KAIPARA DISTRICT

Kaipara te Oranganui • Two Oceans Two Harbours

KAIPARA DISTRICT COUNCIL

I hereby give notice of an Ordinary meeting of the:

Meeting	**Raupo Drainage Committee**
Date	Thursday 16 August 2018
Venue	Raupo Drainage Board Offices – Wharf Road, Ruawai
Time	10.00am

Open Agenda

Membership

Chair: Ian Beattie

Members: Councillor Anna Curnow, Greg Gent, David Hart, Brian Madsen, Ross McKinley, Mayor Jason Smith, Ken Whitehead

Staff and Associates:

Land Drainage Co-ordinator, Executive Assistant, Governance Advisor (Minute-taker)

Contents

Ordinary meeting of the Raupo Drainage Committee
Thursday 16 August 2018 in Ruawai

1 Opening

1.1 Present

1.2 Apologies

1.3 Confirmation of Agenda

The Committee to confirm the Agenda.

1.4 Conflict of Interest Declaration

Committee members are reminded of the need to be vigilant to stand aside from decision-making when a conflict arises between their role as a Committee member and any private or other external interest they might have. It is also considered best practice for those members to the Executive Team attending the meeting to also signal any conflicts that they may have with an item before the Committee.

1.5 Deputations and Presentations

2 Confirmation of Minutes

2.1 Raupo Drainage Committee Minutes 11 May 2018

General Manager Governance, Strategy and Democracy **1603.22**

Recommended

That the unconfirmed minutes of the Raupo Drainage Committee meeting held on 11 May 2018 be confirmed as a true and correct record.

Meeting	**Raupo Drainage Committee**
Date	Friday 11 May 2018
Venue	Raupo Drainage Board Offices – Wharf Road, Ruawai
Time	Meeting commenced at 10.00am Meeting concluded at 11.30am
Status	Unconfirmed

Minutes

Membership

Chair: Ian Beattie

Members: Councillor Anna Curnow, Greg Gent, David Hart, Brian Madsen, Ross McKinley, Mayor Jason Smith, Ken Whitehead

Staff and Associates:

Chief Operating Officer and General Manager Infrastructure, Land Drainage Co-ordinator, Governance Advisor (Minute-taker)

Jason Marris

General Manager Governance, Strategy and Democracy

Contents

Minutes of the meeting of the Raupo Drainage Committee

Friday 11 May 2018 in Ruawai

1 Opening

1.1 Present

[Secretarial Note: Councillor Jonathan Larsen stepped down from this Committee, Councillor Curnow [incorrectly stated 'Councillor del la Varis-Woodcock' in the agenda] was appointed in March 2018.]

Chair: Ian Beattie

Members: Councillor Anna Curnow, Greg Gent, David Hart, Ross McKinley, Mayor Jason Smith and Ken Whitehead

In Attendance

Name	Designation	Item(s)
Shelley Paniora	Executive Assistant	All (Minute-taker)
Wayne Crump	Drainage Co-ordinator	All

1.2 Apologies

Moved Beattie/McKinley

That the apology of Brian Madsen be received.

Carried

1.3 Confirmation of Agenda

The Committee to confirm the Agenda.

1.4 Conflict of Interest Declaration

Nil.

1.5 Deputations and Presentations

Nil.

2 Confirmation of Minutes

2.1 Raupo Drainage Committee Minutes 16 November 2017

Democratic Services Manager **1603.22**

Moved **Beattie/Whitehead**

That the unconfirmed minutes of the Raupo Drainage Committee meeting held on 16 November 2017 be confirmed as a true and correct record.

Carried

2.2 Raupo Drainage Committee Minutes 15 February 2018

Administration Manager **1603.22**

Moved **Beattie/Whitehead**

That the unconfirmed minutes of the Raupo Drainage Committee meeting held on 15 February 2018 be confirmed as a true and correct record.

Carried

3 General

3.1 Asset Management Report: February 2018

Land Drainage Co-ordinator **4303.24**

Moved **Beattie/Whitehead**

That the Raupo Drainage Committee receives the Land Drainage Co-ordinator's report 'Asset Management Report: October 2017' dated 08 November 2017. This will enable the Committee to be informed of the current issues.

Carried

3.2 Asset Management Report: May 2018

Land Drainage Co-ordinator **4303.24**

Moved **Curnow/Whitehead**

That the Raupo Drainage Committee receives the Land Drainage Co-ordinator's report 'Asset Management Report: May 2018 dated 26 April 2018. This will enable the Committee to be informed of the current issues.

Carried

3.2 Raupo Financial Report – period ended 31 December 2017

Financial Services Manager **4303.24**

Moved **Beattie/Whitehead**

That the Raupo Drainage Committee receives the tabled Raupo Drainage District Financial Report – period ended 31 December 2017.

Carried

3.3 Raupo Financial Report – period ended 31 March 2018

Financial Services Manager **4303.24**

Moved **Hart/McKinley**

That the Raupo Drainage Committee receives the tabled Raupo Drainage District Financial Report – year ended 31 March 2018.

Carried

4 Closure

4.1 General Business - Extension to Raupo Drainage District A

Land Drainage Coordinator **4303.24**

The Board was asked to accept an additional 248 metres of drain into Raupo Drainage District A with the creation of an additional property from Peter and Sara Ball. The reason being that the new property requires a drainage outlet and does not currently have an outlet. The new drain would be numbered 6C in the network.

Moved **Gent/Hart**

That the Raupo Drainage District accept an additional 248 metres of drain to be maintained as part of the wider drainage network, into the Raupo Drainage District A, from Lot 1 DP 396376.

Carried

The meeting closed at 11.30am.

Confirmed ……

Chair ……

3 General

KAIPARA DISTRICT

Kaipara te Oranganui • Two Oceans Two Harbours

KAIPARA DISTRICT COUNCIL

File number:	4303.24	**Approved for agenda ☒**
Report to:	Raupo Drainage Committee	
Meeting date:	**16 August 2018**	
Subject:	**Asset Management Report: August 2018**	
Date of report:	**07 August 2018**	
From:	Wayne Crump, Land Drainage Co-ordinator	
Report purpose:	☐ Decision	☒ Information
Assessment of significance:	☐ Significant	☒ Non-significant

Summary

This report summarises the work that has been undertaken over the last month and work that is planned or recommended in the forthcoming months. The Committee is asked to receive the report.

Recommendation

That the Raupo Drainage Committee receives the Land Drainage Co-ordinator's report 'Asset Management Report: August 2018' dated 07 August 2018. This will enable the Committee to be informed of the current issues.

Reason for the report

To inform the Committee of the current issues.

Background

The Raupo Drainage Committee meets four times each year to consider maintenance and renewal works that are required in the Raupo Drainage District. The Land Drainage Co-ordinator's report summarises the maintenance and renewal work that has been done over the period and outlines the future work programme.

Issues

Stopbanks

Stop bank maintenance in the past financial year of $11,514 was made up of $7,247 for the supply of limestone and digger works to build up over floodgates and repair access. Costs associated with survey of the stopbanks heights in these area were $967, and the cost of purchase and installation of rail iron posts for the stopbank gates was $3,230.

Stopbank capital works to widen and raise 230m of stopbank between Wilson Landing and Simpson Road was $61,517. This was funded from the 2017/2018 budget and the previous year's unused budget carryover. Lands and Survey completed a survey of stopbank levels from Donovan's Bluff to the Awaroa outlet for a cost of $3,180.

Surveys works and Geo Tech test bores were completed in sections of stopbank in the Bowers property at $23,831.

Floodgates

Floodgate inspections have continued through the winter months. Debris has been removed from floodgates 45, 5, 1 and 20.

The door face timbers have been replaced on floodgate 33 (Raupo Landing). New material has been ordered to fabricate a new door and alterations to the door support points are planned.

Cross chains have been fitted to the floodgate door on No 53 (Floodgate Road). This should prevent the door from swinging side to side during certain stages of discharge.

During the weekend of 14 July 2018, weather events coincided with 3.7m high tides causing floodwater to back flow through Floodgate No 6 (Tramline/Wallace Road) into Drain No 6. This was due to the head wall leaning outwards and parting from the culvert, allowing water pushed up by the tide, to flow in the top of the culvert. This situation had been discussed at committee level with no recommendation for repair, replace or remove being resolved, and until recently, this floodgate had given no problems. A bund was placed in front of the floodgate and later removed when temporary repairs were made to the floodgate head wall and culvert area. A permanent repair to the head wall and culvert will be done in the summer months.

Machine cleaning

Machine cleaning for the past financial year was $20,592. This was made up of mostly weed raking required in August 2017 at a cost of $13,607 in drains 24, 20, 19, 4, 39, 22, 6 and 26. Further weed raking was required during mid May 2018 at a cost of $6,230. Drains cleared were:

- Drain 20 (SH12 Reynard > Dunn Road),
- Drain 19 (Williams Road > Murphy),
- Drain 24 (Tramline Crosby)
- Drain 24 and
- Part of Drain 2 (Preston)

Drain Spraying

The 2017/2018, Contract Spraying came in at a cost of $81,293. This included ordered works, spraying K canal (northern side) below SH12 where the long reach digger had cleaned. Further works have been completed in K canal below SH12 (southern side) at a cost of $2,078. Bullrush spraying below Sunrise bridge G canal to the Double Creek bridge at a cost of $1,402, and the Floodgate outlet of No 20 (Old Maori) at a cost of $697.

Miscellaneous

The miscellaneous expenses this last financial year are made up of fencing the Raupo yard at a cost of $920, supply of padlocks for the stopbank gates at a cost of $325.80, and replacement and installation of a new stove in the Raupo rental house.

Factors to consider

Community views

The community expects the Committee to have a good understanding of and to govern the land drainage requirements for the Raupo District.

Policy implications

There are no policy implications created by this report.

Financial implications

There are no financial implications created by this report. All work recommended falls within the approved budget for the Raupo Drainage District.

Legal/delegation implications

There are no legal implications created by this report and the Committee has the delegated authority to receive the report and make recommendations as to the work required.

Options

Option A: That the Committee receives the Asset Management Report as written.

Option B: That the Committee declines to receive the Asset Management Report as written.

Assessment of options

The community expects the Committee to be informed as to the maintenance and renewal work being undertaken by Council on their behalf. Receiving the Asset Management Report is confirmation that they have been informed.

Assessment of significance

This report does not trigger Council's Significance and Engagement Policy.

Recommended option

The recommended option is Option A.

3.1 Financial report for period ended 30 June 2018

Financial Services Manager **4303.24**

Recommended

That the Raupo Drainage Committee receives the Raupo Drainage District financial report for period ended 30 June 2018.

Raupo Drainage District
Financial report for the period ended 30 June 2018

Raupo Drainage District	Actual year ended 30.06.2017	Budget year ended 30.06.2018	Actual year ended 30.6.2018
Funds/Deficit from prior period	319,113	-	308,754
Rent received	9,357	7,892	8,960
Rates	340,479	342,004	348,421
Funds avaliable	**668,949**	**349,896**	**666,135**
Administration Costs	23,972	4,805	6,435
Committee Costs	1,110	1,691	1,200
Maintenance Costs (note 1)	150,408	153,566	149,509
Total Operating Costs	**175,490**	**160,062**	**157,144**
Total Capital costs (note 2)	**184,705**	**379,699**	**278,935**
Total Costs	**360,194**	**709,304**	**296,234**
Funds Passing to Future Period	**308,754**	**- 359,408**	**369,902**

Note 1

Maintenance Analysis	Actual year ended 30.06.2017	Budget year ended 30.06.2018	Actual year ended 30.6.2018
Floodgates	33,633	10,699	25,374
Pumps	2,010	2,200	1,200
Machine Cleaning	17,525	19,363	20,592
Spraying	83,735	75,657	81,294
Stopbanks	3,300	36,720	11,514
Miscellaneous (incl garage)	5,471	2,246	2,717
Power	1,306	2,718	3,255
Insurance	406	769	415
Rates payments	1,934	1,994	1,994
Rate remissions	1,088	1,200	1,152
Total maintenance	**150,408**	**153,566**	**149,509**

Note 2

Capex Analysis	Actual year ended 30.06.2017	Budget year ended 30.06.2018	Actual year ended 30.6.2018
Floodgates	184,705	320,000	190,427
Pumps			
Stopbanks		59,699	64,677
Stopbanks - Murphy Bowers			23,832
Total capital expenditure	**184,705**	**379,699**	**278,935**

KAIPARA DISTRICT

Kaipara te Oranganui • Two Oceans Two Harbours

KAIPARA DISTRICT COUNCIL

File number:	4303.24	**Approved for agenda** ☒
Report to:	Raupo Drainage Committee	
Meeting date:	**16 August 2018**	
Subject:	**Murphy Bower Stopbank, August 2018**	
Date of report:	09 August 2018	
From:	Donnick Mugutso, Acting General Manager Infrastructure	
Report purpose	☐ **Decision** ☒ **Information**	
Assessment of significance	☒ **Significant** ☐ **Non-significant**	

Summary

The Murphy Bower stopbank issue has been ongoing for some time. Previous reports have discussed historical issues of this stopbank, Council's legal position, a previous report from Duffill Watts and King Limited, and proposed a solution and a way forward.

Subsequent to those reports, the affected landowner has been contacted and supplied ensuing reports, discussions and options into the existing state of the stopbanks, with possible remediation. From the report that was supplied, some prices have been sought from local contractors to implement the work.

In September 2017, Council resolved to *'Delegate responsibility to the interim Chief Executive to complete any associated works for the stopbank reinstatement of Raupo Drainage District flood protection based on feedback from community consultation and expert advice; and that the works are to be funded by Raupo Drainage Targeted Rate'.*

Due to the value of the work to be completed and the possible effects of this cost, there is now a requirement to go to public consultation to gauge the view of the community that will be affected by the works to be completed and any risk associated with a lack of a lasting resolution.

Recommendation

That Raupo Drainage Committee:

1 *Receives the Acting General Manager Infrastructure's report 'Murphy Bower Stopbank – August 2018' dated 09 August 2018; and*

2 *Believes it has complied with the decision-making provisions of the Local Government Act 2002 to the extent necessary in relation to this decision; and in accordance with the provision of s79 of the Act determines that it does not require further information prior to making a decision on this matter; and*

3 *Delegates the Chief Executive to forward all relevant information to the affected landowners for their information just prior to undergoing limited public consultation to go out to the Raupo ratepayers at the end of August 2018.*

Reason for the recommendation

There have been some delays in getting information and prices to get the work completed, plus issues with ensuring that Council is following best practice and not negatively affecting landowners without first

considering all of the options. The above proposal is the best recommendation to complete the required project.

Reason for the report

This report is for information purposes to the Raupo Drainage Committee (the Committee) to ensure that they are aware of everything that is going on, and can answer any questions that will be raised from the consultation requirements. A copy of the Opus report (Attachment 1) and the consultation letter (Attachment 2) are included in the appendices.

Background

This issue reaches back to the 1970s when the original floodgate was relocated due to sedimentation of the outfall. There have been a lot of reports and recommendations regarding this issue and a resolution was almost reached in 2005 before work was stopped.

By finally reaching this resolution and the options below, this work will be completed and the land drainage stopbank protection in this location back up to an acceptable standard.

Issues

The main issues with this project are:

1 The current bank is substandard.

2 If the bank is reinstated in a method that is not outlined in the proposal from Opus (report included as Attachment 1) then the Committee and subsequently the Kaipara District Council will need to be fully aware that they will be accepting any risk associated with failure.

3 There is an unacceptable level of risk to the Raupo community and Ruawai township.

4 The work to be completed is on private property and may have to be completed against the wishes of the current owners.

5 There will be financial implications to the Raupo ratepayers.

Factors to consider

Community views

The community would expect the Committee to manage the risks associated with the work both financial and physical and to take the right option to mitigate the risks as efficiently and cost-effectively as possible.

Policy implications

The recommended decision will trigger Council's Significance and Engagement Policy, because it involves $300,000 per annum or more unbudgeted expenditure.

Financial implications

The indicative costs for the remediation are as outlined below, the financial implications of the method chosen to go forward with will be fully modelled by Council's financial team and submitted in the report to Council as outlined in the recommendations.

Legal/delegation implications

While not a legal implication there would be a legitimate expectation that public participation would be undertaken before decision-making and is best practice.

Options

Option A: Reinstate the original stopbank as per the Opus report with an indicative cost of $750,000. This option would reinstate the stopbank to an acceptable level with allowances for settlement over time. It is along the original alignment of the bank that was removed over time by landowners and is the cheaper of the two options.

Option B: Upgrade of current alignment of the stopbank, indicative cost $1,600,000. This option would also bring the stopbank protection up to an acceptable level allowing for settlement over time. It is twice the price but will be the most palatable option to the existing landowners and will not negatively affect them at all.

Assessment of significance

The risk of this project is significant, as with the current level of stopbank construction the Ruawai Township is at risk of being inundated during a significant rain event, with a catastrophic failure of the existing substandard stopbank.

Recommended option

The recommended option is **Option A**.

Next step

The Raupo Drainage Committee to submit a report to Council delegating the Chief Executive to forward relevant information to the affected landowner prior to a limited consultation process with the public.

Attachments

- Opus Report
- Draft Consultation Letter

Appendix A – Drawings

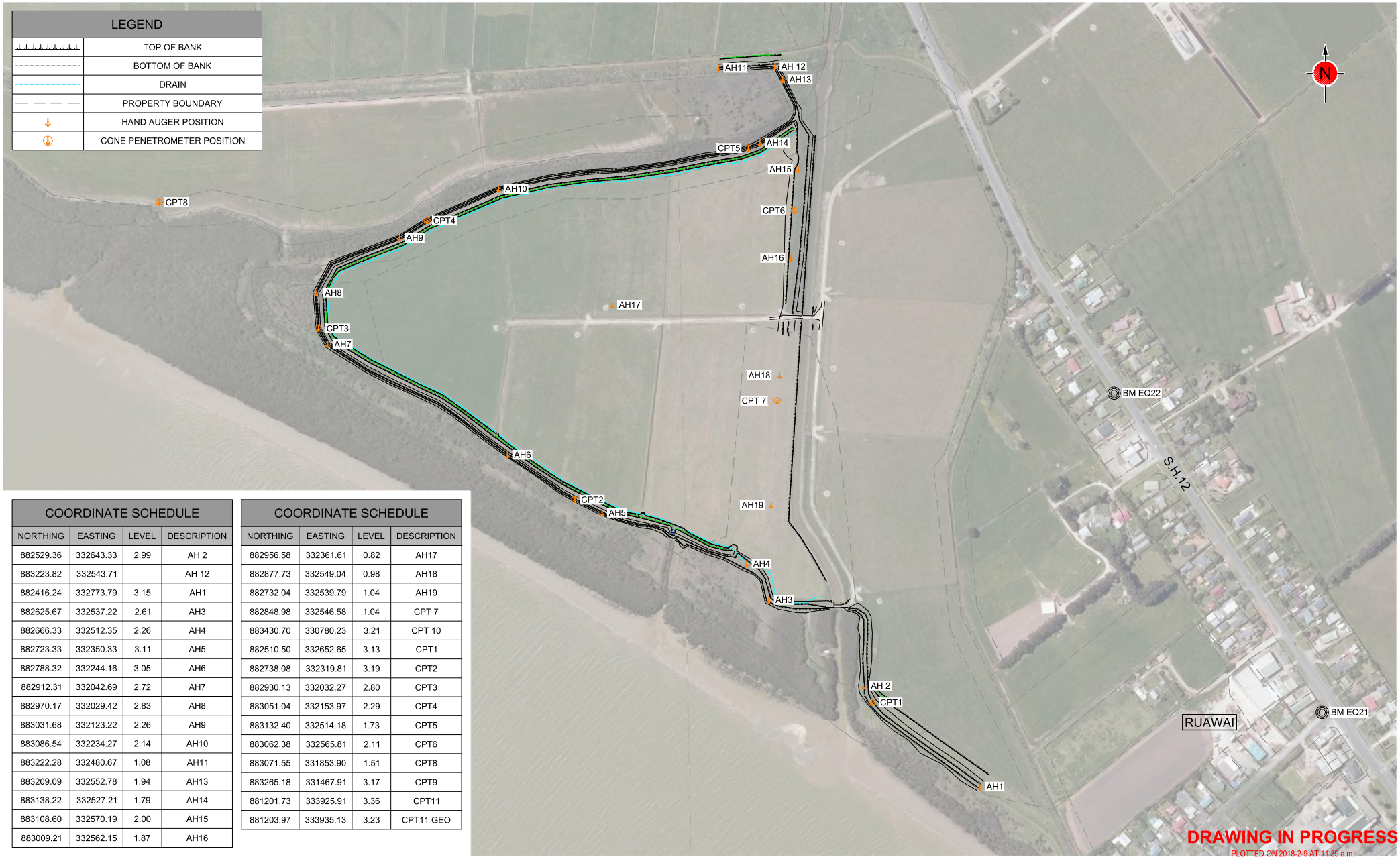
SHEET INDEX		
SHEET No.	SHEET TITLE	REVISION No.
C01	PLAN	A
C02	OPTION 1 DESIGN PLAN	A
C03	OPTION 1 TYPICAL SECTION	A
C05	CROSS SECTIONS STN. 0.0 - 718.0	A
C06	CROSS SECTIONS STN. 758.2 - 1552.7	A
C07	CROSS SECTIONS STN. 1573.4 - 1727.7	A
C10	OPTION 2 DESIGN PLAN	A
C11	OPTION 2 TYPICAL SECTION	A
C12	OPTION 2 CROSS SECTIONS STN. 57.8 - 158.1	A

KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

CONCEPT DESIGN

Project No: 1-13583.00

Date: FEBRUARY 2018



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882416.24	332773.79	3.15	AH1
882625.67	332537.22	2.61	AH3
882666.33	332512.35	2.26	AH4
882723.33	332350.33	3.11	AH5
882788.32	332244.16	3.05	AH6
882912.31	332042.69	2.72	AH7
882970.17	332029.42	2.83	AH8
883031.68	332123.22	2.26	AH9
883086.54	332234.27	2.14	AH10
883222.28	332480.67	1.08	AH11
883209.09	332552.78	1.94	AH13
883138.22	332527.21	1.79	AH14
883108.60	332570.19	2.00	AH15
883009.21	332562.15	1.87	AH16

COORDINATE SCHEDULE			
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882510.50	332652.65	3.13	CPT1
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883062.38	332565.81	2.11	CPT6
883071.55	331853.90	1.51	CPT8
883265.18	331467.91	3.17	CPT9
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DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:39 a.m.

CONCEPT DESIGN

NOTES:

1. LEVELS ARE IN TERMS OF NZ VERTICAL DATUM 2016 (ORIGIN EQ22).
2. COORDINATES ARE IN MT EDEN 2000 CIRCUIT.

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1:4000 @ A3
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Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

KAIPARA DISTRICT

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-
Drawn	Scales	
C. HOULTHAM	1:2000 AT A1	

Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: SURVEY PLAN AND
GEOTECHNICAL INVESTIGATION

Project No.	Sheet. No.	Revision
1-13583.00	C01	A

Survey | Drawing | Design | Checked | Date

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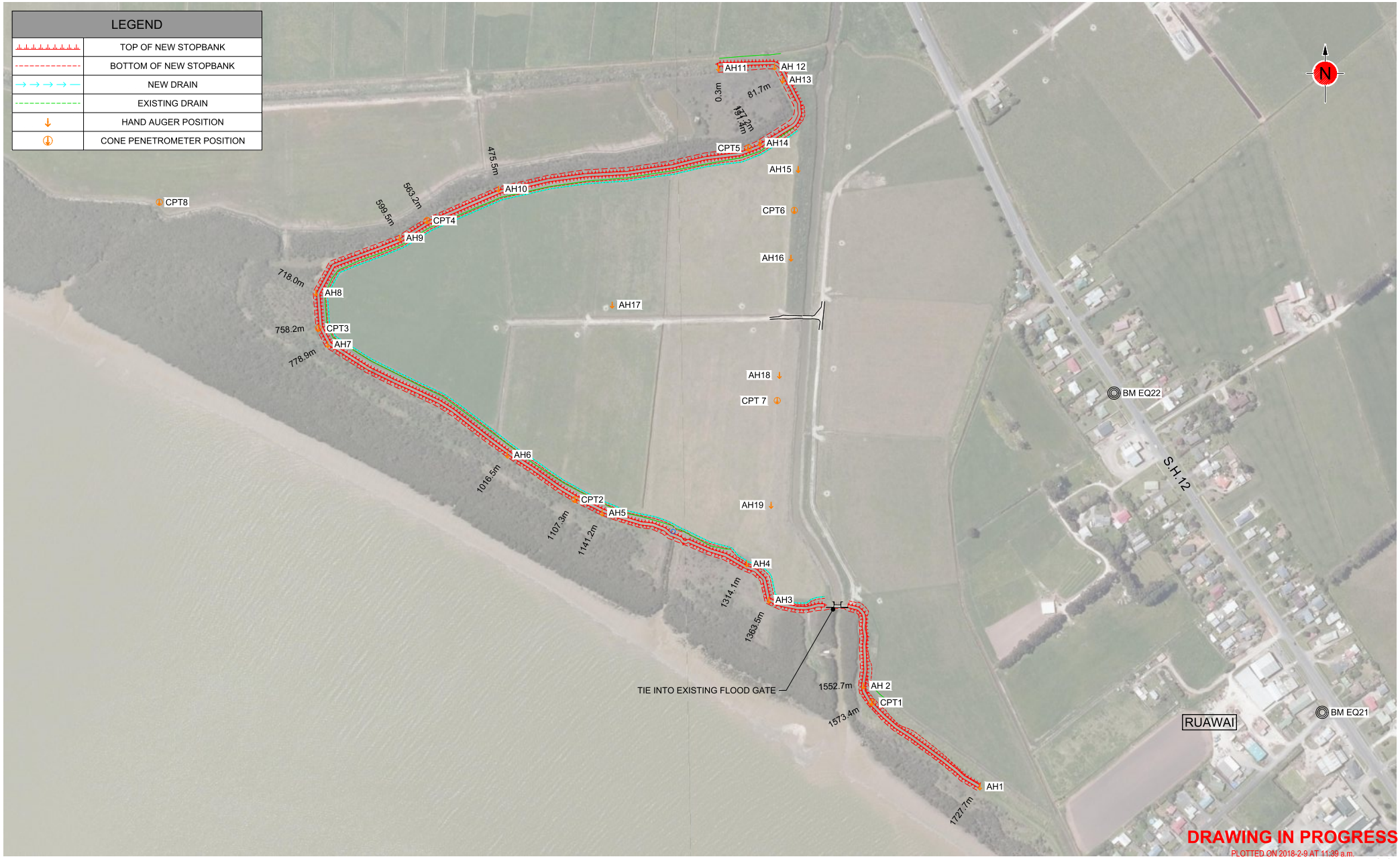

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PLOTTED ON 2018-2-9 AT 11:39 a.m.

CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

KAIPARA DISTRICT

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-
Drawn	Scales	
C. HOULTHAM	1:2000 AT A1	

Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: OPTION ONE
DESIGN PLAN

Project No.	Sheet. No.	Revision
1-13583.00	C02	A

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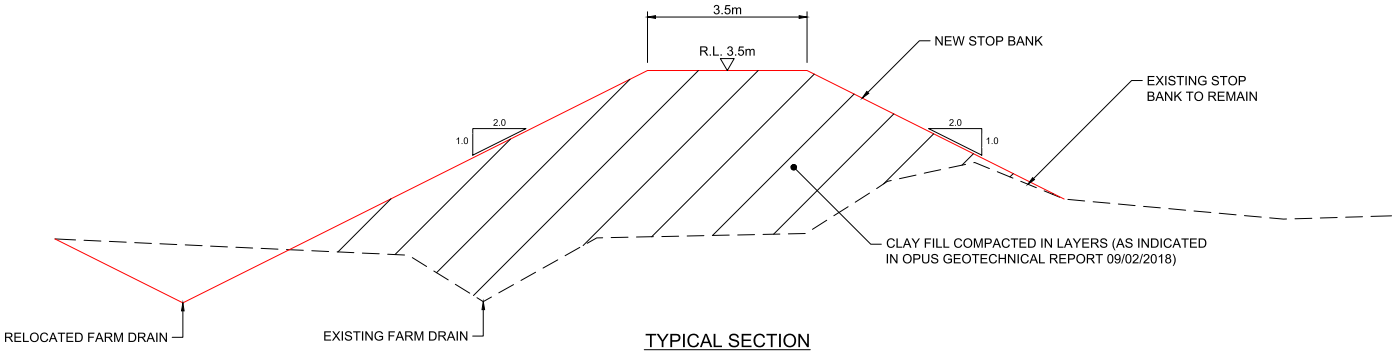

TYPICAL SECTION

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CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
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OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-
Drawn	Scales	
C. HOULTHAM	1:50 AT A1	

Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: OPTION ONE
TYPICAL SECTION

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1-13583.00	C03	A

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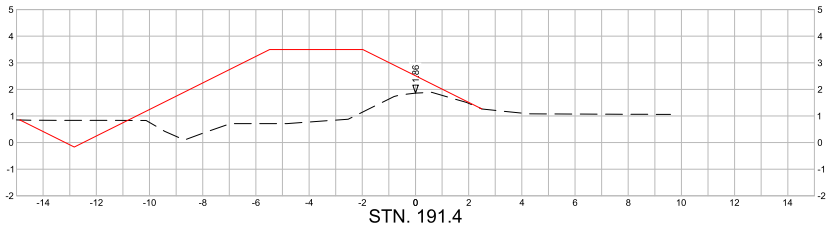

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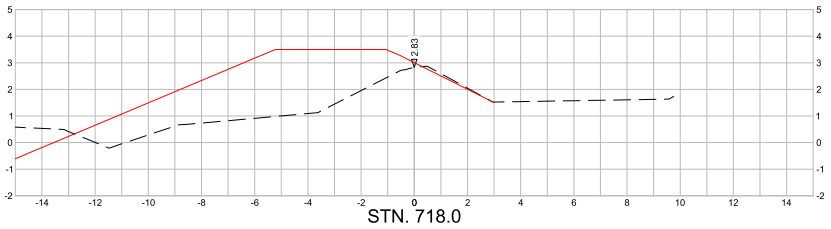

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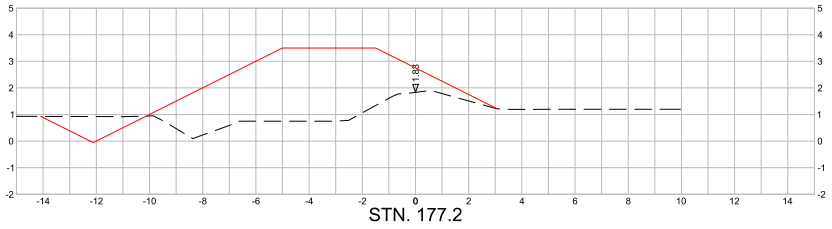

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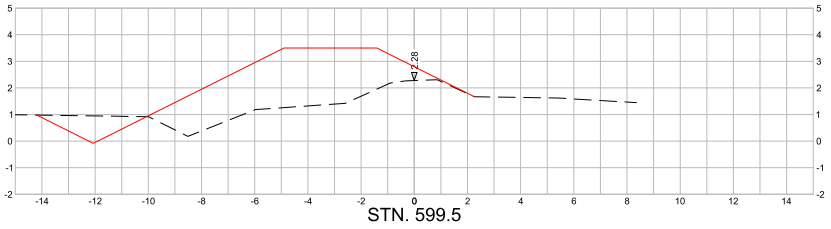

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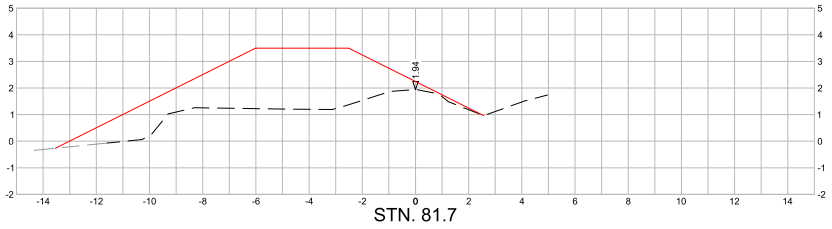

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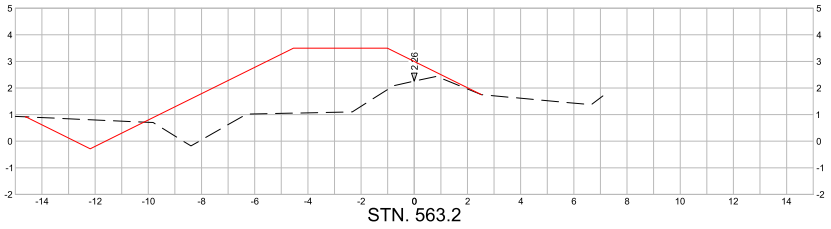

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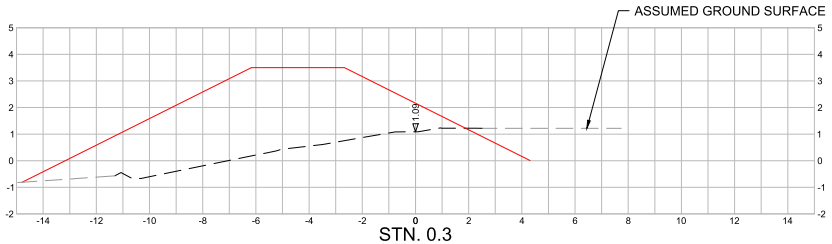

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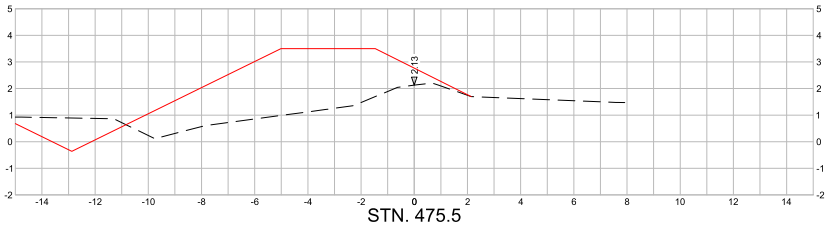


STN. 475.5

DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:39 a.m.

CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-
Drawn	Scales	
C. HOULTHAM	1:100 AT A1	

Project
KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

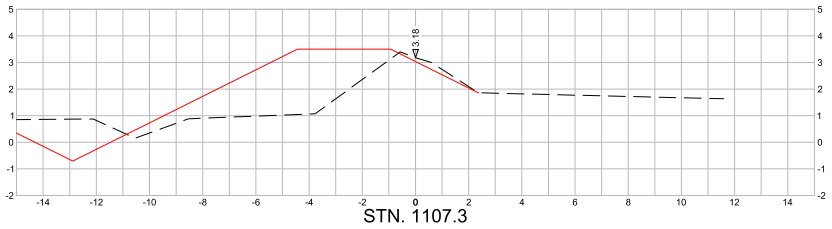
Sheet
OPTION ONE
CROSS SECTIONS STN. 0.0 - 718.0

Project No.	Sheet. No.	Revision
1-13583.00	C05	A

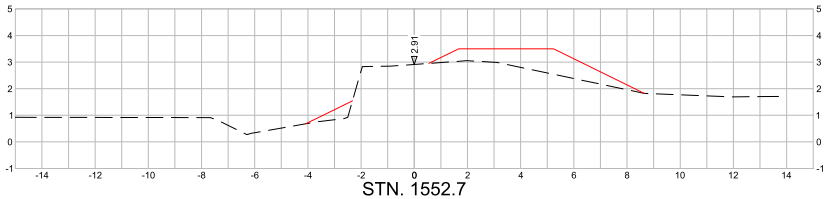
Survey - - -
Drawing - - -
Design - - -
Checked
Date

1:100 @ A1
1:200 @ A3
0 1 2 3 4 5 6 7 8 9 10 m

Original Sheet Size A1 [841x594] Plot Date 2018-02-09 at 11:39:59 a.m. Path S:\Proj\NZ\11\1-13583.00 Bowergate Farm Investigation\Home\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-13583.00_C00-.dwg C05



STN. 1107.3



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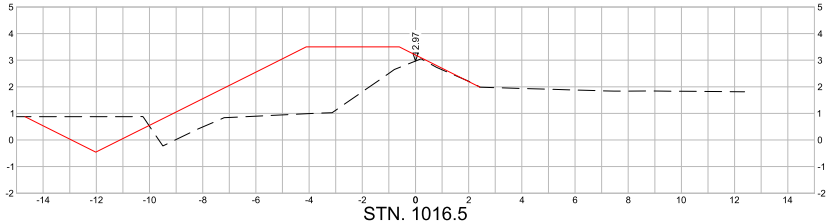

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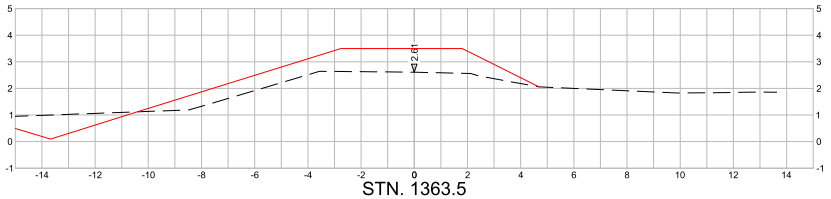

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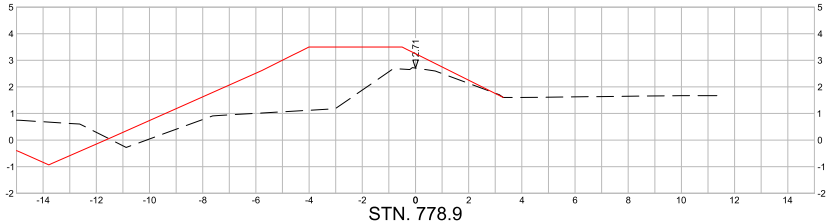

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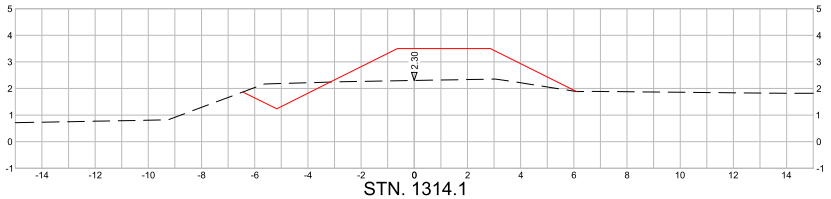

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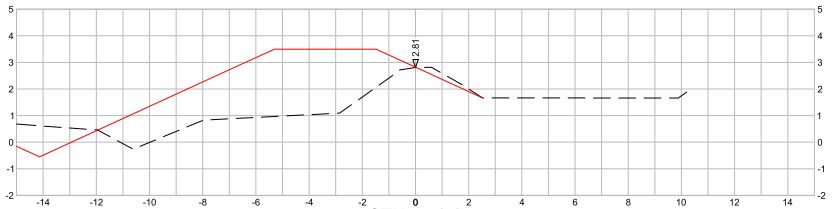

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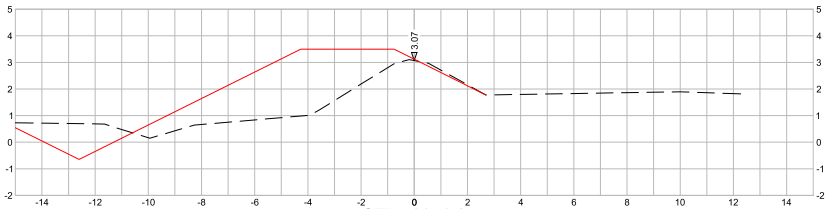


STN. 1141.2

DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:40 a.m.

CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

KAIPARA DISTRICT

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-

Drawn	Scales
C. HOULTHAM	1:100 AT A1

Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: OPTION ONE
CROSS SECTIONS STN. 758.2 - 1552.7

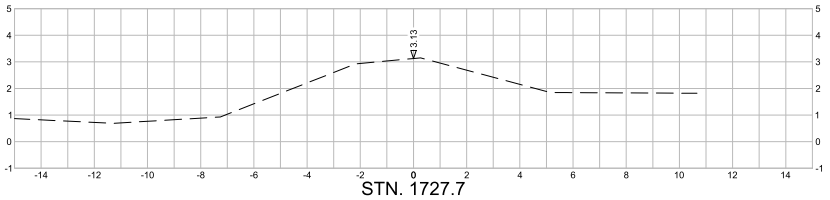
Project No.	Sheet. No.	Revision
1-13583.00	C06	A

	Checked	Design	Drawing	Survey
Date		-	-	-

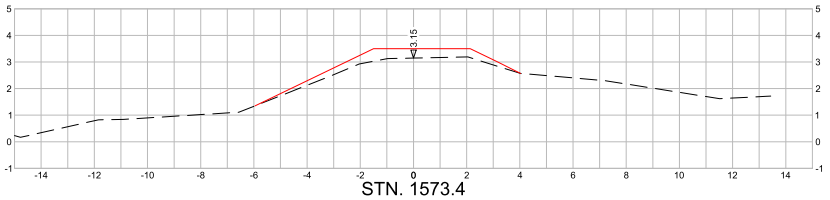
1:100 @ A1
1:200 @ A3
0 1 2 3 4 5 6 7 8 9 10 m

Original Sheet Size A1 [841x594] Plot Date 2018-02-09 at 11:40:01 a.m. Path S:\Proj\NZ\111\1-13583.00 Bowergate Farm Investigation\Home\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-13583.00_C00-.dwg C06

300 mm
200
100
50
10 mm
0
29



STN. 1727.7



STN. 1573.4

DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:40 a.m.

CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

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Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-

Drawn	Scales
C. HOULTHAM	1:100 AT A1

Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: OPTION ONE
CROSS SECTIONS STN. 1573.4 - 1727.7

Project No.	Sheet. No.	Revision
1-13583.00	C07	A

	Design	Drawing	Survey
Checked	-	-	-
Date	-	-	-

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1:200 @ A3
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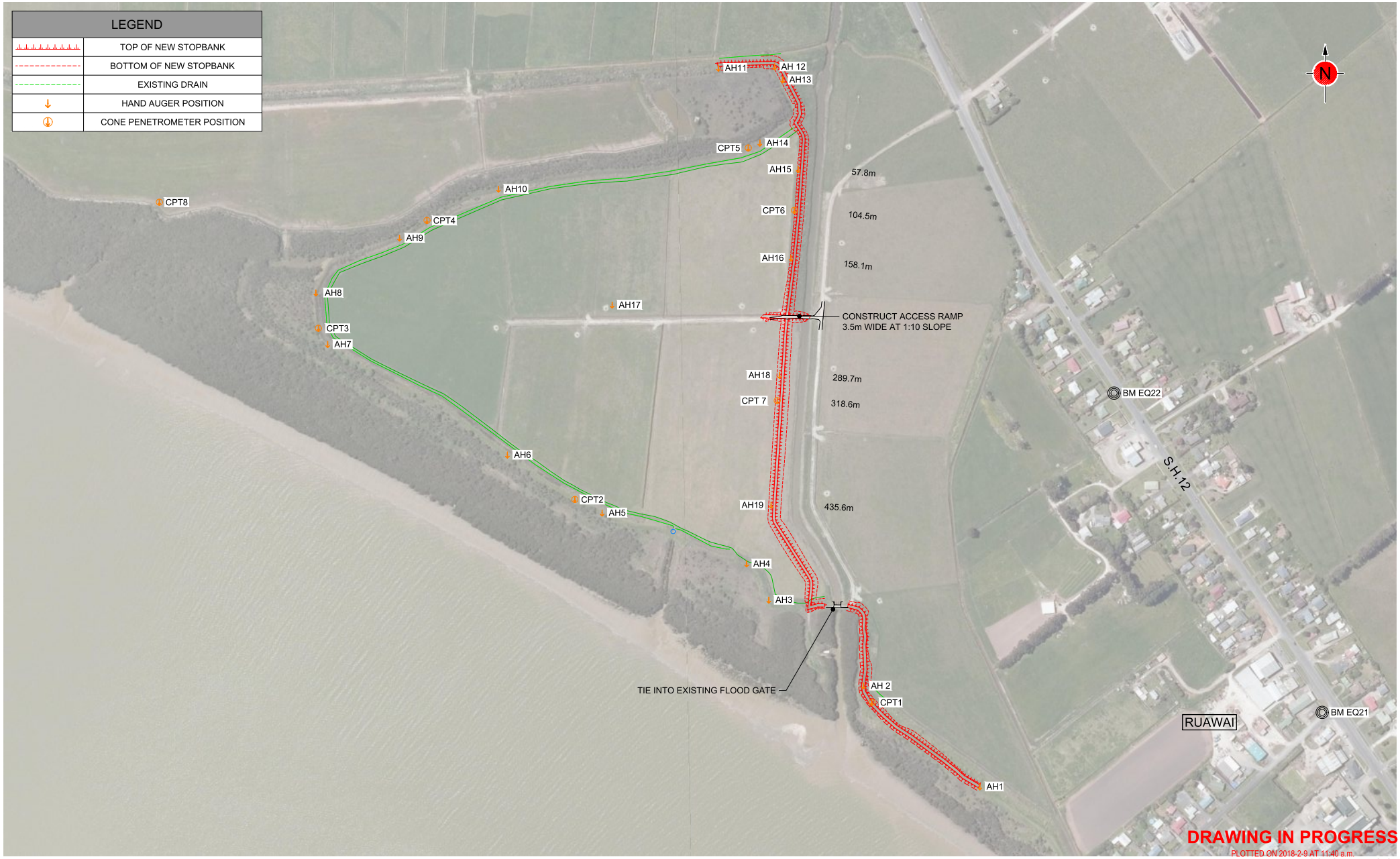

DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:40 a.m.

CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

KAIPARA DISTRICT

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Whangarei Office
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PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-
Drawn	Scales	
C. HOULTHAM	1:2000 AT A1	

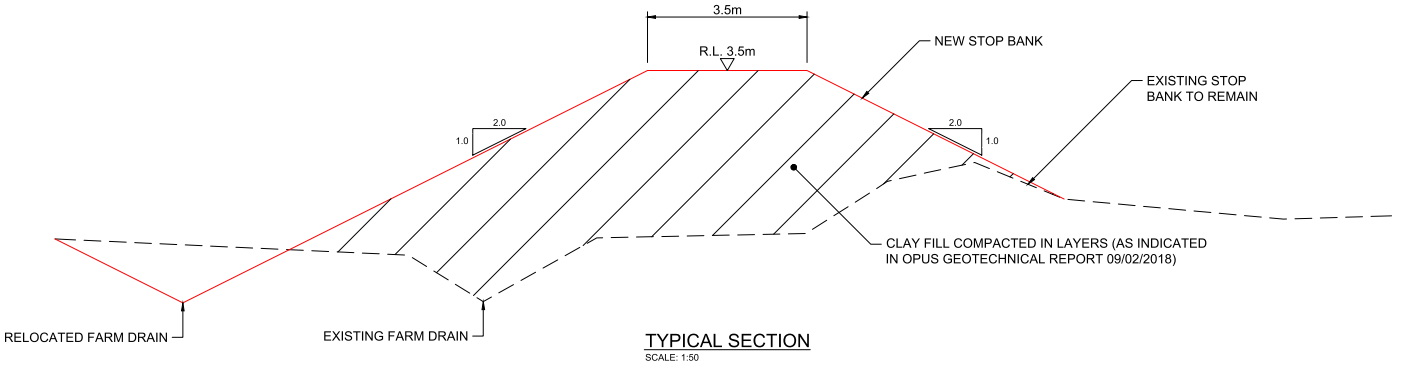
Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: OPTION TWO
DESIGN PLAN

Project No.	Sheet. No.	Revision
1-13583.00	C10	A

1:2000 @ A1
1:4000 @ A3
0 20 40 60 80 100 120 140 160 180 200 m

Original Sheet Size A1 [841x594] Plot Date 2018-02-09 at 11:40:07 a.m. Path S:\Proj\NZ\1\1\1-13583.00 Bowergate Farm Investigation\Home\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-13583.00_C00-.dwg C10



TYPICAL SECTION
SCALE: 1:50

DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:40 a.m.

CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

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Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-
Drawn	Scales	
C. HOULTHAM	1:50 AT A1	

Project
KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet
OPTION TWO
TYPICAL SECTION

Project No.	Sheet. No.	Revision
1-13583.00	C11	A

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1:100 @ A3
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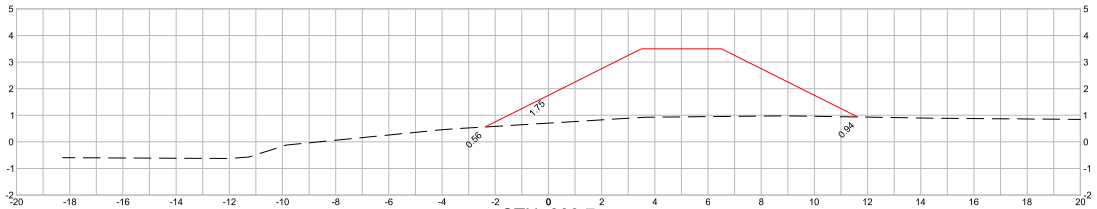
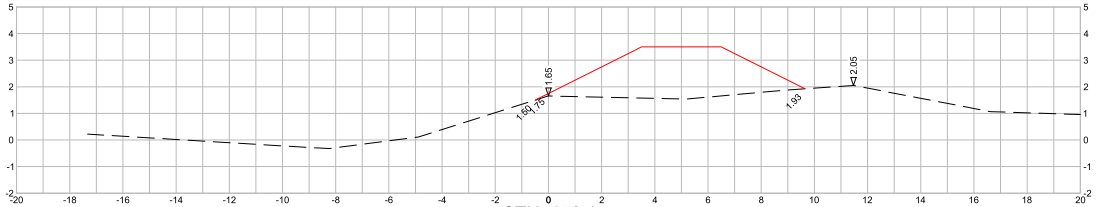
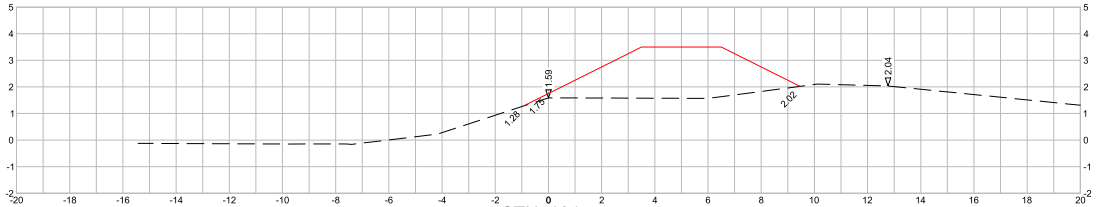
Original Sheet Size A1 [841x594] Plot Date 2018-02-09 at 11:40:09 a.m. Path S:\Proj\NZ\111\1-13583.00 Bowergate Farm Investigation\Home\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-13583.00_C00-.dwg C11



STN. 289.7



STN. 158.1



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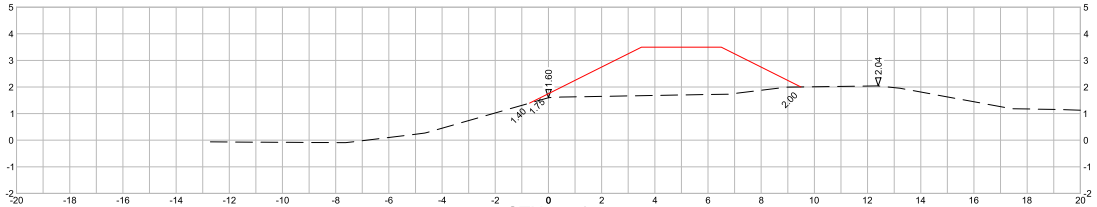


STN. 57.8

DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:40 a.m.

CONCEPT DESIGN

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

KAIPARA DISTRICT

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-

Drawn	Scales
C. HOULTHAM	1:100 AT A1

Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: OPTION TWO
CROSS SECTIONS STN. 57.8 - 158.1

Project No.	Sheet. No.	Revision
1-13583.00	C12	A

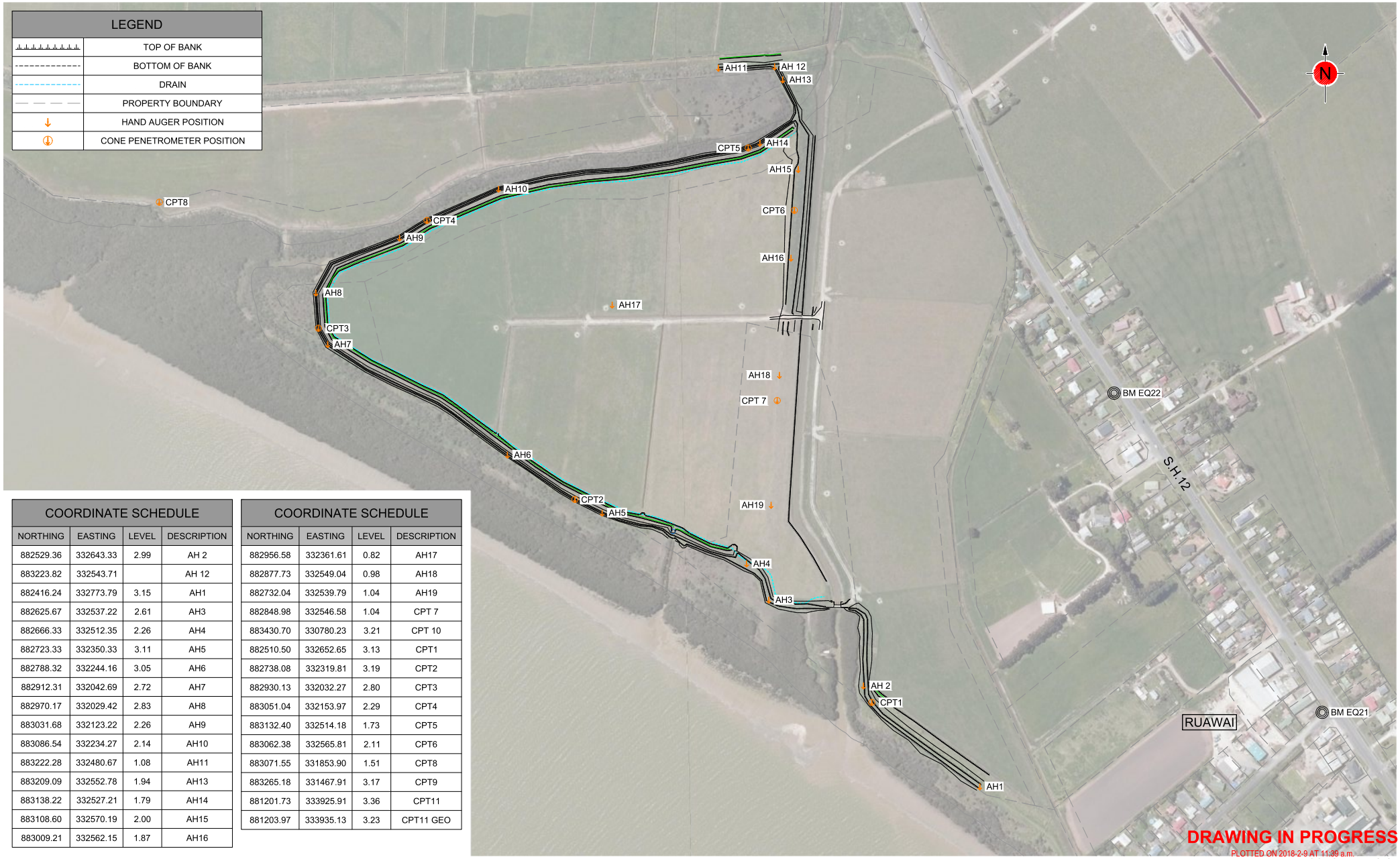
Design	Drawing	Survey
-	-	-

Checked
Date

1:100 @ A1
1:200 @ A3
0 1 2 3 4 5 6 7 8 9 10 m

Original Sheet Size A1 [841x594] Plot Date 2018-02-09 at 11:40:11 a.m. Path S:\Proj\NZ\111\1-13583.00 Bowergate Farm Investigation\Home\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-13583.00_C00-.dwg C12

Appendix B – Geotechnical Investigation



COORDINATE SCHEDULE			
NORTHING	EASTING	LEVEL	DESCRIPTION
882529.36	332643.33	2.99	AH 2
883223.82	332543.71		AH 12
882416.24	332773.79	3.15	AH1
882625.67	332537.22	2.61	AH3
882666.33	332512.35	2.26	AH4
882723.33	332350.33	3.11	AH5
882788.32	332244.16	3.05	AH6
882912.31	332042.69	2.72	AH7
882970.17	332029.42	2.83	AH8
883031.68	332123.22	2.26	AH9
883086.54	332234.27	2.14	AH10
883222.28	332480.67	1.08	AH11
883209.09	332552.78	1.94	AH13
883138.22	332527.21	1.79	AH14
883108.60	332570.19	2.00	AH15
883009.21	332562.15	1.87	AH16

COORDINATE SCHEDULE			
NORTHING	EASTING	LEVEL	DESCRIPTION
882956.58	332361.61	0.82	AH17
882877.73	332549.04	0.98	AH18
882732.04	332539.79	1.04	AH19
882848.98	332546.58	1.04	CPT 7
883430.70	330780.23	3.21	CPT 10
882510.50	332652.65	3.13	CPT1
882738.08	332319.81	3.19	CPT2
882930.13	332032.27	2.80	CPT3
883051.04	332153.97	2.29	CPT4
883132.40	332514.18	1.73	CPT5
883062.38	332565.81	2.11	CPT6
883071.55	331853.90	1.51	CPT8
883265.18	331467.91	3.17	CPT9
881201.73	333925.91	3.36	CPT11
881203.97	333935.13	3.23	CPT11 GEO

DRAWING IN PROGRESS

PLOTTED ON 2018-2-9 AT 11:39 a.m.

CONCEPT DESIGN

NOTES:

1. LEVELS ARE IN TERMS OF NZ VERTICAL DATUM 2016 (ORIGIN EQ22).
2. COORDINATES ARE IN MT EDEN 2000 CIRCUIT.

1:2000 @ A1
1:4000 @ A3
0 20 40 60 80 100 120 140 160 180 200 m

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR PRICING	-	2018-02-09

KAIPARA DISTRICT

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
S. ROTATORI	F. RICHTER	-
Drawn	Scales	
C. HOULTHAM	1:2000 AT A1	

Project: KAIPARA DISTRICT COUNCIL
BOWERGATE; RUAWAI
STOP BANK UPGRADE

Sheet: SURVEY PLAN AND
GEOTECHNICAL INVESTIGATION

Project No.	Sheet No.	Revision
1-13583.00	C01	A

Survey | Drawing | Design | Checked | Date

Original Sheet Size A1 [841x594] Plot Date 2018-02-09 at 11:39:51 a.m. Path S:\Proj\NZ\11\1-13583.00 Bowergate Farm Investigation\Home\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-13583.00_C00-.dwg C01

Geocivil Ltd
166 Bank Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz
M: 027 6565 226

TEST REPORT

Lab Job No:	8368-006
Your ref.:	8011
Date of Issue:	19-01-2018
Date of Re-Issue:	-
Page:	1 of 25

Test Report.

No.W18-013

PROJECT:	Bowergate Farms Geotech Investigation
CLIENT:	OPUS 125A Bank Street, Whangarei
ATTENTION:	Stefano Rotatori
INSTRUCTIONS:	Augerholes where required (not accredited) Hand Held Shear Vane Test
TEST METHOD:	NZGS December 2005 (not accredited) NZGS: August 2001
SAMPLING METHOD:	N/A
TEST RESULTS:	As Per Laboratory Sheets attached

G. Reid
Laboratory Technician

S.Kokich
Approved Signatory

IANZ ACCREDITED LABORATORY

Tests indicated as not accredited are outside the scope of the laboratory's accreditation

GEO CIVIL

AUGERHOLE LOG

166 Bank Street,
Whangarei,
M:0276565226
E:info@geocivil.co.nz

Job No.:	**8368-006**	**Borehole No.:**	**AH01**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	10/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Sandy TOPSOIL, traces of rootlets and very weak gravels to 10mm, brown, moist, low plasticity.	OL				
Silty CLAY, traces of sand and very weak gravels up to 5mm and fibrous organics, dry-moist, greyish brown with brown streaking, moderate plasticity.	CH			131 23	
Moisture change; moist.	CH	0.5		224 40	
				121	
Silty CLAY, traces of coarse sands, traces of fibrous organics and fine rootlets, orangey brown with grey mottling, moist-wet, moderate plastcity.	CH	1.0		33 99 37	
		1.5		72 22	
Colour change; Bluish grey with orangey brown mottling.	CH			84 30	
CLAY, some silt, traces of coarse sand, minor fibrous organics, wet, dark bluish grey, moderate to high plasticity.	CH	2.0		102 49	
				45 33	
End of borehole - Target depth.		2.5		42 29	

Groundwater Not Encountered

Remarks

Shear vane readings from 0.3-0.9m may be inaccurate due to gravels.

