Vineway Ltd
Andrew.as@mylandpartners.com

1 July 2025

Our Ref: 240065-M
Reissue of: 240065-J

Attention: Andrew Allsopp-Smith

Dear Andrew

Geotechnical Response to Council Queries
Delmore Residential Development

1.0 Introduction

Further to your request, we have reviewed the queries raised by the Auckland Council (Council) geotechnical specialist and present our responses below.

Note that query numbering below corresponds to the project team spreadsheet numbering by default, with the corresponding Council query reference in brackets. This letter geotechnical addresses queries 11, 14, 17, 19 to 21, 23 to 26, 31 and 32 (i.e. Council queries 1, 4, 7, 9 to 11, 13 to 16, 21 and 22, respectively). These queries required additional analysis outputs and/or further detailed discussion.

Geotechnical queries 12, 13, 15, 16, 18, 22, 27 to 30 and 33 to 36 (i.e. Council queries 2, 3, 5, 6, 8, 12, 17 to 20 and 23 to 26) were addressed separately in a consolidated spreadsheet previously presented to Council. Groundwater related queries were addressed either in this same spreadsheet or in a separate letter prepared by Riley (Ref: 240065-I, dated 17 June 2025).

Riley has previously prepared and issued responses to these queries. These responses were reviewed by the Council Geotechnical Specialist (Frank Zhou) who subsequently provided feedback in a letter titled Delmore Fast-Track – Auckland Council Response, Annexure 15: Geotechnical, dated 25 June 2025. Riley has reviewed this letter and incorporated Council's feedback into the updated responses below. Council have specifically identified the following information gaps in their letter:

- Request for a Geomorphic Risk Assessment in relation to Query (18) 28. This has been recorded as item 1 from paragraph 250 of the Auckland Council Strategic & Planning Matters memorandum. This item is addressed in a separate letter/memorandum.
- Associated with our previous response to Query (20) 30 in the consolidated spreadsheet. This has been recorded as item 15 paragraph 250 of the Auckland Council Strategic & Planning Matters memorandum. This item addressed within this letter.

2.0 Queries and Responses

The Council queries and our responses are presented below.

Query (1) 11:

It is noted that earthworks and retaining are proposed to be staged, details should be provided to clarify how stability will be maintained between Stages 1 and 2 and substages (particularly where earthworks and retaining are proposed at the stage boundaries).

Response

The earthworks boundary between Stages 1 and 2 is temporarily proposed to comprise a 1(V):2.5(H) cut batter. This temporary batter will be formed during Stage 1 cut to fill earthworks and later removed as part of the proposed Stage 2 cut. Riley has undertaken additional stability analysis on a representative section of this temporary slope under normal and extreme groundwater conditions, and under Ultimate Limit State (ULS) seismic conditions. The results indicate that the Factor of Safety (FoS) values available for this temporary slope achieve the minimum outlined in the Auckland Council Code of Practice for Land Development and Subdivision (CoP). Outputs from the slope stability analysis programme SLIDE2 are appended to this letter.

Because many of the following responses also required slope stability reanalysis, a table summarising relevant slope values for all query responses is also appended to help compare new and previous results.

Query (4) 14:

Stage 1 only - Fill settlement - No settlement analysis was provided.

Response

The Stage 1 fill induced settlement is calculated as settlement occurring within the fill. Following undercutting of compressible materials within the gullies where the maximum fill depths occur there should be little to no additional settlement within the underlying soils. For the purposes of estimating the likely induced settlement we have calculated the 1D settlement using the following parameters:

Unit weight of fill and natural soils = 18kN/m^3

$Cu_{(fill)}$ =150kPa (note this is the minimum value to satisfy fill compaction criteria)

$M_{v(fill)}$ ~1/(300 x 150) ~0.000022m^2/kN

Fill Height = 15m (maximum proposed fill height within Stage 1 of the development)

Max stress at the base of the fill = 18 x 15 = 270kPa

Average stress within the fill (for internal fill settlement) = 270/2 = 135kPa

Internal settlement within the fill = 135 x 15 x 0.000022 = 45mm

A settlement monitoring and contingency plan (which will also cover groundwater monitoring) will be prepared for the development prior to construction commencing.

Query (7) 17:

Noted that earthworks specifications deferred to earthworks contractor and only broad elements included in reporting. Section 5.6.5 recommends fill compaction testing values below NZS4431:2022 requirements. Suggest that specifications be justified where deviating from standards and be included as part of consent to capture effects and allow assessment of E12.6.2(2), E12.8.2(1)(c) and E39 for subdivision.

Response

Reflecting the requirements of NZS4431, Table 11 from our Geotechnical Investigation Report (GIR) (Ref: 240065-F) has been updated to set the minimum shear strength at 150kPa. See updated table below.

Table 1: Fill Compaction Control Criteria

Material	Test	Average Value Not Less Than	Minimum Single Value Not Less Than
Cohesive Fill	Shear Vane – Undrained Shear Strength	NA	150kPa
	Nuclear Densometer – Air Void %	8%	10%

Note: NA = Not Applicable
Average to be determined as a rolling mean value over 5 consecutive tests

Query (9) 19:

Stage 1 and 2 - Expected surcharges such as new dwellings, roads etc., have not been applied for the proposed development condition.

Response

As agreed with the Auckland Council Geotechnical Specialist, Riley has reanalysed the slope stability of a selection of 50% of the cross sections previously analysed to demonstrate that the addition of post-development surcharges will not have a significant effect on the overall stability of the proposed development. Surcharges of 10kPa, 12kPa, and 24kPa have been added to simulate future building platforms, local roads and the NOR road respectively. The results indicate that the FoS for all reanalysed slopes either achieves the required values as per the CoP (or where previous analysis indicated that ULS seismic results were slightly below the CoP requirements, that the reanalysed results are consistent with what was previously indicated, i.e. no worse than previously expected). Slope stability outputs are appended to this letter.

It is noted that where minimum FoS values below the CoP requirements are shown on the reanalysed sections, these are either outside the proposed development area or specifically relate to the ULS seismic loading case. Where ULS seismic FoS values are less than 1.0, seismic deformations were calculated using the Jibson (2007) method as part of the Riley GIR, Ref: 240065-F, and assessed to be acceptable based on MBIE guidelines.

Where post-development FoS values were less than 1.0, there were no instances where these values were significantly worse than the values returned for the existing ground profile, (i.e. the proposed development should not negatively affect the seismic stability of the site). Refer to the response to Query (15) 25 below for further discussion regarding this point.

Query (10) 20:

Soil parameters presented in Table 7 does not align with modelled parameters (e.g. unit weight of Medium Dense ECBF in table is 18 kN/m³ but in the Proposed GL (RHS) - Section V for Stage 2 seismic is 20 kN/m³). Discrepancies should be justified or revised.

Response

This discrepancy was a typographical error in the original stability inputs. The unit weight of the medium dense ECBF material has been corrected in the reanalysis of Section V, with the slope stability outputs included in the slope stability appendix pertaining to the Query (9) response.

Query (11) 21:

The stability analysis assumes that the fill material is completely dry. However, porewater pressure could potentially develop within the fill, particularly in the event of drainage system failure. Therefore, the potential effects of porewater pressure should be considered in the stability analysis to ensure a more conservative and realistic assessment.

Response

Riley considers that the stability analysis undertaken as part of our original reporting adequately considers the realistic effects of extreme groundwater, effectively modelling full saturation of the natural soils above the long-term groundwater table. We also consider that the underfill, retaining wall, MSE wall and REB drainage measures will be sufficiently robust (and have adequate redundancy) so as to prevent pore water pressures accumulating within the engineered fill.

However, as agreed with the Auckland Council Geotechnical Specialist, Riley has reanalysed the slope stability of a selection of eight cross sections to also include 50% saturation of the engineered fill as part of the extreme groundwater scenario (in addition to the post-development surcharges included in our response to Query 19 above). Riley and the Council Specialist agreed that a target FoS of 1.0 would appropriate given that it would take a very extreme rainfall event to result in the fill becoming saturated to this degree. An equivalent Ru value of 0.27 was adopted in the SLIDE2 models to simulate 50% soil saturation. All eight sections analysed under these conditions returned FoS values greater than 1 within the development area, indicating that slope instability is unlikely in this scenario. Some of the models returned minimum FoS values less than 1.0, however, these failure planes are all located on natural slopes remote from the development area and any stability enhancement features, i.e. the FoS in these areas is not reduced from pre-development FoS for this scenario. Slope stability outputs are appended to this letter.

The analysis undertaken to address this query, assumes that the subsoil drains have become ineffective (e.g. blocked or impaired function). The subsoil drainage to be installed as part of the development will utilise TNZ F/2 compliant drainage material. In Riley's experience, this grade of drainage material adequately mitigates the risk of subsoil drainage becoming blocked or needing long-term maintenance. For this reason, Riley considers that the proposed subsoil drainage should not require an Operation and Maintenance Plan during the design life of the drains.

Query (13) 23:

We note that some sections were determined based on a single investigation point, which limits the ability to verify soil strata dip angles and layer thicknesses (e.g. Sections R to T). Additionally, competent bedrock was assumed in certain sections of the stability analysis (such as Section B), despite not being observed in nearby hand-augered boreholes or test pits. To improve the reliability of the ground model and reduce associated uncertainties, we recommend undertaking further geotechnical investigations. This can be conditioned if aggregable.

Response

We consider that an appropriate level of geotechnical investigation has been carried out to develop a ground model to demonstrate that adequate FoS can be provided for the residential lots and accessways. We do not consider that further investigations are required at this stage of the consent process as the results indicate that the proposed development is practically feasible if implementing the stability enhancement measures recommended in the Riley GIR. However, it was noted in the Riley GIR that there were some areas that were inaccessible at the time of our investigations and those will require investigations prior to commencement of site works to confirm the ground model at those locations (refer to Section 6.0 of the Riley GIR). Additional field investigations are also proposed to assist with detailed design of the stability enhancement measures. These additional investigations would be undertaken to support the future detailed design phase are not required as part of the fast-track consenting process. As agreed with the Auckland Council Geotechnical Specialist, Riley has prepared and appended marked up sketches SK190-193 (Rev A) showing the approximate areas within the site where further investigation is intended to be undertaken as part of the detailed design process.

Query (14) 24:

Stage 2 only - It would be beneficial to provide a stability analysis for Section AD, considering potential theoretical slip surfaces from left to right.

Response

Stability analysis of Section AD in a left-to-right direction was excluded from the previous analyses as this particular slope had been analysed as part of Section Y. We have now undertaken further analysis on Section AD in a left-to-right direction (and included the post-development surcharges included in our response to Query 19 above). The results indicate that the stability of the slope in question could realistically be addressed and enhanced utilising a Reinforced Earth Batter (REB), underlain by shear piles and counterfort drains. This is generally consistent with Riley's prior expectations of the remedial measures required to enhance the stability of this slope. Slope stability outputs are appended to this letter.

Query (15) 25:

We note that only proposed slope profiles have been assessed. For assessment against E12.8.2(1)(i) (the extent of risks associated with natural hazards and whether the risks can be reduced or not increased) please provide quantitative slope stability models and assessment for the existing condition for review.

Response

As agreed with the Auckland Council Geotechnical Specialist, Riley has reanalysed 50% of the cross sections for the pre-development contours. The same sections were reanalysed as used in the response to Query (9) above aside from Section J, where the current ground profile comprises an effectively flat stream bed (and therefore can be qualitatively assessed as having no current credible risk of instability). The results of these analyses have been compared to the post-development results to show that the proposal adequately considers the stability of slopes near site boundaries and streams. The results for all sections and scenarios analysed indicate that:

- Where the existing slope returned acceptable FoS values, the proposed development with stability enhancement measures also returned acceptable FoS values,
- Where the existing slope returned low FoS values, the proposed development with stability enhancement measures either returned acceptable FoS values (within the development area) or returned FoS values no worse than the existing slope (beyond the development area).

The above findings indicate that the proposed development will not negatively impact the stability of existing slopes at the site, including near the site boundaries nor through streams immediately beyond the proposed development areas. Slope stability outputs are appended to this letter.

Query (16) 26:

It would be beneficial to provide a stability analysis for Section R, considering potential theoretical slip surfaces from right to left to capture the other side of the MSE slope and palisade wall.

Response

We have undertaken further analysis on Section R in a right-to-left direction with the post-development surcharges included in our response to Query (9) above. The results indicate that FoS values for the small section of the slope with a right-to-left aspect has acceptable FoS values in line with the CoP. Slope stability outputs are included in the appendix pertaining to the Query (9) response.

Query (21) 31:

Stage 1 and 2 - Would benefit reader to show geomorphic features on the surface, proposed roads, lot boundaries etc., and inferred underlying geology and groundwater levels rather than just investigation points.

Response

Riley have prepared two additional sets of sketches displaying the following aspects for both stages:

- SK180-184 (Rev A) showing the inferred geology and geomorphological model, overlain by the subdivision scheme plan, investigation locations, and proposed remedial stability measures.
- SK185-189 (Rev A) showing proposed cut/fill isopachs, overlain by the subdivision scheme plan, investigation locations, and proposed remedial stability measures.

On both of the above sketch sets, some remedial measure name labels have been intentionally omitted for clarity. Sketches are appended to this letter.

Query (22) 32:

Stage 1 only - Geotechnical recommendations should be provided for proposed drainage reserves, pipe bridges around the wetland, culverts and bridges which form part of the access.

Response

The recommendations outlined in Section 5.0 of the Riley GIR can be applied to these aspects of the development. Specific reference should be made to subsections 5.4, 5.6, 5.11, and 5.13 which discuss foundation recommendations and construction monitoring. Riley makes the following additional comments:

- The ground below any future service/bridge foundations etc. should comprise either stiff, inorganic natural soils, the underlying rock, or engineered fill (placed, compacted, and tested under guidance from a geotechnical engineer and compliant with the compaction criteria described above).
- Any soft and/or organic soils below future foundations should either be removed (and replaced with engineered fill as necessary). Alternatively, structures could be designed as fully suspended on piled foundations extending through soft/organic soils and embedded into stiff, inorganic natural soils or underlying rock below such that no reliance is placed on the soft/organic soils for support.
- All foundation excavations should be observed by a geotechnical engineer to confirm founding conditions during construction.

3.0 Other Matters

- The Council letter incorrectly refers to the Riley GIR dated 14 February 2025 as reference 240065-E; the correct reference is 240065-F. This should be updated within the proposed amended consent conditions appended to their letter.
- In our response to Query 30 (20) in the consolidated response spreadsheet, Riley recommended a top-down construction methodology for that specific location and that a construction methodology needed to be prepared in relation to the boundary retaining wall in the southern part of Stage 1A-4. We consider this recommendation should be extended to apply to the whole site and be provided on a stage or substage basis. In any event construction methodologies will need to be considered as part of detailed design for all retaining walls and stability enhancements.

4.0 Key Information Gap – Strategic & Planning Matters Memorandum – Paragraph 250: Item 15

- In our response to Query (19) (29) in the consolidated response spreadsheet, Riley outlined the presence of the retaining walls in the vicinity of Lots 173-182, 184-194 and 254-256. While snips of the drawings were included in our response, the actual drawings were not provided. This was also highlighted as an information gap in the Auckland Council Geotechnical Memo and in Strategic & Planning Matters Memorandum. Further commentary is provided below.

Council has queried several sections of retaining wall not being shown on the site plan sketches appended to the GIR in certain locations. A cantilever retaining wall will be required to support the shared boundaries of proposed Lots 184 to 194 above Lots 173 to 182. However, we consider that this wall is not required to mitigate global stability risks and is only required to address local stability of a standalone vertical cut. Riley has intentionally omitted showing retaining walls that are not required to address global stability on our site sketches. Instead these are shown on Mckenzie & Co drawings 3725-1-2500 to -2507 provided in the consent application.

Riley has updated the Stability Enhancement site sketches previously issued alongside the GIR to show retaining wall REB0x1E extending along the north-western boundary of proposed Lots 254 to 256 (also as requested by Council). These updated sketches SK141-142 (Rev D) are appended to this letter.

5.0 Proposed Consent Conditions

We consider that the proposed conditions included in the Auckland Council Response, Annexure 15: Geotechnical, dated 25 June 2025 are generally acceptable. Specific comments are below:

- As mentioned above, the Consent conditions should be updated to include the correct GIR reference, being Ref: 240065-F not -E.
- We concur with the recommendation for inclusion of a consent condition requiring the preparation of a Settlement Monitoring Plan.
- We consider that properly designed and constructed subsoil drains utilising F/2 compliant aggregate should not require any specific maintenance over their lifespan. Their locations will be recorded on as-built drawings to be attached to the relevant Geotechnical Completion Report. Further, and as part of construction monitoring, observations will be undertaken to ensure that they are functioning as intended. Consequently, we consider that an Operations and Maintenance Plan is not necessary.

We trust these responses are suitable to address the Council's geotechnical queries.

6.0 Limitation

This letter report has been prepared solely for the benefit of Vineway Ltd as our client with respect to the brief and Auckland Council in processing the consent(s). The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Yours faithfully
Riley Consultants Ltd

Prepared by:	Reviewed by:	Approved for issue by:
Chris Burnet	James Beaumont	Brett Black
Senior Geotechnical Engineer	**Principal Geotechnical Engineer, CPEng**	**Project Director, CPEng**

Enc: Slope Stability Analysis Results Summary Table (covering all outputs below)
Response (1)11 – Slope Stability Outputs - Stage 1-2 Temporary Batter
Response (9)19 – Slope Stability Outputs – Proposed Ground Level with Surcharges
Response (11)21 – Slope Stability Outputs – As Above with Partially Saturated Fill
Response (13)23 – Sketches SK190-193
Response (14)24 – Slope Stability Outputs - Cross Section AD (left-to-right)
Response (15)25 – Slope Stability Outputs - Pre-Development Contours
Response (21)31 – Sketches SK180-189
Key Information Gap: Item 15 - SK141-142 (Rev D)

cc: Gus Finlayson
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Slope Stability Analysis Results Summary Table

S92 Response Slope Stability Summary of Results

Site:	Delmore Residential Development
Client:	Vineway Ltd
Project:	Geotechnical Response to Council Queries
Prepared by:	CB
Checked by:	JLB

Results below address Queries 1, 9, 10, 11, 14, 15, 16 (Riley Ref, in brackets) / Queries 11, 19, 20, 21, 24, 25, 26 (corresponding Council Ref)

Key:

	No analysis previously carried out, nor currently required for these scenarios.
	Existing section is either essentially flat or would involve analysis in upslope direction. Analysis not required in this instance.
	Where FoS are below acceptable values, these are located outside area of development / remedial measures. All FoS within development areas / near boundaries acceptable. Results in line with previous analysis (i.e., proposed development not negatively affecting existing slopes).

	Section	Scenario	Query (15)25: Current GL	Proposed GL (from GIR)	Proposed GL with Remedials (from GIR)	Query (9)19: Proposed GL, Remedials & Loading	Query (11)21: 50% Sat. Eng. Fill
	Query (1)11: Temp Cut between Stages 1 & 2	Long Term				2.16	
		Elevated				1.37	
		Seismic				1.38	
Stage 1	A	Long Term	1.29	0.62	1.16	1.29	
		Elevated	0.91	0.61	0.89	0.89	0.89
		Seismic	0.68	0.65	0.71	0.75	
	B	Long Term	2.11	1.2	1.99	1.72	
		Elevated	1.35	0.7	1.36	1.43	
		Seismic	1.33	0.9	1.36	1.19	
	D	Long Term	2.23	1.66	1.86	1.99	
		Elevated	1.4	1.21	1.38	1.31	1.31
		Seismic	1.31	1.27	1.41	1.38	
	F	Long Term	2.5	1.75	2.16	2.14	
		Elevated	2.16	1.34	1.71	1.61	
		Seismic	1.3	1.26	1.24	1.23	
	H	Long Term	2.5	1.62	1.99	1.94	
		Elevated	1.81	1.05	1.33	1.3	1.2
		Seismic	1.44	1.12	1.32	1.27	
	I	Long Term	1.34	1.31	1.59	1.69	
		Elevated	1.24	1.15	1.41	1.5	
		Seismic	0.65	0.66	0.83	0.79	
	J (L-R)	Long Term		0.83	1.55	1.8	
		Elevated		0.83	1.55	1.58	
		Seismic		0.59	0.78	0.85	
	J (R-L)	Long Term		0.67	0.67	1.72	
		Elevated		0.67	0.67	1.71	
		Seismic		0.76	0.44	1.27	
	M	Long Term	1.47	1.44	1.47	1.5	
		Elevated	0.98	0.98	0.98	0.98	0.98
		Seismic	1.04	0.87	0.87	0.88	
Stage 2	R (L-R)	Long Term	1.66	0.7	2.19	1.74	
		Elevated	1.01	0.2	1.39	1.31	1.28
		Seismic	1.13	0.55	1.25	1.23	
	Query (16)26: R (R-L)	Long Term				2.15	
		Elevated				1.43	1.43
		Seismic				1.44	
	T	Long Term	1.62	1.41	1.75	1.72	
		Elevated	1.24	0.91	1.32	1.3	
		Seismic	0.96	1.01	1.09	1.08	
	Query (10)20: V (L-R)	Long Term	1.52	1.5	1.5	1.54	
		Elevated	1	0.95	0.95	0.95	
		Seismic	0.99	1.1	1	0.98	
	Query (10)20: V (R-L)	Long Term	1.52	0.9	1.49	1.52	
		Elevated	0.99	0.6	1.44	1.44	1.14
		Seismic	1.01	0.7	1.06	1.07	
	X	Long Term	1.82	1.2	1.61	1.59	
		Elevated	1.06	0.78	1.38	1.37	
		Seismic	1.19	0.87	1.07	1.06	
	Y	Long Term	2.31	0.71	2.14	1.95	
		Elevated	1.39	0.49	1.51	1.64	1.47
		Seismic	1.35	1.04	0.95	0.99	
	AB	Long Term	1.79	1.22	1.5	1.5	
		Elevated	1.07	0.83	1.43	1.41	1.03
		Seismic	1.03	0.89	1.06	1.04	
	AC	Long Term	2.18	1.19	1.51	1.51	
		Elevated	1.44	0.73	1.41	1.41	
		Seismic	1.23	0.86	1.04	1.04	
	Query (14)24: AD (L-R)	Long Term		1.14		1.52	
		Elevated		0.7		1.4	
		Seismic		0.86		1.04	

Response (1)11

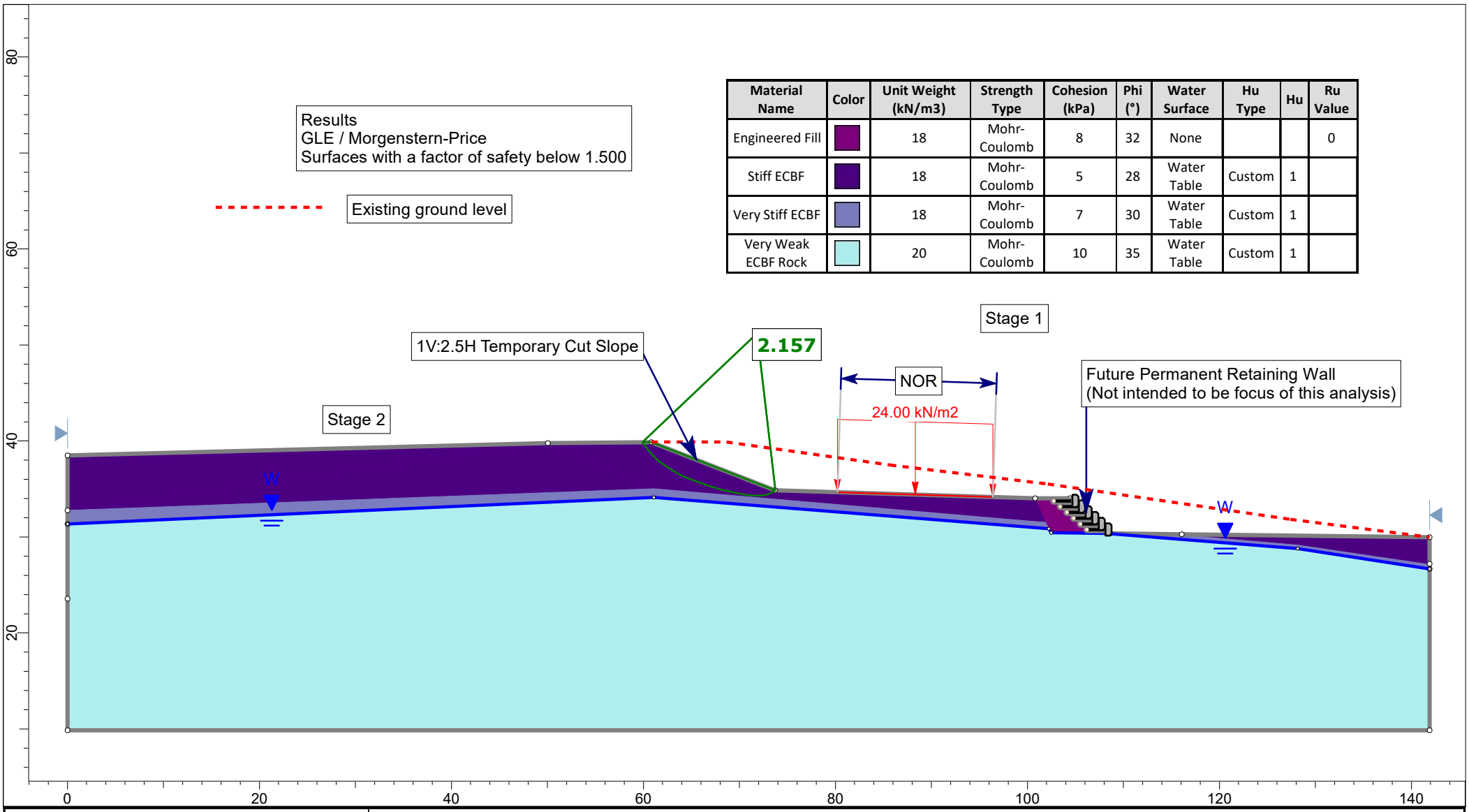
Slope Stability Outputs

Stage 1-2 Temporary Batter

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Existing ground level

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	



RILEY

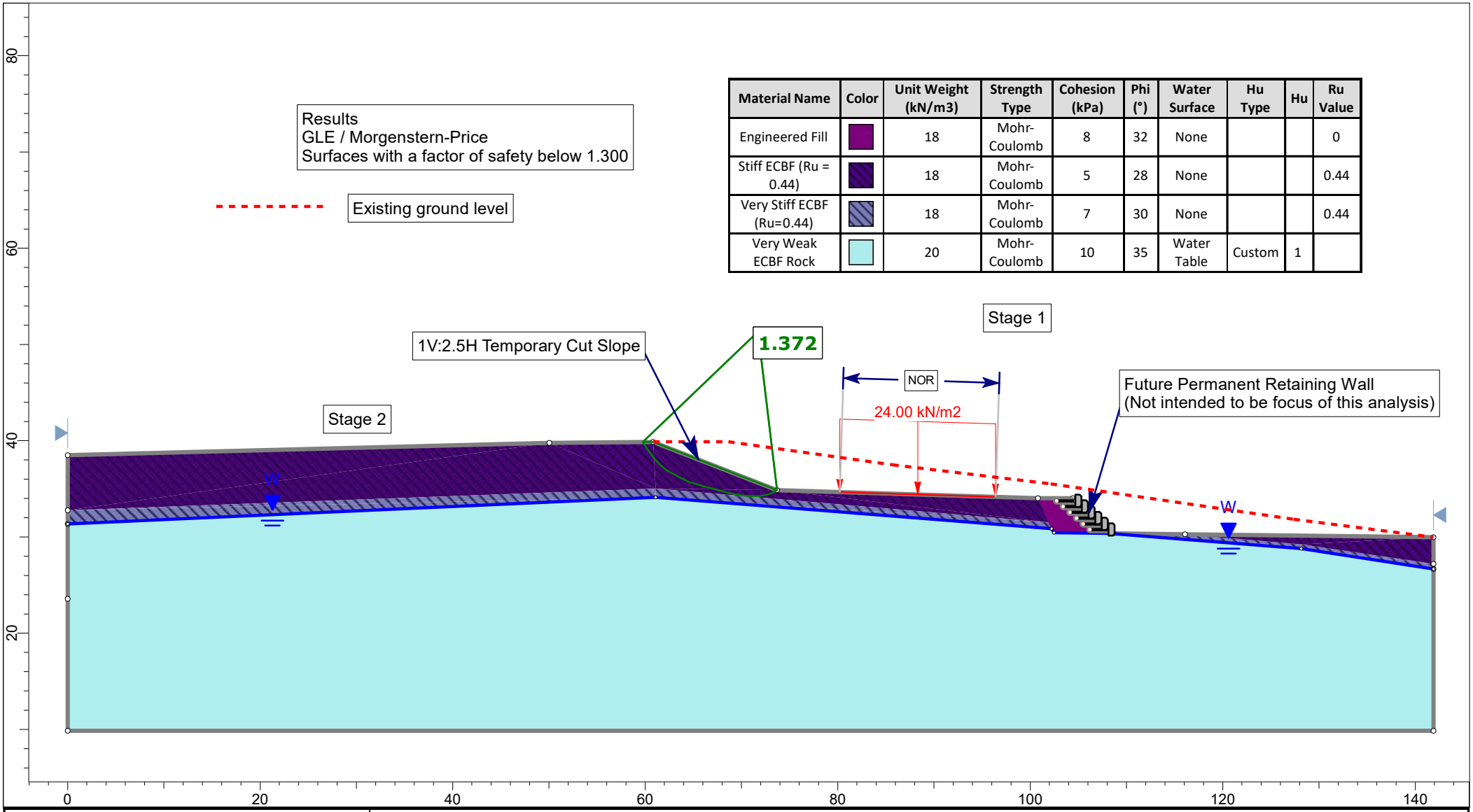
SLIDEINTERPRET 9.031

Project	240065 - Russell Road, Wainui - Temporary Cut Batter		
Group	Proposed Temp Cut Stage 1-2	Scenario	Normal (Measured GW)
Drawn By	CB	Company	Riley Consulants Ltd
Date	10/06/2025	File Name	Temp Cut Section Stages 1-2.slmd

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Existing ground level

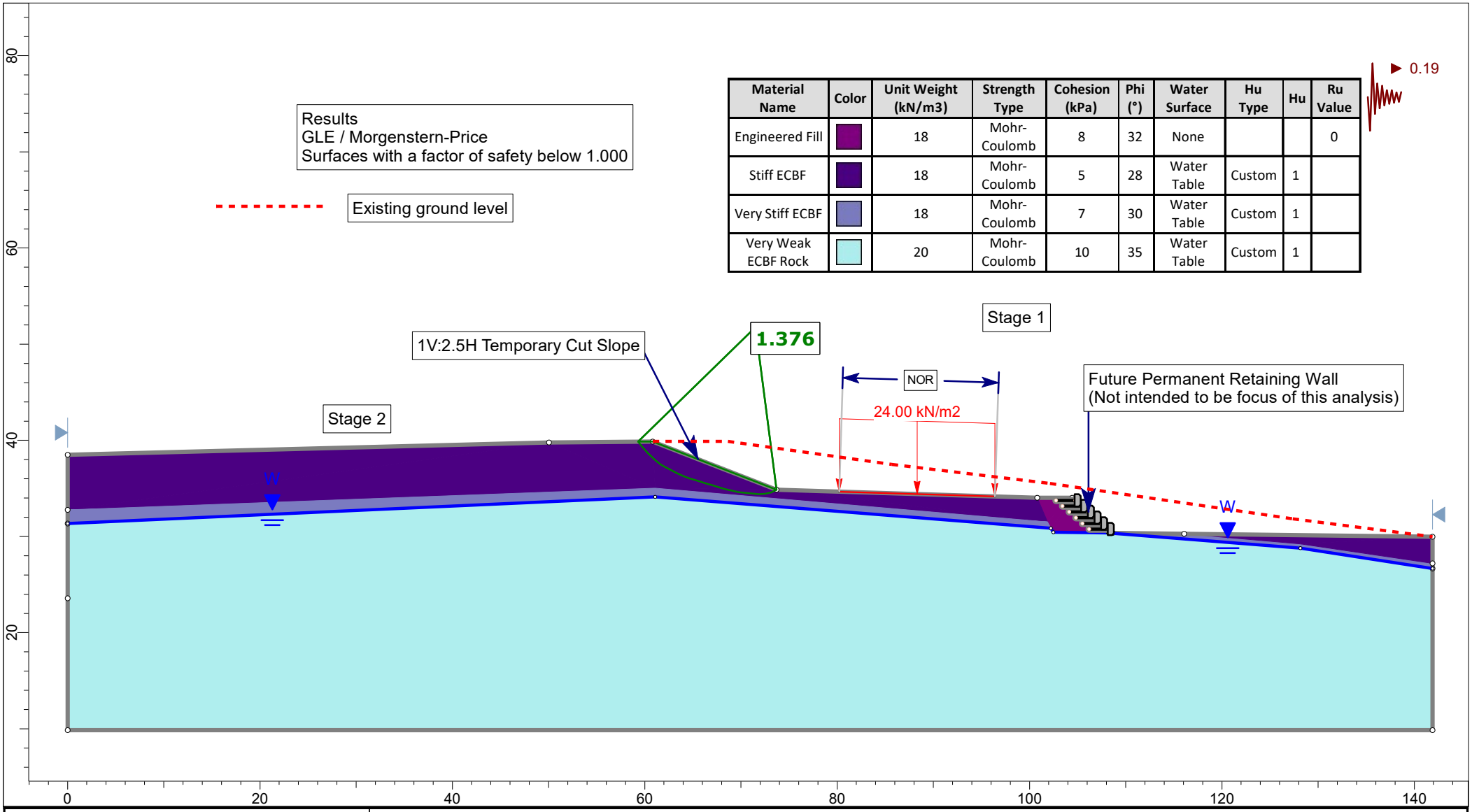
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF (Ru = 0.44)		18	Mohr-Coulomb	5	28	None			0.44
Very Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	7	30	None			0.44
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.031

Project	240065 - Russell Road, Wainui - Temporary Cut Batter		
Group	Proposed Temp Cut Stage 1-2	Scenario	Extreme (Worst Credible GW)
Drawn By	CB	Company	Riley Consulants Ltd
Date	10/06/2025	File Name	Temp Cut Section Stages 1-2.slmd



RILEY	Project	240065 - Russell Road, Wainui - Temporary Cut Batter	
	Group	Proposed Temp Cut Stage 1-2	Scenario: Seismic (0.19g)
	Drawn By	CB	Company: Riley Consulants Ltd
SLIDEINTERPRET 9.031	Date	10/06/2025	File Name: Temp Cut Section Stages 1-2.slmd

