ENGEO

Expect Excellence

Geotechnical Investigation - Stage 2 - 6

Yaldhurst Park

Yaldhurst

Christchurch

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06.12.2018

15518.000.000_02

ACENZ

Contents

Tables

Figures

Appendices

ENGEO Document Control:

Report Title	Geotechnical Investigation - Stage 2 - 6 - Yaldhurst Park, Yaldhurst			
Project No.	15518.000.000	Doc ID	02	
Client	Infinity Yaldhurst Limited	Client Contact	Paul Croft (Infinity Yaldhurst Limited), Richard Graham (Graham Surveying)	
Distribution (PDF)	Richard Graham (Graham Surveying)			
Date	Revision Details/Status	WP	Author	Reviewer
06/12/2018	Final	DF	HF	DEB

1 Introduction

ENGEO Ltd was requested by Infinity Yaldhurst Limited to undertake a Geotechnical Investigation - Stage 2 - 6 for the proposed 191 lot subdivision as outlined in our proposal (ref: P2018.001.727, dated 5 October 2018).

The property at Yaldhurst Park is located south of Yaldhurst Road, and is currently a partially developed subdivision. The purpose of this investigation was to comment on the suitability of the site for residential subdivision, and address the requirements of Section 106 of the Resource Management Act (RMA). To accomplish this, we have developed a geological model of the site, assessed the likely future land performance, and provided recommendations for subdivision works with preliminary geotechnical recommendations related to the design of foundations for typical timber framed residential dwellings.

Our overall scope for the site was to assess and provide geotechnical guidance related to the proposed development of 191 residential lots in two separate stages, diversion of the existing stream, and provide guidance related to stormwater basin design.

As requested by Infinity Yaldhurst Limited, we provided a specific assessment for Stage 1 of the works, which included geotechnical guidance related to the proposed development of 41 residential lots (blue outline in subsequent figures in this report) dated 9 November 2018 (reference 15518.000.000_01). The Stage 1 geotechnical report should be read in conjunction with this report.

Our geotechnical assessment for the remaining 150 lots that are located within Stages 2 through 6 (Figures 2 & 3), comments on the geotechnical aspects of the diversion of the existing stream, and guidance related to the stormwater basin design is provided within this report.

Our scope of works for Stages 2 through 6 included the following:

- Complete a desktop study of relevant available geotechnical and geological publications, including the New Zealand Geotechnical Database.
- Visit the site and undertake a geotechnical site walkover.
- Organise and technically supervise the excavation up to 30 test pits and associated Scala penetrometer and Shear Vane tests to a maximum depth of 3 m below ground level (or to native gravel) including geotechnical logging of the exposed soils, to assess the near surface material types and strength characteristics.
- Organise and technically supervise the drilling of up to four machine boreholes with SPTs at 1.5 m intervals to a target depth of 10 m below ground level. This includes geotechnical logging of the core to assess the deep soil types, strength characteristics and ground water depth, (as applicable).
- Preparation of this report outlining our findings on the ground conditions, and the suitability of the site for residential subdivision of Stages 2 to 6 (150 lots). This includes provision of geotechnical advice on the likely foundation Technical Category, conceptual foundation recommendations for typical timber-framed residential dwellings, and an assessment of the likely Geohazards required by Section 106 of the RMA.

2 Site Description

The development covers approximately 16.1 hectares including proposed parks, reserves, roads and existing waterways (Figure 1).

Stages 2 to 6 (approximately 11.8 hectares) is bound by an existing residential development south of the site, lifestyle blocks and farmland west of the site, and further residential development to the north and east of the site. Sir John McKenzie Ave, which was previously formed during prior subdivision development, intersects the subdivision. Stage 1 is outlined in blue as the area which has been previously assessed and has a geotechnical report issued (as outlined in Section 1).

The predominantly flat, to gently undulating site is partially developed land with stockpiled silt, fill, and unknown material observed in areas ‘1C’ and areas ‘5A’, ‘5B’ and ‘5C’on the southern and eastern sides of the proposed development (Figures 2 & 3).

A stream, on the south-western corner of the site, is planned to be diverted during earthworks. Geotechnical recommendations for stream diversion are outlined in following sections of this report. Parks and areas of recreation are planned to run adjacent to the stream and beneath the row of electrical pylons intersecting the proposed subdivision (Figure 2). There are no significant watercourses mapped within the vicinity of the proposed development area.

Figure 1: Site Location and Subdivision Plan

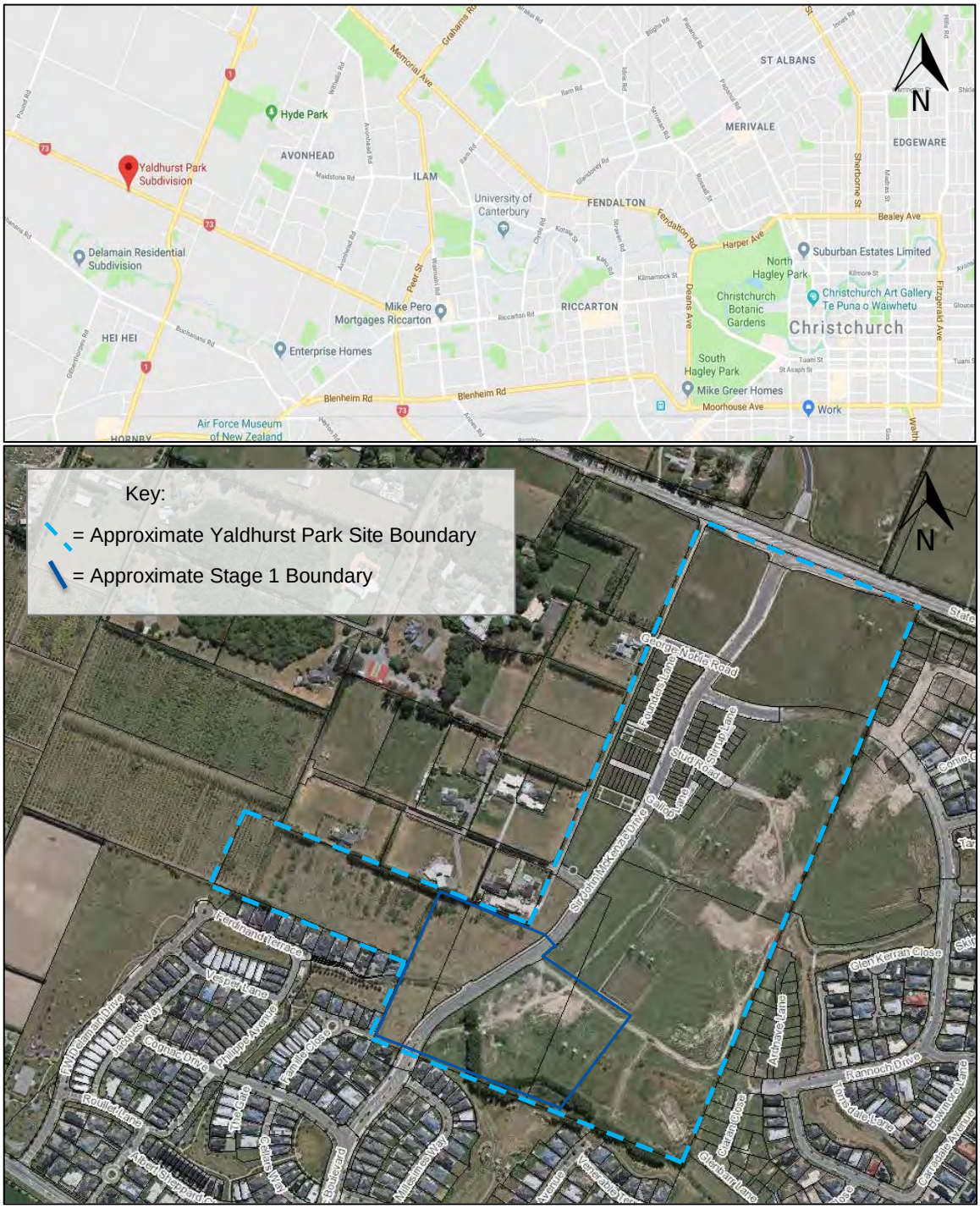

Image sourced from Canterbury Maps. Not to scale.

3 Development Proposal

Based on the Graham Surveying Limited Subdivision plans dated June 2018 (drawing number: GSL18036-CS-001 and GSL18036-CS-002) we understand that it is intended to subdivide stages 2 to 6 into 150 residential lots with multiple areas of recreation (Figure 2 and Figure 3). Lot sizes vary between 305 m² to 1520 m². A stream with associated recreation and park areas intended for public use will be incorporated within the development footprint.

We anticipate that future earthworks at the site for the residential development in Stages 2 to 6 will be limited to minor cut and fill to form building platforms and access ways. We anticipate moderate cut and fill to remove the stock piles of fill in stages 1C, 5A, 5B and 5C, to divert and form the proposed new stream location in stages 1B and 5C, to backfill the existing stormwater retention basin in stage 5C, and excavate the proposed stormwater basins on the western side of Stage 2.