Water

- Standing Water Level
- Out flow
- In flow

Investigation Type

- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		2 of 25	D.O		2.50 m

Printed: 22/01/2018 1:15:19 p.m.

GEO CIVIL

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH02**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	10/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Water	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Sandy TOPSOIL, traces of rootlets and very weak greavel up to 10mm, brown, moist, low plasticity.	OL					
Silty CLAY, traces of rootlets, greyish brown with orangey brown mottling, moist, moderate plasticity.		0.5			124 41 100 14	
	CH	1.0			102 21 200+ -	
		1.5			113 19 64 17	
Silty CLAY, traces of coarse sand and very weak gravels up to 5mm, wet, grey with brown streaking, high plasticity, traces of fibrous organics.	CH	2.0	SWL 2.10m		72	
Moisture change; Saturated.	CH				7	
CLAY, some silt, traces of coarse sand and fibrous organics, saturated, dark bluish grey, high plasticity.	CH				47 14	
End of borehole - Target depth.		2.5			34 23	

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		3 of 25	D.O		2.50 m

Printed: 22/01/2018 1:15:19 p.m.

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E:info@geocivil.co.nz

AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH03**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	12/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values
Silty TOPSOIL, traces of rootlets, brown, moist, moderate plasticity.	OH			
Clayey SILT, minor gravels up to 20mm (moderately strong), slightly weathered, traces of sand, traces of rootlets, brown mottled orange, moist, friable, low plasticity.	ML			208+
Silty CLAY, traces of sand, brown with orange brown mottling/streaking, moist, high plasticity, traces of extremely weak gravels up to 10mm.	CH	0.5		- 196 50
		1.0	Groundwater Not Encountered	199 39 89 27
Moisture change; wet.	CH	1.5		92 39 56
Silty CLAY, traces of sand, traces of fibrous organics, wet, bluish grey, high plasticity.	CH	2.0		34 59 22 53 27
End of borehole - Target depth.		2.5		

Vane Shear Strength (kPa) scale: 50 100 150 200

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		4 of 25	D.O		2.50 m

Printed: 22/01/2018 1:15:19 p.m.

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Whangarei,
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E:info@geocivil.co.nz

AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH04**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**	E 1,719,599.00 N 6,046,497.00	**Date:**	17/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, brown mottled orange, moderate plasticity, dry, traces of organics(rootlets).	CH	0.5		69 11	
Clayey SILT, light brown mottled orange, dry, low plasticity, traces of fine sand.	ML			200+ - 132	
Silty CLAY, light grey, brown mottled orange, moist, moderate to high plasticity, traces of fine sand and extremely weak gravels to 5mm	CH	1.0		11 69 31	
Silty CLAY, bluish grey mottled orange, high plastcity, traces of sand and extremely weak gravel to 5mm, moist to wet.	CH	1.5		63 26	
Silty CLAY, bluish grey, high plasticity, wet, traces or extremely weak gravels to 10mm.	CH		SWL 1.90m	57 29	
Moisture change; Saturated.	CH	2.0		54 26	
Colour change; dark grey	CH			43 17	
End of borehole - target depth.		2.5		40 14	

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		5 of 25	D.M		2.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH05**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	17/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Clayey SILT, brown mottled orange, dry, low plasticity.	ML			89 11	
Silty CLAY, light brown mottled orange, dry to moist, moderate plasticity, minor organics (rootlets).	CH	0.5		83 9 140	
Silty CLAY, light brown mottled orange, moist, moderate to high plasticity, minor organics (rootlets).	CH	1.0		11 155	
Silty CLAY, some weak gravels up to 10mm, light brown mottled orange, moist, moderate plasticity, minor organics (rootlets).	CH	1.5		31 117 29	
Silty CLAY, some weak gravels up to 10mm, grey mottled orange, moist, high plasticity, minor organics (rootlets).	CH			114 26	
Silty CLAY, bluish grey, moist to wet, high plasticity, traces of organics (rootlets).	CH	2.0		74 20	
Silty CLAY, dark bluish grey, wet, high plasticity, traces of organics (rootlets).	CH			89 11	
End of borehole - Target depth		2.5		86 11	

Groundwater Not Encountered

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		6 of 25	D.M		2.50 m

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Job No.:	**8368-006**	**Borehole No.:**	**AH06**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	17/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, light brown, mottled orange, dry, moderate plasticity, traces of minor organics (rootlets).	CH	0.5		132 9 140 11 169 26	
Clayey SILT, light brown mottled orange, dry, low plasticity, traces of fine sand.	ML	1.0		126 14	
Silty CLAY, light grey brown mottled orange, moist, moderate plasticity, traces of weak gravels to 10mm.	CH	1.5		117 31	
Silty CLAY, traces of organics (rootlets), light grey brown mottled orange, moist, high plasticity, traces of weak gravels to 10mm.	CH	2.0		77 29	
CLAY, some silt, bluish grey, wet, high plasticity, traces of extremely weak gravels up to 10mm.	CH	2.5		69 26	
CLAY, some silt, dark bluish grey, saturated, high plasticity, traces of extremely weak gravels up to 10mm.	CH			57 17	
End of borehole - target depth				31 11	

Groundwater Not Encountered

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		7 of 25	D.M		2.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH07**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	16/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Water	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, brown mottled orange, dry, moderate plasticity, traces of organics (rootlets).	CH	0.5			126 31 93 14 169	
Silty CLAY, light brown mottled orange, moist, moderate plasticity, traces of oganics (rootlets).	CH	1.0			26 112 31	
Colour change; light brownish grey mottled orange.	CH	1.5			97 36	
Silty CLAY, light brownish grey, moist, high plasticity, traces of minor organics (rootlets).	CH				69 26	
Silty CLAY, light grey mottled orange, wet, high plasticity, traces of weak gravel up to 10mm	CH	2.0	SWL 2.00m		66	
Silty CLAY, dark bluish grey, high plasticity, saturated, traces of fibrous organics.	CH				29 57 29	
End of borehole - Target depth		2.5			57 26	

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		8 of 25	D.M		2.50 m

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Job No.:	**8368-006**	**Borehole No.:**	**AH08**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	16/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values
Silty CLAY. light brown mottled orange, dry, moderate plasticity, traces of sand and organics (rootlets).	CH			89 14
Colour change; brown mottled orange.	CH	0.5		140 14 74 11
Silty CLAY. light brown mottled orange, moist, moderate plasticity, traces of sand and organics (rootlets).	CH	1.0		69 14
Silty CLAY. light brown mottled orange, moist, moderate to high plasticity, traces of sand and organics (rootlets).	CH	1.5		89 31 60 29
Silty CLAY, light brownish grey mottled orange, moist to wet, high plasticity, traces of sand and organics (rootlets).	CH	2.0		69
Silty CLAY, bluish grey mottled orange, wet, high plasticity, traces of fibrous organics.	CH			29
Colour change; dark bluish grey.	CH		SWL 2.20m	
Silty CLAY, dark bluish grey mottled orange, saturated, high plasticity, traces of fibrous organics, minor weak gravel to 5mm.	CH			74 26
End of borehole - target depth		2.5		54 17

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		9 of 25	D.M		2.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH09**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	16/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Water	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY. light brown mottled orange, moderate plasticity, dry, traces of organics (rootlets).	CH	0.5		106 17 100 17 129		
Silty CLAY, light brown mottled orange, moderate plasticity, moist, traces of fine sand and gravel up to 3mm.	CH	1.0		21 74		
Colour change; brown mottled orange.	CH			26		
Silty CLAY, light brown mottled orange, moderate plasticity, moist, traces of fine sand and gravel up to 3mm, traces of fibrous organics.	CH	1.5		60 26		
Silty CLAY, traces of extremely weak gravels up to 5mm, wet, moderate to high plasticity, light grey brown mottled orange.	CH			54		
Silty CLAY, bluish grey, high plasticity, moist to wet.	CH			17		
Silty CLAY, dark bluish grey, wet, high plasticity, traces of fibrous organics.	CH	2.0	SWL 2.00m	52		
Moisture change; Saturated.	CH			14		
Colour change; dark grey.	CH			43 11		
End of borehole - Target depth		2.5		31 11		

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		10 of 25	D.M		2.50 m

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Job No.:	**8368-006**	**Borehole No.:**	**AH10**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	16/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, light brown mottled orange, dry, low plasticity, traces of organics (rootlets).	CH			166 16	
Silty CLAY, light brown mottled orange, moist, moderate plasticity, traces of organics (rootlets).	CH	0.5		57 9 79	
Silty CLAY, brown mottled orange, moist, moderate to high plasticity, traces of weak gravels up to 5mm, traces of fibrous organics.	CH	1.0		29 49	
Silty CLAY, light brown mottled orange, moist, minor black nodules (3.5mm), traces of weak gravel and fibrous organics.	CH			17	
Silty CLAY, grey mottled orange, moist to wet, moist, minor black nodules (3.5mm), traces of weak gravel and fibrous organics.	CH	1.5		43 11	
Silty CLAY, bluish grey, wet, high plasticity, traces of organics (rootlets).	CH			29	
Silty CLAY, dark bluish grey, wet, high plasticity, minor black nodules, traces of organics (rootlets).	CH	SWL 1.80m 2.0		9 17	
Moisture change; Saturated.	CH			6 14 6	
End of borehole - Target depth		2.5		11 3	

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		11 of 25	D.M		2.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH11**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	11/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty TOPSOIL, traces of sand and organics(rootlets), moist, dark brown, moderate plasticity.	OH				
Silty CLAY, traces of sand and extremely weak gravels up to 10mm, moist, brown with orangey brown and grey streaking/mottling, moderate plasticity.	CH	0.5		133 13 104 14	
Silty CLAY, traces of sand and very weak gravels up to 5mm, moist, grey with brown mottling, moderate plasticity, traces of fibrous organics.				79	
	CH	1.0		14 87 27	
		1.5		123 29	
Moisture change; wet.	CH			86 26	
Moisture change; Saturated.			SWL 1.90m		
	CH	2.0		49 21	
				40 14	
End of borehole - Target depth		2.5		31 11	

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		12 of 25	D.O		2.50 m

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AUGERHOLE LOG

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Job No.:	**8368-006**	**Borehole No.:**	**AH12**	**Sheet:**	1 of 1
Report No.:	W18-013	**Coordinates:**		**Date:**	11/01/18
Client:	OPUS Whangarei				
Client Ref. No.:	PO:8011	**Location:**	Ruawai	**Ground Level:**	0
Project:	Bowergate Farm				

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values
Silty TOPSOIL, traces of sand and organics (rootlets), dark brown, moist, moderate plasticity.	OH			
Silty CLAY, traces of sand and very weak gravels up to 5mm, moist, brown with grey and orangey brown mottling, moderate plasticity, traces of organics (bark and rootlets).	CH	0.5		100 14 183 36
SIlty CLAY, traces of extremely weak gravels up to 10mm, grey with orangey brown mottling, moist, moderate plasticity, traces of rootlets.	CH	1.0		137 17 162 41
Silty CLAY, traces of sands and organics (rootlets), moist, brownish grey with orangey brown mottling, high plasticity.	CH	1.5		149 59 92 36
Moisture change; wet.	CH	2.0		73 12 59 23
End of borehole - target depth		2.5		

Groundwater Not Encountered

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		13 of 25	D.O		2.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH13**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	11/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty TOPSOIL, minor organics (rootlets), dark brown, moist, high plasticity.	CH			104	
Silty CLAY, traces of sands and extremely weak gravels up to 5mm, brownish grey with orangey brown streaking, moist, moderate to high plasticity.	CH	0.5		29 114 36	
		1.0		107 34 93	
Moisture change; wet.	CH			31 29	
Moisture change; Saturated.	CH	1.5	SWL 1.50m	6 29	
Silty CLAY, traces of sand, traces of fibrous organics, bluish grey, saturated, high plasticity.	CH	2.0		3 31 7	
Silty CLAY, traces of sands and extremely weak gravels up to 10mm and fibrous organics, dark bluish grey, saturated, high plasticity.	CH			29 6	
End of borehole - Target depth.		2.5		24 1	

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		14 of 25	D.O		2.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH14**	**Sheet:**	1 of 1
Report No.:	W18-013	**Coordinates:**		**Date:**	16/01/18
Client:	OPUS Whangarei				
Client Ref. No.:	PO:8011	**Location:**	Ruawai	**Ground Level:**	0
Project:	Bowergate Farm				

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values
Silty CLAY, light brown mottled orange, dry, moderate plasticity, some organic rootlets.	CH	0.5		49 16
Silty CLAY, light brown mottled orange, moist, moderate to high plasticity, some organic rootlets.	CH	1.0		112 23 74
Colour change; light brown grey mottled orange.	CH	1.5		26 43
Silty CLAY, light brown mottled orange, moist, moderate to high plasticity, some organic rootlets.	CH	2.0	SWL 1.80m	9 69 11 57 14
Silty CLAY, bluish grey, high plasticity, moist to wet, traces of fine sand, fibrous organics, some black nodules(2.5mm).	CH	2.5		31 11
Silty CLAY, dark grey, high plasticity, saturated, traces of fine sand, fibrous organics, some black nodules(2.5mm).	CH			34 14
End of borehole - Target depth				31 11

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Samples

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		15 of 25	D.M		2.50 m

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AUGERHOLE LOG

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Job No.: 8368-006
Report No.: W18-013
Client: OPUS Whangarei
Client Ref. No.: PO:8011
Project: Bowergate Farm

Borehole No.: AH15
Coordinates:
Location: Ruawai

Sheet: 1 of 1
Date: 10/01/18
Ground Level: 0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, traces of sands and very weak gravels up to 5mm, dry to moist, light brown, moderate plasticity.	CH			200+	
Silty CLAY, some sand, traces of very weak gravels up to 5mm, light brown with brown and brownish grey streaking, moist, moderate plasticity.	CH	0.5		92 29	
Silty CLAY, minor sand, traces of very weak gravels up to 10mm, traces of fibrous organics, moist, brown with brownish grey and reddish brown streaking/mottling, moderate plasticity.	CH	1.0		156 64 80 46	
Moisture change; Wet.	CH	1.5		70 36	
Silty CLAY, traces of extremely weak gravels up to 10mm, light brown with brown streaking, wet, high plasticity.	CH			86 54	
Moisture change; Saturated.	CH	2.0	SWL 2.10m	39 17	
CLAY, some silt, traces of fibrous organics, bluish grey, saturated, high plasticity.	CH			26 13	
End of borehole - target depth		2.5		24 11	

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		16 of 25	D.O		2.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH16**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	10/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, traces of sands and very weak gravels up to 5mm, dry to moist, light brown, moderate plasticity.	CH				
Silty CLAY, some sand, traces of very weak gravels to 5mm, light brown with brown and brownish grey streaking, moderate plasticity.	CH	0.5		104 33	
Silty CLAY, minor sand, traces of very weak gravels up tp 10mm, traces of fibrous organics, moist, brown with brownish grey and reddish brown streaking/mottling, moderate plasticity.				122 40 127	
	CH	1.0		35 142 47	
		1.5		121 50	
Silty CLAY, traces of extremely weak gravels up to 10mm, light brown with brown streaking, wet, high plasticity.	CH	2.0		67 30 39 23	
CLAY some silt, traces of fibrous organics, bluish grey, saturated, high plasticity.	CH		SWL 2.20m	33 15	
End of borehole - target depth		2.5		32 17	

Remarks

Shear vane readings from 0.9-1.8m may be inaccurate due to gravels.

Water

- Standing Water Level
- Out flow
- In flow

Investigation Type

- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		17 of 25	D.O		2.50 m

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AUGERHOLE LOG

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Job No.:	**8368-006**	**Borehole No.:**	**AH17**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	10/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Water	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, traces of sands and weaks gravels up to 10mm, moist, dark brown, moderate plasticity.	CH				112 43	
Colour change; brownish grey with brown streaking.	CH	0.5			53 21	
Moisture change; wet.	CH				29 14	
Moisture change; Saturated.	CH	1.0	SWL 1.00m			
CLAY, traces of sands, saturated, bluish grey, high plasticity.	CH	1.5			14 3 14 7 10	
End of borehole - Hole collapsed		2.0			1	

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		18 of 25	D.O		1.80 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH18**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	10/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Water	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, traces of extremely weak gravels up to 10mm and rootlets, light brown, dry, moderate plasticity.	CH					
Silty CLAY, traces of coarse sands, traces of rootlets, moist, brown with greyish brown streaking/mottling, moderate plasticity.	CH	0.5			73 49 74 40	
Colour and moisture change; greyish brown with brown streaking and bluish grey mottling, wet.	CH				59 31	
Moisture change; Saturated.	CH	1.0	SWL 1.00m		14	
CLAY, some silt , traces of sands and fibrous organics, saturated, dark bluish grey, high plasticity.	CH				3 13	
End of borehole - Hole collapsed		1.5			3	
		2.0				

50 100 150 200

Remarks

Water

- Standing Water Level
- Out flow
- In flow

Investigation Type

- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		19 of 25	D.O		1.50 m

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AUGERHOLE LOG

Job No.:	**8368-006**	**Borehole No.:**	**AH19**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	10/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Water	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values	Samples
Silty CLAY, traces of extremely weak gravels up to 10mm and rootlets, light brown, dry, moderate plasticity.	CH					
Silty CLAY, traces of coarse sands, traces of fibrous organics and rootlets, moist, brown with greyish brown streaking/mottling, moderate plasticity.	CH	0.5			50 17	
Colour change; greyish brown with yellow brown and bluish grey mottling, brown streaking.	CH				57 26	
Moisture change; Wet.	CH	1.0	SWL 1.00m		43 21	
Moisture change; Saturated.	CH				43	
CLAY, some silt, traces of sands and fibrous organics, saturated, dark bluish grey, high plasticity.	CH	1.5			9 16	
End of borehole - Hole collapsed		2.0			4	

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		20 of 25	D.O		1.50 m

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AUGERHOLE LOG

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Job No.:	**8368-006**	**Borehole No.:**	**AH20**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	11/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values
Clayey TOPSOIL, traces of organics(rootlets), dark brown, moist, high plasticity.	OH			
Silty CLAY, traces of extremely weak gravels to 10mm, brown with orangey brown and grey mottling, moist, moderate plasticity, traces of fibrous organics.	CH	0.5		57 29 50 21
Silty CLAY, traces of sands, brownish grey with orangey brown streaking, moist, high plasticity.				72
	CH	1.0		14 92 27
		1.5		103 43
				82 26
Moisture change; Wet.	CH	2.0		86 21
Moisture change; Saturated.	CH		SWL 2.40m	57 14
End of borehole - Target depth		2.5		

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		21 of 25	D.O		2.50 m

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AUGERHOLE LOG

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Job No.:	**8368-006**	**Borehole No.:**	**AH21**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	11/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values
Silty CLAY, traces of rootlets, traces of sand and weak gravels up to 5mm, dark brown with brown mottling, moist, moderate plasticity.	CH	0.5		126 14
Colour change; dark greyish brown with orangey brown and dark grey streaking/mottling.	CH	1.0		200+ - 170 26
Silty CLAY, minor sands, traces of very weak gravels up to 10mm, moist, greyish brown with orangey brown and light brown mottling, moderate plasticity.	CH			200+ -
Silty CLAY, traces of coarse sand, wet, brown grey with orange brown mottling, high plasticity.	CH	1.5		157 26
Silty CLAY, minor fibrous organics, traces of sand, grey with brown streaking, wet, high plasticity.	CH	2.0		117 80
Silty CLAY, traces of fibrous organics, wet, dark bluish grey, high plasticity.	CH			21 11
Moisture change; Saturated.	CH			26 7
End of borehole - target depth		2.5		

Groundwater Not Encountered

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Samples

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		22 of 25	D.O		2.50 m

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AUGERHOLE LOG

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Job No.:	**8368-006**	**Borehole No.:**	**AH22**	**Sheet:**	1 of 1
Report No.:	W18-013				
Client:	OPUS Whangarei	**Coordinates:**		**Date:**	12/01/18
Client Ref. No.:	PO:8011				
Project:	Bowergate Farm	**Location:**	Ruawai	**Ground Level:**	0

Geological Interpretation (In accordance with NZGS 2005)	UCS	Depth (m)	Vane Shear Strength (kPa) (Tested in accordance with NZGS Aug 2001)	Values
ClayeyTOPSOIL, traces of sands and rootlets, dark brown, moist, moderate plasticity.	OH			
Silty CLAY, some sand, traces of rootlets, dark brown with brown mottling, moist, moderate plasticity.	CH	0.5		114 30 200+ -
Clayey SILT, traces of sands and extremely weak gravels up to 5mm, light brown with brown streaking, dry-moist, friable, low plasticity.	ML	1.0		172 33
Silty SAND, minor clay, sand is; well graded, traces of extremely weak gravels to 5mm, light brown, moist, dilatant, friable.	SM	1.5		126 13 63 19
Silty CLAY, some sand, wet, grey with light grey and brown streaking, moderate plasticity.	CH	2.0		117 43 157 63
Silty CLAY, traces of fibrous organics, brownish grey with bluish grey streaking, wet, high plasticity.	CH	2.5		116 52
End of borehole - target depth				

Groundwater Not Encountered

Vane Shear Strength (kPa) scale: 50, 100, 150, 200

Samples

Remarks

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Test Pit

Contractor:	Rig/Plant Used:	Page No.:	Logged By:	Checked By:	Hole Depth:
Geocivil		23 of 25	D.O		2.50 m

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TEST RIGHT • BUILD RIGHT

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SITE PLAN

Lab Job No:	8368-008	**Tested by**	D.O/D.M
Client:	Opus Whangarei	**Date:**	10,11,12,16 & 17/01/2018
Project:	Bowergate Farms	**Page:**	24 of 25
Location:	Ruawai		
Report No:	W18-013		
REF:	8011	***Approximate Test Locations***	

Site Plan
22/01/2018
Site Plan

GEO CIVIL
TEST RIGHT • BUILD RIGHT

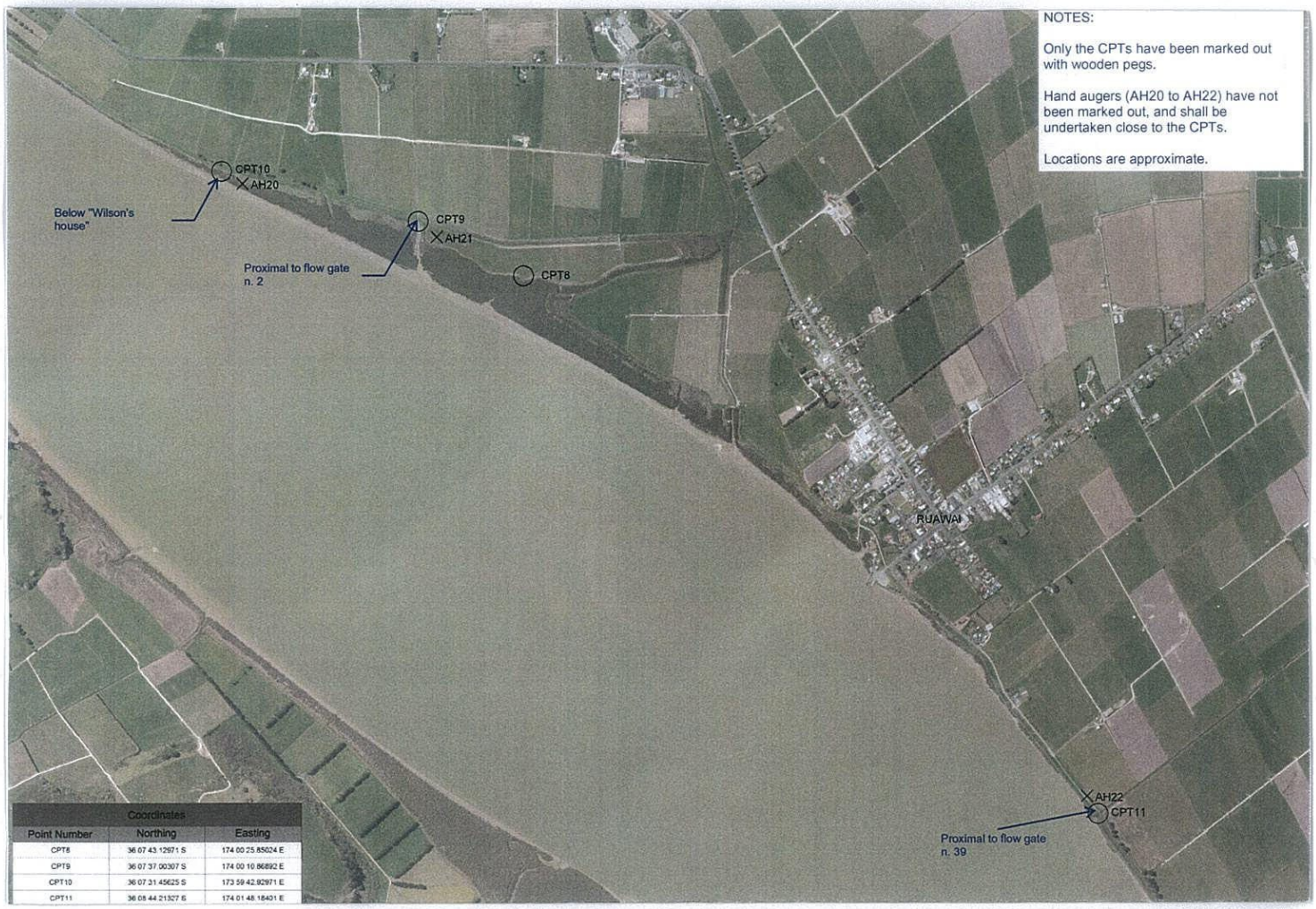
166 Bank Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz

SITE PLAN

Lab Job No: 8368-008
Client: Opus Whangarei
Project: Bowergate Farms
Location: Ruawai
Report No: W18-013
REF: 8011

Tested by D.O/D.M
Date: 10,11,12,16 & 17/01/2018
Page: 25 of 25

Approximate Test Locations



Coordinates		
Point Number	Northing	Easting
CPT8	36 07 43.12971 S	174 00 25.85024 E
CPT9	36 07 37.00307 S	174 00 10.86892 E
CPT10	36 07 31.45625 S	173 59 42.92971 E
CPT11	36 08 44.21327 S	174 01 48.18401 E

Site Plan
22/01/2018
Site Plan

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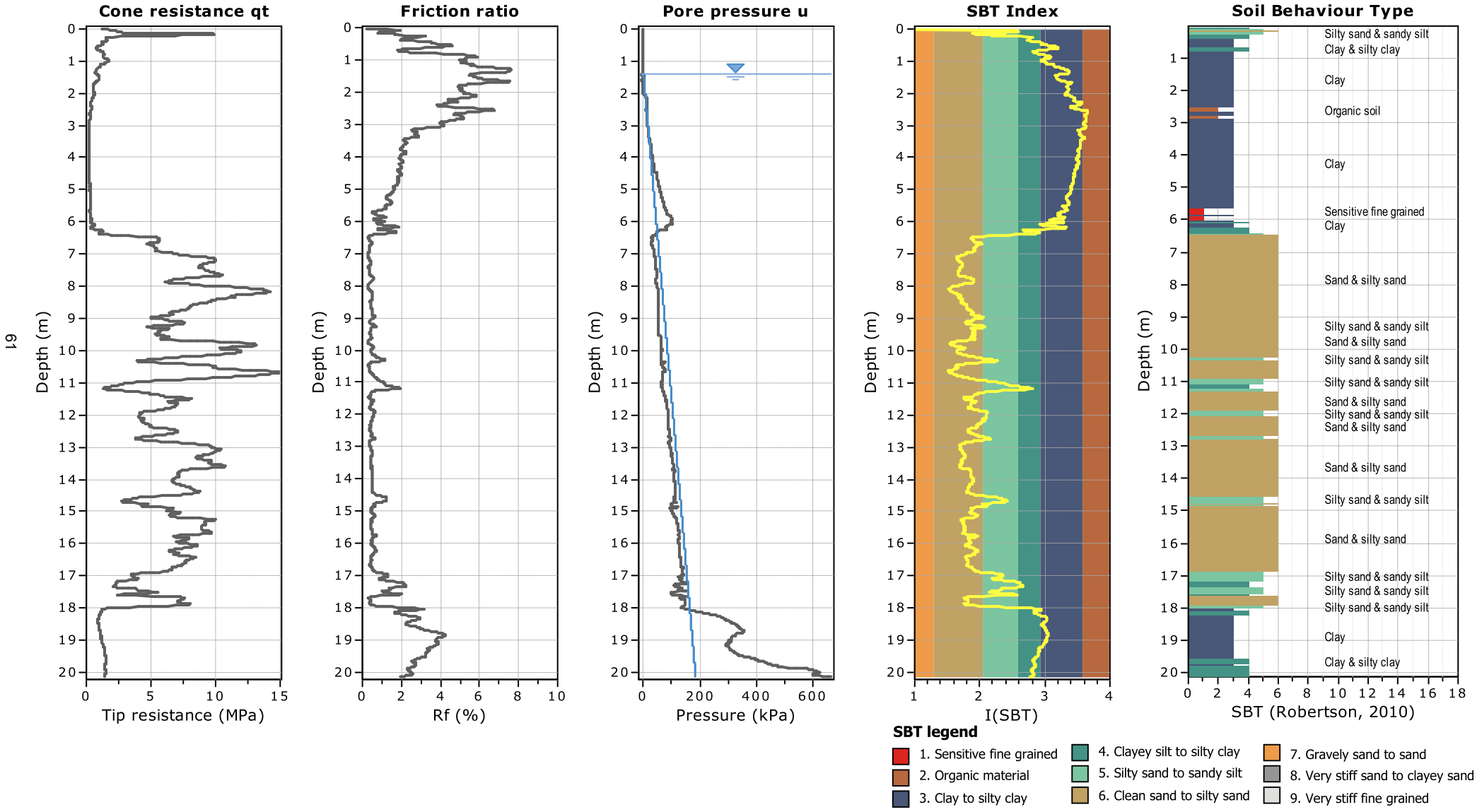
http://www.geologismiki.gr