Response (9)19

Slope Stability Outputs

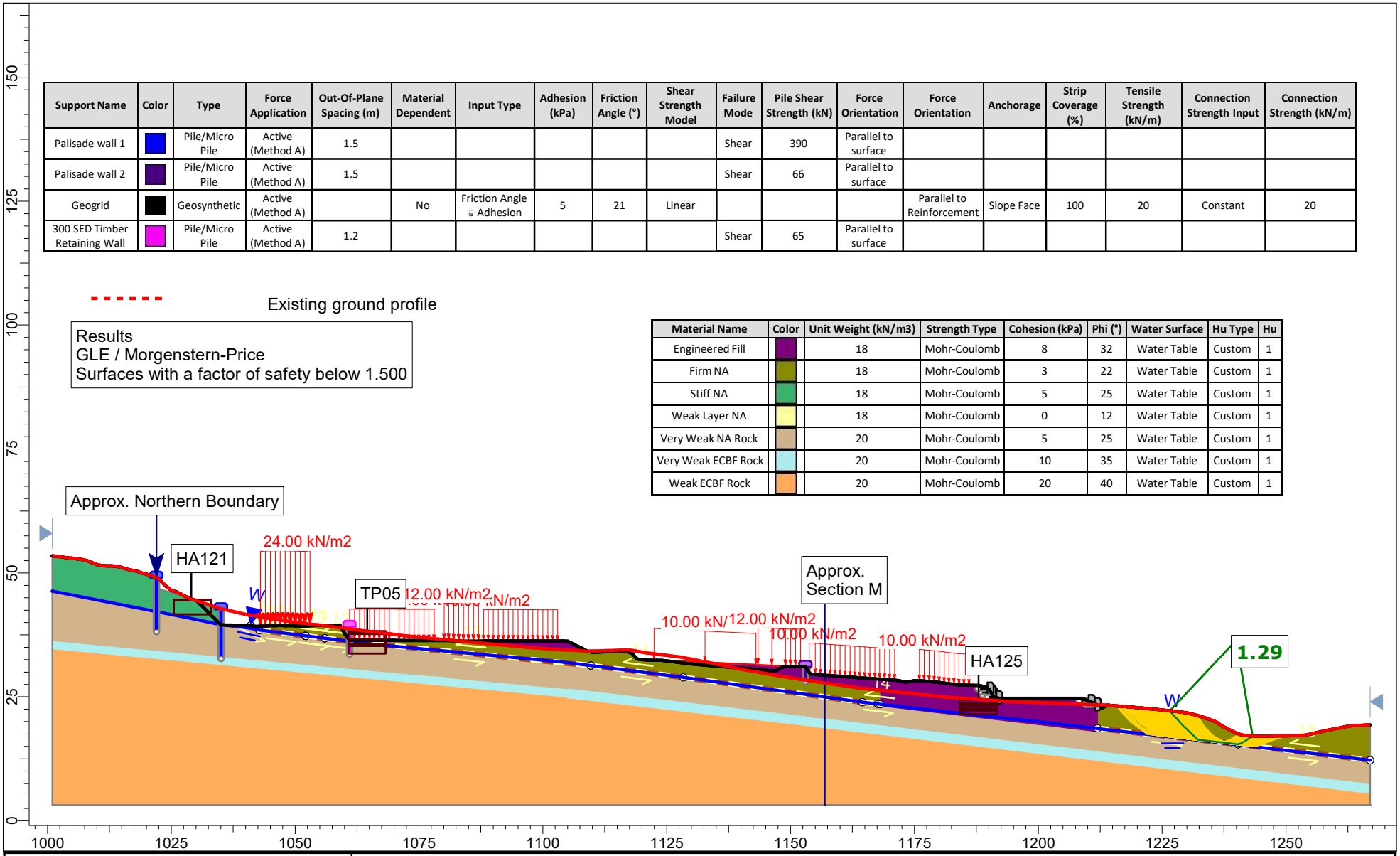
Proposed Ground Level with Surcharges

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Palisade wall 1		Pile/Micro Pile	Active (Method A)	1.5						Shear	390	Parallel to surface						
Palisade wall 2		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
300 SED Timber Retaining Wall		Pile/Micro Pile	Active (Method A)	1.2						Shear	65	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1
Firm NA		18	Mohr-Coulomb	3	22	Water Table	Custom	1
Stiff NA		18	Mohr-Coulomb	5	25	Water Table	Custom	1
Weak Layer NA		18	Mohr-Coulomb	0	12	Water Table	Custom	1
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1



RILEY

SLIDEINTERPRET 9.029

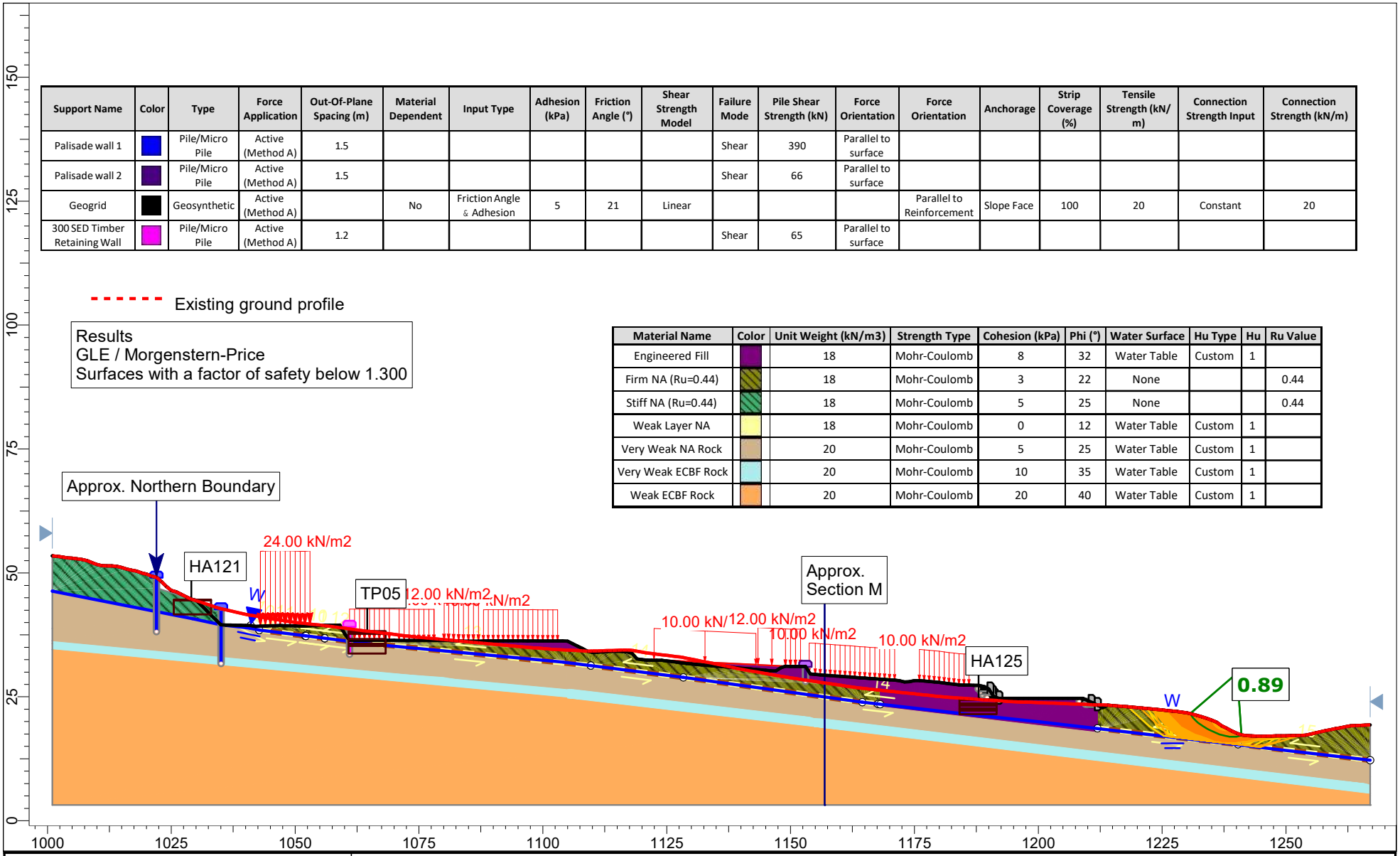
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section A Proposed GL, Remedials, Loads	Scenario	Normal (Measured GW)
Drawn By	AB	Company	Riley Consultants Ltd
Date	11/12/2024, 1:30:46 pm	File Name	Section A - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Palisade wall 1		Pile/Micro Pile	Active (Method A)	1.5						Shear	390	Parallel to surface						
Palisade wall 2		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
300 SED Timber Retaining Wall		Pile/Micro Pile	Active (Method A)	1.2						Shear	65	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1	
Firm NA (Ru=0.44)		18	Mohr-Coulomb	3	22	None			0.44
Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	25	None			0.44
Weak Layer NA		18	Mohr-Coulomb	0	12	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section A Proposed GL, Remedials, Loads	Scenario	Extreme (Worst Credible)
Drawn By	AB	Company	Riley Consultants Ltd
Date	11/12/2024, 1:30:46 pm	File Name	Section A - Proposed GL.slmd

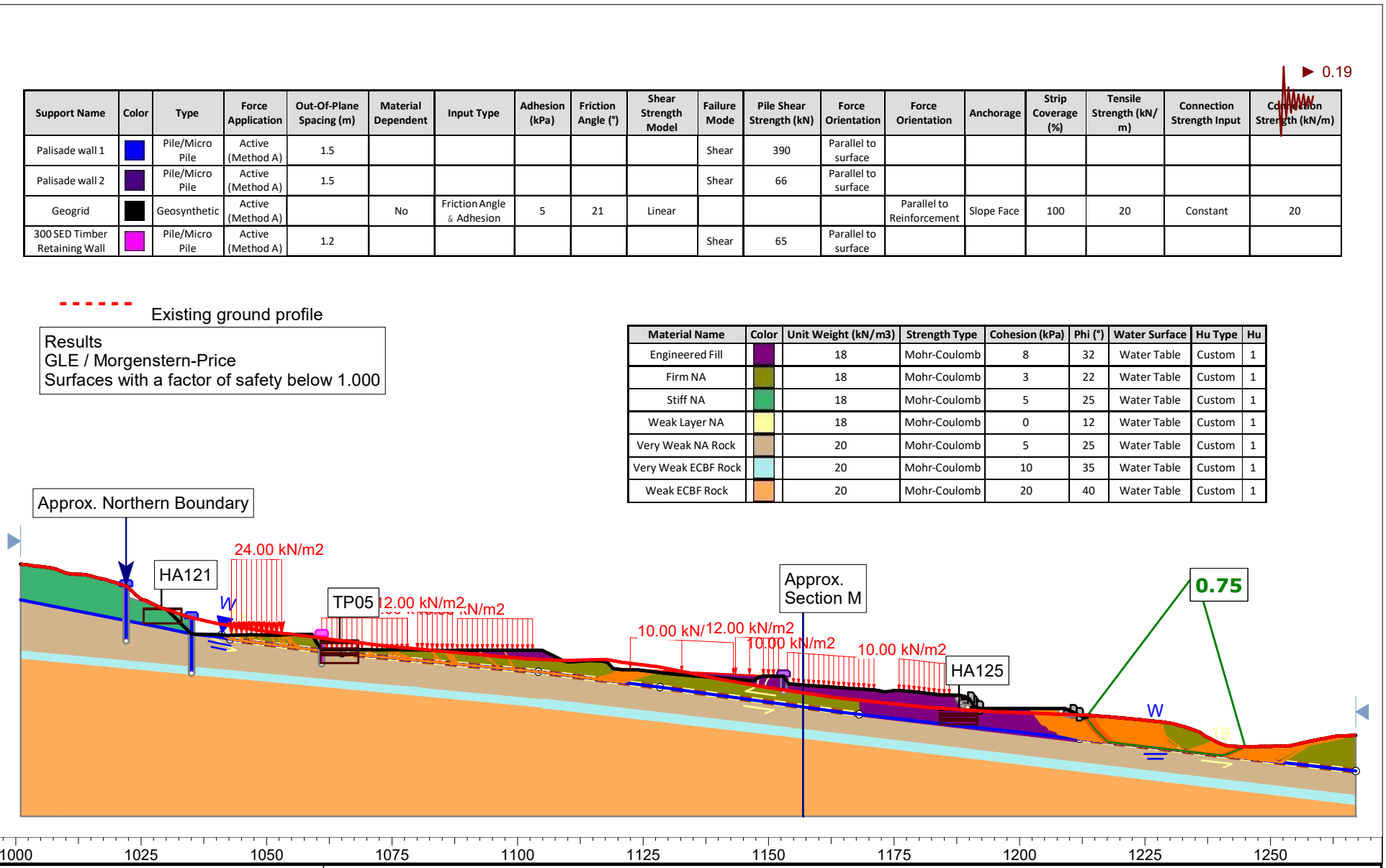
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Palisade wall 1		Pile/Micro Pile	Active (Method A)	1.5						Shear	390	Parallel to surface						
Palisade wall 2		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
300 SED Timber Retaining Wall		Pile/Micro Pile	Active (Method A)	1.2						Shear	65	Parallel to surface						

▶ 0.19

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1
Firm NA		18	Mohr-Coulomb	3	22	Water Table	Custom	1
Stiff NA		18	Mohr-Coulomb	5	25	Water Table	Custom	1
Weak Layer NA		18	Mohr-Coulomb	0	12	Water Table	Custom	1
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1



RILEY

SLIDEINTERPRET 9.029

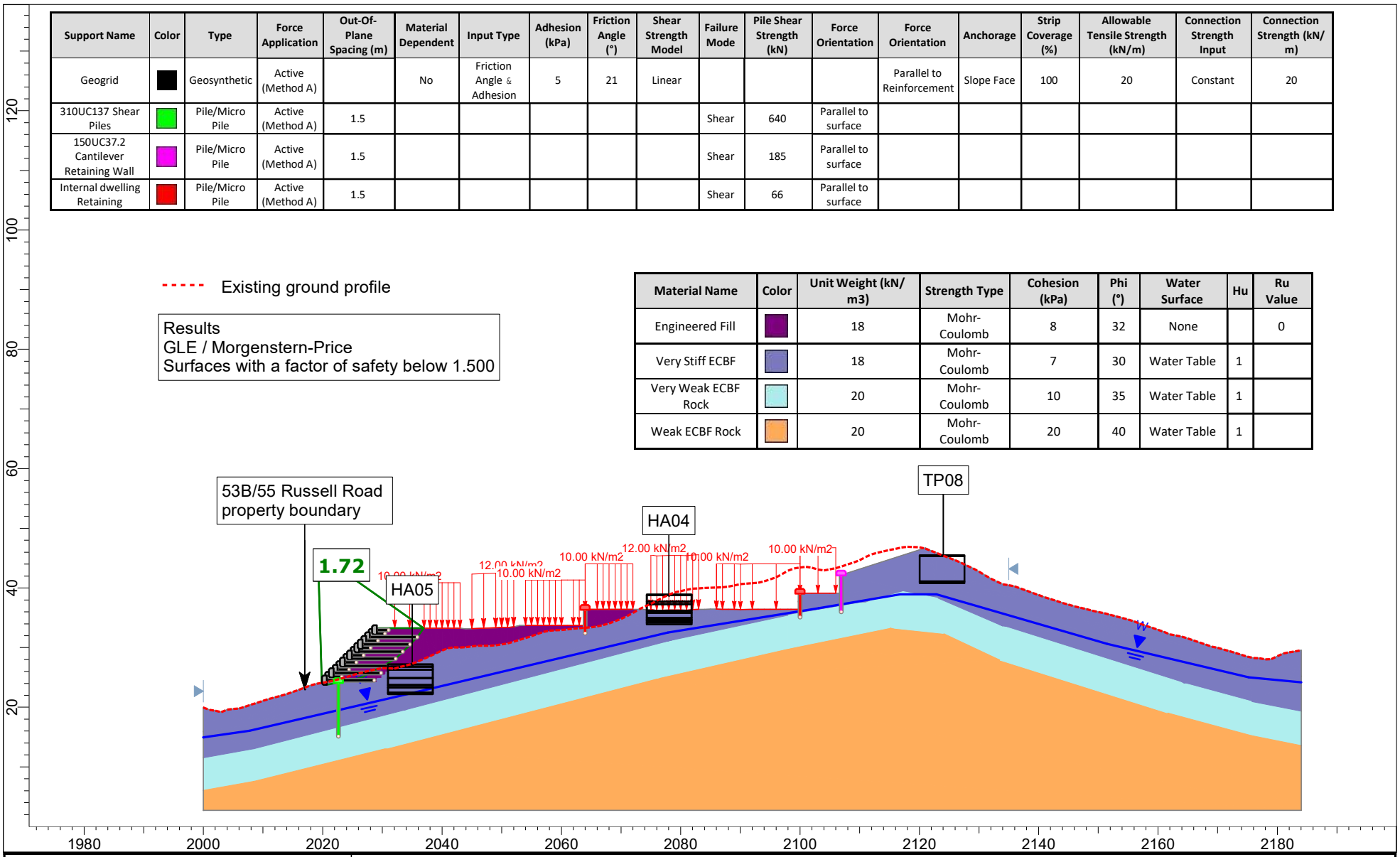
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section A Proposed GL, Remedials, Loads	Scenario	Seismic (0.19g)
Drawn By	AB	Company	Riley Consultants Ltd
Date	11/12/2024, 1:30:46 pm	File Name	Section A - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
310UC137 Shear Piles		Pile/Micro Pile	Active (Method A)	1.5						Shear	640	Parallel to surface						
150UC37.2 Cantilever Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	185	Parallel to surface						
Internal dwelling Retaining		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None		0
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	1	



RILEY

SLIDEINTERPRET 9.029

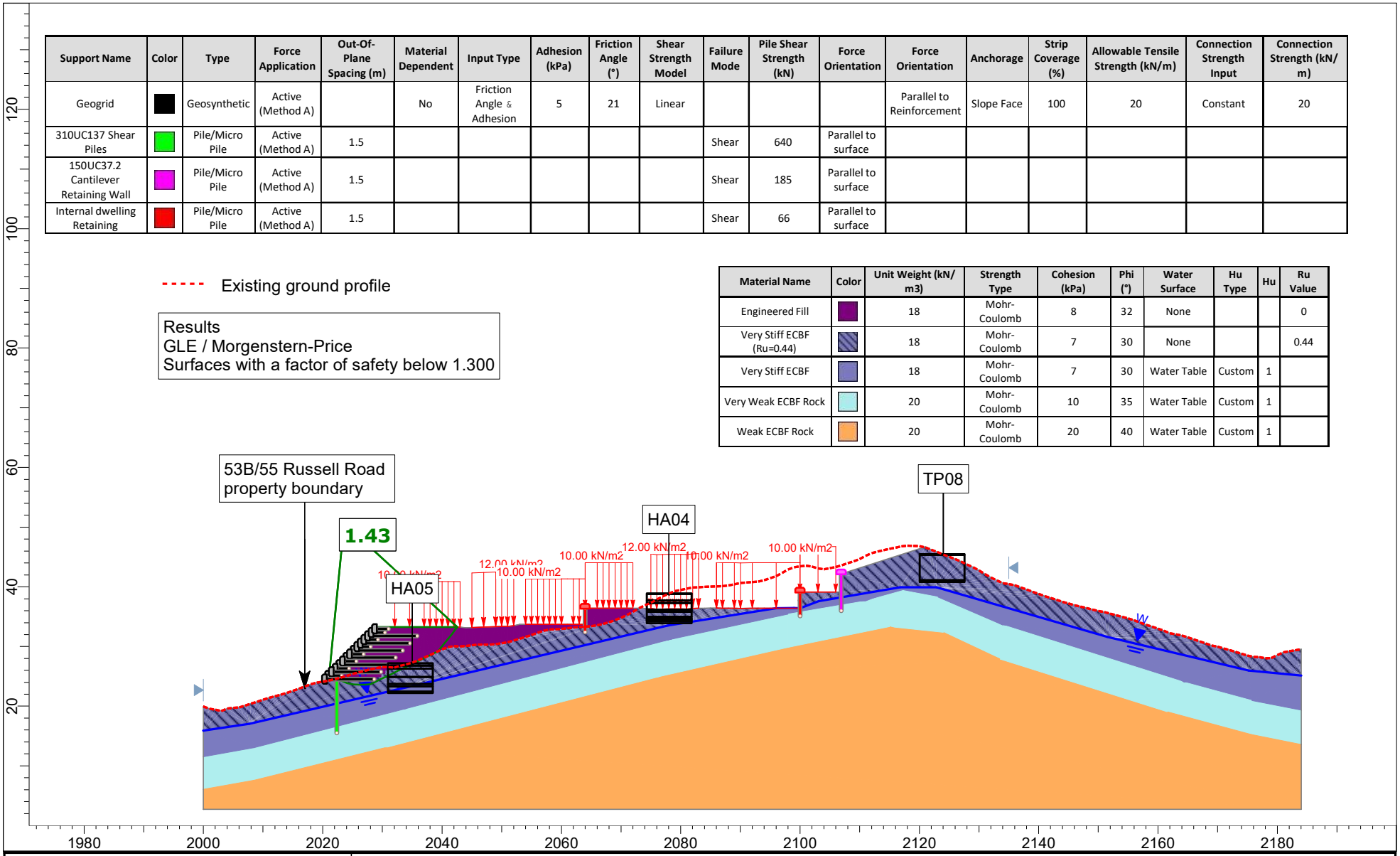
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section B - Remedial, eased upper gradient	*Scenario*	Normal (Measured GW)
Drawn By	RS	*Company*	Riley Consultants Ltd
Date	12/12/2024, 8:28:52 am	*File Name*	Section B - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
310UC137 Shear Piles		Pile/Micro Pile	Active (Method A)	1.5						Shear	640	Parallel to surface						
150UC37.2 Cantilever Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	185	Parallel to surface						
Internal dwelling Retaining		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	7	30	None			0.44
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section B - Remedial, eased upper gradient	*Scenario*	Extreme (Worst Credible GW)
Drawn By	RS	*Company*	Riley Consultants Ltd
Date	12/12/2024, 8:28:52 am	*File Name*	Section B - Proposed GL.slmd

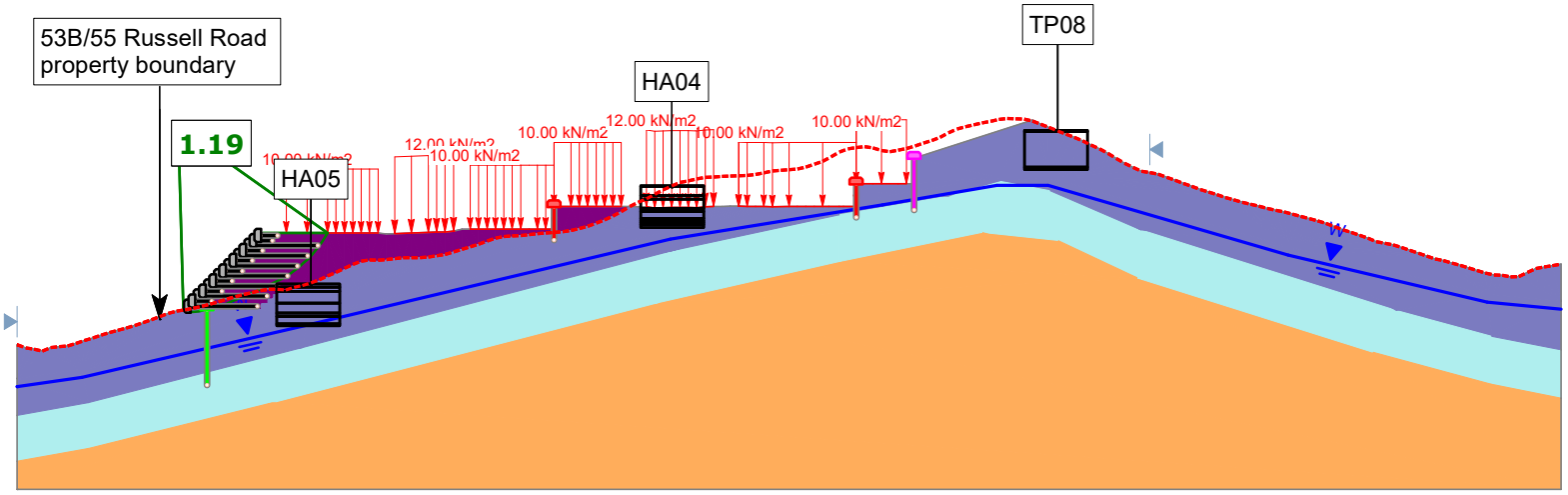
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
310UC137 Shear Piles		Pile/Micro Pile	Active (Method A)	1.5						Shear	640	Parallel to surface						
150UC37.2 Cantilever Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	185	Parallel to surface						
Internal dwelling Retaining		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						

◄ 0.19

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None		0
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	1	



RILEY

SLIDEINTERPRET 9.029

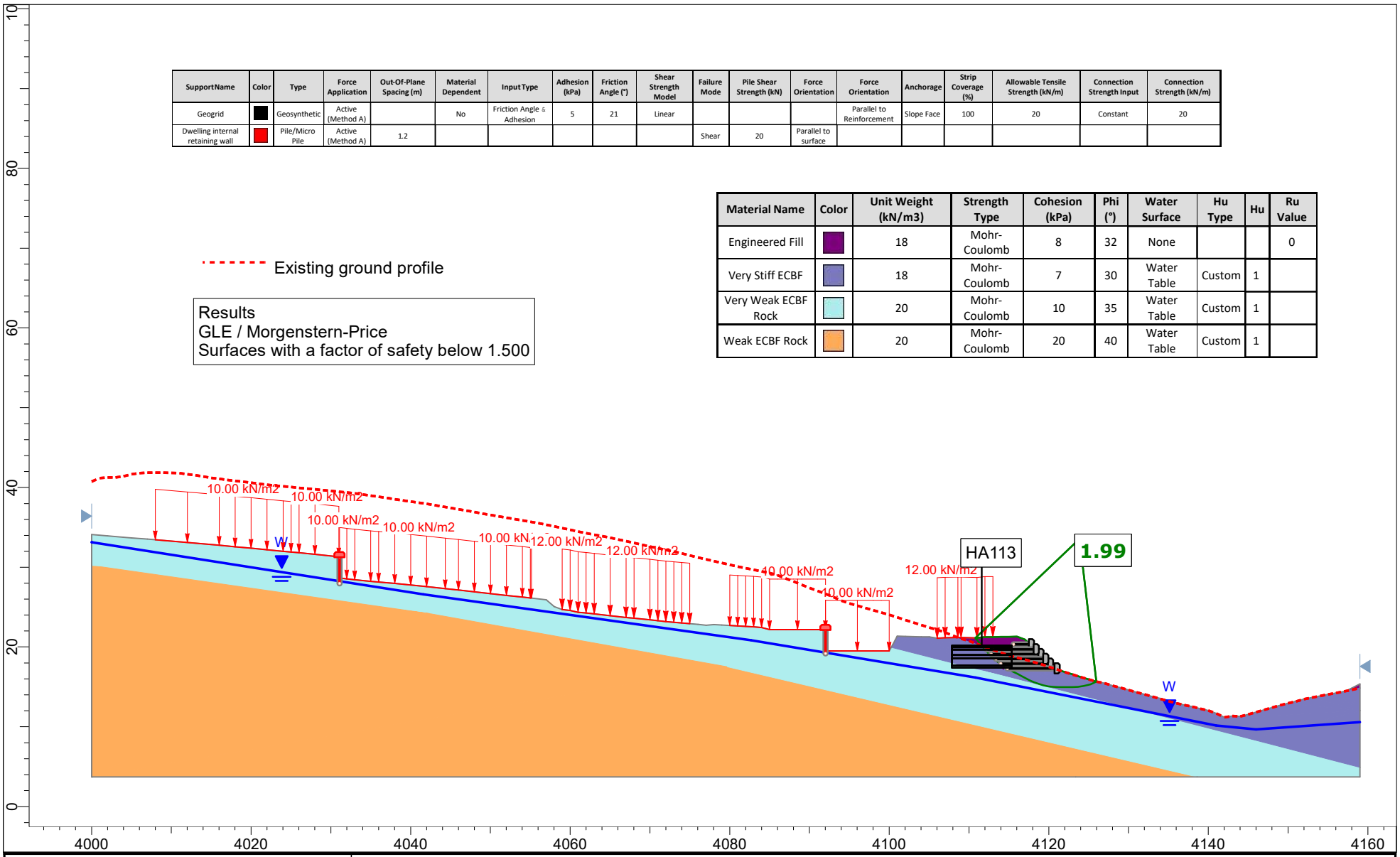
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section B - Remedial, eased upper gradient	*Scenario*	Seismic (0.19g)
Drawn By	RS	*Company*	Riley Consultants Ltd
Date	12/12/2024, 8:28:52 am	*File Name*	Section B - Proposed GL.slmd

SupportName	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Dwelling internal retaining wall		Pile/Micro Pile	Active (Method A)	1.2						Shear	20	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500



SLIDEINTERPRET 9.029

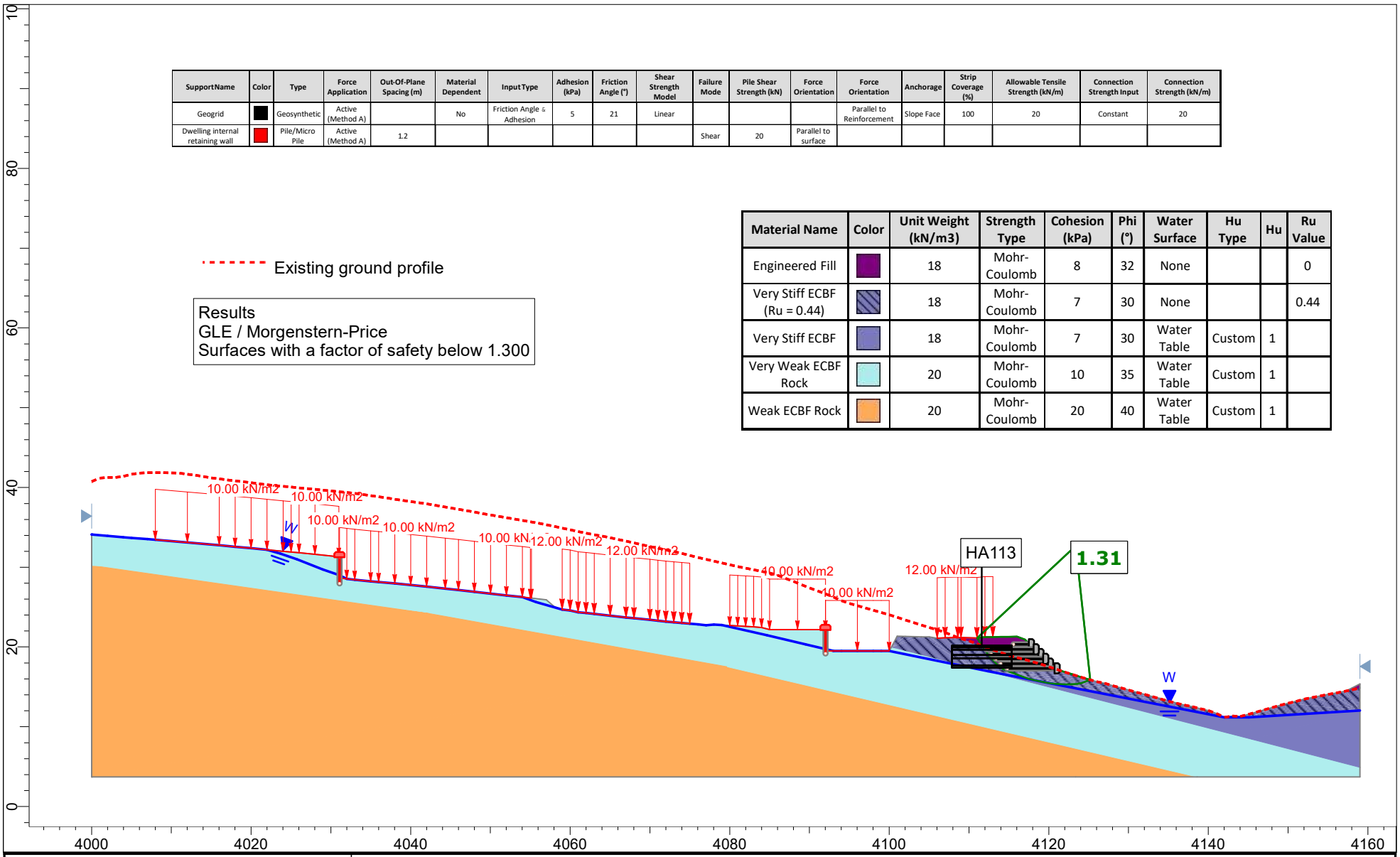
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section D - Remedials	Scenario	Normal (Measured GW)
Drawn By	RS	Company	Riley Consultants Ltd
Date	12/12/2024, 4:26:19 pm	File Name	Section D - Proposed GL.slmd

SupportName	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Dwelling internal retaining wall		Pile/Micro Pile	Active (Method A)	1.2						Shear	20	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff ECBF (Ru = 0.44)		18	Mohr-Coulomb	7	30	None			0.44
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section D - Remedials	Scenario	Extreme (Worst Credible GW)
Drawn By	RS	Company	Riley Consultants Ltd
Date	12/12/2024, 4:26:19 pm	File Name	Section D - Proposed GL.slmd

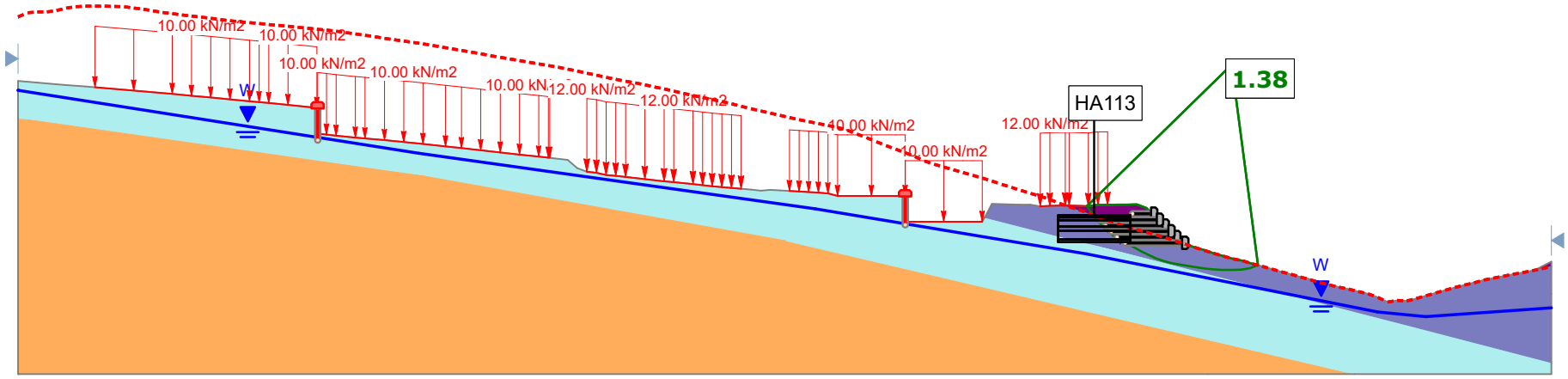
SupportName	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Dwelling internal retaining wall		Pile/Micro Pile	Active (Method A)	1.2						Shear	20	Parallel to surface						

