

16 December 2022

Our ref: 773-AKLGE305593

Studio D4 Limited
Level 1, 103 Carlton Gore Road
Newmarket
Auckland 1023

Attention: Patrick Fontein

Geotechnical Desktop Study for Plan Change for Proposed Frecklington Farm Subdivision, Mangawhai

1. INTRODUCTION

Tetra Tech Coffey (NZ) Limited has been engaged by Studio D4 Limited to provide a geotechnical desktop study for the plan change for the proposed subdivision development of the Frecklington Farm site. The proposed subdivision comprises approx. 158Ha, which we understand will be subdivided into approx. 400 Lots in 5 stages.

The purpose and scope of this report is to provide a detailed review of all available geotechnical information for the site including the proposed subdivision master plan, the previous Wiley geotechnical report for the site, published geology, aerial photos, and the New Zealand geotechnical database (NZGD).

This report is intended to provide support for the plan change application with Kaipara District Council.

2. SITE DESCRIPTION

The proposed Frecklington Farm subdivision development is a 158Ha area located 1.5km to the northwest of Mangawhai Village and approximately 3km to the southwest of Mangawhai Heads.

With reference to the Frecklington Farm Conceptual Structure Plan provided in Appendix A, we understand the proposed development will be undertaken in 5 stages and will create approximately 400 residential lots.

The site is currently a farm that has a gully running in a north-west to south-east direction with a ridge line either side. These ridges have moderate to steep slopes with visible head scarps towards the top of them. The eastern ridgeline has dense vegetation and bush downslope whilst the southern ridgeline is benched along its southern face. Historical failures can also be seen along the valley flanks with evidence of shallow soil movement. There is further evidence of head scarps caused by watercourse incision where overland flowpaths and watercourses can be seen within the lower section of the valley. Surrounding this lower valley area hummocky ground is visible with wetland vegetation and swampy ground in the lower lying areas.

3. EXISTING INFORMATION

3.1 GEOLOGICAL SETTING

The 1:250,000 Institute of Geological and Nuclear Sciences map¹ indicates that the majority of the site is underlain by Neogene soils of the Pakiri Formation within the Warkworth Subgroup, which forms a part of the Waitemata Group Lithology. Commonly found materials in the Waitemata Group, Pakiri Formation residual soils include alternating thick bedded, volcanic rich, graded sandstone and siltstone.

At the southern end of the site, fingers of early to middle Pleistocene undifferentiated estuary, river and swamp deposits of the Tauranga Group are mapped. Commonly found materials within this formation comprise partly consolidated mud, sand, gravel and peat or lignite of alluvial, colluvial, lacustrine, swamp and estuarine origins.

In the northern corner of the site, a small area of Northland Allochthon materials are mapped. These comprise a mix of sheared mudstone with tectonic blocks of Northland Allochthon soils, Te Kuiti Group soils and Waitemata Group soils.

3.2 NEW ZEALAND GEOTECHNICAL DATABASE (NZGD)

A review of the New Zealand geotechnical database (NZGD) shows four hand-auger boreholes (HA) drilled approximately 400m southwest of the site to depths ranging from 2.5m to 3.6m. In all of the hand-augers natural soils were encountered comprising stiff to very stiff silty clays and clayey silts of the Pakiri Formation.

Five cone penetrometer tests (CPTs) approximately 700m east of the eastern site boundary are available on the NZGD. The CPTs were carried out to depths ranging from 6.0m to 9.0m. The soils encountered comprised silty clays and clayey silts to depths ranging between 2.0 and 7.8m. Underlying these upper soils sandy silts and silty sands were encountered.

3.3 HISTORIAL AERIAL PHOTOGRAPHS

Historical aerial photographs obtained from Retrolens and Google Earth have been studied to observe the landform and history of site use from 1961 to 2022. No significant changes can be seen on the site from these images.

¹ Edbrooke, S.W. (compiler) 2001: Geology of the Auckland area: scale 1:250,000. Lower Hutt: Institute of Geological & Nuclear Sciences Limited. Institute of Geological & Nuclear Sciences 1:250,000 geological map 3. 74 p. + 1 folded map

4. WILEY GEOTECHNICAL INVESTIGATION REPORT

In 2016 Wiley Geotechnical Limited (WGL) were contracted to undertake a preliminary geotechnical investigation, evaluation and assessment for a proposed subdivision on the site. This report can be found in Appendix B. A preliminary geotechnical investigation was carried out comprising twenty hand-auger boreholes (HA) to depths ranging 2.1m to 3.0m and six cone penetrometer tests (CPT) to depths ranging 9.0m to 15.0m.

The ground conditions encountered within the investigation comprised slightly to moderately clayey silts with bands of slightly sandy silt to a depth of approximately 8.0m. Underlying this material silty sands were encountered. The groundwater was estimated to be between 1.0m and 4.0m depth based on pore water readings from the CPTs however it was not encountered within any of the hand-augers.

The soils encountered in the Wiley investigation were as expected from the published geology. Potential geohazards identified in the Wiley report comprise:

- Based on visual and field assessments the soils were thought to be moderately expansive (M) so accordingly minimum footing depths for residential foundation was expected to be 600mm.
- Portions of the site were expected to have good ground in accordance with NZS 3604 for residential foundation design.

Some areas of potential historical slope stability were identified on steeper portions of the site. These areas will require further assessment at the design stage to identify suitable building platforms.

5. RECOMMENDATIONS

Based on the geotechnical information we have reviewed; we believe that the site is geotechnically suitable for the proposed plan change for residential subdivision. Potential geohazards that may exist on the site and are expected to require geotechnical investigation and assessment have been identified as detailed in the Wiley Report.

A site-specific investigation will be carried out to support the subdivision resource consent. This investigation will include a geotechnical site walkover, hazard mapping and identification of areas for site-specific investigations comprising hand-augered boreholes, excavator trial pits, machine boreholes and piezocone penetration testing. Detailed assessment of potential geohazards will be carried out to provide design input for recommended building platforms and suitable foundation types.

6. LIMITATIONS

This geotechnical desktop study report has been prepared solely for the use of our client, Studio D4 Limited, in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity.


All future owners of this property should seek professional geotechnical advice to satisfy themselves as to its ongoing suitability for their intended use

For and on behalf of Tetra Tech Coffey

Prepared by:


Bridget Lenting
Engineering Geologist

Reviewed and authorised by:


Lee Buhagiar
BE(Hons) CPEng CEngNZ IntPE(NZ)
Associate Geotechnical Engineer

Appendices: A – Frecklington Farm Conceptual Structure Plan
B – Wiley Geotechnical Limited Report

APPENDIX A: FRECKLINGTON FARM CONCEPTUAL STRUCTURE PLAN

Conceptual Structure Plan

A collaborative urban design approach with planning, ecology, landscape and engineering has driven the development of the conceptual structure plan to guide future development within the site.

A comprehensive analysis of the existing environmental qualities, features and characteristics informed the identification of appropriate opportunities and constraints. This, has subsequently informed the development of the conceptual structure plan which indicates key structural elements of movement and land use as well as specific open space and other place making recommendations.

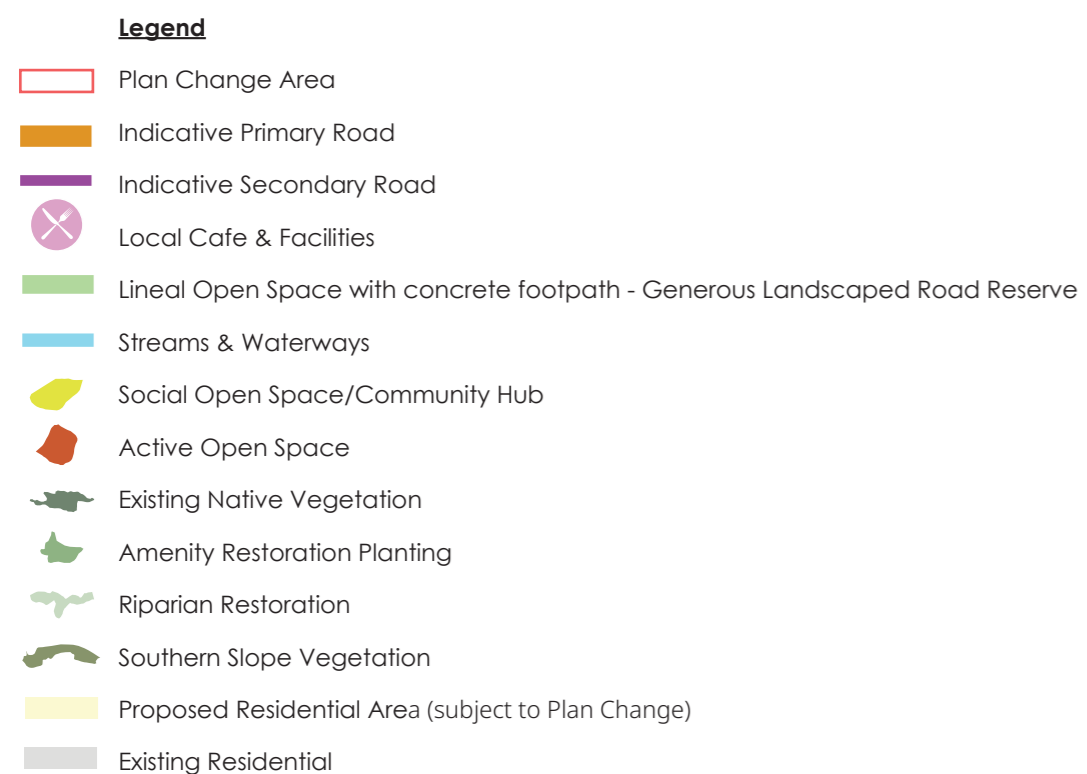


Figure 14
Scale 1:12,500 at A3

APPENDIX B: WILEY GEOTECHNICAL LIMITED REPORT



21 August 2019

Keith Frecklington
C/- Pacific Coast Surveys
adam@pacificcoastsurvey.com

RE: Preliminary Geotechnical Investigation for Proposed Subdivision of Lot 2 DP 172698 at Tara Road Subdivision, Mangawhai

Wiley Geotechnical Limited (WGL) was requested by Keith Frecklington to provide a preliminary geotechnical investigation to assess the viability of the site for subdivision development. Please note this report supersedes our previous report dated 8 August 2018 as we understand the proposed lot numbers of the subdivision have changed. We have since received and reviewed an updated scheme plan produced by Pacific Coast Surveys (Ref. 2081, August 2019) which illustrates the site subdivided into 80 Lots with 79 proposed as residential lots and the remaining lot to be a proposed reserve vested to Kaipara District Council. The proposed access to the majority of the proposed Lots is via common access roadways across the site generally trending along ridgelines and existing farm tracks.

WGL carried out several site visits and investigations between October 2016 and July 2017.

Site Description

The site comprises an approximate area of 160 Ha and is located north west of Mangawhai village. Tara Road, Cove Road and Old Waipu (North) Road generally bound the west, north and north eastern sides of the site, respectively, with the remainder of the site bounded by rural and residential properties. A residential dwelling is located to the western side of the site situated on the main access way. Farm buildings are also located in the vicinity. Access around the site is predominantly provided by unpaved farm tracks which generally follow ridgeline formations. Drainage from the majority of the site is provided by a natural gully formation which trends from the northwest through the centre of the site to the south-eastern boundary. A smaller watercourse extends along the western side of the site connecting to the aforementioned gully formation downstream.

Regional Geology

The GNS map for the site indicates that the site is predominantly underlain by sedimentary rocks of the Pakiri Formation (Waitemata Group) (PF) comprising “alternating thick-bedded, volcanic rich, graded sandstone and siltstone with volcanoclastic grit beds.”

The map illustrates the south central and south eastern lower lying areas of the site to be underlain by alluvium of the Tauranga Group comprising “partly consolidated mud, sand, gravel and peat or lignite of alluvial, colluvial, lacustrine, swamp and estuarine origins”.

The northern corner section of the property is illustrated upon the map to be underlain by undifferentiated melange of the Northland Allochthon Group comprising “melange, comprising a matrix of sheared mudstone with included tectonic blocks of Northland Allochthon, Te Kuiti Group and Waitemata”.

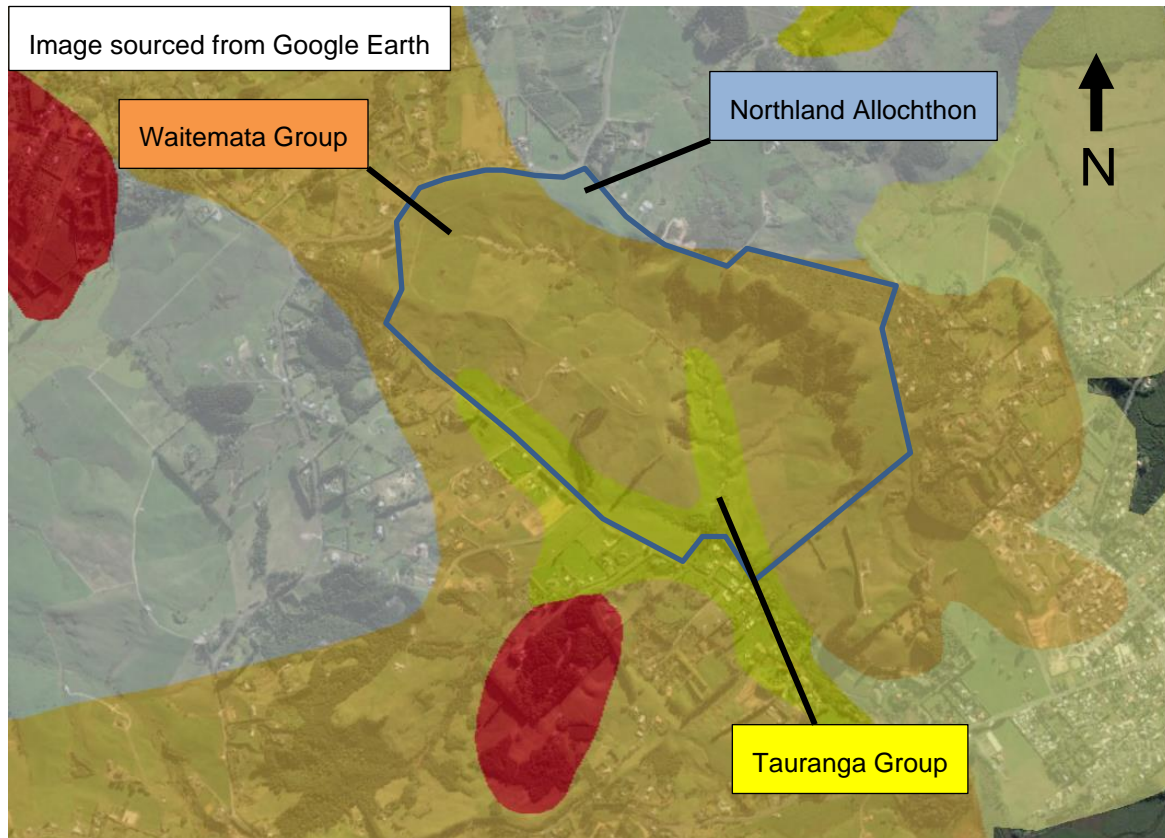


Figure 1: Mapped Site Geology

Historical Aerial Photography

Historic aerial photography dating back to 2006 was reviewed using available Google Earth images. It appears no obvious development or earthworks have been carried out since 2006 with the current site generally remaining as is.

Geomorphology

The prominent features of the site are two ridgeline formations generally trending in a northwest to southeast direction with moderate to steep slopes creating a large gully formation in between. Head scarps with soil ridges were observed in areas towards the top of the ridgelines. Historical slope failures were observed along the valley flanks along with evidence of shallow soil movement and soil creep. Overland flow paths and ephemeral watercourses lead to a main watercourse running through the base of the valley formation. Evidence of instability in the form of scarps and receding gully heads caused by watercourse incision and erosion is present on the lower sections of the valley. Localised areas of hummocky ground were observed across the sloping valley sides with wetland vegetation and swampy ground in the lower lying areas of the gully formation. Steep sloping sections trend off

either side of the ridgeline located towards the eastern corner of the site with dense vegetation and bush downslope. The southern ridgeline contains cascading benches along its southern side with steep sections along the watercourse side likely caused by incision. Soil creep was evident along the watercourse banks due to the steep nature of the slopes. The western side of the watercourse is relatively flat with a slight grade towards the east. Evidence of shallow soil creep and hummocky ground was observed throughout areas of the site.

Field Exploration and Subsurface Conditions

WGL carried out a preliminary geotechnical investigation consisting of twenty hand auger boreholes and six Cone Penetration Tests (CPT). The approximate locations of these tests are shown on the Test Location Plan which is attached to this report as an appendix.

The hand auger exploration points provide data to characterise near surface soils which was carried out up to a maximum depth of 3.0 m. The soils encountered generally consisted topsoil underlain by slightly to moderately clayey silt with bands of slightly sandy silt. Desiccation cracks were observed to a maximum depth of 0.7 m. Groundwater was not encountered at the time of exploration.

The CPT probe gathers raw data including cone tip resistance, friction sleeve resistance and pore water pressure at 2 cm intervals during the test. This information is used to infer the soil type, soil density, strength and ground water conditions. These inferred parameters can be used in design when determining settlement and liquefaction risk or design of piled foundations and other geotechnical analysis. The six CPTs were extended to depths between 9 m and 15 m. CPT01 achieved target a depth of 15 m with the remaining encountering practical refusal due to max tip pressure or the anchors pulling out of the ground at shallower depths. The inferred soils encountered generally consisted topsoil underlain by interbedded layers of clay and silt with occasional layers of sandy silt generally grading into sand and silty sand towards the base of the investigations. The inferred shear strength of the subsoil from the CPTs generally consisted of firm to very stiff silt and clay in the upper 8 m grading into very stiff to hard material with depth. Pore water readings from the CPT indicate that a ground water level may vary between 1 and 4 m; however, dissipation tests were not carried out during the CPT investigation. The groundwater level may vary from this estimated as a result of seasonal change, recent precipitation and/or irrigation practices.

Based on this, it is our opinion that the material encountered and inferred in our subsurface investigation is broadly consistent with published geologic mapping. The bore logs are presented as an appendix to this report and are written in general accordance with the New Zealand Geotechnical Society field classification guidelines (NZGS, 2005). The CPT analysis data is also attached as an appendix to this report.

Expansive Soils

Based on our visual and field assessment of the soils encountered onsite, and our experience in the area, we consider that the Expansive Site Class for this site is "M - moderate" - in accordance with AS 2870. Accordingly, the minimum footing depth for future residential foundations is expected to be 600 mm below cleared ground level.

Conclusions and Recommendations

Based on the findings of our preliminary geotechnical investigation and site assessment, it is our opinion that the site is generally suitable for the proposed subdivision development, subject to further geotechnical investigations to develop more detailed geological models and provide engineering design recommendations to support subdivision of the site.

Foundations

A Geotechnical Assessment Plan is attached as an appendix to this report which illustrates the Lots which are envisaged to be suitable for NZS 3604 foundations and the remaining Lots which are expected to require specific engineering design. Further geotechnical investigations shall be required upon each Lot at the building consent stage to confirm if NZS 3604 foundation are suitable or what degree of engineering design is required to be implemented. Earthworks as part of the subdivision or engineering cut and fill operations may create a suitable NZS 3604 dwelling building platform on Lots which had otherwise been marked requiring specific engineered design.

Based on the preliminary borehole investigations we would generally expect that a geotechnical ultimate bearing capacity of 300 kPa would be available; however, further geotechnical investigations and design shall have to be carried out.

Slope Stability

Areas throughout the site were observed to have evidence of historical large-scale instability. Small scale instability was also observed in form of soil creep and shallow slumping with hummocky ground widespread. Steeper sloping ground and high seasonal groundwater levels are considered to be the main drivers behind these observations. Slope stability analysis shall likely be required on some of the Lots with steeper sloping ground so further field assessments shall be required. This may be carried out at the stage when proposed building platforms are being identified during detailed design phase of the subdivision process.

Onsite Wastewater Disposal

We consider that the majority of the proposed Lots shall require the implementation of a Secondary wastewater system. Some of the Lots may be suitable for a Primary wastewater system depending on the final dwelling structure and location as well as the available area for a disposal field. Both the Primary and the Secondary systems require the effluent field to be fenced if the land intends to be grazed.

The final onsite wastewater disposal system must conform to G13 of the NZ Building code. There are a number of proprietary systems available to suit the requirements of the proposed dwelling, which are a function of the building footprint and total number of occupants.

Any treated material must be dispersed in a controlled manner across a relatively level discharge area in order to maximise the efficient infiltration of material without compromising the stability of any slopes. To this end, we recommend that the effluent disposal fields be located clear of the building locations.

In terms of AS/NZS: 1547-2000) a Soil Category of 4 should be adopted (i.e. Clay loams – imperfectly drained).

Stormwater

We recommend that stormwater runoff overflow from newly developed dwelling water tanks, driveways and other impervious areas is directed downslope via closed conduit towards the existing overland flow paths, if possible. For the overland flow path to be considered suitable it would have to convey stormwater to one of the two main watercourses trending through the site and not direct water into neighbouring Lots. This method of stormwater disposal is expected to be limited to the Lower lying Lots within the central valley formation and to the east of the site. The outlet of any stormwater pipe should not be positioned above sloping ground where the risk of slope instability would be increased. We recommend the outlet pipe directs water in to rip rap erosion protection. This should consist of geotextile cloth placed upon insitu soil with clean rock of 150-300 mm in diameter. This area should be a minimum of 1 m wide and 3 m in length.

If a suitable overland flow path is not available, we would recommend implementing suitable subsoil level spreader to disperse stormwater runoff from future water tank overflow pipe(s). This should consist of a 0.5 m wide by a 0.5 m deep excavation with a perforated 110 mm novacoil pipe backfilled with clean drainage rock. The base and side should be wrapped with a geotextile cloth (Bidim A29, Cirtex AS410 or similar approved product) and fold over the top of the drainage metal enclosing it. The subsoil level spreader should be constructed to have 1 m length for every 10 m³ of roof area of the proposed dwelling.

If the total impervious area being developed on any lot (roofs, driveways, paving etc.) is greater than 10% of the entire lot area, then specific stormwater design shall have to be carried out with regards to attenuation in order to offset the increase in stormwater runoff up to the 100 year storm event. Specific design must reach Kaipara District Council standards. This shall be determined at the building consent stage once final impervious areas are known.

Drainage

Due to the gradients on the majority of Lots it is envisaged that concrete lined cut off or simple v-drains would need to be constructed upslope of the future building platform to help catch stormwater run-off from the upslope areas. We would expect drain should have a minimum width of 500 mm and depth of 150 mm, be fully lined with 50 mm thickness of concrete and discharge downslope clear of the proposed dwelling. The outlet should have a 3 m section of rock rip rap to protect against any scour. The rip-rap apron should have a minimum width of 1 m and depth of 0.3 m, and be filled with 150-300 mm clean rock.

Further Geotechnical Investigation

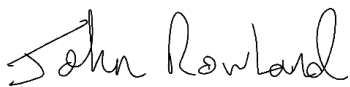
This report entailed a preliminary investigation for the subdivision development of the site. The recommendations and considerations outlined are indicative of what is expected based on the preliminary investigations. Further geotechnical investigations and engineering input shall be required through the subdivision process as well as monitoring and certification of any subdivision earthworks.

LIMITATIONS

- (i) This report has been prepared for the use of our client, Keith Frecklington and their professional advisers and the relevant Regional Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

- (ii) Assessments made in this report are based on the ground conditions indicated from published sources, site inspections and subsurface investigations described in this report based on accepted normal methods of site investigations. Variations in ground conditions may exist between test locations and therefore have not been taken into account in the report. If variations are found during excavation or at foundation preparation stage WGL should be notified immediately so we can amend our recommendations.
- (iii) This Limitation should be read in conjunction with the IPENZ/ACENZ Standard Terms of Engagement.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on 021 0399 385 or matt@wileygeotechnical.co.nz if you require any further information.



