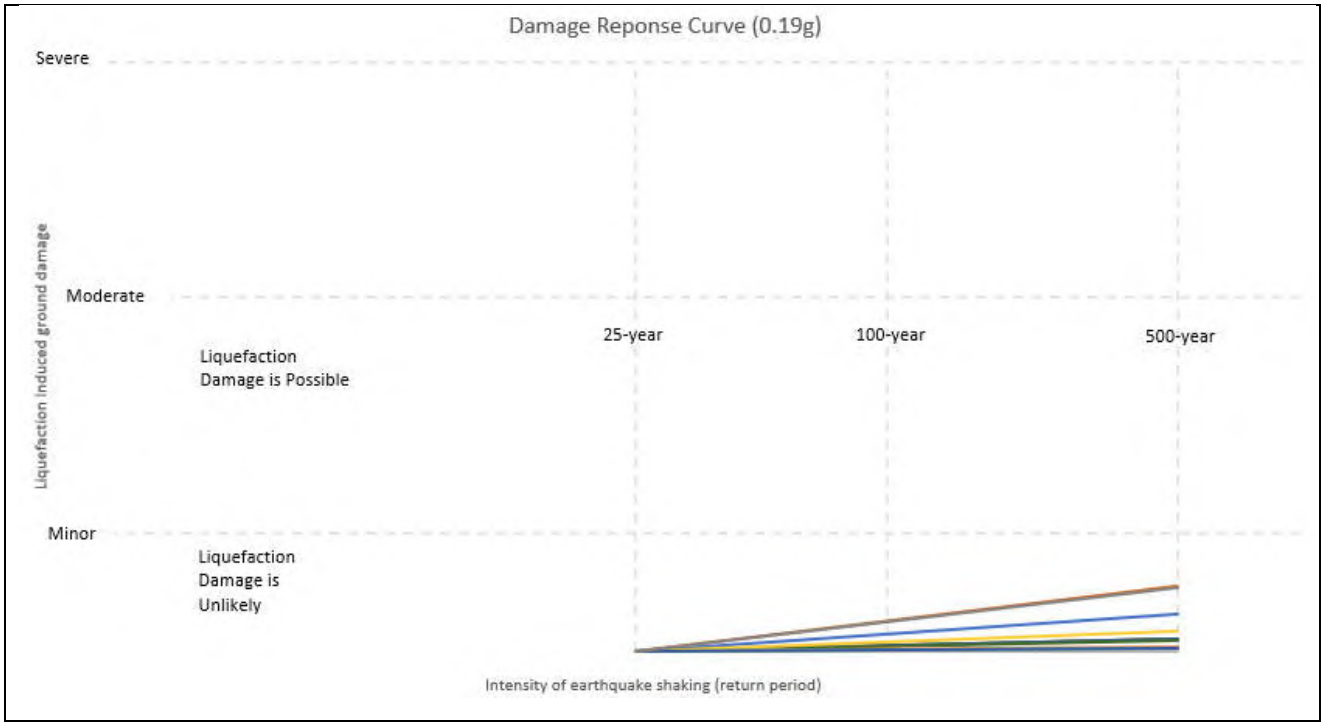
Table 5 - Summary of results

Test data	Liquefiable Zone (mbgl) – 0.13g, Mw 5.8	Estimated total vertical free field settlement (mm) – ULS^	Liquefaction Severity Number (LSN) – ULS^*	Liquefaction Potential Index
CPT01	n/a	<5 (11)	<1 (3)	Low Risk
CPT02	n/a	<5	<1	Low Risk
CPT03	n/a	<5	<1 (1)	Low Risk
CPT04	n/a	<5	<1 (1)	Low Risk
CPT05	9.0 – 10.0	15 (53)	<1 (1)	Low Risk
CPT06	n/a	<5	<1	Low Risk
CPT07	n/a	<5	<1	Low Risk
CPT08	n/a	<5	<1	Low Risk
CPT09	n/a	<5	<1	Low Risk
CPT10	n/a	<5	<1 (1.8)	Low Risk
CPT11	n/a	<5	<1	Low Risk
CPT12	n/a	<5	<1	Low Risk
CPT13	10.0-10.5	17 (68)	1.1 (5.6)	Low Risk
CPT14	4.0-4.2 9.0-9.5	20 (57)	1.4 (5.4)	Low Risk
CPT01WM	n/a	<5	<1 (1.5)	Low Risk
CPT02WM	n/a	<5	<1 (2.6)	Low Risk
CPT03WM	n/a	<5	<1 (4.0)	Low Risk
CPT04WM	n/a	<5	<1	Low Risk
CPT05WM	6.0-6.5	<5 (10)	<1 (4.3)	Low Risk
CPT06WM	n/a	<5	<1 (2.5)	Low Risk
CPT07WM	5.1-5.8	7 (15)	1.1 (2.3)	Low Risk
CPT08WM	6.2-6.4	7 (35)	1.7 (9.7)	Low Risk

^ Values given in parenthesis represent PGA = 0.19g, Mw = 6.5. (Only changes in behaviour are recorded)

* Values less than 10 indicate 'Little to no expression of liquefaction'



Based on our assessment we consider liquefaction induced ground damage is less than minor and liquefaction damage is unlikely based on 'Planning and engineering guidance for potentially liquefaction-prone land, MBIE, September 2017). Based on the assessment, we consider the effects from excess pore pressure and liquefaction to be between insignificant (L0) to moderate (L2) in accordance with Table 5.1 (Module 3), with relatively small differential settlements across the site due to limited excess pore water pressures. The free field settlement within the paleochannel is higher than the remainder of the site for the lower bound PGA = 0.19 g case and the structural designer should consider the ground deformation to ensure the structure can tolerate deflection under the design earthquake limit state.

4.8.1 *Other Considerations*

Cyclic softening is another seismically induced phenomenon that may occur at the site considering the underlying soft to firm cohesive alluvial silts and clays. An assessment of cyclic softening triggering was undertaken by Haigh Workman using the CPT data and the methods presented by Idriss and Boulanger (2008), with the magnitude scaling factor (MSF) adjusted accordingly for the fine-grained soils.

Based on the results, thin lenses of soil are expected to exhibit cycling softening under the lower bound ULS earthquake event (0.19 g, Mw = 6.5). The thin lenses that exhibit cyclic softening will result in some minor settlement but not have an adverse effect on the building or the overall bearing capacity of the site, refer Figure 4.

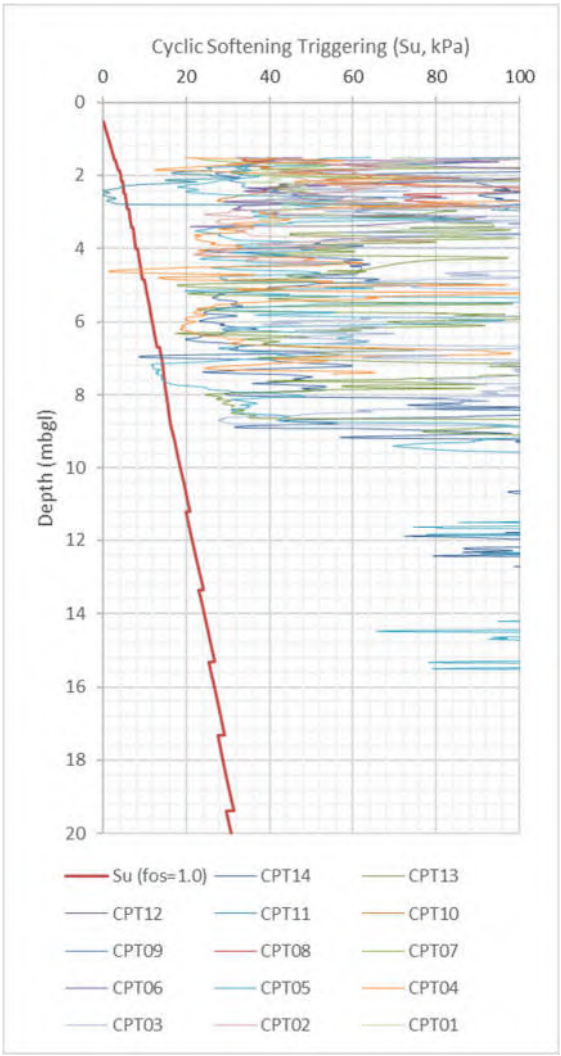


Figure 4 - Cyclic softening triggering

5 Foundation Recommendations

5.1 General

Concept drawings prepared by Peter Swan Limited indicates a single storey warehouse with approximately 6000 m^2 floor area with dry storage, chiller, and cold storage areas (Option B). A drive-through canopy is shown on the western side of the building, with a sealed heavy vehicle accessway around the Lots and concrete yards. The land surrounding the warehouse will comprise a sealed off yard for carparking and heavy vehicle manoeuvring, with a specific area for wastewater disposal. A uniformly distributed floor slab loading of 20 kPa has been provided by the Client.

Based on the need to raise the building platform out of the flood hazard and the resultant settlement, particularly across the paleochannel area, we consider shallow foundations are more appropriate for this site due to potential down drag on the piles from the filling, and gaps forming beneath slab due to consolidation settlement occurring over a long time, e.g., a fully suspended floor slab will be required.

5.2 Shallow Foundations

The subsoils comprised fine-grained alluvial soils, moderately susceptible to seasonal shrink-swell behaviour. The site is located within/near a flood hazard zone and minor earthworks are required to raise to provide an FFL of 78.9 mRL. Consolidation settlement has been analysed based slab on grade construction with a uniformly distributed load of 20 kPa and raising the site prior to building. Based on the ground conditions, we consider concrete slab on grade foundations will be appropriate provided the site is subject to a monitored settlement preload.

If a raft foundation type is adopted, we recommend that the upper 300 mm across the site is removed and reinstated with granular hardfill, with a geotextile and geogrid (minimum 40 kN) placed at the interface of the soil and granular hardfill.

For conventional spread foundation design, we recommend embedment for spread footings be 600 mm below finished ground level. The soils are variable across the site and adopting conventional spread foundations may encounter unsuitable ground conditions and high groundwater level. We recommend the following maximum dimensions to support concentrated loads, with an ultimate bearing capacity of 200 kPa (geotechnical strength reduction factor of 0.5 for limit state design) available upon completion of the settlement preload:

- Pad Foundations = 1200 x 1200 mm
- Continuous strip footing width = 600 mm

Larger foundation area can be adopted to spread the load. However, this will result in the pressure bulb deepening, reducing the ultimate bearing capacity and will require a detailed settlement analysis to predict settlement under the given loading scenario. The parameters given in Table 3 and Figure 3 can be adopted for settlement analyses.

A preliminary consolidation settlement assessment has been undertaken based on the proposed building layout, assuming a permanent uniformly distributed load of 20 kPa across the building plan area. Based on the required filling and a 20 kPa uniformly distributed load, 150 mm differential settlement across the building is anticipated without preloading the site. The differential settlement can be mitigated if filling is undertaken in advance (minimum 6 months and subject to an additional surcharge being applied). The settlement predictions are subject to change based on building and floor loadings, and the required final level of the site due to flood hazard. A settlement preload design will be required once the final building layout has been determined.

Confirmation of the stripped subgrade is recommended prior to preparing foundations to ensure all unsuitable material, e.g., topsoil or non-certified fill, has been removed. Where filling is required, compaction testing will be required to confirm the hardfill has been compacted to an engineered standard.

- Ultimate bearing capacity of 200kPa (based on the limiting foundation sizes as detailed within Section 5.2 and settlement preload being undertaken in advance).
- Geotechnical strength reduction factor – 0.5.
- Soil expansivity class – Site Class M (moderately reactive soils).
- Seismic class – Site Class D (deep or soft soil site).

Bearing capacity values included in this report are for vertical loads only and do not consider horizontal shear or moment.

Where foundation excavations expose soft/weak or otherwise unsuitable ground these materials should be undercut and replaced with GAP40 compacted to an engineered standard.

6 Construction

6.1 Earthworks Operation and Compaction Control

We have not yet been supplied with any drawings showing the likely scope of earthworks associated with the development, however, given the size of the warehouse building (proposed and future) and the large canopy, we anticipate that earthworks will be required to create a level building platform and to raise the site above the flood level, we have assumed approximately 800 mm for our assessments. Prior to the placement of any filling, it will be necessary to strip all topsoil.

All filling across the site should be done at the same time, including the future warehouses along the southern boundary of the Lot. A typical construction sequence is as follows:

- Strip the site of topsoil – [Subgrade check by Geotechnical Engineer]
- Geotextile – BIDIM A39 across the subgrade prior to filling (install min. 40 kN geogrid, e.g., CombiGrid®)
- Settlement monitoring pins to be added across the building platform.
- Import fill and start running in layer (200 mm loose for granular fill). Building platforms to be done first and overfilled a minimum 2.0 m from all edges of building. Fill up to FFL level.
- Surcharge the building platforms with fill to replicate the proposed building loads and other additional surcharge required to speed up the settlement i.e., decrease the time for settlement to occur. Settlement to be monitored. [Subject to settlement preload design and reporting]

- Once approved by the Engineer, surcharge fill can be removed and spread over other areas of the site to achieve the desired levels.

6.2 Earthworks

6.2.1 *Subgrade Preparation*

Due to the soil sensitivity at the site, site concrete or gravel surface protection is recommended under all perimeter or pad footings to provide a suitable working base when preparing foundations, this is particularly important if preparing foundations in wet weather or during winter, or during summer where exposure to the sun and heat will result in the soils becoming desiccated. Slab preparation should also be protected by granular

6.2.2 *Filling*

The site can be raised with granular fill, subject to approval by the Engineer and preload monitoring. Our recommended control criteria are as follows:

Table 6 - Maximum dry density for granular fill

	Dy Density Percentage of N.Z. Standard Compaction Test	Water Content Allow variations from Optimum
GAP65/GAP40	95%	6% to 8%

Table 7 - Clegg Impact Value (CIV) testing on granular fill

Clegg Impact Value – 4.5kg Clegg	
Average value	25
Maximum single value	20

Note: Average value shall be determined over ten consecutive tests.

Table 8 - Proof roll testing on granular hardfill

Proof rolling observations	
Target elastic settlement beneath a fully loaded six-wheel truck or 10 tonne smooth drum roller	<5 mm

All filling shall be compacted in thin layers, approximately 200 mm loose, with compaction testing completed at every second layer by a CPEng (Geotechnical).

6.2.3 *Groundwater Control*

Groundwater level across the site is shallow and service installation will need to be aware of this during construction. The site will need to be built up as part of the site preparation and should be done well in advance of preparing the site for service installation. Where possible, all services should be installed during summer.

6.3 Subgrade Protection

We recommend that trafficking of the building platform and carparking areas are minimised and that subgrades are only trimmed to final levels immediately prior to covering with granular hardfill. The site should be shaped to avoid water ponding during rain, thereby limiting the need for additional undercutting and hard filling. Areas of trimmed subgrade shall not be left exposed to allow the ingress of water, nor should subgrade areas be trafficked prior to drying out after rain.

6.4 Stormwater Disposal

Stormwater from paved areas, roofs, driveways, and water storage tanks should be collected in sealed, flexible pipes and discharged in such a manner to not cause any instability or erosion. It is essential for the long-term stability of this site, that all storm water be piped away from any proposed building platform to avoid over saturation of the underlying natural soils.

Stormwater shall be piped away from any proposed building platform to avoid over saturation of the subsoils and to maintain stability across the site. All stormwater overflow drainages should be channelled away from the development platform and discharged in a controlled manner.

Uncontrolled stormwater discharges onto the ground surface can cause erosion and should not be permitted under any circumstances where stability could be compromised.

6.5 Services

At the time of writing, no known underground services cross beneath the proposed development area. Where it is intended for the installation of underground services, we recommend that all services are installed prior to foundation excavations and construction and that all services are designed to be outside the influence of foundation excavations. We recommend that any new services are accurately located on site and the depth to invert be determined prior to the commencement of foundation excavations.

6.6 Pavement Design

Scala penetrometer testing was undertaken across the site from the surface to determine an indicative CBR% for pavement design. Based on the in-situ test results, we recommend a design CBR of 2.0% should be adopted for concept pavement design purposes, with the inclusion of a geogrid and textile at the subgrade level. Localised soft zones are expected and will need to be undercut and removed during construction. Subsoil drainage is also recommended across the site due to the high groundwater level.

A minimum undrained shear strength of 50 kPa in the upper 1.0 m is required for pavement design. We recommend the pavement is reinforced with geogrid to confine the subbase material. A geotextile (BIDIM A29 or equivalent) should be installed between subgrade and pavement to minimise the ingress of fines into the pavement during dynamic loading.

6.7 Geotechnical Review

Haigh Workman Limited have only been provided with concept design drawings for the site. We therefore would like to be given the opportunity of reviewing the final civil and structural drawings for this development prior to Building Consent application to ensure that our recommendations relating to site works and foundation design have been interpreted as intended. Our involvement in the detailed design process is recommended.

6.8 Construction Observations

We consider the following specific items will need to be observed at the time of construction to ensure the foundation soils are consistent with the assumptions made in this geotechnical report:

1. Geotechnical drawing review to confirm the foundation design is as per the geotechnical recommendations.
2. Observe subgrade exposure prior to covering with hardfill protection.
3. Observe fill placement and confirmation fill has been placed to an engineered standard.
4. Review settlement monitoring results. Engineer to confirm removal of surcharge.
5. Observe all foundation excavations and exposure of foundation soils.
6. Observe pavement construction and testing at regular intervals.

Provision should be allowed for modifying the foundation solution at this time should unforeseen ground conditions be encountered.

7 Limitations

This report has been prepared for the use of Peter Swan Limited with respect to the brief outlined to us. This report is to be used by our Client and their Consultants and may be relied upon when considering geotechnical advice. Furthermore, this report may be utilised in the preparation of building and/or resource consent applications with local authorities. The information and opinions contained within this report shall not be used in other context for any other purpose without prior review and agreement by Haigh Workman Ltd.

The recommendations given in this report are based on site data from discrete locations. Inferences about the subsoil conditions away from the test locations have been made but cannot be guaranteed. We have inferred an appropriate geotechnical model that can be applied for our analyses. However, variations in ground conditions from those described in this report could exist across the site. Should conditions encountered differ

to those outlined in this report we ask that we be given the opportunity to review the continued applicability of our recommendations.

Appendix A – Drawings

Drawing No.	Title
22 189/G01	Site Investigation Plan
22 189/G02	Geological Section A-A
22 189/G03	Geological Section B-B and C-C

NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

KAHIKATEAROA LANE EXTENSION

SP01 SP02 SP03 SP04 SP05 SP06 SP07 SP08 SP09 SP10 SP11 SP12 SP13 SP14 SP15 SP16 SP17 SP18 SP19

CPT01 [8.11m] CPT02 [2.63m] CPT03 [2.59m] CPT04 [2.76m] CPT05 [6.63m] CPT06 [2.58m] CPT07 [6.49m] CPT08 [7.27m]

CPT01 [4.66m] CPT02 [4.07m] CPT03 [8.37m] CPT04 [6.95m] CPT05 [20.51m] CPT06 [2.95m] CPT07 [1.87m] CPT08 [2.72m] CPT09 [2.47m] CPT10 [2.95m] CPT11 [2.51m] CPT12 [2.13m] CPT13 [12.95m] CPT14 [12.58m]

LOT 6 — Lot 6 DP 567982 — 0.3799 Ha

LOT 7

LOT 8 — LOT 8 DP 567982 — 0.4047 Ha

OFFICE

DRIVE THOUGH CAMOPY 1,100m²

CANOPY

COLDSTORE

18000 CANOPY

3000 SETBACK

8000

PALEOCHANNEL

BDY 54000 - 89°20'00"

BDY 50520 - 89°20'00"

BDY 4940 - 89°40'00"

BDY 7990 - 1°35'40"

BDY 70410 - 181°34'30"

BDY 66180 - 181°35'00"

BDY 62400 - 1°35'40"

BDY 54180 - 89°20'00"

BDY 57170 - 89°20'00"

BDY 16870 - 89°20'00"

BDY 6610 - 89°20'00"

BDY 34040 - 89°20'00"

Issue	Date	Revision
A	11/01/2023	FIRST ISSUE

DWG: SITE LOCATION PLAN

Scale 1:500 @A3 | Date JAN 2023

Drawn WT | Checked JP | Approved JP

File C:\USERS\WAYNETHORBURN\HAIGH WORKMAN LIMITED\SUITEFILES - PETER SWAN LIMITED\JOBS\22 189 - KAHIKATEAROA LANE WAIPAPA (LOT 1 DP 178287)\ENGINEERING\DRAWINGS\22 189_GEOTECHNICAL DRAWINGS.DWG

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Project: PROPOSED WAREHOUSE BIDFOODS
LOTS 6 - 8, KAHIKATEAROA LANE

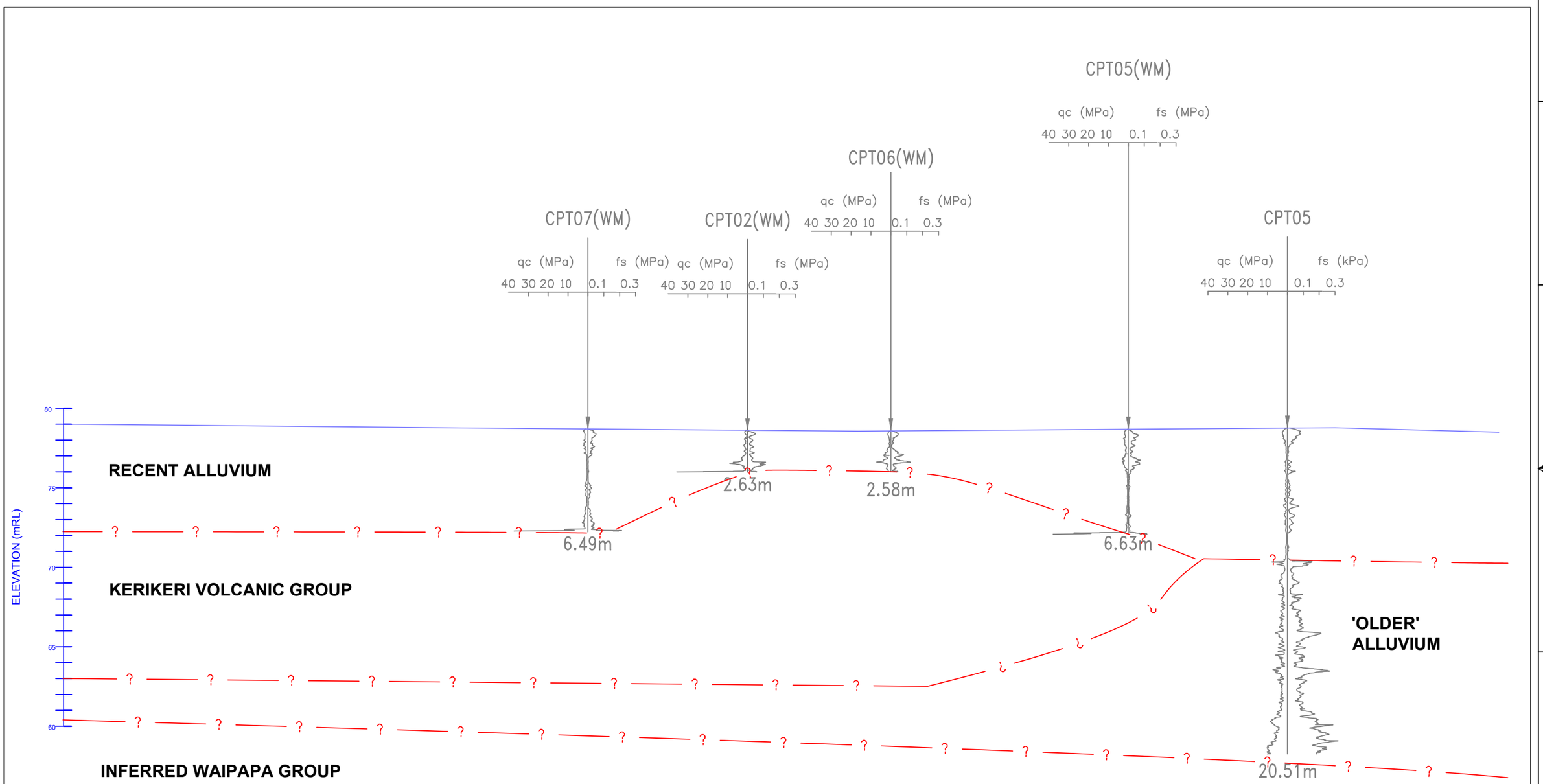
Client: PETER SWAN LTD

Project No. 22 189 | RC no. N/A

DWG No. G01

Sheet No. 1 of 3

Plotted By Wayne Thorburn at 19/01/2023 3:15:31 pm



SECTION A-A

Issue	Date	Revision
A	11/01/2023	FIRST ISSUE

DWG: GEOLOGICAL SECTION A-A

Scale 1:250 @A3 | Date JAN 2023 | Drawn WT | Checked JP | Approved JP

File C:\USERS\WAYNETHORBURN\HAIGH WORKMAN LIMITED\SUITEFILES - PETER SWAN LIMITED\JOBS\22 189 - KAHIKATEAROA LANE WAIPAPA (LOT 1 DP 178287)\ENGINEERING\DRAWINGS\22 189_GEOTECHNICAL DRAWINGS.DWG

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Project: PROPOSED WAREHOUSE BIDFOODS
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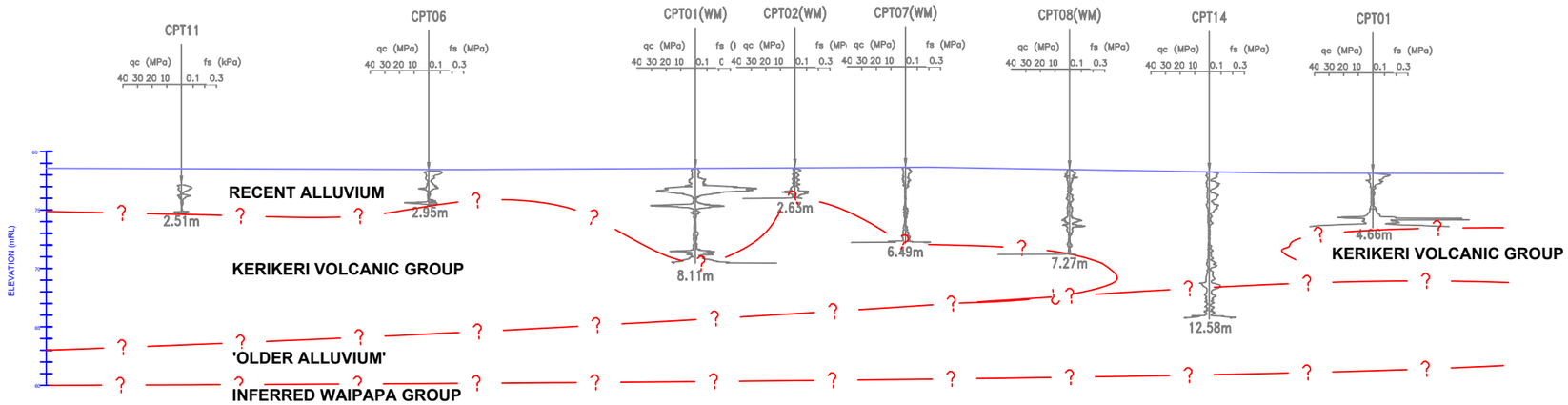
Client: PETER SWAN LTD

Project No. 22 189 | RC no. N/A

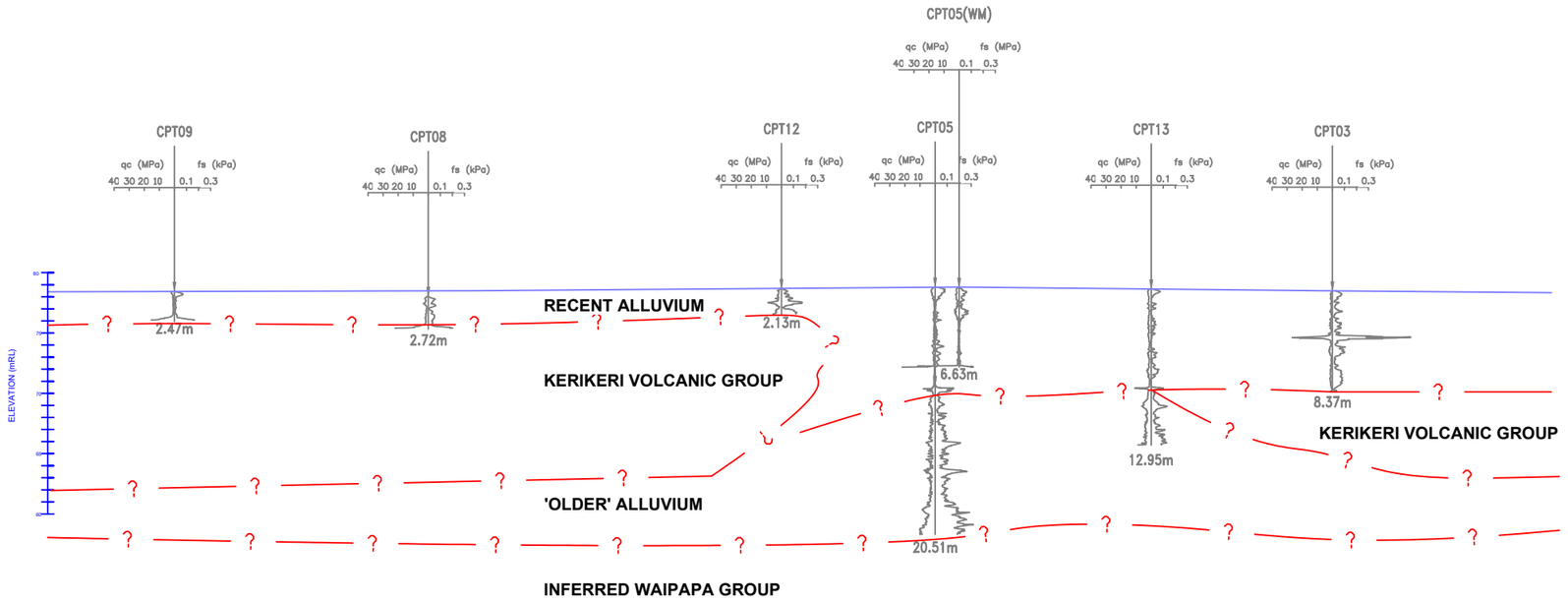
DWG No. G02

Sheet No. 2 of 3

Plotted By Wayne Thorburn at 19/01/2023 3:15:34 pm



SECTION B-B



SECTION C-C

Issue	Date	Revision
A	11/01/2023	FIRST ISSUE

DWG: GEOLOGICAL SECTION B-B & C-C

Scale 1:500 @A3 | Date JAN 2023 | Drawn WT | Checked JP | Approved JP

File C:\USERS\WAYNE.THORBURN\HAIGH WORKMAN LIMITED\SUITEFILES - PETER SWAN LIMITED\22 189 - KAHIKATEAROA LANE WAIPAPA (LOT 1 DP 178287)\ENGINEERING\DRAWINGS\22 189_GEOTECHNICAL DRAWINGS.DWG

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Client: PETER SWAN LTD

Project No. 22 189 | RC no. N/A

DWG No. G03

Sheet No. 3 of 3

Plotted By Wayne Thorburn at 19/01/2023 3:15:39 pm

Appendix B – Site Investigation Logs

CONE PENETRATION TEST (CPT) LOG

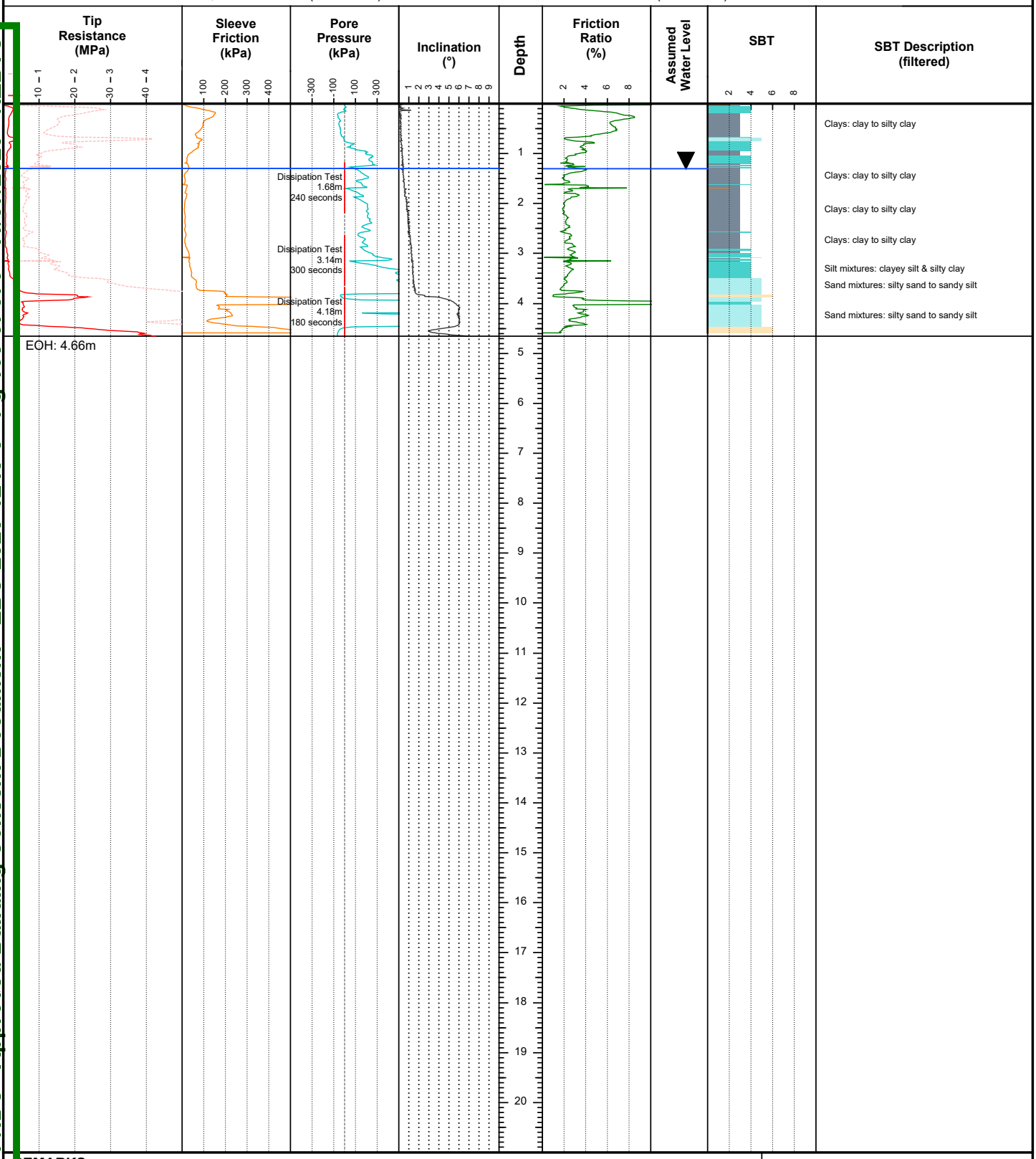
HOLE NO.: CPT01

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 19/12/2022

CO-ORDINATES: 1683461.00mE, 6103004.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 19/12/2022



REMARKS:

Groundwater measured at 1.3m

NOTES:

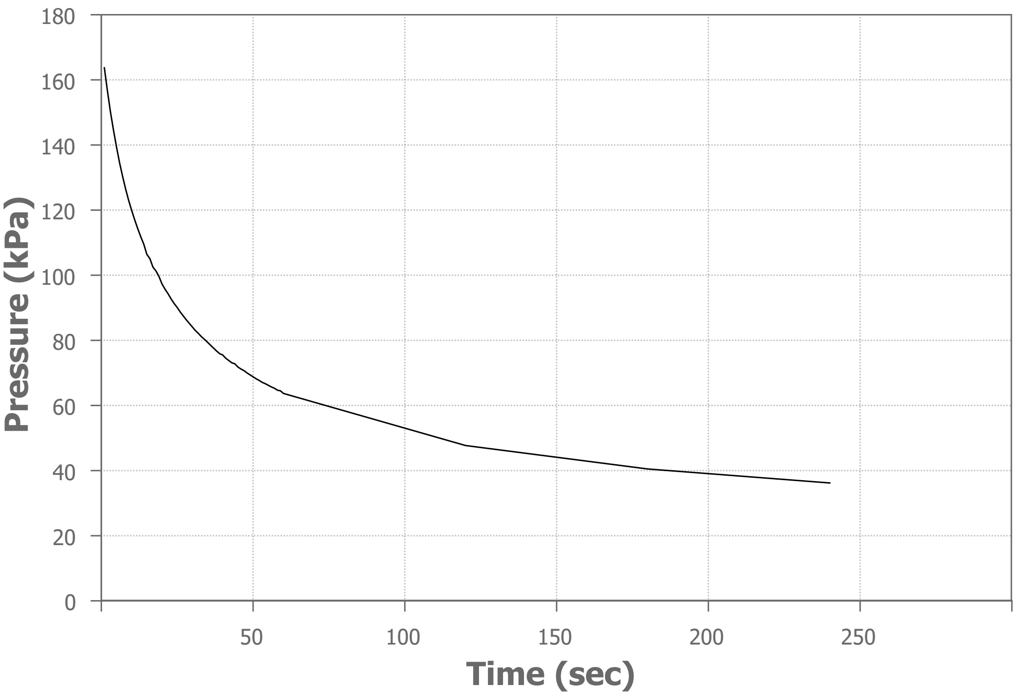
TEST DETAILS:

Cone Number	Mks953
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

DISSIPATION TESTS

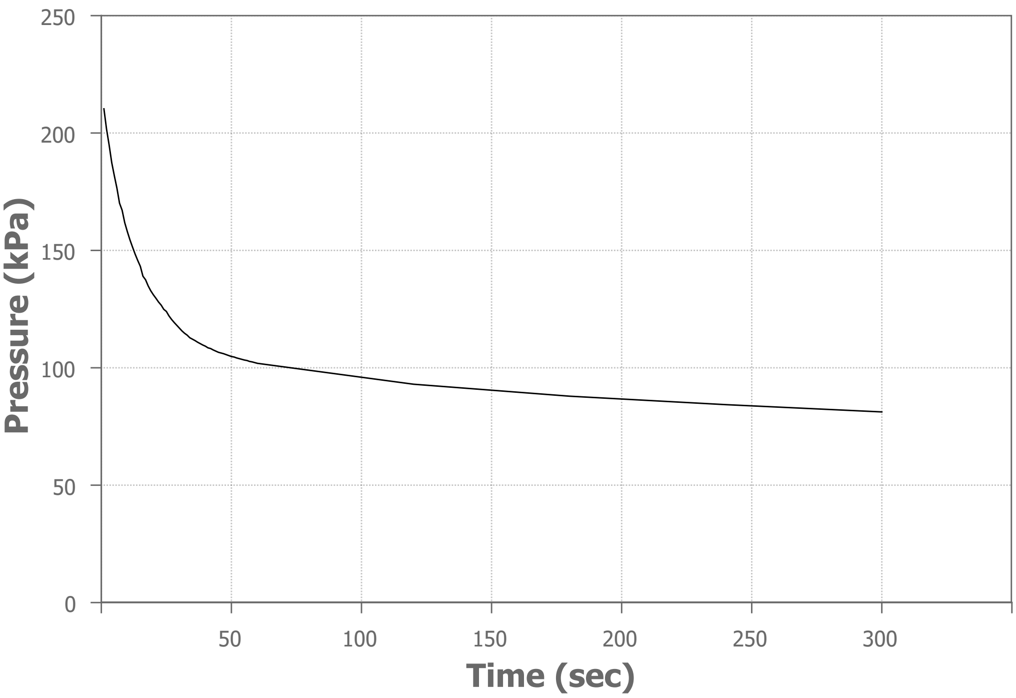
Test Depth: 1.68

240



Test Depth: 3.14

300



DISSIPATION TESTS

Test Depth: 4.18

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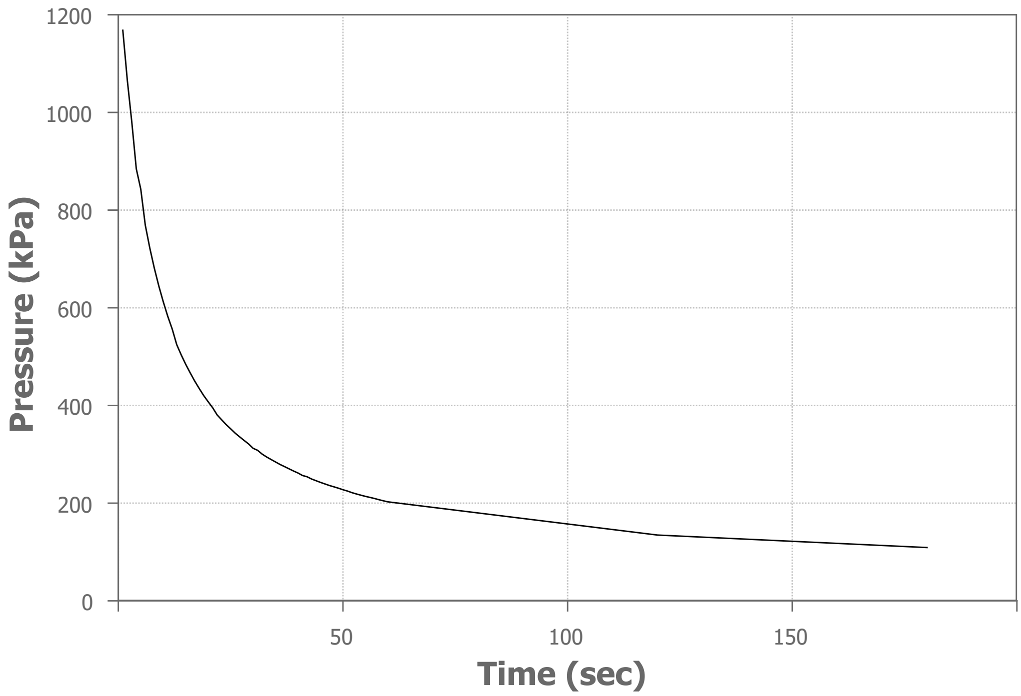


CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT02

CLIENT: Haigh Workman

PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa

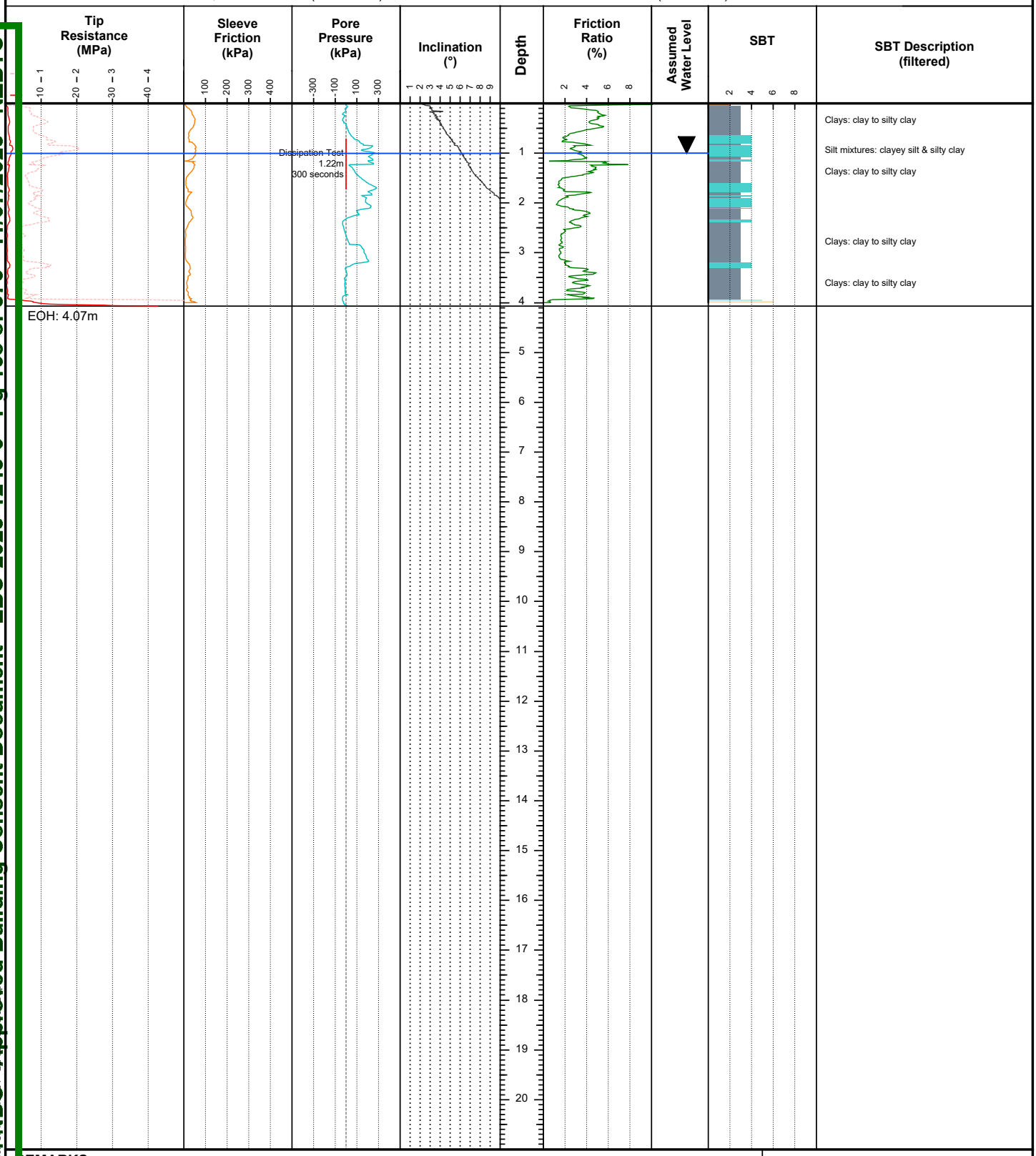
OPERATOR: CW

START DATE: 19/12/2022

CO-ORDINATES: 1683471.00mE, 6102975.00mN (NZTM2000)

ELEVATION: 78.5m (NZVD2016)

END DATE: 19/12/2022



REMARKS:

Groundwater measured at 1.0m

NOTES:

TEST DETAILS:

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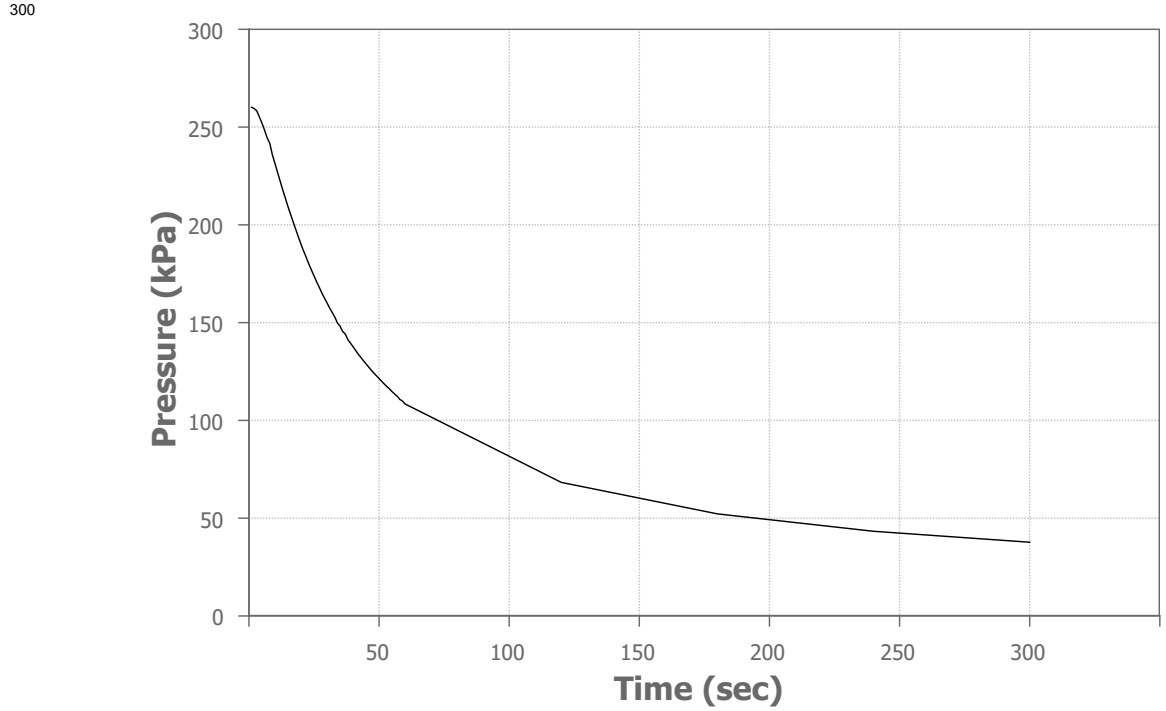
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

DISSIPATION TESTS

Test Depth: 1.22



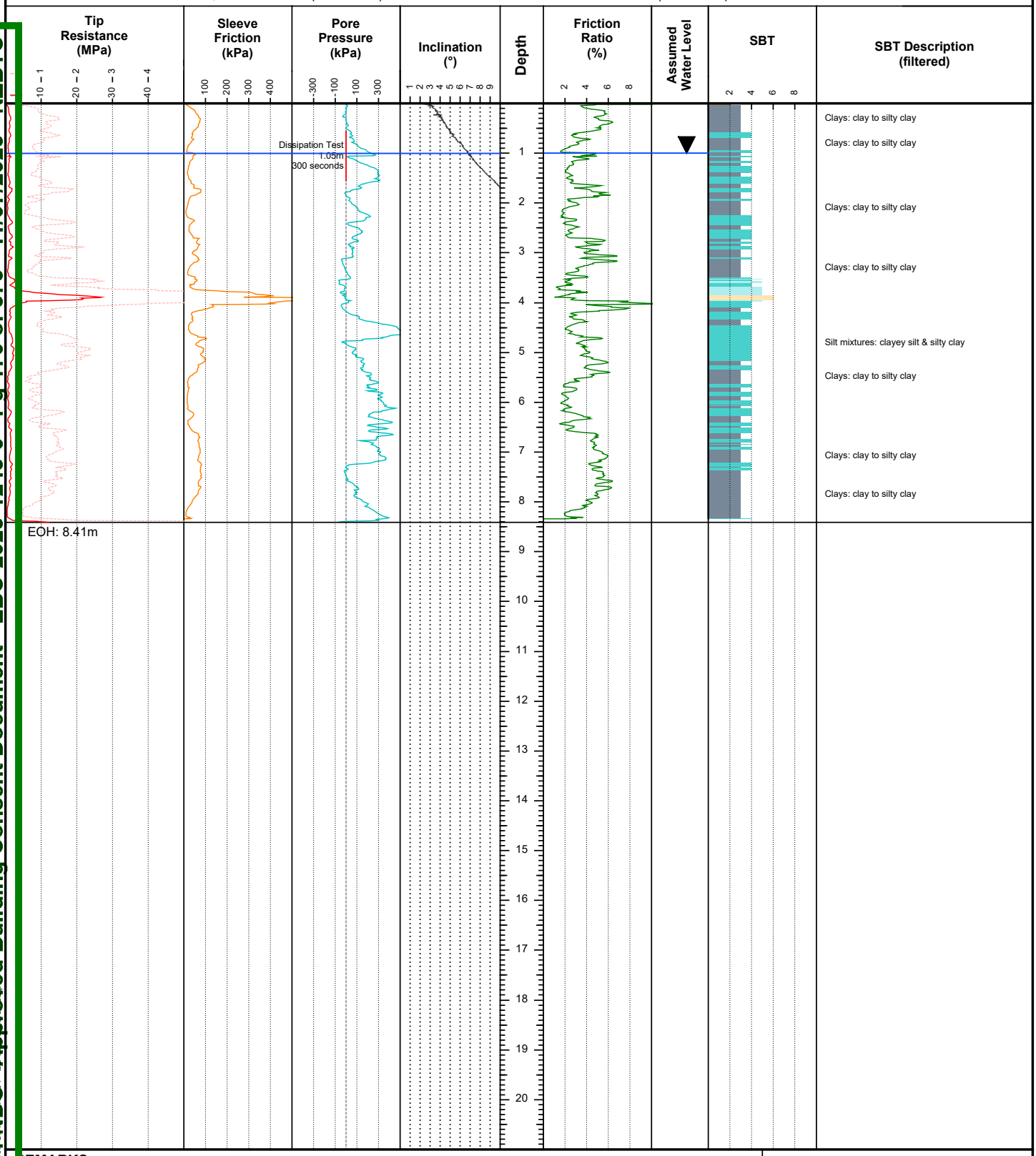
CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT03

CLIENT: Haigh Workman
PROJECT: CPT Testing
JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 19/12/2022

CO-ORDINATES: 1683454.00mE, 6102950.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 19/12/2022



REMARKS:

Groundwater measured at 1.0m

NOTES:

TEST DETAILS:

Cone Number	Mks953
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

DISSIPATION TESTS

Test Depth: 1.05

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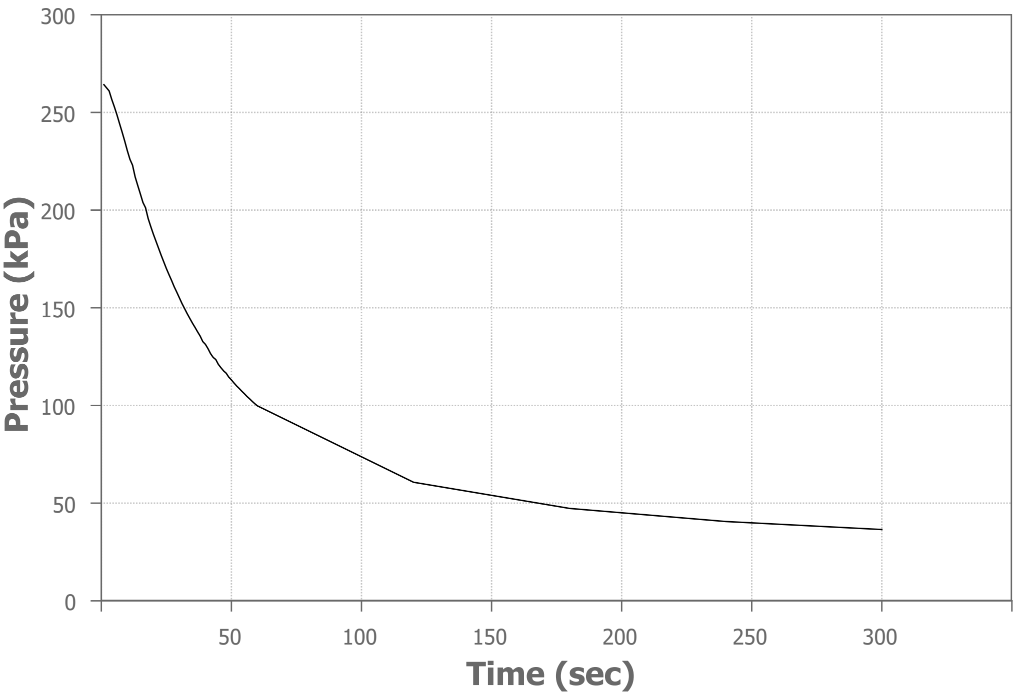


CONE PENETRATION TEST (CPT) LOG

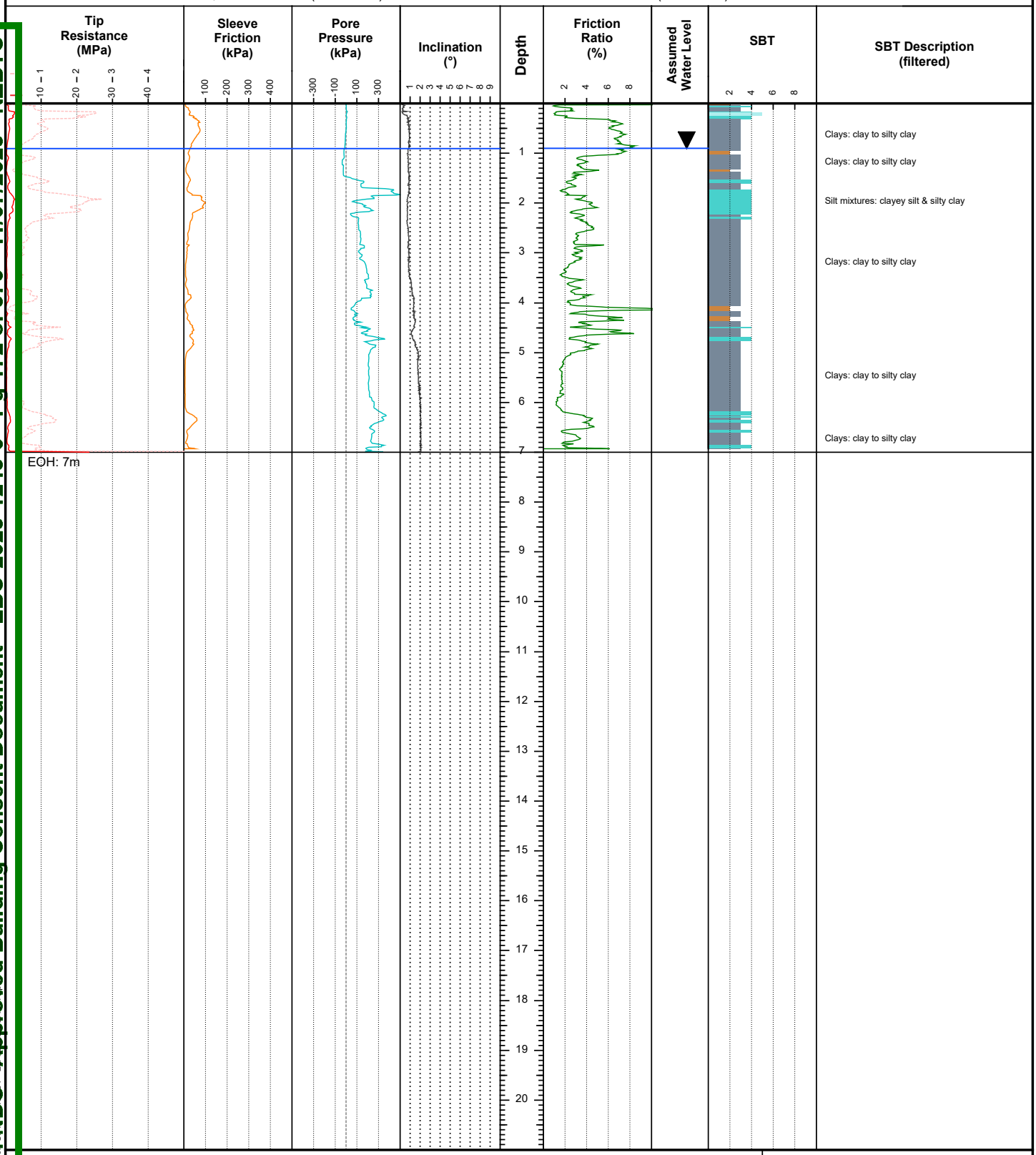
HOLE NO.: CPT04

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 19/12/2022

CO-ORDINATES: 1683446.00mE, 6102975.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 19/12/2022



REMARKS:

Groundwater measured at 0.9m

NOTES:

TEST DETAILS:

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Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

CONE PENETRATION TEST (CPT) LOG

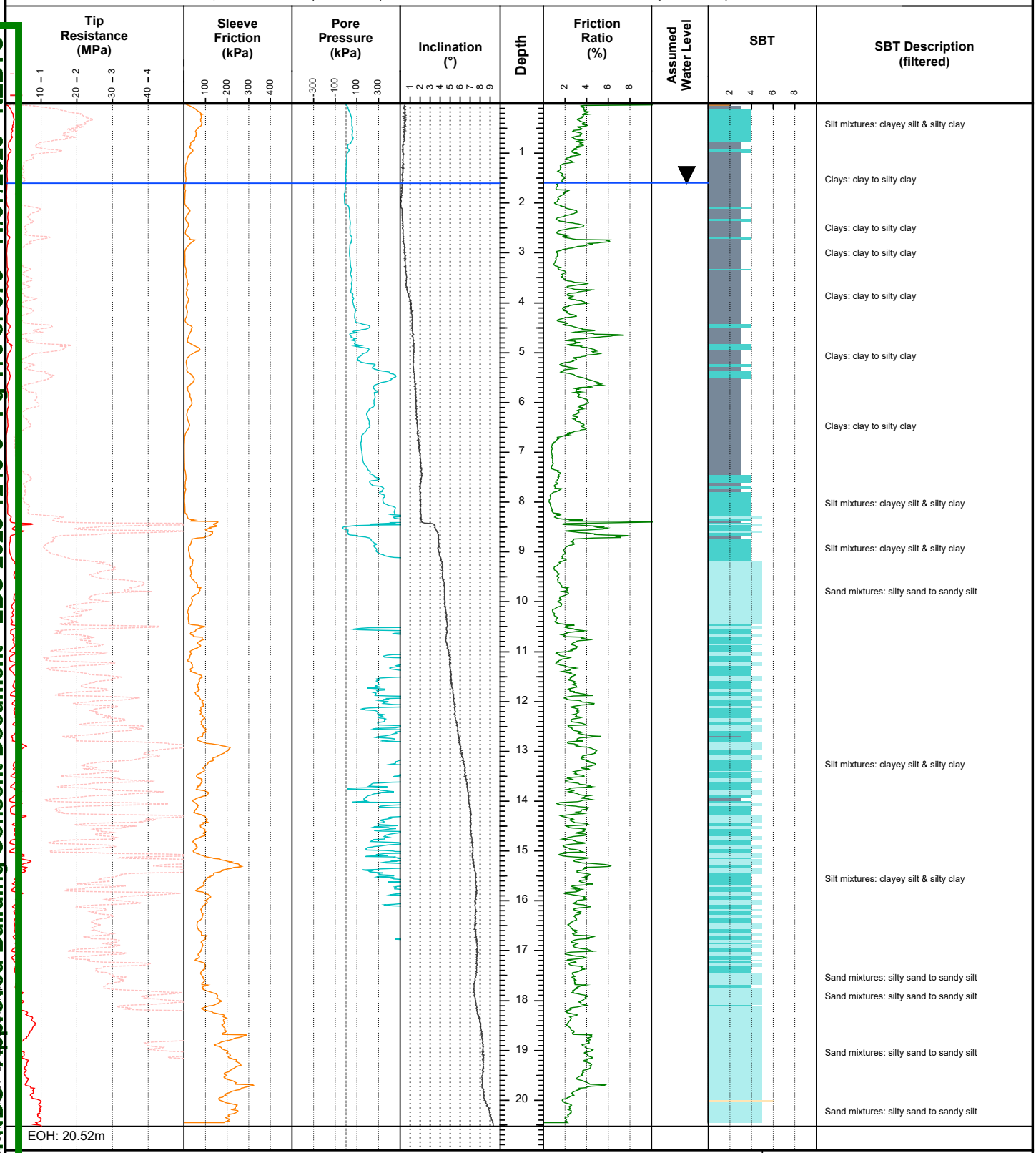
HOLE NO.: CPT05

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 19/12/2022

CO-ORDINATES: 1683420.00mE, 6102954.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 19/12/2022



REMARKS:

Groundwater measured at 1.6m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	u2 refusal

CONE PENETRATION TEST (CPT) LOG

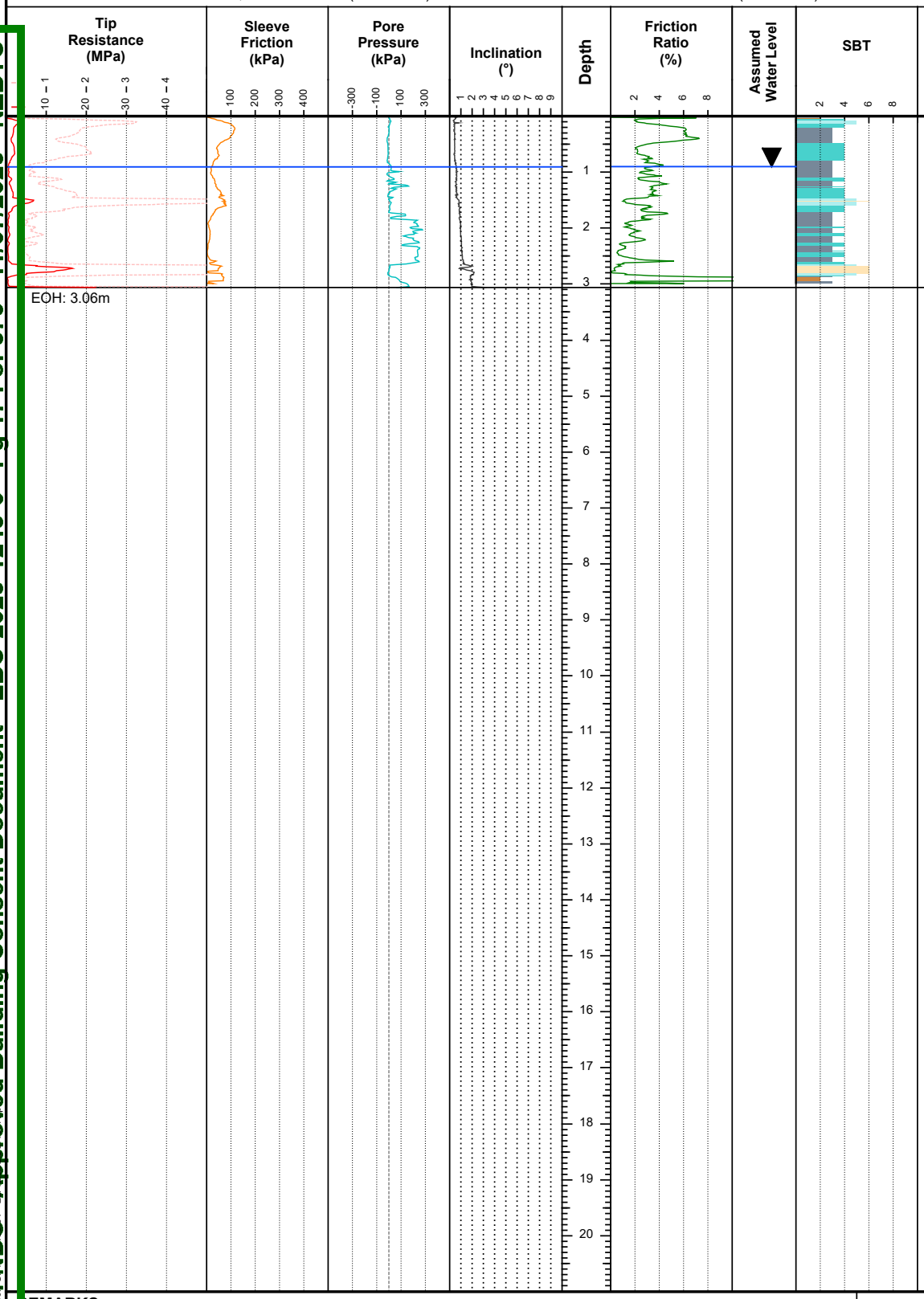
HOLE NO.: CPT06

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683379.00mE, 6103005.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 0.9m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT07

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683383.00mE, 6102980.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022

REMARKS:

Groundwater measured at 0.7m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

CONE PENETRATION TEST (CPT) LOG

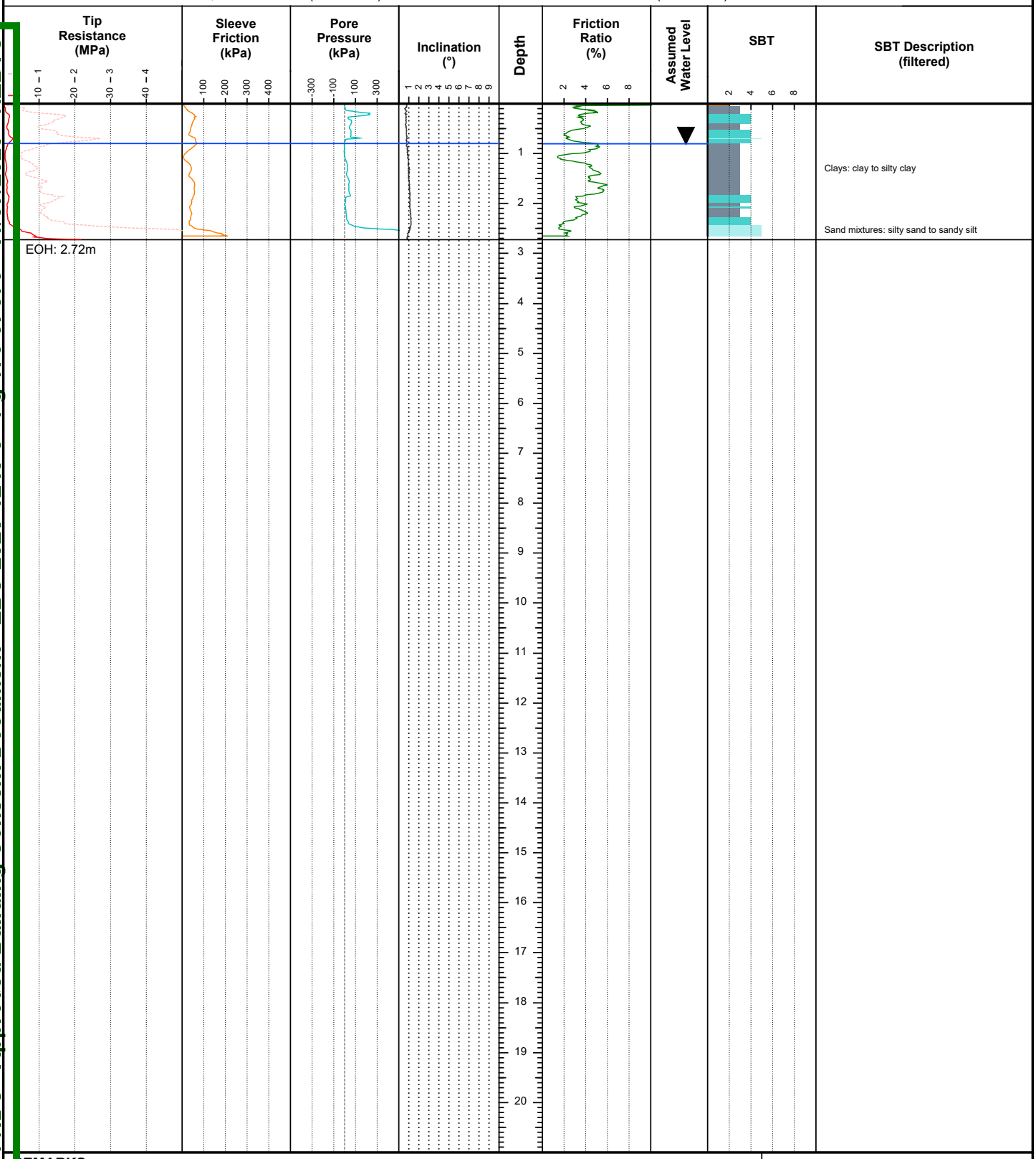
HOLE NO.: CPT08

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683378.00mE, 6102950.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 0.8m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

CONE PENETRATION TEST (CPT) LOG

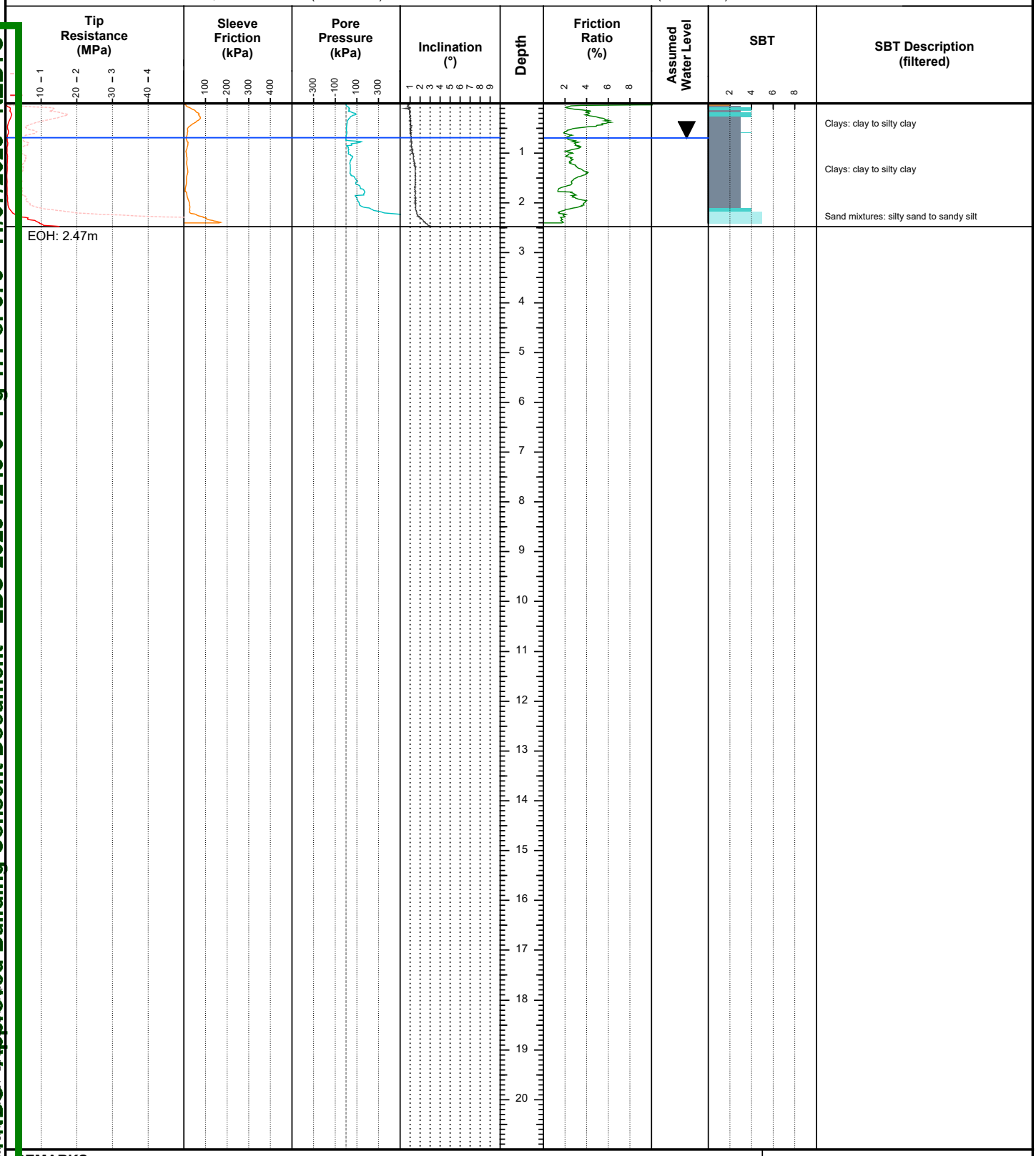
HOLE NO.: CPT09

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683356.00mE, 6102954.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 0.7m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

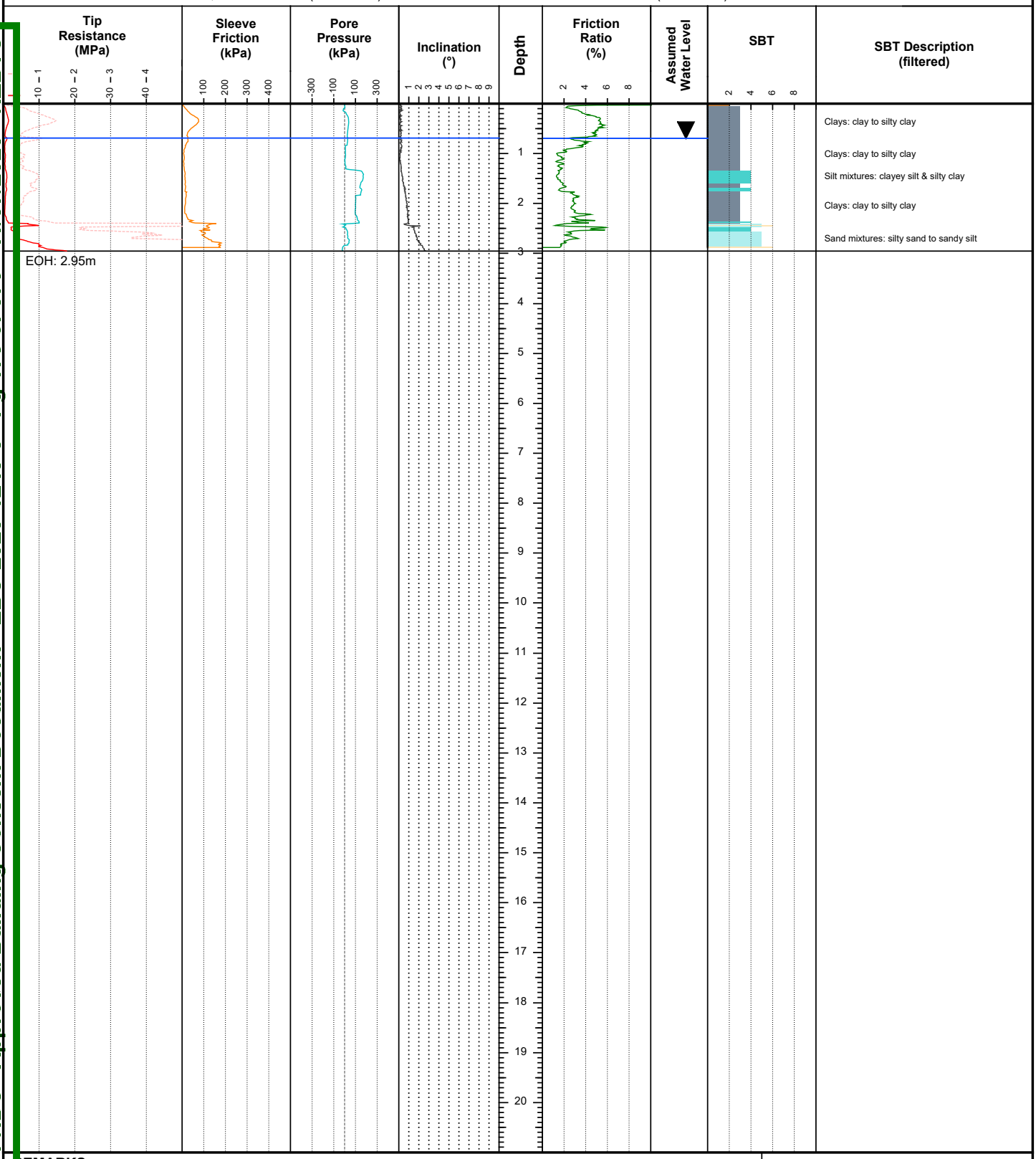
CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT10