▶ 0.19

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000



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SLIDEINTERPRET 9.029

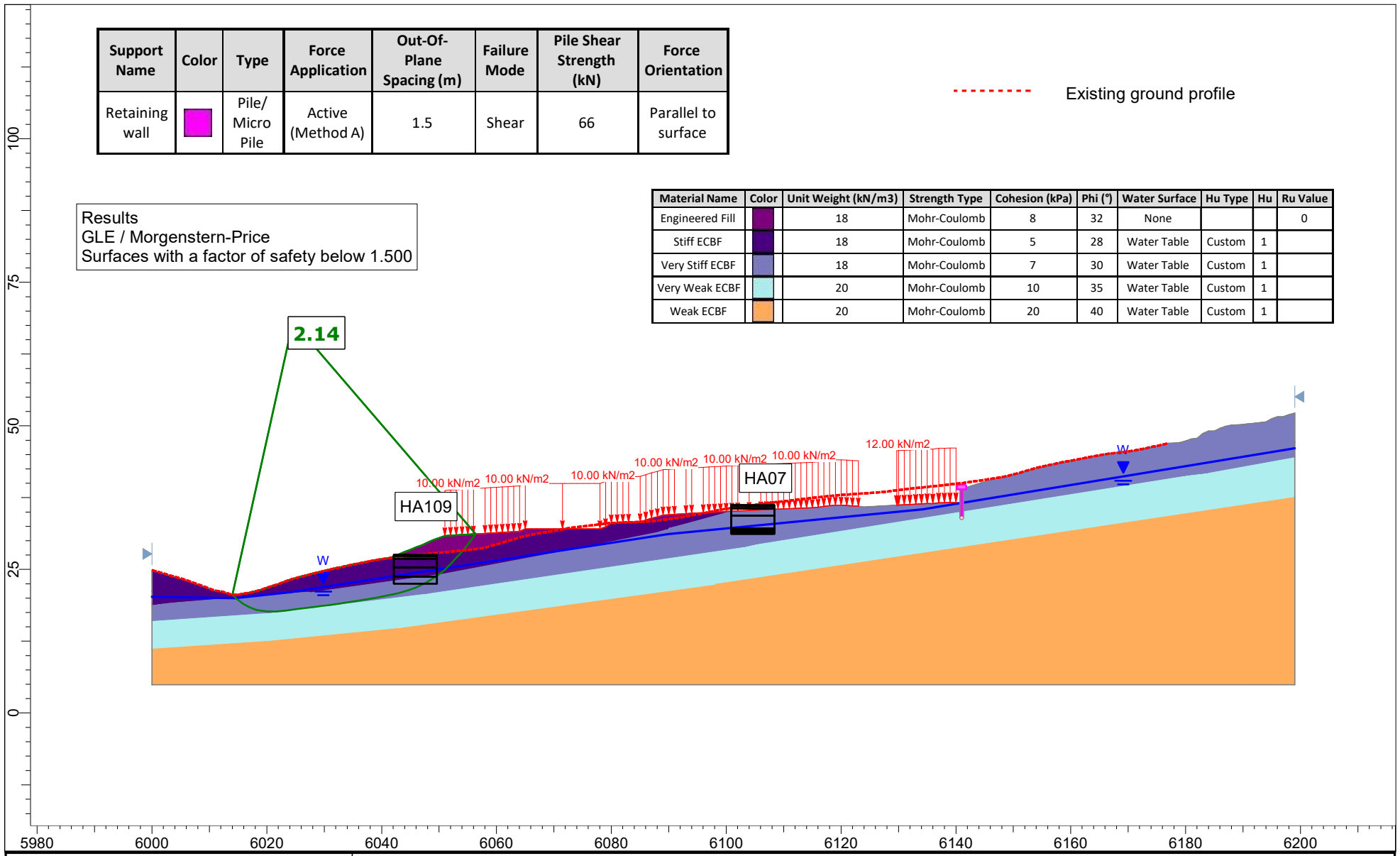
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section D - Remedials	Scenario	Seismic (0.19g)
Drawn By	RS	Company	Riley Consultants Ltd
Date	12/12/2024, 4:26:19 pm	File Name	Section D - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Retaining wall		Pile/ Micro Pile	Active (Method A)	1.5	Shear	66	Parallel to surface

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

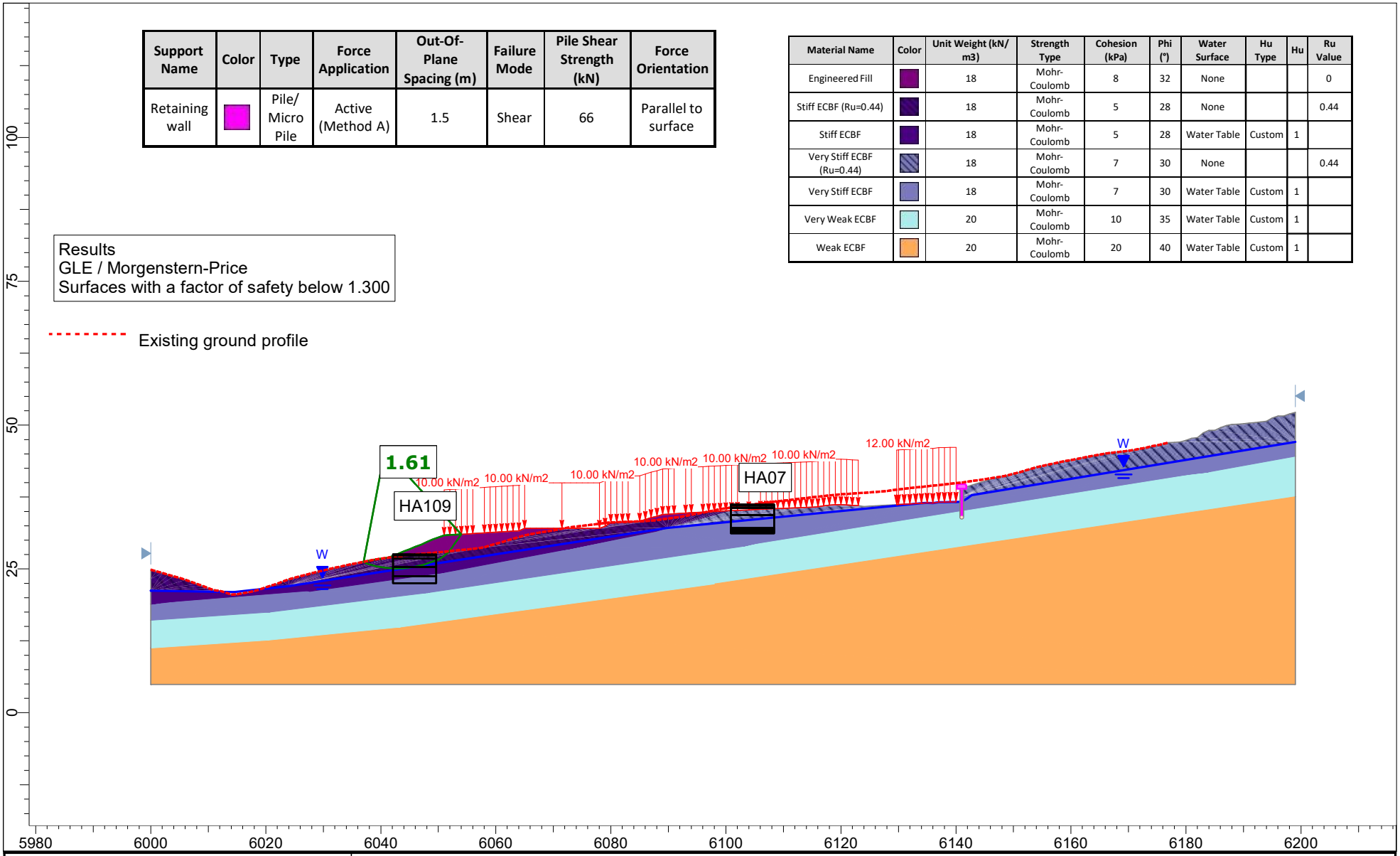
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section F - Remedials	Scenario	Normal (Measured GW)
Drawn By	RS	Company	Riley Consultants Ltd
Date	13/12/2024, 8:15:35 am	File Name	Section F - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Retaining wall		Pile/ Micro Pile	Active (Method A)	1.5	Shear	66	Parallel to surface

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	7	30	None			0.44
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Existing ground profile



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SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section F - Remedials	*Scenario*	Extreme (Worst Credible GW)
Drawn By	RS	*Company*	Riley Consultants Ltd
Date	13/12/2024, 8:15:35 am	*File Name*	Section F - Proposed GL.slmd

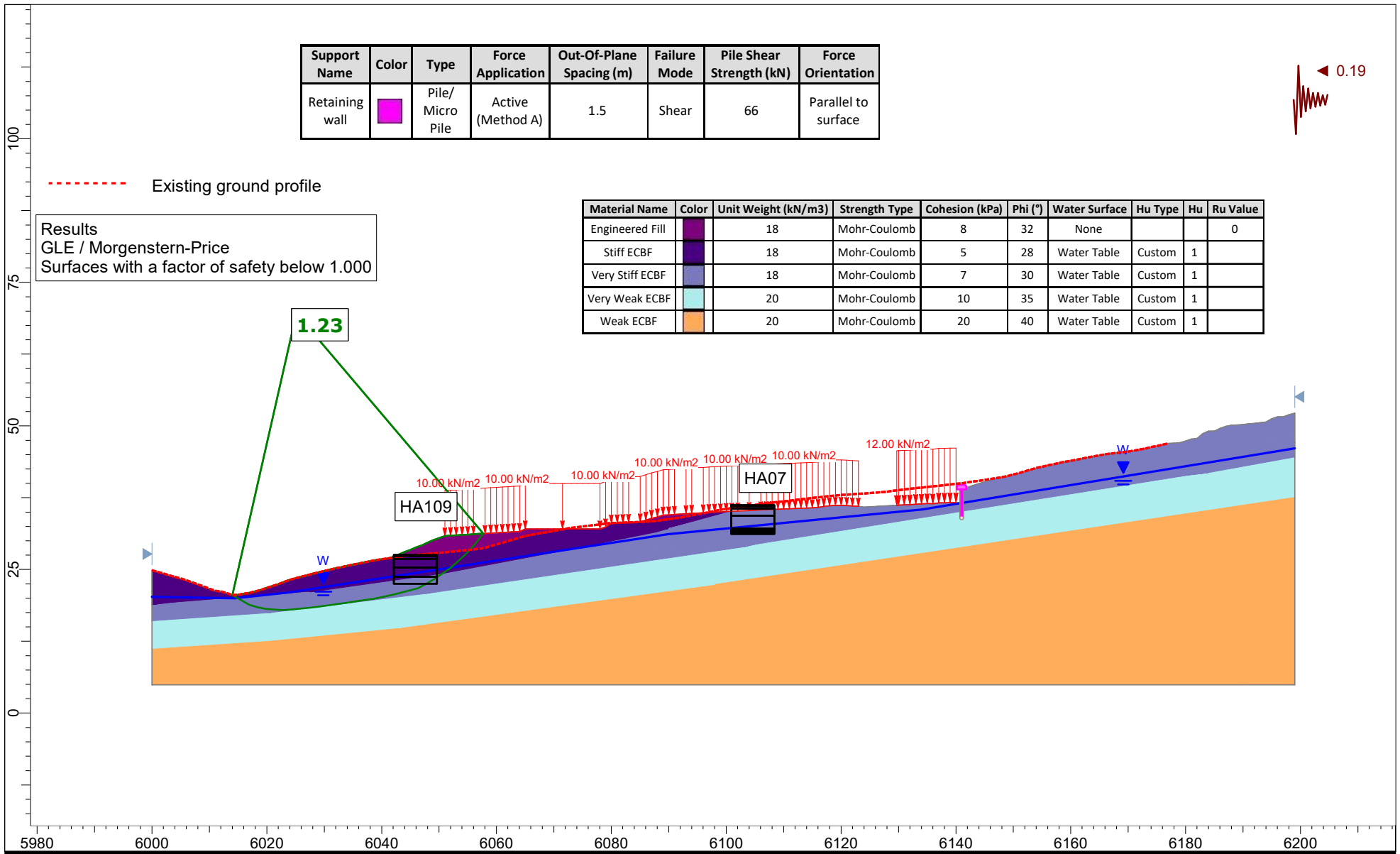
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Retaining wall		Pile/ Micro Pile	Active (Method A)	1.5	Shear	66	Parallel to surface

◄ 0.19

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



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SLIDEINTERPRET 9.029

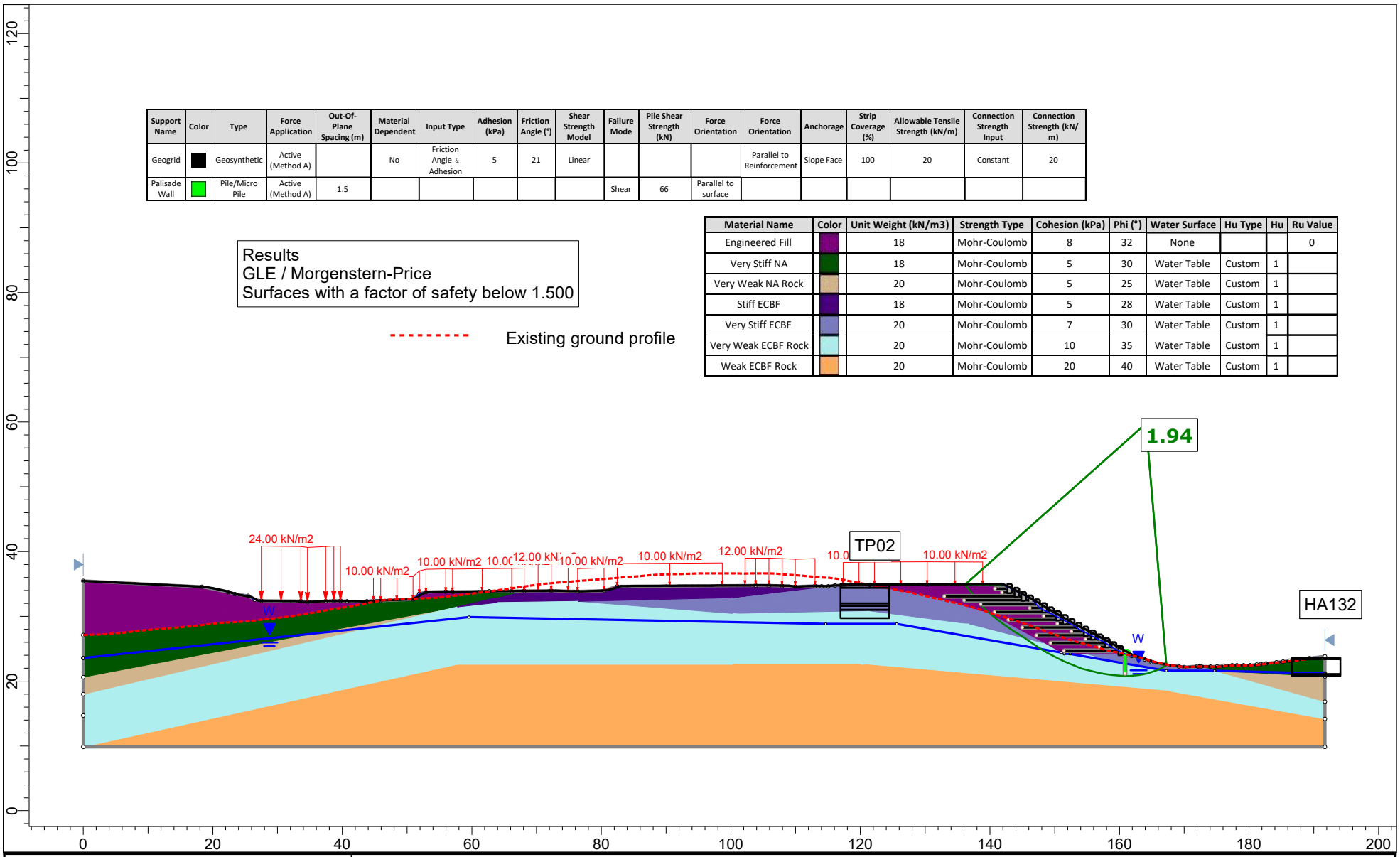
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section F - Remedials	Scenario	Seismic (0.19g)
Drawn By	RS	Company	Riley Consultants Ltd
Date	13/12/2024, 8:15:35 am	File Name	Section F - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Existing ground profile

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF		20	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

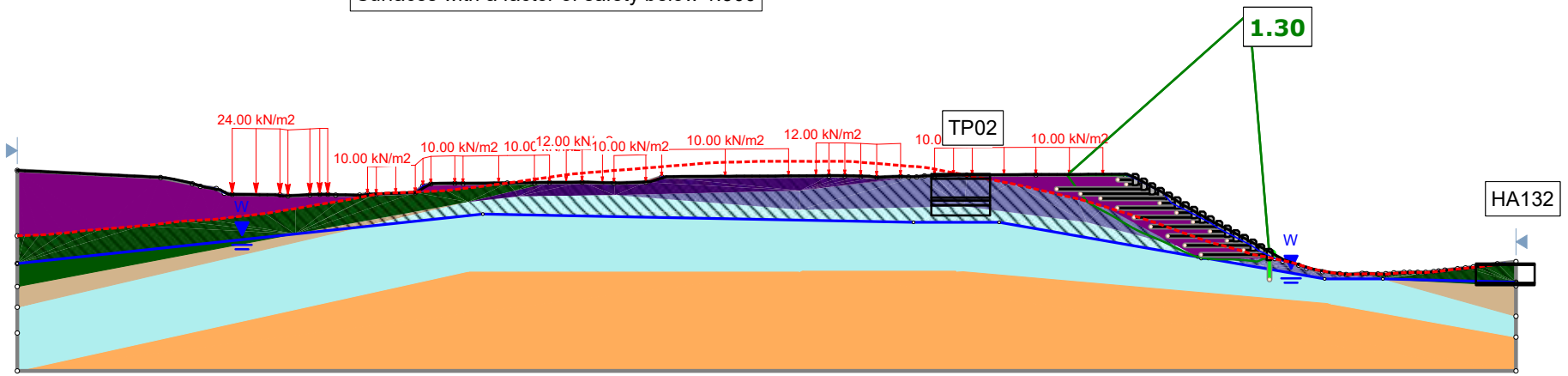
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section H - Remedials	*Scenario*	Normal (Measured GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	20/12/2024	*File Name*	Section H - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	30	None			0.44
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock (Ru=0.44)		20	Mohr-Coulomb	5	25	None			0.44
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Stiff ECBF (Ru = 0.44)		18	Mohr-Coulomb	5	28	None			0.44
Very Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	7	30	None			0.44
Very Weak ECBF Rock (Ru=0.44)		20	Mohr-Coulomb	10	35	None			0.44
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300



RILEY

SLIDEINTERPRET 9.029

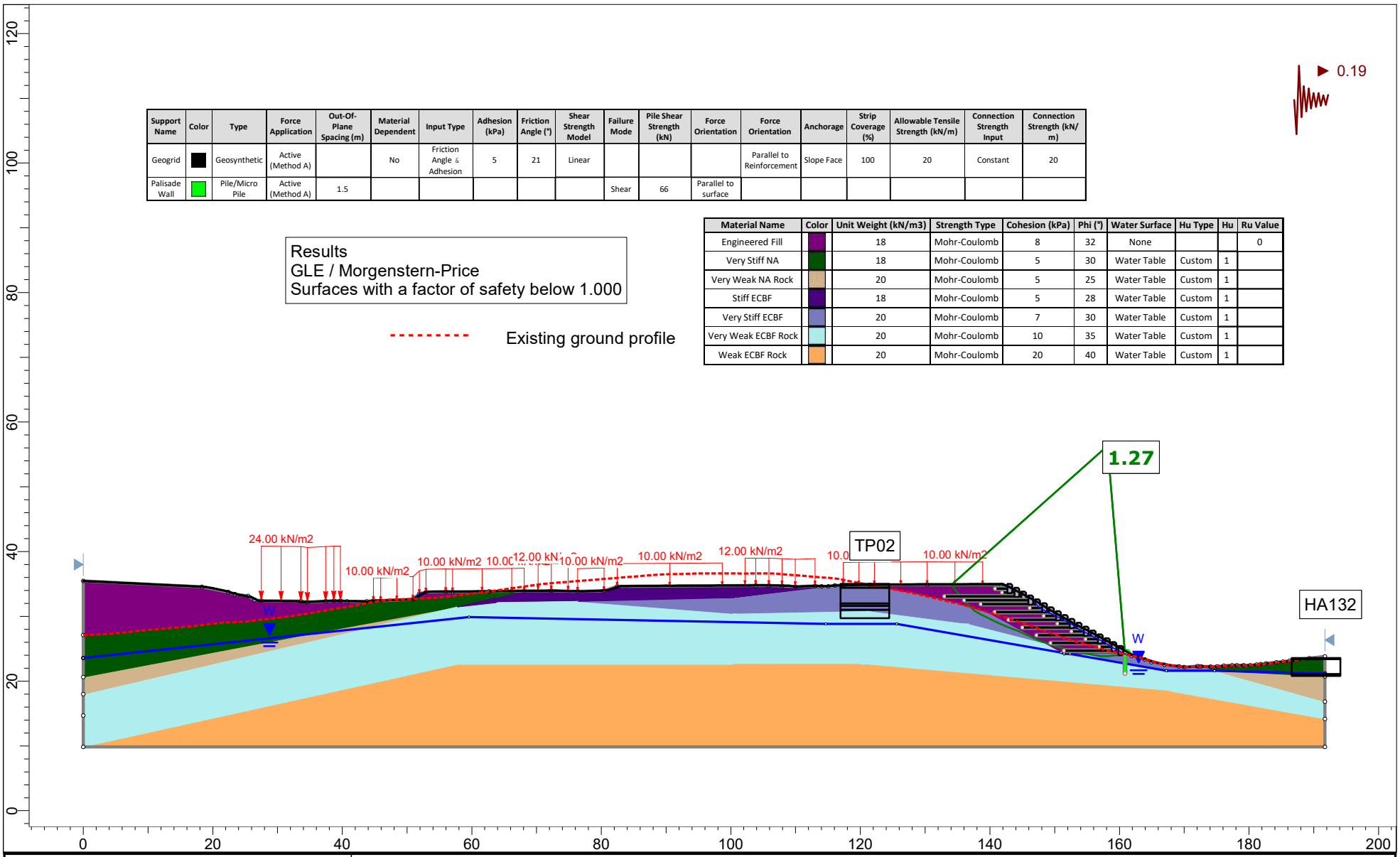
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section H - Remedials	*Scenario*	Extreme (Worst Credible GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	20/12/2024	*File Name*	Section H - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground profile

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF		20	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

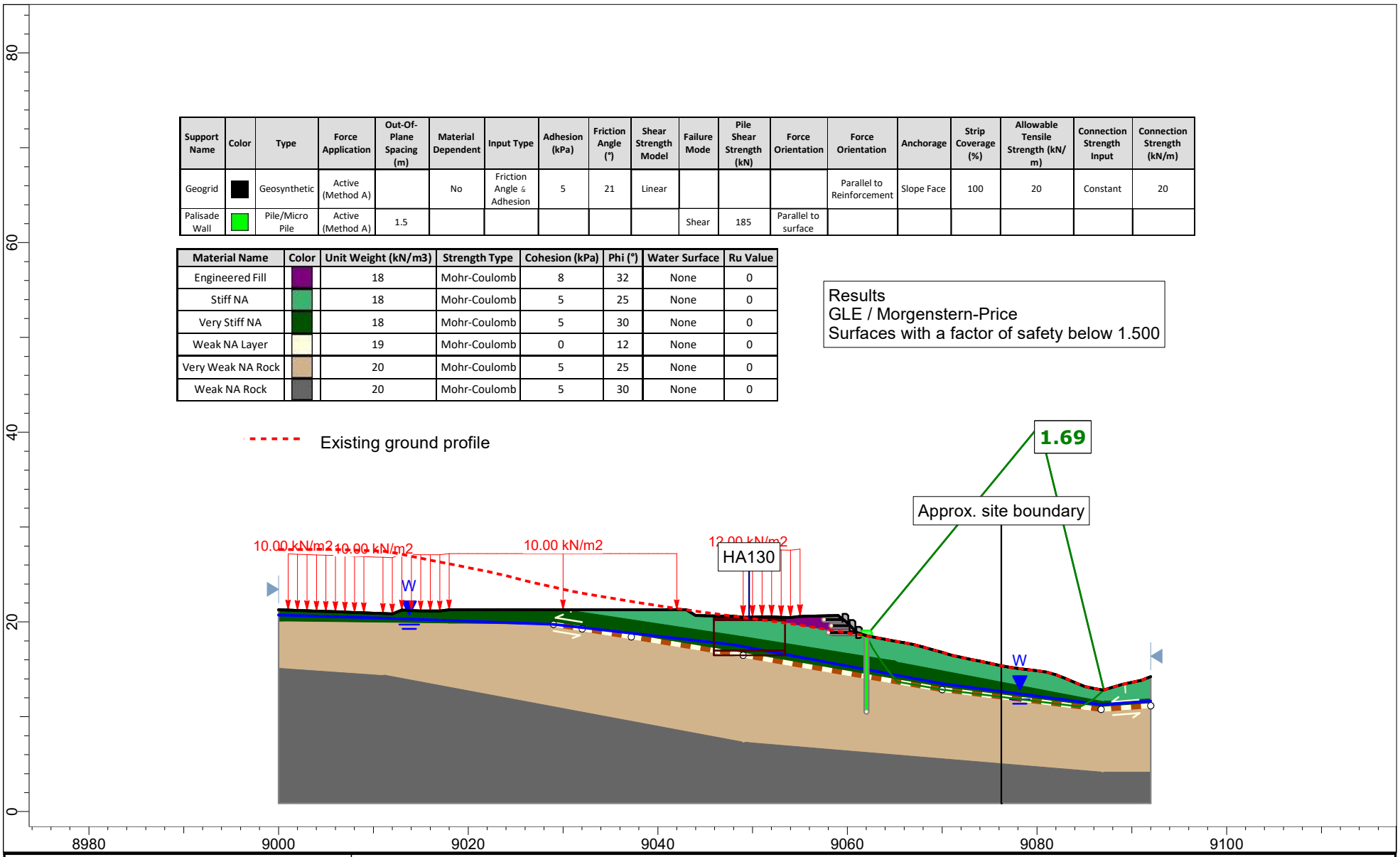
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section H - Remedials	*Scenario*	Seismic (0.19g)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	20/12/2024	*File Name*	Section H - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	185	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None	0
Stiff NA		18	Mohr-Coulomb	5	25	None	0
Very Stiff NA		18	Mohr-Coulomb	5	30	None	0
Weak NA Layer		19	Mohr-Coulomb	0	12	None	0
Very Weak NA Rock		20	Mohr-Coulomb	5	25	None	0
Weak NA Rock		20	Mohr-Coulomb	5	30	None	0

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500



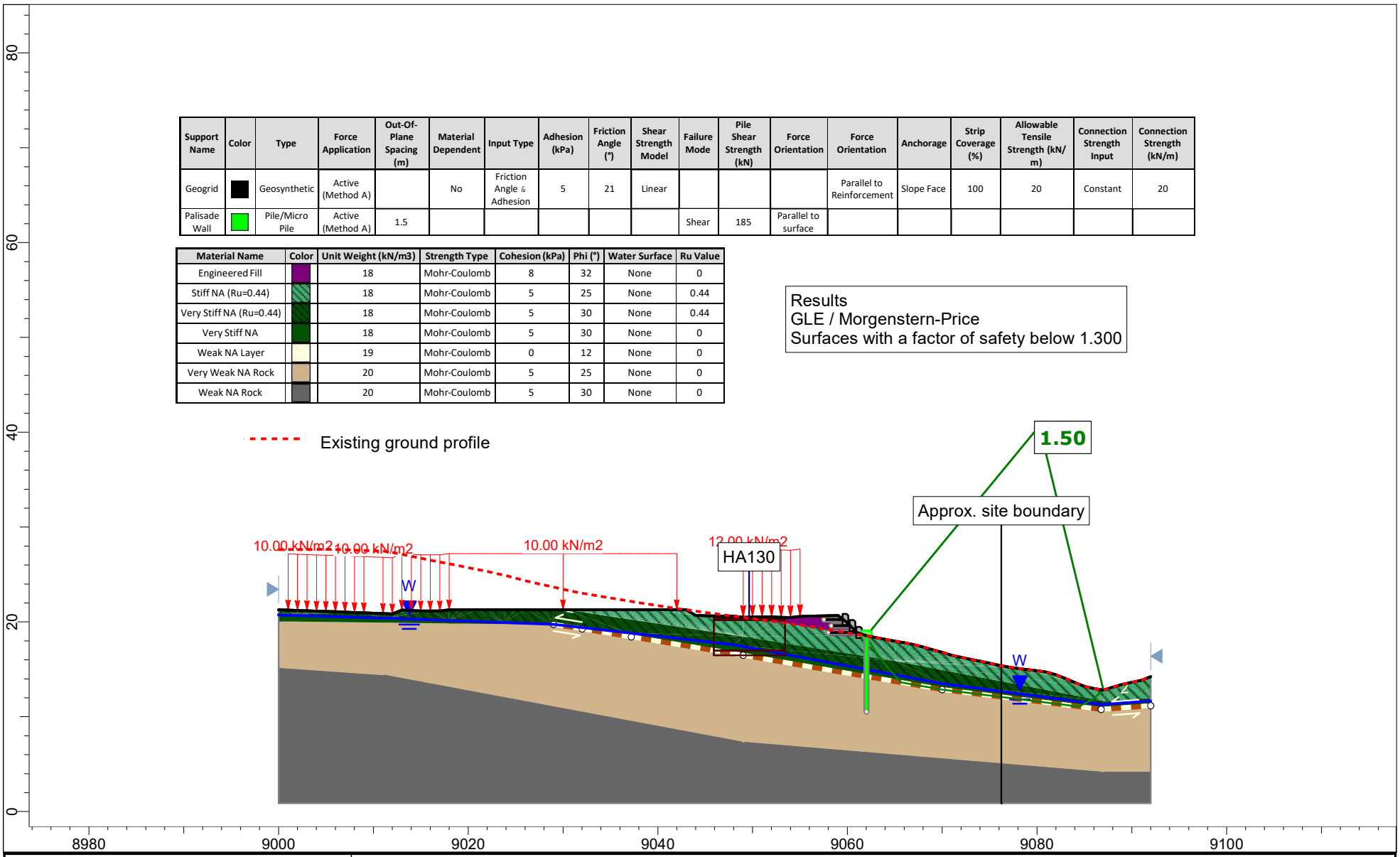
RILEY	Project	240065 - Russell Road, Wainui - Stage 1	
	Group	Proposed GL Scenario I - Remedials	Scenario: Normal (Measured GW)
	Drawn By	ADT	Company: Riley Consulants Ltd
	Date	15/01/2025	File Name: Section I - Proposed GL.slmd

SLIDEINTERPRET 9.029

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	185	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None	0
Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	25	None	0.44
Very Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	30	None	0.44
Very Stiff NA		18	Mohr-Coulomb	5	30	None	0
Weak NA Layer		19	Mohr-Coulomb	0	12	None	0
Very Weak NA Rock		20	Mohr-Coulomb	5	25	None	0
Weak NA Rock		20	Mohr-Coulomb	5	30	None	0

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

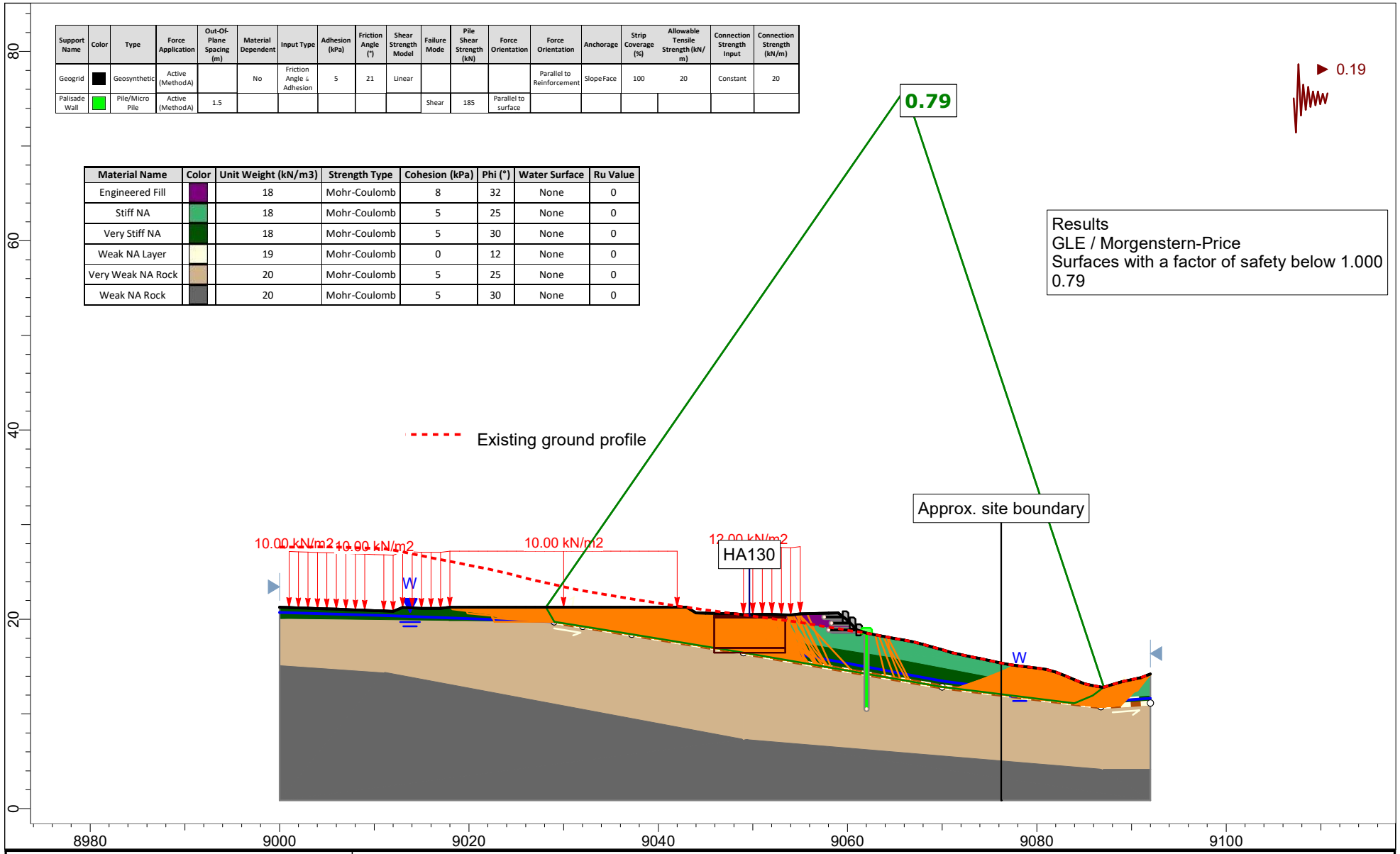


RILEY	Project	240065 - Russell Road, Wainui - Stage 1	
	Group	Proposed GL Scenario I - Remedials	Scenario: Extreme (Worst Credible GW)
	Drawn By	ADT	Company: Riley Consulants Ltd
	Date	15/01/2025	File Name: Section I - Proposed GL.slmd

SLIDEINTERPRET 9.029

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	185	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None	0
Stiff NA		18	Mohr-Coulomb	5	25	None	0
Very Stiff NA		18	Mohr-Coulomb	5	30	None	0
Weak NA Layer		19	Mohr-Coulomb	0	12	None	0
Very Weak NA Rock		20	Mohr-Coulomb	5	25	None	0
Weak NA Rock		20	Mohr-Coulomb	5	30	None	0