CPT: CPT01
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



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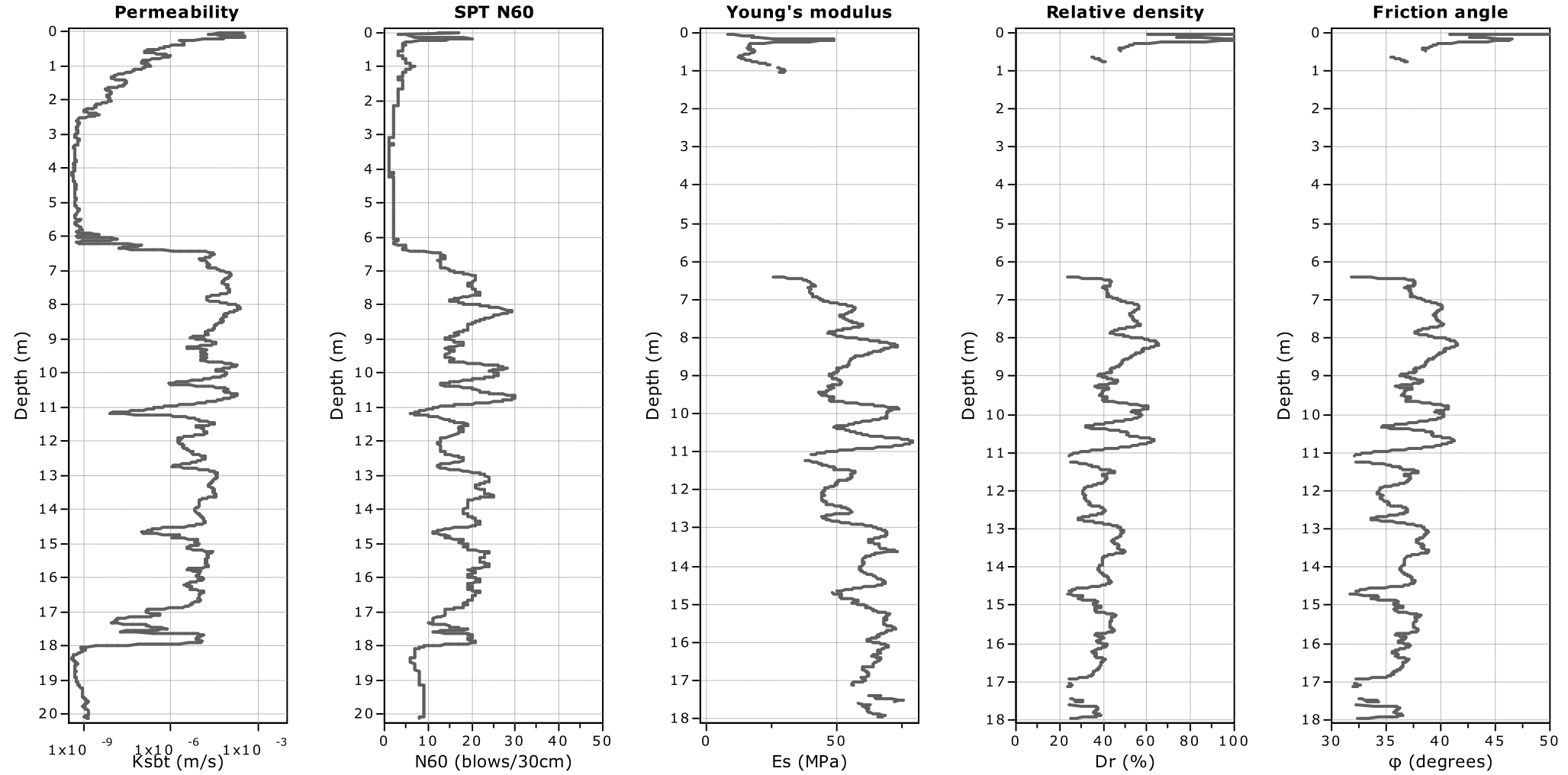
CPT: CPT01
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

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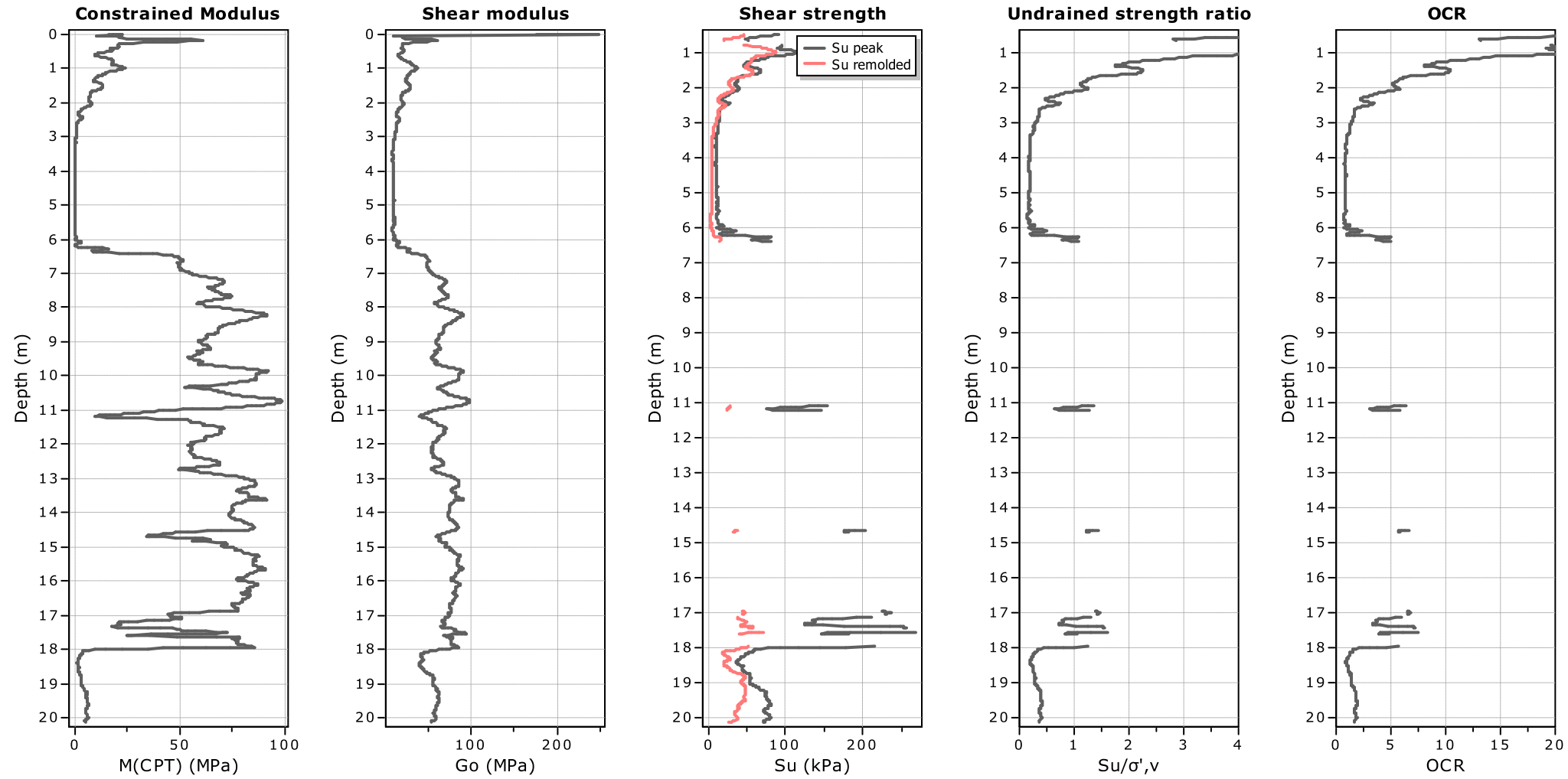
CPT: CPT01
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
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

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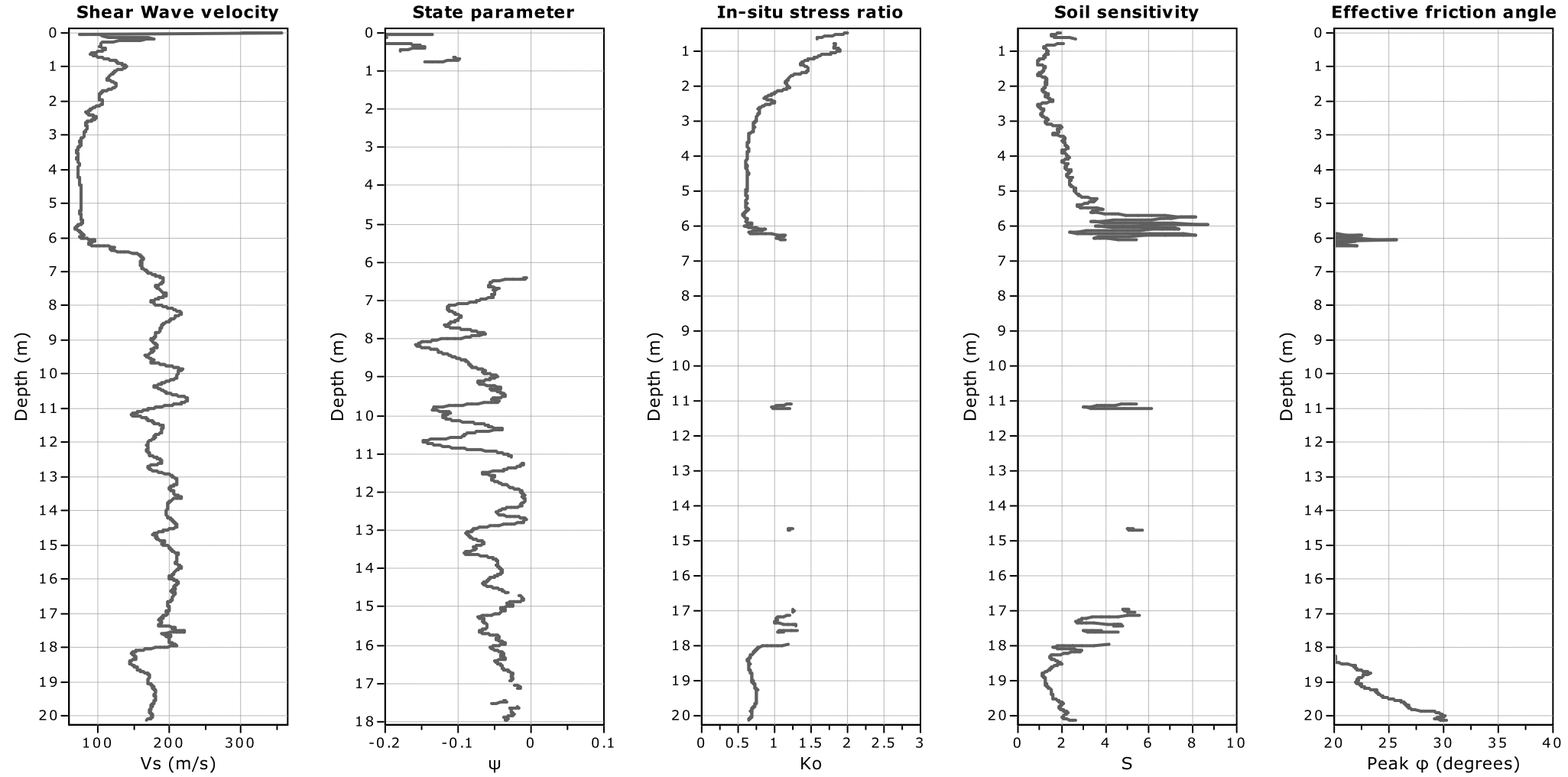
CPT: CPT01
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



Calculation parameters

Soil Sensitivity factor, N_S: 7.00
User defined estimation data

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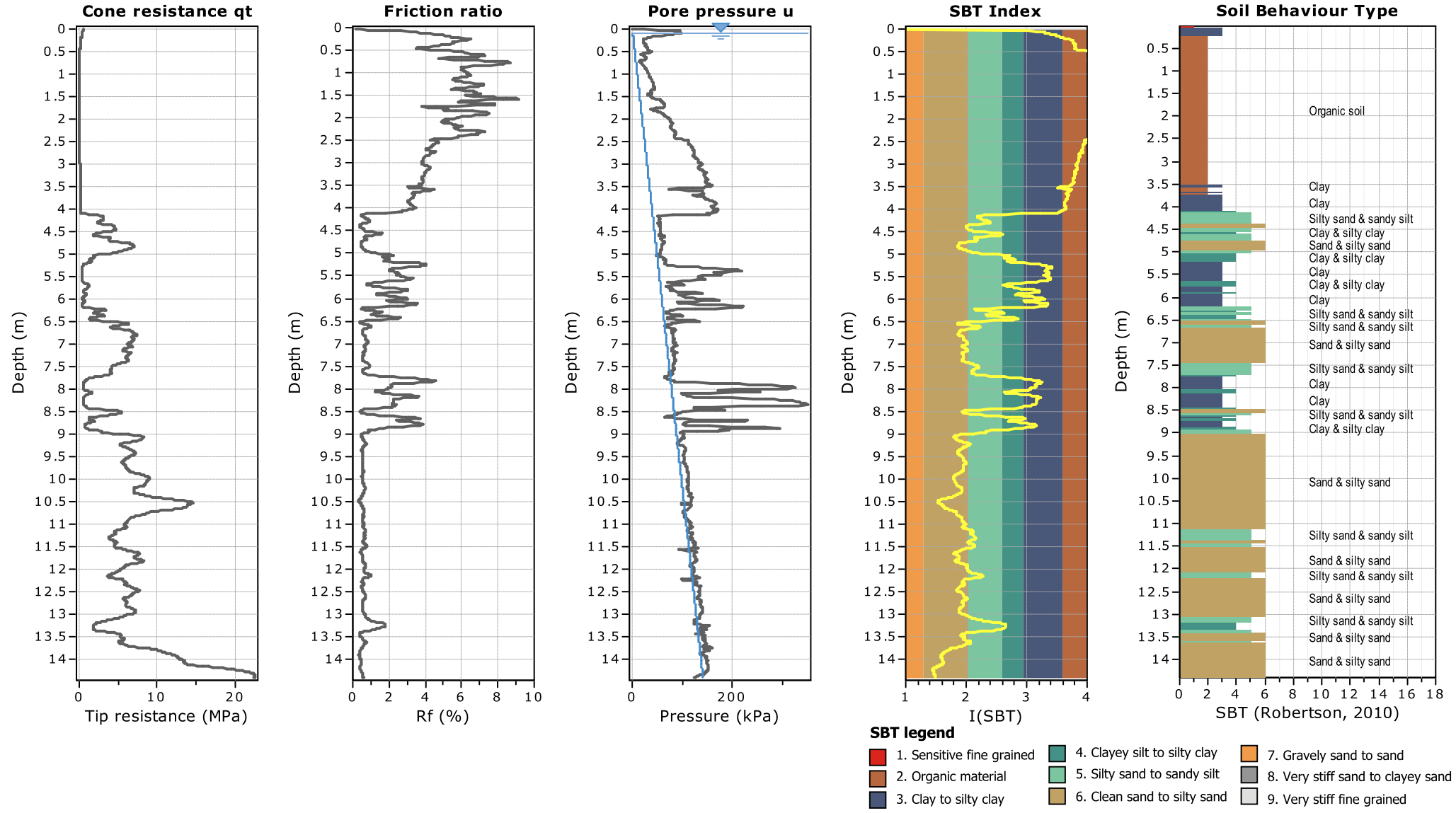
CPT: CPT02
Total depth: 14.40 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



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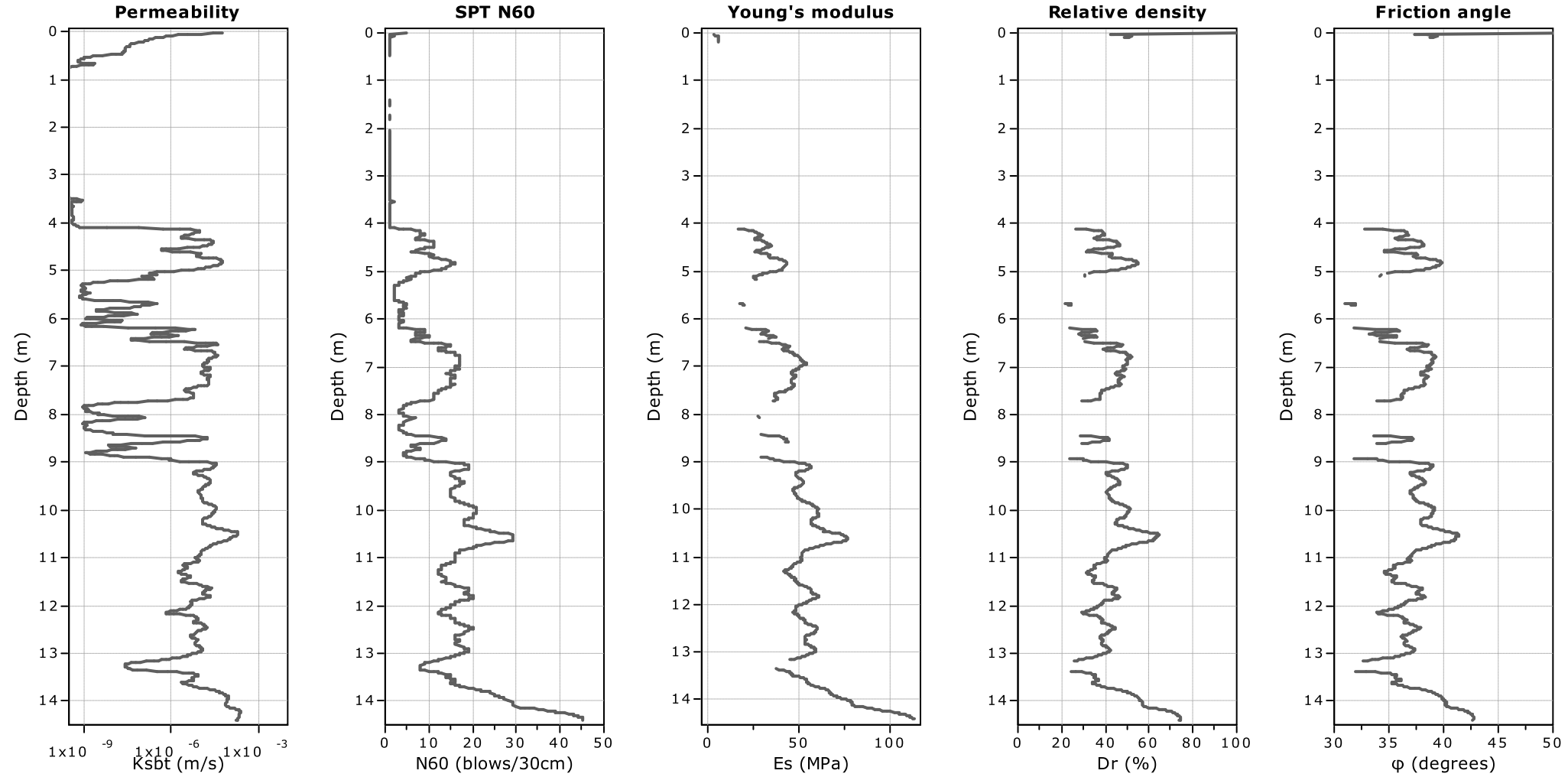
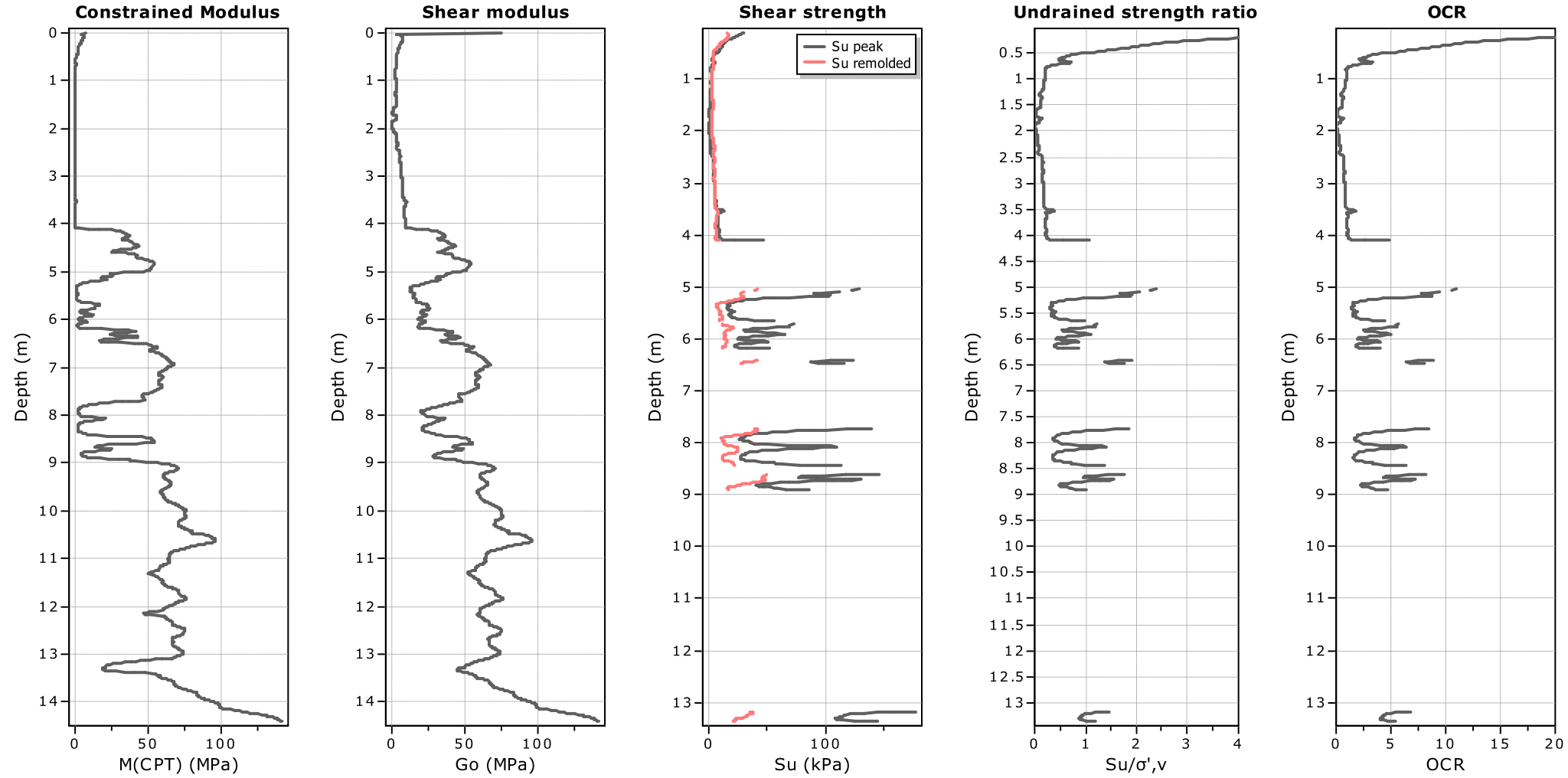
CPT: CPT02
Total depth: 14.40 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data



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

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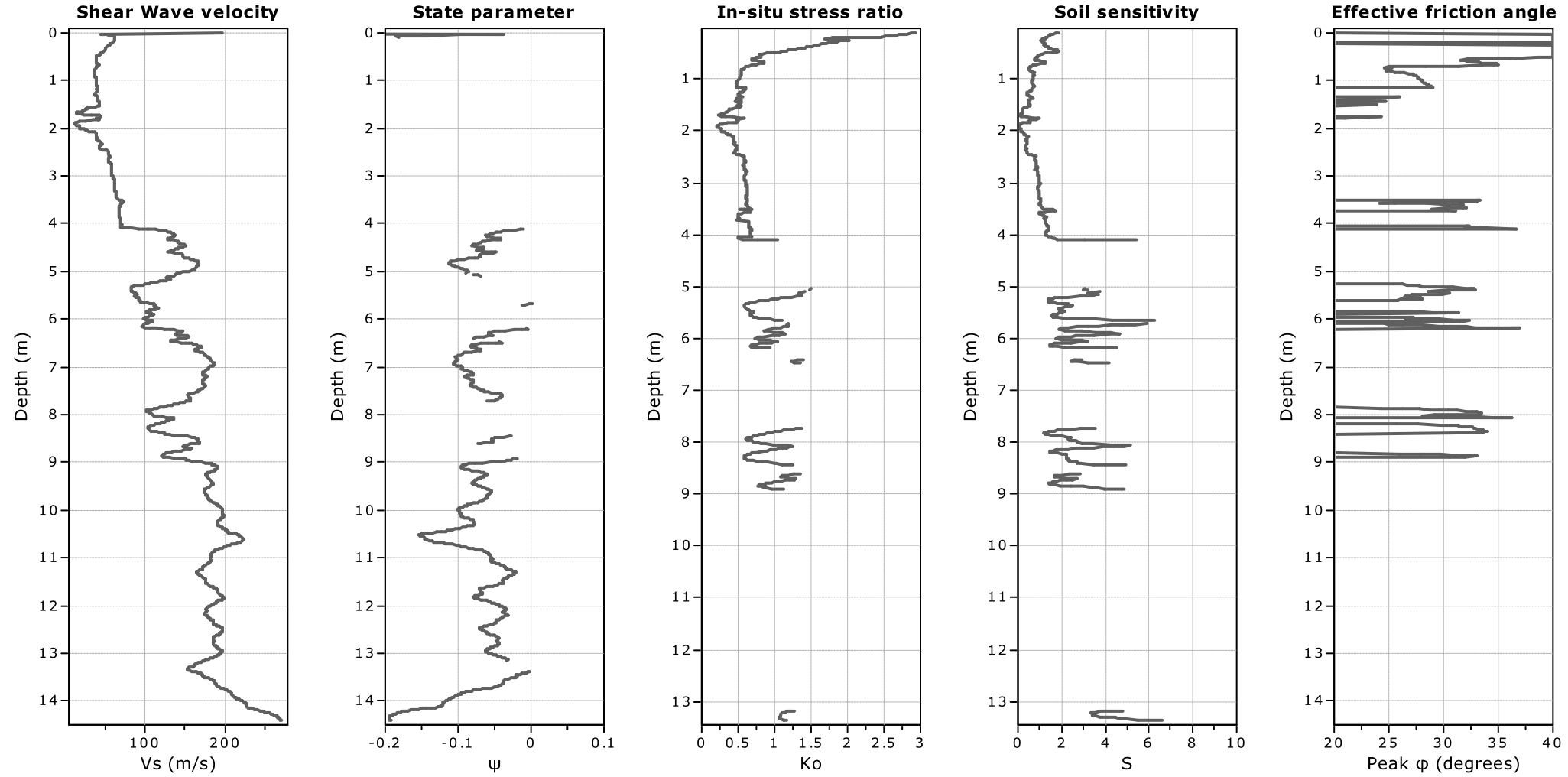
CPT: CPT02
Total depth: 14.40 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



Calculation parameters

Soil Sensitivity factor, N_S: 7.00
User defined estimation data

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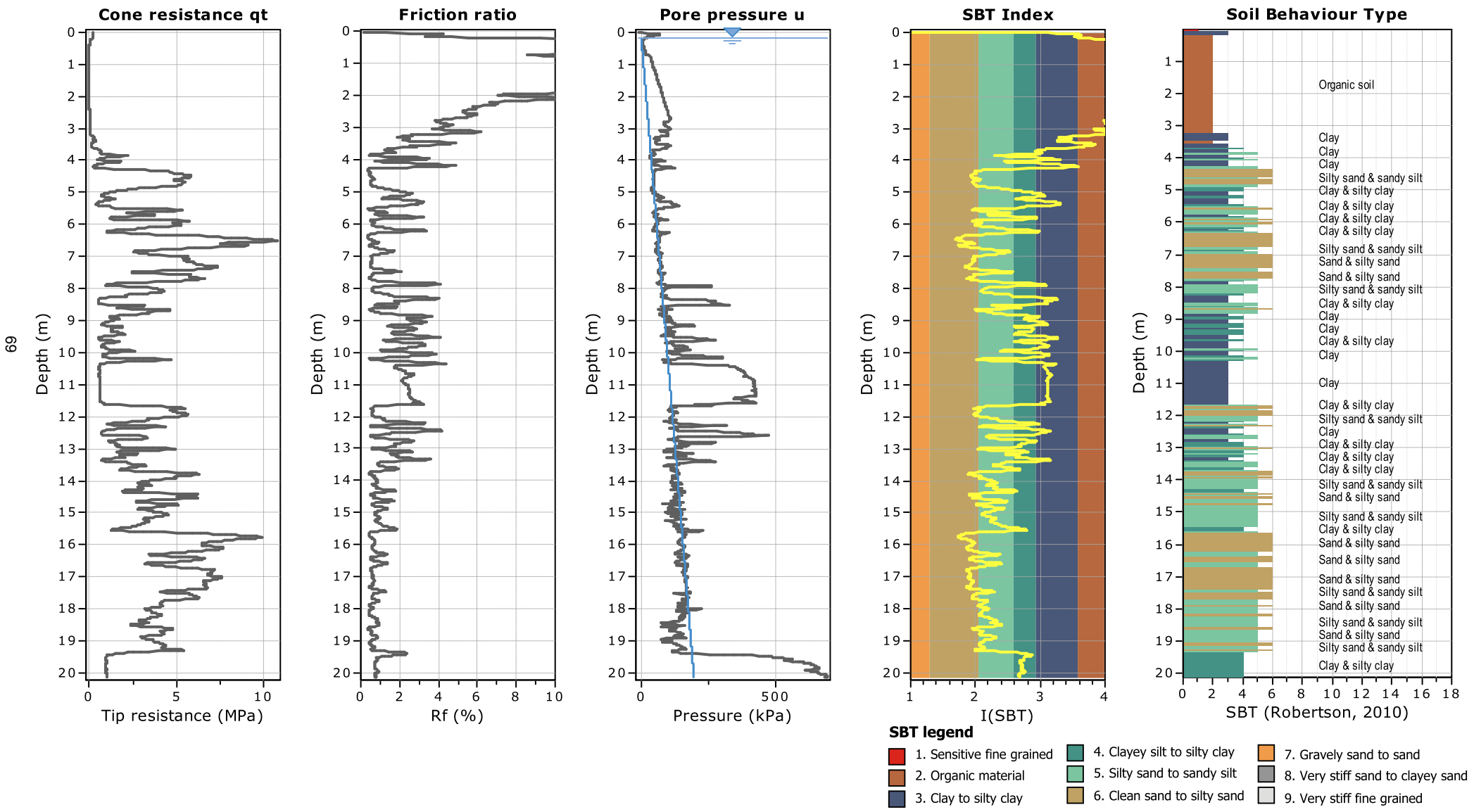
CPT: CPT03
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



