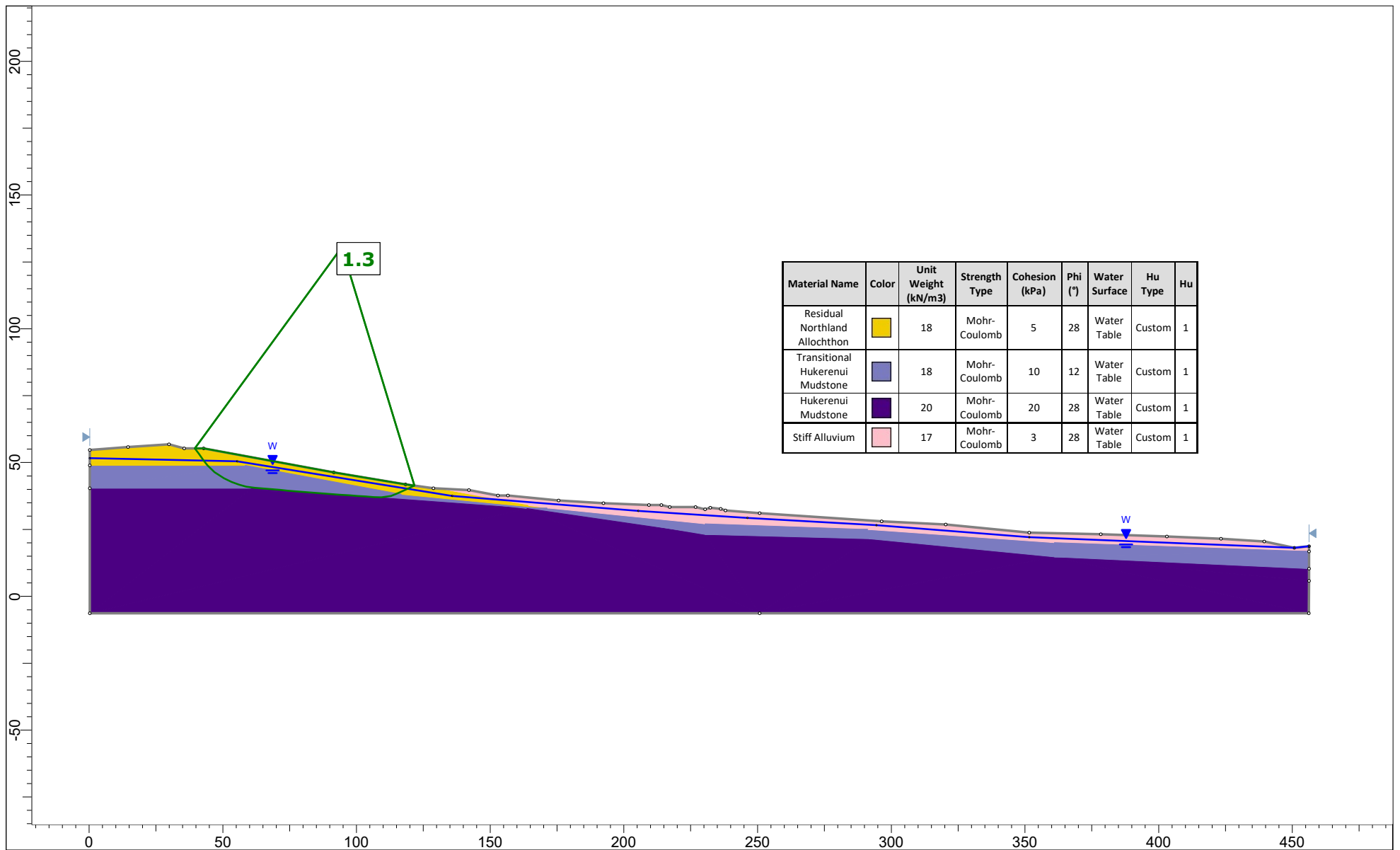


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28				Water Table	Custom	1
Residual Northland Allochthon (UD)		18	Undrained	80	0	Constant			Water Table	Custom	0
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	Water Table	Custom	0
Engineered Fill		18	Mohr-Coulomb	5	30				Water Table	Custom	1
Engineered Fill (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Undercut / Shear Key (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0



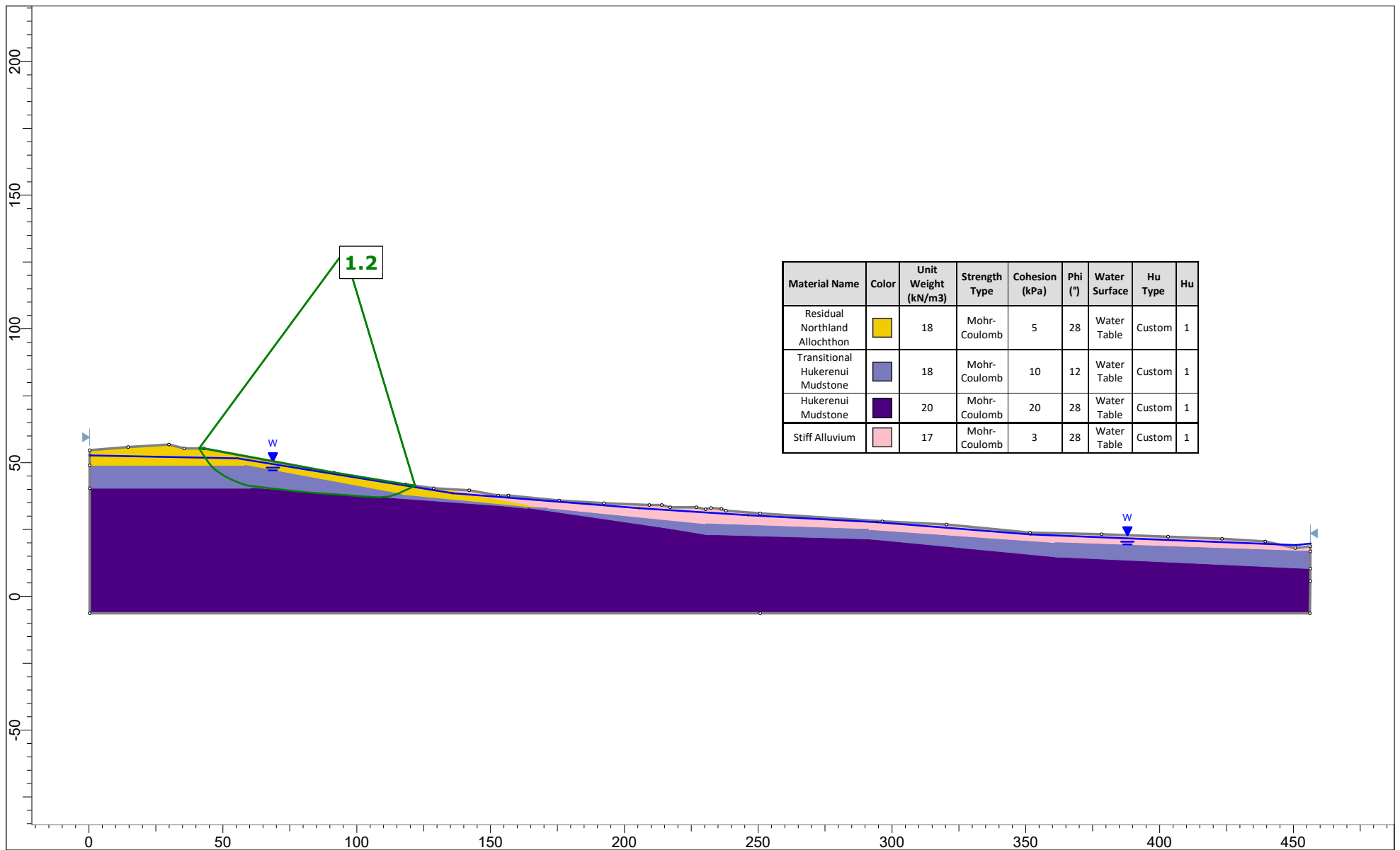
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section C - Remediated		Scenario		Remediated Seismic	
ST		CR		Company		Gibb Ritchie Geotechnical Engineers	
Date		20/07/2026, 10:02:44 am		File Name		XS C.slmd	



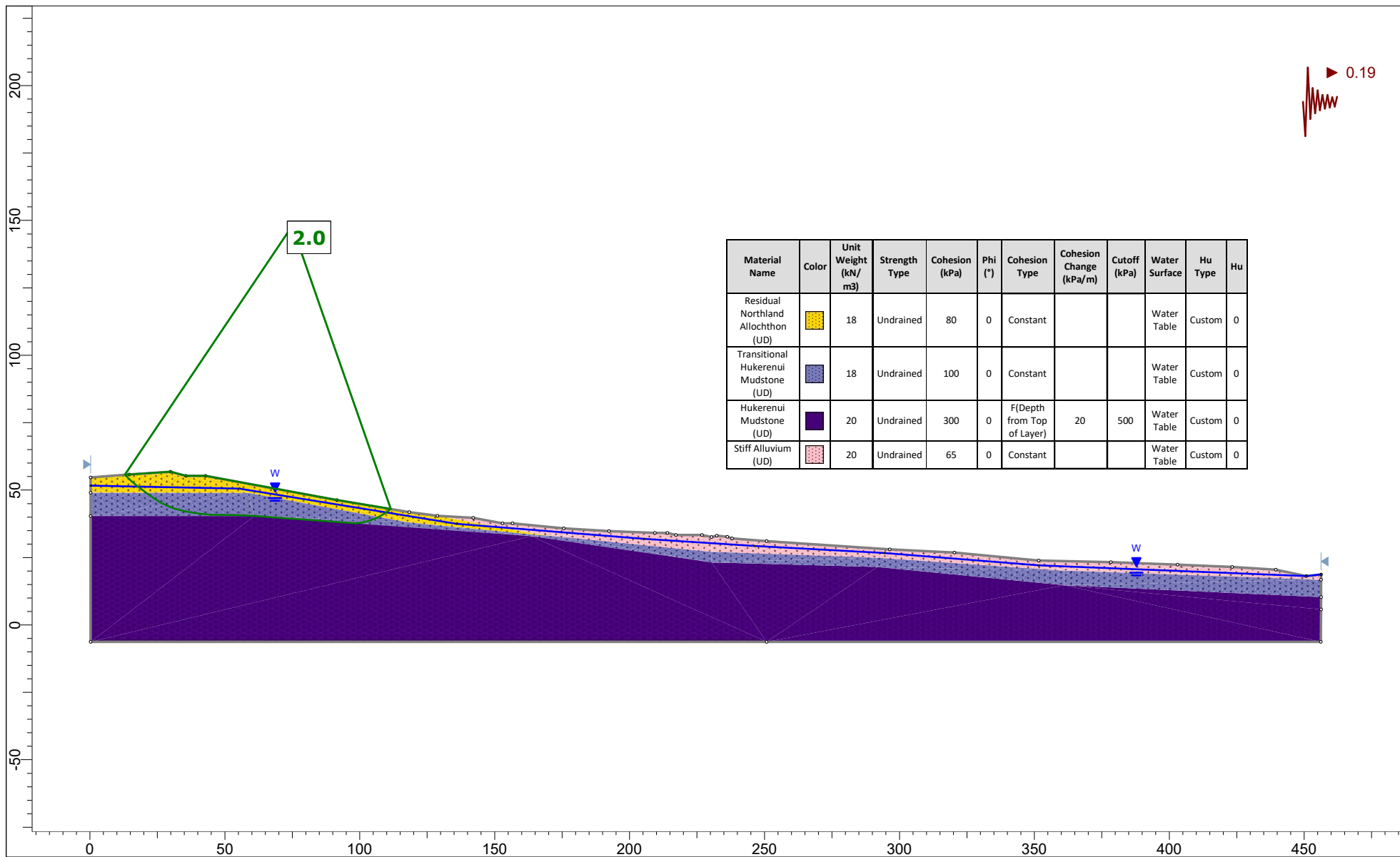
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section D - Existing	Scenario	Existing NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	25/03/2026, 10:02:44 am	File Name	XS D.slmd



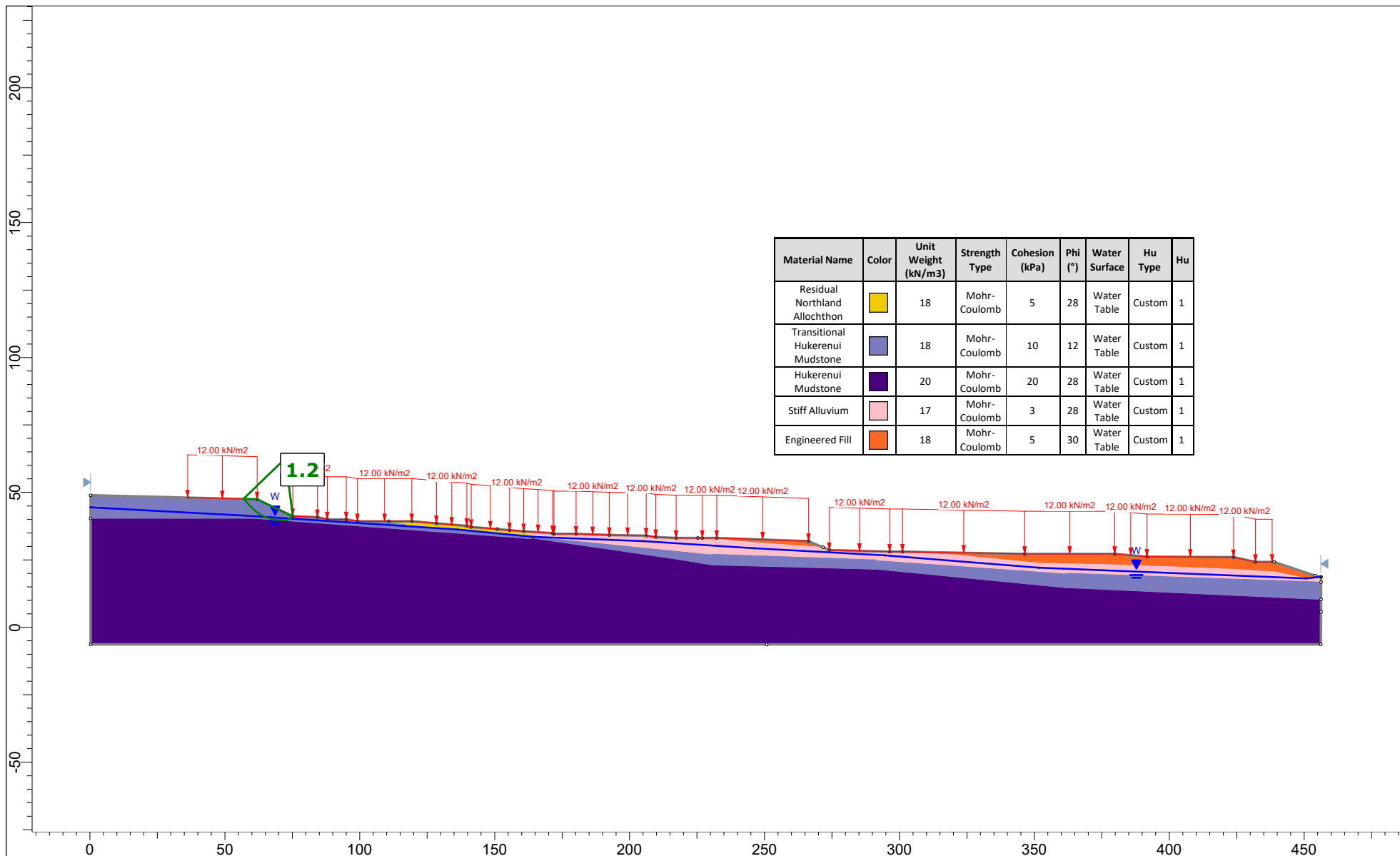
SLIDEINTERPRET 9.038

Project			
Milldale North Stages 14-17			
Group	Section D - Existing		Scenario
			Existing HGW
ST	CR		Company
			Gibb Ritchie Geotechnical Engineers
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			XS D.slmd



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Project			
Milldale North Stages 14-17			
Group	Section D - Existing		Scenario Existing Seismic
ST	CR		Company Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am		File Name XS D.slm

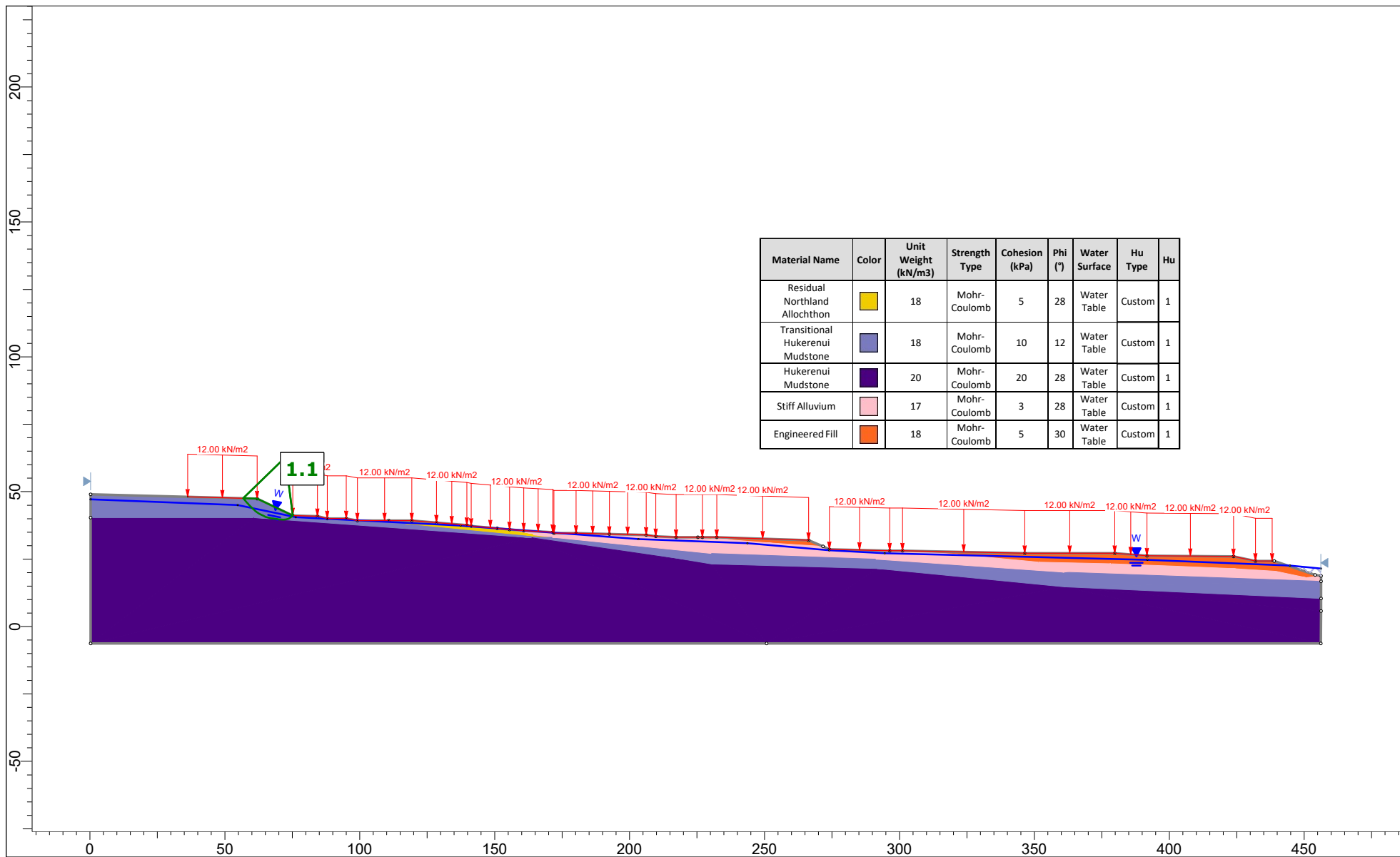


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon	Yellow	18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone	Blue	18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone	Purple	20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium	Pink	17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill	Orange	18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section D - Proposed	Scenario	Proposed NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS D.slm

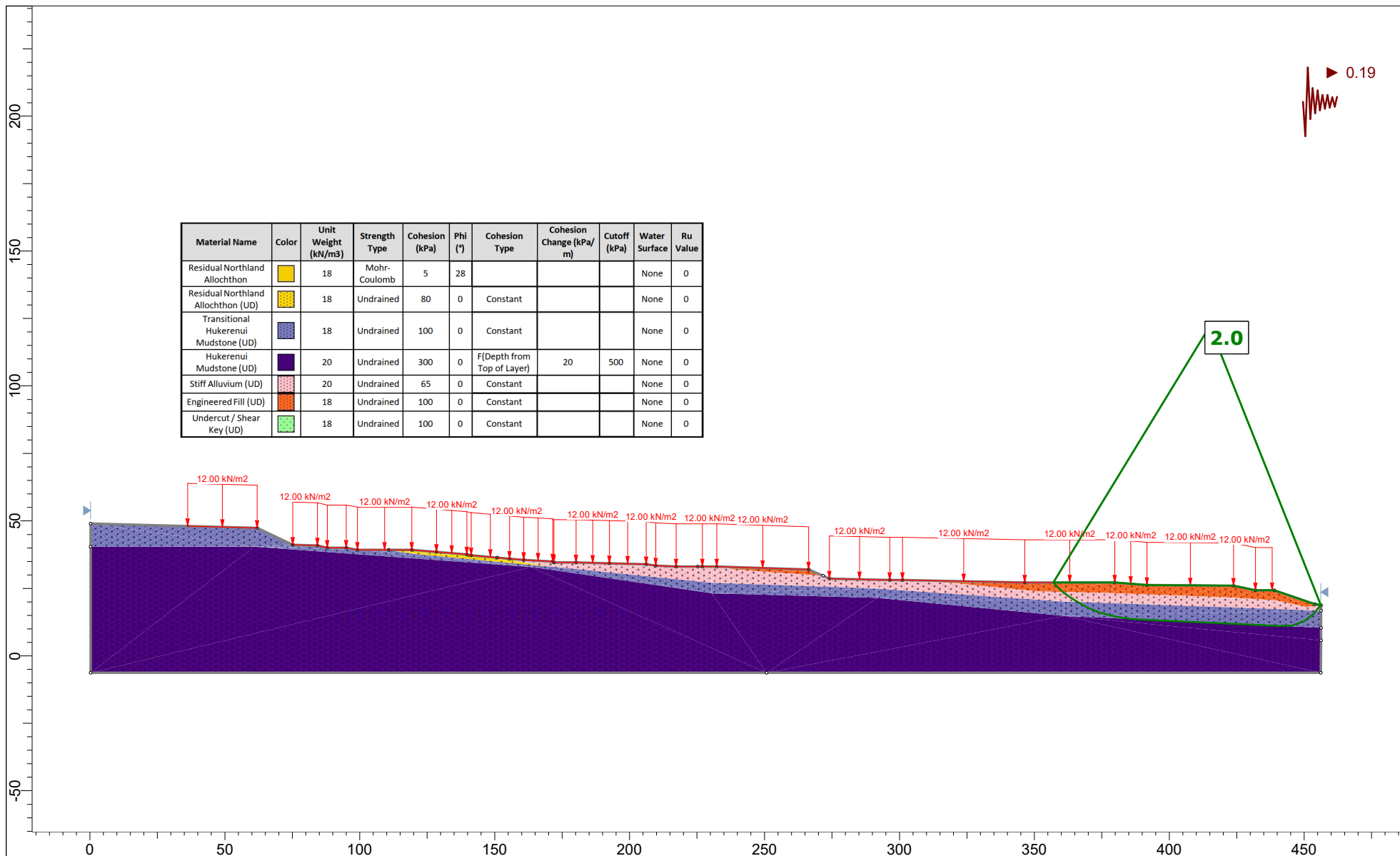


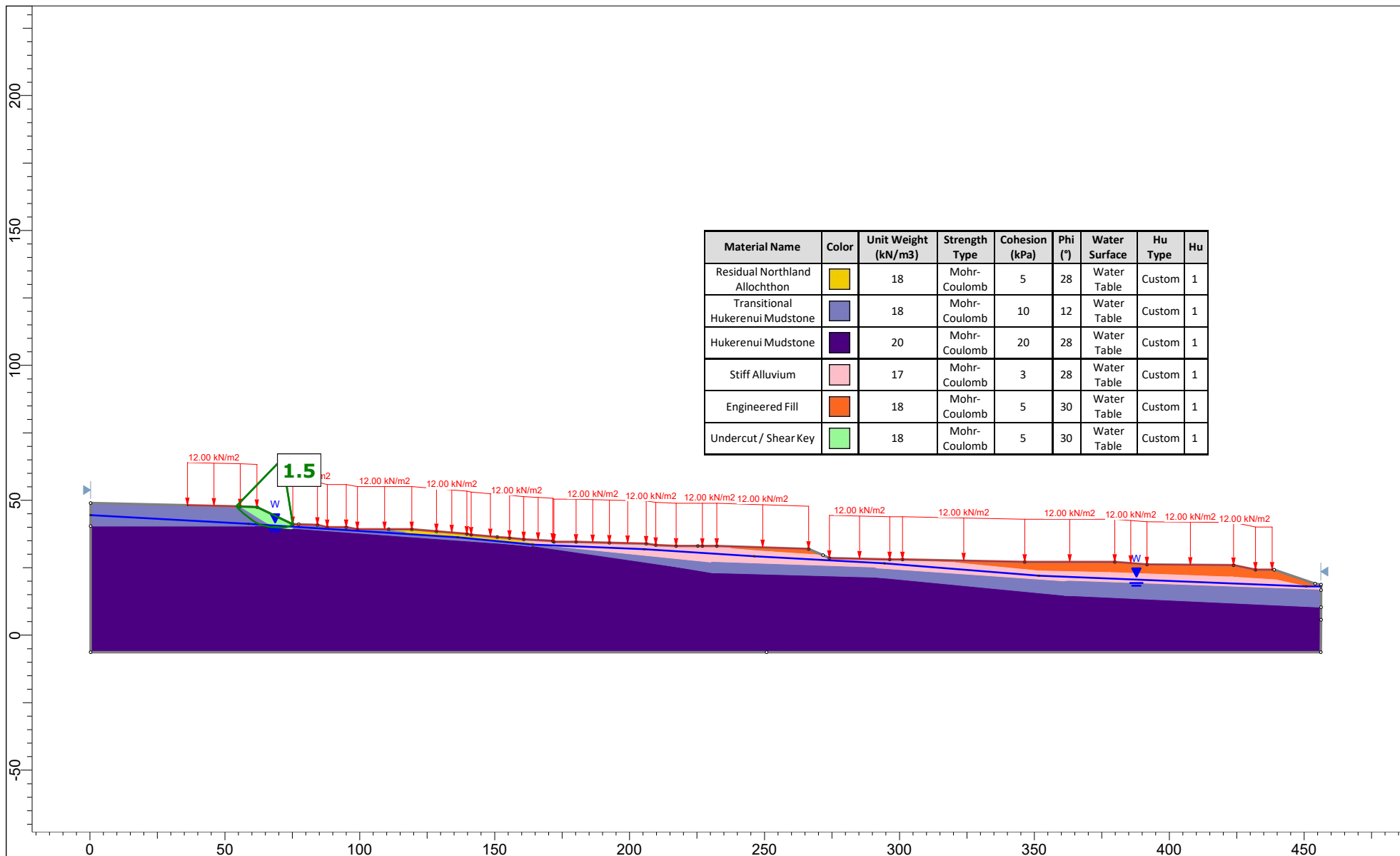
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon	Yellow	18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone	Blue	18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone	Dark Blue	20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium	Pink	17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill	Orange	18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section D - Proposed	Scenario	Proposed HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS D.slm



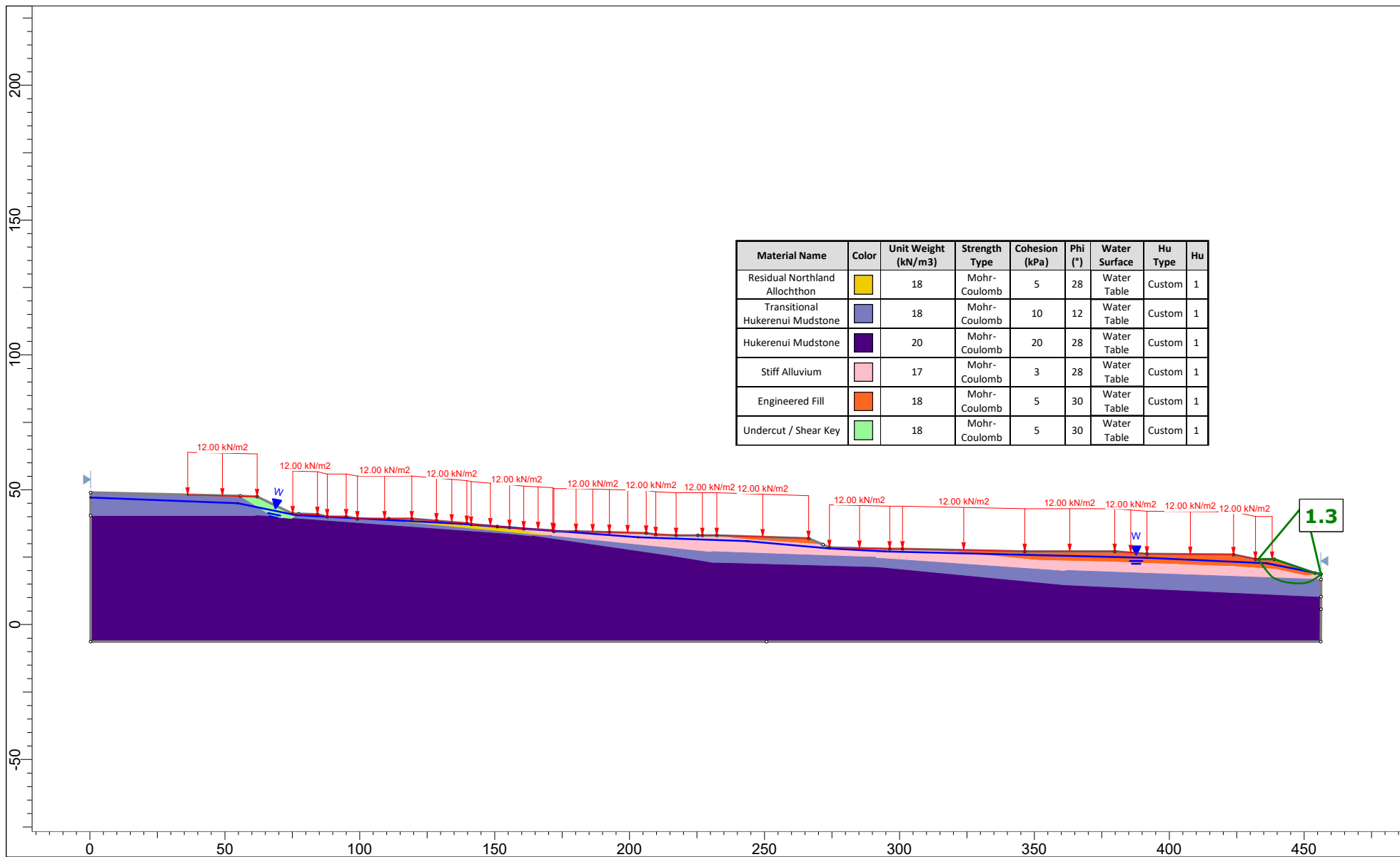


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1
Undercut / Shear Key		18	Mohr-Coulomb	5	30	Water Table	Custom	1



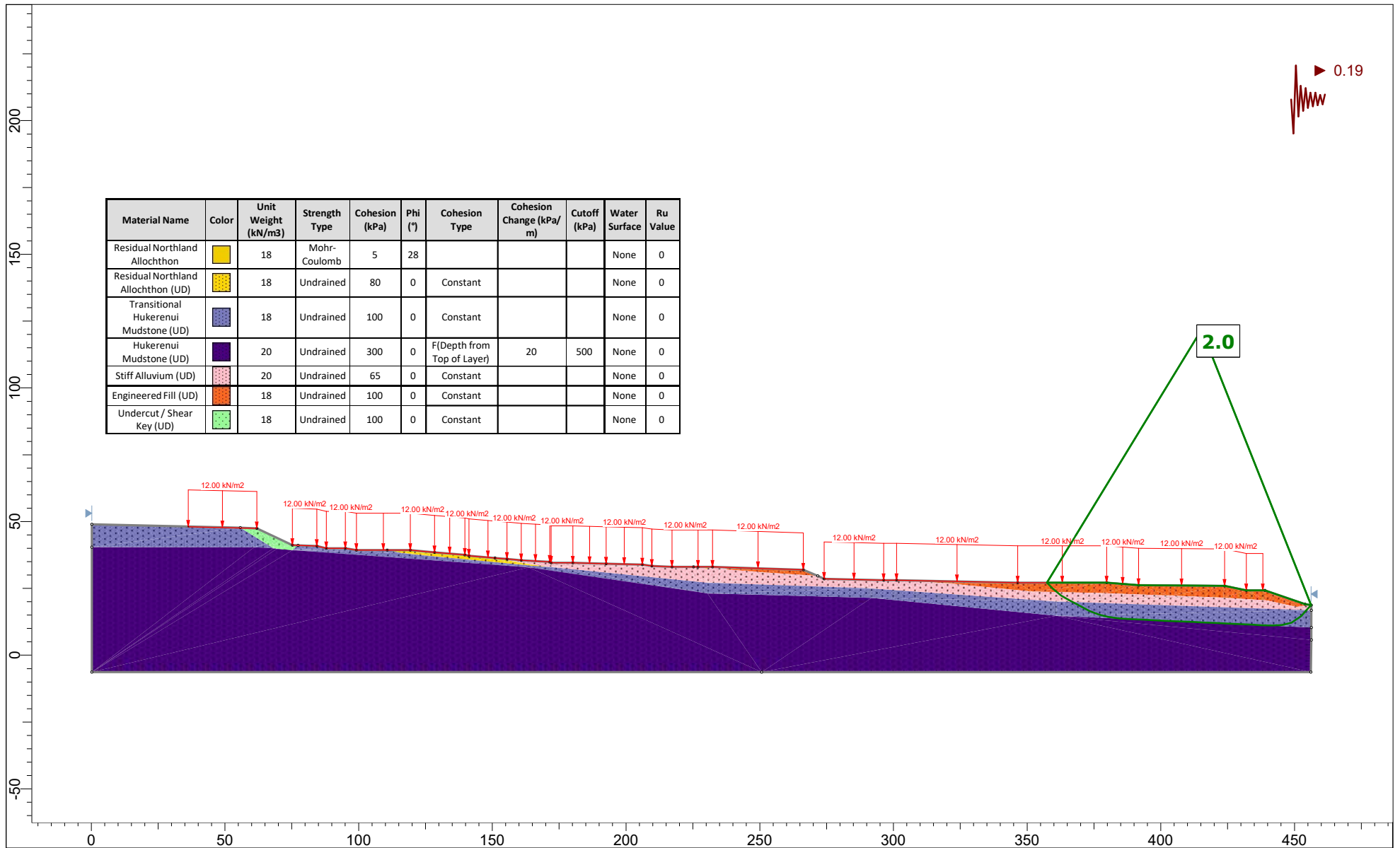
SLIDEINTERPRET 9.038

Project			Milldale North Stages 14-17		
Group		Section D - Remediated		Scenario	
ST		CR		Company	
Date		20/07/2026, 10:02:44 am		File Name	
				Remediated NGW	
				Gibb Ritchie Geotechnical Engineers	
				XS D.slm	



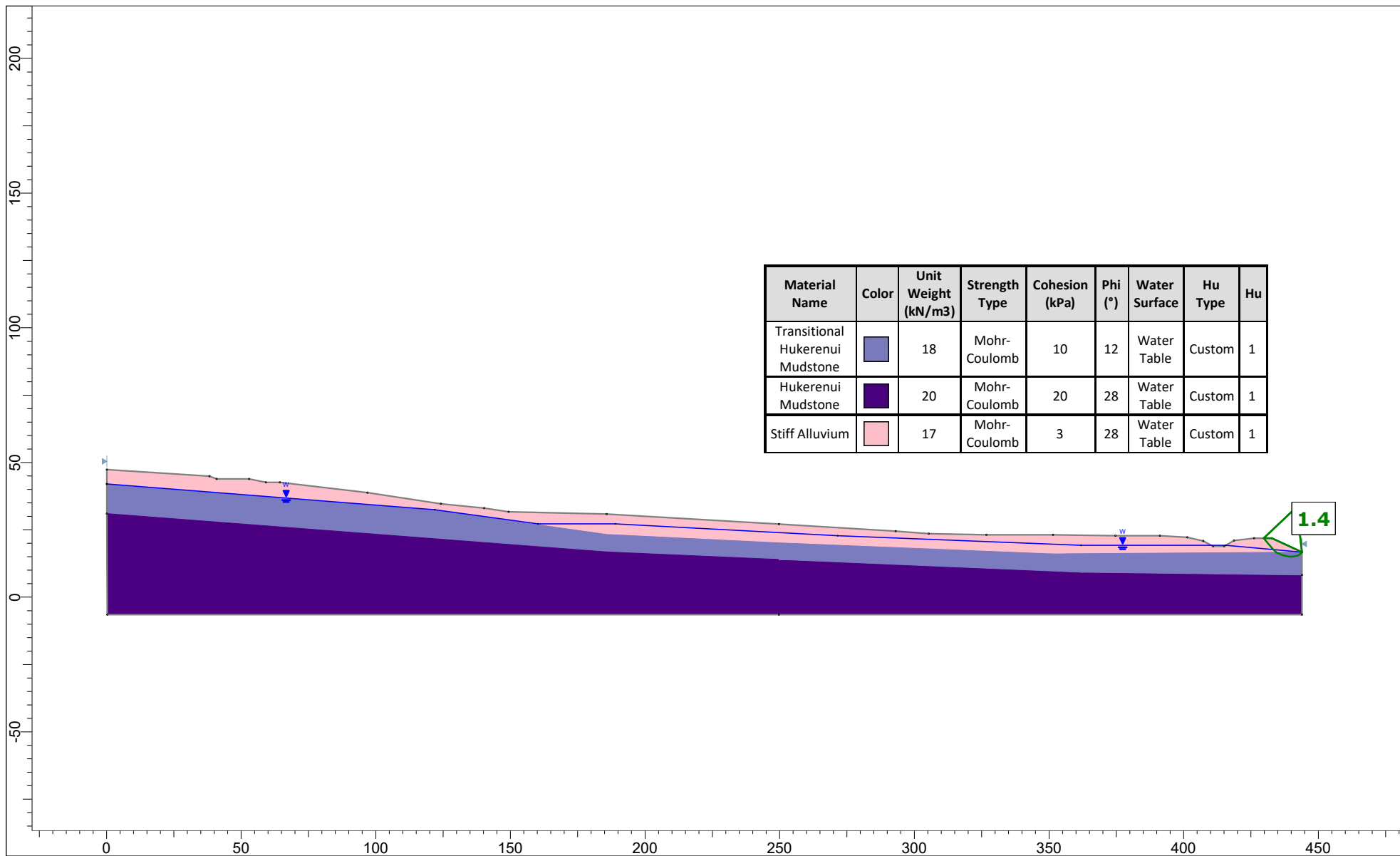
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section D - Remediated	Scenario	Remediated HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS D.slm



Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Ru Value
Residual Northland Allochthon		18	Mohr-Coulomb	5	28				None	0
Residual Northland Allochthon (UD)		18	Undrained	80	0	Constant			None	0
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			None	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	None	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			None	0
Engineered Fill (UD)		18	Undrained	100	0	Constant			None	0
Undercut/Shear Key (UD)		18	Undrained	100	0	Constant			None	0

	Project		Milldale North Stages 14-17	
	Group	Section D - Remediated	Scenario	Remediated Seismic
	ST	CR	Company	Gibb Ritchie Geotechnical Engineers
	Date	20/07/2026, 10:02:44 am	File Name	XS D.slm
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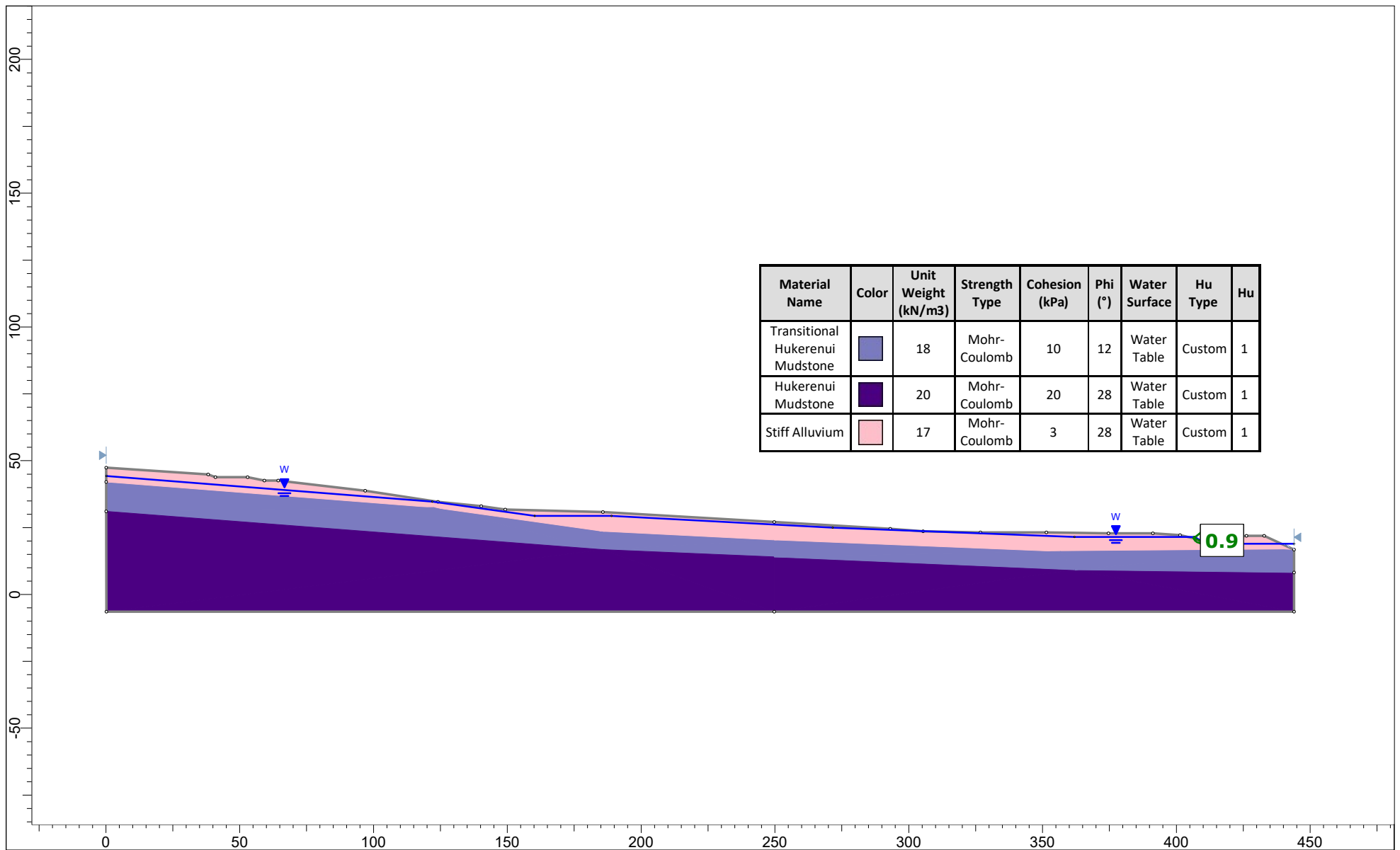


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1



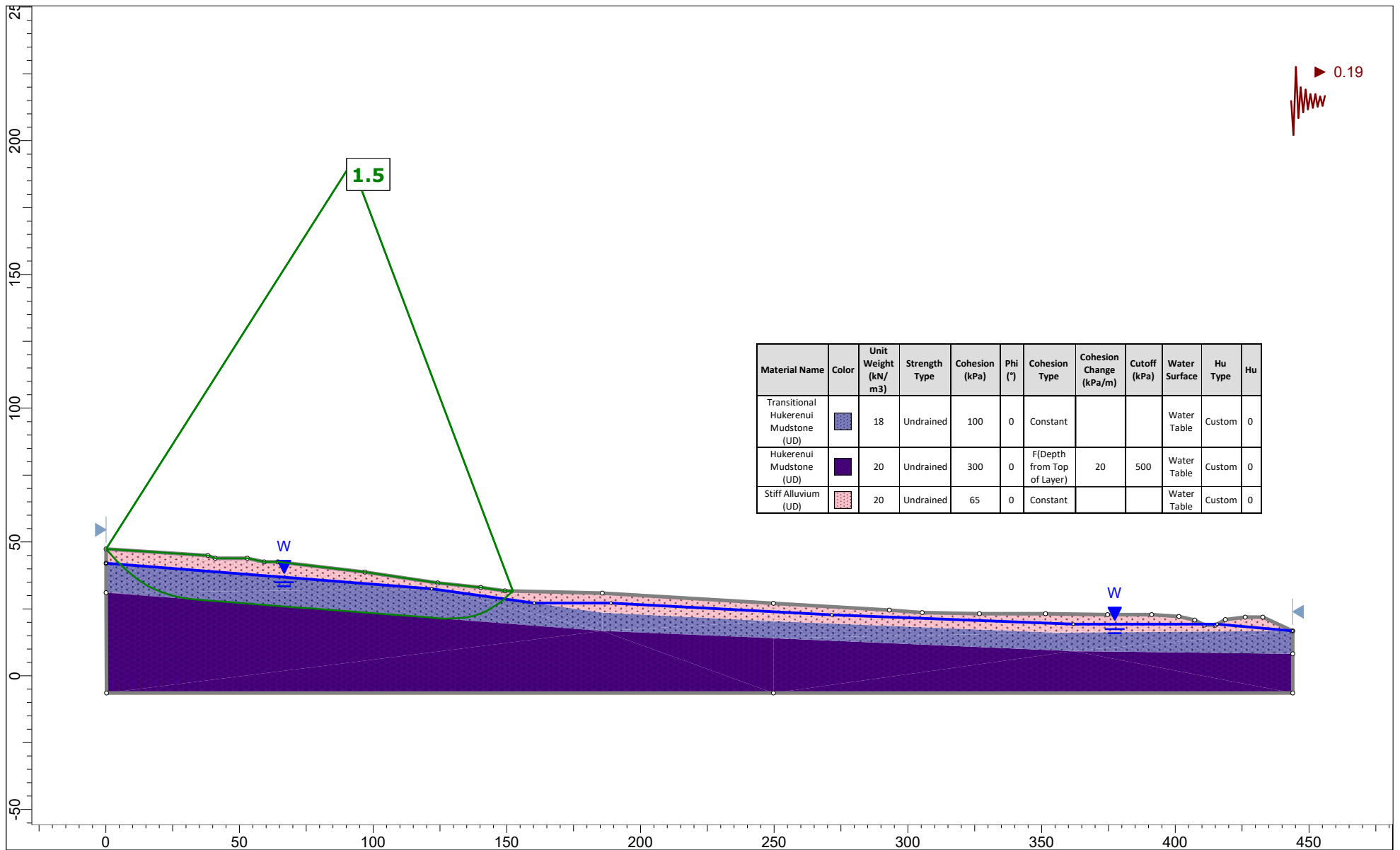
SLIDEINTERPRET 9.038

Project			
Milldale North Stages 14-17			
Group	Section E - Existing		Scenario
ST	CR		Company
Date	20/07/2026, 10:02:44 am		File Name
			XS E.slm



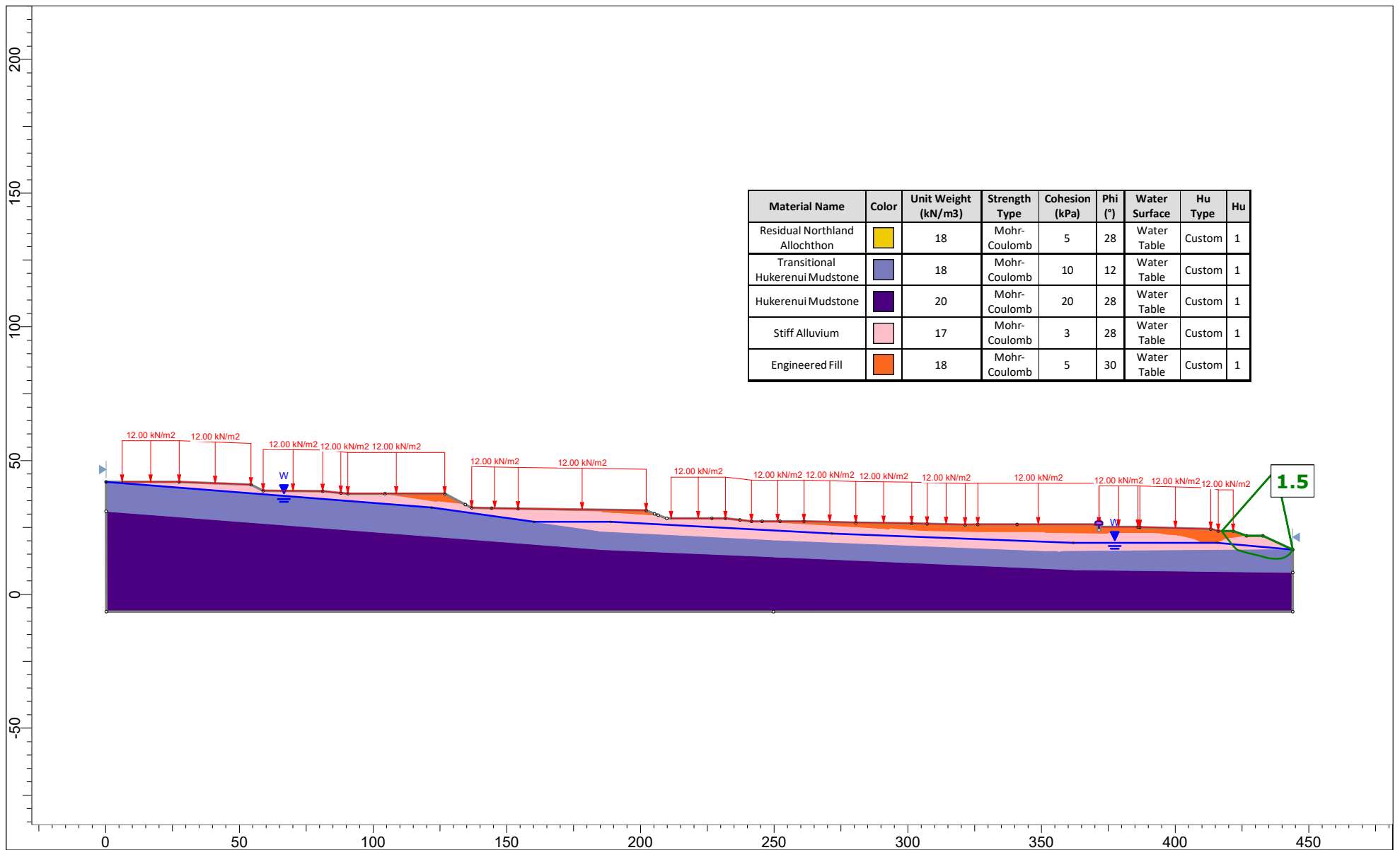
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section E - Existing			Scenario		
ST		CR			Company		
Date		25/03/2026, 10:02:44 am			File Name		
					Existing HGW		
					Gibb Ritchie Geotechnical Engineers		
					XS E.slm		



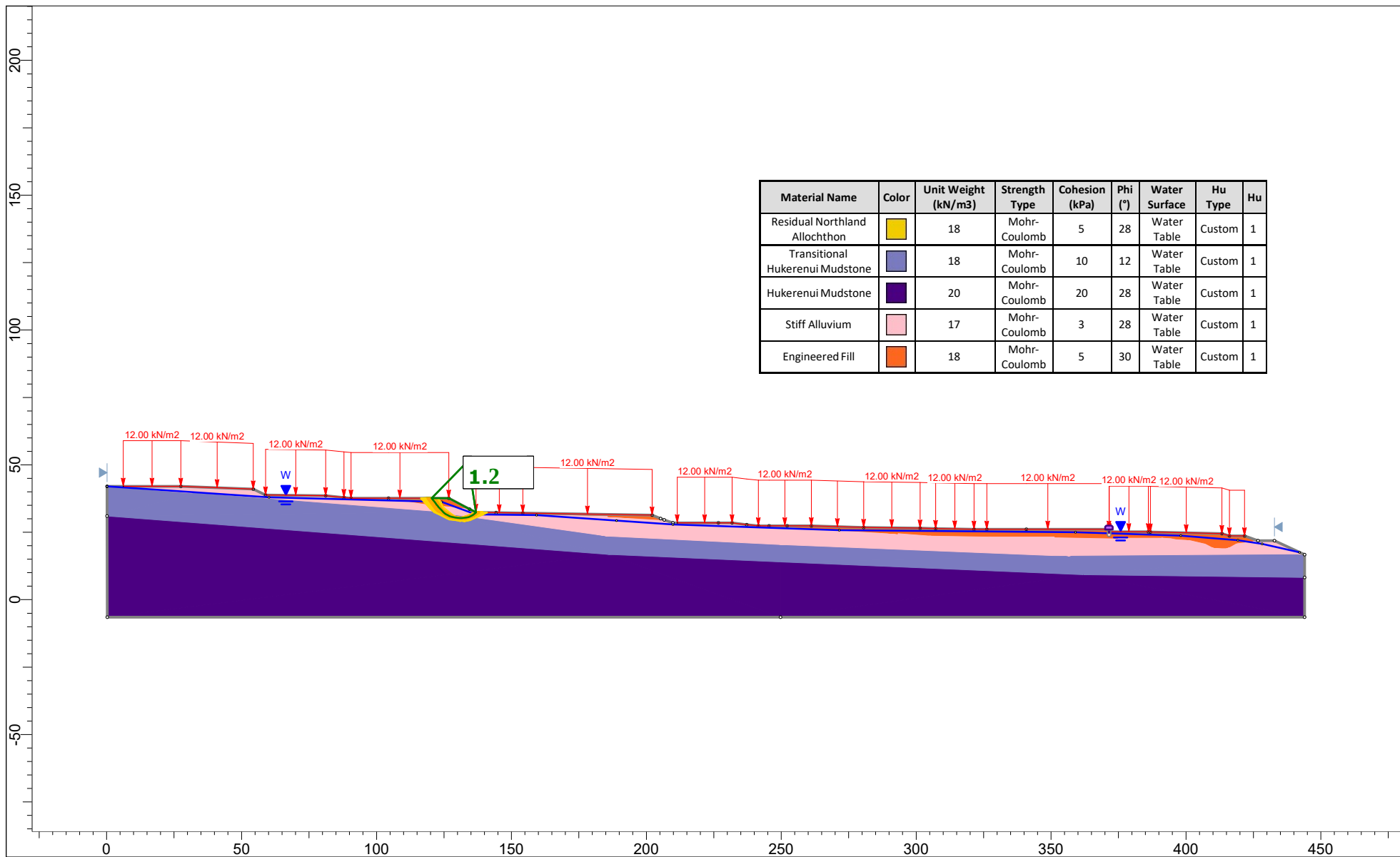
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section E - Existing			Scenario		
ST		CR			Company		
Date		25/03/2026, 10:02:44 am			File Name		
					XS E.slm		



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Project			Milldale North Stages 14-17	
Group	Section E - Proposed		Scenario	Proposed NGW
ST	CR		Company	Gibb Ritchie Geotechnical Engineers
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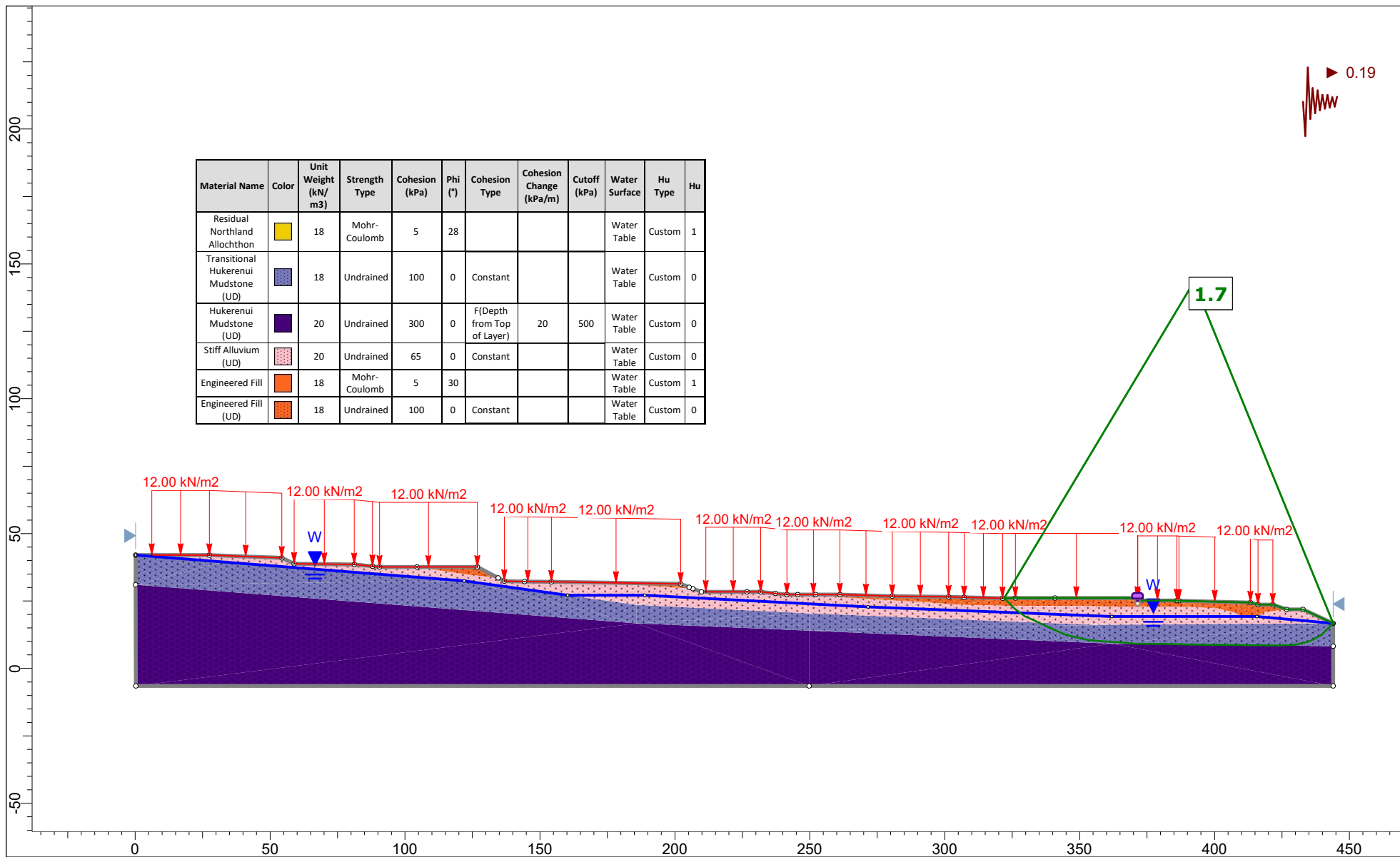


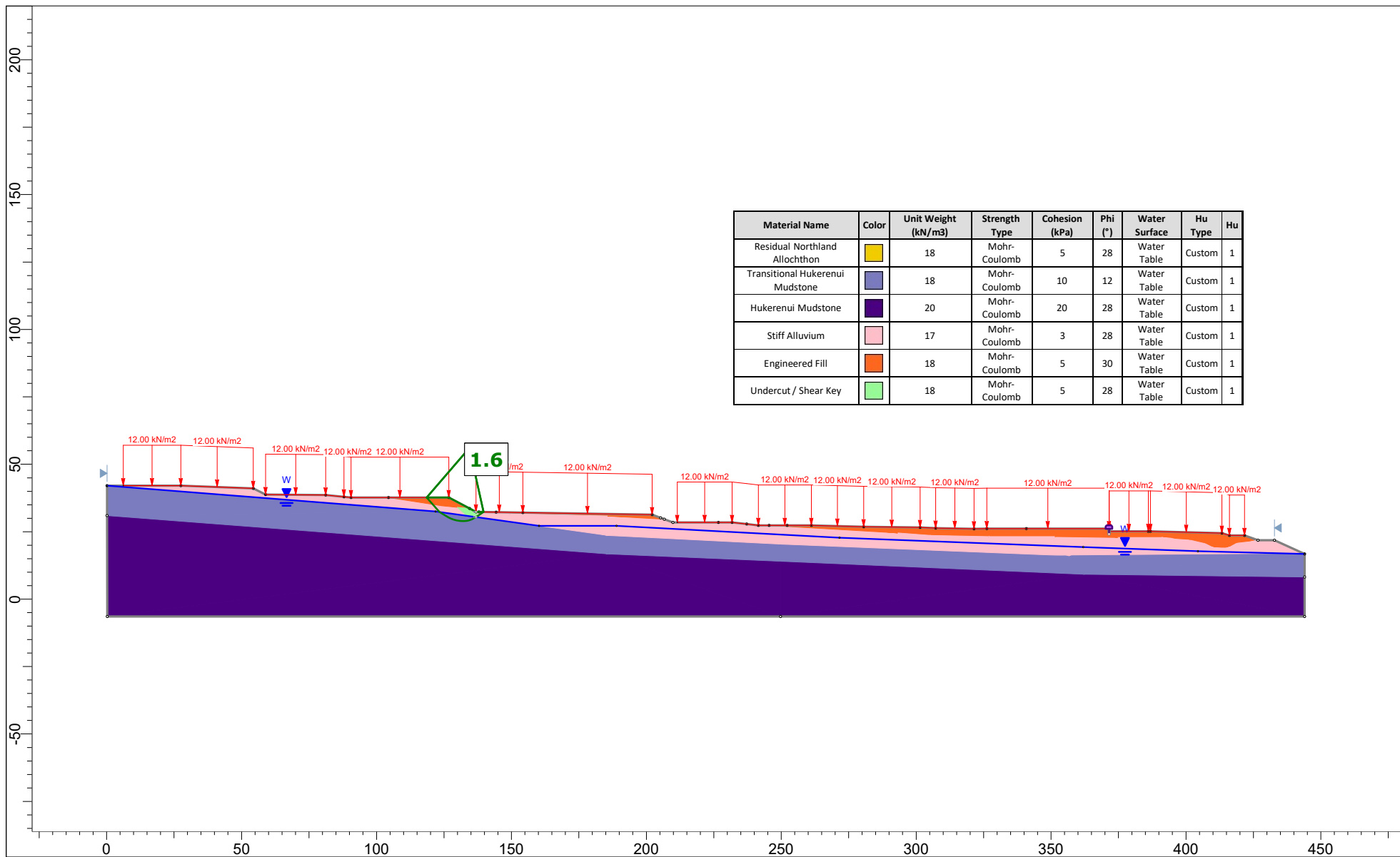
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section E - Proposed	Scenario	Proposed HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
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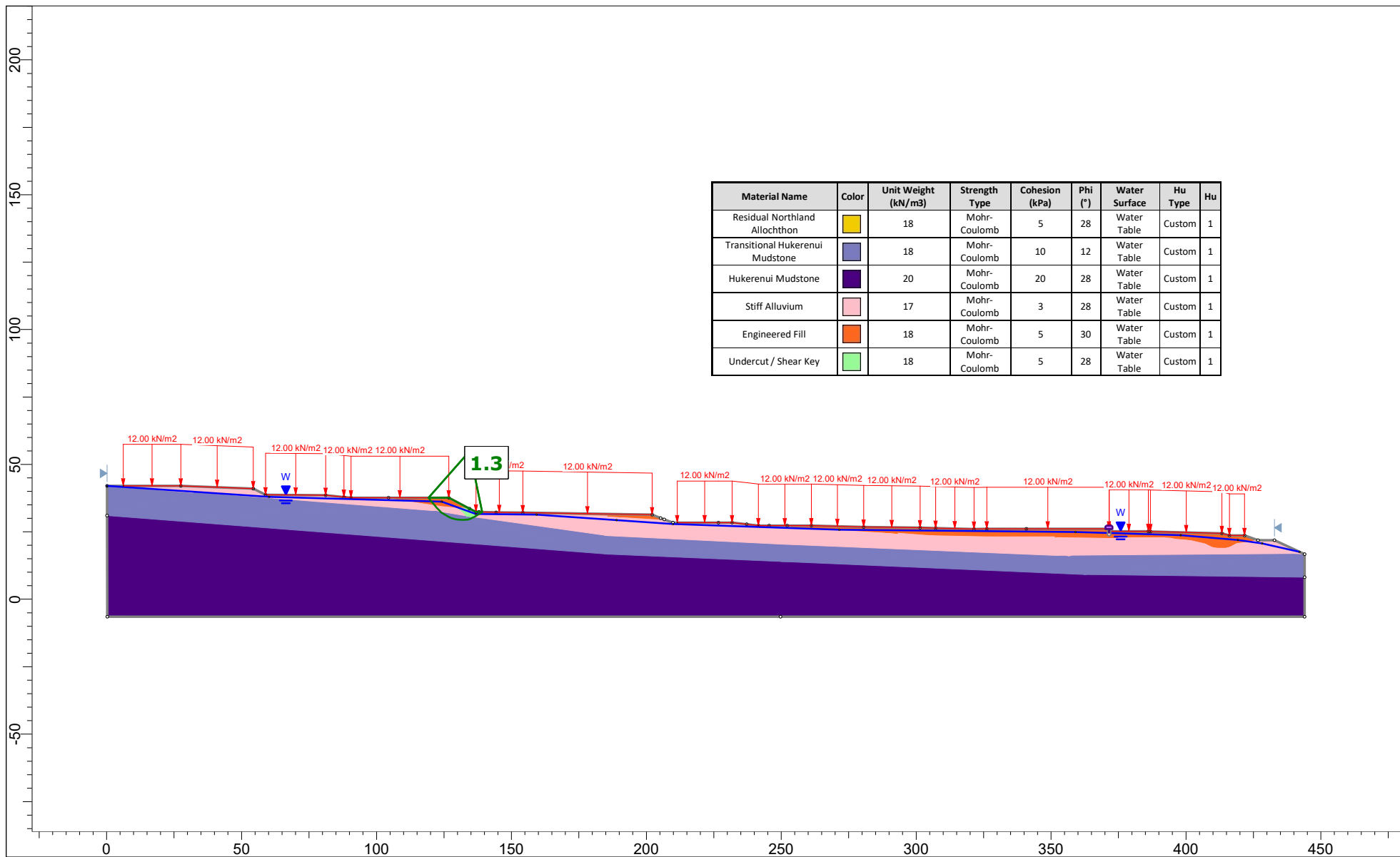


Material Name	Color	Unit Weight (kN/m³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon	Yellow	18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone	Blue	18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone	Purple	20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium	Pink	17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill	Orange	18	Mohr-Coulomb	5	30	Water Table	Custom	1
Undercut / Shear Key	Green	18	Mohr-Coulomb	5	28	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section E - Remediated	Scenario	Remediated NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
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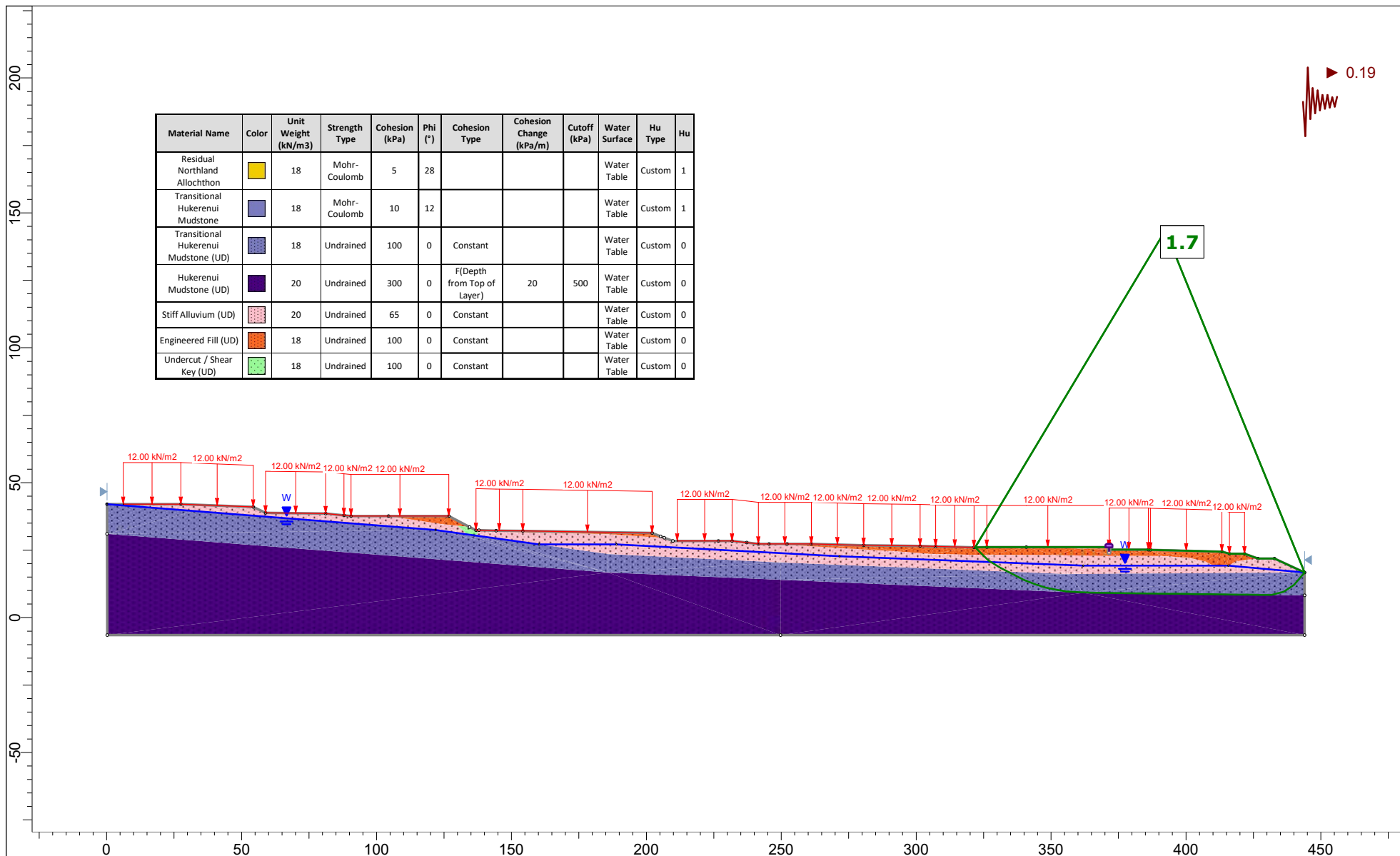


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon	Yellow	18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone	Blue	18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone	Purple	20	Mohr-Coulomb	20	28	Water Table	Custom	1
Stiff Alluvium	Pink	17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill	Orange	18	Mohr-Coulomb	5	30	Water Table	Custom	1
Undercut / Shear Key	Green	18	Mohr-Coulomb	5	28	Water Table	Custom	1

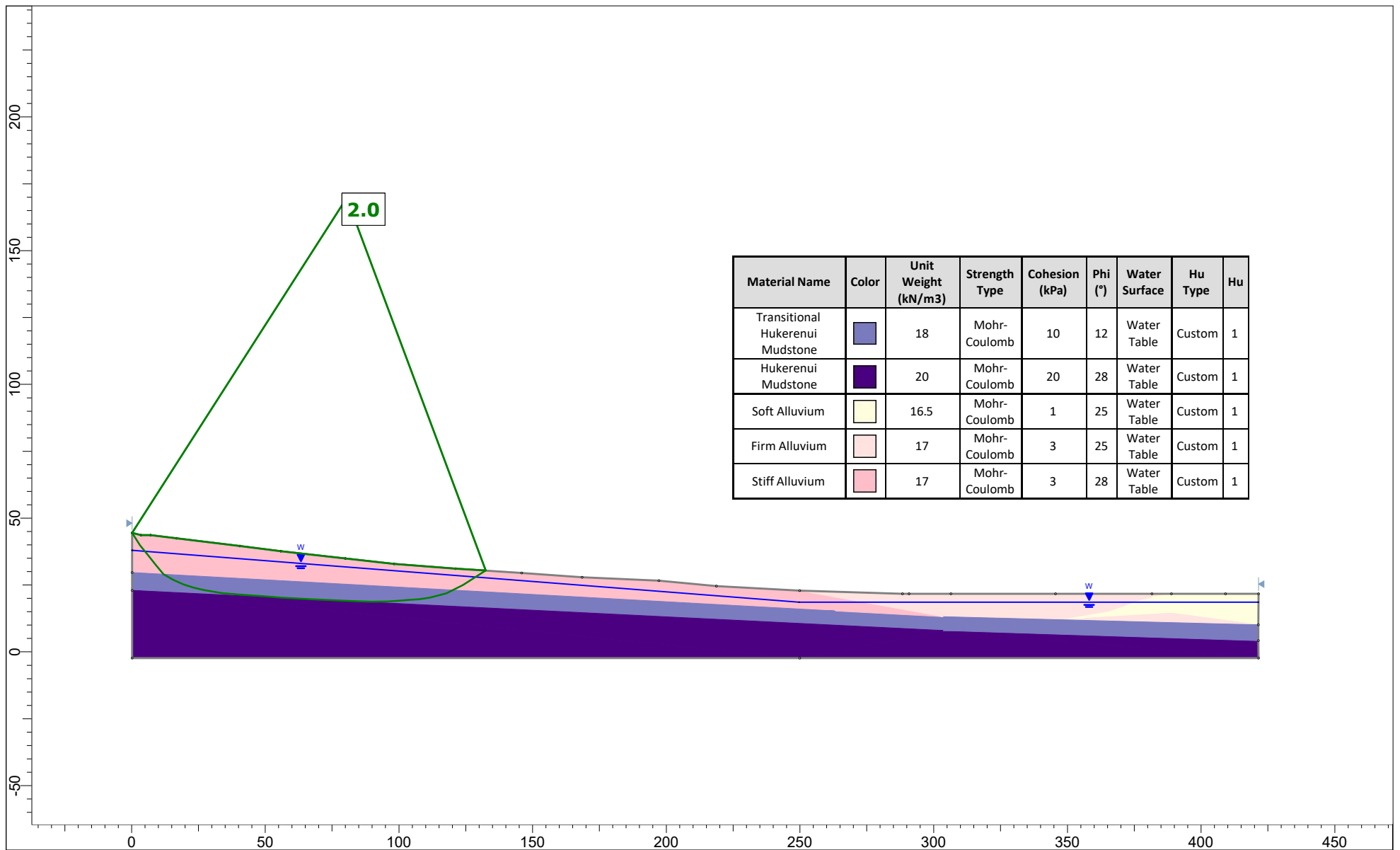


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Project		Milldale North Stages 14-17	
Group	Section E - Remediated	Scenario	Remediated HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS E.slm

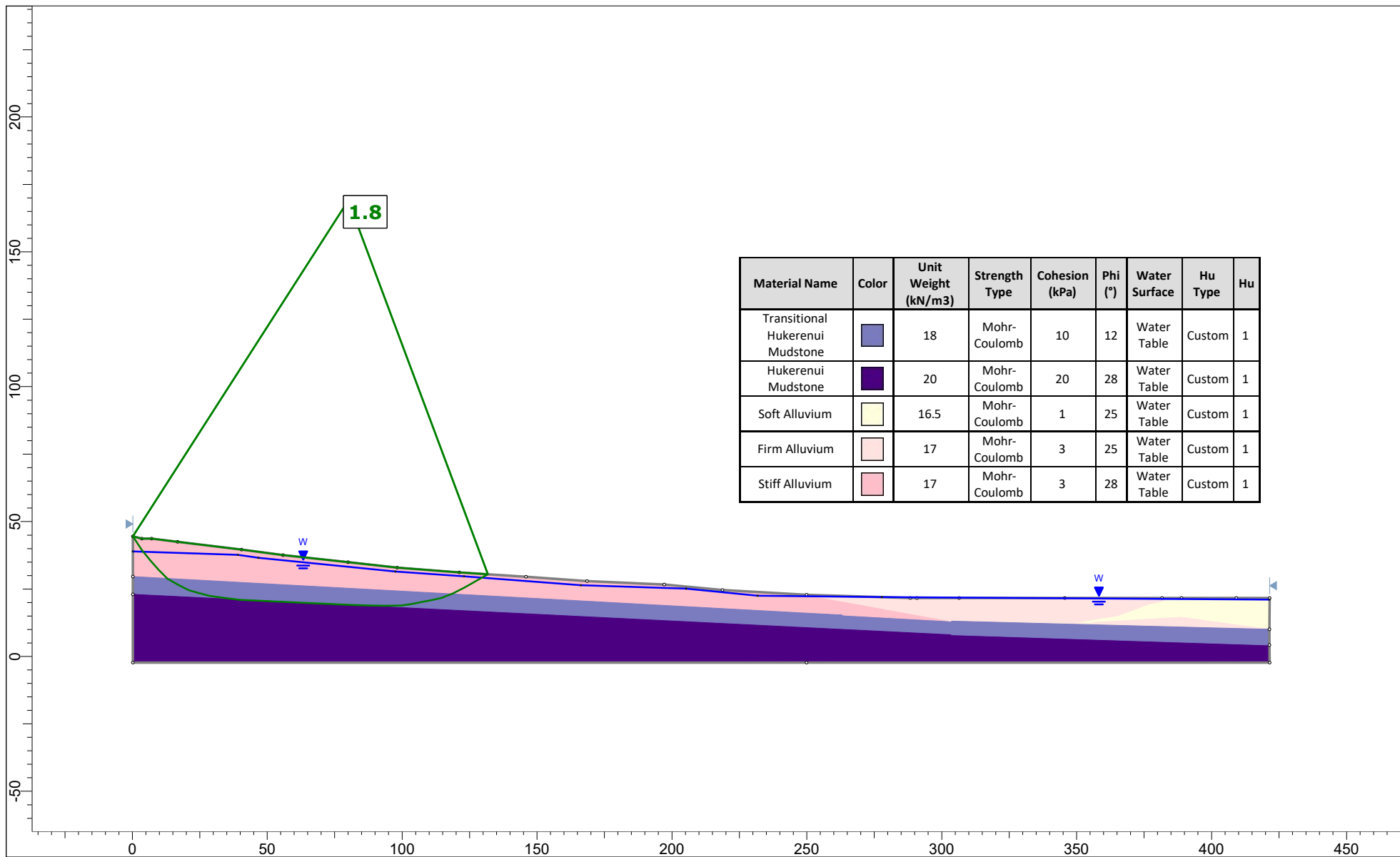


Project		Milldale North Stages 14-17	
Group	Section E - Remediated	Scenario	Remediated Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS E.slmd