Future buildings are anticipated to comprise conventional lightweight, timber framing and roof elements over a maximum of two-storeys.

Figure 2: Proposed Subdivision Development – Stages 1, 2, 3 and 5 (Stage 1 outlined in blue)

Image sourced from Graham Surveying proposed plans (Ref: GSL18036-CS-001 dated, 26 June 2018). Not to scale.

Figure 3: Proposed Subdivision Development – Stages 4 and 6

Image sourced from Graham Surveying proposed plans (Ref: GSL18036-CS-002 dated, 26 June 2018). Not to scale.

4 Published Geotechnical Information

4.1 Regional Geology

The site has been regionally mapped by Brown and Weeber (1992) as being underlain by dominantly alluvial sand and silt overbank deposits (Figure 4) and by GNS (Forsyth et al., 2008) as being underlain by river alluvium.

Figure 4: Site Geology

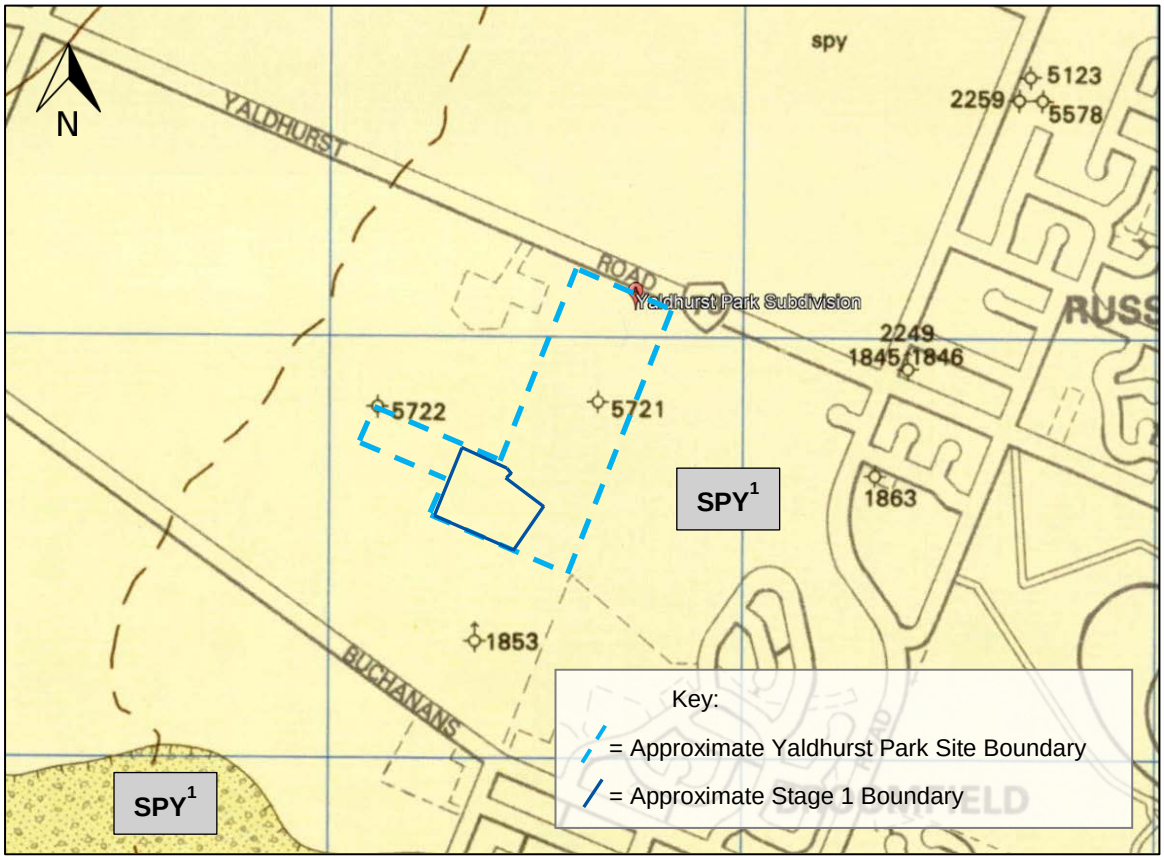

Image sourced from Google Earth with the Brown and Weeber (1992) map overlay sourced from the New Zealand Geotechnical Database (NZGD). Not to scale.

[1] SPY = Dominantly alluvial sand and silt overbank deposits

4.2 CERA Land Classification

The Canterbury Earthquake Recovery Authority (CERA, now disestablished) has categorised the site as 'N/A Urban Non-residential', meaning future development can proceed following normal consenting processes. While the site itself does not have a specific technical classification (TC) as it is not zoned residential, nearby residential sites are classified as TC1 where "future land damage from liquefaction is unlikely", and "shallow soil strength testing which is standard for all homes" is required (Figure 5).

Figure 5: MBIE Residential Technical Categories Overlay

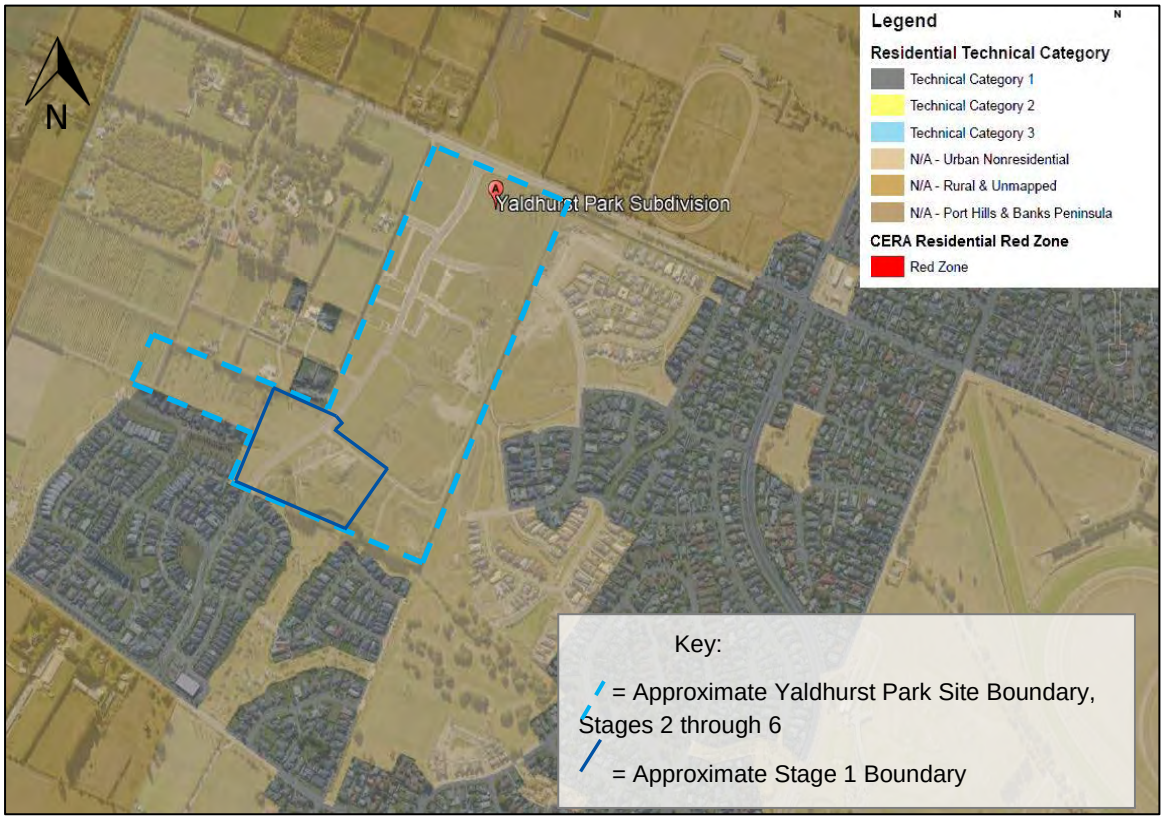

Image sourced from Google Earth with the MBIE Residential Technical Categories map overlay sourced from the New Zealand Geotechnical Database (NZGD). Not to scale.

4.3 New Zealand Geotechnical Database

Subsurface and Earthquake Specific Data

We have reviewed the NZGD and summarised the data relevant to this site in Tables 1 and 2. Publicly available nearby deep testing is summarised in Table 1 and with the location of this testing depicted in Figure 6.