RILEY

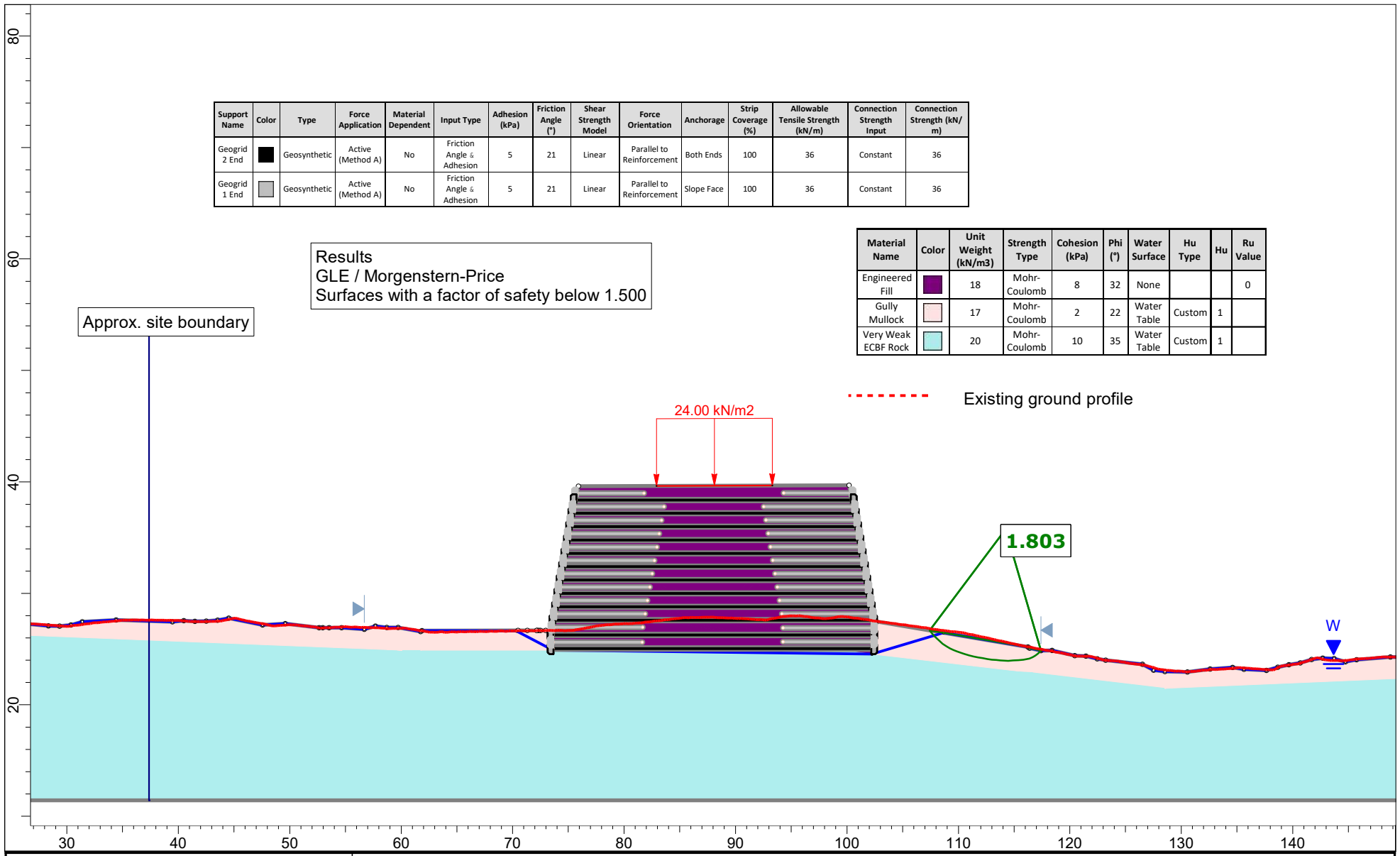
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Scenario I - Remedials	*Scenario*	Seismic (0.19g)
Drawn By	ADT	*Company*	Riley Consulants Ltd
Date	15/01/2025	*File Name*	Section I - Proposed GL.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid 2 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Both Ends	100	36	Constant	36
Geogrid 1 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	36	Constant	36

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Gully Mullock		17	Mohr-Coulomb	2	22	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500



RILEY

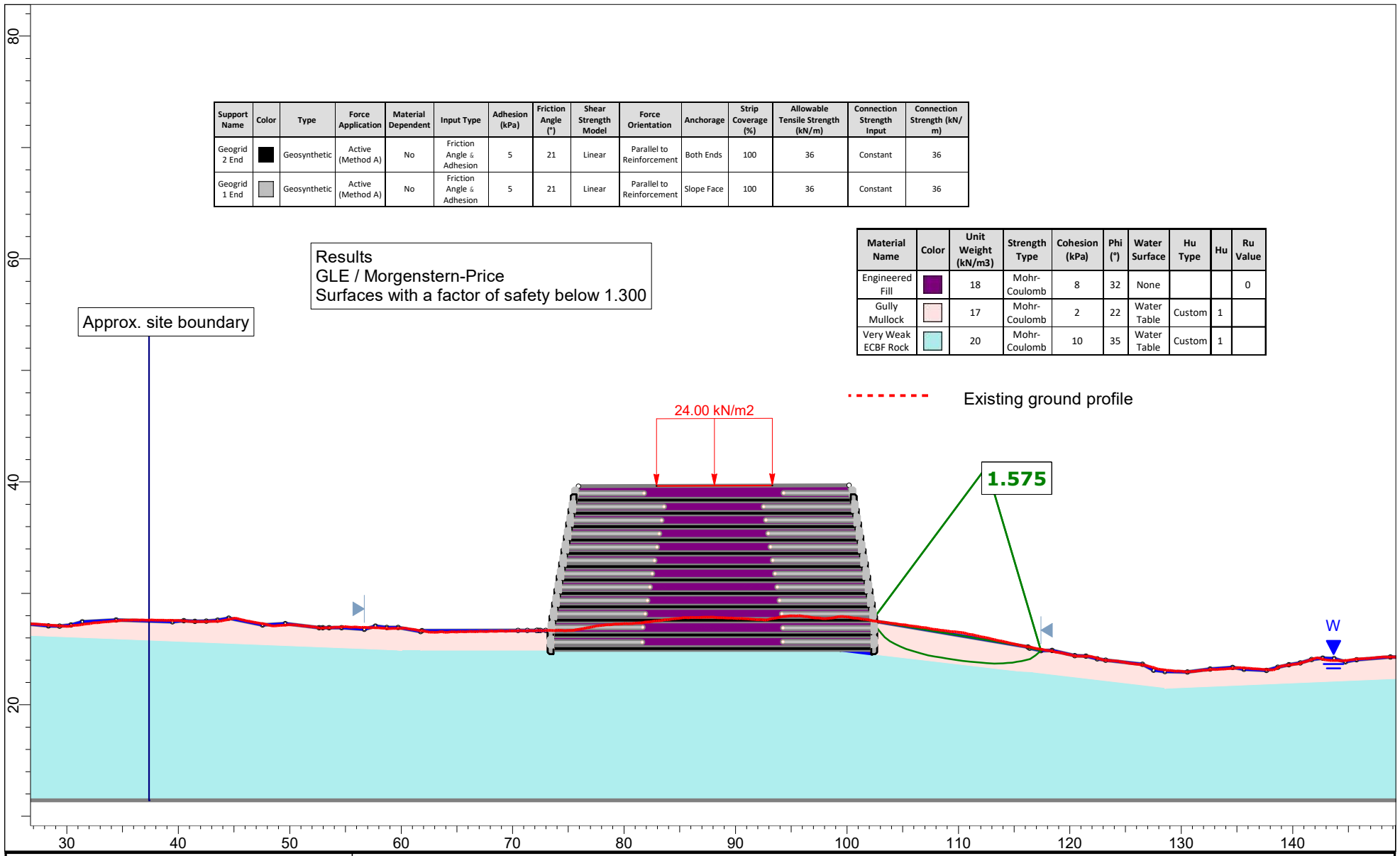
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section J - Proposed GL, Remedials, Loads (L-R)	*Scenario*	Normal (Measured GW)
Drawn By	ADT	*Company*	Riley Consulants Ltd
Date	15/01/2025	*File Name*	Section J - Proposed GL.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid 2 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Both Ends	100	36	Constant	36
Geogrid 1 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	36	Constant	36

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Gully Mullock		17	Mohr-Coulomb	2	22	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300



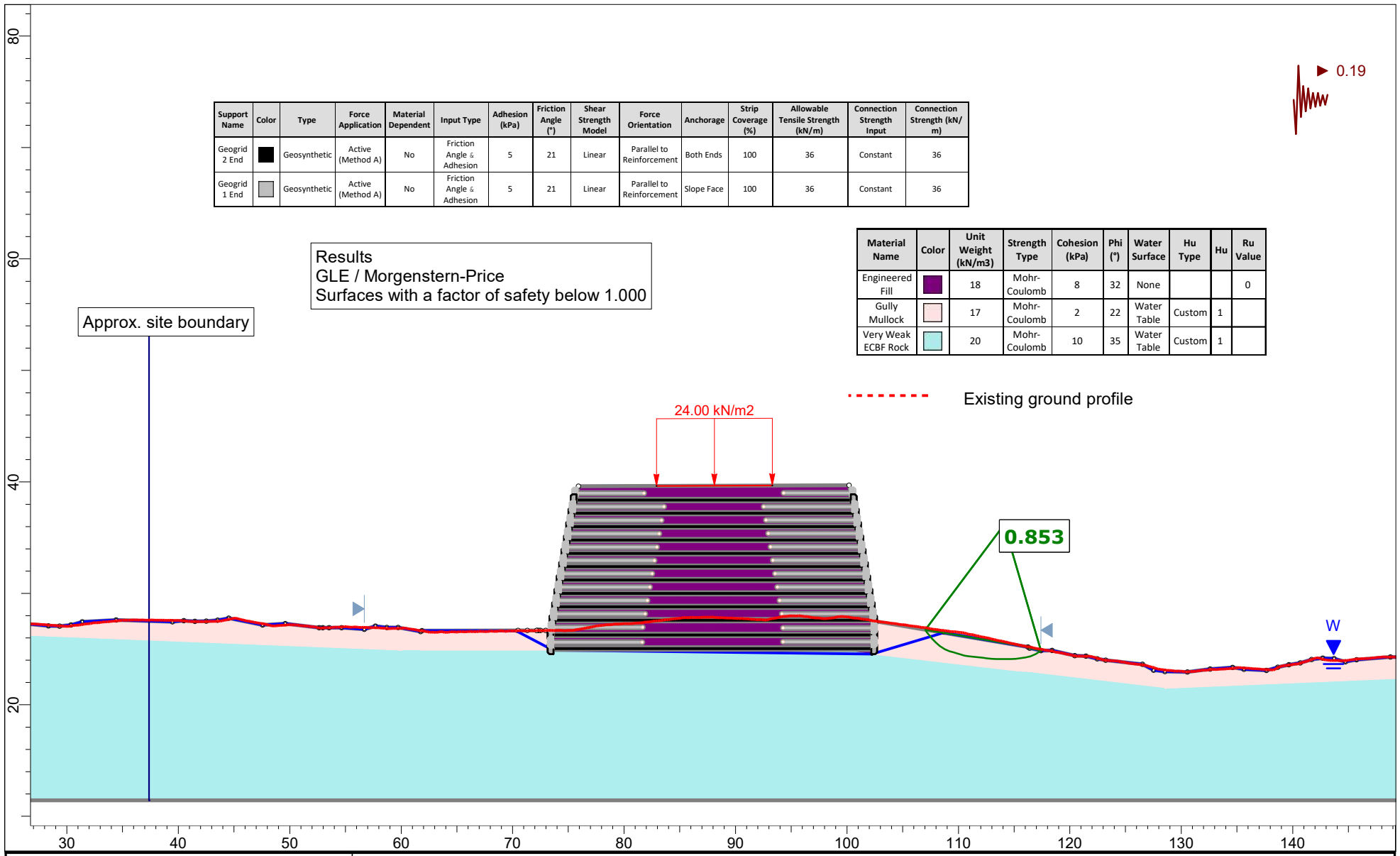
RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section J - Proposed GL, Remedials, Loads (L-R)	*Scenario*	Extreme (Worst Credible GW)
Drawn By	ADT	*Company*	Riley Consulants Ltd
Date	15/01/2025	*File Name*	Section J - Proposed GL.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid 2 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Both Ends	100	36	Constant	36
Geogrid 1 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	36	Constant	36

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Gully Mullock		17	Mohr-Coulomb	2	22	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	



RILEY

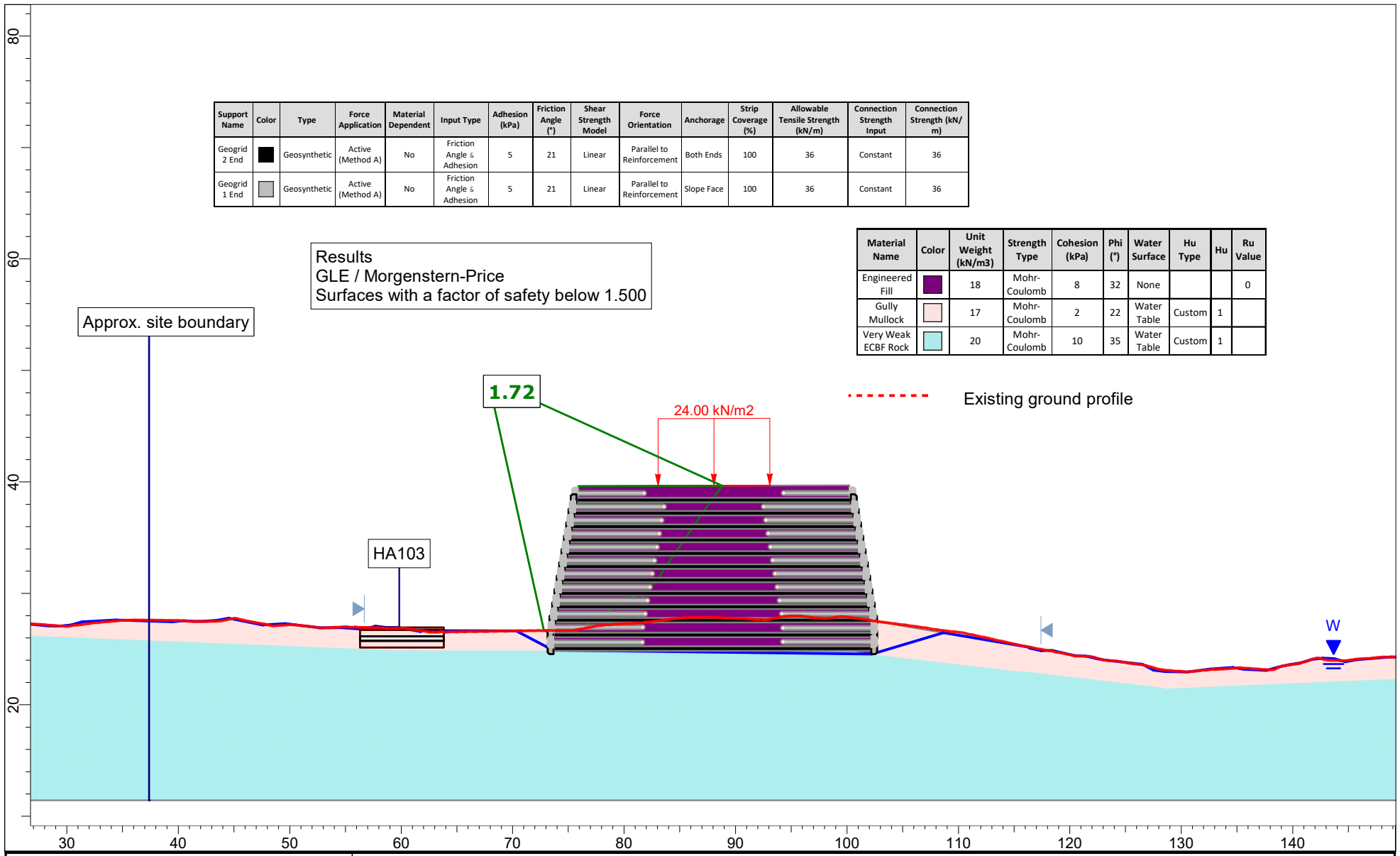
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section J - Proposed GL, Remedials, Loads (L-R)	*Scenario*	Seismic (0.19g)
Drawn By	ADT	*Company*	Riley Consulants Ltd
Date	15/01/2025	*File Name*	Section J - Proposed GL.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid 2 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Both Ends	100	36	Constant	36
Geogrid 1 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	36	Constant	36

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Gully Mullock		17	Mohr-Coulomb	2	22	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500



RILEY

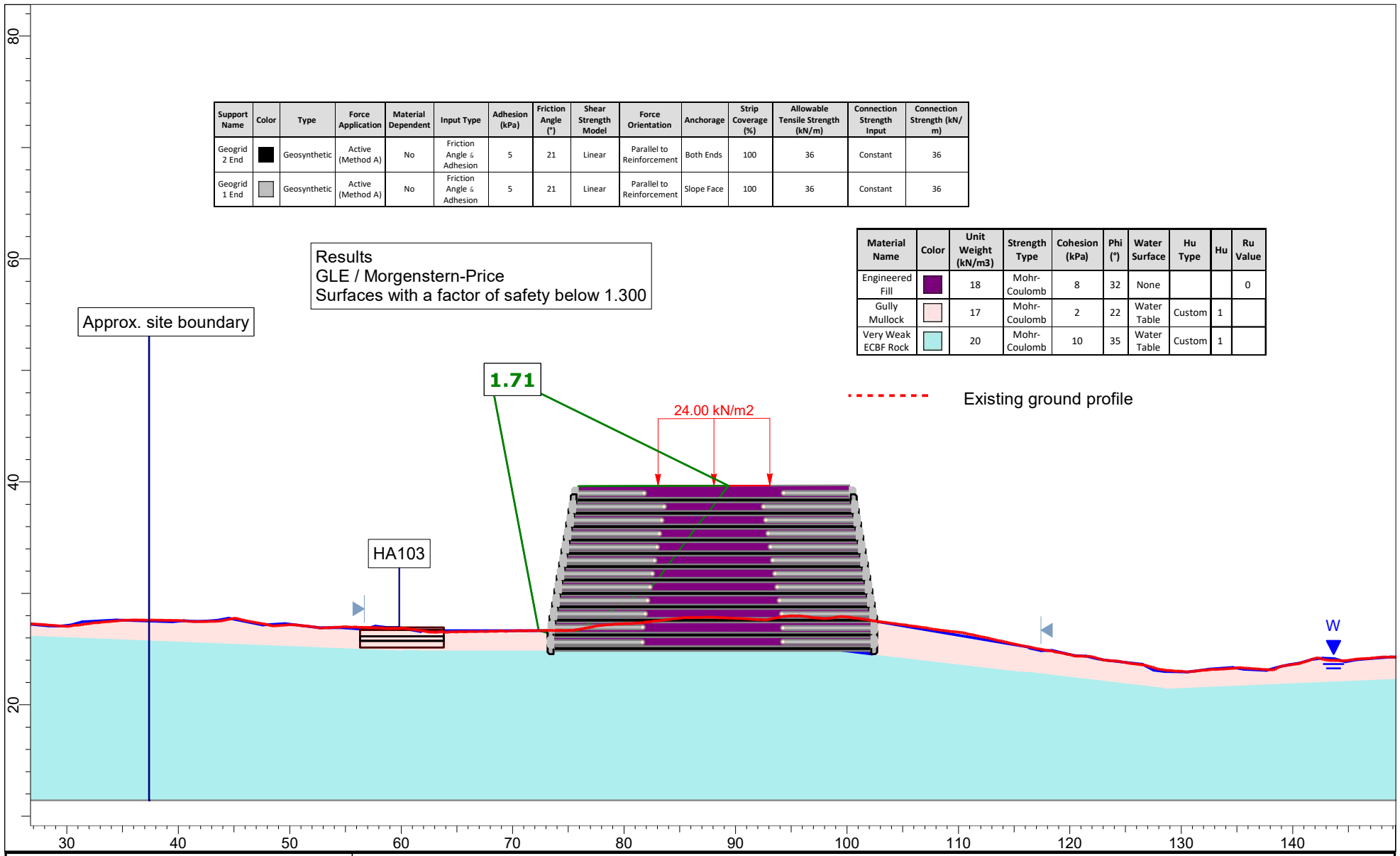
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section J - Proposed GL, Remedials, Loads (R-L)	Scenario	Normal (Measured GW)
Drawn By	ADT	Company	Riley Consulants Ltd
Date	15/01/2025	File Name	Section J - Proposed GL.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid 2 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Both Ends	100	36	Constant	36
Geogrid 1 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	36	Constant	36

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Gully Mullock		17	Mohr-Coulomb	2	22	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300



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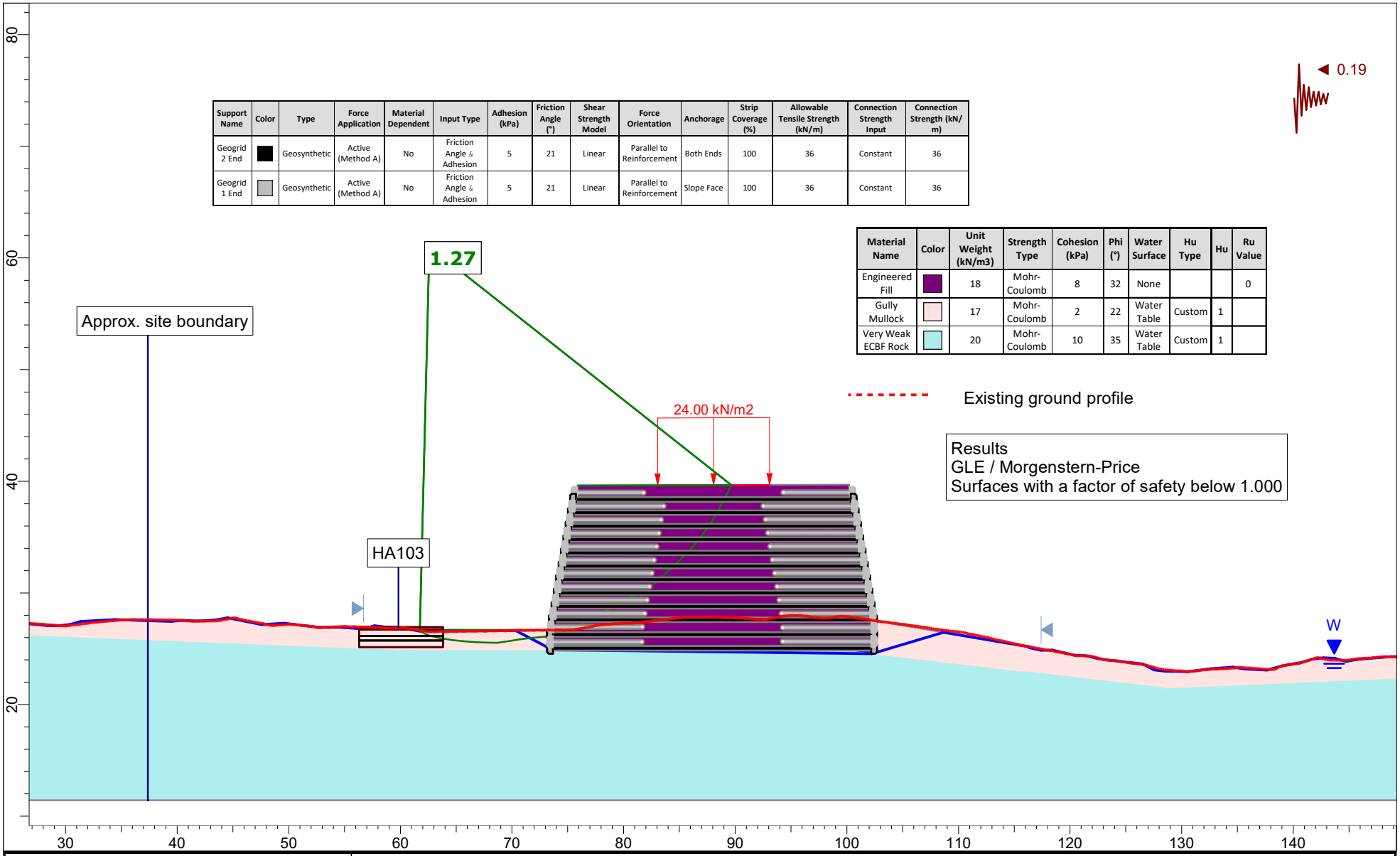
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section J - Proposed GL, Remedials, Loads (R-L)	*Scenario*	Extreme (Worst Credible GW)
Drawn By	ADT	*Company*	Riley Consulants Ltd
Date	15/01/2025	*File Name*	Section J - Proposed GL.slmd



Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid 2 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Both Ends	100	36	Constant	36
Geogrid 1 End		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	36	Constant	36

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Gully Mullock		17	Mohr-Coulomb	2	22	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	

RILEY

SLIDEINTERPRET 9.029

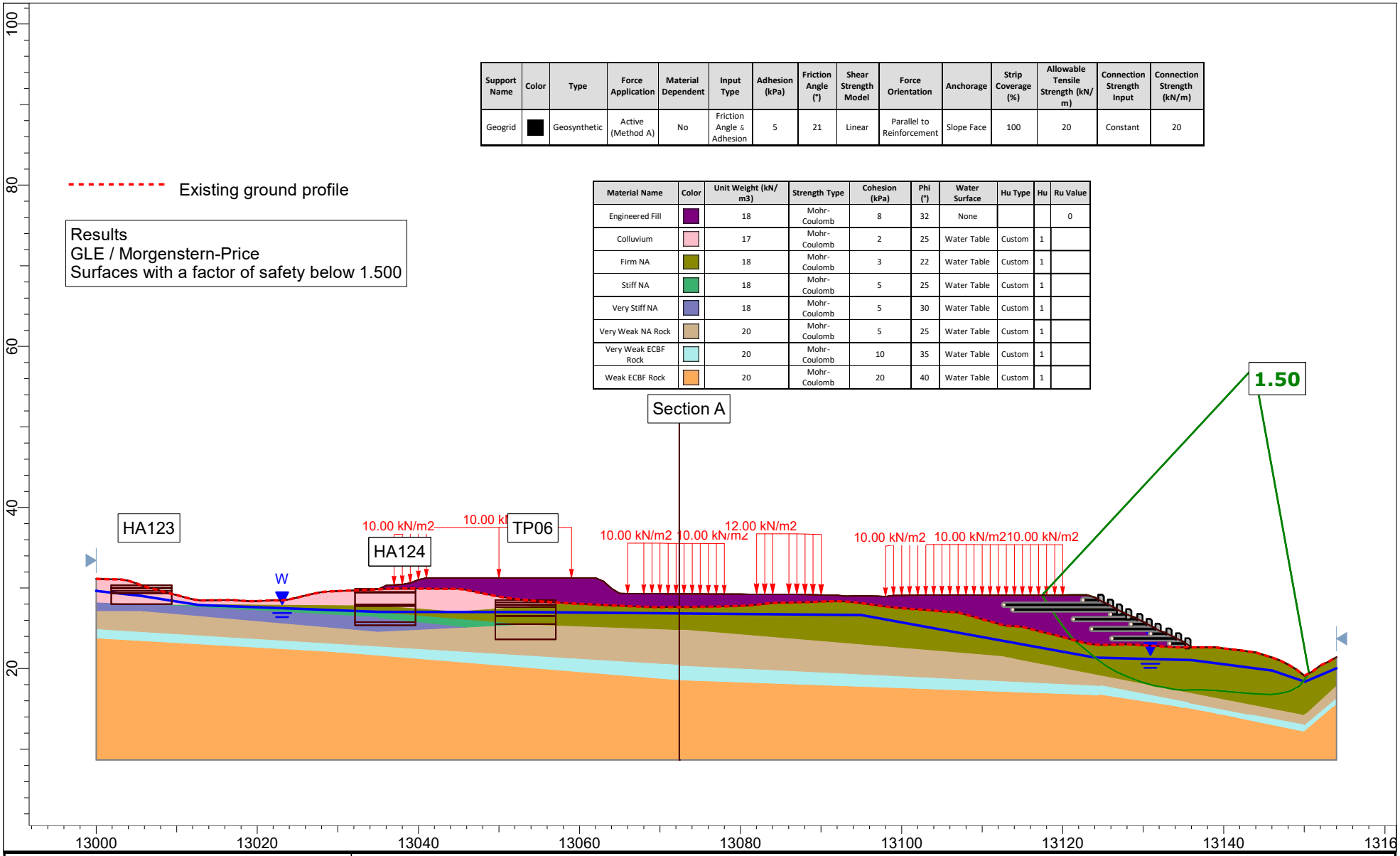
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section J - Proposed GL, Remedials, Loads (R-L)	Scenario	Seismic (0.19g)
Drawn By	ADT	Company	Riley Consulants Ltd
Date	15/01/2025	File Name	Section J - Proposed GL.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	20	Constant	20

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Colluvium		17	Mohr-Coulomb	2	25	Water Table	Custom	1	
Firm NA		18	Mohr-Coulomb	3	22	Water Table	Custom	1	
Stiff NA		18	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



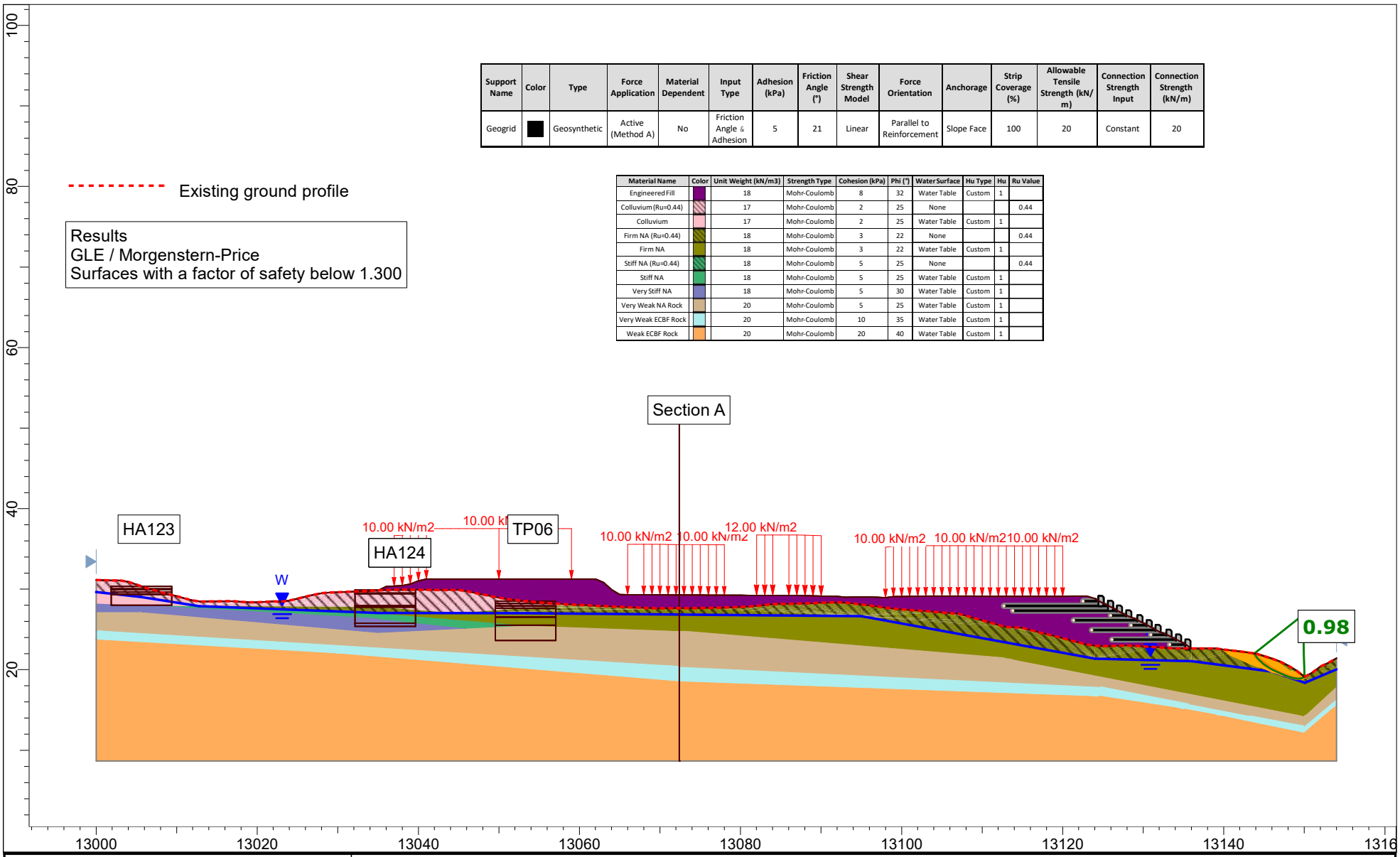
RILEY	*Project*	240065 - Russell Road, Wainui - Stage 1	
	Group	Proposed GL Section M - Remedials	*Scenario* Normal (Measured GW)
	Drawn By	RS	*Company* Riley Consulants Ltd
SLIDEINTERPRET 9.029	*Date*	20/12/2024	*File Name* Section M - Proposed GL.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	20	Constant	20

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1	
Colluvium (Ru=0.44)		17	Mohr-Coulomb	2	25	None			0.44
Colluvium		17	Mohr-Coulomb	2	25	Water Table	Custom	1	
Firm NA (Ru=0.44)		18	Mohr-Coulomb	3	22	None			0.44
Firm NA		18	Mohr-Coulomb	3	22	Water Table	Custom	1	
Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	25	None			0.44
Stiff NA		18	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY	Project	240065 - Russell Road, Wainui - Stage 1	
	Group	Proposed GL Section M - Remedials	Scenario: Extreme (Worst Credible GW)
	Drawn By	RS	Company: Riley Consulants Ltd
	Date	20/12/2024	File Name: Section M - Proposed GL.slmd

