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Cable Bay 0420
Phone 021 2929226

13 September 2025

Resource Consents Department
Far North District Council
Memorial Avenue
Private Bag 752
Kaikohe 0440

By Email Only

Dear Sir / Madam,

Re: RESOURCE CONSENT APPLICATION : 914 & 976 ORURU ROAD, PERIA

1.0 Tripark Farms Ltd (the Applicant) has instructed us to lodge two separate subdivision resource consent applications for their captioned properties.

1.1 This is because the FNDC has advised it is necessary for the Applicants proposed subdivision layout to be addressed in two separate subdivision resource consent applications.

1.2 The FNDC as part of those same communications has advised that Nikki Callinan will be the processing planner for both of these applications.

1.3 Given this direction from the FNDC it will also be necessary for RC 2260001-RMASUB to be withdrawn, and we request that the remaining deposit fee be credited towards the deposit fee for these two applications.

1.4 Two full AEE's in accordance with the requirements of the RMA 1991 are attached. The requisite FNDC Application form is included in the appendices of each.

1.5 If you could kindly advise the relevant reference numbers, we will arrange for the Client to make the necessary residual deposit payment to the FNDC by bank transfer.

Yours sincerely,

Neil Mumby

Director

Cable Bay Consulting

APPLICATION FOR RESOURCE CONSENT TO THE FAR NORTH DISTRICT COUNCIL PURSUANT TO SECTION 88 OF THE RESOURCE MANAGEMENT ACT 1991

Restricted Discretionary Activity resource consent for a Five Lot Subdivision in the Rural Production Zone.

976 Oruru Road, Peria

Assessment of Environmental Effects

September 2025

Cable Bay Consulting Ltd, 11 Bush Point Road, Cable Bay 0420

INTRODUCTION AND PROPOSAL

1.1 Tripark Farms Ltd ("the Applicant") seek resource consent under the Resource Management Act 1991 and the Far North District Council Operative Plan ("ODP") for a five lot subdivision in the Rural Production Zone.

1.2 The land presently comprises two titles, all of which were in existence as at 28 April 2000. The proposed allotments are summarised in Table 1 below;

Existing Titles	Existing Area	Number of Lots to be created with this Title & Resultant Area
Part Allotment 5 Parish of Oruru created 1991. Limited as to Parcels.	71.1873 ha	Lot 1 (2 ha) Lot 2 & Sec 1 SO62852 and balance (13.45 ha) Lot 3 (2.7 ha) Lot 4 (2.1 ha) Lot 6 (52.6 ha)
Section 1 Survey Office Plan 62852 created 1994	1.255 ha	None – to be amalgamated with Proposed Lot 2 and balance of Part Allotment 5 as set out above for a total area of 13.45 ha.

Table 1 : Registers of Title and Proposed Allotments

1.3 In summary form, and after amalgamations are undertaken, this proposed subdivision will result in a net increase of four additional allotments ranging in size from two hectares (Lot 1) to 52.6 hectares (Lot 6).

1.4 It is important to note that this subdivision consent application represents "Stage 2" of a concurrent subdivision consent ("Stage 1") lodged for the land to the immediate north, which is also owned by the Applicant.

1.5 The subdivision applications have been divided in this way due to the FNDC's insistence that this is necessary to meet the restricted discretionary activity rules within the ODP. Based on the feedback from the FNDC, the earlier proposed boundary adjustments have also been removed, and as a consequence there may also be a subsequent boundary adjustment application lodged ("Stage 3") in the future - but that does not form part of the current proposal (s) at this time.

1.6 The splitting of the applications in this matter, whilst meeting the FNDC requirements, significantly complicates the requisite survey works that need to be undertaken, given the site is limited as to parcels. This in turn complicates the matter of survey conditions. Specifically;

- Whilst Stage 1 and Stage 2 are lodged concurrently and are separate, these subdivisions will be undertaken in numerical order to deal with LINZ requirements.

- These stages of the subdivision if granted by the FNDC may need to be shown on a Single Cadastral Survey set so flexibility is sought for the wording of amalgamations at the s.223 stage. As a consequence it is important that we are provided with a set of draft conditions prior to finalisation.

DOCUMENTATION

1.7 This application is accompanied by the following documents;

i. Register of Title (**Attachment 1**)
ii. Adjacent Land Analysis (**Attachment 2**)
iii. Scheme Plan (**Attachment 3**)
iv. Engineering Report (**Attachment 4**)
v. Ecological Report (**Attachment 5**)
vi. Archaeological Report (**Attachment 6**)
vii. Section 86B of the RMA 1991 Check (**Attachment 7**)
viii. Operative District Plan Development Control Check (**Attachment 8**)
ix. Relevant ODP Assessment Criteria (**Attachment 9**)
x. Fourth Schedule Compliance Assessment (**Attachment 10**)
xi. NRPS : Relevant Objectives & Policies (**Attachment 11**)
xii. ODP : Relevant Objectives & Policies (**Attachment 12**)
xiii. PDP : Relevant Objectives & Policies (**Attachment 13**)
xiv. Service Provider Correspondence (**Attachment 14**)
xv. Iwi Consultation (**Attachment 15**).
xvi. Application Form & Checklist (**Attachment 16**).

DESCRIPTION OF SITE AND SURROUNDS

1.8 The land is as legally described in Table 1 with a total land area of approximately 72 ha, and has been owned by the Applicants since 1996. The two Registers of Title are appended in **Attachment 1** for ease of reference.

1.9 The topography of the site is steep to rolling, and then falls with progressively flatter topography from west to east. The site is bisected by Oruru Road and also the upper reaches of the Oruru river.

1.10 The lower lying portions of the site on the margins of the Oruru river comprise riverine flats, which together with inundation with flood waters has resulted in the land being productive and suitable for intensive maize cropping / grazing, both of which have occurred extensively on these lower lying portions of the site over the years.

1.11 The land is run as a dairy unit in conjunction with the land that the Applicants own to the north at 914 & 978 Oruru Road. This detail can be seen in the image in Figure 1 below.

Figure 1 : Aerial Imagery *<u>Source</u> NRC GIS as at 12/12/24.*

1.12 Typical of a rural site no reticulated services are present.

1.13 In general terms, the site is located some 10 kilometres inland from Taipa, in a well-defined valley catchment. The surrounding area is typically rural in nature. Exceptions to this include the Taipa Refuse Station some seven kilometres to the north, and the Peria Saleyards approximately one kilometre to the south.

1.14 Adjacent land uses are also primarily rural in nature. Adjacent land analysis is contained in **Attachment 2**. As can be seen from the adjacent land assessment (outside of the land owned by the Applicant and which is subject to a concurrent subdivision application), the characteristics of these neighbouring sites are typified by farm land (with associated land uses) interspersed with the occasional rural residential allotment.

1.15 The subject site (and adjacent sites) are all zoned Rural Production. There are no limitations listed in the Resource Maps for the site as shown in Figure 2 & 3 below.

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Road, Cable Bay 0420

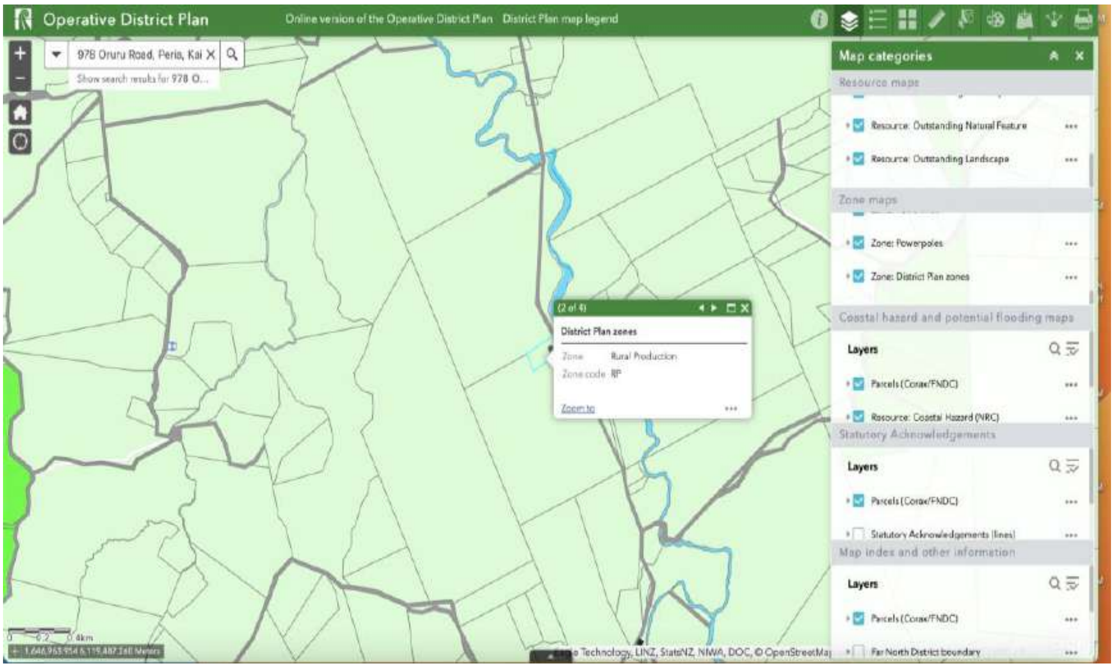


Figure 2 : ODP Zoning Map <u>Source</u> *FNDC GIS 16/12/24*

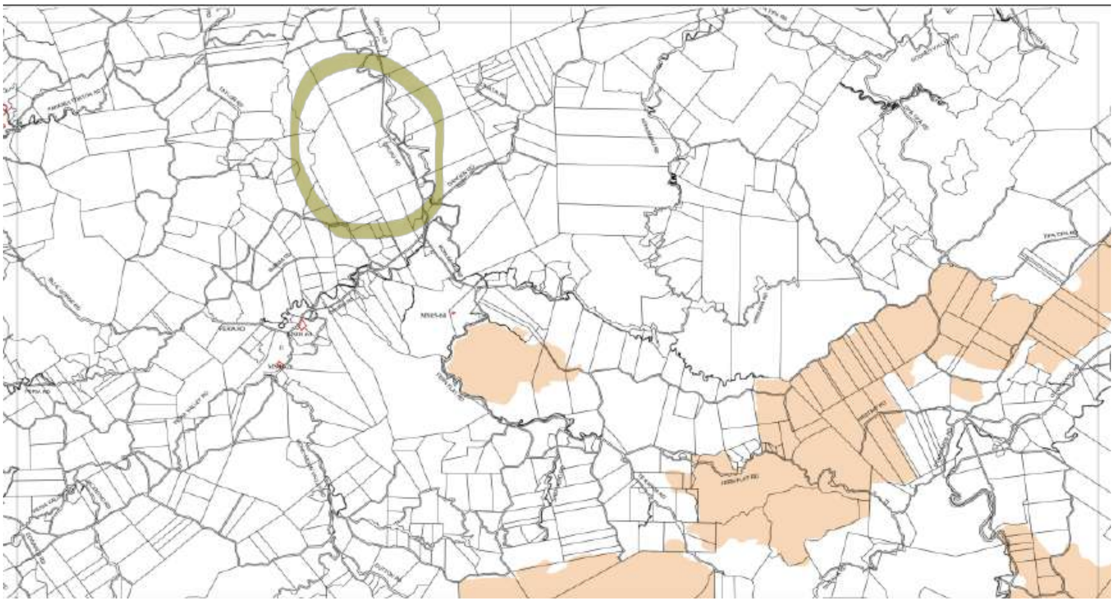


Figure 3 : ODP Resource Map <u>Source</u> *FNDC GIS 10/05/25*

1.16 The ODP flooding maps do however show the site as being subject to flooding as per figure 4 below.

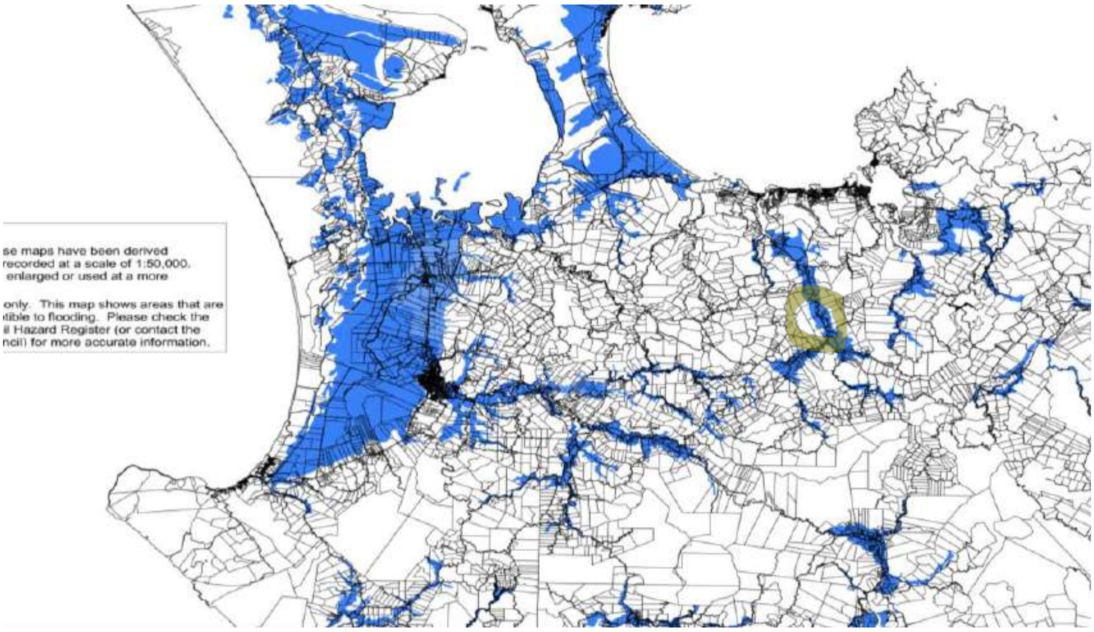


Figure 4 : Flood Map FL2 *<u>Source</u> FNDC Maps 10/04/25*

1.17 No HAIL sites are present as per the screenshot in figure 5 below;

Figure 5 : HAIL Map *<u>Source</u> FNDC GIS 16/12/24*

1.18 Several recorded NZAA Archaeological sites are present on the site, but the site does not contain any District Plan Historic Sites, District Plan Archaeological Sites, or District Plan Sites of Significance to Māori.

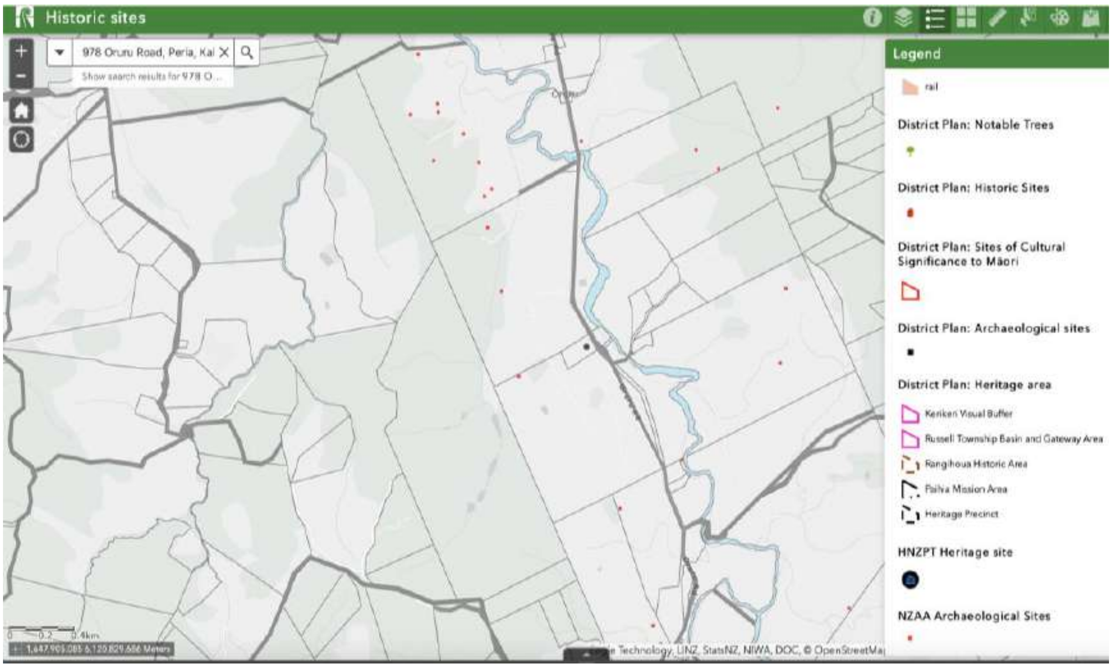


Figure 6: NZAA Archaeological Sites *<u>Source</u> FNDC GIS 16/12/24*

1.19 The site is located within a Kiwi Present area as shown in Figure 7 below.

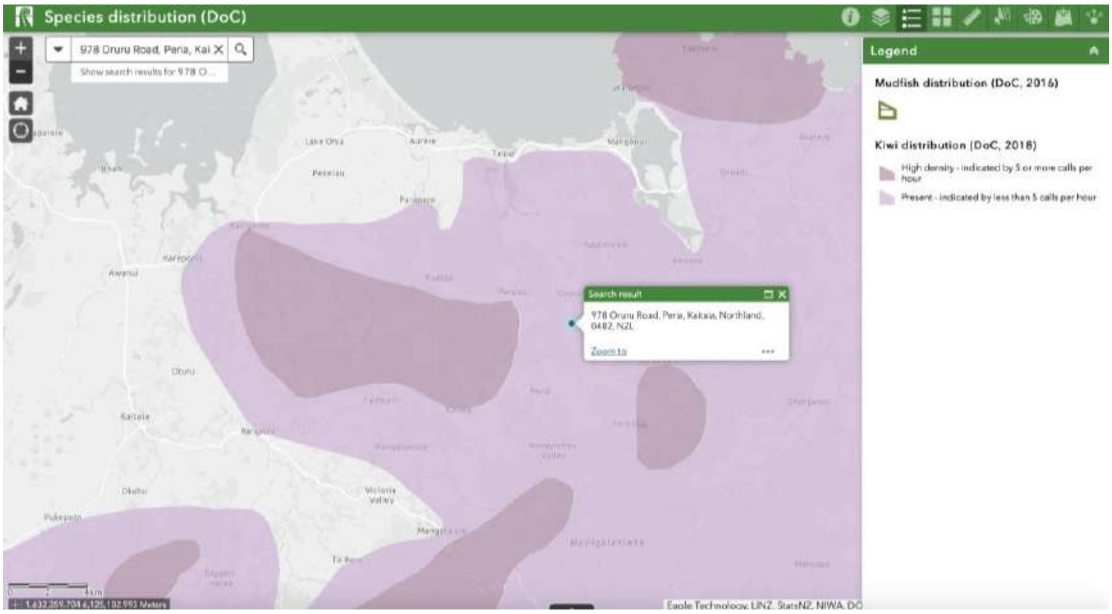


Figure 7: Kiwi Present Area *<u>Source</u> FNDC GIS 16/12/24*

1.20 The site is also located within 500 metres of Department of Conservation land as shown in Figure 8 below

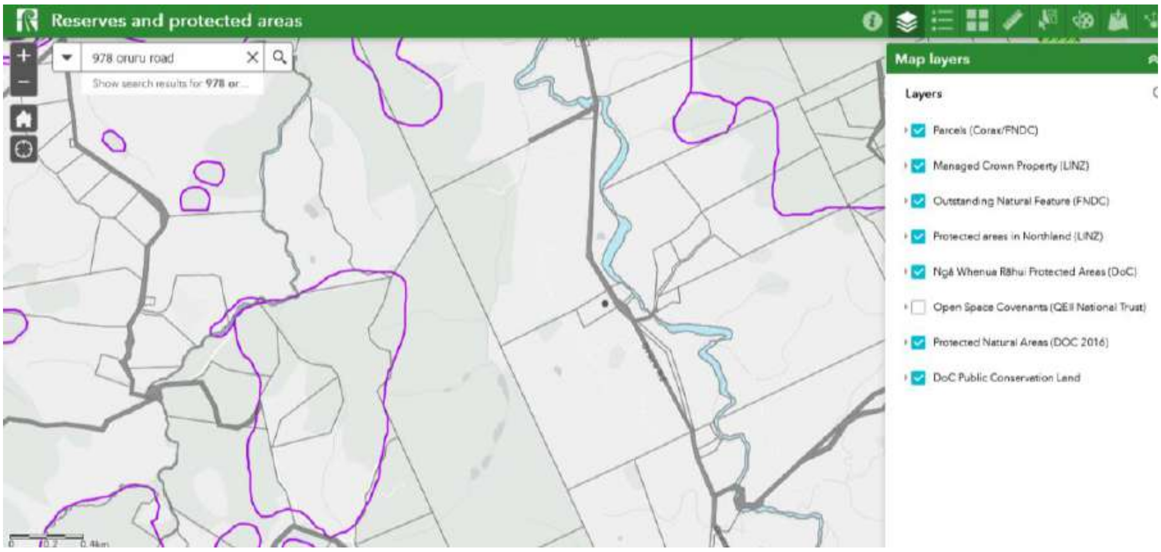


Figure 8: DOC Land within 500 metres *<u>Source</u> FNDC GIS 10/04/25*

1.21 We also note that the Proposed District Plan ("PDP") continues to zone the subject site as Rural Production, and also identifies that the lower lying margins are subject to flooding as per Figure 9 below.

1.22 No heritage matters, notable trees, Sites and Areas of Significance to Māori, Outstanding Natural Landscapes, Outstanding Natural Features, or Statutory Acknowledgment Areas are notated on the PDP maps.

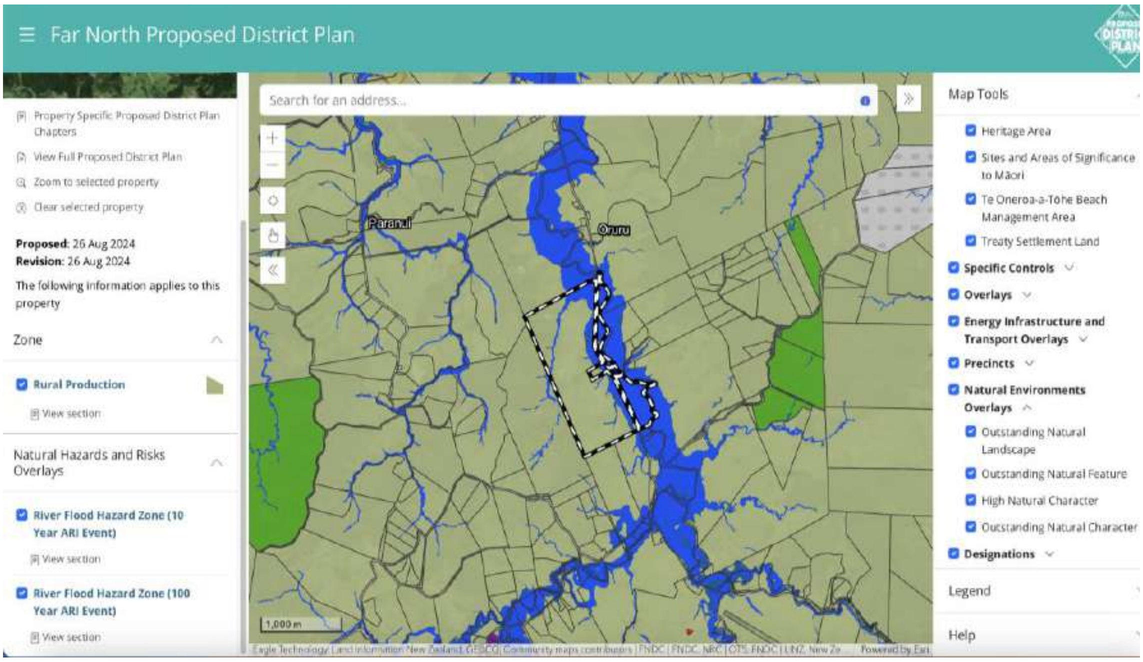


Figure 9: PDP Zoning and Flood Notation *<u>Source</u> FNDC GIS 16/12/24*

Site History

1.23 A review of the Council property files shows a modest consenting history with no consent conditions that would preclude the proposed subdivision.

Subdivision Concept Design

2.1 The proposed subdivision layout is shown below, with a further full detailed plan set in **Attachment 3** for ease of reference.

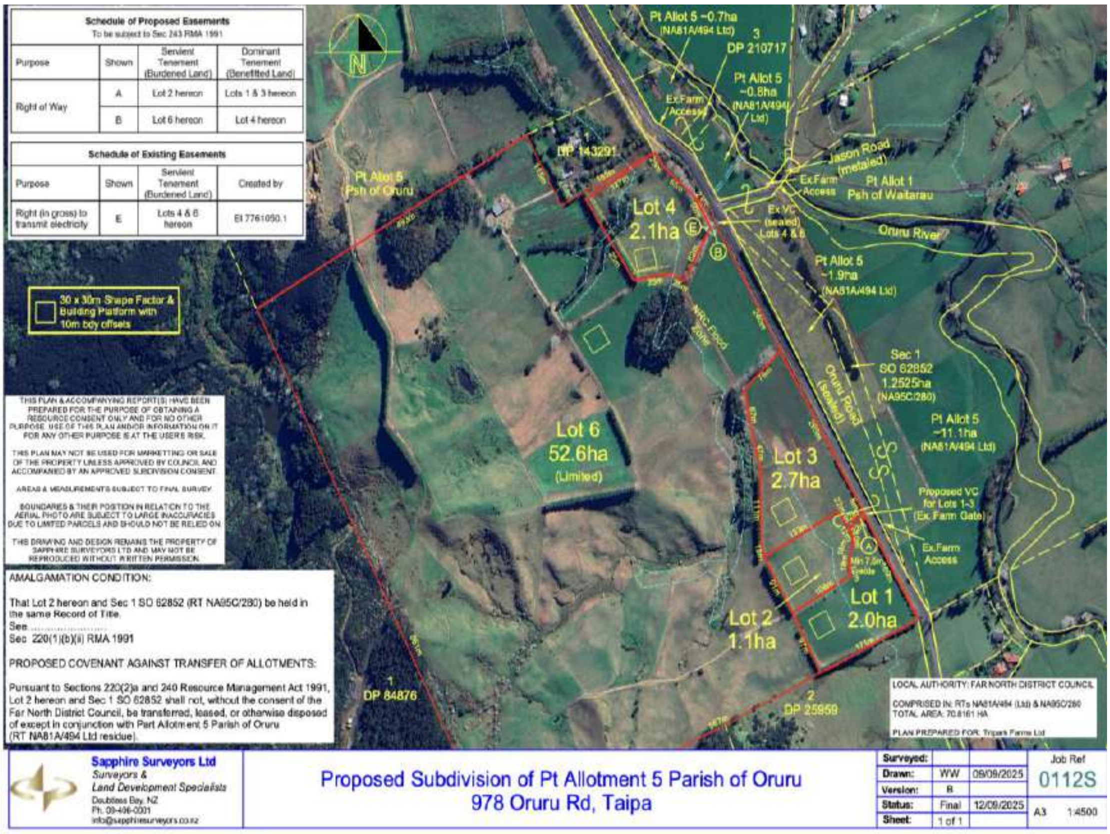


Figure 10 : Overall Scheme Plan *__Source__ Sapphire Surveyors*

2.2 Careful consideration has been given to the overall design of the subdivision. This design has been informed by engineering, archaeological and ecological features of the site, as well as ensuring the design provides for the ongoing productive operation of the larger titles within the subdivision, as well as neighbouring sites.

<u>Engineering Design Considerations</u>

2.3 All building platforms have been subject to an engineering assessment. This has resulted in the building platforms being located clear of the modelled flood plain present on the lower reaches of the site, and are also located on stable ground. This approach for example, has informed the design of Lot 2 which ensures a building platform clear of the modelled flood plain is available, notwithstanding the majority of the allotment being located to the east of Oruru Road and within the modelled flood plain.

2.4 Appropriate onsite services are able to be provided on each lot taking into account soil characteristics, topography and allotment size. Accessways are all sited appropriately to provide for adequate sight distances, and to minimise land form modification.

2.5 A copy of the engineering report is contained in **Attachment 4.** Additional suggested consent conditions addressing the recommendations of the engineering report are contained in paragraphs 3.15 to 3.26 of this report.

Ecological Design Considerations

2.6 All building platforms and accessways have been located clear of the steeper vegetated areas of the site and are also appropriately setback from the wetlands that are present on the site. An ecological assessment of the proposed design is contained in **Attachment 5.** Suggested consent conditions addressing the recommendations of the ecological report are contained in paragraphs 3.15 to 3.26 of this report.

2.7 We also observe that width of the Oruru River likely exceeds three metres in width as it bisects the site. We say this because we note that the property at 1071 Oruru Road (the site to the immediate south) contains an existing esplanade reserve. However no allotments of less than four hectares are being created in this subdivision that adjoin the Oruru River, so no esplanade reserve or strip is offered as part of this proposal.

Archaeological Design Considerations

2.8 The supplied archaeological report has identified that there are no listed archaeological features present on the site as recorded in the District Plan or Proposed District Plan. However there are generally recorded archaeological sites in the NZAA database present on the site. The Applicant has designed their subdivision so that the identified building platforms and accessways are clear of these recorded sites.

2.9 A copy of the archaeological report confirming this is contained in **Attachment 6** and the matter of consent conditions / advice notes are discussed in paragraphs 3.15 to 3.26 of this report.

DISTRICT PLANNING FRAMEWORK

3.1 At the present time, the principal district planning instruments relevant to this subdivision are the Operative District Plan, the Proposed District Plan, and Variation 1 to the Proposed District Plan. There are no other plan changes relevant to this proposal.

Proposed District Plan

3.2 The Council publicly notified the PDP on 27th July 2022. Whilst hearings on the PDP have commenced, no decisions have yet been issued by the Hearings Commissioners. It is understood that decisions will be issued by Council in May 2026.

3.3 Under s86B of the Resource Management Act 1991 a rule in a Proposed District Plan has legal effect only once a decision on submissions have been made, unless the criteria under s.86B(3)(a) to (e) apply.

3.4 In terms of s.86B(3) of the Act, a review of the PDP shows that there are no provisions that relate to water, air or soil, significant indigenous vegetation, significant indigenous habitats of fauna, historic heritage or aquaculture activities that require resource consent in this intervening period.

3.5 Tabulated analysis of the PDP are contained in **Attachment 7.** As there are no relevant rules within the PDP with immediate legal effect that affect the proposed subdivision activity status, the activity status of this application is prescribed by the current ODP.

3.6 The objectives and policies of the PDP are relevant for the s.104 assessment undertaken later in this report. This matter is discussed further in paragraphs 5.14 to 5.27 of this report.

Operative District Plan

3.7 As already stated, the ODP is the dominant planning document in considering this subdivision proposal. Tabulated analysis of the ODP provisions is contained in **Attachment 8**. The analysis confirms that consent is required under the following rules of the ODP;

- Restricted Discretionary Activity subdivision under Rule 13.7.2.1 (3) "…*A maximum of 5 lots in a subdivision (including the parent lot) where the minimum size of the lots is 2ha, and where the subdivision is created from a site that existed at or prior to 28 April 2000…*"

3.8 The nett effect of the proposed subdivision will see a net increase of four lots, for a total of five lots (including the balance lot), and overall the proposal is to be considered as a restricted discretionary activity.

Section 104 & 106 of The RMA 1991 - Matters Of Discretion

3.9 As a restricted discretionary activity subdivision, and in addition to s.106 matters, Council is only able to consider specific matters in deciding whether to approve or decline a consent application. Then in the instance of the ODP, additional specific matters for the purpose of imposing conditions. These matters of discretion are set out in **Attachment 9**.

3.10 Rule 13.8.1 of the ODP identifies the matters of discretion that are able to be considered in deciding whether or not to grant consent. The only listed matters of relevance to this application are;

- *effects on the natural character of the coastal environment for proposed lots which are in the coastal environment;*
- *effects of the subdivision… within 500m of land administered by the Department of Conservation upon the ability of the Department to manage and administer its land;*
- *effects on areas of significant indigenous flora and significant habitats of indigenous fauna;*
- *the mitigation of fire hazards for health and safety of residents.*

3.11 We briefly comment that the effects on the natural character of the coastal environment are not relevant due to the distance from the coastline. Moreover, the mitigation of fire hazards is typically addressed by conditions requiring onsite storage (via water tanks) for firefighting purposes.

3.12 This leaves "*the effects on areas of significant indigenous flora and significant habitats of indigenous fauna*" together with the effects on Department of Conservation administered land within 500 metres of the site, as the two remaining issues. It is under these provision that Council may consider ecological matters further.

3.13 The Department of Conservation administered land is located to the west and east of the site as shown in Figure 8 . Whilst there are no foreseeable effects on this land, Council may consult with the Department of Conservation on this proposal during the processing of this consent, and if they consider it appropriate. In turn, the supplied ecological report addresses potential effects on the ecological features present on the site.

3.14 Conditions are able to then be granted on the matters as already identified above, and on those additional matters specifically listed under Rule 13.7.3 of the ODP. These are;

- *Access and Transportation*
- *Natural and Other Hazards*
- *Water Supply*
- *Stormwater Disposal*
- *Wastewater Disposal*
- *Energy Supply*
- *Telecommunications*
- *Easements*
- *Preservation of Heritage Resources, Vegetation, Fauna and Landscape*
- *Access to Reserves and Waterways (Esplanade Reserves)*
- *Land Use Compatibility*

- *Proximity to Airports*

Recommended Conditions of Consent

3.15 The supporting engineering, archaeological and ecological reports have considered the effects of the proposal and made recommendations where appropriate. Standard Council conditions can appropriately address the balance of matters.

3.16 The wording of the proposed amalgamation condition for consulting with the Registrar-General of Land on practicality, is noted on the plan of subdivision, as well as the covenant against the separate disposal of proposed Lot 2 and Part Allotment 5 are also listed on the scheme plan. Easements are straight forward, involving standard ROW provisions proposed and electrical (existing).

3.17 Conditions requiring the demarcation of wetlands / ecological features on the site can be addressed within the conditions of consent. Specific comment is made on suggested consent notices for the subdivision below.

<u>Access and Building Platform Formation – All Lots</u>

3.18 Whilst the subdivision has been designed so as to utilise existing crossings and accessways as much as possible, the reality is that works will be required to either upgrade these existing accessways, form the necessary accessways to the building platforms, or form the building platforms themselves. Discussion with the engineers confirm that total earthworks for building platforms across all newly created sites will involve approximately 2000m^3 of earthworks. As already stated, these earthworks for building platforms are all clear of the modelled flood plain.

3.19 In turn and with respect to access ways, only Lots 1, 2, 3, 4 & 6 will require earthworks for new crossings and accessways to be constructed within the modelled flood plain. The balance of sites will use the already formed accessways / crossings in place, that will be upgraded to Council standards as appropriate. Discussions with the Applicants engineers indicates that each of these lots may require up to 500m^3 of earthworks for each access with no influence on flood levels as a result of either conveyance restriction of loss of flood storage. This is due to the existing ground levels.

3.20 The NRC Proposed Regional Plan (Rule C.8.3.3) requires controlled resource consent for earthworks between 100m^3 to 1000m^3 of earthworks within a flood plain. Given this activity status and that future lot owners will need to design their access at the time of building consent in any event, a consent notice appended to the title for these lots is considered appropriate. Wording to the like effect is suggested;

> *"The future access to the building platforms within this lot is located within a modelled flood plain. At the time of building consent, the consent holder shall provide evidence that the earthworks and construction works associated with the provision of access to the building platform are a permitted activity under*

the rules of the Proposed Regional Plan (or successor), or alternatively provide evidence that the necessary approval from the Northland Regional Council has been obtained for the works"

3.21 As the supplied engineering report identities that a further site specific engineers report will be required at the time of building consent (see page 41 of the report) to address stability, stormwater matters etc, a consent notice is recommended with wording to the like effect;

> *"…At the time of lodging Building Consent, the consent holder must supply a site specific engineering report from a suitably qualified and experienced engineer that references the recommendations of the engineering report (title / date) that accompanied application (FNDC Reference), and which addresses stability, stormwater, wastewater, and earthworks matters to the satisfaction of Council…"*

Archaeological Matters – All Lots

3.22 The supplied archaeological report confirms that there are two previously recorded archaeological sites present on the property; these are a ridge pā site (O04/1032), and a terrace and pit (O04/1033). In turn no additional above-ground sites were identified from either the review of historical images, Lidar imagery, or the field survey undertaken by the archaeologist. However, there is a "low to medium" probability (building platforms / access and utilities, respectively) that additional sites may be discovered elsewhere on the site once construction commences.

3.23 The supplied Archaeological report indicates that an Archaeological Authority may be required once ground conditions are ascertained. A standard condition imposed by Council (within the bounds of discretion) or advice note can appropriately address this issue.

Ecological Matters – Various Lots

3.24 The wetland boundaries within Lots 6 can also be pegged with input from an ecologist to ensure adequate setback of construction activities or stormwater run-off at the time of dwelling construction on the adjacent lots (Lots 2 & 3). The site as a whole is contiguous with a large area of bush and is within a Kiwi Present area. The Applicants have advised that they have a pest control program as well as a weed management plan in place on their property at the present time, so no additional conditions are required on these matters.

Land Use Compatibility – Lots 1,3 & 4,

3.25 Whilst building platforms are located clear of the minimum setbacks required by the ODP and there are no intensive land uses on neighbouring properties immediately adjacent the proposed building platforms, a consent notice on this matter is appropriate to ensure reverse sensitivity matters do not arise in the future.

3.26 A consent notice with wording to the like effect is recommended;

> *"…No owners, lessees, tenants, visitors or other occupiers of the lots shall obstruct the operation of, complain, or initiate enforcement action of any kind against those persons or entities undertaking lawfully established or permitted rural activities on adjacent sites…"*

STATUTORY REQUIREMENTS

4.0 Section 5 – Purpose of the RMA

Purpose

(1) *The purpose of this Act is to promote the sustainable management of natural andphysical resources.*

(2) *In this Act, "sustainable management" means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while –*

(a) *Sustaining the potential of natural and physical resources (excluding the minerals) to meet the reasonably foreseeable needs of future generations; and*

(b) *Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and*

(c) *Avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

4.1 Section 104 – Consideration of Applications

4.2 Section 104 of the Resource Management Act 1991 sets out those matters that must be considered when assessing an application for resource consent. Subject to Part II of the Act, Section 104C requires a consent authority to have regard to the following matters relevance in this instance:

104C When considering an application for a resource consent for a restricted discretionary activity, a consent authority must consider only those matters over which—

(a)a discretion is restricted in national environmental standards or other regulations:
(b)it has restricted the exercise of its discretion in its plan or proposed plan.
(2)The consent authority may grant or refuse the application.
(3)However, if it grants the application, the consent authority may impose conditions under section 108 only for those matters over which—
(a)a discretion is restricted in national environmental standards or other regulations:
(b)it has restricted the exercise of its discretion in its plan or proposed plan.

4.3 The Fourth Schedule of the Act outlines the matters that should be included in an assessment of effects. A compliance check against the matters required by the Fourth Schedule is contained in **Attachment 10.** The subsequent sections of this AEE address the requirements of s.5, s.104 and the Fourth Schedule of the Act as appropriate to the scale of the activity, and as necessary to provide an informed assessment of this proposal.

ASSESSMENT OF EFFECTS

4.4 As already stated, the extent of environmental effects able to be considered by Council is effectively limited to the matters of discretion set out in Rule 13.8.1 of the ODP and s.106 of the Act. The following assessment of effects is informed by these matters of discretion. The Council must decide whether the activity will have, or is likely to have, adverse effects on the environment that are more than minor.

Permitted Baseline

4.5 The permitted baseline may be taken into account and the Council has the discretion to disregard those effects. In terms of the subject site, whilst there is no permitted baseline for subdivision per se, we observe that residential units can be constructed on the site at a density of one dwelling per 12 hectares of land under Rule 8.6.5.1.1 of the ODP, and this would allow six dwellings to be constructed on the site as close as 10 metres from external boundaries as a permitted activity.

Receiving Environment

4.6 The receiving environment beyond the subject site includes permitted activities under the relevant plans, lawfully established activities (via existing use rights or resource consent), and any unimplemented resource consents that are likely to be implemented. The effects of any unimplemented consents on the subject site that are likely to be implemented (and which are not being replaced by the current proposal) also form part of this reasonably foreseeable receiving environment. This is the environment within which the adverse effects of this application must be assessed. There are no known consents in the area or that have been recently applied for on adjacent sites that may impact this proposal. However if Council is aware of any relevant applications, this AEE can be updated as required to reflect any change in circumstances.

Section 106 Matters

4.7 The engineering report in Attachment 4 contains a s.106 assessment on engineering matters. Moreover, the proposed subdivision appropriately provides for legal access to each of the proposed lots. There are no adverse effects of the nature identified in s.106 of the Act, and referenced in the engineering report, that preclude this subdivision from proceeding.

Effects on Significant Flora & Fauna

4.8 The ecological report in **Attachment 5** addresses effects on indigenous flora and fauna and finds the effects arising from the subdivision are less than minor.

Water Supply for Fire Fighting

4.9 For the purposes of firefighting, the Applicant is agreeable to standard conditions requiring the provision of water supply for firefighting at the time of building consent application. Effects in this respect are less than minor. No further assessment of effects (for example, landscape values, etc) for the purposes of approving the consent are necessary, as these matters are outside of the matters of discretion. Conditions of consent can be imposed to address those matters set out in Rule 13.7.3 of the ODP.

PROVISIONS OF ANY RELEVANT PLAN, POLICY STATEMENT, OR OTHER REGULATION

National Environmental Standards for Assessing and Managing Contaminated in Soils to Protect Human Health (2011) (NES :CS)

5.0 With respect to the NES:CS specifically, the site has been used for standard grazing activities for a long period of time and the Applicants have advised that they are not aware of any HAIL activities present. In addition, the HAIL GIS Maps on Councils website have been reviewed and this also does not indicate any HAIL sites on the property or nearby.

National Environmental Standards for Freshwater (2022) ("NES:FW")

5.1 These standards have been assessed in the attached ecological assessment and the proposed subdivision is consistent with the NES FW. As such there are no additional requirements for consent under this environmental standard, with the possible exception of the wetland within Lot 6 and this is addressed in the recommended consent conditions.

National Policy Statement for Freshwater Management(2022) ("NPS:FW)

5.2 The NPS : FW sets out objectives and policies that direct local government to manage water in an integrated and sustainable way, while providing for economic growth within set water quantity and quality limits. It is considered that the proposal is not inconsistent with the objectives of the NPS FW in that the extent of any requisite earthworks are modest and conditions can be reasonably imposed to ensure that adverse effects in terms of sedimentation and water quality are appropriately avoided, remedied or mitigated.

NPS Indigenous Biodiversity

5.3 The objective of this National Policy Statement is to maintain indigenous biodiversity across New Zealand so that there is at least no overall loss in indigenous biodiversity. A precautionary approach is to be adopted when considering adverse effects on indigenous biodiversity. The attached ecological report has been informed by the provisions of the NPS Indigenous Biodiversity and does not raise any concerns. This proposal is in accordance with the objectives and policies of this document.

New Zealand Coastal Policy Statement

5.4 The site is not visible from the coast, but is located within a catchment connected with the Coastal Marine Area via the Oruru River. However the proposal will comply with the ODP standards for impermeable surfaces and stormwater control, and earthworks for building platforms and access will be undertaken in accordance with accepted engineering standards. As a consequence no adverse effects on the coasts natural character, intrinsic values or water quality that will arise.

The Northland Regional Policy Statement

5.5 The Northland Regional Policy Statement ("NRPS") was made operative in May 2016. The site is located outside of any outstanding natural landscape, outstanding natural features, natural character areas, as well as the coastal environment. This can be seen in Figure 8 below.

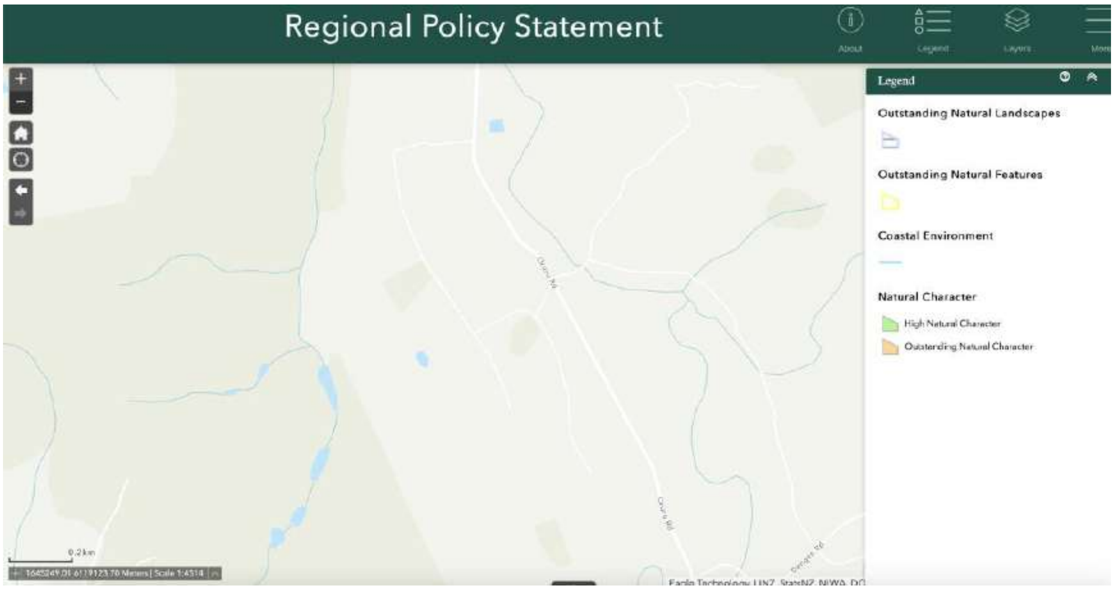


Figure 11: Regional Policy Statement Map *Source NRC GIS 17/12/24*

5.6 The NRPS contains objectives and policies related to infrastructure and regional form and economic development. The objectives and policies considered relevant to this proposed subdivision are contained in **Attachment 11**.

5.7 As outlined earlier in this report, building platforms have all been sited clear of the modelled flood plain. Due to the topography only minimal earthworks for crossings, access etc will be necessary in the flood plains. The hazard risk has been assessed and the proposal is consistent with NRPS policies regarding flood hazard.

5.8 Reverse sensitivity effects are less than minor. They are less than minor for two reasons. Firstly, the Applicant is able to construct up to six dwellings (as a permitted activity on the site, and locate these dwellings within 10 metres of external boundaries. This has the potential to result in a greater level of reverse sensitivity effect than is likely to arise from the proposed subdivision given the number and location of identified building platforms.

5.9 Secondly, the Applicant is also offering a consent notice condition to address reverse sensitivity matters. Therefore this proposal is consistent with the relevant objectives and policies in the Regional Policy Statement for Northland.

FNDC ODP Objectives and Policies

5.10 As already stated, the proposal constitutes a restricted discretionary activity under the ODP. The following assessment of the objectives and policies are informed by the matters of discretion specified in Rule 13.8.1 and Rule 13.7.3 of the ODP. The pertinent objectives and policies are contained in **Attachment 12**.

Commentary – Subdivision Objectives and Policies

5.11 The proposed subdivision is of a nature specifically envisaged by the zone provisions (13.3.1). The lot sizes, dimensions and location of the allotments have been designed so as to take into account the archaeological and ecological features of the site, as well as existing land uses (13.4.1). This has resulted in the clustering of building platforms in the less environmentally sensitive portions of the site, clear of flood hazard (13.4.3), and the building platforms have all been designed and located so at to be north facing and take into account solar gain to facilitate energy efficient design (13.3.9, 13.4.15 (a)) . There are no scheduled heritage resources present on the site (13.3.4) , and stormwater management will be in place for the proposed development (13.3.5). The proposal contains a set of suggested resource consent conditions to address reverse sensitivity and environmental effects arising from the proposal (13.3.2). Particular consideration has been given to ensuring adverse effects are appropriately avoided, remedied or mitigated. The proposal is in accordance with these objectives and policies.

Commentary – Rural Production Zone Objectives and Policies

5.12 The proposed subdivision is of a nature specifically envisaged by the zone provisions (8.4.2). The subdivision has been designed so as to take into account the archaeological and ecological features of the site (8.3.4), and there are no outstanding natural features or landscapes present on the site (8.3.5). The proposal contains a set of suggested resource consent conditions to address reverse sensitivity and environmental effects arising from the proposal (8.4.5). Particular consideration has been given to ensuring that adverse effects are appropriately avoided, remedied or mitigated (8.4.2) . The proposal is in accordance with these objectives and policies.

Summary

5.13 In summary, for the reasons detailed above can be considered consistent with the relevant objectives and policies contained within the ODP.

PDP Objectives and Policies

5.14 Many of the matters flagged in the objectives and policies of the PDP fall outside the matters of discretion able to be considered by Council as a restricted discretionary activity subdivision. They are however addressed below in the interests of completeness. The pertinent objectives and policies are contained in **Attachment 13**.

5.15 As the objectives and policies of the Rural Production zone and associated subdivision standards depart significantly from the approach set out in the ODP, this proposal does not sit comfortably with the objectives that appear to envisage only “primary production activities” and “other compatible activities that have a functional need to be in a rural environment” with the additional objective of avoiding subdivision on “Highly Productive Land” in its entirety (RPROZ-01 & RPROZ-02, RPOZ-03 (c)) and (RPROZ-P5). Subdivision is anticipated in exchange for environmental benefit but only if subdivision on productive soils is avoided (SUB-P8).

5.16 However as covered in paragraphs 2.1 to 2.11 of this report, the subdivision nonetheless has been carefully designed to protect the ongoing operation of the larger allotments present on the site as well as neighbouring land uses. The subdivision also avoids the more environmentally sensitive areas of the site (SUB-P11). Appropriate infrastructure is also provided (RPROZ-03 (b) RPROZ-P3 & (d)).

5.17 As with the Rural Production zone objectives and policies, the associated subdivision objectives and policies do not sit comfortably alongside this proposal. (for example SUB-02 & 08), but as already stated these types matters are outside of the bounds of discretion at the current time.

5.18 With respect to natural hazards, building platforms have all been sited clear of the modelled flood plain. Due to the topography only minimal earthworks for crossing and access will be necessary in the flood plains. The hazard risk has been assessed and the proposal is consistent with policies regarding flood hazard (NH-01 & NH-02, NH-P2, NH-P5, NH-P6, NH-P8).

5.19 The Far North District Council has notified Proposed Plan Variation 1 (Minor Corrections and Other Matters) to the Proposed District Plan. Proposed Plan Variation 1 makes minor amendments to correct minor errors, amend provisions that are having unintended consequences, remove ambiguity and improve clarity and workability of provisions. There are multiple zones and provisions of the PDP that are affected by this variation. Examples of this include changes to the wording of both rural, urban and special purpose zones. Changes are sought to the Rural Production Zone specifically, but the variation does not seek changes to the subdivision provisions in this Zone. Submissions for this variation closed in December 2024 so the provision have no effect on activity classification and little if any weight in the decision making process for this application at the current time.

ANY OTHER RELEVANT AND REASONABLY NECESSARY MATTER

Weighting of District Planning Documents

5.20 In general terms the weight afforded to the objectives and policies of a PDP are determined by the extent to which the PDP provisions have been tested in the statutory process. Typically, a PDP notified by a consent authority will garner greater weighting in the process a few years after notification as decisions are issued and appeals are resolved in accordance with the time frames prescribed in the RMA 1991.

5.21 However this is not the case with PDP. Whilst the statutory process for the PDP effectively commenced on 27 July 2022 with the public notification of the PDP, the PDP received "…*a high number of submissions with 580 original submissions (with over 8,500 original submission points), and 549 further submissions (with 26,174 further submission points) covering a broad range of issues…*"

5.22 As a consequence of that significant number of submissions, as well as staffing issues, Council wrote to the Minister for Environment on 15 July 2024 seeking an extension of time until 27 May 2026 for the issue of Council decisions on the PDP. This extension of time was granted by the Minister for the Environment on 17 September 2024.

5.23 All of this means that despite being in the public realm for a number of years, the PDP has not yet had any decisions issued on submissions by either the Hearings Panel or Council.

5.24 As a consequence, the PDP carries less weighting in the decision making process at the present time, than would otherwise be expected. This is setting aside the fact that the Council will still need to make a decision as to whether or not they will accept the recommendations of the Hearings Panel. The Council decisions will then be subject to potential challenge via appeal.

5.25 In order to understand the potential for the subdivision provisions of the Rural Production zone to be appealed, we have reviewed the submissions. We note that there are multiple submissions opposing / seeking changes to the provisions of the Rural Production zone and minimum lot sizes. Some relevant examples of these submissions are in S421.207, S373.001, S488.001, S17.001, S40.001, S41.001 and S43.001.

5.26 We also note that in parallel with this Council has recently notified a plan variation to correct errors, including corrections to zoning and other amendments to the PDP. Submissions for this variation closed in December 2024.

5.27 In our opinion all of this means that the Operative District Plan remains the dominant document in weighing up of the objectives and policies of the district planning documents.

PART 2 OF THE RMA

6.0 The purpose of the RMA under s5 is to promote the sustainable management of natural and physical resources. This means managing the use of natural and physical resources in a way or at a rate that enables people and communities to provide for their social, cultural and economic well-being while sustaining those resources for future generations, protecting the life supporting capacity of ecosystems, and avoiding, remedying or mitigating adverse effects on the environment.

6.1 This application is considered to be consistent with this purpose. In particular, the proposal seeks to enable the wellbeing (social and economic) of the applicants by allowing efficient utilisation of their site and will ensure that adverse effects of the proposal on the environment will be avoided, remedied and/or mitigated.

6.2 Section 6 of the Act sets out a number of matters of national importance which need to be recognised and provided for and includes among other things and in no order of priority, the protection of outstanding natural features and landscapes, the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna, and the protection of historic heritage.

6.3 The site does not contain any identified outstanding landscape or outstanding features. Appropriate conditions / advice notes can be imposed to protect wetland and indigenous vegetation areas, as well as archaeological sites that are present.

6.4 Section 7 identifies a number of "other matters" to be given particular regard to by a Council in the consideration of any assessment for resource consent, and includes the efficient use of natural and physical resources, and the maintenance and enhancement of amenity values. The proposal is considered to be consistent with the maintenance and enhancement of amenity values.

- The development has been designed to take into account the surrounding topography, and will not result in any adverse impacts on adjacent sites.
- The proposal will enable an efficient use of natural and physical resources.
- Conditions can be imposed to ensure the protection of the more sensitive ecological elements of the site.

6.5 Section 8 requires all persons exercising functions and powers under the RMA to 'take into account' the Principles of the Treaty of Waitangi. No section 8 issues are considered to result.

6.6 Overall, the application is consistent with Part 2 of the RMA for the following reasons:

- The proposal provides for the wellbeing of people within the District by providing for the efficient utilisation of an existing site, and the proposal avoids, remedies or mitigates adverse effects on the environment.

Written Approvals / Consultation

7.0 The Applicant has consulted with Chorus and Top Energy on service provider matters, and the results of that consultation is contained in **Attachment 14**.

7.1 The costs for the provision of fibre to the sites (as advised by Chorus) are prohibitive, so it is anticipated that phone and internet connectively will be via wireless provider or satellite for the future dwellings. The Applicant will accept standard conditions of consent / advice notes to this effect.

7.2 Section 36A of the RMA 1991 is clear that that there is no obligation on an Applicant to consult. The Applicant has nonetheless consulted with Te Paatu ki Kauhanga Trust. A copy of their report on the overall subdivision proposal is contained in **Attachment 15.**

7.3 No other written approvals have been sought or other consultation undertaken with this application as the nature of the subdivision is specifically provided for in the zone. It is understood that Council may choose to directly liaise with the Department of Conservation on this proposal.

7.4 This subdivision design will ensure that both the larger allotments within the site, as well as operations on adjacent sites can operate without reverse sensitivity effects arising. The Applicant is agreeable to a consent notice precluding future occupants complaining about lawfully established or permitted rural activities on adjacent properties.

SECTION 95 NOTIFICATION

8.0 Section 95A specifies the steps the council is to follow to determine whether an application is to be publicly notified. These steps are addressed in the statutory order below.

Step 1: mandatory public notification in certain circumstances

8.1 No mandatory notification is required as:

- the applicant has not requested that the application is publicly notified (s95A(3)(a))
- there are no outstanding or refused requests for further information (s95C and s95A(3)(b)), and
- the application does not involve any exchange of recreation reserve land under s15AA of the Reserves Act 1977 (s95A(3)(c)).

Step 2: if not required by step 1, public notification precluded in certain circumstances

8.2 The application is not precluded from public notification as:

- the activities are not subject to a rule or national environmental standard (NES) which precludes public notification (s95A(5)(a)); and
- the application does not involve one or more of the activities specified in s95A(5)(b).

Step 3: if not precluded by step 2, public notification required in certain circumstances

8.3 The application is not required to be publicly notified as the activities are not subject to any rule or a NES that requires public notification (s95A(8)(a)). For the reasons outlined earlier in this report public notification is not required as the activities will have or are likely to have adverse effects on the environment that are less than minor (s95A(8)(b)). An adjacent land assessment for the purposes of s95D (a) (ii) has been provided in **Attachment 2.**

Step 4: public notification in special circumstances

8.4 If an application has not been publicly notified as a result of any of the previous steps, then the council is required to determine whether special circumstances exist that warrant it being publicly notified (s95A(9)).

Special circumstances are those that are:

- Exceptional, abnormal or unusual, but something less than extraordinary or unique;
- outside of the common run of applications of this nature; or
- circumstances which make notification desirable, notwithstanding the conclusion that the activities will not have adverse effects on the environment that are more than minor.

8.5 Special circumstances” have been defined by the Court of Appeal as those that are unusual or exceptional, but they may be less than extraordinary or unique (Peninsula Watchdog Group (Inc) v Minister of Energy [1996] 2 NZLR 529). With regards to what may constitute an unusual or exceptional circumstance, Salmon J commented in Bayley v Manukau CC [1998] NZRMA 396 that if the district plan specifically envisages what is proposed, it cannot be described as being out of the ordinary and giving rise to special circumstances.

8.6 In Murray v Whakatane DC [1997] NZRMA 433, Elias J stated that circumstances which are “special” will be those which make notification desirable, notwithstanding the general provisions excluding the need for notification. In determining what may amount to “special circumstances” it is necessary to consider the matters relevant to the merits of the application as a whole, not merely those considerations stipulated in the tests for notification and service.

8.7 In this instance there are no special circumstances as the nature of the consent application is consistent with the rules, and objectives and policies for subdivision in the zone.

Public notification conclusion

8.8 Having undertaken the s95A public notification tests, the following conclusions are reached:

- Under step 1, public notification is not mandatory.
- Under step 2, there is no rule or NES that specifically precludes public notification of the activities, and the application is for activities other than those specified in s95A(5)(b).
- Under step 3, public notification is not required as the application is for activities that is are not subject to a rule that specifically requires it, and it is considered that the activities will not have adverse effects on the environment that are more than minor.
- Under step 4, there are no special circumstances that warrant the application being publicly notified.

8.9 It is therefore recommended that this application be processed without public notification.

Limited notification assessment (sections 95B, 95E-95G)

8.10 If the application is not publicly notified under s95A, the council must follow the steps set out in s95B to determine whether to limited notify the application. These steps are addressed in the statutory order below.

Cable Bay Consulting Ltd, 11 Bush Point Road, Cable Bay 0420

Step 1: certain affected protected customary rights groups must be notified.

8.11 There are no protected customary rights groups or customary marine title groups affected by the proposed activities (s95B(2)).

8.12 In addition, the council must determine whether the proposed activities are on or adjacent to, or may affect, land that is subject of a statutory acknowledgement under schedule 11, and whether the person to whom the statutory acknowledgement is made is an affected person (s95B(3)). In this instance, the proposal is not on and will not affect land that is subject to a statutory acknowledgement, and will not result in adversely affected persons in this regard.

Step 2: if not required by step 1, limited notification precluded in certain circumstances

8.13 The application is not precluded from limited notification as:

- the application is not for one or more activities that are exclusively subject to a rule or NES which preclude limited notification (s95B(6)(a)); and
- the application is not exclusively for a controlled activity, other than a subdivision, that requires consent under a district plan (s95B(6)(b)).

Step 3: if not precluded by step 2, certain other affected persons must be notified.

8.14 As this application is not for a boundary activity, there are no affected persons related to that type of activity (s95B(7)).

The following assessment addresses whether there are any affected persons that the application is required to be limited notified to (s95B(8)).

In determining whether a person is an affected person:

- a person is affected if adverse effects on that person are minor or more than minor (but not less than minor);
- adverse effects permitted by a rule in a plan or NES (the permitted baseline) may be disregarded; and
- the adverse effects on those persons who have provided their written approval must be disregarded.

Adversely affected persons assessment (sections 95B(8) and 95E)

8.15 As already stated, and as Illustrated earlier in this AEE, there are less than minor effects on persons arising from this application.

Step 4: further notification in special circumstances

8.16 In addition to the findings of the previous steps, the council is also required to determine whether special circumstances exist in relation to the application that warrants it being notified to any other persons not already determined as eligible for limited notification (excluding persons assessed under section 95E as not being affected persons).

Special circumstances are those that are:

- Exceptional, abnormal or unusual, but something less than extraordinary or unique;
- outside of the common run of applications of this nature; or
- circumstances which make limited notification to any other person desirable, notwithstanding the conclusion that no other person has been considered eligible.

8.17 In this instance there is nothing exceptional or unusual about the application, and that the proposal has nothing out of the ordinary run of things to suggest that notification to any other persons should occur.

Limited notification conclusion

8.18 Having undertaken the s95B limited notification tests, the following conclusions are reached:

- Under step 1, limited notification is not mandatory.
- Under step 2, there is no rule or NES that specifically precludes limited notification of the activities, and the application is for activities other than that specified in s95B(6)(b).
- Under step 3, limited notification is not required as it is considered that the activities will not result in any adversely affected persons.
- Under step 4, there are no special circumstances that warrant the application being limited notified to any other persons.

8.19 It is therefore recommended that this application be processed without limited notification.

CONCLUSION

9.0 Under the ODP the application site is zoned Rural Production. The proposal seeks restricted discretionary subdivision consent which is consistent with the matters for discretion and objectives and policies of the zone.

9.1 The application has been assessed in terms of the matters detailed in the relevant sections of the RMA (1991), and the ODP.

9.2 In my opinion the proposal accords with Section 104 of the RMA and can be granted resource consent on a non-notified basis.

Neil Mumby
Planning Consultant
B. Soc.Sci (REP) (Hons)
MNZPI(Full),
Member
ISOCARP
September 2025

Attachment 1

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Limited as to Parcels
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **NA81A/494** **Part-Cancelled**

Land Registration District **North Auckland**

Date Issued 18 March 1991

Prior References
NA763/209

Estate Fee Simple
Area 71.1873 hectares more or less
Legal Description Part Allotment 5 Parish of Oruru
Registered Owners
Tripark Farms Limited

Interests

Subject to a right to convey water over part marked A on Plan 143291 created by Transfer C265815.2 - 16.5.1991 at 2.20 pm

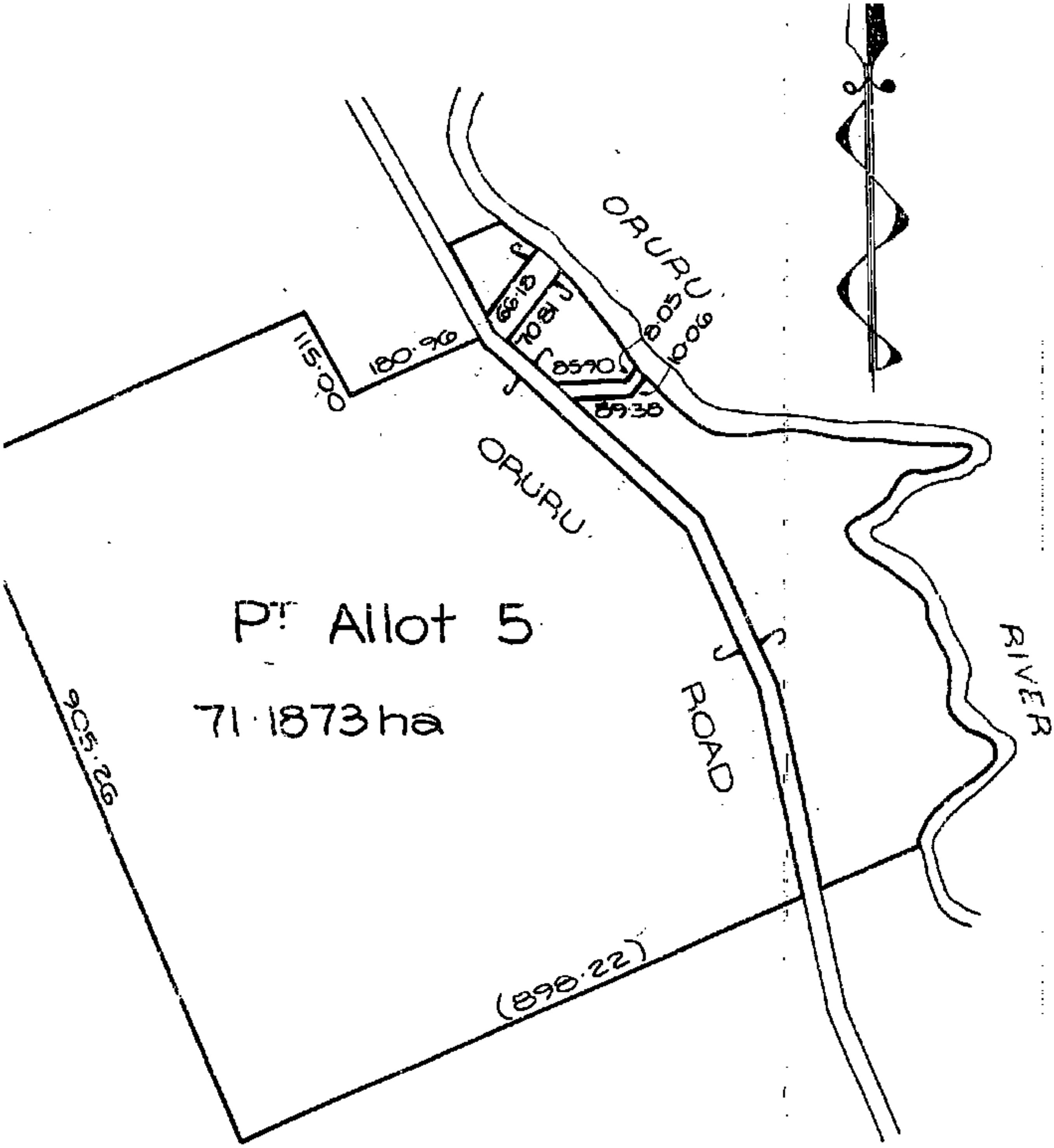
C570363.1 Gazette Notice (NZ Gazette Notice 10.2.1994 p.730) declaring parts (495m²) (1173m²) (1.3760 ha) for road and declaring other parts (1425m²) (1.2555 ha) to be stopped and vesting all in the Far North District - 22.2.1994 at 1.53 pm

D263584.1 Compensation Certificate pursuant to Section 19 Public Works Act 1981 by Far North District Council - 21.4.1998 at 2.56 pm

D315106.1 Gazette Notice (14.9.1998 pg 3596) declaring parts herein (53m²) marked C on SO Plan 68671, (756m²) marked B on SO Plan 68671 to be road and vested in The Far North District Council - 28.9.1998 at 3.14 pm

5871758.2 Mortgage to The National Bank of New Zealand Limited - 22.1.2004 at 9:00 am

Subject to a right (in gross) to transmit electricity over part marked B on DP 390147 in favour of Top Energy Limited created by Easement Instrument 7761050.1 - 26.3.2008 at 9:00 am


ORURU
66·18
70·81
85·90
89·38
8·05
10·06
180·96
115·00
ORURU
Pt Allot 5
71·1873 ha
ROAD
RIVER
905·26
(898·22)

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **NA95C/280** **Part-Cancelled**

Land Registration District **North Auckland**

Date Issued 29 April 1994

Prior References

GN C570363.1

Estate Fee Simple

Area 1.2555 hectares more or less

Legal Description Section 1 Survey Office Plan 62852

Registered Owners

Tripark Farms Limited

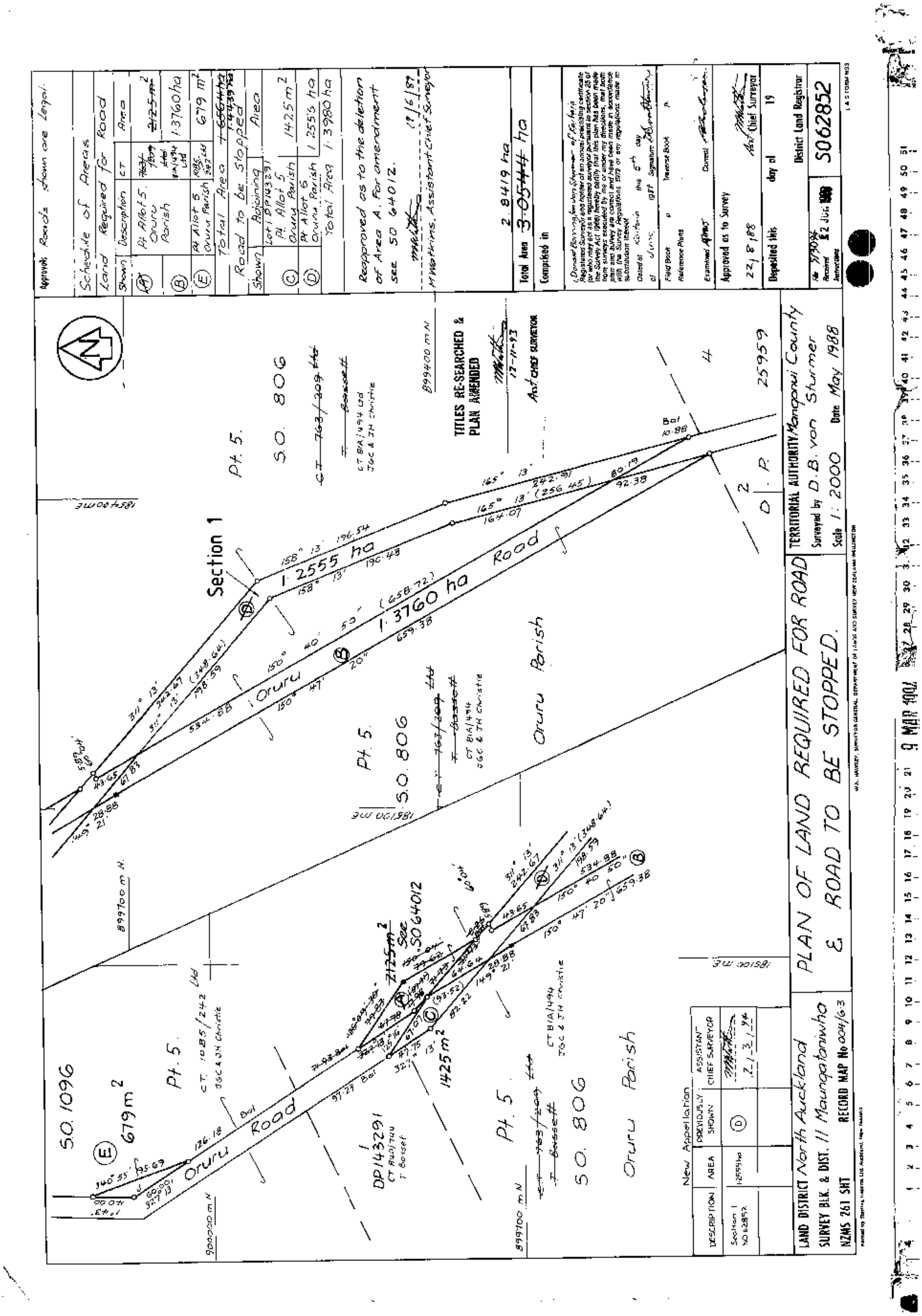
Interests

D263584.1 Compensation Certificate pursuant to Section 19 Public Works Act 1981 by Far North District Council - 21.4.1998 at 2.56 pm

D315106.1 Gazette Notice (14.9.1998 Pg 3596) declaring part herein (30m²) marked A SO NA68671 to be road and vested in The Far North District Council - 28.9.1998 at 3.14 pm

5871758.2 Mortgage to The National Bank of New Zealand Limited - 22.1.2004 at 9:00 am

Subject to a right (in gross) to transmit electricity over part marked A on DP 390147 in favour of Top Energy Limited created by Easement Instrument 7761050.1 - 26.3.2008 at 9:00 am



Approvals: Roads shown are Legal.
Schedule of Areas
Land Required for Road
Pt Allot 5 Oruru Parish
1.3760 ha
679 m²
Road to be Stopped
Pt Allot 5 Oruru Parish
1.2555 ha
Total Area 1.3980 ha
Reapproved as to the deletion of Area A. For amendment see SO 64012.
M Watkins, Assistant Chief Surveyor
Total Area 2.8419 ha
Comprised in
Approved as to Survey
Deposited this day of 19
District Land Registrar
S062852
TITLES RE-SEARCHED & PLAN AMENDED
Asst. CHIEF SURVEYOR
Section 1
1.2555 ha
1.3760 ha
Oruru Road
Oruru Parish
Pt. 5
S.O. 806
S.O. 1096
679m²
1425m²
DP143291
See SO64012
D.P. 25959
New Appellation
PLAN OF LAND REQUIRED FOR ROAD & ROAD TO BE STOPPED.
LAND DISTRICT North Auckland
SURVEY BLK. & DIST. II Maungataniwha
RECORD MAP No 004/63
NZMS 261 SHT
TERRITORIAL AUTHORITY Mangonui County
Surveyed by D.B. von Sturmer
Scale 1:2000 Date May 1988
9 MAR 1994

Attachment 2

Adjacent Land Assessment – Tripark Farms Ltd 976 Oruru Road

1.1 Adjacent land uses are also primarily rural in nature. A table identifying the legal descriptions of adjacent land is contained in Table 2 below;

Street Address	Legal Description	Property Description
874 Oruru Road	Allotment 8 PSH OF Oruru	Farm land with existing quarry and dwelling.
-	Pt Allotment 68 PSH OF ORURU	Farm land.
-	Lot 1 DP 84876	Farm land.
1188 Oruru Road	Lot 1 DP 25959	Farm land with dwelling.
1084 Oruru Road	Lot 2 DP 25959	Farm land with dwelling
1071 Oruru Road	Lot 1 DP 175805	Rural-Residential with esplanade reserve.
12 Jason Road	Pt Allot 1 Psh of WAITARAU	Farm land with dwelling
14 Jason Road	Pt Allot 1 Psh of WAITARAU	Rural - Residential
17 Jason Road	Lot 1 DP 210717	Farm land with dwelling
-	Allot 24 Psh of MANGONUI	Farm land.
341 Oruru Road	Pt Allotment 20 PSH OF Mangonui	Farm land.
-	Pt Allot 2 Psh of WAITARAU	Farm land.

1.2 An image showing the location of the adjacent land is below in Figure 2;

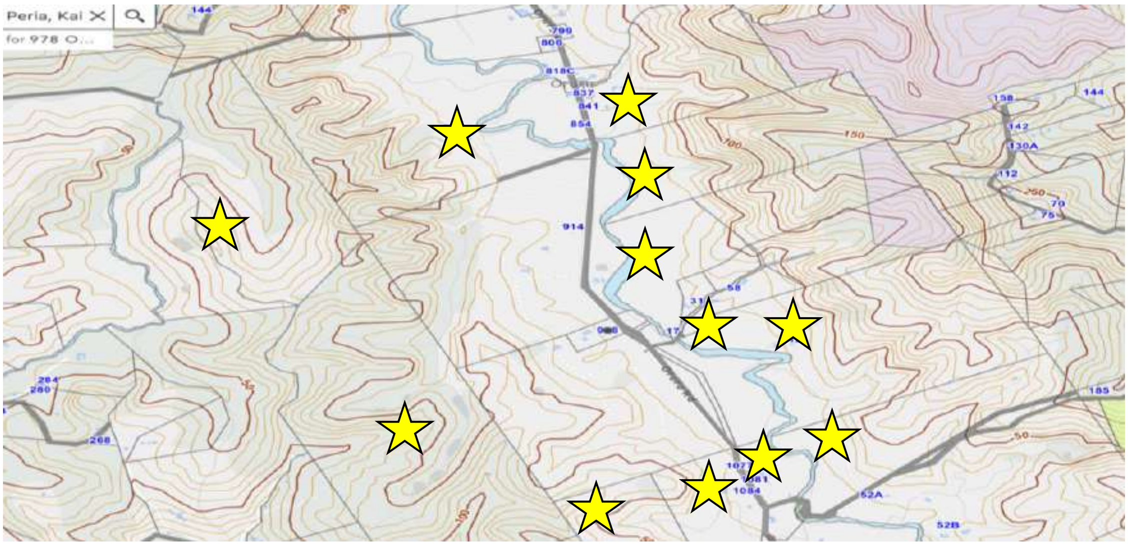


Figure 2 : Adjacent Land Assessment

Key

= Adjacent Land

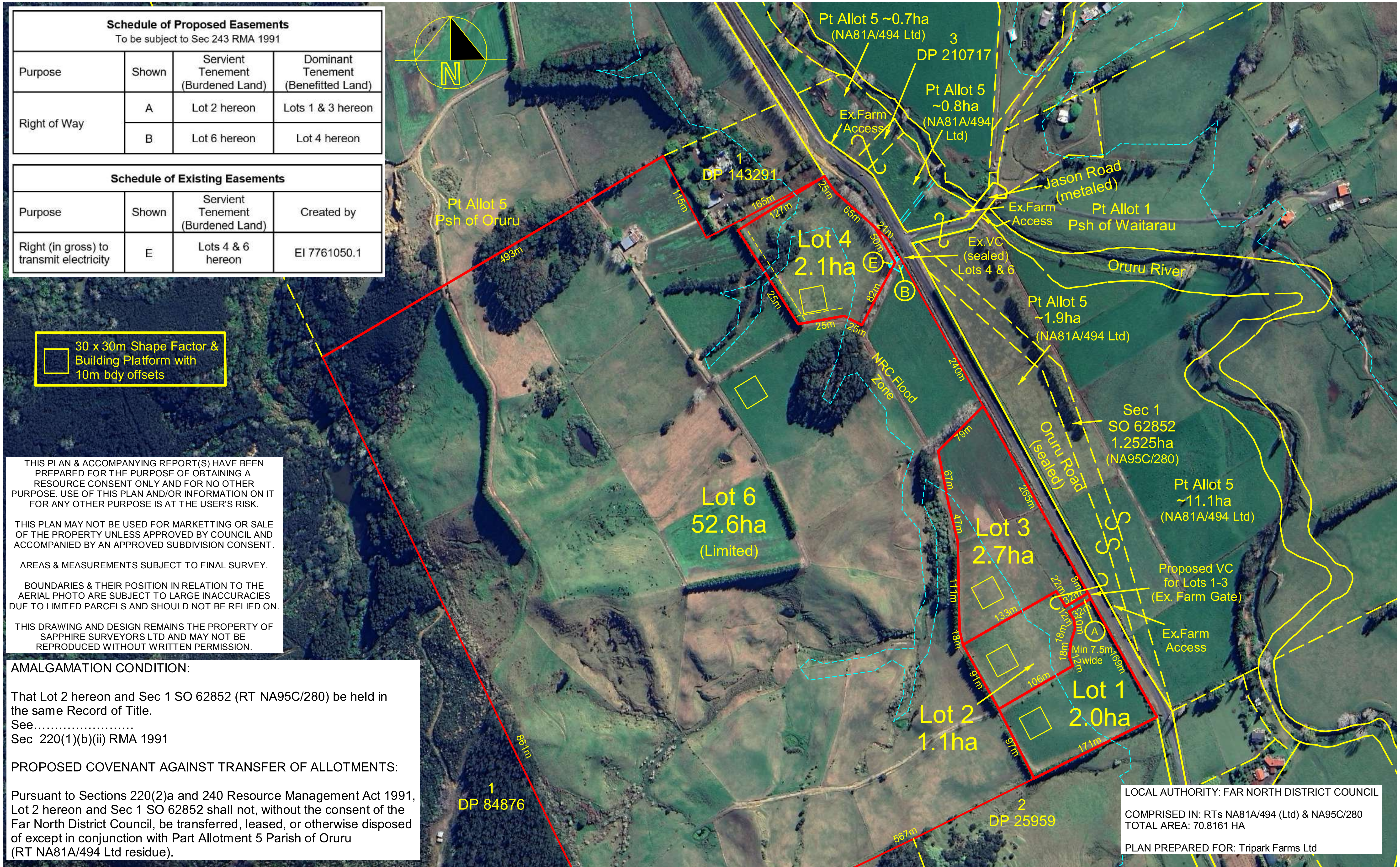
Attachment 3

Schedule of Proposed Easements
To be subject to Sec 243 RMA 1991

Purpose	Shown	Servient Tenement (Burdened Land)	Dominant Tenement (Benefitted Land)
Right of Way	A	Lot 2 hereon	Lots 1 & 3 hereon
	B	Lot 6 hereon	Lot 4 hereon

Schedule of Existing Easements

Purpose	Shown	Servient Tenement (Burdened Land)	Created by
Right (in gross) to transmit electricity	E	Lots 4 & 6 hereon	EI 7761050.1



THIS PLAN & ACCOMPANYING REPORT(S) HAVE BEEN PREPARED FOR THE PURPOSE OF OBTAINING A RESOURCE CONSENT ONLY AND FOR NO OTHER PURPOSE. USE OF THIS PLAN AND/OR INFORMATION ON IT FOR ANY OTHER PURPOSE IS AT THE USER'S RISK.

THIS PLAN MAY NOT BE USED FOR MARKETTING OR SALE OF THE PROPERTY UNLESS APPROVED BY COUNCIL AND ACCOMPANIED BY AN APPROVED SUBDIVISION CONSENT.

AREAS & MEASUREMENTS SUBJECT TO FINAL SURVEY.

BOUNDARIES & THEIR POSITION IN RELATION TO THE AERIAL PHOTO ARE SUBJECT TO LARGE INACCURACIES DUE TO LIMITED PARCELS AND SHOULD NOT BE RELIED ON.

AMALGAMATION CONDITION:

That Lot 2 hereon and Sec 1 SO 62852 (RT NA95C/280) be held in the same Record of Title.
See……………………
Sec 220(1)(b)(ii) RMA 1991

PROPOSED COVENANT AGAINST TRANSFER OF ALLOTMENTS:

Pursuant to Sections 220(2)a and 240 Resource Management Act 1991, Lot 2 hereon and Sec 1 SO 62852 shall not, without the consent of the Far North District Council, be transferred, leased, or otherwise disposed of except in conjunction with Part Allotment 5 Parish of Oruru (RT NA81A/494 Ltd residue).

LOCAL AUTHORITY: FAR NORTH DISTRICT COUNCIL

COMPRISED IN: RTs NA81A/494 (Ltd) & NA95C/280
TOTAL AREA: 70.8161 HA

PLAN PREPARED FOR: Tripark Farms Ltd

Sapphire Surveyors Ltd
Surveyors &
Land Development Specialists
Doubtless Bay, NZ
Ph. 09-406-0001
info@sapphiresurveyors.co.nz

Proposed Subdivision of Pt Allotment 5 Parish of Oruru
978 Oruru Rd, Taipa

Surveyed:		
Drawn:	WW	09/09/2025
Version:	B	
Status:	Final	12/09/2025
Sheet:	1 of 1	

Job Ref
0112S
A3 1:4500

Attachment 4

Hawthorn Geddes
engineers & architects ltd

ENGINEERING REPORT FOR RESOURCE CONSENT

PREPARED FOR TRIPARK FARMS LTD

AT 978 ORURU ROAD, TAIPA

PT ALLOTMENTS 5 PARISH OF ORURU

7 Selwyn Avenue
Whangarei 0110
09 438 7139

hg@hgcs.co.nz

Civil, Structural, Environmental and Geotechnical Engineers
Registered Architects and Project Managers

Also at Warkworth

21A The Grange
Warkworth 0910
09 283 3428

hawthorngeddes.co.nz

ENGINEERING REPORT FOR PROPOSED SUBDIVISION

Table of Contents

Report Prepared by:	Kaley Boyd, Engineering Geologist, BSc, AMEngNZ	Report Prepared by:	Linta Joy, Civil Engineer, MTech (Env), MEngNZ
Report Approved by:	Callum Sands, Geotechnical Engineer, BE(Hons), CMEngNZ, CPEng	Report Approved by:	James Blackburn, Civil Engineer, BEng (Hons), CPEng, CMEngNZ, IntPE(NZ)

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13270</td></tr>
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CC
Via email</td><td>Tripark Farms Ltd
Karen Parker
tripark.kp@gmail.com
Neil Mumby
Neil.mumby@cableconsulting.co.nz</td><td>EMAIL</td><td>25.11.2024</td></tr>
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Via email:
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Via email</td><td>Tripark Farms Ltd
Karen Parker
tripark.kp@gmail.com
Neil Mumby
Neil.mumby@cableconsulting.co.nz</td><td>EMAIL</td><td>17.12.2024</td></tr>
</table>

1. Purpose

The purpose of this report is to present the results of the engineering assessment completed at PT Allotments 5 Parish of Oruru at 978 Oruru Road, Taipa. This report provides advice for the proposed development on liquefaction damage potential, slope stability, settlement, earthworks, on-site wastewater disposal, and founding soil conditions.

This report is suitable to support a resource consent application to Far North District Council (FNDC).

2. Executive Summary

This report presents the results of an engineering investigation and suitability assessment completed for the proposed development as described in Section 3 below.

This Executive Summary provides a brief overview of our engineering evaluation for the project and is not intended to replace more detailed information contained elsewhere in this report. A summary of important engineering considerations, our conclusions, and recommendations for the proposed development are as follows:

- **Report Purpose:** to assess the suitability of the subject property for a proposed fifteen lot subdivision. Building sites for ten of the fifteen proposed lots are reported on, the remaining lots already contain dwellings or are proposed to be balance lots.

- **Geological Unit:** three separate lithologies have been mapped by GNS Science over the property including: Punakitere Sandstone, Whangai Formation mudstone, and OIS4-OIS1 estuary, river and swamp deposits.

- **General Site Topography:** the proposed subdivision is over foothills and river terraced ground with multiple stormwater runoff drains / gullies situated across the property.

- **Subsoil Investigation:** twenty-one hand augered boreholes and thirteen Cone Penetrometer Tests were completed over the 7th – 9th of October 2024. The subsoil investigation encountered / inferred soils and rock representative of Punakitere Sandstone and Whangai Formation mudstone mapped by GNS Science.

- **Groundwater:** groundwater transmissions were not encountered within any hand augered borehole. Evidence of elevated groundwater transmissions was not observed in the upper 3.0m over the proposed building sites. Groundwater transmissions were encountered within the Cone Penetrometer Tests between 0.5m bgl and 7.0m bgl.

- **Site Seismic Subsoil Class:** Seismic Subsoil Class C, per AS/NZS 1170.5:2004, Amd 2016, Section 3.1.3.1.

- **Liquefaction Vulnerability:** the proposed subdivision has been assessed as having a low liquefaction vulnerability during a 1,000-year seismic event or smaller, with no surface manifestation expected.

- **Static Load Settlement:** the proposed subdivision has been preliminarily assessed to be subject to negligible settlement under a typical residential building foundations including loads such as fill not greater than 0.5m (10kPa). Total settlements which include primary and secondary, are not expected to exceed 35mm.

- **Earthworks:** excavations are expected to be up to 2.5m deep for the formation of a flat building site or driveway / shared accessway. Fill over any of the proposed sites is not expected to exceed 2.0m for the formation of a building site or driveway / shared accessway. Retaining or battering is required to support both excavations and fill where greater than 1.0m high anywhere over the proposed subdivision.

- **Foundation Options:** shallow or piled foundations are considered appropriate for future residential development over the proposed subdivision following the appropriate earthworks. NZS 3604 type foundations are not considered suitable and specific engineered design is required.

- **Wastewater Field:** a pressure compensated dripper irrigation (PCDI) disposal field of some 630m^2 (not including a 33% reserve area) is proposed where slopes do not exceed 18°, with an appropriate discharge rate of 2.0mm/day. This is proposal is considered adequate for each proposed residential dwelling.

- **Flooding:** The NRC flood mapping indicates that the proposed house sites are not susceptible to flooding inundation at the existing ground levels.

- **Stormwater:** it is highly unlikely that the stormwater detention controls will be required, given the lot sizes. At the building consent stage, if the proposed impervious coverage exceeds 15% of the net site area, then site specific attenuation design is required.

- **Traffic & Access:** The proposed subdivision is within the Permitted Activity criteria for additional traffic generation. All vehicle crossings (other than those serving existing residential properties) are to be upgraded (for Lot 6, constructed) in accordance with the FNDC EES (2023). Compliant sight lines exist at all crossing locations, provided vegetation clearance is undertaken for Lots 4/7 and Lot 14.

3. Purpose

It is proposed to amalgamate and subdivide the subject properties (Lot 1 DP 143291 Pt Allot 5 Oruru Psh Clsd Rd SO 62852 Blks I II Maungataniwha Sd) into fifteen new lots – Lot 1 to Lot 15 – with lot areas ranging between 0.07Ha (shared accessway) up to 58Ha. A plan view of the proposed subdivision is provided in Figure A below:

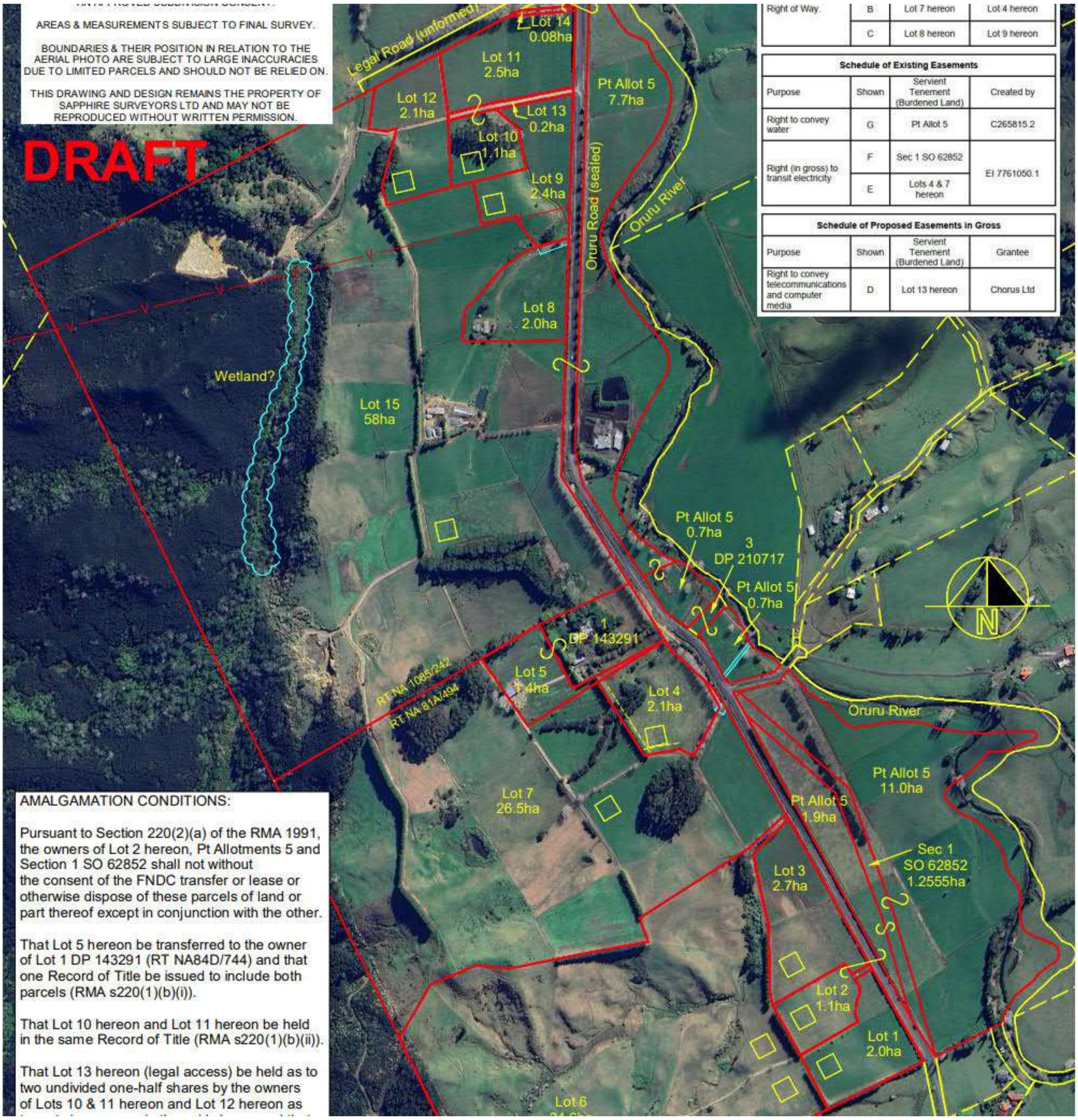


Figure A: Partial snip of the layout sheet provided by Sapphire Surveyors Ltd, reference 0122S, dated 28/08/2024.

The property is not connected to the council's reticulated wastewater, potable water, or stormwater networks. On-site wastewater disposal and stormwater management will be required.

Access to the proposed lots will be via a shared accessway extending westward off Oruru Road, private driveways will be required to extend off shared accessway(s).

4. Site Description

The property is irregular in shape, approximately 151Ha in area located within the rural production zone based on the FNDC proposed district plan (Figure B). The property is located some 8.0km south of Taipa township and some 50m west of Oruru River. Site topography comprises a gently to steeply sloping foothills that transition to a historic river terrace. The property has been deforested in the past to form the dairy farm pasture that exists today.

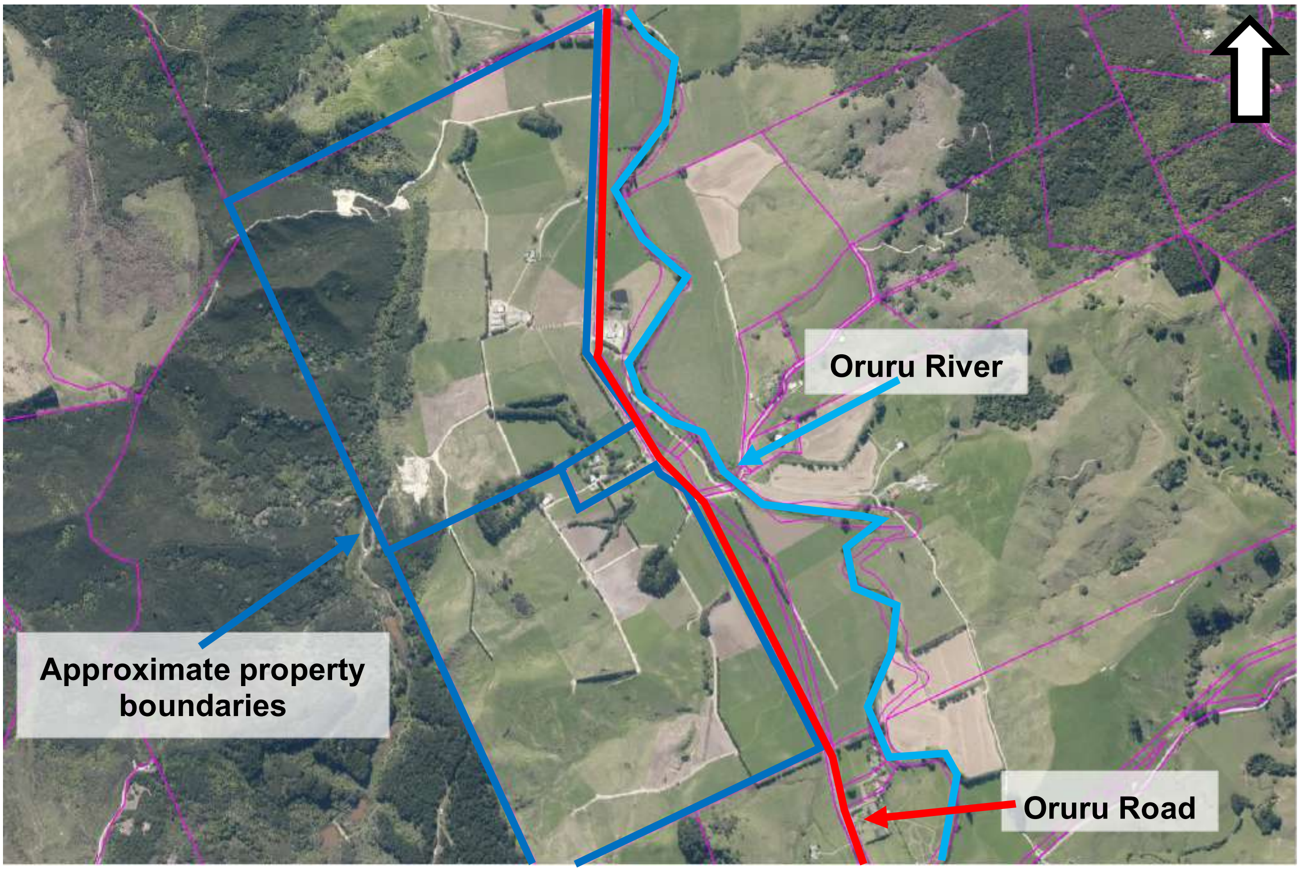


Figure B: Aerial image of the property in relation to its immediate surrounds (source: LINZ Data).

5. Geological Setting

The published geology by GNS Science indicates that the proposed sites are underlain by a variety of lithologies including Punakitere Sandstone, Whangai Formation (Mangakahia Complex) in Northland Allochthon, and OIS4-OIS1 estuary, river and swamp deposits.

All proposed building sites are illustrated to be underlain by OIS1 to OIS4 (Holocene to Late Pleistocene) estuary, river, and swamp deposits. These deposits are described as comprising poorly to un- consolidated sand, peat, mud, and shell deposits from estuarine, lacustrine, swamp, alluvial, and colluvial origins.

The Whangai Formation boundary is marked by a thrust fault with Punakitere mapped to the south of the fault. Whangai Formation is described as comprising fissile, dark grey to white weathering siliceous mudstone, with blue-grey calcareous mudstone, minor micritic limestone, and chert layers present throughout the formation.

Punakitere Sandstone is described as comprising weakly indurated metre-bedded quartzrose, micaceous sandstone with minor conglomerate, and interbedded with blue-grey mudstone.

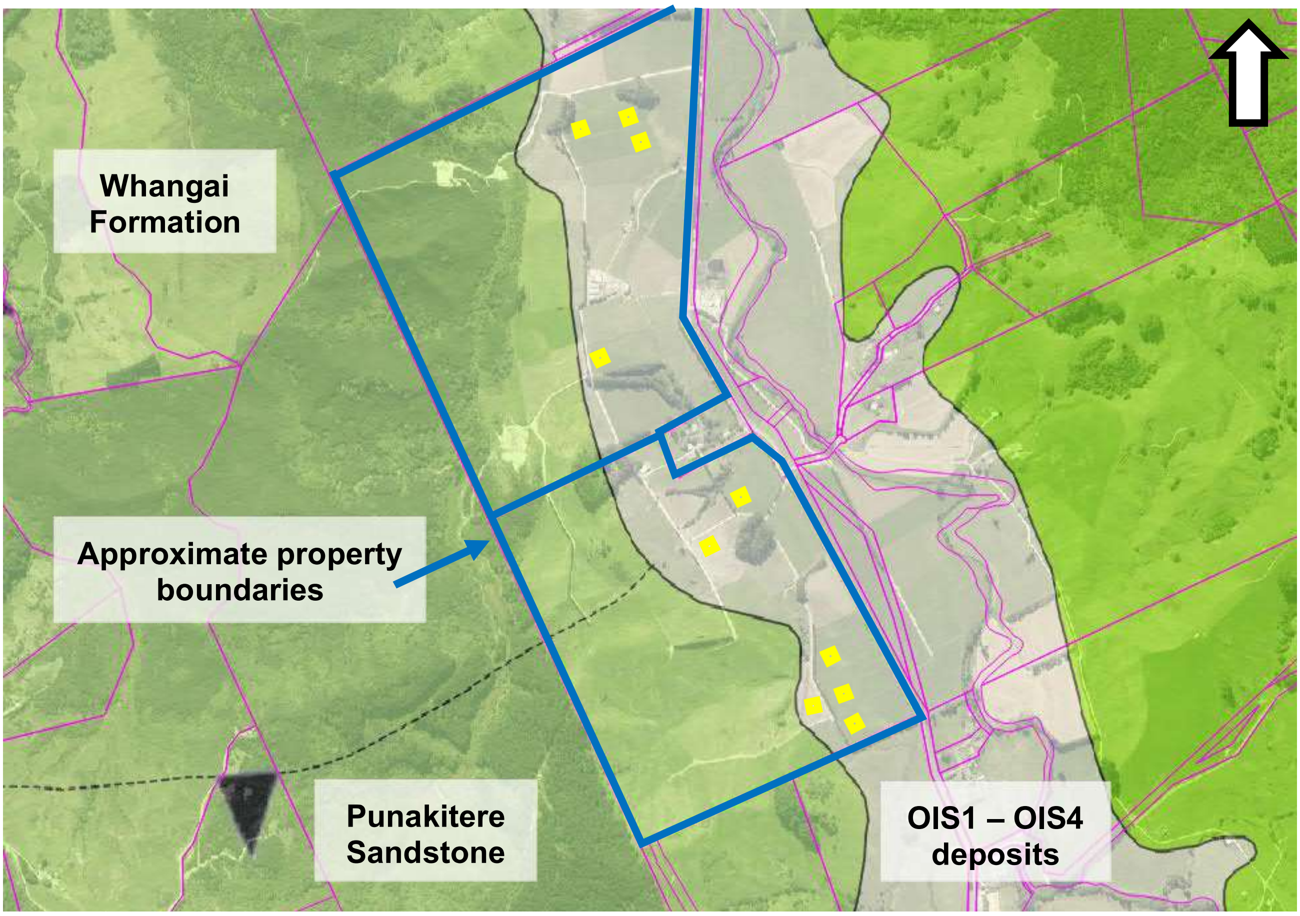


Figure C: Aerial view of the property and its surrounds with the published 250k geological units overlain (source: LINZ Data and GNS Science). The yellow boxes illustrate the proposed building sites.

6. Geotechnical Investigation

A site-specific subsoil investigation was undertaken over the 7th – 9th of October 2024 to determine the quality of the subsoil present beneath the proposed building sites and on-site wastewater fields. The investigation comprised the following:

- Twenty-one hand augers (HA1 – HA21) and nine dynamic cone penetrometers (DCPTs) performed by Hawthorn Geddes engineers and architects (HGEA), and
- Thirteen cone penetrometer tests (CPT1 to CPT13) performed by Underground Investigations Ltd, interpreted by HGEA.

6.1. Subsoil Investigation

Hand augered boreholes drilled to depths between 1.2m and 2.9m below ground level (bgl) were completed to inform subsoil conditions beneath a potential future building site within each proposed lot. Hand augered boreholes drilled to a maximum depth of 1.0m have been undertaken to assess the suitability of the upper subsoil conditions for on-site wastewater disposal field.

Most hand augered boreholes completed to depths greater than 1.0m had a DCPT completed from the base of the borehole using a Scala Penetrometer. The results were attained to refusal (≥20 blows/100mm) at a maximum depth of 6.1m bgl. Refusal is inferred to be contact with the underlying highly weathered bedrock of either the Punakitere Sandstone or the Whangai Formation Mudstone.

The undrained shear strengths were measured within the cohesive soils in accordance with NZGS Guideline for Handheld Shear Vane Test. A handheld shear vane was used at nominal 0.3m intervals within all boreholes, the results ranged between 47kPa and unable to penetrate (UTP). Within the Punakitere Sandstone residual soils (HA1 – HA13), the shear vane readings ranged between 84kPa and UTP, averaging a shear vane reading greater than 120kPa. The Whangai Formation Mudstone shear vane readings ranged between 47kPa and UTP, averaging a result greater than 100kPa.

Groundwater transmissions were not encountered within the hand augers completed over the elevated terraced land and elevated groundwater transmissions are not expected to exceed 3.0m bgl based on topography and an absence of water transmissions evidence. The hand augered boreholes completed over the lower, flat terraced land encountered groundwater no shallower than 0.9m bgl. This is considered representative of normal groundwater transmissions. Elevated groundwater transmissions over the lower terraced ground, are expected to raise to depths no shallower than 0.5m bgl based on iron oxide staining of the soils and site observations.

Soils encountered within the hand augered boreholes were consistent with the nearby published geology by GNS Science of Punakitere Sandstone and Whangai Formation residual soils.

Logs of the hand augered boreholes and a site plan indicating the hand augered borehole locations, are attached to this report. Each hand augered borehole is summarised on Table 1 below:

<u>Table 1: Summary of Subsoil Conditions</u>

<table>
<tr><th>Hand Augered Borehole</th><th>Hand Auger Termination Depth</th><th>Scala Penetrometer Termination Depth</th><th>Topsoil Depth</th><th>Groundwater Depth</th><th>Shear Vane Soil Strengths</th><th>Scala Penetrometer Raw Data in Natural Ground</th><th rowspan="3">Generalised Description</th></tr>
<tr><th colspan="5" rowspan="2">All depths measured in (m) below current ground level</th><th colspan="2">min - max</th></tr>
<tr><th>kPa</th><th>Blows/ 100mm</th></tr>
<tr><td>HA1</td><td>1.0</td><td>NM</td><td>0.1</td><td>NE</td><td>105 – 125</td><td>NM</td><td rowspan="11">Residual Punakitere Sandstone Soils: dark brown and blue-grey silts and clays that range from low to high plasticity. These soils are very stiff to hard and range from dry to wet depending on the locale of the respective hand auger. These soils are considered representative of the interbedded mudstone within the Punakitere Sandstone.

Residual Whangai Formation Soils: light grey and light golden brown clays that are highly plastic in nature. These soils are stiff to very stiff and range from dry to wet depending on the locale of the respective hand auger. These soils are considered representative of the Whangai Formation Mudstone.</td></tr>
<tr><td>HA2</td><td>2.7</td><td>4.9</td><td>0.2</td><td>NE</td><td>139 – 167</td><td>2 – 15</td></tr>
<tr><td>HA3</td><td>2.5</td><td>3.8</td><td>0.1</td><td>NE</td><td>98 – 195+</td><td>2 – 15</td></tr>
<tr><td>HA4</td><td>1.0</td><td>NM</td><td>0.2</td><td>NE</td><td>195+</td><td>NM</td></tr>
<tr><td>HA5</td><td>2.6</td><td>4.5</td><td>0.2</td><td>NE</td><td>195+</td><td>3 – 20</td></tr>
<tr><td>HA6</td><td>1.0</td><td>NM</td><td>0.1</td><td>NE</td><td>195+</td><td>NM</td></tr>
<tr><td>HA7</td><td>1.2</td><td>3.0</td><td>0.1</td><td>NE</td><td>167 – UTP</td><td>4 – 20</td></tr>
<tr><td>HA8</td><td>1.0</td><td>NM</td><td>0.1</td><td>NE</td><td>167 – 195+</td><td>NM</td></tr>
<tr><td>HA9</td><td>1.7</td><td>6.1</td><td>0.1</td><td>1.0</td><td>84 – 125</td><td>0.2 – 15</td></tr>
<tr><td>HA10</td><td>1.0</td><td>NM</td><td>0.2</td><td>0.9</td><td>112 – 125</td><td>NM</td></tr>
<tr><td>HA11</td><td>2.5</td><td>3.7</td><td>0.1</td><td>2.6</td><td>112 – 195+</td><td>4 – 15</td></tr>
</table>

Hand Augered Borehole	Hand Auger Termination Depth	Scala Penetrometer Termination Depth	Topsoil Depth	Groundwater Depth	Shear Vane Soil Strengths	Scala Penetrometer Raw Data in Natural Ground	Generalised Description
All depths measured in (m) below current ground level					min - max		
					kPa	Blows/ 100mm	
HA12	1.0	NM	0.1	NE	195+	NM	
HA13	2.1	5.9	0.1	NE	125 – 181	2 – 17	
HA14	1.0	NM	0.1	NE	195+	NM	
HA15	2.0	NM	0.3	1.5	92 – 221+	NM	
HA16	2.9	NM	NE	1.4	47 – UTP	NM	
HA17	2.0	NM	0.2	NE	118 – 139	NM	
HA18	2.8	3.4	0.2	NE	47 – UTP	5 – 20	
HA19	1.0	NM	0.2	NE	125 – 139	NM	
HA20	2.1	3.3	0.1	NE	125 – 167	3 – 20	
HA21	1.0	NM	0.2	NE	125 – 139	NM	

Table 1 Notes:

NM = not measured NE = not encountered UTP = unable to penetrate

6.2. Cone Penetrometer Testing Investigation

Thirteen CPTs were completed by Underground Investigation Ltd over the 8th and 9th of October 2024. A CPT was undertaken within / in close proximity to each proposed building site with four additional CPTs completed over the shared accessway to determine the suitability of the underlying soils. All CPTs were pushed until practical refusal was encountered, which ranged between 3.9m and 14.6m bgl.

CPT1 – CPT5 and CPT12 – CPT13 shared a similar soil profile with inferred soils belonging to the Punakitere Sandstone lithology. This subsoil profile typically comprised a capping layer of silty clay, underlain by varying depths and thicknesses of clay, silty clay, silt, medium dense sands. Practical refusal was inferred to be over highly to slightly weathered sandstone.

The remaining CPTs (CPT6 – CPT11) shared a similar soil profile with inferred soils belonging to the Whangai Formation lithology. This subsoil profile typically comprised a capping layer of silty clay, with varying depths and thicknesses of underlying clay, silt, silty clay, and highly to un- weathered mudstone.

No river deposits were inferred from CPTs across the property, all soil horizons were consistent with residual soils.

Refusal was encountered at a range of depths with CPT1 to CPT9 ranging between 6.0m and 14.6m bgl and CPT10 to CPT13 ranged between 3.9m and 4.4m bgl. Rock has been inferred where the tip resistance is greater than 20MPa with an estimated relative density greater than 50%. The inferred Whangai Formation mudstone had an average tip resistance ranging between 20MPa and 45MPa. The inferred Punakitere Sandstone had an average tip resistance ranging between 20MPa and 65MPa.

Based on the analysis of the CPT data, an idealised soil profile has been determined for each CPT to evaluate the geotechnical parameters of the soils encountered. The soil profile was inferred from the CPT measured tip resistance (qc), sleeve friction (fs), and porewater pressure (u). The inferred geotechnical parameters have been estimated and are summarised in Table 2 below.

CPT logs and a site plan indicating CPT locations are attached to this report.

Table 2: Summary of CPT Testing and Estimated Soil Parameters in Whangai Formation

Measured Soil Parameters				Estimated Soil Parameters		
General Description	**General depth layer was encountered (m)**	**Tip resistance – qc (MPa)**	**Undrained shear strength (kPa)**	**Relative density – Rd (%)**	**Effective friction angle - ϕ' (°)**	**Soil unit weight - γ (kN/m³)**
Residual Soil Silty Clay	0.0 – 2.5 & 9.0 – 10	1.5 & 1.0	100 & 125	-	25	18
Residual Soil Clay	2.0 – 5.5	0.75	55	-	22	17
Residual Soil Silt	8.5 – 9.5	6.0	375	-	26	18
Highly Weathered Mudstone	5.5 – 9.0	10	-	50	28	19
Moderately Weathered Mudstone	9.0 – 10.5	20	-	65	30	19
Slightly Weathered Mudstone	12.5+	30	-	70	32	20
Unweathered Mudstone	12+	45	-	80	35	22

Table 2 Notes:

- Represents CPT6 through CPT11 which are inferred to have encountered soils representative of Whangai Formation only.
- (-) are not relevant to the inferred soil / rock parameters.

Table 3: Summary of CPT Testing and Estimated Soil Parameters in Punakitere Sandstone

Measured Soil Parameters			Estimated Soil Parameters			
General Description	General depth layer was encountered (m)	Tip resistance – qc (MPa)	Undrained shear strength (kPa)	Relative density – Rd (%)	Effective friction angle - ϕ' (°)	Soil unit weight - γ (kN/m^3)
Silty Clay	0.0 – 2.5	1.5	120	-	25	18
Clay	2.0 – 5.0 & 6.5 – 7.5	0.65 & 0.9	50 & 65	-	22	17
Silt	4.0 – 6.0	2.5	200	-	26	18
Medium Dense Sand	5.0 – 6.0	8.0	-	50	28	18
Highly Weathered Sandstone	6.5 – 7.5	20	-	75	32	19
Moderately Weathered Sandstone	6.0+	50	-	90	35	22
Slightly Weathered Sandstone	7.5+	65	-	100	38	22

Table 3 Notes:

- Represents CPT1 through CPT5 and CPT 12 to CPT13 which are inferred to have encountered soils representative of Punakitere Sandstone only.
- (-) are not relevant to the inferred soil / rock parameters.

6.3. Geological Model

A geological profile though a building site in proposed Lot 1 is considered representative of Punakitere Sandstone lithology which was encountered over the southern portion of the proposed subdivision (Figure D). A separate geological profile is presented through the building site in proposed Lot 9, which is considered representative of the Whangai Formation lithology which was encountered over the northern portion of the proposed subdivision (Figure E). The illustrated images show the encountered subsoil depths from hand augered boreholes and the inferred depths from DCPT and CPT data, it also identifies encountered normal groundwater transmissions. The locality of this section is identified in the site plan in Appendix A of this report.

The southern portion of the property is underlain by silty clay, clay, silt, medium dense sand, before transitioning into moderately strong to strong, highly to slightly weathered Punakitere Sandstone. The northern portion of the property is underlain by silty clay, clay, silt, weak to moderately strong, highly to un- weathered Whangai Formation mudstone. The findings of the subsoil investigation are typically consistent with the mapped geology of the area by GNS Science.

Geologic Cross Section Key					
	Silty Clay		Clay		Silt
	Medium Dense Sand		Slightly Weathered Sandstone		

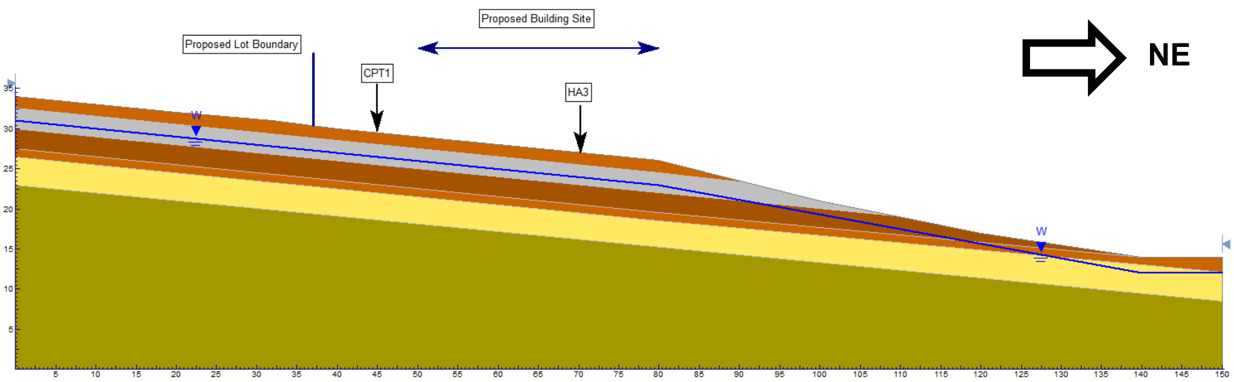


Figure D: Snip of geological cross section completed in RocScience Slide2, it transects through the proposed building site within Lot 1. The blue line represents the conservative elevated groundwater transmissions some 2.0m bgl.

Geologic Cross Section Key					
	Silty Clay		Clay		Silt
	Highly Weathered Mudstone		Moderately Weathered Mudstone		Slightly Weathered Mudstone

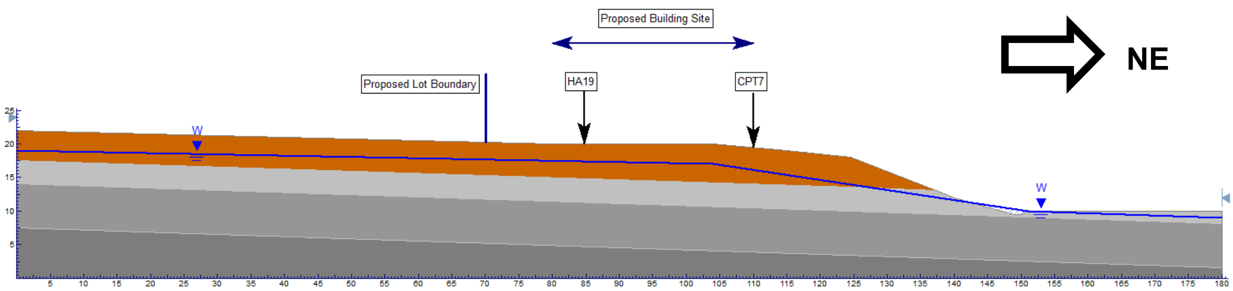


Figure E: Snip of geological cross section completed in RocScience Slide2, it transects through the proposed building site within Lot 9. The blue line represents the conservative elevated groundwater transmissions some 2.0m bgl.

7. Seismic Subsoil Classification

The results of the investigation indicate the site is Seismic Subsoil Class C; in accordance with AS/NZS 1170.5:2004. This was assessed based on the geological properties measured during our investigation in correlation with AS/NZS 1170.5:2004; (method (c) of the hierarchy for site classification methods, AS/NZS 1170.5:2004, Amd 2014, Section 3.1.3.1).

8. Stability Assessment

Rotational movement is characterised by the detachment and subsequent downslope movement of a mass of soil or rock along a curved or concave failure surface. The triggering mechanism often involves factors such as increased porewater pressure due to heavy rainfall, saturation of the soil matrix, and geological weaknesses, such as the presence of a weak layer or discontinuity within the slope. On the surface, this type of failure manifests as a distinctive concave-shaped head scarp or scar at the uppermost part of the slope, marking the point of initial detachment. Below the head scarp, a displaced slump block forms, featuring an irregular surface morphology. This surface disruption is the result of the non-uniform deposition of material during its downward movement, leading to an observable hummocky or undulating terrain.

Translational slope movement is a type of slope failure where a relatively coherent mass of soil, rock, or debris moves downslope along a nearly planar surface. In simpler terms, it when a chunk of the hillside breaks away and slides downhill in a fairly flat, sheet-like manner, without much rotation or “tumbling”. This type of movement is typical to occur over a shear plane, whereby there is a notable difference in soil mass and strength.

On a smaller scale, terracettes are evidence of shallow translational movement / planar failure (soil creep / slippage) in the upper 1.0m of soils due to oversaturation, slope oversteepening, and/or soil expansive processes.

8.1. Visual Stability Assessment

A visual stability assessment was undertaken by an engineering geologist and reviewed by a chartered geotechnical engineer from HGEA. This comprised a detailed site walkover, a review of historical aerial photographs and (source: Google Earth and Retro Lens), and a review of available LiDAR data.

The proposed subdivision is over a historic river terrace at the base of foothills that traverse north to south along the western property boundary (Figure F and Figure G). The foothills comprise gentle to steep slopes that typically trend towards the northeast or east. Localised slopes range up to very steep gradients that are present in natural and anthropogenic formed surface water runoff drains. Excavations have historically been made to form the existing farm tracks, these excavations are battered at approximately 1V:1H (45°) with soils exposed to weathering however, other than minimal erosion and frittering, show no signs of instability.

Terracettes are present over the property and where over slopes underlain by Punakitere Sandstone, are present over slopes 30° or more. Within the Whangai Formation, terracettes are present where slopes exceed 24°.

The river terrace has slopes that are steeply graded, not typically greater than 30° with minimal slippage occurring where slopes exceed this. These slopes formed from historic river movement and are considered globally stable, with shallow slips likely to occur where oversteepened (≥30°).

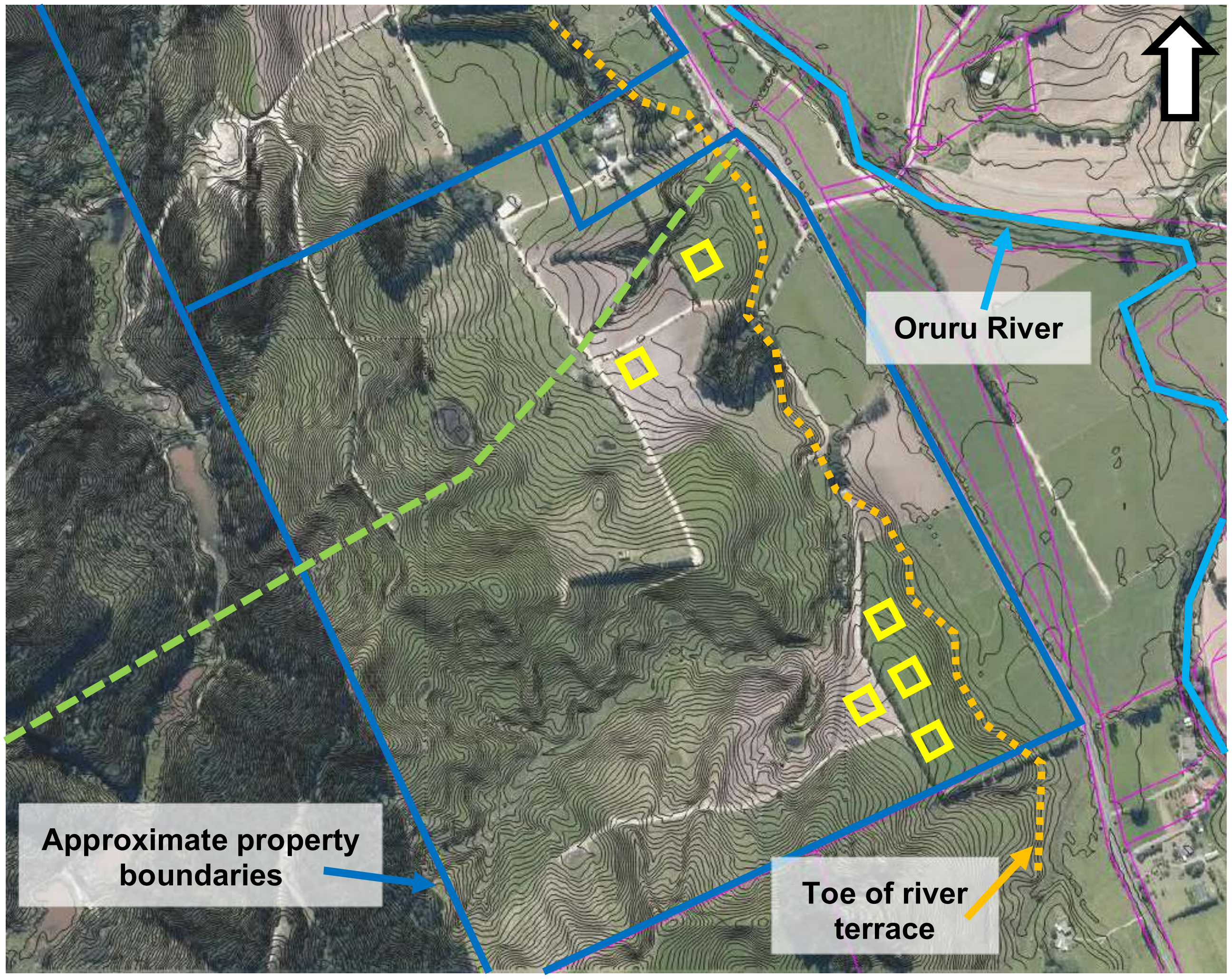


Figure F: Aerial image of the southern portion of the property with contours overlain at 1.0m intervals (source: LINZ Data). The green dashed line represents the approximate geological boundary between Punakitere Sandstone (south) and Whangai Formation Mudstone (north). The yellow squares represent the approximate location of the building sites.

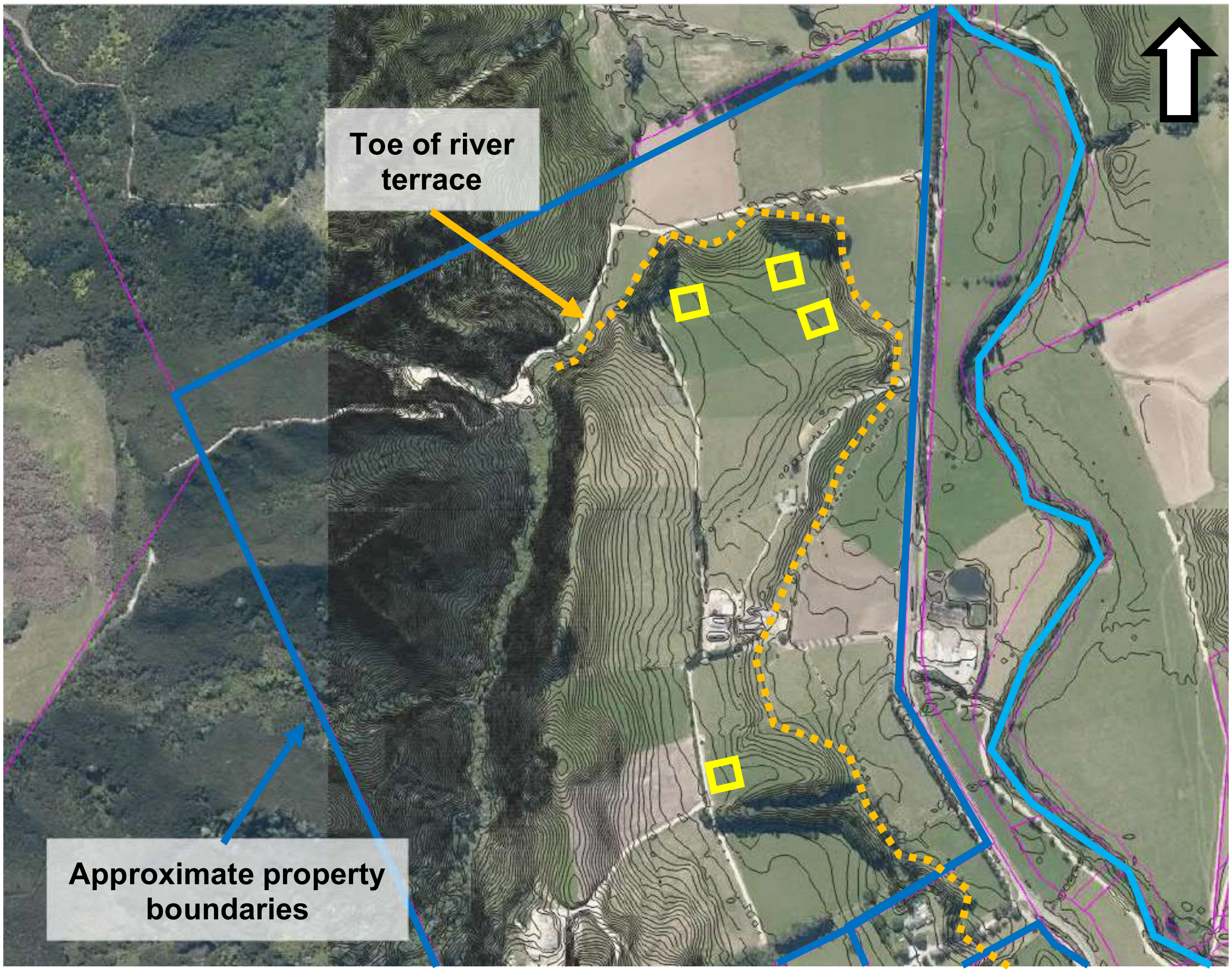


Figure G: Aerial image of the southern portion of the property with contours overlain at 1.0m intervals (source: LINZ Data). The underlying geology of the illustrated building sites is the Whangai Formation. The yellow squares represent the approximate location of the building sites.

The hillshade model shown in Figure H and Figure I below illustrates the surface topography using a digital elevation model (DEM) available from LINZ, to more readily identify any surface movements occurring. Historic rotational slips are observed over the property in the hillside, these are not situated near the proposed building sites, a minimum 200m away. These historic slips could be the result of oversteepening, based on aerial imagery, all significant slips occurred over 80years ago. Based on no surficial evidence of the fault mapped by GNS Science, we have assumed this historic fault line is significantly older than the observed rotational slips therefore there was no tectonic involvement in the formation of the historic slips. No significant land movements were identified as active during the site walkover.

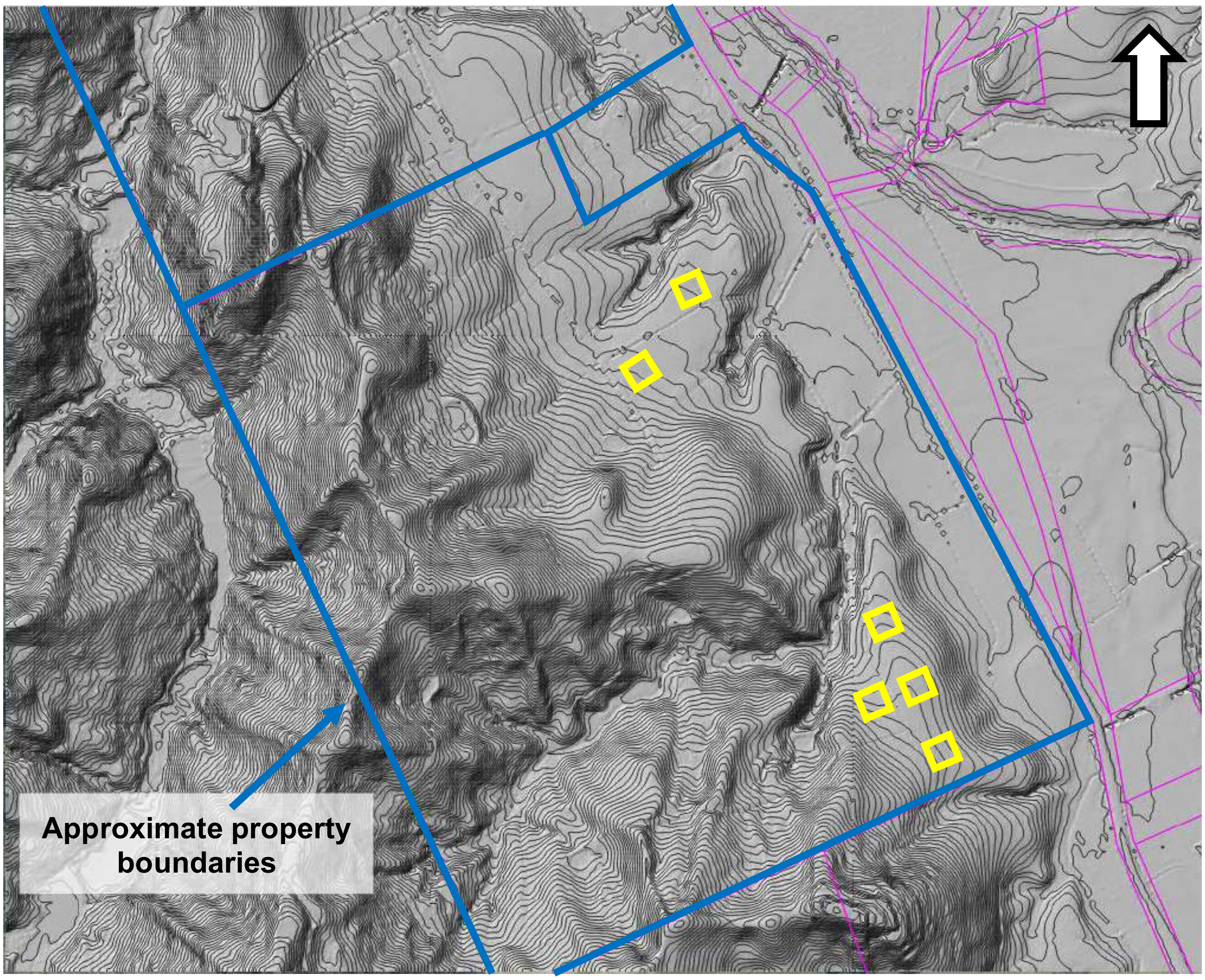


Figure H: Hillshade image of the southern portion of the property with contours overlain in 1.0m intervals (source: LINZ Data). The yellow squares illustrate the approximate location of the proposed building sites.

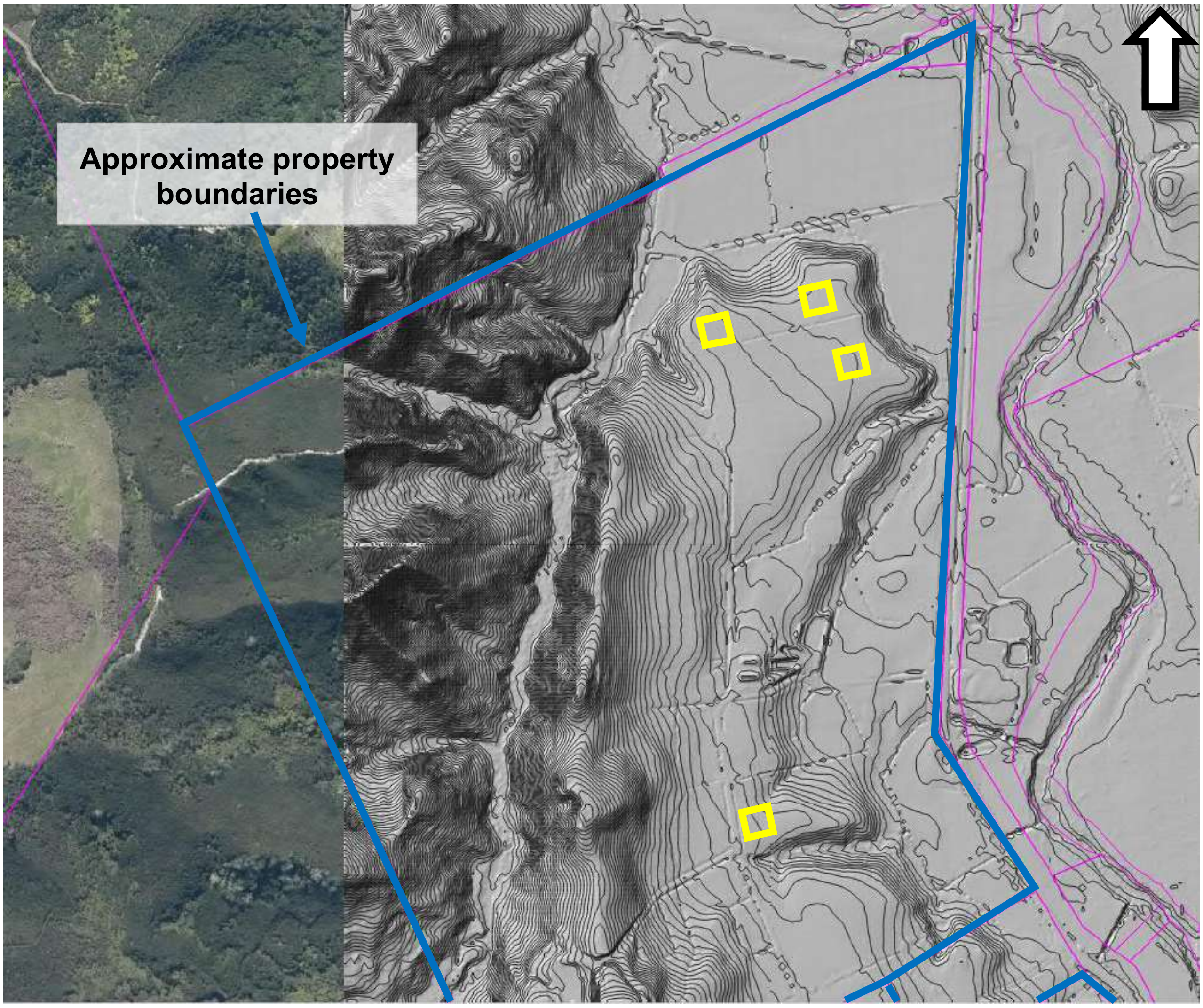


Figure I: Hillshade image of the northern portion of the property with contours overlain in 1.0m intervals (source: LINZ Data). The yellow squares illustrate the approximate location of the proposed building sites.

8.2. Numerical Analysis

A numerical slope stability analysis has been undertaken to determine the Factor of Safety (FoS) against sliding for the proposed building site has been completed using RocScience Slide 2. The cross sections used for the analyses has been adopted from available LiDAR data, these cross sections are illustrated in Figure J and Figure K below.

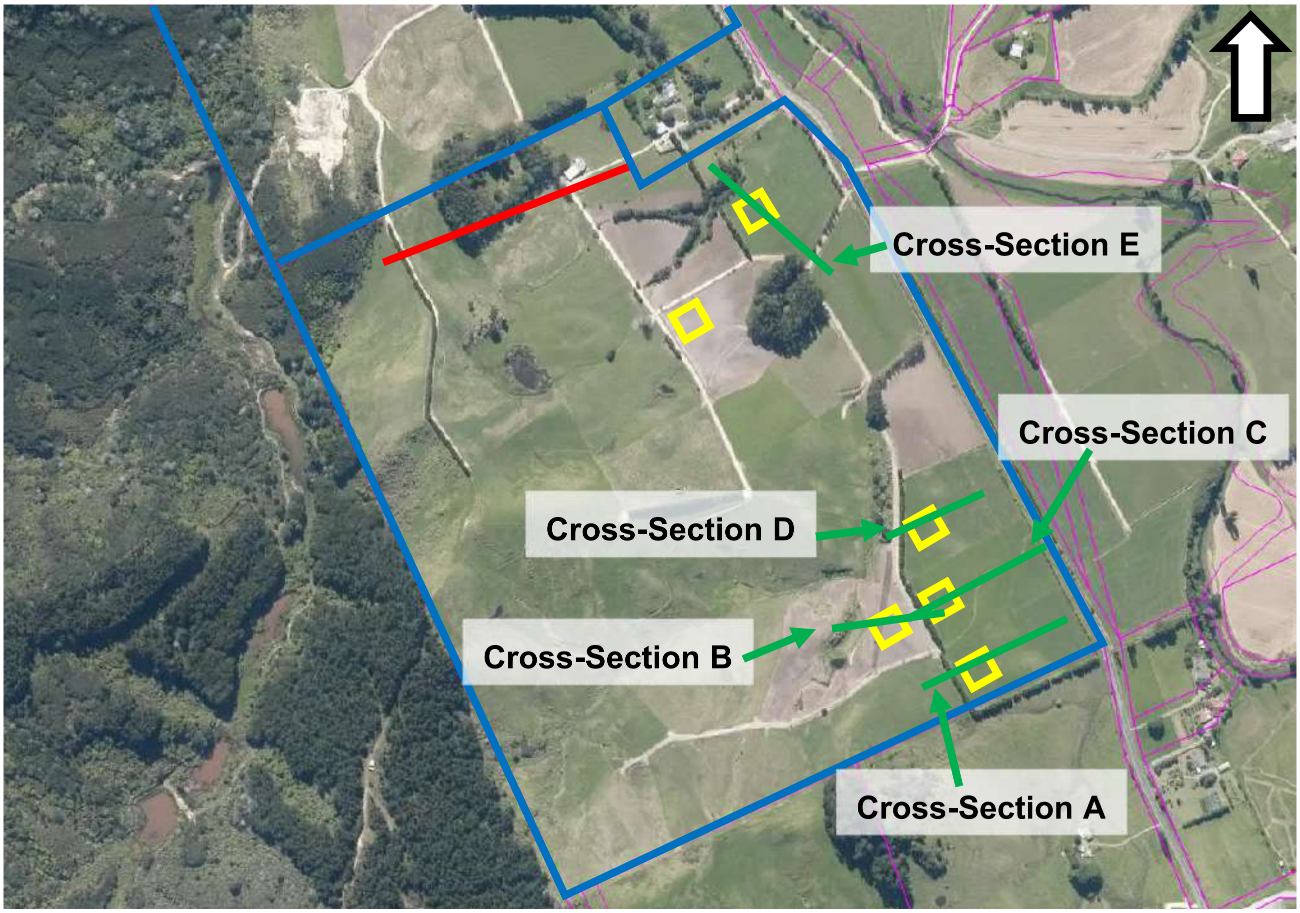


Figure J: Aerial image of the southern portion of the property with the property boundary identified in dark blue, the proposed building sites are identified as yellow squares (source: LINZ Data). The green lines represent the approximate location of the cross-sections completed for the numerical stability analysis within this report. The red line represents the approximate location of the back analysis.

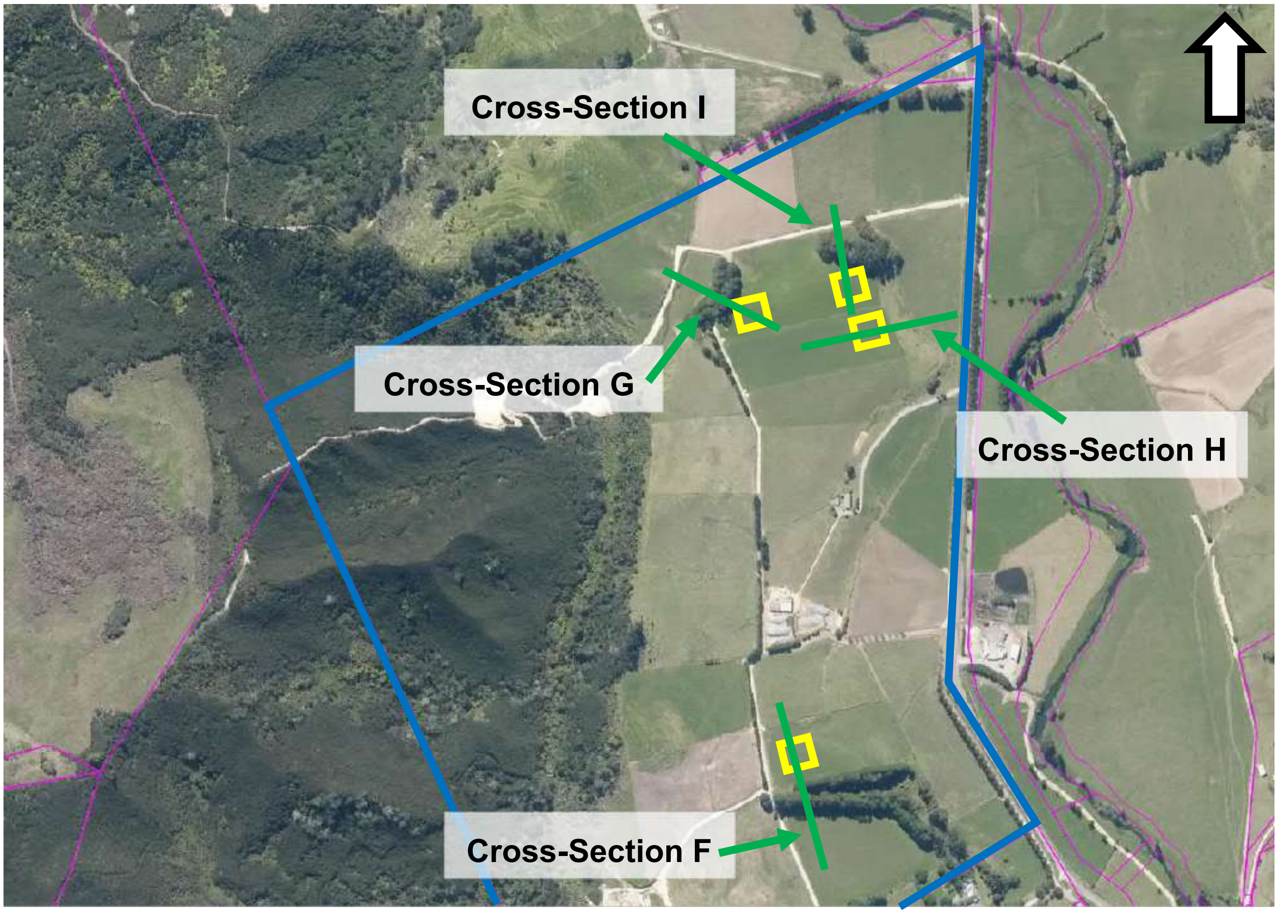


Figure K: Aerial image of the northern portion of the property with the property boundary identified in dark blue, the proposed building sites are identified as yellow squares (source: LINZ Data). The green lines represent the approximate location of the cross-sections completed for the numerical stability analysis within this report.

Global stability is defined as the large-scale instability of the site where the critical failure plane intercepts the proposed building sites. Local stability relates to smaller slippage of localised steep slopes and earthworks (cut/fill) batters. RocScience Slide2 and the Morgenstern-Price slope model have been used to assess the global and local stability of the proposed development through each building site.

An analysis has been undertaken for the critical cross-section/s through each proposed residential building site. To ensure the parameters and methods used are critical representations, a sensitivity analysis was conducted.

Three load cases / slope conditions have been assessed; these are:

1. Normal groundwater conditions (NGWT),

2. Elevated groundwater conditions (EGWT), and

3. Seismic with normal groundwater conditions (DCLS).

Soil lithology and depth for the forward analyses have been inferred based on site topography, measured and estimated CPT parameters, and subsoil profiles encountered in the hand augered boreholes, inferring post-earthworks slope conditions. The calibrated Mohr Coulomb (MC) soil parameters used for these analyses are summarised in Table 4 below:

Table 4: Calibrated Mohr-Coulomb Soil Parameters

Soil Description	Soil Unit Weight (γ)	Effective Cohesion (c')	Effective Friction Angle (ϕ')
	kN/m^3	kPa	Degrees
Silty Clay	18	3	25
Clay	17	4	22
Silt	18	2	26
Medium Dense Sand	18	0	28
HW Whangai Formation Mudstone	19	5	28
MW Whangai Formation Mudstone	19	8	30
SW Whangai Formation Mudstone	20	10	32
UW Whangai Formation Mudstone	20	15	35
HW Punakitere Sandstone	19	5	32
MW Punakitere Sandstone	20	10	35
SW Punakitere Sandstone	21	15	38
UW Punakitere Sandstone	21	20	45

Table 4 Notes:

CW= Completely Weathered HW= Highly Weathered

MW= Moderately Weathered SW= Slightly Weathered UW= Unweathered

For an IL2 structure, a DCLS level seismic event may be adopted for slope stability assessments to model a minimum seismicity event in areas with a perceived low seismic potential as is recommended within the NZ Bridge Manual (SP/M/022) and has been adopted as standard engineering practice.

The analysis criteria adopted herein is based on standard engineering practice. This requires a minimum FoS against sliding of 1.5 to be achieved for normal groundwater conditions (NGWT), 1.3 for extreme groundwater conditions (undrained) (EGWT) and 1.0 for a DCLS level seismic event.

Peak ground acceleration (PGA) and magnitude for this analysis have been adopted from Table A1, Appendix A of the MBIE/NZGS Earthquake Geotechnical Engineering Practice Module 1, 2021. Input parameters for the liquefaction assessment are summarised in Table 5 below:

Table 5: Liquefaction Assessment Input Parameters

Importance Level	Limit State	Probability of Exceedance (per annum)	PGA	Earthquake Magnitude
2	DCLS	Undefined (>1,000)	0.19	6.5

Initial slope modelling was undertaken to ascertain the most appropriate balance of earthworks, drainage, and slope mitigation required for the proposed development; referred to herein as the ‘proposed’ slope conditions. The proposed building sites have been modelled with a 10kPa surcharge load to represent typical NZS 3604 type residential buildings. A building platform of 20m *x* 20m has been adopted. The following parameters were assumed for the proposed slope conditions for each building site and the accessway:

The formation of a flat building platform is expected to be via excavations or a combination of excavation and fill. Over the proposed subdivision no building site is expected to be formed via excavations greater than 3.0m and fill no greater than 2.0m. Battering of fill is not acceptable and retaining is required where: fill is greater than 1.0m deep and/or slopes are greater than 18° (1V:3H). Retaining of excavations shall be required where: battering is unable to achieve 18° and/or excavation is greater than 2.0m deep. Drainage shall be installed to re-route surface water runoff away from slopes ≥18°, the building site driveway, the shared accessway, and shall not outlet directly downslope of the retaining walls or within 20m of slopes ≥18°. An inground retaining has been modelled where a setback of 20m is unable to be achieved.

Groundwater have been modelled at 2.0m bgl for elevated conditions and at 3.0m bgl for normal conditions.

Results of our numerical slope stability analysis identify the lowest FoS in relation to each of the proposed residential building sites with the exception of the building site within Lot 7 due to its essentially flat ground and surrounds. The results are presented in Table 6 below:

Table 6: Assessed Critical FoS of Different Conditions

Cross-Section	Condition	Existing FoS	Proposed FoS
Cross-Section A Lot 1 With Setback	NGWT	1.50	1.51
	EGWT	1.31	1.31
	Seismic – DCLS	0.79	0.79
	Seismic – Newmark	-	21mm
Cross-Section A Lot 1 With Inground RTW	NGWT	1.50	>1.50
	EGWT	1.31	1.36
	Seismic – DCLS	0.79	0.79
	Seismic – Newmark	-	<10mm
Cross-Section B Lot 6	NGWT	0.92	>1.50
	EGWT	0.77	>1.50
	Seismic – DCLS	0.92	>1.50
	Seismic – Newmark	-	<10mm
Cross-Section C Lot 2	NGWT	1.48	>1.50
	EGWT	1.37	1.49
	Seismic – DCLS	0.77	0.99
	Seismic – Newmark	-	<10mm
Cross-Section D Lot 3	NGWT	2.28	1.72
	EGWT	2.27	1.70
	Seismic – DCLS	1.10	1.06
Cross-Section E Lot 4 (L to R)	NGWT	1.85	>1.50
	EGWT	1.71	>1.50
	Seismic – DCLS	1.26	1.25
Cross-Section E Lot 4 (R to L)	NGWT	>1.50	>1.50
	EGWT	>1.50	>1.50
	Seismic – DCLS	1.63	1.25
	Seismic – Newmark	<10mm	<10mm
Cross-Section F Lot 15	NGWT	>1.50	>1.50
	EGWT	>1.50	>1.50
	Seismic – DCLS	1.18	1.49
Cross-Section G Lot 9	NGWT	1.49	1.50
	EGWT	1.43	>1.50
	Seismic – DCLS	0.99	0.97
	Seismic – Newmark	-	<10mm
Cross-Section H	NGWT	>1.50	>1.50

Cross-Section	Condition	Existing FoS	Proposed FoS
Lot 10	EGWT	>1.50	>1.50
	Seismic – DCLS	0.92	0.86
	Seismic – Newmark	-	<10mm
Cross-Section I Lot 12 With Setback	NGWT	1.40	>1.50
	EGWT	1.08	>1.50
	Seismic – DCLS	0.94	0.82
	Seismic – Newmark	-	<10mm
Cross-Section I Lot 12 With Inground RTW	NGWT	1.40	>1.50
	EGWT	1.08	1.42
	Seismic – DCLS	0.94	0.81
	Seismic – Newmark	-	<10mm

Table 6 Notes:

- The FoS presented above have been rounded to the nearest two decimal places.
- L to R = slip plane has been analysed from left to right.
- R to L = slip plane has been analysed from right to left.
- RTW = retaining wall.
- Where the DCLS level seismic event has returned a result lower than 1.0, a Newmark Displacement analysis has been undertaken.

Results of our numerical stability analyses indicate that the FoS against rotational failure for slopes near and/or beneath the proposed critical building sites are appropriate for the proposed subdivision subject to adequate drainage, battering of fill and excavations, and retaining where necessary.

Results of the sensitivity analyses indicate that site conditions are sensitive to changes in load, groundwater transmissions, and proximity to slopes greater than 18° without adequate retaining.

Where the seismic FoS is lower than 1.0, a Newmark Rigid Body analysis has been performed to determine the co-seismic site displacements. This analysis was conducted using Slide2 and the regression models proposed by Jibson (2007) and Jobson et al. (2013).

The Newmark Rigid Body analysis was completed to predict the likelihood of seismic induced site displacement during a DCLS level seismic event with the associated critical seismic coefficient measured against a FoS of 1.0. The DCLS magnitude displacement was assessed based on a seismic record with a PGA between the MBIE defined ULS and DCLS level seismic events but of a greater magnitude. The seismic data model used is that of Kobe, Japan 1995 – HIK090 – with a magnitude of 6.9 and a PGA of 0.15.

The assessment for proposed conditions for the proposed building sites within Lot 1, 2, 4, 9, 10, and 12 calculated that seismic induced damage is expected to be minimal. The largest displacement was assessed at 21mm within Lot 1, all other assessed building sites returned results less than 10mm. The remaining cross-sections were not required to be assessed by the Newmark Displacement analysis as they returned a DCLS seismic FoS greater than 1.0.

The FoS for the proposed building platform, as described above, are compliant with the current standard engineering practice.

9. Liquefaction Assessment

The liquefaction analysis contained herein has been completed using the programme CLiq2, over the full depth of the CPTs.

Liquefaction is a phenomenon where saturated low plasticity soils lose strength due to high pore pressure development during earthquake shaking. This generally occurs in loose to medium dense, cohesionless soils such as sand and other river deposited non-plastic silts, most common in low-lying and coastal areas with associated high groundwater transmissions. Liquefaction of near-surface soils typically results in surface cracking, dislocation, ground deformation, and lateral spreading.

Hand augered boreholes, shear vanes, and DCPTs were undertaken in correspondence with a 'Level D' calibrated desktop assessment of liquefaction risk, as per the Planning and Engineering Guidance released by EQC, MBIE, and MfE in 2017 (PEG 2017). The assessment was completed to provide a significant reduction in the uncertainty level of liquefaction related risks.

We have considered the future residential lots over the subject property to consist of Importance Level 2 (IL2) buildings. Following the guidance set out in MBIE Module 4 and NZS 1170.5:2004, IL2 buildings are required to be designed to resist damage caused by seismic activity of a defined 25-year return period, known as the Serviceability Limit State (SLS) design load. The deformation for this design case shall be limited such that the building's structural system does not experience deformation that causes the resulting damage to prevent continued use of the structure, nor significant repair. The magnitude of this deformation is typically accepted as that described in the New Zealand Building Code B1 Structures, Appendix B B1/VM1, Clause B1.0.2 (differential settlement no greater than 25mm over 6.0m, or 1:240).

An Ultimate Limit State (ULS) seismic event is defined in Module 4 with an annual probability of exceedance of a 500-year return period (1/500), whereby the structure must remain sound enough to allow evacuation and preservation of life (though irreparable damage may occur). At the specific design stage (Building Consent) the design engineers can readily quantify as such, however, for the purpose of this assessment, assuming lightweight NZS3604 type foundations, differential settlements in excess of 1:80 are considered appropriate.

Peak ground acceleration (PGA) and magnitude for SLS and ULS level events have been adopted from Table A1, Appendix A of the MBIE / NZGS Earthquake Geotechnical Engineering

Practise Module 1, Nov 2021. The NZ Bridge Manual suggests that all structures should be assessed for a Damage Control Limit State (DCLS) seismic events when modelling areas perceived as having a low seismic potential. A DCLS level seismic event is modelled within MBIE / NZGS Module 1 and is similar to an event with a 1,000-year return period. During a DCLS level seismic event, the structure may undergo significant / irreparable damage but should preserve life and allow for evacuation.

The latest MBIE guidelines are prepared for, and actioned under, the Building Act 2004, however, are commonly used as guidance during liquefaction assessment under the Resource Management Act 1991 (RMA). It is best practice to adhere to the advice contained within the Building Act 2004 when undertaking assessment under Section 106(1) of the RMA. These guidelines have been used to facilitate the liquefaction assessment contained herein.

A comparison of the DCLS liquefaction potential index (LPI) and for the liquefaction severity number (LSN) was undertaken for five empirical liquefaction triggering correlations (Figure L). This comparison was conducted to determine the most appropriate empirical method to use when completing our liquefaction assessment.

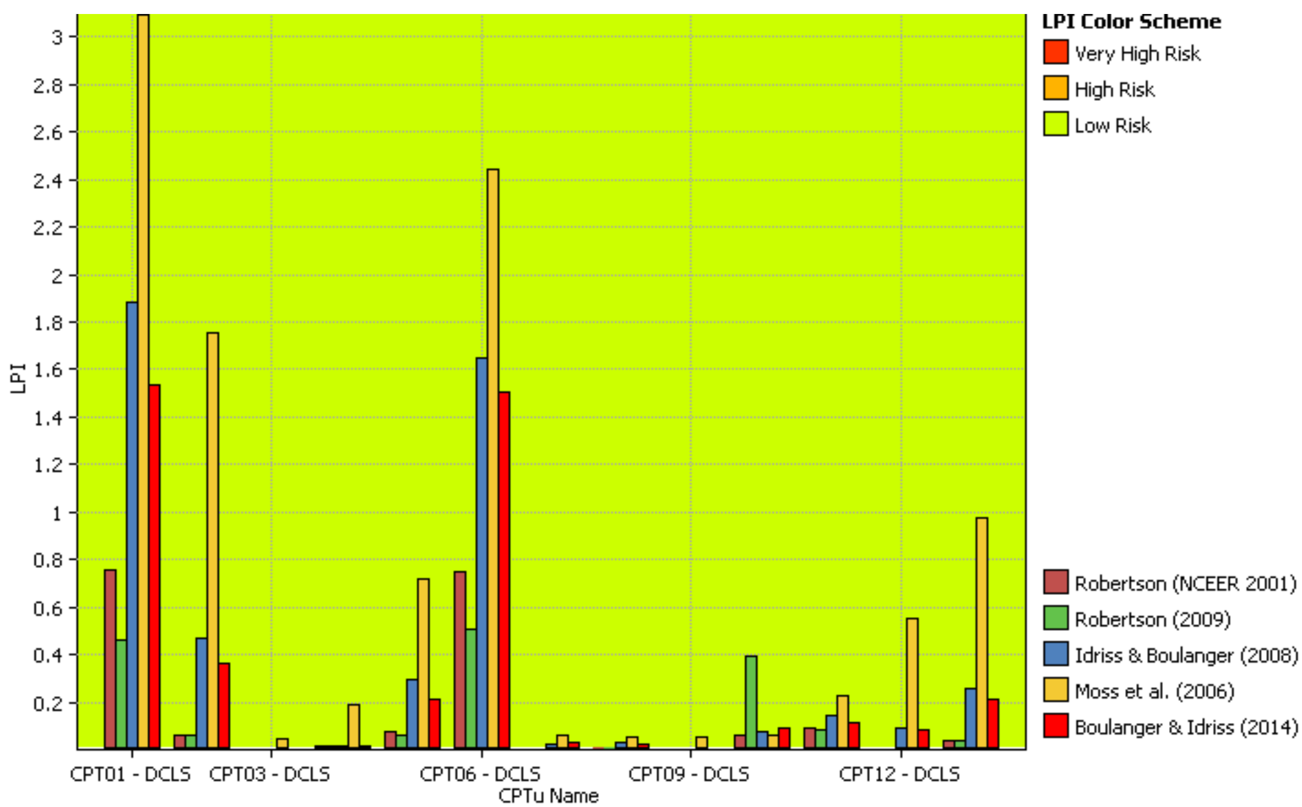


Figure L: Graph of all five empirical methods used to calculate the DCLS LPI, the most conservative results were typically provided by Moss et al. (2006).

Based on the outputs of all five empirical liquefaction triggering correlations, the Boulanger and Idriss (2014) relationship is considered to be the most representative for the property and has been adopted for the assessment contained herein.

In accordance with the recommendations set out in MBHIE / NZGS Earthquake Geotechnical Engineering Practise Module 4, Section 3.5, a triggering analysis has been undertaken to understand the site behaviour under various PGA scenarios.

Input parameters for the liquefaction assessment are summarised in Table 4 below:

Table 7: Seismic Input Parameters for the Liquefaction Assessment Based on FNDC

Importance Level	Limit State	Probability of Exceedance (per annum)	PGA	Earthquake Magnitude
2	SLS	1/25	0.03	5.8
	Not Defined	1/50	0.05	5.8
	Not Defined	1/100	0.07	5.8
	Not Defined	1/250	0.10	5.8
	ULS	1/500	0.13	5.8
	DCLS	1/2,500	0.19	6.5

Table 7 Notes:

- Not Defined = No limit state per NZS 1170.5:2004 and/or MBIE / NZGS Module 4.