Table 1: Summary of Near Site Investigations

CPT / Borehole Identifier	Position Relative to Site	Depth of Exploration (m)
BH_112631	100 m to the north	6.08
TP_93731	100 m to the north	2.7
TP_93730	100 m to the north	2.6
BH_72200	500 m to the south	5.27

Figure 6: Publicly Available Near-by Site Investigations

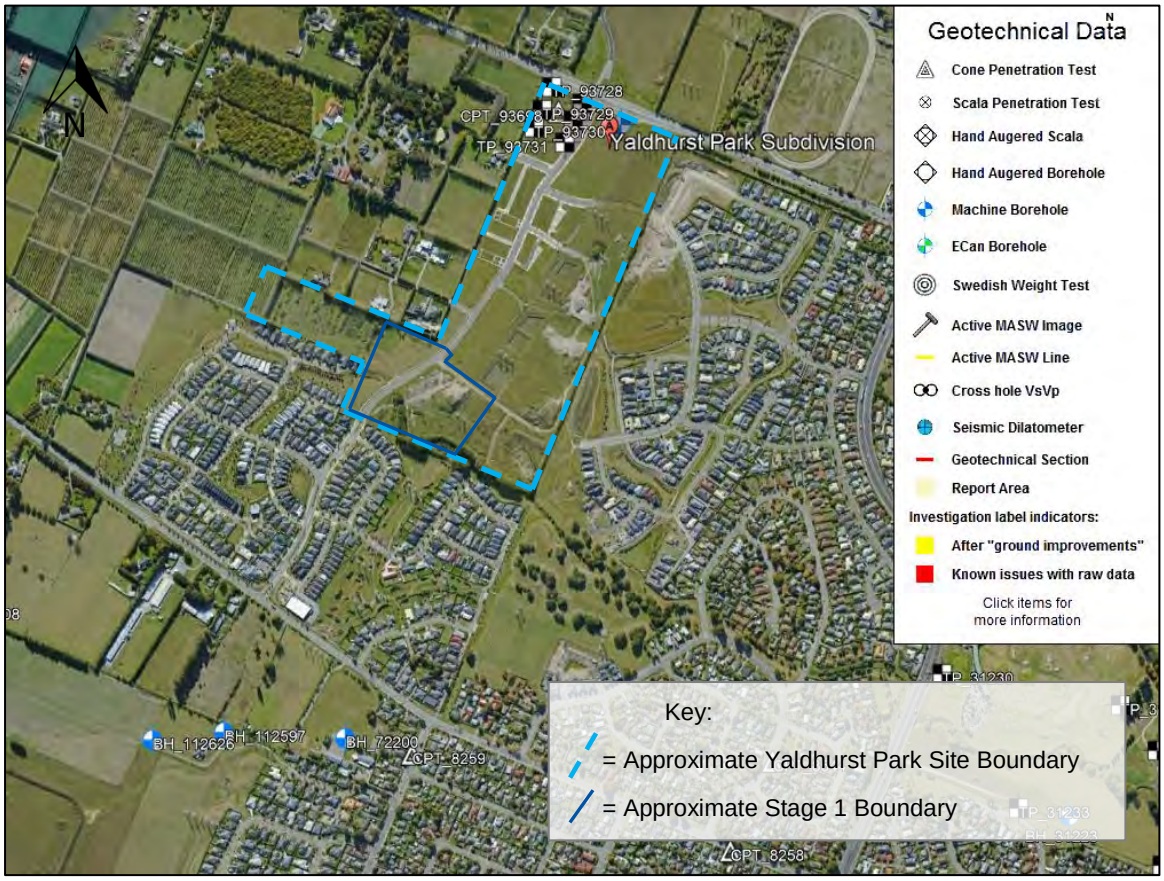

Image sourced from Google Earth with the Surrounding Investigation Data map overlay sourced from the New Zealand Geotechnical Database (NZGD). Not to scale.

Table 2: Summary of Earthquake Specific Data

	Events			
	4 Sept 2010 (Mw 7.1)	**22 Feb 2011 (Mw 6.2)**	**13 Jun 2011 (Mw 6.0)**	**23 Dec 2011 (Mw 5.9)**
Median PGA (g)	0.28	0.23	0.12	0.12
PGA Probable Range (g)1	0.17 to 0.41	0.13 to 0.35	0.07 to 0.19	0.07 to 0.19
PGA7.5 (g)2	0.25	0.16	0.08	0.08
170% of SLS	Sufficient	Not Sufficient	Not Sufficient	Not Sufficient
10th Percentile >SLS	Sufficient	Sufficient	Not Sufficient	Not Sufficient
Liquefaction and Lateral Spreading Observations (EQC)	No observed liquefaction ejecta (road observations)	No observed liquefaction ejecta (road observations)	No observed liquefaction ejecta (road observations)	No data available
Site Specific Aerial Photograph Liquefaction Interpretation3	No data available	No obvious evidence of liquefaction ejecta at the site or the surrounding area	No data available	No data available
Mapped Ground Cracks	No mapped cracks on site, or mapped within 150 m of the site.			

[1]Range for one standard deviation either side of the mean.

[2]Using Idriss and Boulanger (2008) magnitude scaling factor.

[3]Interpreted by ENGEO.

Groundwater

Groundwater has been regionally mapped by both GNS Science (GNS) and EQC to be greater than 6 m below the ground surface at the time of the 2010 - 2011 Canterbury earthquake sequence. The closest measurement well is approximately 1.5 km west and 1.5 km north of the site.

LiDAR and Ground Movement

EQC has prepared maps showing the change in surface elevation and horizontal deformation, as measured by a series of aerial LiDAR surveys. GNS has created a “dislocated tectonic contour model” which shows the tectonic uplift or subsidence on a regional level based on survey of discrete benchmarks on bedrock outcrops across the Canterbury region. Subtracting the tectonic component of vertical deformation from surveyed ground levels gives an indication of vertical deformation from soil subsidence.

LiDAR maps prepared for the EQC generally show a cumulative subsidence of approximately up to 100 mm across the site.

4.4 Historic Aerial Photography

We reviewed limited aerial photographs of the site dating back to 1941 and describe relevant observations below:

- Prior to 1941, the site appears to have been developed with a track for horse training and outside of the horse training track has been used for agricultural purposes. The stream locations observed in the 1941 aerial photography, appear to be in the same locations as present.
- Between 1941 and 1950, the size of the horse racing track increased (Figure 7).
- Between 1960 and 1970, a row of pylons had been constructed in the same location as the present location.
- Between 1980 and 1990, the site had been developed into an orchard (Figure 8).
- Between 2000 and 2011, the site had been cleared and the development begun for the existing subdivision.

Figure 7: 1950 Aerial Photography

Image sourced from Canterbury Maps with the 1950 aerial photo overlay. Not to scale.

Figure 8: 1990 Aerial Photography

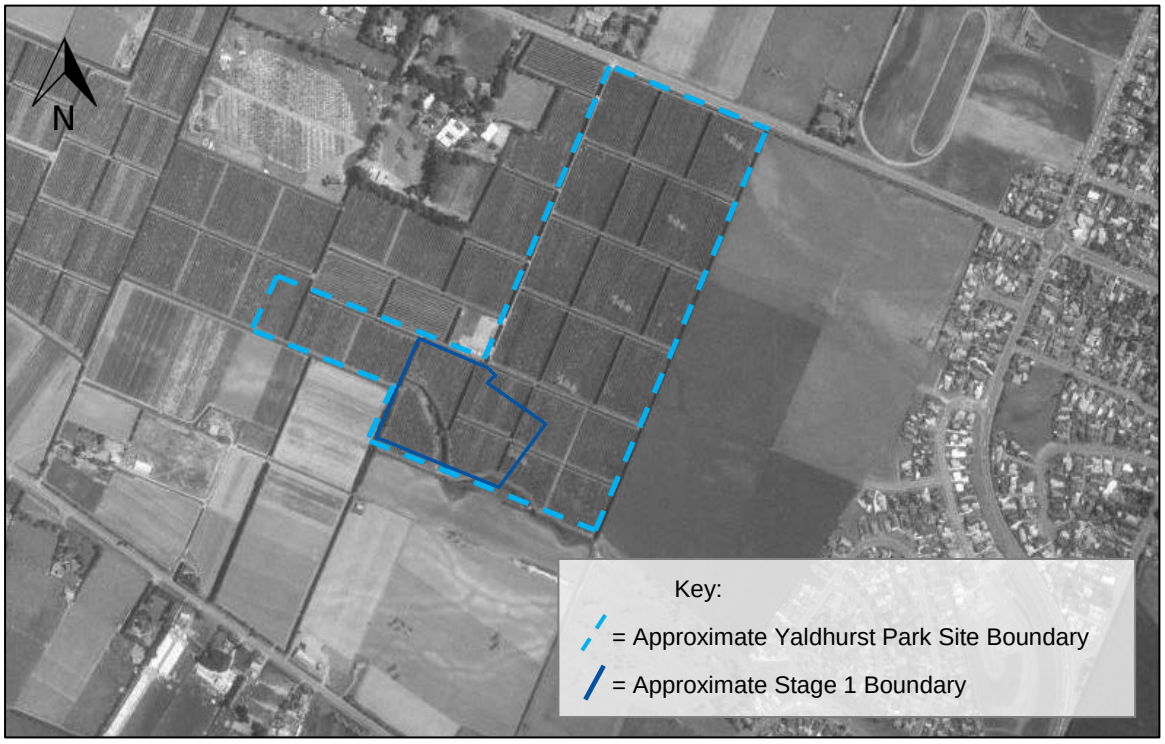

Image sourced from Canterbury Maps with the 1990 aerial photo overlay. Not to scale.