SLIDEINTERPRET 9.029

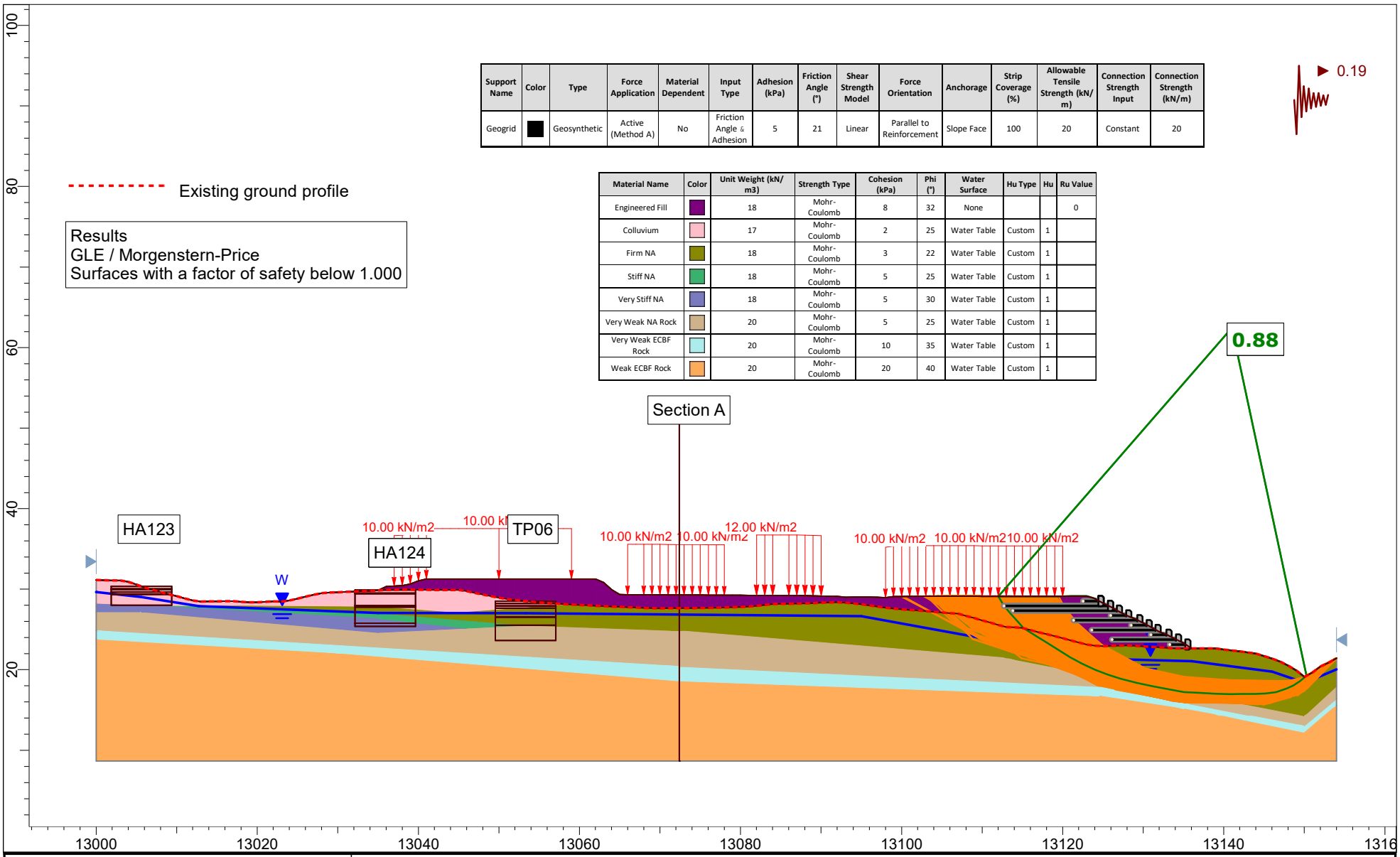
Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	20	Constant	20

▶ 0.19

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Colluvium		17	Mohr-Coulomb	2	25	Water Table	Custom	1	
Firm NA		18	Mohr-Coulomb	3	22	Water Table	Custom	1	
Stiff NA		18	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

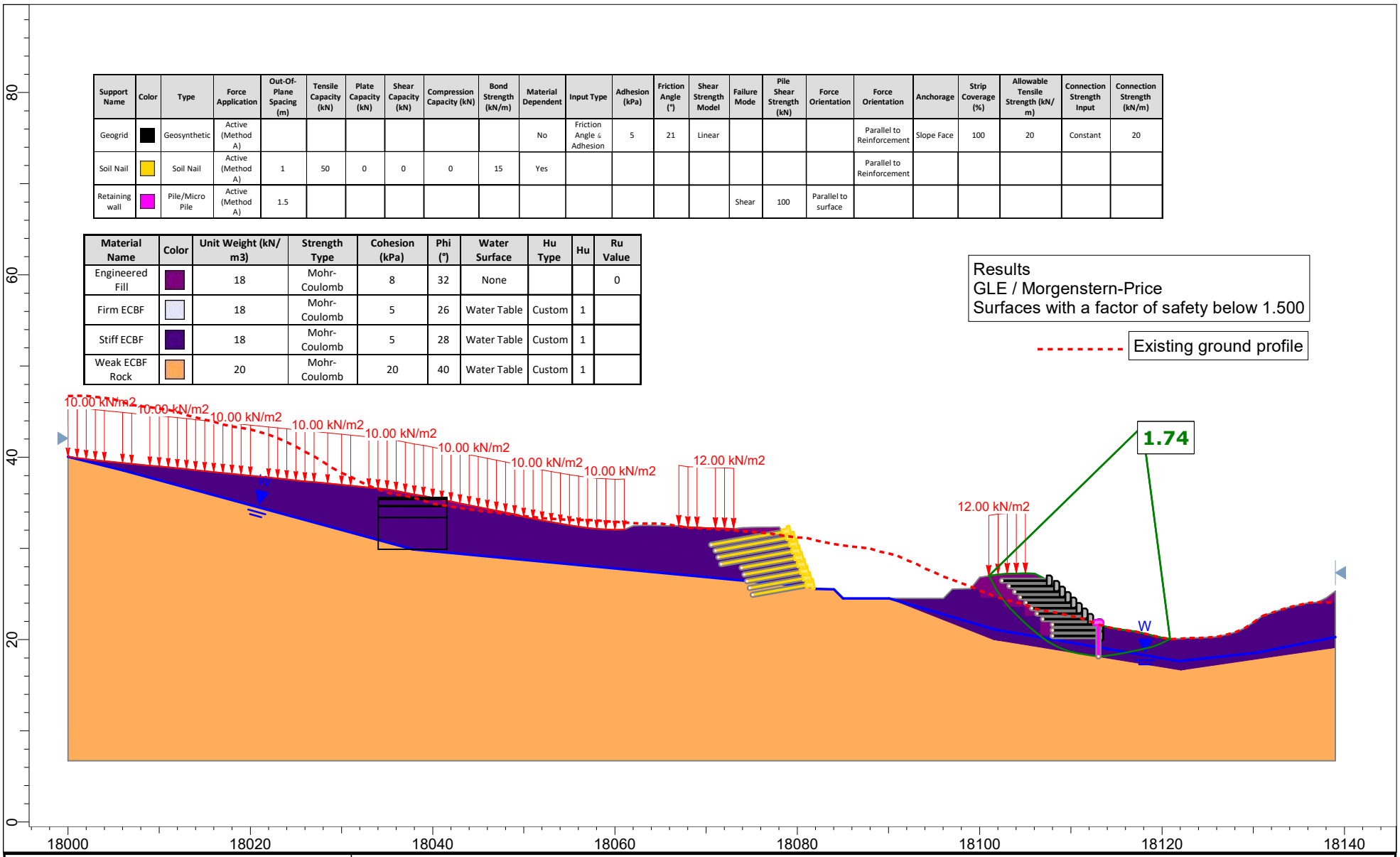
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section M - Remedials	*Scenario*	Seismic (0.19g)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	20/12/2024	*File Name*	Section M - Proposed GL.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Existing ground profile



RILEY

SLIDEINTERPRET 9.029

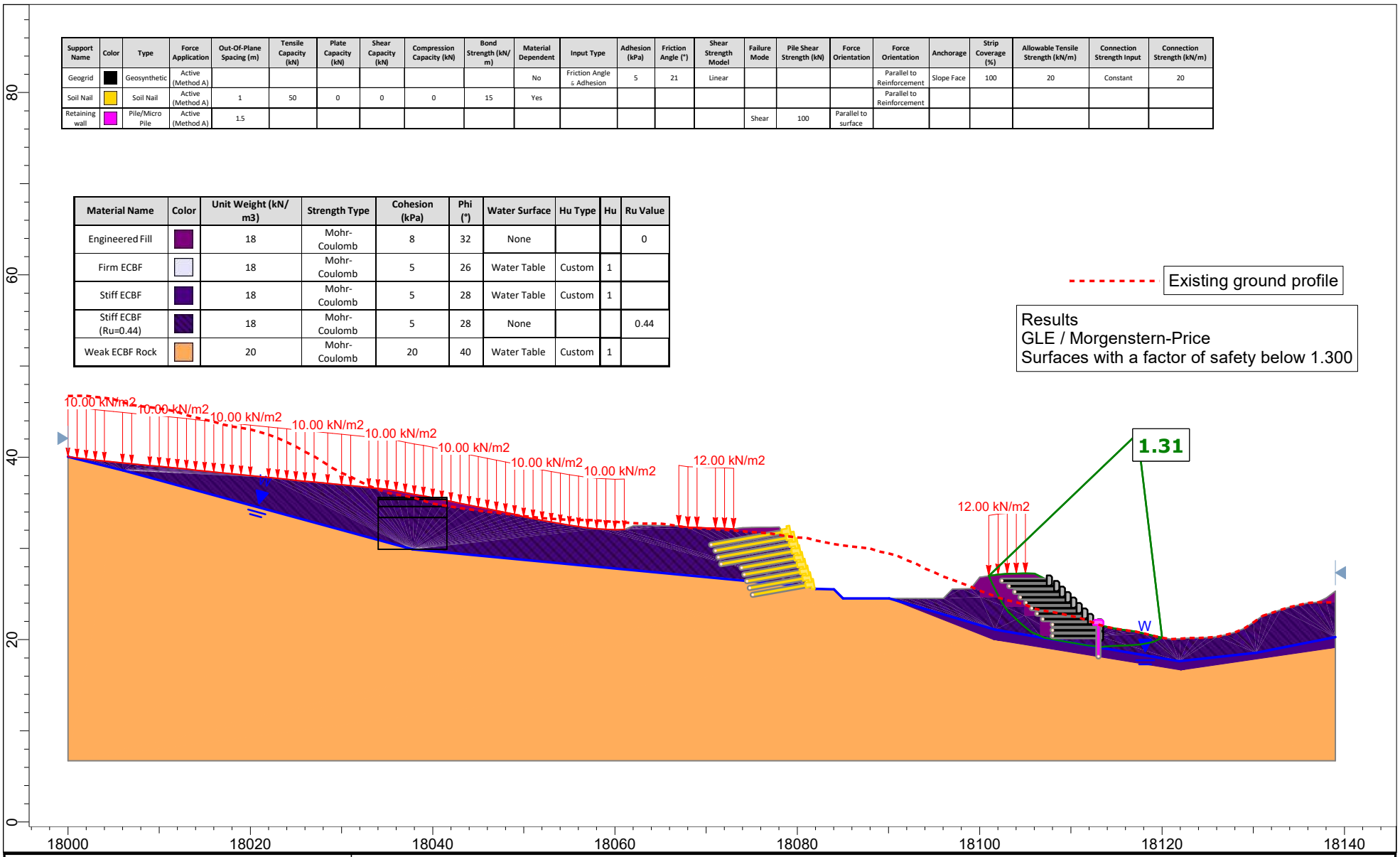
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (L-R)	Scenario	Normal (Measured GW)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section R - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (L-R)	*Scenario*	Extreme (Worst Credible GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section R - June 2025.slmd

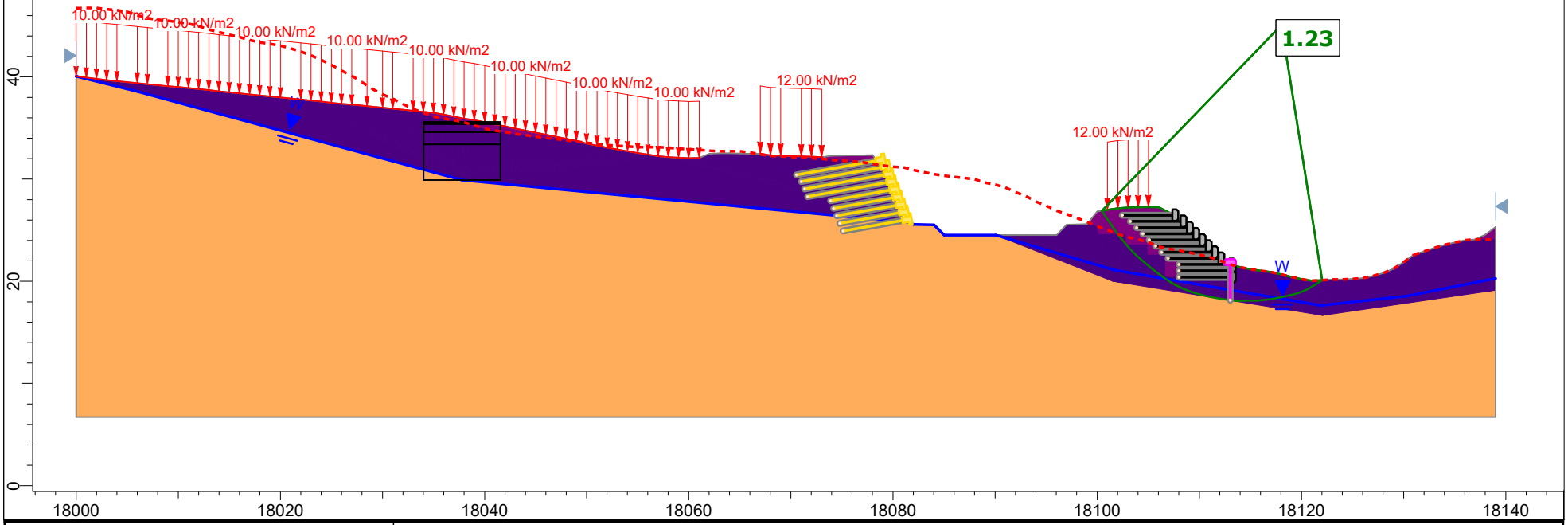
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

0.19

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground profile



RILEY

SLIDEINTERPRET 9.029

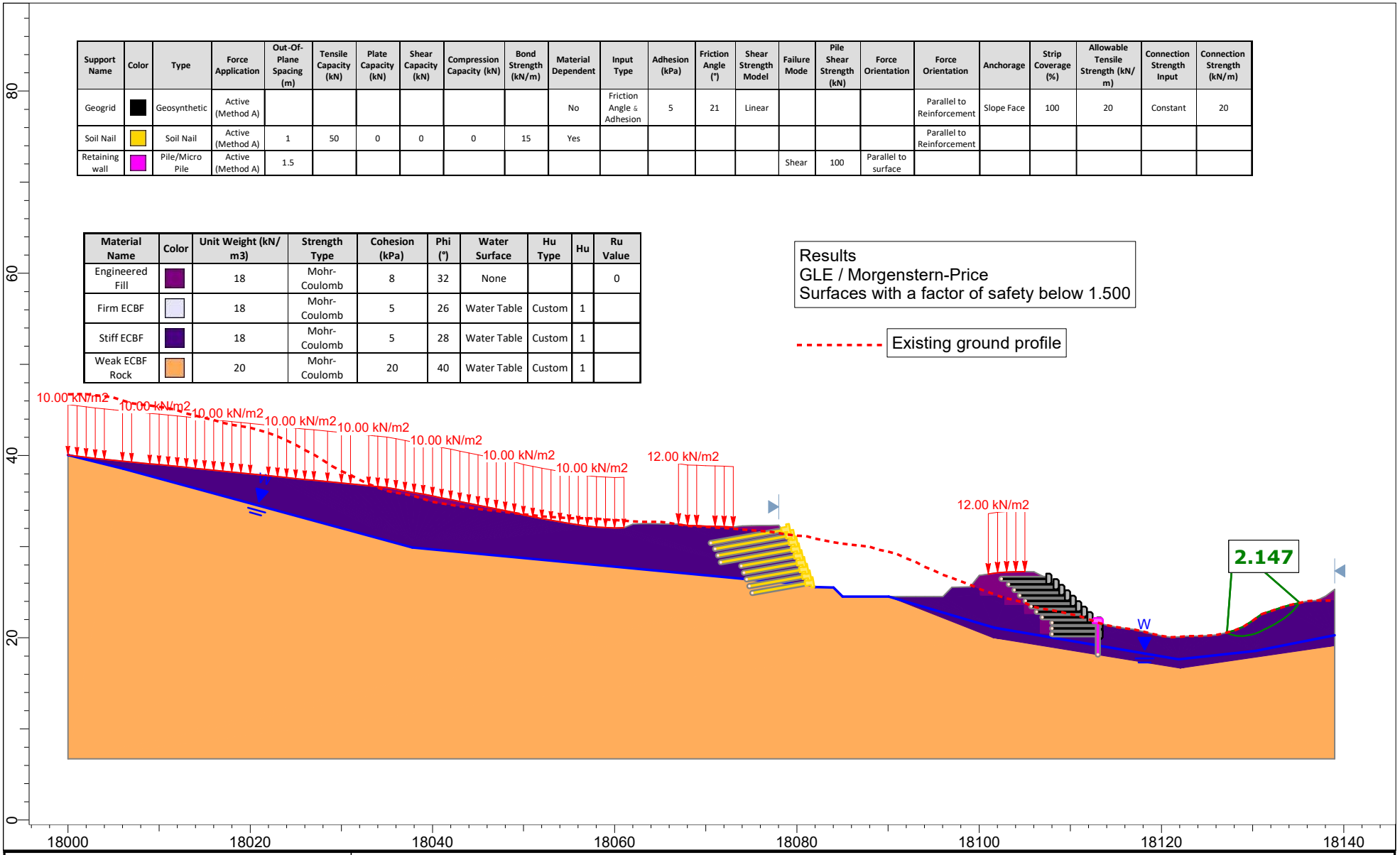
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (L-R)	Scenario	Seismic (0.19g)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section R - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Existing ground profile



RILEY

SLIDEINTERPRET 9.029

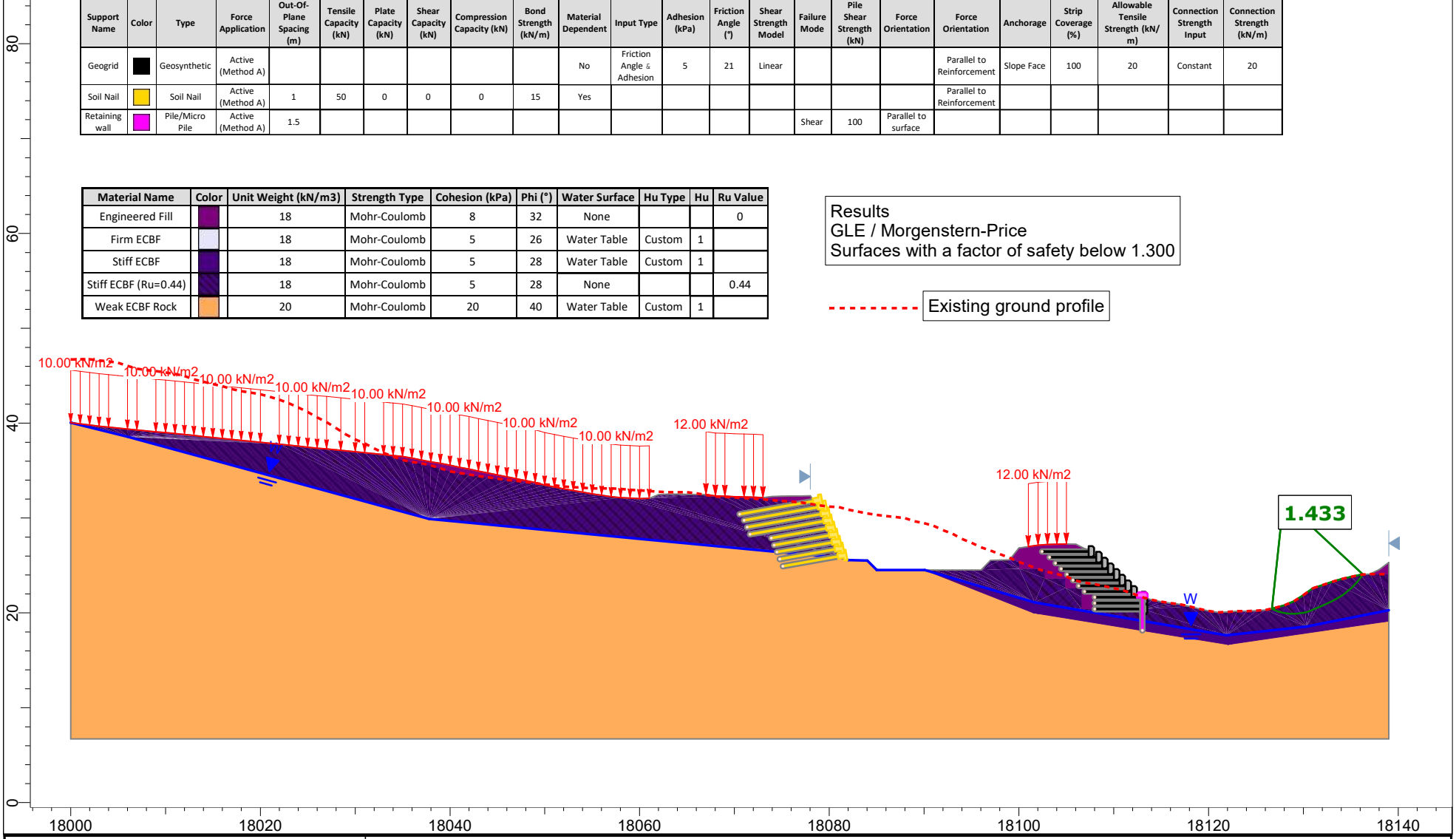
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (R-L)	Scenario	Normal (Measured GW)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section R - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Existing ground profile



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (R-L)	*Scenario*	Extreme (Worst Credible GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section R - June 2025.slmd

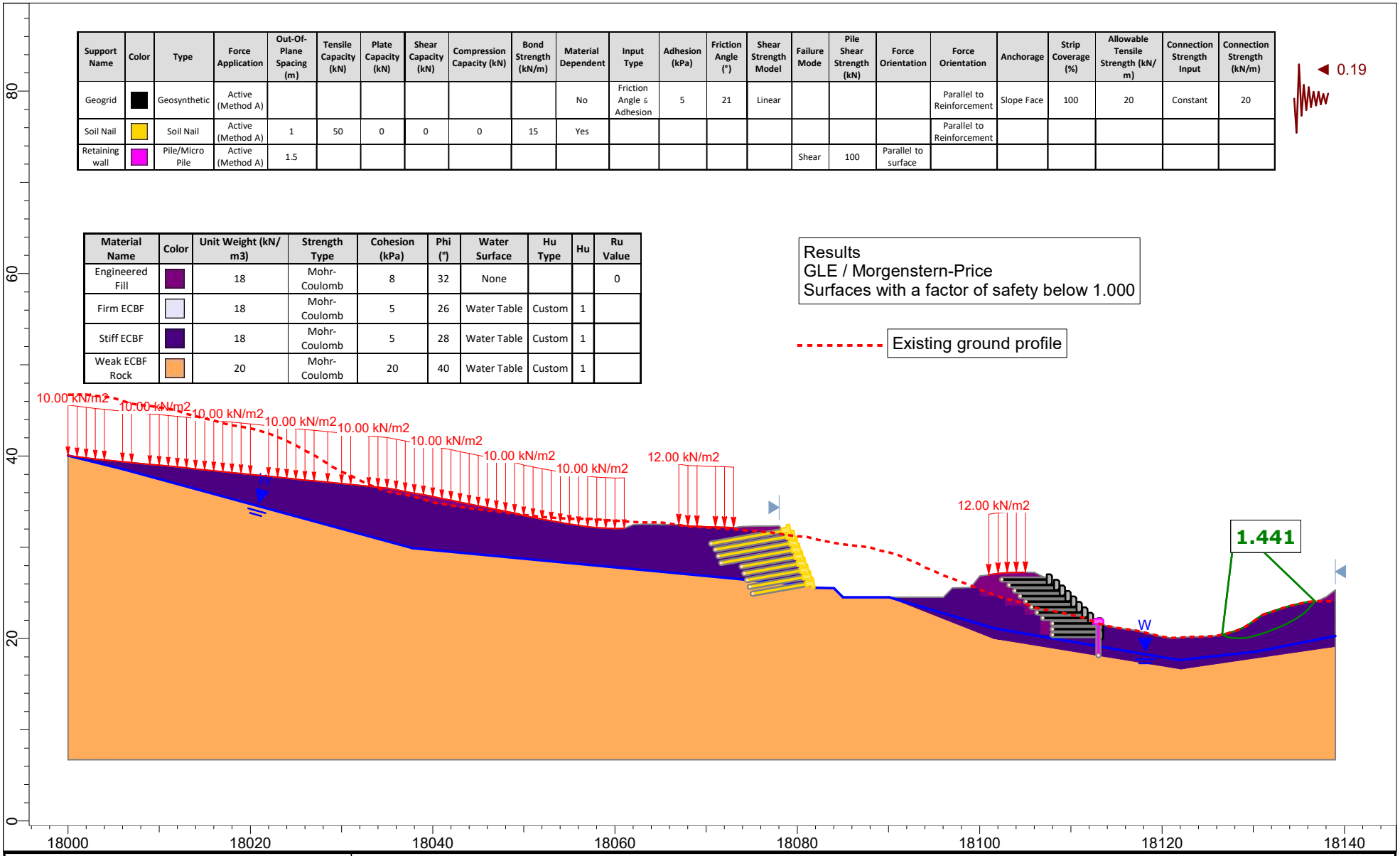
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

◄ 0.19

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground profile



RILEY

SLIDEINTERPRET 9.029

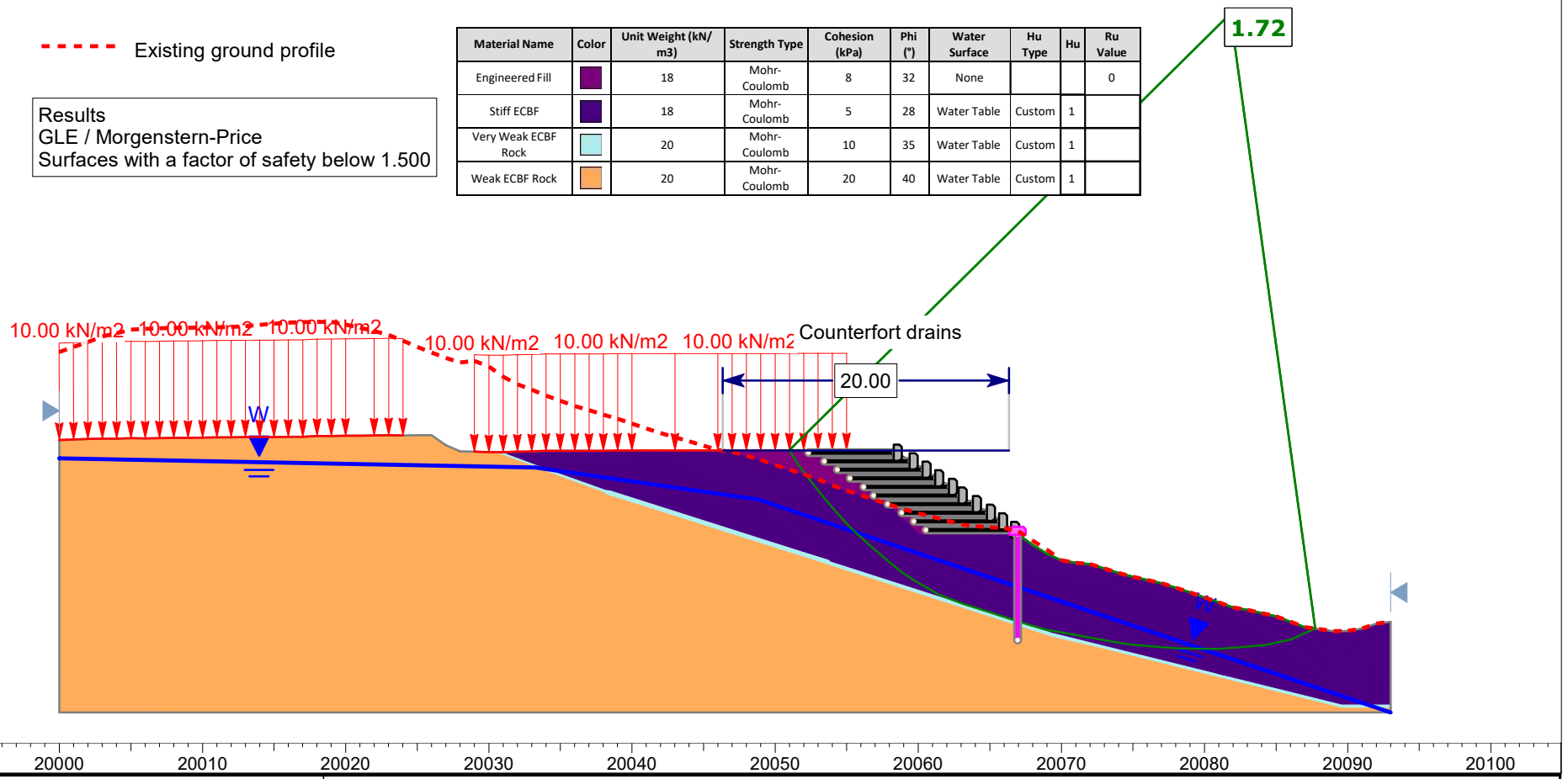
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (R-L)	Scenario	Seismic (0.19g)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section R - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	150	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

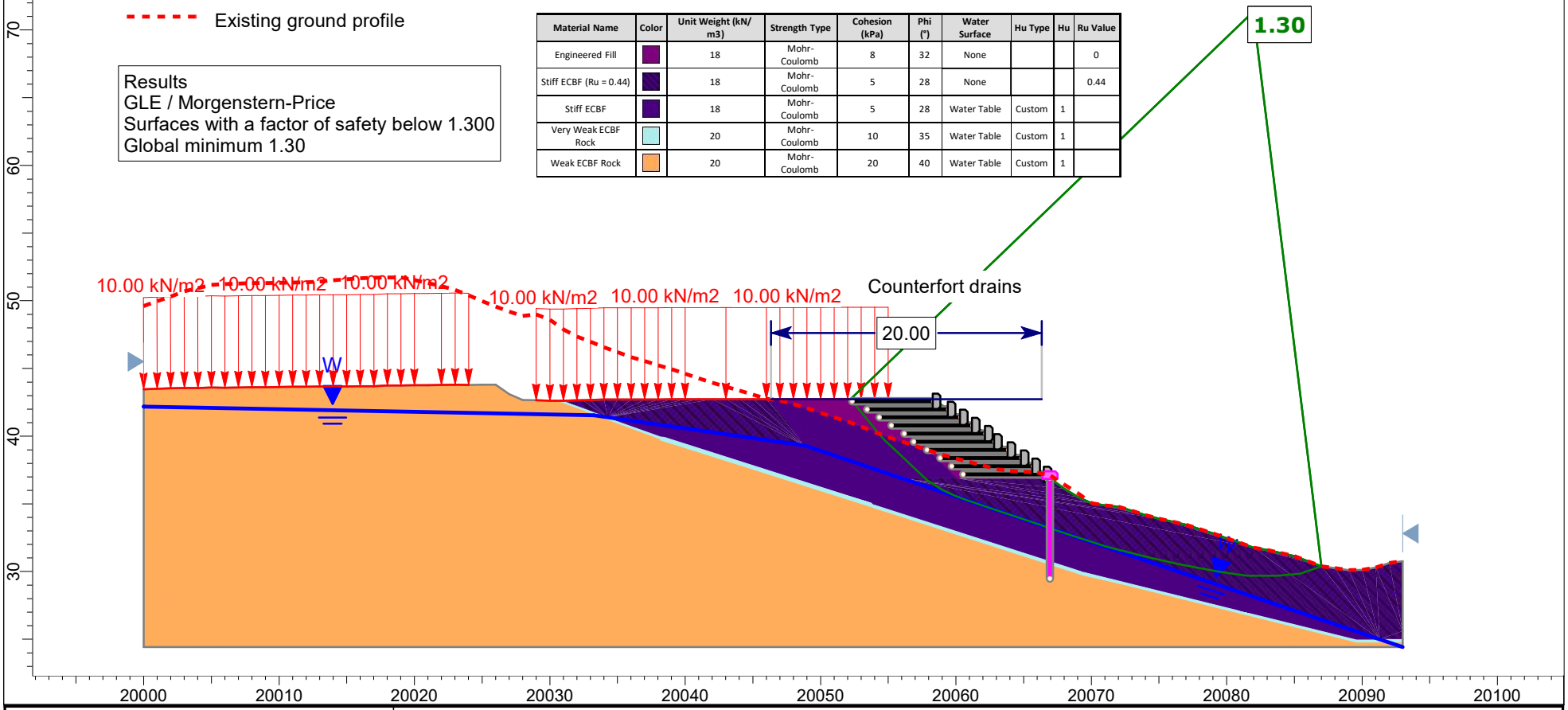
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Proposed GL Section T - Remedials	Scenario	Normal (Measured GW)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section T - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	150	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300
Global minimum 1.30

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF (Ru = 0.44)		18	Mohr-Coulomb	5	28	None			0.44
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Proposed GL Section T - Remedials	Scenario	Extreme (Worst Credible GW)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section T - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	150	Parallel to surface						