The liquefaction analysis presented below has been undertaken adopting the following:

- The Boulanger & Idriss (2014) empirical correlation / method,
- A conservative depth to the groundwater table of 2.0m bgl,
- A soil behaviour index (Ic) cut-off of 2.6, assuming soils with an Ic greater than 2.6 are clay-like and not liquefiable, and
- DCLS, per MBIE Guidelines and the NZ Bridge Manual (SP/M/022).

Under current codes, design engineering must only consider the SLS and ULS seismic events, however, it is important to understand the behaviour of the site during the intermediary seismic events (annual exceedance probabilities) and a DCLS level seismic event.

Based on the above, the liquefaction analysis contained herein is considered to be conservative in nature, and representative of the worst-case scenario for the site.

9.1. Seismic Induced Vertical Settlement Analysis

Liquefaction-induced vertical settlement has been assessed under a DCLS and SLS seismic event over the full CPT depths.

Results of the analysis indicate that soils over the site are highly unlikely to liquefy during a SLS level event and may undergo high levels of liquefaction during a DCLS level event. The results of this analysis are detailed in Table 5 below.

The performance levels are presented below based on those described in MBIE / NZGS Earthquake Geotechnical Engineering Practise Module 3, Nov 2021, as follows:

"Level 0 'Insignificant' liquefaction effects are described as "No significant excess pore water pressures (no liquefaction)". This classification indicates the FoS has been calculated to be >1.4, with a liquefaction potential index (LPI) of 0, and a liquefaction severity number (LSN) of less than 10.

Level 1 'Mild' liquefaction effects are described as "limited excess pore water pressures; negligible deformation of the ground and small settlements." A 'Mild' classification means the FoS has been found to be ~1.0, a LPI of less than 5, and a LSN between 5 to 15.

Level 2 'Moderate' liquefaction effects are described as "Liquefaction occurs in layers of limited thickness (small proportion of the deposit, some 10% or less) and lateral extent; ground deformation results in relatively small differential settlements." This classification indicates the FoS has been found to be ~1.0, a LPI of less than 5, and a LSN between 10-25.

Level 3 'High' liquefaction effects are described as "Liquefaction occurs in a significant portion of the deposit (say 30% to 50%) resulting in transient lateral displacement, moderate-to-large differential movements, and settlement of the ground in the order of 100mm to 200mm." A 'High' classification indicates the FoS has been calculated to be less than 1.0, LPI ranges between 5 to 15, and the LSN ranges between 15 to 35.

Level 4 'Severe' liquefaction effects are described as "Complete liquefaction develops in most of the deposit resulting in large lateral displacements of the ground, excessive differential settlements and total settlement of over 200mm." This classification indicates the FoS is much less than 1.0, the LPI is greater than 15, and the LSN is greater than 30.

Level 5 'Very Severe' liquefaction effects are described as "Liquefaction resulting in lateral spreading (flow), large permanent lateral ground displacements and/or significant ground distortion (lateral strains/stretch, vertical offsets, and angular distortion." A 'Very Severe' classification does not provide characteristics but is considered to be much greater than that of Level 4 'Severe'."

Table 8: Summary of Liquefaction under DCLS Analysis – Full CPT Depth

CPT	Overall Vertical Settlement (mm)	FoS	LPI	LSN	Probability (%)	Performance Level
1	34	0.8	1.5	6.4	6.0	L1
2	23	0.9	0.4	4.6	4.7	L1
3	0	1.1	0.0	0.1	4.3	L0
4	4	1.0	0.0	0.5	4.4	L0
5	14	0.9	0.2	1.5	4.5	L0
6	33	0.7	1.5	4.5	5.9	L1
7	9	1.1	0.0	0.9	4.4	L0
8	3	1.1	0.0	0.1	4.4	L0
9	3	1.2	0.0	0.3	4.3	L0
10	1	>2.0	0.1	0.3	4.4	L0
11	4	1.3	0.1	1.4	4.5	L0
12	4	1.0	0.1	1.9	4.4	L0
13	8	1.0	0.2	3.3	4.5	L0

For a DCLS level seismic event, the site performance level of each CPT is calculated to have an insignificant to mild probability of liquefaction occurrence, with an LPI and LSN commensurate of L0 to L1 events over the full CPT depth. Consider the upper 4.0m of the subsoil profile only, this level is closer to that of L0 event due to the confining cohesive, silty clay and clay layers.

Results of our DCLS liquefaction assessment over the full CPT depth indicate that the site may experience an overall vertical settlement in order of 0mm to 34mm, with a probability of occurrence ranging from 4% to 6% for a DCLS level seismic event. Liquefaction-induced settlement of some 90% is expected to occur within medium dense sand or silt layers at depths typically greater than 4.0m bgl, beneath the groundwater table.

Due to the liquefaction induced settlement likely occurring at depths below 4.0m and the presence of cohesive, normally consolidated silty clay and clay, we expect a majority of the settlement to be rafted by the overlying soils with insignificant settlement damage observed at the surface.

A copy of the CLiq2 outputs is attached to this report, see Appendix E.

9.2. Liquefaction Triggering Analysis

Results of our triggering analysis indicate that vertical settlements induced by a seismic event with a magnitude and PGA for a 1/250 year event or smaller, is unlikely. A ULS level event will likely result in minor damage to the building within the ULS tolerance requirements with differential settlement assessed to be imperceptible at the surface. For a DCLS level event, damage is likely if surface manifestation occurs. Differential settlement is not likely to occur outside of the building design tolerances during a DCLS level seismic event. All remaining scenarios have been assessed to be within building design tolerances for all remaining modelled seismic events.

The assessed liquefaction performance levels and magnitude of vertical settlement over the full CPT depth for the various earthquake / seismic load cases as defined in Table 4 above, are summarised below:

- 1/25-year event (SLS under MBIE / NZGS Modules for IL2)
    - Performance level = L0
    - Maximum assessed vertical settlement = 0mm
- 1/50-year event
    - Performance level = L0
    - Maximum assessed vertical settlement = 0mm
- 1/100-year event
    - Performance level = L0
    - Maximum assessed vertical settlement = 0mm
- 1/250-year event
    - Performance level = L0

- Maximum assessed vertical settlement = 1mm

- 1/500-year event (ULS under MBIE / NZGS Modules for IL2)
  - Performance level = L0
  - Maximum assessed vertical settlement = 7mm

A copy of the CLiq2 outputs is attached to this report, see Appendix E.

9.3. Surface Manifestation

Liquefaction induced damage observed at the ground surface is a function of the severity of liquefaction and thickness / density of the non-liquefiable crust. Analysis of the potential liquefaction surface manifestation has been undertaken using the computer programme CLiq2 and the Ishihara (1985) empirical correlation. Based on results of the CPT testing, the non-liquefiable crust over the site is typically some 4.0m thick however, for totality the effect of no thick crust was modelled (Figure M).

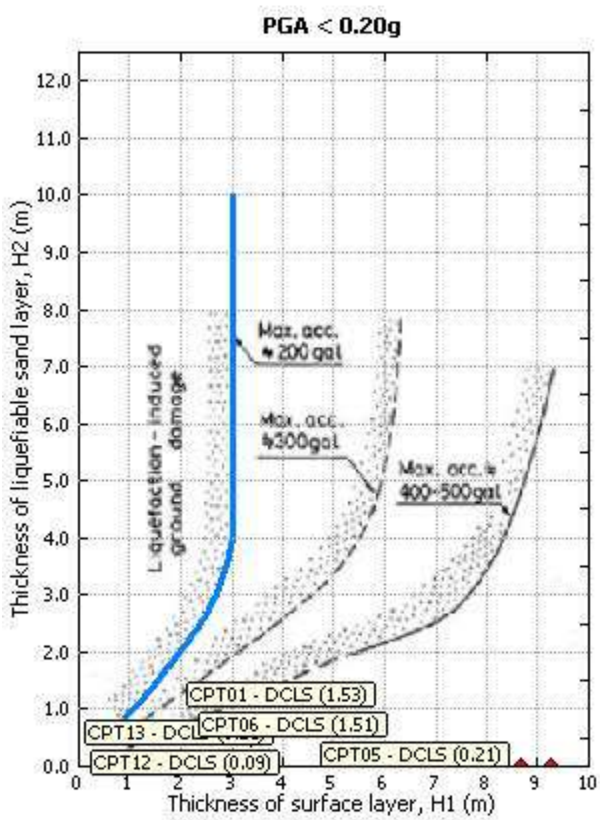


Figure M: Plot of the site CPTs against Ishihara's chart (1985) for assessment of the effects of no crust on liquefaction induced ground damage. DCLS level seismic events have been mapped.

The above graph shows the site specific CPTs plotted over Ishihara's (1985) crust thickness chart. This indicates that for a DCLS event, with a 1.0m crust there is unlikely to be surface manifestation of liquefaction damage.

9.4. Lateral Spreading

Lateral spreading normally occurs along an open slope face such as a riverbank or steep coastal slope, where loose, saturated sandy soils are commonly encountered at shallow depths. The effect of lateral spreading generally decreases with increased distance from the slope face.

A lateral spreading assessment was undertaken using CLiq2, this found lateral displacements likely to range between 0mm through to 390mm. In consideration of CPT1 and CPT6 which both returned displacement results greater than 120mm (377mm and 387mm respectively) further analysis was undertaken.

An assessment of lateral spreading was conducted using Slide2 and the regression models proposed by Jibson (2007), as well as Jobson et al. (2013). The results were further verified using Equation 7 and Figure 3 presented in the paper titled 'Regression models for estimating co-seismic landslide displacement' by Jibson (2007).

Results of this assessment indicate that lateral spreading has a Factor of Safety less than 1.0, with the Newmark Displacements estimated to be no greater than 20mm. This assessment has been further explained within Section 8.2 of this report.

The proposed building sites and the property are considered highly unlikely to be at risk of lateral spreading.

10. Static Settlement

Results of our geotechnical investigation indicate that the site is typically underlain by a variety of clays, silts, medium dense sand, weathered sandstone, and weathered mudstone. A silty clay layer was encountered over the entirety of the site, with this layer typically no less than 2.0m thick. The silty clay is frequently underlain by clay, both soil lithologies are considered to be normally consolidated and stiff to very stiff.

A preliminary numerical settlement analysis of the potential primary and secondary creep settlements over a 120-month period has been undertaken to ascertain the potential levels of settlement under a future NZS3604 type lightweight building. This analysis has been completed using the computer programme CPeT-IT2.

Consolidation settlement is the process of excess porewater pressure dissipation, whereby when a load is applied to a soil structure, the load is initially taken up by the porewater pressure and gradually transferred to the soil structure. This process results in the consolidation of the soil structure over time, referred to as 'primary consolidation settlement'.

Creep settlement occurs over an extensive period and is the re-adjustment of soil particles under constant load, generally commencing once all excess pore water pressure dissipates (at the end of consolidation settlement), referred to as ‘secondary settlement’.

Under the Resource Management Act (RMA) Section 106(1), a building platform can only be considered suitable for development should it not be subject to natural hazards, including subsidence. The purpose of this settlement analysis is to determine what magnitude of settlement can be expected from the proposed load and what allowance of overfilling should be applied to the development following the conclusion of consolidation, such that an appropriate finished floor level is maintained.

The general guidance on differential settlement for Serviceability Limit State (SLS) design load combinations, as described in the NZ Building Code B1 Structures, Appendix B B1/VM1, Clause B1.0.2, advises a design tolerance for differential settlement beneath a building platform to be no greater than 25mm over a horizontal distance of 6.0m (1:240) is generally suitable. This tolerance is typical of a lightweight building, however, will decrease in magnitude for a stiff, pre-cast concrete clad building found over a concrete floor slab. The assessment contained herein has been undertaken on the assumption that the future development over the property will comprise a structure that is tolerable of differential settlements in the order of 1:240 across the building footprint for SLS design.

The analysis presented below is for the assessment of potential settlement (consolidation and secondary settlement) for a lightweight residential building with a footprint of some 400m^2 using CPeT-IT2. The analysis has been undertaken over the full depth of the soil profile as measured by the CPTs (Table 6). All CPTs within a building site have been assessed with only 0.5m of fill with the exception of CPT3 which has been assessed to account for 2.0m of fill based on the numerical stability assessment set out in Section 8.2 of this report. For the CPTs completed over proposed accessways, the total load has been limited to 0.5m of fill and 12.5kPa to account for heavy vehicle movements.

The dimensions and loads used for this analysis are as follows:

- Length = 20m
- Proposed building load = 5kPa
- Maximum proposed fill load = 10kPa (0.5m) – 40kPa (2.0m)
- Total load = 15kPa, 22.5kPa, or 45kPa
- Width = 20m

Table 9: Results of Predicted Static Settlement using CPeT-IT2

CPT	Total Load Applied (kPa)	Total primary settlement	Total secondary settlement	Total settlement
		(mm)		
CPT1	15	14.8	6.3	21.1
CPT2	15	5.7	2.6	8.3
CPT3	45	13.3	1.8	15.1
CPT4	15	9.8	8.7	18.5
CPT5	15	21.1	15.6	36.7
CPT6	15	14.0	7.2	21.2
CPT7	15	21.7	19.5	41.2
CPT8	15	17.1	16.6	33.7
CPT9	15	20.9	15.7	36.6
CPT10	22.5	20.4	3.6	24.0
CPT11	22.5	4.9	0.6	5.4
CPT12	22.5	2.9	0.2	3.1
CPT13	22.5	5.1	0.5	5.6

Table 6 above provides a summary of the expected total settlement over the full soil profile depth, including primary and secondary consolidation. Results of our analysis under the proposed buildings sites indicate that some 90% of the calculated settlements will occur at depths greater than 3.0m bgl beneath the silty clay layer. The analysis using CPeT-IT2 suggests that the primary consolidation settlement ranges between 8mm to 37mm for a future lightweight dwelling with an imposed load up to 15kPa (or 45kPa for CPT3). The settlement over the proposed accessway occurs in the upper 3.5m of the subsoil profile with the primary settlement under an imposed load of 22.5kPa ranging between 2.5mm and 21mm. The calculated settlement over the property is very minor and is considered to be negligible.

Results of our analysis indicate that secondary settlement is negligible as is expected for the inferred and encountered soils beneath the property.

It should be noted that the above settlement predictions are not precise calculations and are highly sensitive to changes in applied fill and/or building loads. The accuracy of the predicted total settlement magnitudes should be considered in the order of ±50%.

Results of our preliminary analysis using CPeT-IT2 conclude the site is unlikely to be subject to considerable settlement and therefore further assessment (i.e., using Plaxis) is not necessary.

Results of our settlement analysis are attached in Appendix F and the CPT logs are attached to this report within Appendix C.

11. Stormwater

As per section 8.6.5.1.3 of the Far North District Plan, the proposed activity will be a permitted activity in relation to the impervious coverage if the proposed impermeable surface areas are less than 15% of the net site area. The proposed lot sizes are at least 2Ha and therefore it is highly unlikely that the stormwater detention controls will be required (attenuation required only if proposed impervious coverage exceeds 3000m^2 per lot). At the building consent stage, if the proposed impervious coverage exceeds 15% of the net site area, then site specific attenuation design is required.

Stormwater disposal from lots shall be to land via a diffuse discharge swale. The diffuse swale is to be located downslope of the effluent disposal field and is to follow the contours of the land. To disperse the flows at a rate of 1ℓ/s or less per metre length of the swale, it is calculated that a 2m (minimum) length of diffuse swale will be required for every 100m^2 of unattenuated impervious area on the site, discharging to the diffuse swale.

12. Flooding

The Oruru River flows along the property boundary from the southern boundary to the northern boundary. Any flooding within the proposed lots will be as a result of overflow (out of bank flow) from the river. Coastal flood hazard does not apply to the subject site.

The NRC flood mapping indicates that the proposed house sites are not susceptible to flooding inundation at the existing ground levels.

The 100-year fluvial flood level at the subject site is estimated as 15.5m OTP64 (flood level at the southern site boundary) reducing to 11.4 m OTP64 (flood level at the northern site boundary) over 2.34km length of the river from the review of NRC Regionwide Flood Mapping and LiDAR levels.

Table 10 below gives recommended minimum finished platform levels (FPL) and minimum finished floor levels (FFL) for the identified building footprints. FFLs have been calculated using a minimum freeboard of 500mm above the 100-year ARI flood level to meet the FNDC ES freeboard requirements.

Table 10: Recommended minimum platform levels and minimum finished floor levels

Lot Number	Minimum FPL (OTP64)	Minimum FFL (OTP64)
Lots 1-3,6	15	15.4
Lots 4 & 7	14.7	15.1
Lot 15	13.9	14.3
Lots 9,10 &12	14.1	14.5

We advise not placing a consent notice on title on all lots as the identified building platforms are well above the 100 year ARI flood level (Figure N).

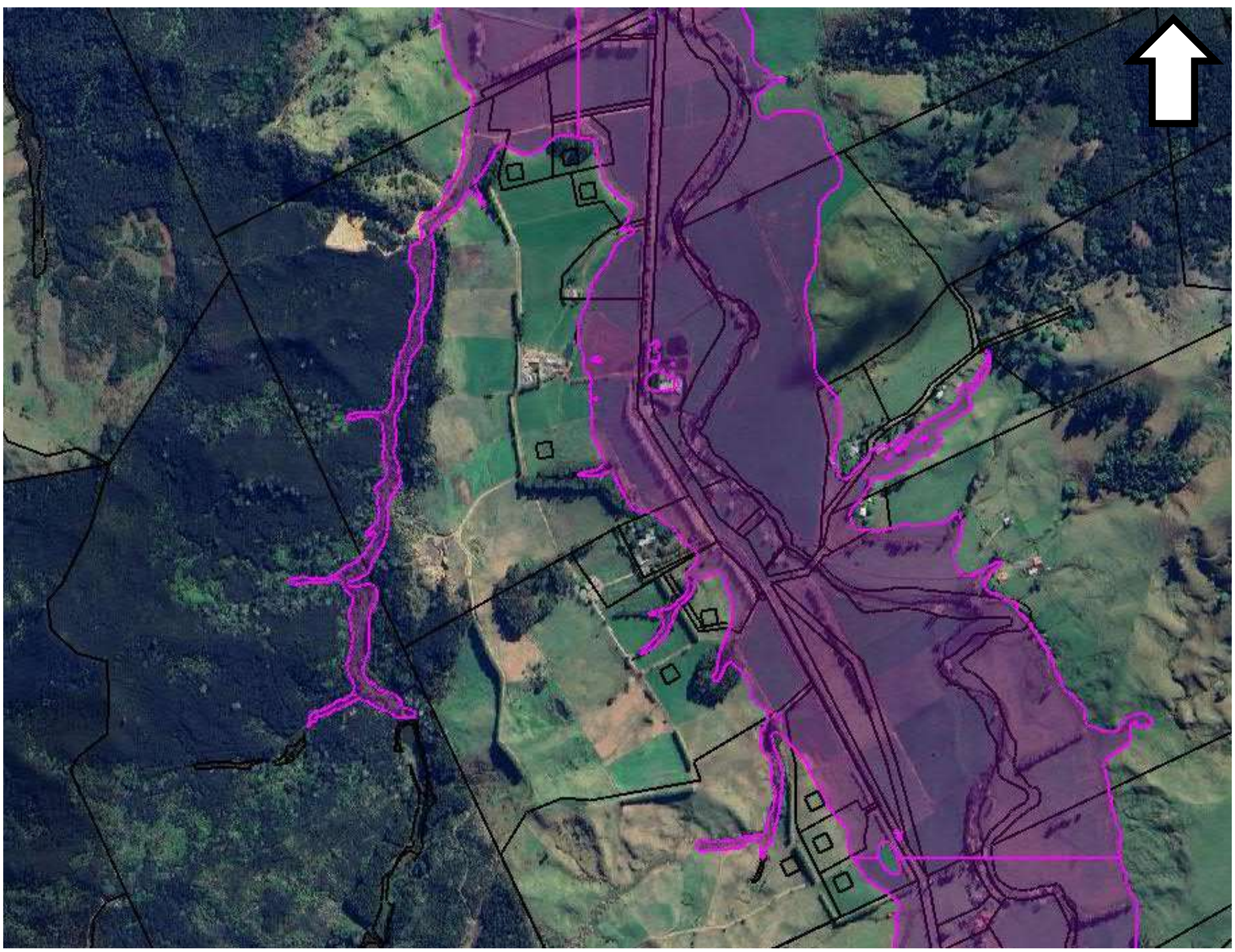


Figure N: Subdivision scheme plan showing proposed house platforms overlaid by NRC Regionwide flood mapping (100yr ARI).

13. On-site Effluent Field Soil Assessment

An assessment of the near surface soils was undertaken during our site investigation. Soils on the property have been assessed for on-site effluent disposal in terms of the Proposed Regional Plan (PRP) for Northland 2024 and AS/NZS 1547:2012.

The soils over the sites are identified as medium clays, or Category 6 in terms of Table 5.2. of AS/NZS 1547:2012 (Table 11 below). We recommend secondary treated effluent be discharged via pressure compensated dripper irrigation (PCDI) lines, with a design rate of 2.0mm which is considered appropriate for this soil type.

Table 11: Summary of Effluent Field Sizing per Proposed Future Residential Building Site

No of Potential Bedrooms	4
Design Occupancy (Based on Bedrooms)	7
Tank Water Supply	180ℓ/person/day
Total Effluent	1,260ℓ/person/day
Soil Category (AS/NZ 1547:2012)	6
Design Irrigation Rate	2mm/day
Irrigation Area Required	630m²
Reserve Area Required (33%)	210m²
Total Area	840m²

There are limited areas for a discharge and reserve field, with appropriate separation distances from boundaries, over slopes less than 18°, setback a minimum 15m from slopes that are greater than 18°, and surface water swale drains (illustrated in Figure 1 Appendix A of this report). The wastewater disposal fields are typically situated over slopes that have a potential for a moderate to high volume of surface water runoff, therefore we recommend installing an impermeable bund around the upper slopes of the wastewater disposal field/s to divert surface water runoff.

A list of appropriate plant species to plant the wastewater disposal field can be found at:

https://www.nrc.govt.nz/resource-library-summary/publications/waste/septic-tanks-and-sewerage-systems/suitable-plants-for-effluent-disposal-areas/

Table 12: PRP for Northland 2024 C.6.1.3 Permitted Activity Requirements

NRP Permitted Activity Requirement	Proposed Means of Compliance	Requirement Met?
The system is designed in accordance with AS/NZS 1547:2012 'On-site Domestic Wastewater Management'	System to be designed to AS/NZS 1547:2012	✓
The maximum discharge volume of effluent is <$3m^3$/day	<$3m^3$ is proposed to be discharged per future residential lot	✓
Disposal field is not over slopes that exceed 25°	All disposal field slopes shall be <18°	✓
Irrigation lines are covered by >100mm of topsoil / mulch / bark	PCDI lines shall be covered in 200mm of topsoil / mulch / bark	✓
Provide a 30% reserve field area	33% reserve area required	✓
On-site effluent system is maintained and operating effectively at all times	A maintenance agreement for treatment and disposal systems shall be supplied during BC	✓
Discharge does not contaminate any groundwater or surface water supply	The location of the disposal field complies with the permitted activity setback rules	✓
No surface water runoff or ponding of discharged wastewater	Recommended daily irrigation rate will ensure compliance	✓
No offensive / objectionable odour beyond the property boundary	Appropriate setback distances have been maintained	✓

Table 13: PRP for Northland 2024 Table 9 - Exclusion Areas and Setback Distances

Feature	PRP 2024 Requirement	Provided / Proposed	Requirement Met?
Exclusion Areas			
Floodplain	5% annual exceedance probability	No area of the properties is within a floodplain	✓
Horizontal Setback Distances			
Identified stormwater flow path (incl. a formed road with kerb and channel, and water table drain) that is down-slope of the disposal area	5.0m	>5.0m	✓
River / lake / stream / pond / dam / natural wetland	15m	>15m	✓
Coastal marine area	15m	>15m	✓
Existing water supply bore	20m	>20m	✓
Property boundary	1.5m	>1.5m	✓
Vertical Setback Distances			
Winter groundwater table	>0.6m	Elevated groundwater transmissions (EGWT) no shallower than 2.0m bgl	✓

14. Traffic & Access

The proposed subdivision has been assessed in terms of effects of increased traffic movements on the local roading environment, and to determine whether appropriate sightlines exist for the proposed access locations.

14.1. Traffic Generation

Oruru Road is shown on MobileRoad.org as having an ONRC (One Network Road Classification) of Primary Collector, with an ADT of 949 vehicles per day (vpd). This is less than the criteria stated in Table 3-3 of FNDC EES (2023), which defines a Primary Collector (Rural) as having an ADT of 1001-3000 vpd. In terms of additional generation arising from the development, 2 lots have existing dwellings and do not result in any further increase.

Under Part 2 of the Proposed District Plan, Rule TRAN-R5 states that activity status is Permitted where the thresholds in TRAN-Table 11-Trip Generation are not exceeded. Table 11 states a threshold of 20 Residential units, therefore the additional 10 residential units arising from the proposed subdivision meet the Permitted Activity Criteria.

14.2. Access Requirements

Other than Lot 6, all lots currently have existing vehicle crossings, which will be upgraded in accordance with the requirements of FNDC EES (2023). In terms of sight distances, all crossings other than those for Lot 14 and Lot 4/7 comply with the distance requirement of 210m for a 100km/h road, as defined in Sheet 4 of the FNDC EES (2023). Both the non-complying crossings require vegetation removal to achieve adequate sight distances, as shown in Figures O and P below.

Figure O: Lot 4/7 access (left) and Lot 14 access (right) showing roadside vegetation to be removed to achieve sight distance.

Lot 6 requires creation of a new vehicle crossing, which is to be undertaken in accordance with FNDC Engineering Standards (2023). The proposed crossing location has adequate sight distances.

15. Recommendations and Conclusions

15.1. Liquefaction

Results of our subsoil investigation found the property typically underlain by cohesive soils, comprising silts and clays overlying over consolidated, weathered Punakitere Sandstone or Whangai Formation Mudstone. Potentially liquefiable material (inferred to be medium dense sand weathered from sandstone bedrock) was identified at depths greater than 4.0m bgl above the Punakitere Sandstone bedrock.

Normal groundwater transmissions were encountered on the property at depths greater than 5.0m beneath the proposed building sites and at depths no shallower than 0.9m bgl along the lower terraced ground. Elevated groundwater transmissions are expected to be no shallower than 3.0m bgl beneath the elevated terraced slopes and over the lower-lying flat ground, no shallower than 0.5m bgl.

A ‘Level D’ liquefaction assessment was completed to reduce the uncertainty of liquefaction related risks. Ground damage induced by a DCLS level earthquake event (1,000-year return) has a >94% likelihood of not occurring at this site. The assessed building sites are considered to have *low* liquefaction vulnerability for a DCLS level seismic event, as defined by PEG 2017.

The probability of liquefaction occurring for an ULS and a DCLS level seismic event was assessed and classified in accordance with Table 5.1 MBIE Module 3. For a DCLS level seismic event and below, the probability of liquefaction occurring is some 6% and has been classified as Level 0 (Insignificant) to Level 1 (Mild) liquefaction event. The liquefaction caused by a DCLS level seismic event has been typically assessed to occur deeper than 4.0m bgl, with the overlying clays and silts considered sufficiently thick enough to prevent surface manifestation of any liquefaction occurring beneath these soils.

The results of the CLiq2 analysis indicate minor variation in soil compositions and layering over the property. Differential settlement over the building platform is not expected to occur for seismic events up to an ULS level event and are likely to be negligible for a DCLS level seismic event.

The proposed building sites are highly unlikely to undergo significant infrastructure failure that may cause catastrophic damage to the building and is unlikely to cause loss of life following a DCLS level seismic event. The likelihood of an earthquake occurring to create such a catastrophic failure is extremely low for Taipa and its surrounds.

15.2. Stability

The proposed subdivision comprises of two terraces separated by an approximately 30m high slope that ranges between 7° and 30°. The upper and lower terrace gradients typically range between 1° and 8°, with the building sites proposed over the upper terrace. Isolated incised surface water drains or gullies can have gradients exceeding 60°, however, these are suitably setback from all proposed building sites.

The property's slopes are assessed to have formed as the result of surface water runoff, historic river movements, and historic tectonic movements. Within the Punakitere Sandstone residual soils, terracettes were observed where slopes exceed 30°. Within the Whangai Formation residual soils, terracettes were observed where slopes exceed 24°. All terracettes observed over the entirety of the property appear to occur in the upper 1.0m of the subsoil column, as is typical for the encountered soil lithologies.

There is evidence of historic global instability over the wider property, these slips were observed a minimum 200m away from the nearest proposed building site. These historic slips appear to be the result of oversteepening, with the global instabilities greater than 80-years old.

A suitable building site, subject to specific limitations and engineering assessment, has been identified on each of the proposed residential lots. These building sites are over slopes no greater than 20°, away from overland flow paths, historic areas of instability, and typically intended to be formed within excavations with limitations on filling. In general, the governing load case for the numerical stability analysis was elevated groundwater conditions.

The stability assessment has been undertaken assuming a lightweight, flexible, single-storey type dwelling, found over shall foundations. An additional engineering assessment shall be undertaken at the Building Consent stage by a geo-professional engaged by the future landowner, specific to the proposed development at that time.

Results of our numerical stability assessment found the FoS against sliding for the proposed building sites to be appropriate to meet the industry standard requirements for normal and elevated groundwater transmissions, and during / following a DCLS level seismic event. Retaining walls are modelled in some of the proposed lots to support excavations and/or fill. Following our conclusions and recommendations, the proposed building sites are considered unlikely to be subject to future, or ongoing erosion / slippage.

Refer to Figure 01, Appendix A for the location of these building sites, the identified building site in these figures are the only location that has been assessed.

Future residential development over the property, shall comply with the following conclusions, recommendations, and restrictions:

Drainage:

Surface water runoff shall be controlled over each of the lots and the driveways. Formalised drainage shall be required to divert surface water runoff away from the retaining walls, excavations, and slopes greater than 18°. Any installed surface water drainage shall discharge downslope of the proposed building site, over a minimum 10m long diffuse level spreader to decrease the effect of soil erosion which can increase the instability of a site.

No stormwater discharge is to be reliant on soakage due to the nature of the residual soils.

Accessway:

Any accessway shall not be excavated within 10m immediately downslope of any proposed building site without further geotechnical assessment. The accessway formation may require excavations up to 2.0m with fill expected to be greater than 0.5m thick. Where the accessway excavations exceed 0.5m, they shall be battered at no more than 18° (1V:3H) or retained. Where the accessway excavations are to be less than 0.5m high, the batter may be at constructed at 35°(1V:1.5H).

Building Sites:

Below are specific recommendations for the proposed fill, excavation, batters, and retaining wall requirements for each proposed building site:

Lot 1:

- Fill Depth - ≤0.5m
- Excavation Depth - 2.0m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥8.0m

Where the setback distance from slopes ≥18° is unable to be met, an inground retaining wall a minimum 5.0m deep shall be required to sufficiently isolate from shallow slippages.

Lot 2:

- Fill Depth - ≤0.5m
- Excavation Depth - 2.5m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥10.0m

Lot 3:

- Fill Depth - ≤2.0m
- Excavation Depth - 3.0m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥8.0m

The fill shall be retained where depths exceed 0.5m to a minimum 2.0m bgl.

Lot 4:

- Fill Depth - ≤0.5m
- Excavation Depth - ≤2.0m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥8.0m

Lot 6:

- Fill Depth - ≤0.5m
- Excavation Depth - ≤0.5m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥20.0m

Where the setback distance from slopes ≥18° is unable to be met, an inground retaining wall a minimum 5.0m deep shall be required to sufficiently isolate from shallow slippages.

Lot 7:

- Fill Depth - ≤0.5m
- Excavation Depth - ≤0.5m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥20.0m

This building site is situated greater than 50m from a slope greater than 18° therefore, has not been assessed in terms of a numerical stability analysis.

Lot 9:

- Fill Depth - ≤0.5m
- Excavation Depth - ≤1.0m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥20.0m

Where the setback distance from slopes ≥18° is unable to be met, an inground retaining wall a minimum 5.0m deep shall be required to sufficiently isolate from shallow slippages.

Lot 10:

- Fill Depth - ≤0.5m
- Excavation Depth - ≤1.0m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥20.0m

Where the setback distance from slopes ≥18° is unable to be met, an inground retaining wall a minimum 5.0m deep shall be required to sufficiently isolate from shallow slippages.

Lot 12:

- Fill Depth - ≤0.5m
- Excavation Depth - ≤1.0m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥25.0m

Where the setback distance from slopes ≥18° is unable to be met, an inground retaining wall a minimum 7.0m deep shall be required to sufficiently isolate from shallow slippages.

Lot 15:

- Fill Depth - ≤0.5m
- Excavation Depth - ≤1.0m
- Excavation Batter (where ≥1.0m) - ≤18° or retained
- Setback Distance from Slopes ≥18° - ≥10.0m

Where the setback distance from slopes ≥18° is unable to be met, an inground retaining wall a minimum 5.0m deep shall be required to sufficiently isolate from shallow slippages.

15.3. Static Settlement

Results of our subsoil investigation indicate that the property is underlain by over consolidated residual soils in the upper 5.0m to 11.5m overlying the inferred bedrock. Some 90% of the calculated settlements will occur at depths greater than 3.0m bgl beneath the silts and clays. Differential settlement over the building platform is not expected to be greater than the typical design tolerance of a residential building as outlined in Section 10 within this report.

15.4. Earthworks

All areas to be filed and/or found over must be stripped of topsoil prior to filling. Clean topsoil may be used for the formation of lawns and gardens or shall be removed from site. All batters completed over the property shall be covered in coconut matting and planted to prevent weathering / erosion of exposed soils.

A suitable batter angle for all excavations is no greater than 18° (1V:3H) however, if a suitable gradient is unable to be formed, retaining will be required. Where the excavations are less than 0.5m high, 45° (1V:1H) is considered appropriate.

Fill exceeding 0.5m shall be battered at no more than 18° (1V:3H) however, if this gradient is unable to be formed, then retaining shall be required. Fill that exceeds 1.0m thick for the formation of a driveway, or a building site shall be placed over benches formed into the natural ground with each bench a minimum 0.5m deep.

Based on the results of our subsoil investigation and our experience with similar soils, we consider clean, cohesive site excavated soils appropriate for use as 'site-won' engineered fill. All excess site-won material shall be removed from the property in a controlled manner.

Driveways to each building site may require fill placed to meet the proposed shared accessway or the road elevations. This fill will be up to 2.0m deep to form an appropriate driveway gradient, the fill shall be retained appropriately. Battering of driveway fill shall be battered at 18° or retained where unable to achieved. If retaining walls are required, they shall consider a 12.5kPa load during their design to account for heavy vehicle movements.

All retaining walls are required to support the proposed excavations or fill, where battering is not considered appropriate to isolate from future slope instabilities / erosional processes. All retaining walls shall be found at depths specified above. All retaining walls completed over the property shall be specifically designed by a Geotechnical Chartered Professional Engineer (CPEng).

All earthworks undertaken over the property shall be completed in general accordance with NZS 4431:2022 and shall be subject to engineering specification and supervision.

15.5. Fill Specification

Testing of cohesive fill shall be performed at 500mm fill depth intervals with a minimum of two tests per 1,000m^2 of placed fill. All cohesive filling over the site will be subject to engineer monitoring and Nuclear Densometer (NDM) testing, to the following engineering specification:

- Strip all unsuitable topsoil from beneath the area to be filled, extending a minimum 2.0m from the edge of the proposed filling perimeter.

- Average undrained shear strengths as measured with a handheld shear vane shall average 170kPa with no result less than 150kPa, and

- Air voids measured by the NDM testing and following water content correction testing, the results shall average no greater than 8%, with no single value greater than 10%.

Alternatively, the site may be brought to the design level by placing compacted engineered clean gravel (GAP40 or similar). This fill shall adhere to the following specification:

- Strip all unsuitable topsoil from beneath the fill area, extending a minimum 2.0m from the edge of the proposed filling perimeter.

- Gravel fill shall be placed at nominal uncompacted thicknesses of no greater than 150mm and be compacted to achieve a Clegg Impact Value (CIV) of not less than 20.

- Testing of compacted fill shall be undertaken at nominal 500mm lifts.

Appropriate compaction equipment and methodology shall be adopted to achieve the desired level of compaction for any material used. All areas to be filled must be stripped of topsoil and benched as required, prior to filling.

15.6. Building Site Suitability

Results of our subsoil investigation indicate that the southern portion of the property is underlain by residual soils and bedrock of Punakitere Sandstone and the northern portion of the property is underlain by residual soils and bedrock of Whangai Formation mudstone. Undrained shear strengths within residual soils of Punakitere Sandstone measured typically greater than 120kPa and typically greater than 100kPa within Whangai Formation mudstone.

At the specific design of any future development, the geo-professional engaged by the subsequent landowner shall undertake an appropriate assessment of the ground conditions to ascertain the classification of soil expansivity. This may be undertaken in accordance with Clause 7.5.13.1 “Identification of Expansive Soils” outlined in the NZ Building Code B1/AS1 (Amd 19).

Subject to the above, the site is considered suitable for residential development found over either timber pile foundations or over a shallow concrete pad, such as a waffle raft or a conventional concrete slab. Foundations will likely require specific engineering design and shall be determined during the site specific Building Consent investigation.

15.7. Stormwater

At the building consent stage, if the proposed impervious coverage exceeds 15% of the net site area, then site specific attenuation design is required.

15.8. Flooding

As per section 106(1)(a) of the RMA, the wider land is subject to flooding. However, the proposed house site locations within Lots 1-4,6-7,9-10,12 and 15 are not susceptible to flooding inundation at the existing ground levels. Therefore, in terms of section 106 1(A) of the RMA, it is considered that:

i) There is no significant risk from natural hazards,
ii) Any subsequent use that is likely to be made of the land is not likely to accelerate, worsen, or result in inundation from any source,
iii) Any subsequent use that is likely to be made of the land is not likely to accelerate, worsen, or result in material damage to other land.

15.9. Resource Management Act (RMA) – Section 106(1)

Based on our findings and subject to our recommendations on stability and building site suitability, for each of the proposed lots and nominated building sites, the risk of future instability affecting the property is low, and in terms of Section 106(1) of the RMA:

a) the land in respect of which a consent is sought, or any structure on the land, is not, and is not likely to be, subject to material damage by stability from any source,

b) *repealed; and*

c) that sufficient provision has been made for stable physical access to each allotment to be created by the subdivision.

15.10. On-site Effluent Disposal

Soils on the property have been assessed for on-site effluent disposal in terms of AS/NZS 1547:2012 and are identified as medium clays or Category 6.

We have indicated suitable areas for on-site wastewater disposal over each of the proposed residential lots, as indicated on the attached plan in Appendix A. The disposal field locations achieve the appropriate setbacks per the PRP for Northland 2024 Section C.6.1.3, Table 9, and a suitable design irrigation rate defined in accordance with AS/NZS 1547:2012.

It is recommended that the disposal field comprises PCDI irrigation lines, pinned at the surface and covered with a further 200mm of topsoil / mulch and planted with approved plant species to aid in evapotranspiration.

The wastewater disposal fields have been positioned such that they are over slopes not typically exceeding 18°. Care should be taken during the building consent stage for all future development to ensure the wastewater disposal fields are appropriately designed for site conditions, including the use of bunds to divert any surface runoff around the field, and positioning the field such that it is isolated from any potential building sites.

The total peak daily volume of wastewater is estimated to be 1,260ℓ/day (1.26m³/day), based on the design occupancy and daily water usage. This volume of effluent is less than the permitted activity threshold as stated in the PRP for Northland 2024. The proposed on-site wastewater disposal fields, therefore, comply with AS/NZS 1547:2012 and the PRP for Northland 2024.

15.11. Traffic and Access

The proposed subdivision is within the Permitted Activity criteria for additional traffic generation. All vehicle crossings (other than those serving existing residential properties) are to be upgraded (for Lot 6, constructed) in accordance with the FNDC EES (2023). Compliant sight lines exist at all crossing locations, provided vegetation clearance is undertaken for Lots 4/7 and Lot 14.

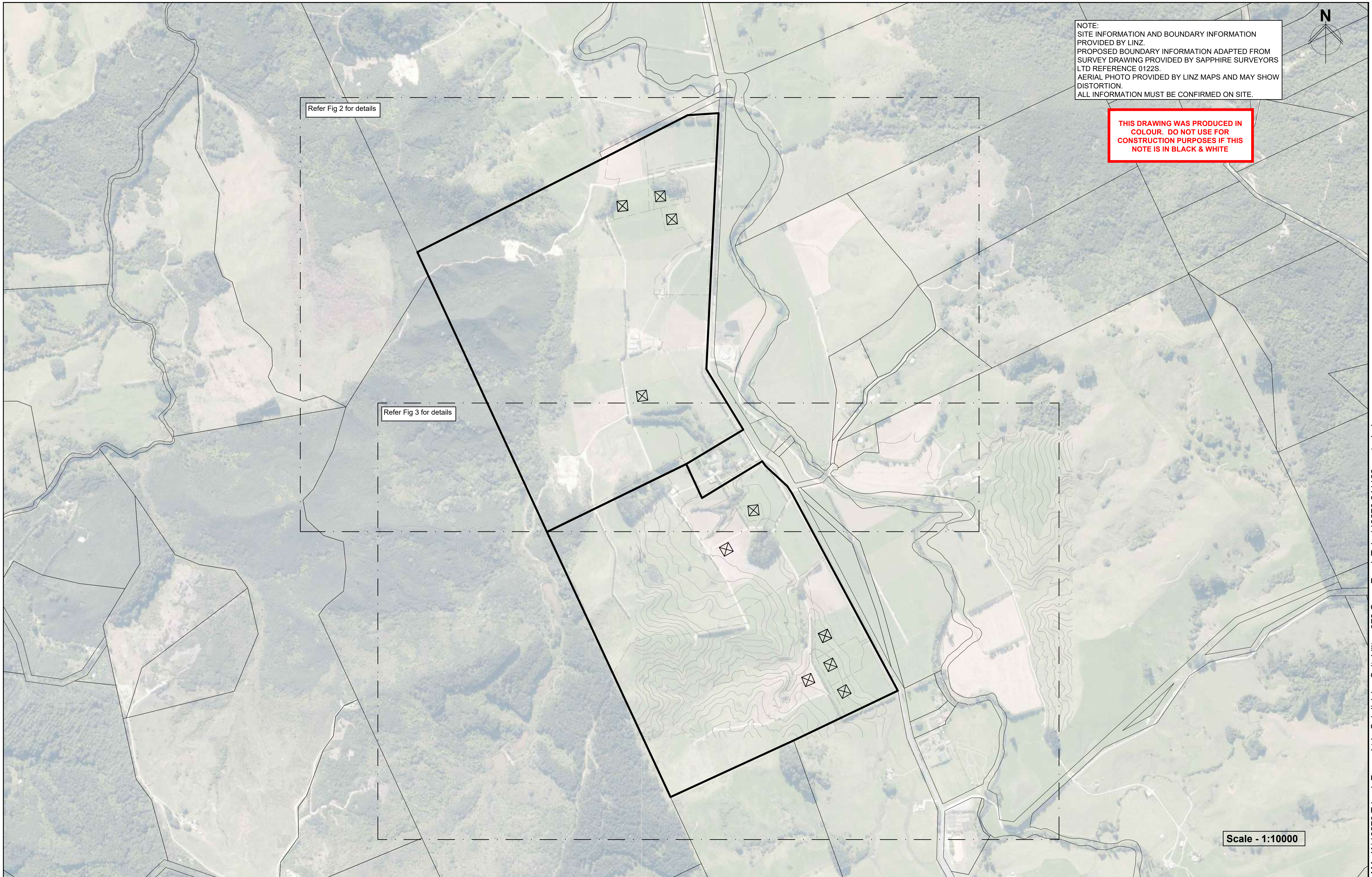
16. Limitation

Recommendations and opinions in this report are based on data from the investigation described herein. The nature and continuity of subsoil conditions away from the boreholes is inferred and it is possible that actual conditions could vary from those assumed. Should subsoil conditions vary from those described in this report, it is essential that Hawthorn Geddes engineers and architects ltd be contacted to confirm the applicability of the recommendations.

This report has been prepared solely for the benefit of our client Tripark Farms Ltd and the Far North District Council in relation to the resource consent application for which this report has been prepared.

The comments in it are limited to the purpose stated in this report. No liability is accepted by Hawthorn Geddes engineers & architects ltd in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at their own risk.

Appendix A. Figures



K:\13270 Tripark Farms Ltd - Subdivision Suitability - 978 Oruru Road, Taipa\13270 241122 geotech.dwg 25/11/2024 7:54:39 AM

THIS FIGURE IS TO BE READ ONLY IN CONJUNCTION WITH ASSOCIATED REPORT

USE WRITTEN DIMENSIONS. DO NOT SCALE FROM DRAWING.

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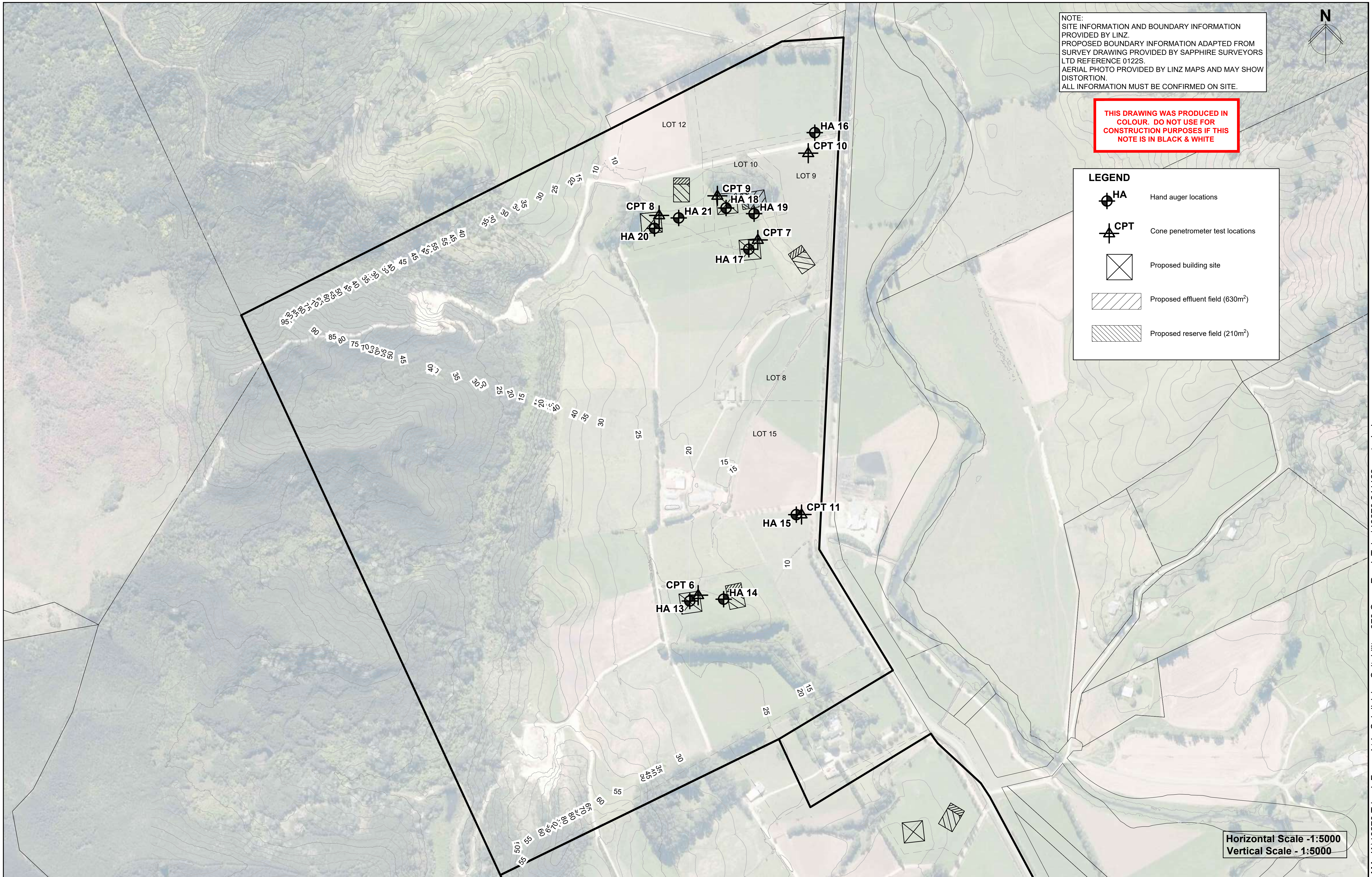
CLIENT	TRIPARK FARMS LTD
PROJECT	GEOTECHNICAL REPORT 978 ORURU ROAD, TAIPA
DRAWING	LOCALITY PLAN
SCALE @ A3	AS SHOWN
PROJECT No.	13270
FIGURE No.	01
REV.	-



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CLIENT	**TRIPARK FARMS LTD**
PROJECT	**GEOTECHNICAL REPORT**
	978 ORURU ROAD, TAIPA
DRAWING	**SITE PLAN - NORTH**
SCALE @ A3	AS SHOWN
PROJECT No.	13270
FIGURE No.	02
REV.	-

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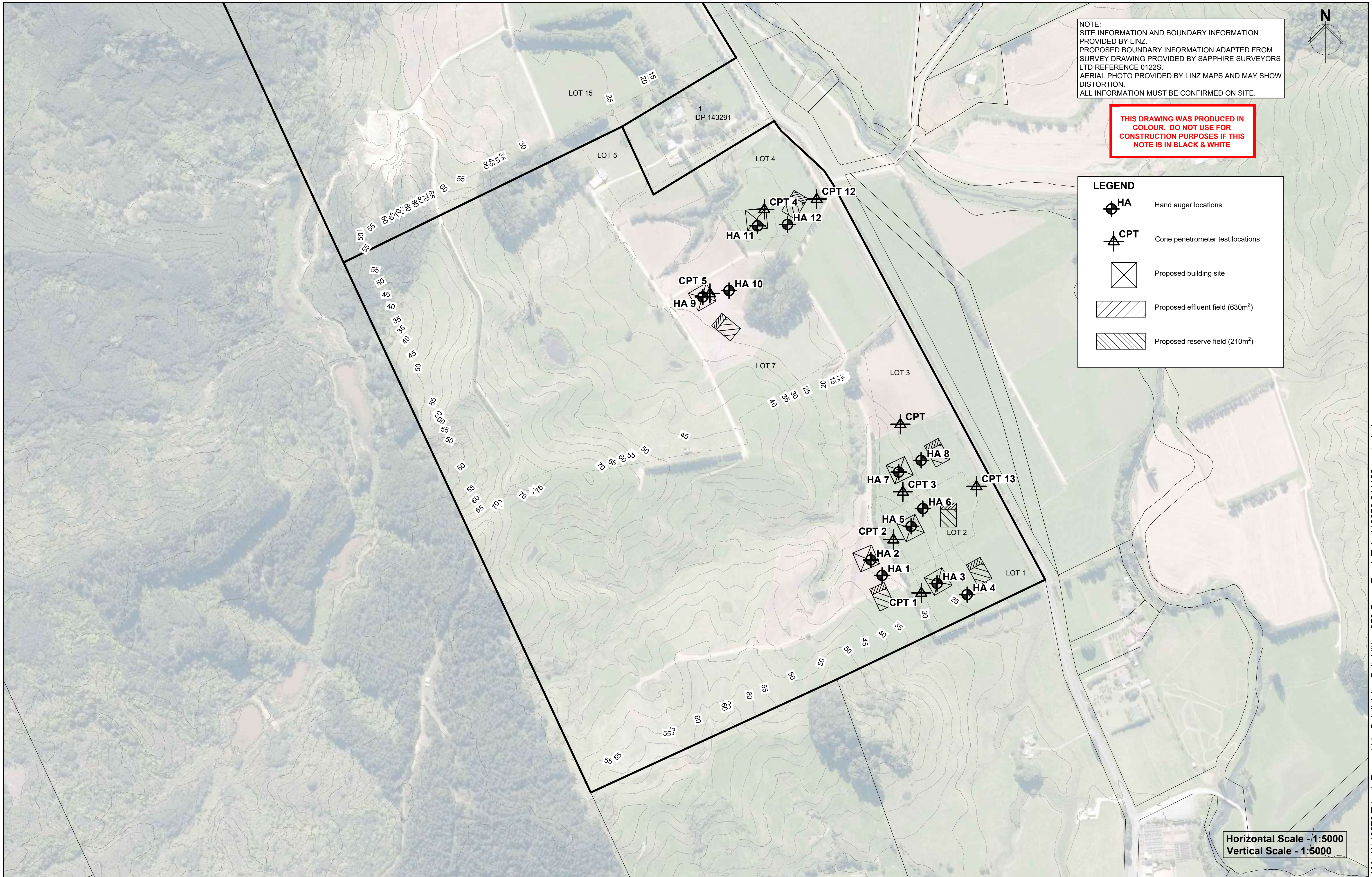

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PROJECT GEOTECHNICAL REPORT
978 ORURU ROAD, TAIPA

DRAWING SITE PLAN - SOUTH

SCALE @ A3 AS SHOWN

PROJECT No. 13270

FIGURE No. 03

REV. -

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Appendix B. Hand Augered Borehole Logs

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

CLIENT Karen Parker
PROJECT Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER 13270
PROJECT LOCATION 978 Oruru Road, Taipa
START DATE 07/10/24 **COMPLETED DATE** 07/10/24
COORDINATES 1646112.57E, 6118363.63N **LEVEL** 0.00
DRILLING CONTRACTOR
DRILLING METHOD 50mm Hand Auger
LOGGED BY US
HOLE LOCATION

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.100			TS	TOPSOIL; dark brown.	Groundwater Not Encountered	
		SV = 105 / 14 kPa (Geo 3928)		SILT, with some clay, with minor sand; light grey. Very stiff; non-plastic; wet.		
		SV = 114 / 28 kPa (Geo 3928)		0.6m: Wet.		
				0.8m: Stained light yellow.		
1.000		SV = 125 / 14 kPa (Geo 3928)		EOH: 1.00m		1
2						2

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS
- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

CLIENT Karen Parker
PROJECT Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER 13270
PROJECT LOCATION 978 Oruru Road, Taipa
START DATE 07/10/24 **COMPLETED DATE** 07/10/24
COORDINATES 1646094.35E, 6118387.34N **LEVEL** 0.00
DRILLING CONTRACTOR
DRILLING METHOD 50mm Hand Auger
LOGGED BY US
HOLE LOCATION

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.000–0.200			TS	TOPSOIL; dark brown.		
0.200–1.600		SV = 153 / 56 kPa (Geo 3928) SV = 139 / 70 kPa (Geo 3928) SV = 139 / 70 kPa (Geo 3928) SV = 167 / 70 kPa (Geo 3928) SV = 139 / 63 kPa (Geo 3928)		Silty CLAY; yellowish brown. Very stiff; high plasticity; moist. 1.2m: Golden brown with purple inclusions.		
1.600–2.700				Clayey SILT; light grey yellowish brown stained orange. Very stiff; low plasticity; moist. 2.1m: Light brown. Wet.	07/10/2024	
2.700	2 2 3			EOH: 2.70m		

Depth scale: 1, 2

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
7/10/2024 12:00:00 p.m.	2.100	Static Water Level	

REMARKS

SYMBOLS
- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

HA2

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	07/10/24 **COMPLETED DATE** 07/10/24	**COORDINATES**	1646094.35E, 6118387.34N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	3					
	3					
	5					
	7					
	5					
	4					
	6					
	13					
	11					
	11					
	10					
	12					
	12					
	10					
	10					
	11					
	11					
	15					
	15					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
7/10/2024 12:00:00 p.m.	2.100	Static Water Level	

REMARKS

SYMBOLS

- ▼ Standing Water Level
- ◁ Water Out flow
- ▷ Water In flow

Produced with Core-GS

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

HA3

CLIENT Karen Parker
PROJECT Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER 13270
PROJECT LOCATION 978 Oruru Road, Taipa
START DATE 07/10/24 **COMPLETED DATE** 07/10/24
COORDINATES 1646199.28E, 6118346.88N **LEVEL** 0.00
DRILLING CONTRACTOR
DRILLING METHOD 50mm Hand Auger
LOGGED BY US
HOLE LOCATION

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
				0.100 TOPSOIL; dark brown.	Groundwater Not Encountered	
		SV = 195+ kPa (Geo 3928)		Silty CLAY; brown . Very stiff; high plasticity; moist.		
		SV = 195+ kPa (Geo 3928)		0.5m: With trace rootlets.		
1		SV = 195+ kPa (Geo 3928)		1.000		
		SV = 139 / 42 kPa (Geo 3928)		CLAY, with some silt; brown . Very stiff; high plasticity; moist. 1.3m: With trace gravel. Gravel, fine to medium, angular to subround.		
				1.500		
		SV = 112 / 42 kPa (Geo 3928)		SILT, with some clay, with trace sand; brown . Very stiff; low plasticity; moist; sand, fine.		
2		SV = 112 / 42 kPa (Geo 3928)				
		SV = 98 / 49 kPa (Geo 3928)		2.1m: Stiff.		
				2.500 EOH: 2.50m		
	2					
	2					
	5					
	4					
	4					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA3

CLIENT Karen Parker		**PROJECT** Tripark Farms Ltd – Subdivision Suitability	
PROJECT NUMBER 13270		**PROJECT LOCATION** 978 Oruru Road, Taipa	
START DATE 07/10/24	**COMPLETED DATE** 07/10/24	**COORDINATES** 1646199.28E, 6118346.88N	**LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD 50mm Hand Auger			
LOGGED BY US			
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	5					
	5					
	6					
	7					
	9					
	14					
	15					
	15					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Produced with Core-GS

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT Karen Parker		**PROJECT** Tripark Farms Ltd – Subdivision Suitability	
PROJECT NUMBER 13270		**PROJECT LOCATION** 978 Oruru Road, Taipa	
START DATE 07/10/24	**COMPLETED DATE** 07/10/24	**COORDINATES** 1646255.03E, 6118345.62N	**LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD 50mm Hand Auger			
LOGGED BY US			
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
			TS	TOPSOIL; dark brown.	Groundwater Not Encountered	
0.200		SV = 195+ kPa (Geo 3928)		Silty CLAY; brown . Very stiff; high plasticity; moist. 0.4m: With trace sand and gravel. Sand, fine, gravel, fine to medium, angular to subround.		
		SV = 195+ kPa (Geo 3928)				
1		SV = 195+ kPa (Geo 3928)				
1.000				EOH: 1.00m		
2						

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Produced with Core-GS

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	07/10/24 **COMPLETED DATE** 07/10/24	**COORDINATES**	1646151.87E, 6118432.69N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.0–0.2			TS	TOPSOIL; dark brown. (0.200)	Groundwater Not Encountered	
0.2–1.1		SV = 195+ kPa (Geo 3928) at ~0.3 m; SV = 195+ kPa (Geo 3928) at ~0.6 m; SV = 195+ kPa (Geo 3928) at ~0.9 m		Silty CLAY; brown . Very stiff; high plasticity; moist. (1.100)		
1.1–2.6		SV = 195+ kPa (Geo 3928) at ~1.2 m; SV = 195+ kPa (Geo 3928) at ~1.5 m; SV = 195+ kPa (Geo 3928) at ~1.8 m; SV = 195+ kPa (Geo 3928) at ~2.1 m; SV = 195+ kPa (Geo 3928) at ~2.4 m		Clayey SILT; brown . Very stiff; low plasticity; moist. 1.5m: Stained red and orange. 2.1m: With trace gravel. Gravel, fine to medium.		
2.6		SV = 195+ kPa (Geo 3928)		2.600 EOH: 2.60m		
2.6–3.0	4, 6, 6, 6					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA5

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	07/10/24	**COMPLETED DATE**	07/10/24
COORDINATES	1646151.87E, 6118432.69N	**LEVEL**	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	3					
	4					
	4					
	4					
	4					
	4					
	5					
	5					
	7					
	6					
	8					
	11					
	13					
	20					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	07/10/24	**COMPLETED DATE**	07/10/24
COORDINATES	1646170.63E, 6118466.67N	**LEVEL**	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.100			TS	TOPSOIL; dark brown.	Groundwater Not Encountered	
		SV = 195+ kPa (Geo 3928) SV = 195+ kPa (Geo 3928) SV = 195+ kPa (Geo 3928)		Silty CLAY; yellowish brown. Very stiff; high plasticity; moist. 0.7m: Light grey stained orange.		
1.000				EOH: 1.00m		1
2						2

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

HA7

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24 **COMPLETED DATE** 08/10/24	**COORDINATES**	1646132.30E, 6118527.97N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.100				TOPSOIL; dark brown.	Groundwater Not Encountered	
0.900		SV = 167 / 63 kPa (Geo 3928) SV = 174 / 56 kPa (Geo 3928)		Silty CLAY; brown . Very stiff; high plasticity; moist. 0.4m: Stained dark orange.		
1.200		SV = 174 / 63 kPa (Geo 3928)		Clayey SILT; brown . Very stiff; low plasticity; moist.		1
		SV = UTP (Geo 3928)		EOH: 1.20m		

Scala (Blows / 100mm), from 1.2 m: 8, 9, 6, 8, 4, 5, 7, 7, 5, 7, 5, 4, 9, 6, 9, 12, 18, 20

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA8

CLIENT Karen Parker
PROJECT Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER 13270
PROJECT LOCATION 978 Oruru Road, Taipa
START DATE 08/10/24 **COMPLETED DATE** 08/10/24
COORDINATES 1646163.71E, 6118549.23N **LEVEL** 0.00
DRILLING CONTRACTOR
DRILLING METHOD 50mm Hand Auger
LOGGED BY US
HOLE LOCATION

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.100				Dark brown.	Groundwater Not Encountered	
		SV = 167 / - kPa (Geo 3928)		Silty CLAY; brown . Very stiff; high plasticity; moist.		
				0.4m: With trace rootlets.		
		SV = 167 / - kPa (Geo 3928)				
1 (1.000)		SV = 195+ kPa (Geo 3928)		EOH: 1.00m		
2						

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Produced with Core-GS

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24	**COMPLETED DATE**	08/10/24
COORDINATES	1645835.69E, 6118773.40N	**LEVEL**	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.100				TOPSOIL; dark brown .		
		SV = 84 / 21 kPa (Geo 3928)		Silty CLAY, with trace sand; dark grey. Stiff; high plasticity; moist; sand, fine.		
		SV = 98 / 21 kPa (Geo 3928)		0.7m: With some silt, with trace gravel. Gravel, fine to medium.		
1		SV = 125 / 28 kPa (Geo 3928)		1.0m: Wet.	08/10/2024	
1.100				SILT, with trace gravel; brown . Very stiff; moist; gravel, fine to medium.		
				1.3m: With trace gravel; purplish. Gravel, fine to medium, angular to subround, highly weathered to moderately weathered.		
1.700				EOH: 1.70m		
	11					
	2					
2	2					
	0					
	1					
	1					
	0					
	0.2					
	0.2					
	0.2					
	0.2					
	0.2					
	5					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	1.000	Inflow	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT Karen Parker		**PROJECT** Tripark Farms Ltd – Subdivision Suitability	
PROJECT NUMBER 13270		**PROJECT LOCATION** 978 Oruru Road, Taipa	
START DATE 08/10/24	**COMPLETED DATE** 08/10/24	**COORDINATES** 1645835.69E, 6118773.40N	**LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD 50mm Hand Auger			
LOGGED BY US			
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	2					
	3					
	5					
	5					
	3					
	4					
	3					
	4					
	4					
	4					
	4					
	4					
	5					
	8					
	6					
	2					
	5					
	6					
	5					
	7					
	8					
	13					
	10					
	12					
	8					
	12					
	13					
	15					
	11					
	11					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	1.000	Inflow	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT Karen Parker		**PROJECT** Tripark Farms Ltd – Subdivision Suitability	
PROJECT NUMBER 13270		**PROJECT LOCATION** 978 Oruru Road, Taipa	
START DATE 08/10/24	**COMPLETED DATE** 08/10/24	**COORDINATES** 1645835.69E, 6118773.40N	**LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD 50mm Hand Auger			
LOGGED BY US			
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	13					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	1.000	Inflow	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA10

CLIENT Karen Parker
PROJECT Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER 13270
PROJECT LOCATION 978 Oruru Road, Taipa
START DATE 08/10/24 **COMPLETED DATE** 08/10/24
COORDINATES 1645886.17E, 6118794.09N **LEVEL** 0.00
DRILLING CONTRACTOR
DRILLING METHOD 50mm Hand Auger
LOGGED BY US
HOLE LOCATION

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
			TS	Dark brown.		
0.200				CLAY, with some silt; brown. Very stiff; high plasticity; moist.		
		SV = 125 / 42 kPa (Geo 3928)				
		SV = 125 / 49 kPa (Geo 3928)		0.6m: With trace rootlets.		
				0.9m: Wet.	08/10/2024	
1.000		SV = 112 / 28 kPa (Geo 3928)		EOH: 1.00m		

Depth scale: 1, 2

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	0.900	Inflow	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Produced with Core-GS

LOG OF HAND AUGER

HA11

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24 **COMPLETED DATE** 08/10/24	**COORDINATES**	1645938.56E, 6118878.30N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
				0.100 TOPSOIL; dark brown.		
		SV = 195+ kPa (Geo 3928)		Silty CLAY; yellowish brown. Very stiff; high plasticity; moist.		
				0.4m: With trace rootlets; stained dark brown.		
		SV = 153 / 49 kPa (Geo 3928)				
1		SV = 153 / 49 kPa (Geo 3928)		1.000		1
				CLAY, with some silt; yellowish brown stained grey. Very stiff; high plasticity; moist.		
		SV = 153 / 56 kPa (Geo 3928)		1.2m: Speckled orange.		
		SV = 139 / 42 kPa (Geo 3928)				
		SV = 146 / 42 kPa (Geo 3928)		1.8m: With minor silt; brown. Low plasticity.		
2						2
		SV = 118 / 28 kPa (Geo 3928)				
		SV = 112 / 21 kPa (Geo 3928)		2.500 EOH: 2.60m		
	5			2.6m: Wet.	08/10/2024	
	4					
	5					
	6					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	2.600	Static Water Level	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24 **COMPLETED DATE** 08/10/24	**COORDINATES**	1645938.56E, 6118878.30N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	6					
	8					
	11					
	14					
	13					
	15					
	15					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	2.600	Static Water Level	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA12

CLIENT Karen Parker
PROJECT Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER 13270
PROJECT LOCATION 978 Oruru Road, Taipa
START DATE 08/10/24 **COMPLETED DATE** 08/10/24
COORDINATES 1645975.80E, 6118891.99N **LEVEL** 0.00
DRILLING CONTRACTOR
DRILLING METHOD 50mm Hand Auger
LOGGED BY US
HOLE LOCATION

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.100				TOPSOIL; dark brown.	Groundwater Not Encountered	
		SV = 195+ kPa (Geo 3928)		Silty CLAY; brown . Very stiff; high plasticity; moist.		
				0.4m: With trace rootlets.		
		SV = 195+ kPa (Geo 3928)				
1.000		SV = 195+ kPa (Geo 3928)		EOH: 1.00m		1
2						2

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

HA13

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24	**COMPLETED DATE**	08/10/24
COORDINATES	1645594.87E, 6119224.26N	**LEVEL**	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.100				TOPSOIL; dark brown.	Groundwater Not Encountered	
1.000		SV = 181 / 56 kPa (Geo 3928); SV = 139 / 56 kPa (Geo 3928); SV = 139 / 56 kPa (Geo 3928)		Silty CLAY; brown . Very stiff; high plasticity; moist.		1
2.100		SV = 139 / 35 kPa (Geo 3928); SV = 125 / 28 kPa (Geo 3928); SV = 125 / 28 kPa (Geo 3928)		CLAY, with minor silt, with trace sand; light yellow brown. Low plasticity; sand, fine. 1.7m: Non plastic.		2
	2, 2, 2, 3, 3, 5, 4, 5, 5			EOH: 2.10m		

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT Karen Parker		**PROJECT** Tripark Farms Ltd – Subdivision Suitability	
PROJECT NUMBER 13270		**PROJECT LOCATION** 978 Oruru Road, Taipa	
START DATE 08/10/24	**COMPLETED DATE** 08/10/24	**COORDINATES** 1645594.87E, 6119224.26N	**LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD 50mm Hand Auger			
LOGGED BY US			
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	5					
	4					
	5					
	4					
	5					
	7					
	9					
	8					
	12					
	8					
	7					
	8					
	7					
	8					
	12					
	10					
	9					
	10					
	11					
	8					
	11					
	17					
	8					
	10					
	10					
	8					
	12					
	15					
	15					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA14

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24 **COMPLETED DATE** 08/10/24	**COORDINATES**	1645655.55E, 6119229.80N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
				Silty CLAY; brown . Very stiff; high plasticity; moist.	Groundwater Not Encountered	
			0.100	Silty CLAY; brown . Very stiff; high plasticity; moist.		
		SV = 195+ kPa (Geo 3928)		0.3m: With trace rootlets.		
				0.5m: Stained light purple.		
		SV = 195+ kPa (Geo 3928)				
1		SV = 195+ kPa (Geo 3928)	1.000	EOH: 1.00m		
2						

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

HA15

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24 **COMPLETED DATE** 08/10/24	**COORDINATES**	1645755.24E, 6119357.60N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.000–0.300			TS	TOPSOIL; dark brown.		
0.300–0.800		SV = 221+ kPa (GEO287) SV = 187 / 73 kPa (GEO287)		CLAY, with trace rootlets; golden brown. Very stiff; high plasticity; moist.		
0.800–1.000		SV = 98 / 63 kPa (GEO287)		Silty CLAY, with minor gravel; light brown. Very stiff; low plasticity; moist; gravel, fine, angular to subround.		
1.000–1.400		SV = 111 / 43 kPa (GEO287)		Clayey SILT, with minor gravel, with trace carbonaceous; dark brown. Stiff; low plasticity; moist; gravel, fine.		
1.400–1.600		SV = 92 / 35 kPa (GEO287)		Silty CLAY, with minor sand; light grey stained orange. Stiff; low plasticity; wet; sand, fine.	08/10/2024	
1.600–2.000				Sandy CLAY, with trace gravel; light grey with black specks mottled orange. Medium dense; low plasticity; saturated; sand, fine to coarse; gravel, fine; Completely Weathered .		
2.000				EOH: 2.00m		

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	1.500	Inflow	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT Karen Parker		**PROJECT** Tripark Farms Ltd – Subdivision Suitability	
PROJECT NUMBER 13270		**PROJECT LOCATION** 978 Oruru Road, Taipa	
START DATE 08/10/24	**COMPLETED DATE** 08/10/24	**COORDINATES** 1645779.57E, 6119922.51N	**LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD 50mm Hand Auger			
LOGGED BY US			
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
		SV = 161 / 40 kPa (GEO287)		Clayey SILT; brown. Very stiff; low plasticity; moist.		
		SV = 152 / 47 kPa (GEO287)				
1		SV = 123 / 35 kPa (GEO287)		1.000		
		SV = 123 / 35 kPa (GEO287)		Silty CLAY; brown with black speckles and mottled orange. Firm; high plasticity; wet.		
		SV = 47 / 8 kPa (GEO287)		1.4m: Saturated.	08/10/2024	
		SV = 136 / 27 kPa (GEO287)				
2		SV = 100 / 28 kPa (GEO287)		2.300		
		SV = 55 / 28 kPa (GEO287)		CLAY; grey. Soft; high plasticity; saturated.		
		SV = 52 / 24 kPa (GEO287)		2.900 EOH: 2.90m		
		SV = UTP				

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	1.400	Inflow	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA16

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	08/10/24	**COMPLETED DATE**	08/10/24
COORDINATES	1645779.57E, 6119922.51N	**LEVEL**	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
		(GEO287)				

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks
8/10/2024 12:00:00 p.m.	1.400	Inflow	

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Produced with Core-GS

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	09/10/24	**COMPLETED DATE**	09/10/24
COORDINATES	1645671.59E, 6119744.80N	**LEVEL**	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
0.000–0.200			TS	TOPSOIL; dark brown.	Groundwater Not Encountered	
0.200–0.800		SV = 125 / 63 kPa (Geo 3928); SV = 139 / 63 kPa (Geo 3928)		Silty CLAY; brown . Very stiff; high plasticity; moist. 0.4m: With trace rootlets.		
0.800–2.000		SV = 139 / 56 kPa (Geo 3928); SV = 125 / 56 kPa (Geo 3928); SV = 118 / 49 kPa (Geo 3928); SV = 139 / 56 kPa (Geo 3928)		CLAY, with some silt; golden brown and grey. Very stiff; high plasticity; moist.		
2.000				EOH: 2.00m		

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS
- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA18

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	09/10/24 **COMPLETED DATE** 09/10/24	**COORDINATES**	1645658.25E, 6119816.93N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER
0.0–0.2		SV = 161 / 40 kPa (GEO287)	TS	TOPSOIL; dark brown.	Groundwater Not Encountered
0.200–1.000		SV = 152 / 47 kPa (GEO287); SV = 123 / 35 kPa (GEO287); SV = 47 / 8 kPa (GEO287)		Silty CLAY; yellow brown. Very stiff; high plasticity; moist. 0.6m: With trace rootlets; stained dark brown.	
1.000–2.800		SV = 136 / 92 kPa (GEO287); SV = 100 / 16 kPa (GEO287); SV = 136 / 27 kPa (GEO287); SV = 100 / 28 kPa (GEO287); SV = 55 / 28 kPa (GEO287); SV = 52 / 24 kPa (GEO287)		CLAY, with some silt; golden brown. Very stiff; high plasticity; moist. 1.2m: Golden brown mottled orange. 1.8m: With minor silt; greyish brown.	
2.800	5, 6	SV = UTP		EOH: 2.90m. 2.8m: EOH: Unable To Penetrate	

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	09/10/24	**COMPLETED DATE**	09/10/24
COORDINATES	1645658.25E, 6119816.93N	**LEVEL**	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	10	(GEO287)				
	12					
	18					
	20					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA19

CLIENT Karen Parker
PROJECT Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER 13270
PROJECT LOCATION 978 Oruru Road, Taipa
START DATE 09/10/24 **COMPLETED DATE** 09/10/24
COORDINATES 1645691.95E, 6119806.05N **LEVEL** 0.00
DRILLING CONTRACTOR
DRILLING METHOD 50mm Hand Auger
LOGGED BY US
HOLE LOCATION

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
			TS	TOPSOIL; dark brown.	Groundwater Not Encountered	
0.200		SV = 139 / 56 kPa (Geo 3928)	CH	Silty CLAY; golden brown. Very stiff; high plasticity; moist.		
				0.4m: With trace rootlets.		
		SV = 125 / 56 kPa (Geo 3928)				
1		SV = 125 / 49 kPa (Geo 3928)				1
1.000				EOH: 1.00m		
2						2

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS
- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	PROJECT	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	PROJECT LOCATION	978 Oruru Road, Taipa
START DATE	09/10/24	COMPLETED DATE	09/10/24
COORDINATES	1645545.06E, 6119777.57N	LEVEL	0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER
0.100			TS	TOPSOIL; dark brown.	Groundwater Not Encountered
0.800		SV = 167 / 63 kPa (Geo 3928); SV = 153 / 63 kPa (Geo 3928)		Silty CLAY; yellowish brown. Very stiff; high plasticity; moist. 0.4m: With trace rootlets.	
2.100		SV = 160 / 21 kPa (Geo 3928); SV = 153 / 70 kPa (Geo 3928); SV = 139 / 70 kPa (Geo 3928); SV = 125 / 49 kPa (Geo 3928)		CLAY, with some silt; yellowish brown stained red. Very stiff; high plasticity; moist. 1.1m: Dark red and brown. 1.7m: With minor silt.	
				EOH: 2.10m	
2.1–3.0	3, 3, 7, 10, 10, 11, 17, 11, 12	SV = 125 / 49 kPa (Geo 3928)			

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Hawthorn Geddes engineers & architects ltd

LOG OF HAND AUGER

HA20

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	09/10/24 **COMPLETED DATE** 09/10/24	**COORDINATES**	1645545.06E, 6119777.57N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
	13					
	18					
	20					

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

LOG OF HAND AUGER

Hawthorn Geddes engineers & architects ltd

CLIENT	Karen Parker	**PROJECT**	Tripark Farms Ltd – Subdivision Suitability
PROJECT NUMBER	13270	**PROJECT LOCATION**	978 Oruru Road, Taipa
START DATE	09/10/24 **COMPLETED DATE** 09/10/24	**COORDINATES**	1645582.82E, 6119797.35N **LEVEL** 0.00
DRILLING CONTRACTOR			
DRILLING METHOD	50mm Hand Auger		
LOGGED BY	US		
HOLE LOCATION			

DEPTH (m)	SCALA (Blows / 100mm)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER	DEPTH (m)
			TS	TOPSOIL; dark brown.	Groundwater Not Encountered	
0.200		SV = 125 / 28 kPa (Geo 3928)		Silty CLAY; light brown. Very stiff; high plasticity; moist. 0.4m: With trace rootlets.		
		SV = 125 / 21 kPa (Geo 3928)				
1 (1.000)		SV = 139 / 28 kPa (Geo 3928)		EOH: 1.00m		1
2						2

PHOTO / SKETCH

WATER OBSERVATIONS

Date / Time	Water Level (m)	Type	Remarks

REMARKS

SYMBOLS

- Standing Water Level
- Water Out flow
- Water In flow

Produced with Core-GS

Appendix C. CPT Logs

Underground Investigation Ltd
Cone Penetration Testing
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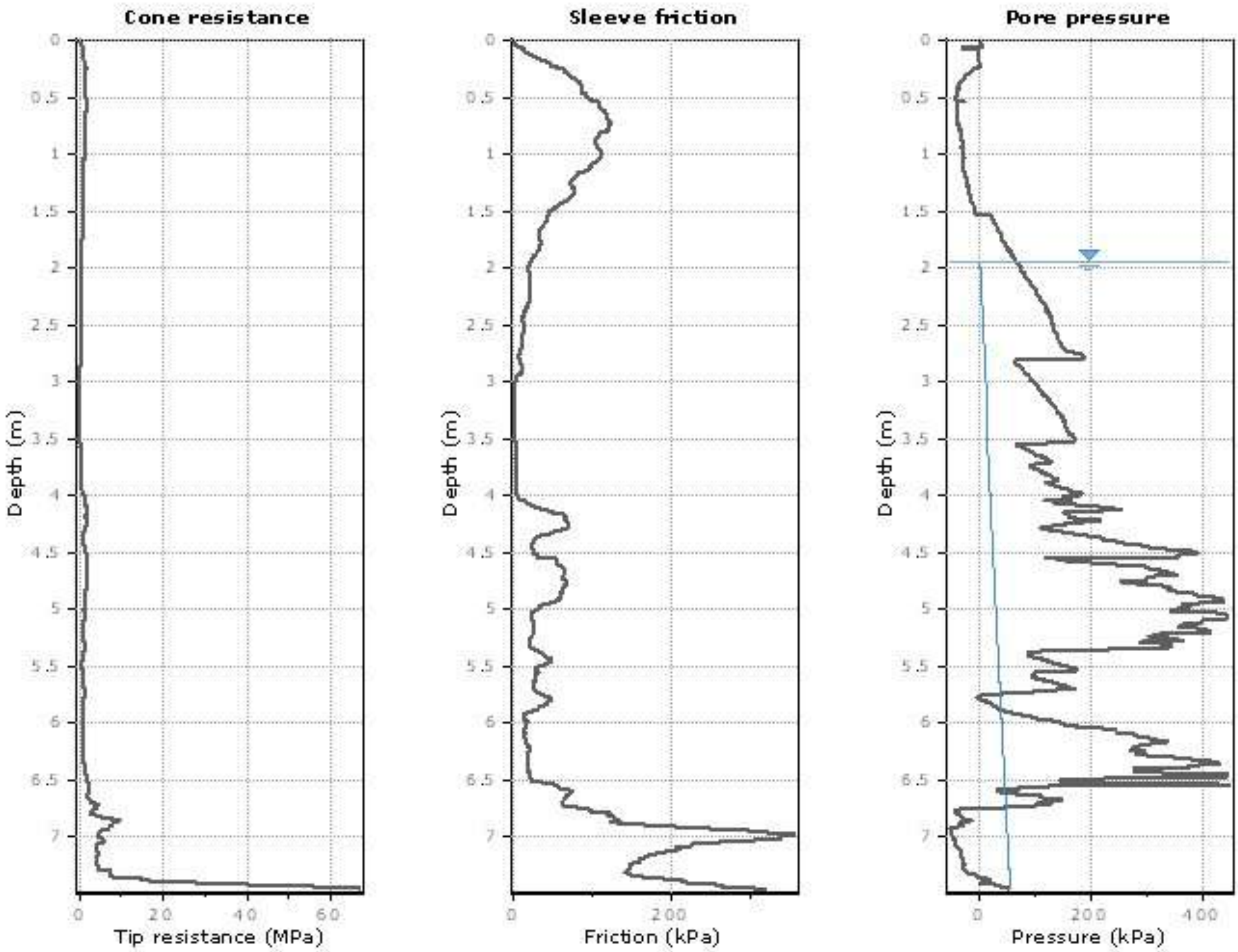
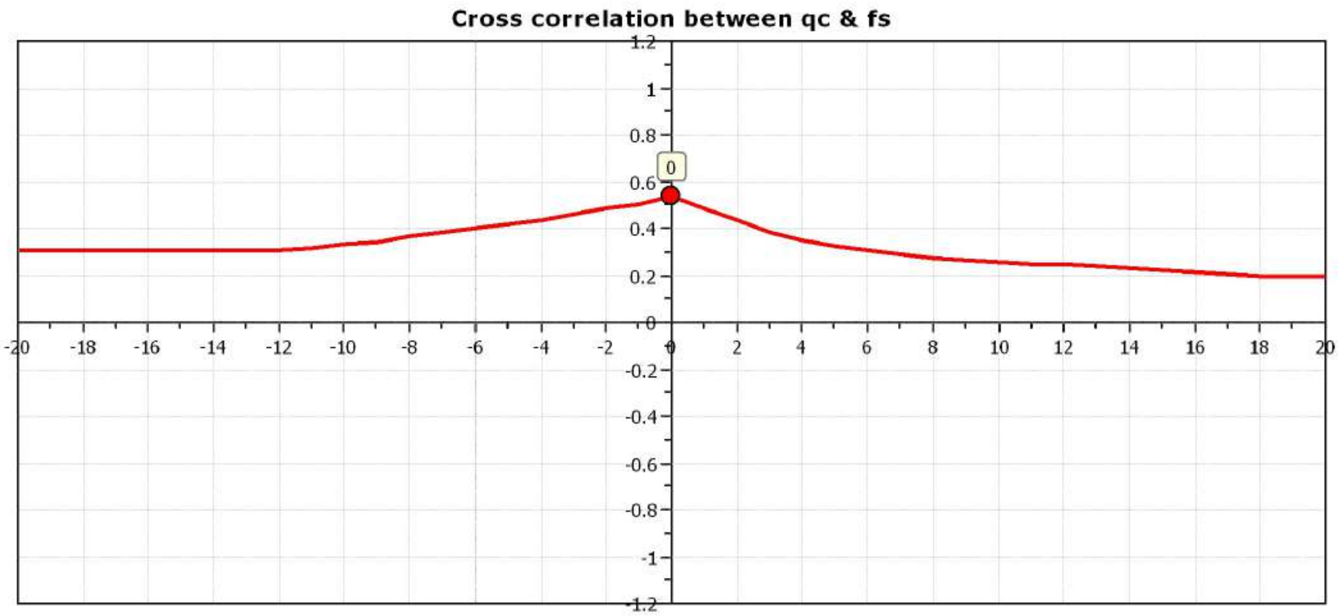
+64211473249

CPT: CPT01
Total depth: 7.46 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



Underground Investigation Ltd
Cone Penetration Testing
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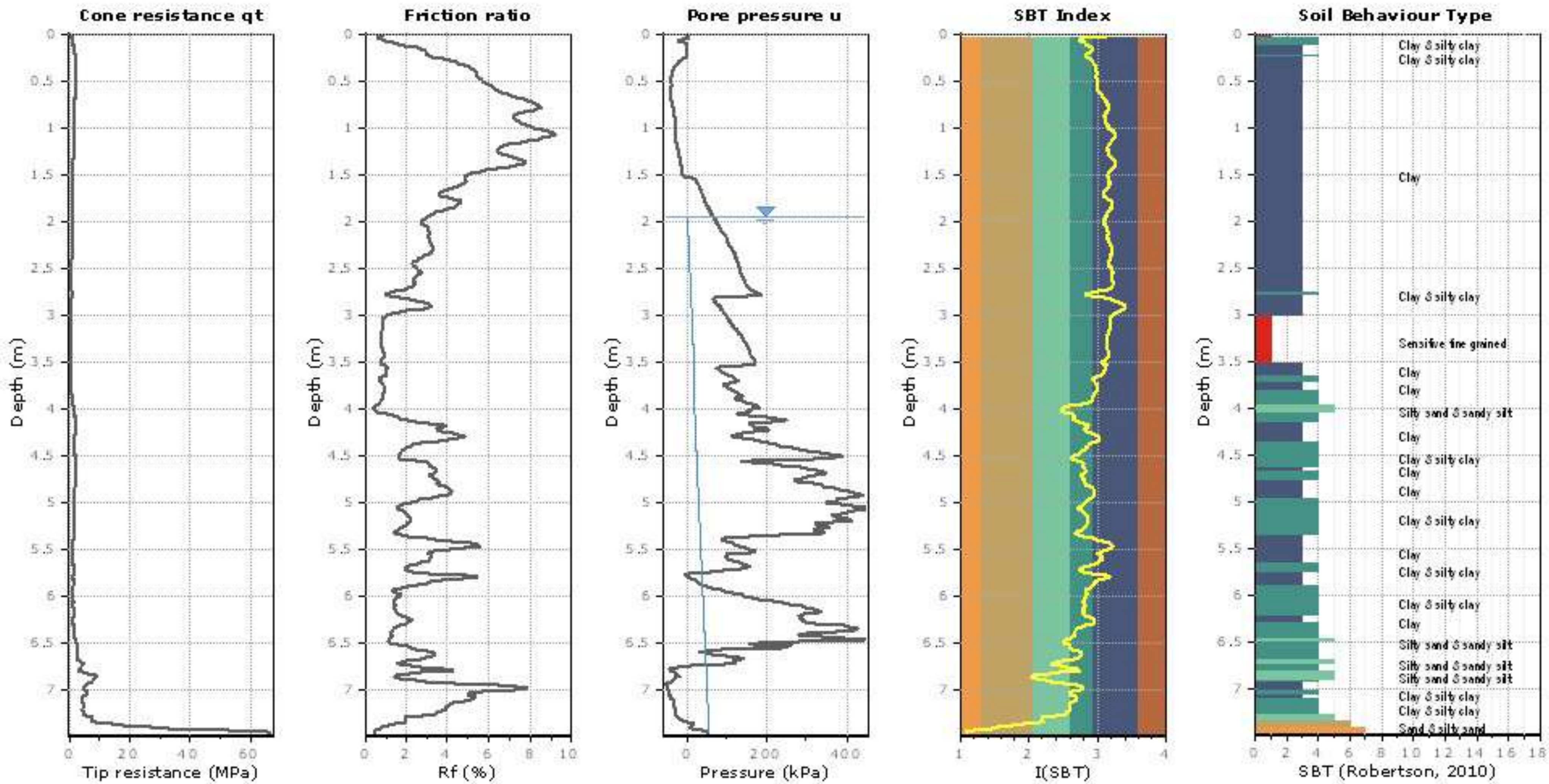
+64211473249

CPT: CPT01
Total depth: 7.46 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



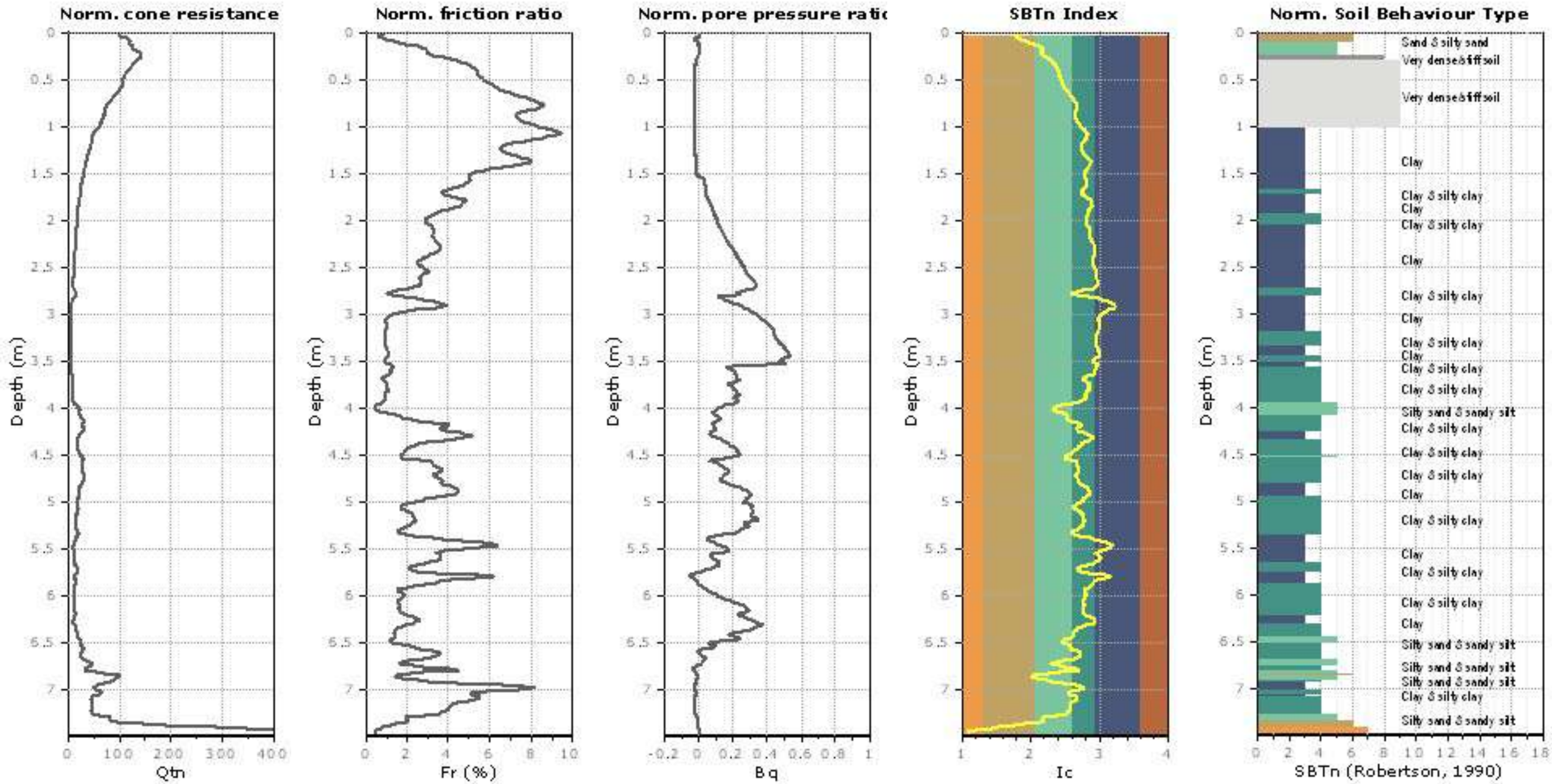
SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Underground Investigation Ltd
Cone Penetration Testing
craig@undergroundinvestigation.co.nz
+64211473249

CPT: CPT01
Total depth: 7.46 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



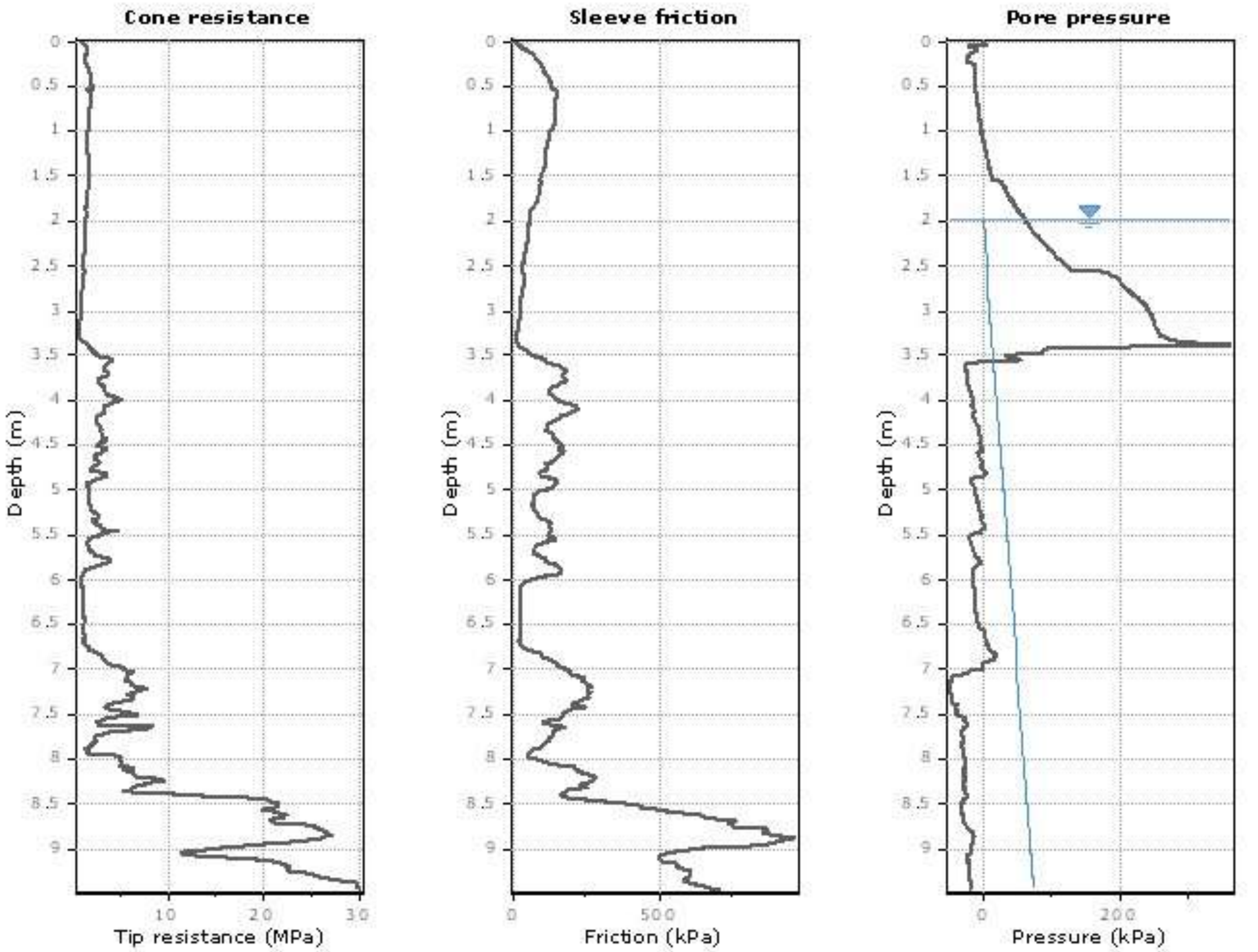
SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

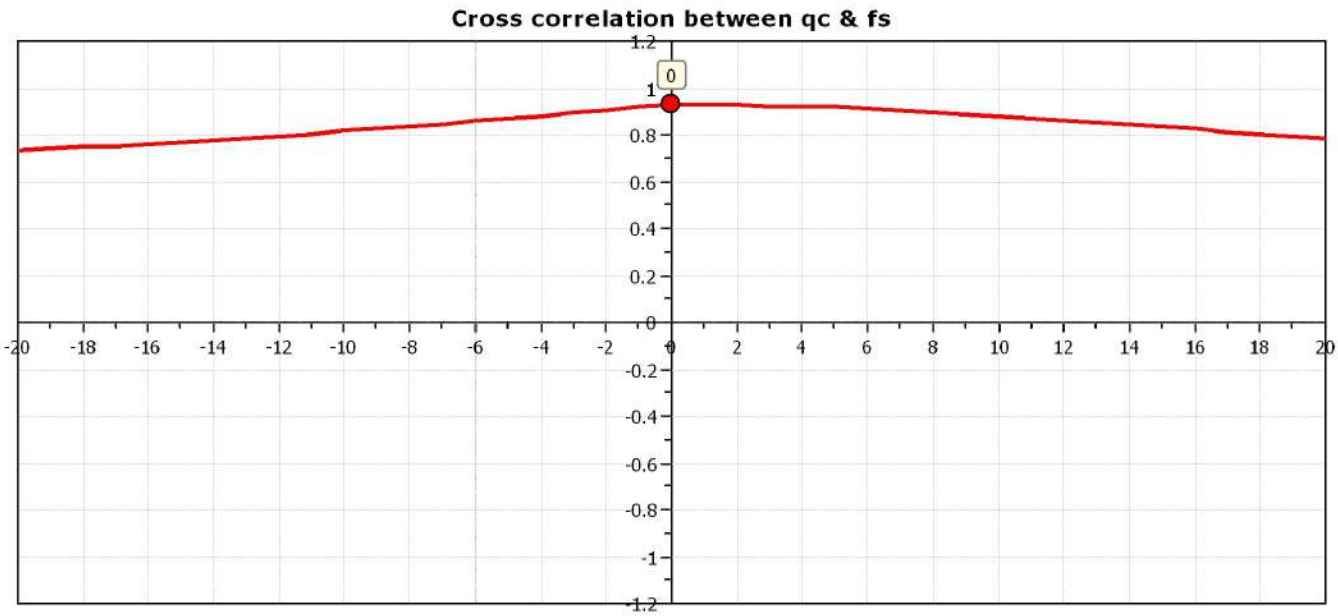
Underground Investigation Ltd
Cone Penetration Testing
craig@undergroundinvestigation.co.nz
+64211473249

CPT: CPT02
Total depth: 9.45 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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Cone Penetration Testing
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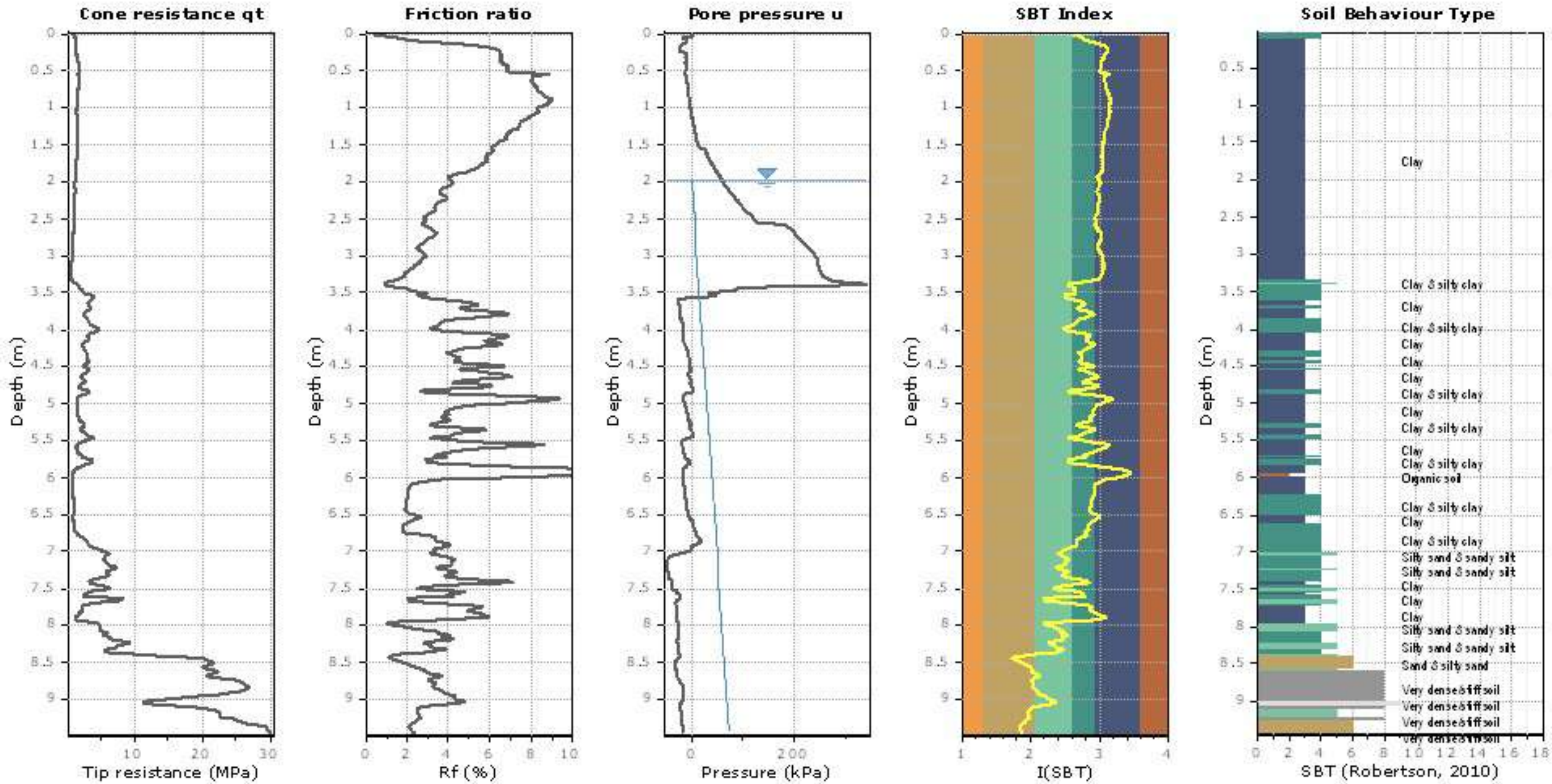
CPT: CPT02
Total depth: 9.45 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

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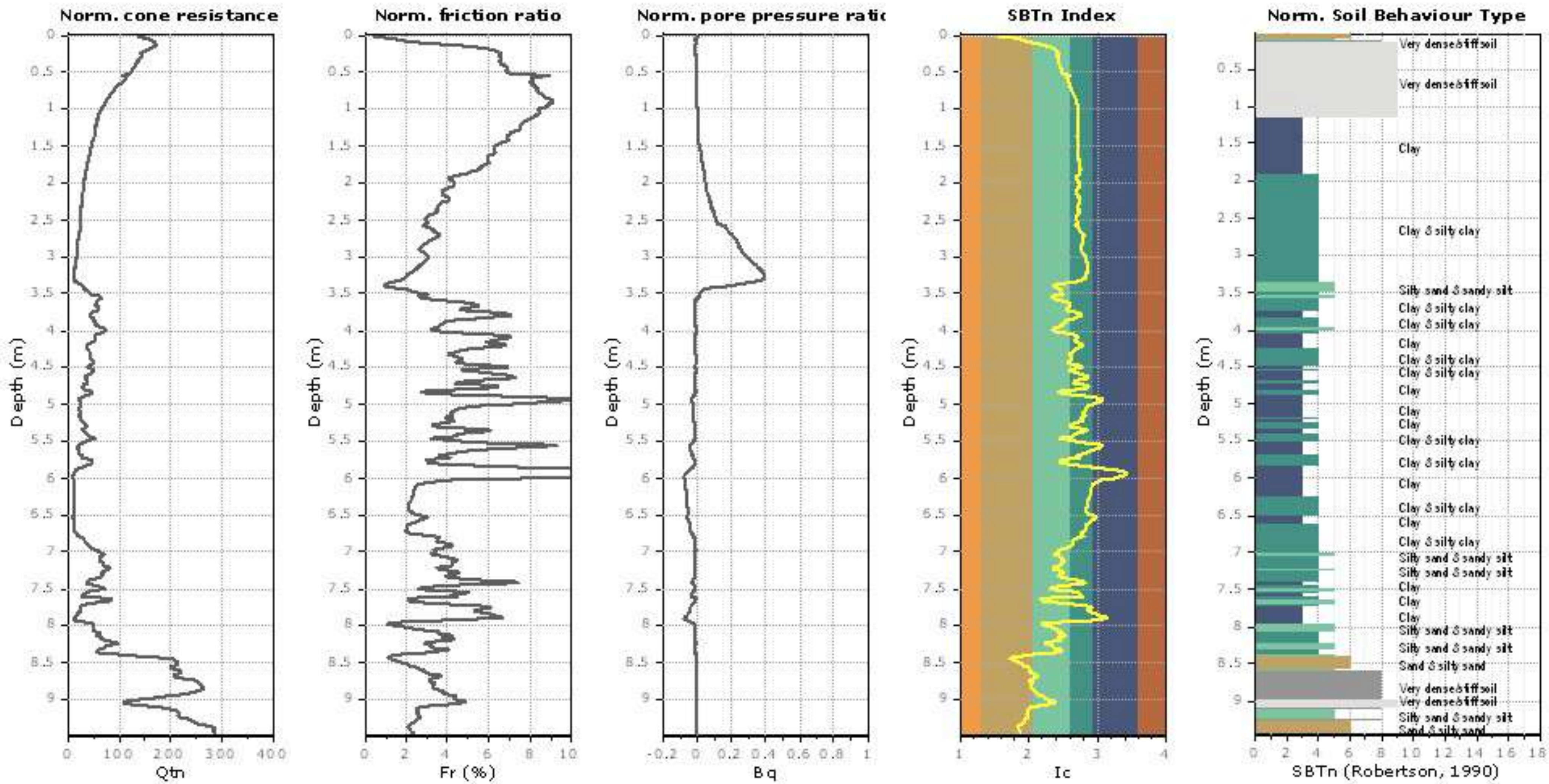
+64211473249

CPT: CPT02
Total depth: 9.45 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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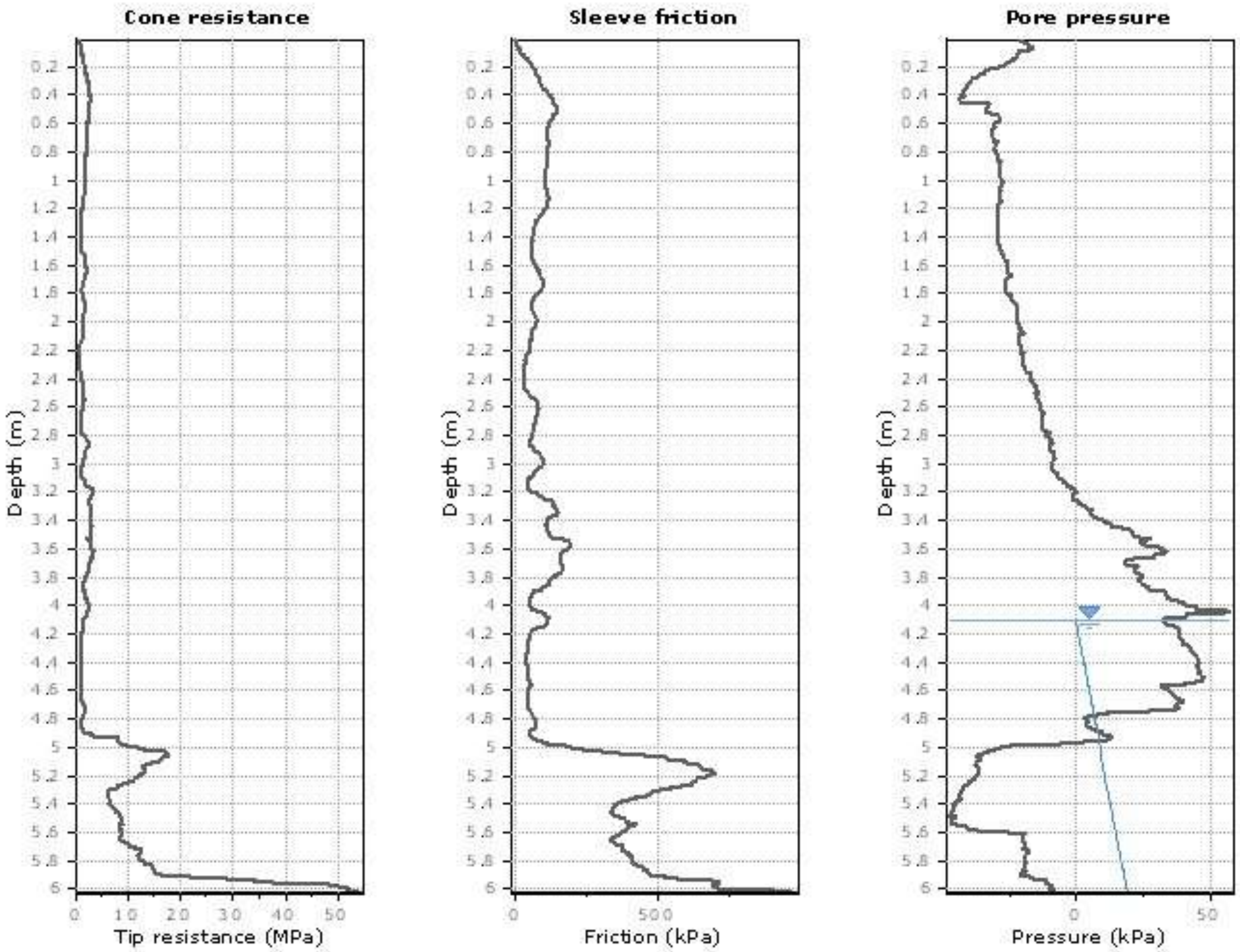
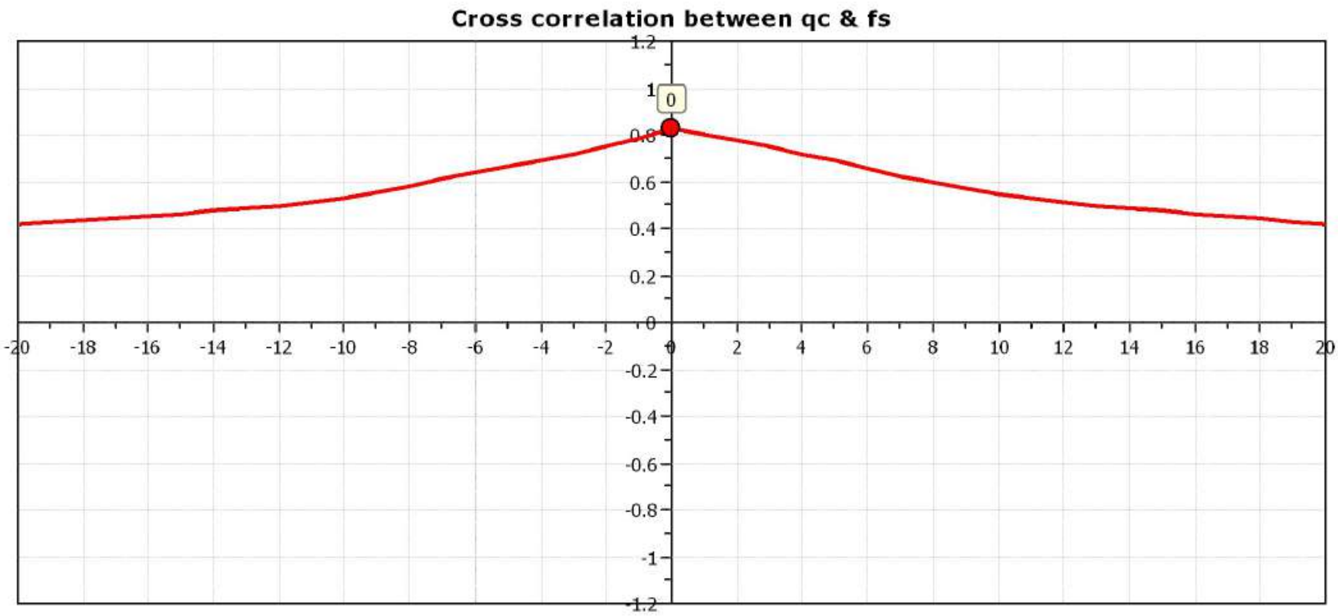
+64211473249

CPT: CPT03
Total depth: 6.02 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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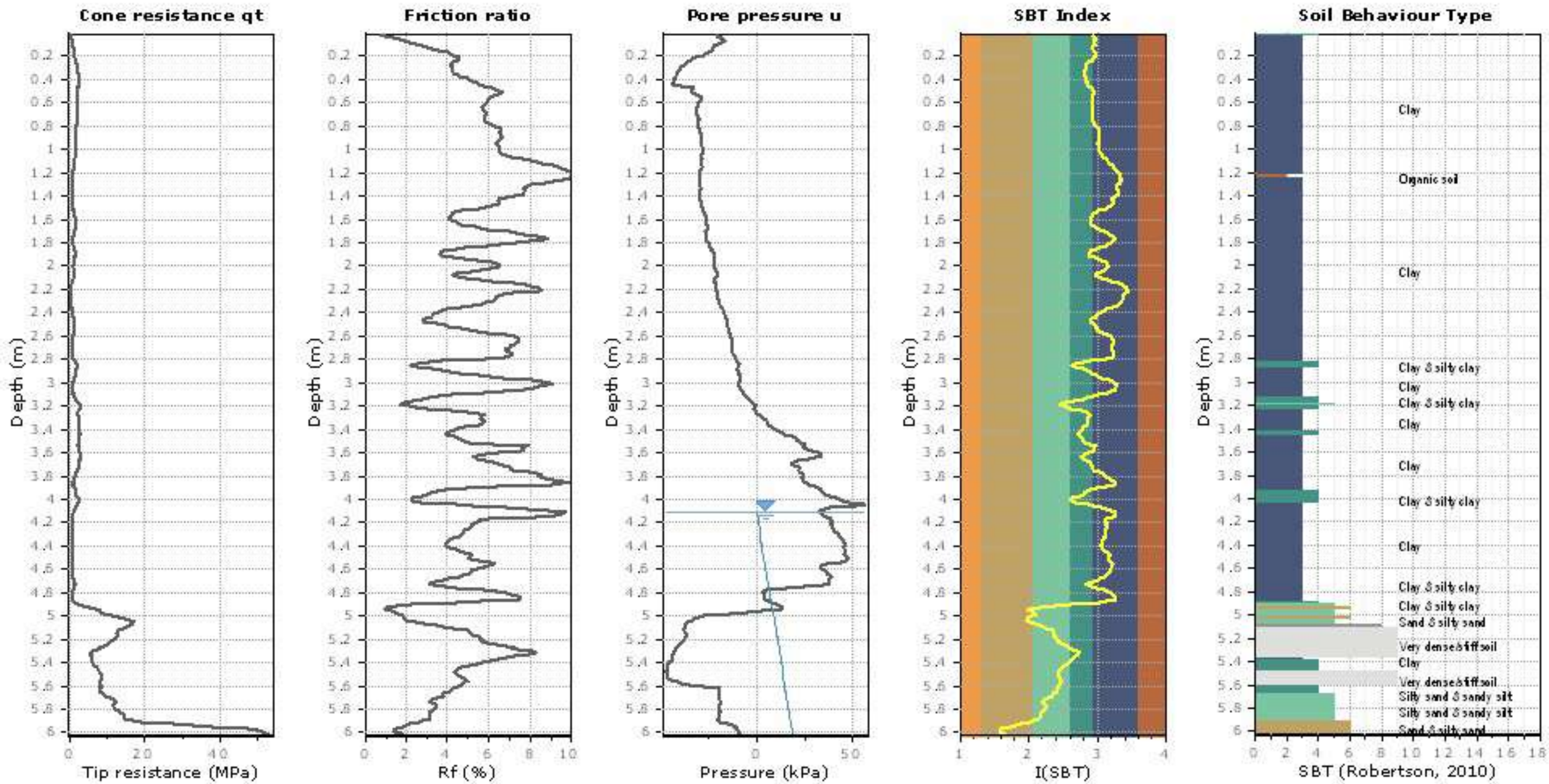
CPT: CPT03
Total depth: 6.02 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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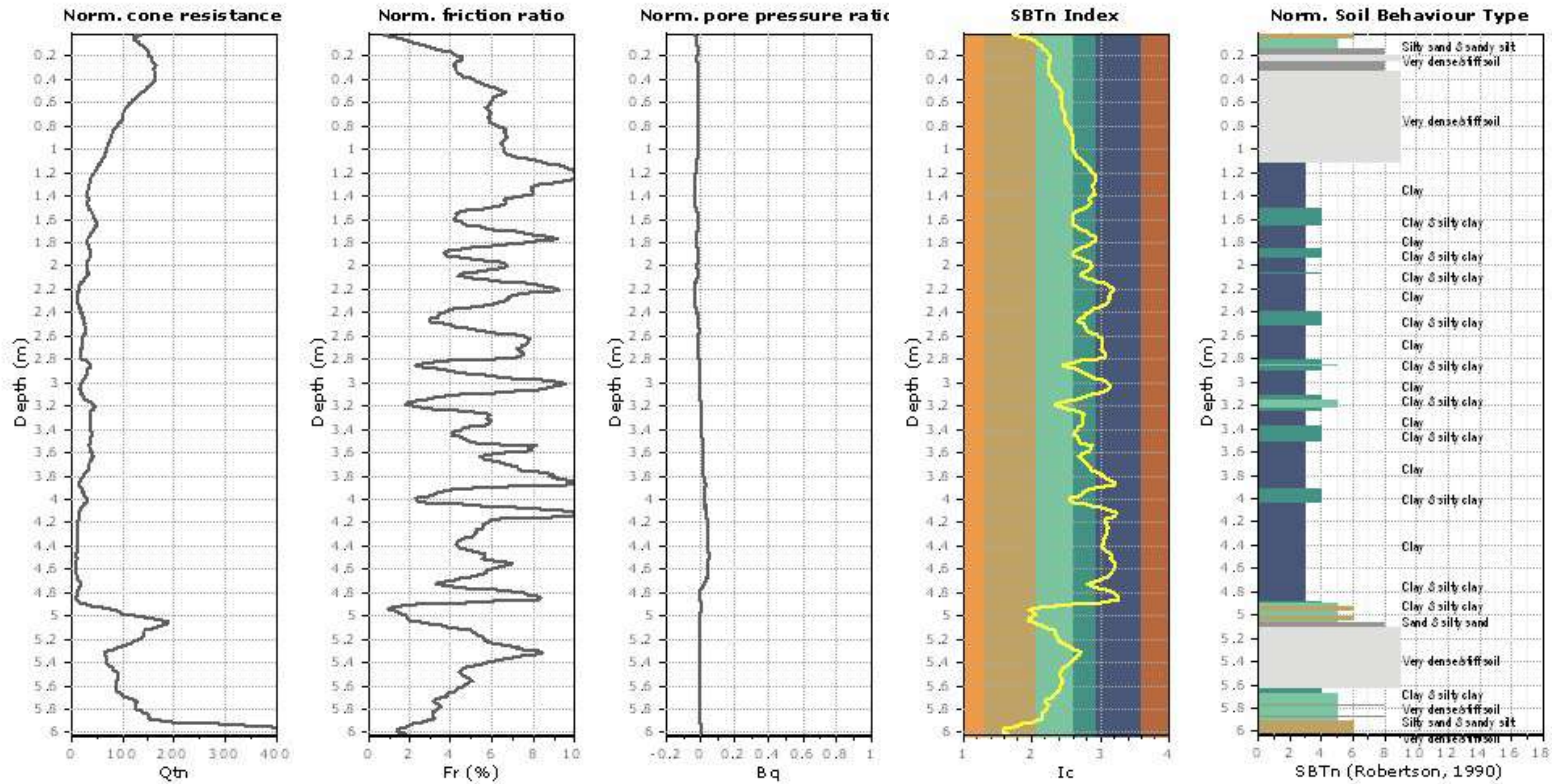
CPT: CPT03

Total depth: 6.02 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

Underground Investigation Ltd
Cone Penetration Testing
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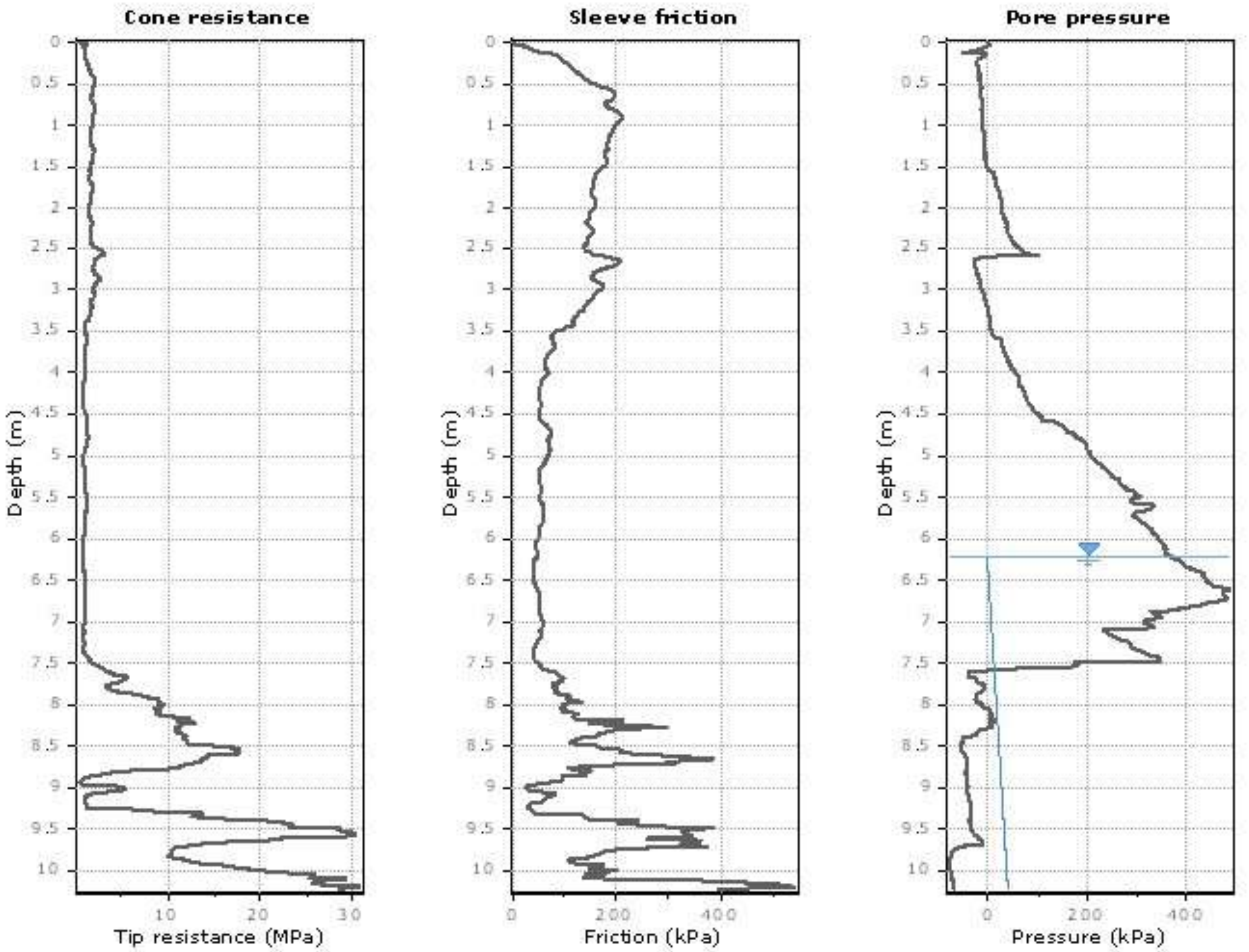
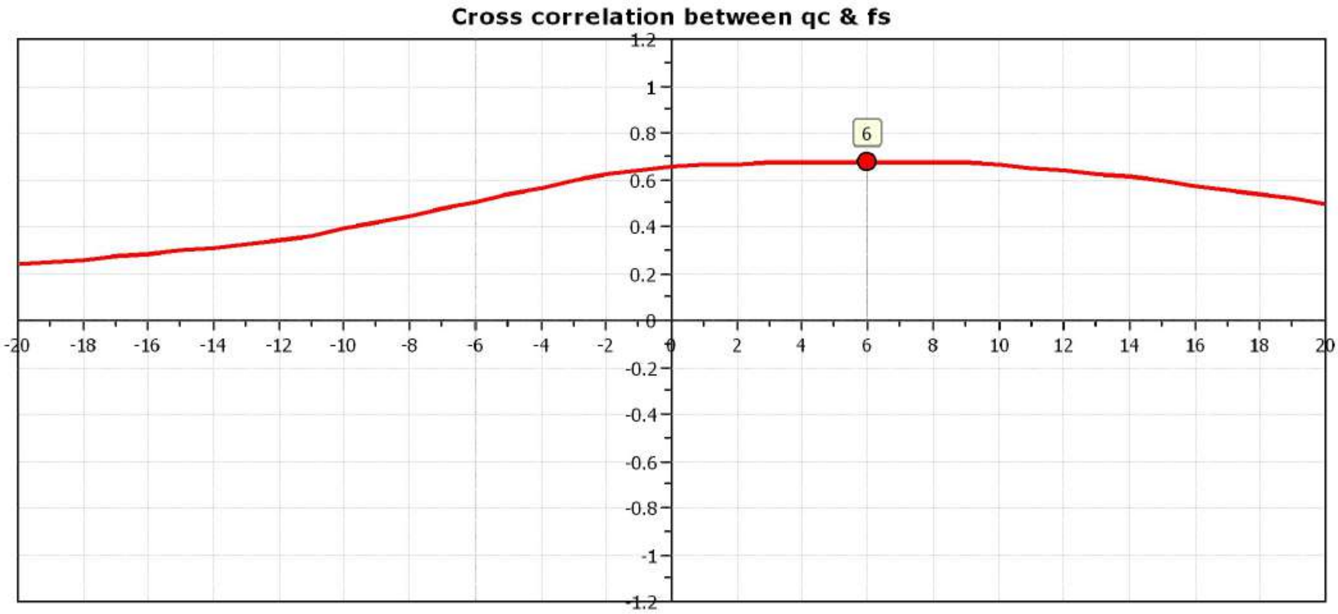
CPT: CPT04
Total depth: 10.21 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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Cone Penetration Testing
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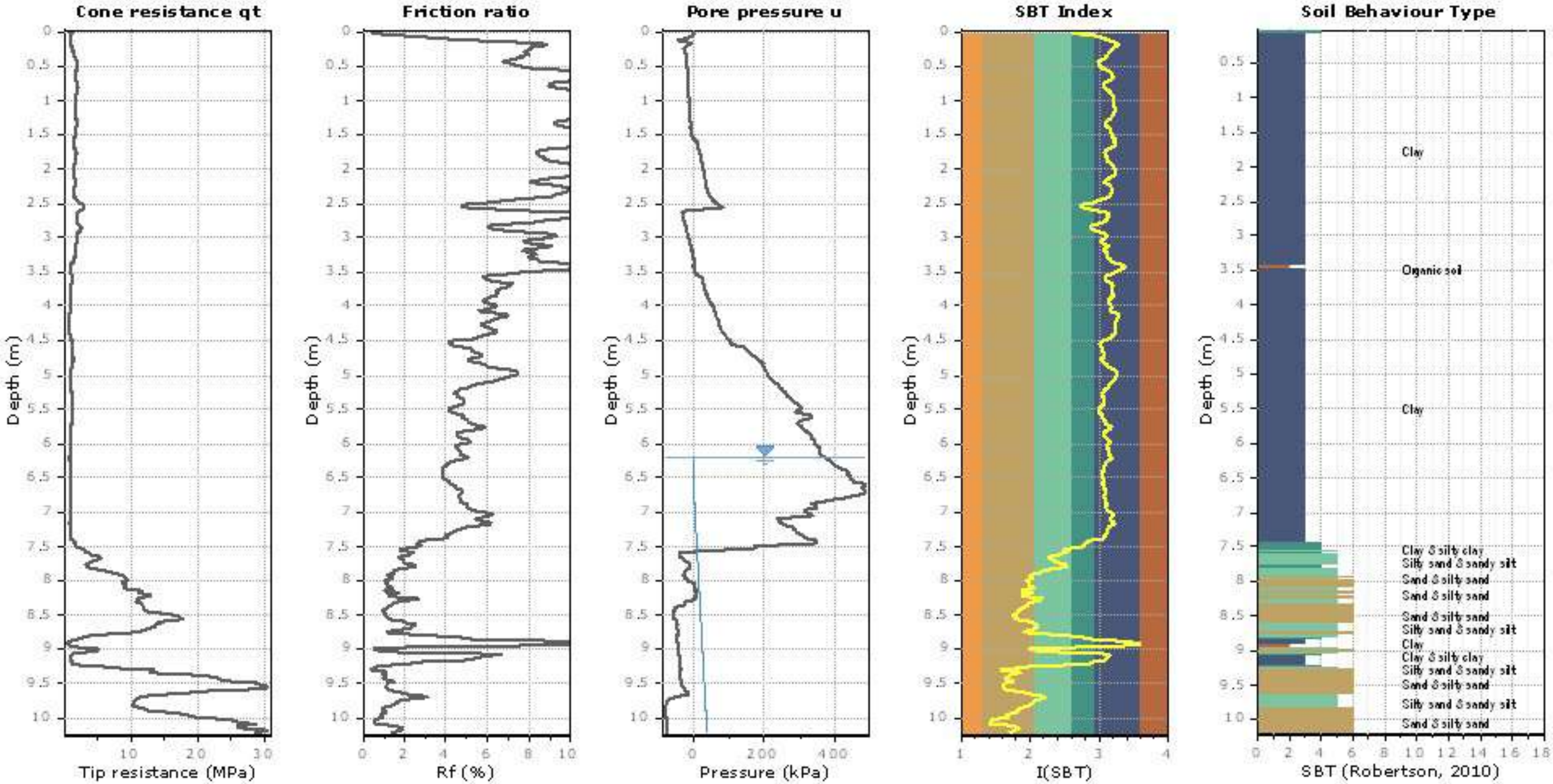
CPT: CPT04
Total depth: 10.21 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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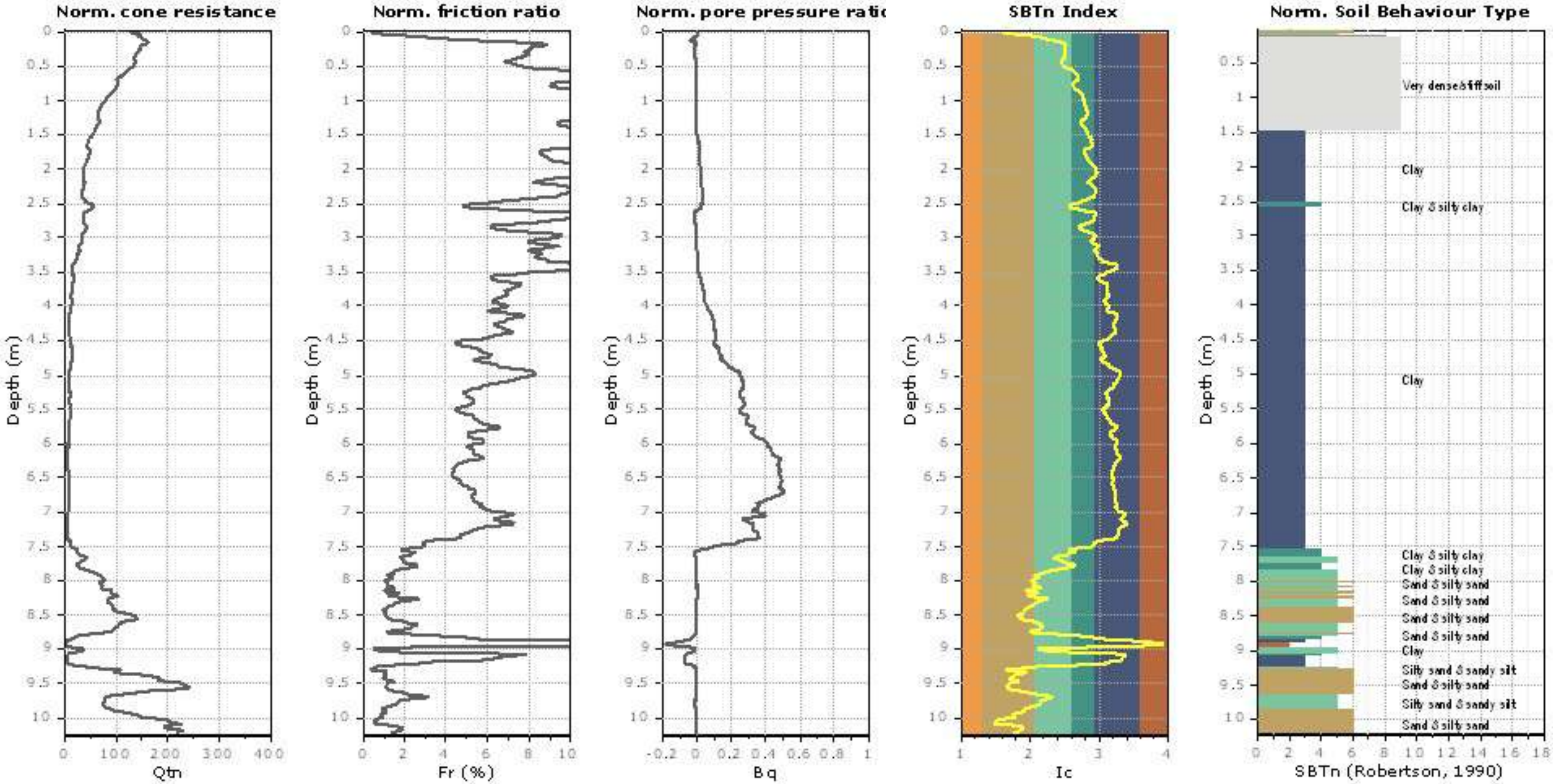
CPT: CPT04
Total depth: 10.21 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

Underground Investigation Ltd
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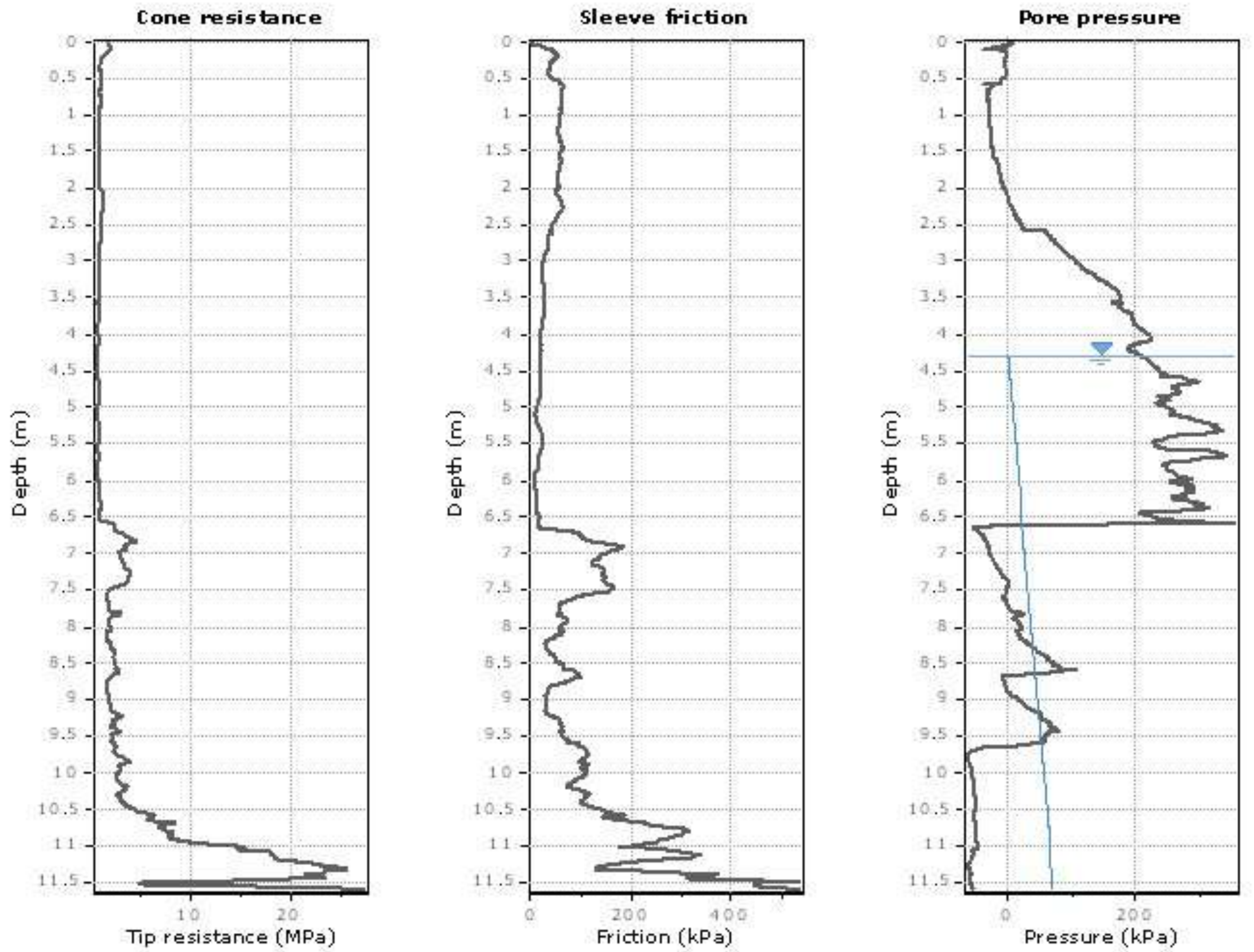
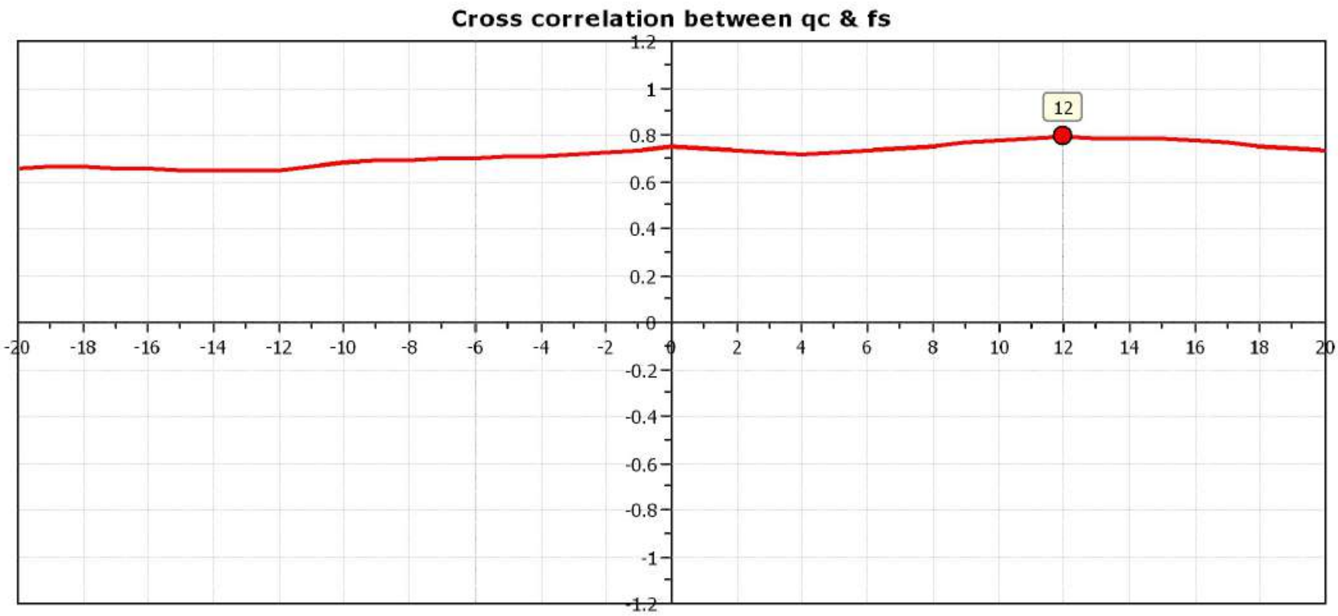
+64211473249

CPT: CPT05
Total depth: 11.59 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



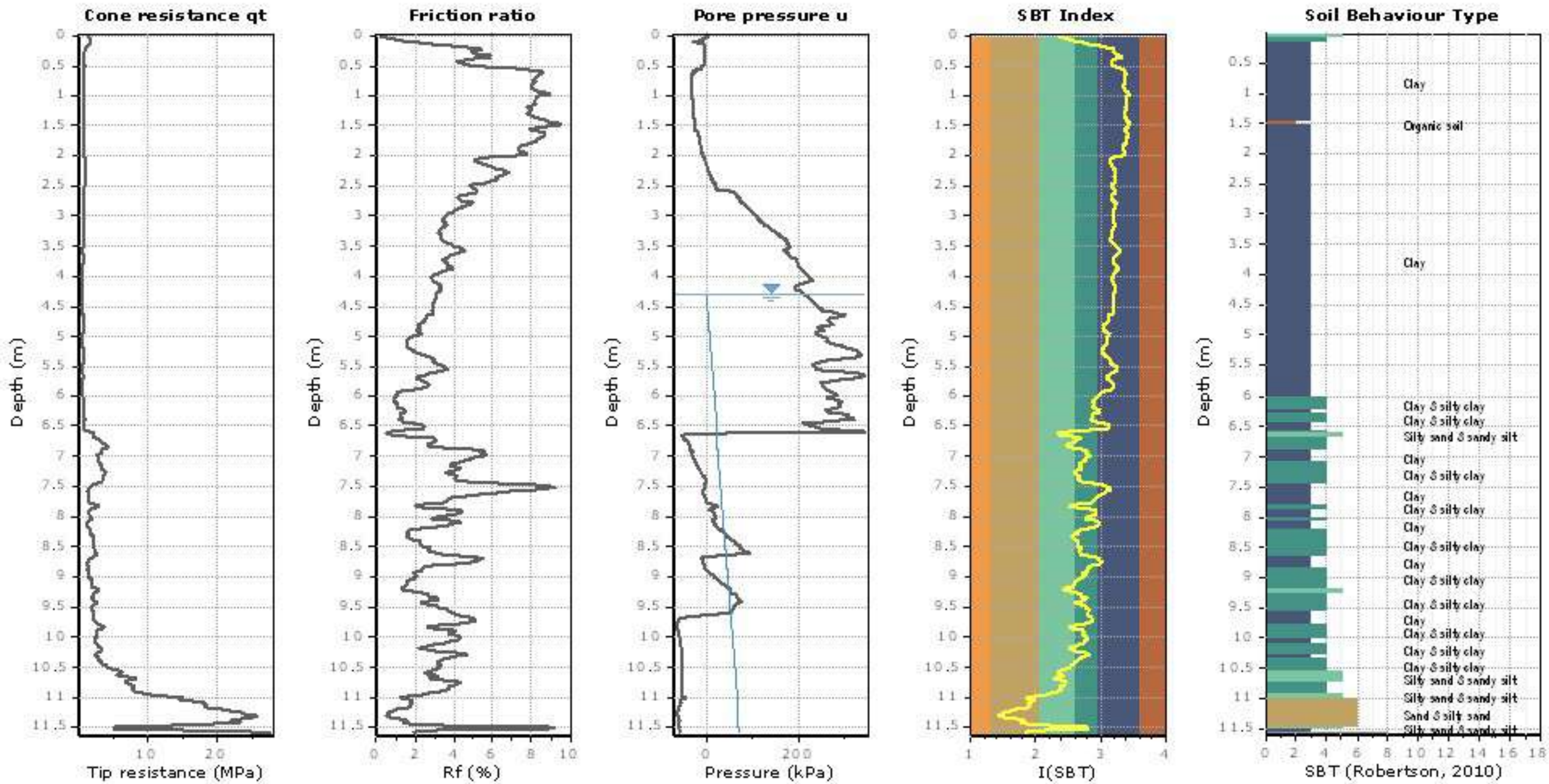
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



Underground Investigation Ltd
Cone Penetration Testing
craig@undergroundinvestigation.co.nz
+64211473249

CPT: CPT05
Total depth: 11.59 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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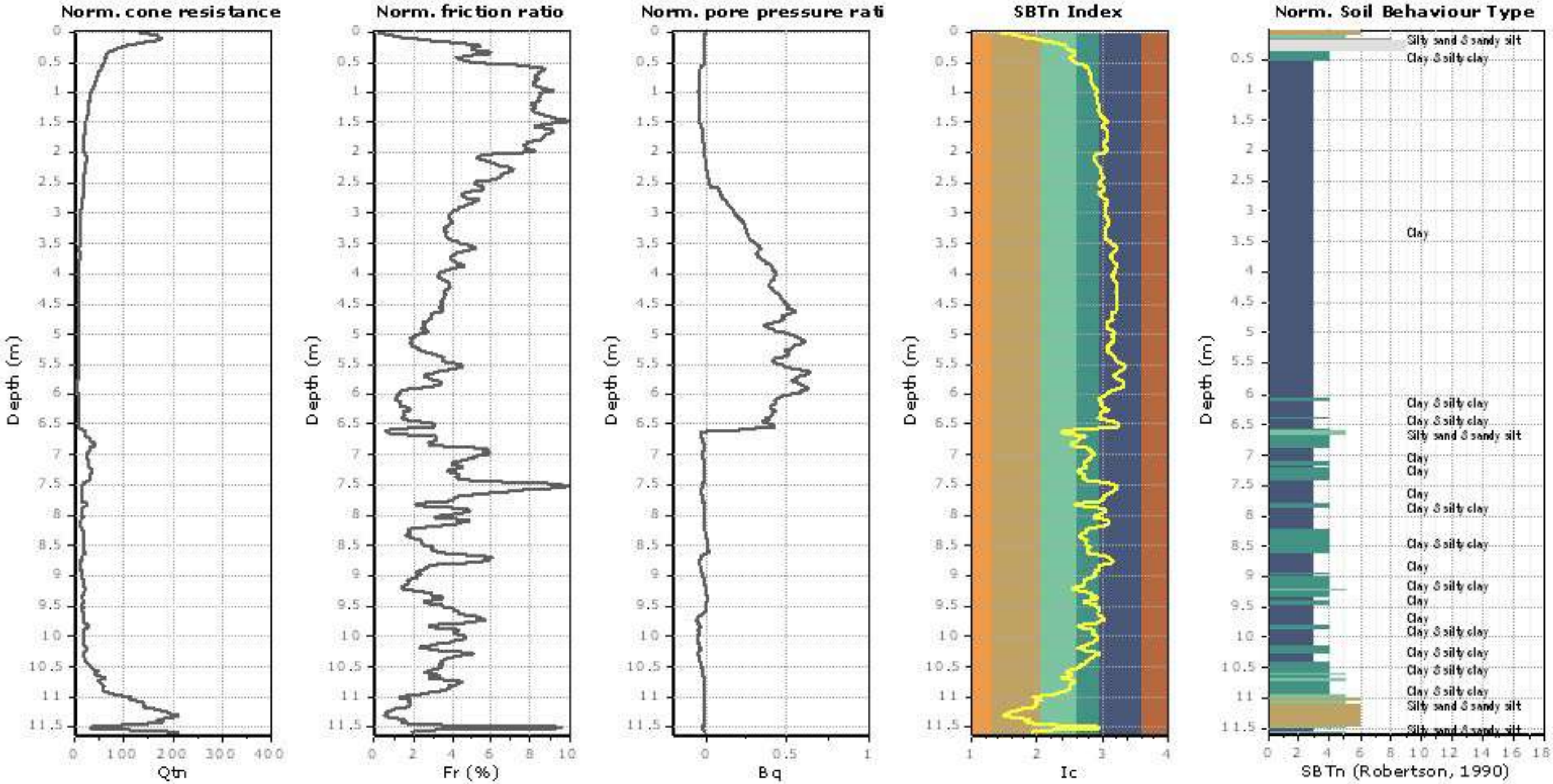
CPT: CPT05
Total depth: 11.59 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

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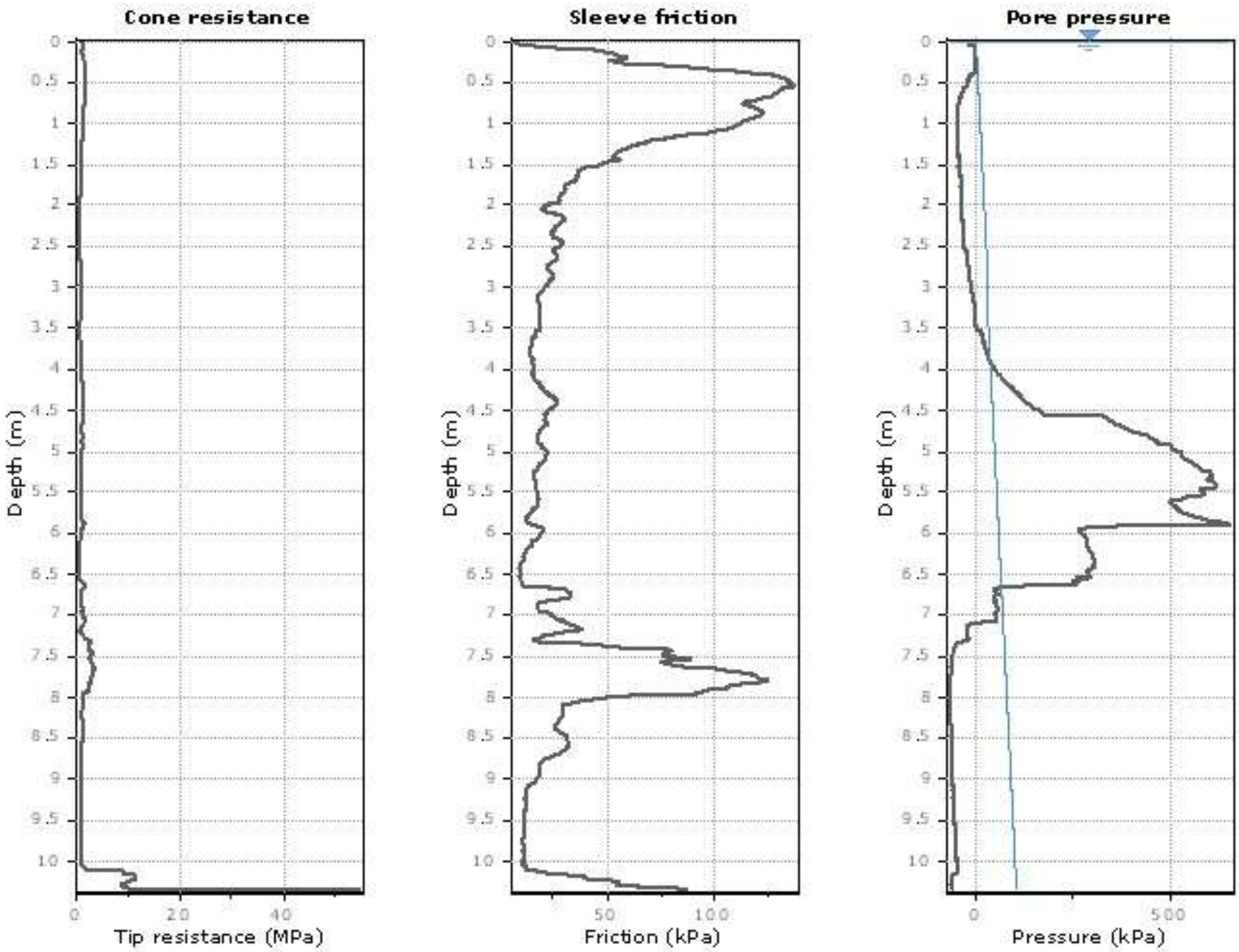
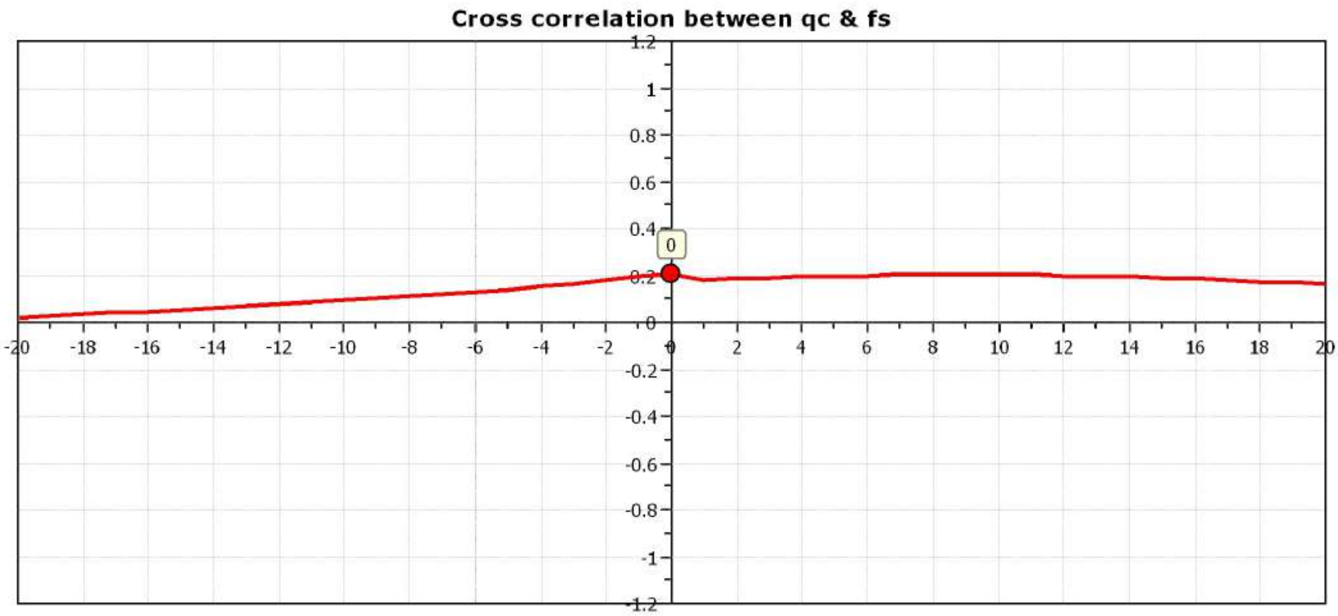
CPT: CPT06
Total depth: 10.34 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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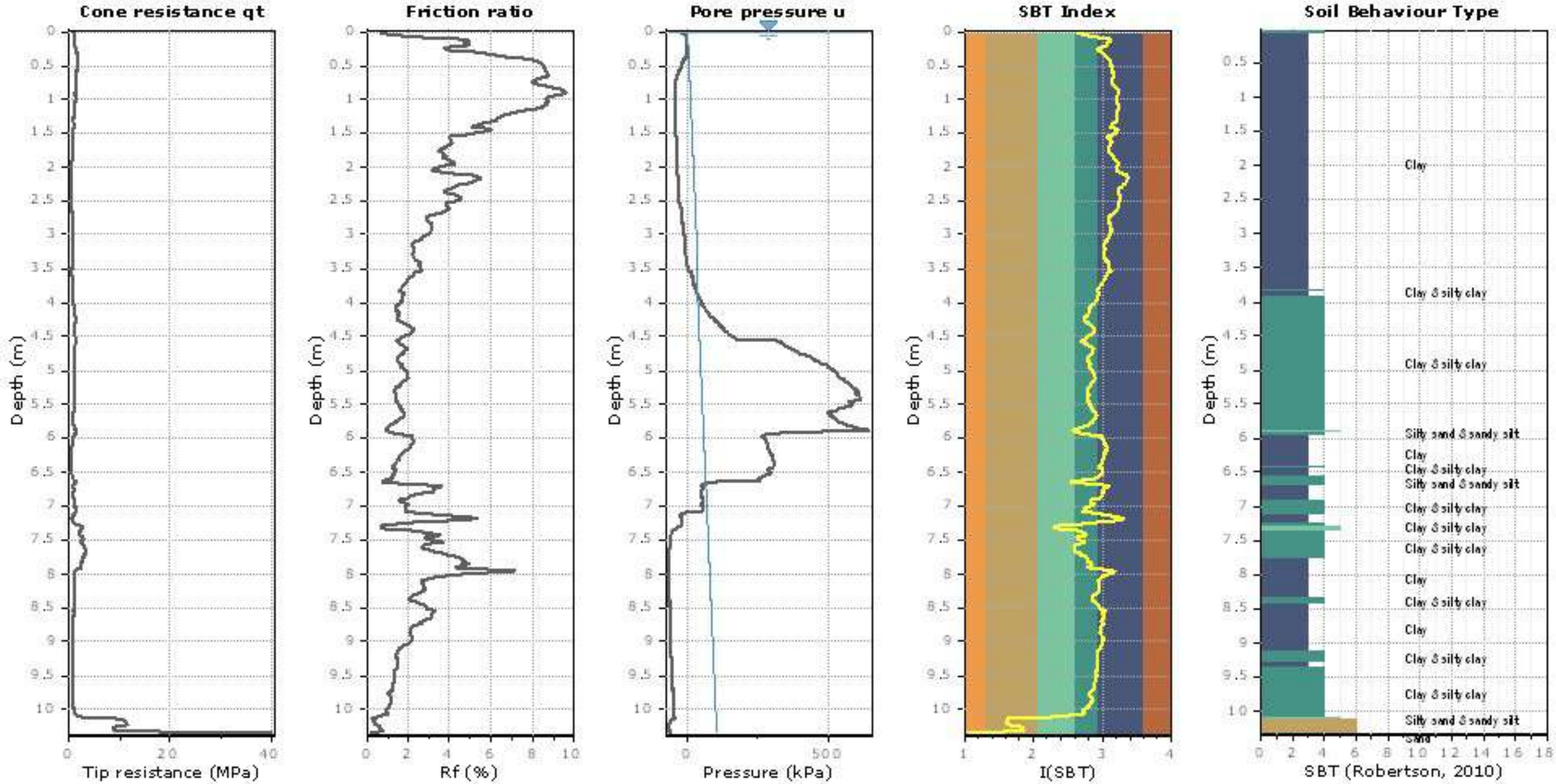
CPT: CPT06
Total depth: 10.34 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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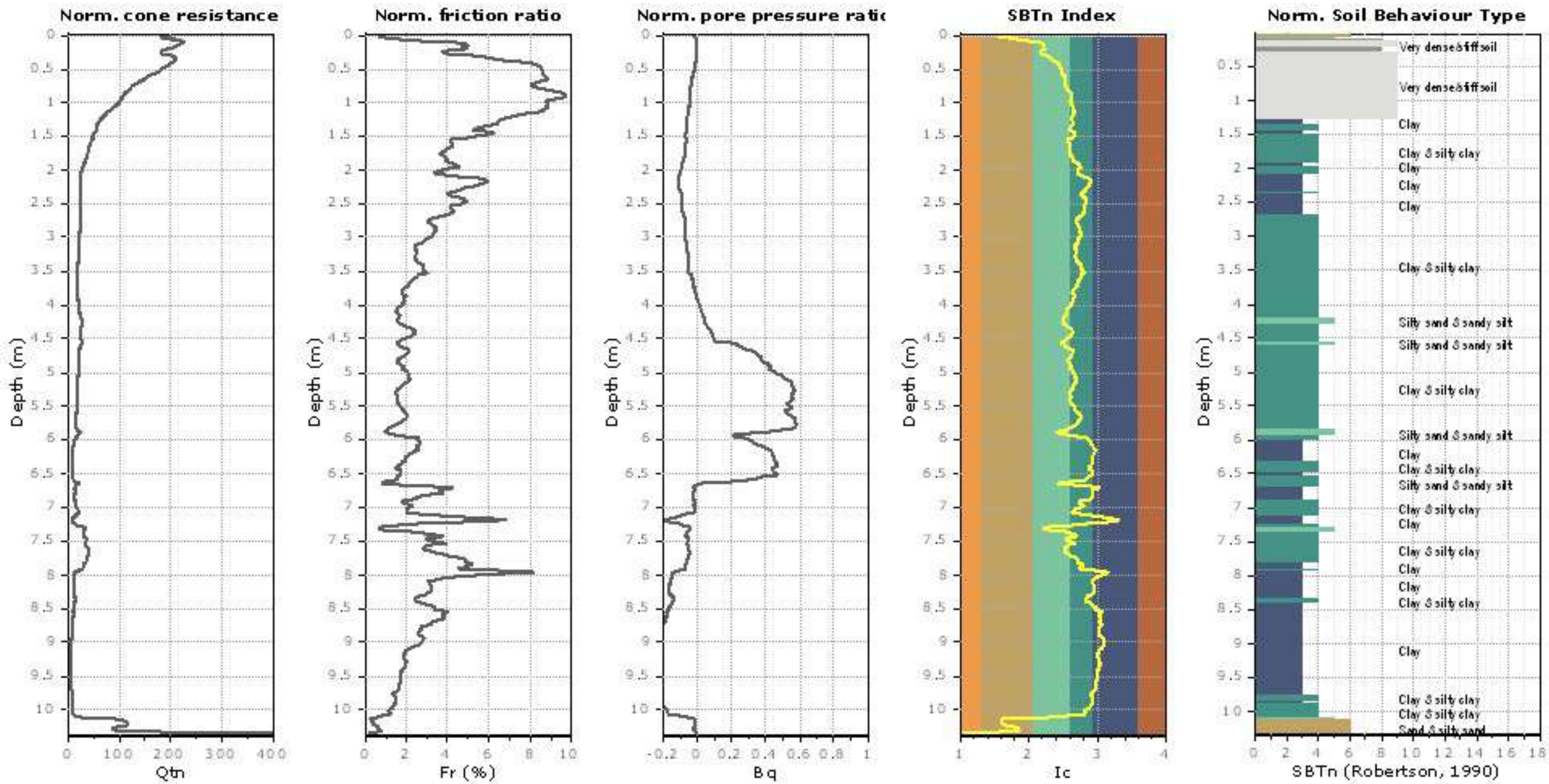
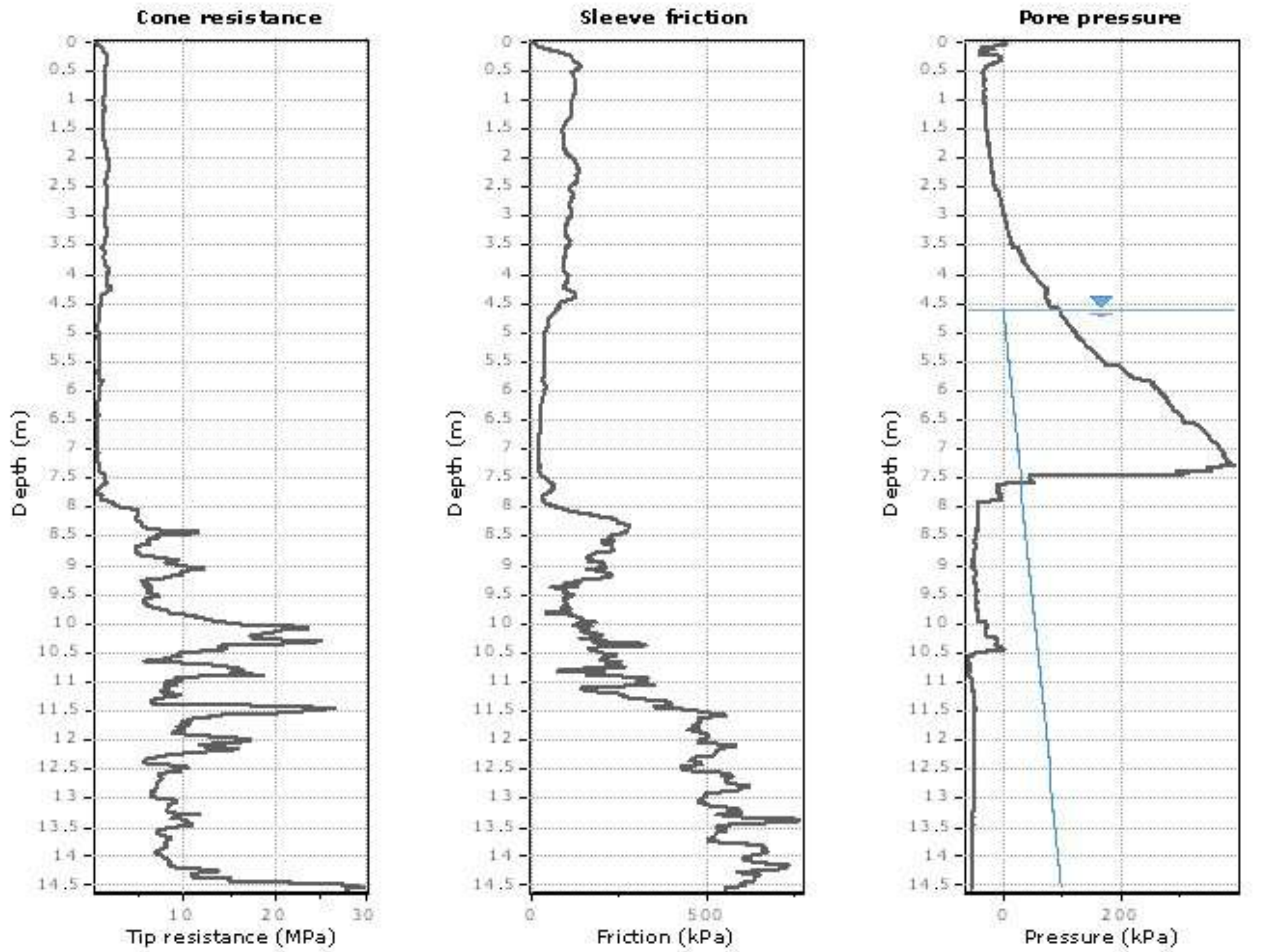
CPT: CPT06
Total depth: 10.34 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