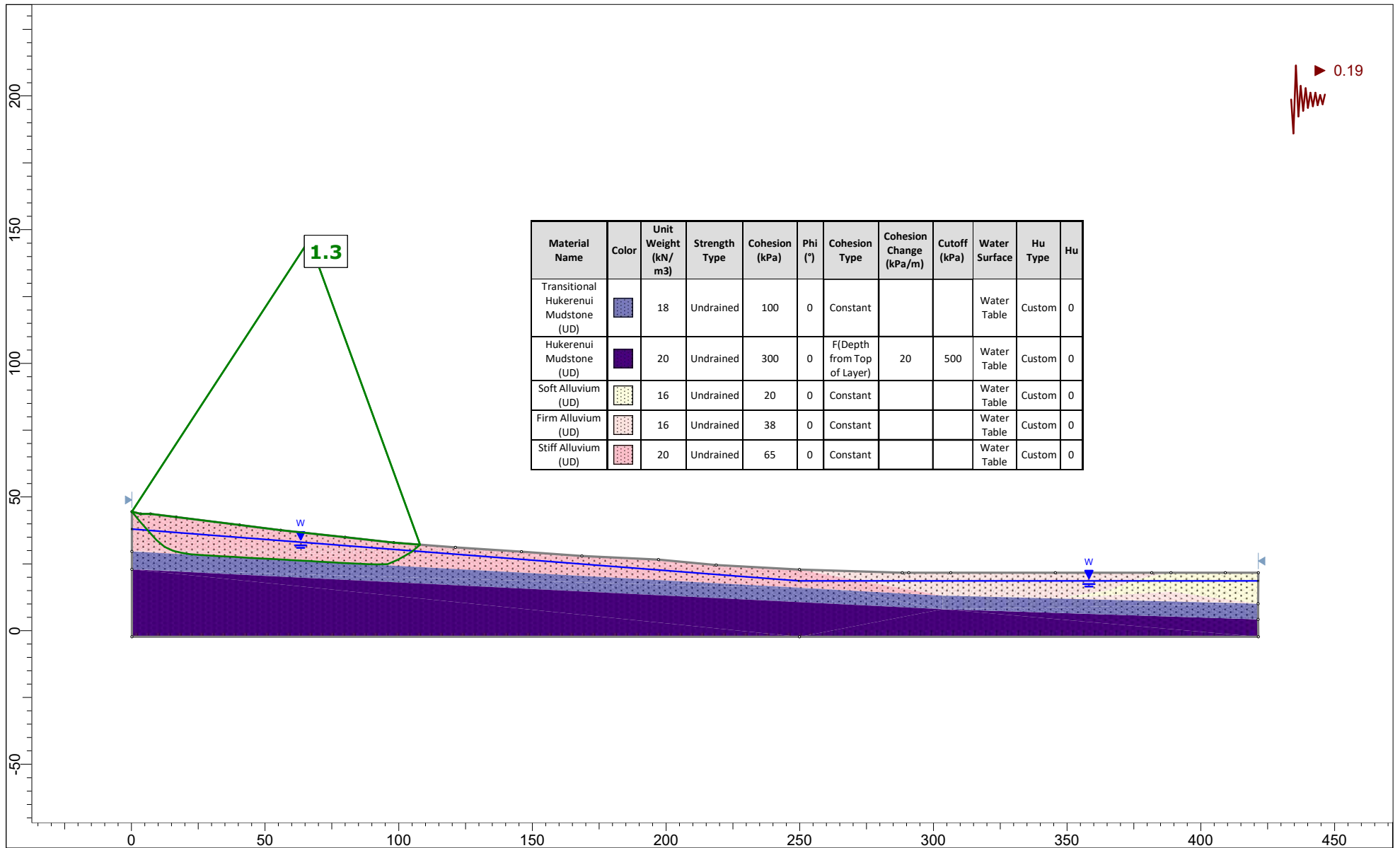
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section F - Existing			Scenario		
ST		CR			Company		
Date		25/03/2026, 10:02:44 am			File Name		
					XS F.slm		



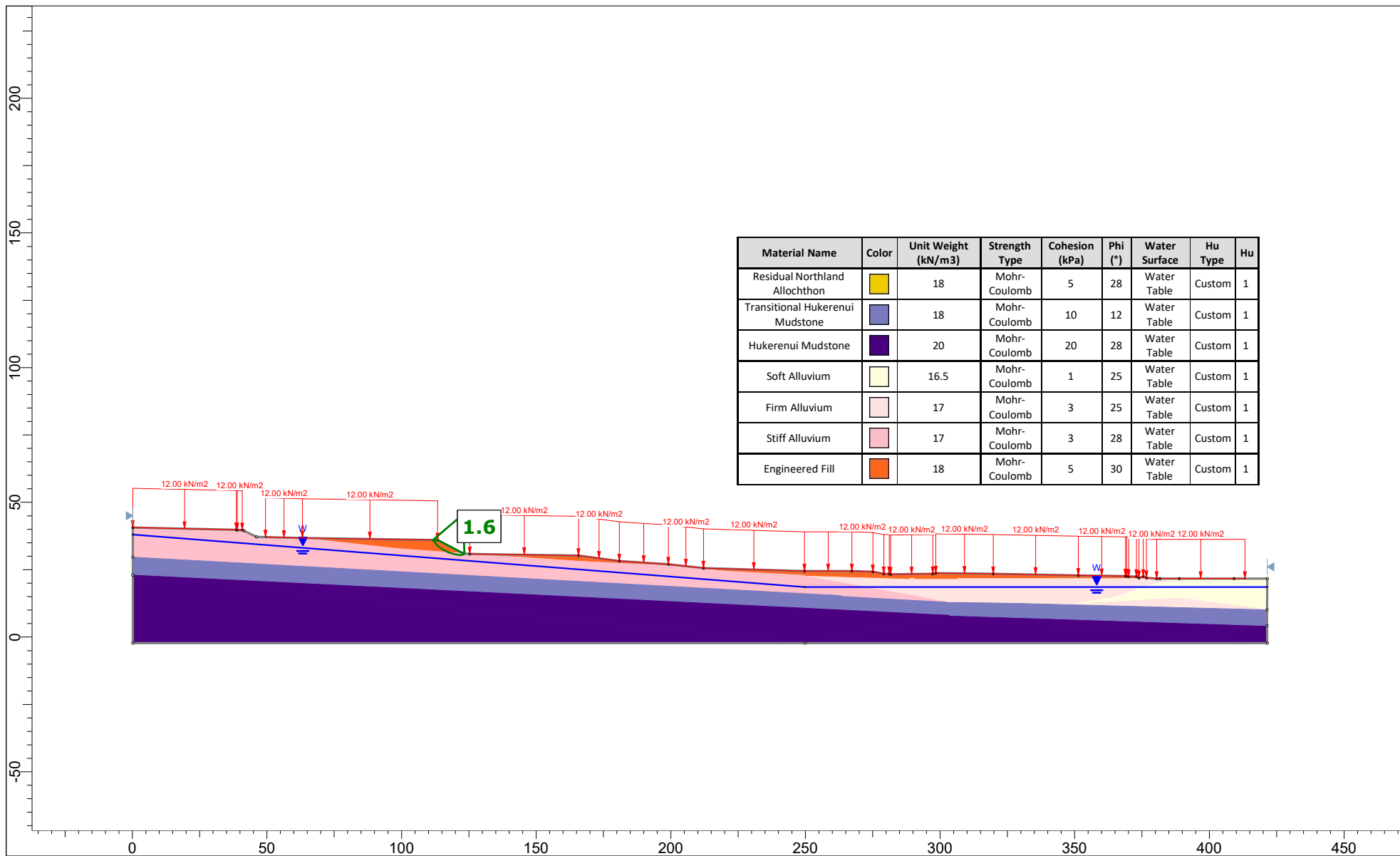
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section F - Existing			Scenario		
ST		CR			Company		
Date		20/07/2026, 10:02:44 am			File Name		
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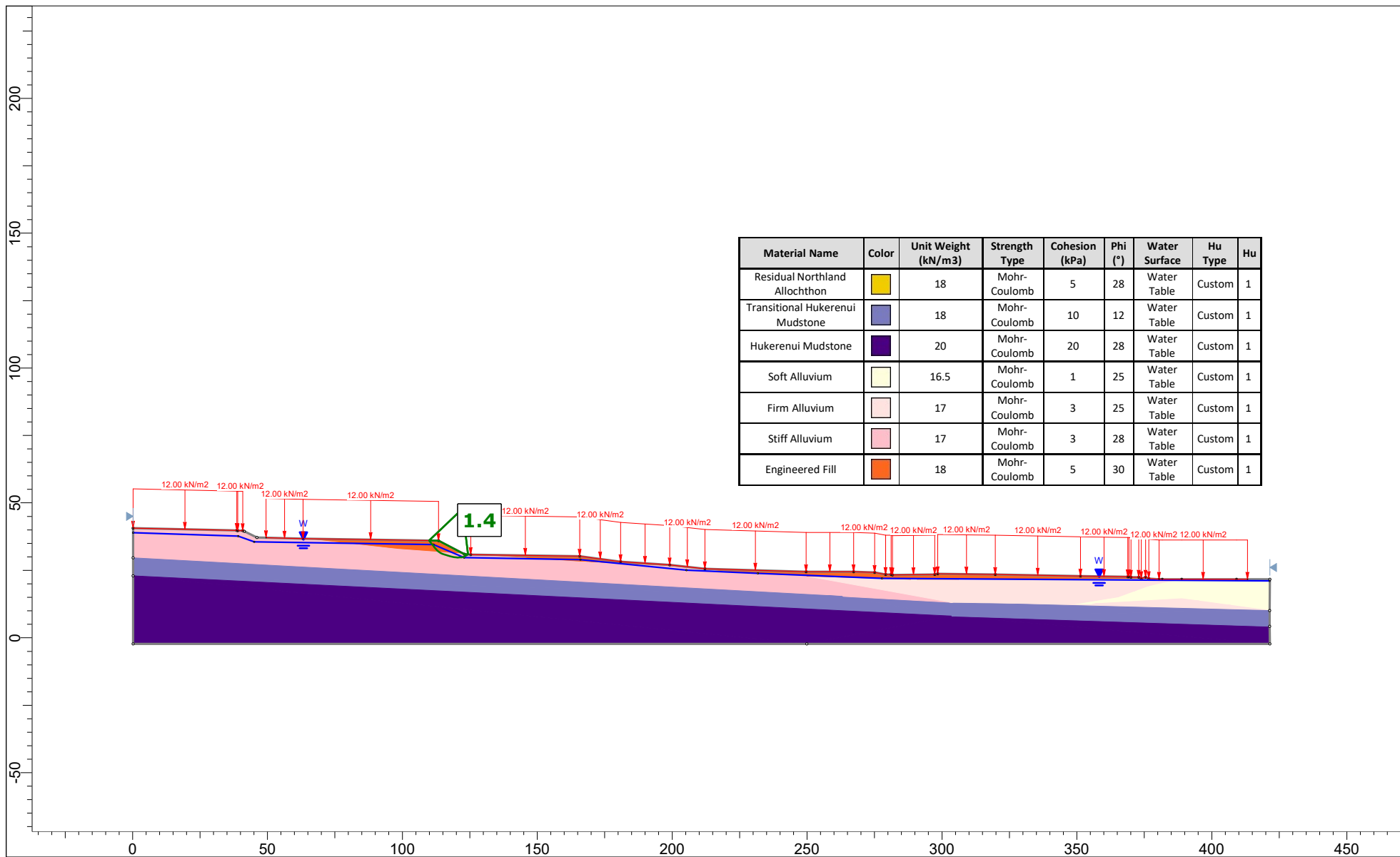


SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section F - Existing	Scenario	Existing Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS F.slm



Project				Milldale North Stages 14-17			
Group		Section F - Proposed		Scenario		Proposed NGW	
ST		CR		Company		Gibb Ritchie Geotechnical Engineers	
Date		20/07/2026, 10:02:44 am		File Name		XS F.slm	

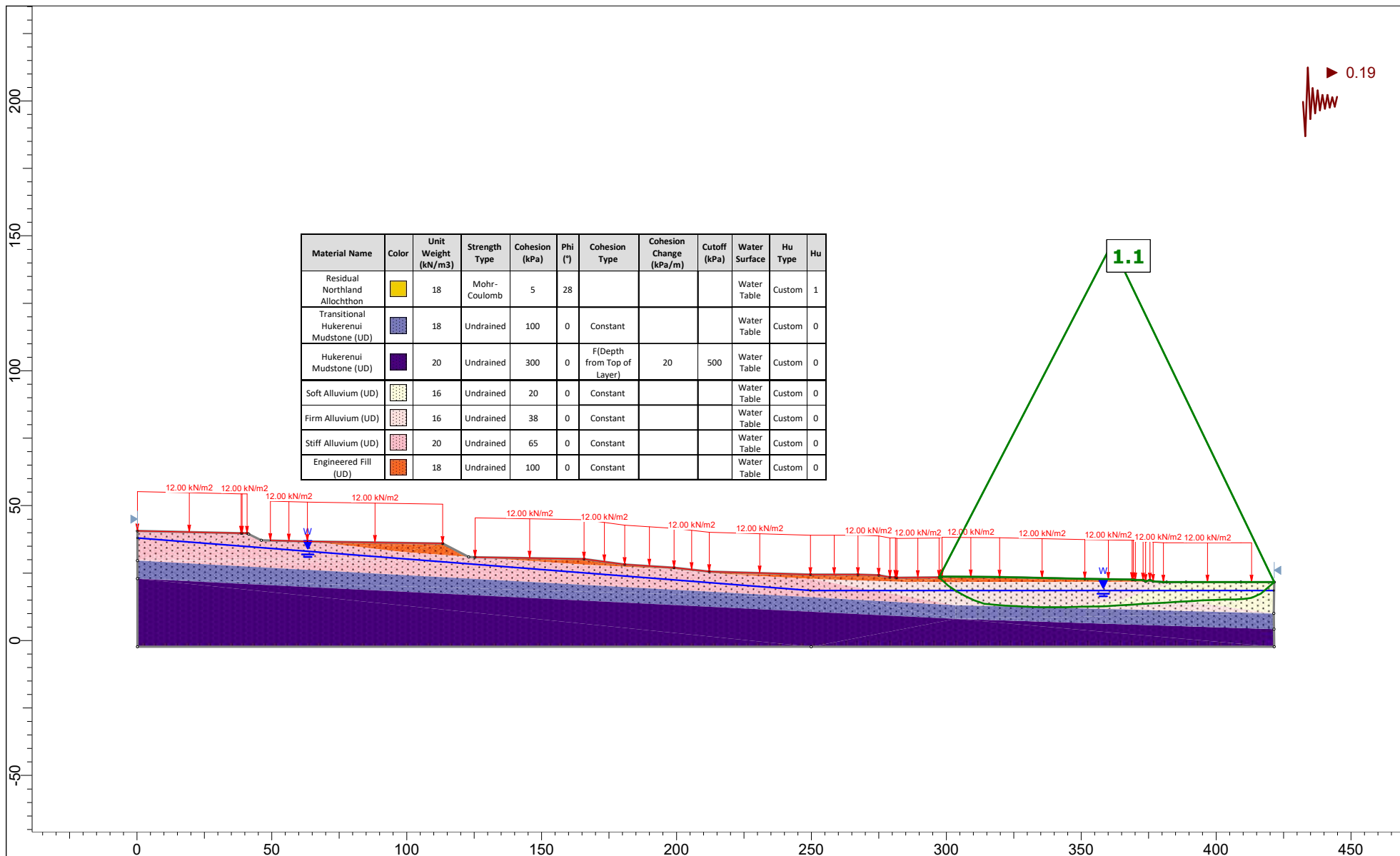


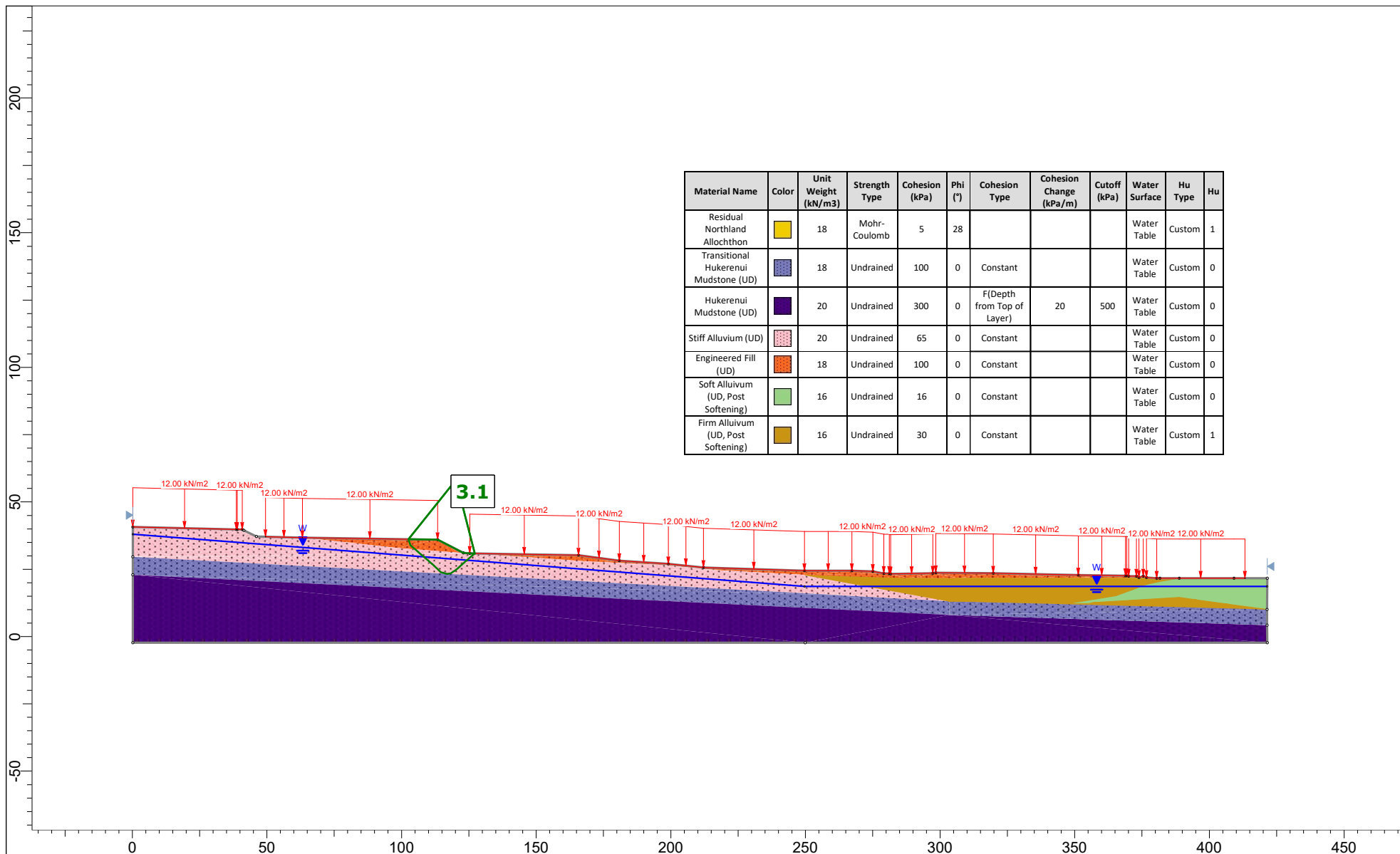
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Soft Alluvium		16.5	Mohr-Coulomb	1	25	Water Table	Custom	1
Firm Alluvium		17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section F - Proposed	Scenario	Proposed HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS F.slm



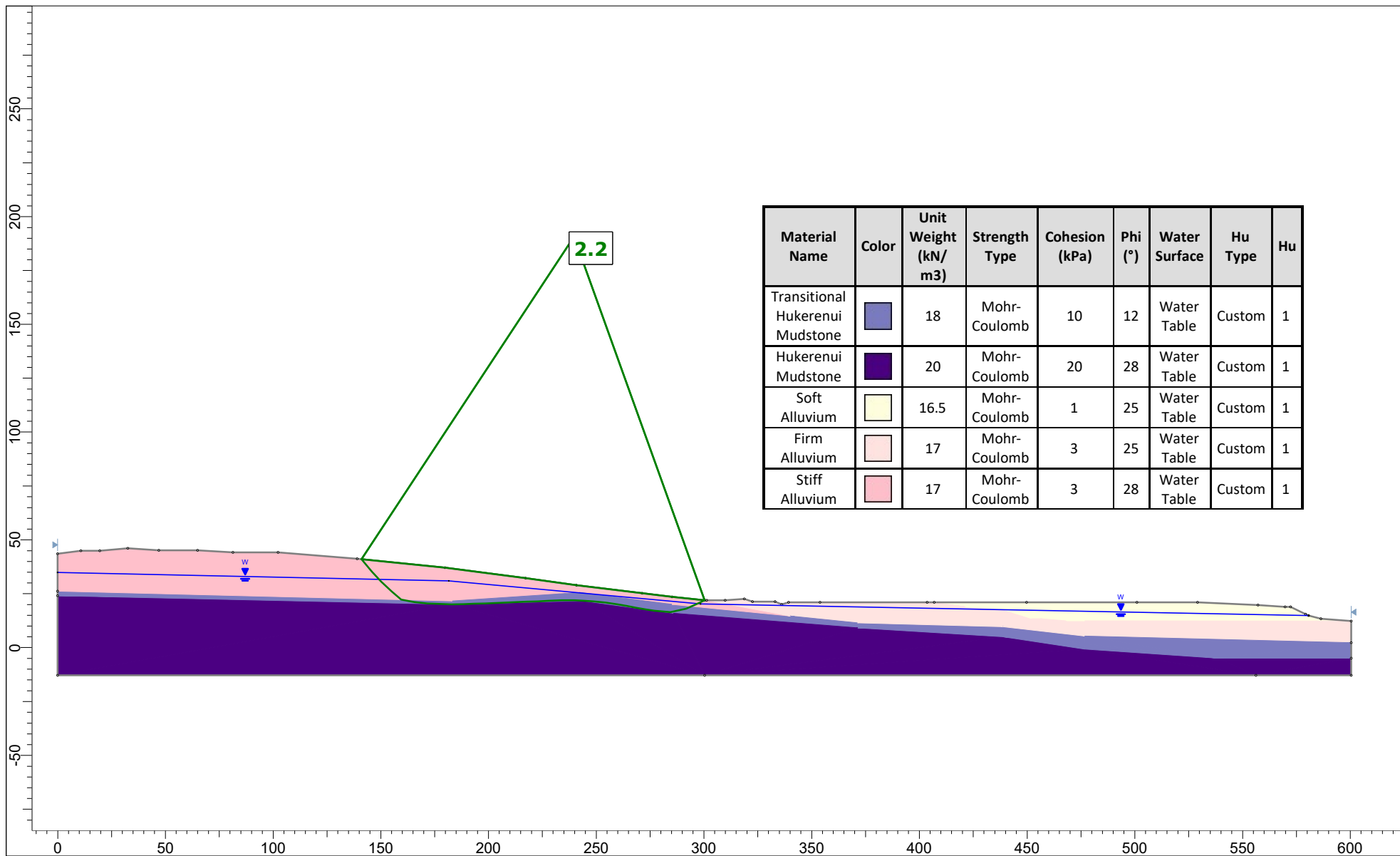


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28				Water Table	Custom	1
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	Water Table	Custom	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			Water Table	Custom	0
Engineered Fill (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Soft Alluvium (UD, Post Softening)		16	Undrained	16	0	Constant			Water Table	Custom	0
Firm Alluvium (UD, Post Softening)		16	Undrained	30	0	Constant			Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section F - Proposed	Scenario	Proposed Cyclic Softening
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS F.sldm



SLIDEINTERPRET 9.038

Project

Milldale North Stages 14-17

Group

Section G - Existing

Scenario

Existing NGW

ST

CR

Company

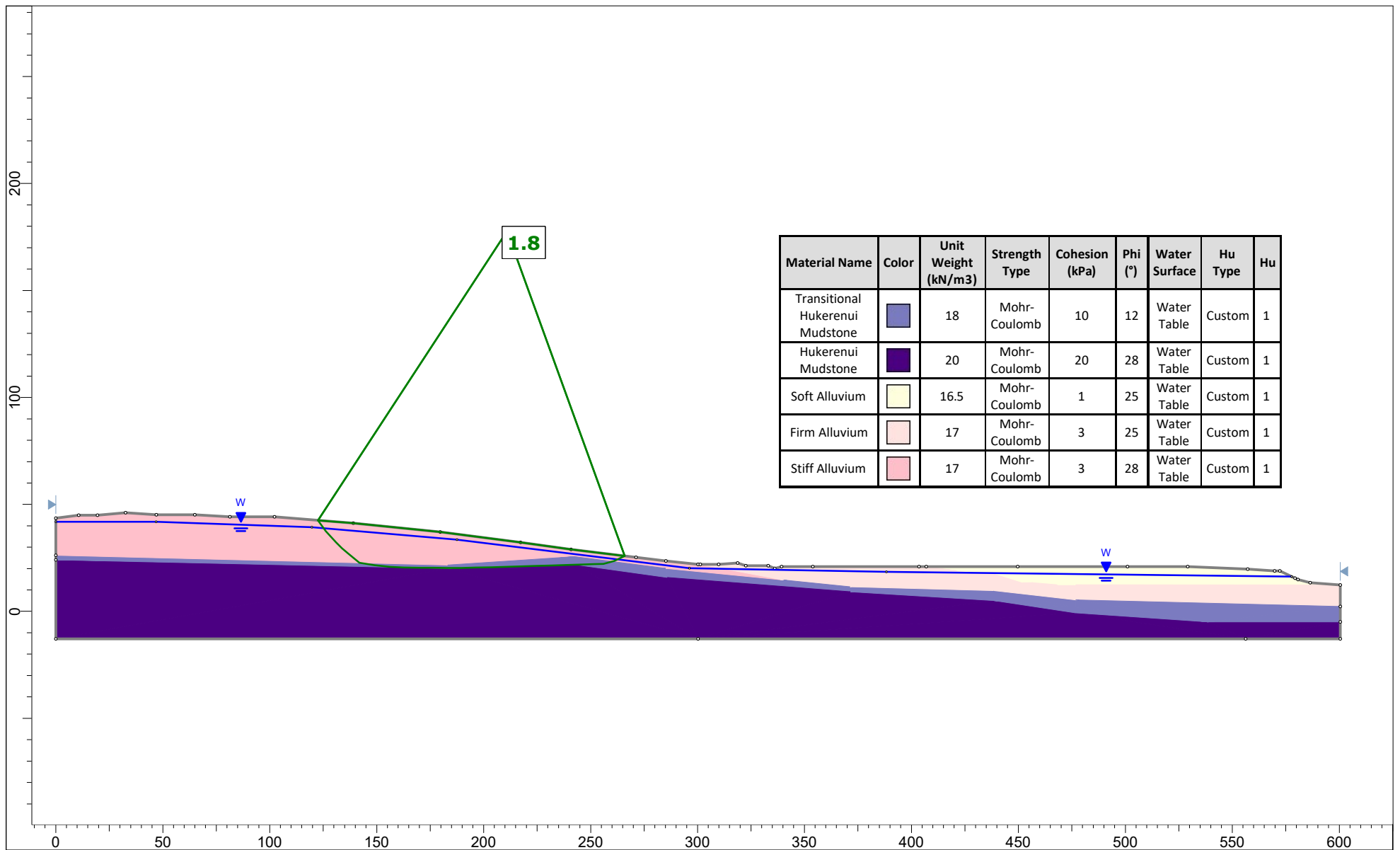
Gibb Ritchie Geotechnical Engineers

Date

20/07/2026, 10:02:44 am

File Name

XS G.slm



SLIDEINTERPRET 9.038

Project

Milldale North Stages 14-17

Group

Section G - Existing

Scenario

Existing HGW

ST

CR

Company

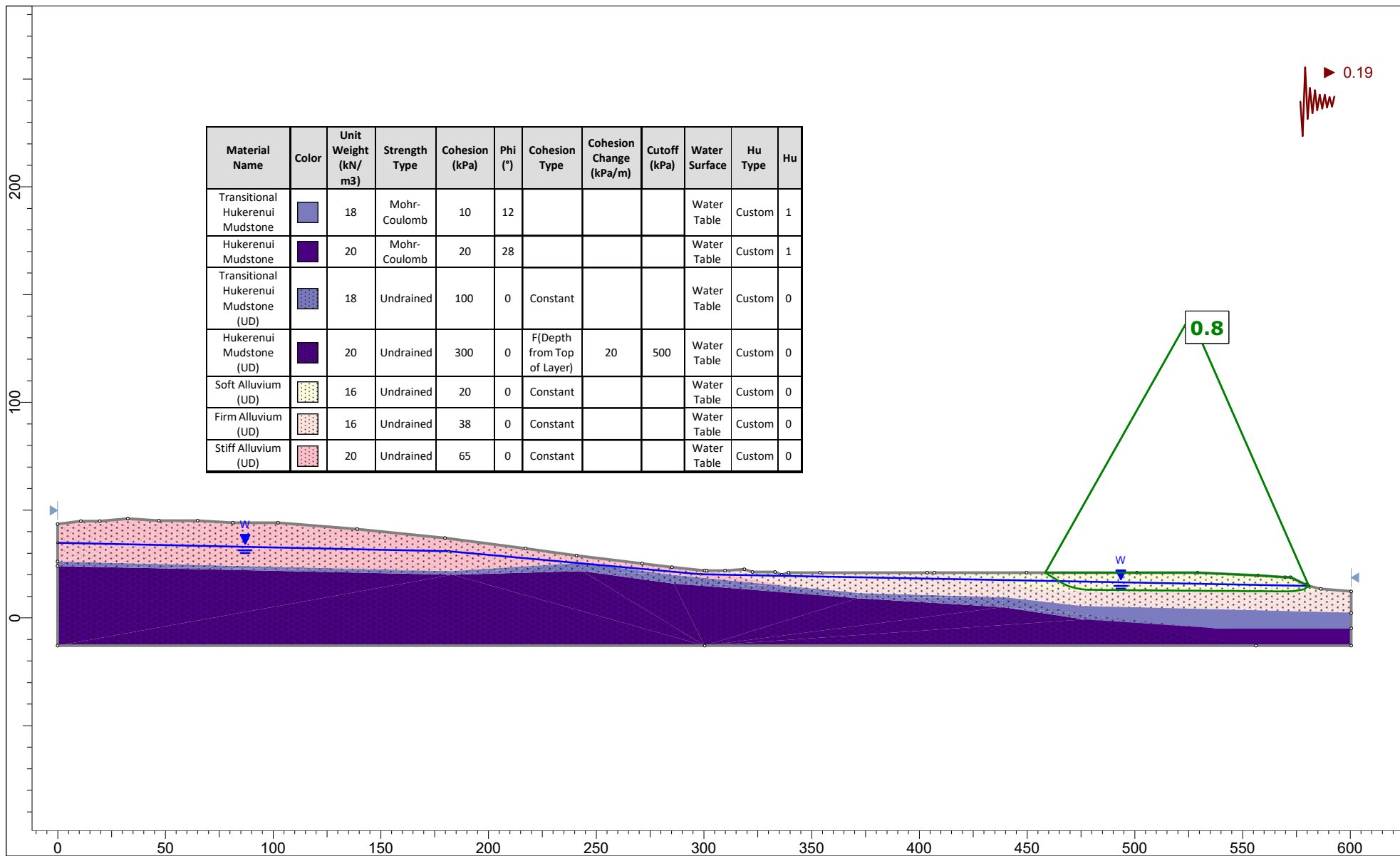
Gibb Ritchie Geotechnical Engineers

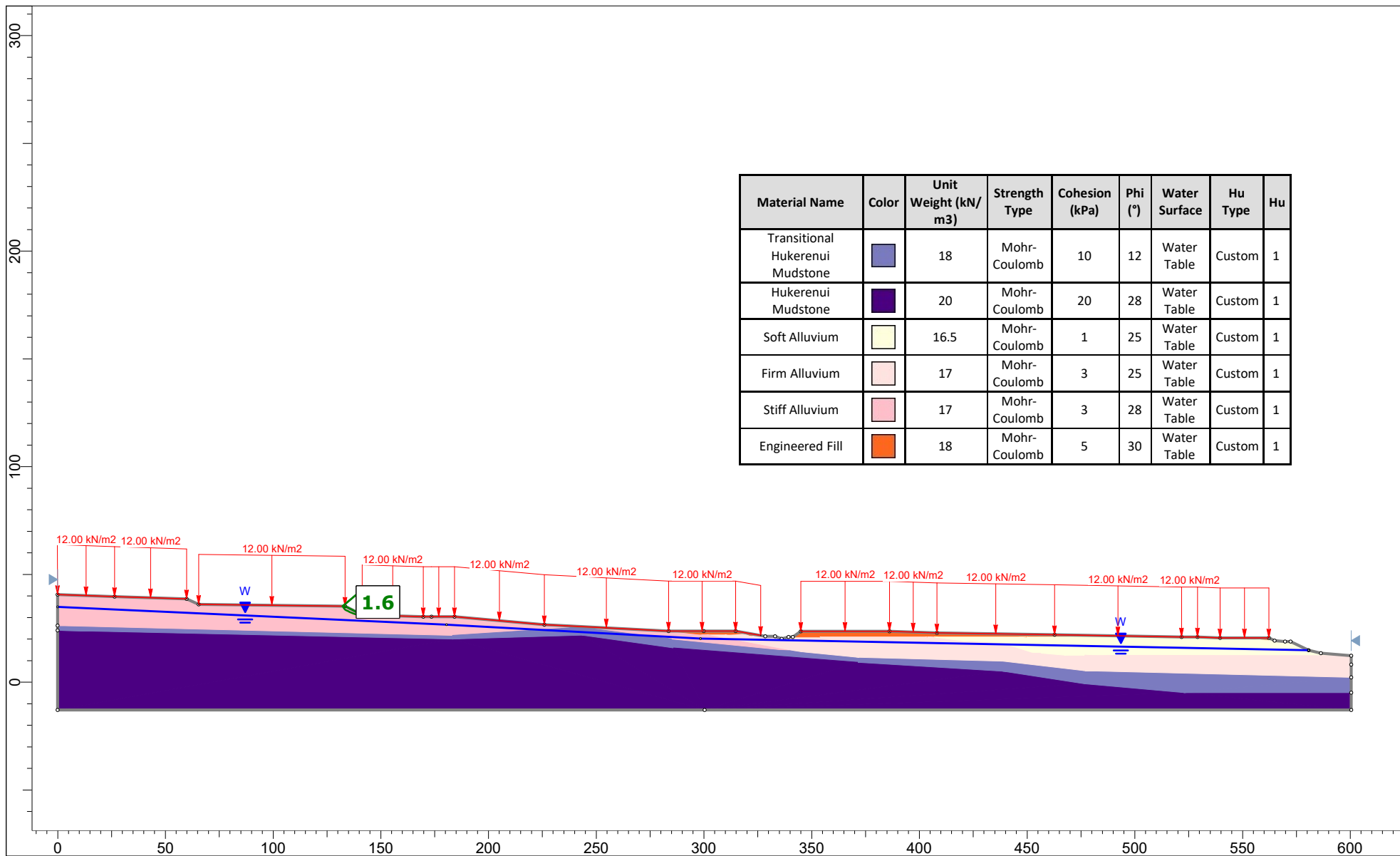
Date

20/07/2026, 10:02:44 am

File Name

XS G.slm



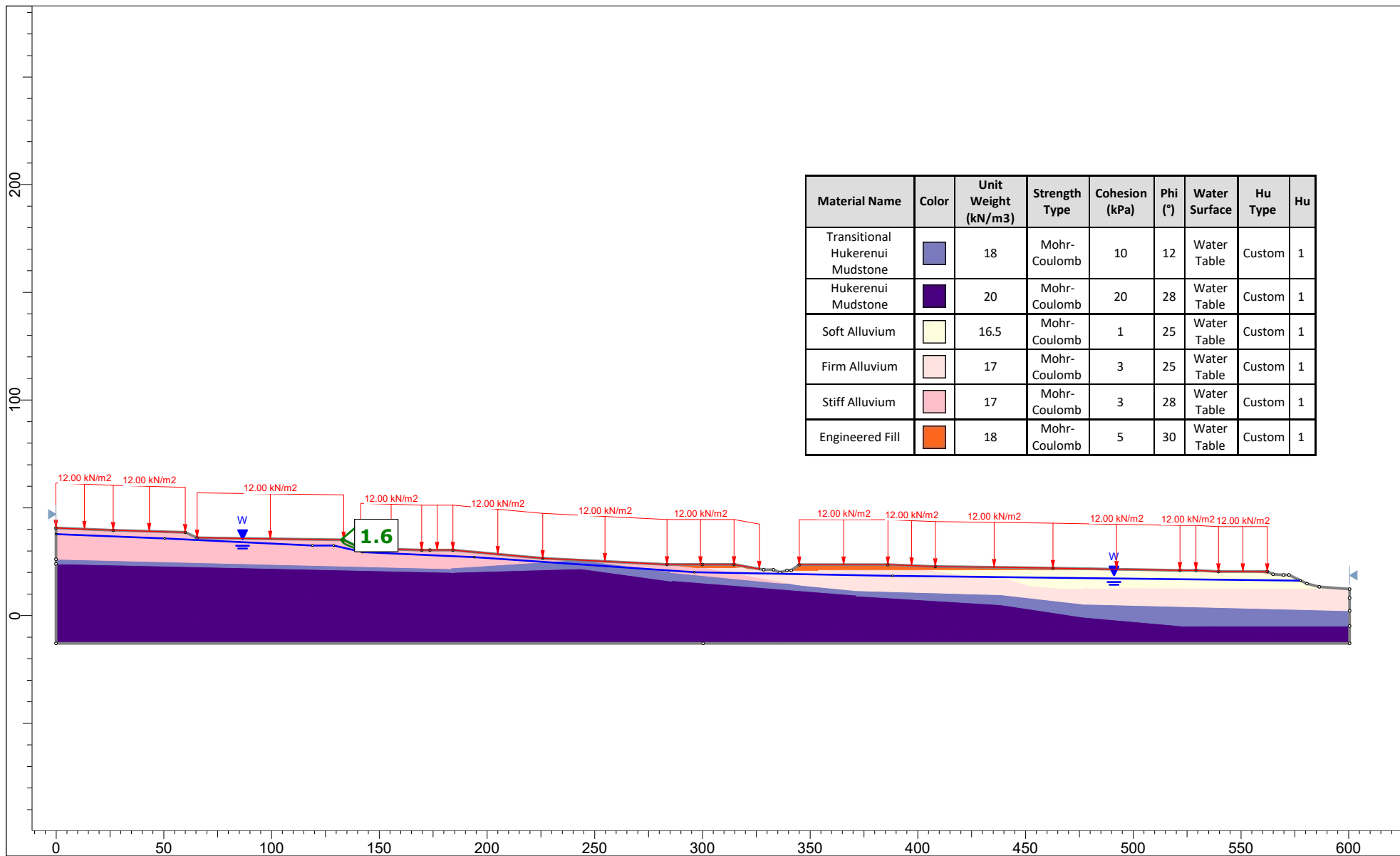


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Soft Alluvium		16.5	Mohr-Coulomb	1	25	Water Table	Custom	1
Firm Alluvium		17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



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Project		Milldale North Stages 14-17	
Group	Section G - Proposed	Scenario	Proposed NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS G.slm



Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Soft Alluvium		16.5	Mohr-Coulomb	1	25	Water Table	Custom	1
Firm Alluvium		17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



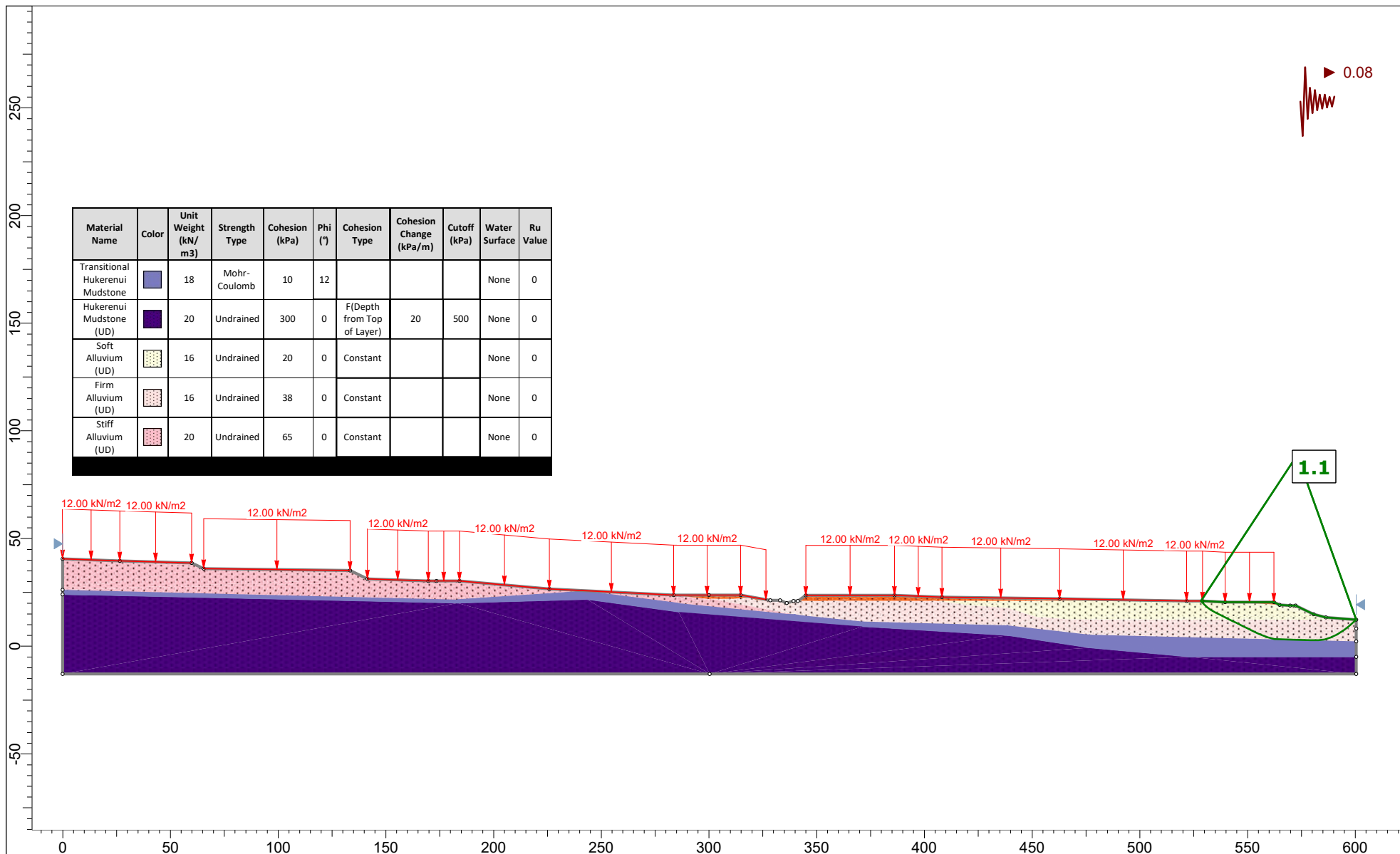
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section G - Proposed	Scenario	Proposed HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS G.slm



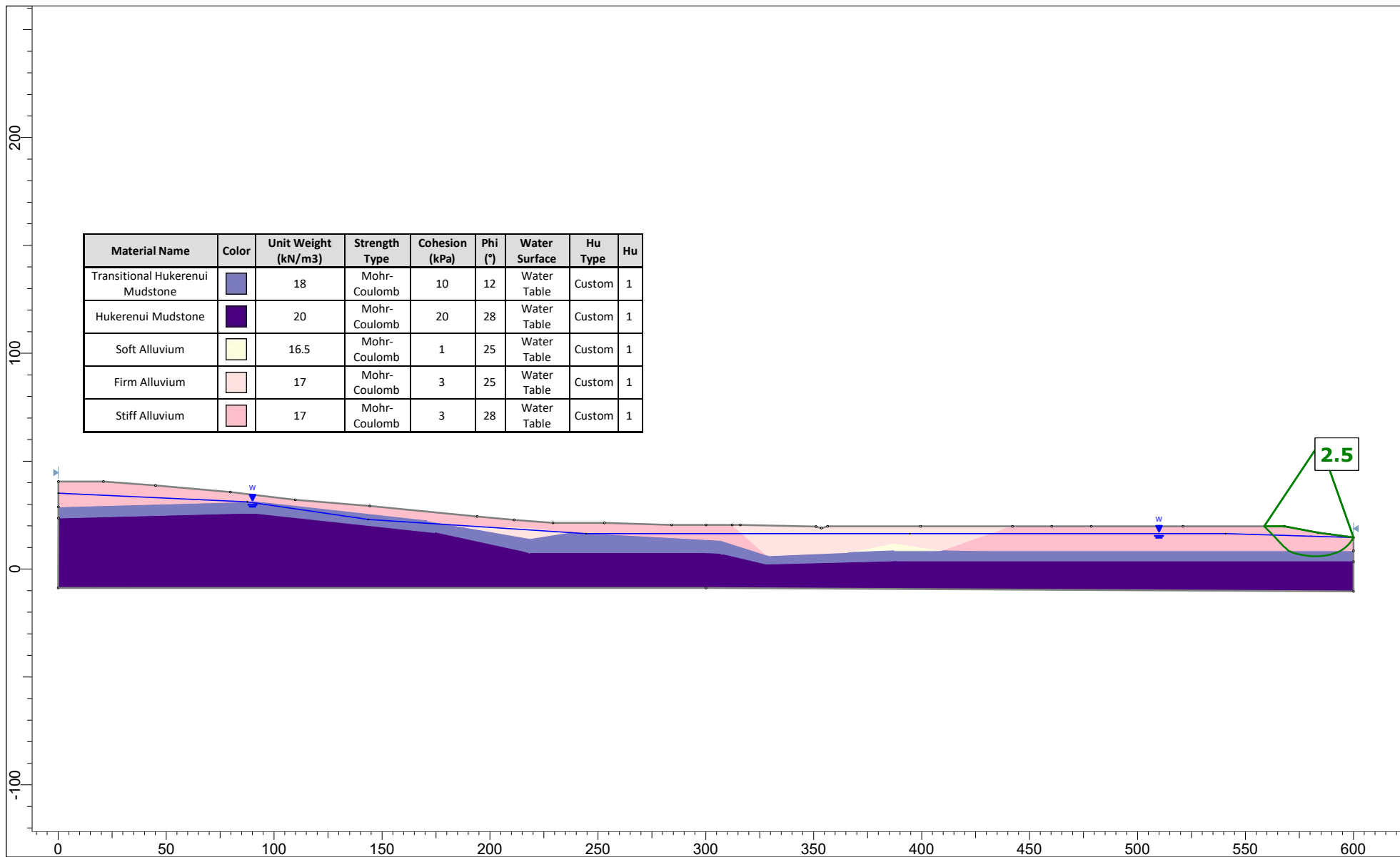
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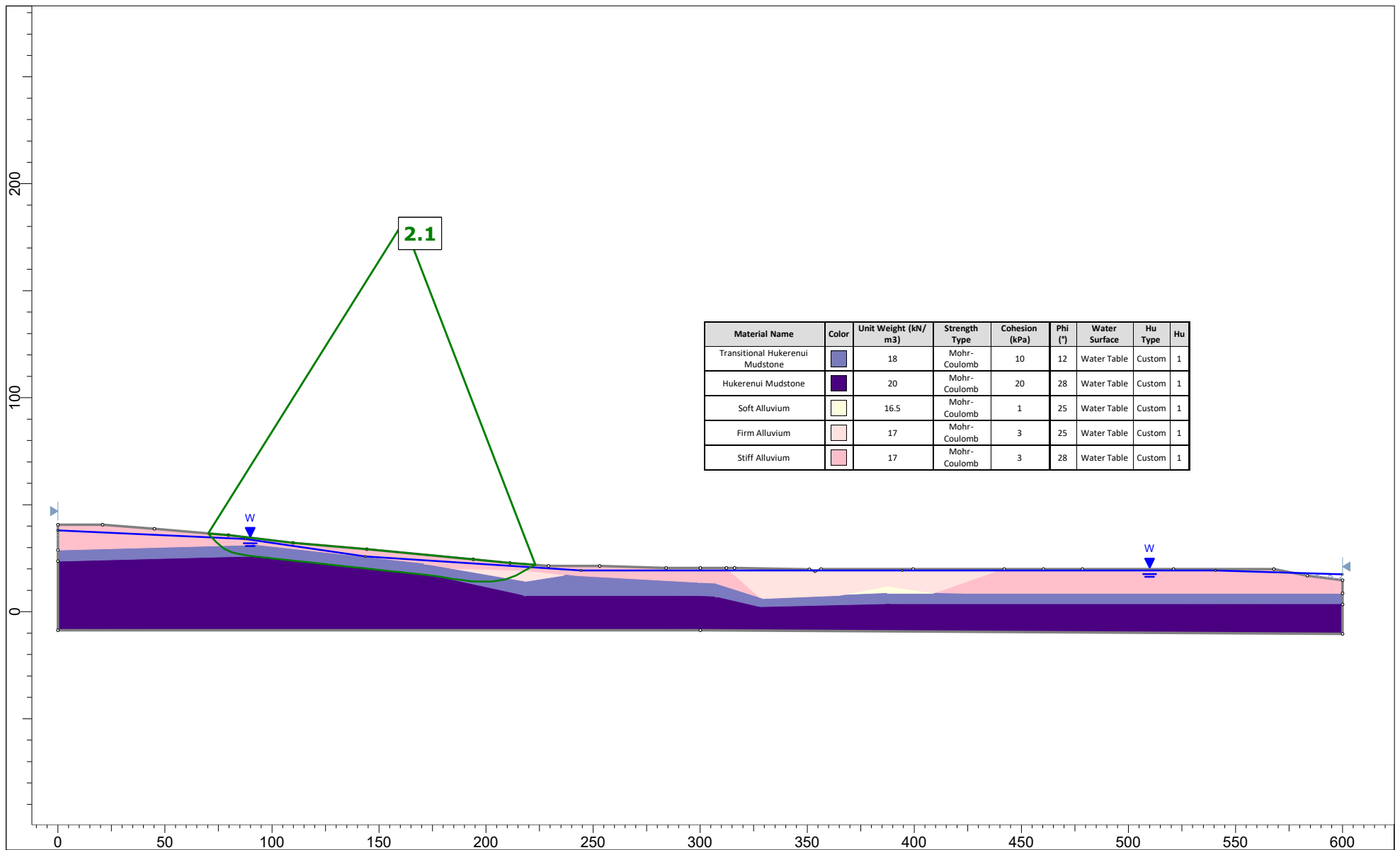
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section G - Proposed	Scenario	Proposed Seismic Yield
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS G.slm



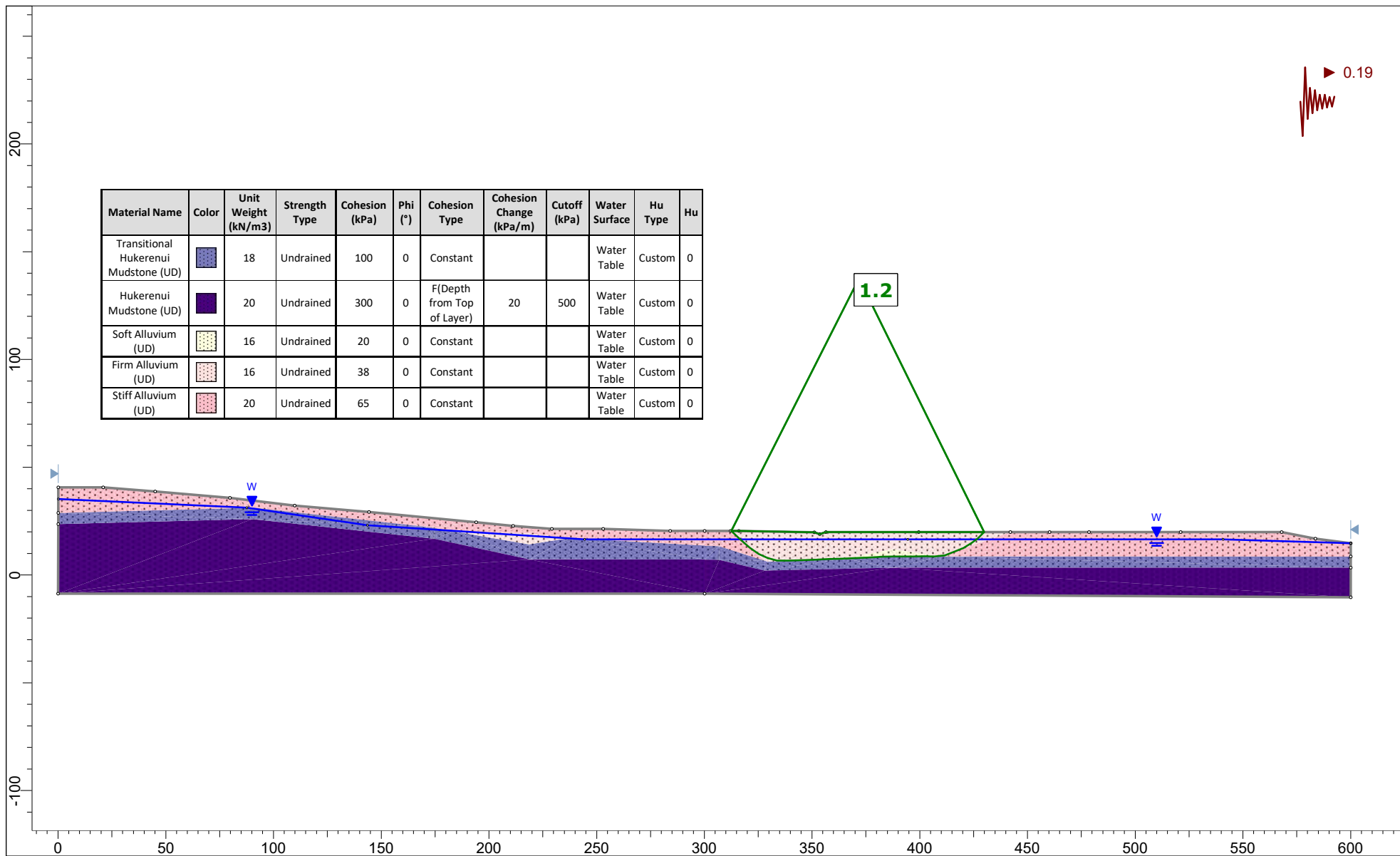
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Soft Alluvium		16.5	Mohr-Coulomb	1	25	Water Table	Custom	1
Firm Alluvium		17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1

	Project		Milldale North Stages 14-17	
	Group		Section H - Existing	Scenario Existing NGW
	ST		CR	Company Gibb Ritchie Geotechnical Engineers
	Date		20/07/2026, 10:02:44 am	File Name XS H.slmd
	SLIDEINTERPRET 9.038			



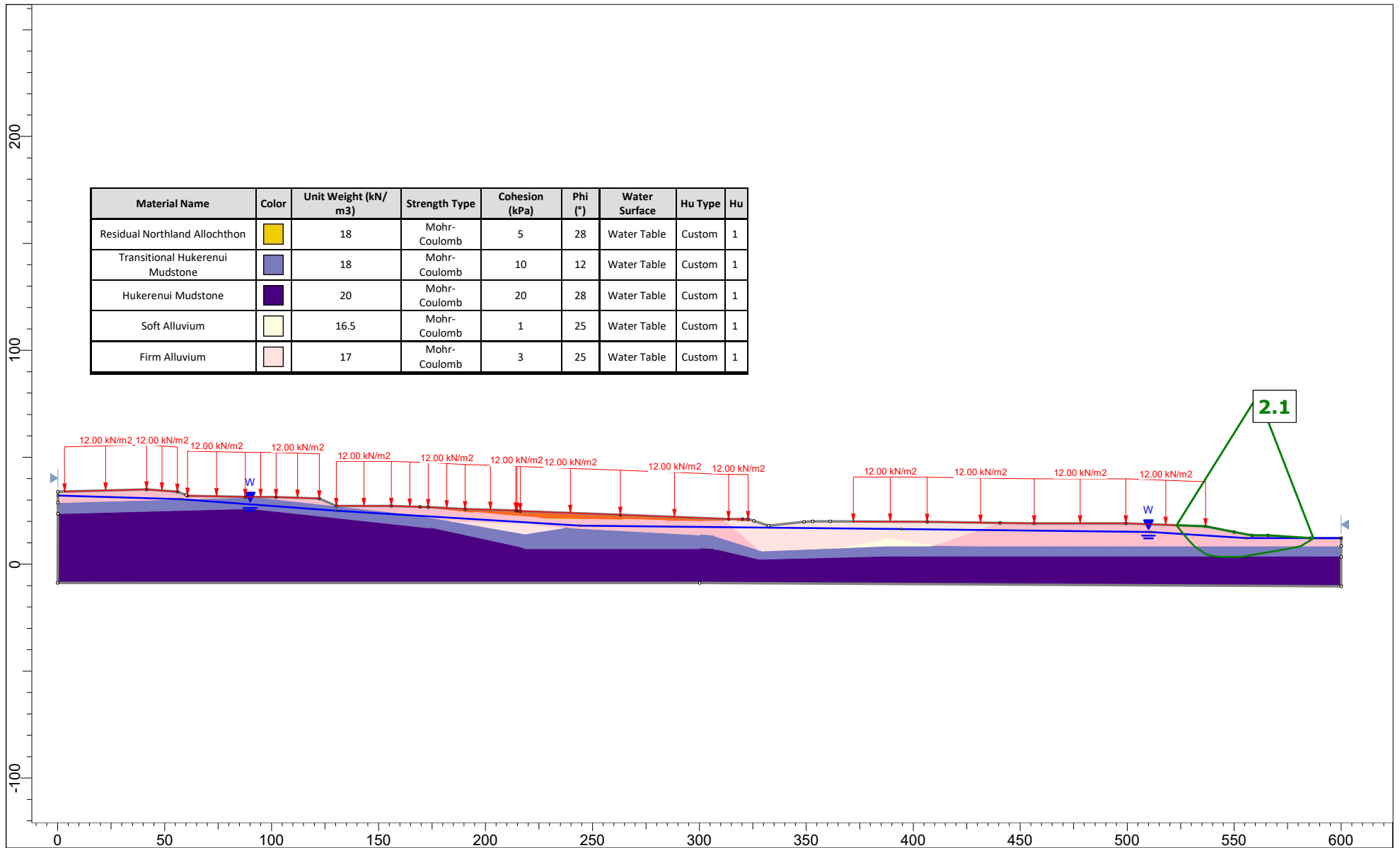
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section H - Existing	Scenario	Existing HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS H.slm



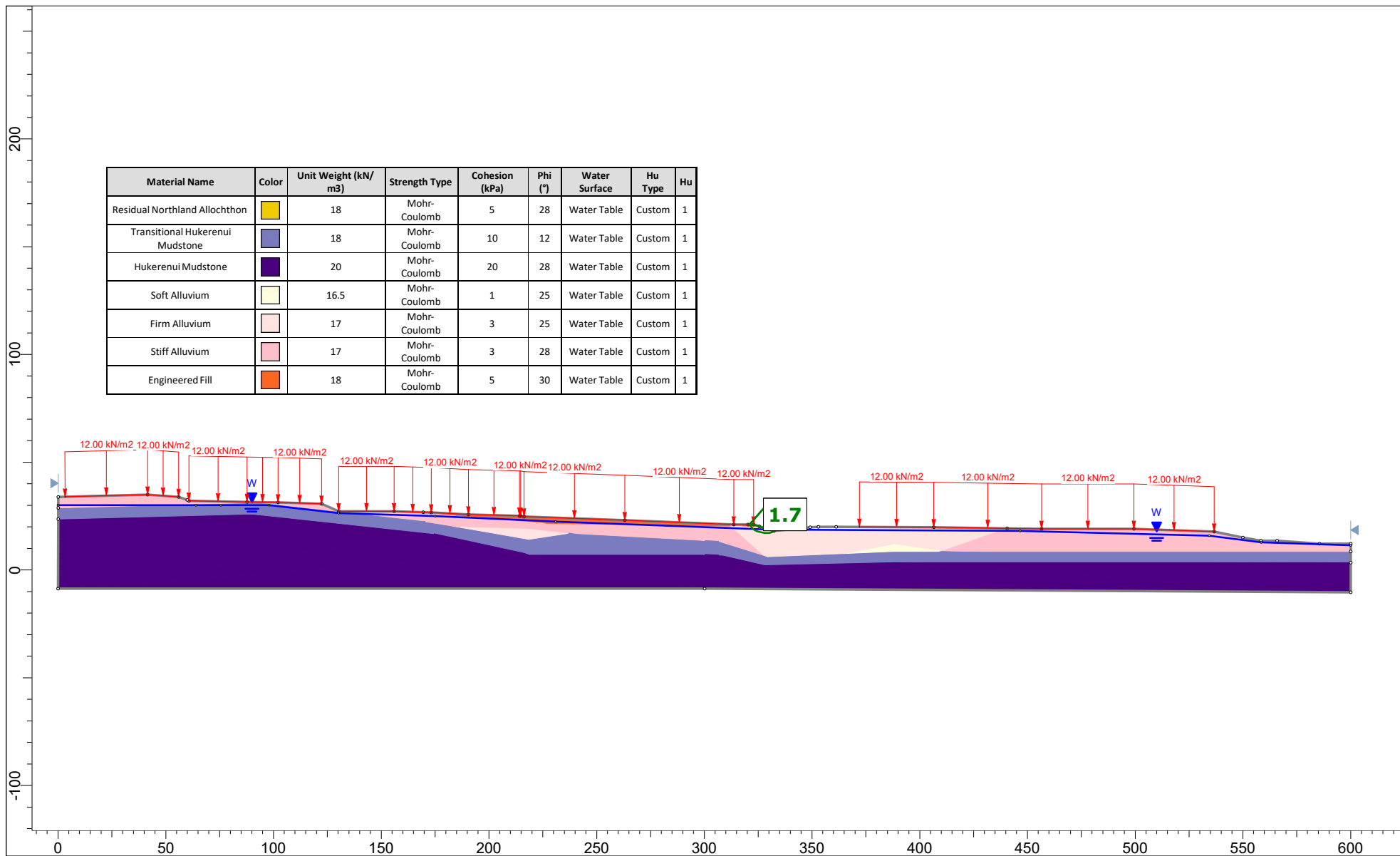
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Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F (Depth from Top of Layer)	20	500	Water Table	Custom	0
Soft Alluvium (UD)		16	Undrained	20	0	Constant			Water Table	Custom	0
Firm Alluvium (UD)		16	Undrained	38	0	Constant			Water Table	Custom	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			Water Table	Custom	0

	Project		Milldale North Stages 14-17	
	Group		Section H - Existing	Scenario Existing Seismic
	ST		CR	Company Gibb Ritchie Geotechnical Engineers
	Date		20/07/2026, 10:02:44 am	File Name XS H.slmd
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Project		Milldale North Stages 14-17	
Group	Section H - Proposed	Scenario	Proposed NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS H.slmd



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Project

Milldale North Stages 14-17

Group

Section H - Proposed

Scenario

Proposed HGW

ST

CR

Company

Gibb Ritchie Geotechnical Engineers

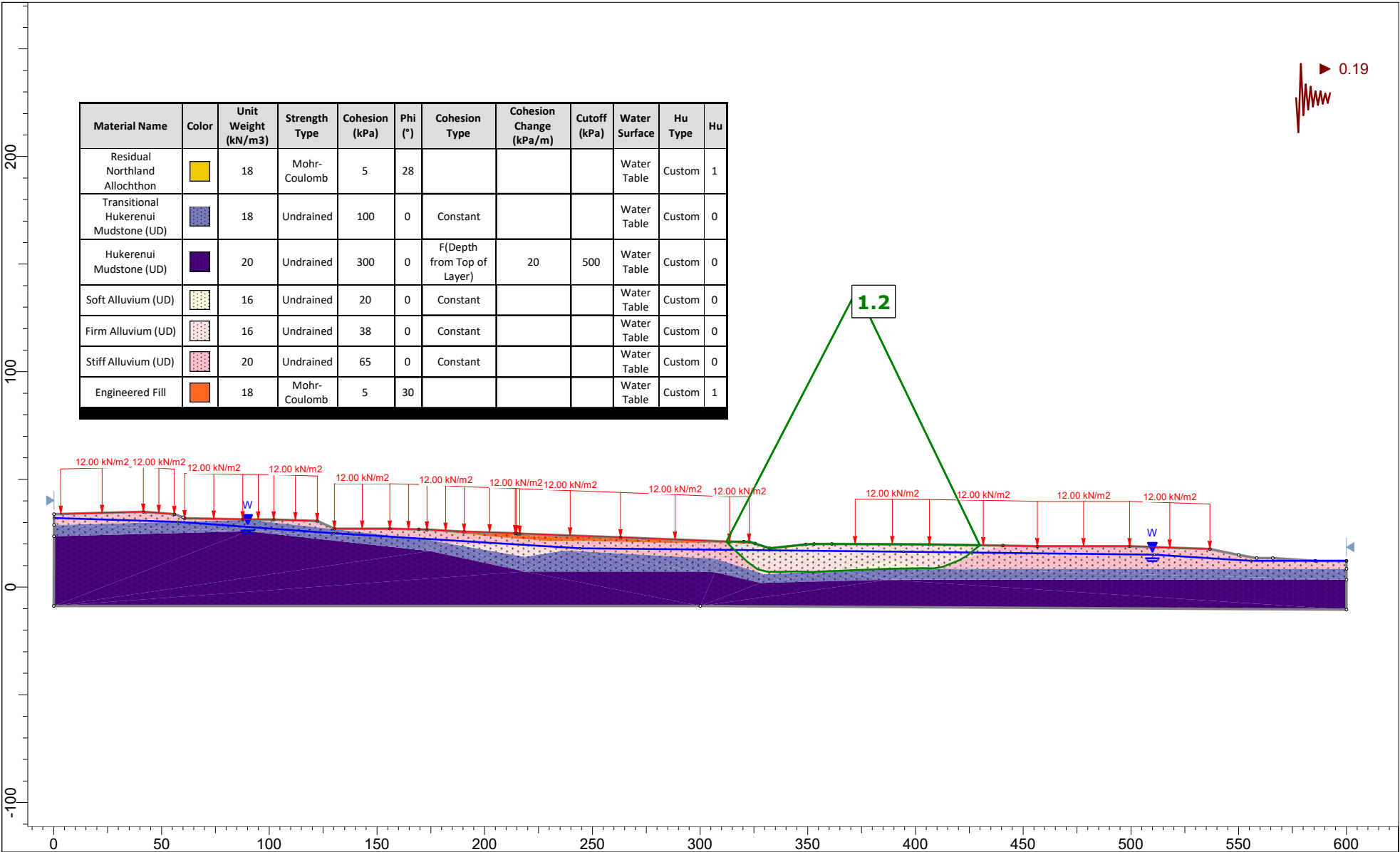
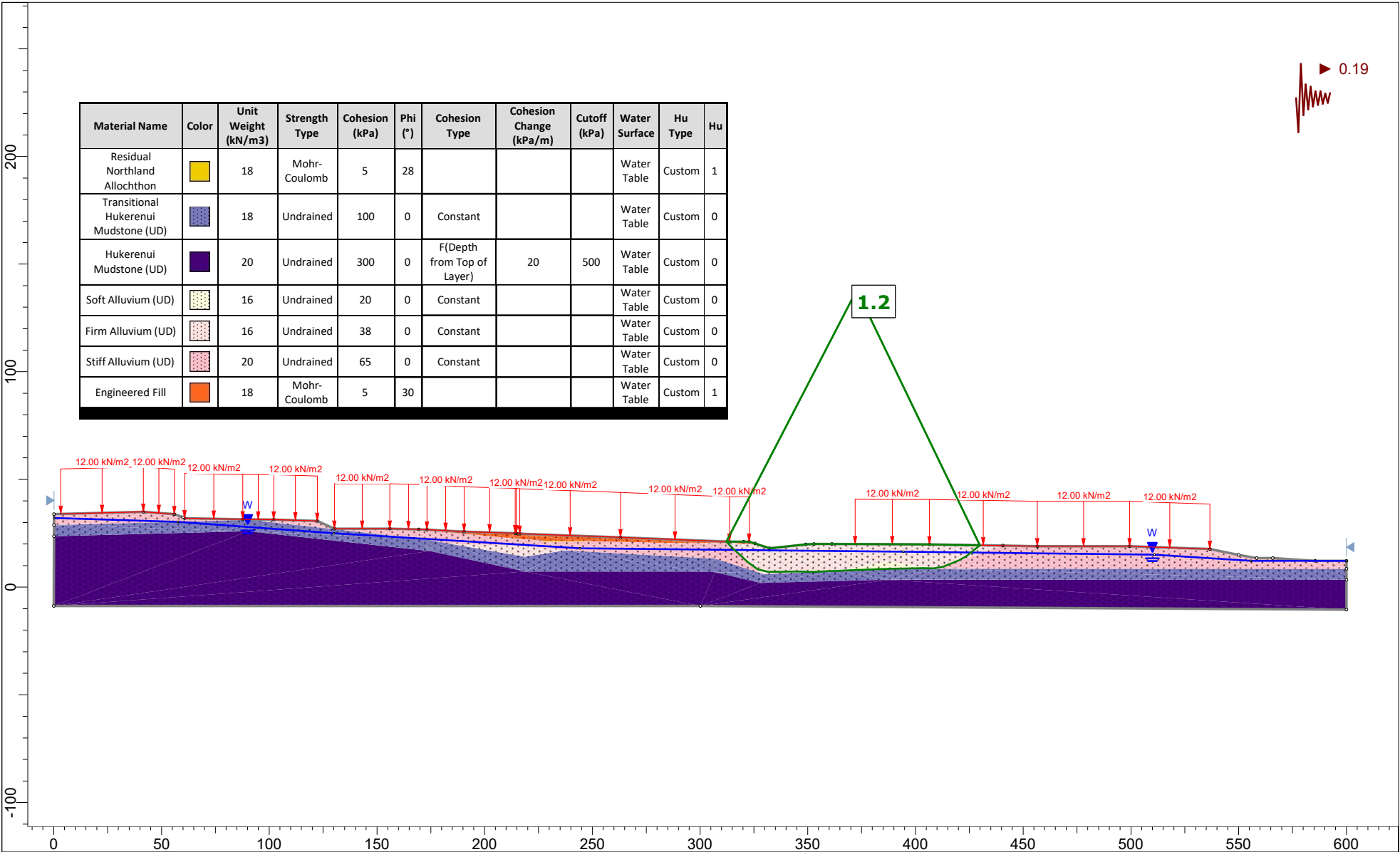
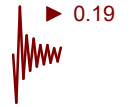
Date

20/07/2026, 10:02:44 am

File Name

XS H.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Hu Type	Hu Value
Residual Northland Allochthon		18	Mohr-Coulomb	5	28				Water Table	Custom	1
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	Water Table	Custom	0
Soft Alluvium (UD)		16	Undrained	20	0	Constant			Water Table	Custom	0
Firm Alluvium (UD)		16	Undrained	38	0	Constant			Water Table	Custom	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			Water Table	Custom	0
Engineered Fill		18	Mohr-Coulomb	5	30				Water Table	Custom	1



	<i>Project</i>
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Milldale North Stages 14-17

Group

Section H - Proposed

Scenario

Proposed Seismic

ST

	Company
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Gibb Ritchie Geotechnical Engineers

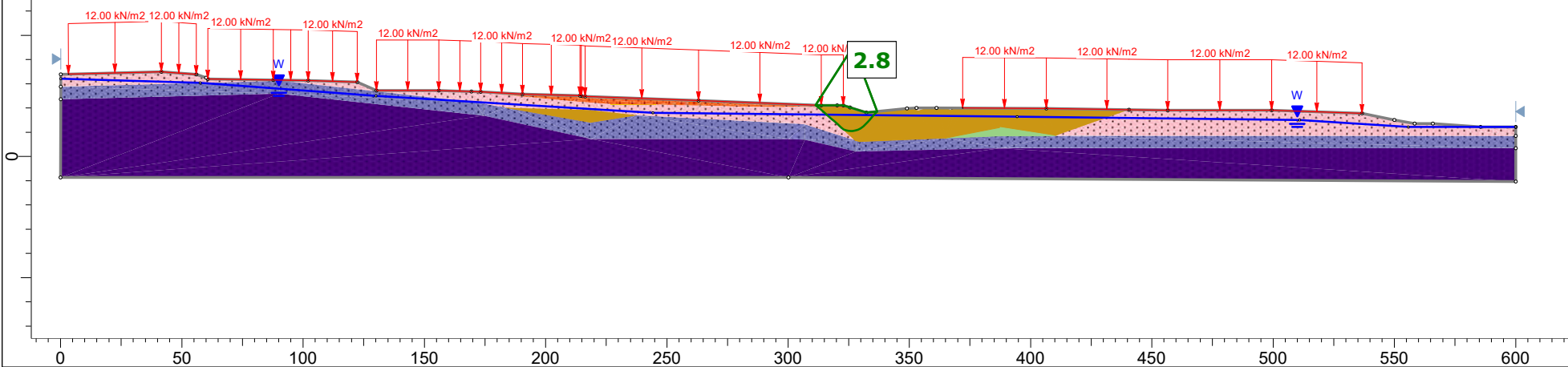
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File Name

XS H.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28				Water Table	Custom	1
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	Water Table	Custom	0
Firm Alluvium (UD)		16	Undrained	38	0	Constant			Water Table	Custom	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			Water Table	Custom	0
Engineered Fill		18	Mohr-Coulomb	5	30				Water Table	Custom	1
Engineered Fill (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0
Soft Alluvium (UD, Post Softening)		16	Undrained	16	0	Constant			Water Table	Custom	0
Firm Alluvium (UD, Post Softening)		16	Undrained	30	0	Constant			Water Table	Custom	0