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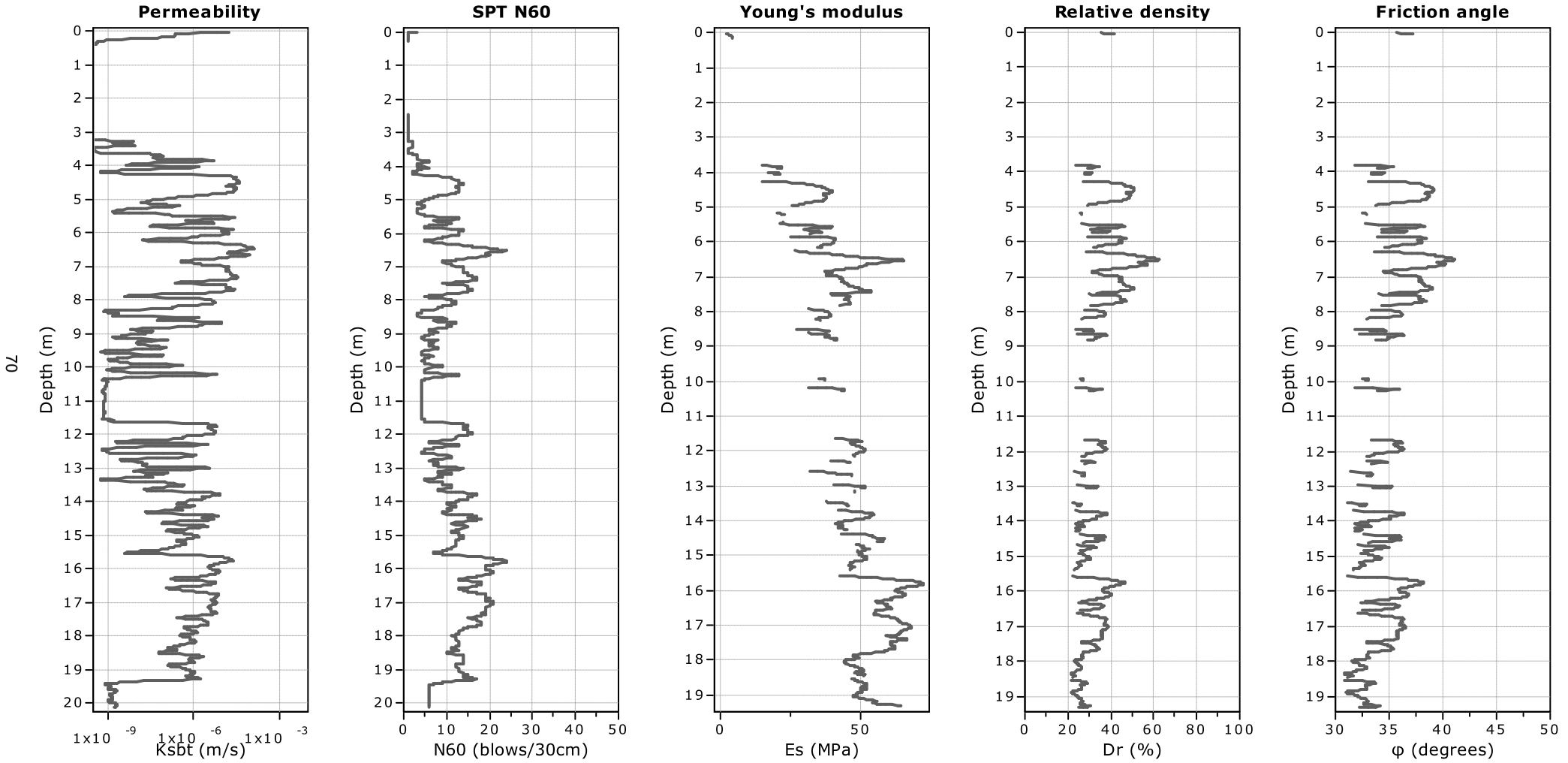
CPT: CPT03
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

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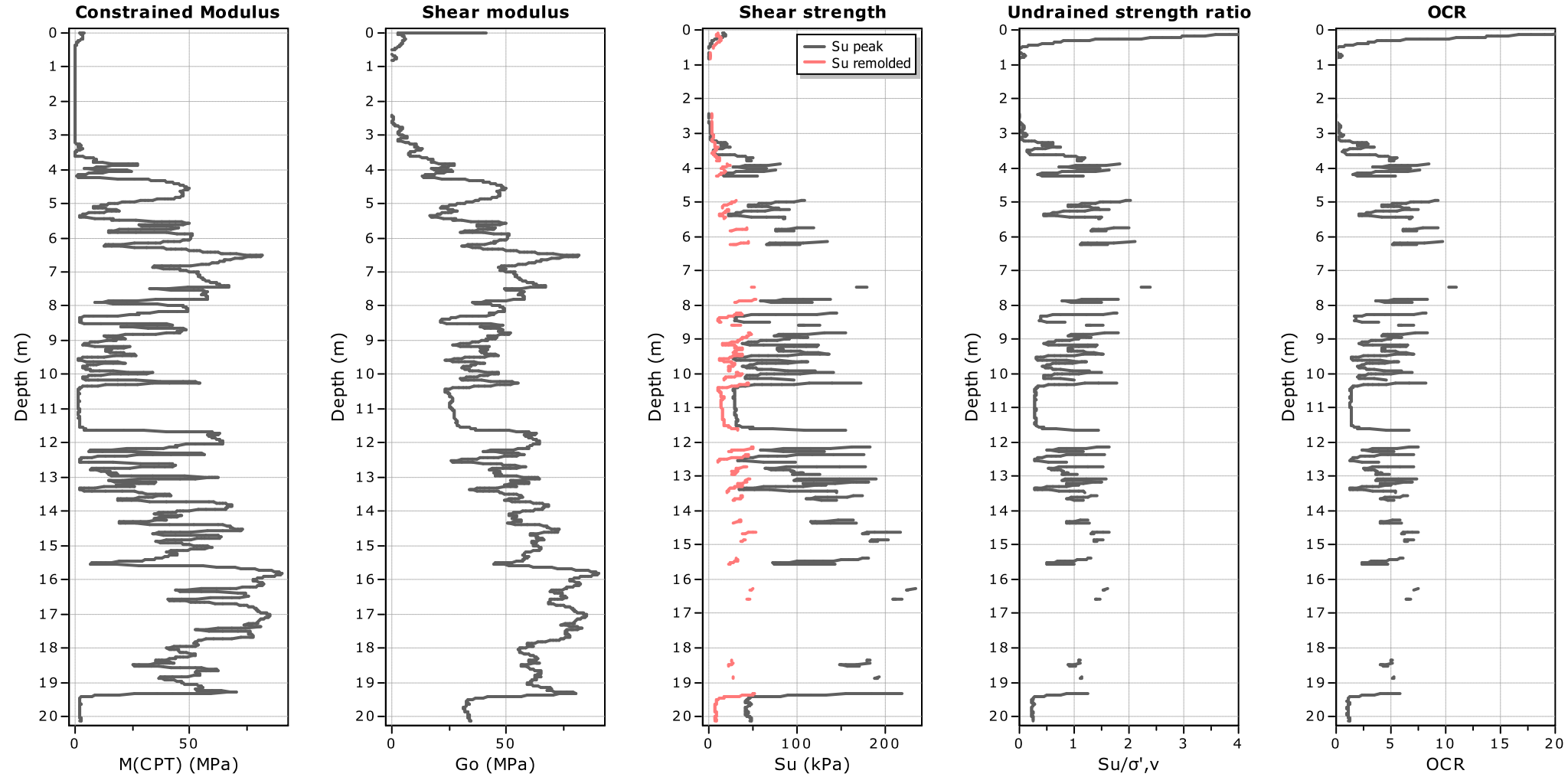
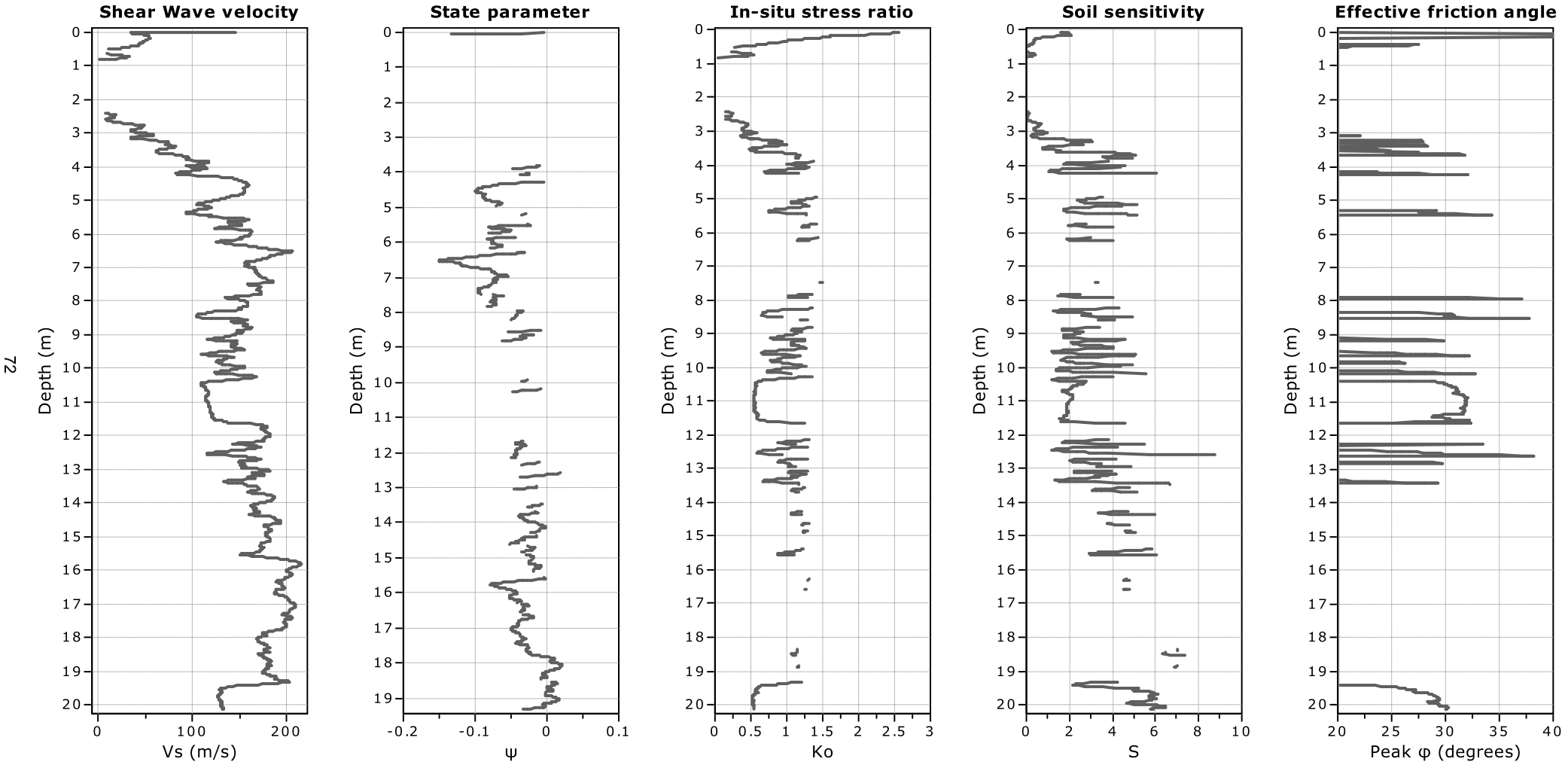
CPT: CPT03
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
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



Calculation parameters

Soil Sensitivity factor, N_S: 7.00

User defined estimation data

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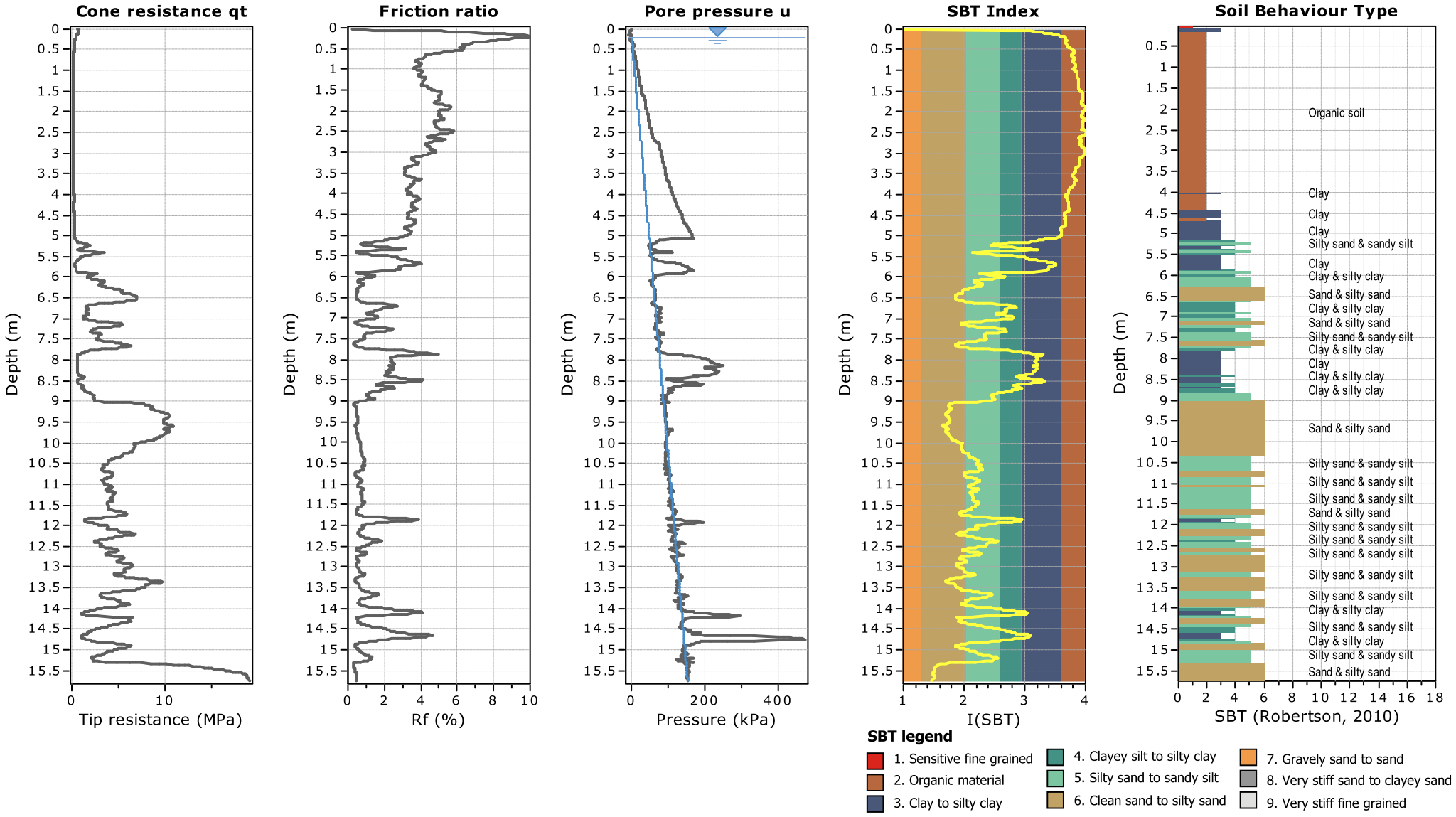
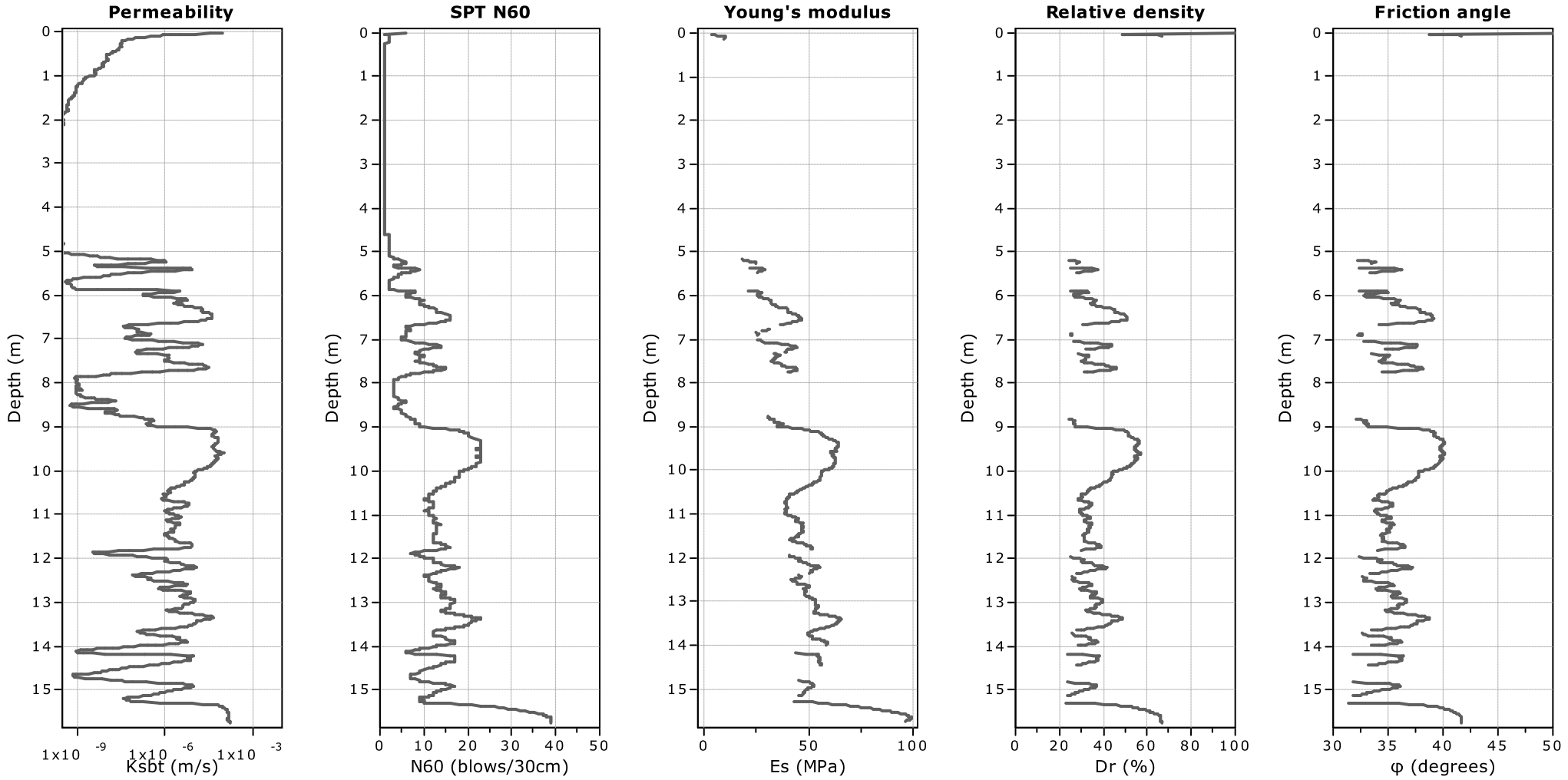
CPT: CPT04
Total depth: 15.75 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

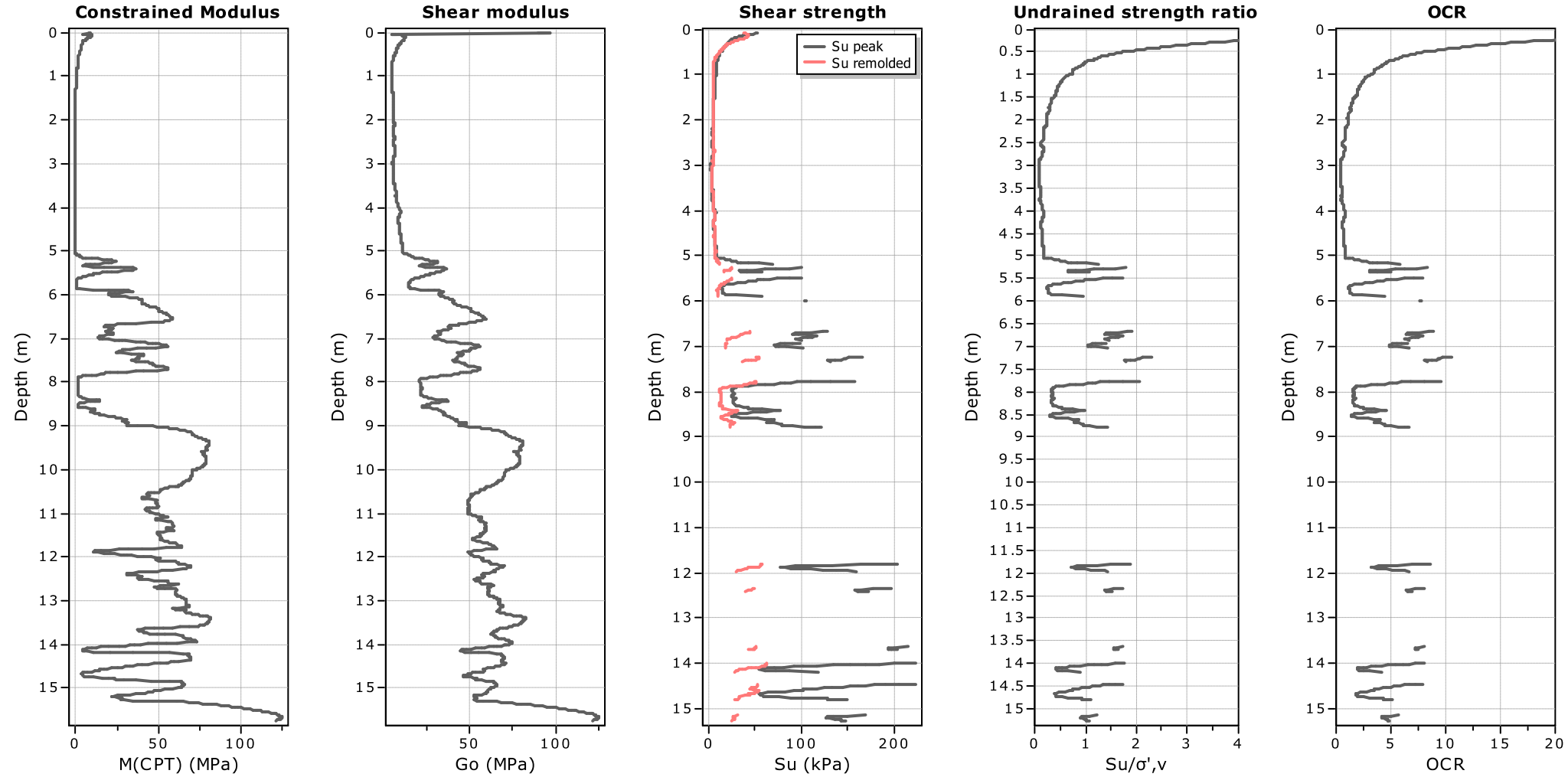
Project:
Location:





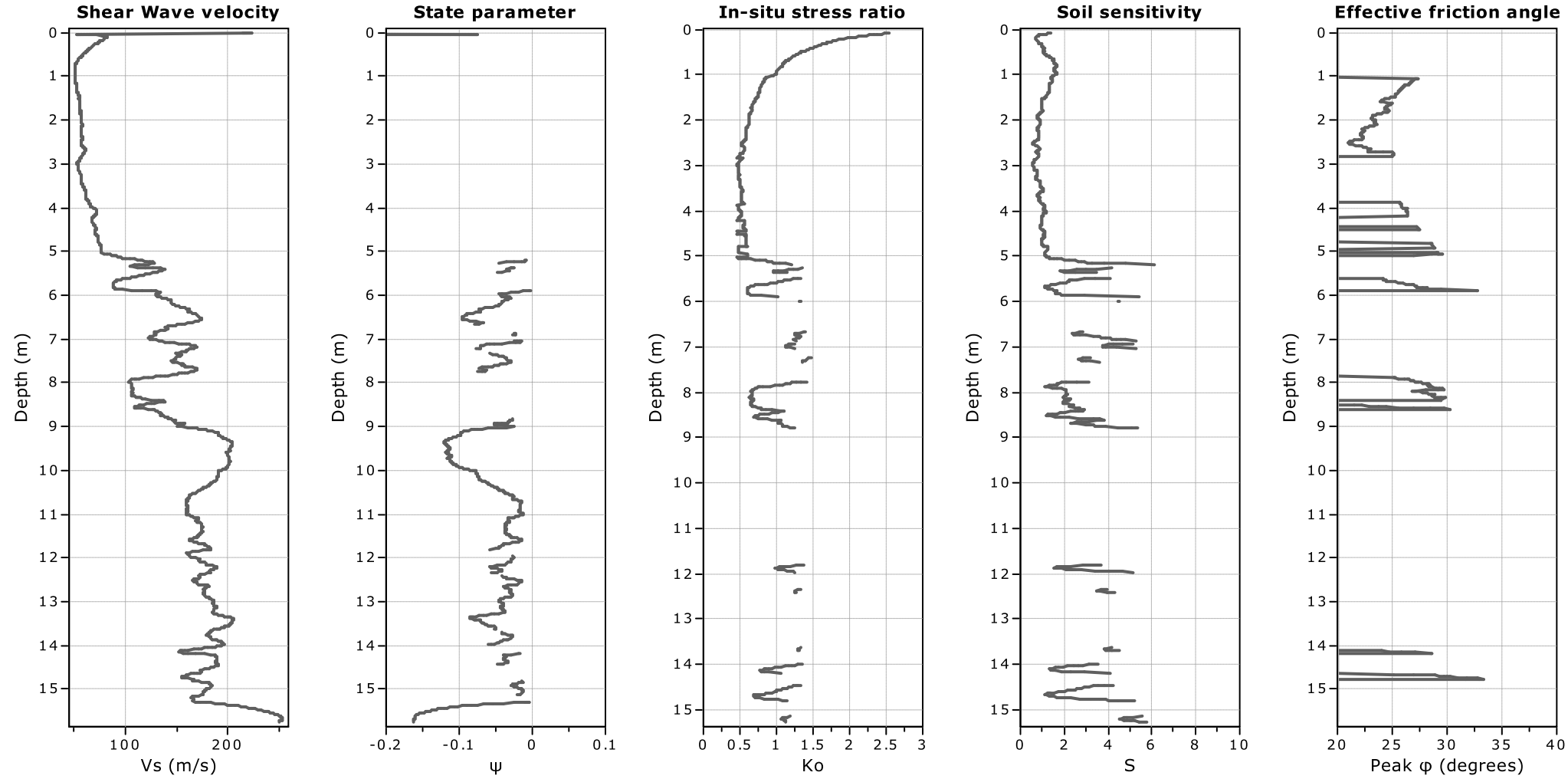
Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data