Figure 9: 2011 Aerial Photography

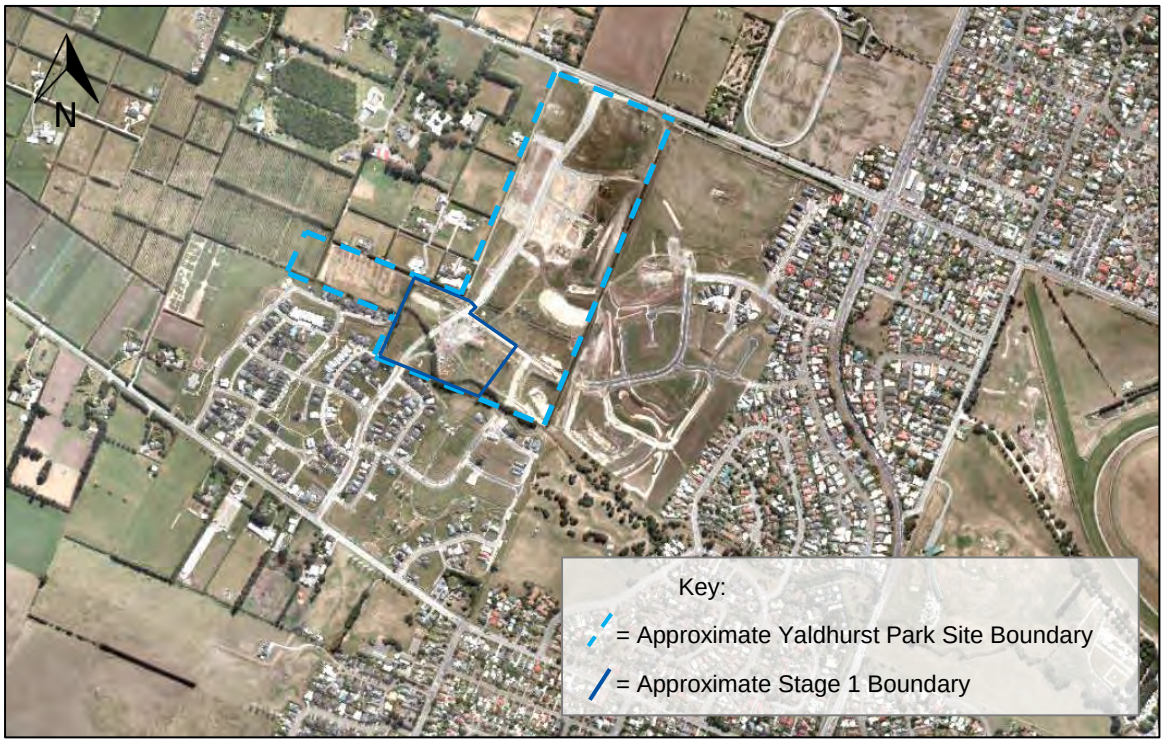

Image sourced from Canterbury Maps with the 2011 aerial photo overlay. Not to scale.

4.5 Minimum Floor Levels for Flood Mitigation

The Christchurch City Council (CCC) and CERA have released updated recommended floor levels for flood avoidance for properties in the Avon, Heathcote and Styx river catchments, as well as Sumner. The site is located outside the “CCC City Plan – Flood Management Area”, and specific floor level recommendations are not provided by the Council. CCC should be contacted for specific floor level elevations related to the site prior to finalised development.

5 Site Investigation

ENGEO visited the site on 24 October and 23 November 2018 and made the following observations which are also depicted in photographs presented in Figure 10:

- The subdivision is currently partially established from the work completed by a previous developer. Some formed roads, partially formed roads, partially formed lots, public recreation areas and stormwater basins (Photo 1) have been constructed.
- A stream is running east to west on the southern side of Stage 1 and Stage 5C of the development, and the base of the streambed is approximately 1.5 m below adjacent ground level (Photo 1). Approximately 200 mm to 400 mm of water was observed in the base of the stream at the time of our site visit. We understand that the stream is planned to be diverted during the earthworks stage of development.
- A row of electrical pylons run through the proposed development with retention basins constructed adjacent to the pylons (Photo 2 and depicted in Figure 2 & 3)
- In the area of Stages 1C, 5A, 5B and 5C a series of fill, silt and unknown material stockpiles were observed (Photos 3 & 4). Through discussions with the client, these stockpiles are to be removed or re-used (depending on soil type) during the proposed earthworks and development of the site.
- In Stage 2 a series of stockpiles of organic material and unknown material stock piles were observed (Photo 5). Through discussions with the client, these were likely the old orchard trees which were removed and stockpiled. An existing orchard was observed in the north-eastern most corner of Stage 2.
- In Stage 4 and Stage 5B, localised areas of contaminated soils were flagged by a previous environmental consultant (Figure 11). At the request of the client, we avoided these areas during our subsurface investigation.
- In the south-eastern corner of Stage 5C we observed an existing stormwater retention basin excavated approximately 2.5 m to 3 m below adjacent ground level (Photo 6). Through discussions with the client, it is proposed to fill this basin with engineered fill during the earthworks stage of this project.
- No obvious evidence of lateral stretch across the site was observed during our site visit. However, owing to the vegetation, stock piles, soft soil and machine activity on-site, minor ground cracks could have been concealed.
- No obvious signs of earthquake-induced land damage such as lateral spreading, sand boils or other features that we would associate with liquefaction, or fault rupture was observed at the time of our site visit.

Site photographs are presented in Figure 10.

Figure 10: Site Photographs

Photo 1: Stage 1 of Yaldhurst Park Subdivision development. Stream described above in the foreground (black arrow).

Photo 2: Electrical pylons observed to intersect the subdivision development. Existing storm water retention basins adjacent to the pylons (black arrow).

Photo 3: Silt, fill and unknown material stockpiles observed in Stages 1C, 5A, 5B and 5C of the development. Row of electrical tower pylons with adjacent stormwater retention basins observed.

Photo 4: Areas of stockpiled fill within Stage 5B. Stock piles are overgrown and the material type is unknown.

Photo 5: Organic and unknown stockpiles observed in Stage 2 of the development. The client indicated these are likely to be old orchard trees.

Photo 6: Stormwater retention basin observed in Stage 5C approximately 2.5 to 3 m below adjacent ground level.

6 Subsurface Investigation

ENGEO completed a site investigation on 24 October 2018 to assess the shallow subsurface material types and strength characteristics within Stages 2 to 6 of the Yaldhurst Park Subdivision Development. The investigations comprised of 30 test pit investigations with associated Scala penetrometer tests to assess the near surface soil types and strength characteristics.

We also completed site investigation to assess the deep subsurface materials on 23 November 2018 to 27 November 2018 which comprised of four machine boreholes drilled to a target depth of 10 m with 1.5 m SPT's to assess the soil types, strength characteristics and ground water depth (if applicable).

The locations of all tests are shown in Figure 11 (and Appendix 1) and our findings are detailed in the following sections.

Figure 11: Site Investigation Locations

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 3.

Table 3: Generalised Summary of Subsurface Conditions

Soil Type	Depth to top of layer (m)	Layer Thickness (m)	Density / Consistency	Comment
TOPSOIL / FILL	0.0	0.2 to 0.5	Firm to Stiff / Loose to Medium Dense	-
SILT / SAND	0.5	1.5 to 2.4	Stiff to Very Stiff / Loose to Dense	Varies between silt and sand depending on test pit location
Sandy GRAVEL	2.0 to 10.91*	Unknown	Medium Dense to Very Dense (inferred from SPT results)	-

- Subsurface profile below approximately 2.9 m inferred from the machine boreholes.

No standing water was observed in any of the test pit excavations. Standing water was observed between 7.5 m bgl in BH02 and 9 m bgl in BH03. In both BH01 and BH04, no standing water was observed within the depth drilled, 10.91 m.

Test pit and borehole locations are shown in Figure 10 and in the Site Plan presented in Appendix 1. Test pit logs, showing detailed soil descriptions are presented in Appendix 2. Borehole logs, showing detailed soil descriptions are presented in Appendix 3.

6.1 ECan Boreholes

A review of five deep ECan borehole logs located onsite, M35/5721, M35/11334, M35/11335, M35/11336 and M35/11338 was conducted (Canterbury Maps). The location of these boreholes is presented in Figure 12 and includes well points that have no log data available. The logs from all five holes of interest are presented in Appendix 3 and indicate the site is underlain by gravel and sandy gravel with thin slit and clay layers to depths of at least 15 m below ground level.

6.2 ECan Groundwater

Groundwater is recorded in the surrounding ECan boreholes between approximately 13.9 m and 14.9 m depth. These ground water depths are a function of the slotted depth of the wells installed for groundwater well pumping, and do not necessarily represent the actual groundwater depth at the site.

Figure 12: Nearby ECan Borehole Locations

Image sourced from Canterbury Maps (November 2018). Not to scale.

6.3 Site Seismic Class

In accordance with NZS 1170.5:2004, site classification “Class D” applies to this particular site, defining it as a ‘deep soft soil site’.