CLIENT: Haigh Workman
PROJECT: CPT Testing
JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683359.00mE, 6102979.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 0.7

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

CONE PENETRATION TEST (CPT) LOG

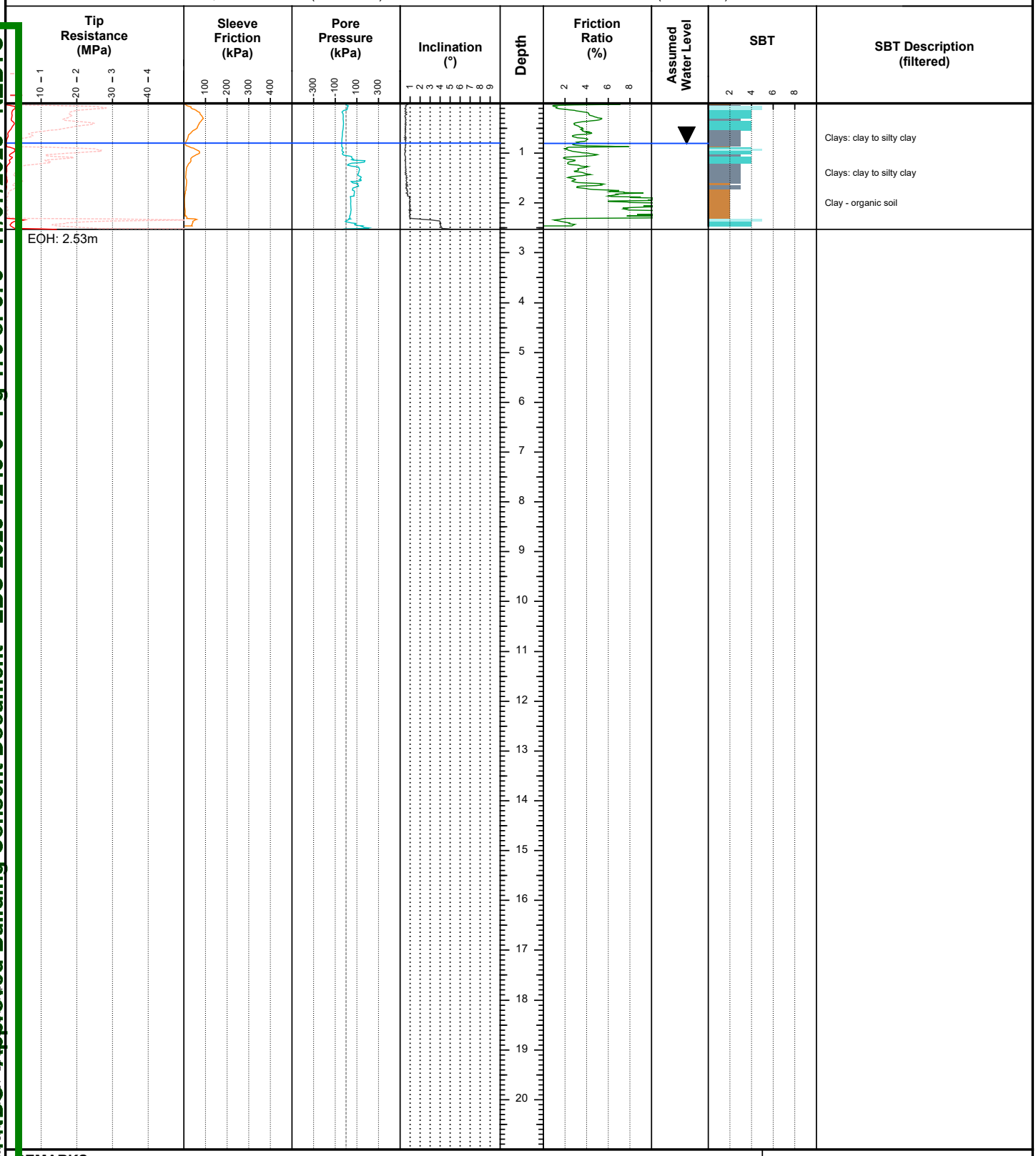
HOLE NO.: CPT11

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683357.00mE, 6103003.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 0.8m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

CONE PENETRATION TEST (CPT) LOG

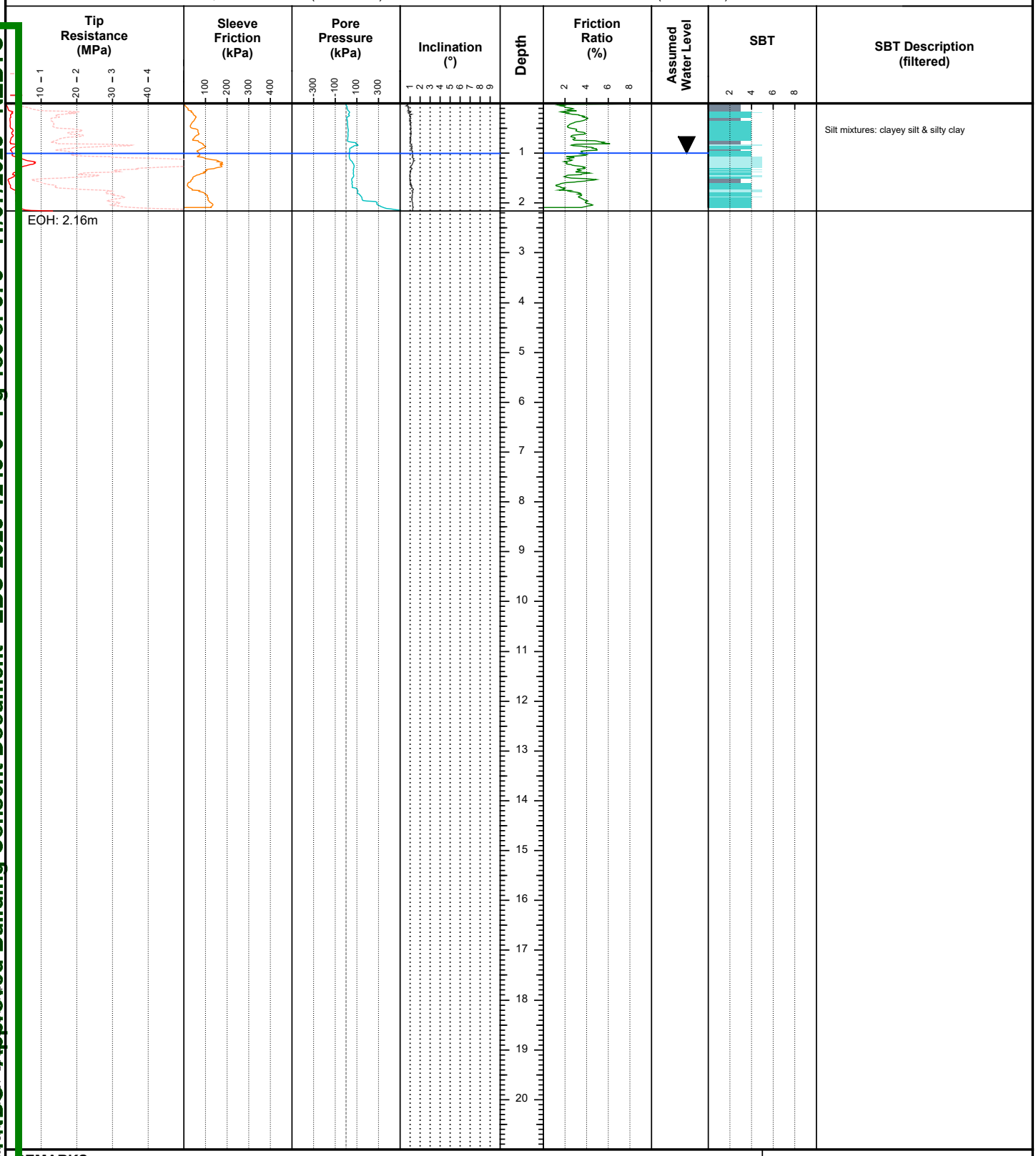
HOLE NO.: CPT12

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683407.00mE, 6102952.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 1.0m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

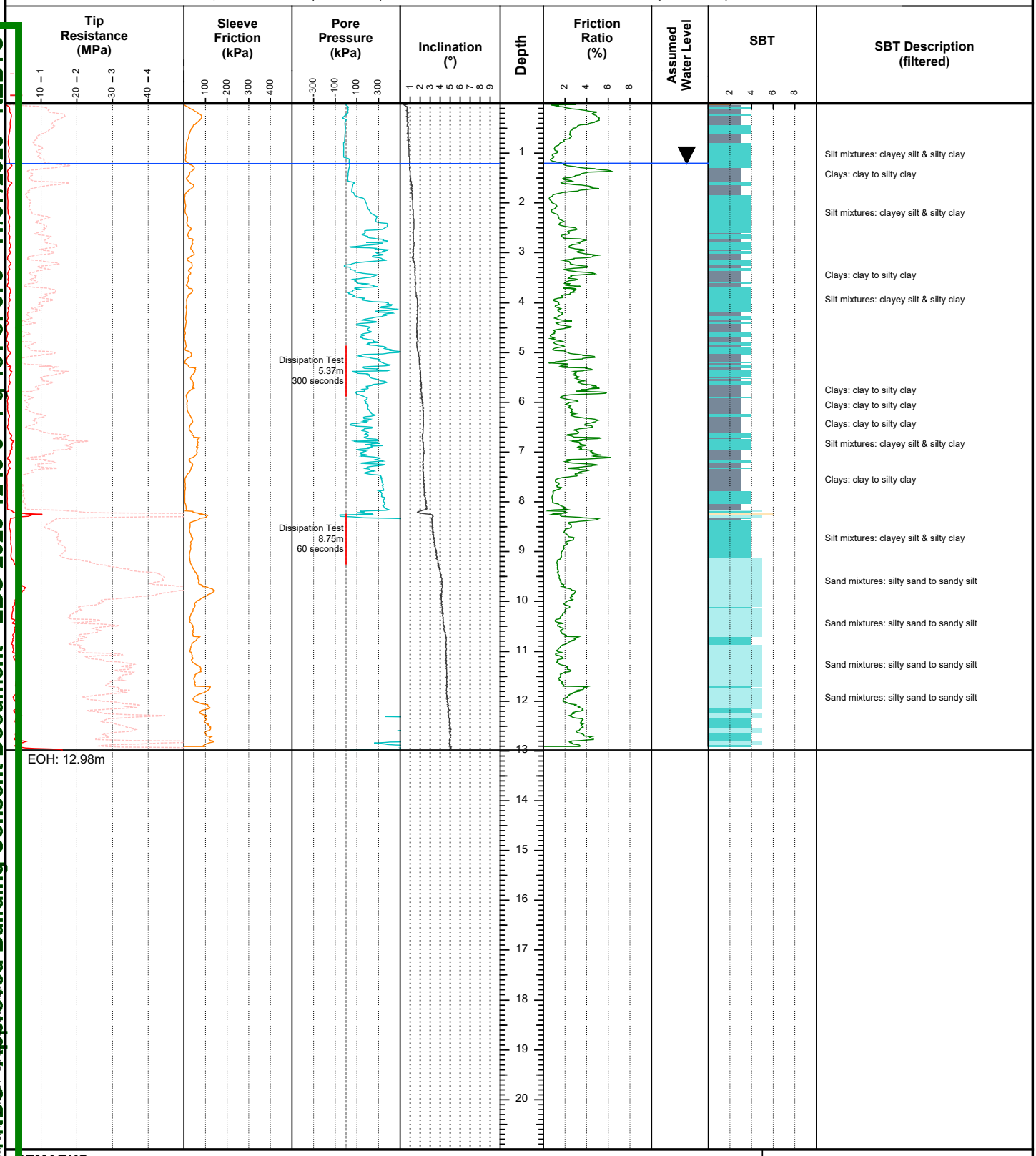
CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT13

CLIENT: Haigh Workman
PROJECT: CPT Testing
JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683439.00mE, 6102951.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 1.2m

NOTES:

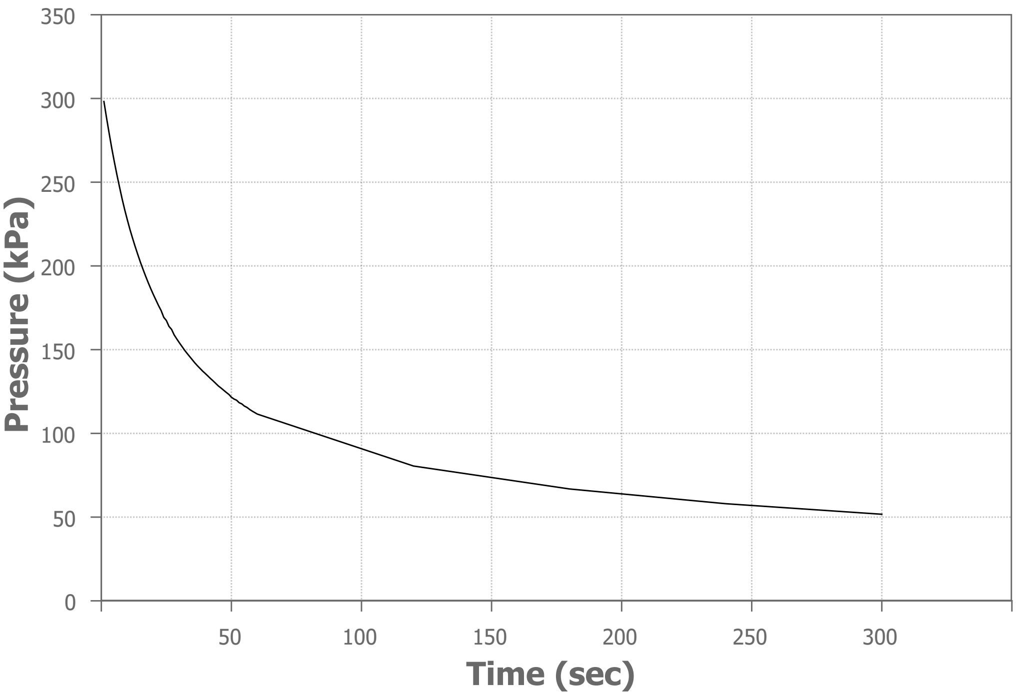
TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

DISSIPATION TESTS

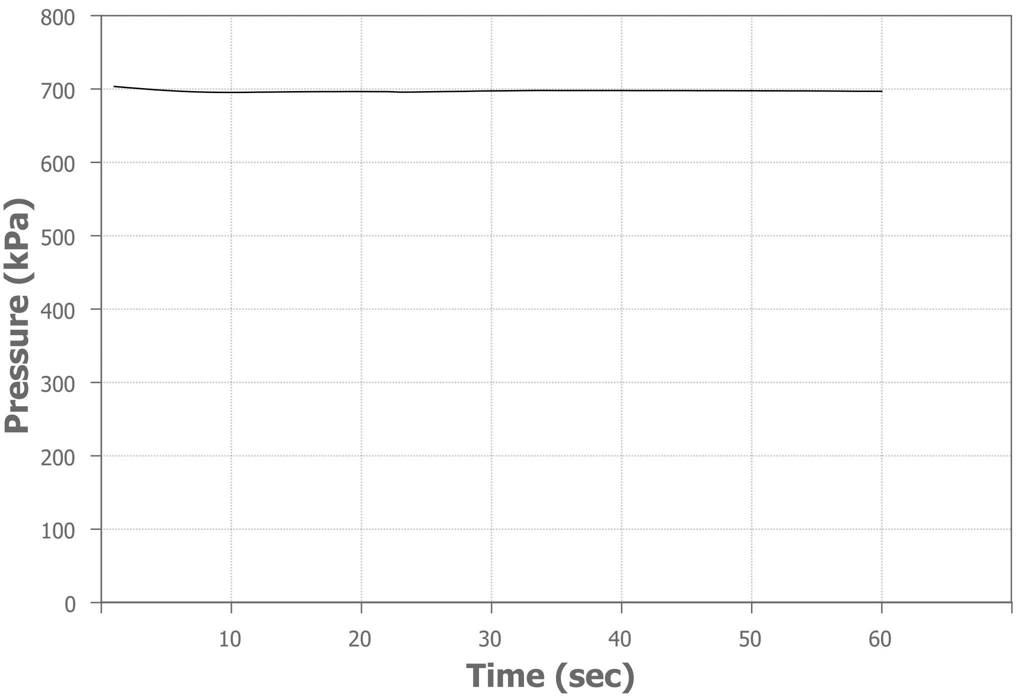
Test Depth: 5.37

300



Test Depth: 8.75

60



CONE PENETRATION TEST (CPT) LOG

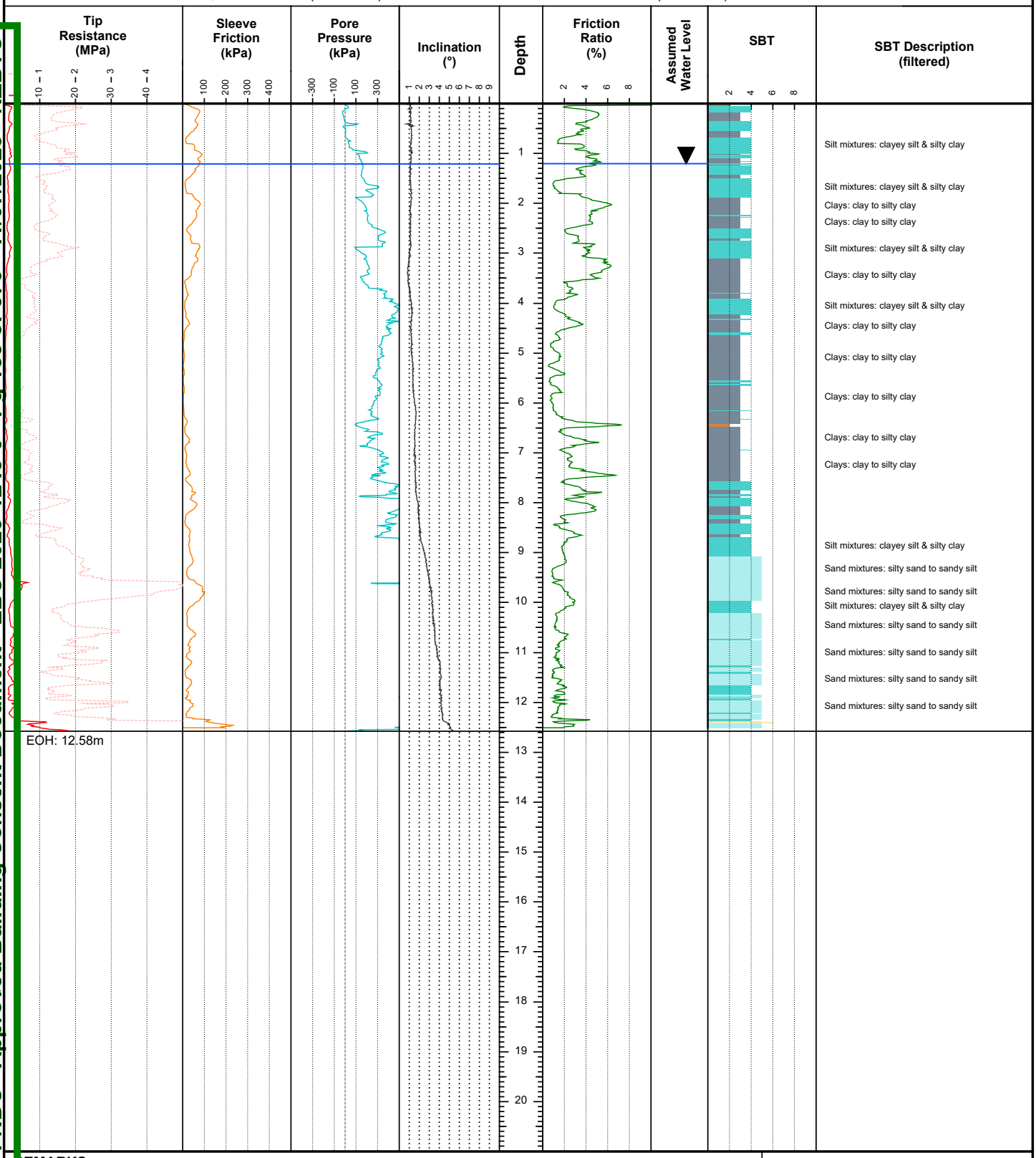
HOLE NO.: CPT14

CLIENT: Haigh Workman
PROJECT: CPT Testing

JOB NO.: LTA22467

SITE LOCATION: Lot 6 - 8, Kahikatearoa Lane, Waipapa
OPERATOR: CW
START DATE: 20/12/2022

CO-ORDINATES: 1683447.00mE, 6103003.00mN (NZTM2000)
ELEVATION: 78.5m (NZVD2016)
END DATE: 20/12/2022



REMARKS:

Groundwater measured at 1.2m

NOTES:

TEST DETAILS:

Cone Number	Mks954
Cone Type	PC
Area Ratio	0.80
Filter Location	u2
Termination Reason	Auger fail

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Borehole Log - BH3

Hole Location: Refer to Site Plan

JOB No. 22 189

CLIENT:	Peter Swan Limited	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1, Deposited Plan 178287)		
Date Started:	21/12/2022	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	CN
Date Completed:	21/12/2022	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description

Based on NZGS Logging Guidelines 2005

SILT, some clay; greyish brown, streaked orange. Very stiff, dry, low plasticity. [Tauranga Group]

Clayey **SILT**, trace fine to coarse sand; brownish grey, mottled light brownish orange. Very stiff, moist, low plasticity.

0.7m: becomes moist to wet.

0.9m: becomes brownish grey to grey, trace fine sand only.

SILT, trace fine sand; grey to bluish grey, stiff, saturated, no plasticity.

1.2m: becomes soft.

1.4m: becomes no fine sand, light yellowish grey. Low plasticity.

1.5m: becomes trace fine sand.

1.7m: becomes no fine sand.

2.0m: becomes bluish grey. No plasticity. Poor sample recovery.

End of Borehole (2.6mbgl) Unable to Penetrate

Depth (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Geology: TAURANGA GROUP

Graphic Log

Water Level: Groundwater at 0.75mbgl

Sensitivity: 0, 31, 2, 16, 20

Vane Shear and Remoulded Vane Shear Strengths (kPa)

Vane Shear	Remoulded Vane Shear
173	2
107	3
221	2
28	2
35	2

Scala Penetrometer (blows/100mm): 0 5 10 15 20

Scala Penetrometer Immediate Refusal

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable To Penetrate. T.S. = Topsoil.
Scala penetrometer test begins at base of borehole.
Hand Held Shear Vane S/N: 2278

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Borehole Log - BH4

Hole Location: Refer to Site Plan

JOB No. 22 189

CLIENT:	Peter Swan Limited	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1, Deposited Plan 178287)		
Date Started:	21/12/2022	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	CN
Date Completed:	21/12/2022	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description

Based on NZGS Logging Guidelines 2005

Clayey **SILT**; orangish brown to brown. Very stiff, dry to moist, low to medium plasticity. [Tauranga Group]

0.2m: becomes moist.

Clayey **SILT**, minor fine to medium sand; brown, mottled light brown. Stiff, wet, low plasticity.

SILT, trace fine sand and clay; brown. Very stiff, wet, no to low plasticity.

0.9m: some fibrous organics.

1.1m: becomes brownish grey to grey. Stiff.

1.2m: becomes no organics. Saturated.

1.4m: becomes mottled light brown. Soft. No clay.

1.5m: becomes bluish grey.

1.9m: trace fine sand.

End of Borehole (2.2mbgl) Unable to Penetrate

Depth (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Geology: TAURANGA GROUP

Graphic Log

Water Level: Groundwater at 0.7mbgl

Sensitivity: 10, 26, 16, 21

Vane Shear and Remoulded Vane Shear Strengths (kPa)

Vane Shear	Remoulded Vane Shear
104	10
90	3
28	2
72	3

Scala Penetrometer (blows/100mm)

0 5 10 15 20

Scala Penetrometer Immediate Refusal

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable To Penetrate. T.S. = Topsoil.
Scala penetrometer test begins at base of borehole.
Hand Held Shear Vane S/N: 2278

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Borehole Log - BH5

Hole Location: Refer to Site Plan

JOB No. 22 189

CLIENT:	Peter Swan Limited	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1, Deposited Plan 178287)		
Date Started:	21/12/2022	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	CN
Date Completed:	21/12/2022	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description

Based on NZGS Logging Guidelines 2005

SILT, some clay; brown to greyish brown. Very stiff, dry, low to medium plasticity. [Tauranga Group]

Clayey **SILT**; orangish brown. Very stiff, dry, medium plasticity.
0.3m: becomes dry to moist.
0.4m: becomes moist.

Clayey **SILT**, trace fine to medium sand.; greyish brown, mottled brown and brownish orange. Stiff to very stiff, moist to wet, medium plasticity.

SILT, trace clay; brownish grey to grey. Stiff, saturated, no to low plasticity.

1.1m: becomes grey, mottled light yellowish brown. No clay.

1.4m: becomes grey, mottled orange to dark orange. No plasticity.

Between 1.6 to 1.9m: trace fibrous organics. Soft.

SILT, trace sine sand; bluish grey. Firm, saturated. No plasticity.

2.3m: becomes very stiff.

End of Borehole (2.9mbgl) Unable to Penetrate

Depth (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Geology: TAURANGA GROUP

Graphic Log

Water Level: Groundwater at 0.75mbgl

Sensitivity: 34, 22, 26, 12

Vane Shear and Remoulded Vane Shear Strengths (kPa)

	Vane Shear	Remoulded Vane Shear
34	117	3
22	76	3
26	45	2
12	21	2
	UTP	

Scala Penetrometer (blows/100mm): 0, 5, 10, 15, 20

Scala Penetrometer Refusal @ 3.0mbgl

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable To Penetrate. T.S. = Topsoil.
Scala penetrometer test begins at base of borehole.
Hand Held Shear Vane S/N: 2278

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Borehole Log - BH6

Hole Location: Refer to Site Plan

JOB No. 22 189

CLIENT:	Peter Swan Limited	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1, Deposited Plan 178287)		
Date Started:	21/12/2022	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	OT
Date Completed:	21/12/2022	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description

Based on NZGS Logging Guidelines 2005

Clayey **SILT**; greyish brown. Very stiff, dry, no to low plasticity. [Tauranga Group]

0.3m: becomes mottled whitish orange, light orange and white.

SILT, trace clay; light brownish grey, streaked light orange, mottled white. Very stiff, moist, no plasticity.

0.7m: becomes moist to wet.

1.2m: becomes wet.

1.4m: becomes wet to saturated.

End of Borehole (3.0mbgl) Target Depth

Depth (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Geology: TAURANGA GROUP

Graphic Log

Water Level: Groundwater Not Encountered

Sensitivity: 15, 9, 5, 12, 4

Vane Shear and Remoulded Vane Shear Strengths (kPa)

Vane Shear	Remoulded Vane Shear
199	13
185	20
101	20
195	17
74	20

Scala Penetrometer (blows/100mm): 0, 5, 10, 15, 20

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable To Penetrate. T.S. = Topsoil.
Scala penetrometer test begins at base of borehole.
Hand Held Shear Vane S/N: 1617

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Borehole Log - BH7

Hole Location: Refer to Site Plan

JOB No. 22 189

CLIENT:	Peter Swan Limited	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1, Deposited Plan 178287)		
Date Started:	21/12/2022	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	OT
Date Completed:	21/12/2022	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description

Based on NZGS Logging Guidelines 2005

SILT, some clay; greyish brown. Very stiff, dry, no plasticity. [Topsoil]

Clayey **SILT**; light greyish brown. Stiff to very stiff, moist, no plasticity. [Tauranga Group]

0.7m: becomes moist to wet.

0.9m: becomes wet.

1.4m: becomes mottled dark brownish black.

SILT; dark brownish black, stiff, wet, no plasticity. Organic peat.

SILT, some clay; light greyish brown, mottled brown. Stiff, wet, no plasticity.

2.7m: becomes light greenish grey. Trace fine sand weakly cemented clasts.

End of Borehole (2.9mbgl) No Sample Recovery

Depth (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Geology: TS

Graphic Log

Water Level: Groundwater at 0.8mbgl

Sensitivity: 3, 9, 4, 4, 3

Vane Shear and Remoulded Vane Shear Strengths (kPa)

Vane Shear	Remoulded Vane Shear
101	30
182	20
74	17
74	17
67	20

Scala Penetrometer (blows/100mm): 0, 5, 10, 15, 20

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable To Penetrate. T.S. = Topsoil.
Scala penetrometer test begins at base of borehole.
Hand Held Shear Vane S/N: 1617

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Borehole Log - BH8

Hole Location: Refer to Site Plan

JOB No. 22 189

CLIENT:	Peter Swan Limited	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1, Deposited Plan 178287)		
Date Started:	21/12/2022	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	OT
Date Completed:	21/12/2022	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description

Based on NZGS Logging Guidelines 2005

SILT, some clay; brownish grey. Very stiff, dry to moist, no plasticity. [Topsoil]

SILT, some clay; light greyish brown to light brown, speckled light orange. Stiff to very stiff, moist, no plasticity. [Tauranga Group]

0.5m: becomes white to light whitish brown, mottled white. Wet.

SILT, some clay; grey, streaked dark grey to green. Stiff to very stiff, wet, no plasticity.

1.5m: becomes streaked white and green.

End of Borehole (3.0mbgl) Target Depth

Depth (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Geology: TS; TAURANGA GROUP

Groundwater at 0.95mbgl

Sensitivity: 9, 21, 9, 6, 8

Vane Shear and Remoulded Vane Shear Strengths (kPa)

	Vane Shear	Remoulded Vane Shear
9	182	20
21	71	3
9	145	17
6	148	24
8	205	27

Scala Penetrometer (blows/100mm): 0 5 10 15 20

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable To Penetrate. T.S. = Topsoil.
Scala penetrometer test begins at base of borehole.
Hand Held Shear Vane S/N: 1617

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Borehole Log - BH01

Hole Location: Refer to Site Plan

JOB No. 21 131

CLIENT:	Windermere Holdings Ltd	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1 DP 178287)		
Date Started:	24/05/2021	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	JP
Date Completed:	24/05/2021	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Vane Shear and Remoulded Vane Shear Strengths (kPa)	Scala Penetrometer (blows/100mm)
SILT, trace fine gravel; brown to dark brown. Stiff, moist, no plasticity. Rootlets. [Topsoil]	0.0	T.S.		Groundwater Encountered at 1.6mbgl.	7	170 / 24	0 5 10 15 20 25 30 35 40
SILT, some clay, trace fine gravel; light brown to brown, mottled yellow and orange. Stiff to very stiff, moist, low plasticity. [Tauranga Group]		TAURANGA GROUP			11	97 / 9	
SILT, minor clay, trace fine gravel and coarse sand; light brown to light yellowish brown, mottled light grey. Very stiff, dry to moist, low plasticity. Gravel: weakly cemented. From 0.8m: Trace clay.	0.5				9	55 / 6	
	1.0						
SILT, trace fine gravel and coarse sand; light grey to white. Firm to stiff, wet, no plasticity. From 1.4m: No gravel.	1.5				15	46 / 3	
SILT, minor clay, trace coarse sand; light grey to white. Firm to stiff, saturated, no plasticity. (slightly dilatant)	2.0				3	73 / 21	
	2.5						
SILT, trace fine gravel; light yellowish brown and light grey. Firm, saturated, no plasticity. Gravel: weakly cemented.					11	33 / 3	
End of Hole at 3.0m (Target Depth)	3.0						
	3.5						
	4.0						
	4.5						

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable to penetrate. T.S. = Topsoil.
Hand Held Shear Vane S/N: 2278. Groundwater Encountered at 1.6mbgl at time of drilling.
Scala penetrometer testing not undertaken.

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Borehole Log - BH02

Hole Location: Refer to Site Plan

JOB No. 21 131

CLIENT:	Windermere Holdings Ltd	**SITE:**	Kahikatearoa Lane, Waipapa (Lot 1 DP 178287)		
Date Started:	24/05/2021	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	JP
Date Completed:	24/05/2021	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	WT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Vane Shear and Remoulded Vane Shear Strengths (kPa)	Scala Penetrometer (blows/100mm)
SILT; brown to dark brown. Stiff, moist, low plasticity. Rootlets. [Topsoil]	0.0	T.S.		Groundwater Encountered at 1.2mbgl.	5	82 / 15	0 5 10 15 20 25 30 35 40
SILT, minor clay; light brown to brown, mottled orange. Stiff to very stiff, moist, low to medium plasticity. [Tauranga Group]	0.5	TAURANGA GROUP			8	118 / 15	
From 0.7m: Becomes light brown to greyish brown, mottled orange. Trace fine gravel (weakly cemented).	1.0				9	131 / 15	
SILT, trace clay, trace fine gravel; light brown to light grey, streaked orange. Very stiff, wet, no plasticity. Gravel: weakly cemented.	1.5				18	106 / 6	
From 1.3m: Becomes light grey, mottled light brown, streaked orange.	2.0				5	61 / 12	
SILT, minor fine to medium gravel; brown to dark brown. Very stiff, moist, no plasticity. Gravel: weakly cemented.	2.5				5	82 / 15	
From 1.9m: Becomes light brown, mottled dark brown and white.	3.0						
SILT, minor fine to coarse sand; light grey to bluish grey. Stiff, saturated, no plasticity.	3.5						
From 2.4m: Poor sample recovery. Sample saturated.	4.0						
End of Hole at 3.0m (Target Depth)	4.5						

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: UTP = Unable to penetrate. T.S. = Topsoil.
Hand Held Shear Vane S/N: 2278. Groundwater Encountered at 1.2mbgl at time of drilling.
Scala penetrometer testing not undertaken.

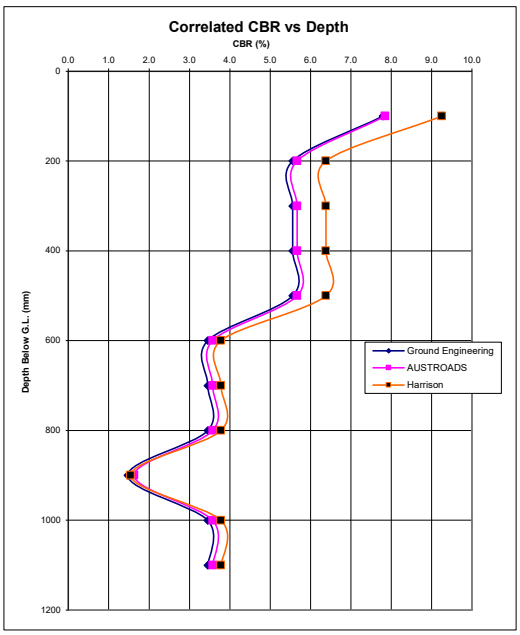
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 1/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 1 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	4		1	7.80	25.0	7.85	9.25
100 - 200	3		0.75	5.56	33.3	5.67	6.38
200 - 300	3		0.75	5.56	33.3	5.67	6.38
300 - 400	3		0.75	5.56	33.3	5.67	6.38
400 - 500	3		0.75	5.56	33.3	5.67	6.38
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	1		0.25	1.47	100.0	1.63	1.55
900 - 1000	2		0.5	3.45	50.0	3.58	3.78
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



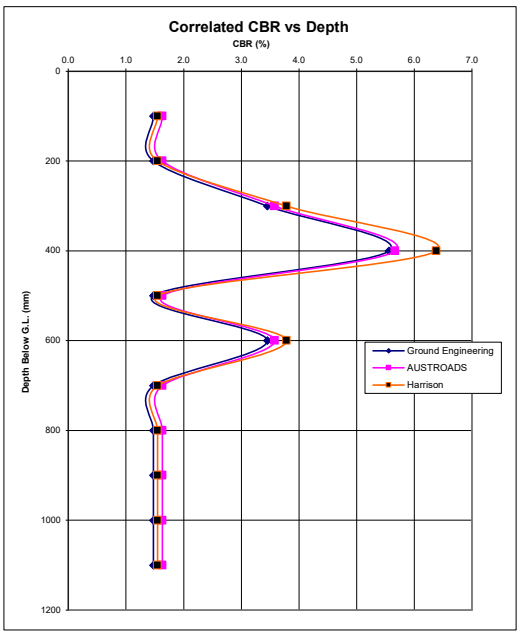
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 2/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 2 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	3		0.75	5.56	33.3	5.67	6.38
400 - 500	1		0.25	1.47	100.0	1.63	1.55
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	1		0.25	1.47	100.0	1.63	1.55
700 - 800	1		0.25	1.47	100.0	1.63	1.55
800 - 900	1		0.25	1.47	100.0	1.63	1.55
900 - 1000	1		0.25	1.47	100.0	1.63	1.55
1000 - 1100	1		0.25	1.47	100.0	1.63	1.55
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



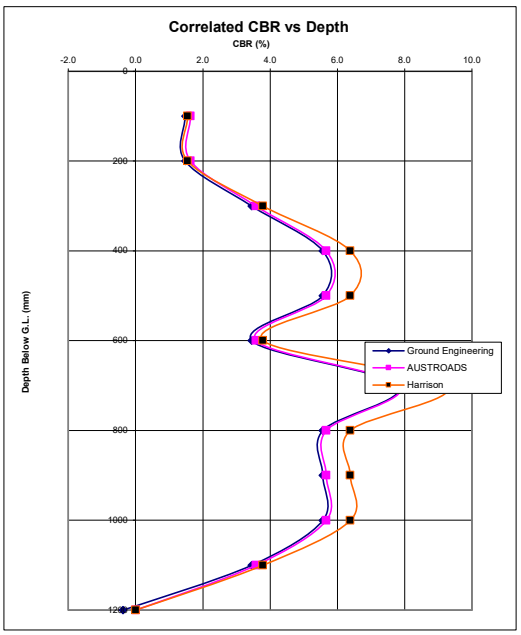
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 3/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 3 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	3		0.75	5.56	33.3	5.67	6.38
400 - 500	3		0.75	5.56	33.3	5.67	6.38
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	4		1	7.80	25.0	7.85	9.25
700 - 800	3		0.75	5.56	33.3	5.67	6.38
800 - 900	3		0.75	5.56	33.3	5.67	6.38
900 - 1000	3		0.75	5.56	33.3	5.67	6.38
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200			0	-0.37	#DIV/0!	#DIV/0!	#DIV/0!
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



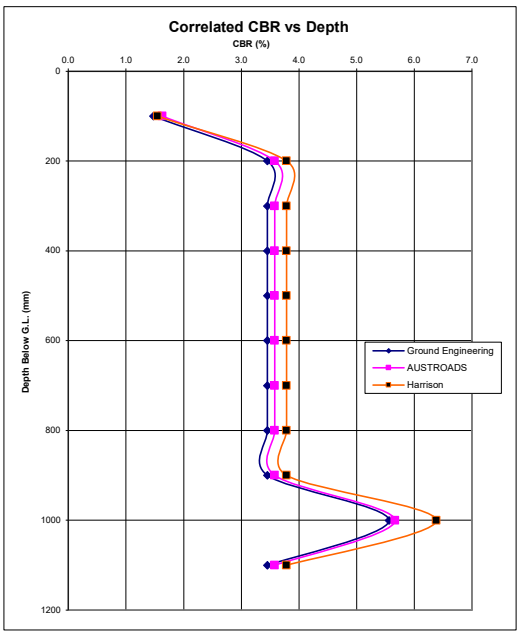
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 4/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 4 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	2		0.5	3.45	50.0	3.58	3.78
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	2		0.5	3.45	50.0	3.58	3.78
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	2		0.5	3.45	50.0	3.58	3.78
900 - 1000	3		0.75	5.56	33.3	5.67	6.38
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 5/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 5 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	2		0.5	3.45	50.0	3.58	3.78
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	1		0.25	1.47	100.0	1.63	1.55
500 - 600	1		0.25	1.47	100.0	1.63	1.55
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	1		0.25	1.47	100.0	1.63	1.55
900 - 1000	2		0.5	3.45	50.0	3.58	3.78
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
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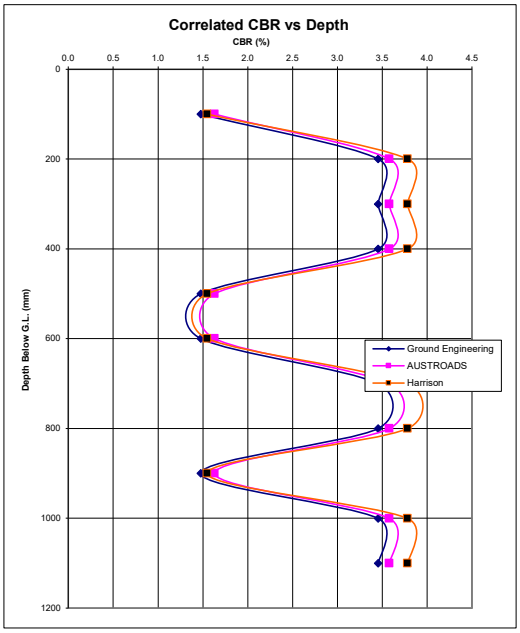
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 6/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 6 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	1		0.25	1.47	100.0	1.63	1.55
400 - 500	1		0.25	1.47	100.0	1.63	1.55
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	1		0.25	1.47	100.0	1.63	1.55
800 - 900	2		0.5	3.45	50.0	3.58	3.78
900 - 1000	2		0.5	3.45	50.0	3.58	3.78
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
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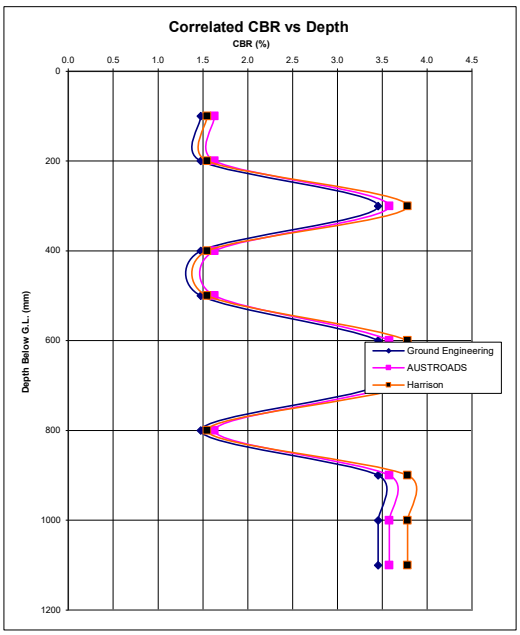
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 7/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 7 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	2		0.5	3.45	50.0	3.58	3.78
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	1		0.25	1.47	100.0	1.63	1.55
800 - 900	2		0.5	3.45	50.0	3.58	3.78
900 - 1000	1		0.25	1.47	100.0	1.63	1.55
1000 - 1100	1		0.25	1.47	100.0	1.63	1.55
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
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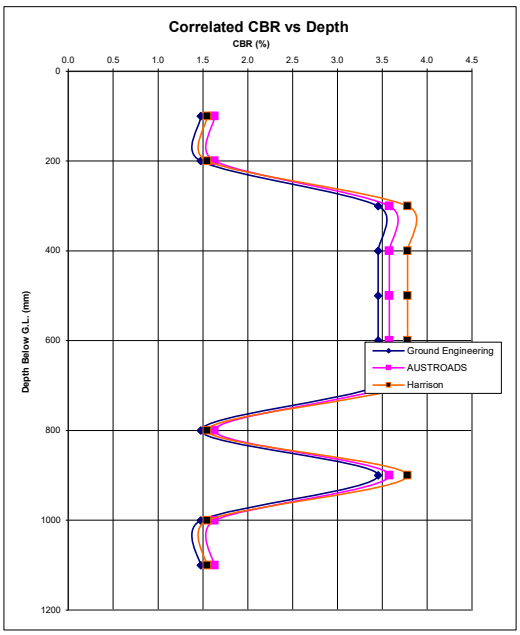
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



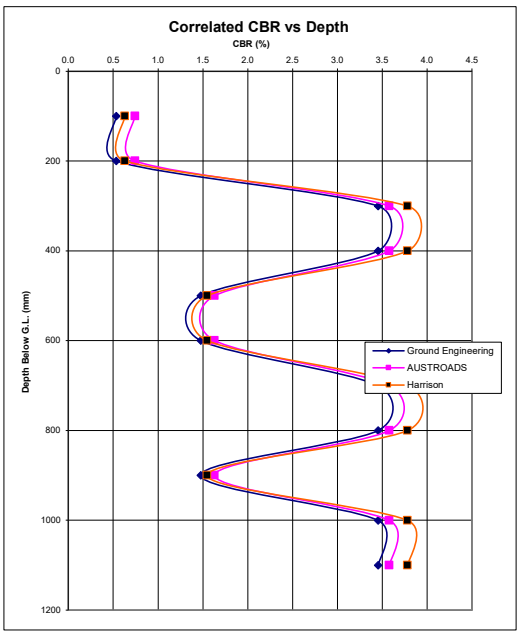
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 8/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 8 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	0.5		0.125	0.53	200.0	0.74	0.63
100 - 200	0.5		0.125	0.53	200.0	0.74	0.63
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	1		0.25	1.47	100.0	1.63	1.55
500 - 600	1		0.25	1.47	100.0	1.63	1.55
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	1		0.25	1.47	100.0	1.63	1.55
900 - 1000	2		0.5	3.45	50.0	3.58	3.78
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



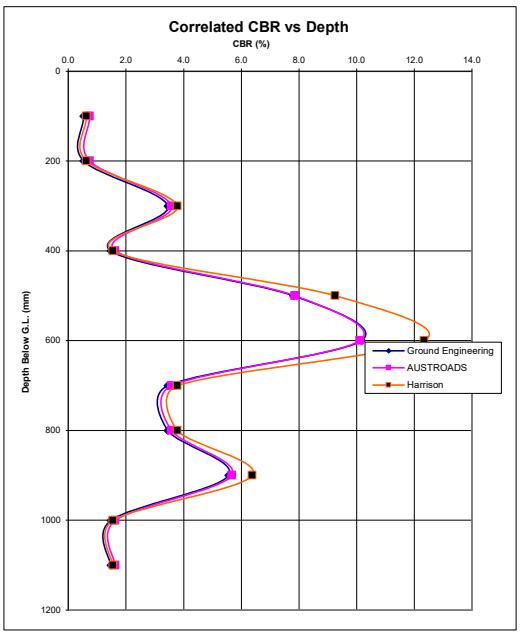
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 9/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 9 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	0.5		0.125	0.53	200.0	0.74	0.63
100 - 200	0.5		0.125	0.53	200.0	0.74	0.63
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	1		0.25	1.47	100.0	1.63	1.55
400 - 500	4		1	7.80	25.0	7.85	9.25
500 - 600	5		1.25	10.16	20.0	10.11	12.34
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	3		0.75	5.56	33.3	5.67	6.38
900 - 1000	1		0.25	1.47	100.0	1.63	1.55
1000 - 1100	1		0.25	1.47	100.0	1.63	1.55
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



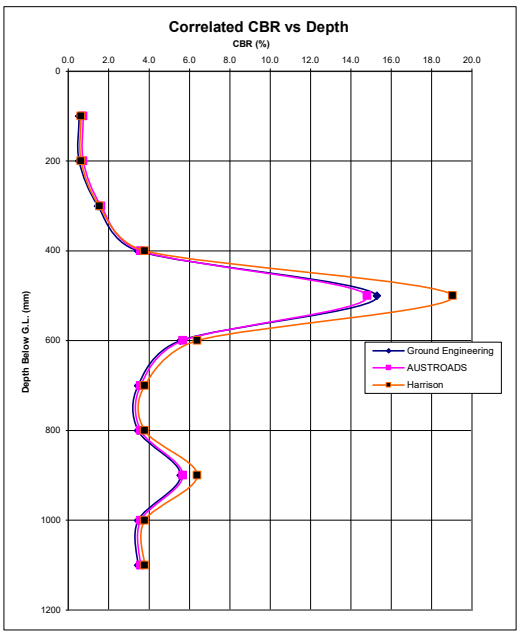
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 10/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 10 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	0.5		0.125	0.53	200.0	0.74	0.63
100 - 200	0.5		0.125	0.53	200.0	0.74	0.63
200 - 300	1		0.25	1.47	100.0	1.63	1.55
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	7		1.75	15.28	14.3	14.81	19.04
500 - 600	3		0.75	5.56	33.3	5.67	6.38
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	3		0.75	5.56	33.3	5.67	6.38
900 - 1000	2		0.5	3.45	50.0	3.58	3.78
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



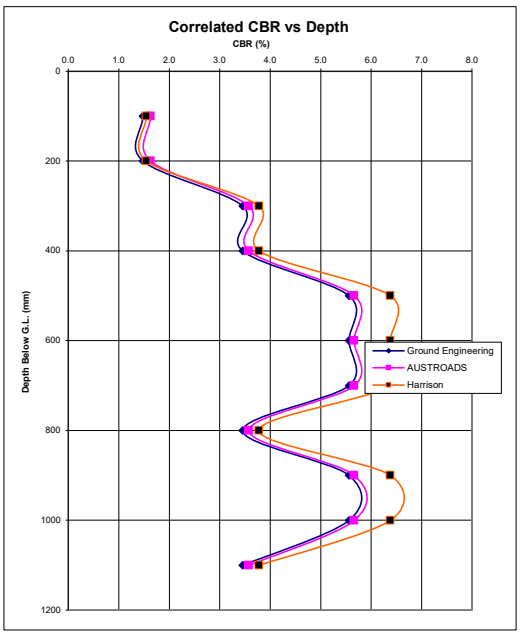
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 11/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 11 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	3		0.75	5.56	33.3	5.67	6.38
500 - 600	3		0.75	5.56	33.3	5.67	6.38
600 - 700	3		0.75	5.56	33.3	5.67	6.38
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	3		0.75	5.56	33.3	5.67	6.38
900 - 1000	3		0.75	5.56	33.3	5.67	6.38
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



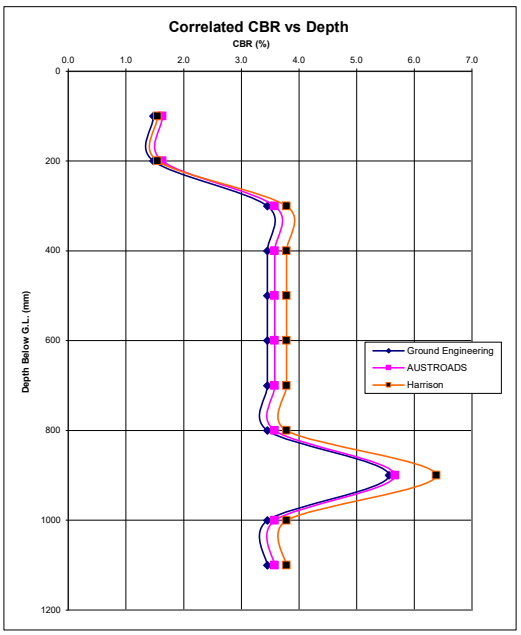
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 12/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 12 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	2		0.5	3.45	50.0	3.58	3.78
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	3		0.75	5.56	33.3	5.67	6.38
900 - 1000	2		0.5	3.45	50.0	3.58	3.78
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



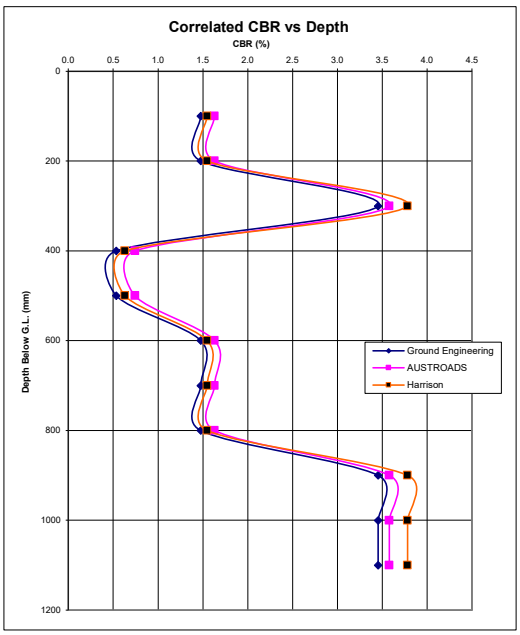
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 13/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 13 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	0.5		0.125	0.53	200.0	0.74	0.63
400 - 500	0.5		0.125	0.53	200.0	0.74	0.63
500 - 600	1		0.25	1.47	100.0	1.63	1.55
600 - 700	1		0.25	1.47	100.0	1.63	1.55
700 - 800	1		0.25	1.47	100.0	1.63	1.55
800 - 900	2		0.5	3.45	50.0	3.58	3.78
900 - 1000	2		0.5	3.45	50.0	3.58	3.78
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



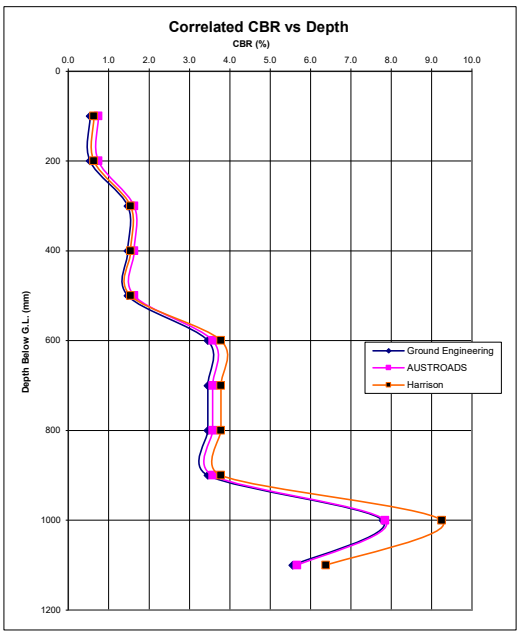
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 14/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 14 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	0.5		0.125	0.53	200.0	0.74	0.63
100 - 200	0.5		0.125	0.53	200.0	0.74	0.63
200 - 300	1		0.25	1.47	100.0	1.63	1.55
300 - 400	1		0.25	1.47	100.0	1.63	1.55
400 - 500	1		0.25	1.47	100.0	1.63	1.55
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	2		0.5	3.45	50.0	3.58	3.78
900 - 1000	4		1	7.80	25.0	7.85	9.25
1000 - 1100	3		0.75	5.56	33.3	5.67	6.38
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



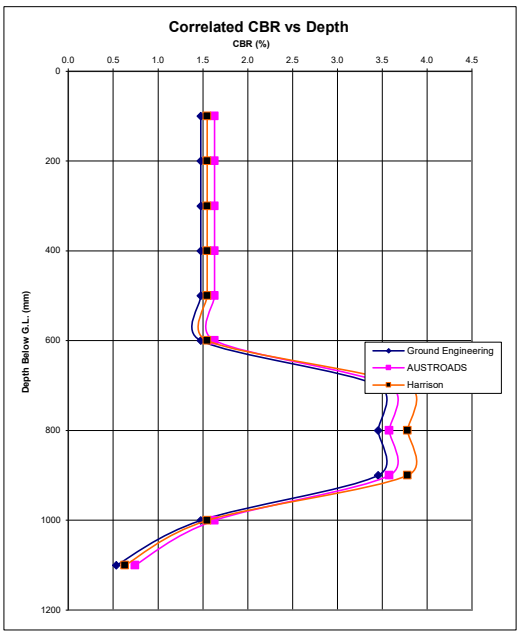
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 15/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 15 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	1		0.25	1.47	100.0	1.63	1.55
300 - 400	1		0.25	1.47	100.0	1.63	1.55
400 - 500	1		0.25	1.47	100.0	1.63	1.55
500 - 600	1		0.25	1.47	100.0	1.63	1.55
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	2		0.5	3.45	50.0	3.58	3.78
900 - 1000	1		0.25	1.47	100.0	1.63	1.55
1000 - 1100	0.5		0.125	0.53	200.0	0.74	0.63
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



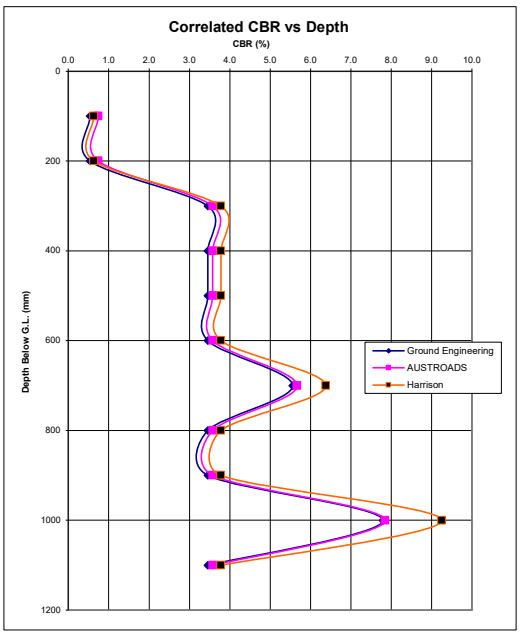
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 16/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 16 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	0.5		0.125	0.53	200.0	0.74	0.63
100 - 200	0.5		0.125	0.53	200.0	0.74	0.63
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	2		0.5	3.45	50.0	3.58	3.78
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	3		0.75	5.56	33.3	5.67	6.38
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	2		0.5	3.45	50.0	3.58	3.78
900 - 1000	4		1	7.80	25.0	7.85	9.25
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



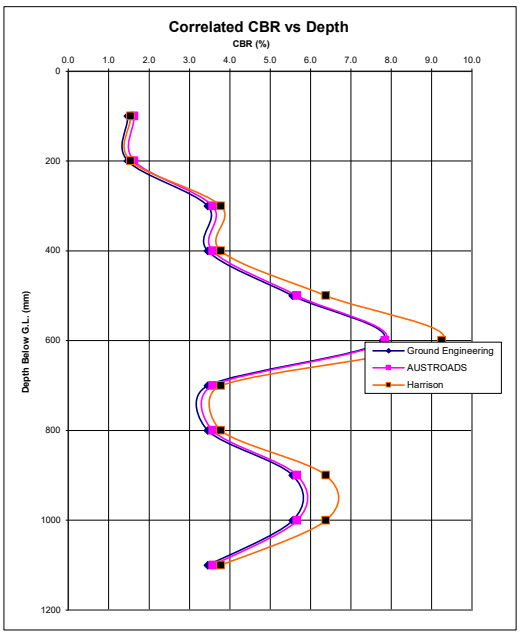
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 17/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 17 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	2		0.5	3.45	50.0	3.58	3.78
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	3		0.75	5.56	33.3	5.67	6.38
500 - 600	4		1	7.80	25.0	7.85	9.25
600 - 700	2		0.5	3.45	50.0	3.58	3.78
700 - 800	2		0.5	3.45	50.0	3.58	3.78
800 - 900	3		0.75	5.56	33.3	5.67	6.38
900 - 1000	3		0.75	5.56	33.3	5.67	6.38
1000 - 1100	2		0.5	3.45	50.0	3.58	3.78
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



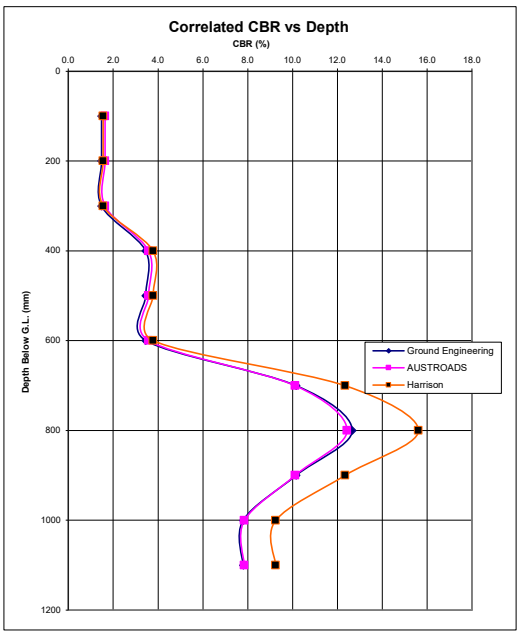
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 18/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 18 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	1		0.25	1.47	100.0	1.63	1.55
200 - 300	1		0.25	1.47	100.0	1.63	1.55
300 - 400	2		0.5	3.45	50.0	3.58	3.78
400 - 500	2		0.5	3.45	50.0	3.58	3.78
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	5		1.25	10.16	20.0	10.11	12.34
700 - 800	6		1.5	12.66	16.7	12.43	15.61
800 - 900	5		1.25	10.16	20.0	10.11	12.34
900 - 1000	4		1	7.80	25.0	7.85	9.25
1000 - 1100	4		1	7.80	25.0	7.85	9.25
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



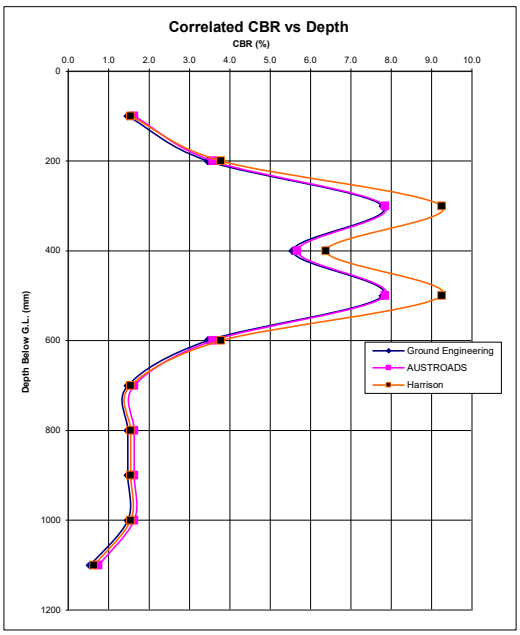
SCALA PENETROMETER TEST - CBR CORRELATION

Client:	Peter Swan Limited		Project/Task No: 22 189
Subject:	CBR Scala Penetrometer		Date: 16/01/2023
By:	CN	Date: 16/01/2023	Sheet: 19/19
Verified By:	WT	Date: 16/01/2023	

Test Number: 19 **Location:** Kahikatearoa Lane, Waipapa **Test Date:** 13/01/2023

Site: Lot 7 / 8 **Tested By:** CN **Reported By:** CN

Depth (mm)	Measured No. blows / 100mm	NZGS-Correlated SPT blows/ 300mm	No. blows/25mm	Ground Engineering Correlated CBR (%)	Penetration mm/blow	AUSTROADS-Correlated CBR (%)	Harrison-Correlated CBR (%)
0 - 100	1		0.25	1.47	100.0	1.63	1.55
100 - 200	2		0.5	3.45	50.0	3.58	3.78
200 - 300	4		1	7.80	25.0	7.85	9.25
300 - 400	3		0.75	5.56	33.3	5.67	6.38
400 - 500	4		1	7.80	25.0	7.85	9.25
500 - 600	2		0.5	3.45	50.0	3.58	3.78
600 - 700	1		0.25	1.47	100.0	1.63	1.55
700 - 800	1		0.25	1.47	100.0	1.63	1.55
800 - 900	1		0.25	1.47	100.0	1.63	1.55
900 - 1000	1		0.25	1.47	100.0	1.63	1.55
1000 - 1100	0.5		0.125	0.53	200.0	0.74	0.63
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							



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Auckland 1010
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P O Box 2027
New Zealand
64-9-367 4954
wec@babbage.co.nz

Please reply to: W.E. Campton

Haigh Workman Ltd.
PO Box 89
Kerikeri 0245

Job Number: 63632#L
BGL Registration Number: 2828
Checked by: WEC

Attention: **JOHN POWER**

16th June 2021

ATTERBERG LIMITS & LINEAR SHRINKAGE TESTING

Dear John,

Re: LOT 1, KAHIKATEAROA LANE, WAIPAPA

Your Reference: Job # 21 131
Report Number: 63632#L/AL Kahikatearoa

The following report presents the results of Atterberg Limits & Linear Shrinkage testing at BGL of a soil sample delivered to this laboratory on the 9th of June 2021. Test results are summarised below, with page 3 showing where the sample plots on the Unified Soil Classification System (Casagrande) Chart. Test standards used were:

Water Content:	NZS4402:1986:Test 2.1
Liquid Limit:	NZS4402:1986:Test 2.2
Plastic Limit:	NZS4402:1986:Test 2.3
Plasticity Index:	NZS4402:1986:Test 2.4
Linear Shrinkage:	NZS4402:1986:Test 2.6

Borehole Number	Sample Number	Depth (m)	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Linear Shrinkage (%)
BH01	**BAG**	**0.50 – 1.00**	**62.7**	**69**	**55**	**14**	**10**

The whole soil was used for the water content test (the soil was in a natural state), and for the liquid limit, plastic limit and linear shrinkage tests. The soil was wet up and dried where required for the liquid limit, plastic limit and linear shrinkage tests.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.2: liquid limit, test 2.3: plastic limit, and test 2.6: linear shrinkage are reported to the nearest whole number.

Please note that the test results relate only to the sample as-received, and relate only to the sample under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

Justin Franklin
Signatory (Assistant Laboratory Manager)
Babbage Geotechnical Laboratory

ACCREDITED
IANZ
TESTING LABORATORY
№ 126

Babbage Geotechnical Laboratory	Job Number: 63632#L	Sheet 1 of 1	Page 3 of 3
	Reg. Number: 2828	Version No:	6
	Report No: 63632#L/AL Kahikatearoa	Version Date:	September 2018
	Project: LOT 1, KAHIKATEAROA LANE, WAIPAPA		

DETERMINATION OF THE LIQUID LIMIT, PLASTIC LIMIT & THE PLASTICITY INDEX

Test Methods: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4

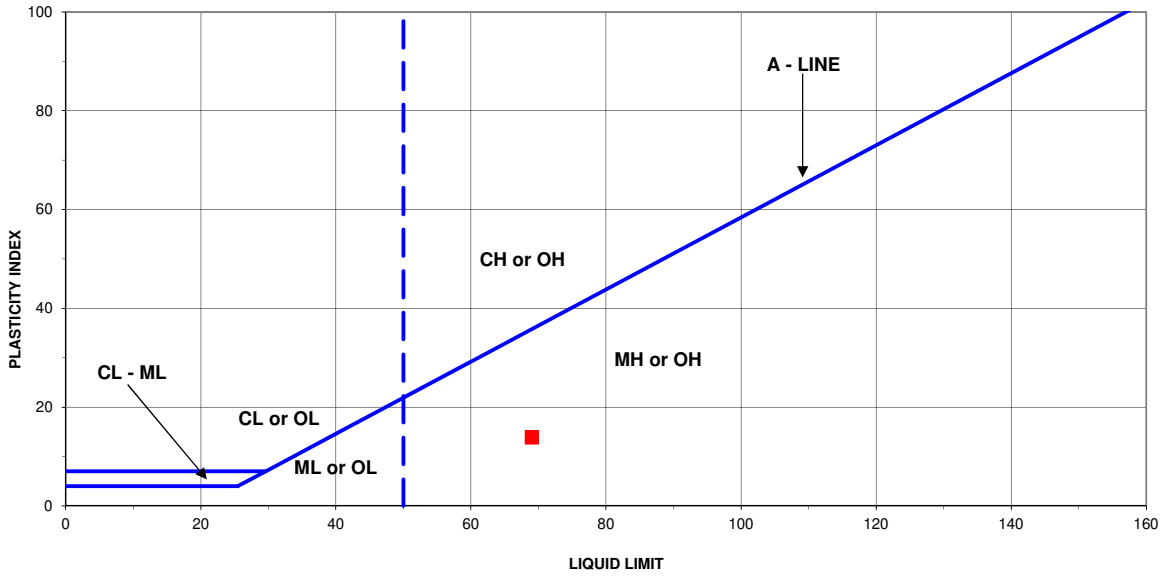
Tested By:	JW	June 2021
Compiled By:	JF	16/06/2021
Checked By:	JF	16/06/2021

SUMMARY OF TESTING

Borehole Number	Sample Number	Depth (m)	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification Based on USCS Chart Below
BH01	BAG	0.50 - 1.00	69	55	14	MH

The chart below & soil classification terminology is taken from ASTM D2487-17 "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)", January 2018, & is based on the classification scheme developed by A. Casagrande in the 1940's (Casagrande, A., 1948: Classification and identification of soil. Transactions of the American Society of Civil Engineers, v. 113, p. 901-930). The chart below & the soil classification given in the table above are included for your information only, and are not included in the IANZ endorsement for this report.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) PLASTICITY (CASAGRANDE) CHART



■ BH01 / BAG / 0.50 - 1.00m

CHART LEGEND

CL = CLAY, low plasticity ('lean' clay)
OL = ORGANIC CLAY or ORGANIC SILT, low liquid limit
ML = SILT, low liquid limit
CL - ML = SILTY CLAY
CH = CLAY, high plasticity ('fat' clay)
OH = ORGANIC CLAY or ORGANIC SILT, high liquid limit
MH = SILT, high liquid limit ('elastic silt')

UNDERGROUND INVESTIGATION

CPT Test Information

Test Hole Number	CPT01	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5233	Battery Voltage Start	6.4
Start Recording	10:26:00 AM	Finish Recording	10:43:00 AM
Tip Area	10cm	Ground Water Depth	1.3
Cone Area Ratio	0.838	Total Penetration Depth (m)	8.217
Probe Radius	0.018	Metres To Next Calibration	149
Data Interval	10mm	Test ended due to:	Tip Pressure

Zero Value Change % FSO

	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.07%	0.01%	0.44%

Dissipation Testing

Test No	Depth (m)	Duration (secs)	Comments

Notes and Comments

qc fs u

CPT Test Information

Test Hole Number	CPT02	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5343	Battery Voltage Start	6.32
Start Recording	11:07:00 AM	Finish Recording	11:16:00 AM
Tip Area	10cm	Ground Water Depth	0.9
Cone Area Ratio	0.852	Total Penetration Depth (m)	2.63
Probe Radius	0.0179	Metres To Next Calibration	858
Data Interval	10mm	Test ended due to:	Anchor Failure

Zero Value Change % FSO

	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.04%	0.02%	0.06%

Dissipation Testing

Test No	Depth (m)	Duration (secs)	Comments

Notes and Comments

qc fs u

CPT Test Information

Test Hole Number	CPT03	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5233	Battery Voltage Start	6.29
Start Recording	11:49:00 AM	Finish Recording	11:59:00 AM
Tip Area	10cm	Ground Water Depth	0.6
Cone Area Ratio	0.848	Total Penetration Depth (m)	2.59
Probe Radius	0.018	Metres To Next Calibration	141
Data Interval	10mm	Test ended due to:	Anchor Failure

Zero Value Change % FSO

	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.11%	0.00%	0.34%

Dissipation Testing

Test No	Depth (m)	Duration (secs)	Comments

Notes and Comments

qc fs u

CPT Test Information

Test Hole Number	CPT04	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5325	Battery Voltage Start	6.24
Start Recording	12:20:00 PM	Finish Recording	12:30:00 PM
Tip Area	10cm	Ground Water Depth	0.7
Cone Area Ratio	0.867	Total Penetration Depth (m)	2.767
Probe Radius	0.018	Metres To Next Calibration	1076
Data Interval	10mm	Test ended due to:	Anchor Failure

Zero Value Change % FSO

	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.10%	0.00%	0.60%

Dissipation Testing

Test No	Depth (m)	Duration (secs)	Comments

Notes and Comments

qc fs u

UNDERGROUND INVESTIGATION

CPT Test Information

Test Hole Number	CPT05	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5233	Battery Voltage Start	6.23
Start Recording	1:19:00 PM	Finish Recording	1:33:00 PM
Tip Area	10cm	Ground Water Depth	1.3
Cone Area Ratio	0.838	Total Penetration Depth (m)	6.63
Probe Radius	0.018	Metres To Next Calibration	139
Data Interval	10mm	Test ended due to:	Anchor Failure

Zero Value Change % FSO

	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.07%	0.07%	0.00%

Dissipation Testing

Test No	Depth (m)	Duration (secs)	Comments

Notes and Comments

	qc	fs	u
	1.36		
	1.37		

CPT Test Information

Test Hole Number	CPT06	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5233	Battery Voltage Start	6.18
Start Recording	1:57:00 PM	Finish Recording	2:06:00 PM
Tip Area	10cm	Ground Water Depth	0.7
Cone Area Ratio	0.838	Total Penetration Depth (m)	2.665
Probe Radius	0.018	Metres To Next Calibration	132
Data Interval	10mm	Test ended due to:	Anchor Failure

Zero Value Change % FSO

	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.10%	0.06%	0.72%

Dissipation Testing

Test No	Depth (m)	Duration (secs)	Comments

Notes and Comments

qc fs u

UNDERGROUND INVESTIGATION

CPT Test Information

Test Hole Number	CPT07	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5446	Battery Voltage Start	6.15
Start Recording	2:27:00 PM	Finish Recording	2:40:00 PM
Tip Area	10cm	Ground Water Depth	1.2
Cone Area Ratio	0.846	Total Penetration Depth (m)	6.49
Probe Radius	0.018	Metres To Next Calibration	1438
Data Interval	10mm	Test ended due to:	Anchor Failure/Tilt

Zero Value Change % FSO

	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.08%	0.01%	0.86%

Dissipation Testing

Test No	Depth (m)	Duration (secs)	Comments

Notes and Comments

qc fs u

CPT Test Information

Test Hole Number	CPT08	Job Identifier	HG Kowhai Falls, Warkworth
Test Date	24/05/2021	Operator	Craig Greenfield
CPT Rig Type	Georig 220 with Screw Anchors	Cone Type	Nova Cone 100MPa
Cone Serial Number	5233	Battery Voltage Start	6.12
Start Recording	2:56:00 PM	Finish Recording	3:52:00 PM
Tip Area	10cm	Ground Water Depth	1.7
Cone Area Ratio	0.838	Total Penetration Depth (m)	7.275
Probe Radius	0.018	Metres To Next Calibration	129
Data Interval	10mm	Test ended due to:	Anchor Failure

Zero Value Change % FSO

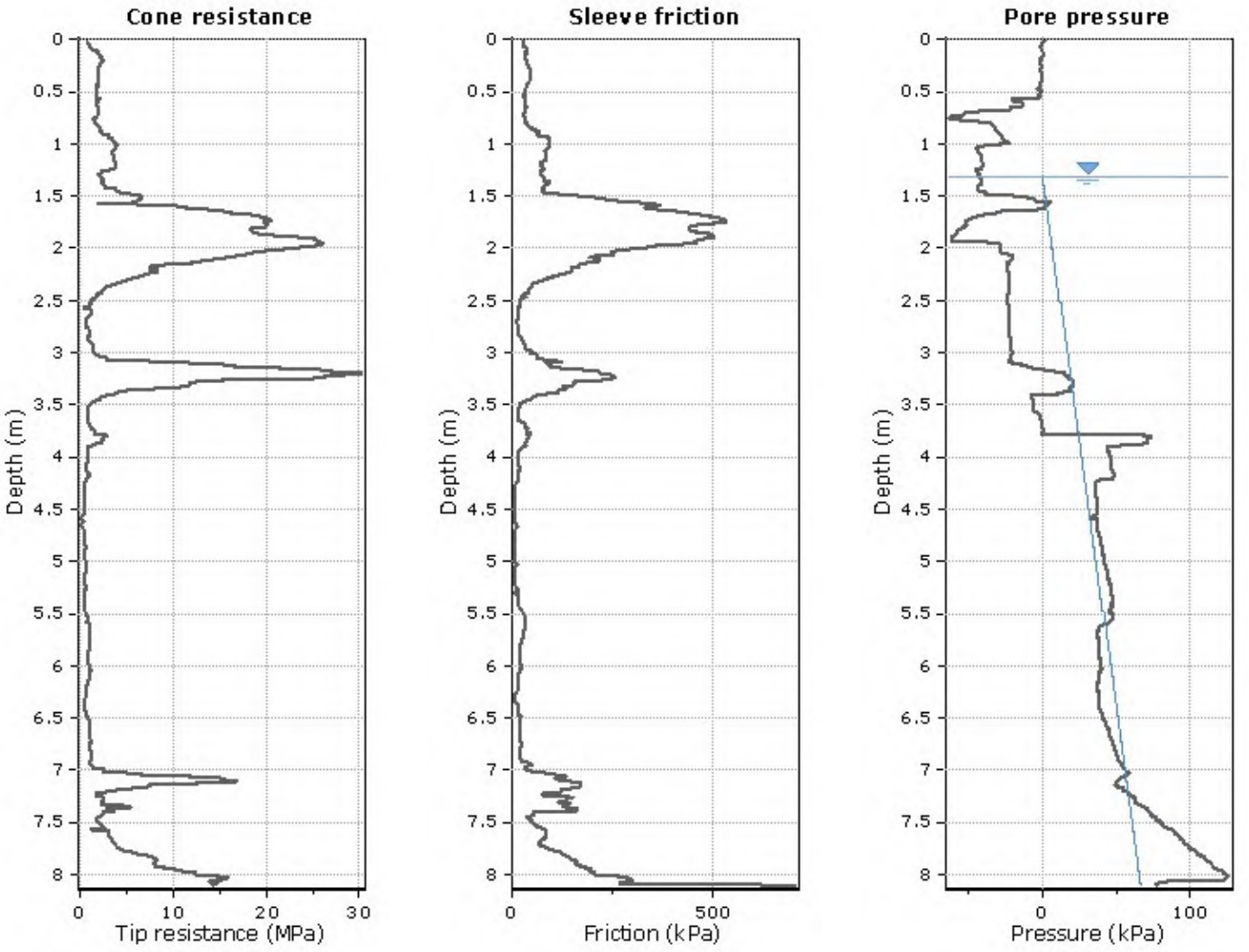
	Point Resistance	Pore Pressure	Sleeve Friction
End of test with tip loosened	0.11%	0.04%	0.78%