John Rowland, BEng

Geotechnical/Stormwater Engineer

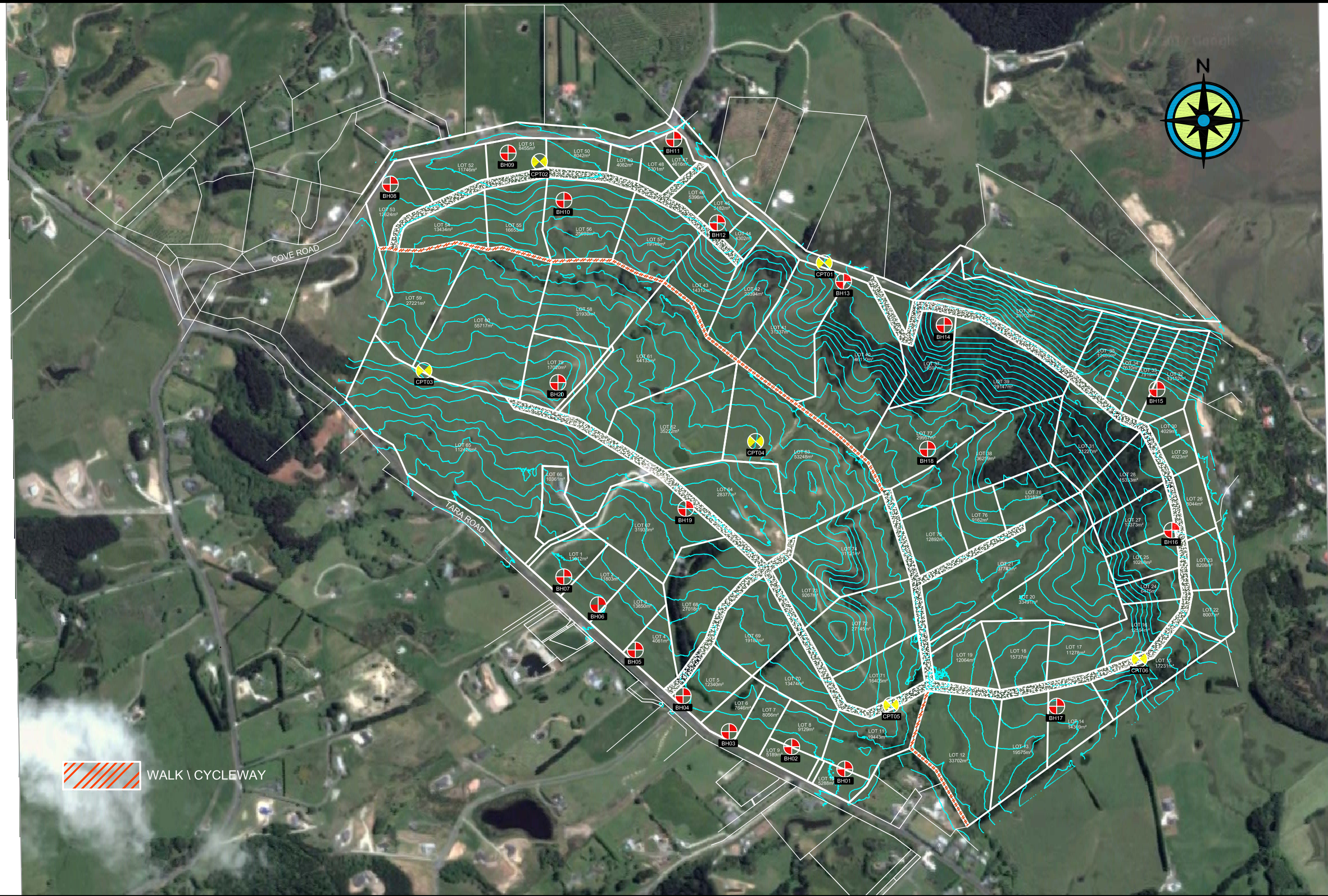


Matt Wiley, CPEng

Principal Engineer

Attachments:

- *Test Location Plan*
- *Geotechnical Assessment Plan*
- *Bore Logs*
- *CPT Data Results*



 WALK | CYCLEWAY



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 www.pacificcoastsurvey.com

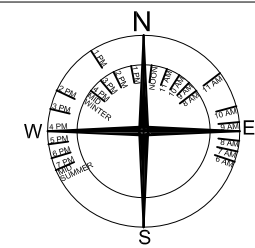
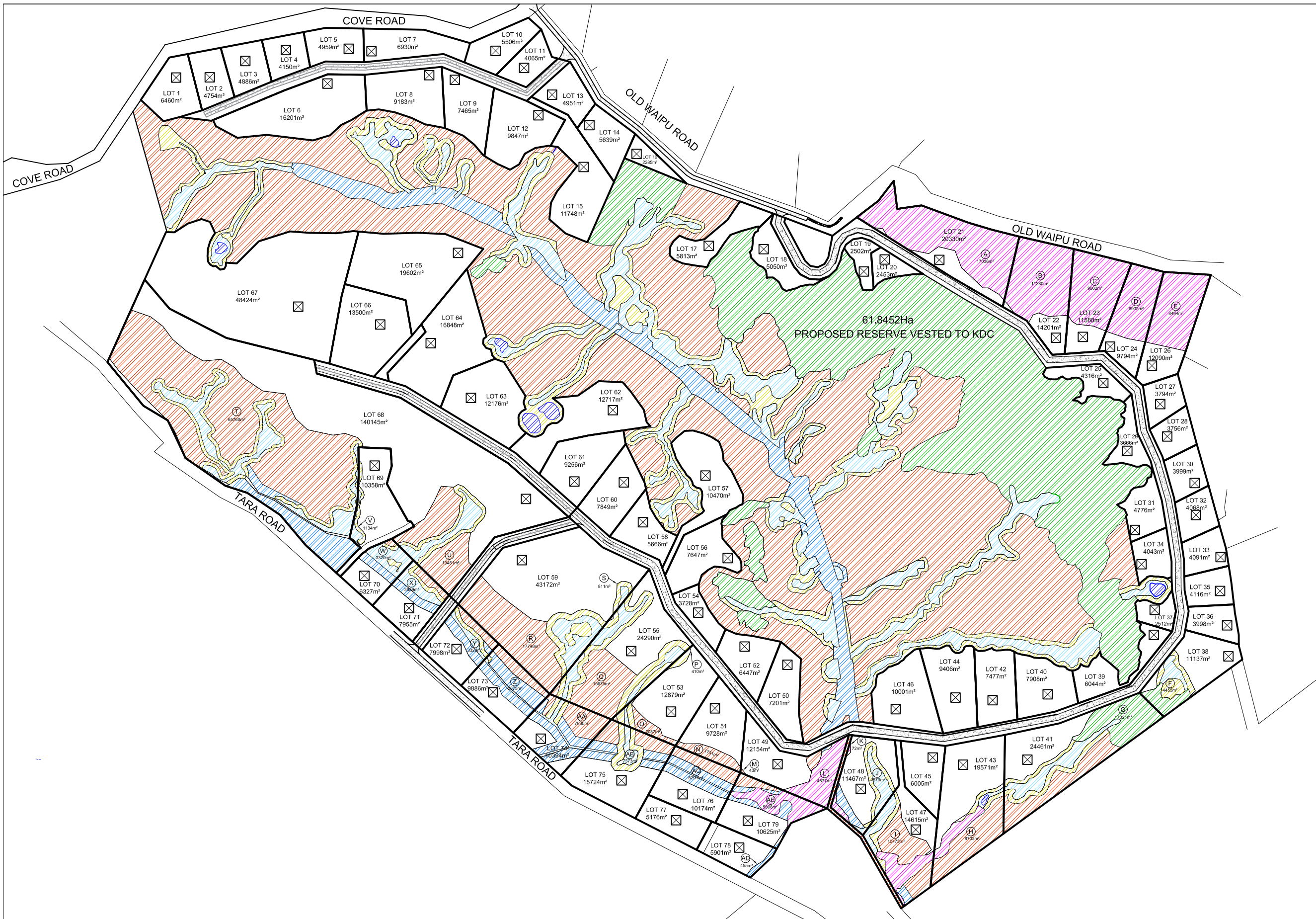
TEST LOCATION PLAN

TARA ROAD, MANGAWHAI

CLIENT
 KEITH FRECKLINGTON
 FILE 2081 REVISION 3
 DATE FEBRUARY 2018
 SCALE 1:7500 @ A3
 COUNCIL FILE

NOTES: 1 - Any queries should be directed to Pacific Coast Surveys Ltd.

PROPOSED SUBDIVISION
 OF LOT 2 DP 172698



LEGEND

- MAJ CONTOUR
- PROPERTY BDY
- EXOTIC BUSH
- EXOTIC TREE STAND
- NATIVE BUSH
- PONDS
- STREAM RIPARIAN REVEGE
- WATERCOURSE
- WETLAND AREA TOTAL
- WETLAND RIPARIAN REVEGE
- DRYLAND REVEGE
- BUILDING RESTRICTIONS
- SCREEN PLANTING PRE 224c
- SCREEN PLANTING BUILDING CONSENT

- NOTE:**
- ANY QUERIES SHOULD BE DIRECTED TO PACIFIC COAST SURVEYS LTD.
 - COORDINATES ARE IN TERMS OF MOUNT EDEN CIRCUIT 2000.
 - VERTICAL DATUM ASSUMED.
 - ALL PHOTO OVERLAY BOUNDARIES ARE INDICATIVE ONLY.
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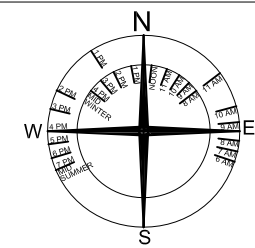
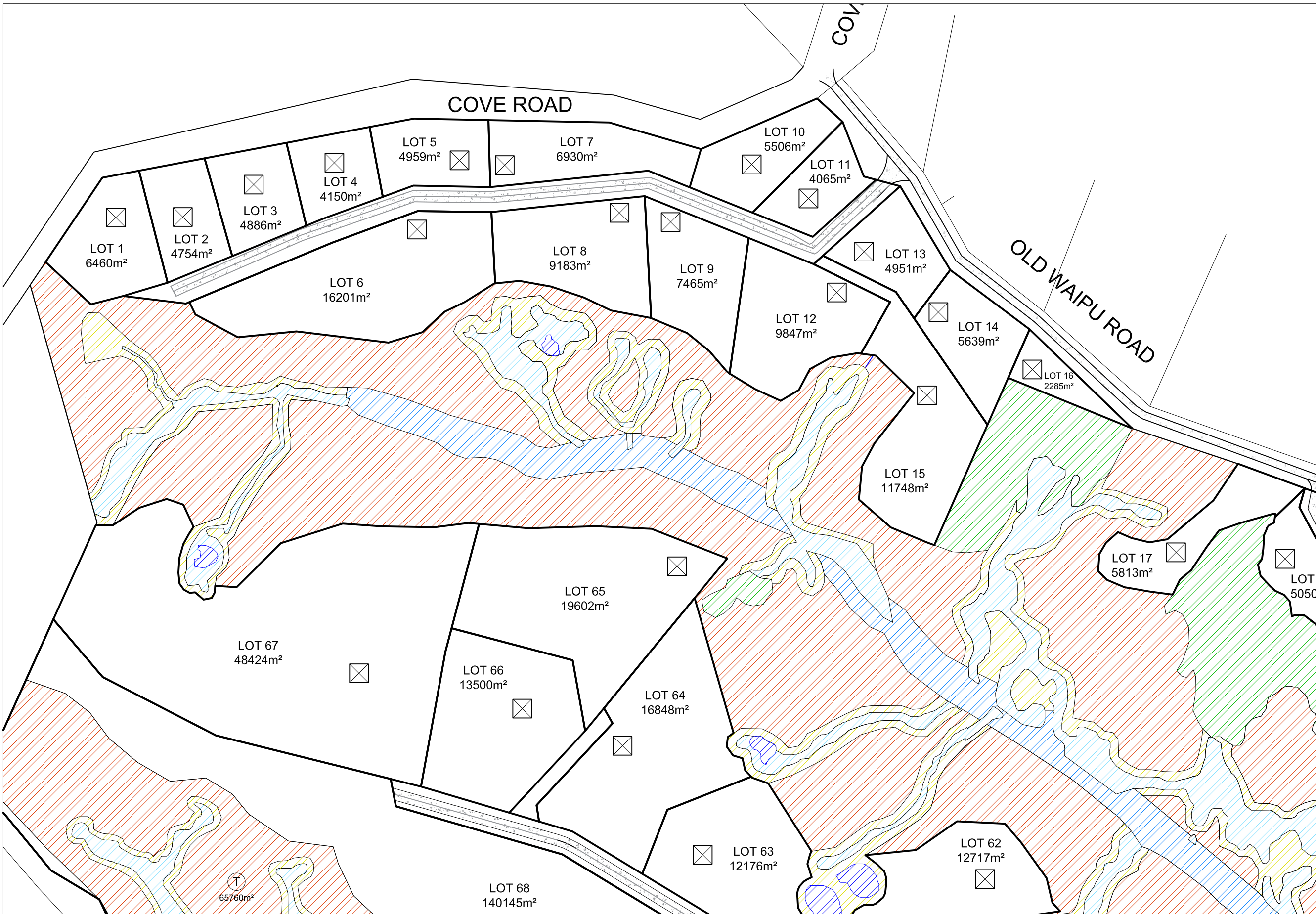
0800 PACIFIC (0800 722 434)
 info@pacificcoastsurvey.com
 www.pacificcoastsurvey.com

PLANTING PLAN

TARA ROAD, MANGAWHAI

CLIENT **KEITH FRECKLINGTON**
 FILE 2081
 REVISION 7
 DATE AUGUST 2019
 SCALE 1:6000 @ A3
 COUNCIL FILE RM
 PAGE 1 OF 7

PROPOSED SUBDIVISION OF LOT 2 DP 172698



LEGEND

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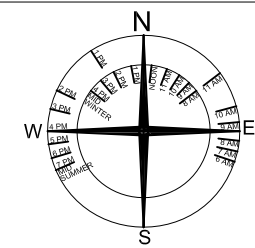
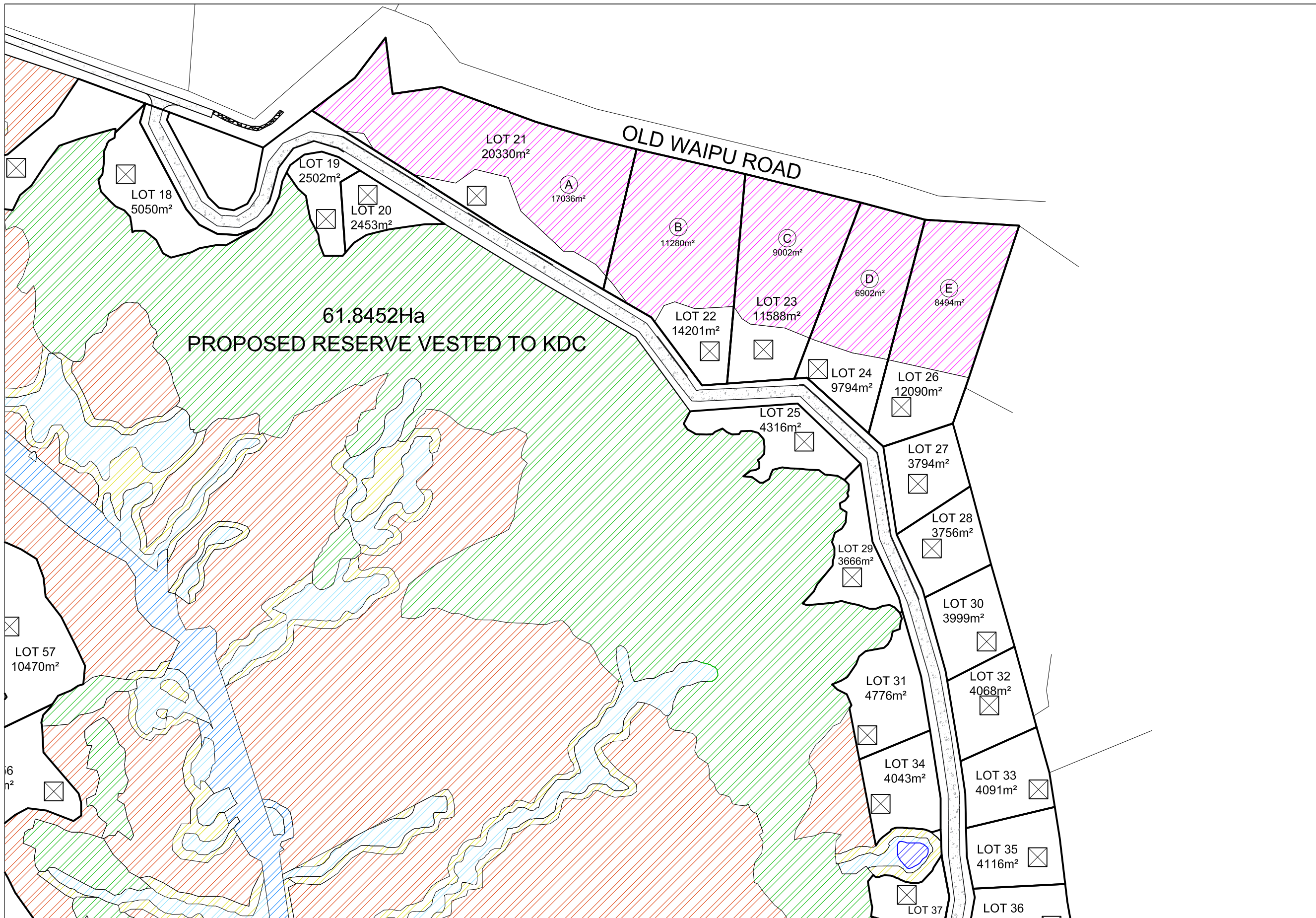
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 www.pacificcoastsurvey.com

PLANTING PLAN
 TARA ROAD, MANGAWHAI

CLIENT **KEITH FRECKLINGTON**
 FILE 2081
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 SCALE 1:3000 @ A3
 COUNCIL FILE RM
 PAGE 2 OF 7

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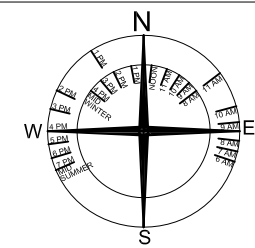
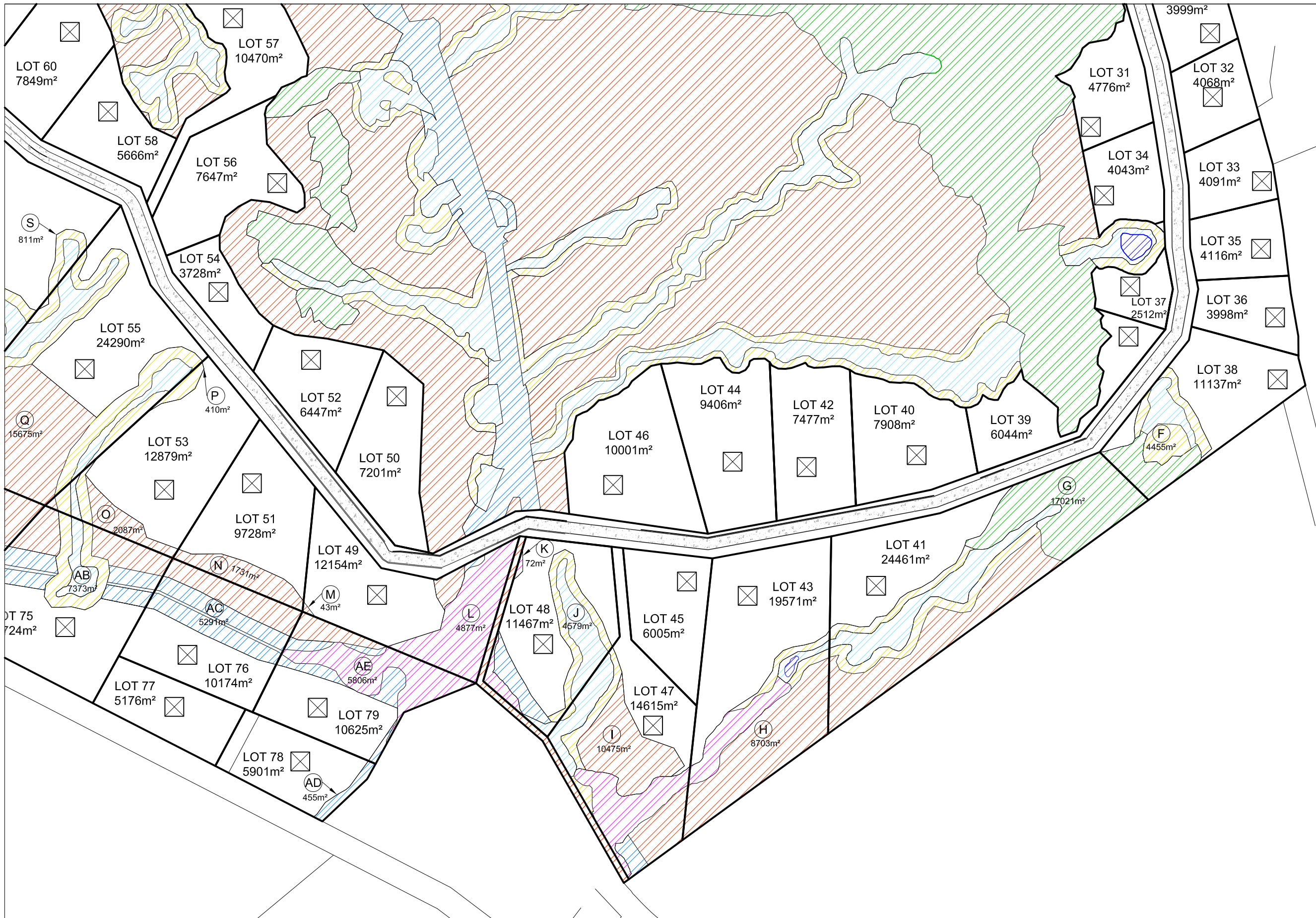
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PLANTING PLAN

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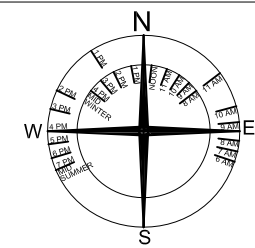
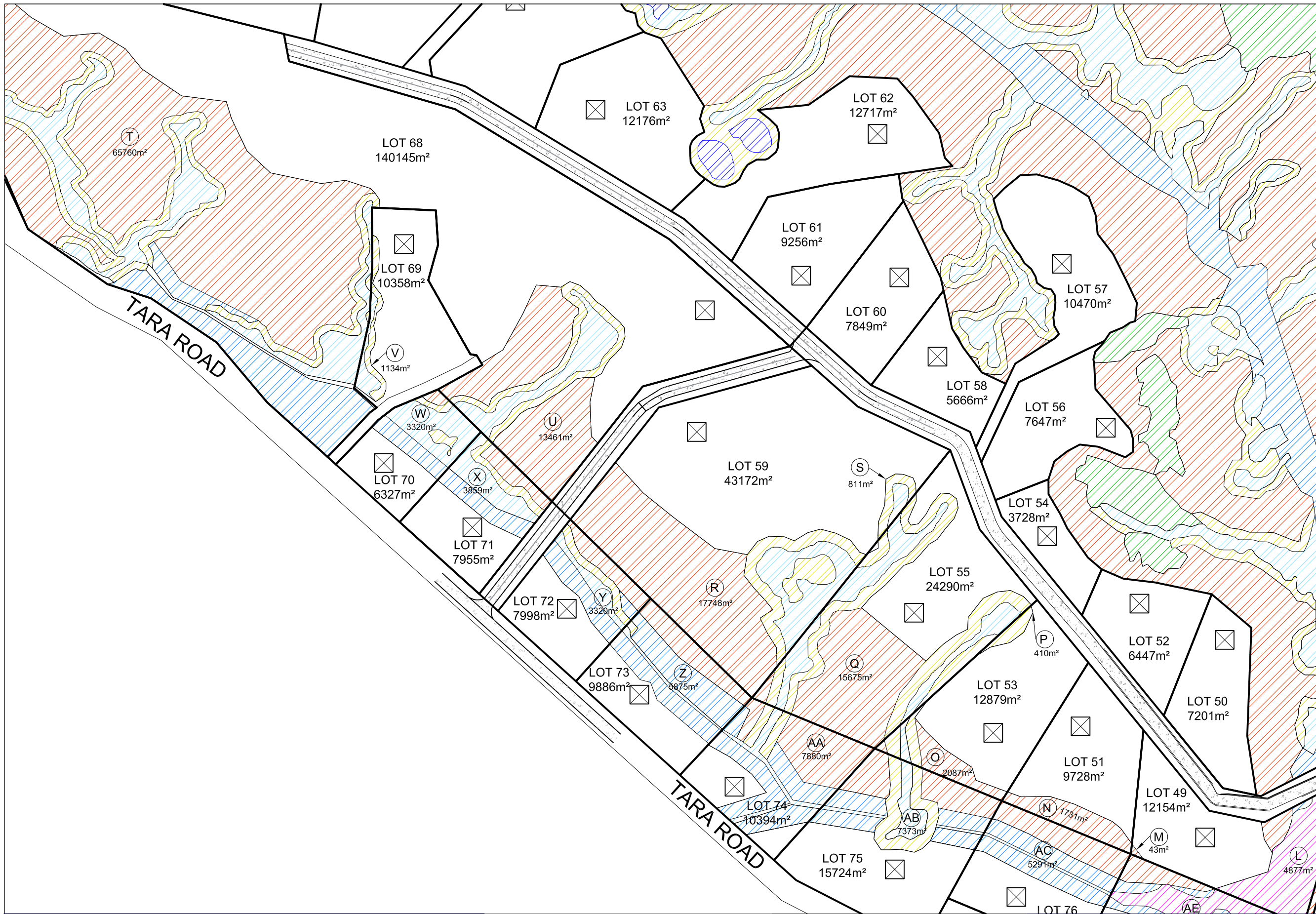
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PLANTING PLAN
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PACIFIC COAST SURVEYS