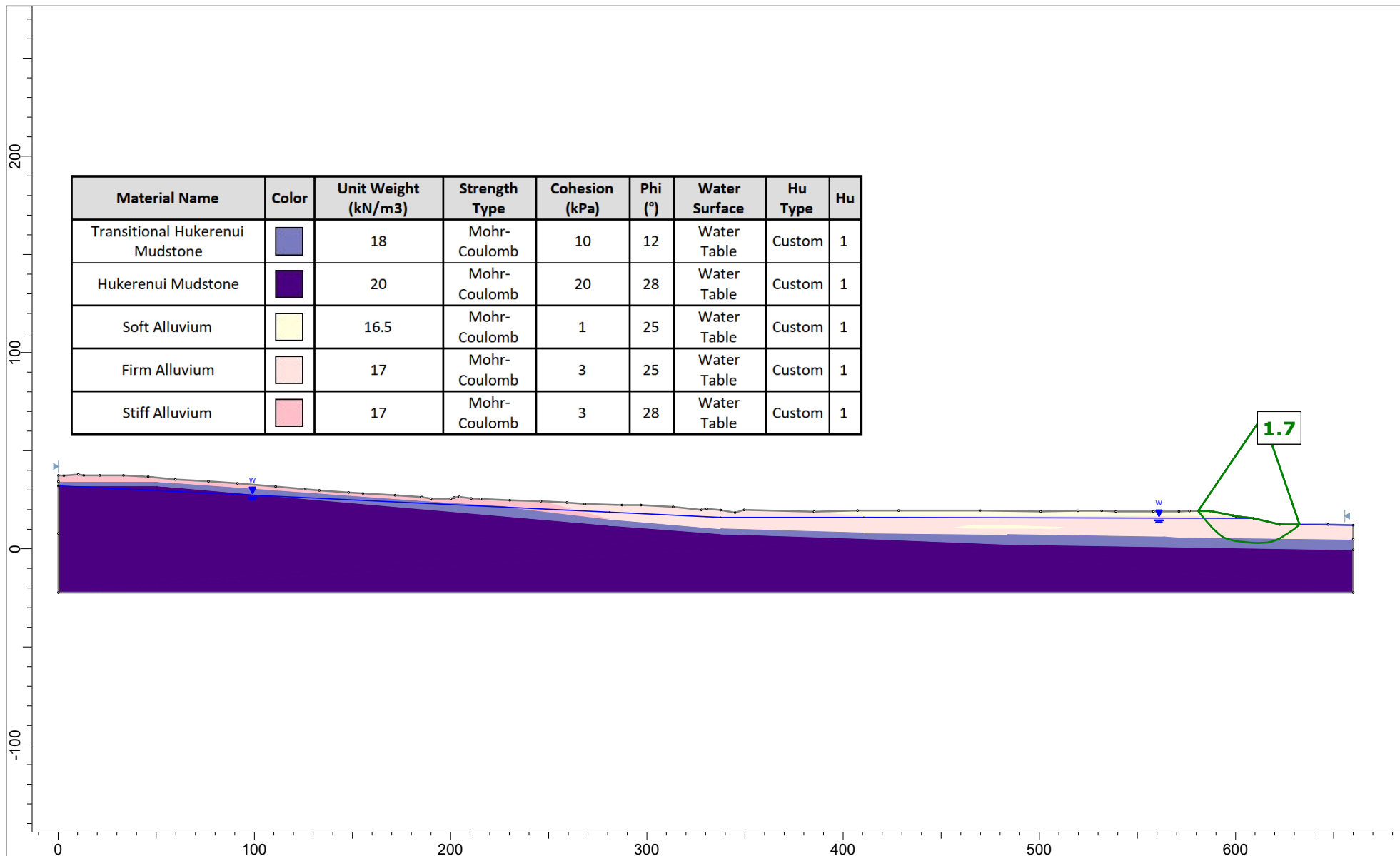


Project

Milldale North Stages 14-17

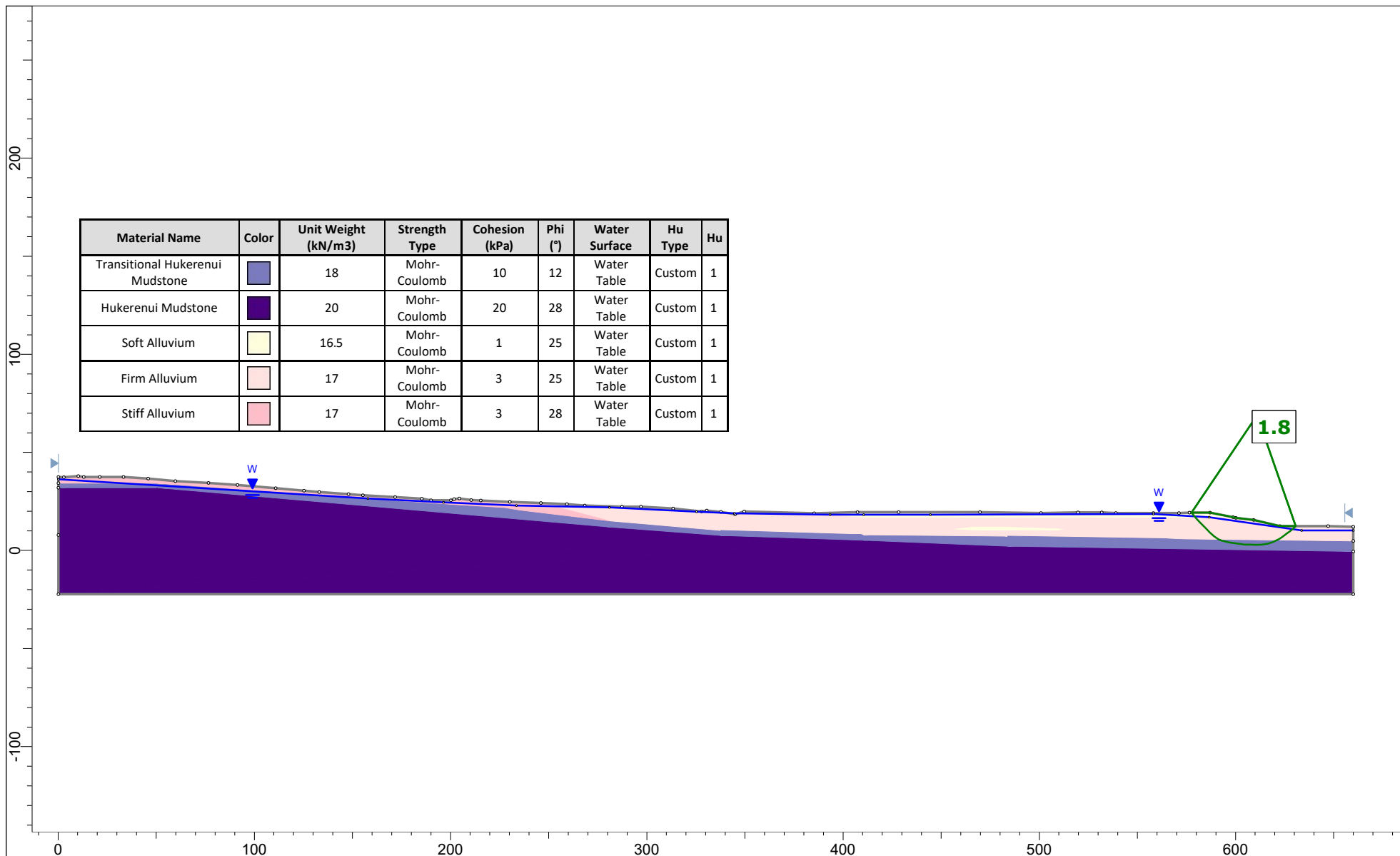
Scenario

Milldale North Stages 14-17



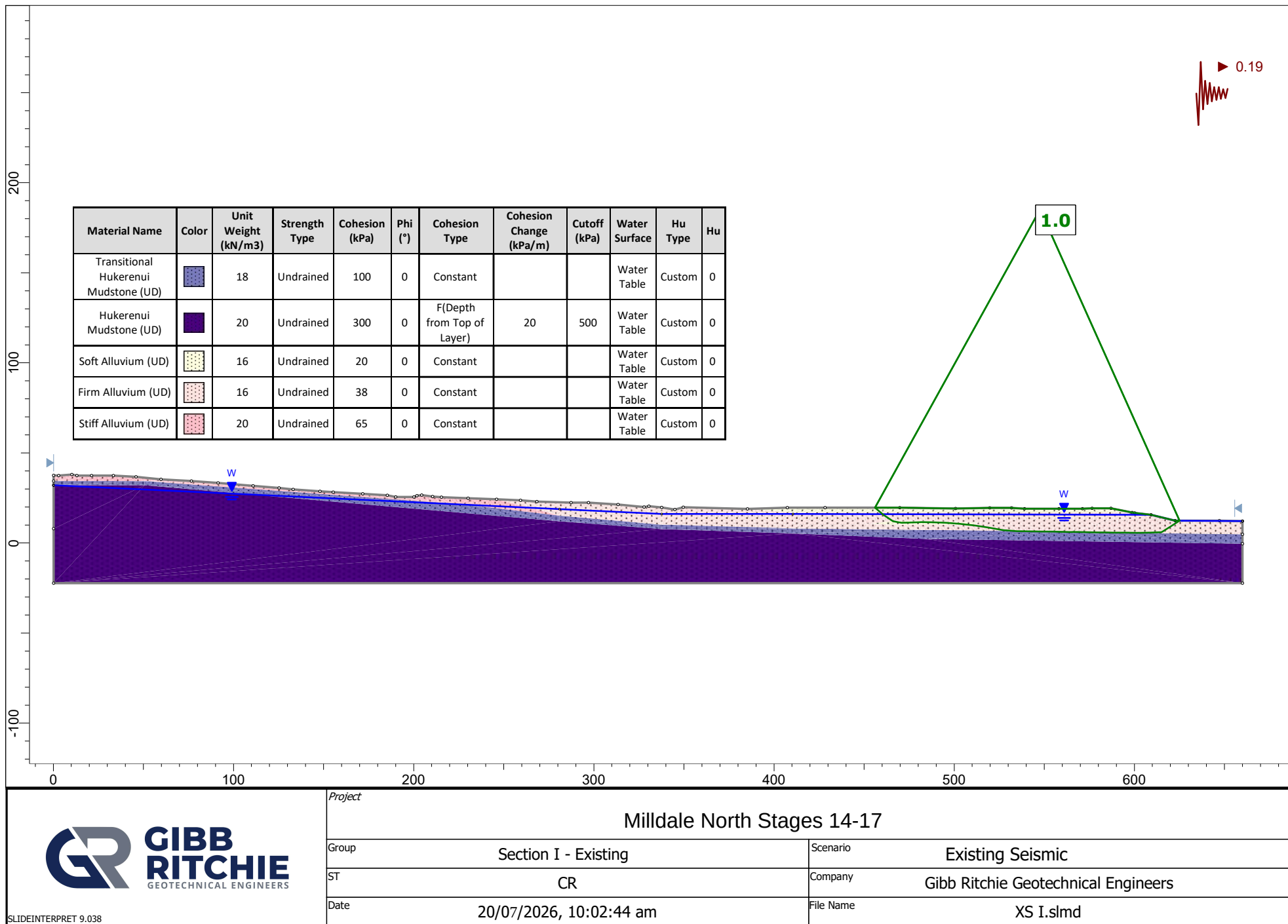
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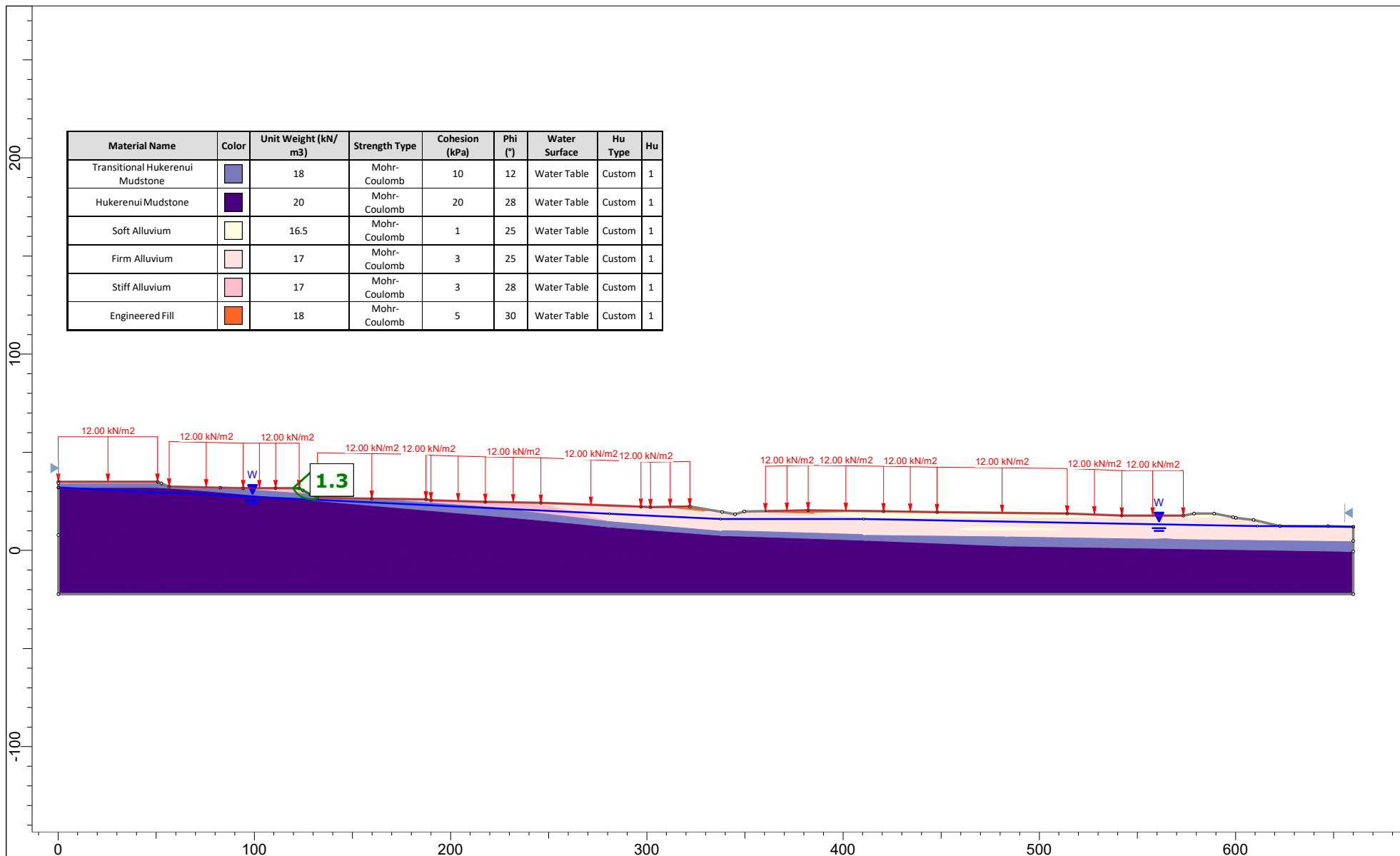
Project		Milldale North Stages 14-17	
Group	Section I - Existing	Scenario	Existing NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS I.slmd



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Project				Milldale North Stages 14-17			
Group		Section I - Existing			Scenario		
ST		CR			Company		
Date		20/07/2026, 10:02:44 am			File Name		
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					Gibb Ritchie Geotechnical Engineers		
					XS I.slmd		



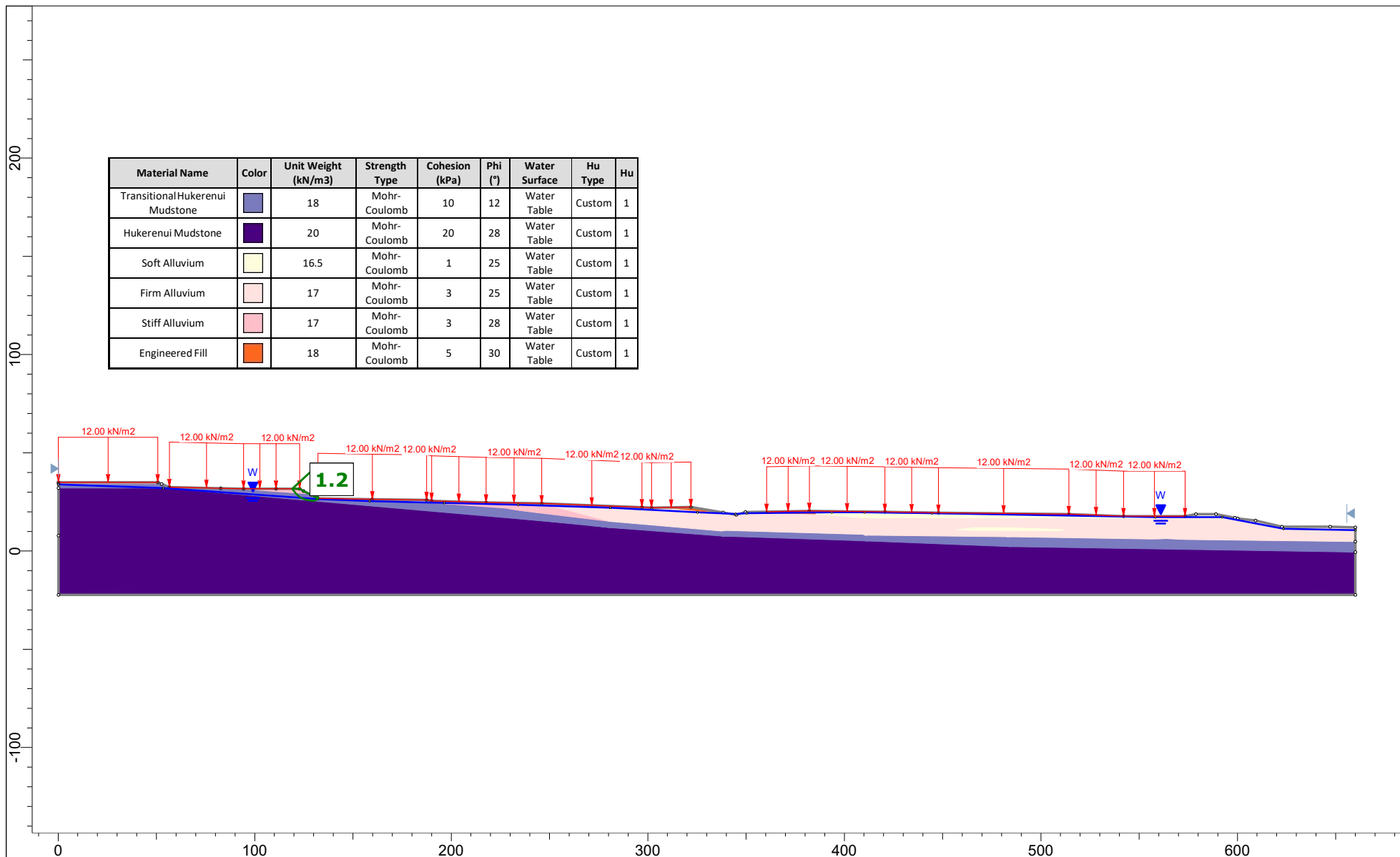


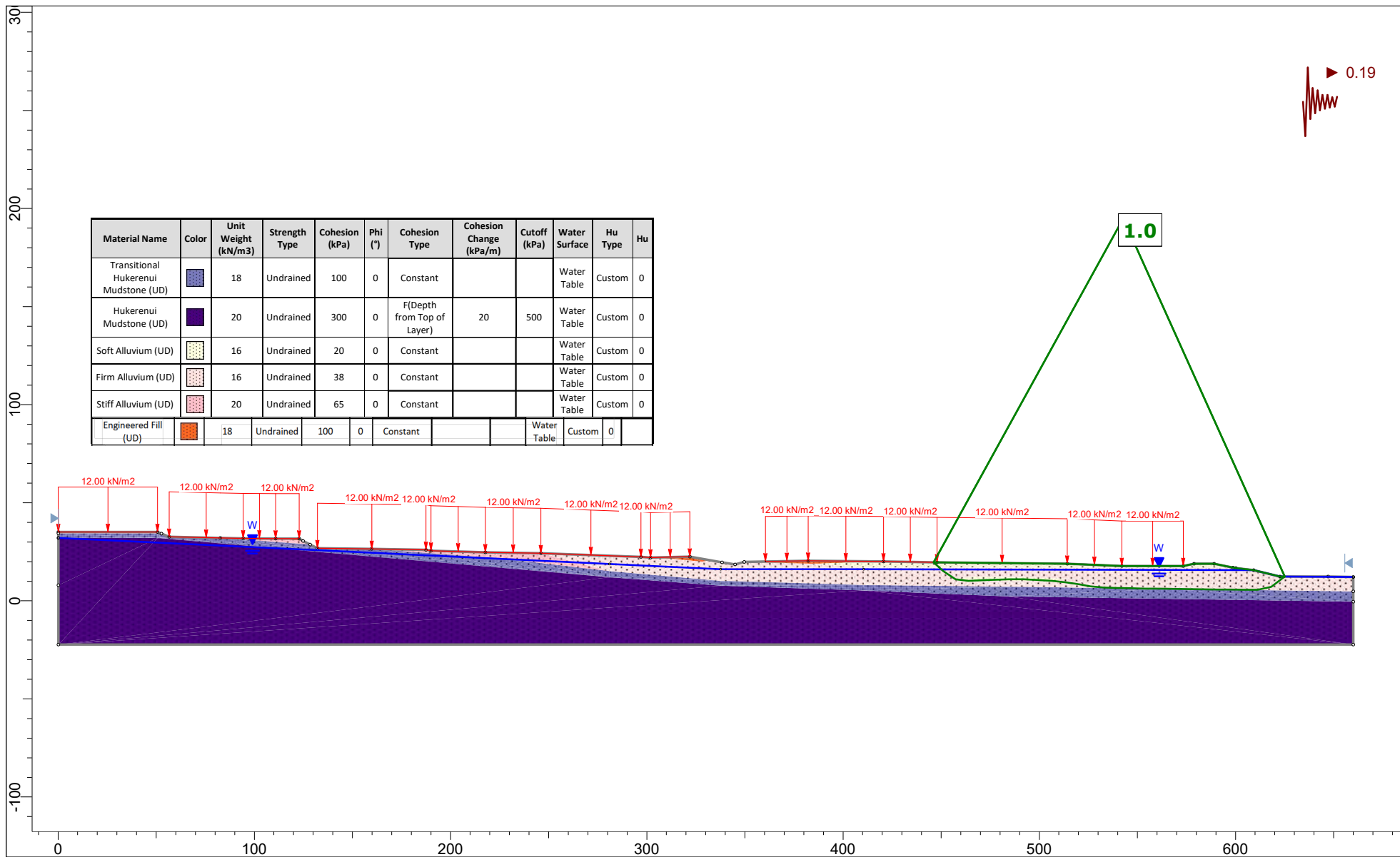
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Soft Alluvium		16.5	Mohr-Coulomb	1	25	Water Table	Custom	1
Firm Alluvium		17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



SLIDEINTERPRET 9.038

Project			
Milldale North Stages 14-17			
Group	Section I - Proposed		Scenario
ST	CR		Company
Date	20/07/2026, 10:02:44 am		File Name
			Proposed NGW
			Gibb Ritchie Geotechnical Engineers
			XS I.slmd



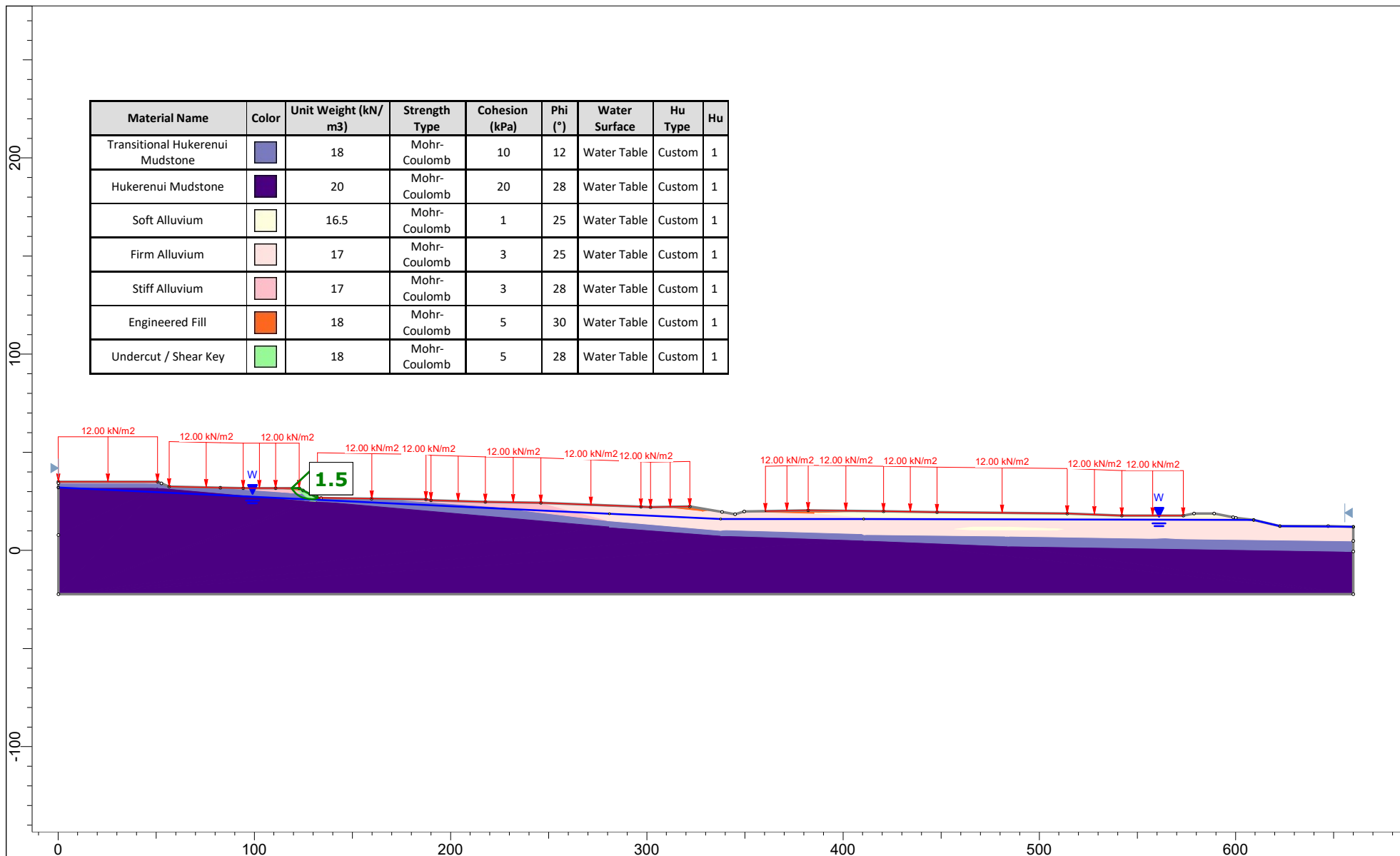


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	Group	Section I - Proposed	Scenario	Proposed Seismic
	ST	CR	Company	Gibb Ritchie Geotechnical Engineers
	Date	20/07/2026, 10:02:44 am	File Name	XS I.slmd
	SLIDEINTERPRET 9.038			

Material Name	Color	Unit Weight (kN/m³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Hu Type	Hu	Ru Value
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0	
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	Water Table	Custom	0	
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			Water Table	Custom	0	
Engineered Fill (UD)		18	Undrained	100	0	Constant			Water Table	Custom	0	
Soft Alluvium (UD, Post Softening)		16	Undrained	16	0	Constant			None			0
Firm Alluvium (UD, Post Softening)		16	Undrained	30	0	Constant			None			0



	<i>Project</i>
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SLIDEINTERPRET 9.038

Project

Milldale North Stages 14-17

Group

Section I - Remediated

Scenario

Remediated NGW

ST

CR

Company

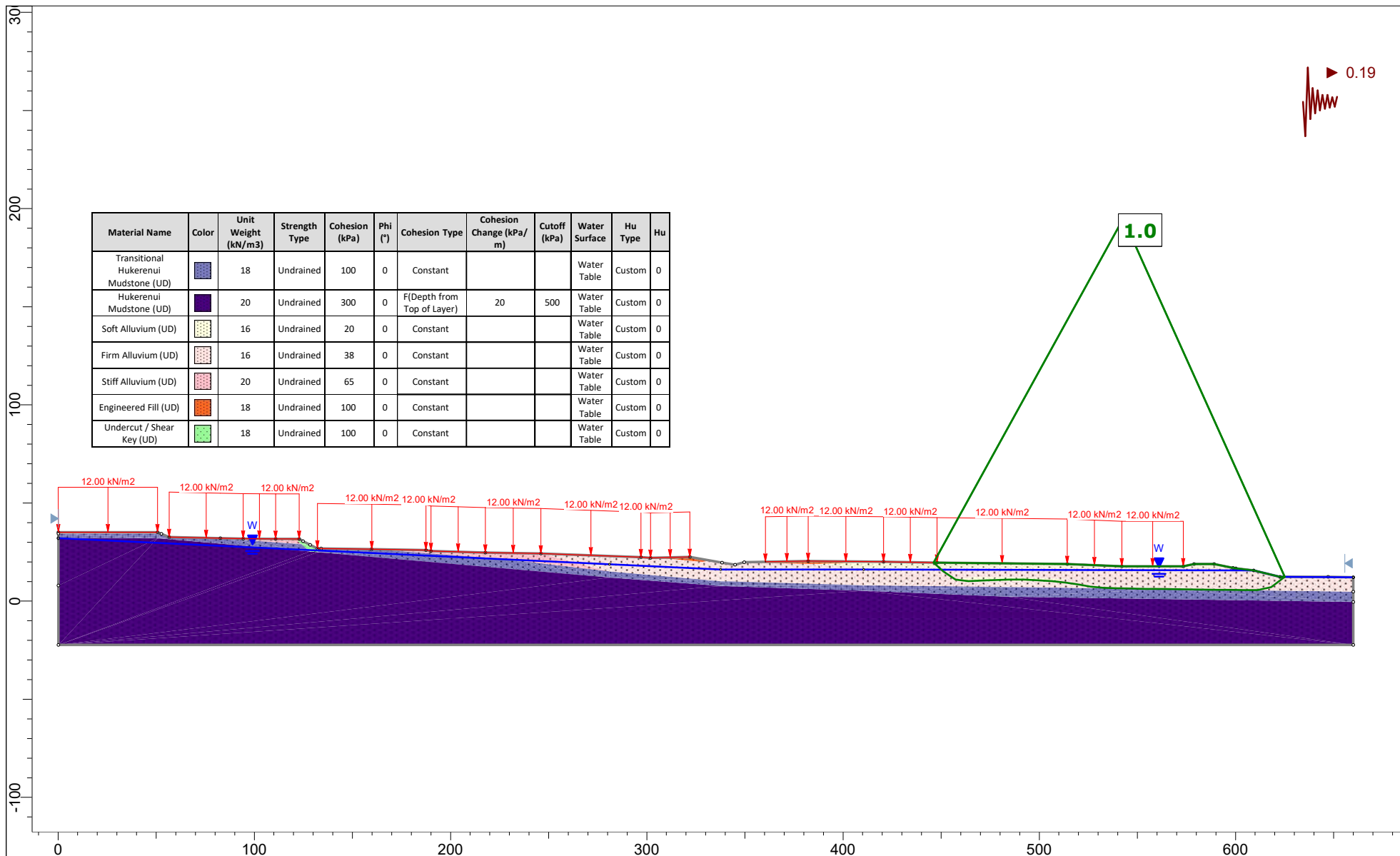
Gibb Ritchie Geotechnical Engineers

Date

20/07/2026, 10:02:44 am

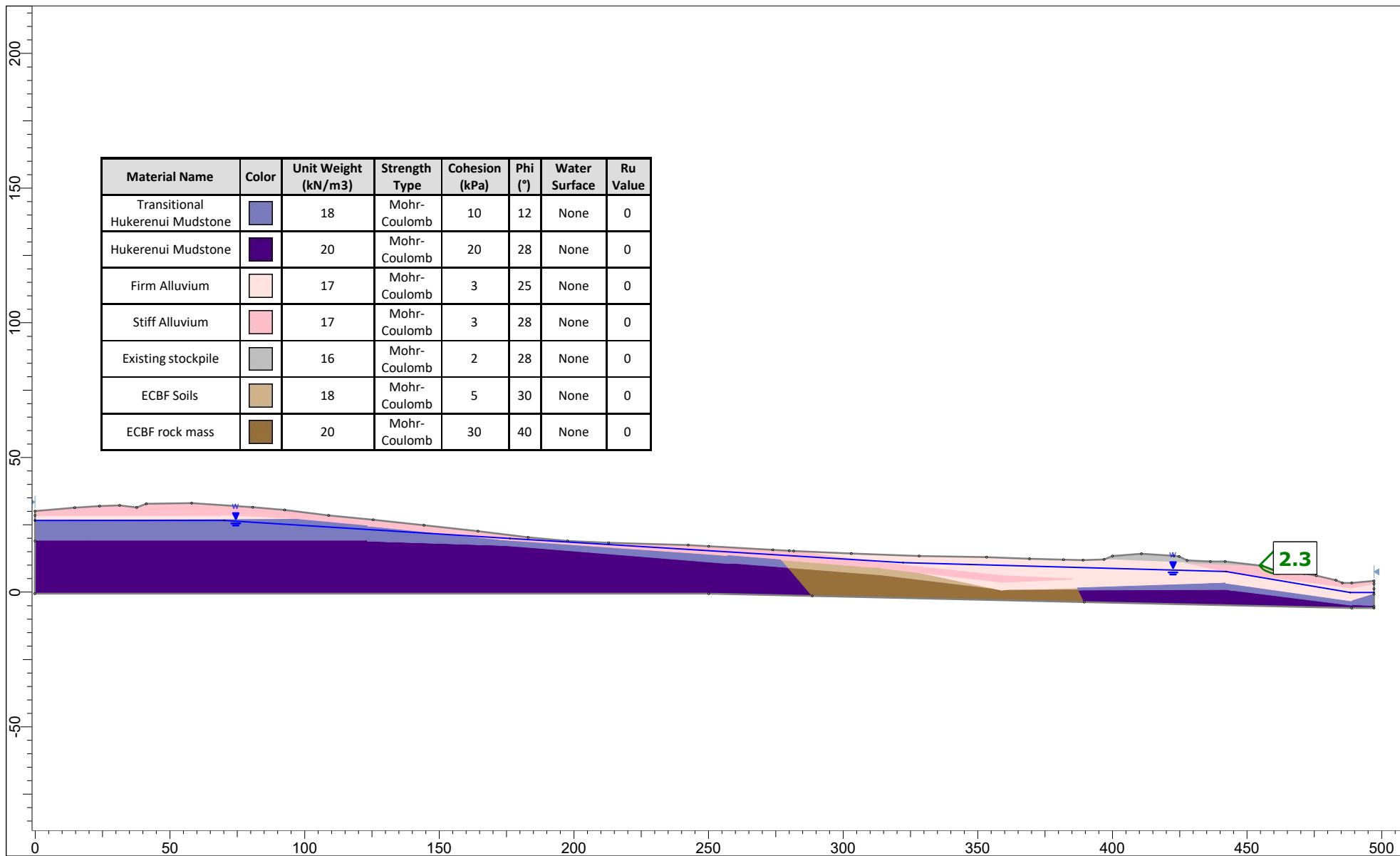
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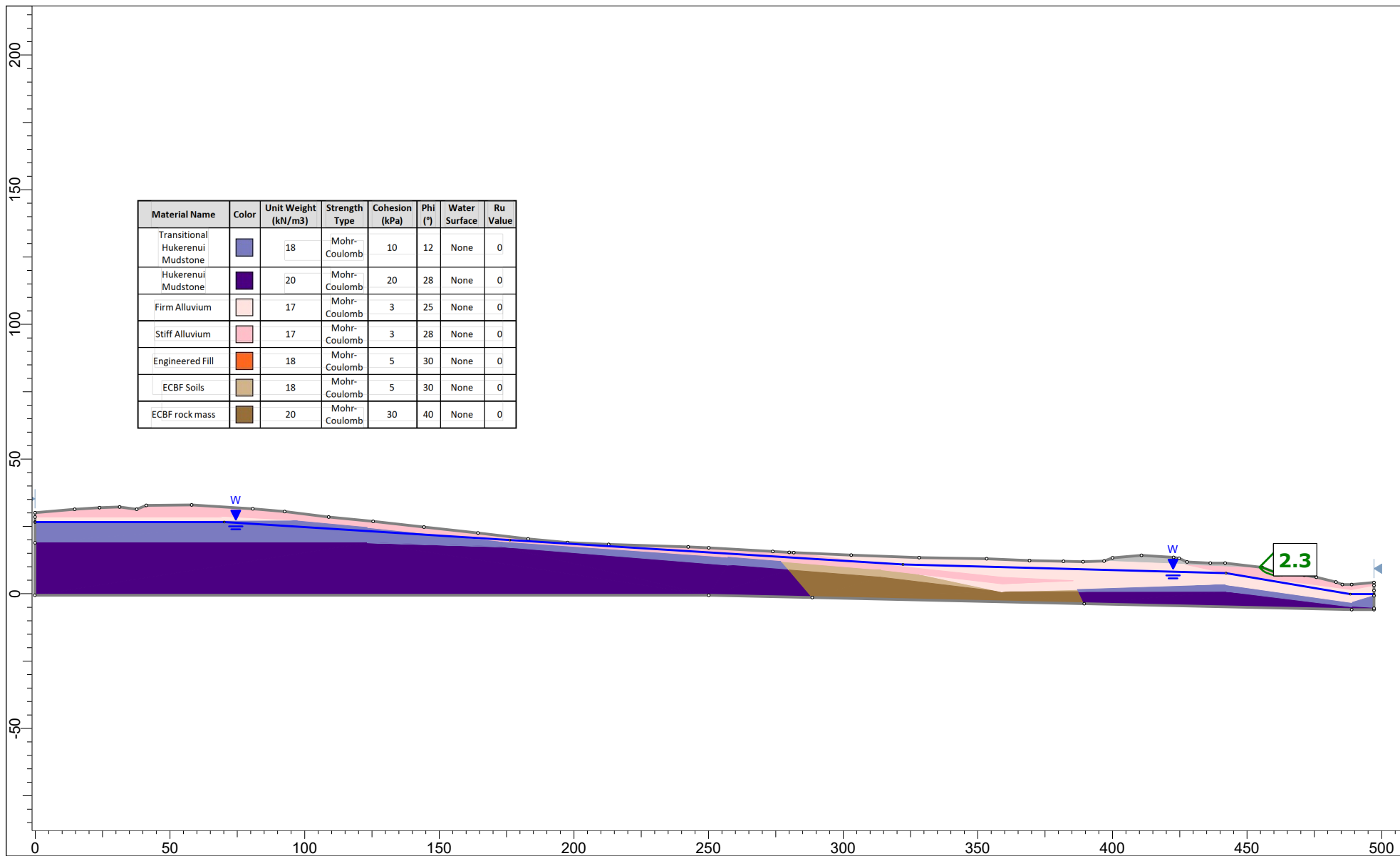
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section I - Existing	Scenario	Remediated - Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	25/03/2026, 10:02:44 am	File Name	XS I.slmd



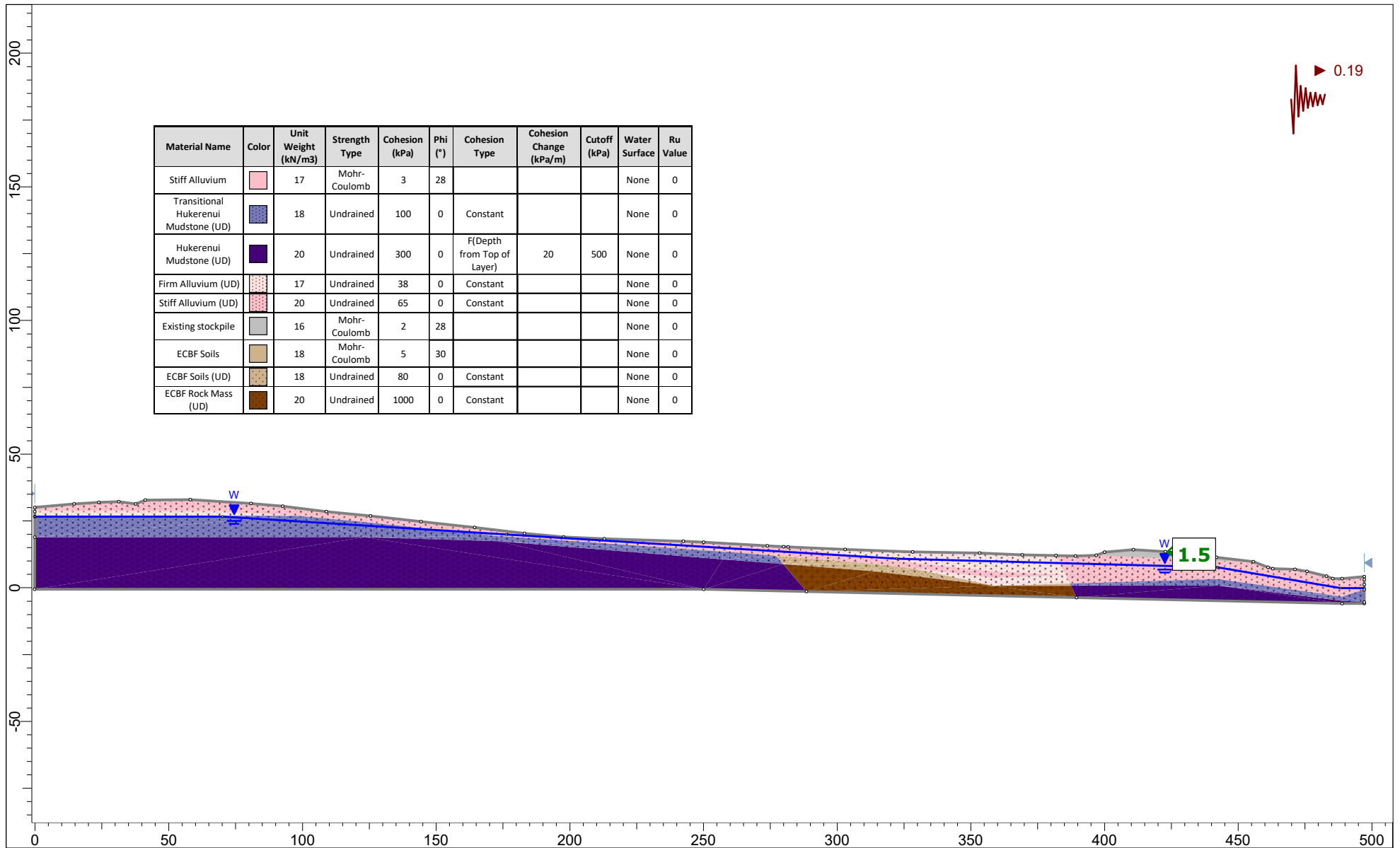
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section K - Existing			Scenario		
ST		CR			Company		
Date		20/07/2026, 10:02:44 am			File Name		
					Existing NGW		
					Gibb Ritchie Geotechnical Engineers		
					XS K.slm		



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Project		Milldale North Stages 14-17	
Group	Section K - Existing	Scenario	Existing HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS K.slmd

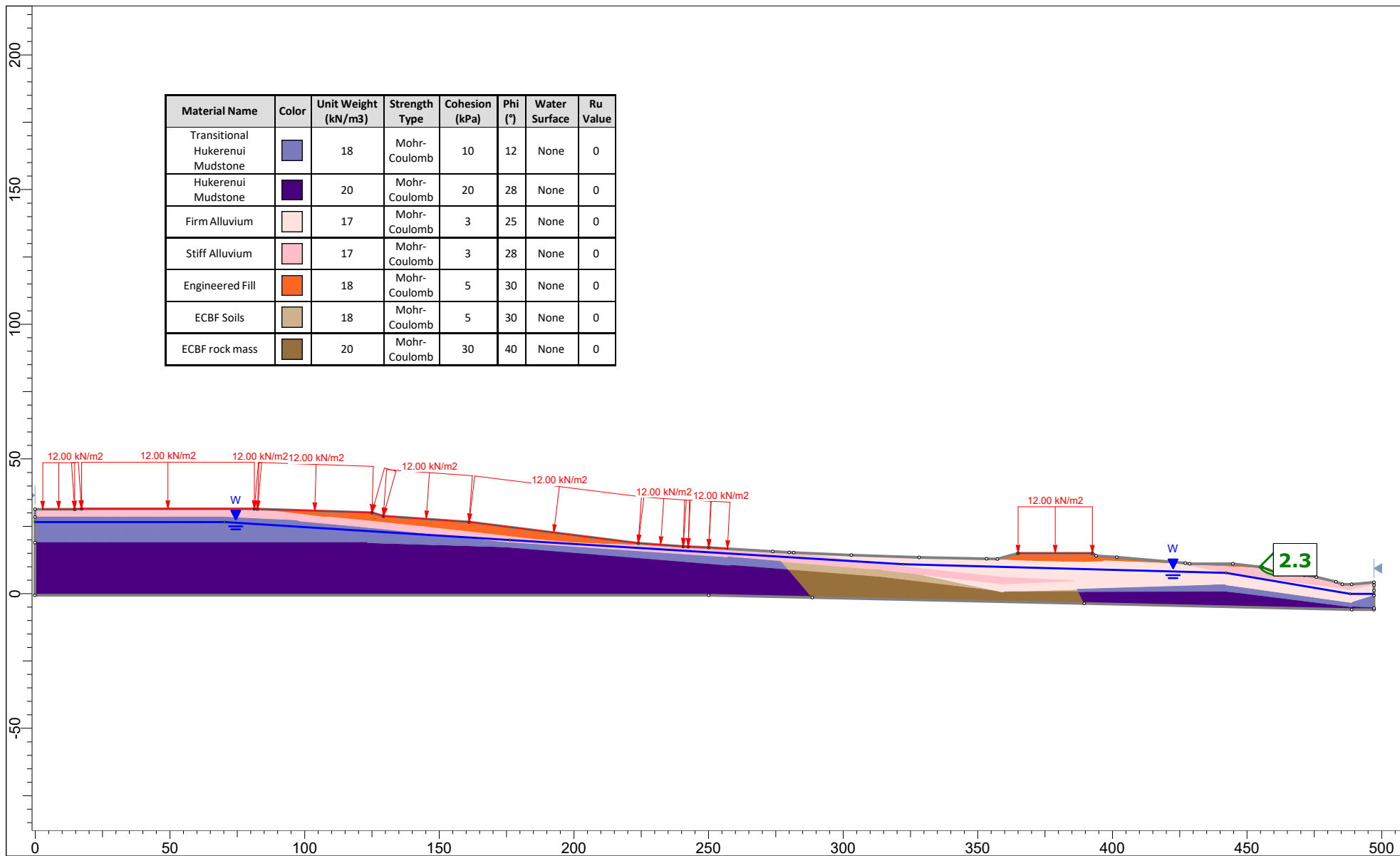


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Ru Value
Stiff Alluvium		17	Mohr-Coulomb	3	28				None	0
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			None	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	None	0
Firm Alluvium (UD)		17	Undrained	38	0	Constant			None	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			None	0
Existing stockpile		16	Mohr-Coulomb	2	28				None	0
ECBF Soils		18	Mohr-Coulomb	5	30				None	0
ECBF Soils (UD)		18	Undrained	80	0	Constant			None	0
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SLIDEINTERPRET 9.038

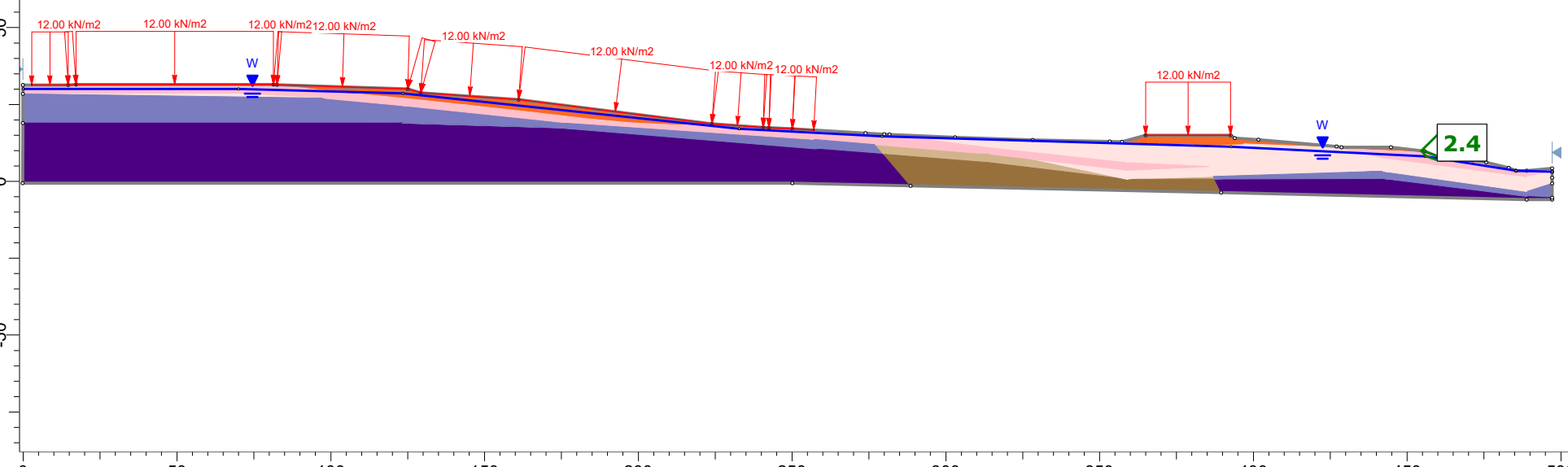
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Group	Section K - Existing	Scenario	Existing Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS K.slmd



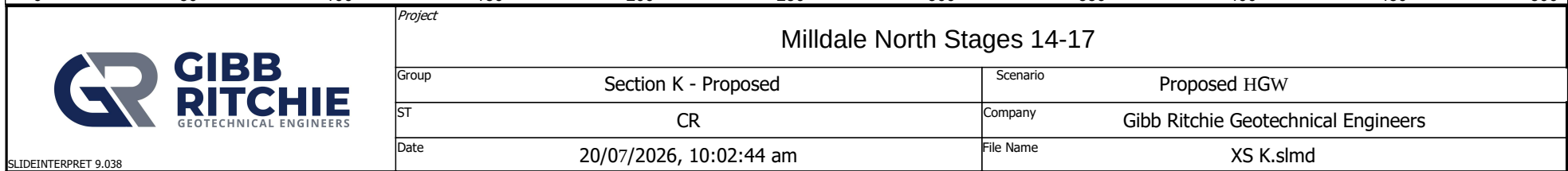
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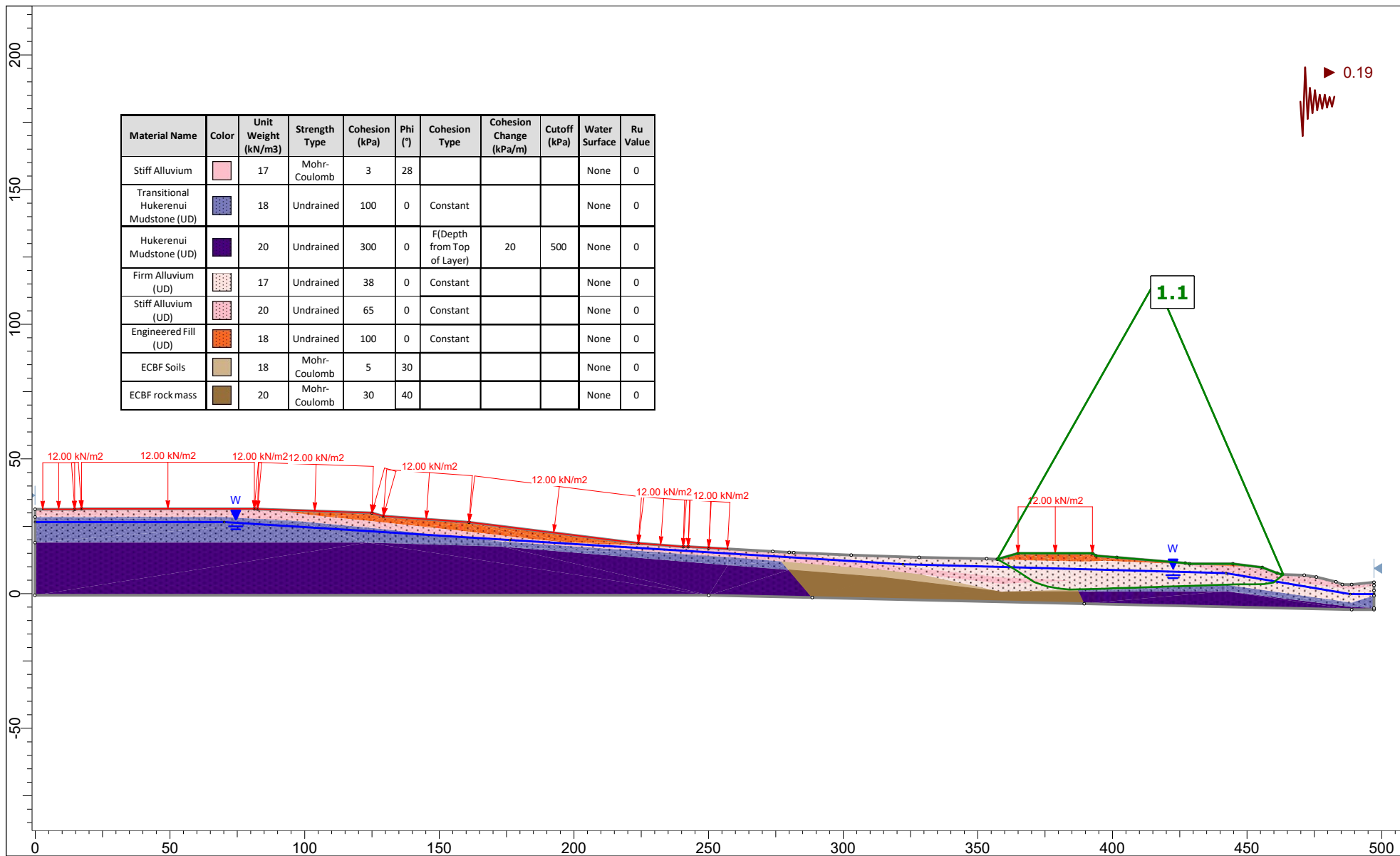
Project			
Milldale North Stages 14-17			
Group	Section K - Proposed		Scenario
			Proposed NGW
ST	CR		Company
			Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am		File Name
			XS K.slmd

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	None	0
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	None	0
Firm Alluvium		17	Mohr-Coulomb	3	25	None	0
Stiff Alluvium		17	Mohr-Coulomb	3	28	None	0
Engineered Fill		18	Mohr-Coulomb	5	30	None	0
ECBF Soils		18	Mohr-Coulomb	5	30	None	0
ECBF rock mass		20	Mohr-Coulomb	30	40	None	0



The diagram illustrates a geotechnical cross-section of a slope. The horizontal axis represents distance in meters, ranging from 0 to 500. The vertical axis represents elevation in meters, ranging from -50 to 200. The soil profile consists of several layers: a top layer of Firm Alluvium (light pink), followed by Stiff Alluvium (pink), Engineered Fill (orange), ECBF Soils (tan), and ECBF rock mass (brown). A water table is indicated by a blue line with downward arrows labeled 'W'. Multiple surcharge loads of 12.00 kN/m² are applied to the ground surface, represented by red arrows. A green box with the value '2.4' is located near the right end of the slope.



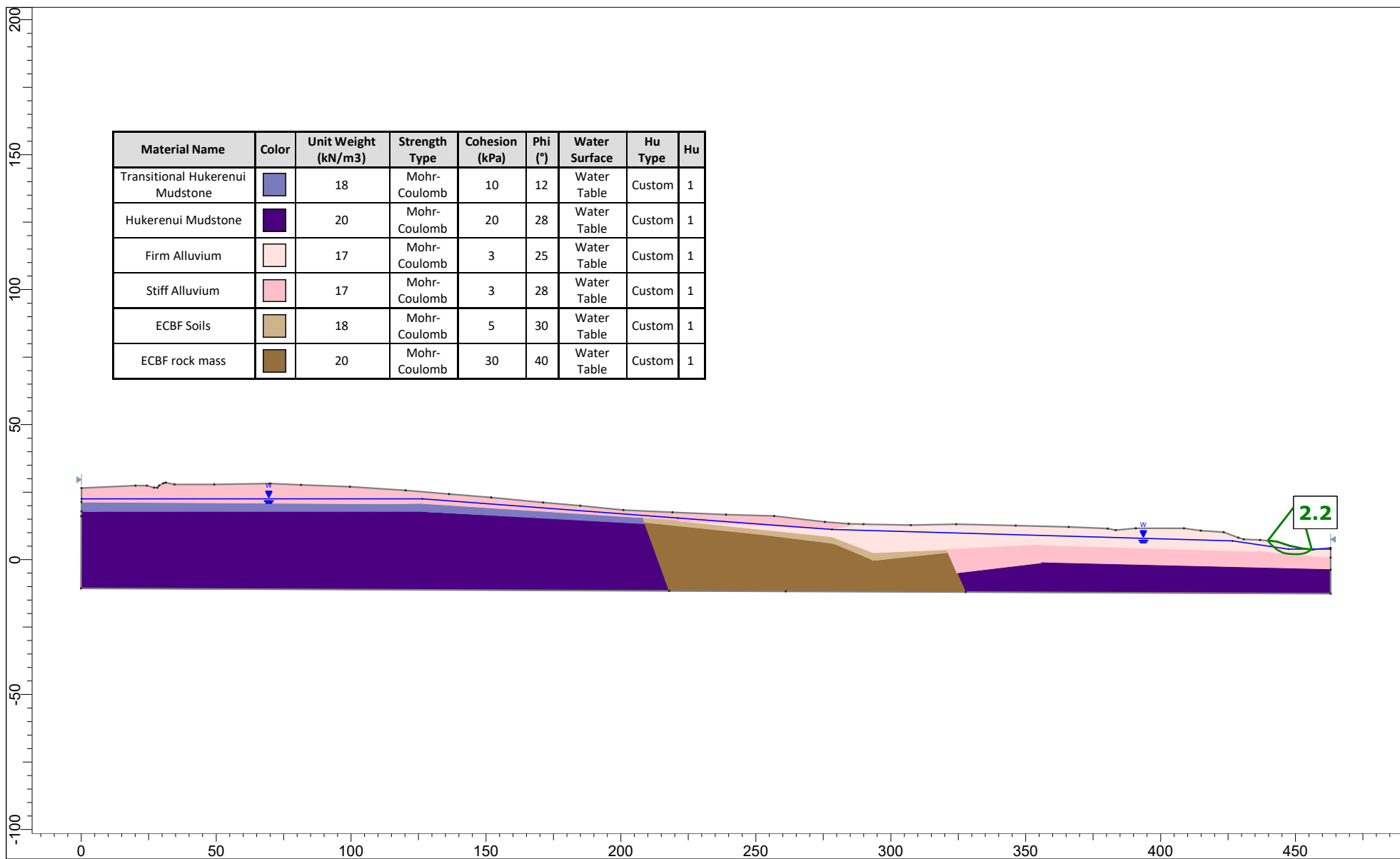


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Cutoff (kPa)	Water Surface	Ru Value
Stiff Alluvium		17	Mohr-Coulomb	3	28				None	0
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant			None	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	500	None	0
Firm Alluvium (UD)		17	Undrained	38	0	Constant			None	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant			None	0
Engineered Fill (UD)		18	Undrained	100	0	Constant			None	0
ECBF Soils		18	Mohr-Coulomb	5	30				None	0
ECBF rock mass		20	Mohr-Coulomb	30	40				None	0



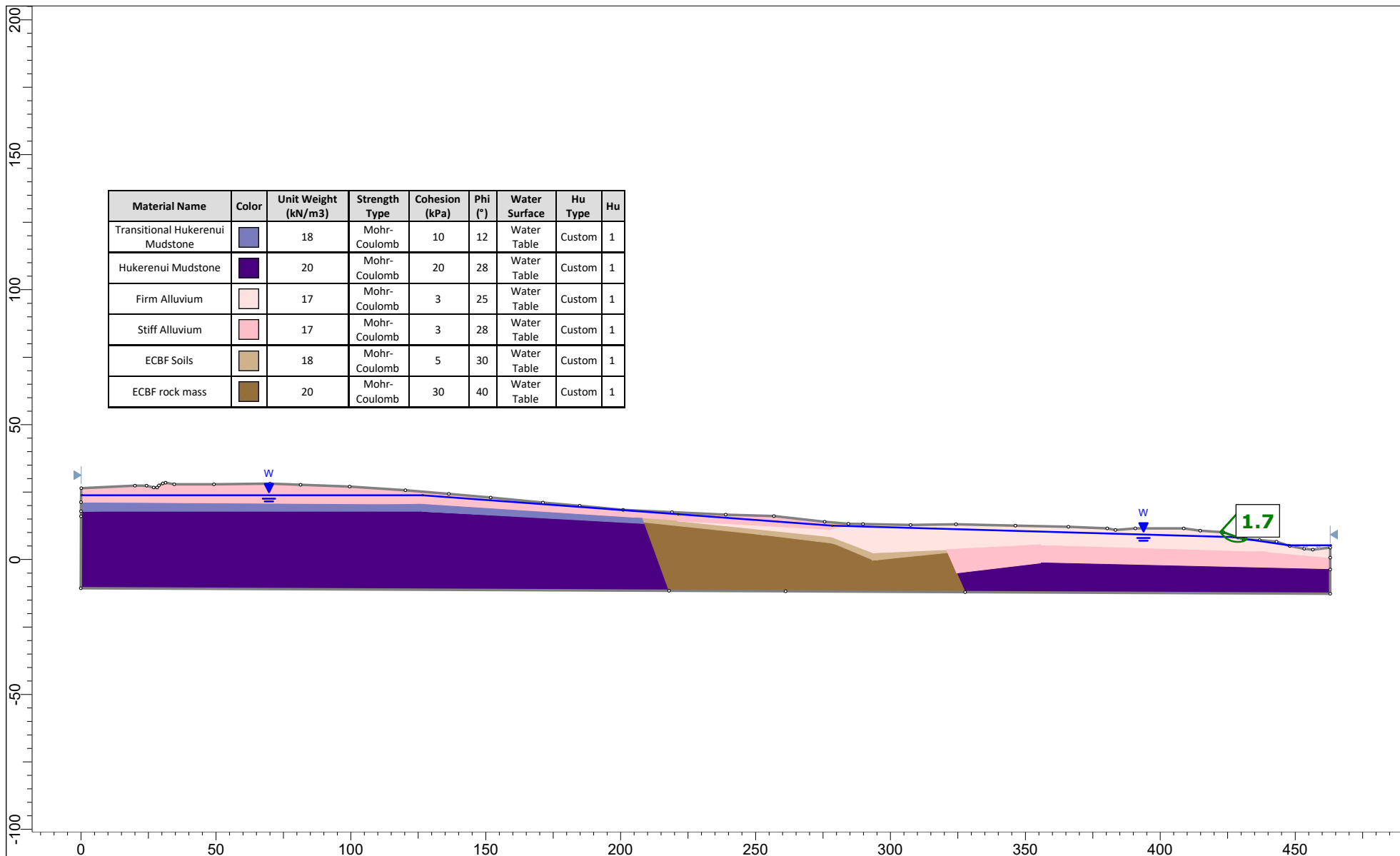
SLIDEINTERPRET 9.038

Project			Milldale North Stages 14-17		
Group		Section K - Proposed		Scenario	
ST		CR		Company	
Date		20/07/2026, 10:02:44 am		File Name	
				Gibb Ritchie Geotechnical Engineers	
				XS K.slmd	



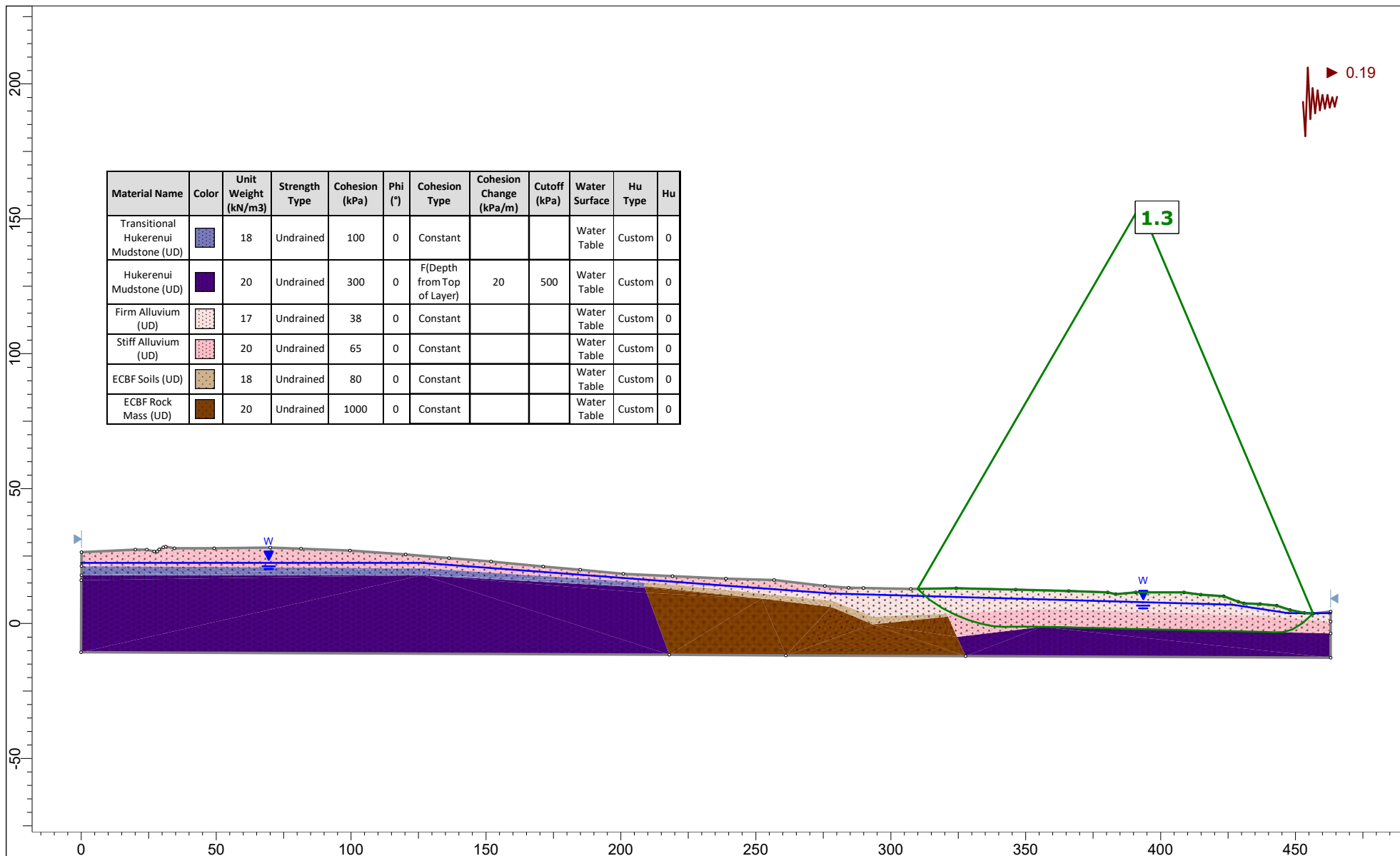
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section L - Existing			Scenario		
ST		CR			Company		
Date		20/07/2026, 10:02:44 am			File Name		
					Existing NGW		
					Gibb Ritchie Geotechnical Engineers		
					XS L.slmd		



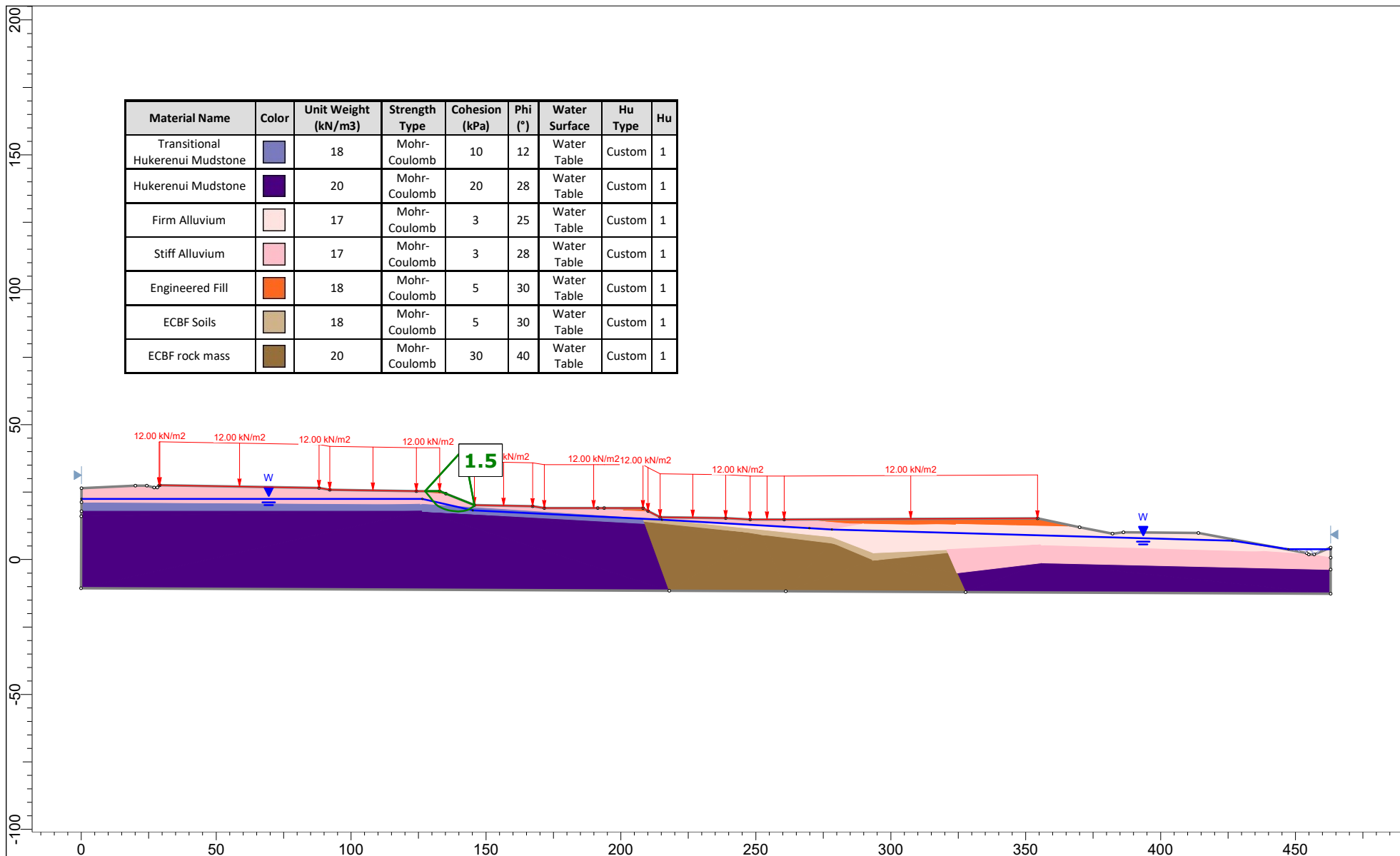
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section L - Existing	Scenario	Existing HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS L.slmd



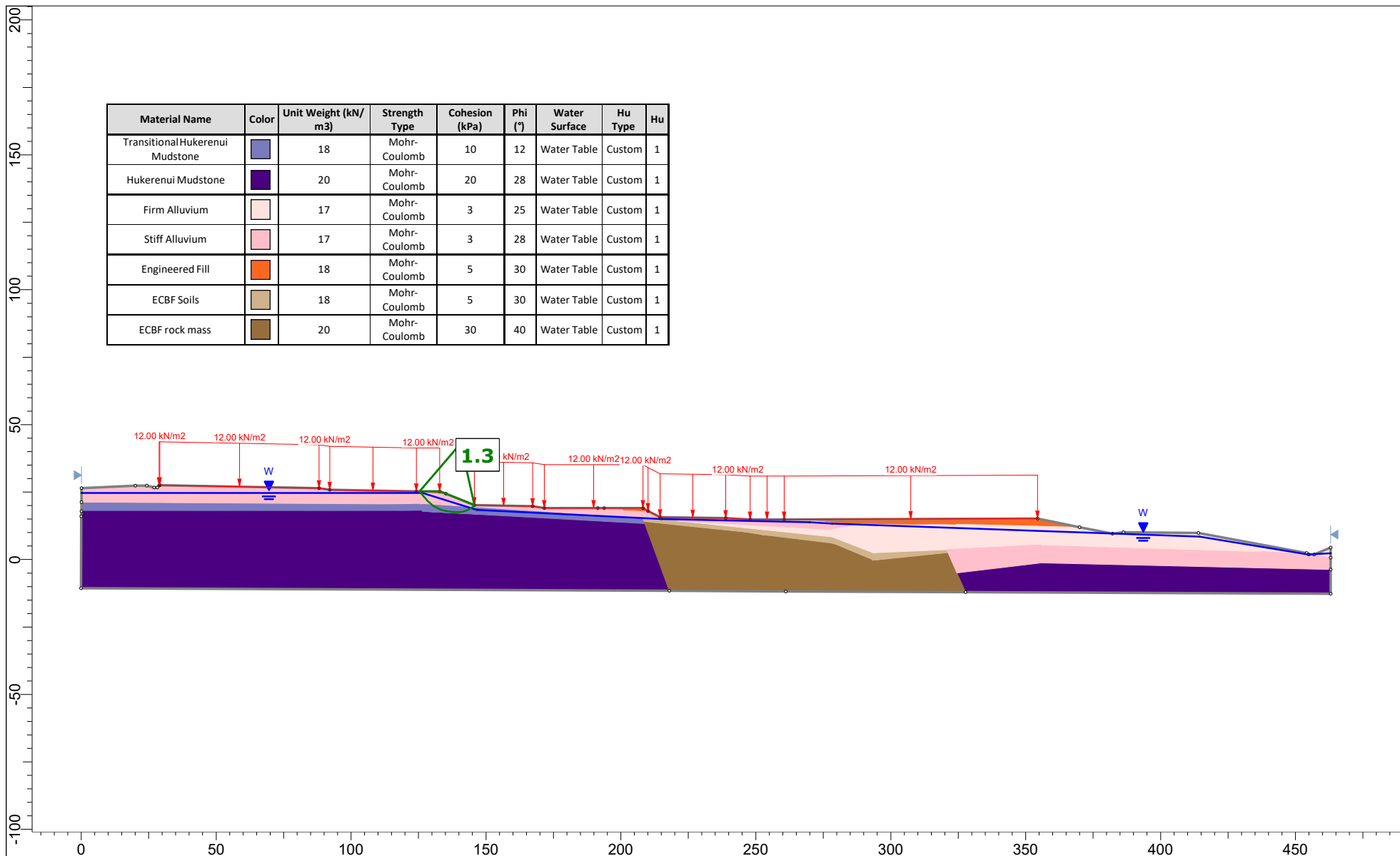
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section L - Existing	Scenario	Existing Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS L.slmd



SLIDEINTERPRET 9.038

Project			Milldale North Stages 14-17	
Group	Section L - Proposed		Scenario	Proposed NGW
ST	CR		Company	Gibb Ritchie Geotechnical Engineers
Date	25/03/2026, 10:02:44 am		File Name	XS L.slmd

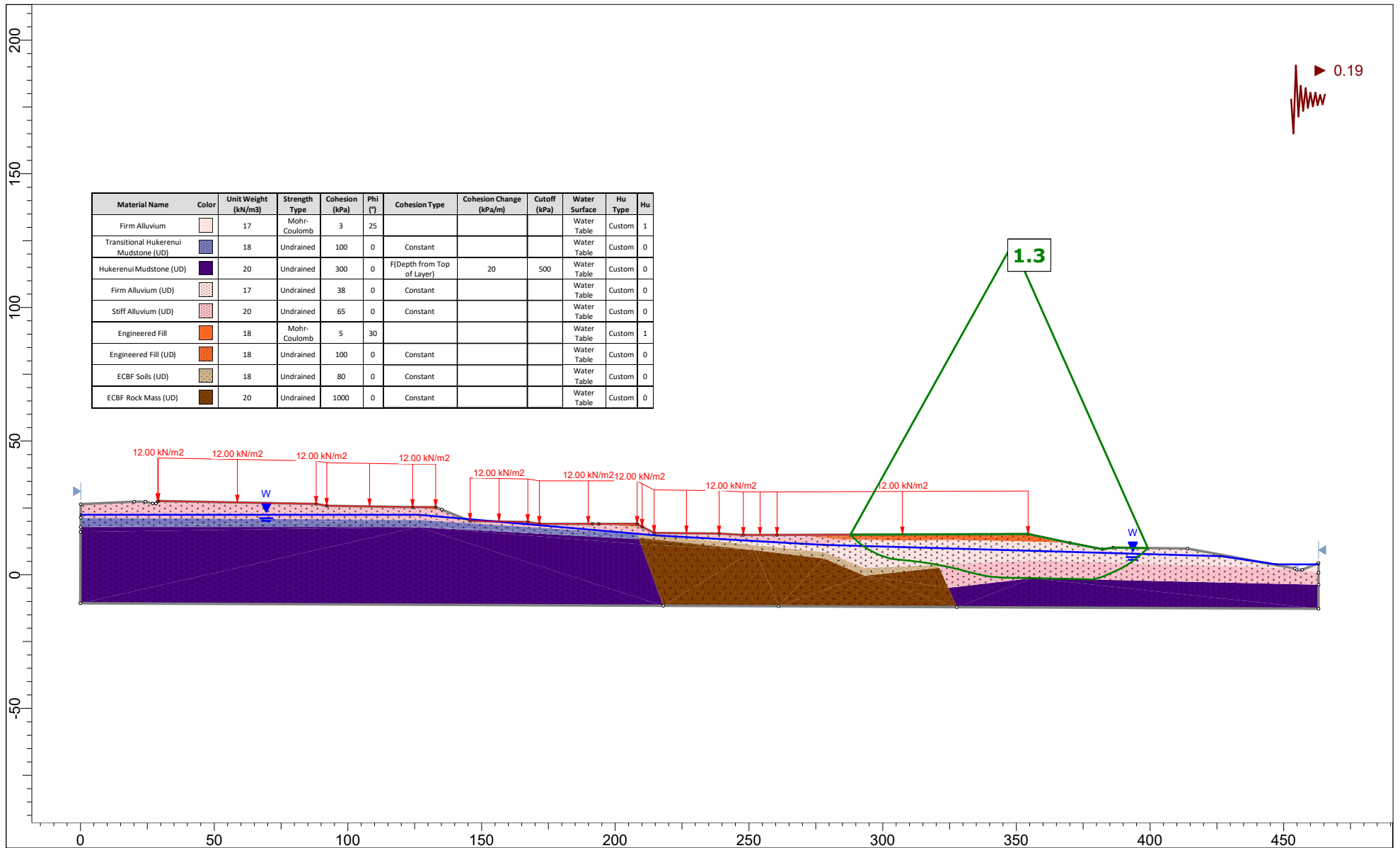


Material Name	Color	Unit Weight (kN/m³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Firm Alluvium		17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1
ECBF Soils		18	Mohr-Coulomb	5	30	Water Table	Custom	1
ECBF rock mass		20	Mohr-Coulomb	30	40	Water Table	Custom	1



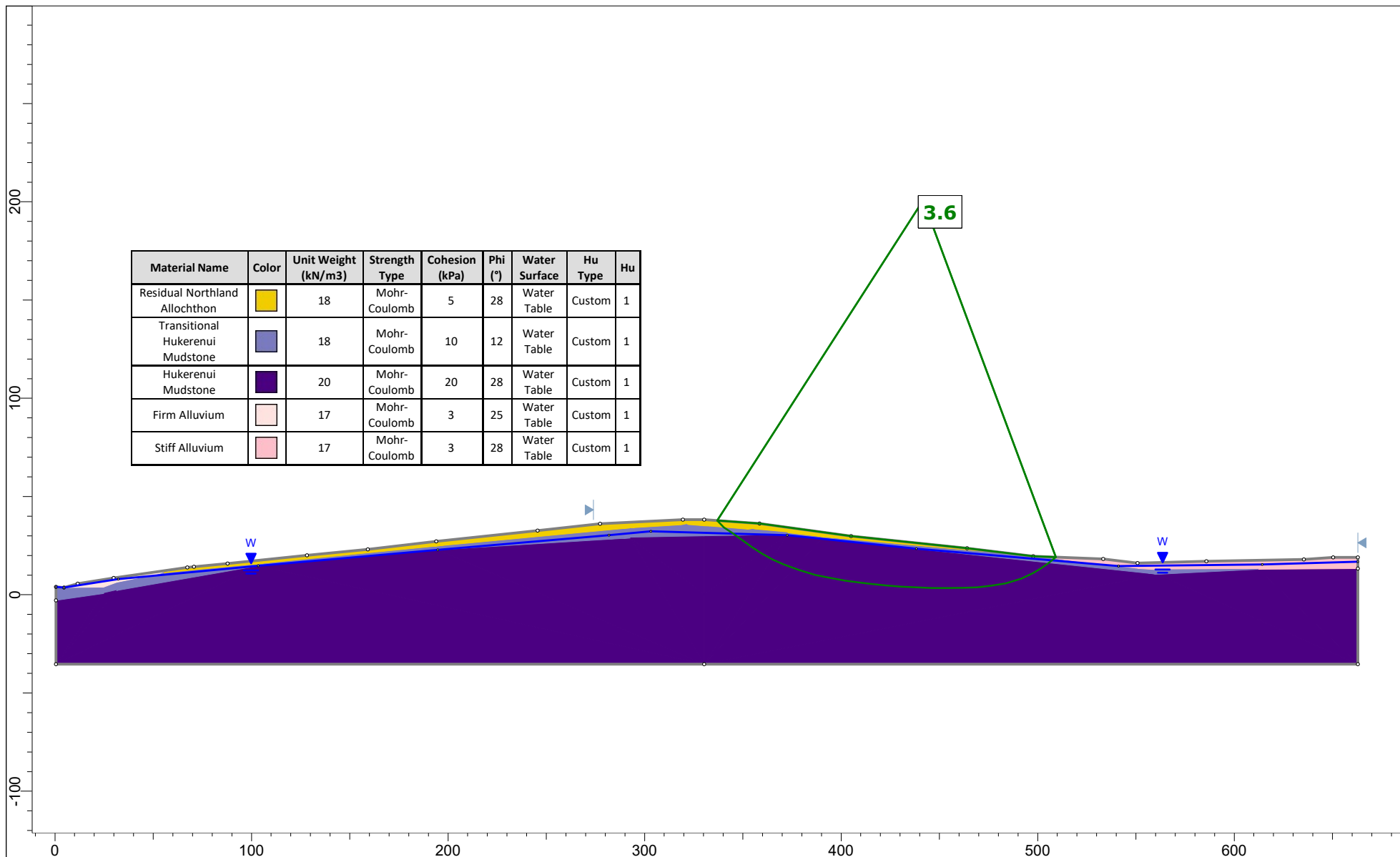
SLIDEINTERPRET 9.038

Project				Milldale North Stages 14-17			
Group		Section L - Proposed		Scenario		Proposed HGW	
ST		CR		Company		Gibb Ritchie Geotechnical Engineers	
Date		20/07/2026, 10:02:44 am		File Name		XS L.slmd	