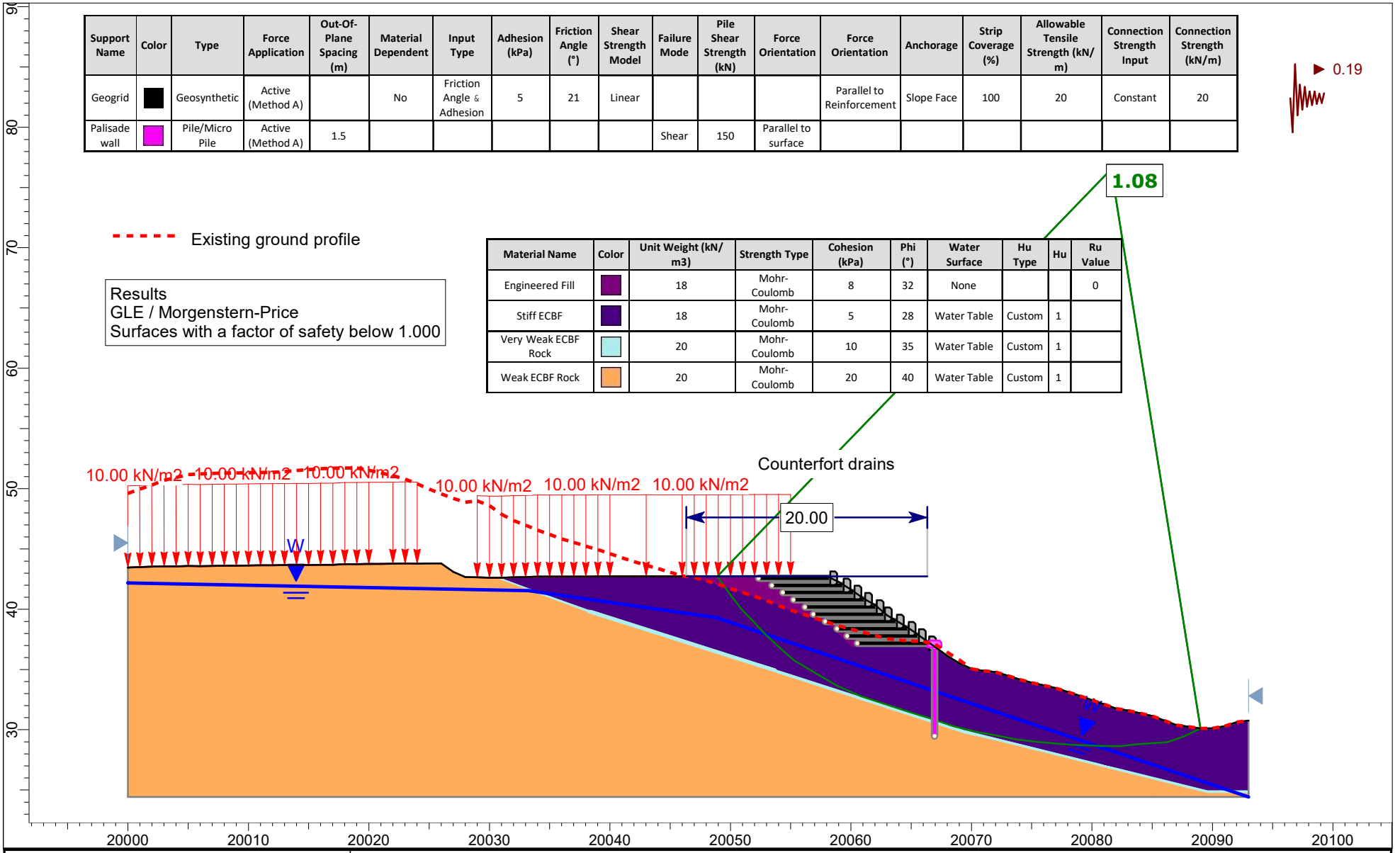
▶ 0.19

1.08

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

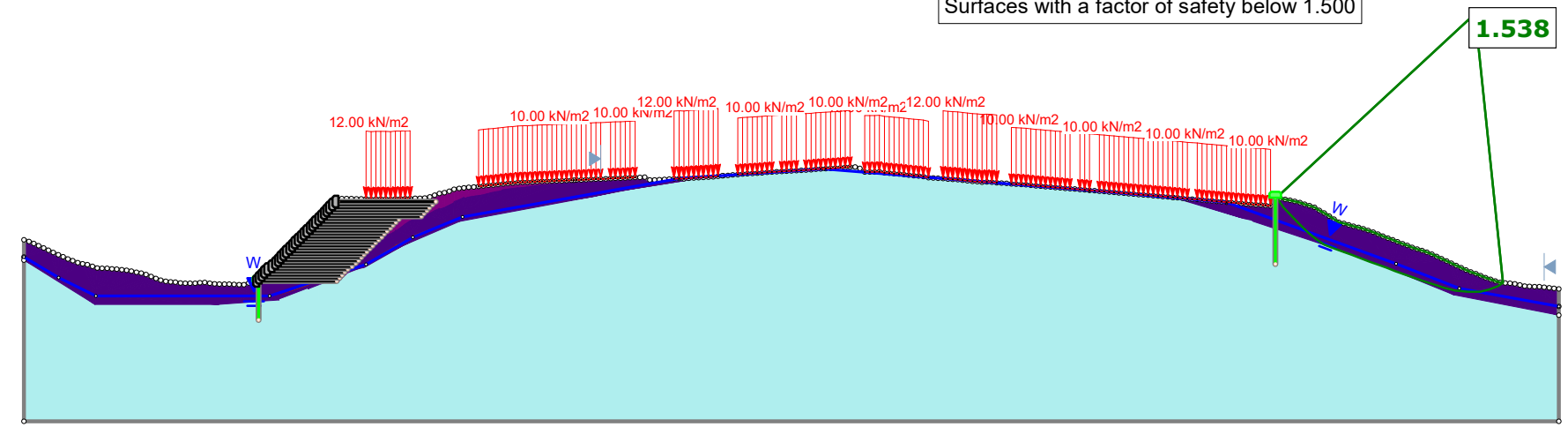
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Proposed GL Section T - Remedials	Scenario	Seismic (0.19g)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section T - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	40	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	400	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500



200
150
100
50
22000
22050
22100
22150
22200
22250
22300

RILEY

SLIDEINTERPRET 9.029

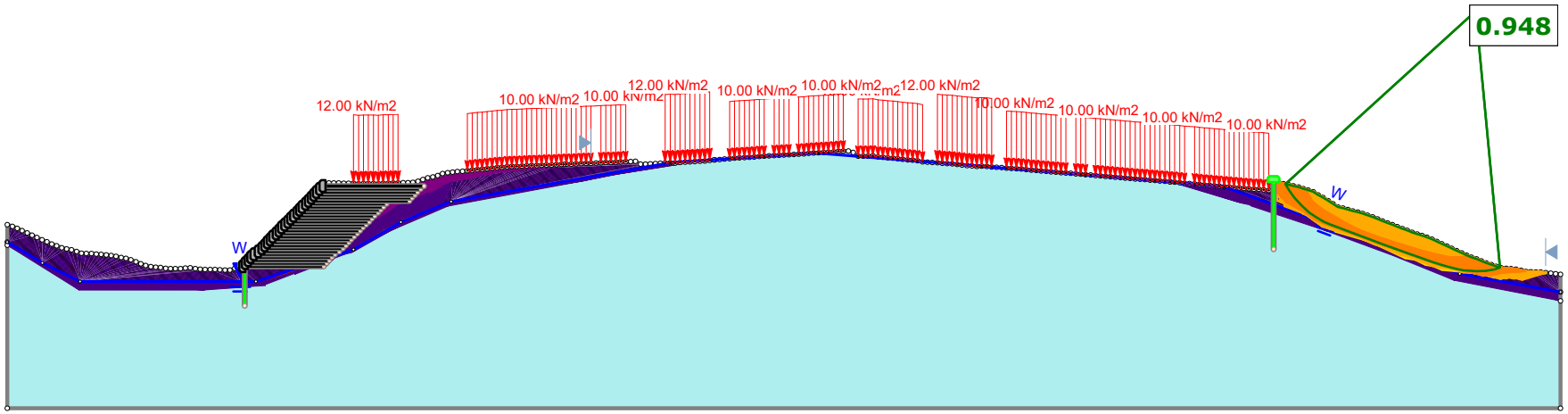
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section V - Proposed GL, Remedials, Loads (L-R)	*Scenario*	Normal (Measured GW)
Drawn By	JJW	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section V - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	40	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	400	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300



200
150
100
50
22000
22050
22100
22150
22200
22250
22300

RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section V - Proposed GL, Remedials, Loads (L-R)	*Scenario*	Extreme (Worst Case GW)
Drawn By	JJW	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section V - June 2025.slmd

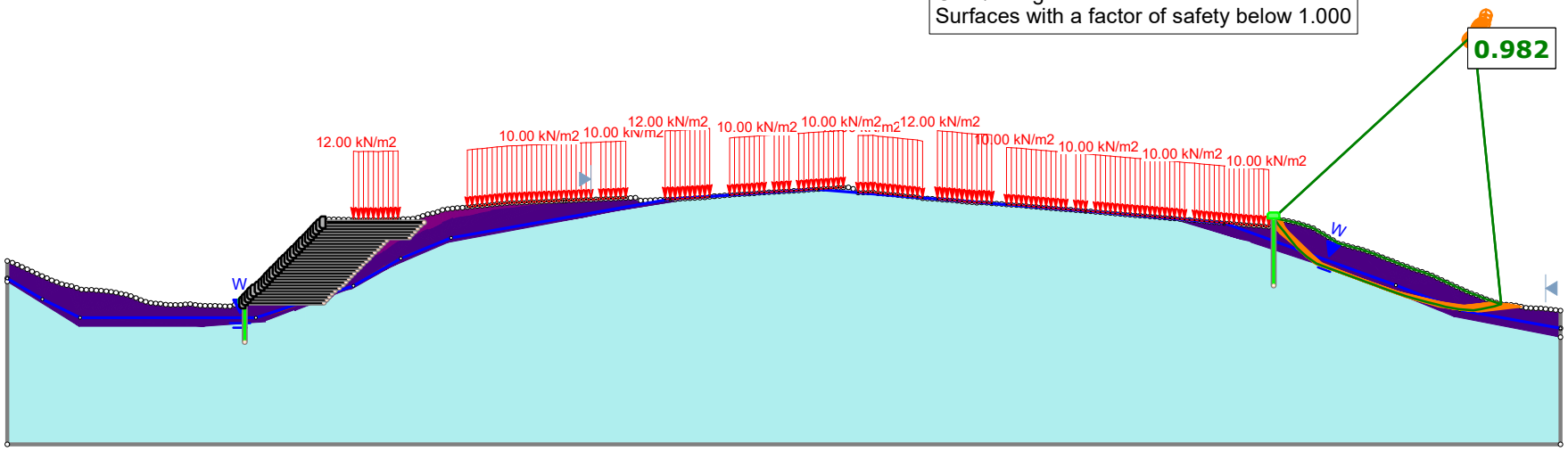
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	40	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	400	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	

▶ 0.19

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000



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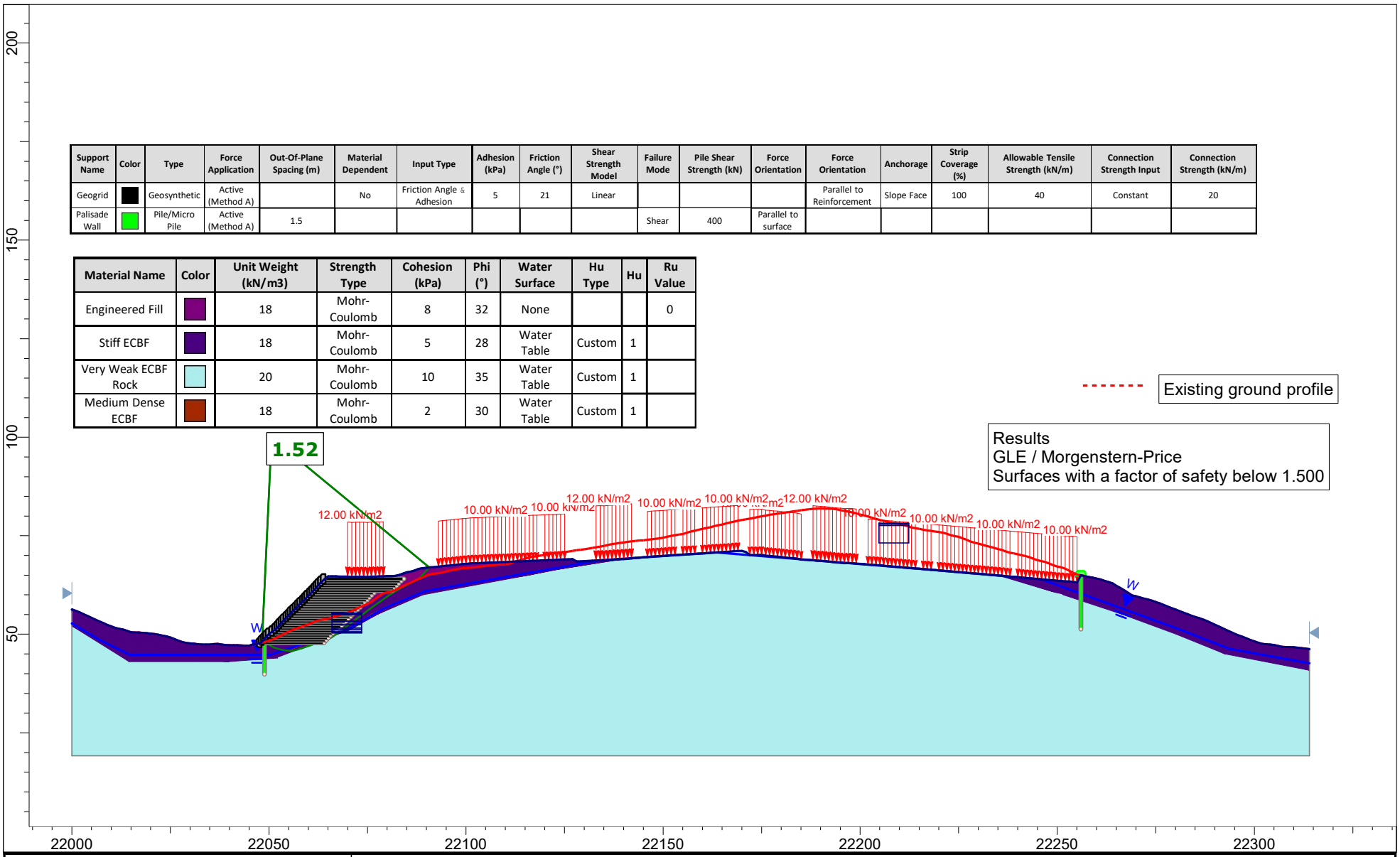
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section V - Proposed GL, Remedials, Loads (L-R)	*Scenario*	Seismic (0.19g)
Drawn By	JJW	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section V - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	40	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	400	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	



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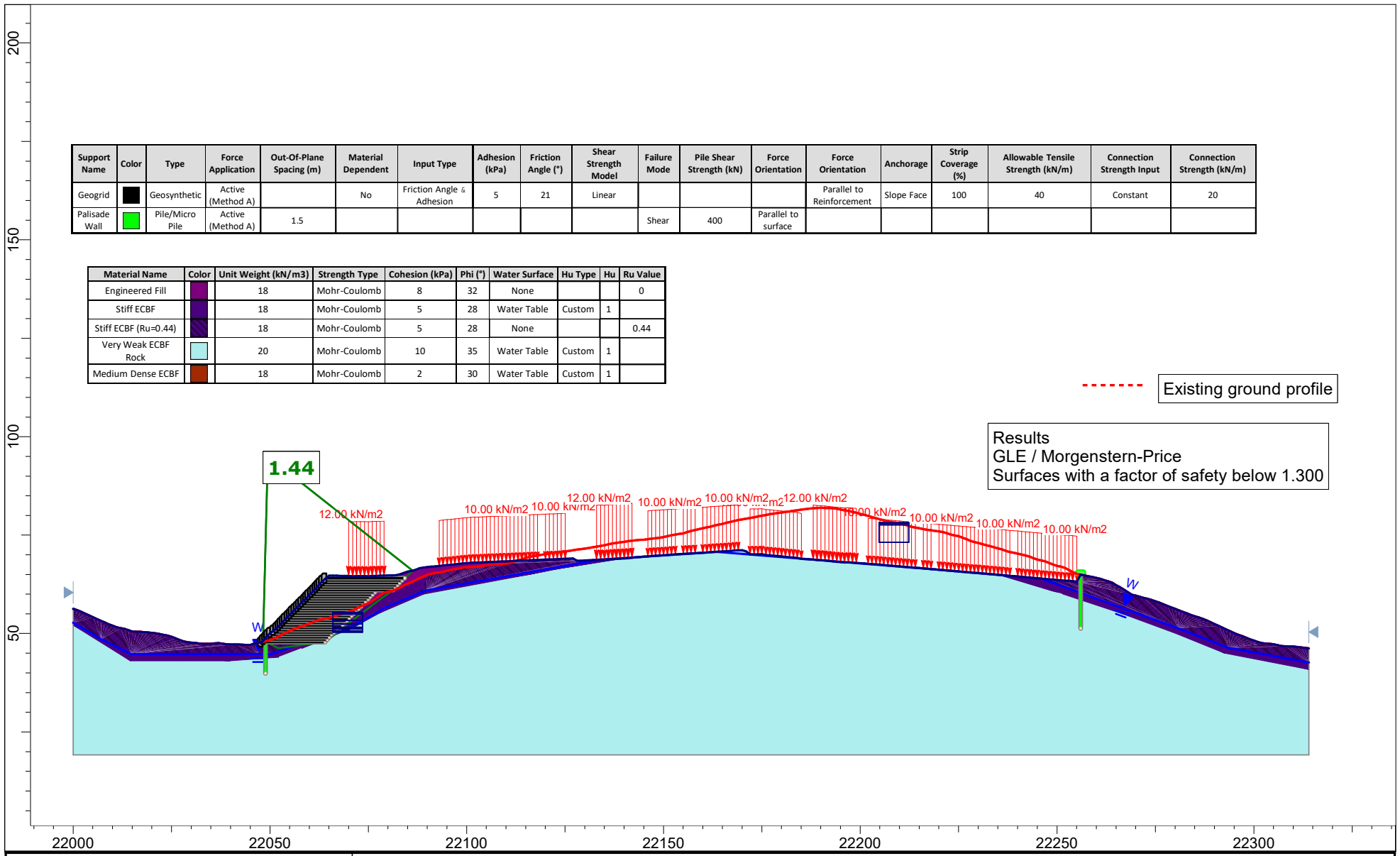
SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section V - Proposed GL, Remedials, Loads (R-L)	*Scenario*	Normal (Measured GW)
Drawn By	JJW	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section V - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	40	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	400	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	



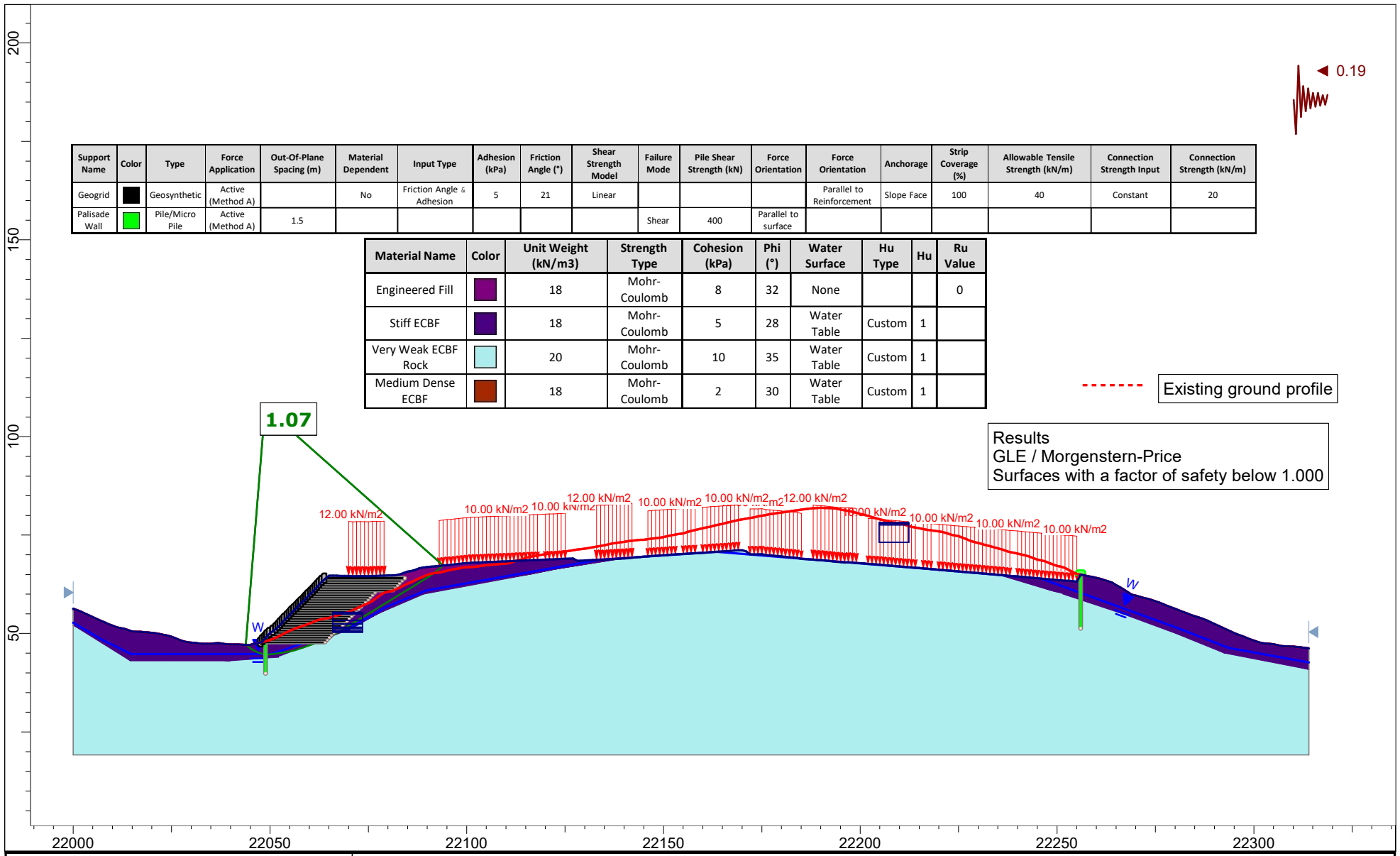
RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section V - Proposed GL, Remedials, Loads (R-L)	*Scenario*	Extreme (Worst Case GW)
Drawn By	JJW	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section V - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	40	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	400	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

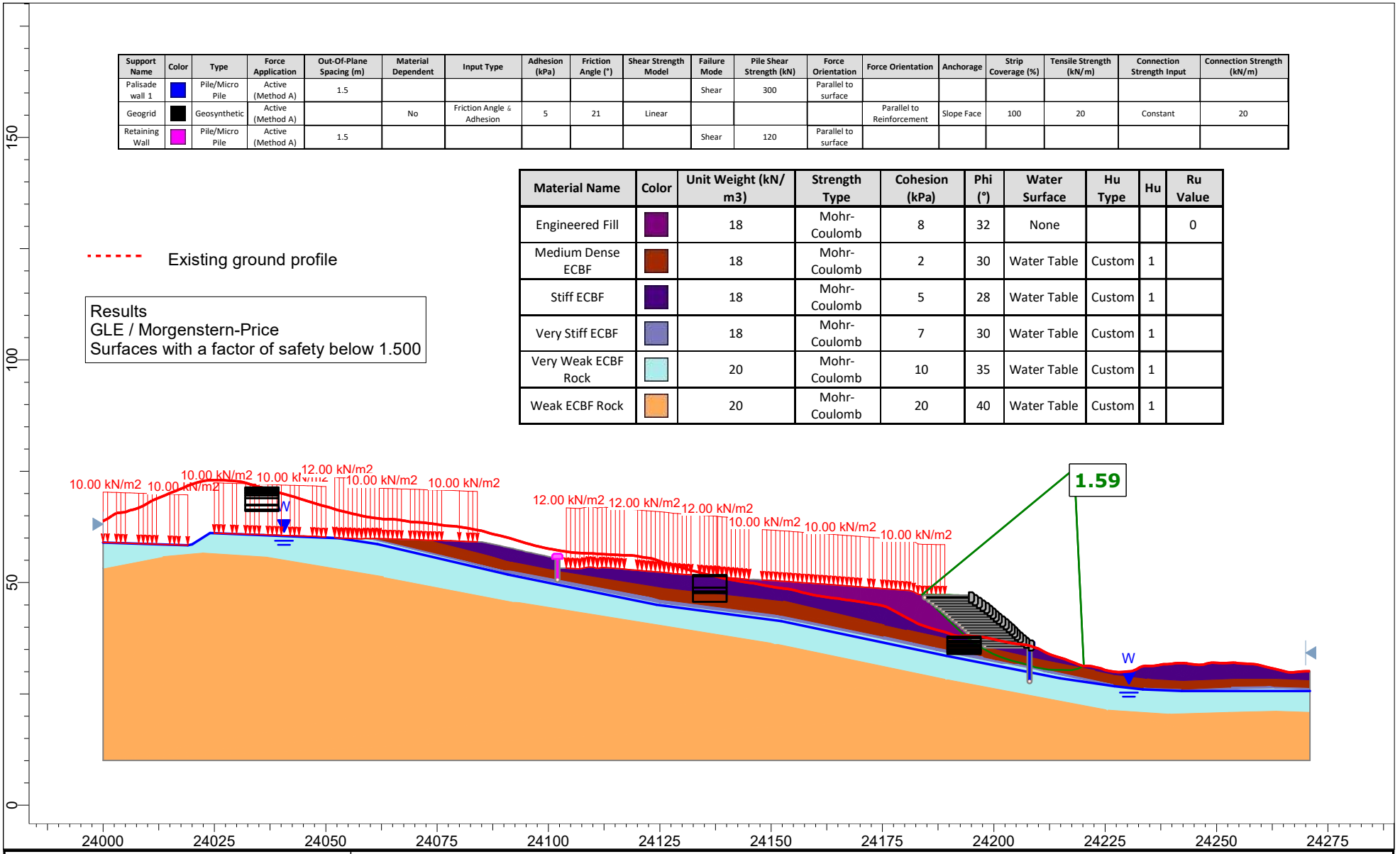
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section V - Proposed GL, Remedials, Loads (R-L)	*Scenario*	Seismic (0.19g)
Drawn By	JJW	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section V - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Palisade wall 1		Pile/Micro Pile	Active (Method A)	1.5						Shear	300	Parallel to surface						
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	120	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

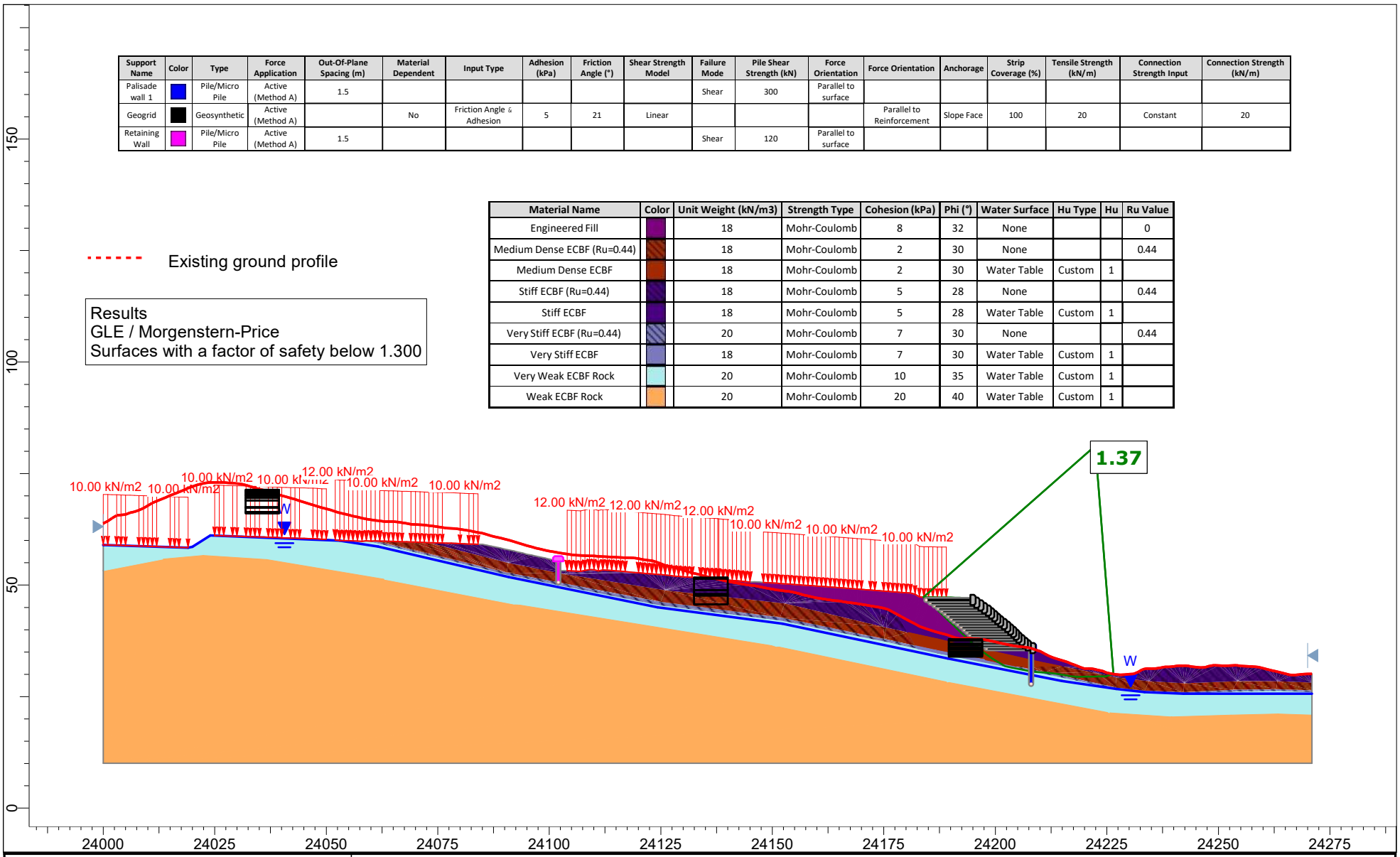
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section X - Proposed GL, Remedials, Loads	*Scenario*	Normal (Measured GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section X - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Palisade wall 1		Pile/Micro Pile	Active (Method A)	1.5						Shear	300	Parallel to surface						
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	120	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Medium Dense ECBF (Ru=0.44)		18	Mohr-Coulomb	2	30	None			0.44
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF (Ru=0.44)		20	Mohr-Coulomb	7	30	None			0.44
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300



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SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section X - Proposed GL, Remedials, Loads	*Scenario*	Extreme (Worst Credible GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section X - June 2025.slmd

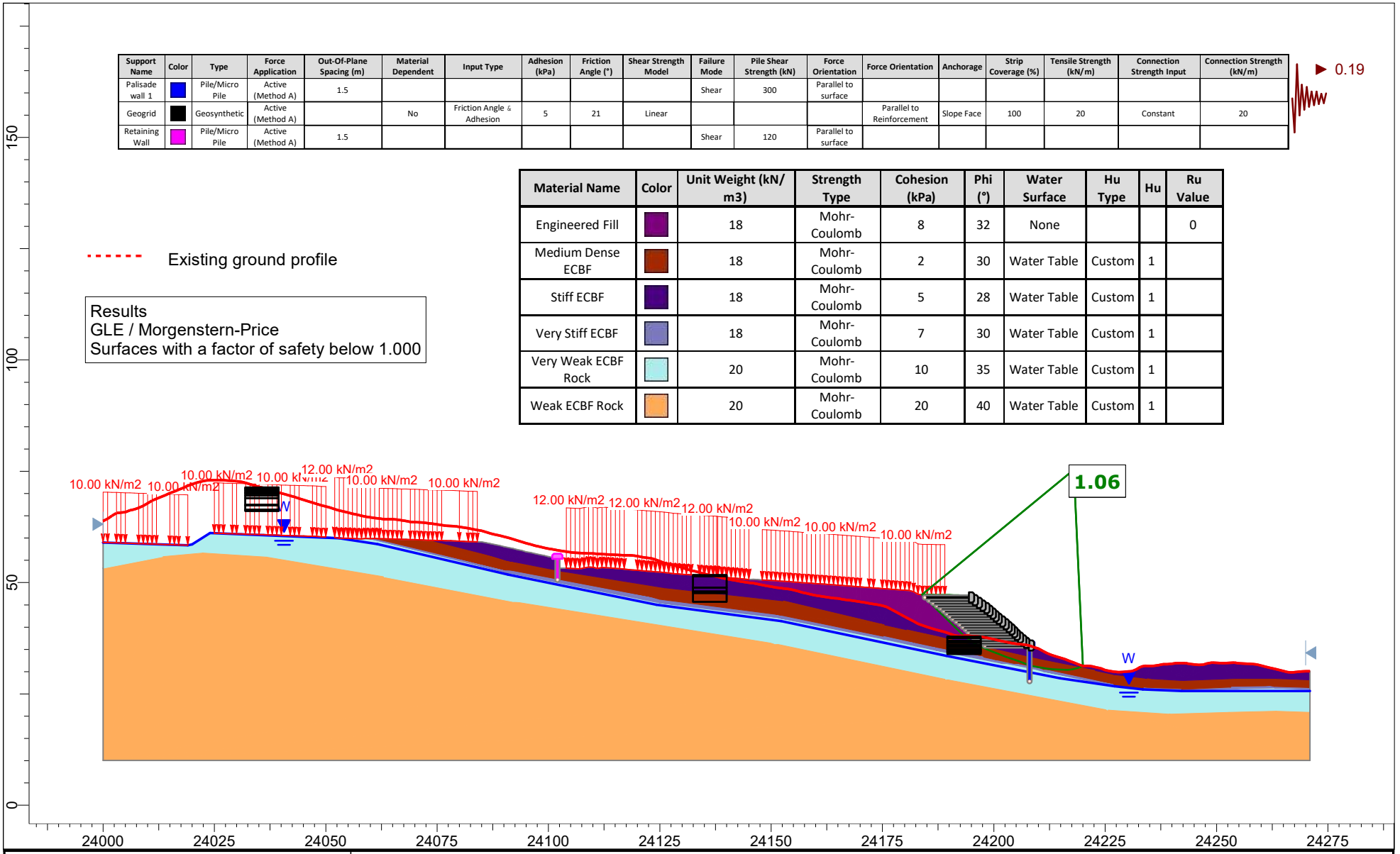
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Palisade wall 1		Pile/Micro Pile	Active (Method A)	1.5						Shear	300	Parallel to surface						
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	120	Parallel to surface						

▶ 0.19

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	



RILEY

SLIDEINTERPRET 9.029

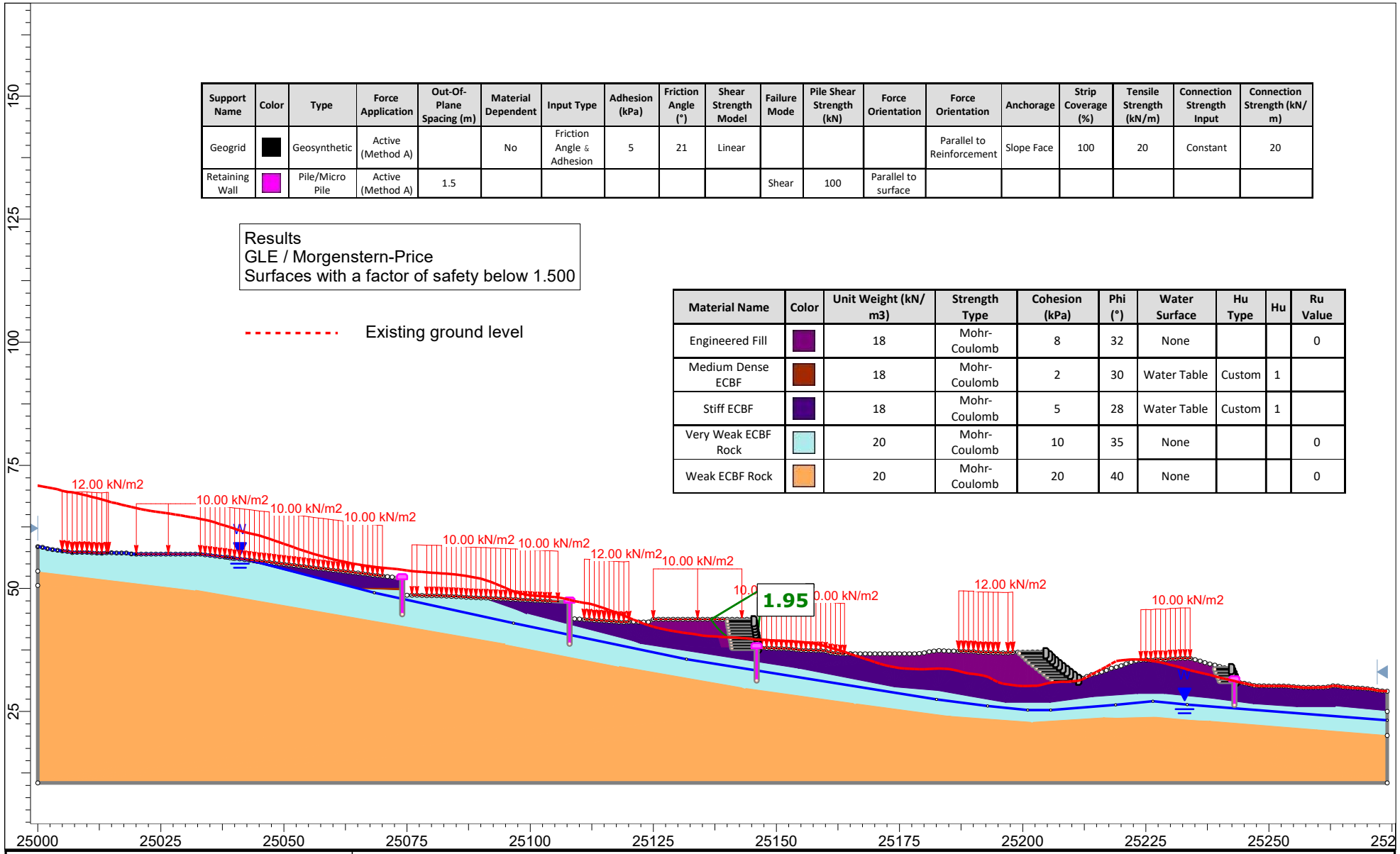
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section X - Proposed GL, Remedials, Loads	*Scenario*	Seismic (0.19g)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section X - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Existing ground level