Dissipation Testing

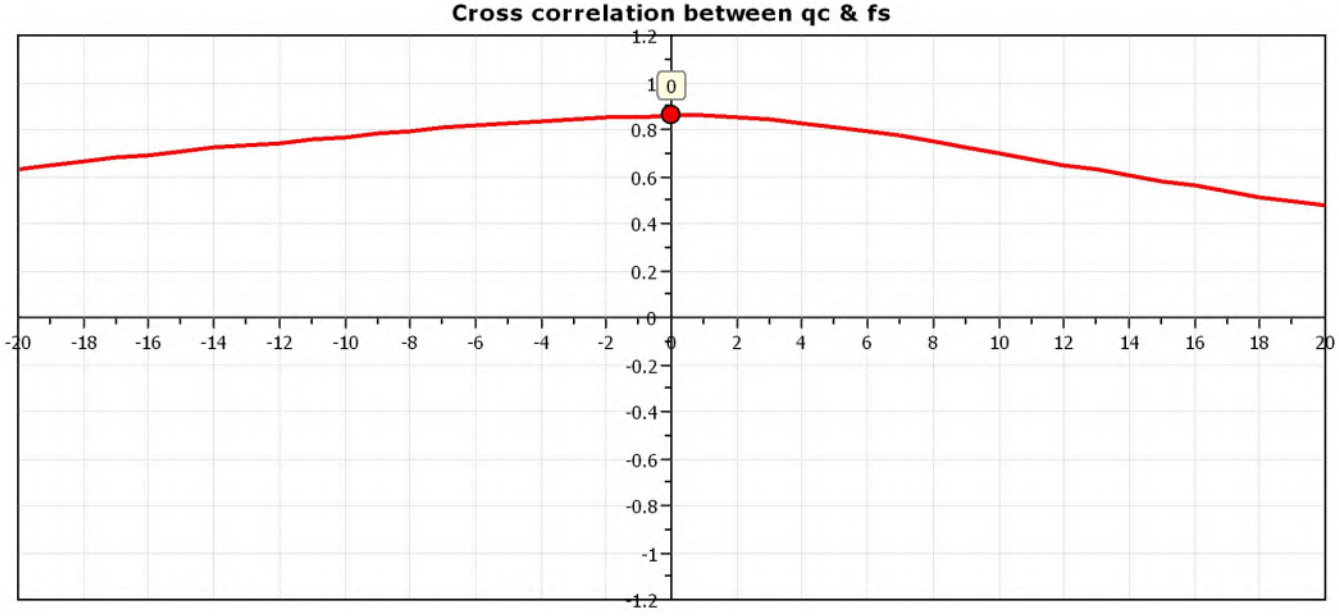
Test No	Depth (m)	Duration (secs)	Comments
D1	5.572	2134s	0.06

Notes and Comments

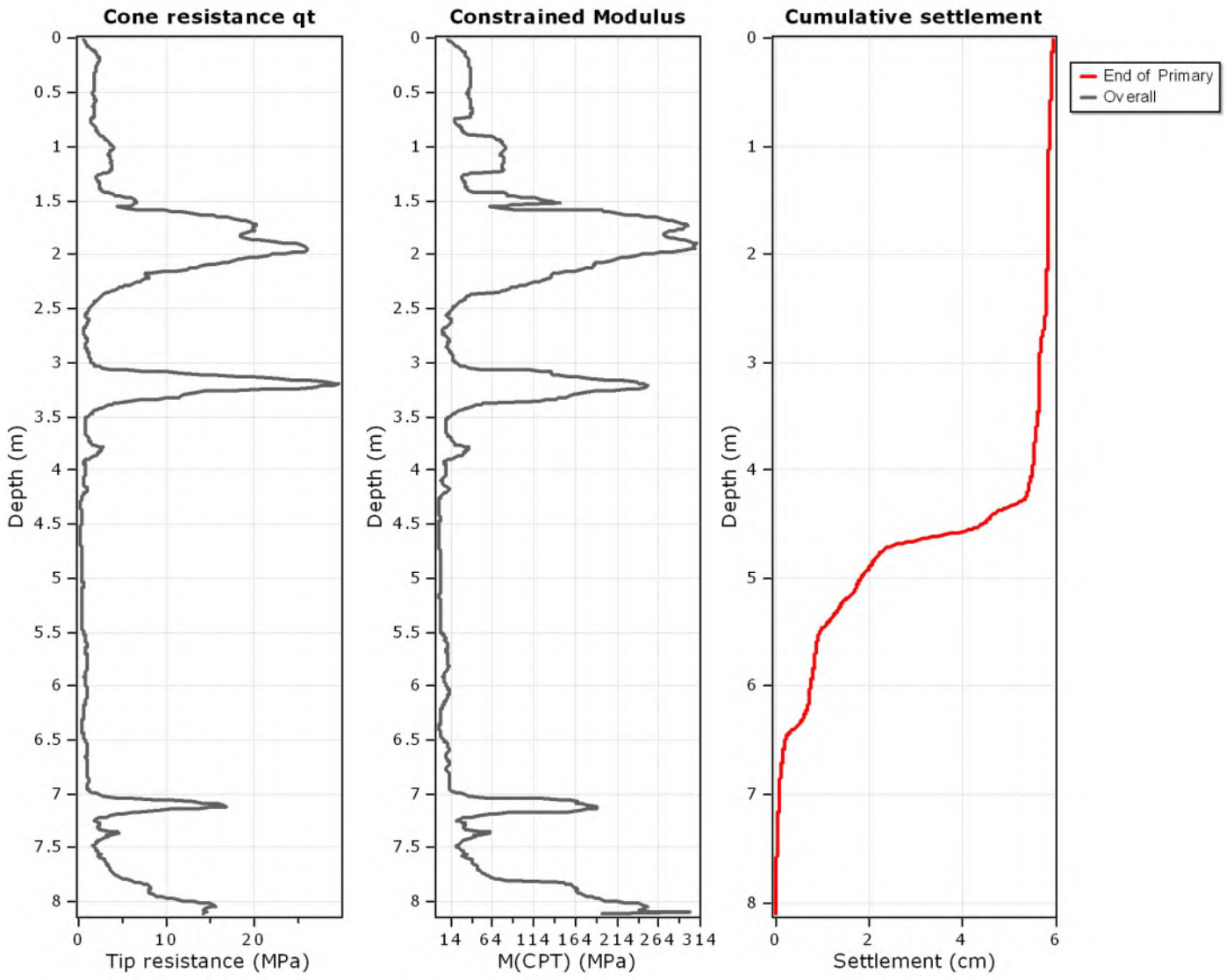
qc fs u



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



Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 40.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

:: Tabular results ::

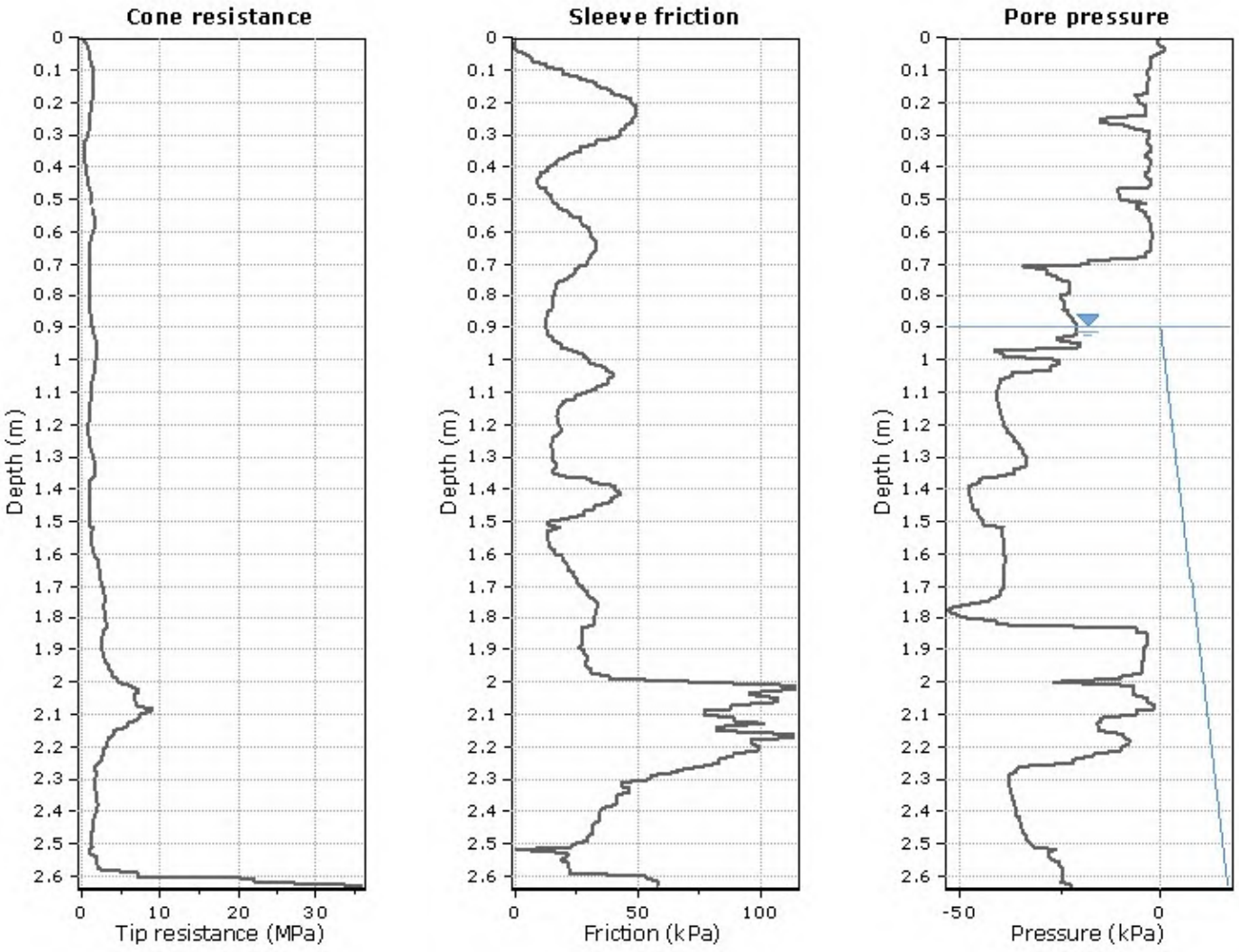
Point No	Start depth (m)	End depth (m)	Thickness (m)	Relative depth (m)	Delta P (kPa)	$M_{(CPT)}$ (MPa)	Iz	Settlement (cm)	Second. settlement (cm)	Overall settlement (cm)

Total primary settlement: 5.93
Total secondary settlement: 0.00

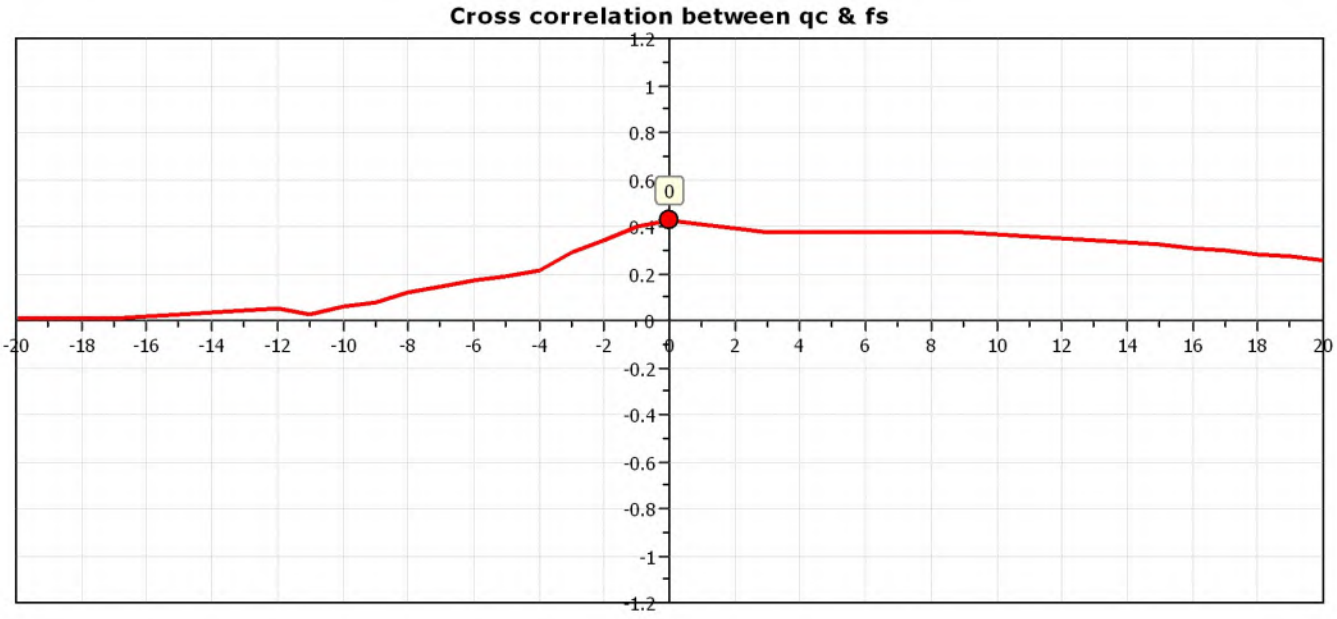
Total calculated settlement: 5.93

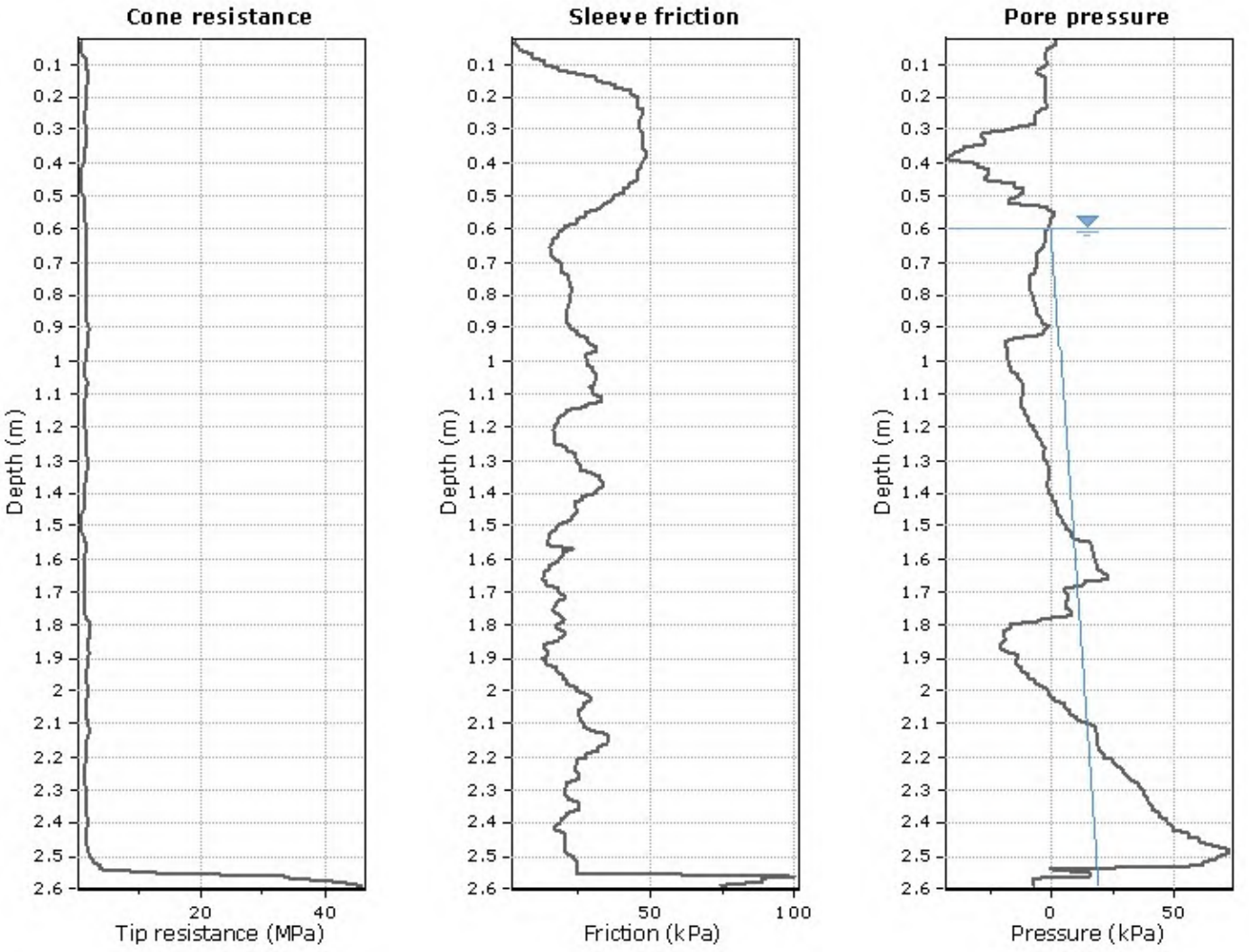
Abbreviations

Start depth:	Start depth of soil layer (penetration depth measured from ground free surface)
End depth:	End depth of soil layer (penetration depth measured from ground free surface)
Thickness:	Thickness of soil layer
Relative depth:	Depth of calculation relative to footing
Iz:	Stress influence factor
Delta P:	Footing impossed stress:
Eff. stress:	Effective stress
$M_{(CPT)}$:	Constrained modulus from CPT
Settlement:	Primary settlement
Second. settlement:	Secondary settlemends due to creep



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





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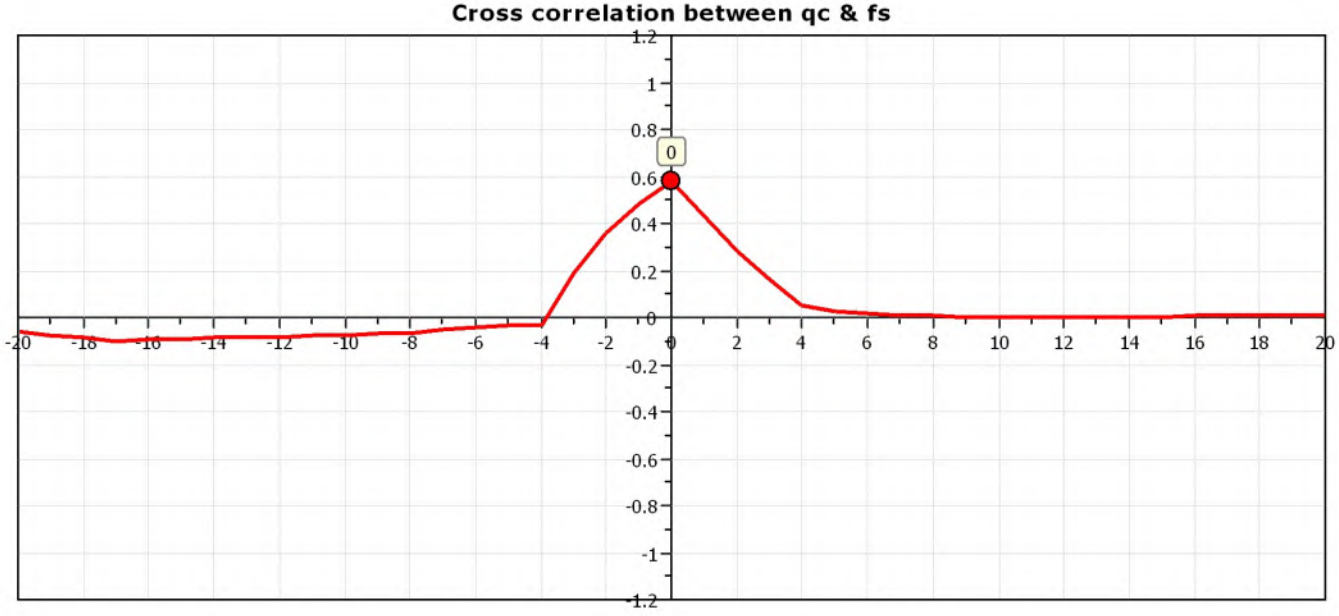
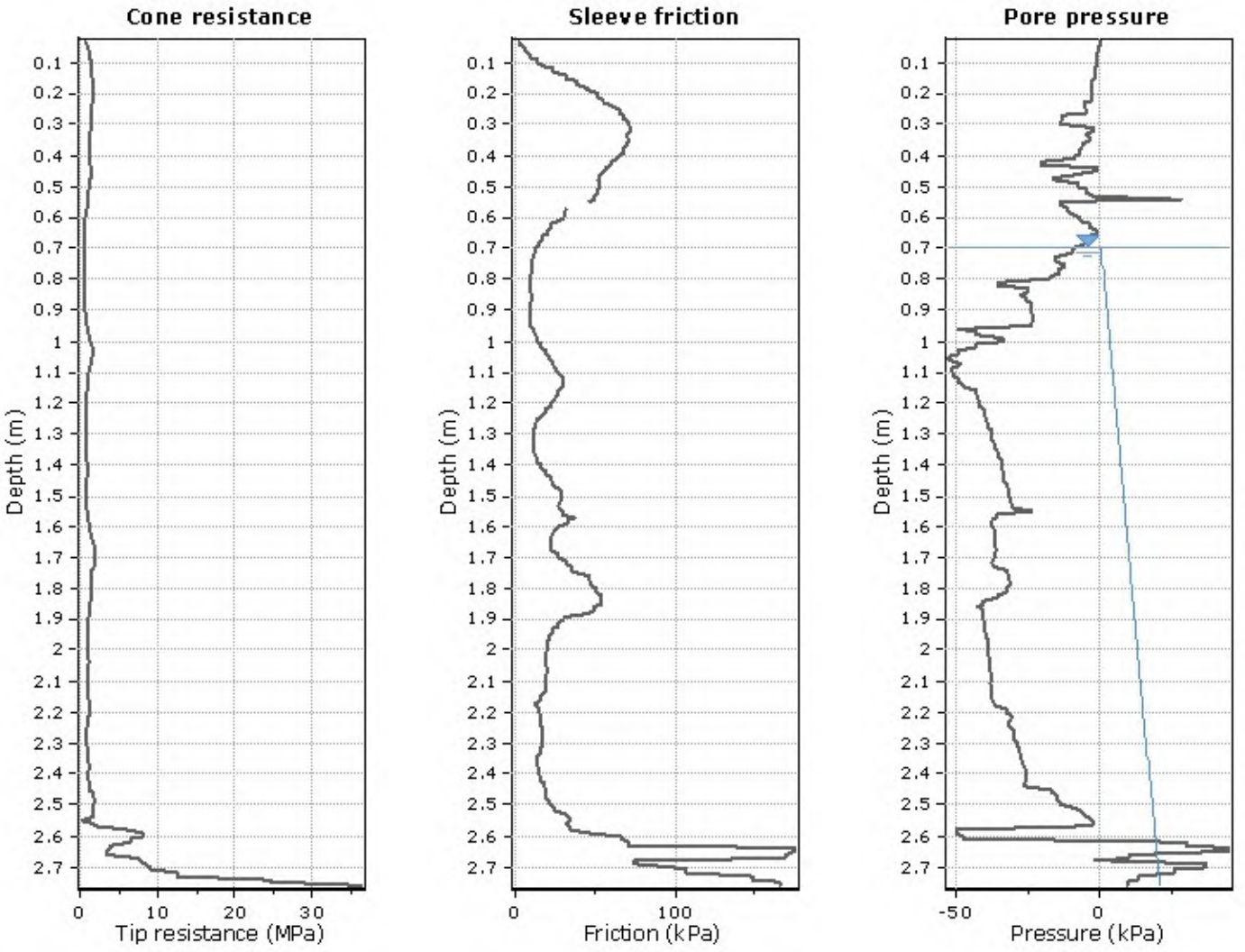
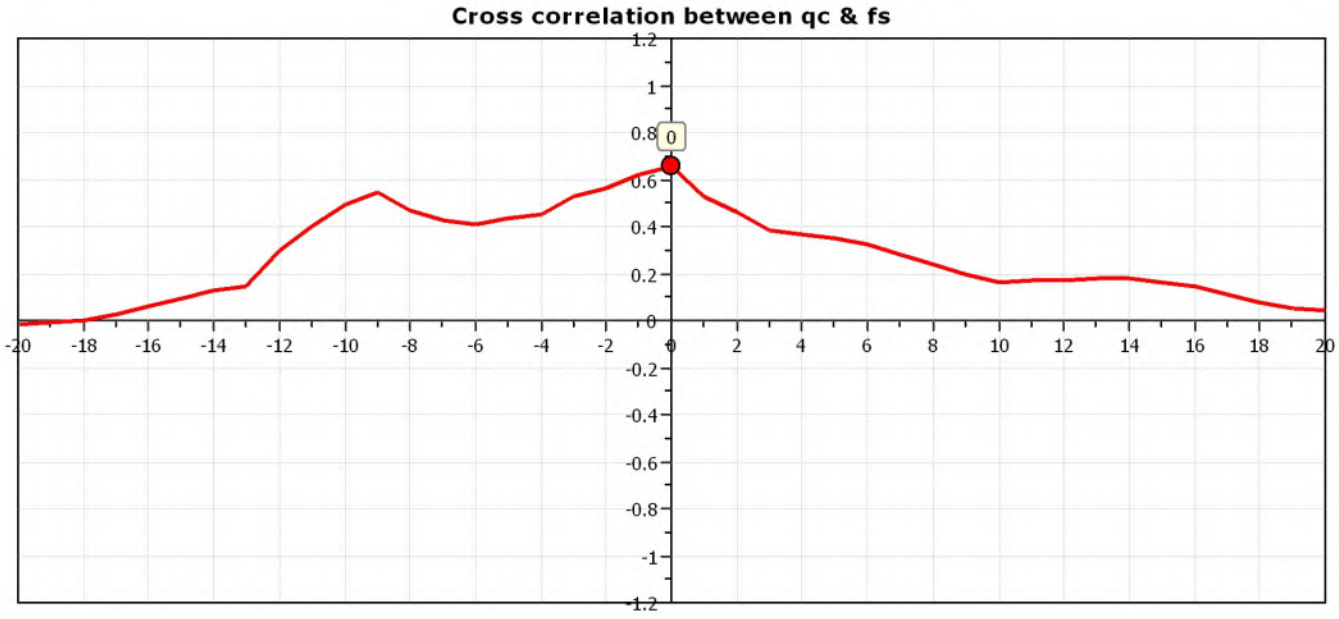
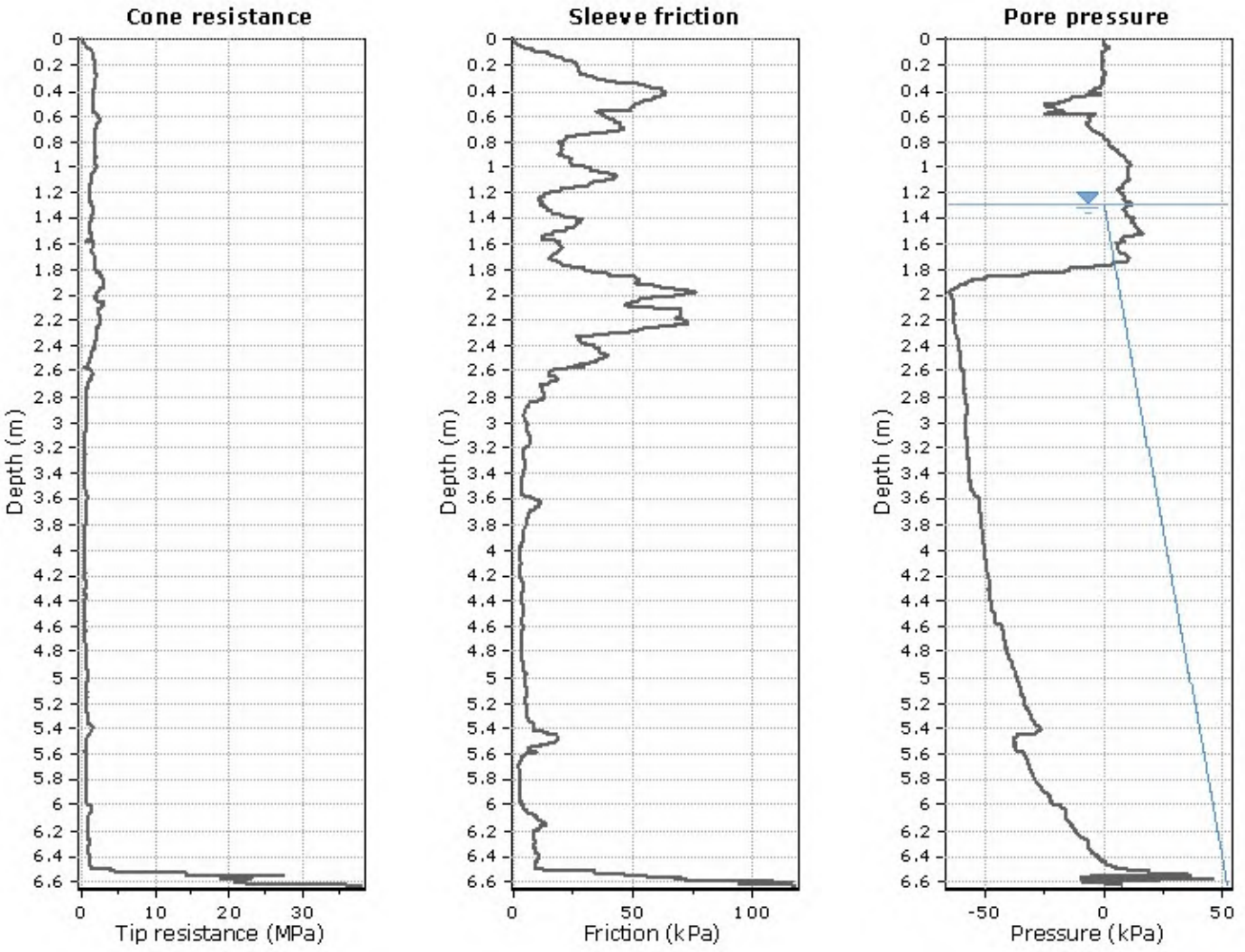


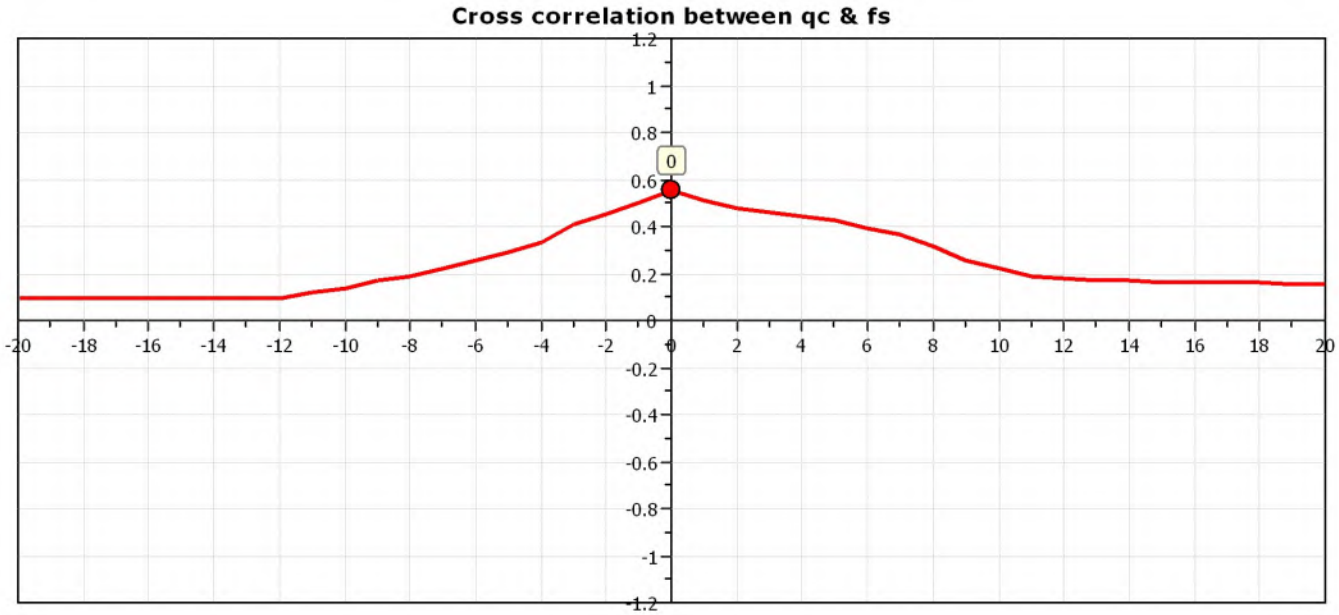


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

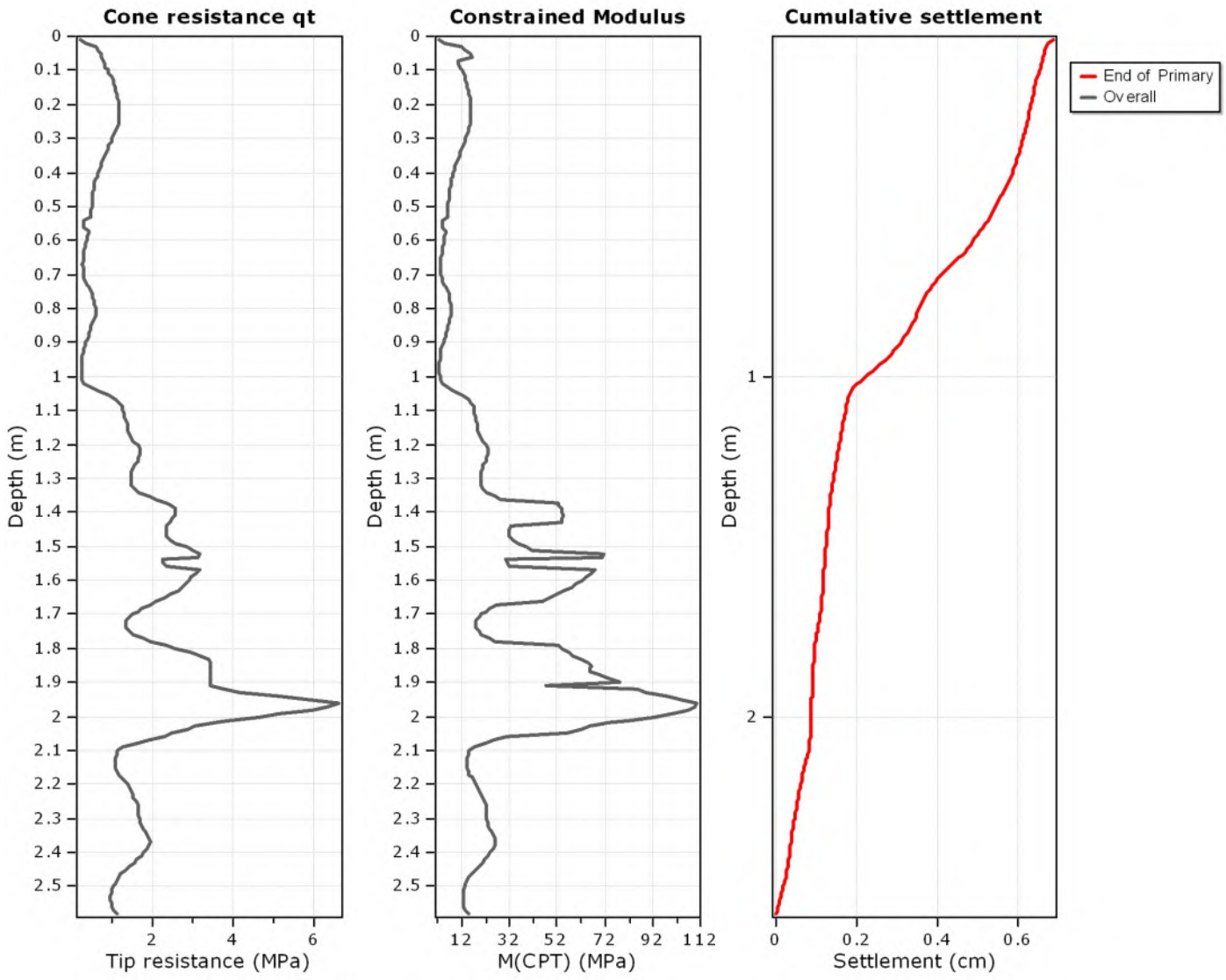




The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 40.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

:: Tabular results ::

Point No	Start depth (m)	End depth (m)	Thickness (m)	Relative depth (m)	Delta P (kPa)	$M_{(CPT)}$ (MPa)	Iz	Settlement (cm)	Second. settlement (cm)	Overall settlement (cm)
226	2.26	2.27	0.01	2.27	29.97	22.20	1.00	0.001	0.000	0.001
227	2.27	2.28	0.01	2.28	29.97	22.49	1.00	0.001	0.000	0.001
228	2.28	2.29	0.01	2.29	29.97	22.34	1.00	0.001	0.000	0.001
229	2.29	2.30	0.01	2.30	29.97	22.41	1.00	0.001	0.000	0.001
230	2.30	2.31	0.01	2.31	29.97	22.64	1.00	0.001	0.000	0.001
231	2.31	2.32	0.01	2.32	29.97	23.15	1.00	0.001	0.000	0.001
232	2.32	2.33	0.01	2.33	29.97	23.44	1.00	0.001	0.000	0.001
233	2.33	2.34	0.01	2.34	29.96	23.92	1.00	0.001	0.000	0.001
234	2.34	2.35	0.01	2.35	29.96	24.74	1.00	0.001	0.000	0.001
235	2.35	2.36	0.01	2.36	29.96	25.57	1.00	0.001	0.000	0.001
236	2.36	2.37	0.01	2.37	29.96	26.26	1.00	0.001	0.000	0.001
237	2.37	2.38	0.01	2.38	29.96	26.30	1.00	0.001	0.000	0.001
238	2.38	2.39	0.01	2.38	29.96	25.99	1.00	0.001	0.000	0.001
239	2.39	2.40	0.01	2.40	29.96	25.62	1.00	0.001	0.000	0.001
240	2.40	2.41	0.01	2.40	29.96	24.27	1.00	0.001	0.000	0.001
241	2.41	2.42	0.01	2.42	29.96	23.26	1.00	0.001	0.000	0.001
242	2.42	2.43	0.01	2.42	29.96	21.56	1.00	0.001	0.000	0.001
243	2.43	2.44	0.01	2.44	29.96	20.84	1.00	0.001	0.000	0.001
244	2.44	2.45	0.01	2.45	29.96	19.30	1.00	0.002	0.000	0.002
245	2.45	2.46	0.01	2.46	29.96	17.83	1.00	0.002	0.000	0.002
246	2.46	2.47	0.01	2.47	29.96	16.37	1.00	0.002	0.000	0.002
247	2.47	2.48	0.01	2.48	29.96	15.29	1.00	0.002	0.000	0.002
248	2.48	2.49	0.01	2.49	29.96	14.81	1.00	0.002	0.000	0.002
249	2.49	2.50	0.01	2.50	29.96	14.09	1.00	0.002	0.000	0.002
250	2.50	2.51	0.01	2.51	29.96	13.85	1.00	0.002	0.000	0.002
251	2.51	2.52	0.01	2.52	29.96	13.30	1.00	0.002	0.000	0.002
252	2.52	2.53	0.01	2.53	29.96	12.98	1.00	0.002	0.000	0.002
253	2.53	2.54	0.01	2.54	29.96	12.72	1.00	0.002	0.000	0.002
254	2.54	2.55	0.01	2.55	29.95	12.77	1.00	0.002	0.000	0.002
255	2.55	2.56	0.01	2.56	29.95	12.83	1.00	0.002	0.000	0.002
256	2.56	2.57	0.01	2.57	29.95	12.82	1.00	0.002	0.000	0.002
257	2.57	2.58	0.01	2.58	29.95	13.95	1.00	0.002	0.000	0.002

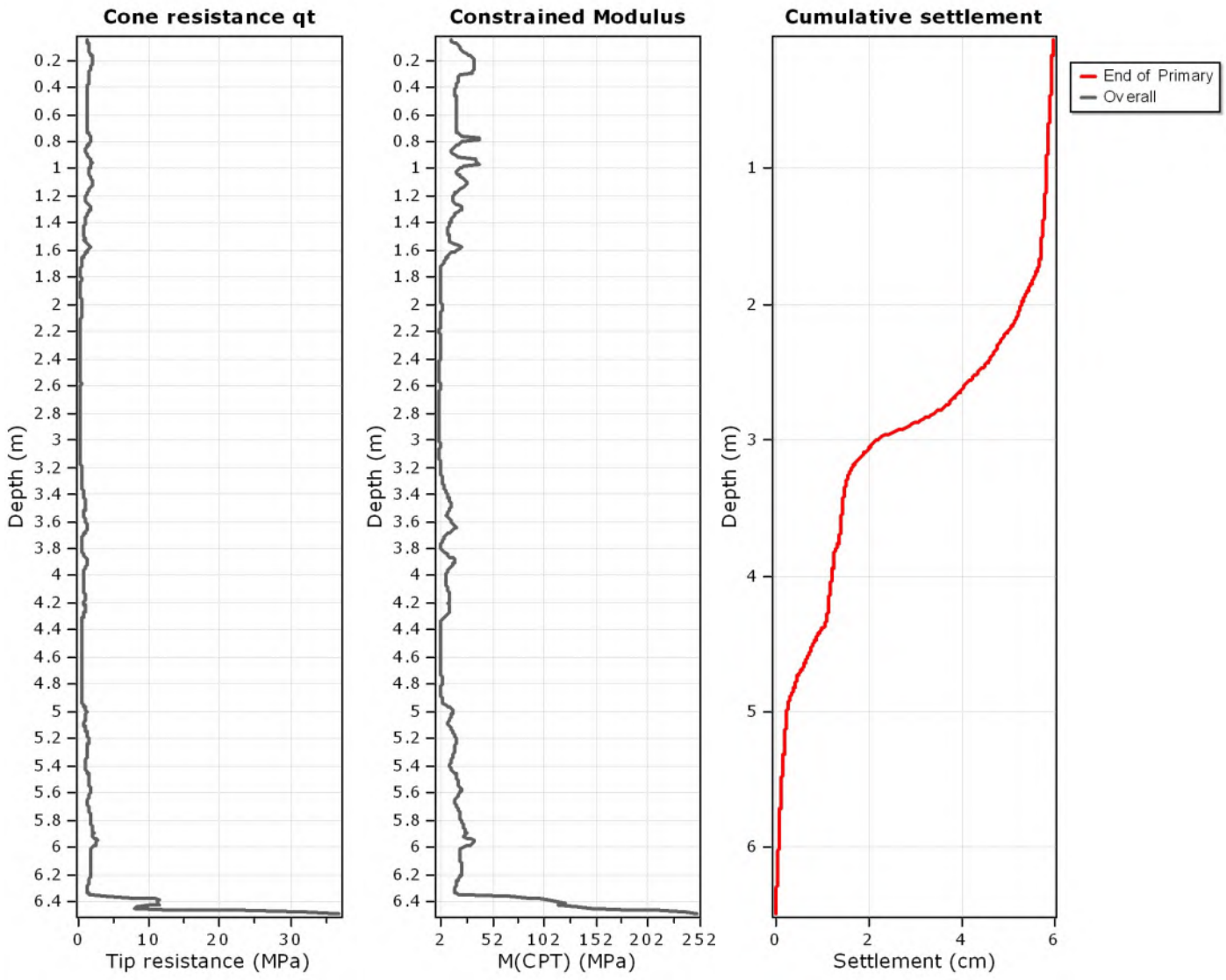
Total primary settlement: 0.68
Total secondary settlement: 0.00

Total calculated settlement: 0.68

Abbreviations

Start depth:	Start depth of soil layer (penetration depth measured from ground free surface)
End depth:	End depth of soil layer (penetration depth measured from ground free surface)
Thickness:	Thickness of soil layer
Relative depth:	Depth of calculation relative to footing
Iz:	Stress influence factor
Delta P:	Footing impossed stress:
Eff. stress:	Effective stress
$M_{(CPT)}$:	Constrained modulus from CPT
Settlement:	Primary settlement
Second. settlement:	Secondary settlemends due to creep

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 40.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

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

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

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

$$S = C_a \cdot \Delta z \cdot \log(t)$$

:: Tabular results ::

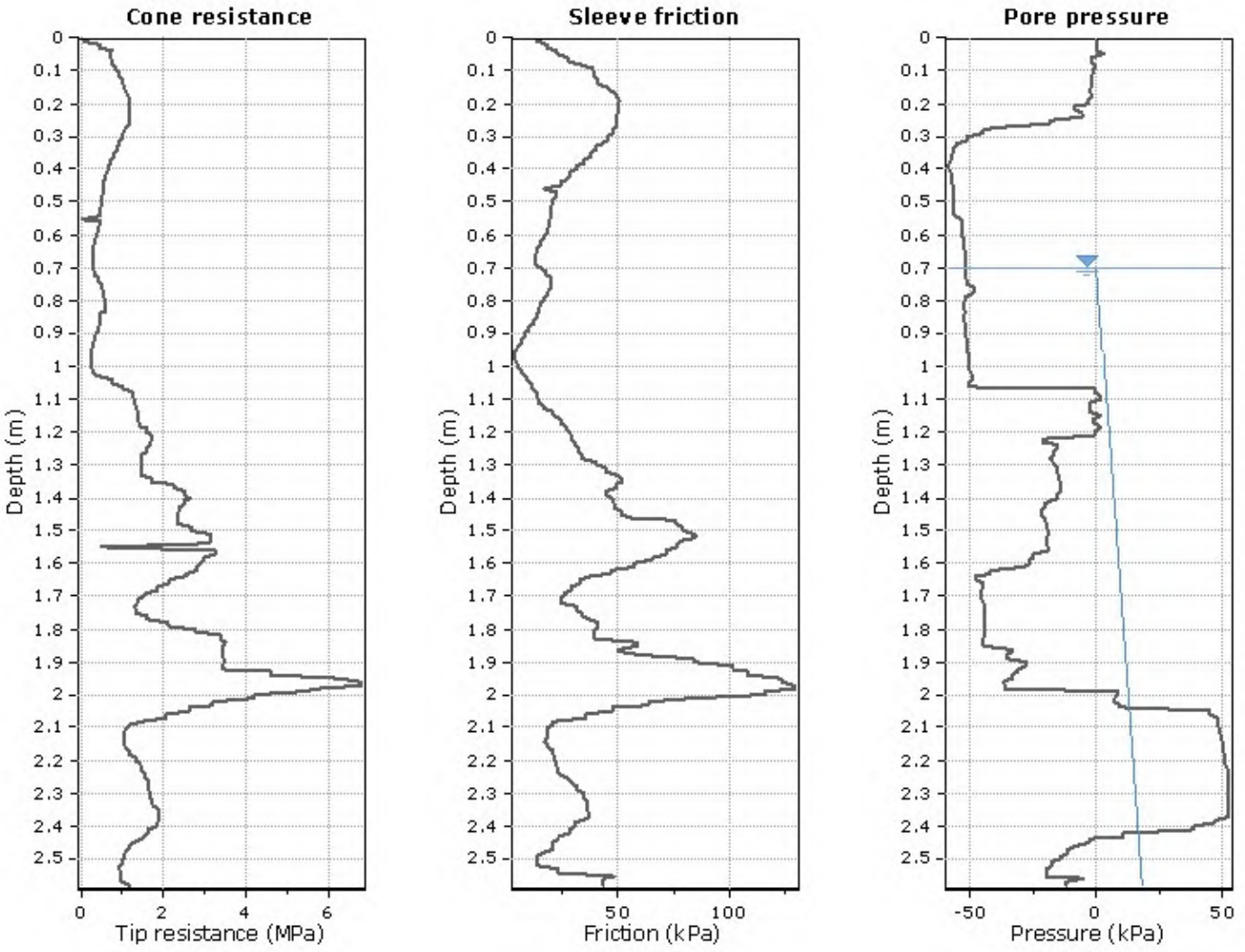
Point No	Start depth (m)	End depth (m)	Thickness (m)	Relative depth (m)	Delta P (kPa)	$M_{(CPT)}$ (MPa)	Iz	Settlement (cm)	Second. settlement (cm)	Overall settlement (cm)
631	6.35	6.36	0.01	6.36	29.36	19.25	0.98	0.002	0.000	0.002
632	6.36	6.37	0.01	6.37	29.36	70.27	0.98	0.000	0.000	0.000
633	6.37	6.38	0.01	6.38	29.36	84.38	0.98	0.000	0.000	0.000
634	6.38	6.39	0.01	6.39	29.35	95.04	0.98	0.000	0.000	0.000
635	6.39	6.40	0.01	6.40	29.35	105.92	0.98	0.000	0.000	0.000
636	6.40	6.41	0.01	6.41	29.35	113.66	0.98	0.000	0.000	0.000
637	6.41	6.42	0.01	6.42	29.35	121.62	0.98	0.000	0.000	0.000
638	6.42	6.43	0.01	6.43	29.34	120.95	0.98	0.000	0.000	0.000
639	6.43	6.44	0.01	6.44	29.34	114.92	0.98	0.000	0.000	0.000
640	6.44	6.45	0.01	6.45	29.34	134.20	0.98	0.000	0.000	0.000
641	6.45	6.46	0.01	6.46	29.33	147.55	0.98	0.000	0.000	0.000
642	6.46	6.47	0.01	6.47	29.33	190.24	0.98	0.000	0.000	0.000
643	6.47	6.48	0.01	6.48	29.33	213.98	0.98	0.000	0.000	0.000
644	6.48	6.49	0.01	6.49	29.33	239.30	0.98	0.000	0.000	0.000

Total primary settlement: 5.96
Total secondary settlement: 0.00

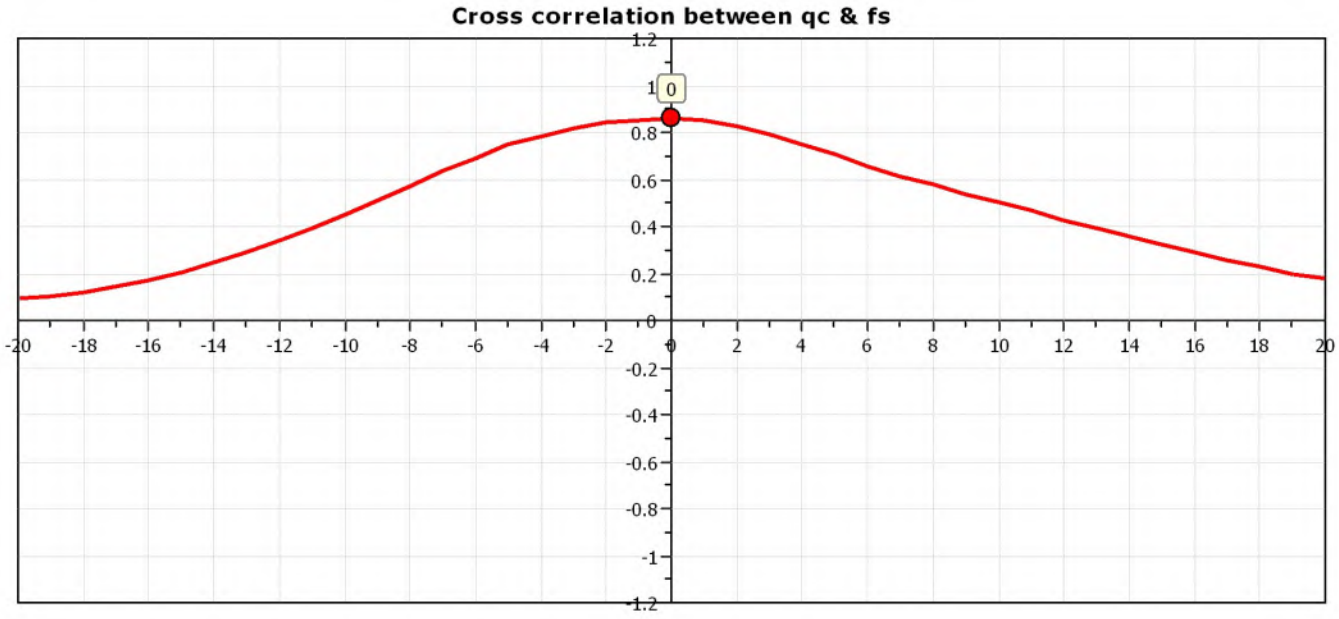
Total calculated settlement: 5.96

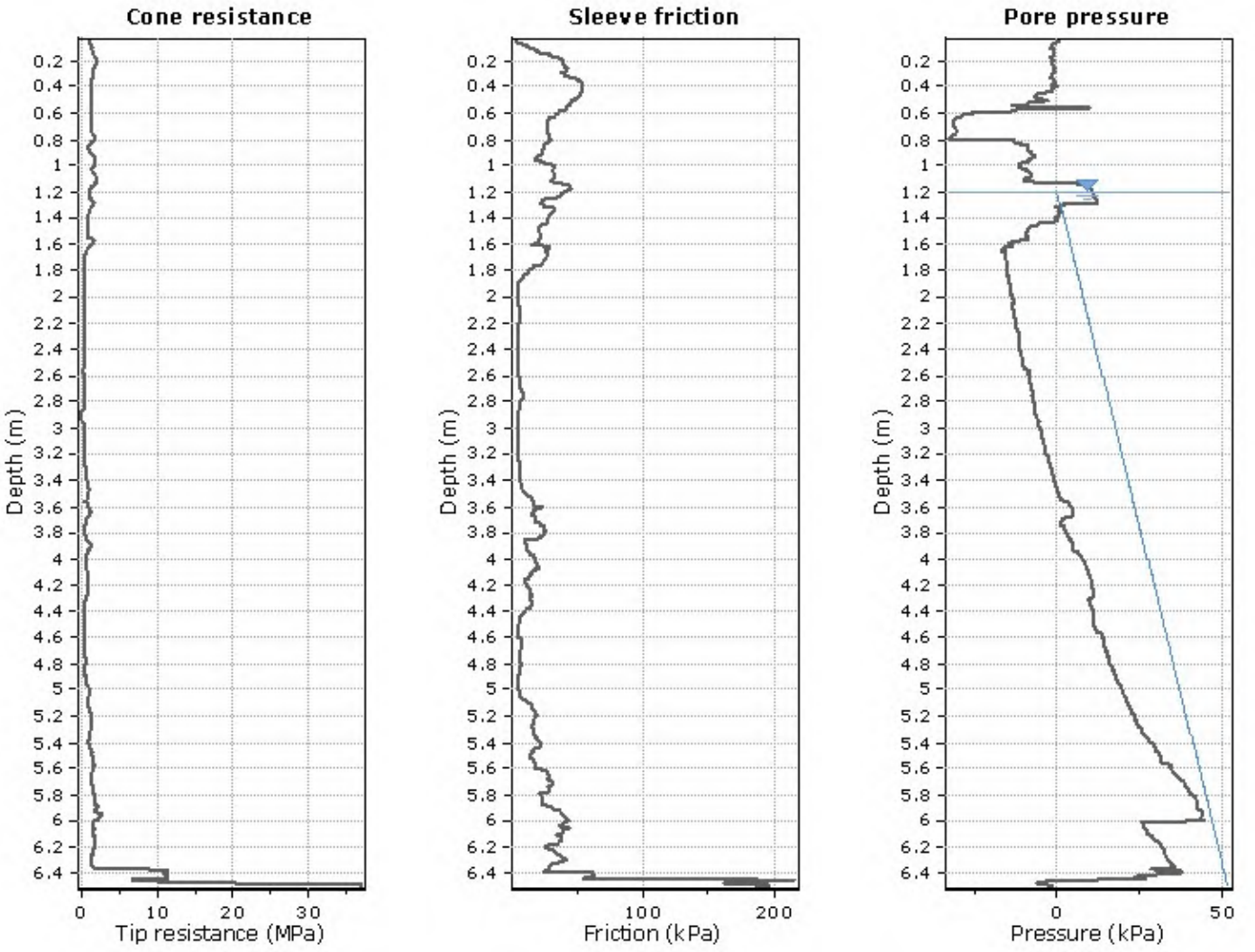
Abbreviations

Start depth:	Start depth of soil layer (penetration depth measured from ground free surface)
End depth:	End depth of soil layer (penetration depth measured from ground free surface)
Thickness:	Thickness of soil layer
Relative depth:	Depth of calculation relative to footing
Iz:	Stress influence factor
Delta P:	Footing impossed stress:
Eff. stress:	Effective stress
$M_{(CPT)}$:	Constrained modulus from CPT
Settlement:	Primary settlement
Second. settlement:	Secondary settlemends due to creep

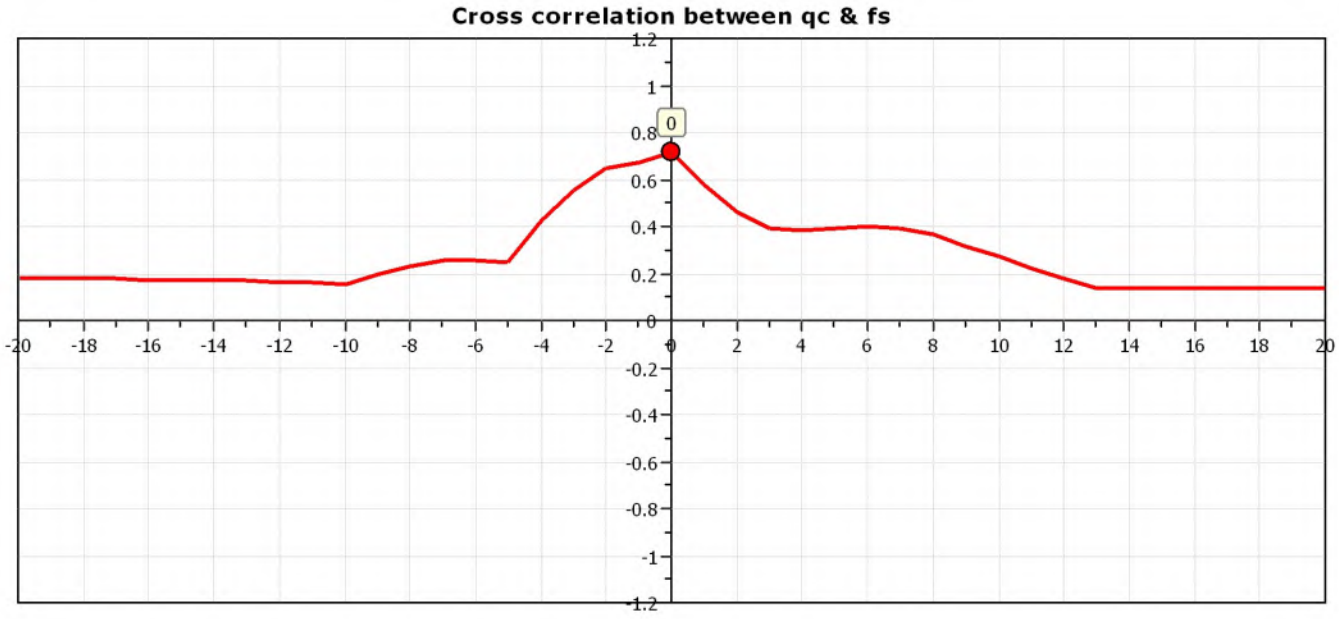


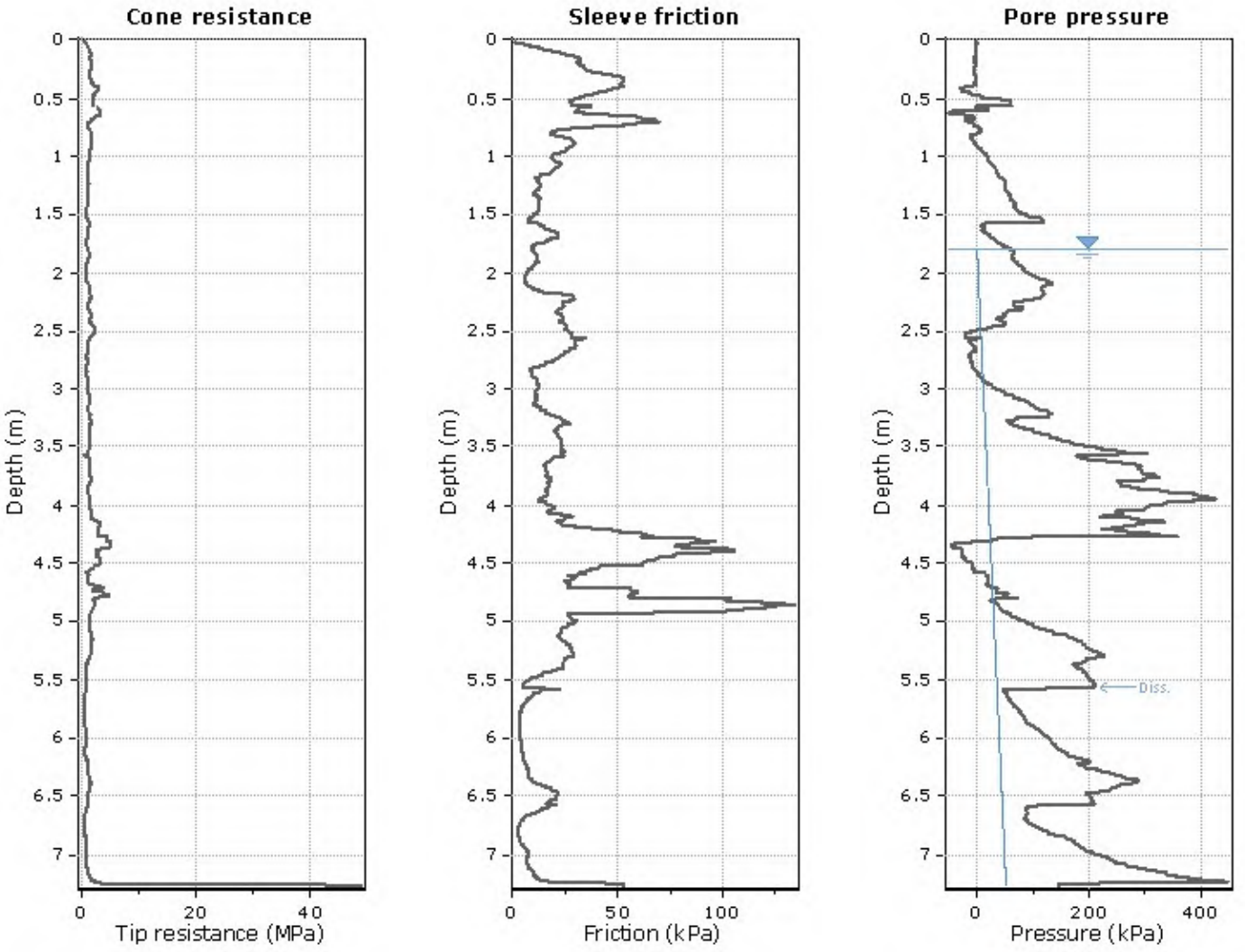
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



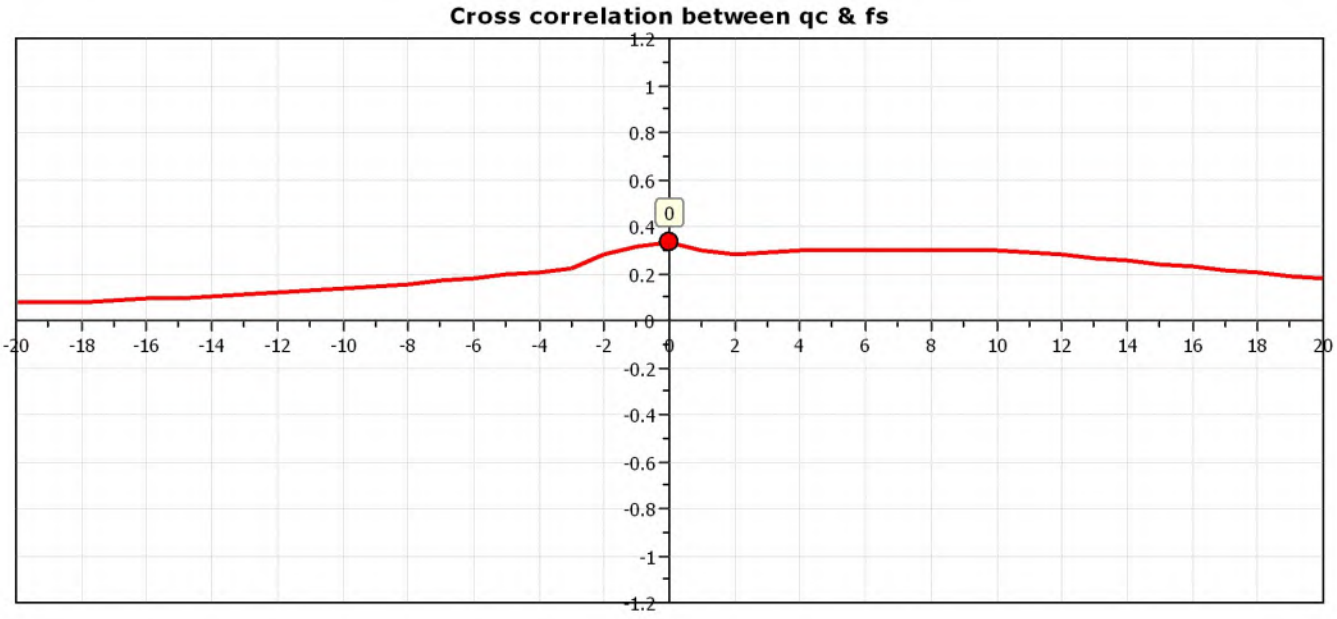


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).