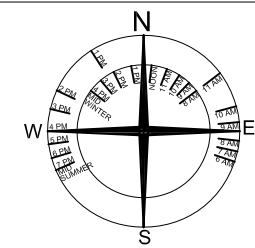
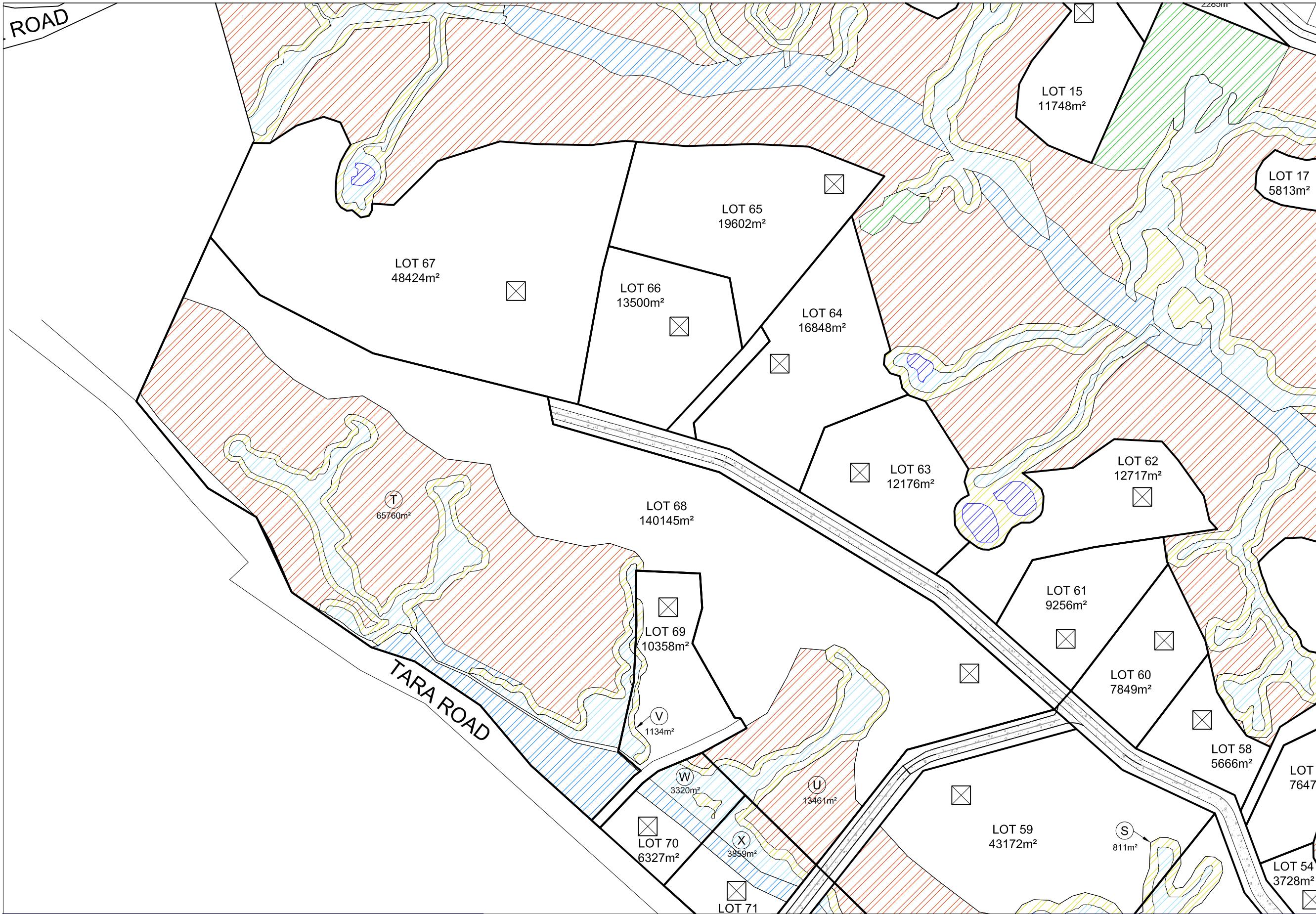
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PLANTING PLAN






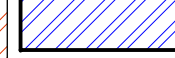
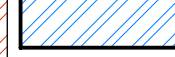
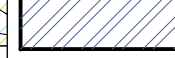






TARA ROAD, MANGAWHAI

CLIENT **KEITH FRECKLINGTON**
 FILE 2081
 REVISION 7
 DATE AUGUST 2019
 SCALE 1:3000 @ A3
 COUNCIL FILE RM
 PAGE 5 OF 7

PROPOSED SUBDIVISION OF LOT 2 DP 172698



LEGEND

-  MAJ CONTOUR
-  PROPERTY BDY
-  EXOTIC BUSH
-  EXOTIC TREE STAND
-  NATIVE BUSH
-  PONDS
-  STREAM RIPARIAN REVEGE
-  WATERCOURSE
-  WETLAND AREA TOTAL
-  WETLAND RIPARIAN REVEGE
-  DRYLAND REVEGE
-  BUILDING RESTRICTIONS
-  SCREEN PLANTING PRE 224c
-  SCREEN PLANTING BUILDING CONSENT

- NOTE:**
- ANY QUERIES SHOULD BE DIRECTED TO PACIFIC COAST SURVEYS LTD.
 - COORDINATES ARE IN TERMS OF MOUNT EDEN CIRCUIT 2000.
 - VERTICAL DATUM ASSUMED.
 - ALL PHOTO OVERLAY BOUNDARIES ARE INDICATIVE ONLY.
 - MAJOR CONTOUR LINES ARE AT 1m INTERVALS.



PACIFIC COAST SURVEYS

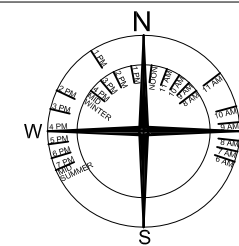
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PLANTING PLAN

TARA ROAD, MANGAWHAI

CLIENT **KEITH FRECKLINGTON**
 FILE 2081
 REVISION 7
 DATE AUGUST 2019
 SCALE 1:3000 @ A3
 COUNCIL FILE RM
 PAGE 6 OF 7

PROPOSED SUBDIVISION OF LOT 2 DP 172698



LEGEND

- MAJ CONTOUR
- PROPERTY BDY
- EXOTIC BUSH
- EXOTIC TREE STAND
- NATIVE BUSH
- PONDS
- STREAM RIPARIAN REVEGE
- WATERCOURSE
- WETLAND AREA TOTAL
- WETLAND RIPARIAN REVEGE
- DRYLAND REVEGE
- BUILDING RESTRICTIONS
- SCREEN PLANTING PRE 224c
- SCREEN PLANTING BUILDING CONSENT

NOTE:

- ANY QUERIES SHOULD BE DIRECTED TO PACIFIC COAST SURVEYS LTD.
- COORDINATES ARE IN TERMS OF MOUNT EDEN CIRCUIT 2000.
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- MAJOR CONTOUR LINES ARE AT 1m INTERVALS.

EXOTIC BUSH	
LOT	AREA
LOT 21	17036m ²
LOT 22	11280m ²
LOT 23	9002m ²
LOT 24	6902m ²
LOT 26	8494m ²
LOT 43	1613m ²
LOT 47	2625m ²
LOT 48	514m ²
LOT 49	4310m ²
LOT 79	3375m ²

NATIVE BUSH	
LOT	AREA
LOT 38	1744m ²
LOT 41	6064m ²
RESERVE	157926m ²

PONDS	
LOT	AREA
LOT 43	92m ²
RESERVE	2334m ²

WETLAND AREA TOTAL	
LOT	AREA
LOT 38	984m ²
LOT 41	3009m ²
LOT 43	307m ²
LOT 47	1358m ²
LOT 48	1743m ²
LOT 53	189m ²
LOT 55	3340m ²
LOT 59	3165m ²
LOT 68	10037m ²
LOT 69	496m ²
LOT 70	1921m ²
LOT 71	1400m ²
LOT 72	650m ²
LOT 73	280m ²
LOT 74	739m ²
LOT 75	1080m ²
LOT 76	245m ²
RESERVE	64246m ²

DRYLAND REVEGE	
LOT	AREA
LOT 41	5424m ²
LOT 43	5908m ²
LOT 47	5085m ²
LOT 49	527m ²
LOT 51	1731m ²
LOT 53	1306m ²
LOT 55	7116m ²
LOT 59	12178m ²
LOT 68	53328m ²
LOT 70	157m ²
LOT 71	789m ²
LOT 72	1073m ²
LOT 73	1659m ²
LOT 74	3000m ²
LOT 75	2341m ²
LOT 76	2104m ²
LOT 79	928m ²
RESERVE	297068m ²

WETLAND RIPARIAN REVEGE	
LOT	AREA
LOT 38	1727m ²
LOT 41	2511m ²
LOT 43	781m ²
LOT 47	1002m ²
LOT 48	1452m ²
LOT 53	1000m ²
LOT 55	5219m ²
LOT 59	3217m ²
LOT 68	8961m ²
LOT 69	638m ²
LOT 70	346m ²
LOT 71	548m ²
LOT 72	615m ²
LOT 73	57m ²
LOT 74	580m ²
LOT 75	1704m ²
RESERVE	63432m ²

STREAM RIPARIAN REVEGE	
LOT	AREA
LOT 47	403m ²
LOT 48	941m ²
LOT 49	83m ²
LOT 68	6891m ²
LOT 70	889m ²
LOT 71	1119m ²
LOT 72	1430m ²
LOT 73	3878m ²
LOT 74	3559m ²
LOT 75	2246m ²
LOT 76	2940m ²
LOT 78	455m ²
LOT 79	1502m ²
RESERVE	32285m ²



PACIFIC COAST SURVEYS

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PLANTING PLAN
 AREAS TO BE COVENANTED

TARA ROAD, MANGAWHAI

CLIENT KEITH FRECKLINGTON
 FILE 2081
 REVISION 7
 DATE AUGUST 2019
 SCALE NTS
 COUNCIL FILE RM
 PAGE 7 OF 7

PROPOSED SUBDIVISION OF
LOT 2 DP 172698



WILEY GEOTECHNICAL LTD

BOREHOLE No. 1

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Alluvium of the Tauranga Group	TOPSOIL: dk brown											
	<p>SILT moderately clayey, moderate plasticity, light brown to light grey with orange-brown staining</p> <hr/> <p>occasional rootlets</p>		0				52					
	<p>highly clayey, light grey with orange-brown staining</p>		1				61	135				
			1.5				78	141				
			2				81	144				
			2.5				64	98				
			3				43	80				
	E.O.B: 2.1 m		3.5				34	83				
			4									
			5									

NOTES: Groundwater was not encountered.

Borehole Location: 36° 7'21.17"S 174°33'21.18"E

LOGGED BY: JR & KW

DATE DRILLED: 5-Oct-16

DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 2

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							● Peak Field Vane	○ Remoulded Field vane		5	10	15
Alluvium of the Tauranga Group	TOPSOIL: dk brown											
	SILT moderately clayey, moderate plasticity, occasional organics, light brown with orange-brown staining, organic staining						23 ○					
	occasional rootlets											
	moderate to highly clayey		1				77 ○	132 ●				
	hole squeezing at 1.2 m						54 ○	92 ●				
	water seepage at 1.7 m						52 ○	84 ●				
			2				37 ○	58 ●				
							34 ○	67 ●				
			3									
							68 ○	113 ●				
			4									
			5									

NOTES: Groundwater was not encountered.
 Borehole Location: 36° 7'19.75"S 174°33'17.26"E

LOGGED BY: JR & KW
 DATE DRILLED: 5-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 3

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Alluvium of the Tauranga Group	TOPSOIL minor amounts of Kauri gum, dark brown											
	SILT slightly clayey, slightly plastic, occasional rootlets, grey with orange-brown staining		0.5				73					
	moderately clayey		1.0				89					
	becomes damp, occasional rootlets, light brown with orange-brown staining		1.5				96					
	slightly sandy (fine), slightly clayey		2.0									
	E.O.B: 2.1 m		2.1									
			3.0									
			4.0									
			5.0									

NOTES: Groundwater was not encountered.
 Borehole Location: 36° 7'18.60"S 174°33'12.02"E

LOGGED BY: JR & KW
 DATE DRILLED: 5-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 4

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Alluvium of the Tauranga Group	TOPSOIL: dk brown											
	SILT slightly clayey, occasional organics, dry, slightly friable, light grey-brown with orange-brown mottling <hr/> moderately clayey, moderate plasticity, occasional rootlets, light grey with orange-brown mottling		1									
	E.O.B: 2.1 m		2									
			3									
			4									
			5									

NOTES: Groundwater was not encountered
 Borehole Location: 36° 7'13.03"S 174°33'3.43"E

LOGGED BY: JR & KW
 DATE DRILLED: 13-Mar-17
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 5

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm			
							● Peak Field Vane	○ Remoulded Field vane	50	100	150	5	10
Alluvium of the Tauranga Group	TOPSOIL friable, brown												
	SILT slightly clayey, occasional organics, dry, friable, light grey-brown with orange-brown mottling												
	slight water seepage @ 0.5 m												
	limonitic staining												
	moderately clayey, moderate plasticity, light greyish brown		1										
	grey with orange-brown mottling, occasional rootlets												
	slightly sandy, decrease in clay												
	occasional charcoal, occasional Kauri? gum		2										
	abundant charcoal and tree bark, occasional Kauri? gum												
	highly clayey, high plasticity, occasional charcoal, occasional organics (bark), light blueish-grey												
	E.O.B: 3.0 m		3										
			4										
			5										

NOTES: Groundwater was not encountered.
Borehole Location: 36° 7'12.74"S 174°33'3.25"E

LOGGED BY: JR & KW
DATE DRILLED: 13-Mar-17
DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 6

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Alluvium of the Tauranga Group	TOPSOIL: dk brown											
	SILT slightly clayey, friable, occasional organics, light grey with orange-brown staining						67	177				
	moderately clayey, moderate plasticity						107	171				
	occasional rootlets		1				89	156				
	organic staining with orange-brown mottling						116	190				
			2				110	156				
							89	135				
	E.O.B: 2.1 m		3				86	119				
			4									
			5									

NOTES: Groundwater was not encountered.
 Borehole Location: 36° 7'9.76"S 174°33'0.71"E

LOGGED BY: JR & KW
 DATE DRILLED: 5-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 7

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Alluvium of the Tauranga Group	TOPSOIL: dk brown											
	<p>SILT moderately clayey, slight plasticity, occasional organics, light brown-grey becomes soft, water seepage limonitic staining light grey with orange-brown staining</p> <hr/> <p>hole squeezing at 1.2 m moderately to highly clayey</p> <hr/> <p>occasional rootlets</p>		1				58	113	120			
	E.O.B: 2.1 m		2				58	162				
			3									
			4									
			5									

NOTES: Groundwater was not encountered.

Borehole Location: 36° 7'8.34"S 174°32'57.38"E

LOGGED BY: JR & KW

DATE DRILLED: 13-Mar-17

DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 8

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL											
	<p>SILT slightly to moderately clayey, occasional rootlets, intermixed organic staining and orange-brown mottling</p> <p>dessication cracking to 0.7 m</p> <p>light grey with orange-brown mottling</p> <p>becomes highly clayey</p> <p>occasional rootlets slightly clayey, friable, light brown</p>		1				46	122				
	E.O.B: 2.1 m		2				58	115				
							52	92				
							54	90				
							44	115				
							46	107				
							52	166				
			3									
			4									
			5									

NOTES: Groundwater was not encountered

LOGGED BY: JR & KW
 DATE DRILLED: 5-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 9

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL SILT organic, slightly sandy (fine), brown moderately clayey, orange-brown staining dessication cracking to 0.7 m, minor charcoal present, occasional rootlets, becomes friable slightly sandy horizons, light brown with orange-brown staining moderately-highly clayey, moderate plasticity, occasional rootlets, orange-brown with reddish streaks occasional white specks highly clayey, damp		0									
	E.O.B: 2.1 m		2.1									
			1									
			2									
			3									
			4									
			5									

NOTES: Groundwater was not encountered

LOGGED BY: JR & KW
 DATE DRILLED: 5-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 10

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL											
	SILT slightly clayey, slightly friable, light brown-red, highly oxidised						43	92	139			
	occasional white clasts of highly weather siltstone friable, reddish brown		1				40	89	124			
	occasional black specks, possibly limonite light brown - light grey with reddish brown staining		2				43	89	148			
	E.O.B: 2.1 m		3				28	75	135			
			4									
			5									

NOTES: Groundwater was not encountered

LOGGED BY: JR & KW
 DATE DRILLED: 5-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 11

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Undifferentiated melange of Northland Allocthon	TOPSOIL											
	<p>SILT slightly clayey, friable, light brown-light grey with organic staining, highly oxidised, rare limonitic nodules, dessication cracking to 0.5 m</p> <p>moderately clayey, moderate plasticity, occasional rootlets, light grey-light brown with orange-brown mottling</p> <p>light grey with red streaking, less mottling moderately to highly clayey</p> <p>occasional rootlets</p>		1				73	83				
	E.O.B: 2.1 m		2					58	69			
			3					64	89			
			4					73	107			
			5					73	110			
								61	101			

NOTES: Groundwater was not encountered

LOGGED BY: JR & KW
 DATE DRILLED: 4-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 12

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Undifferentiated melange of Northland Allocthon	TOPSOIL											
	SILT moderately clayey, moderate plasticity, light brown - light grey with orange-brown mottling, occasional rootlets						67	138				
	highly clayey, light grey		1				98	141				
	hole squeezing, moist						86	129				
	slightly friable		2				61	98				
	E.O.B: 2.1 m						58	125				
							64	159				
			3				52	141				
			4									
			5									

NOTES: Groundwater was not encountered

LOGGED BY: JR & KW
 DATE DRILLED: 5-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 13

SITE: Tara Road 90 Lot Subdivision

REF: 16362

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL SILT moderately clayey, moderately plastic, occasional rootlets, light brown-light grey with orange-brown mottling occasional white specks slightly clayey, slightly friable occasional limonitic nodules		0									
	E.O.B: 2.1 m		2.1									
			1				83	197				
							84	187				
							61	185				
							43	165				
							38	138				
							31	122				
							24	104				
			2									
			3									
			4									
			5									

NOTES: Groundwater was not encountered

LOGGED BY: JR & KW
 DATE DRILLED: 4-Oct-16
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 14

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL to 200mm											
	SILT slightly to moderately clayey, light brown\light grey with orange brown staining occasional organics becomes moderately plastic occasional white specs dry friable, decrease in clay limonitic staining, friable light brown\white, friable orange\light brown mottling		1									
	E.O.B: 2.1m		2									
			3									
			4									
			5									

NOTES Groundwater was not encountered

LOGGED BY: JR & EOD
 DATE DRILLED: 28-Jun-17
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 15

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							● Peak Field Vane	○ Remoulded Field vane		5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL to 200mm											
	SILT moderately clayey, moderately plastic light brown/light grey with orange brown staining occasional organics, moist deseccation cracks to 0.6m						91 ○	165 ●				
	becomes slightly clayey, slightly friable white nodules, increase in moisture		1				96 ○	179 ●				
	light grey with orange brown staining becomes wet, white clasts/fragments		2				77 ○	154 ●				
			3				33 ○	109 ●				
			4				31 ○	104 ●				
			5				25 ○	96 ●				
							35 ○	140 ●				
							46 ○	151 ●				
							28 ○	146 ●				
	E.O.B: 3.0m											

NOTES Groundwater was not encountered

LOGGED BY: JR & EOD

DATE DRILLED: 28-Jun-17

DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 16

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							● Peak Field Vane	○ Remoulded Field vane		5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL to 300mm											
	<p>SILT moderately clay, moderately plastic with orange\brown mottling dessionication cracks to 0.6m</p> <p>occasional organics</p> <p>light grey\light brown with orange brown staining, increase in strength, decrease in moisture.</p> <p>occasional slightly sandy horizons</p>		0 to 5				35 ○ 88 ● 50 ○ 113 ● 57 ○ 143 ● 71 ○ 172 ● 72 ○ 146 ● 82 ○ 154 ● 76 ○ 157 ●					
	E.O.B: 2.1m											

NOTES Groundwater was not encountered

LOGGED BY: JR & EOD
 DATE DRILLED: 28-Jun-17
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 17

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL to 250mm											
	SILT moderately clayey, moderately plastic, light brown with orange\brown mottling, occasional rootlits becomes light brown\orange staining		0.25					94	157			
			0.5					79	145			
			0.75					88	173			
			1.0					87	150			
			1.25					79	139			
			1.5					76	129			
			1.75					60	142			
			2.0									
			2.25									
			2.5									
			2.75									
			3.0									
			3.25									
			3.5									
			3.75									
			4.0									
			4.25									
			4.5									
			4.75									
			5.0									

NOTES Groundwater was not encountered

LOGGED BY: JR & EOD
 DATE DRILLED: 28-Jun-17
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 18

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Alluvium of the Tauranga Group	TOPSOIL to 200mm											
	<p>SILT slightly clay, slightly plastic, slightly sandy, light brown with orange\brown staining, friable occasional rootlets</p> <p>SAND silty, light grey with orange\brown mottling, wet limonotic nodules in-flow of water slightly clayey</p> <p>occasional rootlets</p>		1				60	85	151	200		
	E.O.B: 2.1m		2				47	61	131	170		
			3				35	169	127	173		
			4									
			5									

NOTES Groundwater was not encountered

LOGGED BY: JR & EOD
 DATE DRILLED: 28-Jun-17
 DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 19

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							● Peak Field Vane	○ Remoulded Field vane		5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL to 200mm											
	<p>SILT moderately clay, moderately plastic light brown with orange\brown staining occasional rootlets, moist dessication cracking</p> <p>light grey with orange\brown staining</p> <p>slightly friable</p> <p>pink\red tinge</p>		1				66 ○ 129 ●					
	E.O.B: 2.1m		2				94 ○ 157 ●					
			3				82 ○ 134 ●					
			4				71 ○ 110 ●					
			5				79 ○ 157 ●					
										200 ●		
										200 ●		