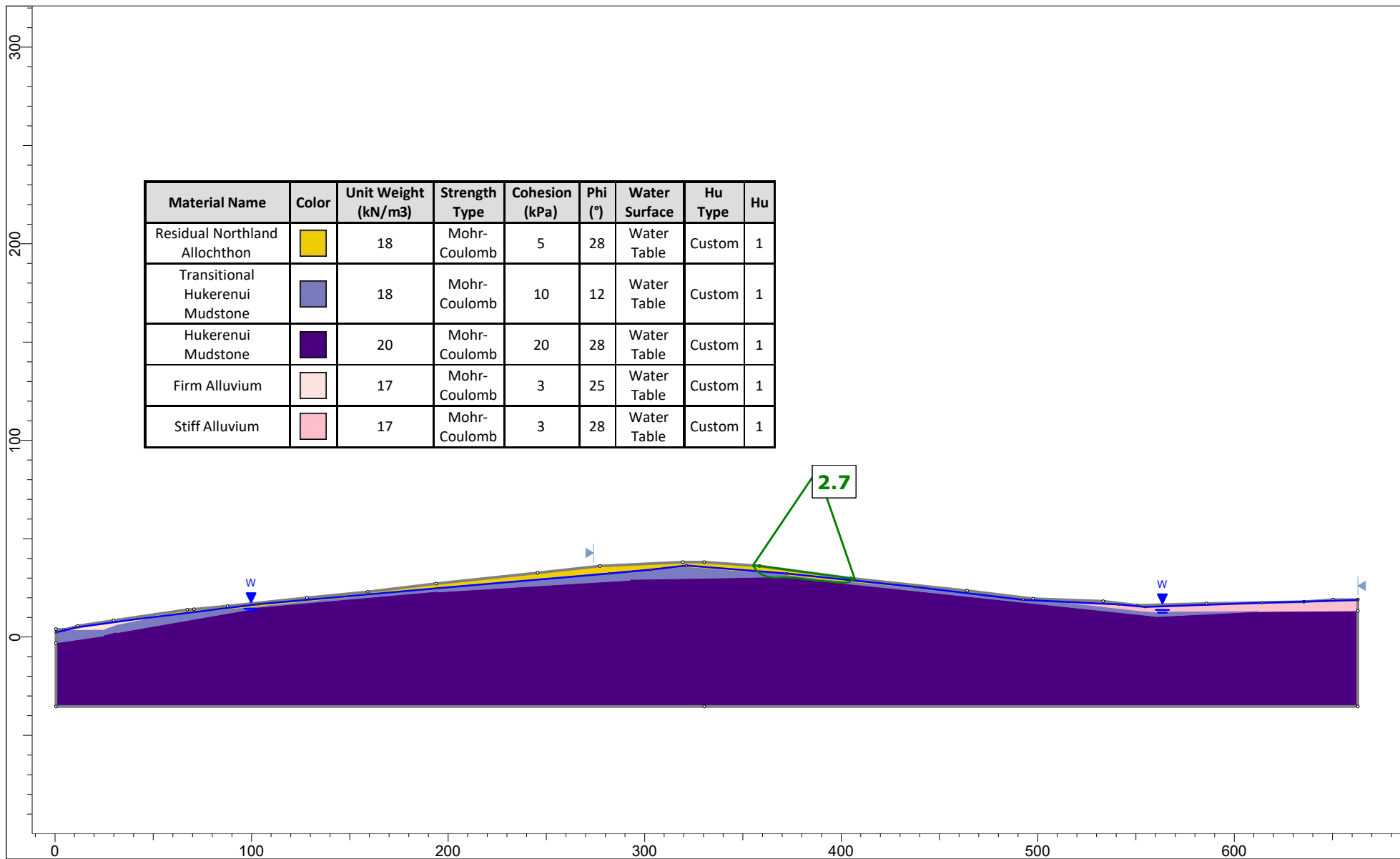
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section L - Existing	Scenario	Proposed Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	20/07/2026, 10:02:44 am	File Name	XS L.slmd



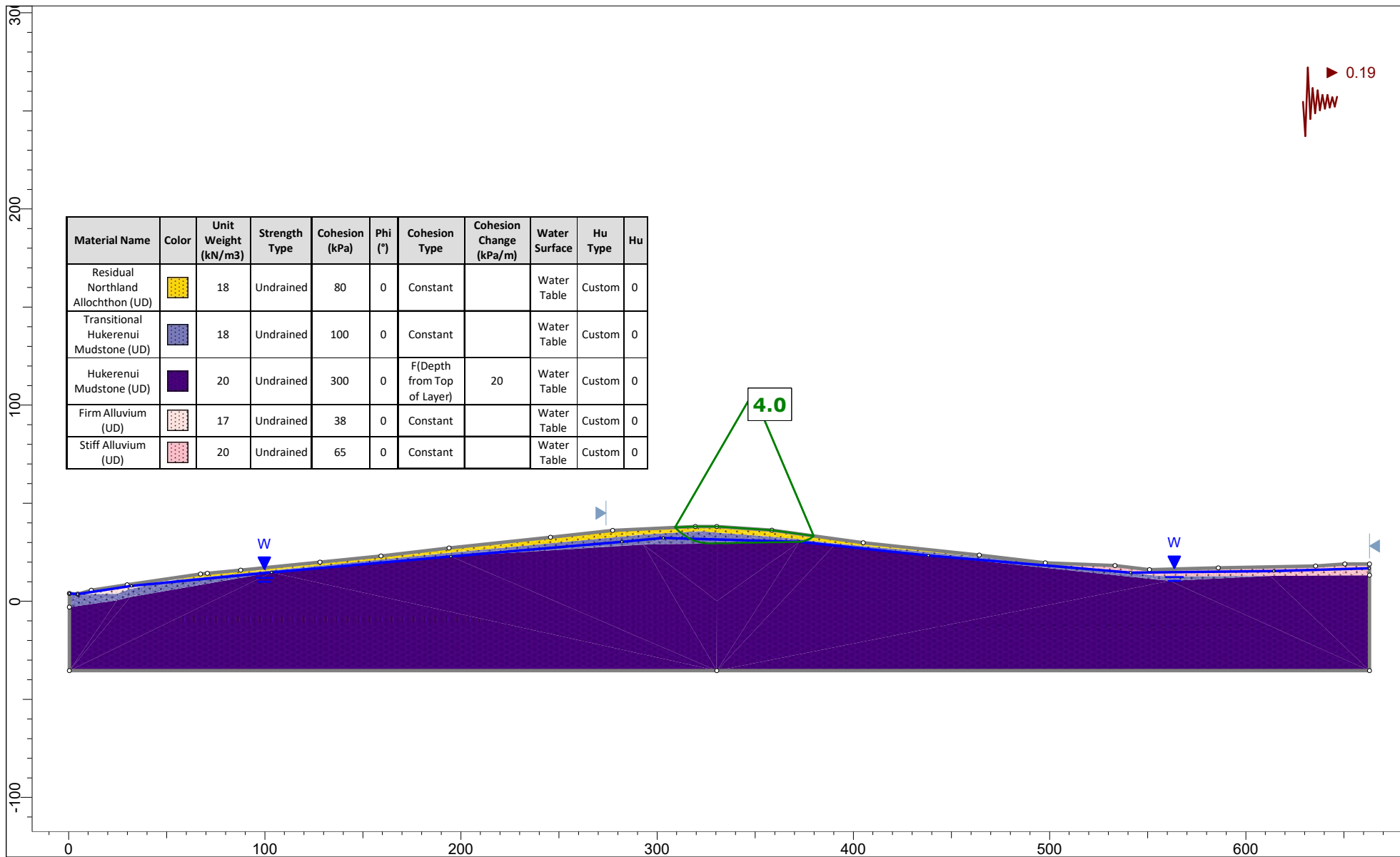
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section M - Existing West to East	Scenario	NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:16 am	File Name	XS M FINAL.slm



SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section M - Existing West to East	Scenario	HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:16 am	File Name	XS M FINAL.slmd

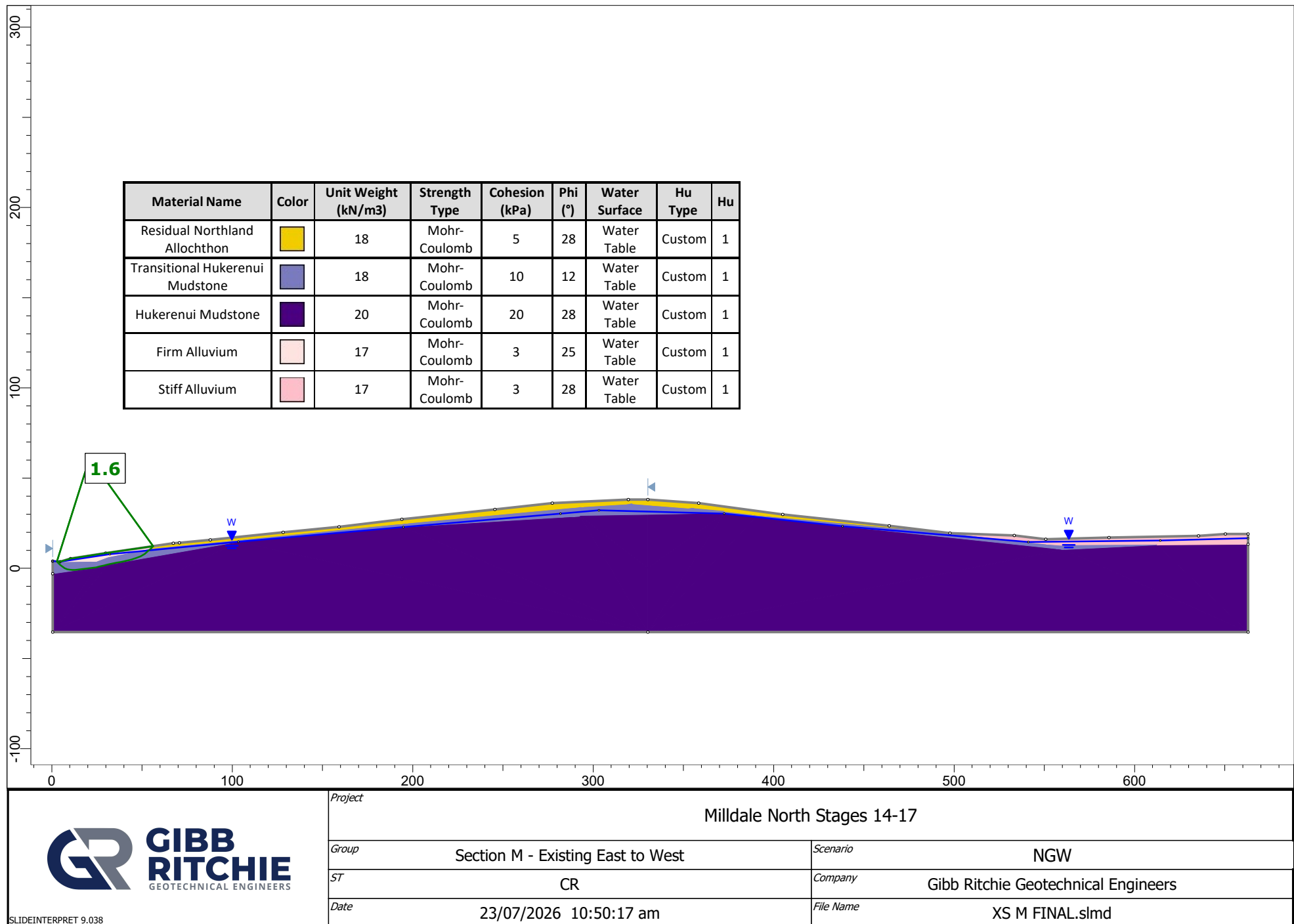


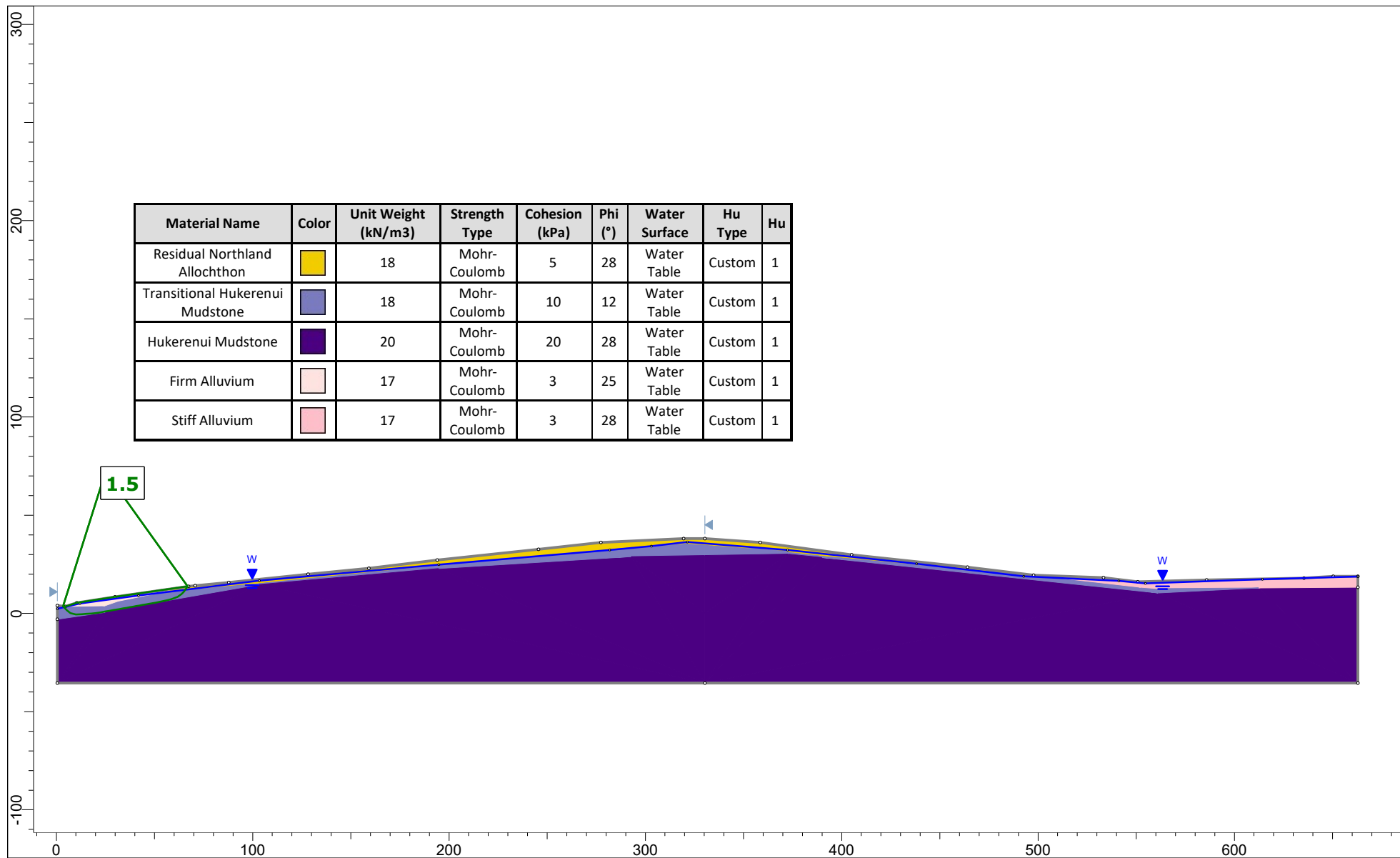
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Water Surface	Hu Type	Hu
Residual Northland Allochthon (UD)		18	Undrained	80	0	Constant		Water Table	Custom	0
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant		Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	Water Table	Custom	0
Firm Alluvium (UD)		17	Undrained	38	0	Constant		Water Table	Custom	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant		Water Table	Custom	0



SLIDEINTERPRET 9.038

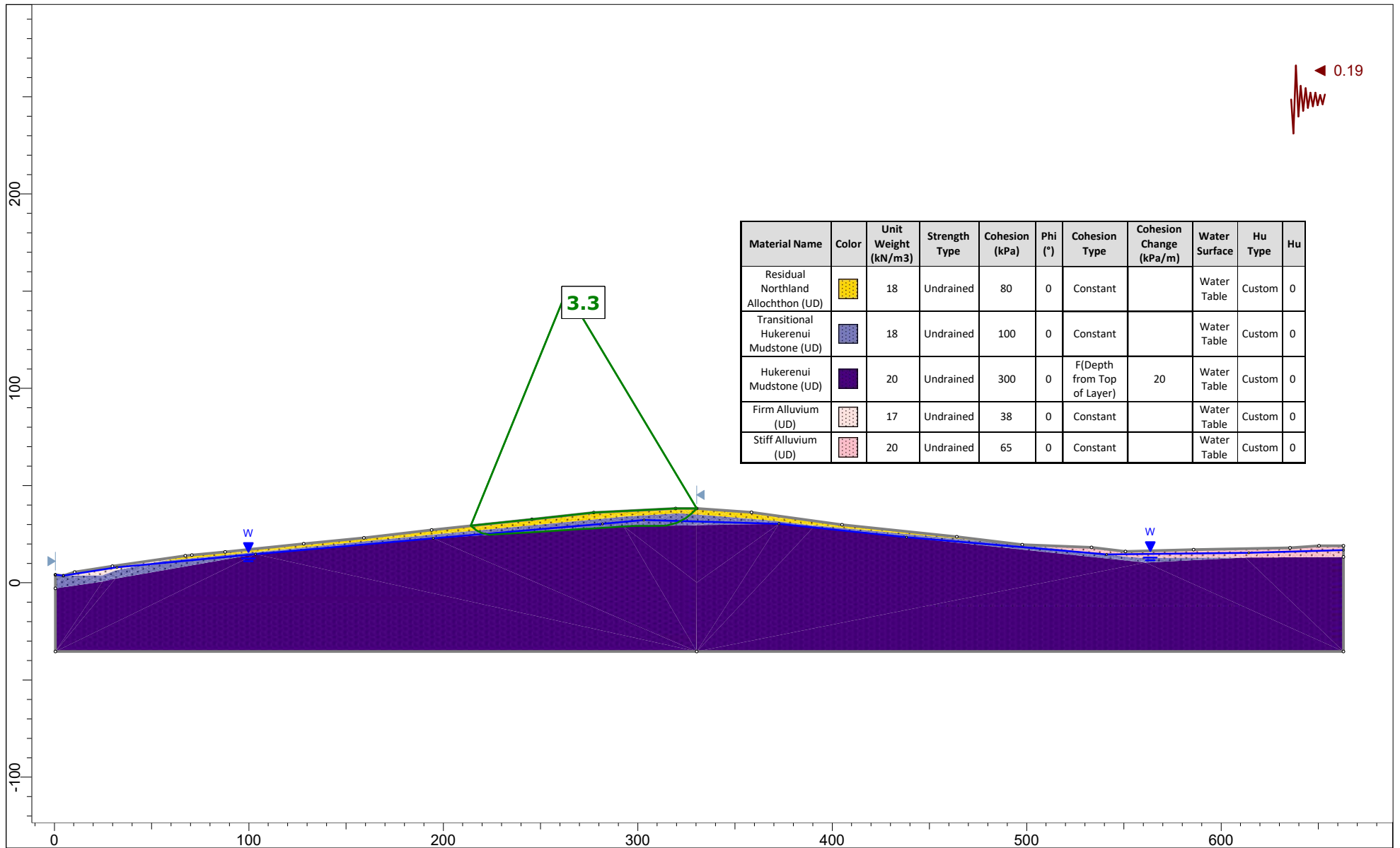
Project		Milldale North Stages 14-17	
Group	Section M - Existing West to East	Scenario	Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:17 am	File Name	XS M FINAL.slmd



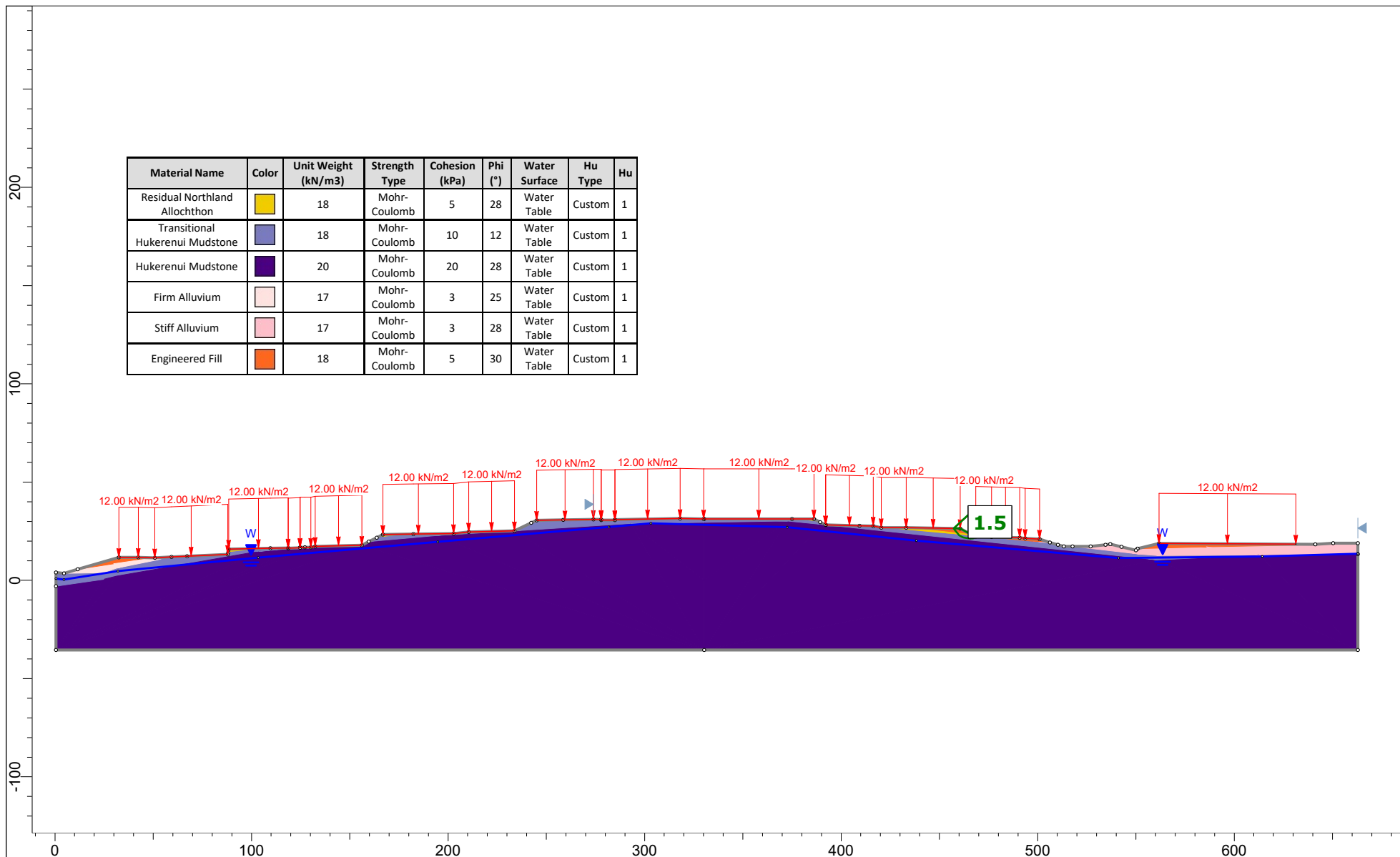


SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section M - Existing East to West	Scenario	HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:18 am	File Name	XS M FINAL.slmd



Project		Milldale North Stages 14-17	
Group	Section M - Existing East to West	Scenario	Seismic
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:18 am	File Name	XS M FINAL.slmd

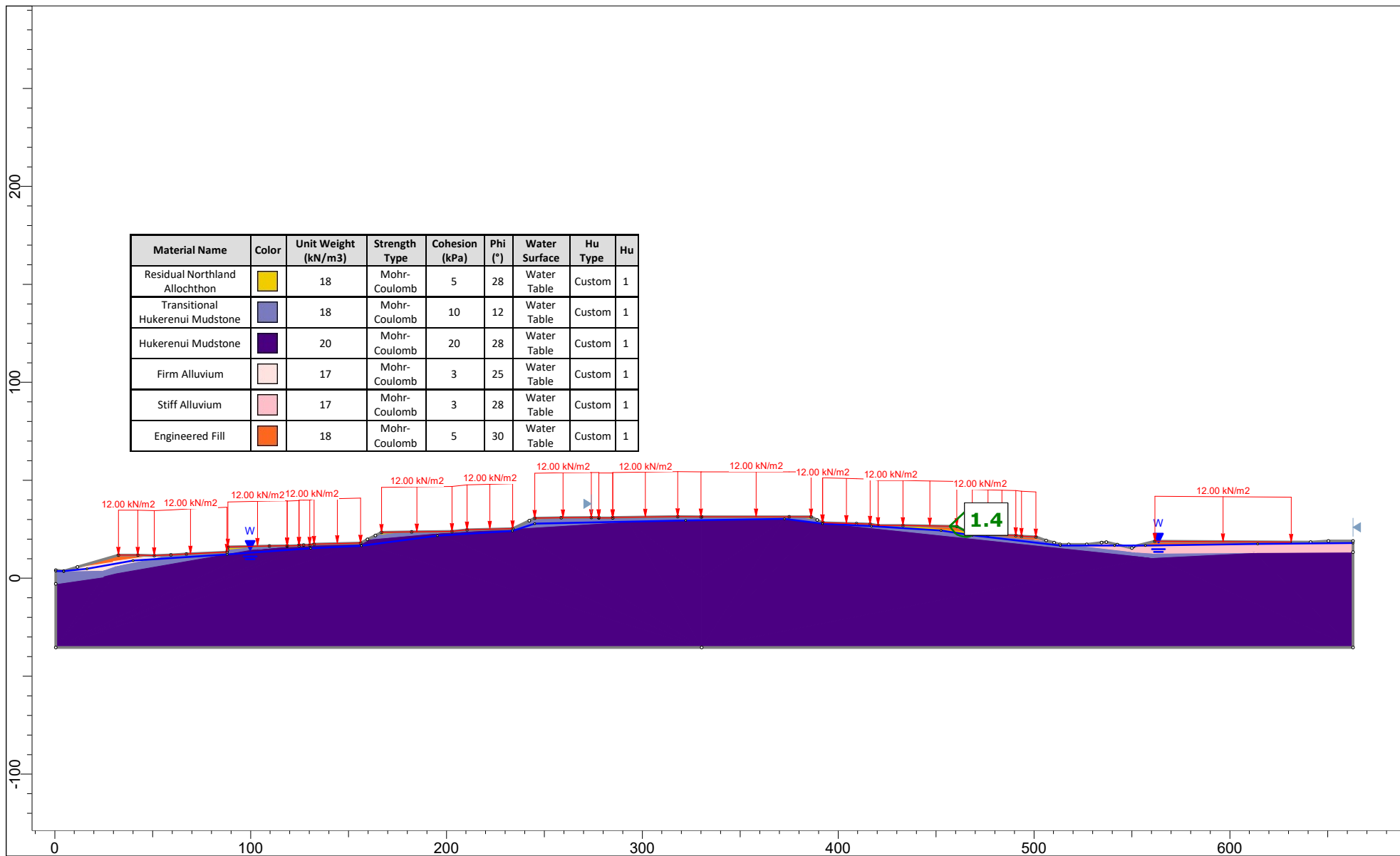


Material Name	Color	Unit Weight (kN/m³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone		20	Mohr-Coulomb	20	28	Water Table	Custom	1
Firm Alluvium		17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium		17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill		18	Mohr-Coulomb	5	30	Water Table	Custom	1



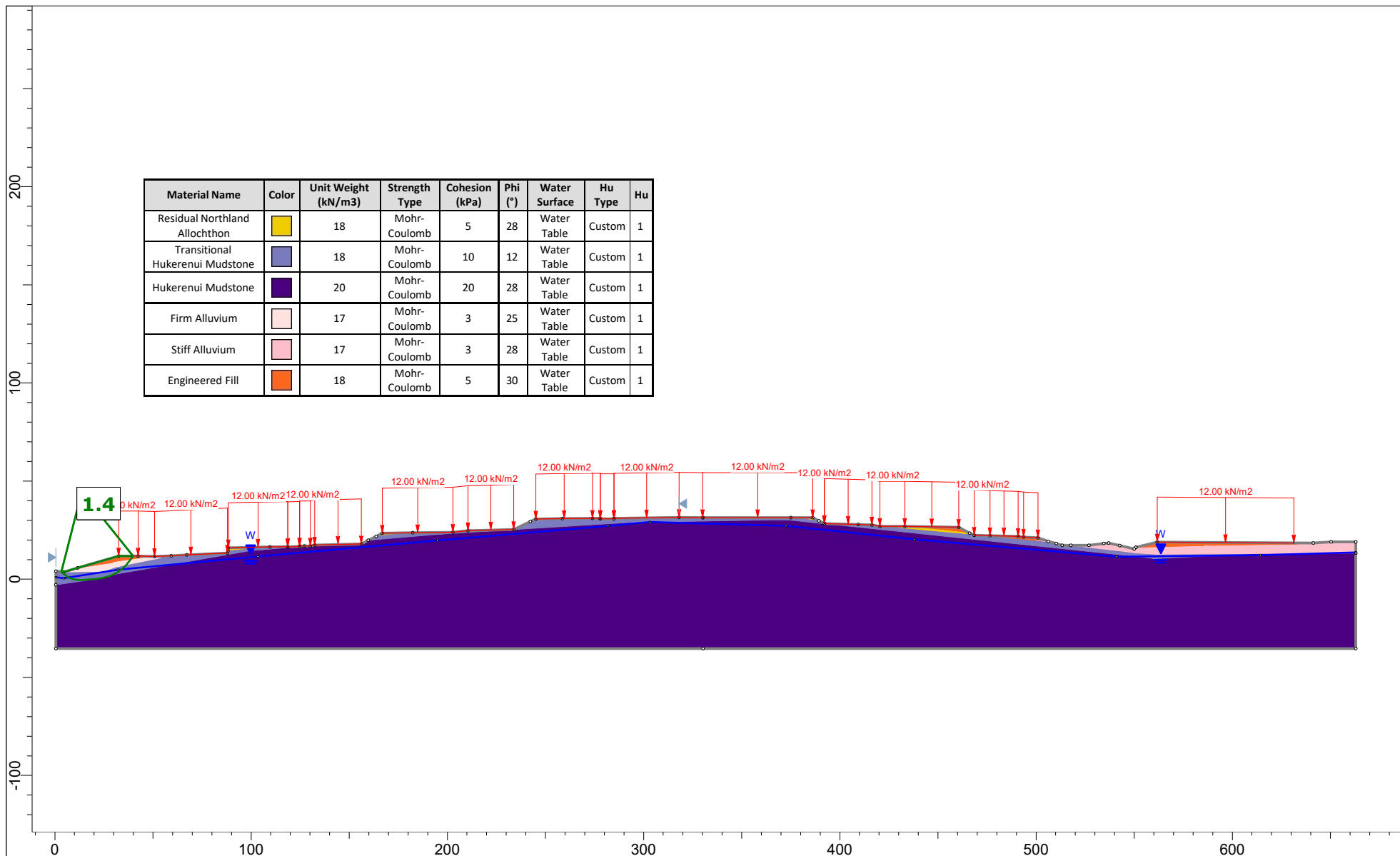
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section M - Proposed West to East	Scenario	NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:18 am	File Name	XS M FINAL.slmd



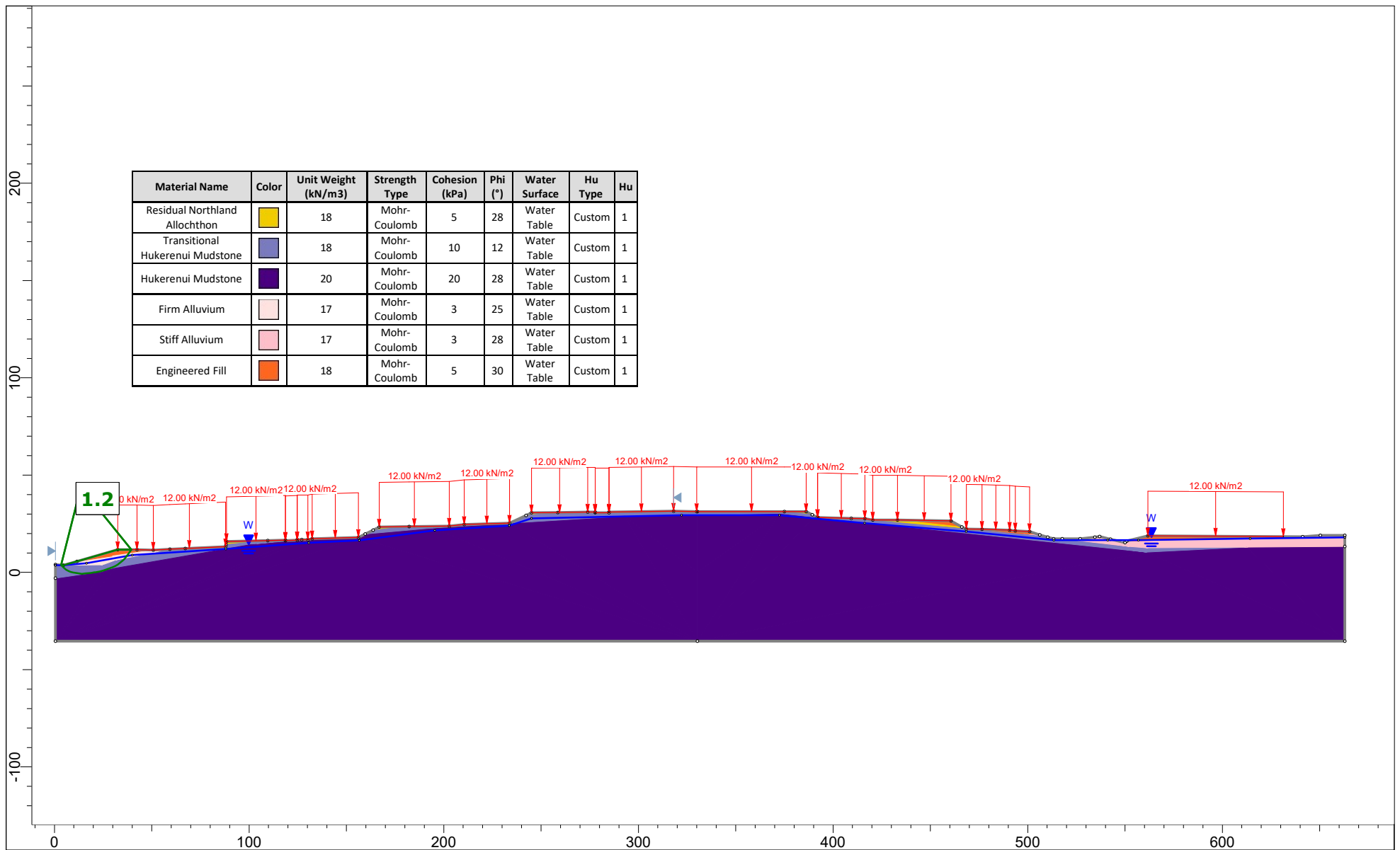
SLIDEINTERPRET 9.038

Project		Milldale North Stages 14-17	
Group	Section M - Proposed West to East	Scenario	HGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:19 am	File Name	XS M FINAL.slmd



SLIDEINTERPRET 9.038

Project			Milldale North Stages 14-17		
Group		Section M - Proposed East to West		Scenario	
ST		CR		Company	
Date		23/07/2026 10:50:20 am		File Name	
				NGW	
				Gibb Ritchie Geotechnical Engineers	
				XS M FINAL.slm	



SLIDEINTERPRET 9.038

Project			Milldale North Stages 14-17		
Group		Section M - Proposed East to West		Scenario	
ST		CR		Company	
Date		23/07/2026 10:50:20 am		File Name	
				Gibb Ritchie Geotechnical Engineers	
				XS M FINAL.slmd	

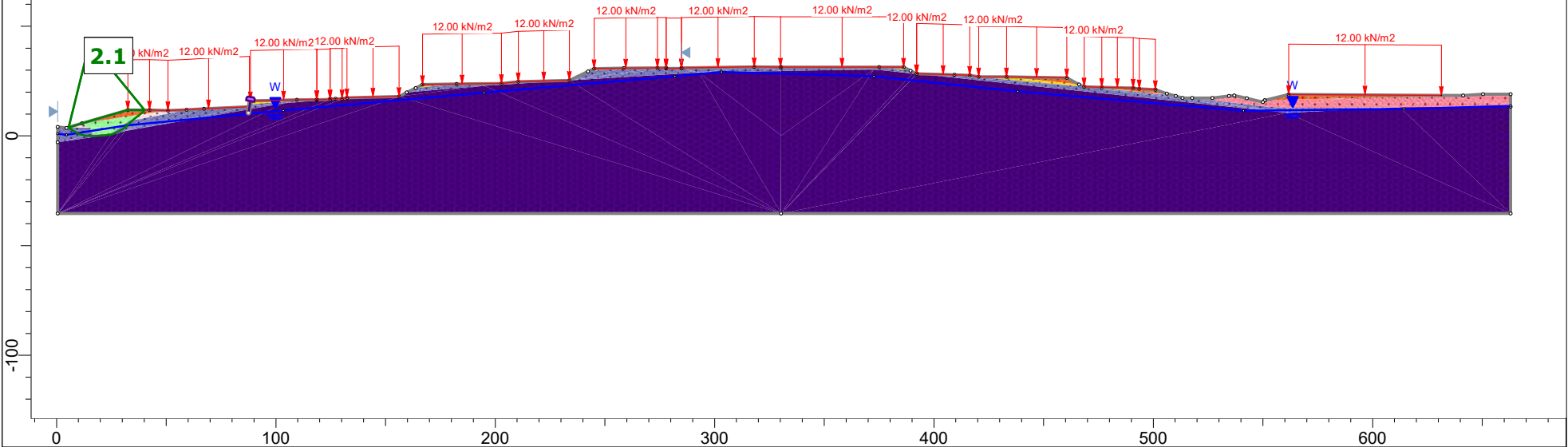
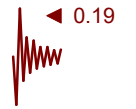
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Residual Northland Allochthon	[Yellow]	18	Mohr-Coulomb	5	28	Water Table	Custom	1
Transitional Hukerenui Mudstone	[Blue-Gray]	18	Mohr-Coulomb	10	12	Water Table	Custom	1
Hukerenui Mudstone	[Dark Purple]	20	Mohr-Coulomb	20	28	Water Table	Custom	1
Firm Alluvium	[Light Pink]	17	Mohr-Coulomb	3	25	Water Table	Custom	1
Stiff Alluvium	[Pink]	17	Mohr-Coulomb	3	28	Water Table	Custom	1
Engineered Fill	[Orange]	18	Mohr-Coulomb	5	30	Water Table	Custom	1
Undercut / Shear Key	[Green]	18	Mohr-Coulomb	5	30	Water Table	Custom	1

The diagram illustrates a geotechnical cross-section of a slope. The vertical axis represents elevation from -100 to 200 meters. The horizontal axis represents distance from 0 to 600+ meters. The soil profile consists of several layers: a thick base layer of Hukerenui Mudstone (dark purple), followed by Firm Alluvium (light pink) and Stiff Alluvium (pink). A water table is shown as a dashed blue line, generally following the topography of the alluvium layers. Applied loads are indicated by red arrows pointing downwards, with values ranging from 1.5 kN/m² to 12.00 kN/m². Blue arrows labeled 'W' represent pore water pressure acting horizontally at specific points along the slope. A green circle highlights a specific area near the surface on the left side.



Project		Milldale North Stages 14-17	
Group	Section M - Remediated East to West	Scenario	NGW
ST	CR	Company	Gibb Ritchie Geotechnical Engineers
Date	23/07/2026 10:50:21 am	File Name	XS M FINAL.slmd

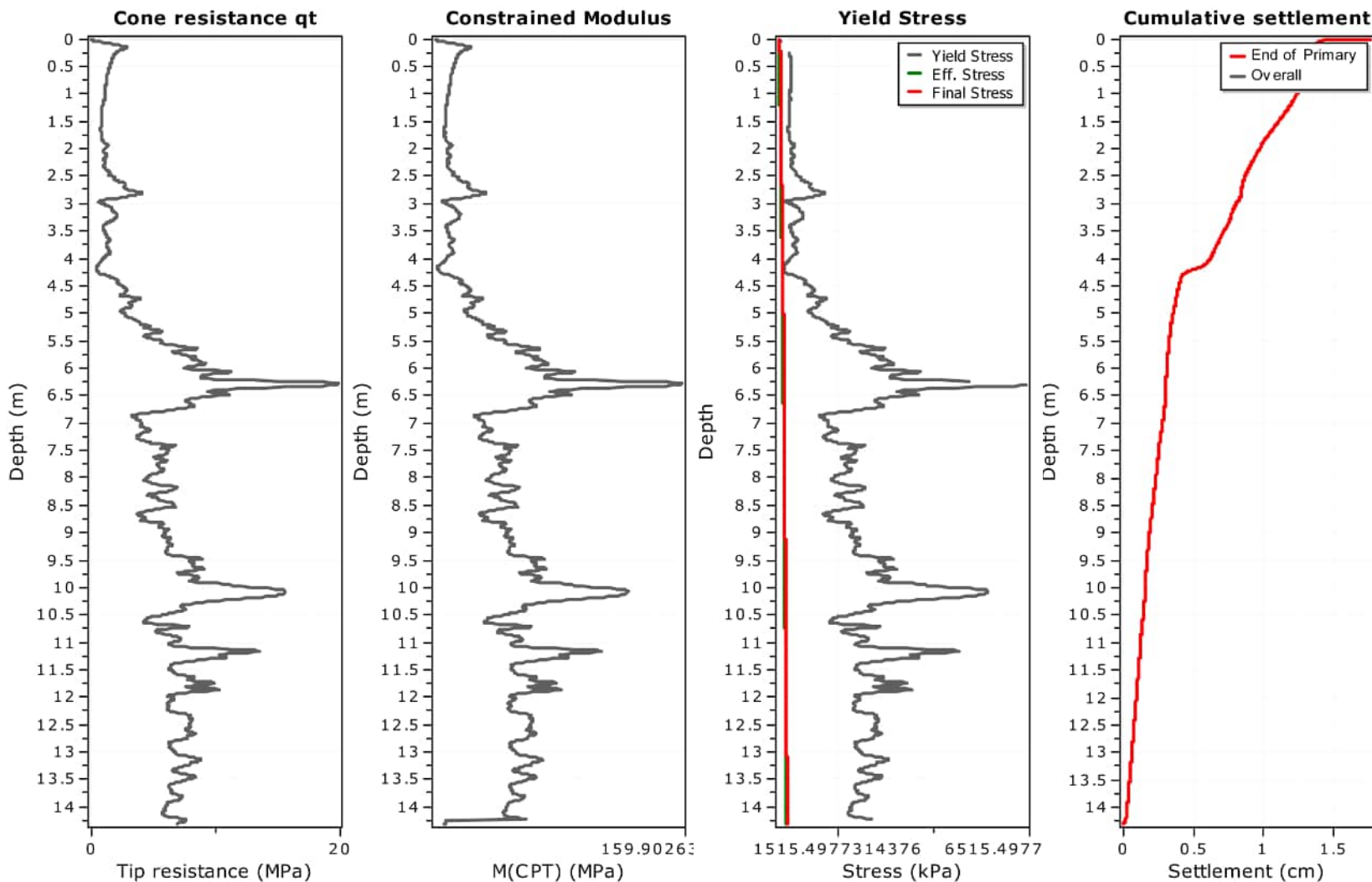
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Cohesion Change (kPa/m)	Water Surface	Hu Type	Hu Value
Transitional Hukerenui Mudstone		18	Mohr-Coulomb	10	12			Water Table	Custom	1
Residual Northland Allochthon (UD)		18	Undrained	80	0	Constant		Water Table	Custom	0
Transitional Hukerenui Mudstone (UD)		18	Undrained	100	0	Constant		Water Table	Custom	0
Hukerenui Mudstone (UD)		20	Undrained	300	0	F(Depth from Top of Layer)	20	Water Table	Custom	0
Firm Alluvium (UD)		17	Undrained	38	0	Constant		Water Table	Custom	0
Stiff Alluvium (UD)		20	Undrained	65	0	Constant		Water Table	Custom	0
V. St Alluvium (UD)		18	Undrained	120	0	Constant		Water Table	Custom	0
Engineered Fill (UD)		18	Undrained	100	0	Constant		Water Table	Custom	0
Undercut / Shear Key (UD)		18	Undrained	100	0	Constant		Water Table	Custom	0



APPENDIX I | Settlement Estimates

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

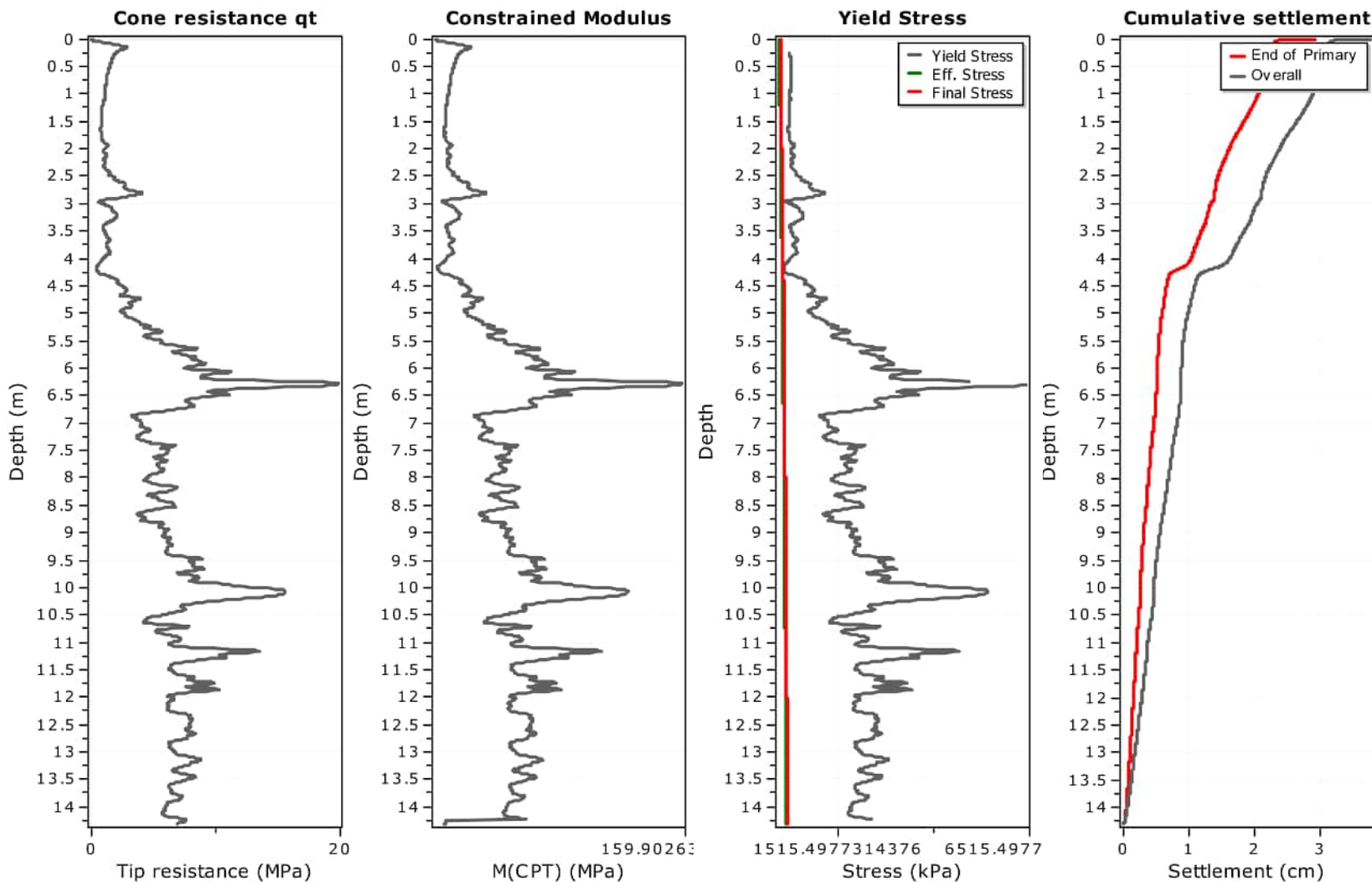
* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

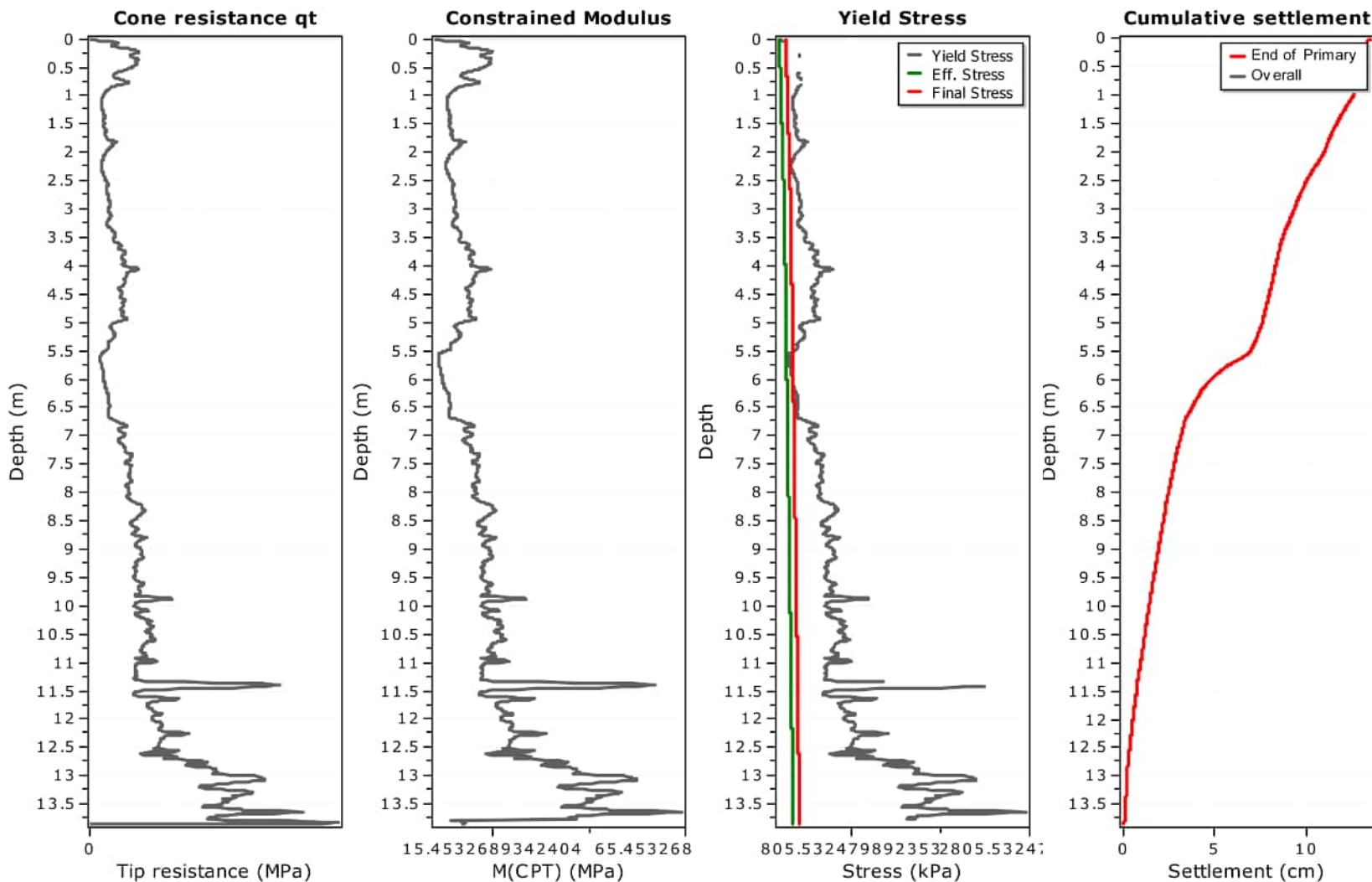
* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 72.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

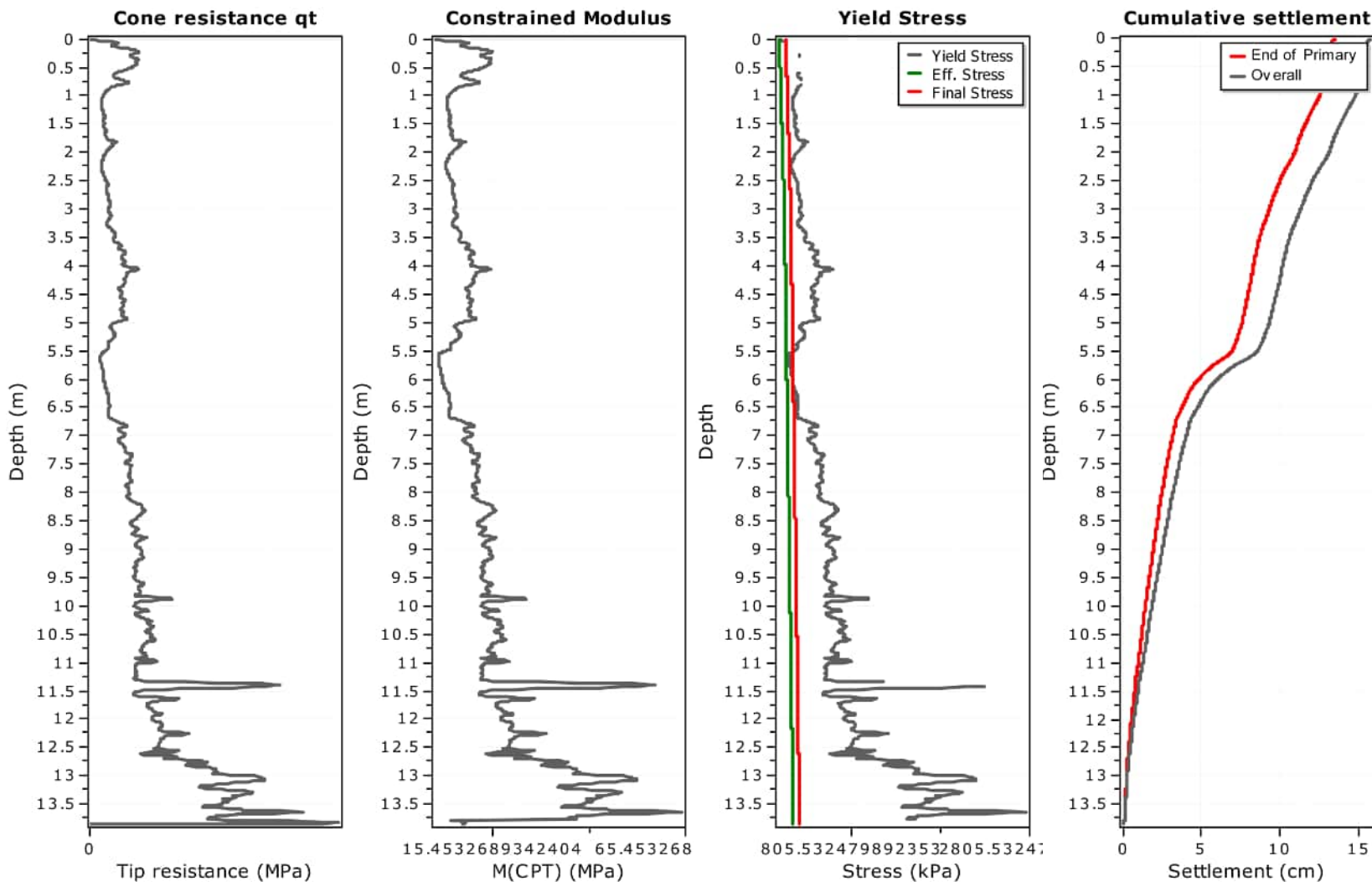
* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 72.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

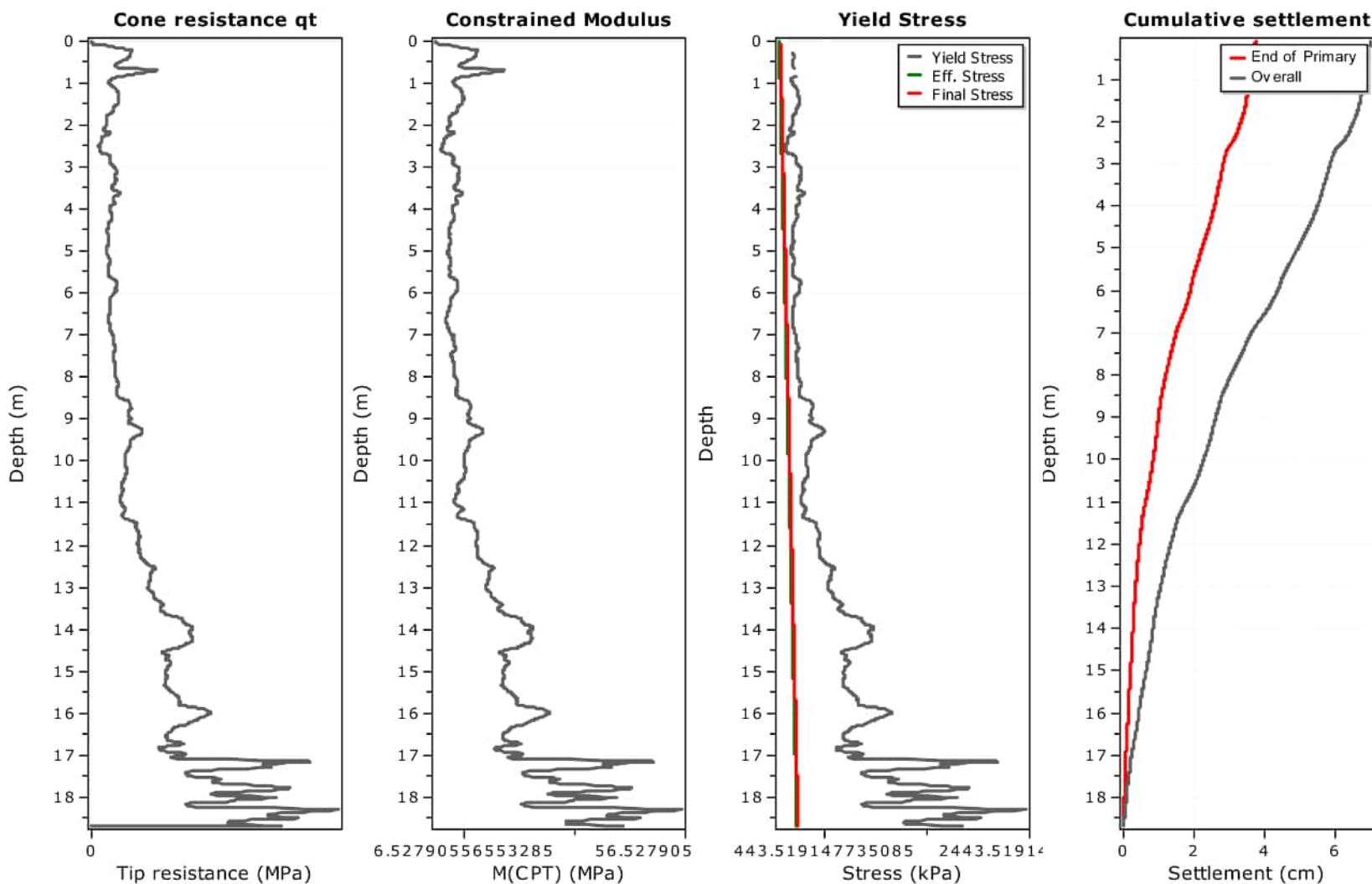
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{secondary} = S_{primary} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 12.00 (kPa)
Embedment depth: 0.10 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

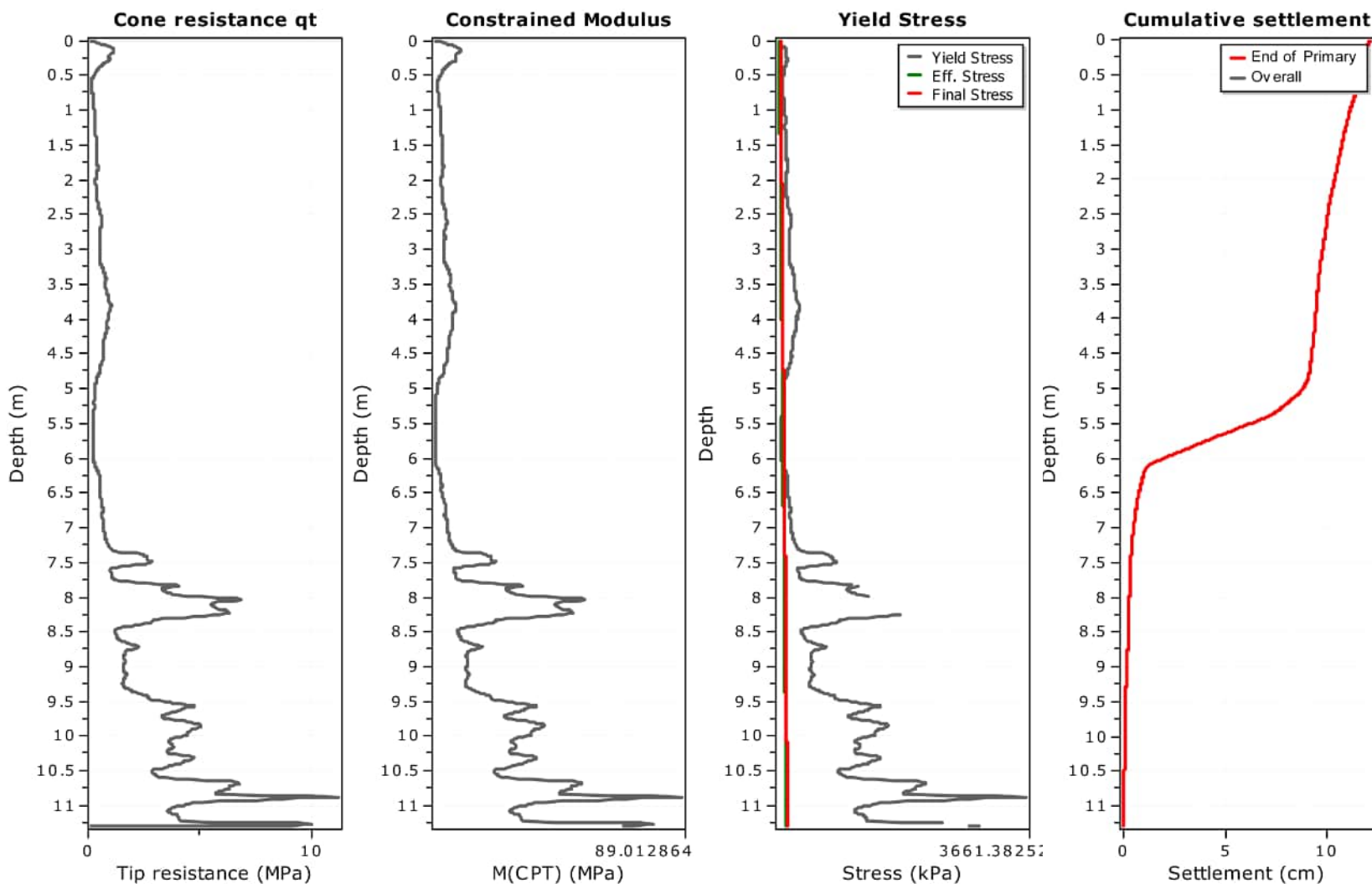
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

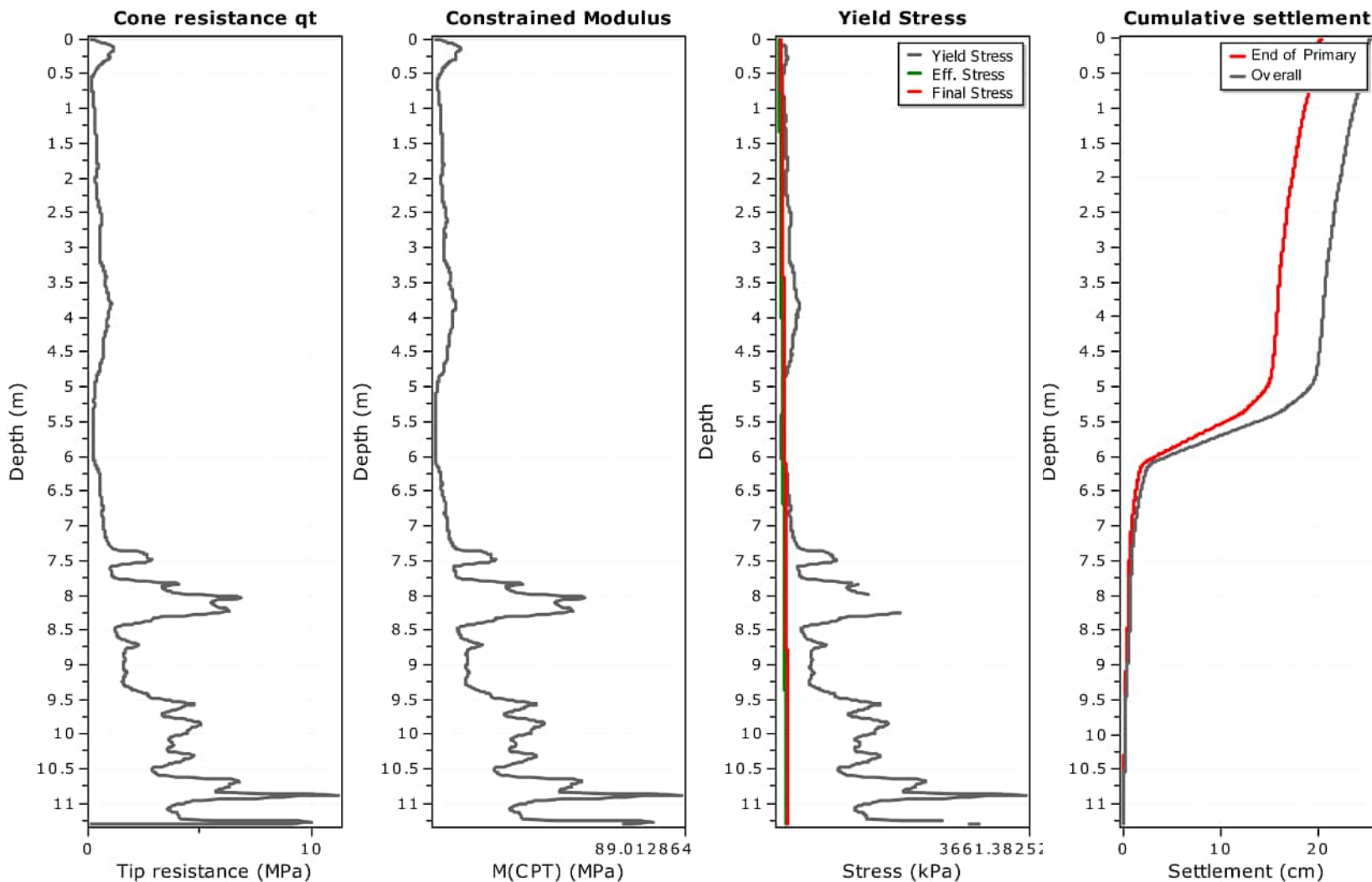
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

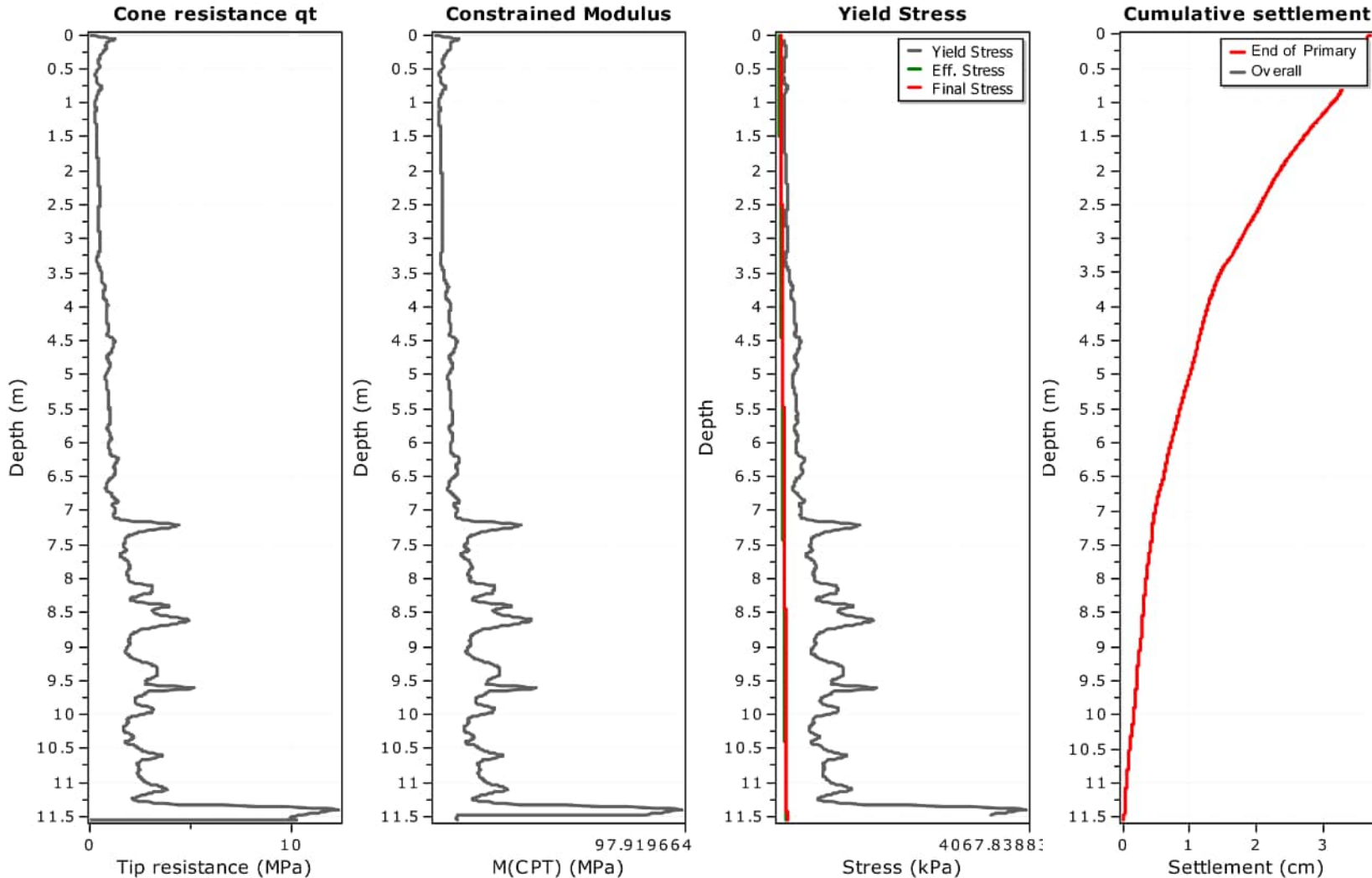
* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

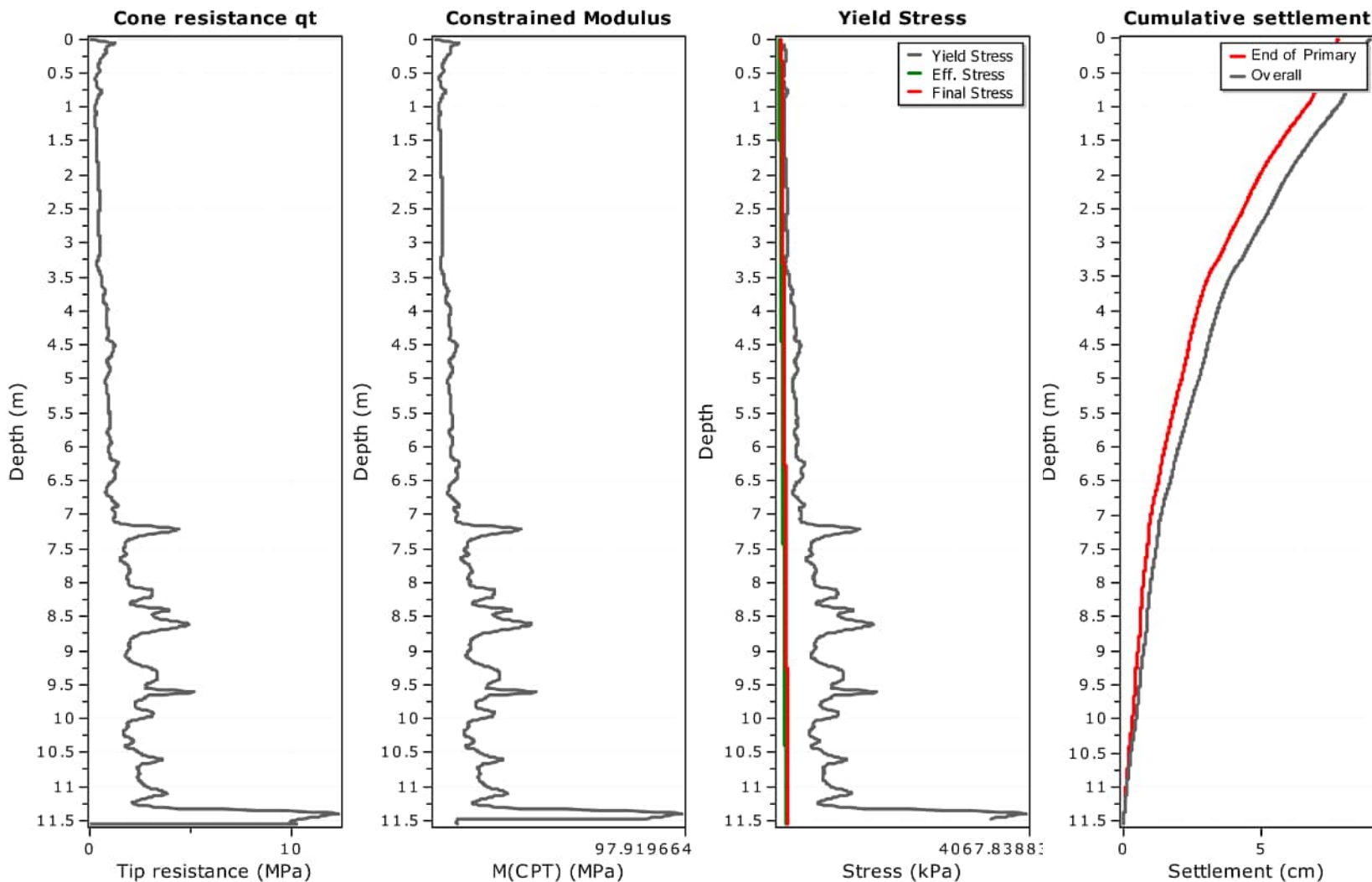
* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 38.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

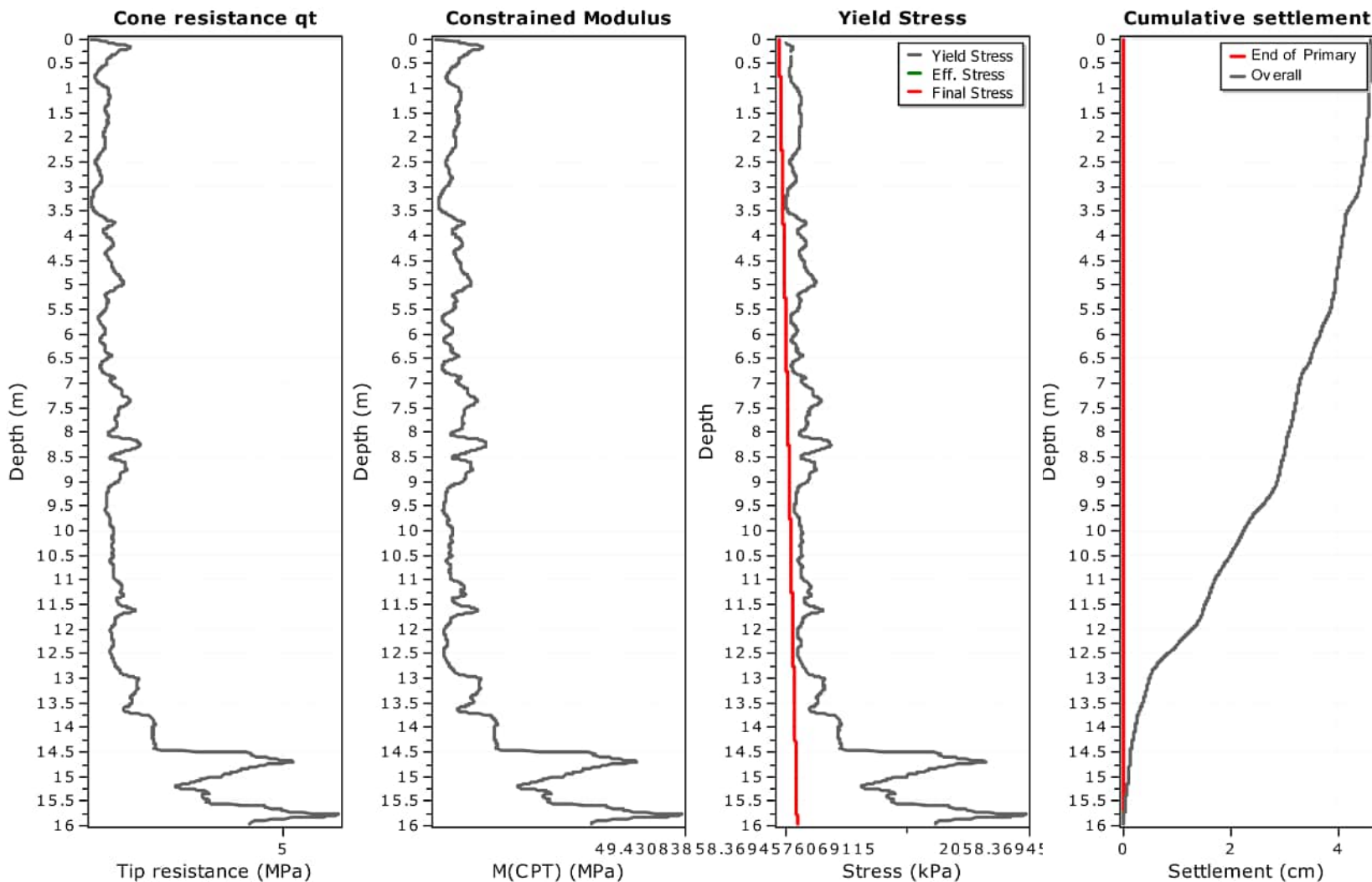
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{secondary} = S_{primary} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 0.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