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



Appendix C – Settle 3D Analysis and Liquefaction Assessment Results

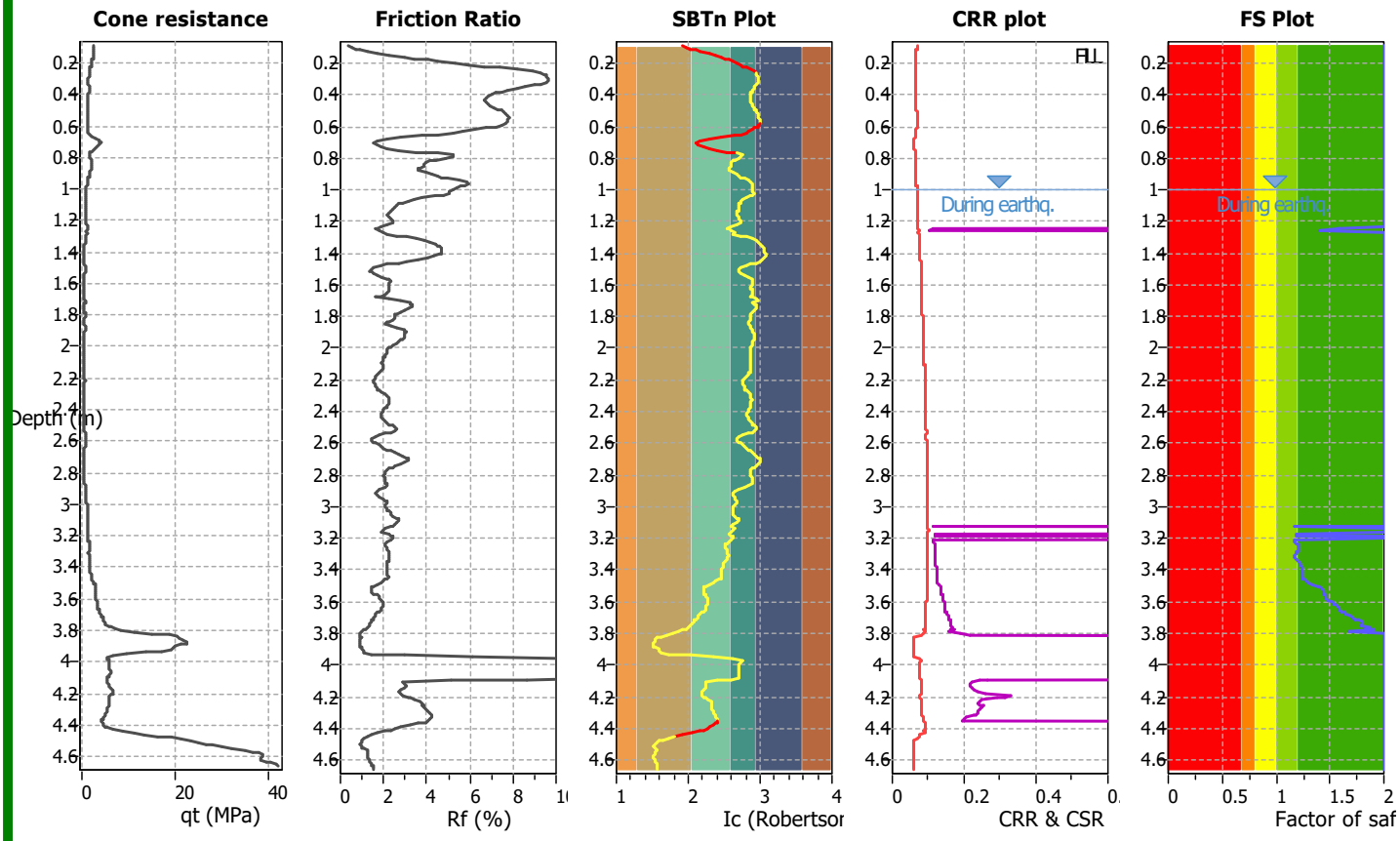
LIQUEFACTION ANALYSIS REPORT

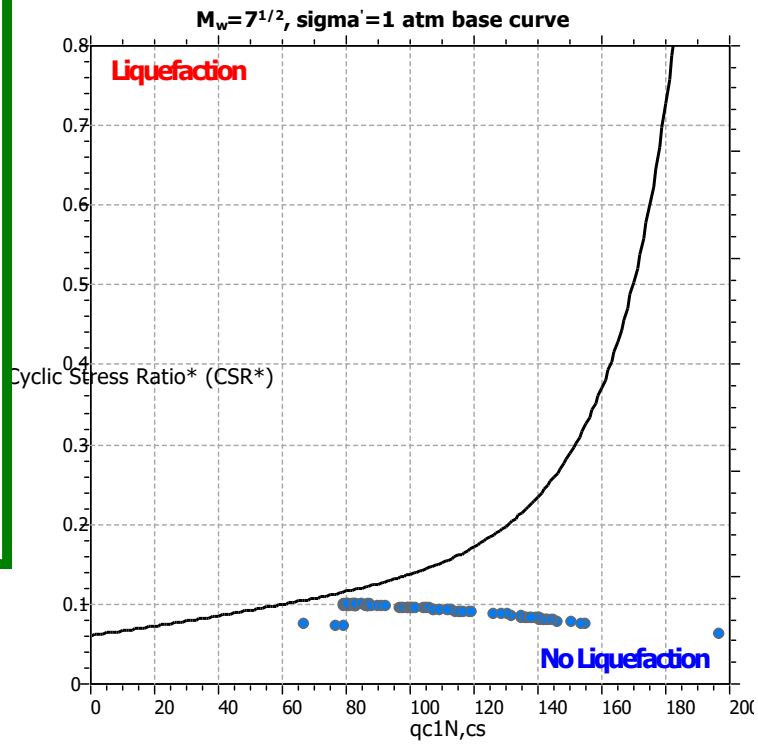
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

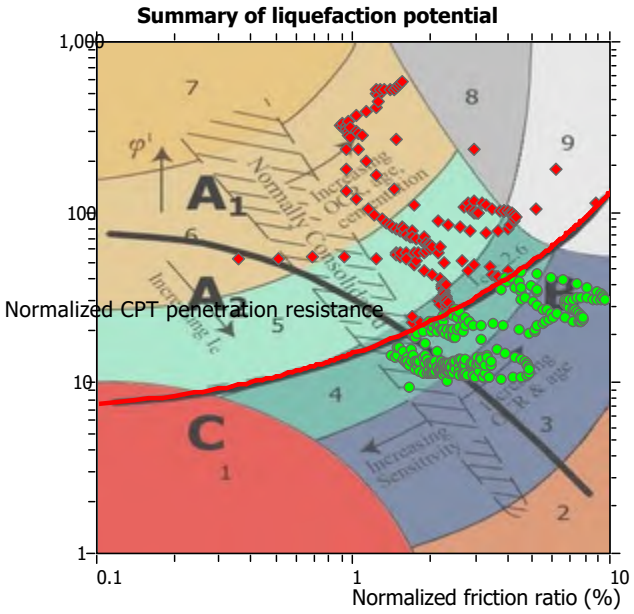
CPT file : CPT-01

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

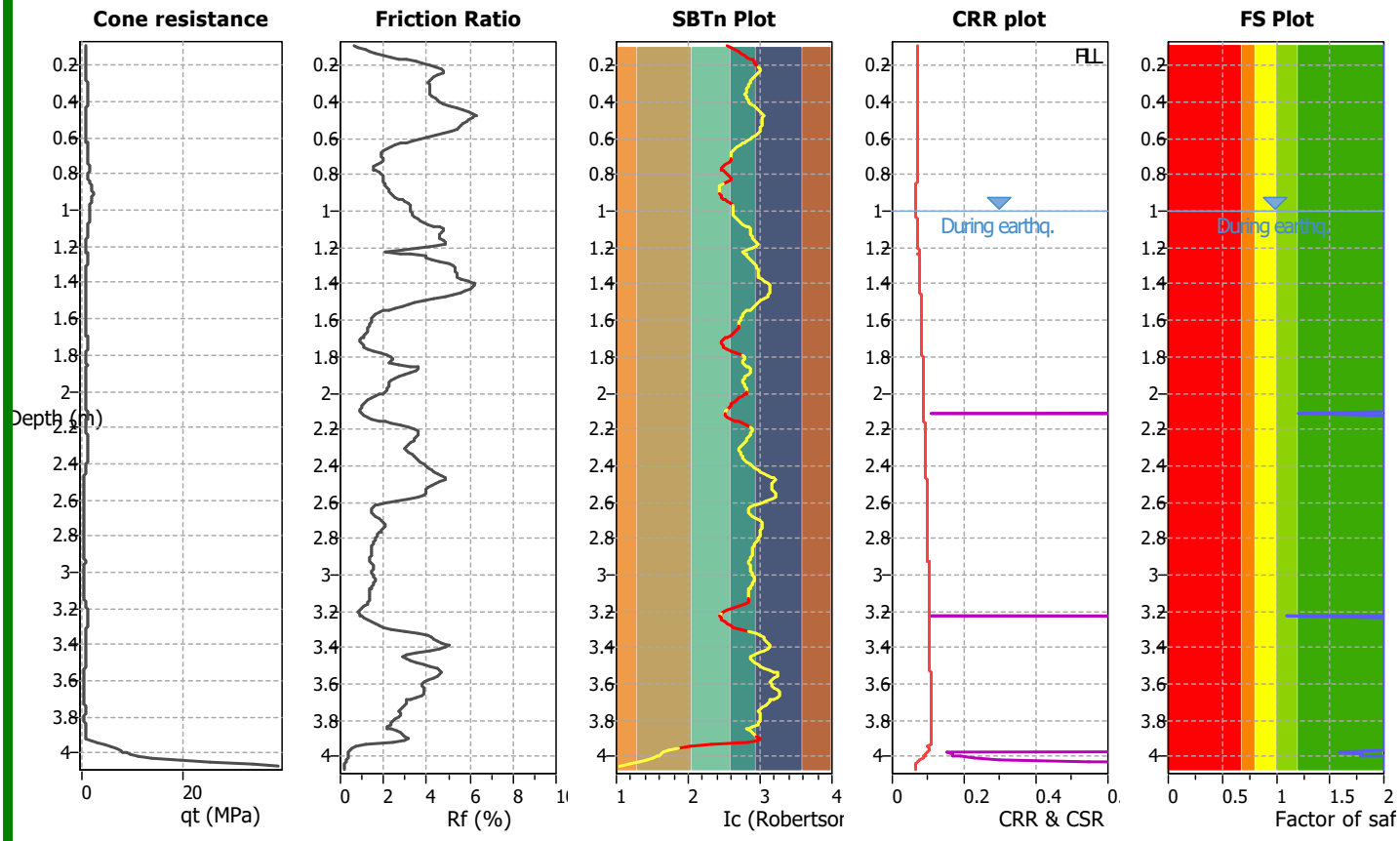
LIQUEFACTION ANALYSIS REPORT

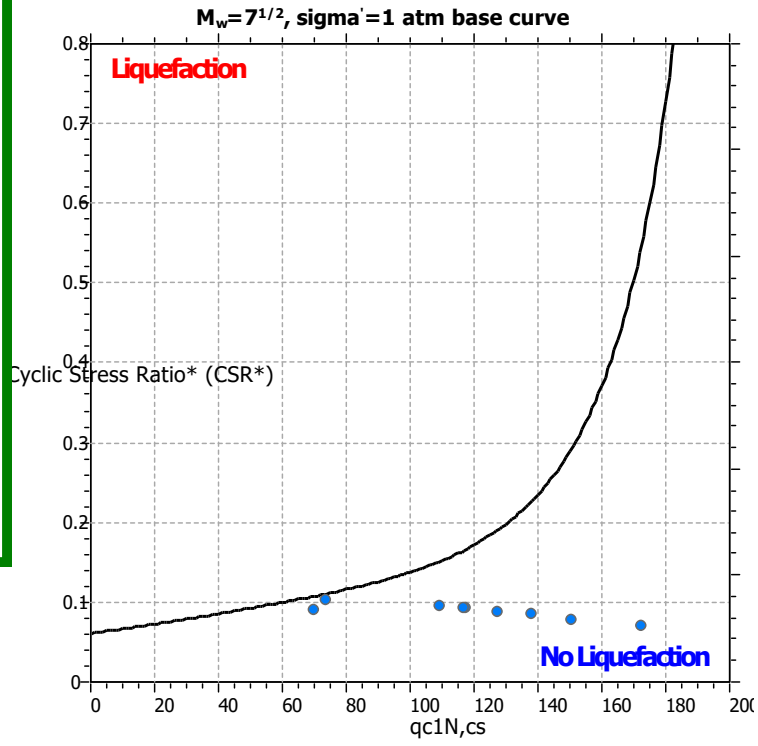
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

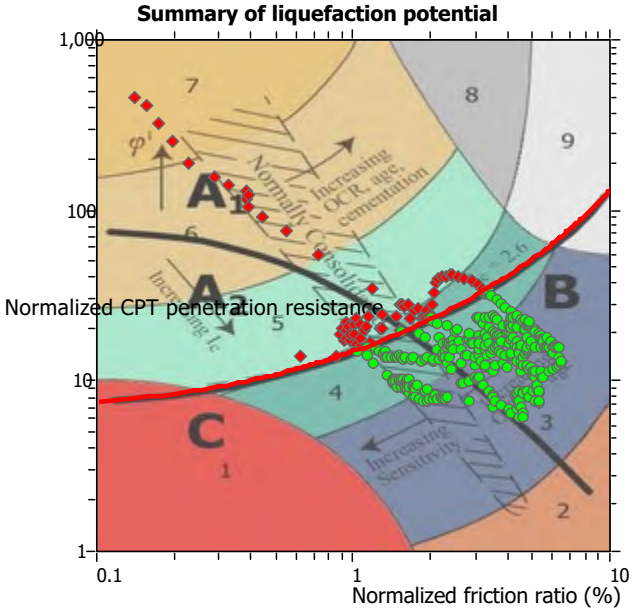
CPT file : CPT-02

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

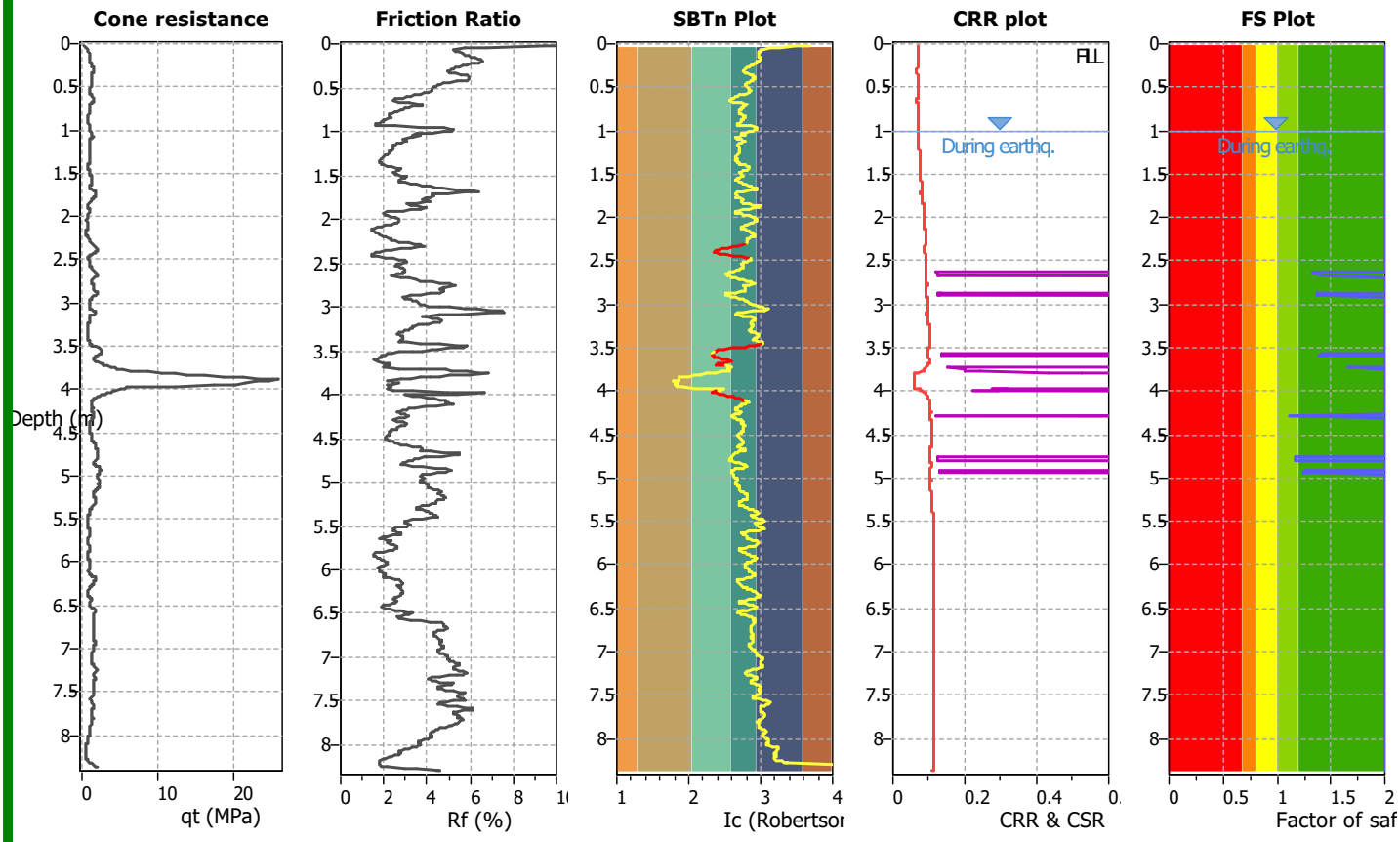
LIQUEFACTION ANALYSIS REPORT

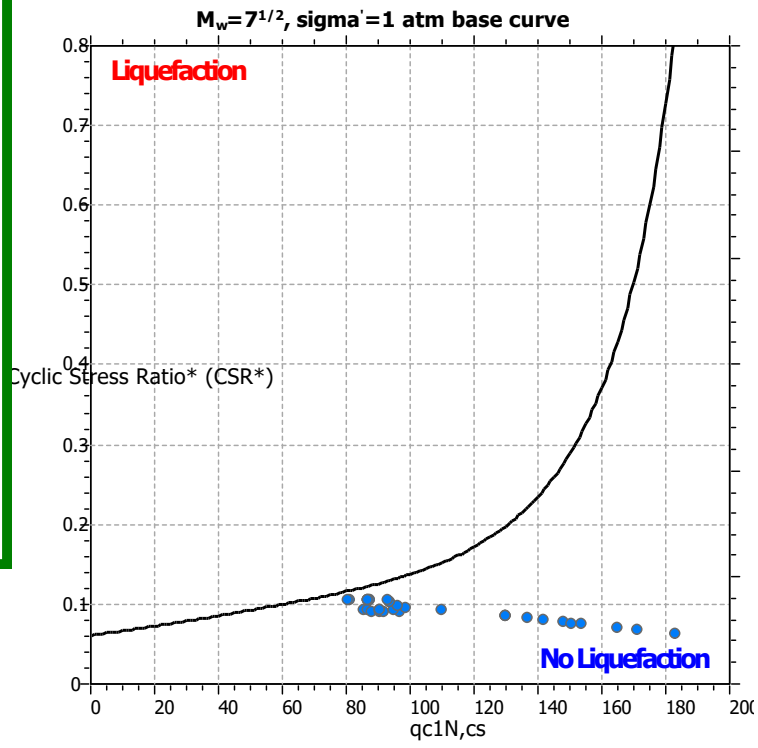
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

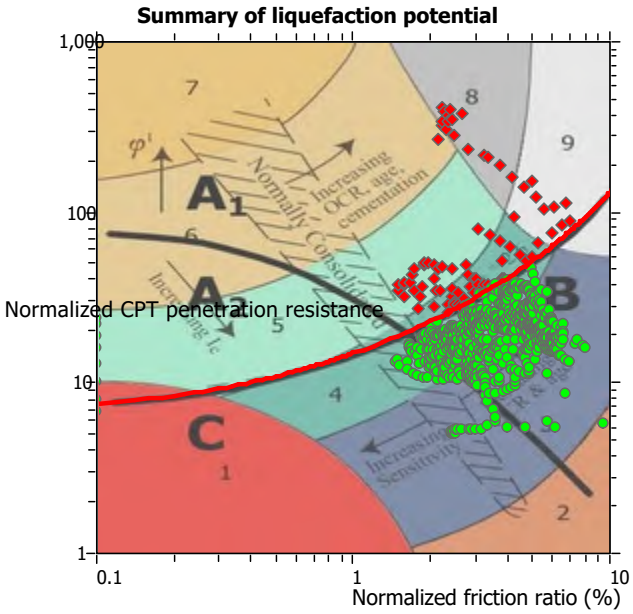
CPT file : CPT-03

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

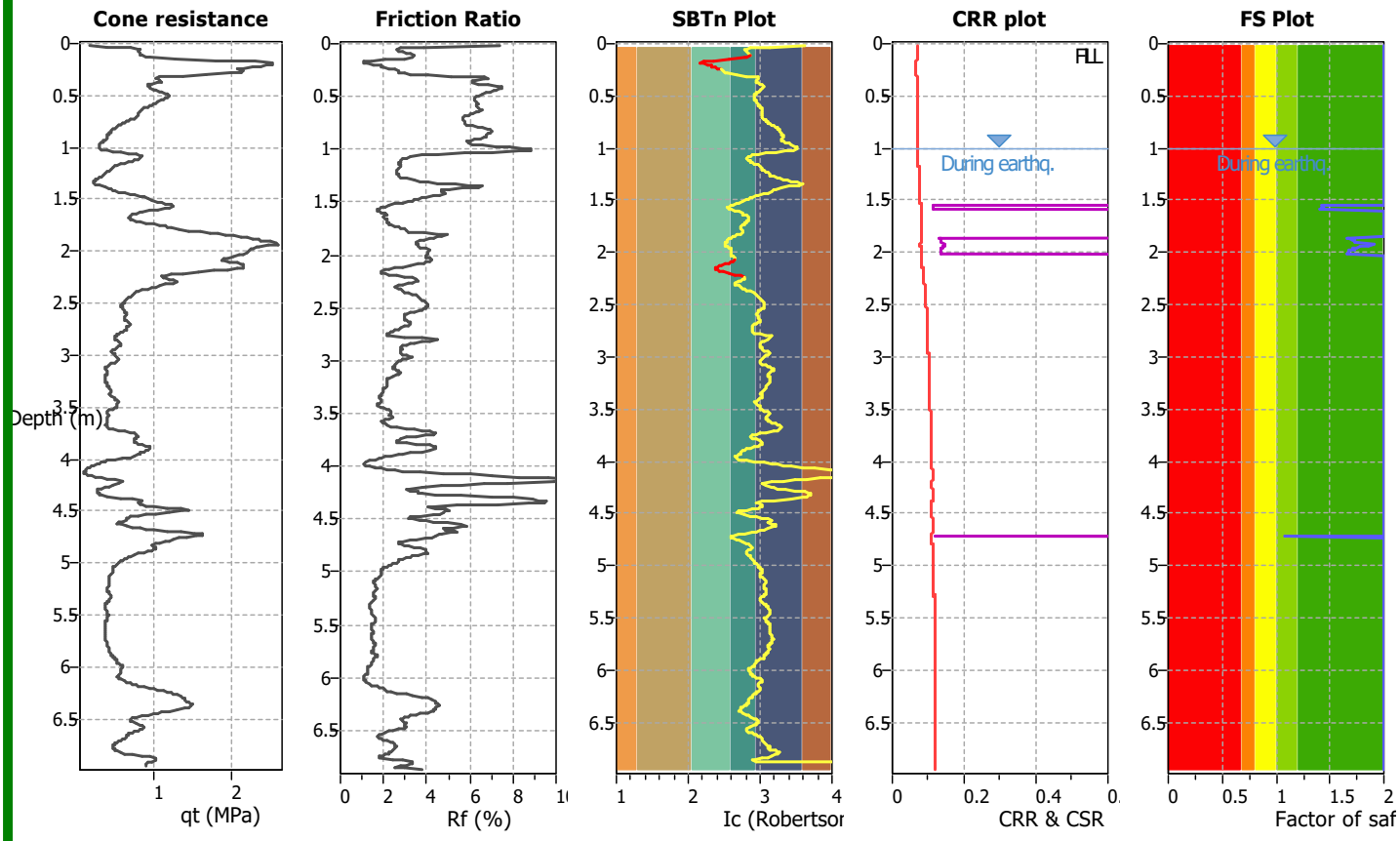
LIQUEFACTION ANALYSIS REPORT

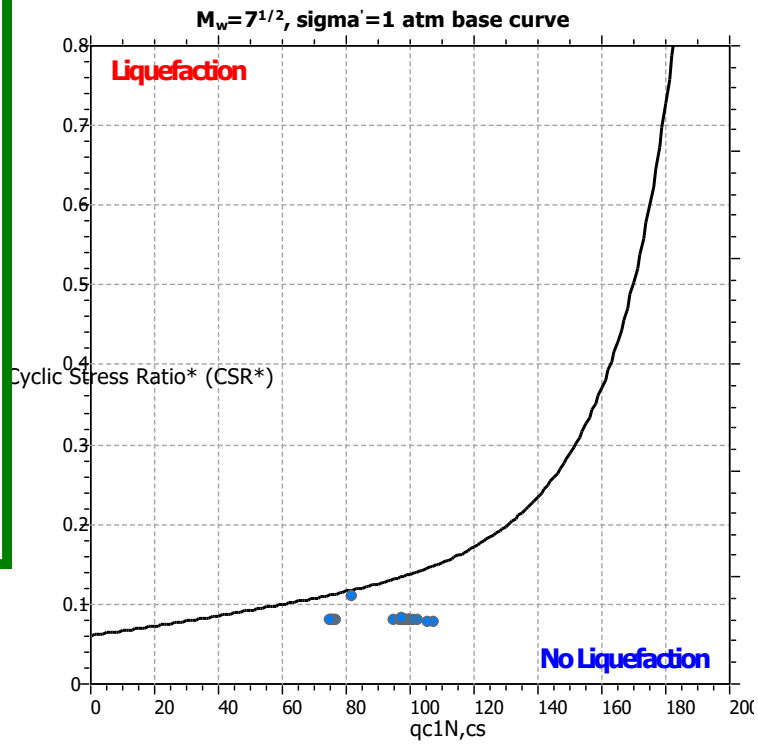
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

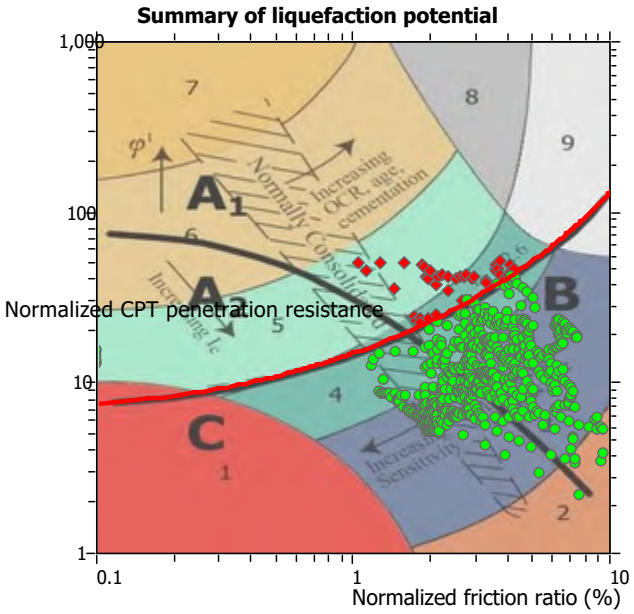
CPT file : CPT-04

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

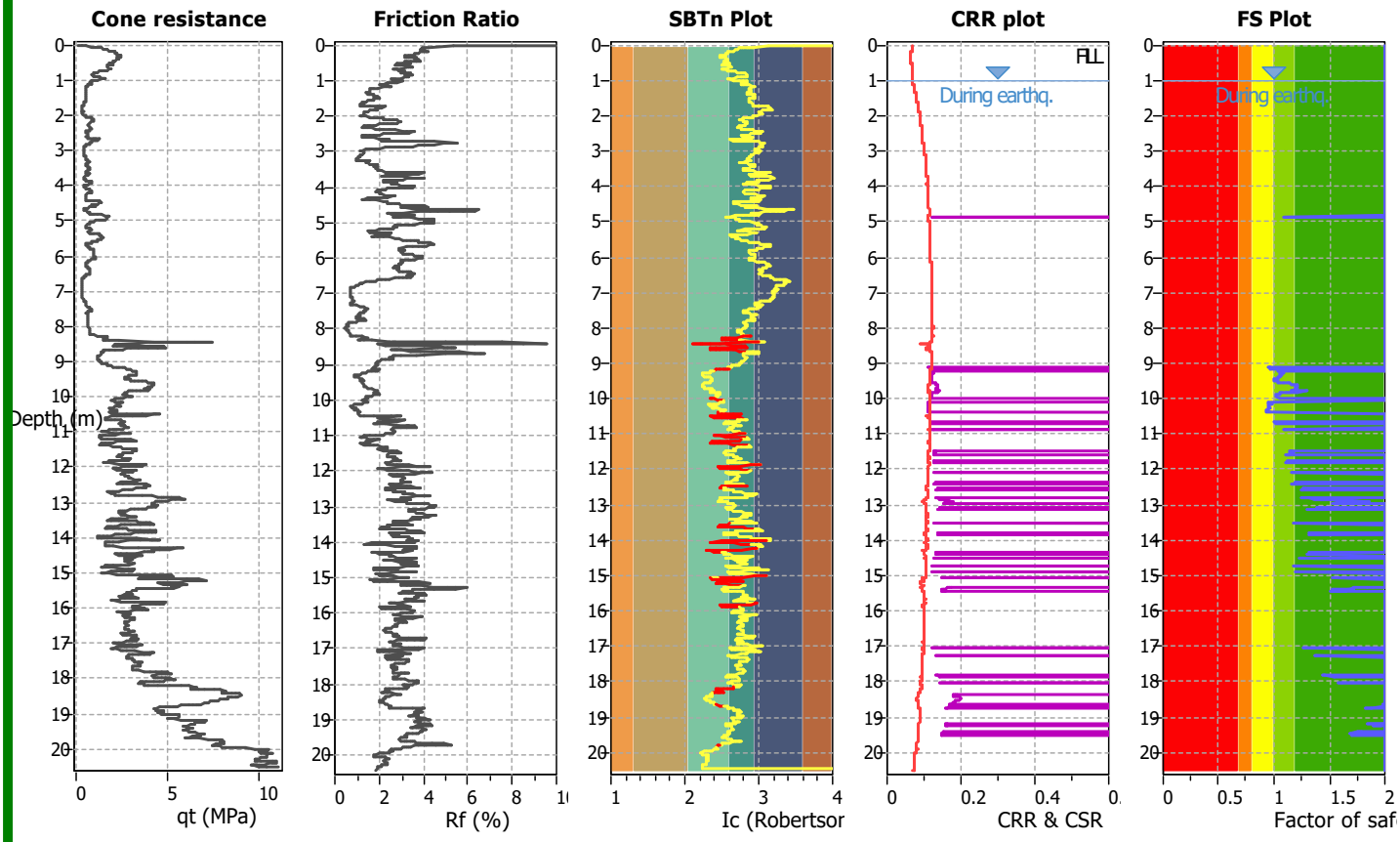
LIQUEFACTION ANALYSIS REPORT

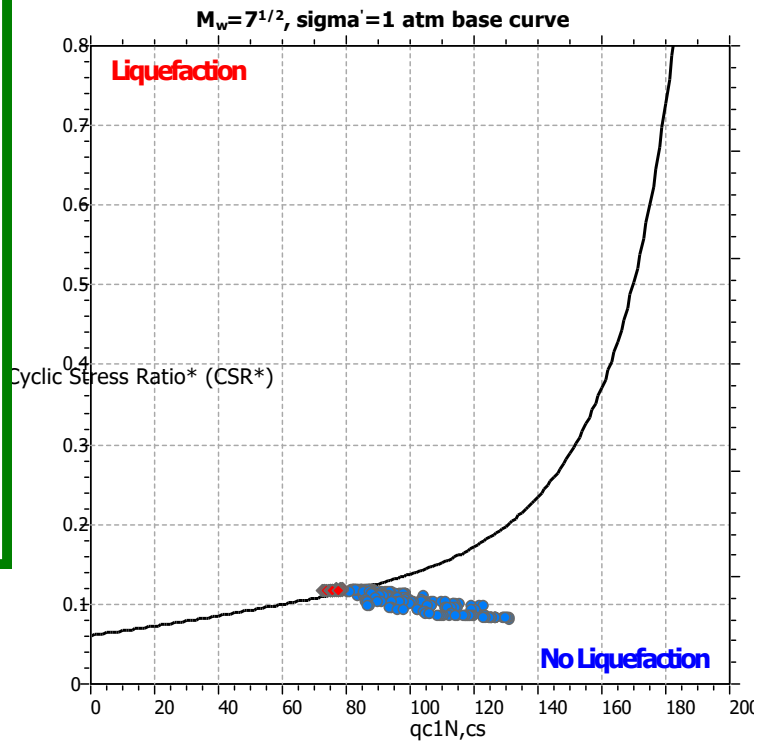
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

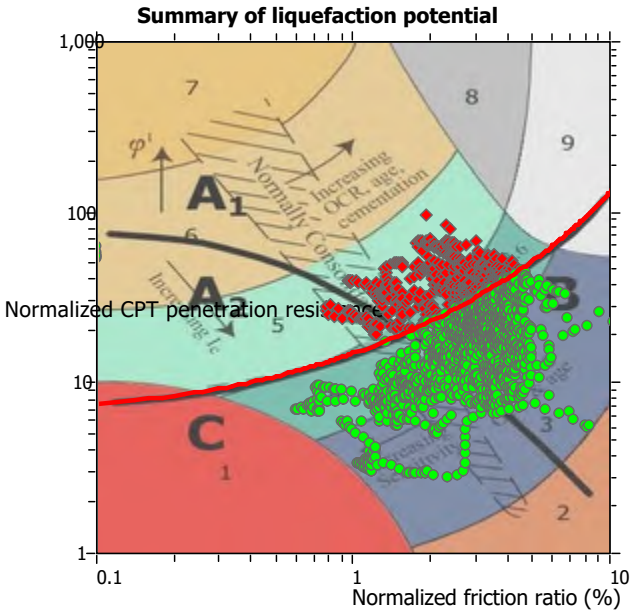
CPT file : CPT-05

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

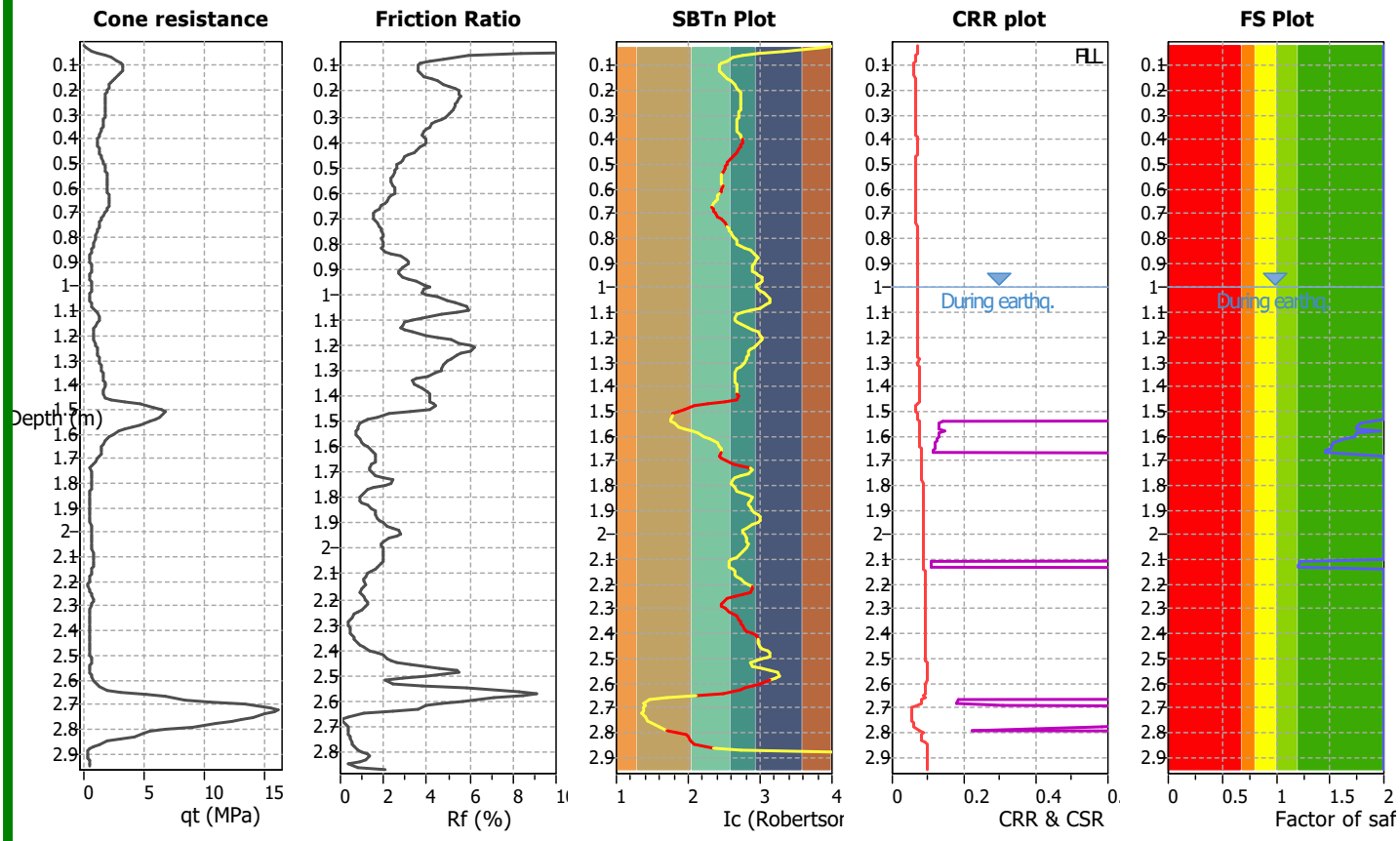
LIQUEFACTION ANALYSIS REPORT

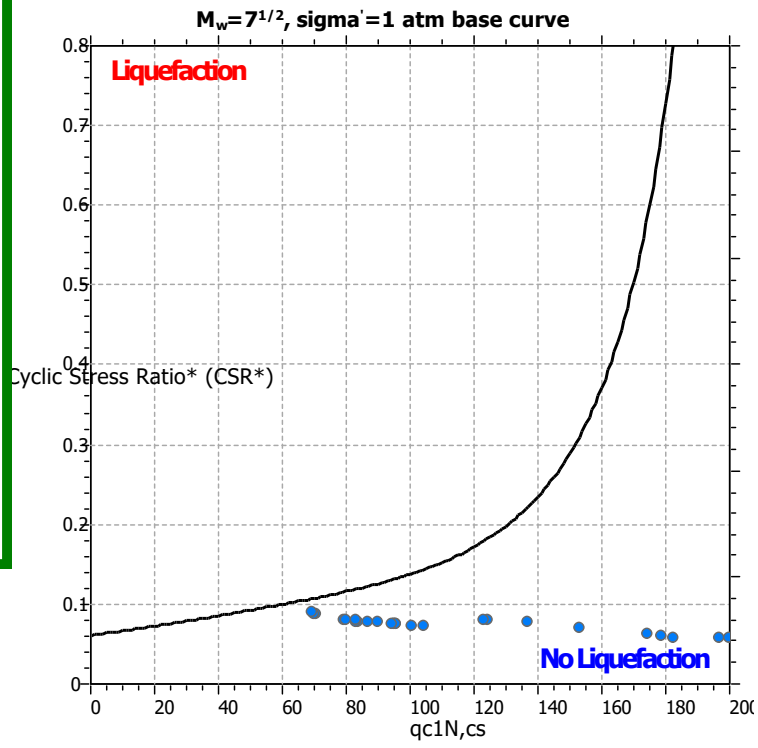
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

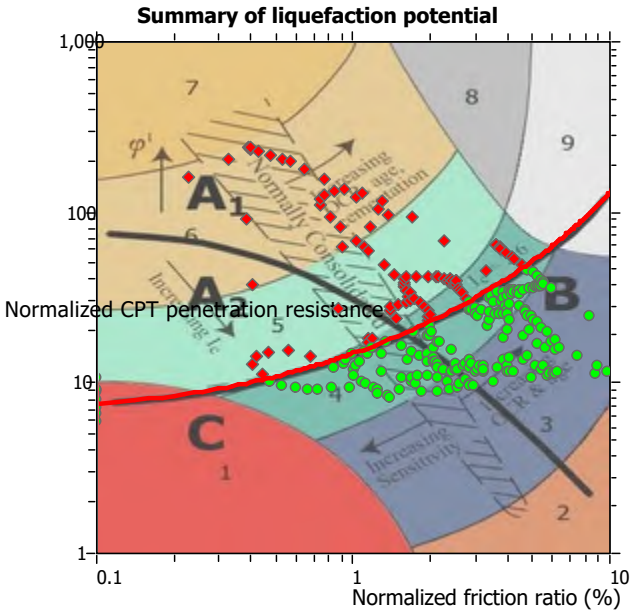
CPT file : CPT-06

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

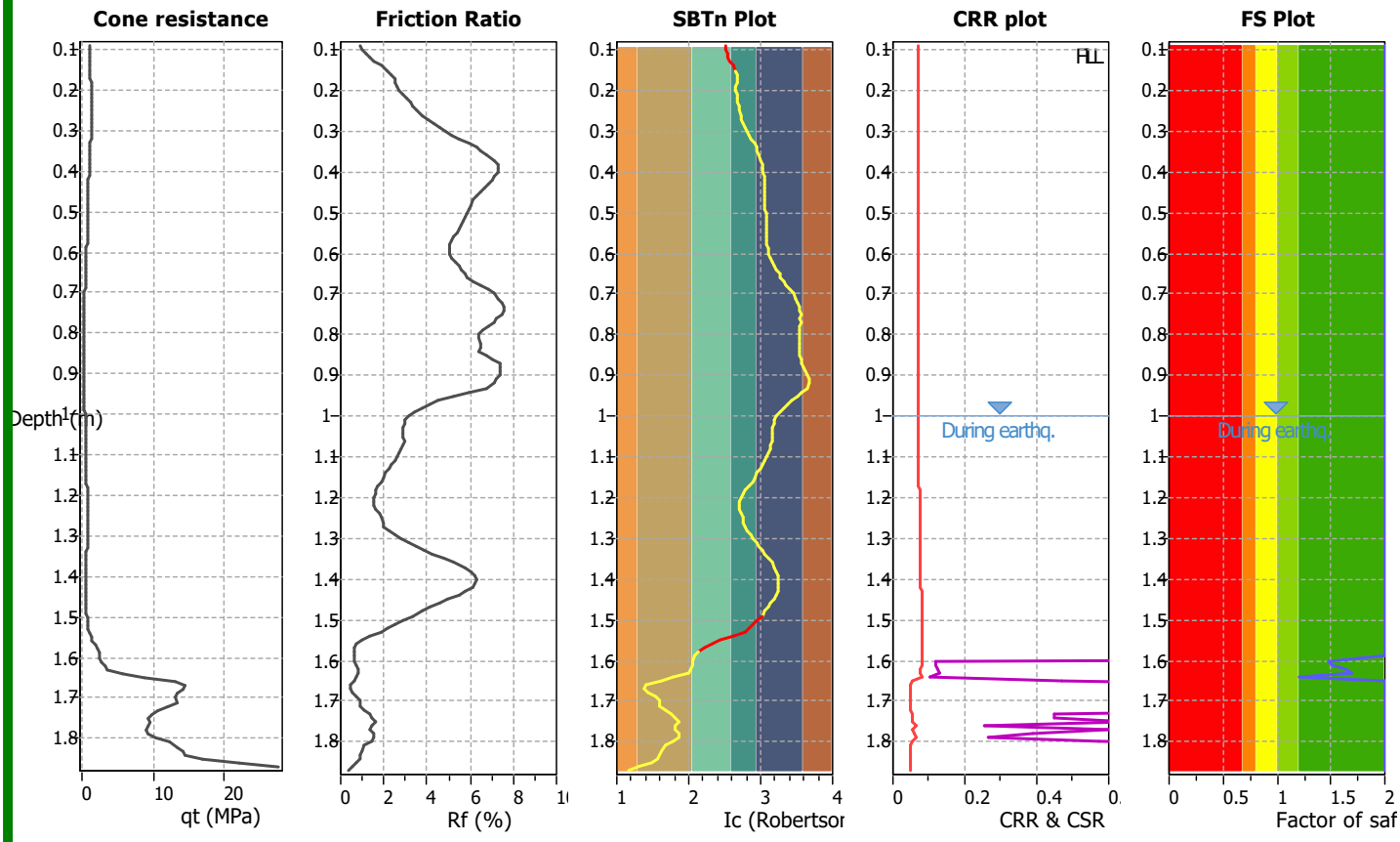
LIQUEFACTION ANALYSIS REPORT

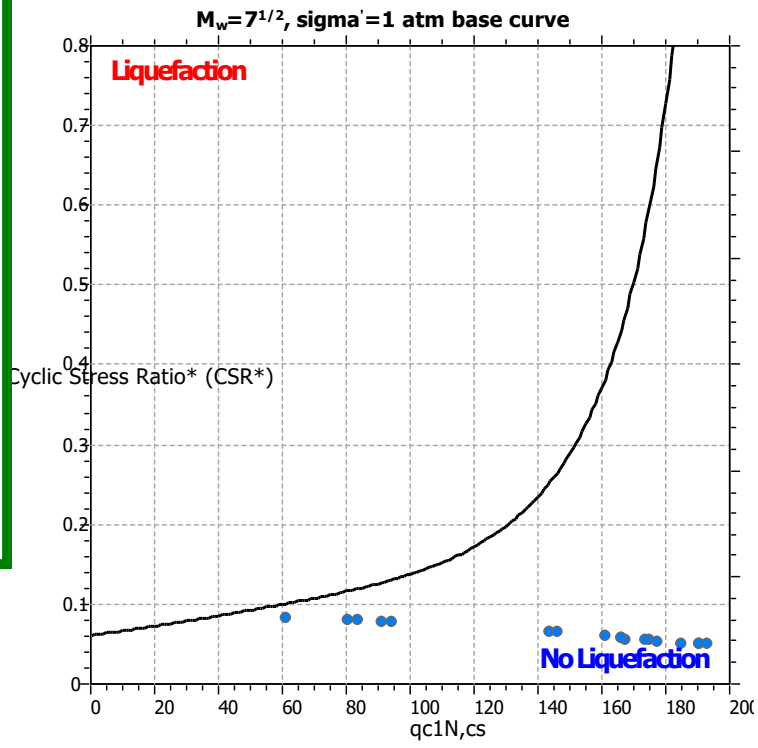
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

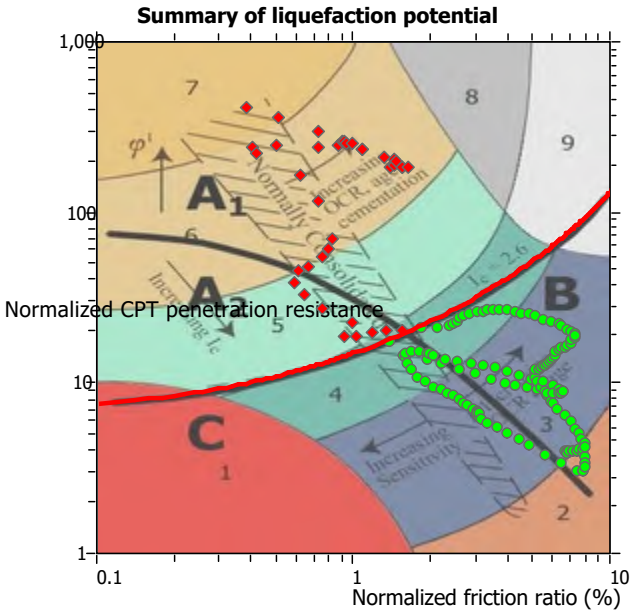
CPT file : CPT-07

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

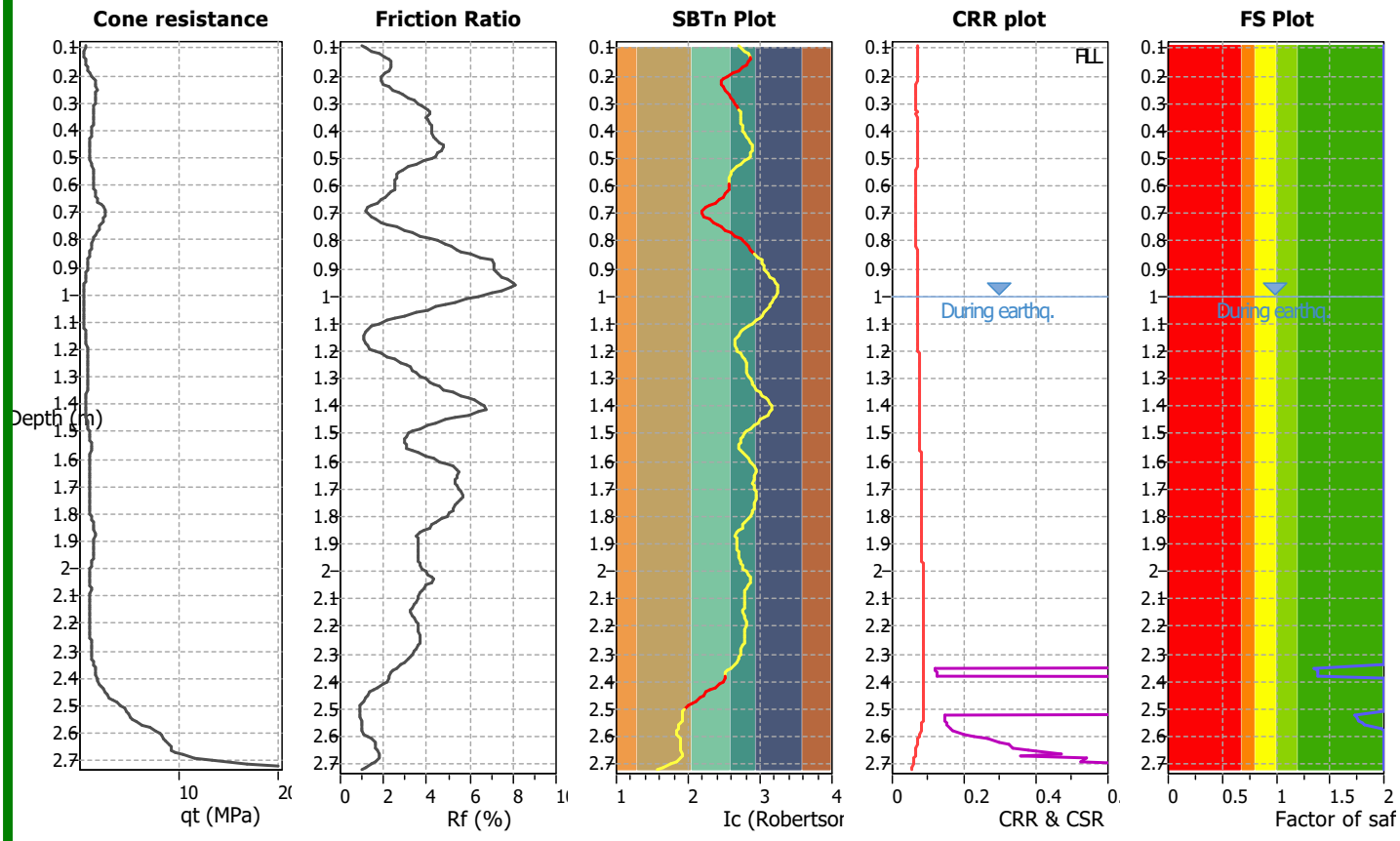
LIQUEFACTION ANALYSIS REPORT

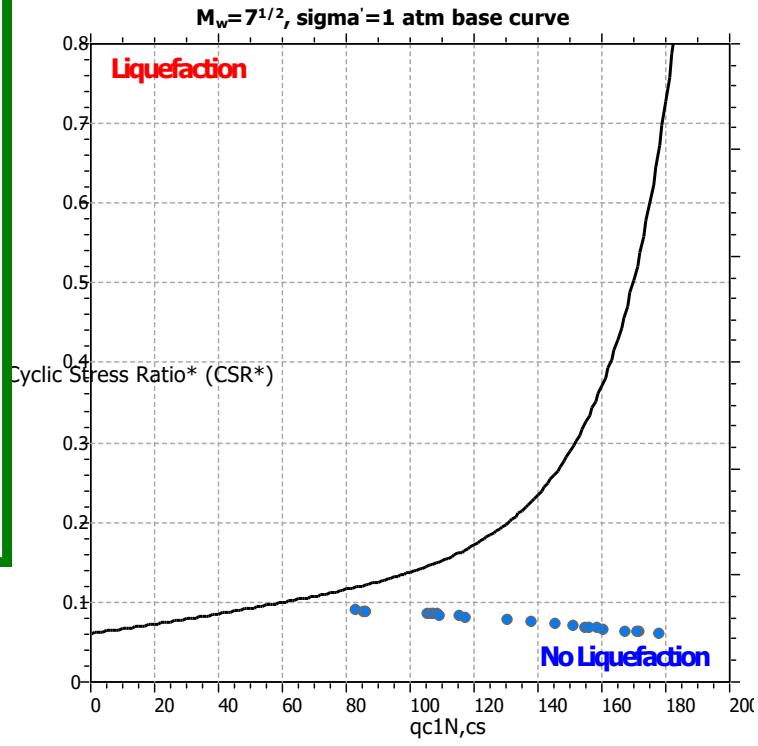
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

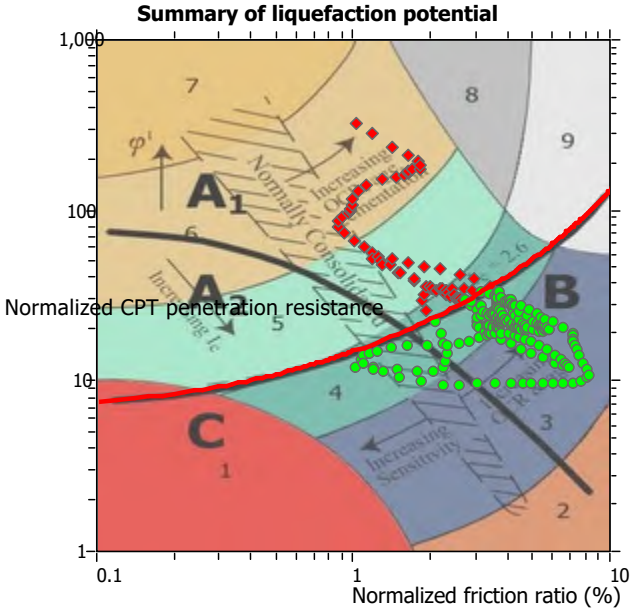
CPT file : CPT-08

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

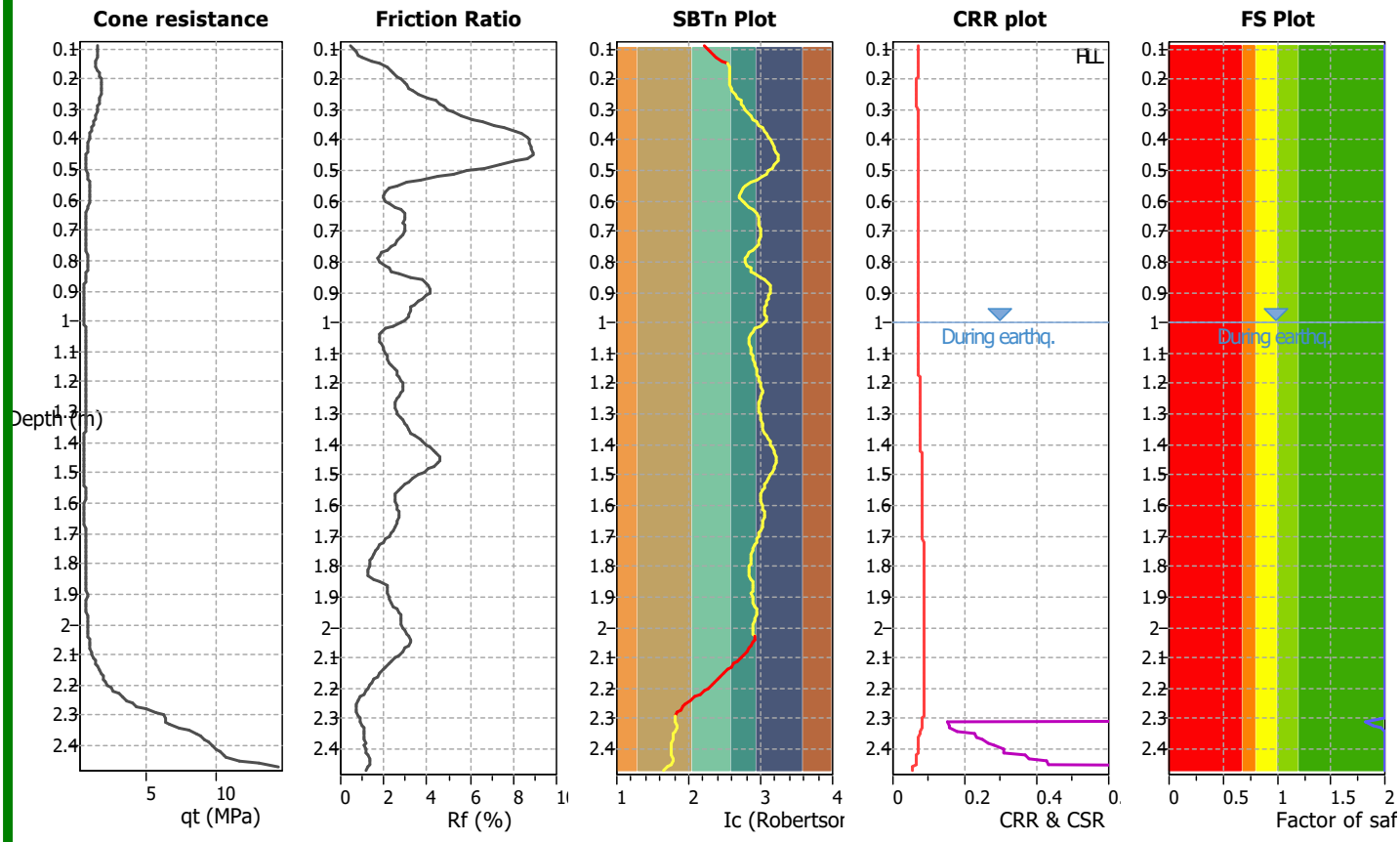
LIQUEFACTION ANALYSIS REPORT

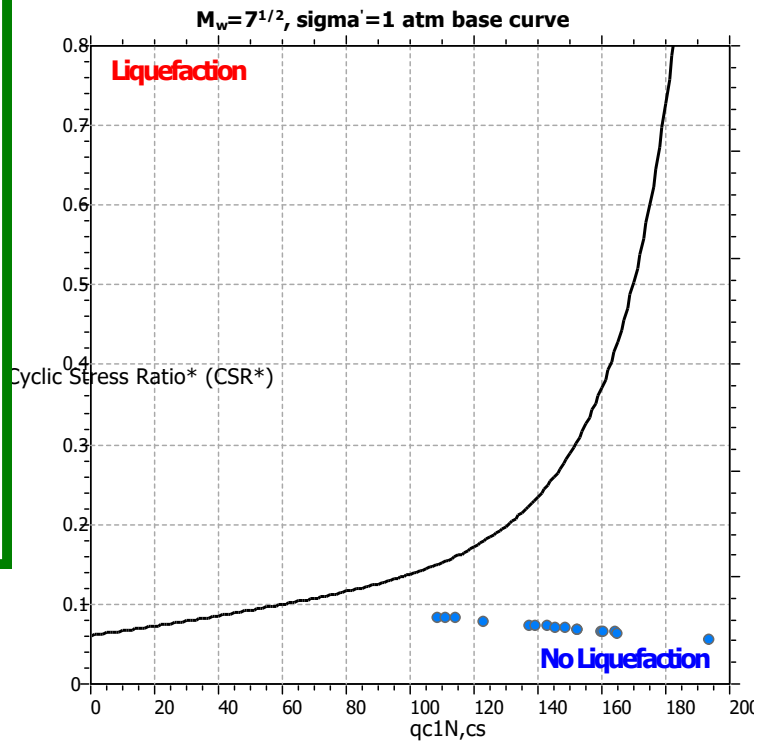
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

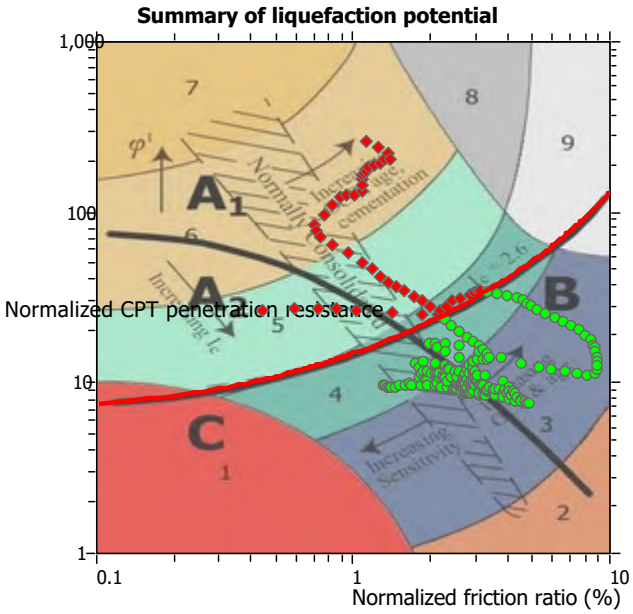
CPT file : CPT-09

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

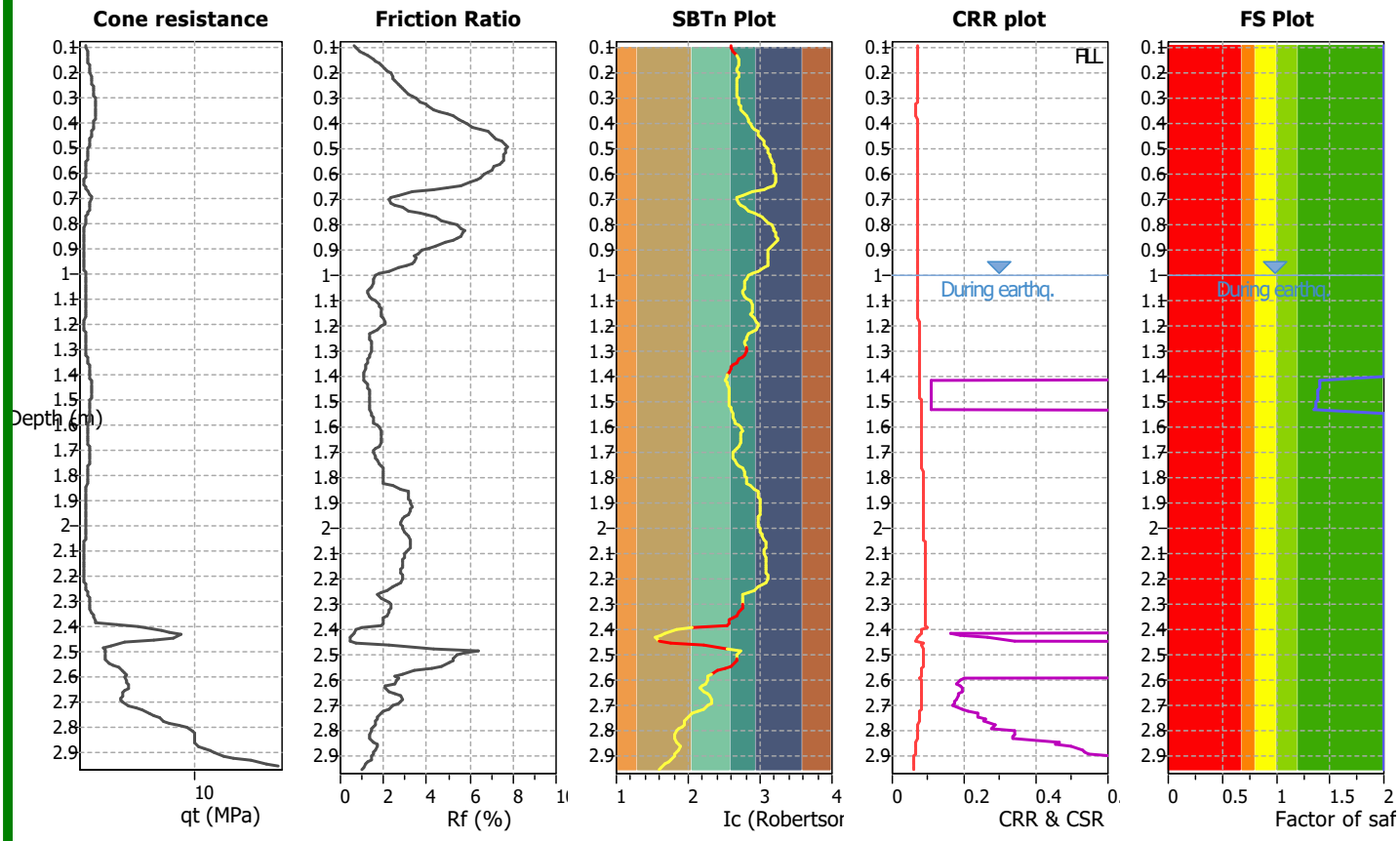
LIQUEFACTION ANALYSIS REPORT

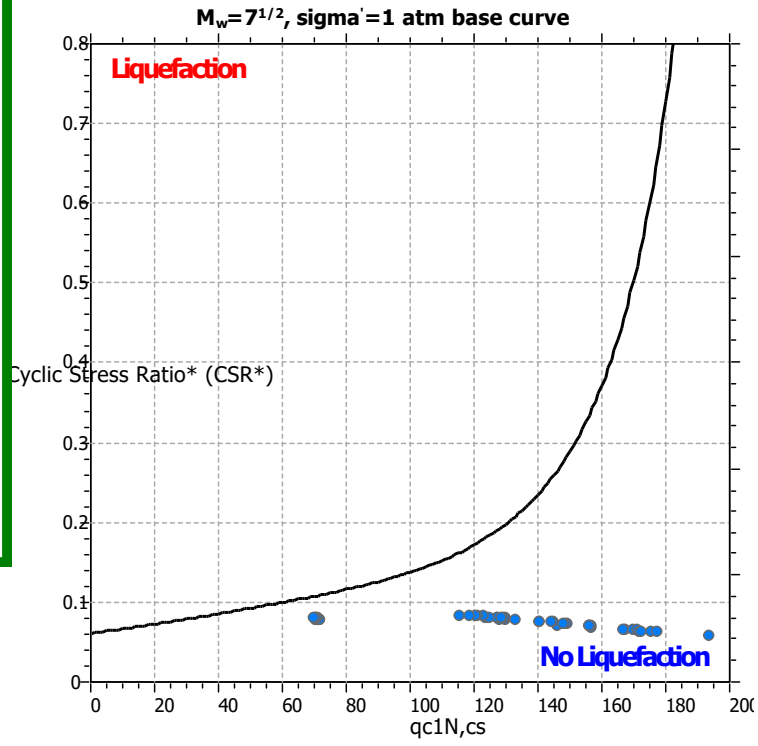
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

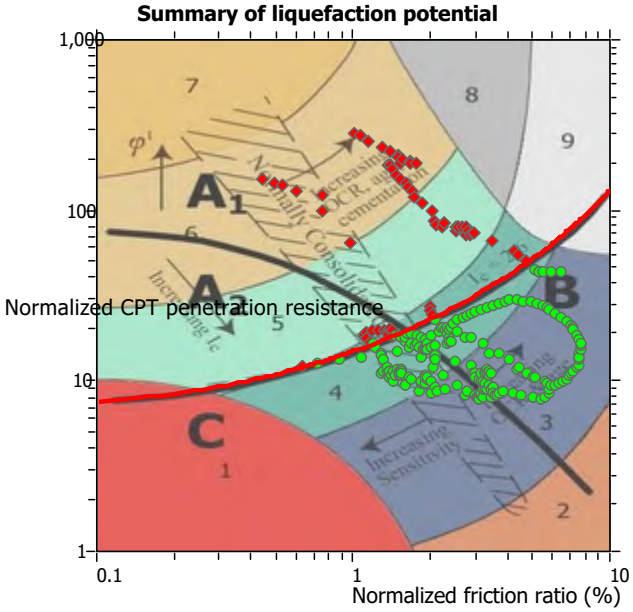
CPT file : CPT-10

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

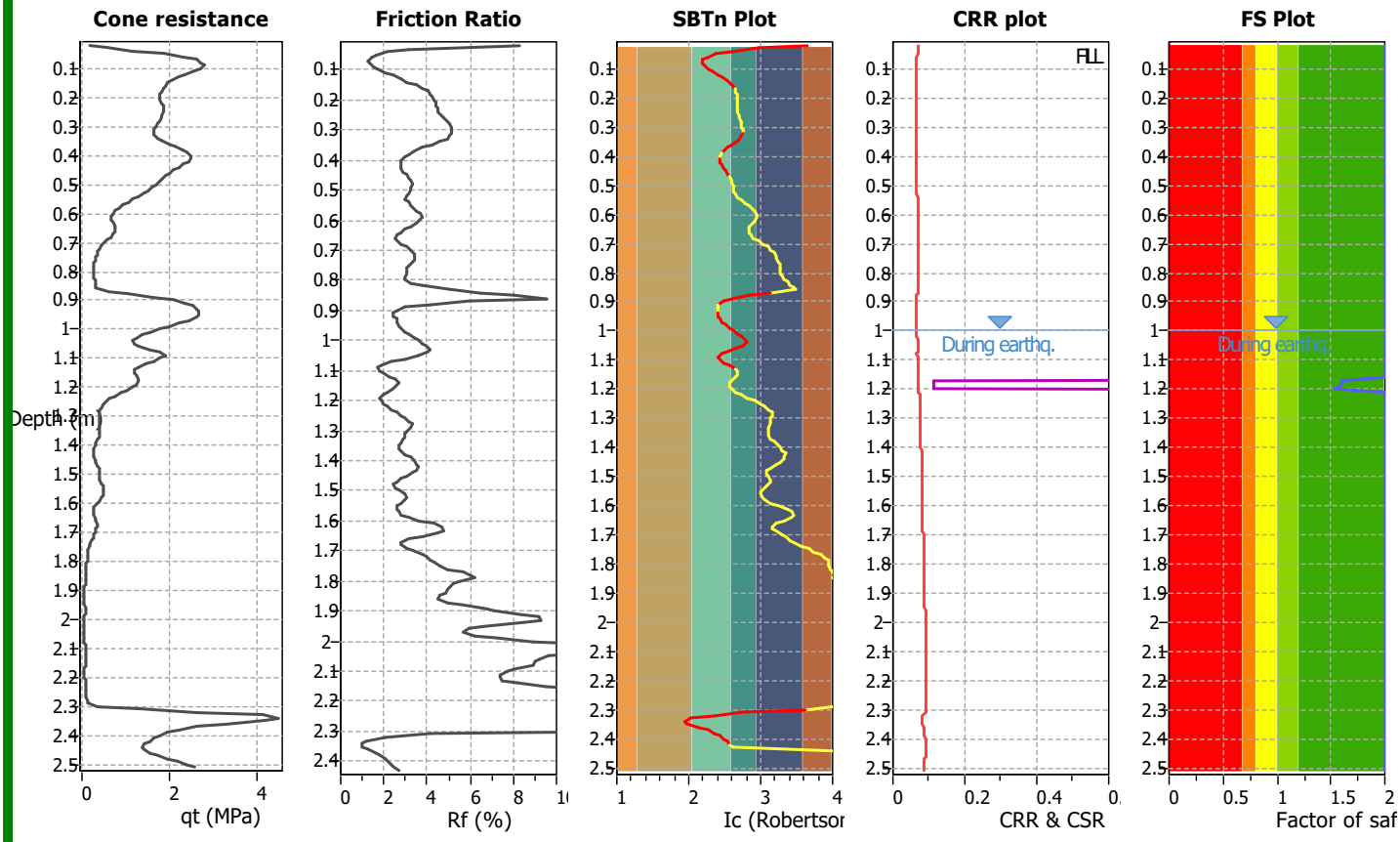
LIQUEFACTION ANALYSIS REPORT

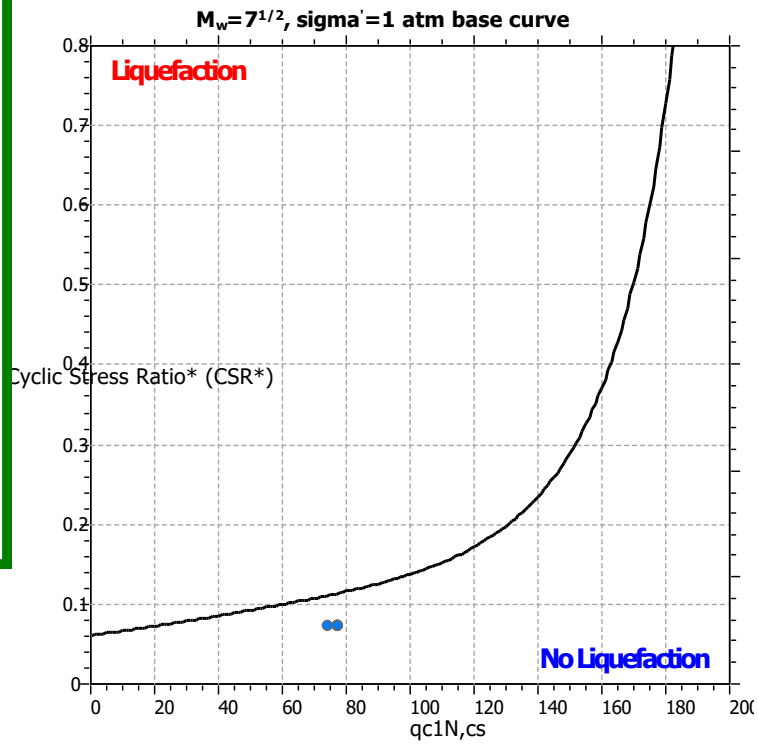
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

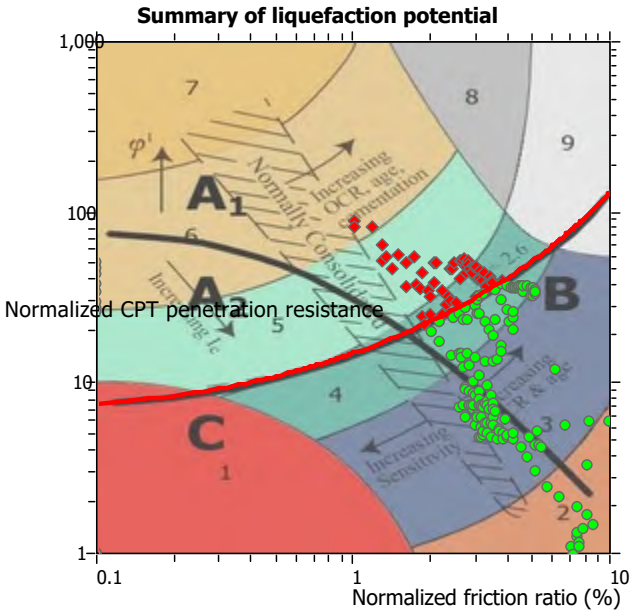
CPT file : CPT-11

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

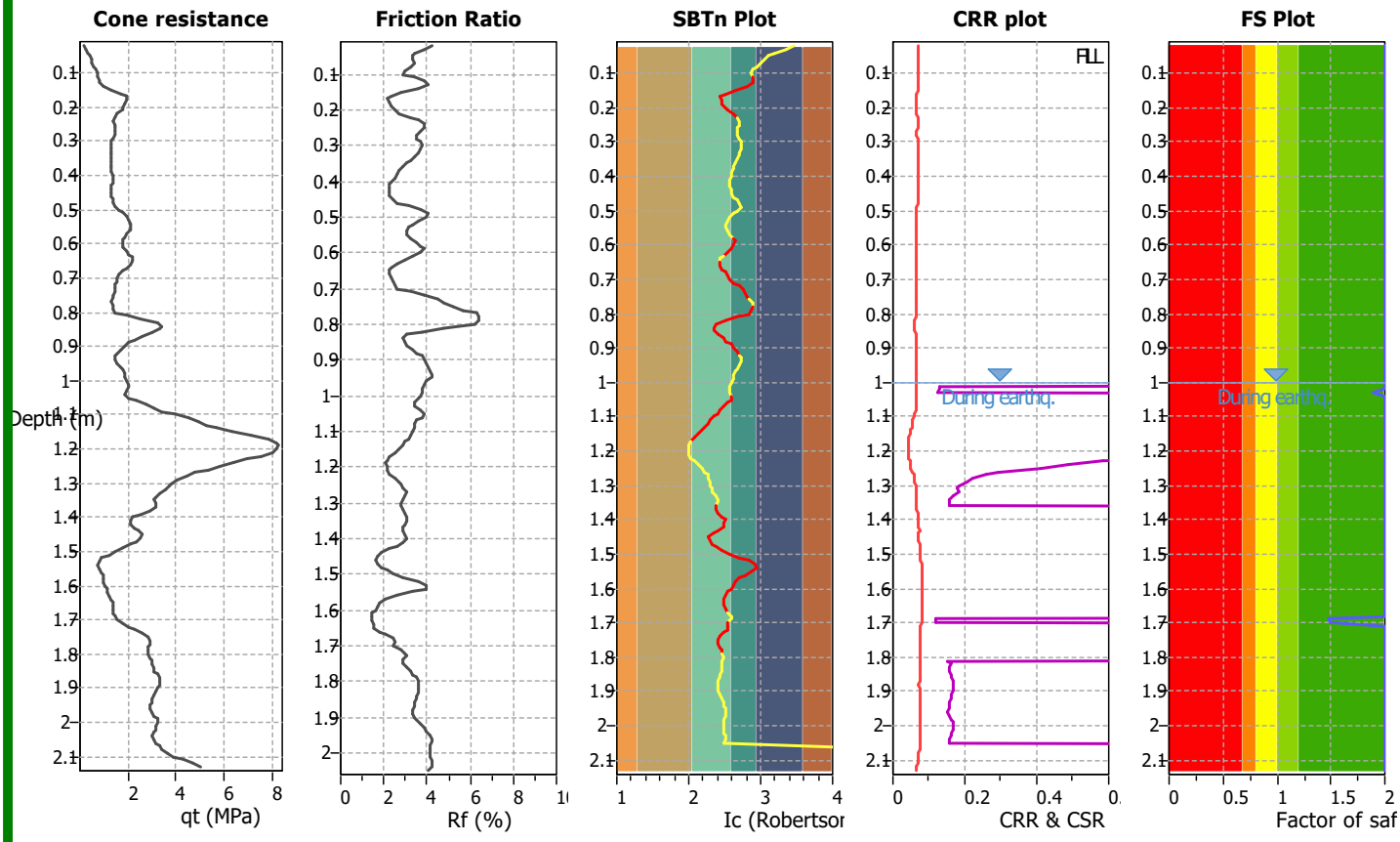
LIQUEFACTION ANALYSIS REPORT

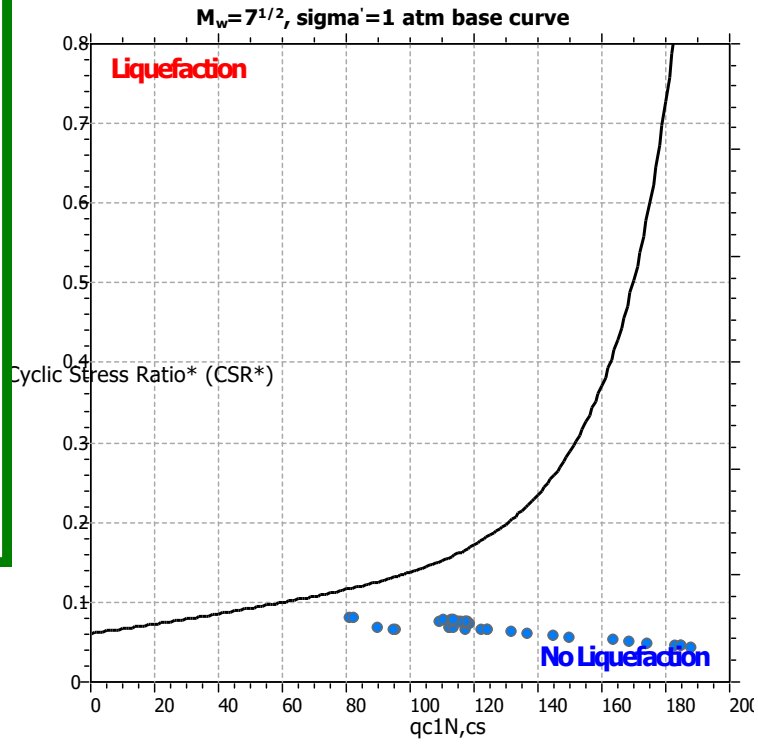
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

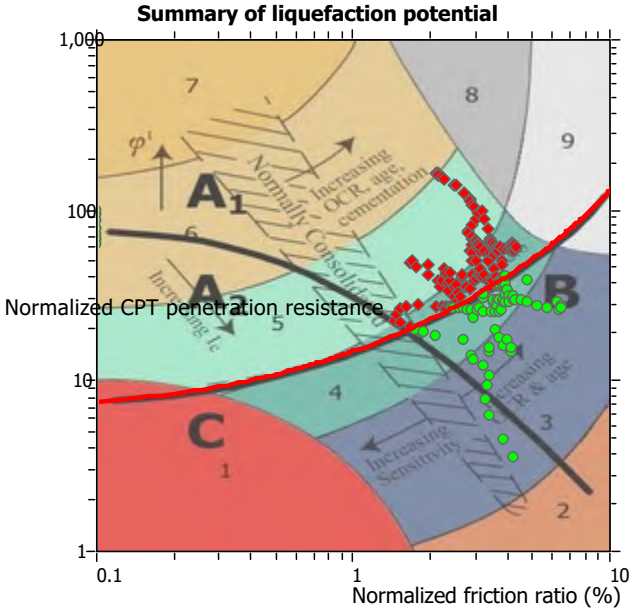
CPT file : CPT-12

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

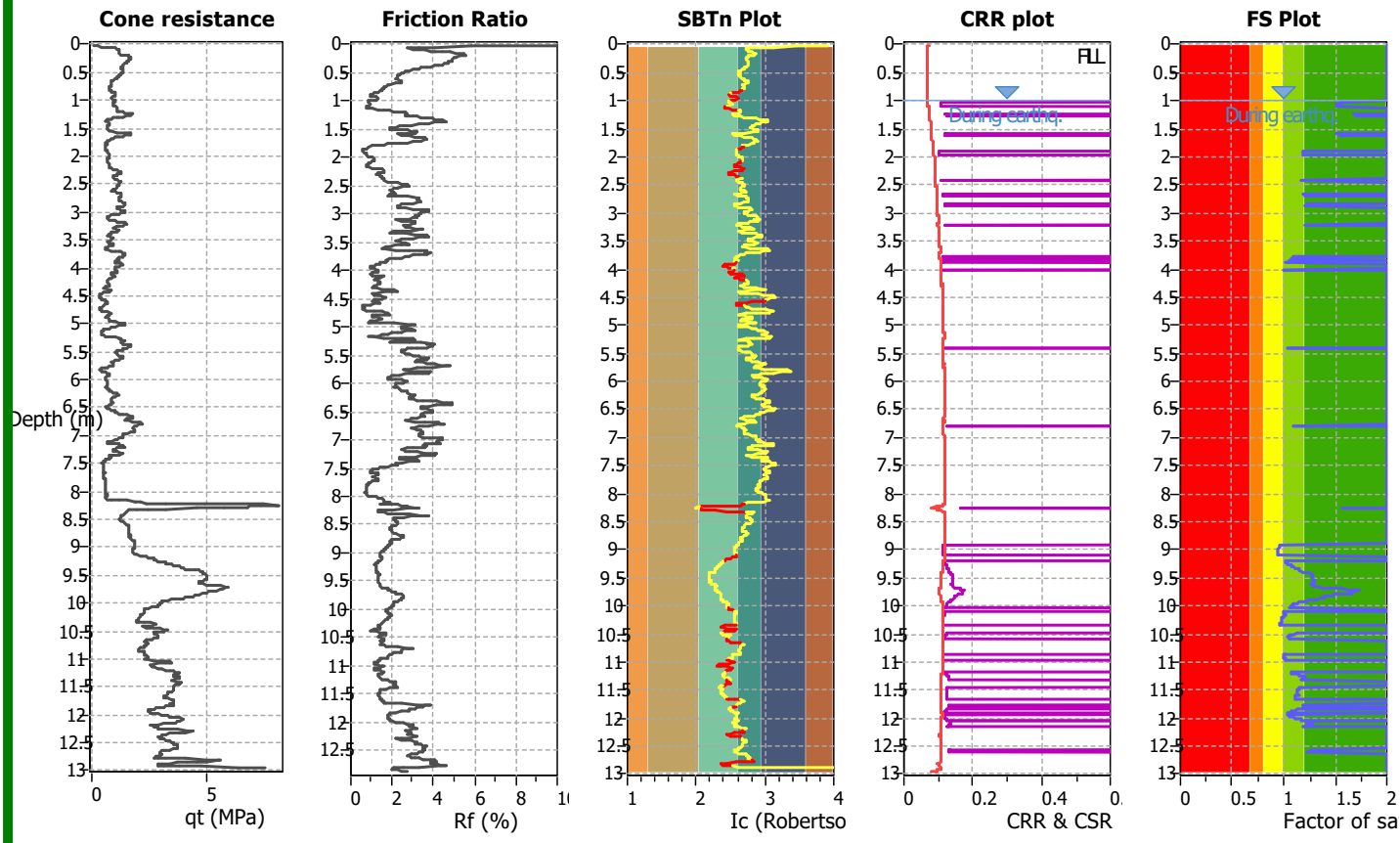
LIQUEFACTION ANALYSIS REPORT

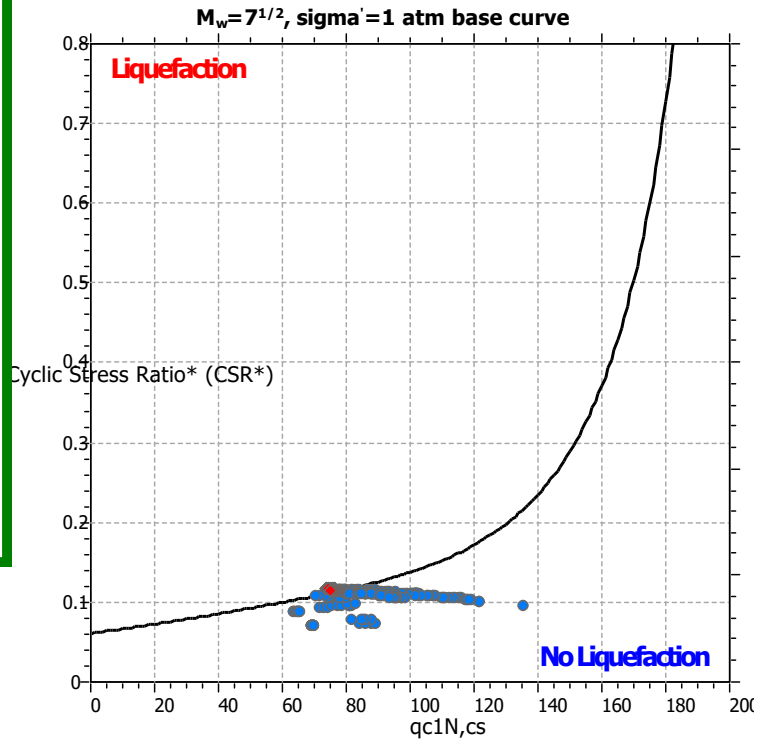
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