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



Calculation parameters

Soil Sensitivity factor, N_S: 7.00

User defined estimation data

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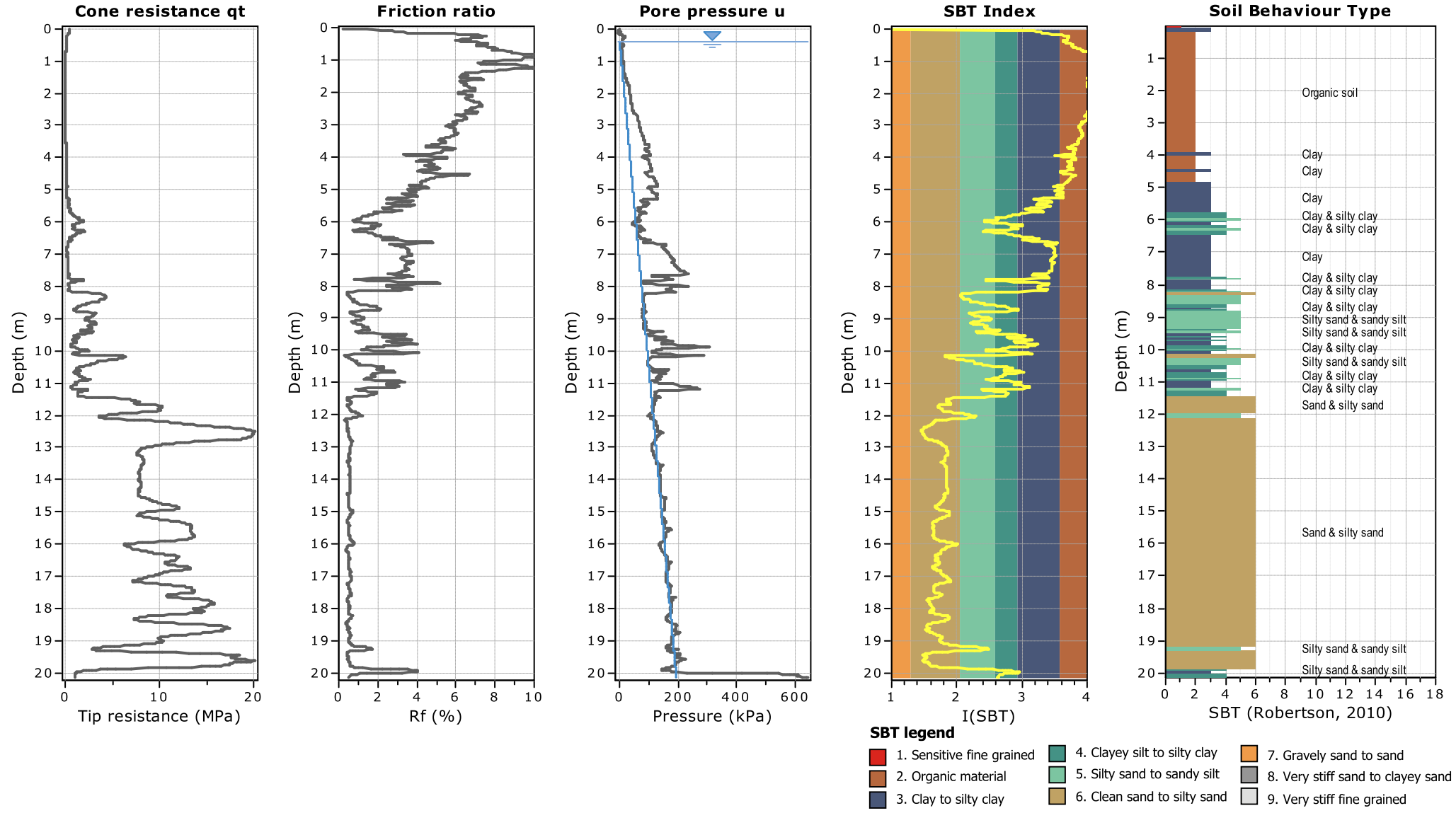
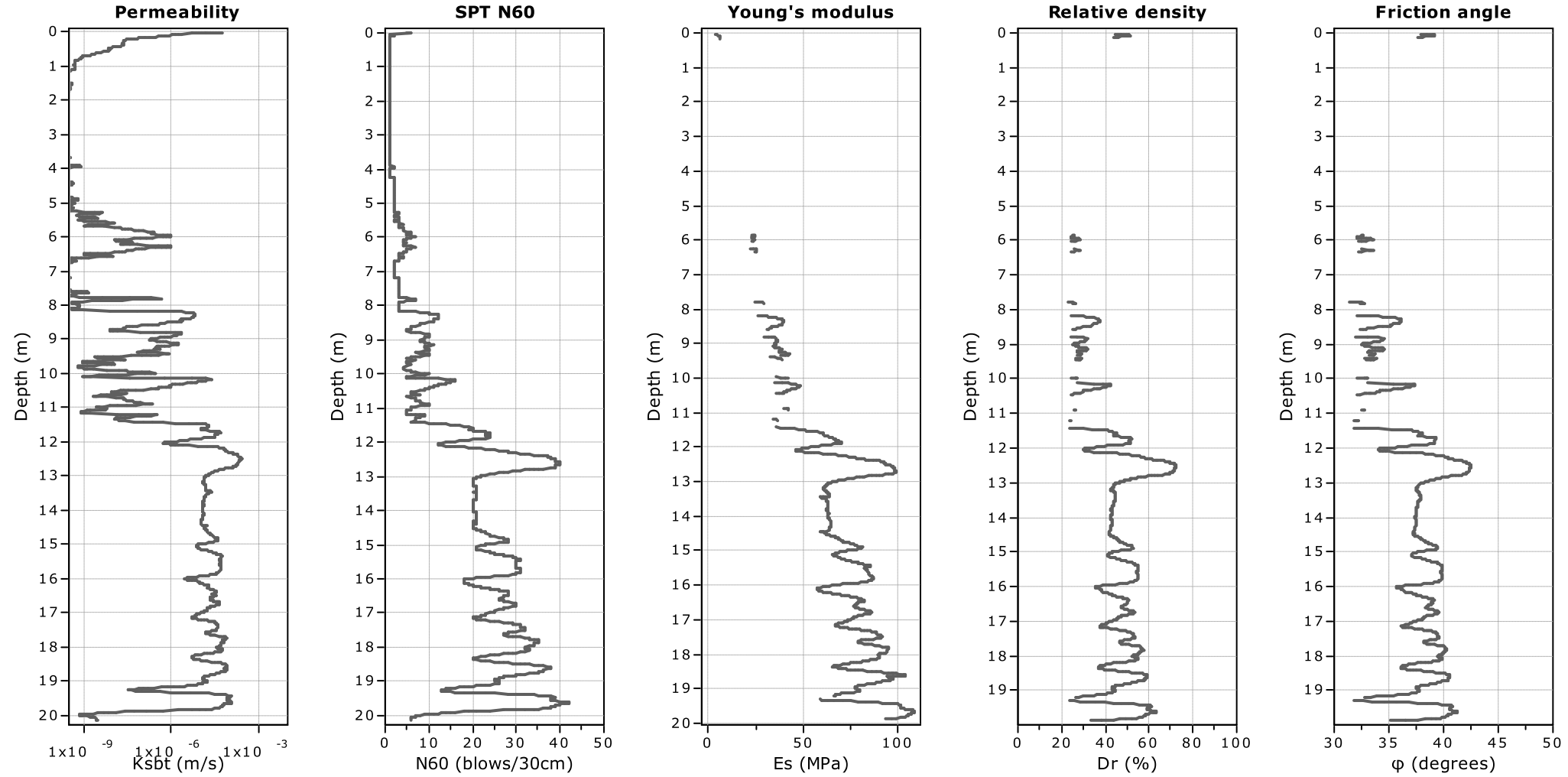
CPT: CPT05
Total depth: 20.14 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:





Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

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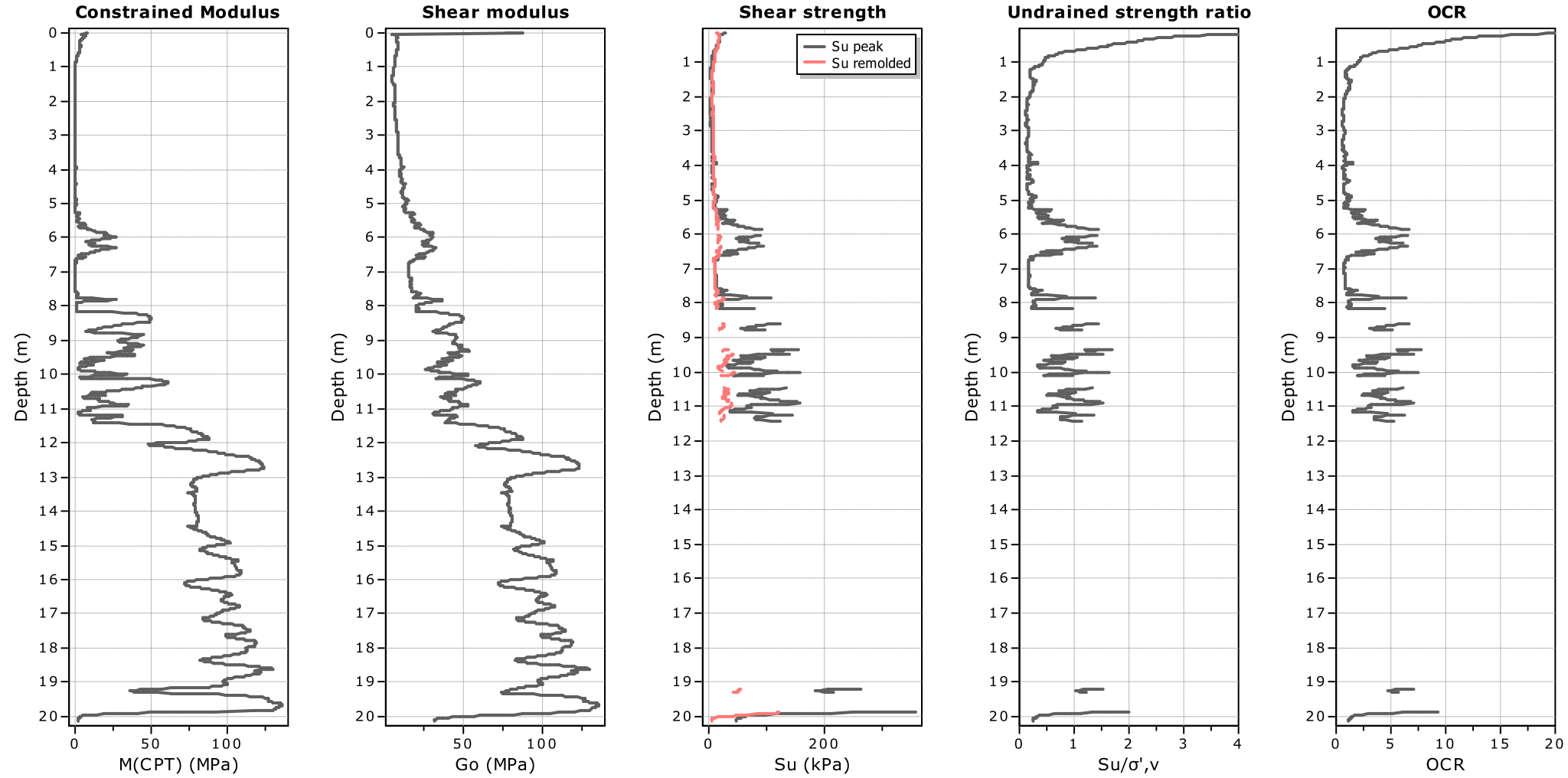
CPT: CPT05
Total depth: 20.14 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



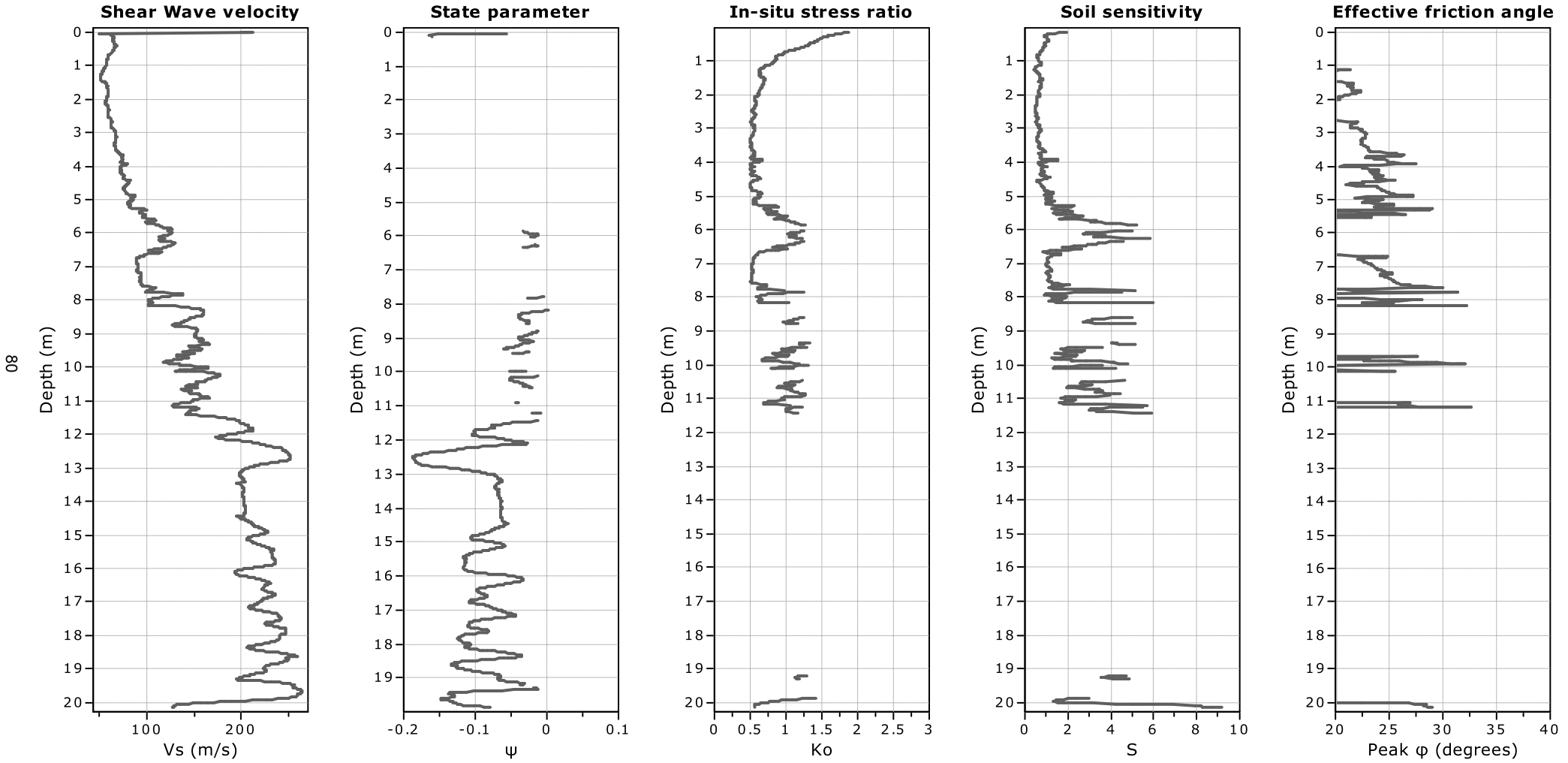
Calculation parameters

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

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT05
Total depth: 20.14 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



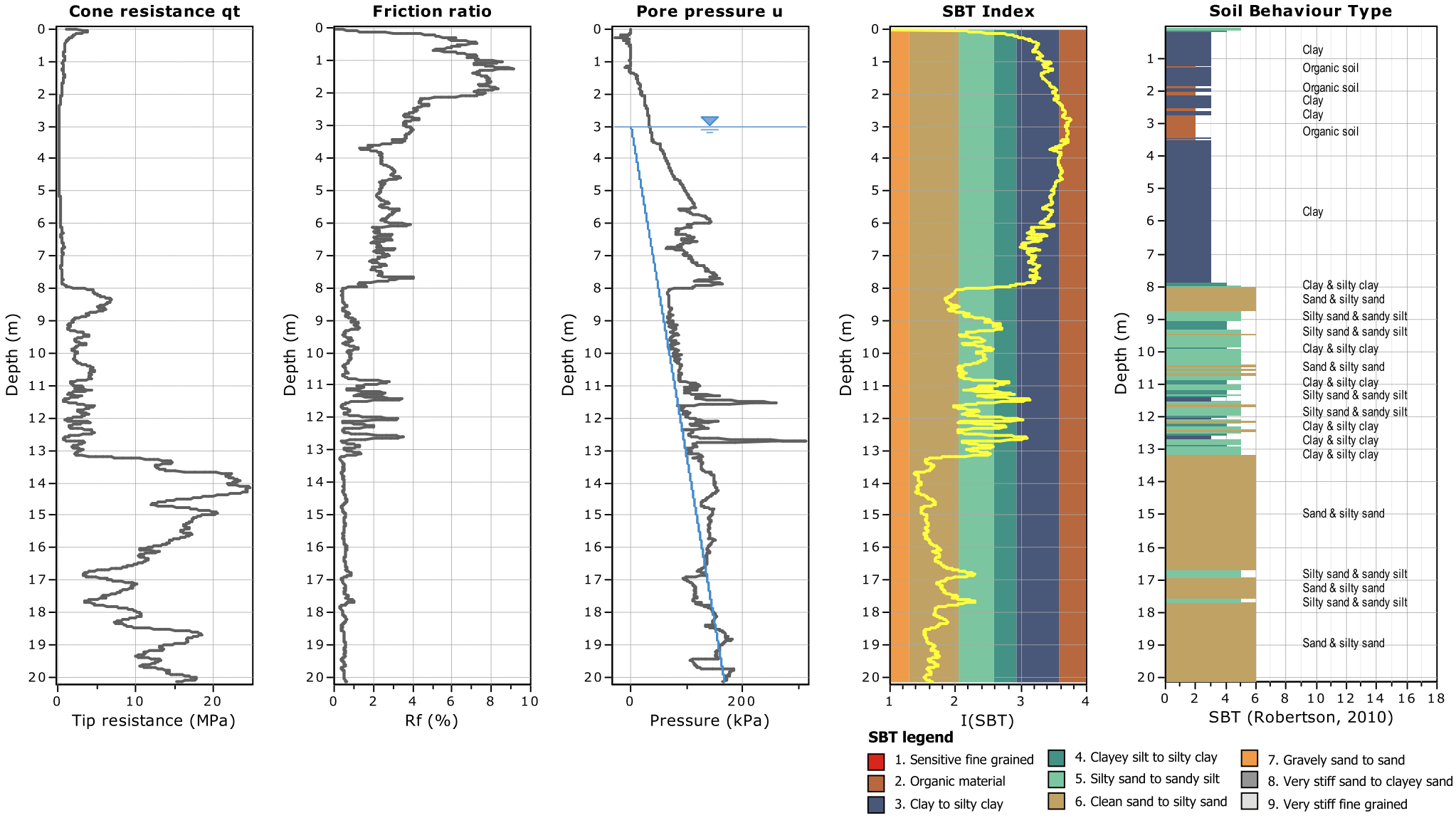
Calculation parameters

Soil Sensitivity factor, N_S: 7.00
User defined estimation data

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT06
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

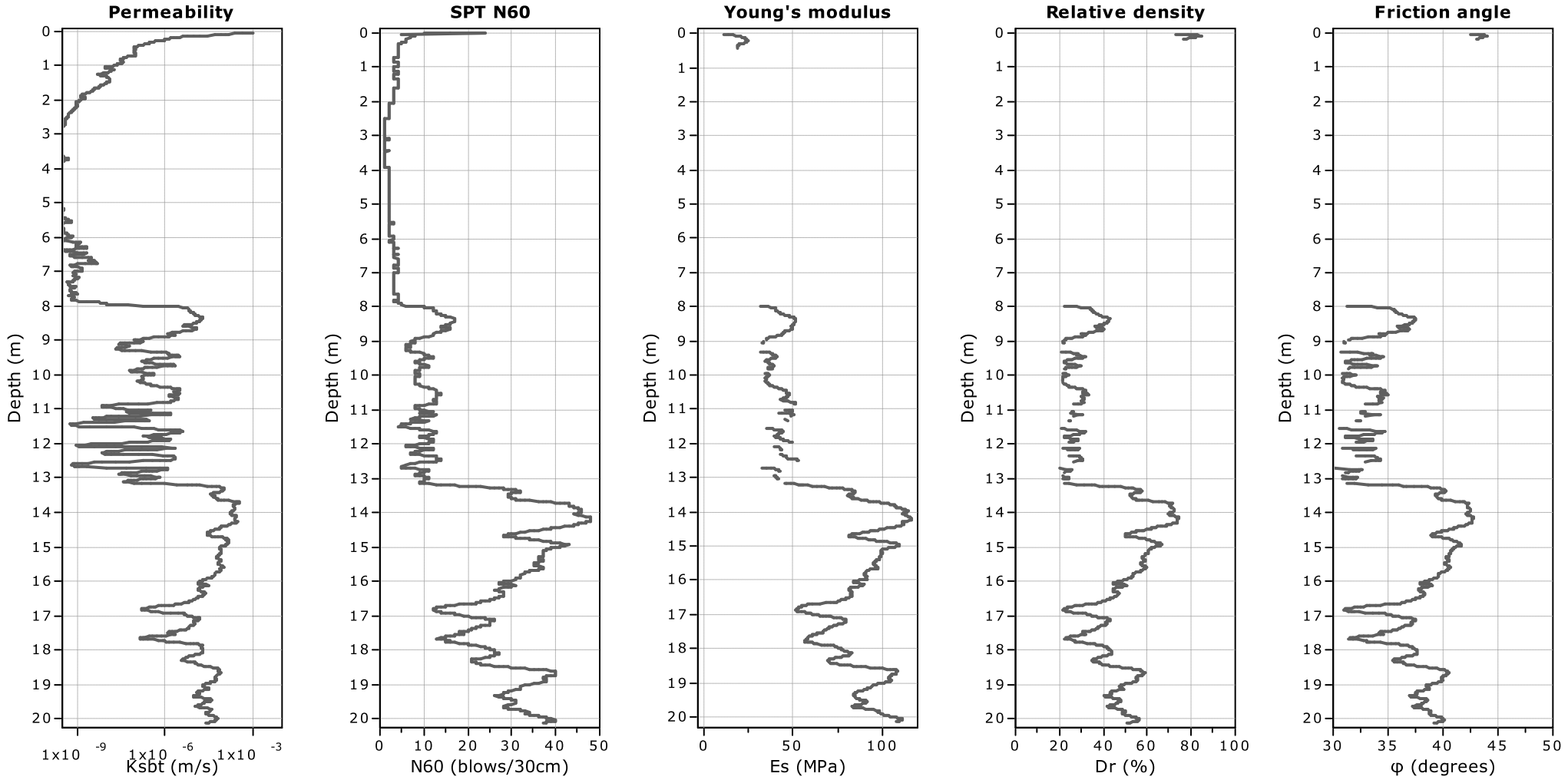
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT06
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



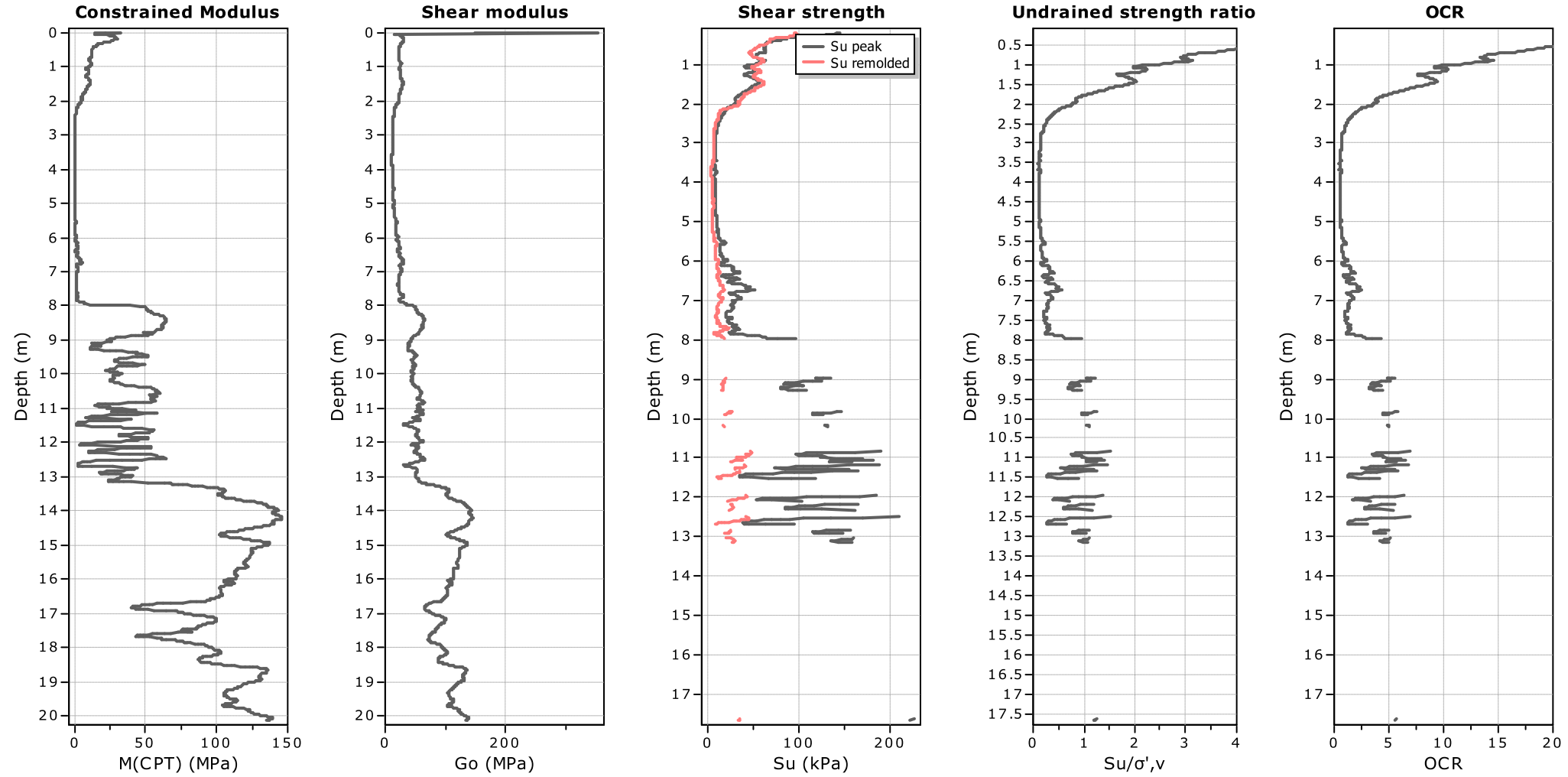
Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

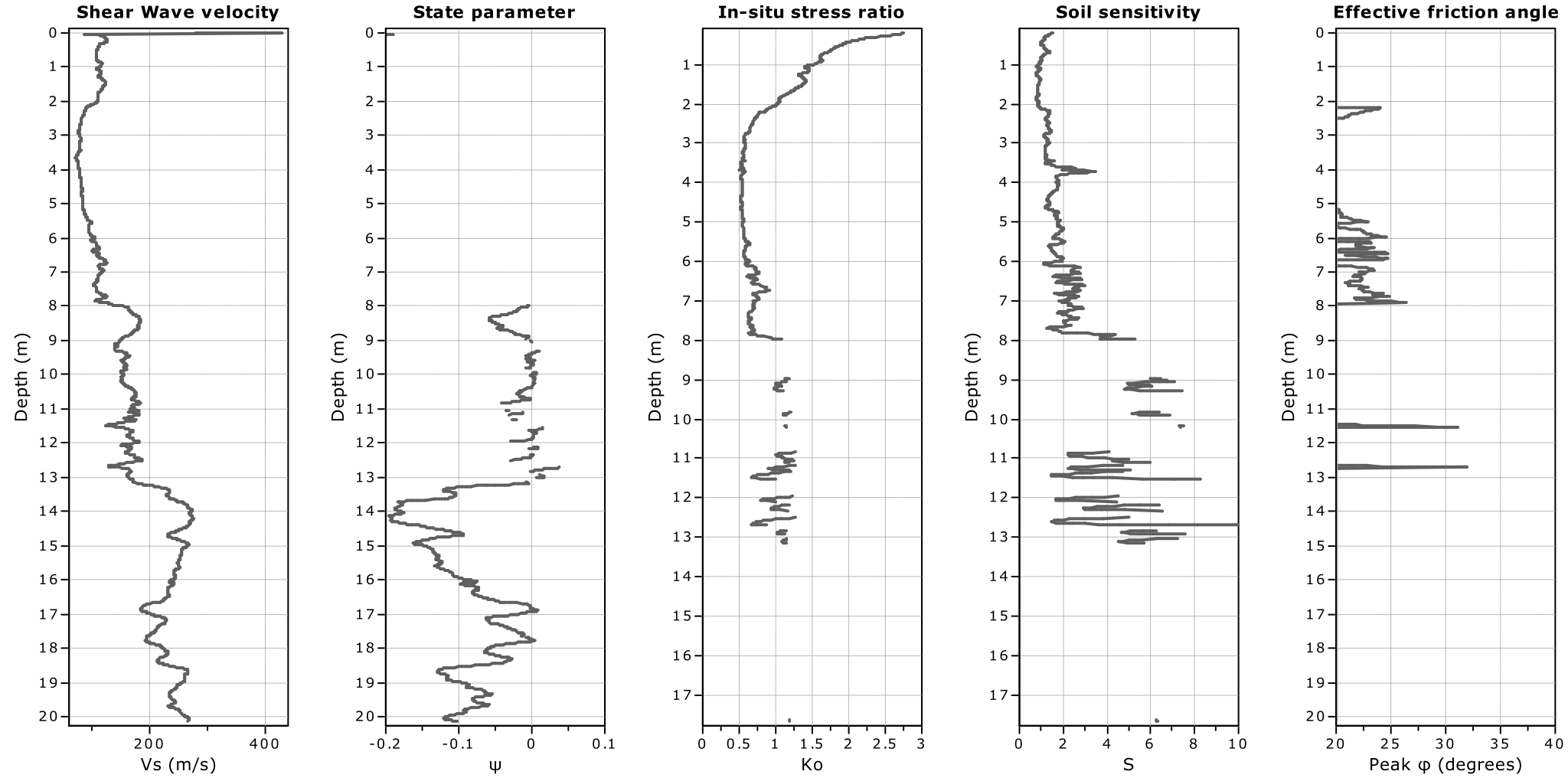
CPT: CPT06
Total depth: 20.13 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
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



Calculation parameters

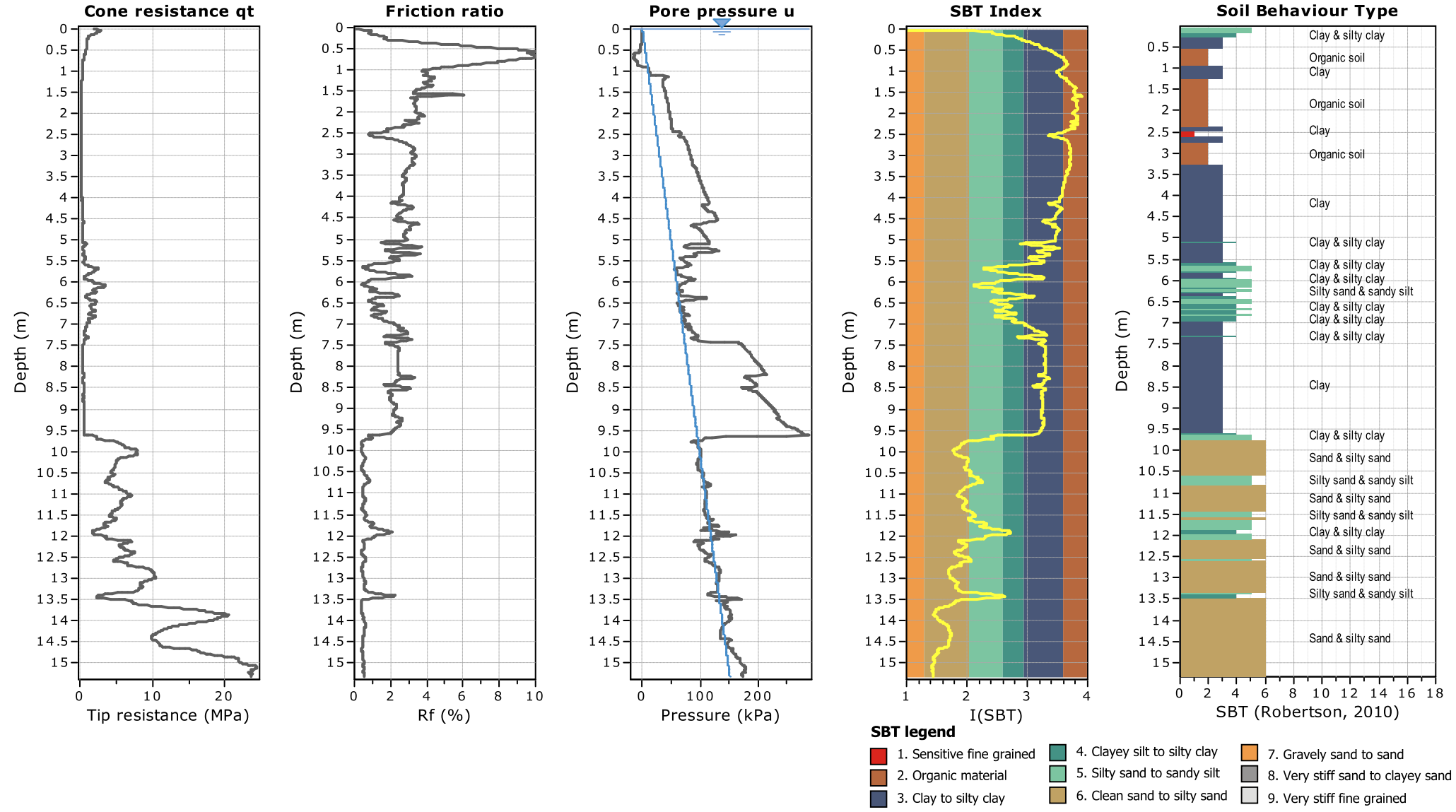
Soil Sensitivity factor, N_S: 7.00

User defined estimation data

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT07
Total depth: 15.33 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