NOTES Groundwater was not encountered

LOGGED BY: JR & EOD
DATE DRILLED: 28-Jun-17
DRILL METHOD: 50 mm Hand Auger



WILEY GEOTECHNICAL LTD

BOREHOLE No. 20

SITE: Tara Road 90 Lot Subdivision

REF: 16326

Sheet 1 of 1

REDUCED LEVEL (RL) INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)			SCALA PENETROMETER BLOWS / 100 mm		
							50	100	150	5	10	15
Pakiri Formation of the Waitemata Group	TOPSOIL to 250mm											
	<p>SILT moderately clay, moderately plastic, moist light brown with orange\brown staining occasional rootlets</p> <p>light grey with orange\brown staining decrease in clay</p> <p>becomes wet</p>		1				107	187				
			2				87	165				
							74	126				
							76	192				
							52	139				
							74	157				
			3									
			4									
			5									

NOTES Groundwater was not encountered

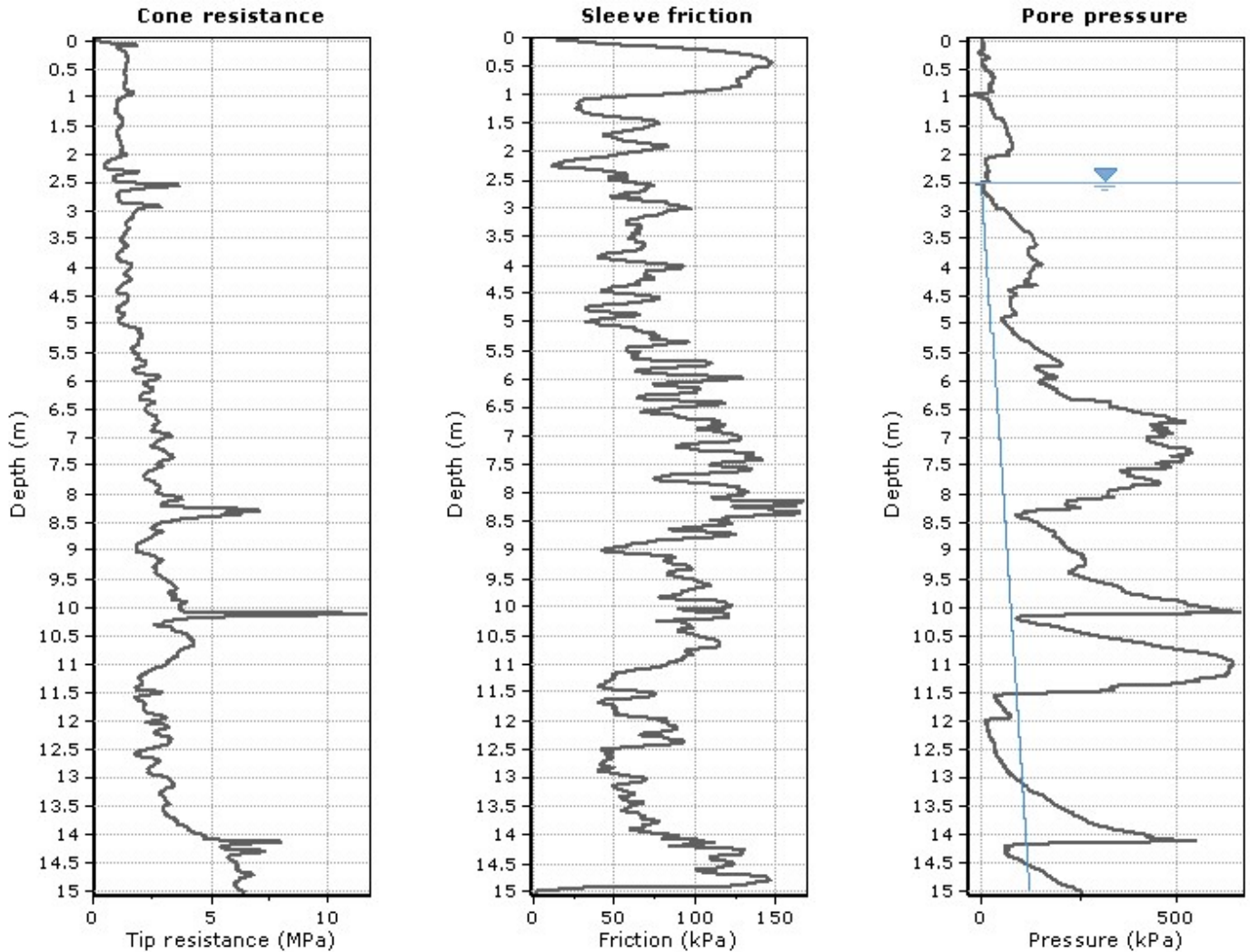
LOGGED BY: JR & EOD

DATE DRILLED: 28-Jun-17

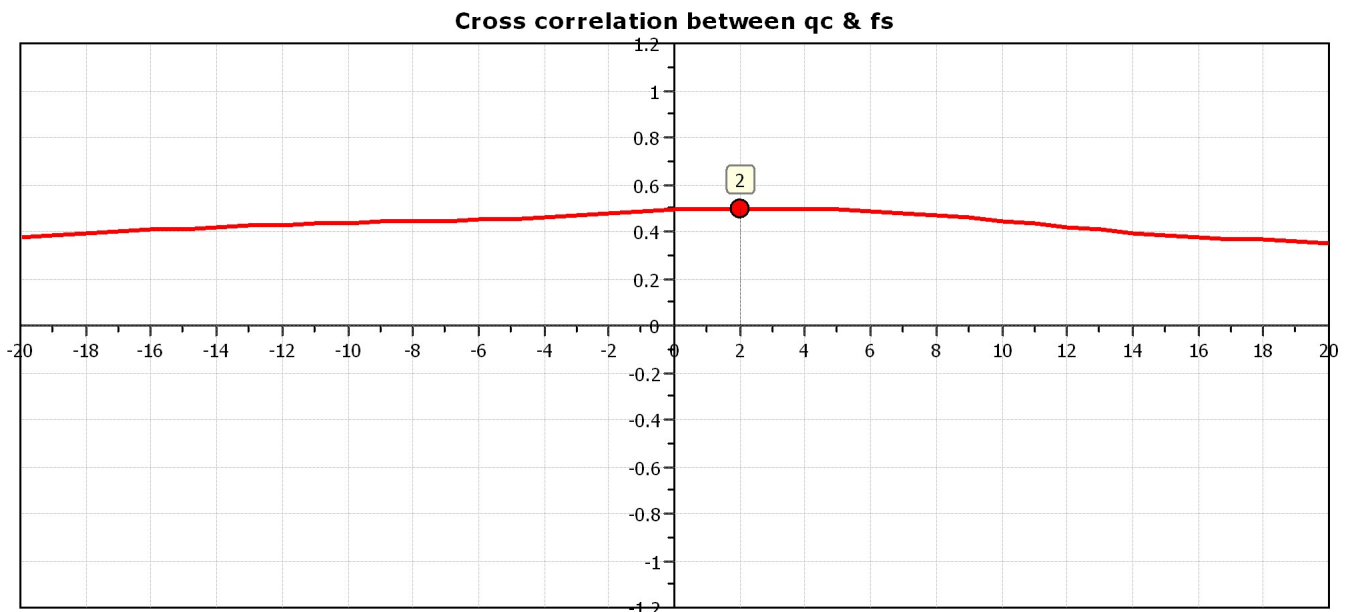
DRILL METHOD: 50 mm Hand Auger

Project: Tara Road Subdivision

Location:



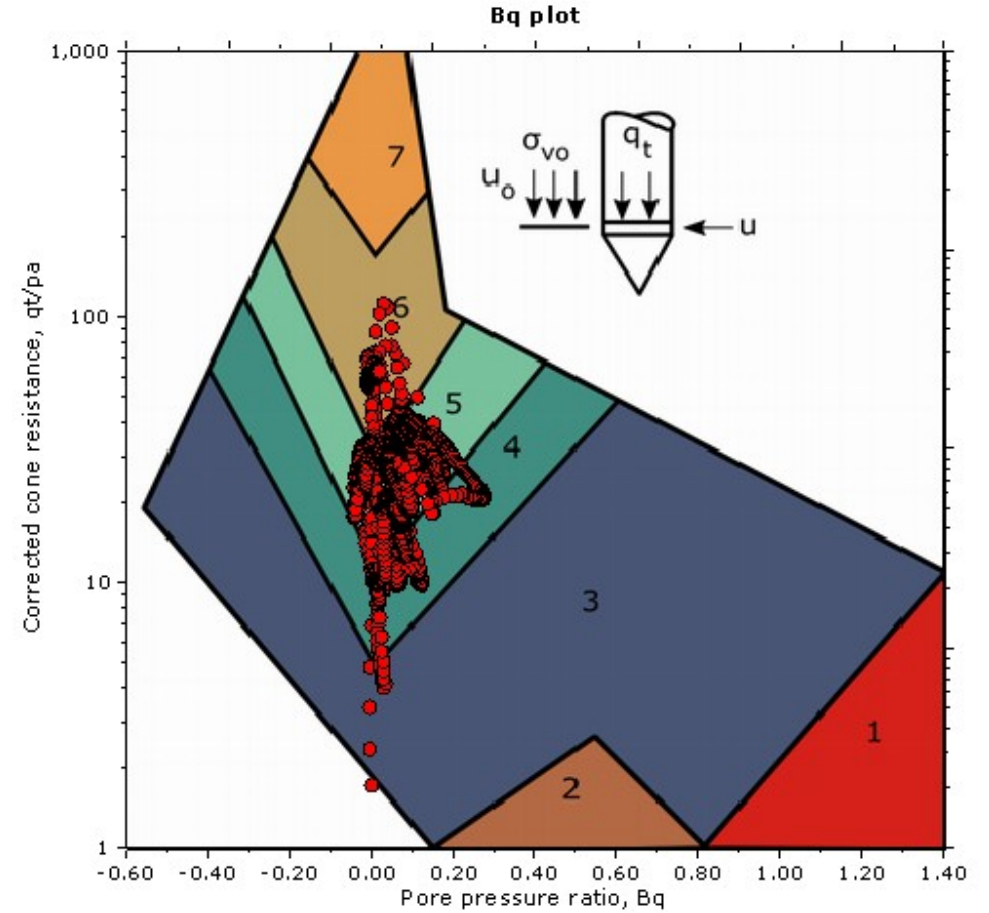
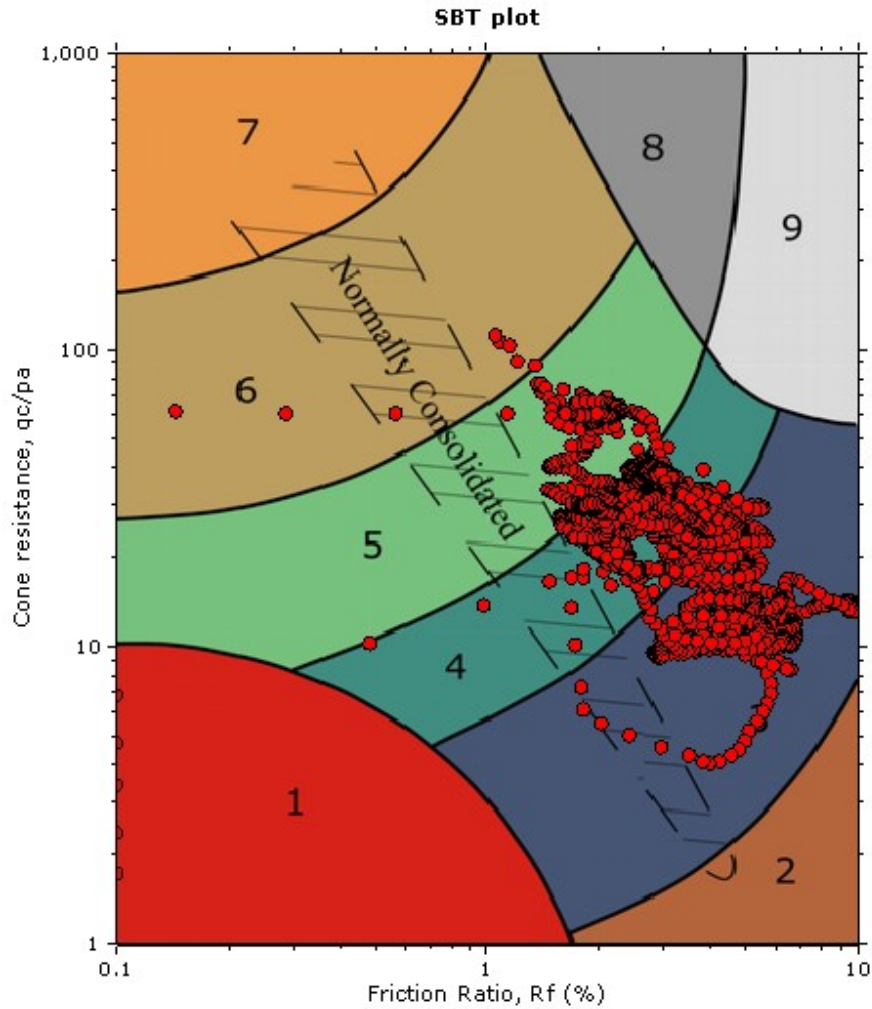
The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



Project: Tara Road Subdivision

Location:

SBT - Bq plots

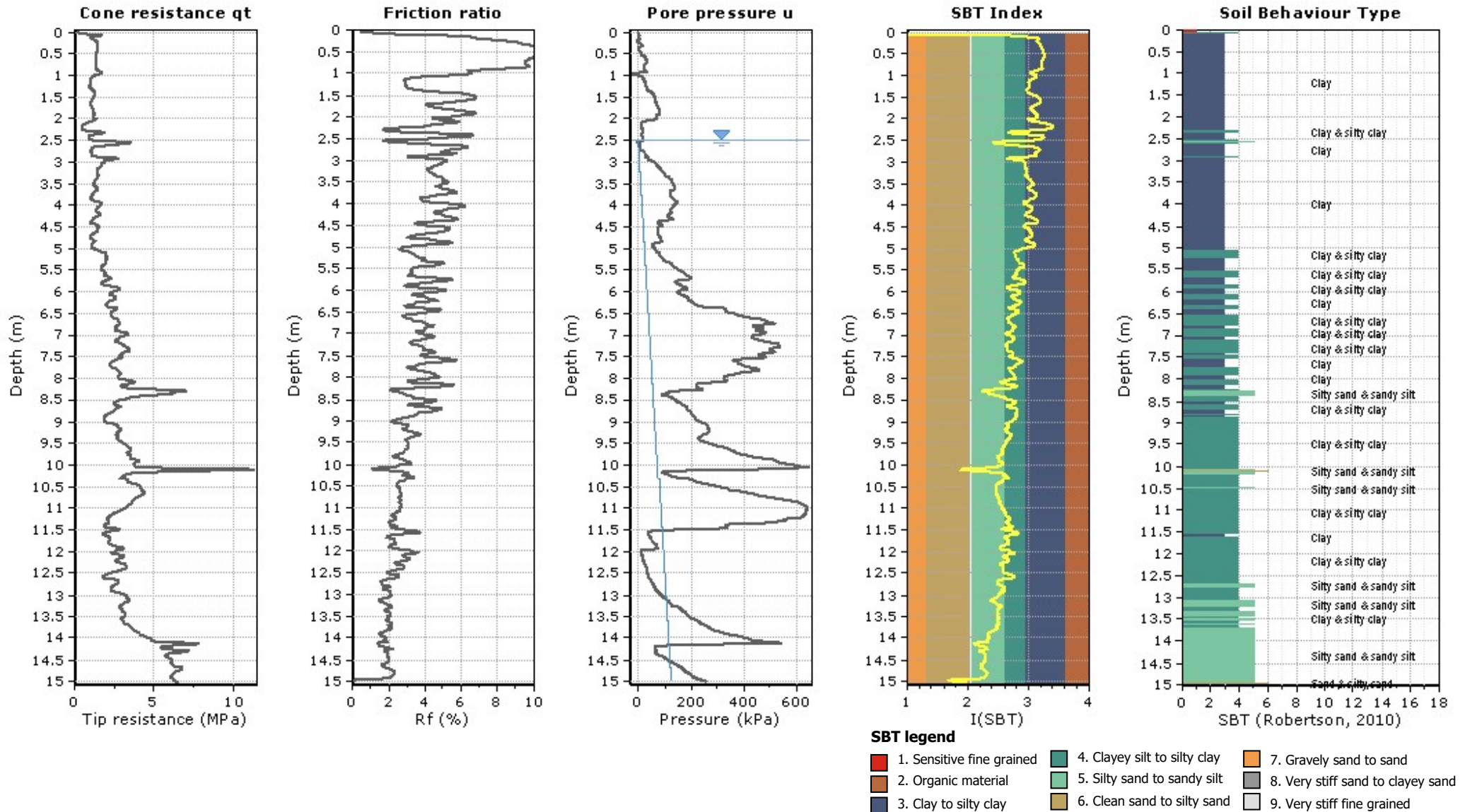


SBT legend

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

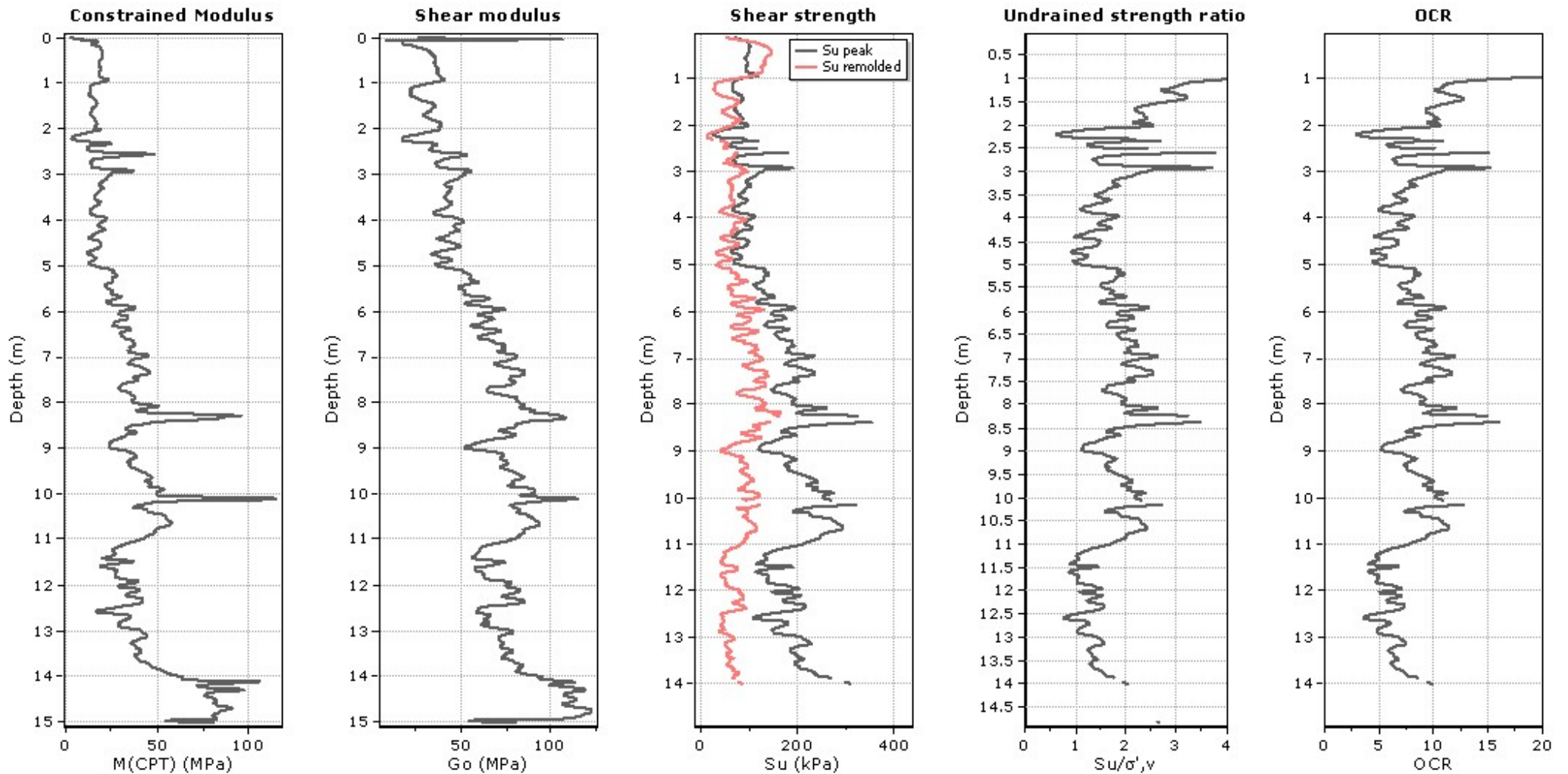
Project: Tara Road Subdivision

Location:



Project: Tara Road Subdivision

Location:



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

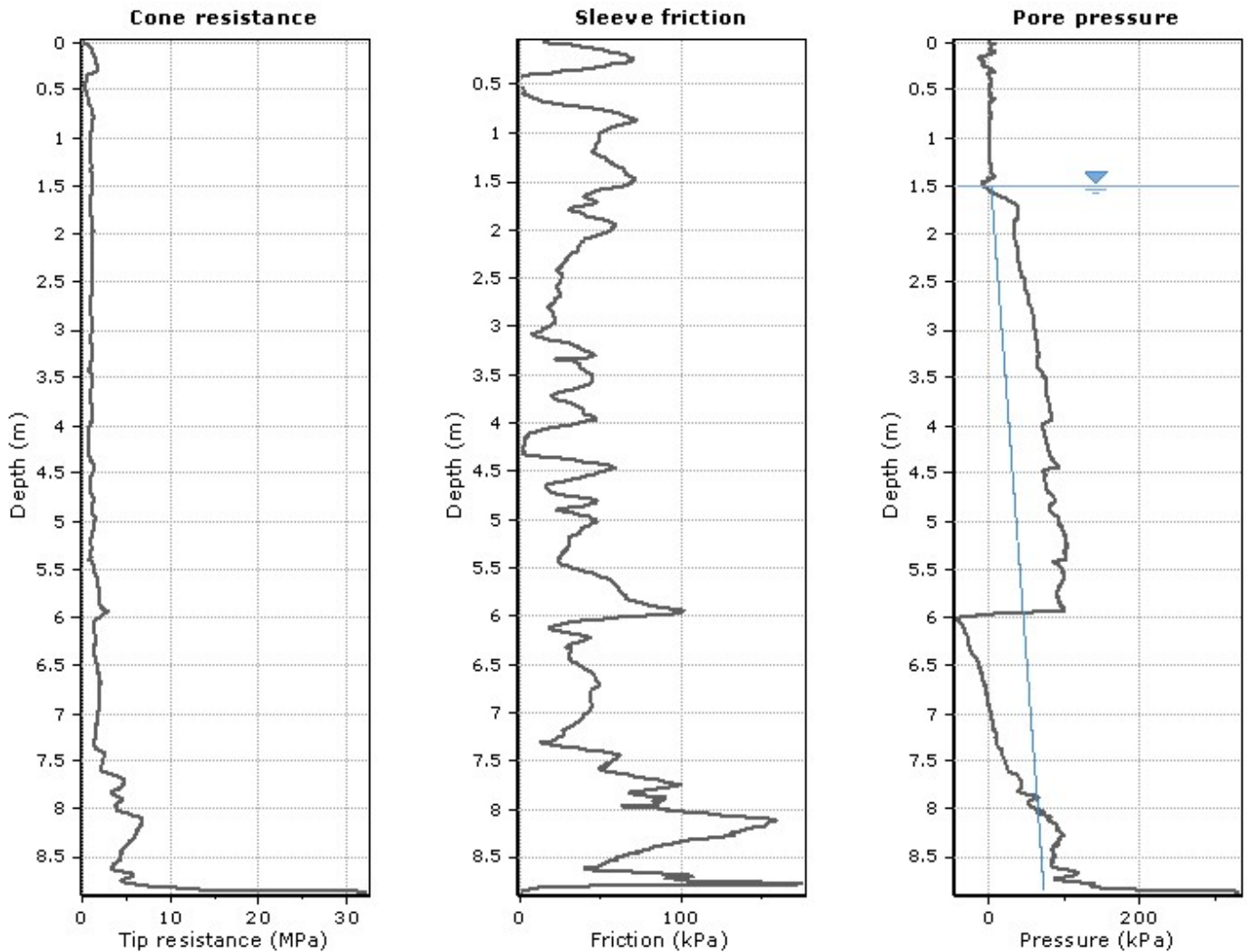
OCR factor for clays, N_{kt} : 0.33

● User defined estimation data

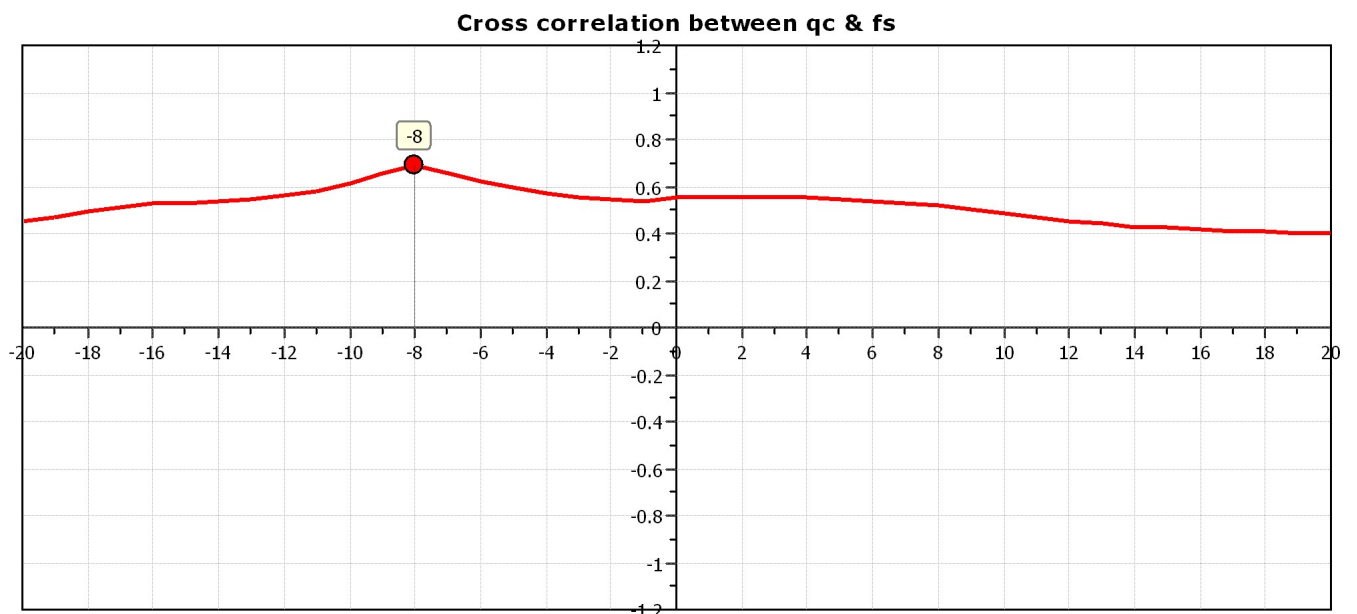
● Flat Dilatometer Test data

Project: Tara Road Subdivision

Location:



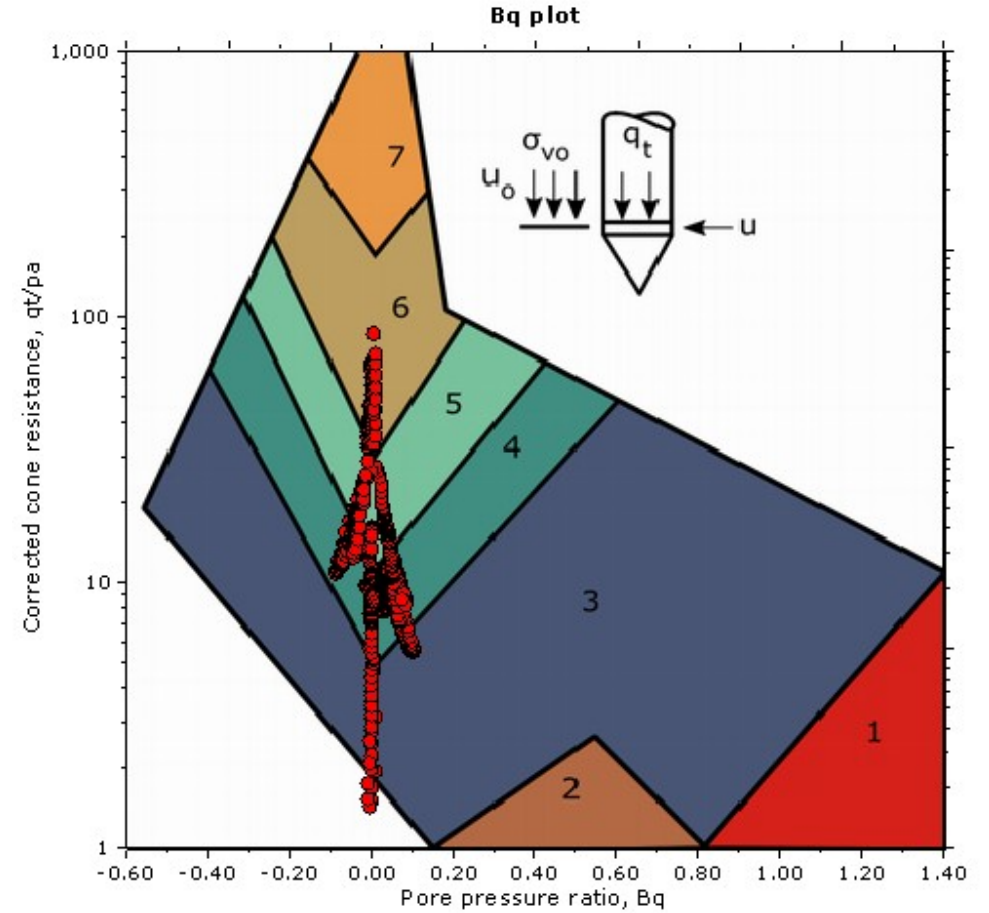
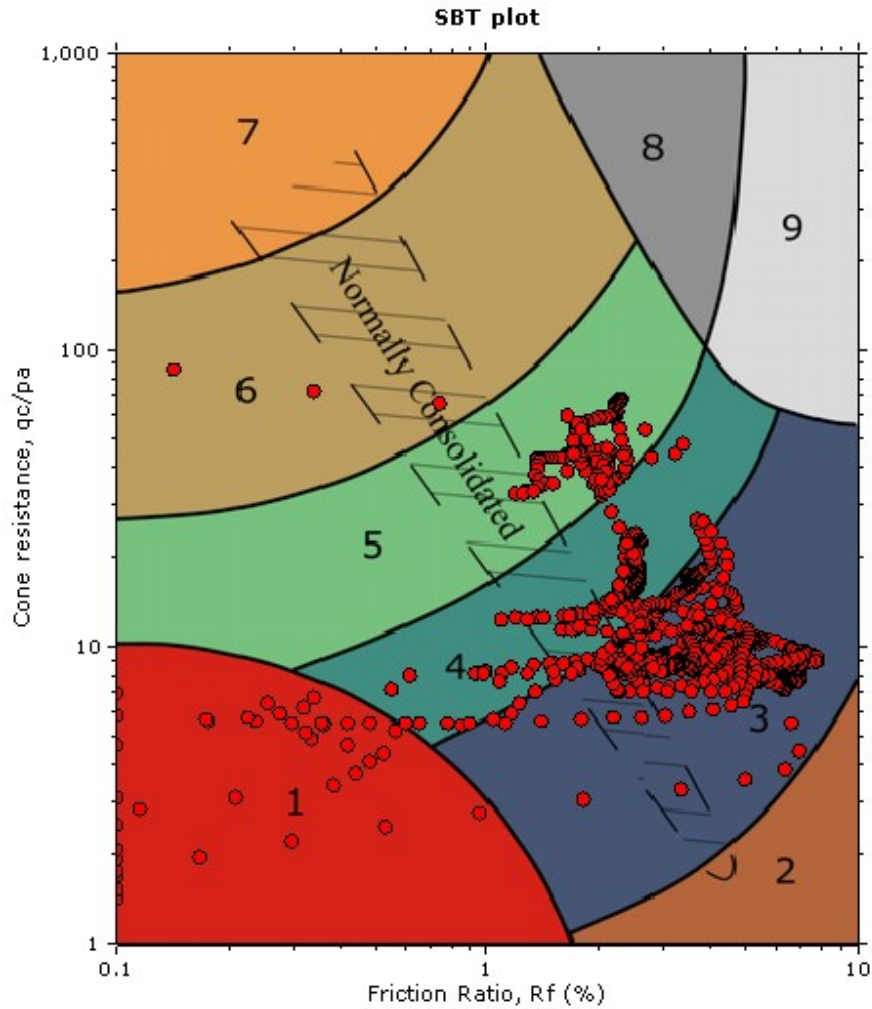
The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



Project: Tara Road Subdivision

Location:

SBT - Bq plots

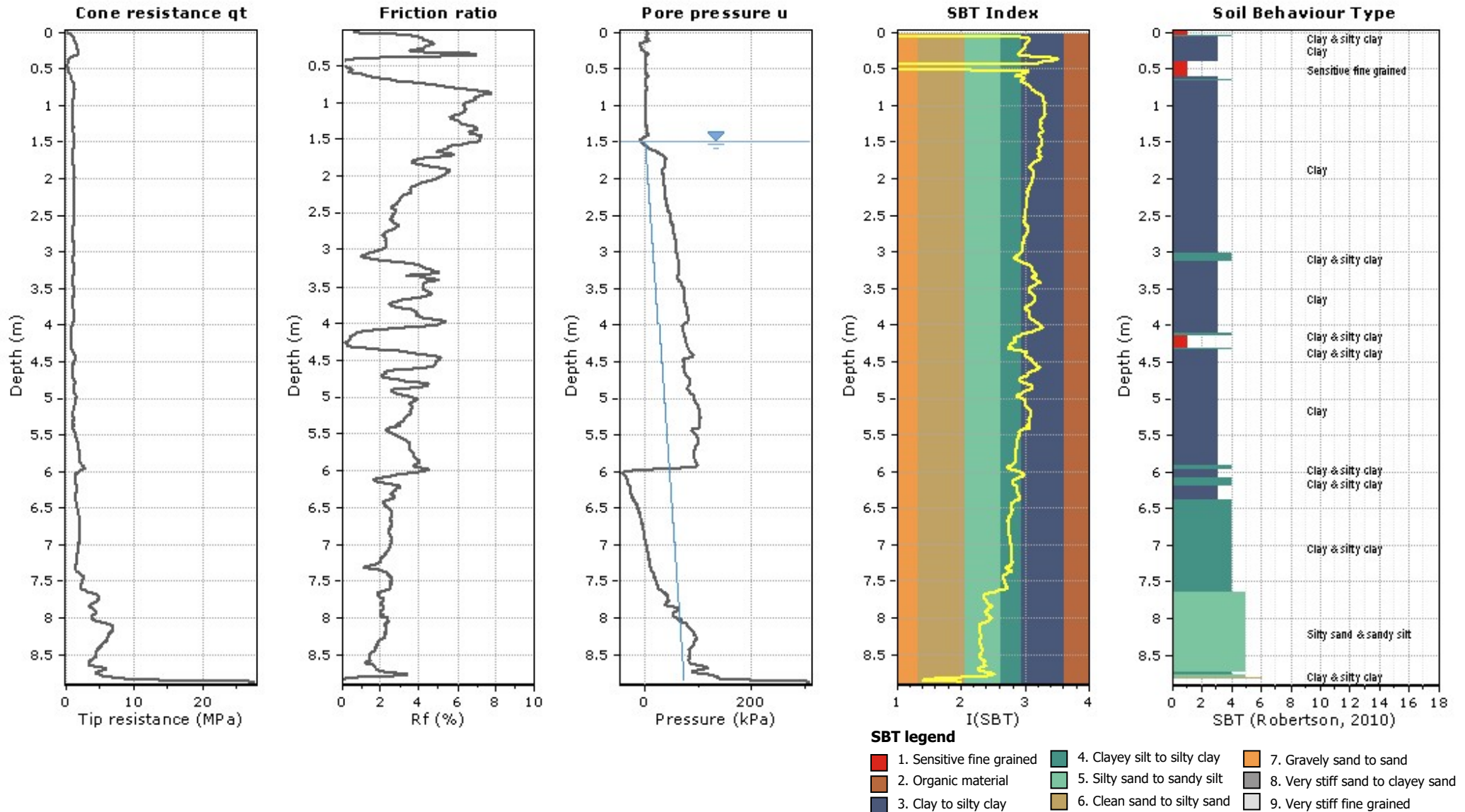


SBT legend

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

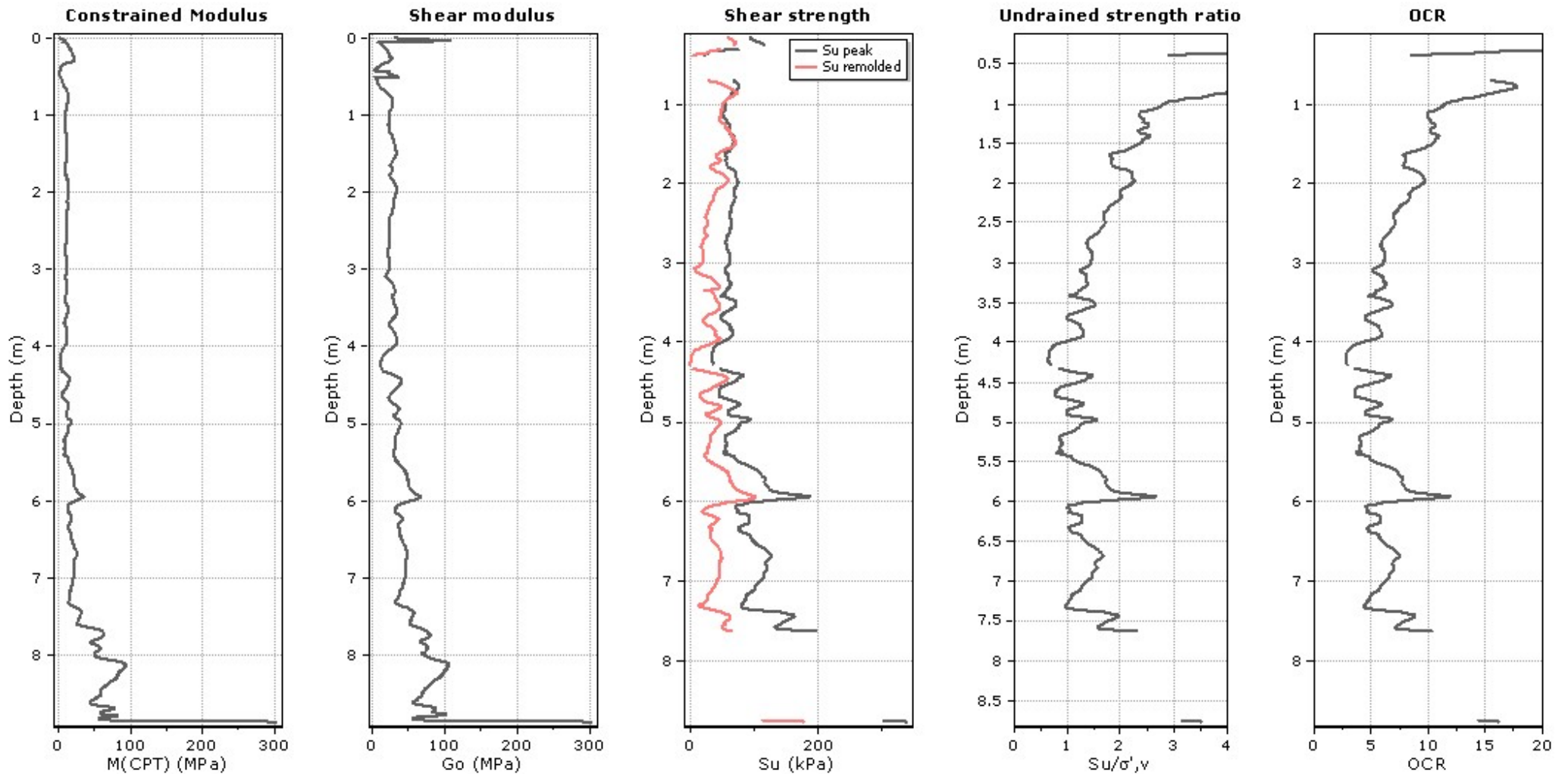
Project: Tara Road Subdivision

Location:



Project: Tara Road Subdivision

Location:



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

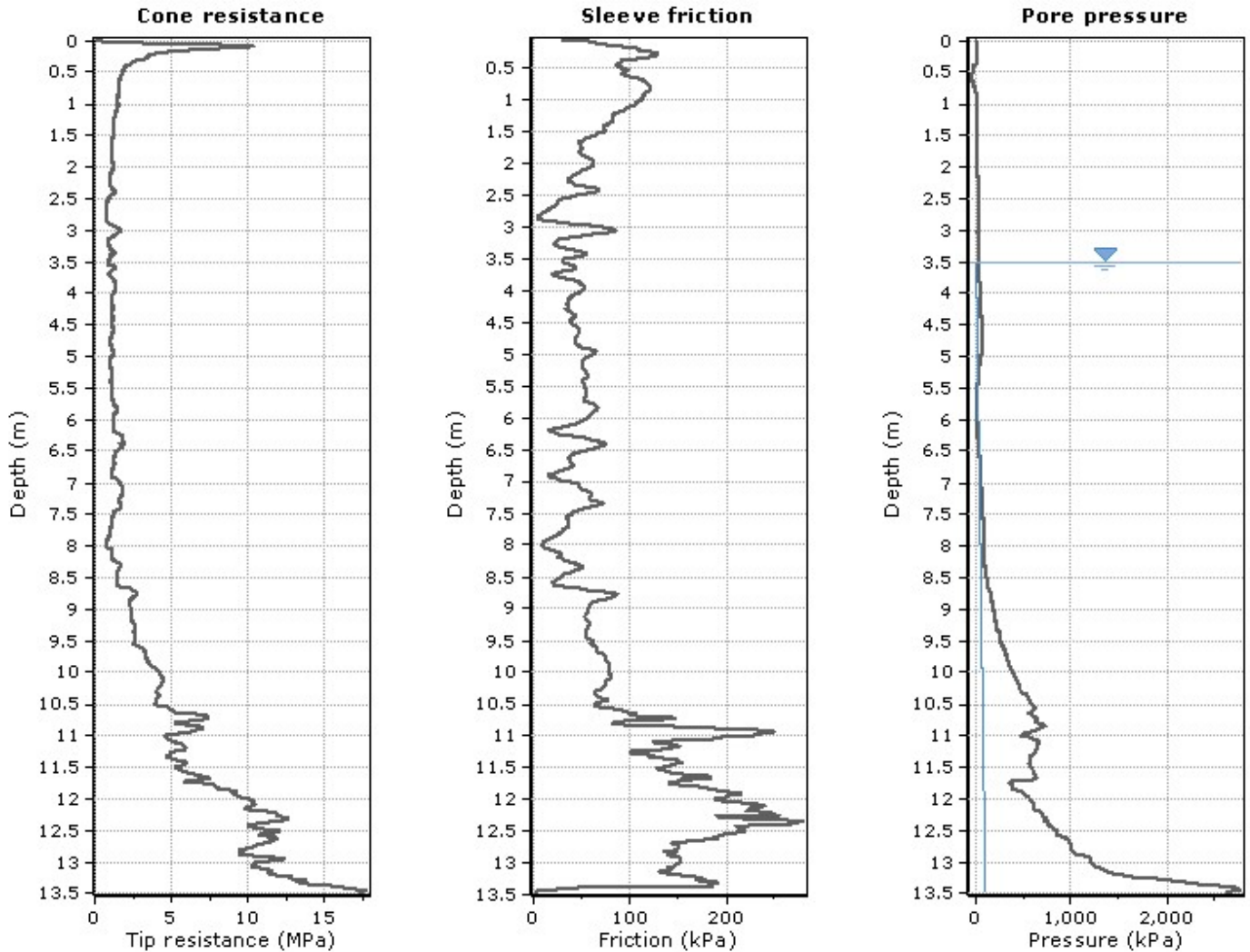
OCR factor for clays, N_{kt} : 0.33

● User defined estimation data

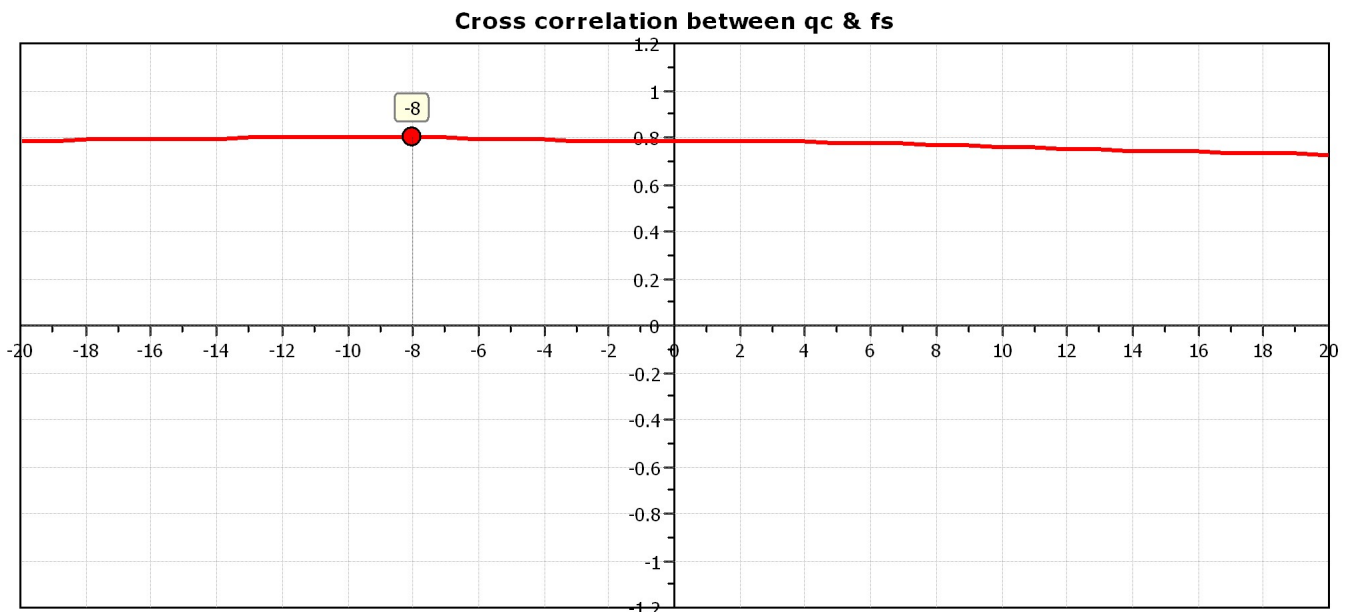
● Flat Dilatometer Test data

Project: Tara Road Subdivision

Location:



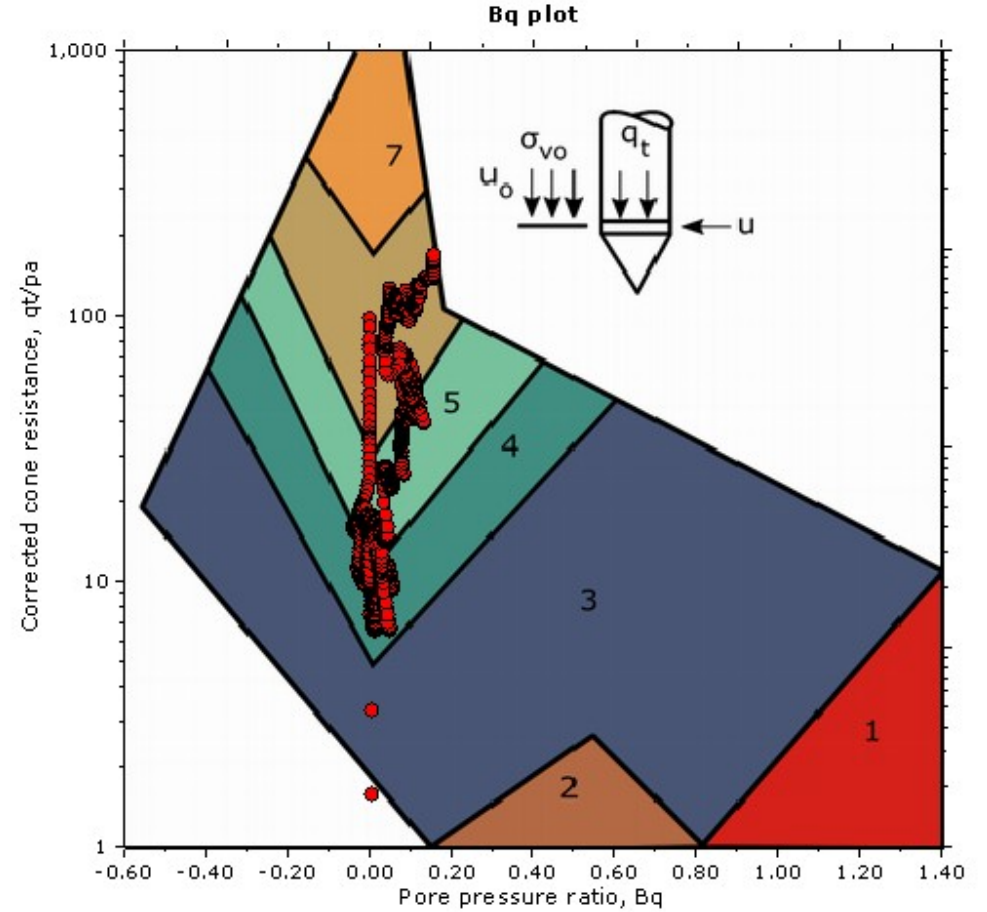
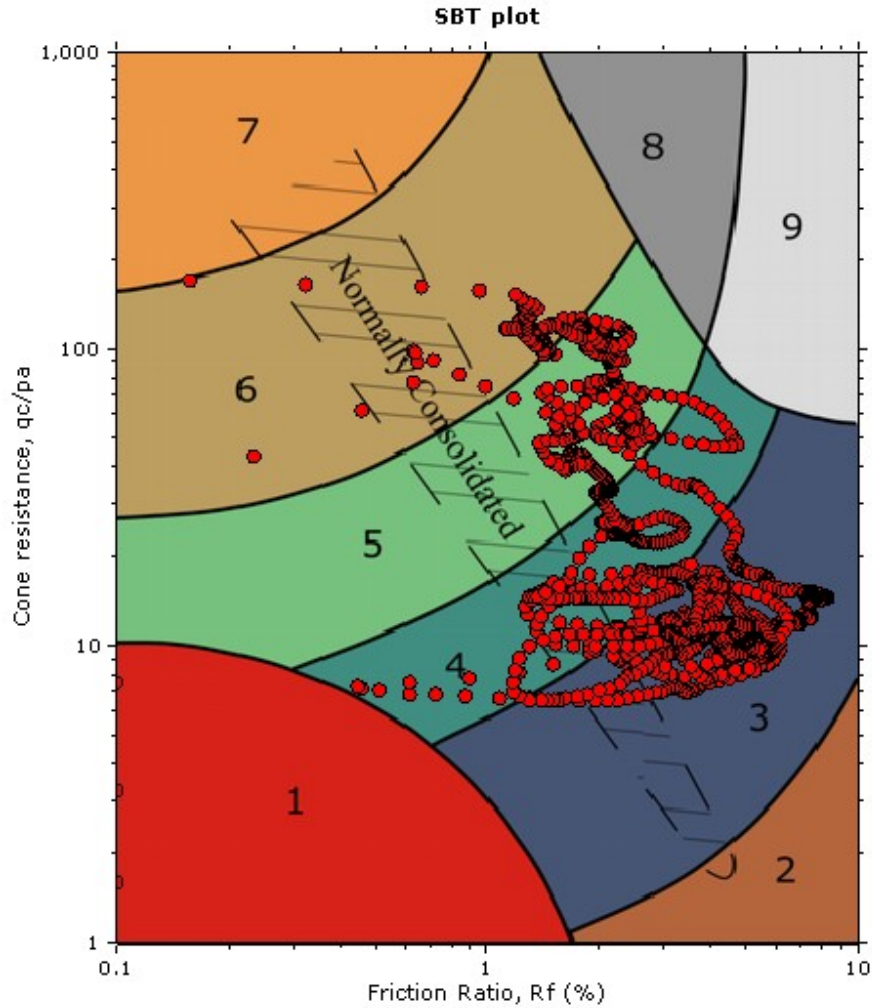
The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



Project: Tara Road Subdivision

Location:

SBT - Bq plots

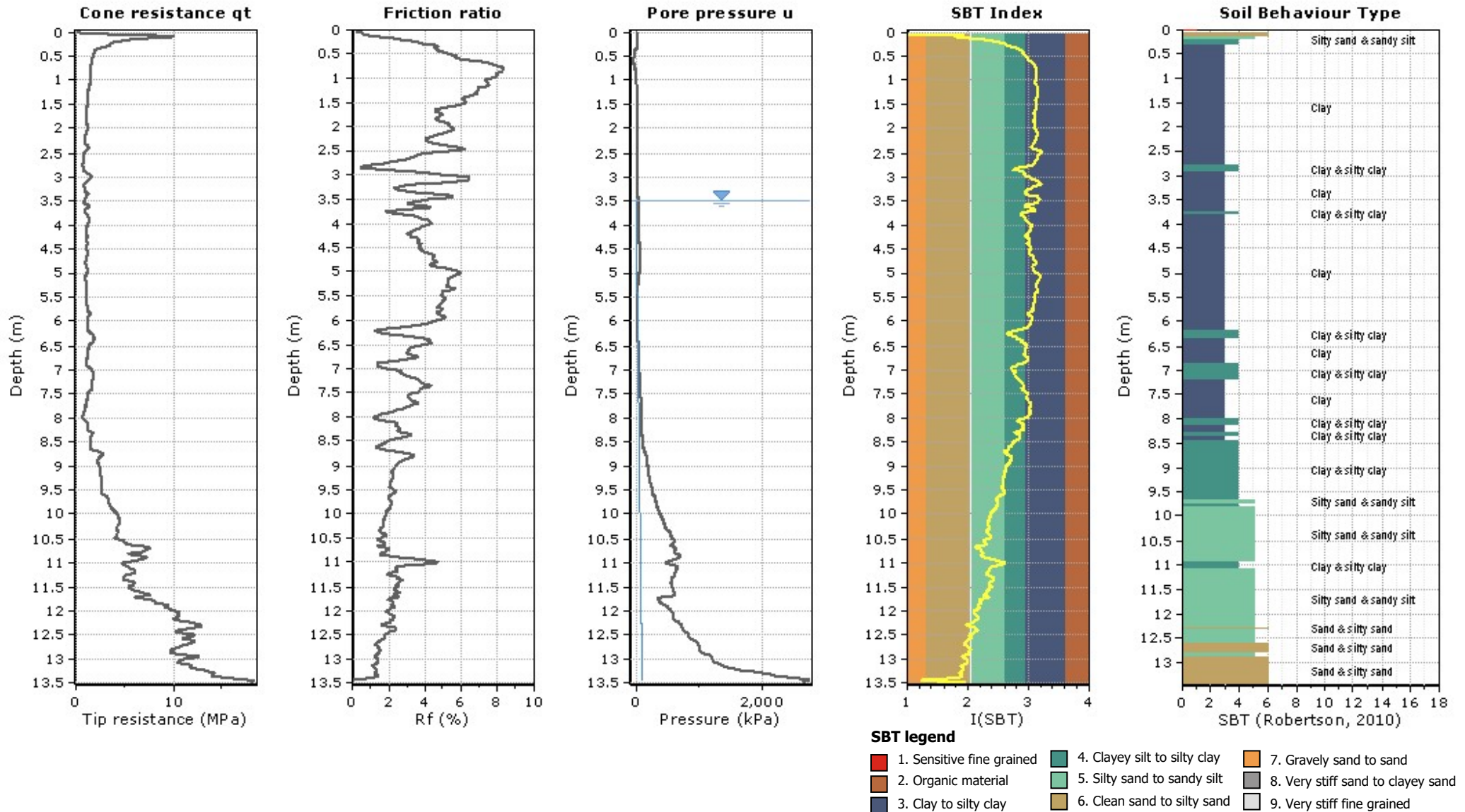


SBT legend

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

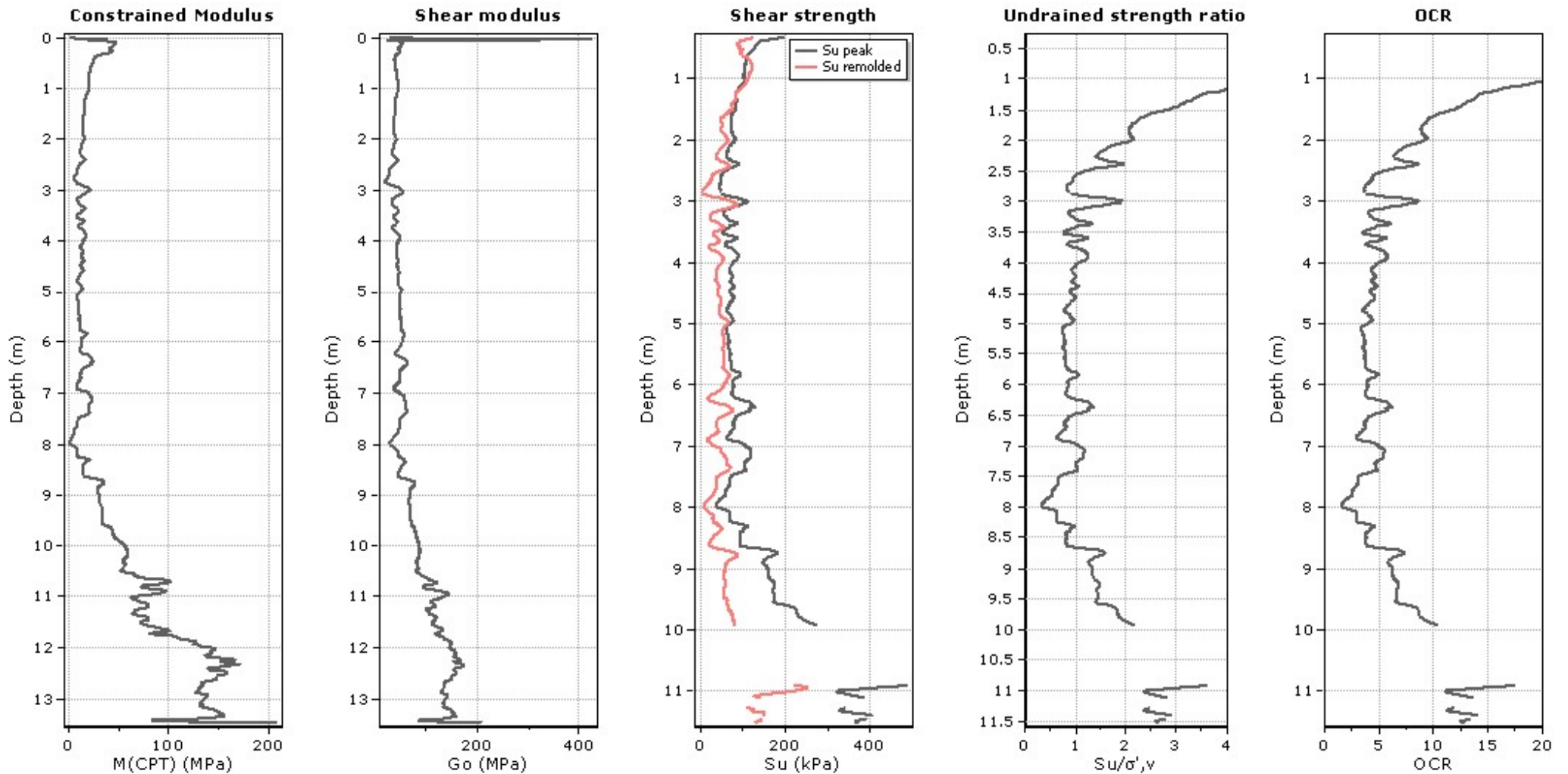
Project: Tara Road Subdivision

Location:



Project: Tara Road Subdivision

Location:



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

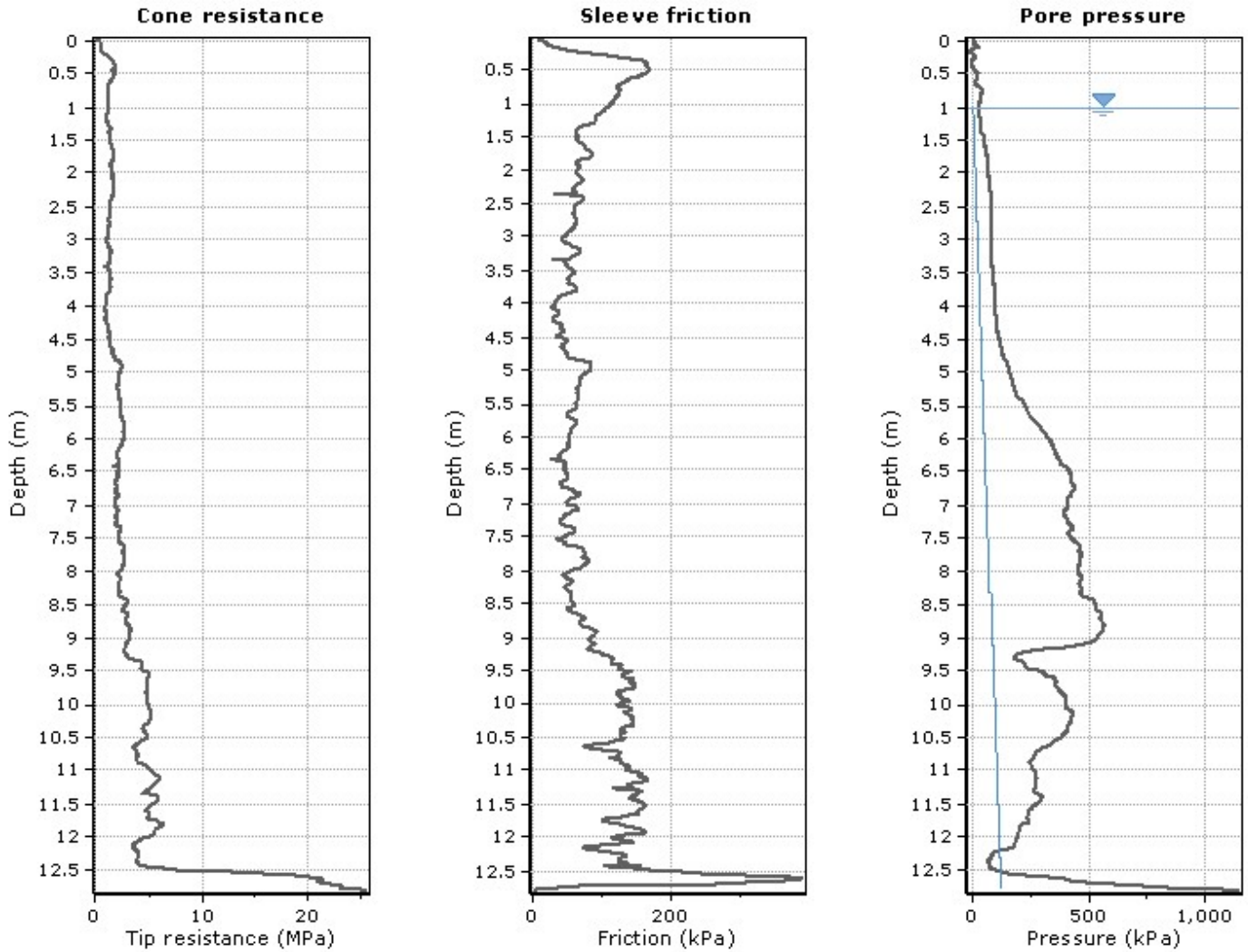
OCR factor for clays, N_{kt} : 0.33

● User defined estimation data

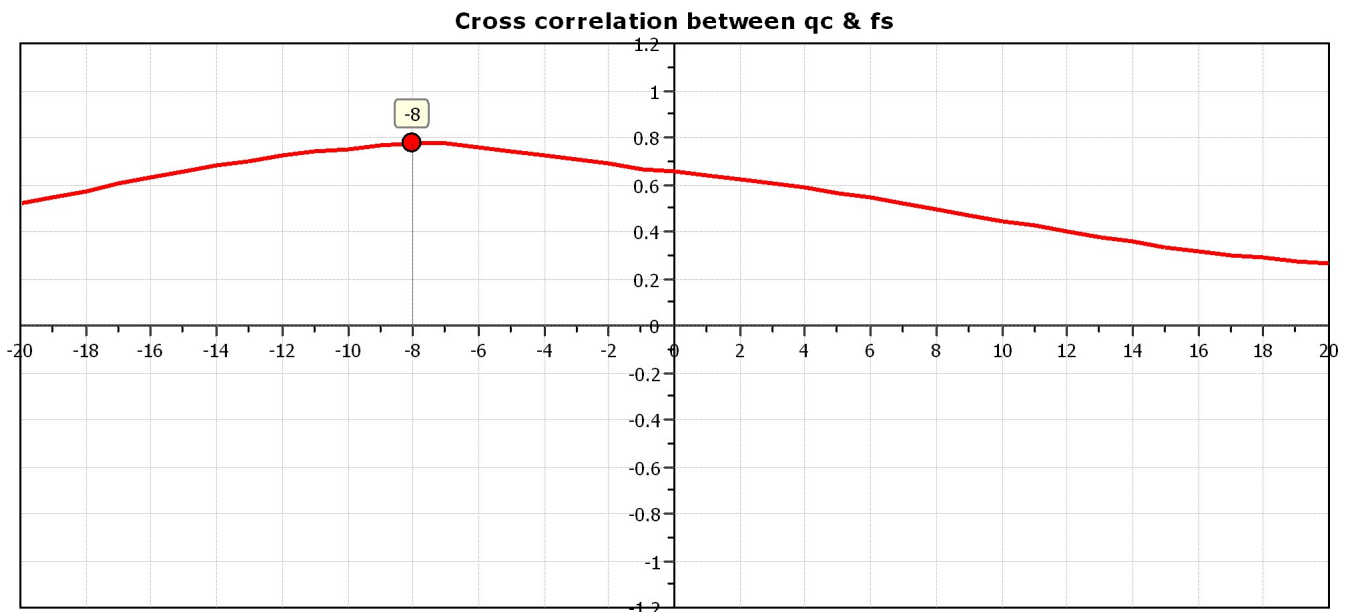
● Flat Dilatometer Test data

Project: Tara Road Subdivision

Location:



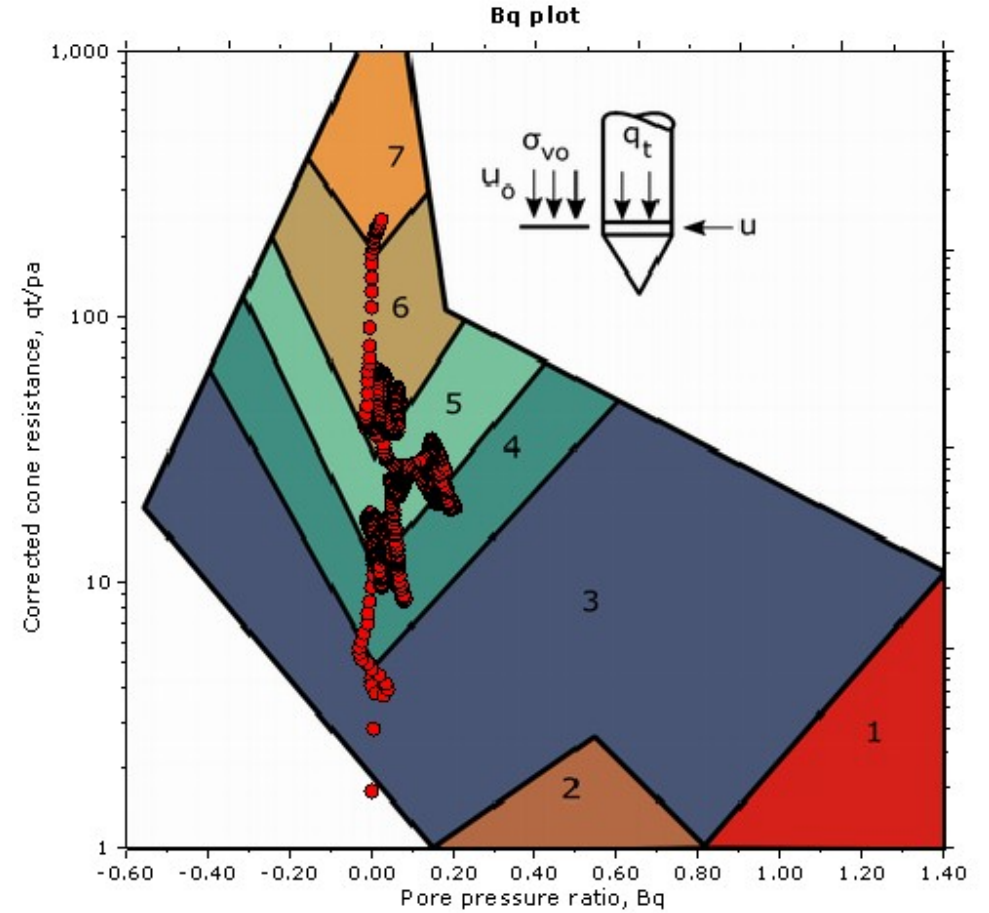
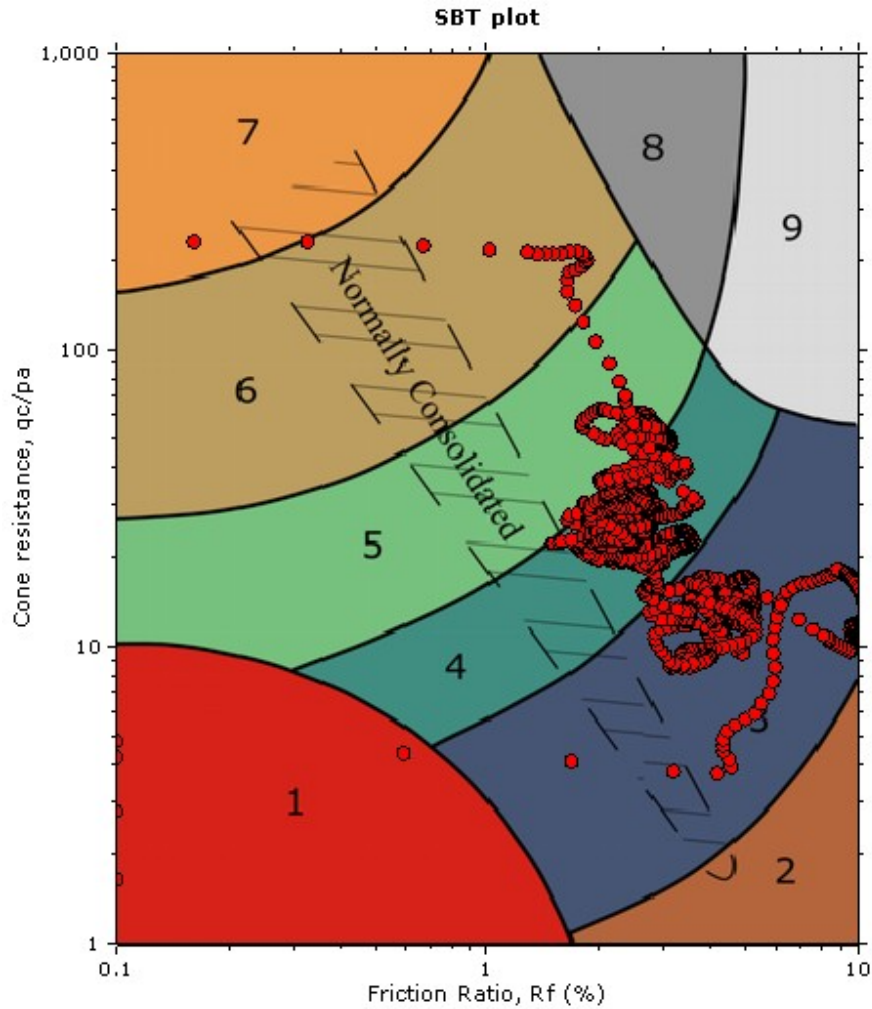
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Project: Tara Road Subdivision