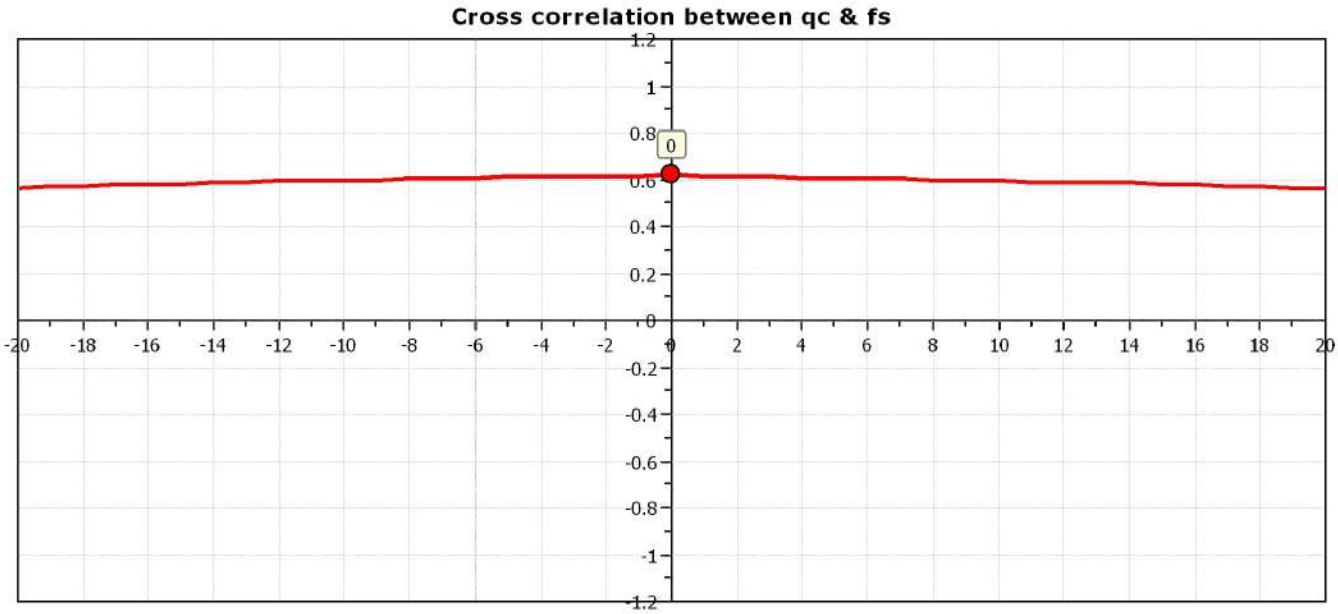


SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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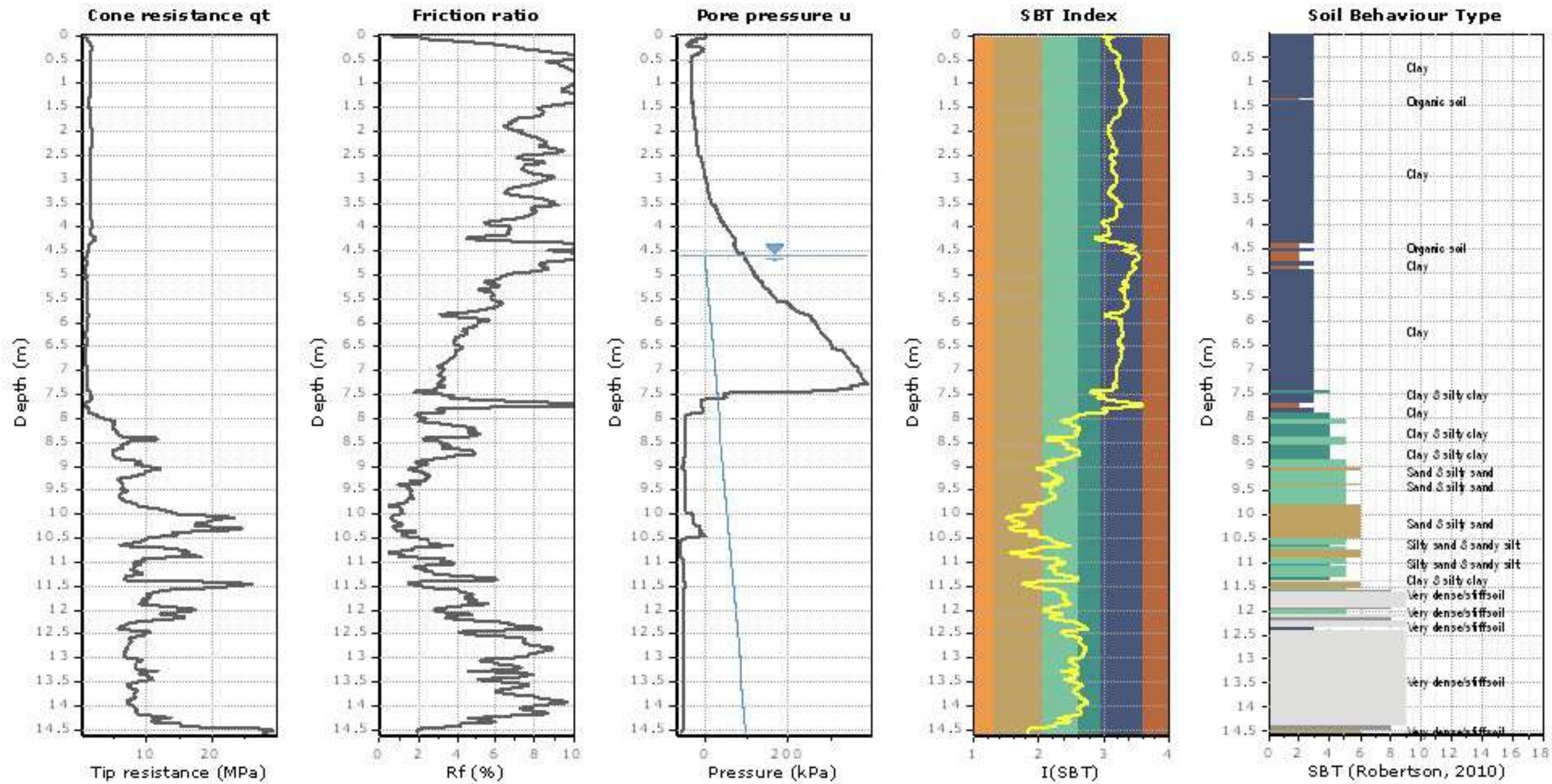
CPT: CPT07
Total depth: 14.57 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

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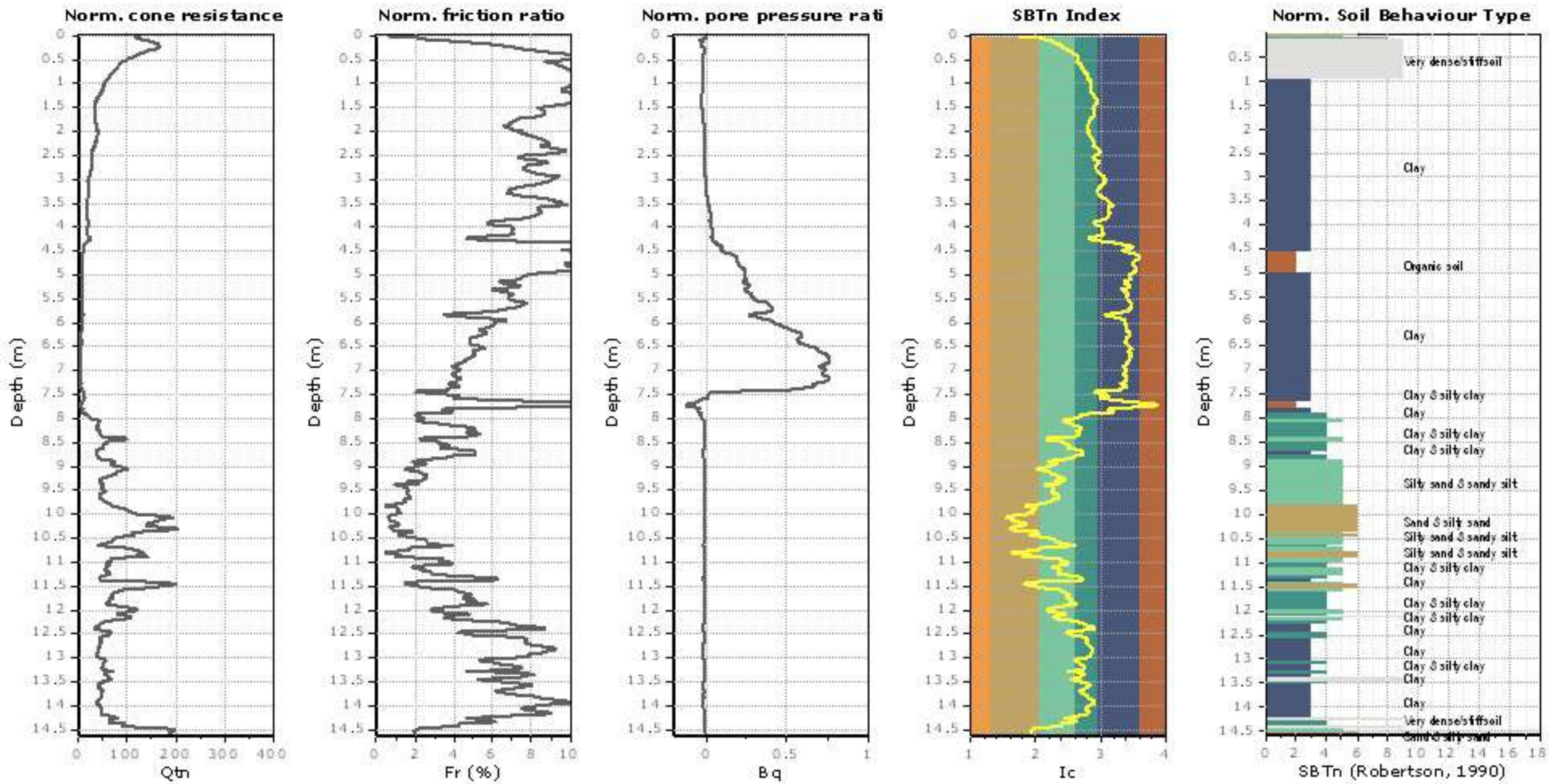
CPT: CPT07
Total depth: 14.57 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

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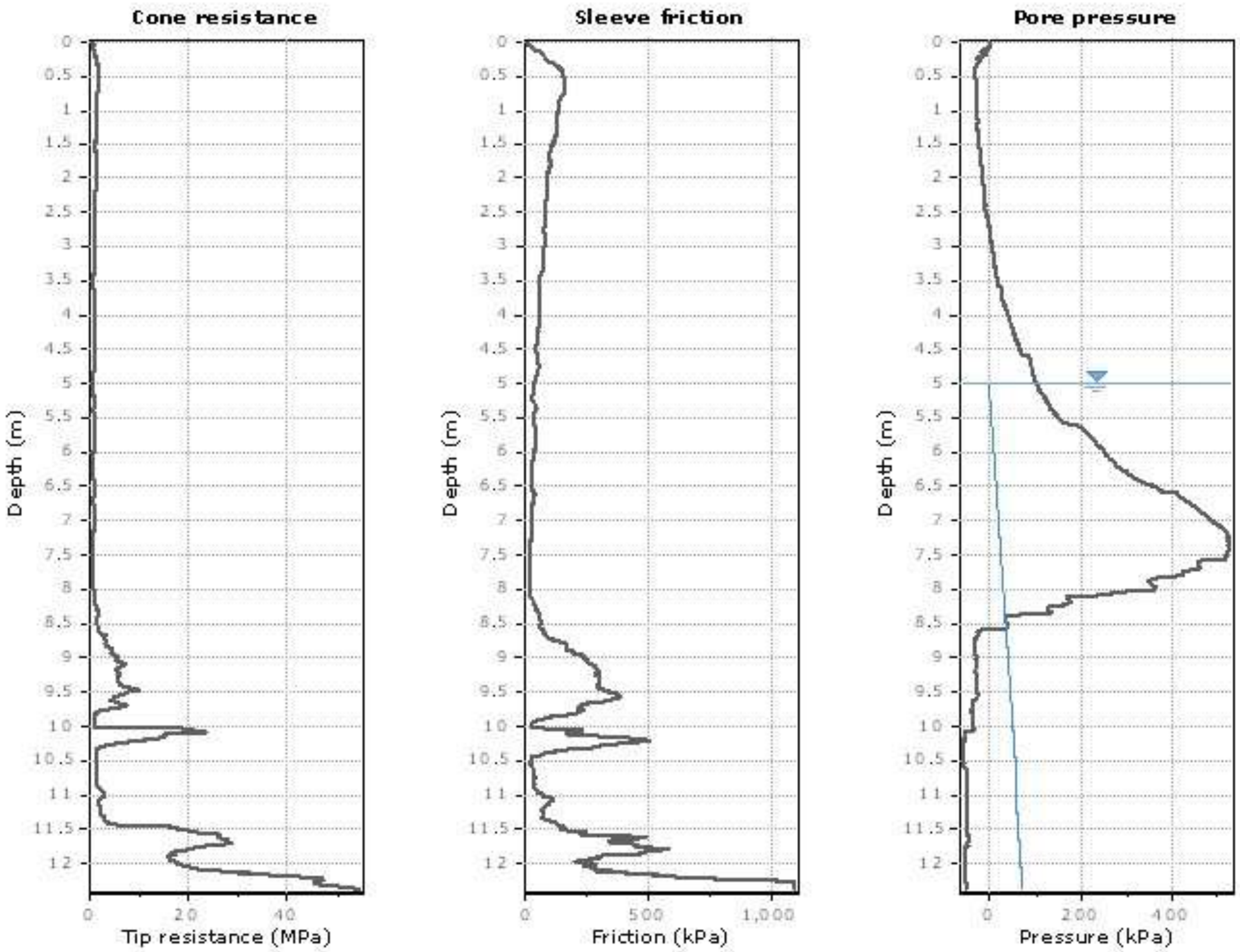
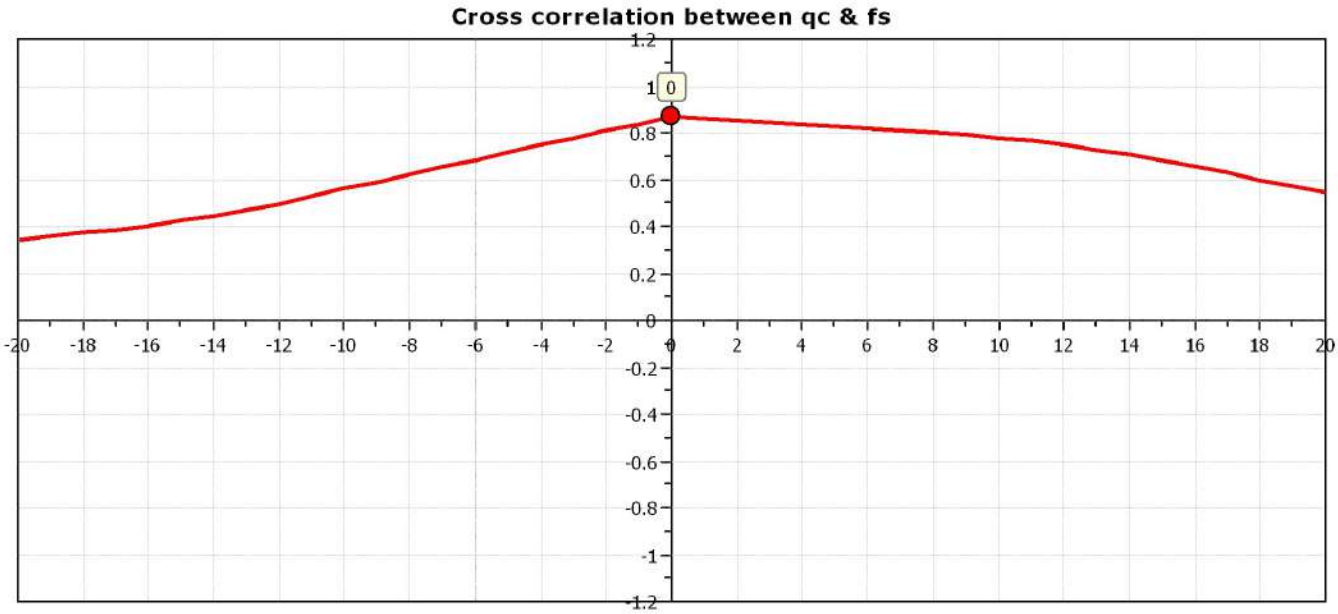
CPT: CPT08
Total depth: 12.38 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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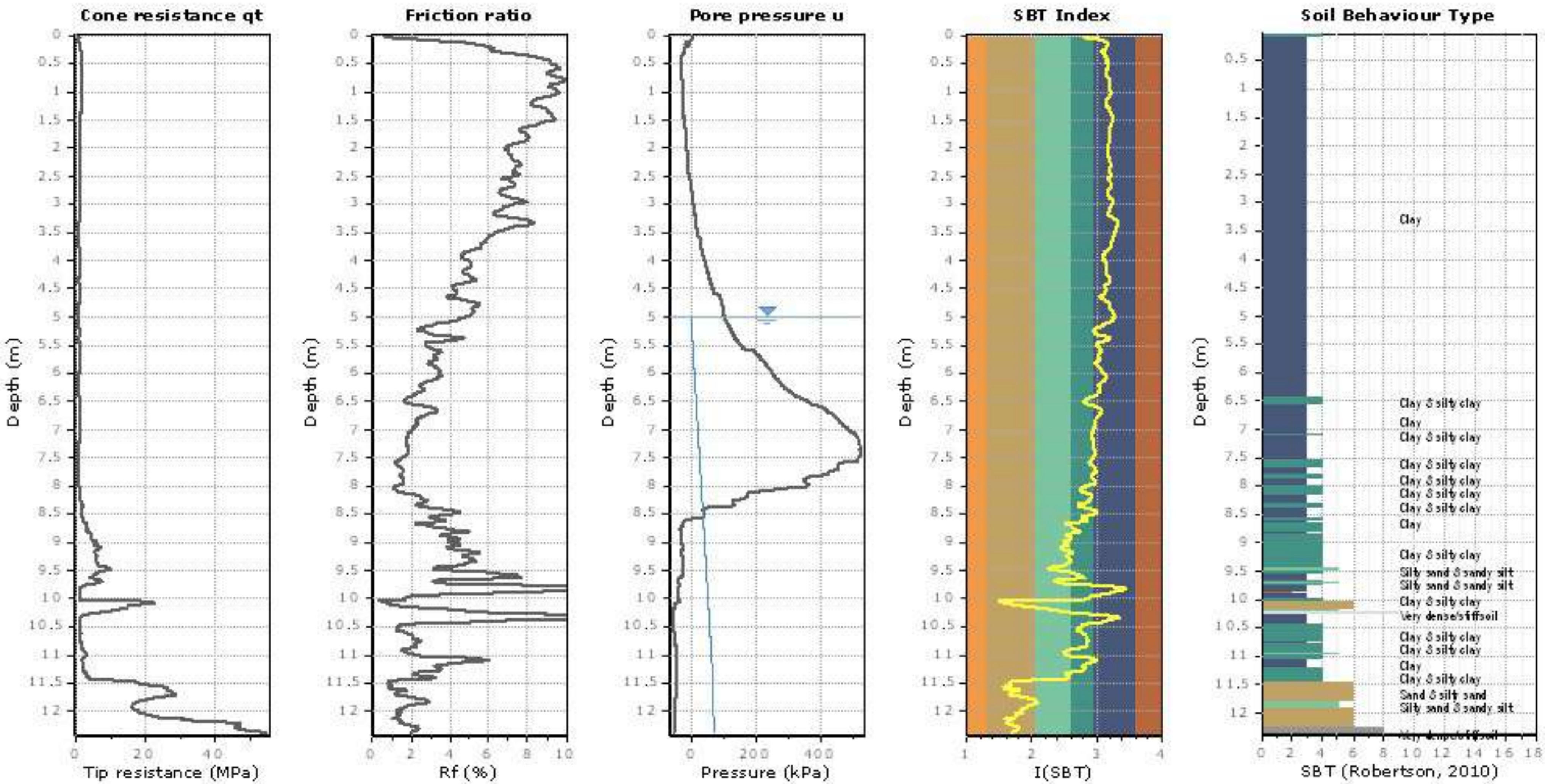
CPT: CPT08
Total depth: 12.38 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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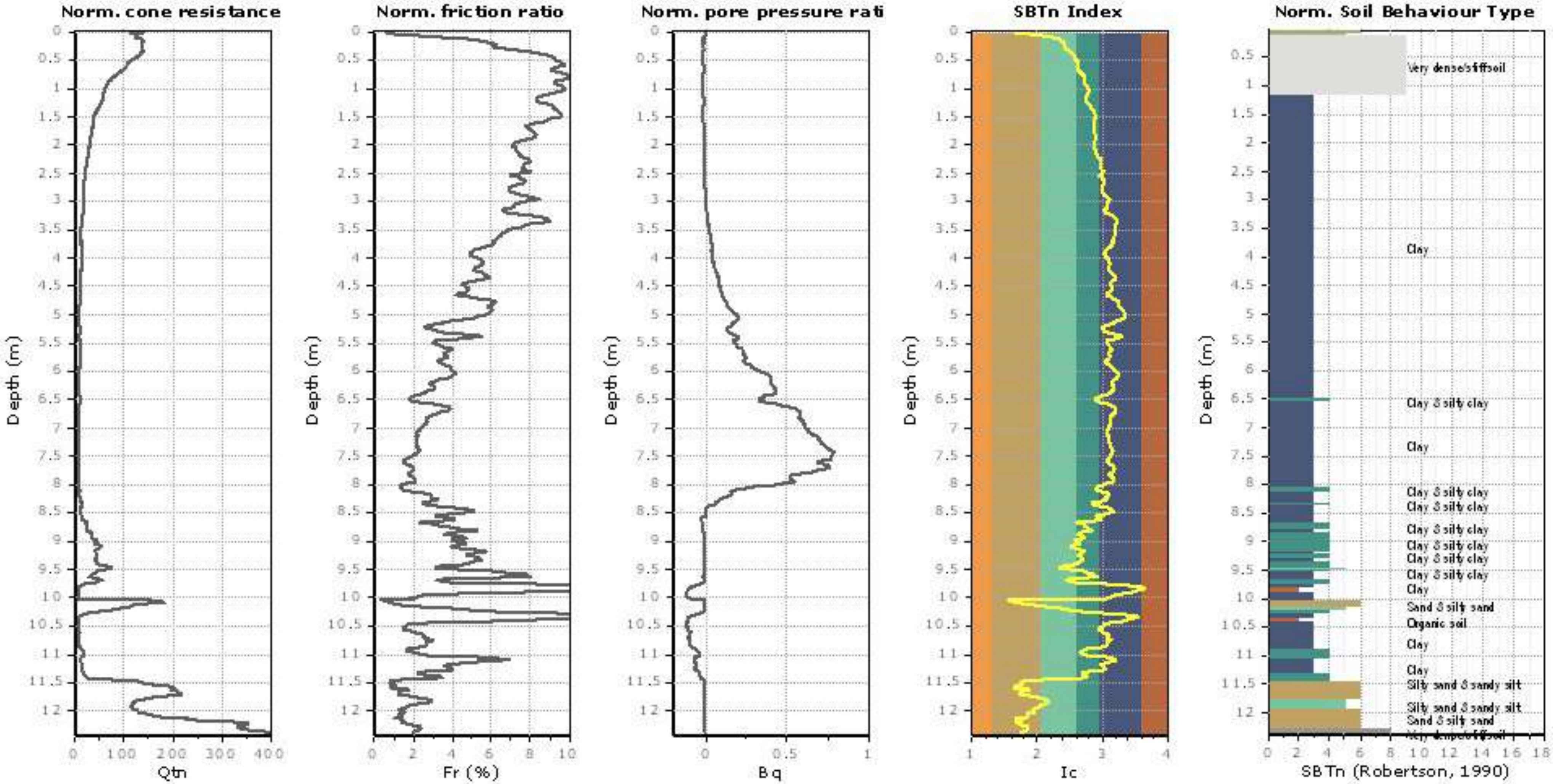
CPT: CPT08
Total depth: 12.38 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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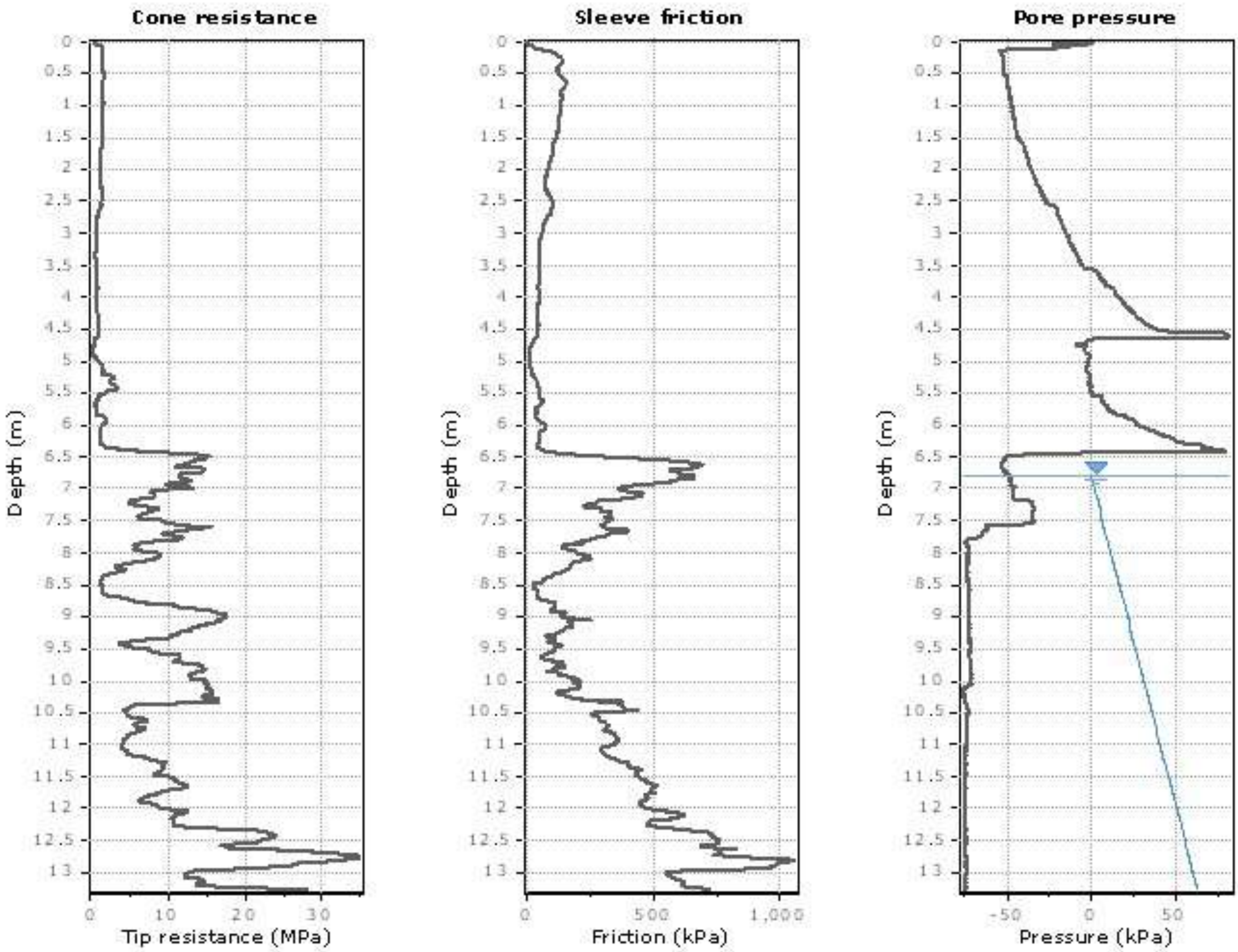
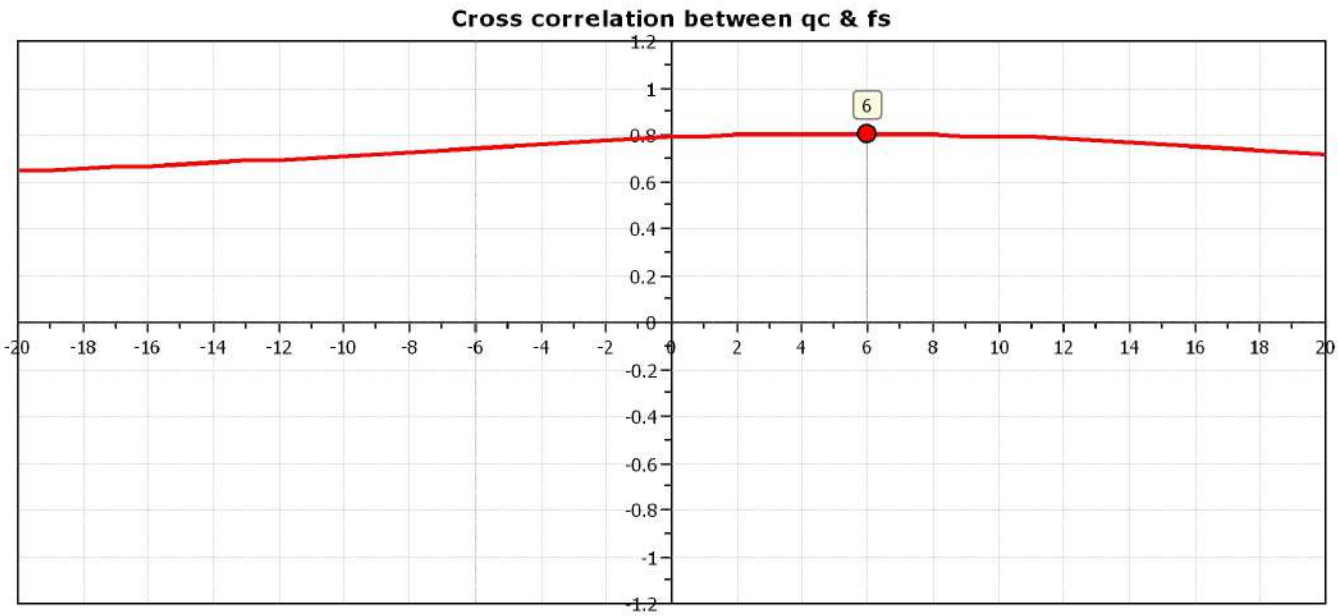
CPT: CPT09
Total depth: 13.26 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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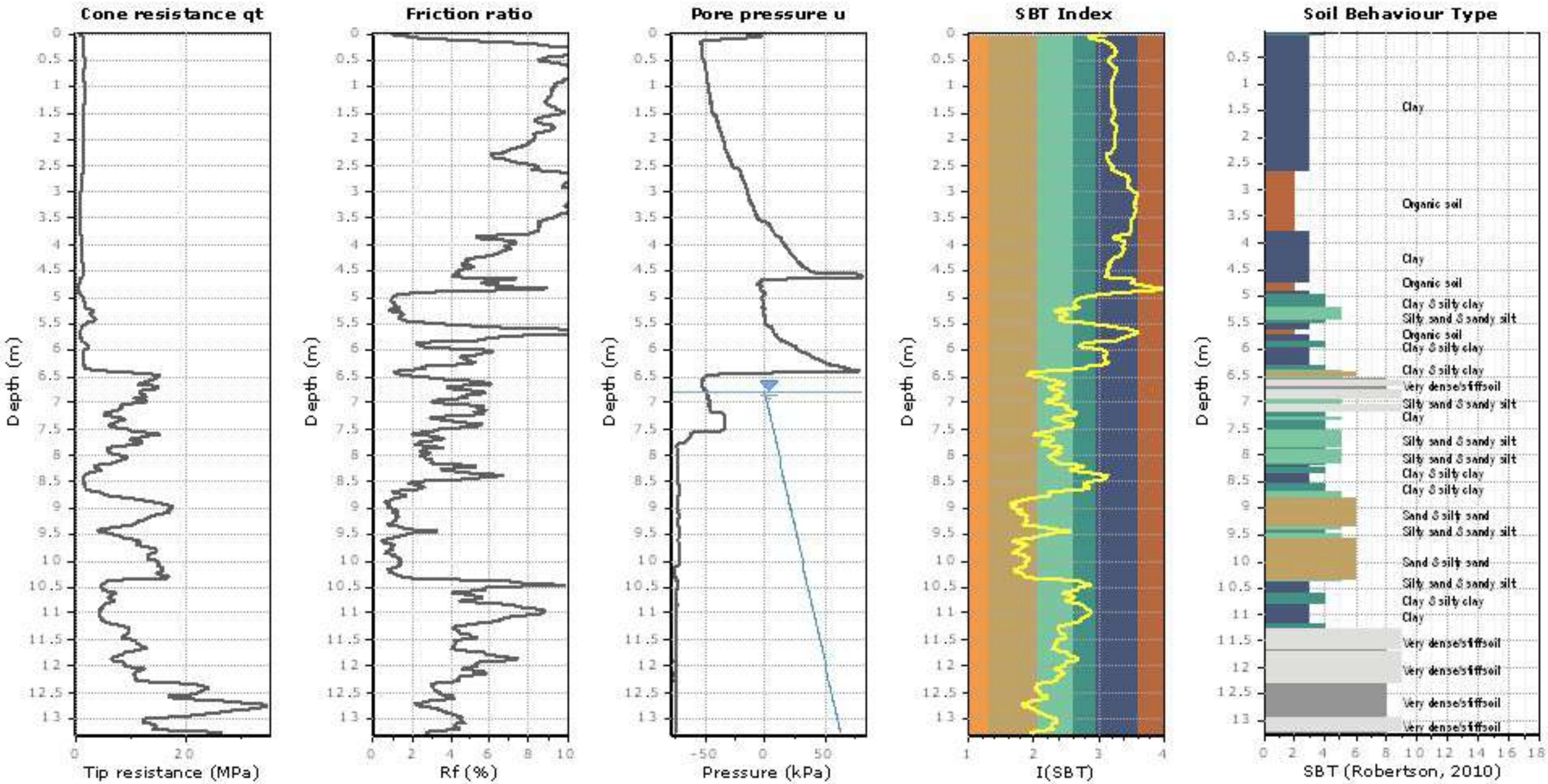
CPT: CPT09
Total depth: 13.26 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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craig@undergroundinvestigation.co.nz
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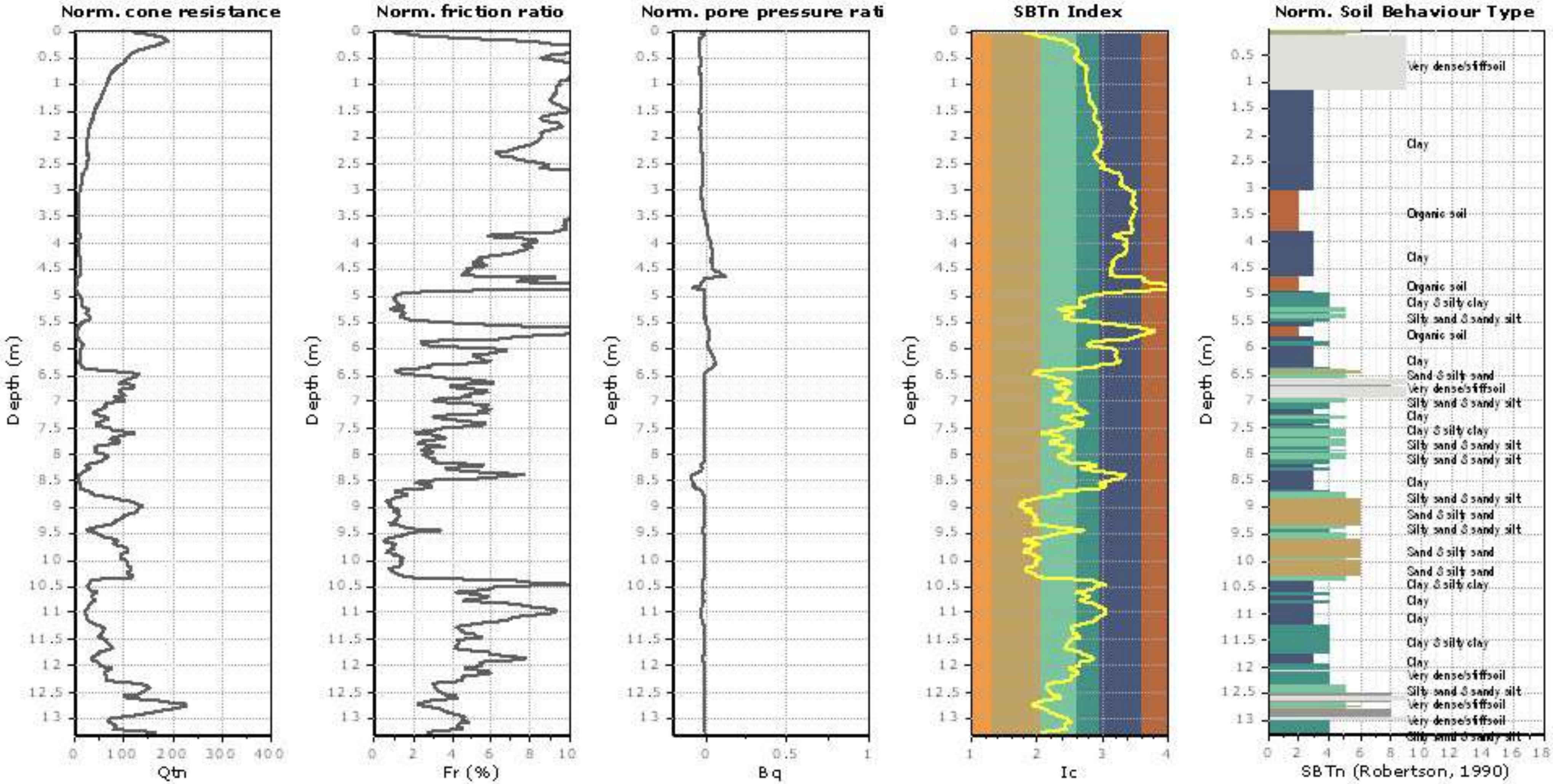
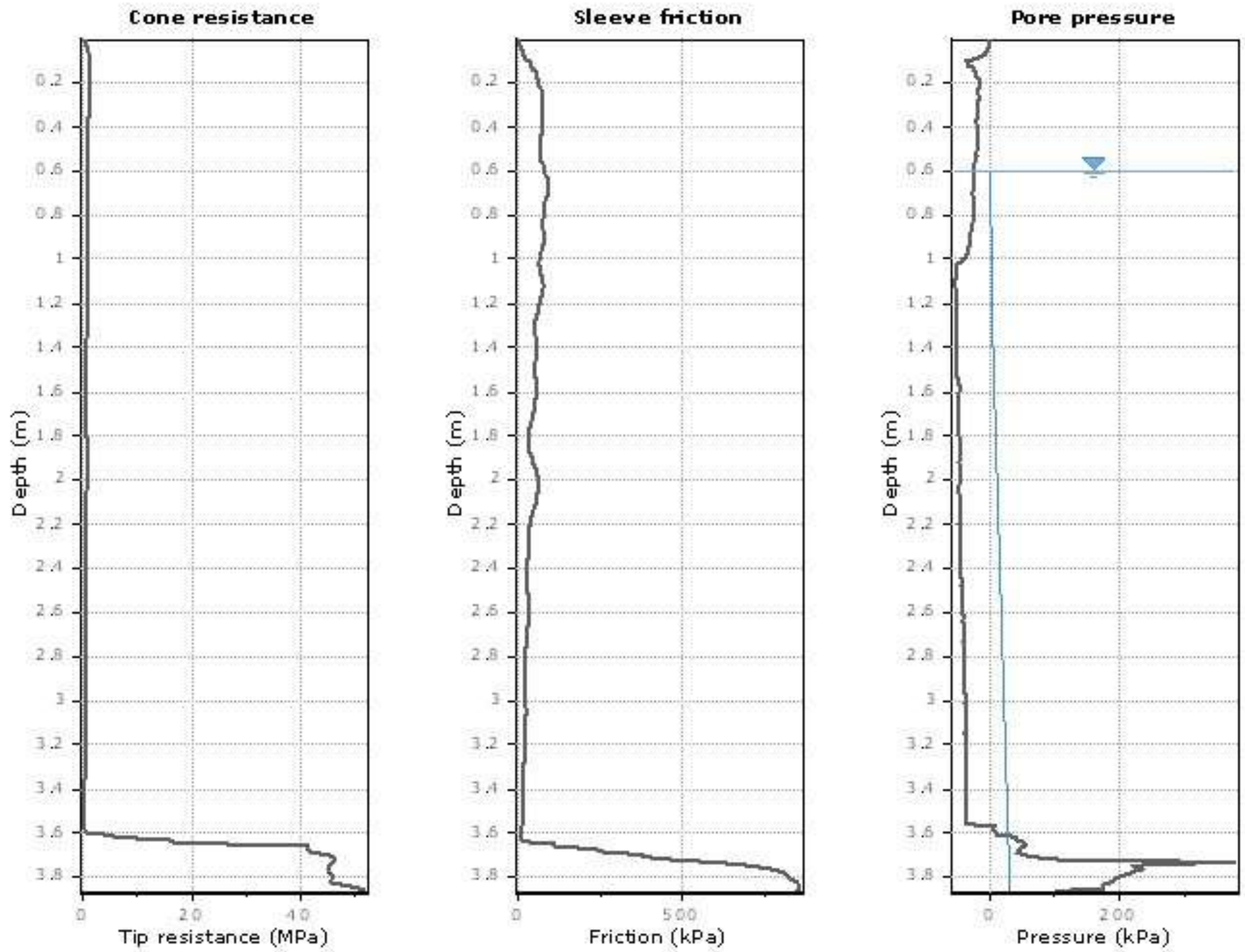
CPT: CPT09
Total depth: 13.26 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

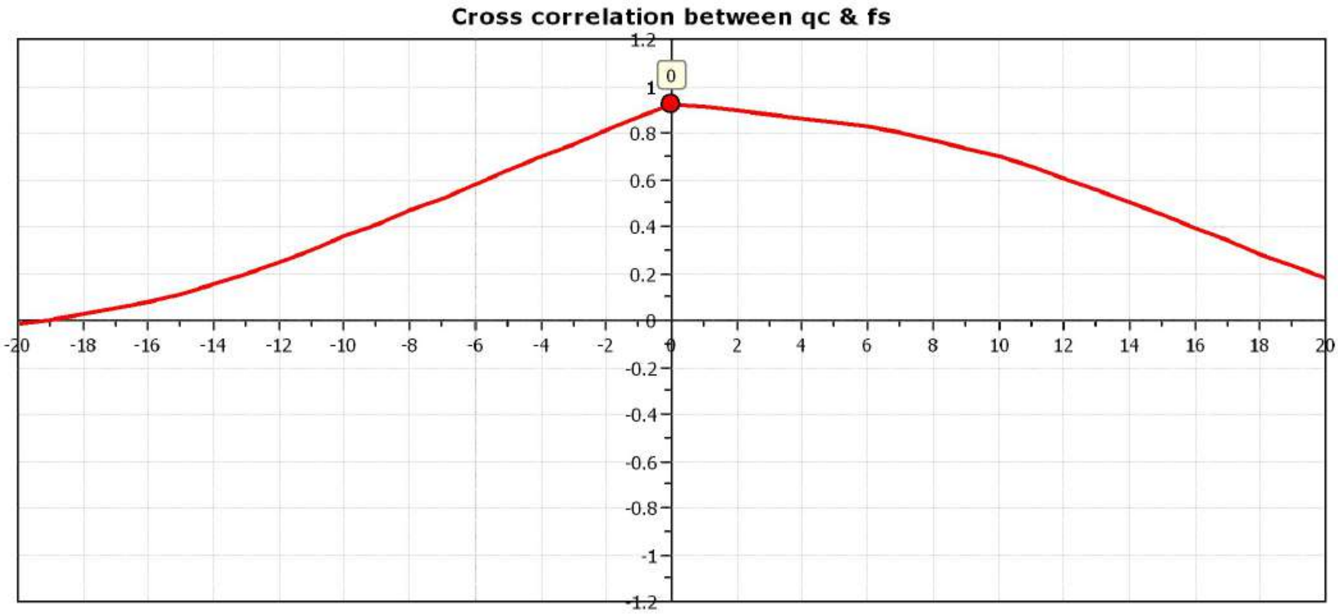


SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



Underground Investigation Ltd
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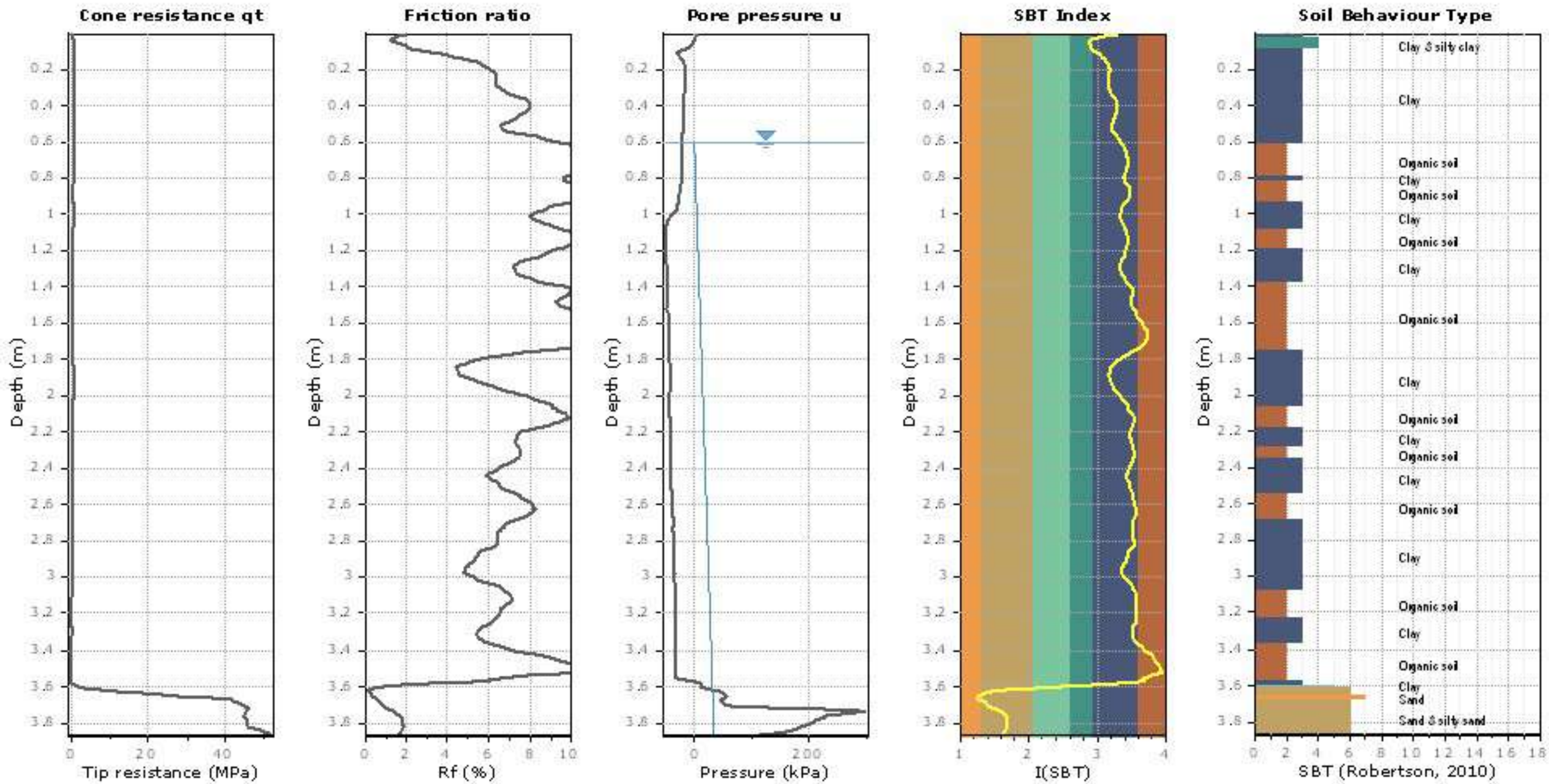
CPT: CPT10
Total depth: 3.87 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

Underground Investigation Ltd
Cone Penetration Testing
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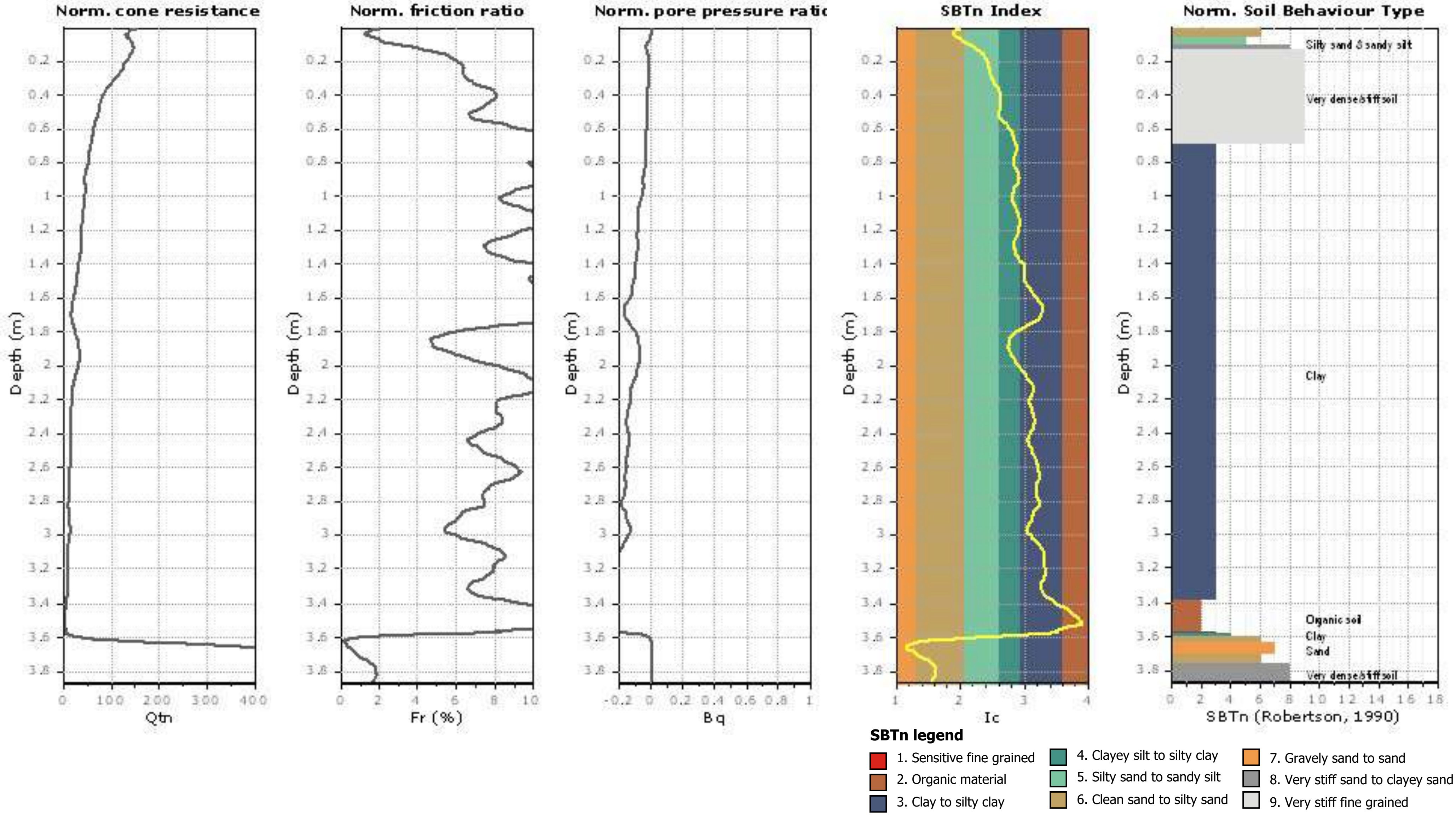
+64211473249

CPT: CPT10
Total depth: 3.87 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



Underground Investigation Ltd
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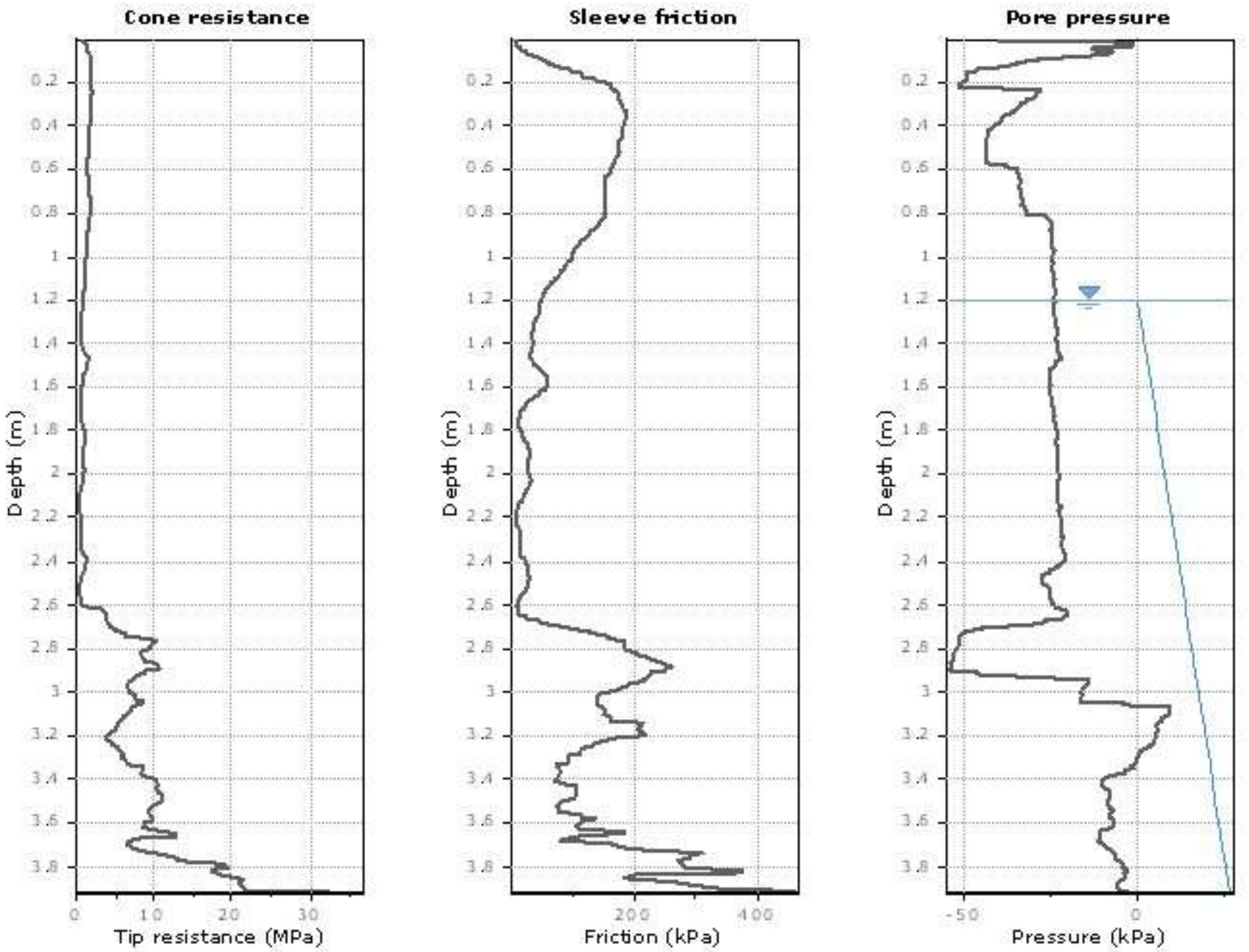
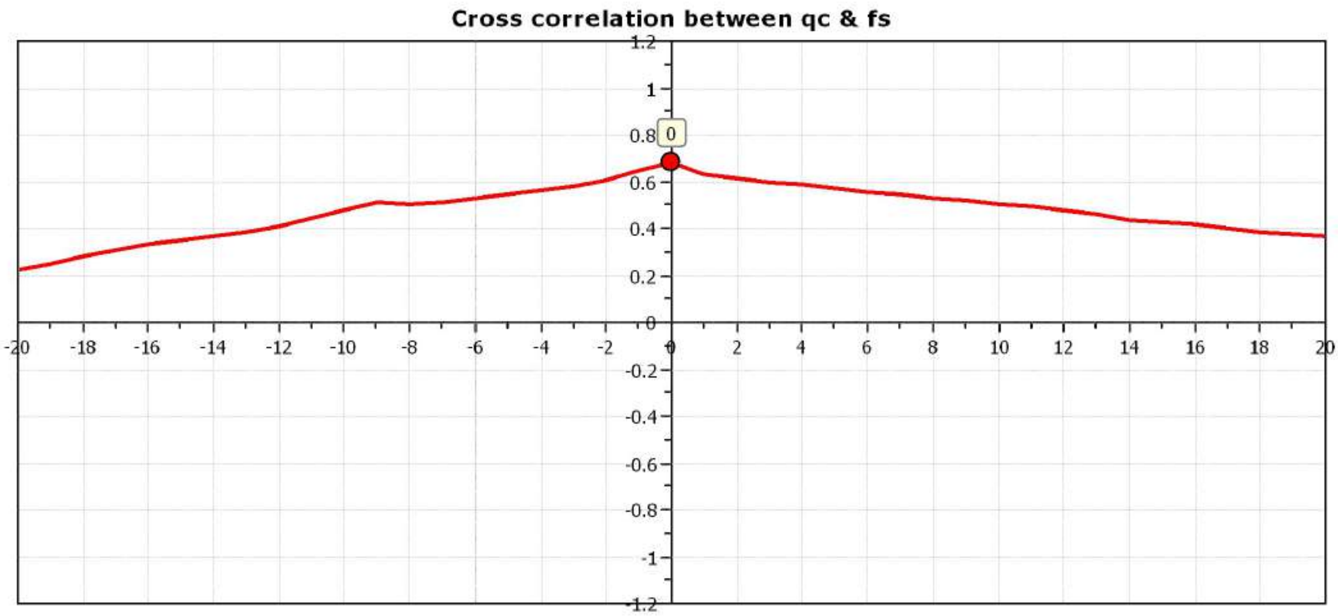
CPT: CPT11
Total depth: 3.92 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



Underground Investigation Ltd
Cone Penetration Testing
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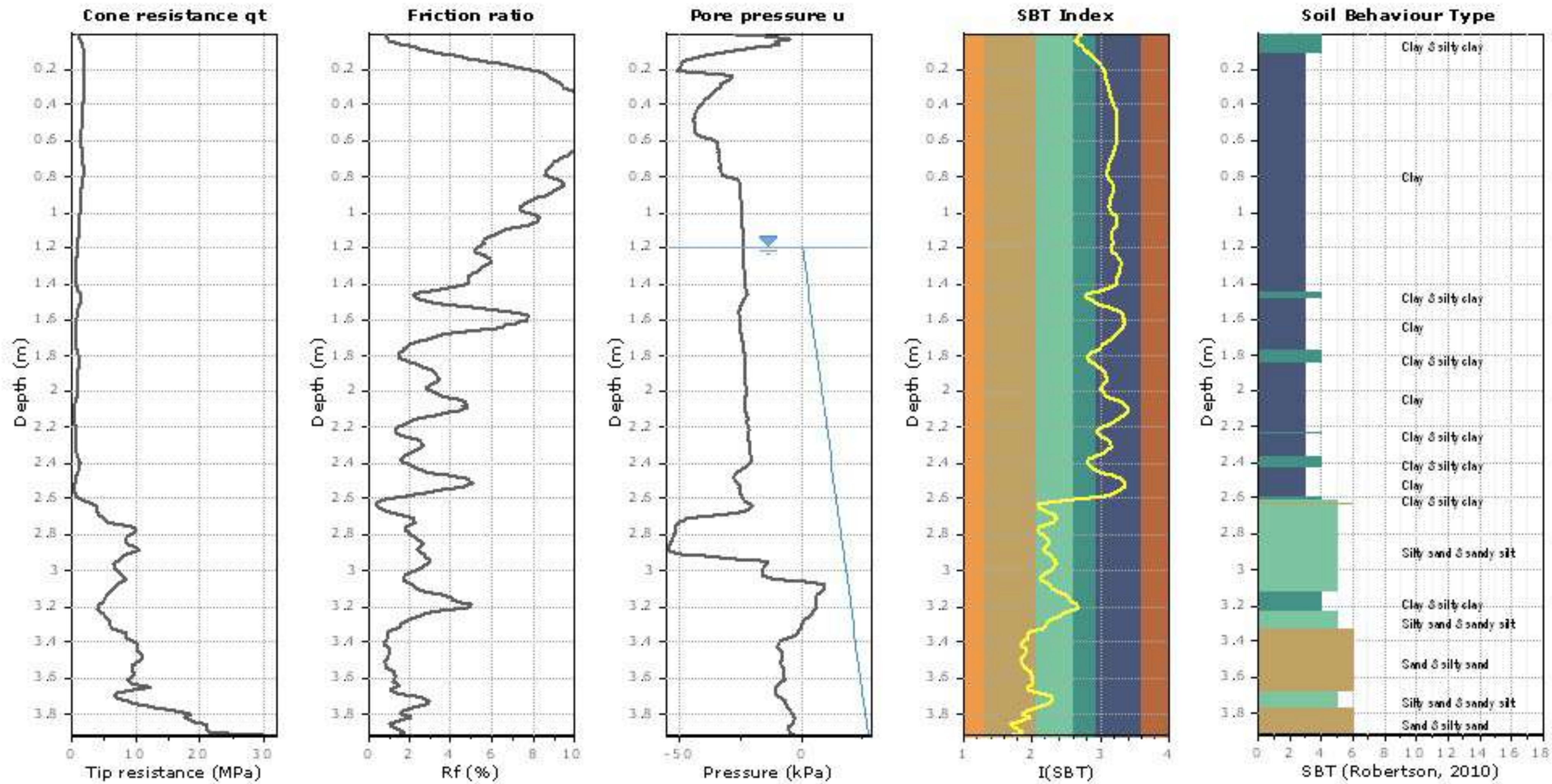
+64211473249

CPT: CPT11
Total depth: 3.92 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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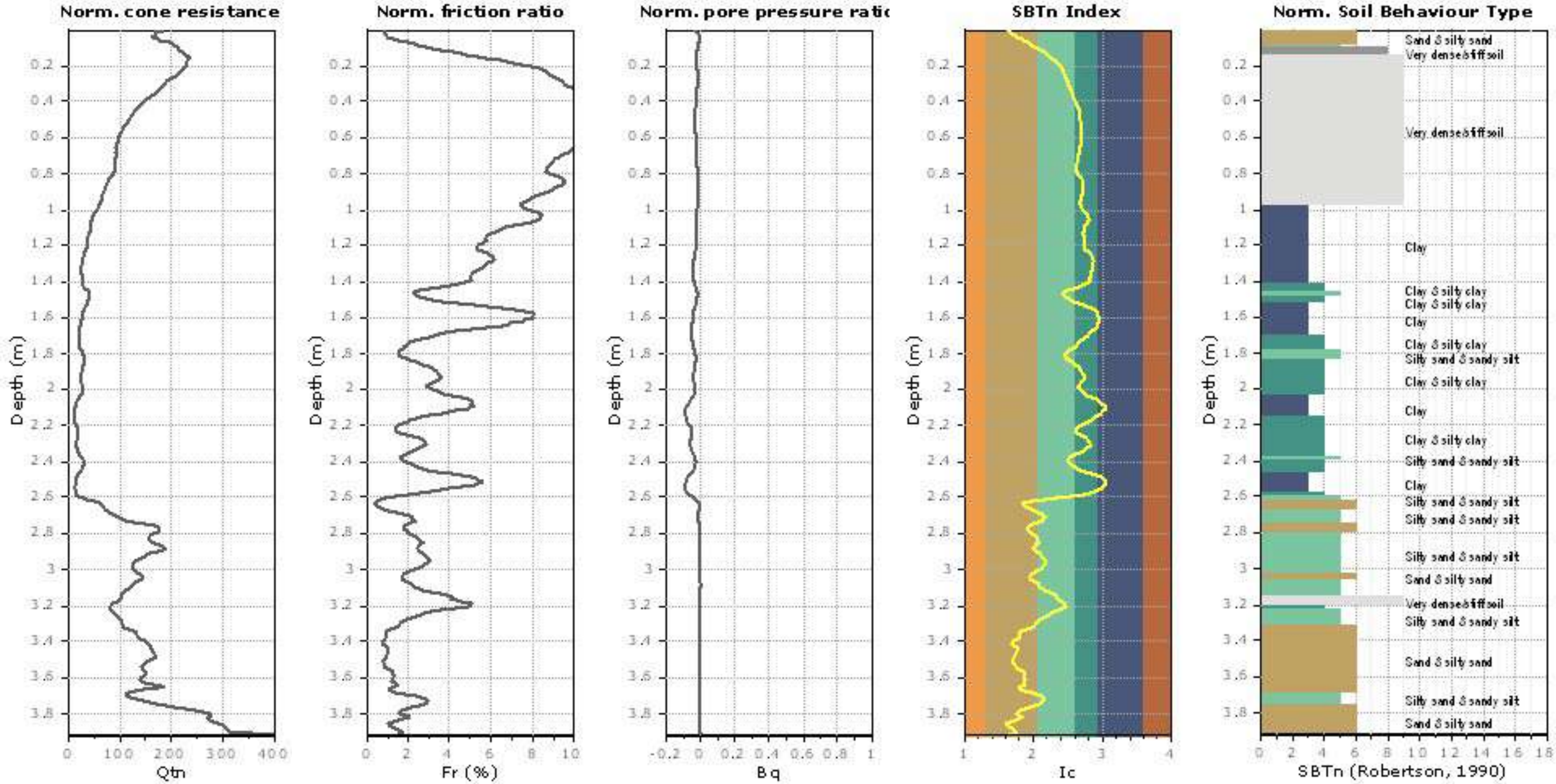
CPT: CPT11
Total depth: 3.92 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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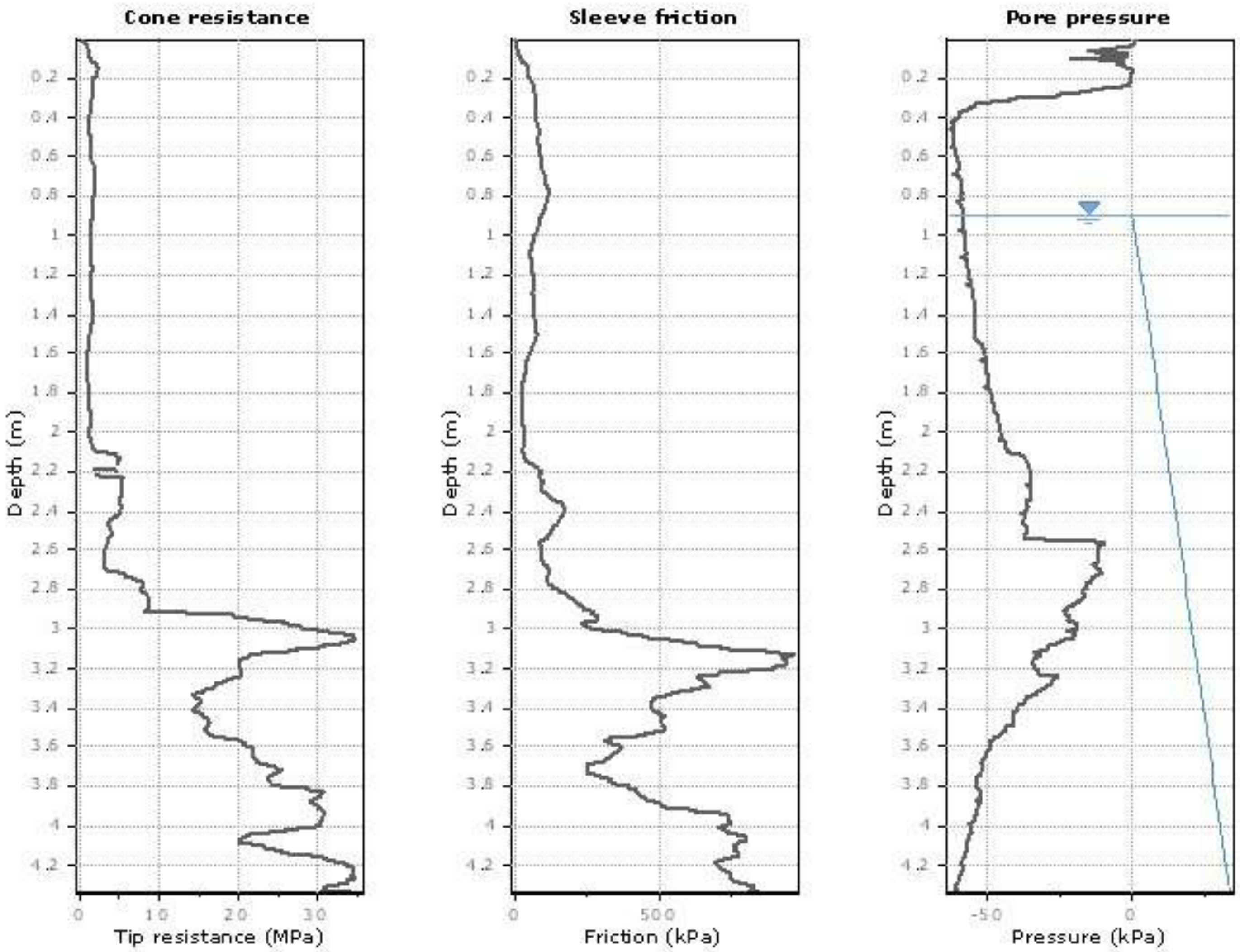
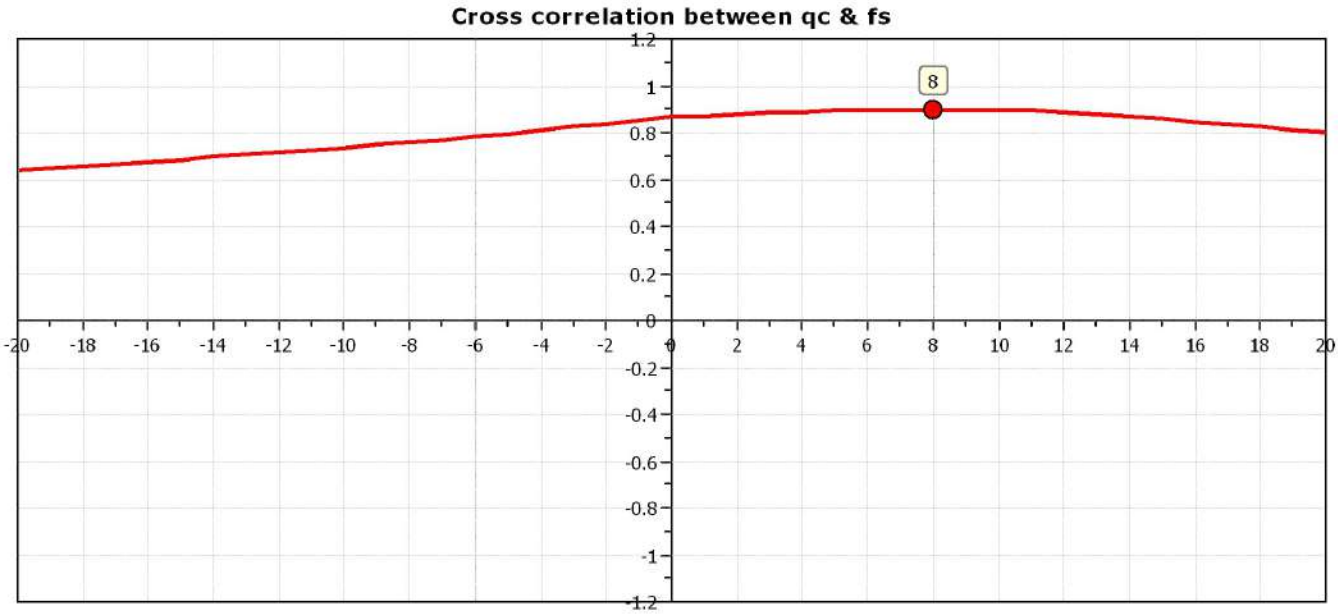
CPT: CPT12
Total depth: 4.34 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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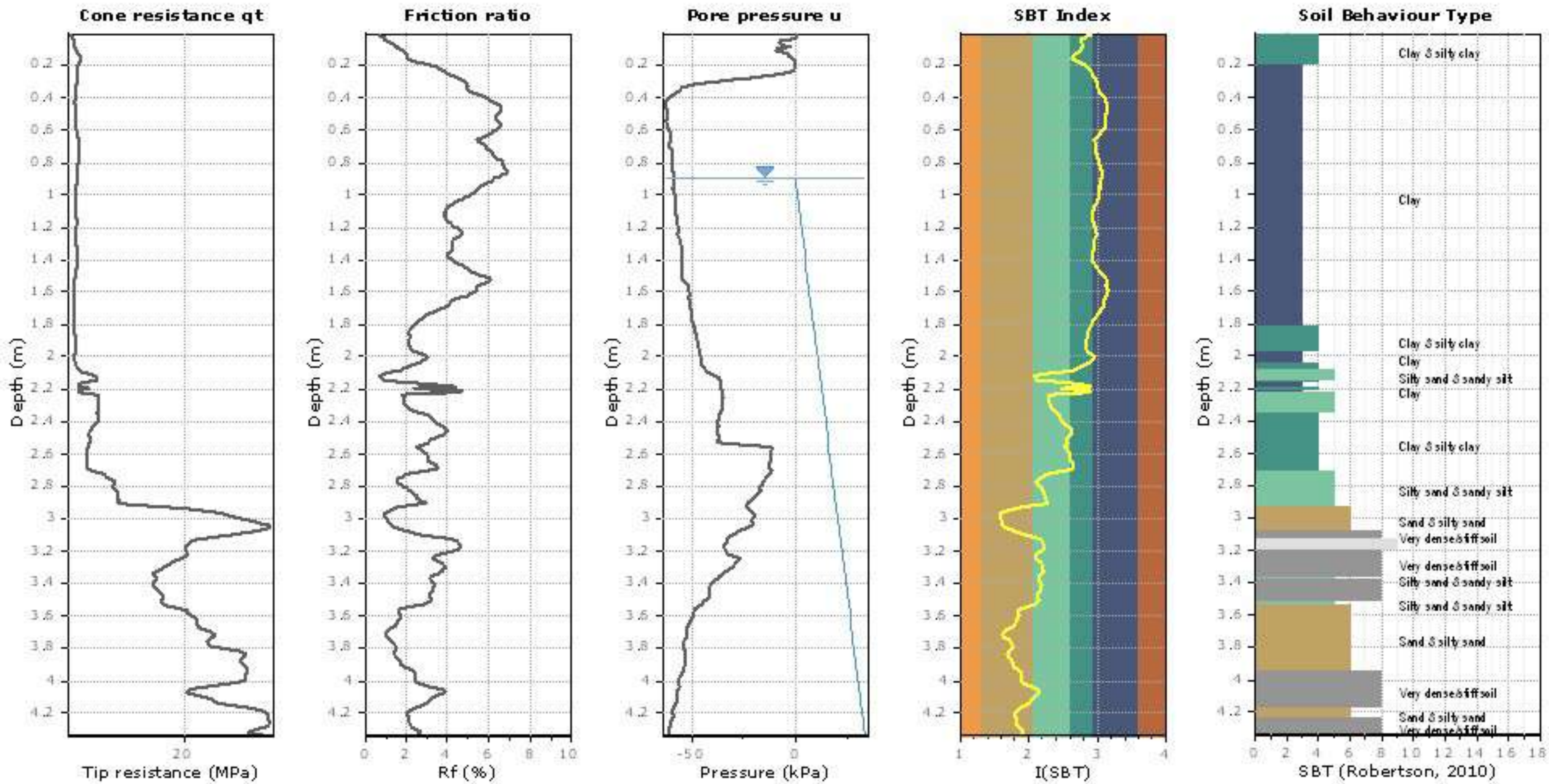
CPT: CPT12
Total depth: 4.34 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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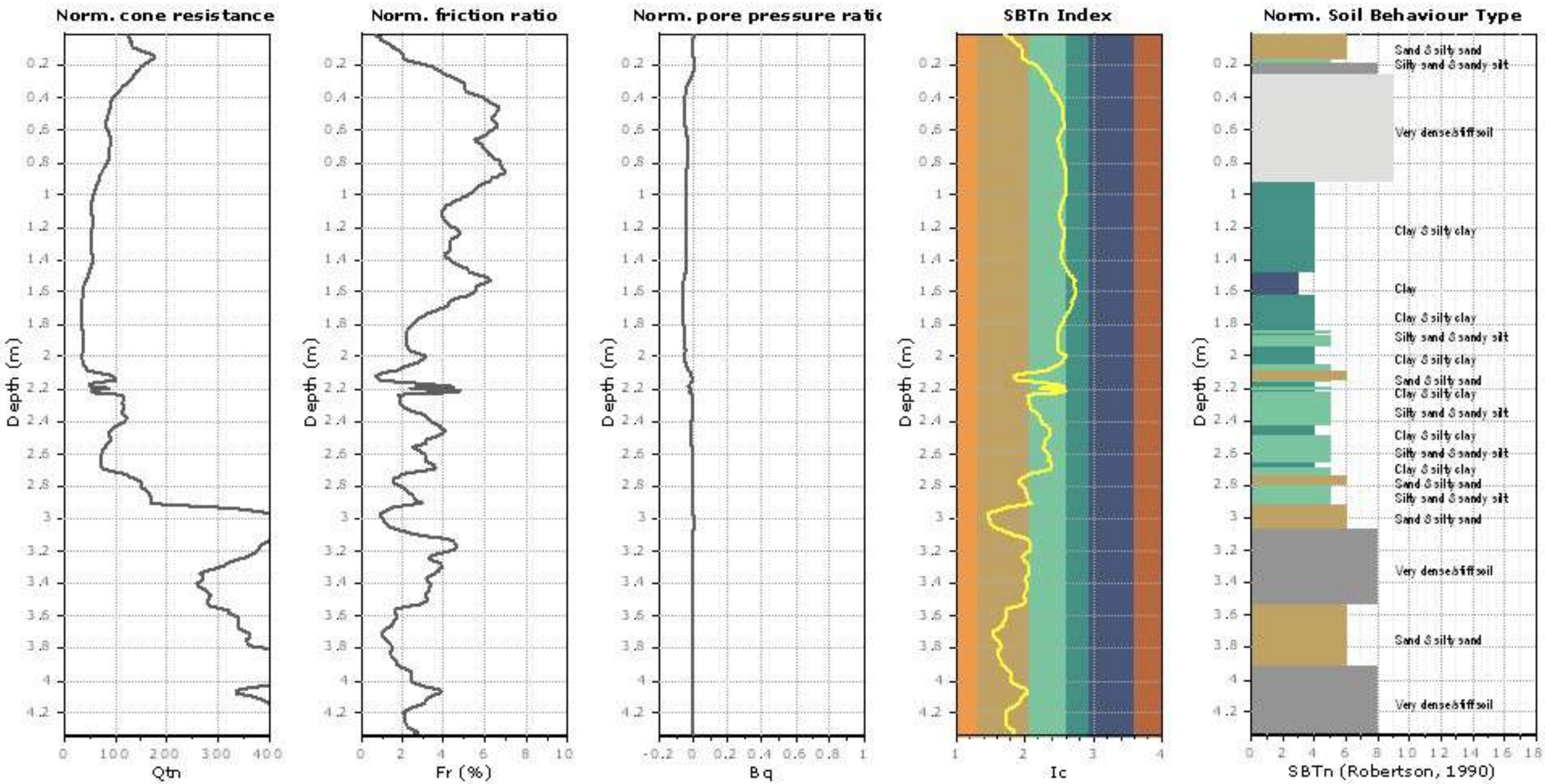
CPT: CPT12
Total depth: 4.34 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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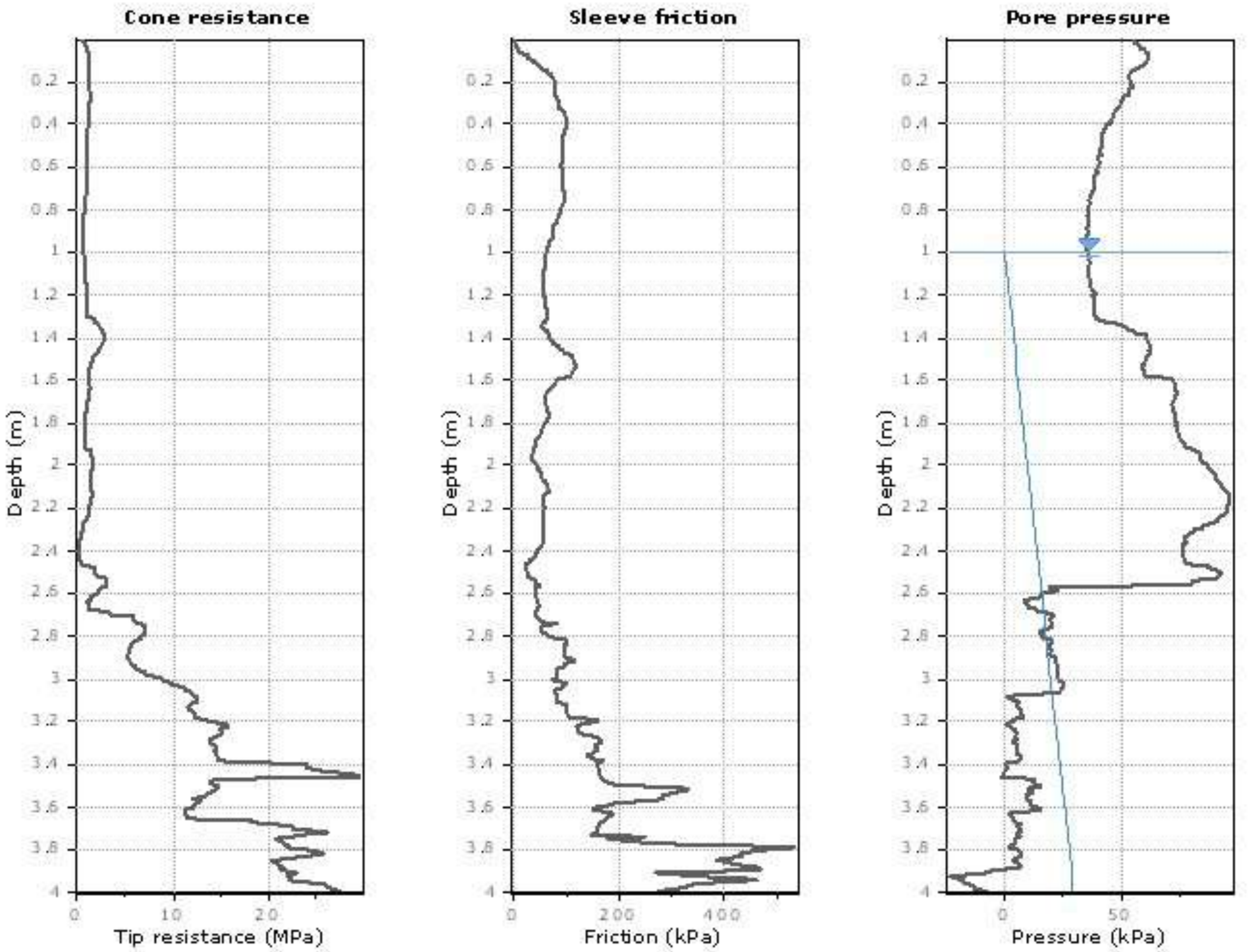
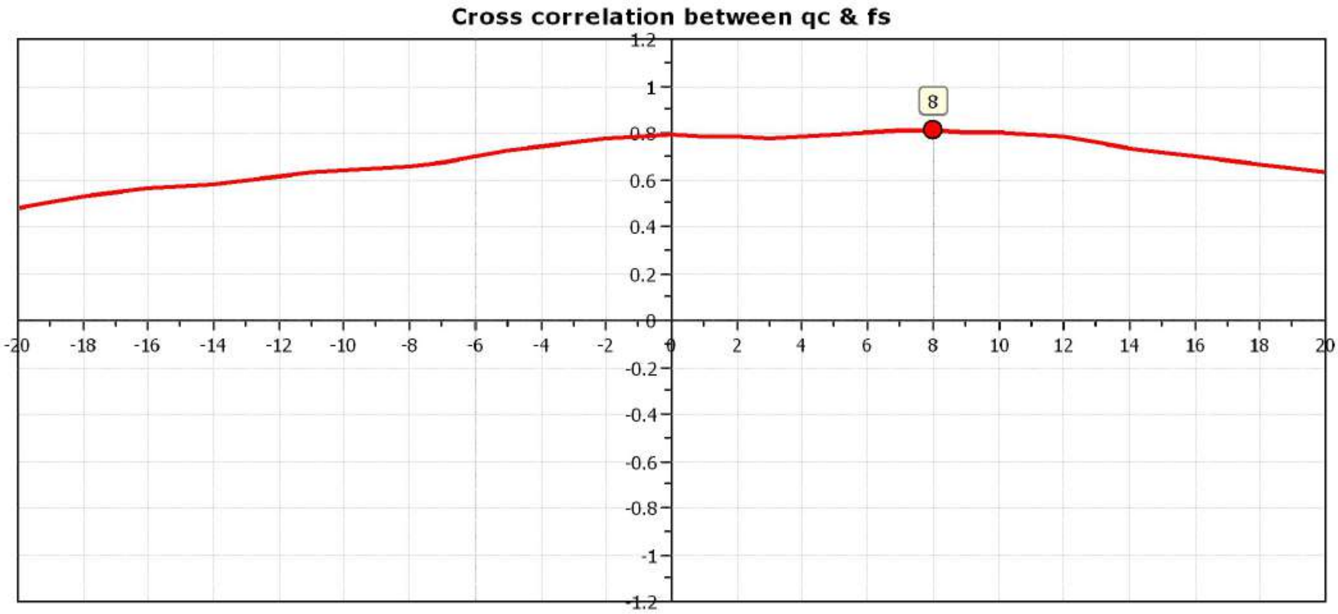
CPT: CPT13
Total depth: 4.00 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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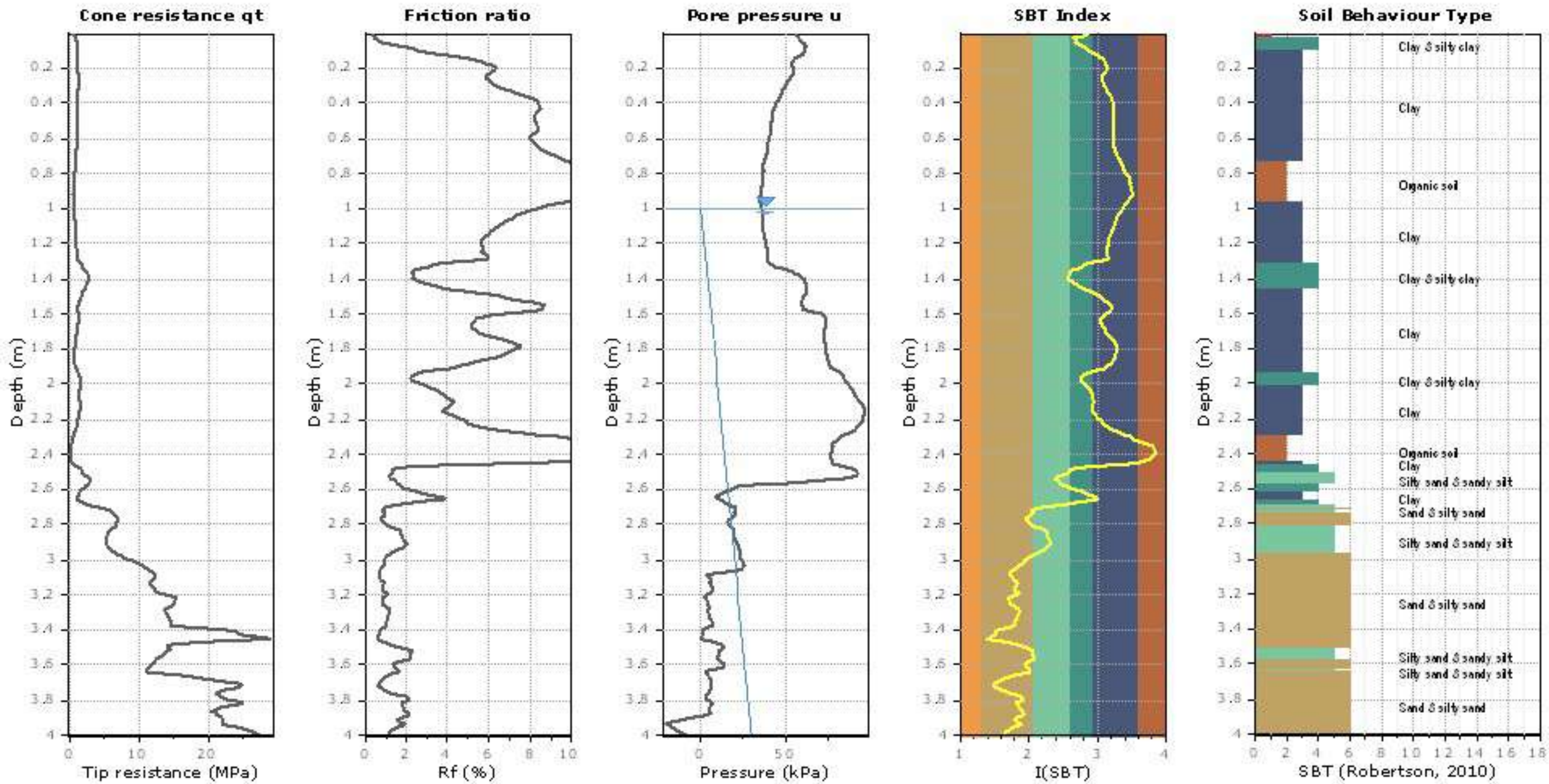
CPT: CPT13
Total depth: 4.00 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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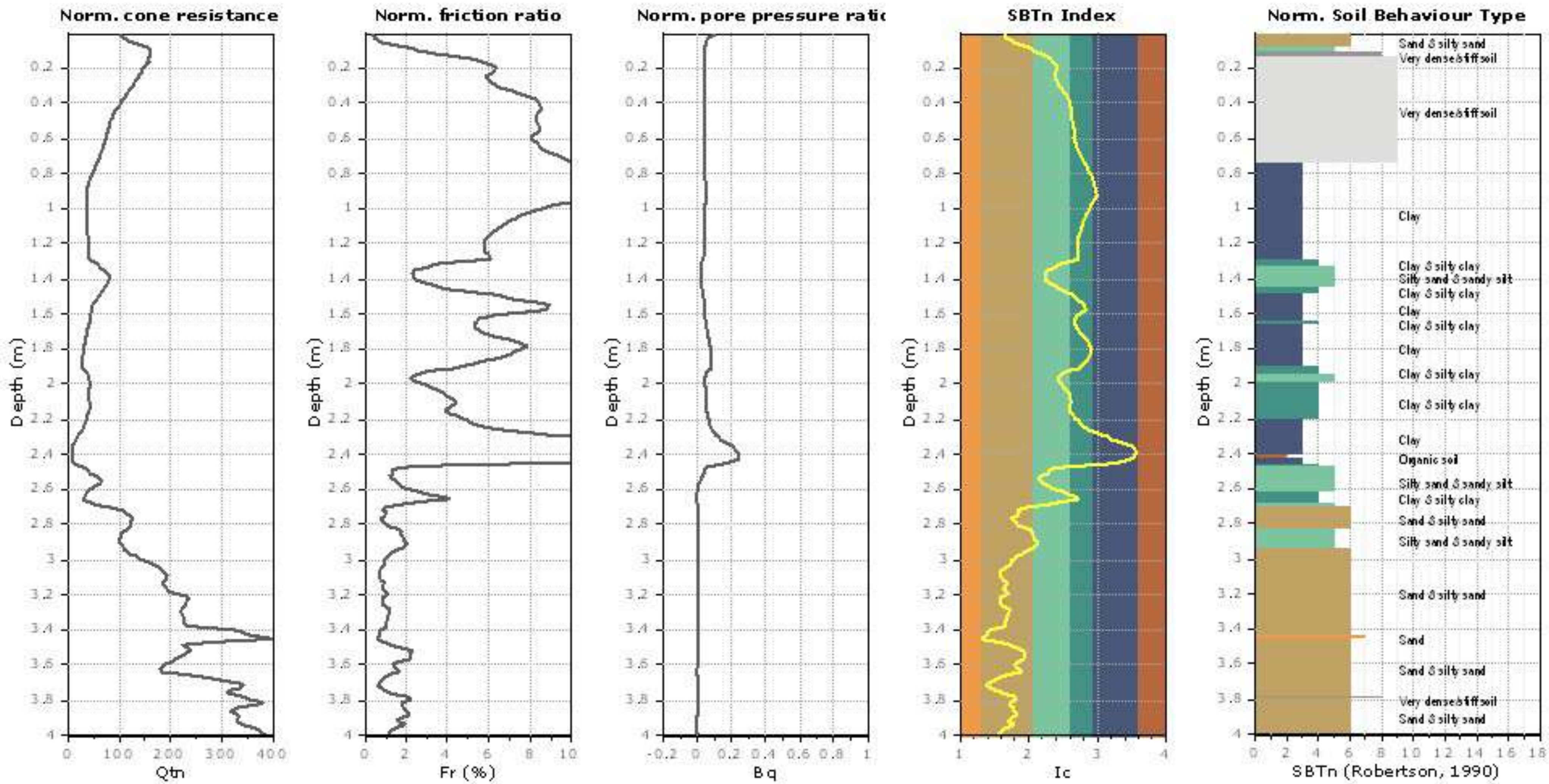
CPT: CPT13
Total depth: 4.00 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

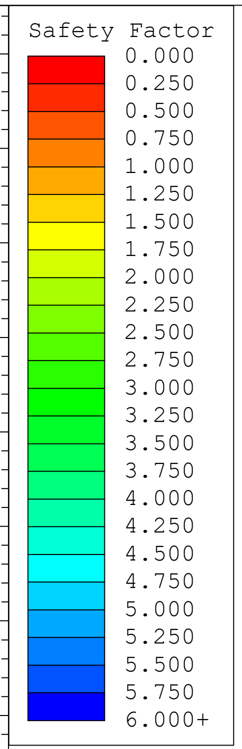
Project:
Location:



SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

Appendix D. Slope Stability Outputs

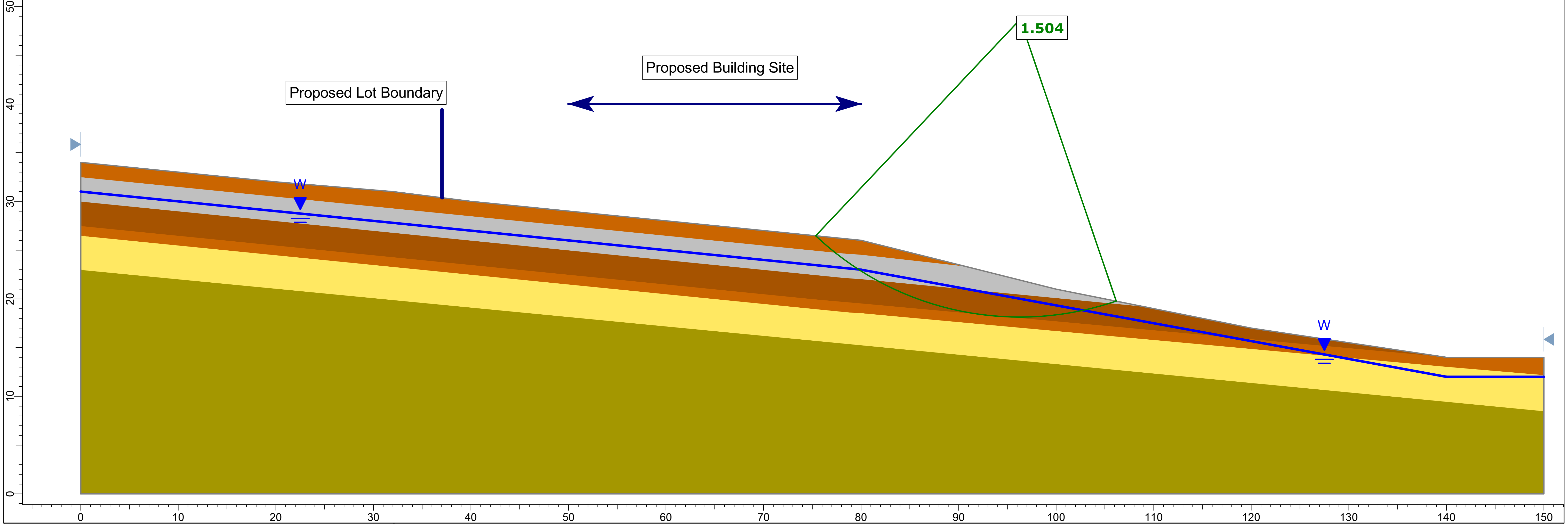


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400



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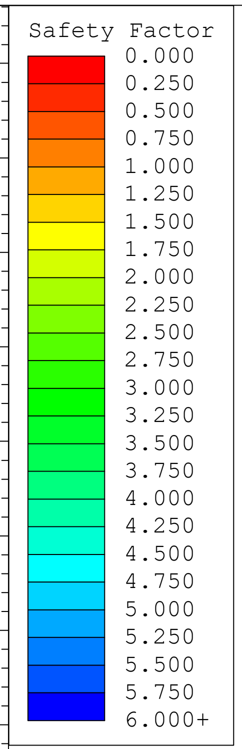
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section A - Existing Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

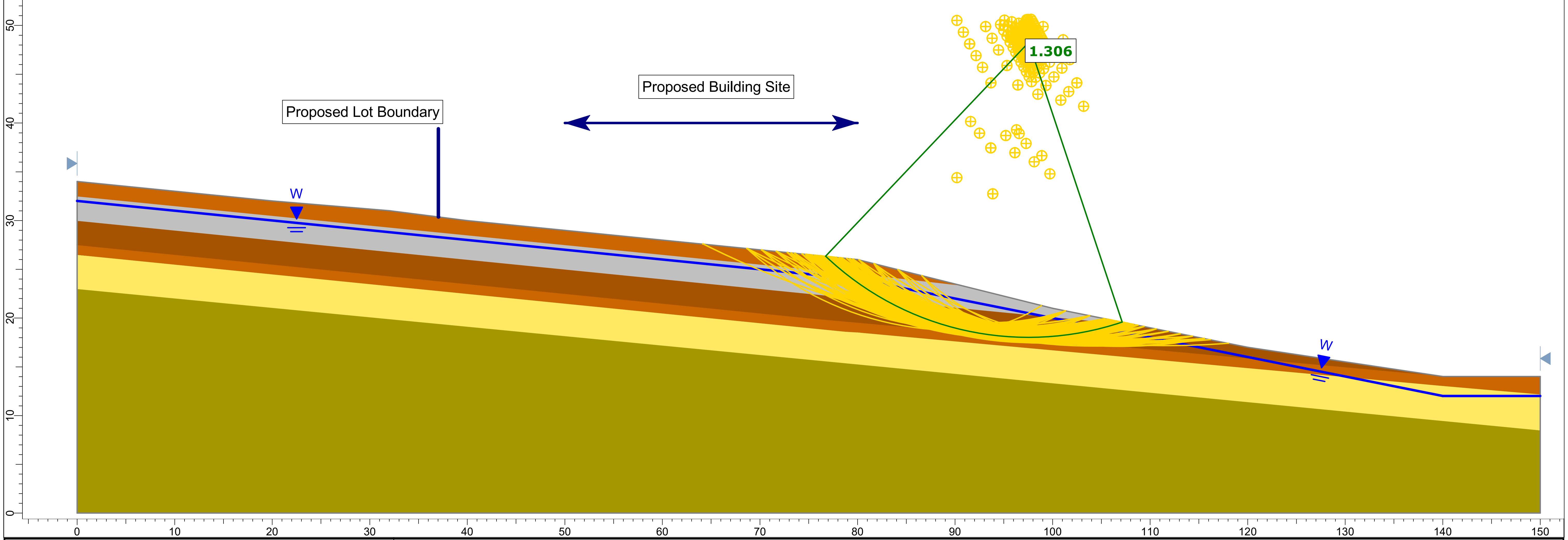


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

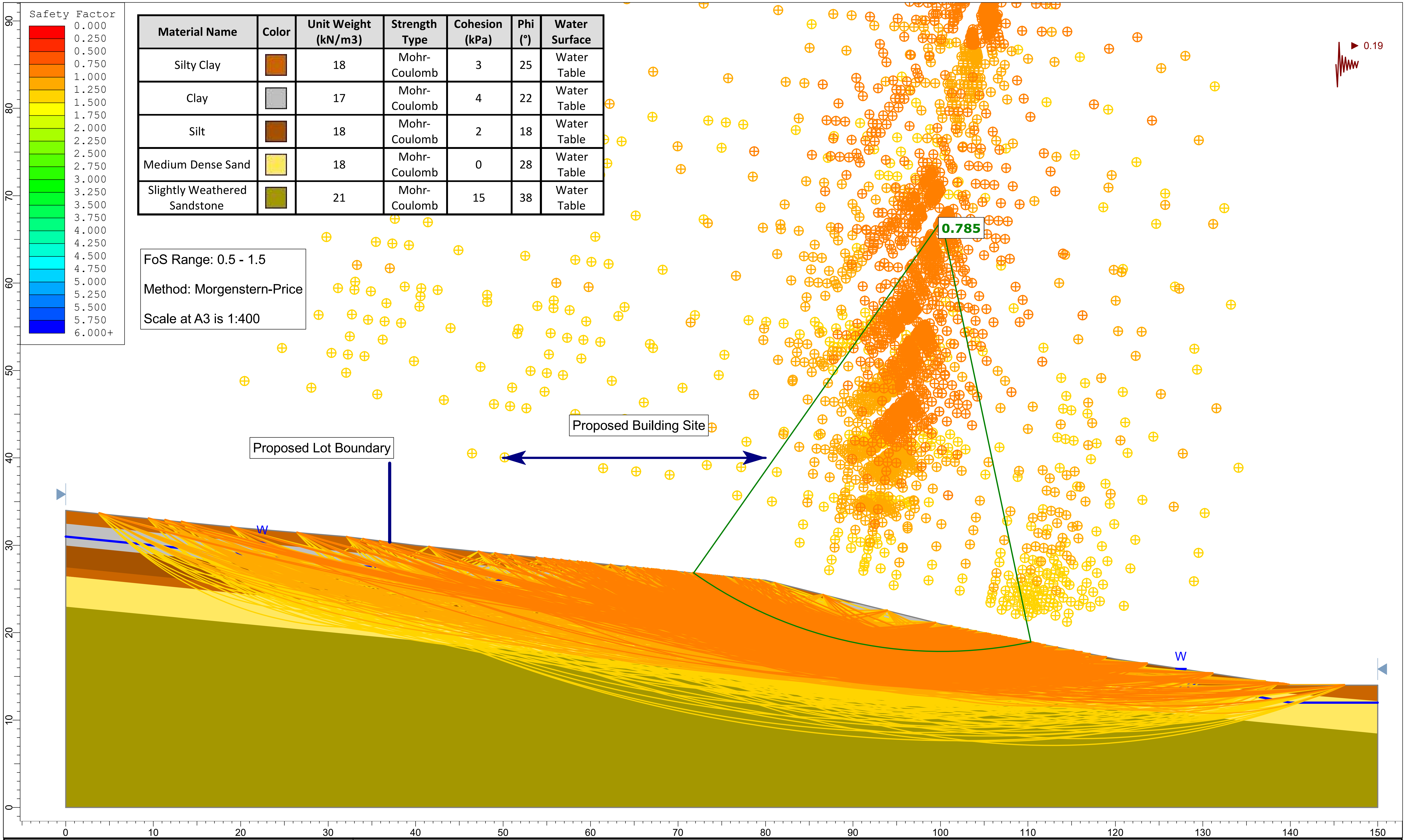
Scale at A3 is 1:400



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section A - Existing Conditions
Scenario	EGWT
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section A - Existing Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

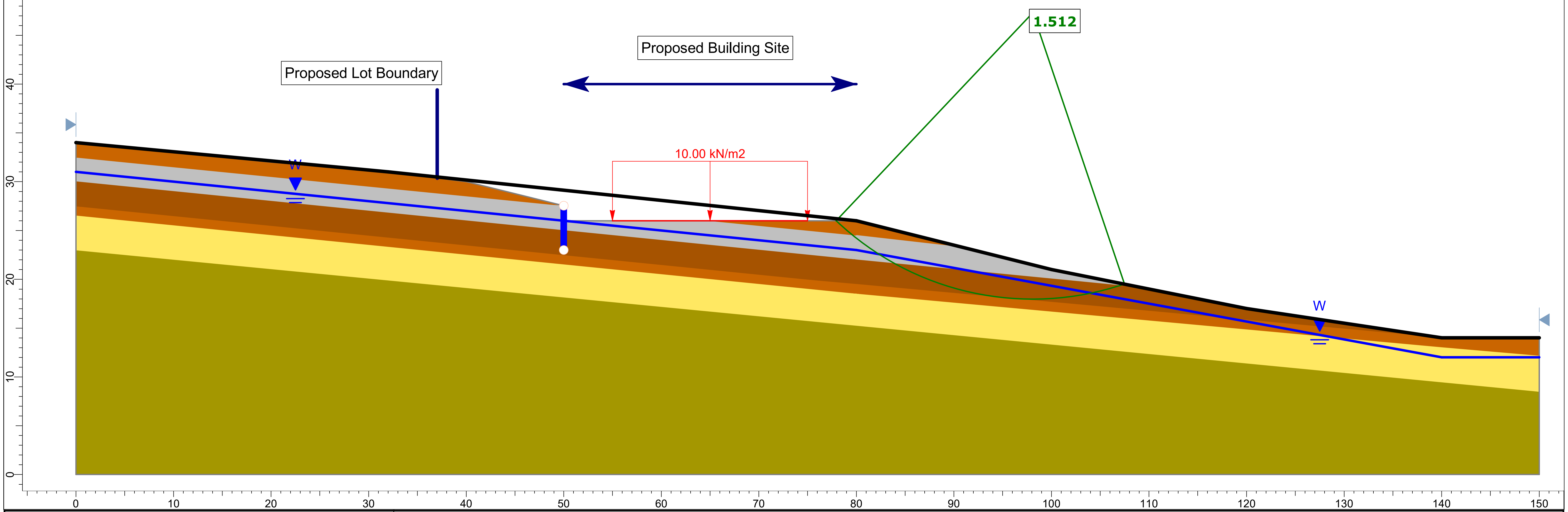
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section A - Proposed Conditions without RTW	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

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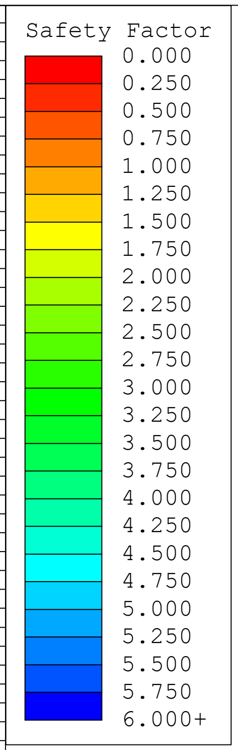
SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

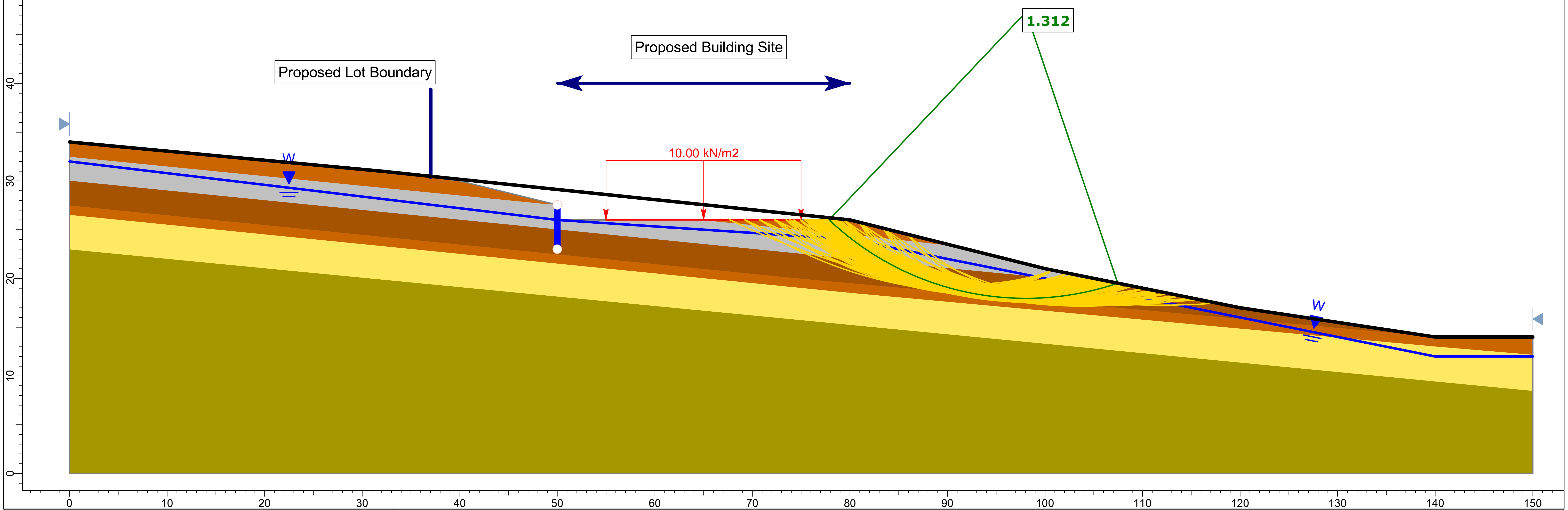
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



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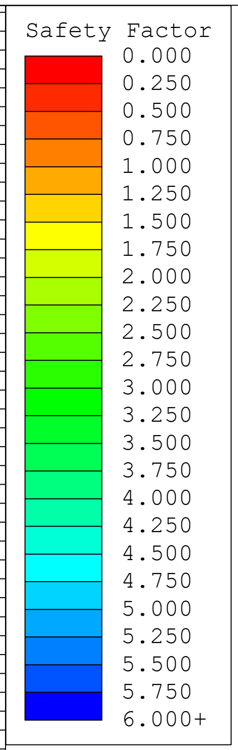
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section A - Proposed Conditions without RTW	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

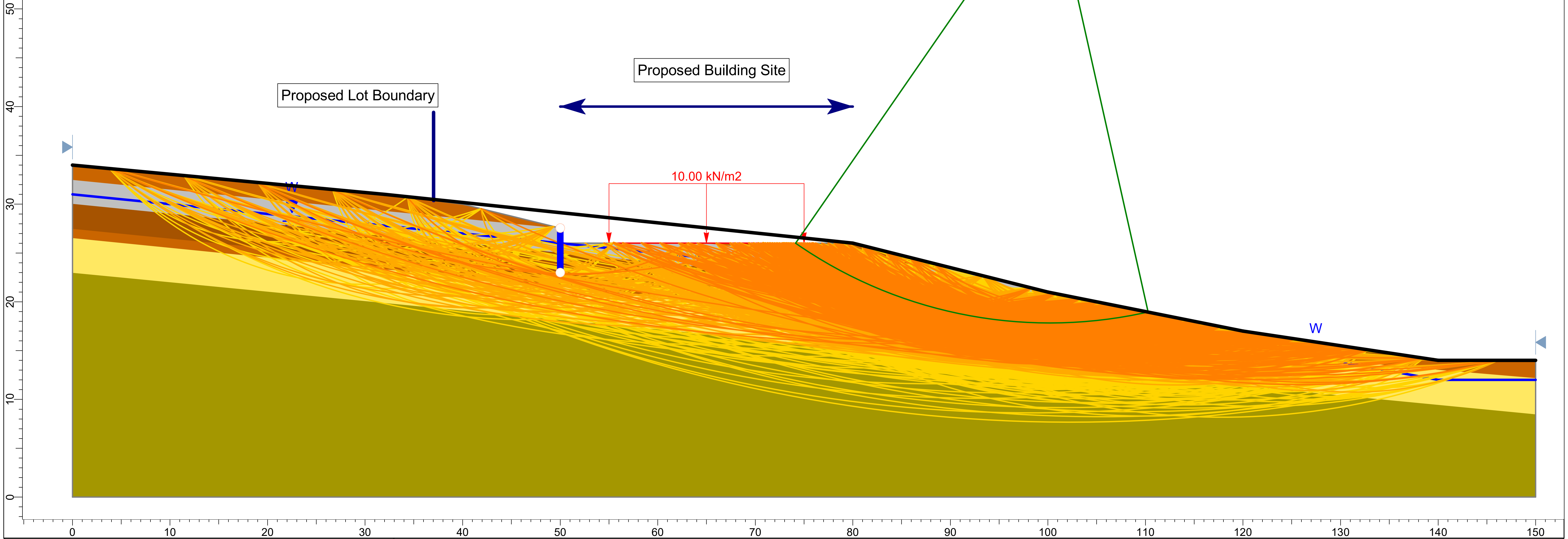
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



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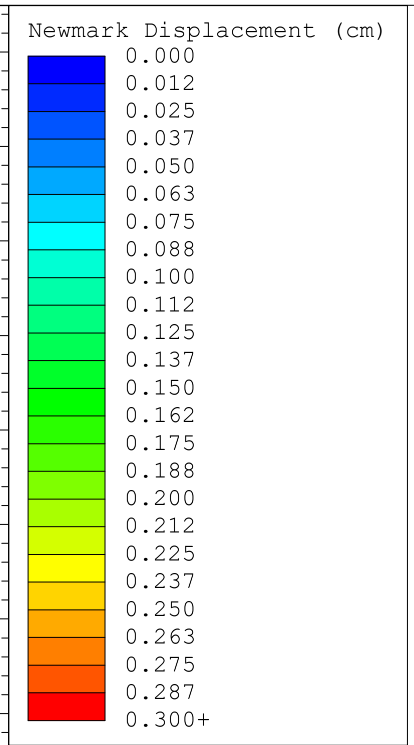
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section A - Proposed Conditions without RTW	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

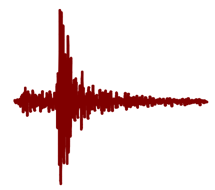
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

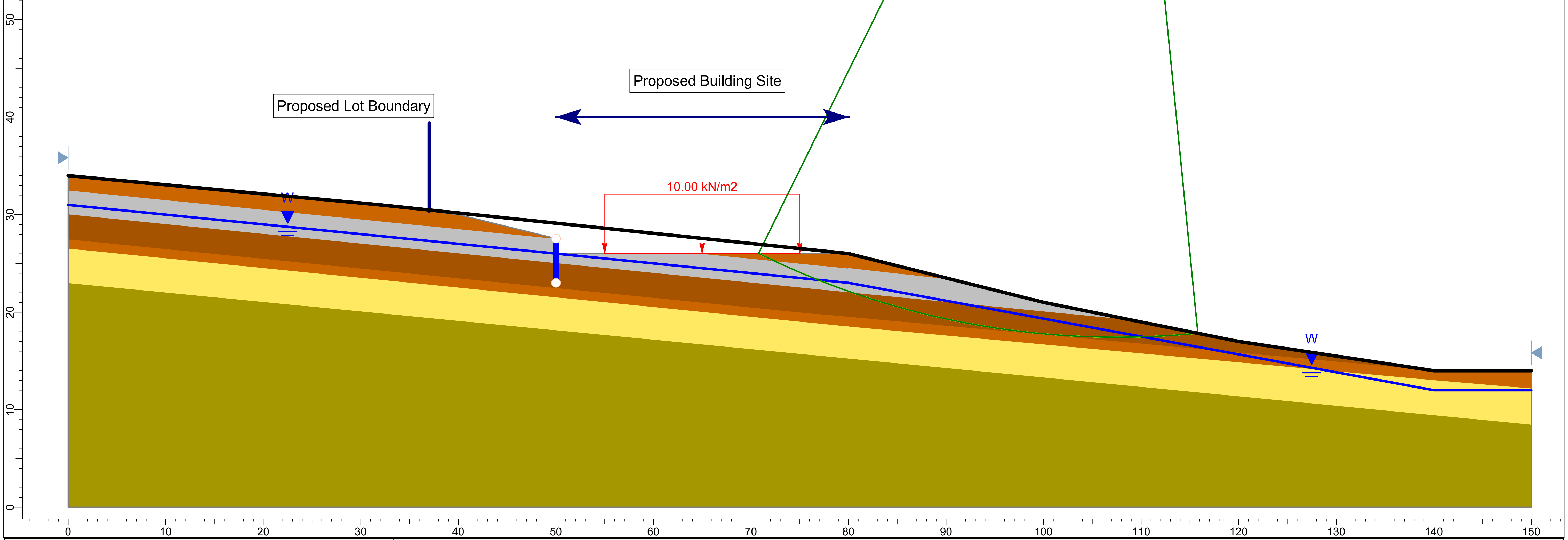
Newmark Displacement: HIK090

Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.





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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section A - Proposed Conditions without RTW	Scenario	Newmark Displacement
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

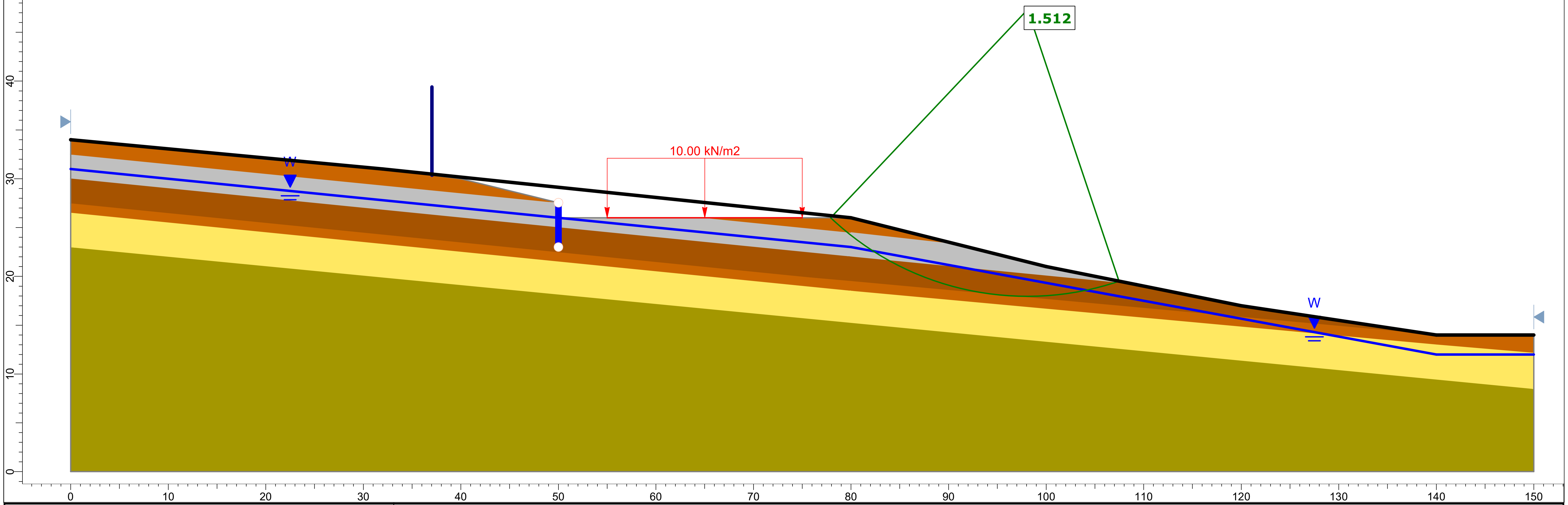
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

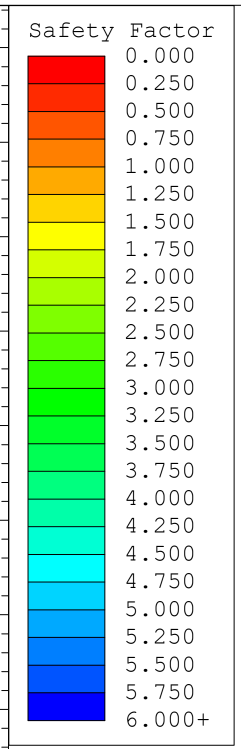
Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd	Project	Tripark Farms - Subdivision Suitability	
	Group: Cross-Section A - Proposed Conditions with RTW	Scenario: NGWT	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd	



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

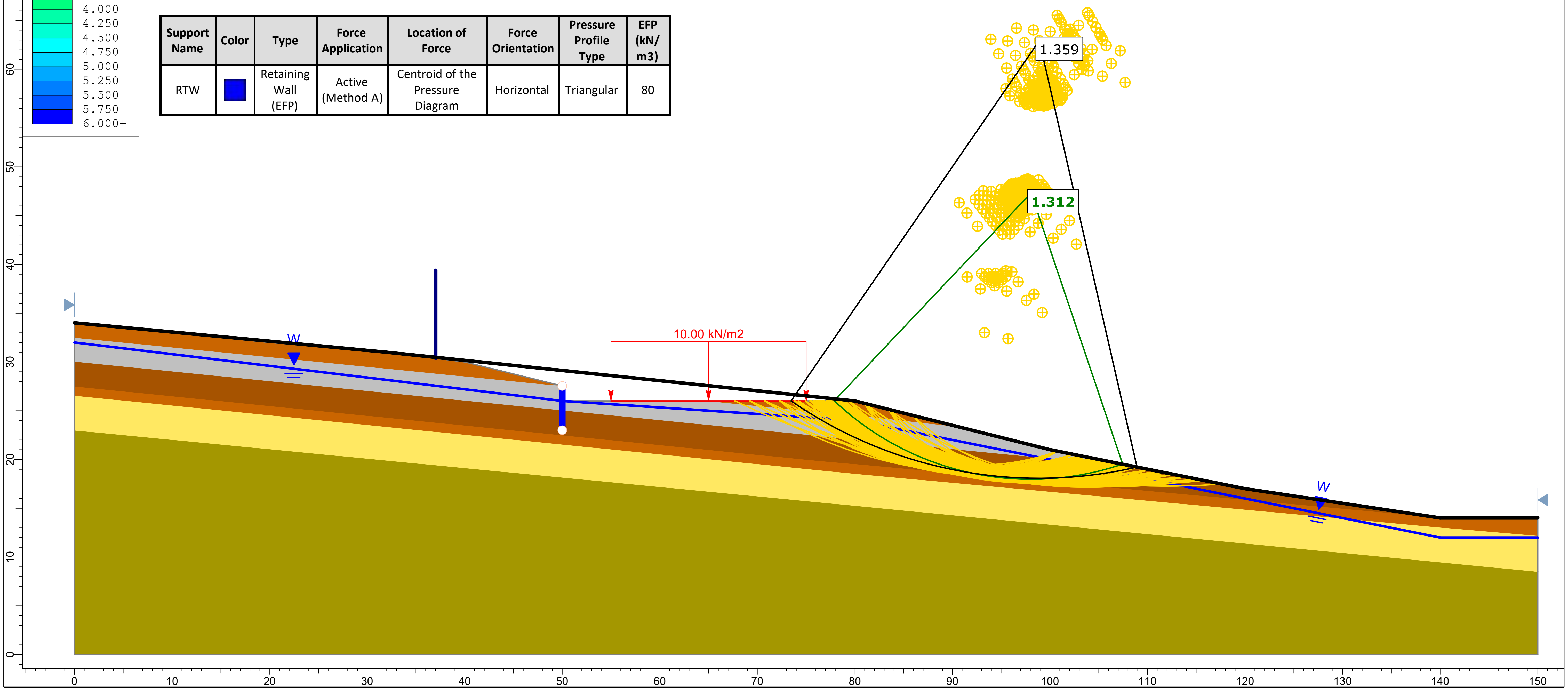
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

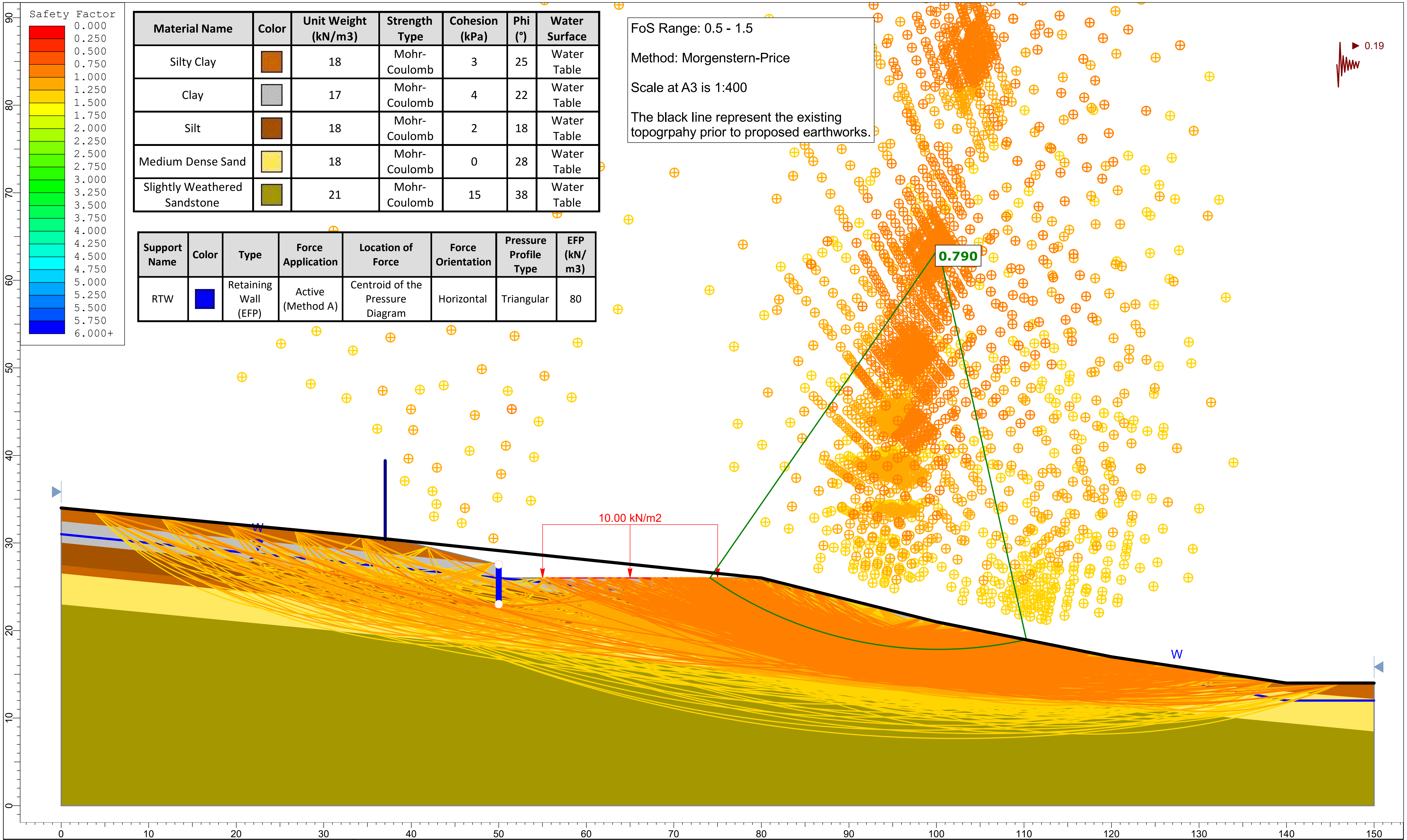
Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd	Project: Tripark Farms - Subdivision Suitability		
	Group: Cross-Section A - Proposed Conditions with RTW	Scenario: EGWT	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd	



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section A - Proposed Conditions with RTW
Scenario	Seismic - DCLS
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd

Newmark Displacement (cm)
0.000
0.004
0.008
0.013
0.017
0.021
0.025
0.029
0.033
0.038
0.042
0.046
0.050
0.054
0.058
0.063
0.067
0.071
0.075
0.079
0.083
0.088
0.092
0.096
0.100+

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table

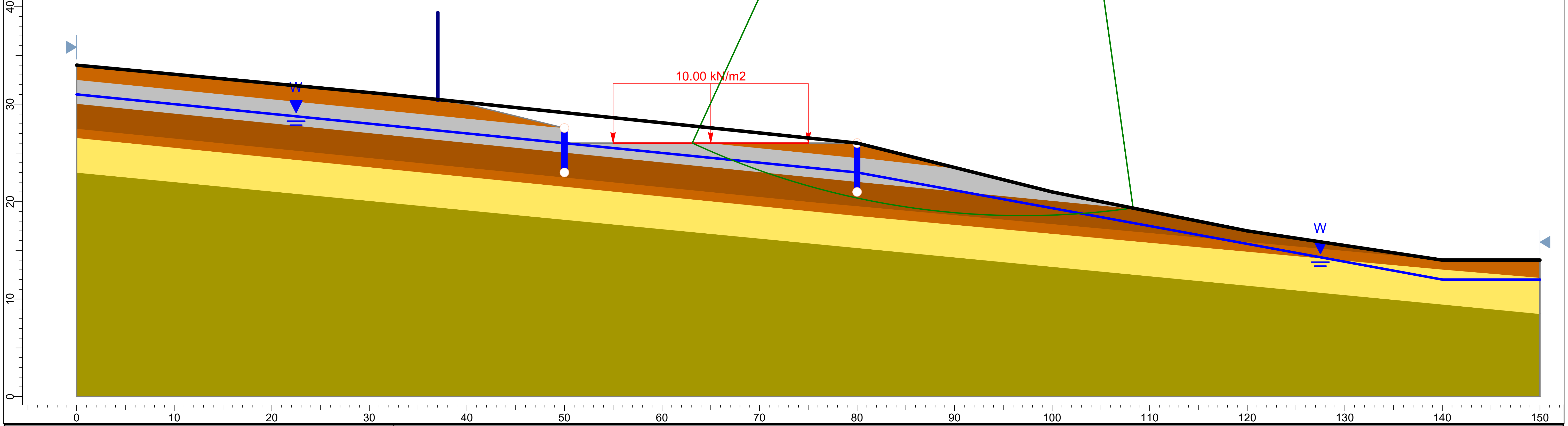
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

Newmark Displacement: HIK090

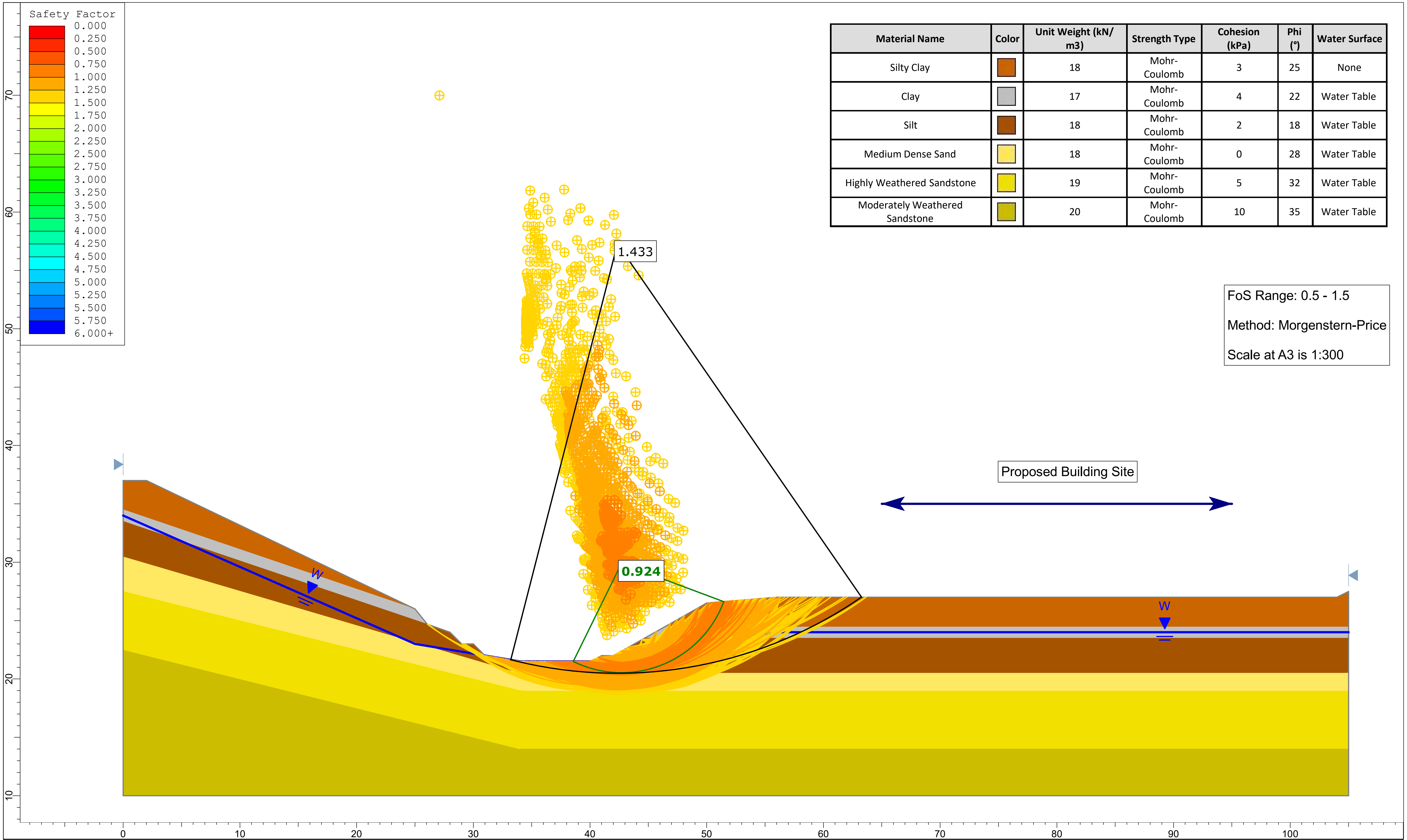
Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd	Project	Tripark Farms - Subdivision Suitability	
	Group: Cross-Section A - Proposed Conditions with RTW	Scenario: Newmark Displacement	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd	

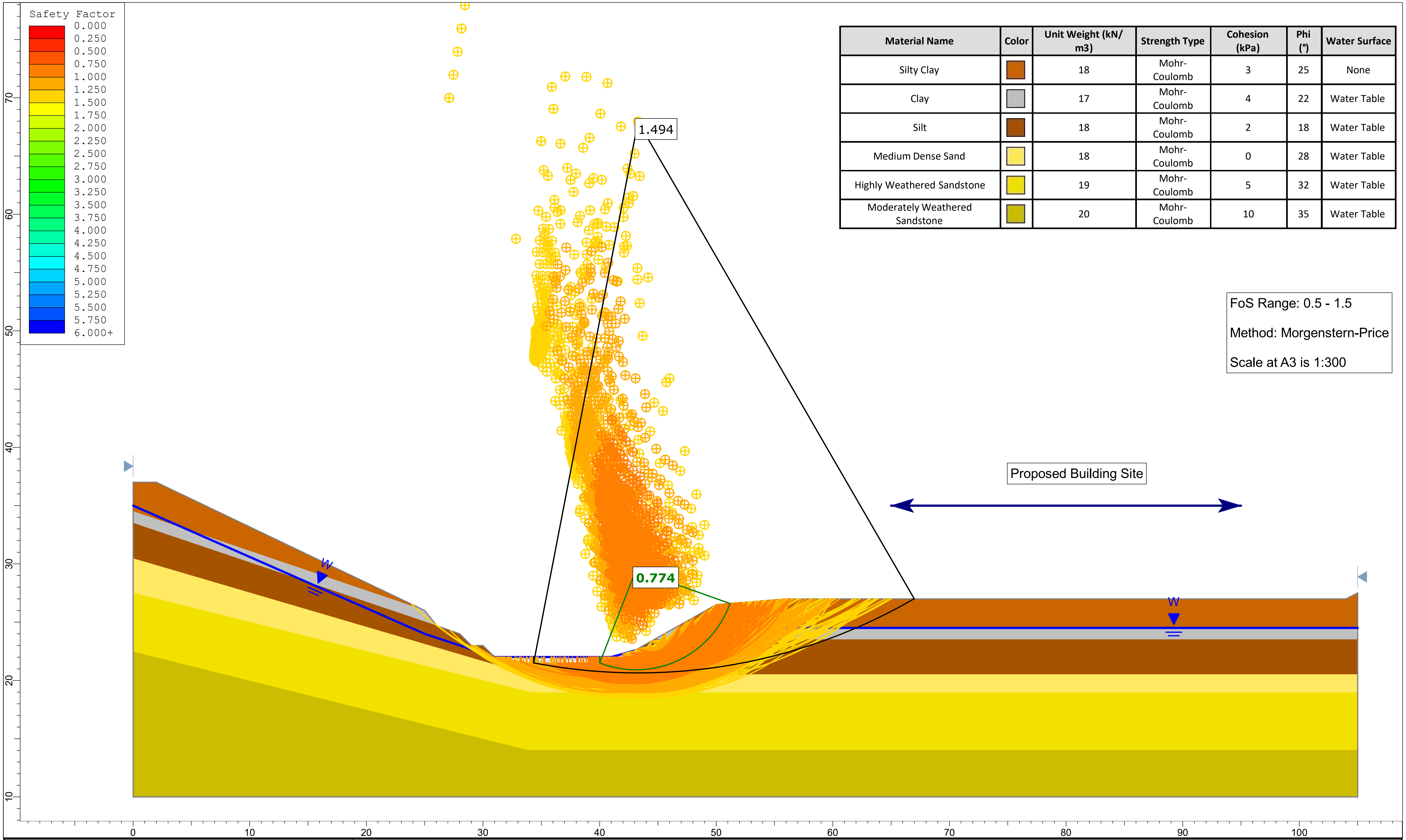


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

Hawthorn Geddes engineers & architects ltd

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section B - Existing Conditions	Scenario	NGWT
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd

SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

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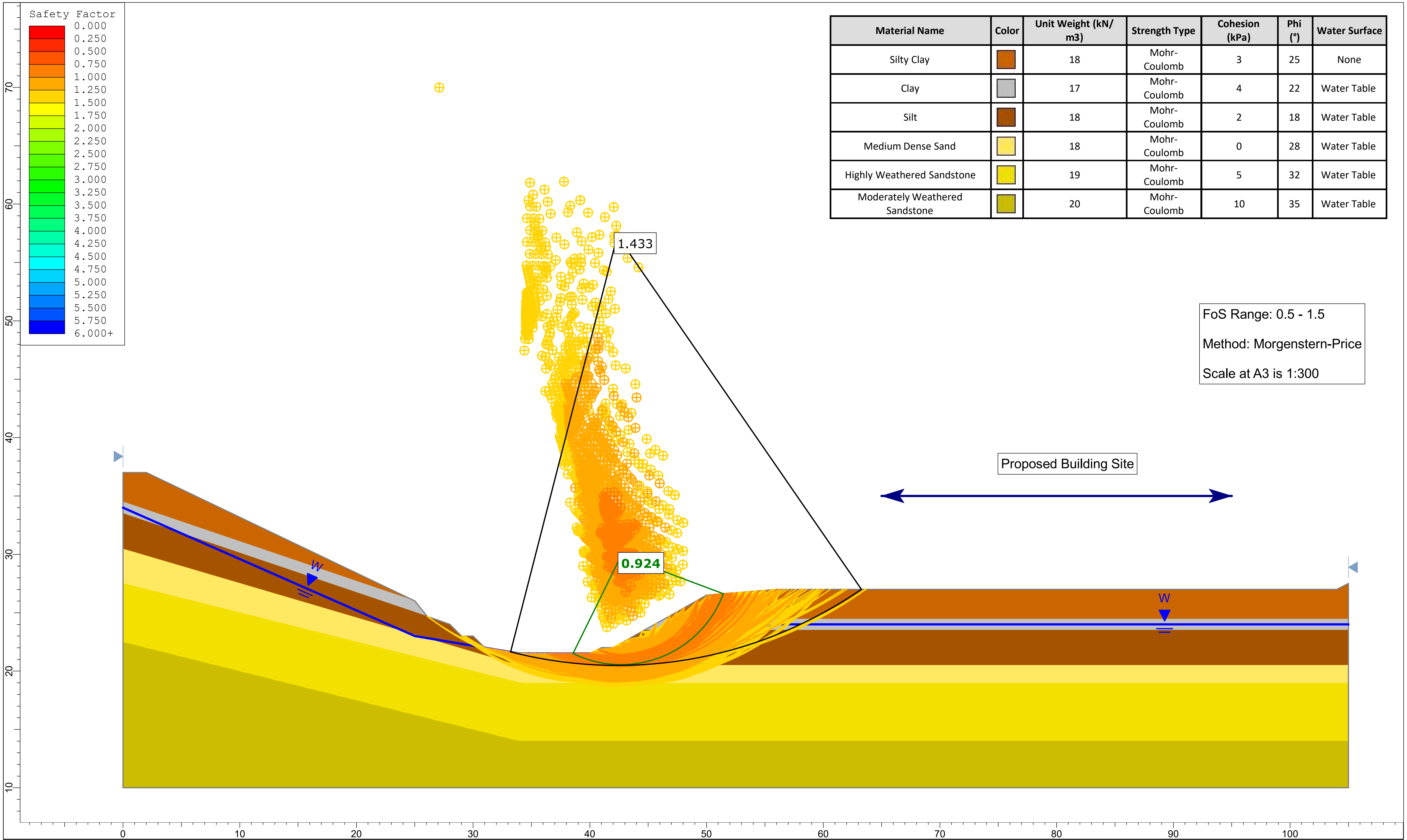
SLIDEINTERPRET 9.036

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section B - Existing Conditions	Scenario	EGWT
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:300

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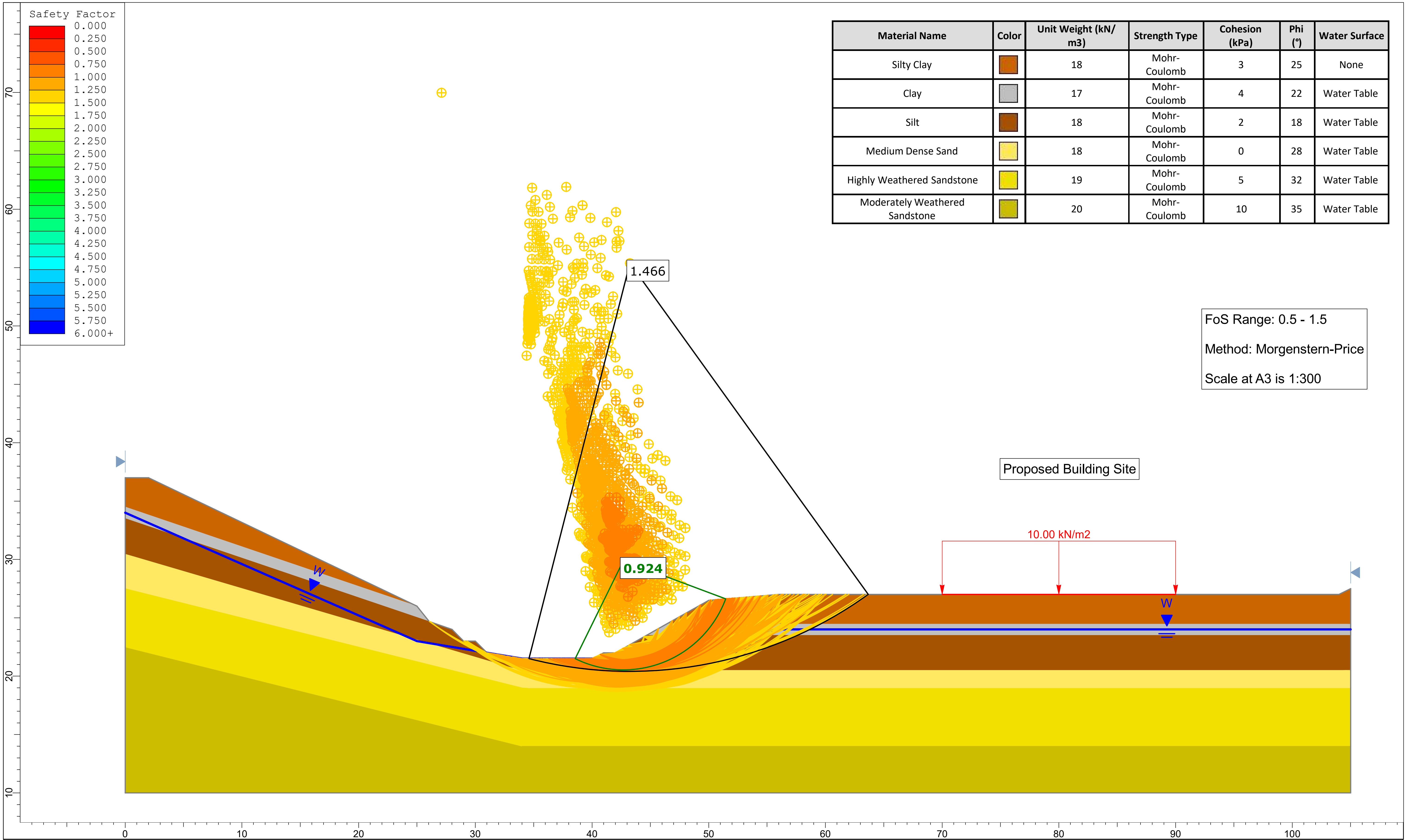
SLIDEINTERPRET 9.036

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section B - Existing Conditions	Scenario	Seismic - DCLS
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

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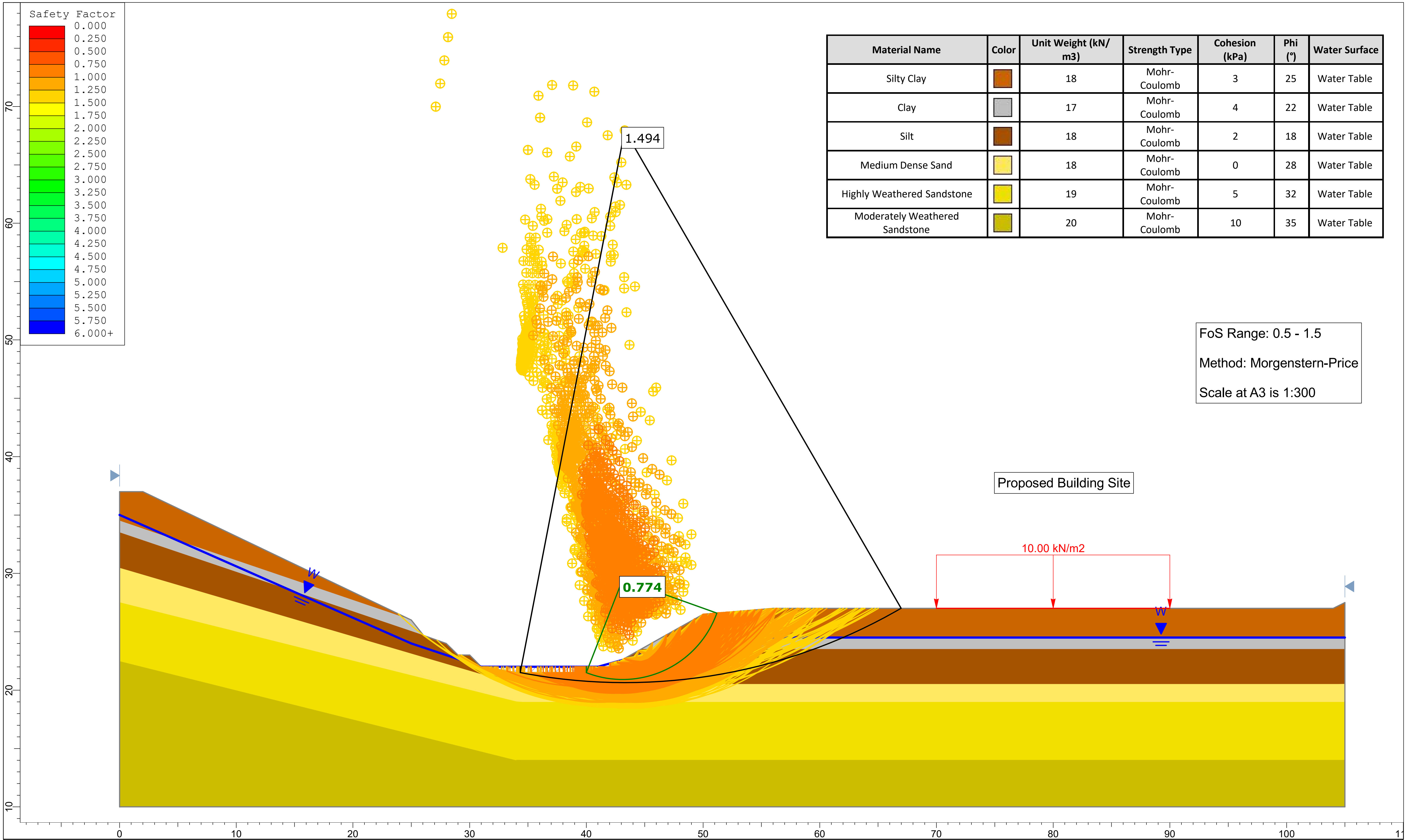
Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section B - Proposed Conditions	Scenario	NGWT
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd

SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

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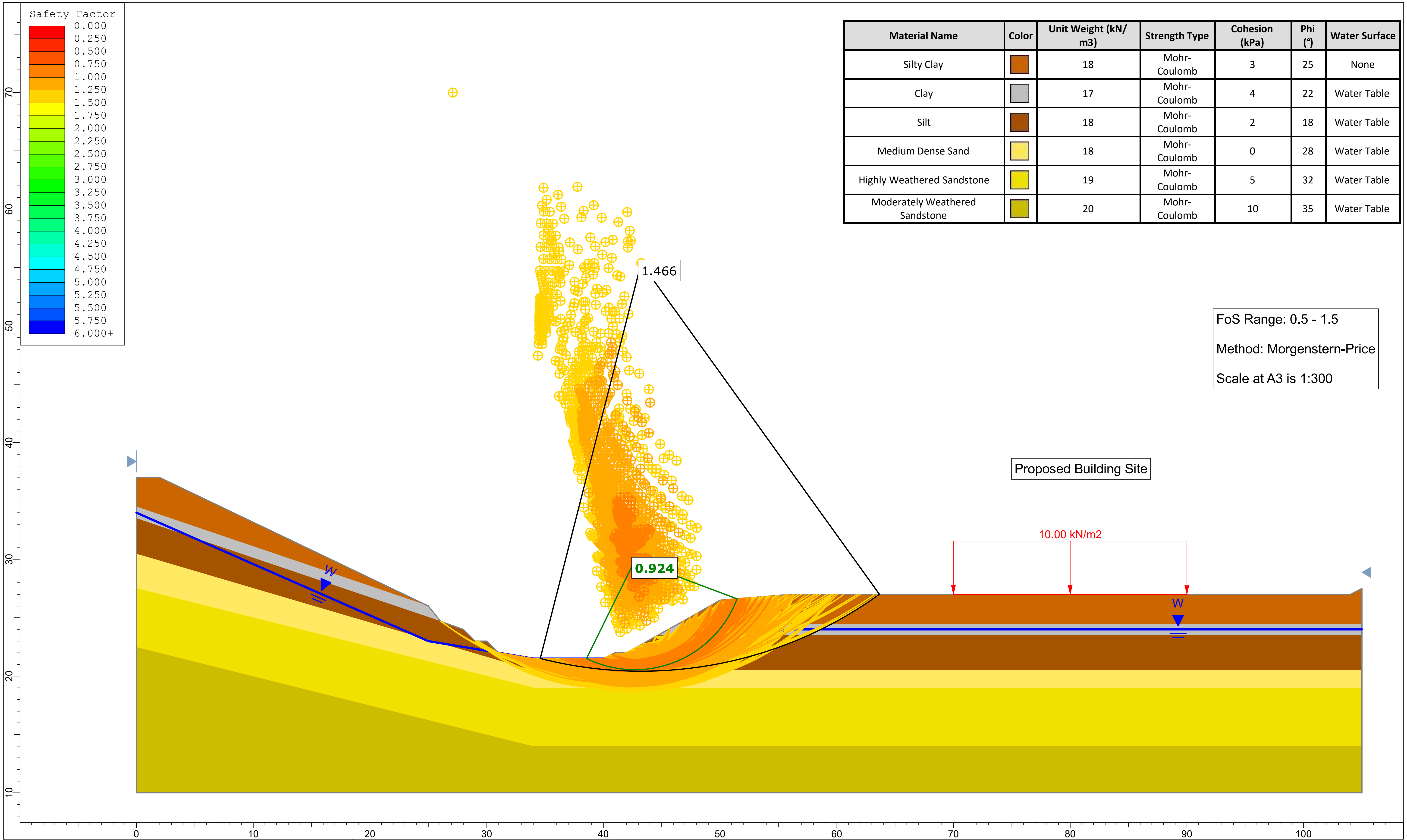
SLIDEINTERPRET 9.036

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section B - Proposed Conditions	Scenario	EGWT
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

Hawthorn Geddes engineers & architects ltd

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section B - Proposed Conditions	Scenario	Seismic - DCLS
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd

SLIDEINTERPRET 9.036

Newmark Displacement (cm)

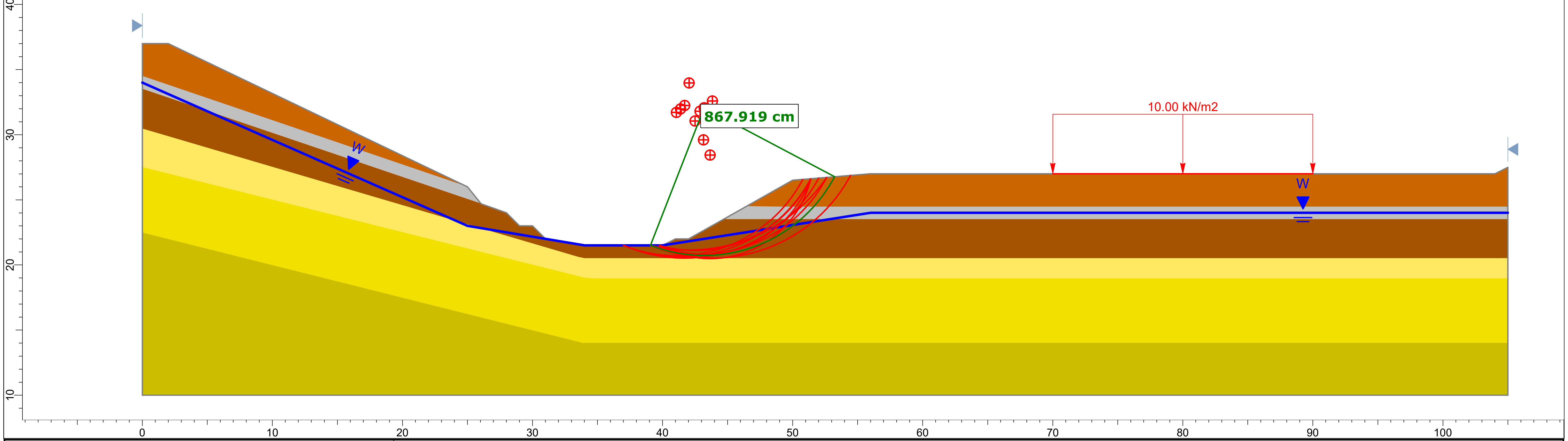
0.000
36.167
72.333
108.500
144.667
180.833
217.000
253.167
289.333
325.500
361.667
397.833
434.000
470.167
506.333
542.500
578.667
614.833
651.000
687.167
723.333
759.500
795.667
831.833
868.000+