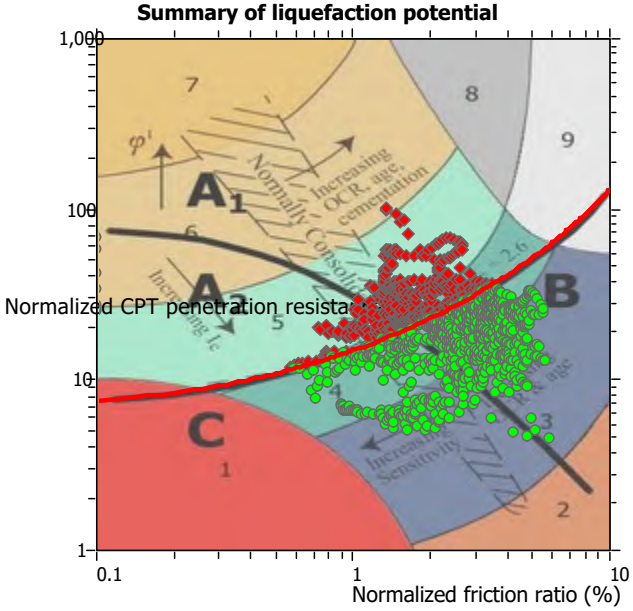
CPT file : CPT-13

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

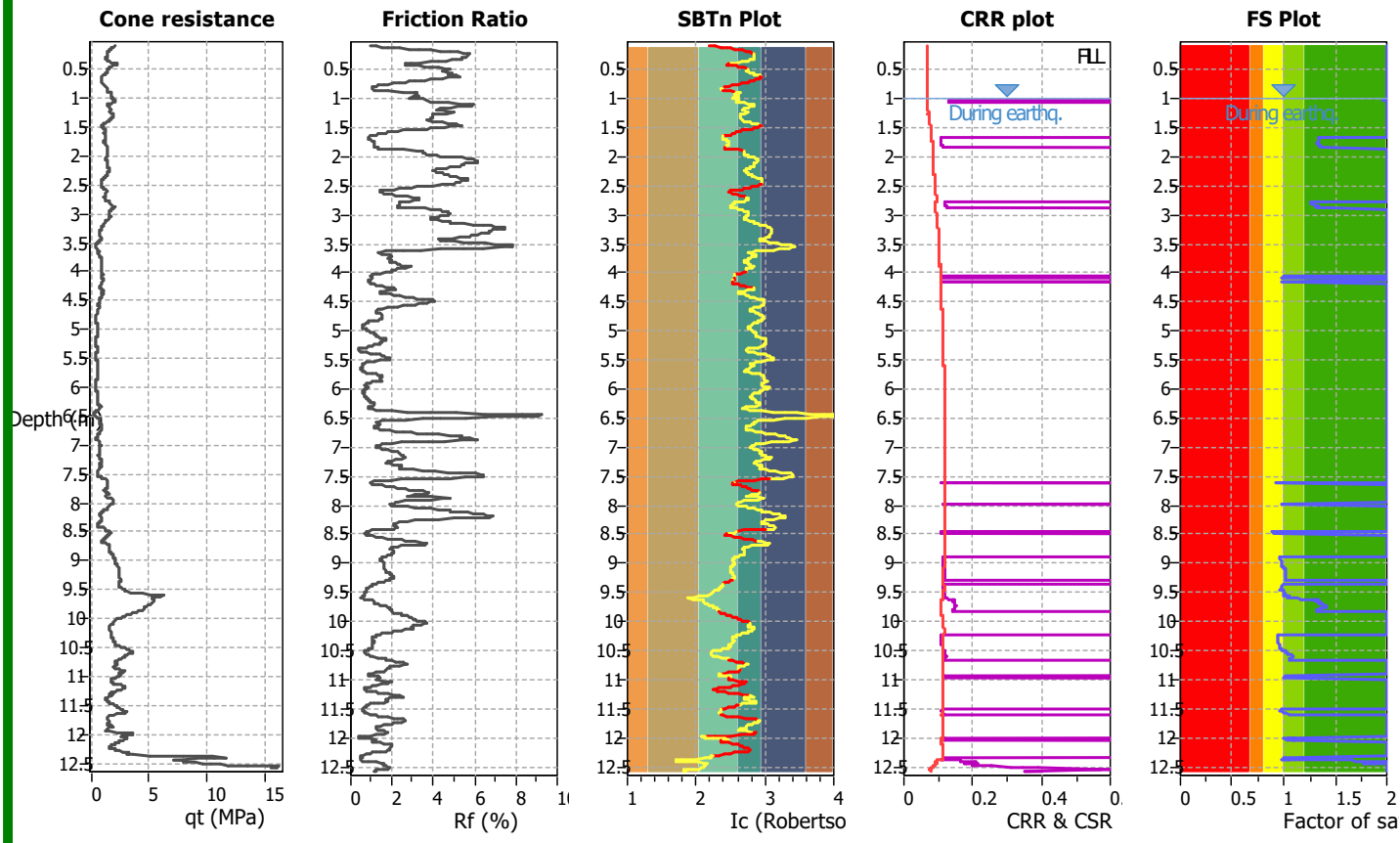
LIQUEFACTION ANALYSIS REPORT

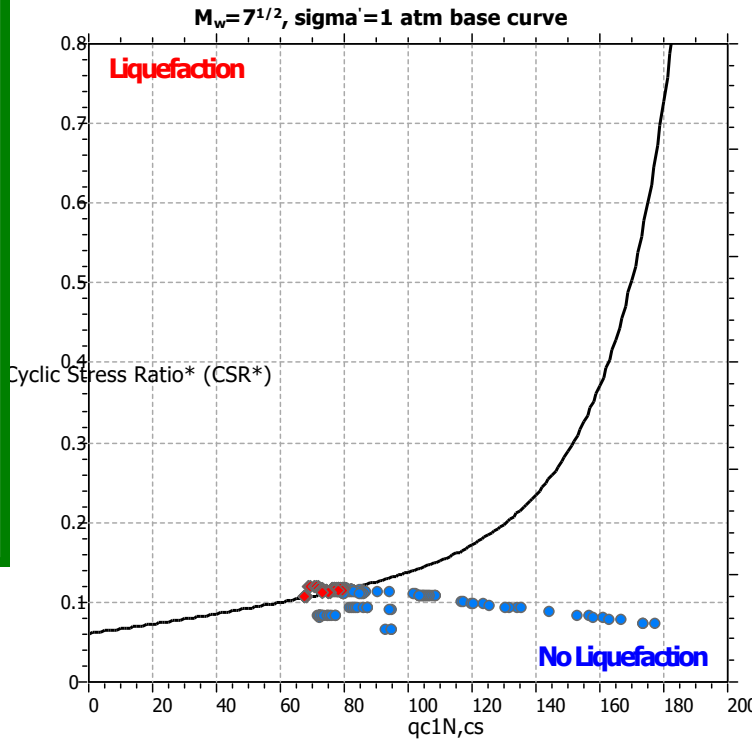
Project title : Peter Swan Limited **Location : Kahikatearoa Extention (Bidfoods)**

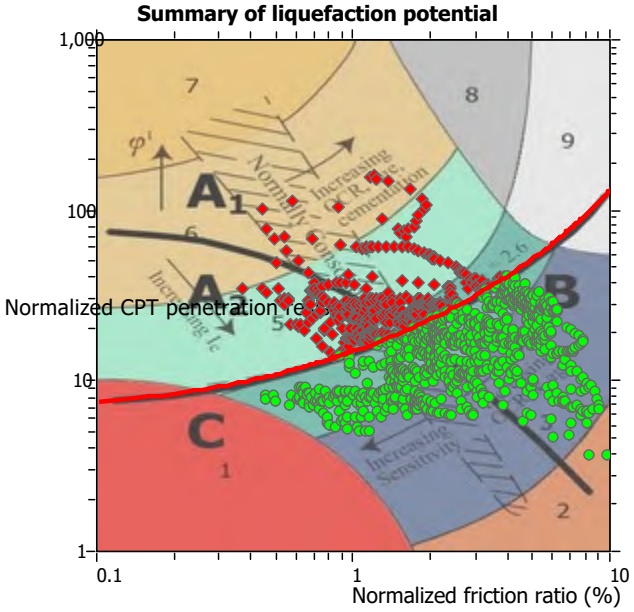
CPT file : CPT-14

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	22.00 kN/m³	Limit depth:	20.00 m
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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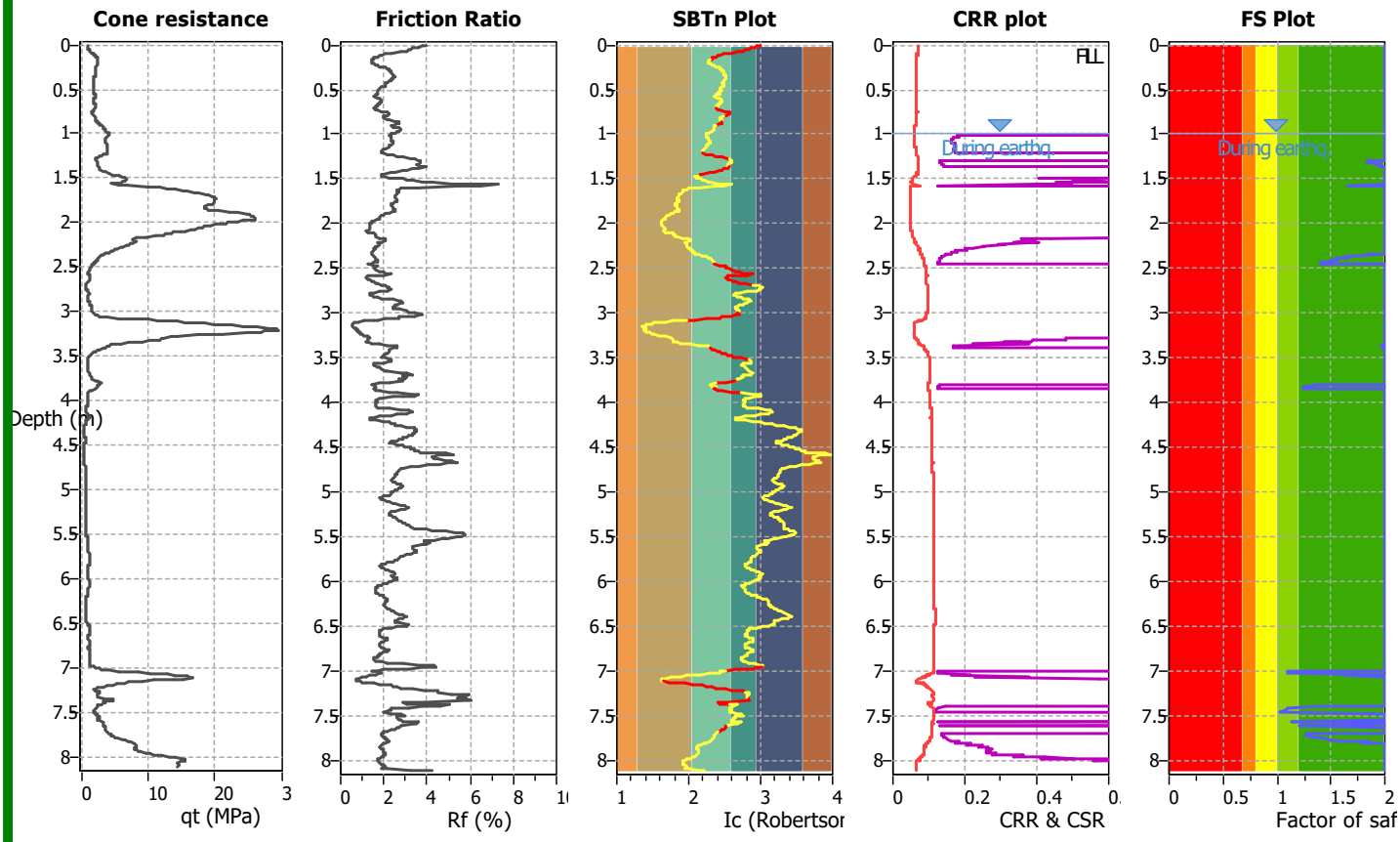
LIQUEFACTION ANALYSIS REPORT

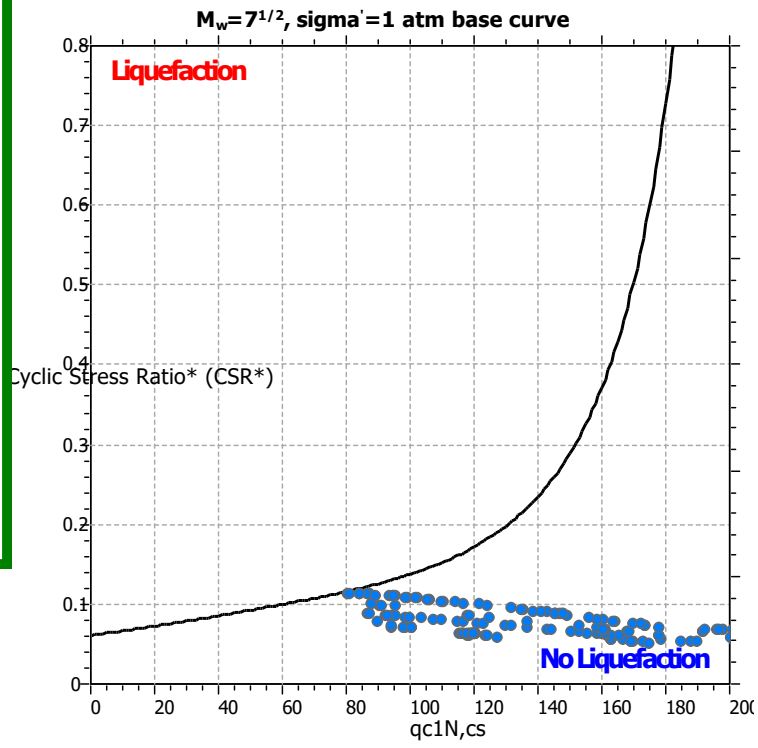
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

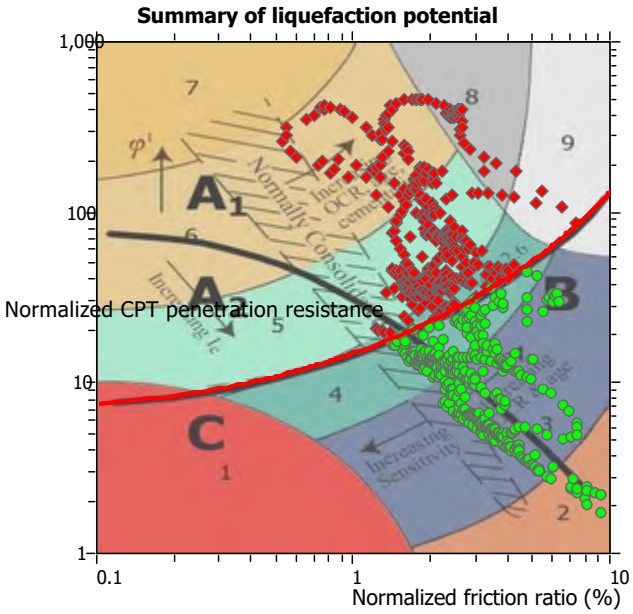
CPT file : CPT01

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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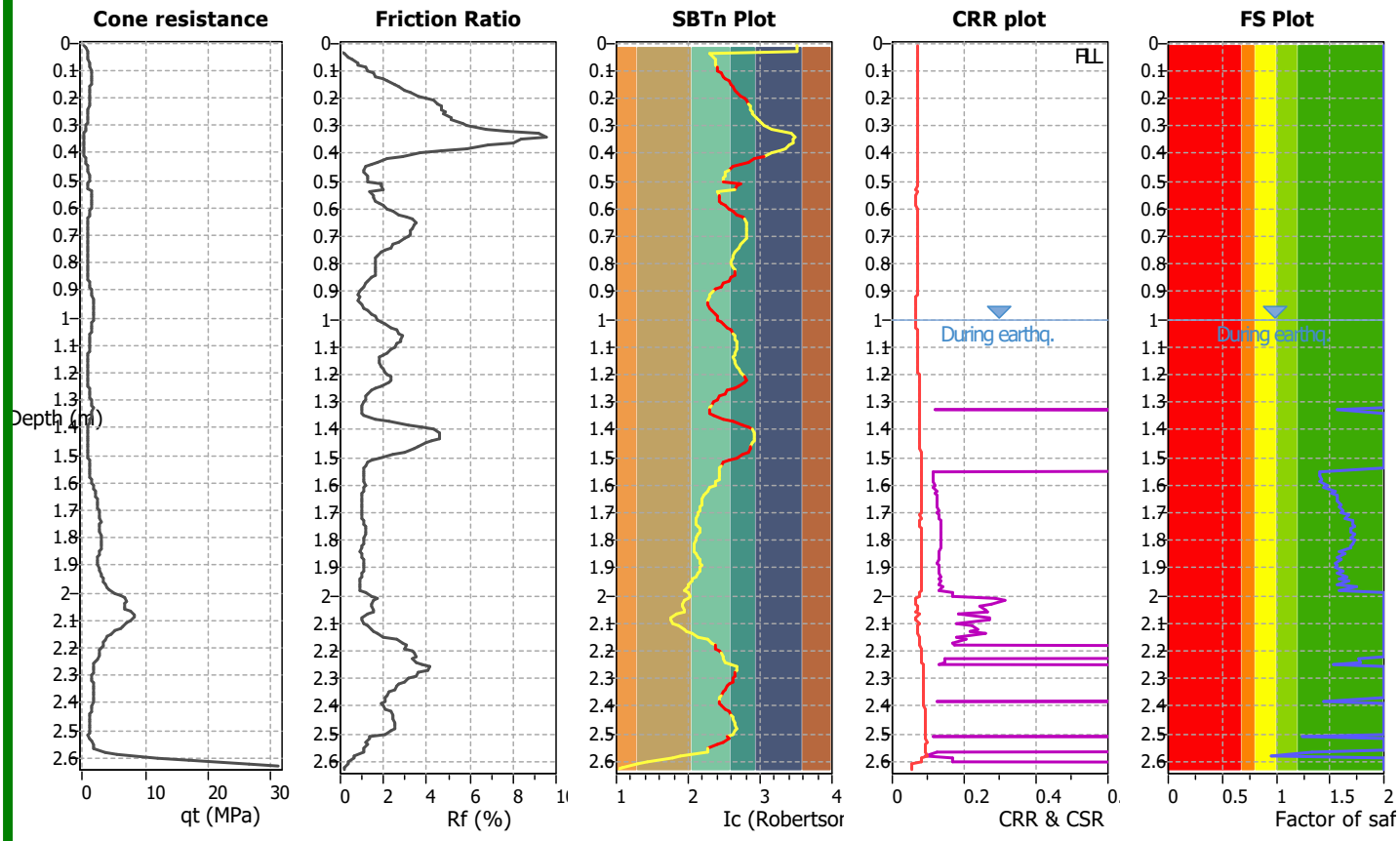
LIQUEFACTION ANALYSIS REPORT

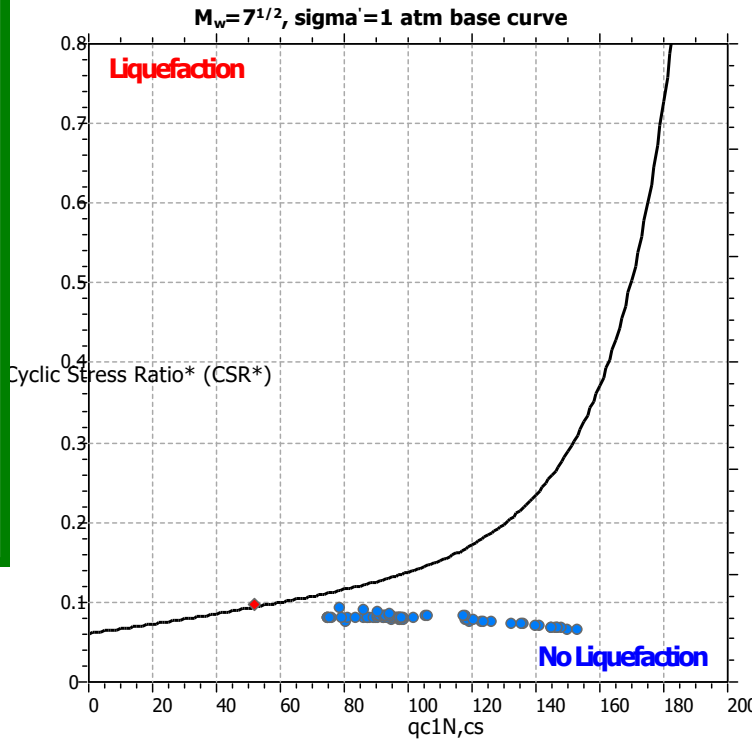
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

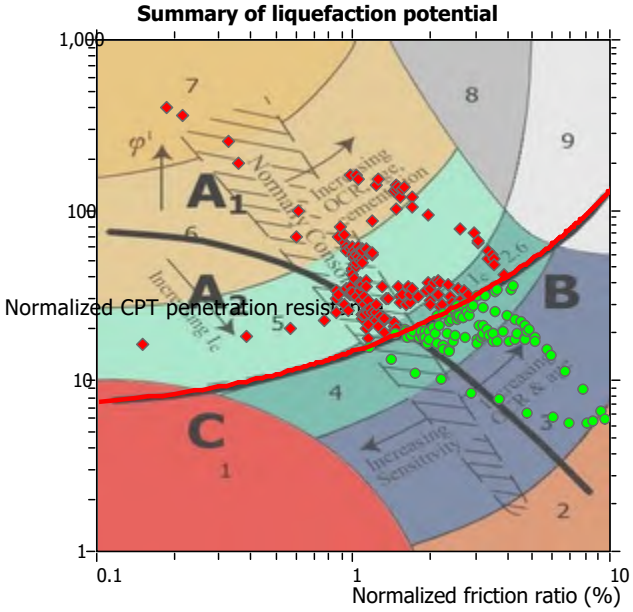
CPT file : CPT02

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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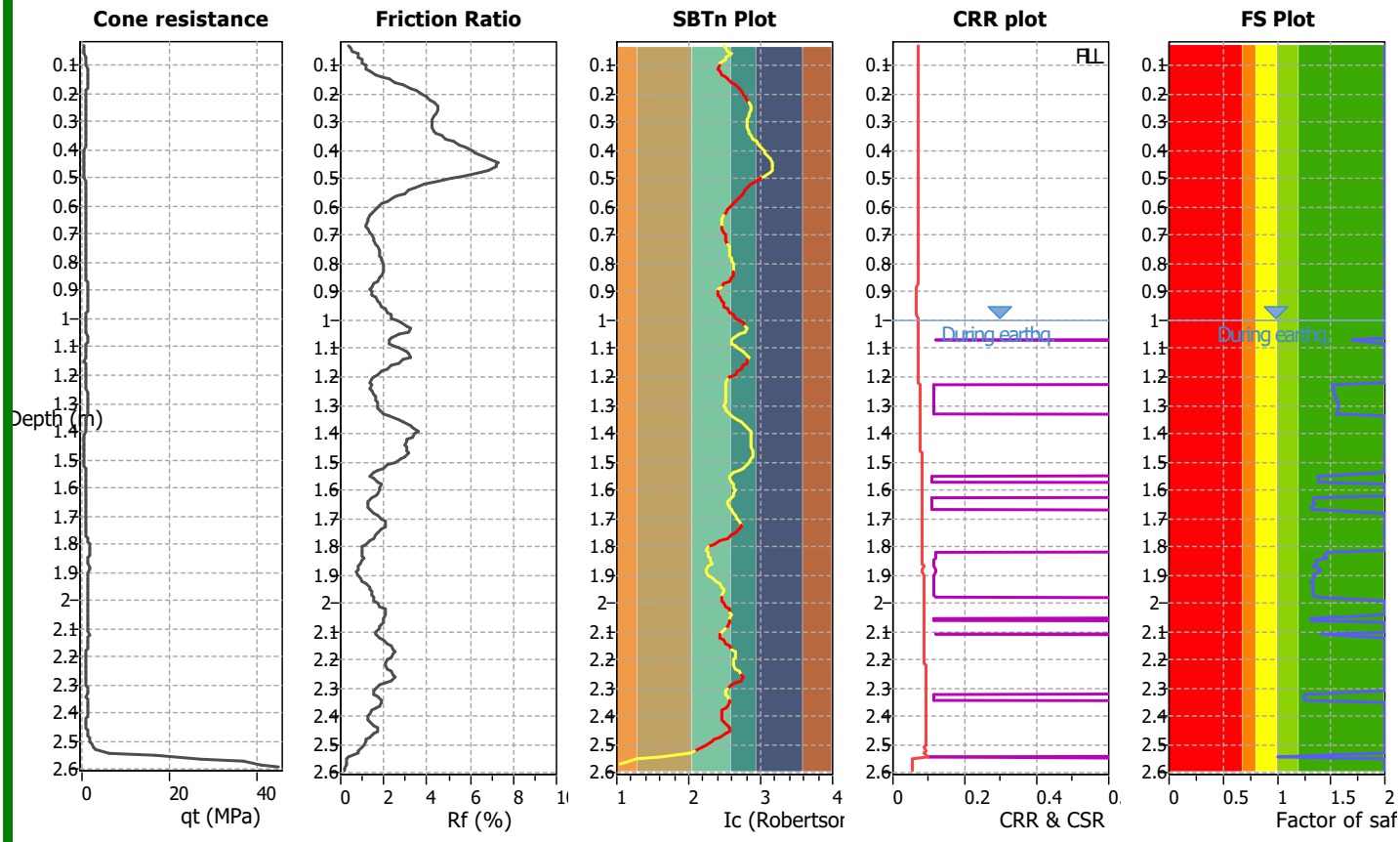
LIQUEFACTION ANALYSIS REPORT

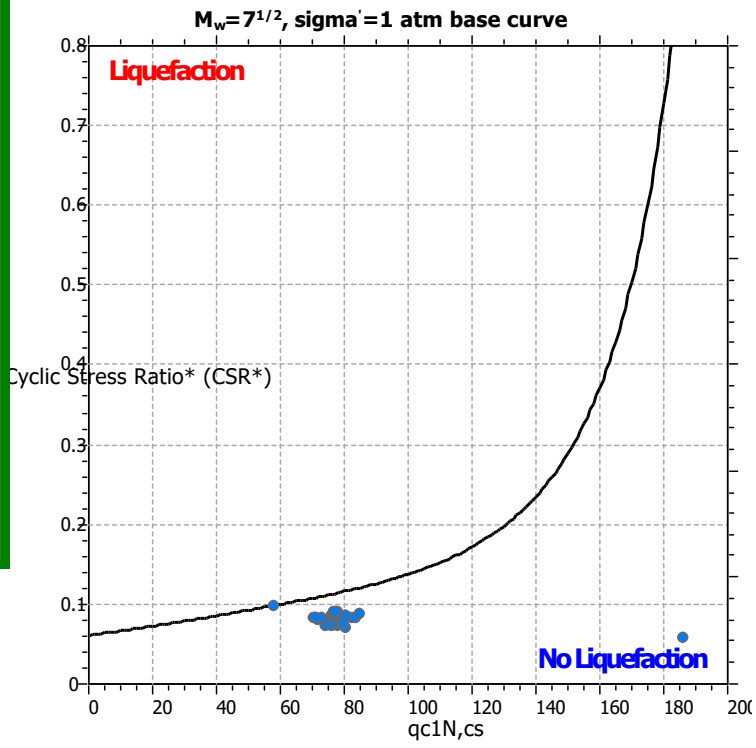
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

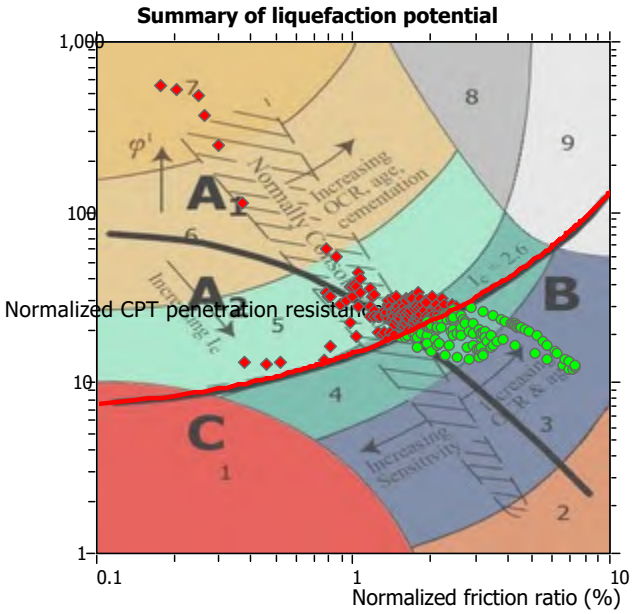
CPT file : CPT03

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

HAIGH WORKMAN Ltd
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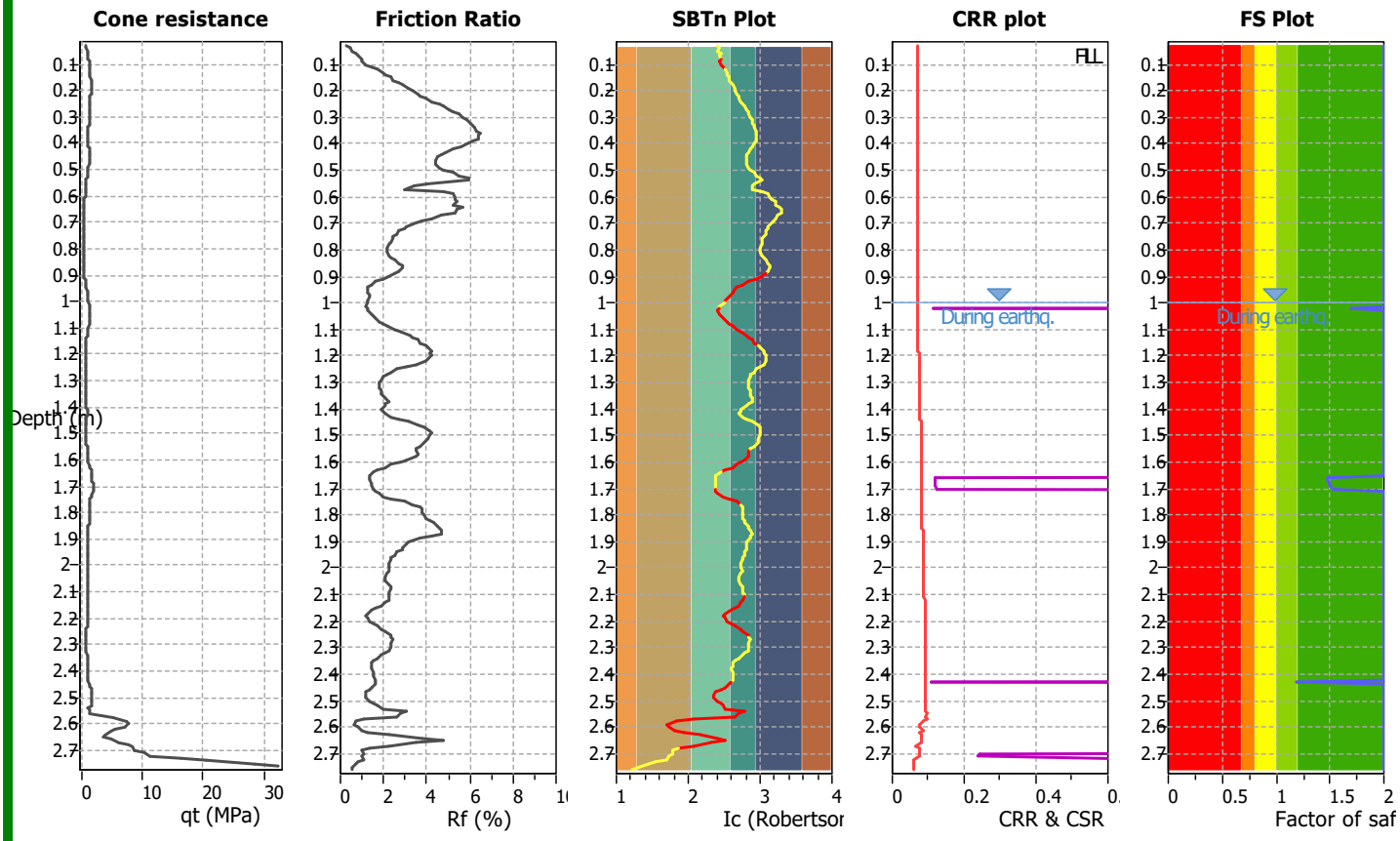
LIQUEFACTION ANALYSIS REPORT

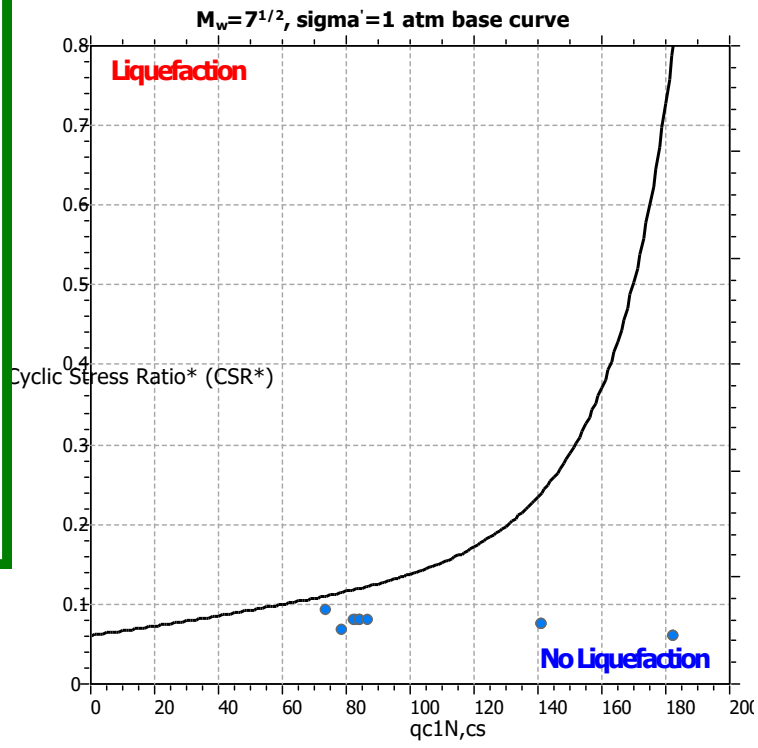
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

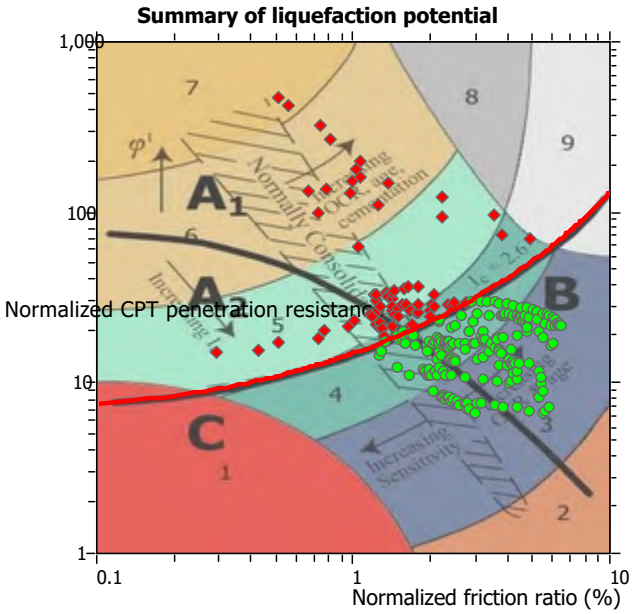
CPT file : CPT04

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

HAIGH WORKMAN Ltd
Civil & Structural Engineers

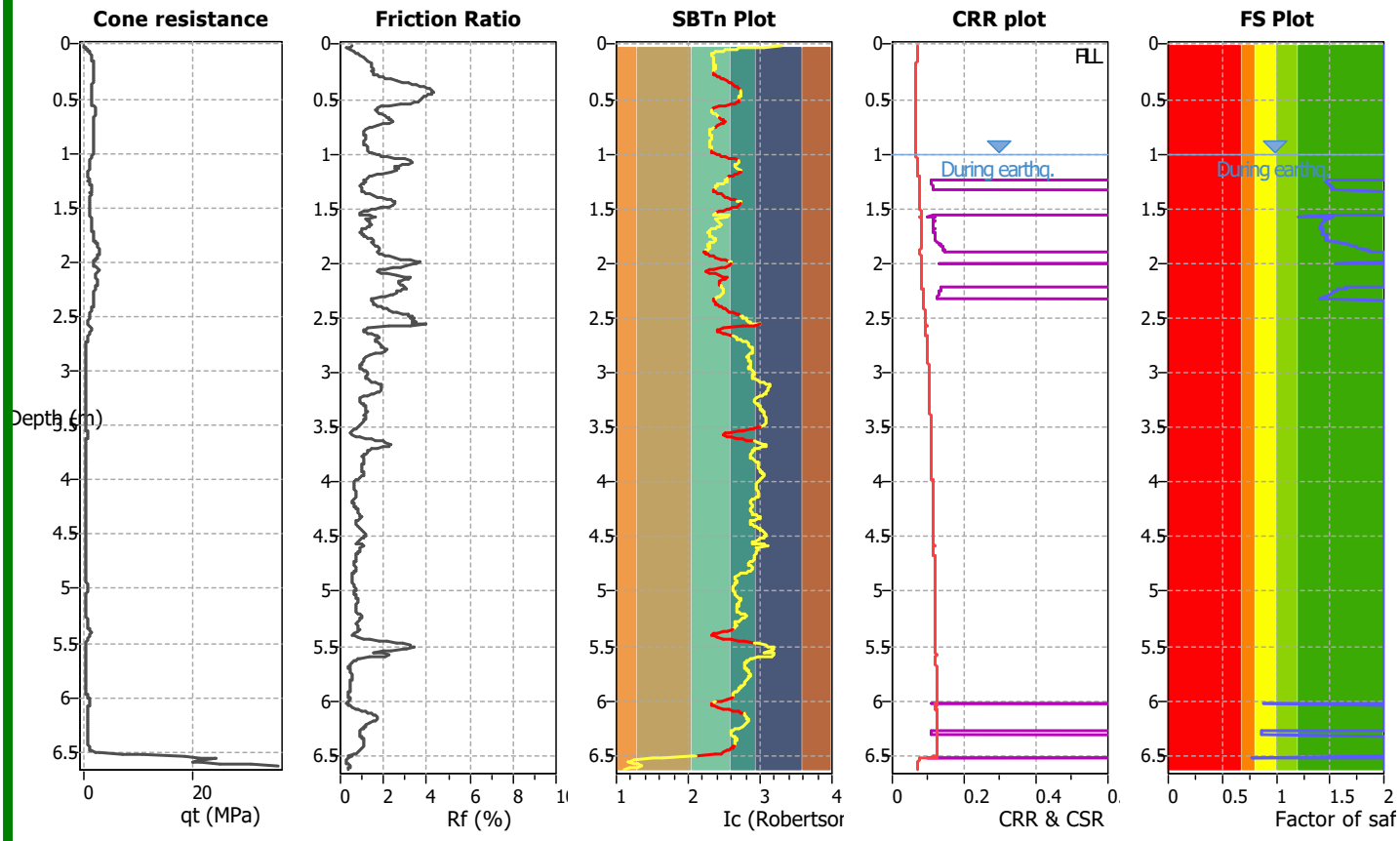
LIQUEFACTION ANALYSIS REPORT

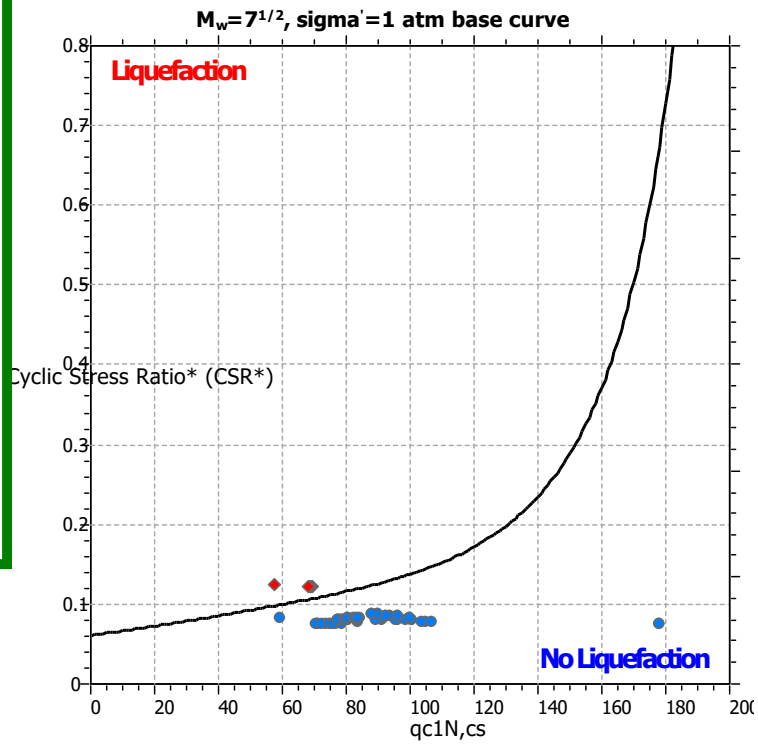
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

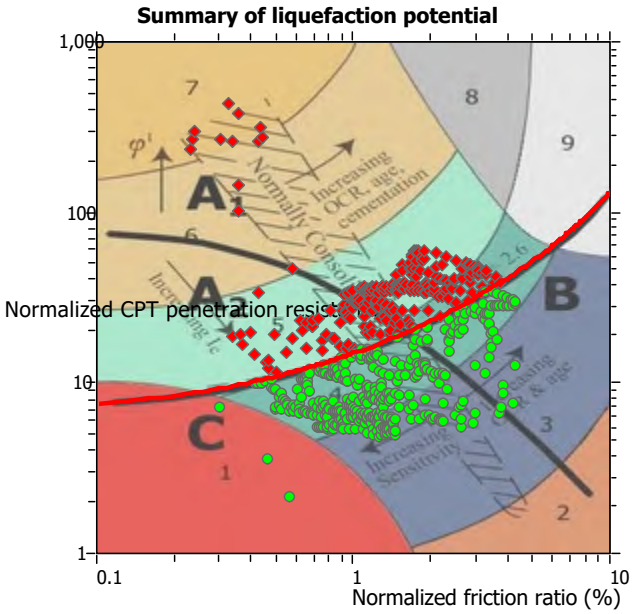
CPT file : CPT05

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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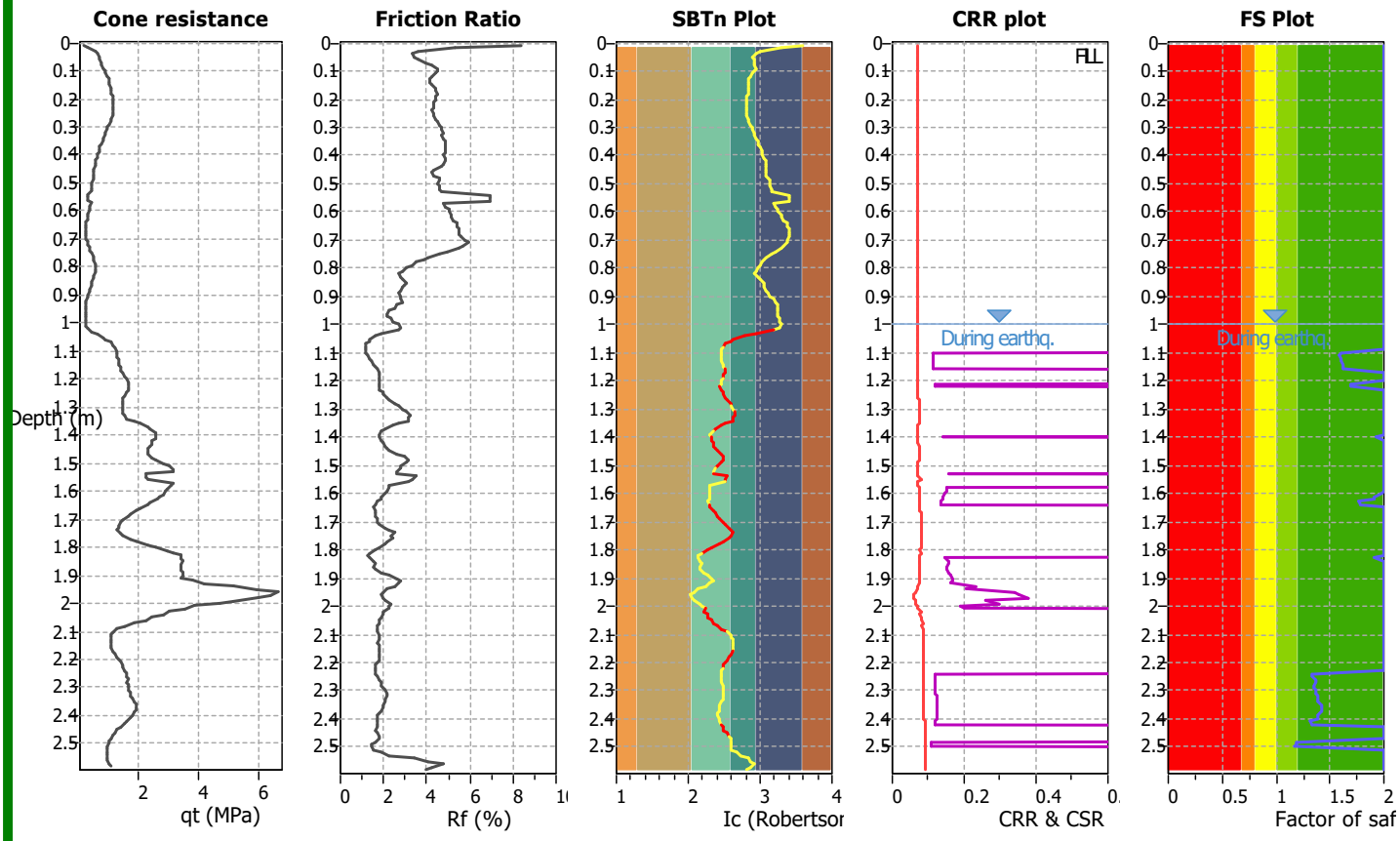
LIQUEFACTION ANALYSIS REPORT

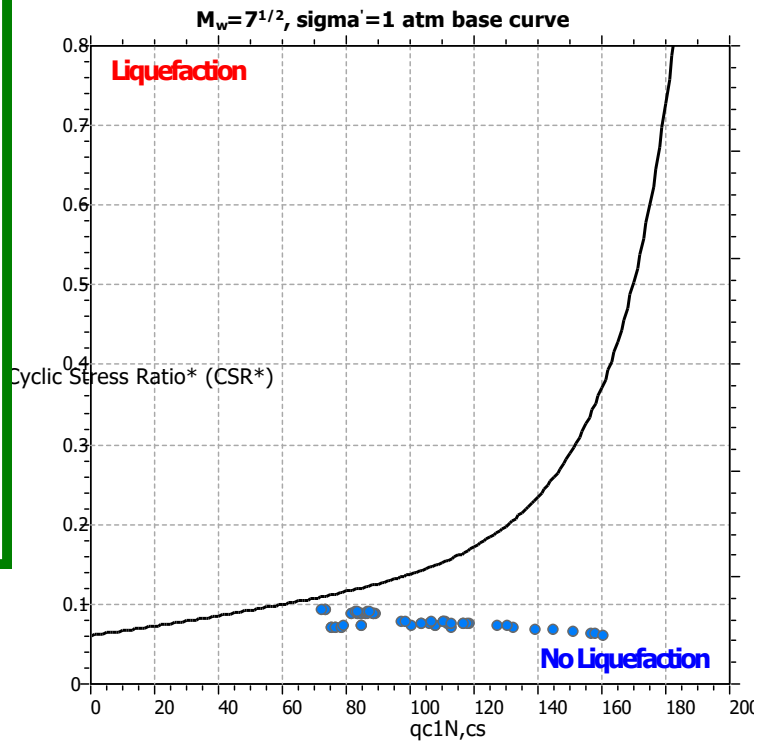
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

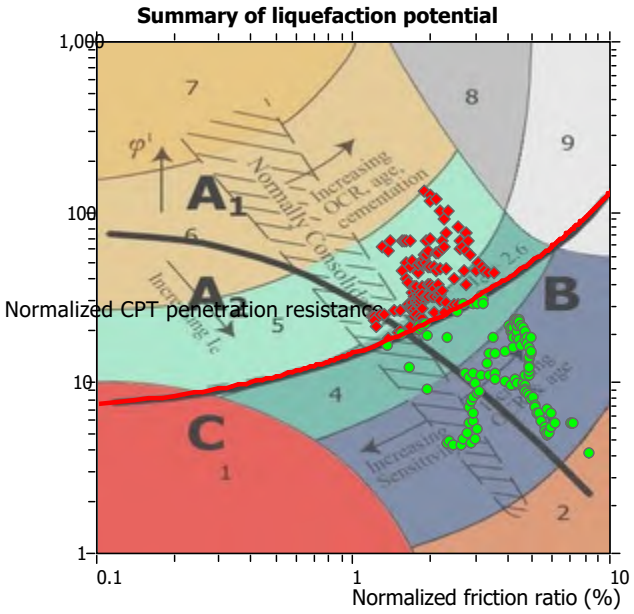
CPT file : CPT06

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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Civil & Structural Engineers

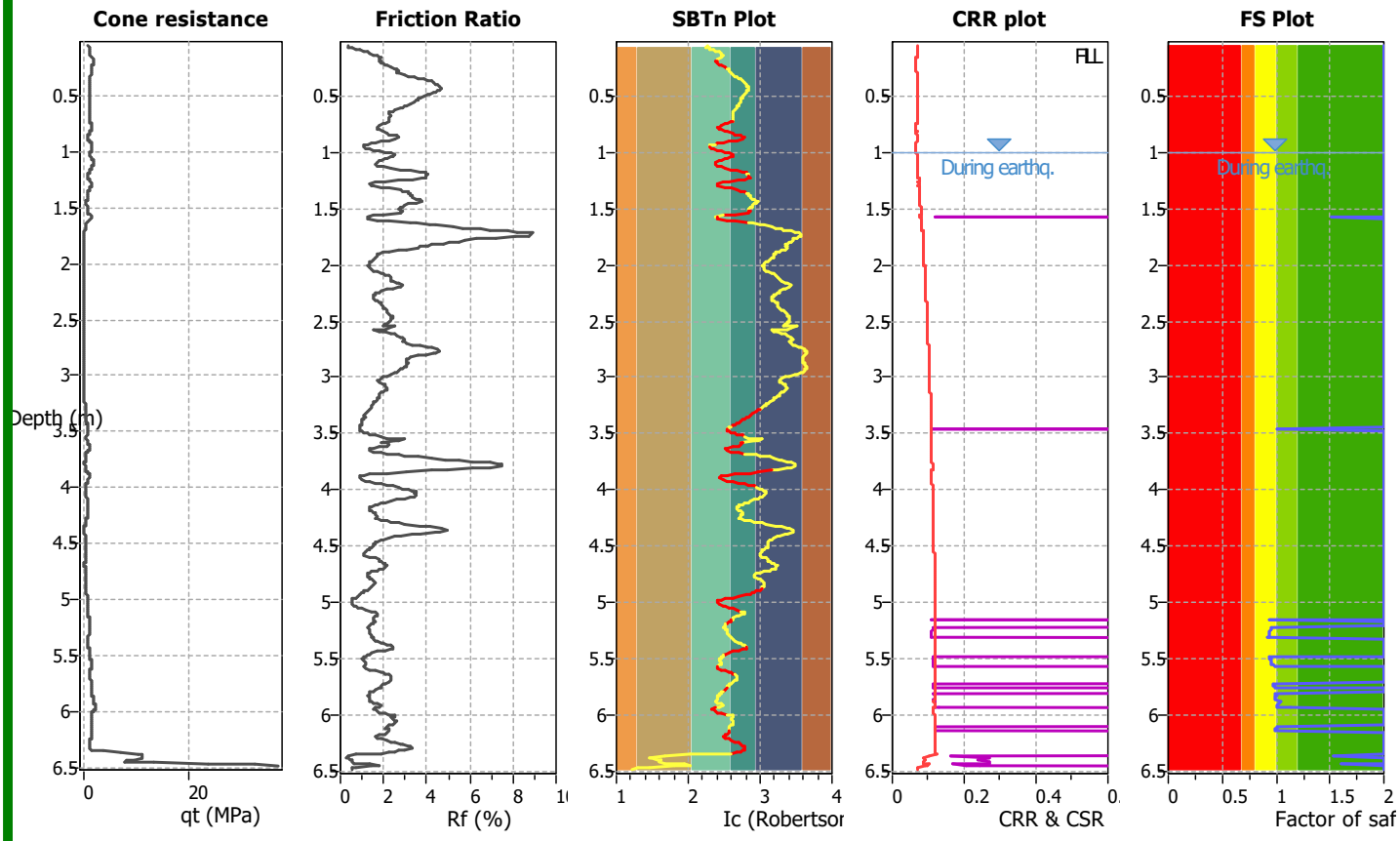
LIQUEFACTION ANALYSIS REPORT

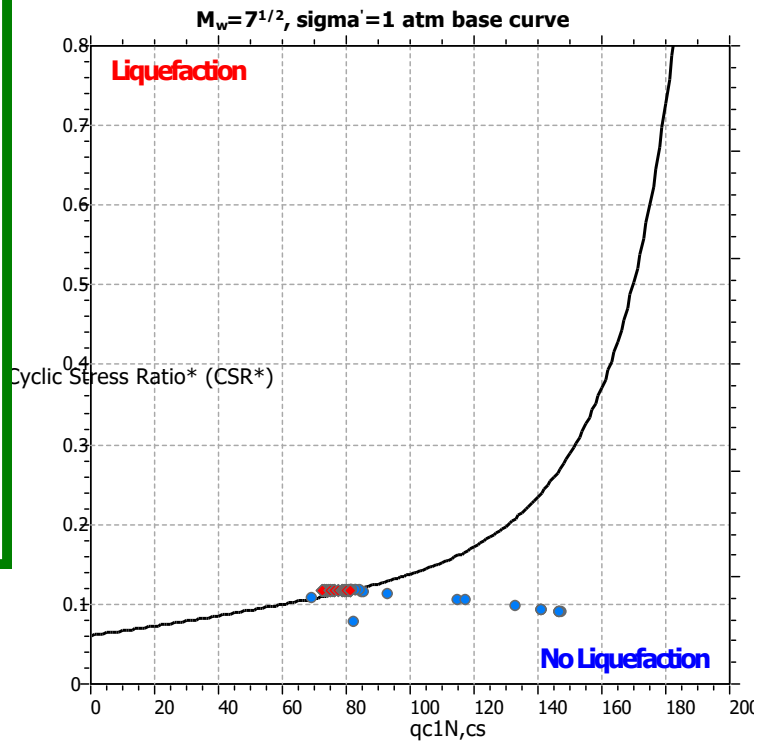
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

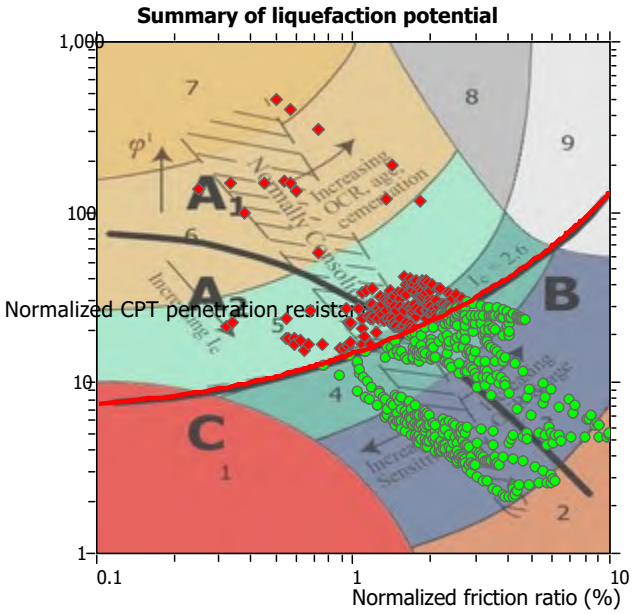
CPT file : CPT07

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

HAIGH WORKMAN LTD
Civil & Structural Engineers

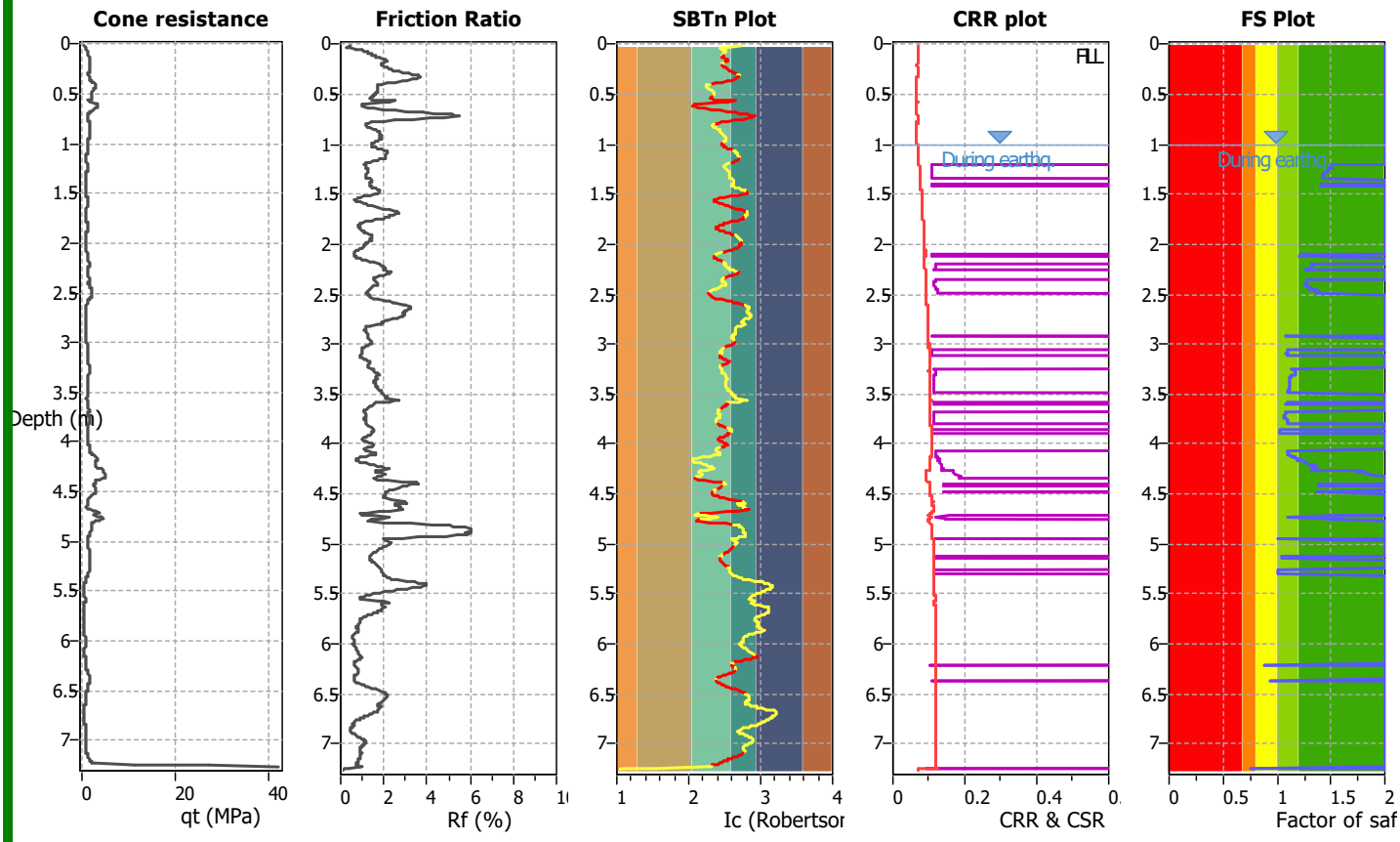
LIQUEFACTION ANALYSIS REPORT

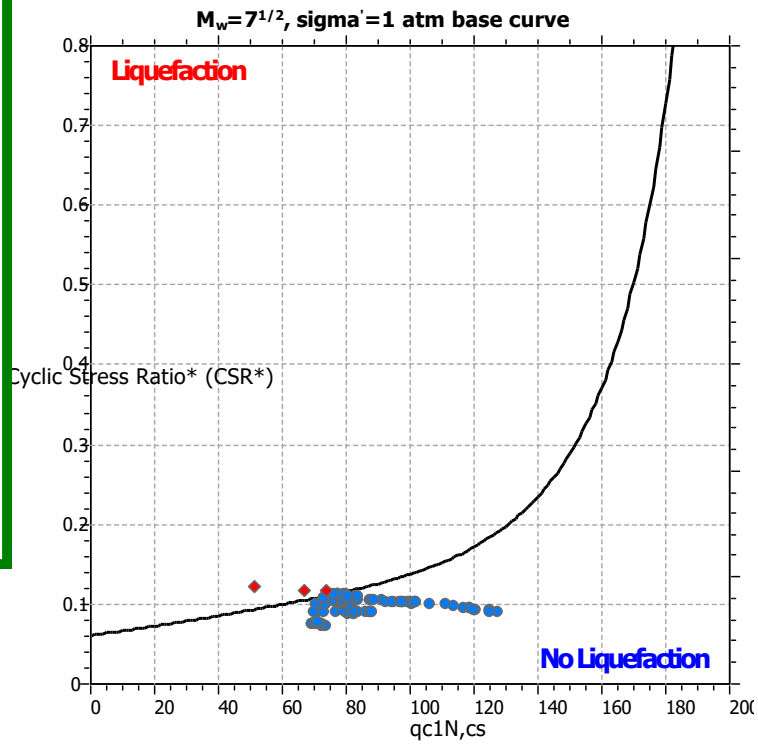
Project title : Windermere Engergy Ltd (2021) **Location : Kerikeri**

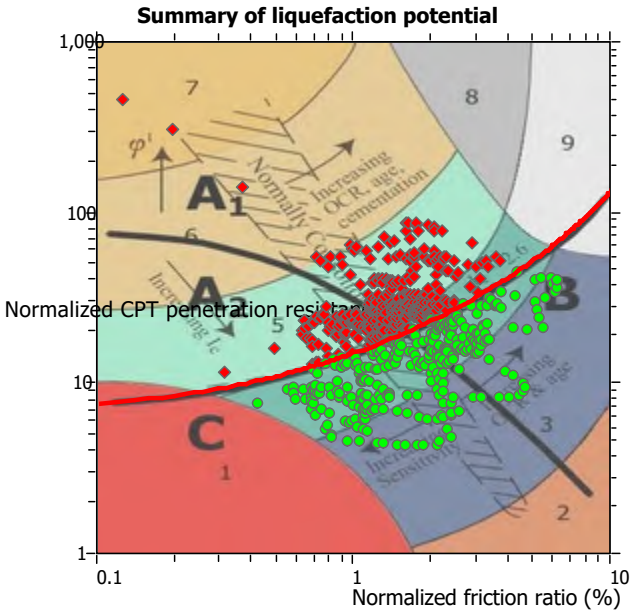
CPT file : CPT08

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.50 m	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	0.50 m	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	20.00 kN/m³	Limit depth:	N/A
Earthquake magnitude M_w:	5.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Table of Contents

Project Settings

Document Name	03_surcharge
Project Title	Peter Swan Ltd
Analysis	Lots 6-8
Author	W.T
Company	HWL
Date Created	13/01/2023, 9:25:55 am
Last saved with Settle3 version	5.018
Stress Computation Method	Boussinesq
Stress Units	Metric, stress as kPa
Settlement Units	millimeters
Time-dependent Consolidation Analysis	
Time Units	years
Permeability Units	meters/second

Advanced Settings

Calculate settlement with mean stress	
Start of secondary consolidation (% of primary)	95
Min. stress for secondary consolidation (% of initial)	1
Reset time when load changes for secondary consolidation	No
Minimum settlement ratio for subgrade modulus	0.9
Use average poisson's ratio to calculate layered stresses	
Update Cv in each time step (improves consolidation accuracy)	
Ignore negative effective stresses in settlement calculations	
Add field points to load edges	

Soil Profile

Layer Option	Extruded Section Layers

Stage Settings

Stage #	Name	Time [years]
1	Stage 1	0
2	Stage 2	0.5
3	Stage 3	1
4	Stage 4	2
5	Stage 5	5
6	Stage 6	10
7	Stage 7	50

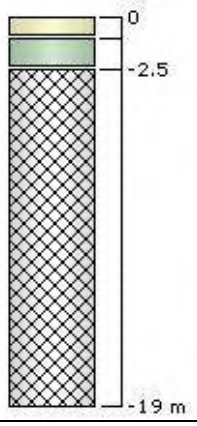
Soil Layers

Ground Surface Drained: Yes

cpt11

XY Location: cpt11: (20, -7)

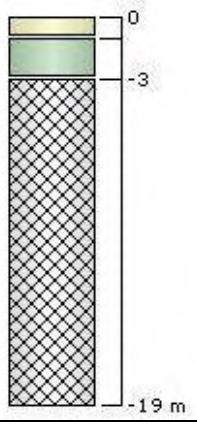
Layer #	Type	Thickness [m]	Elevation [m]	Drained at Bottom
1	Crustal Layer	1	0	No
2	Recent Alluvium	1.5	-1	Yes
3	Older Alluvium	0	-2.5	No



cpt6

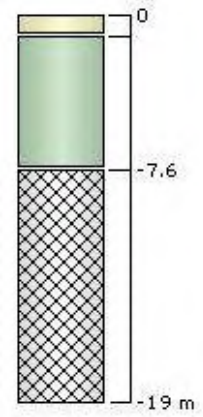
XY Location: cpt6: (40, -5)

Layer #	Type	Thickness [m]	Elevation [m]	Drained at Bottom
1	Crustal Layer	1	0	No
2	Recent Alluvium	2	-1	Yes
3	Older Alluvium	0	-3	No



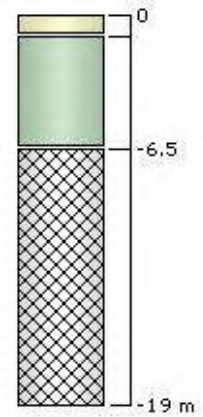
cpt01wm

XY Location:		cpt01wm: (65, -5)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	6.6	-1	Yes
3	Older Alluvium	0	-7.6	No



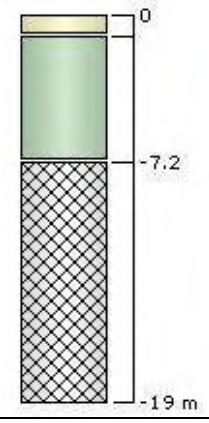
cpt07wm

XY Location:		cpt07wm: (85, -10)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	5.5	-1	Yes
3	Older Alluvium	0	-6.5	No



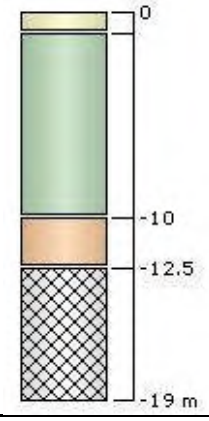
cpt08wm

XY Location:		cpt08wm: (95, -13)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	6.2	-1	Yes
3	Older Alluvium	0	-7.2	No



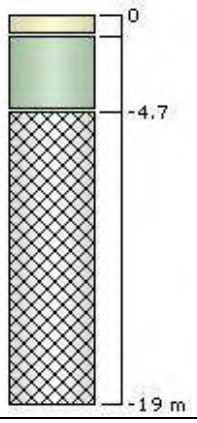
cpt14

XY Location:		cpt14: (110, -5)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	9	-1	Yes
3	Older Alluvium	2.5	-10	No



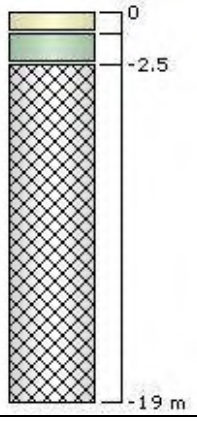
cpt01

XY Location:		cpt01: (120, -5)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	3.7	-1	Yes
3	Older Alluvium	0	-4.7	No



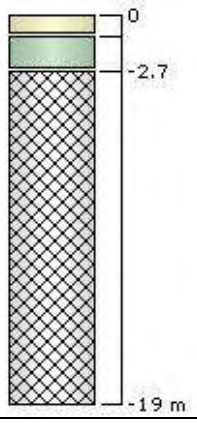
cpt09

XY Location:		cpt09: (20, -55)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	1.5	-1	Yes
3	Older Alluvium	0	-2.5	No



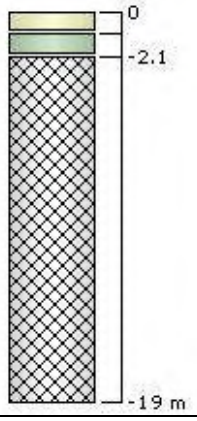
cpt08

XY Location:		cpt08: (40, -58)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	1.7	-1	Yes
3	Older Alluvium	0	-2.7	No



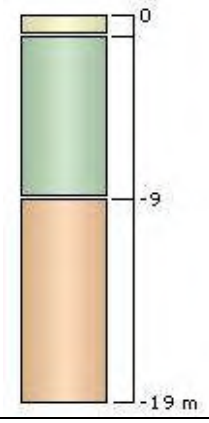
cpt12

XY Location:		cpt12: (70, -55)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	1.1	-1	Yes
3	Older Alluvium	0	-2.1	No



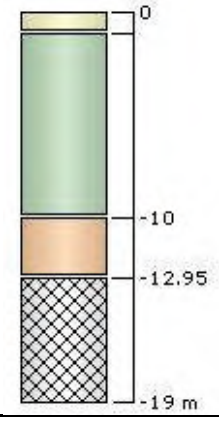
cpt05

XY Location:		cpt05: (85, -50)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	8	-1	Yes
3	Older Alluvium	10	-9	No



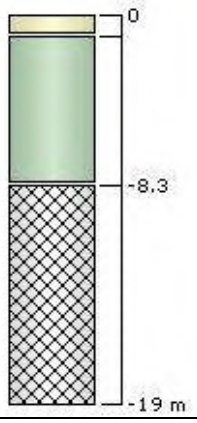
cpt13

XY Location:		cpt13: (105, -58)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	9	-1	Yes
3	Older Alluvium	2.95	-10	No



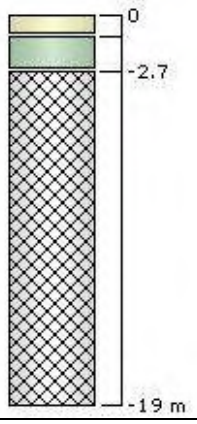
cpt03

XY Location:		cpt03: (120, -58)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	7.3	-1	Yes
3	Older Alluvium	0	-8.3	No



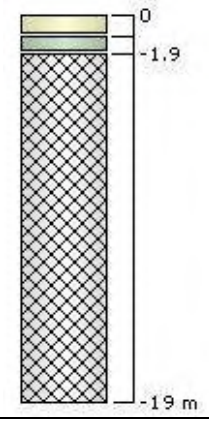
cpt10

XY Location:		cpt10: (20, -30)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	1.7	-1	Yes
3	Older Alluvium	0	-2.7	No



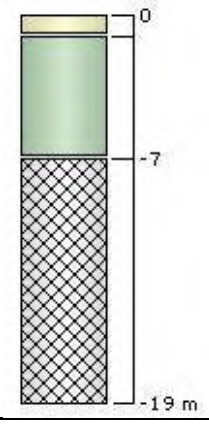
cpt07

XY Location:		cpt07: (40, -30)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	0.9	-1	Yes
3	Older Alluvium	0	-1.9	No



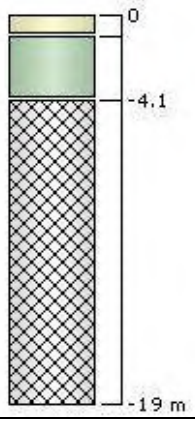
cpt04

XY Location:		cpt04: (110, -30)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	6	-1	Yes
3	Older Alluvium	0	-7	No



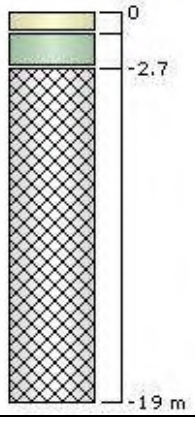
cpt02

XY Location:		cpt02: (120, -30)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	3.1	-1	Yes
3	Older Alluvium	0	-4.1	No



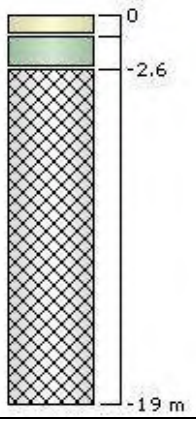
cpt04wm

XY Location:		cpt04wm: (60, -25)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	1.7	-1	Yes
3	Older Alluvium	0	-2.7	No



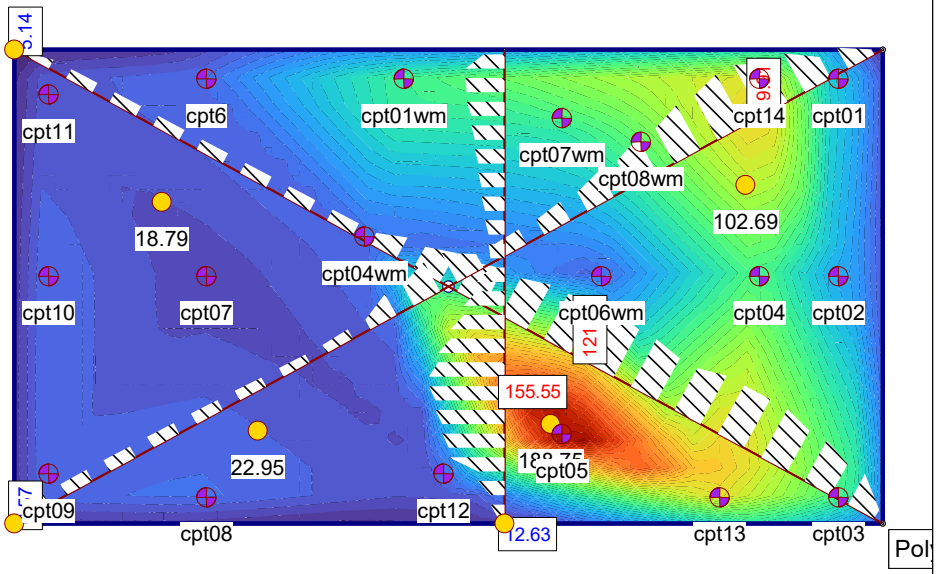
cpt06wm

XY Location:		cpt06wm: (90, -30)		
Layer #	**Type**	**Thickness [m]**	**Elevation [m]**	**Drained at Bottom**
1	Crustal Layer	1	0	No
2	Recent Alluvium	1.6	-1	Yes
3	Older Alluvium	0	-2.6	No