Location:

SBT - Bq plots

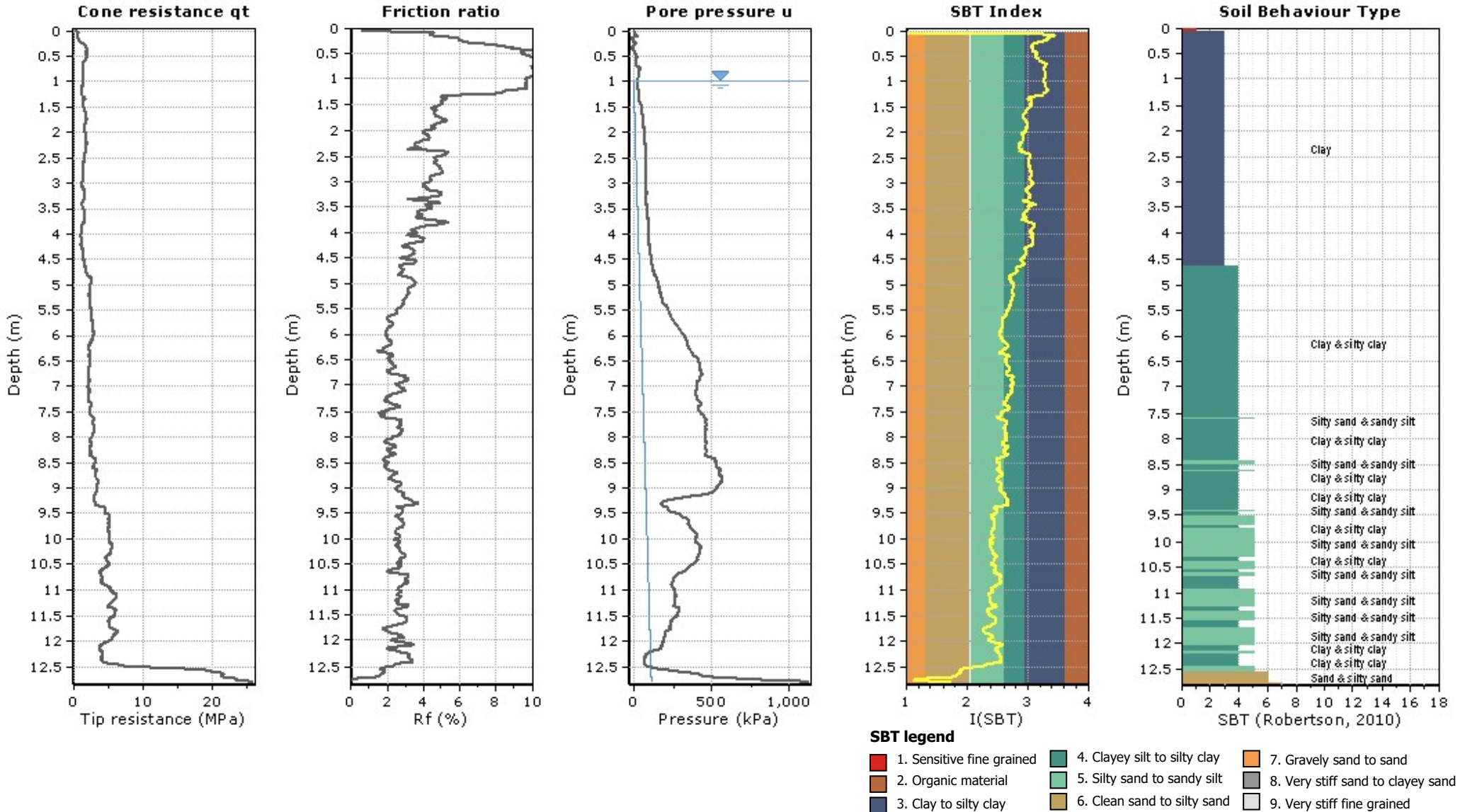


SBT legend

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

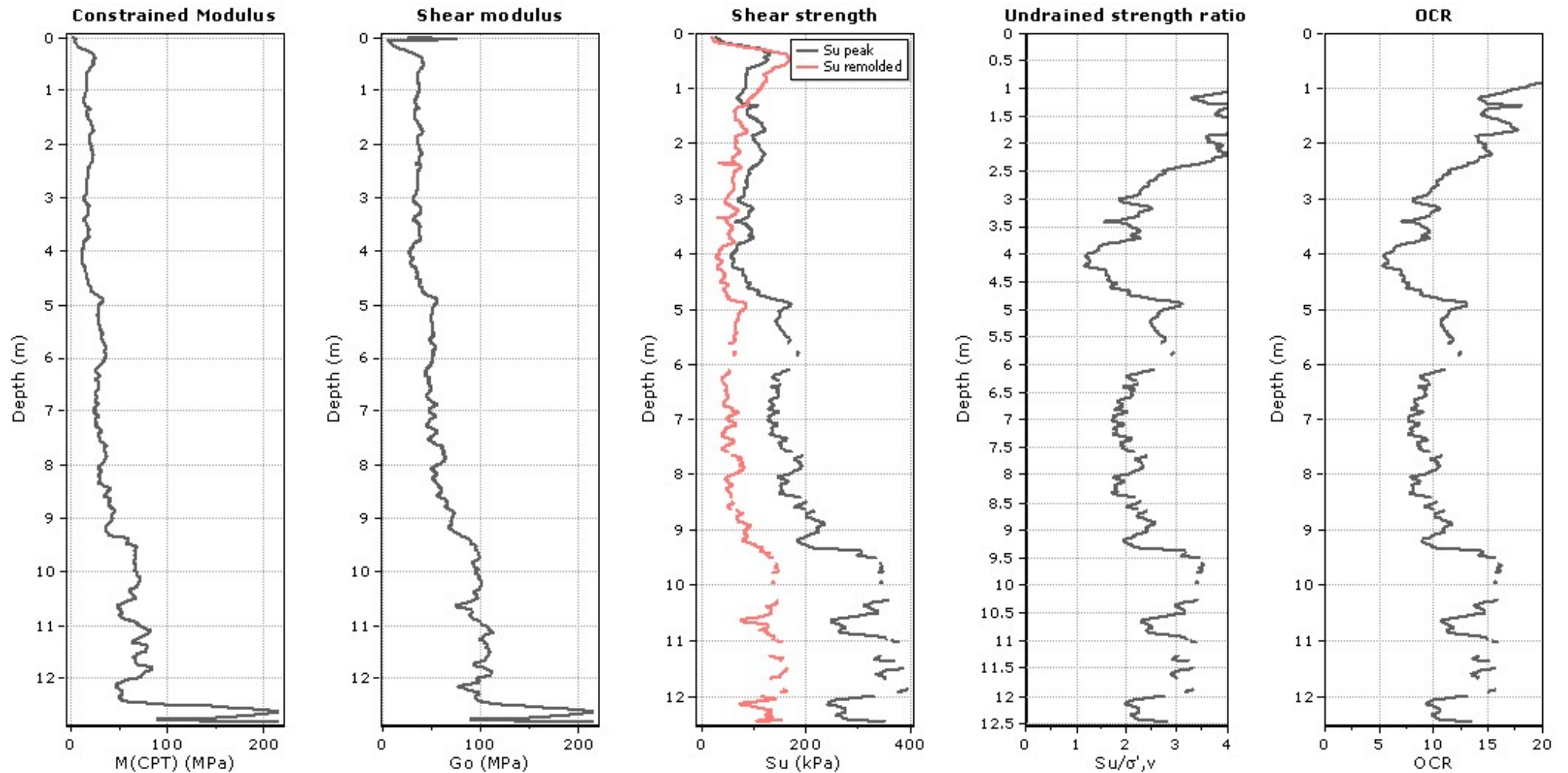
Project: Tara Road Subdivision

Location:



Project: Tara Road Subdivision

Location:



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

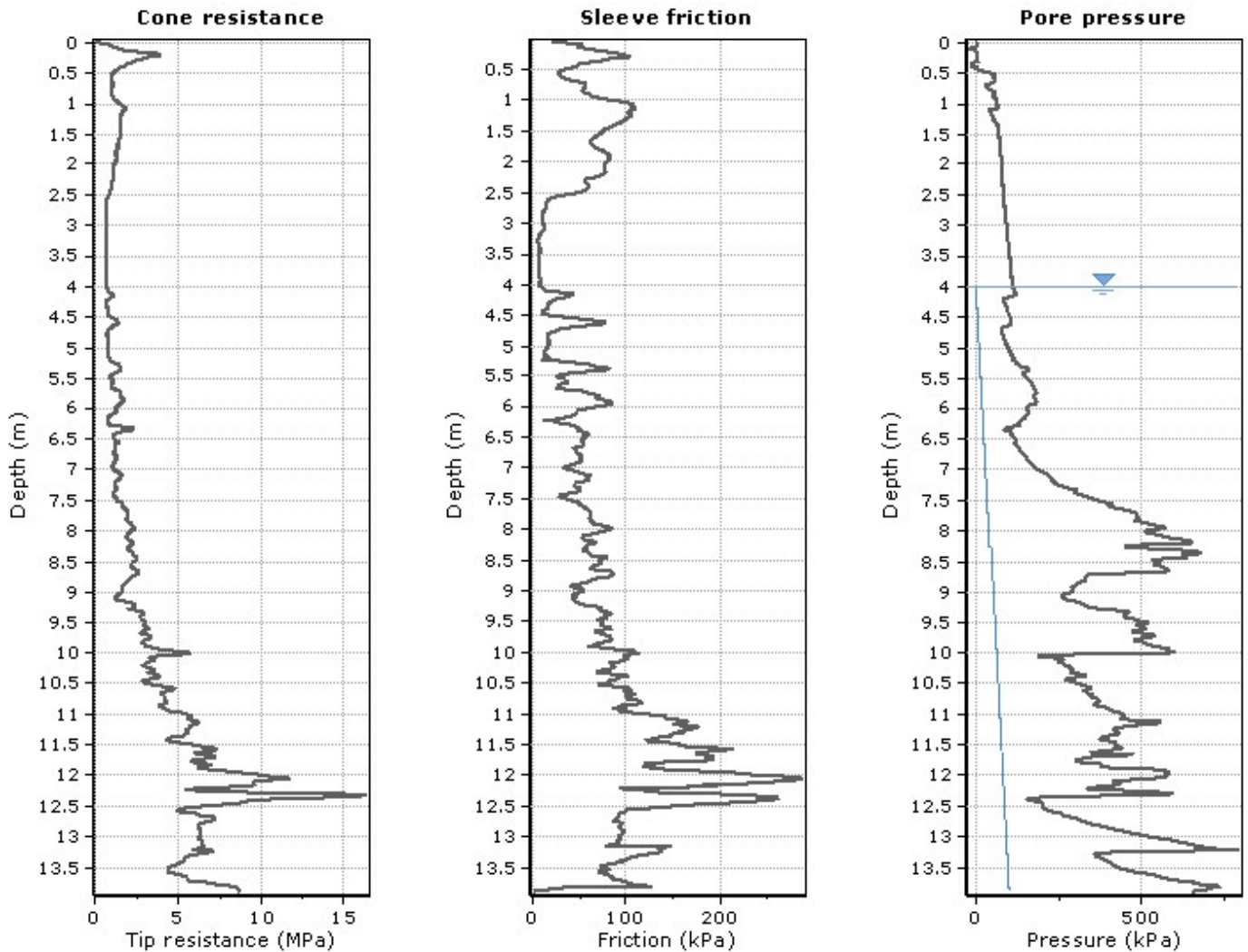
OCR factor for clays, N_{kt} : 0.33

● User defined estimation data

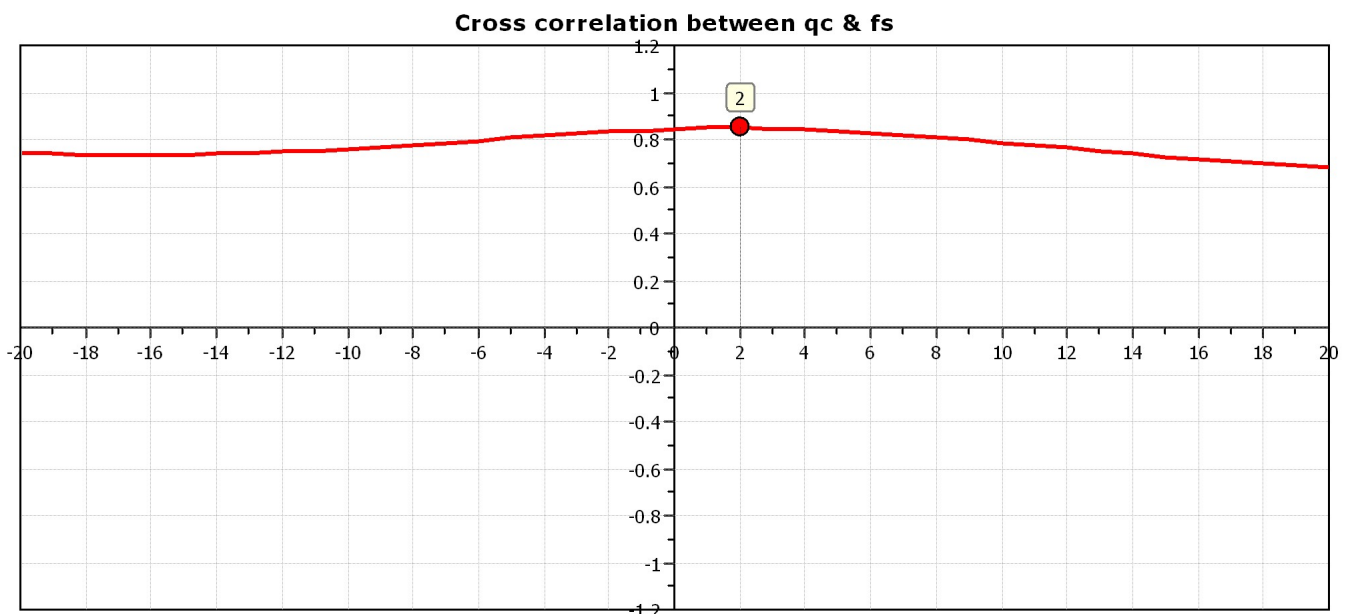
● Flat Dilatometer Test data

Project: Tara Road Subdivision

Location:



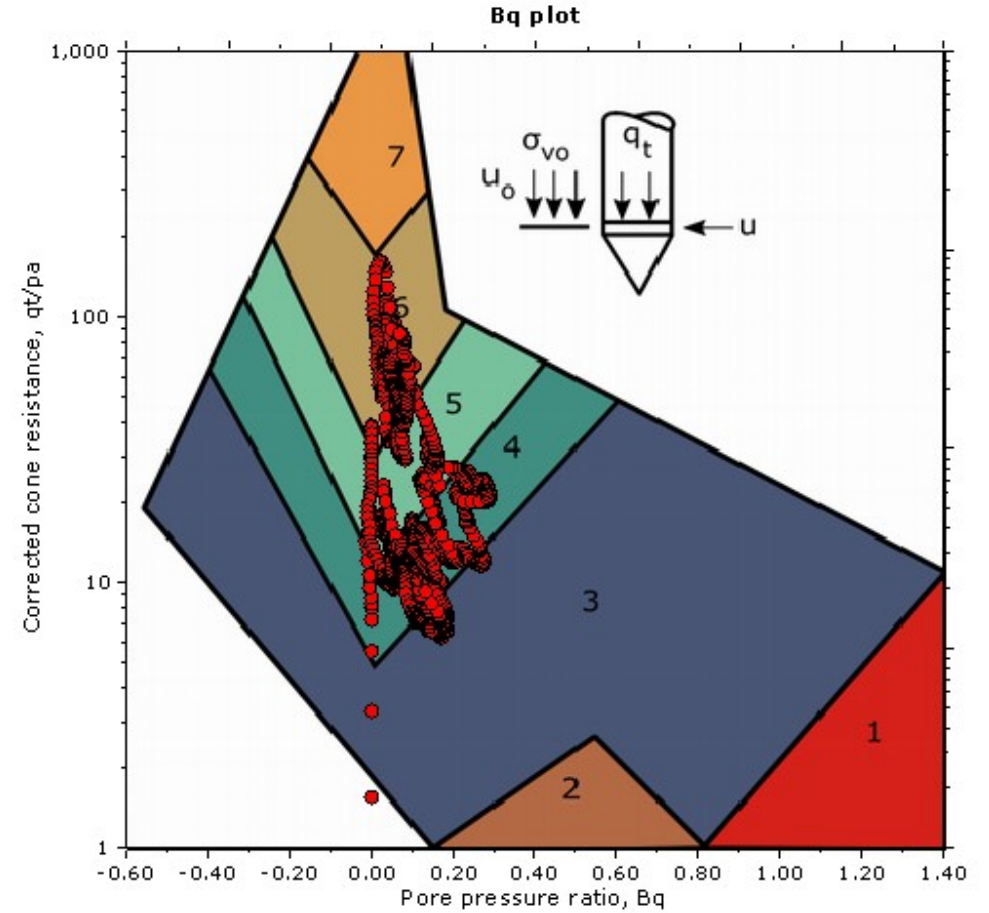
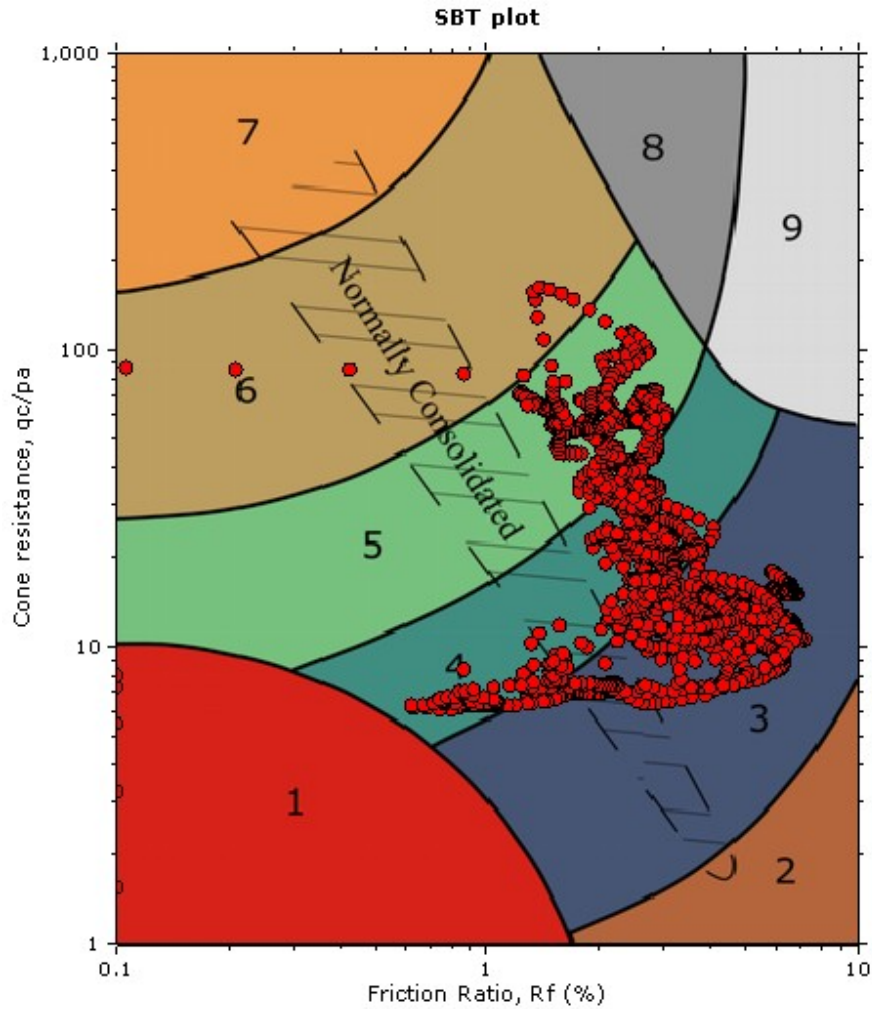
The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



Project: Tara Road Subdivision

Location:

SBT - Bq plots

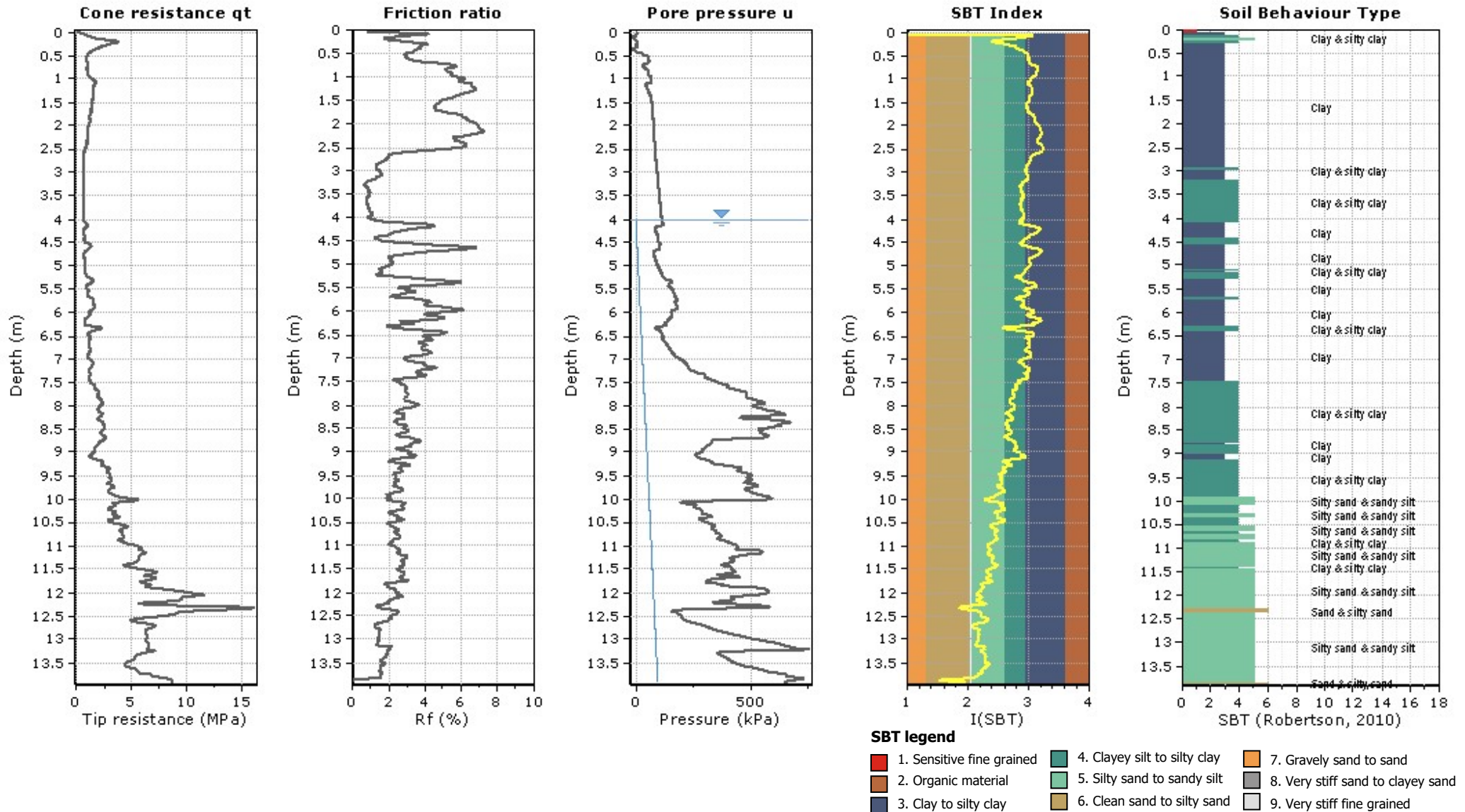


SBT legend

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

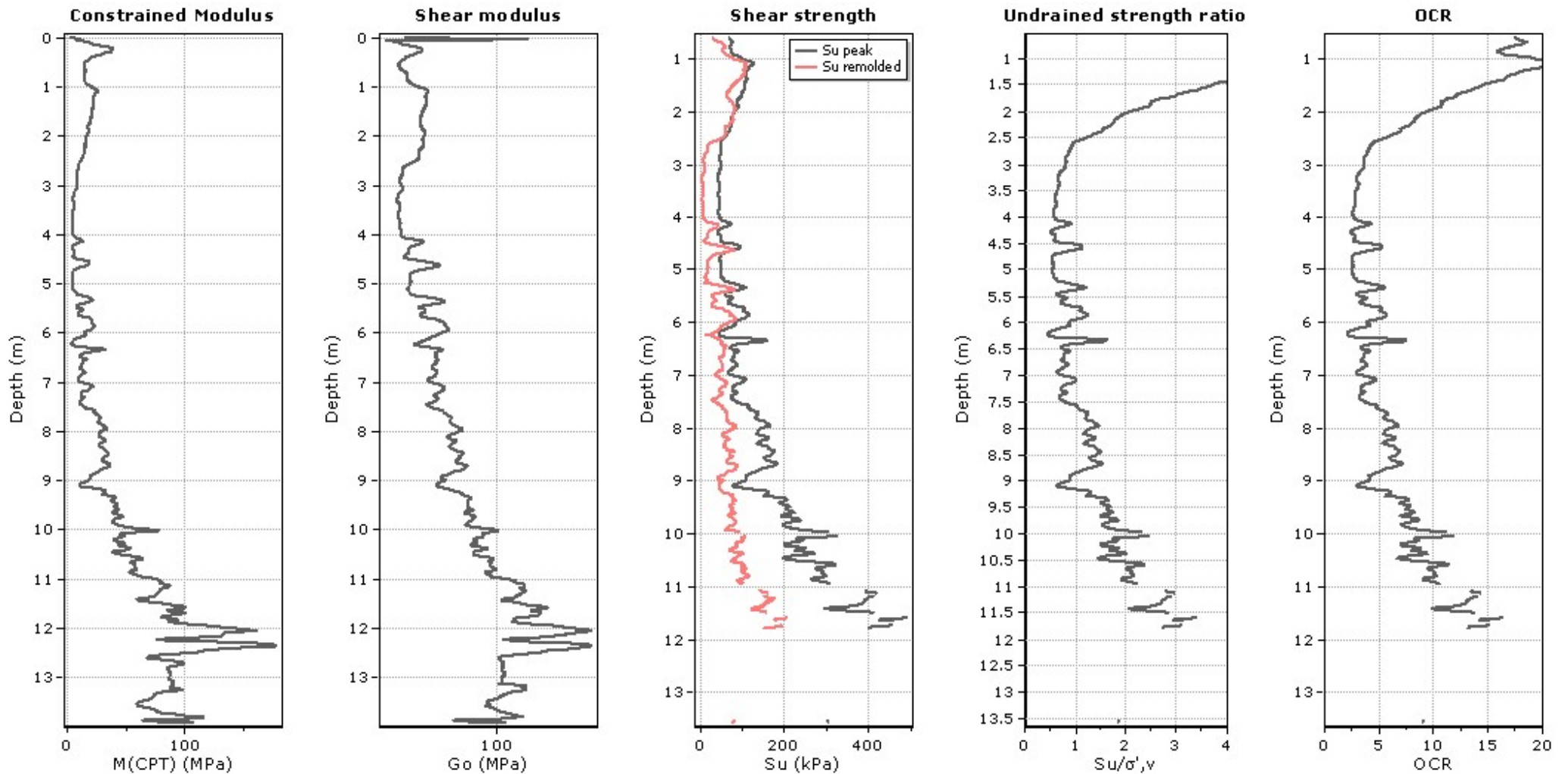
Project: Tara Road Subdivision

Location:



Project: Tara Road Subdivision

Location:



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

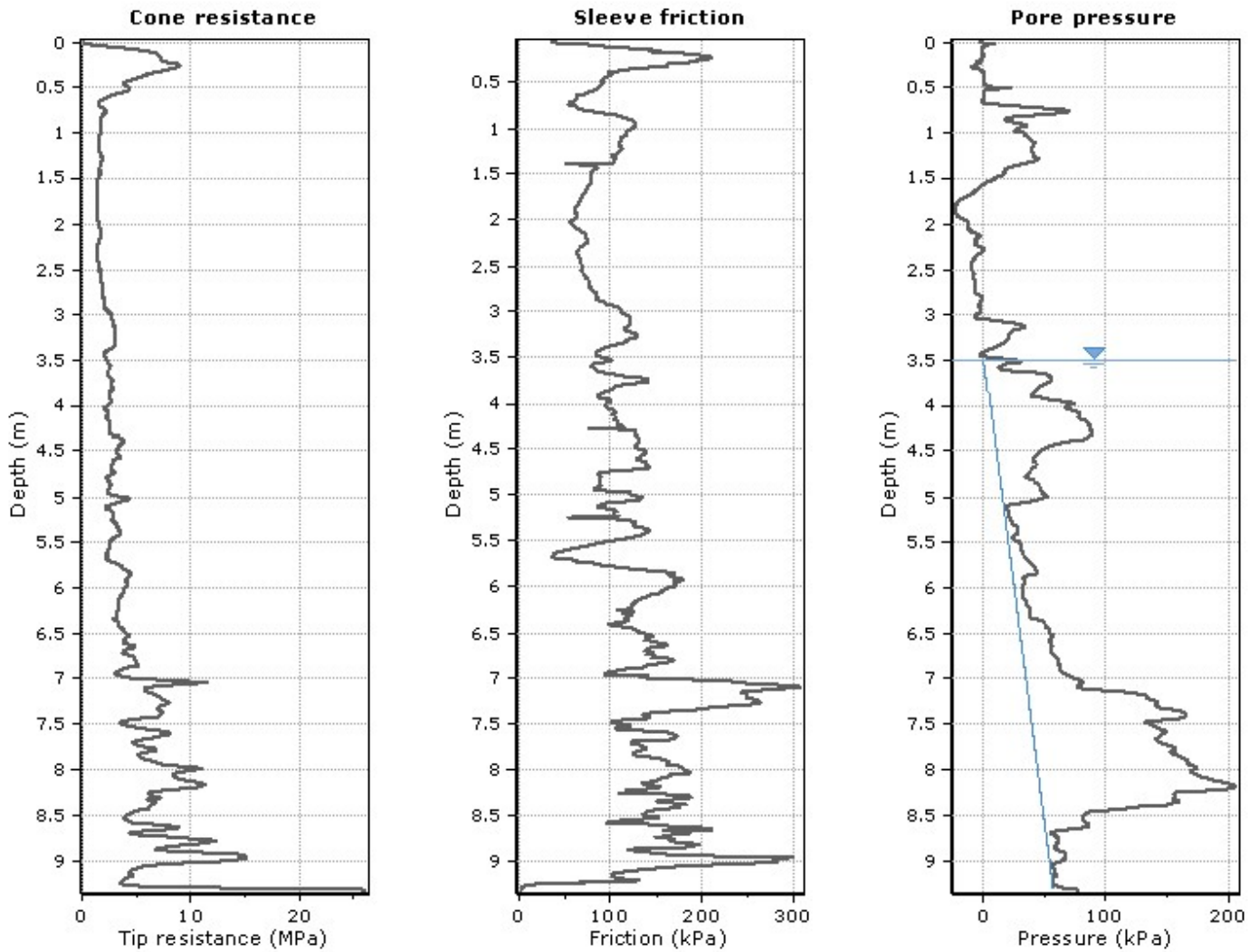
OCR factor for clays, N_{kt} : 0.33

● User defined estimation data

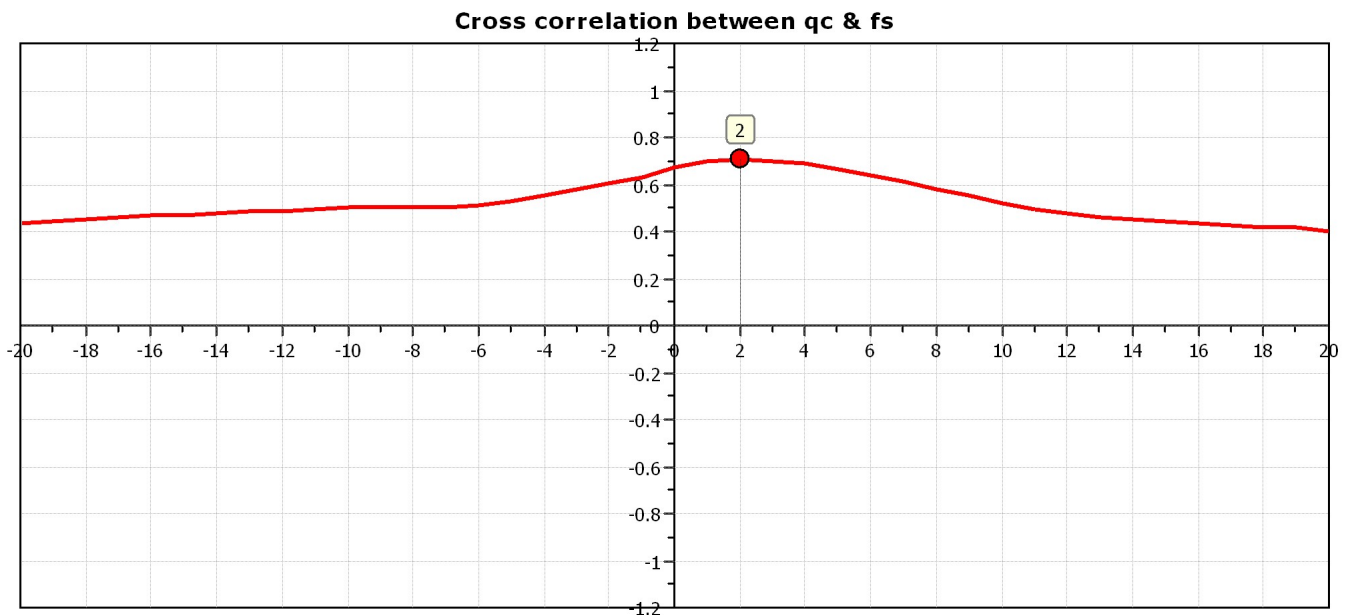
● Flat Dilatometer Test data

Project: Tara Road Subdivision

Location:



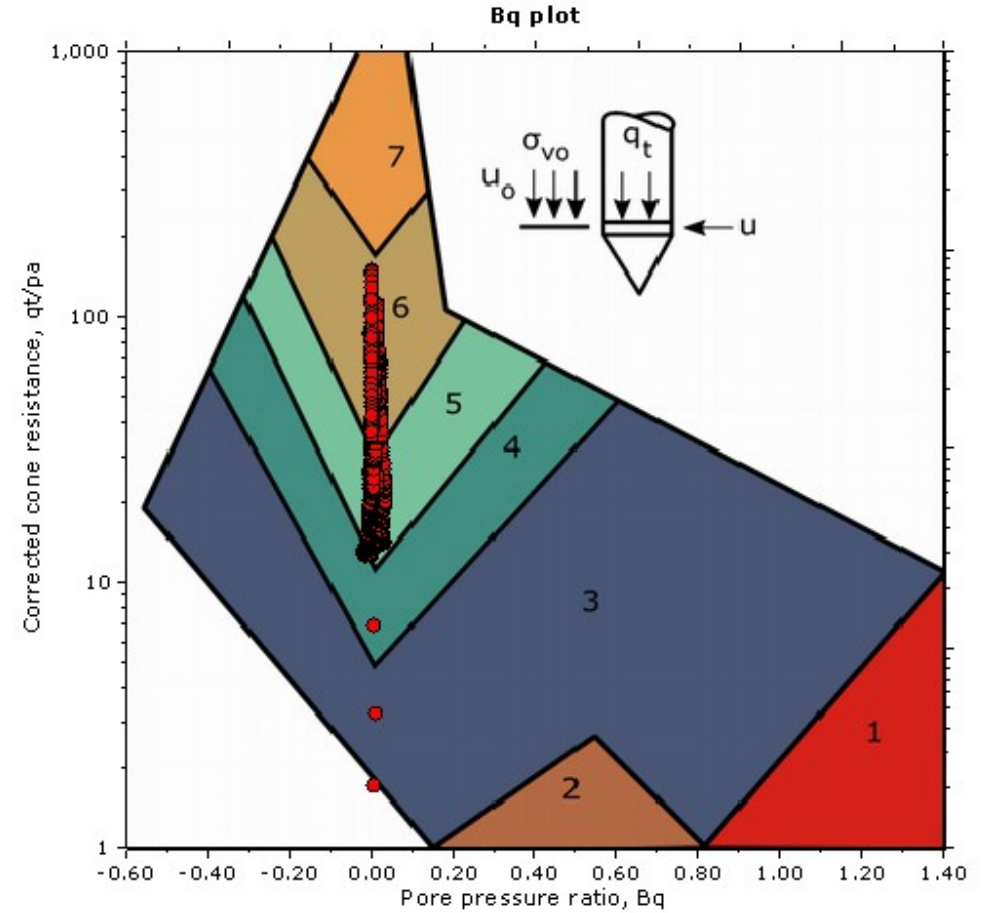
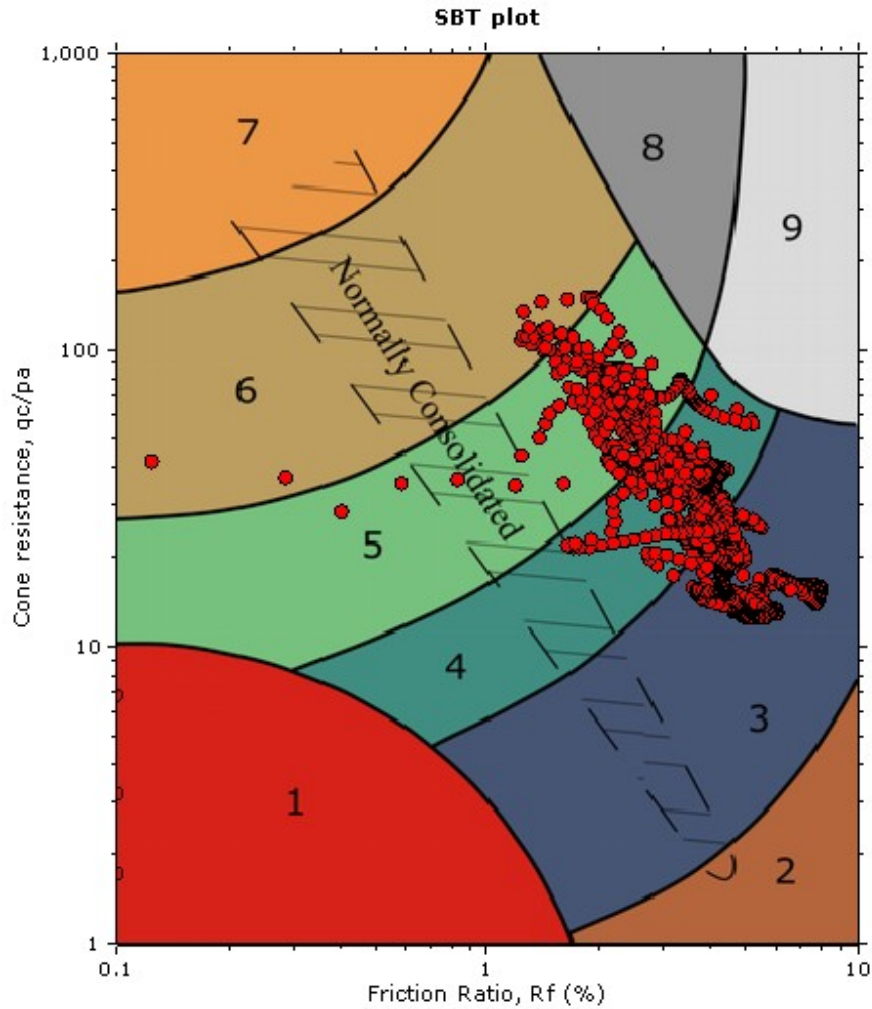
The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



Project: Tara Road Subdivision

Location:

SBT - Bq plots

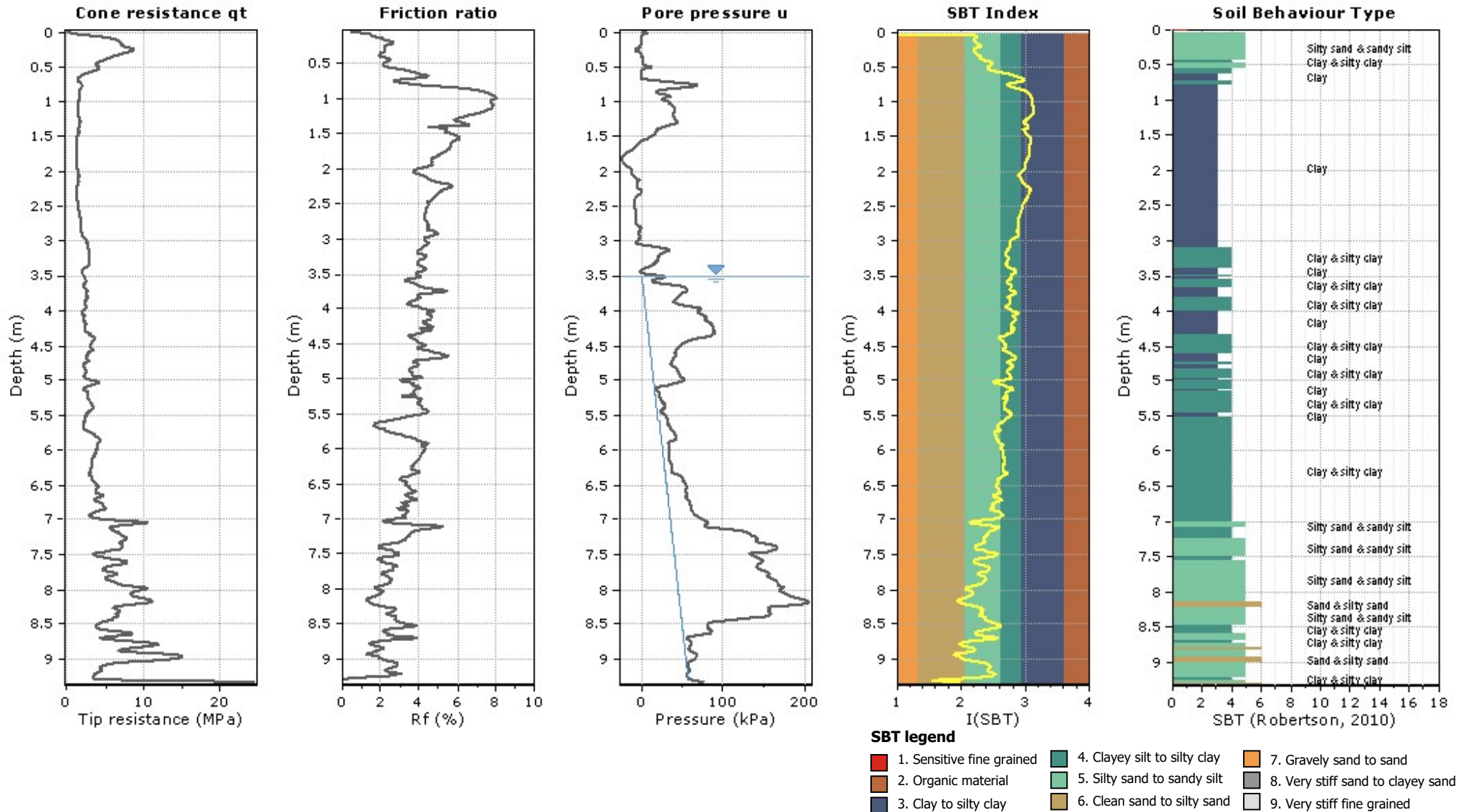


SBT legend

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

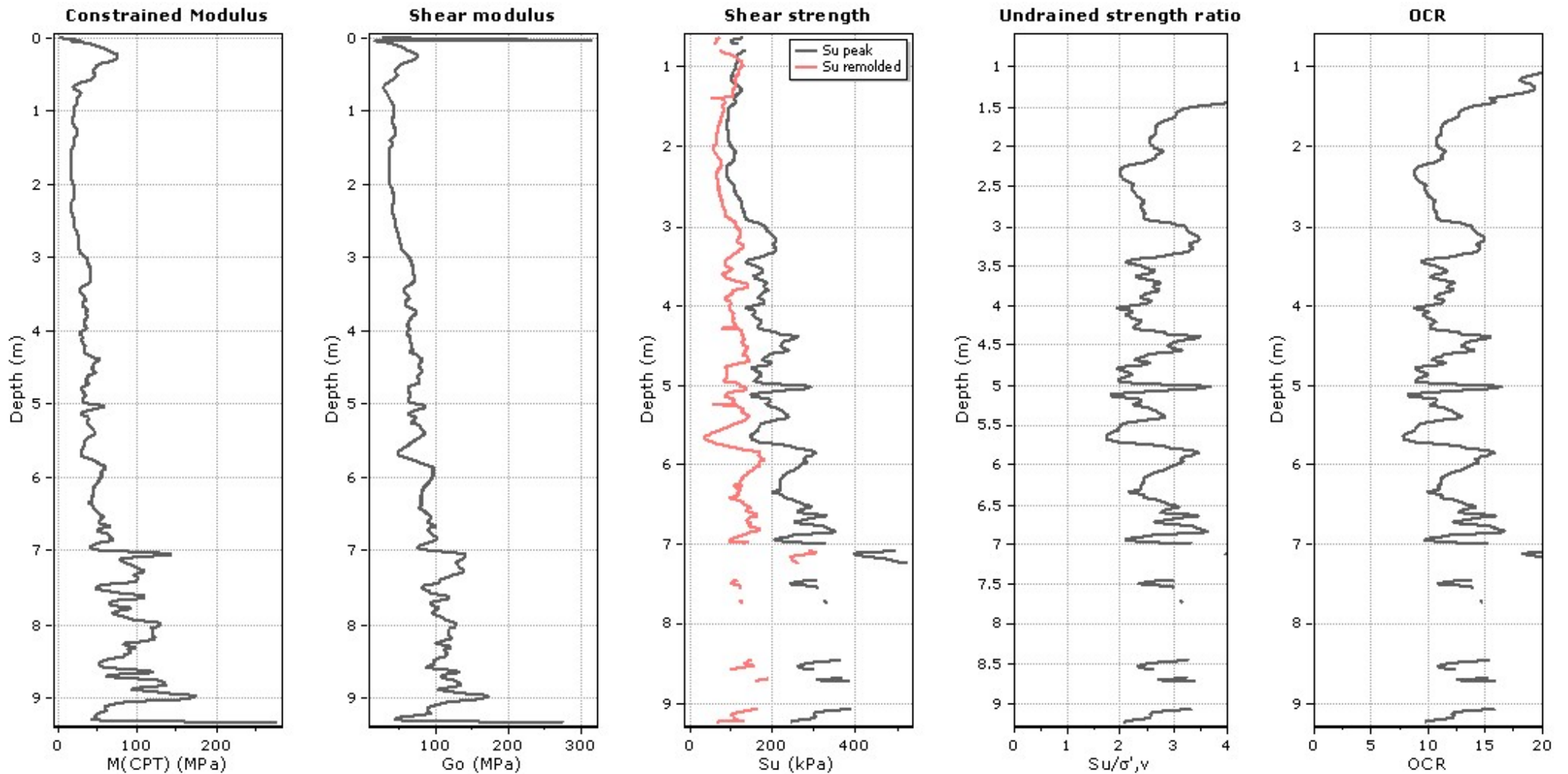
Project: Tara Road Subdivision

Location:



Project: Tara Road Subdivision

Location:



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tm} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

● User defined estimation data

● Flat Dilatometer Test data