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

Newmark Displacement: HIK090

Method: Morgenstern-Price

Scale at A3 is 1:300



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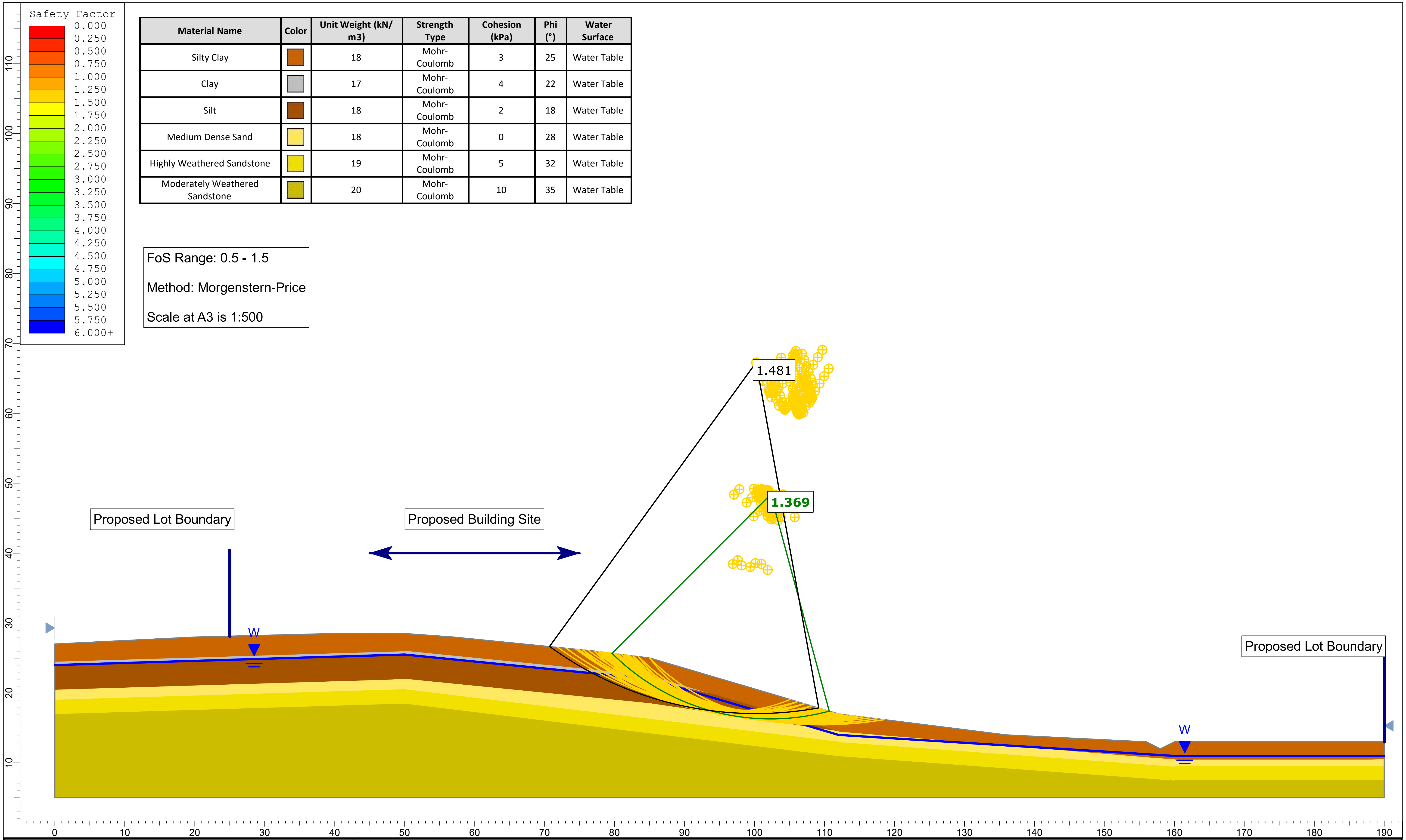
SLIDEINTERPRET 9.036

Project	Slide2 - An Interactive Slope Stability Program
Group	Cross-Section B - Proposed Conditions
Scenario	Newmark Displacement
Drawn By	
Company	
Date	5/11/2024, 12:55:53 p.m.
File Name	geo 241105 slide assessment.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

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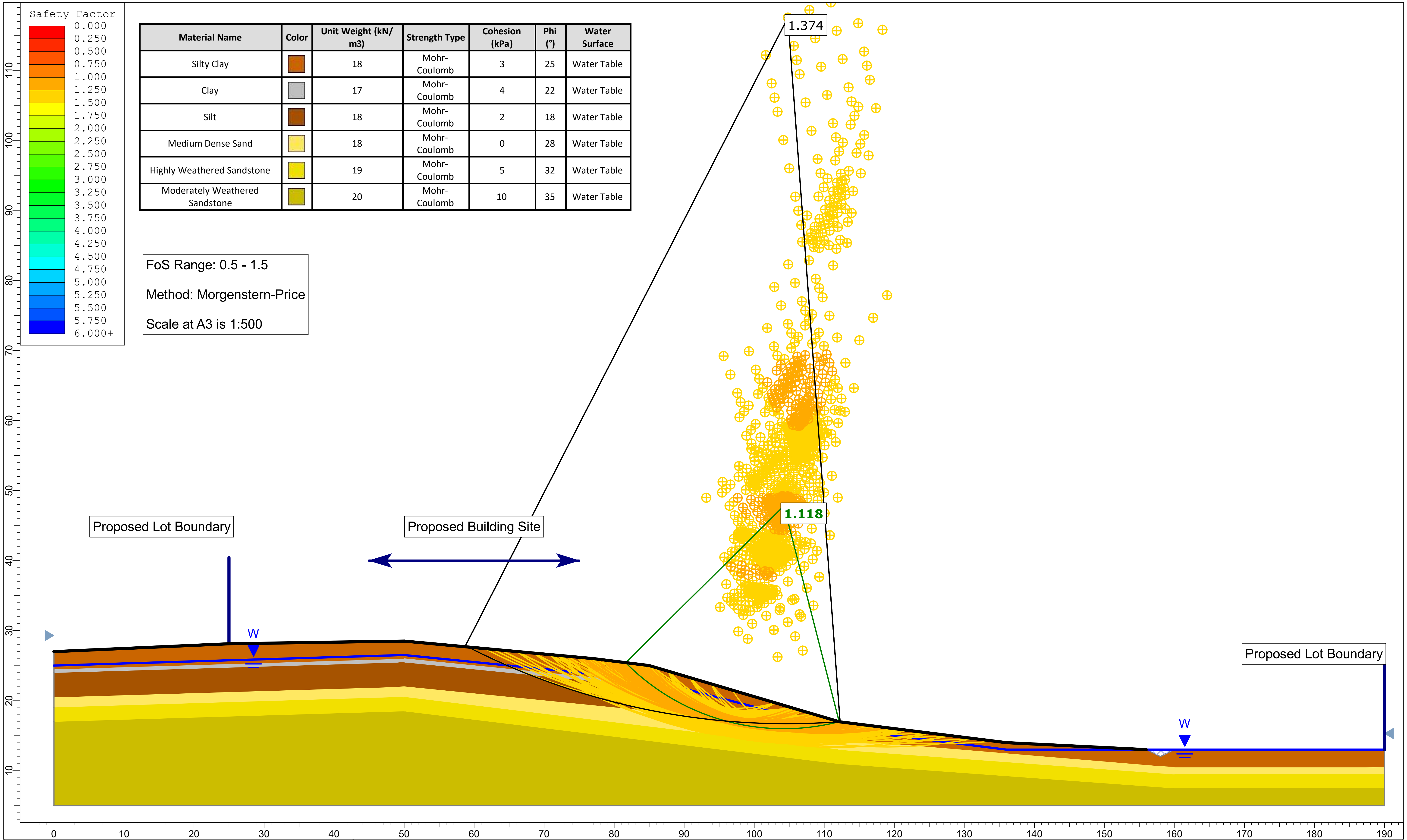
Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section C - Existing Conditions	Scenario	NGWT
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd

SLIDEINTERPRET 9.036

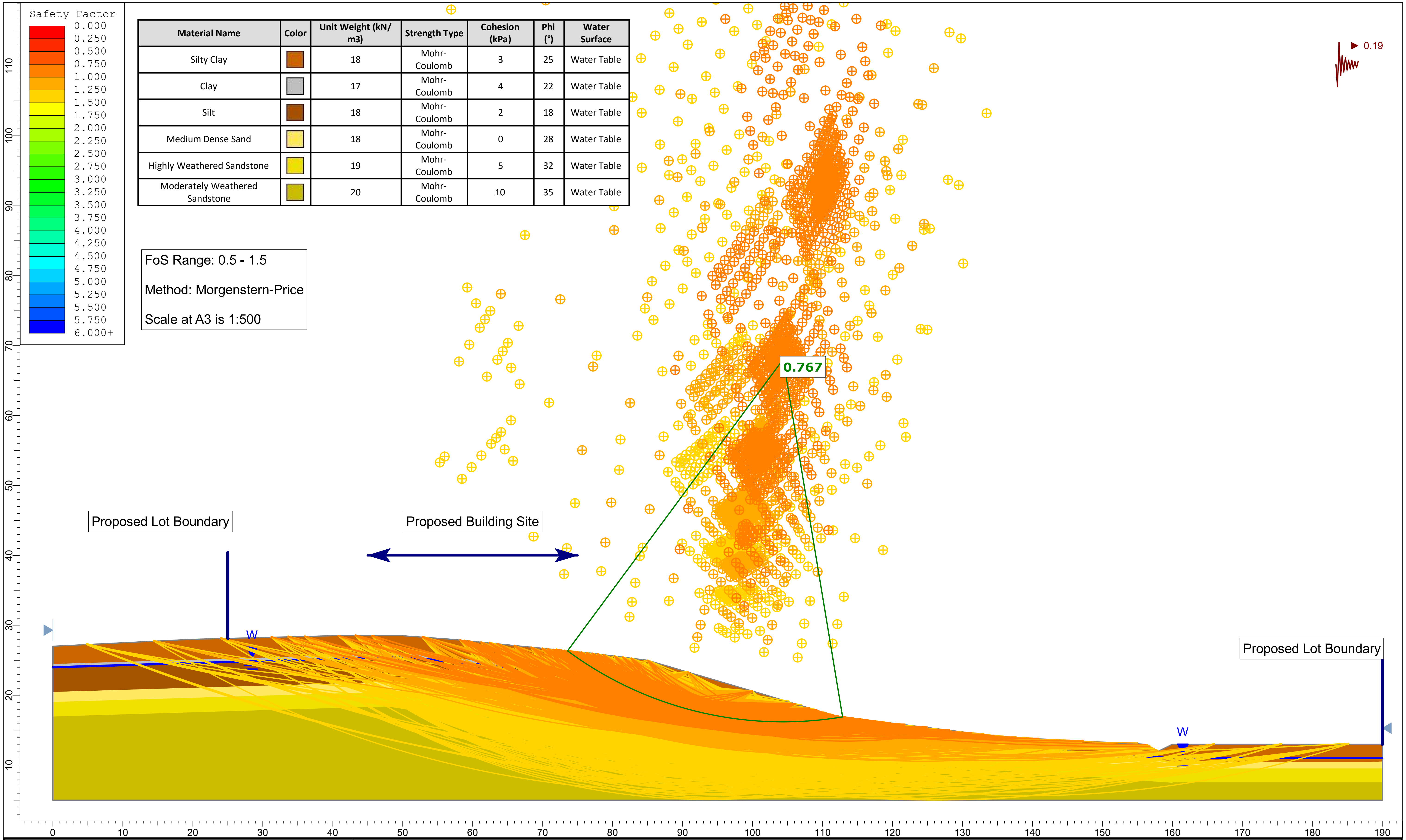


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section C - Existing Conditions	Scenario	EGWT
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

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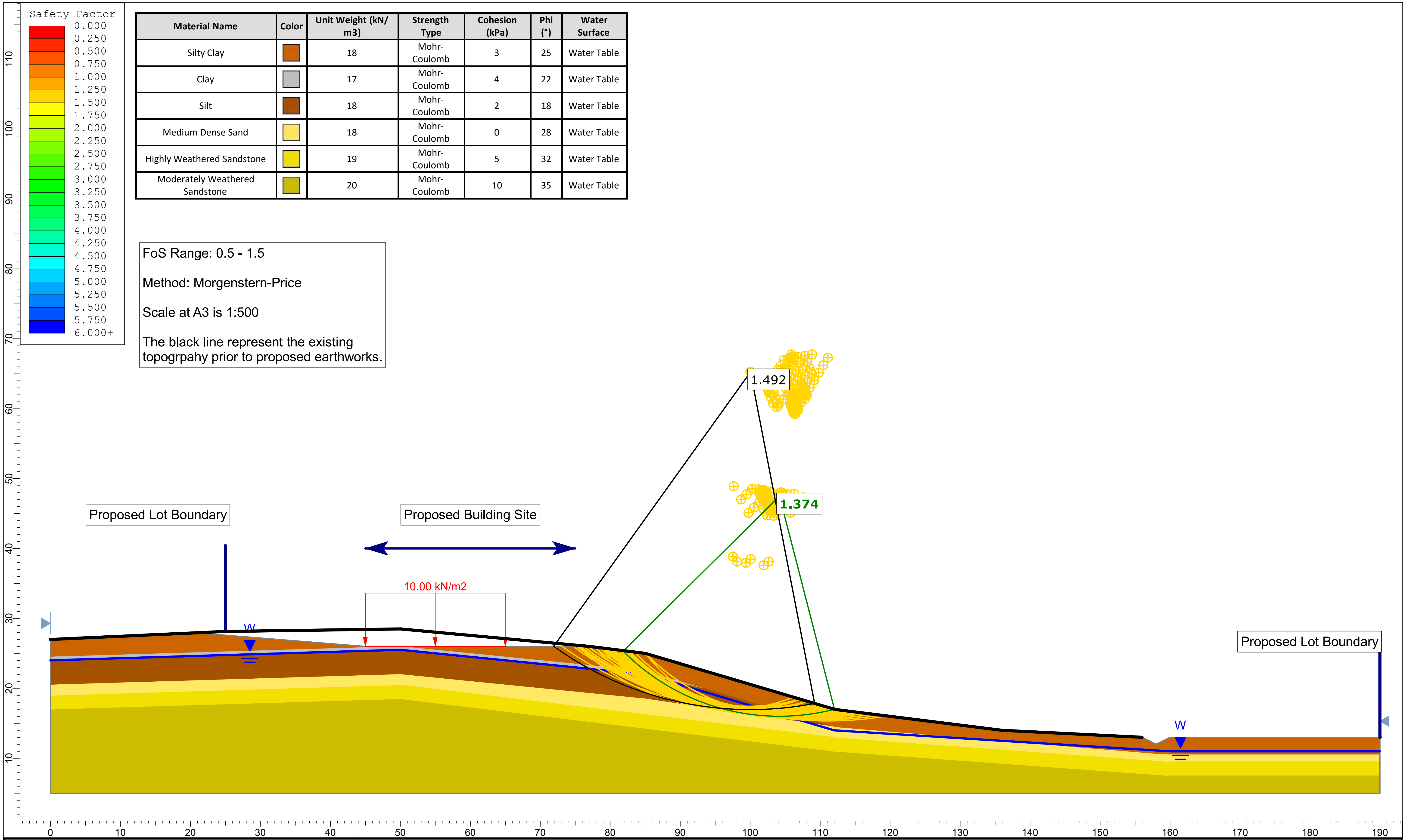
SLIDEINTERPRET 9.036

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section C - Existing Conditions	Scenario	Seismic - DCLS
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

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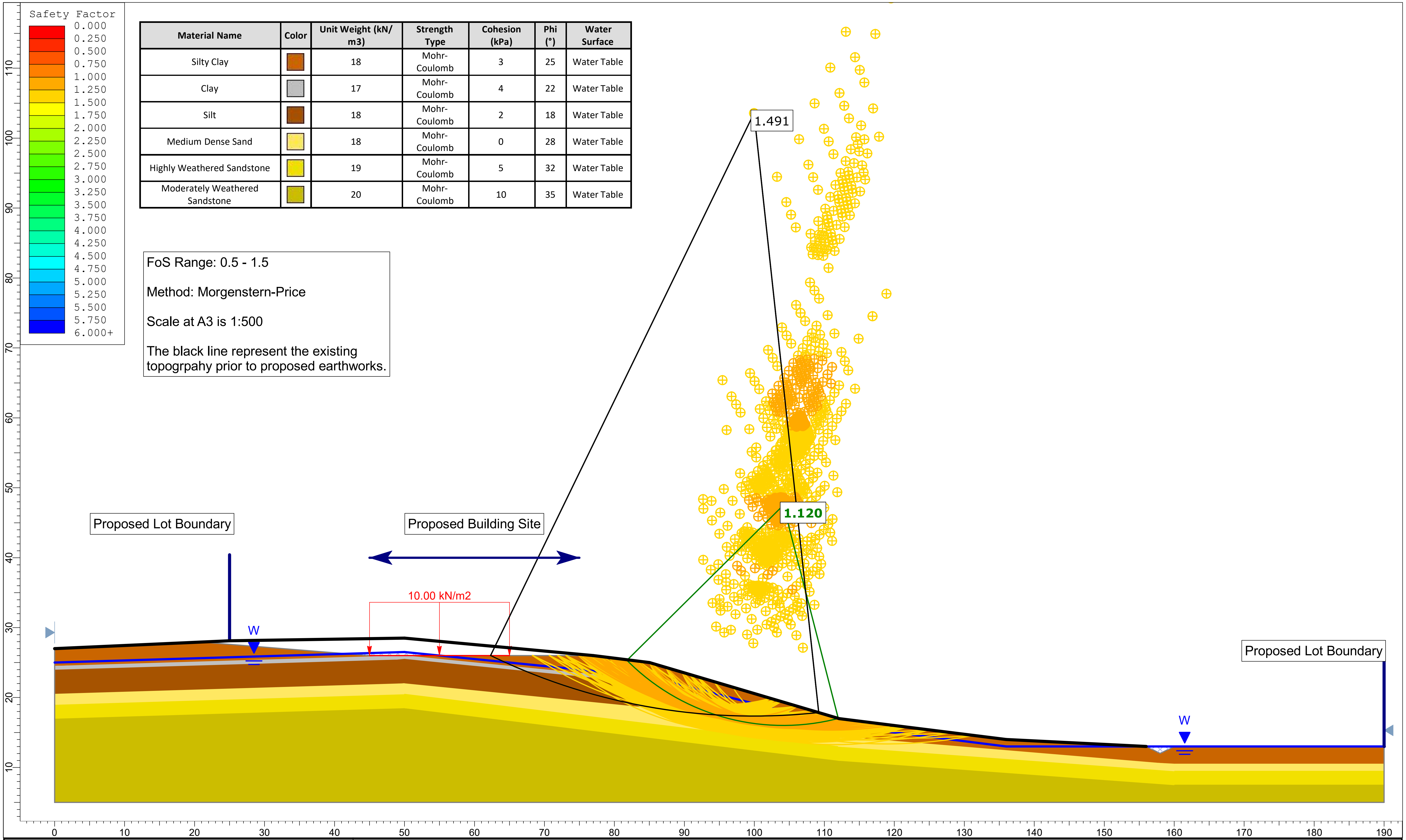
SLIDEINTERPRET 9.036

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section C - Proposed Conditions	*Scenario*	NGWT
Drawn By		*Company*	
Date	5/11/2024, 12:55:53 p.m.	*File Name*	geo 241105 slide assessment.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

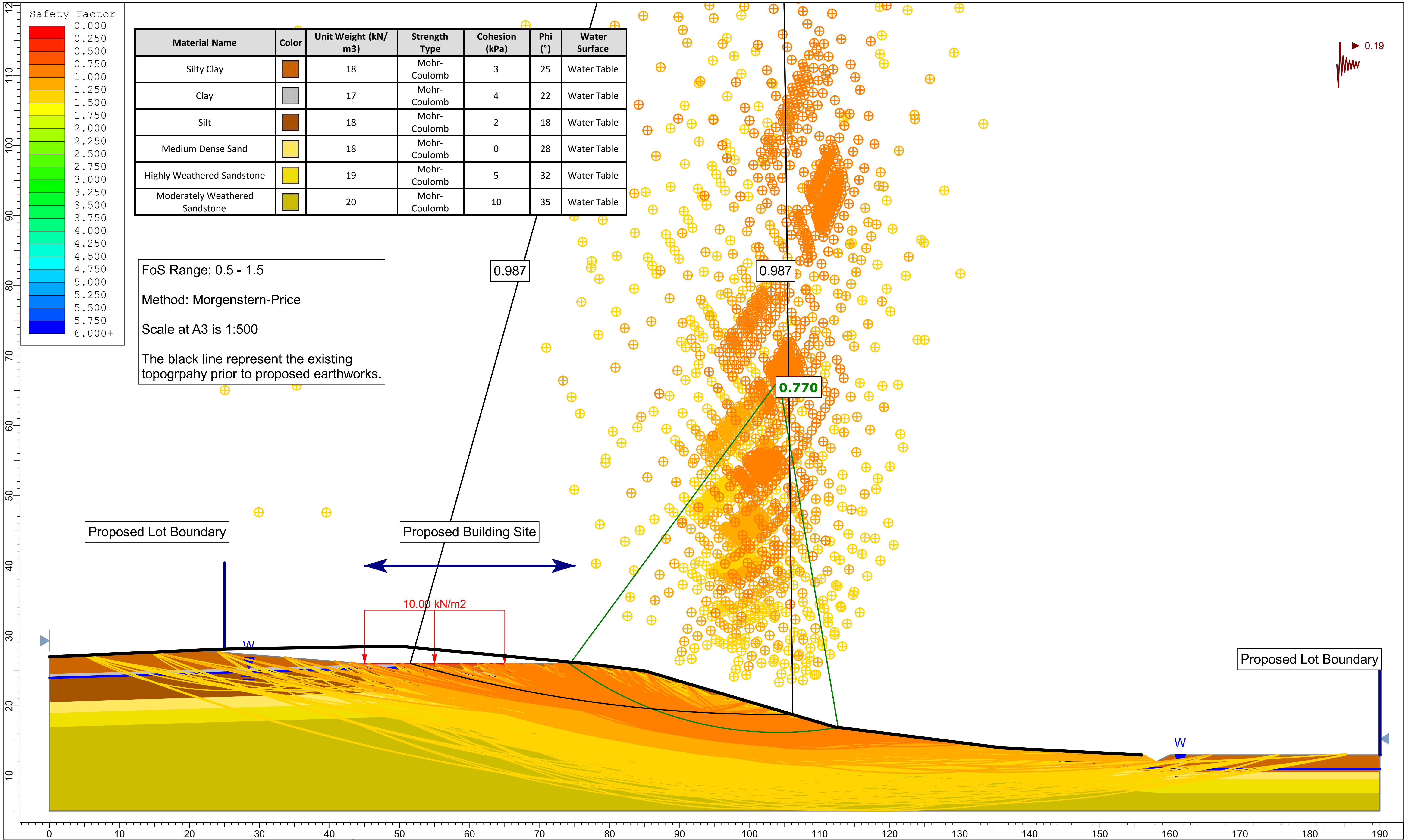
FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

Hawthorn Geddes engineers & architects ltd	Project: Slide2 - An Interactive Slope Stability Program		
	Group: Cross-Section C - Proposed Conditions	Scenario: EGWT	
	Drawn By:	Company:	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 12:55:53 p.m.	File Name: geo 241105 slide assessment.slmd	

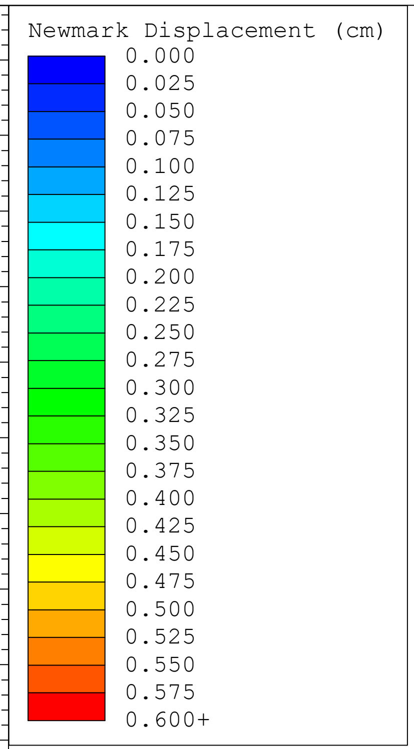


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

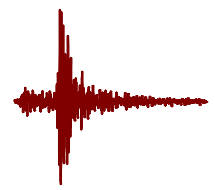
Hawthorn Geddes engineers & architects ltd

Project	Slide2 - An Interactive Slope Stability Program		
Group	Cross-Section C - Proposed Conditions	Scenario	Seismic - DCLS
Drawn By		Company	
Date	5/11/2024, 12:55:53 p.m.	File Name	geo 241105 slide assessment.slmd

SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

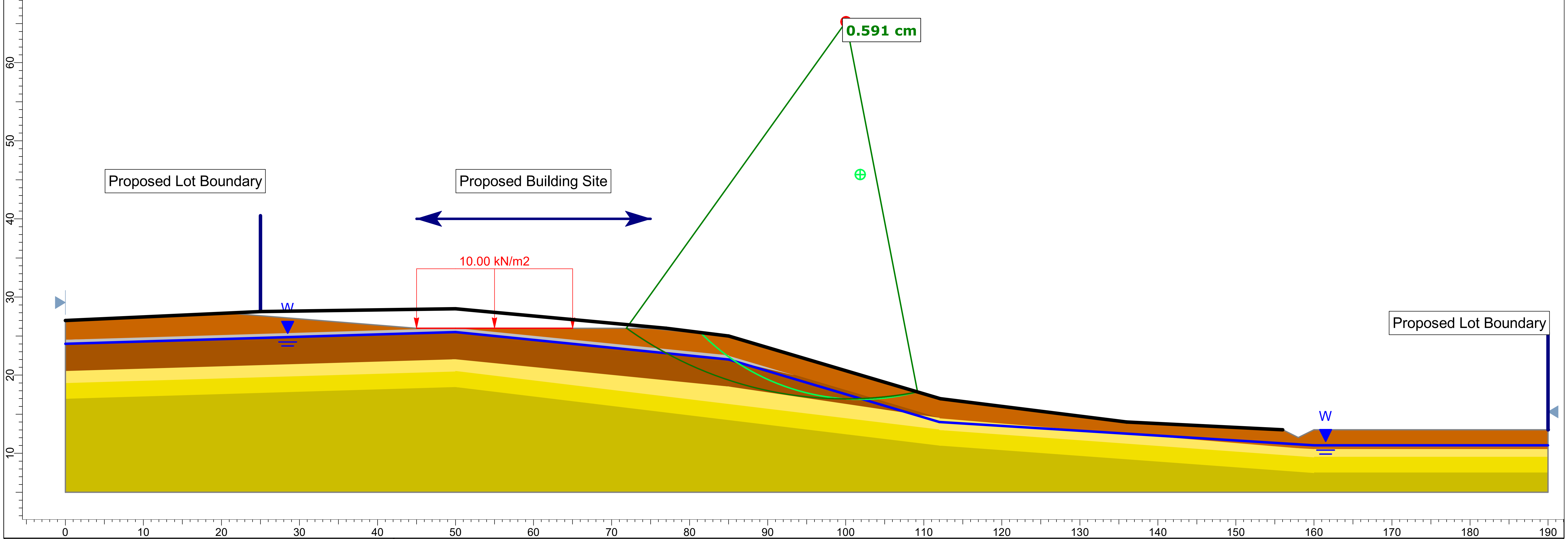


Newmark Displacement: HIK090

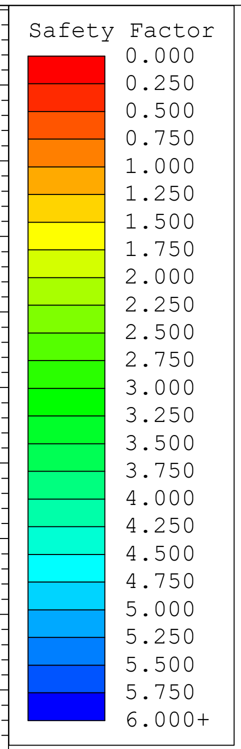
Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd	Project: Slide2 - An Interactive Slope Stability Program		
	Group: Cross-Section C - Proposed Conditions	Scenario: Newmark Displacement	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 12:55:53 p.m.	File Name: geo 241105 slide assessment.slmd	



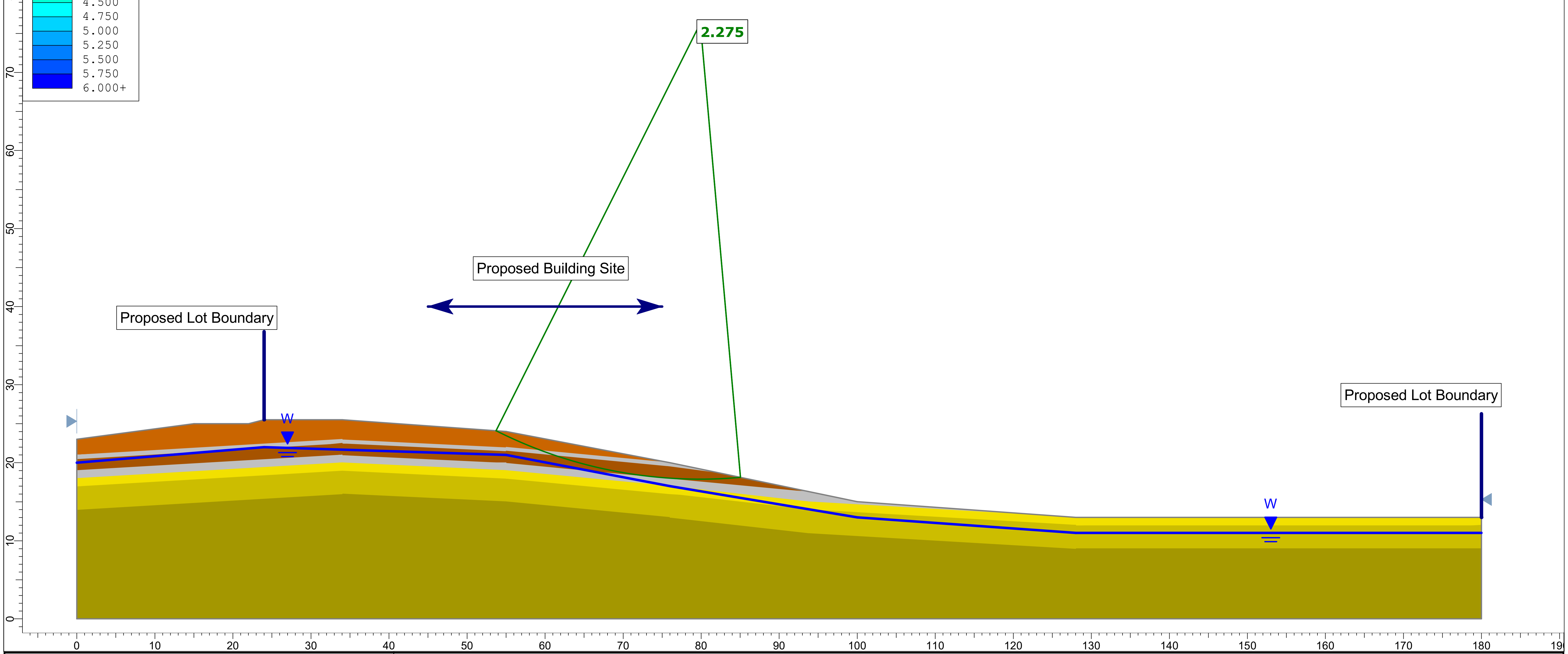
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table
Engineered Fill		20	Mohr-Coulomb	8	35	Water Table

Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500



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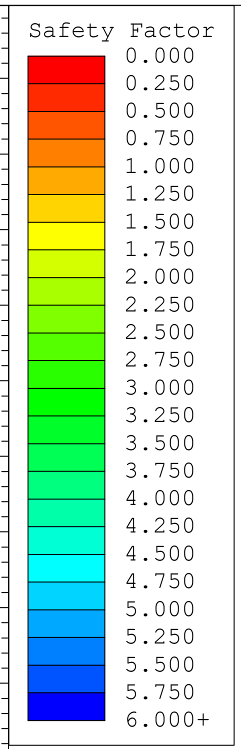
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section D - Existing Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



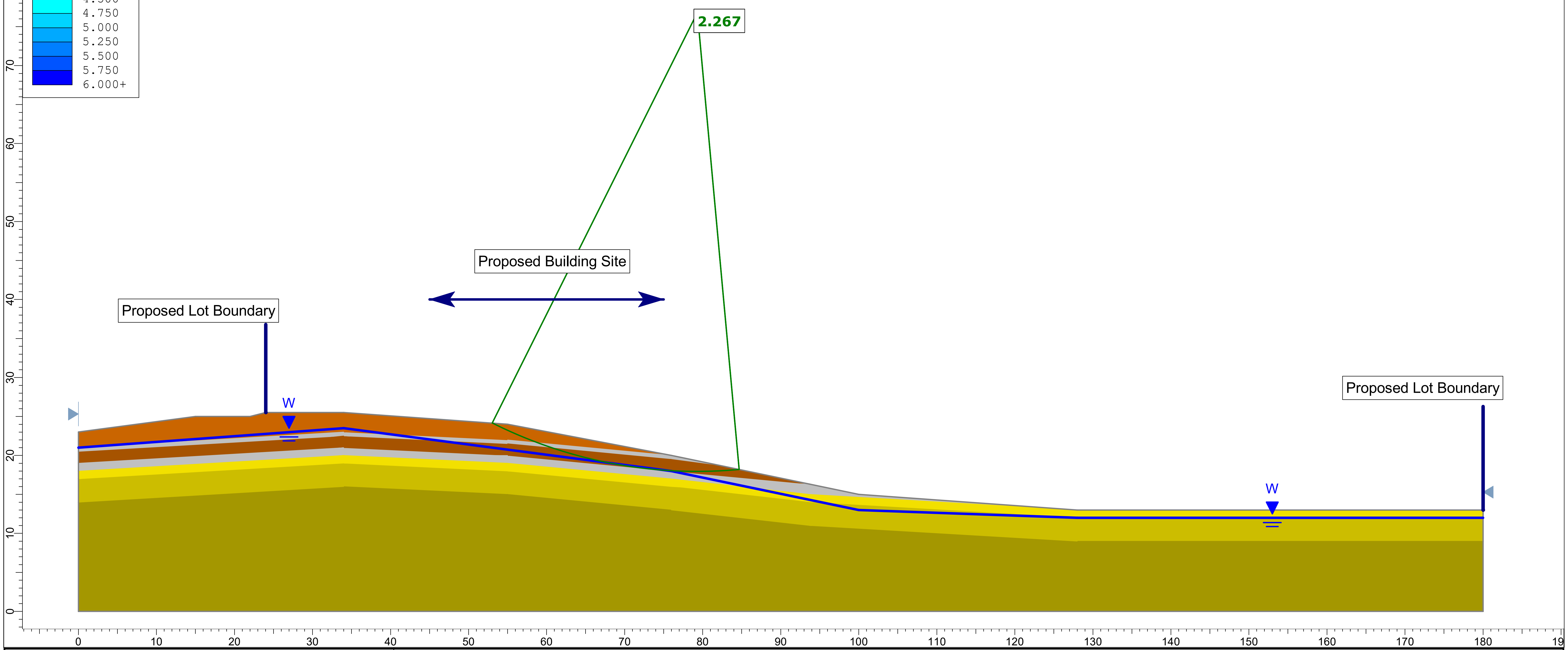
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table
Engineered Fill		20	Mohr-Coulomb	8	35	Water Table

Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

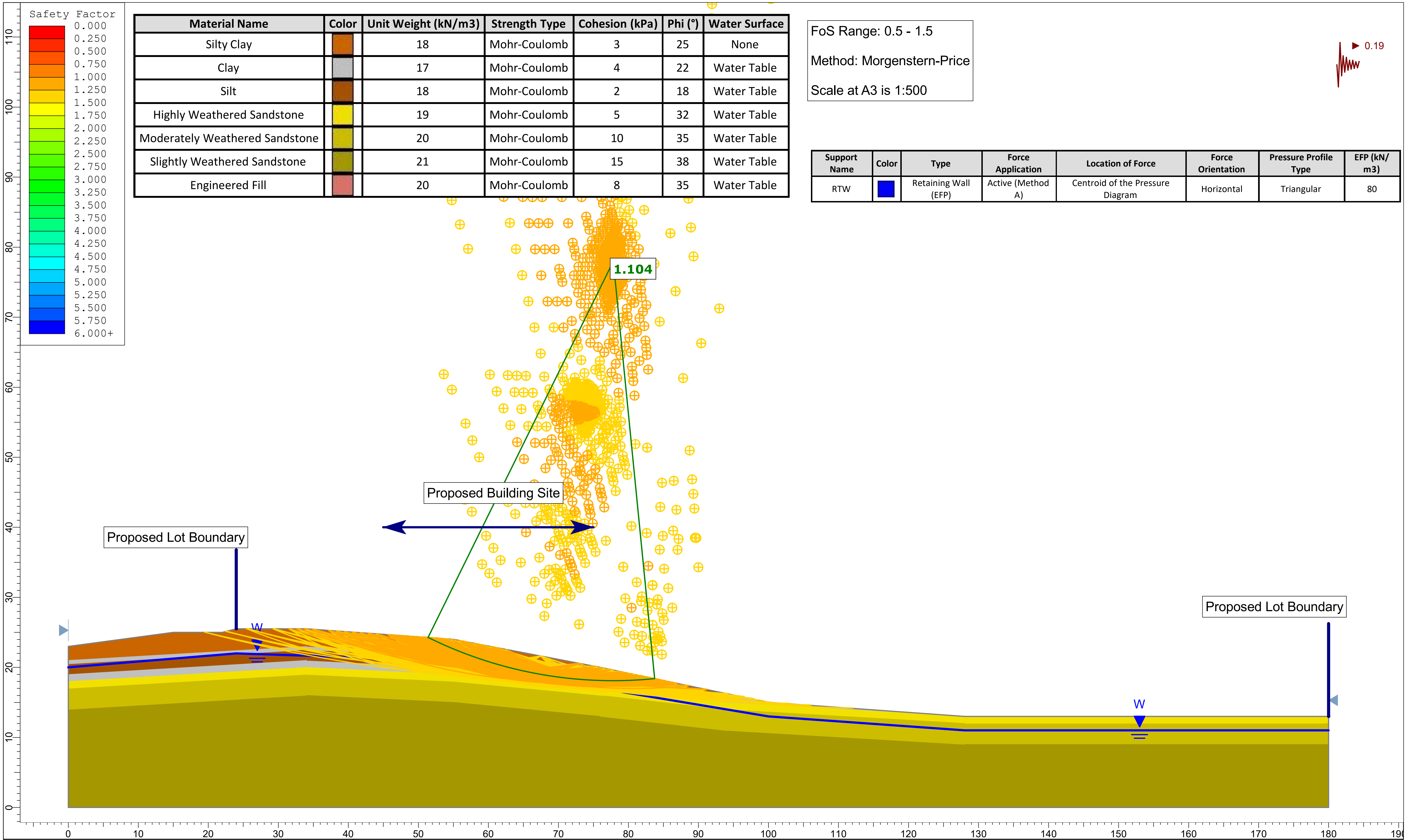
Scale at A3 is 1:500



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section D - Existing Conditions	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table
Engineered Fill		20	Mohr-Coulomb	8	35	Water Table

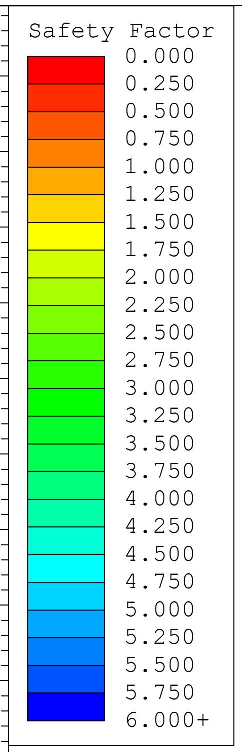
FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

Hawthorn Geddes engineers & architects ltd	Project	Tripark Farms - Subdivision Suitability	
	Group	Cross-Section D - Existing Conditions	Scenario: Seismic - DCLS
	Drawn By	KB	Company: HGEA
SLIDEINTERPRET 9.036	Date	5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
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Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table
Engineered Fill		20	Mohr-Coulomb	8	35	Water Table

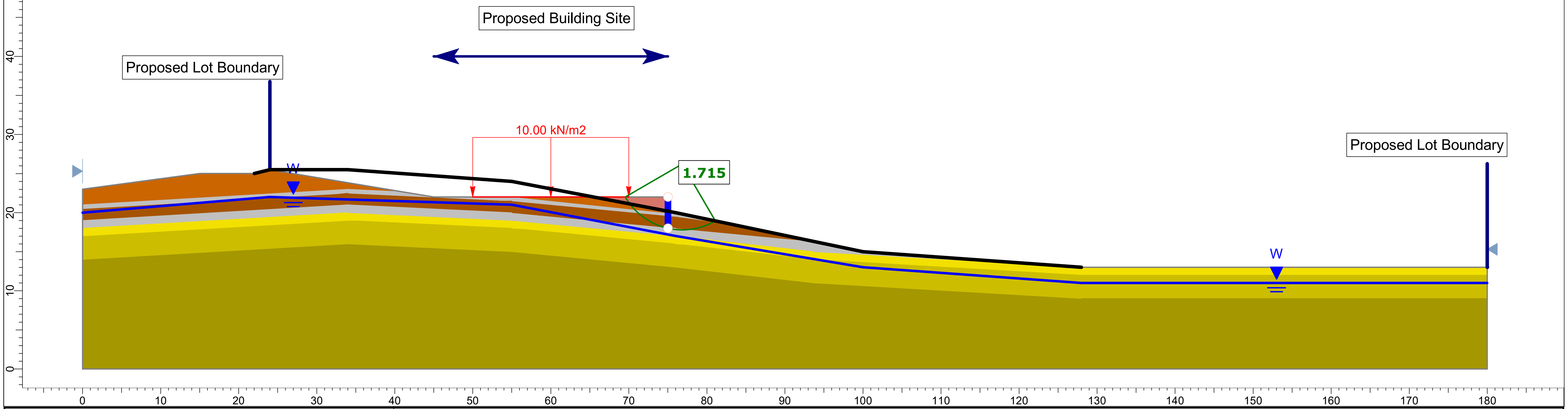
FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section D - Proposed Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table
Engineered Fill		20	Mohr-Coulomb	8	35	Water Table

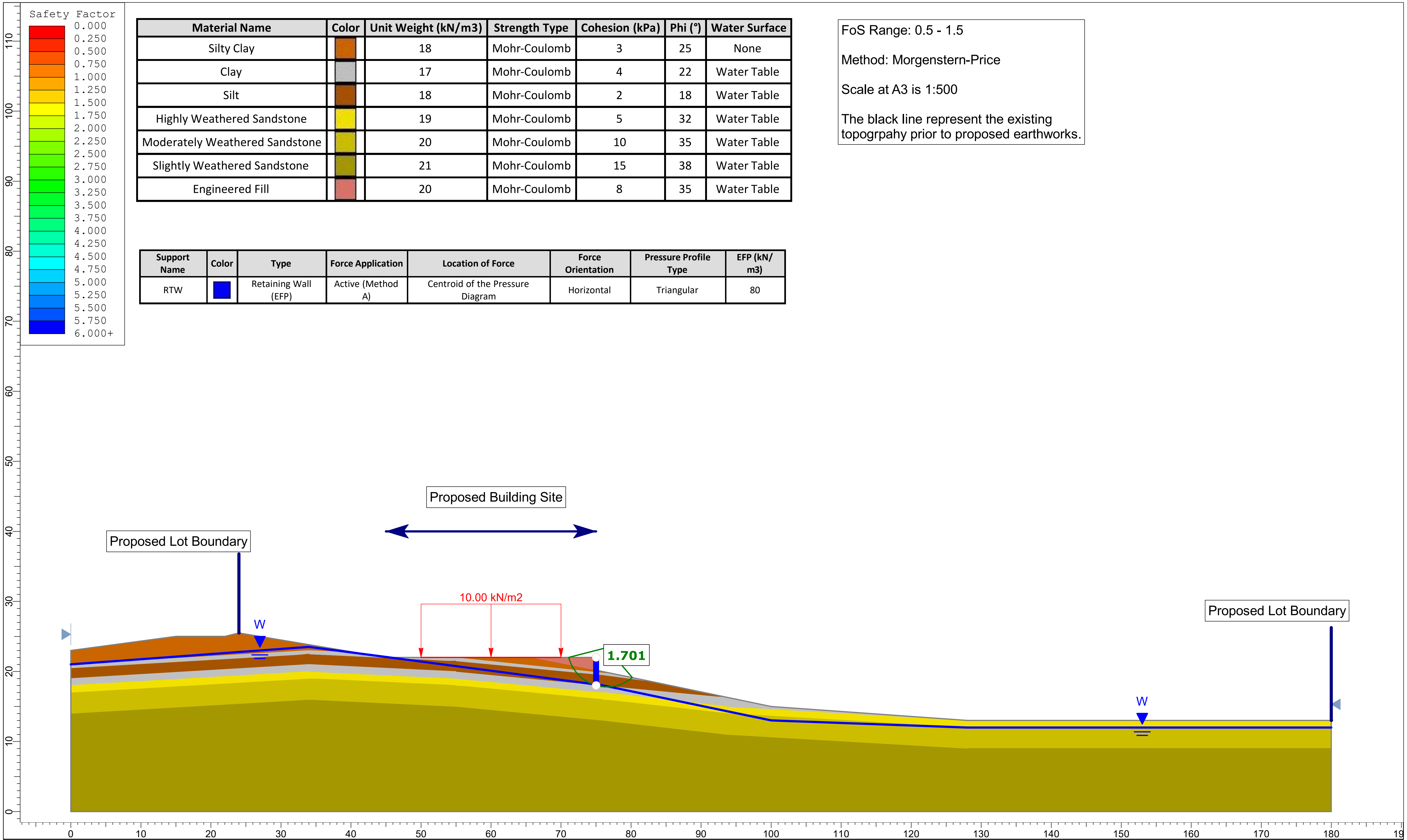
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.



Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section D - Proposed Conditions	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	None
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table
Slightly Weathered Sandstone		21	Mohr-Coulomb	15	38	Water Table
Engineered Fill		20	Mohr-Coulomb	8	35	Water Table

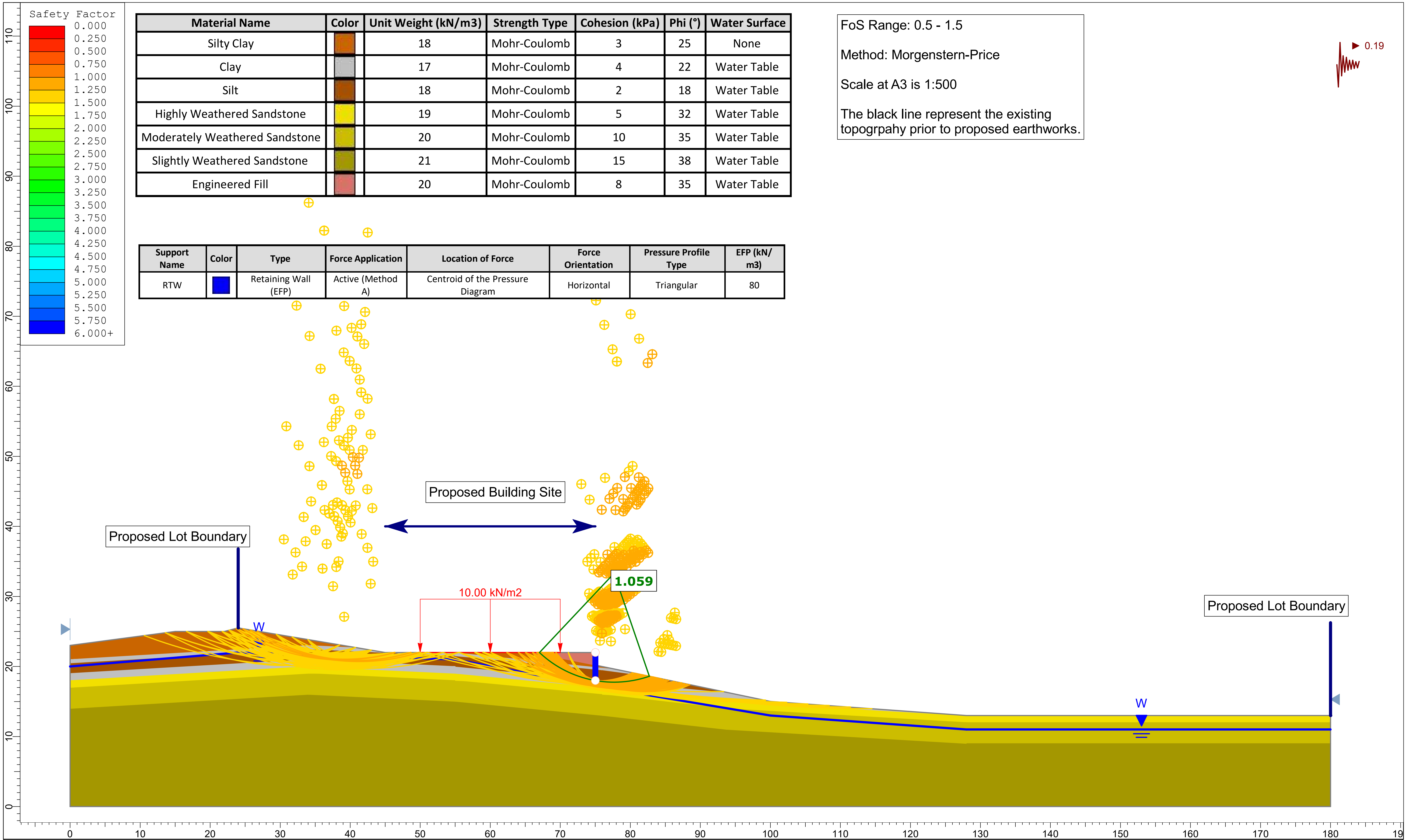
FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

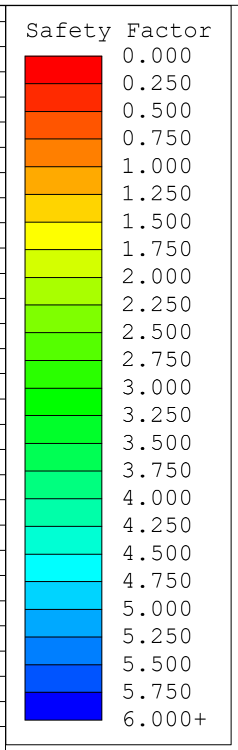
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80



SLIDEINTERPRET 9.036

Hawthorn Geddes
engineers & architects ltd

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section D - Proposed Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

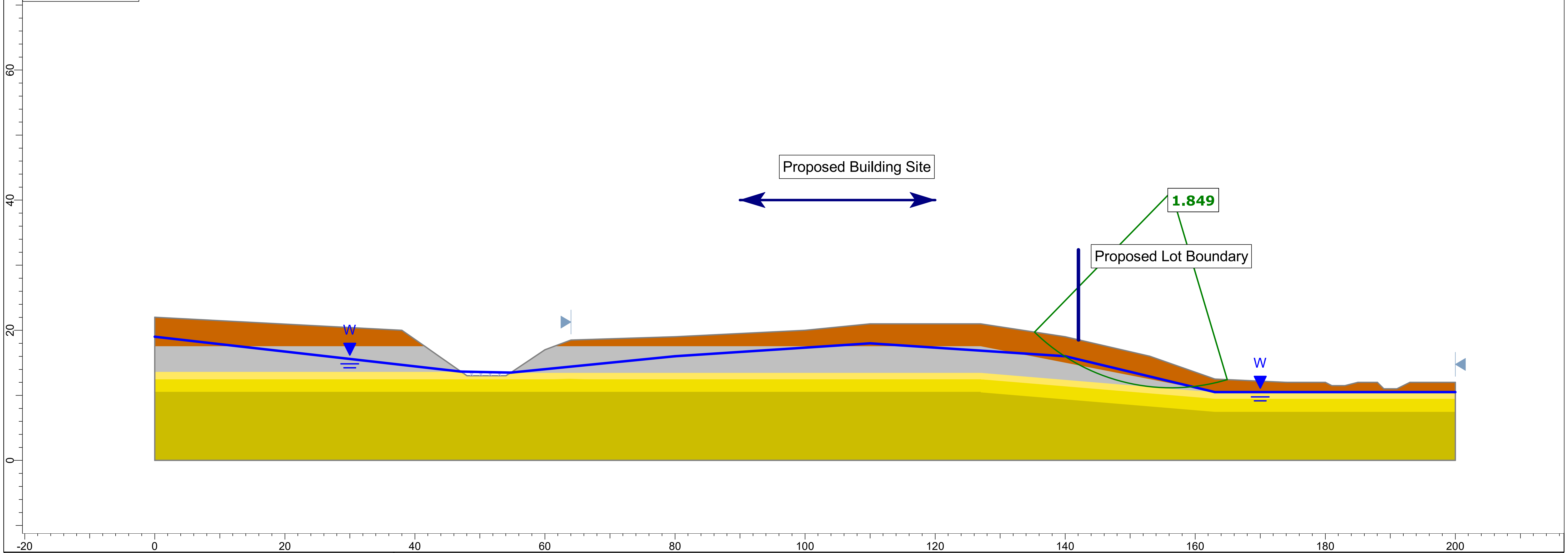


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

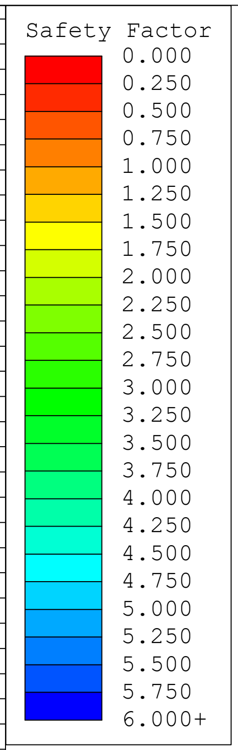
FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600



Hawthorn Geddes engineers & architects ltd	*Project*	Tripark Farms - Subdivision Suitability	
	Group	Cross-Section E - Existing Conditions (L to R)	*Scenario* NGWT
	Drawn By	KB	*Company* HGEA
SLIDEINTERPRET 9.036	*Date*	5/11/2024, 3:37:40 p.m.	*File Name* geo 241105 slide assessment 13270.slmd

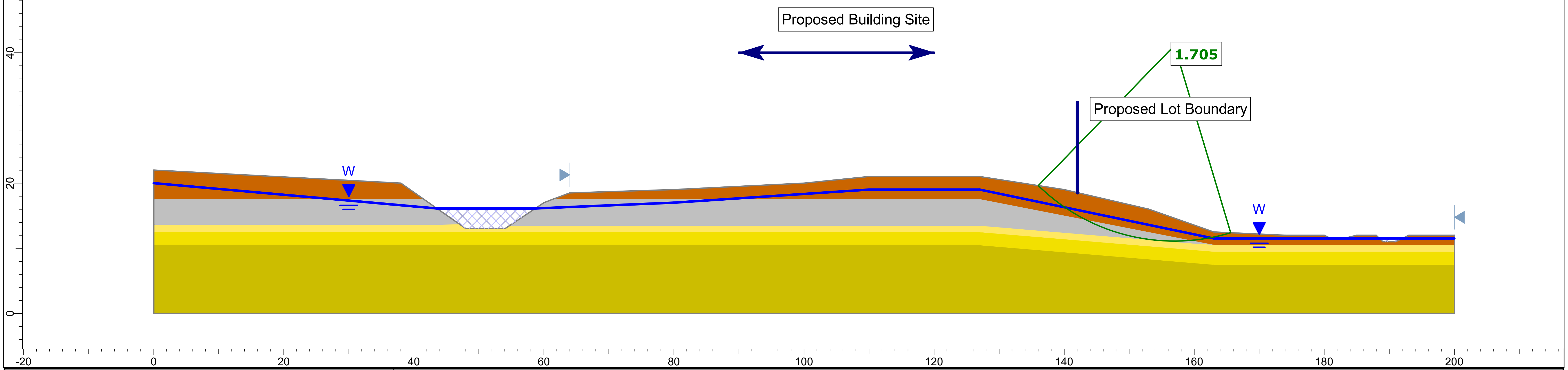


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600



Hawthorn Geddes engineers & architects ltd

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section E - Existing Conditions (L to R)	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

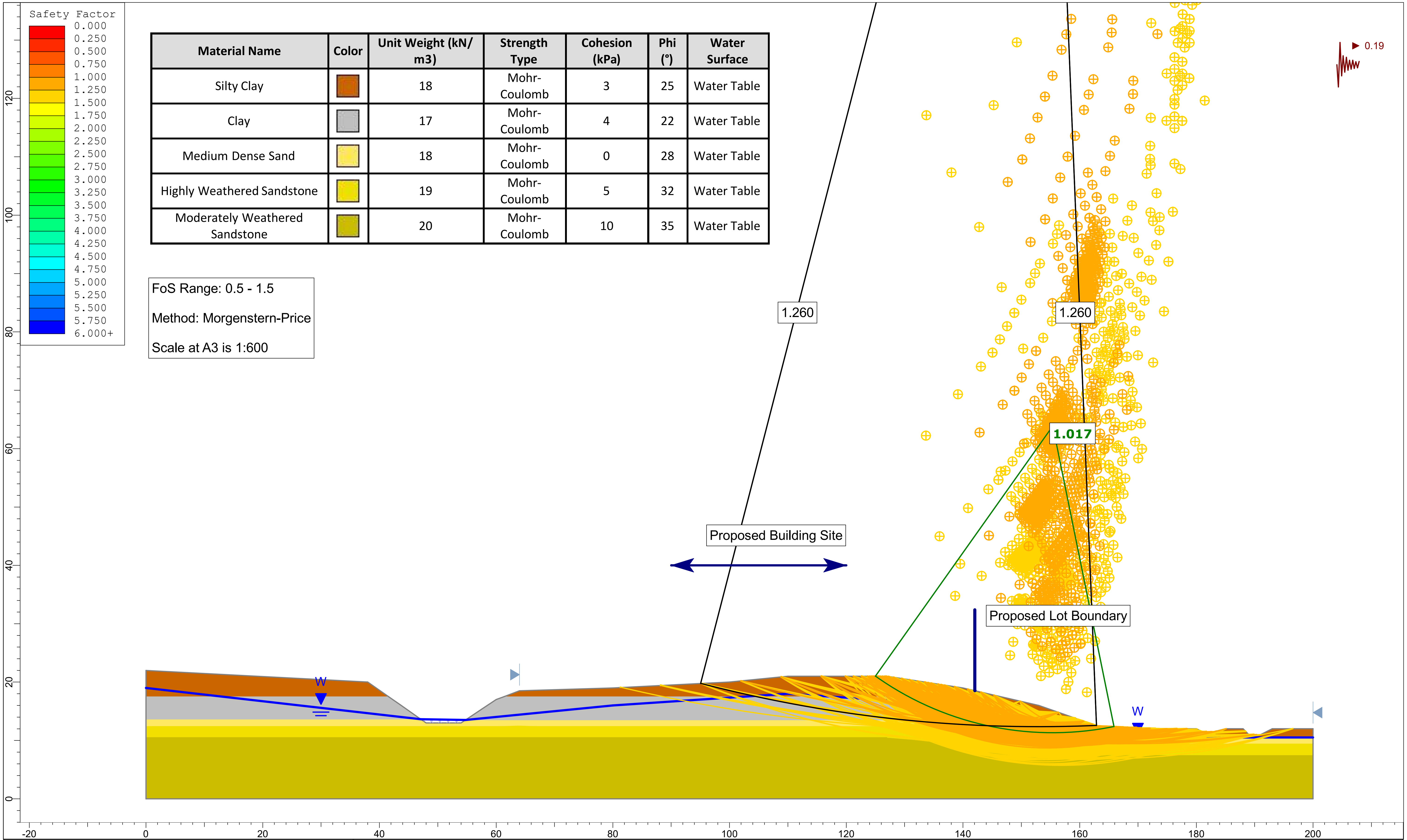
SLIDEINTERPRET 9.036

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

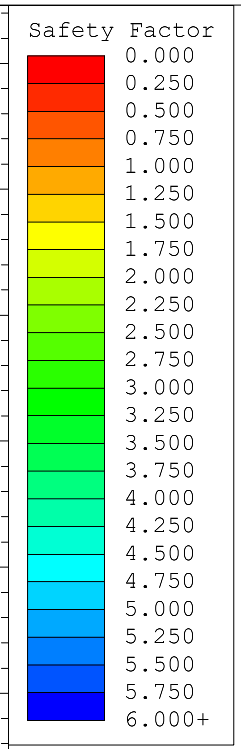
FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600



Hawthorn Geddes engineers & architects ltd	Project: Tripark Farms - Subdivision Suitability		
	Group: Cross-Section E - Existing Conditions (L to R)	Scenario: Seismic - DCLS	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd	

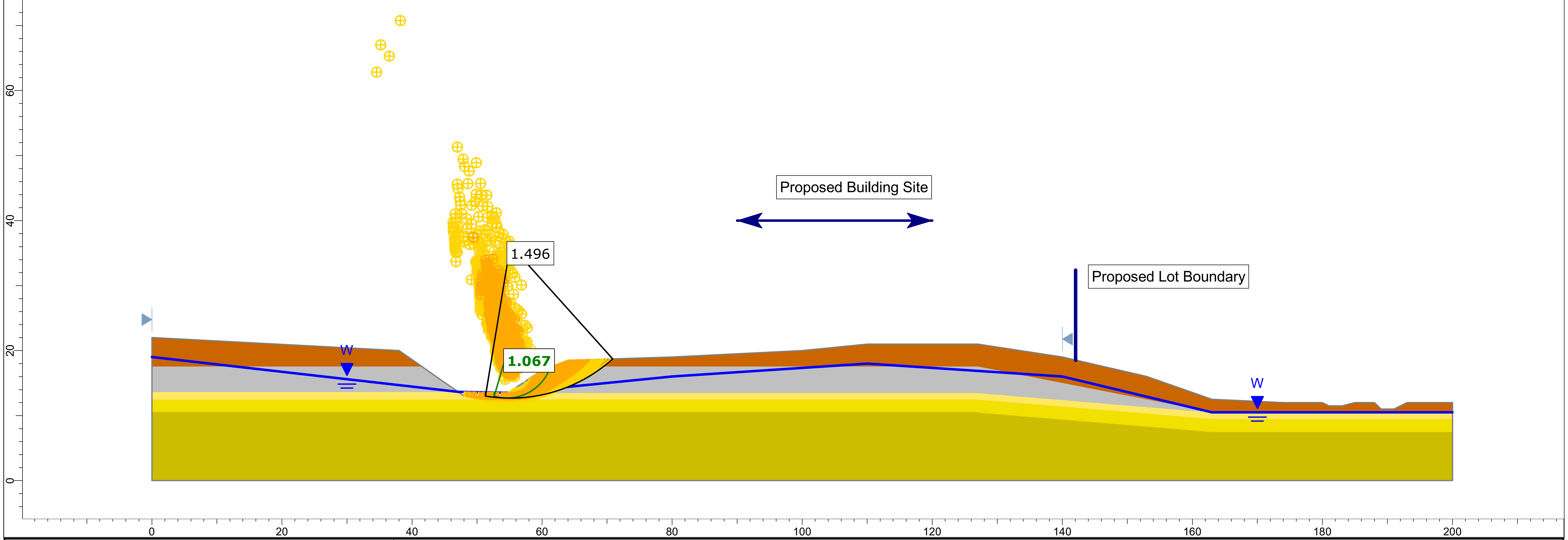


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

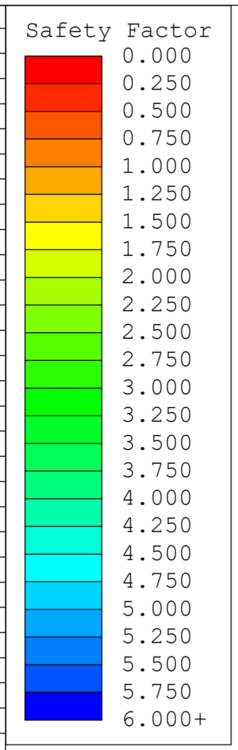
Scale at A3 is 1:600



Hawthorn Geddes engineers & architects ltd

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section E - Existing Conditions (R to L)	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036

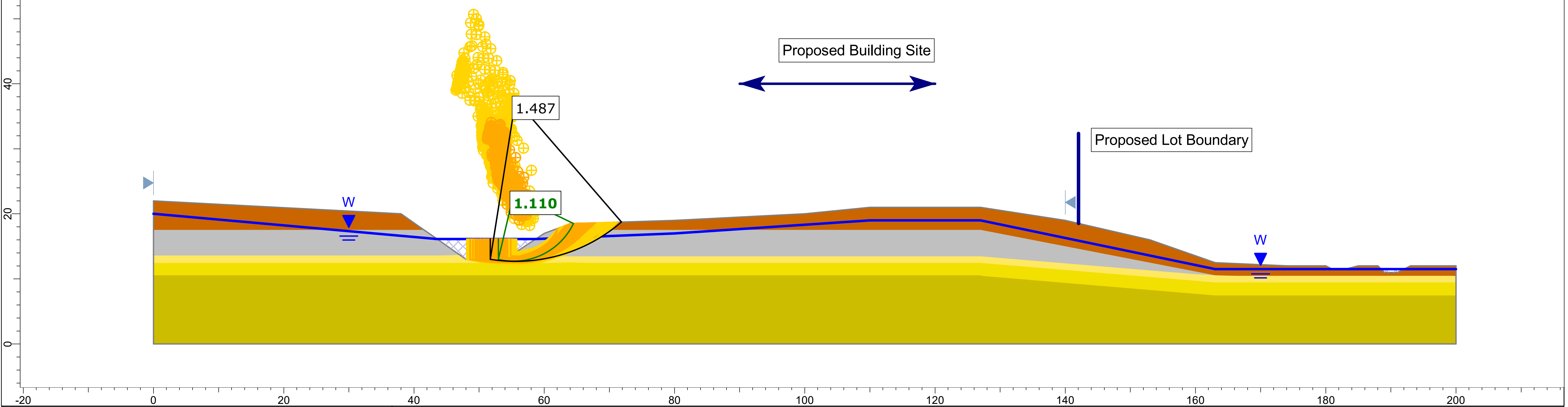


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

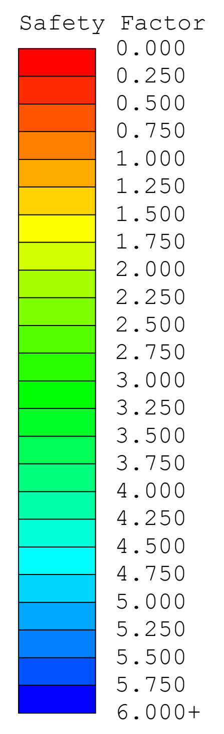
Scale at A3 is 1:600



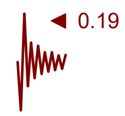
Hawthorn Geddes engineers & architects ltd

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section E - Existing Conditions (R to L)
Scenario	EGWT
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036



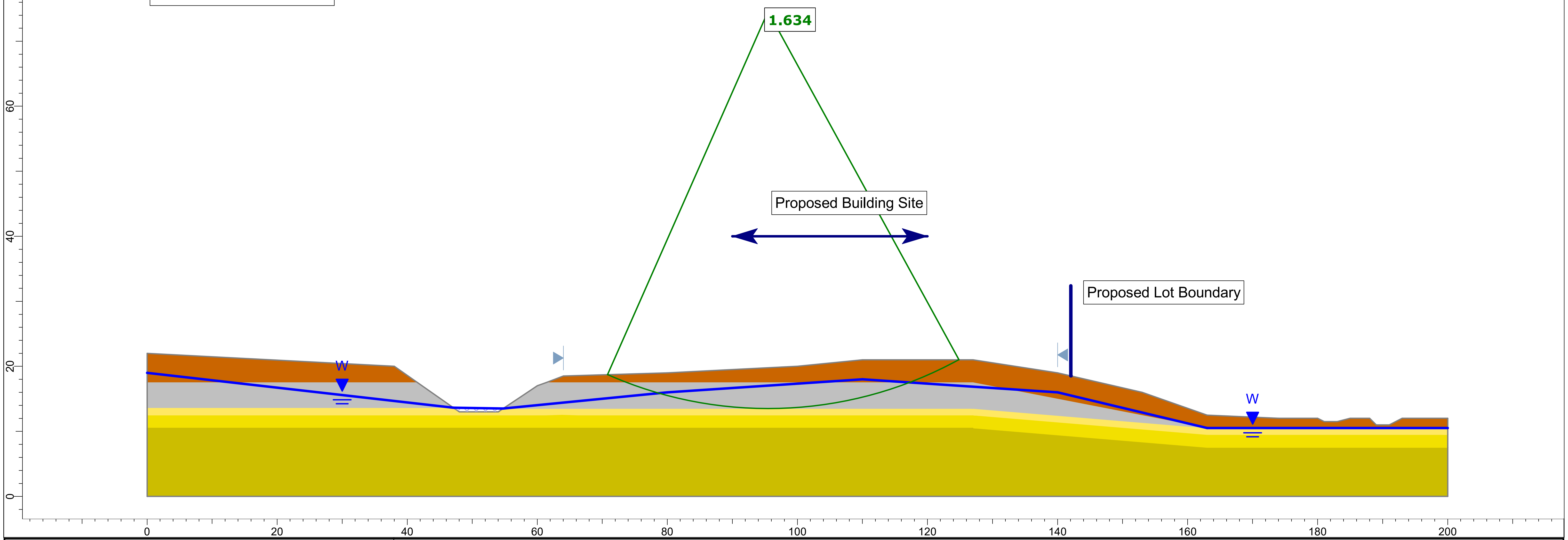
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table



FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600



Hawthorn Geddes engineers & architects ltd

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section E - Existing Conditions (R to L)	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036

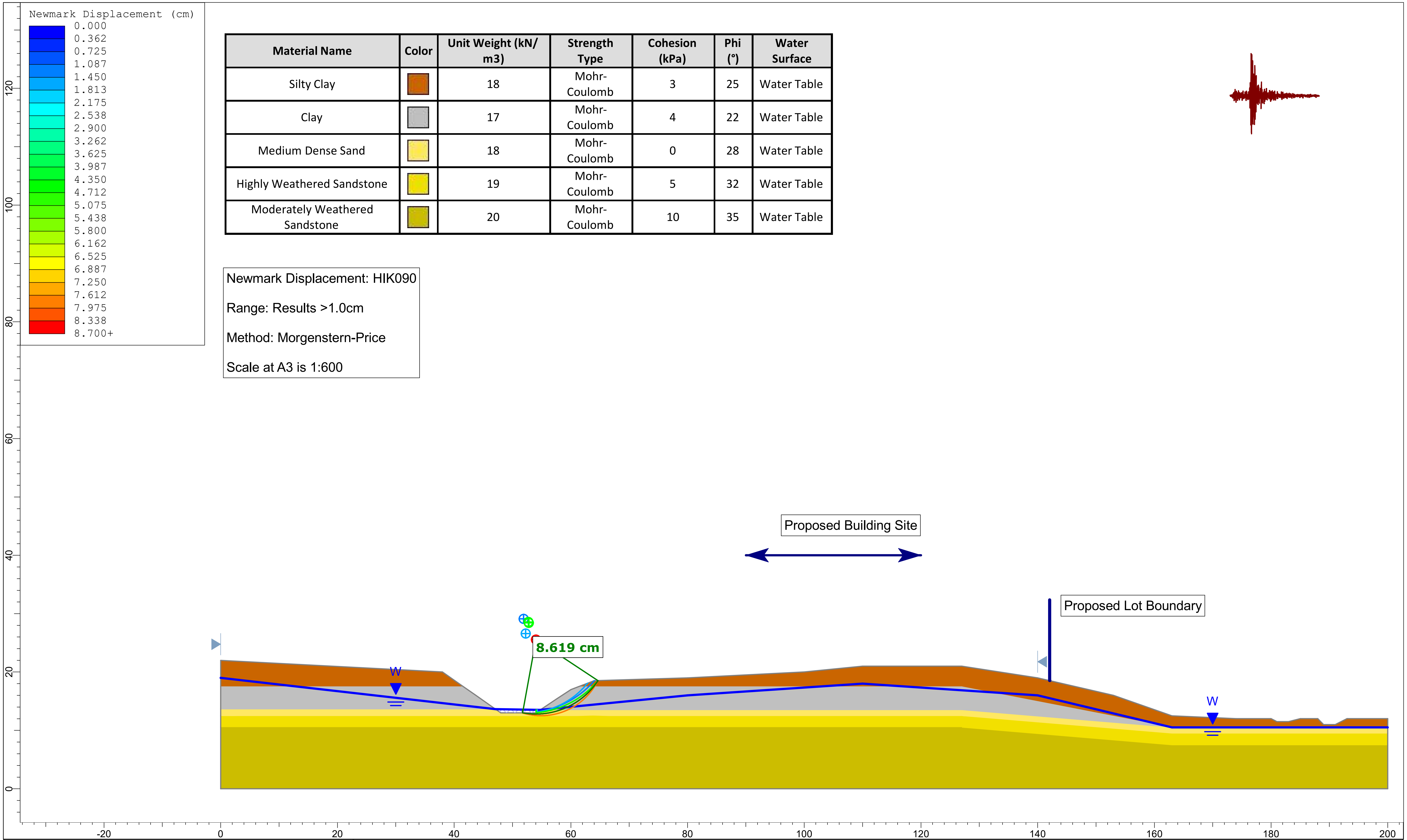
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

Newmark Displacement: HIK090

Range: Results >1.0cm

Method: Morgenstern-Price

Scale at A3 is 1:600



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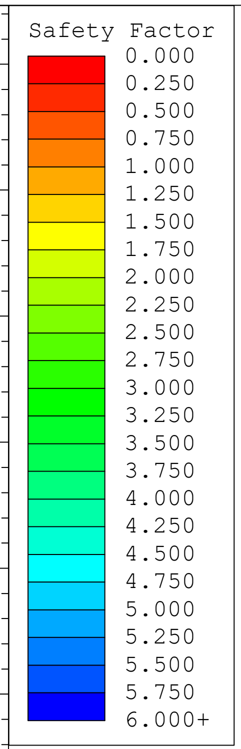
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section E - Existing Conditions (R to L)
Scenario	Newmark Displacement
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
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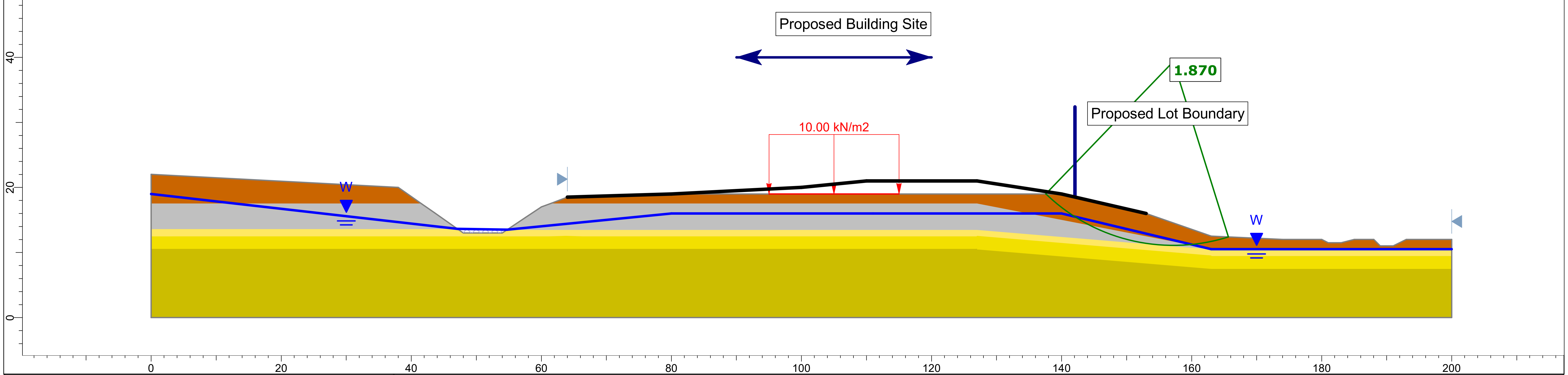
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600

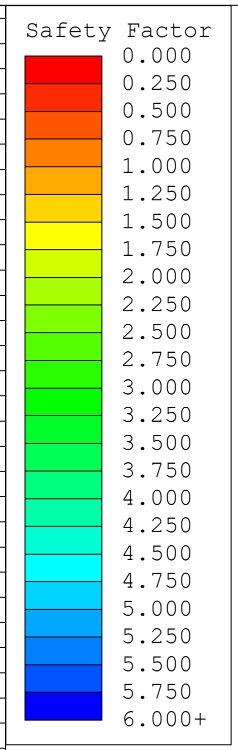
The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section E - Proposed Conditions (L to R)
Scenario	NGWT
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd



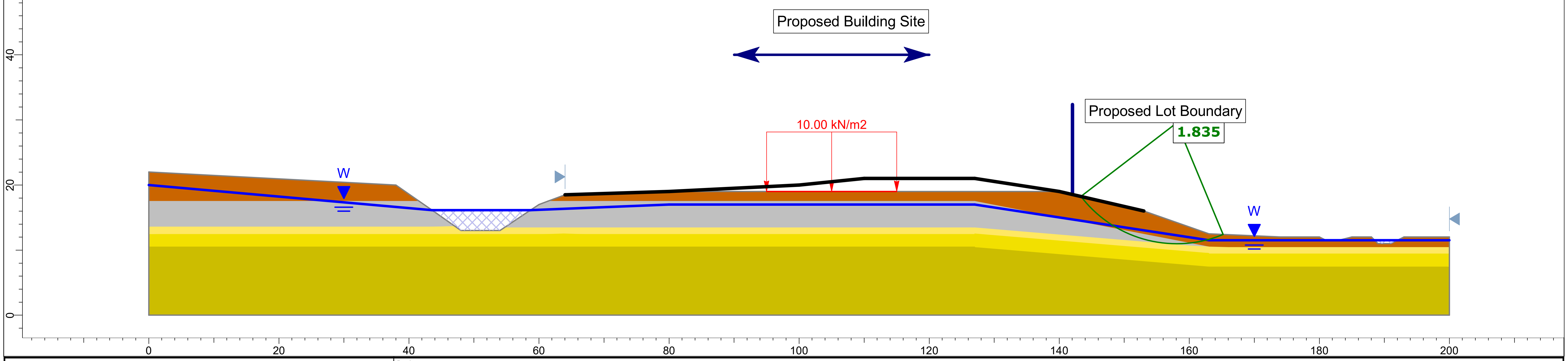
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600

The black line represent the existing topogrpahy prior to proposed earthworks.



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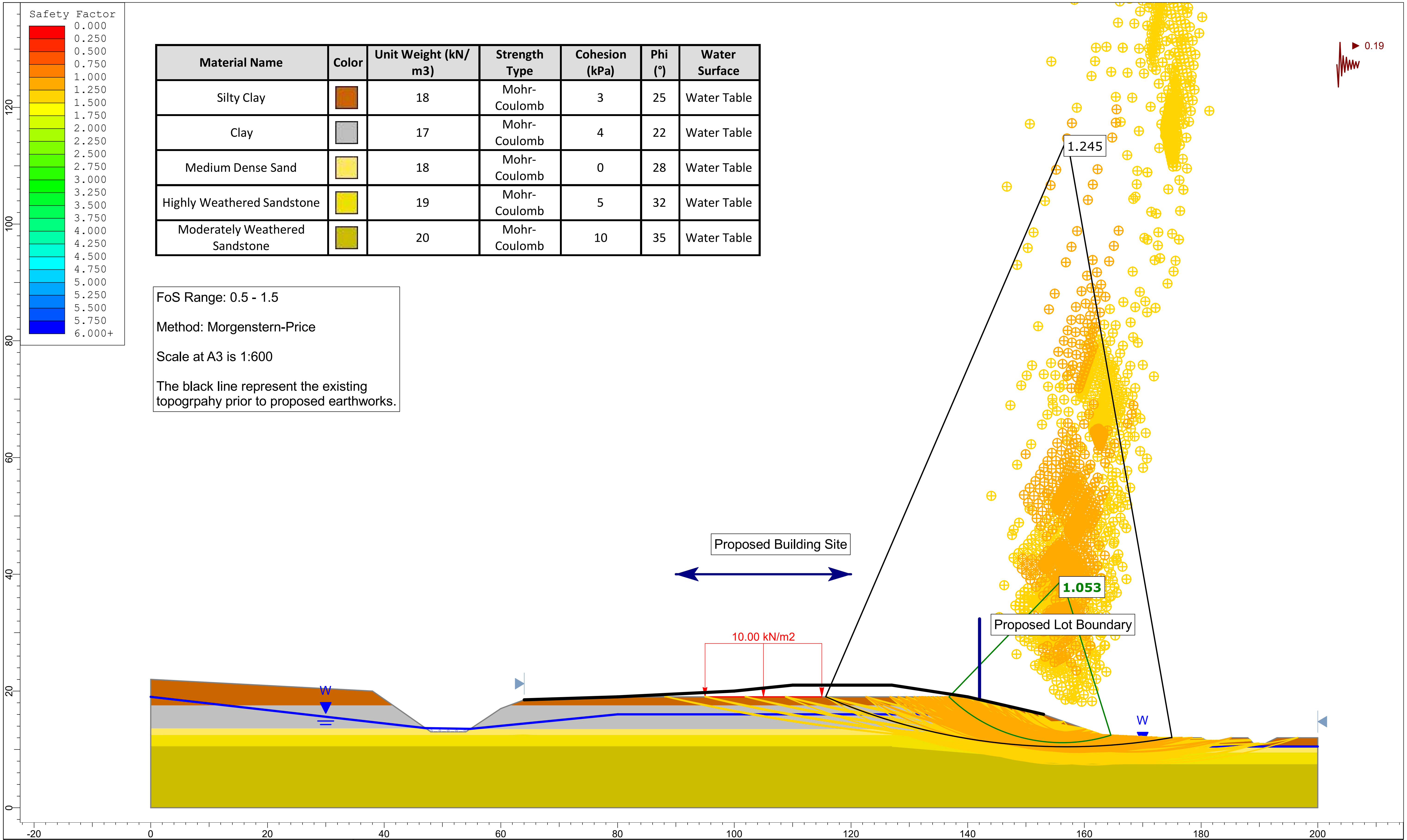
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section E - Proposed Conditions (L to R)
Scenario	EGWT
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600

The black line represent the existing topogrpahy prior to proposed earthworks.

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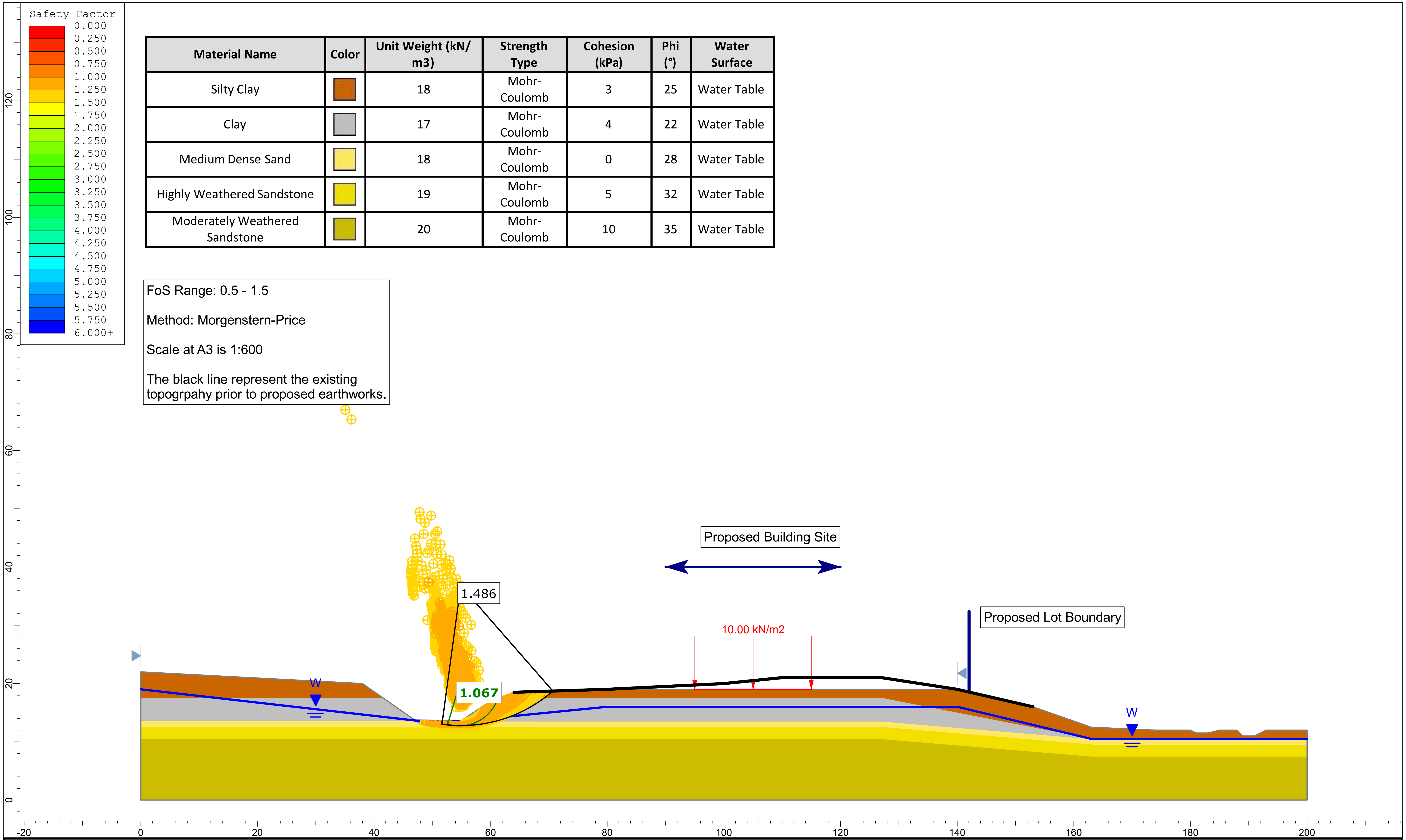
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section E - Proposed Conditions (L to R)	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600

The black line represent the existing topogrpahy prior to proposed earthworks.

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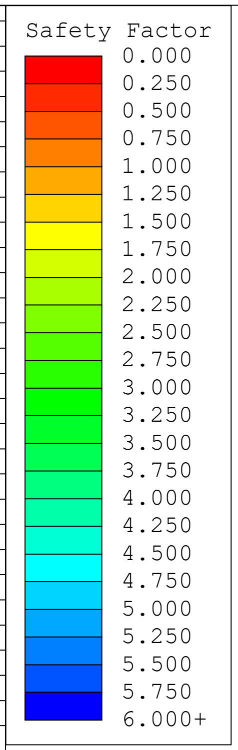
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section E - Proposed Conditions (R to L)	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



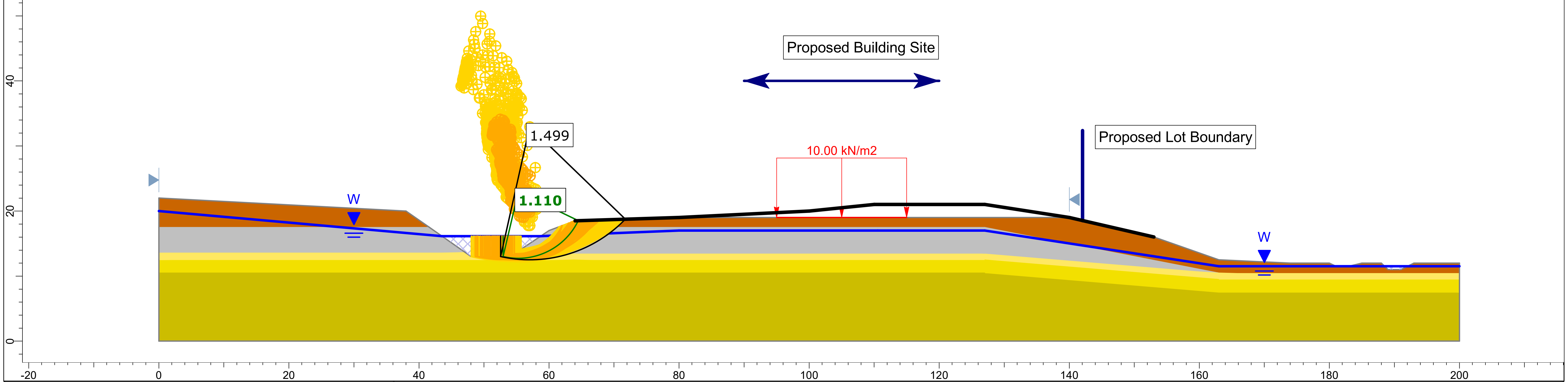
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

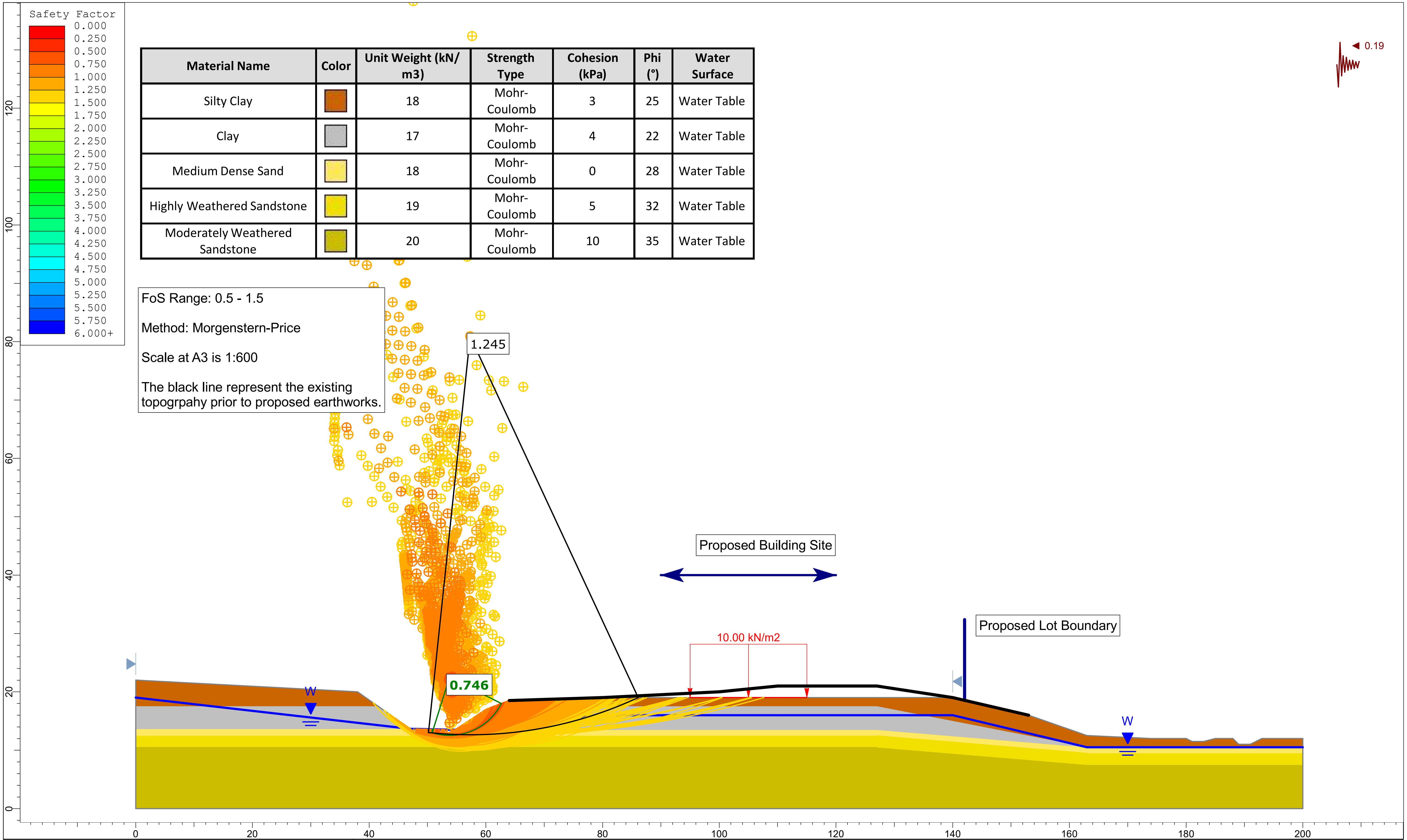
Scale at A3 is 1:600

The black line represent the existing topogrpahy prior to proposed earthworks.

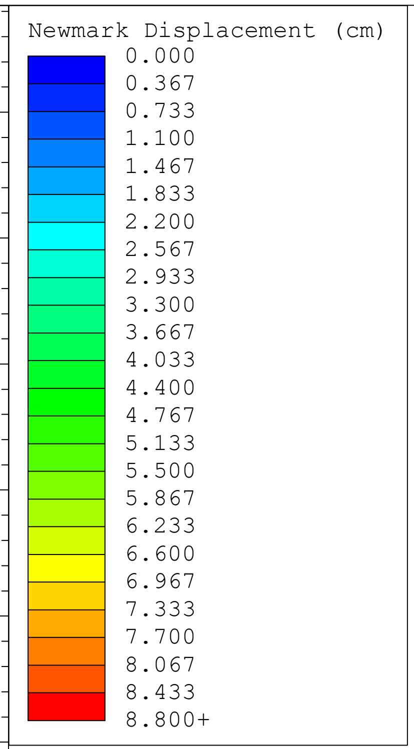


Hawthorn Geddes engineers & architects ltd	Project	Tripark Farms - Subdivision Suitability	
	Group	Cross-Section E - Proposed Conditions (R to L)	Scenario: EGWT
	Drawn By	KB	Company: HGEA
SLIDEINTERPRET 9.036	Date	5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table



Hawthorn Geddes engineers & architects ltd	Project	Tripark Farms - Subdivision Suitability	
	Group: Cross-Section E - Proposed Conditions (R to L)	Scenario: Seismic - DCLS	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd	



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
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Medium Dense Sand		18	Mohr-Coulomb	0	28	Water Table
Highly Weathered Sandstone		19	Mohr-Coulomb	5	32	Water Table
Moderately Weathered Sandstone		20	Mohr-Coulomb	10	35	Water Table

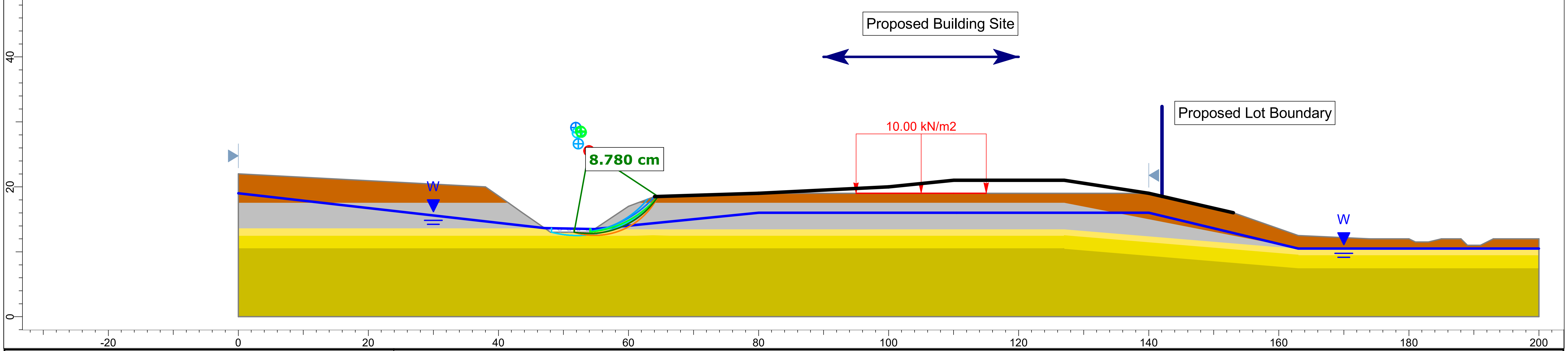
Newmark Displacement: HIK090

Range: >1.0cm

Method: Morgenstern-Price

Scale at A3 is 1:600

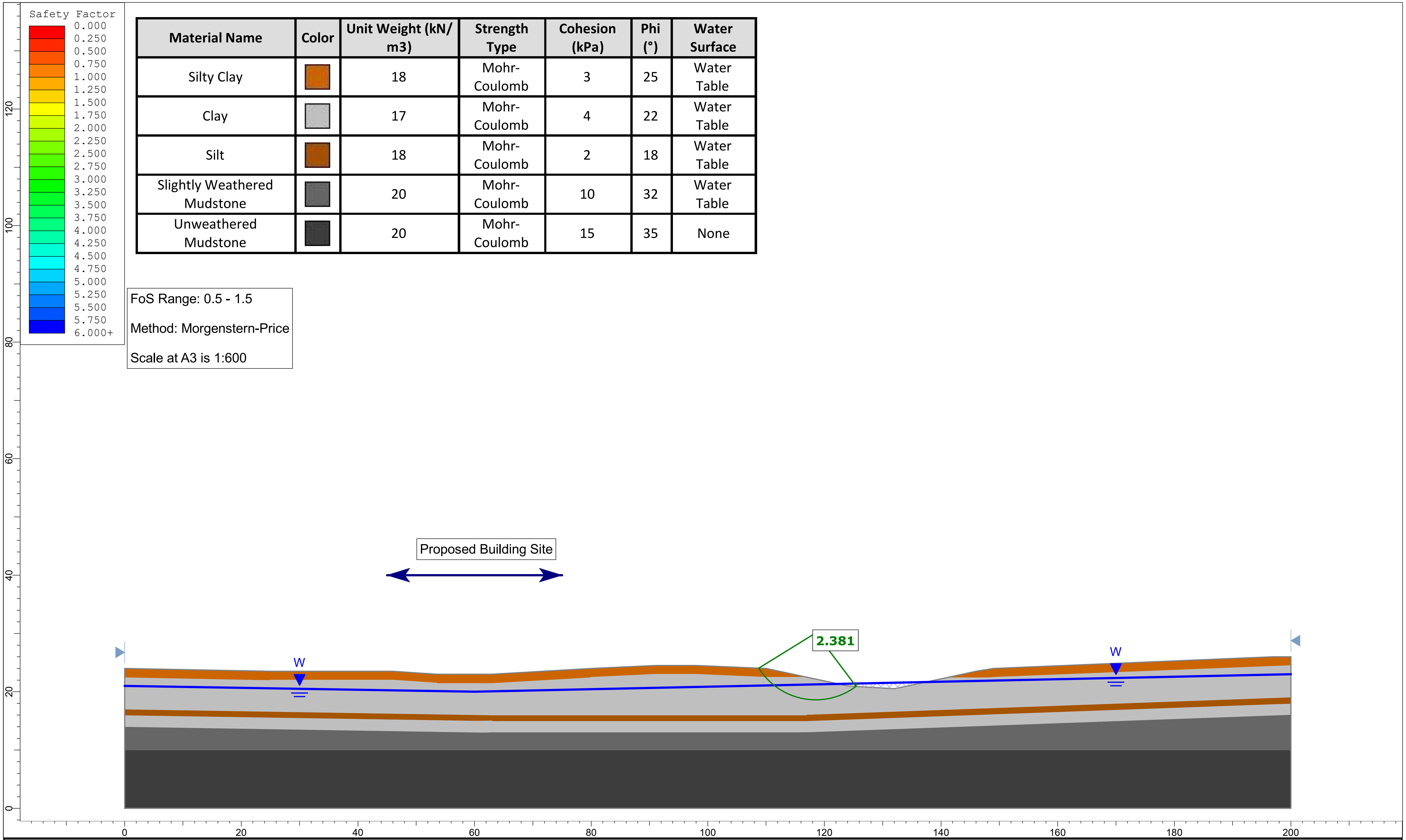
The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section E - Proposed Conditions (R to L)
Scenario	Newmark Displacement
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

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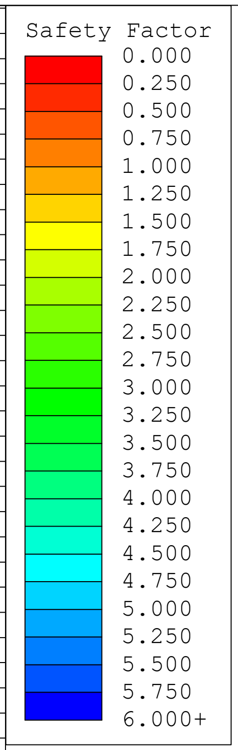
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section F - Existing Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

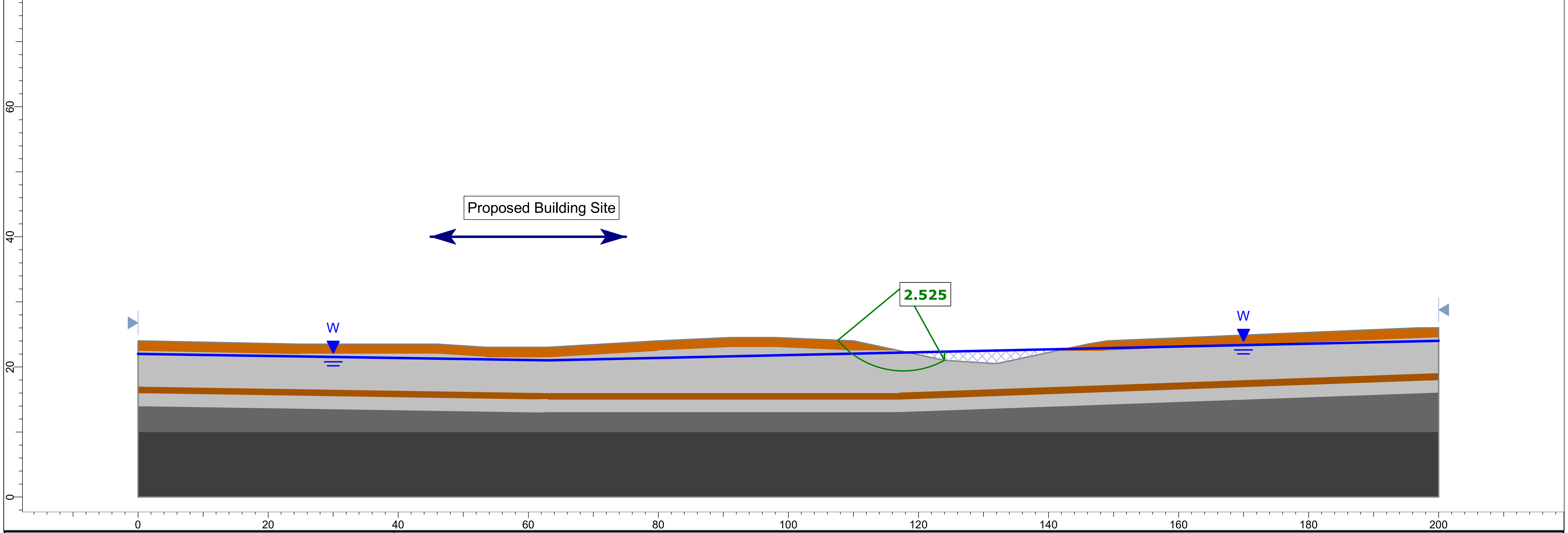


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

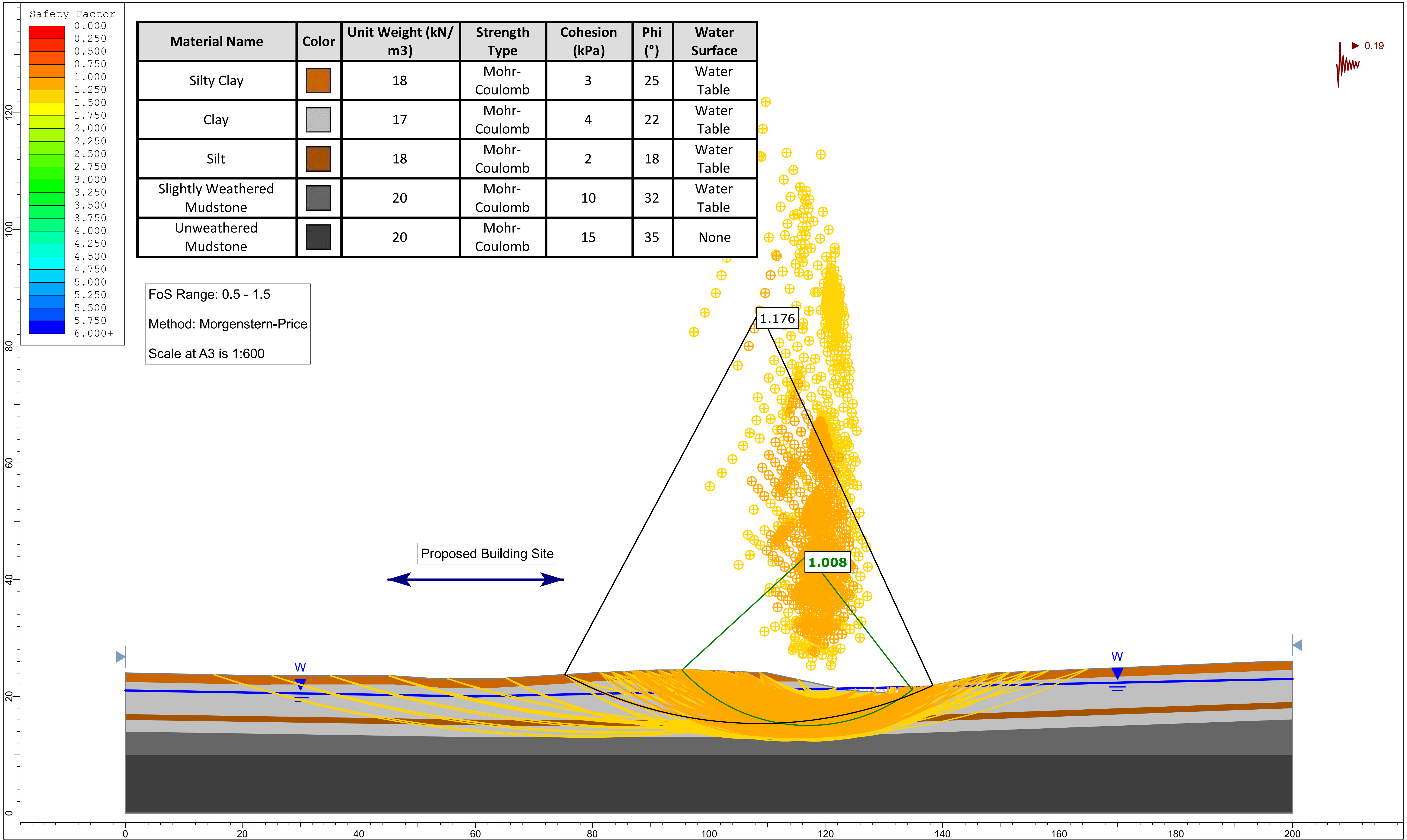
FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600



Hawthorn Geddes engineers & architects ltd	Project: Tripark Farms - Subdivision Suitability		
	Group: Cross-Section F - Existing Conditions	Scenario: EGWT	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd	



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

Hawthorn Geddes
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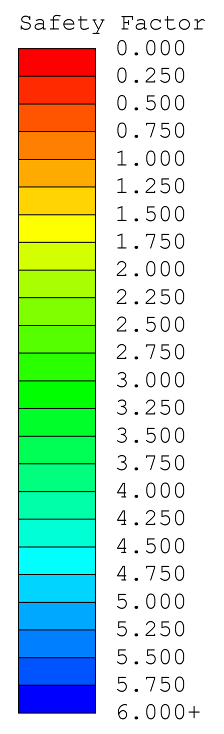
Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section F - Existing Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036



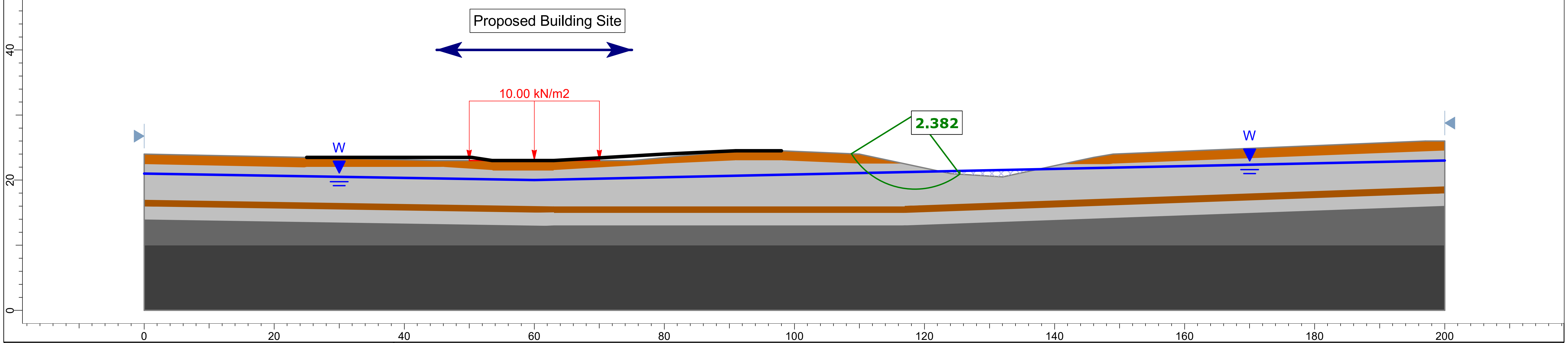
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600

The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability

Group	Cross-Section F - Proposed Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

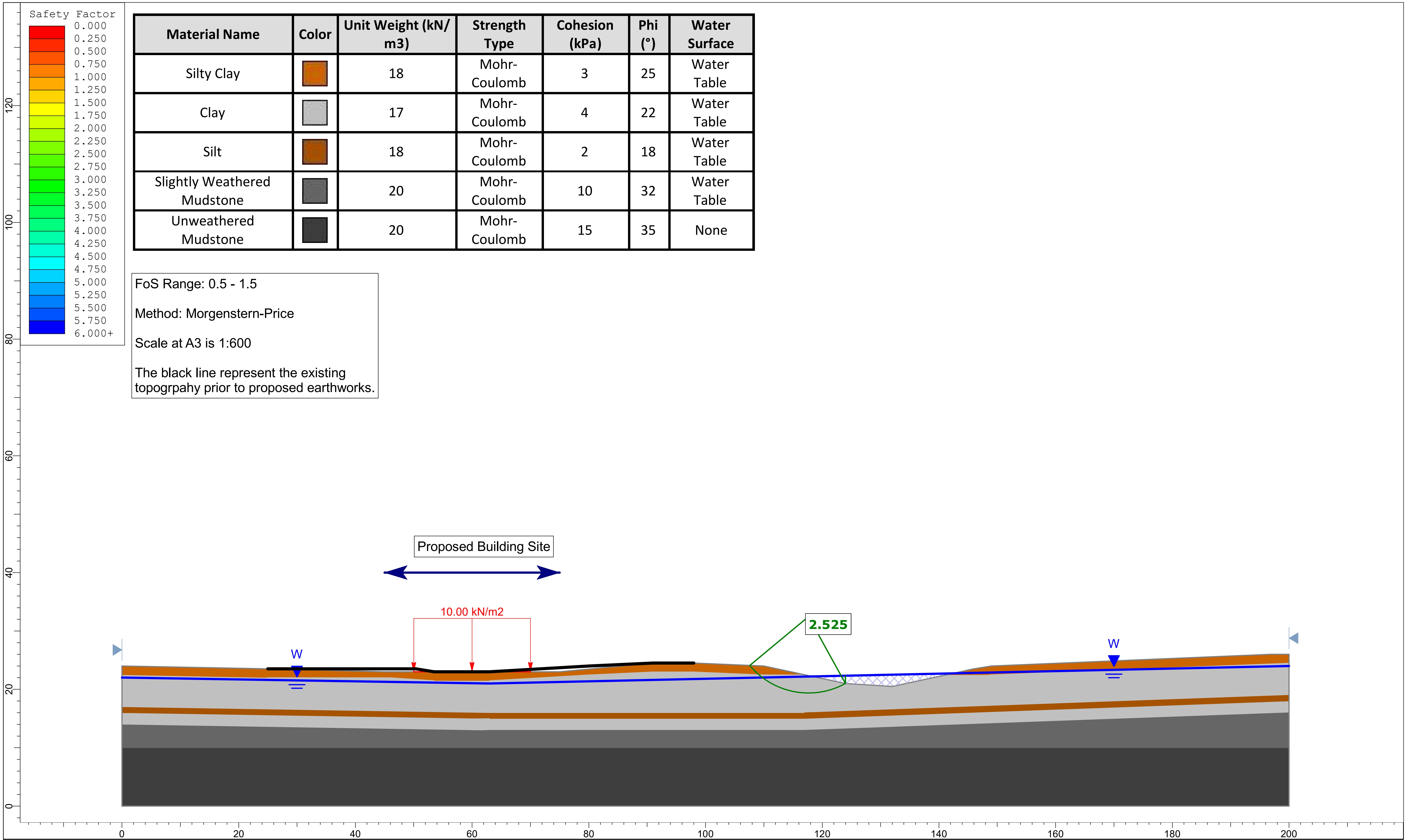
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:600

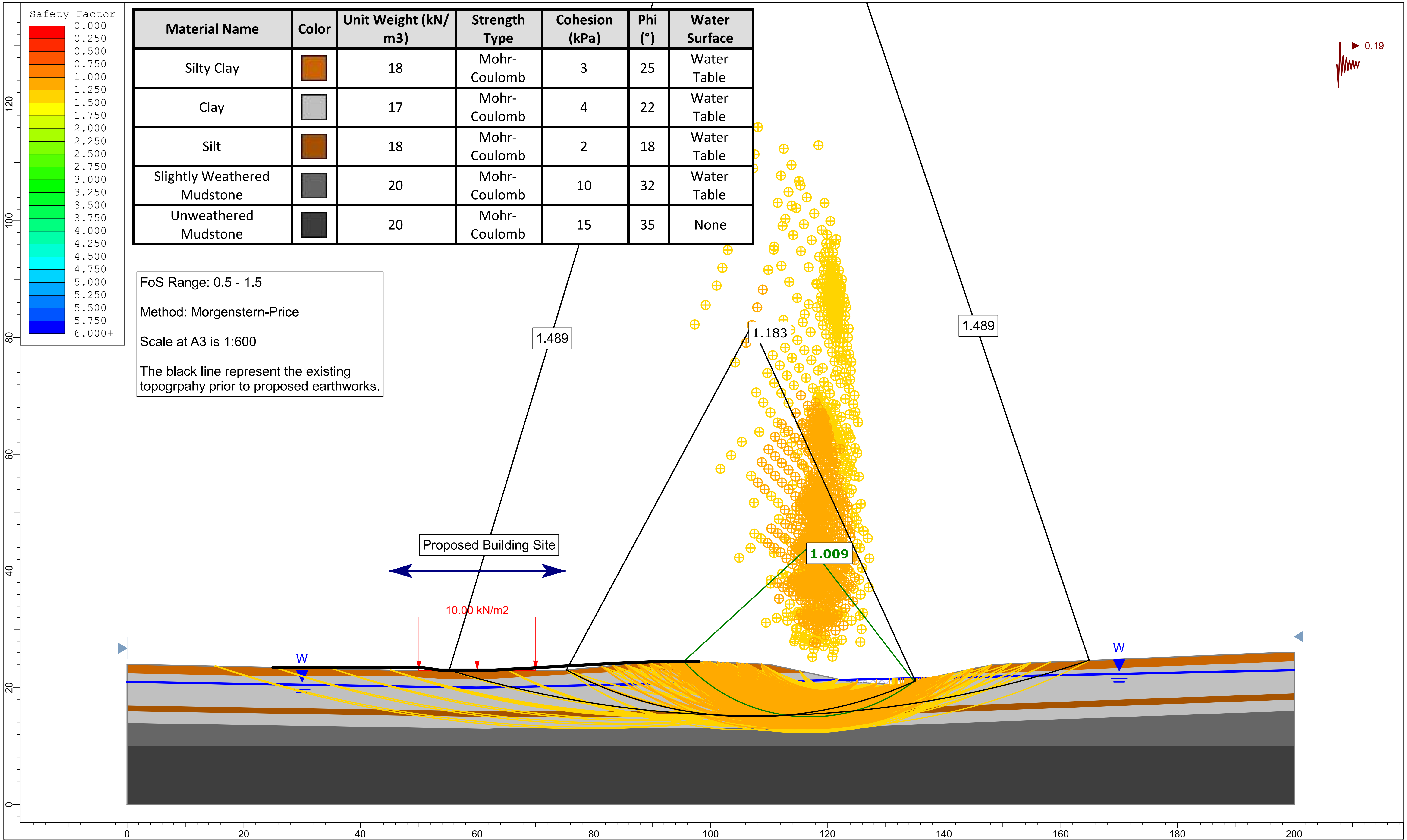
The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section F - Proposed Conditions	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

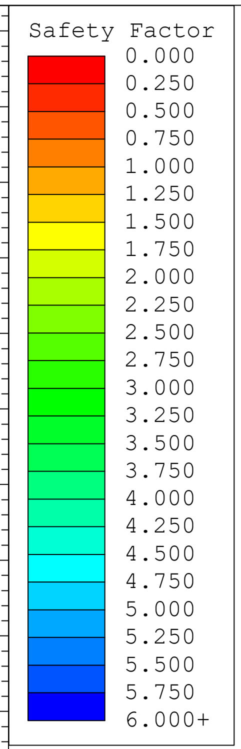
Scale at A3 is 1:600

The black line represent the existing topogrpahy prior to proposed earthworks.

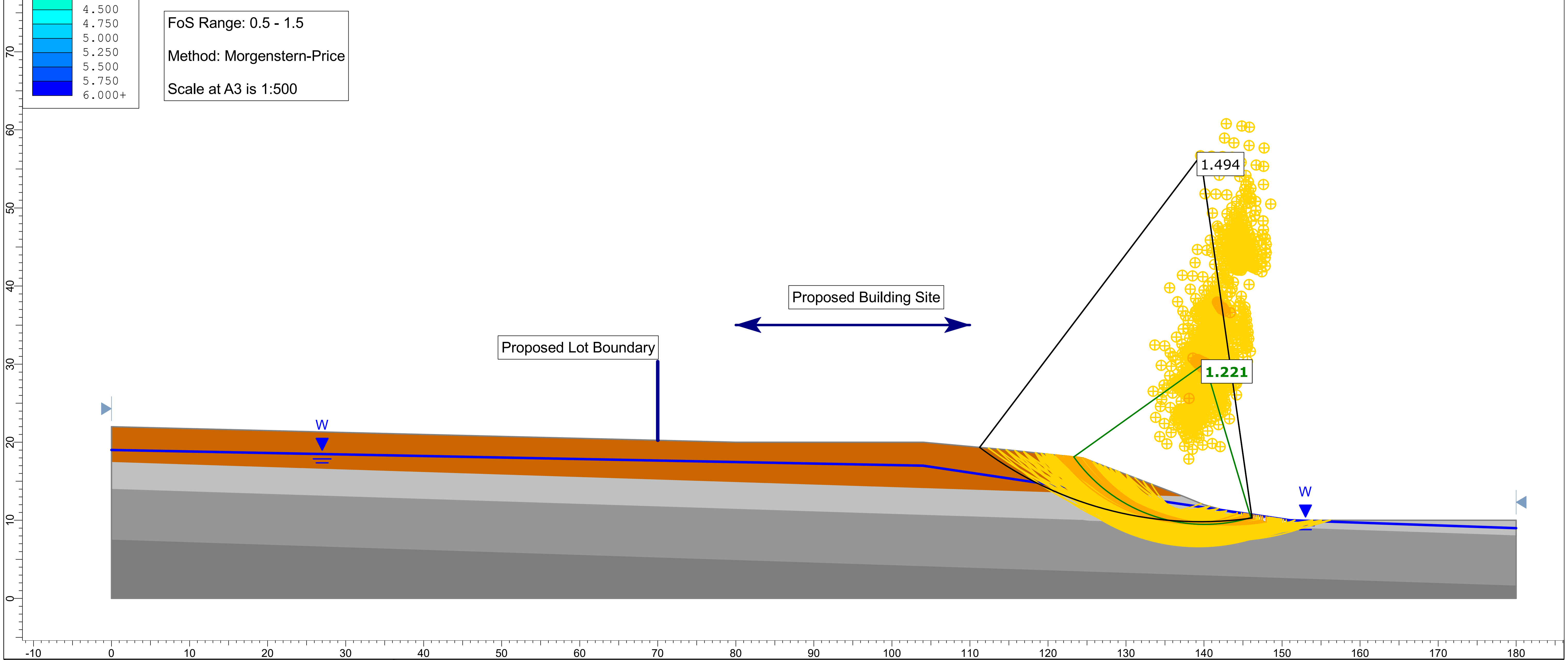
Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section F - Proposed Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



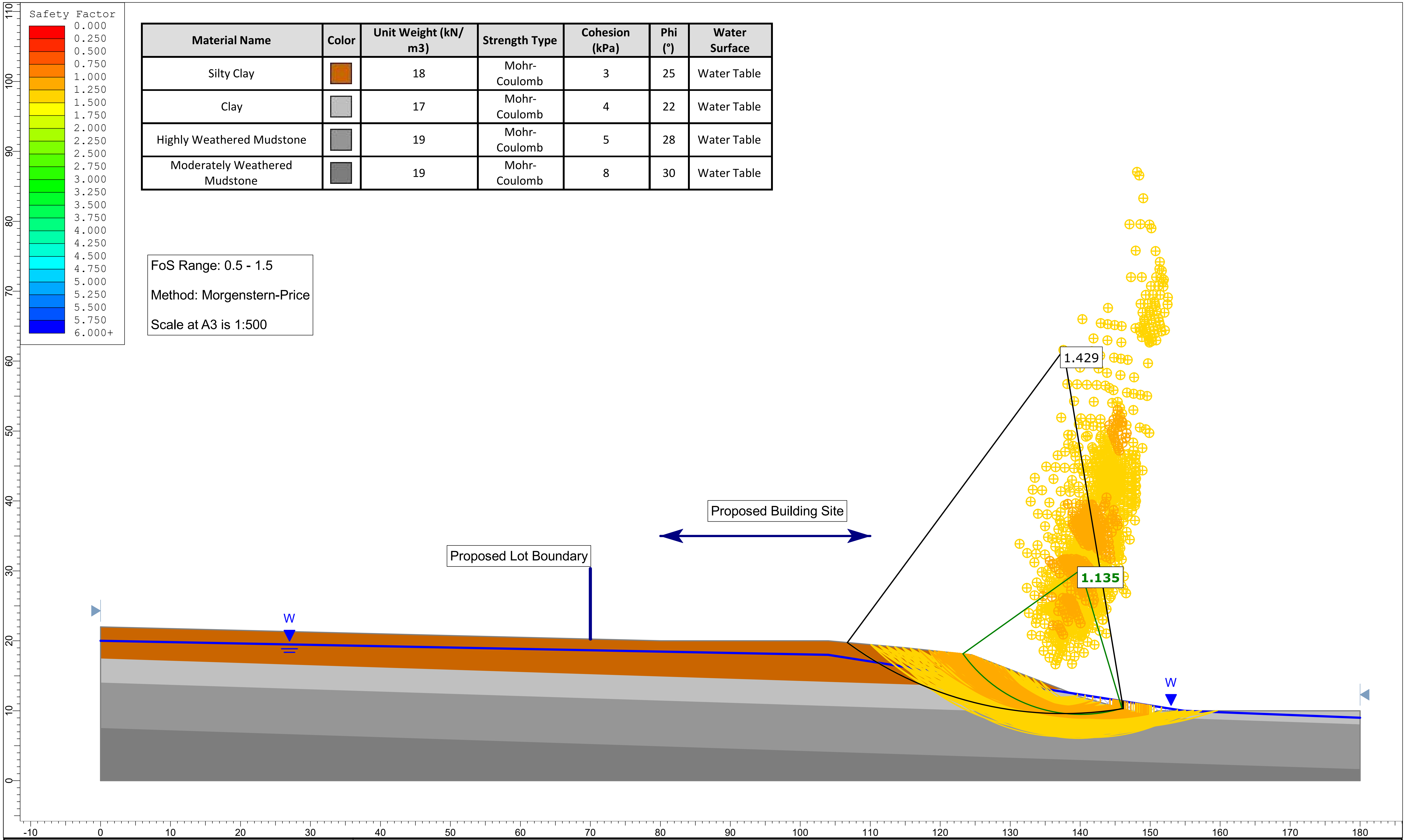
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section G - Existing Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table

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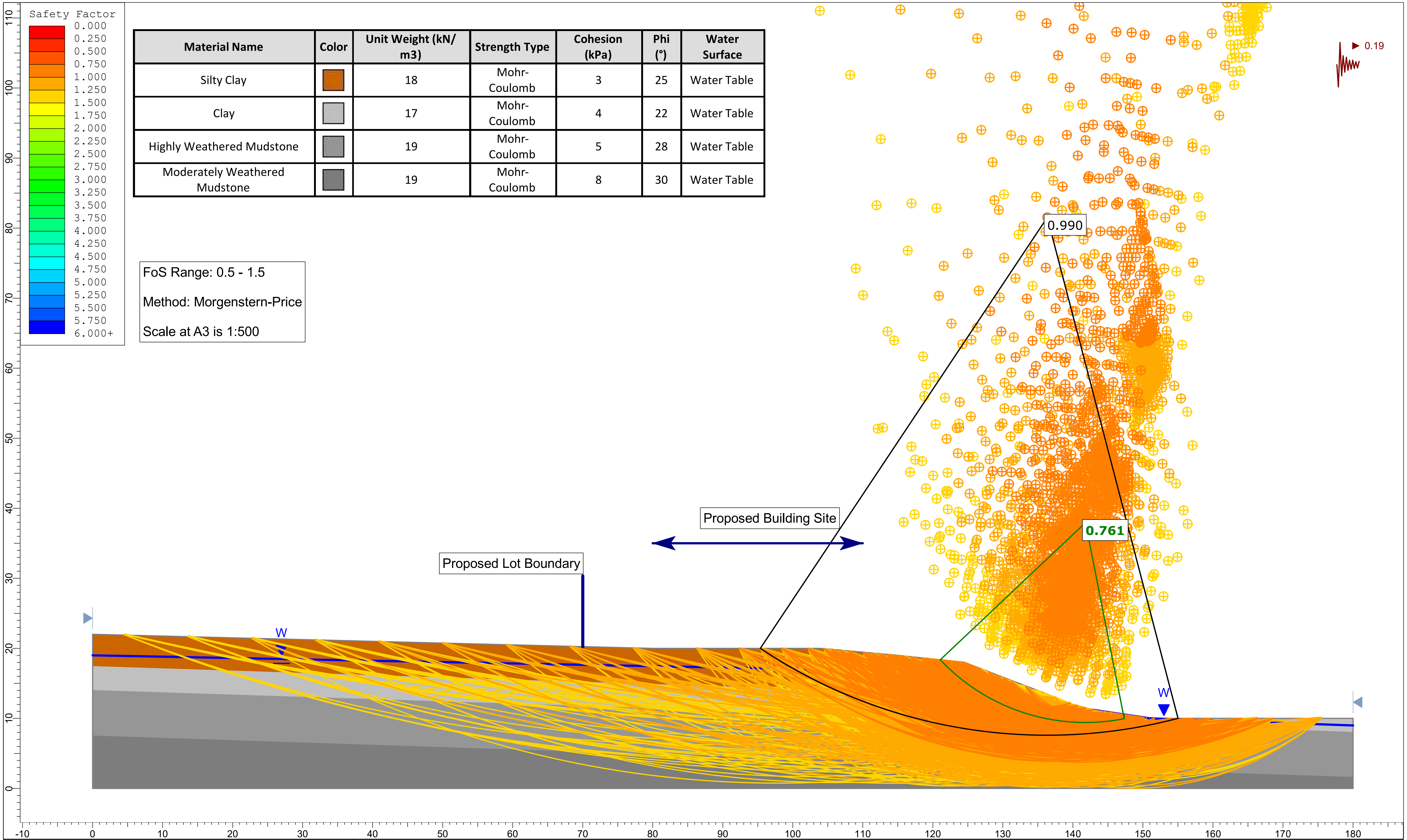
Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section G - Existing Conditions	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table

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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section G - Existing Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

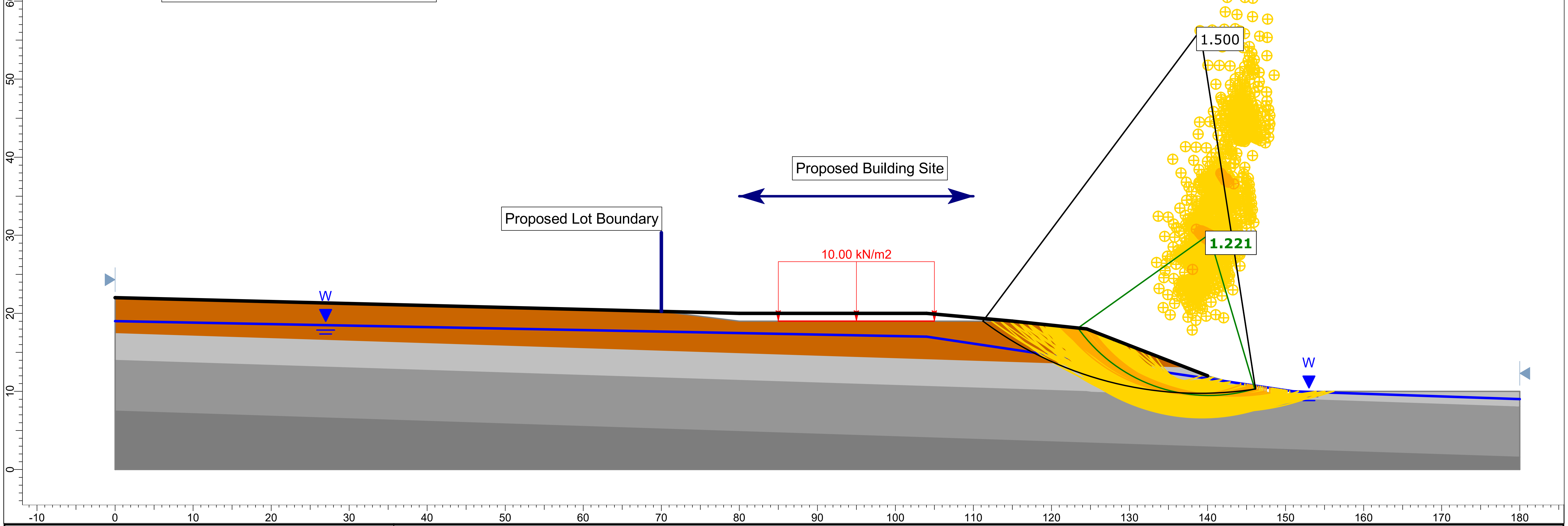
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.



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Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section G - Proposed Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036

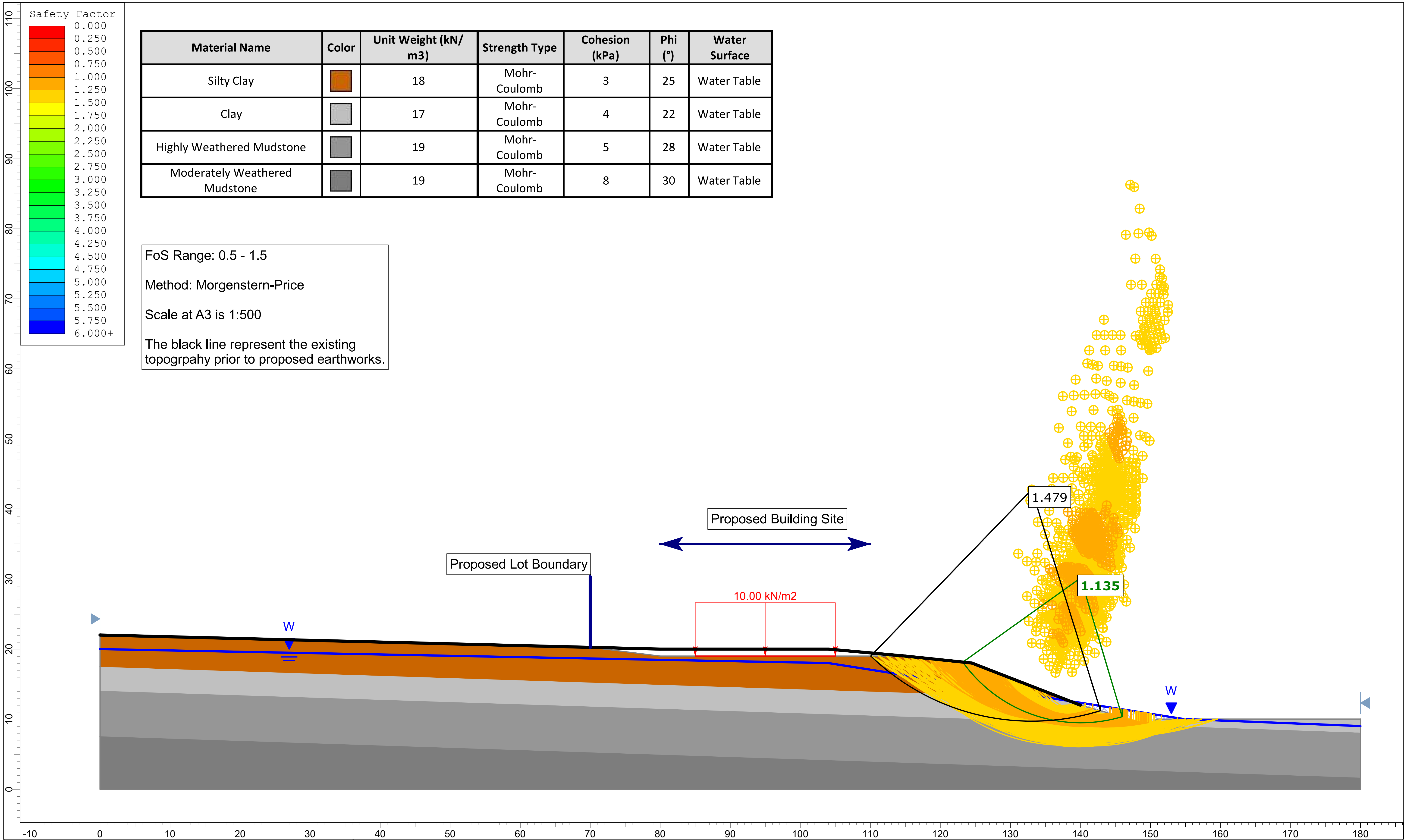
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.



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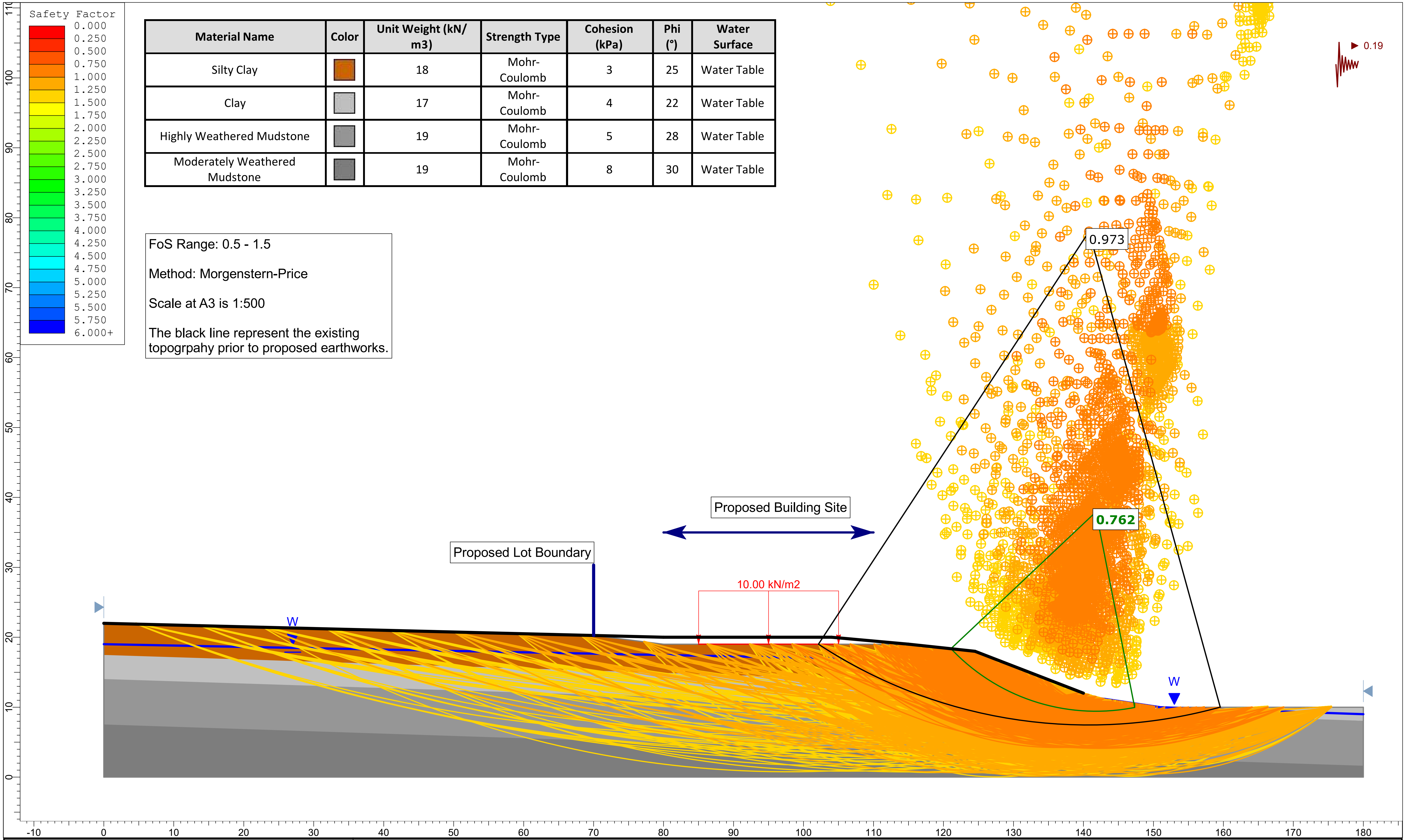
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section G - Proposed Conditions	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section G - Proposed Conditions
Scenario	Seismic - DCLS
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd

Newmark Displacement (cm)

0.000
0.063
0.125
0.188
0.250
0.313
0.375
0.438
0.500
0.563
0.625
0.688
0.750
0.813
0.875
0.938
1.000
1.063
1.125
1.188
1.250
1.313
1.375
1.438
1.500+

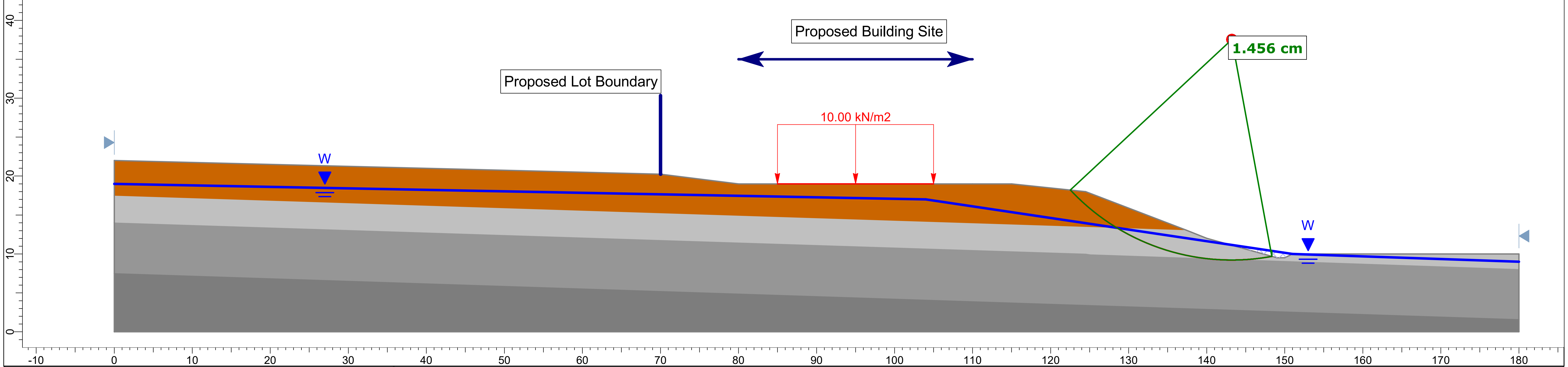
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table

Newmark Displacement: HIK090

Range: Results >1.0cm

Method: Morgenstern-Price

Scale at A3 is 1:500



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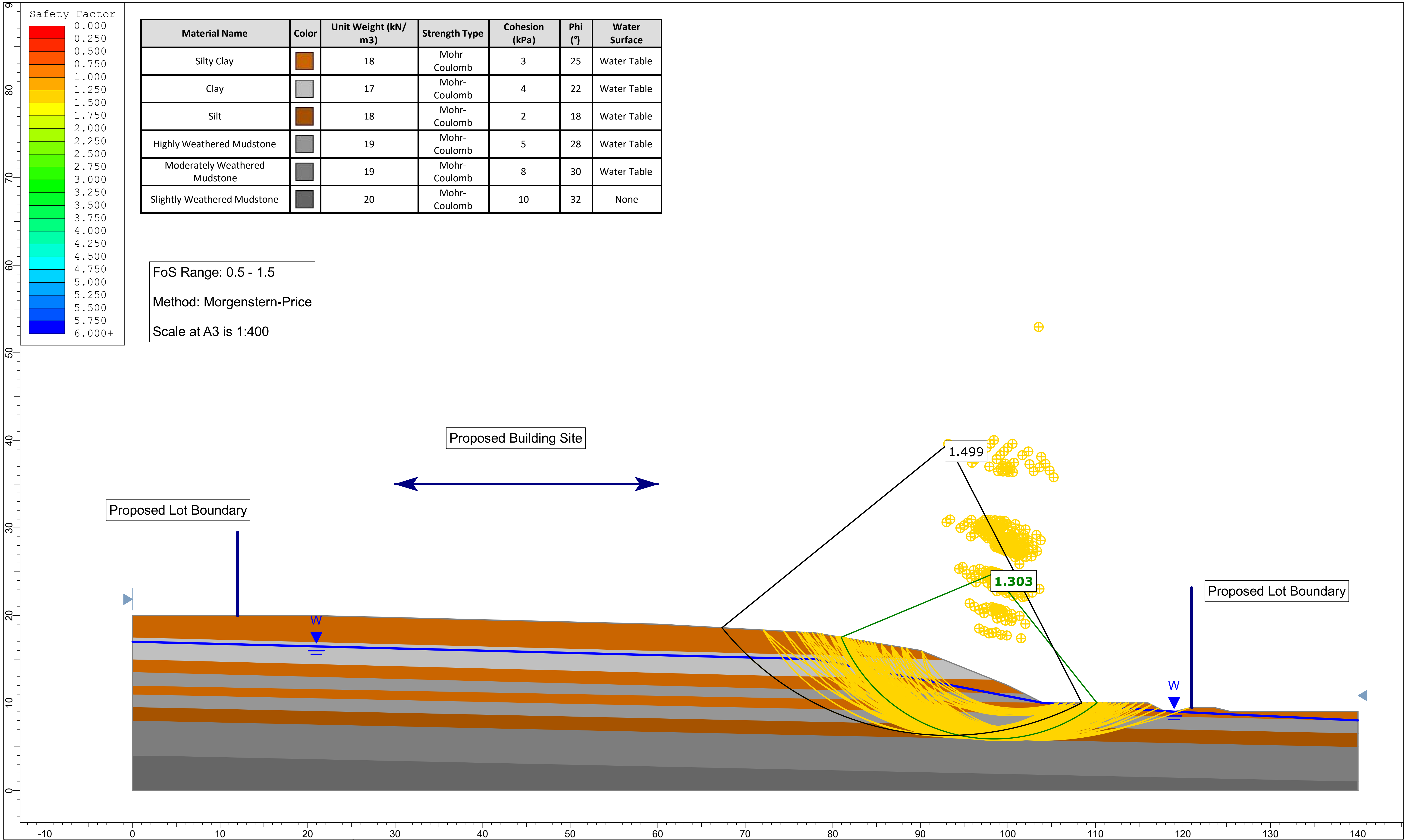
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section G - Proposed Conditions	Scenario	Newmark Displacement
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

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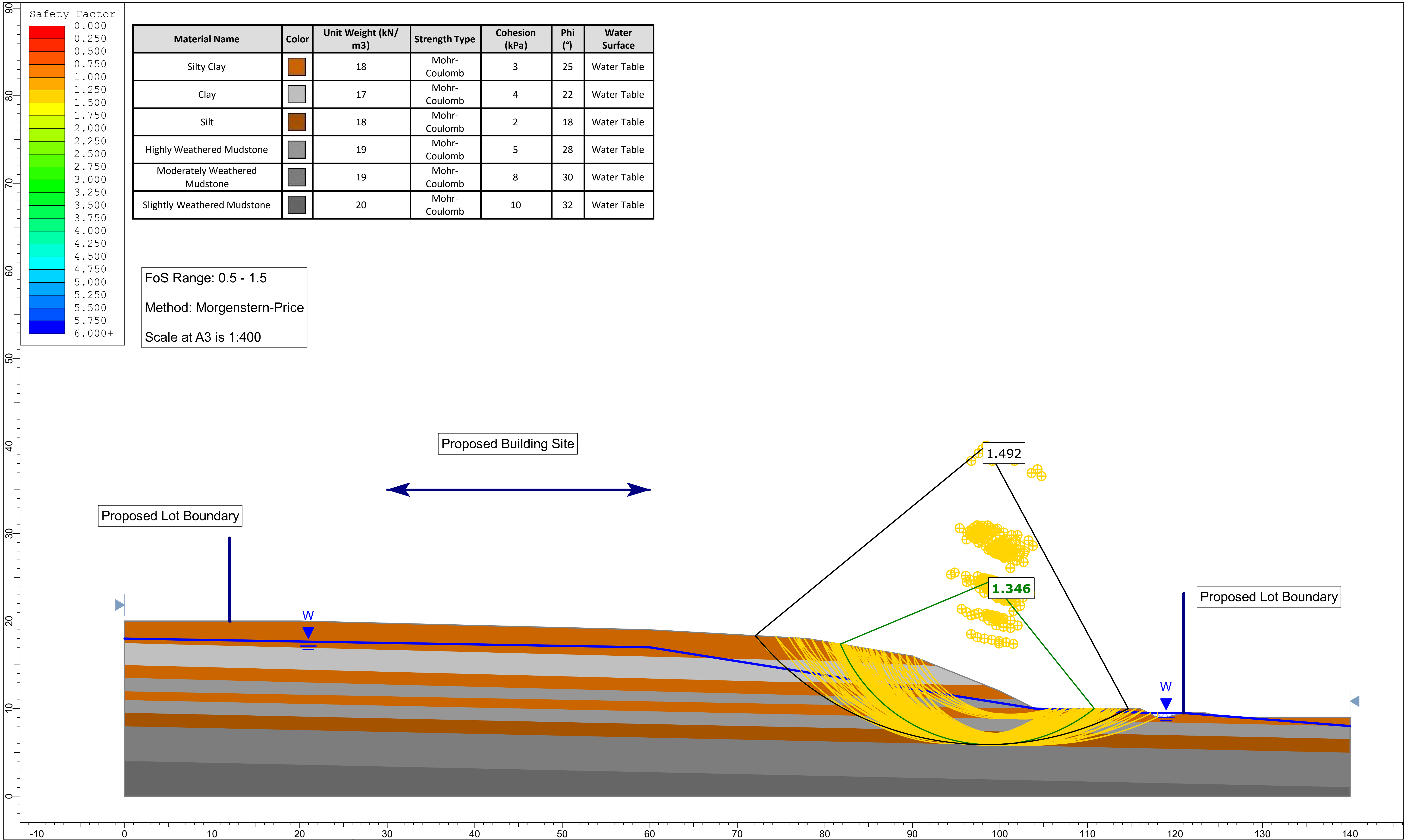
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section H - Existing Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

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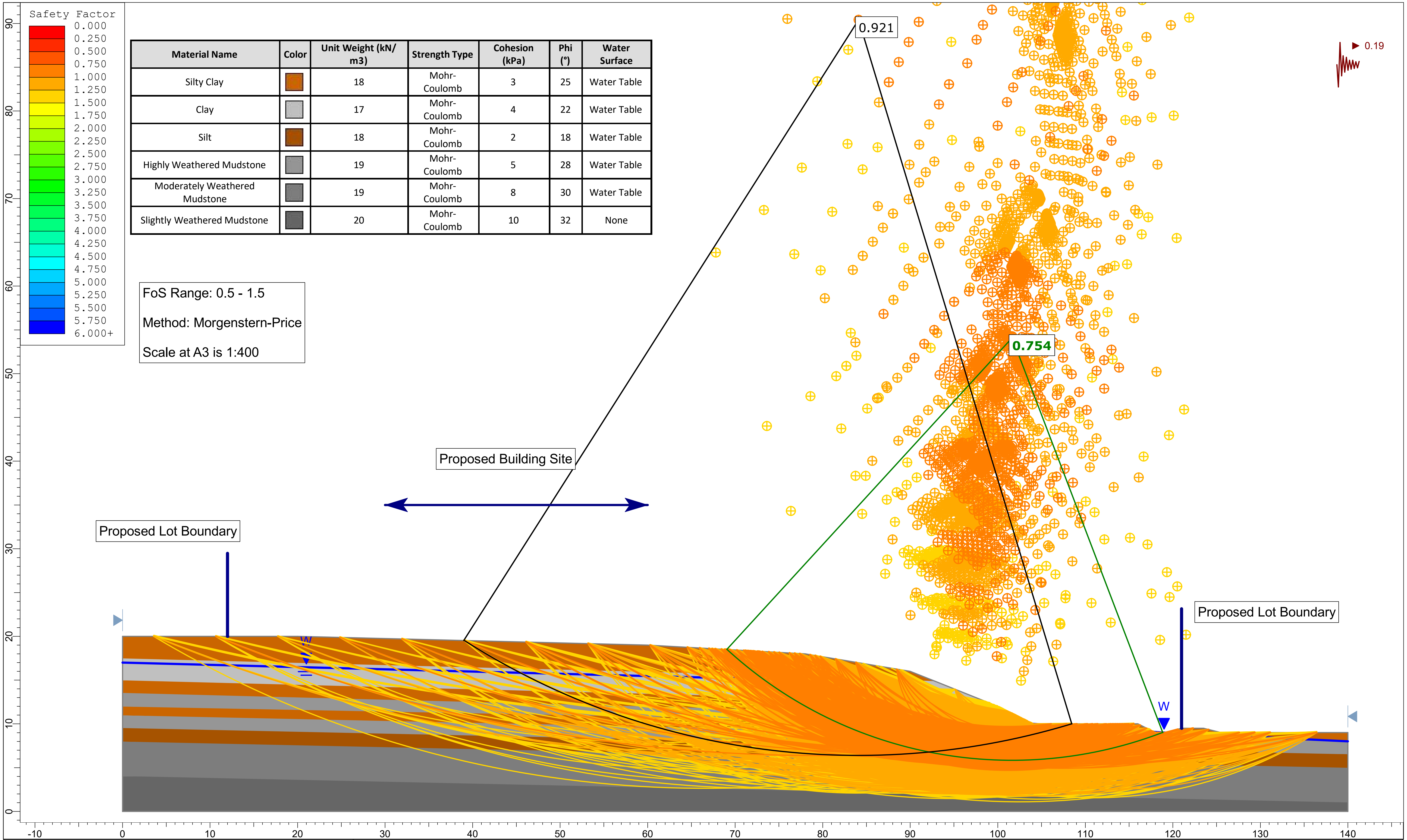
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section H - Existing Conditions	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	None

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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section H - Existing Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

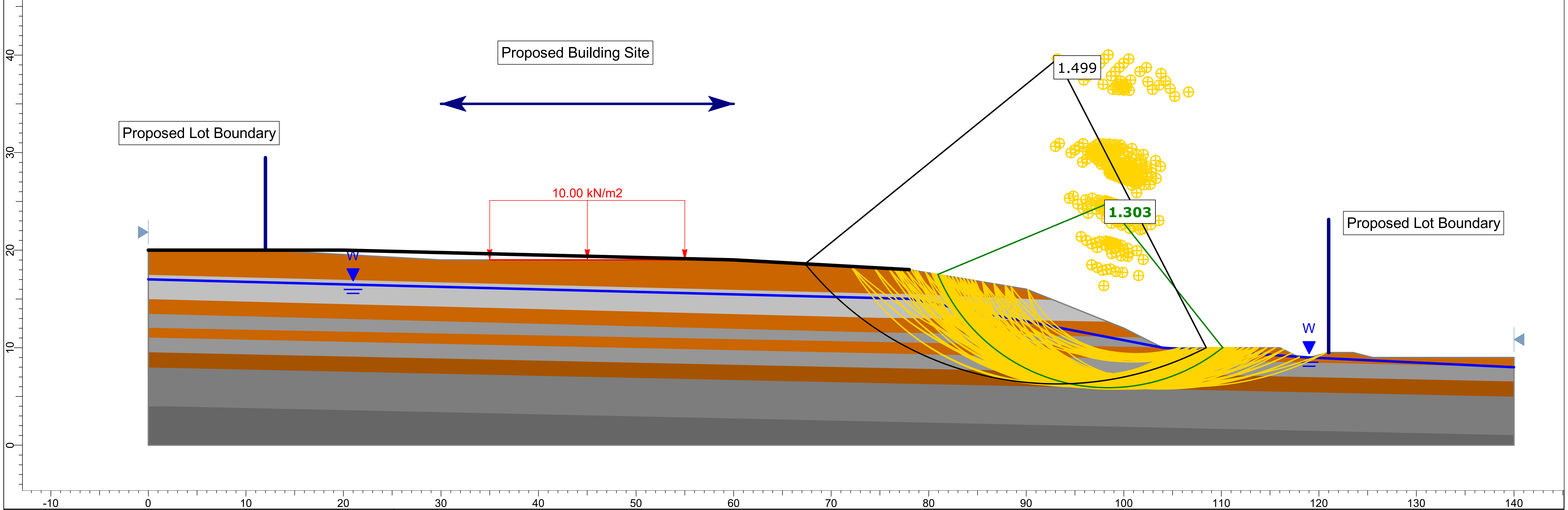
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section H - Proposed Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

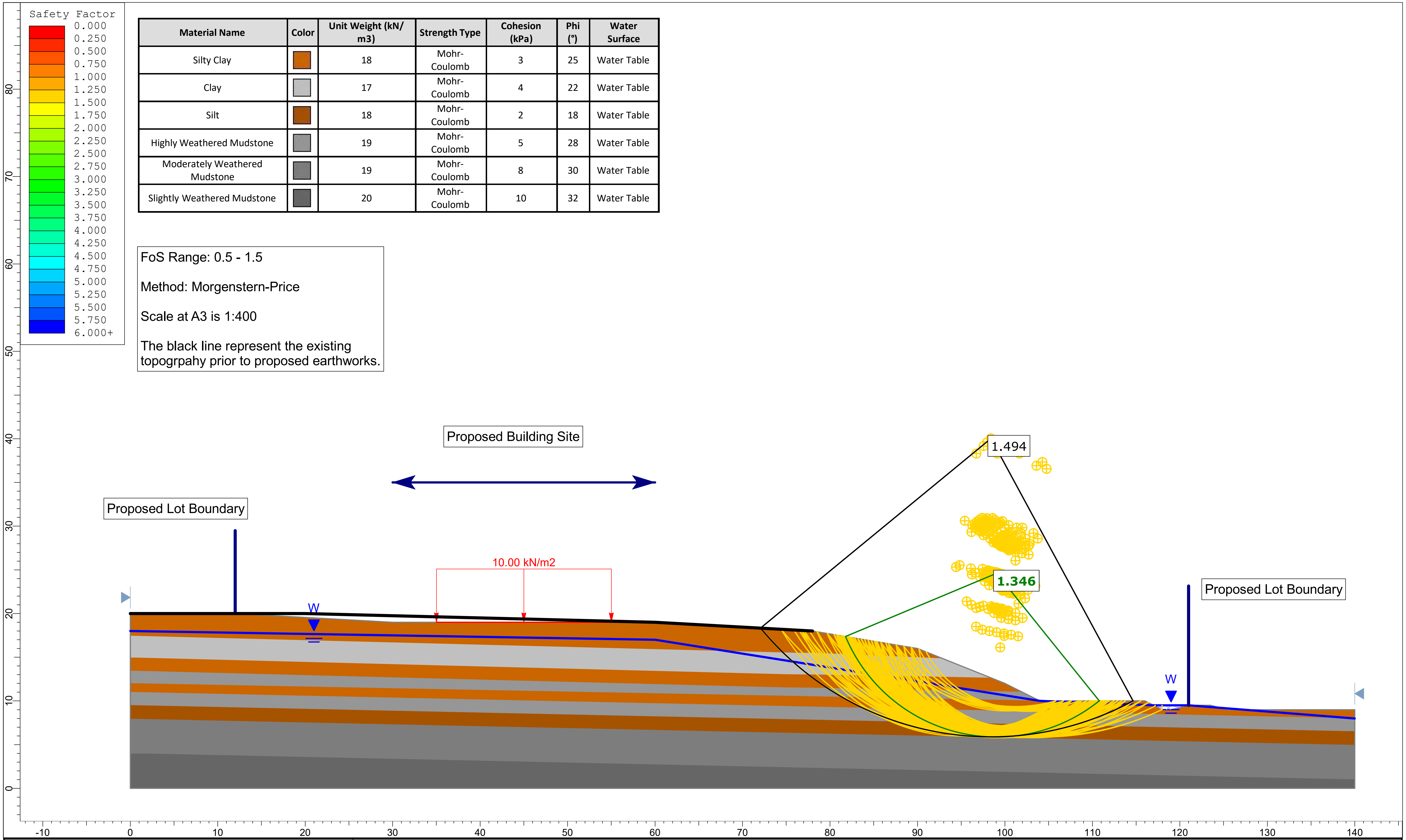
Material Name	Color	Unit Weight (kN/ m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.



Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section H - Proposed Conditions	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

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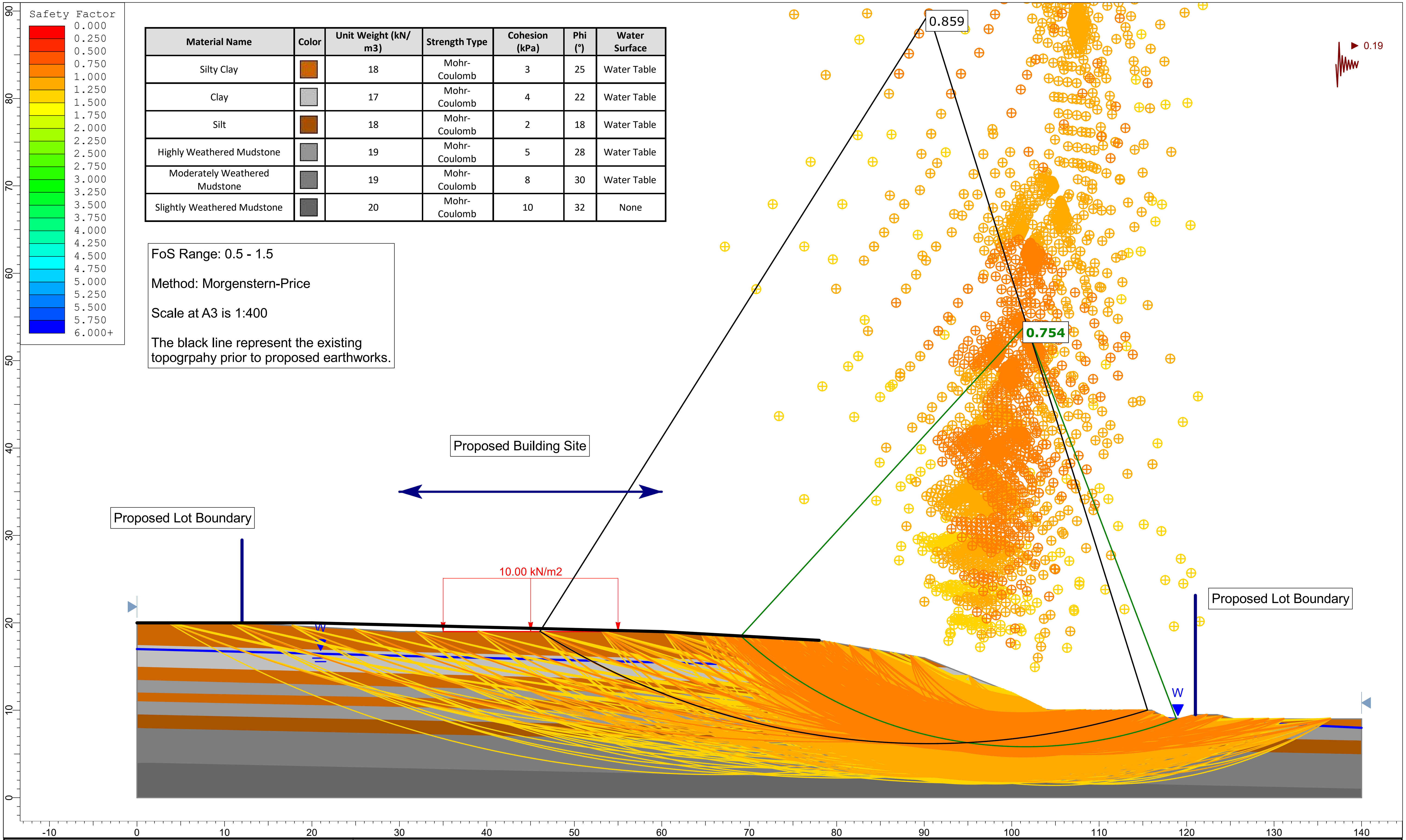
SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:400

The black line represent the existing topogrpahy prior to proposed earthworks.

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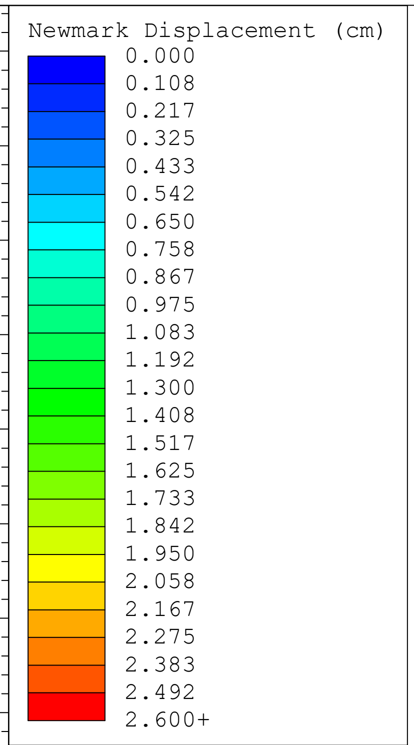
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section H - Proposed Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



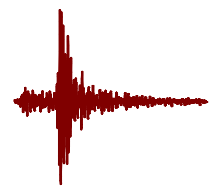
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Highly Weathered Mudstone		19	Mohr-Coulomb	5	28	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	None

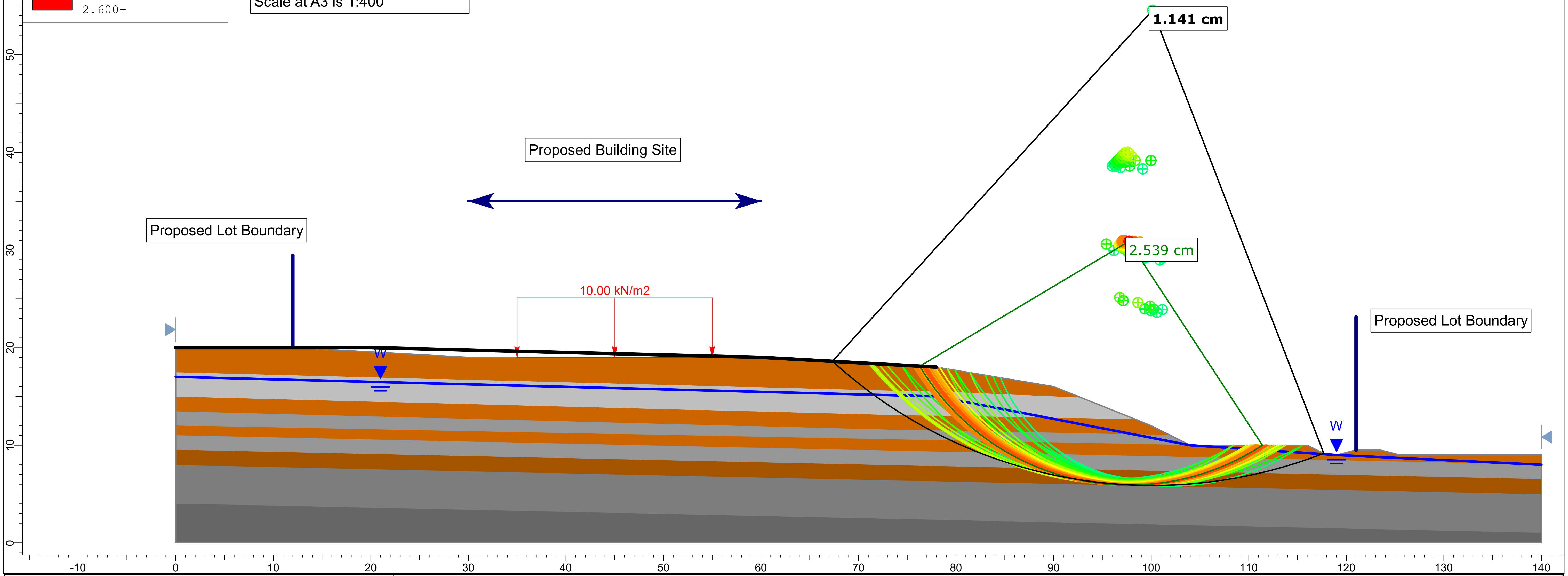
Newmark Displacement: HIK090

Range: Results >1.0cm

Method: Morgenstern-Price

Scale at A3 is 1:400





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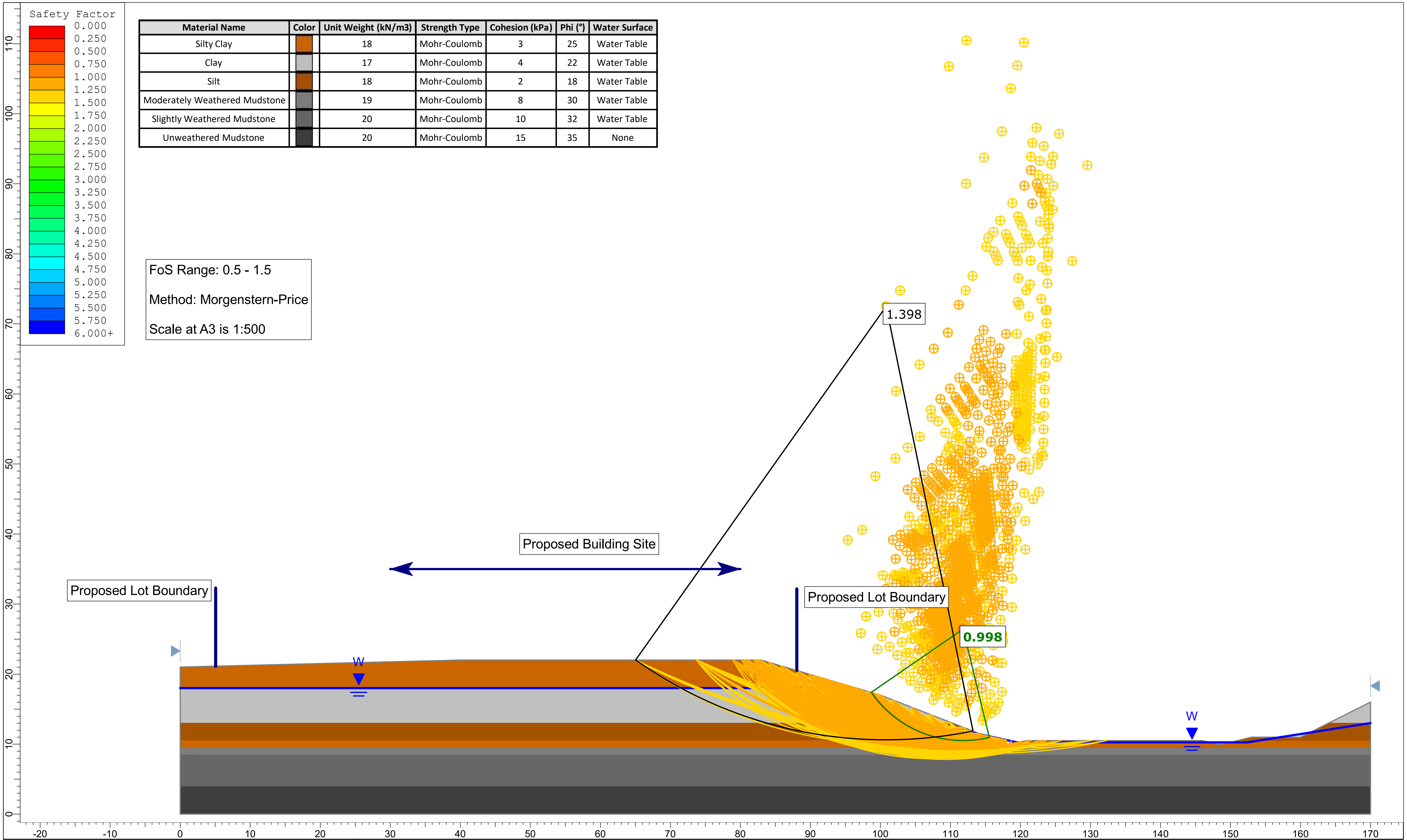
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section H - Proposed Conditions	Scenario	Newmark Displacement
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

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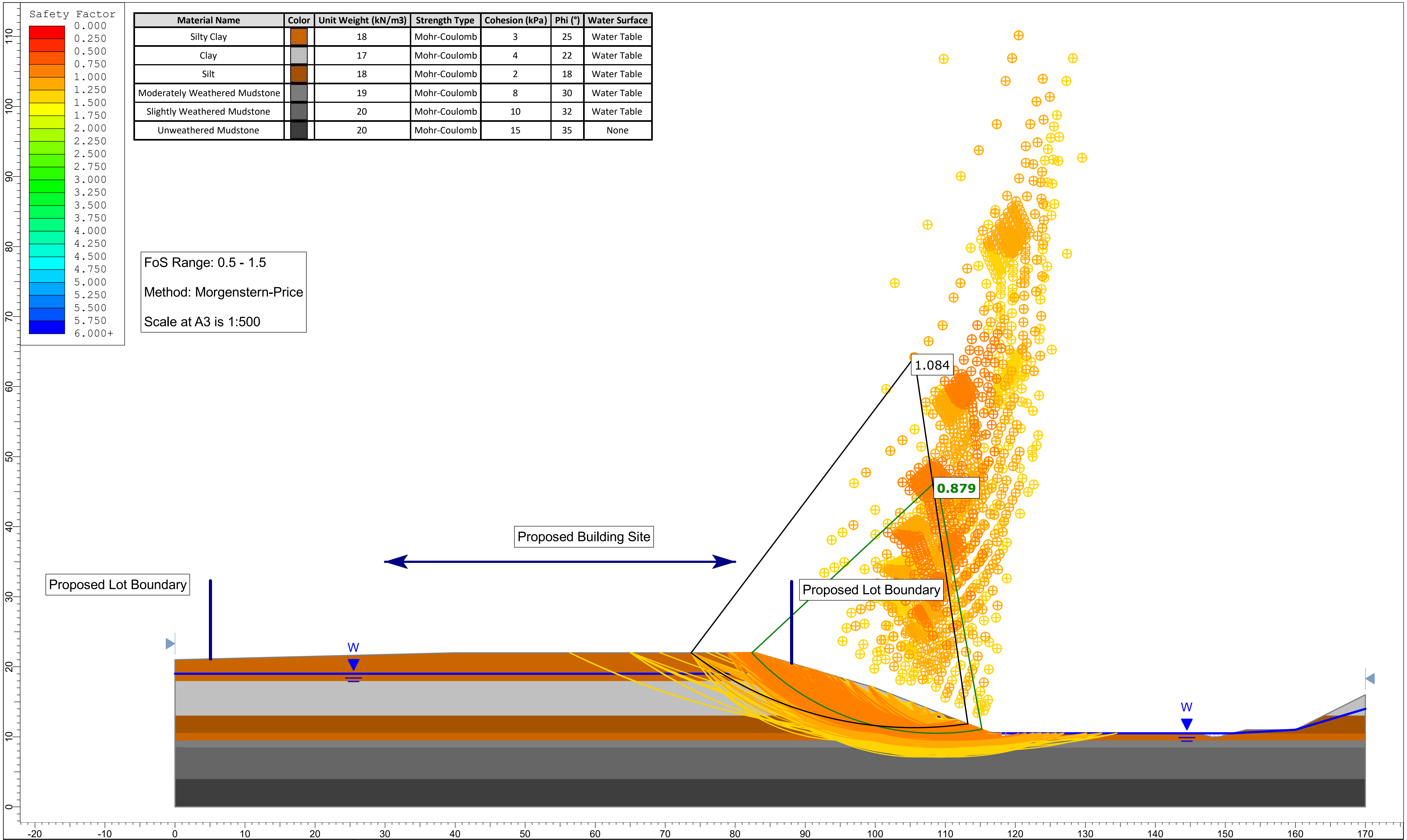
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section I - Existing Conditions	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

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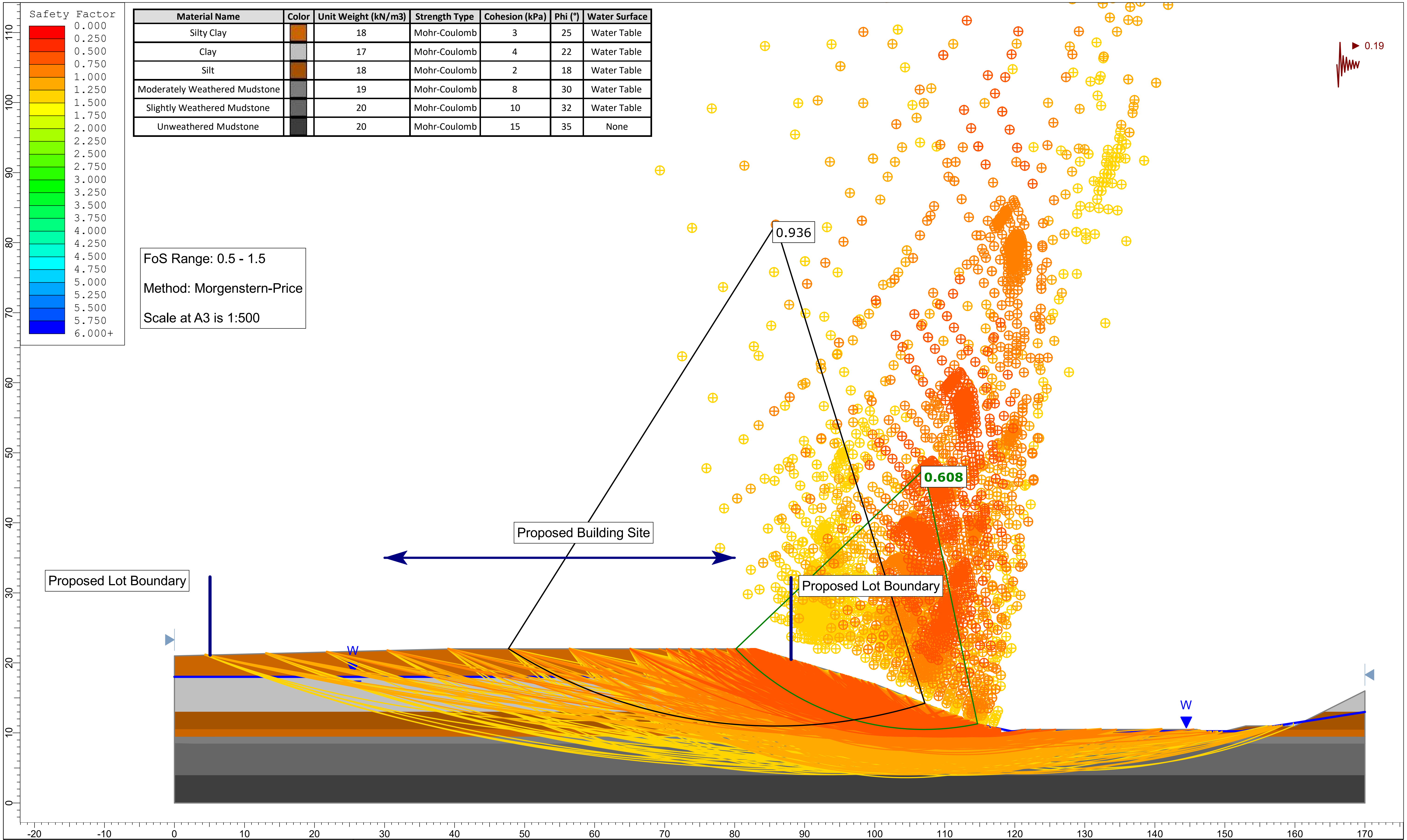
Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section I - Existing Conditions	*Scenario*	EGWT
Drawn By	KB	*Company*	HGEA
Date	5/11/2024, 3:37:40 p.m.	*File Name*	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

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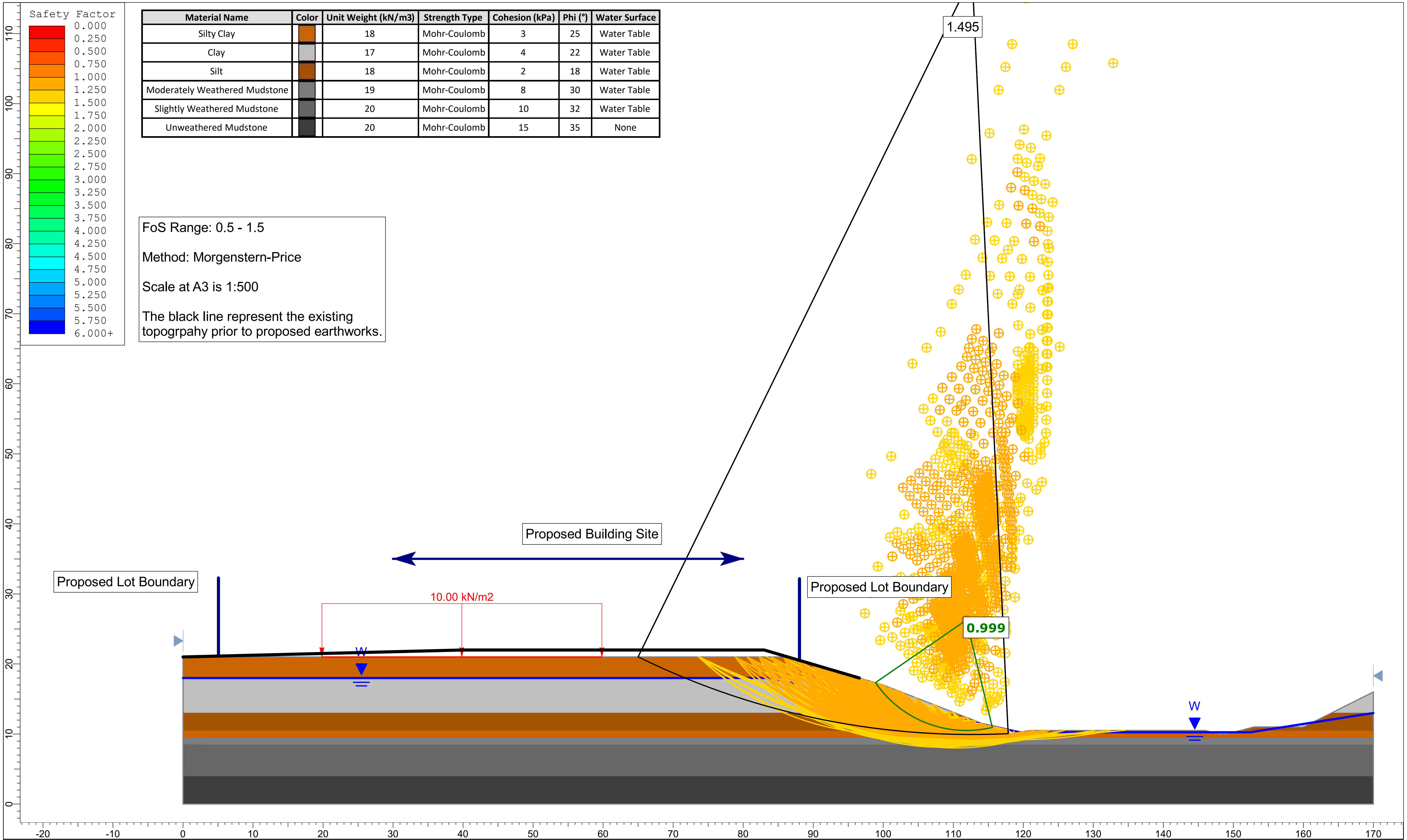
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section I - Existing Conditions	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

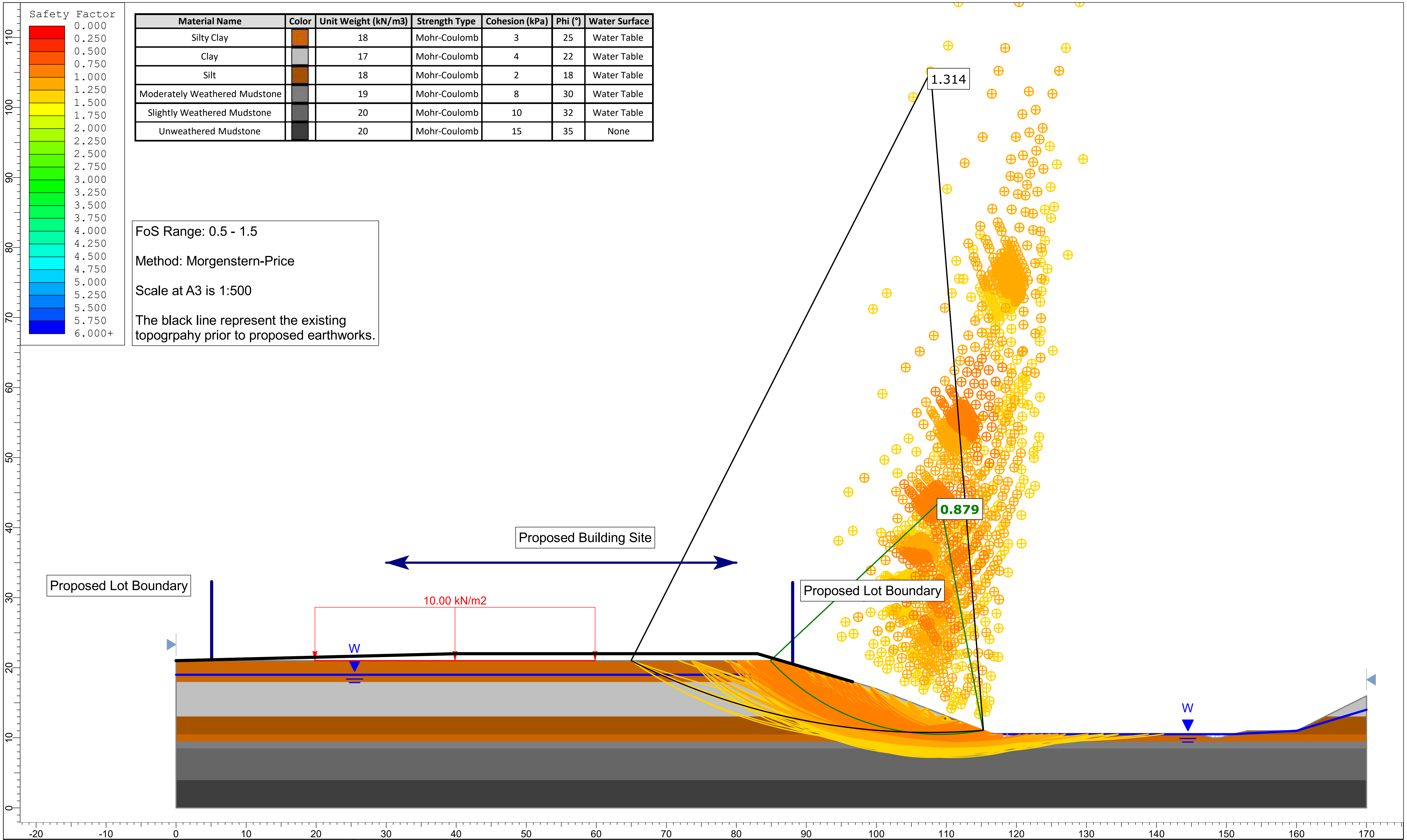
Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

Hawthorn Geddes engineers & architects ltd

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section I - Proposed Conditions without RTW	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

SLIDEINTERPRET 9.036



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

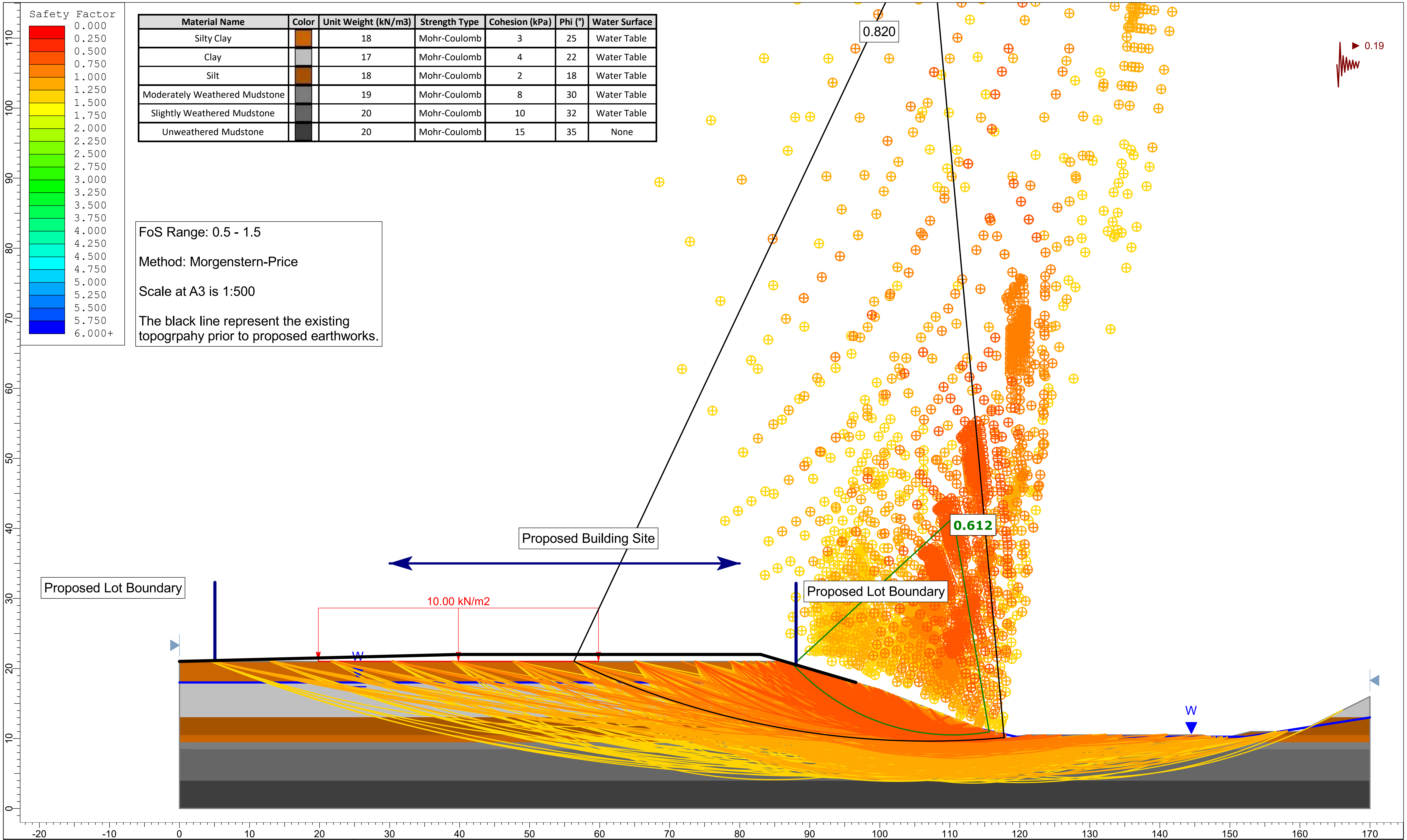
Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section I - Proposed Conditions without RTW
Scenario	EGWT
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

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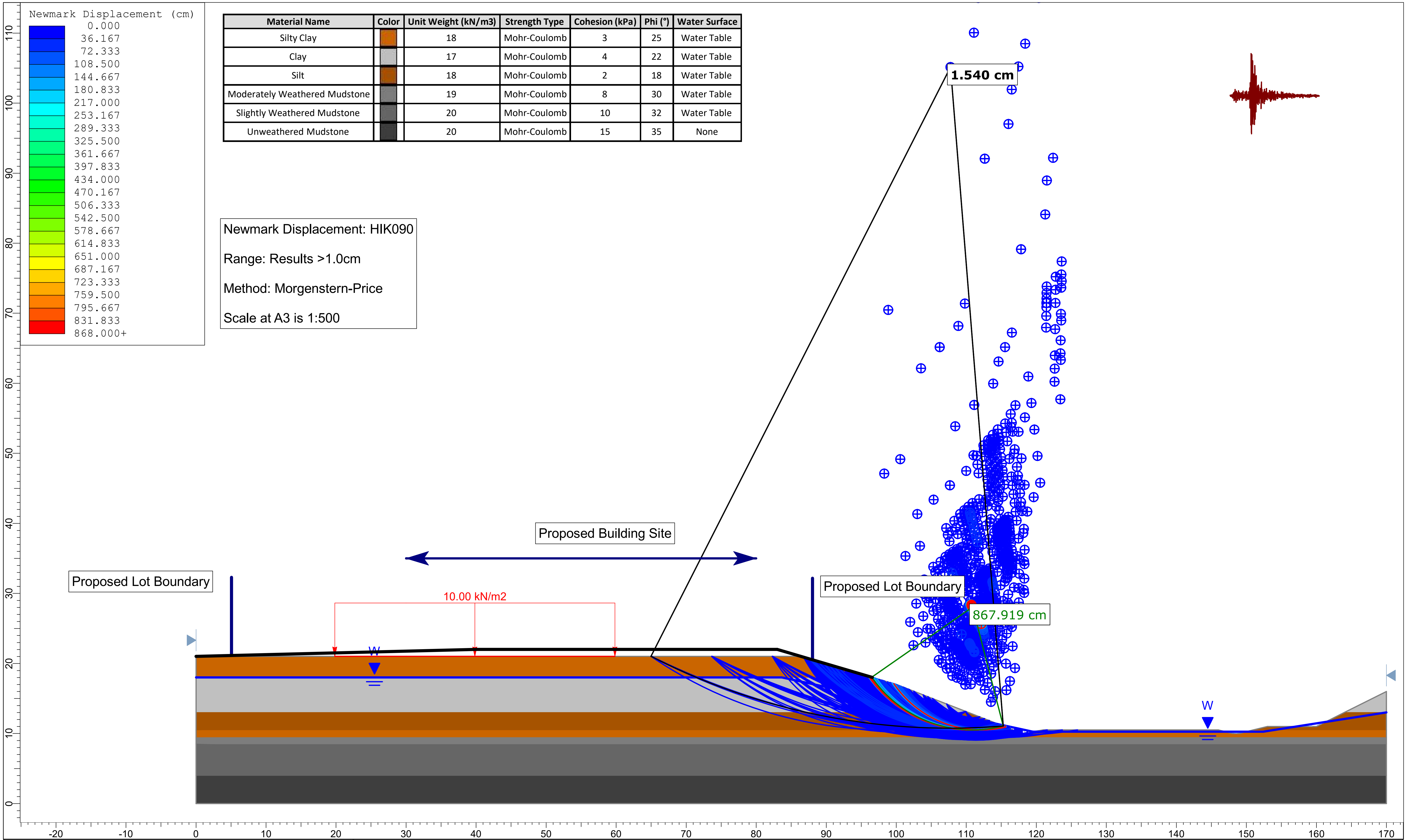
SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section I - Proposed Conditions without RTW
Scenario	Seismic - DCLS
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None



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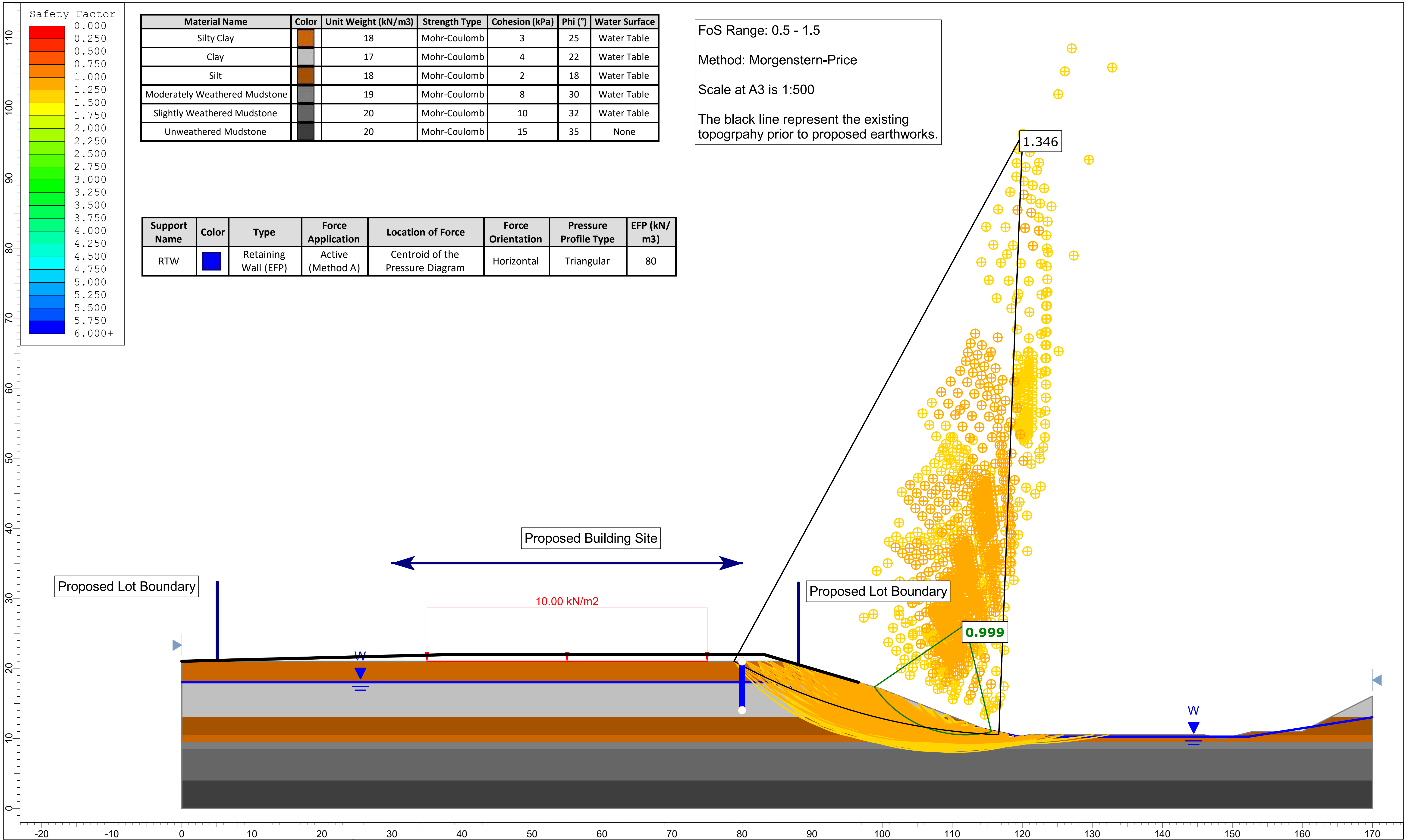
engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability
Group	Cross-Section I - Proposed Conditions without RTW
Scenario	Newmark Displacement
Drawn By	KB
Company	HGEA
Date	5/11/2024, 3:37:40 p.m.
File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

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SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section I - Proposed Conditions with RTW	Scenario	NGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

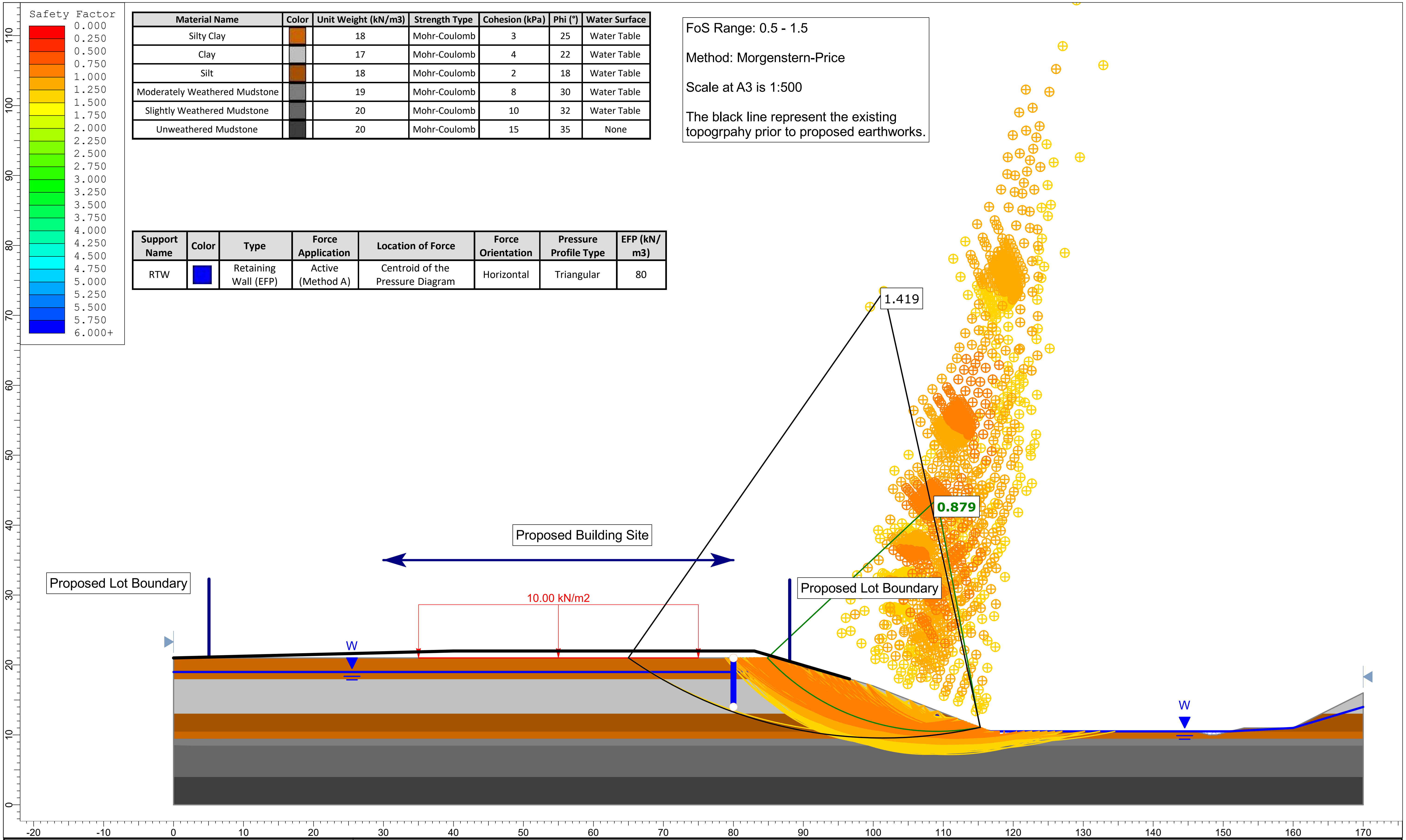
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

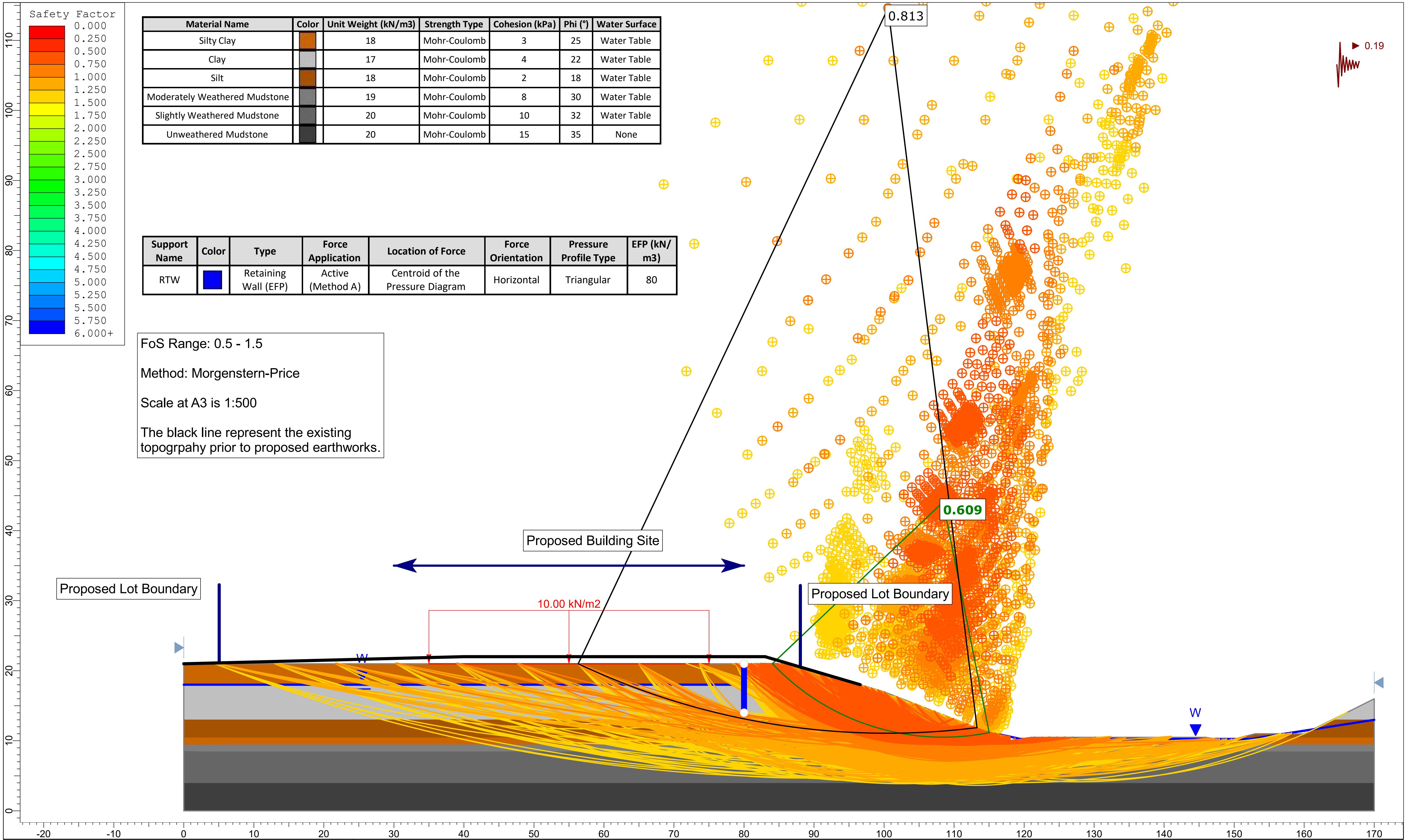
The black line represent the existing topogrpahy prior to proposed earthworks.



Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section I - Proposed Conditions with RTW	Scenario	EGWT
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

FoS Range: 0.5 - 1.5

Method: Morgenstern-Price

Scale at A3 is 1:500

The black line represent the existing topogrpahy prior to proposed earthworks.

Hawthorn Geddes engineers & architects ltd

SLIDEINTERPRET 9.036

Project	Tripark Farms - Subdivision Suitability		
Group	Cross-Section I - Proposed Conditions with RTW	Scenario	Seismic - DCLS
Drawn By	KB	Company	HGEA
Date	5/11/2024, 3:37:40 p.m.	File Name	geo 241105 slide assessment 13270.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface
Silty Clay		18	Mohr-Coulomb	3	25	Water Table
Clay		17	Mohr-Coulomb	4	22	Water Table
Silt		18	Mohr-Coulomb	2	18	Water Table
Moderately Weathered Mudstone		19	Mohr-Coulomb	8	30	Water Table
Slightly Weathered Mudstone		20	Mohr-Coulomb	10	32	Water Table
Unweathered Mudstone		20	Mohr-Coulomb	15	35	None

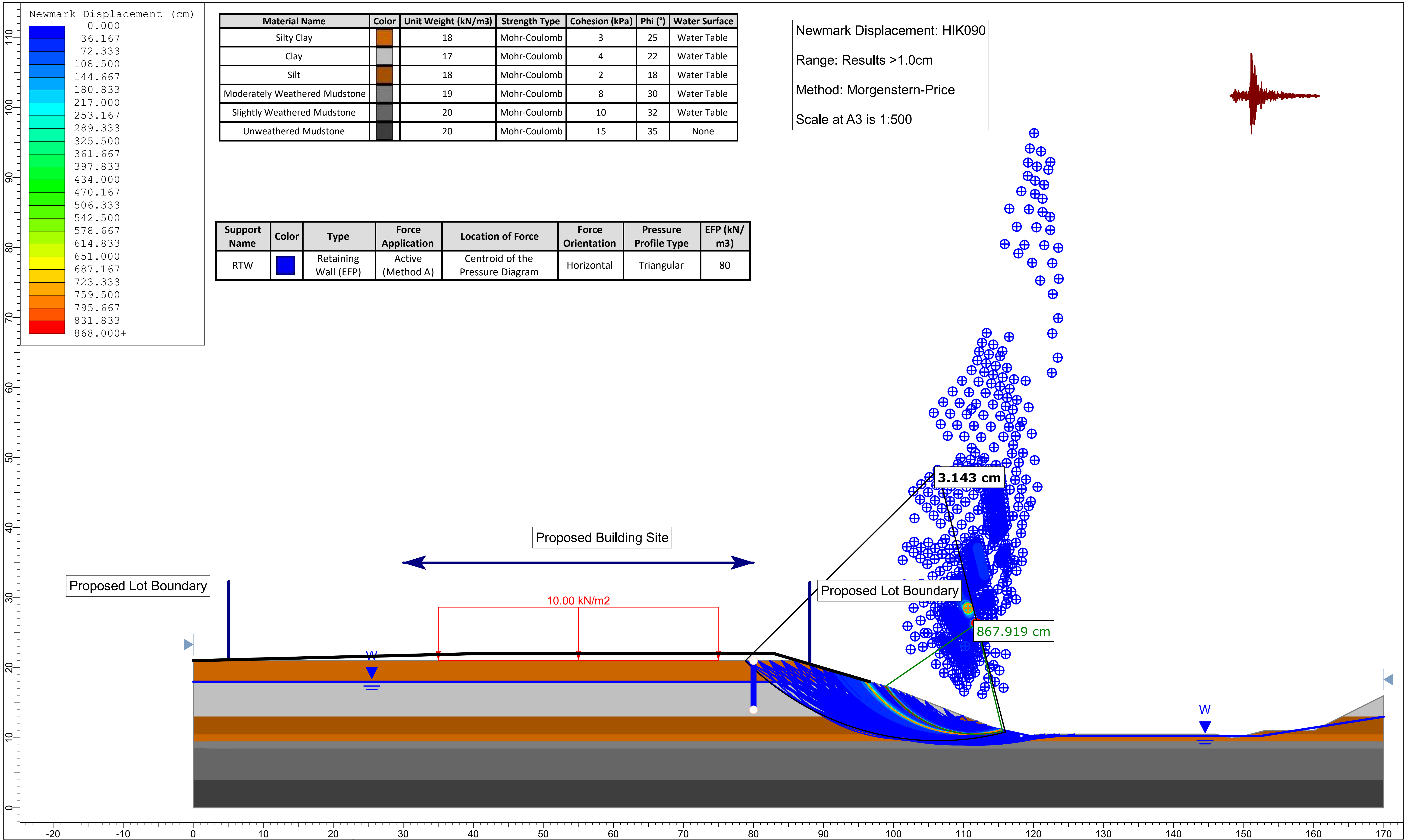
Support Name	Color	Type	Force Application	Location of Force	Force Orientation	Pressure Profile Type	EFP (kN/m3)
RTW		Retaining Wall (EFP)	Active (Method A)	Centroid of the Pressure Diagram	Horizontal	Triangular	80

Newmark Displacement: HIK090

Range: Results >1.0cm

Method: Morgenstern-Price

Scale at A3 is 1:500



Hawthorn Geddes engineers & architects ltd	Project: Tripark Farms - Subdivision Suitability		
	Group: Cross-Section I - Proposed Conditions with RTW	Scenario: Newmark Displacement	
	Drawn By: KB	Company: HGEA	
SLIDEINTERPRET 9.036	Date: 5/11/2024, 3:37:40 p.m.	File Name: geo 241105 slide assessment 13270.slmd	

Appendix E. Liquefaction Outputs

Underground Investigation Ltd
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craig@undergroundinvestigation.co.nz
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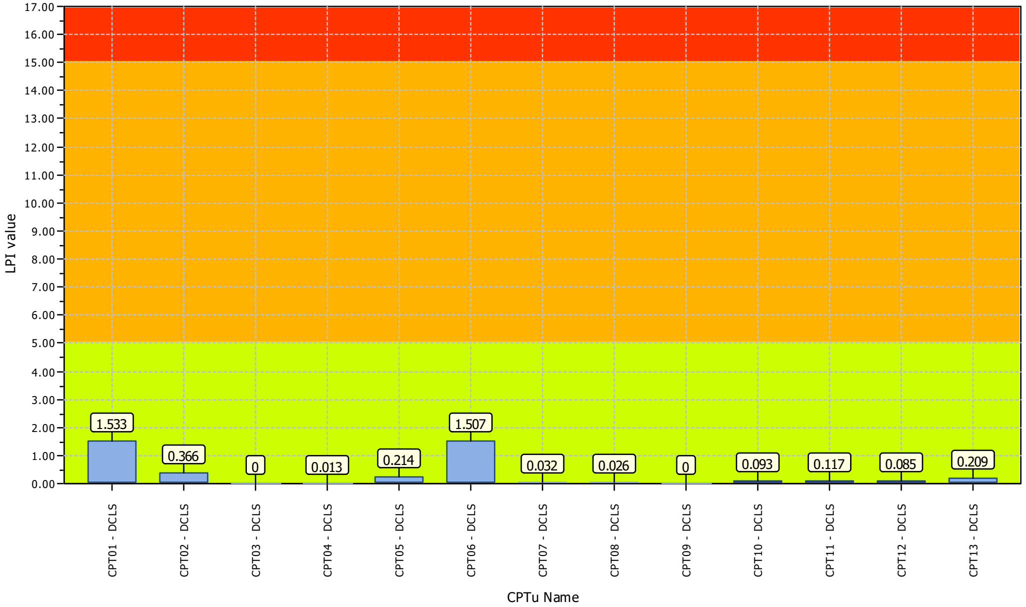
Project title :

Location :

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

Total CPT number: 13

100% low risk

0% high risk

0% very high risk

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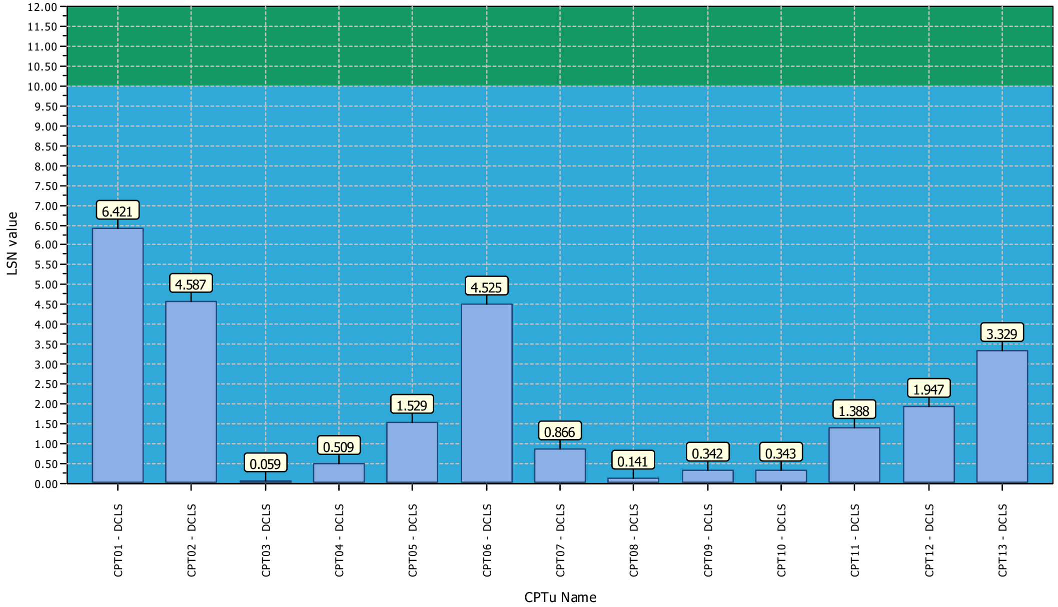
+64211473249

Project title :

Location :

Overall Liquefaction Severity Number report



LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

Basic statistics

Total CPT number: 13

100% little liquefaction

0% minor liquefaction

0% moderate liquefaction

0% moderate to major liquefaction

0% major liquefaction

0% severe liquefaction

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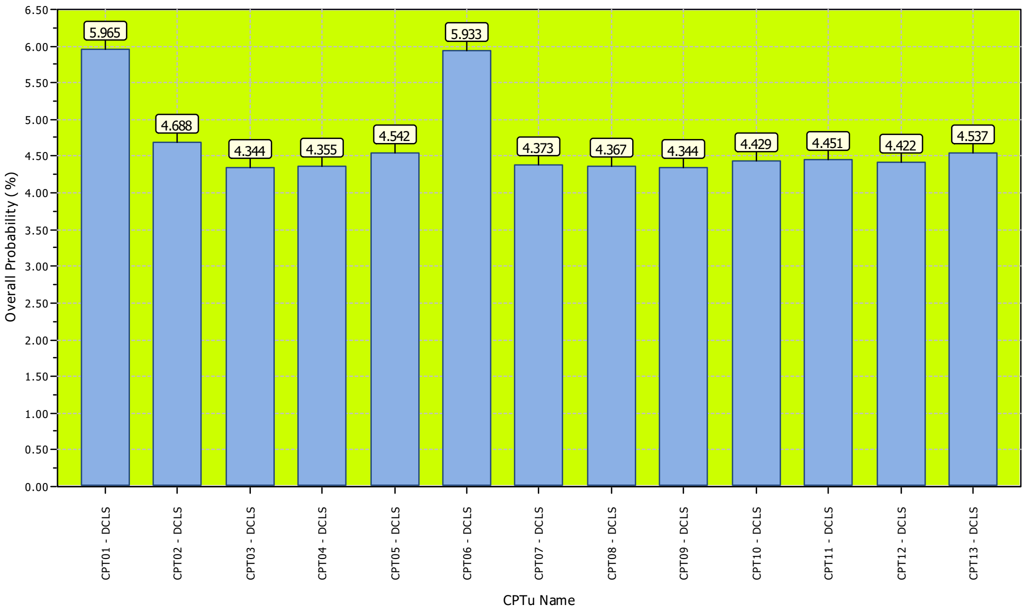
Project title :

Location :

Overall Probability for Liquefaction report



Probability color scheme

- Very High Probability
- High Probability
- Low Probability

Basic statistics

Total CPT number: 78

100% low probability

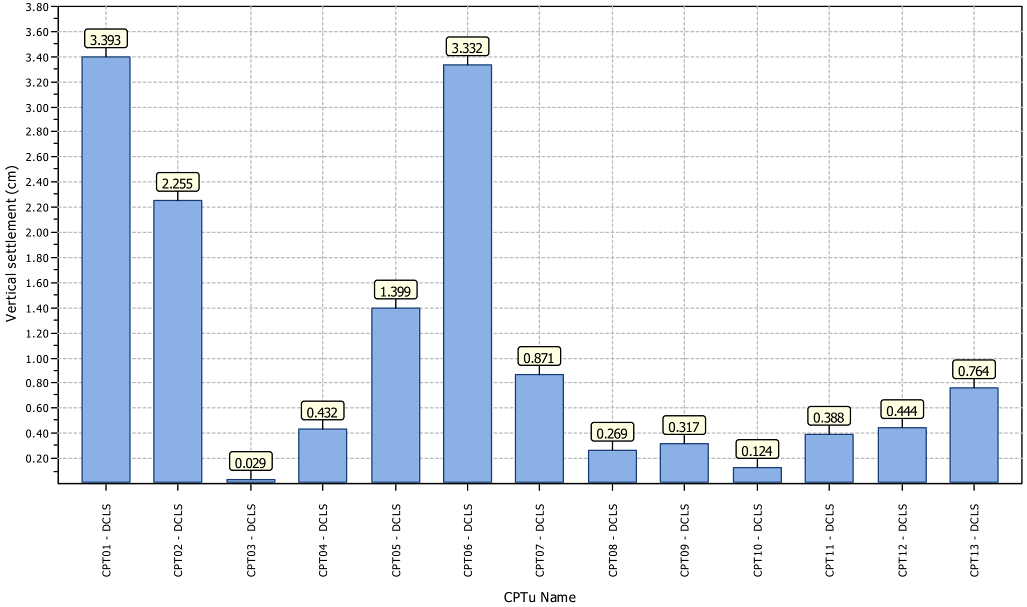
0% high probability

0% very high probability

Project title :

Location :

Overall vertical settlements report



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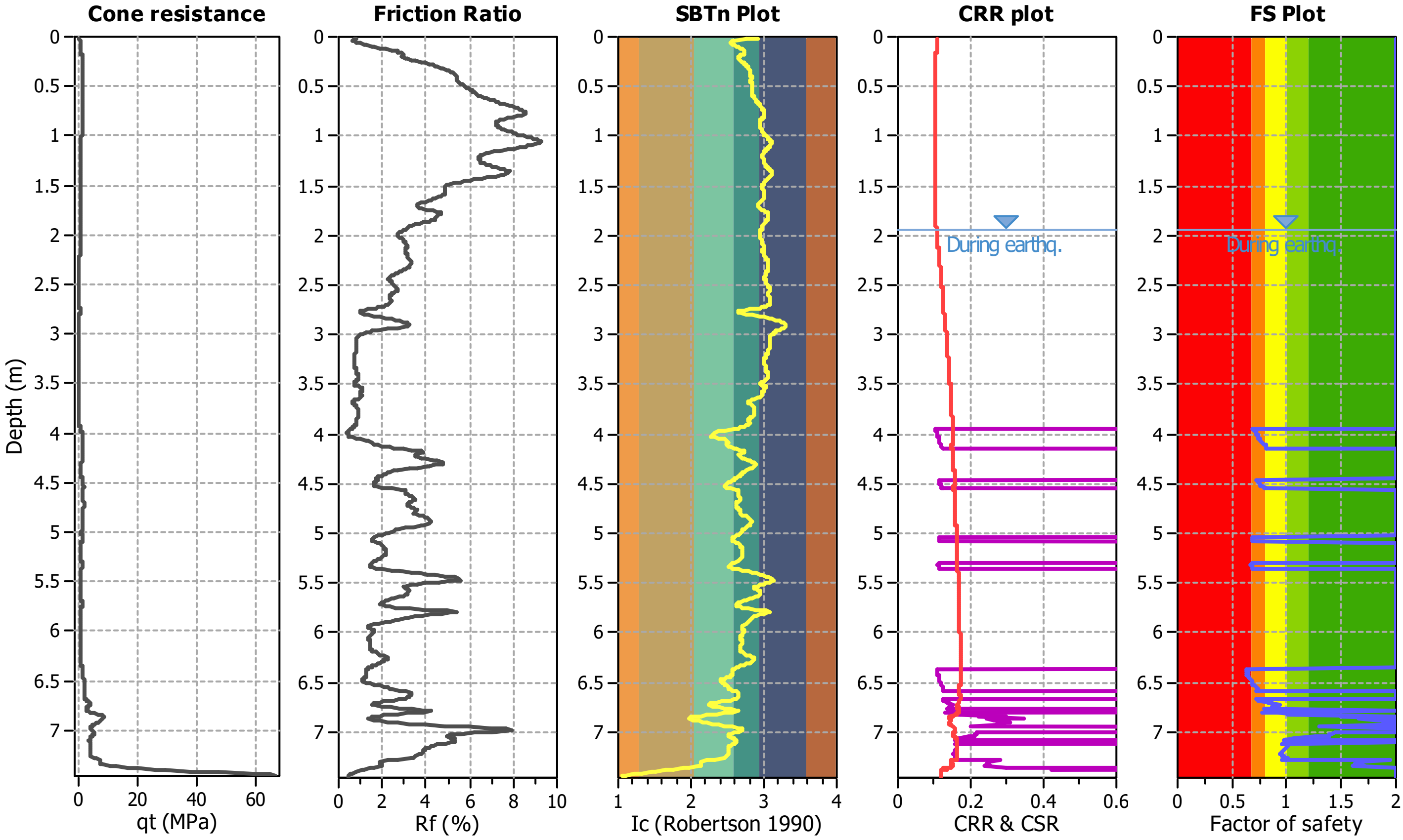
LIQUEFACTION ANALYSIS REPORT

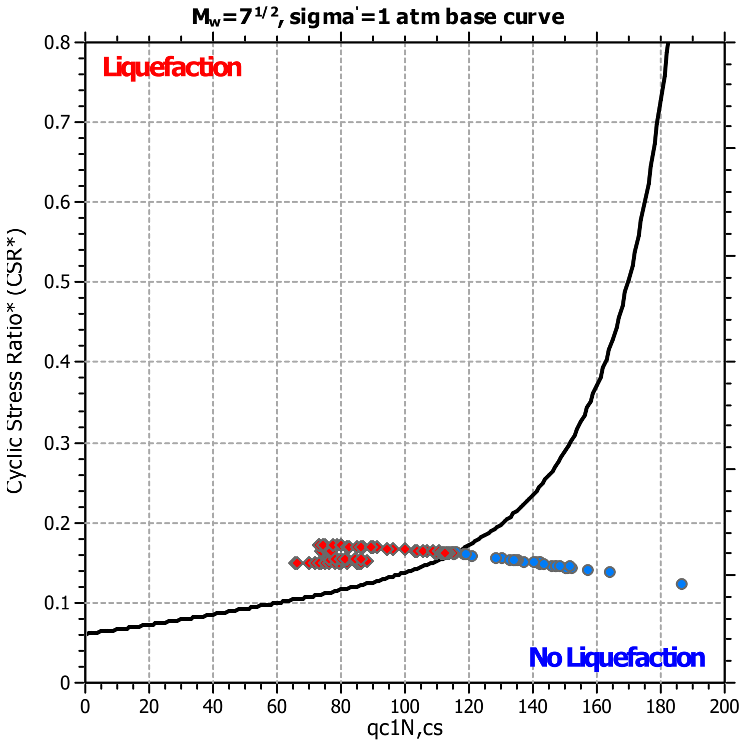
Project title : **Location :**

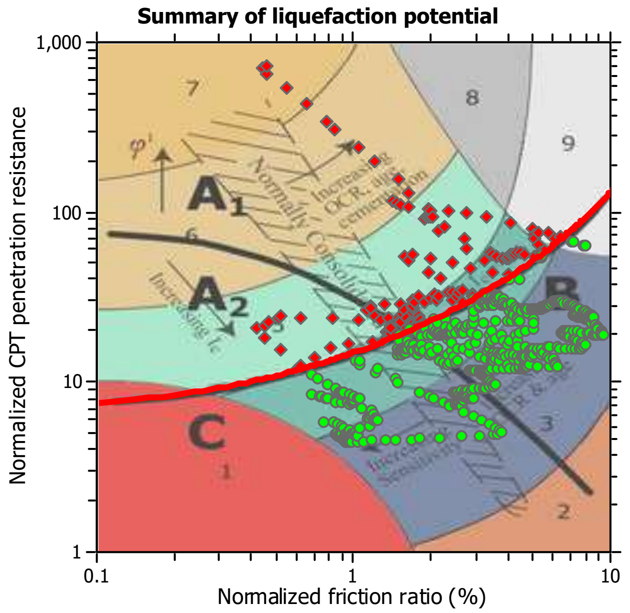
CPT file : CPT01 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.95 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.95 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

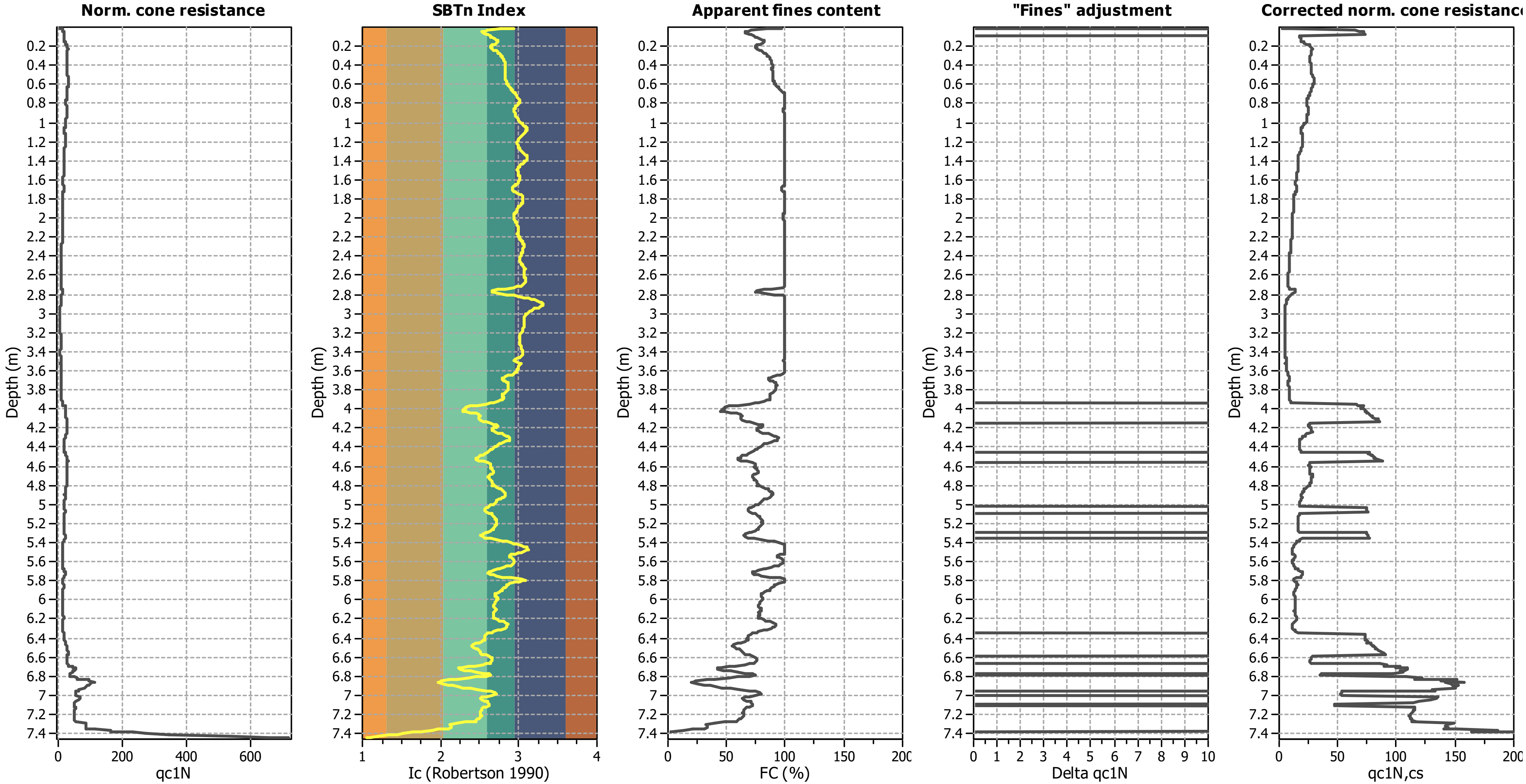






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

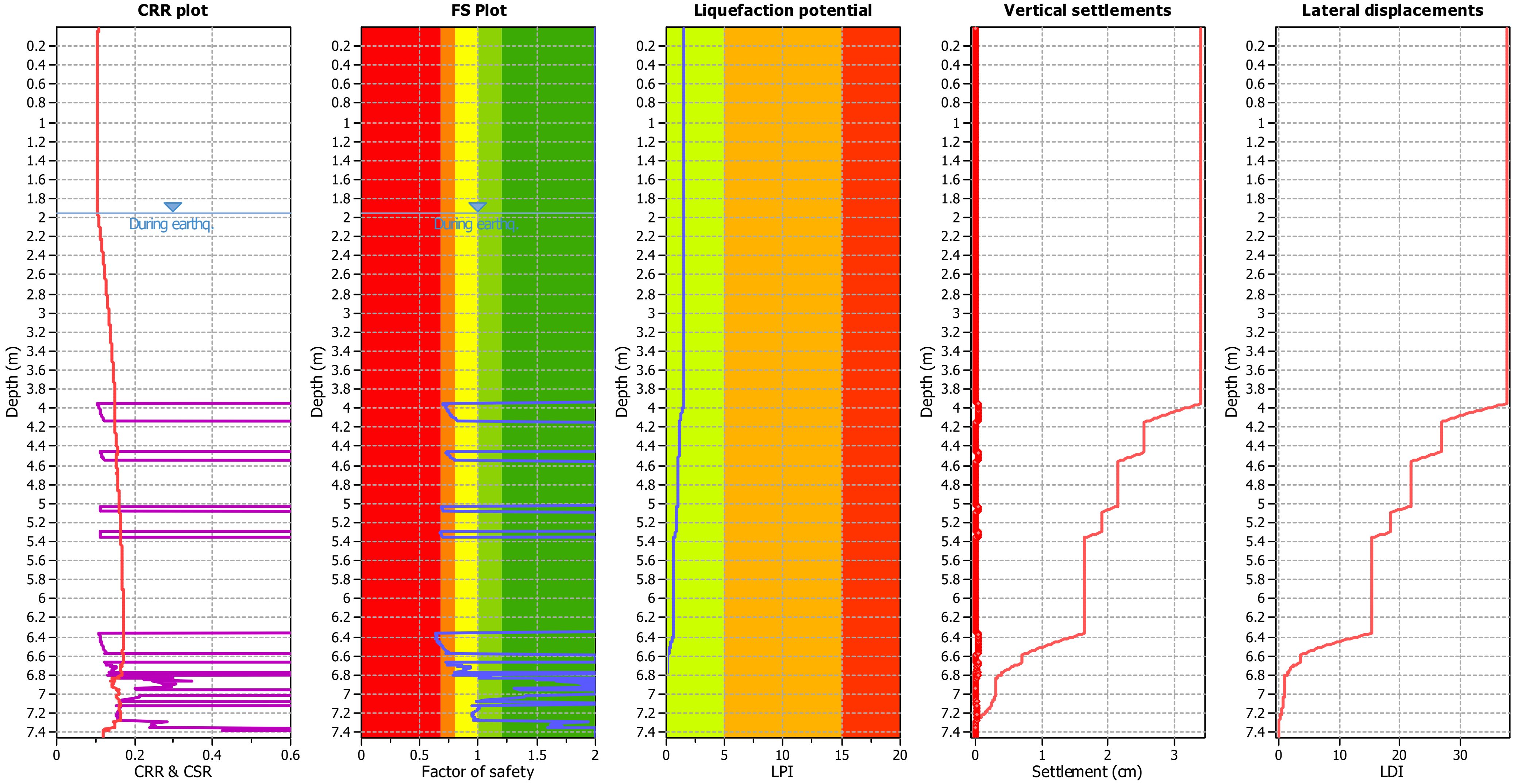
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.95 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.95 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.95 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.95 m	Fill height:	N/A	Limit depth:	N/A

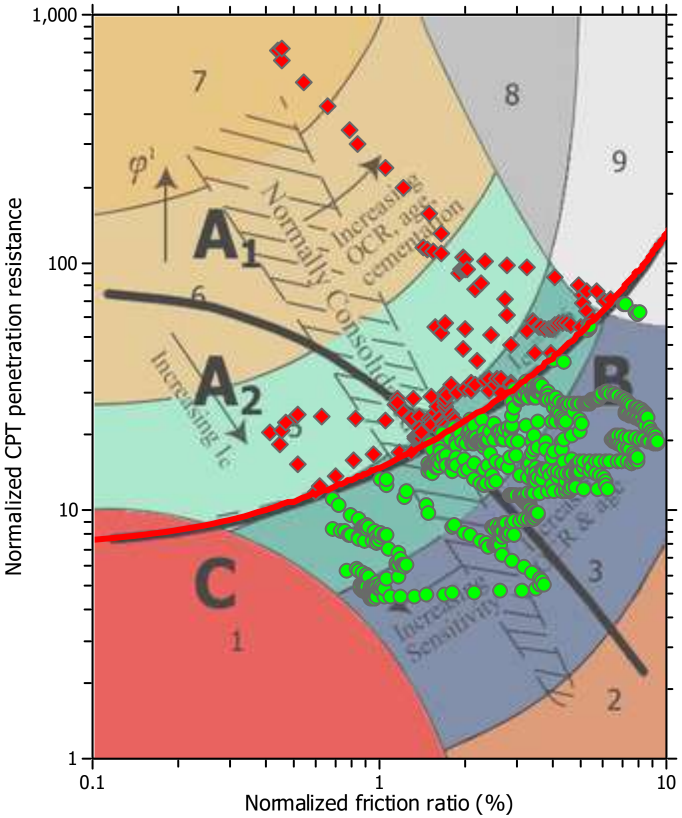
F.S. color scheme

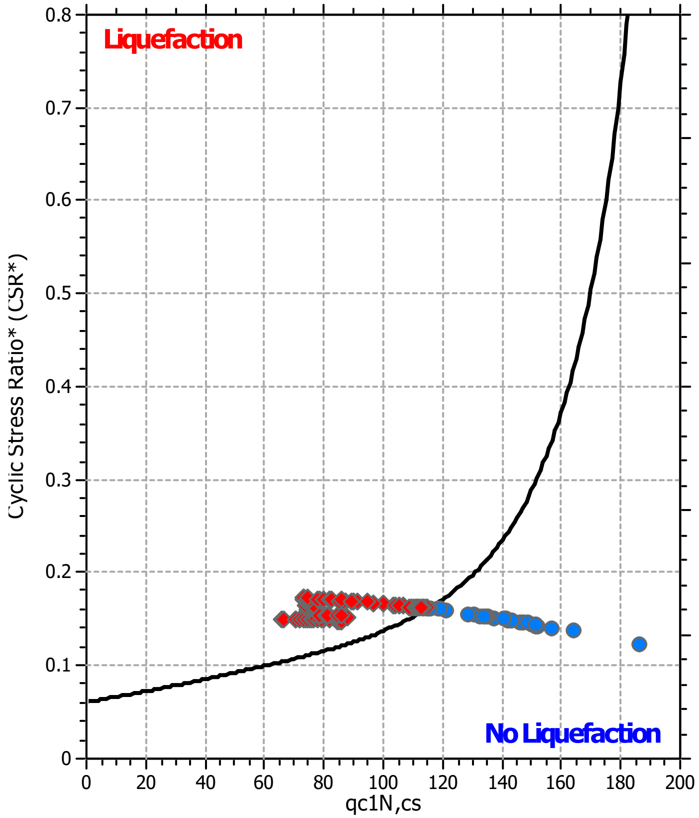
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

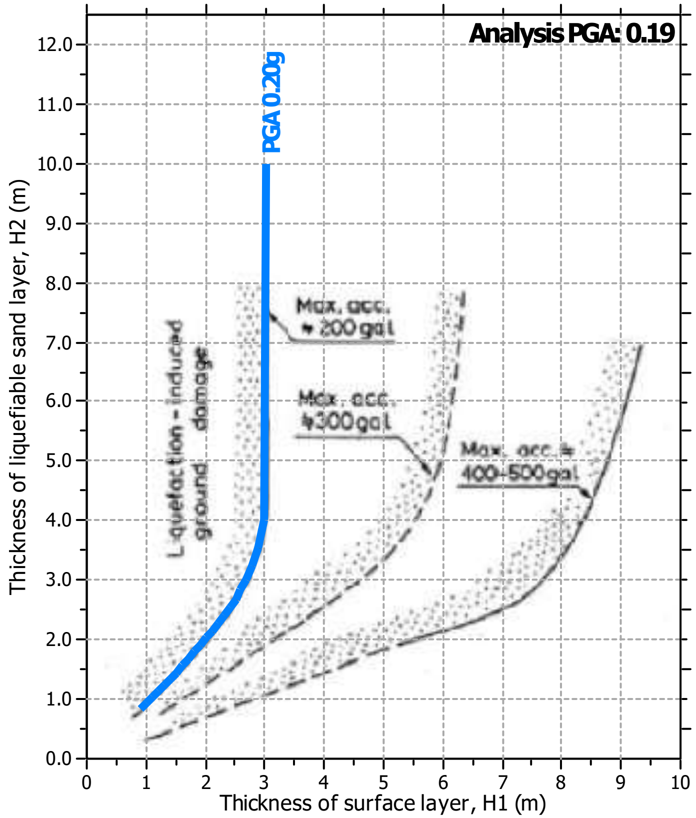
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.95 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.95 m	Fill height:	N/A	Limit depth:	N/A

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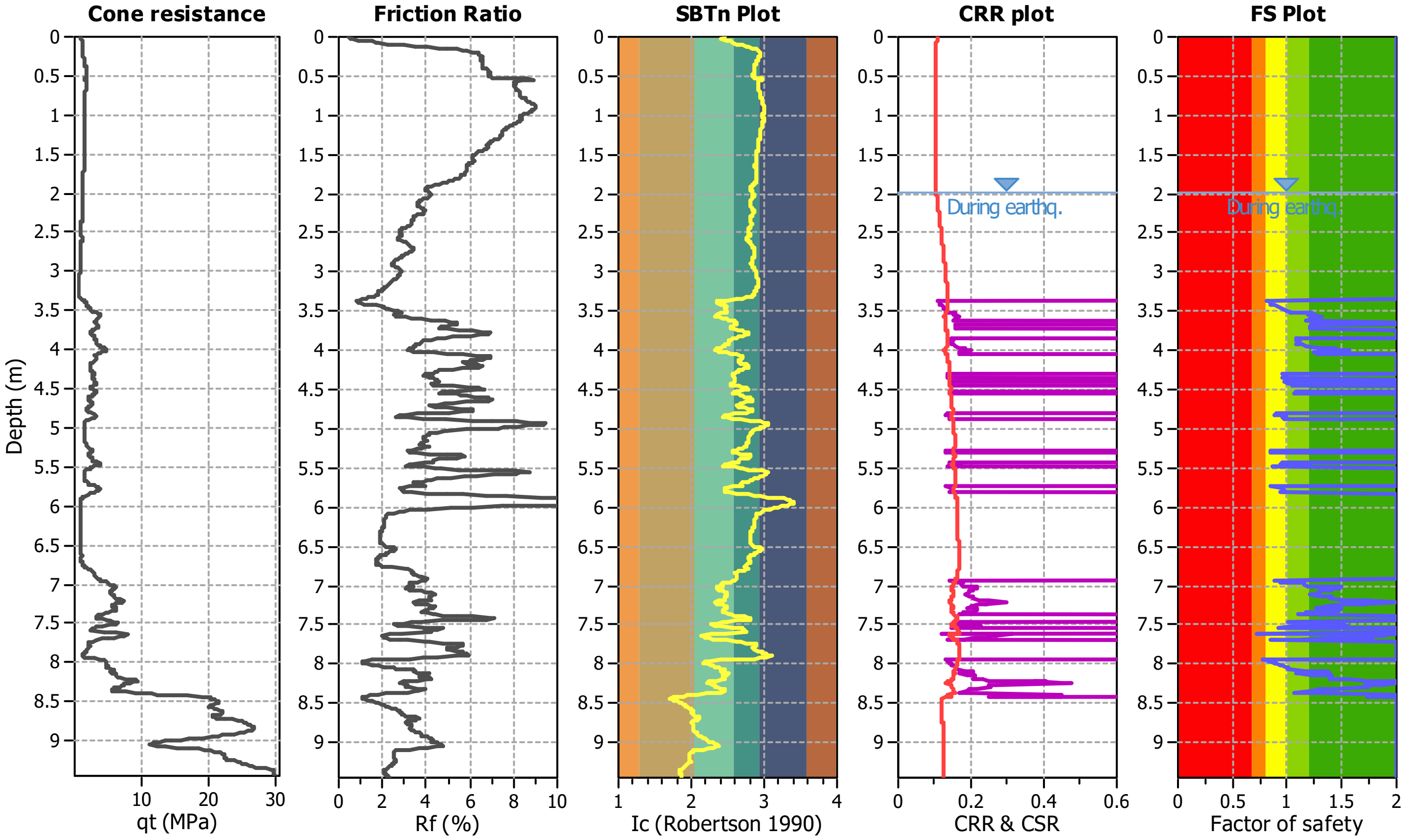
LIQUEFACTION ANALYSIS REPORT

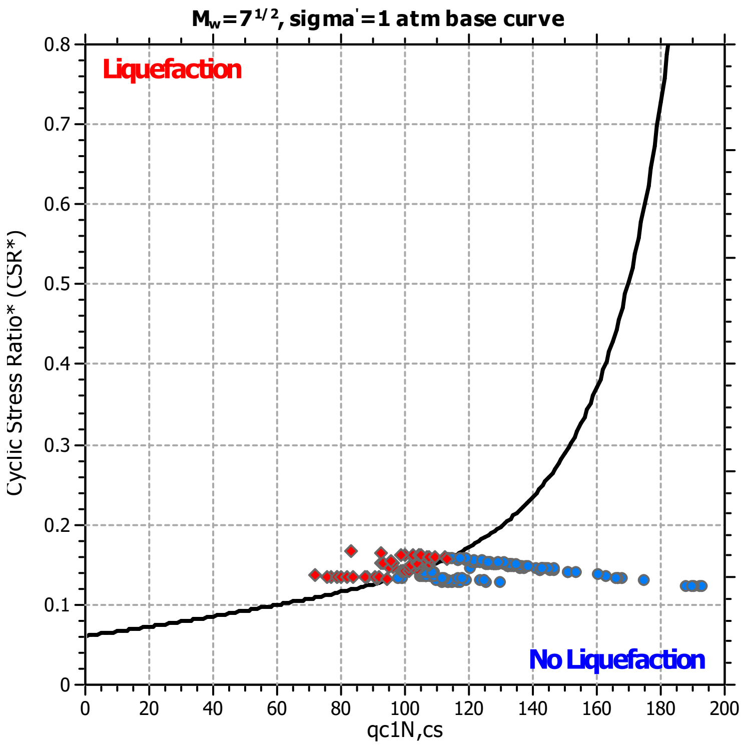
Project title : **Location :**

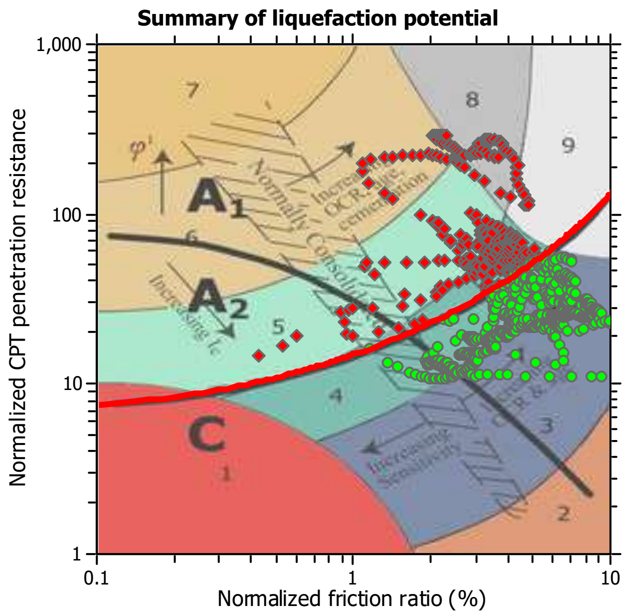
CPT file : CPT02 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.98 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.98 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

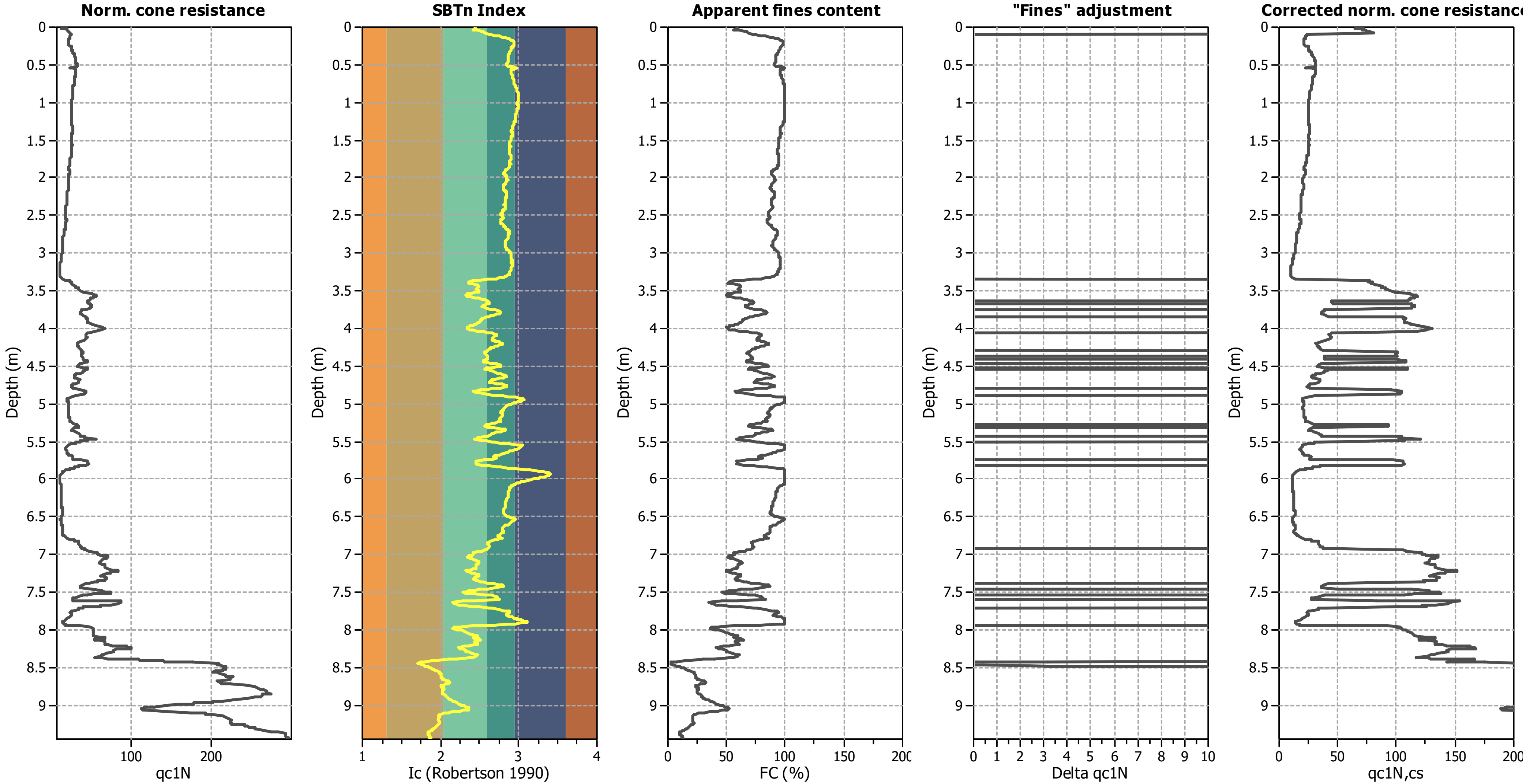






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

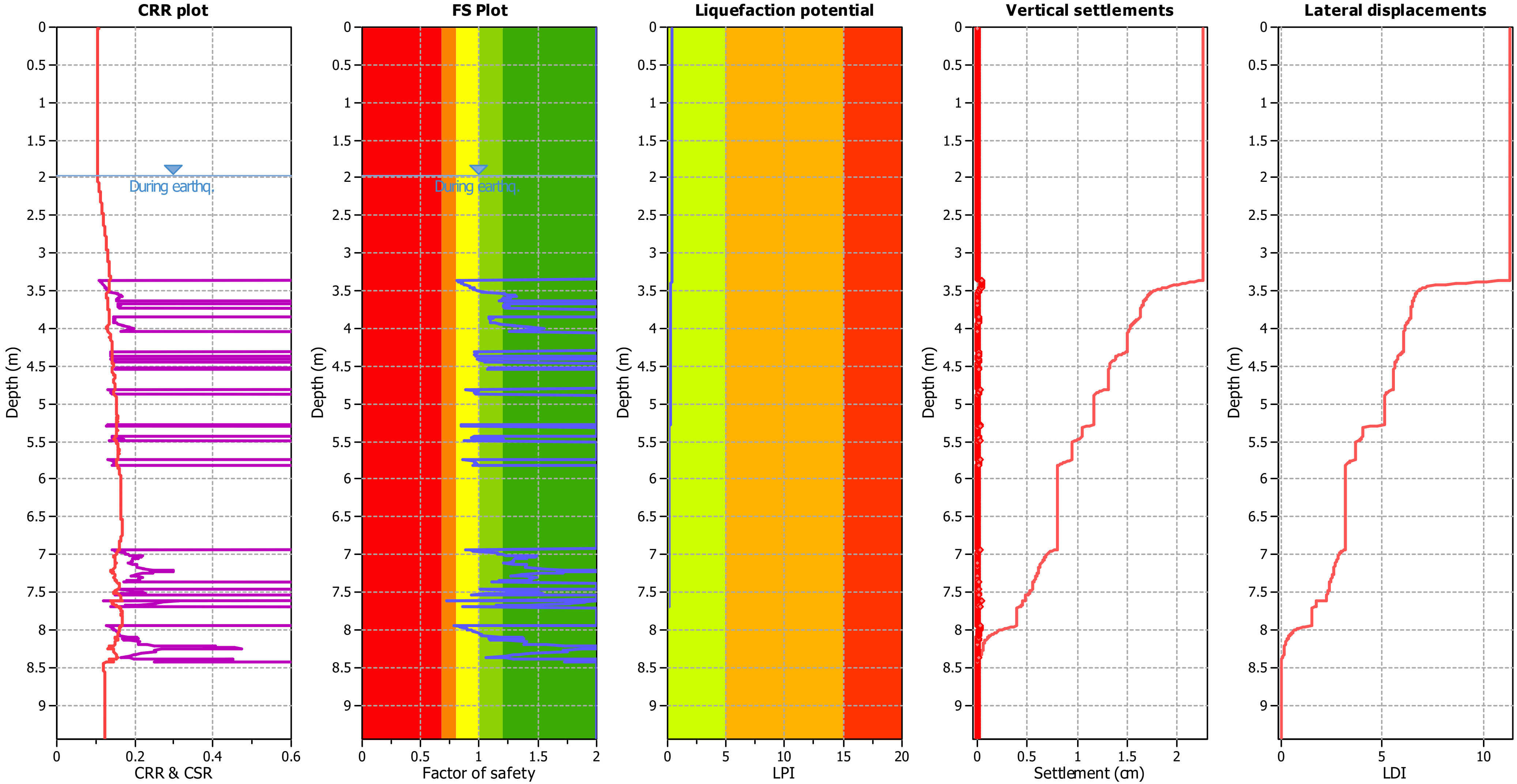
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.98 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.98 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.98 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.98 m	Fill height:	N/A	Limit depth:	N/A

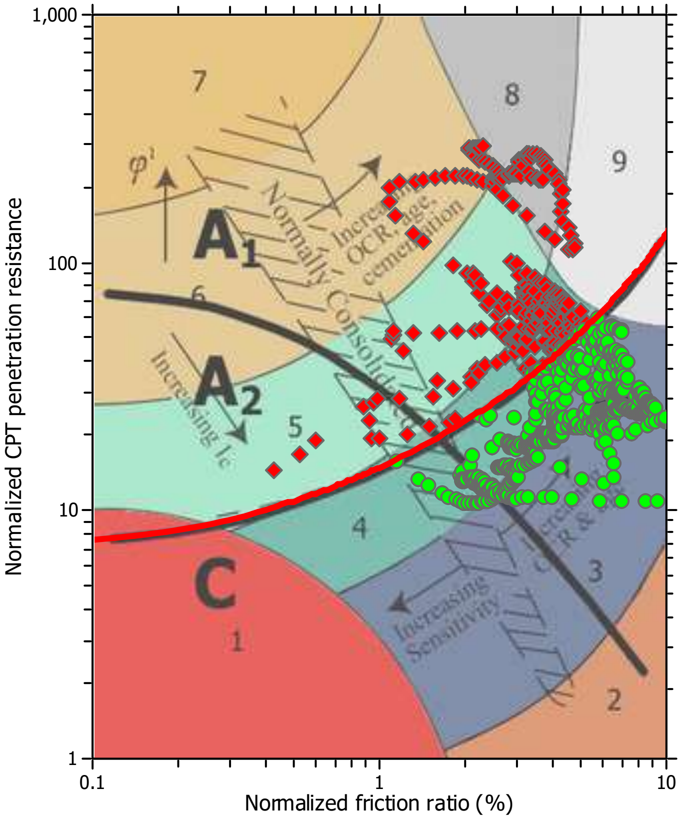
F.S. color scheme

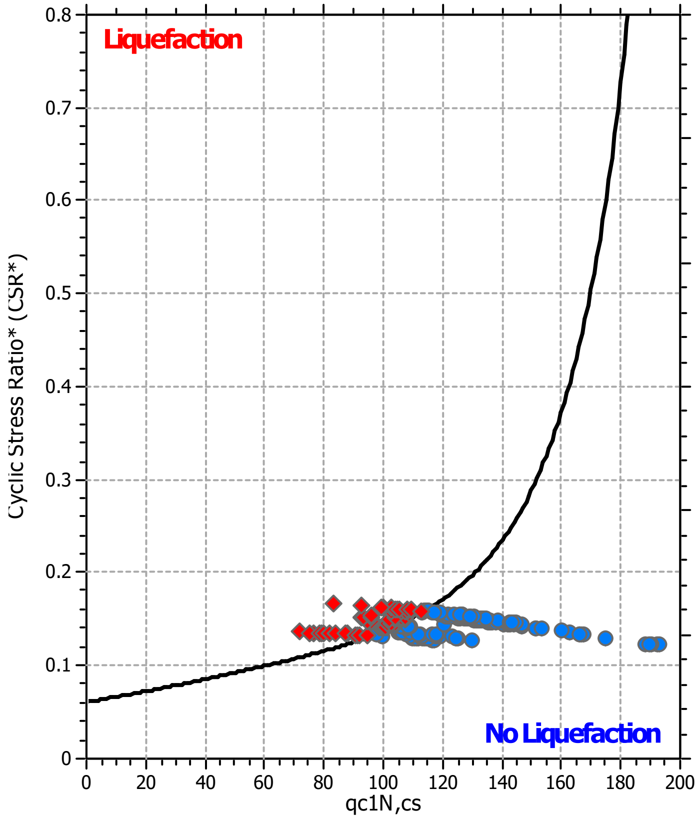
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

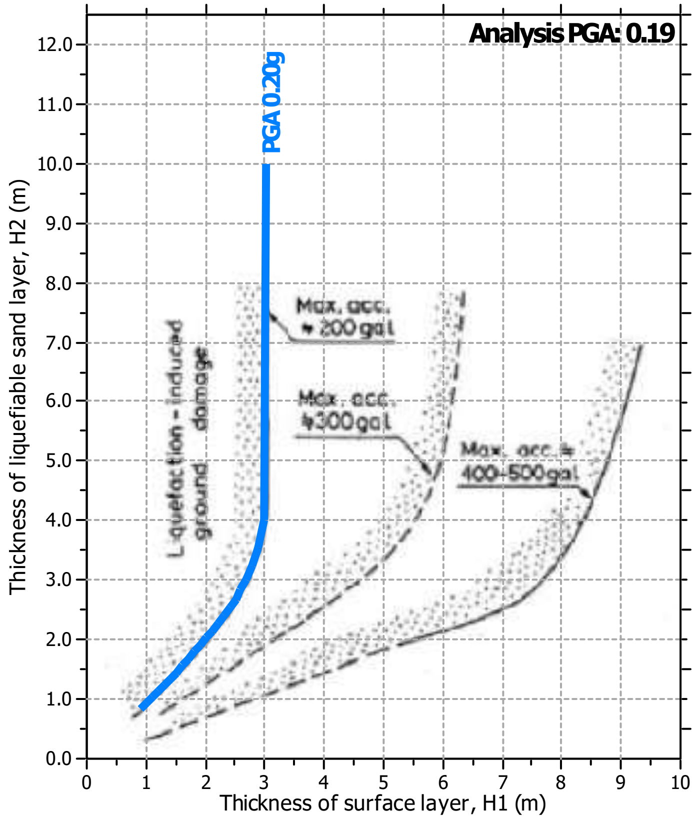
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.98 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.98 m	Fill height:	N/A	Limit depth:	N/A

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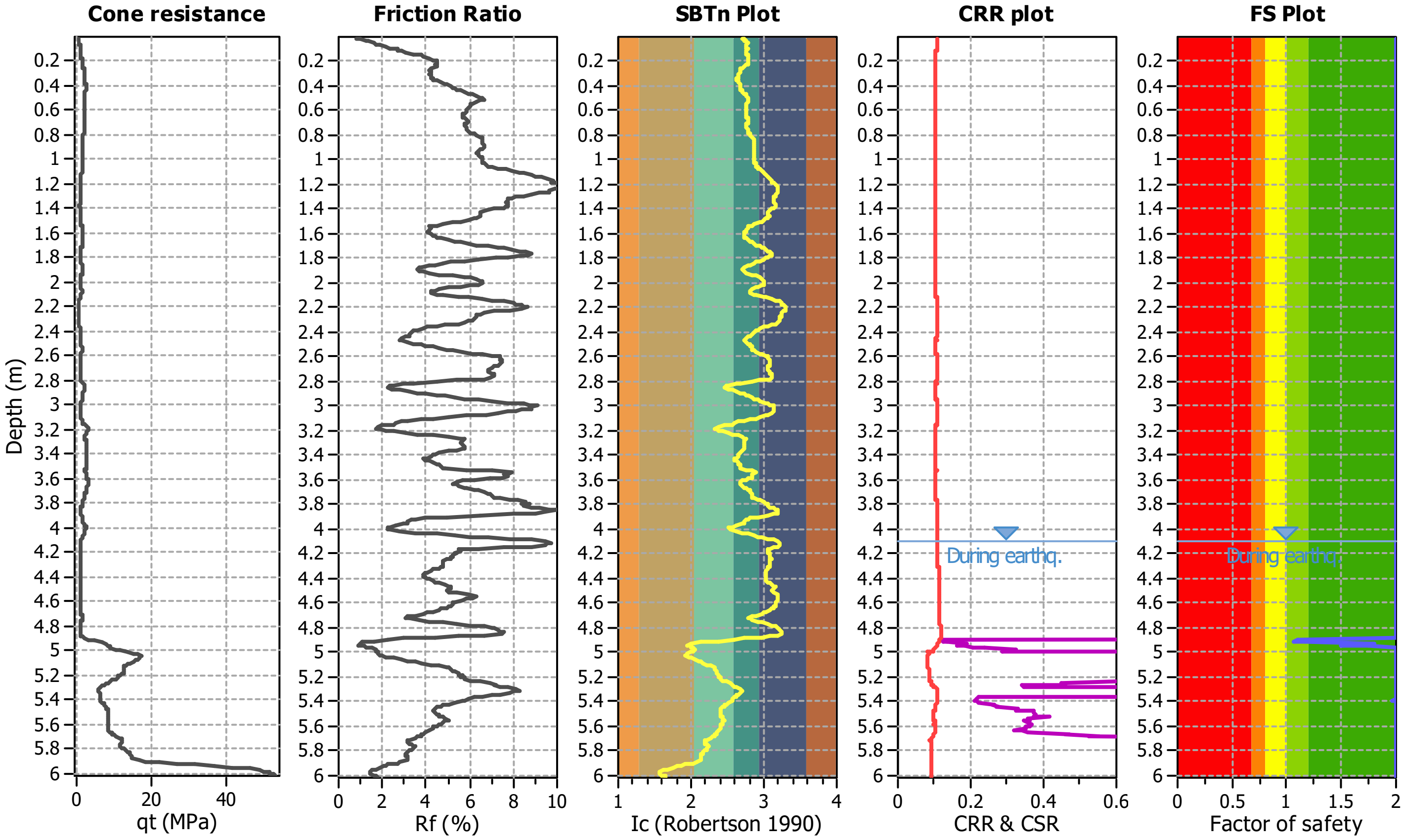
LIQUEFACTION ANALYSIS REPORT

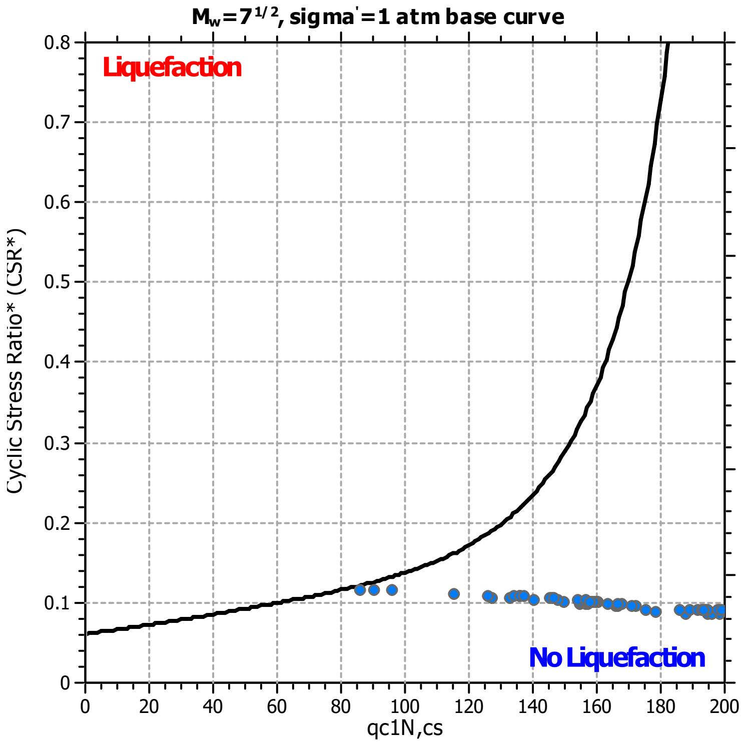
Project title : **Location :**

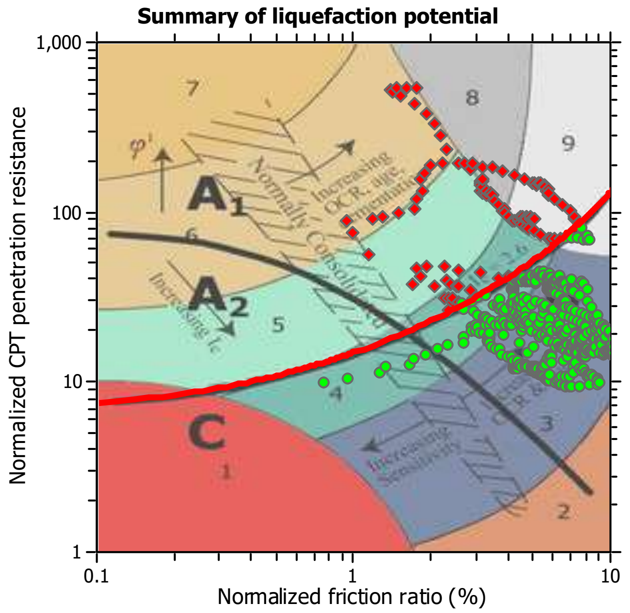
CPT file : CPT03 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

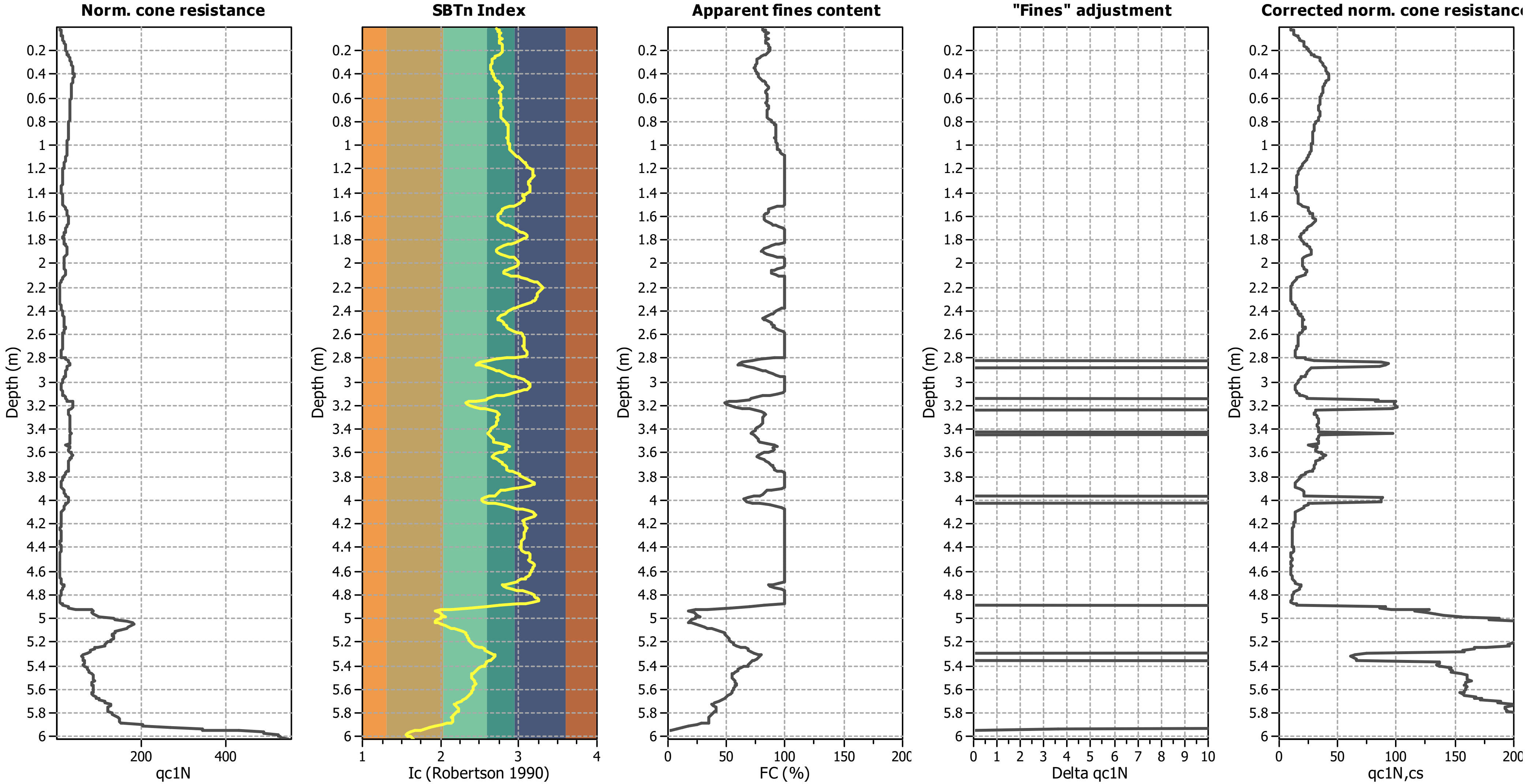






Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

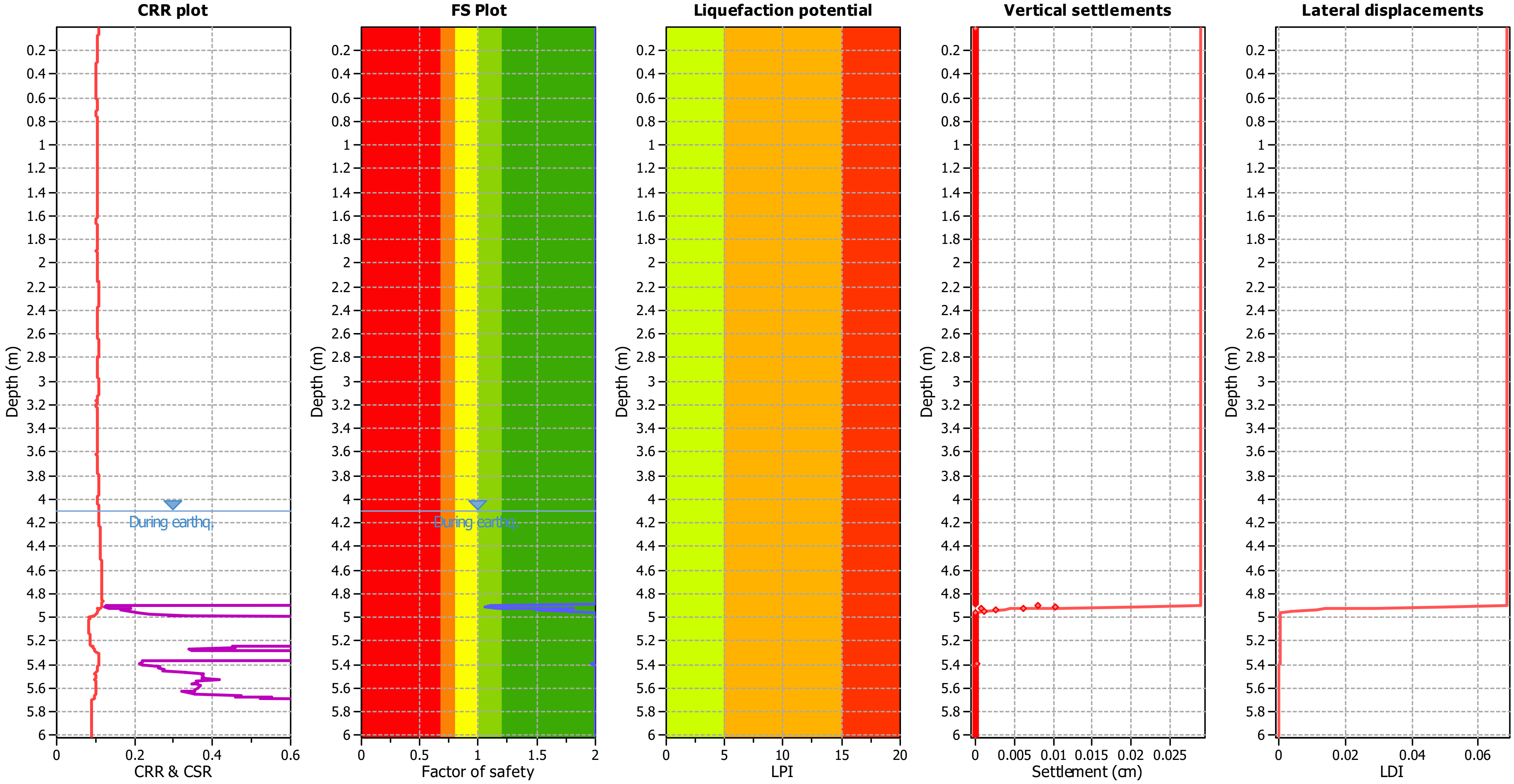
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.10 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.10 m	Fill height:	N/A	Limit depth:	N/A

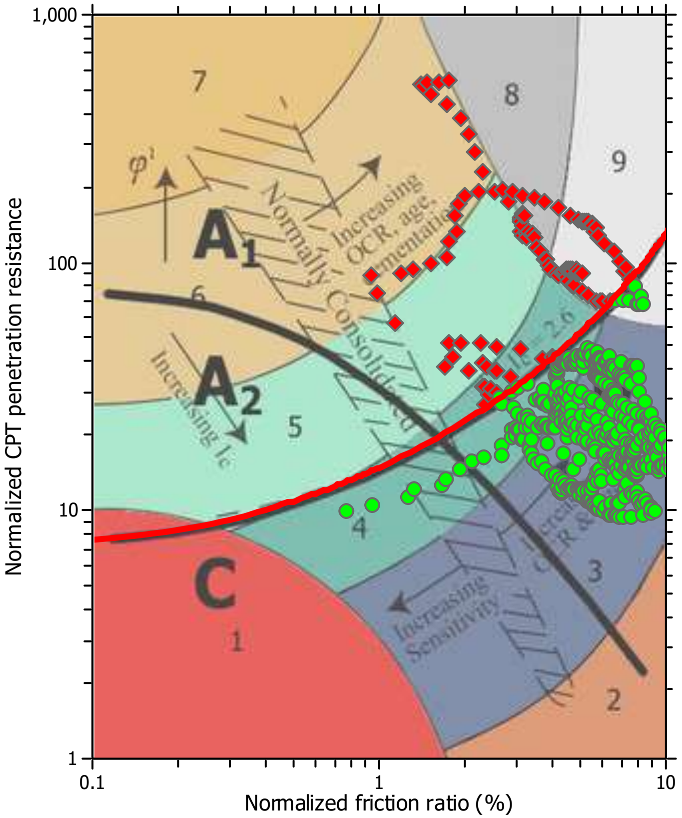
F.S. color scheme

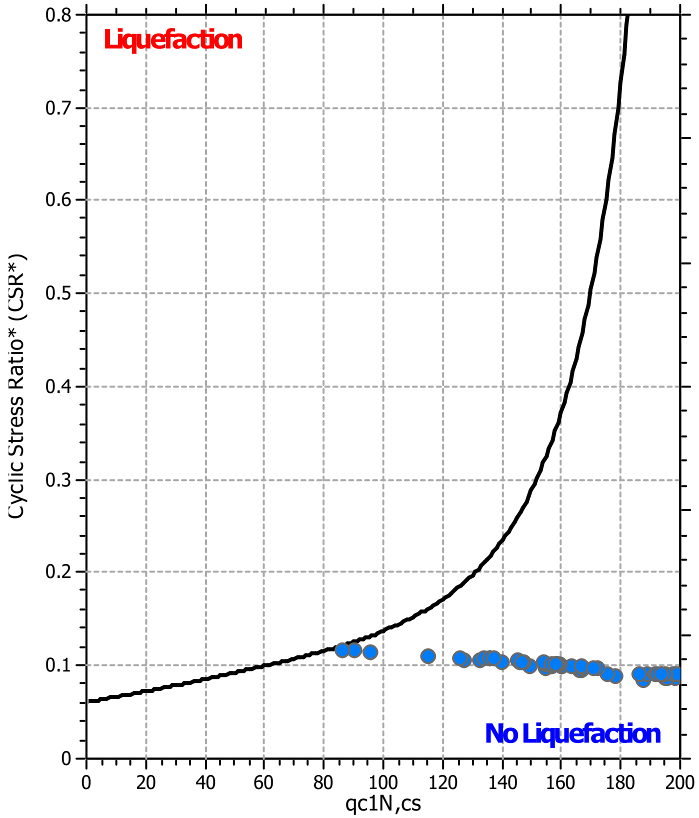
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

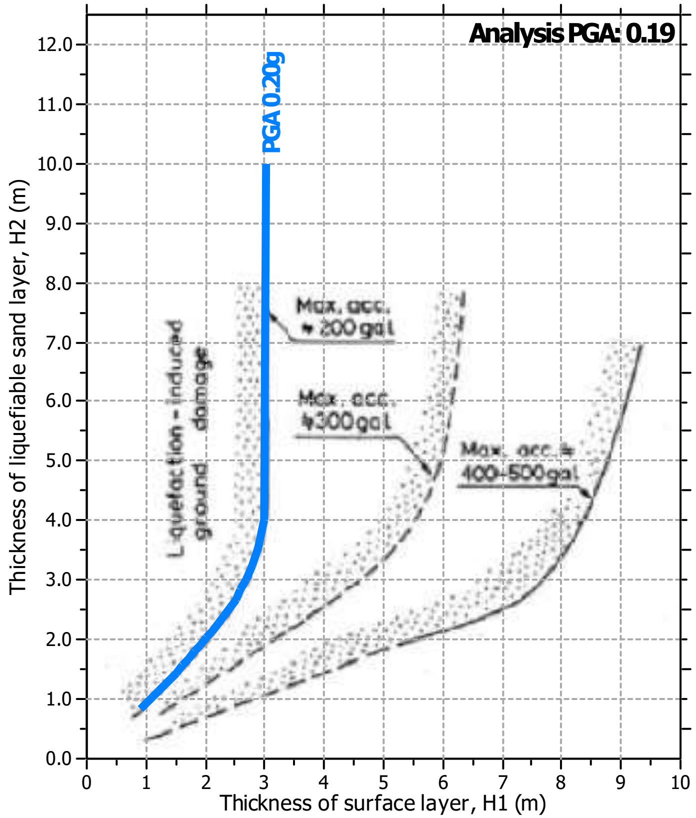
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.10 m	Fill height:	N/A	Limit depth:	N/A

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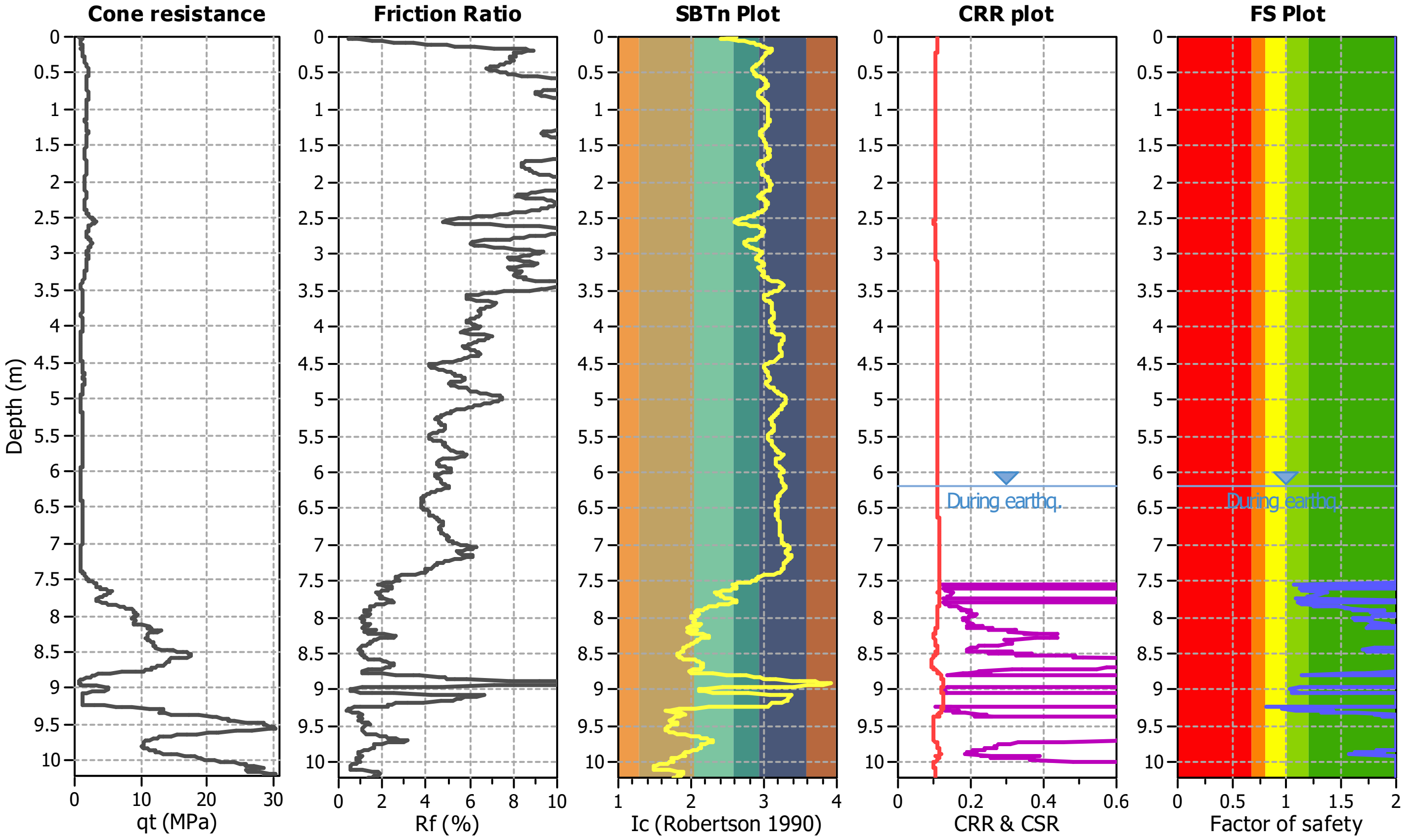
LIQUEFACTION ANALYSIS REPORT

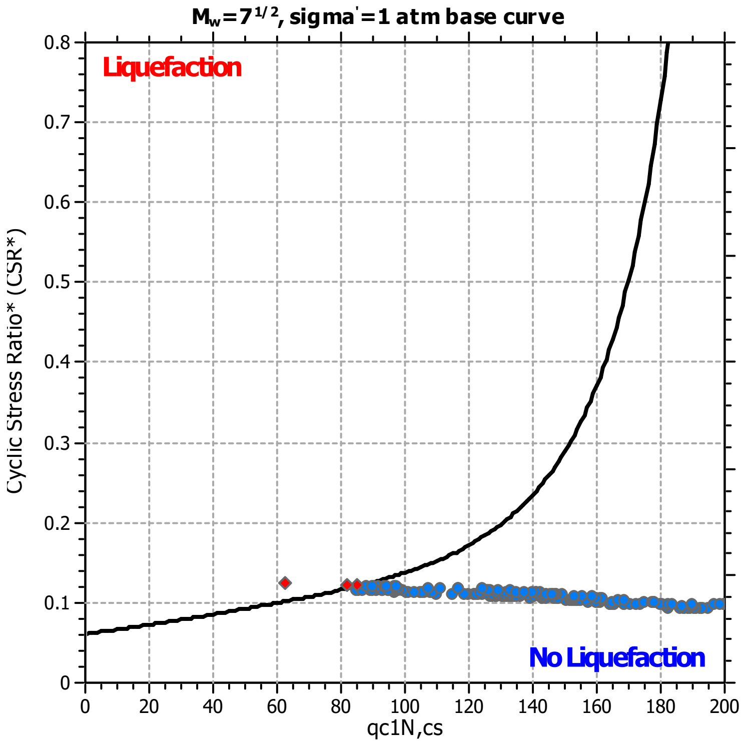
Project title : **Location :**

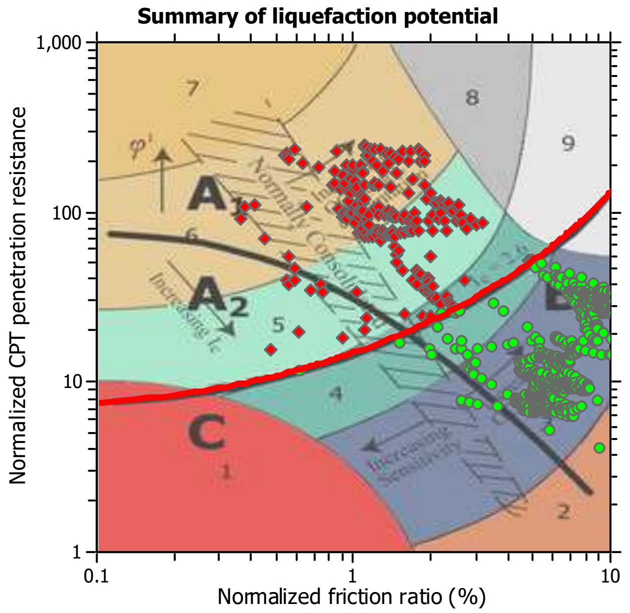
CPT file : CPT04 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

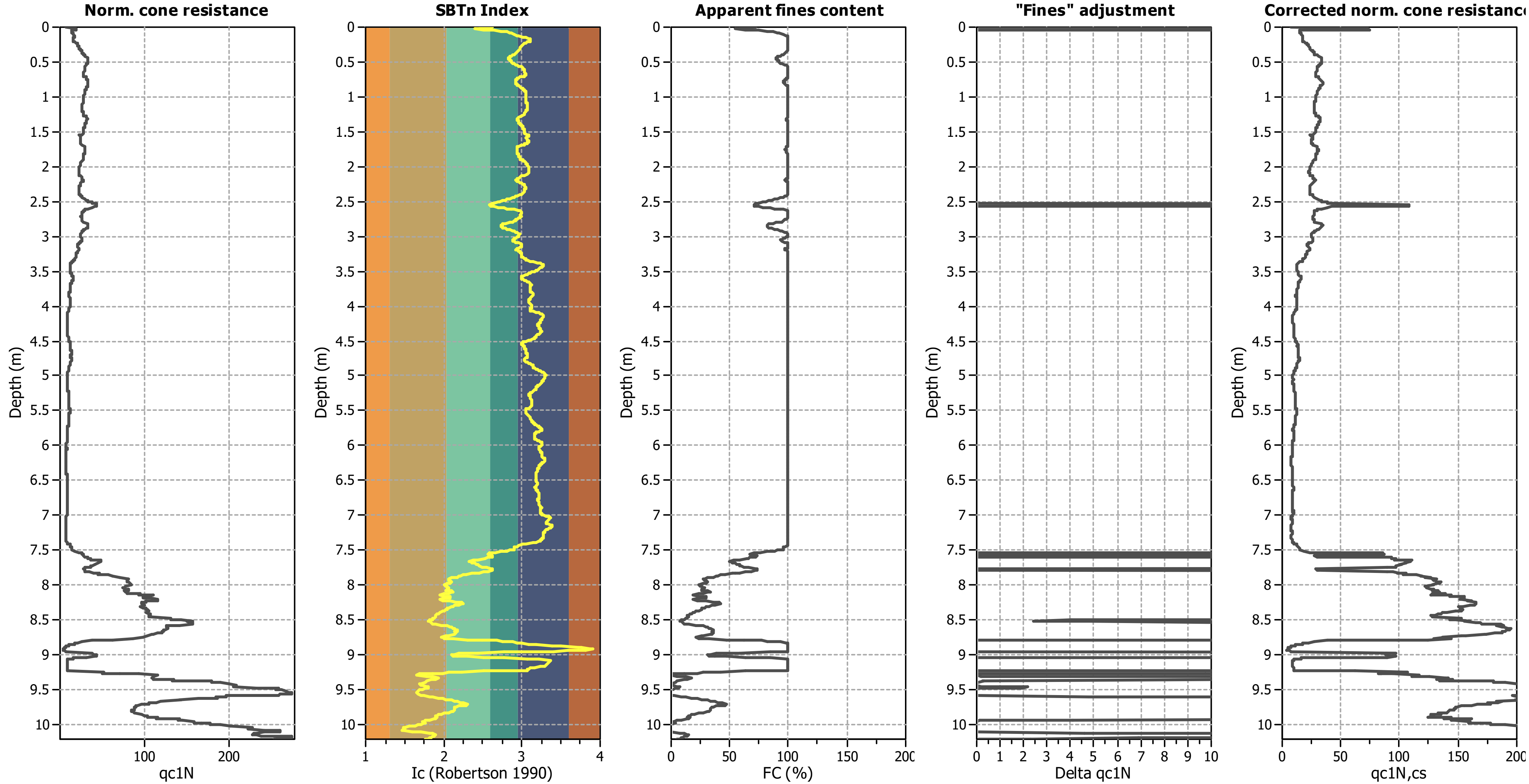






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

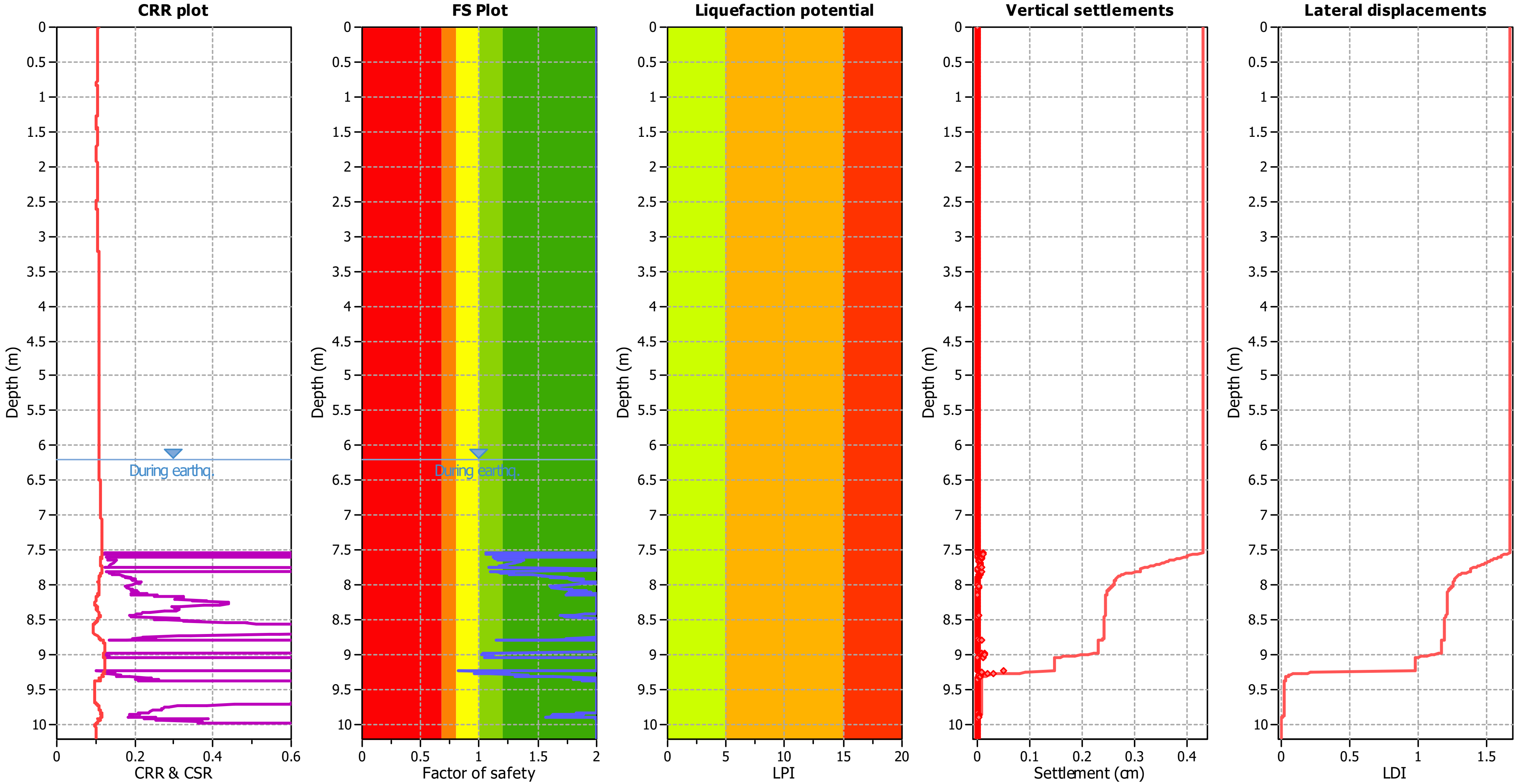
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.20 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.20 m	Fill height:	N/A	Limit depth:	N/A

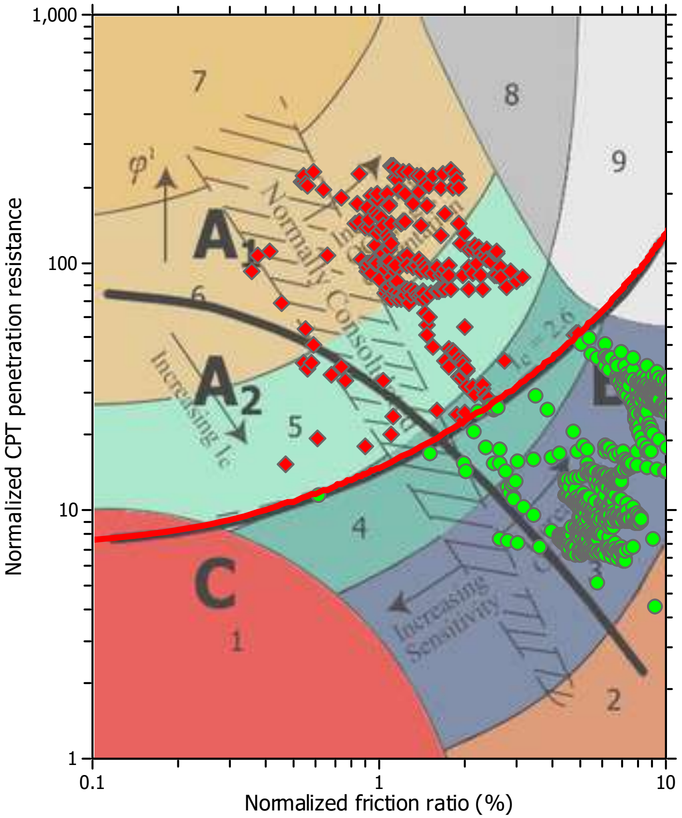
F.S. color scheme

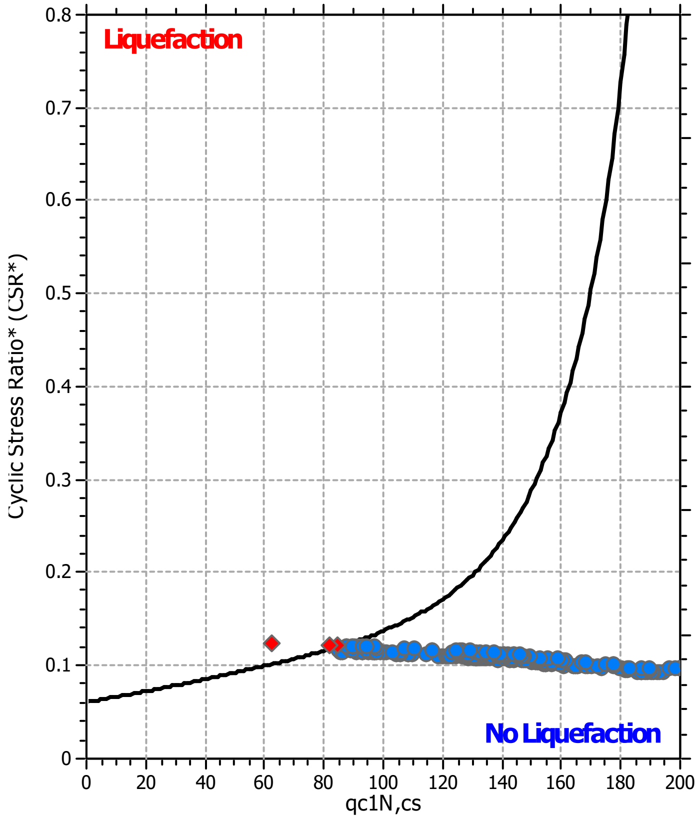
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

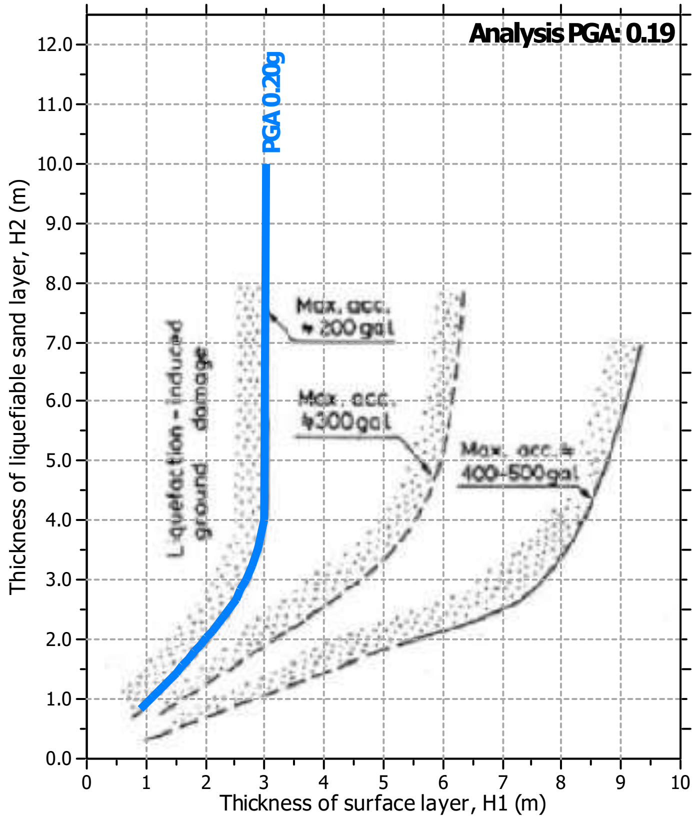
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.20 m	Fill height:	N/A	Limit depth:	N/A

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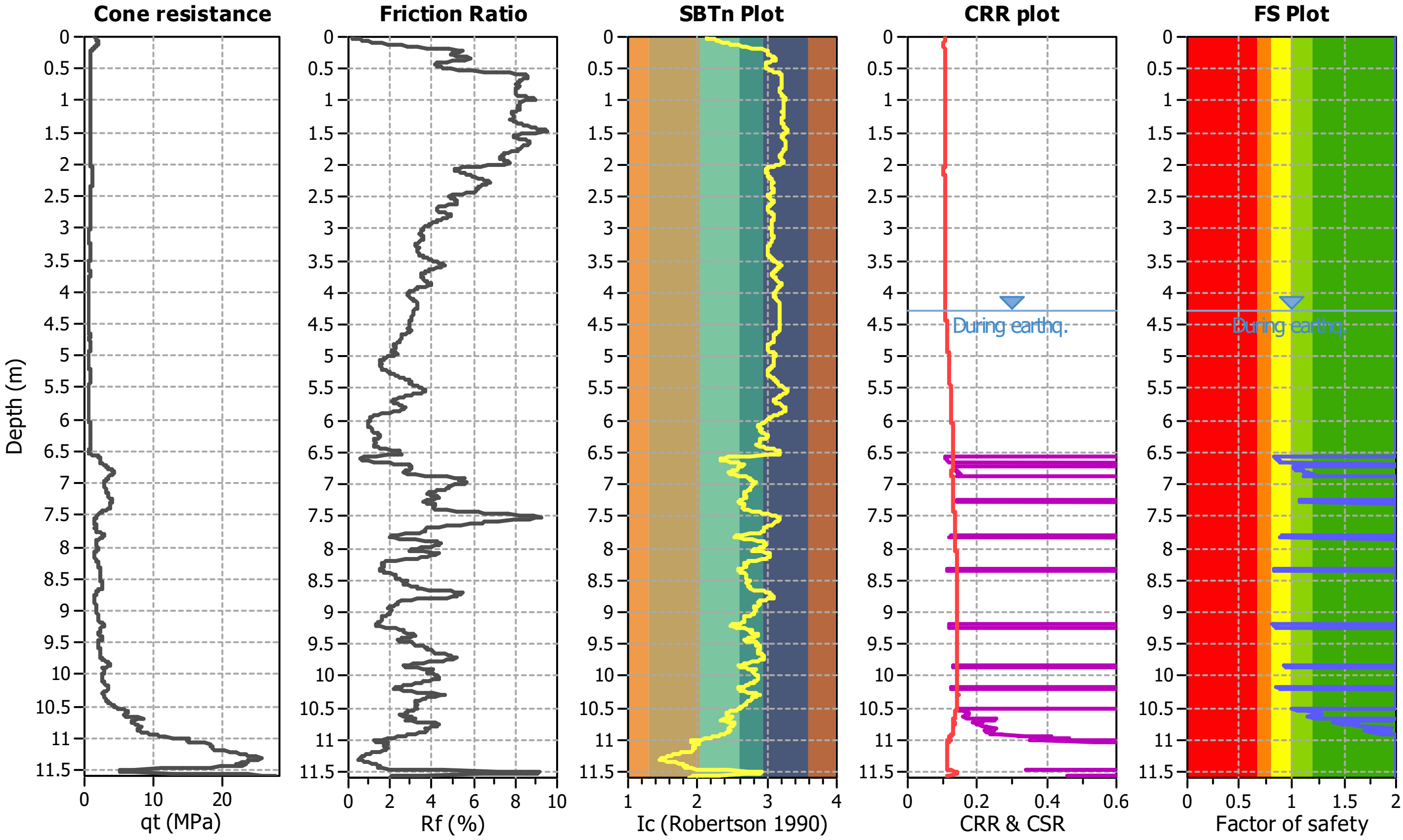
LIQUEFACTION ANALYSIS REPORT

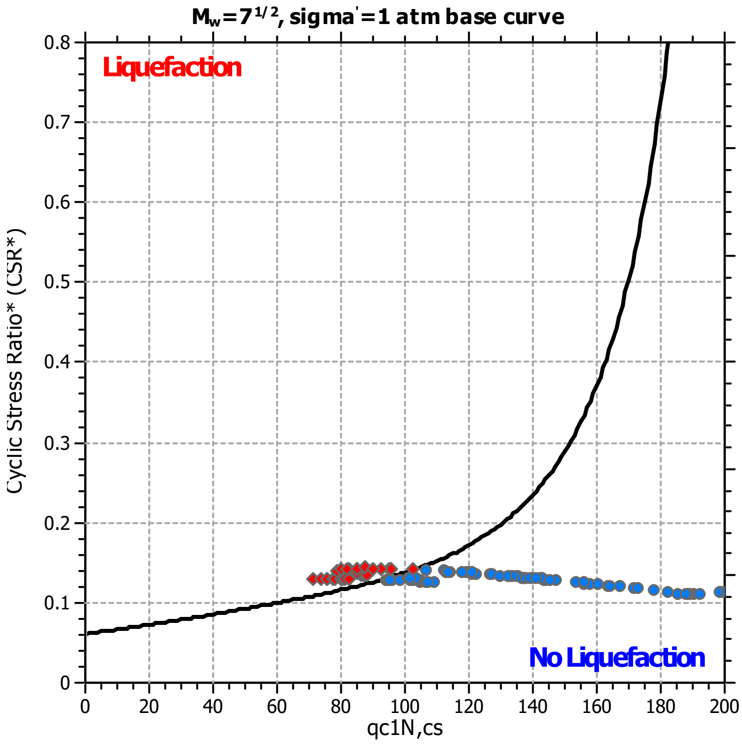
Project title : **Location :**

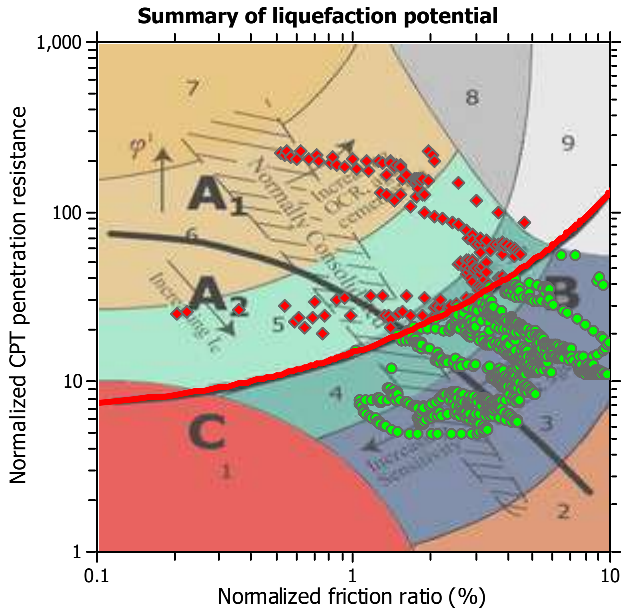
CPT file : CPT05 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.30 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.30 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

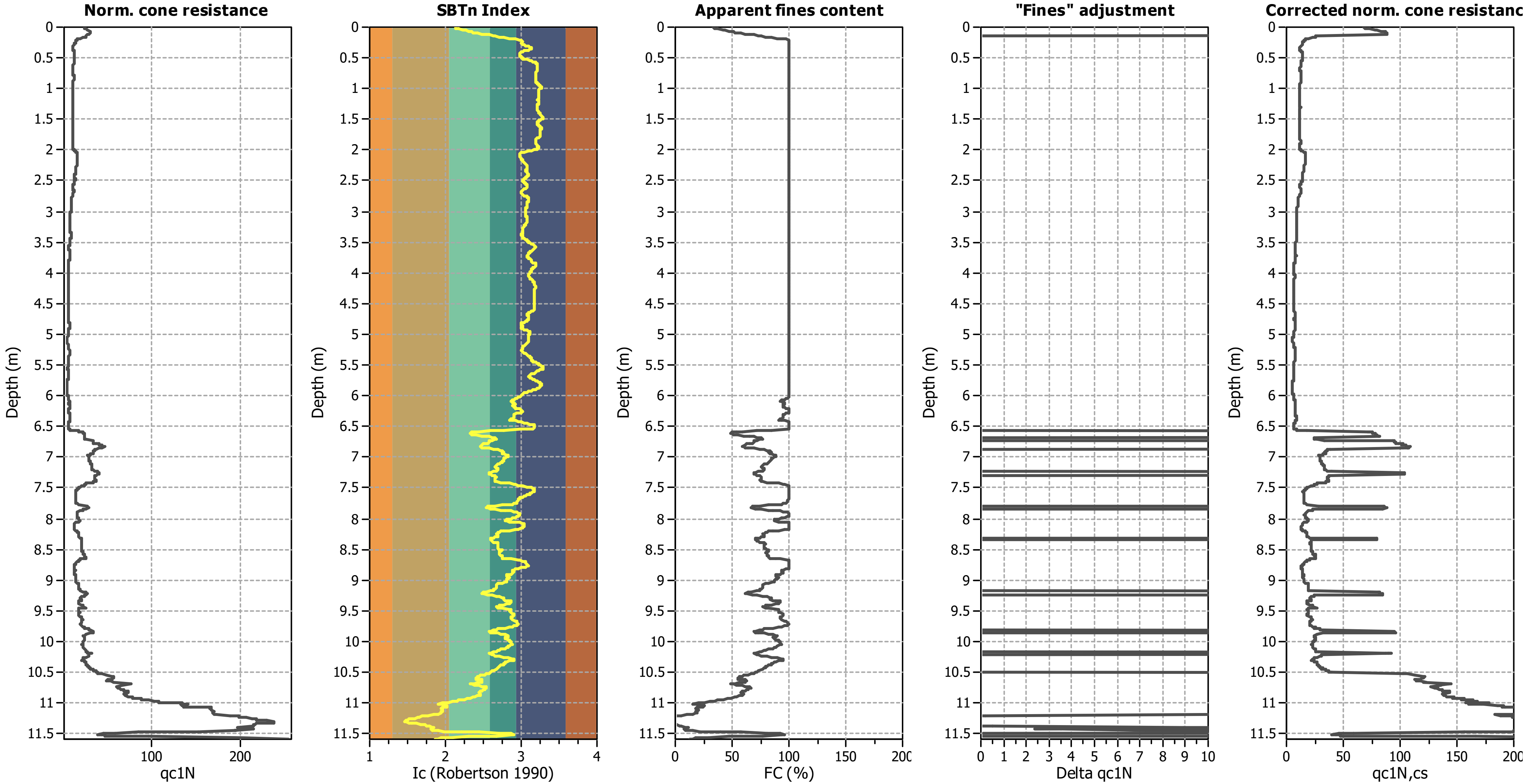






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

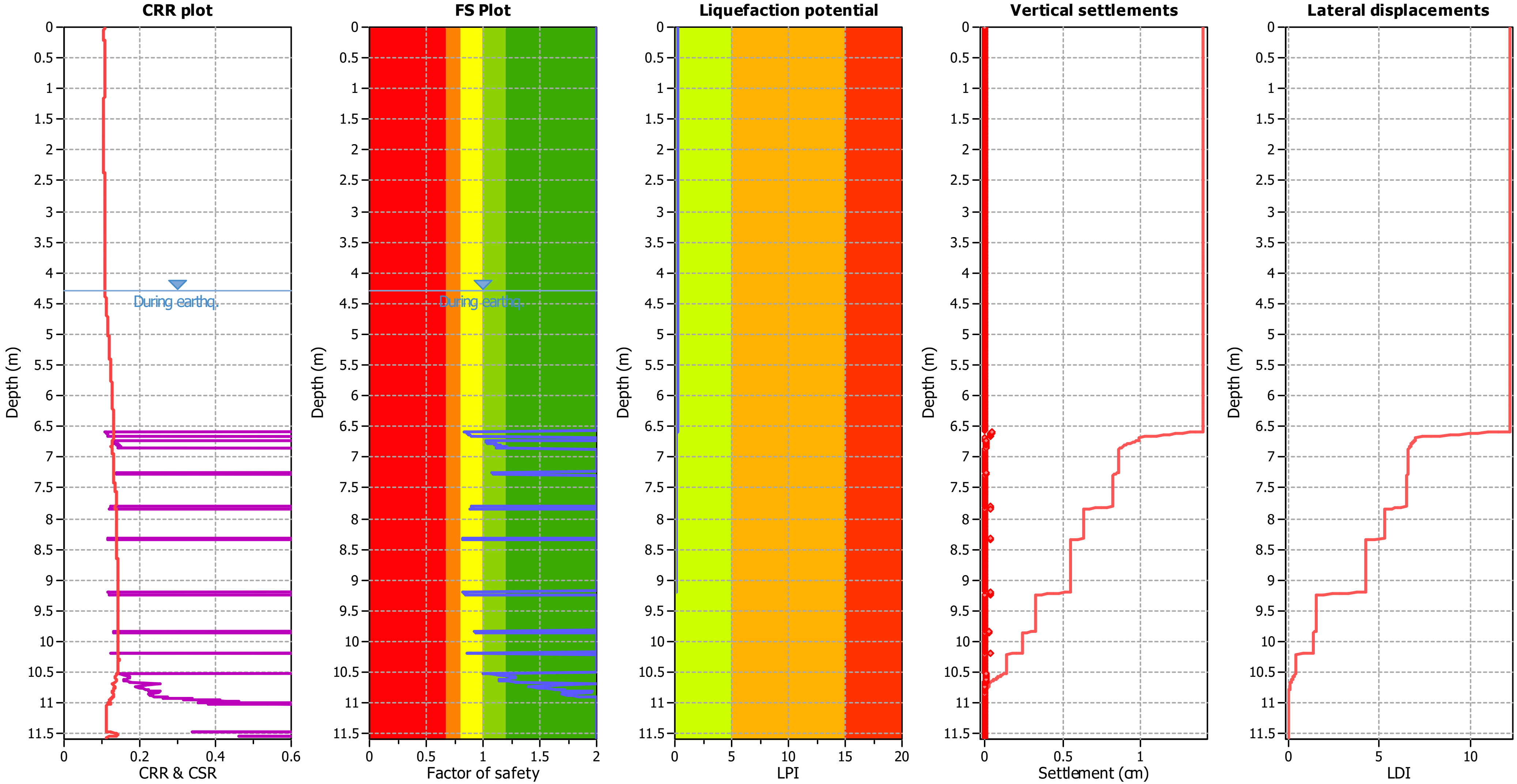
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.30 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.30 m	Fill height:	N/A	Limit depth:	N/A

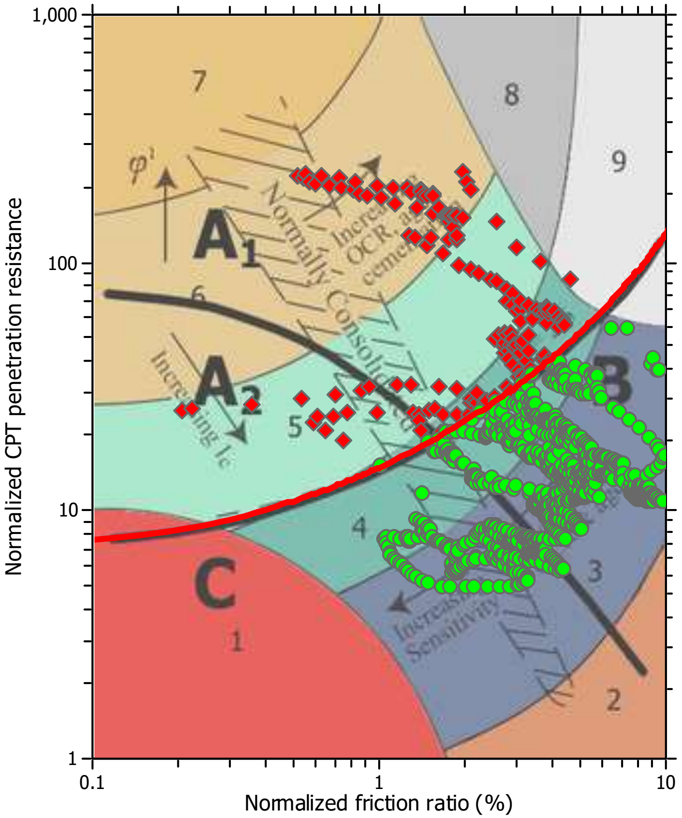
F.S. color scheme

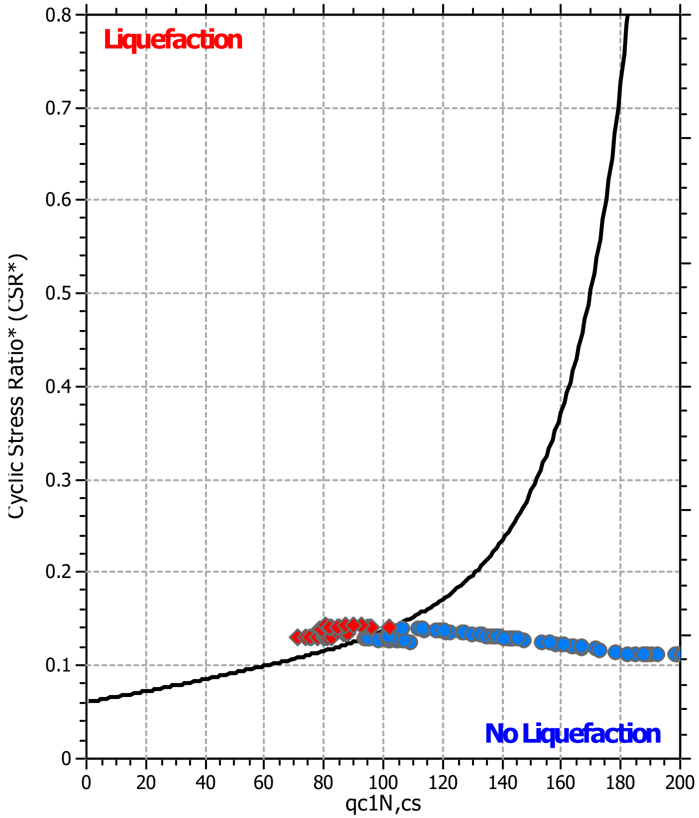
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

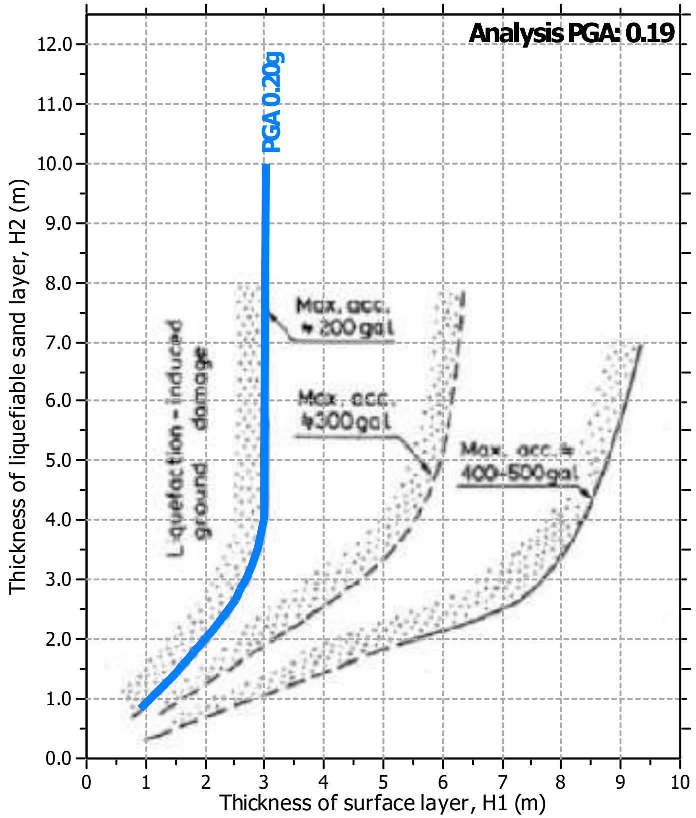
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.30 m	Fill height:	N/A	Limit depth:	N/A

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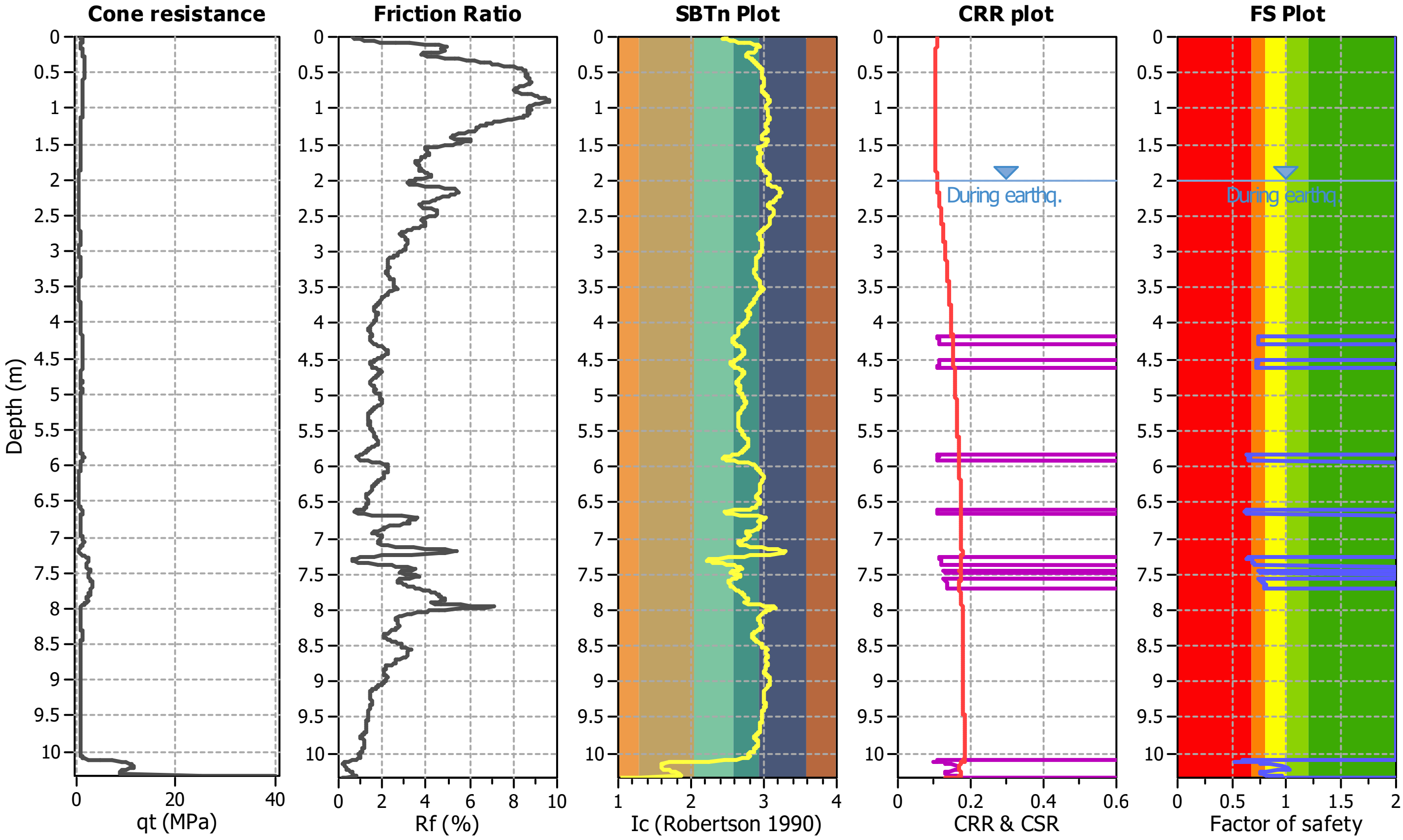
LIQUEFACTION ANALYSIS REPORT