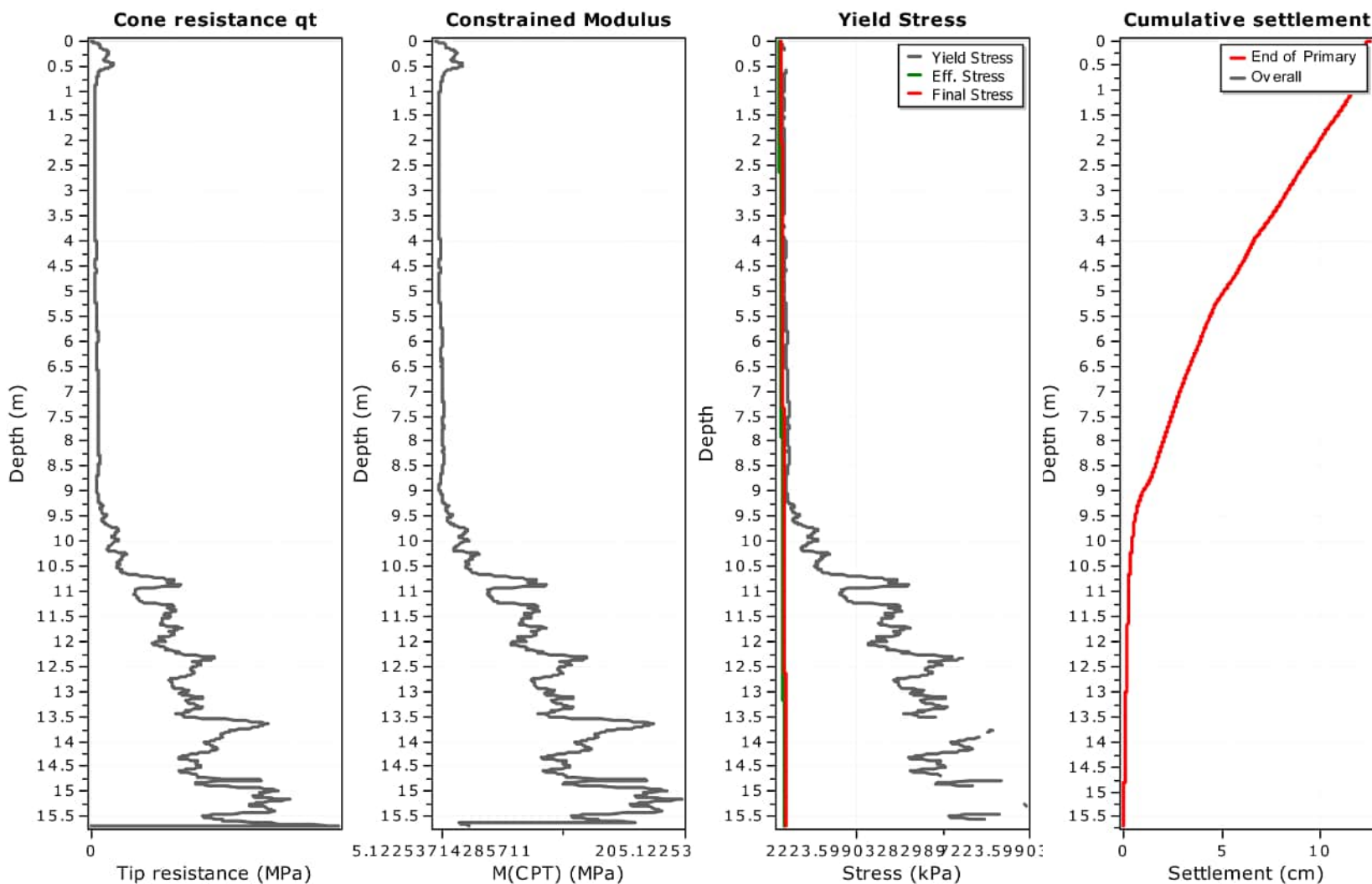
* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_s = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

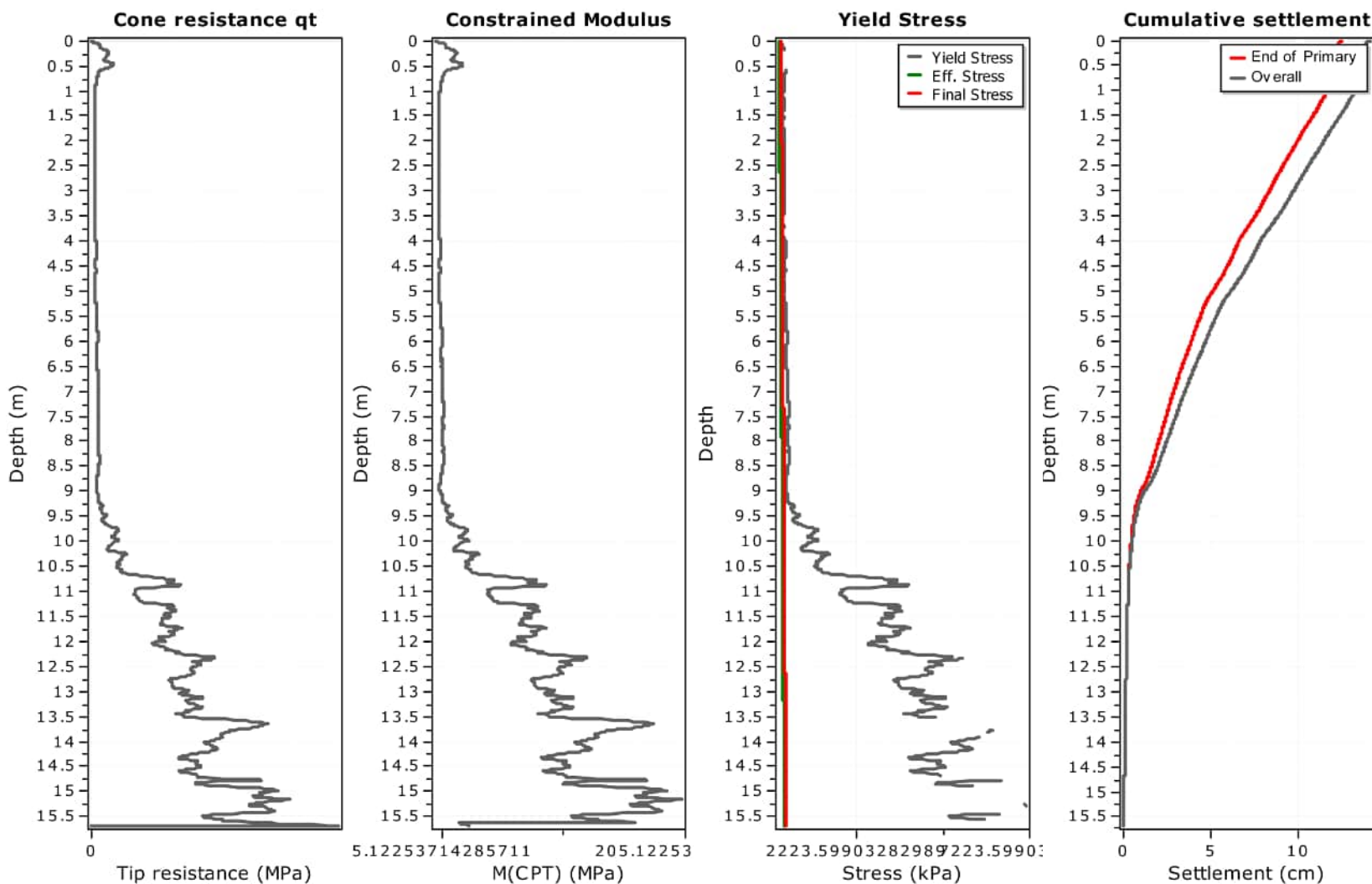
* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{\text{secondary}} = S_{\text{primary}} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

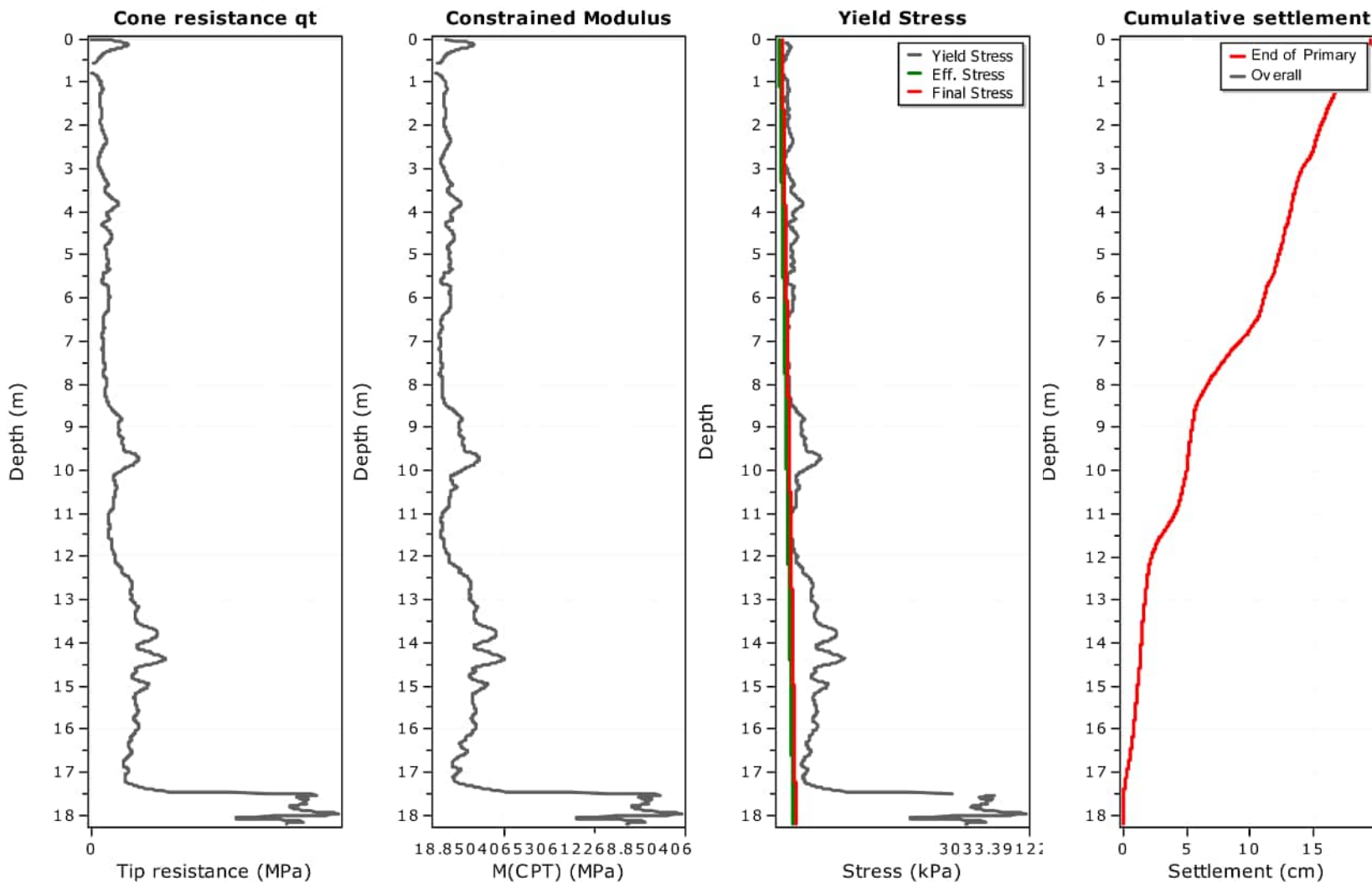
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

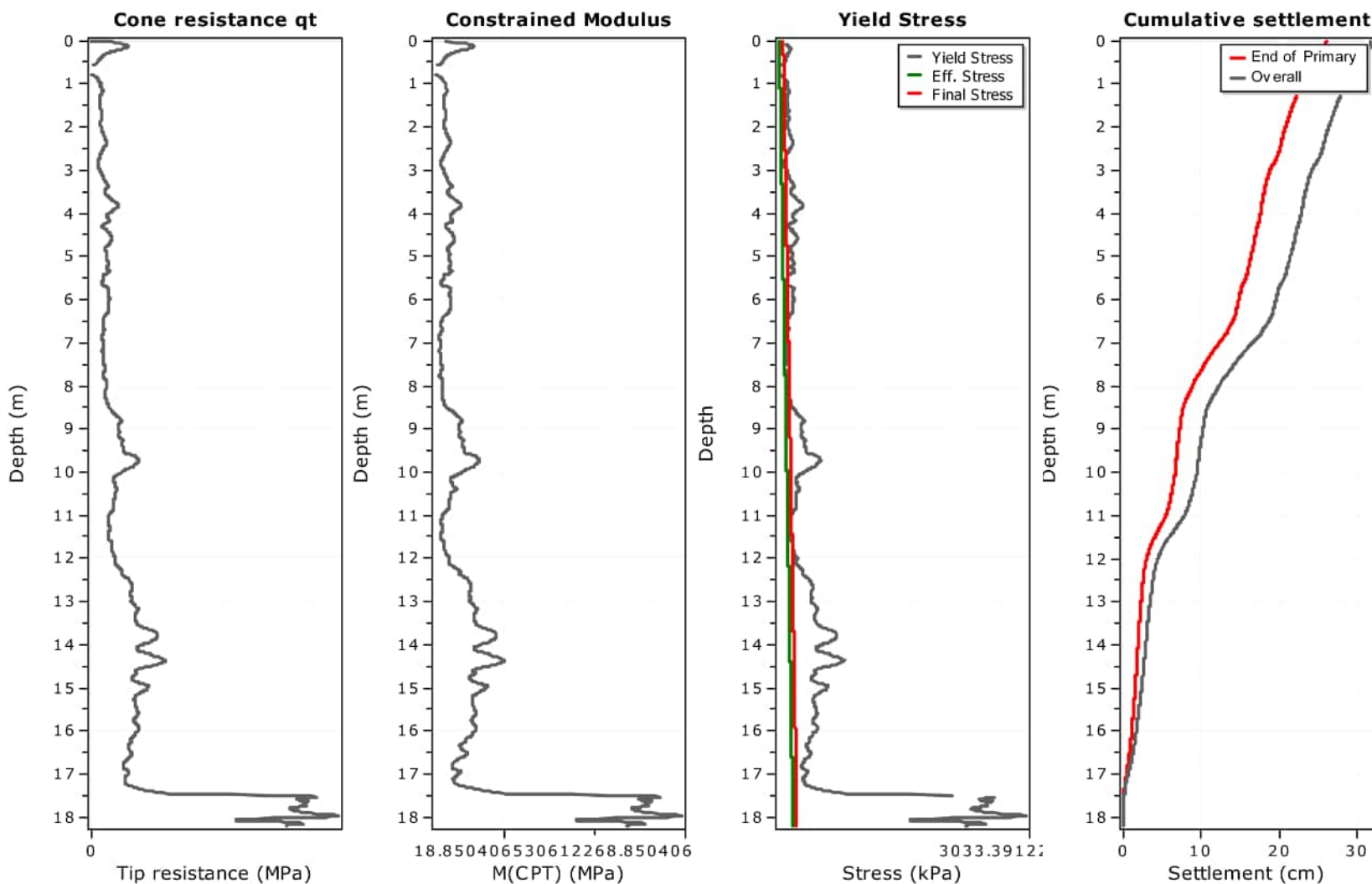
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 48.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

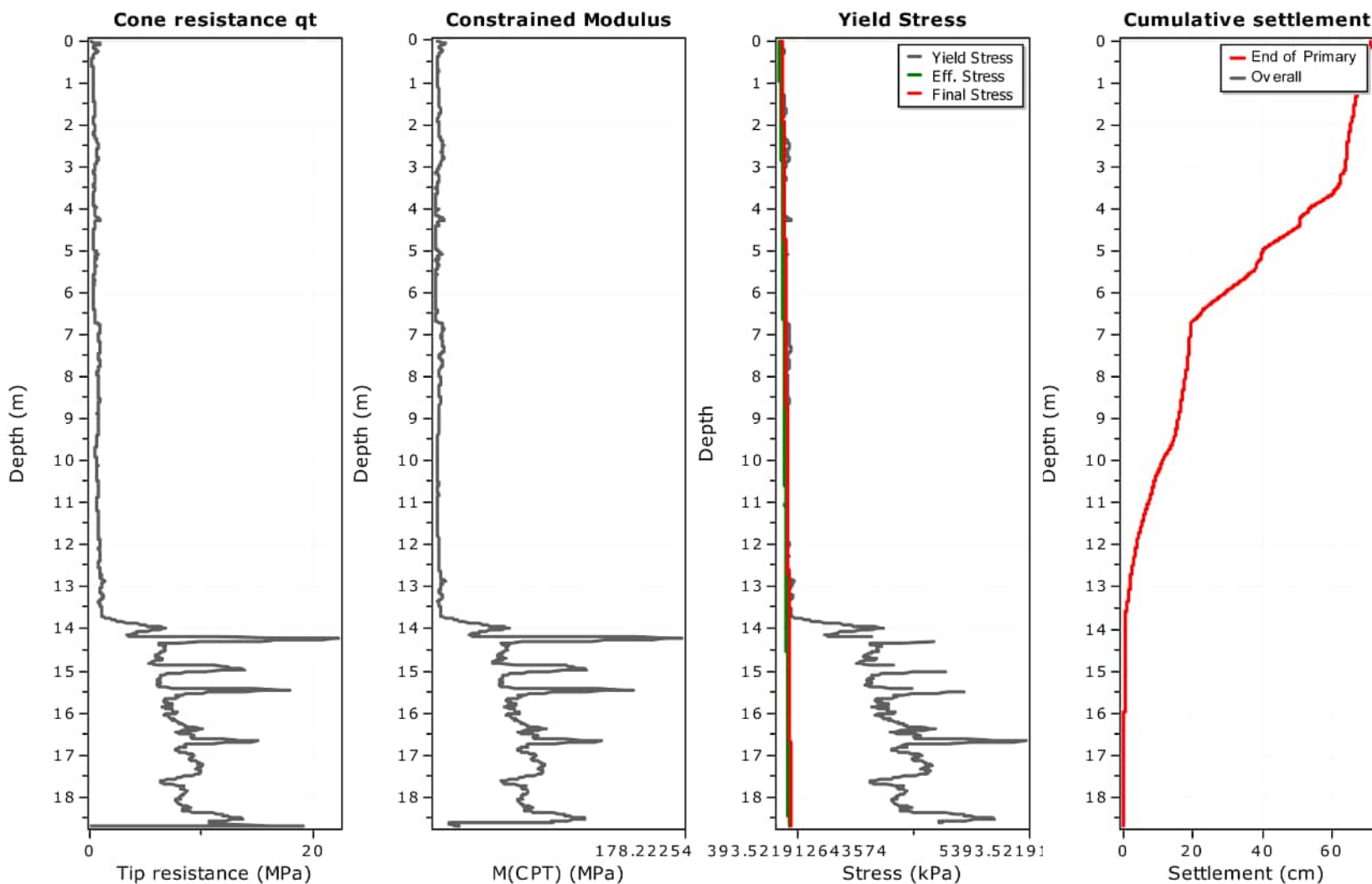
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

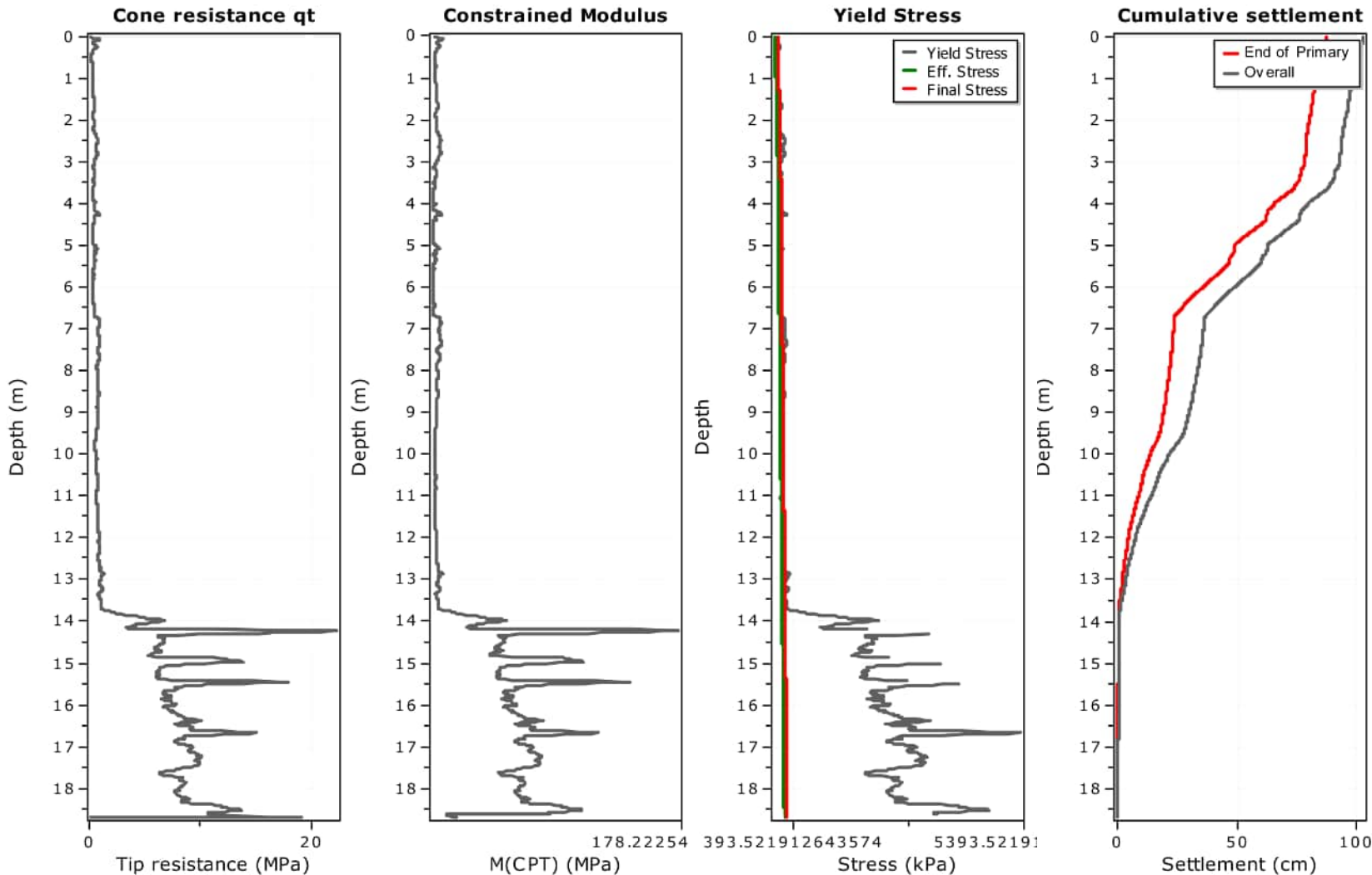
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 66.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 1 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

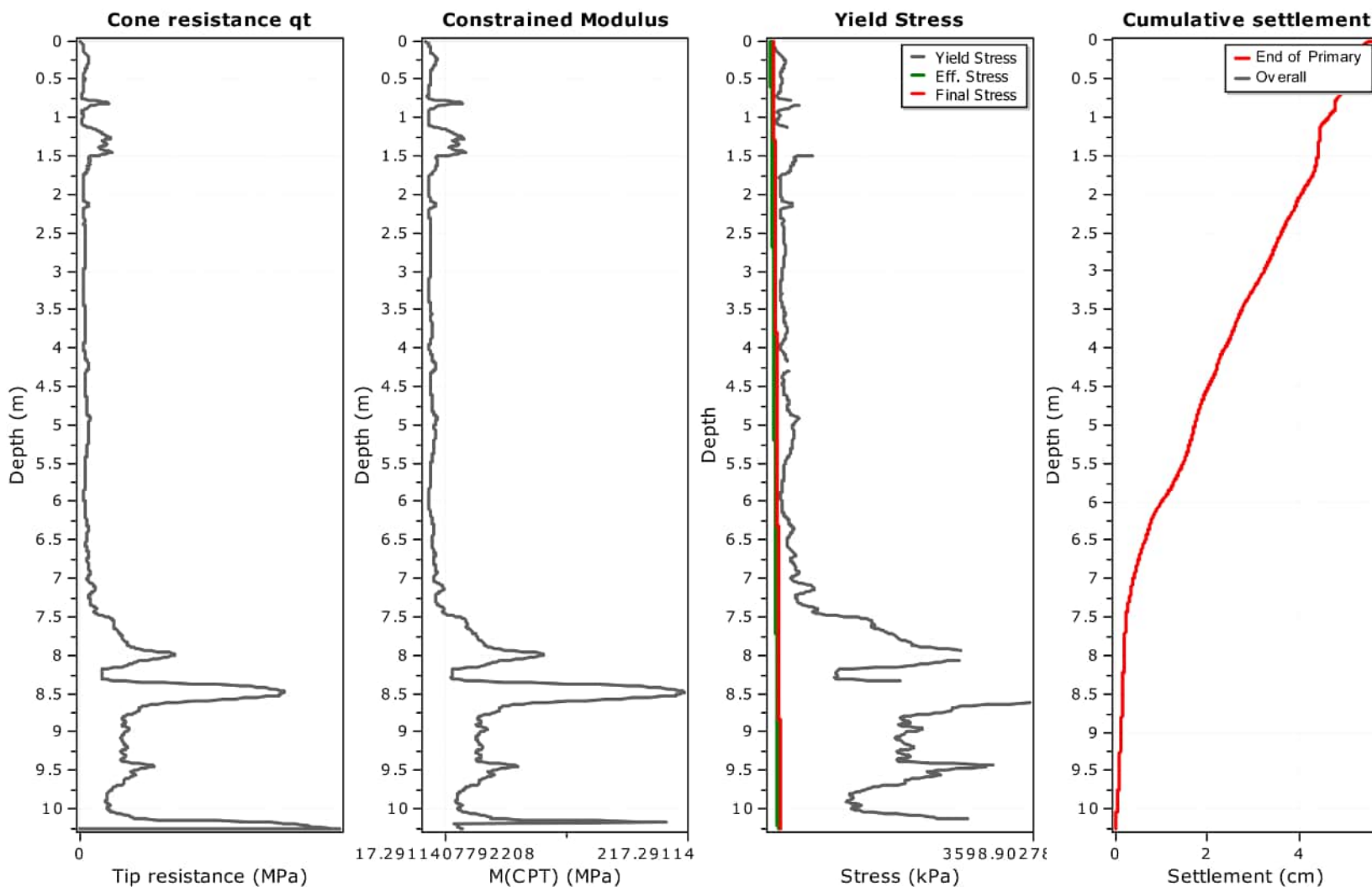
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{\text{secondary}} = S_{\text{primary}} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

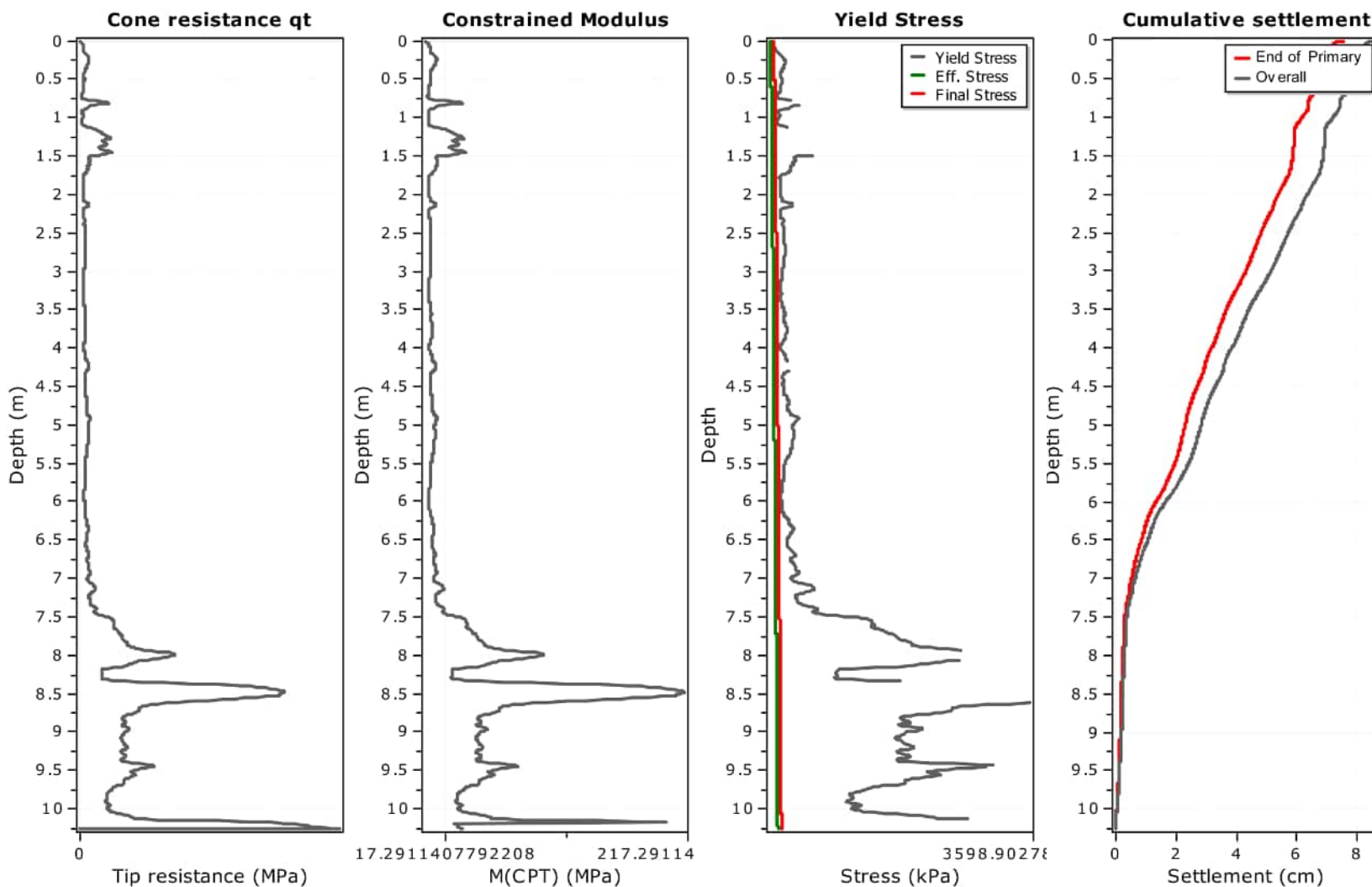
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 48.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

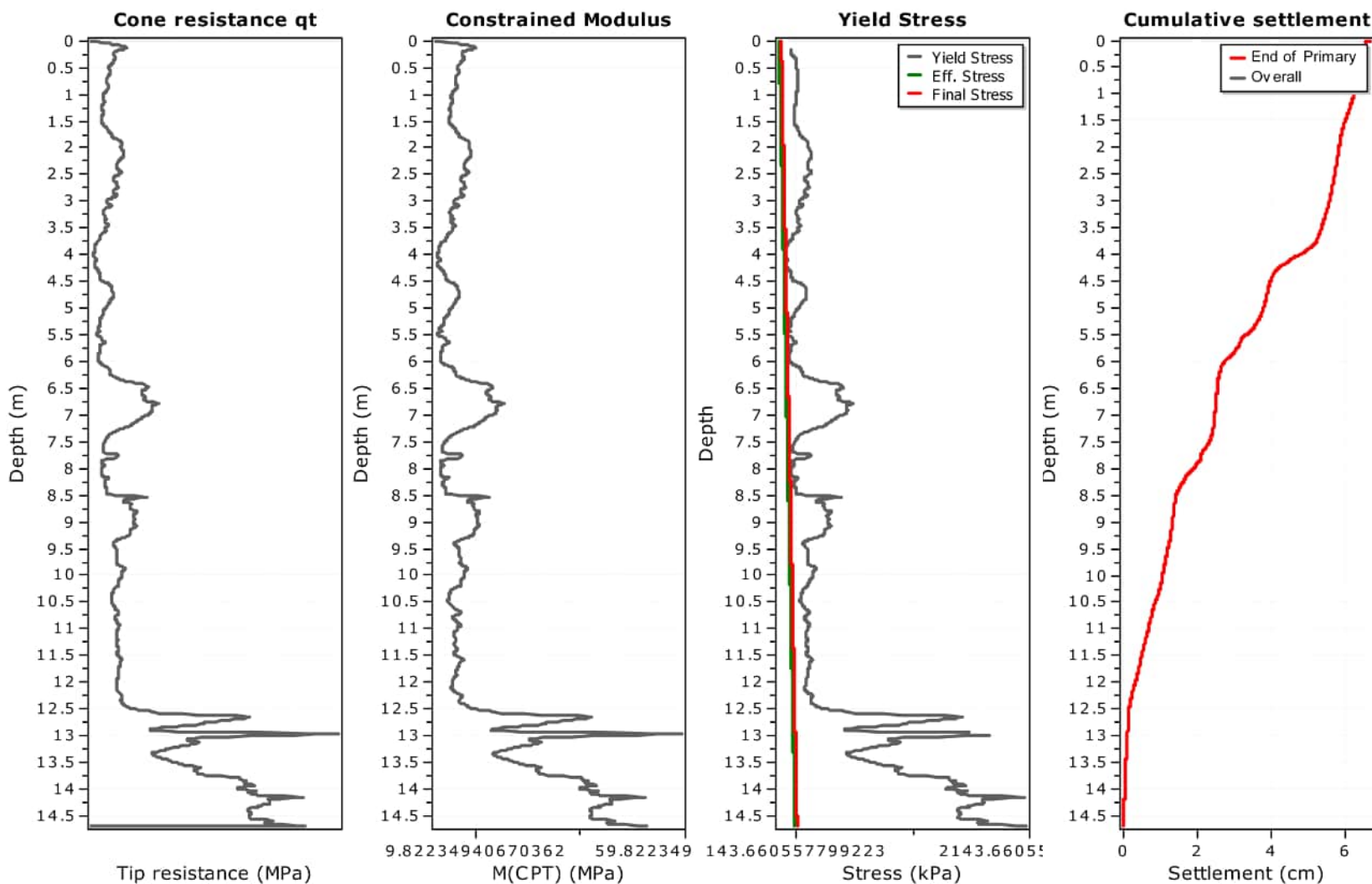
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

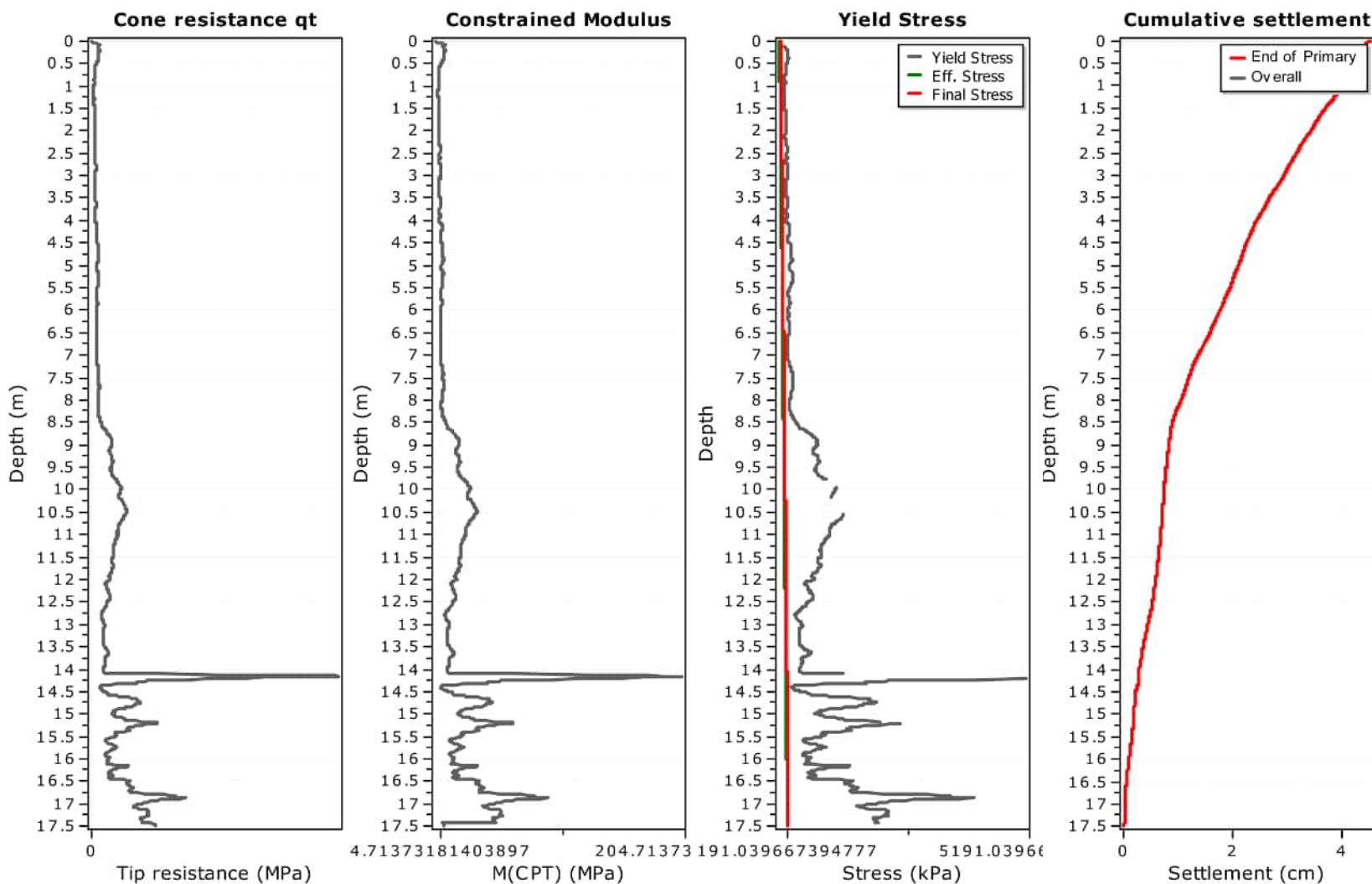
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

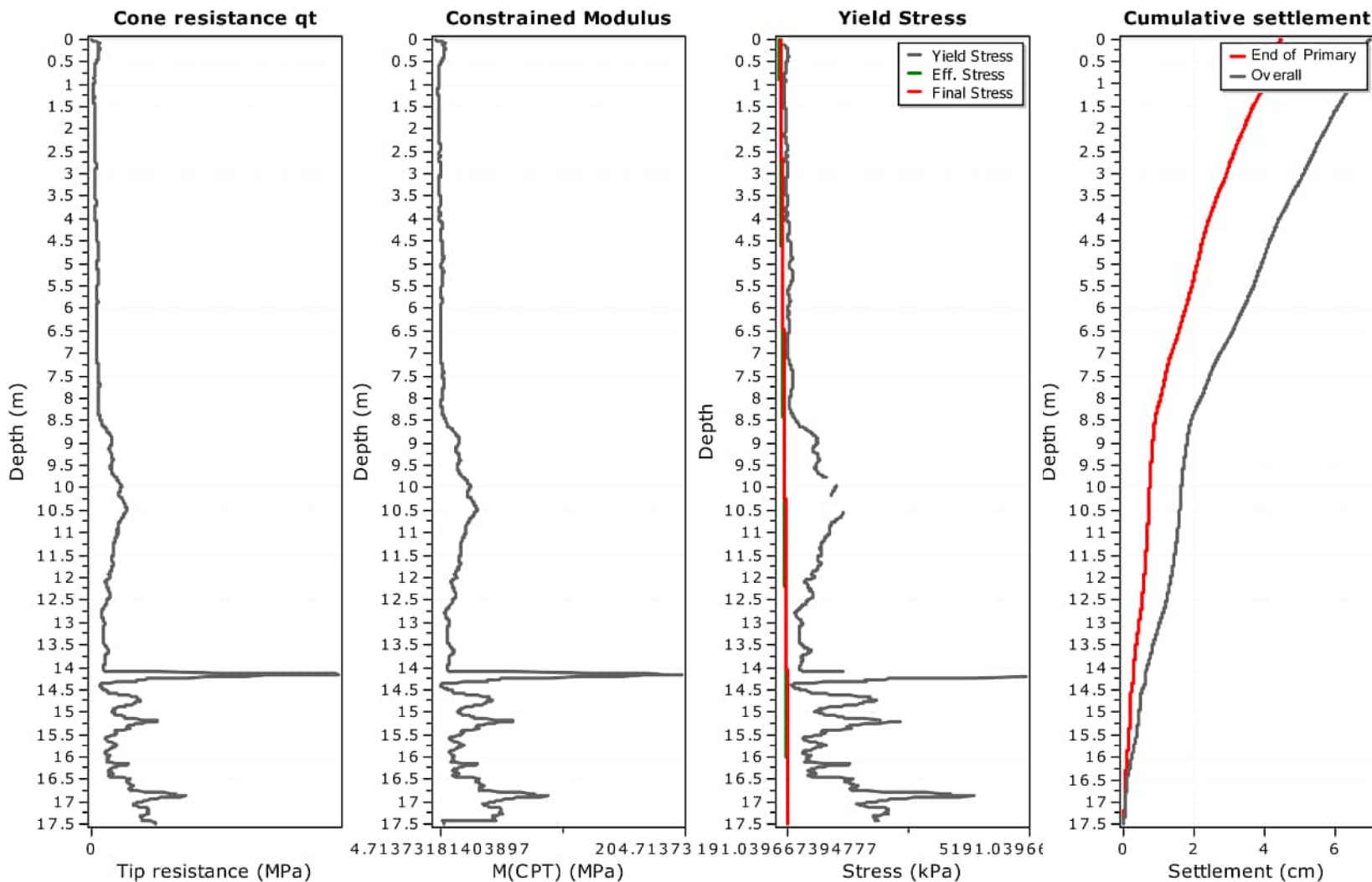
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

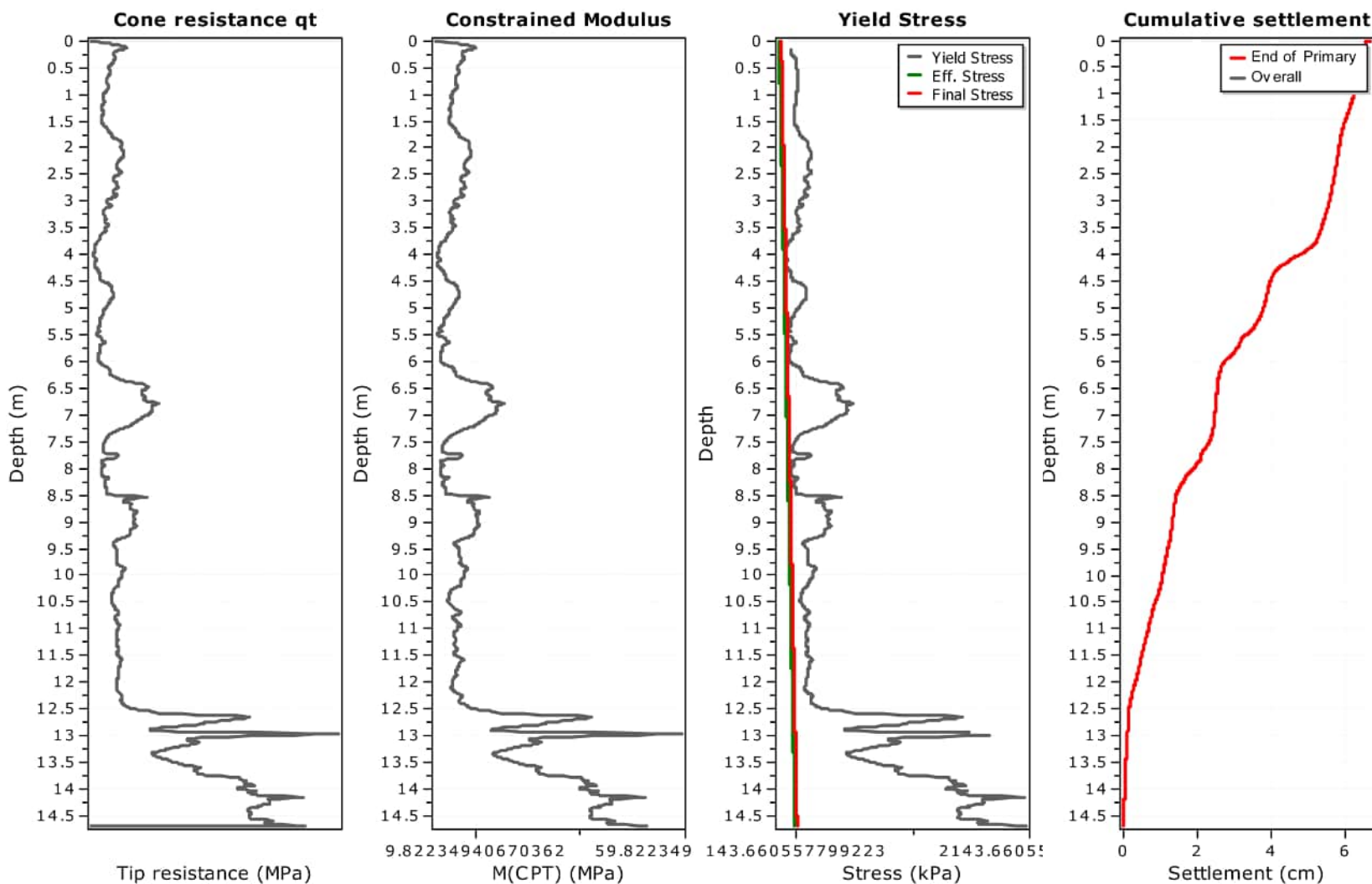
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

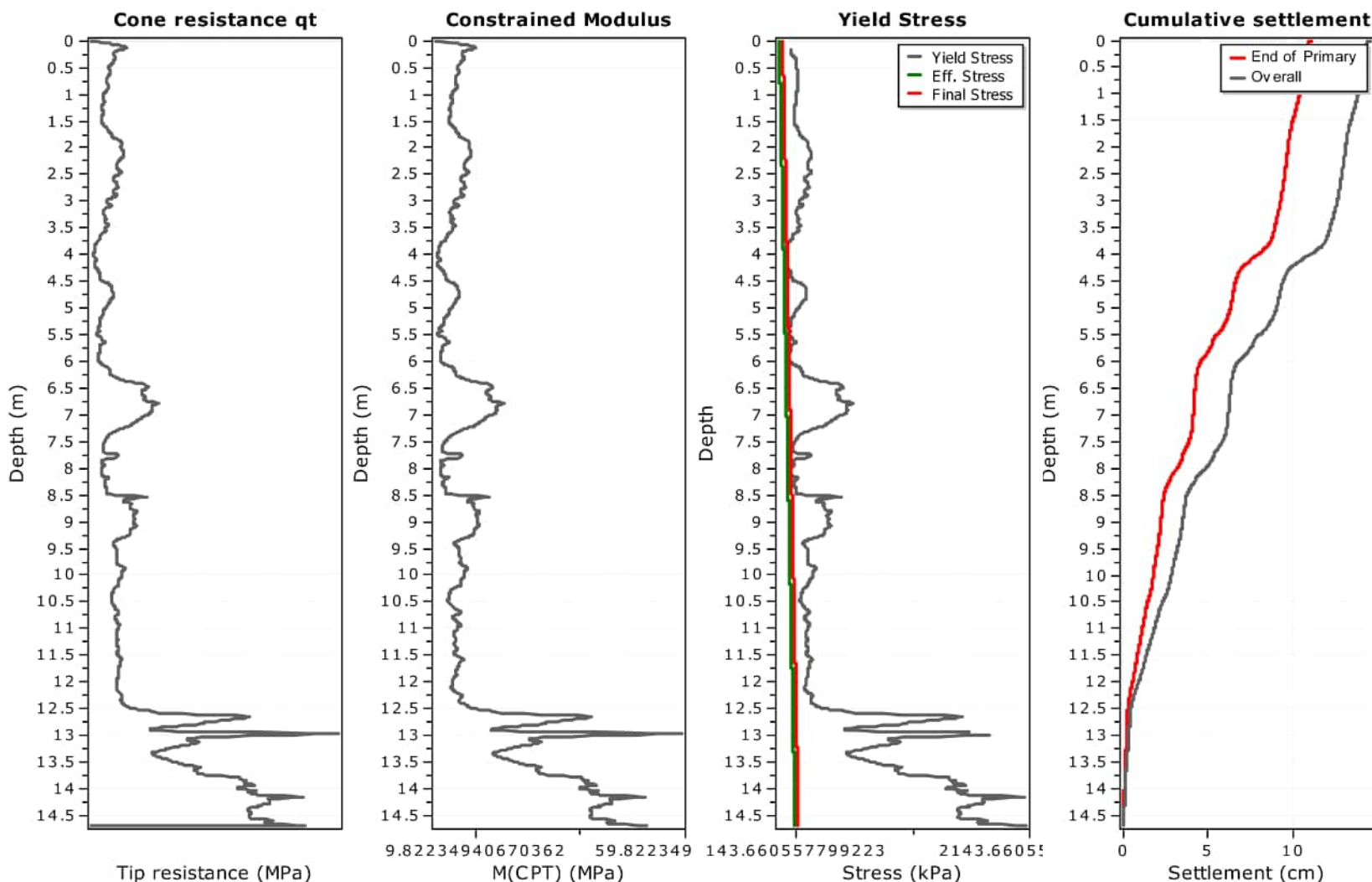
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

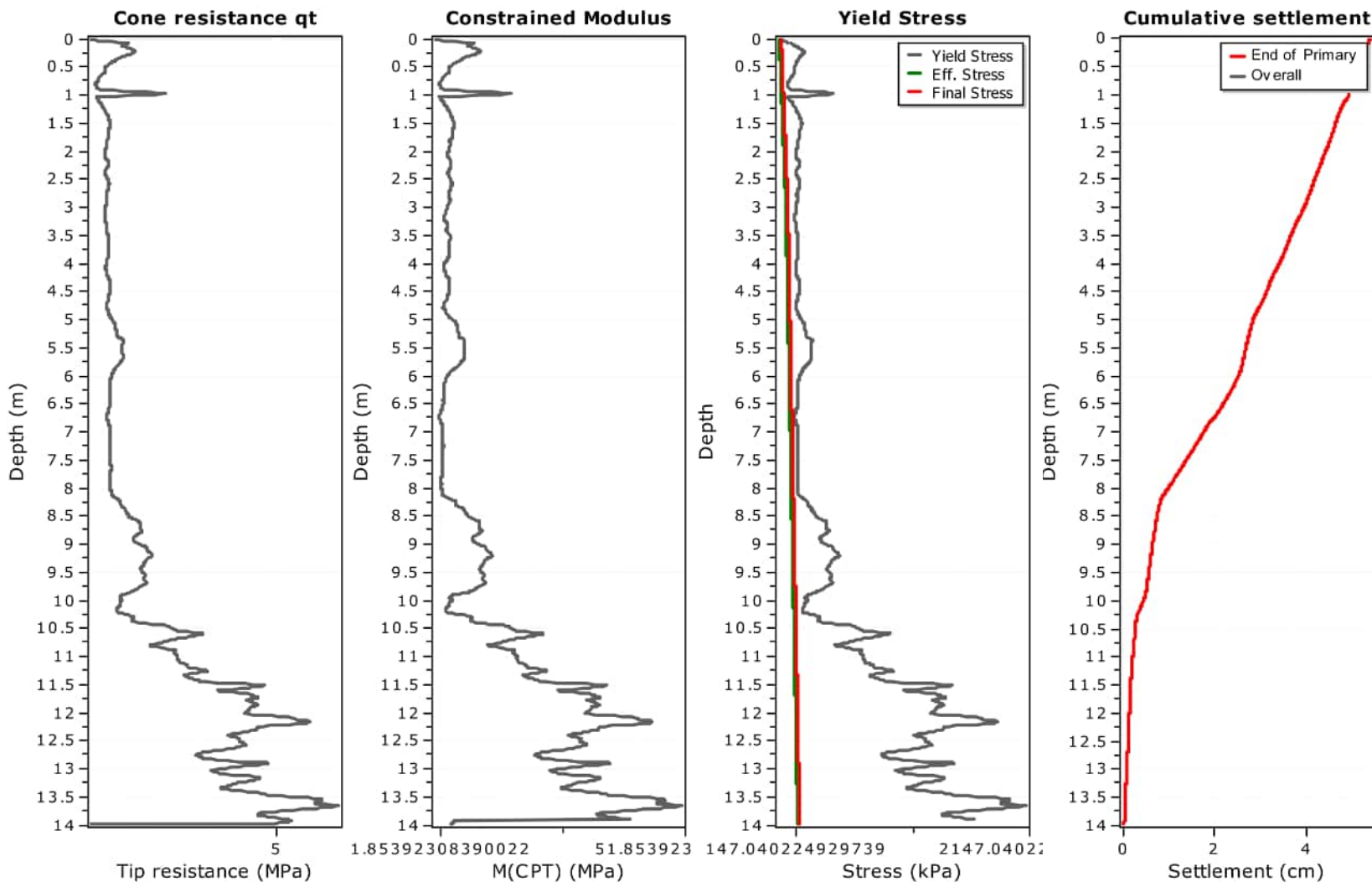
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{\text{secondary}} = S_{\text{primary}} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

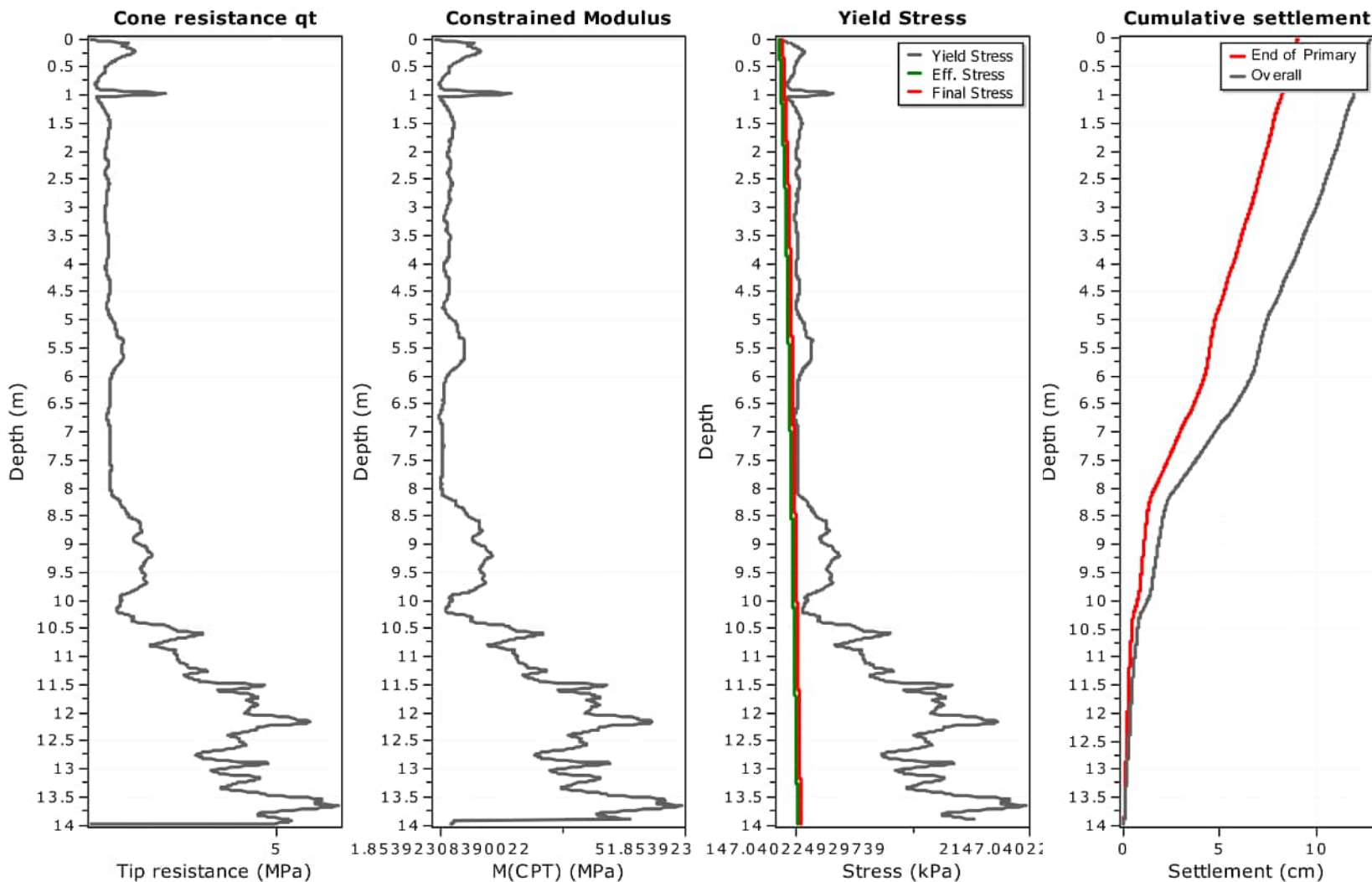
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

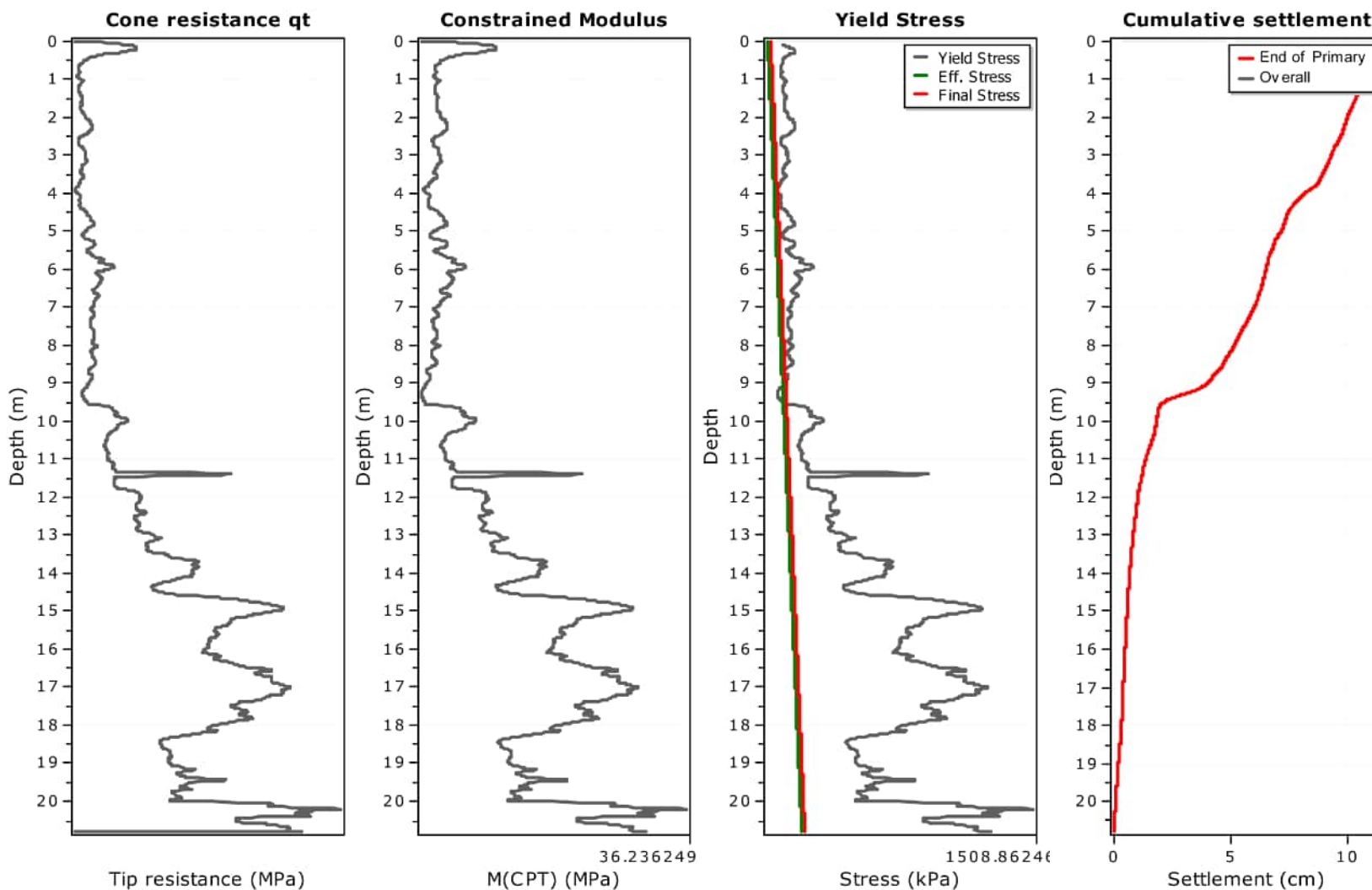
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{secondary} = S_{primary} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

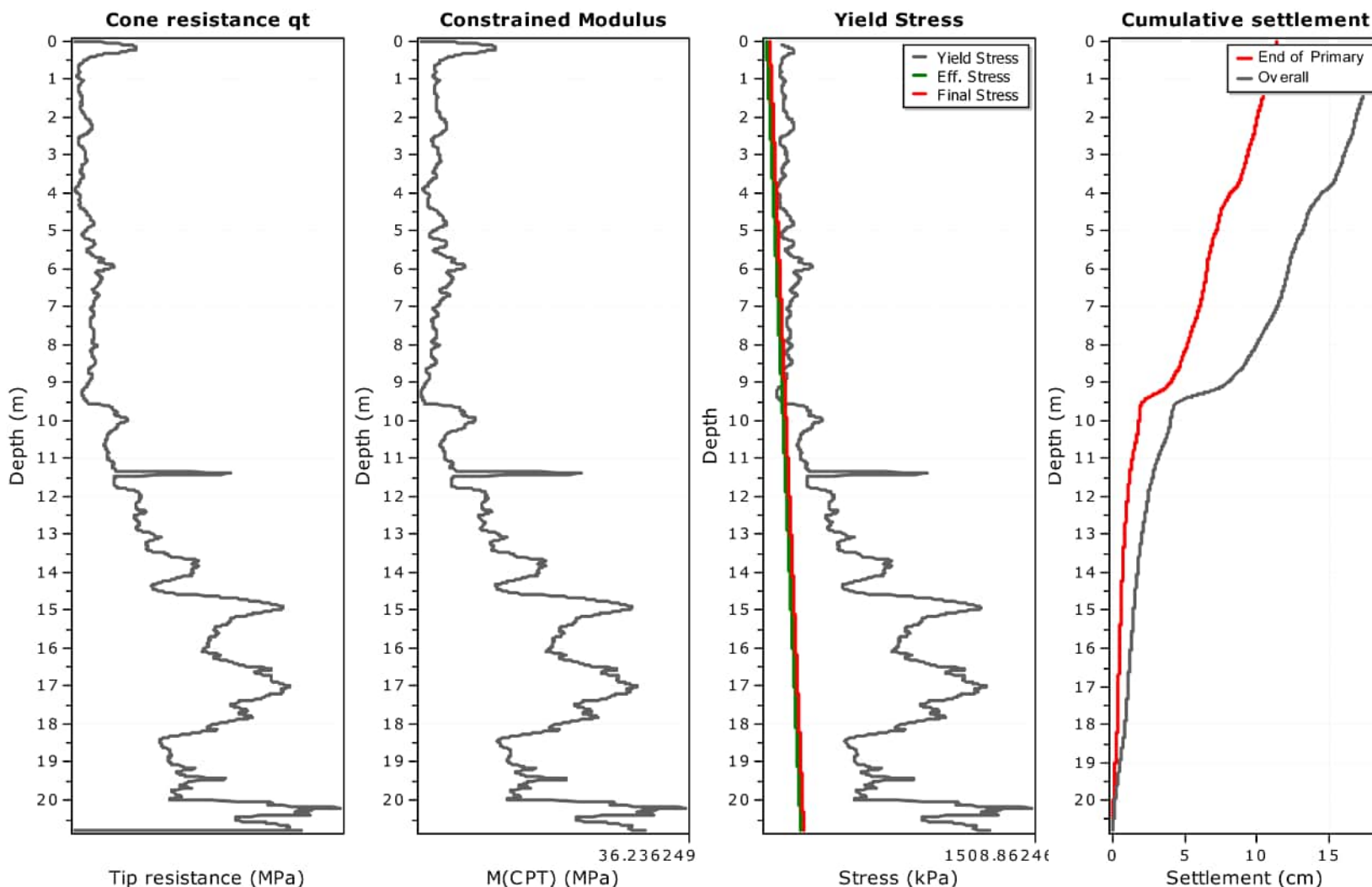
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

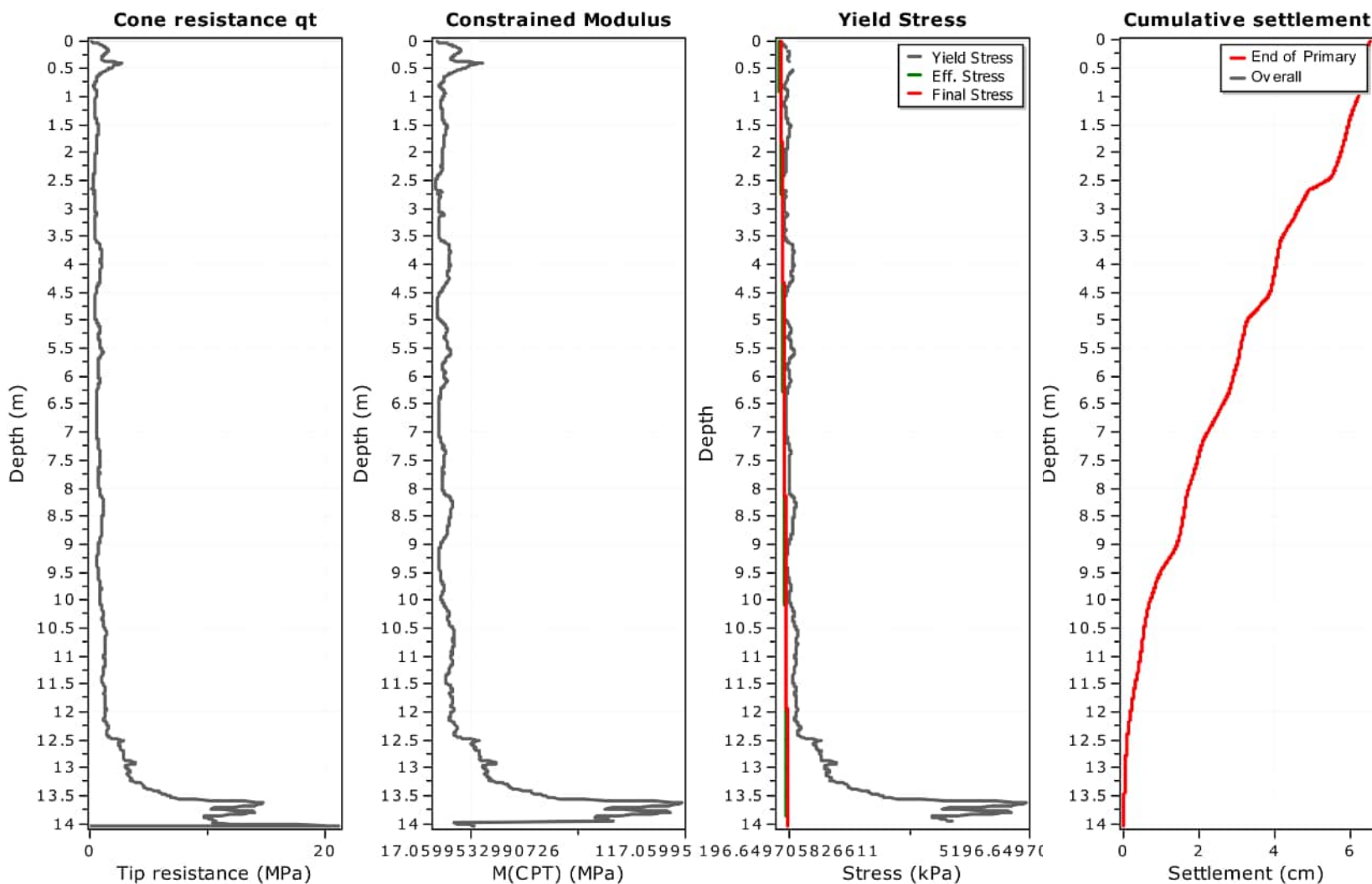
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

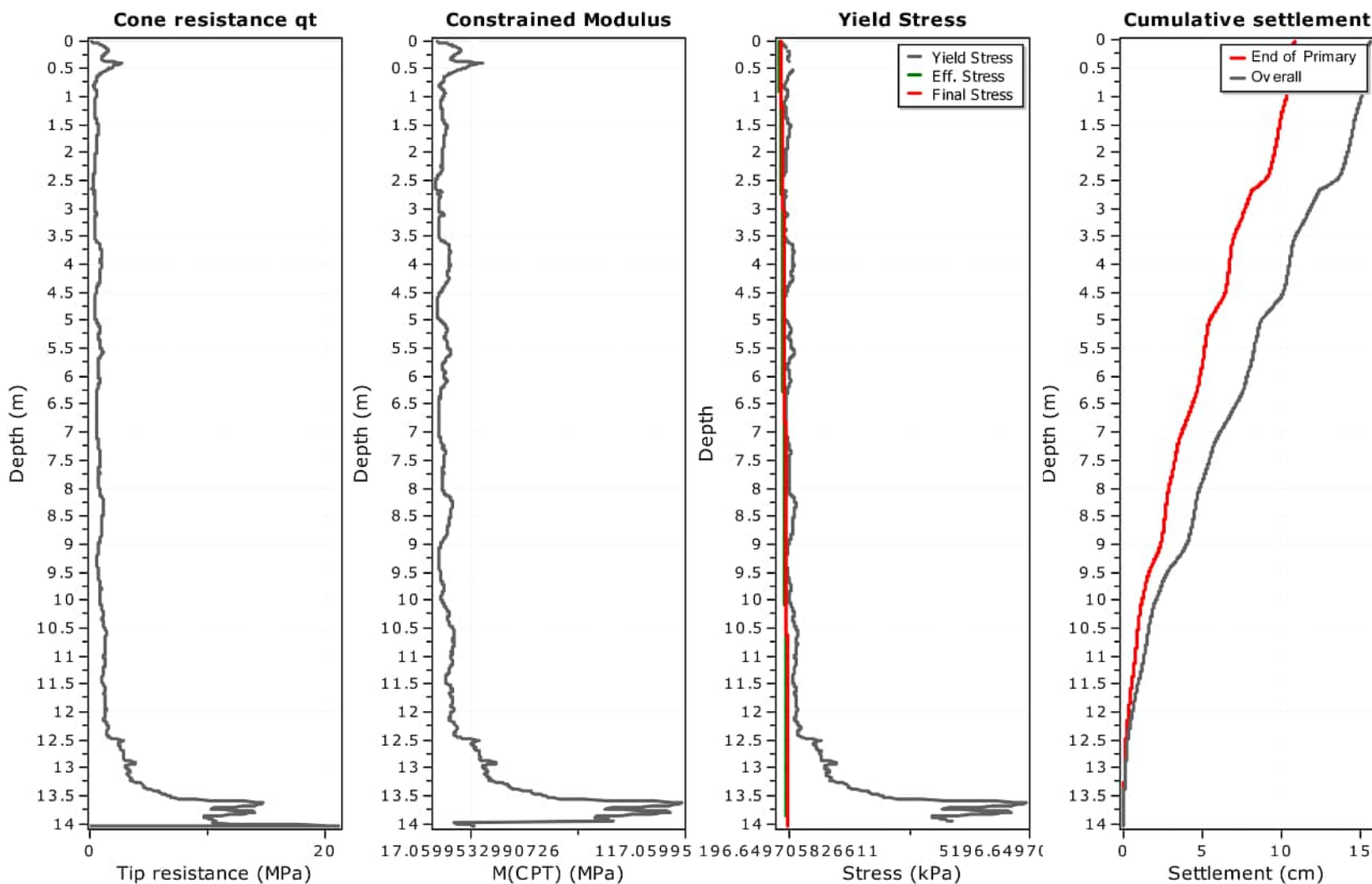
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

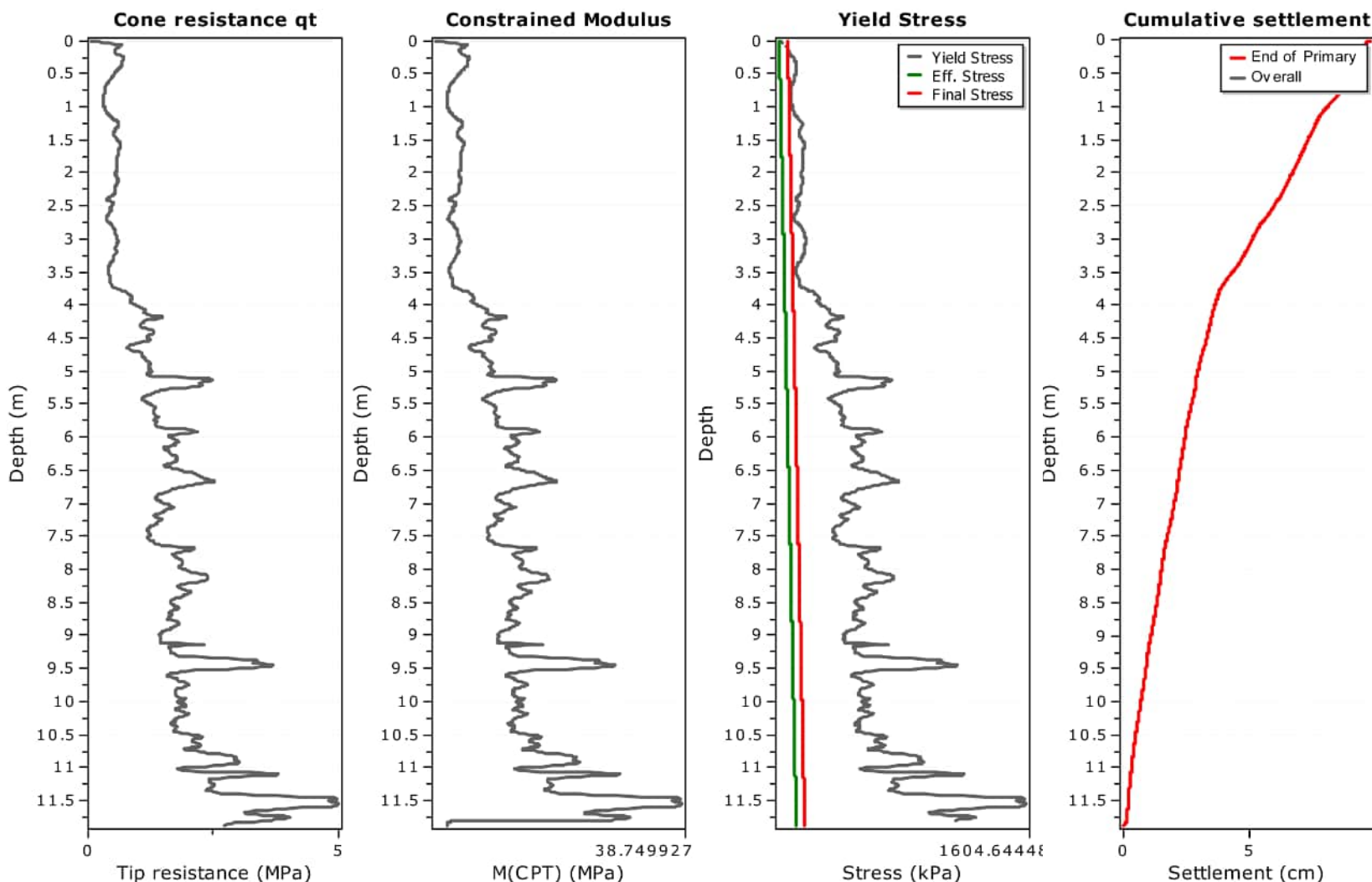
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

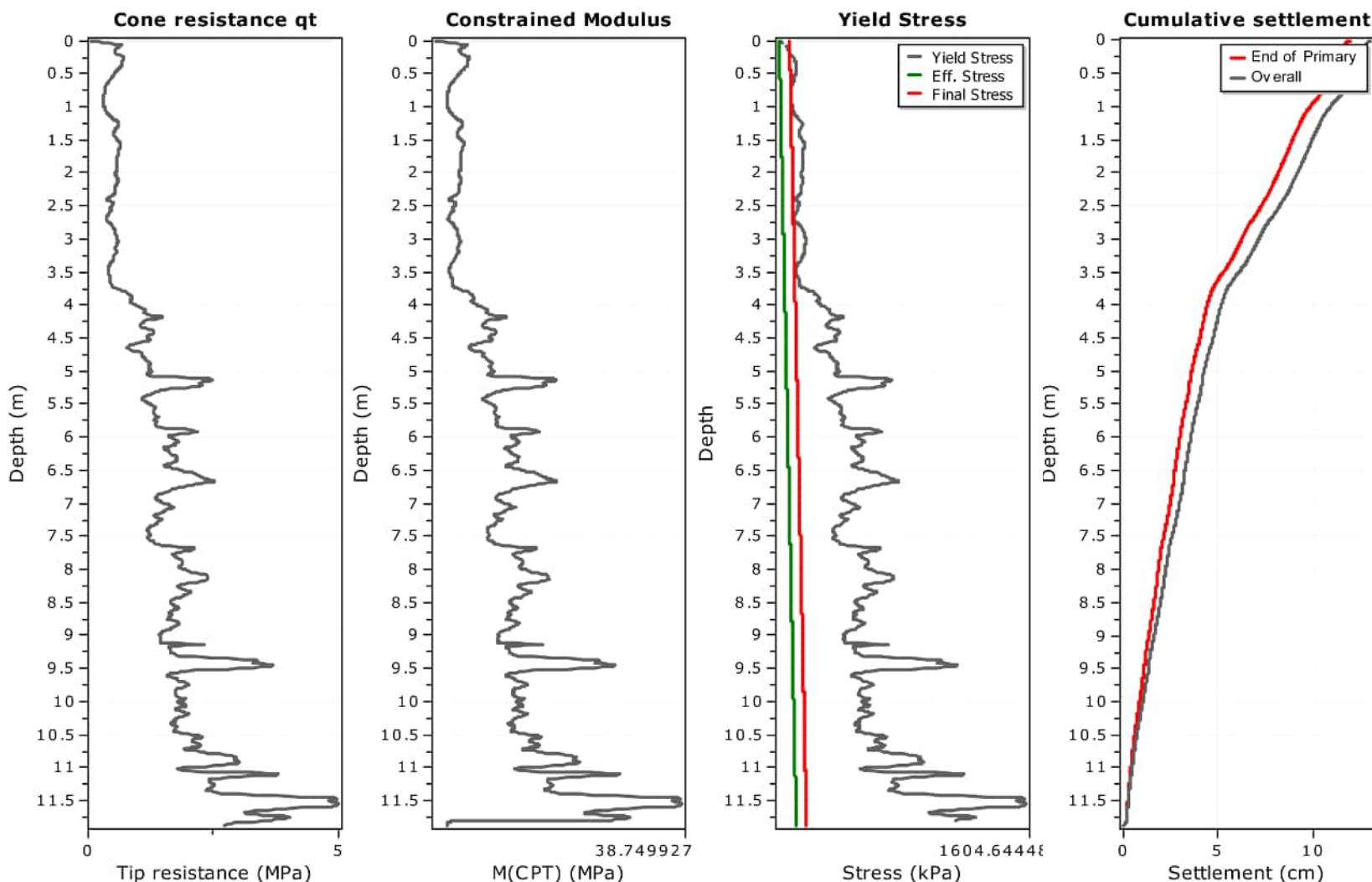
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 66.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