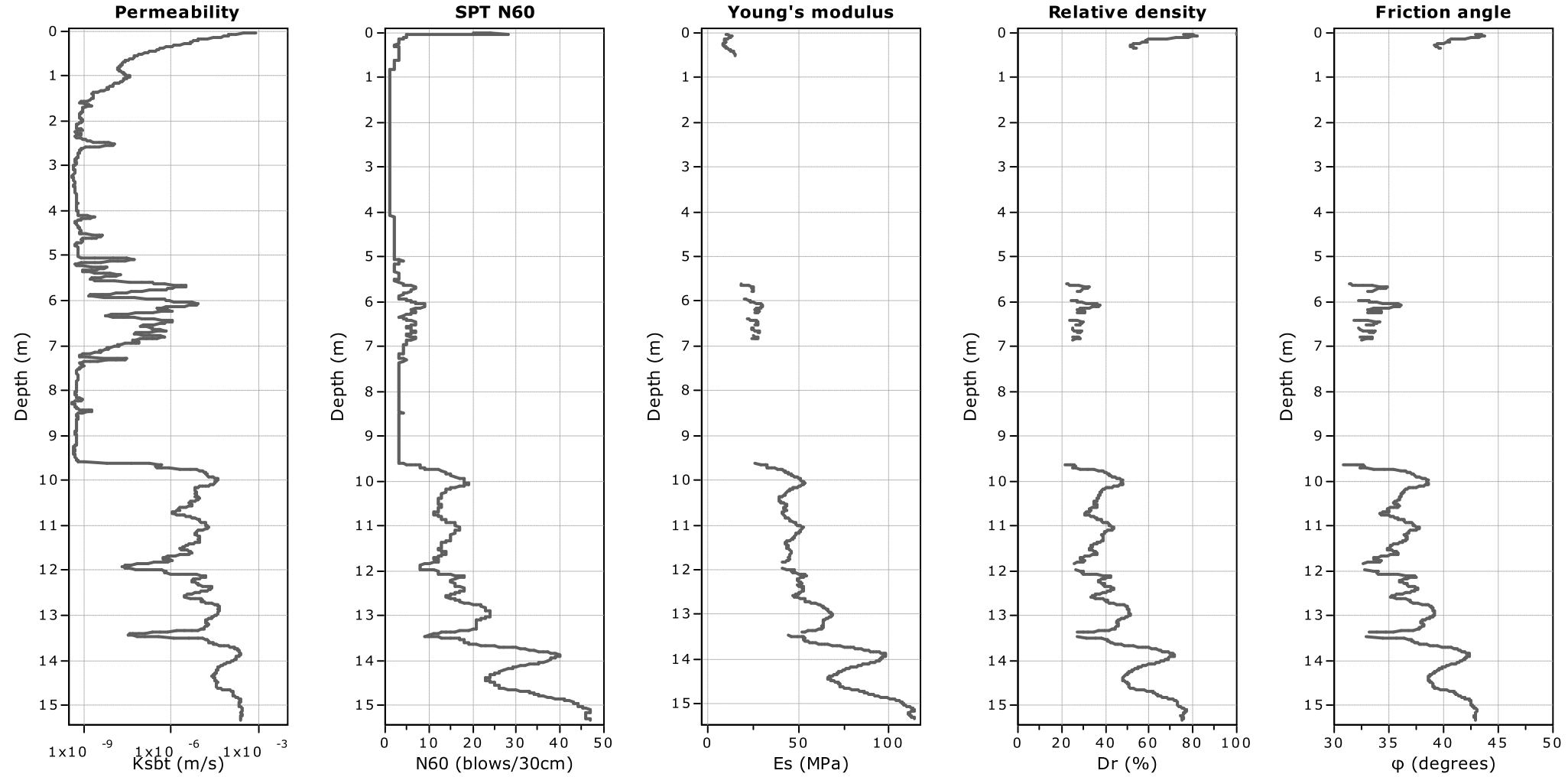
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT07
Total depth: 15.33 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



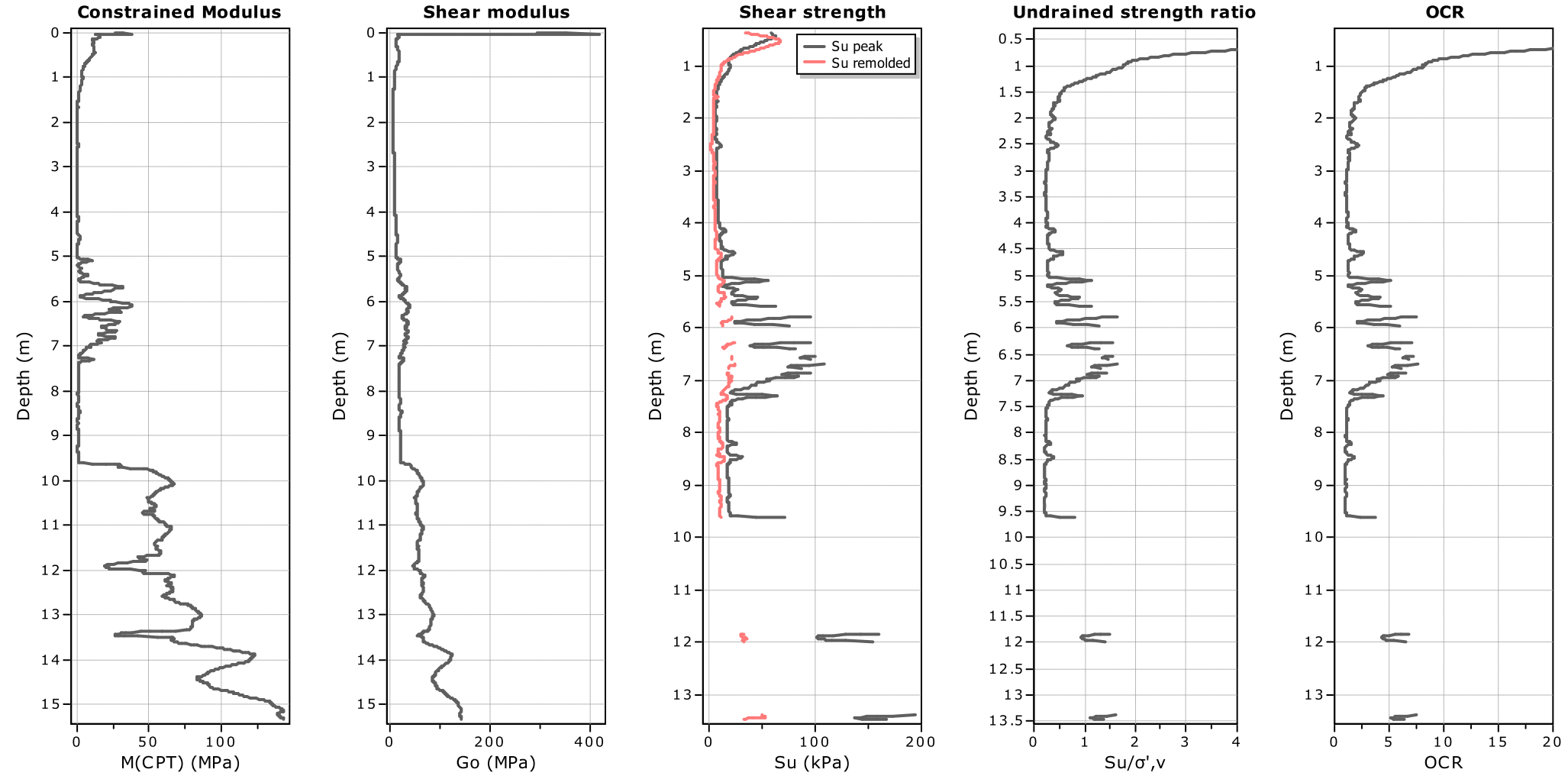
Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT07
Total depth: 15.33 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



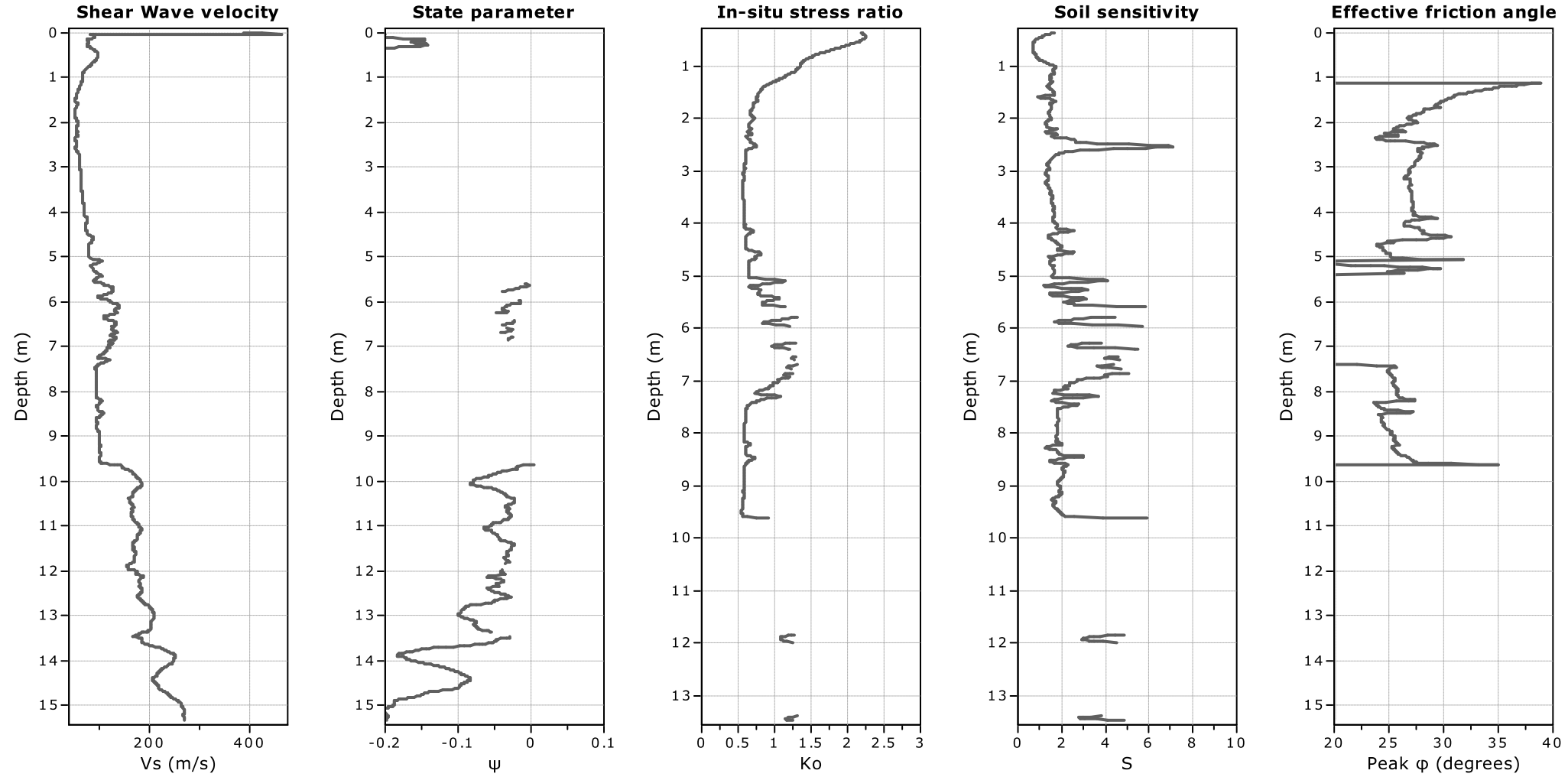
Calculation parameters

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

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT07
Total depth: 15.33 m, Date: 1/02/2018
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

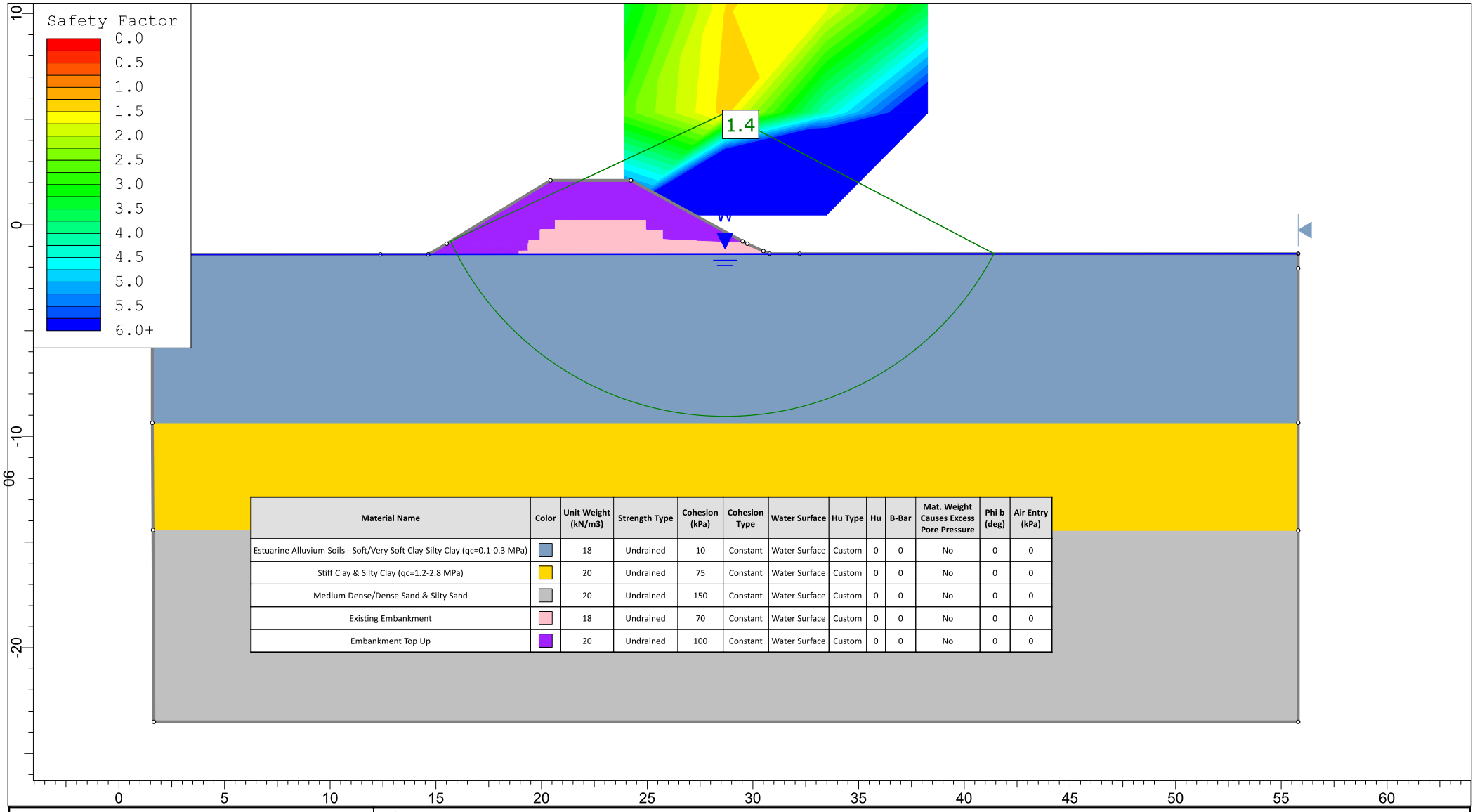
Project:
Location:



Calculation parameters

Soil Sensitivity factor, N_S: 7.00
User defined estimation data

Appendix C – Stability Analyses

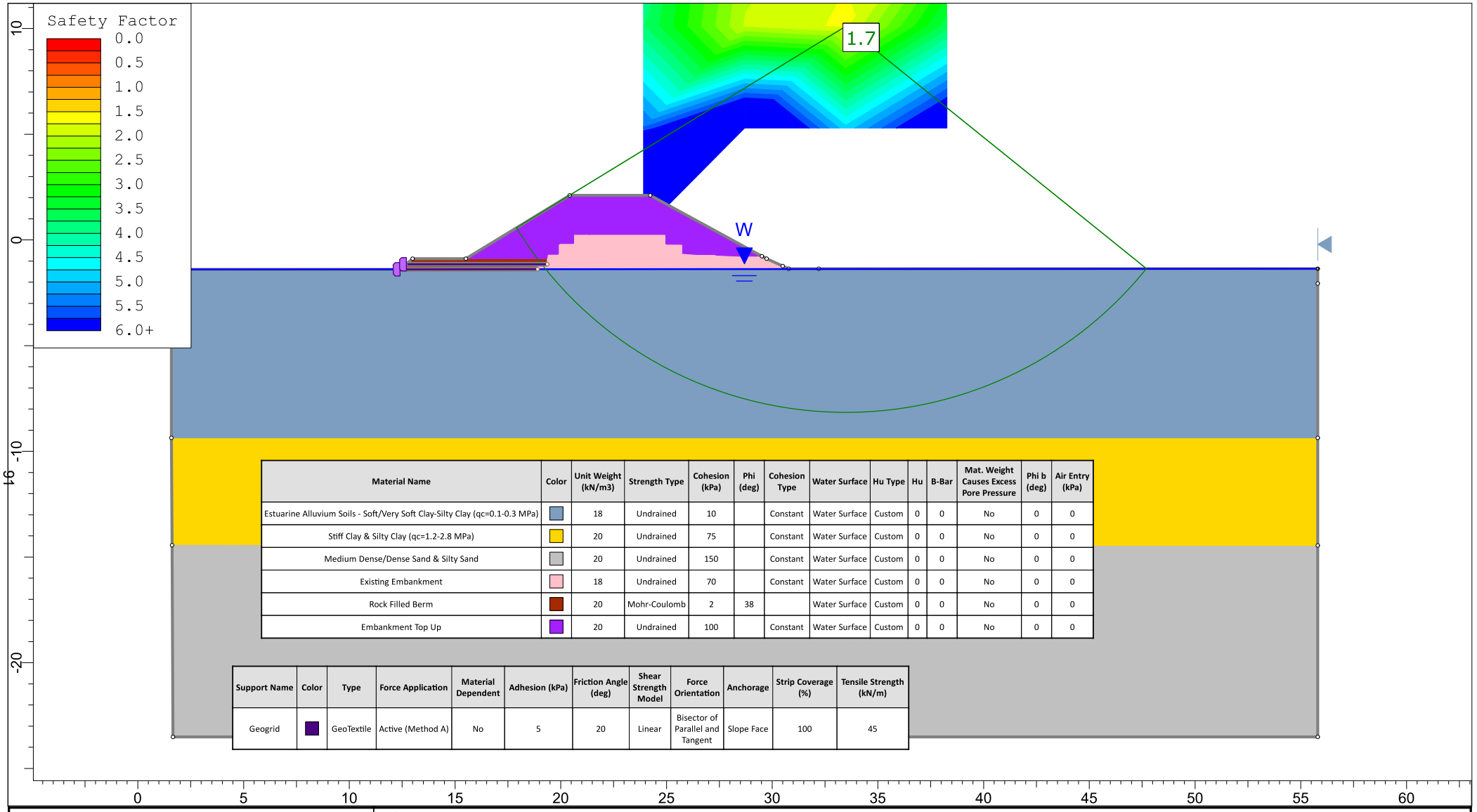


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Cohesion Type	Water Surface	Hu Type	Hu	B-Bar	Mat. Weight Causes Excess Pore Pressure	Phi b (deg)	Air Entry (kPa)
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Undrained	10	Constant	Water Surface	Custom	0	0	No	0	0
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Undrained	75	Constant	Water Surface	Custom	0	0	No	0	0
Medium Dense/Dense Sand & Silty Sand		20	Undrained	150	Constant	Water Surface	Custom	0	0	No	0	0
Existing Embankment		18	Undrained	70	Constant	Water Surface	Custom	0	0	No	0	0
Embankment Top Up		20	Undrained	100	Constant	Water Surface	Custom	0	0	No	0	0

OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm		
Analysis Description	Static conditions - Short Term - Existing Stop Bank upgrade without ground improvement		
Drawn By	SR	*Scale* 1:250	*Company* WSP - Opus International Consultants
Date	02/02/2018, 3:59:23 PM		*File Name* Static Conditions-Undrained- no GI.slim



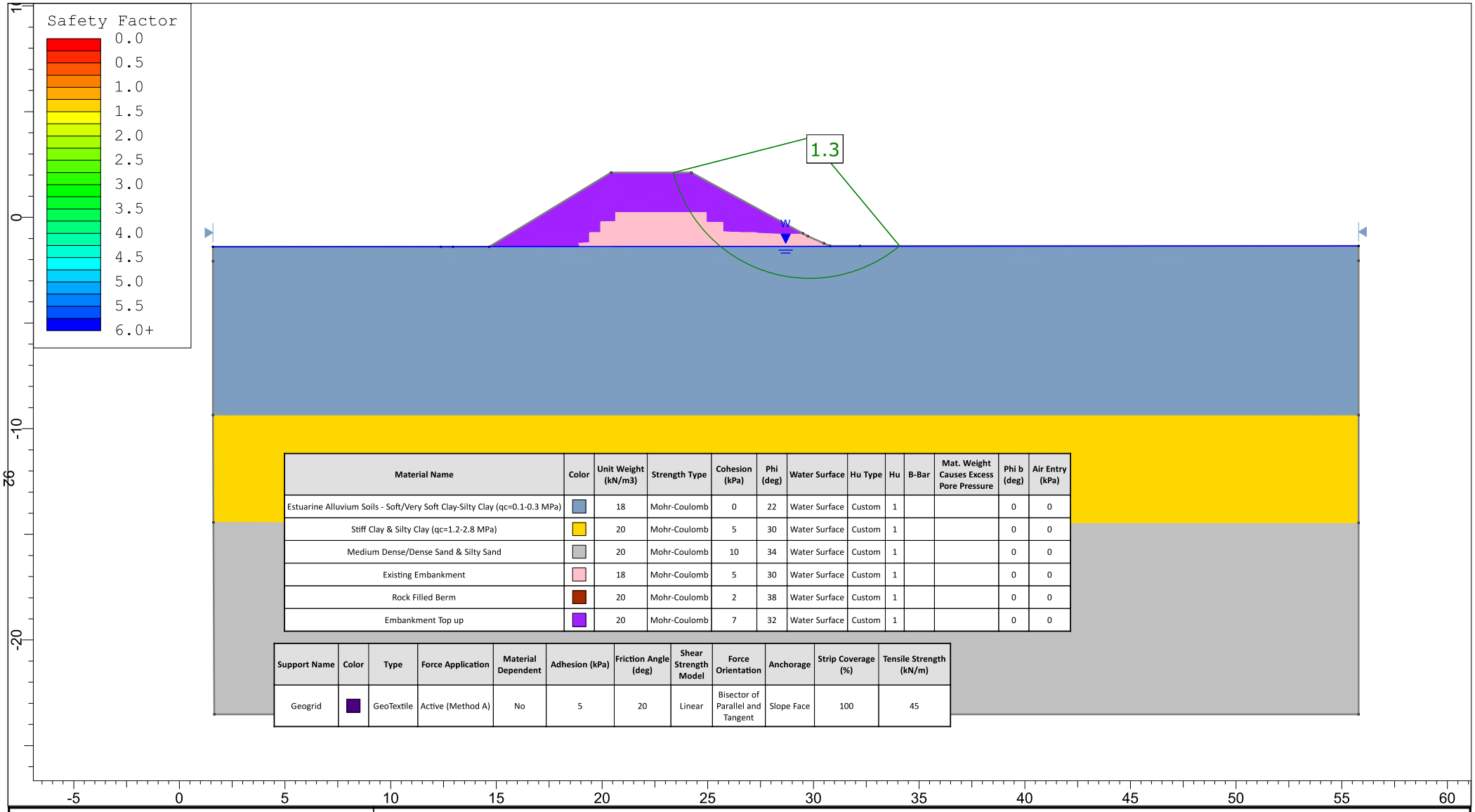
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	B-Bar	Mat. Weight Causes Excess Pore Pressure	Phi b (deg)	Air Entry (kPa)
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Undrained	10		Constant	Water Surface	Custom	0	0	No	0	0
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Undrained	75		Constant	Water Surface	Custom	0	0	No	0	0
Medium Dense/Dense Sand & Silty Sand		20	Undrained	150		Constant	Water Surface	Custom	0	0	No	0	0
Existing Embankment		18	Undrained	70		Constant	Water Surface	Custom	0	0	No	0	0
Rock Filled Berm		20	Mohr-Coulomb	2	38		Water Surface	Custom	0	0	No	0	0
Embankment Top Up		20	Undrained	100		Constant	Water Surface	Custom	0	0	No	0	0

Support Name	Color	Type	Force Application	Material Dependent	Adhesion (kPa)	Friction Angle (deg)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)
Geogrid		GeoTextile	Active (Method A)	No	5	20	Linear	Bisector of Parallel and Tangent	Slope Face	100	45

OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm		
Analysis Description	Static conditions - Short Term - Existing Stop Bank upgrade with ground improvement		
Drawn By	SR	*Scale* 1:250	*Company* WSP - Opus International Consultants
Date	02/02/2018, 3:59:23 PM		*File Name* Static Conditions-Undrained- with GI.slim



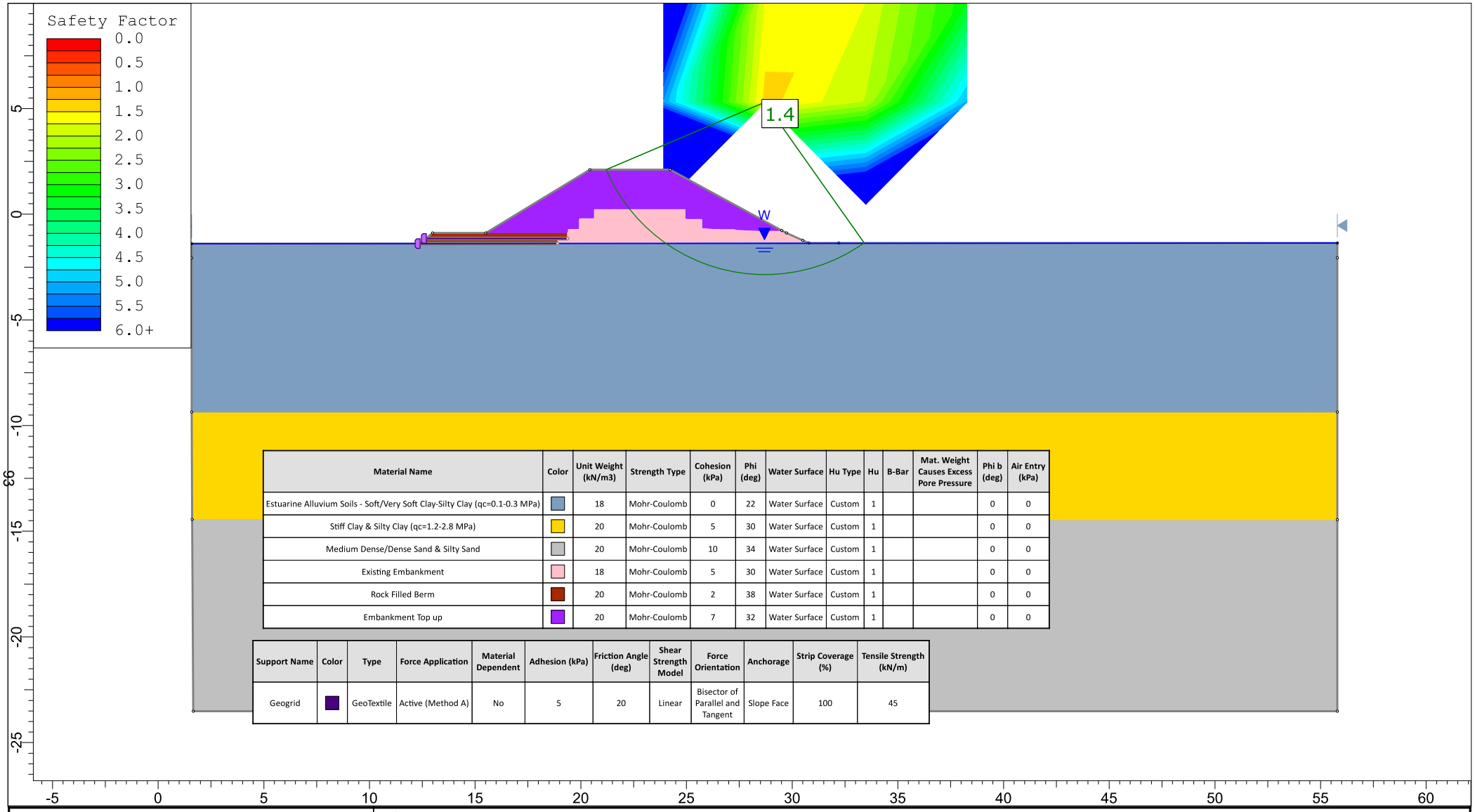
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	B-Bar	Mat. Weight Causes Excess Pore Pressure	Phi b (deg)	Air Entry (kPa)
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Mohr-Coulomb	0	22	Water Surface	Custom	1			0	0
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Mohr-Coulomb	5	30	Water Surface	Custom	1			0	0
Medium Dense/Dense Sand & Silty Sand		20	Mohr-Coulomb	10	34	Water Surface	Custom	1			0	0
Existing Embankment		18	Mohr-Coulomb	5	30	Water Surface	Custom	1			0	0
Rock Filled Berm		20	Mohr-Coulomb	2	38	Water Surface	Custom	1			0	0
Embankment Top up		20	Mohr-Coulomb	7	32	Water Surface	Custom	1			0	0