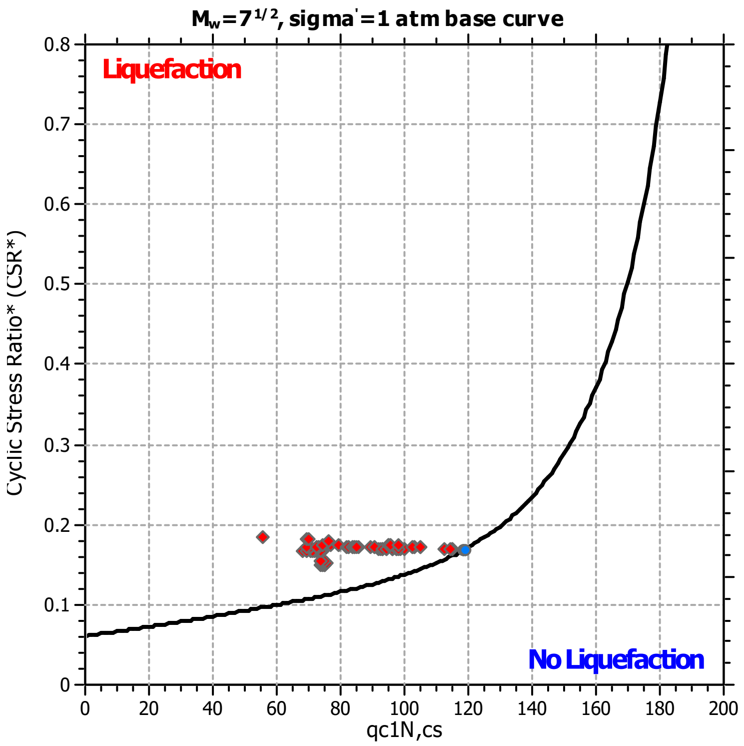
Project title : **Location :**

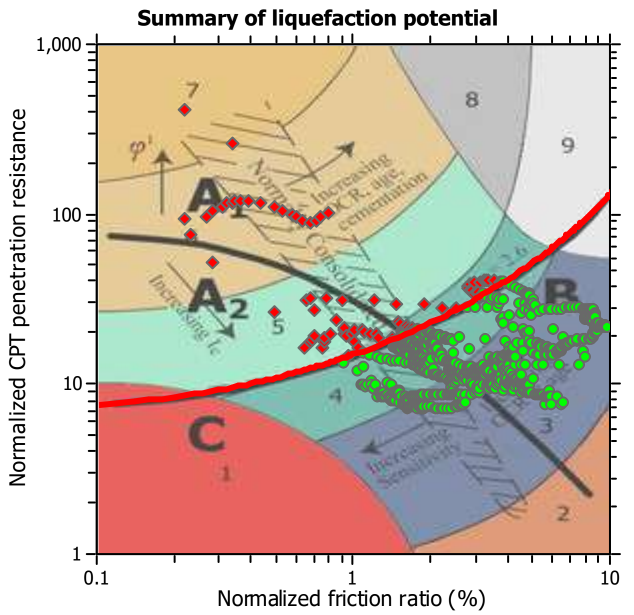
CPT file : CPT06 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

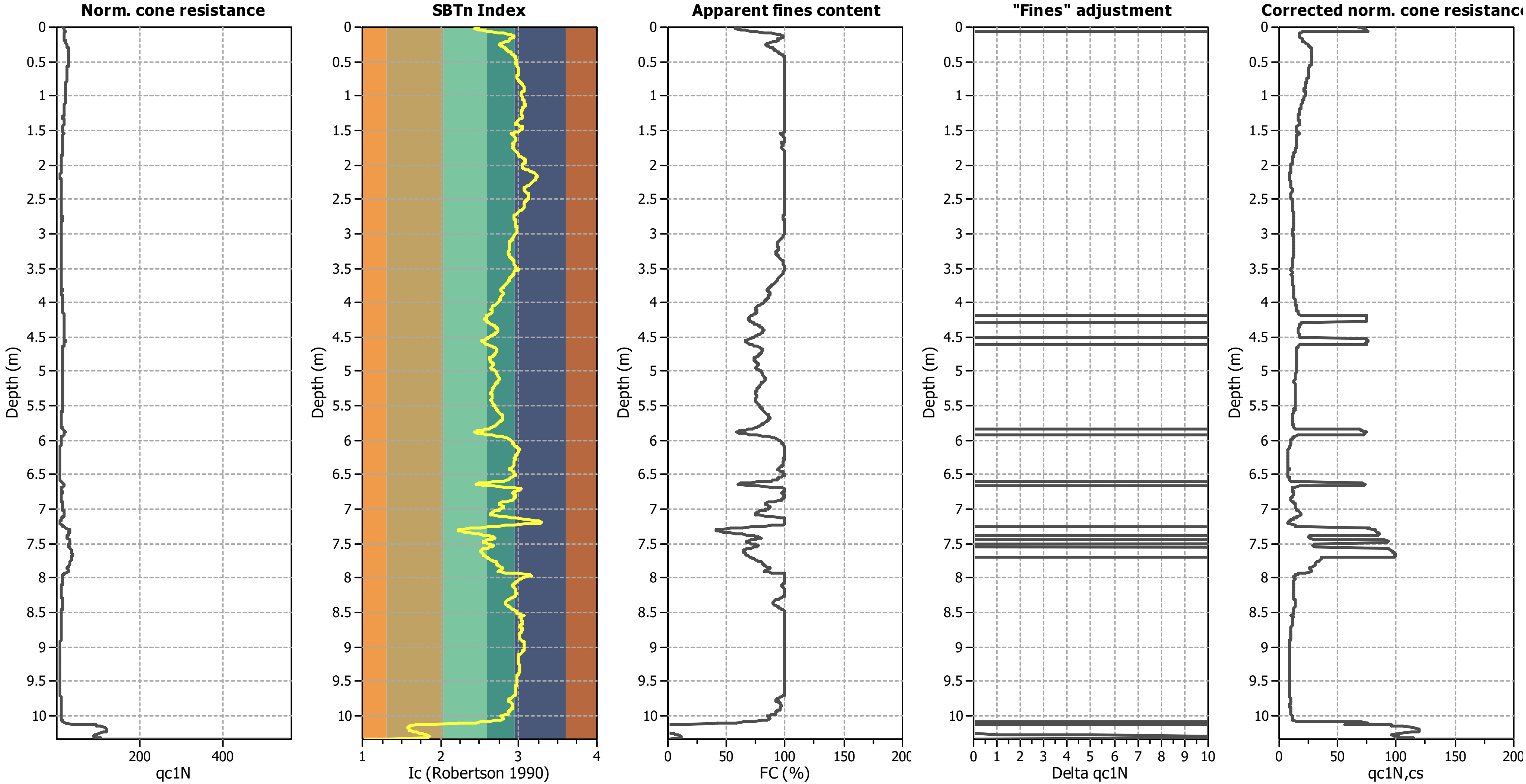






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

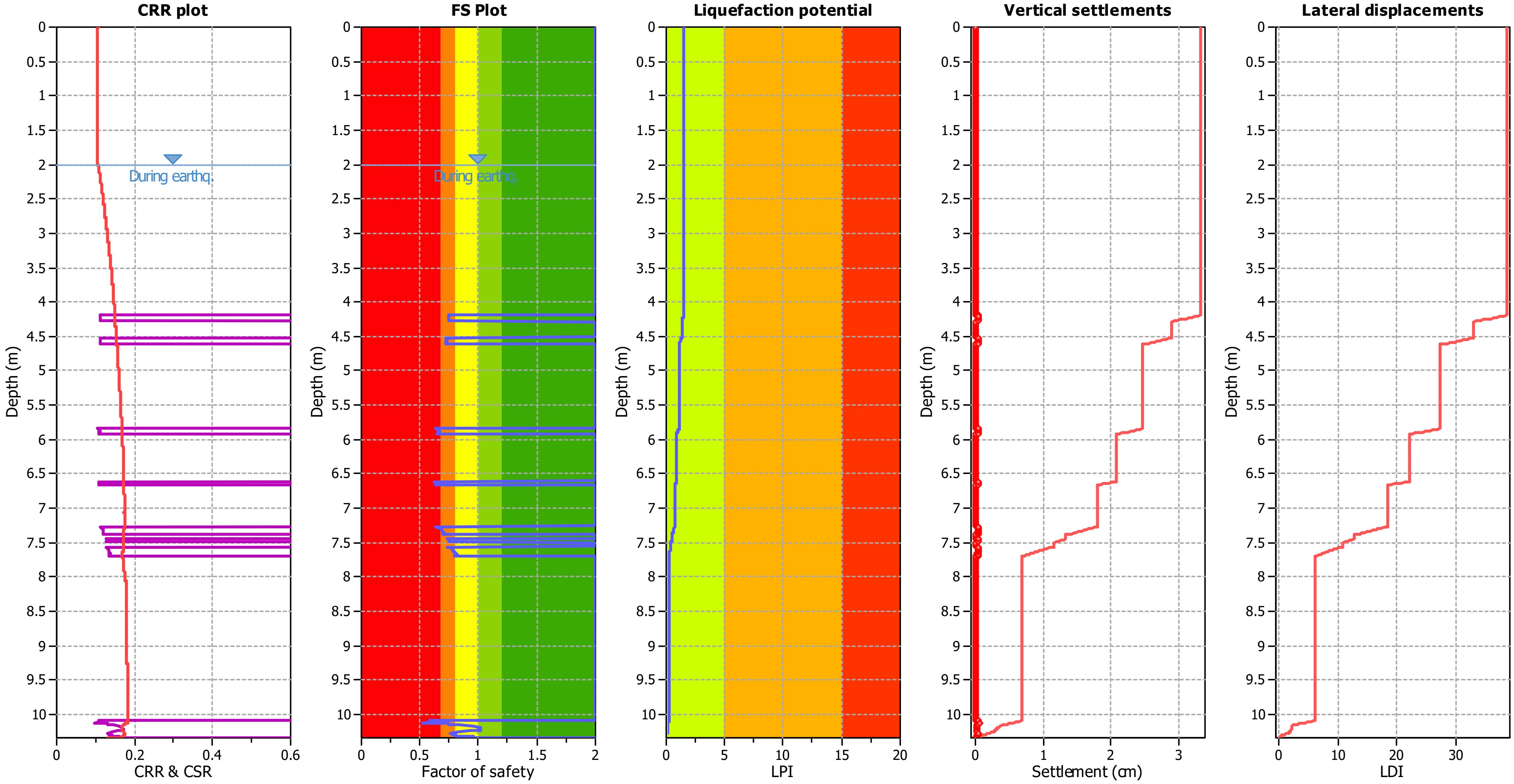
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	6.50
Peak ground acceleration:	0.19
Depth to water table (insitu):	2.00 m
Depth to GWT (erthq.):	2.00 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sands only
Limit depth applied:	No
Limit depth:	N/A

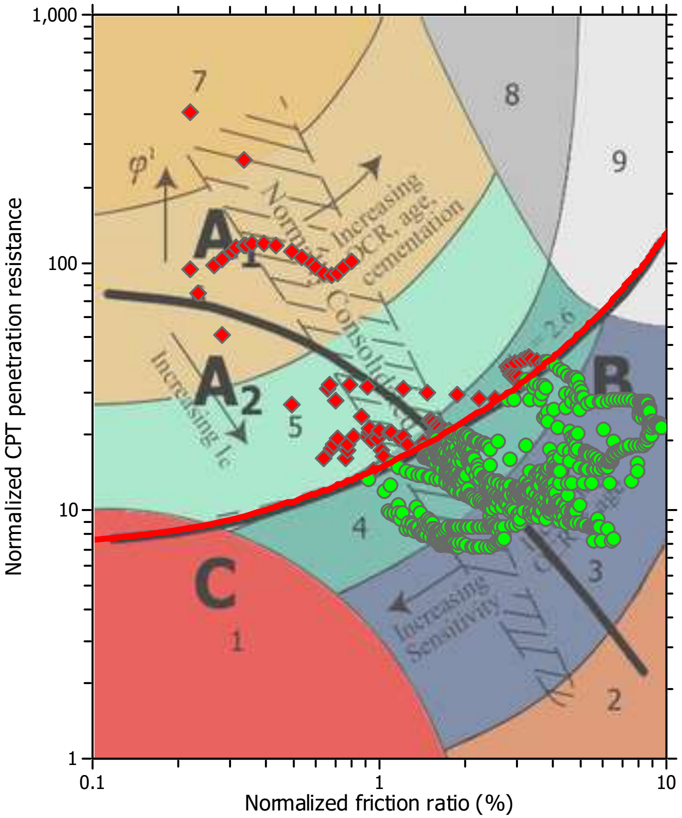
F.S. color scheme

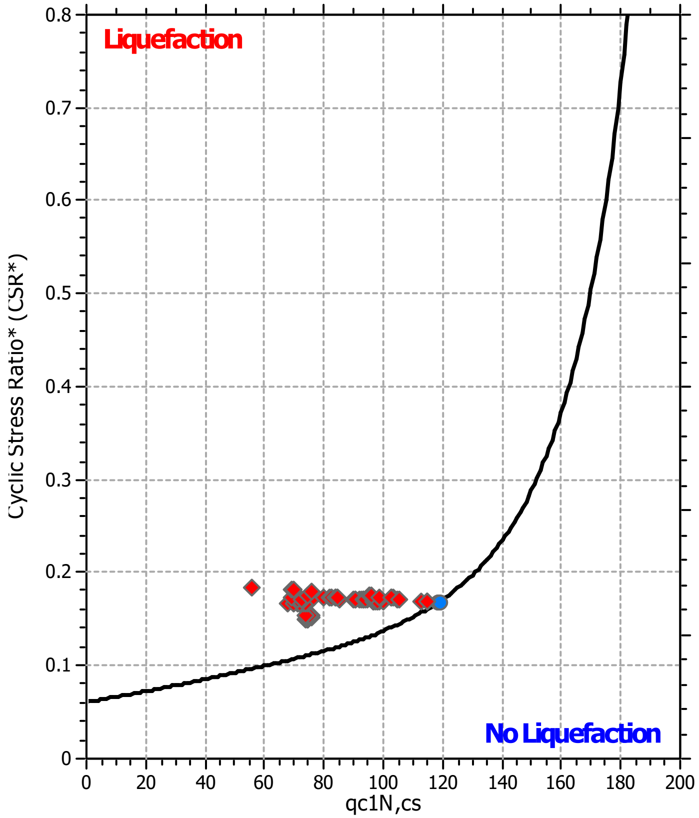
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

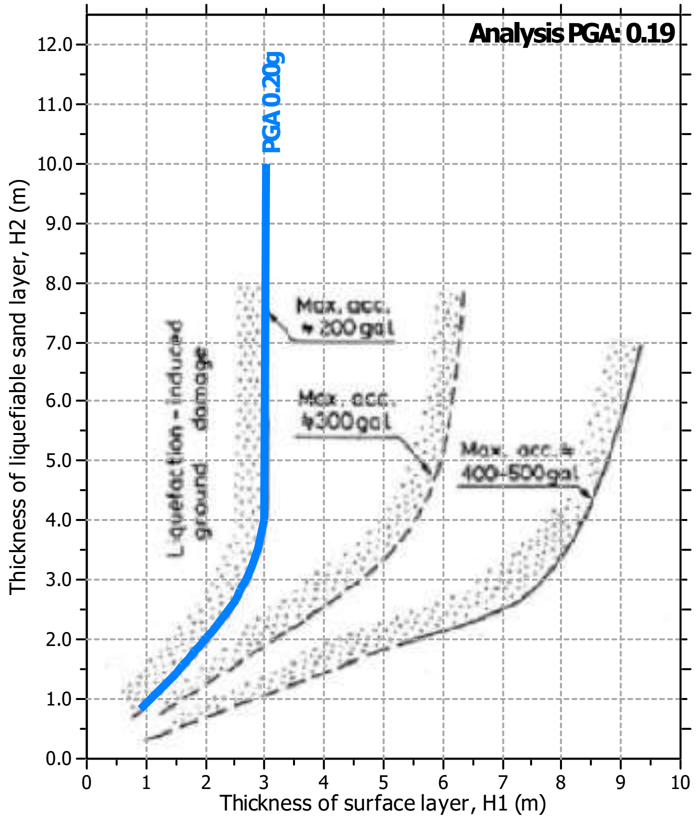
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

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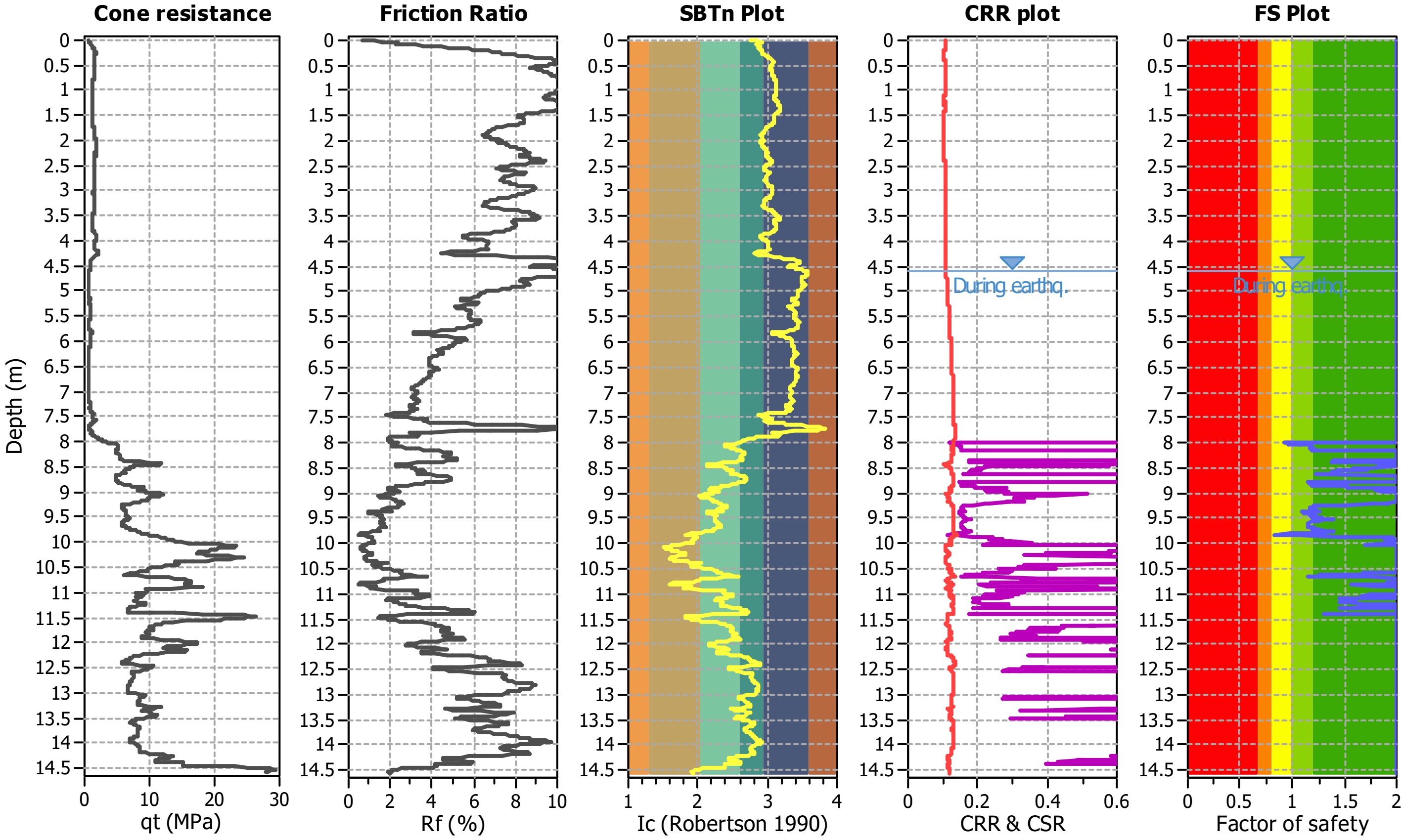
LIQUEFACTION ANALYSIS REPORT

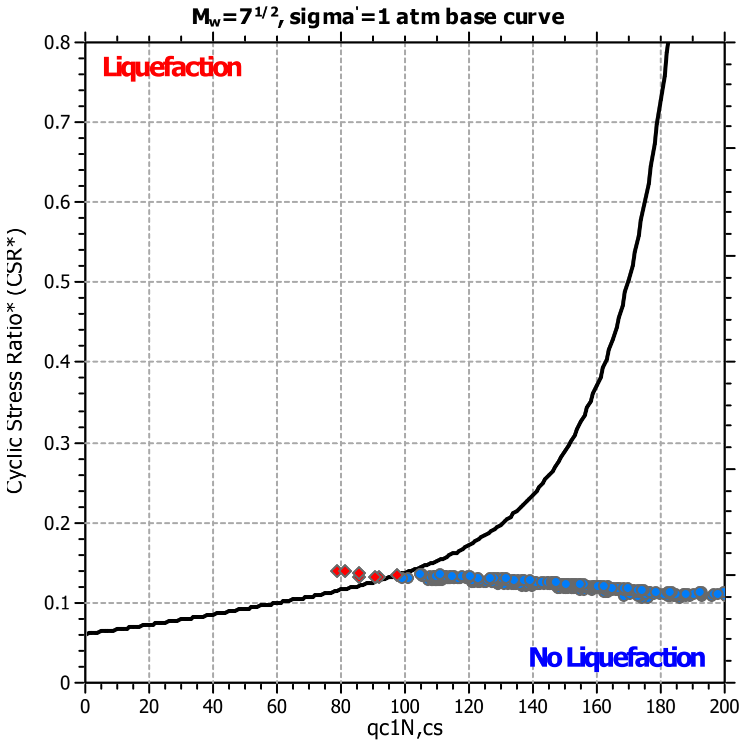
Project title : **Location :**

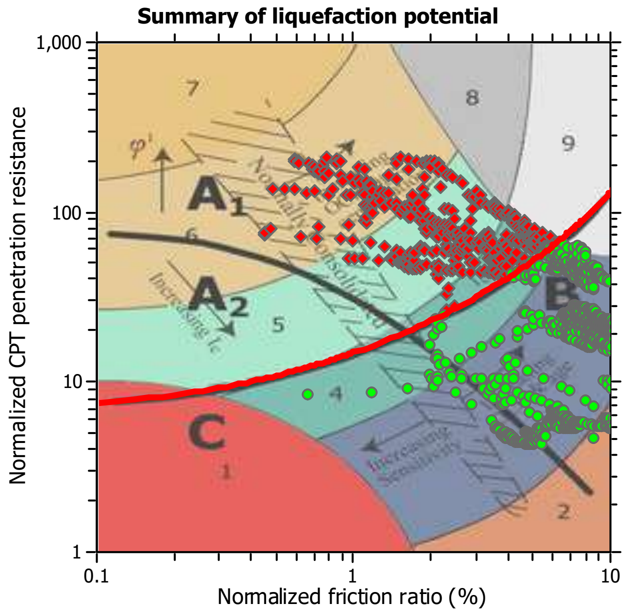
CPT file : CPT07 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.60 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

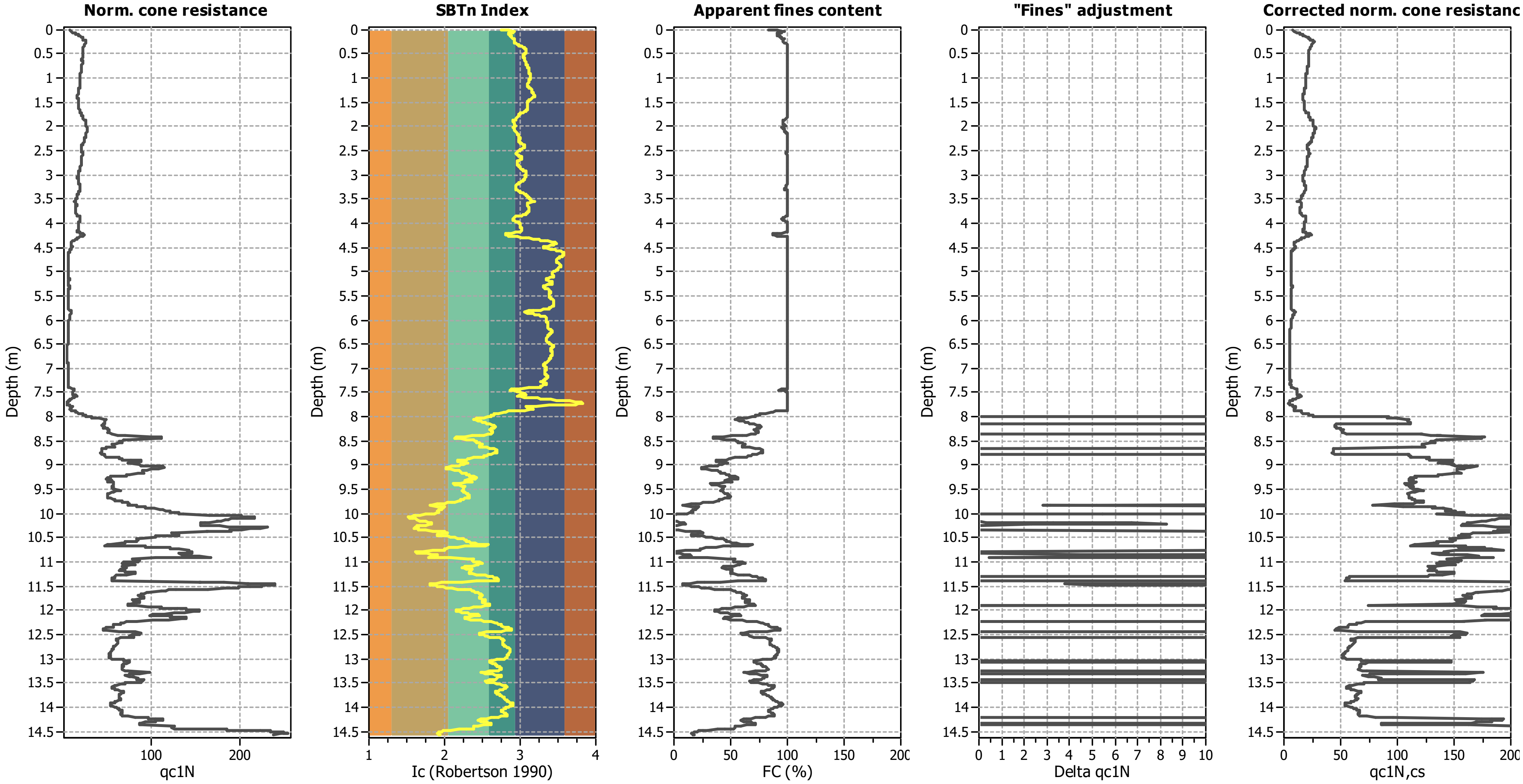






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

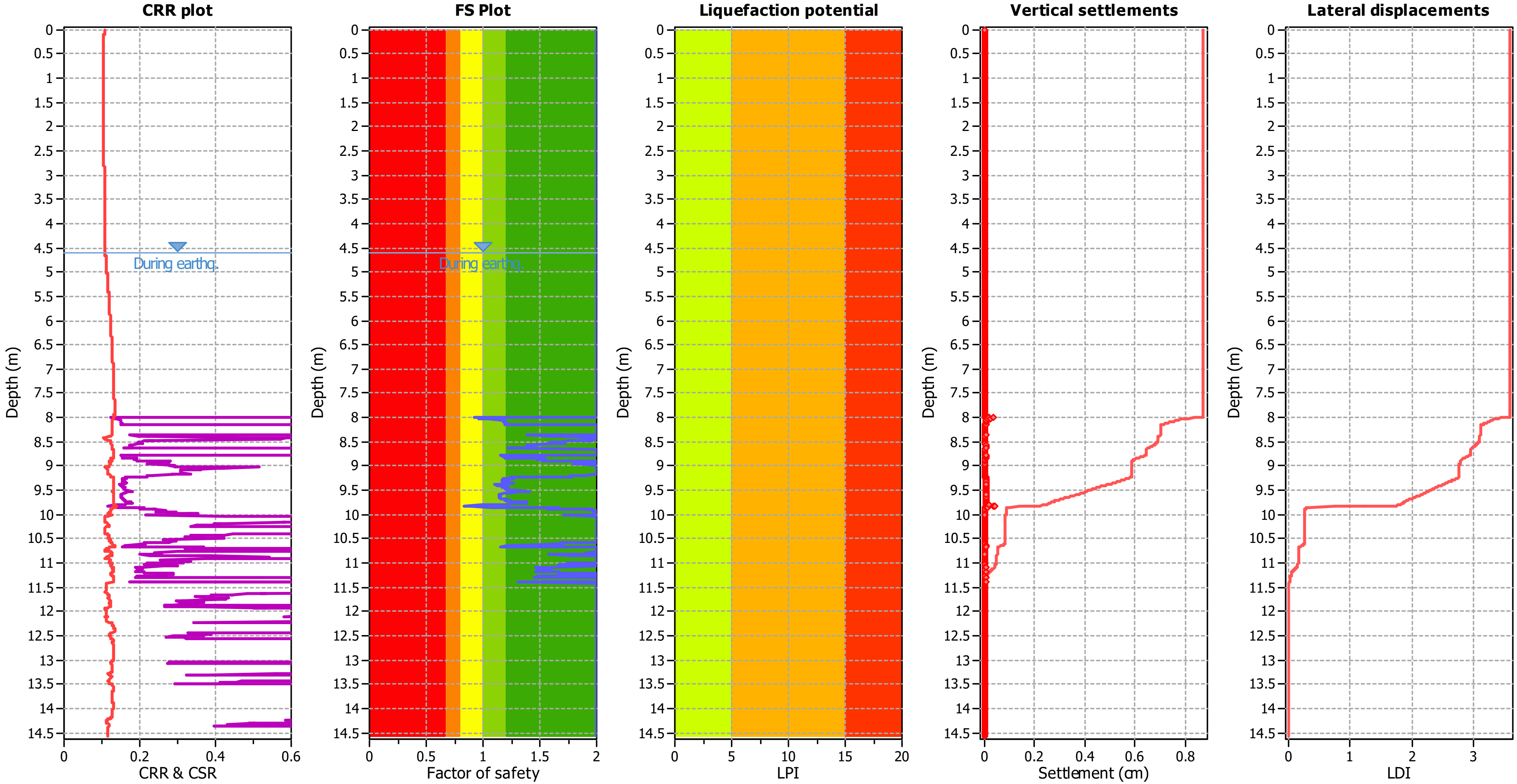
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.60 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.60 m	Fill height:	N/A	Limit depth:	N/A

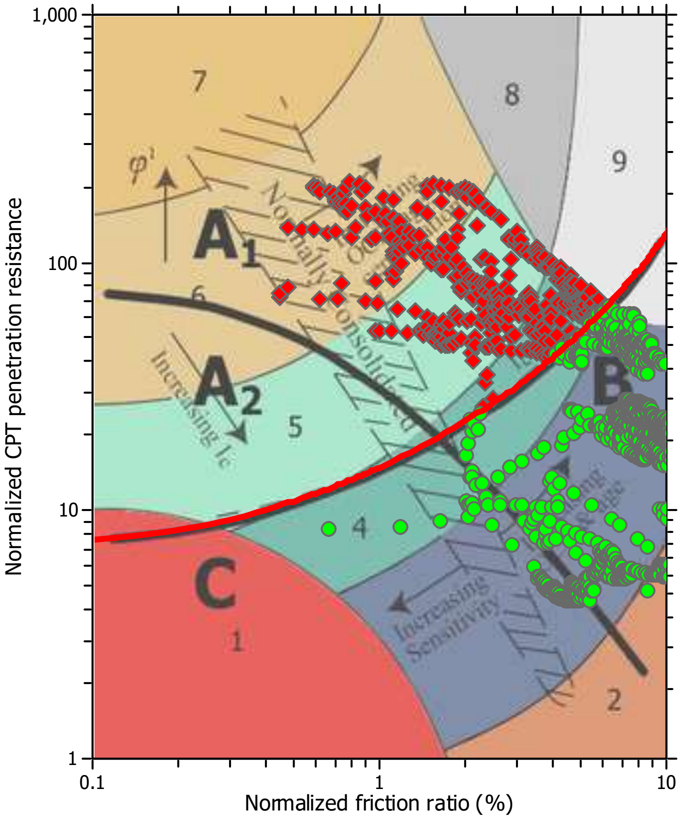
F.S. color scheme

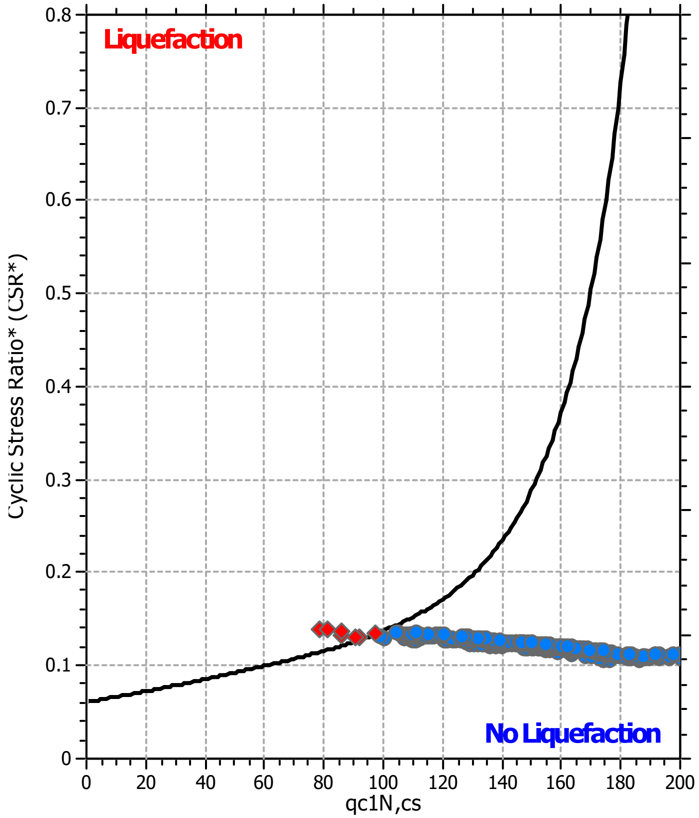
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

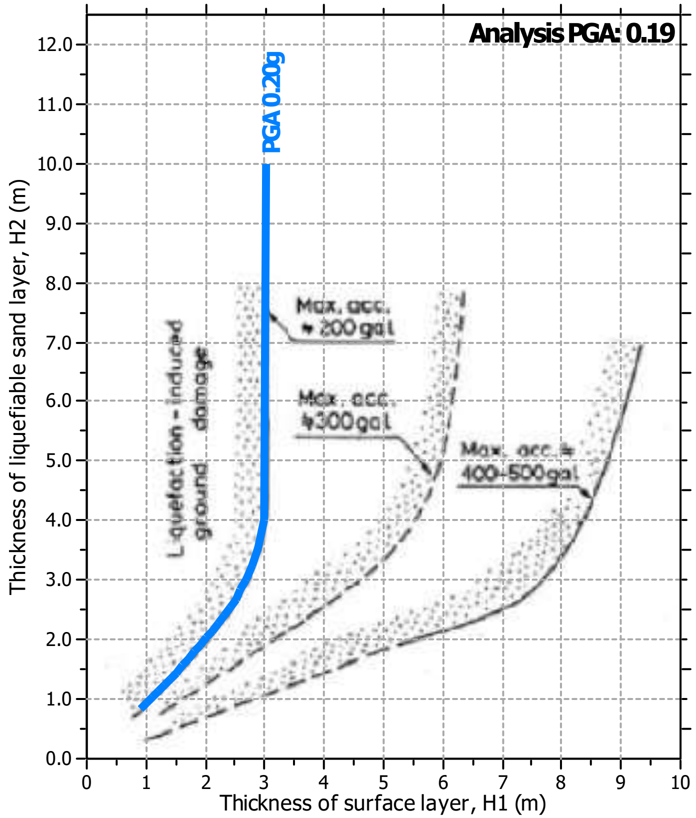
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.60 m	Fill height:	N/A	Limit depth:	N/A

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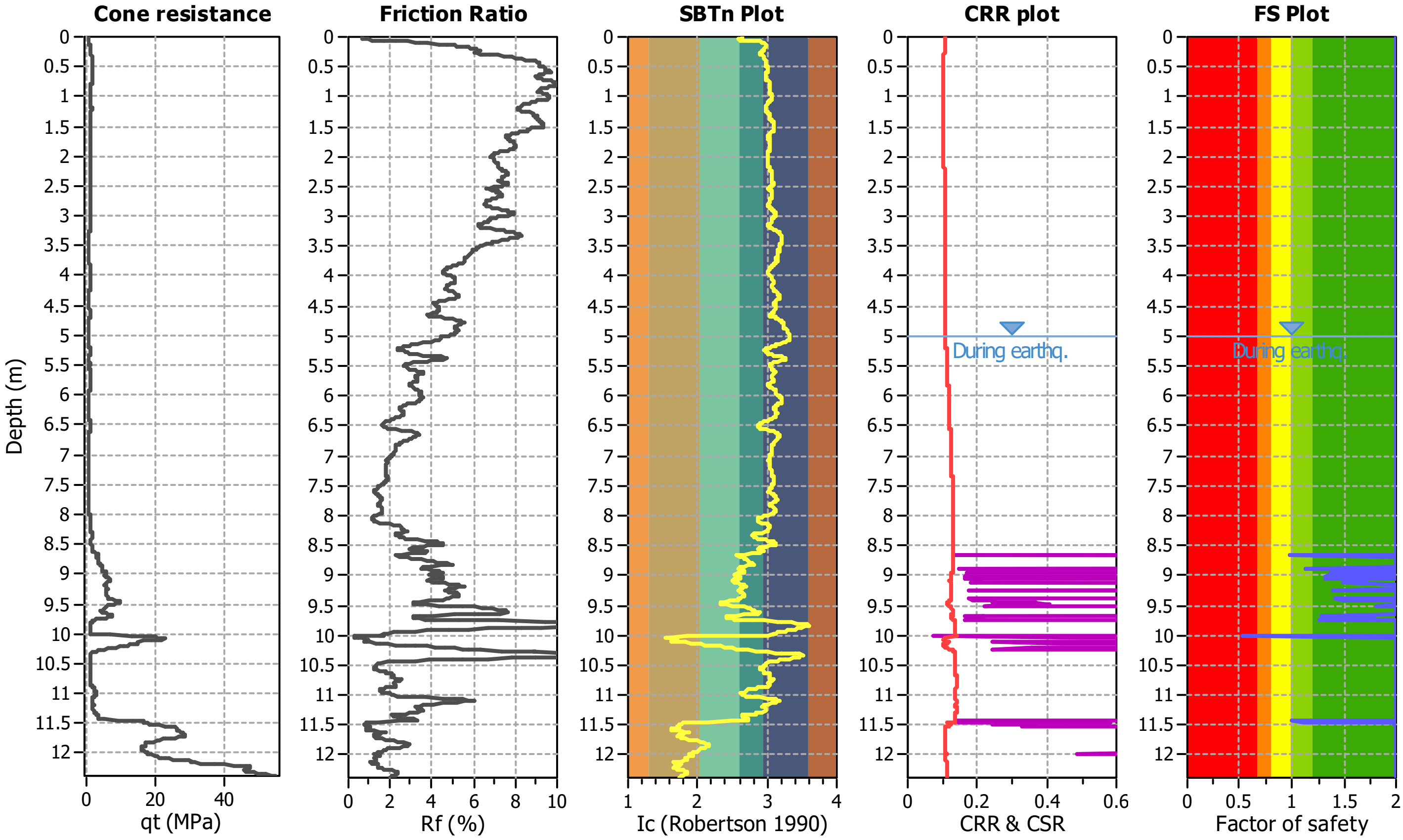
LIQUEFACTION ANALYSIS REPORT

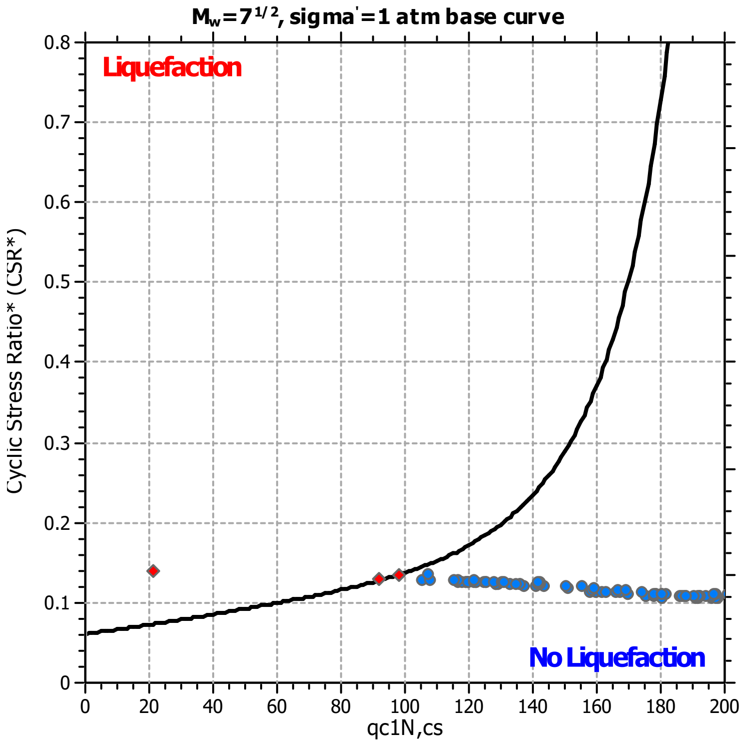
Project title : **Location :**

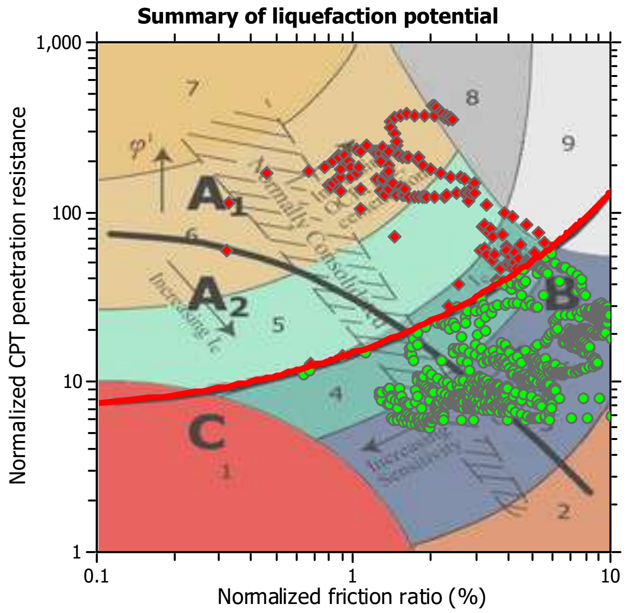
CPT file : CPT08 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

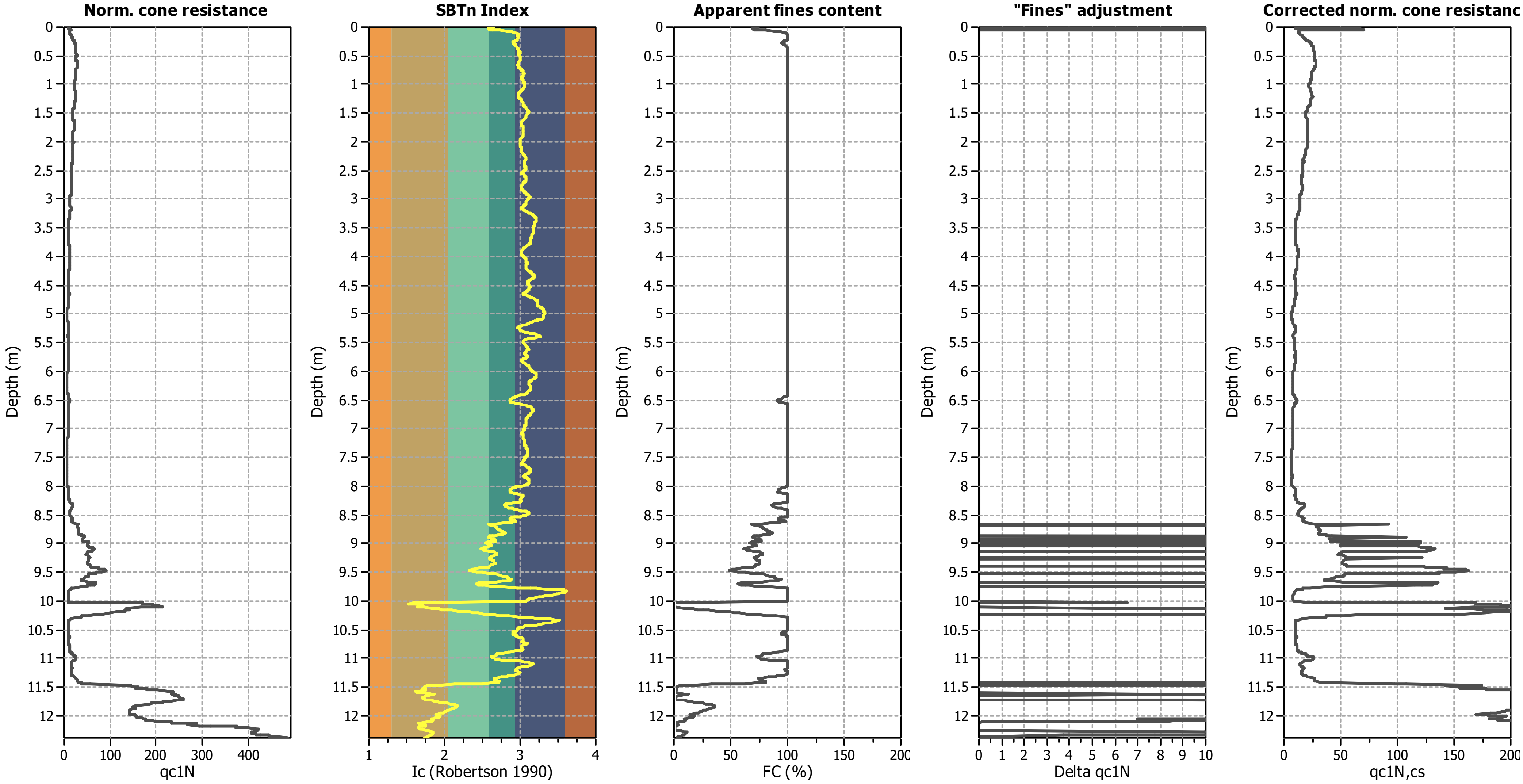






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

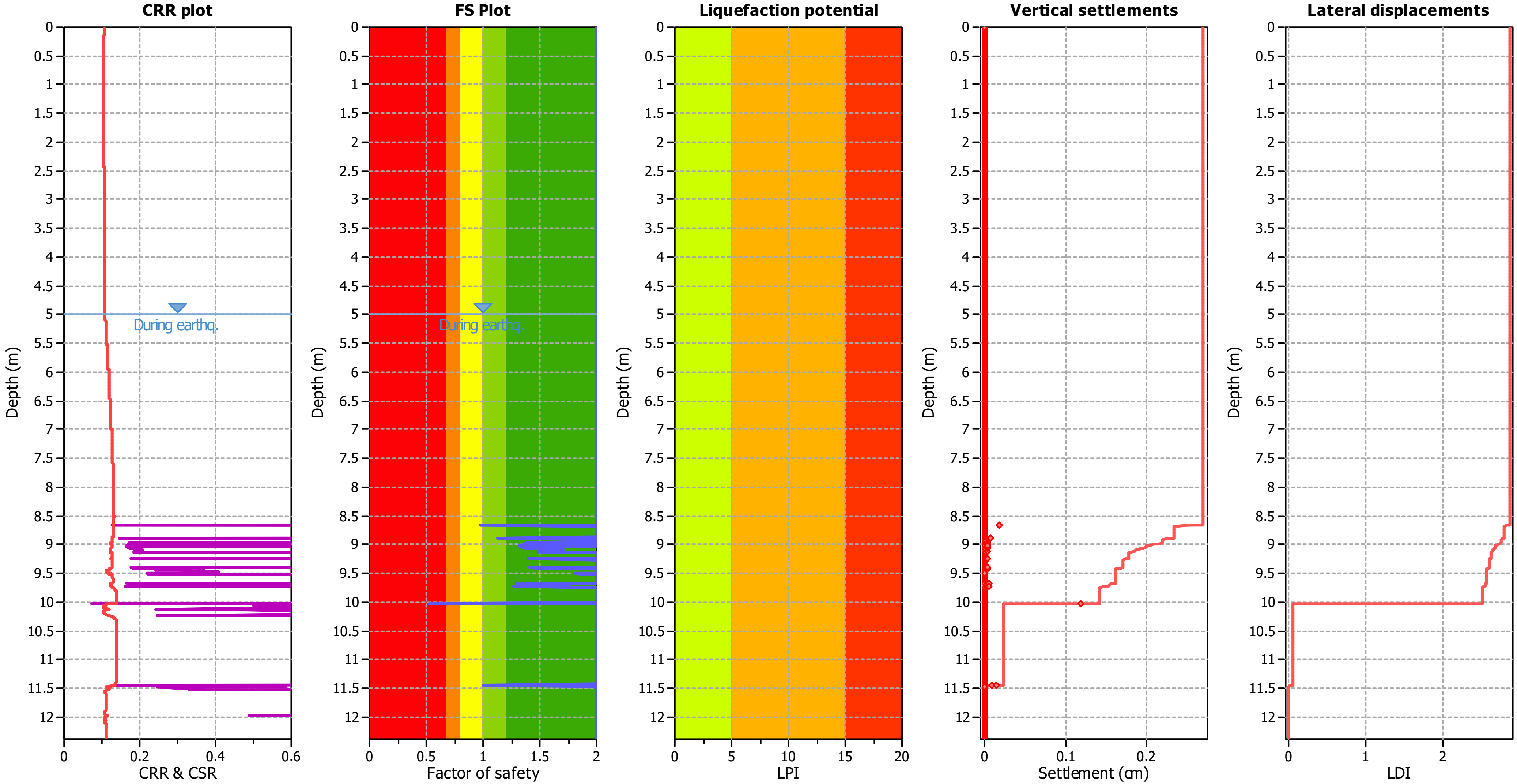
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	5.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	5.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 m	Fill height:	N/A	Limit depth:	N/A

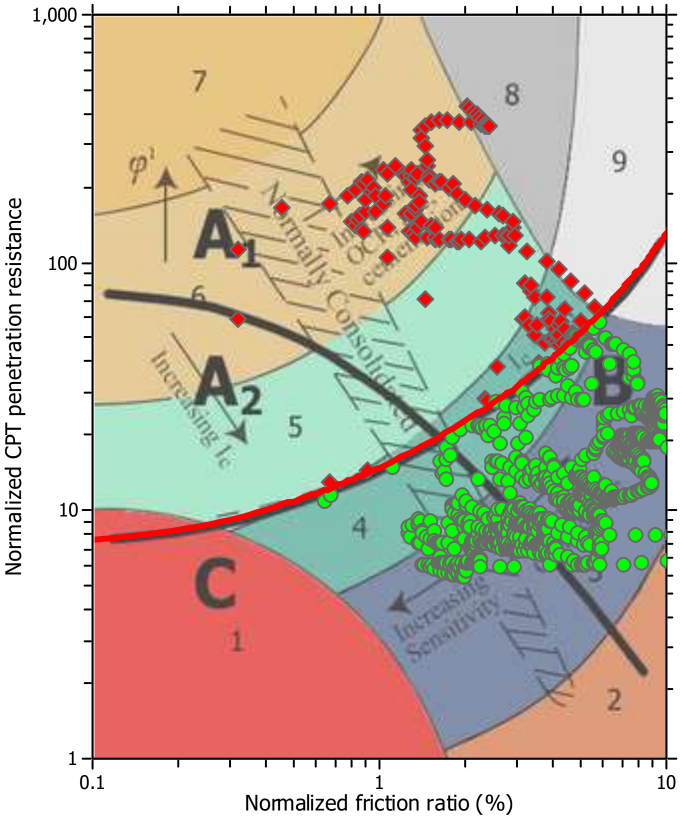
F.S. color scheme

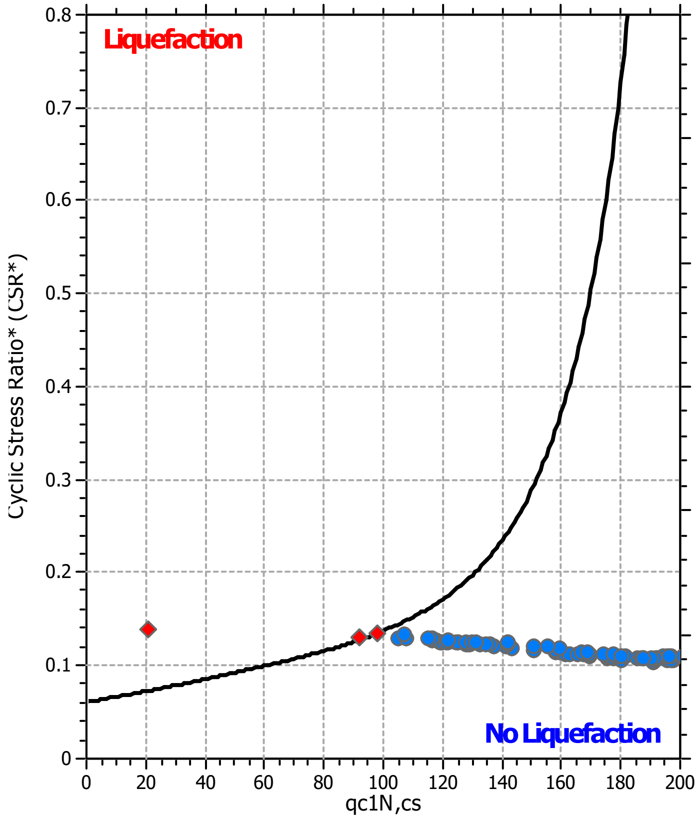
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

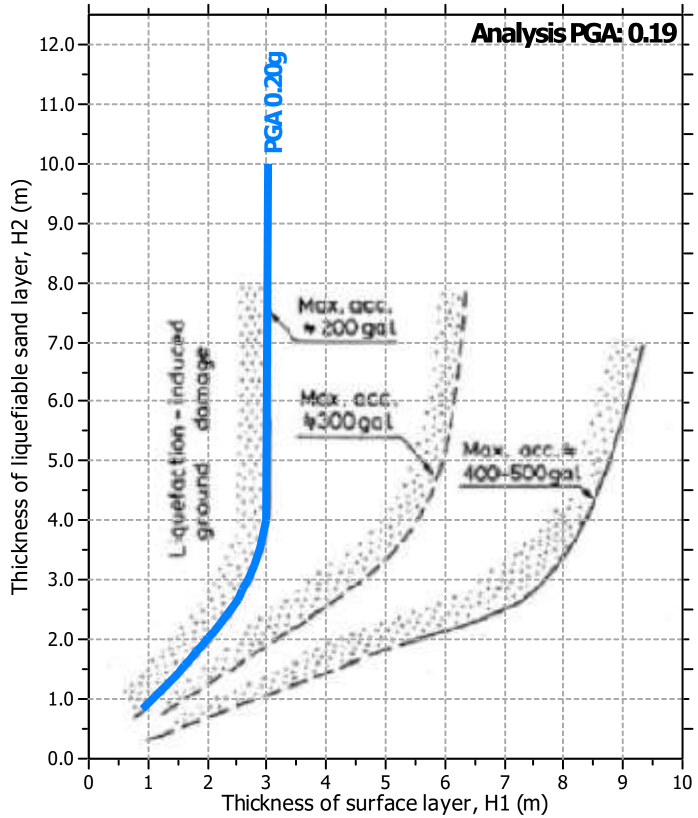
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	5.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 m	Fill height:	N/A	Limit depth:	N/A

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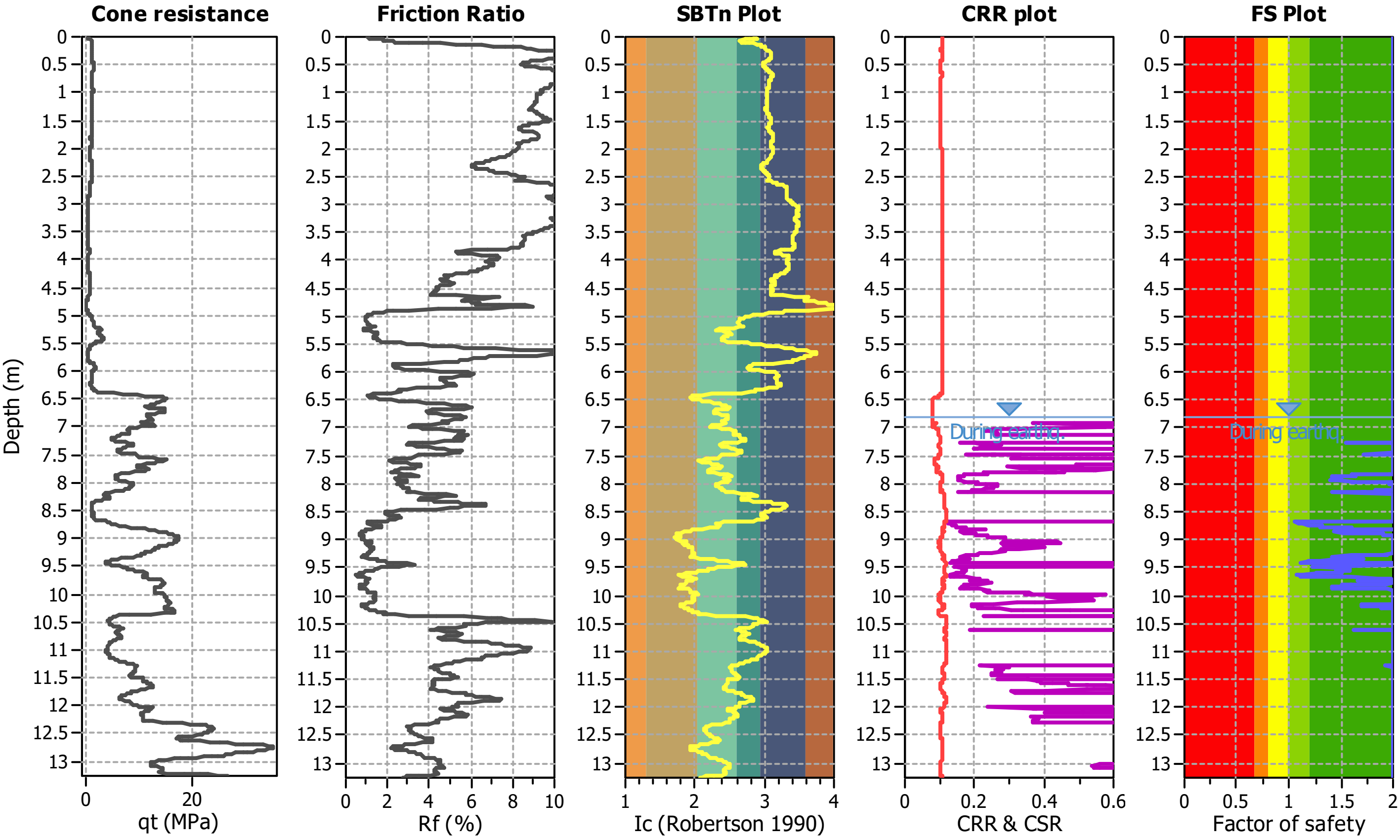
LIQUEFACTION ANALYSIS REPORT

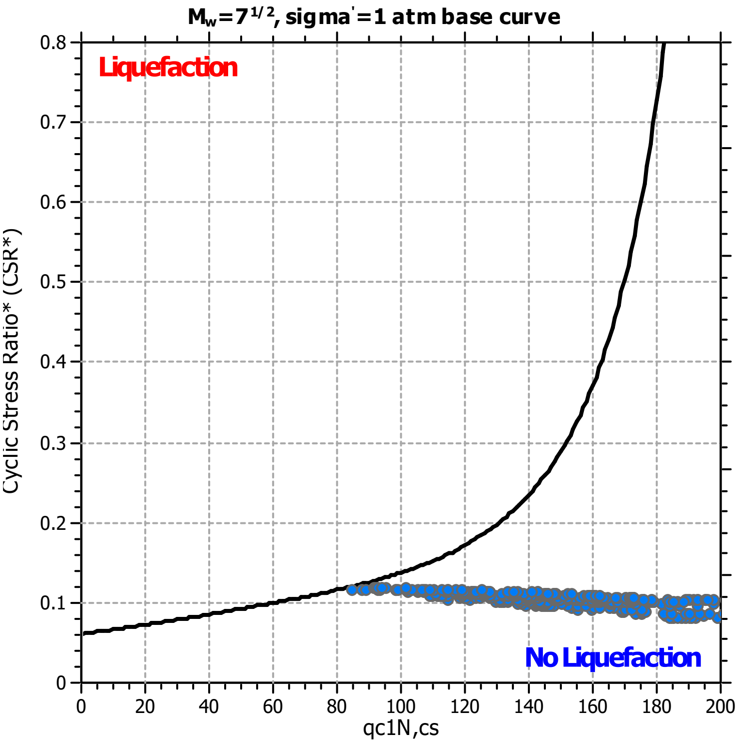
Project title : **Location :**

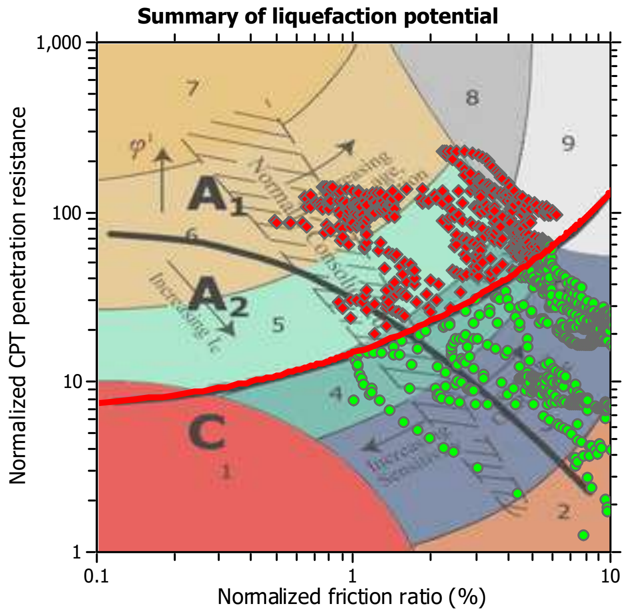
CPT file : CPT09 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.80 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

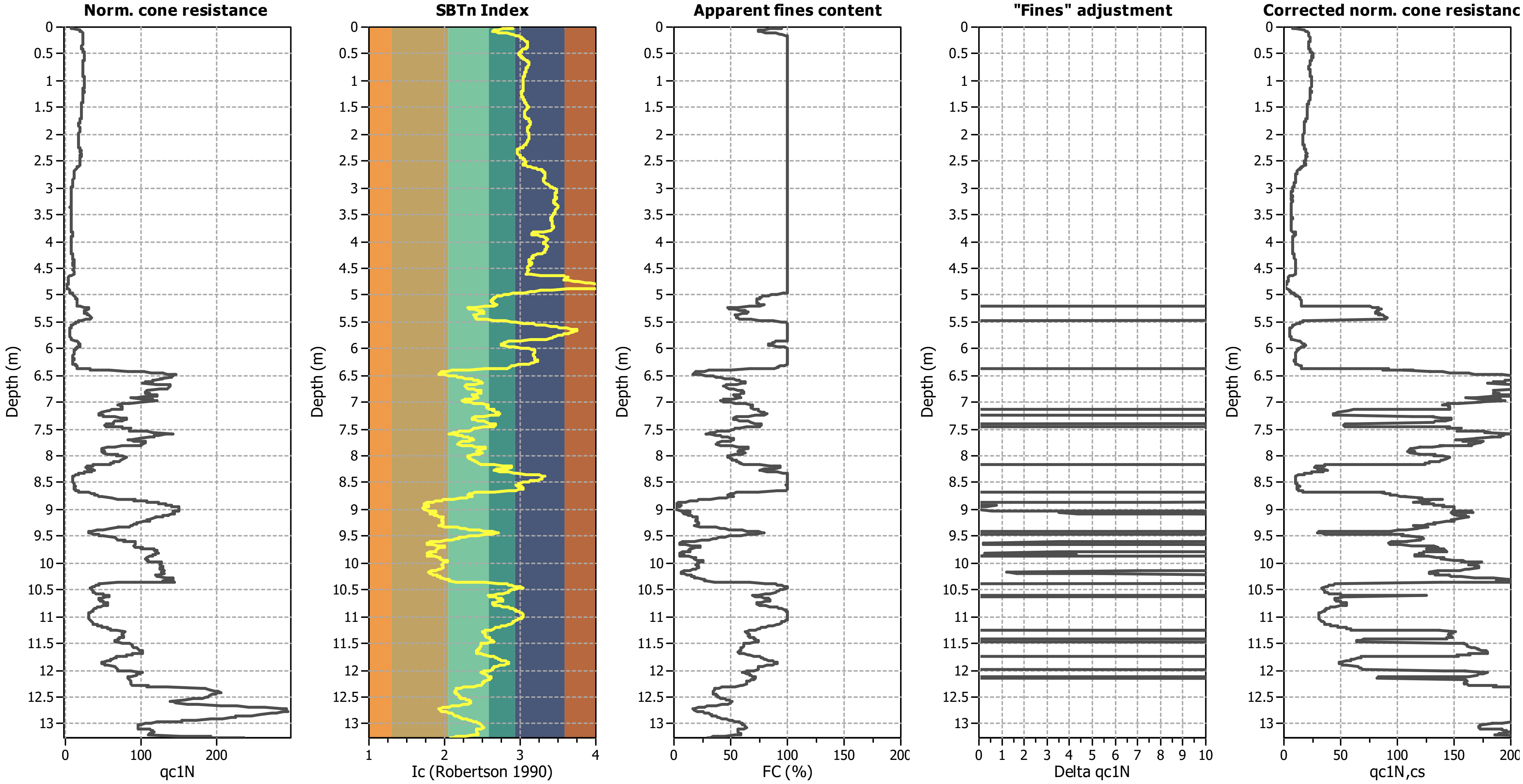






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

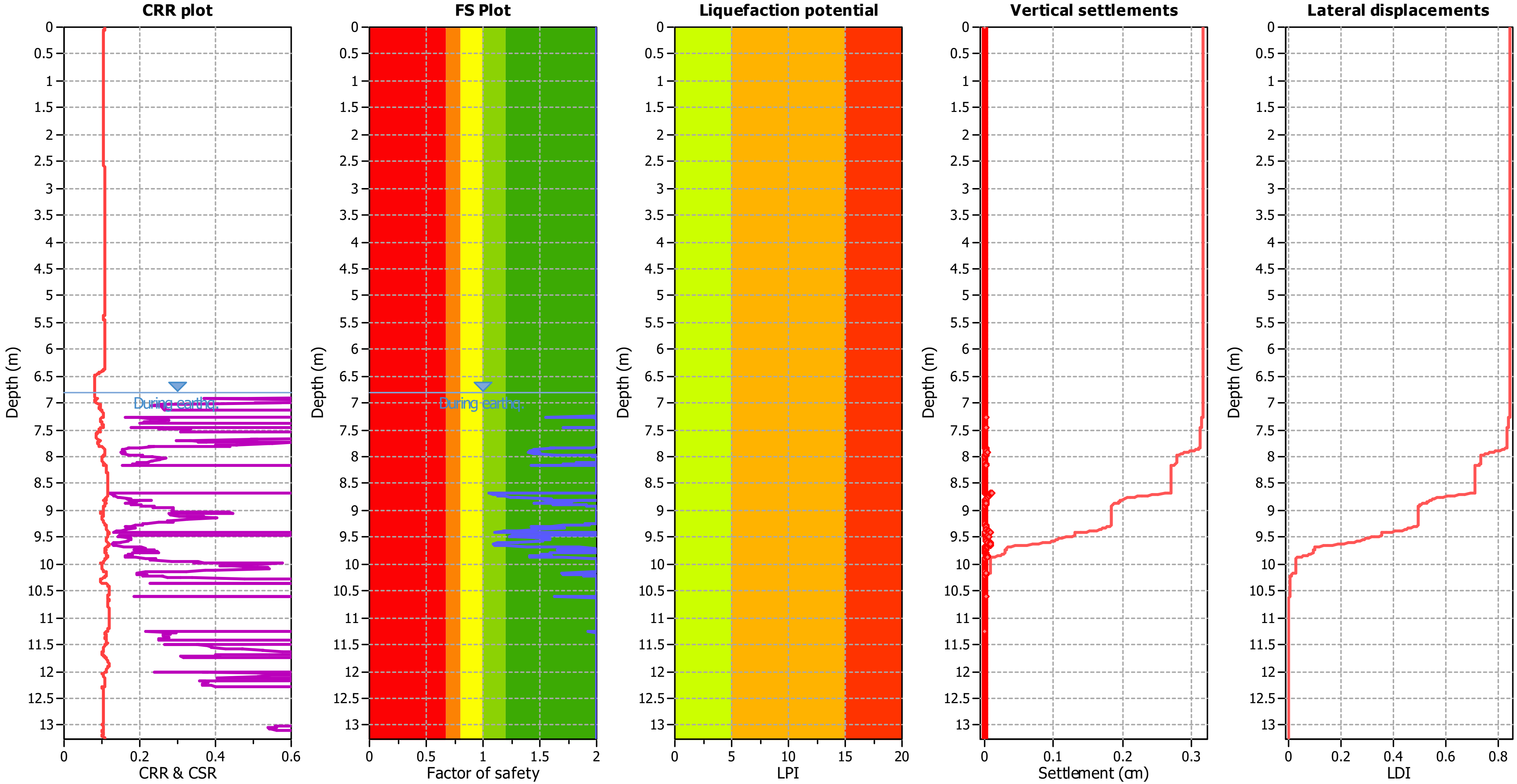
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.80 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.80 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.80 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.80 m	Fill height:	N/A	Limit depth:	N/A

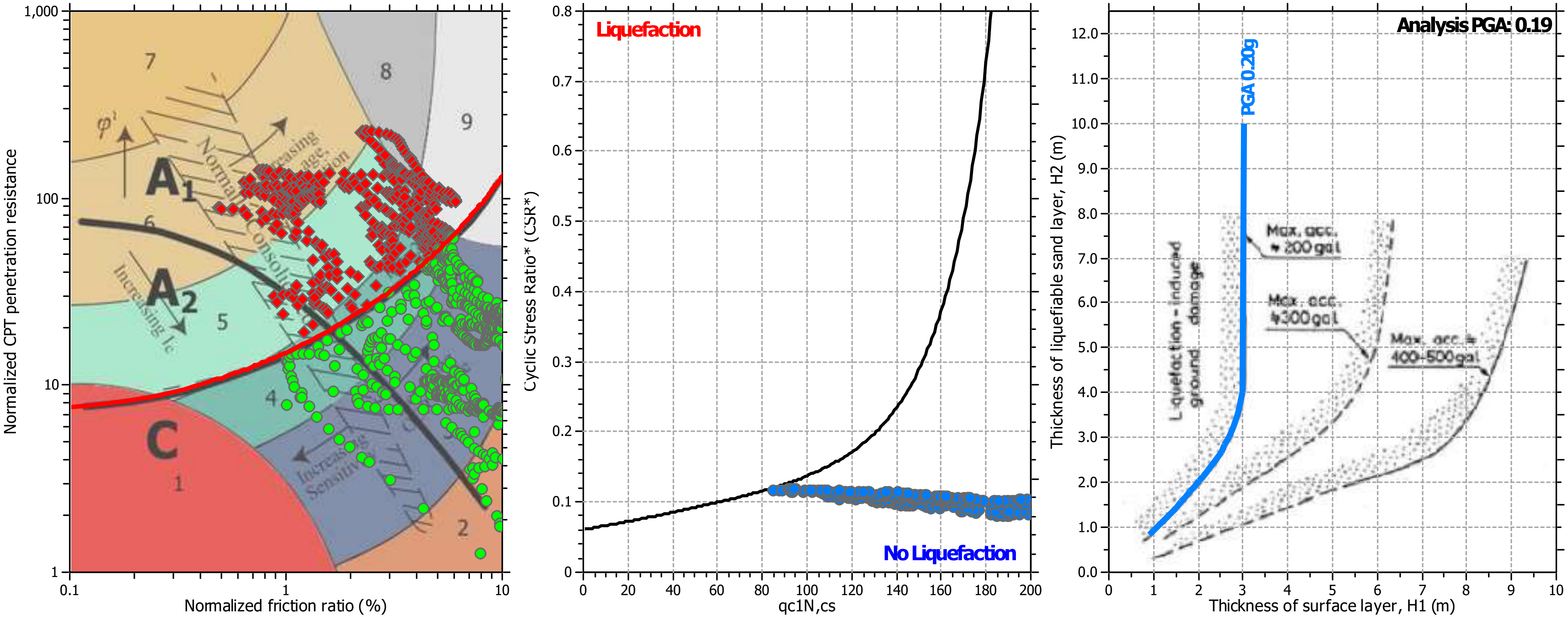
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.80 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.80 m	Fill height:	N/A	Limit depth:	N/A

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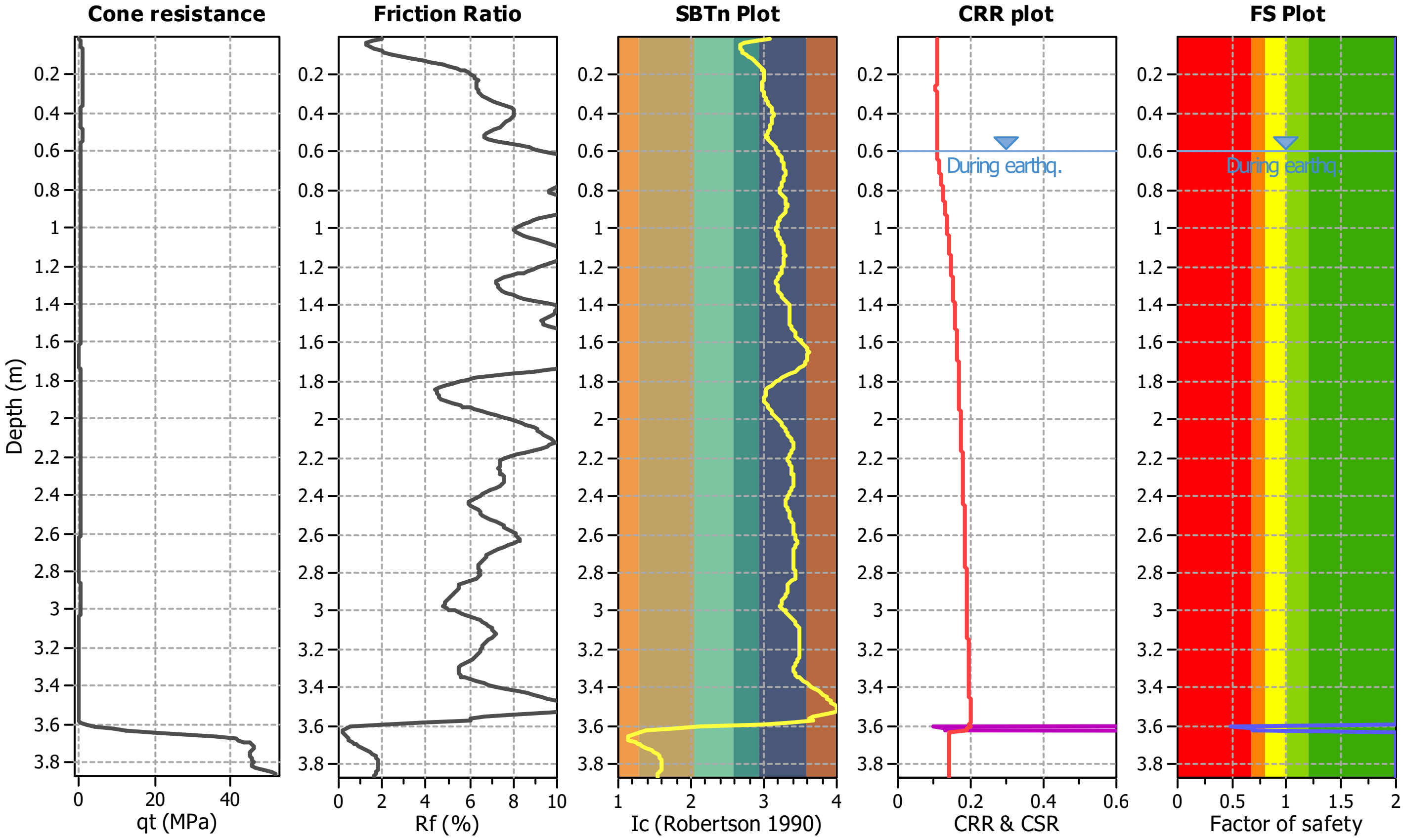
LIQUEFACTION ANALYSIS REPORT

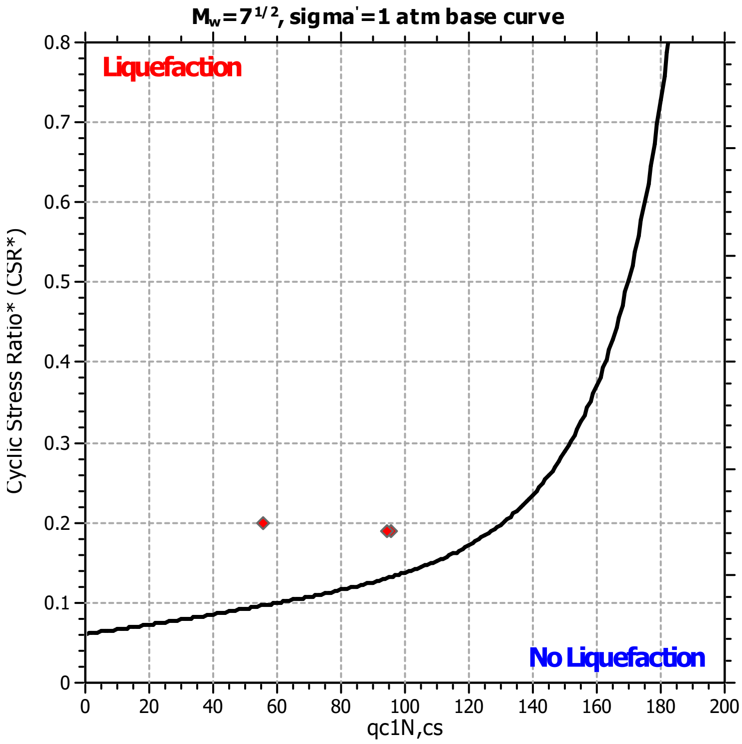
Project title : **Location :**

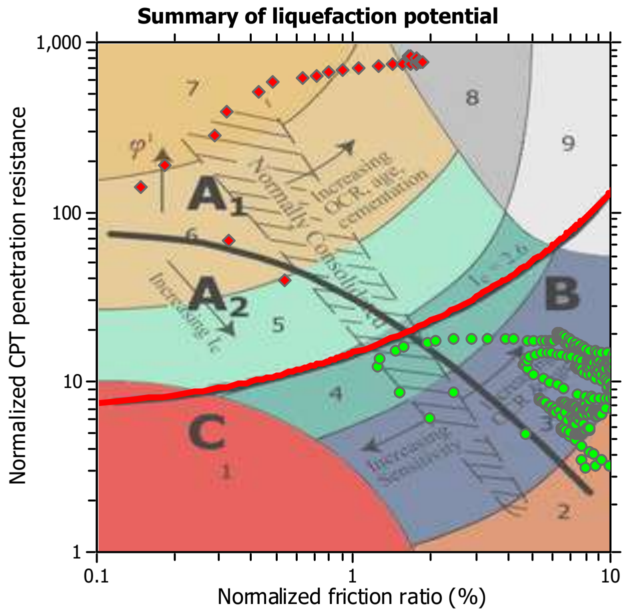
CPT file : CPT10 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.60 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	0.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

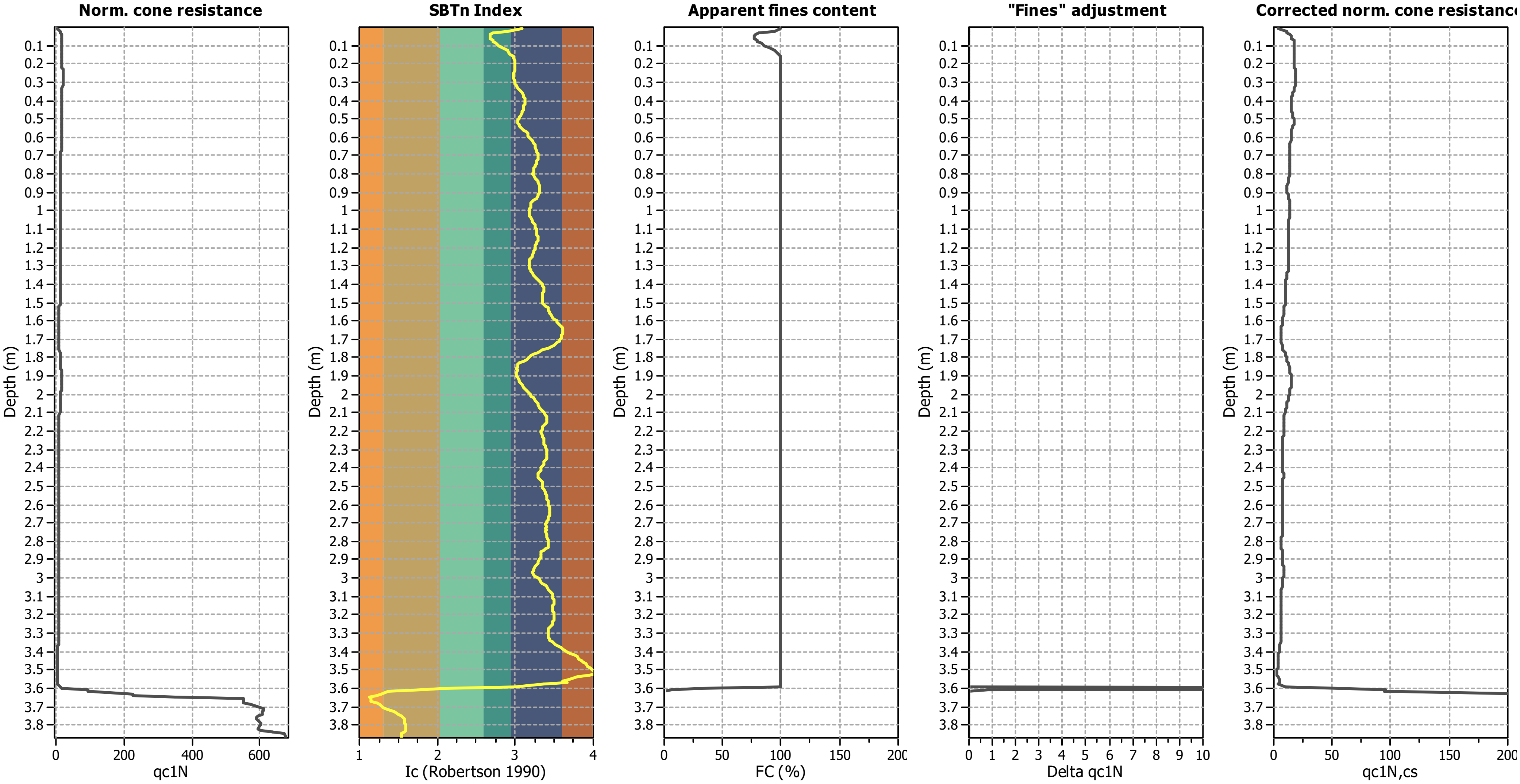






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

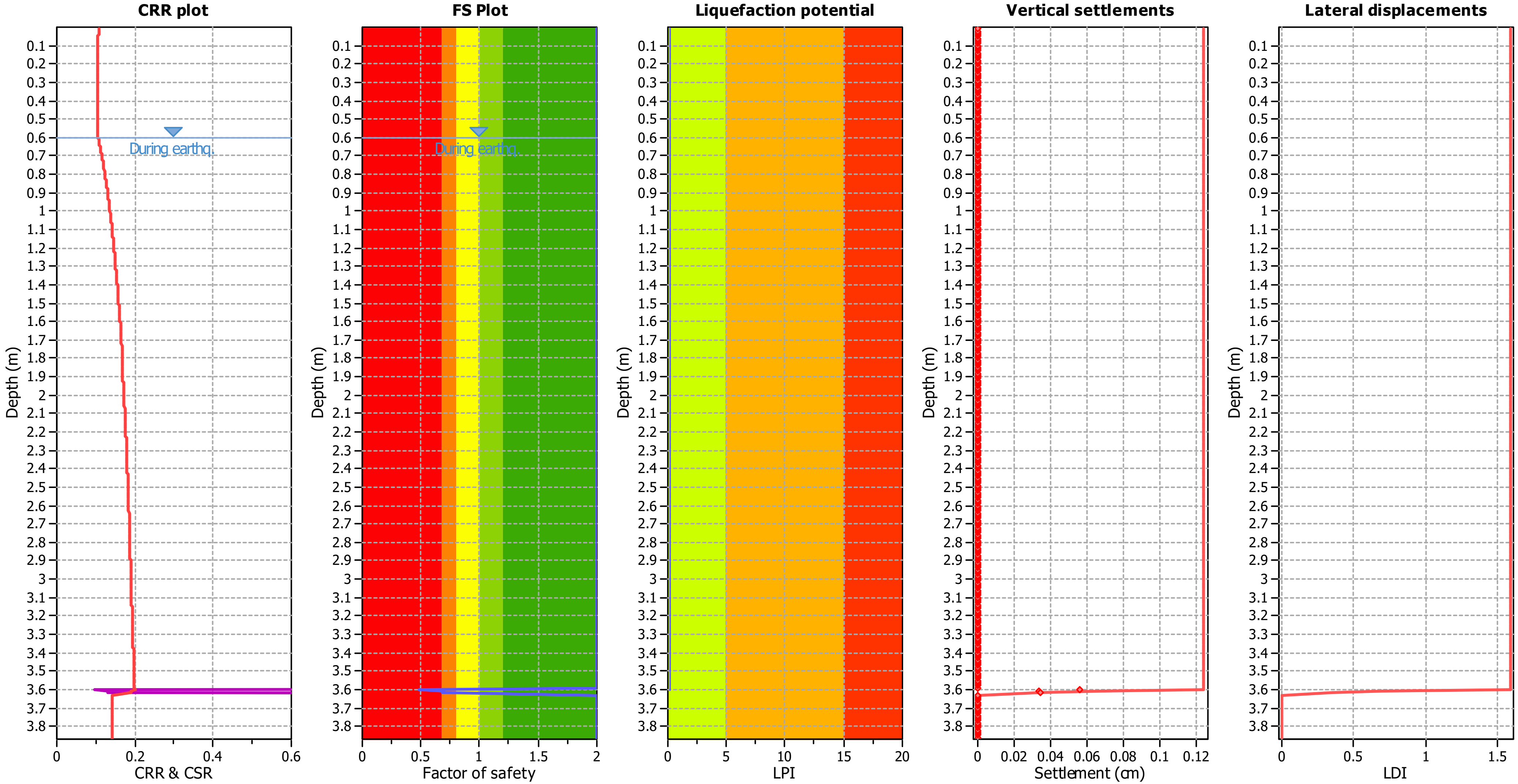
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.60 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	6.50
Peak ground acceleration:	0.19
Depth to water table (insitu):	0.60 m
Depth to GWT (erthq.):	0.60 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sands only
Limit depth applied:	No
Limit depth:	N/A

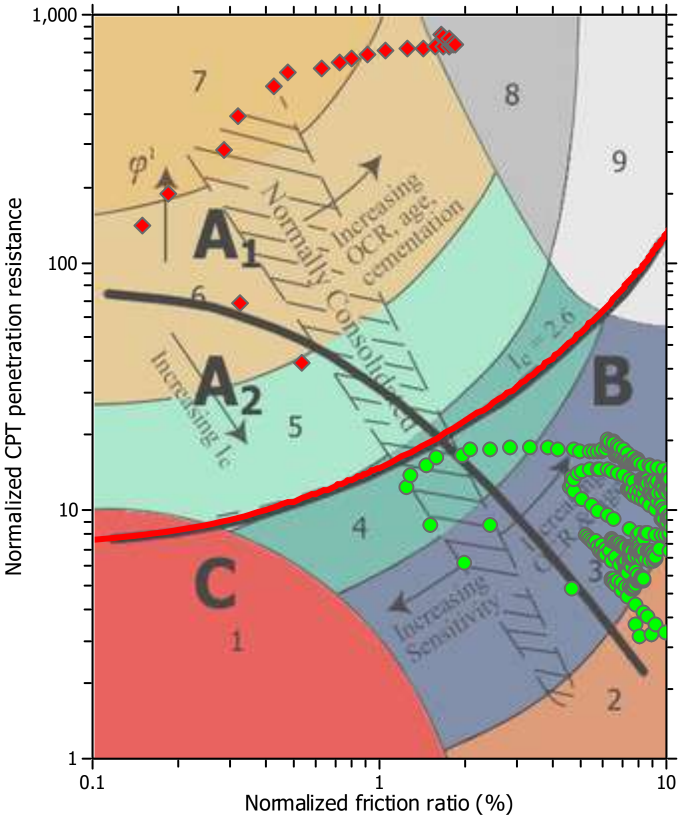
F.S. color scheme

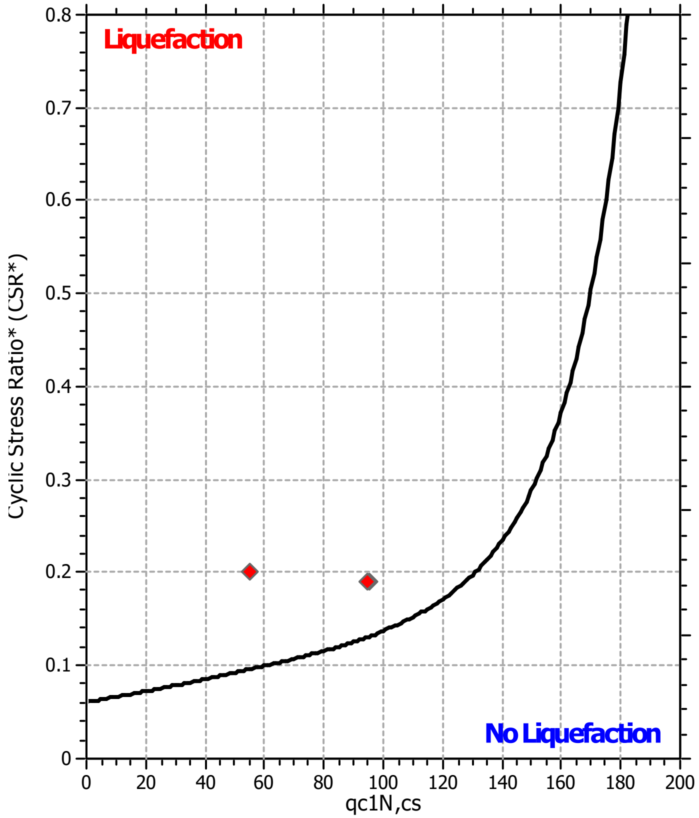
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

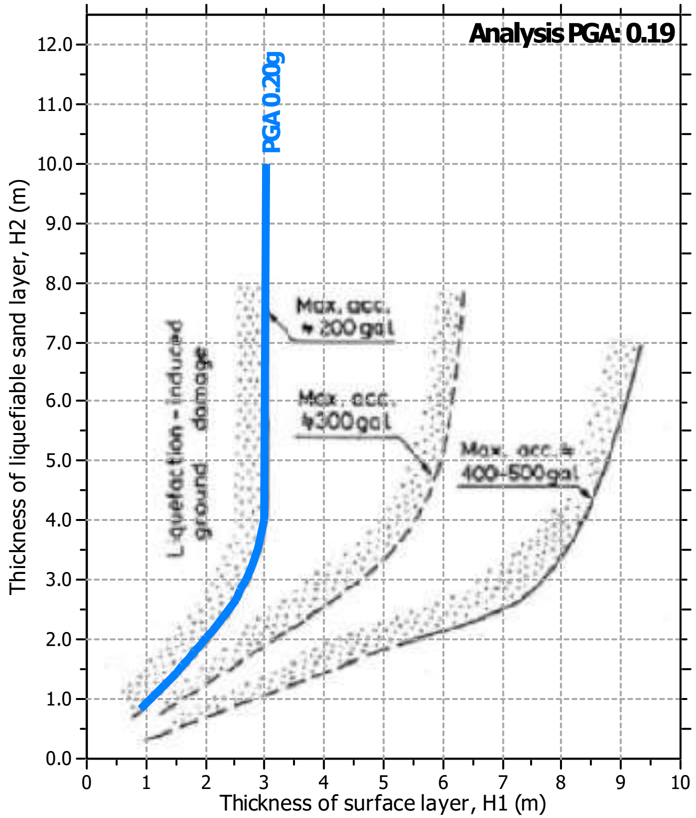
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.60 m	Fill height:	N/A	Limit depth:	N/A

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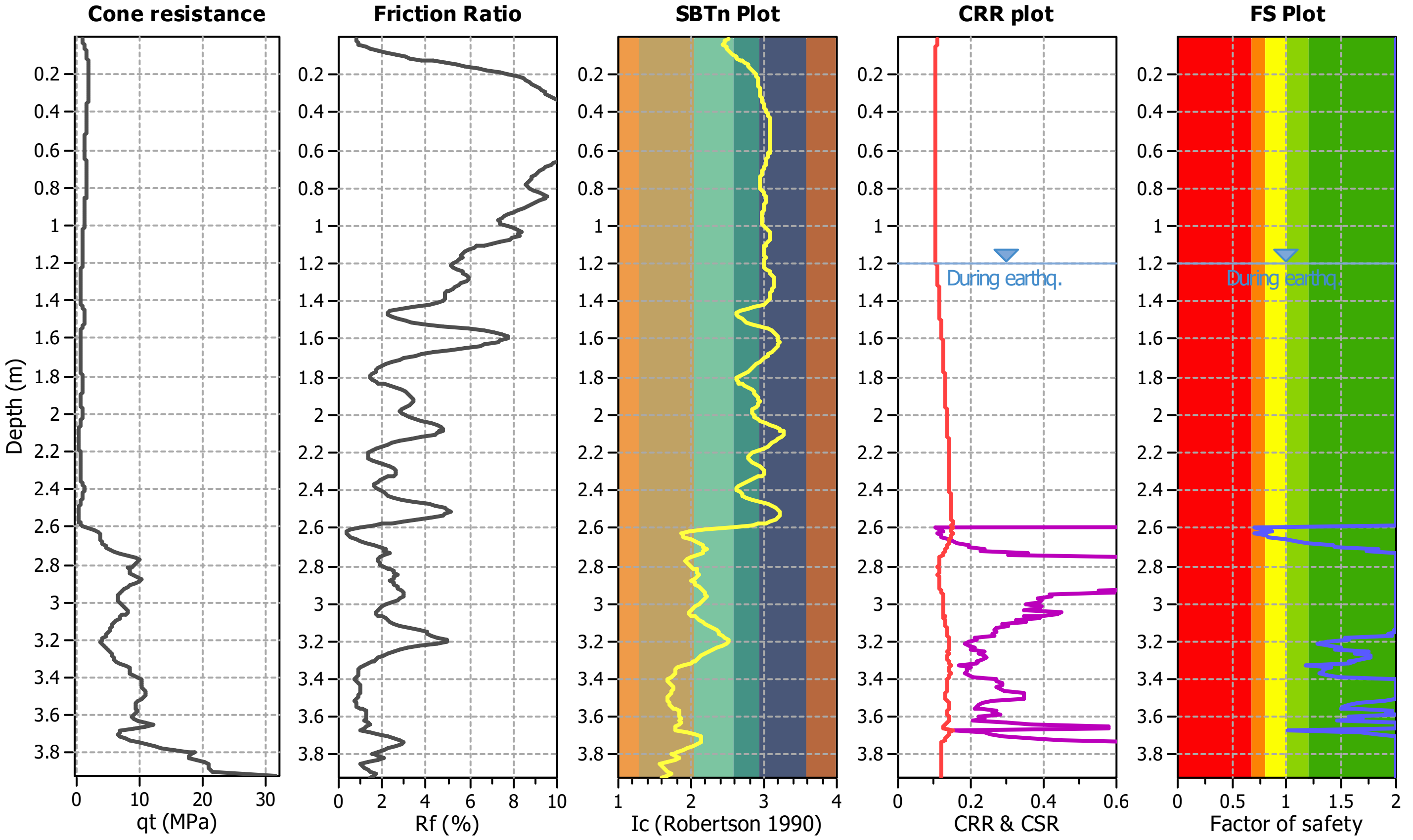
LIQUEFACTION ANALYSIS REPORT

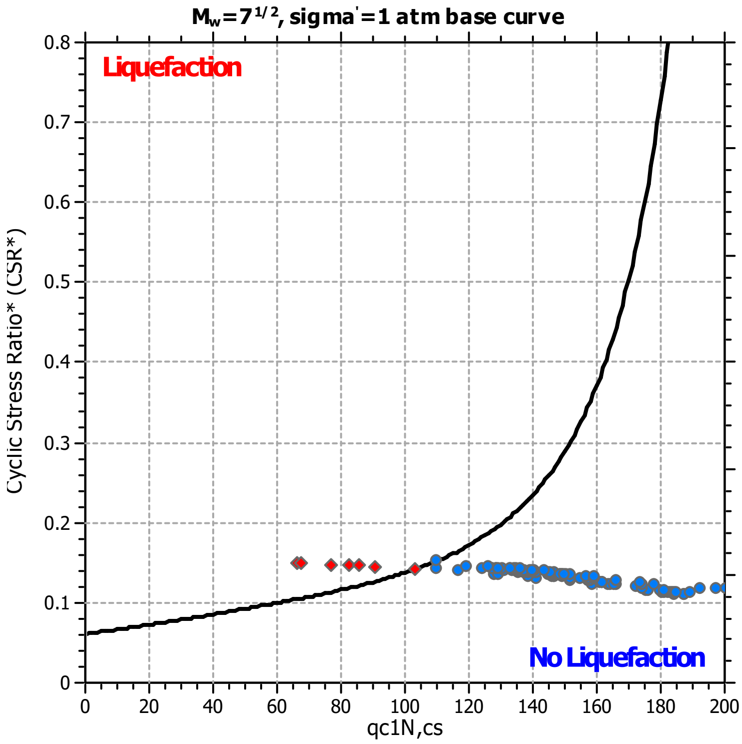
Project title : **Location :**

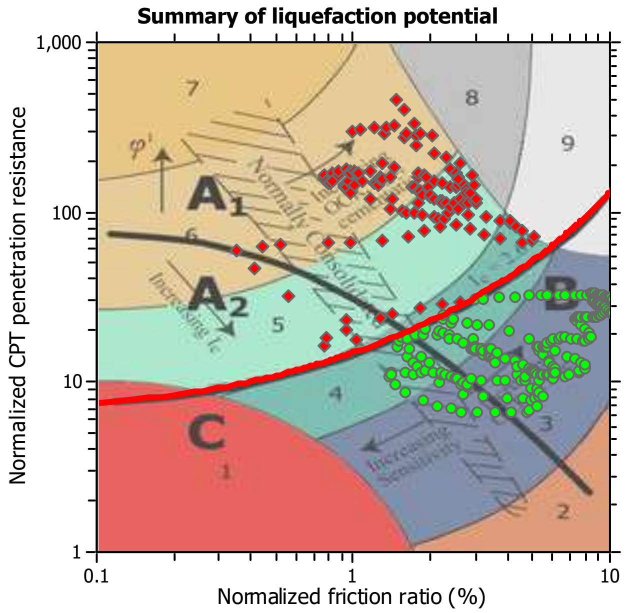
CPT file : CPT11 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

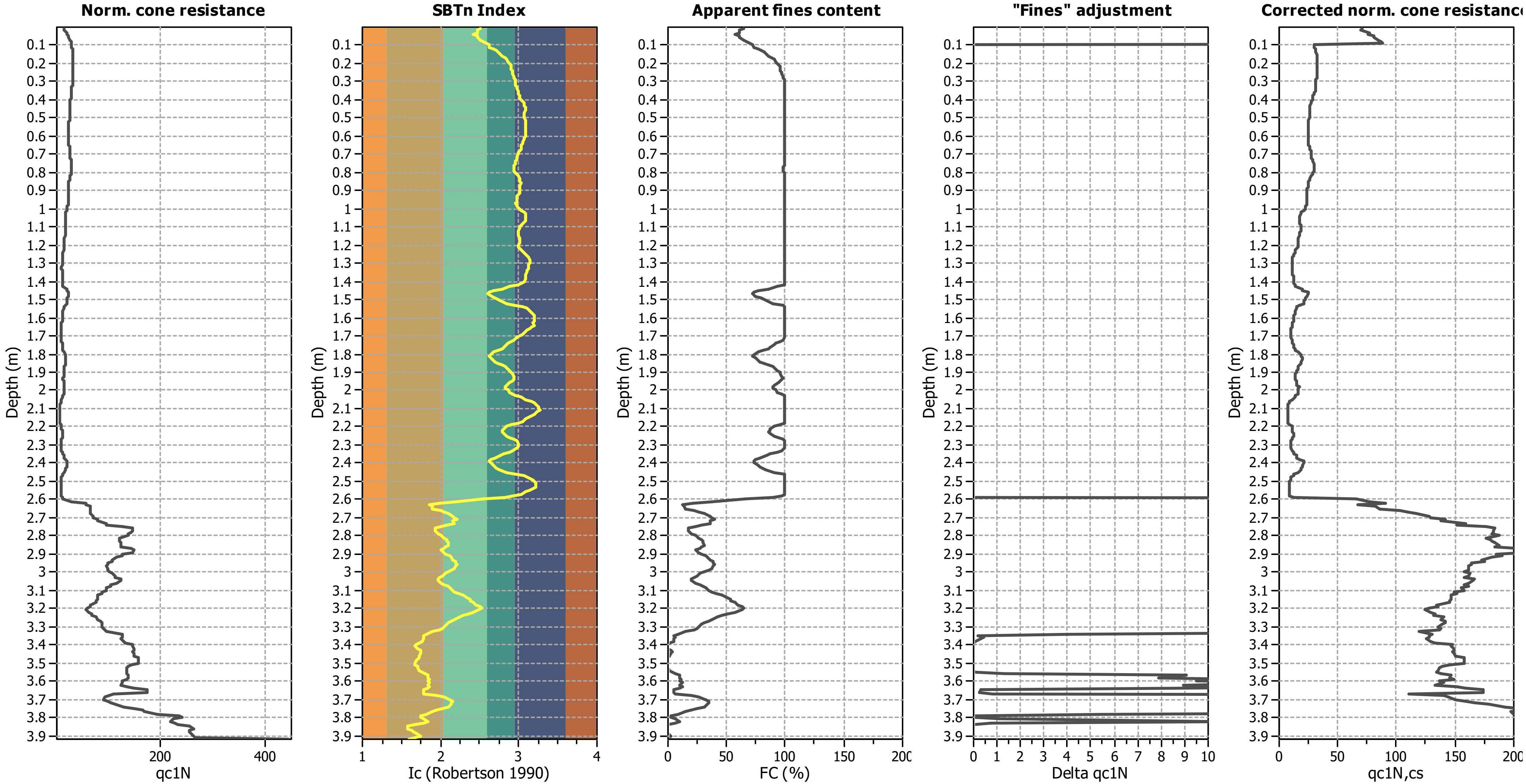






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

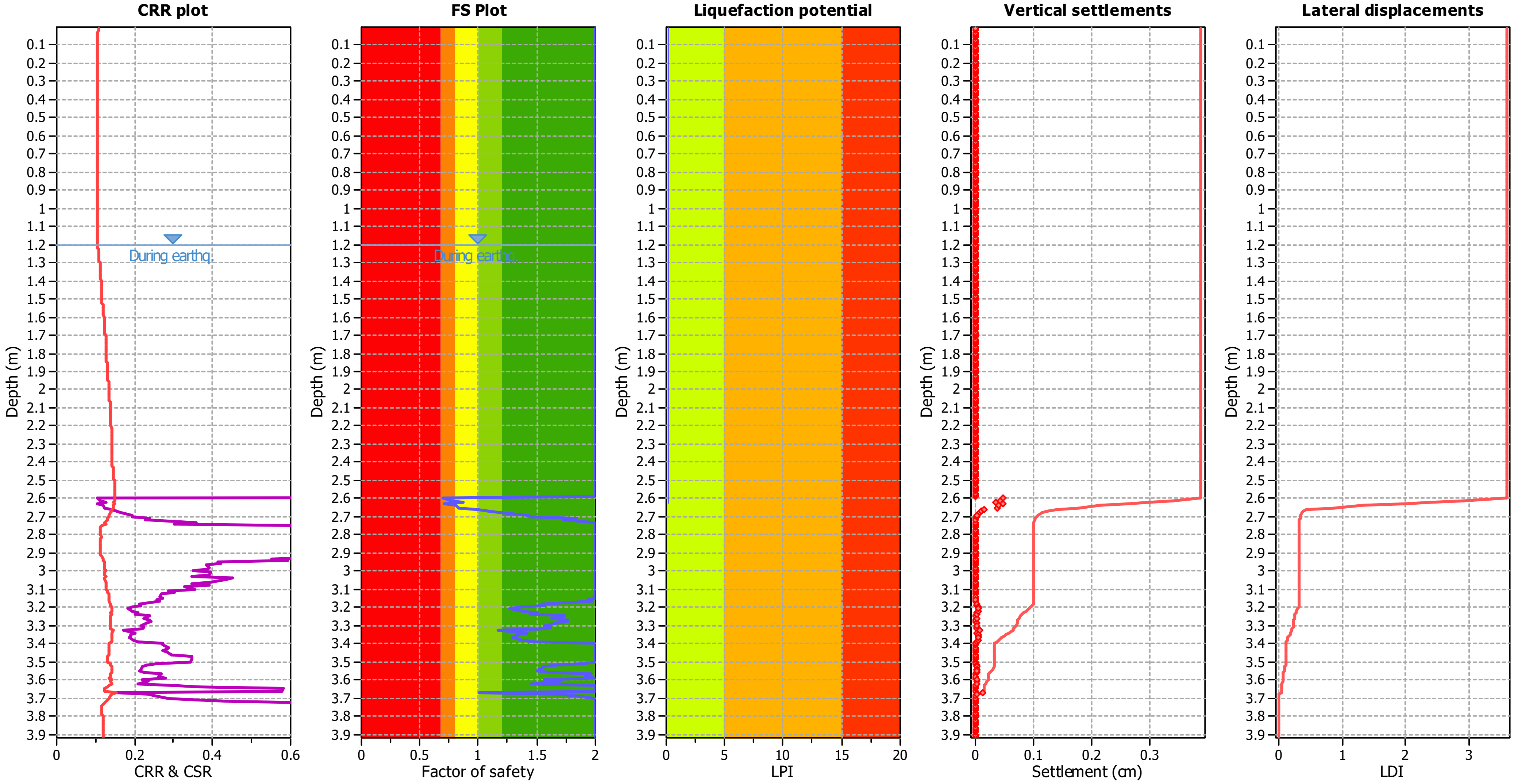
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.20 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	6.50
Peak ground acceleration:	0.19
Depth to water table (insitu):	1.20 m
Depth to GWT (erthq.):	1.20 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sands only
Limit depth applied:	No
Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
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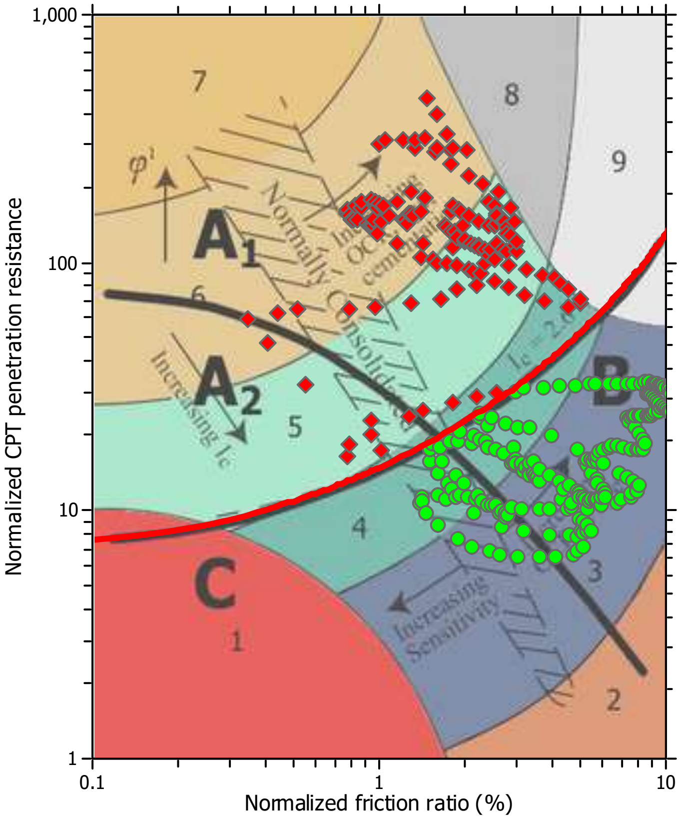
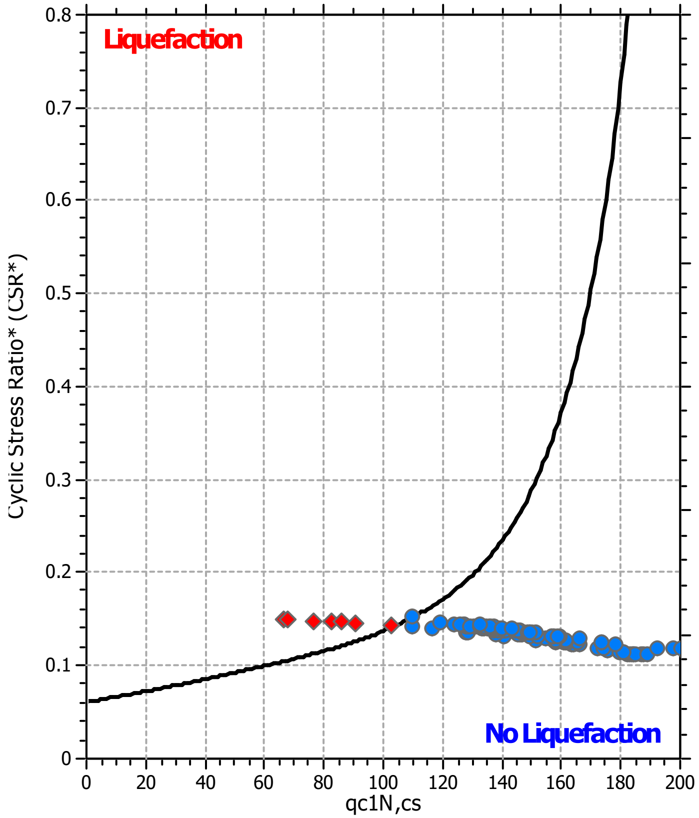
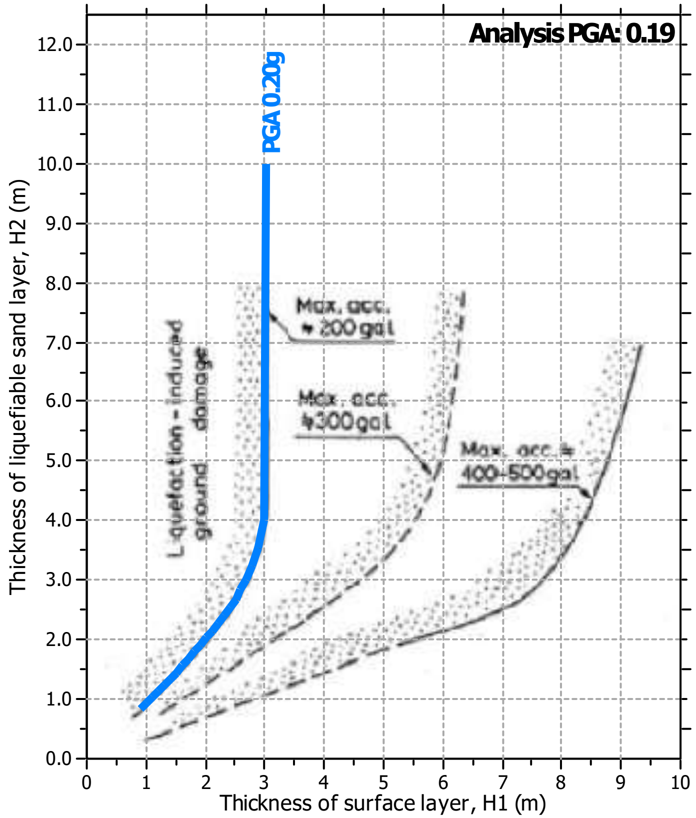
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.20 m	Fill height:	N/A	Limit depth:	N/A

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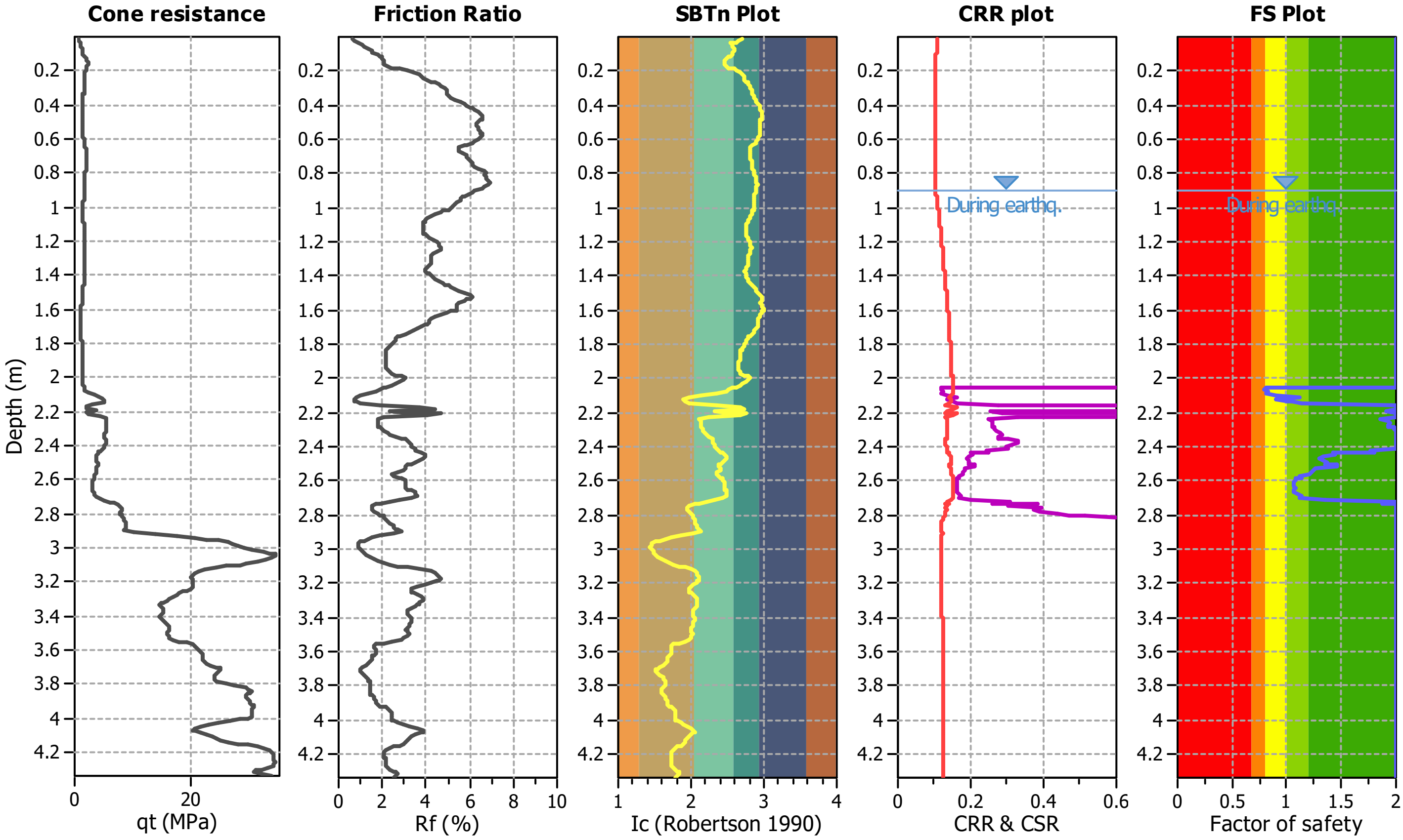
LIQUEFACTION ANALYSIS REPORT

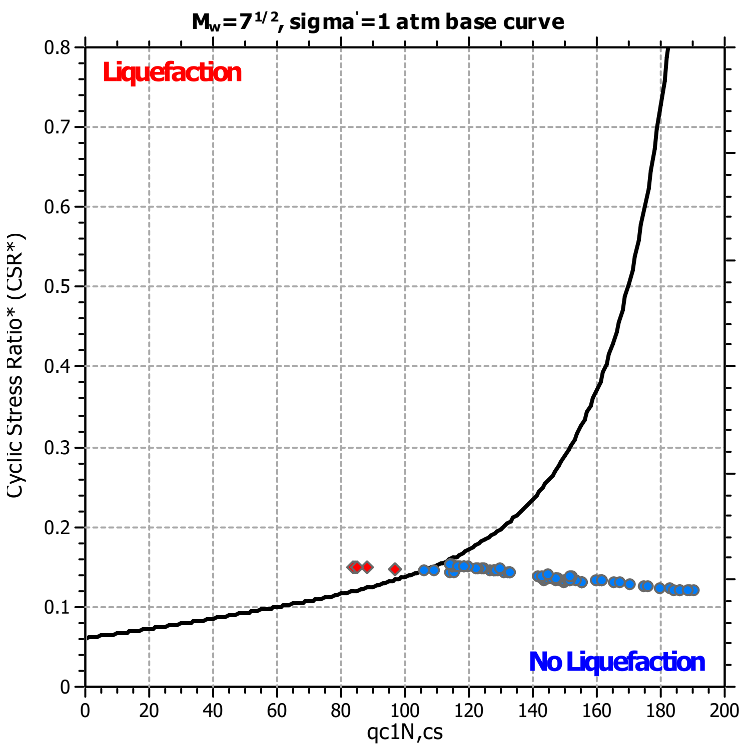
Project title : **Location :**

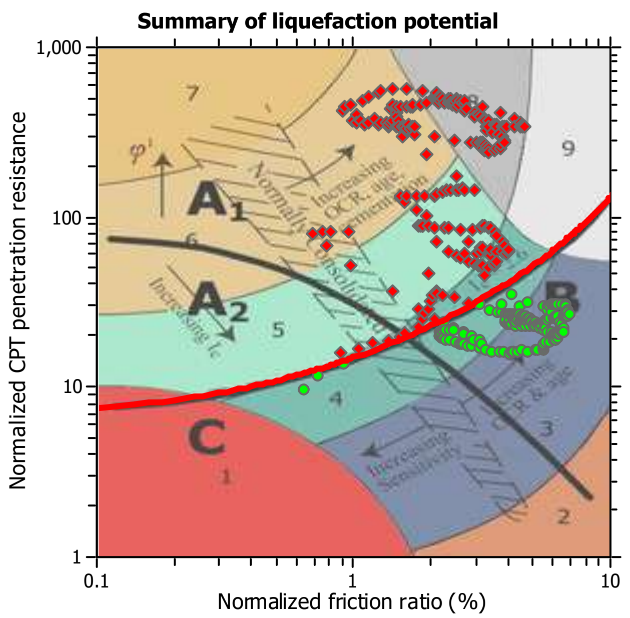
CPT file : CPT12 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.90 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	0.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

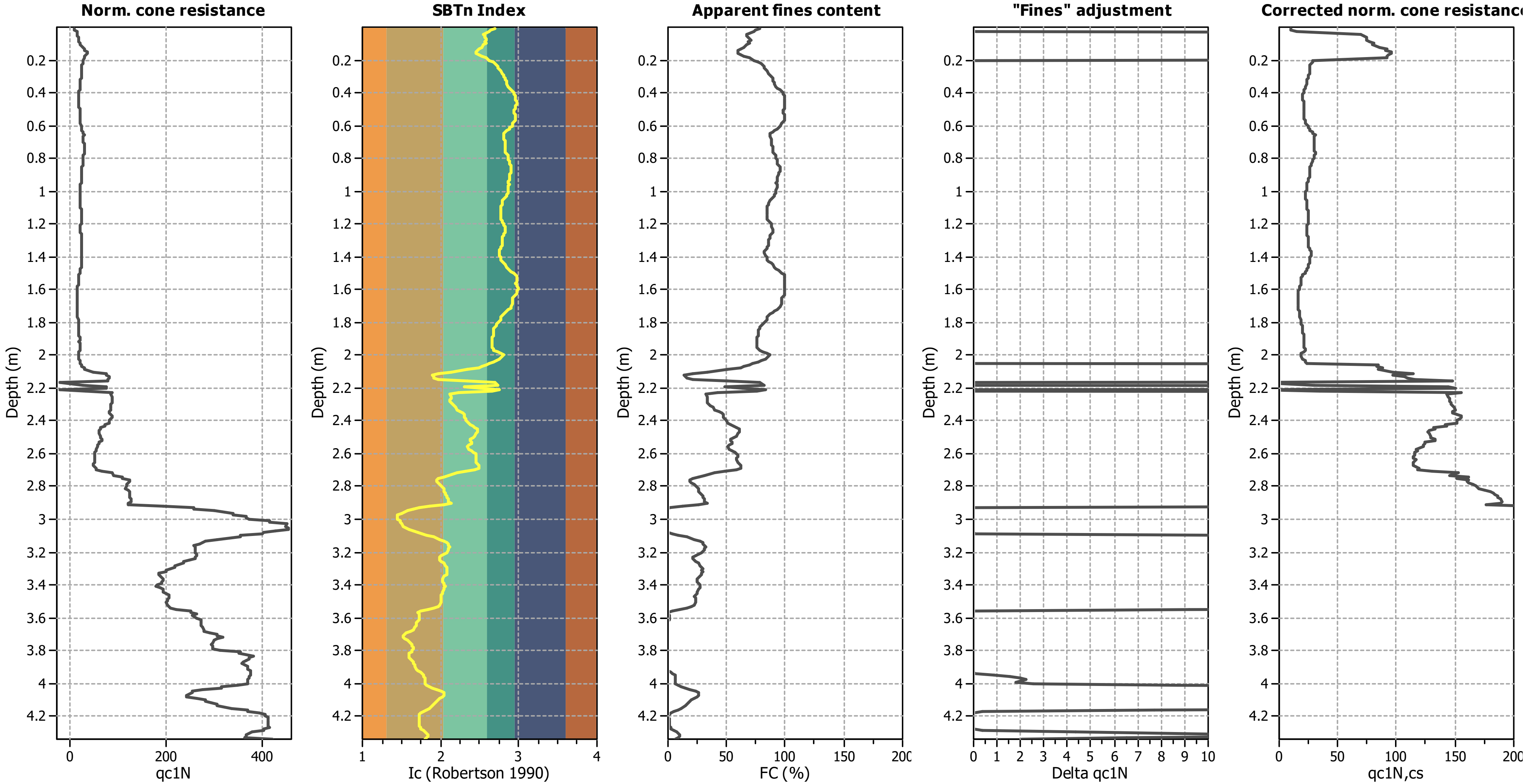






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

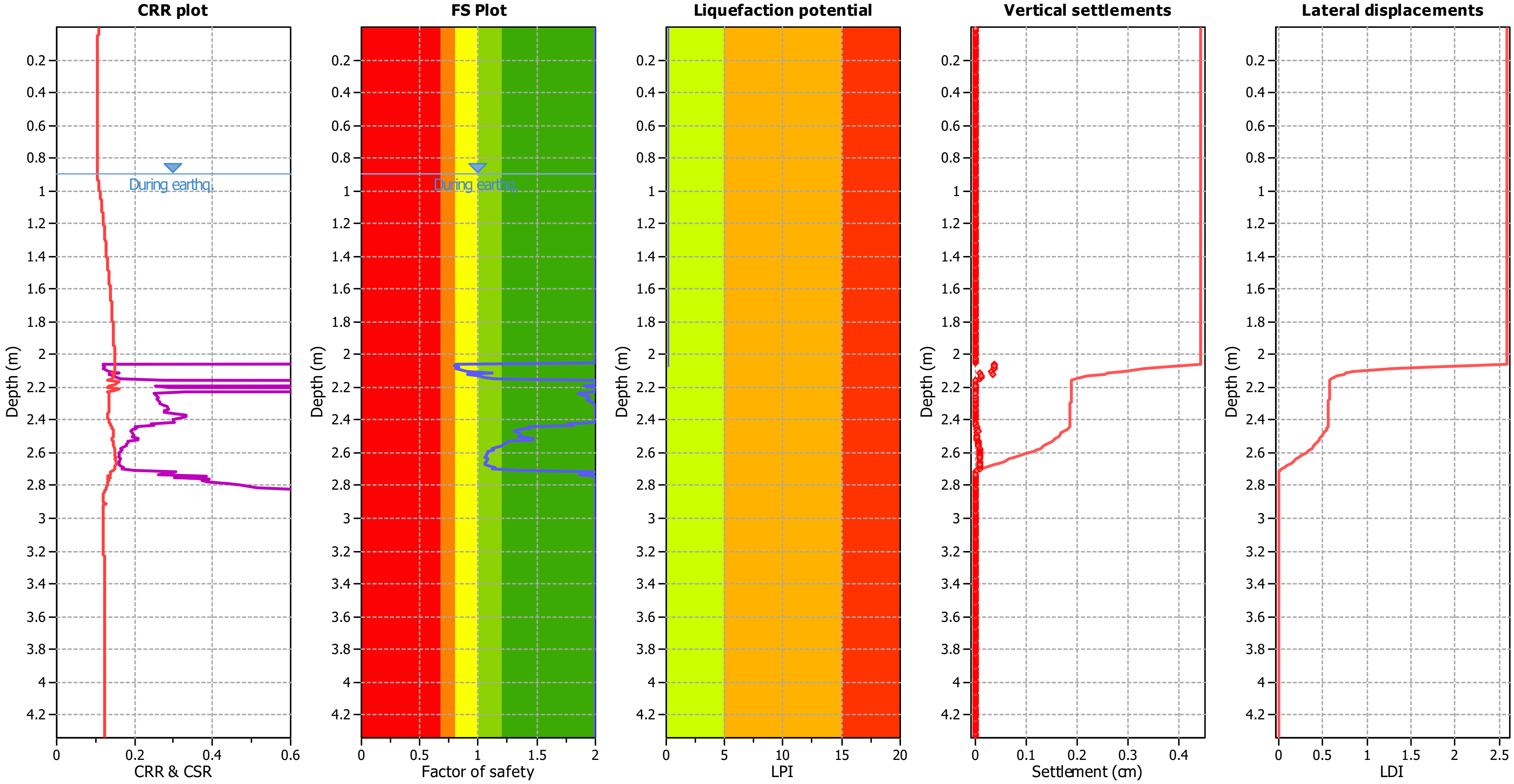
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.90 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.90 m	Fill height:	N/A	Limit depth:	N/A

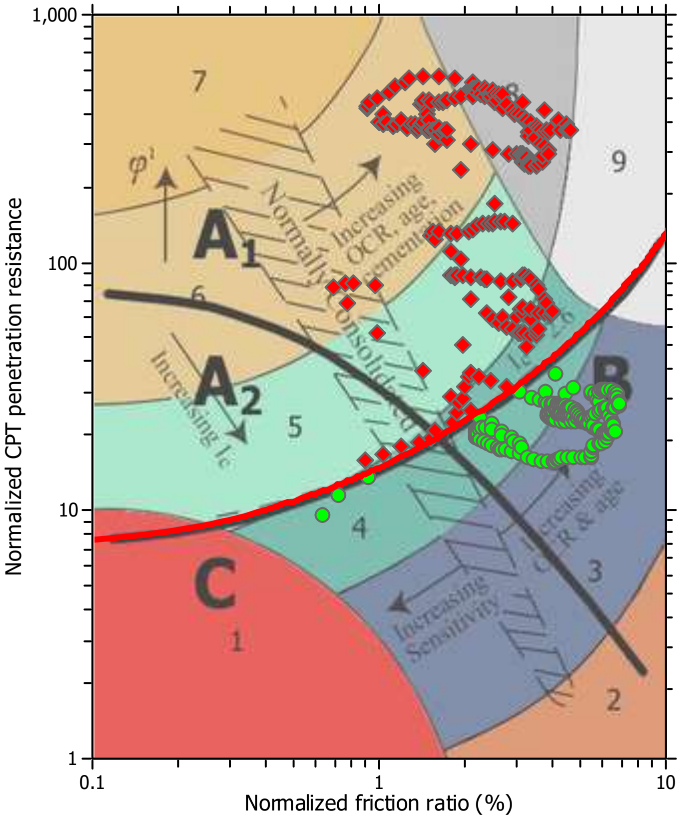
F.S. color scheme

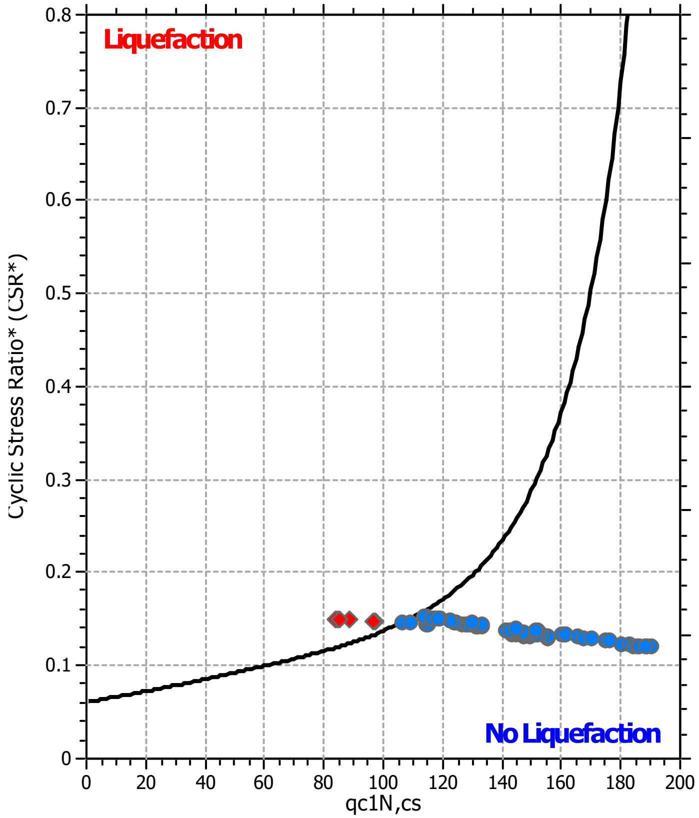
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

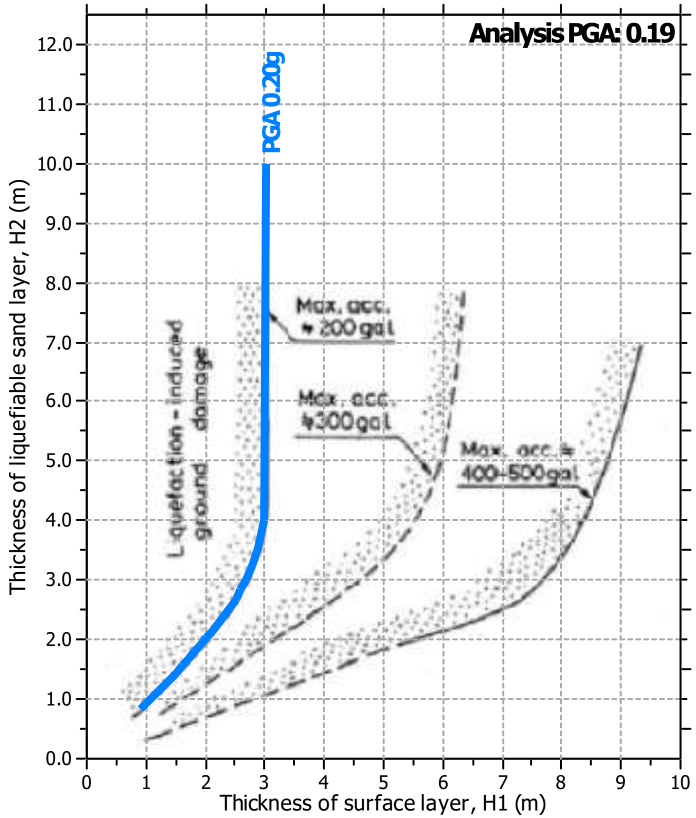
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.90 m	Fill height:	N/A	Limit depth:	N/A

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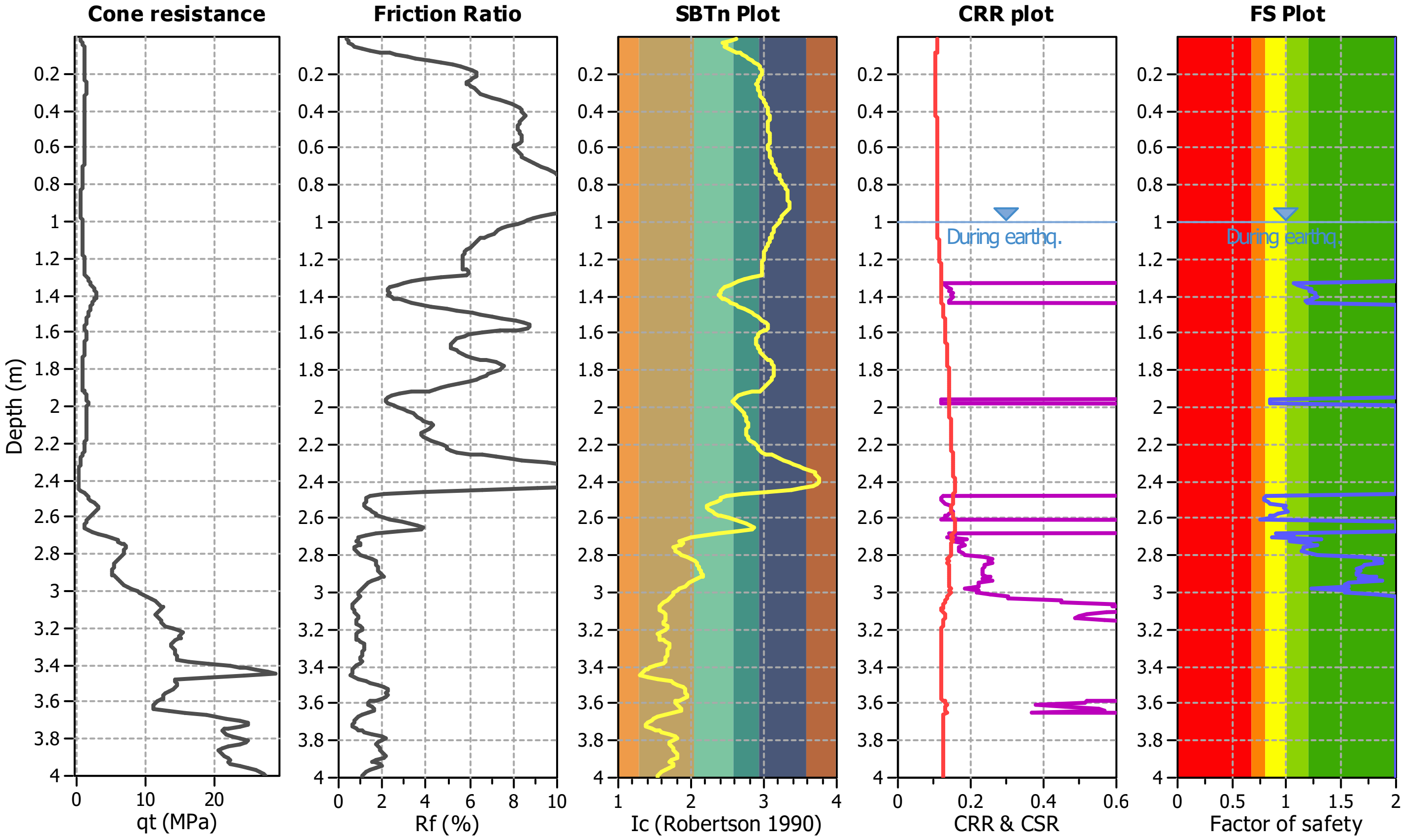
LIQUEFACTION ANALYSIS REPORT

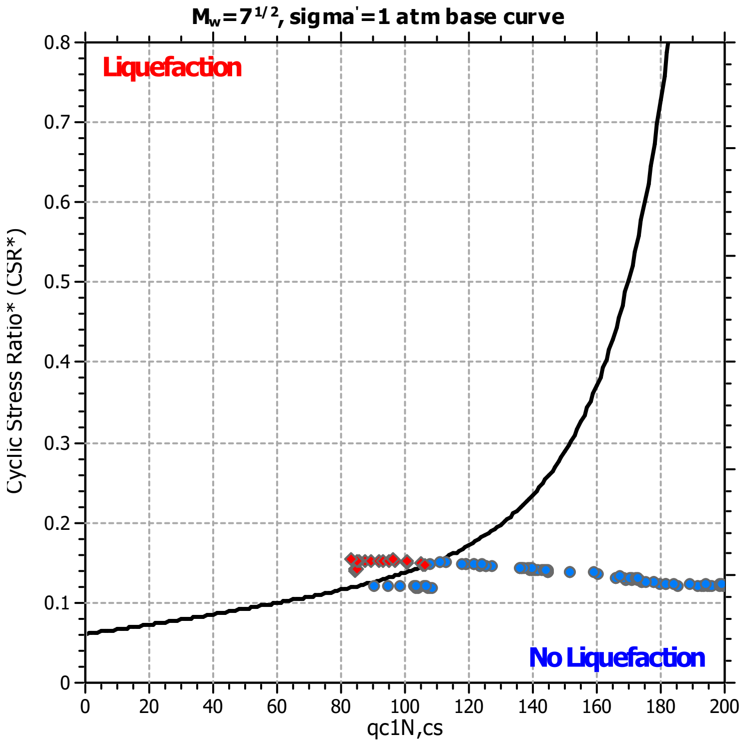
Project title : **Location :**

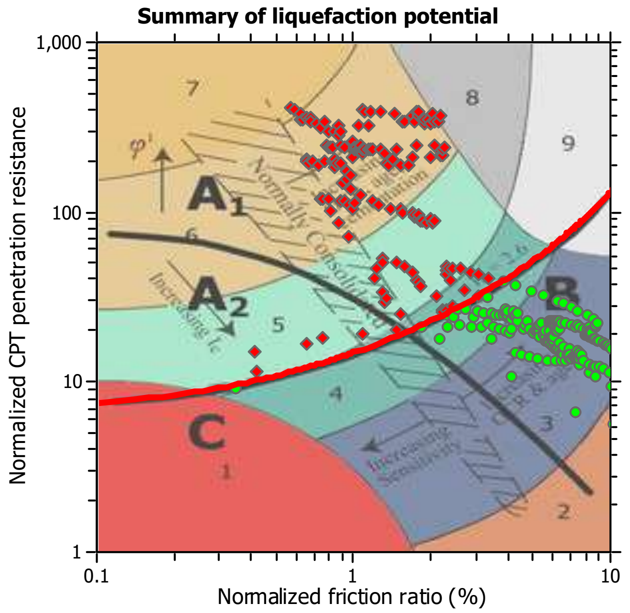
CPT file : CPT13 - DCLS

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.19	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

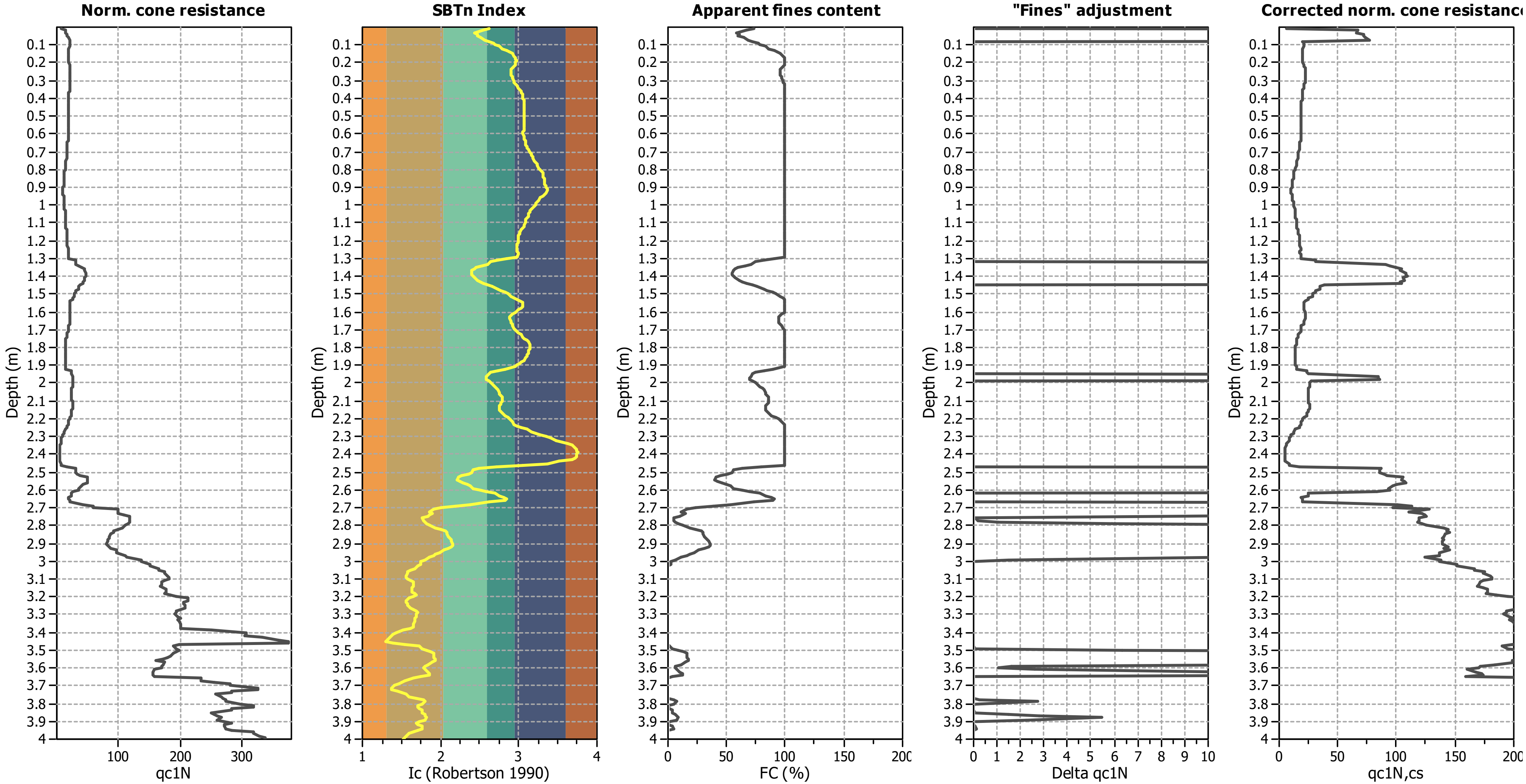






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

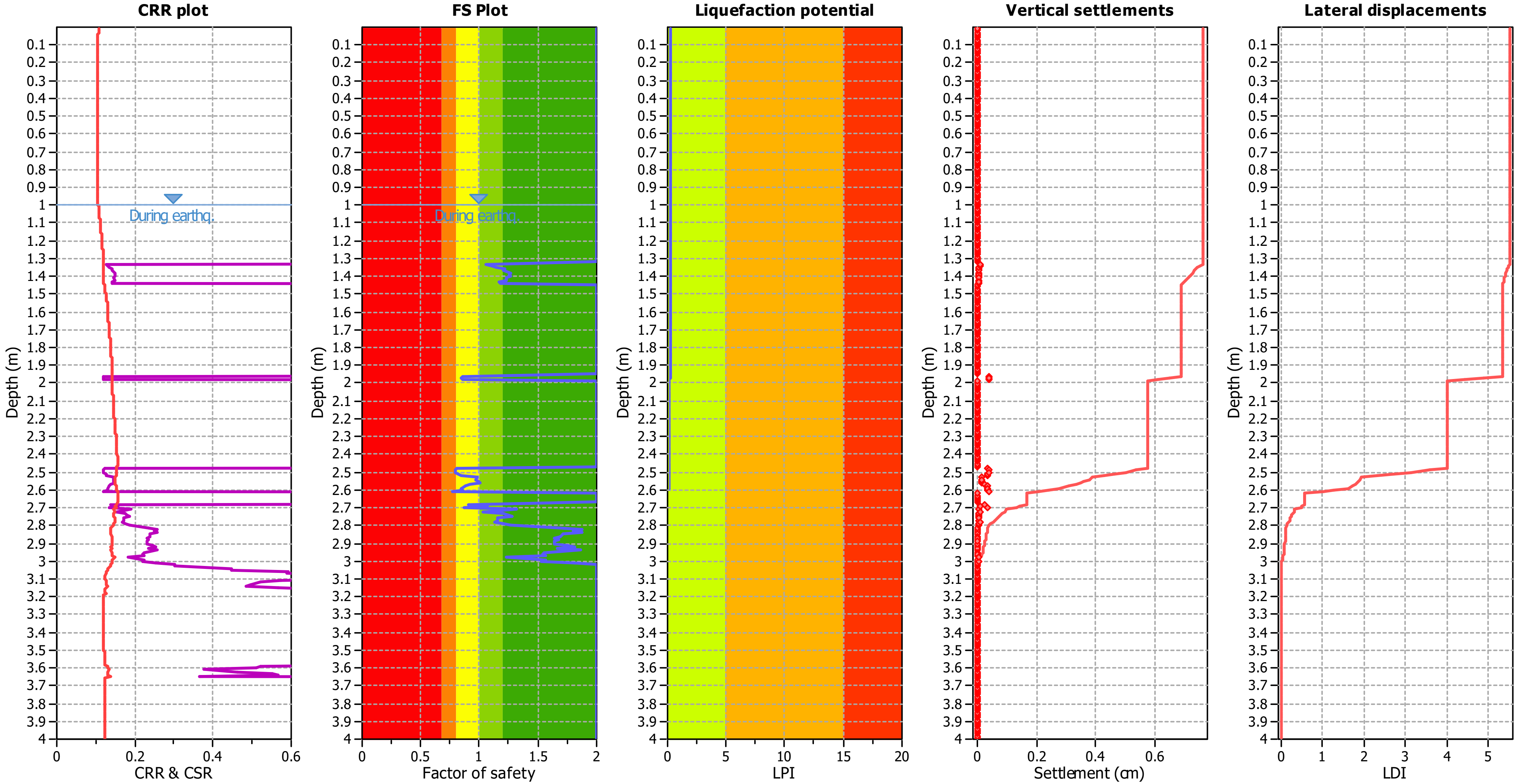
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

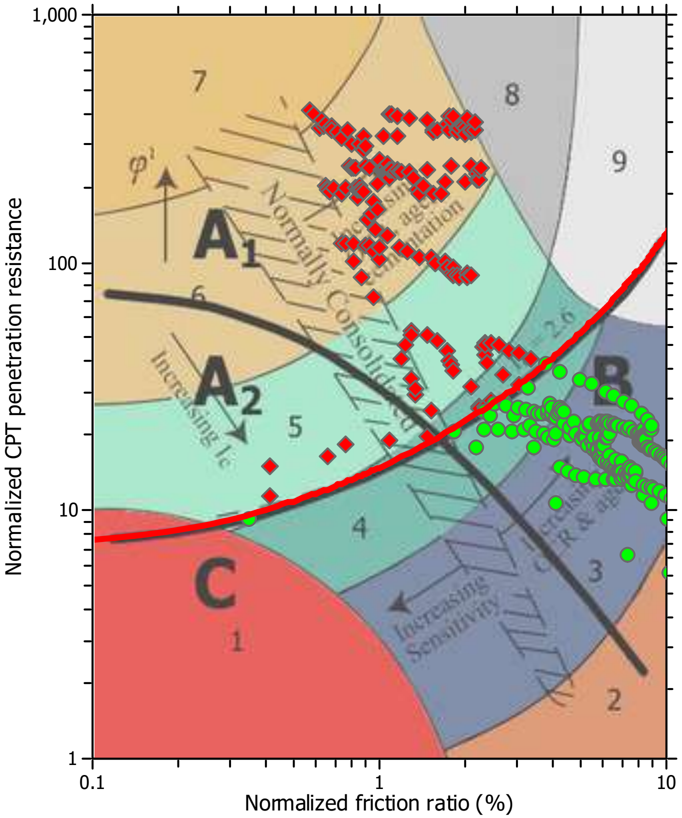
F.S. color scheme

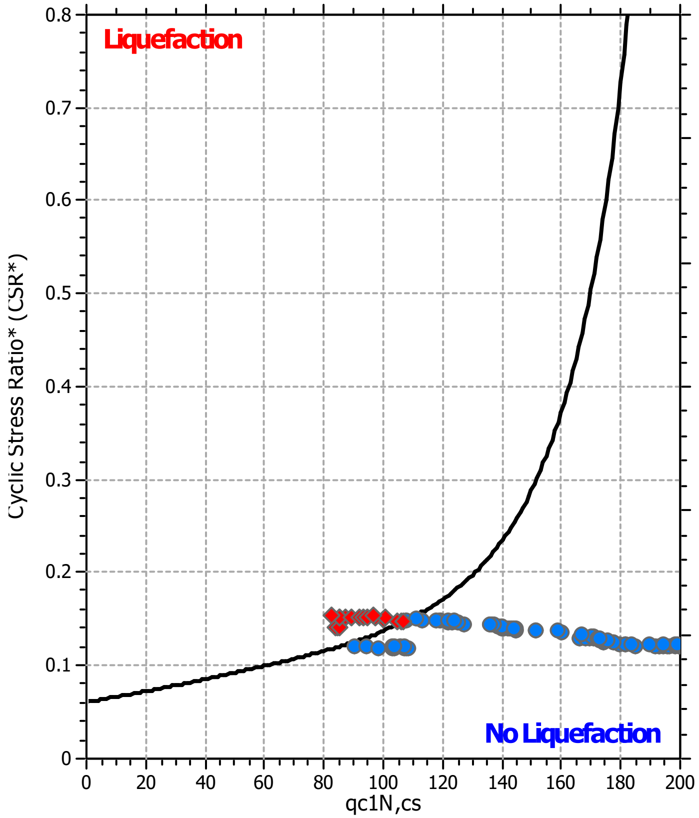
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

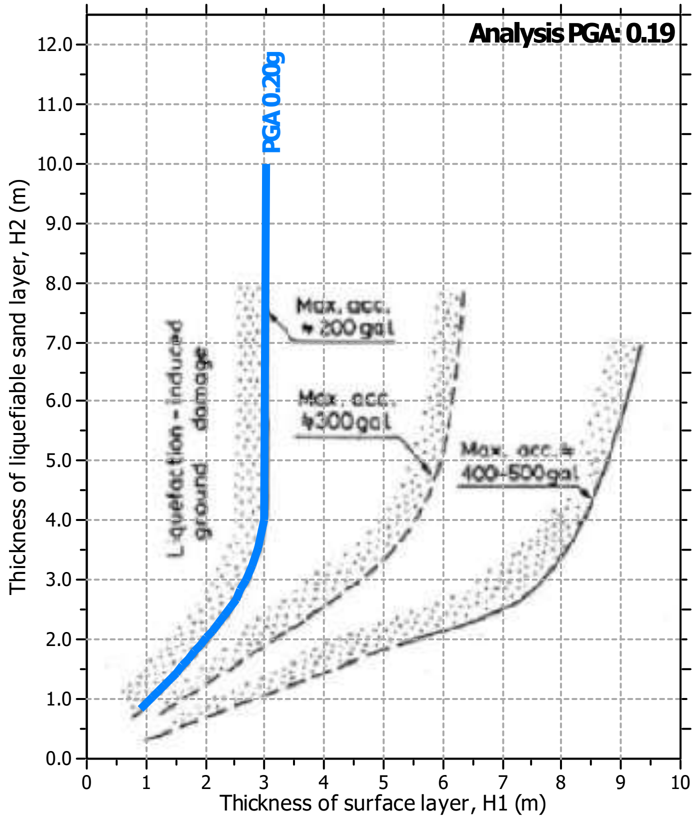
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.19	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

Appendix F. Settlement Analysis Outputs

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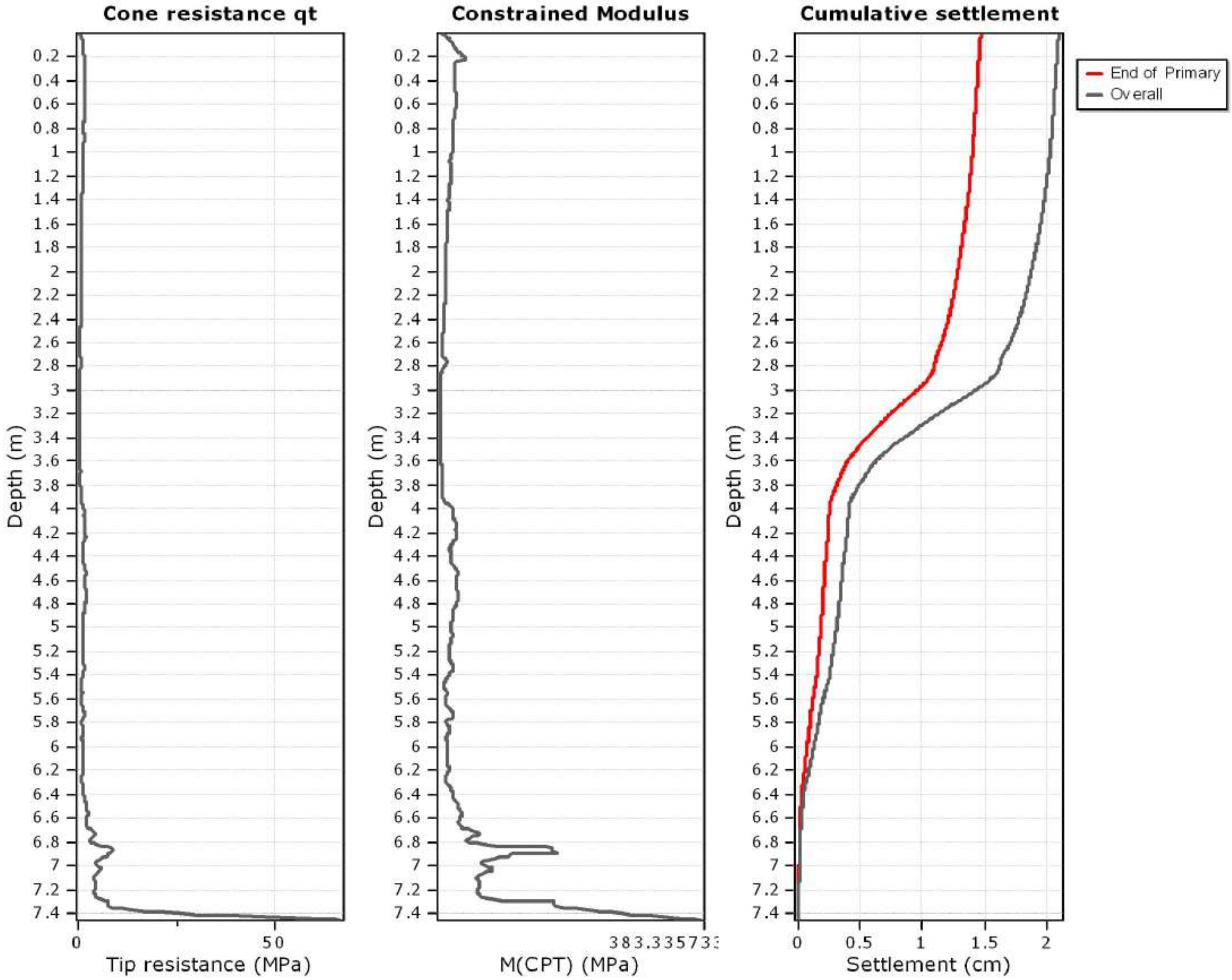
CPT: CPT01
Total depth: 7.46 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

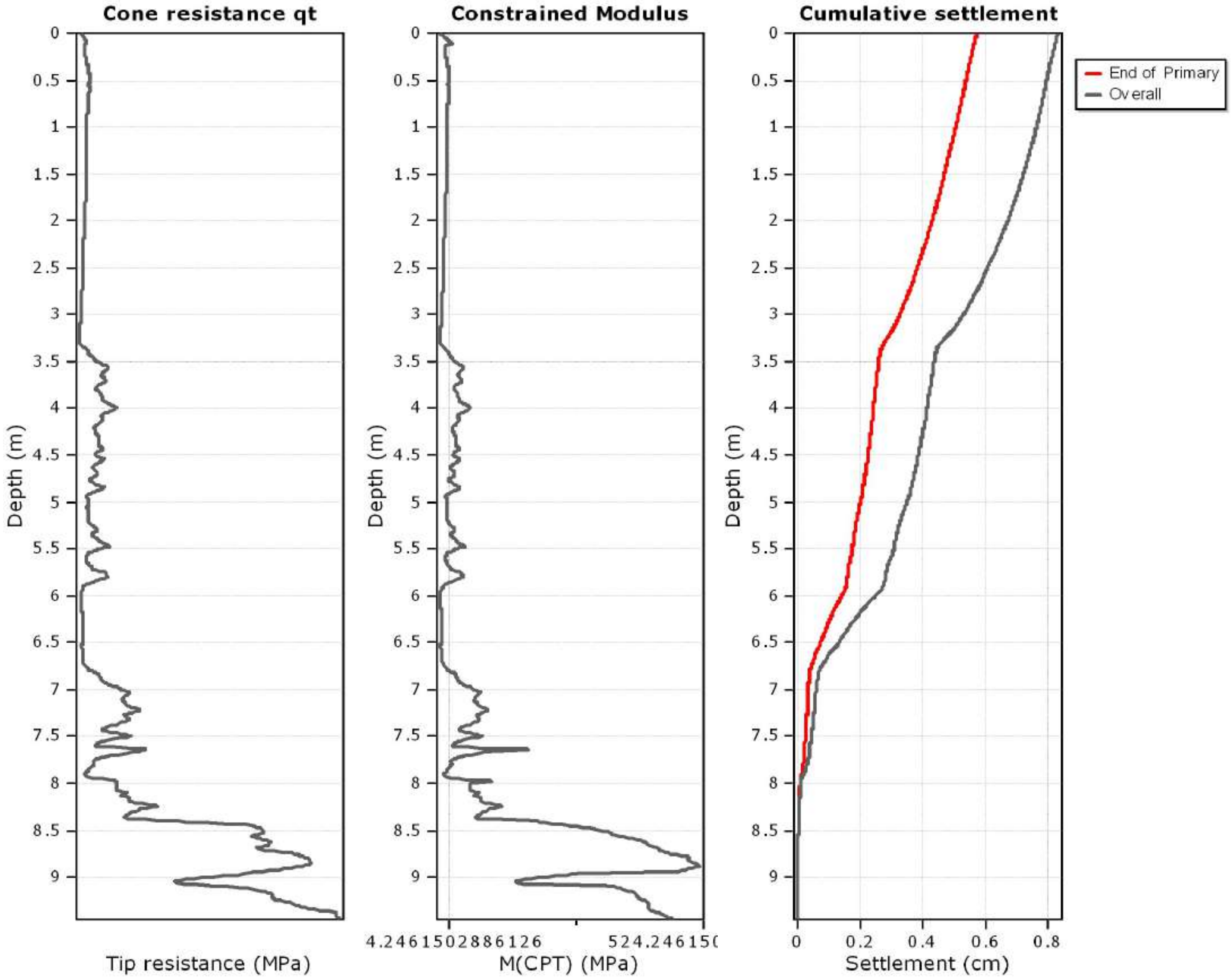
* Primary settlements calculation is performed according to the following formula:

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

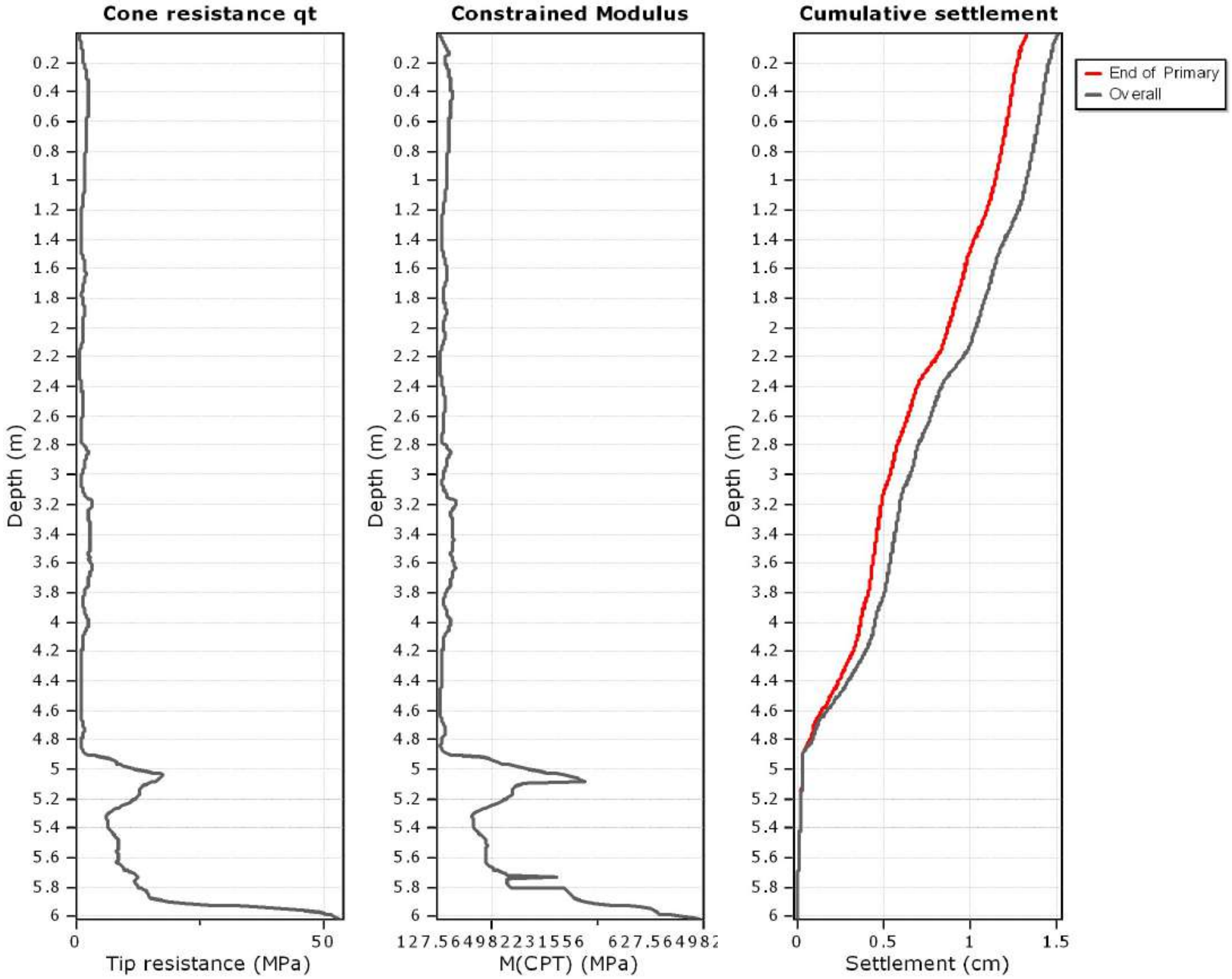
* Primary settlements calculation is performed according to the following formula:

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 45.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

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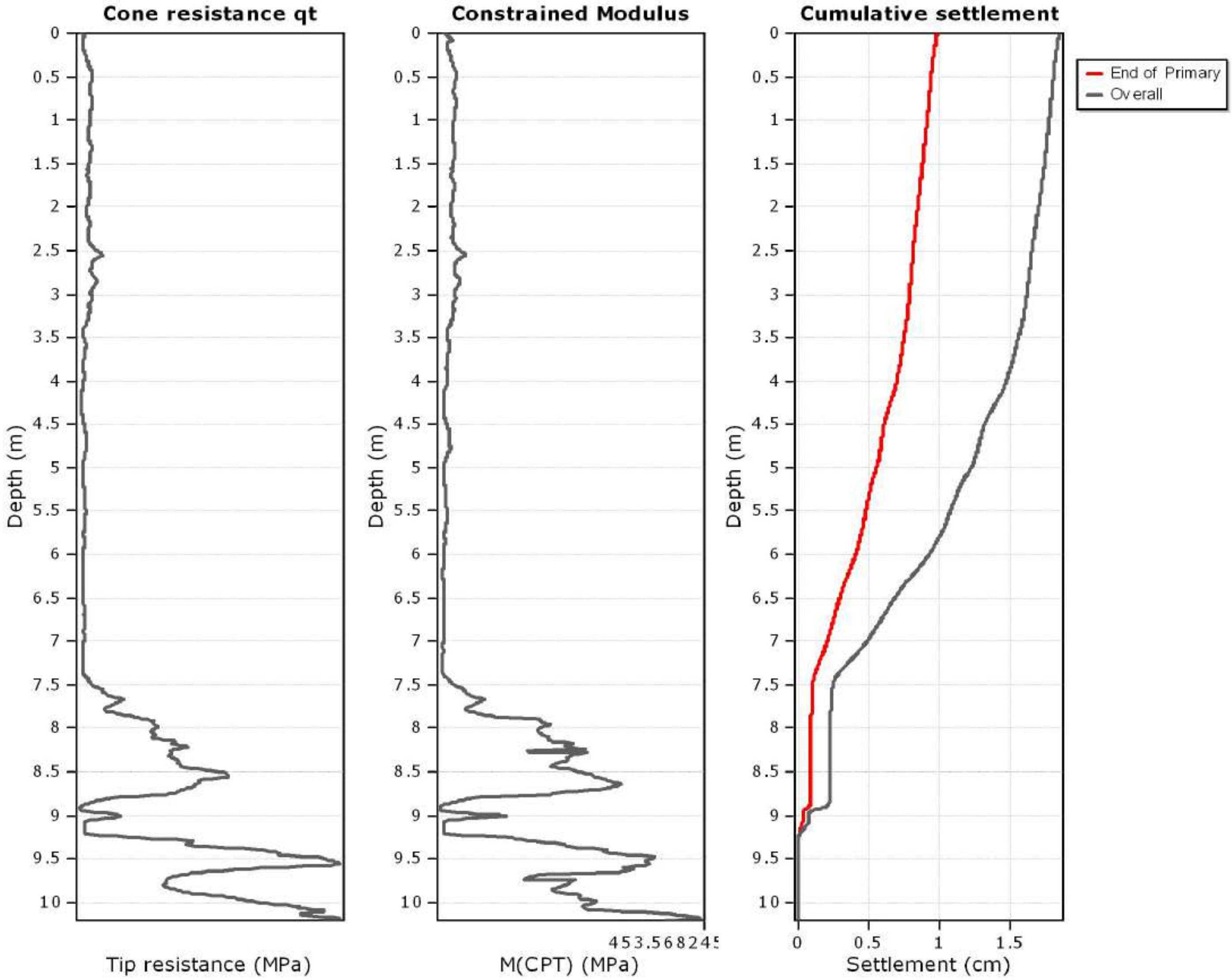
CPT: CPT04
Total depth: 10.21 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00

Project:
Cone Type:
Location:
Cone Operator:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

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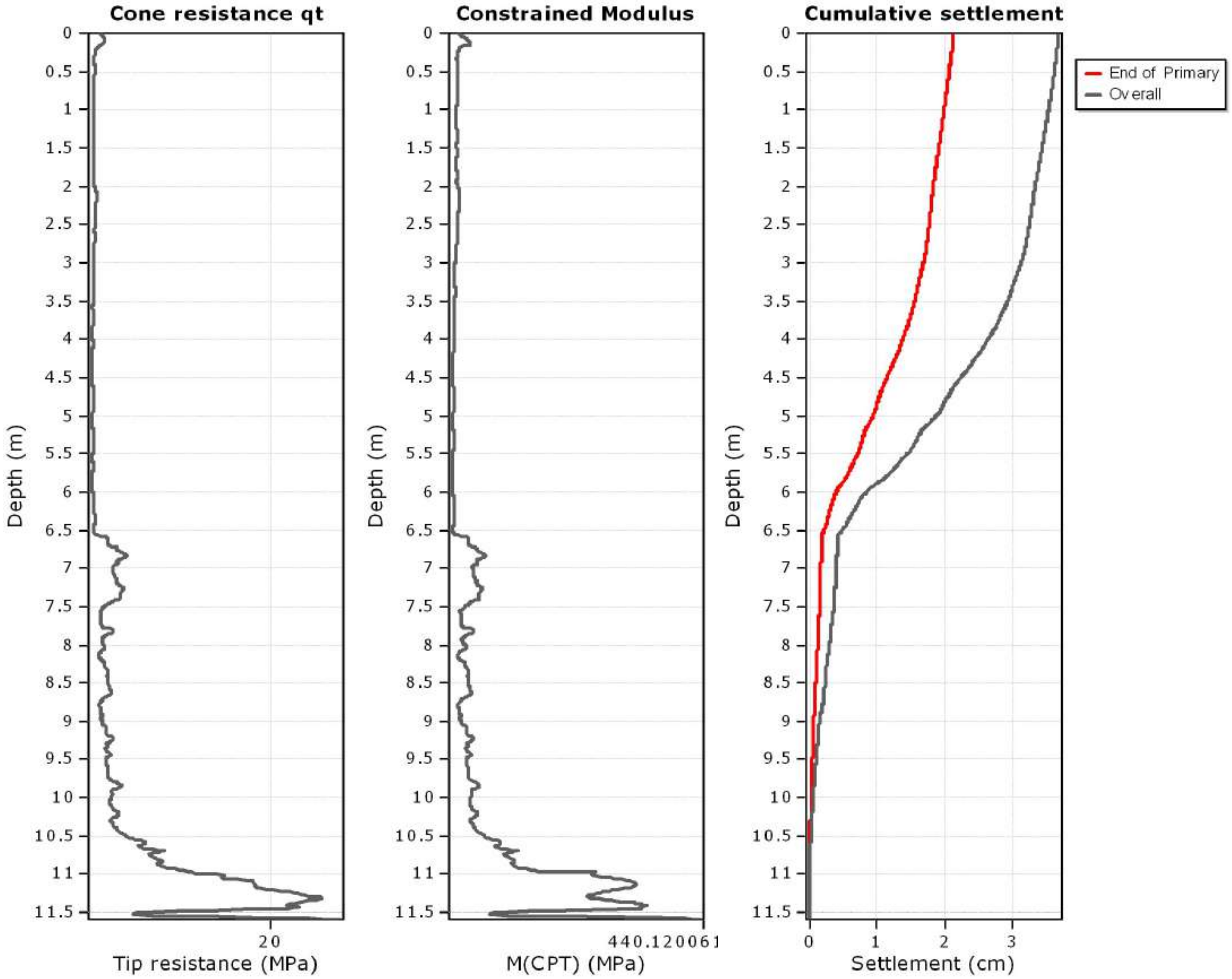
CPT: CPT05
Total depth: 11.59 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

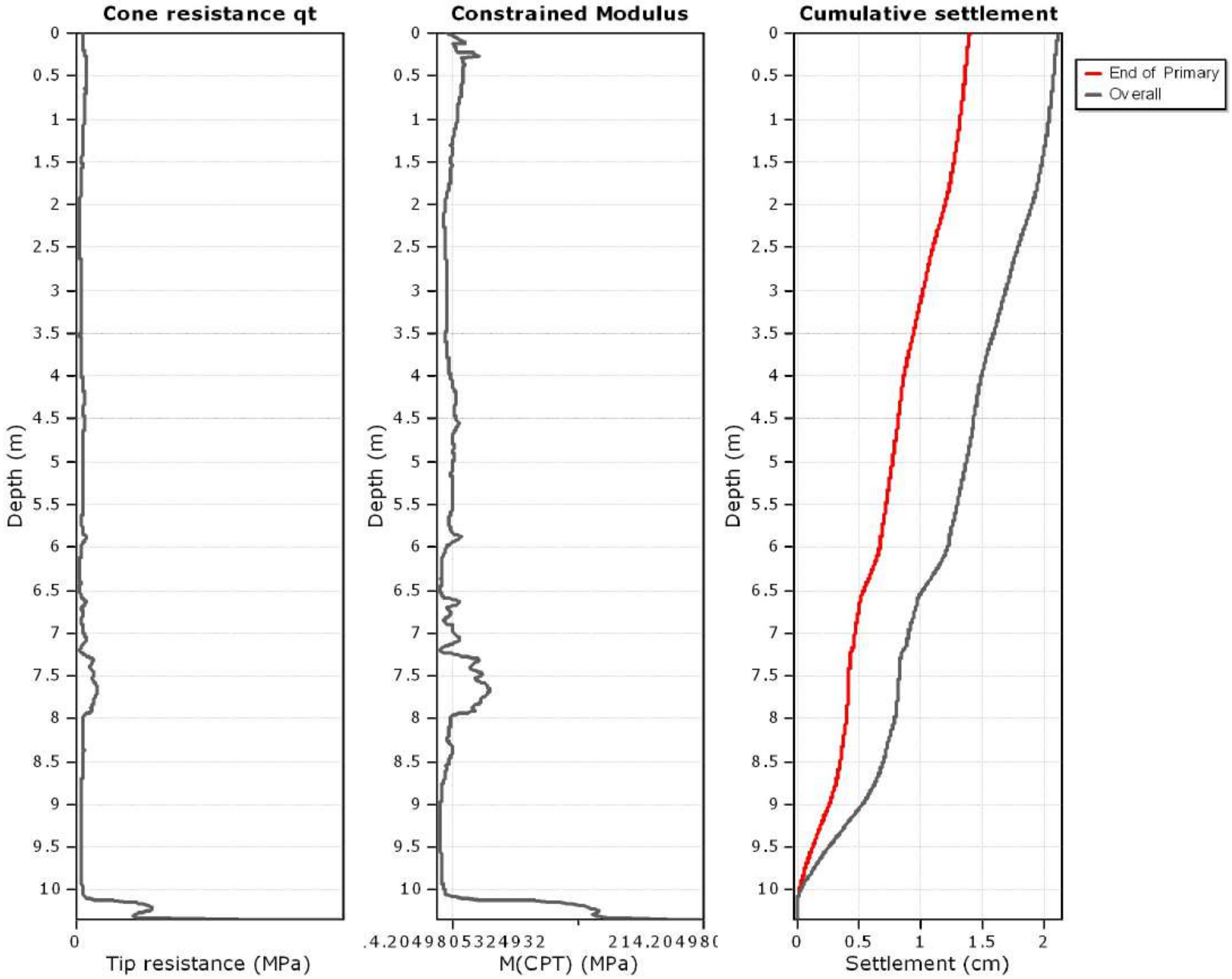
* Primary settlements calculation is performed according to the following formula:

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

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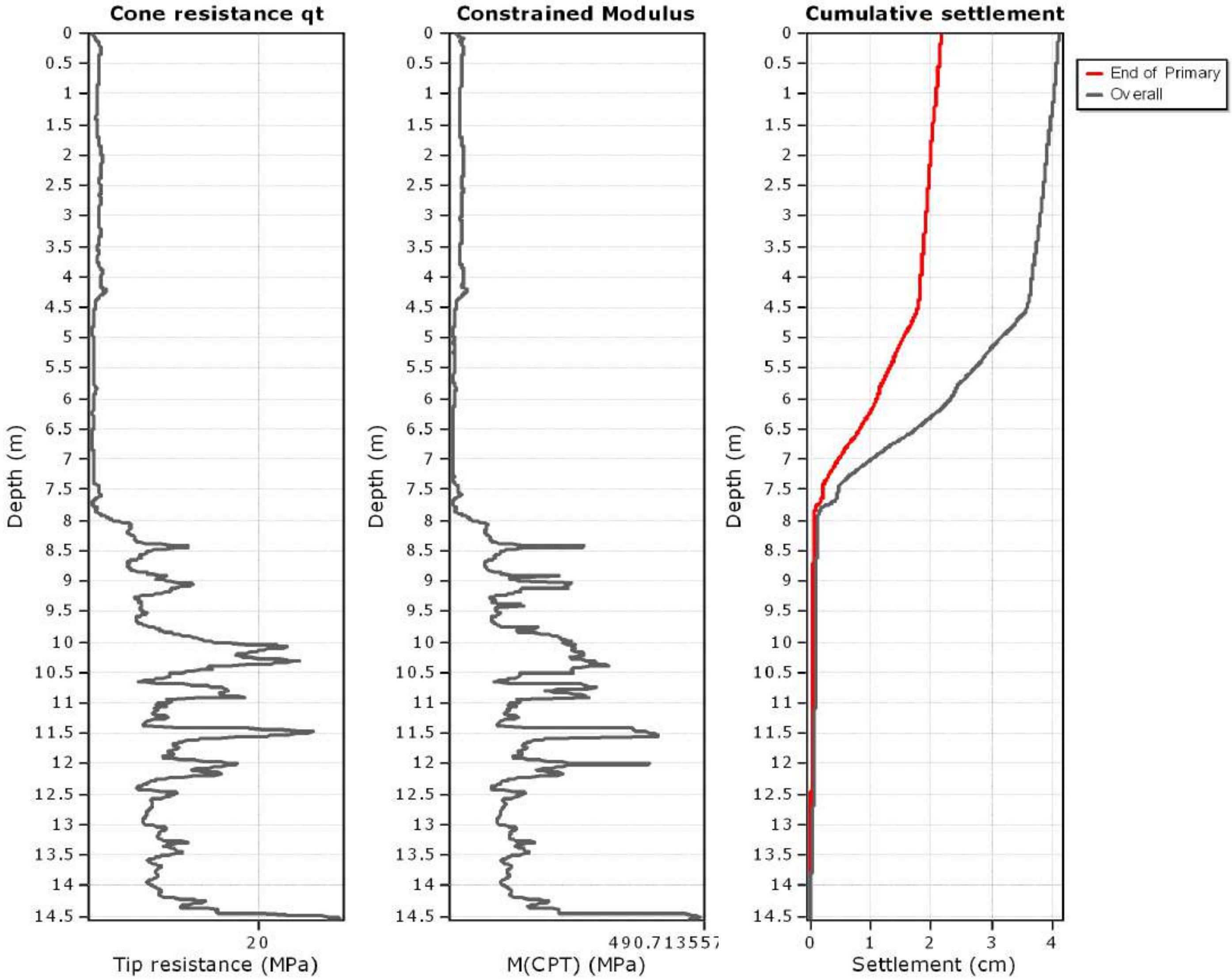
CPT: CPT07
Total depth: 14.57 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

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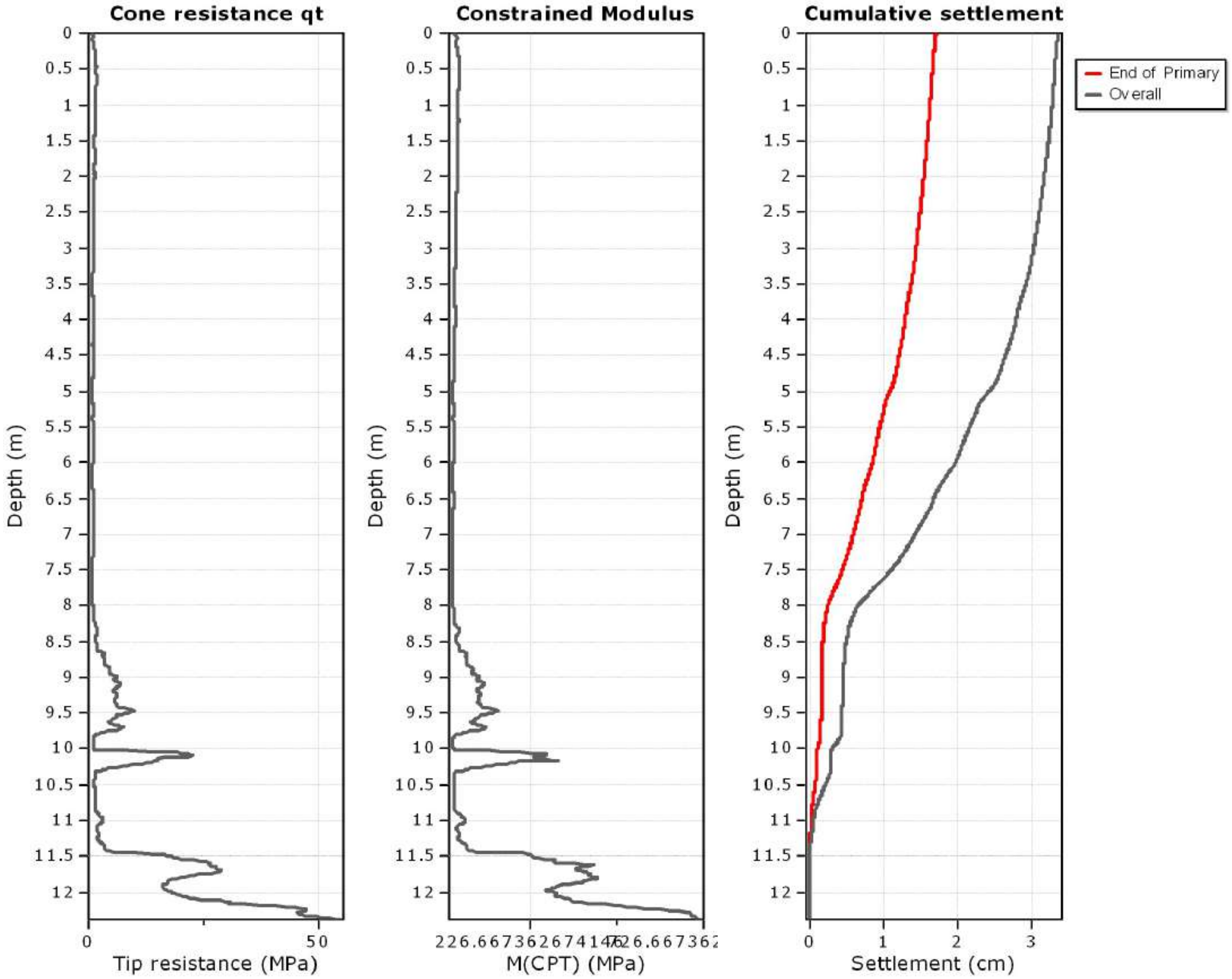
CPT: CPT08
Total depth: 12.38 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

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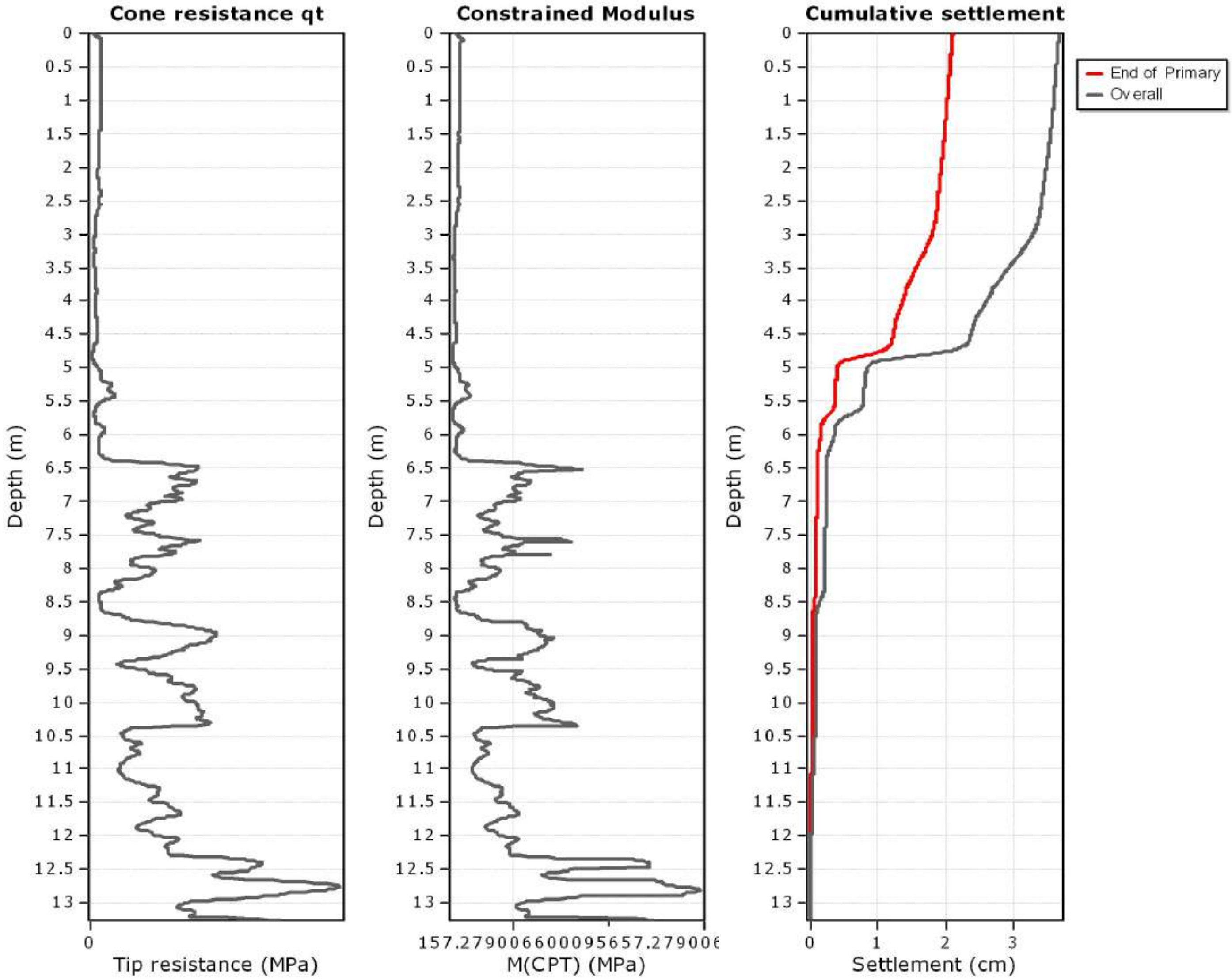
CPT: CPT09
Total depth: 13.26 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 15.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

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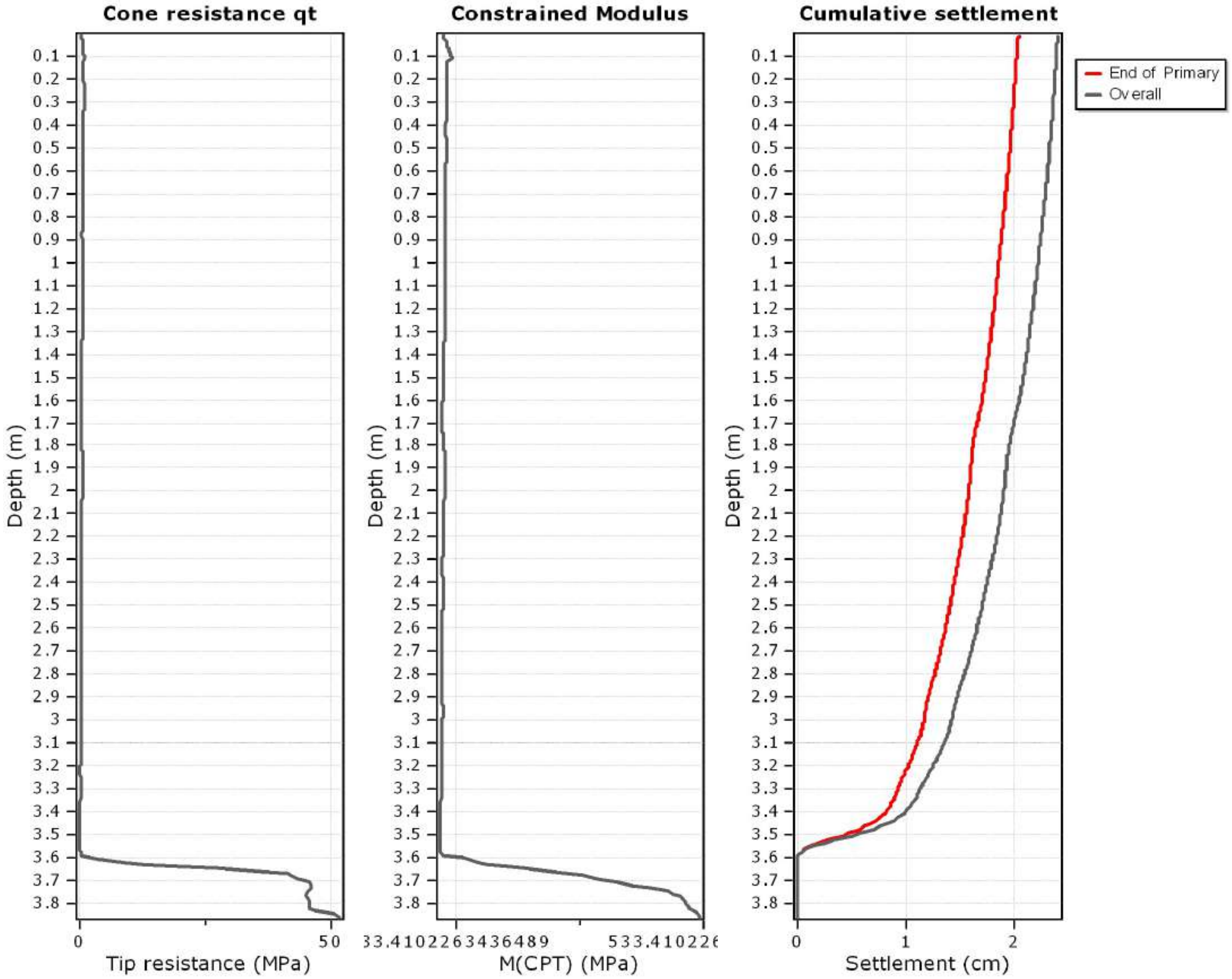
CPT: CPT10
Total depth: 3.87 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 22.50 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

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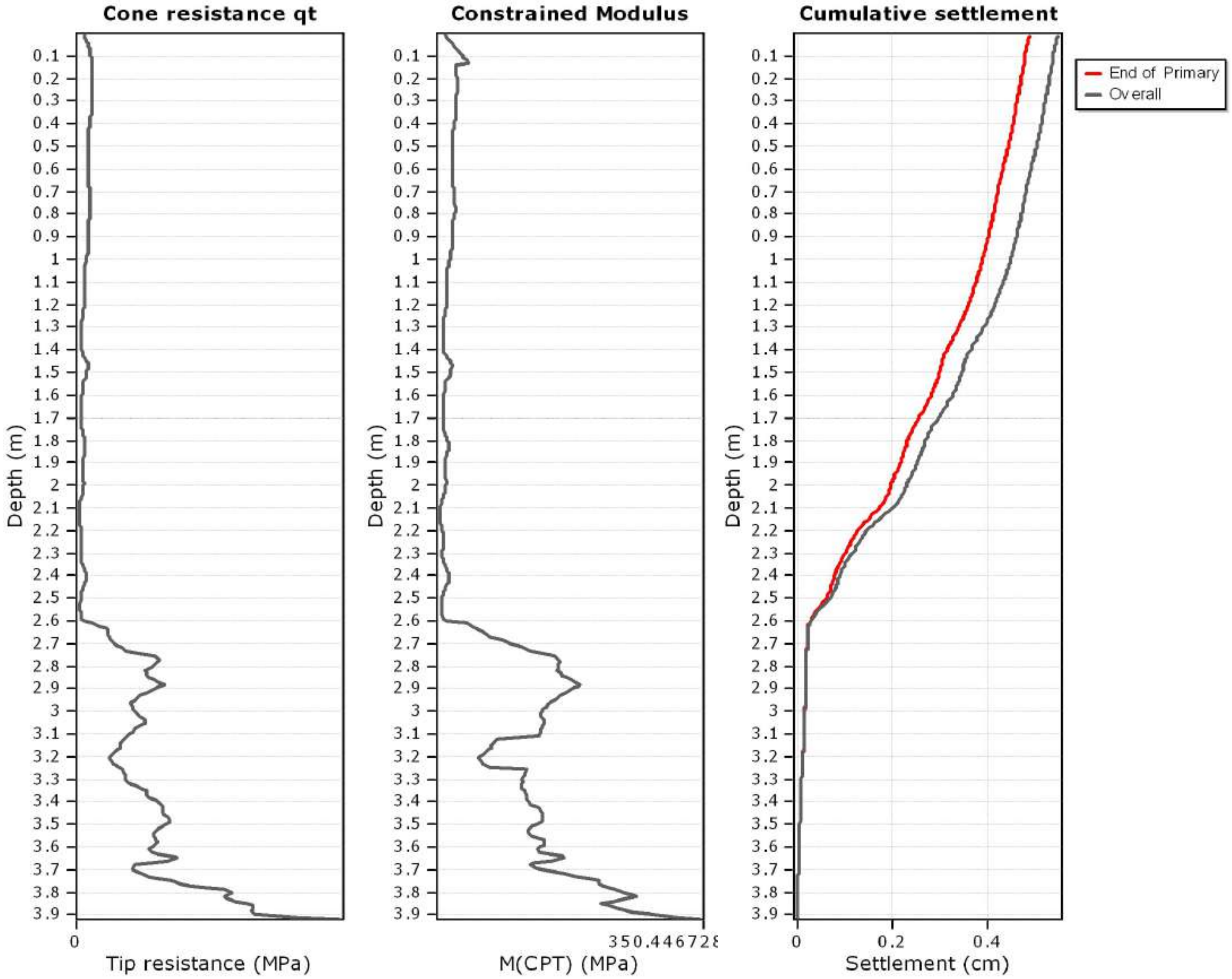
CPT: CPT11
Total depth: 3.92 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00

Project:
Cone Type:

Location:
Cone Operator:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 22.50 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

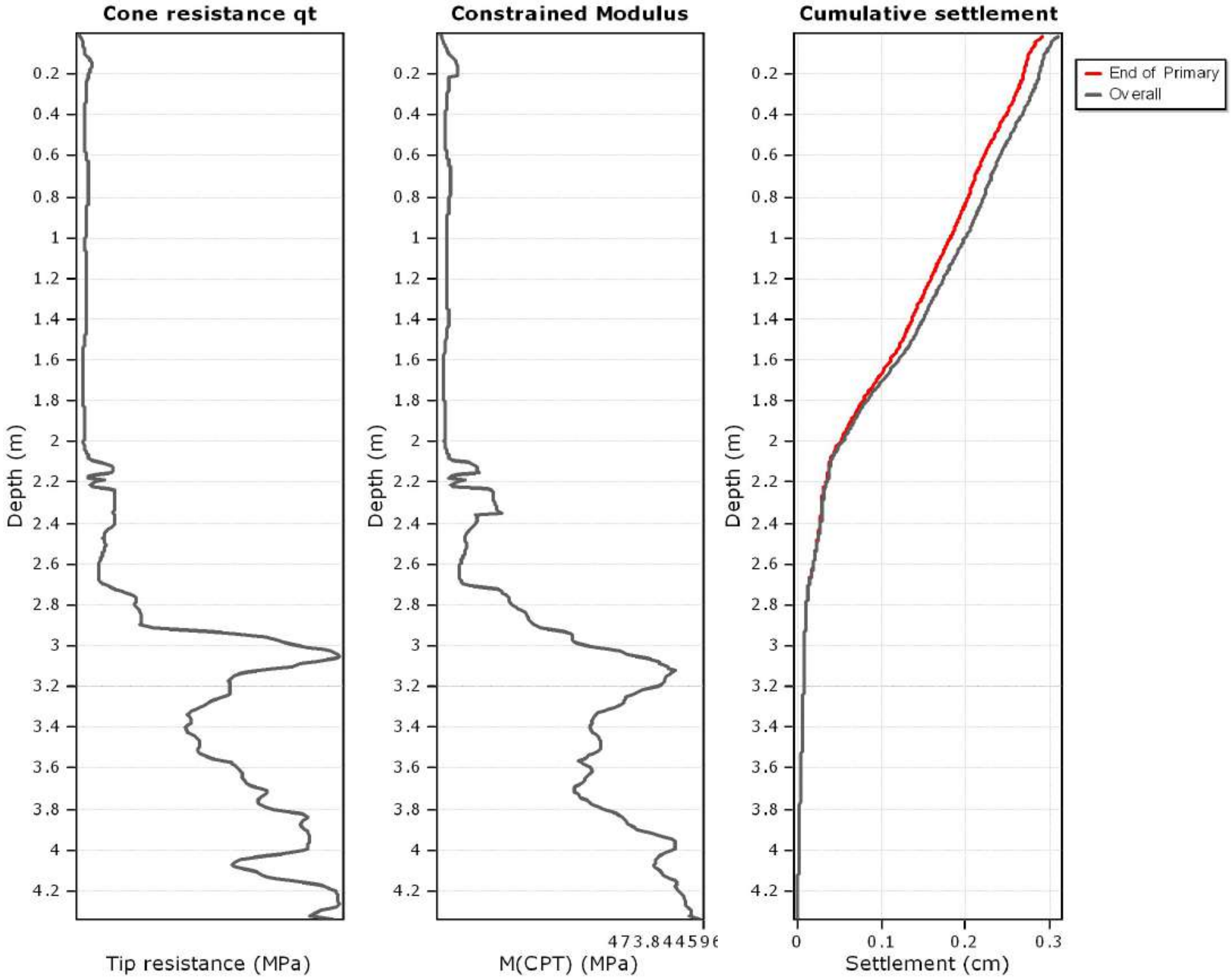
$$S = C_a \cdot \Delta z \cdot \log(t)$$

Underground Investigation Ltd
Cone Penetration Testing
craig@undergroundinvestigation.co.nz
+64211473249

CPT: CPT12
Total depth: 4.34 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 22.50 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

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

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

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

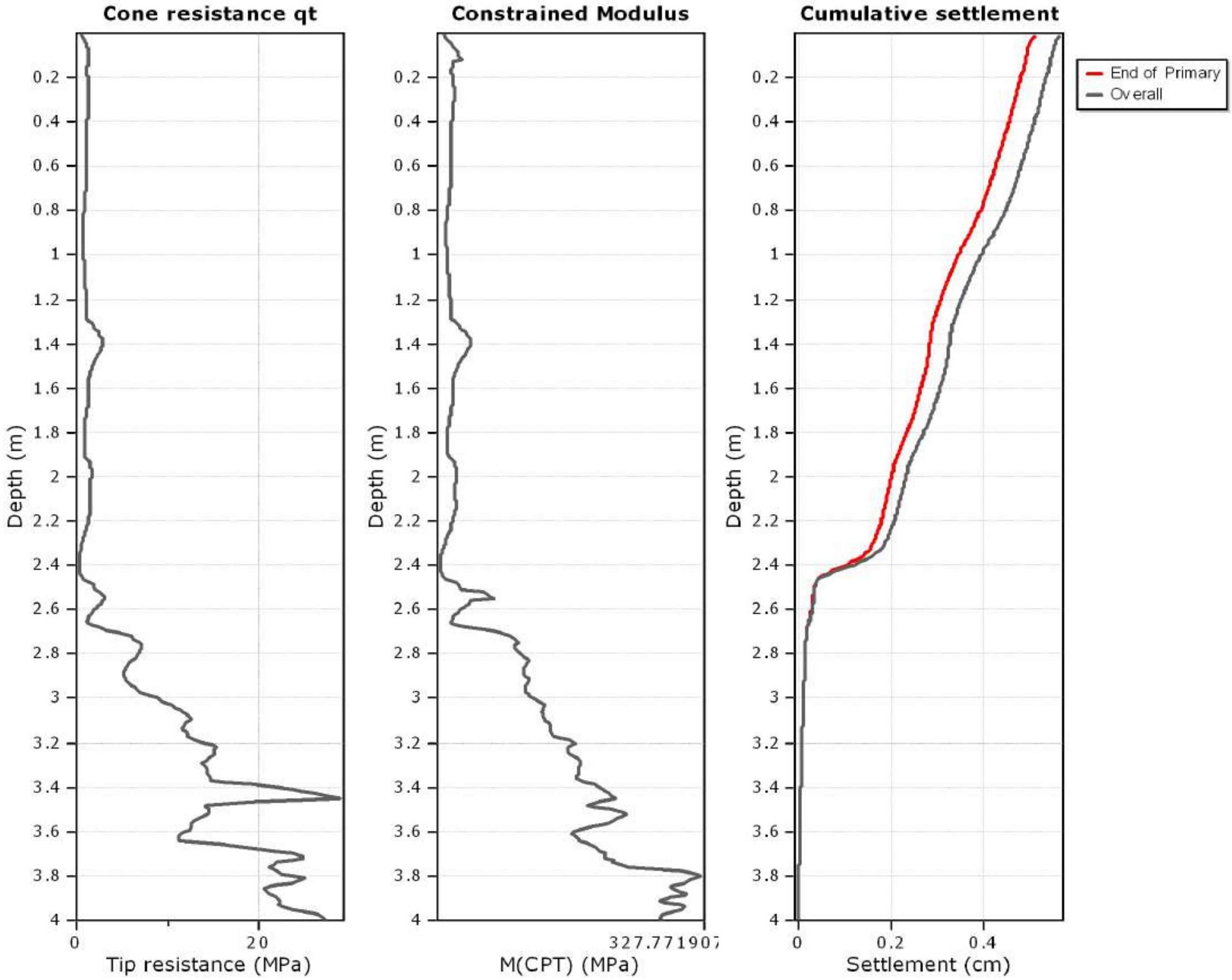
$$S = C_a \cdot \Delta z \cdot \log(t)$$

Underground Investigation Ltd
Cone Penetration Testing
craig@undergroundinvestigation.co.nz
+64211473249

CPT: CPT13
Total depth: 4.00 m, Date: 10/10/2024
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 22.50 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 120 months

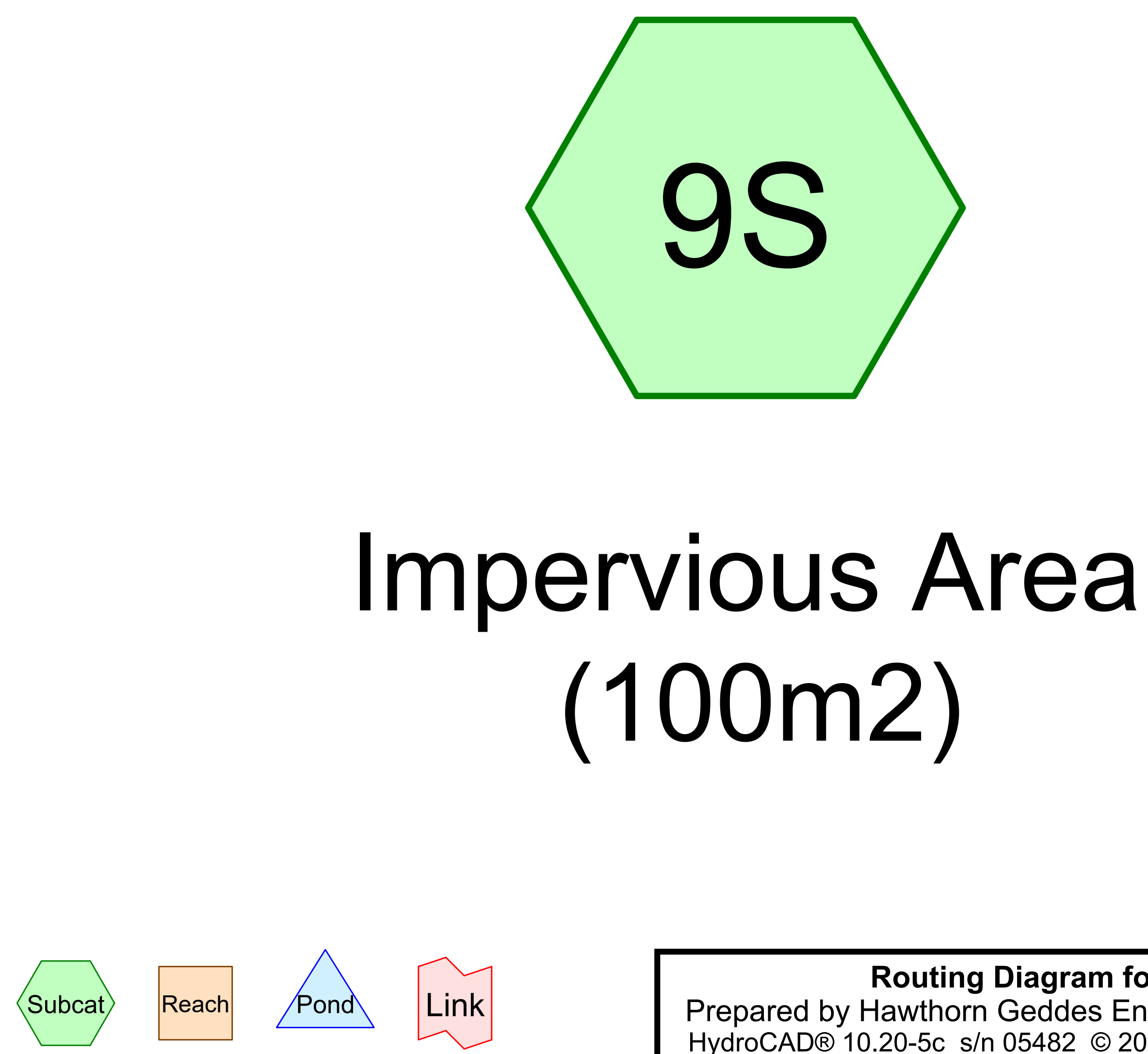
* Primary settlements calculation is performed according to the following formula:

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

Appendix G. HydroCAD Outputs



Routing Diagram for Diffuse discharge
Prepared by Hawthorn Geddes Eng & Arch Ltd, Printed 25/11/2024
HydroCAD® 10.20-5c s/n 05482 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment 9S: Impervious Area (100m2)

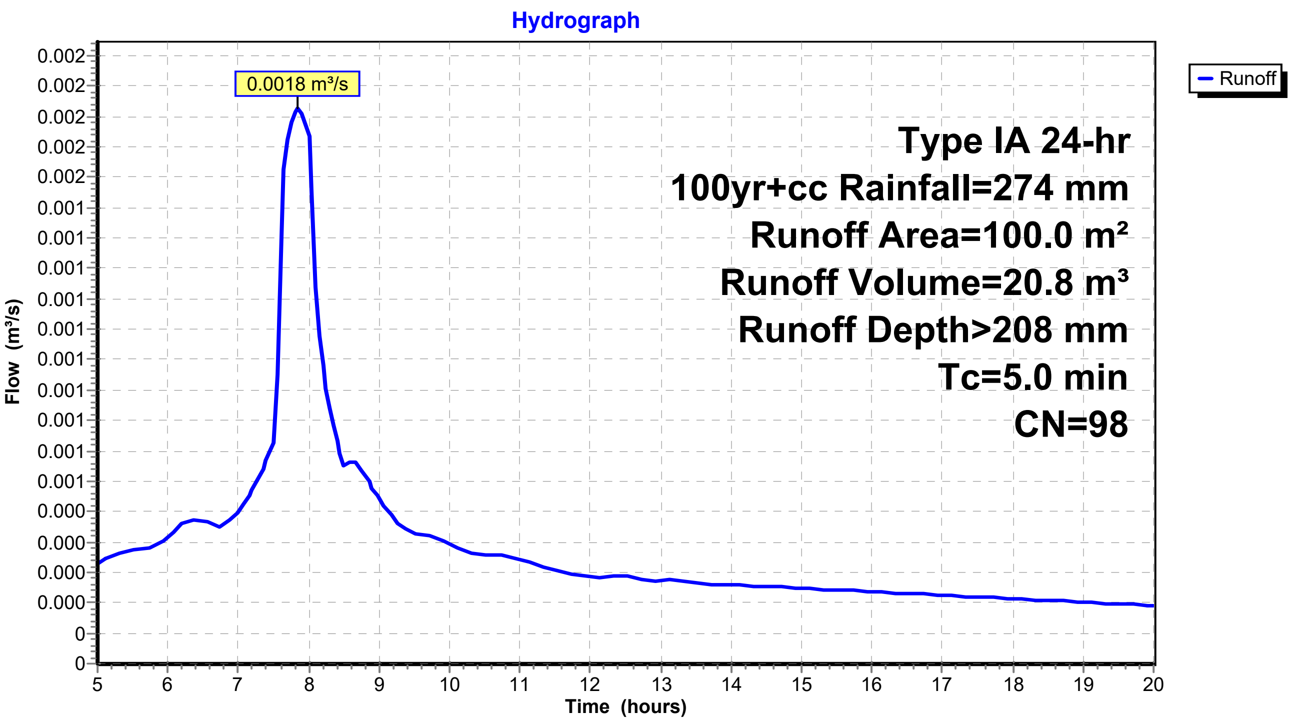
Runoff = 0.0018 m³/s @ 7.85 hrs, Volume= 20.8 m³, Depth> 208 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100yr+cc Rainfall=274 mm

	Area (m²)	CN	Description
*	100.0	98	impervious
	100.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
5.0					**Direct Entry,**

Subcatchment 9S: Impervious Area (100m2)



Attachment 5

ECOLOGICAL IMPACT ASSESSMENT (ECIA)

PROPOSED SUBDIVISION PT ALLOTMENTS 5 PARISH OF ŌRURU
978 ŌRURU RD, TAIPA
TRIPARK FARMS LTD

Bay Ecological
CONSULTANCY LTD
PO Box 229, KERIKERI
PH 021 151 8315

CONTENTS

This report may be cited as-
BAY ECOLOGICAL CONSULTANCY LTD (7/3/25) ECOLOGICAL IMPACT ASSESSMENT PROPOSED TRIPARK FARMS LTD SUBDIVISION PROPOSED SUBDIVISION PT ALLOTMENTS 5 PARISH OF ŌRURU
978 ŌRURU RD, TAIPA

EXECUTIVE SUMMARY

Bay Ecological Consultancy Ltd has been engaged by Tripark Farms Ltd to undertake an Ecological Impact Assessment (EcIA) in regards to subdivision of the subject property (PT Allotments 5 Parish Ōruru; approx. 143.8663 ha), creating 13 Lots for rural residential purpose in the Rural Production zone as a *Restricted Discretionary* activity.

The proposal site has been considered on the basis of a desktop review of available ecological information, complimented by fieldwork on the 25/11/25, to assign value to site features, assess potential effects of the proposal and formulate recommendations. This included delineation of wetland extent and associated *values*[1], subject to regulations of the *NES-F (2020)*. *Extent* and *values* are primary considerations in avoidance of adverse effects of any development, largely dependant on maintenance of hydrology.
Throughout the design development, placement of access and proposed building envelopes have been sited to acknowledge site wetlands, melding increased residential purpose and ecological context comfortably into the currently production landscape.
Reporting provides consideration of significance in regard to Northland Regional Policy Statement *Appendix 5* (2018). The core foundation principles for ecological assessment therein are also directly aligned with the *Appendix 1* criteria of the *National Policy Statement for Indigenous Biodiversity (2023)*[2].

Key findings from this reporting are:

- Predicted ecosystem[3] types corresponding with mapped soil type and climate are
  - ***WF11 Kauri Broadleaved podocarp***
  - ***WF7.1 Puriri totara forest***

  Terrestrial indigenous vegetation onsite is limited to the western portion of proposed Lot 15 occupied by *manuka- kanuka- towai -totara- tanekaha* dominant.
- The majority of vegetation within the Lots consists of exotic shelterbelts. No indigenous vegetation clearance is required to establish the house sites or access. There are no kauri in the development area to invoke consideration of the Biosecurity (National PA Pest Management Plan) Order 2022.
- Beyond the indigenous vegetation and wetland on proposed Lot 15 ecological site values within the designated footprint are related to wetland.
- Site hydrology descends primarily west to east through the landscape toward Ōruru Rd and tributary to the Ōruru River. It includes headwaters NZSEG# 1003610 on proposed Lot 15 and NZSEG#1003872 within proposed Lot 6, encompassed within the *Doubtless Bay NRC Priority Catchment.*

[1] VALUES (NPS FM 2020 Amendment No.1 (2022) (i) ecosystem health; (ii) indigenous biodiversity; (iii) hydrological function; (iv) Maori freshwater values; (v) amenity values

[2] 4/8/2023 *Appendix 1 : Criteria for identifying areas that qualify as significant natural areas (SNAs)*

[3] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/Northland_Biodiversity_Ranking/FeatureServer

- *Natural inland wetlands* subject to the National Environmental Standards for Freshwater NES – F (2020) have been recognized, according to definitions of the NPS FM (2020) and PNRP (2021), by dominant hydrophytic (OBL, FACW) floral assemblages supported by evidence of persistent site hydrology.
- Site wetlands are diagnostically
    - *Seepage*
    - *Swamp*
- The Rapid Test, as the first strata of wetland delineation, was sufficient to determine wetland presence with dominance typified by obligate (OBL) and facultative wetland (FACW) species forming very obvious <u>*natural inland wetland*</u> communities.
- Primary hydric indicators included saturation and surface water, with supportive indicators of the dominant drainage pattern of the landscape. The wetlands are generally embedded in natural basal contour of gullies with abrupt loss of wetland dominance occuring with slight elevation in contour at the edges.
- The far western portion of proposed Lot 15 contains significant ecological values including wet gumland (heathland) within the larger tract of remnant WF11 forest and a large wetland associated with NZSEG# 1003610. Its OBL wetland species associations imply deep permanent water and include *raupo*; *Machaerina*, *Schoenoplectus* and *kuta* varying with depth of saturation and >50% indigenous in coverage.
- The primary associations throughout the remainder of the site exhibit a typic pastoral influence and are exotic dominant - FACW & OBL short herbaceous and grass spp. *Paspalum distichum* (FACW)* dominant with varied frequency of *Isachne globosa* (OBL) & *Glyceria notata* (OBL)*; *Agrostis stolonifera** (FACW) & *Persicaria* (OBL & FACW spp); Carex leporina* (FACW);Isolepsis prolifera (OBL); Cyperus brevifolius* (FACW); Ludwigia palustris*; *Eleocharis acuta (OBL). Epilobium chionanthum (FACW) & Juncus spp (FACW)* present are common generalists - *Juncus effusus*; J. edgariae; J. articulatus*, &* small leafy *Juncus bulbosus*.* Larger *Machaerina tenax (FACW)* is found in within proposed Lot 6 wetland.
- The occurrence of innocuous exotics *Holcus lanatus*; Ranunculus repens* & Lotus pedunculatus* (FAC)* on micro hummocks within the wetland is not sufficient in frequency to alter the evident wetland diagnosis.
- None of the *natural inland wetland* <u>mapped</u> in this reporting would be subject to the pastoral exclusion clause of the *natural inland wetland* definition[4]. Stock exclusion was required[5] of creeks and wetland (>500m^2) by 1/1/25 underpining a positive effect of subdivision and likely resultant retirement of areas.
- No rare/ threatened flora were found within the wetlands.
- The prevailing character of the site beyond identified wetland is rough pastoral- kikuyu dominance; rye; browntop; ratstail and large strong clumps of *Paspalum dilatum*; with further common FACU / UPL grass and weed species e.g. *Senecio; Plantago* and abundant *Daucus*.
- Five minute bird counts during fieldwork determined habitat suitable for insectivourous generalists sighted e.g. kingfisher; skylark; pitpit (*At Risk – Declining*) as part of wider territorial economics. No habitat is available for specialist wetland birds due to the exposed pastoral character of all other than the large wetland on proposed balance Lot 15 with taller stature sedge/ rush habitat and intact riparian margins. Fernbird (*At Risk Declining*) was heard adjacent the quarry access and there are likely populations within further extent.

[4] (e) a wetland that:
(i) is within an area of pasture used for grazing; and
(ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8)
(iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply
[55] PNRP FEB (2024) T*able 14: Dates when livestock must be effectively excluded from water bodies and continually flowing artificial watercourses*

- A fish survey was not undertaken. Protection of wetland habitat as per the NES-F (2020) confers protection to any species present. Predicted species[6] for the site reaches are those that favour the site habitat niche of elevation and near elevation –common bully; redfin bully; longfin & shortfin eel and banded kokopu. However, access throughout the site from the Ōruru River is occluded. This does not necessarily result in absence of diadromous species as tuna may be able to traverse bunding and pasture under wet nocturnal conditions and bullies form landlocked populations.
- Aupouri PNA[7] sites to the west offsite are not considered within a zone of influence (ZOI) of the proposal.
- The site is mapped majority as *TEC Level III,* with the predicted WF7.1 forest area adjacent Ōruru rd mapped *TEC Level II,* - referenced in regional significance assessment *RPS (2018) Appendix 5: 2(a)1.* Although this implies significance this vegetation type is not present.
- Other than the new culvert crossing required to proposed Lot 9, the building platforms for proposed Lots 1; 2; 3; 4; 6; 7; 9; 12; 15 and associated infrastructure are potentially within 100m of *natural inland wetland* but do not occupy critical source areas, seepage or overland flow path that through their formation may change the water level range or hydrological function of the wetland. All house sites are pre emptively sited in dry pasture with negligible ecological value.
- We recommend wetlands are formally surveyed for future Sec 223 compliance, covenanted and construction envelopes be established to prevent inadvertent damage.
- Diversion of diffuse natural discharge naturally permeating or sheetflow downslope through the building sites or ROW across pasture *will not cause drainage of all or part of the wetlands or likely change the water level range or hydrological function of the wetland* in any measureable way in reference to *Reg 52(i);(ii)* & *Reg 54 (c) & (d).*
- Likewise earthworks within 100m or 10m will not result in *complete or partial drainage of all or part of the wetland or likely change the water level range or hydrological function of the wetlands* as per *Reg 52(i);(ii)* & *Reg 54 (c) & (d)* if they do not occupy or intersect with the wetlands.
- In the absence of unmitigated point source discharge there is highly unlikely to be any wetland *change in seasonal or annual range water levels*, as per *PNRP Policy H.4.2 Minimum levels for Lakes and natural wetlands*.
- Due to the extant variable output highly responsive to meteorological conditions in a pastoral setting the species composition throughout has a level of tolerance adapted to periodic moderate to high fluctuation in water levels without discernible shift in composition or aquatic life. Stormwater inputs should be controlled in a manner that prevents sediment, scouring or erosion as best practice to avoid adverse effects of such on wetland and aquatic habitat condition.
- The crossing to proposed Lot 9 within 10m of upstream *natural inland wetland* will require application to NRC consent with provision of the final detailed design including parameters of *NES-F (2020) Regs 62; 63; 69* and alignment with permitted activity status of *NES-F Reg 70*; or alternatively as a *Discretionary* activity as per *NES-F Reg 71.*

[6] Shiny Rivers NIWA
[7] Conning & Holland (2003) Natural Areas of the Aupouri Ecological District Reconnaisance Survey for the Protected Natural Areas Programme

SUMMARY EFFECTS & MANAGEMENT

The primary potential effects from **development** are limited to

- stormwater discharge within 100m of a *natural inland wetland.*
- earthworks within 100m of a *natural inland wetland.*

Additional potential, but avoidable effects of **residential occupation** include

- landscaping/ alteration of the majority LOW (EIANZ) ecological value wetland & creeks resulting in encroachment or hydrological change
- pest and weed increase from reduced pastoral management

It is presumed from the proposed configuration that no earthworks will interact within the wetland to cause drainage as per *NES-F (2020) 53 Prohibited Activities*. No vegetation clearance or earthworks are proposed within 10m for house sites.
The proposed building platform within 100m do not occupy critical source areas, seepage or overland flow paths that through their formation may ***divert*** contributing hydrology to cause :

- *NES F (2020) REG 52(1)* ***complete or partial drainage of all or part of a natural inland wetland***
- *NES –F (2020) 54 (c)* ***change the water level range or hydrological function[8] of the wetland****.*

Uncontrolled point source discharge of stormwater and intersection of works with the directly wetlands should be avoided so not as to cause

- *PNRP Policy H.4.2 Minimum levels for lakes and natural wetlands* : ***change in seasonal or annual range in water levels***
- NES-F (2024) 54(d) ***change, or likely change, the water level range or hydrological function of the wetland***

The crossing to proposed Lot 9 from the joint access with the existing proposed Lot 8 access to an original farm cottage has been positioned outside but within 10m of *natural inland wetland*, where the character of the waterway becomes is intermittent creek. Parameters of *NES-F (2020) Regs 62; 63 & 69* must be provided to NRC prior to the installation. If it cannot comply with the permitted activity status of *NES- F Reg 70* it is a *Discretionary Activity* as per *NES-F Reg 71* with an emphasis on preservation of natural flow and the passage of fish. However, we consider there is no resident fish population and no potential for occurrence due to the unsuitability of the shallow ephemeral waterway extent above the culvert install site. We considered the magnitude of effects of the culvert installation as *NEGLIGIBLE*, in terms of a change from the current ecological context; ecosystem function, habitat or range for identified site ***potential*** species. The culvert installation is therefore considered to have a *Very Low* or *less than minor* effect with the proviso that significant alteration of hydrology is not created e.g. upstream wetland or drainage as per *NES F Reg 53 Prohibited Activities*.

No indigenous vegetation clearance is required. Stock exclusion from the waterways & encompassing wetland was required 1/1/2025. Fencing and planting to a minimum of 2m allowing for contour riparian buffer protects from ingress and disturbance from residential occupation and ongoing pastoral use of the larger Lots, providing joint functional purpose of

[8] Not specifically defined in the NPS-FM or NES-F- includes elements of regulation, movement, and quality of water in the environment.

aquatic function (attenuation; shade; sediment control; bank stabilization) and amenity within the rural landscape. The majority of sediment is trapped within the first 2m of a source by dense ground cover and this is considered an appropriate width. Lowland riparian species appropriate to the soil type and WF11 designation are recommended and/ or flax or sedges.

- It should be noted that any planting within 10m of wetland must be locally appropriate and indigenous as per *REG 55 NES- F (2020)* to create a natural ecosystem pattern and to avoid potential adverse effect of loss of values.

Protection of the mature forest vegetation onsite and the large gully wetland on proposed Lot 15 as an expansive ecological unit is considered suitable for a formal instrument under the Reserves Act 1977, allowing rates relief as per FNDC Policy P21/01. However it has long been excluded from farm activities due to contour and provisions of the ODP and is unlikely to be developed regardless.
Site procedures for residential and infrastructure development should include designated earthworks envelopes or marking of wetlands prior to ensure contractors avoid inadvertent incursion and unquantifiable effects
We also recommend-

- **ALL LOTS** A formal **Pest Management & Weed Management Plan**
  - predator control to provide higher functionality of habitat
  - ongoing prevention/ removal of exotic infestations assisted by browser control to allow natural regeneration as the site develops increasing *values* of wetland and protecting *extent* from invasion of non wetland shrubs and herbaceous species e.g. wild ginger[9] *Hedychium gardnerianum;* mistflower *Ageratina riparia*
  - Exotic vegetation which could adversely affect natural regeneration or local forest health is not to be introduced. This includes environmental weeds[10] and those listed in the National Pest Plant Accord[11].

Together these will ensure impact is avoided throughout development or residential occupation. Adherence to the NES-F (2020) and best practice stormwater management will provide for maintenance of wetland functional values, including as catchment water quality protection and habitat patches in the wider landscape, aligned with aspirations of the NPS-FM (2020) & PNRP wetland policies and objectives.

[9] *Hedychium gardnerianum* -currently no wetland ranking but highly tolerant of damp riparian conditions
[10] McAlpine, K & Howell, C. Clayson (2024) List of environmental weeds in New Zealand. Science for Conservation Series 340, DoC Wellington
[11] Latest List - https://www.mpi.govt.nz/dmsdocument/3664-National-Pest-Plant-Accord-manual-Reprinted-in-February-2020-minor-amendments-only

INTRODUCTION

The subject property Pt Allotments 5 Parish Ōruru, 978 Ōruru Rd, Taipa is located approximately 8km south of the Taipa Bridge in the Ōruru River valley and plain, to the west of the Ōruru River. It slopes from its eastern pastoral extent to steeper vegetated slopes 8-80masl.

Build form is currently comprised of 3 residences - 2 farm cottages and sheds. The original homestead occupies separate title Lot 1 DP 143291 embedded within the proposal. The activity will result in 14 Lots promoting an increase in residential occupation of the currently pastoral landscape.

The majority will be located closely adjacent to Ōruru Rd of a range of sizes:

- Small - proposed Lots 2 (1.1ha); Lot 5 (1.4ha) existing shed;
- Majority - proposed Lots 1 (2.0ha); Lot 3 (2.7ha); Lot 4 (2.1ha); Lot 8 (2.0ha) with existing farm cottage; Lot 9 (2.4ha); Lot 10 (3.9ha);Lot 12 (2.1ha)
- Balance production - Lot 6 (24.6ha); Lot 7 (26.5ha); Lot 15 (58ha) 2 farm quarries; utility and sheds

A new waterway crossing is required for proposed Lot 9. The site and proposal are illustrated in *Figs 1 - 3* and described in *Table 1.*

FIGURE 1: SITE LOCATION

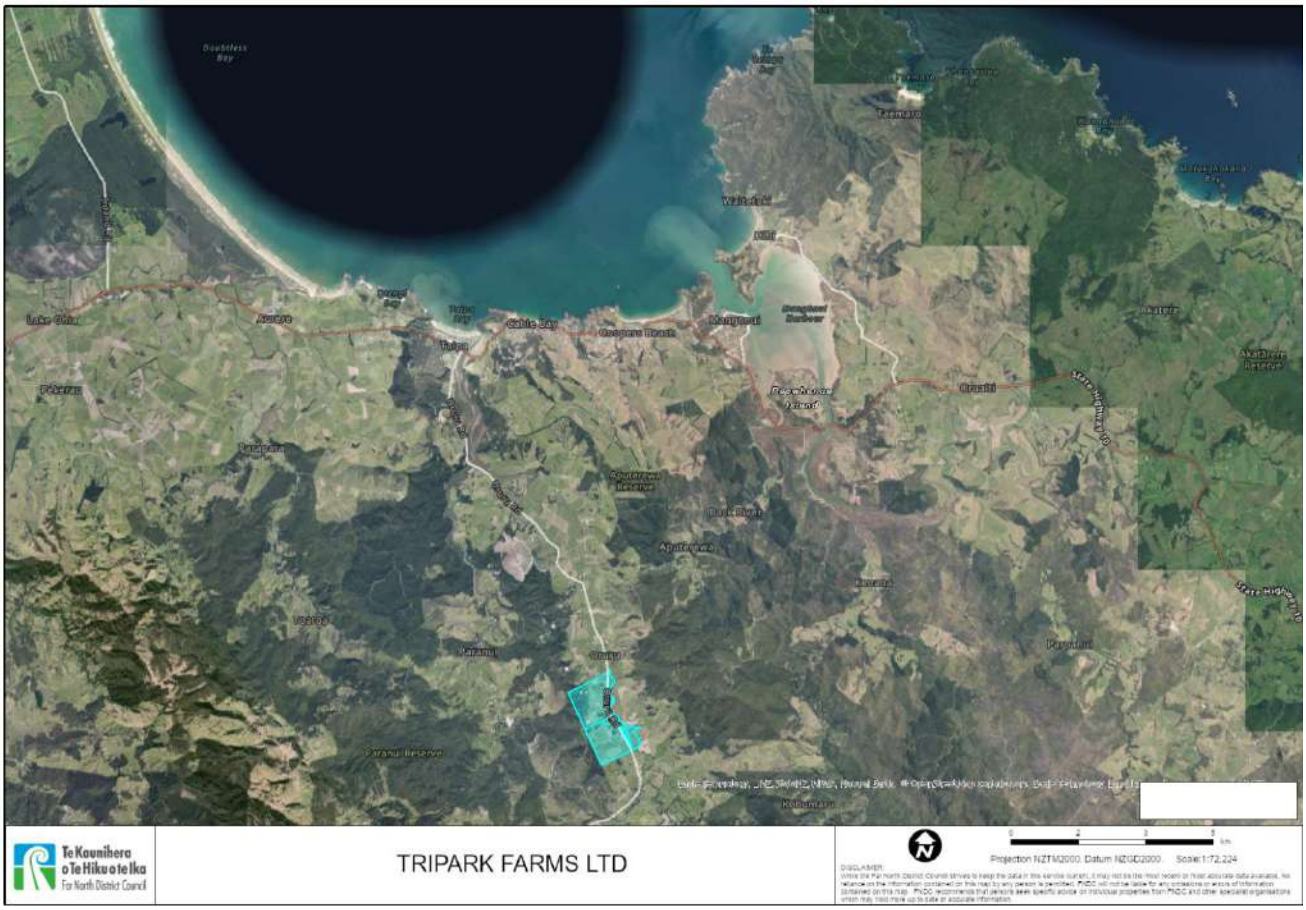


FIGURE 2: PROPOSED SCHEME

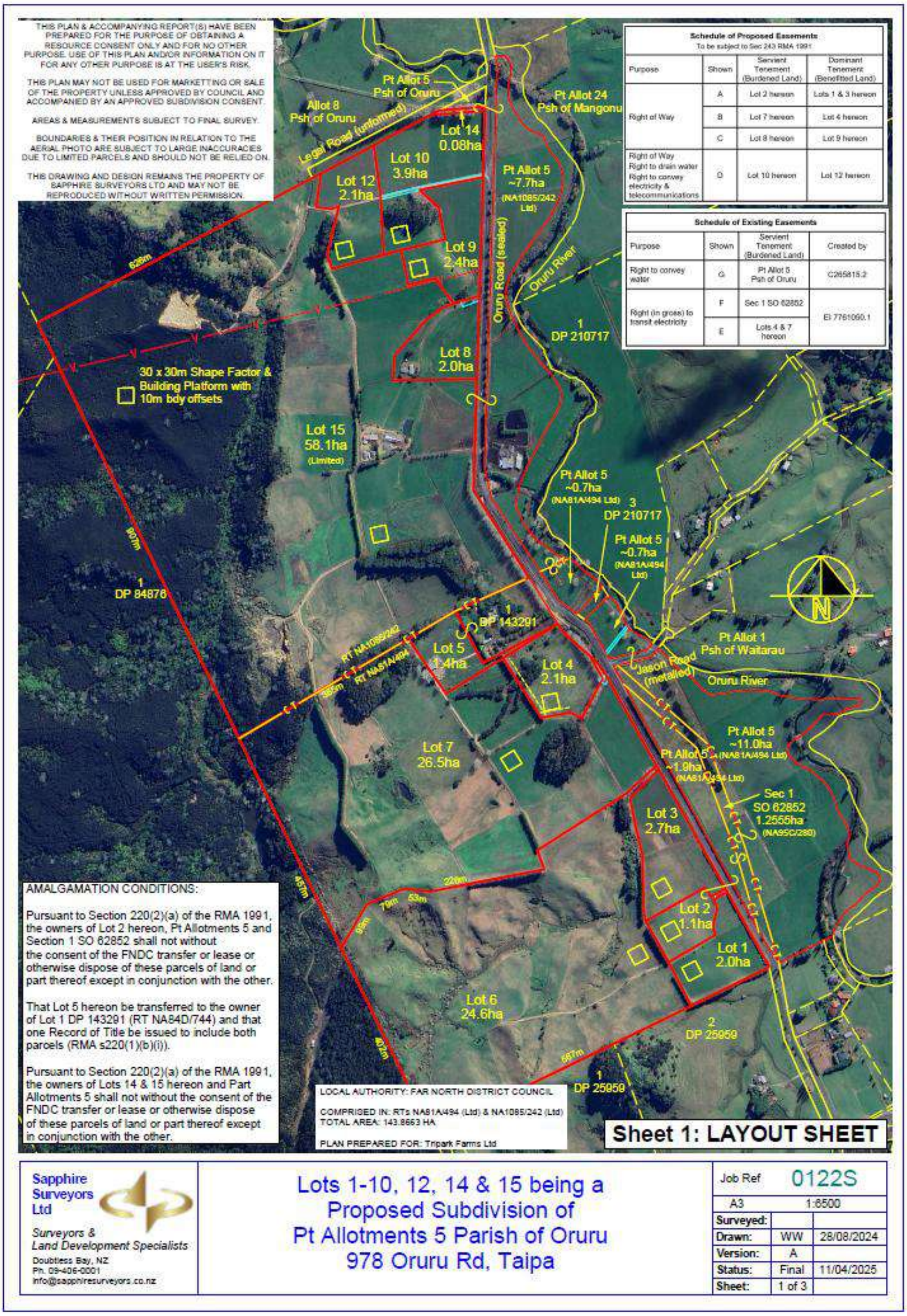
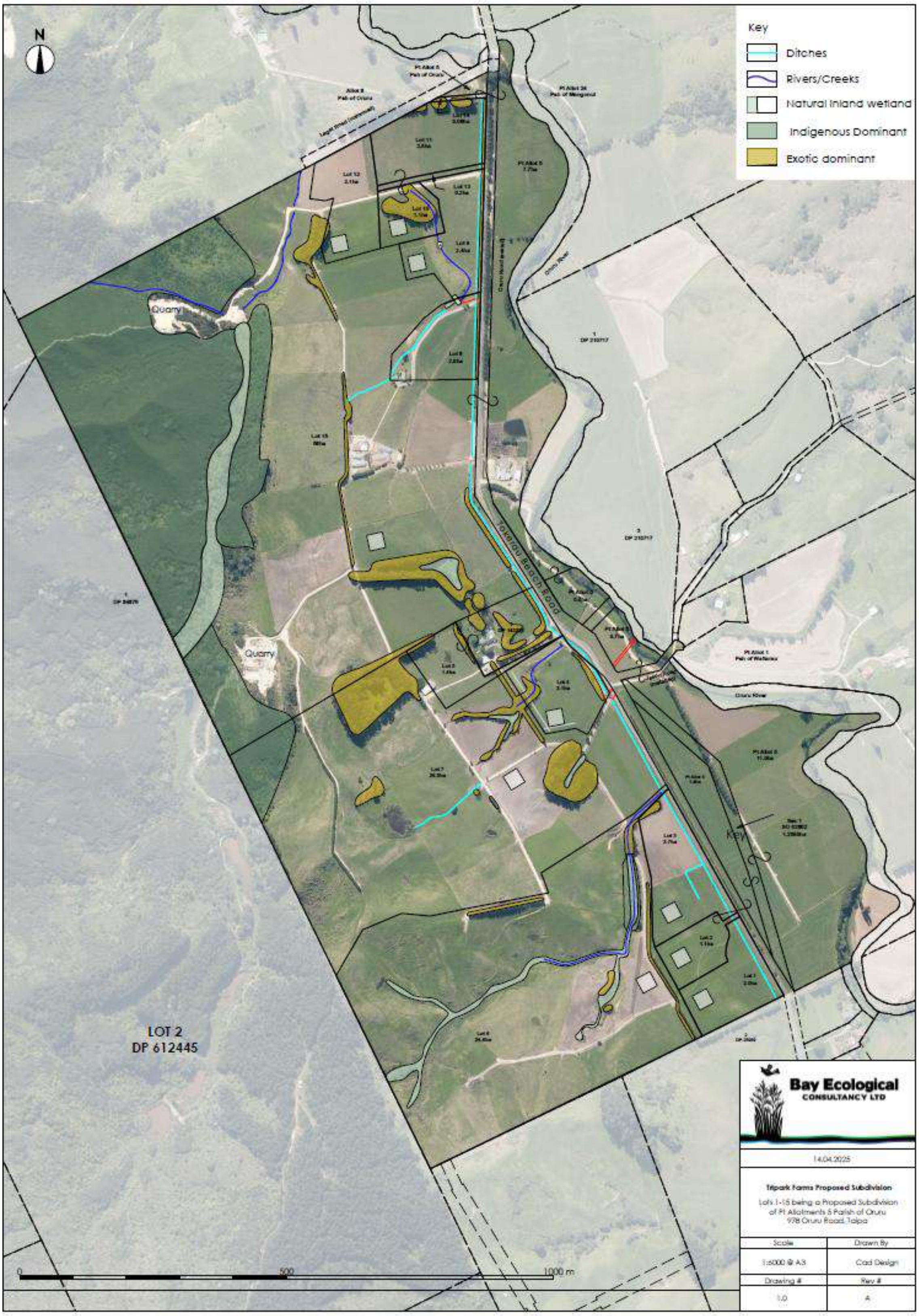


FIGURE 3: SITE FEATURES



SITE CONTEXT

The following site context is a combination of desktop review and site visit, including detail of the immediate surrounding landscape.

TABLE 1: MAPPED SITE SUMMARY

DESCRIPTION	
OWNER	TRIPARK FARMS LTD
FNDP OPERATIVE ZONE	RURAL PRODUCTION
AREA & INTENDED PURPOSE	TOTAL 12.2973ha New residential purpose proposed Lots *1; 2; 3; 4;6; 7; 9; 10; 12; 14;15* Proposed Lot 8 existing residence Proposed Lots 6; 7 & 15 size allow for continued pastoral Proposed lot 15 farm quarries and large utility /shed area
ECOLOGICAL DISTRICT	AUPOURI
COVER	• EXOTIC GRASS/ PASTURE/ SHELTERBELTS • WETLAND – seepage; swamp • Large indigenous area proposed Lot 15
RIVERS[12]	• NZSEG# 1003610 on proposed Lot 15 • NZSEG#1003872 within proposed Lot 6 • encompassed within the *Doubtless Bay NRC Priority Catchment.*
SOIL TYPE[13]	• HUKERENUI SILT LOAM (HKH) • MANGAKAHIA SILT LOAM (MF) • KOHUMARU CLAY (KM) • WAIOTIRA CLAY (YCE)
POTENTIAL ECOSYSTEM[14]	• ***WF7.1: Puriri totara forest*** • ***WF11: Kauri, broadleaved, podocarp***
TEC CLASSIFICATION[15]	• *Class II adjacent Ōruru Rd* • *Class III majority Site*
MAPPED PNA;NORTHLAND BIODIVERSITY RANKING - TERRESTRIAL TOP 30 SITES; RANKED RIVERS; KNOWN WETLANDS; RANKED WETLANDS	• *NRC mapped heathland (wetland gumland) proposed Lot 15* • *Local PNA sites are not within a ZOI*
RARE ECOSYSTEMS[16]	• Wetlands • NRC mapped gumland

Sources of the desktop review included:

- *Retrolens aerial photography www.retrolens.co.nz*
- *https://data.linz.govt.nz/*
- *Conning & Miller (2004) Natural Areas of Aupori Ecological District Reconnaissance Survey Report for the PNA Programme. DoC, Whangarei*
- *Forester & Townsend (2004) Threatened plants of the Northland Conservancy*
- *Johnson & Gerbeaux (2004) Wetland types in NZ. DoC, Wellington*
- *LRIS portal https://lris.scinfo.org.nz/*
- *NRC Local Mapping & supporting documents – Leathwick (2018); Singers (2018)*
- *TEC Classification https://ourenvironment.scinfo.org.nz/*
- *Wildlands Consultants (2011) Ranking of top Wetlands in the Northland Region Stage 4 - Rankings for 304 Wetlands Wildlands Contract Report No. 2489 for the Northland Regional Council*
- *Wildlands Consultants (2012) Report on Wetland Guidelines for the Northland Region Contract Report 2952*

[12] LINZ 2022 NZ River Centrelines https://data.linz.govt.nz/layer/50327-nz-river-centrelines-topo-150k/
[13] https://nrcgis.maps.arcgis.com/apps/webappviewer/index.html?id=fd6bac88893049e1beae97c3467408a9
[14] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/Northland_Biodiversity_Ranking/FeatureServer/0
[15] https://ourenvironment.scinfo.org.nz/maps-and-tools/app/Habitats/lenz_tec
[16]Williams et al (2007) New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework *New Zealand Journal of Ecology 31(2):* 119-128

HISTORIC AERIAL REVIEW

Review of available aerial photography preceded fieldwork to determine historic location and subsequent persistence of any site hydrology/ wetland. Historic topo maps revealed no further detail other than Oruru Rd previously named Manganui Pamapuria Rd.

KEY FINDINGS

- The earliest aerial photography (1950) indicates the pastoral waterways and wetlands present today
- All farm buildings and utility areas present in 1950 other than farm cottage proposed Lot 8 first visible in aerials 2000
- Little change occurs in intervening years until 1981

FIG 4: RETROLENS 1950 NORTHERN

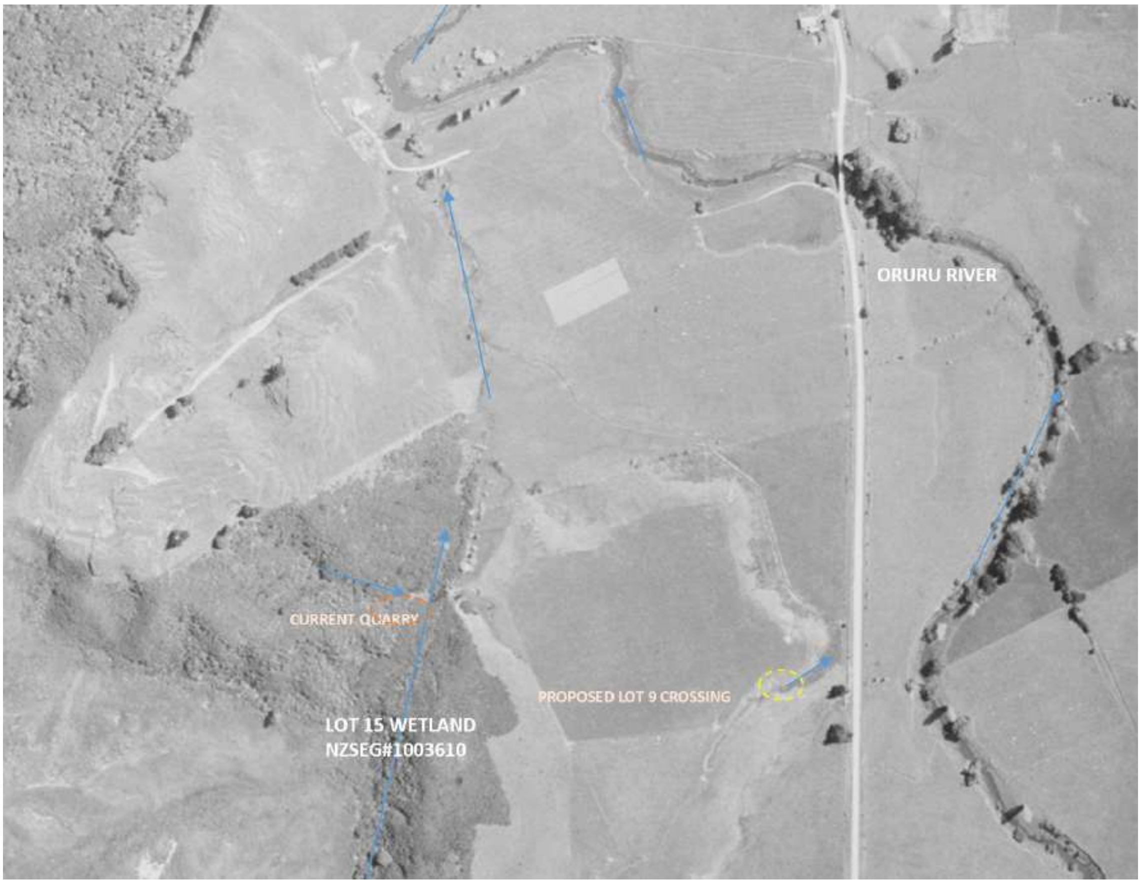


FIG 5: RETROLENS 1950

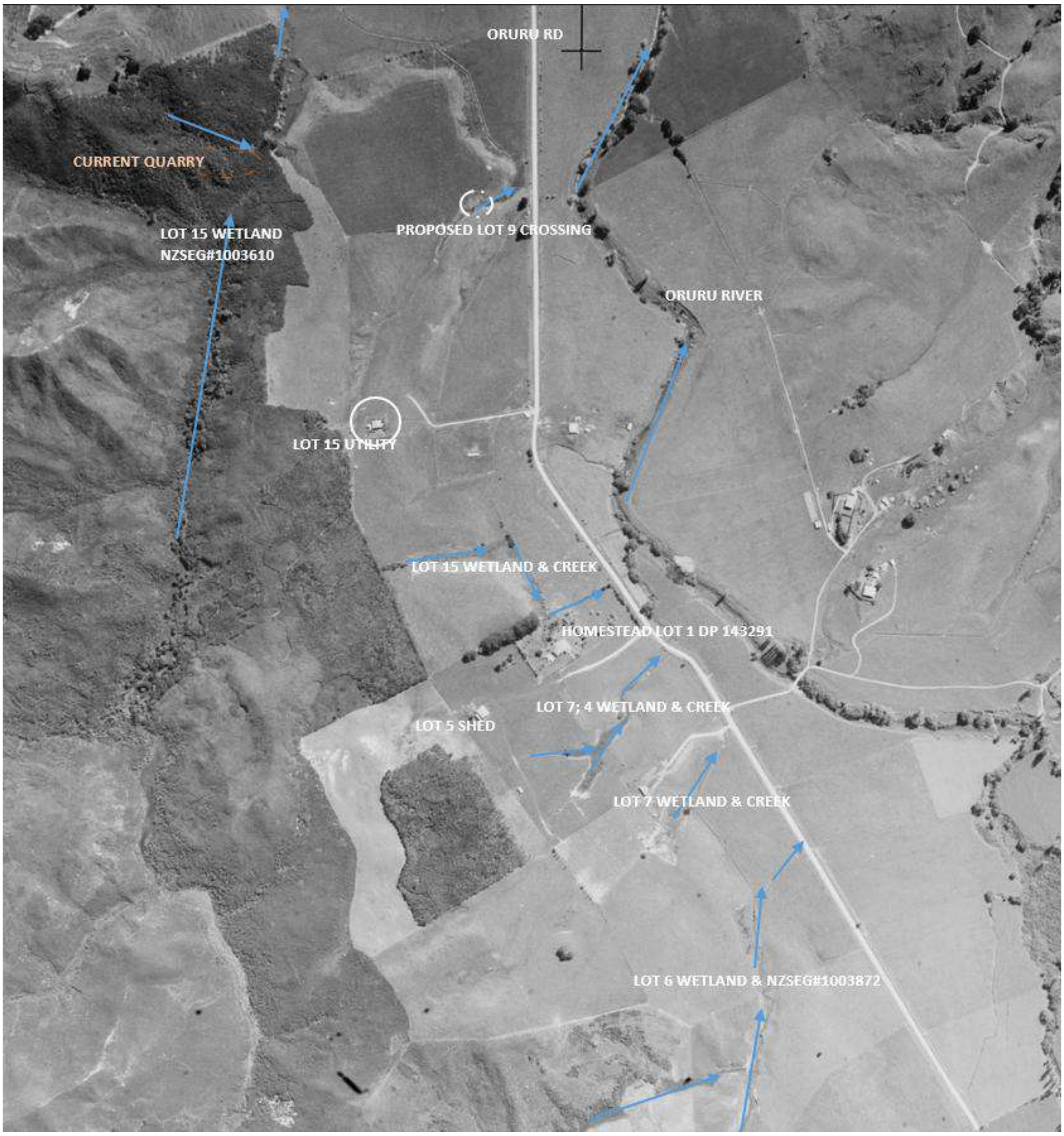


FIG 6: RETROLENS 1981

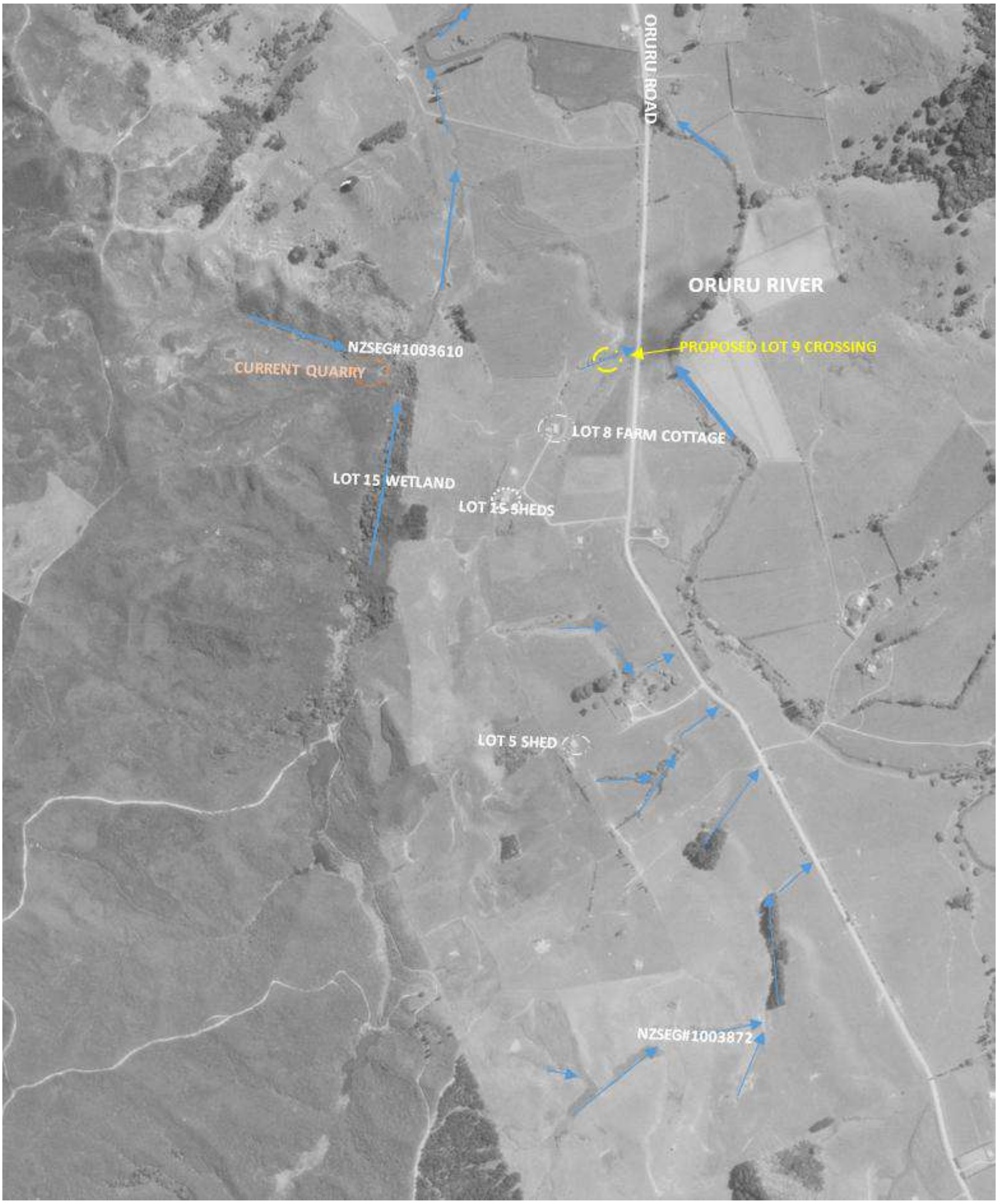


FIG 7: LINZ/FNDC 2000

VALUES MAPPING

WATERWAYS

The area of the waterways and wetlands are apparent from the 1950s, with two larger LINZ mapped *rivers* [17] *NZSEG#1003610 & NZSEG#1003872* of A3 type, characterized as per REC V2 below. Any modifications to waterways natural in origin results in a *modified watercourse.* Ditches occupying former creeks or wetland cannot be considered a *deliberately constructed wetland*[18] *, waterbody*[19] or *artificial watercourse*[20] or subject to exclusion in the *natural inland wetland* definition*(c)*[21] .

TABLE 2: NZSEG#1003610 & NZSEG#1003872

CHARACTERISTIC	UNNAMED CREEKS TRIBUTRY TO ŌRURU RIVER	
NZ SEGMENT	NZSEG# 1003610 proposed Lot 15	NZSEG#1003872 proposed Lot 6
ORDER	1st & 2nd	1st
TYPE	**A3** - very small, gentle gradient streams on sandy substrates occurring in coastal locations Widespread in coastal parts of the Eastern Northland unit	
MEAN FLOW (m^{-3} s^{-1})	0.07	
CONDITION SCORE (A3 TYPE)	0.325	
CONDITION SCORE	0.621	0.242
CLIMATE	**WW** Warm Wet	**WW** Warm Wet
SOURCE OF FLOW	**L** Low Elevation	**L** Low Elevation
GEOLOGY	**SS** Soft Sedimentary	**SS** Soft Sedimentary
LAND COVER	**S** Scrub	**P** Pastoral
NETWORK POSITION	**LO** Low Order	**LO** Low Order
VALLEY -LANDFORM	**MG** Medium Gradient	**LG** Low Gradient

The low *elevation origin (L)*, typically has marked seasonal flow patterns: high in winter, low in summer. Erosion rates in the *pastoral (P*) setting tend to be high, with rapid and more extreme flood peaks, resulting in higher suspended sediment compared to natural land cover of the scrub class (S). The flow of the proposed Lot 15 reach is assigned a higher condition score than the type, likely influenced by the cover and lack of modification in comparison to the proposed

[17] RMA (1991) ***RIVER*** *- a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal)*

[18] PRPN (2021) Definitions | Whakamāramatanga ***CONSTRUCTED WETLAND*** *A wetland developed deliberately by artificial means or constructed on a site where: 1) a wetland has not occurred naturally previously, or 2) a wetland has been previously constructed legally.*

[19] RMA (1991) ***WATER BODY*** *means fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area*

[20] *PNRP (2021) B Definitions | Whakamāramatanga* ***ARTIFICIAL WATERCOURSE*** *: A man-made channel constructed in or over land for carrying water and includes an irrigation canal, roadside drains and water tables, water supply race, canal for the supply of water for electricity power generation and farm drainage canals. It does not include a channel constructed in or along the path of any historical or existing river, stream or natural wetland.*

[21] NPS – FM (2020 Amendment 8th December 2022) *Natural inland wetland* is NOT … *(c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body*

Lot 6 reach with a lower score than the type. Condition scores are based on FENZ database parameters,[22] values closest to 1 representing optimal condition.

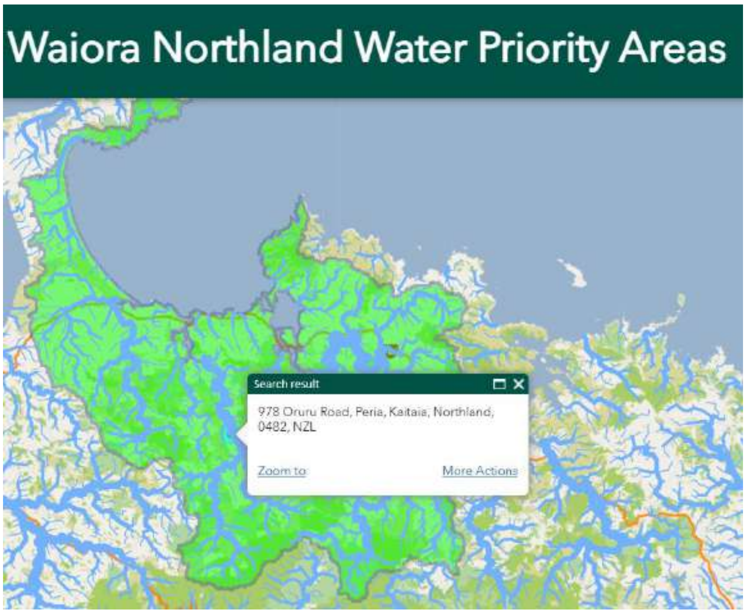
The A3 character was considered likely to contain wetland prior to the site visit due to the relatively slow flow rate for its class and low *Landform* class.

The site is encompassed in the NRC Doubtless Bay Priority Catchment. The initial Catchment Plan Report[23] identified retirement of riparian margins and CSAs[24] to entrain sediment and runoff and process nutrient are primary interventions for improvement water quality. Long term monitoring of the Ōruru River shows it to be within the worst 25% of total and dissolved phosphorus of similar lowland rural rivers in NZ, with degrading nitrogen and clarity parameters.

As per PRP Catchment Policy E.2.1. resource consent application assessment in the Doubtless Bay catchment should consider

1) reducing the amount of sediment entering waterways from hill slope and stream-bank erosion, and
2) improving the quality of fresh and coastal water for cultural and recreational uses, particularly contact recreation and the ability to gather mahinga kai, and
3) protecting the ecosystem health and Natural Character of freshwater bodies….

FIG 8: NRC DOUBTLESS BAY PRIORITY CATCHMENT

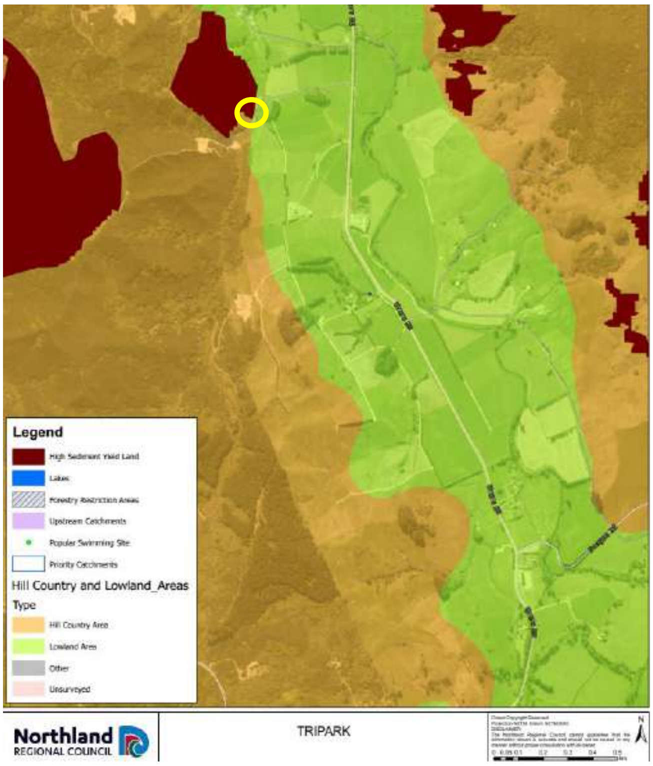


The majority of the subdivision is included in NRC Lowland mapping *(FIG 9 below)* requiring stock exclusion of watercourses and wetland (>500m^2) by 1/1/25, which as a standing requirement, including wetland on Lot 15; 6 & 7. However, retirement of the smaller wetland

[22] Ranking parameters include indigenous cover in the upstream catchment; estimates of instream nitrogen concentrations; alteration of river flows and fish passage by control structures; introduced fish, discharges from industry; and impervious surfaces from development. DoC 2010
[23] NRC (2017) Wairoa Northland Doubtless Bay Catchment Management Plan
[24]**CSA Critical source areas** are areas within a farm or catchment that contribute a disproportionately large quantity of contaminants to water (relative to their extent), leading to poor water quality. They are the combination of both a source of contaminants (eg, nutrients, sediment or faecal microorganisms) and a transport pathway (eg, surface run-off, ephemeral drainage). Minimising either the source or the transport pathway will decrease the risk of contaminant losses. Targeting relevant mitigations specifically to critical source areas is an efficient and cost-effective approach to reduce nutrient loss from the whole property

on proposed Lot 9 is not required and may therefore be considered a positive effect of subdivision. A small northwestern area of proposed Lot 15 overlaps with the NRC High Sediment Yielding layer.

FIG 9: NRC HIGH SEDIMENT & LOWLAND MAPPING



FISH

A primary freshwater fish survey was outside the scope of this report. There are no site, reach or further downstream extent specific FWFD records[25], and local records are limited in general. NIWA has combined REC V2 classification with monitoring data to extrapolate a wide range of instream water quality and fish habitat parameters for all mapped NZ rivers. This resource gives potential fish species interacting directly with the site as below *TABLE 3.* Fish passage has long been occluded to and throughout the site from the Ōruru River. This does not necessarily result in absence of diadromous species as tuna may be able to traverse bunding and pasture under wet nocturnal conditions and bullies form landlocked populations.

TABLE 3: NIWA PREDICTED SPECIES

PREDICTED SPECIES NZSEG#1001918	COMMON NAME	THREAT STATUS
Anguilla australis	SHORTFIN EEL	NOT THREATENED
Anguilla dieffenbachii	LONGFIN EEL	AT RISK - DECLINING
Galaxias fasciatus	BANDED KŌKOPU	NOT THREATENED REGIONALLY SIGNIFICANT
Gobiomorphus cotidianus	COMMON BULLY	NOT THREATENED
Gobiomorphus hutonni	REDFIN BULLY	NOT THREATENED

REDFIN BULLY (NOT TAKEN ONSITE) © BAY ECOLOGICAL CONSULTANCY 2025

[25] Freshwater Fish Database records NIWA

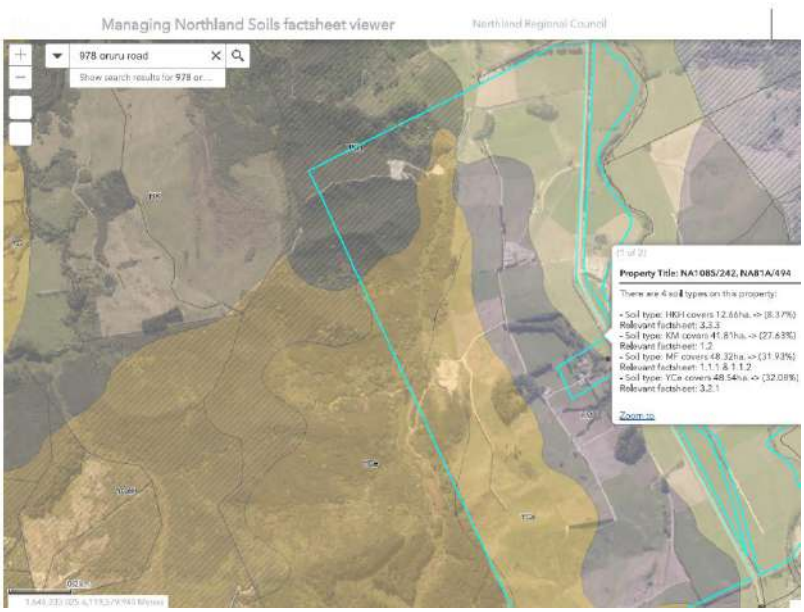
SOILS & PREDICTED ECOSYSTEM TYPE

Underlying soil patterns provide an indication wetland likelihood e.g. poor permeability or podzolisation. Broad scale geology changes across a site may also promote the eruption of hydrological sources. Soil types infer an historic associated cover, which is a relevant reference for any revegetation or amenity planting.
Site soils are mapped throughout as *Ruakaka peaty silt loam* with a small contribution of *Maungarei clay* (MEH) adjacent the road in the area of the proposed house site.

TABLE 4: MAPPED SOIL TYPE

SOIL TYPE NZRLI	SOIL TYPE FSL	DESCRIPTORS	PREDICTED COVER
HUKERENUI SILT LOAM (HKH) HILL COUNTRY VARIANT	TYPIC ULTIC YELLOW SOIL (UYT)	OMU SUITE – OLD MUDSTONE SOIL • basement rock of mudstone • *Typic Ultic Yellow soil (UYT)* clayey and lacking thick densipan or E horizon • aluminium can be to toxic levels in the B horizon • acidic strongly weathered with low nutrient reserves • very poorly drained - surface soil horizons are seasonally wet • soil is very susceptible to livestock treading damage.	WF11 KAURI BROADLEAVED PODOCARP
MANGAKAHIA SILT LOAM (MF)	(RFW)	KOHUMARU SUITE- RECENT ALLUVIUM • occur on floodplains close to watersource where coaser debri is deposited close , forming relatively free draining and fertilesilt loams • Organic matter levels are generally low. Less available water than is typical of Ultic Soils. • exposed subsoils are difficult to revegetate. These soils lack aluminium and iron and do not strongly fix phosphate	WF7-1 PURIRI, TOTARA
KOHUMARU CLAY (KM)	MOTTLED OXIDIE GRANULAR SOILS (NXM)	KOHUMARU SUITE- TERRACE SOILS • found on terraces and alluvial fans that are generally above flood level and no longer being replenished by sediment in floodwater • On terraces from Tangihua alluvium 5-10m above flood plain • moderately drained but high clay content makes these soils prone to pugging when wet • Granular soils that have a cutanoxidic horizon more than 30 cm thick with an upper boundary at 25 cm or more from the mineral soil resulting in periods of perching of water. • Soils are low in phosphorus, potassium and magnesium and acid • The extension of plant roots in subsoils is commonly limited by either high penetration resistance, wetness or aluminium toxicity.	WF11 KAURI BROADLEAVED PODOCARP
WAIOTIRA CLAY (YCE)	MOTTLED ACID BROWN SOILS (BAM)	WAIOTIRA CLAY – YOUNG SANDSTONE • Imperfectly drained stickiness and plasticity after heavy rainfall, • P retention is moderate to very high • Biologically active • Low in sulphur; acidic pH of 4.8 or less in some part between 20 and 60 cm from the mineral soil surface • Weakly weathered; iron and aluminium oxides are dispersed throughout the soil mass	WF11 KAURI BROADLEAVED PODOCARP

FIG 10: NRC SOIL MAPPING



Broad ecosystem classification[26] shows the potential vegetation type as correlated with soil type and climate:

TABLE 5: MAPPED POTENTIAL ECOSYSTEM TYPE

ECOSYSTEM CLASSIFICATION	TYPE DISTRIBUTION	TYPE DESCRIPTION
WF11 ***KAURI PODOCARP BROADLEAVED FOREST***	*Warm climatic zone from the Three Kings Islands and Te Paki south to Mahia and New Plymouth.*	• *Kauri, podocarp, broadleaved forest with occasional rimu, miro, kahikatea, kauri, taraire, tawa, tōwai, kohekohe, pūriri and rewarewa.* • *Drivers of composition are fertility, drainage and altitude* • *Altitude variants - taraire and kohekohe more abundant at lower altitudes, and tawa and tōwai more common at higher altitudes.* • *Broadleaved species in gullies* • *Commonly a secondary derivative of kauri forest* • *Rainfall 1000–2500mm.*
WF7-1 ***PURURI TOTARA FOREST***	*In predominantly frost-free, warm and sub-humid areas from Northland to northern Waikato, Bay of Plenty and Poverty Bay. On moderately fertile to fertile soils on alluvial terraces and in recent basaltic areas.*	Broadleaved forest of abundant pūriri (WF7)of three variants determined by landform and soil type: • TYPE 1. occasional tōtara, mataī, kahikatea and tītoki locally, with kōwhai and taraire on alluvial, free-draining soils

Mapped wetlands onsite are limited to the NRC heathlands layer[27] in the northwestern corner of the property. Gumland vegetation is a distinctive association of stunted mānuka with a low diversity complement of associated species, which vary with soil moisture as the primary abiotic factor, refining the gumland character further.
The **wetland** subset of gumland, the '*Gumland/ Pakahi* 'type of the NZ wetland classification system[28], is characterised by a consistent suite of sedge/rush in a lower strata, typically obligate *(OBL)* or facultative wetland *(FACW)* species exhibiting an obvious wetland community. Sedges commonly include *Machaerina rubignosa (OBL); M. teretifolia (FACW); Netrostylis capillaris* (FACW) and *Schoenus brevifolius* (FACW), the latter is an indicator species found little elsewhere in other habitats[29].The wettest areas including with standing water have sparser mānuka.

The drier end of the gumland spectrum (non wetland) is typified by mānuka with a much higher degree of species richness including trees/shrubs and greater invasion by weed species. Highly adaptable *Hakea* spp & gorse are typically most frequent, the later particularly on edges of the gumland where soils are more fertile. The two gumland types may be highly localized in their association in a landscape.
Assessment of mapped extent was not undertaken beyond a 10m fringe of the existing quarry, as there are no subdivision activities proposed within 100m and no potential effects to assess. This area did not contain diagnostic a gumland wetland association.

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[26] Singers & Rogers (2014) A classification of NZs terrestrial ecosystems. DoC Wellington
[27] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/NorthlandWetlandsPublic/FeatureServer Dataset of known pakihi and gumlands in Northland. This dataset is not complete, but features all known locations as at August 2018 combining an original NRC dataset added to during the Wildlands Heathland project.
[28] Johnson & Gerbeaux (2004) Wetland types in New Zealand. DoC, Wellington.
[29] Clunie, N & Wardle P. (1983) Botany of the Ahipara Gumlands and the Tauroa Peninsula. Botany Division DSIR

FIG 11: NRC WETLAND MAPPING HEATHLANDS

TABLE 6: NRC WETLAND GUMLAND

WL1 ***Mānuka, gumland grass tree, Machaerina scrub/sedgeland (gumland)***	• *Developed in association with historic kauri forest largely podzolised Wharekohe and Te Kopuru soils (strongly leached and acidic)* • *rainfed, poorly draining, seasonal waterlogging* • *low scrub of mānuka with gumland grass tree and tall mingimingi,* • *common Machaerina, Schoenus, Gahnia, Tetraria, Lepidosperma sedges* • *locally includes tangle fern (Gleichenia)* • *Fernbird commonly occurs in these ecosystems* • *geckos occur where mānuka cover and tangle fern are present* • *seasonally dry type common on Te Kopuru soils*	*Palustrine wetlands in the Northland and Auckland regions, developed in association with historic kauri forest podzolised Wharekohe and Te Kopuru soils (Molloy 1998: 92–94). Poor-draining type occurs on Wharekohe soils, while seasonally dry type occurs on Te Kopuru soils. Vegetation type also occurs on fire-induced and highly leached,non-podzolised soils, and it is now difficult to determine which areas are natural or induced.*

Both wet and dry gumland ecosystem types are included in classification of New Zealand's *naturally rare* or *uncommon ecosystems*[30]. They are included in regional significance assessment criteria[31]. Prior to human colonisation (approx. AD 1280), ecosystems such as these had an estimated maximum total area of <0.5% of New Zealand's land area and represent a distinct set of environmental conditions often associated with rare and threatened endemic species. A subset of *naturally uncommon ecosystems* are also threatened[32]. Gumlands are classified as *critically endangered ecosystem* due to short term (50 years) decline of >80%, resultant from their lack of recognition and ongoing clearance.

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[30] Williams et al (2007) New Zealand's naturally rare ecosystems set in a physical and physiognomic framework. New Zealand Journal of Ecology(2007) 31(2):119-128

[31] Northland Regional Policy Statement 2018 Appendix 5:2C & D

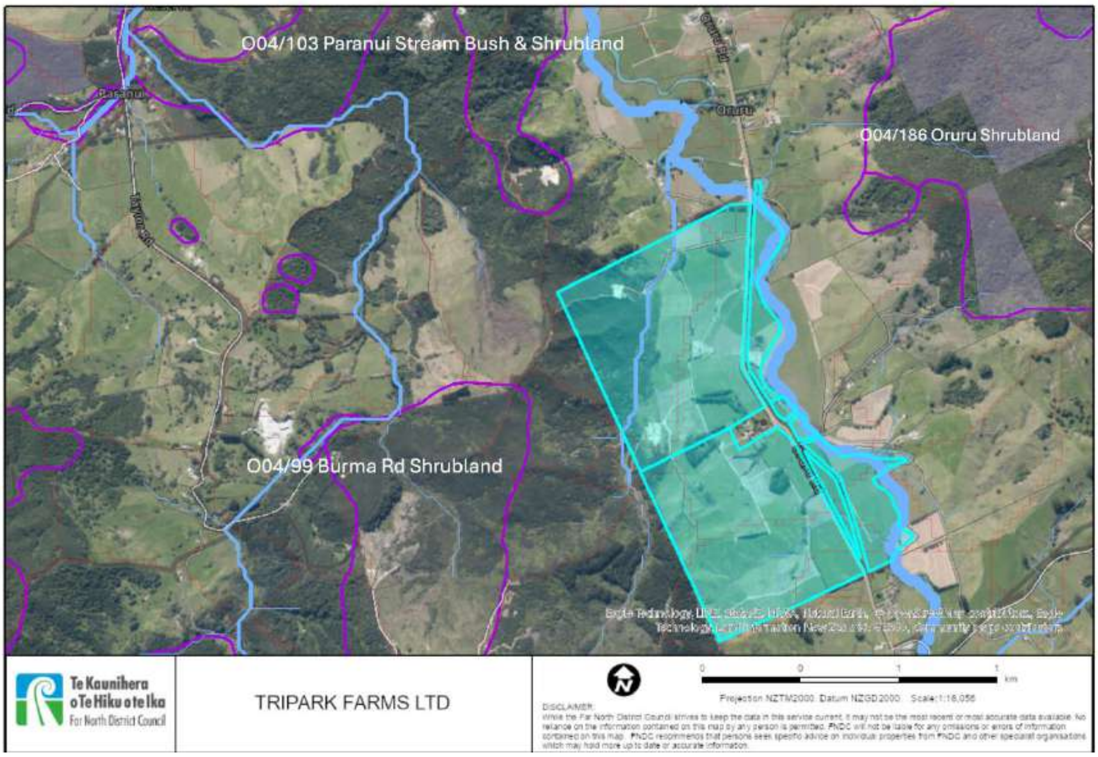
[32] Holdaway et al (2012) Status assessment of NZs naturally uncommon ecosystems. Conservation Biology 26(4):619-29

There are no NRC Biodiversity Ranking[33] or PNA[34] areas within the proposal. The Aupouri Ecological District PNA report[35] describes forest sites further to the west contiguous with the terrestrial indigenous vegetation of the proposed Lot 15 slopes, although in a separate catchment:

- Paranui Stream Bush & Shrubland (*Unit #O04/0103*)
- Burma Rd Shrubland (*Unit #O04/99*)

These share vegetative similarities in cover type of manuka- kanuka shrubland with emergent podocarps (primarily totara – tanekaha) and broadleaves. They are not considered in a zone of influence (ZOI) of the proposal activities although any Lot 15 pest/ weed control has potential wider landscape benefit. The Ōruru Shrubland (Unit # O04/186) east of Ōruru Rd is in a seperate catchment and sufficiently distant.

FIG 12: LOCAL FEATURES



There are local records[36] for a wide range of indigenous orchids, as well as *Threatened* & *At Risk* species including:

- marsh fern (*Thelypteris confluens; At Risk – Declining)*
- bog club moss (*Brownseya serpentine; Threatened –Nationally Vulnerable)*
- *Loxsoma fern (Loxsoma cunninghamii ;At Risk – Declining)*
- *Sun orchid (Thelymitra pauciflora; Not Threatened)*
- *King fern (Ptisana salicina- At Risk Declining)*
- *Mangeo (Litsea calicaris _ Regionally Significant)*
- kaikōmako (*Pennantia corymbosa- Regionally Significant)*
- *Ixerbia*

[33] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/Northland_Biodiversity_Ranking/FeatureServer
[34] https://services5.arcgis.com/H4FlrMy6xTBd6Ywx/arcgis/rest/services/Protected_Natural_Areas_(DOC_2016)/FeatureServer
[35] Conning, L; Holland, W. (2003) Natural Areas of the Aupouri Ecological District. Reconnaissance Survey Report for the Protected Natural Areas Programme. DoC, Whangarei.
[36] Conning & Holland (2003);ala.org.nz; inaturalist org nz; nzpcn org nz

Specific search was made however none located within the proposal area.

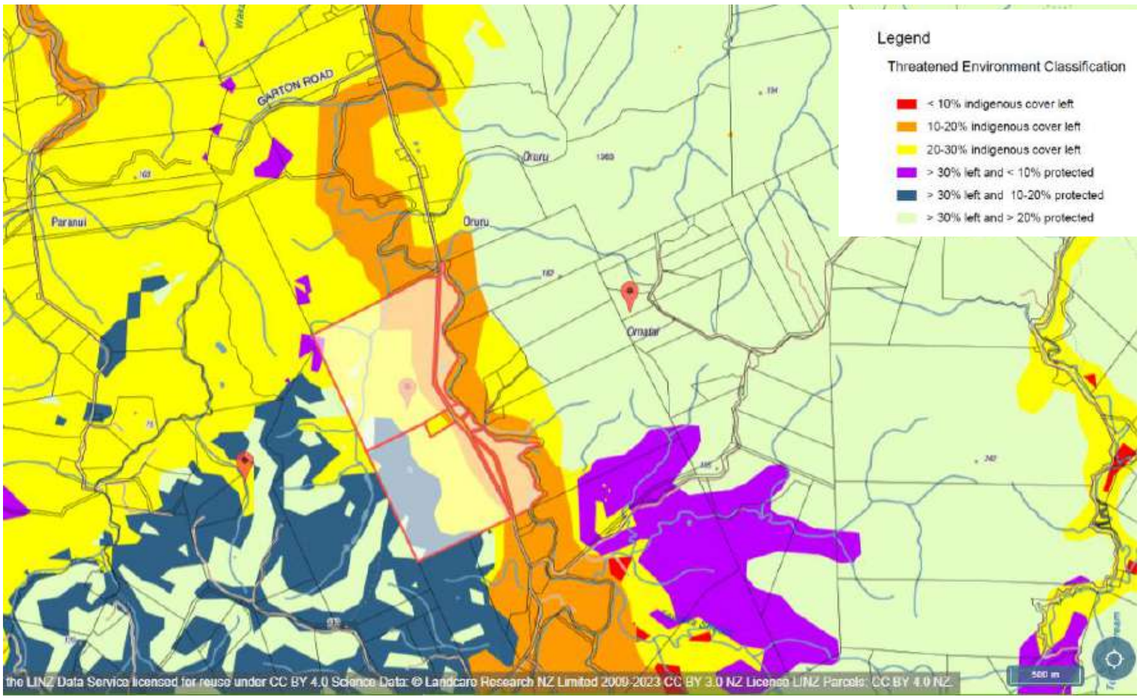
The TEC mapping[37] layer most appropriately applied to help identify priorities for formal protection against clearance and/or incompatible land-uses, and/or to restore lost species, linkages and buffers. The first two levels have been incorporated into national and regional policy[38] to address biodiversity protection on private land. Any remaining indigenous vegetation on such sites is considered significant and a priority for formal protection, linkage and buffering, including wetland. The southeastern contour adjacent Ōruru Rd is classed correlating with the *MF* type soils and consequently *WF7.1* forest type, threatened in a wider context due to suitability for pastoral use. It is therefore ranked

- *Level II Chronically Threatened (10-20% Indigenous Cover Remains)*

This vegetation is not represented onsite.

The site is largely encompassed by *Level III At Risk (>30% Indigenous cover remains, 10-20% protected),* based on cover in the wider area.

FIG 13: TEC CLASSIFICATION



[37] Threatened Environment Classification (2012) Landcare Research Manaaki Whenua. Based on Land Environments New Zealand (LENZ), classes of the 4th Land Cover Database (LCDB4, based on 2012 satellite imagery) and the protected areas network (version 2012, reflecting areas legally protected for the purpose of natural heritage protection).Combination of components of *Land Environments New Zealand Level VI; Land Cover Database 4 (2012); Protected Areas Network (2012).* Classifications – *Acutely Threatened (<10% Indigenous cover remains); Chronically Threatened (10-20% Indigenous Cover remains); At Risk (20-30%) Indigenous Cover Remains; Critically Underprotected (>30% cover, <10% protected);Underprotected(>30% Indigenous cover remains, 10-20% protected); Better Protected(>30 indigenous cover, >20% protected)*

[38] National Policy Statement for Indigenous Biodiversity 2023; Northland Regional Policy Statement 2018 Appendix 5:2(a)i

WETLAND

REGULATORY CONTEXT

Site investigation has been undertaken specifically with regard to the presence or otherwise of *natural inland wetland,* as defined in the National Policy Statement for Freshwater Management (NPS -FM2020) and subject to the protective regulations within the National Environmental Standards for Freshwater (NES-F 2020). There is no previously mapped *known wetland*[39] or ranked wetland[40] on the parent parcel. We are not aware of any previous reporting on site wetland.

The definition of **wetland** is given in the Resource Management Act (1991):

Wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals adapted to wet conditions.

Plants adapted to live in wetland conditions as above are defined in three categories –

- **OBL**: Obligate. Almost always is a hydrophyte, rarely in uplands (estimated probability >99% occurrence in wetlands)
- **FACW**: Facultative Wetland. Usually is a hydrophyte but occasionally found in uplands (estimated probability 67–99% occurrence in wetlands)
- **FAC**: Facultative. Commonly occurs as either a hydrophyte or non-hydrophyte (estimated probability 34–66% occurrence in wetlands)

(Clarkson, B. et al 2021)

Identification and dominance of these species in vegetation forms the basis for diagnosis as wetland and has been incorporated into the NPS –FM (2020). To this end, both exotic and native species have been categorised by NZ experts in supporting documentation.

The NPS – FM (2020) & accompanying regulations of the NPS- F (2020) have recently been amended[41], incorporating a new definition of *natural inland wetland* as subject to the *NES F (2020)* as below, providing exclusions of some classes of wetland as per the broader RMA definition:

Natural inland wetland means a wetland (**as defined in the Act) that is not**:

(a) in the coastal marine area; or

(b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or

(c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or

(d) a geothermal wetland; or

(e) a wetland that:

(i) is within an area of pasture used for grazing; ***and***

[39] NRC BIODIVERSITY WETLANDS https://localmaps.nrc.govt.nz/localmapsviewer/?map=55bdd943767a493587323fc025b1335c

[40] Wildlands (2011) RANKING OF TOP WETLANDS IN THE NORTHLAND REGION STAGE 4 - RANKINGS FOR 304 WETLANDS Contract Report No. 2489

[41] 8th December 2022 NPS; 5th December NES effective 5 Jan 2023

(ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8); ***unless***
(iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply

Under these updates, Regulation (e) (i) & (ii) only apply while a site is in active pastoral use, and not once its purpose changes[42]. The planning application is for anticipated residential purpose and Lots singularly insufficient for continued pastoral use, also evident onsite in pasture quality and bedrock protrusion.

Exotic pasture species[43] as per definition do not include common wetland/ wet pasture grasses *Glyceria*; *Paspalum distichum**[44] *(FACW), Isachne globosa* (OBL); *Alopecaurus geniculatus (FACW)* and *Agrostis stolonifera* (FACW)* or unpalatable exotics such as *Ranunculus repens (FAC).*

SITE VISIT

Visual vegetation survey was undertaken to characterize the site associations for wetland presence with regard to the MfE Wetland Delineation Protocol (2022) and supporting documents:

- *A vegetation tool for wetland delineation in New Zealand (Clarkson et al 2021)*
- *Hydric soils – a field identification guide (Fraser et al 2018)*
- *Wetland delineation hydrology tool for Aotearoa New Zealand. (MfE 2021)*
- *Wetlands types in New Zealand (Johnson & Gerbeaux 2004)*

The Rapid Test, as the first strata of wetland delineation, was sufficient to determine wetland presence with dominance typified by obligate (OBL) and facultative wetland (FACW) species in saturated ground forming very obvious *natural inland wetland* communities. Hydrology and vegetation precluded the need for repeated soil observations, however banks and exposed faces and sand pans corresponded with features of the mapped types.

Wetland determination as per the Protocols is not dependent on indigenous dominance. Regardless of origin, wetland species have high functionality in retaining sediment and protecting groundwater or open waterways from nutrient input.

The extant source of the large proposed Lot 15 wetland is NZSEG# 1003610, originating further to the south offsite on Lot 1 DP 84876. View from the quarry access at its northern edn, and from a high view point at the southern quarry indicate a swamp type of tall rush and sedges, >50% indigenous in dominance and significant in terms of size.[45] The large stature OBL perennial species *raupo; Eleocharis sphacelata; Schoenoplectus tabaermontanii and Machaerina spp.* suggest prolonged stability of deeper hydrology. Indigenous swamp millet *Isachne globosa*

[42] *"This exclusion is not targeted at pasture being targeted for urban development or for other land uses. It does not apply to wetlands in other areas of grassland that are not grazed, such as in parklands, golfcourses, landscaped areas and areas of farmland not used for grazing purposes".* MfE (December 2022) Pasture Exclusion Assessment Methodology *Pg 9*
[43] National List of Exotic Pasture Species List (2022) MFE
[44] * denotes exotic
[45] Appendix 5 RPS 2018 Criteria 2(3) c swamp 0.4ha

(OBL) is visible entangled and rafting throughout the larger species from the margin. Towards the edges typical riparian species swamp kiokio (*Parablechnum minus FACW*), flax & cabbage tree amongst taller terrestrial species form a dense riparian buffer.

In the remainder of the development the primary *FACW & OBL* short herbaceous, grass and *Juncus* species represent a typical pastoral association commonly able to persist regardless of grazing and pugging due to growth form and/or unpalatability.

The species associations vary dependant on water depth. Composition may vary over time due to natural factors e.g. drought; invasion; interspecific competition. The dominant character is a lower stature sedge and rafting grass matrix of *OBL & FACW* species with associations of FACW & OBL short herbaceous and grass spp. *Paspalum distichum* (FACW)* dominant with varied frequency of *Agrostis stolonifera* (FACW)* & *Glyceria (FACW)* & *Persicaria* (OBL & FACW spp); Carex leporina* (FACW);Isolepsis prolifera (OBL); Cyperus brevifolius* (FACW); Ludwigia palustris*; *Eleocharis acuta (OBL). Epilobium chionanthum (FACW) & Juncus spp (FACW)* present are common generalists - *Juncus effusus*; J. edgariae; J. articulatus*,* & small leafy *Juncus bulbosus*.*

The upper source of wetland adjacent the proposed house site Lot 6 has an area of *Machaerina juncea* (FACW) of distinct character comparatively.

The dominance of OBL & FACW species implies consistent hydrology, with FACW species dominating the periphery adapted to tolerate a greater variation seasonally in response to rainfall. *Isolepsis,* filamentous green algae and *Callitriche* (OBL) imply nutrient enrichment in some areas of standing water.

NZ wetland typology is based on the emphasis of observed vegetation and hydrology as below:

TABLE 7: IDENTIFIED NATURAL INLAND WETLAND

TYPE[46]	SWAMP/SHALLOW WATER LOT 15 NZSEG#10083610	SWAMP
CHARACTERISTIC	within or adjacent groundwater e.g. Lake river flow nil to fast water table well above surface: inundated wetness almost permanent with flashy high fluctuation in addition to seasonal usually mineral substrate	*standing water and/ or surface channels; leads with gentle flow* *mainly surface water with groundwater* *water table usually above the surface* *moderate to high fluctuation but permanent wetness at depth* *poor drainage* *combination of mineral and peat soils* *wide spread - basins; valleys, gullies and plains*
CLASSIFICATION	***WL19- RAUPŌ REEDLAND*** *Reedland of abundant raupō, in shallow water* *Locally Bolboschoenus, Schoenoplectus and Machaerina, Carex and spiked sedges (e.g. kuta)* *Floating/rafted aquatics -water milfoils, buttercups, willow herbs, species of Potamogeton, Isolepis, Azolla and Lemna,*	WL11- MACHAERINA SEDGELAND Shallow palustrine/riverine/lacustrine wetlands of a wide range of variants throughout New Zealand. Sedgeland, rushland with a high water table Dominated by species of Machaerina, square sedge, Eleocharis, Carex spp. & Juncus spp
TYPIC SITE SPECIES	Raupō OBL Eleocharis sphacaelata OBL Machaerina articulata OBL Myriophyllum (OBL) Isachne globosa (OBL) scrambling Schoenoplectus tabernaemontanii (OBL)	Epilobium(OBL) Myosotis(FACW) Juncus spp (FACW) Persicaria spp (FACW & OBL) Carex spp (FACW) Paspalum distichum(FACW) Isolepis spp (OBL & FACW) Machaerina juncea (FACW) Eleocharis acuta (OBL) Isachne globose (OBL)
LOCATION	Proposed Lot 15	Throughout proposal site refer FIGS 3 & Appendix 1

[46] Johnson & Gerbeaux (2014) Wetland types of NZ.

The occurrence of innocuous exotics *Holcus lanatus*; Ranunculus repens* & Lotus pedunculatus* (FAC)* within peripheral fen wetland is not sufficiently frequent to alter the evident wetland diagnosis. These species are common throughout many forms of wetland in Northland, particularly on margins or on slightly raised microtopography, not preferring prolonged submersion.

Wetland throughout grades quickly with reduced soil saturation and slight micro elevation to loss of dominance typified by FACU & UPL exotic grass species including kikuyu; ryegrass; browntop; hairstail (*Lagurus ovatus*); carrotweed (UPL); *Paspalum dilatatum*; *Paspalum urvillei (FAC);* rough meadow grass *(Poa trivialis)* and ratstail with common herbaceous pasture weeds such as hawksbeard (FACU), plantain (FACU). These represent <u>non wetland</u> both in terms of wetland ratings and NEPSL[47] pastoral exclusion species.

There was an absence of riparian shrubland vegetation on site. Taller terrestrial vegetation consists of various exotic shelter belt species including bamboo; gum and pine. There are no kauri in the development area to invoke consideration of the *Biosecurity (National PA Pest Management Plan) Order 2022.* No flora species with threat status or locally uncommon were found within or beyond the wetlands.

Grasses were recognised through professional experience from leaf form, ligule; growth habit and habitat, with simple determination from seed heads practicable at this time of year. The NLEPS does not include common wetland grasses *Glyceria spp (FACW & OBL)*; *Paspalum distichum**[48] *(FACW), Isachne globosa* (OBL) and *Agrostis stolonifera* (FACW*).

Rushes are visible dotted within some areas. Discrete plants of *Juncus* scattered throughout dominant exotic pasture do not uphold a *natural inland wetland* diagnosis in isolation. A key visual cue is dominance of associated ground cover that cannot withstand long term saturation necessary for wetland species dominance e.g. clovers; *Lotus corniculatus*; kikuyu & further *FACU & UPL* exotic pasture grasses.
The larger FACW *Juncus* are adapted with root structure; shoot water retention capacity and mass production of long lived seeds which allow them to compete within pasture, and persist through drier periods as opposed to other smaller FACW or specialized OBL hydrophilic species.

[47] National Exotic Pasture Species List (2022) AgResearch for MfE
[48] * denotes exotic

FAUNA

Basic observations were incidental to the main consideration of wetland and vegetation significance, soils and hydrology, but complement the characterisation of the site. Pest control and an increased density of peripheral shrubby riparian cover would create better functional habitat for any species on site including as a buffer for aquatic function and internal habitat, mitigatory of increased residential occupation.

AVIFAUNA

5 minute bird counts were undertaken from vantage points throughout the site on the morning of the 25/11/24 under fine clear conditions, as well as incidental observation.

Conspicuous birdlife was limited largely to exotic and native insectivorous generalists for which the pasture , wetlands and scattered shelterbelts contribute to territorial feeding areas habitat e.g. skylark; kingfisher; pitpit
No habitat is available for specialist wetland birds due to the exposed pastoral character of all other than the large wetland on proposed balance Lot 15, with taller stature sedge/ rush habitat and intact riparian margins. Fernbird (*At Risk -Declining*) was heard adjacent the quarry access and there are likely populations within further extent.
An increase in shrubby riparian cover and pest control would improve functional habitat.

INVERTEBRATES

Invertebrate survey was outside the scope of this reporting. However, the proliferation of OBL & FACW wetland species is also an indicator of niches supportive of invertebrate populations adapted to complete at least a portion of their lifecycle in wet conditions, and it may be assumed they are present. In NZ this has been shown to vary with region; wetland type and water chemistry (largely acidity) with fauna dominated by communities of five invertebrate groups -*Chironomidae* midges; aquatic mites (*Acarina*); microcrustacea (copepods &ostracods) and aquatic nematodes. The mud snail *Potamopyrgus antipodarum* is cosmopolitan across NZ. Unlike aquatic insects, meiofauna such as the nematodes, copepods and ostrocods do not leave the wetland environment as winged adults.

Despite their inconspicuousness and little recognition in comparison to fauna commonly valued by society e.g. birds & fish - they have a critical role in wider ecosystem function e.g. organic carbon and nutrient turnover; as part of the food web reaching large densities and in terms of intrinsic biodiversity value -many being known only to NZ.

SIGNIFICANCE

NPS-FM VALUES (2020)

Values[49] of the creeks and wetland were considered, including as receiving environment of stormwater discharge. These translate to potential significance aspects for consideration against *RPS 2018 Appendix 5* criteria. Avoidance of *extent* and *values* loss in regard to rivers and wetlands is core policy[50] of the NPS – FM (2020)

TABLE 8: VALUES NPS-FM (2020)

VALUE	WETLAND / CREEK	LOT 15 WETLAND/ NZSEG# 1003610
ECOSYSTEM HEALTH	Currently impacted condition – limited diversity, exotic dominant with functionality of sediment retention and processing Flow occluded by historic legal culverts and accessways No fish passage from Oruru to site . Non diamodous populations may persist Basic water source for fauna in landscape Exotic & open/no riparian buffer Some water quality -sediment retention and nutrient processing function Consistent water regime implied by OBL & FACW dominance species Exotic influence typical pastoral assemblages no targeted pest control Farm management control of woody weeds	No fish passage from Oruru to site. Non diamodous populations may persist Indigenous dominance Extensive riparian margin High water quality -sediment retention and nutrient processing function Consistent water regime implied by large stature OBL dominance
INDIGENOUS BIODIVERSITY	Limited bird guild - insectivores use as wider feeding territory No specialist wetland birds evident other than common water fowl likely due to lack of riparian buffer and tall stature rushes for cover Not currently wetland bird habitat Limited flora diversity, exotic dominant.	Potential wetland bird habitat – fernbird identified High diversity, indigenous dominant Insectivores
HYDROLOGICAL FUNCTION	Sediment retention and nutrient processing protective of groundwater. Hydrologically connected as headwater to Oruru in Doubtless Bay priority catchment Stock nutrient inputs directly to some areas of waterway Slows stormwater from exiting configuration to Oruru River Pastoral catchment Long historically modified	Sediment retention and nutrient processing protective of groundwater. Hydrologically connected as headwater to Oruru in Doubtless Bay priority catchment No stock nutrient access Slows stormwater from exiting configuration to Oruru River Ndigenous vegetated catchment
MĀORI FRESHWATER VALUES	Outside scope of this report	Outside scope of this report
AMENITY VALUES	Not considered to provide direct opportunity for human contact; recreation or food provision. Wider wetland visually apparent from neighbouring Lots.	Not considered to provide direct opportunity for human contact; recreation or food provision. Not visually apparent from the wider subdivision

[49] Values (NPS FM 2020 Amendment No.1 (2022) (i) ecosystem health; (ii) indigenous biodiversity; (iii) hydrological function; (iv) Māori freshwater values; (v) amenity values

[50] *Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted. Policy 7: The loss of river extent and values is avoided to the extent practicable.*

Consideration of significance is given, in regard to *Northland Regional Policy Statement Appendix 5 (2018) as* the standard Northland criteria for assessing significance of an ecological site. It directly reflects those contained in *Appendix 1* of the recently mandated *National Policy Statement for Indigenous Biodiversity (2023)* including consideration of *Representativeness; Diversity & Pattern; Rarity and Distinctiveness & Ecological Context .* The gumland is assumed to be significant, as a naturally rare ecosystem and of large size with connectivity to further extent offsite and as catchment protection. No activities are proposed to interact with this area, so further consideration is not given.

TABLE 9: ASSESSMENT OF SIGNIFICANT INDIGENOUS VEGETATION AND SIGNIFICANT HABITATS OF INDIGENOUS FAUNA IN TERRESTRIAL, FRESHWATER AND MARINE ENVIRONMENTS NORTHLAND REGIONAL POLICY STATEMENT (2018) APPENDIX 5

(1) REPRESENTATIVENESS	**WETLAND**	**LOT 15 WETLAND/ NZSEG# 1003610**
(A)*Regardless of its size, the ecological site is largely indigenous vegetation or habitat that is representative , typical and characteristic of the natural diversity at the relevant and recognised ecological classification and scale to which the ecological site belongs* *(i) if the ecological site comprises largely indigenous vegetation types: and* *(ii) Is typical of what would have existed circa 1840* *(iii)Is represented by the faunal assemblages in most of the guilds expected for the habitat type* ***(B)*** *The ecological site* *(i) Is a large example of indigenous vegetation or habitat of indigenous fauna* *(ii) Contains a combination of landform and indigenous vegetation and habitats of indigenous fauna that is considered to be a good example of its type at the relevant and recognised ecological classification and scale*	A(i) No large exotic component (ii) in occupancy however character likely different due to exotic component and modification (iii) freshwater fish likely but not surveyed likely limited to tuna and non diadromous ; no wetland birds sighted B) (i)no (ii) Lot 6 representative of lowland swamp as most freshwater wetlands have been reduced in the ecological district as nationally. Impacted by lack of buffer **LOW**	A(i) (ii)YES (iii) fernbird implies wider usage potential intact riparian margin and large stature reeds represent high quality habitat for wetland specialists B(i) yes (ii) yes gully swamp and creek contiguous with indigenous vegetated slopes **HIGH**
(2)RARITY/ DISTINCTIVENESS *(A)The ecological site comprises indigenous ecosystems or indigenous vegetation types that:* *(i) Are acutely or chronically threatened land environments associated with LENZ Level 4* *(ii) Excluding wetlands, are now less than 20% original extent* *(iii) excluding man made wetlands are examples of wetland classes that either otherwise trigger Appendix 5 criteria or exceed any of the following area threshold* *(a) Saltmarsh 0.5ha* *(b) Shallow water lake margins and rivers 0.5ha* *(c) Swamp >0.4* *(d) Bog >0.2 ha* *(e) Wet heathlands>0.2 ha* *(f) Marsh; fen; ephemeral wetland or seepage/flush >0.05ha* *(B) Indigenous vegetation or habitat of indigenous fauna that supports one or more indigenous taxa that are threatened, at risk, data deficient , or uncommon either nationally or within the relevant ecological scale* *(C) The ecological site contains indigenous vegetation or an indigenous taxon that is* *(i) endemic to the Northland/ Auckland region* *(ii) At its distribution limit in the Northland region* *(D) The ecological site contains indigenous vegetation or an association of indigenous taxa that* *(i) Is distinctive of a restricted occurrence* *(ii) Is part of an ecological unit that occurs on a originally rare ecosystem* *(iii) Is an indigenous ecosystem and vegetation type that is naturally rare or has developed as a result of an unusual environmental factor(s) that occur or are likely to occur in Northland: or* *(iv) Is an example of a nationally or regionally rare habitat as recognised in the New Zealand Marine Protected Areas Policy*	A(i)YES all wetlands/ creek have part extent in TEC Level II adjacent Oruru Rd (ii) - no (iii) YES - swamp size LOT 15; 7 & 6 but not >50% indigenous B) Long fin eel (*At Risk Declining*) mapped but not surveyed. C) no ***LOW***	A(i) no (ii) no however gumland mapped as upper riparian iii)Yes B) Fernbird (At Risk – Declining) potentially long fin eel (At Risk Declining) C) & D) the wider riparian area (ecological site)has mapped gumland an association distinct within Northland & naturally rare **MODERATE - HIGH**
(3)DIVERSITY AND PATTERN *(A) Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of:* *(i) Indigenous ecosystem or habitat types; or* *(ii) Indigenous taxa* *(B) Changes in taxon composition reflecting the existence of diverse natural features or ecological gradients; or* *(C) Intact ecological sequences*	A)Swamp and creek unit provides a diversity of habitat niches but do not have accompanying wetland high diversity of indigenous flora or fauna occupying B/C)Ecological sequences and vegetation change when considered in association with the Oruru as upstream headwater wetland & creek	A)Swamp and creek unit provides a diversity of habitat niches with accompanying wetland high diversity of indigenous flora B/C)Intact cological sequences and vegetation change when considered in association with the Oruru as upstream headwater wetland & creek *Vegetated hills- Headwater Creek – swamp – river*

	Headwater Creek – swamp - river **LOW**	**HIGH**
(4) ECOLOGICAL CONTEXT *(A) Indigenous vegetation or habitat of indigenous fauna is present that provides or contributes to an important ecological linkage or network, or provides an important buffering function: or* *(B) The ecological site plays an important hydrological, biological or ecological role in the natural functioning of a riverine, lacustrine, palustrine, estuarine, plutonic(including karst), geothermal or marine system* *(C) The ecological site is an important habitat for critical life history stages of indigenous fauna including breeding/ spawning, roosting, nesting, resting, feeding, moulting, refugia or migration staging point (as used seasonally, temporarily or permanently*	A) & B) The wetlands buffer creek and Oruru River from pastoral contribution of sediment; nutrient with additional high flow/ stormwater retention . C) Freshwater source in times of drought for local fauna eg. higher territorial economics c.f dominant pasture **LOW -MODERATE**	A) & B) The wetland buffers headwater and Oruru River from pastoral contribution of sediment; nutrient with additional high flow/ stormwater retention . C) Freshwater source in times of drought for local fauna eg. higher territorial economics c.f dominant pasture. Fernbird & lpotential further wetland birds from broader catchment **LOW -MODERATE**

The majority of the wetlands have *LOW* significance overall, but retain value related to their water quality protection functionality and size criteria. The individual species value across the site is largely *LOW* as per EIANZ (2018)[51] criteria below, other than *Moderate* fernbird (*At Risk - Declining*) within proposed Lot 15 and NZ pitpit (*At Risk – Declining)* ranging across pastoral extent.

A shift in vegetation associations from heightened stormwater input from impervious surfaces to wetland would not likely result in loss of habitat or threatened species, with the proviso it is diffuse and not in a manner that will increase scour, erosion or sediment input.

TABLE 10: FACTORS TO CONSIDER IN ASSESSING SPECIES VALUE (TABLE 5 EIANZ 2018)

VALUE	EXPLANATION
VERY HIGH	*Nationally Threatened species (Critical, Endangered or Vulnerable*) found in the Zone of Influence (ZOI) or likely to occur there, either permanently or occasionally
HIGH	*At Risk (Declining)* species found in the Zone of Influence or likely to occur there, either permanently or occasionally
MODERATE-HIGH	Species listed in any other category of *At Risk category (Recovering, Relict or Naturally Uncommon*) found in the Zone of Influence or likely to occur there, either permanently or occasionally.
MODERATE	Locally uncommon/rare species but not *Nationally Threatened or At Risk*.
LOW	Species *Not Threatened* nationally and common locally.
NEGLIGIBLE	Exotic species, including pests

We rate the proposed development footprints in pasture as ***NEGLIGIBLE*** . No highly mobile species[52] are likely <u>dependant</u> on the areas for any part of their lifecycle and unlikely to affect any of these species in a significant adverse way. All will live closely proximate with residential occupation if predator control in functional habitat allows. It is an offence under the Wildlife Act 1953 to **intentionally** harm, disturb or kill native wildlife.

[51] (2018) EIANZ Ecological Impact Assessment Guidelines for New Zealand 2nd Edition
[52] NPSIB (2023) *Appendix 2: Specified highly mobile fauna*

ASSESSMENT OF EFFECTS

EIANZ METHODOLOGY

Assessment of effects follows the systematic process of the EIANZ[53] Guidelines as best practice.

Standard criteria are utilised in a matrix framework to determine the impact of a proposal on a habitat, incorporating a three step process:

- Ecological values are ranked on a scale of *Negligible, Low, Moderate, High, or Very High.*
- The magnitude of effects on these values is ranked on a similar scale (EIANZ TABLE 8)
- The overall level of effect is determined by a combination of value and the magnitude of the effect. (EIANZ TABLE 10)

DEVELOPMENT PHASE

The primary potential effects from are limited to

- stormwater discharge 100m of a *natural inland wetland.*
- earthworks within 100m of a *natural inland wetland.*

RESIDENTIAL OCCUPATION

Additional potential, but avoidable effects of include

- landscaping/ alteration of the wetlands & creeks resulting in further encroachment or hydrological change
- pest and weed increase from reduced pastoral management

Consideration of a raw proposal form without any consideration/ mitigation is best practice methodology.

MAGNITUDE OF EFFECTS

Magnitude is determined by a combination of scale (temporal and spatial) of effect and degree of change that will be caused in or to the ecological component. **It should initially be considered in a raw or unmitigated form.**

TABLE 11: CRITERIA FOR DESCRIBING MAGNITUDE OF EFFECT (EIANZ 2018 TABLE 8)

MAGNITUDE	DESCRIPTION
VERY HIGH	Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature
HIGH	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature
MODERATE	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature
LOW	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR

[53] Environmental Institute of Australia and New Zealand

	Having a minor effect on the known population or range of the element/feature
NEGLIGIBLE	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature

The interaction of magnitude of effect and ecological value (or significance) of species or habitat gives the **unmitigated level of effect** as per *EIANZs Table 10* (below). This resultant level of effects is then a guide to the extent and nature of the ecological management required to render them acceptable in the statutory framework.

Impact management should enable maintenance or improvement of existing biodiversity (EIANZ 2018).

In this regard we consider the **unmitigated** effects as below*:*

PROPOSED BUILDING/ ACCESS AREA s

- ***VERY LOW*** *as* a potential interaction between a *NEGLIGIBLE level* of effects on *NEGLIGIBLE* value elements

WETLAND

- ***VERY LOW*** as a potential *MODERATE* effect on the *LOW* value of the wetland/creeks

There are no activities/ potential effects proposed as part of the subdivision in proximity to the larger HIGH value Lot 15 wetland or vegetation surrounding it.

TABLE 12: CRITERIA FOR DESCRIBING LEVEL OF EFFECTS (EIANZ TABLE 10)

		ECOLOGICAL &/OR CONSERVATION VALUE				
		VERY HIGH	HIGH	MODERATE	LOW	NEGLIGIBLE
MAGNITUDE	VERY HIGH	*Very High*	*Very High*	*High*	*Moderate*	*Low*
	HIGH	*Very High*	*Very High*	*Moderate*	*Low*	*Very Low*
	MODERATE	*Very High*	*High*	*Moderate*	*Very Low*	*Very Low*
	LOW	*Moderate*	*Low*	*Low*	*Very low*	*Very Low*
	NEGLIGIBLE	*Low*	*Very Low*	*Very Low*	*Very Low*	*Very Low*
	POSITIVE	*Net Gain*	*Net Gain*	*Net Gain*	*Net Gain*	*Net Gain*

It is presumed from the proposed configuration that no earthworks will interact within the wetland or CSAs to cause drainage as per *NES-F (2020) 53 Prohibited Activities*. No vegetation clearance or earthworks are currently proposed within 10m.

The extant source of hydrology of the wetland are the creeks / springs at home. The proposed building platforms within 100m of the wetlands, but do not occupy critical source areas, seepage or overland flow path that through its formation may ***divert*** contributing hydrology to cause :

- *NES F (2020) REG 52(1)* ***complete or partial drainage of all or part of a natural inland wetland***

- *NES –F (2020) 54 (c) **change the water level range or hydrological function[54] of the wetland**.*

Uncontrolled point source discharge of stormwater and intersection of works with the proposed Lot 2 seepage basins and flushes/ overland flow paths directly hydrologically connected to the wetland should be avoided so not as to cause

- *PNRP Policy H.4.2 Minimum levels for lakes and natural wetlands* : ***change in seasonal or annual range in water levels***
- NES-F (2024) 54(d) ***change, or likely change, the water level range or hydrological function of the wetland***

Beyond regulatory requirements and impact management, protection and continued preservation of the Lot 15 wetland and vegetation of *HIGH* significance would be suitable under one of the instruments recommended as per

- *FNDC Operative Plan 13.7.3.9 PRESERVATION OF HERITAGE RESOURCES, VEGETATION, FAUNA AND LANDSCAPE, AND LAND SET ASIDE FOR CONSERVATION PURPOSES* ***(g)i*** **a reserve or covenant under the Reserves Act.**
- *RATING RELIEF POLICY P21/01 LAND SUBJECT TO PROTECTION FOR OUTSTANDING NATURAL LANDSCAPE, CULTURAL, HISTORIC OR ECOLOGICAL PURPOSES CRITERIA* ***2(e) a management agreement for conservation purposes under Section 38 of the Reserves Act 1977***

These conditions, along with FNDC *Policy P21/01* require a Management Plan *detailing how the values of the land will be maintained, restored and/or enhanced[55].* Accordingly as per FNDC *Policy P21/01,* in order to gain rates relief the land *must not be in use.*

No indigenous vegetation clearance is required. Stock exclusion from the waterways & encompassing wetland was required 1/1/2025. Fencing and planting to a minimum of 2m allowing for contour riparian buffer protects from ingress and disturbance from residential occupation and ongoing pastoral use of the larger Lots, providing joint functional purpose of aquatic function (attenuation; shade; sediment control; bank stabilization) and amenity within the rural landscape. The majority of sediment is trapped within the first 2m of a source by dense ground cover and this is considered an appropriate width. Lowland riparian species appropriate to the soil type and WF11 designation are recommended and/ or flax or sedges.

- It should be noted that any planting within 10m of wetland must be locally appropriate and indigenous as per *REG 55 NES- F (2020)* to create a natural ecosystem pattern and to avoid potential adverse effect of loss of values.

Protection of the mature forest vegetation onsite and the large gully wetland on proposed Lot 15 as an expansive ecological unit is considered suitable for a formal instrument under the Reserves Act 1977, allowing rates relief as per FNDC Policy P21/01. However it has long been excluded from farm activities due to contour and provisions of the ODP and is unlikely to be developed regardless.

[54] Not specifically defined in the NPS-FM or NES-F- includes elements of regulation, movement, and quality of water in the environment.
[55] FNDC RATING RELIEF POLICY P21/01 Conditions and Criteria 1)

Site procedures for residential and infrastructure development should include designated earthworks envelopes or marking of wetlands prior to ensure contractors avoid inadvertent incursion and unquantifiable effects
We also recommend-

- **ALL LOTS** A formal **Pest Management & Weed Management Plan**
  - predator control to provide higher functionality of habitat
  - ongoing prevention/ removal of exotic infestations assisted by browser control to allow natural regeneration as the site develops increasing *values* of wetland and protecting *extent* from invasion of non wetland shrubs and herbaceous species e.g. wild ginger[56] *Hedychium gardnerianum;* mistflower *Ageratina riparia*
  - Exotic vegetation which could adversely affect natural regeneration or local forest health is not to be introduced. This includes environmental weeds[57] and those listed in the National Pest Plant Accord[58].

Together these will ensure impact is avoided throughout development or residential occupation. Adherence to the NES-F (2020) and best practice stormwater management will provide for maintenance of wetland functional values, including as catchment water quality protection and habitat patches in the wider landscape, aligned with aspirations of the NPS-FM (2020) & PNRP wetland policies and objectives.

No fauna salvage or translocation is expected but assistance may be requested from the consulting ecologist if unexpected values come to light. It is an offence under the Wildlife Act 1953 to harm, disturb or kill native wildlife.

BULLOCK TEAMS HAULING LOGS INFRONT OF THE HOMESTEAD

[56] *Hedychium gardnerianum* -currently no wetland ranking but highly tolerant of damp riparian conditions
[57] McAlpine, K & Howell, C. Clayson (2024) List of environmental weeds in New Zealand. Science for Conservation Series 340, DoC Wellington
[58] Latest List - https://www.mpi.govt.nz/dmsdocument/3664-National-Pest-Plant-Accord-manual-Reprinted-in-February-2020-minor-amendments-only

NES-F (2020)

Recognition of *natural inland wetland* onsite promotes the intent of *NPS-FM(2020)* Policies 5 & 6[59] and avoidance of effects through pre emptive location of the proposed house sites and likely access at the maximal distance from the wetlands.

Drainage/ destruction of wetlands is a prohibited adverse effect as per *NES- F Reg 53* and it is presupposed that this will not occur.

In the absence of unmitigated point source discharge there is highly unlikely to be any wetland change in seasonal or annual range water levels, as per *PNRP Policy H.4.2 Minimum levels for Lakes and natural wetlands.*

No vegetation clearance within 10m is required as per *NES-F Reg 52(i).*

TABLE 13: SITE HYDROLOGY

CHARACTERISTIC	PROPOSED LOT												
	1	2	3	4	5	6	7	8	9	10	12	14	15
NATURAL INLAND WETLAND						✓	✓		✓				✓
BUILDING PLATFORM < 100m NATURAL INLAND WETLAND	✓	✓	✓	✓	N/A	✓	✓	N/A	✓	✓	✓	✓	✓
CREEK/ MAPPED RIVER				✓		✓	✓		✓				✓

The proposed house sites do not occupy critical source areas, seepages or overland flow paths. As per *NES F Reg 52(2) & 54(c)* minor natural diffuse or sheetflow inputs permeating to the wetlands within 100m will likely be *diverted* by the change of site cover, however this will not result in *complete or partial drainage*, **or** *change the water level range or hydrological function of the wetland.*

No earthworks are currently proposed within 10m, but are unlikely to change the *water level range or hydrological function of the wetland* as per *NES F Reg 54 (b)* if they do not occupy or intersect with the mapped wetland or CSA seepages. This is also the case for earthworks required for house platform and access (<100m) which are not considered to likely result in *complete or partial drainage of all or part of the wetland* as per *NES F Reg 52(1).*

There is no detailed design of the residential development at this stage. Stormwater inputs to the wetland likely represent a discharge within 100m, controlled by *NES F Reg 54(d).* The wetland type current has developed in a pastoral catchment with variable output, highly responsive to meteorological conditions, and is adapted to moderate to high fluctuations in **water level range** without discernible shift in extent or value, including **hydrological function.** Dominant species OBL & FACW *Paspalum ditstichum, Glyceria; Ludwigia; Eleocharis, Persicaria;*

[59] **Policy 5:** Freshwater is managed (including through a National Objectives Framework) to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.
Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted**.**

Juncus are adapted to raft or persist through the current inundation cycle in response to rainfall. A shift in species composition that retains an indigenous *natural inland wetland* composition is considered not to be a loss of *value* or *extent* and a less than minor level of effects.
Under the proviso inputs modelled to date should be diffuse and avoid scouring, gross sediment input from the CSAs or displacement of wetland vegetation, adverse effects are avoided and aquatic values and extent will be maintained.

TABLE 14: NES-F (2020) REG 52

DRAINAGE OF NATURAL INLAND WETLANDS: 52 NON-COMPLYING ACTIVITIES	
(1) Earthworks outside, but within a 100 m setback from, a natural inland wetland is a non-complying activity if it—	
(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural inland wetland; and	NO platforms and access do not occupy source areas or CSAs. Construction envelope and formal survey of wetland for Sec 223 recommended to allow visual constraint to damage
(b) does not have another status under any of regulations 38 to 51.	N/A
(2) The taking, use, damming, or diversion of water outside, but within a 100 m setback from, a natural inland wetland is a non-complying activity if it—	
(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural inland wetland; and	NO Proposed building platforms and access do not occupy source areas or CSAs.
(b) does not have another status under any of regulations 38 to 51.	N/A

It is considered the proposal will not result in ***complete or partial drainage of all or part of the wetland*** .

TABLE 15: NES-F (2020) REG 54

OTHER ACTIVITIES: 54 NON-COMPLYING ACTIVITIES	
The following activities are non-complying activities if they do not have another status under this subpart:	
(a) vegetation clearance within, or within a 10 m setback from, a natural inland wetland:	NONE REQUIRED IN THE PROPOSAL
(b) earthworks within, or within a 10 m setback from, a natural inland wetland:	NONE REQUIRED IN THE PROPOSAL – proposed building platform and infrastructure works all outside 10m
(c) the taking, use, damming, or diversion of water within, or within a 100 m setback from, a natural inland wetland if—	
(i) there is a hydrological connection between the taking, use, damming, or diversion and the wetland; and	Likely earthworks within 100m of wetland. Minor natural diffuse or sheetflow inputs within 100m may be diverted by the change of site cover however in the absence of alteration of any point source inputs or CSAs this is unlikely to change the water level range or hydrological function of the wetlands.
(ii) the taking, use, damming, or diversion will change, or is likely to change, the water level range or hydrological function of the wetland:	
(d) the discharge of water into water within, or within a 100 m setback from, a natural inland wetland if—	
(i) there is a hydrological connection between the discharge and the wetland; and	Potential stormwater
(ii) the discharge will enter the wetland; and	Likely
(iii) the discharge will change, or is likely to change, the water level range or hydrological function of the wetland.	NO –The wetland type current has developed in a pastoral catchment with variable output highly responsive to meteorological conditions, adapted to moderate to high fluctuations without discernible shift in extent or value, hydrological function under the proviso inputs modelled to date should be diffuse and avoid scouring, sediment input or displacement of wetland vegetation

Controls as above are considered sufficient to avoid adverse effects on any species and habitat downstream.

Site procedures for residential and infrastructure development should include designated earthworks envelopes or marking of wetlands prior to ensure contractors avoid accidental incursion and unquantifiable effects.

Existing access and driveways are considered *other infrastructure*[60], illustrated in the historic aerial review as long established before the ratification of the NES-F 92020), however remain subject to *NES- F (2020) Reg 46 Maintenance and operation of specified infrastructure and other infrastructure* if significant upgrade is required . Application for resource consent will be required to NRC in this regard based on design of the modifications and proximity to any wetland.
A proposed new crossing to Lot 9 from the existing access from Oruru Rd to Lot 8 farm cottage has been sited outside but within 10m of *natural inland wetland*, where the character of the waterway becomes is intermittent creek. Parameters of *NES-F (2020) Regs 62; 63 & 69* must be provided to NRC prior to the installation.

FIG 14: PROPOSED LOT 9 CROSSING

If it cannot comply with the permitted activity status of *NES- F Reg 70* it is a *Discretionary Activity* as per *NES-F Reg 71* with an emphasis on preservation of natural flow and the passage of fish. However, we consider there is no resident fish population and no potential for occurrence due to the unsuitability of the shallow ephemeral waterway extent above the

[60] As defined in the NPS-FM Infrastructure present prior to commencement of the regulations (2/9/2020) is considered *existing infrastructure.*

culvert install site. We considered the magnitude of effects of the culvert installation as *NEGLIGIBLE*, in terms of a change from the current ecological context; ecosystem function, habitat or range for identified site ***potential*** species. The culvert installation is therefore considered to have a *Very Low* or *less than minor* effect with the proviso that significant alteration of hydrology is not created e.g. upstream wetland or drainage as per *NES F Reg 53 Prohibited Activities*.

TABLE 16: NES-F (2020) REG 70 PERMITTED ACTIVITIES

NES- F REG 70 ***(1) THE PLACEMENT, USE, ALTERATION, EXTENSION, OR RECONSTRUCTION OF A CULVERT IN, ON, OVER, OR UNDER THE BED OF ANY RIVER OR CONNECTED AREA IS A PERMITTED ACTIVITY IF ITCOMPLIES WITH THE CONDITIONS.***	
(2) THE CONDITIONS ARE THAT—	
(A) THE CULVERT MUST PROVIDE FOR THE SAME PASSAGE OF FISH UPSTREAM AND DOWNSTREAM AS WOULD EXIST WITHOUT THE CULVERT, EXCEPT AS REQUIRED TO CARRY OUT THE WORKS TO PLACE, ALTER, EXTEND, OR RECONSTRUCT THE CULVERT; AND	
(B) THE CULVERT MUST BE LAID PARALLEL TO THE SLOPE OF THE BED OF THE RIVER OR CONNECTED AREA; AND	
(C) THE MEAN CROSS-SECTIONAL WATER VELOCITY IN THE CULVERT MUST BE NO GREATER THAN THAT IN ALL IMMEDIATELY ADJOINING RIVER REACHES; AND	
(D) THE CULVERT'S WIDTH WHERE IT INTERSECTS WITH THE BED OF THE RIVER OR CONNECTED AREA (S) AND THE WIDTH OF THE BED AT THAT LOCATION (W), BOTH MEASURED *IN METRES, MUST COMPARE AS FOLLOWS:* *(I) WHERE* $W \leq 3$, $S \geq 1.3 \times W$: *(II) WHERE* $W > 3$, $S \geq (1.2 \times W) + 0.6$; *AND*	
(E) THE CULVERT MUST BE OPEN-BOTTOMED OR ITS INVERT MUST BE PLACED SO THAT AT LEAST 25% OF THE CULVERT'S DIAMETER IS BELOW THE LEVEL OF THE BED; AND	
(F) THE BED SUBSTRATE MUST BE PRESENT OVER THE FULL LENGTH OF THE CULVERT AND STABLE AT THE FLOW RATE AT OR BELOW WHICH THE WATER FLOWS FOR 80% OF THE TIME; AND	
(G) THE CULVERT PROVIDES FOR CONTINUITY OF GEOMORPHIC PROCESSES (SUCH AS THE MOVEMENT OF SEDIMENT AND DEBRIS).	