Soil Properties

Property	Crustal Layer	Recent Alluvium	Older Alluvium
Color			
Unit Weight [kN/m3]	17	15	17
Saturated Unit Weight [kN/m3]	17	15	17
Poisson's Ratio	0.35	0.35	0.35
K0	1	1	1
Primary Consolidation	Enabled	Enabled	Enabled
Material Type	Linear	Linear	Linear
mv [m2/kN]	0.0001	0.0003	0.00025
mvur [m2/kN]	0.0001	0.0003	0.00025
Cv [m2/s]	-	1e-05	1e-07
Cvr [m2/s]	-	-	-
B-bar	1	1	1
Undrained Su A [kN/m2]	0	0	0
Undrained Su S	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8
Piezo Line ID	1	1	1


cpt11
cpt6
cpt01wm
cpt07wm
cpt08wm
cpt14
cpt01
18.79
102.69
cpt04wm
cpt10
cpt07
cpt06wm
cpt04
cpt02
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cpt05
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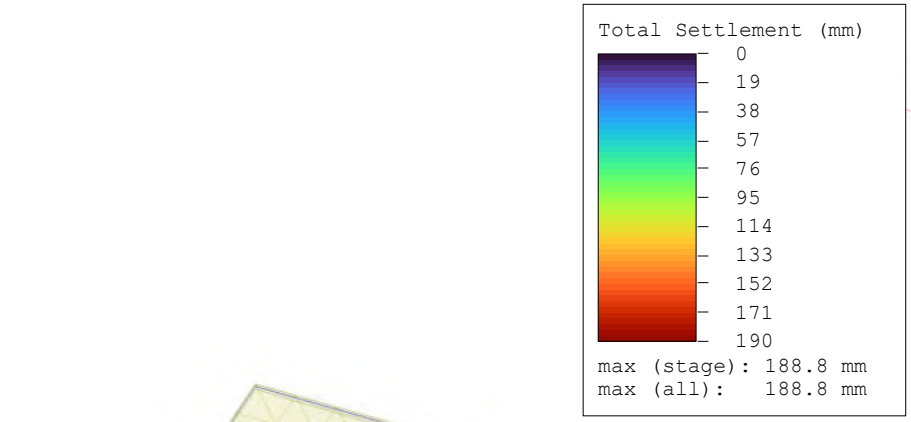
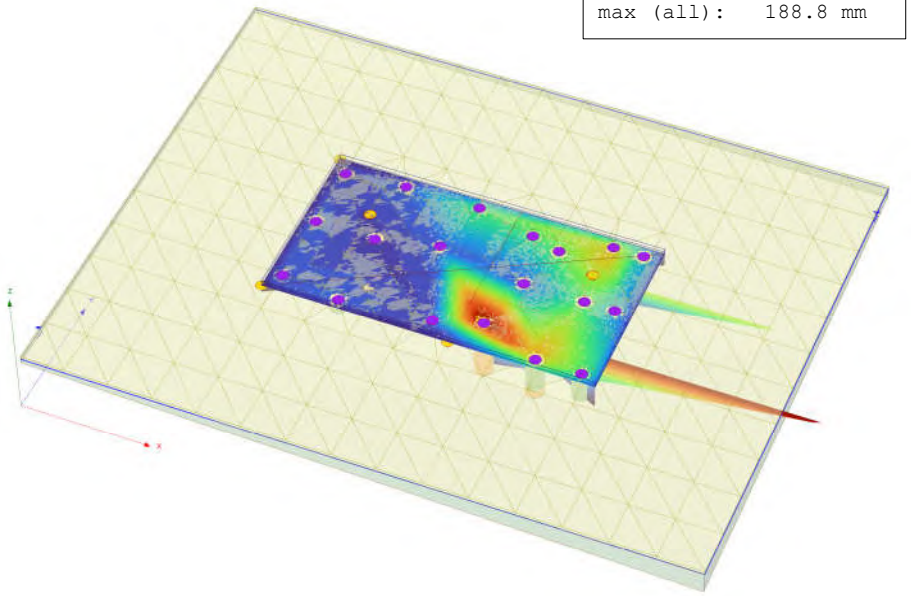
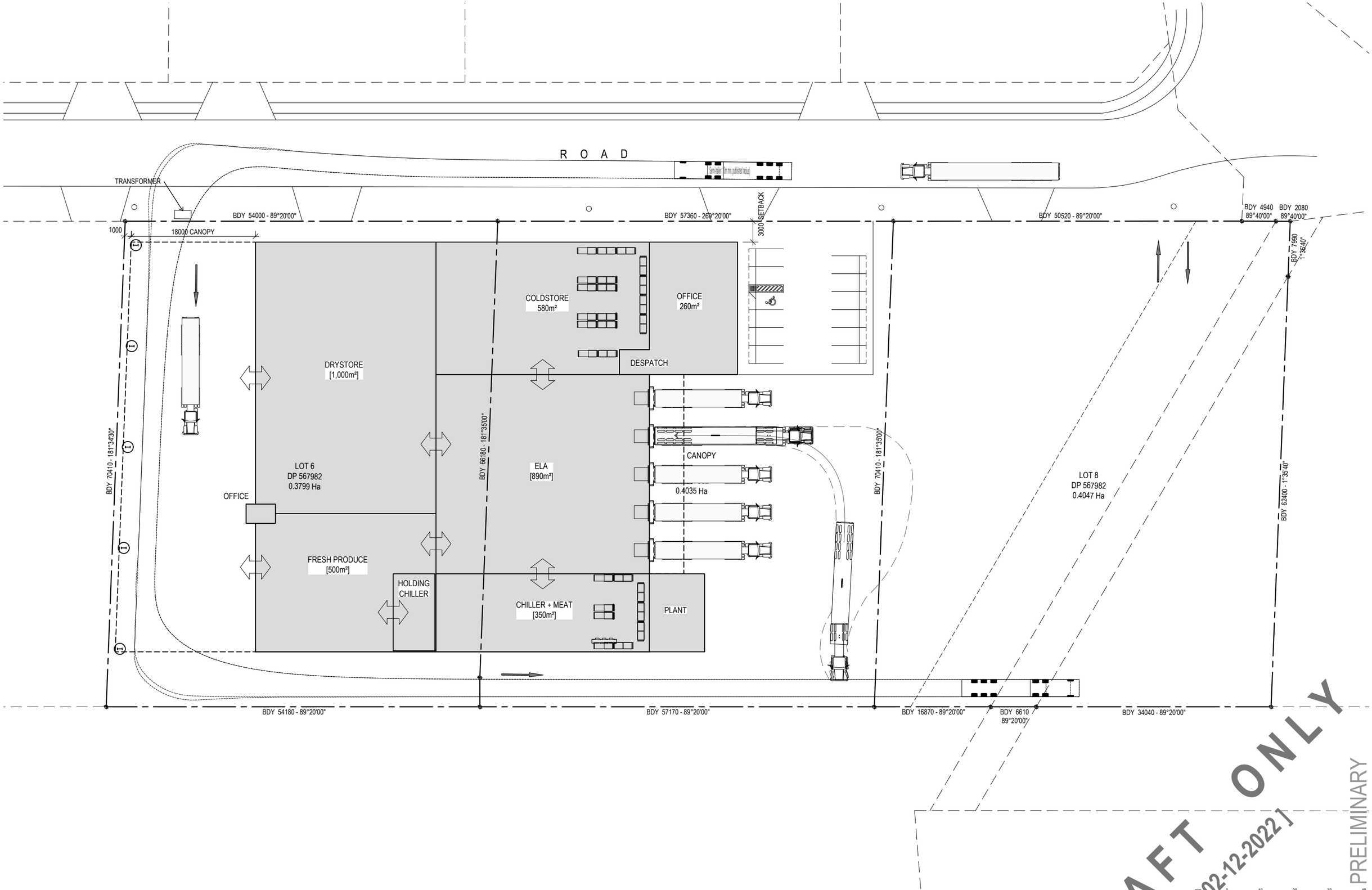
cpt12
cpt08
cpt13
cpt03
20
40
60
80
100
120


Total Settlement (mm)
0
19
38
57
76
95
114
133
152
171
190
max (stage): 188.8 mm
max (all): 188.8 mm



Appendix D – Provided Development Drawings



1:1 mm 0 10 20 30 40

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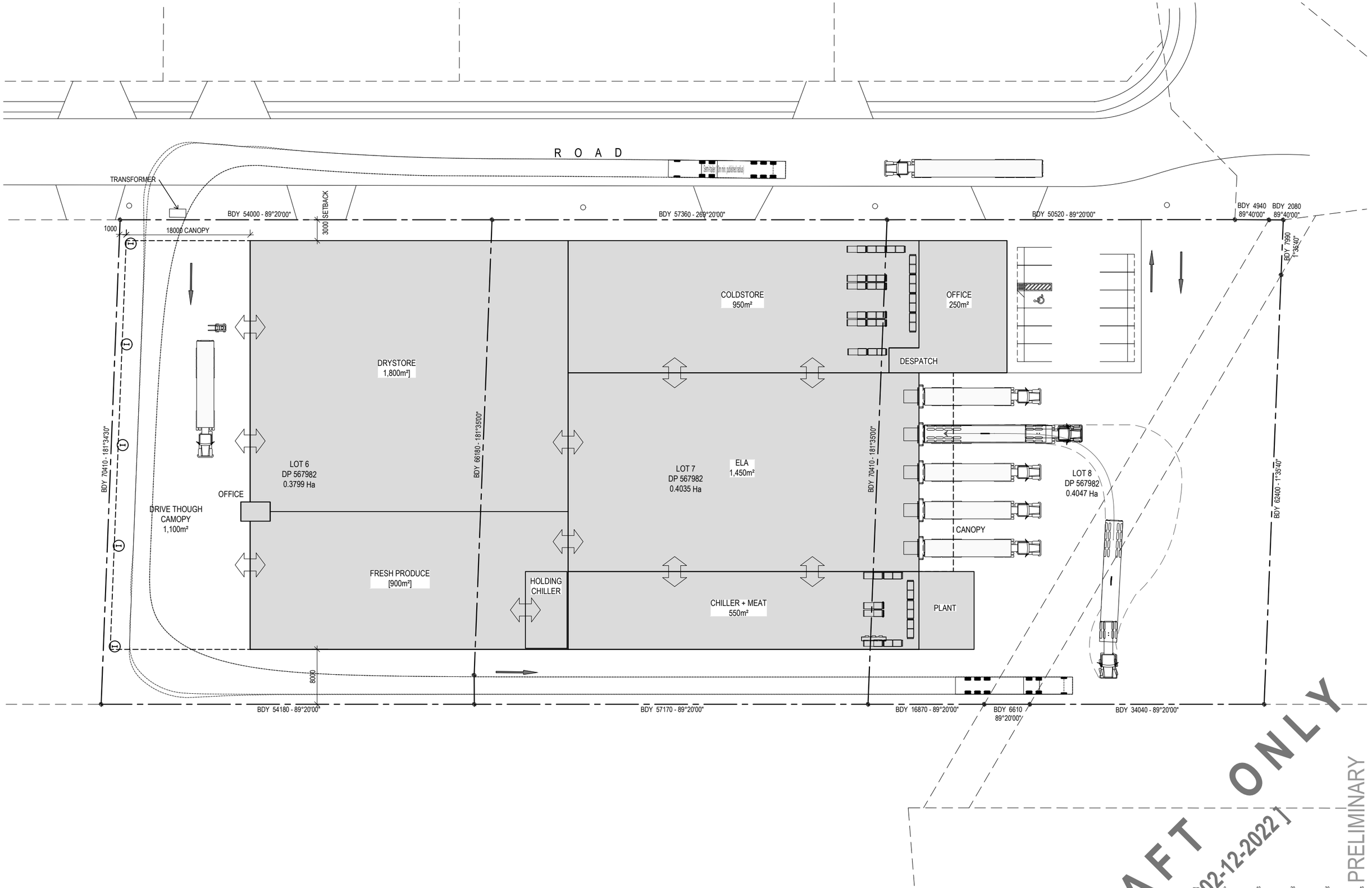
CLIENT: | PROJECT TITLE:
Bidfood

SITE DEVELOPMENT
FOR:
BIDFOOD LIMITED
AT:
KERI KERI

DRAWING TITLE:
SITE PLAN
OPTION -A

NORTH

SCALE: A3 - 1:500 A1 - 1:250		ORIGINAL SHEET SIZE: A3
DESIGNED: BB	CHECKED:	REF: --
DRAWN: CW	APPROVED:	DATE: NOV 2022
		DRAWING No.: 110695 - P201 REV.: 1
PRELIMINARY	--	1
REVISION:	DATE:	No.:



1:1 mm 0 10 20 30 40

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CLIENT: Bidfood | PROJECT TITLE:

SITE DEVELOPMENT
FOR:
BIDFOOD LIMITED
AT:
KERI KERI

DRAWING TITLE:

SITE PLAN
OPTION -B

NORTH

SCALE: A3 - 1:500 A1 - 1:250		ORIGINAL SHEET SIZE:	A3
DESIGNED: BB	CHECKED:	REF:	--
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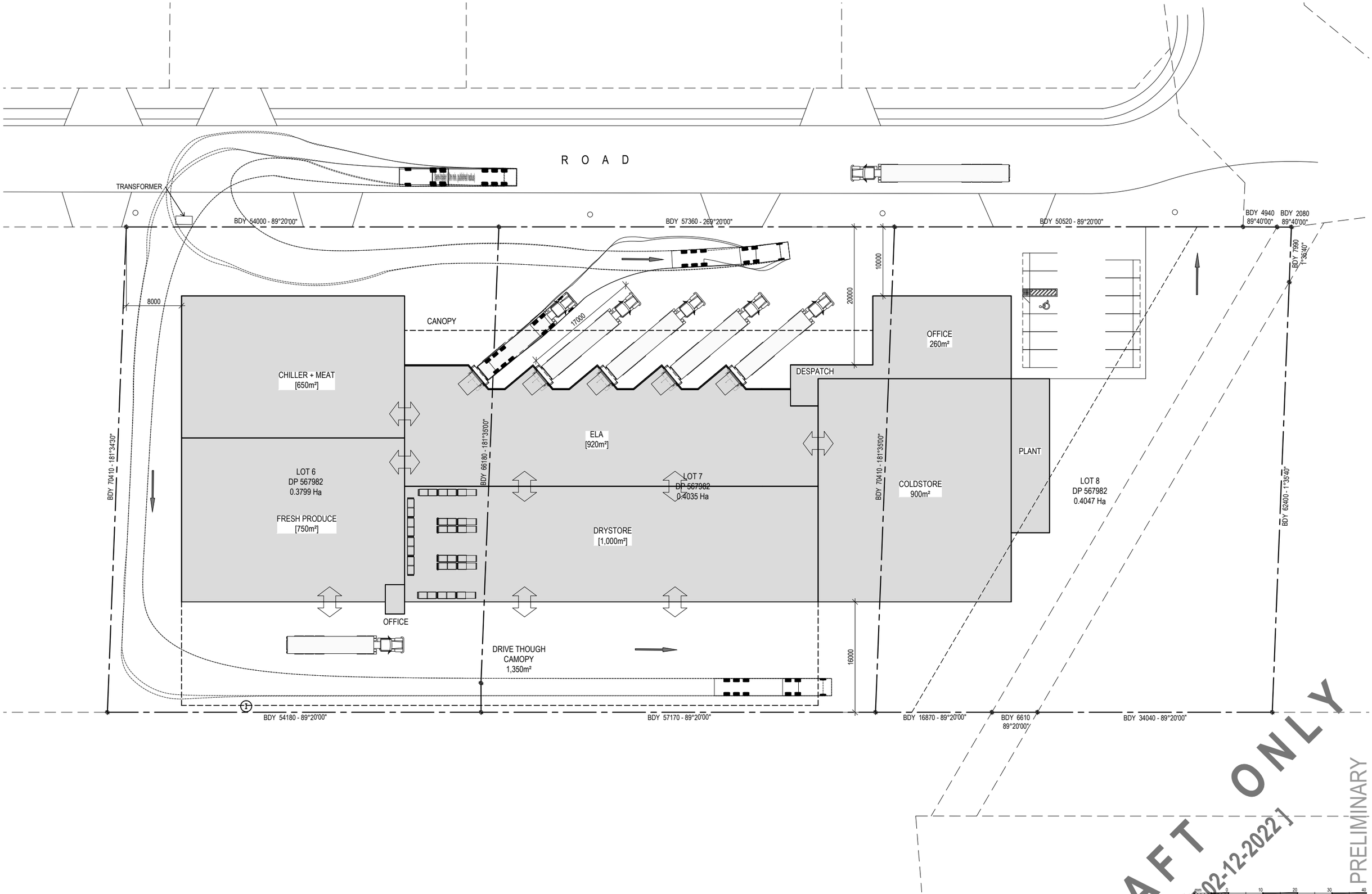
DRAWING No.:	110695 - P201		REV.: 1

PRELIMINARY -- 1
REVISION: DATE: No.:



1:1 mm 0 10 20 30 40

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CLIENT: Bidfood | PROJECT TITLE:

SITE DEVELOPMENT
FOR:
BIDFOOD LIMITED
AT:
KERI KERI

DRAWING TITLE:

SITE PLAN
OPTION -C

NORTH

SCALE: A3 - 1:500 A1 - 1:250		ORIGINAL SHEET SIZE:	A3
DESIGNED: BB	CHECKED:	REF:	--
DRAWN: CW	APPROVED:	DATE:	NOV 2022
DRAWING No.: 110695 - P201			REV.: 1

PRELIMINARY -- 1
REVISION: DATE: No.:

STORMWATER DESIGN

FOR

BIDFOOD LIMITED PROPOSED DISTRIBUTION CENTRE

AT

LOTS 6-9 KAHIKATEAROA LINE, WAIPAPA

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1. STORMWATER MANAGEMENT OVERVIEW

a. Roof Areas

Stormwater from the building roof areas is collected by a system of external gutters and downpipes sized in accordance with E2. The downpipes have leaf guards and first flush devices incorporated in them to reduce the debris entering the system as the roof water will be re-used on site. The roof water is piped to underground storage tanks and then in turn pumped into above ground storage tanks.

If the storage tanks are full the stormwater will overflow from the underground storage and be discharged into the public stormwater system.

b. Yard areas

Stormwater from yard areas is collected by inground cesspit chambers with sediment filters then discharged into the public stormwater system via an inground pipe system

c. Stormwater Attenuation

As required by the site consent notices the stormwater discharge from site is attenuated and this is achieved using an underground detention tank located under the office carparking area. The piped stormwater flows from both the yard areas and roof tank overflow is connected to a 154m3 rainsmart storage tank which then discharges through orifice plates into the public stormwater system in Kahikatearoa lane.

APPENDIX A

Stormwater Calculations

DESIGN RAINFALL

SITE:- **BIDFOOD WIPAPA**

DESIGN RAINFALL INTENSITIES

Raifall intensities for the required design rainfall events
NEWA & E1/AS1 Appendix A

2% AEP 20 minute rainfall event =	**47.2**	mm/hr
10% AEP 20 minute rainfall event =	**71.3**	mm/hr
2% AEP 24 hour rainfall event =	**4.8**	mm/hr
10% AEP 10min rainfall event =	**97.9**	mm/hr

Rain event for sizing Piped Systems:-

10min 10% AEP intensity i =	**97.9**	mm/hr
Climate Change Factor =	**1.16**	
i.e. Design Rainfall Intensity =	**113.6**	mm/hr

DESIGN RUNOFF

Buildings and Paved areas	AREA		RUNOFF		
Building roofs =	**11,732**	m^2	**20,001.0**	ℓ/min	333.3 ℓ/s
Paved Yards =	**4,638**	m^2	**7,467.7**	ℓ/min	124.5 ℓ/s
Aruba Grove Frontage =	**1,974**	m^2	**1,308.7**	ℓ/min	21.8 ℓ/s
Total =	**18,344**	m^2	**28,777**	ℓ/min	479.6 ℓ/s

IMPERVIOUS AREAS & STORMWATER RUNOFF

SITE:- BIDFOOD WIPAPA

CATCHMENT:- LOT 1 - POST-DEVELOPMENT

Total Catchment Area = **11,867** m^2

Buildings and Paved areas

Building roofs =	**11,732**	m^2			
Paved Yards =	**4,638**	m^2	Total Impervious =	**16,370**	m^2
Total Landscaped Area =	**-4,503**	m^2		138%	coverage

DESIGN STORM

E1/AS1 Appendix A

10min 10% AEP intensity i =	**97.9**	mm/hr
Climate Change Factor =	**1.16**	
i.e. Design Rainfall Intensity =	**113.6**	mm/hr

Using the Rational Method:

Runoff = C i A/3600 ℓ/sec

ROOF AREAS

(Refer attached marked-up site plan)

	AREA		RUNOFF			
Coldstore Roof =	3984	m^2	**6,792**	ℓ/min	113.2	l/s
Drive-through Canopy Roof =	952	m^2	**1,623**	ℓ/min	27.0	l/s
Office / ELA canopy =	6667	m^2	**11,366**	ℓ/min	189.4	l/s
Pod Roof =	41	m^2	**70**	ℓ/min	1.2	l/s
Plantroom Roof =	88	m^2	**150**	ℓ/min	2.5	l/s
	11,732	m^2	**20,001**	ℓ/min	**333**	l/s

PAVED AREAS

(Refer attached marked-up site plan)

			RUNOFF			
Carpark =	565	m^2	**909.7**	ℓ/min	15.2	l/s
Drive =	1026	m^2	**1,652.0**	ℓ/min	27.5	l/s
Yard =	3013	m^2	**4,851.3**	ℓ/min	80.9	l/s
Lunch Area =	34	m^2	**54.7**	ℓ/min	0.9	l/s
Total =	**4,638**	m^2	**7,468**	ℓ/min	**124**	l/s

LANDSCAPED AREAS

landscape area A1 =	94	m^2	**62.3**	ℓ/min	**1.0**	l/s
landscape area A2 =	240	m^2	**159.1**	ℓ/min	**2.7**	l/s
landscape area A3 =	1273	m^2	**844.0**	ℓ/min	**14.1**	l/s
landscape area A4 =	58	m^2	**38.5**	ℓ/min	**0.6**	l/s
landscape area A5 =	101	m^2	**67.0**	ℓ/min	**1.1**	l/s
landscape area A6 =	208	m^2	**137.9**	ℓ/min	**2.3**	l/s
Total =	**1,974**	m^2	**1,309**	ℓ/min	**22**	l/s

TOTAL RUNOFF

Post-development Runoff for 10% AEP rain event =	**480**	l/s
Pre-development Runoff for 10% AEP rain event =	**112**	l/s
Increase =	**367**	l/s

STORMWATER ROOF RUNOFF

SITE:- **BIDFOOD WIPAPA**

RUNOFF:-

Design rainfall intensity required is 10 minute 10% AEP rainfall event.

10min 10% AEP intensity i = **113.6** mm/hr

i.e. Design runoff for sizing drainage pipes :-

CATCHMENT 1 TO UNDERGROUND TANKS

CATCHMENT		AREA		C	RUNOFF	
DRIVE-THRU CANOPY	DP13	**306**	m^2	0.9	8.7	ℓ/s
DRIVE-THRU CANOPY	DP14	**318**	m^2	0.9	9.0	ℓ/s
DRIVE-THRU CANOPY	DP15	**328**	m^2	0.9	9.3	ℓ/s
WARHOUSE ROOF	DP1	**332**	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP2	**332**	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP3	**332**	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP4	**332**	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP5	**332**	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP6	**332**	m^2	0.9	9.4	ℓ/s
POD	DP16	**41**	m^2	0.9	1.2	ℓ/s
ELA CANOPY	DP20	**73**	m^2	0.9	2.1	ℓ/s
		3058	m^2		Total = **86.9**	ℓ/s

Pipe capacity from AS/NZS 3500.3 Figure 5.4.11.2, using k = 0.015 for uPVC & k=0.6 for conc.

Node ID	UPSTREAM G.L	UPSTREAM I.L.	Pipe ϕ (mm)	GRADE (1: x)	Capacity (l/sec)	Flow (l/sec)	DIST (m)	fall (mm)	DOWNSTREAM G.L	DOWNSTREAM I.L.	Cover (mm)
DP13	79.20	83.00	STARTING POINT								-3,960
		OUT	*150*	*200*	**18**	**8.7**	*19.2*	96		IN	
DP14 Intersection									79.20	82.90	-3,864
DP14 Intersection	79.20	82.90									-3,714
		OUT	*0*	*200*	**18**	**17.7**	*16.2*	81		IN	
150 to 225 Reducer									79.20	82.82	-3,633
150 to 225 Reducer	79.20	82.82									-3,858
		OUT	*225*	*200*	**48**	**17.7**	*0.7*	4		IN	
DP15 Intersection									79.20	82.82	-3,854
DP15 Intersection	79.20	82.82									-3,779
		OUT	*150*	*200*	**18**	**27.0**	*0.9*	5		IN	
Change of Direction									79.20	82.82	-3,775
Change of Direction	79.20	82.82									-3,850
		OUT	*225*	*200*	**47**	**27.0**	*1.3*	7		IN	
Dropper/First Flush									79.20	82.81	-3,843
Dropper/First Flush	79.21	78.51									470
		OUT	*225*	*200*	**47**	**27.0**	*16.9*	85		IN	
SWMH-T1									79.05	78.42	395
SWMH-T1	79.05	78.32									495
		OUT	*225*	*150*	**59**	**27.0**	*10.0*	67		IN	
DP1 Intersection									78.98	78.25	491
DP1	79.00	78.26									580
		OUT	*150*	*200*	**18**	**9.4**	*1.5*	8		IN	
DP1 Intersection									78.98	78.25	568
DP1 Intersection	78.98	78.25									491
		OUT	*225*	*150*	**59**	**36.5**	*11.1*	74		IN	
DP2 Intersection									78.92	78.18	505
DP2	78.93	78.19									580
		OUT	*150*	*200*	**18**	**9.4**	*1.5*	8		IN	
DP2 Intersection									78.92	78.18	577
DP2 Intersection	78.92	78.18									505
		OUT	*225*	*150*	**59**	**45.9**	*10.4*	69		IN	
DP3 Intersection									78.85	78.11	504
DP3	78.86	78.12									580
		OUT	*150*	*200*	**18**	**9.4**	*1.5*	8		IN	
DP3 Intersection									78.85	78.11	577

DP3 Intersection	78.85	78.11									504
		OUT	*225*	*150*	**59**	**55.3**	*11.1*	74		IN	
225 to300 Reducer									78.79	78.04	519
225 to300 Reducer	78.79	78.04									444
		OUT	*300*	*150*	**130**	**45.9**	*1.0*	7		IN	
DP4 Intersection									78.78	78.03	440
DP4	78.79	78.04									590
		OUT	*150*	*200*	**18**	**9.4**	*1.5*	8		IN	
DP4 Intersection									78.78	78.03	587
DP4 Intersection	78.78	78.03									440
		OUT	*300*	*150*	**130**	**64.8**	*11.1*	74		IN	
DP5 Intersection									78.71	77.96	444
DP5	78.72	77.97									590
		OUT	*150*	*200*	**18**	**9.4**	*1.5*	8		IN	
DP5 Intersection									78.71	77.96	587
DP5 Intersection	78.71	77.96									444
		OUT	*300*	*150*	**130**	**74.2**	*11.1*	74		IN	
DP6 Intersection									78.64	77.88	448
DP6	78.65	77.89									600
		OUT	*150*	*200*	**18**	**9.4**	*1.5*	8		IN	
DP6 Intersection									78.64	77.88	597
DP6 Intersection	78.64	77.88									448
		OUT	*300*	*150*	**130**	**83.6**	*10.2*	68		IN	
DP16 Intersection									78.58	77.81	456
DP16	78.59	77.82									660
		OUT	*100*	*100*	**8**	**1.2**	*1.5*	15		IN	
DP16 Intersection									78.58	77.81	665
DP16 Intersection	78.58	77.81									456
		OUT	*300*	*150*	**130**	**84.8**	*9.7*	65		IN	
SWMH-T2									78.52	77.75	461
SWMH-T2	78.52	77.54									671
		OUT	*300*	*150*	**130**	**84.8**	*28.5*	190		IN	
Tank1									78.13	77.35	471
DP20	78.00	77.50									390
		OUT	*100*	*120*	**8**	**2.1**	*17.7*	148		IN	
Tank1									78.13	77.35	667

i.e. Design runoff for sizing drainage pipes :-

CATCHMENT 2 TO UNDERGROUND TANKS

CATCHMENT		AREA		C	RUNOFF	
WARHOUSE ROOF	DP7	332	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP8	332	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP9	332	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP10	332	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP11	332	m^2	0.9	9.4	ℓ/s
WARHOUSE ROOF	DP12	332	m^2	0.9	9.4	ℓ/s
OFFICE DP	DP22	135	m^2	0.9	3.8	ℓ/s
OFFICE DP	DP21	145	m^2	0.9	4.1	ℓ/s
		2272	m^2		Total = 64.6	ℓ/s

Pipe capacity from AS/NZS 3500.3 Figure 5.4.11.2, using k = 0.015 for uPVC & k=0.6 for conc.

Node ID	UPSTREAM G.L	UPSTREAM I.L.	Pipe ϕ (mm)	GRADE (1: x)	Capacity (l/sec)	Flow (l/sec)	DIST (m)	fall (mm)	DOWNSTREAM G.L	DOWNSTREAM I.L.	Above FFL (mm)
DP7	78.90	78.10	STARTING POINT								640
		OUT	150	200	18	9.4	12.2	61		IN	
225 to 150 Reducer									78.67	78.04	471
225 to 150 Reducer	78.67	78.04									396
		OUT	225	200	48	9.4	0.9	5		IN	
DP8 Intersection									78.67	78.03	401
DP8	78.85	78.04									650
		OUT	150	200	18	9.4	1.8	9		IN	
DP8 Intersection									78.67	78.03	479
DP8 Intersection	78.67	78.03									401
		OUT	225	200	48	18.9	11.1	56		IN	
DP9 Intersection									78.64	77.98	426
DP9	78.80	77.99									650
		OUT	150	200	18	9.4	1.8	9		IN	
DP9 Intersection									78.64	77.98	499
DP9 Intersection	78.64	77.98									426
		OUT	225	200	48	28.3	11.0	55		IN	
DP10 Intersection									78.59	77.92	431
DP10	78.76	77.93									670
		OUT	150	200	18	9.4	1.8	9		IN	
DP10 Intersection									78.59	77.92	509
DP10 Intersection	78.59	77.92									431
		OUT	225	200	48	37.7	11.1	56		IN	
DP11 Intersection									78.55	77.87	447
DP11	78.70	77.88									660
		OUT	150	200	18	9.4	1.8	9		IN	
DP11 Intersection									78.55	77.87	519
DP11 Intersection	78.55	77.87									447
		OUT	225	200	48	47.2	7.6	38		IN	
225 to300 Reducer									78.55	77.83	484
225 to300 Reducer	78.55	77.83									409
		OUT	300	200	97	47.2	1.0	5		IN	
DP12 Intersection									78.55	77.83	414
DP12	78.79	77.84									790
		OUT	150	200	18	9.4	2.5	13		IN	
DP12 Intersection									78.55	77.83	562
DP12 Intersection	78.55	77.83									414
		OUT	300	200	97	56.6	22.9	115		IN	
SWMH-T3									78.50	77.71	479
SWMH-T3	78.50	77.47									719
		OUT	300	200	97	56.6	11.1	56		IN	
DP22 Intersection									78.96	77.42	1,234
DP22	79.11	78.46									540
		OUT	100	100	8	3.8	2.0	20		IN	
DP22 Intersection								Drop-In	78.96	78.44	410
DP22 Intersection	78.96	77.42									1,234
		OUT	300	200	97	60.4	4.3	22		IN	
DP21 Intersection									79.13	77.39	1,426

DP21	79.11	78.61									390
		OUT	*100*	*100*	**8**	**4.1**	*3.0*	30		IN	
DP21 Intersection								Drop-In	79.13	78.58	440
DP21 Intersection	79.13	77.39									1,426
		OUT	*300*	*200*	**97**	**64.6**	*9.0*	45		IN	
Tank									78.14	77.35	481

STORMWATER DRAINAGE DESIGN

SITE:- **BIDFOOD WIPAPA**

CATCHMENT 1 DRIVE THROUGH ENTRY

10min 10% AEP intensity = **113.6** mm/hr Q = CiA/3600

	Catchment	AREA		C	RUNOFF	
Drive-Thru Drive	CP 1	**23**	m^2	0.85	0.6	ℓ/s

Pipe capacity from AS/NZS 3500.3 Figure 5.4.11.2, using k = 0.015 for uPVC & k=0.6 for conc.

Node ID	UPSTREAM G.L.	UPSTREAM I.L.	Pipe ϕ (mm)	GRADE (1: x)	Capacity (l/sec)	Flow (l/sec)	DIST (m)	fall (mm)	DOWNSTREAM G.L.	DOWNSTREAM I.L.	cover (mm)
CP 1	78.71	78.06	STARTING POINT								490
		OUT	*150*	*200*	**18**	**0.6**	*1.5*	8		IN	
SWMH 1									78.67	78.05	458
SWMH 1	78.67	77.80	COS Ex. PIPE DIA & INVERT								633
		OUT	*225*	*200*	**48**	**0.6**	*1.5*	8		IN	
Ex. SWMH 07									78.46	77.80	430

CATCHMENT 1 DRIVE, YARD, LOADING BAYS & CARPARK

10min 10% AEP intensity = **113.6** mm/hr Q = CiA/3600

	Catchment	AREA		C	RUNOFF	
Humes Maxpit	CP2	**1026**	m^2	0.85	27.5	ℓ/s
Humes Maxpit	CP3	**1563**	m^2	0.85	41.9	ℓ/s
Cesspit	CP4a & 4b	**467**	m^2	0.85	12.5	ℓ/s
Landscape	A4	**58**	m2	0.35	0.6	ℓ/s
Cesspit	CP5	**81**	m2	0.85	2.2	ℓ/s
Plantroom	DP17	**54**	m^2	0.9	1.5	ℓ/s
Plantroom	DP18	**34**	m2	0.9	1.0	ℓ/s
ELA Canopy	DP19	**73**	m2	0.9	2.1	ℓ/s
Cesspit	CP6	**221**	m2	0.85	5.9	ℓ/s
Cesspit	CP7	**246**	m2	0.85	6.6	ℓ/s
Cesspit	CP8	**435**	m2	0.85	11.7	ℓ/s
Retention Tank Overflow	Tank1				89.0	ℓ/s
Carpark	CP9a & 9b	**446**	m2	0.85	12.0	ℓ/s
Carpark	CP10	**119**	m2	0.85	3.2	ℓ/s
Lunch Area	CP11	**34**	m2	0.85	0.9	ℓ/s
Landscape	A1	**94**	m2	0.35	1.0	ℓ/s
Landscape	A2	**240**	m2	0.35	2.6	ℓ/s
Landscape	A3	**1273**	m2	0.35	14.1	ℓ/s
Landscape	A5	**101**	m2	0.35	1.1	ℓ/s
Landscape	A6	**208**	m2	0.35	2.3	ℓ/s

Pipe capacity from AS/NZS 3500.3 Figure 5.4.11.2, using k = 0.015 for uPVC & k=0.6 for conc.

Node ID	UPSTREAM G.L.	UPSTREAM I.L.	Pipe ϕ (mm)	GRADE (1: x)	Capacity (l/sec)	Flow (l/sec)	DIST (m)	fall (mm)	DOWNSTREAM G.L.	DOWNSTREAM I.L.	cover (mm)
CP2	78.25	77.43	STARTING POINT								590
		OUT	*225*	*200*	**48**	**27.5**	*56.0*	280		IN	
SWMH 5									77.92	77.15	540
CP3	77.66	77.04	STARTING POINT								390
		OUT	*225*	*200*	**48**	**41.9**	*12.2*	61		IN	
SWMH 5									77.92	76.97	711
SWMH 5	77.92	76.94									666
		OUT	*300*	*-*	**-**	**69.4**	*20.5*	0		IN	
Rainsmart									78.65	76.94	1,396
DP17	78.60	78.05	STARTING POINT								440
		OUT	*100*	*80*	**9**	**1.5**	*3.5*	44		IN	
Rodding Eye Intersection									78.60	78.01	484
Rodding Eye	78.60	78.02									470
		OUT	*100*	*80*	**9**	**1.5**	*0.5*	6		IN	
Rodding Eye Intersection									78.60	78.01	476

Rodding Eye Intersection	78.60	78.01 OUT	*100*	*80*	**9**	**1.5**	*8.1*	101		IN	484
DP18 Intersection									78.53	77.91	515
DP18	78.60	77.98 OUT	*100*	*80*	**9**	**1.0**	*5.9*	74		IN	510
DP18 Intersection									78.53	77.91	514
DP18 Intersection	78.53	77.91 OUT	*100*	*80*	**9**	**2.5**	*0.6*	8		IN	515
Change of Direction									78.45	77.90	442
Change of Direction	78.45	77.90 OUT	*100*	*80*	**9**	**2.5**	*12.0*	150 (Drop-In)		IN	442
DP17 Intersection									78.33	77.75	472
CP5	78.24	77.30 OUT	*150*	*150*	**20**	**2.2**	*1.9*	13		IN	780
DP17 Intersection									78.33	77.29	883
DP17 Intersection	78.33	77.29 OUT	*150*	*150*	**20**	**4.7**	*2.2*	15		IN	883
DP 19 Intersection									78.18	77.27	747
DP19	78.20	77.59 OUT	*100*	*80*	**8**	**2.1**	*5.9*	74 (Drop-In)		IN	500
DP 19 Intersection									78.18	77.52	554
DP 19 Intersection	78.18	77.27 OUT	*150*	*150*	**20**	**6.7**	*2.3*	15		IN	747
CP6 Intersection									78.14	77.26	723
CP6	78.12	77.51 OUT	*150*	*150*	**20**	**5.9**	*0.7*	5 (Drop-In)		IN	450
CP6 Intersection									78.14	77.51	475
CP6 Intersection	78.14	77.26 OUT	*150*	*150*	**20**	**12.7**	*7.1*	47		IN	723
CP7 Intersection									78.06	77.21	690
CP7	78.01	77.46 OUT	*150*	*150*	**20**	**6.6**	*3.0*	20 (Drop-In)		IN	390
CP7 Intersection									78.06	77.44	460
CP7 Intersection	78.06	77.21 OUT	*150*	*150*	**20**	**19.3**	*14.5*	97		IN	690
SWMH 4									78.09	77.11	817
CP8	77.92	77.18 OUT	STARTING POINT *150*	*200*	**17**	**11.7**	*12.9*	65		IN	580
SWMH 4									78.09	77.12	815
Tank1	78.20	77.35 OUT	STARTING POINT *300*	*200*	**97**	**89.0**	*5.9*	30		IN	540
SWMH 4									78.09	77.32	460
SWMH 4	78.09	77.09 OUT	*300*	*150*	**125**	**119.9**	*12.8*	85		IN	690
SWMH 3									78.67	77.00	1,355
CP10	78.28	77.73 OUT	STARTING POINT *150*	*200*	**17**	**3.2**	*10.2*	51		IN	390
SWMH 3									78.67	77.68	831
SWMH 3	78.67	76.97 OUT	*300*	-	-	**123.1**	*21.5*	0		IN	1,385
Rainsmart									77.94	76.97	655
Rainsmart	78.53	76.50 OUT	*300*	-	-	**123.1**	*21.5*	0		IN	1,720
SWMH 2					(75mm Orifice Size to be determined)				77.88	76.50	1,070
CP9a & 9b	77.74	77.19 OUT	STARTING POINT *150*	*200*	**17**	**12.0**	*4.5*	23		IN	390
SWMH 2									77.88	77.17	553
SWMH 2	77.88	76.47 OUT	*300*	*150*	**125**	**135.0**	*13.5*	90		IN	1,100
SWMH 1									77.40	76.38	710
CP4a & 4b	77.33	76.78 OUT	STARTING POINT *150*	*200*	**17**	**13.2**	*1.0*	5		IN	390
SWMH 1									77.40	76.78	465
SWMH 1	77.40	76.35 OUT	*300*	*150*	**125**	**148.2**	*3.5*	23		IN	740
Ex. SWMH									77.40	76.33	763

Subcat Reach Pond Link

Routing Diagram for 22 189 20240613_Basin (Type 1A)
Prepared by Haigh Workman Limited, Printed 13/06/2024

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (mm)	AMC
1	Type 1A-2yr	Type IA 24-hr		Default	24.00	1	129	2
2	Type 1A-5yr	Type IA 24-hr		Default	24.00	1	171	2

Area Listing (selected nodes)

Area (sq-meters)	CN	Description (subcatchment-numbers)
4,480	98	(32S)
9,877	80	>75% Grass cover, Good, HSG D (30S)
5,397	98	Roof (24S)
19,754	**89**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-meters)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
9,877	HSG D	30S
9,877	Other	24S, 32S
19,754		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover	Subca Numbe
0	0	0	0	4,480	4,480		
0	0	0	9,877	0	9,877	>75% Grass cover, Good	
0	0	0	0	5,397	5,397	Roof	
0	**0**	**0**	**9,877**	**9,877**	**19,754**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 24S: Roofs Runoff Area=5,397 m² 100.00% Impervious Runoff Depth>123 mm
Tc=10.0 min CN=98 Runoff=46 L/s 662 m³

Subcatchment 30S: Predevelopment Runoff Area=9,877 m² 0.00% Impervious Runoff Depth>75 mm
Tc=10.0 min CN=80 Runoff=50 L/s 740 m³

Subcatchment 32S: Concrete Runoff Area=4,480 m² 100.00% Impervious Runoff Depth>123 mm
Tc=0.0 min CN=98 Runoff=38 L/s 551 m³

Pond 23P: 20x10x0.8 (high) Z=0 Peak Elev=0.59 m Storage=118 m³ Inflow=83 L/s 1,213 m³
Outflow=49 L/s 1,196 m³

Link 30L: Pre-development Inflow=50 L/s 740 m³
Primary=50 L/s 740 m³

Link 31L: Mitigated Inflow=49 L/s 1,196 m³
Primary=49 L/s 1,196 m³

Total Runoff Area = 19,754 m² Runoff Volume = 1,953 m³ Average Runoff Depth = 99 mm
50.00% Pervious = 9,877 m² 50.00% Impervious = 9,877 m²

Summary for Subcatchment 24S: Roofs

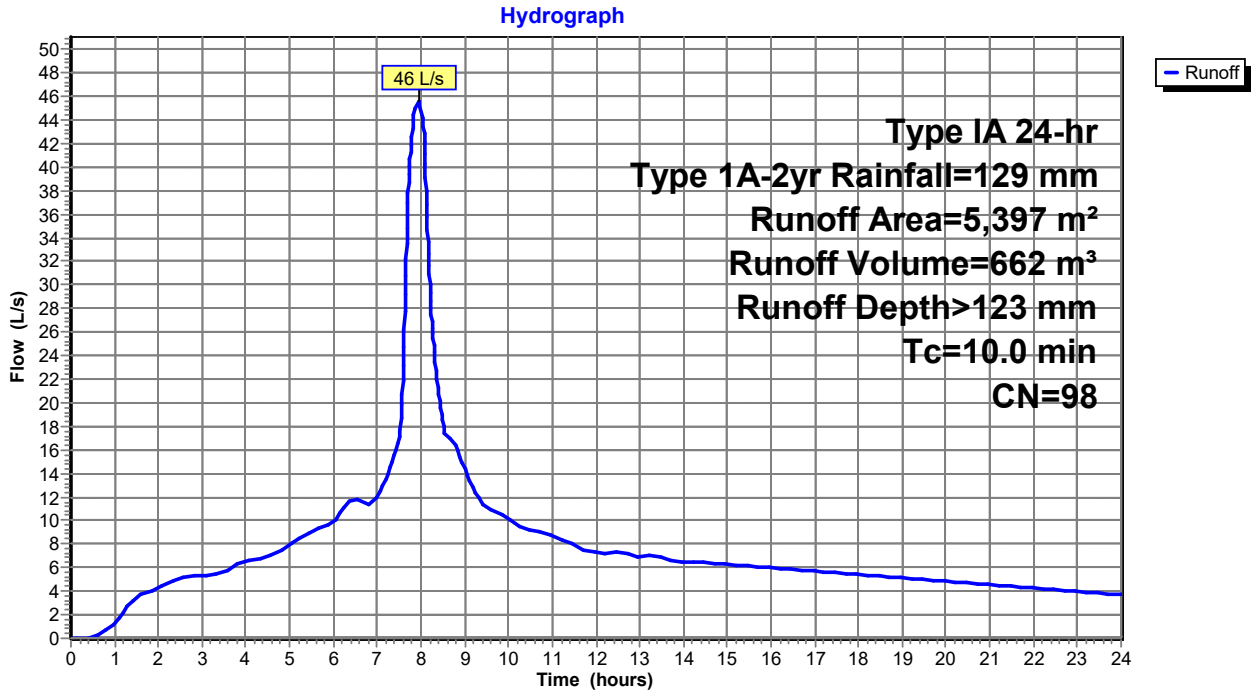
Runoff = 46 L/s @ 7.94 hrs, Volume= 662 m³, Depth> 123 mm
Routed to Pond 23P : 20x10x0.8 (high) Z=0

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr Type 1A-2yr Rainfall=129 mm

	Area (m²)	CN	Description
*	5,397	98	Roof
	5,397		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 24S: Roofs



Summary for Subcatchment 30S: Predevelopment

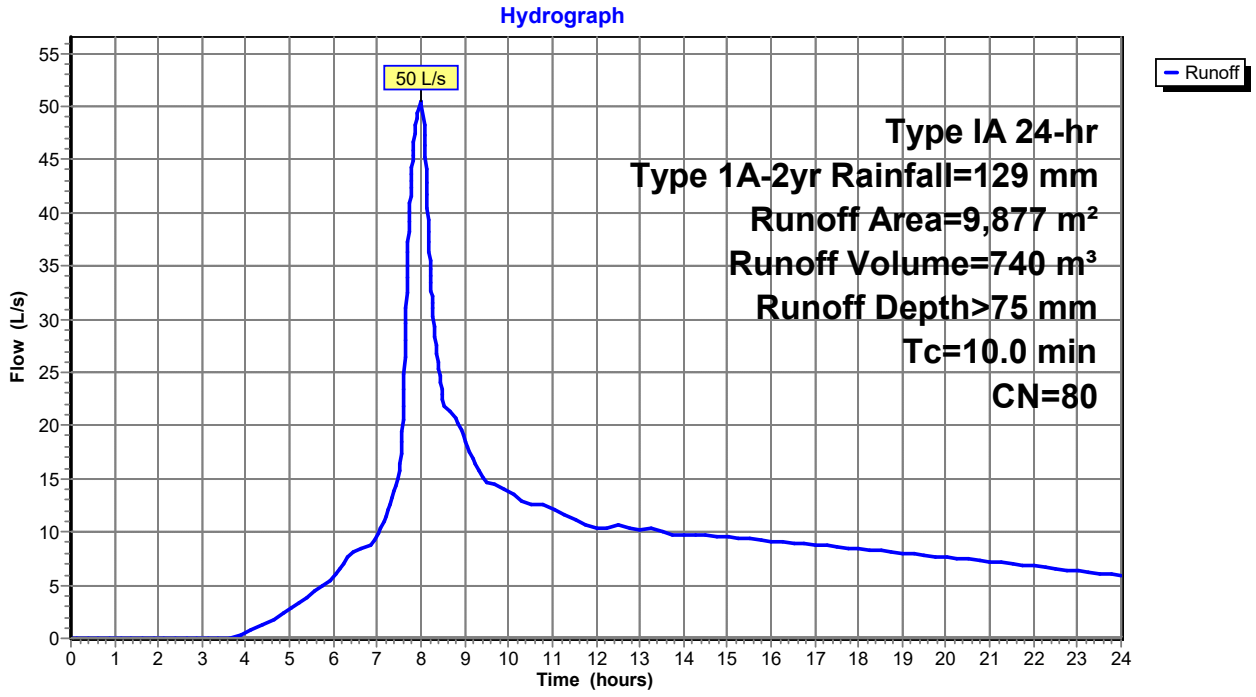
Runoff = 50 L/s @ 8.01 hrs, Volume= 740 m³, Depth> 75 mm
Routed to Link 30L : Pre-development

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr Type 1A-2yr Rainfall=129 mm

Area (m²)	CN	Description
9,877	80	>75% Grass cover, Good, HSG D
9,877		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 30S: Predevelopment



Summary for Subcatchment 32S: Concrete

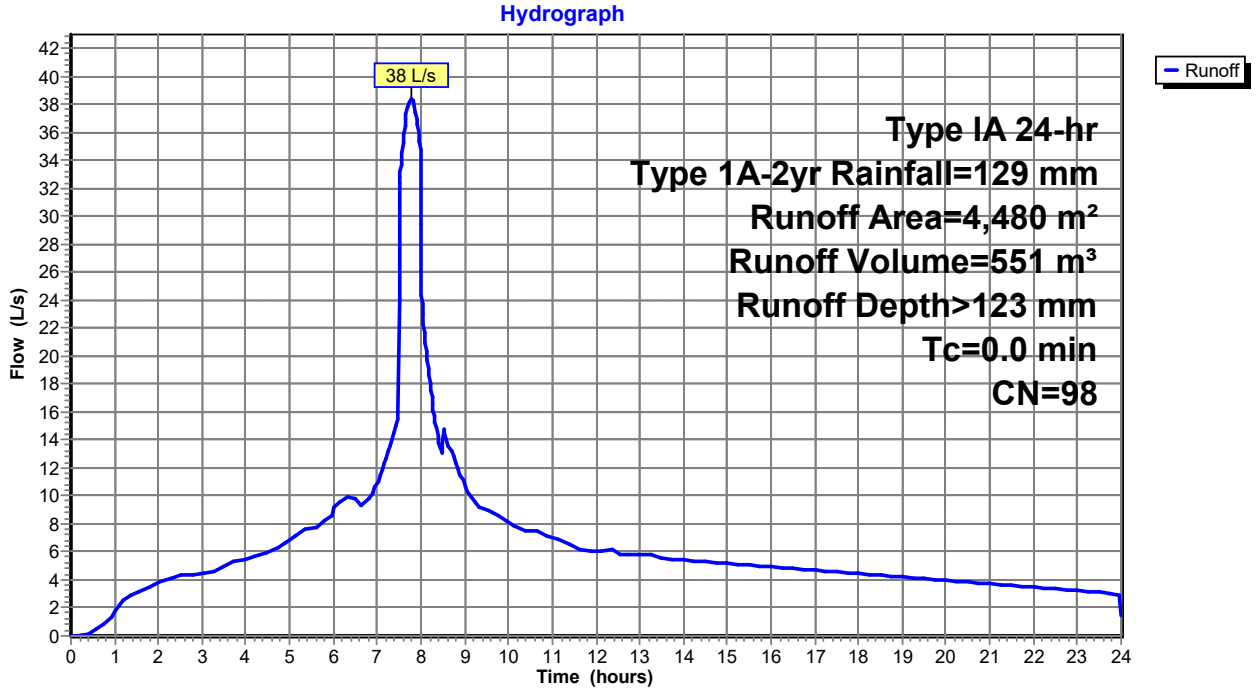
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 38 L/s @ 7.78 hrs, Volume= 551 m³, Depth> 123 mm
Routed to Pond 23P : 20x10x0.8 (high) Z=0

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr Type 1A-2yr Rainfall=129 mm

	Area (m²)	CN	Description
*	4,480	98	
	4,480		100.00% Impervious Area

Subcatchment 32S: Concrete



Summary for Pond 23P: 20x10x0.8 (high) Z=0

Inflow Area = 9,877 m²,100.00% Impervious, Inflow Depth > 123 mm for Type 1A-2yr event
Inflow = 83 L/s @ 7.88 hrs, Volume= 1,213 m³
Outflow = 49 L/s @ 8.20 hrs, Volume= 1,196 m³, Atten= 41%, Lag= 19.2 min
Primary = 49 L/s @ 8.20 hrs, Volume= 1,196 m³
Routed to Link 31L : Mitigated

Routing by Sim-Route method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 0.59 m @ 8.20 hrs Surf.Area= 200 m² Storage= 118 m³

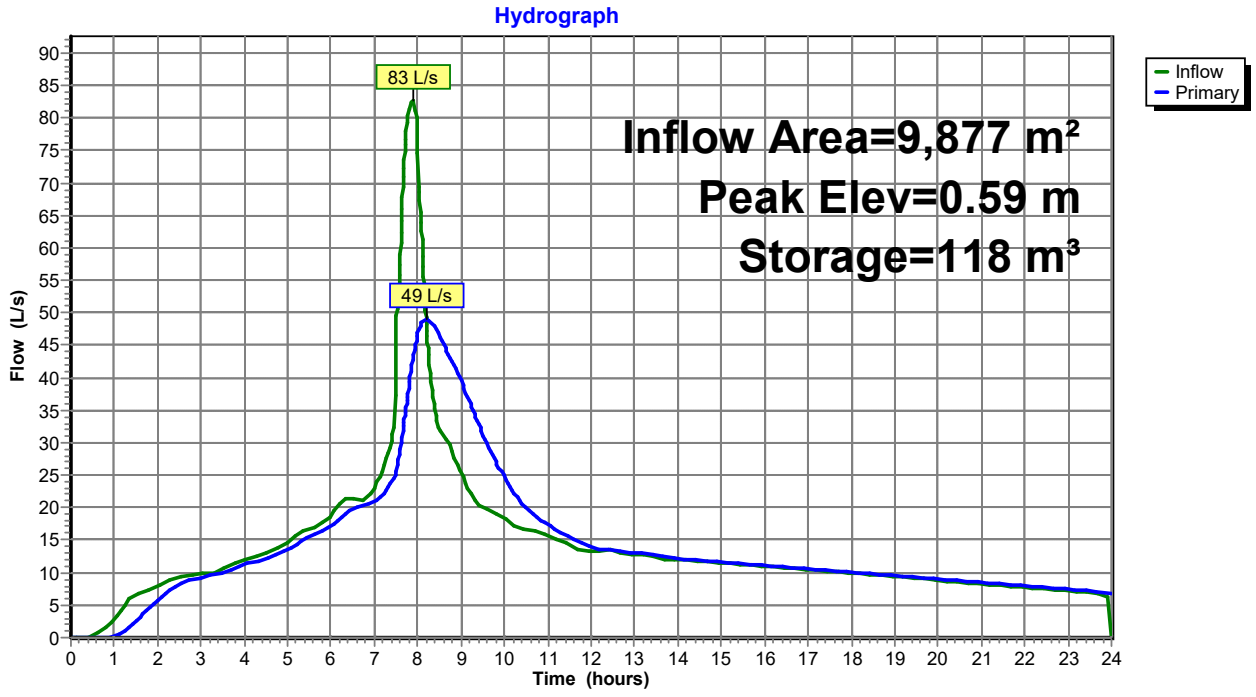
Plug-Flow detention time= 33.5 min calculated for 1,196 m³ (99% of inflow)
Center-of-Mass det. time= 22.7 min (675.5 - 652.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00 m	160 m³	**20.00 mW x 10.00 mL x 0.80 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00 m	**175 mm Vert. Orifice/Grate 2yr** C= 0.650 Limited to weir flow at low heads
#2	Primary	0.59 m	**170 mm Vert. Orifice/Grate** C= 0.650 Limited to weir flow at low heads

Primary OutFlow Max=49 L/s @ 8.20 hrs HW=0.59 m TW=0.00 m (Dynamic Tailwater)
└─**1=Orifice/Grate 2yr** (Orifice Controls 49 L/s @ 2.04 m/s)
└─**2=Orifice/Grate** (Orifice Controls 0 L/s @ 0.07 m/s)

Pond 23P: 20x10x0.8 (high) Z=0

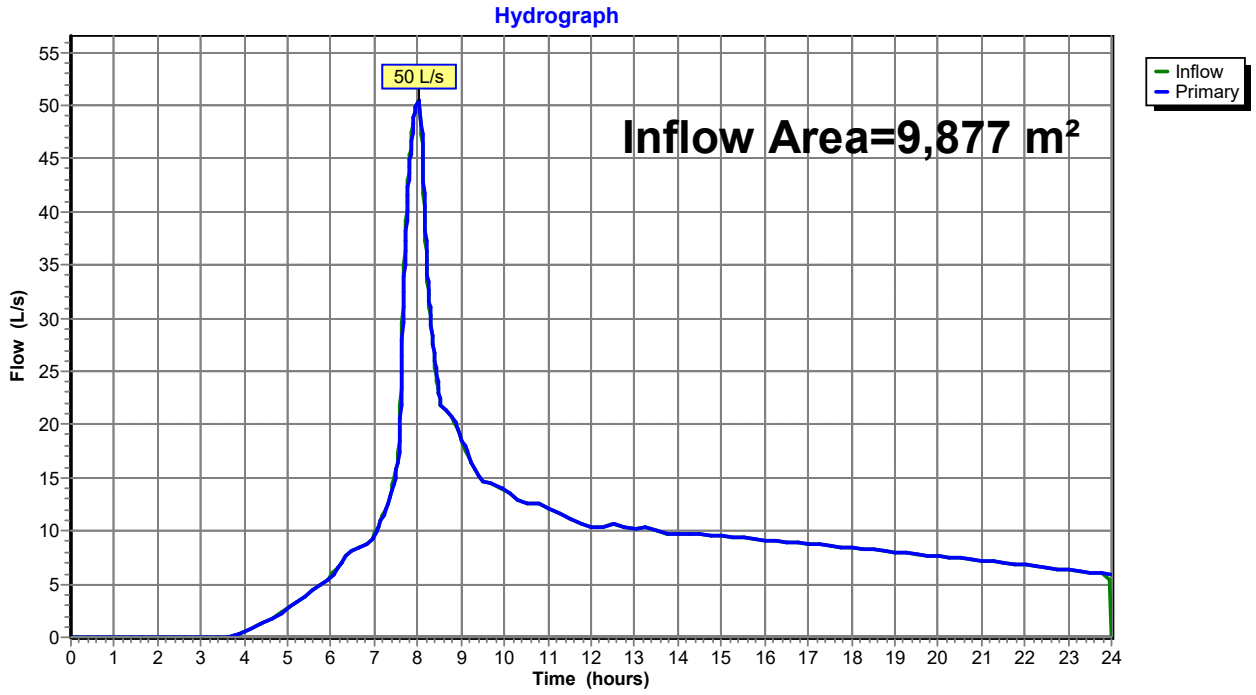


Summary for Link 30L: Pre-development

Inflow Area = 9,877 m², 0.00% Impervious, Inflow Depth > 75 mm for Type 1A-2yr event
Inflow = 50 L/s @ 8.01 hrs, Volume= 740 m³
Primary = 50 L/s @ 8.02 hrs, Volume= 740 m³, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 30L: Pre-development

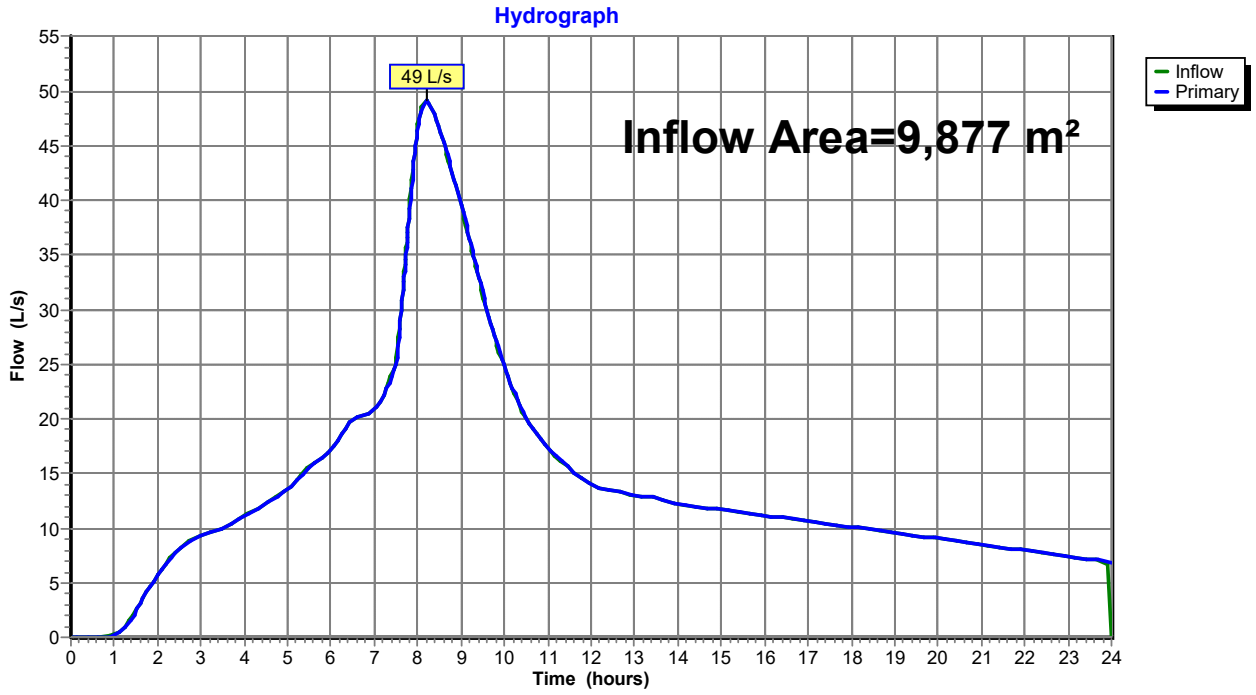


Summary for Link 31L: Mitigated

Inflow Area = 9,877 m²,100.00% Impervious, Inflow Depth > 121 mm for Type 1A-2yr event
Inflow = 49 L/s @ 8.20 hrs, Volume= 1,196 m³
Primary = 49 L/s @ 8.21 hrs, Volume= 1,196 m³, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 31L: Mitigated



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 24S: Roofs Runoff Area=5,397 m² 100.00% Impervious Runoff Depth>164 mm
Tc=10.0 min CN=98 Runoff=61 L/s 888 m³

Subcatchment 30S: Predevelopment Runoff Area=9,877 m² 0.00% Impervious Runoff Depth>113 mm
Tc=10.0 min CN=80 Runoff=78 L/s 1,112 m³

Subcatchment 32S: Concrete Runoff Area=4,480 m² 100.00% Impervious Runoff Depth>165 mm
Tc=0.0 min CN=98 Runoff=51 L/s 739 m³

Pond 23P: 20x10x0.8 (high) Z=0 Peak Elev=0.77 m Storage=154 m³ Inflow=110 L/s 1,626 m³
Outflow=78 L/s 1,607 m³

Link 30L: Pre-development Inflow=78 L/s 1,111 m³
Primary=78 L/s 1,111 m³

Link 31L: Mitigated Inflow=78 L/s 1,606 m³
Primary=78 L/s 1,606 m³

Total Runoff Area = 19,754 m² Runoff Volume = 2,738 m³ Average Runoff Depth = 139 mm
50.00% Pervious = 9,877 m² 50.00% Impervious = 9,877 m²

Summary for Subcatchment 24S: Roofs

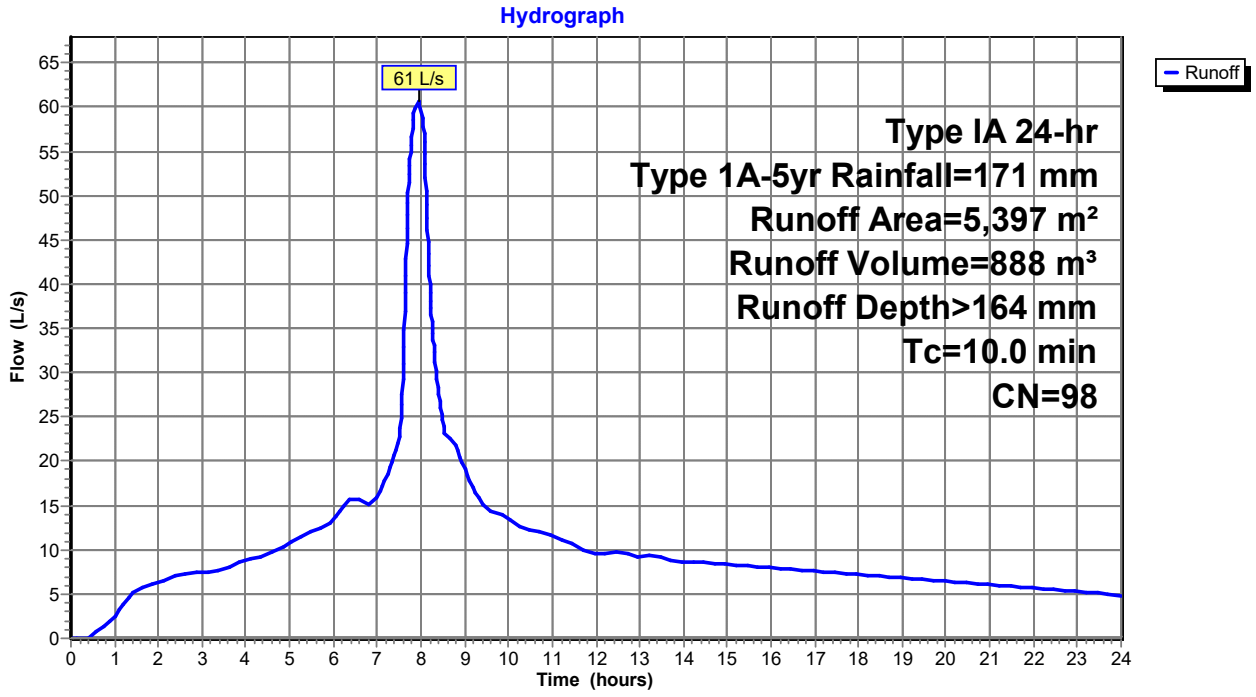
Runoff = 61 L/s @ 7.94 hrs, Volume= 888 m³, Depth> 164 mm
Routed to Pond 23P : 20x10x0.8 (high) Z=0

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr Type 1A-5yr Rainfall=171 mm

	Area (m²)	CN	Description
*	5,397	98	Roof
	5,397		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 24S: Roofs



Summary for Subcatchment 30S: Predevelopment

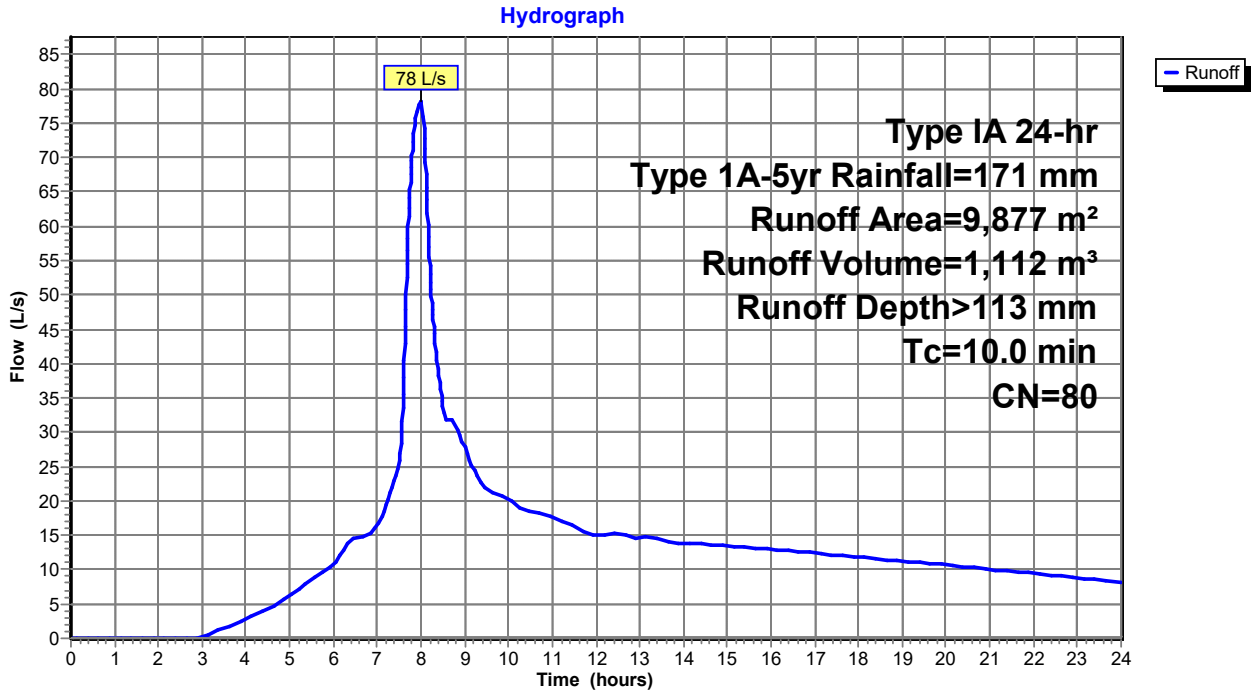
Runoff = 78 L/s @ 7.99 hrs, Volume= 1,112 m³, Depth> 113 mm
Routed to Link 30L : Pre-development

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr Type 1A-5yr Rainfall=171 mm

Area (m²)	CN	Description
9,877	80	>75% Grass cover, Good, HSG D
9,877		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 30S: Predevelopment



Summary for Subcatchment 32S: Concrete

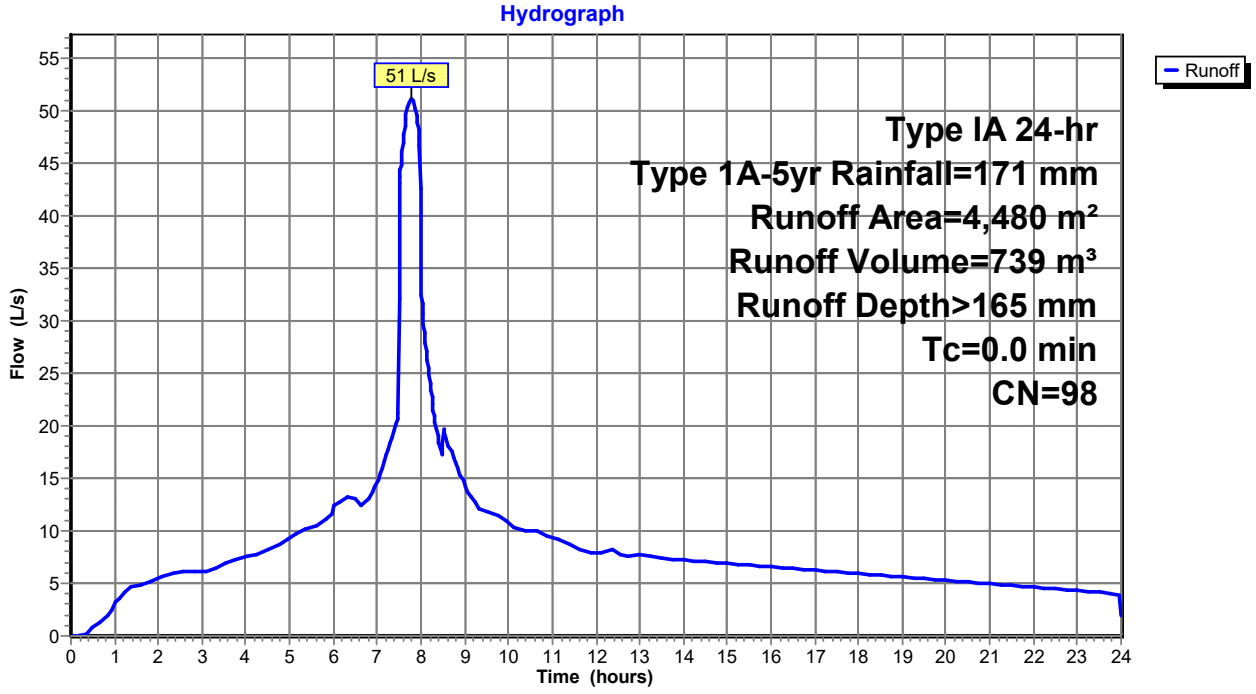
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 51 L/s @ 7.78 hrs, Volume= 739 m³, Depth> 165 mm
Routed to Pond 23P : 20x10x0.8 (high) Z=0

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr Type 1A-5yr Rainfall=171 mm

	Area (m²)	CN	Description
*	4,480	98	
	4,480		100.00% Impervious Area

Subcatchment 32S: Concrete



Summary for Pond 23P: 20x10x0.8 (high) Z=0

Inflow Area = 9,877 m²,100.00% Impervious, Inflow Depth > 165 mm for Type 1A-5yr event
Inflow = 110 L/s @ 7.88 hrs, Volume= 1,626 m³
Outflow = 78 L/s @ 8.13 hrs, Volume= 1,607 m³, Atten= 29%, Lag= 15.0 min
Primary = 78 L/s @ 8.13 hrs, Volume= 1,607 m³
Routed to Link 31L : Mitigated

Routing by Sim-Route method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 0.77 m @ 8.13 hrs Surf.Area= 200 m² Storage= 154 m³

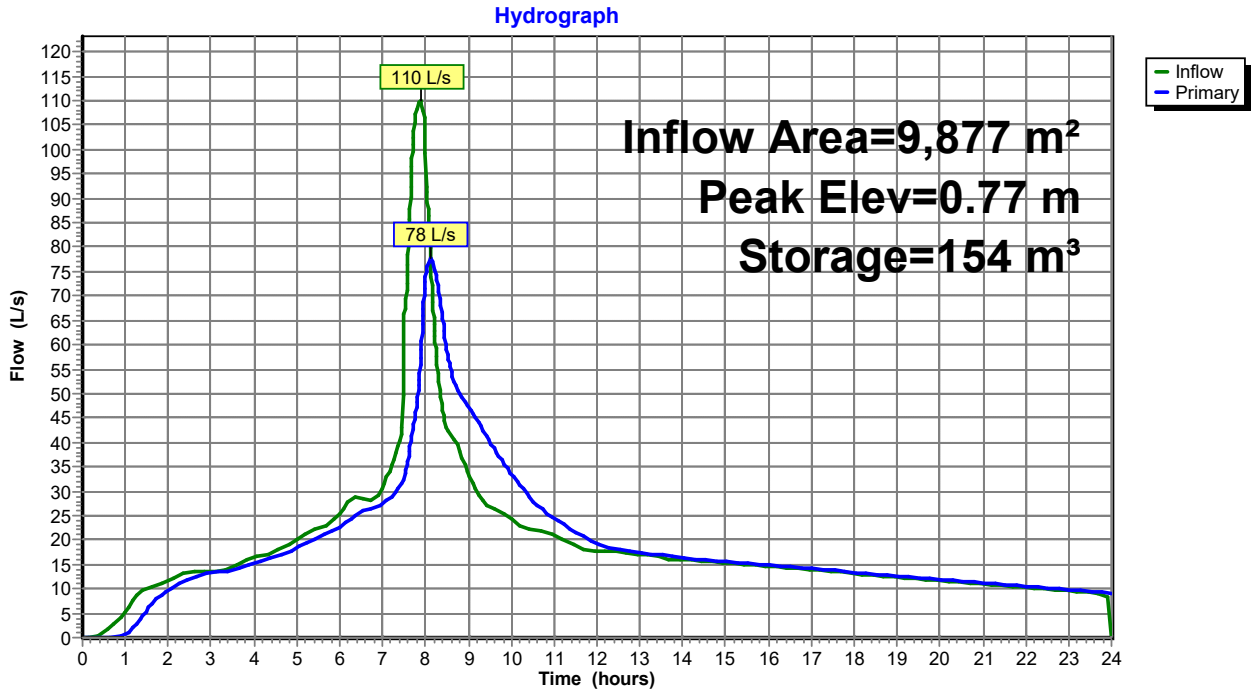
Plug-Flow detention time= 32.1 min calculated for 1,606 m³ (99% of inflow)
Center-of-Mass det. time= 22.6 min (670.4 - 647.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00 m	160 m³	**20.00 mW x 10.00 mL x 0.80 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00 m	**175 mm Vert. Orifice/Grate 2yr** C= 0.650 Limited to weir flow at low heads
#2	Primary	0.59 m	**170 mm Vert. Orifice/Grate** C= 0.650 Limited to weir flow at low heads

Primary OutFlow Max=78 L/s @ 8.13 hrs HW=0.77 m TW=0.00 m (Dynamic Tailwater)
└─**1=Orifice/Grate 2yr** (Orifice Controls 57 L/s @ 2.38 m/s)
└─**2=Orifice/Grate** (Orifice Controls 20 L/s @ 0.90 m/s)

Pond 23P: 20x10x0.8 (high) Z=0

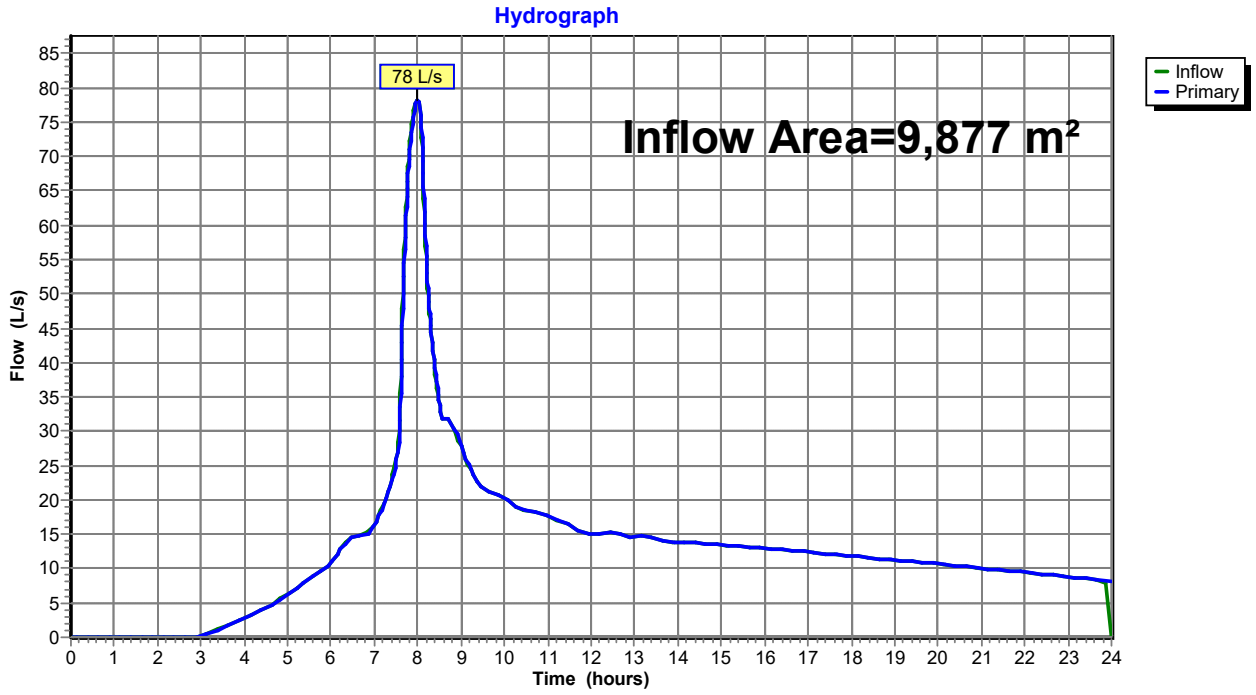


Summary for Link 30L: Pre-development

Inflow Area = 9,877 m², 0.00% Impervious, Inflow Depth > 113 mm for Type 1A-5yr event
Inflow = 78 L/s @ 7.99 hrs, Volume= 1,111 m³
Primary = 78 L/s @ 8.00 hrs, Volume= 1,111 m³, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 30L: Pre-development