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	None			0
Weak ECBF Rock		20	Mohr-Coulomb	20	40	None			0



RILEY

SLIDEINTERPRET 9.029

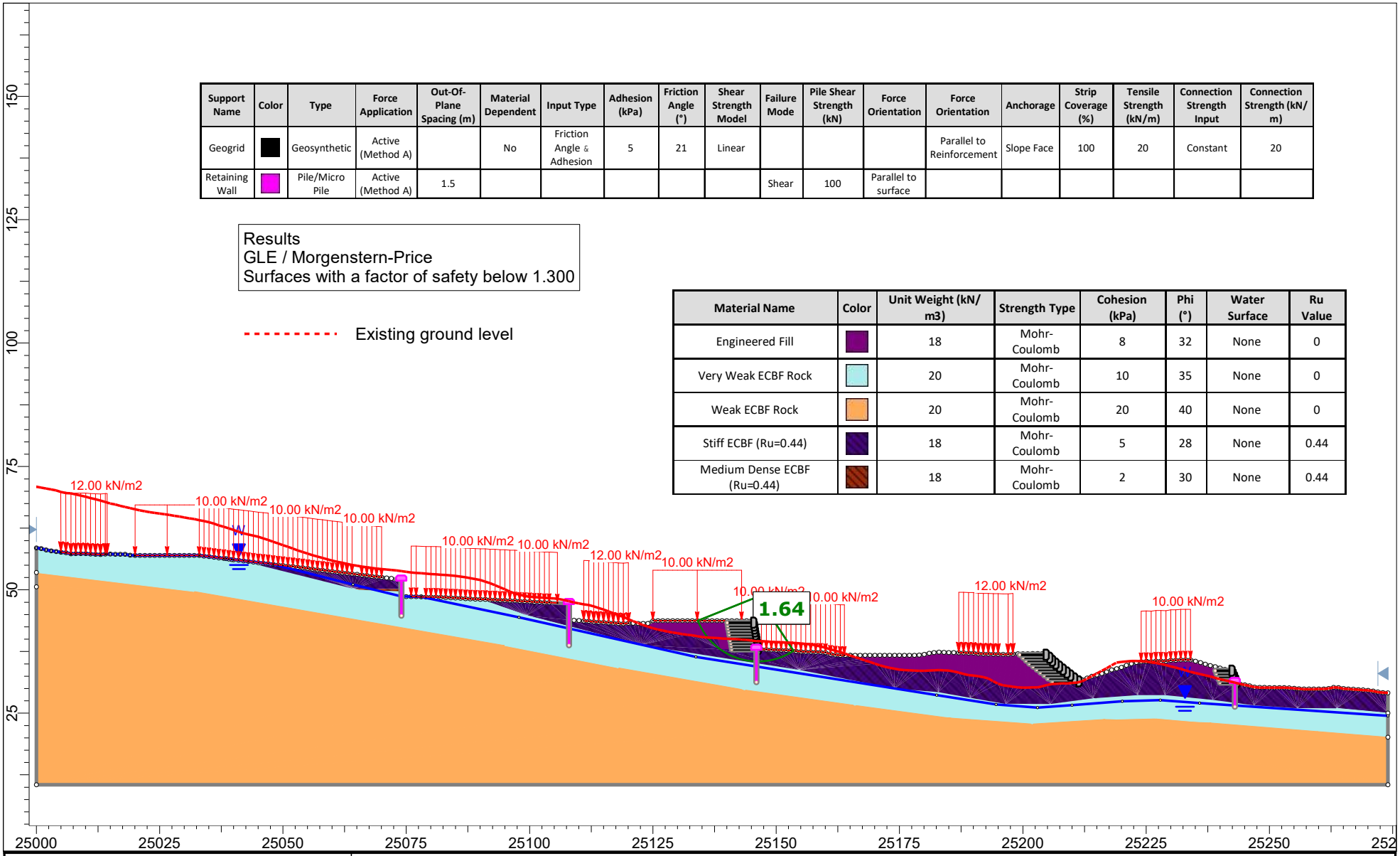
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section Y - Proposed GL, Remedials, Loads	*Scenario*	Normal (Measured GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section Y - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Existing ground level

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None	0
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	None	0
Weak ECBF Rock		20	Mohr-Coulomb	20	40	None	0
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None	0.44
Medium Dense ECBF (Ru=0.44)		18	Mohr-Coulomb	2	30	None	0.44



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SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section Y - Proposed GL, Remedials, Loads	*Scenario*	Extreme (Worst Case GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section Y - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

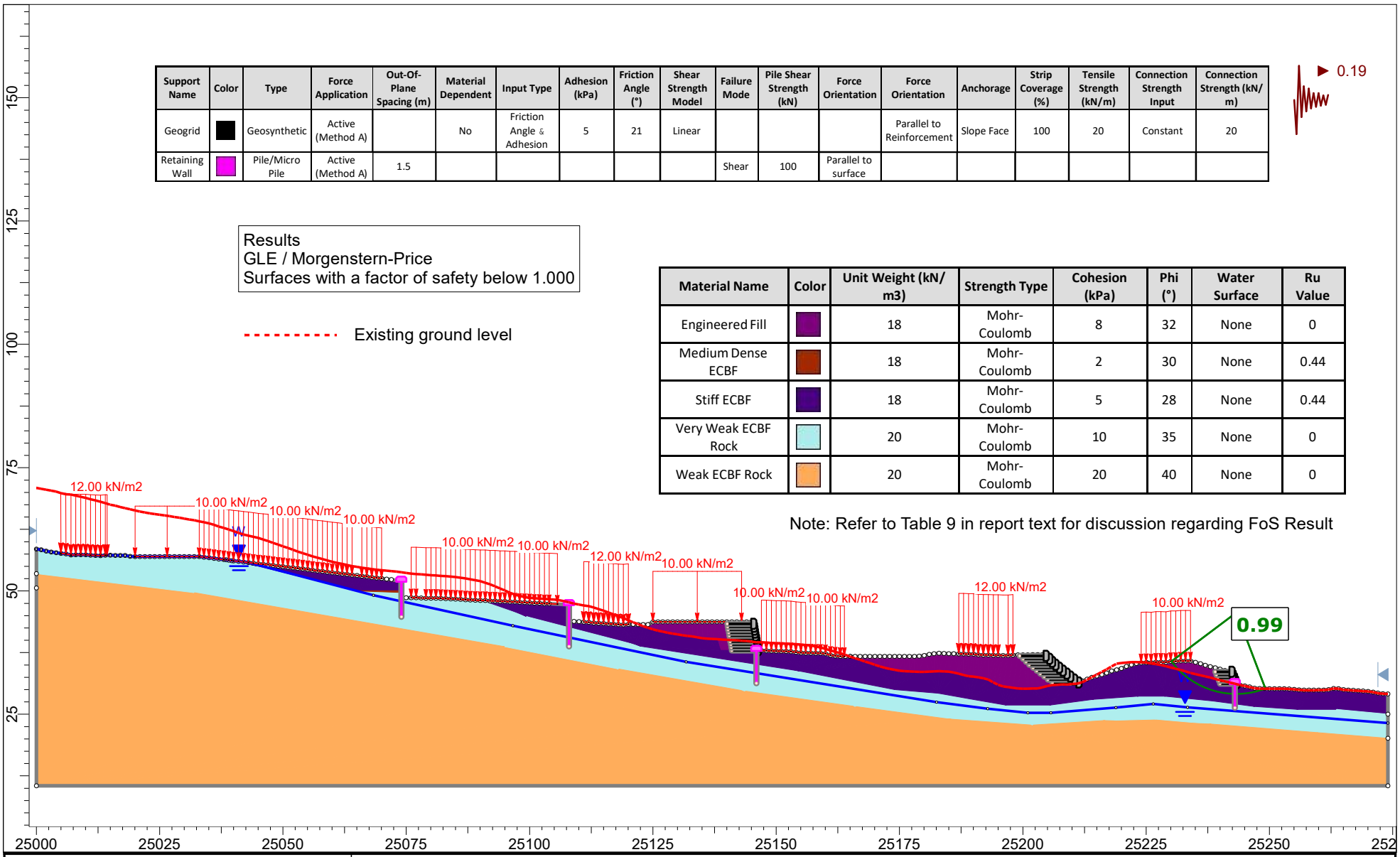
▶ 0.19

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground level

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None	0
Medium Dense ECBF		18	Mohr-Coulomb	2	30	None	0.44
Stiff ECBF		18	Mohr-Coulomb	5	28	None	0.44
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	None	0
Weak ECBF Rock		20	Mohr-Coulomb	20	40	None	0

Note: Refer to Table 9 in report text for discussion regarding FoS Result



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SLIDEINTERPRET 9.029

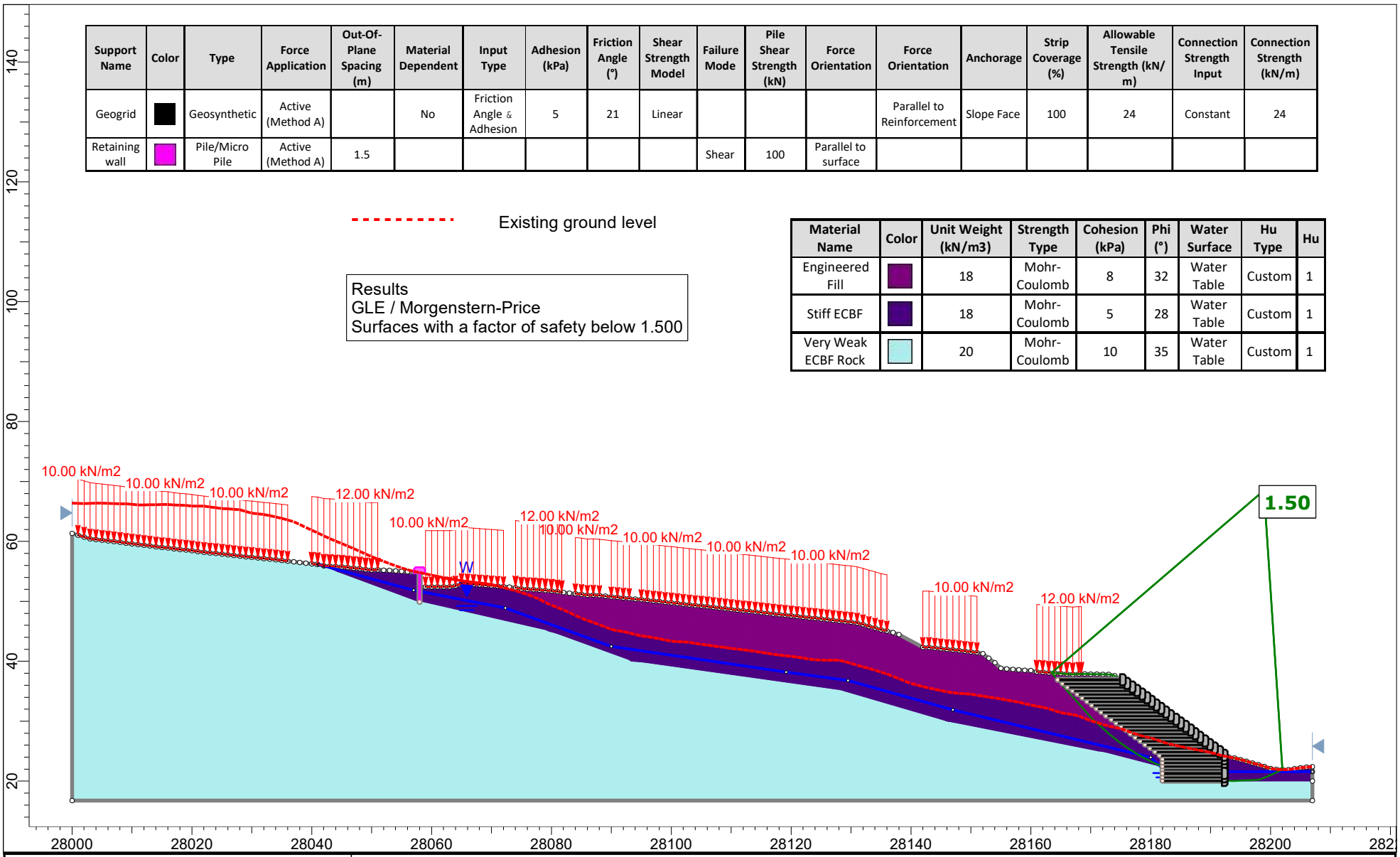
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section Y - Proposed GL, Remedials, Loads	*Scenario*	Seismic (0.19g)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section Y - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	24	Constant	24
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

Existing ground level

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1



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SLIDEINTERPRET 9.029

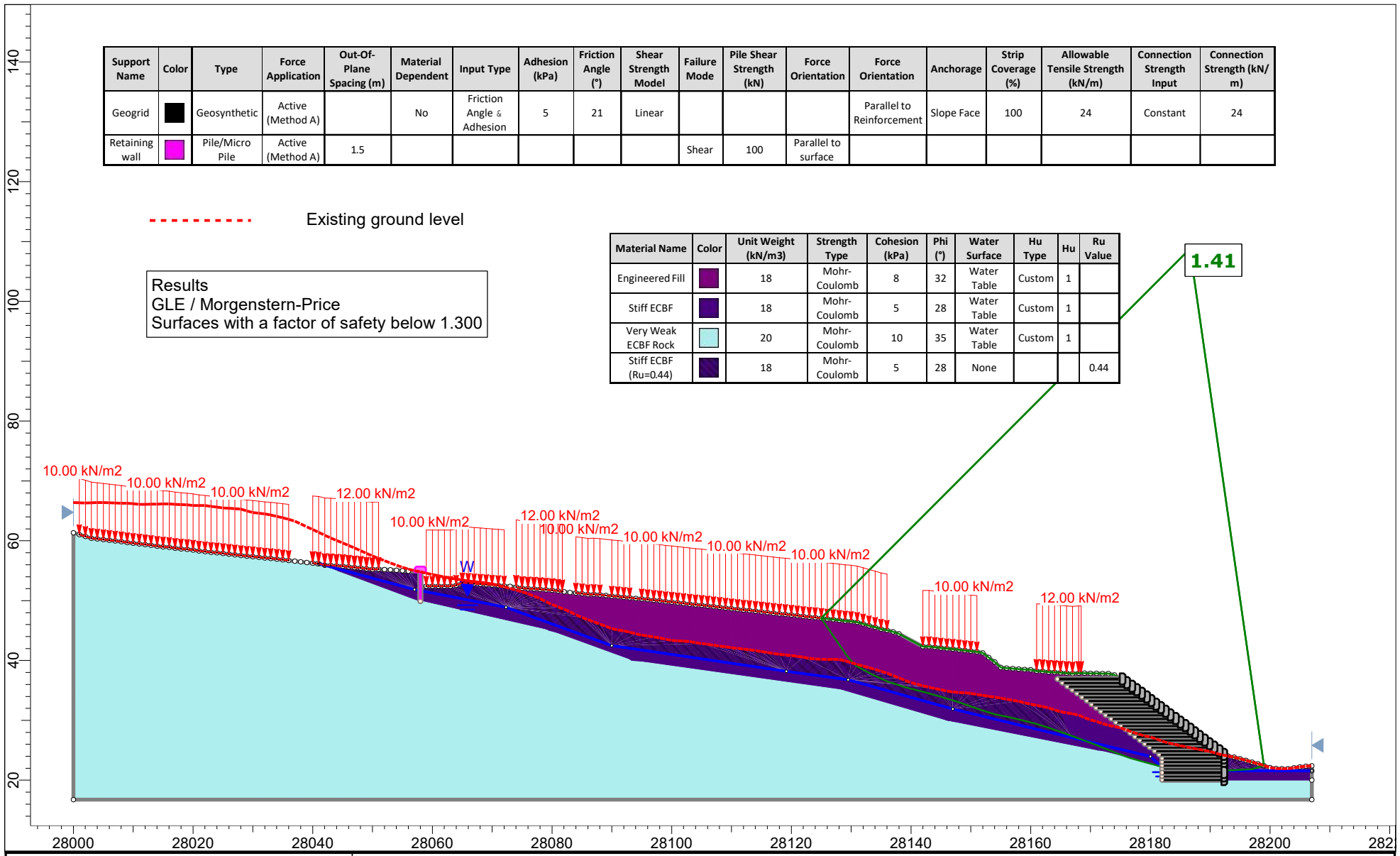
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section AB - Proposed GL, Remedial, Loads	Scenario	Normal (Measured GW)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section AB - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	24	Constant	24
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

Existing ground level

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section AB - Proposed GL, Remedial, Loads	*Scenario*	Extreme (Worst Credible GW)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section AB - June 2025.slmd

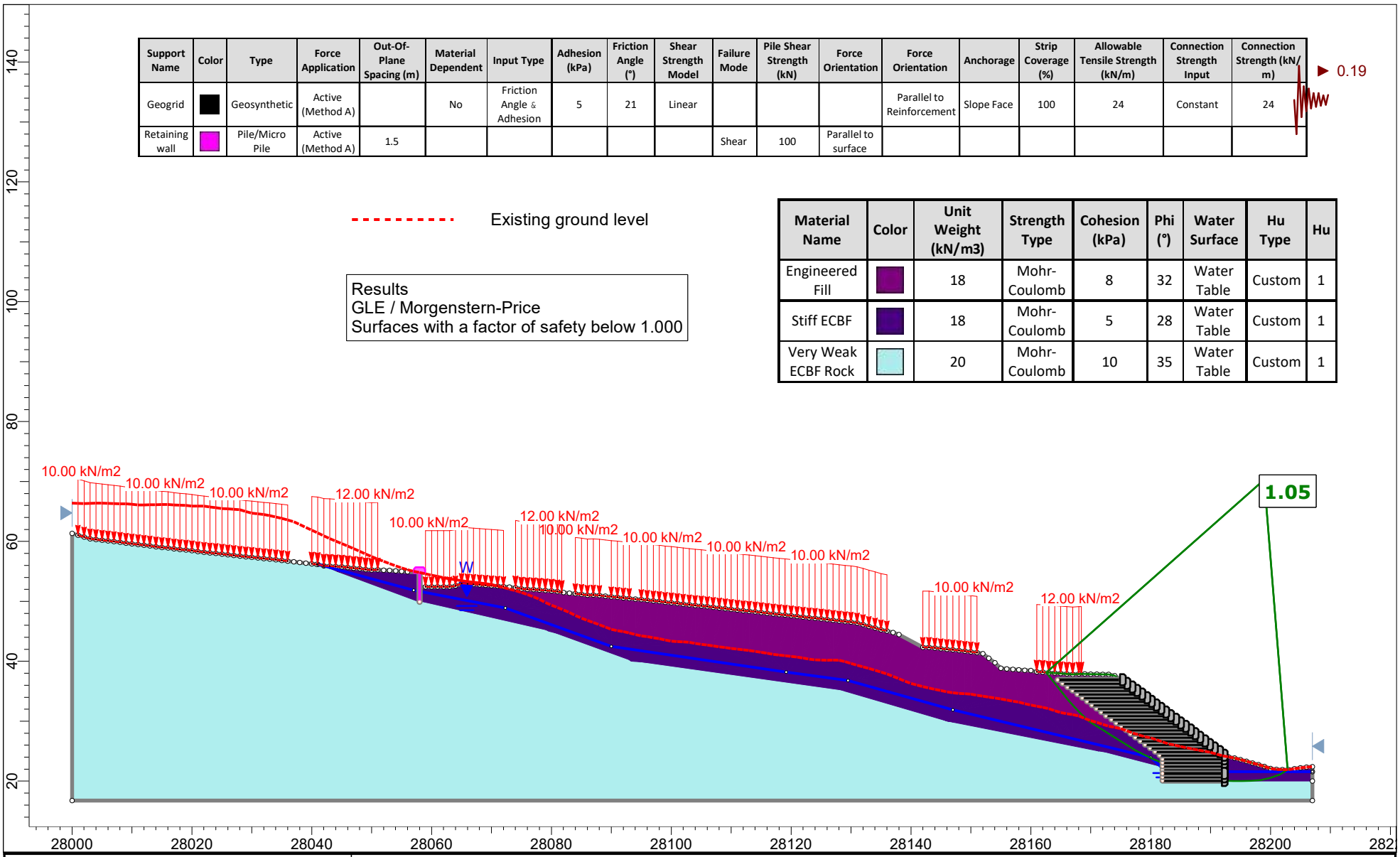
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	24	Constant	24
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

▶ 0.19

Existing ground level

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section AB - Proposed GL, Remedial, Loads	*Scenario*	Seismic (0.19g)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section AB - June 2025.slmd

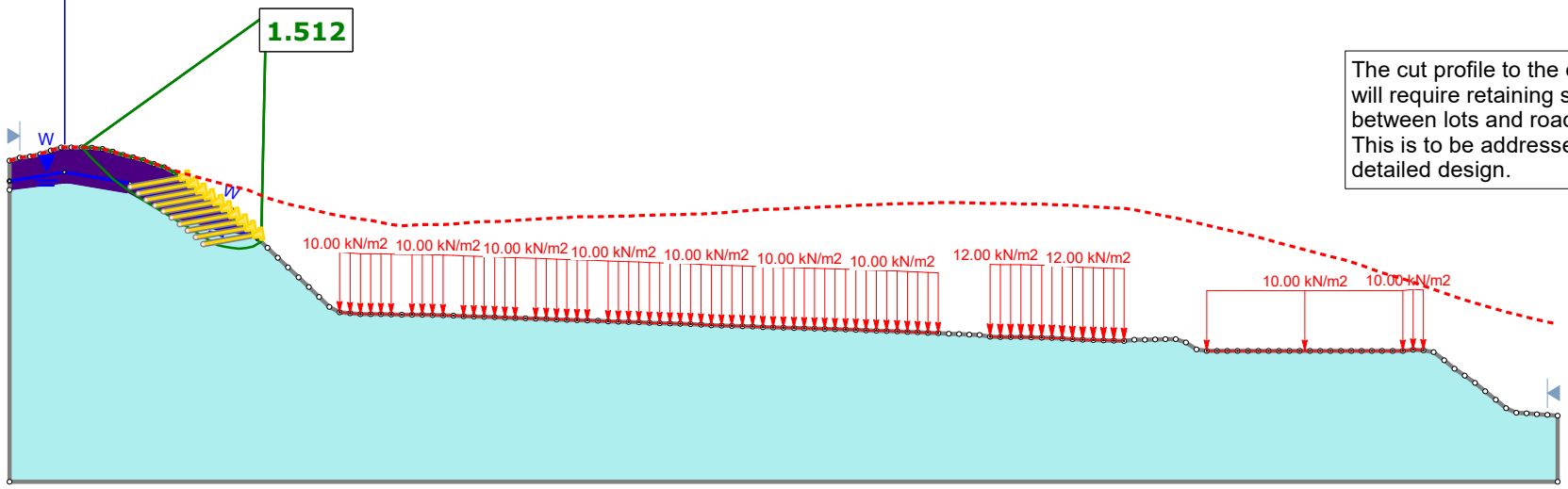
Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Force Orientation
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes	Parallel to Reinforcement

Existing ground level

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.500

Approx. Western Site Boundary



The cut profile to the east will require retaining solutions between lots and roads. This is to be addressed during detailed design.

RILEY

SLIDEINTERPRET 9.029

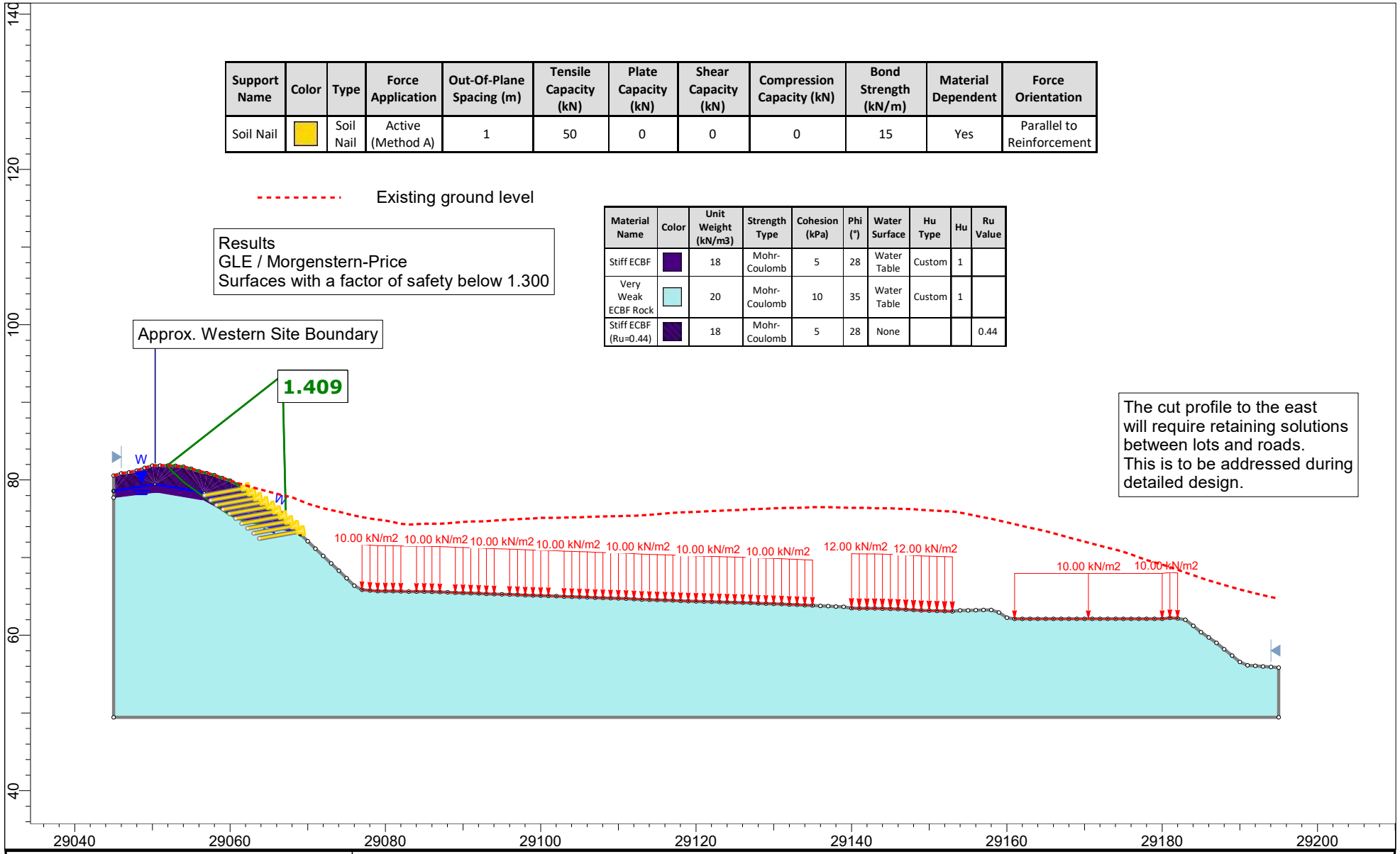
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section AC - Proposed GL, Remedials, Loads	Scenario	Normal (Measured GW)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section AC - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Force Orientation
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes	Parallel to Reinforcement

Existing ground level

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.300



The cut profile to the east will require retaining solutions between lots and roads. This is to be addressed during detailed design.

RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section AC - Proposed GL, Remedials, Loads	Scenario	Extreme (Worst Credible GW)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section AC - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Force Orientation
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes	Parallel to Reinforcement

▶ 0.19

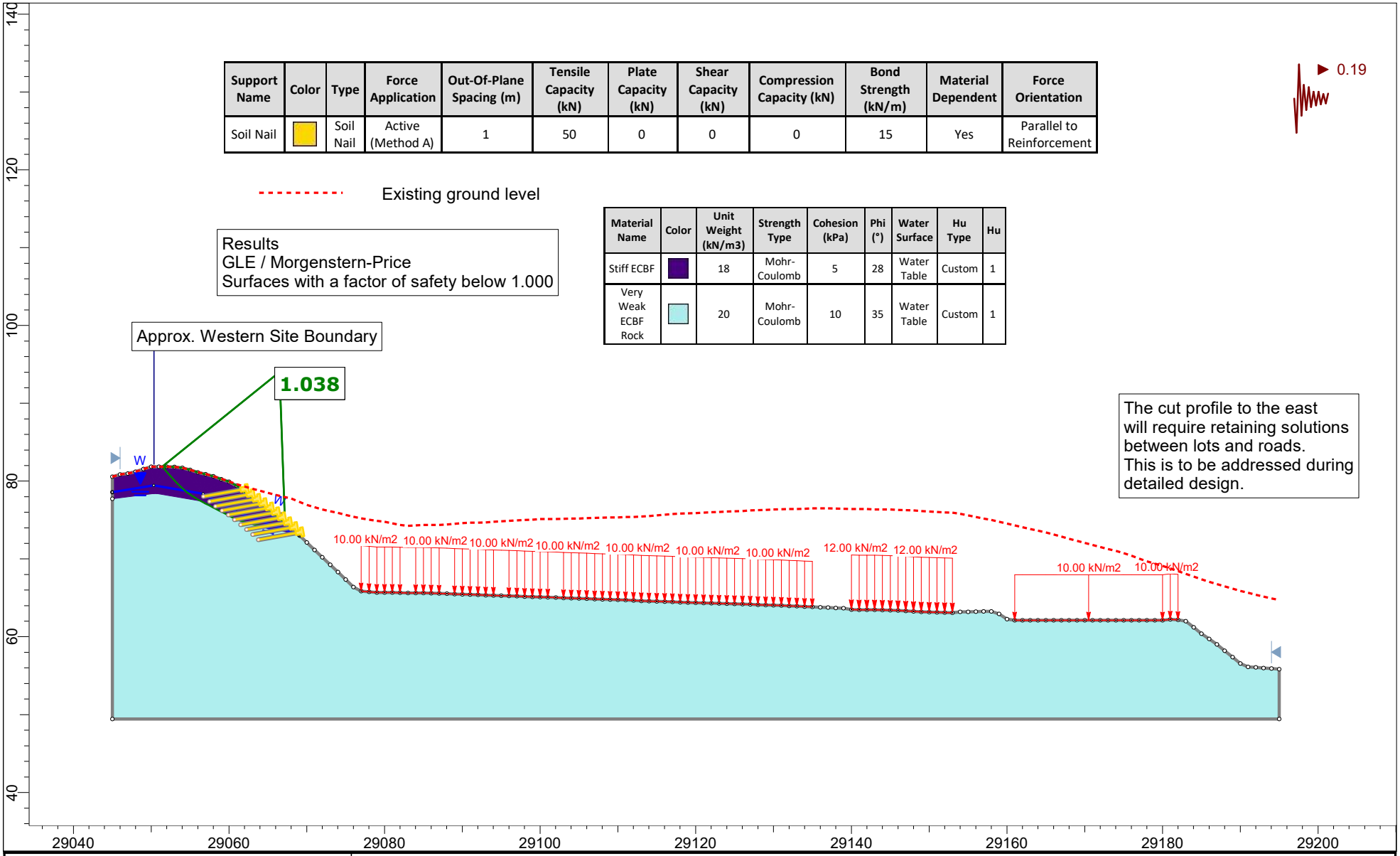
Existing ground level

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1

Approx. Western Site Boundary

The cut profile to the east will require retaining solutions between lots and roads. This is to be addressed during detailed design.