7 Liquefaction Assessment

7.1 Canterbury Earthquake Sequence Ground Shaking

Bradley and Hughes (2012) have developed a contour map of the conditional median peak ground accelerations (PGA) interpolated from data measured at various recording stations during the 2010 - 2011 Canterbury earthquake sequence. The PGA contour map was created by combining the prediction from an empirical ground motion model of the fault rupture with the PGA recorded at strong motion sites. The conditional median PGA experienced at the site during the major Christchurch earthquake events using the published contour mapping are presented in Table 2.

Based on the model by Bradley and Hughes (2012), and earthquake magnitude scaling to M7.5, we can conclude that the site, under the 10th percentile test, has undergone more than 170% of the serviceability limit state (SLS) level seismic event for the September 2010 and February 2011 earthquake event. According to Appendix D1 of the MBIE Guidance, the site can therefore be regarded as having been sufficiently tested for a SLS event.

7.2 Liquefaction and Lateral Spreading Analysis

For comparison to the "index values" in the MBIE Guidance document, we performed liquefaction analyses using on-site SPT (borehole) data and based on the liquefaction triggering methodologies presented by Boulanger and Idriss (2014). For the SLS and ULS events, from our site investigation, a conservative groundwater depth of 7 m was used for the analysis.

The main input parameters used in our assessment include the following:

- Three ground motions (2 SLS motions, and 1 ULS motion) as outlined below:
    - ULS = PGA of 0.35 g / Magnitude of 7.5
    - SLS Case 1 = PGA of 0.13 g / Magnitude of 7.5
    - SLS Case 2 = PGA of 0.19 g / Magnitude of 6.0
- A probability of liquefaction triggering curve (PL) of 15% (deterministic curve).

Liquefaction analyses are included as an attachment to this document and calculated settlements are summarised in Table 4. We note that the settlements provided are for an undeveloped site and that settlements beneath the dwelling are likely to be greater.

Table 4 presents the results of our liquefaction analysis under ULS and SLS loading.

Table 4: Summary of Liquefaction and lateral spreading analysis

Design Case	Calculated Vertical Settlement[1]	
	Total	Upper 10 m
ULS	<10 mm	<10 mm
SLS	<10 mm	<10 mm

[1]For an undeveloped site. Settlements beneath buildings are likely to be greater.

Due to the groundwater depth and ground conditions observed in our geotechnical investigation, we anticipate that liquefaction is unlikely to occur under SLS level and ULS earthquake ground motions. Calculated vertical settlements in the upper 10 m were estimated to be less than 10 mm under both SLS and ULS.

The analysis considers volumetric strain and does not account for ground loss due to ejecta. Owing to the thickness of the non-liquefiable layer above the ground water level (7 m), the minimal liquefiable layers and potentially liquefiable material below the groundwater table, sand boil formation and ejecta are unlikely to occur at the site under both SLS and ULS shaking.

The liquefaction analysis is attached to this report.

7.3 Technical Classification – Stages 2 to 6 of Yaldhurst Park Development

Based on our site investigation and observations, and owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading to be low within Stages 2 to 6 of the Yaldhurst Park Subdivision.

We therefore consider that Stages 2 to 6 of the proposed subdivision to have Technical Category 1 (TC1) related to future land performance where by future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.

8 RMA Section 106 Requirements and Suitability to Subdivide

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant a subdivision consent, or may grant a consent subject to specific consent conditions if the land is likely to be subject to the following:

- Erosion, including surface and subsurface erosion, associated with water and wind.
- Falling debris, including rockfall that could impact the site from upslope sources.
- Subsidence, which involves the removal of underlying support by natural or artificial means.
- Slippage, which is defined as the downslope transfer of materials by sliding and / or flowage.
- Inundation, which may be sourced from streams, coastal processes or excess precipitation.

Based on our observations and the nature of the site, its performance during the CES, and the site's distance from the nearest significant watercourse, we consider it is unlikely for the site to be subject to any of the above hazards. As such, the site is considered suitable for subdivision from a geotechnical perspective.

9 Preliminary Geotechnical Recommendations

9.1 Earthworks

For planning purposes, structure footprints should be set back at least 10 m from any water course. Earthworks carried out for the subdivision shall be in accordance with NZS 4404:2010, Land Development and Subdivision Infrastructure and NZS 4431:1989, Code of Practice for Earthfilling for Residential Development. In particular, any areas to receive fill should be stripped of any vegetation, topsoil, non-engineered fill, soft or organic soils prior to fill placement.

Fill may comprise clean natural sandy gravel, sandy or silty soils, or clean imported soils and / or granular fill, compacted to achieve no less than 95% of maximum dry density. Fill faces steeper than 2:1 (horizontal to vertical) and higher than 600 mm should be retained or specifically designed and referred back to ENGEO. Although unlikely, where any springs or groundwater seeps are encountered, they should be intercepted with suitable drainage and discharged to a Council approved outlet.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.

9.2 Stream Diversion

Where the stream in planned to be diverted, directly effecting Lots 105 and 106, any soft, wet, and organic soils should be removed prior to placement of engineered fill. The engineered fill should be benched into the sides of the former stream bank and the differential fill thickness under specific building footprints should be less than 1.5 m.

We will provide a subsequent document with specific earthworks recommendations for the proposed diversion of the stream.

9.3 Stormwater Retention Basin Design

All unretained batters of pond and stormwater drains constructed with the native silty, sandy, or sandy gravel material should be at an inclination no steeper than 1V:3H, with protection schemes in place to control erosion of the formed batters within the waterways.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.

9.4 Subdivision Roading

Vegetation, any organic or deleterious material, topsoil and non-engineered fill should be removed from under pavement areas prior to aggregate placement. Based on our observations during testing, we consider the native ground below the topsoil at the site should provide an adequate subgrade for the proposed pavement areas. However, specific testing of the roadway subgrade should be accomplished to provide CBR values that can be utilised for the design of the roadways

9.5 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system or an alternative disposal point subject to approval from Council. Uncontrolled stormwater must not be allowed to saturate the ground as this will potentially affect future foundation performance both statically and during future seismic activity.

9.6 Foundations

Foundations for future proposed residential dwellings within the subdivision may comprise pad, strip or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings.

For planning purposes, a preliminary geotechnical Ultimate Bearing Capacity of 200 kPa may be assumed for foundations bearing on native sandy or silty soils, or engineered fill, below any topsoil. We anticipate the bearing layer to be between 0.2 m to 0.5 m depth based on our subsurface investigations.

Lot specific testing as defined in Module 2 of MBIE Earthquake Geotechnical Engineering Practice (Nov 2016) should be accomplished as part of the design level geotechnical report to provide final foundation design recommendations as ground conditions may vary across the site. Subgrade conditions should be confirmed during construction by a suitably qualified geotechnical professional.

10 Additional Considerations

- A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.
- ENGEO should be given the opportunity to review the geotechnical aspects of the grading plan prior to submitting for Building Consent;
- ENGEO has been engaged to observe the excavations during construction to assess the suitability of the subgrade prior to placement of any fill, test fill for verification of compaction, and to assess that the recommendations presented in this report have been interpreted as intended.
- Lot specific subsurface testing as defined in Module 2 of MBIE Earthquake Geotechnical Engineering Practice (Nov 2016) should be accomplished as part of the design level geotechnical report to provide final foundation design recommendations.

11 References

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We also acknowledge the New Zealand GeoNet project and its sponsors EQC, GNS Science and LINZ, for providing data used in this report.

12 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Infinity Yaldhurst Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

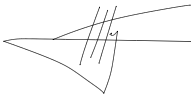
iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineers NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by



Hamish Foy

Geotechnical Engineer

Report reviewed by

Don Bruggers, CMEngNZ (CPEng)

Principal Engineer

APPENDIX 1:

Testing Location Plan

DATE PLOTTED: 30 November 2018 11:13:54 a.m. BY: rwilliams

Legend

- Test pit / Borehole
- Test pit
- Culvert
- Asbestos
- Stage 1 boundary
- Property title boundary

Aerial: LINZ and Eagle Technology, CC-BY-3.0-NZ.
Map image: Eagle Technology, CC-BY-3.0-NZ.
Development image: Graham Surveying
GSL18036-CS-001 Rev3

0 60 120
Metres

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

ENGEO

Christchurch Office
124 Montreal Street, Sydenham, Christchurch 8023
Tel: 03 328 9012, www.engeo.co.nz

Title:
Grtound investigation plan

Client: Infinity Yaldhurst Limited		Figure No: 1
Project: Yaldhurst Park Yaldhurst Road Christchurch	Designed: HF Drawn: RW Checked: XX Date: Nov 18	Size: A3
Proj No: 15518.000.000	Scale: 1:2,250	Revision: A

ORIGINAL FIGURE PRINTED IN COLOUR

PATH: \\nzfile\crd\Projects\15501 to 15600\15518 - Yaldhurst Park Development\06 CAD-GIS & Figures\F01 TestingLayout.mxd

APPENDIX 2:

Test Pit Logs

LOG OF TEST PIT TP01

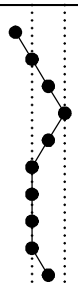
Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.520219
Longitude : 172.5257