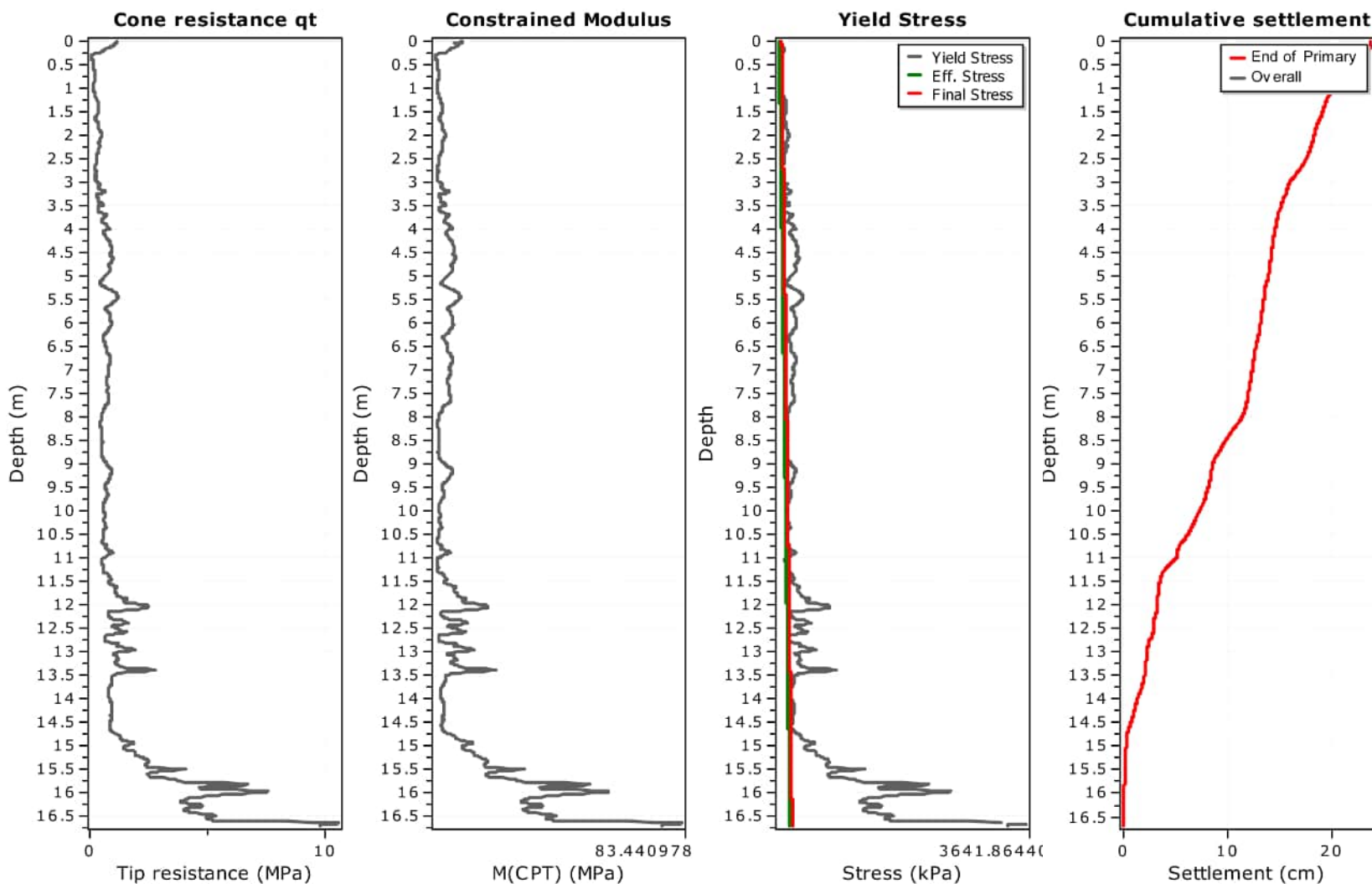
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_s = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

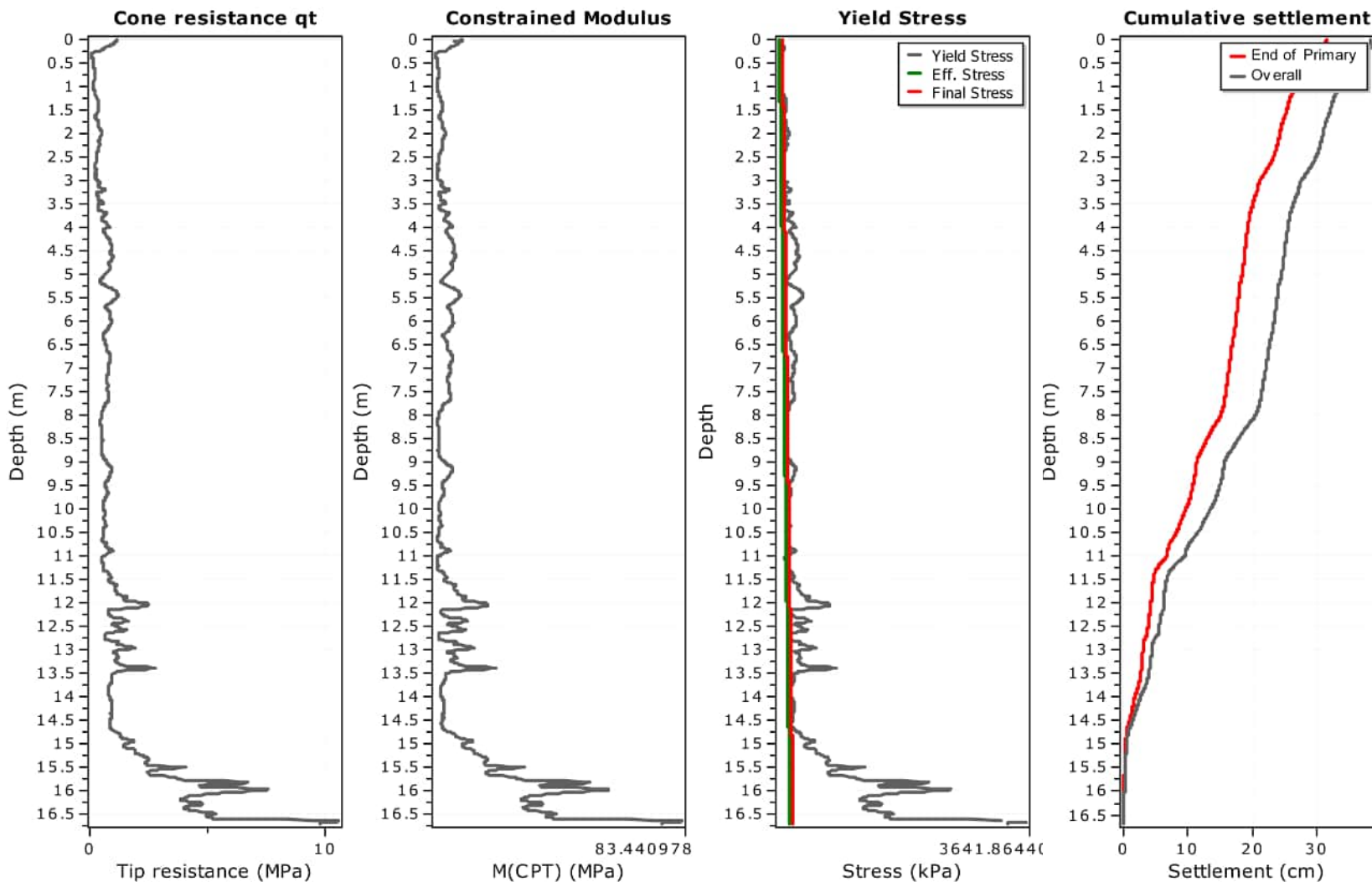
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-t/t_p} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 48.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

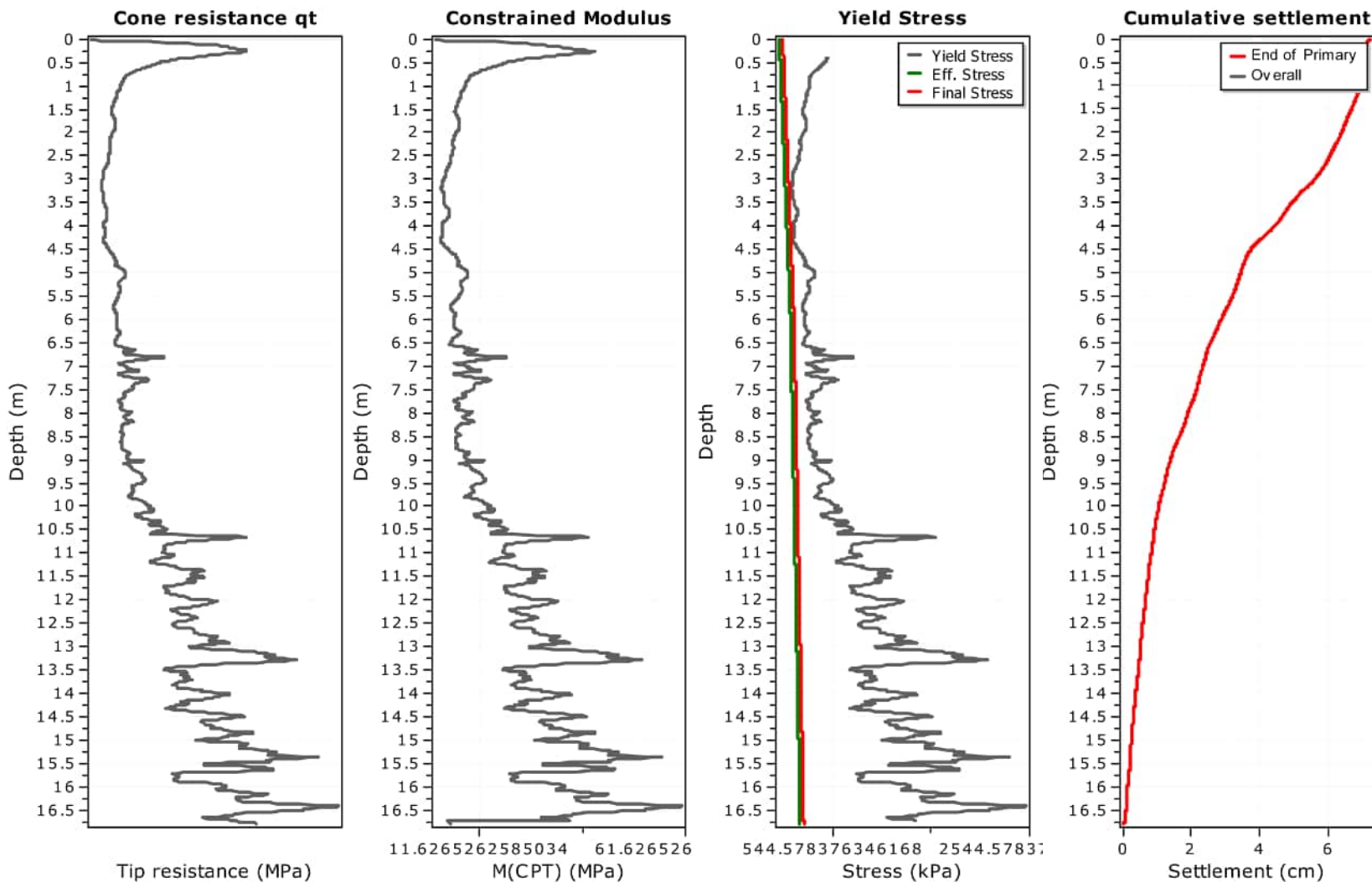
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

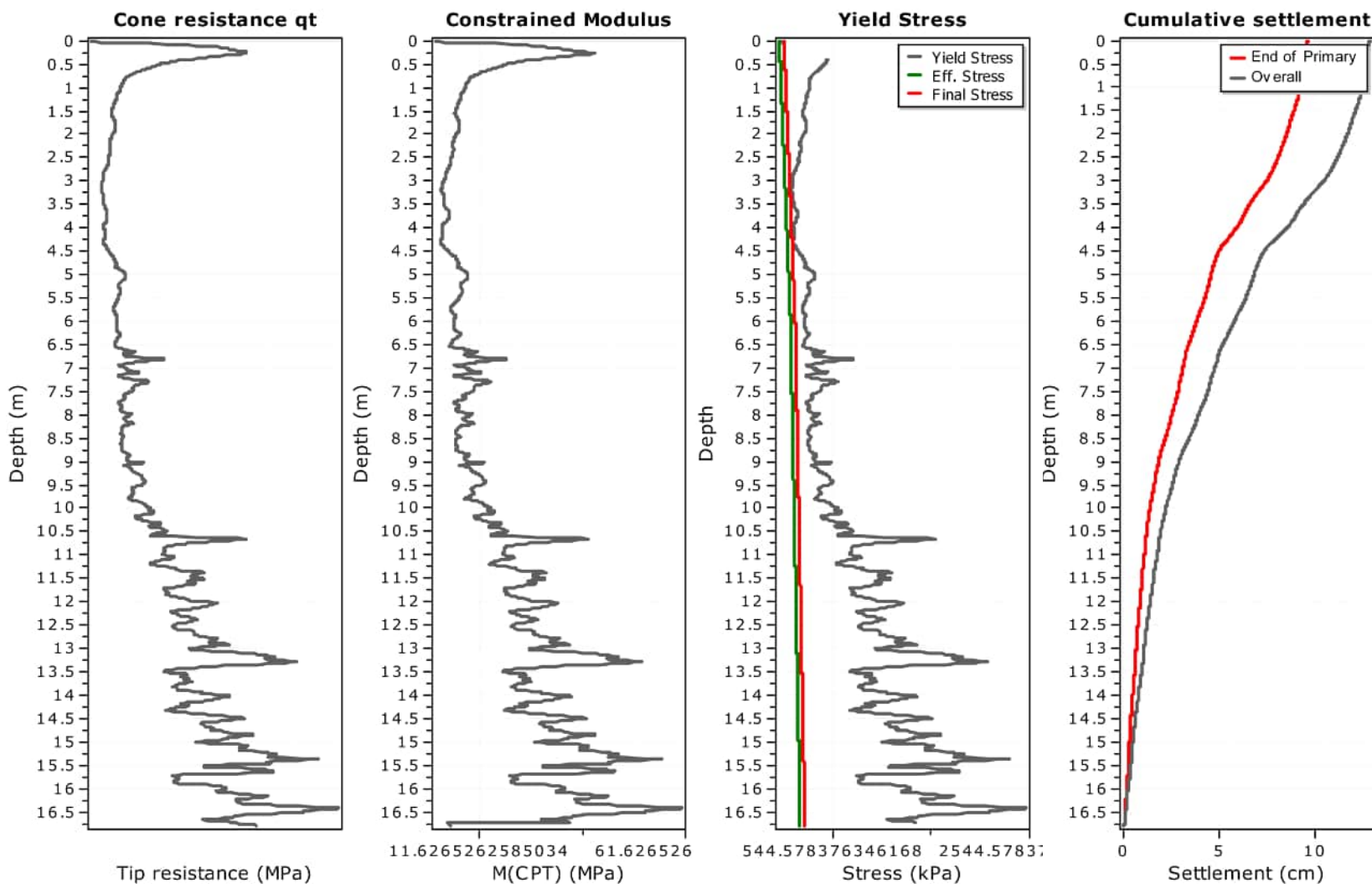
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 48.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

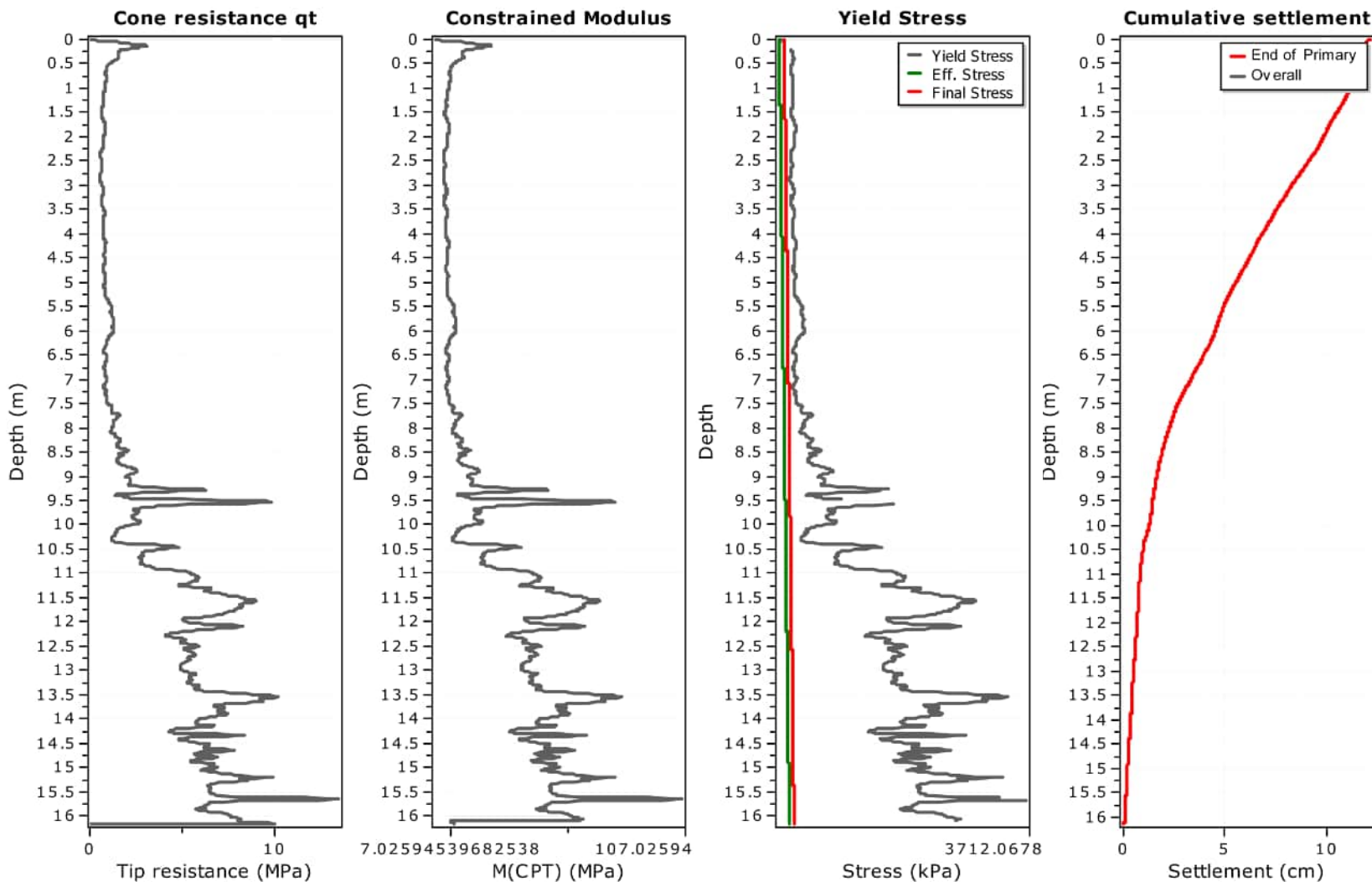
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 72.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

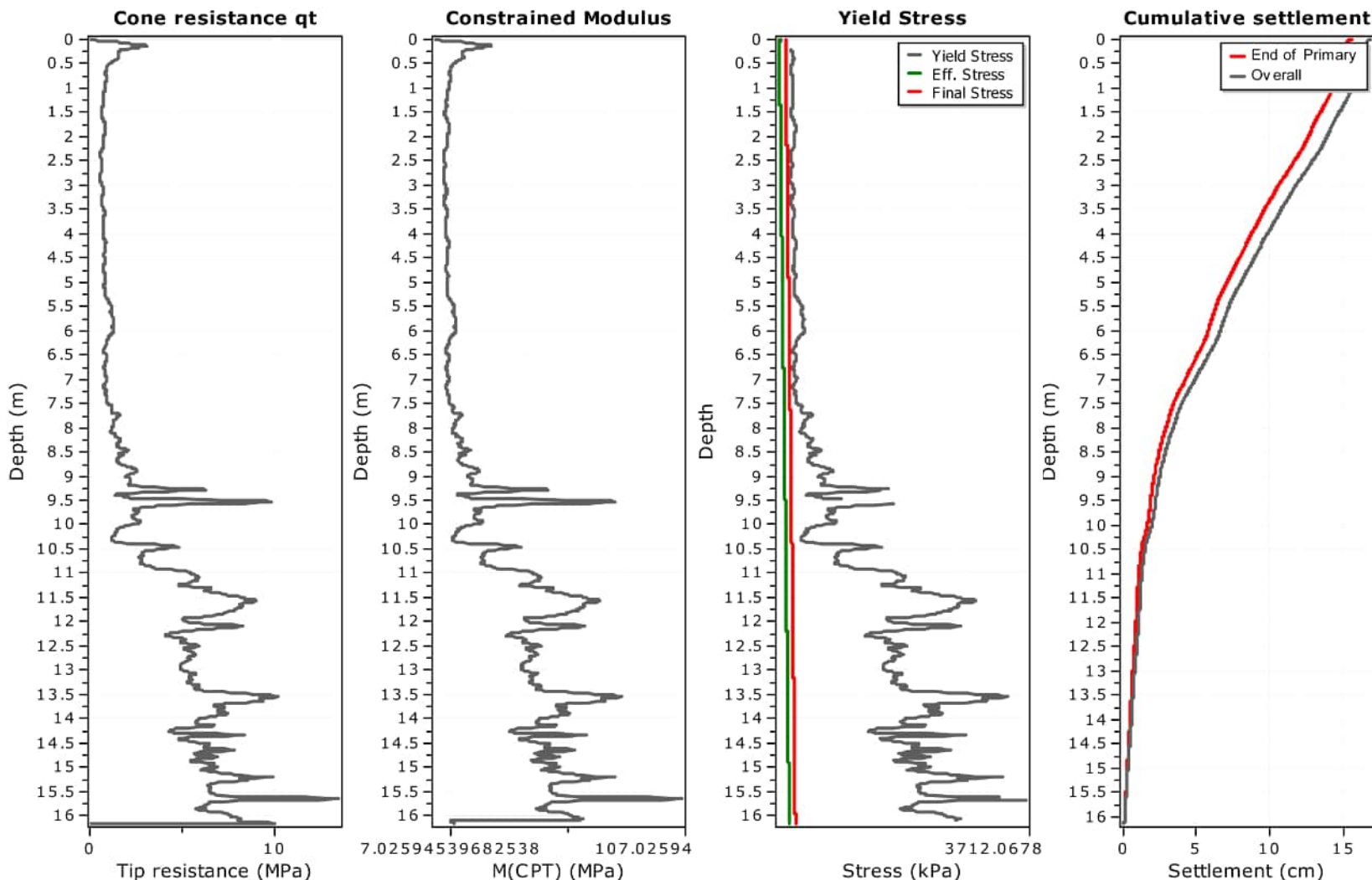
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 92.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

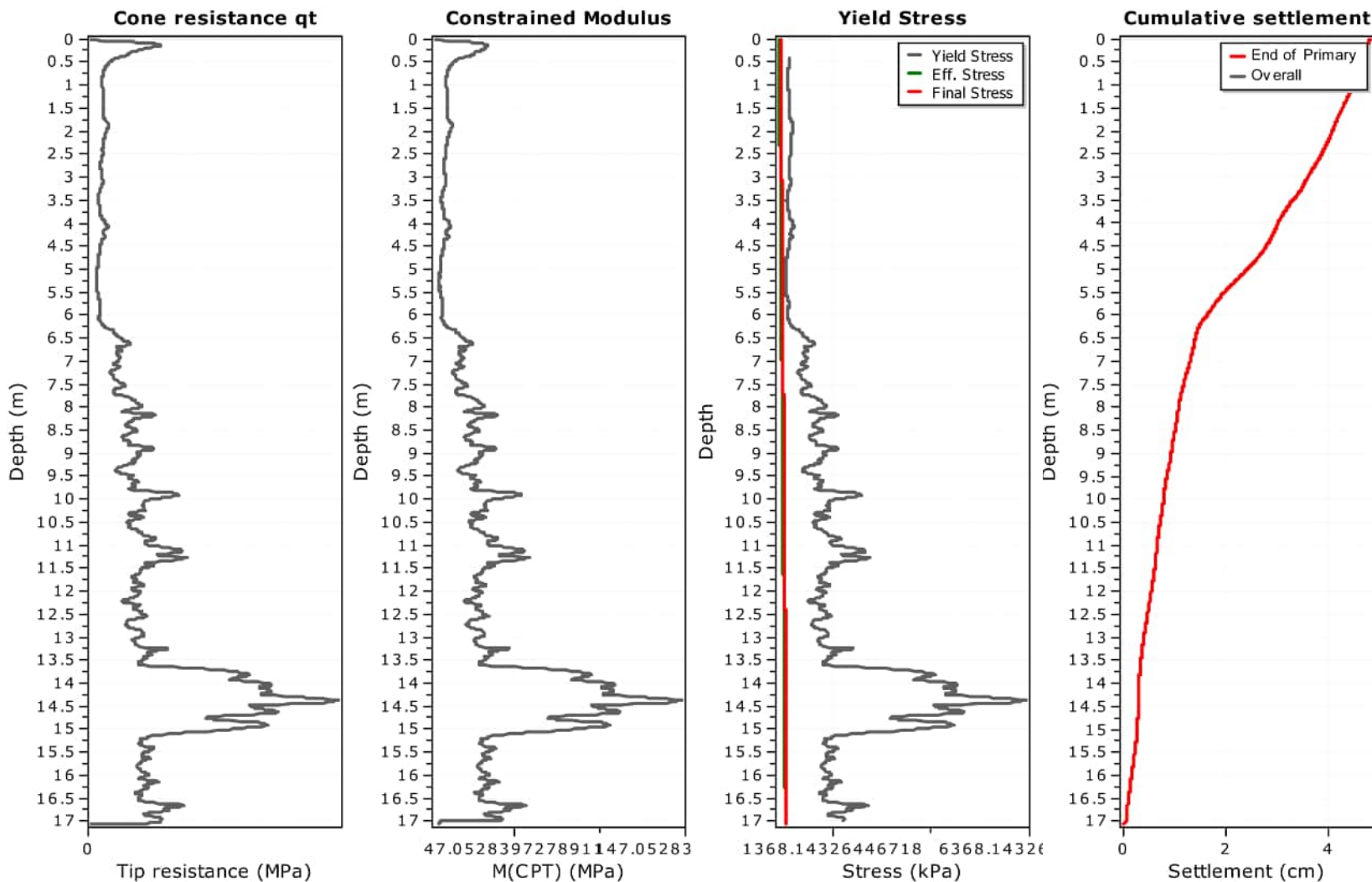
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

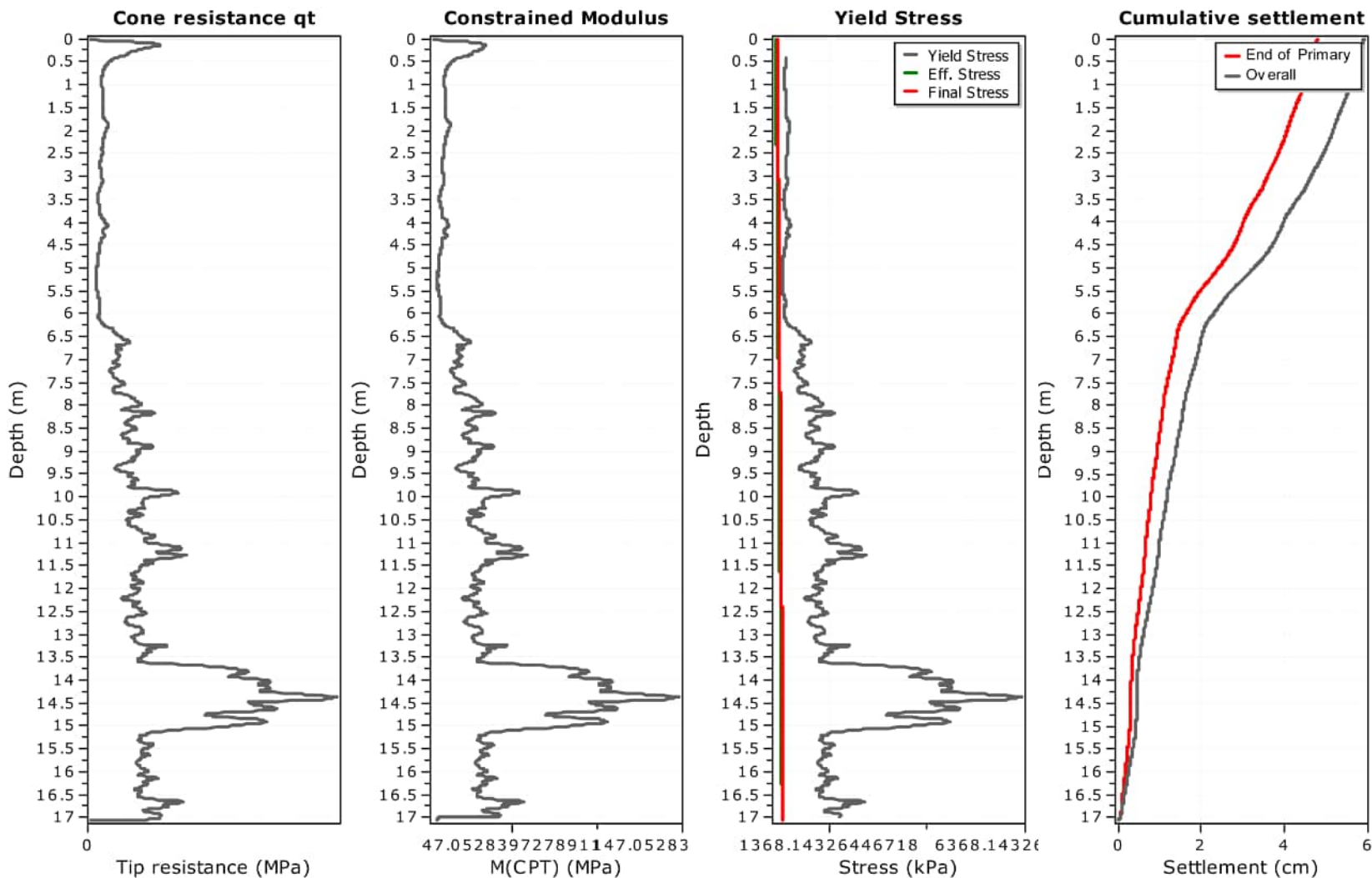
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

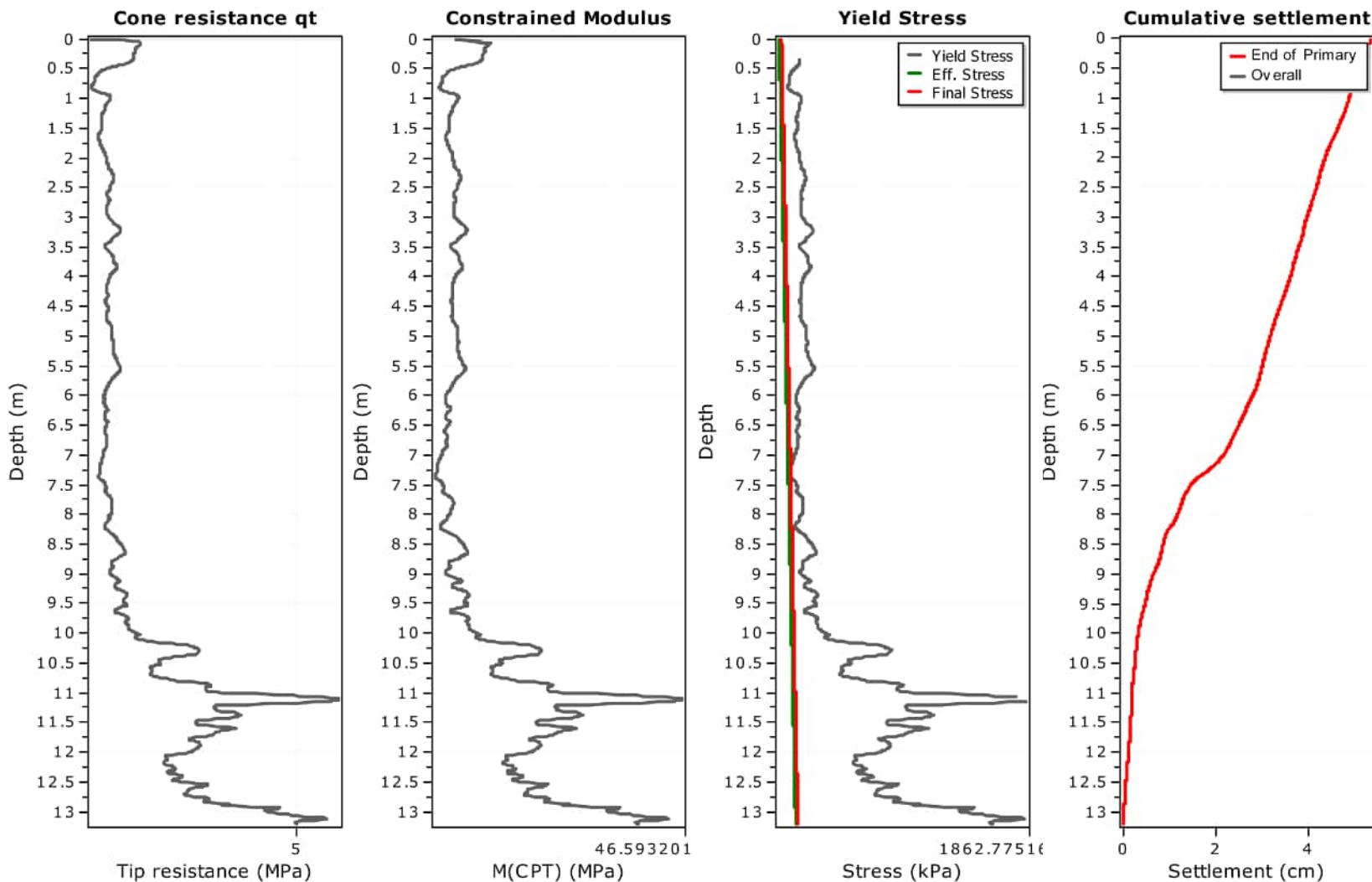
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{secondary} = S_{primary} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

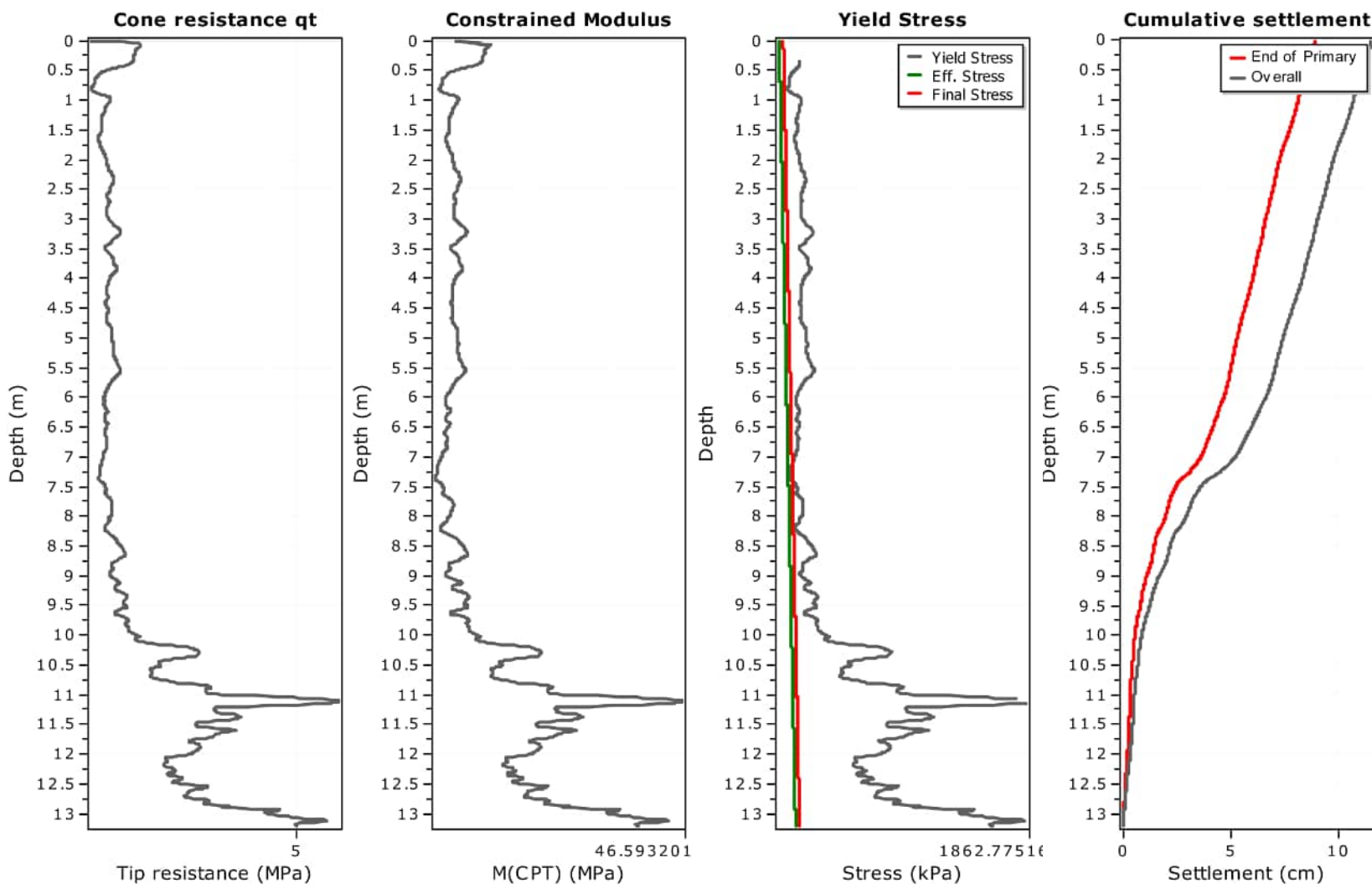
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

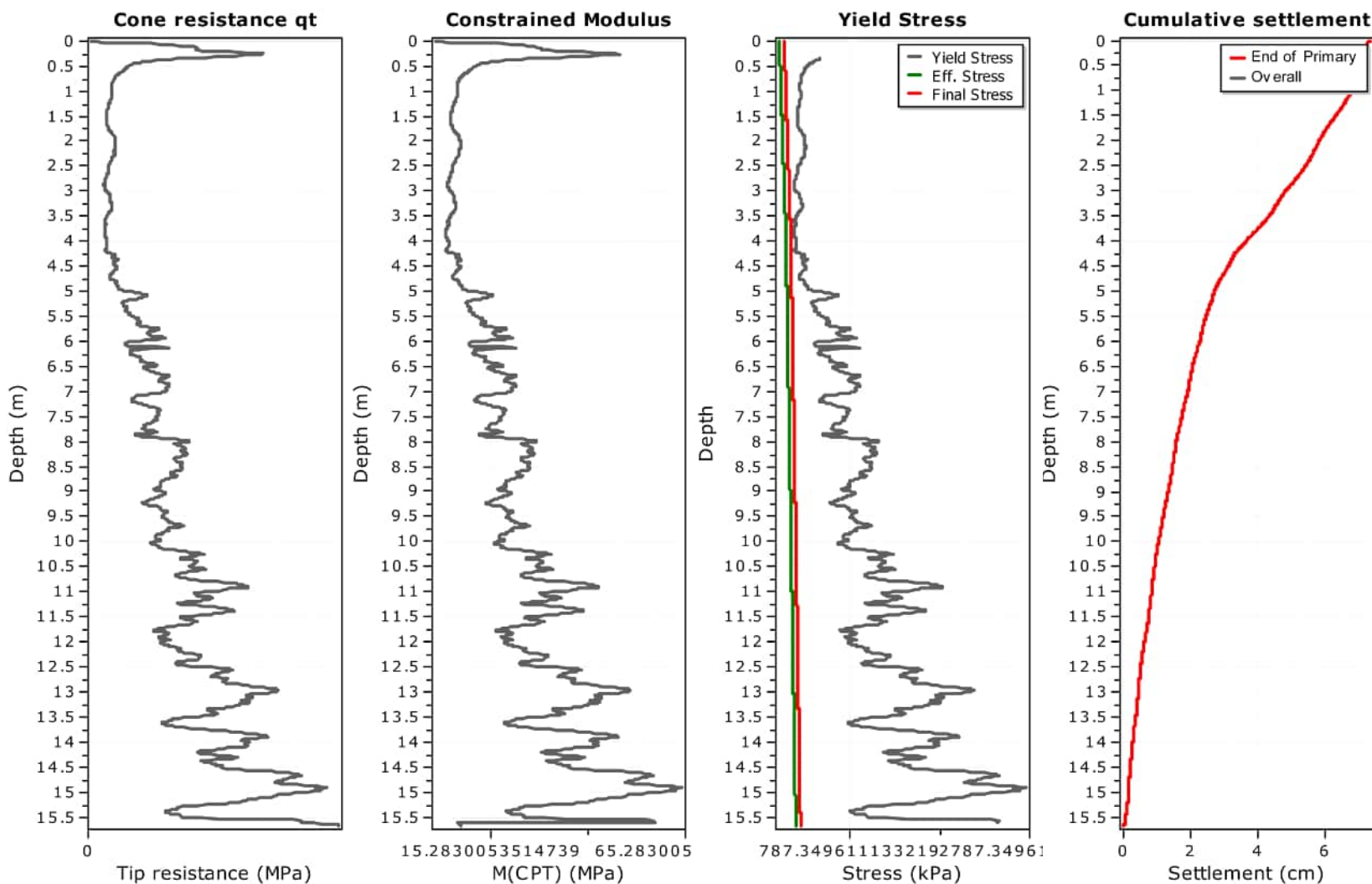
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

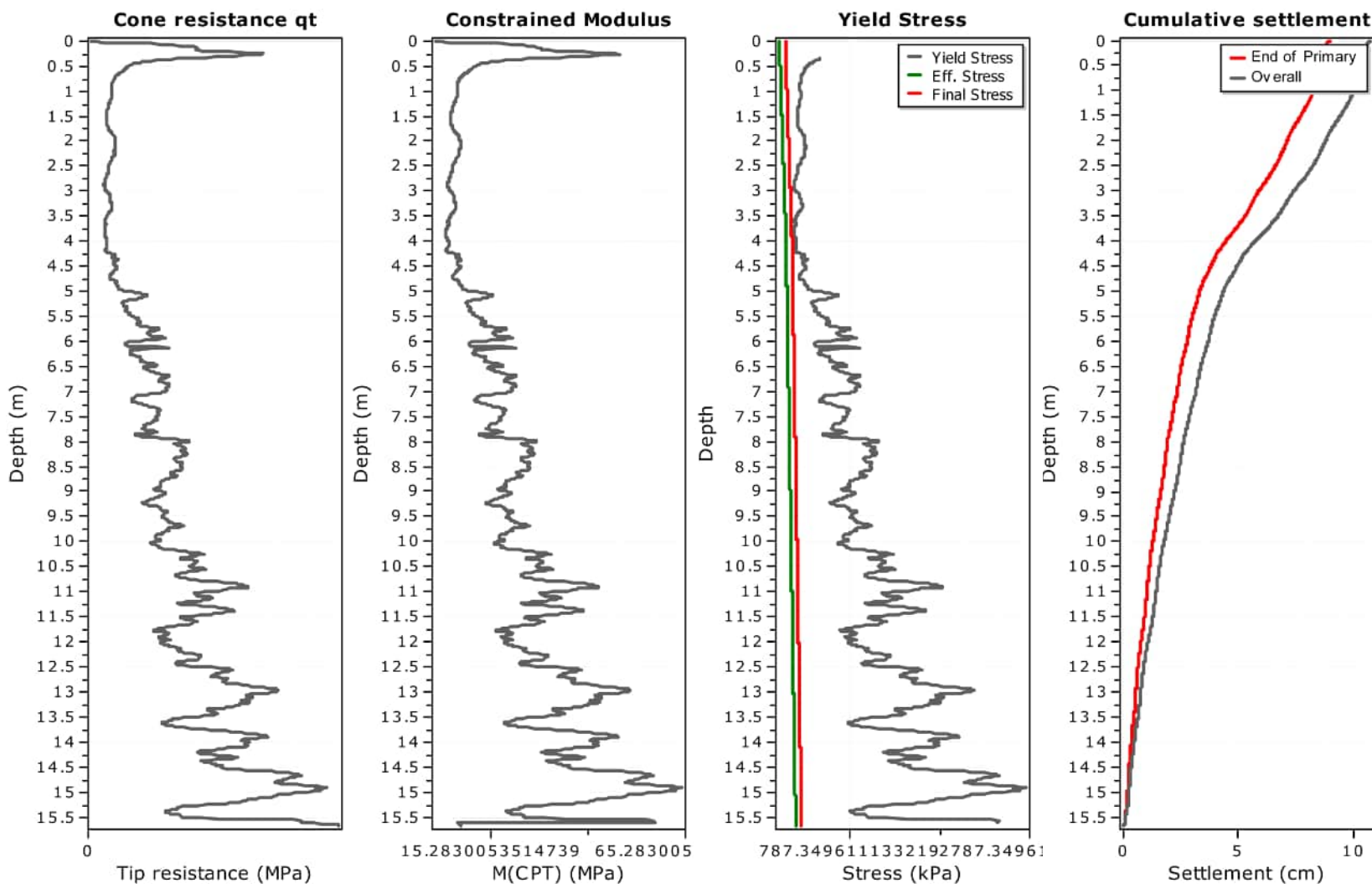
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 66.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

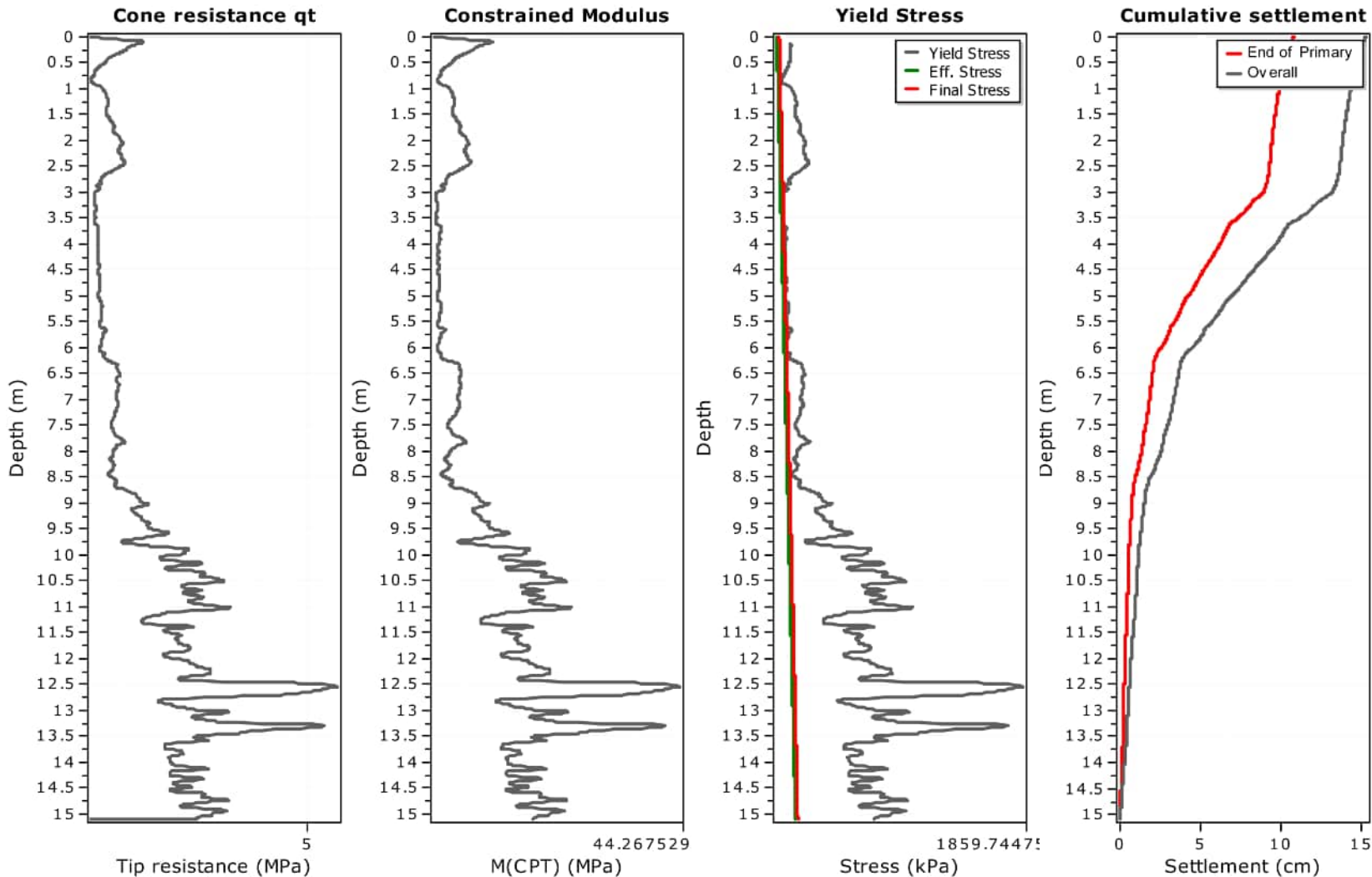
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

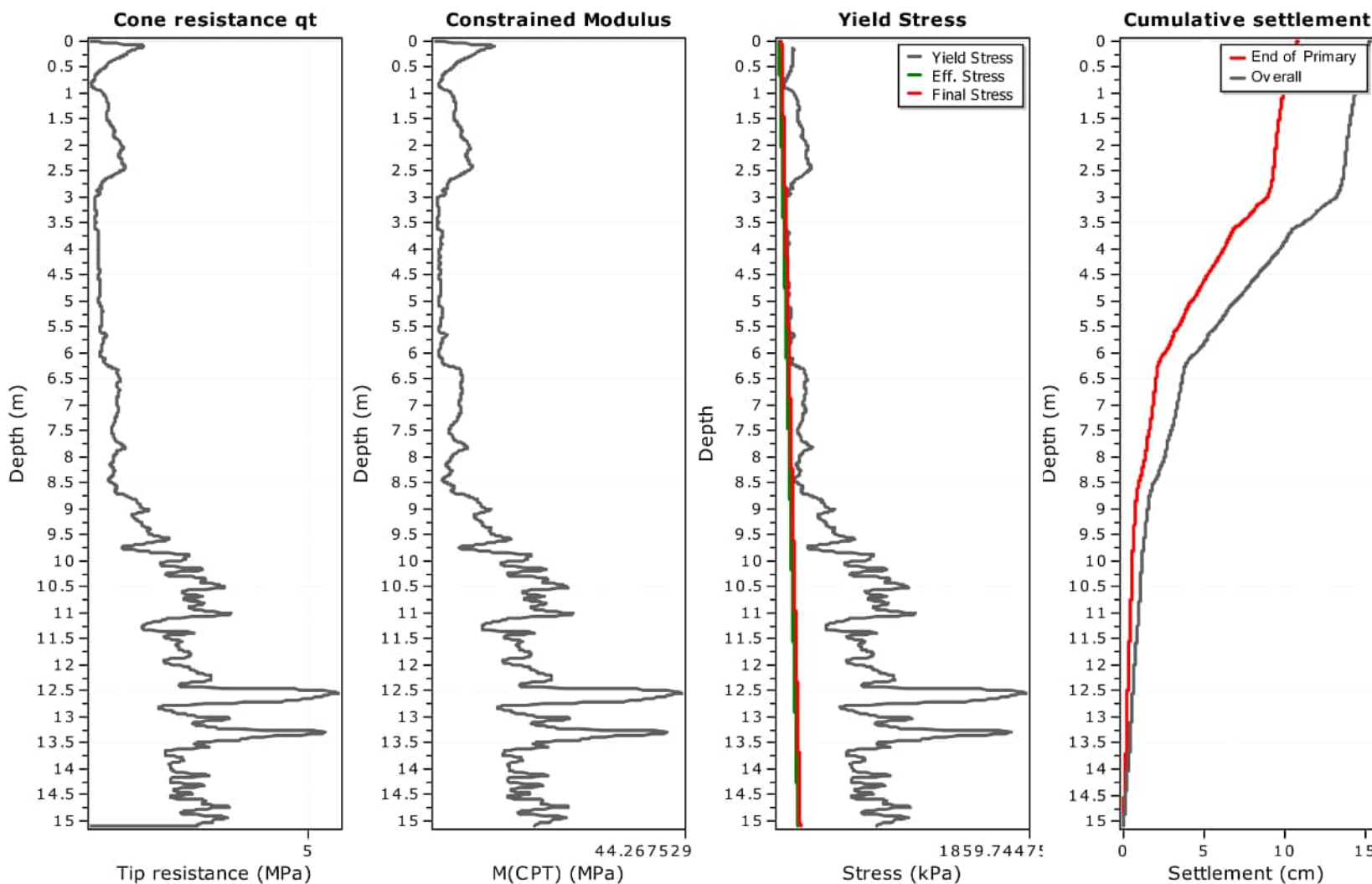
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

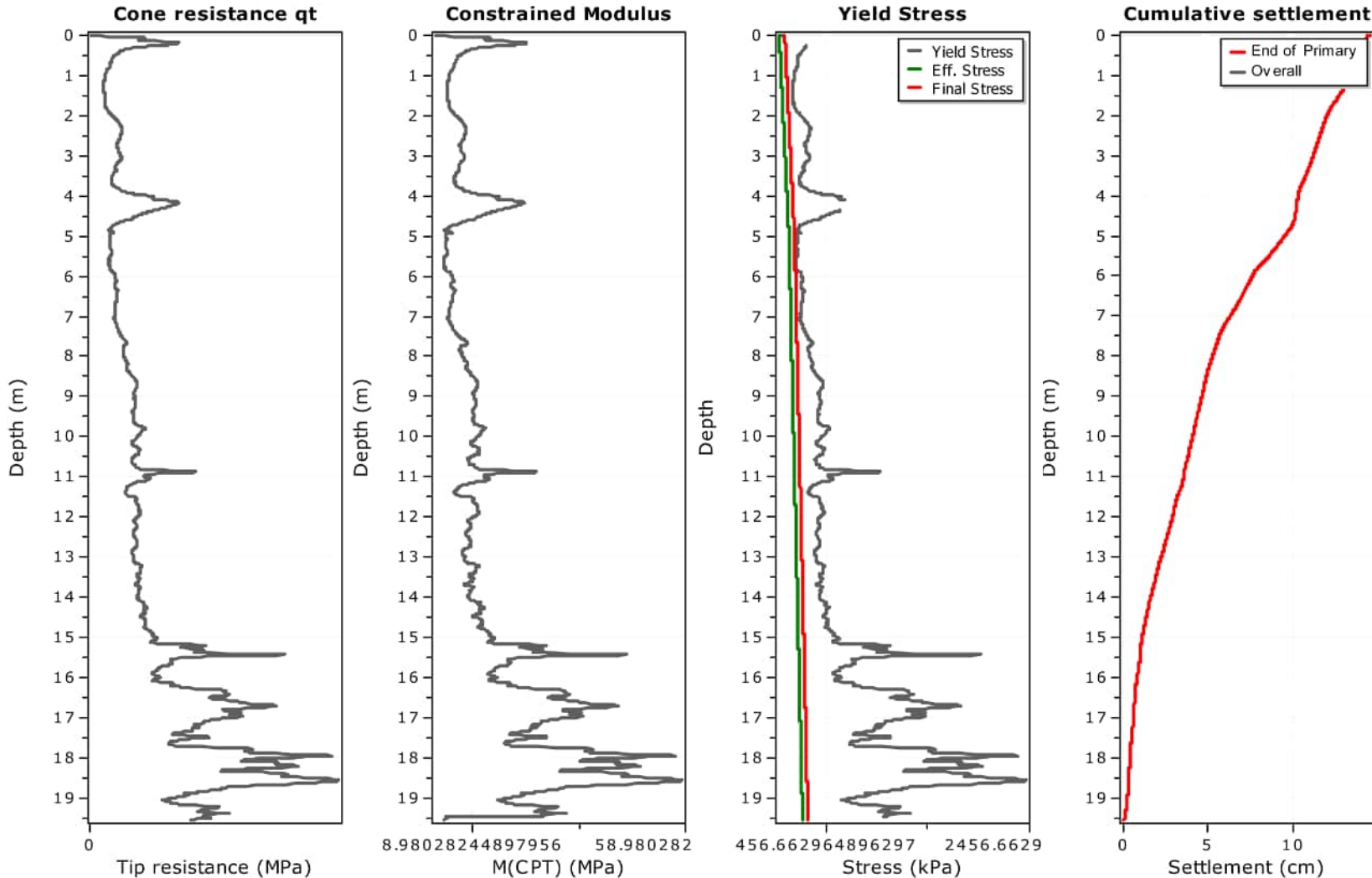
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

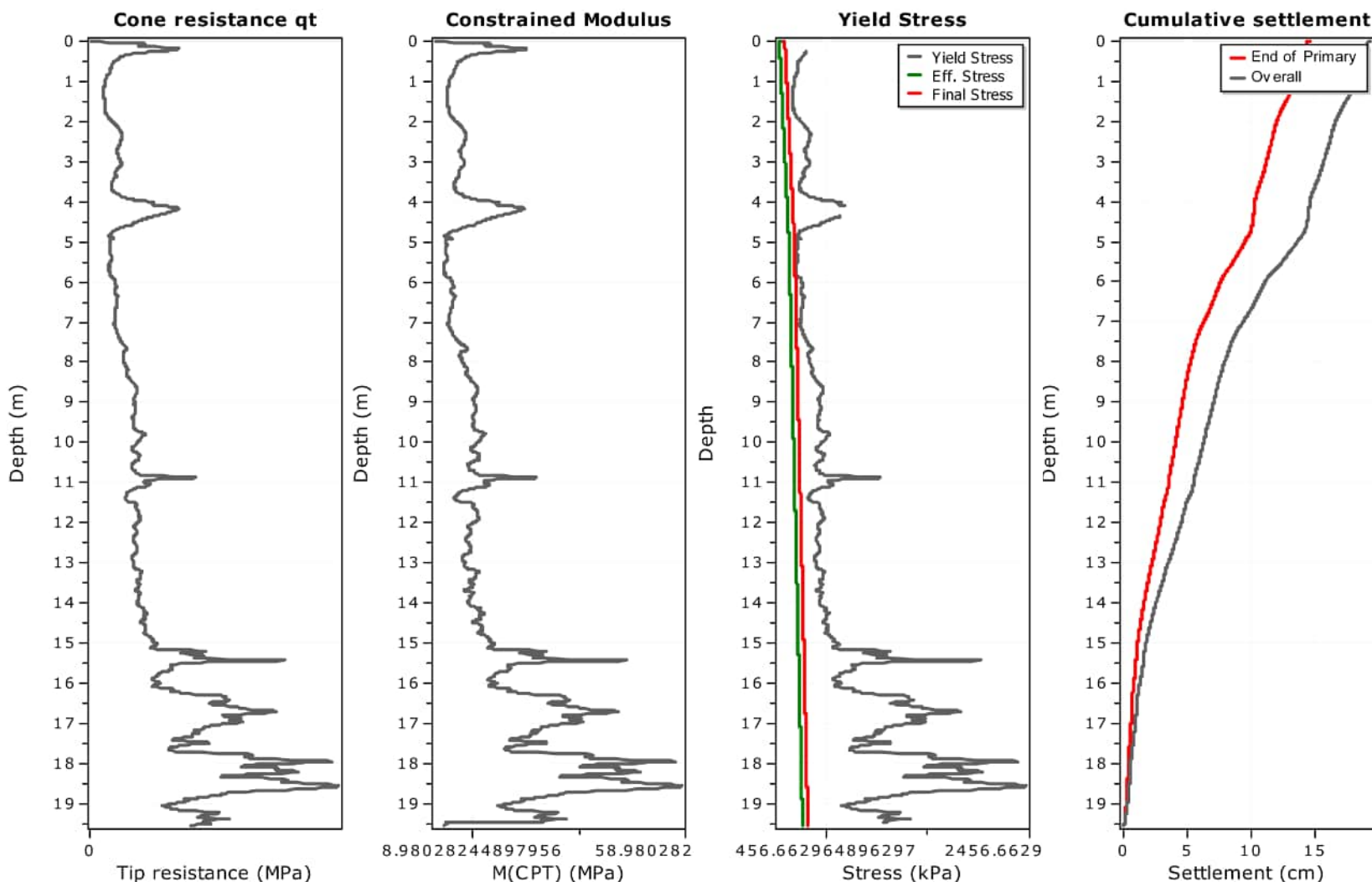
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

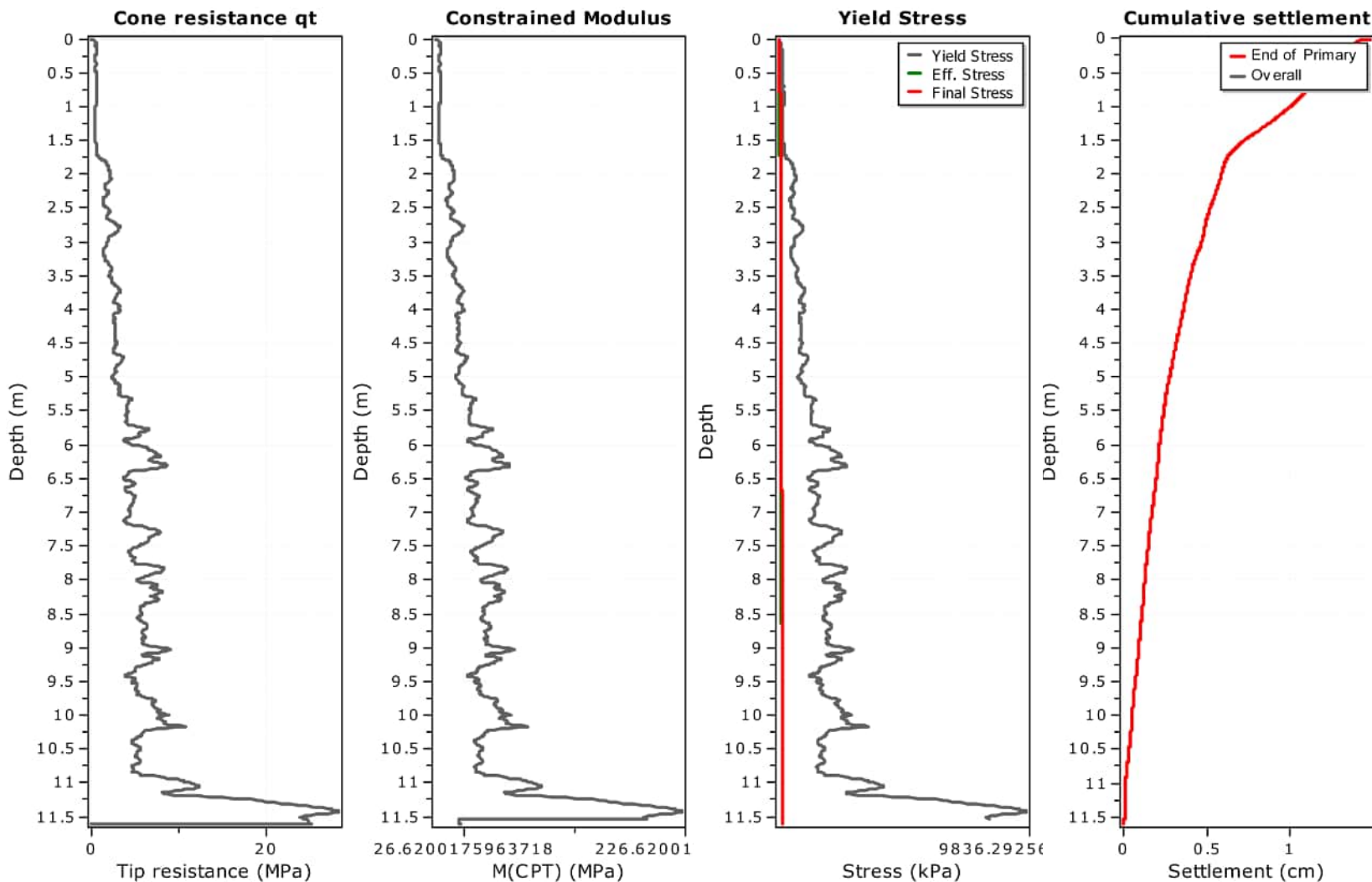
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

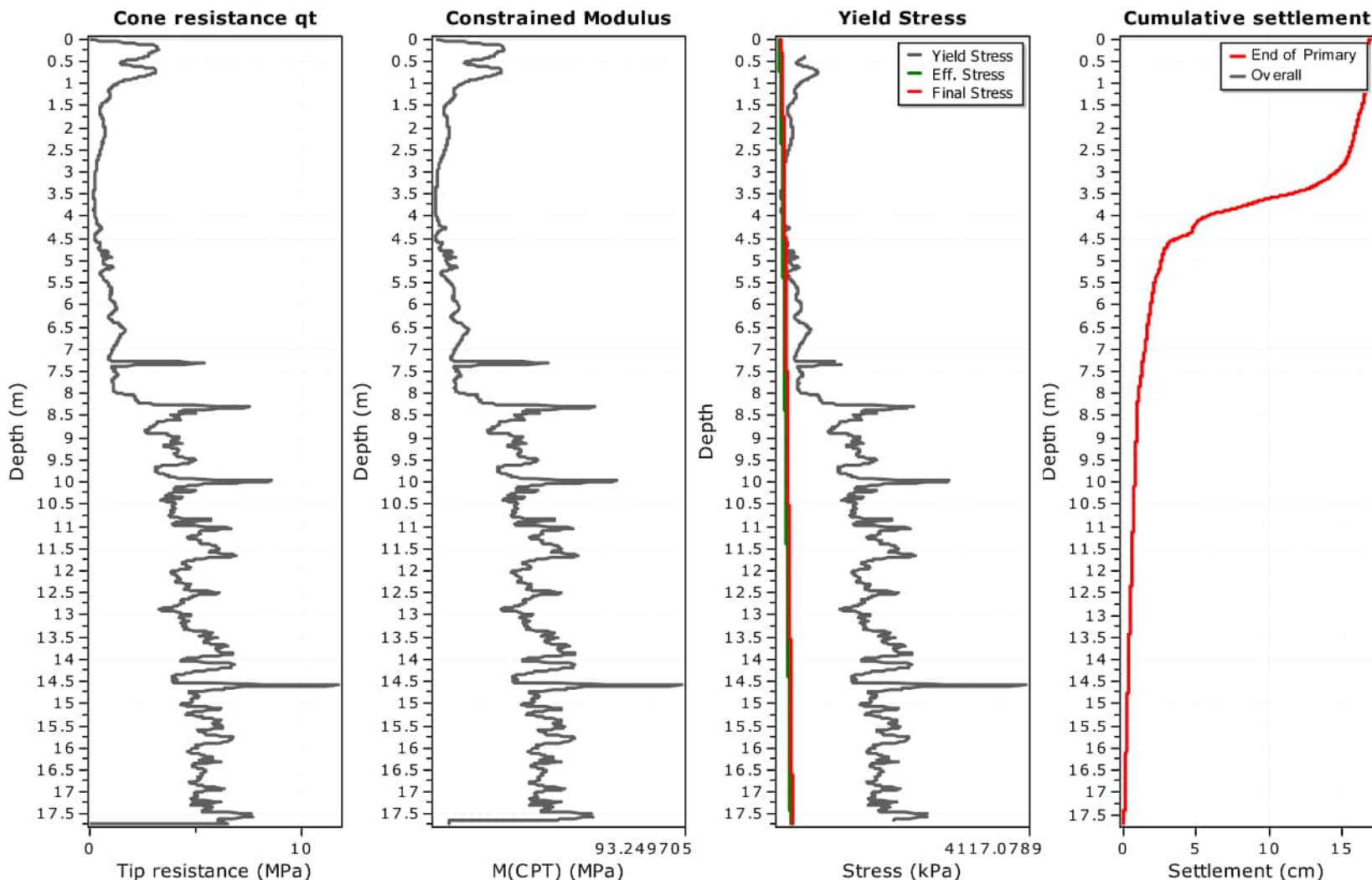
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

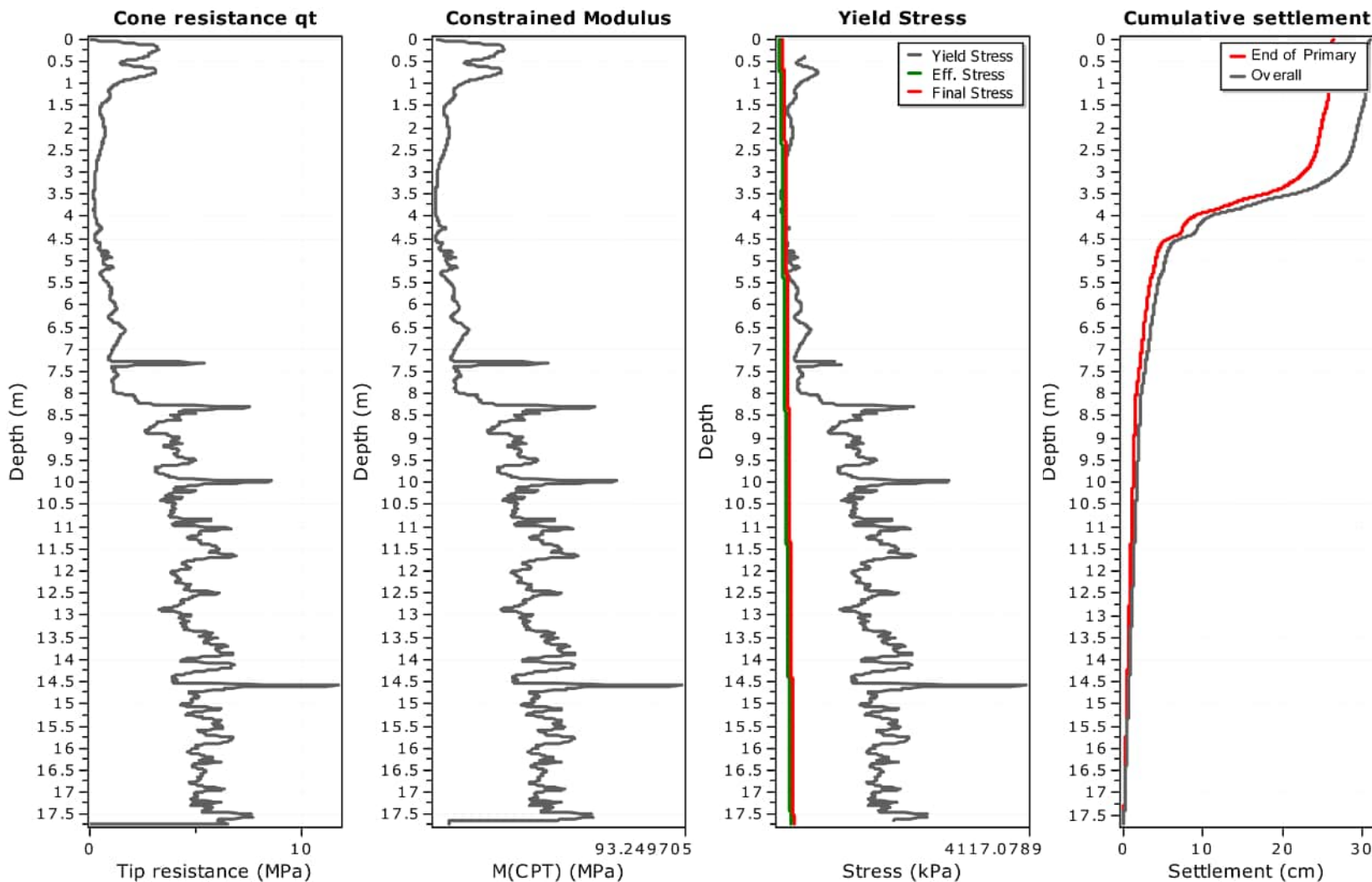
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 56.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

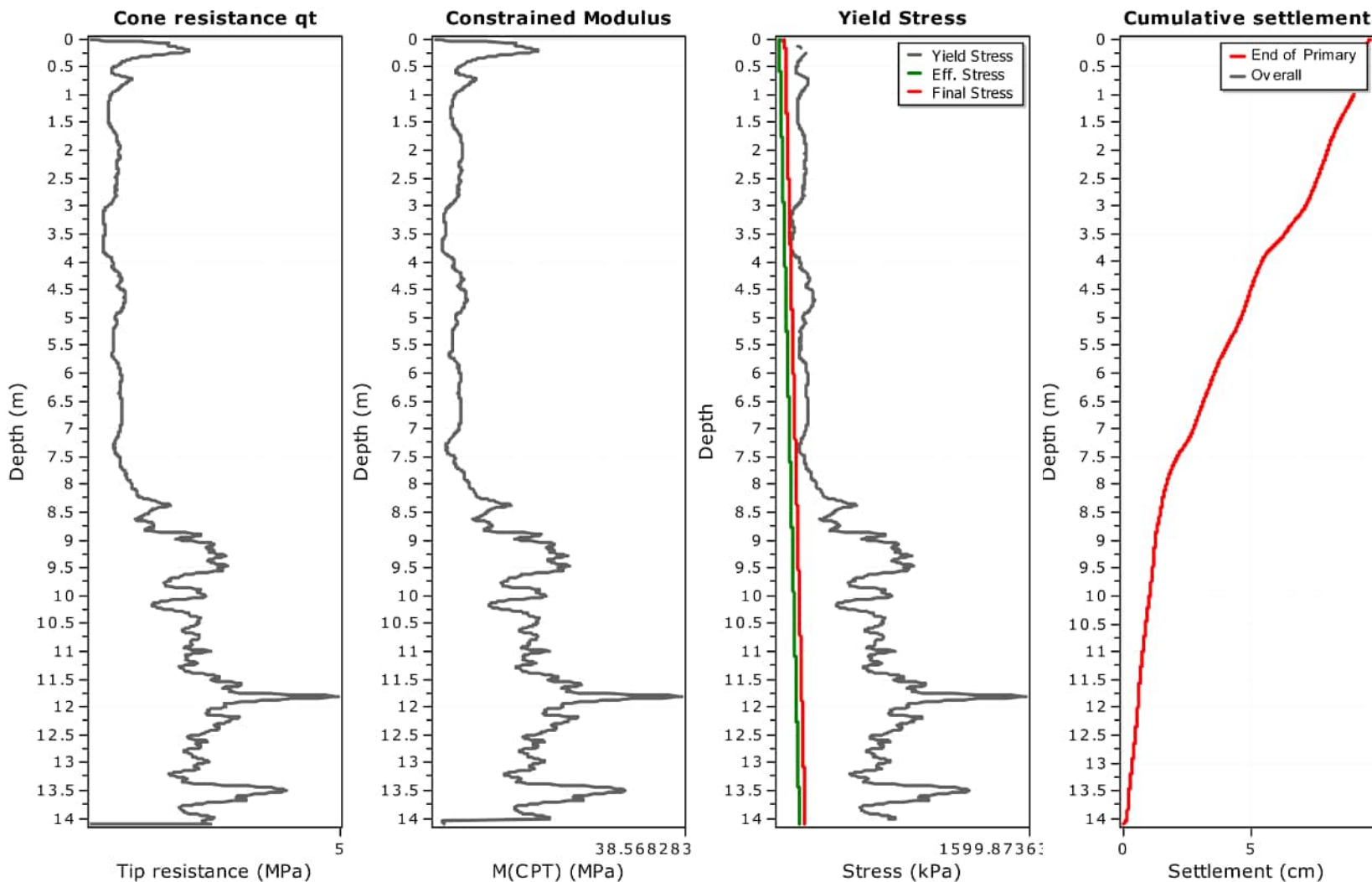
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