Support Name	Color	Type	Force Application	Material Dependent	Adhesion (kPa)	Friction Angle (deg)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)
Geogrid		GeoTextile	Active (Method A)	No	5	20	Linear	Bisector of Parallel and Tangent	Slope Face	100	45

OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm		
Analysis Description	Static conditions - Long term - Existing Stop Bank upgrade without ground improvement		
Drawn By	SR	*Scale* 1:250	*Company* WSP - Opus International Consultants
Date	02/02/2018, 3:59:23 PM		*File Name* Static Conditions-Drained- without GI.slim



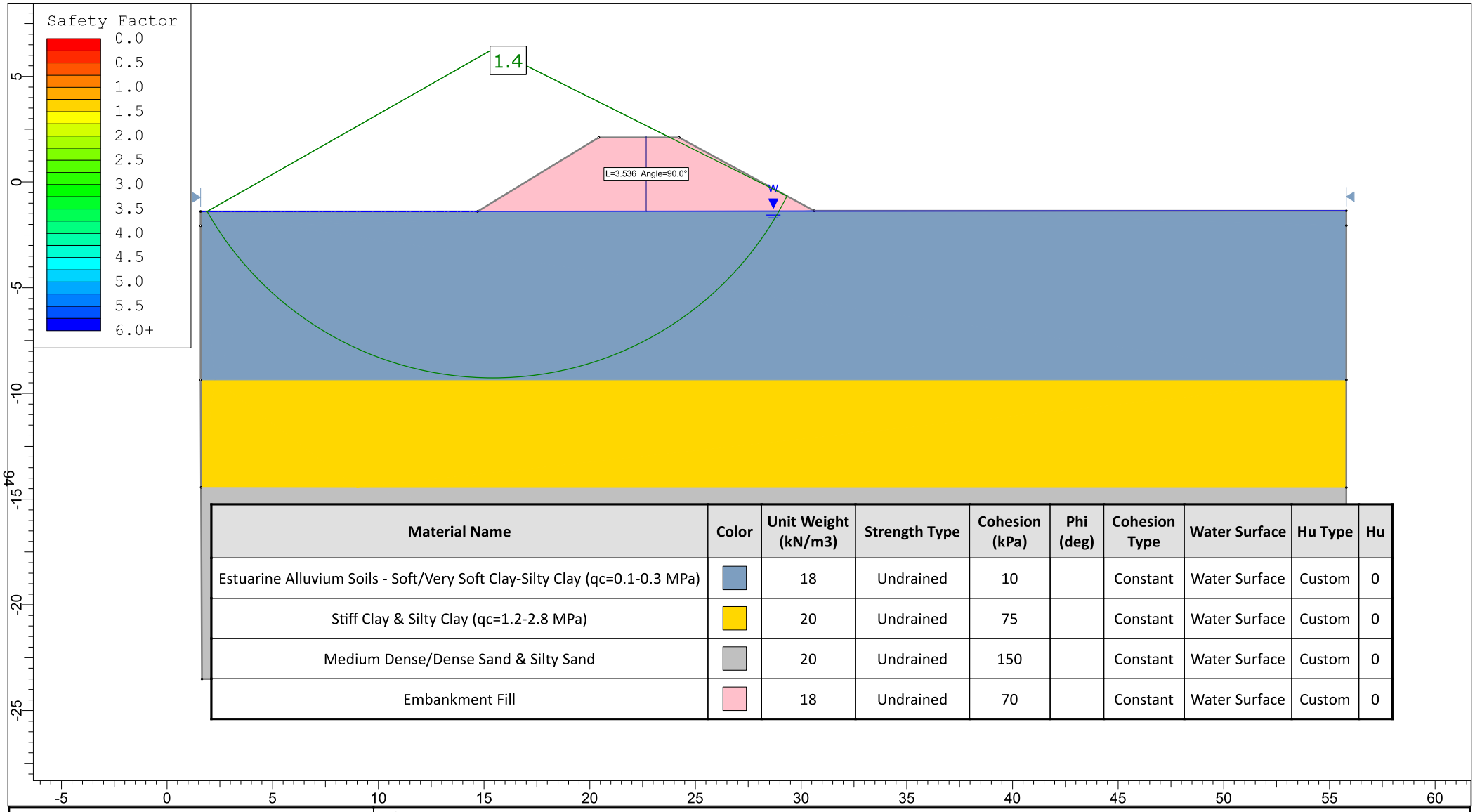
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	B-Bar	Mat. Weight Causes Excess Pore Pressure	Phi b (deg)	Air Entry (kPa)
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Mohr-Coulomb	0	22	Water Surface	Custom	1			0	0
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Mohr-Coulomb	5	30	Water Surface	Custom	1			0	0
Medium Dense/Dense Sand & Silty Sand		20	Mohr-Coulomb	10	34	Water Surface	Custom	1			0	0
Existing Embankment		18	Mohr-Coulomb	5	30	Water Surface	Custom	1			0	0
Rock Filled Berm		20	Mohr-Coulomb	2	38	Water Surface	Custom	1			0	0
Embankment Top up		20	Mohr-Coulomb	7	32	Water Surface	Custom	1			0	0

Support Name	Color	Type	Force Application	Material Dependent	Adhesion (kPa)	Friction Angle (deg)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)
Geogrid		GeoTextile	Active (Method A)	No	5	20	Linear	Bisector of Parallel and Tangent	Slope Face	100	45

OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm		
Analysis Description	Static conditions - Long term - Existing Stop Bank upgrade with ground improvement		
Drawn By	SR	*Scale* 1:250	*Company* WSP - Opus International Consultants
Date	02/02/2018, 3:59:23 PM		*File Name* Static Conditions-Drained- with GI.slim

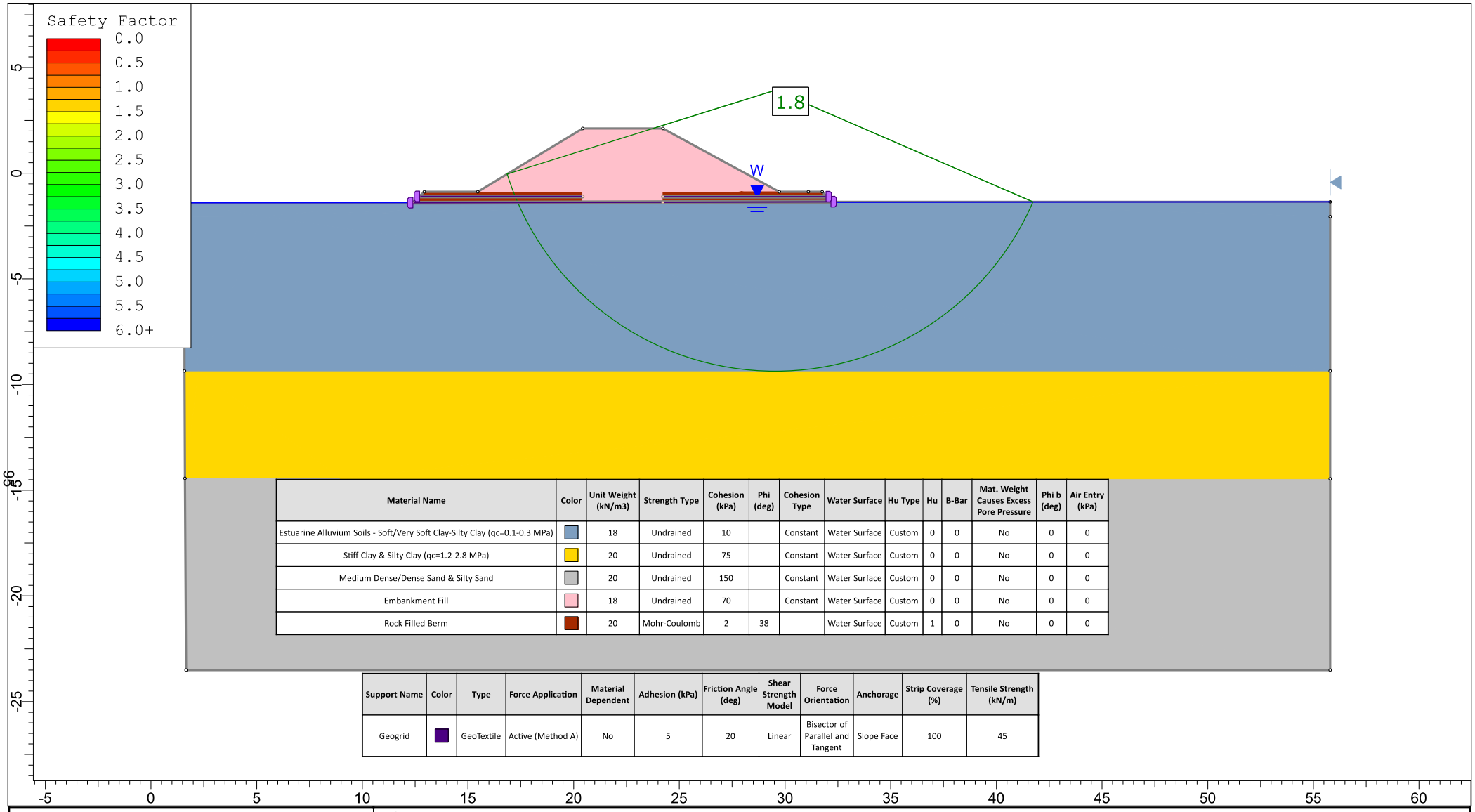


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Undrained	10		Constant	Water Surface	Custom	0
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Undrained	75		Constant	Water Surface	Custom	0
Medium Dense/Dense Sand & Silty Sand		20	Undrained	150		Constant	Water Surface	Custom	0
Embankment Fill		18	Undrained	70		Constant	Water Surface	Custom	0

OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm				
Analysis Description	Static conditions - Short term - New Stop Bank (without Ground Improvement)				
Drawn By	SR	*Scale*	1:250	*Company*	WSP - Opus International Consultants
Date	02/02/2018, 3:59:23 PM			*File Name*	Static Conditions-Undrained.slim



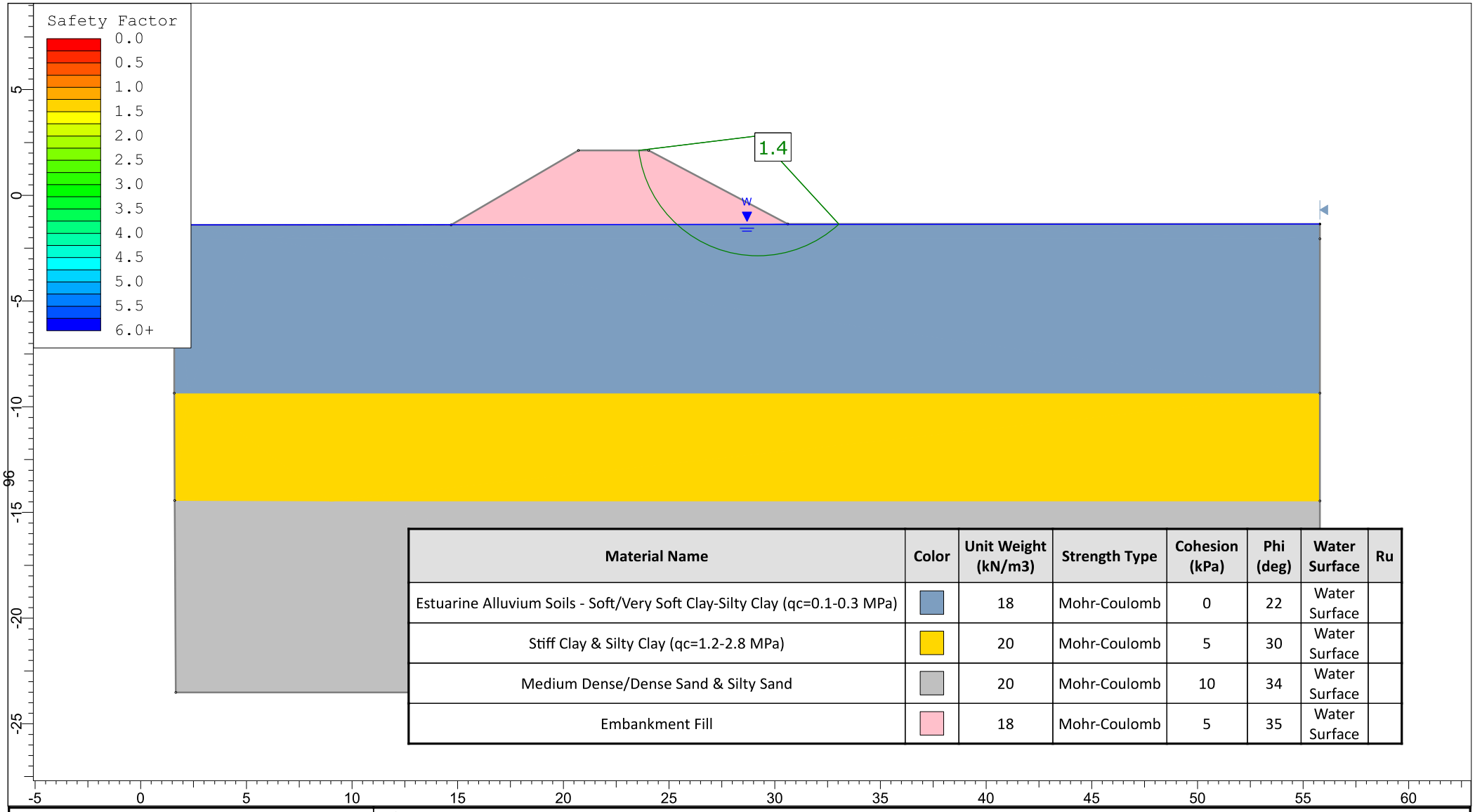
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	B-Bar	Mat. Weight Causes Excess Pore Pressure	Phi b (deg)	Air Entry (kPa)
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Undrained	10		Constant	Water Surface	Custom	0	0	No	0	0
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Undrained	75		Constant	Water Surface	Custom	0	0	No	0	0
Medium Dense/Dense Sand & Silty Sand		20	Undrained	150		Constant	Water Surface	Custom	0	0	No	0	0
Embankment Fill		18	Undrained	70		Constant	Water Surface	Custom	0	0	No	0	0
Rock Filled Berm		20	Mohr-Coulomb	2	38		Water Surface	Custom	1	0	No	0	0

Support Name	Color	Type	Force Application	Material Dependent	Adhesion (kPa)	Friction Angle (deg)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)
Geogrid		GeoTextile	Active (Method A)	No	5	20	Linear	Bisector of Parallel and Tangent	Slope Face	100	45

OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm		
Analysis Description	Static conditions - Short term - New Stop Bank with ground improvement		
Drawn By	SR	*Scale* 1:250	*Company* WSP - Opus International Consultants
Date	02/02/2018, 3:59:23 PM		*File Name* Static Conditions-Undrained- with GI trial.slim

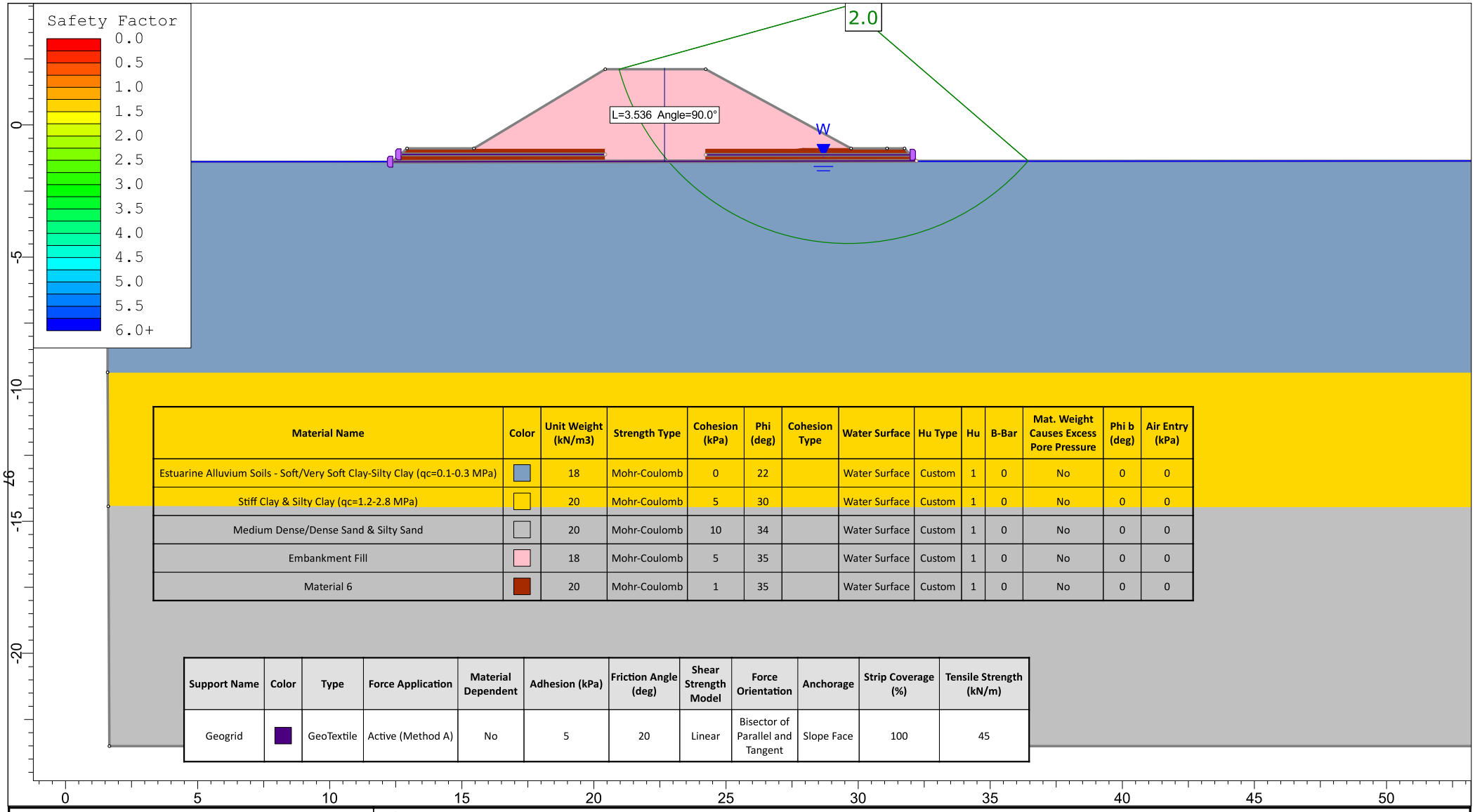


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Mohr-Coulomb	0	22	Water Surface	
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Mohr-Coulomb	5	30	Water Surface	
Medium Dense/Dense Sand & Silty Sand		20	Mohr-Coulomb	10	34	Water Surface	
Embankment Fill		18	Mohr-Coulomb	5	35	Water Surface	

OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm				
Analysis Description	Static conditions - Short term - New Stop Bank (without Ground Improvement)				
Drawn By	SR	*Scale*	1:250	*Company*	WSP-Opus International Consultants
Date	02/02/2018, 3:59:23 PM			*File Name*	Static-Drained-no GI.slim



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	B-Bar	Mat. Weight Causes Excess Pore Pressure	Phi b (deg)	Air Entry (kPa)
Estuarine Alluvium Soils - Soft/Very Soft Clay-Silty Clay (qc=0.1-0.3 MPa)		18	Mohr-Coulomb	0	22		Water Surface	Custom	1	0	No	0	0
Stiff Clay & Silty Clay (qc=1.2-2.8 MPa)		20	Mohr-Coulomb	5	30		Water Surface	Custom	1	0	No	0	0
Medium Dense/Dense Sand & Silty Sand		20	Mohr-Coulomb	10	34		Water Surface	Custom	1	0	No	0	0
Embankment Fill		18	Mohr-Coulomb	5	35		Water Surface	Custom	1	0	No	0	0
Material 6		20	Mohr-Coulomb	1	35		Water Surface	Custom	1	0	No	0	0

Support Name	Color	Type	Force Application	Material Dependent	Adhesion (kPa)	Friction Angle (deg)	Shear Strength Model	Force Orientation	Anchorage	Strip Coverage (%)	Tensile Strength (kN/m)
Geogrid		GeoTextile	Active (Method A)	No	5	20	Linear	Bisector of Parallel and Tangent	Slope Face	100	45

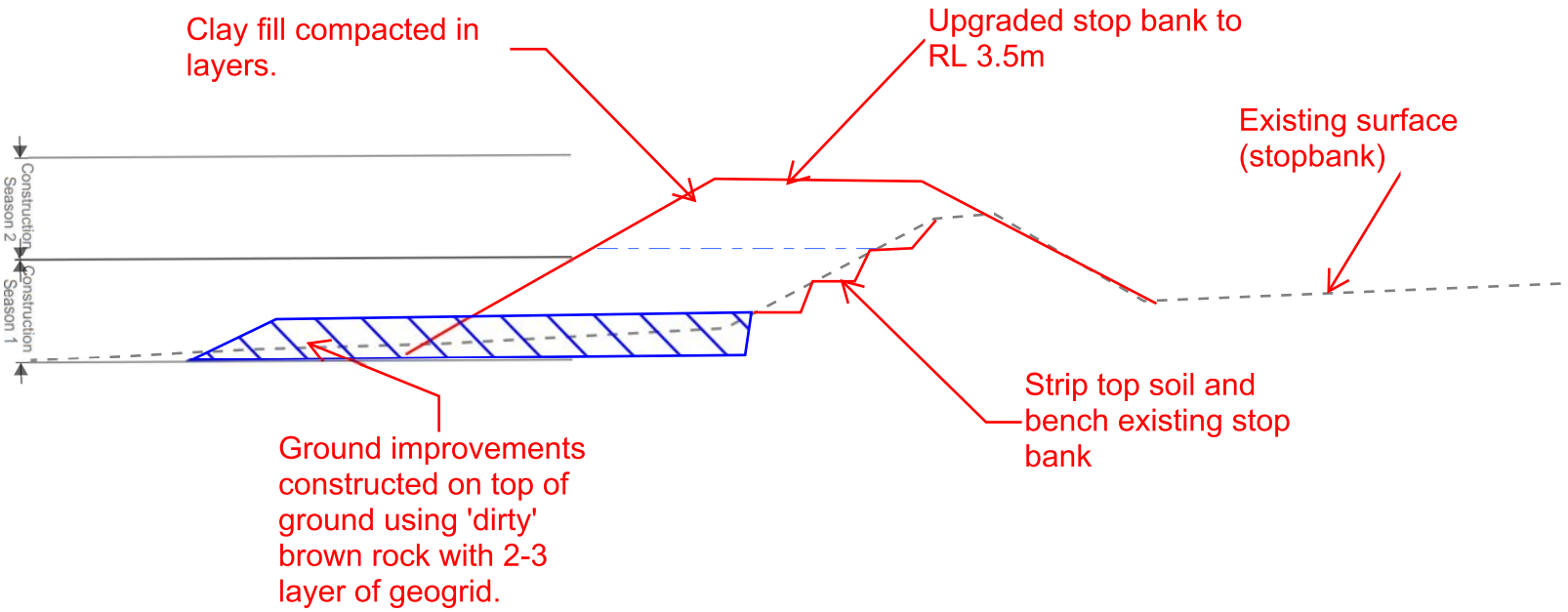
OPUS

SLIDEINTERPRET 7.023

Project	Bowergate Farm		
Analysis Description	Static conditions - Long term - New Stop Bank with ground improvement		
Drawn By	SR	*Scale* 1:200	*Company* WSP - Opus International Consultants
Date	02/02/2018, 3:59:23 PM		*File Name* Static Conditions-drained- with GI.slim

Appendix D – Schemes of Options

Figure 5 - Existing Stop Bank Upgrade



Notes:
Design shall take into consideration the source material for filling and ground improvements. Preference for clay fill shall for low density to minimize load on the existing ground

Permeability of source material for ground improvement layer shall be checked and stabilized if required

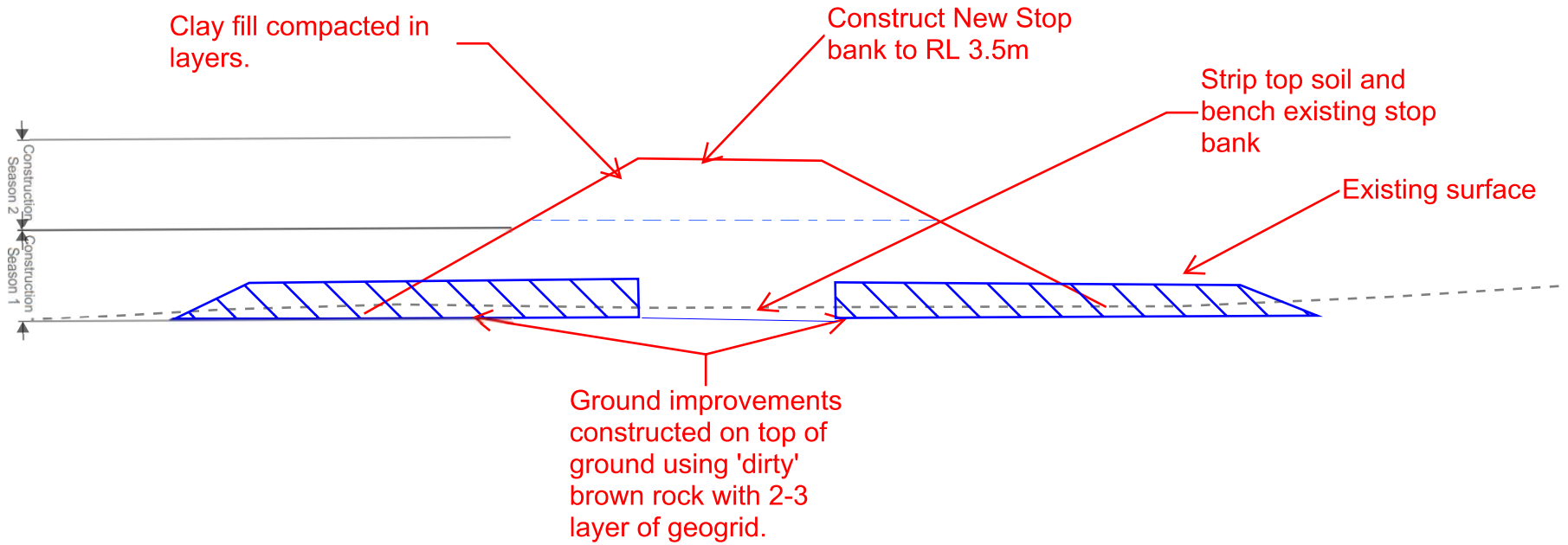
Design shall consider construction sequencing and site access.

The existing ground is extremely sensitive and care shall be taken to minimize ground disturbance during construction.

Involvement of the a Contractor during detailed design would be prudent to minimse the construction risk for KDC

Upgrade Existing Stop Bank Scheme

Figure 6 - New Stop Bank Construction



Notes:

Design shall take into consideration the source material for filling and ground improvements. Preference for

Permeability of source material for ground improvement layer shall be checked and stabilized if required

Design shall consider construction sequencing and site access.

The existing ground is extremely sensitive and care shall be taken to minimize ground disturbance during cons

Involvement of the a Contractor during detailed design would be prudent to minimise the construction risk for

New Stop Bank Scheme

ddmmyy in full

Name
Address
Address
Address and postcode

Dear name

Raupo Stopbank Reinstatement

This letter is seeking your feedback on a stopbank issue that requires resolution. The situation has resulted in the Drainage Committee and Council having a different view to the directly affected landowners. We have resolved that a key input into making the final decision will be feedback from the affected community, being Ruawai.

Background

The Raupo drainage scheme is overseen by a committee of locals; Ian Beattie (Chair), David Hart, Brian Madsen, Ross McKinley, Ken Whitehead, Greg Gent, Councillor Anna Curnow and Mayor Dr Jason Smith.

The Committee works with Council Engineers, on a voluntary basis, to keep our drainage scheme operating at the level it does. This structure has been in place for many years. Landowners collectively in the district pay a targeted rate of $349,000 annually which is solely used for the maintenance and capital works associated with drainage. The Committee has a modest contingency fund which is there for unforeseen expenses.

The capital works programme both recently and into the future is dominated by floodgate renewals as all floodgates are at a similar age and are showing signs of potential failure. Each renewal costs around $120,000 to replace.

A past owner of the land under consideration removed a portion of the stopbank and constructed a new bank that encircled a part of their property that had sat outside of the stopbank and therefore the drainage district. We can find no evidence that this activity had formal approval. The farm has since sold.

Current situation

An engineer's report has identified that the section of stopbank (as identified above) that was moved is far below the standard needed to provide adequate flood protection of Ruawai. The Committee has now

put a "peg in the sand" and prefers the agreed solution to be implemented. The risk to Ruawai is simply too great for this matter to be left to continue.

Cost implications

There are two options to remedy this:

- Option 1 – Reinstatement of the stopbank to its original condition and position. The cost of this to be around $750,000.
- Option 2 – Improve the stopbank that was created by the landowner that reclaimed the land. That will cost in the vicinity of $1,600,000.

Reinstating the original stopbank would mean Council would cease collecting land drainage rates on 19.8 hectares of land which would then sit outside of the Raupo Drainage District. This land would have limited flood protection from the existing (moved) stopbank which we are not suggesting we would dismantle and would be the landowner's responsibility from thereon.

Committee's and Council's preferred option

Option 1: To reinstate the historic stopbank at an approximate cost of $750,000 to all Raupo Drainage District ratepayers. This is the most cost-effective option, it does not set a precedent (there is other Ruawai land outside of the main stopbank) and restores an appropriate level of flood protection, this would see an increase in the Raupo Drainage targeted rate of between 15% - 21% per annum over 20 years.

The rates impact of option 2, would see an increase in the Raupo drainage rate of 34% - 45% per annum over 20 years.

As part of informing the final decision, we are encouraging you to let us know your views. This can be done by contacting myself, a Committee member, by email to council@kaipara.govt.nz or by telephone to Shelley Paniora on 09 439 3225 before 4.00pm Friday 20 October 2017.

Yours faithfully

Curt Martin
Acting Chief Executive

Closure

Kaipara District Council

Dargaville