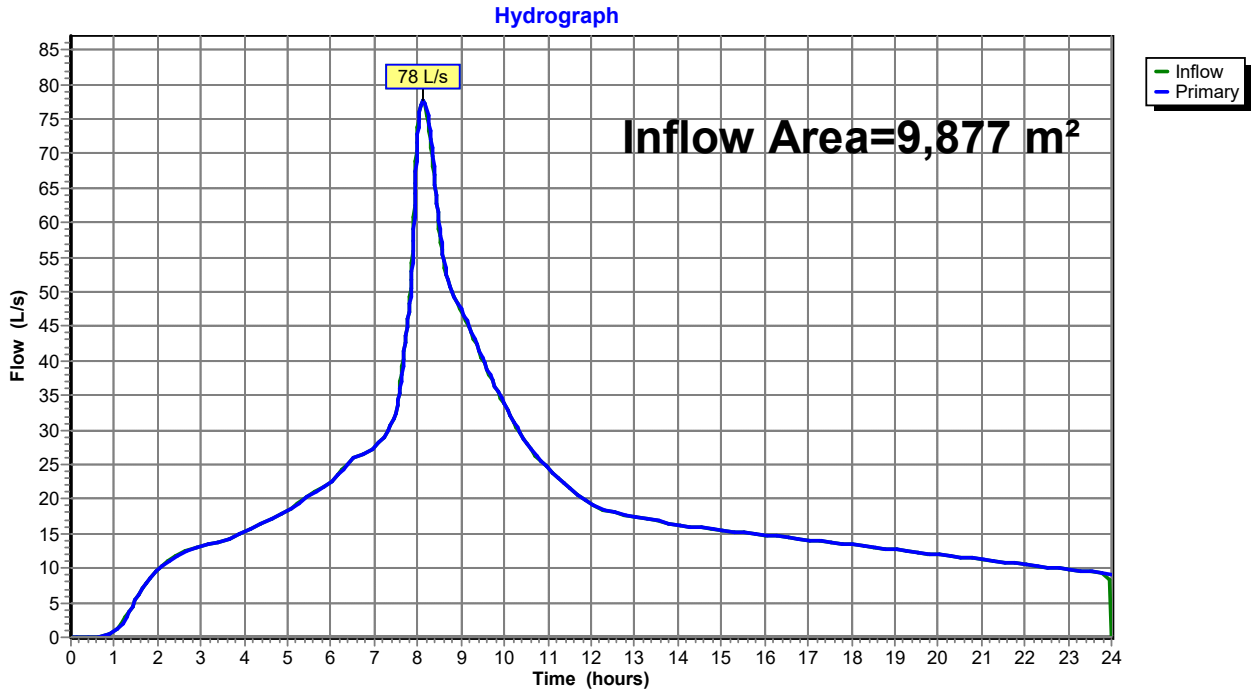


Summary for Link 31L: Mitigated

Inflow Area = 9,877 m²,100.00% Impervious, Inflow Depth > 163 mm for Type 1A-5yr event
Inflow = 78 L/s @ 8.13 hrs, Volume= 1,606 m³
Primary = 78 L/s @ 8.14 hrs, Volume= 1,606 m³, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 31L: Mitigated



SANITARY DRAINAGE DESIGN

SITE:- **BIDFOOD WIPAPA**

MAIN OFFICE

Node ID	UPSTREAM G.L.	UPSTREAM I.L.	Pipe ϕ (mm)	GRADE (1: x)	DIST (m)	fall (mm)	DOWNSTREAM G.L.	DOWNSTREAM I.L.	cover (mm)
GT	78.72	77.60	STARTING POINT						1,010
			100	60	3.6	60			
TV intersection							79.20	77.54	1,550
Main TV	79.20	78.70							390
			100	60	0.8	13			
TV intersection						(Drop-In)	79.20	78.69	403
TV intersection	79.20	77.54							1,550
			100	60	0.4	6			
Main WC1 Intersection							79.20	77.53	1,556
Male WC1	79.20	78.70							390
			100	60	1.3	21			
Main WC1 Intersection						(Drop-In)	79.20	78.68	411
Main WC1 Intersection	79.20	77.53							1,556
			100	60	1.7	28			
main line intersection 1							79.20	77.51	1,585
Urinal	79.20	77.54							1,550
			100	60	1.0	17			
Male FWG intersection							79.20	77.52	1,567
Male WHB	79.20	78.74							390
			65	40	3.4	85			
FWG							79.20	78.65	475
FWG	79.20	78.55							540
			100	60	1.3	22			
Male FWG intersection						(Drop-In)	79.20	78.53	562
Male FWG intersection	79.20	77.52							1,567
			100	60	0.7	12			
main line intersection 1							79.20	77.51	1,578
main line intersection 1	79.20	77.51							1,578
			100	60	1.6	27			
main line intersection 2							79.20	77.49	1,605
Cupbaord sink	79.20	78.59							540
			65	40	4.6	115			
main line intersection 2						(Drop-In)	79.20	78.47	655
main line intersection 2	79.20	77.49							1,605
			100	60	1.0	17			
male WC2 intersection							79.20	77.47	1,622
Male WC2	79.20	78.70							390
			100	60	2.3	38			
male WC2 intersection						(Drop-In)	79.20	78.66	428
male WC2 intersection	79.20	77.47							1,622
			100	60	0.9	15			
Female WHB intersection							79.20	77.45	1,636
ACC WHB	79.20	78.74							390
			65	40	1.8	45			
ACC FWG							79.20	78.69	435
ACC FWG	79.20	78.59							500
			100	60	1.6	27			
ACC WC INTERSECTION							79.20	78.56	527
ACC WC	79.20	78.57							520
			100	60	0.4	7			
ACC WC INTERSECTION							79.20	78.56	527
ACC WC INTERSECTION	79.20	78.56							527
			100	60	2.4	40			
Female FWG intersection							79.20	78.52	567
Female WHB	79.20	78.74							390
			65	40	0.8	20			
Female FWG							79.20	78.72	410

Female FWG	79.20	78.62							470
			100	*60*	*0.5*	8			
Female FWG intersection							79.20	78.61	478
Female FWG intersection	79.20	78.52							567
			100	*60*	*1.8*	30			
Female WHB intersection						(Drop-In)	79.20	78.49	597
Female WHB intersection	79.20	77.45							1,636
			100	*60*	*0.5*	8			
Femail WC 1 intersection							79.20	77.45	1,645
Female WC1	79.20	78.74							390
			65	*40*	*2.2*	55			
Femail WC 1 intersection						(Drop-In)	79.20	78.68	445
Femail WC 1 intersection	79.20	77.45							1,645
			100	*60*	*1.2*	20			
Femail WC 2 intersection							79.20	77.43	1,664
Female WC2	79.20	78.74							390
			65	*40*	*2.0*	50			
Femail WC 2 intersection						(Drop-In)	79.20	78.69	440
Femail WC 2 intersection	79.20	77.43							1,664
			100	*60*	*12.5*	208			
ORG intersection							78.92	77.22	1,593
ORG	78.92	78.42							390
			100	*60*	*2.1*	35			
ORG intersection						(Drop-In)	78.92	78.39	425
ORG intersection	78.92	77.22							1,593
			100	*60*	*7.0*	117			
SSMH1							78.60	77.10	1,389

SSMH-1 TO SSMH-2

SSMH1	78.60	76.47							1,970
			150	*100*	*29.0*	290			
Wastewater Treatment Plant							77.69	76.18	1,350

TRADEWASTE DRAINAGE DESIGN

SITE:- **BIDFOOD WIPAPA**

Produce area

Node ID	UPSTREAM G.L.	UPSTREAM I.L.	Pipe ϕ (mm)	GRADE (1: x)	DIST (m)	fall (mm)	DOWNSTREAM G.L.	DOWNSTREAM I.L.	cover (mm)
ORG	79.20	77.75	STARTING POINT						1,340
			100	100	0.5	5			
TV intersection							79.20	77.75	1,345
Main TV	79.20	77.75							1,340
			100	100	0.5	5			
TV intersection							79.20	77.75	1,345
TV intersection	79.20	77.75							1,345
			100	100	19.5	195			
intersection Produce sink							79.20	77.55	1,540
Produce sink stack	79.20	78.70							390
			100	100	2.5	25			
intersection Produce sink						(Drop-in)	79.20	78.68	415
intersection Produce sink	79.20	77.55							1,540
			100	100	3.0	30			
DN150-DN100 Reducer							79.20	77.52	1,570
DN150-DN100 Reducer	79.20	77.52							1,520
			150	100	0.5	5			
intersection Chiller 1 Condesate							79.20	77.52	1,525
Chiller 1 Condensate	79.20	78.49							600
			100	100	11.0	110			
intersection Chiller 1 Condesate							79.20	78.38	710
intersection Chiller 1 Condesate	79.20	77.52							1,525
			150	100	17.3	173			
intersection Chiiler2 condensate							79.20	77.34	1,697
chiller 2 Condensate	79.20	78.49							600
			100	100	11.4	114			
intersection Chiiler2 condensate							79.20	78.38	714
intersection Chiiler2 condensate	79.20	77.34							1,697
			150	100	23.5	235			
ELA AHU drain intersection							78.10	77.11	832
ELA AHU drain	78.10	77.15							840
			100	100	3.8	38			
ELA AHU drain intersection							78.10	77.11	877
ELA AHU drain intersection	78.10	77.11							832
			150	100	16.2	162			
Plantroom Intersection							78.12	76.95	1,014
Plantroom Intersection	78.12	76.95							1,014
			150	100	6.8	68			
TWMH-1							78.20	76.88	1,162
TWMH-1	78.20	76.85							1,192
			150	100	17.3	173			
Hynds Grease Trap							78.12	76.67	1,286
Hynds Grease Trap	78.21	76.62							1,425
			150	100	12.5	125			
SSMH-1							78.60	76.50	1,940

Plantroom

Node ID	UPSTREAM G.L.	UPSTREAM I.L.	Pipe ϕ (mm)	GRADE (1: x)	DIST (m)	fall (mm)	DOWNSTREAM G.L.	DOWNSTREAM I.L.	cover (mm)
Plantroom GT	78.60	78.10	STARTING POINT						390
			100	60	11.6	193			
GT Intersection							78.53	77.91	513
RE	78.52	77.91							500
			100	60	0.3	5			
GT Intersection							78.53	77.91	515
GT Intersection	78.53	77.91							515
			100	60	3.0	50			
TWMH-1 intersection							78.57	77.86	605
plantroom WHB	78.80	78.34							390
			65	40	5.4	135			
Plantrrom FWG							78.80	78.20	525
Plantrrom FWG	78.80	78.11							580
			100	60	8.2	137			
TWMH-1							78.57	77.97	487
TWMH-1	78.57	78.20							260
			100	60	1.0	16			
TWMH-1 intersection							78.57	78.18	276
TWMH-1 intersection	78.57	77.86							605
			100	60	2.6	44			
Pump room intersection							79.05	77.81	1,129
Pump Room Tundish	78.80	78.40							290
			100	60	3.6	60			
Pump room intersection							79.05	78.34	600
Pump room intersection	79.05	77.81							1,129
			100	60	6.5	108			
mcc room tundish intersection							78.79	77.70	976
MCC ROOM GT	79.05	78.65							290
			100	60	6.6	110			
mcc room tundish intersection							78.79	78.54	140
mcc room tundish intersection	78.79	77.70							976
			100	60	3.3	55			
TWMH-2							78.48	77.65	721

APPENDIX B

Stormwater Plans

DRAINAGE NOTES

1. ALL DRAINAGE WORKS TO BE IN ACCORDANCE WITH AS/NZS3500
2. ALLOW TO INSTALL PVC SLEEVES FOR ALL FOUNDATION BEAM DRAIN PENETRATIONS
3. TOP OF GULLY TRAPS 75mm BELOW FFL & 75mm ABOVE GROUND LEVEL
4. ALL MANHOLES ARE Ø1050mm (U.N.O.)
5. INTERIOR DRAINAGE PIPES SHALL BE NEW uPVC - SN8 (U.N.O.)
6. EXTERIOR DRAINAGE PIPES SHALL BE NEW uPVC - SN16 (U.N.O.)
7. DIAMETER SHOWN ON DRAINAGE DRAWINGS ARE INTERNAL DIMENSIONS (U.N.O.)
8. ALL DOWNPIPE DIAMETER ARE Ø150 (U.N.O)
9. CP'S HYNDS 675x450 (U.N.O)

10. MINIMUM GRADES OF S.S. DRAINS (U.N.O.)
    - 10.1. 65DN 1:40 FALL
    - 10.2. 80DN 1:60 FALL
    - 10.3. 100DN, 1:60 FALL
    - 10.4. 150DN, 1:100 FALL
    - 10.5. 225DN, 1:150 FALL
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    - 11.3. 225DN, 1:350 FALL
    - 11.4. 300DN, 1:400 FALL
    - 11.5. 375DN, 1:500 FALL

DRAINAGE LEGEND

- SW — STORMWATER (EXISTING)
- SW — STORMWATER (NEW)
- SS — SANITARY SEWER (EXISTING)
- SS — SANITARY SEWER (NEW)
- TW — TRADEWASTE SEWER (NEW)
- GT — GULLY TRAP
- TV — 80Ø PVC TERMINAL VENT PIPE
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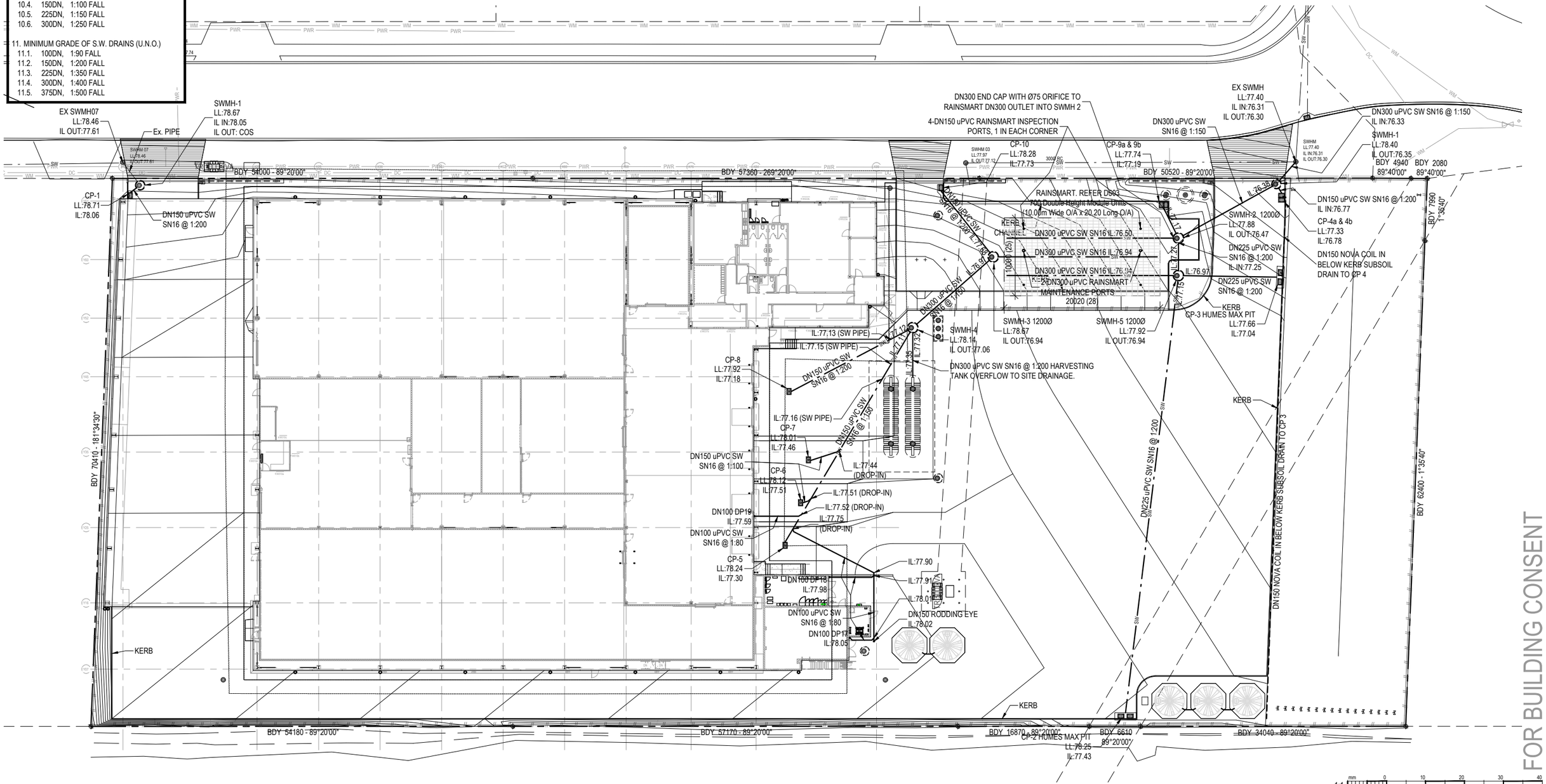
- IC — INSPECTION CHAMBER
- FWG — FLOOR WASTE GULLY - HEAVY DUTY TO FHR

DRAINAGE NOTES:

ALL PIPE DIAMETERS ON THIS DWG SHALL BE INTERNAL DIAMETERS, UNLESS NOTED OTHERWISE



FOR BUILDING CONSENT

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CLIENT: Bidfood

PROJECT TITLE:
NEW DISTRIBUTION CENTRE
FOR:
BIDFOOD LIMITED
AT:
(LOTS 6-9) KAHIKATEAROA LANE EXTN, WAIPAPA

DRAWING TITLE:
DRAINAGE
STORMWATER - YARD & PAVED AREAS
LAYOUT PLAN

NORTH

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DESIGNED: HJ	CHECKED:	REF: --
DRAWN: HJ	APPROVED:	DATE: MAY 2024
DRAWING No.: 110695 - D111		REV.: 1

REVISION:	DATE:	No.:
FOR BUILDING CONSENT	24-06-24	1

DRAINAGE NOTES

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SW	STORMWATER (NEW)
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TW	TRADEWASTE SEWER (NEW)
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TV	80Ø PVC TERMINAL VENT PIPE
IP / IB / IJ	INSPECTION POINT / BEND / JUNCTION
IC	INSPECTION CHAMBER
FWG	FLOOR WASTE GULLY - HEAVY DUTY TO FHR

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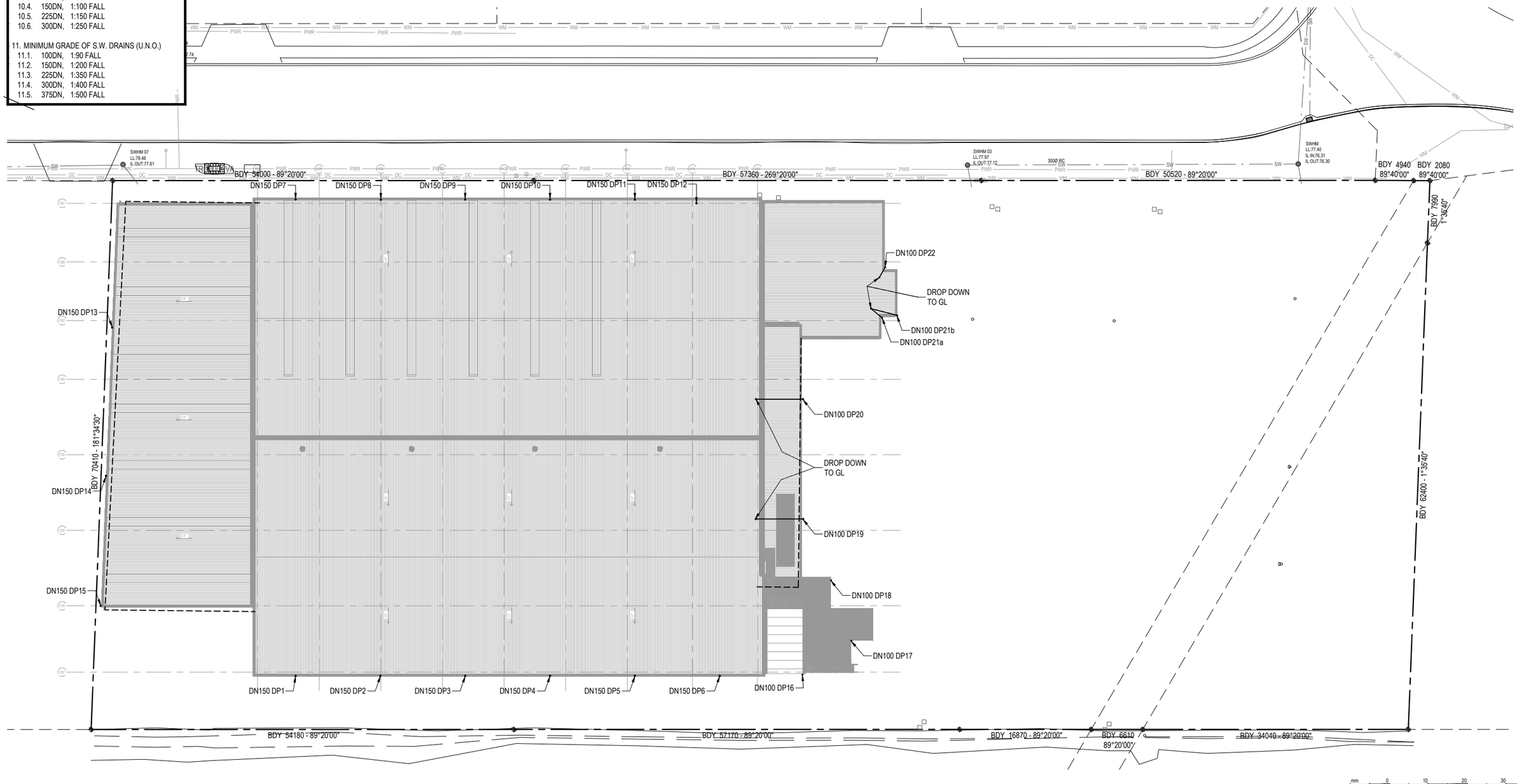

FOR BUILDING CONSENT

1:1 mm 0 10 20 30 40

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F:\110695_AutoCAD_Dwgs\D110695-D112.dwg, 25/06/2024 5:03:22 PM, roger

CLIENT: Bidfood

PROJECT TITLE:
NEW DISTRIBUTION CENTRE
FOR:
BIDFOOD LIMITED
AT:
(LOTS 6-9) KAHIKATEAROA LANE EXTN, WAIPAPA

DRAWING TITLE:
DRAINAGE
STORMWATER - ROOF
LAYOUT PLAN

NORTH

FOR BUILDING CONSENT	24-06-24	1
REVISION:	DATE:	No.:

SCALE: A3 - 1:500	A1 - 1:250	ORIGINAL SHEET SIZE:	A3
DESIGNED: HJ	CHECKED:	REF: --	
DRAWN: HJ	APPROVED:	DATE: MAY 2024	
DRAWING No.: 110695 - D112		REV: 1	

DRAINAGE NOTES

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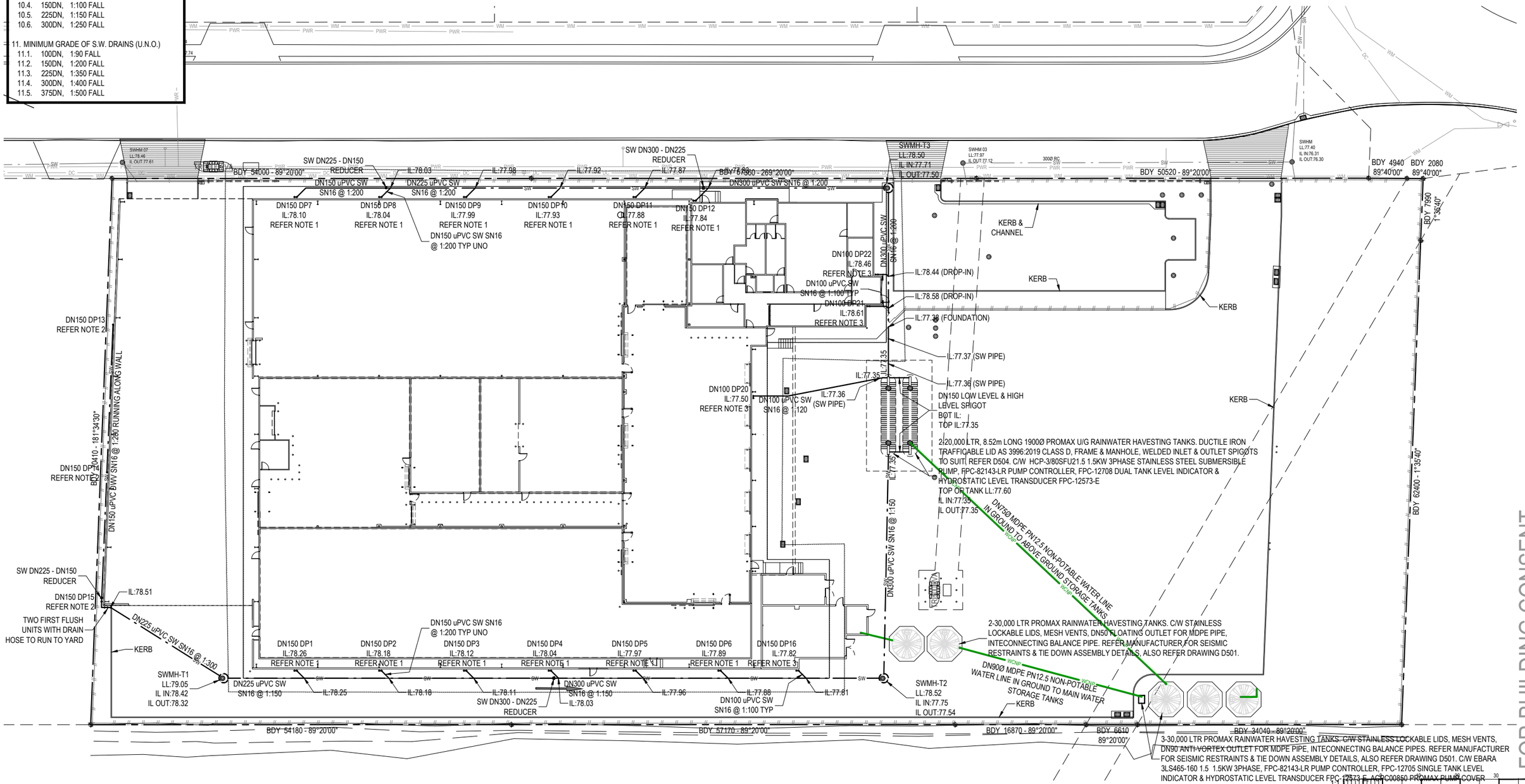
DRAINAGE NOTES:

ALL PIPE DIAMETERS ON THIS DWG SHALL BE INTERNAL DIAMETERS, UNLESS NOTED OTHERWISE

NOTE:

1. DN150 DOWNPIPES DP1 TO DP12 TO BE FITTED WITH BLUE MOUNTAIN CO. COMMERCIAL LEAF EATER WITH HOOD (RHCL61-150MM) & FIRST FLUSH POST/WALL w/300mm CHAMBER 90/100mm (WDPW01) WITH DN150 TEE & DN150/DN100 REDUCER & WITH 2.3m LENGTH OF DN300 PIPE, OR SIMILAR APPROVED.
2. DN150 DOWNPIPES DP13 TO DP12 TO BE FITTED WITH BLUE MOUNTAIN CO. COMMERCIAL LEAF EATER WITH HOOD (RHCL61-150MM) CONNECTED TOGETHER WITH TWO FIRST FLUSH POST/WALL w/300mm CHAMBERS 90/100mm (WDPW01) WITH DN225 TEES & DN225/DN150/DN100 REDUCERS & WITH TWO 3.0m LENGTHS OF DN300 PIPE, OR SIMILAR APPROVED. DRIP DRAIN HOSE TO RUN TO YARD.
3. DN100 DOWNPIPES DP16, DP20, DP21 & DP22 TO BE FITTED WITH BLUE MOUNTAIN CO. LEAF EATER ORIGINAL C/W 0.955 SECONDARY MESH (RHLE06-100mm) & FIRST FLUSH POST/WALL w/300mm CHAMBER 90/100mm (WDPW01) WITH 1.05m LENGTH OF DN300 PIPE, OR SIMILAR APPROVED.



FOR BUILDING CONSENT

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CLIENT: Bidfood

PROJECT TITLE:
NEW DISTRIBUTION CENTRE
FOR:
BIDFOOD LIMITED
AT:
(LOTS 6-9) KAHIKATEAROA LANE EXTN, WAIPAPA

DRAWING TITLE:
DRAINAGE
STORMWATER - ROOF COLLECTION
LAYOUT PLAN

NORTH

REVISION:	DATE:	No.:
FOR BUILDING CONSENT	24-06-24	1

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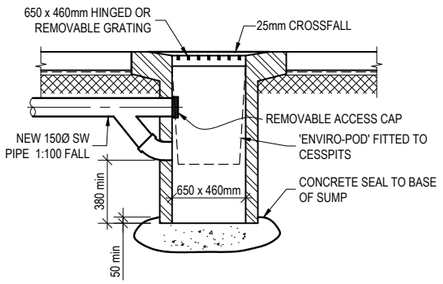
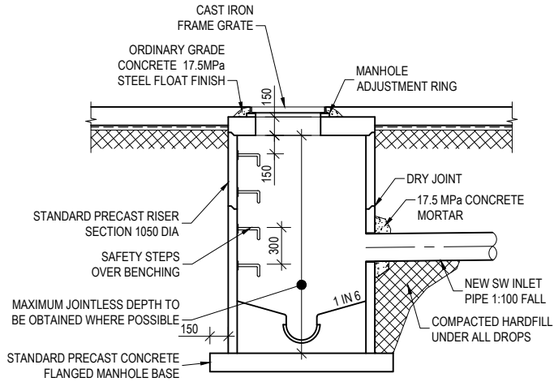
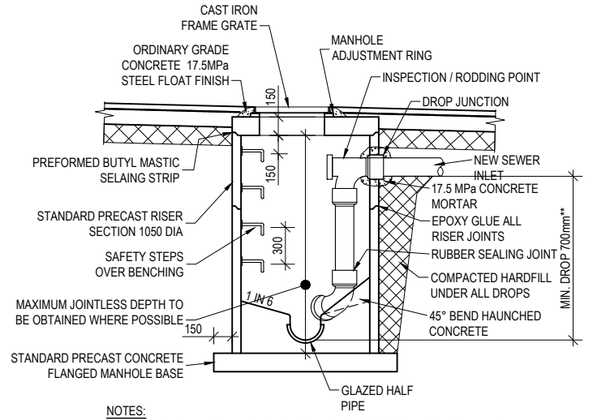
DESIGNED: HJ
CHECKED:
REF: --
DRAWN: HJ
APPROVED:
DATE: MAY 2024
DRAWING No.: 110695 - D113
REV: 1

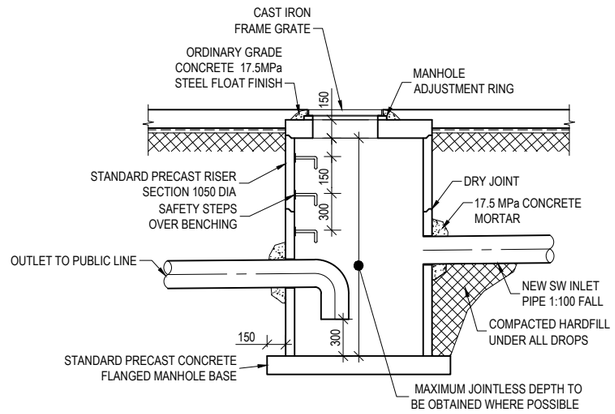
NOTE:
ALL MANHOLES TO BE 1050Ø UNO
ALL RCRRJ PIPES TO BE CLASS 'X'





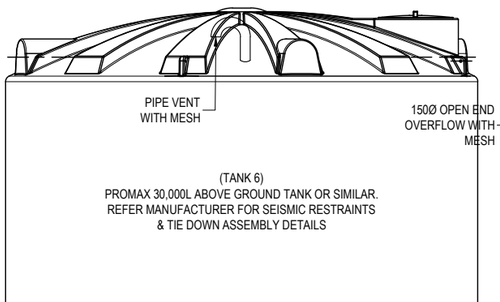


NOTES:
- GALVANISED MILD STEEL STRAP TO BE USED TO SECURE PIPE TO MANHOLE WALL
- IF DROP IS > 1800. * MAY INCREASE TO 350 WITH HEAVY DUTY LIDS WHEN FIXED SURFACE LEVELS ARE TO BE MATCHED ** FOR DROPS LESS THAN 700mm THE LINE MUST JOIN THE MANHOLE AT THE SPRING LINE

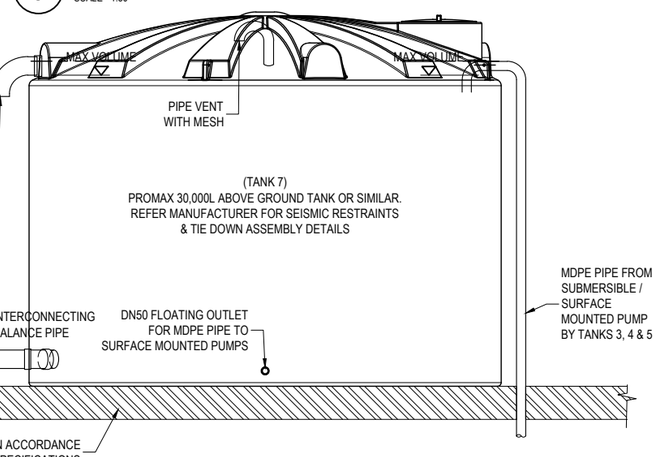


D STORMWATER MANHOLE DETAILS
SCALE 1:50
MANHOLES DISCHARGING TO PUBLIC LINES

A SECTION THROUGH CATCHPIT
SCALE 1:50

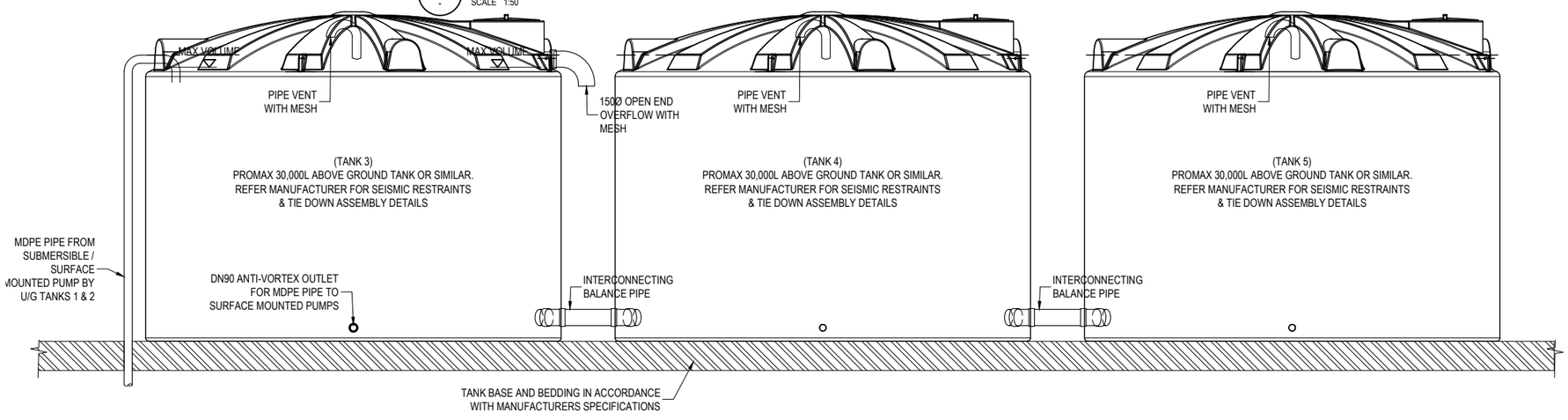


B STORMWATER MANHOLE DETAILS
SCALE 1:50



C SEWER MANHOLE DETAILS
SCALE 1:50

E DETAIL- ABOVE GROUND STORAGE TANKS
SCALE 1:50



F DETAIL- ABOVE GROUND STORAGE TANKS
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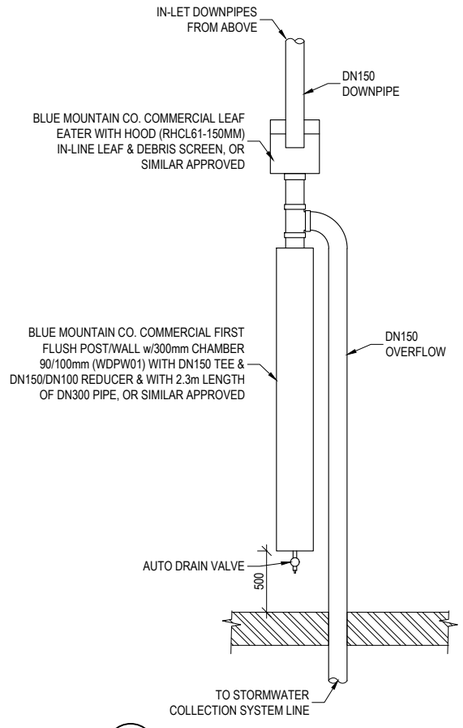

G DETAIL- DOWNPIPE FIRST FLUSH DIVERTER TYP
SCALE 1:50

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CLIENT: Bidfood
PROJECT TITLE:
NEW DISTRIBUTION CENTRE
FOR:
BIDFOOD LIMITED
AT:
(LOTS 6-9) KAHIKATEAROA LANE EXTN, WAIPAPA

DRAWING TITLE:
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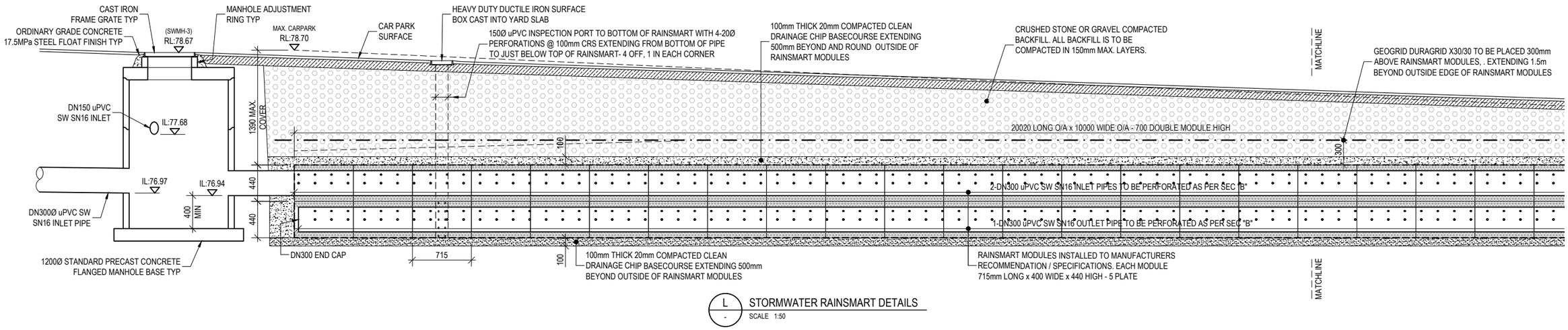
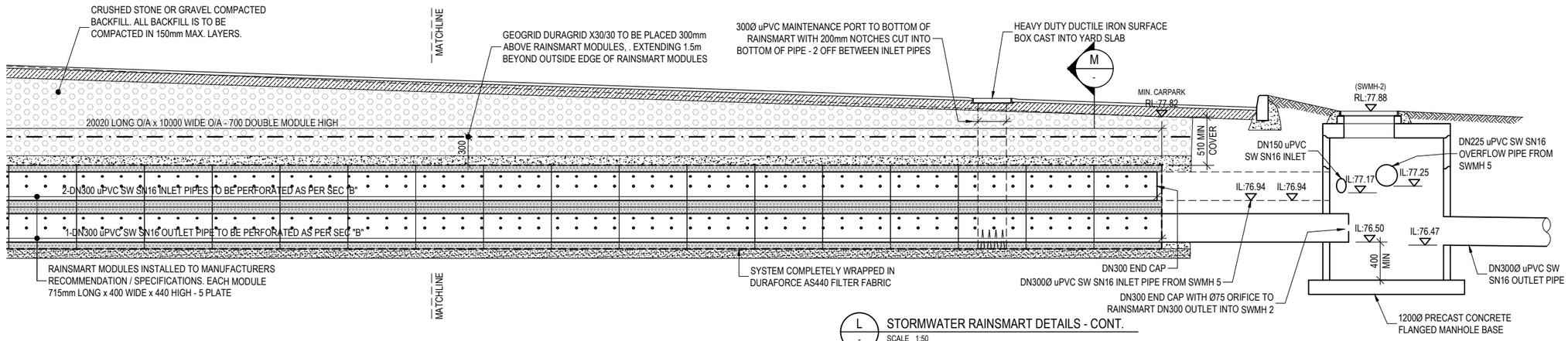
DESIGNED: HJ	CHECKED:	REF: --
DRAWN: HJ	APPROVED:	DATE: DEC 2021
DRAWING No.: 110695 - D501		REV.: 1

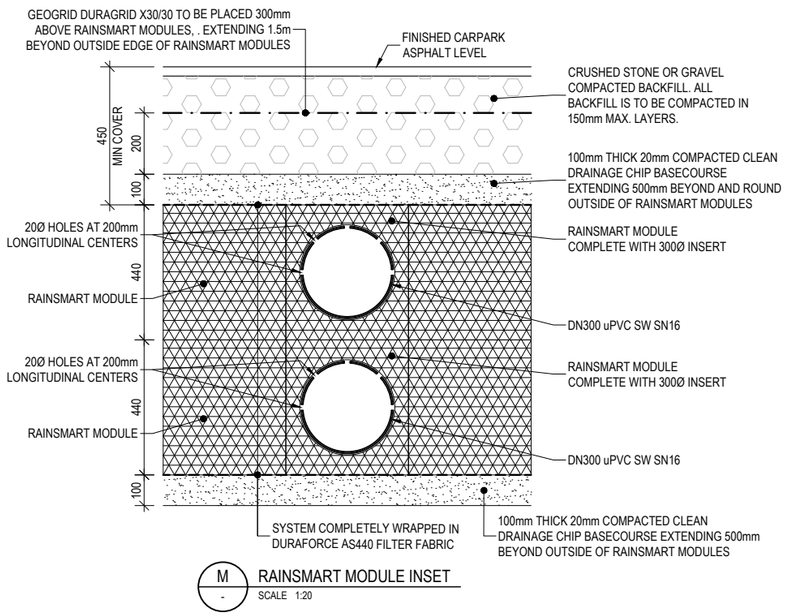
REVISION:	DATE:	No.:
FOR BUILDING CONSENT	24-06-24	1



L - STORMWATER RAINSMART DETAILS
SCALE 1:50



L - STORMWATER RAINSMART DETAILS - CONT.
SCALE 1:50



M - RAINSMART MODULE INSET
SCALE 1:20

FOR BUILDING CONSENT

1:1 mm 0 10 20 30 40

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DRAWING TITLE:
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SCALE: A3 - 1:50,1:20 A1 - 1:25,1:10			ORIGINAL SHEET SIZE: A3
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DRAWN: HJ	APPROVED:		DATE: JUN 2024
DRAWING No.: 110695 - D503			REV.: 1
FOR BUILDING CONSENT	24-06-24	1	
REVISION:	DATE:	No.:	

HAIGH WORKMAN LTD
Civil & Structural Engineers

On-Site Wastewater System
New Distribution Centre at
Lots 6-8 Kahikatearoa Lane, Waipapa
For Peter Swan Ltd

Haigh Workman reference 22 189

May 2024

Phone: +64 9 407 8327 • Fax: +64 9 407 8378 • info@haighworkman.co.nz • www.haighworkman.co.nz

PO Box 89 • 6 Fairway Drive • Kerikeri 0245 • New Zealand

Revision History

Revision №	Issued By	Description	Date
A	John Papesch	First Issue	31 May 2024

Prepared by

John Papesch

Senior Civil Engineer

CPEng CMEngNZ

Reviewed By

Wayne Thorburn

Senior Geotechnical Engineer

CPEng CMEngNZ

TABLE OF CONTENTS

TABLES

FIGURES

Executive Summary

It is proposed to construct a new distribution centre for Bidfoods Limited at Lots 6-8 Kahikatearoa Lane, Waipapa. The proposed development site spans three properties; Lots 6-8 DP 567982 which have a combined site area of 11,881 m2. Up until recently, the site was wholly in pasture. Topsoil has been stripped from lots 6 and 7 and aggregate placed on those sites for preloading the building platform. Lot 8 is still in pasture, and it is within lot 8 where the proposed wastewater system is to be sited.

This report presents a design for an on-site wastewater system to service the proposed development as no reticulated town sewerage system is available.

Wastewater Flows

Wastewater from the proposed new distribution centre is calculated to be ;

- 50 staff x 40 L/person 2,000 litres/day
- Condensate from the chillers: 1,000 litres/day

  Combined total: 3,000 litres/day

The volume of condensate was provided from Peter Swan Ltd at 870 litres/day, which we have rounded up to 1,000 litres. There are no chemicals in the air condition or defrost condensate discharges and no chemicals are to be used to flush condensate lines which could otherwise damage the biology in an on-site wastewater treatment plant.

Staff loading from a rural factory can vary from 30-50 litres/person/day, depending on various factors such as the source of water supply. Readings from a nearby factory have yielded average daily loading rates of 34 L/person and peaks of 44 L/person. On this basis we consider a mid-range rate of 40 L/person is suitable.

Treatment Plant

A treatment plant which is sized to cater for 3,000 litre/day is proposed here. The treatment plant is to meet the quality output of NZS 1546:3:2003, capable of producing effluent with Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) concentrations not exceeding 20 g/m^3 and 30 g/m^3, respectively. Grease traps (4,500 litre minimum) are to be included with the proposed building development to intercept oil and grease prior to discharge to the treatment plant.

The treatment plant brand and specifications are to be included with the building consent application. The treatment plant is to include electronic metering to provide accurate data for monitoring records.

Disposal Field

The land disposal area is on the eastern side of the development, in an area of green-field, undisturbed ground. This position is gently elevated above the road, with an open and sunny aspect in an area designated for landscape planting.

Being a commercial site, we have investigated the land disposal area by conducting 4x test pits with constant head soakage tests to carefully measure and record the soil properties for evaluation of soil structure and soil category. The soil has been evaluated as AS/NZS 1547 category 6 clay due to the elevated ground water and moisture conditions which is reflected in this soakage test results. Detailed investigations from field works are presented in Appendix B.

Due to the poorly drained soils and elevated ground water table, it is proposed to construct a raised topsoil mound with drip irrigation, in general accordance with AS/NZS1547 specifications. A densely planted raised topsoil mount with a sunny aspect is expected to be able to cope with a design irrigation rate of 3 mm/day which results in a 1,000 m2 land application area. This is achieved with a 15 m wide mound x 67 m long, on the eastern site of the development.

The dripper lines are to be placed at least 1.5 m from the Site boundaries and 1.5 m from the kerb line as per the typical details enclosed.

A reserve (no-build) area of 300 m2 is also required and has been set aside within the proposed yard. It is unlikely that the reserve area is ever to be used here, instead if greater wastewater volumes are to be generated on site the nature of the disposal field would need to be redesigned as a Wisconsen mound or similar.

Resource Consent Required

The wastewater is less than 5 m from an 'identified stormwater flow path', being the adjacent kerbs of the car park and the open drain on southern neighbours property. The daily loading rate is also in excess of 2,000 litres/day. Resource consent from NRC is therefore required for this activity.

Design Summary

Criteria	Comments
Occupancy	50 workers
Wastewater source	Black water from staff kitchen and toilet facilities Condensate from the chillers
Wastewater generation	3,000 L/day
Treatment system	Secondary treatment plant
Location of effluent disposal	Eastern boundary of lot 8
Effluent disposal system	Buried drip irrigation to a raised topsoil mound. Cover with bark mulch and densely plant
Dripperline design	15 lines x 67 m long with flush valves at the end of each line. Dripper field to be split into 3 zones, ie 5 lines per zone with a 3-way sequencing valve.
Irrigation pump	Davey D42A/B or equivalent
Soil type	AS/NZS1547 category 6
Application rate	3 mm/day
Extent of land application area	1,000 m^2
Slope of land application area	5˚

1 Introduction

1.1 Project Brief Scope

Haigh Workman Ltd. (Haigh Workman) has been commissioned by Peter Swan Ltd (the Client) to undertake a on-site wastewater design for a proposed distribution centre at Lots 6-8 Kahikatearoa Lane Extension, Waipapa. This report presents the information gathered during the site investigation, interpretation of data obtained and on-site wastewater recommendations relevant to the site.

The scope of this report encompasses the wastewater design in the context of the proposed development as defined in the drawings provided by Peter Swan Ltd. This appraisal has been designed to assess the subsoil conditions for wastewater design and identify constraints for the proposed development.

This report provides the following:

- A summary of the published geology with reference to the geotechnical investigations undertaken.
- Analysis of the data obtained from site investigations and a geological ground model.
- Wastewater design recommendations.

1.2 Site Description

Site Address:	15-19 Kahikatearoa Lane, Waipapa.
Legal Description:	Lot 6-8 DP 567920
Title:	1019564, 1019565, 1019566
Owner:	Bidfood Ltd
Area:	3,799 m^2 , 4,035 m^2, 4,047 m^2

Lots 6-8 DP 567982 which have a combined site area of 11,881 m2. Up until recently, the site was wholly in pasture. Topsoil has been stripped from lots 6 and 7 and aggregate placed on those sites for preloading the building platform. Lot 8 is still in pasture, and it is within lot 8 where the proposed wastewater system is to be sited.

The site is bound by Kahikatearoa Lane to the north, greenfield land (zoned industrial) to the west, and industrial use sites to the south and east. Topographically the property generally dips towards Kahikatearoa Lane to the north and east over an elevation difference of approximately 1 m. The gradient of the land is in the order of 1-2 degrees. Mature trees were noted along the eastern boundary. A 33 kV overhead line transects lot 8 in a north-easterly direction, with a pylon located near the north-eastern boundary corner.

Kahikatearoa Lane is a new road recently vested with FNDC. The road level has been set specifically low so that it acts as an overland flow path for flood waters, to avoid flood water spilling through the subject site. The road does include a vested water main and hydrants for fire fighting, however the water reticulation network is not available for site supply.

1.3 Proposed Development

We understand that Bidfood Ltd intends to develop the site with the construction of a New Distribution Centre as per drawings provided by Peter Swan Ltd. The proposed building works span across lots 6 and 7 whilst lot 8 contains the dispatch yard and proposed wastewater field, sited along the eastern boundary.

Should the wastewater field be relocated outside of the investigated area, further investigation and/or amendments to the recommendations made in this report may be required.

Figure 1 - Site Location

1.4 Limitations

This report has been prepared for the use of Peter Swan Ltd with respect to the particular brief outlined to us. This report is to be used by our Client and their Consultants and may be relied upon by Northland Regional Council and Far North District Council when considering Resource/Building Consent aspects for the proposed development. The information and opinions contained within this report shall not be used in any other context for any other purpose without prior review and agreement with Haigh Workman Ltd.

2 Geology

2.1 Published Geology

Sources of Information:

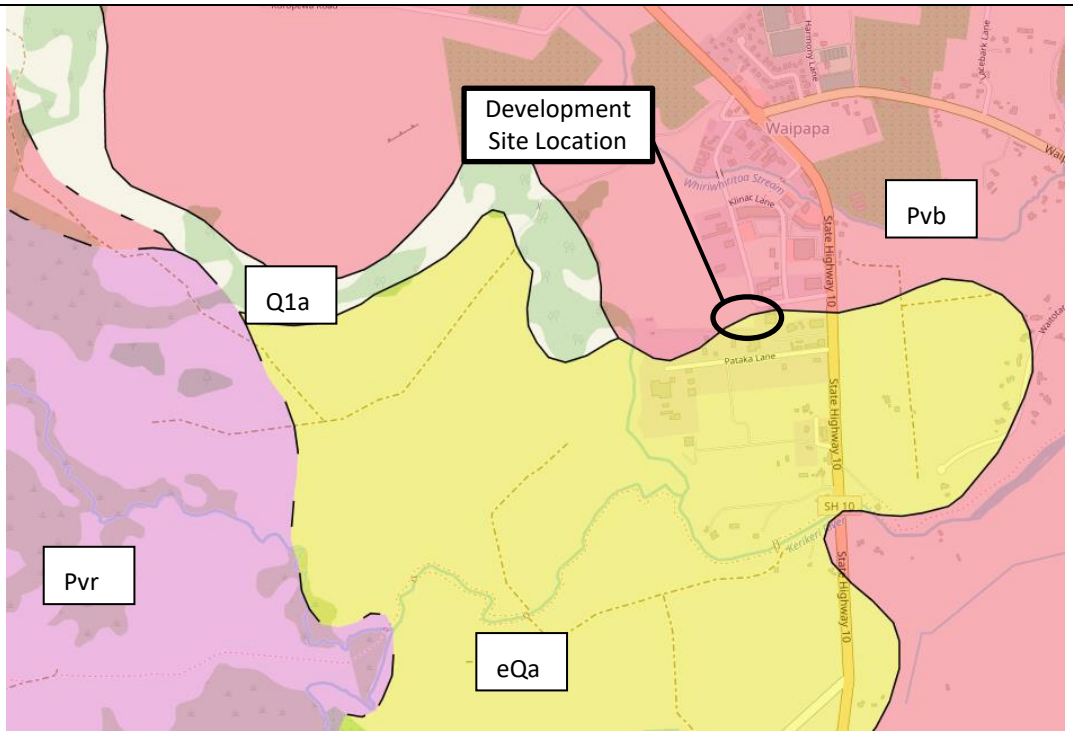
- Institute of Geological & Nuclear Sciences 1:250,000 Geological Map 2, 2009: "*Geology of the Whangarei area*"
- NZMS 290 Sheet P04/05, 1: 100,000 scale, 1982: *"Rock types map of the Whangaroa - Kaikohe area"*
- NZMS 290 Sheet P04/05, 1: 100,000 scale, 1980: *"Soil map of the Whangaroa - Kaikohe area"*

The site is within the bounds of the GNS Geological Map 2 "Geology of the Whangarei area", 1:250,000 scale[1]. The published geology shows the site to be located near a geological boundary of Kerikeri Volcanic Group and Tauranga Group alluvial soils. The Waipapa area, although mapped as Kerikeri Volcanic Group, typically is overlain by recent alluvial soils exhibiting variable strength. Further reference to the published New Zealand land inventory maps (Whangaroa-Kaikohe 1980) also indicates the site is underlain by alluvium ($A1_2$), forming riverbed and flood plain deposits, in places forming a thin veneer (1-3m) over rugged surfaces of lava flows.

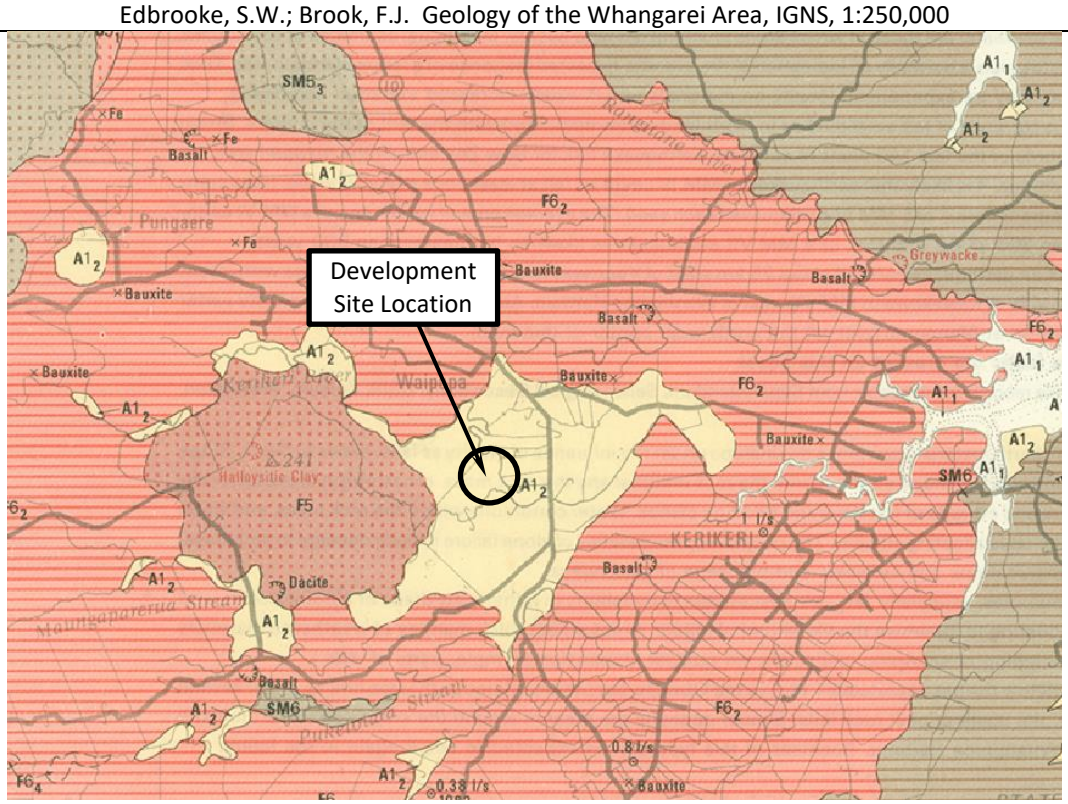
Table 1 - Geological Legend

Symbol	Unit Name	Description
Q1a / $A1_2$	Tauranga Group (Holocene)	Unconsolidated to poorly consolidated mud, sand, gravel, and peat deposits of alluvial, colluvial and lacustrine origins. Holocene river deposits.
eQa	Tauranga Group (Early to middle Pleistocene)	Partly consolidated mud, sand, gravel and peat or lignite of alluvial, colluvial, lacustrine, swamp and estuarine origins. Early Pleistocene – Middle Pleistocene estuary, river, and swamp deposits.
Pvb / $F6_2$	Kerikeri Volcanic Group (Late Miocene to early Pliocene)	Basalt lava, volcanic plugs, and minor tuff. Kerikeri Volcanic Group Late Miocene basalt of Kaikohe – Bay of Islands Volcanic Field.
Pvr / F5	Kerikeri Volcanic Group (Late Miocene to early Pliocene)	Alkaline and peralkaline rhyolite domes with some obsidian.

[1] Edbrooke, S.W; Brook, F.J. (compilers) 2009. Geology of the Whangarei area.



Edbrooke, S.W.; Brook, F.J. Geology of the Whangarei Area, IGNS, 1:250,000



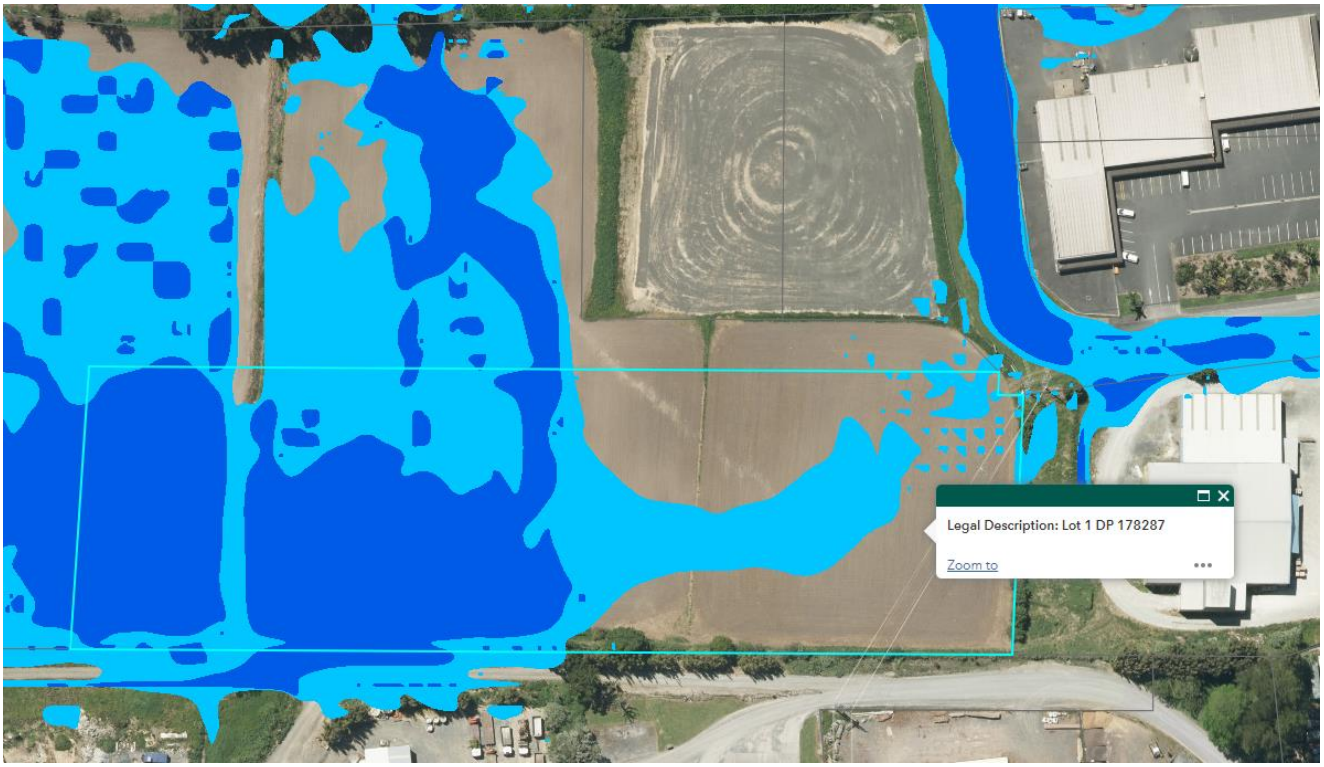
Kermode, L.O. 1982: Whangaroa – Kaikohe, NZMS 290, Sheet P04/05, 1:100,000

Figure 2 – Published geological maps

3 Flood Hazard

3.1 Published Flood Data

Published flood data indicates flood water spilling from Kerikeri River catchment to the west, through the site and toward Kahikatearoa Lane. This flood model was published prior to the development of the subdivision, and does not reflect the alterations made to ground levels by way of subdivisional earthworks and roading.



3.1 Flood Hazard Assessment

Haigh Workman issued a flood hazard assessment for the site in a letter report dated 11 August 2023. In that report it identified NRC consent 43067 which provided for the diversion of floodwater within the subdivision development. That diversion of flood water was provided for in Haigh Workman report dated 28 September 2021 (ref 21 131). This design involved diverting flood water which was modelled to spill through the subject site, to instead be directed to spill down the new road to vest (Kahikatearoa Lane). On the basis of Haigh Workman prior flood hazard assessments, we consider the proposed disposal field is not prone to flooding.

4 Ground Investigations

4.1 Geotechnical Investigations

Haigh Workman has completed a geotechnical investigation for the site comprising 14 cone penetration tests, six hand augured boreholes and 19 scala penetrometer tests. The CPTs and hand augers were focussed on the proposed building development, with the scala penetrometer testing around the pavement areas. The CPT testing revealed refusal on the Kerikeri Volcanic Group typically in the upper 5 m, however some thicker alluvial deposits were encountered in lot 7, indicating a paleochannel through the site.

Ground water was on average encountered at 1 m depth (range 0.6 to 1.7 m). This results in the soil profile having a stiff crustal layer in the upper 1 m. Below grondwater, in a saturated condition, the soils are soft to firm.

4.2 Wastewater Investigations

Four test pits were dug on 27 May 2024 along the eastern boundary of the site with constant head soakage testing. The soils have been logged and categorised according to AS/NZS1547. Detailed descriptions of soils and groundwater observations made during intrusive investigation works are presented in Appendix B. A summary of ground conditions is included in Table 5.1.

Table 4.1 – Summary of Ground Conditions

Strata	Depth to Top of Strata (m bgl)	Details
Topsoil	0.00	Ground conditions include a surface covering of topsoil. Topsoil is expected to be typically 100-200 mm depth across the proposed wastewater field
Waipapa clays (YF)	0.15 m	Firm silty clays considered to be consistent with the YF horizon were identified within each exploratory location. The upper horizon was logged as a clay loam, transitioning at varying depths into a heavy clay. As the depth of the upper horizon was limited, and due to the shallow depth of ground water encountered, the drainage properties were poor with kSat values varying from 0.02-0.09 m/day Ground water was typically encountered at 0.7 – 1.0 m depth over the proposed disposal field.
Basalt Rock	NE	A basalt shelf likely underlies the site, as identified in the Haigh Workman geotechnical report. The depth to the basalt rock was not investigated in this assessment.

NE - Not Encountered.

4.2.1 *Material Properties*

A summary of the material properties and soakage testing in accordance with AS/NZS1547 is included in Table 5.2.

Table 4.2 – Summary of Excavation Logs

Strata	Depth to Top of Strata (m bgl) (Thickness)	Texture	Structure	Constant Head Soakage Testing (k_{sat} in m/day)
Waipapa Clays	0.10 m (0.5-0.8 m)	Clay loam	Moderate	TP1 – 0.02 TP2 – 0.07 TP3 – 0.09 TP4 – 0.06
	0.6-0.9 m	Heavy clay	Moderate	

4.2.2 *Groundwater*

Groundwater was encountered in all test pits. It should be noted that the water levels are likely to fluctuate with the seasons/rainfall. Only light rainfall occurred in the days preceding the investigation, and soil moisture deficits are returning to normal following a summer drought. The groundwater table encountered is therefore anticipated to be indicative of a normal groundwater scenario.

Table 4.3 – Summary of Groundwater Occurrence

Exploratory Hole	Depth Encountered (m bgl)	Description	Stratum
TP1-TP4	0.7-1.0	At depth expected based upon observation of soil types	Heavy clays

4.2.3 *Soil Category*

Whilst a clay loam dominates the upper 0.5-0.8 m soil profile, the soil soakage testing indicates the site is poorly drained as a result of the heavy clays beneath and resultant high water table. In accordance with AS/NZS 1547:2012 the soils across the proposed disposal field are therefore classed as soil category 6 *medium to heavy clay* with moderate structure.

Table 4.4 – 1547:2012 Soil categories and recommended design loading rates

Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

5 On-Site Wastewater System

5.1 Design Population and Flow

We understand there are to be 50 staff at the new distribution centre. Staff loading from a rural factory can vary from 30-50 litres/person/day, depending on various factors such as the source of water supply. The water main within Kahikatearoa Lane is not available for potable water supply at this time. Therefore, roof water supply is required.

TP58 recommends a design loading rate of 40 litres/person/day for day staff for standard facilities. Readings from a nearby factory have yielded average daily loading rates of 34 L/person and peaks of 44 L/person. On this basis we consider a mid-range rate of 40 L/person is suitable.

- 50 staff x 40 L/person 2,000 litres/day

5.2 Condensate waste

The volume of condensate was provided from Peter Swan Ltd at 870 litres/day. There are no chemicals in the air condition or defrost condensate discharges and no chemicals are to be used to flush condensate lines which could otherwise damage the biology in an on-site wastewater treatment plant. For design we adopt the following:

- Condensate from the chillers: 1,000 litres/day

5.3 Site and Soil Evaluation

Whilst a clay loam dominates the upper 0.5-0.8 m soil profile, the soil soakage testing indicates the site is poorly drained as a result of the heavy clays beneath and resultant high ground water table. In accordance with AS/NZS 1547:2012 the soils across the proposed disposal field are therefore classed as soil category 6 *medium to heavy clay* with moderate structure. These soils are normally suitable for drip irrigation at a rate of 2 mm/day, or a Wisconsin mound at 5 mm/day (subject to conditions).

The effluent disposal field is fairly flat and raising the disposal field will have the benefit of increasing separation from the ground water table and achieving positive draining of surface water as the natural site gradients will be prone to ponding.

The formation of a car park adjacent will serve to intercept surface water, and with imposition of standard under kerb drainage, will aid in reducing potential for elevated ground water conditions during periods of extreme rainfall.

To address issues with poor drainage associated with elevated ground water conditions and poor surface water management, we recommend the disposal field is formed as a raised topsoil mound. The effluent disposal field has an open and sunny disposition and if densely planted will be able to maximise evapotranspiration update. For a densely planted raised topsoil mound, we consider a drip irrigation rate of 3 mm per day is suitable.

5.4 Disposal Field

The area requirement for the disposal field is as follows;

$$Area\ of\ drip\ irrigation\ required = \frac{Design\ Loading\ Rate}{Design\ Irrigation\ Rate}$$

$$= \frac{3{,}000}{3}$$

$$= \mathbf{1{,}000\ m2}$$

The dripper lines are to be placed at least 1.5 m from the Site boundaries and 1.5 m from the kerb line as per the typical details enclosed.

A reserve (no-build) area of 300 m2 is also required and has been set aside within the proposed yard. It is unlikely that the reserve area is ever to be used here, instead if greater wastewater volumes are to be generated on site the nature of the disposal field would need to be redesigned as a Wisconsen mound or similar.

5.5 Secondary Treatment System

A treatment plant which is sized to cater for 3,000 litre/day is proposed here. The treatment plant is to meet the quality output of NZS 1546:3:2003, capable of producing effluent with Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) concentrations not exceeding 20 g/m^3 and 30 g/m^3, respectively.

The treatment plant brand and specifications are to be included with the building consent application.

Grease traps (4,500 litre minimum) are to be included with the proposed building development to intercept oil and grease prior to discharge to the treatment plant.

The treatment plant is to include electronic metering to provide accurate data for monitoring records.

It would be prudent to note that when considering a wastewater treatment system, it should be designed to meet the quality output of NZS 1546:3:2003, capable of producing effluent with Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) concentrations not exceeding 20 g/m^3 and 3 0g/m^3, respectively.

6 Summary of Regulatory Requirements

6.1 Regional Plan

The discharge of sewage effluent on to land is controlled by the permitted activity rules C.6.1.3 of the Regional Plan for Northland. A summary of the requirements is included below:

	Criterion	Comment
1)	The on-site system is designed and constructed in accordance with the Australian/New Zealand Standard. On-site Domestic Wastewater Management (AS/NZS 1547:2012), and	We have designed in general accordance with this standard, except we have adopted a design irrigation rate of 3 mm/day which is higher than recommended for a cat 6 soil. This higher rate is respective of forming a raised topsoil mound, densely planted with a sunny disposition
2)	The volume of wastewater discharged does not exceed two cubic metres per day, and	Consent required at 3,000 litres / day proposed)
3)	The discharge is not via a spray irrigation system or deep soakage system, and	Complies (drip irrigation proposed)
4)	The slope of the disposal area is not greater than 25 degrees, and	Complies (Mound Slopes are 5° or less)
5)	For wastewater that has received secondary treatment or tertiary treatment, it is discharged via: a) a trench or bed system in soil categories 3 to 5 that is designed in accordance with Appendix L of Australian/New Zealand Standard On-Site Domestic Wastewater Management (AS/NZS 1547:2012); or b) an irrigation line system that is dose loaded and covered by a minimum of 50 millimetres of topsoil, mulch, or bark, and	Complies. The irrigation system will be dose limited. The dripperlines will be buried or covered in mulch.
6)	for the discharge of wastewater **onto the surface of slopes greater than 10 degrees:** c) the wastewater, excluding greywater, has received at least secondary treatment, and d) the irrigation lines are firmly attached to the disposal area, and e) where there is an up-slope catchment that generates stormwater runoff, a diversion system is installed and maintained to divert surface water runoff from the up-slope catchment away from the disposal area, and f) a minimum 10 metre buffer area down-slope of the lowest irrigation line is included as part of the disposal area, and g) the disposal area is located within existing established vegetation that has at least 80 percent canopy cover, or h) the irrigation lines are covered by a minimum of 100 millimetres of topsoil, mulch, or bark, and	Not applicable. Slopes are not greater than 10 degrees.

7)	the disposal area and reserve disposal area are situated outside the relevant exclusion areas and setbacks in Table 9: Exclusion areas and setback distances for on-site domestic wastewater systems, and	Surface water setbacks from kerbs and channels are not complied with
8)	for septic tank treatment systems, a filter that retains solids greater than 3.5 millimetres in size is fitted on the outlet, and	NA
9)	the following reserve disposal areas are available at all times: a) one hundred percent of the existing effluent disposal area where the wastewater has received primary treatment or is only comprised of greywater, or b) thirty percent of the existing effluent disposal area where the wastewater has received secondary treatment or tertiary treatment, and	30% Reserve area provided
10)	the on-site system is maintained so that it operates effectively at all times and maintenance is undertaken in accordance with the manufacturer's specifications, and	Proposed per Maintenance recommendations
11)	the discharge does not contaminate any groundwater water supply or surface water, and	Will comply given provided design parameters
12)	there is no surface runoff or ponding of wastewater, and	Will comply given provided design parameters
13)	there is no offensive or objectionable odour beyond the property boundary.	Will comply given provided design parameters

Exclusion areas and setback distances are provided in Table 9 of the plan and presented below:

Table 9: Exclusion areas and setback distances for on-site domestic wastewater systems

Feature	Primary treated domestic type wastewater	Secondary and tertiary treated domestic type wastewater	Greywater
Exclusion areas			
Floodplain	5% annual exceedance probability	5% annual exceedance probability	5% annual exceedance probability
Horizontal setback distances			
Identified stormwater flow path (including a formed road with kerb and channel, and water-table drain) that is down-slope of the disposal area	5 metres	5 metres	5 metres
River, lake, stream, pond, dam or natural wetland	20 metres	15 metres	15 metres
Coastal marine area	20 metres	15 metres	15 metres
Existing water supply bore	20 metres	20 metres	20 metres
Property boundary	1.5 metres	1.5 metres	1.5 metres
Vertical setback distances			
Winter groundwater table	1.2 metres	0.6 metres	0.6 metres

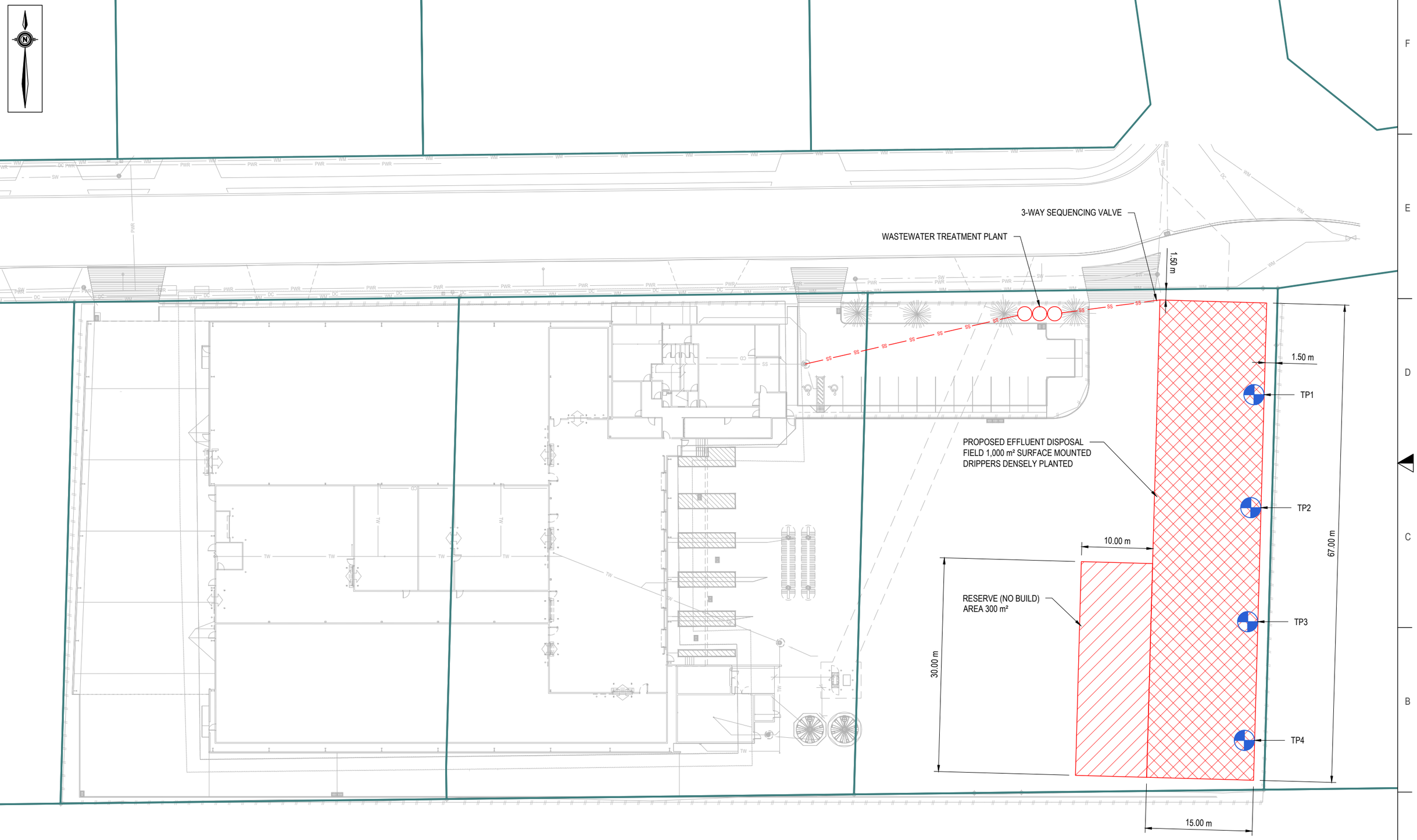
6.2 District Plan

The Far North District Plan contains an additional rule relating to wastewater discharges to land:

- District Plan Rule 12.7.6.1.4 specifies that effluent fields shall be located no closer than 30 m from any river, lake, wetland or the Coastal Marine Area.

Kerikeri river is the nearest water waterway that meets this definition, but it is well separated from the site.