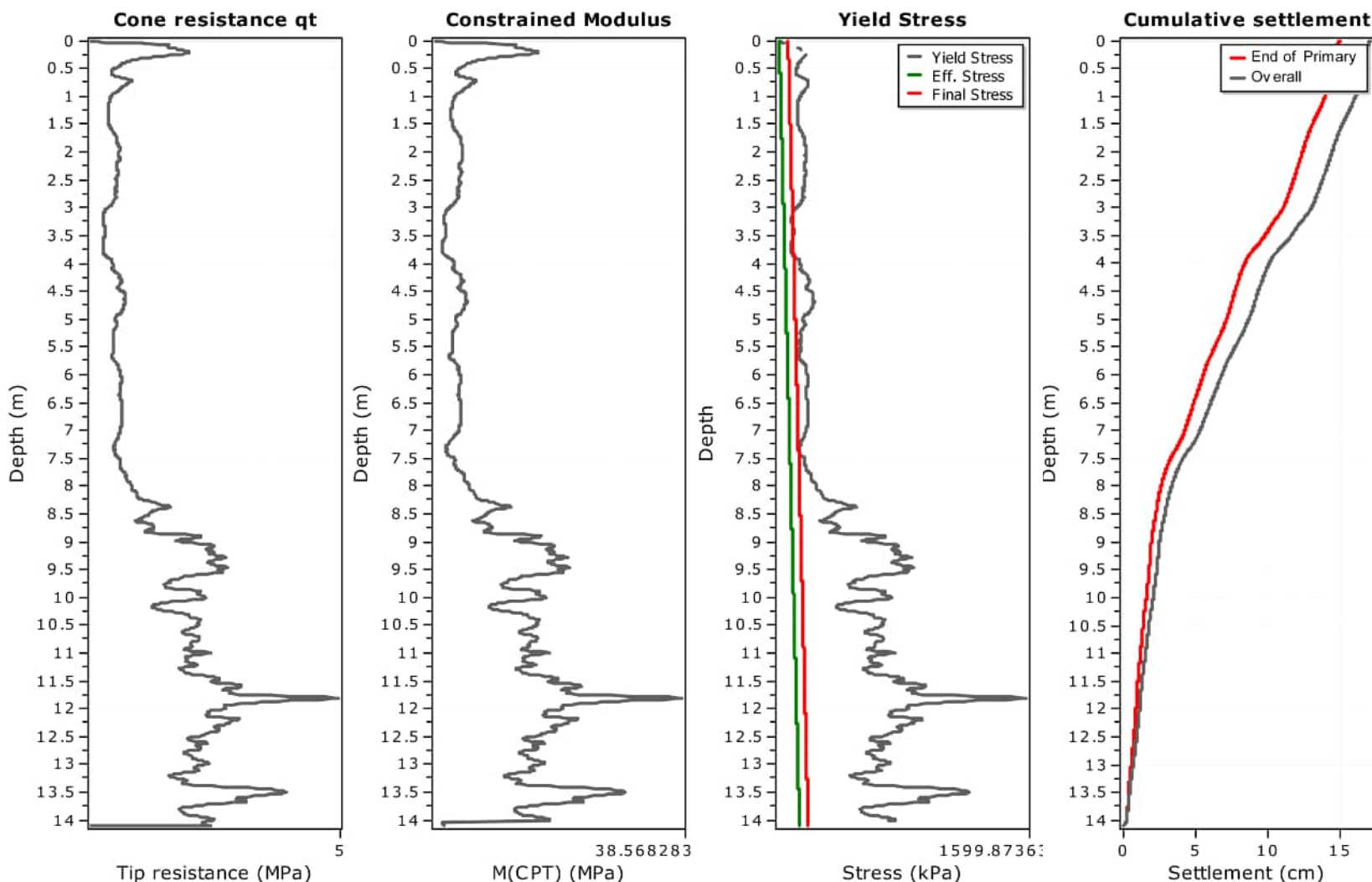
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 56.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

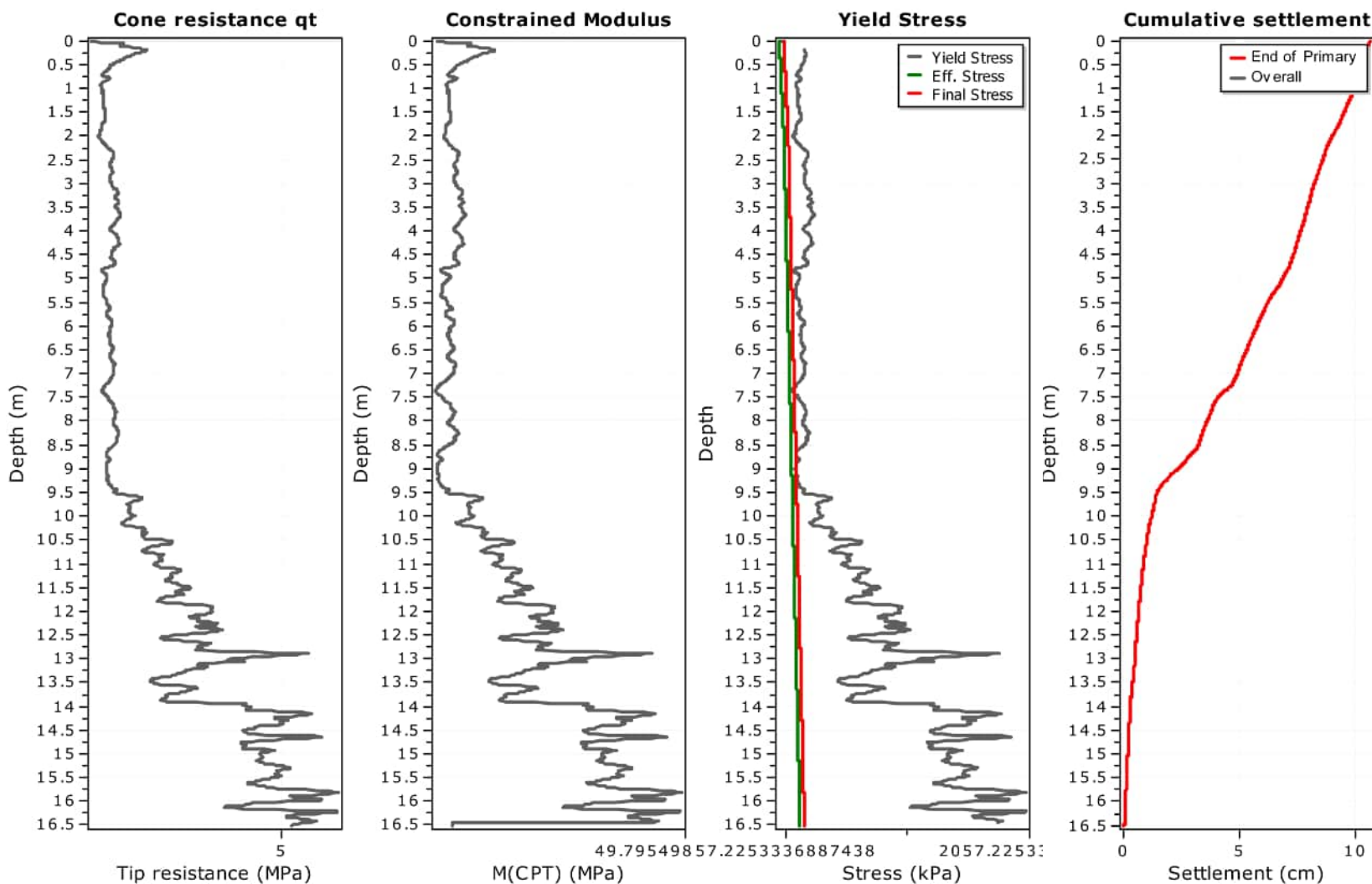
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

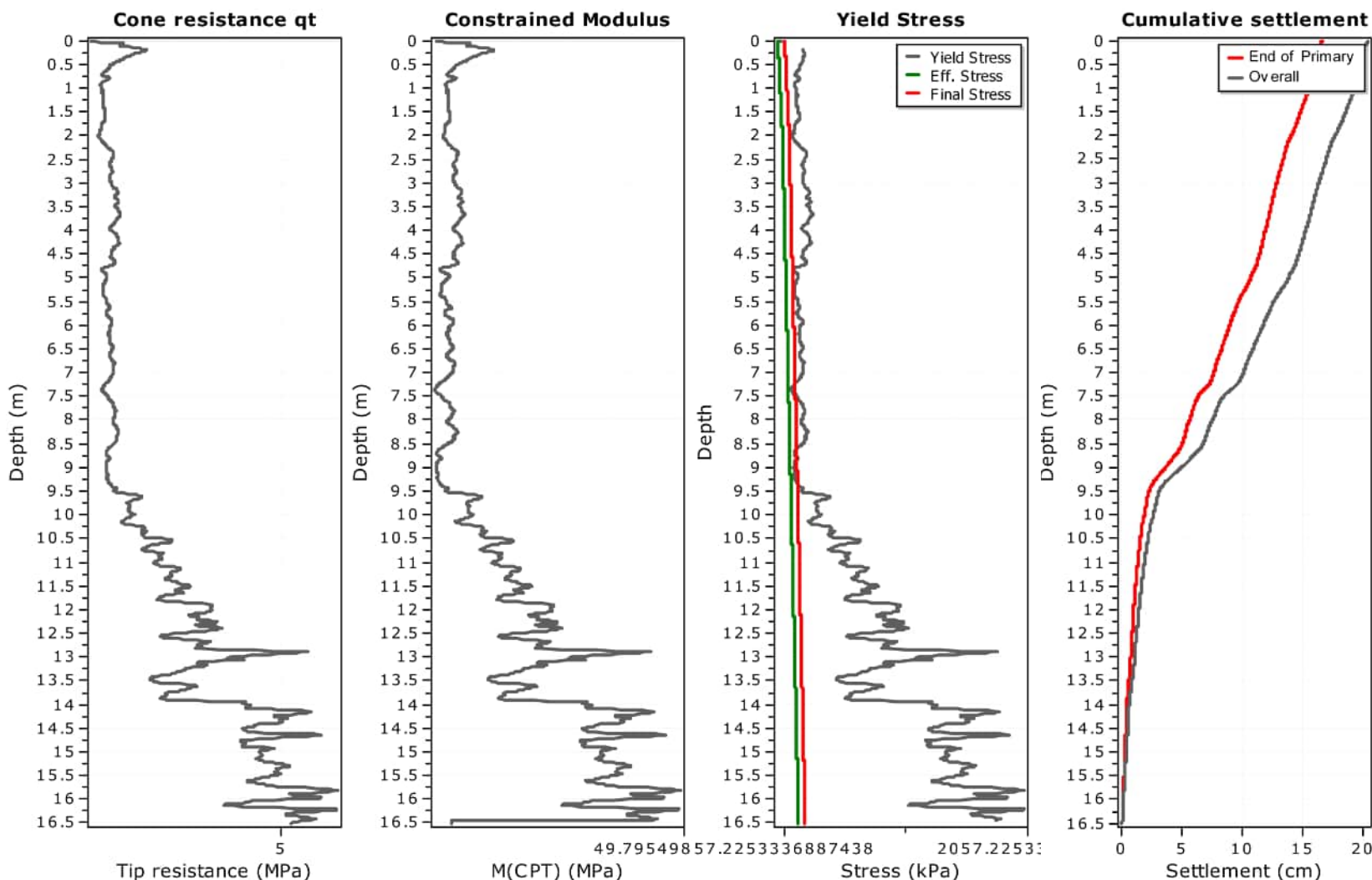
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{secondary} = S_{primary} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 56.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

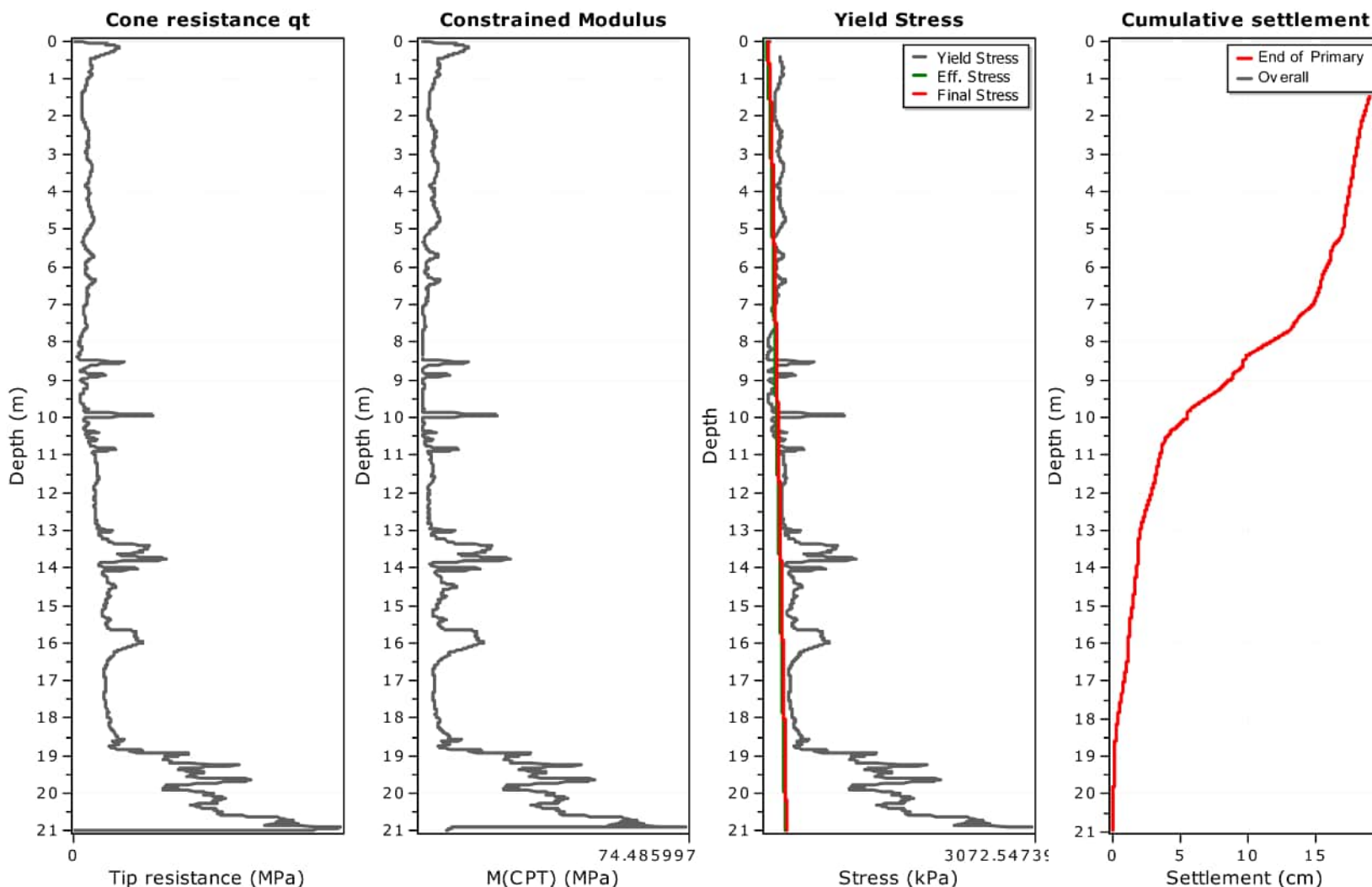
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

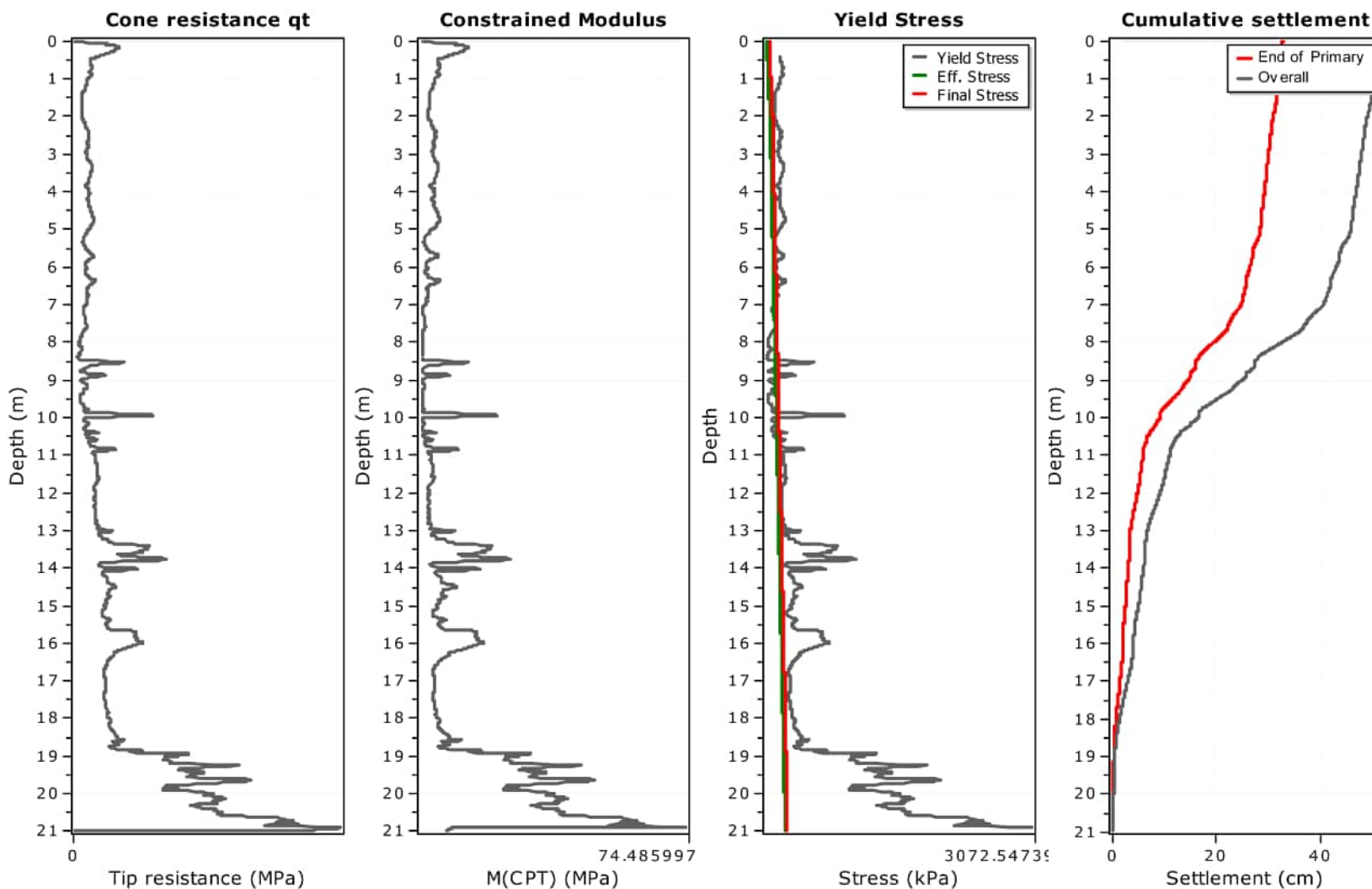
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

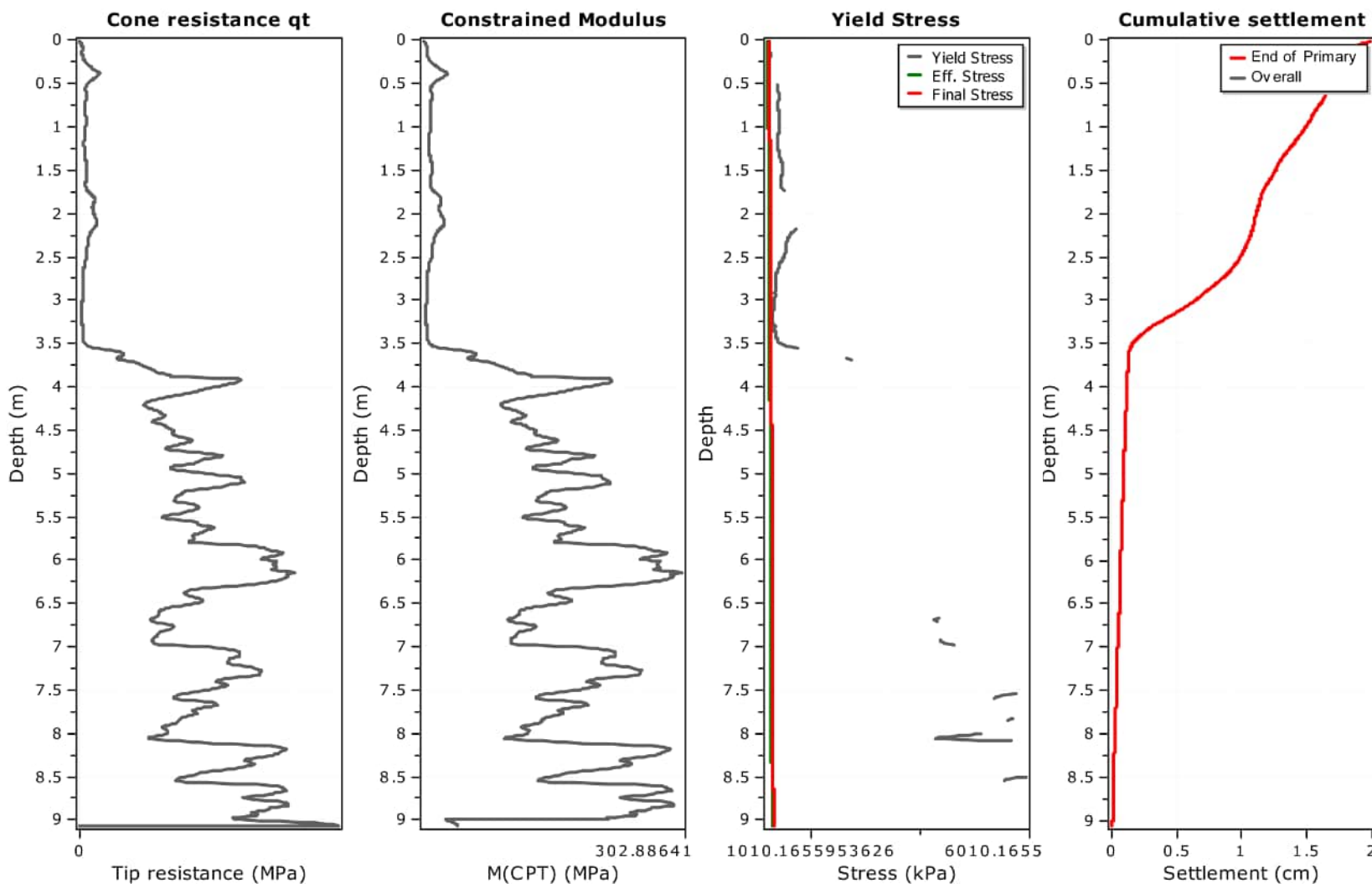
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

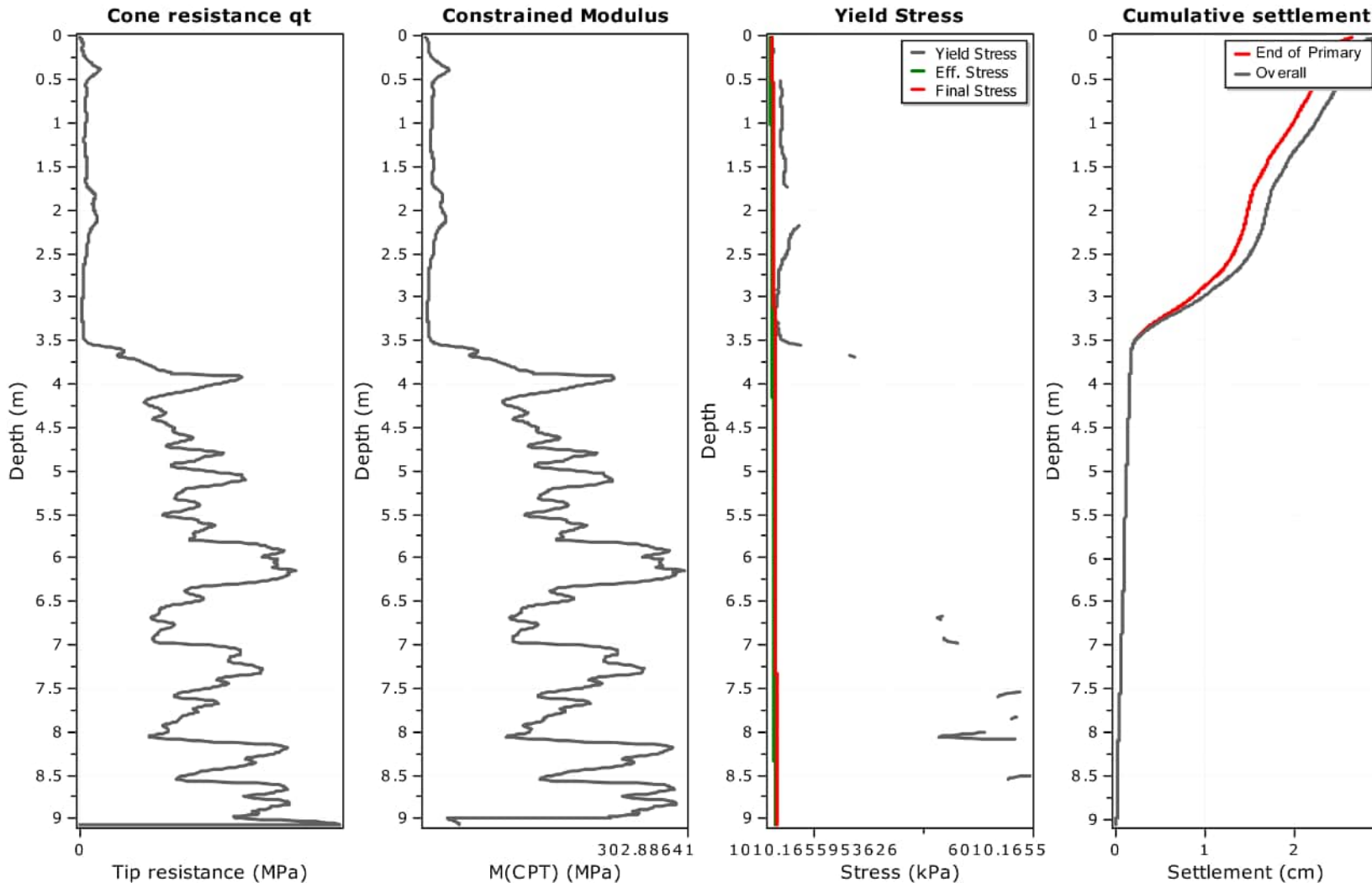
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 48.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

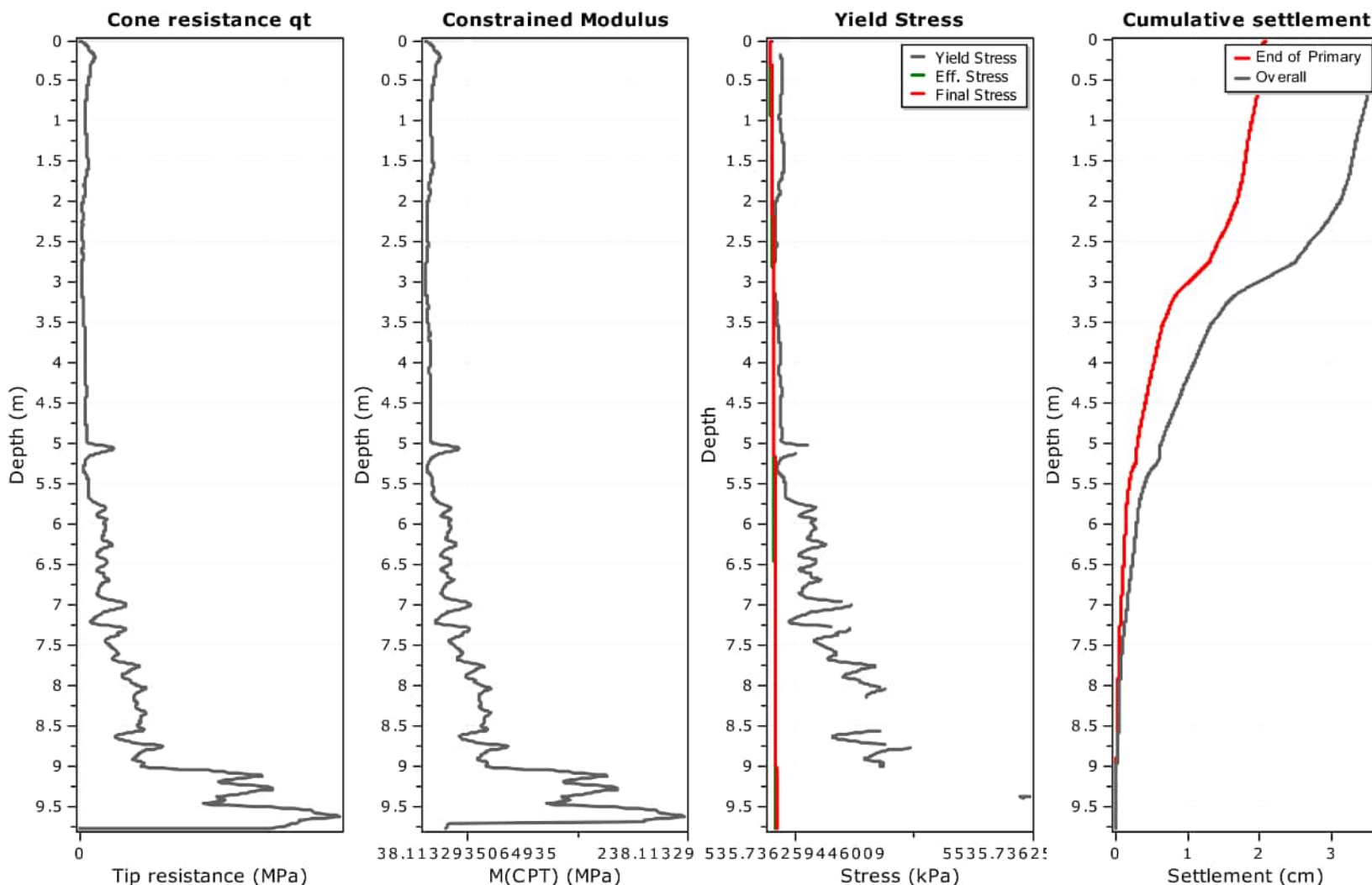
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_s = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 12.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

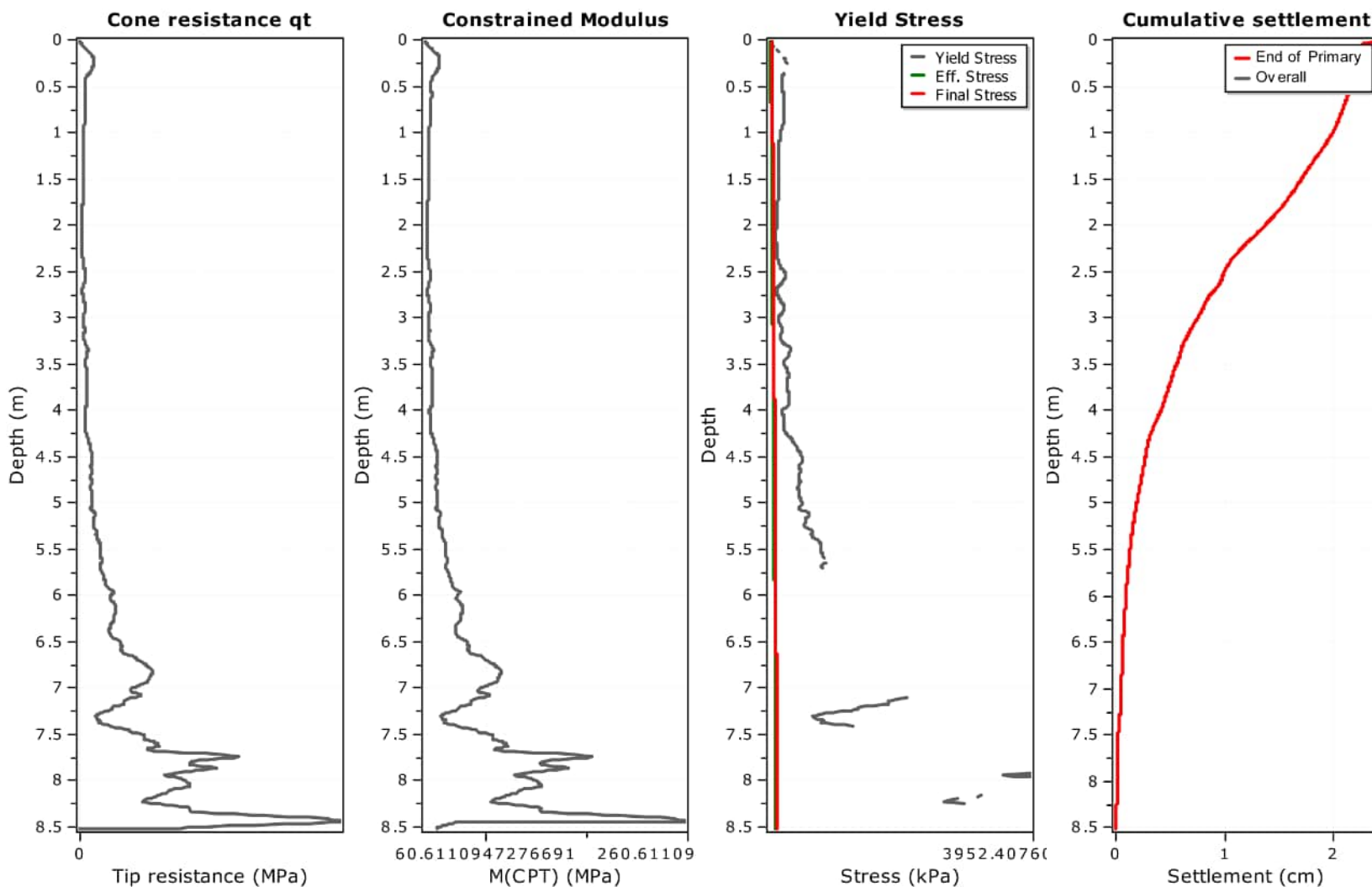
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

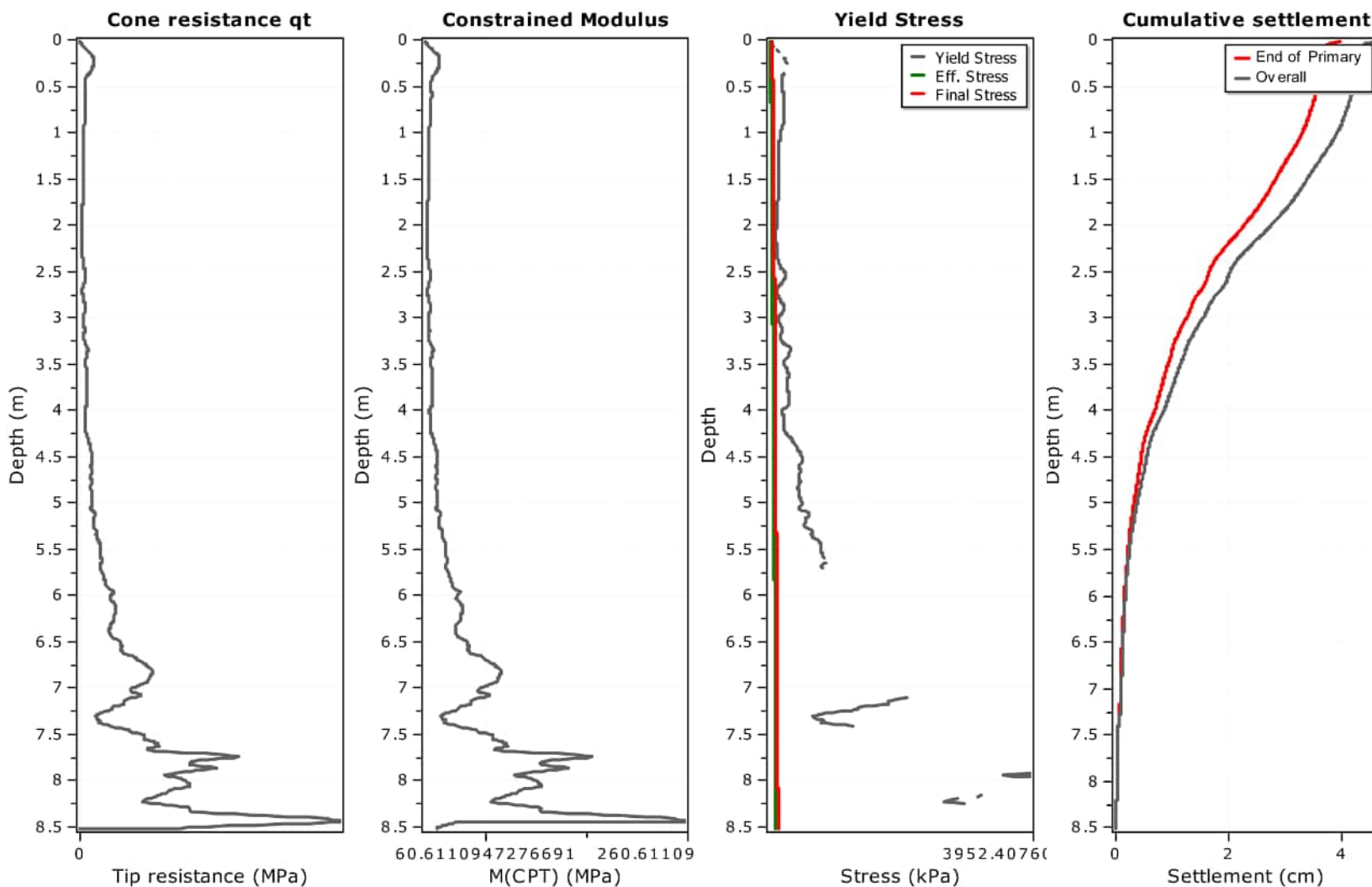
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

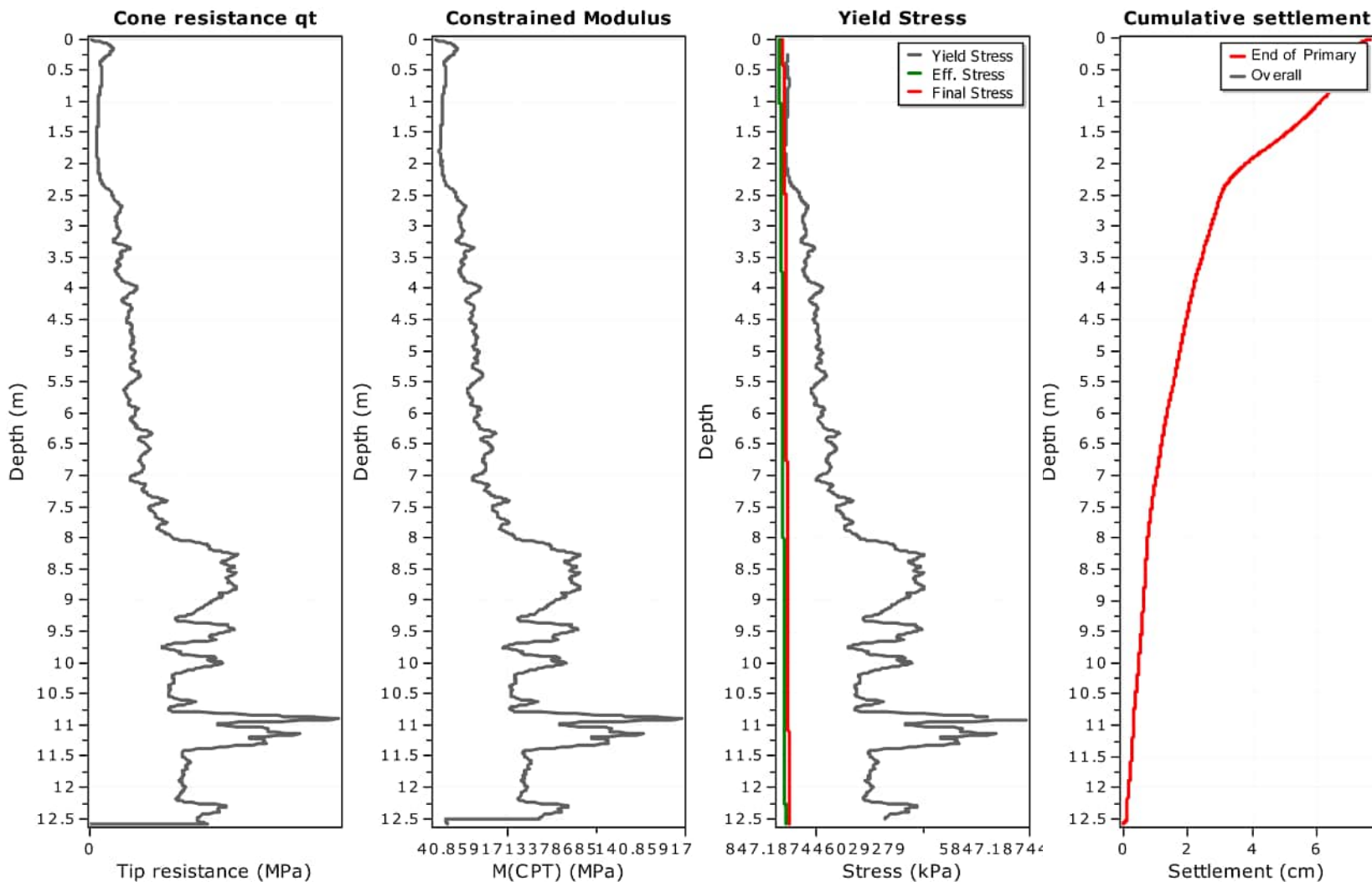
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 90.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

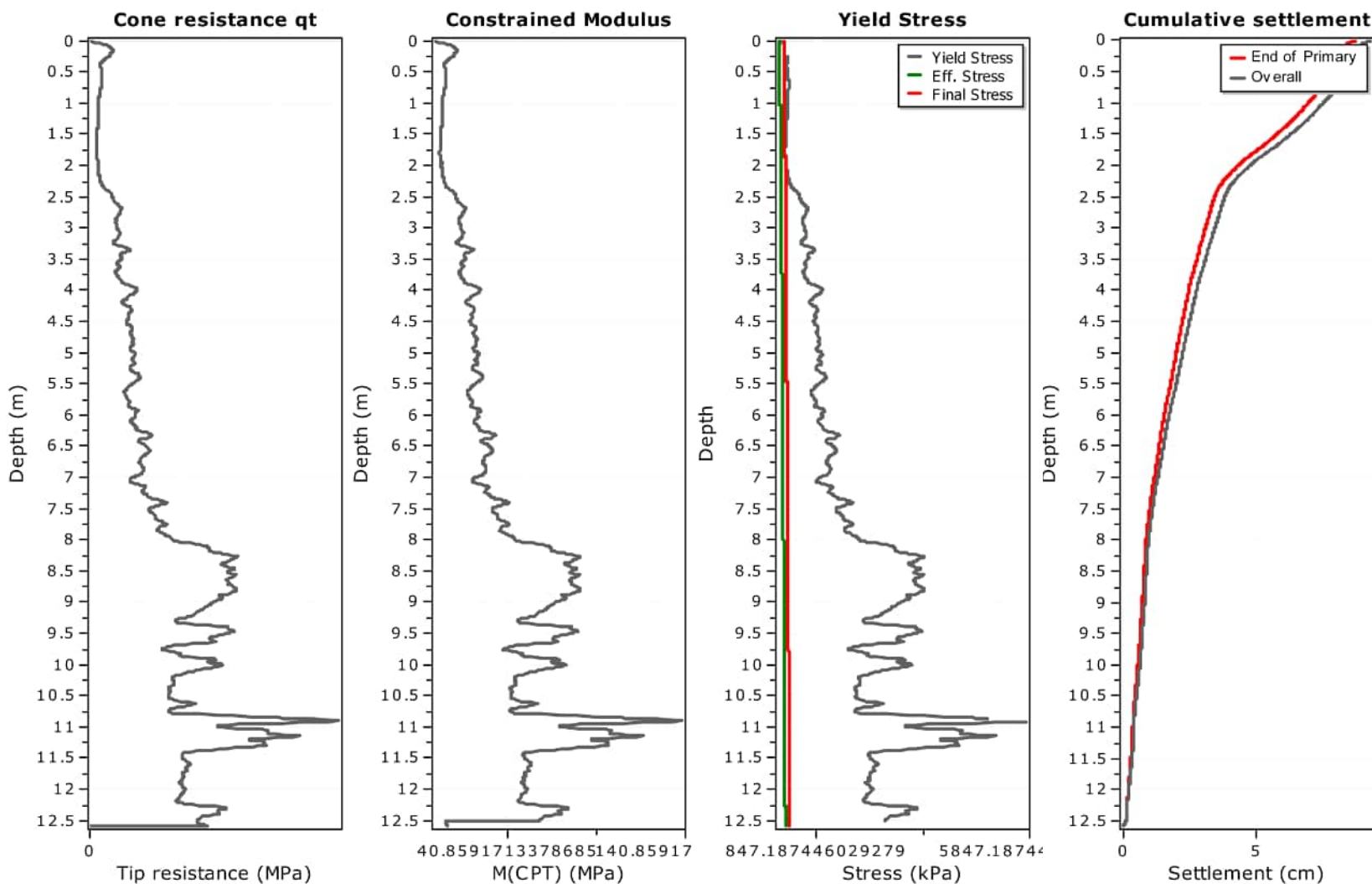
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 102.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

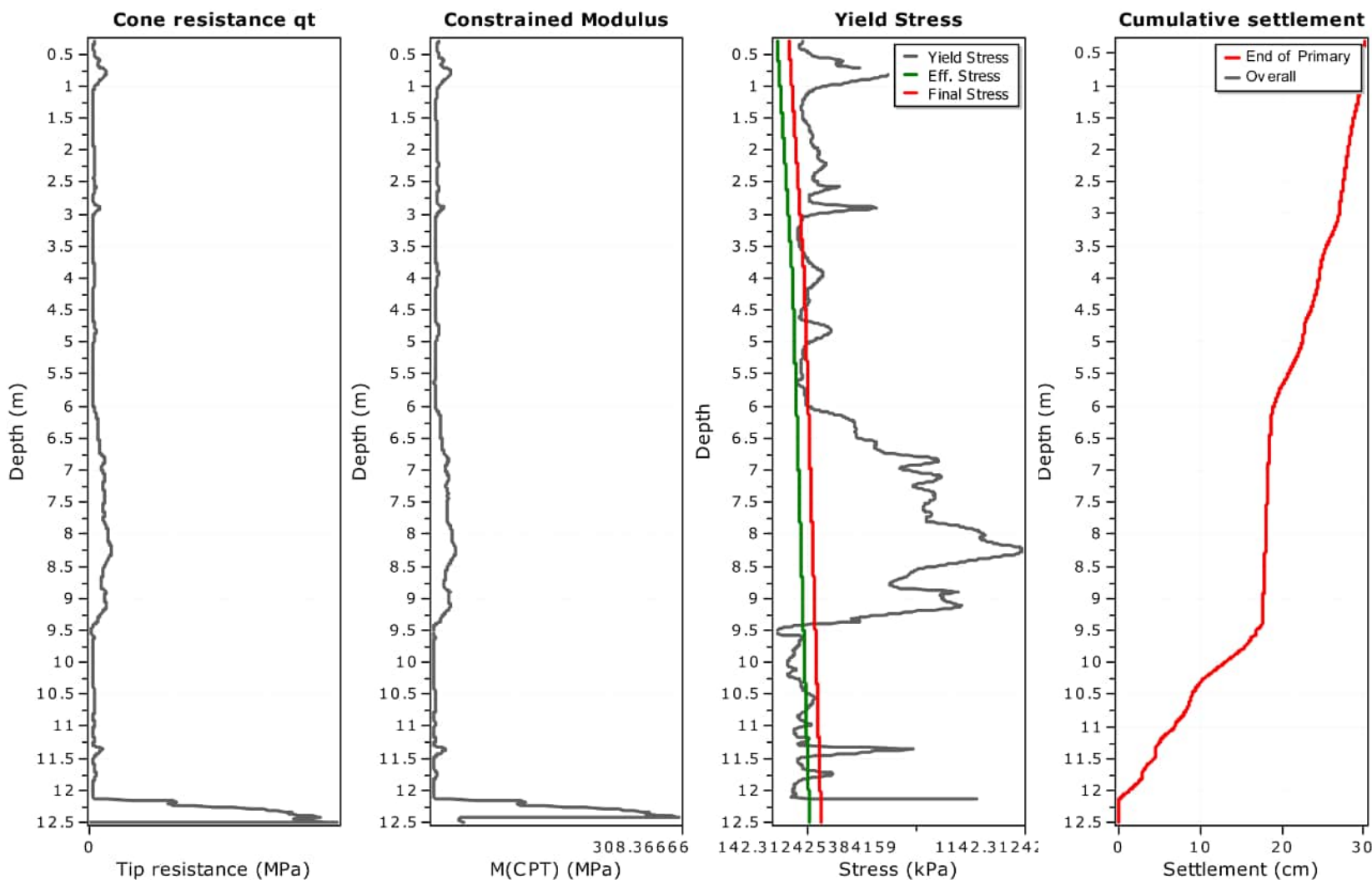
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

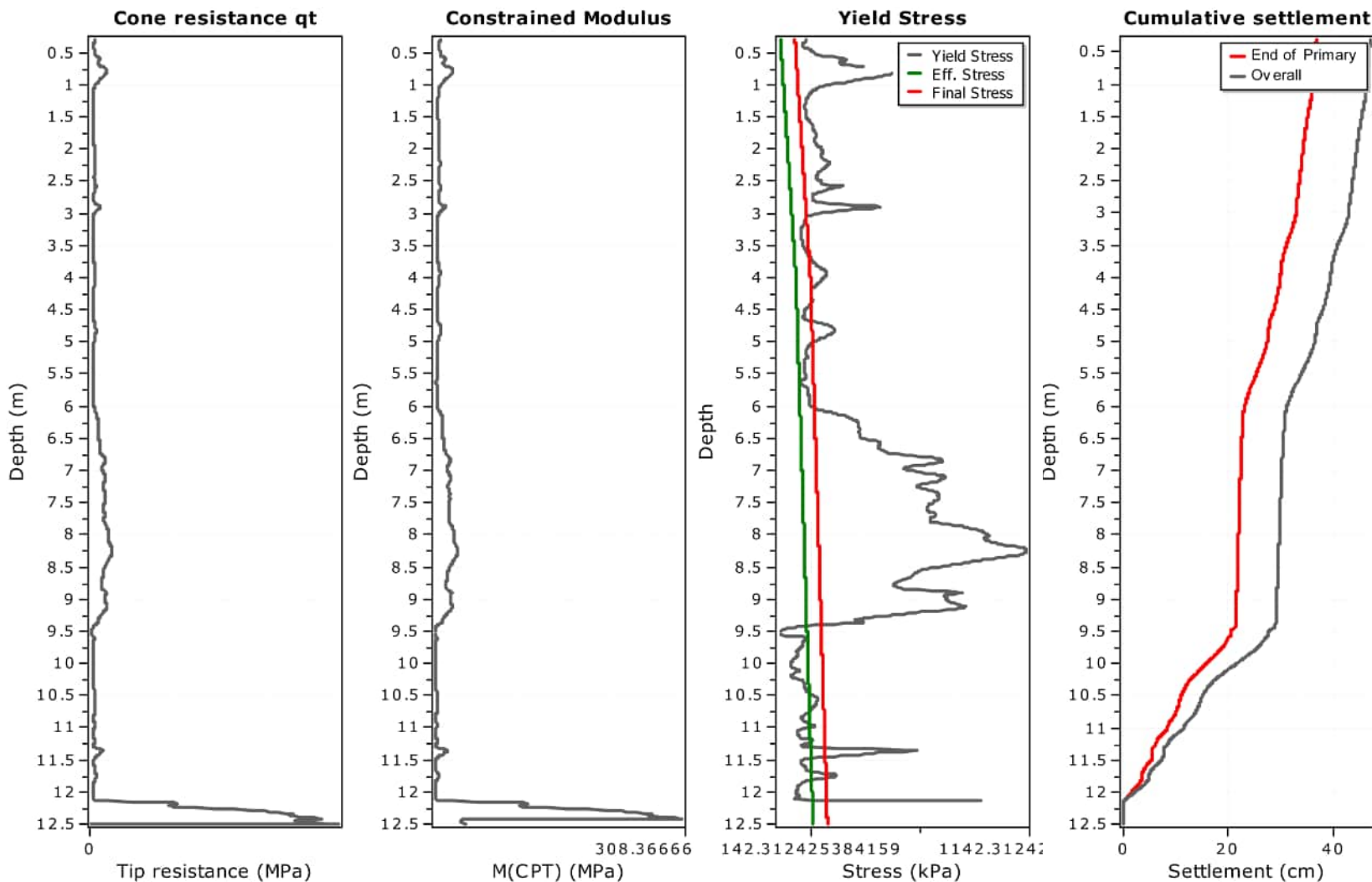
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 66.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

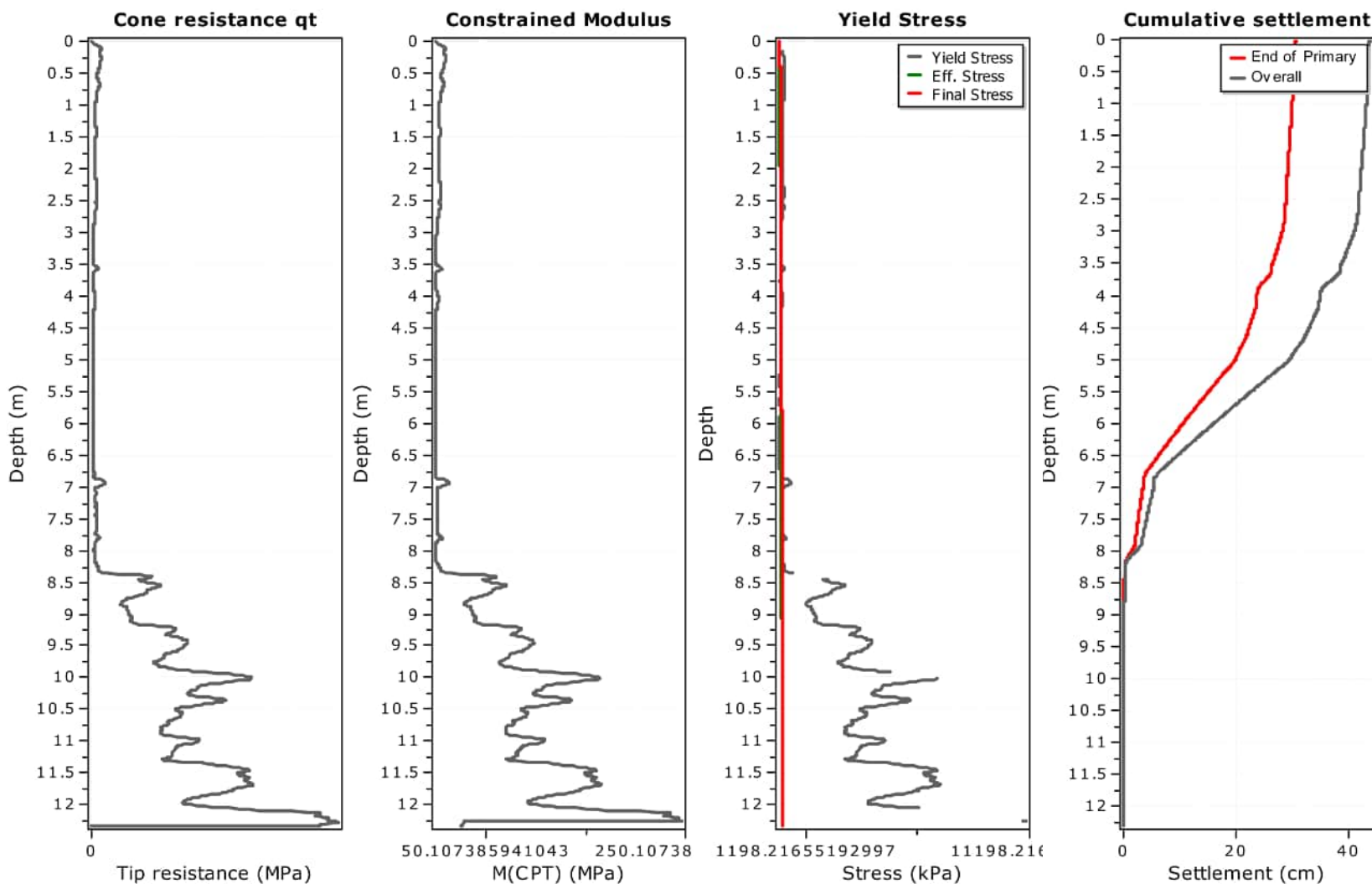
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

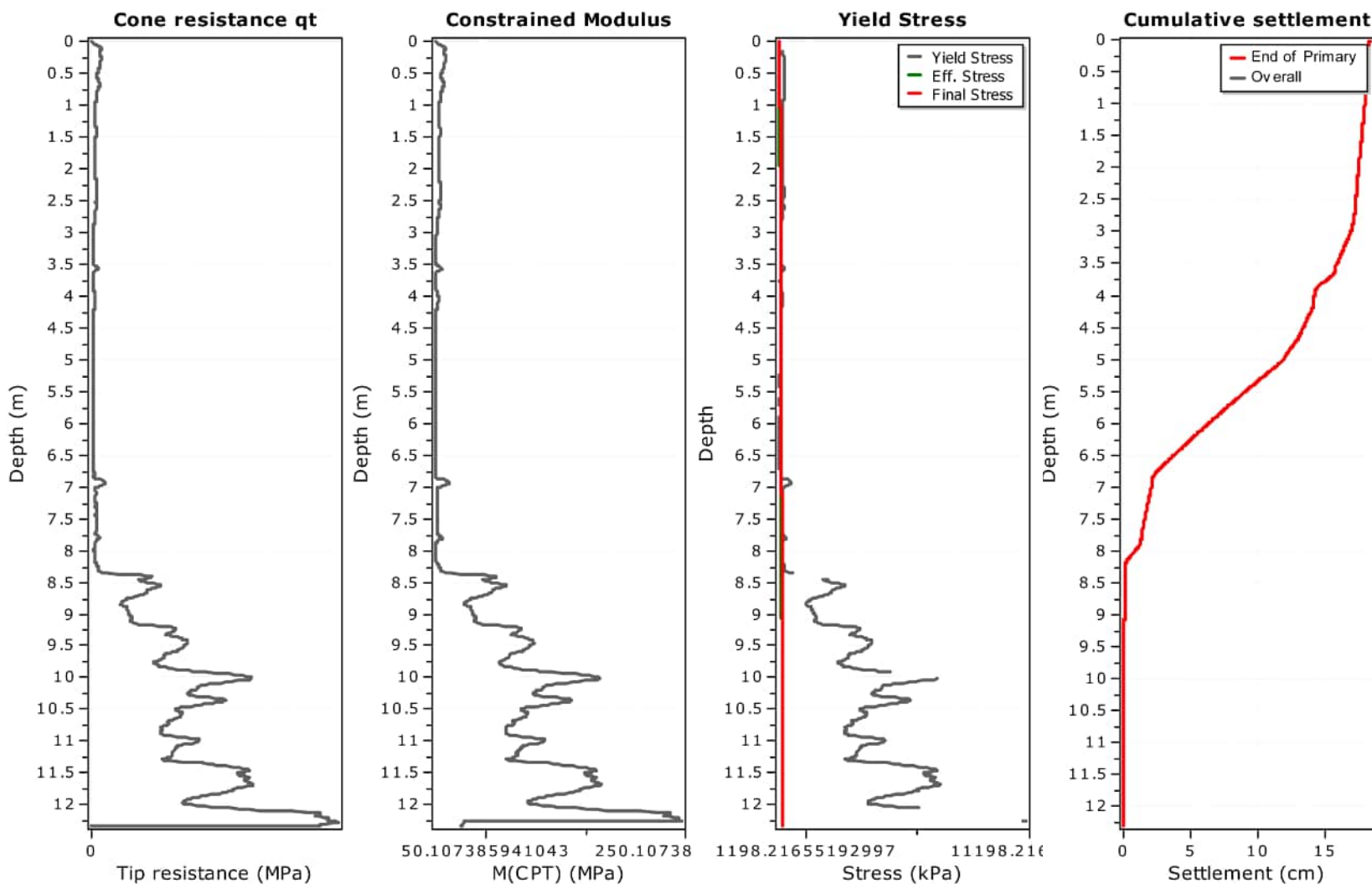
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

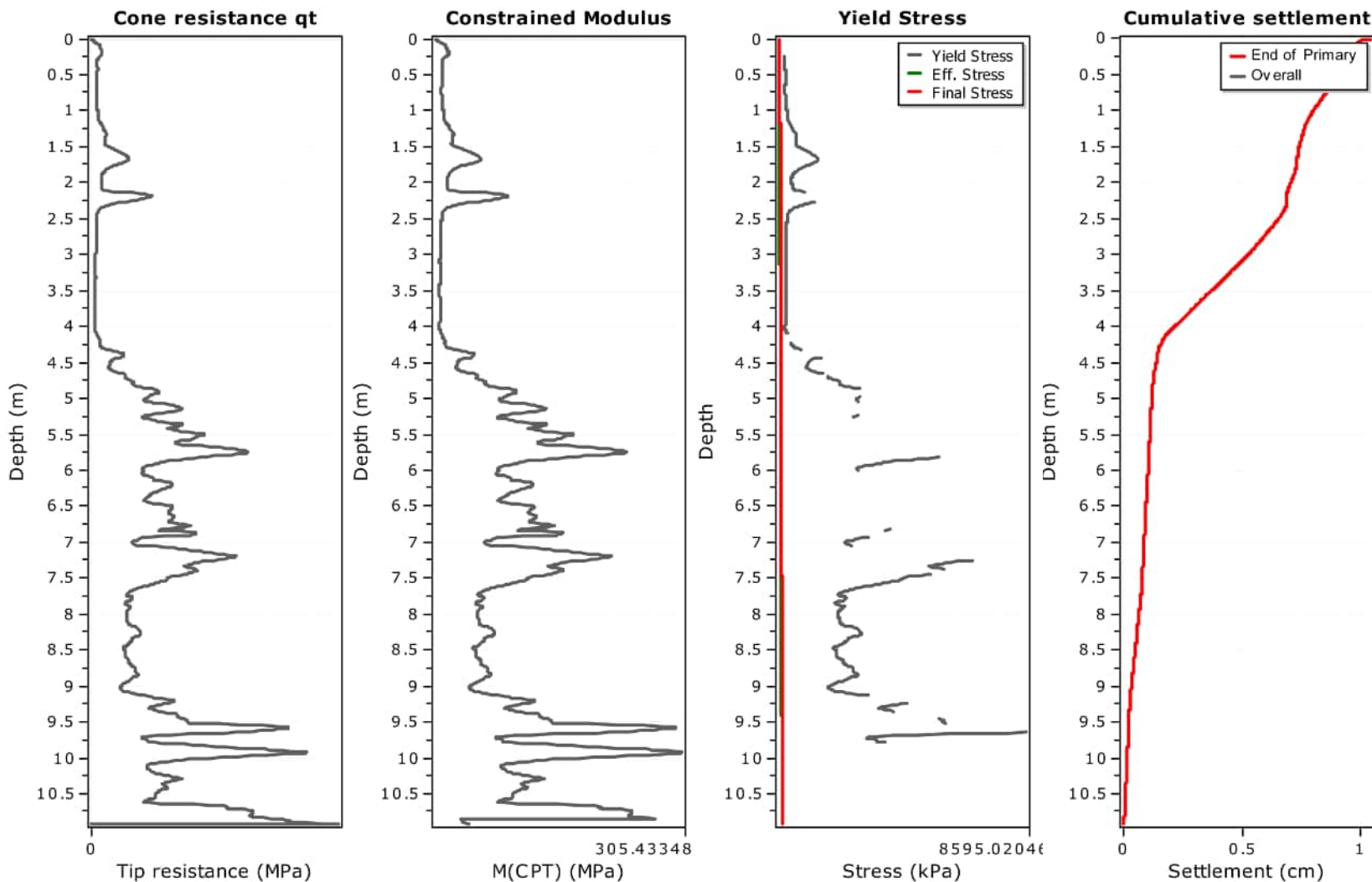
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

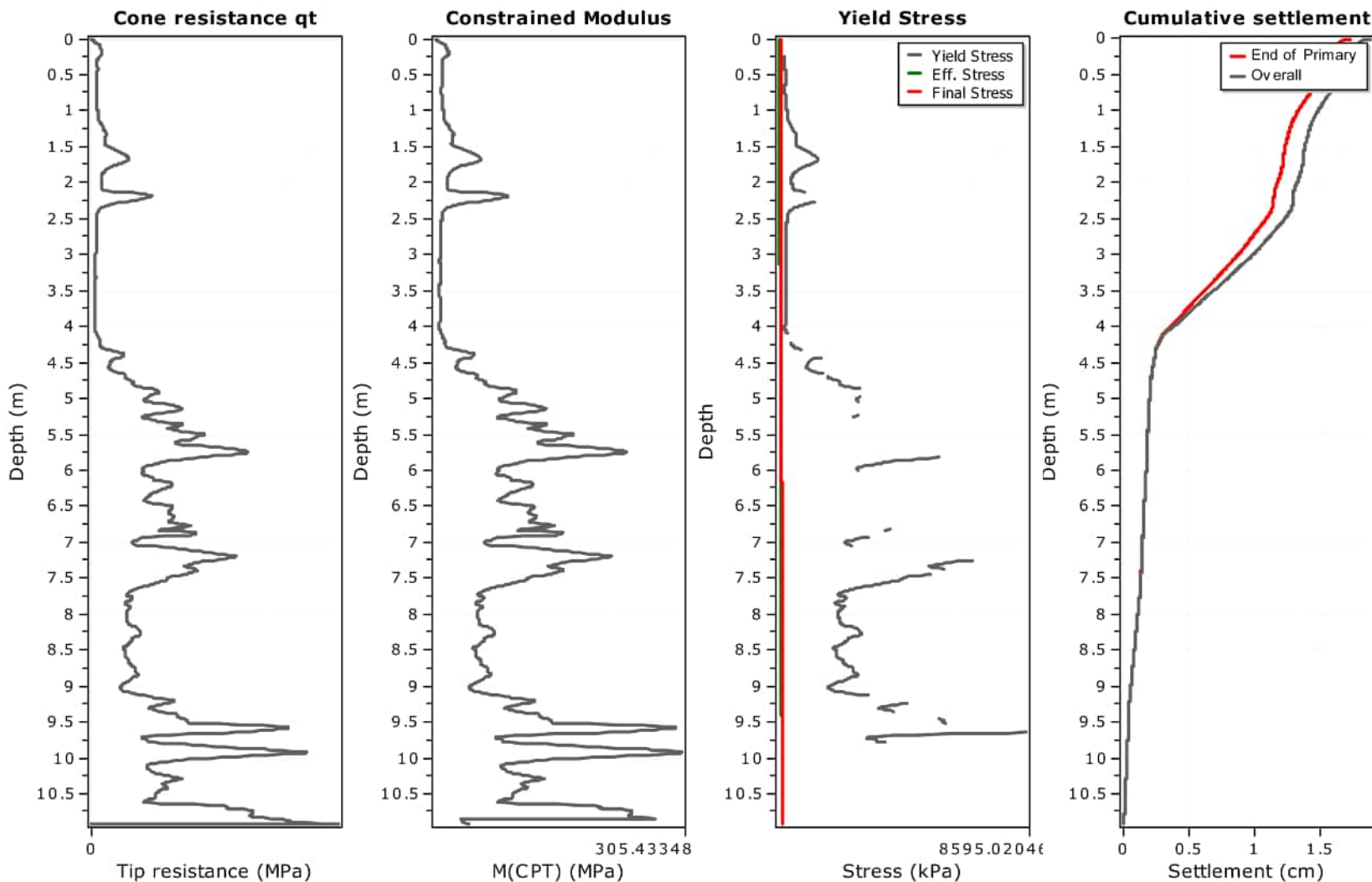
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

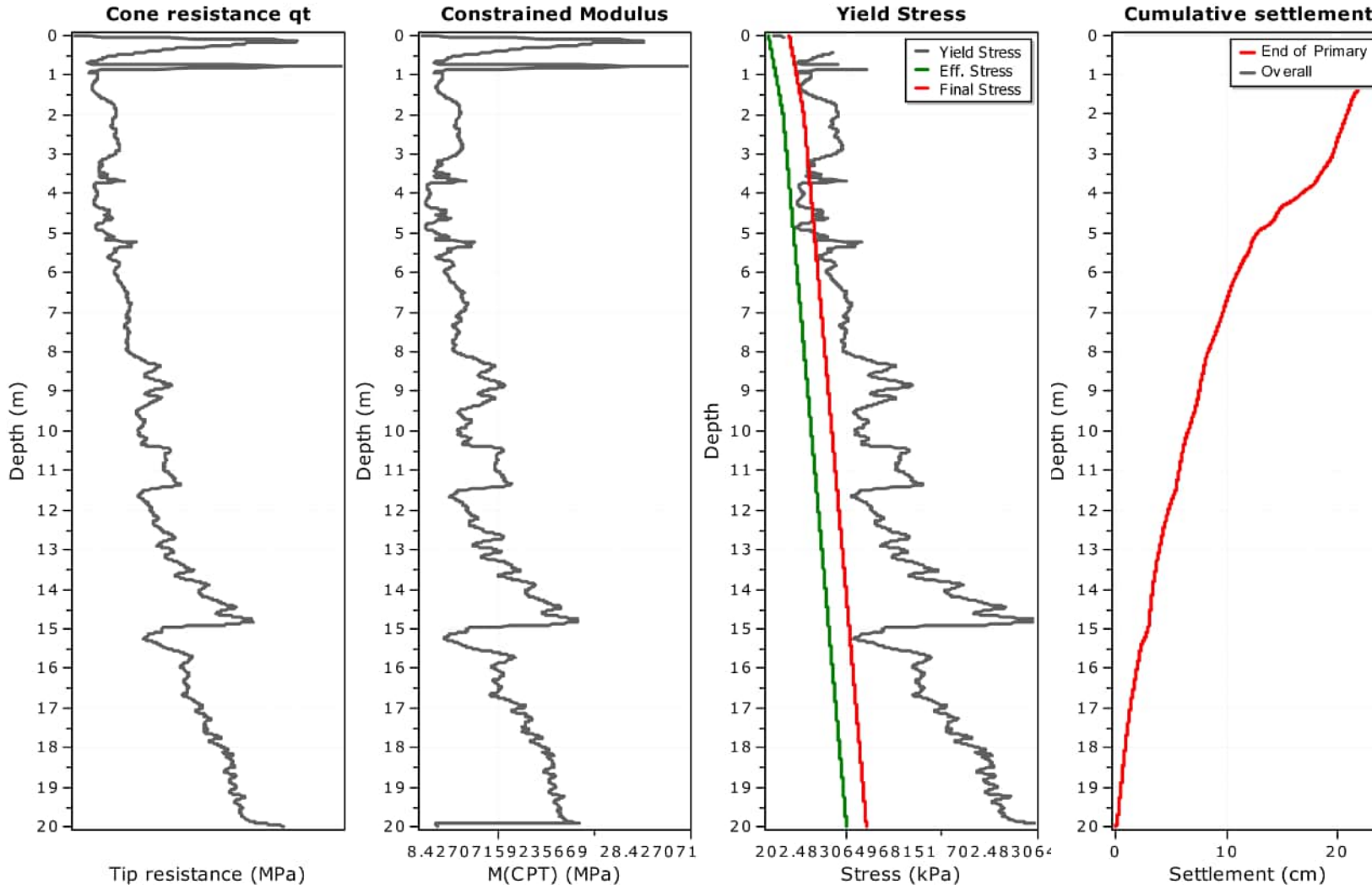
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

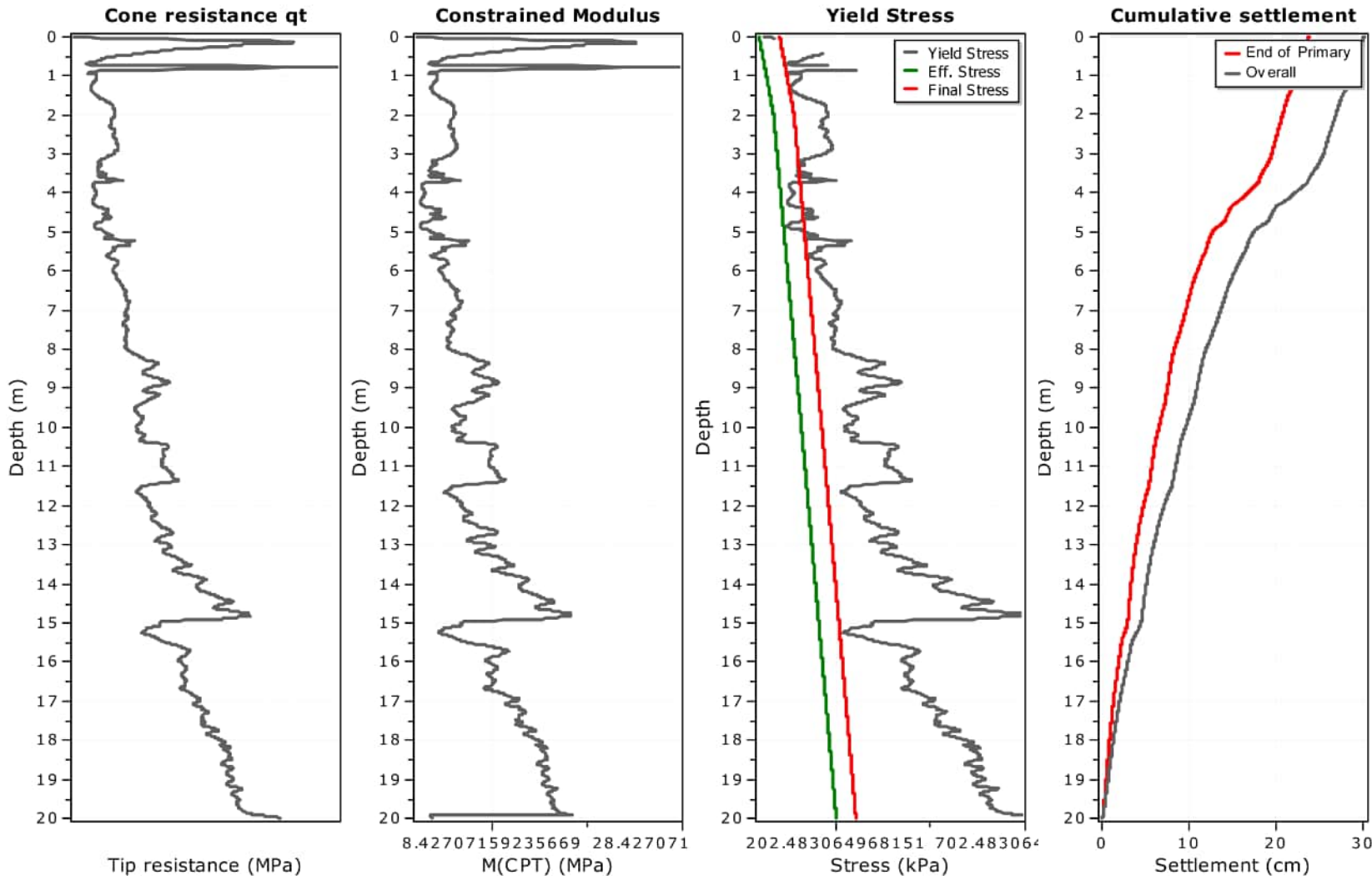
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

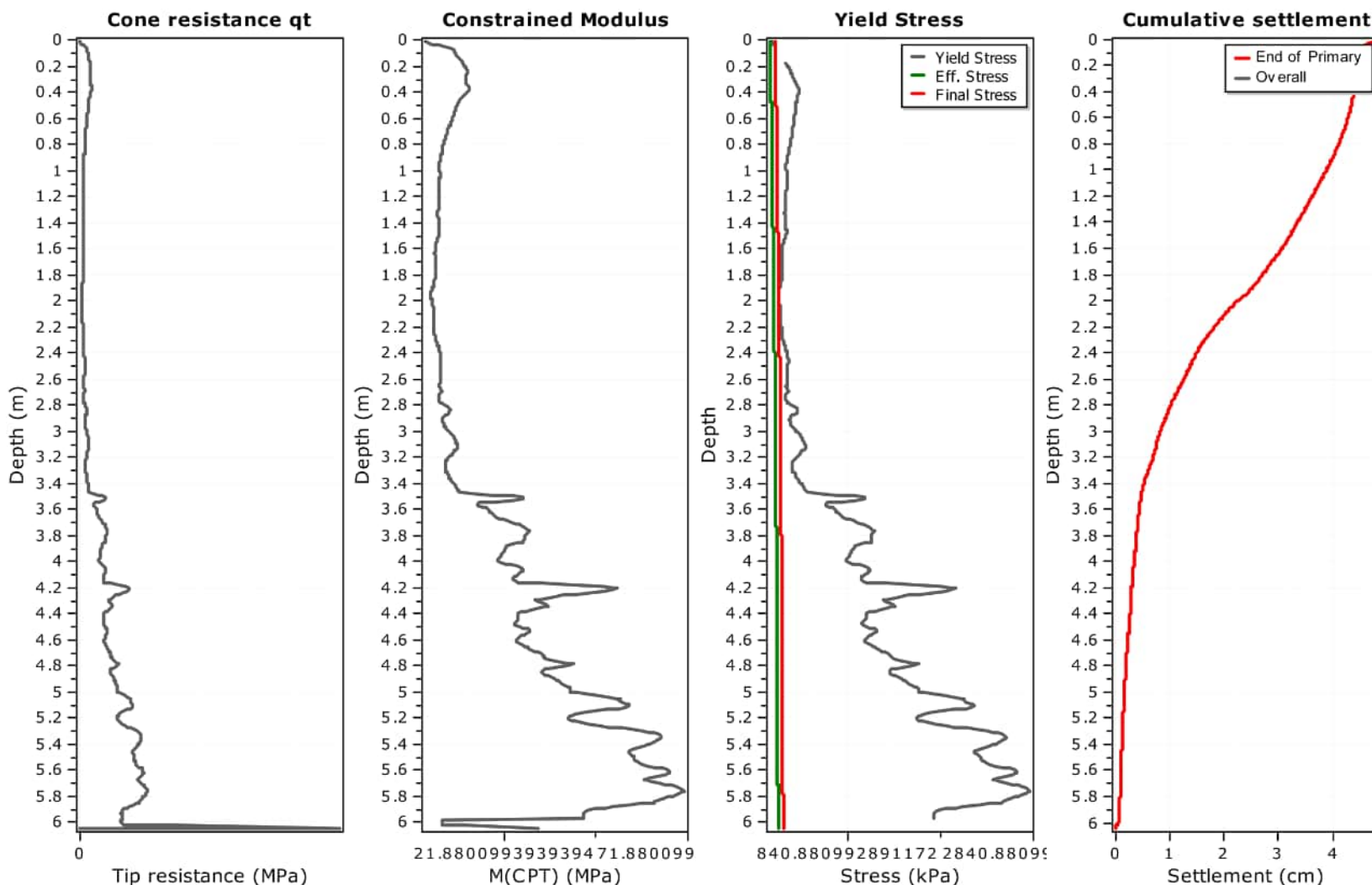
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