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F	
0.4	F		ML	SILT with some fine to medium sand; brown. Low plasticity [FILL].				S-F	
0.5	ALLUVIUM		SP	Fine to medium SAND with some silt; brownish grey. Poorly graded.				L-MD	
1.5			ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	F-St	
2.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				MD	
3.0				Encountered trace gravel from 2.9 m depth. Gravel, medium to coarse, subrounded to rounded.					
				Depth of Excavation: 3 m Termination Condition: Target depth					

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12



Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL
F = FILL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP02

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.9 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.520803
Longitude : 172.525052

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand, trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.3	ALLUVIUM		ML	SILT with minor fine sand, trace gravel; brown. Low plasticity [FILL].				S-F		
0.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD		
1.0			ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	F-St		
2.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				MD		
2.9				Depth of Excavation: 2.9 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP03

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.9 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521154
Longitude : 172.52451

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	SILT with minor fine sand, trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD		
1.0			ML	Sandy SILT with; brownish grey. Low plasticity. Sand, fine to medium.			M	F-St		
1.5										
2.0										
2.5			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium.				MD-D		
3.0				Depth of Excavation: 2.9 m Termination Condition: Target depth						
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP04

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.5 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521512
Longitude : 172.524361

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0	TOPSOIL		ML	SILT with minor fine sand, trace rootlets; brown. Low plasticity [TOPSOIL].			D	S-F	
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.				S-F	
1.0			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD	
1.5			ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	F-St	
2.0			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium.				MD-D	
2.5				Depth of Excavation: 2.5 m Termination Condition: Target depth					
3.0									
3.5									

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP05

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.8 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521185
Longitude : 172.525992

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	F		ML	SILT with minor fine sand, trace gravel. trace rootlets; brown. Low plasticity [FILL].				S-F		
0.5	ALLUVIUM		ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.			M	S-St		
2.5			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium.				MD-D		
2.8				Depth of Excavation: 2.8 m Termination Condition: Target depth						

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

LOG OF TEST PIT TP06

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.520967
Longitude : 172.523773

Depth (m)	Material	Excavatability (Relative Scale) Easier / Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	FILL		ML	SILT with minor fine sand, trace gravel. trace rootlets; brown. Low plasticity [FILL].				S-F		
0.5	ALLUVIUM		ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.				S-F		
1.0			SP	Fine to medium SAND; brownish grey. Poorly graded.			M	L-MD		
1.5			ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.				F-Sf		
2.0			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium.				MD-D		
2.2				Depth of Excavation: 2.2 m Termination Condition: Target depth						
2.5										
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

F = FILL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP07

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.1 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521349
Longitude : 172.523357

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	SILT with some fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				0.3		
0.5	ALLUVIUM		ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.			M	S-St		
2.0			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium.				MD-D		
2.1				Depth of Excavation: 2.1 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP08

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521863
Longitude : 172.522961

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.			M	S-St		
1.0			SP	Fine to medium SAND with some silt; brownish grey. Poorly graded.				L-MD		
1.5			ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.				F-St		
2.0			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium.				MD-D		
2.5				Depth of Excavation: 2.2 m Termination Condition: Target depth						
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP09

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521816
Longitude : 172.523878

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F	
0.5	ALLUVIUM		ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.			M	S-F	
1.0									
1.5			SP	Fine to medium SAND with some silt; brownish grey. Poorly graded.				L-MD	
2.0			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium.				MD-D	
2.5				Depth of Excavation: 2 m Termination Condition: Target depth					
3.0									
3.5									

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP10

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522431
Longitude : 172.523828

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	TOPSOIL		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F	
0.5	ALLUVIUM		ML	SILT with minor sand; brownish grey. Low plasticity. Sand, fine to medium.				S-VSt	
1.0									
1.5				Sand becomes some from 1.8 m depth.					
2.0			GW	Medium to coarse GRAVEL with some sand and minor cobbles; grey. Poorly graded, subrounded to rounded. Sand, fine to medium. Becomes wet from 2.1 m depth.				MD-D	
2.5				Depth of Excavation: 2.3 m Termination Condition: Target depth					
3.0									
3.5									

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP11

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522672
Longitude : 172.523302

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		SP	Fine to medium SAND with some silt and trace rootlets; brown. Poorly graded [TOPSOIL].				L-MD		
0.3	ALLUVIUM		SP	Fine to medium SAND with some silt; brownish grey. Poorly graded.				L-MD		
0.5			ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	F-St		
2.0			GW	Fine to coarse GRAVEL with some sand and minor cobbles; grey. Well graded, subrounded to rounded. Sand, fine to medium.				MD-D		
2.2				Depth of Excavation: 2.2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP12

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522865
Longitude : 172.523295

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	FILL		ML	SILT with minor fine sand and gravel; brown. Low plasticity [FILL].				F		
0.5	ALLUVIUM		ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.			M	F - St		
1.0										
1.5			ML	Sandy SILT; brownish grey. Low plasticity. Sand, fine to medium.				St - VSt		
2.0			GW	Fine to coarse GRAVEL with some sand and minor cobbles; grey. Well graded, subrounded to rounded. Sand, fine to medium.				MD - D		
2.5				Depth of Excavation: 2.2 m Termination Condition: Target depth						
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

F = FILL

LOG OF TEST PIT TP13

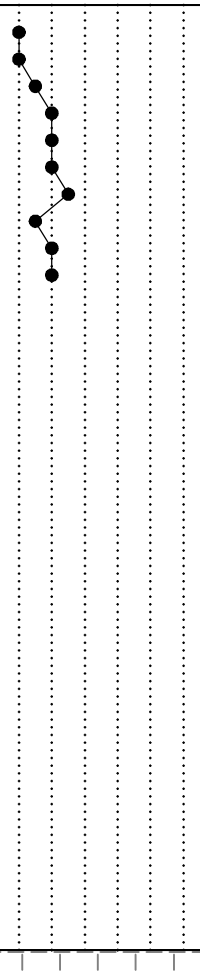
Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522658
Longitude : 172.522731

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	FILL		ML	SILT with minor fine sand and gravel; brown. Low plasticity [FILL].				F	
0.5	ALLUVIUM		ML	SILT with some sand; brownish grey. Low plasticity. Sand, fine to medium.				St	
1.5			ML	Sandy SILT; brownish grey. Low plasticity. Sand, fine to medium.			M	St - VSt	
2.5			GW	Fine to coarse GRAVEL with some sand and minor cobbles; grey. Well graded, subrounded to rounded. Sand, fine to medium.				MD - D	
3.0				Depth of Excavation: 3 m Termination Condition: Target depth					
3.5									

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12



Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP14

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.8 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.52309
Longitude : 172.522098

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	FILL		GP	Medium to coarse GRAVEL with minor silt; dark brown. Poorly graded, subrounded to rounded [FILL].				L - MD		
0.5	ALLUVIUM		ML	SILT with minor sand; brownish grey. Low plasticity. Sand, fine to medium.			M	St - VSt		
1.0										
1.5				Sand becomes some from 1.4 m depth.						
2.0										
2.5										
3.0				Depth of Excavation: 2.8 m Termination Condition: Target depth						
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

Difficult to excavate, increasing with depth. Located beneath stockpile

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP15

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.6 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523072
Longitude : 172.522567

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	FILL		ML	SILT with some gravel and trace rootlets; brown. Low plasticity. Gravel, fine to coarse, sub rounded to rounded [FILL].			St			
0.5	ALLUVIUM		SM	Silty fine to medium SAND; brownish grey. Poorly graded.			MD			
1.5			ML	SILT with minor fine sand; brownish grey. Low plasticity.			St - VSt			
2.5				Depth of Excavation: 2.6 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

Difficult to excavate, increasing with depth. Located beneath stockpile

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP16

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.8 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523367
Longitude : 172.522588

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0 – 0.5	FILL		ML	SILT with some gravel and trace rootlets; brown. Low plasticity. Gravel, fine to coarse, sub rounded to rounded [FILL].				St		
0.5 – 1.5	ALLUVIUM		SM	Fine to medium SAND with minor silt; brownish grey. Poorly graded.			M	MD		
1.5 – 2.8	ALLUVIUM		ML	SILT with trace fine sand; brownish grey. Low plasticity.				MD - D		
2.8				Depth of Excavation: 2.8 m Termination Condition: Target depth						

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

LOG OF TEST PIT TP17

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.8 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522327
Longitude : 172.522145

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				St		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.				St		
1.0										
1.5										
2.0			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				MD		
2.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD - D		
3.0				Depth of Excavation: 2.8 m Termination Condition: Target depth						
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP18

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 24/10/18
Max Test Pit Depth : 2.6 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522631
Longitude : 172.521835

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand; brown. Low plasticity [TOPSOIL].				St		
0.5	ALLUVIUM		ML	SILT with some fine sand; brownish grey. Low plasticity.			M	St - VSt		
2.5			GW	Fine to coarse GRAVEL with some silt, minor cobbles and sand; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD - D		
3.0				Depth of Excavation: 2.6 m Termination Condition: Target depth						
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