It should also be noted that *REG 55 NES- F (2020)* requires any planting within 10m of wetland to be locally appropriate and indigenous to create a natural ecosystem pattern and avoid potential loss of values.

CONCLUSION

This review included available documentation of the proposal and ecological context, the latter primarily from aerial photography and online mapping, complimented by fieldwork.

N*atural inland wetland (NPS FM 2020)* subject to the National Environmental Standards for Freshwater NES – F (2020) is located onsite. Potential adverse development effects on wetland, creek and more diverse gully and remnant habitat have been pre empted by their recognition in a mitigation strategy specifically to protect significance values of the wider ecological unit.

Residential occupation of the currently pastoral in the allocated proposal footprints will not result in any loss of vegetation; habitat or species with threat status. Attention to pest and weed control and protection of the remaining extent and values through fencing and buffering is considered primary mitigation to embed the increase residential occupancy in a resilient and effective habitat, mitigating cumulative effects and increasing both amenity and ecological value.

Subject to mitigatory measures provided in this EcIA, development will not involve any loss of ecological features, *values* or *extent* of wetland. We considered the magnitude of effects of the suggested permanent clearance and introduction of further residential purpose in the proposal areas, as the primary focus, as *Very Low (EIANZ) or less than minor* , in terms of a change from the current ecological context as a result of the subdivision.

The proposal is undertaken with regard to the long term functionality and integrity of the wider environment as legacy of the current owners Tripark Farms, recognising the interdependency of the wetlands, waterway and connectivity throughout the landscape within the Doubtless Bay Priority catchment.

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REBECCA LODGE, PRINCIPAL ECOLOGIST
BScEcology **PGDipSci (Distinction) Botany**
Bay Ecological Consultancy Ltd

Bay Ecological
CONSULTANCY LTD

APPENDIX 1: SPECIES LIST

Species are listed as per Clarkson, B. et al (2021):

- **OBL: OBLIGATE**. Almost always is a hydrophyte, rarely in uplands (estimated probability >99% occurrence in wetlands)
  FACW: FACULTATIVE WETLAND. Usually is a hydrophyte but occasionally found in uplands (estimated probability 67–99% occurrence in wetlands)
- **FAC: FACULTATIVE**. Commonly occurs as either a hydrophyte or non-hydrophyte (estimated probability 34–66% occurrence in wetlands)
- **FACU: FACULTATIVE UPLAND**. Occasionally is a hydrophyte but usually occurs in uplands (estimated probability 1–33% occurrence in wetlands)
- **UPL: OBLIGATE UPLAND**. Rarely is a hydrophyte, almost always in uplands (estimated probability <1% occurrence in wetlands)

The majority of tree species are considered upland unless otherwise described.

*Denotes exotic species

MONOCOT TREES & SHRUBS

Cordyline australis (FAC)	cabbage tree

DICOT HERBS

Callitriche stagnalis (OBL)	starwort
Crepsis capillaris(FACU)*	hawksbeard
Daucus carota (UPL presumed)*	carrot weed
Epilobium pallidiflorum(OBL)	tarawera, willowherb
Gamochaeta americana	cudweed
Leondonton saxatilis (FAC)*	hawkbit
*Lotus penduncul atus** (FAC)	Lotus
Ludwigia palustris (OBL)*	ludwigia
*Myosotis laxa subsp. caespitosa**	water forget me not
Myriophyllum triphyllum (OBL)	common milfoil
Persicaria hydropiper (FACW)*	Persicaria
P. decipiens (OBL)	tutanawai willow weed persicaria
Phormium tenax (FACW)	flax
Plantago lanceolata (FACU)*	narrow leaved plantain
Trifolium spp(FACU/ UPL)*	clover

GRASSES

Agrostis capillaris (FACU)*	browntop
Agrostis stolonifera *(FACW)*	
*Alopecurus pratensis** (FACU)	meadow foxtail
Cenchrus clandestinus(FACU)*	kikuyu
*Cortaderia selloana (FAC)**	pampas
Gahnia spp.	gahnia; cutty grass;
Glyceria notata (OBL)*	sweet grass
*Holcus lanatus** (FAC)	Yorkshire fog
Isachne globosa (OBL)	native swamp millet
Lagurus ovatus(UPL)	hairstail
Lolium spp (FACU/ UPL)*	ryegrass
Paspalum dilatatum (FACU)*	paspalum
P. distichum (FACW)*	mercer grass
Poa trivialis (FACU)	rough meadow grass
Sporobolus africanus (FACU)*	ratstail

SEDGES & RUSHES

Carex leporina (FACW)*	
Cyperus brevifolius (FACW)*	*globe sedge*
C. eragrostis (FACW)*	
Cyperus esculentus (FACW)*	*yellow nutsedge*
Eleocharis acuta(OBL)	
Eleocharis sphacelata (OBL)	
Isolepis prolifera (OBL)	
I.reticularis (FACW)	
Juncus articulatus (FACW)	*jointed rush*
J. australis (FACW)	*wiwi*
J.effusus (FACW)*	*soft rush*
J.edgariae (FACW)	*wiwi/ Edgars rush*
Machaerina juncea (FACW)	
Schoenoplectus tabernaemontani (OBL)	*lake club rush*
Schoenus concinnus (FACW)	
Sparganium subglobosum (OBL)	

TREES & SHRUBS

Coprosma rhamnoides	
Coprosma robusta	
Coprosma spatulata	
*Cotoneaster**	cotoneaster
*Eucalyptus spp**	gum
Geniostoma ligustrifolium	hangehange
Kunzea robusta	kanuka
Leptospermum scoparium	manuka
Melicytus ramiflorus	mahoe
Myrsine australis	red matipo
Phyllocladus trichomanoides	tanekaha
*Phyllostachys spp**	bamboo
*Pinus spp**	pine
Podocarpus totara	totara
*Solanum mauritianum**	tobacco weed
*Ulex europaeus** (FACU)	gorse

FERNS

Adiantum hispidulum	rosy maiden hair
Alsophila cunninghamii	slender tree fern
Alsophila tricolor	silver fern
Astroblechnum minus (FACW)	swamp kiokio
Lindsaea linearis	common lindsay
Sphaeropteris medullaris	mamaku

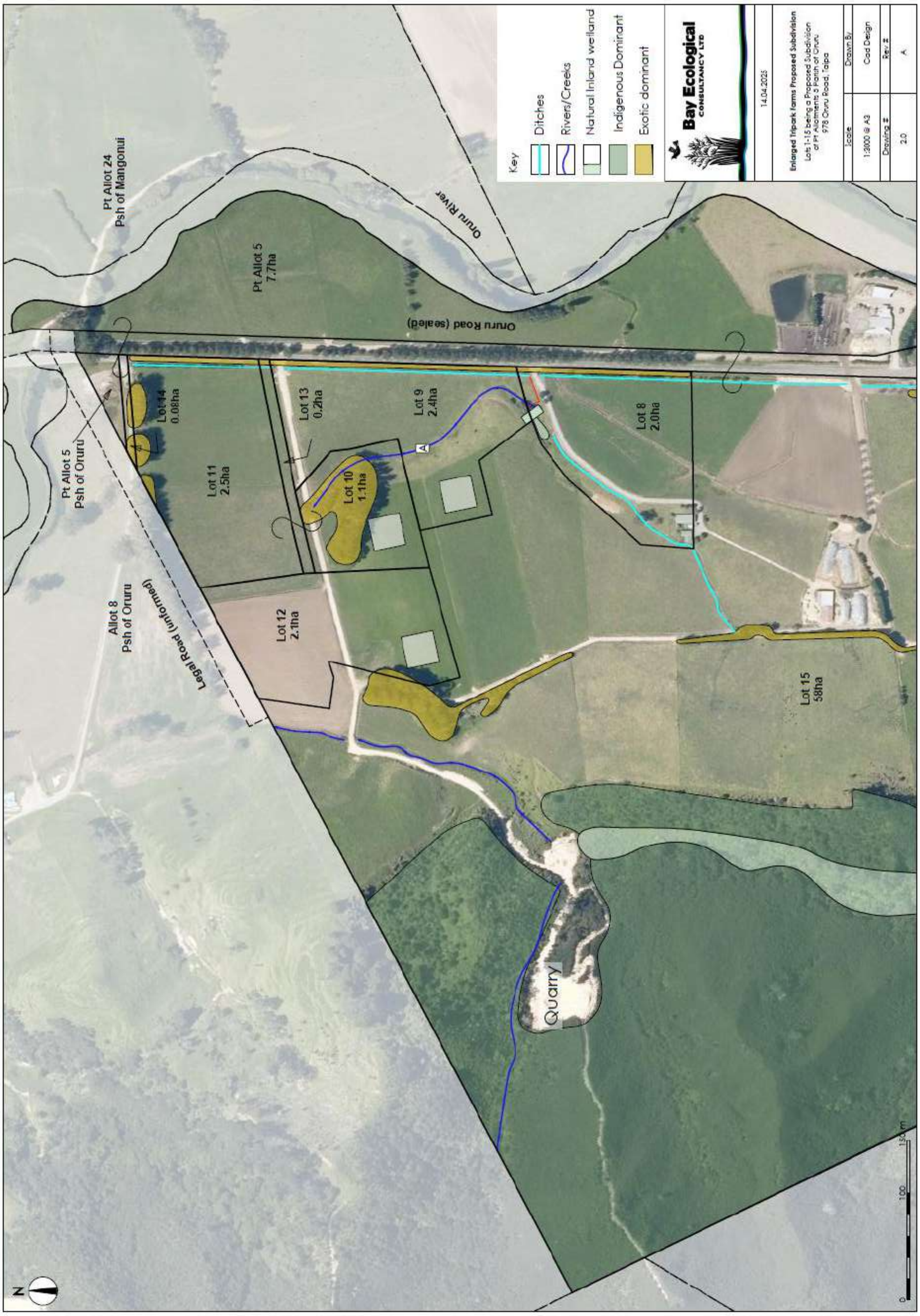
VINES

Blackberry *	
Cassytha paniculata	māwhai

LICHENS LYCOPODS BRYOPHYTES

Plants given as rare in Northland as per Wildlands (2012)
No orchids were observed

APPENDIX 2: SITE ECOLOGICAL FEATURES




N
Lot 15
58ha
3
DP 210717
1
DP 84876
Quarry
Pt Allot 5
0.7ha
Pt Allot 5
0.7ha
DP 143291
Lot 5
1.4ha
Lot 4
2.1ha
Jason Road
(metalled)
Lot 7
26.5ha
Lot 3
0
100
150 m
Key
Ditches
Rivers/Creeks
Natural Inland wetland
Indigenous Dominant
Exotic dominant
Bay Ecological
CONSULTANCY LTD
14.04.2025
Enlarged Tripark Farms Proposed Subdivision
Lots 1-15 being a Proposed Subdivision
of Pt Alotments 5 Parish of Oruru
970 Oruru Road, Taipa
Scale
Drawn By
1:3000 @ A3
Cad Design
Drawing #
Rev #
2.1
A


Pt Allot 5
11.0ha
Sec 1
SO 62852
1.2555ha
Pt Allot 5
1.9ha
Lot 1
2.0ha
Lot 2
1.1ha
Lot 3
2.7ha
2
DP 25959
Lot 6
24.6ha
Lot 7
26.5ha
Key
Ditches
Rivers/Creeks
Natural Inland wetland
Indigenous Dominant
Exotic dominant
Bay Ecological
CONSULTANCY LTD
14.04.2025
Enlarged Tripark Farms Proposed Subdivision
Lots 1-15 being a Proposed Subdivision of Pt Allotments 5 Parish of Oruru
978 Oruru Road, Taipa
Scale
1:3000 @ A3
Drawn By
Cad Design
Drawing #
2.2
Rev #
A
N
150 m

APPENDIX 3: SITE PHOTOS

MACHAERINA LOT 6; NZSEG#1003872 LOT 6 IS DEPRESSED WITHIN THE LANDSCAPE CONTAINS NATURAL INLAND WETLAND; BUILDING SITE PROPOSED LOT 6 ON HIGH DRY KNOLLUPPER EXTENT OF WETLAND GULLIES ON LOT 6 ADJACNT LOT 1DP84876

VIEW OVER PROPOSED LOT 3 HOUSE SITE HIGH DRY PASTURE;

PROPOSED LOT 7 HOUSE SITE

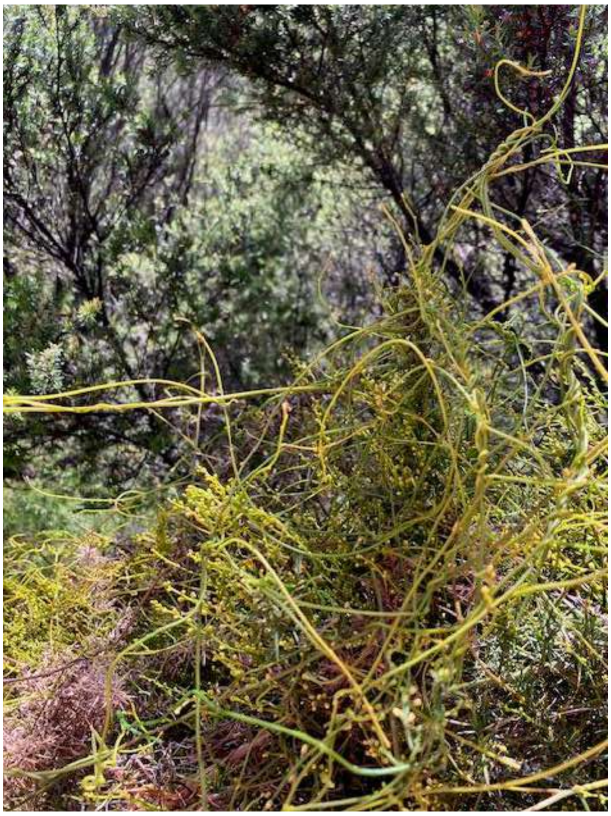
PROPOSED LOT 15 HOUSE SITE

CLOCKWISE :LOT 9 WETLAND ABOVE PROPOSED CROSSING ; LOT 9 WETLAND IN LOW GULLY; LOT 12 BUILDING SITE; LOT 10 BUILDING SITE; LOT 9 BUILDING SITE

LOT 4 BUILDING PLATFORM; LOTS 1 & 2 BUILDING PLATFORMS; PASPALUM DISTICHUM & ELEOCHARIS ACUTA COMMON THROUGHOUT SITE WETLANDS

LOT 15 WETLAND NEXT TO QUARRY TALLER STATURE SEDGES AND RIPARIAN BUFFER ; LOT 15 A3 TRIBUTARY NZSEG#1003681; SLENDER GULLY TREE FERN; TOTARA - BROADLEAVED DOMINANT SLOPE ADJACENT GULLY FERN IN MORE RECENT DISTURBANCE SLIP; QUARRY

CASSYTHA PANICULATA; MANUKA DOMINANT VEGETATION ABOVE THE QUARRY WITHOUT DIAGNOSTIC WETLAND SEDGES;



LOT 6 CREEK/ WETLAND; *ELEOCHARIS ACUTA(OBL); PASPALUM DISTICHUM (FACW)& PERSICARIA* WETLAND(FACW) LOT 7; *PASPALUM DISTICHUM & ISACHNE GLOBOSA* (OBL)WETLAND LOT 7

Attachment 6

Archaeological Survey and Assessment of 978 Oruru Road, Peria, Far North

Prepared for Grant and Karen Parker, Tripark Farms Ltd.

Justin Maxwell and Jennifer Huebert

Sunrise Archaeology Report No. 2024-25

April 2025

Sunrise Archaeology

Justin Maxwell & Jennifer Huebert

Phone 021 088 31418

Email jj@sunarc.co.nz

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Cover image: Portion of survey map central Oruru Valley, 1857 (SO1096). Source: LINZ.

1 Introduction

Grant and Karen Parker of Tripark Farms Ltd. commissioned this archaeological survey and assessment of part of their property at 978 Oruru Road, Peria, Far North (Figure 1). The legal description of the property is Pt Allotments 5 Parish of Oruru.

The landowners are proposing to subdivide land at this address. A final plan showing the proposed divisions, accessways, and house platforms was supplied for evaluation (Figure 2, and Appendix).

This purpose of this work is to record archaeological sites or remains in areas that could be affected by the proposed subdivision. It was also done to advise the landowner as to their obligations under the *Heritage New Zealand Pouhere Taonga Act 2014*, in respect to any affected archaeological sites. The survey was undertaken by Justin Maxwell on 3 December 2021. This report outlines the results.

Figure 1. Satellite imagery of project location in Oruru Valley. Source: Google Earth 2024.

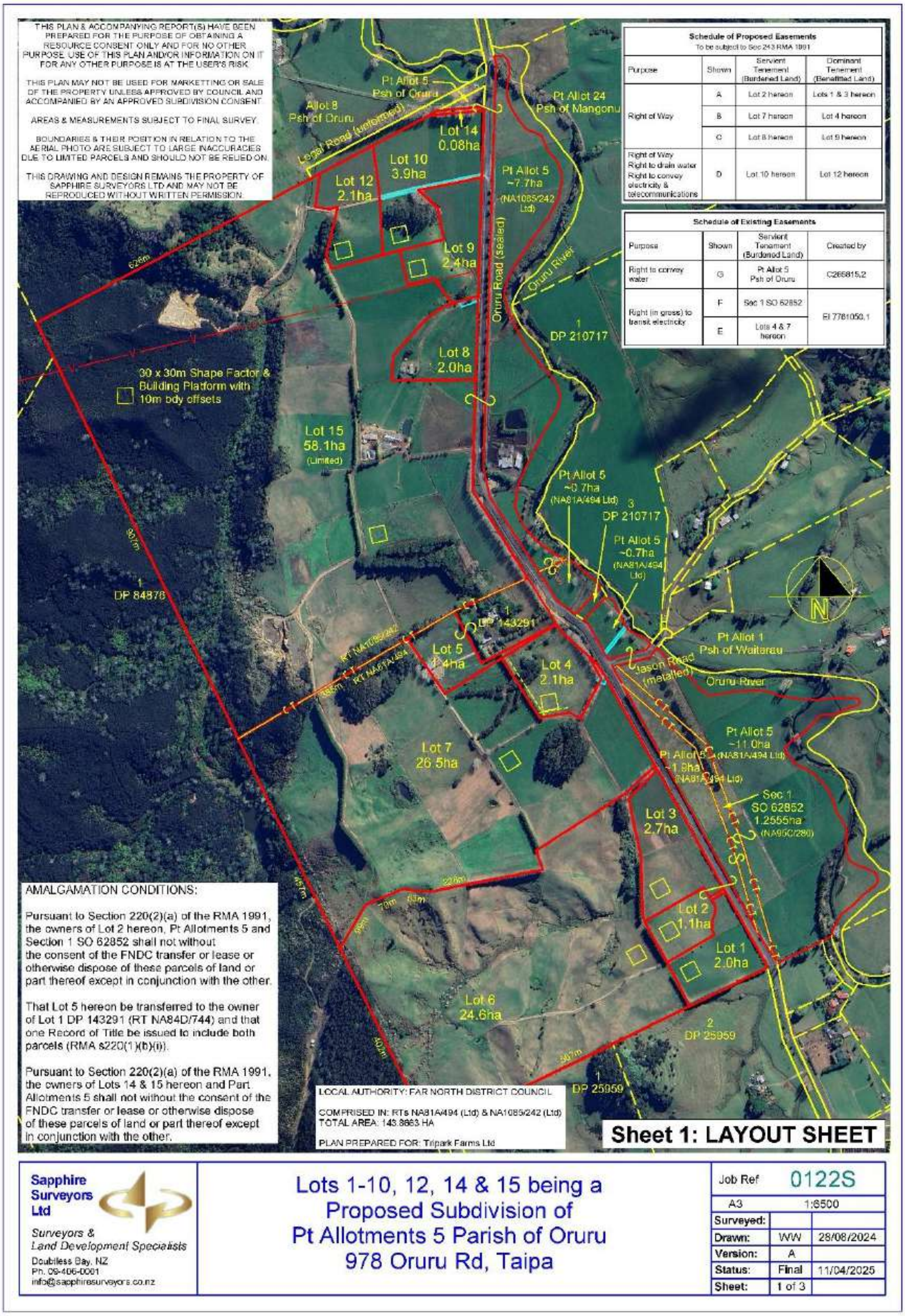

Figure 2. Final subdivision plan, dated 11/04/2025. Source: client.

2 Statutory Requirements

There are two main pieces of legislation in New Zealand that control work affecting archaeological sites. These are the *Heritage New Zealand Pouhere Taonga Act*, 2014 (HNZPTA), and the *Resource Management Act*, 1991 (RMA).

Heritage New Zealand Pouhere Taonga Act 2014 - Archaeological Provisions

Heritage New Zealand Pouhere Taonga (HNZPT) administers the *Heritage New Zealand Pouhere Taonga Act* (HNZPTA). All archaeological sites in New Zealand are protected under this act and may only be modified with the written authority of the HNZPT. The act contains a consent (commonly referred to as an "Authority") process for work of any nature affecting archaeological sites, which are defined as:

Any place in New Zealand, including any building or structure (or part of a building or structure), that:

> *(i) Was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where the wreck occurred before 1900; and*
>
> *(ii) Provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand; and*

(b) Includes a site for which a declaration is made under section 43(1)

Any person who intends carrying out work that may damage, modify, or destroy an archaeological site must first obtain an authority from the HNZPT (Part 3 Section 44). The process applies to archaeological sites on all land in New Zealand irrespective of the type of tenure. The maximum penalty in the HNZPTA for un-authorised damage of an archaeological site is $120,000. The maximum penalty for un-authorised site destruction is $300,000.

The archaeological authority process applies to all sites that fit the Heritage New Zealand definition, regardless of whether:

- The site is recorded in the New Zealand Archaeological Association (NZAA) Site Recording Scheme or registered/declared by the Heritage New Zealand Pouhere Taonga,
- The site only becomes known about as a result of ground disturbance and /or,
- The activity is permitted under a district or regional plan, or resource or building consent has been granted.

HNZPT also maintains a Register of Historic Places, Historic Areas, Wahi Tapu and Wahi Tapu Areas. The register can include some archaeological sites (though the main database for archaeological sites is maintained independently by the NZAA). The purpose of the register is to inform members of the public about such places and to assist with their protection under the *Resource Management Act, 1991*.

The Resource Management Act 1991 - Archaeological Provisions

The RMA requires City, District and Regional Councils to manage the use, development, and protection of natural and physical resources in a way that provided for the well-being of today's communities while safeguarding the options for future generations. The protection of historic heritage from inappropriate subdivision, use, and development is identified as a matter of national importance (section 6f).

Historic Heritage is defined as those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, derived from archaeological, architectural, cultural, historic, scientific, or technological qualities.

Historic heritage includes:

- historic sites, structures, places, and areas;
- archaeological sites;
- sites of significance to Māori, including wāhi tapu;
- surroundings associated with the natural and physical resources (RMA section 2).

These categories are not mutually exclusive, and some archaeological sites may include above ground structures or may also be places that are of significance to Māori.

Where resource consent is required for any activity, the assessment of effects is required to address cultural and historic heritage matters (RMA 4th Schedule and the District Plan assessment criteria (if appropriate).

3 Methodology

Sunrise Archaeology consulted local histories and other relevant archaeological literature in preparation of this assessment. The New Zealand Archaeological Association (NZAA) site recording scheme ArchSite (www.archsite.org.nz) was consulted to determine whether any previously known sites were present on or near the property. Historical land ownership records from LINZ, Archives New Zealand, and Turton's Index were consulted. Some historic records and reference texts were also reviewed.

Prior to the site visit, aerial photos and cartographic records were researched to indicate potential areas of interest. Old survey plans of the area were examined for information relating to early structures and infrastructure in the area.

Justin Maxwell then visited the project area on 18 and 24 September 2024. A foot survey, probing, shovel test, and drone reconnaissance was conducted in areas that were potentially of interest. Details of the survey are provided in Section 7.

This survey was conducted to locate and record archaeological remains. The survey and report do not aim to locate or identify wāhi tapu or other places of cultural or spiritual significance to Māori. Those assessments are to be made by Tangata Whenua, who may be approached independently for any information or concerns they may have.

4 Physical Setting

The Oruru Valley is essentially series of microenvironments that stretch from the montane forests of the Maungataniwha range in the south to the fertile floodplains to long stretches of consolidated dunes, ending in sand and mud banks at Doubtless Bay. This is a large alluvial river valley system, which was once wide and deep enough to support water travel from the coast to a long distance inland. The river is fed by numerous streams that create natural land divisions as they descend from the hills to the valley floor. Alluvial floodplains define the areas flanking the river, and above that are older floodplains (aggraded terraces) that feature well-drained soils, rising to ridges that define the valley.

Today, the vegetation of this valley largely follows an elevational gradient. The Oruru River is fringed by mangroves, which nearer to the river mouth can extend several hundred metres from the shore. On the surrounding flats and hills, there are large areas of grazed land. Higher elevations have plantation forests, and well-developed scrub and secondary vegetation formations.

The property of interest at 978 Oruru Road in Peria (see Figure 1) encompasses 143 ha, more or less, in the central valley bordering the Oruru River to the west. The eastern side of the property is grazed, and the western side is hilly land in scrub and bush. There are two quarried areas in the north- and central- western parts of the property, ~500 m from the road. There is a homestead approximately in the centre of the farm, which is on its own title (Lot 1 DP 143291).

The soils of the subject area are varied. The northwestern corner of the property is Hukerenui silt loam (HKH), a mudstone soil that is pale in colour, prone to gully erosion, and acidic with low fertility. The western third of the property is Waiotira clay (YCe), a young sandstone. These soils are prone to winter pugging, and have a high clay content in the topsoil which can cause landslide erosion.

The flatter eastern side of the property adjacent to the road and river is Mangakahia silt loam and clay loam (MF), which is an alluvial soil that occurs on floodplains. It is relatively fertile but can be impacted by flooding; pugging can cause the soil structure to collapse. The central swathe is Kohumaru clay (KM), a fertile terrace soil that occurs on alluvial fans which are now generally above the flood level. These soils can pug when wet and crack when dry; a hardpan can restrict drainage resulting in anaerobic conditions in this type of soil.

5 Background

5.1 Historical Background

Doubtless Bay / Tokarau has long been the homeland of Ngati Kahu (Wai-17 1988:1). They trace their ancestry to Parata, who arrived from Hawaiki and made his home at Taipa Beach. Major shellfish beds were nearby, and fresh water was readily available by digging in the sand at Taipa (Wai-17 1988:12-14).

By the eighteenth century, Taipa and the Oruru Valley were the most populous places in the area (Wai-17 1988:14). Early European explorers such as Captain James Cook and Jean-Francis-Marie de Surville visited Doubtless Bay, and whalers frequented the Bay and Mangonui, where Māori provisioned ships and provided flax and timber to traders. Māori farming in Oruru became heavily involved in trade with visiting ships, and were reported to have produced and sold more than two hundred tons of potatoes to passing vessels in 1840, with settlements at that time stretching ten miles up the Oruru River (New Zealand Advertiser, 13 August 1840).

Introduced diseases had a severe impact on the large Māori settlements in this area, which were greatly reduced in only a few decades. This led to numerous conflicts as other tribes attempted to take control of the area, and the last known battle took place at Taipa in 1843. Māori continued to occupy and cultivate the land, while the Crown acquired the large Oruru Block in 1856 (Turton 1877b:3-4). Missionaries and more settlers eventually arrived in the area. The remaining Ngati Kahu eventually regrouped farther out in Peria-Parapara, Karikari, and points farther east and west (Wai-17 1988:1-2; 20-24).

In the later nineteenth century, timber milling and gum-digging became local industries in the area, but growth slowed as economic centres developed elsewhere. Farming then became the major activity. Improvements such as sealed roads and electricity came to Doubtless Bay residents relatively late (Wai-17 1988:12-13). Today, the area is farmland with some locations in pine plantations, or regenerating bush, with small communities scattered throughout the valley.

5.2 Historical Land Ownership

A map of 1858 land divisions in the valley (Figure 3) shows the subject property was part of an 800-ac land parcel surveyed for JJ and S&R Campbell, one of whom was a surveyor for the government. Their map which included the project area (SO 1096, Figure 4) delineates Lot 5, describing it as rugged and hilly to the west, "Clay Range" running north-south through the central area with a footpath to Victoria Valley and Hokianga, and rich land near the river. Rectangular cultivation areas are marked out just across the Oruru River.

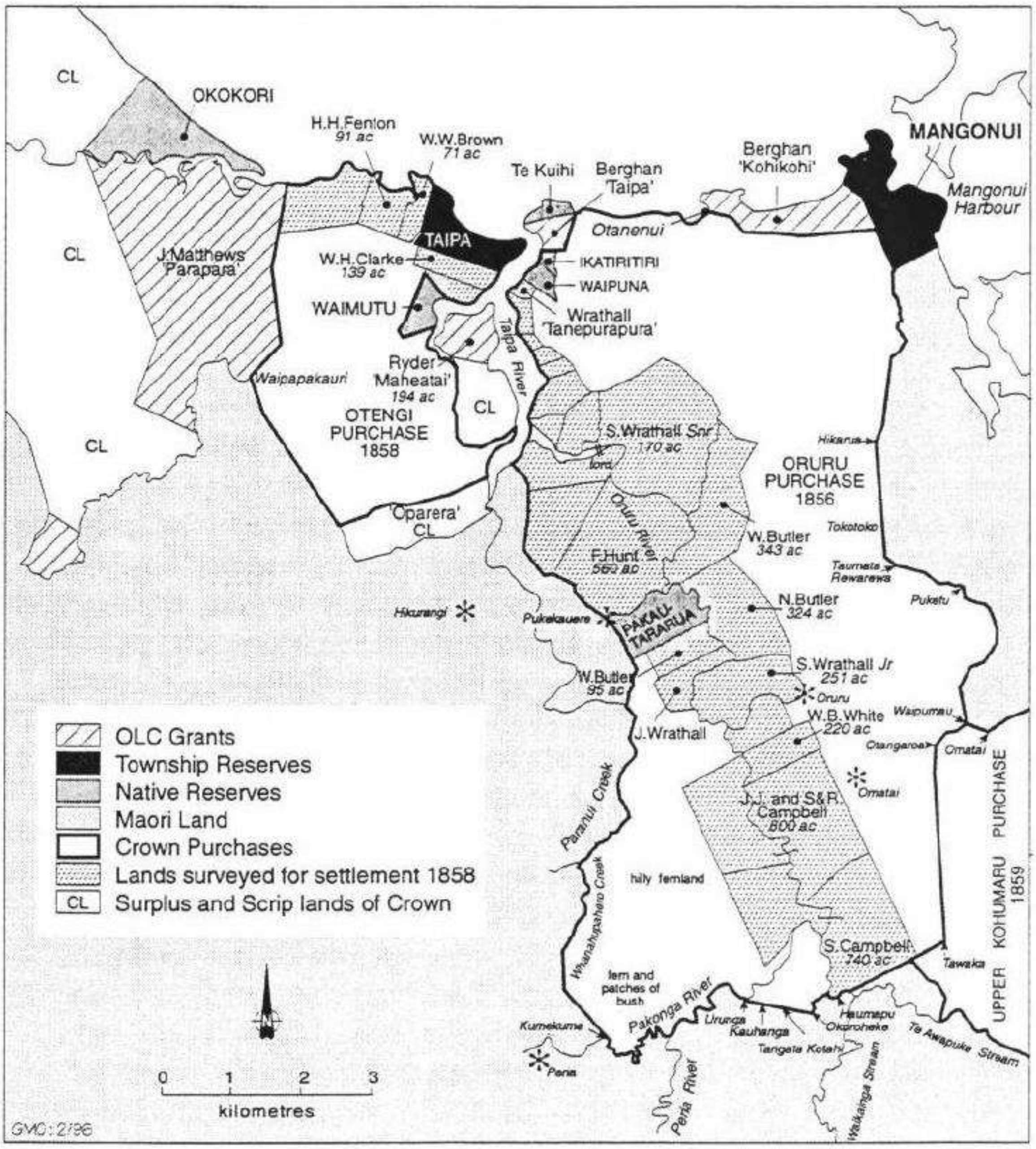

Figure 3. Oruru Valley and area land divisions in 1858. Project area is part of JJ and S&R Campbell 800-ac section to south. Source: Wai-45 (1997:Fig. 40).

Figure 4. Portion of survey map of lots in central Oruru Valley, by S. Campbell, Sr., 1857 (SO1096). Subject property is part of Lot 5, pictured. Source: LINZ.

6 Previous Archaeology

The most significant archaeological survey work done in Oruru was a 1983-4 pedestrian survey which covered much of the Valley and the Taipa River mouth, conducted by Johnson (1986), wherein over one thousand sites were described. Site types found included numerous terraces and pits, approximately 60 pā, 30 open settlement sites, 13 burial locations, earth ovens, stone mounds, and agricultural features. It is of note that Māori horticultural drainage systems were once extensive here, especially on the floodplains, and drains can be seen today on historical aerial photographs as a network of mainly linear depressions with different structural components.

The area of interest west of the Oruru River has been the subject of one known prior archaeological investigation. Clough and Associates (2013) recorded a series of pā, pits, and extensive terracing west of the river in 2013, primarily by reviewing historical aerial imagery. These sites were recorded in the NZAA Archsite database; no associated report was located.

The present property has (according to Archsite) four previously recorded archaeological sites (Figure 5, Table 1). Numerous other sites are present all along the Oruru Valley from Taipa to Peria. Site types include pā, extensive terracing, pits, midden, and other features and finds. Most of the recorded archaeological features could readily identified by reviewing historical aerial imagery.

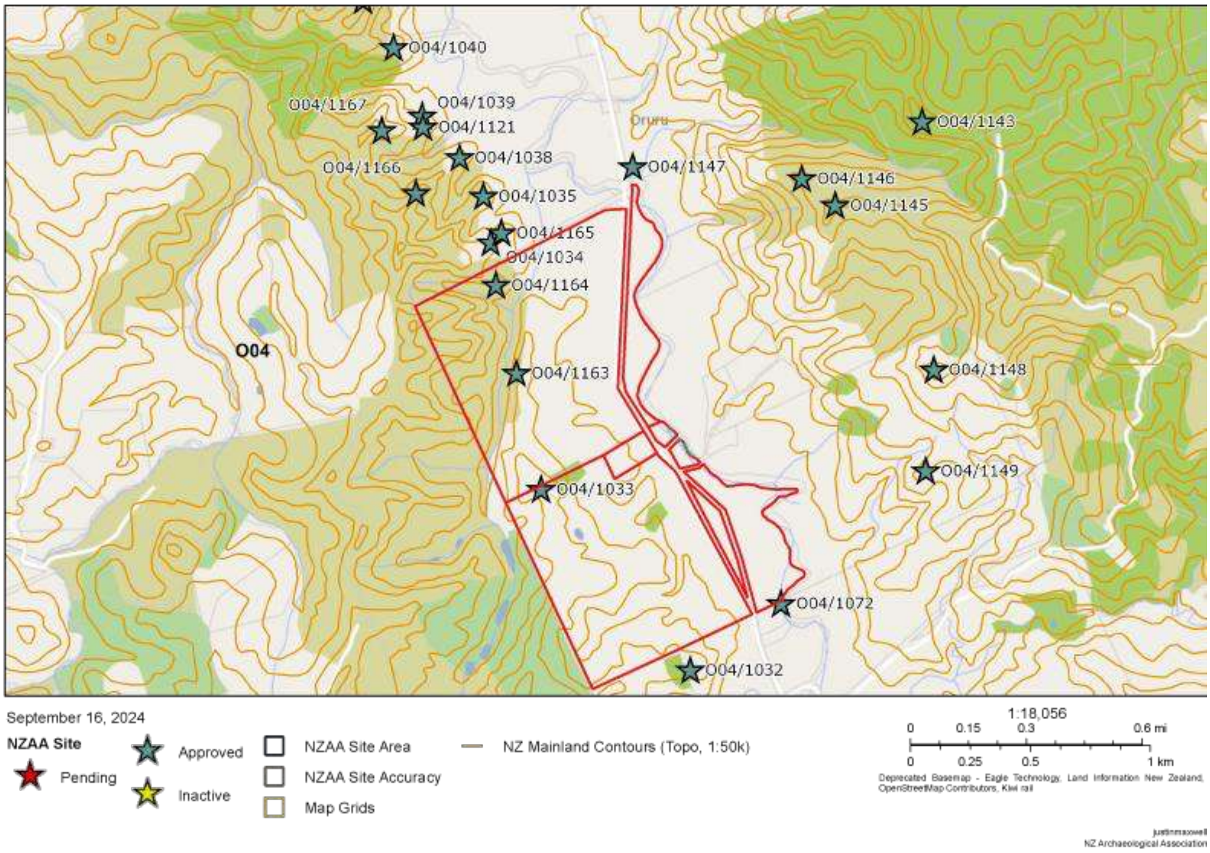

Figure 5. Recorded archaeological sites on or in the vicinity of the project area. Source: NZAA Archsite (www.archsite.org.nz).

Table 1. Recorded archaeological sites in the vicinity of the project area. Starred sites are in the project area. Source: NZAA Archsite.

NZAA Site Number O04/	Site Type	Year Recorded	Description
1032*	Pā	2013	Ridge pā (needs ground truth)
1033*	Pits and terraces	2013	Series of pits and terraces on ridge
1034*	Pā	2013	Pā above 1165
1035	Pits and terraces	2013	Series of pits and terraces on ridge
1038	Pits and terraces	2013	Series of pits and terraces on ridge
1072*	Find spot	2019	Carving in drain
1121	Terrace	2021	Single terrace
1146	Pā	2023	Covered in bush
1147*	Swamp pā	2023	Visible in aerials
1163*	Pā	2023	Ridge pā (needs ground truth)
1164*	Pā	2023	Ridge pā (needs ground truth)
1165?	Pā	2023	Large ridge pā
1166	Pā	2023	Ridge pā
1167	Pā	2023	Ridge pā

6.1 Site O04/1032 (Ridge pā)

A ridge pā and terraces, partly covered by vegetation. Pā was only described from roadside and has not been ground truthed.

6.2 Site O04/1033 (Terraces and pits)

A series of four terraces and pits running down an east-running spur. The site was noted as bisected by a farm track, and a fifth pit/terrace was in scrub to the west of a farm track. Site was in fair condition when recorded in 2013, with some stock damage.

6.3 Site O04/1034 (Ridge pā)

A ridge pā described in 2013 from a roadside visit. Aerial images suggest two pā are present in this location. The site is clearly visible in aerial images but has never been ground truthed.

6.4 Site O04/1072 (Find spot)

A wooden carving 1.5 m in length and 30 cm wide; of a stylised human form. The carving was recovered from a deep drain.

6.5 Site O04/1147 (Swamp pā)

A swamp pā. This site was recorded during a desktop survey of the Oruru valley by the author. The site is clearly visible in aerial images but has never been ground truthed. previously it had been described but not added to the NZAA Archsite scheme in 1984.

6.6 Site O04/1163 (Ridge pā)

A ridge pā. This site was recorded during a desktop survey of the Oruru valley by the author, previously it had been described but not added to the NZAA Archsite scheme in 1984. The site is clearly visible in Lidar images but has never been ground truthed.

6.7 Site O04/1164 (Ridge pā)

A ridge pā. This site was recorded during a desktop survey of the Oruru valley by the author; previously it had been described but not added to the NZAA Archsite scheme in 1984. The site is clearly visible in aerial images but has never been ground truthed.

6.8 Site O04/1165 (Ridge pā)

A ridge pā, possibly a continuation of the upper pā (O04/1034). This site was recorded during a desktop survey of the Oruru valley by the author, previously it had been described but not added to the NZAA Archsite scheme in 1984. The site is clearly visible in aerial images but has never been ground truthed.

7 Site Visit

Justin Maxwell visited the project area on 19 and 24 September 2023, accompanied by the landowner at the start of the survey. The weather was good. Visibility of the ground surface was good in grazed areas; in some areas it was, however, poor due to vegetation cover, regenerating bush, and the steepness of the terrain.

The primary areas investigated were those in proximity to recorded sites, around the two existing quarry sites, and the proposed building platforms. All areas which were not covered in bush or vegetation that might be affected by the proposed subdivision were surveyed. Each of the proposed building platforms and surrounding areas were assessed for above-ground archaeological features, including reviewing drone images. Shovel tests and limited probing was also undertaken to determine whether subsurface archaeological material was present.

The two quarries are on ridges, and both are adjacent to archaeological sites. The quarry activities do not currently affect any archaeological features; both are described below.

An overview of property, location of recorded archaeological sites, and areas of surveyed archaeological features for this project are shown in Figure 6. The findings are described in more detail below.

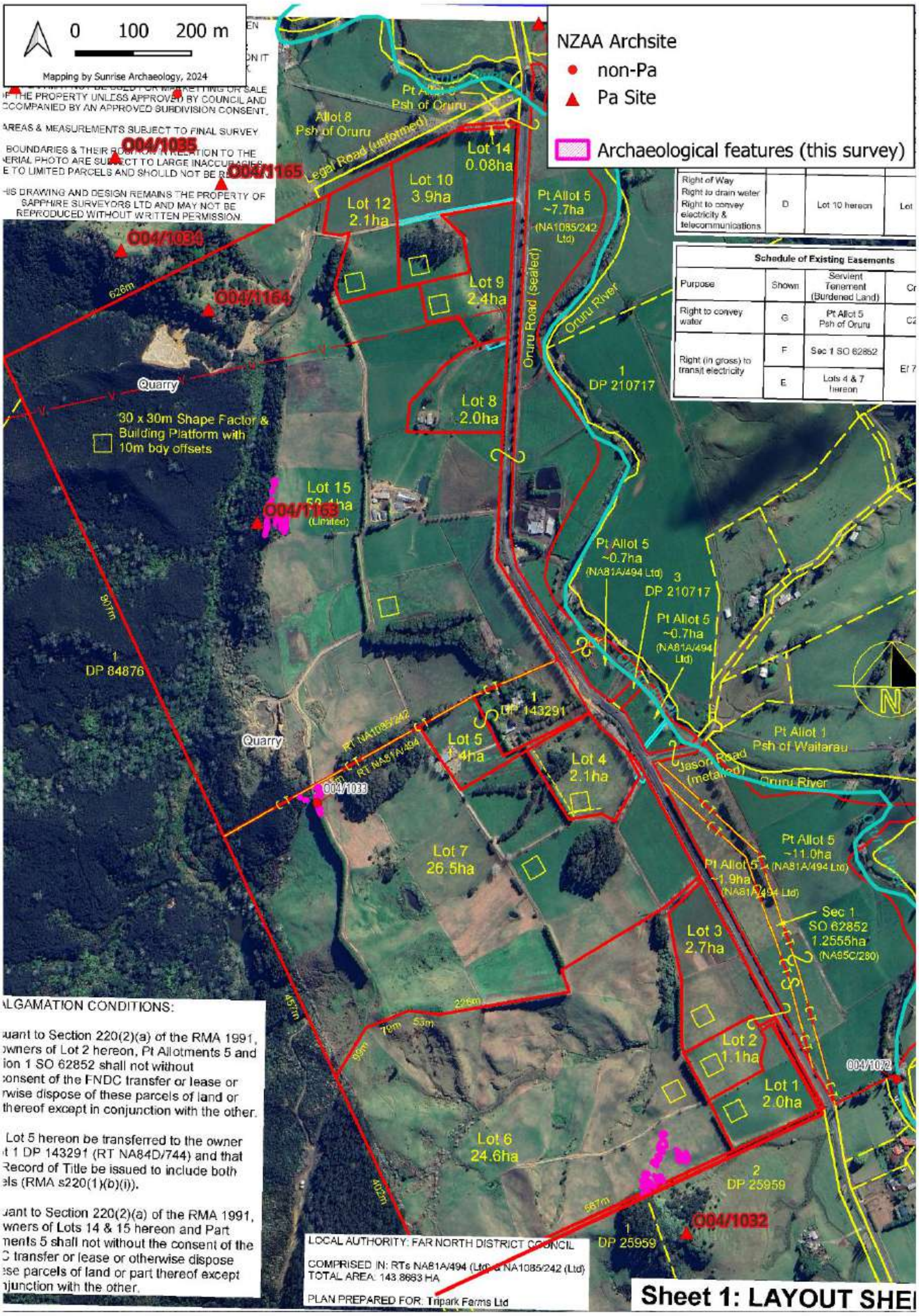

Figure 6. Overview of property, recorded archaeological sites, and areas of surveyed features. Base figure: Provided by client (finalised April 2025).

7.1 Building platforms - proposed Lots 9, 10, and 12

The three proposed building platforms in these lots are in the northeast corner of the proposed subdivision. Each lot is level ground, currently in pasture. The lots are on a raised natural plateau. Soils in the area are 10-20 cm deep, with clay below.

No archaeological features were noted, and no indications of subsurface material were identified.

Figure 7. Proposed Lot 9. Facing south.

Figure 8. Proposed Lot 10, centre of image. Facing east.

Figure 9. Proposed Lot 12. Side-by-side in approximate area of building platform.

7.2 Northern quarry, and Pā Site O04/1164

This quarry is located in the northwest corner of the property (Figure 10). It is surrounded by regenerating bush and scrub. The immediate area was surveyed, including walking the perimeter of the quarry where it was practical. The drone was also deployed over the quarry to determine whether any features were present, and to examine the extent of pā Site O04/1164.

The regenerating bush to the north of the quarry, towards the pā, is on the opposite side of a creek. It was largely impenetrable and therefore not surveyable on foot. The pā (O04/1164) and an adjacent pā (O04/1034) and their associated terraces are likely to extend to the base of the creek, as Lidar imagery (Figure 11) suggests, which is the northern boundary of the quarry area.

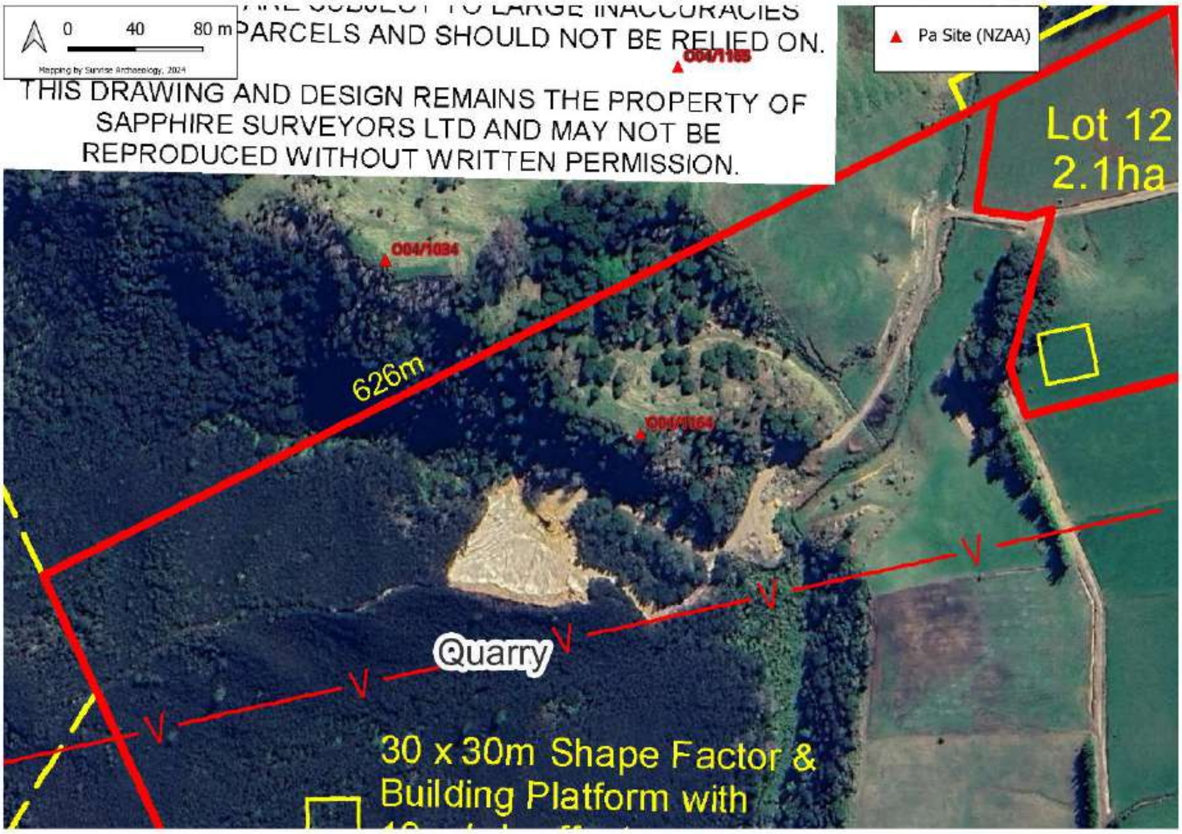

Figure 10. Closeup of proposed subdivisions and archaeological sites near northern quarry. Base figure: Provided by client.

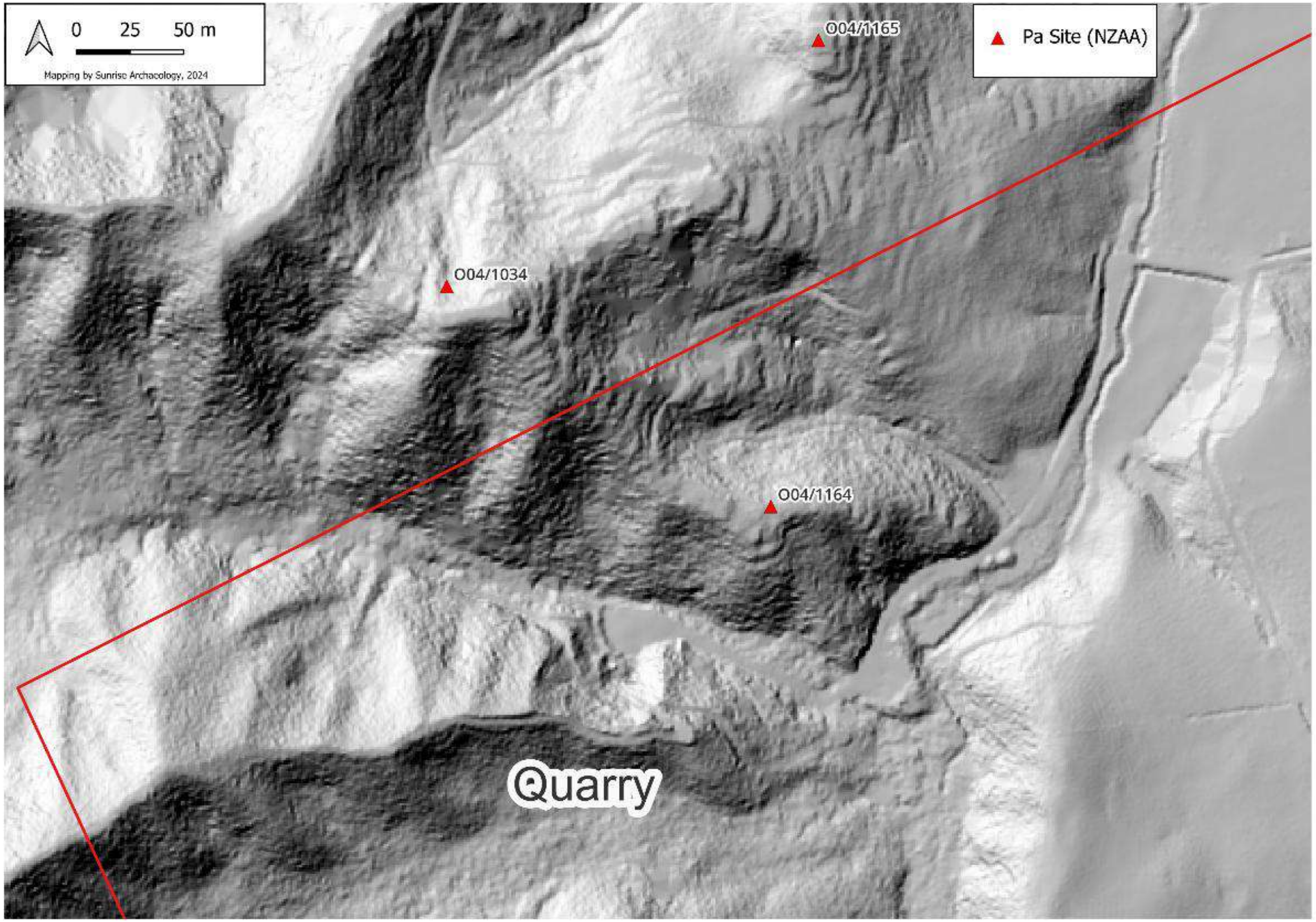

Figure 11. Lidar of pā sites O04/1164, 1034, and 1165, showing evidence of terracing under forest.

Figure 12. Regenerating bush on north side of quarry.

Figure 13. Aerial view of hillside at northeast corner of property and to east of quarry. Note terraces on upper slope and small possible pā across boundary. Facing north.

Figure 14. Quarry and ridgeline. Facing southwest.

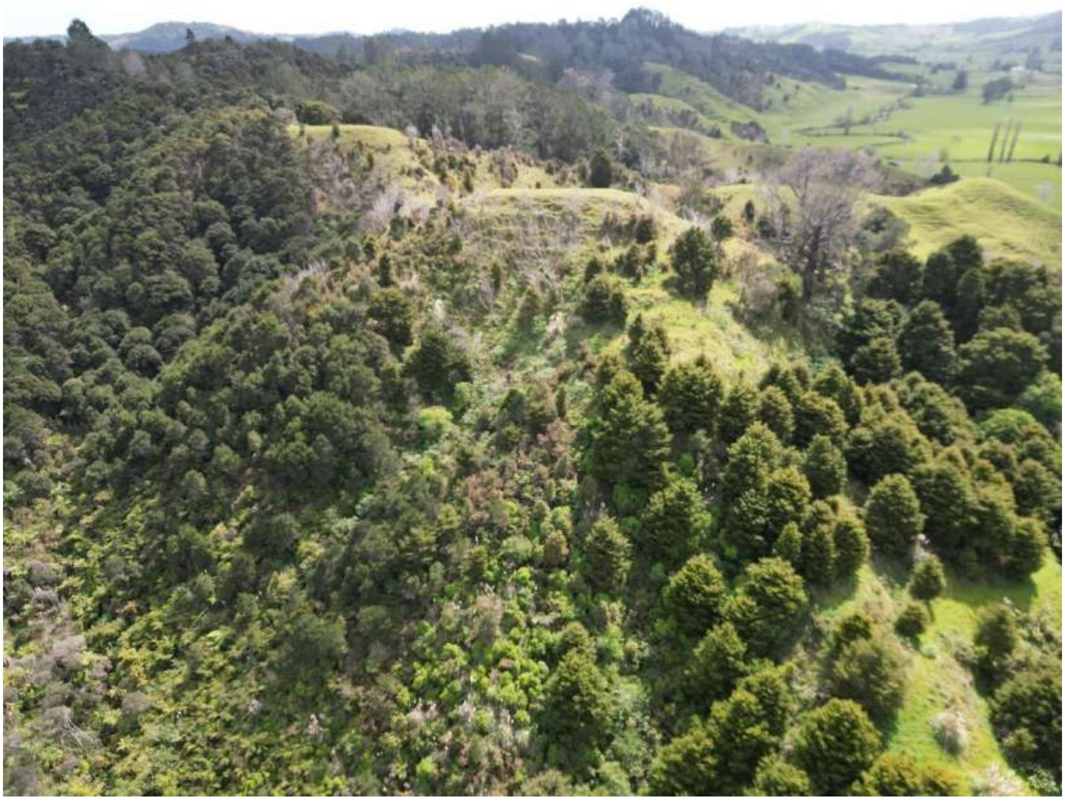

Figure 15. Pā Sites O03/1034 and 1164 below.

Figure 16. Another view of Pā O03/1034 and 1164 below.

Figure 17. Pā O03/1164, grassed area on high ground and quarry entrance.

Figure 18. Pā Site O03/1034 from above.

Figure 19. Upper ridge of quarry.

Figure 20. Upper ridge of quarry, facing west.

7.3 <u>Building platform - proposed Lot 15</u>

This proposed building platform is 200 m southeast of Pā Site O04/1163, and 200 m west of Oruru Road, in the centre of the proposed subdivision. The lot is level ground, currently in pasture. Soils in the area are 20-30 cm deep, a silty clay, overlaying a clay pan. No archaeological features were noted, and no indications of subsurface materials were identified.

Figure 21. Proposed building platform, Lot 15. Facing west. Scale units: 20 cm.

Figure 22. Proposed building platform, Lot 15. Facing east. Scale units: 20 cm.

7.4 Pā Site O04/1163

This pā and associated terraces and pits is located on a high ridge overlooking the valley. It is a small pā with a steep natural defence on the west side, a now largely infilled ditch and bank on the north side, and a series of three defensive terraces on the east side (Figure 23, Figure 24). The southern end of the pā is under scrub and gorse and could not be surveyed.

The pā is in good to poor condition, having been modified by erosion, farming practices, and tree fall.

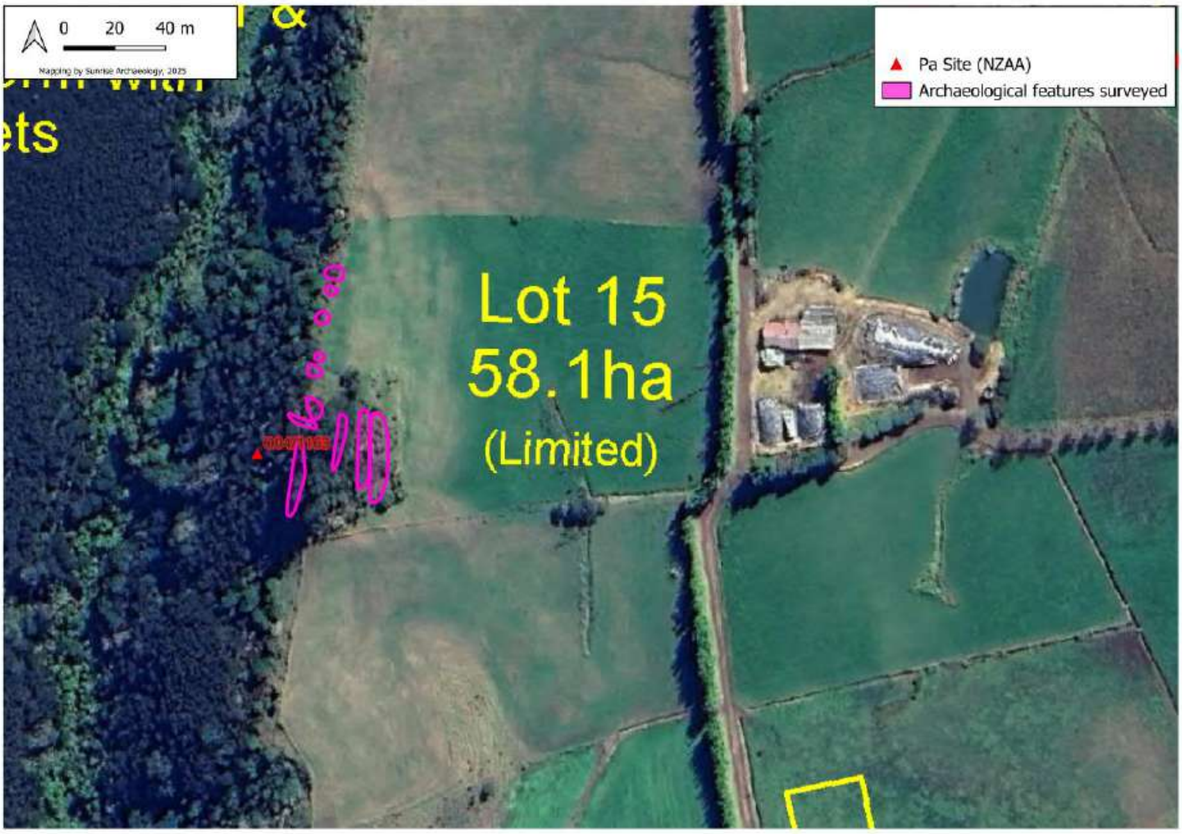

Figure 23. Closeup of surveyed archaeological features at Pa Site O04/1163, and proposed building platform for Lot 15 (lower right). Base figure: Provided by client.

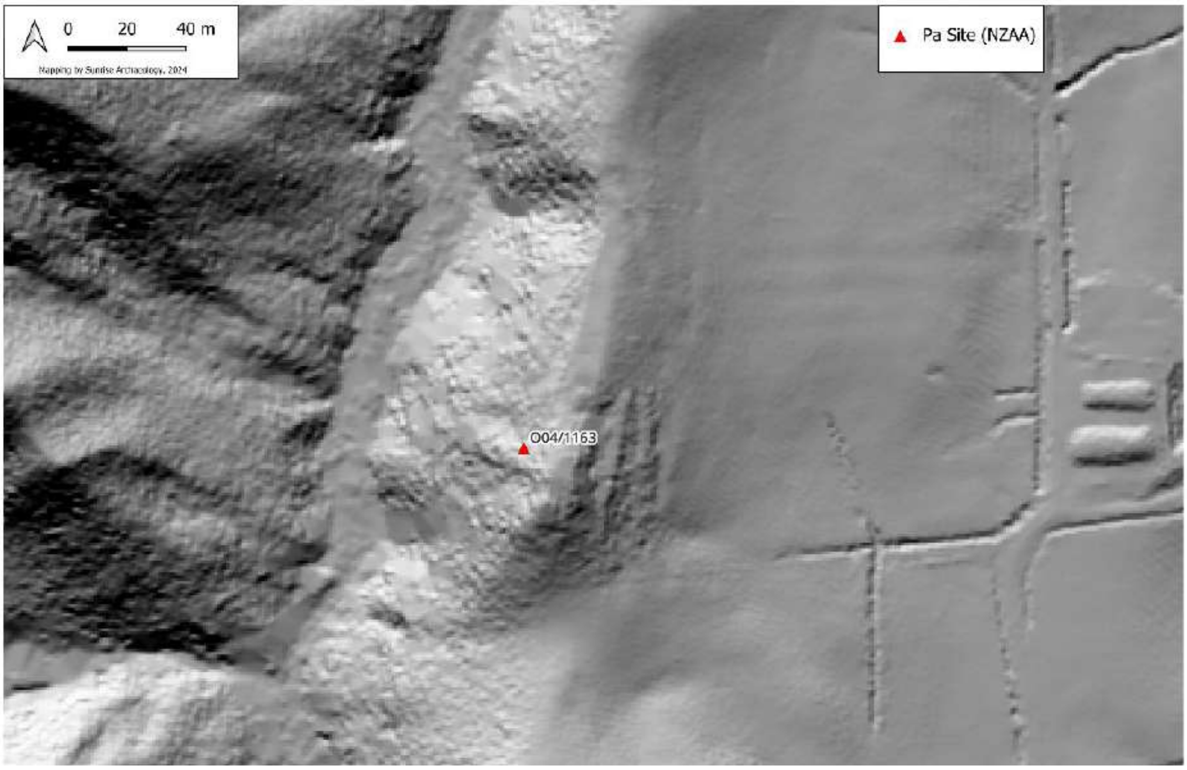

Figure 24. Lidar of Pā O04/1163, showing features of site.

Figure 25. Pā Site O04/1163, under trees and scrub. Facing west. Scale units: 20 cm.

Figure 26. Pā Site O04/1163, under trees and scrub, from above. Top of image is west.

Figure 27. Pā Site O04/1163. Lower large terrace on east side of pā. Facing south. Scale units: 20 cm

Figure 28. Pā O04/1163. Upper large terrace on east side of pā. Facing south. Scale units: 20 cm.

Figure 29. Pā O04/1163. Another view of upper large terrace on east side of pā. Facing south. Scale units: 20 cm.

Figure 30. Pā Site O04/1163. Pits and terraces on north side of ridge. Facing north. Scale units: 20 cm.

Figure 31. Pā Site O04/1163. Another view of pits and terraces on north side of ridge. Facing northwest. Scale units: 20 cm.

Figure 32. Pā O04/1163. Pits and terraces on north side of ridge. Facing northwest. Scale units: 20 cm.

Figure 33. Pā O04/1163. Another view of pits and terraces on north side of ridge. Facing south. Scale units: 20 cm.

Figure 34. Pā site O04/1163. Wider view of pits and terraces on north side of ridge. Facing south. Scale units: 20 cm.

Figure 35. Pā O04/1163. Vegetation covering south side of ridge. Facing south. Scale units: 20 cm.

Figure 36. Pā O04/1163. Upper platform vegetation. Facing north.

Figure 37. Pā Site O04/1163, pits and terrace. Facing north.

Figure 38. Pā Site O04/1163, another view of pits and terrace. Facing north.

7.5 Terraces and pits, Site O04/1033, and central quarry

Terraces and pits were recorded on both sides of the farm access track in this area (Figure 39). On the eastern side, the pits and terraces are in pasture. On this side of the road, these features are in poor condition having been modified by erosion and stock damage.

On the western side of the road, the terraces and pits are under regenerating native bush and scrub and not all of the area was surveyable due to vegetation cover. The pits that were recorded are in good condition, compared to those on the opposite side of the road.

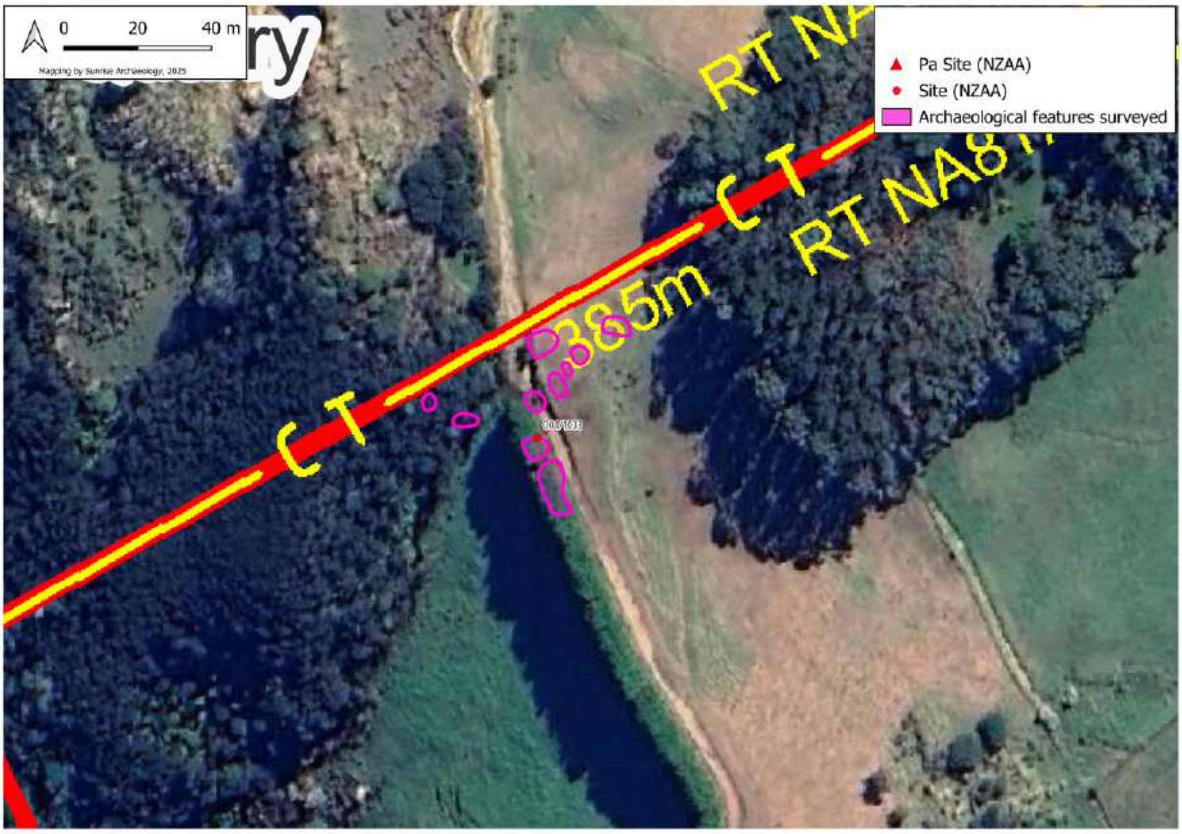

Figure 39. Closeup of surveyed archaeological features at site O04/1033, near central quarry. Base figure: Provided by client.

Figure 40. Terrace and possible pit, north side of hill. Facing southeast. Scale units: 20 cm.

Figure 41. Another view of terraces and possible pits, north side of hill. Facing southeast. Scale units: 20 cm.

Figure 42. Terraces and possible pits, south side of hill. Facing east. Scale units: 20 cm.

Figure 43. Pits on west side of farm track. Facing northeast. Scale units: 20 cm.

Figure 44. Pits on west side of farm track. Facing north. Scale units: 20 cm.

Figure 45. Another view of pits on west side of farm track. Facing north. Scale units: 20 cm.

7.5.1 Central quarry

This quarry is located on the northern flank of a large hill, 150 m north of the terrace Site O04/1033. The edges of the quarry were walked, and the general area was surveyed as practical using a drone. The surrounding area is in a mix of pasture and scrub and if features were present, they would have been identifiable. No archaeological features were noted in the vicinity of this quarry.

Figure 46. Central quarry. Facing southwest.

Figure 47. Another view of central quarry. Facing southwest.

Figure 48. Aerial view of central quarry. Top of image north.

7.6 Building platform - proposed Lot 7

The proposed building platform is located 250 m west of Oruru Road, in the centre of the proposed subdivision. The lot is level ground, currently in pasture. Site O04/1033 is 380 m to the west. Soils in the area are 20-30 cm deep; a silty clay, overlaying a clay pan. The building platform is on a large natural terrace above the lower river flat terrace. No archaeological features were noted, and no indications of subsurface material was identified.

Figure 49. Lot 7, proposed building platform. Facing north.

Figure 50. Lot 7, another view of proposed building platform. Facing northwest. Scale units: 20 cm.

7.7 Building platform - proposed Lot 4

The proposed building platform is located 120 m west of Oruru Road in the centre of the proposed subdivision. The lot is level ground, currently in pasture. Soils in the area are 20-30 cm deep, a silty clay, overlaying a clay pan. The building platform is on a large natural terrace above the lower river flat terrace. No archaeological features were noted, and no indications of subsurface material was identified.

Figure 51. Lot 4, proposed building platform. Facing northeast. Scale units: 20 cm.

Figure 52. Lot 4, proposed building platform. Facing northwest. Scale units: 20 cm.

7.8 Building platforms - proposed Lot 6

One building platform is proposed within Lot 6. The proposed platform is on roughly level ground. No features were identified within the proposed building platform.

7.8.1 Lot 6, platform

The proposed building platform is located 210 m west of Oruru Road, at the southern end of the proposed subdivision. The lot is fairly level ground, currently in pasture, with a creek to the northwest of the proposed building platform. The closest feature of Site O04/1032 is 60 m to the southwest. Soils in the area are 20-30 cm deep; a silty clay, overlaying a clay pan. The proposed platform is on a large natural terrace, which slopes down to a creek. No archaeological features were noted, and no indications of subsurface material was identified.

Figure 53. Lot 6 north. Facing east. Scale units: 20 cm.

Figure 54. Lot 6, facing southwest toward Pā Site O04/1032.

Figure 55. Lot 6. Facing northeast.

Figure 56. Lot 6, view south of building platform looking toward terraces and Pā Site O04/1032. Distant stadial rod is on first terrace. Scale units: 20 cm. Facing southwest.

7.9 Pā and associated terraces, Site O04/1032

Pā O04/1032 extends into Lot 6 (Figure 57), and covers a large area of this paddock. It does not extend into the proposed building platform on this lot.

The majority of the features that make up this site had not been previously recorded, and many remain unrecorded as they are on the neighbouring property. Aerial imagery and Lidar (Figure 58) indicate there are numerus terraces on the neighboring property which are part of this site complex. Most of the defended pā is on the neighbouring property and was surveyed from the fence line. It appears to be in good condition.

Within the project area, there are 13 small to large terraces covering an area 110 m north-south and 60 m east-west. The light conditions and long grass made it difficult to determine features from the drone imagery taken during the survey, but Lidar (see Figure 58) provided more details. This series of terraces are also in good condition but, as expected, they have been modified by farming practices. The terraces on the north-facing ridge here are likely the remnants of a medium-sized kāinga (village) associated with the pā; given the variety of sizes present and their orientation they are likely to be a mixture of garden and house terraces.

Overall, it is estimated that the entire pā and associated terraces that constitute Site O04/1032 cover an area ~350 m by 250 m.

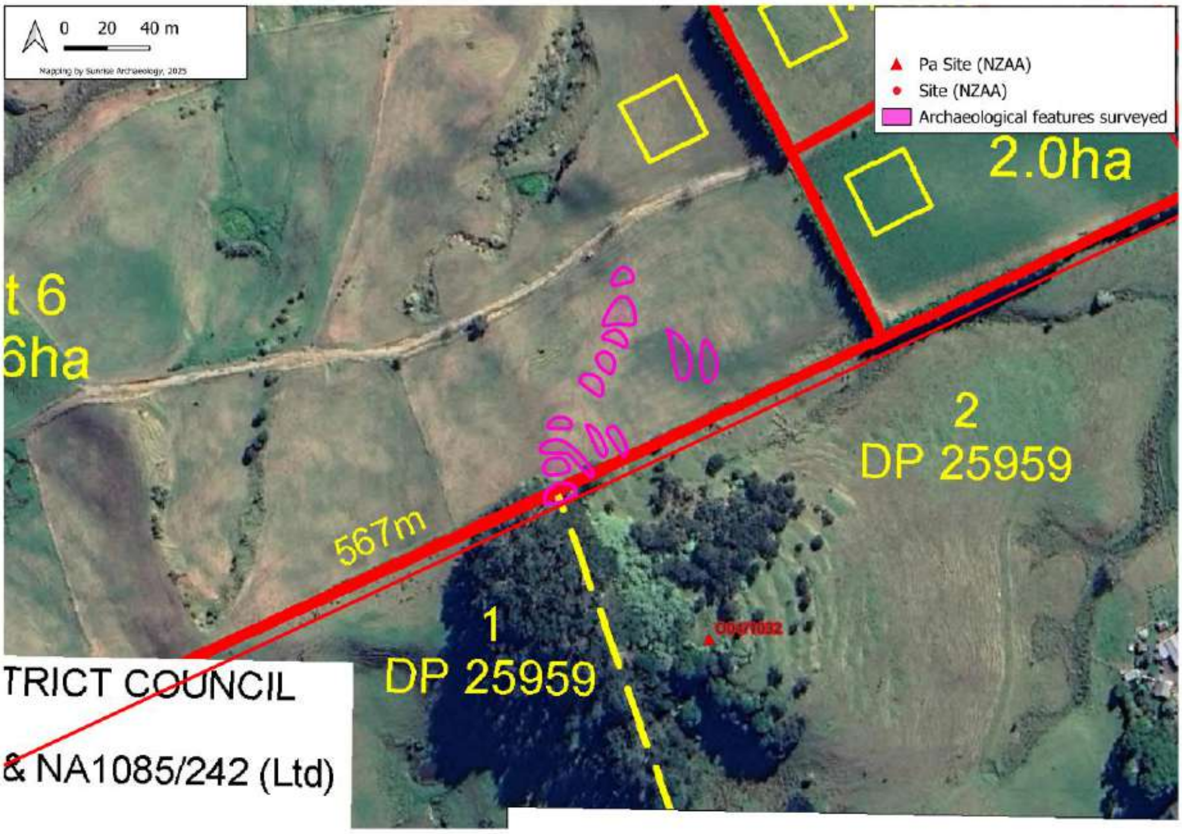

Figure 57. Closeup of surveyed archaeological features at Pa Site O04/1032, and proposed building platforms. Base figure: Provided by client.

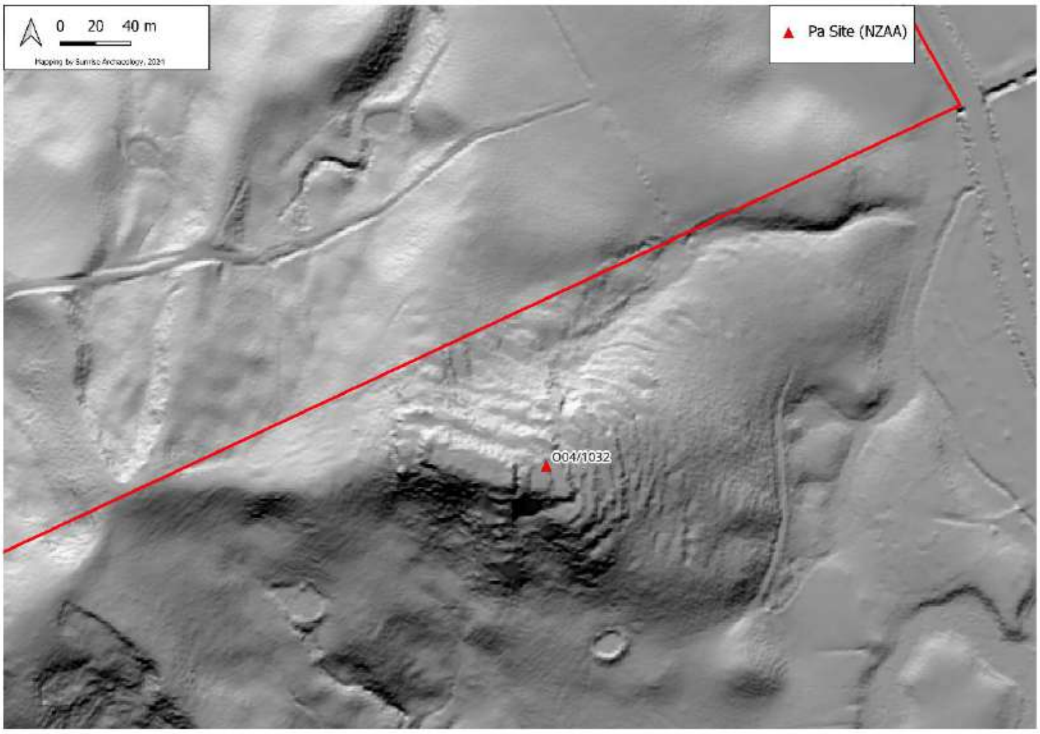

Figure 58. Lidar of Pā Site O04/1032, showing terraces extending into Lot 6.

Figure 59. Area in red encloses the 13 terraces of Pā O04/1032. Facing southwest.

Figure 60. Defended portion of Pā O04/1032 is under trees. Facing south.

Figure 61. High point of paddock, upper terraces of O04/1032. Facing north.

Figure 62. Lower terraces with defended pā of O04/1032 in background. Scale units: 20 cm.

Figure 63. Lower terraces of O04/1032. Facing north. Scale units: 20 cm.

7.10 Building platforms - proposed Lots 1, 2, and 3

These proposed building platforms are 120 m west of Oruru Road, at the southern end of the proposed subdivision. Archaeological Site O04/1032 is over 120 m to the west. The lots are on level ground, currently in pasture. The building platforms are all on a large natural terrace which is above the river flats (Figure 64). Soils in the area are 20-30 cm deep, consisting of a silty clay overlaying a clay pan. No archaeological features were noted, and no indications of subsurface material was identified.

Figure 64. Proposed building platforms 1-3 on right side of three paddocks. Facing south.

7.10.1 Lot 1

Figure 65. Proposed building platform, Lot 1. Facing northwest. Scale units: 20 cm.

Figure 66. Proposed building platform, Lot 1. Facing east. Scale units: 20 cm.

7.10.2 Lot 2

Figure 67. Proposed building platform, Lot 2. Facing west. Scale units: 20 cm.

Figure 68. Proposed building platform, Lot 2. Facing east. Scale units: 20 cm.

7.10.3 Lot 3

Figure 69. Proposed building platform, Lot 3. Facing north. Scale units: 20 cm.

Figure 70. Proposed building platform, Lot 3. Facing northwest. Scale units: 20 cm.

8 Archaeological Significance

Heritage New Zealand Pouhere Taonga requires certain matters to be taken into account when assessing the archaeological value or significance of an archaeological site. These are: condition; rarity, unusualness, uniqueness; the context; information potential; amenity potential; and any cultural associations (HNZPT 2014).

Four archaeological sites were previously recorded on the property. O04/1164 is a large and complex pā and terrace site, which extends into the neighbouring property to the north. Site O04/1163 is a small defended pā and pit and terrace complex. Site O04/1033 is a series of pits and terraces. Site O04/1032 is also a large and complex pā and terrace site, which extends to the south into the neighbouring property. It has been determined that these four sites are still present on the property. They are on ridges and/or high points. The sites are evaluated to be in poor to good condition, mainly due to stock damage and erosion.

The sites found on this property, and the numerous other recorded sites in this area, form an extensive archaeological landscape. Overall, the presence of numerous archaeological sites in the surrounding area make the Oruru Valley one of the most intensive pre-contact archaeological landscapes in New Zealand, and provide evidence these lands were once home to a large Māori population.

Table 2. Archaeological significance assessment.

Sites O04/	Criteria	Assessment
1163, 1164, 1032, 1033, **Pā, pits, and terraces**	Condition	Poor/Good. All sites are on medium ridges which have been damaged by stock and erosion.
	Rarity/ Uniqueness	Pā, pits, and terraces are common components of pre-contact Māori settlement of the Oruru Valley.
	Contextual Value	These sites have value as part of the extensive archaeological landscape of the Oruru Valley. They provide evidence of Māori use of what was once a well-populated area.
	Information Potential	The sites have medium-high information potential due to the intactness of the landscape.
	Amenity Value	Being on private land, the sites have limited public amenity value. They are all visible from the road.
	Cultural Associations	Pre-contact Māori.

The archaeological significance or value of sites recorded in the project area are associated with their condition, rarity, contextual value, information potential and/or amenity value. No ranking of sites is allowed or appropriate under the Act or HNZPT guidelines.

9 Heritage Significance

Heritage significance and values accounted for under the Resource Management Act 1991. The following matters must be taken into account when assessing Heritage significance/values include: historical, architectural, cultural, scientific, and technological qualities (RMA 1991).

Table 2. Heritage significance evaluation.

Location	Criteria	Assessment	Significance
	Historical: the place reflects important or representative aspects of national, regional, or local history, or is associated with an important event, person, group or idea or early period of settlement within NZ, the region or locality.	This area forms part of a wider cultural/ archaeological landscape associated with intensive pre-contact Māori occupations, and also early Māori-European interactions.	Moderate-High

Location	Criteria	Assessment	Significance
Tripark Farm, Oruru Valley	Architectural attributes: the place is notable or representative example of its type, design or style, method of construction, craftsmanship or use of materials or the work of a notable architect, designer, engineer or builder.	The location has no architectural significance/value.	None
	Social: the place has a strong or special association with or is held in high esteem by a particular community or cultural group for its symbolic, spiritual, commemorative, traditional or other cultural value.	Significance to Māori be determined by the affected tangata whenua.	N/A
	Cultural/Mana whenua: the place has a strong or special association with or is held in high esteem by mana whenua for its symbolic, spiritual, commemorative, traditional or other cultural value.	This to be determined by the affected tangata whenua.	N/A
	Scientific: the place has potential to provide knowledge through scientific or scholarly study or to contribute to an understanding of the cultural or national history of NZ, the region or locality.	Pā, pits, and terrace sites have potential to provide scientific information on past Māori activities.	Moderate-High
	Technology: the place demonstrates technical accomplishment, innovation or achievement in its structure, construction, components, or use of materials.	These sites have no technological significance/value.	None
	Aesthetic: the place is notable or distinctive for its aesthetic, visual or landmark qualities.	The sites have aesthetic value, and the archaeological features are visible from the main road through the valley.	Moderate

Location	Criteria	Assessment	Significance
	Context: the place contributes to or is associated with a wider historic or cultural context, streetscape, townscape, landscape or setting.	The sites on this property, along with the other recorded features in the area, contribute to the wider pre-1900 settlement landscape of the Oruru Valley.	Moderate-High

Additional comments

Overall, the heritage value of the location/sites/area is of moderate-high significance, at a local and regional level. No additional ranking is appropriate or required.

10 Assessment of Effects on Archaeological Features

This survey was undertaken to relocate and establish the extent of known archaeological sites on the property, and to determine whether the proposed building platforms and associated infrastructure would affect known or unidentified archaeological material or sites. The assessment was done to determine whether sites would be damaged during the planned development, and advise as to how those damages could be mitigated.

Four recorded archaeological sites were relocated on the property during this survey, and the extent of those sites was determined. The archaeological sites on this property are all on high ground, along major ridges, above the proposed building platforms. The landowner has been advised to situate the proposed house platforms, driveways, and utilities to avoid the known archaeological sites. The locations of most of the proposed building platforms meet this criterion and, overall, the proposed locations where ground disturbance might occur are assessed as having a low-medium likelihood of encountering intact archaeological material or features. Exceptions are noted below in the recommendations.

It should be noted that considering the extent of known archaeological features on this property, and the density of sites in the nearby area, the project area is part of an extensive and intensive archaeological landscape. The platforms are, therefore, in areas which may have been utilised in the past by Māori for gardening or living activities. Because these areas have been heavily used post-contact for pastural practices, these activities may have modified or destroyed intact archaeological features within the proposed lots.

This survey was conducted specifically to locate and record archaeological remains. The survey and report does not necessarily include the location and/or assessment of wāhi tapu or sites of cultural or spiritual significance to the local Māori community, who may be approached independently for any information or concerns they may have.

11 Recommendations and Conclusion

Sunrise Archaeology was commissioned by Grant and Karen Parker of Tripark Farms Ltd. to provide an archaeological assessment of 978 Oruru Road, Peria, Far North. The legal description of this property is Pt Allotments 5 Parish of Oruru.

Four previously recorded archaeological sites are present on the property; of these, three are pā sites and terrace/pit complexes (O04/1164, O04/1163, O04/1032) and one (O04/1033) is a terrace and pit. No additional above-ground sites were identified from either the review of historical images, Lidar imagery, or the field survey.

No known archaeological sites are located within or near the building platforms for proposed Lots 1, 2, 3, 4, 5, 9, 10, 12, and 15, and no additional above-ground archaeological sites were found within those areas.

A pā site and terrace complex (O04/1032) is in proposed Lot 6. Its features cover much of the land south of the farm track through this area. The proposed building platform has been situated to avoid the features of this site.

It should be noted that there are recorded archaeological sites within two of the proposed lots. A pit and terrace site (O04/1033) is in proposed Lot 7. This site is ~350 m to the northwest of the proposed house platform. A pā and pits and terrace complex (O04/1163) is located in proposed Lot 15, it is on high ground, the archaeological site is ~200 m to the northwest of the proposed house platform. Within approximately 50 m of these sites, no developments should occur.

It is determined that there is a low-medium likelihood of encountering intact archaeological features or material at the proposed building platforms and potential areas of associated infrastructure. The high number of large and complex sites on and adjacent to the proposed subdivision indicate that this was once an intensive area of settlement by Māori prior to European contact, and that the proposed house platforms and the natural terraces beside the river that must be crossed to access the building platforms were, at a minimum, used by Māori for gardening.

The following recommendations are made:

1. It is our expert opinion that the subdivision can proceed but each of the proposed lots may require a Heritage New Zealand Authority to damage, modify or destroy an archaeological site prior to any groundworks occurring. This will be determined once all areas of potential ground disturbance have been identified and tested.

2. The proposed building platforms are all in areas where there is a low likelihood of encountering archaeological features, but are within an area where an archaeological authority could be appropriate.

3. There is a low to medium likelihood that the as-yet undescribed earthworks that will be required for access and utilities will potentially impact on as yet unidentified archaeological sites, and would therefore require an archaeological authority.

4. Any alterations to the proposed works need to be reviewed for comment and/or assessment by an archaeologist.

The survey of the property was conducted specifically to locate and record archaeological remains. The survey and report does not necessarily include the location and/or assessment of wāhi-tapu or sites of cultural or spiritual significance to the local Māori community, who may be approached independently for any information or concerns they may have.

12 References

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Appendix: Proposed subdivision plans

Attachment 7

PROPOSED DISTRICT PLAN – DEVELOPMENT CONTROL CHECK S.86B OF THE RMA 1991

914, 976 & 978 Oruru Road

Rule	Assessment
Hazardous Substances HS-R2, R5, R6, R9	The site does not contain, nor are any hazardous substance facilities proposed.
Heritage Area Overlays HA-R1 to R14 inclusive. HA S1 & S2	N/A as none apply to the application site.
Historic Heritage Rules and Schedule 2. Rules HH R1-R9 Inclusive.	N/A as the site does not have any identified (scheduled) historic heritage values.
Notable Trees NT R1 – R9 inclusive and NT S1 & S2	N/A – no notable trees present on the site.
Sites and Areas of Significance to Māori SASM R1 – R7 inclusive.	The PDP does not list any site or area of significance to Māori as being present on the site.
Ecosystems and Indigenous Biodiversity – IB-R1 to R5	No indigenous vegetation clearance is proposed.
Subdivision SUB R6, R13, R14, R15, R17.	The site contains no Heritage Resources, Scheduled Sites of Significance to Māori or a Scheduled Significant Natural Area. No Environmental Benefit subdivision is proposed.
Activities on the Surface of Water ASW R1 – R4 inclusive.	N/A as no such activities are proposed.
Earthworks EW R12 & EW R13 and EWS3 & EWS5	EW-R12 and associated EW-S3 relate to the requirement to abide by Accidental Discovery Protocol if carrying out earthworks and artefacts are discovered. EW-R13 and associated EW-S5 refer to operating under appropriate Erosion and Sediment Control measures. These are addressed in the earthworks methodology.
Signage – SIGN R9 & R10 and S1 to S6 Inclusive.	N/A – No heritage resources are present on the site and signage does not form part of this application.

Attachment 8

OPERATIVE DISTRICT PLAN – DEVELOPMENT CONTROL CHECK

914, 976 & 978 Oruru Road

Chapter / Rule	Compliance Statement
Chapter 12.1 - Landscapes and Natural Features	Does not apply as there is no landscape or natural feature overlay applying to the site.
Chapter 12.2 Indigenous Flora and Fauna	Does not apply as there is no clearance of indigenous vegetation proposed. The supplied ecological report demonstrates that there are no effects on indigenous flora and fauna.
Chapters 12.5, (5A) and (5B) Heritage	Does not apply as the site does not contain any heritage sites, notable trees, sites of cultural significance to Māori that are scheduled in the ODP. There are however recorded archaeological sites as shown on the NZAA Database - but the building platforms and accessways are clear of these recorded sites and as demonstrated in the supplied Archaeological report.
Chapter 12.7 Waterbodies	Does not apply as the subdivision does not include any buildings or other impermeable surfaces, nor on-site wastewater system, breaching the setback requirements specified in this chapter and there is no indigenous wetland within which works are being proposed. The supplied ecological report addresses these matters.
Chapter 12.8 Hazardous Substances	Does not apply as the activity being applied for is not a hazardous substances facility.
Chapter 12.9 Renewable Energy	Does not apply as the activity does not involve renewable energy.
13.6.5 Legal Road Frontage	Each lot has adequate legal frontage as shown on plan of subdivision.
13.6.8 Subdivision Consent before work commences	All necessary calculations and assessment of effects have been provided so that this subdivision consent application is deemed to include consent to excavate and fill land for access and building platforms. No vegetation clearance is proposed.
13.7.2 Allotment size	Complies with standards for RDA subdivision under Rule 13.7.2.1 (4)
13.7.2.2 Allotment Dimensions	30 metre by 30 metre building platforms are shown on plan of subdivision
13.7.2.3 Amalgamation of Land	N/A

13.7.2.4 Lots Divided by Zone Boundaries	N/A
13.7.2.5 Outstanding Landscape, Outstanding Landscape Feature Or Outstanding Natural Feature	N/A as the ODP does not list any of these items on the site.
13.7.2.6 Access, Utilities, Roads, Reserves	Complies - see easement schedule on scheme plan and standard conditions of consent can be imposed to ensure that access meets the requisite Council standards.
13.7.2.7 Savings as to previous proposals	N/A
13.7.2.8 Proximity To Top Energy Transmission Lines	The lines that bisect the site are less than 110kV. Nonetheless conditions of consent are offered for this matter.
13.7.2.9 Proximity To The National Grid	As above.
13.7.3.1 Property Access	Complies - and as addressed under the Chapter 15 assessment below.
13.7.3.2 Natural And Other Hazards	Complies – see attached engineering report on s.106 matters.
13.7.3.3 Water Supply	Complies - Water supply will be via roof catchment and also used for firefighting
13.7.3.4 Stormwater Disposal	Complies – an engineering report from a Chartered Professional Engineer has been supplied.
13.7.3.5 Sanitary Sewage Disposal	Complies - a detailed report from a Chartered Professional Engineer has been supplied. Consent conditions requiring the identification of the existing wastewater fields for Lot 8 and Lot 5 within lot boundaries can be imposed.
13.7.3.6 Energy Supply	Complies - see correspondence from Top Energy confirming connections available.
13.7.3.7 Telecommunications	The sites are rural in nature, so this rule does not apply. See correspondence from the telecommunications provider confirming connections are available, but wireless is sought given cost considerations.
13.7.3.8 Easements For Any Purpose	Complies – appropriate easements are listed on the plan of subdivision.
13.7.3.9 Preservation Of Heritage Resources, Vegetation, Fauna And Landscape, And Land Set Aside For Conservation Purposes	N/ A as there are no listed items are present.

13.7.3.10 Access To Reserves And Waterways	Complies - as no allotments smaller than four hectares adjoin the Oruru River.
13.7.3.11 Land Use Compatibility	Conditions of consent are suggested to address this issue.
13.7.3.12 Proximity To Airports	N/A
Chapter 14 Financial Contributions	The Oruru River likely exceeds three metres in width as it runs along the eastern boundary of the site. However, all proposed lots that adjoin the river exceed four hectares in size, so no esplanade reserve or strip is offered is as part of this subdivision.
Chapter 15.1.6A.1 & 15.1.6A.2 & 15.1.6A.2.1 – Traffic Movements	The rules in Chapter 15.1.6A.1 & 15.16A.2 are clear that they are to be applied in conjunction with the Traffic Intensity Factor ("TIF") Tables in Appendix 3A. These only apply to land use activities so are not relevant to the proposed subdivision.
15.1.6B - Parking Requirements)	As above, these rules apply to land use activities and not subdivision.
Rule 15.1.6C.1.1 to 15.1.6C.1.11 inclusive. Access	Complies - all proposed Lots will have a minimum carriage way width of three metres or more and an access gradient of less than 1:5. The access lots will not serve 8HHE or more. No crossings are proposed within 30 metres of an intersection with an arterial or collector road. Passing bays can be constructed in accordance with Council standards iif required. All crossings can be formed to Council's "Engineering Standards and Guidelines" (June 2004 – Revised 2009). General access standards can be complied with and Oruru Road is of legal width in this location. The supplied engineering report addresses visibility matters from access points and recommends vegetation trimming to ensure adequate site distances.

Attachment 9

Operative District Plan – Relevant Assessment Criteria

976 Oruru Road

Restricted Discretionary Subdivision Consent : Matters for Discretion & Assessment Criteria

13.8.1 SUBDIVISION WITHIN THE RURAL PRODUCTION ZONE

Subdivision is a restricted discretionary activity where:

(a) the minimum lot size is 12ha; or alternatively

(b) a maximum of 3 lots in any subdivision, provided that the minimum size of any lot is 4,000m^2 and there is at least one lot in the subdivision with a minimum lot size of 4ha, and provided further that the subdivision is of sites which existed at or prior to 28 April 2000, or which are amalgamated from titles existing at or prior to 28 April 2000; or alternatively

(c) a maximum of 5 lots in a subdivision (including the parent lot) where the minimum size of lots is 2ha, and where the subdivision is created from a lot that existed at or prior to 28 April 2000.

In considering whether or not to grant consent on applications for restricted discretionary subdivision activities, the Council will restrict the exercise of its discretion to the following matters:

(i) for applications under ***13.8.1(a)***:

- effects on the natural character of the coastal environment for proposed lots which are in the coastal environment.

(ii) for applications under ***13.8.1(b)*** or ***(c)***:

- effects on the natural character of the coastal environment for proposed lots which are in the coastal environment;
- effects of the subdivision under ***(b)*** and ***(c)*** above within 500m of land administered by the Department of Conservation upon the ability of the Department to manage and administer its land;
- effects on areas of significant indigenous flora and significant habitats of indigenous fauna;
- the mitigation of fire hazards for health and safety of residents.

In considering whether or not to impose conditions on applications for restricted discretionary subdivision activities the Council will restrict the exercise of its discretion to the following matters:

(1) the matters listed in ***13.7.3***;

(2) the matters listed in ***(i)*** and ***(ii)*** above.

For the purposes of this rule the upstream boundary of the coastal environment in the upper reaches of harbours is to be established by multiplying the width of the river mouth by five.

13.7.3 CONTROLLED (SUBDIVISION) ACTIVITIES: OTHER MATTERS TO BE TAKEN INTO ACCOUNT

Any application for a controlled (subdivision) activity resource consent must also make provision (where relevant) for the matters listed under ***Rules 13.7.3.1*** to ***13.7.3.12*** (inclusive), and the Council shall take account of these matters in reaching a decision on the application.

13.7.3.1 PROPERTY ACCESS (see *Chapter 15 Transportation*)

A controlled (subdivision) activity application must comply with rules for property access in ***Chapter 15***, namely ***Rules 15.1.6C.1.1 - 15.1.6C.1.11*** (inclusive).

13.7.3.2 NATURAL AND OTHER HAZARDS

Any proposed subdivision shall avoid, remedy or mitigate any adverse effects of natural hazards.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.2*** the Council will restrict the exercise of its control to the following matters and shall have regard to section 106 of the Resource Management Act 1991:

(a) the degree to which the proposed subdivision avoids, remedies or mitigates the potential adverse effects of:

(i) erosion;
(ii) overland flow paths, flooding and inundation;
(iii) landslip;
(iv) rockfall;
(v) alluvion (deposition of alluvium);
(vi) avulsion (erosion by streams or rivers);
(vii) unconsolidated fill;
(viii) soil contamination;

(ix) subsidence;

(x) fire hazard;

(xi) sea level rise

Provided that where ***Coastal Hazard Maps*** show land as being within a Coastal Hazard 1 Area, any subdivision that will create additional allotments (other than to facilitate the subdivision of land for the purposes of transfer to the Council) shall be a non-complying subdivision activity.

13.7.3.3 WATER SUPPLY

All new allotments shall be provided with the ability to connect to a safe potable water supply with an adequate capacity for the respective potential land uses, except where the allotment is for a utility, road, reserve or access purposes, by means of one of the following:

(a) a lawfully established reticulated water supply system; or

(b) where no reticulated water supply is available, the ability to provide an individual water supply on the respective allotment.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.3*** the Council will restrict the exercise of its control to the following matters:

(i) the adequacy of the supply of water to every allotment being created on the subdivision, and its suitability for the likely land use, for example the installation of filtration equipment if necessary;

(ii) adequacy of water supplies, and access for fire fighting purposes;

(iii) the standard of water supply infrastructure installed in subdivisions, and the adequacy of existing supply systems outside the subdivision.

13.7.3.4 STORMWATER DISPOSAL

(a) All allotments shall be provided, within their net area, with a means for the disposal of collected stormwater from the roof of all potential or existing buildings and from all impervious surfaces, in such a way so as to avoid or mitigate any adverse effects of stormwater runoff on receiving environments, including downstream properties. This shall be done for a rainfall event with a 10% Annual Exceedance Probability (AEP).

(b) The preferred means of disposal of collected stormwater in urban areas will be by way of piping to an approved outfall, each new allotment shall be provided with a piped connection to the outfall laid at least 600mm into the net area of the allotment. This includes land allocated on a cross lease or company lease. The connection should be at the lowest point of the site to enable water from driveways and other impervious surfaces to drain to it. Where it is not practical to provide stormwater connections for each lot then the application for subdivision shall include a report detailing how stormwater from each lot is to be disposed of without adversely affecting downstream properties or the receiving environment.

(c) The provision of grass swales and other water retention devices such as ponds and depressions in the land surface may be required by the Council in order to achieve adequate mitigation of the effects of stormwater runoff.

(d) All subdivision applications creating sites 2ha or less shall include a detailed report from a Chartered Professional Engineer or other suitably qualified person addressing stormwater disposal.

(d) Where flow rate control is required to protect downstream properties and/or the receiving environment then the stormwater disposal system shall be designed in accordance with the onsite control practices as contained in "*Technical Publication 10, Stormwater Management Devices – Design Guidelines Manual" Auckland Regional Council (2003).*

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.4*** the Council will restrict the exercise of its control to the following matters:

(i) control of water-borne contaminants, litter and sediments;

(ii) the capacity of existing and proposed stormwater disposal systems (refer also to the Council's various urban stormwater management plans and any relevant Northland Regional Council stormwater discharge consents);

(iii) the effectiveness and environmental impacts of any measures proposed for avoiding or mitigating the effects of stormwater runoff, including low impact design principles;

(iv) the location, scale and construction of stormwater infrastructure;

(v) measures that are necessary in order to give effect to any drainage or catchment management plan that has been prepared for the area.

13.7.3.5 SANITARY SEWAGE DISPOSAL

(a) Where an allotment is situated within a duly gazetted district or drainage area of a lawfully established reticulated sewerage scheme, or within an area to be serviced by a private reticulated sewerage scheme for which Northland Regional Council has issued a consent, each new allotment shall be provided with a piped outfall connected to that scheme and shall be laid at least 600mm into the net area of the allotment.

(b) Where connection is not available, all allotments in urban, rural and coastal zones shall be provided with a means of disposing of sanitary sewage within the net area of the allotment, except where the allotment is for a road, or for access purposes, or for a purpose or activity for which sewerage is not necessary (such as a transformer).

Note: Allotments include additional vacant sites on cross lease or unit titles.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.5*** the Council will restrict the exercise of its control to the following matters:

(i) the method and adequacy of sewage disposal where a Council owned reticulated system is not available;

(ii) the capacity of, and impacts on, the existing reticulated sewage disposal system;

(iii) the location, capacity and environmental effects of the proposed sanitary sewerage system.

13.7.3.6 ENERGY SUPPLY

All urban allotments (Residential, Commercial, Industrial Zones) including the Coastal Residential, Russell Township, and Rural Living Zones, shall be provided with the ability to connect to an electrical utility system and applications for subdivision consent should indicate how this could be done.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.6*** the Council will restrict the exercise of its control to the following matters:

(i) the adequacy and standard of any electrical utility system.

13.7.3.7 TELECOMMUNICATIONS

All urban allotments (Residential, Commercial, Industrial Zones) including the Coastal Residential, Russell Township, and Rural Living Zones, shall be provided with the ability to connect to a telecommunications system at the boundary of the site.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.7*** the Council will restrict the exercise of its control to the following matters:

(i) the adequacy and standard of telecommunication installations.

13.7.3.8 EASEMENTS FOR ANY PURPOSE

Easements shall be provided where necessary for public works and utility services.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.8*** the Council will restrict the exercise of its control to the following matters:

(a) Easements in gross where a service or access is required by the Council.

(b) Easements in respect of other parties in favour of nominated allotments or adjoining Certificates of Title.

(c) Service easements, whether in gross or private purposes, with sufficient width to permit maintenance, repair or replacement. Centre line easements shall apply when the line is privately owned and unlikely to require upgrading.

(d) The need for easements for any of the following purposes:

- (i) private ways, whether mutual or not;
- (ii) stormwater, sanitary sewer, water supply, electric power, gas reticulation;
- (iii) telecommunications;
- (iv) party walls and floors/ceilings;
- (v) other utilities.

13.7.3.9 PRESERVATION OF HERITAGE RESOURCES, VEGETATION, FAUNA AND LANDSCAPE, AND LAND SET ASIDE FOR CONSERVATION PURPOSES

Where any proposed allotment contains one or more of the following:

(a) a Notable Tree as listed in ***Appendix 1D***;

(b) an Historic Site, Building or Object as listed in ***Appendix 1E***;

(c) a Site of Cultural Significance to Maori as listed in ***Appendix 1F***;

(d) an Outstanding Natural Feature as listed in ***Appendix 1A***;

(e) an Outstanding Landscape Feature as listed in ***Appendix 1B***;

(f) an archaeological site as listed in ***Appendix 1G***;

(g) an area of significant indigenous vegetation or significant habitats of indigenous fauna, as defined in ***Method 12.2.5.6***.

The continued preservation of that resource, area or feature shall be an ongoing condition for approval to the subdivision consent.

Note: There are many ways in which preservation/protection can be achieved, and the appropriate means will vary according to the circumstance. In some cases physical means (e.g. fencing) may be appropriate. In other cases, a legal means will be preferred instead of (or as well as) physical means.

Council encourages permanent protection by:

(i) a reserve or covenant under the Reserves Act;

(ii) a Maori reservation under s338 and s340 of Te Ture Whenua Maori (Maori Land) Act;

(iii) a conservation covenant with the Department of Conservation or the Council;

(iv) an open space covenant with the Queen Elizabeth II National Trust;

(v) a heritage covenant with the Heritage New Zealand Pouhere Taonga.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.9*** the Council will restrict the exercise of its control to the preservation of significant indigenous vegetation and fauna habitats, heritage resources and landscape.

Where an application is made under this provision, the following shall be included as affected parties in terms of s93 and s94 of the Act:

- for an Historic Site, Building or Object, or archaeological site, the Heritage New Zealand Pouhere Taonga and the Department of Conservation;
- for a Site of Cultural Significance to Maori, the tangata whenua for whom the site has significance;
- for an area of significant indigenous vegetation or significant habitat of indigenous fauna, the Department of Conservation.

13.7.3.10 ACCESS TO RESERVES AND WATERWAYS

Where appropriate and relevant, public access shall be provided in proposed subdivisions, to public reserves, waterways and esplanade reserves.

The Council may decide, on application, that public access to reserves or public areas may be provided in lieu of, or partially in lieu of, any reserves or financial contribution that is required in respect of the subdivision.

In considering a controlled (subdivision) activity application under ***Rule 13.7.3.10*** the Council will restrict the exercise of its control to the provision of easements or registration of an instrument for the purpose of public access and the provision of public works and utility services.

13.7.3.11 LAND USE COMPATIBILITY

Subdivision shall avoid, remedy or mitigate any adverse effects of incompatible land uses (reverse sensitivity). In considering a controlled subdivision activity under **Rule 13.7.3.11** the Council will restrict the exercise of its control to the following matters:

(i) the degree to which the proposed allotments take into account adverse effects arising from incompatible land use activities (including but not limited to noise, vibration, smell, smoke, dust and spray) resulting from an existing land use adjacent to the proposed subdivision.

13.7.3.12 PROXIMITY TO AIRPORTS

Where applications for subdivision consent relate to land that is situated within 500m of the nearest boundary of land that is used for an airport, the airport operator will be considered by the Council to be an affected party. The written approval of the airport operator to the proposed subdivision must be obtained by the applicant. Where this approval cannot be obtained, the Council will consider the application as a discretionary activity application.

Attachment 10

Fourth Schedule Assessment under Resource Management Act 1991

Compliance Check for Information Required

976 Oruru Road, Peria

Clause 2 Information Required in all applications	
(1) An application for a resource consent for an activity must include the following:	
(a) a description of the activity: .	Refer Paragraphs 2.1 to 2.9 of this Planning Report and attachments.
(b) an assessment of the actual or potential effect on the environment of the activity:	Refer to Paragraphs 4.4 to 4.9 of this Planning Report and attachments.

(b) a description of the site at which the activity is to occur:	Refer to Paragraphs 1.5 to 1.19 of this report.
(c) the full name and address of each owner or occupier of the site:	This information is contained in the Form 9 attached to the application.
(d) a description of any other activities that are part of the proposal to which the application relates:	The application is for subdivision as anticipated by the ODP. No other breaches of the ODP have been identified. Please refer to Attachment 8.
(e) a description of any other resource consents required for the proposal to which the application relates:	Consent is being sought for subdivision under the ODP only.
(f) an assessment of the activity against the matters set out in Part 2:	Refer to Paragraphs 6.0 to 6.6 of this Planning Report.
(g) an assessment of the activity against any relevant provisions of a document referred to in section 104(1)(b), including matters in Clause (2): *(2) The assessment under subclause (1)(g) must include an assessment of the activity against—* *(a). any relevant objectives, policies, or rules in a document; and* *(b) any relevant requirements, conditions, or permissions in any rules in a document; and* *(c) any other relevant requirements in a document (for example, in a national environmental standard or other regulations).* *(3) An application must also include an assessment of the activity's effects on the environment that—* *(a) includes the information required by clause 6; and* *(b) addresses the matters specified in clause 7; and* *(c)includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.*	Refer to Paragraphs 5.0 to 5.19 of this Planning Report.

Clause 3. Additional Information Required in Some Applications	
An application must also include any of the following that apply:	
a. *if any permitted activity is part of the proposal to which the application relates, a description of the permitted activity that demonstrates that it complies with the requirements, conditions, and permissions for the permitted activity (so that a resource consent is not required for that activity under section 87A(1)):*	Please refer to Attachment 5.
b. *if the application is affected by section 124 or 165ZH(1)(c) (which relate to existing resource consents), an assessment of the value of the investment of the existing consent holder (for the purposes of section 104(2A)):*	There is no existing resource consent. Not applicable.
c. *if the activity is to occur in an area within the scope of a planning document prepared by a customary marine title group under section 85 of the Marine and Coastal Area (Takutai Moana) Act 2011, an assessment of the activity against any resource management matters set out in that planning document (for the purposes of section 104(2B)).*	The site is not within an area subject to a customary marine title group. Not applicable.

Clause 4 Additional Information required in application for subdivision consent	
An application for a subdivision consent must also include information that adequately defines the following:	
(a) the position of all new boundaries: *(b) the areas of all new allotments, unless the subdivision involves a cross lease, company lease, or unit plan:* *(c) the locations and areas of new reserves to be created, including any esplanade reserves and esplanade strips:* *(d) the locations and areas of any existing esplanade reserves, esplanade strips, and access strips:* *(e) the locations and areas of any part of the bed of a river or lake to be vested in a territorial authority under section 237A:* *(f) the locations and areas of any land within the coastal marine area (which is to become part of the common marine and coastal area under section 237A):* *(g) the locations and areas of land to be set aside as new roads.*	Refer to Scheme Plan in Attachment 3.

Clause 6: Information required in assessment of environmental effects	
(1) An assessment of the activity's effects on the environment must include the following information:	
(a) if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity:	Refer to Paragraphs 4.4 to 4.9 of this planning report. The activity will not result in any significant adverse effect on the environment.
(b) an assessment of the actual or potential effect on the environment of the activity:	Refer to Paragraphs 4.4 to 4.9 of this planning report plus attachments.
(c) if the activity includes the use of hazardous installations, an assessment of any risks to the environment that are likely to arise from such use:	Not applicable as the application does not involve hazardous installations.
(d) if the activity includes the discharge of any contaminant, a description of—	The subdivision does not involve any discharge of contaminant.

(i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and *(ii) any possible alternative methods of discharge, including discharge into any other receiving environment:*	
(e) a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect:	Refer to Paragraphs 3.15 to 3.26 and 4.4 to 4.9 of this planning report and attachments.
(f) identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted:	Refer to Paragraphs 7.0 to 7.4 of this planning report.
g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved:	No monitoring is required as the scale and significance of the effects do not warrant it.
(h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).	No protected customary right is affected.

Clause 7: Matters that must be addressed by assessment of environmental effects	
(1) An assessment of the activity's effects on the environment must address the following matters:	
(a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects:	Refer to Paragraphs 4.4 to 4.9 and also to the assessment of objectives and policies Paragraphs 5.0 to 5.27.
(b) any physical effect on the locality, including any landscape and visual effects:	Refer to Paragraphs 4.4 to 4.9, and also to the assessment of objectives and policies Paragraphs 5.0 to 5.27. The site has no high or outstanding landscape or natural character values.
(c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity:	Refer to Paragraphs 4.4 to 4.9 and Attachment 5. The subdivision has no effect on ecosystems or habitat that cannot be mitigated by conditions of consent.
(d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations:	Refer to Paragraphs 4.4 to 4.9 and Attachment 6. The site has no aesthetic, recreational, scientific, spiritual or cultural values that will be adversely affected by the act of subdividing.
(e) any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants:	The subdivision will not result in the discharge of contaminants, nor any unreasonable emission of noise.
(f) any risk to the neighbourhood, the wider community, or the environment through natural hazards or hazardous installations.	The subdivision site is within a mapped flood hazard area, but development of building platforms can occur outside of these areas. The proposal does not involve hazardous installations.

Attachment 11

Northland Regional Policy Statement – Objectives and Policies

Objective 3.6 - Economic activities – reverse sensitivity and sterilisation

The viability of land and activities important for Northland's economy is protected from the negative impacts of new subdivision, use and development, with particular emphasis on either:

(a) Reverse sensitivity for existing:

(i) Primary production activities;

(ii) Industrial and commercial activities;

(iii) Mining; or*

(iv) Existing and planned regionally significant infrastructure; or

(b) Sterilisation of:

(i) Land with regionally significant mineral resources; or

(ii) Land which is likely to be used for regionally significant infrastructure.

**Includes aggregates and other minerals.*

Objective 3.13 - Natural Hazard Risk

The risks and impacts of natural hazard events (including the influence of climate change) on people, communities, property, natural systems, infrastructure and our regional economy are minimised by:

(a) Increasing our understanding of natural hazards, including the potential influence of climate change on natural hazard events;

(b) Becoming better prepared for the consequences of natural hazard events;

(c) Avoiding inappropriate new development in 10 and 100 year flood hazard areas and coastal hazard areas;

(d) Not compromising the effectiveness of existing defences (natural and man-made);

(e) Enabling appropriate hazard mitigation measures to be created to protect existing vulnerable development; and

(f) Promoting long-term strategies that reduce the risk of natural hazards impacting on people and communities.

(g) Recognising that in justified circumstances, critical infrastructure may have to be located in natural hazard-prone areas.

5.1.3 Policy – Avoiding the adverse effects of new use(s) and development

Avoid the adverse effects, including reverse sensitivity effects of new subdivision, use and development, particularly residential development on the following:

(a) Primary production activities in primary production zones (including within the coastal marine area);

(b) Commercial and industrial activities in commercial and industrial zones;

(c) The operation, maintenance or upgrading of existing or planned[13] regionally significant infrastructure[14]; and

(d) The use and development of regionally significant mineral resources[15].

7.1.1 Policy – General risk management approach

Subdivision, use and development of land will be managed to minimise the risks from natural hazards by:

(a) Seeking to use the best available information, including formal risk management techniques in areas potentially affected by natural hazards;

(b) Minimising any increase in vulnerability due to residual risk;

(c) Aligning with emergency management approaches (especially risk reduction);

(d) Ensuring that natural hazard risk to vehicular access routes and building platforms for proposed new lots is considered when assessing subdivision proposals; and

(e) Exercising a degree of caution that reflects the level of uncertainty as to the likelihood or consequences of a natural hazard event.

Attachment 12

Operative District Plan - Subdivision Objectives and Policies

Objectives

13.3.1 To provide for the subdivision of land in such a way as will be consistent with the purpose of the various zones in the Plan, and will promote the sustainable management of the natural and physical resources of the District, including airports and roads and the social, economic and cultural well being of people and communities.

13.3.2 To ensure that subdivision of land is appropriate and is carried out in a manner that does not compromise the life-supporting capacity of air, water, soil or ecosystems, and that any actual or potential adverse effects on the environment which result directly from subdivision, including reverse sensitivity effects and the creation or acceleration of natural hazards, are avoided, remedied or mitigated.

13.3.3 To ensure that the subdivision of land does not jeopardise the protection of outstanding landscapes or natural features in the coastal environment.

13.3.4 To ensure that subdivision does not adversely affect scheduled heritage resources through alienation of the resource from its immediate setting/context.

13.3.5 To ensure that all new subdivisions provide a reticulated water supply and/or on-site water storage and include storm water management sufficient to meet the needs of the activities that will establish all year round.

13.3.6 To encourage innovative development and integrated management of effects between subdivision and land use which results in superior outcomes to more traditional forms of subdivision, use and development, for example the protection, enhancement and restoration of areas and features which have particular value or may have been compromised by past land management practices.

13.3.7 To ensure the relationship between Maori and their ancestral lands, water, sites, wahi tapu and other taonga is recognised and provided for.

13.3.8 To ensure that all new subdivision provides an electricity supply sufficient to meet the needs of the activities that will establish on the new lots created.

13.3.9 To ensure, to the greatest extent possible, that all new subdivision supports energy efficient design through appropriate site layout and orientation in order to maximise the ability to provide light, heating, ventilation and cooling through passive design strategies for any buildings developed on the site(s).

13.3.10 To ensure that the design of all new subdivision promotes efficient provision of infrastructure, including access to alternative transport options, communications and local services.

13.3.11 To ensure that the operation, maintenance, development and upgrading of the existing National Grid is not compromised by incompatible subdivision and land use activities.

Policies

13.4.1 That the sizes, dimensions and distribution of allotments created through the subdivision process be determined with regard to the potential effects including cumulative effects, of the use of those allotments on:

(a) natural character, particularly of the coastal environment;

(b) ecological values;

(c) landscape values;

(d) amenity values;

(e) cultural values;

(f) heritage values; and

(g) existing land uses.

13.4.2 That standards be imposed upon the subdivision of land to require safe and effective vehicular and pedestrian access to new properties.

13.4.3 That natural and other hazards be taken into account in the design and location of any subdivision.

13.4.4 That in any subdivision where provision is made for connection to utility services, the potential adverse visual impacts of these services are avoided.

13.4.5 That access to, and servicing of, the new allotments be provided for in such a way as will avoid, remedy or mitigate any adverse effects on neighbouring property, public roads (including State Highways), and the natural and physical resources of the site caused by silt runoff, traffic, excavation and filling and removal of vegetation.

13.4.6 That any subdivision proposal provides for the protection, restoration and enhancement of heritage resources, areas of significant indigenous vegetation and significant habitats of indigenous fauna, threatened species, the natural character of the coastal environment and riparian margins, and outstanding landscapes and natural features where appropriate.

13.4.7 That the need for a financial contribution be considered only where the subdivision would:

(a) result in increased demands on car parking associated with non-residential activities; or

(b) result in increased demand for esplanade areas; or

(c) involve adverse effects on riparian areas; or

(d) depend on the assimilative capacity of the environment external to the site.

13.4.8 That the provision of water storage be taken into account in the design of any subdivision.

13.4.9 That bonus development donor and recipient areas be provided for so as to minimise the adverse effects of subdivision on Outstanding Landscapes and areas of significant indigenous flora and significant habitats of fauna.

13.4.10 The Council will recognise that subdivision within the Conservation Zone that results in a net conservation gain is generally appropriate.

13.4.11 That subdivision recognises and provides for the relationship of Maori and their culture and traditions, with their ancestral lands, water, sites, waahi tapu and other taonga and shall take into account the principles of the Treaty of Waitangi.

13.4.12 That more intensive, innovative development and subdivision which recognises specific site characteristics is provided for through the management plan rule where this will result in superior environmental outcomes.

13.4.13 Subdivision, use and development shall preserve and where possible enhance, restore and rehabilitate the character of the applicable zone in regards to s6 matters. In addition subdivision, use and development shall avoid adverse effects as far as practicable by using techniques including:

(a) clustering or grouping development within areas where there is the least impact on natural character and its elements such as indigenous vegetation, landforms, rivers, streams and wetlands, and coherent natural patterns;

(b) minimising the visual impact of buildings, development, and associated vegetation clearance and earthworks, particularly as seen from public land and the coastal marine area;

(c) providing for, through siting of buildings and development and design of subdivisions, legal public right of access to and use of the foreshore and any esplanade areas;

(d) through siting of buildings and development, design of subdivisions, and provision of access that recognise and provide for the relationship of Maori with their culture, traditions and taonga including concepts of mauri, tapu, mana, wehi and karakia and the important contribution Maori culture makes to the character of the District (refer ***Chapter 2*** and in particular ***Section 2.5*** and Council's *"Tangata Whenua Values and Perspectives" (2004)*;

(e) providing planting of indigenous vegetation in a way that links existing habitats of indigenous fauna and provides the opportunity for the extension, enhancement or creation of habitats for indigenous fauna, including mechanisms to exclude pests;

(f) protecting historic heritage through the siting of buildings and development and design of subdivisions.

(g) achieving hydraulic neutrality and ensuring that natural hazards will not be exacerbated or induced through the siting and design of buildings and development.

13.4.14 That the objectives and policies of the applicable environment and zone and relevant parts of ***Part 3*** of the Plan will be taken into account when considering the intensity, design and layout of any subdivision.

13.4.15 That conditions be imposed upon the design of subdivision of land to require that the layout and orientation of all new lots and building platforms created include, as appropriate, provisions for achieving the following:

(a) development of energy efficient buildings and structures;

(b) reduced travel distances and private car usage;

(c) encouragement of pedestrian and cycle use;

(d) access to alternative transport facilities;

(e) domestic or community renewable electricity generation and renewable energy use.

13.4.16 When considering proposals for subdivision and development within an existing National Grid Corridor the following will be taken into account:

(a) the extent to which the proposal may restrict or inhibit the operation, access, maintenance, upgrading of transmission lines or support structures;

(b) any potential cumulative effects that may restrict the operation, access, maintenance, upgrade of transmission lines or support structures; and

(c) whether the proposal involves the establishment or intensification of a sensitive activity in the vicinity of an existing National Grid line.

Note 1: Structures and activities located near transmission lines must comply with the safe distance requirements in the New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP34:2001). Compliance with this plan does not ensure compliance with NZECP34:2001.

Note 2: Vegetation to be planted within, or adjacent to, the National Grid Corridor should be selected and/or managed to ensure that it will not result in that vegetation breaching the Electricity (Hazards from Trees) Regulations 2003.

Operative District Plan – Rural Production Zone Objectives & Policies

Objectives

8.3.1 To promote the sustainable management of natural and physical resources of the rural environment.

8.3.2 To ensure that the life supporting capacity of soils is not compromised by inappropriate subdivision, use or development.

8.3.3 To avoid, remedy or mitigate the adverse and cumulative effects of activities on the rural environment.

8.3.4 To protect areas of significant indigenous vegetation and significant habitats of indigenous fauna.

8.3.5 To protect outstanding natural features and landscapes.

8.3.6 To avoid actual and potential conflicts between land use activities in the rural environment.

8.3.7 To promote the maintenance and enhancement of amenity values of the rural environment to a level that is consistent with the productive intent of the zone.

8.3.8 To facilitate the sustainable management of natural and physical resources in an integrated way to achieve superior outcomes to more traditional forms of subdivision, use and development through management plans and integrated development.

8.3.9 To enable rural production activities to be undertaken in the rural environment.

8.3.10 To enable the activities compatible with the amenity values of rural areas and rural production activities to establish in the rural environment.

Policies

8.4.1 That activities which will contribute to the sustainable management of the natural and physical resources of the rural environment are enabled to locate in that environment.

8.4.2 That activities be allowed to establish within the rural environment to the extent that any adverse effects of these activities are able to be avoided, remedied or mitigated and as a result the life supporting capacity of soils and ecosystems is safeguarded and rural productive activities are able to continue.

8.4.3 That any new infrastructure for development in rural areas be designed and operated in a way that safeguards the life supporting capacity of air, water, soil and ecosystems while protecting areas of significant indigenous vegetation and significant habitats of indigenous fauna, outstanding natural features and landscapes.

8.4.4 That development which will maintain or enhance the amenity value of the rural environment and outstanding natural features and outstanding landscapes be enabled to locate in the rural environment.

8.4.5 That plan provisions encourage the avoidance of adverse effects from incompatible land uses, particularly new developments adversely affecting existing land-uses (including by constraining the existing land-uses on account of sensitivity by the new use to adverse affects from the existing use – i.e. reverse sensitivity).

8.4.6 That areas of significant indigenous vegetation and significant habitats of indigenous fauna habitat be protected as an integral part of managing the use, development and protection of the natural and physical resources of the rural environment.

8.4.7 That Plan provisions encourage the efficient use and development of natural and physical resources, including consideration of demands upon infrastructure.

8.4.8 That, when considering subdivision, use and development in the rural environment, the Council will have particular regard to ensuring that its intensity, scale and type is controlled to ensure that adverse effects on habitats (including freshwater habitats), outstanding natural features and landscapes on the amenity value of the rural environment, and where appropriate on natural character of the coastal environment, are avoided, remedied or mitigated. Consideration will further be given to the functional need for the activity to be within rural environment and the potential cumulative effects of non-farming activities.

Attachment 13

Proposed District Plan – Objectives and Policies

Objectives – Rural Production Zone

RPROZ-O1 - The Rural Production zone is managed to ensure its availability for primary production activities and its long-term protection for current and future generations.
RPROZ-O2 - The Rural Production zone is used for primary production activities, ancillary activities that support primary production and other compatible activities that have a functional need to be in a rural environment.
RPROZ-O3 - Land use and subdivision in the Rural Production zone:

a. protects highly productive land from sterilisation and enables it to be used for more productive forms of primary production;
b. protects primary production activities from reverse sensitivity effects that may constrain their effective and efficient operation;
c. does not compromise the use of land for farming activities, particularly on highly productive land;
d. does not exacerbate any natural hazards; and
e. is able to be serviced by on-site infrastructure.

RPROZ-O4 - The rural character and amenity associated with a rural working environment is maintained.

Policies Rural Production Zone

RPROZ-P1 - Enable primary production activities, provided they internalise adverse effects onsite where practicable, while recognising that typical adverse effects associated with primary production should be anticipated and accepted within the Rural Production zone.
RPROZ-P2 - Ensure the Rural Production zone provides for activities that require a rural location by:

a. enabling primary production activities as the predominant land use;
b. enabling a range of compatible activities that support primary production activities, including ancillary activities, rural produce manufacturing, rural produce retail, visitor accommodation and home businesses.

RPROZ-P3 - Manage the establishment, design and location of new sensitive activities and other non-productive activities in the Rural Production zone to avoid where possible, or otherwise mitigate, reverse sensitivity effects on primary production activities.
RPROZ-P4 Land use and subdivision activities are undertaken in a manner that maintains or enhances the rural character and amenity of the Rural Production zone, which includes:

a. a predominance of primary production activities;
b. low density development with generally low site coverage of buildings or structures;
c. typical adverse effects such as odour, noise and dust associated with a rural working environment; and
d. a diverse range of rural environments, rural character and amenity values throughout the district.

RPROZ-P5 - Avoid land use that:

a. is incompatible with the purpose, character and amenity of the Rural Production zone;
b. does not have a functional need to locate in the Rural Production zone and is more appropriately located in another zone;
c. would result in the loss of productive capacity of highly productive land;
d. would exacerbate natural hazards; and
e. cannot provide appropriate on-site infrastructure.

RPROZ-P6 - Avoid subdivision that:

a. results in the loss of highly productive land for use by farming activities;
b. fragments land into parcel sizes that are no longer able to support farming activities, taking into account:
    i. the type of farming proposed; and
    ii. whether smaller land parcels can support more productive forms of farming due to the presence of highly productive land.
c. provides for rural lifestyle living unless there is an environmental benefit.

RPROZ-P7 - Manage land use and subdivision to address the effects of the activity requiring resource consent, including (but not limited to) consideration of the following matters where relevant to the application:

a. whether the proposal will increase production potential in the zone;
b. whether the activity relies on the productive nature of the soil;
c. consistency with the scale and character of the rural environment;
d. location, scale and design of buildings or structures;
e. for subdivision or non-primary production activities:
    i. scale and compatibility with rural activities;
    ii. potential reverse sensitivity effects on primary production activities and existing infrastructure;
    iii. the potential for loss of highly productive land, land sterilisation or fragmentation
f. at zone interfaces:
    i. any setbacks, fencing, screening or landscaping required to address potential conflicts;
    ii. the extent to which adverse effects on adjoining or surrounding sites are mitigated and internalised within the site as far as practicable;
g. the capacity of the site to cater for on-site infrastructure associated with the proposed activity, including whether the site has access to a water source such as an irrigation network supply, dam or aquifer;
h. the adequacy of roading infrastructure to service the proposed activity;
i. Any adverse effects on historic heritage and cultural values, natural features and landscapes or indigenous biodiversity;
j. Any historical, spiritual, or cultural association held by tangata whenua, with regard to the matters set out in Policy TW-P6.

Objectives – Subdivision

SUB-O1

Subdivision results in the efficient use of land, which:

a. achieves the objectives of each relevant zone, overlays and district wide provisions;
b. contributes to the local character and sense of place;
c. avoids reverse sensitivity issues that would prevent or adversely affect activities already established on land from continuing to operate;
d. avoids land use patterns which would prevent land from achieving the objectives and policies of the zone in which it is located;
e. does not increase risk from natural hazards or risks are mitigates and existing risks reduced; and
f. manages adverse effects on the environment.

SUB-O2

Subdivision provides for the:

a. Protection of highly productive land; and
b. Protection, restoration or enhancement of Outstanding Natural Features, Outstanding Natural Landscapes, Natural Character of the Coastal Environment, Areas of High Natural Character, Outstanding Natural Character, wetland, lake and river margins, Significant Natural Areas, Sites and Areas of Significance to Māori, and Historic Heritage.

SUB-O3

Infrastructure is planned to service the proposed subdivision and development where:

a. there is existing infrastructure connection, infrastructure should provided in an integrated, efficient, coordinated and future-proofed manner at the time of subdivision; and
b. where no existing connection is available infrastructure should be planned and consideration be given to connections with the wider infrastructure network.

SUB-O4

Subdivision is accessible, connected, and integrated with the surrounding environment and provides for:

a. public open spaces;
b. esplanade where land adjoins the coastal marine area; and
c. esplanade where land adjoins other qualifying waterbodies.

Subdivision - Policies

SUB-P1

Enable boundary adjustments that:

a. do not alter:
    i. the degree of non compliance with District Plan rules and standards;
    ii. the number and location of any access; and
    iii. the number of certificates of title; and
b. are in accordance with the minimum lot sizes of the zone and comply with access, infrastructure and esplanade provisions.

SUB-P2

Enable subdivision for the purpose of public works, infrastructure, reserves or access.

SUB-P3

Provide for subdivision where it results in allotments that:

a. are consistent with the purpose, characteristics and qualities of the zone;
b. comply with the minimum allotment sizes for each zone;
c. have an adequate size and appropriate shape to contain a building platform; and
d. have legal and physical access.

SUB-P4

Manage subdivision of land as detailed in the district wide, natural environment values, historical an cultural values and hazard and risks sections of the plan

SUB-P5

Manage subdivision design and layout in the General Residential, Mixed Use and Settlement zone to provide for safe, connected and accessible environments by:

a. minimising vehicle crossings that could affect the safety and efficiency of the current and future transport network;
b. avoid cul-de-sac development unless the site or the topography prevents future public access and connections;
c. providing for development that encourages social interaction, neighbourhood cohesion, a sense of place and is well connected to public spaces;
d. contributing to a well connected transport network that safeguards future roading connections; and
e. maximising accessibility, connectivity by creating walkways, cycleways and an interconnected transport network.

SUB-P6

Require infrastructure to be provided in an integrated and comprehensive manner by:

a. demonstrating that the subdivision will be appropriately serviced and integrated with existing and planned infrastructure if available; and
b. ensuring that the infrastructure is provided is in accordance the purpose, characteristics and qualities of the zone.

SUB- P7

Require the vesting of esplanade reserves when subdividing land adjoining the coast or other qualifying waterbodies.

SUB-P8

Avoid rural lifestyle subdivision in the Rural Production zone unless the subdivision:

a. will protect a qualifying SNA in perpetuity and result in the SNA being added to the District Plan SNA schedule; and
b. will not result in the loss of versatile soils for primary production activities.

SUB-P9

Avoid subdivision rural lifestyle subdivision in the Rural Production zone and Rural residential subdivision in the Rural Lifestyle zone unless the development achieves the environmental outcomes required in the management plan subdivision rule.

SUB-P10

To protect amenity and character by avoiding the subdivision of minor residential units from principal residential units where resultant allotments do not comply with minimum allotment size and residential density.

SUB-P11

Manage subdivision to address the effects of the activity requiring resource consent including (but not limited to) consideration of the following matters where relevant to the application:

a. consistency with the scale, density, design and character of the environment and purpose of the zone;
b. the location, scale and design of buildings and structures;
c. the adequacy and capacity of available or programmed development infrastructure to accommodate the proposed activity; or the capacity of the site to cater for on-site infrastructure associated with the proposed activity;
d. managing natural hazards;
e. Any adverse effects on areas with historic heritage and cultural values, natural features and landscapes, natural character or indigenous biodiversity values; and
f. any historical, spiritual, or cultural association held by tangata whenua, with regard to the matters set out in Policy TW-P6.

Objectives - Natural Hazards

NH-O1
The risks from natural hazards to people, infrastructure and property are managed, including taking into account the likely long-term effects of climate change, to ensure the health, safety and resilience of communities.
NH-O2
Land use and subdivision does not increase the risk from natural hazards or risks are mitigated, and existing risks are reduced where there are practicable opportunities to do so.
NH-O3
New infrastructure is located outside of identified natural hazard areas unless:
it has a functional or operational need to be located in that area;
it is designed to maintain its integrity and function, as far as practicable during a natural hazard event; and
adverse effects resulting from that location on other people, property and the environment are mitigated.
NH-O4
Natural defences, such as natural systems and features, and existing structural mitigation assets are protected to maintain their functionality and integrity and used in preference to new structural mitigation assets to manage natural hazard risk.

Policies - Natural Hazards

NH-P2
Manage land use and subdivision so that natural hazard risk is not increased or is mitigated, giving consideration to the following:

a. the nature, frequency and scale of the natural hazard;
b. not increasing natural hazard risk to other people, property, infrastructure and the environment beyond the site;
c. the location of building platforms and vehicle access;
d. the use of the site, including by vulnerable activities;

e. the location and types of buildings or structures, their design to mitigate the effects and risks of natural hazards, and the ability to adapt to long term changes in natural hazards;
f. earthworks, including excavation and fill;
g. location and design of infrastructure;
h. activities that involve the use and storage of hazardous substances;
i. aligning with emergency management approaches and requirements;
j. whether mitigation results in transference of natural hazard risk to other locations or exacerbates the natural hazard; and
k. reduction of risk relating to existing activities.

NH-P3 Take a precautionary approach to the management of natural hazard risk associated with land use and subdivision.

NH – P5 Require an assessment of risk prior to land use and subdivision in areas that are subject to identified natural hazards, including consideration of the following:

a. the nature, frequency and scale of the natural hazard;
b. the temporary or permanent nature of any adverse effect;
c. the type of activity being undertaken and its vulnerability to an event, including the effects of climate change;
d. the consequences of a natural hazard event in relation to the activity;
e. any potential to increase existing risk or creation of a new risk to people, property, infrastructure and the environment within and beyond the site and how this will be mitigated;
f. the design, location and construction of buildings, structures and infrastructure to manage and mitigate the effects and risk of natural hazards including the ability to respond and adapt to changing hazards;
g. the subdivision/site layout and management, including ability to access and exit the site during a natural hazard event; and .
h. the use of natural features and natural buffers to manage adverse effects.

NH – P6 Manage land use and subdivision in river flood hazard areas to protect the subject site and its development, and other property, by requiring:

a. subdivision applications to identify building platforms that will not be subject to inundation and material damage (including erosion) in a 1 in 100 year flood event;
b. a minimum freeboard for all buildings designed to accommodate vulnerable activities of at least 500mm above the 1 in 100 year flood event and at least 300mm above the 1 in 100 year flood event for other new buildings;
c. commercial and industrial buildings to be constructed so they will not be subject to material damage in a 1 in 100 year flood event;
d. buildings within a 1 in 10 Year River Flood Hazard Area to be designed to avoid material damage in a 1 in 100 year flood event;

e. storage and containment of hazardous substances so that the integrity of the storage method will not be compromised in a 1 in 100 year flood event;
f. earthworks (other than earthworks associated with flood control works) do not divert flood flow onto surrounding properties and do not reduce flood plain storage capacity within a 1 in 10 Year River Flood Hazard area;
g. the capacity and function of overland flow paths to convey stormwater flows safely and without causing damage to property or the environment is retained, unless sufficient capacity is provided by an alternative method; and
h. the provision of safe vehicle access within the site

NH P8 - Locate and design subdivision and land use to avoid land susceptible to land instability, or if this is not practicable, mitigate risks and effects to people, buildings, structures, property and the environment.

Attachment 14

TOP ENERGY
Te Puna Hihiko
www.topenergy.co.nz

Top Energy Limited
Level 2, John Butler Centre
60 Kerikeri Road
P O Box 43
Kerikeri 0245
New Zealand
PH +64 (0)9 401 5440
FAX +64 (0)9 407 0611

7 January 2025

Neil Mumby
Cable Bay Consulting Ltd

Email: neil.mumby@cablebayconsulting.co.nz

To Whom It May Concern:

RE: PROPOSED SUBDIVISION
Tripark Farms Ltd – 914, 976 & 978 Oruru Road, Taipa.
Lot 1 DP 143291, Pt Allotment 5 Parish of Oruru, Section 1 Survey Office Plan 62852.

Thank you for your recent correspondence with attached proposed subdivision scheme plans.

Top Energy's requirements for this subdivision are nil.
Top Energy recommends that power be made available to the proposed lots at the development stage. Design and costs to make power available would be provided after application and an on-site survey have been completed.
Link to application: Top Energy | Top Energy

In order to get a letter from Top Energy upon completion of your subdivision, a copy of the resource consent decision must be provided.

Yours sincerely

Aaron Birt
Planning and Design
T: 09 407 0685
E: aaron.birt@topenergy.co.nz

From: **Chorus Property Development Do Not Reply** npdnoreply@chorus.co.nz
Subject: Chorus 11097346 : We can service your development
Date: 14 January 2025 at 8:00 AM
To: npdnoreply@chorus.co.nz

CHORUS

Hi

Your reference: Tripark Farms Ltd - 12 Lot Subdivision 914, 976 & 978 Oruru Road, Peria
Development address: 914 Oruru Road , Peria, Far North District, 0482

This email is to confirm that Chorus can provide our fibre network to your development. An indicative cost for the work we would need to do (noting that this excludes costs for any work you may be required to do inside the site boundary) is presented in the below notes:

An approx. estimate to our fibre network to your development $340,000.00 ex GST. This would to come approx. 2.7km from the Peria exchange building on the corner of Oruru Rd and Kohumaru Rd. UFB exchange equipment is also required.
The communications technology available to serve customers in our rural areas is rapidly changing. Copper is no longer the only option for customers, and is in some cases, not the best option. New Zealand runs on fibre, and the UFB roll-out has gone past 87 per cent of Kiwis. We would like to extend fibre further to enable more Kiwis to receive the best technology available. We will not be investing in extending the copper network further.

If you would like this formalised into a quote, then please log in to your account and let us know. If you need to amend the connection numbers or provide updated plans, you can also do that via your account.

Chorus New Property Development Team

Please do not reply to this email as this inbox is not monitored. For any follow up queries please visit www.chorus.co.nz/develop-with-chorus or log in to your account. If you do not yet have an account with us, you will need to create an account to view your job progress and documentation.

Attachment 15

Te Paatu ki Kauhanga Trust Board

28 July 2025

Grant & Karen Parker
Tripark Farms Ltd
978 Ōruru Rd
TAIPA

Email: tripark.kp@gmail.com

Dear Grant and Karen

Thank you for enabling a site visit at Tripark Farms Ltd, 978 Ōruru Road, Taipa on the 21 July 2025.

The proposal is a subdivision of Pt Allotments 5 Parish of Ōruru, Lots 1-10, 12, 13 & 15 as outlined in Appendix 1. For the purpose of communications for this consent application, the applicant has provided:

(1) Archaeological Survey and Assessment of 978 Ōruru Road, Peria, Far North by Justin Maxwell and Jennifer Huebert of Sunrise Archaeology, April 2025.
(2) Ecological Impact Assessment (ECIA) Proposed Subdivision Pt Allotments 5 Parish of Ōruru, 978 Ōruru Road, Taipa, Tripark Farms Ltd by Bay Ecological Consultancy Ltd.
(3) Subdivision plan of Pt Allotments 5 Parish of Ōruru, Lots 1-10, 12, 13 & 15 by Sapphire Surveyors Ltd.

Archaeological Features

Justin Maxwell of Sunrise Archaeology who undertook a site visit on the 19 and 24 September 2023 identified that there are eight key Pā sites significant to tangata whenua on the property:

(1) **Site O04/1032 (Ridge pā):** ridge pā and terraces, partly covered by vegetation. Pā was only described from roadside and has not been ground truthed.

(2) **Site O04/1033 (Terraces and pits):** A series of four terraces and pits running down an east-running spur. The site was noted as bisected by a farm track, and a fifth pit/terrace was in scrub to the west of a farm track. Site was in fair condition when recorded in 2013, with some stock damage.

(3) **Site O04/1034 (Ridge pā):** A ridge pā described in 2013 from a roadside visit. Aerial images suggest two pā are present in this location. The site is clearly visible in aerial images but has never been ground truthed.

(4) **Site O04/1072 (Finda Spot):** A wooden carving 1.5 m in length and 30 cm wide; of a stylised human form. The carving was recovered from a deep drain.

(5) **Site O04/1147 (Swamp pā):** A swamp pā. This site was recorded during a desktop survey of the Ōruru valley by the author. The site is clearly visible in aerial images but has never been ground truthed. previously it had been described but not added to the NZAA Archsite scheme in 1984.

(6) **Site O04/1163 (Ridge pā):** A ridge pā. This site was recorded during a desktop survey of the Ōruru valley by the author, previously it had been described but not added to the NZAA Archsite scheme in 1984. The site is clearly visible in Lidar images but has never been ground truthed.

(7) **Site O04/1164 (Ridge pā):** A ridge pā. This site was recorded during a desktop survey of the Ōruru valley by the author; previously it had been described but not added to the NZAA Archsite scheme in 1984. The site is clearly visible in aerial images but has never been ground truthed.

(8) **Site O04/1165 (Ridge pā):** A ridge pā, possibly a continuation of the upper pā (O04/1034). This site was recorded during a desktop survey of the Ōruru valley by the author, previously it had been described but not added to the NZAA Archsite scheme in 1984. The site is clearly visible in aerial images but has never been ground truthed.

<u>Building Platforms</u>

Lot 1, 2, 3 building platforms no archaeological features were noted, and no indications of subsurface material was identified. Archaeological site O04/1032 is 120 m to the west of the proposed building platform.

Lot 4 building platform, no archaeological features were noted, and no indications of subsurface material was identified.

Lot 6 proposed building platform, no archaeological features were noted, and no indications of subsurface material were identified. Sunrise Archaeology noted that the Pā O04/1032 extends into Lot 6 and covers a large area of this paddock. However, it does not extend into the proposed building platform on this lot.

Site O04/1033 is 380 to the west of the proposed building platform for Lot 7. No archaeological features were noted, and no indications of subsurface material was identified.

Sunrise Archeology advised that for building platforms proposed for Lots 9, 10 and 12 no archaeological features were noted, and no indications of subsurface material were identified.

Lot 15 proposed building platform is 200 m southeast of site O04/1163 (Ridge pā) in the centre of the proposed subdivision. No archaeological features were noted, and no indications of subsurface materials were identified.

<u>Conclusions and Recommendations</u>

The applicants have undertaken a precautionary approach when identifying building platforms for this proposed subdivision. Sunrise Archeology (2025) confirmed that there were *"no known archaeological sites are located within or near the building platforms for proposed Lots 1, 2, 3, 4, 5, 9, 10, 12, and 15, and no additional above-ground archaeological sites were found within those areas."*

However, Sunrise Archaeology (2025) also noted that:

(a) Lot 6 – the building platform has been situated to avoid the pā site and terrace complex.
(b) Lot 7 – there are pits and terrace sites 350 m northwest of the building platform.
(c) Lot 15 – no developments should occur within 50 m of the pā, pits and terrace platforms.

We therefore concur with the recommendations by Sunrise Archaeology (2025) as set out in their report on page 50 as follows:

1. *It is our expert opinion that the subdivision can proceed but each of the proposed lots may require a Heritage New Zealand Authority to damage, modify or destroy an archaeological site prior to any groundworks occurring. This will be determined once all areas of potential ground disturbance have been identified and tested.*

2. *The proposed building platforms are all in areas where there is a low likelihood of encountering archaeological features but are within an area where an archaeological authority could be appropriate.*

3. *There is a low to medium likelihood that the as-yet undescribed earthworks that will be required for access and utilities will potentially impact on as yet unidentified archaeological sites and would therefore require an archaeological authority.*

4. *Any alterations to the proposed works need to be reviewed for comment and/or assessment by an archaeologist.*

In addition:

5. *Due to the high nature of archaeological sites located at 978 Ōruru Road, Taipa that an Archaeological Management Plan (AMP) be provided by Sunrise Archaeology prior to the commencement of all-project work.*

6. *Archaeological authorities be obtained from Heritage New Zealand Pouhere Taonga specifically for Lot 6, 7 and 15.*

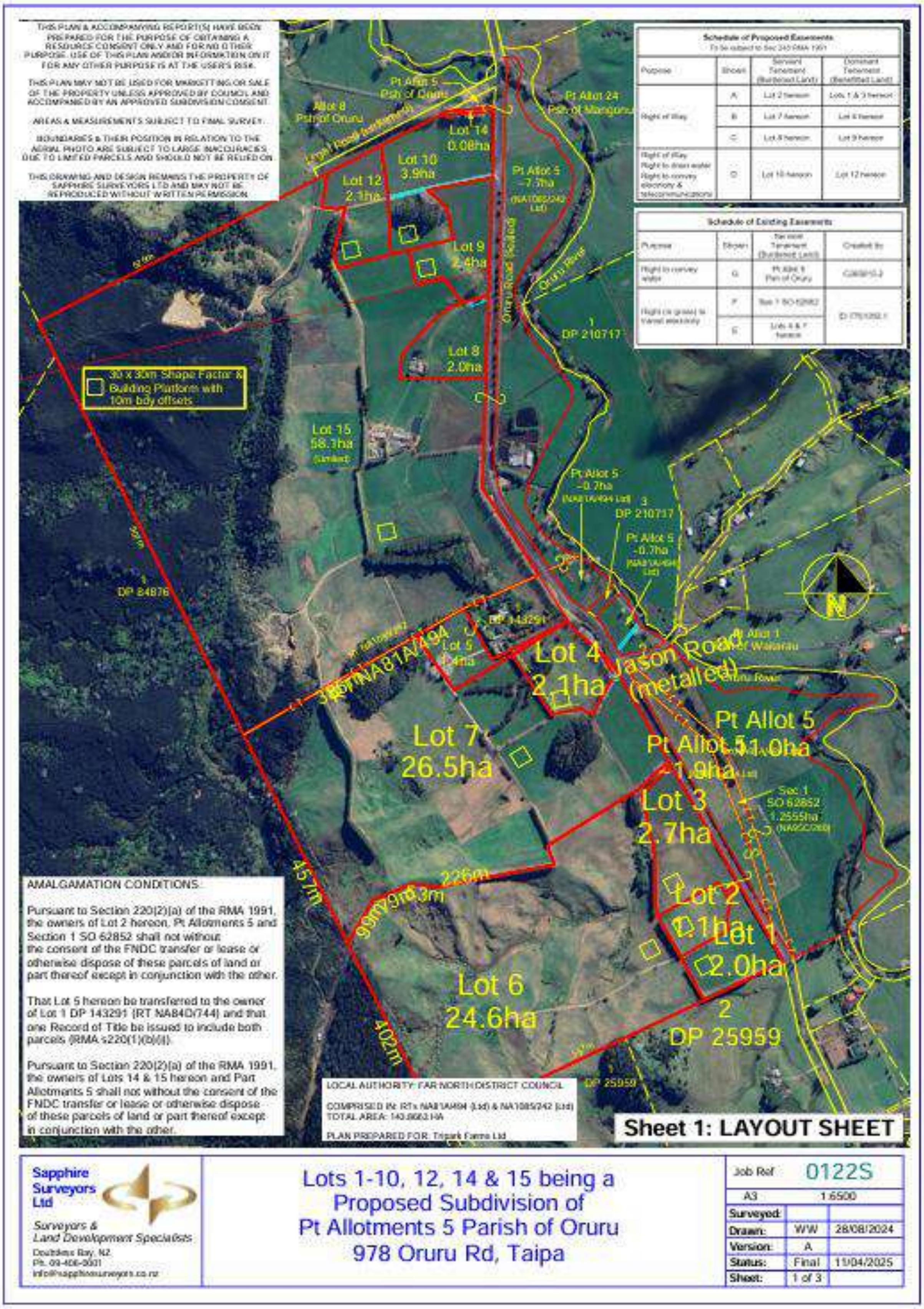
7. *Stopping works due to discovery of an archaeological site (Heritage New Zealand Pouhere Taonga Act 2014) or Taonga Tūturu (Protected Objects Act 1975), and informing Heritage New Zealand Pouhere Taonga, Kerikeri and Te Paatu ki Kauhanga Trust.*

8. *Enable hapu cultural monitoring of any earthworks where there is destruction and/or modification of archaeological site that cannot be avoided, and the discovery of Taonga Tūturu.*

Yours sincerely

Tina Latimer
Trust Secretary

Appendix 1:



Lot 14
0.08ha
Lot 10
3.9ha
Lot 12
2.1ha
Lot 9
2.4ha
Lot 8
2.0ha
Lot 15
58.1ha
Lot 5
Lot 4
2.1ha
Lot 7
26.5ha
Lot 3
2.7ha
Lot 2
Lot 1
2.0ha
Lot 6
24.6ha
Pt Allot 5
Pt Allot 24
Oruru Road (sealed)
Oruru River
DP 210717
3
DP 210717
Jason Road (metalled)
Pt Allot 5
1.0ha
2
DP 25959
1
DP 84876
DP 143291
30 x 30m Shape Factor & Building Platform with 10m bdy offsets
457m
402m
226m
AMALGAMATION CONDITIONS:
Pursuant to Section 220(2)(a) of the RMA 1991, the owners of Lot 2 hereon, Pt Allotments 5 and Section 1 SO 62852 shall not without the consent of the FNDC transfer or lease or otherwise dispose of these parcels of land or part thereof except in conjunction with the other.
That Lot 5 hereon be transferred to the owner of Lot 1 DP 143291 (RT NA84D/744) and that one Record of Title be issued to include both parcels (RMA s220(1)(b)(i)).
Pursuant to Section 220(2)(a) of the RMA 1991, the owners of Lots 14 & 15 hereon and Part Allotments 5 shall not without the consent of the FNDC transfer or lease or otherwise dispose of these parcels of land or part thereof except in conjunction with the other.
LOCAL AUTHORITY: FAR NORTH DISTRICT COUNCIL
Sheet 1: LAYOUT SHEET
Sapphire Surveyors Ltd
Surveyors & Land Development Specialists
Lots 1-10, 12, 14 & 15 being a Proposed Subdivision of Pt Allotments 5 Parish of Oruru
978 Oruru Rd, Taipa
Job Ref 0122S
A3
Surveyed:
Drawn: WW 28/08/2024
Version: A
Status: Final 11/04/2025
Sheet: 1 of 3

Attachment 16

Te Kaunihera o Te Hiku o te Ika
Far North District Council

Office Use Only Application Number:

Application for resource consent or fast-track resource consent

(Or Associated Consent Pursuant to the Resource Management Act 1991 (RMA)) (If applying for a Resource Consent pursuant to Section 87AAC or 88 of the RMA, this form can be used to satisfy the requirements of Schedule 4). Prior to, and during, completion of this application form, please refer to Resource Consent Guidance Notes and Schedule of Fees and Charges — both available on the Council's web page.

1. Pre-Lodgement Meeting

Have you met with a council Resource Consent representative to discuss this application prior to lodgement? ○ **Yes** ✔ **No**

2. Type of Consent being applied for

(more than one circle can be ticked):

○ **Land Use**
○ **Fast Track Land Use***
✔ **Subdivision**
○ **Consent under National Environmental Standard** (e.g. Assessing and Managing Contaminants in Soil)
○ **Other (please specify)** ______
○ **Discharge**
○ **Change of Consent Notice (s.221(3))**
○ **Extension of time (s.125)**

** The fast track is for simple land use consents and is restricted to consents with a controlled activity status.*

3. Would you like to opt out of the Fast Track Process?

✔ **Yes** ○ **No**

4. Consultation

Have you consulted with Iwi/Hapū? ✔ **Yes** ○ **No**

If yes, which groups have you consulted with?	Commenced with Tina Latimer, Secretary/Treasurer of Te Paatu ki Kauhanga Trust
Who else have you consulted with?	Top Energy, Chorus

For any questions or information regarding iwi/hapū consultation, please contact Te Hono at Far North District Council ***tehonosupport@fndc.govt.nz***

5. Applicant Details

Name/s: Tripark Farms Ltd

Email:

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

[redacted]

6. Address for Correspondence

Name and address for service and correspondence (if using an Agent write their details here)

Name/s: Neil Mumby

Email:

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

[redacted]

**** All correspondence will be sent by email in the first instance. Please advise us if you would prefer an alternative means of communication.***

7. Details of Property Owner/s and Occupier/s

Name and Address of the Owner/Occupiers of the land to which this application relates (where there are multiple owners or occupiers please list on a separate sheet if required)

Name/s: Tripark Farms Ltd

Property Address/ Location: 976 Oruru Road

Postcode 0482

8. Application Site Details

Location and/or property street address of the proposed activity:

Name/s: Tripark Farms Ltd

Site Address/ Location: 976 Oruru Road,

Postcode 0482

Legal Description: See AEE **Val Number:** 00085-36000

Certificate of title: See AEE

Please remember to attach a copy of your Certificate of Title to the application, along with relevant consent notices and/or easements and encumbrances (search copy must be less than 6 months old)

Site visit requirements:

Is there a locked gate or security system restricting access by Council staff? ◯ **Yes** ✔ **No**

Is there a dog on the property? ✔ **Yes** ◯ **No**

Please provide details of any other entry restrictions that Council staff should be aware of, e.g. health and safety, caretaker's details. This is important to avoid a wasted trip and having to re-arrange a second visit.

Please notify the applicants before undertaking any site visits for briefing on health and safety requirements.

9. Description of the Proposal:

Please enter a brief description of the proposal here. Please refer to Chapter 4 of the District Plan, and Guidance Notes, for further details of information requirements.

Restricted Discretionary Activity Subdivision - please refer to attached AEE.

If this is an application for a Change or Cancellation of Consent Notice conditions (s.221(3)), please quote relevant existing Resource Consents and Consent Notice identifiers and provide details of the change(s), with reasons for requesting them.

10. Would you like to request Public Notification?

◯ **Yes** ✔ **No**

11. Other Consent required/being applied for under different legislation

(more than one circle can be ticked):

- ○ **Building Consent** Enter BC ref # here (if known)
- ○ **Regional Council Consent (ref # if known)** Ref # here (if known)
- ○ **National Environmental Standard consent** Consent here (if known)
- ○ **Other (please specify)** Specify 'other' here

12. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health:

The site and proposal may be subject to the above NES. In order to determine whether regard needs to be had to the NES please answer the following:

Is the piece of land currently being used or has it historically ever been used for an activity or industry on the Hazardous Industries and Activities List (HAIL) ○ **Yes** ✔ **No** ○ **Don't know**

Is the proposed activity an activity covered by the NES? Please tick if any of the following apply to your proposal, as the NESCS may apply as a result. ○ **Yes** ○ **No** ○ **Don't know**

- ✔ **Subdividing land**
- ○ **Changing the use of a piece of land**
- ○ **Disturbing, removing or sampling soil**
- ○ **Removing or replacing a fuel storage system**

13. Assessment of Environmental Effects:

Every application for resource consent must be accompanied by an Assessment of Environmental Effects (AEE). This is a requirement of Schedule 4 of the Resource Management Act 1991 and an application can be rejected if an adequate AEE is not provided. The information in an AEE must be specified in sufficient detail to satisfy the purpose for which it is required. Your AEE may include additional information such as Written Approvals from adjoining property owners, or affected parties.

Your AEE is attached to this application ✔ **Yes**

13. Draft Conditions:

Do you wish to see the draft conditions prior to the release of the resource consent decision? ● **Yes** ○ **No**

If yes, do you agree to extend the processing timeframe pursuant to Section 37 of the Resource Management Act by 5 working days? ✔ **Yes** ○ **No**

14. Billing Details:

This identifies the person or entity that will be responsible for paying any invoices or receiving any refunds associated with processing this resource consent. Please also refer to Council's Fees and Charges Schedule.

Name/s: (please write in full) Tripark Farms Ltd

Email: [redacted]

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

Fees Information

An instalment fee for processing this application is payable at the time of lodgement and must accompany your application in order for it to be lodged. Please note that if the instalment fee is insufficient to cover the actual and reasonable costs of work undertaken to process the application you will be required to pay any additional costs. Invoiced amounts are payable by the 20th of the month following invoice date. You may also be required to make additional payments if your application requires notification.

Declaration concerning Payment of Fees

I/we understand that the Council may charge me/us for all costs actually and reasonably incurred in processing this application. Subject to my/our rights under Sections 357B and 358 of the RMA, to object to any costs, I/we undertake to pay all and future processing costs incurred by the Council. Without limiting the Far North District Council's legal rights if any steps (including the use of debt collection agencies) are necessary to recover unpaid processing costs I/we agree to pay all costs of recovering those processing costs. If this application is made on behalf of a trust (private or family), a society (incorporated or unincorporated) or a company in signing this application I/we are binding the trust, society or company to pay all the above costs and guaranteeing to pay all the above costs in my/our personal capacity.

Name: (please write in full) Karen Nicola Parker

Signature: [redacted] Date 25/6/25
(signature of bill payer

MANDATORY

15. Important Information:

Note to applicant

You must include all information required by this form. The information must be specified in sufficient detail to satisfy the purpose for which it is required.

You may apply for 2 or more resource consents that are needed for the same activity on the same form. You must pay the charge payable to the consent authority for the resource consent application under the Resource Management Act 1991.

Fast-track application

Under the fast-track resource consent process, notice of the decision must be given within 10 working days after the date the application was first lodged with the authority, unless the applicant opts out of that process at the time of lodgement. A fast-track application may cease to be a fast-track application under section 87AAC(2) of the RMA.

Privacy Information:

Once this application is lodged with the Council it becomes public information. Please advise Council if there is sensitive information in the proposal. The information you have provided on this form is required so that your application for consent pursuant to the Resource Management Act 1991 can be processed under that Act. The information will be stored on a public register and held by the Far North District Council. The details of your application may also be made available to the public on the Council's website, www.fndc.govt.nz. These details are collected to inform the general public and community groups about all consents which have been issued through the Far North District Council.

15. Important information continued...

Declaration

The information I have supplied with this application is true and complete to the best of my knowledge.

Name: (please write in full) Neil Mumby

Signature:

Date 10/04/25

A signature is not required if the application is made by electronic means

Checklist (please tick if information is provided)

- [ ] Payment (cheques payable to Far North District Council)
- [x] A current Certificate of Title (Search Copy not more than 6 months old)
- [x] Details of your consultation with Iwi and hapū
- [ ] Copies of any listed encumbrances, easements and/or consent notices relevant to the application
- [x] Applicant / Agent / Property Owner / Bill Payer details provided
- [x] Location of property and description of proposal
- [x] Assessment of Environmental Effects
- [x] Written Approvals / correspondence from consulted parties
- [x] Reports from technical experts (if required)
- [ ] Copies of other relevant consents associated with this application
- [ ] Location and Site plans (land use) AND/OR
- [x] Location and Scheme Plan (subdivision)
- [ ] Elevations / Floor plans
- [ ] Topographical / contour plans

Please refer to Chapter 4 of the District Plan for details of the information that must be provided with an application. Please also refer to the RC Checklist available on the Council's website. This contains more helpful hints as to what information needs to be shown on plans.