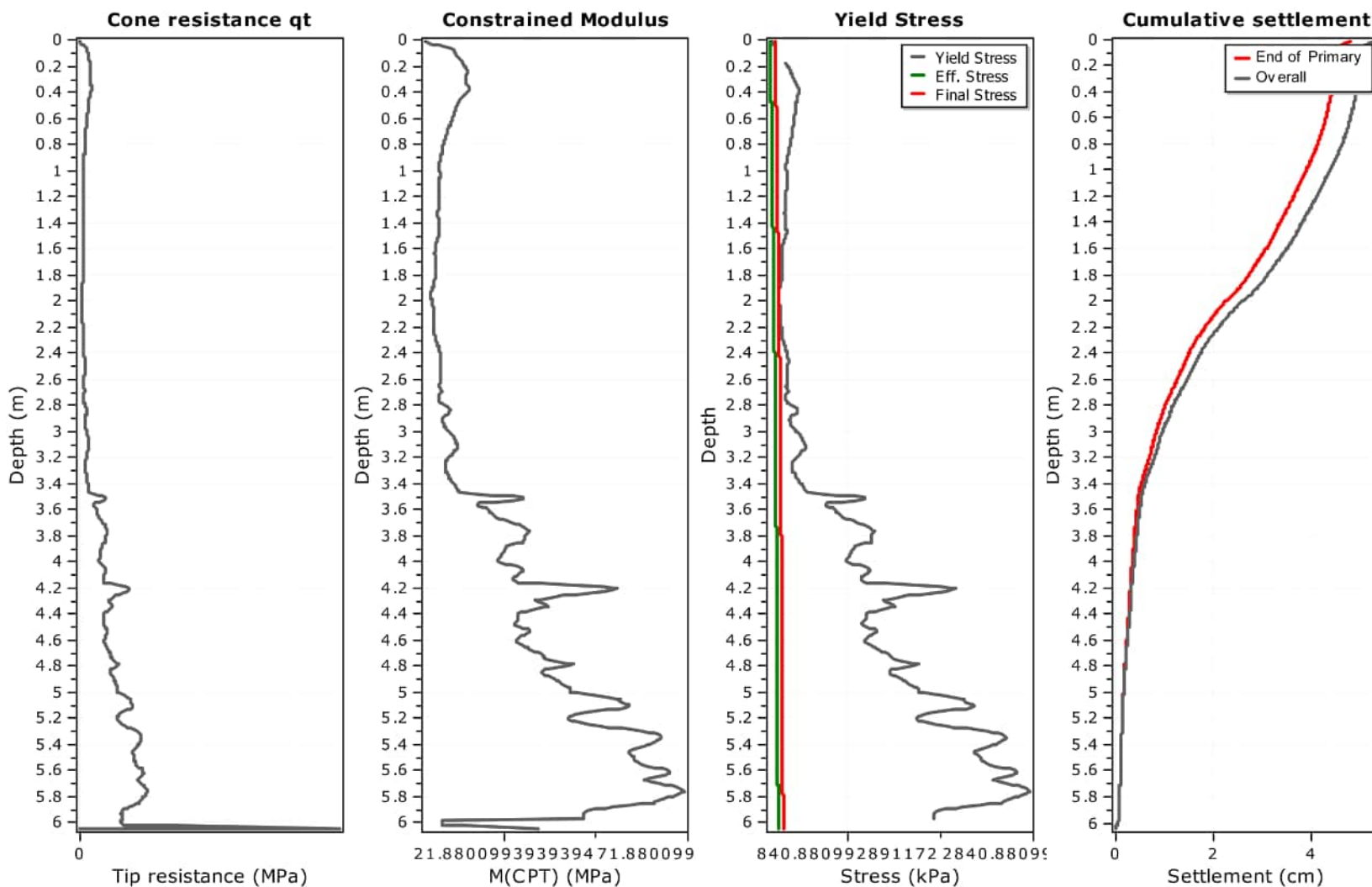
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

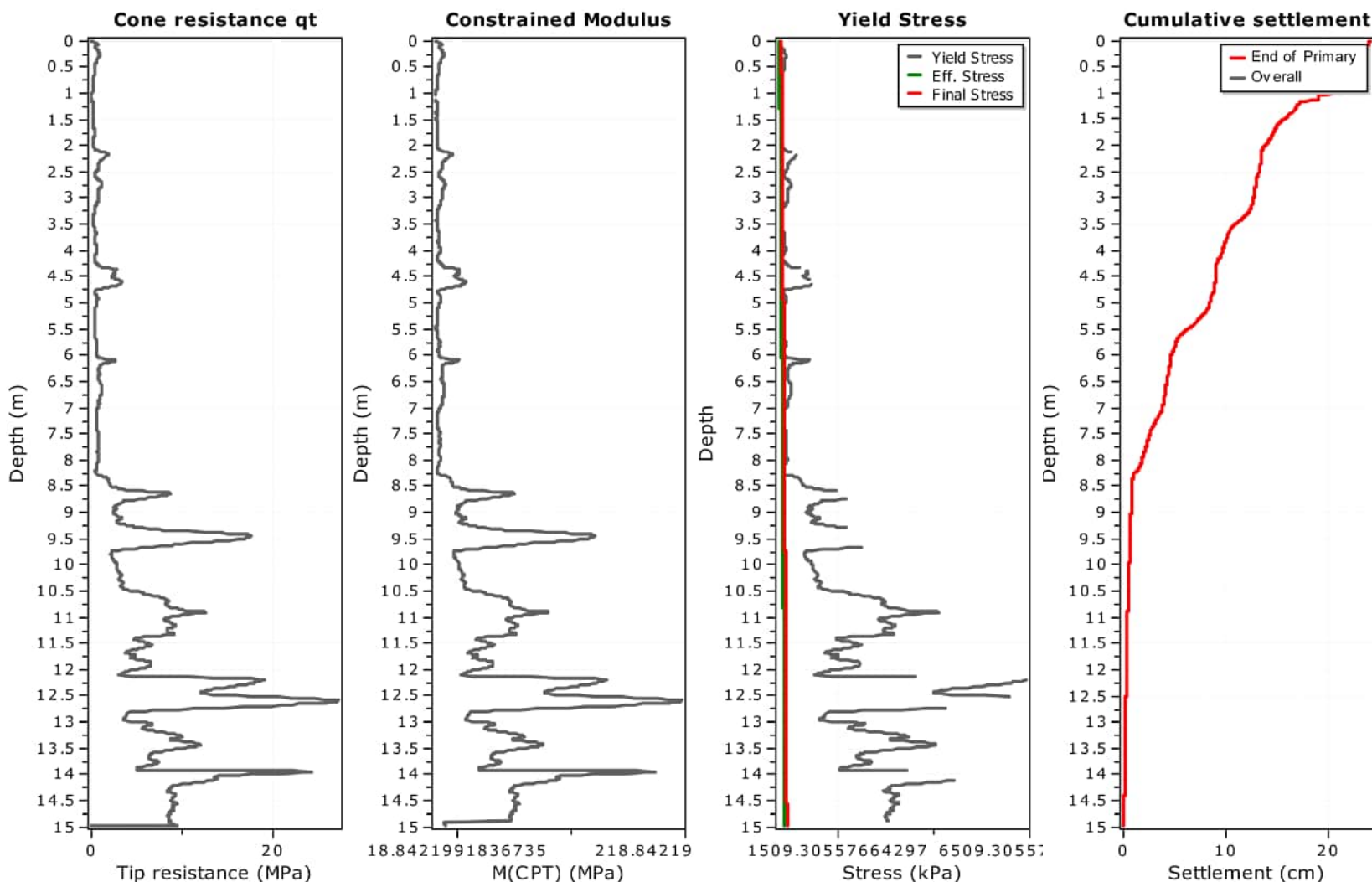
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{pri} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

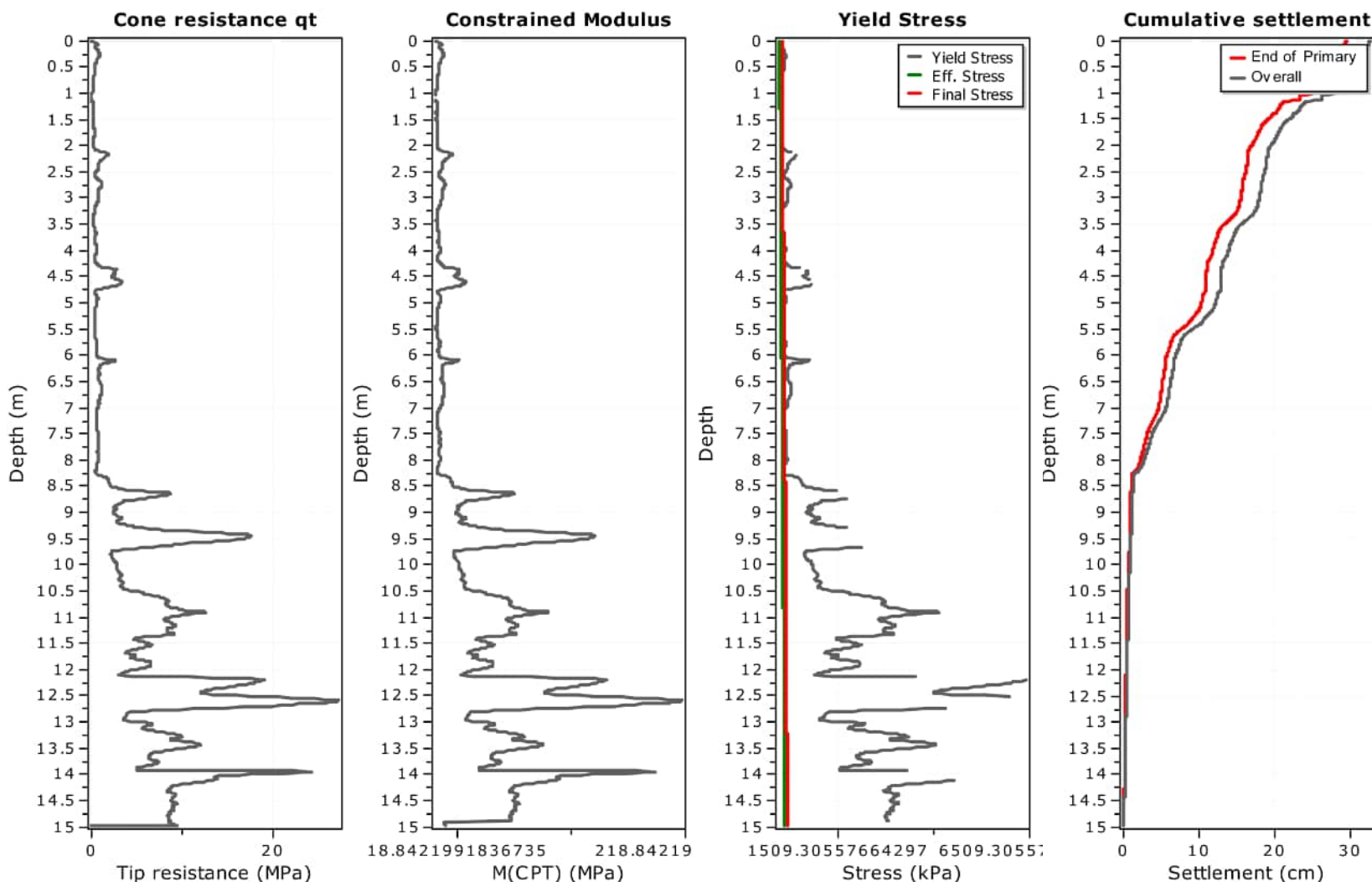
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 66.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

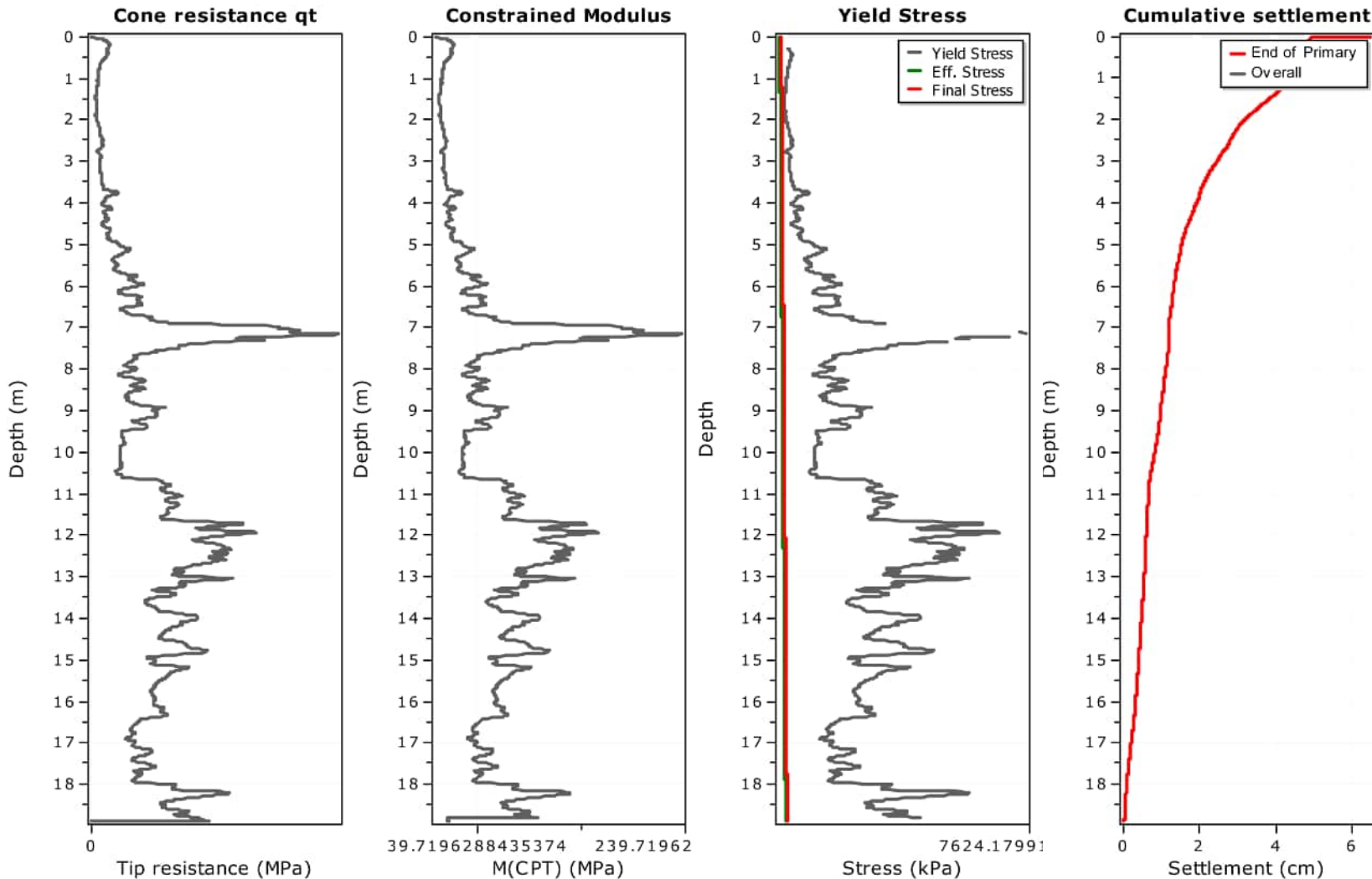
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_{sec} = S_{p} \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 54.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

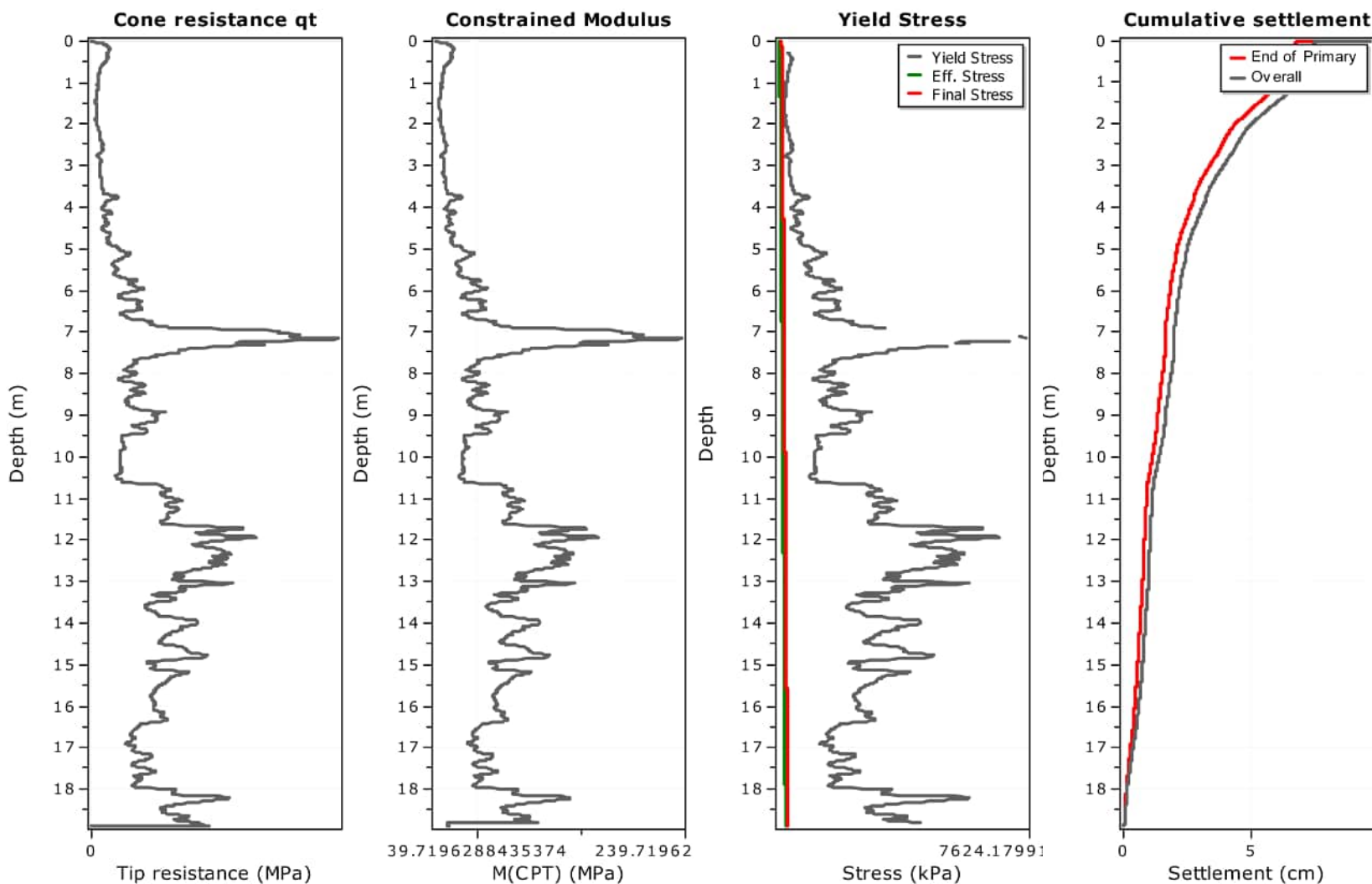
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(1 - e^{-\frac{t}{t_p}} \right)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 74.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

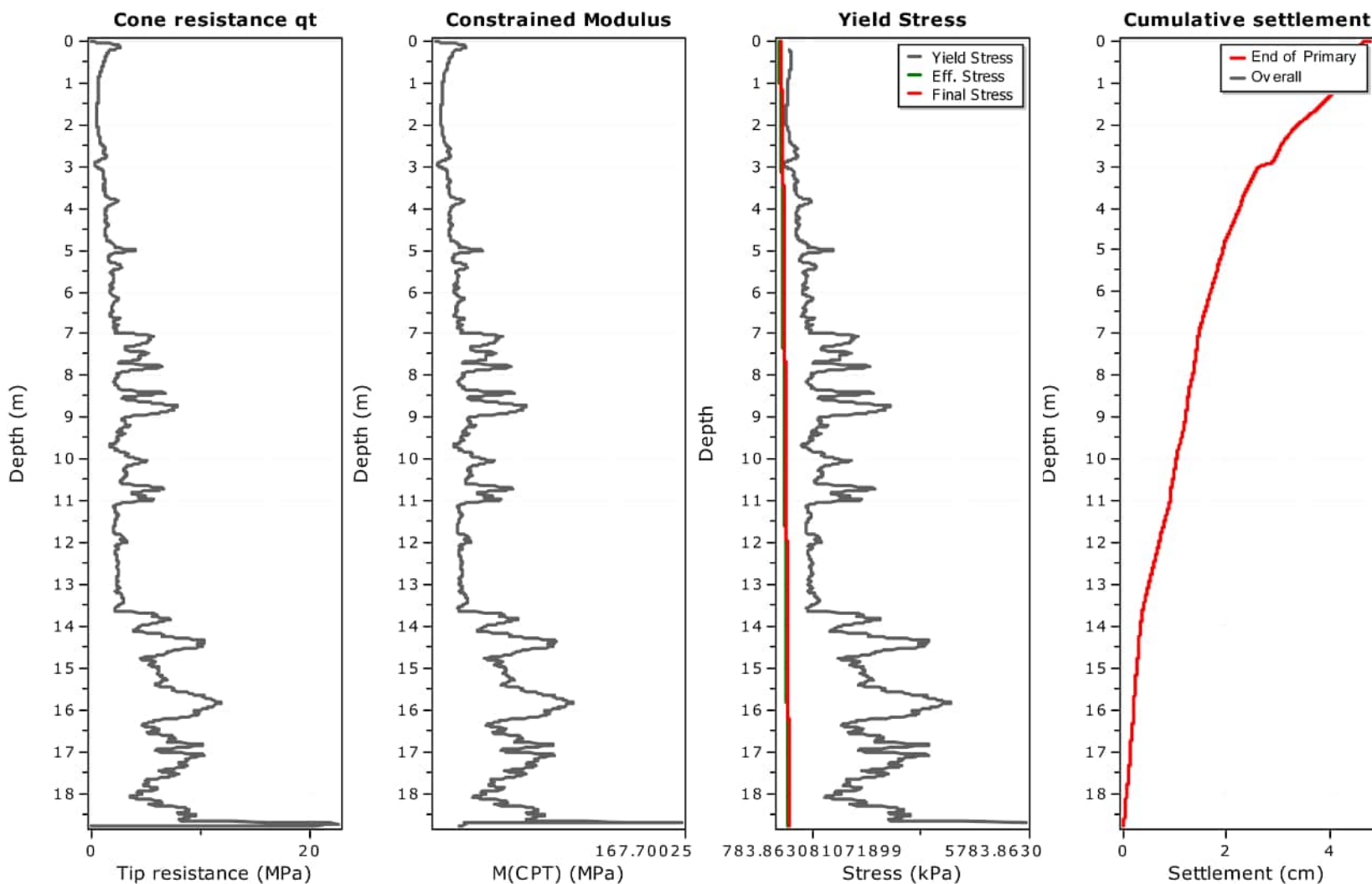
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 36.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

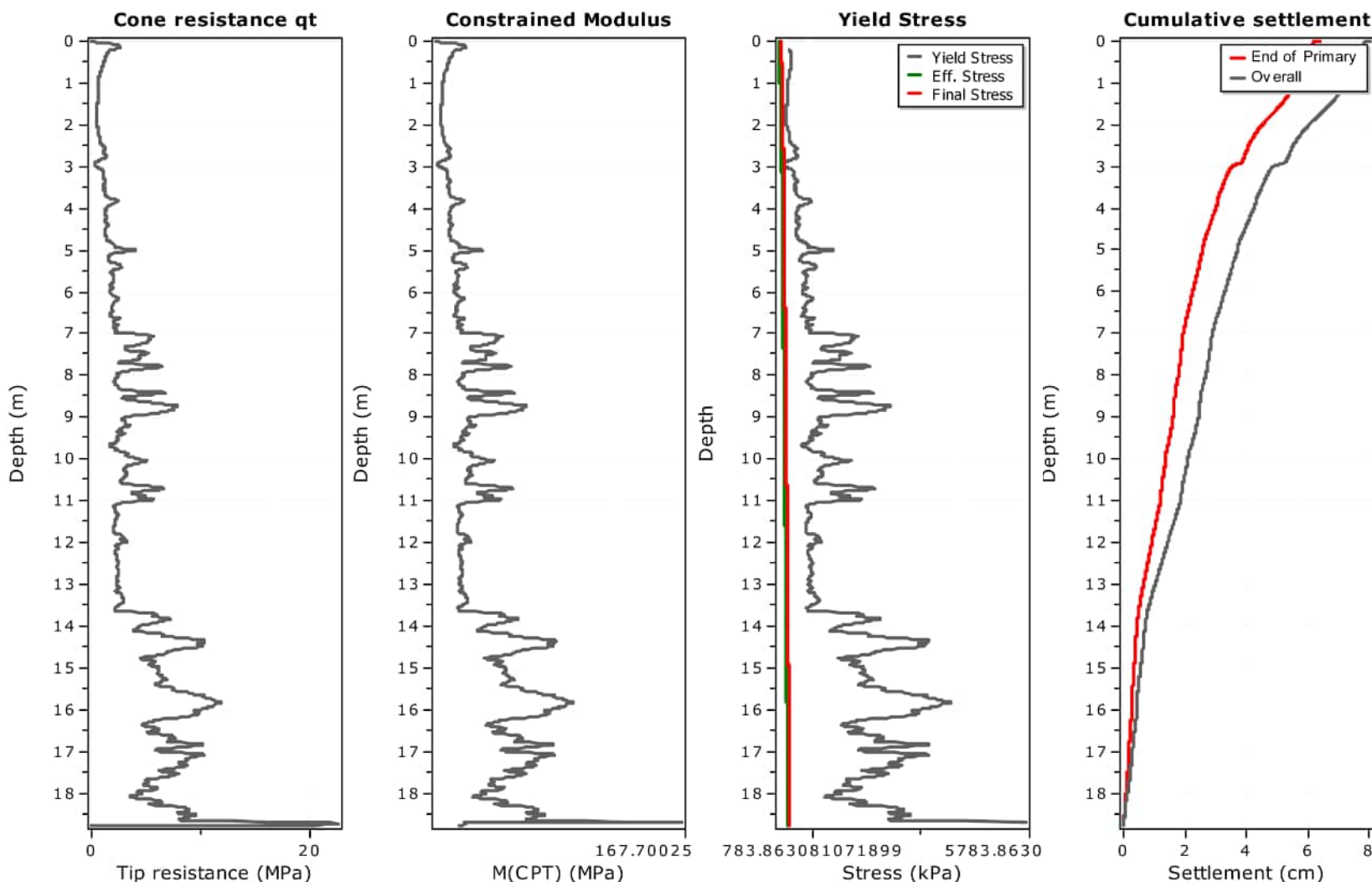
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 48.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 12 months
Time period for second. settlements: 588 months

* Primary settlement calculation is performed according to the following formula:

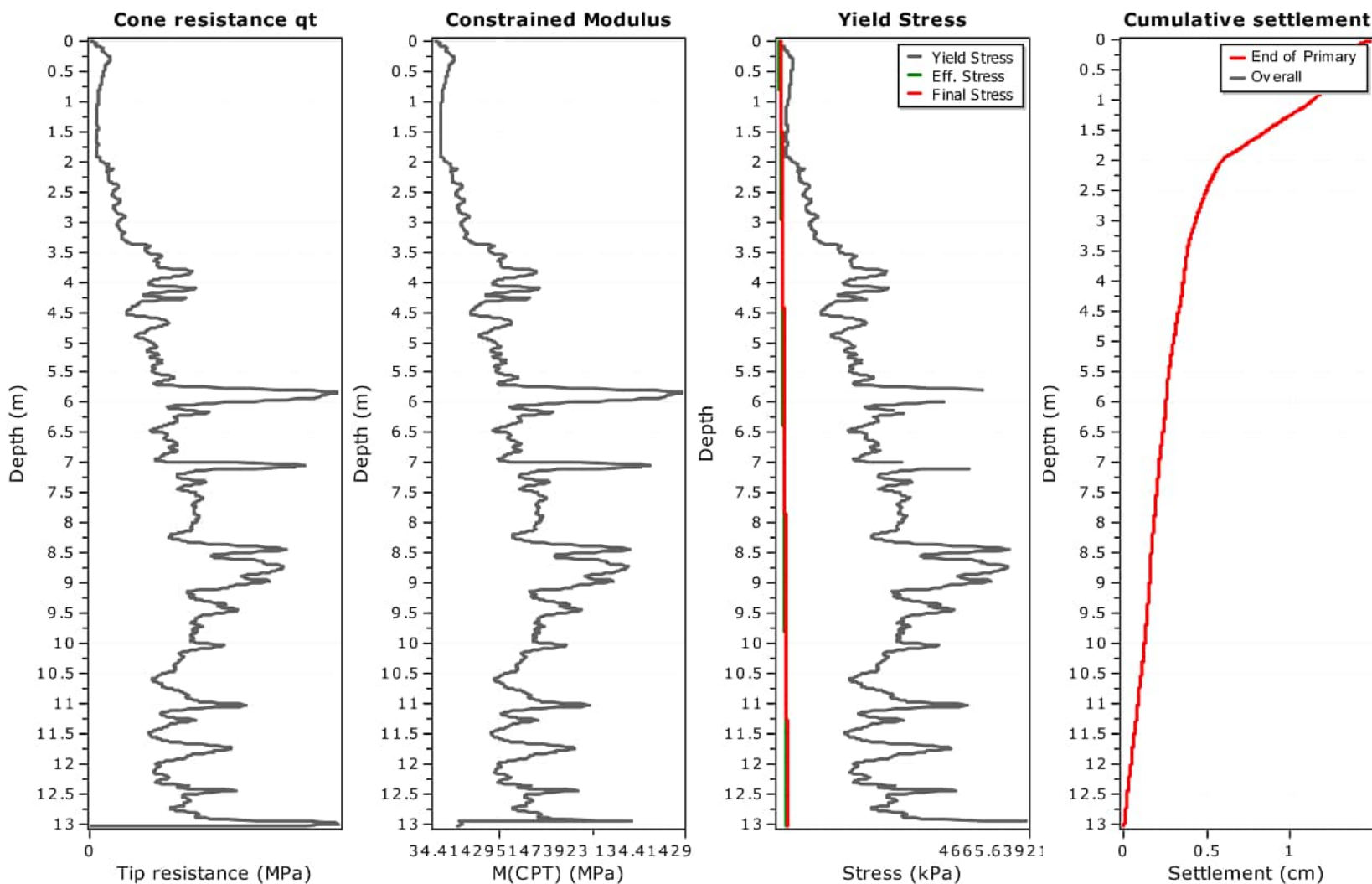
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_s = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 100.00 (m)
L/B: 1.0
Footing pressure: 18.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = S_p \left(\frac{t}{t_p} \right)^n$$

where t_p is the duration of primary consolidation

	CLIENT:	FHLD	DESIGNER:	CR
	PROJECT:	Pine Valley Road Culvert	CHECKED:	SG
			REVISION:	0
	TITLE:	Primary and Secondary Consolidation of Soft Soil Layers	DATE:	5/06/2026
			PROJECT:	

1. Consolidation Settlement (Terzaghi)

Exist Fill Density:

18 kN/m3

Soft Soil Density (Saturated):

16 kN/m3

Surcharge Density:

18 kN/m3

1.1. Back Analysis of Consolidation Parameters

Layer	Original Ground RL	Water Table RL	Surcharge Top RL	Exist Fill Thickness	Soft Soil Thickness	Base Fill RL	Base Soft Soil RL	Mid-Point Soft Soil RL	Surcharge Height	Initial Eff Stress	Applied Surcharge	Comp Index C _c	Recomp. Index C _R	Initial Void Ratio e ₀	Exist Over Consol.	Δe	Consol Settlement	t90 Consol	actual %	t90 time
	(mAHD)	(mAHD)	(mAHD)	(m)	(m)	(mAHD)	(mAHD)	(mAHD)	(m)	(kPa)	(kPa)				(kPa)		(m)	(m)		
2.5m - Firm Clay	0	-1	0	0	3	0	-3	-1.5	0	19	0	0.25	0.03	0.863	0	0.0000	0.000	0.00000		
2.5m - Firm Clay	0	-1	1	0	3	0	-3	-1.5	1	19	18	0.25	0.03	0.863	0	-0.0721	0.116	0.10449		
2.5m - Firm Clay	0	-1	2	0	3	0	-3	-1.5	2	19	36	0.25	0.03	0.863	0	-0.1150	0.185	0.16674		
2.5m - Firm Clay	0	-1	3	0	3	0	-3	-1.5	3	19	54	0.25	0.03	0.863	0	-0.1457	0.235	0.21122		
5.5 - Soft Clay	0	-1	0	0	3	0	-3	-1.5	0	19	0	0.63	0.03	1.75	0	0.0000	0.000	0.00000		
5.5 - Soft Clay	0	-1	1	0	3	0	-3	-1.5	1	19	18	0.63	0.03	1.75	0	-0.1817	0.198	0.178		
5.5 - Soft Clay	0	-1	2	0	3	0	-3	-1.5	2	19	36	0.63	0.03	1.75	0	-0.2899	0.316	0.285		
8.5m - Firm Clay	0	-1	0	0	3	0	-3	-1.5	0	19	0	0.4	0.03	1.2	0	0.0000	0.000	0.00000		
8.5m - Firm Clay	0	-1	1	0	3	0	-3	-1.5	1	19	18	0.4	0.03	1.2	0	-0.1154	0.157	0.14158		
8.5m - Firm Clay	0	-1	2	0	3	0	-3	-1.5	2	19	36	0.4	0.03	1.2	0	-0.1841	0.251	0.22591		
8.5m - Firm Clay	0	-1	3	0	3	0	-3	-1.5	3	19	54	0.4	0.03	1.2	0	-0.2332	0.318	0.28618		

1.2. Forward Analysis for the Abutments

Layer	Original Ground RL	Water Table RL	Surcharge Top RL	Exist Fill Thickness	Soft Soil Thickness	Base Fill RL	Base Soft Soil RL	Mid-Point Soft Soil RL	Surcharge Height	Initial Eff Stress	Applied Surcharge	Comp Index C _c	Recomp. Index C _R	Initial Void Ratio e ₀	Exist Over Consol.	Δe	t90 achieved	Consol Settlement	Post Construction Settlement	Total Settlement
	(mAHD)	(mAHD)	(mAHD)	(m)	(m)	(mAHD)	(mAHD)	(mAHD)	(m)	(kPa)	(kPa)				(kPa)		(y)	(m)	(m)	(m)
2.5m - Firm Clay	0	-1	0	0	3	0	-3	-1.5	0	19	12	0.25	0.082	0.863	0	-0.0529	1	0.085	0.041	0.126
2.5m - Firm Clay	0	-1	1	0	3	0	-3	-1.5	1	19	30	0.25	0.082	0.863	0	-0.1025	1	0.165	0.041	0.206
2.5m - Firm Clay	0	-1	2	0	3	0	-3	-1.5	2	19	48	0.25	0.082	0.863	0	-0.1364	1	0.220	0.041	0.261
2.5m - Firm Clay	0	-1	3	0	3	0	-3	-1.5	3	19	66	0.25	0.082	0.863	0	-0.1622	1	0.261	0.041	0.302
5.5 - Soft Clay	0	-1	0	0	3	0	-3	-1.5	0	19	12	0.63	0.082	1.75	0	-0.1334	1	0.146	0.070	0.216
5.5 - Soft Clay	0	-1	1	0	3	0	-3	-1.5	1	19	30	0.63	0	1.75	0	-0.2584	1	0.282	0.070	0.352
5.5 - Soft Clay	0	-1	2	0	3	0	-3	-1.5	2	19	48	0.63	0	1.75	0	-0.3438	1	0.375	0.070	0.445
8.5m - Firm Clay	0	-1	0	0	3	0	-3	-1.5	0	19	12	0.4	0.04	1.2	0	-0.0847	1	0.116	0.056	0.171
8.5m - Firm Clay	0	-1	1	0	3	0	-3	-1.5	1	19	30	0.4	0.04	1.2	0	-0.1640	1	0.224	0.056	0.279
8.5m - Firm Clay	0	-1	2	0	3	0	-3	-1.5	2.000	19	48	0.4	0.04	1.2	0	-0.2183	1	0.298	0.056	0.353
8.5m - Firm Clay	0	-1	3	0	3	0	-3	-1.5	3	19	66	0.4	0.05	1.2	0	-0.2596	1	0.354	0.056	0.410

Assumed C_α/C_c =

0.06

Design Period, t =

50 yr

12

	CLIENT:	FHLD	DESIGNER:	CR
	PROJECT:	MILLDALE STAGES 14-17	CHECKED:	SG
			REVISION:	0
	TITLE:	Primary and Secondary Consolidation of Soft Soil Layers - Surcharge Design	DATE:	5/06/2026
			PROJECT:	AK26-027

1. Consolidation Settlement (Terzaghi)

Exist Fill Density:	18 kN/m3
Soft Soil Density (Saturated):	16 kN/m3
Surcharge Density:	18 kN/m3

Layer	Original Ground RL	Water Table RL	Surcharge Top RL	Exist Fill Thickness	Soft Soil Thickness	Base Fill RL	Base Soft Soil RL	Mid-Point Soft Soil RL	Surcharge Height	Initial Eff Stress	Applied Surcharge	Comp Index C _c	Recomp. Index C _r	Initial Void Ratio e ₀	Exist Over Consol.	Δe	Consol Settlement	t90 Consol
	(mAHD)	(mAHD)	(mAHD)	(m)	(m)	(mAHD)	(mAHD)	(mAHD)	(m)	(kPa)	(kPa)				(kPa)		(m)	(m)
2.5m - Firm Clay	0	-1	1.3	1	9	-1	-10	-5.5	1.3	46	23.4	0.25	0.03	0.863	0	-0.0448	0.216	0.19
2.5m - Firm Clay	0	-1	2.7	1	9	-1	-10	-5.5	2.7	46	48.6	0.25	0.03	0.863	0	-0.0785	0.379	0.34
2.5m - Firm Clay	0	-1	4	1	9	-1	-10	-5.5	4	46	72	0.25	0.03	0.863	0	-0.1025	0.495	0.45
2.5m - Firm Clay	0	-1	5.4	1	9	-1	-10	-5.5	5.4	46	97.2	0.25	0.03	0.863	0	-0.1235	0.597	0.54
5.5 - Soft Clay	0	-1	1.7	1	9	-1	-10	-5.5	1.7	46	30.6	0.63	0.03	1.75	0	-0.1399	0.458	0.41
5.5 - Soft Clay	0	-1	3.2	1	9	-1	-10	-5.5	3.2	46	57.6	0.63	0.03	1.75	0	-0.2226	0.729	0.66
5.5 - Soft Clay	0	-1	4.7	1	9	-1	-10	-5.5	4.7	46	84.6	0.63	0.03	1.75	0	-0.2861	0.936	0.84
8.5m - Firm Clay	0	-1	1.5	1	9	-1	-10	-5.5	1.5	46	27	0.4	0.03	1.2	0	-0.0804	0.329	0.30
8.5m - Firm Clay	0	-1	3	1	9	-1	-10	-5.5	3	46	54	0.4	0.03	1.2	0	-0.1352	0.553	0.50
8.5m - Firm Clay	0	-1	4.4	1	9	-1	-10	-5.5	4.4	46	79.2	0.4	0.03	1.2	0	-0.1743	0.713	0.64
8.5m - Firm Clay	0	-1	5.7	1	9	-1	-10	-5.5	5.7	46	102.6	0.4	0.03	1.2	0	-0.2041	0.835	0.75

2. Mesri Creep Settlement - (Mesri et al (1994) and Mesri & Ajlouni (2007))

Assumed C _α /C _c =	0.06
Design Period, t =	50 yr
Future Load, Δσ =	12 kPa

															Mesri et al (1994), Mesri & Ajlouni (2007)					
	Final Ground	Surc. Consol			Preloaded	New Surch	New Fill Base	Final centre		Total Final										
	RL	Achieved	Original OCR	Original σ_{vi} '	σ_{vp} '	Base RL	RL	Soft Soil RL	Final Grd σ_v '	σ_{vf} '	Final OCR	Rs'	$C_c/(1+e_0)$	$C_\alpha/(1+e_0)$	t_{pr}	t_i	t/t_i	C_α''/C_α	$C_\alpha''/(1+e_0)$	Creep Settlement
	(m)	(%)		(kPa)	(kPa)	(m AHD)	(m AHD)	(m AHD)	(kPa)	(kPa)					(Yr)	(Yr)				(mm)
2.5m - Firm Clay	0.0	90%	1	46	65	-0.2	-1.2	-5.6	47	59	1.10	0.10	0.13	0.008	1	1.96	25	0.30	0.002	31
2.5m - Firm Clay	1.0	90%	1	46	86	-0.4	-1.4	-5.7	66	78	1.10	0.10	0.13	0.008	1	2.13	23	0.27	0.002	27
2.5m - Firm Clay	2.0	90%	1	46	106	-0.5	-1.5	-5.7	84	96	1.10	0.10	0.13	0.008	1	1.92	26	0.31	0.003	32
2.5m - Firm Clay	3.0	90%	1	46	127	-0.6	-1.6	-5.8	103	115	1.11	0.11	0.13	0.008	1	2.33	21	0.24	0.002	23
5.5 - Soft Clay	0.0	90%	1	46	69	-0.5	-1.5	-5.7	48	60	1.14	0.14	0.23	0.014	1	3.75	13	0.13	0.002	18
5.5 - Soft Clay	1.0	90%	1	46	91	-0.7	-1.7	-5.9	68	80	1.14	0.14	0.23	0.014	1	3.45	14	0.14	0.002	21
5.5 - Soft Clay	2.0	90%	1	46	113	-0.9	-1.9	-6.0	87	99	1.14	0.14	0.23	0.014	1	3.70	14	0.13	0.002	18
8.5m - Firm Clay	0.0	90%	1	46	67	-0.3	-1.3	-5.7	48	60	1.12	0.12	0.18	0.011	1	2.89	17	0.18	0.002	22
8.5m - Firm Clay	1.0	90%	1	46	89	-0.6	-1.6	-5.8	67	79	1.13	0.13	0.18	0.011	1	3.18	16	0.16	0.002	19
8.5m - Firm Clay	2.0	90%	1	46	110	-0.7	-1.7	-5.9	85	97	1.13	0.13	0.18	0.011	1	3.11	16	0.17	0.002	20
8.5m - Firm Clay	3.0	90%	1	46	130	-0.8	-1.8	-5.9	104	116	1.12	0.12	0.18	0.011	1	2.71	18	0.20	0.002	25

APPENDIX J Geotechnical Works Specification



GEOTECHNICAL WORKS SPECIFICATION

MILLDALE STAGES 14-17

FULTON HOGAN LAND DEVELOPMENT LTD

AK26-027AC Rev 1

23 July 2026

LIMITATIONS AND USE OF THIS REPORT

This report has been prepared by Gibb Ritchie Geotechnical Engineers for the exclusive use of Fulton Hogan Land Development Ltd in relation to the Milldale North Project. It has been prepared in accordance with the scope of work and the specific purpose agreed with the client.

The report should not be used for any other project, site, or purpose without the prior written consent of Gibb Ritchie Geotechnical Engineers. Where a party other than the named client seeks to rely on or use this report, they must first obtain such consent. Gibb Ritchie Geotechnical Engineers accepts no responsibility or liability to any other party who may use or rely on the contents of this report without authorisation.

This report is based on information available at the time of preparation, including site conditions observed and data obtained during the investigation. Subsurface conditions can vary significantly between investigation locations, and no warranty is given that the conditions described are representative of those across the entire site.

If you have any questions about the content or use of this report, please contact Gibb Ritchie Geotechnical Engineers for clarification.

Date	Revision	Comments
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5 June 2026	0	For Client Review
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23 July 2026	1	Final
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Name	Position	Signature
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Prepared by

Chris Ritchie	Principal Geotechnical Engineer, CPEng
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Reviewed by

Sam Gibb	Principal Geotechnical Engineer, CPEng
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1 INTRODUCTION

Gibb Ritchie Geotechnical Engineers (GRGE) was engaged by Fulton Hogan Land Development Ltd to prepare a Geotechnical Works Specification for a site located at Milldale Stages 14-17 which is being considered for a residential subdivision.

This report is to support the earthworks and civil construction.

This specification covers the geotechnical remediation works and associated earthworks outlined in the GRGE Geotechnical Investigation Report and Drawings (referenced AK26-027AB Rev 0 dated 5 June 2026). It supplements the information provided on the design drawings and reports above. It provides detail on the required specification for:

- Site clearance and preparation including topsoil stripping and stockpiling.
- Geotechnical stabilisation works such as shear keys, reinforced earth slopes (with 30-degree face angle or less) and stability undercuts.
- Subsoil drainage installation.
- Cut to fill earthworks operations.
- Fill materials and testing requirements.
- Earthworks finishing and respread of topsoil; and,
- As-built records.

Excluded from the scope are geotextile reinforced slopes with a face and steeper than 30 degrees or retaining structures covered by a Building Consent. Such works will be carried out in accordance with an independent structure specific specification.

Unless varied onsite by the Geotechnical Engineer, the following specification requirements must be met in order to provide a Geotechnical Completion Report (GCR) for the works.

2 RELEVANT DOCUMENTS

2.1 Standards, Guidelines and Consents

The works shall comply with the relevant sections of the following standards, guidelines, and consents:

- Health and Safety at Work Act 2015 and Regulations 2016.
- All Project Resource Consent Conditions and Engineering Works Approvals.
- Auckland Council Code of Practice for Land Development and Subdivision Chapter 2 (v2, May 2023)
- Auckland Council Erosion and Sediment Control Guide, GD05 (August 2023).
- NZS 4431:2022 Engineered Fill Construction for Lightweight Structures.
- NZS 4402: 1986 Methods of Testing Soils for Civil Engineering Purposes; and,
- NZS 4404: 2010 Code of Practice for Urban Land Subdivision.
- WorkSafe NZ – Excavation Safety Good Practice Guidelines, July 2016.

2.2 Geotechnical Investigation Report

Details of the geotechnical investigation, soil and rock conditions encountered, and the design of the geotechnical remedial works are contained in the GRGE GIR. The contractor should be aware of the contents and comply with the recommendations contained in that report.

2.3 Construction Drawings

The works shall comply with the following geotechnical design drawings and standard details:

- Maven Drawings Earthworks Drawings
- GRGE Geotechnical Features Plan Drawing 05
- GRGE Underfill Drain Detail referenced Drawing 06.

2.4 Conflicting Information

Where there is any conflict or discrepancy in the requirements of this specification and the documents listed above the matter shall be referred to the Geotechnical Engineer for clarification.

3 GEOTECHNICAL OBSERVATIONS

The following items form hold points in the construction works that require observation, testing and approval by the Geotechnical Engineer:

- Foundations for filling once topsoil and unsuitable materials have been stripped prior to fill placement.
- Undercut excavations and undercuts to confirm depth and extents prior to backfilling.
- Rock exposures for design of rockfall mitigation.
- Subsoil drain excavations prior to placement of aggregate;
- Any imported soil fill materials prior to placement on site.
- Drainage aggregate quality prior to placement.
- Geotextile layers once in place and prior to backfilling.
- Filling placed at regular intervals to comply with the fill test frequency requirements below.
- Compaction of backfilling in critical service trenches.
- Flushing of the subsoil drainage system at the completion of earthworks.
- Any unforeseen ground conditions that may impact on the construction works or future land use; and,
- Installation of any settlement monitoring plates or points.

It is the contractor's responsibility to ensure that the Geotechnical Engineer is given reasonable notice and opportunity to observe the above works and that the works do not proceed until approval has been gained from the Geotechnical Engineer.

24 hours is considered reasonable notice.

4 CONSTRUCTION SPECIFICATION

4.1 Site Preparation

The Contractor shall remove all vegetation from the site of the earthworks except for trees indicated for preservation by either markings on site or notes on the drawings.

Clearing shall mean the felling of all trees, except those indicated, removal of all growth other than grass and weeds, extraction of tree stumps, demolition of fences and other minor items remaining in the way of site stripping, and the complete disposal of all items. Stumping shall mean the removal of all roots greater than 25mm in diameter.

Cleared areas shall be stripped to remove all turf and organic topsoil to depths designated by the Engineer ahead of or during the stripping operations. Stripping shall also cover picking up any old topsoil stockpiles and any buried topsoil detected during the course of the works. The depth shall be sufficient to remove all materials considered unsuitable as fill or unsuitable to remain beneath fill but will not necessarily extend to the full limit of organic penetration.

4.2 Erosion and Sediment Control

The works shall be carried out in accordance with the project Erosion and Sediment Control Management Plan and associated drawings.

The contractor shall ensure good control of surface water runoff at all times by shaping of the surface in cut and fill areas to prevent ponding during rainfall events.

The location of temporary Sediment Retention Ponds (SRP) on sloping ground shall be decided upon with input from the Geotechnical Engineer. Where comment of SRP stability is sought by Council then all fill materials used to form batters, must be placed as engineered fill and tested accordingly unless advised otherwise by the Geotechnical Engineer.

When decommissioning temporary sediment ponds, all water softened material in the bases and sides of the ponds shall be removed and undercut to the satisfaction of the Geotechnical Engineer. Backfilling of temporary ponds shall be to the compaction standard for general filling unless otherwise specified.

4.3 Stockpiles

Topsoil stockpiles can add significant driving force for slope instability when placed at or near the crest of a slope. The location of all temporary stockpiles must be approved by the Geotechnical Engineer prior to placement. Where stockpiles cannot be avoided above sloping ground, they should be placed over a wide area with the height restricted under the direction of the Geotechnical Engineer.

4.4 Fill Foundations and Benching Slopes

The foundation on which filling is to be placed must be observed by the Geotechnical Engineer following clearing and prior to the placement of any filling to confirm the strength of the underlying soils is sufficient.

Where it is found, after clearing and stripping operations as specified, that the foundation on which filling is to be placed is unstable, or in cuttings if it is found after the excavation has been cut down to the levels shown in the drawings that unstable ground is encountered, then the Engineer may direct that the soft, yielding, or unstable materials causing such instability shall be removed to such depth as directed.

Benching of slopes prior to the placement and compaction of filling should be carried out in accordance with the normal requirements of NZS 4431 and related documents as mentioned above, especially on the steeper areas of the site, to ensure that the filling placed is keyed into the underlying natural ground. This would involve the cutting of benches approximately the width of a bulldozer, with a slight reverse gradient back into the slope. The optimum depth of each bench is best confirmed by careful Engineering inspections during construction.

4.5 Shear Key, Fill Drainage Key and Buttress Fill Excavations

All shear keys, fill drainage keys and buttress fills required to improve long term stability conditions are to be constructed in accordance with the design drawings and standard details. The key/buttress base width, lateral extent and benching requirements need to be confirmed on site by the Geotechnical Engineer during construction. In most cases this requires detailed logging of the excavation faces by a geo-professional and may require trial pits to be dug in the base of the excavation. The contractor should make allowance for the time and plant required for these inspections in their work programme.

4.6 Fill Materials and Conditioning

4.6.1 Material Types

Table 1: Material Types

Material Type	Description	Comments
T	Topsoil	Natural material at surface
F	Fine-grained	≥35% material passing the 75µm sieve. 100% passing 19mm sieve.
I	Intermediate-grained	15% to 35% passing the 75µm sieve. 100% passing 75mm sieve.

The soils at this site are predominantly classified as material type F to I with potential for importation of hard fill..

4.6.2 Blending of Unsuitable

The blending of ‘unsuitables’ into structural fills may be undertaken only at the discretion of the Geotechnical Engineer following a request by the contractor and with sufficient time for appropriate consideration. Approval for any such blending must be sought from and provided by the Geotechnical Engineer in writing prior to the commencement of any blending.

In consideration of any such requests, the Geotechnical Engineer will need to be able to assess, inter alia, the composition of the materials requested to be blended, the location on the site for the proposed fills, the fill depths and the elevation of the blended materials within the fills and any environmental constraints.

As a minimum, it is expected that any blended fills will be directed to comply with the following conditions:

- All significant, solid inorganics (such as roots and stumps) to be removed prior to blending; and,
- All inclusions of suitable man-made materials (e.g. concrete) and any excavated rock must comply with the normal compaction requirements specified herein in terms of size and ability for appropriate compaction to be achieved in close vicinity to the inclusions.
- All blended materials must be appropriately mixed/ blended normal fill materials to the specified ratio. Un-mixed interlayering of normal engineered filling with unsuitables will not be accepted.
- As a preliminary indication, it is expected that the ratio of unsuitables to suitable fill will not exceed 1 in 10 by volume.

It is expected that the Geotechnical Engineer will also need to apply limits to the location/ depth of blended fills within any specified fill area.

4.6.3 Hardfill

Hardfill used as structural filling shall be a graded, unweathered, durable, crushed rock product approved by the Geotechnical Engineer, with a grading suitable for compaction.

4.6.4 Material Conditioning

The cut materials on site may require some drying prior to compaction to achieve the required specification. This may be done by harrowing (such as with discs) and air drying when conditions permit or by the addition of hydrated lime.

The addition of lime and/or cement to engineered filling in concentrations greater than 3% requires the approval of the Geotechnical Engineer.

All additives such as lime or cement proposed for use in backfill materials for Reinforced Earth Slopes or other materials in contact with geosynthetics must be approved and monitored by the Geotechnical Engineer.

4.7 Fill Placement, Compaction and Testing Requirements

4.7.1 Soil Fill

Soil placed in fills shall be conditioned and compacted until the following conditions are satisfied.

It should be noted that the surface of the fill area prior to placement of subsequent fill lifts should be in a state so as not to create a break in the consistency of the fill material between lifts. For example, if surfaces are left to dry out, or rolled to seal them from rainfall infiltration then the surface must be broken up and scarified with rippers or by other means to ensure a good bond between fill lifts.

The maximum lift of filling placed before compaction is dependent on the size and nature of the compaction equipment. Typically, 250mm to 300mm loose depth is considered the maximum for a Cat 815/820 type compactor. In any event the contractor must ensure that the fill is placed and compacted to achieve even and adequate compaction throughout each layer/lift.

The test criteria and frequency are set out below.

Table 2: Soil Fill Testing Requirements

Material Type	Test and Methods	Acceptance Requirements	Min. Frequency
Fine and Intermediate (F-I)	Dry density / water content relationship (NZS4402.4.1.1, NZS4402.4.1.2)	OMC and MDD determined	1 per source and 1 per change in material
	Water content (NZS4402.2.1)	Between OMC -2% and OMC +4%	
	Solid density (NZS4402.2.7.1 or 2.7.2)	Solid density determined	
	Field water content and density (NDM) (NZS4402.2.1 and NZS4407 test 4)	Maximum 10% air voids over 10 tests. Maximum single value 12%	2 per 1,000m ³
	Shear strength (NZGS guideline for handheld shear vane)	Minimum average 140kPa over 10 tests. Minimum single value 110kPa	2 per 1,000m ³

The test criteria and/or frequency may be relaxed at the discretion of the Geotechnical Engineer for the project or in a discrete fill area subject to the consistency of the results achieved being acceptable over a specified period of time.

4.7.2 Hardfill

The test criteria and frequency are set out below for hardfill.

Table 3: Hardfill Testing Requirements

Material Type	Test and Method	Acceptance Requirement	Min. Frequency
HARDFILL	Particle size distribution (NZS4407 test 3.8 or NZS4402.2.8.1)	Refer particle size criteria in NZS4431 (Table A2) for the relevant product	1 per source and 1 per change in material
	Dry density / water content relationship (NZS4402.4.1.1, NZS4402.4.1.2)	OMC and MDD determined	
	Solid density (NZS4402.2.7.1 or 2.7.2)	Solid density determined	
	Weathering quality index	AA, AB, AC, BA, BB or CA	
	Field water content and density (NDM) (NZS4402.2.1 AND NZS4407 test 4)	>95% MDD	2 per 1,000m ³
	Impact test – 4.5kg hammer (ASTM D 5874)	CIV > 25	1 per 50m ² on each compacted layer (min 2 per lift)

4.7.3 Compaction Testing Reporting Requirements

All test location coordinates to be recorded by handheld GPS with reference to the NZTM projection. If testing is undertaken by the contractor, test location coordinates, with date and test number reference are to be provided to the Geotechnical Engineer in electronic (excel) format on a weekly basis. Alternatively, the Geotechnical Engineer may approve the use of site plans to mark the location of tests in lieu of GPS location.

The volume of filling placed for each progress claim month (typically ending 20th of the month) including all filling placed (undercut and cut to fill) to be provided to the Geotechnical Engineer monthly by the contractor or Engineer to the Contract to allow assessment of test frequency adequacy.

Interim fill test summaries are to be provided to the Geotechnical Engineer for review on a regular basis.

4.8 Subsurface Drainage

4.8.1 General

Drainage for underfill gully drains shall be constructed in accordance with the design drawings and standard details.

4.8.2 Materials

Pipes

Drainage pipes used in subsoil drainage shall be 160mm diameter highway grade drain coil. Drain coil walls shall be perforated or solid as detailed in the design drawings or directed by the Geotechnical Engineer on site. Drain coils shall not have a geofabric filter sock unless requested by the Geotechnical Engineer on site.

Aggregate

Auckland Council now generally require that subsoil drainage has a 100-year design life and is essentially maintenance free, unless there is an entity such as body corporate or resident's association that maintenance responsibility can be transferred to. Maintenance by individual owners is not practical as the subsoil drainage systems usually cross over, and generally benefit, multiple lots.

This requires a high-quality drainage aggregate with the following properties:

- Self-filters against the soils present on site preventing loss of permeability over time; or, able to be practically wrapped in a suitable geofabric filter.
- High permeability, which translates to a low fines content; and
- Stable and not subject to crushing, weathering, internal erosion or piping, or significant loss of volume (settlement) over time.

Ideally the drainage aggregate should be a well graded self-filtering material such as a clean (free of significant cohesive fines) scoria SAP50 product or Transit F/2 specification filter media.

Alternatively, for shear key drainage, blanket drains, underfill drainage and all applications where full encapsulation with a geofabric filter cloth can be relatively simply and safely achieved, an open graded product, preferably 27/7 Scoria may be used. Care will need to be taken to ensure that the cloth fully encapsulates the aggregate. Observation of the cloth wrap should form an inspection hold point prior to backfilling over the drain. Drain coils in this instance do not require a filter sock.

Light compaction (i.e. tamping with back of excavator bucket) only is to be applied to drainage aggregates.

Filter Cloth

Any filter cloth surround specified on the drawings shall meet the requirements of Transit Specification TNZ/F7, Filtration Class 2 and Strength Class B unless otherwise specified on the drawings.

Trench Backfill in Service Trenches

It is important on all sloping land that service trenches running parallel to contours are avoided where possible as they can permit the ingress of surface water and/or lateral movement of trench sides that could lead to progressive land slippage, help develop tension cracks and possibly lead to slope and building instability.

Backfilling of all trenches should be to the general fill standard above unless specifically varied in writing by the Geotechnical Engineer and where possible the pipe bedding in all trenches on steep ground should contain a 50mm diameter perforated drain coil that is connected into each manhole on the line. This is to help prevent instability arising from the ingress of surface water and/or lateral movement of trench sides that could lead to progressive land slippage and is especially important where the lines are in close proximity to buildings.

The subdivision drain laying contractor must be made aware of these requirements and of the need to contact us when trench backfilling is to take place.

4.8.3 Depth and Extent

The location, extent and depth of the drainage shown on the design drawings may be varied on site by the Geotechnical Engineer in response to the ground conditions encountered.

4.8.4 Drainage Outlets and Inspection Points

Outlets for subsurface drainage shall be provided at regular intervals as shown on the drawings or as determined on site by the Geotechnical Engineer. Pipe outlets shall be specifically formed structures with adequate protection such as a headwall and/or rock rip rap. The position of all outlets shall be recorded on the as-built drawings.

Where possible it is good practice to include additional inspection and/or flushing points in the subsoil drainage system in the event that their performance needs to be confirmed in the future.

In any event, at least one temporary flush point is required for each subsoil drainage system to enable flushing of the system once the earthworks are substantially complete.

The flushing of the subsoil drainage system must be witnessed by the Geotechnical Engineer.

4.9 Finishing Works and Topsoil Spread

4.9.1 Overcut

All areas cut to below finished level should be reinstated with engineered filling to the satisfaction of the Geotechnical Engineer.

4.9.2 Topsoil Depth

Topsoil respread depth should be between 100mm and 300mm, or as directed by the Engineer to the contract. On ground steeper than 1V:3H the surface should be roughened under the supervision of the Geotechnical Engineer prior to topsoil placement.

4.9.3 Unsuitable Materials

At the conclusion of earthworks all surplus unsuitable materials should be removed from site or placed in designated permanent stockpiles. The size and location of such stockpiles must be approved by the Geotechnical Engineer and recorded on the as-built drawings.

4.9.4 Road Subgrades

Testing and formation of road subgrades will be carried out as part of the subdivision civil works package.

4.10 Preload Surcharging

4.10.1 Temporary Surcharge Over Natural Ground

The Contractor shall clear all approved vegetation, tree stumps, fences and other required structures from the earthworks area. Removal of stumps shall include all roots greater than 25mm in diameter.

Cleared areas shall be stripped to remove all turf and organic topsoil - or to specific depths if designated by the Engineer ahead of the stripping operations.

Where a natural soil subgrade is to be surcharged, 100% of the subgrade surface shall be proof rolled and witnessed by the Engineer using a wheeled machine 12t or greater such as a loaded water cart, or roller. The geotechnical engineer shall confirm that there are no excessively soft spots, and a record of proof roll is to be completed.

Where any particularly weak materials are encountered that weave excessively during the proof rolling process, they shall be undercut as directed by the geotechnical engineer and reinstated with engineered fill.

4.10.2 Temporary Surcharge over Engineered Fill

Proof-rolling is not required for locations where the surcharge is to be placed over recently tested engineered fill.

Similarly, a geotextile may not be required provided the surface fill is readily distinguishable from the surcharge material so that complete surcharge removal can be easily ascertained and provided punching of the surcharge material into the engineered fill surface is not considered an issue by the Geotechnical Engineer.

4.10.3 Topographical Survey

In all cases, the prepared surface must be surveyed prior to commencement of the surcharge placement.

4.10.4 Surcharge Materials and Conditioning

There is no specification for the placement of the surcharge fills. It is primarily intended to provide the required weight and will subsequently be removed. However, the following considerations apply:

- The Geotechnical Engineer is to be given the opportunity to review the proposed surcharge fill materials for suitability in terms of anticipated density.
- Surcharge fills are commonly constructed by either end-tipping and blading operations or by scoops / scrapers. Consideration should be given to applying additional compaction to avoid excessive moisture uptake if the surcharge soil is to be used as an engineered fill in the future.
- Temporary surcharge design typically assumes 1V:1H side batters, but may be altered and specified differently for specific surcharges if global stability conditions govern. These will not be achieved by placing overly wet soils, so a degree of conditioning and compaction may be required for some soils.
- Where low clay-content soils that are prone to erosion are used, batter erosion may be problematic.

We recommend that the project Geotechnical Engineer is contacted by the contractor at the planning stage to assess the soils intended for use as surcharge fill.

5 MONITORING

5.1 Survey and Monitoring Requirements

To ensure appropriate quality settlement data is collected for analysis, the following principles and procedure must be adhered to.

The measurement of settlement plates is to be completed by the surveyors appointed by the contractors.

The measurement of vibrating wire piezometers is to be completed by the Geotechnical Engineer.

5.1.1 Initial Measurement

- Upon installation, all instrument locations are to be fixed with GPS. The RL must be recorded by precise levelling at that time.
- A topographical survey of the stripped and prepared subgrade must be made prior to the placement of any fills.

5.1.2 During Construction

- It is important that the fill surface RL is recorded and reported together with the instrument data whenever monitoring readings are taken.
- Readings must be taken weekly or per 0.5m fill or surcharge lift height, whichever is more frequent.
- GPS level readings can be taken during fill and any surcharge construction.
- Within 48 hours of full surcharge height being achieved, the RL at each monitoring device must be recorded by precise levelling and the full extent of the surcharge must be surveyed and provided to the Geotechnical Engineer as soon as possible to confirm it achieves the height and coverage required.

5.2 Following Surcharging

- Following completion of the surcharge filling, fortnightly monitoring must be undertaken unless advised otherwise by the Geotechnical Engineer.
- Once the Geotechnical Engineer has approved the removal of the surcharge and the surcharge soil has been approved, a topographical survey of the final surface will be required for as-built purposes.

6 ASBUILT INFORMATION REQUIREMENTS

In order to provide a Geotechnical Completion Report (GCR) certain as-built information must be provided. It is the contractor's responsibility to ensure that all of the following items are surveyed prior to placing filling. The survey of these items should therefore form a hold point in the construction sequence.

- The location and invert of all sub surface drainage; and,
- The depth of filling placed including all benching, undercuts, shear or fill drainage keys and temporary ponds which have been backfilled.

We require the following as-built information to be provided for the GCR:

- Cut and fill depth plan (including undercuts and shear keys).
- Final contour plan.
- Drainage locations and inverts (surface and subsurface).
- Drainage outlet locations (surface and subsurface).
- Details of any defined overland flow paths.
- Location and heights of any retaining walls and Mechanically Stabilised Earth (MSE) structures.
- Position and extent of any geogrid layers (in plan view).
- Material data for imported products used such as draincoils, aggregates and geofabrics as well as confirmation that products installed comply with the requirements of the project drawings and this specification; and,
- Any settlement Monitoring Data.

APPENDIX K

PC120 Landslide Assessment



LANDSLIDE RISK ASSESSMENT

Milldale Subdivision Stages 14 -17

Fulton Hogan Land Development Ltd
AK26-027AC Rev.1

23 July 2026

LIMITATIONS AND USE OF THIS REPORT

This report has been prepared by Gibb Ritchie Geotechnical Engineers for the exclusive use of Fulton Hogan Land Development Ltd in relation to the Milldale Subdivision Stages 14 -17 project. It has been prepared in accordance with the scope of work and the specific purpose agreed with the client.

The report should not be used for any other project, site, or purpose without the prior written consent of Gibb Ritchie Geotechnical Engineers. Where a party other than the named client seeks to rely on or use this report, they must first obtain such consent. Gibb Ritchie Geotechnical Engineers accepts no responsibility or liability to any other party who may use or rely on the contents of this report without authorisation.

This report is based on information available at the time of preparation, including site conditions observed and data obtained during the investigation. Subsurface conditions can vary significantly between investigation locations, and no warranty is given that the conditions described are representative of those across the entire site.

If you have any questions about the content or use of this report, please contact Gibb Ritchie Geotechnical Engineers for clarification.

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Date	Revision	Comments
24 April 2026	A	Internal Draft
10 June 2026	0	Draft for review
23 July 2026	1	Final

1 INTRODUCTION

Gibb Ritchie Geotechnical Engineers Limited (GRGE) was engaged by Fulton Hogan Land Development Ltd to carry out a site-specific landslide assessment of the Milldale Subdivision Stages 14 -17 Subdivision.

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal referenced AK26-027AA Rev 0.

2 LANDSLIDE RISK ASSESSMENT METHODOLOGY

Appendix 24 of Plan Change 120 presents a structured process for assessing landslide risk in land-use planning contexts. It consists of **four stages**:

1. **Desk Study** – Review landslide inventories, susceptibility maps, and run-out zones to identify potential hazards and their activity status (recent vs. ancient).
2. **Method Selection** – Choose an appropriate risk assessment approach based on susceptibility class and proposed land use or zoning change, using predefined tables.
3. **Risk Assessment** – Applying either:
 - o **Method 1** (semi-quantitative) for lower-risk scenarios, combining likelihood and consequence categories; or
 - o **Method 2** (semi-quantitative + quantitative) for higher-risk scenarios, including calculation of Annual Individual Fatality Risk (AIFR) using probability-based models or event trees. Climate change impacts (SSP5-8.5) must be considered.
4. **Activity Status Determination** – Use the highest risk classification from the assessment to determine planning activity status under AUP Plan Change 120 Table E36.4.1B.

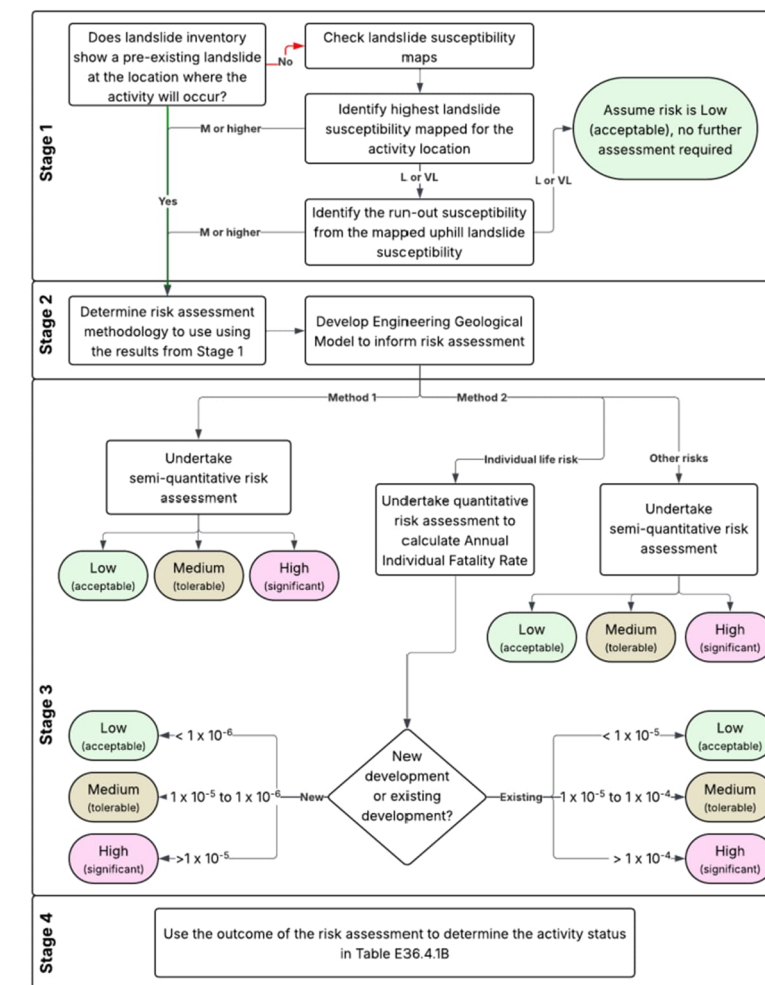
The process requires the development of an **Engineering Geological Model**, considering credible hazard scenarios, and applying robust legal and technical standards to ensure risk-informed land-use decisions.

These stages are summarised in Figure 2.

Figure 1 Site Location Plan



Figure 2 Appendix 24 Landslide Methodology



3 STAGE 1 DESKTOP STUDY

3.1 Related Documents

The full geotechnical investigation and report have been completed for this project. This includes details on the engineering geological ground model, natural hazards assessments including numerical slope stability analysis and preliminary remediation design. The report reference is AK26-027AB Milldale Stages 14 -17 Geotechnical Investigation Report, Gibb Ritchie Geotechnical Engineers Ltd, dated 23 July 2026.

3.2 Landslide Susceptibility Maps

A comprehensive desk-study assessment was undertaken reviewing the following sources:

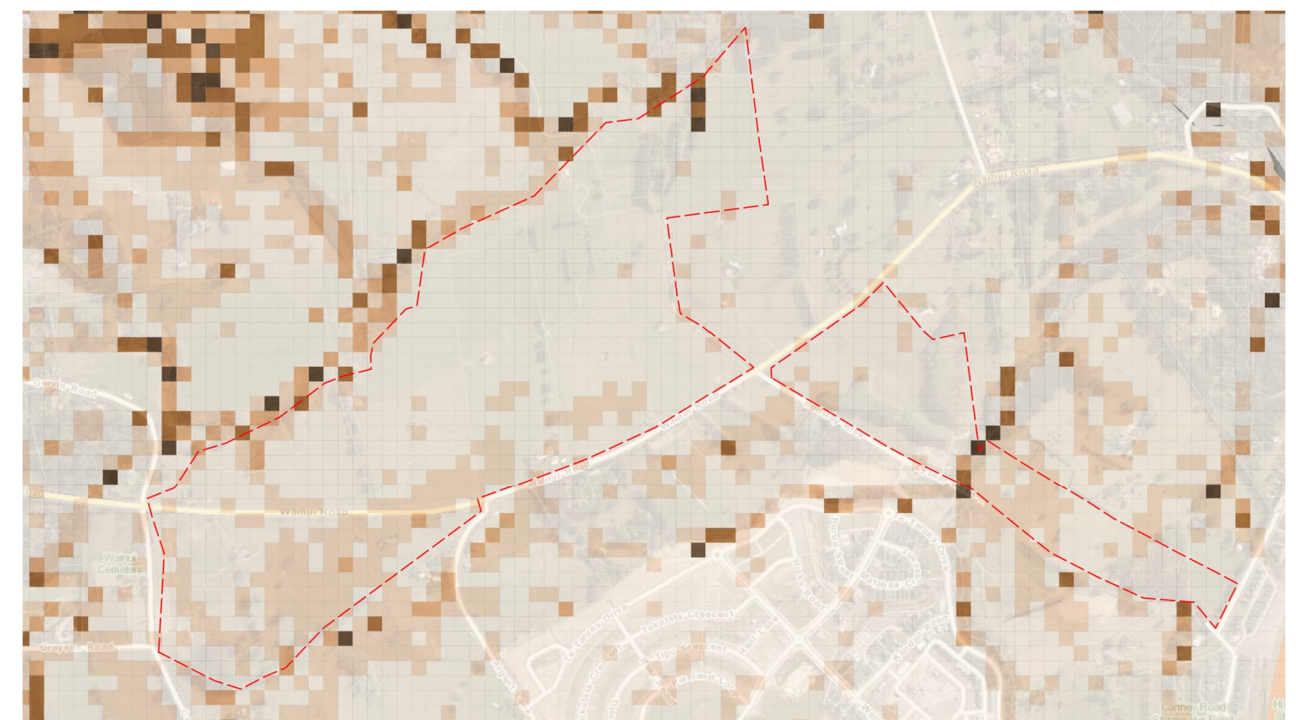
- Auckland Council GeoMaps natural hazard layers.
- Published landslide inventories.
- Shallow and deep-seated landslide susceptibility maps.
- Landslide runout susceptibility for areas within 150 m uphill of each stage.

Outputs of both shallow and deep-seated landslide susceptibility maps for each stage are shown in Figure 3. In summary:

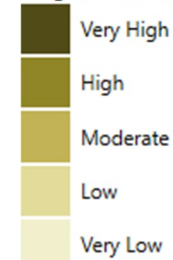
- Large scale landslide susceptibility is very low to low.
- Shallow landslide susceptibility is generally very low to moderate, with high to very high mapped near existing watercourses.
- To determine run-out susceptibility, the highest landslide susceptibility class mapped within 150m of each stage was reviewed. This shows very high shallow landslide susceptibility for Milldale North, in particular near water courses.

In summary the maps typically show very low to low shallow and large-scale landslide susceptibility. Where moderate to very high shallow landslide susceptibility exists, these are within areas designated as reserve and will be well offset from future housing areas. Therefore, landslides originating from these areas are not considered feasible landslide mechanisms to affect occupied dwellings within the development area.

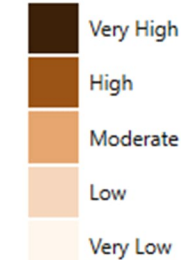
Figure3 Landslide Susceptibility Maps from Auckland Council GIS



Large Scale Landslide Susceptibility



Shallow Landslide Susceptibility



3.3 Mapped Existing Landslides

Two mapped landslides on Auckland Council GIS and Landslide Database. These have limited information; however they exist within the watercourses which will be in future reserve areas.

This supports that landslides originating from these areas designated for reserve pose low run out risk to the development area.

Figure 4 Mapped landslides (Auckland Council GIS)



4 STAGE 4 – ACTIVITY STATUS AND PLANNING IMPLICATIONS

Based on the desktop assessment, we consider that landslide hazard result is Low (acceptable) under Appendix 24.

Under the Auckland Unitary Plan (Chapter E36), a low landslide hazard risk classification means that most proposed activities, including subdivision, can proceed as Permitted or Restricted Discretionary activities, provided that:

- A site-specific landslide hazard risk assessment prepared by a suitably qualified and experienced practitioner (SQEP) is submitted in accordance with E36.6 Standards and Appendix 24 methodology (this report).
- The development does not increase landslide risk beyond the site.
- Appropriate mitigation measures (engineered retaining walls, drainage, erosion and sediment controls, and surface water management) are implemented and maintained.

The proposed development therefore complies with the risk-based planning framework of E36 and meets the requirements for activities in natural hazard areas.

5 CLOSURE

Gibb Ritchie Geotechnical Engineers has prepared this report for Fulton Hogan Land Development Ltd in accordance with the agreed scope of work for the Milldale Subdivision Stages 14 -17 project. It provides geotechnical information and recommendations to assist in consenting.

We view this report as part of an ongoing process. Our team can provide further input during detailed design and construction to help ensure that the recommendations are applied effectively and to provide advice should any unexpected ground conditions arise.

If you have any questions about the report, or if you would like to discuss the next steps for your project, please contact our team.

USING YOUR GIBB RITCHIE REPORT

Geotechnical reporting relies on interpretation of site information using experience, professional judgement, and opinion. As such, all geotechnical reports carry an inherent level of uncertainty, often greater than in other engineering disciplines. The notes below provide guidance on what can reasonably be expected from this report and its inherent limitations.

Purpose of this report

This report has been prepared specifically for Fulton Hogan Land Development Ltd and the Milldale Subdivision Stages 14 -17 project. The contents may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted geotechnical engineering and engineering geology practices. The opinions and conclusions are based on those principles.

Dependence on available information

This report is based on the information available at the time of preparation, including investigation results and referenced data. If further information becomes available or the project scope changes, the findings may no longer be valid. In such cases, Gibb Ritchie Geotechnical Engineers should be engaged to review and update the report.

Applicability to your project

The findings and recommendations in this report relate solely to the site and project described. They should not be applied to other sites or projects, as subsurface conditions and requirements differ between locations and developments. Similarly, applying data or conclusions from other sites to this project may lead to incorrect assumptions.

Interpretation of subsurface condition

Site investigations provide information at discrete locations. Conditions between or beyond these points may differ. Geological interfaces may be more variable than inferred, and actual conditions may only become clear during construction. Engineering judgement has been applied to interpret the available data, but no investigation can remove all uncertainty.

Changes in subsurface conditions

Ground and groundwater conditions can change over time, whether due to natural processes (seasonal variation, settlement, erosion) or human activities (earthworks, adjacent development). This report reflects conditions observed at the time of investigation. Confirmation of conditions may be necessary if significant time has passed before construction.

Role during construction

Recommendations in this report are based on selective point sampling and interpretation. It is strongly recommended that Gibb Ritchie Geotechnical Engineers remain involved during construction to confirm assumptions, review any changes in conditions, and provide timely advice if unexpected ground conditions are encountered.

Use by other parties

This report has been prepared for the named client. Where other design professionals or third parties intend to rely on it, they must first seek consent from Gibb Ritchie Geotechnical Engineers. Misinterpretation of geotechnical reports can lead to costly design or construction issues, and our continued involvement helps reduce these risks.

Environmental matters

Unless explicitly stated, this report does not address environmental issues such as contamination, waste management, or disposal of materials. These require separate investigation and specialist advice.

If you have any questions about the content or use of this report, please contact Gibb Ritchie Geotechnical Engineers for clarification.