Appendix A – Drawings



Rev	Date	Description	By	Checked
A	31/05/2024	FOR BUILDING / RESOURCE CONSENT	JT	JP

DWG WASTEWATER PLAN

A3 SCALE 1:500 0 10m 25m

Date 31/05/2024

Drawn JT | Checked JP | Approved

File O:\SUITEFILES - 22 189 - KAHIKATEAROA LANE, WAIPAPA (LOT 1 DP 178287)\ENGINEERING\DRAWINGS\CIVIL\22_189_CIVIL_DESIGN_C3D.DWG

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Project WASTEWATER DESIGN
KAHIKATEAROA LANE, WAIPAPA

Client PETER SWAN LIMITED

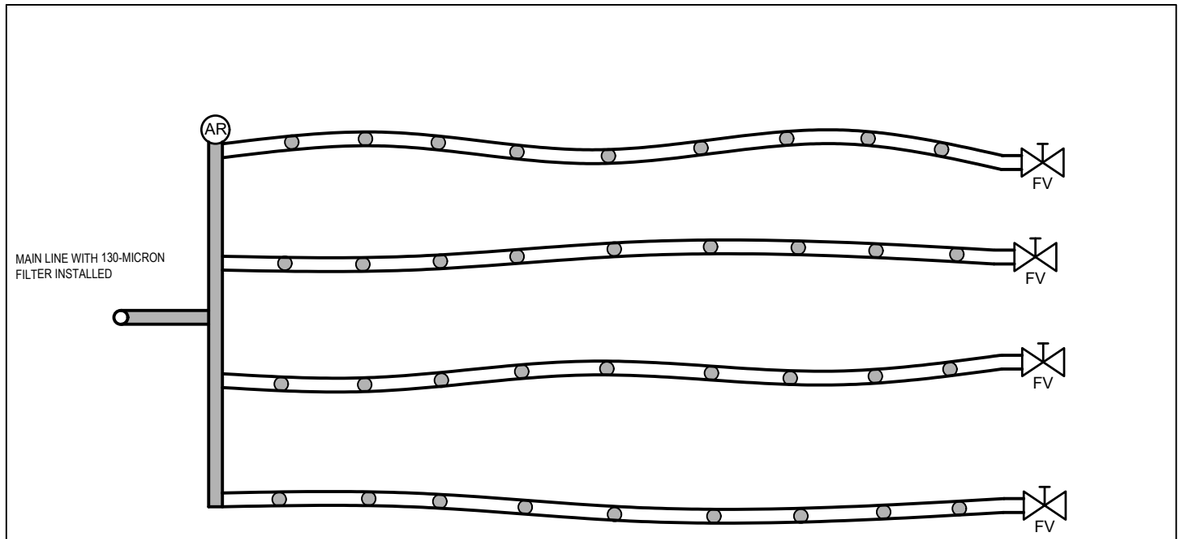
Project No. 22 189

RC no.

Stage

Dwg No. WWP01

Sheet No. 1 of 1



TYPICAL DISPOSAL FIELD LAYOUT

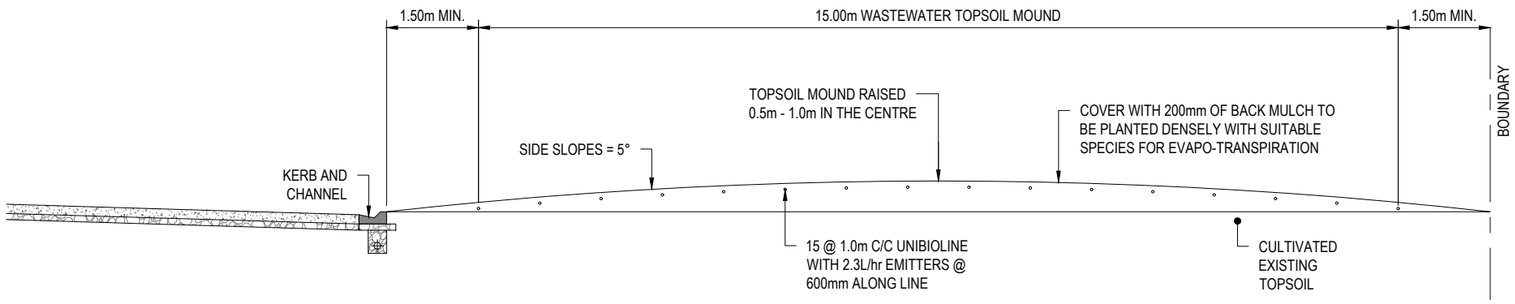
LEGEND:

AR — AIR / VACUUM RELEASE VALVE

FV — FLUSHING VALVE

NOTE:

1. DNL VALVES TO BE PLACED ACCORDINGLY TO PREVENT SATURATION AT LOW POINTS DUE TO DRAIN DOWN.



TYPICAL CROSS SECTION OF RAISED TOPSOIL MOUND

Rev	Date	Description	By	Checked
A	31/05/2024	FOR BUILDING / RESOURCE CONSENT	JT	JP

DWG EFFLUENT DISPOSAL AREA LAYOUT

A3 SCALE Not to Scale | Date 31/05/2024

Drawn JT | Checked JP | Approved

File O:\SUITEFILES - 22 189 - KAHIKATEAROA LANE, WAIPAPA (LOT 1 DP 178287)\ENGINEERING\DRAWINGS\CIVIL\22_189_WASTEWATER_DETAILS.DWG

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Project WASTEWATER DESIGN
KAHIKATEAROA LANE, WAIPAPA

Client PETER SWAN LIMITED

Project No. 22 189 | RC no.

Stage

Dwg No. WWD01

Sheet No. 1 of 1

Appendix B – Exploratory Hole Records

Client: Peter Swan Limited Job: 22 189 Excavation Number: TP1 Logged by: LP

Address: Kahikatearoa Lane, Waipapa (Lot 1 DP 178287) Surface level: 78 m OTP (typ)

Date of inspection: 27-May-24

Slope %: Flat Land form element: Alluvium Surface conditions: Moist Indicative drainage: very poor

Surface stones: Nil Ground cover: Grass Watertable depth: 1m bgl

Land surface notes: Greenfield site Parent material: Alluvium

Layer	Lower depth (mm)	Horizon	Moisture conditions (see Note 2)	Colour (moist)	Field texture	Coarse fragments % volume	Structure (see Note 3)	Modified Emersion	Sample taken (Y/N)	Consistency (see Note 4)	Soil category	Other assessment
1	0.15	A	moist	dark grey	silty clay	very few	-	-	N	-	-	
2	0.55	B	moist	dark grey/brown	clay loam	very few	high	-	N	firm	4	K_{sat} = 0.02
3	1.50	B	wet	grey	clay	very few	moderate	-	N	firm	6	

NOTES:

1 Use another form if >5 layers on major horizons.

2 Dry, moist, very moist, saturated.

3 Apedal (no peds) Either single grain or massive. Pedal (observable peds) Weak, moderate or strong.

4 Strength – loose, very weak, weak, firm, very firm, strong, very strong, rigid. Stickiness (when wet) – non, slightly, moderately, very.

Notes/comments/observations:

Ground water table at 1m

End of test pit at 1.5m bgl

Organisational details/Logo:

HAIGH WORKMAN LTD
Civil & Structural Engineers

Overall soil category assigned: 6 - medium to heavy clay, moderate/high structur Maximum depth of system: 02 m

Soil appears favourable for (list system types): irrigation/mound Checked by: John Papesch

SITE-AND-SOIL EVALUATION FORM - EXCAVATION LOG (FIGURE B1 1547:2012)

Client: Peter Swan Limited | Job: 22 189 | Excavation Number: TP2 | Logged by: LP

Address: Kahikatearoa Lane, Waipapa (Lot 1 DP 178287) | Surface level: 78 m OTP (typ)

Date of inspection: 27-May-24

Slope %: Flat | Land form element: Alluvium | Surface conditions: Moist | Indicative drainage: poor

Surface stones: Nil | Ground cover: Grass | Watertable depth: 0.85 m bgl

Land surface notes: Greenfield site | Parent material: Alluvium

Layer	Lower depth (mm)	Horizon	Moisture conditions (see Note 2)	Colour (moist)	Field texture	Coarse fragments % volume	Structure (see Note 3)	Modified Emersion	Sample taken (Y/N)	Consistency (see Note 4)	Soil category	Other assessment
1	0.10	A	moist	brown/grey	fill		-	-	N	-	-	
2	0.35	B	moist	dark grey	clay loam	few	high	-	N	firm	4	K_{sat} = 0.07
3	0.85	B	moist	orangish brown	clay loam	few	high	-	N	firm	4	
4	1.25		wet	mottles	clay	very few	weak		N	firm	6	
5												

NOTES:

1 Use another form if >5 layers on major horizons.

2 Dry, moist, very moist, saturated.

3 Apedal (no peds) Either single grain or massive. Pedal (observable peds) Weak, moderate or strong.

4 Strength – loose, very weak, weak, firm, very firm, strong, very strong, rigid. Stickiness (when wet) – non, slightly, moderately, very.

Notes/comments/observations:

Ground water table at 0.85 m bgl

End of test pit at 1.25 m bgl

Organisational details/Logo:

HAIGH WORKMAN LTD
Civil & Structural Engineers

Overall soil category assigned: 6 - medium to heavy clay, moderate/high structure | Maximum depth of system: 0.2 m

Soil appears favourable for (list system types): irrigation/mound | Checked by: John Papesch

SITE-AND-SOIL EVALUATION FORM - EXCAVATION LOG (FIGURE B1 1547:2012)

Client: Peter Swan Limited Job: 22 189 Excavation Number: TP3 Logged by: LP

Address: Kahikatearoa Lane, Waipapa (Lot 1 DP 178287) Surface level: 78 m OTP (typ)

Date of inspection: 27-May-24

Slope %: Flat Land form element: Alluvium Surface conditions: Moist Indicative drainage: poor

Surface stones: Nil Ground cover: Grass Watertable depth: 0.7 m bgl

Land surface notes: Greenfield site Parent material: Alluvium

Layer	Lower depth (mm)	Horizon	Moisture conditions (see Note 2)	Colour (moist)	Field texture	Coarse fragments % volume	Structure (see Note 3)	Modified Emersion	Sample taken (Y/N)	Consistency (see Note 4)	Soil category	Other assessment
1	0.25	A	moist	dark brown	fill		-	-	N	-	-	
2	0.60	B	moist	grey	silty clay	very few	high	-	N	firm	4	K_{sat} = 0.09
3	-	B	wet	grey w	sandy clay	few	moderate	-	N	firm	4	
4				mottles								
5												

NOTES:

1 Use another form if >5 layers on major horizons.

2 Dry, moist, very moist, saturated.

3 Apedal (no peds) Either single grain or massive. Pedal (observable peds) Weak, moderate or strong.

4 Strength – loose, very weak, weak, firm, very firm, strong, very strong, rigid. Stickiness (when wet) – non, slightly, moderately, very.

Notes/comments/observations:

Ground water table at 0.7 m bgl

End of test pit at 0.9 m bgl

Organisational details/Logo:

HAIGH WORKMAN LTD
Civil & Structural Engineers

Overall soil category assigned: 6 - medium to heavy clay, moderate/high struc Maximum depth of system: 0.2 m

Soil appears favourable for (list system types): irrigation/mound Checked by: John Papesch

SITE-AND-SOIL EVALUATION FORM - EXCAVATION LOG (FIGURE B1 1547:2012)

Client: Peter Swan Limited Job: 22 189 Excavation Number: TP4 Logged by: LP

Address: Kahikatearoa Lane, Waipapa (Lot 1 DP 178287) Surface level: 78 m OTP (typ)

Date of inspection: 27-May-24

Slope %: Flat Land form element: Alluvium Surface conditions: Moist Indicative drainage: poor

Surface stones: Nil Ground cover: Grass Watertable depth: 0.9 m bgl

Land surface notes: Greenfield site Parent material: Alluvium

Layer	Lower depth (mm)	Horizon	Moisture conditions (see Note 2)	Colour (moist)	Field texture	Coarse fragments % volume	Structure (see Note 3)	Modified Emersion	Sample taken (Y/N)	Consistency (see Note 4)	Soil category	Other assessment
1	0.15	A	moist	grey/brown	fill	-	-	-	N	-	-	
2	0.80	B	moist	dark grey	clay loam	very few	high	-	N	firm	4	K_{sat} = 0.06
3	1.00	B	wet	grey	clay	very few	moderate	-	N	firm	6	
4												
5												

NOTES:

1 Use another form if >5 layers on major horizons.

2 Dry, moist, very moist, saturated.

3 Apedal (no peds) Either single grain or massive. Pedal (observable peds) Weak, moderate or strong.

4 Strength – loose, very weak, weak, firm, very firm, strong, very strong, rigid. Stickiness (when wet) – non, slightly, moderately, very.

Notes/comments/observations:

Ground water table at 0.9 m bgl

End of test pit at 1 m bgl

Organisational details/Logo:

HAIGH WORKMAN LTD
Civil & Structural Engineers

Overall soil category assigned: 6 - medium to heavy clay, moderate/high struc Maximum depth of system: 0.2 m

Soil appears favourable for (list system types): irrigation/mound Checked by: John Papesch

SITE-AND-SOIL EVALUATION FORM - EXCAVATION LOG (FIGURE B1 1547:2012)

Test Pit 01 - 200 mm below ground level

Constant Head Permeability Test Results

HAIGH WORKMAN LTD
Civil & Structural Engineers

Job number:	20 189
Location:	Kahikatearoa Lane, Waipapa (Lot 1 DP 178287)
Client:	Peter Swan Limited
Tested by:	LP
Date tested:	27/05/2024

Depth of auger hole (cm)	50
Depth of water in auger hole (cm)	36
Average radius of auger hole (cm)	10
Depth to any impermaeable layer	Unknown
Time elapsed between first filling and start of measurement	1 - 2 mins
Soil moisture at time of excavation	Moist

Permeameter and time readings

Time (s)	Level in tube (cm)	Velocity (cm/s)
0	56.2	
30	56.2	
60	55.8	0.01
90	55.6	0.01
120	55.4	0.01
150	55.2	0.01
180	55	0.01
210	54.8	0.01
240	54.8	0.00
270	54.4	0.01
300	54	0.01
330	53.8	0.01
360	53.6	0.01
390	53.6	0.00

Chosen infiltration velocity (cm/s)	0.01
Flowrate, Q (cm³/min)	6.59
Ksat (cm/min)	0.00
Ksat (m/day)	**0.02**

$$K_{sat} = \frac{4.4Q\left[0.5\sinh^{-1}\left(\frac{H}{2r}\right) - \sqrt{\left[\left(\frac{r}{H}\right)^2 + 0.25\right]} + \frac{r}{H}\right]}{2\pi H^2}$$

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Test Pit 02 - 200 mm below ground level

Constant Head Permeability Test Results

HAIGH WORKMAN LTD
Civil & Structural Engineers

Job number:	22 189
Location:	Kahikatearoa Lane, Waipapa (Lot 1 DP 178287)
Client:	Peter Swan Limited
Tested by:	LP
Date tested:	27/05/2024

Depth of auger hole (cm)	43
Depth of water in auger hole (cm)	31
Average radius of auger hole (cm)	10
Depth to any impermaeable layer	Unknown
Time elapsed between first filling and start of measurement	1 - 2 mins
Soil moisture at time of excavation	Moist

Permeameter and time readings

Time (s)	Level in tube (cm)	Velocity (cm/s)
0	53	
30	52.4	
60	51.8	0.02
90	51.2	0.02
120	50.4	0.03
150	49.8	0.02
180	49.2	0.02
210	48.6	0.02
240	47.8	0.03
270	47.2	0.02
300	46.6	0.02
330	46	0.02
360	45.4	0.02
390	44.8	0.02
420	44.2	0.02
450	43.4	0.03

Chosen infiltration velocity (cm/s)	0.02
Flowrate, Q (cm³/min)	19.55
Ksat (cm/min)	0.00
Ksat (m/day)	**0.07**

$$K_{sat} = \frac{4.4Q\left[0.5\sinh^{-1}\left(\frac{H}{2r}\right) - \sqrt{\left[\left(\frac{r}{H}\right)^2 + 0.25\right]} + \frac{r}{H}\right]}{2\pi H^2}$$

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Test Pit 03 - 250 mm below ground level

Constant Head Permeability Test Results

HAIGH WORKMAN LTD
Civil & Structural Engineers

Job number:	22 189
Location:	Kahikatearoa Lane, Waipapa (Lot 1 DP 178287)
Client:	Peter Swan Limited
Tested by:	LP
Date tested:	27/05/2024

Depth of auger hole (cm)	54
Depth of water in auger hole (cm)	34
Average radius of auger hole (cm)	10
Depth to any impermaeable layer	Unknown
Time elapsed between first filling and start of measurement	1 - 2 mins
Soil moisture at time of excavation	Moist

Permeameter and time readings

Time (s)	Level in tube (cm)	Velocity (cm/s)
0	55	
40	53.2	
60	52.6	0.03
100	51	0.04
120	50.6	0.02
150	49.8	0.03
180	48.6	0.04
210	47.8	0.03
240	46.6	0.04
270	45.6	0.03
300	44.6	0.03
330	43.8	0.03
360	42.6	0.04
390	41.8	0.03
420	40.8	0.03
450	39.8	0.03
480	38.8	0.03

Chosen infiltration velocity (cm/s)	0.03
Flowrate, Q (cm³/min)	29.24
Ksat (cm/min)	0.01
Ksat (m/day)	**0.09**

$$K_{sat} = \frac{4.4Q\left[0.5\sinh^{-1}\left(\frac{H}{2r}\right) - \sqrt{\left[\left(\frac{r}{H}\right)^2 + 0.25\right]} + \frac{r}{H}\right]}{2\pi H^2}$$

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Test Pit 04 - 250 mm below ground level

Constant Head Permeability Test Results

HAIGH WORKMAN Ltd
Civil & Structural Engineers

Job number:	22 189
Location:	Kahikatearoa Lane, Waipapa (Lot 1 DP 178287)
Client:	Peter Swan Limited
Tested by:	LP
Date tested:	27/05/2024

Depth of auger hole (cm)	43
Depth of water in auger hole (cm)	27
Average radius of auger hole (cm)	10
Depth to any impermaeable layer	Unknown
Time elapsed between first filling and start of measurement	1 - 2 mins
Soil moisture at time of excavation	Moist

Permeameter and time readings

Time (s)	Level in tube (cm)	Velocity (cm/s)
0	54.8	
30	54.2	
60	53.6	0.02
90	53.2	0.01
120	52.6	0.02
150	52.2	0.01
180	51.6	0.02
210	51.2	0.01
240	50.6	0.02
270	50.2	0.01
300	49.6	0.02
330	49	0.02
360	48.6	0.01
390	48	0.02
420	47.6	0.01

Chosen infiltration velocity (cm/s)	0.02
Flowrate, Q (cm³/min)	15.44
Ksat (cm/min)	0.00
Ksat (m/day)	**0.06**

$$K_{sat} = \frac{4.4Q\left[0.5\sinh^{-1}\left(\frac{H}{2r}\right) - \sqrt{\left[\left(\frac{r}{H}\right)^2 + 0.25\right]} + \frac{r}{H}\right]}{2\pi H^2}$$

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Appendix C – FNDC Wastewater Checklist

Onsite Wastewater Disposal Investigation

This form is to be read in conjunction with AS/NZS 1547:2012 (or any amendments as applicable), and, in particular with Part 4: Means of Compliance

Part A – Contact Details

1 - Applicant

Name: *Peter Swan Ltd*

Property Address: *6-9 Kahikatearoa Lane, Waipapa*

Lot/DP Number: *Lots 6-8 DP 597982*

2 – Consultant / Site Evaluator

Site Evaluator Name: *John Papesch*

Company Name: *Haigh Workman Ltd*

Postal Address: *PO Box 89, Kerikeri*

Business Phone: *09 407 8327* Mobile: *027 411 9944*

Email: *johnp@haighworkman.co.nz*

SQEP Registered[2]: ☑ Yes ☐ No If no, details of suitably registered SQEP who will countersign the report are to be supplied below.

Name of SQEP:

Company Name:

Postal Address:

Business Phone: Mobile:

Email:

[2] It is a requirement that the Evaluator be SQEP registered to carry out on-site effluent investigations/designs. If not, then evaluation/design will need to be counter-signed by a suitably registered SQEP

Part B - Site and Soil Evaluation

1: Desk Study

Requirements (✓ appropriate box) Please complete **all** options. (*If more than one option applies to land under consideration, please clarify with supporting information)*

☐	*FNDC REQUIREMENT*	*APPLIES TO LOT(S)*	*COMMENTS*
1	**Stability Risk**		
✓	Low instability risk	*6-8*	*Flat alluvial ground*
	Medium instability risk		
	High instability risk		
2	**Effluent on slope stability**		
✓	Low disposal potential	*6-8*	*Flat alluvial ground*
	Moderate disposal potential		
	High disposal potential		
3	**Effluent suitability**		
	Medium unsuitability		
✓	High unsuitability	*6-8*	*Cat 6 soils, High ground water table*
4	**Flood susceptibility**		
	Is flood susceptible		
✓	Is partially flood susceptible	*6-8*	*See flood hazard section*
	Is not flood susceptible		
5	**Streams**		
	Are there streams on or adjacent to land under investigation? Yes		
✓	No		
6	**GIS land resources layer – aquifers at risk**		
	Is land situated over or adjacent to aquifer? Yes		
✓	No		
7	**Annual Rainfall (HIRDS)**	*1500 mm*	

Note: It is to be noted that all information obtained off FNDC GIS/Hazard Maps is to be taken as a guide only.

Note: All information obtained from the above sites is to be confirmed by a specific site investigation as localised conditions could vary substantially. However, should the above data checks indicate the potential for a hazard/non-complying activity etc., this must be further investigated to confirm/deny the indicated situation.

2: On-Site Evaluation

a. Determination of Soil Category *(refer table 4.1.1 AS/NZS 1547:2012)* (✓ appropriate box)

Soil Category		Structure	Applies to lot(s)	Comments
1 Gravels & Sands		Structureless (massive)		
2 Sandy loams		Weakly Structured		
		Massive		
3 Loams		High/Moderate structured		
		Weakly structured or Massive		
4 Clay loams		High/moderate structured		
		Weakly structured		
		Massive		
5 Light clays		Strongly structured		
		Moderately structured		
		Weakly structured or massive		
6 Medium to heavy clays		Strongly structured		
	✓	Moderately structured	*6-8*	*See site investigation*
		Weakly structured or massive		

Note: Refer 4.1 A4 – Soil Assessment AS/NZS 1547:2012 for assessment criteria.

Note: Details of the method used to determine soil type etc. are to be clearly stated, along with positions of boreholes/test pits etc. clearly marked on a site plan. Bore logs are to be provided. Photos should be included.

Note: The site plan should also clearly show the intended area for effluent disposal, along with any site features such as drains, water bores, overland flows etc., along with separation distance achieved.

On-Site Evaluation Continued

b. Site Characteristics for Proposed Disposal Area: (if there is a marked difference between sites, please fill in a separate form for each site and clearly note which site the assessment applies to) (ü appropriate box)

□	***DETAILS***	***APPLIES TO SITE(S)***
1	**Flooding potential to proposed field and reserve field (refer note 1 below)**	
✓	Fields will not flood, or	
	Fields will flood in	
	20% AEP event	
	5% AEP event	
	1% AEP event	
2	**Surface water separation to proposed field and reserve field (refer note 2 below)**	
	Main/reserve disposal field comply with NRC rules	
✓	*Main/reserve disposal field do not comply with NRC rules*	*<5 m from kerb line, <5 m from drain in neighboring property*
3	**Surface water separation to proposed field and reserve field (refer note 2 below)**	
	Main/reserve disposal field comply with NRC rules	
	Main/reserve disposal field do not comply with NRC rules	
4	**Winter ground water separation to proposed field and reserve field (refer note 3 below)**	
✓	*Main and reserve disposal field comply with NRC rules*	*Raised topsoil mound*
	Main and reserve disposal field do NOT comply with NRC rules	
5	**Slope of ground of proposed field and reserve field (refer note 4)**	
Description	*Topsoil mound with 5-degree side slopes*	
6	**Shape of ground of proposed field and reserve field (Refer note 5 below)**	

	Waxing divergent		*Linear divergent*		*Waning divergent*
	Waxing planar	✓	*Liner planar*		*Waning planar*
	Waxing convergent		*Linear convergent*		*Waning convergent*

Comments	*Ground is near flat and prone to ponding*

	DETAILS	APPLIES TO SITE(S)
7	**Intended water supply source**	
	Public supply	
✓	*Rainwater*	Lots 6-8
	Bore	
8	**Proposed method of disposal and recommended Daily Loading rate (DLR) (refer note 6 below)**	
Description		
Raised topsoil mound, densely planted. DIR 3 mm/day		
Peak loading factored in (refer not 6 below)		Yes ☐ No ✓
Comments	*Nature of wastewater generation is driven by staffing*	

9	Site exposure (refer note 7 below)	*Description*	*Applies to Site(s)*
Site(s) aspect		*Open*	
Pre-dominant wind direction		*South-west*	
Presence of shelter belts		*Along eastern boundary*	
Presence of topographical features or structures		*Very few*	

10	Proximity of water bores (include adjacent to properties) (refer note 9 below)
None close	

11	Visible evidence of slips / instability (refer not 8 below)
Nil	

12	Total suitable area available for type of effluent disposal proposed (including reserve area)
1,000 m2	

13	Setback areas proposed (if any) (refer note 10 below)
1.5 m from boundaries and kerb lines	

Notes

1. *If the FNDC hazard maps/GIS indicate a flooding susceptibility on the site being evaluated, an on -site evaluation is to be carried out to determine the effects from 20%, 5% and 1% AEP storm events. This evaluation is to include all calculations to substantiate conclusions drawn. If necessary, include a detailed contour plan and photos.*
2. *NRC Water & Soil plan defines surface water as 'All water, flowing or not, above the ground. It includes water in continually or intermittently flowing rivers, artificial watercourses, lakes and wetlands, and water impounded by structures such as dams or weirs but does not include water while in pipes, tanks, cisterns, nor water within the Coastal Marine Area'. By this definition, separation (complying with NRC rules) is to be maintained by both the proposed disposal and reserve areas from any overland flowpaths and/or swale drains etc. or R/C will be required from NRC. Surface water is to be clearly marked on each site plan, showing the extent of a 1% AEP storm event, and detailing separation distances to main/reserve disposal areas.*
3. *Positions of test borehole/s to be shown and bore logs to be provided. Separation (complying with NRC rules) is to be maintained by both the proposed disposal and reserve areas from winter ground water level or R/C will be required from NRC. If the investigation is done outside of the winter period, allowance is to be made in determining the likely winter level.*
4. *Slopes of ground are to be compared with those recommended maximums for type of system proposed (refer Appendix 4.2B AS/NZS 1547:2012). Designs exceeding those maximums will require specific design to justify the proposal and may also need Resource Consent from NRC.*
5. *Shape of ground is important as it will determine whether there is potential for concentrated overland flows from the upper slopes and also if effluent might be concentrated at base of slope if leeching occurs. Refer Figure 4.1B2 AS/NZS 1547:2012.*
6. *The proposed system (for residential developments) should be sized to accommodate an average 3 bedroom house with 5 people. Sites in holiday areas need to take peak loading into effect in determining daily volumes. The design must state what DLR was used to determine area necessary (including reserve area). If ground conditions are marginal for type of disposal proposed, then a soil permeability test utilising the constant head method is to be carried out across the proposed disposal area. Refer Appendix 4.1F AS/NZS 1547:2012.*
7. *The site aspect is important as a north-facing site that is not sheltered from wind and sun by shelterbelts or other topographical features or structures will perform far better than a south-facing site on the lee of a hill that is shaded from wind and sun etc.*
8. *If any effluent disposal area (including any reserve area) proposed has or is adjacent to areas that show signs of instability, then a full report from a CPEng (Geotech) will be required to justify the viability of the area for effluent disposal.*
9. *If there are any water bores on the subject property or adjacent properties then a site plan will be required showing bore positions in relation to any proposed effluent field(s).*
10. *If setback areas are proposed to mitigate effects, the extent and position/s need to be shown on a site plan.*

Appendix D – Producer Statement - Design

PRODUCER STATEMENT – PS1
DESIGN

Building Code Clause(s):	G13	Job number: 22 189
ISSUED BY: *(Engineering Design Firm)*	Haigh Workman Ltd	
TO: *(Client)*	Peter Swan Ltd	
TO BE SUPPLIED TO: *(Building Consent Authority)*	Far North District Council	
IN RESPECT OF: *(Description of building work))*	New build	
AT: *(Address)*	15-19 Kahikatearoa Lane, Waipapa	
LEGAL DESCRIPTION	Lots 6-8 DP 567982	

We have been engaged by Peter Swan Ltd to provide:

On-Site Wastewater System

in respect of the requirements of the Clause(s) of the Building Code specified above for part only, as specified in the attached Schedule, of the proposed building work.

The design carried out by Haigh Workman Ltd has been prepared in accordance with:

✓ compliance documents issued by the Ministry of Business, Innovation & Employment (Verification method /acceptable solution): VM4

The proposed building work covered by this producer statement is described in the drawings specified in the attached Schedule, together with the specification, and other documents set out in the attached Schedule.

On behalf of Haigh Workman Ltd, and subject to:

- all proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached Schedule, will comply with the relevant provisions of the Building Code specified above; and that
- the persons who have undertaken the design have the necessary competence to do so.

I recommend the CM3 level of construction monitoring.

I, John Francis Papesch, am:

- CPEng number 224301
- and hold the following qualifications: B.E.

Haigh Workman Ltd holds a current policy of Professional Indemnity Insurance no less than $200,000.

Haigh Workman Ltd is a member of ACE New Zealand.

SIGNED BY: John Francis Papesch

(Signature):  Date: 31/5/2024

ON BEHALF OF: Haigh Workman Ltd

Note: This statement has been prepared solely for Far North District Council and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to Haigh Workman Ltd only. As a condition of reliance on this statement, Far North District Council accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to Far North District Council in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE TO PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

- Engineering Drawing Set: Haigh Workman wastewater drawings WWP01 and WWD01, ref 22 189 dated 31 May 2024
- Engineering Calculations: Haigh Workman report "On-Site Wastewater System", ref 22 189 dated 31 May 2024

Limited Scope of Engagement

We have been engaged by Peter Swan Ltd to provide services in respect of the requirements of the Clause(s) of the Building Code specified above for the following parts of the proposed building work:

On-Site Wastewater System

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on either the ACE New Zealand or Engineering New Zealand websites.

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN: Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;
PS2 DESIGN REVIEW: Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;
PS3 CONSTRUCTION: Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 20112
PS4 CONSTRUCTION REVIEW: Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.
This must be accompanied by a statement of completion of building work (Schedule 6).
The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional
This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.
The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).
Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.
Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance
As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.
The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase
There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers3).
The BCA is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4
BCAs should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued. No design professional should be expected to provide a producer statement unless such a requirement forms part of Haigh Workman Ltd's engagement.

Refer Also:
1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2 NZIA Standard Conditions of Contract SCC 2011
3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4 PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

FILE: 43067
(01 to 04)
Minor Correction

Resource Consent

Document Date: 28.10.2021

Pursuant to the Resource Management Act 1991, the Northland Regional Council (hereinafter called "the council") does hereby grant a Resource Consent to:

WINDERMERE ENERGY LIMITED

To undertake the following activities on Lot 1 DP 178287 and Lot 13 DP 363106 (66 Klinac Lane Waipapa), at or about location co-ordinates 1683365E 6103025N:

Note: All location co-ordinates in this document refer to Geodetic Datum 2000, New Zealand Transverse Mercator Projection.

AUT.043067.01.01	**Earthworks for site development within a high-risk flood hazard zone.**
AUT.043067.02.01	**Divert stormwater during land disturbing activities.**
AUT.043067.03.01	**Discharge stormwater during land disturbance activities.**
AUT.043067.04.01	**Divert floodwater within a subdivision development.**

Subject to the following conditions:

1 The Consent Holder shall notify the council's assigned monitoring officer in writing of the date the works are intended to commence, at least one week beforehand. The Consent Holder shall arrange for a site meeting between the Consent Holder's principal earthmoving contractor and the council's assigned monitoring officer, which shall be held on site prior to any earthworks commencing.

Advice Note: *Notification to the council may be made by email to info@nrc.govt.nz.*

2 The location and nature of the earthworks shall be undertaken in general accordance with the **attached** Haigh Workman Civil and Structural Engineers Limited drawings titled:

(a) DWG: "*Roading and Services A*", DWG No. P1, Sheet 1 of 1, Dated 28/09/2021;

(b) DWG: "*Roading and Services B*"; DWG No. P2, Sheet 1 of 2, Dated 28/09/2021;

(c) DWG: "*Cul de sac Detail Plan*", DWG No. P3, Sheet 3 of 3, Dated 28/09/2021;

(d) DWG: "*Roading Typical Section*", DWG No. DE1, Sheet 1 of 2, Dated 28/09/2021;

(e) DWG: "*Typical Section Over Stormwater Pipes*"; DWG No. DE2; Sheet 2 of 2, Dated 28/09/2021;

(f) DWG: "*Proposed Fill Plan*"; DWG No. 16 153A/06; Sheet 6 of 6, Dated 30/11/2016;

(g) DWG: "*Fill Methodology, Erosion Sediment Control Plan*"; DWG No. 16 153A/07, Sheet 7 of 7, Dated 30/11/2016.

However, if there are any differences or apparent conflict between these documents and any conditions of these consents, then the conditions of consent shall prevail.

Northland REGIONAL COUNCIL
Te Kaunihera ā rohe o Te Taitokerau

3 As part of the written notice required by Condition 1 the Consent Holder or its agent/contractor shall submit a Construction Environmental Management Plan (CEMP) to the council's assigned monitoring officer for certification by the council's Compliance Manager. The CEMP must be prepared by a suitably qualified person who shall provide certification that the erosion and sediment controls in the CEMP have been designed in accordance with GD05. As a minimum, the CEMP shall include the following:

(a) The expected duration (timing and staging) of earthworks;

(b) Details of all erosion and sediment controls;

(c) The commencement and completion dates for the implementation of the proposed erosion and sediment controls;

(d) Details of surface revegetation of disturbed sites and other surface covering measures to minimise erosion and sediment runoff following construction;

(e) Measures to ensure sediment or dust discharge from the earthwork's activity does not create a nuisance on neighbouring properties;

(f) Measures to prevent spillage of fuel, oil and similar contaminants;

(g) Contingency containment and clean-up provisions in the event of accidental spillage of hazardous substances;

(h) Means of ensuring contractor compliance with the CEMP; and

(i) The name and contact telephone number of the person responsible for monitoring and maintaining all erosion and sediment control measures.

4 Sediment control measures shall be constructed and maintained in accordance with the principles and practices contained within the Auckland Council document entitled "2016/005: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region" (GD05). Where there are inconsistencies between any part of GD05 and the conditions of these consents, then the conditions of these consents shall prevail.

5 Erosion and sediment controls shall be installed prior to the commencement of earthworks (other than those required for the erosion and sediment controls) within an area of works and shall be retained until the site is stable against erosion and sediment discharges.

6 The installation of all erosion and sediment controls shall be supervised by an appropriately qualified and experienced person. The Consent Holder shall provide to the council's assigned monitoring officer certification from the appropriately qualified and experienced person who supervised the installation of the erosion and sediment controls that they have been installed in accordance with the requirements of GD05.

7 Prior to the commencement of earthworks on-site, a stabilised construction entrance to the site shall be installed to minimise the tracking of spoil or debris onto off-site public road surfaces. All material tracked onto off-site surfaces as a result of the exercise of these consents shall be removed as soon as possible, but at least daily. The stabilised construction entrance shall be maintained throughout the duration of earthworks operations.

8 No earthworks shall be carried out between 1 May and 30 September in any year unless the prior written agreement of the council's Compliance Manager has been obtained.

9 Any request to undertake works between 1 May and 30 September, inclusive, in any year must be in writing and shall be made at least two weeks prior to the proposed date that the works are required to be undertaken.

10 All stormwater diversion drains, and channels shall be capable of conveying stormwater during not less than the estimated 1 in 20-year rainfall event and, if they are constructed on grades greater than 2%, the outlets shall be adequately protected to prevent erosion occurring.

11 Topsoil and fill material shall not be stockpiled anywhere within a High Risk (10% AEP) Flood Hazard Zone or any flood overland flow path.

12 All offsite stormwater shall be directed away from the earthworks area.

13 No drainage pathways shall be constructed or permitted to flow over fill areas in a manner that creates erosion of the fill material.

14 No slash, soil, debris and detritus associated with the exercise of these consents shall be placed in a position where it may be washed into any downstream water body.

15 All earthworks operations shall be carried out in a manner that minimises the potential for slope instability and soil erosion. Effective mitigation measures shall be installed as required to mitigate and/or remedy any slope failures.

16 All bare areas of land and fill shall be covered with aggregate, or top soiled and established with a suitable grass/legume mixture to achieve an 80% groundcover within one month of the completion of earthworks. Temporary mulching or other suitable groundcover material shall be applied to achieve total groundcover of any areas unable to achieve the above requirements.

17 The exercise of these consents shall not give rise to any discharge of contaminants, including dust, which in the opinion of the monitoring officer of the council is noxious, dangerous, offensive or objectionable at or beyond the property boundary.

18 Refuelling and servicing of machinery shall not be carried out in such a way that soil or water at the site is contaminated. Where an accidental spillage to land occurs, all contaminated soil shall be collected and removed to a suitable disposal site.

19 In the event of archaeological sites or kōiwi being uncovered, activities in the vicinity of the discovery shall cease and the Consent Holder shall contact Heritage New Zealand Pouhere Taonga. Work shall not recommence in the area of the discovery until the relevant Heritage New Zealand Pouhere Taonga approval has been obtained.

Advice Note: *The Heritage New Zealand Pouhere Taonga Act 2014 makes it unlawful for any person to destroy, damage or modify the whole or any part of an archaeological site without the prior authority of Heritage New Zealand Pouhere Taonga.*

20 The Consent Holder shall, on becoming aware of any discharge associated with the Consent Holder's operations that is not authorised by these consents:

(a) Immediately take such action, or execute such work as may be necessary, to stop and or contain the discharge; and

(b) Immediately notify the council by telephone of the discharge; and

(c) Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the discharge; and

(d) Report to the council's Compliance Manager in writing within one week on the cause of the discharge and the steps taken, or being taken, to effectively control or prevent the discharge.

For telephone notification during the council's opening hours, the council's assigned monitoring officer for these consents shall be contacted. If that person cannot be spoken to directly, or it is outside of the council's opening hours, then the Environmental Hotline shall be contacted.

Advice Note: *The Environmental Hotline is a 24-hour, seven day a week, service that is free to call on 0800 504 639.*

21 The council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions annually during the month of September for any one or more of the following purposes.

(a) To deal with any adverse effects on the environment that may arise from the exercise of these consents and which it is appropriate to deal with at a later stage; or

(b) To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

The Consent Holder shall meet all reasonable costs of any such review.

EXPIRY DATE: 31 OCTOBER 2026

These consents were granted on 7 October 2021 under delegated authority from the council by Paul Maxwell, Coastal and Works Consents Manager and, pursuant to Section 133A of the Resource Management Act 1991, a minor correction has been made to the wording of Condition 11. This correction has been authorised under delegated authority from the council by Stuart Savill, Consents Manager on 28 October 2021.

Note: *The plans attached to this consent are reduced copies and therefore may not be to scale and may be difficult to read. In the event that compliance and/or enforcement action is to be based on compliance with the attached plans, it is important that the original plans, are sighted and used. Originals of the plans referred to are available for viewing at the council's Whangārei office.*

Application Number: **APP.045320.01.01**

Application Type: **Non-notified New**

Applicant Name: **Bidfood Limited**

Note: *In this decision document, "application", "activity" and "consent" refer to all activities that are part of the consent application.*

REASONS FOR THE DECISION

This consent is granted pursuant to Section 104B of the Resource Management Act 1991 (the Act). In reaching this decision, the council has considered the matters outlined in Part 2 and Section 104 of the Act. It has been determined that:

(1) The adverse effects of the proposed activity on the environment will be no more than minor.

(2) The proposed activity is consistent with the relevant statutory planning documents and regulations.

(3) The granting of this resource consent achieves the purposes of the Act.

Summary of Activity

The application is for a resource consents for earthworks and associated diversion and discharge of stormwater properties during works for site development on properties (Lots 6-8 DP 567982) at 19 Kahikatearoa Lane, Waipapa. The majority the works are located within a mapped flood hazard area.

The works are required for preloading a site proposed to be developed in preparation for construction a large warehouse and distribution facility. Once preloading has concluded additional works will be required to remove preload material and establish ground levels required for the development.

The extent of the preloading works will cover 5,325 square metre. The total volume of 6,058 cubic metres of aggregate is proposed to be deposited on the site to preload the building platform. The maximum depth of the preload material above existing ground level is approximately 1.12 metres with another 300 mm of the fill being below the existing ground level where topsoil has been removed. Once the preload period is at an end, the upper 500 millimetres (or approximately 2,202 cubic metres) of the metal fill will be removed from the building platform with the remaining finished floor level within the building platform area being maintained at FL 79.2m being approximately 620mm above existing ground level and 600mm above the 100 year ARI flood level The excess metal removed from the foundation area will be stored on site for use in the construction of the accessways and parking areas.

Regional Plan Rule(s) Affected

The earthworks within the flood hazard area will involve more than 1, 000 cubic metres of earth being moved or placed in any 12-month period therefore the earthworks and any associated diversion and discharge of stormwater during the works are deemed to be discretionary activities in accordance with Rule C.8.3.4 of the Proposed Regional Plan for Northland (PRP).

Actual and Potential Effects (Section 104(1)(a) of the Act)

The adverse effects on the environment of this activity have been determined to be no more than minor for the following reasons:

The closest water course to the area of the proposed works is the Kerikeri River. Effects on downstream water quality arising from stormwater discharges will be minimised by timing of works during the drier part of the year and installation of appropriate sediment control measures in accordance with the principles and practices set out in the Auckland Council technical publication "*2016/005: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region"* (GD05).

Windy and dry weather conditions have the potential to create dust nuisance beyond the property boundary. Wetting bare areas during works when required and stabilising and replanting bare areas following works will minimise the risk of wind erosion and dust nuisance.

A large of the site, particularly the western end has been identified by the PRP maps as a River Flood Hazard Zone. Permanently raising the ground level within the site has the potential to increase flooding on adjacent properties due to the displacement of the flood plain. The applicant's consulting engineer provided an assessment of the risk of increased flooding on neighbouring properties following site development as a result of the works and the report concluded that the flood levels post development will be no greater that the present flood levels.

Cultural Effects

The application has been circulated to tangata whenua who have registered with council as having an interest in resource consent applications within the area of the activity. No response has been received by council from tangata whenua.

Relevant Statutory Provisions (Section 104(1)(b) of the Act)

The council has determined that the granting of this resource consent is consistent with the objectives and policies contained in Sections D.1, D.2, D.4 and F of the PRP.

The proposed activity contravenes Section 15 of the Act, and therefore the council has also had regard to the matters outlined in Section 105 of the Act. The council is satisfied that the activity will not give rise to the effects outlined in Section 107 of the Act after reasonable mixing.

Te Rūnanga o Ngāti Rēhia has an iwi/hapū environmental management plan relevant to the location of this activity. This plan has been taken into account during the processing of the application and the granting of this consent is not considered to be contrary to the objectives and policies contained within Chapter 10 Whenua of the Ngāti Rēhia Hapū Environmental Management Plan (2014).

Duration of the Consent

No duration of consent was requested by the applicant. A period of 5 years has been determined to be appropriate in the circumstances of the proposal. In determining duration, regard has also been had to Policy D.2.14 of the PRP.

Name and Signature of Authorised Person:

Paul Maxwell
Coastal and Works Consents Manager

28 September 2023

FILE: 45320
(01 to 03)
New

Resource Consent

Document Date: 28.09.2023

Pursuant to the Resource Management Act 1991, the Northland Regional Council (hereinafter called "the council") does hereby grant a Resource Consent to:

BIDFOOD LIMITED

To undertake the following activities on Lot 6, 567982, Lot 7 DP 567982 and Lot 8 DP 567982 (19 Kahikatearoa Lane, Waipapa), at or about location co-ordinates 1683452E 6102971N:

Note: All location co-ordinates in this document refer to Geodetic Datum 2000, New Zealand Transverse Mercator Projection.

AUT.045320.01.01	**Earthworks for site development within a flood hazard zone.**
AUT.045320.02.01	**Divert stormwater during land disturbance activities.**
AUT.045320.03.01	**Discharge stormwater to land during land disturbance activities.**

Subject to the following conditions:

1 At least two weeks prior to the commencement of any works authorised by these consents on-site, the Consent Holder must notify the council's assigned monitoring officer in writing of the date that the works are intended to commence. The Consent Holder must arrange for a site meeting between the Consent Holder's principal earthworks contractor and the council's assigned monitoring officer, which must be held on site prior to any earthworks commencing.

Advice Note: *Notification to the council may be made by email to info@nrc.govt.nz.*

2 A copy of these consents must be provided to every person who is to carry out the works authorised by these consents, prior to any work commencing.

3 The exercise of these consents must be undertaken in general accordance with the **attached** Peter Swan Limited drawings referenced as Northland Regional Council Plan Numbers **5259/1**, **5259/2** and **5259/3**. However, if there are any differences or apparent conflict between these drawings and any conditions of these consents, then the conditions of consent must prevail.

4 Sediment control measures must be constructed and maintained in accordance with the principles and practices contained within the Auckland Council document titled *"2016/005: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region"* (GD05). Where there are inconsistencies between any part of GD05 and the conditions of these consents, then the conditions of these consents must prevail.

5 As part of the written notice required by Condition 1, the Consent Holder or its agent/contractor must submit an Erosion and Sediment Control Plan (ESCP) to the council for certification by the council's assigned monitoring officer. As a minimum, the ESCP must include the following:

Northland REGIONAL COUNCIL
Te Kaunihera ā rohe o Te Taitokerau

(a) The expected duration (timing and staging) of earthworks, and details of locations of disposal sites for unsuitable materials, and clean water diversions if required;

(b) Details of all erosion and sediment controls including diagrams and/or plans, of a scale suitable for on-site reference, showing the locations of the erosion and silt control structures/measures;

(c) The commencement and completion dates for the implementation of the proposed erosion and sediment controls;

(d) Details of surface revegetation of disturbed sites and other surface covering measures to minimise erosion and sediment runoff following construction;

(e) Measures to minimise sediment being deposited on public roads;

(f) Measures to ensure dust discharge from the earthwork's activity does not create a nuisance on neighbouring properties;

(g) Measures to prevent spillage of fuel, oil and similar contaminants;

(h) Contingency containment and clean-up provisions in the event of accidental spillage of hazardous substances;

(i) Means of ensuring contractor compliance with the ESCP;

(j) The name and contact telephone number of the person responsible for monitoring and maintaining all erosion and sediment control measures;

(k) Contingency provisions for the potential effects of large/high intensity rain storm events.

6 As a minimum, the erosion and sediment control measures must be constructed and maintained in accordance with the ESCP prepared in accordance with Condition 5. The Consent Holder may, in consultation with the council's assigned monitoring officer, amend the ESCP at any time and submit the amended plan to the council's assigned monitoring officer for review and certification. The most recent certified version of the ESCP must be used for compliance purposes.

7 Prior to the commencement of earthworks on-site, a stabilised construction entrance to the site must be installed to minimise the tracking of spoil or debris onto off-site public road surfaces. All material tracked onto off-site surfaces as a result of the exercise of these consents must be removed as soon as possible, but at least daily. The stabilised construction entrance must be maintained throughout the duration of earthworks operations.

8 Erosion and sediment controls must be installed prior to the commencement of earthworks (other than those required for the erosion and sediment controls) within an area of works.

9 The installation of all erosion and sediment controls must be supervised by an appropriately qualified and experienced person. The Consent Holder must provide to the council's assigned monitoring officer certification from the appropriately qualified and experienced person who supervised the installation of the erosion and sediment controls that they have been installed in accordance with the requirements of GD05.

10 No works may be carried out between 1 May and 30 September in any year unless the prior written agreement of the council's Compliance Manager has been obtained.

11 Any request to undertake works between 1 May and 30 September in any year must be in writing and must be made at least two weeks prior to the proposed date that the works are required to be undertaken. This written request must include an amended ESCP for the works that has been prepared in accordance with Condition 5.

12 Drains and cut-offs constructed to divert stormwater must be capable of conveying stormwater during not less than the estimated 1 in 20 year rainfall event. All channels on grades greater than 2% must be protected to avoid erosion occurring.

13 All offsite stormwater must be directed away from earthworks areas and no drainage pathways must be constructed, or permitted to flow, over fill areas in a manner that creates erosion of the fill material.

14 No slash, soil, debris and detritus associated with the exercise of these consents must be placed in a position where it may be washed into any water body.

15 All bare areas of land and fill must be covered with aggregate, or topsoiled and established with a suitable grass/legume mixture to achieve an 80% groundcover within one month of the completion of earthworks. Temporary mulching or other suitable groundcover material must be applied to achieve total groundcover of any areas unable to achieve the above requirements.

16 The exercise of these consents must not give rise to any discharge of contaminants, including dust, which in the opinion of a monitoring officer of the council is noxious, dangerous, offensive or objectionable at or beyond the property boundary.

17 The exercise of these consents must not cause any of the following effects on the water quality of the Kerikeri River, as measured approximately 10 metres downstream of a discharge point into the river, when compared to a site upstream of all land disturbance activities during the same sampling event:

(a) The production of any conspicuous oil or grease films, scums or foams, floatable or suspended materials;

(b) A conspicuous change in colour or visual clarity;

(c) An emission of objectionable odour;

(d) An increase in suspended solids concentration greater than 100 grams per cubic metre.

18 These consents will not lapse until their expiry.

19 The Consent Holder must, on becoming aware of any discharge associated with the Consent Holder's operations that is not authorised by these consents:

(a) Immediately take such action, or execute such work as may be necessary, to stop and/or contain the discharge; and

(b) Immediately notify the council by telephone of the discharge; and

(c) Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the discharge; and

(d) Report to the council's Compliance Manager in writing within one week on the cause of the discharge and the steps taken, or being taken, to effectively control or prevent the discharge.

For telephone notification during the council's opening hours, the council's assigned monitoring officer for these consents must be contacted. If that person cannot be spoken to directly, or it is outside of the council's opening hours, then the Environmental Hotline must be contacted.

Advice Note: *The Environmental Hotline is a 24 hour, seven day a week, service that is free to call on 0800 504 639.*

20 The council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions annually during the month of July for any one or more of the following purposes:

(a) To deal with any adverse effects on the environment that may arise from the exercise of these consents and which it is appropriate to deal with at a later stage; or

(b) To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

The Consent Holder must meet all reasonable costs of any such review.

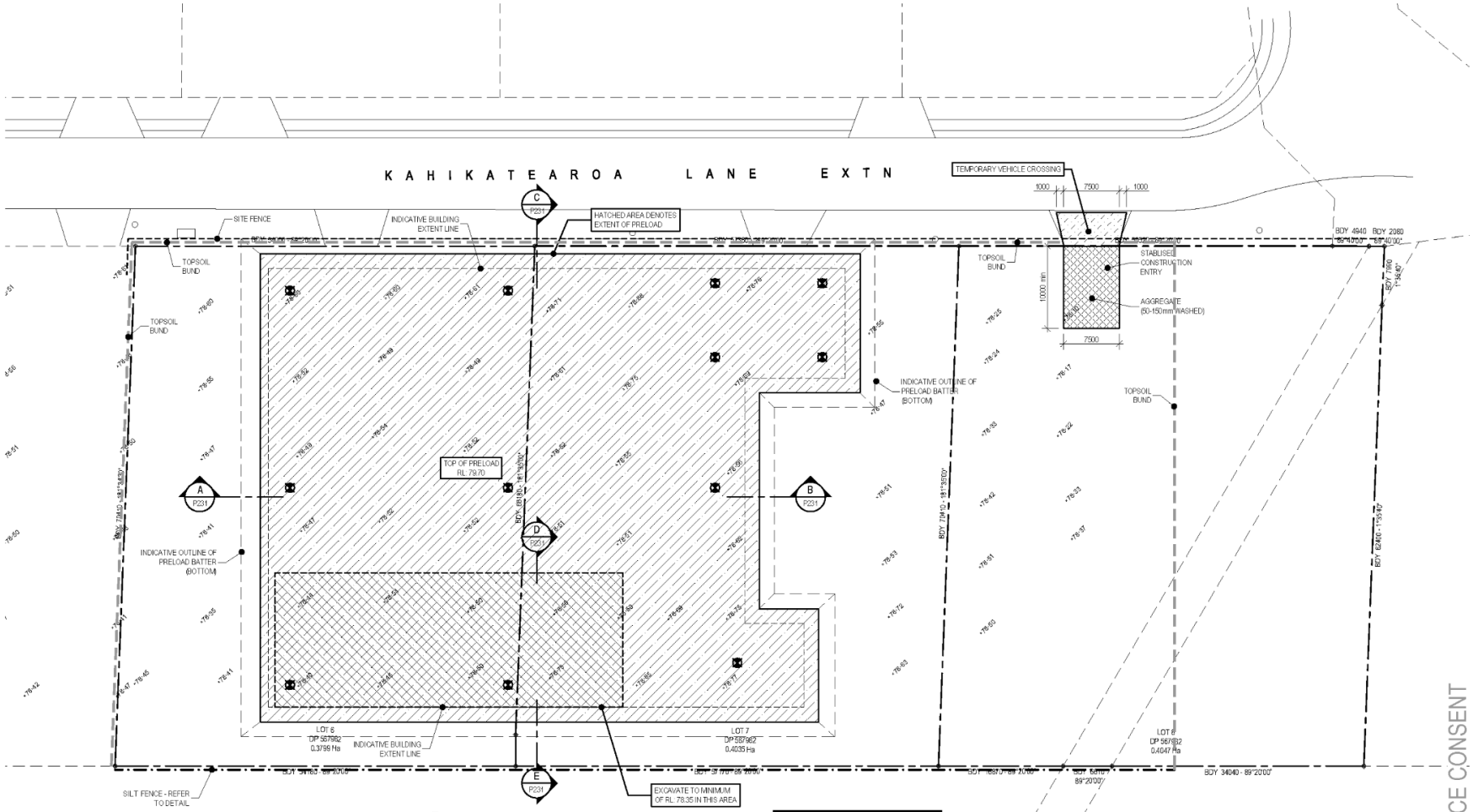
EXPIRY DATE: **31 AUGUST 2028**

Advice Note: *The Heritage New Zealand Pouhere Taonga Act 2014 makes it unlawful for any person to destroy, damage or modify the whole or any part of an archaeological site without the prior authority of Heritage New Zealand Pouhere Taonga.*

These consents are granted this Twenty Eighth day of September 2023 under delegated authority from the council by:

Paul Maxwell
Coastal and Works Consents Manager

Note: *The plans attached to this consent are reduced copies and therefore may not be to scale and may be difficult to read. In the event that compliance and/or enforcement action is to be based on compliance with the attached plans, it is important that the original plans, are sighted and used. Originals of the plans referred to are available for viewing at the council's Whangārei office.*



NORTHLAND REGIONAL COUNCIL
REF : 045320
Plan Number 5259/1

Peter Swan Limited
WWW.PSWAN.CO.NZ
engineering | architecture | project management
Level 7 | Big Albert Building | 87-89 Albert Street | Auckland 1010 | NZ
P O Box 90053 | Victoria Street West | Auckland 1142 | NZ
T: +64 9 373 5880
F: +64 9 373 5883 E: mail@pswan.co.nz

CLIENT | PROJECT TITLE:
Bidfood

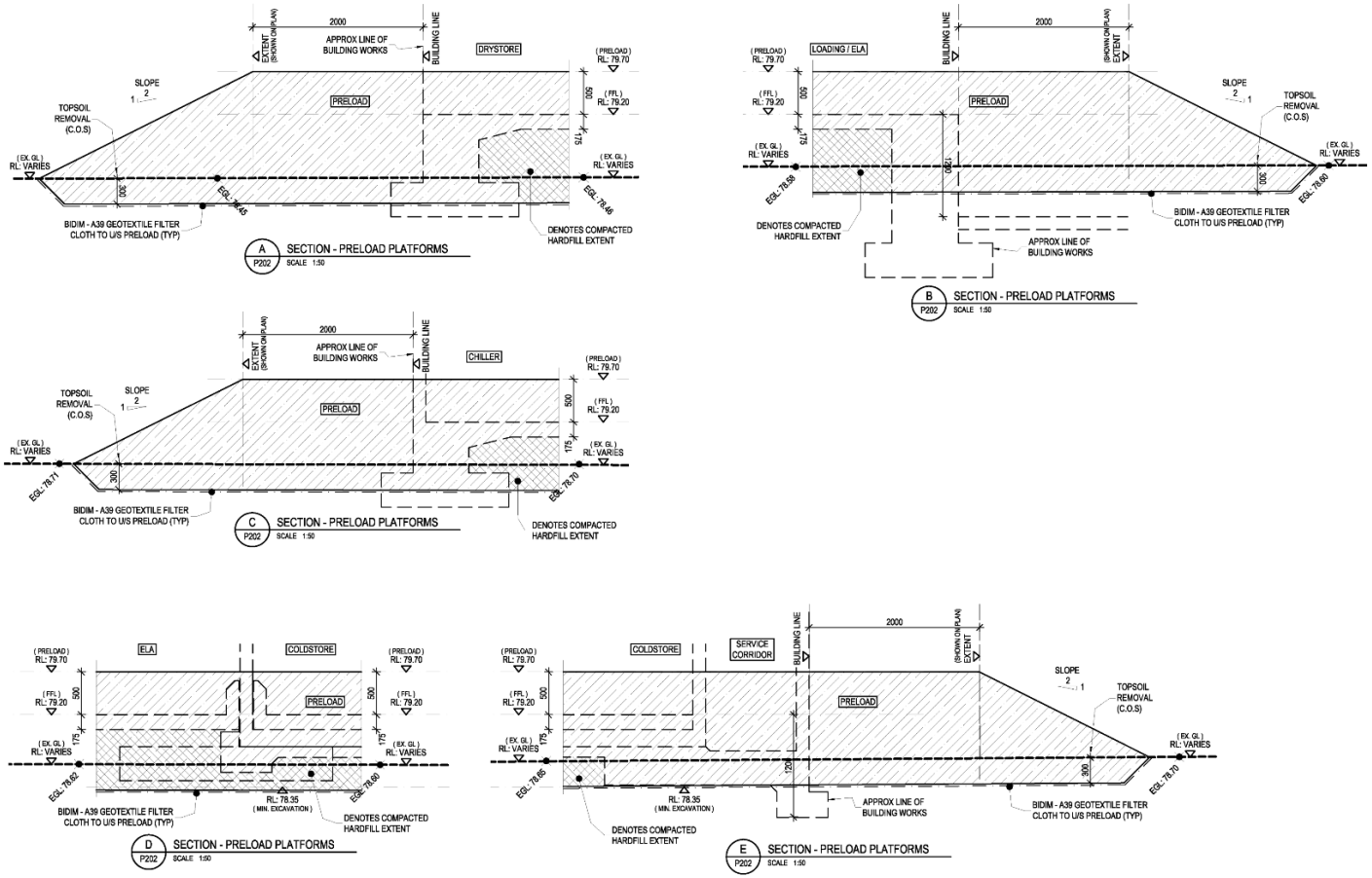
NEW DISTRIBUTION CENTRE
for
BIDFOOD LIMITED
at
LOTS 6-9 KAHIKATEAROA LANE, WAIPAPA

DRAWING TITLE:
EARTHWORKS PLAN

NORTH

REVISION	DATE	No.
FOR RESOURCE CONSENT	21-06-23	4
FOR BUILDING CONSENT - STAGE 1	30-06-23	3
FOR BUILDING CONSENT - STAGE 1	15-06-23	2
FOR PRELOAD EARTHWORKS	02-06-23	1

SCALE: A3 - 1:500 A1 - 1:250 ORIGINAL SHEET SIZE: A3
DESIGNED: BB CHECKED: REF: –
DRAWN: CW APPROVED: DATE: MAY 2023
DRAWING No.: 110695 - P202 REV: 4



FOR RESOURCE CONSENT

NORTHLAND REGIONAL COUNCIL
REF : 045320
Plan Number 5259/2

Peter Swan Limited
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CLIENT: Bidfood

PROJECT TITLE:
NEW DISTRIBUTION CENTRE
FOR:
BIDFOOD LIMITED
AT:
LOTS 6-9 KAHIKATEAROA LANE, WAIPAPA

DRAWING TITLE:
EARTHWORKS SECTIONS

REVISION	DATE:	Rev:
FOR RESOURCE CONSENT	21-09-23	3
FOR BUILDING CONSENT - STAGE 1	15-06-23	2
FOR PRELOAD EARTHWORKS	02-06-23	1

SCALE: A3 - 1:50 A1 - 1:25
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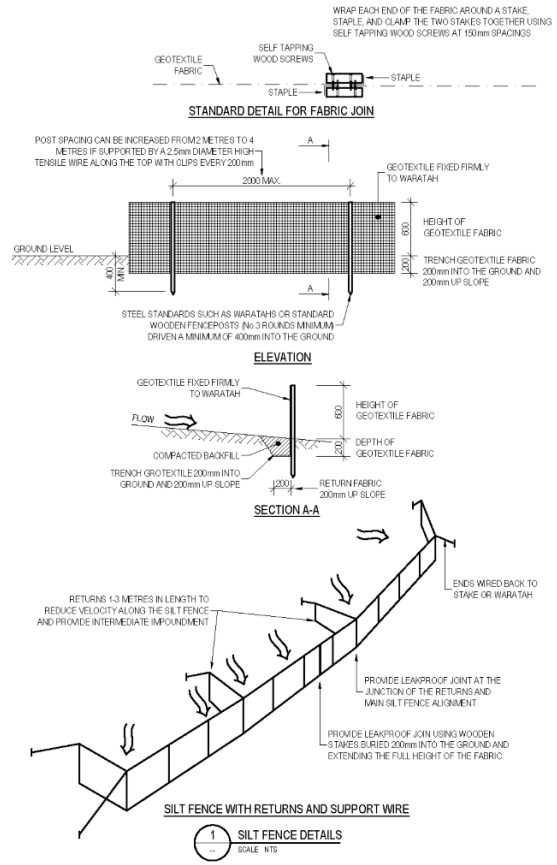
APPROVED:
DATE: MAY 2023
DRAWING No.: 110695 - P231
REV: 3



NORTHLAND REGIONAL COUNCIL
REF : 045320
Plan Number 5259/3

Peter Swan Limited
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CLIENT: Bidfood

PROJECT TITLE:
NEW DISTRIBUTION CENTRE
FOR
BIDFOOD LIMITED
AT
LOTS 6-9 KAHIKATEAROA LANE, WAIPAPA

DRAWING TITLE:
SILT PROTECTION DETAILS

REVISION	DATE	No.
FOR RESOURCE CONSENT	21-09-23	1

SCALE: A3 - 1:200 A1 - 1:100
ORIGINAL SHEET SIZE: A3
DESIGNED: BB
CHECKED:
REF: –
DRAWN: CW
APPROVED:
DATE: NOV 2022
DRAWING No.: 110695 - P251
REV: 1

FOR RESOURCE CONSENT

DISTRIBUTION CENTRE DEVELOPMENT

BIDFOOD LIMITED
KAHIKATEROA LANE EXTN,
WAIPAPA

FOR BUILDING CONSENT
STAGE 1

PROJECT No.: 110695

DRAWINGS PREPARED BY

Peter Swan Limited
engineering | architecture | project management

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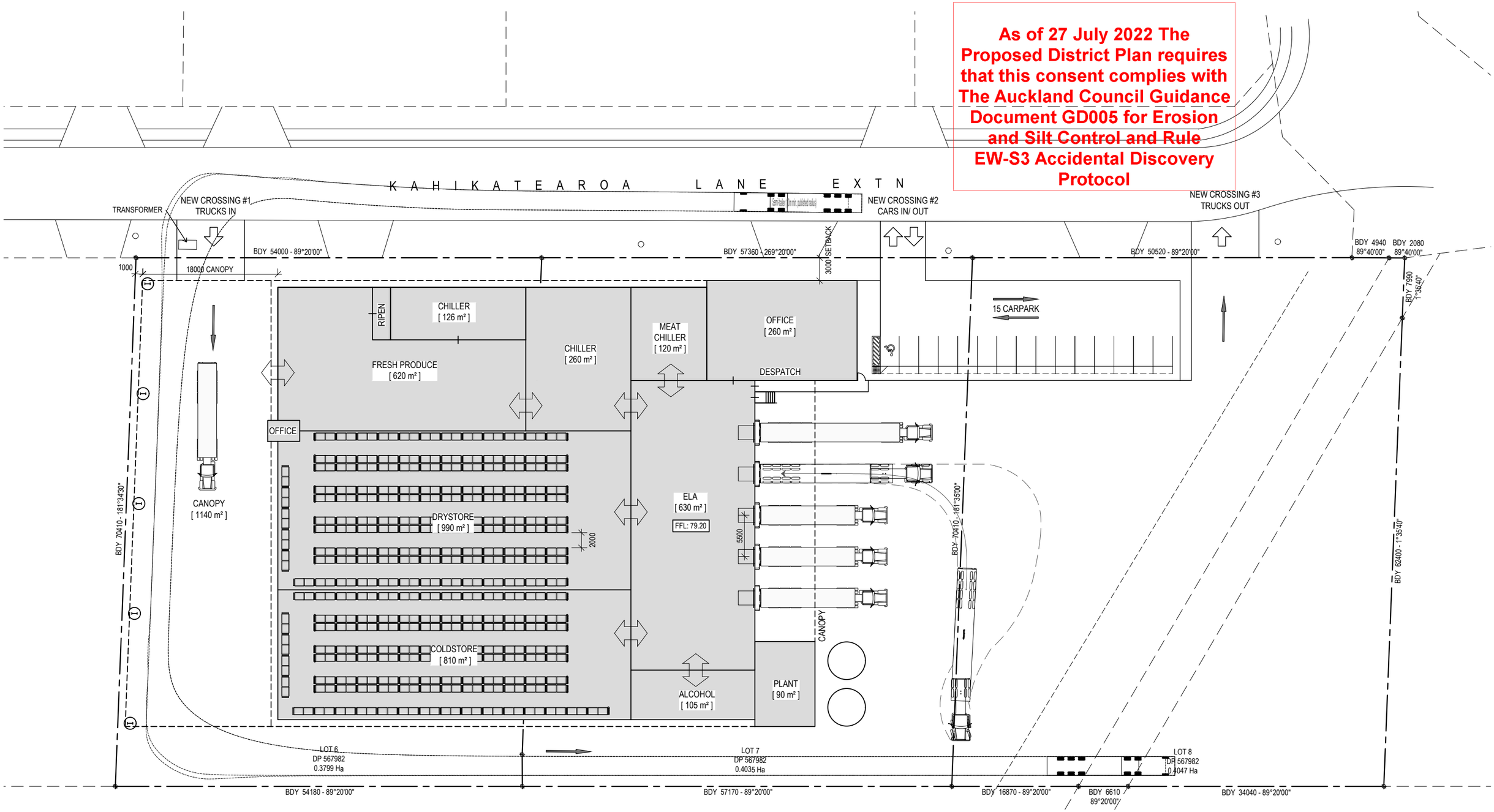
CHCH t +64 3 366 9849 f + 64 3 366 9923 mail@pswan.co.nz

DISTRIBUTION CENTRE DEVELOPMENT
SITE LOCATION

NORTH

LEGAL DESCRIPTION	
LOT:	6, 7, 8
DP:	567982
CT:	1019564, 1019565, 1019566
SITE AREA :	3799, 4035, 4047 m²
SITE ADDRESS:	KAHIKATEAROA LN WAIPAPA

As of 27 July 2022 The Proposed District Plan requires that this consent complies with The Auckland Council Guidance Document GD005 for Erosion and Silt Control and Rule EW-S3 Accidental Discovery Protocol



LEGAL DESCRIPTION	
LOT:	6, 7, 8
DP:	567982
CT:	1019564, 1019565, 1019566
SITE AREA :	3799, 4035, 4047 m²
SITE ADDRESS:	KAHIKATEAROA LN WAIPAPA

1 -- SITE PLAN
SCALE 1:500

FOR APPROVAL

Peter Swan Limited
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engineering | architecture | project management
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CLIENT: Bidfood | PROJECT TITLE: SITE DEVELOPMENT FOR: BIDFOOD LIMITED AT: WAIPAPA

DRAWING TITLE: SITE PLAN

NORTH

1:1 mm 0 10 20 30 40

			SCALE: A3 - 1:500 A1 - 1:250	ORIGINAL SHEET SIZE: A3
			DESIGNED: BB	CHECKED:
			DRAWN: CW	APPROVED:
				DATE: NOV 2022
FOR BUILDING CONSENT - STAGE 1	15-06-23	2	DRAWING No.: 110695 - P201	REV.: 2
FOR PRELOAD EARTHWORKS	02-06-23	1		
REVISION:	DATE:	No.:		

K A H I K A T E A R O A L A N E E X T N

TEMPORARY VEHICLE CROSSING

1000 7500 1000

SITE FENCE

INDICATIVE BUILDING EXTENT LINE

HATCHED AREA DENOTES EXTENT OF PRELOAD

C P231

BDY 54000 - 89°20'00"

BDY 57360 - 269°20'00"

BDY 56320 - 89°20'00"

BDY 4940 89°40'00"

BDY 2080 89°40'00"

BDY 3990 1°35'40"

TOPSOIL BUND

STABILISED CONSTRUCTION ENTRY

AGGREGATE (50-150mm WASHED)

10000 min

100 min

7500

INDICATIVE OUTLINE OF PRELOAD BATTER (BOTTOM)

TOP OF PRELOAD RL: 79.70

BDY 66186 - 181°35'00"

A P231

B P231

D P231

E P231

BDY 70410 - 181°34'30"

BDY 70410 - 181°35'00"

BDY 62400 - 1°35'40"

INDICATIVE OUTLINE OF PRELOAD BATTER (BOTTOM)

LOT 6 DP 567982 0.3799 Ha

INDICATIVE BUILDING EXTENT LINE

LOT 7 DP 567982 0.4035 Ha

LOT 8 DP 567982 0.4047 Ha

BDY 34180 - 89°20'00"

BDY 57170 - 89°20'00"

BDY 16870 - 89°20'00"

BDY 6610 - 89°20'00"

BDY 24040 - 89°20'00"

SILT FENCE - REFER TO DETAIL

EXCAVATE TO MINIMUM OF RL: 78.35 IN THIS AREA

1 -- EARTHWORKS PLAN - PRELOAD
SCALE 1:500

EARTHWORKS NOTES

APPROX. AREA OF PRELOAD;
- TOP OF PRELOAD BATTER; 4655 m²
- BOTTOM OF PRELOAD BATTER; 5325 m²

DENOTES SETTLEMENT MONITORING PINS (REFER HAIGH WORKMAN REPORT 22-189)

78·77 DENOTES EXISTING SPOT LEVELS

FOR APPROVAL

1:1 mm 0 10 20 30 40

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CLIENT: Bidfood

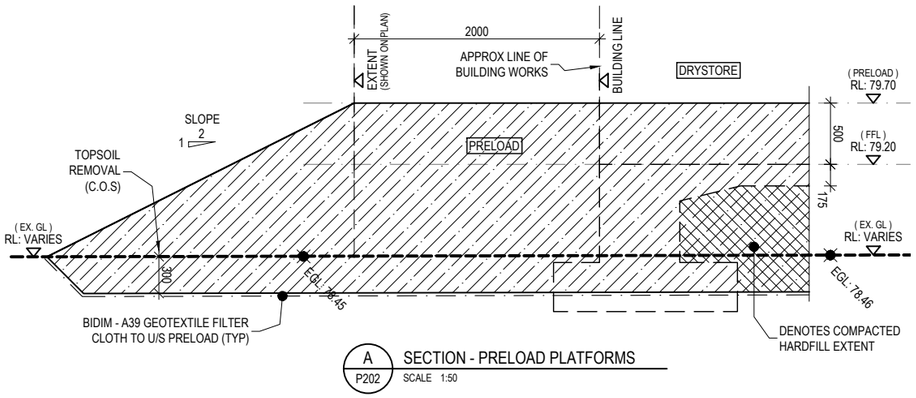
PROJECT TITLE:
NEW DISTRIBUTION CENTRE
FOR:
BIDFOOD LIMITED
AT:
LOTS 6-9 KAHIKATEAROA LANE, WAIPAPA

DRAWING TITLE:
EARTHWORKS PLAN

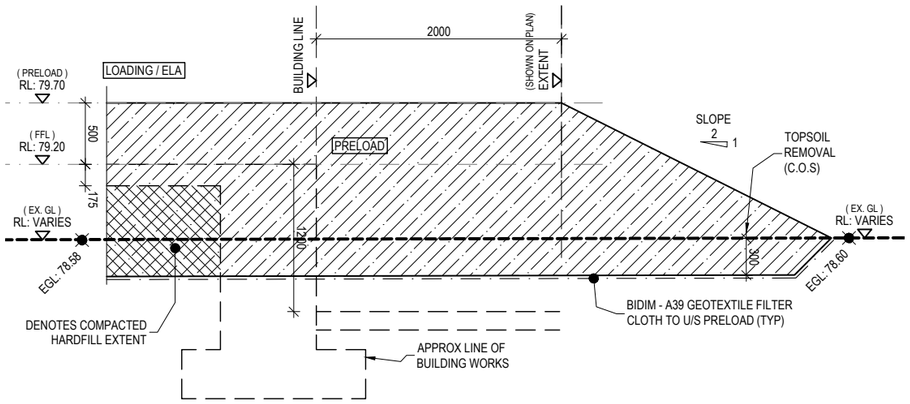
NORTH

REVISION:	DATE:	No.:
FOR BUILDING CONSENT - STAGE 1	30-06-23	3
FOR BUILDING CONSENT - STAGE 1	15-06-23	2
FOR PRELOAD EARTHWORKS	02-06-23	1

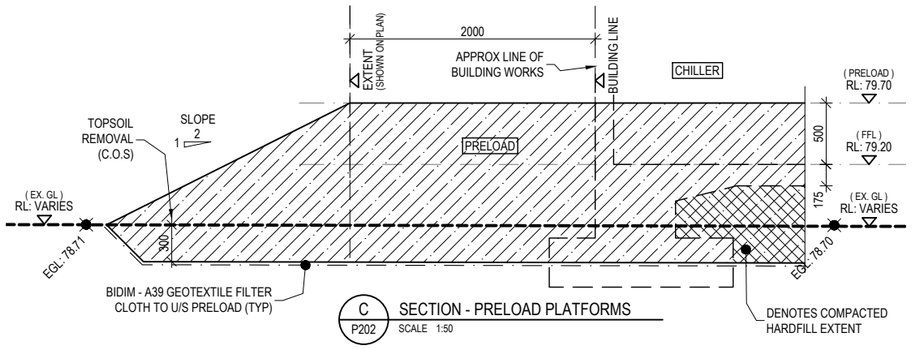
SCALE: A3 - 1:500 A1 - 1:250
ORIGINAL SHEET SIZE: A3
DESIGNED: BB
CHECKED:
REF: --
DRAWN: CW
APPROVED:
DATE: MAY 2023
DRAWING No.: 110695 - P202
REV.: 3



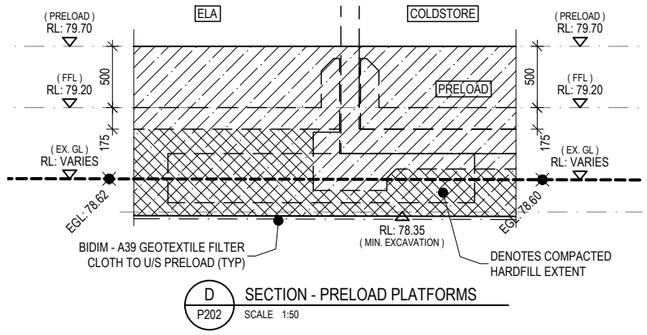
A P202 SECTION - PRELOAD PLATFORMS
SCALE 1:50



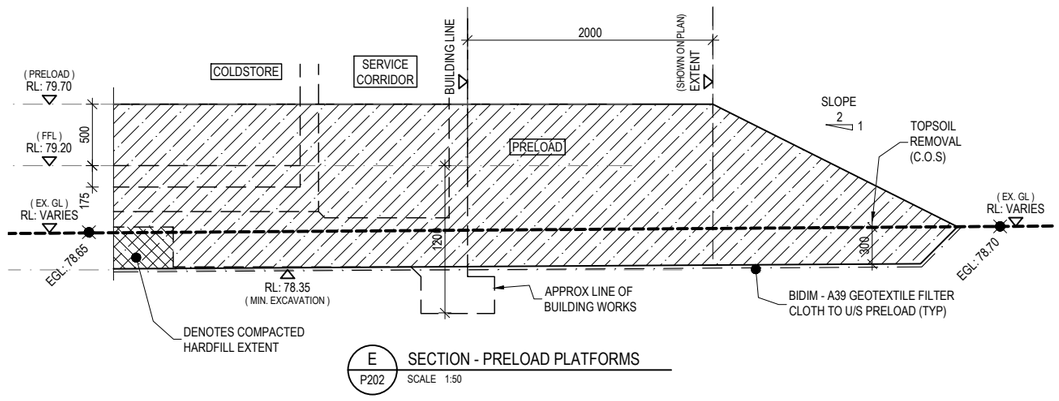
B P202 SECTION - PRELOAD PLATFORMS
SCALE 1:50



C P202 SECTION - PRELOAD PLATFORMS
SCALE 1:50



D P202 SECTION - PRELOAD PLATFORMS
SCALE 1:50



E P202 SECTION - PRELOAD PLATFORMS
SCALE 1:50

FOR APPROVAL

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CLIENT: Bidfood
PROJECT TITLE: SITE DEVELOPMENT FOR: BIDFOOD LIMITED AT: WAIPAPA

DRAWING TITLE: EARTHWORKS SECTIONS

1:1 mm 0 10 20 30 40

SCALE: A3 - 1:50	A1 - 1:25		ORIGINAL SHEET SIZE:	A3
DESIGNED: BB	CHECKED:		REF: --	
DRAWN: CW	APPROVED:		DATE: MAY 2023	
FOR BUILDING CONSENT - STAGE 1	15-06-23	2	DRAWING No.: 110695 - P231	REV.: 2
FOR PRELOAD EARTHWORKS	02-06-23	1		
REVISION:	DATE:	No.:		