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section AC - Proposed GL, Remedials, Loads	Scenario	Seismic (0.19g)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section AC - June 2025.slmd

Response (11)21

Slope Stability Outputs

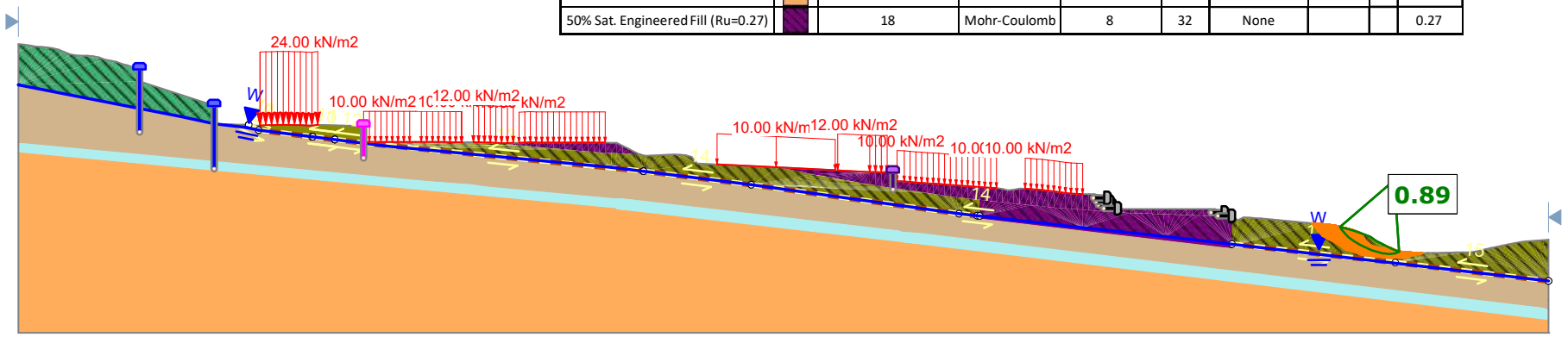
Proposed ground level with surcharges and partially saturated fill

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Palisade wall 1		Pile/Micro Pile	Active (Method A)	1.5						Shear	390	Parallel to surface						
Palisade wall 2		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
300 SED Timber Retaining Wall		Pile/Micro Pile	Active (Method A)	1.2						Shear	65	Parallel to surface						

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1	
Firm NA		18	Mohr-Coulomb	3	22	Water Table	Custom	1	
Firm NA (Ru=0.44)		18	Mohr-Coulomb	3	22	None			0.44
Stiff NA		18	Mohr-Coulomb	5	25	Water Table	Custom	1	
Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	25	None			0.44
Weak Layer NA		18	Mohr-Coulomb	0	12	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27



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SLIDEINTERPRET 9.029

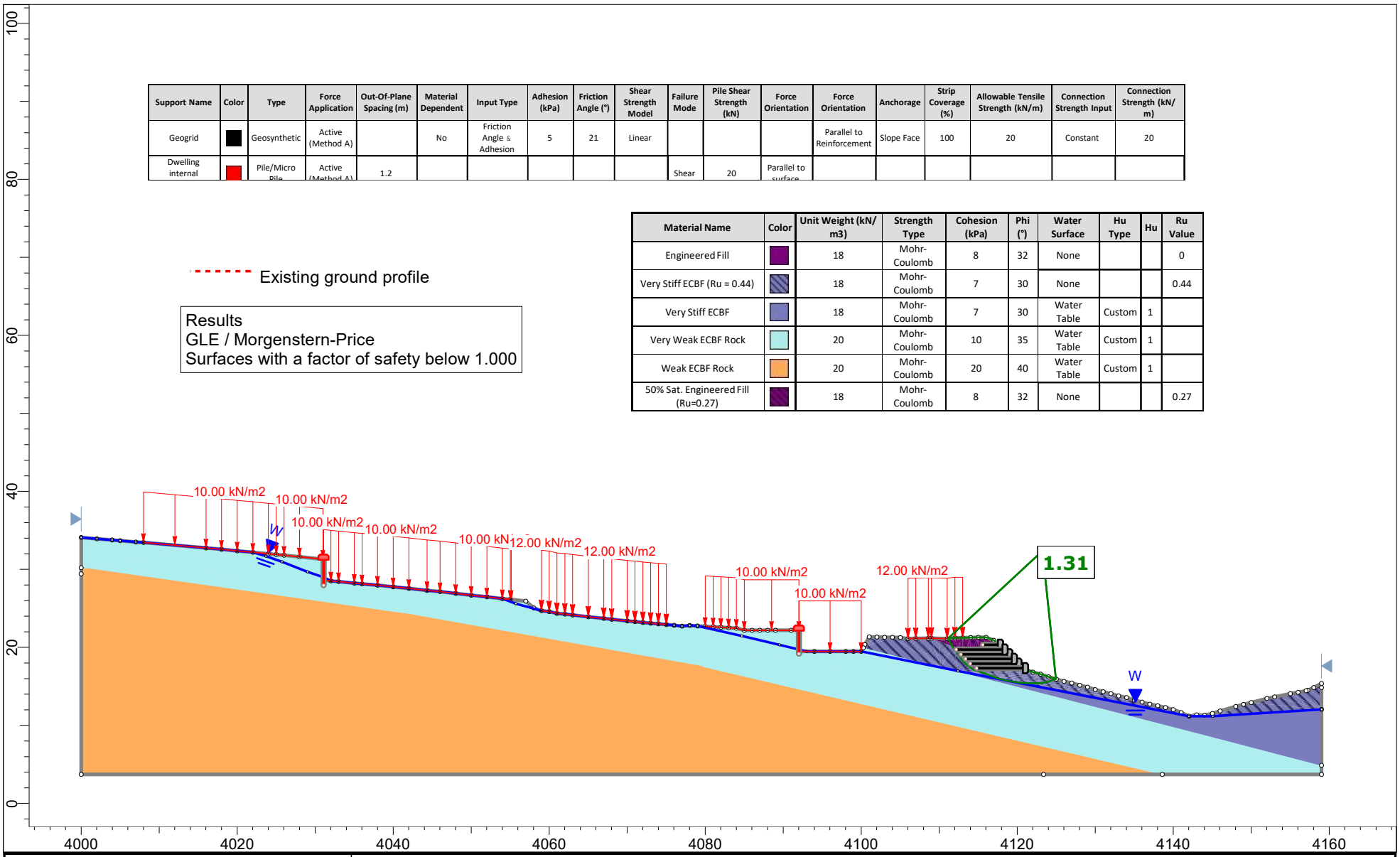
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section A Proposed GL, Remedials, Loads	Scenario	Extreme (50% Fill Saturation)
Drawn By	AB	Company	Riley Consultants Ltd
Date	11/12/2024, 1:30:46 pm	File Name	Section A - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Dwelling internal		Pile/Micro Pile	Active (Method A)	1.2						Shear	20	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	None			0
Very Stiff ECBF (Ru = 0.44)		18	Mohr-Coulomb	7	30	None			0.44
Very Stiff ECBF		18	Mohr-Coulomb	7	30	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000



RILEY

SLIDEINTERPRET 9.029

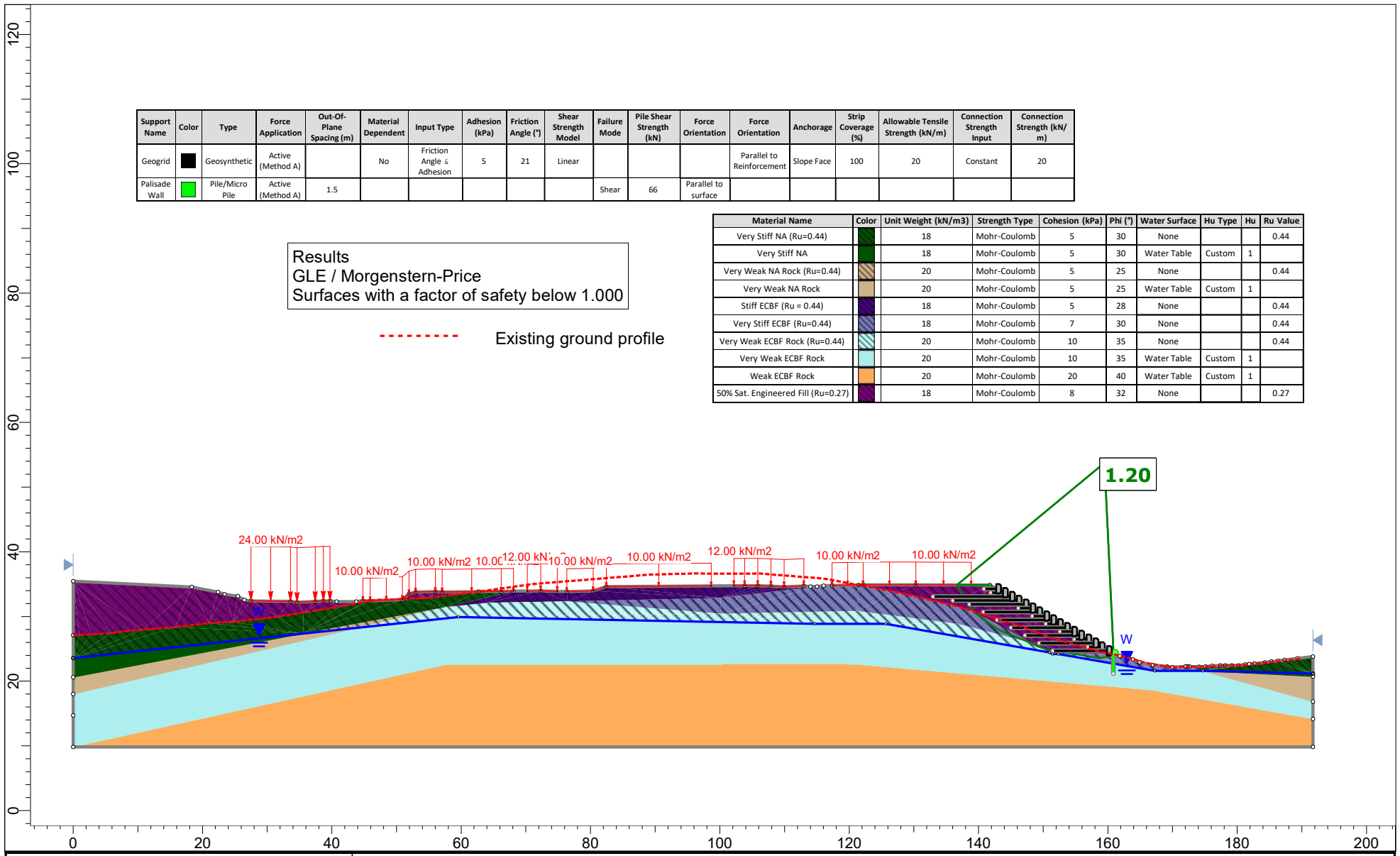
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Section D - Proposed GL, Remedials, Loads	*Scenario*	Extreme (50% Fill Saturation)
Drawn By	RS	*Company*	Riley Consultants Ltd
Date	12/12/2024, 4:26:19 pm	*File Name*	Section D - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	66	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Very Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	30	None			0.44
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock (Ru=0.44)		20	Mohr-Coulomb	5	25	None			0.44
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Stiff ECBF (Ru = 0.44)		18	Mohr-Coulomb	5	28	None			0.44
Very Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	7	30	None			0.44
Very Weak ECBF Rock (Ru=0.44)		20	Mohr-Coulomb	10	35	None			0.44
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground profile



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SLIDEINTERPRET 9.029

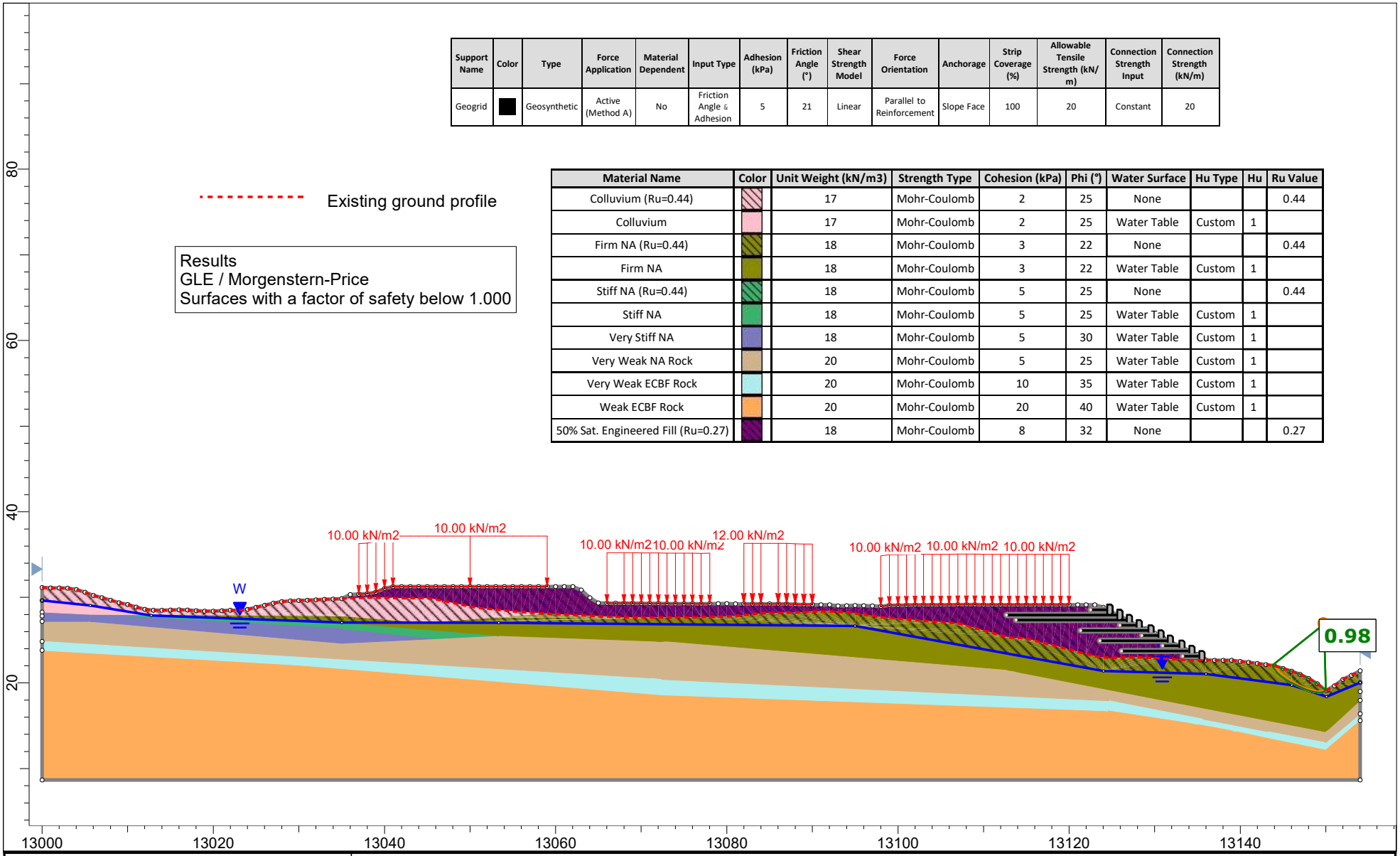
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section H - Remedials	*Scenario*	Extreme (50% Fill Saturation)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	20/12/2024	*File Name*	Section H - June 2025.slmd

Support Name	Color	Type	Force Application	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)	No	Friction Angle & Adhesion	5	21	Linear	Parallel to Reinforcement	Slope Face	100	20	Constant	20

Existing ground profile

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Colluvium (Ru=0.44)		17	Mohr-Coulomb	2	25	None			0.44
Colluvium		17	Mohr-Coulomb	2	25	Water Table	Custom	1	
Firm NA (Ru=0.44)		18	Mohr-Coulomb	3	22	None			0.44
Firm NA		18	Mohr-Coulomb	3	22	Water Table	Custom	1	
Stiff NA (Ru=0.44)		18	Mohr-Coulomb	5	25	None			0.44
Stiff NA		18	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Stiff NA		18	Mohr-Coulomb	5	30	Water Table	Custom	1	
Very Weak NA Rock		20	Mohr-Coulomb	5	25	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27



RILEY

SLIDEINTERPRET 9.029

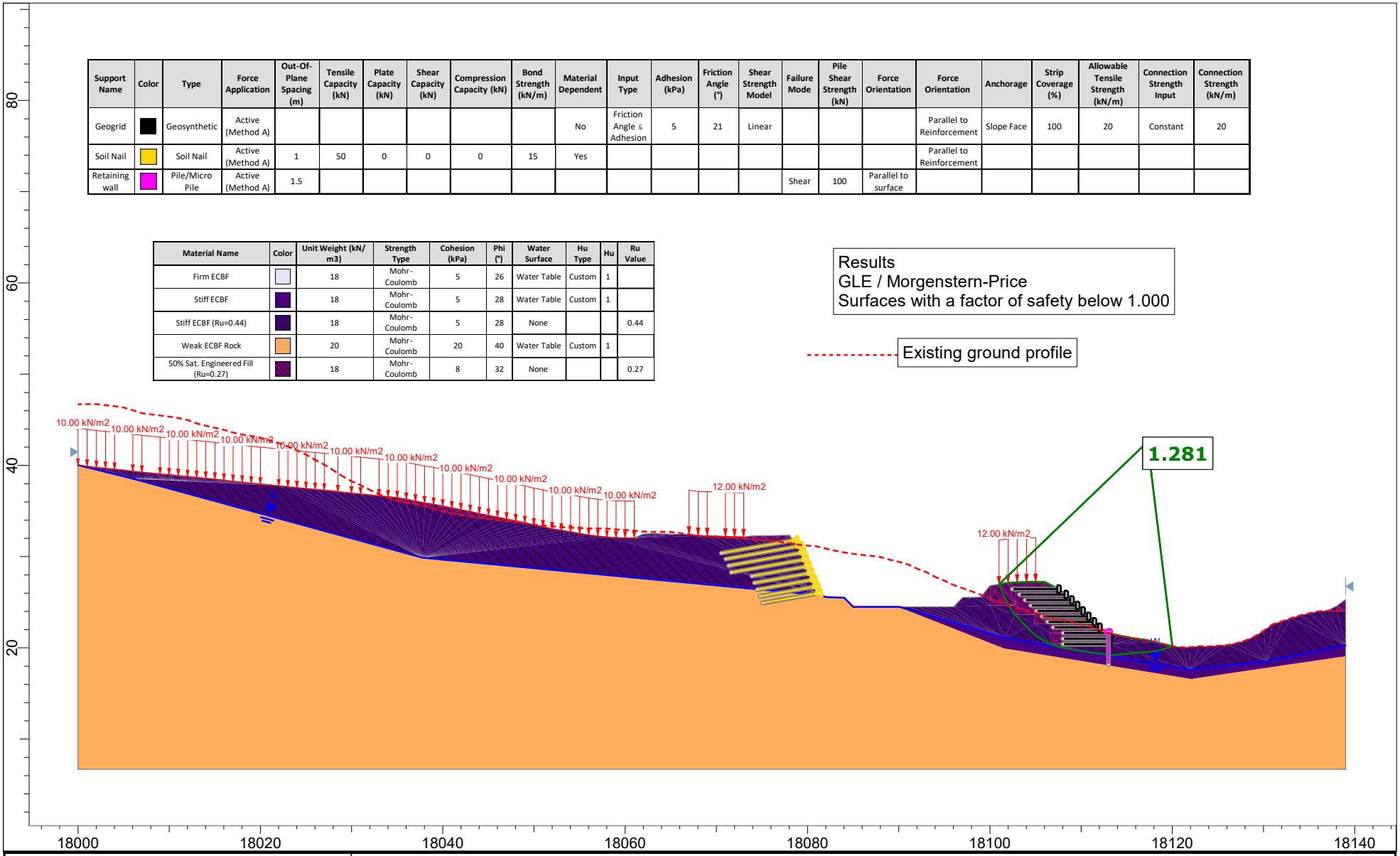
Project	240065 - Russell Road, Wainui - Stage 1		
Group	Proposed GL Section M - Remedials	*Scenario*	Extreme (50% Fill Saturation)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	20/12/2024	*File Name*	Section M - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground profile



RILEY

SLIDEINTERPRET 9.029

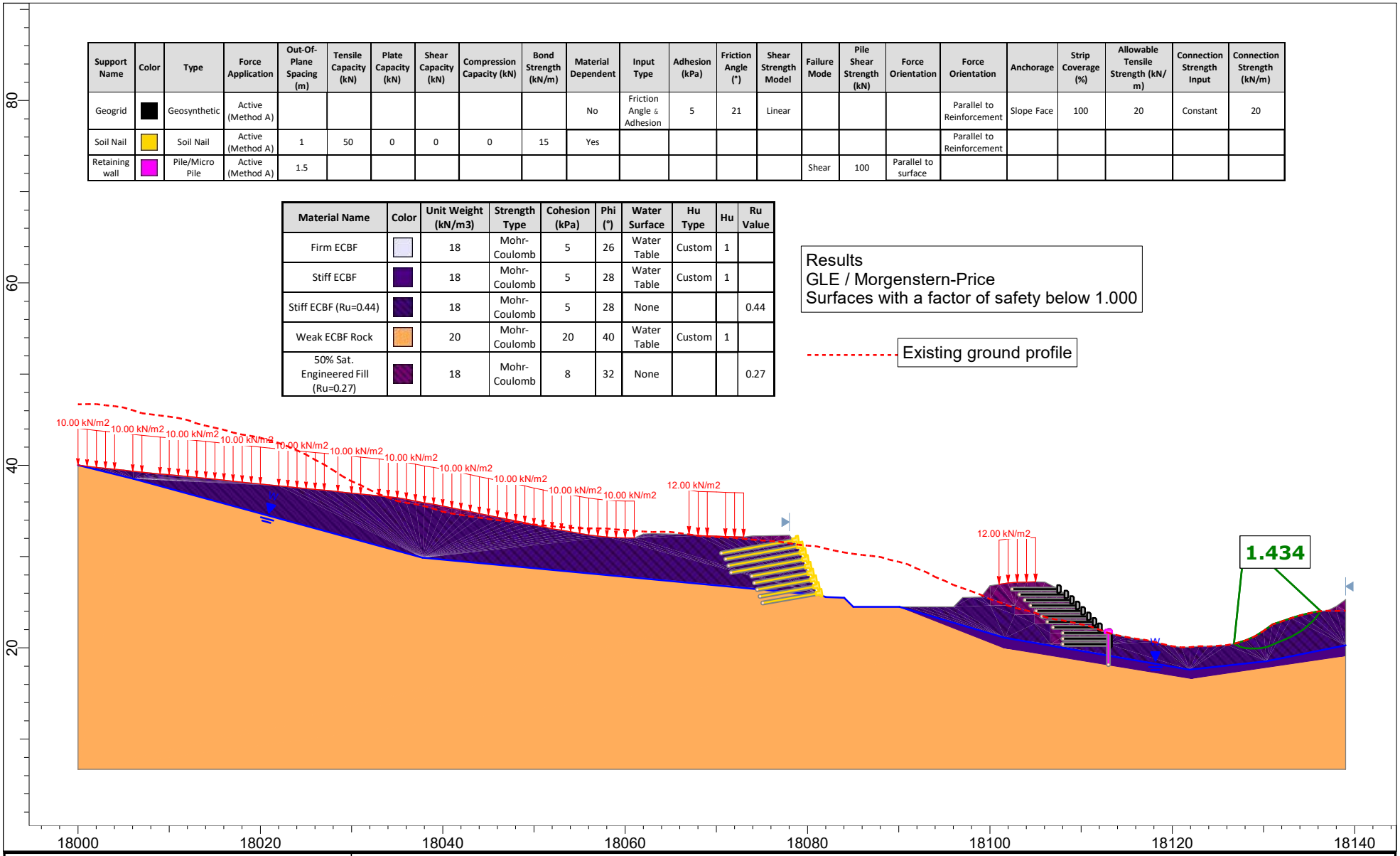
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (L-R)	*Scenario*	Extreme (50% Fill Saturation)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section R - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Tensile Capacity (kN)	Plate Capacity (kN)	Shear Capacity (kN)	Compression Capacity (kN)	Bond Strength (kN/m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)							No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Soil Nail		Soil Nail	Active (Method A)	1	50	0	0	0	15	Yes								Parallel to Reinforcement					
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5											Shear	100	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Firm ECBF		18	Mohr-Coulomb	5	26	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Weak ECBF Rock		20	Mohr-Coulomb	20	40	Water Table	Custom	1	
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground profile



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SLIDEINTERPRET 9.029

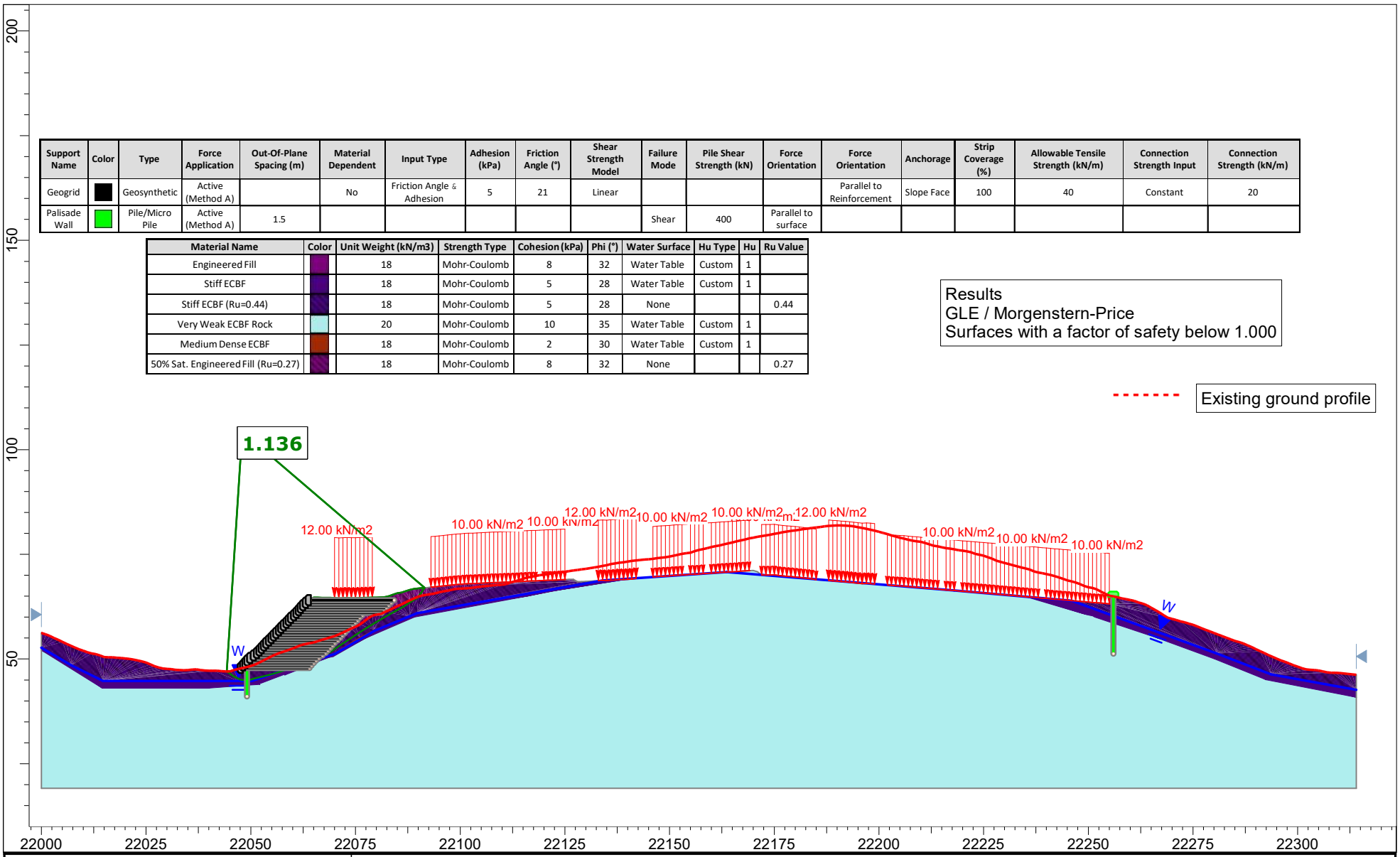
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section R Proposed GL, Remedials, Loads (R-L)	Scenario	Extreme (50% Fill Saturation)
Drawn By	RS	Company	Riley Consulants Ltd
Date	10/12/2024	File Name	Section R - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	40	Constant	20
Palisade Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	400	Parallel to surface						

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Medium Dense ECBF		18	Mohr-Coulomb	2	30	Water Table	Custom	1	
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground profile



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SLIDEINTERPRET 9.029

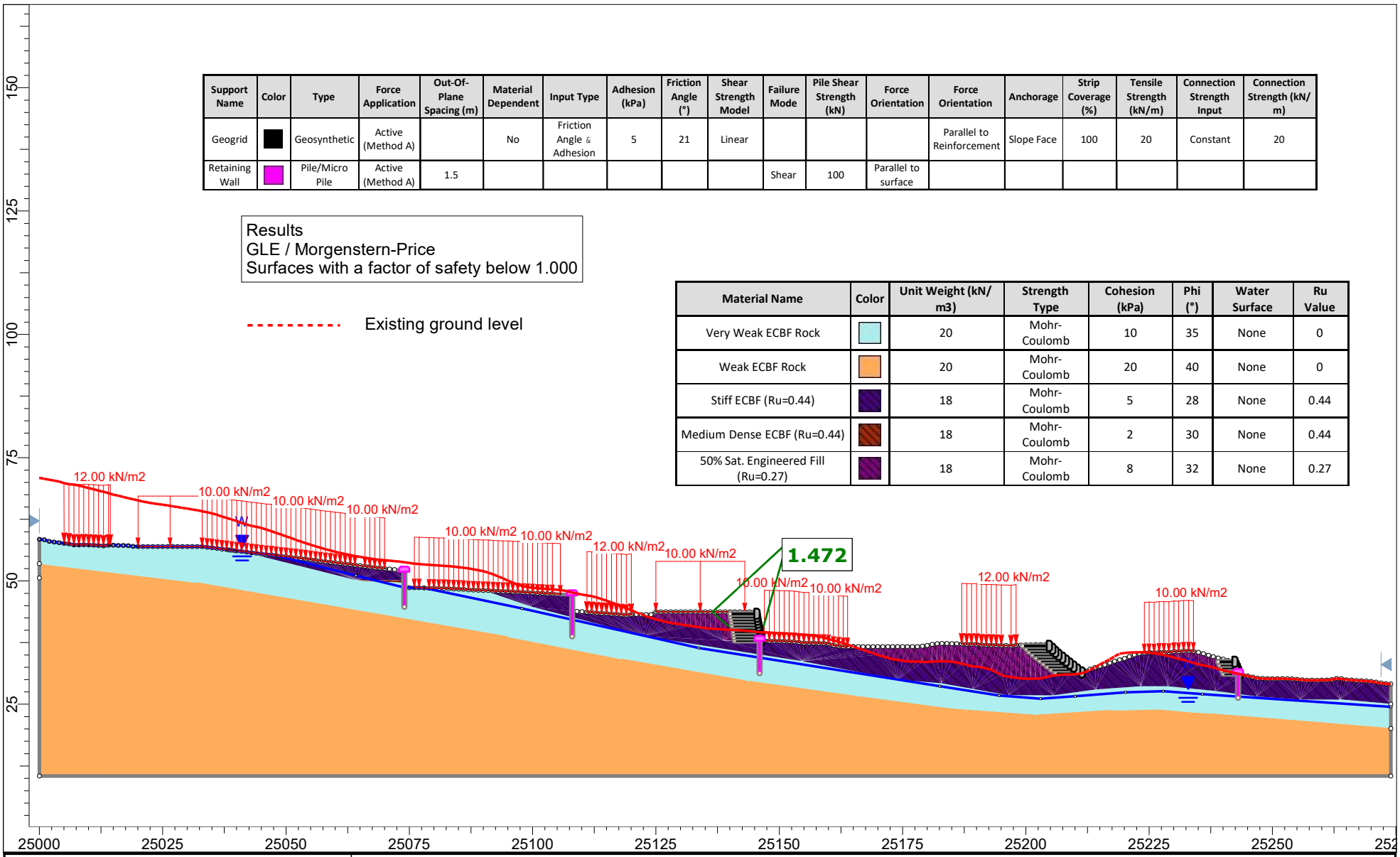
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section V - Proposed GL, Remedials, Loads (R-L)	*Scenario*	Extreme (50% Fill Saturation)
Drawn By	JJW	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section V - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	20	Constant	20
Retaining Wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Existing ground level

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	None	0
Weak ECBF Rock		20	Mohr-Coulomb	20	40	None	0
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None	0.44
Medium Dense ECBF (Ru=0.44)		18	Mohr-Coulomb	2	30	None	0.44
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None	0.27



RILEY

SLIDEINTERPRET 9.029

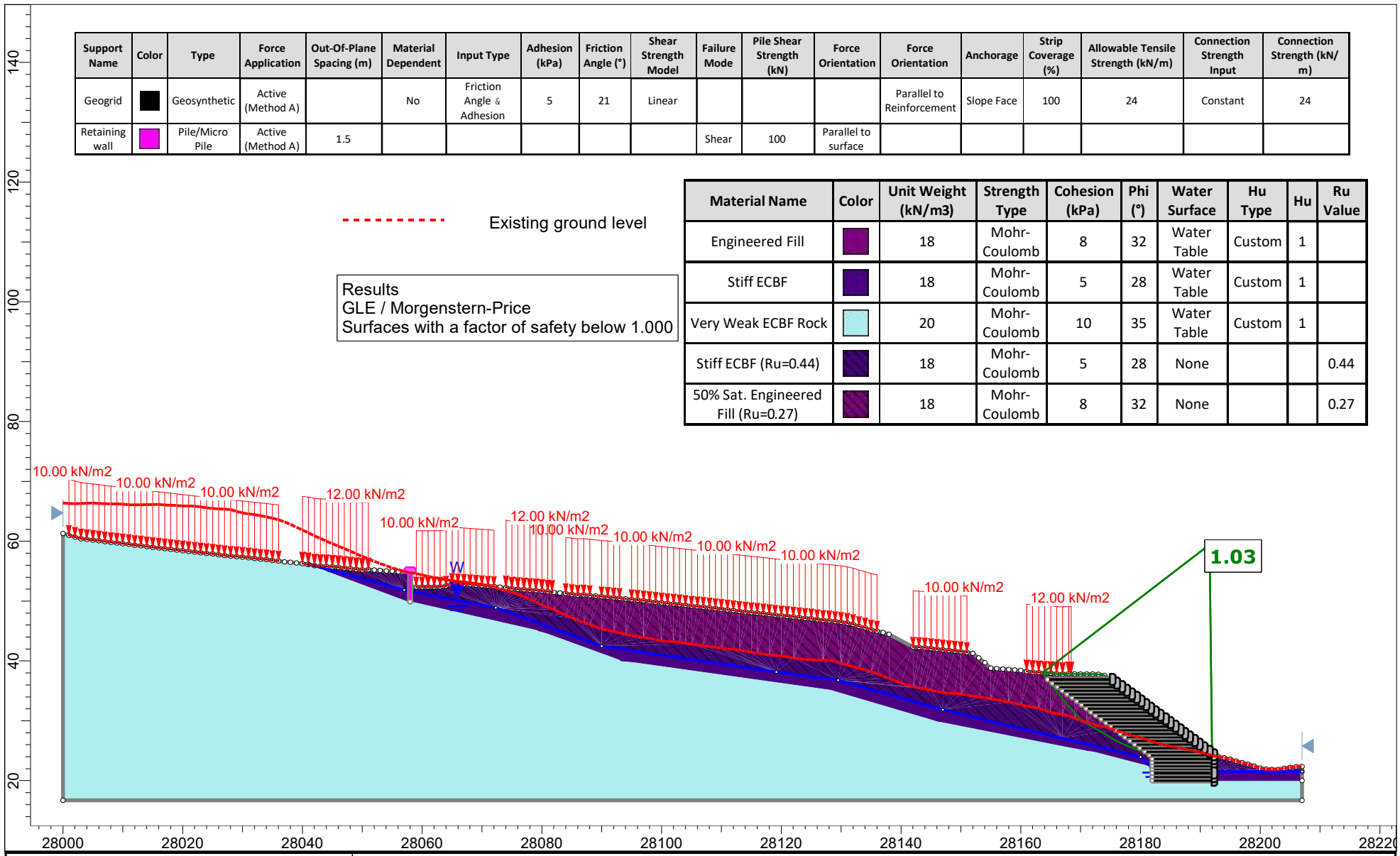
Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section Y - Proposed GL, Remedials, Loads	*Scenario*	Extreme (50% Fill Saturation)*
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section Y - June 2025.slmd

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Material Dependent	Input Type	Adhesion (kPa)	Friction Angle (°)	Shear Strength Model	Failure Mode	Pile Shear Strength (kN)	Force Orientation	Force Orientation	Anchorage	Strip Coverage (%)	Allowable Tensile Strength (kN/m)	Connection Strength Input	Connection Strength (kN/m)
Geogrid		Geosynthetic	Active (Method A)		No	Friction Angle & Adhesion	5	21	Linear				Parallel to Reinforcement	Slope Face	100	24	Constant	24
Retaining wall		Pile/Micro Pile	Active (Method A)	1.5						Shear	100	Parallel to surface						

Existing ground level

Results
GLE / Morgenstern-Price
Surfaces with a factor of safety below 1.000

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Engineered Fill		18	Mohr-Coulomb	8	32	Water Table	Custom	1	
Stiff ECBF		18	Mohr-Coulomb	5	28	Water Table	Custom	1	
Very Weak ECBF Rock		20	Mohr-Coulomb	10	35	Water Table	Custom	1	
Stiff ECBF (Ru=0.44)		18	Mohr-Coulomb	5	28	None			0.44
50% Sat. Engineered Fill (Ru=0.27)		18	Mohr-Coulomb	8	32	None			0.27



RILEY

SLIDEINTERPRET 9.029

Project	240065 - Russell Road, Wainui - Stage 2		
Group	Section AB - Proposed GL, Remedial, Loads	*Scenario*	Extreme (50% Fill Saturation)
Drawn By	RS	*Company*	Riley Consulants Ltd
Date	10/12/2024	*File Name*	Section AB - June 2025.slmd