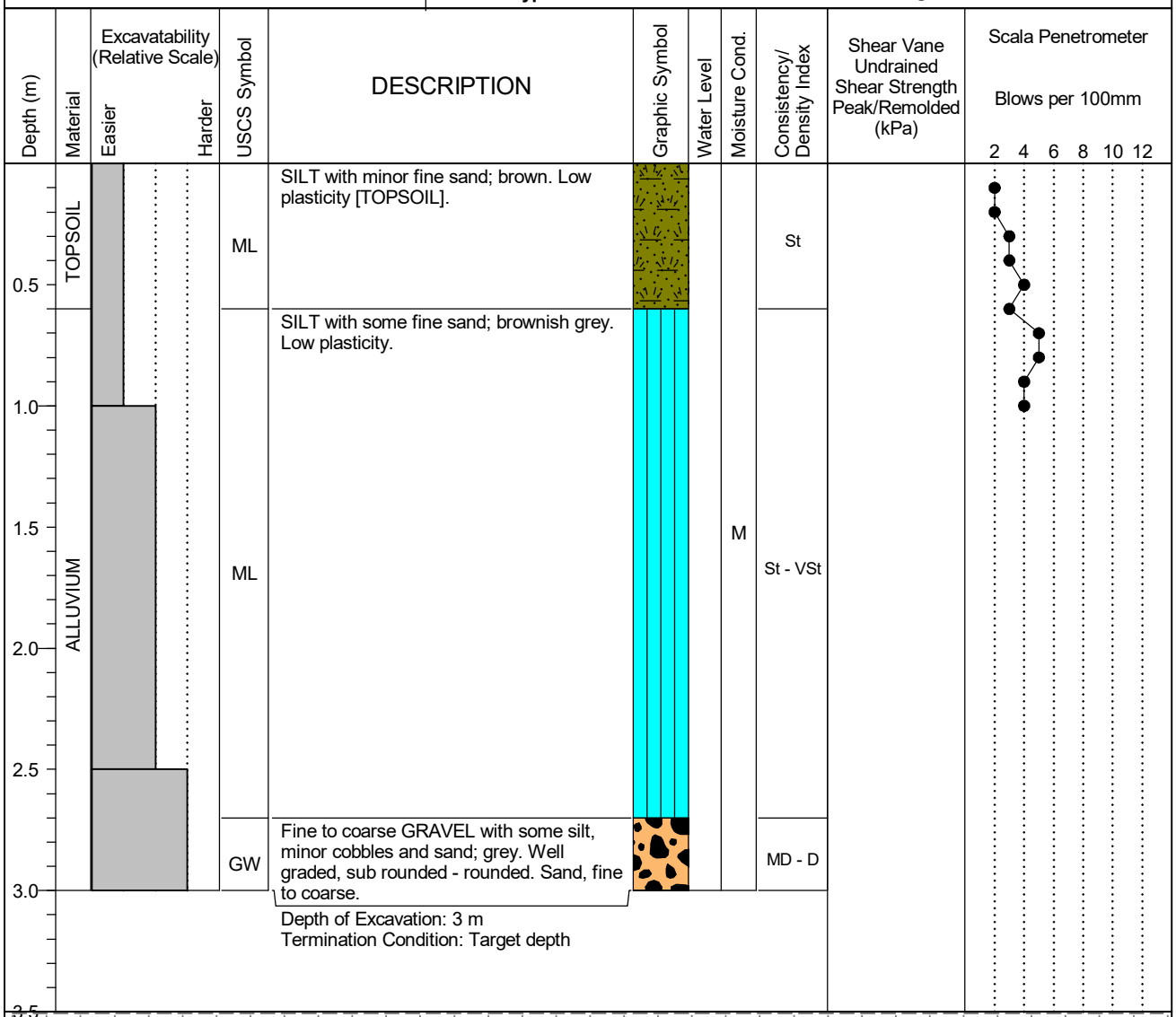
GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP19

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522112
Longitude : 172.521431



Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP20

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 1.4 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522478
Longitude : 172.521017

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with minor fine sand; brown. Low plasticity [TOPSOIL].				F - St		
0.5	FILL		ML	SILT with some fine sand; brown with orange and grey speckles. Low Plasticity [FILL].				St - VSt		
1.0	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	VSt		
1.5			GW	Fine to coarse GRAVEL with some silt, minor cobbles and sand; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD - D		
2.0				Depth of Excavation: 1.4 m Termination Condition: Target depth						
2.5										
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

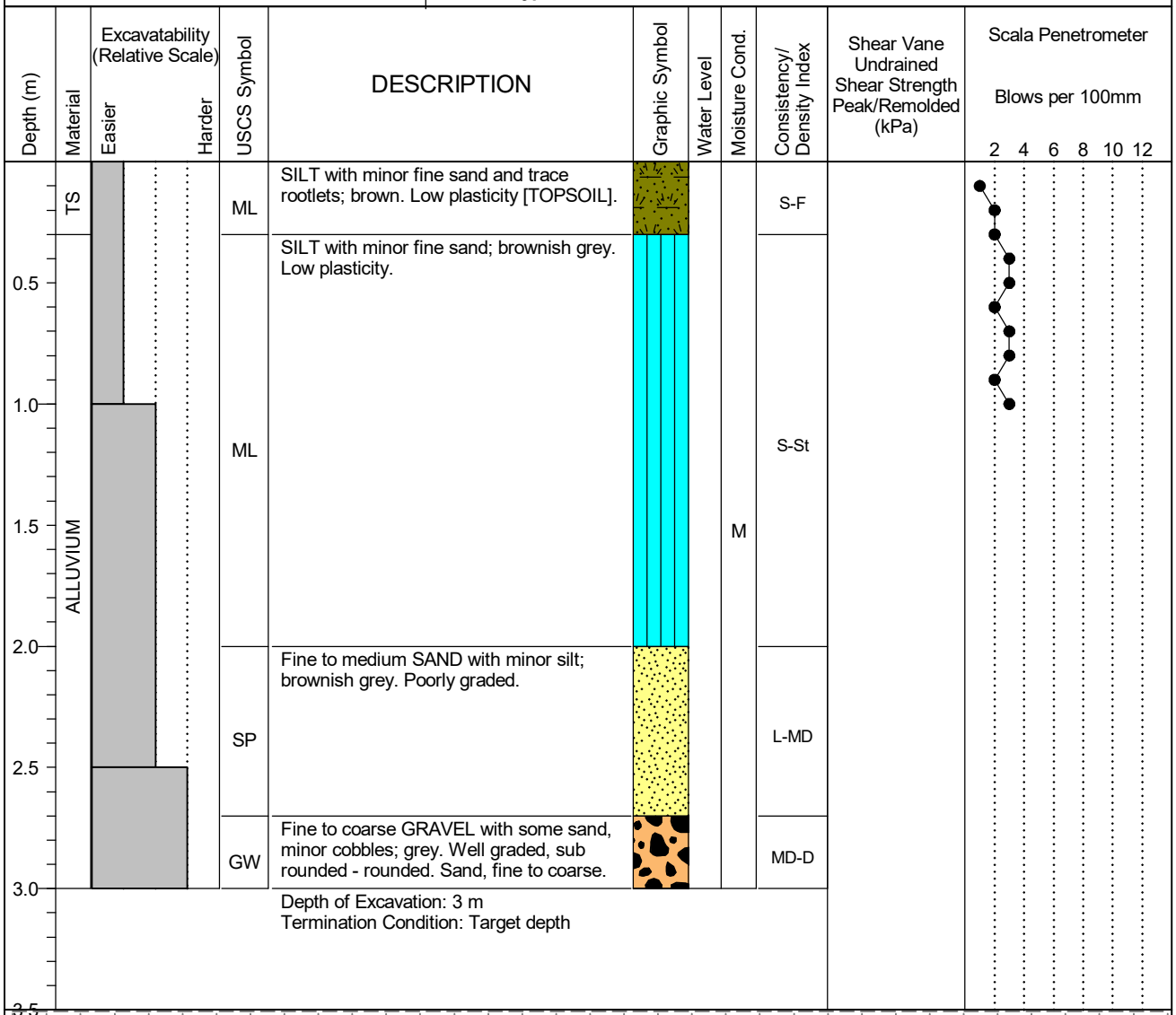
GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP21

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522089
Longitude : 172.520083



Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

LOG OF TEST PIT TP22

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.6 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.52177
Longitude : 172.520437

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-VSt		
1.0										
1.5										
2.0				Becomes some sand from 2.0 m depth.						
2.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
3.0				Depth of Excavation: 2.6 m Termination Condition: Target depth						
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP23

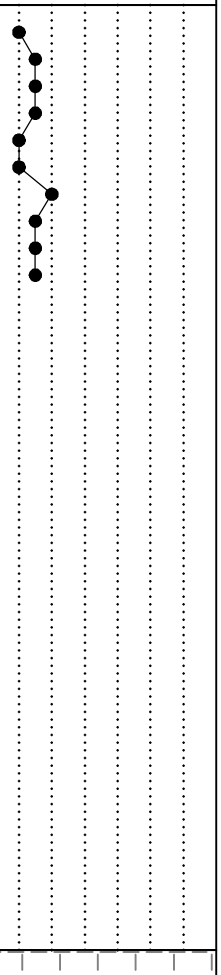
Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521544
Longitude : 172.519976

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F	
0.5	ALLUVIUM		ML	SILT with minor fine sand; brown with orange mottles. Low plasticity.			M	S-St	
1.0									
1.5			SM	Silty fine to medium SAND; grey with orange mottles				L-MD	
2.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D	
2.5				Depth of Excavation: 2.2 m Termination Condition: Target depth					
3.0									
3.5									

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12



Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP24

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.4 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521879
Longitude : 172.519473

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.				S-St		
1.0										
1.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.			M	L-MD		
2.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
2.5				Depth of Excavation: 2.4 m Termination Condition: Target depth						
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP25

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.1 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521351
Longitude : 172.519202

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-St		
1.0										
1.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD		
2.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles and; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
2.5				Depth of Excavation: 2.1 m Termination Condition: Target depth						
3.0										
3.5										

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP26

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.1 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.521304
Longitude : 172.518559

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-St		
1.0										
1.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD		
2.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
2.5				Depth of Excavation: 2.1 m Termination Condition: Target depth						
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP27

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523058
Longitude : 172.524183

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	F-St		
1.0										
1.5			ML	Sandy SILT; brownish grey. Low plasticity. Sand, fine to medium				F-VSt		
2.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
2.5				Depth of Excavation: 2.3 m Termination Condition: Target depth						
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP28

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522591
Longitude : 172.524601

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM			SILT with minor fine sand; brownish grey. Low plasticity.						
1.0										
1.5			ML					S-VSt		
2.0										
2.5				Sand becomes some from 2.5 m depth.						
3.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
3.5				Depth of Excavation: 3 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP29

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.5 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522202
Longitude : 172.524955

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	FILL		GW	Silty fine to coarse GRAVEL; brown. Well graded, sub rounded to rounded [FILL].				L-MD		
0.5	ALLUVIUM		ML	SILT with some fine sand; brownish grey. Low plasticity.			M	F-St		
1.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD		
2.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
3.5				Depth of Excavation: 2.5 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP30

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.8 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522054
Longitude : 172.526073

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	TOPSOIL		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F	
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-St	
1.5			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD	
2.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D	
2.8				Depth of Excavation: 2.8 m Termination Condition: Target depth					

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP31

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.4 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522458
Longitude : 172.525855

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	FILL		GW	Silty fine to coarse GRAVEL; brown. Well graded, sub rounded to rounded [FILL].				L-MD		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-St		
1.0										
1.5				Sand becomes some from 1.8 m depth.						
2.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
2.5				Depth of Excavation: 2.4 m Termination Condition: Target depth						
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP32

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.6 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.52308
Longitude : 172.525415

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with some fine sand; brownish grey. Low plasticity.			M	S-St		
2.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
				Depth of Excavation: 2.6 m Termination Condition: Target depth						

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP33

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 25/10/18
Max Test Pit Depth : 2.9 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523791
Longitude : 172.525058

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-St		
2.0			SP	Fine to medium SAND with minor silt; brownish grey. Poorly graded.				L-MD		
2.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
3.0				Depth of Excavation: 2.9 m Termination Condition: Target depth						
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP34

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 1.3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523494
Longitude : 172.524173

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	T		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with some fine sand; brownish grey. Low plasticity.			M	F-St		
1.0			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
1.3				Depth of Excavation: 1.3 m Termination Condition: Target depth						
1.5										
2.0										
2.5										
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

T = TOPSOIL

LOG OF TEST PIT TP35

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 1.7 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523829
Longitude : 172.523853

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	T		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with some fine sand; brownish grey. Low plasticity.			M	F-St		
1.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD-D		
				Depth of Excavation: 1.7 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

T = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP36

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 2.9 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523783
Longitude : 172.5238

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-VSt		
1.0										
1.5										
2.0										
2.5										
3.0				Depth of Excavation: 2.9 m Termination Condition: Target depth						
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP37

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 2.9 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.52418
Longitude : 172.52394

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-St		
2.5			ML	Sandy SILT; brownish grey. Low plasticity. Sand, fine to medium.				F-VSt		
3.0				Depth of Excavation: 2.9 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP38

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 2.5 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.524515
Longitude : 172.524792

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	S-St		
2.5			ML	Sandy SILT; brownish grey. Low plasticity. Sand, fine to medium.				F-VSt		

Depth of Excavation: 2.5 m
Termination Condition: Target depth

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP39

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 2.4 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523963
Longitude : 172.524598

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.			M	F-St		
1.5			ML	Sandy SILT; brownish grey. Low plasticity. Sand, fine to medium.				F-VSt		
2.0				Depth of Excavation: 2.4 m Termination Condition: Target depth						
2.5										
3.0										
3.5										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

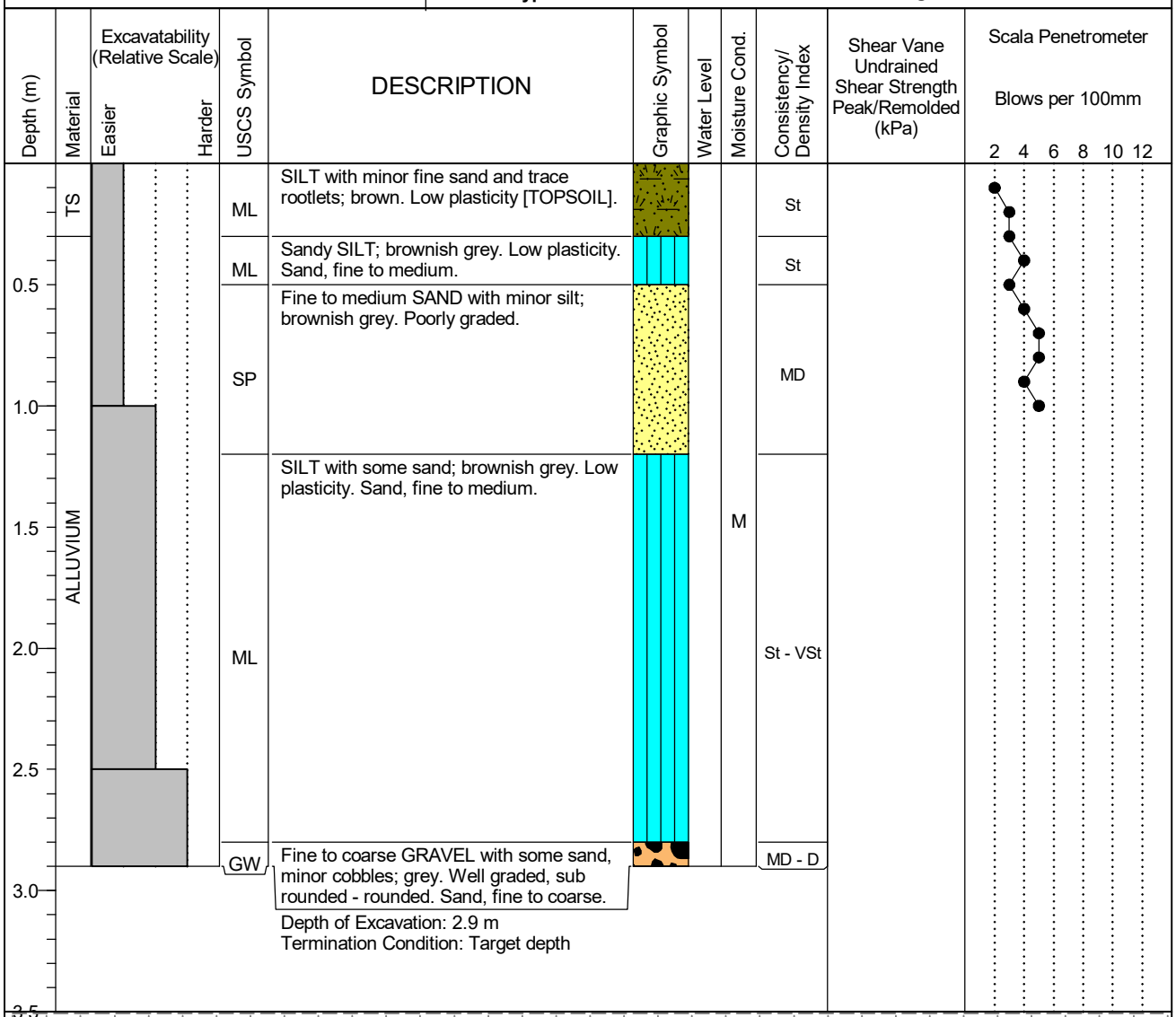
GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

LOG OF TEST PIT TP40

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 2.9 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.522805
Longitude : 172.520894



Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

LOG OF TEST PIT TP41

Yaldhurst Park Subdivision
Yaldhurt Park Subdivision
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 26/10/18
Max Test Pit Depth : 2.9 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 500 mm

Shear Vane No : NA
Logged By : HB
Reviewed By : HF
Latitude : -43.523295
Longitude : 172.520629

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	FILL		ML	SILT with minor fine sand and trace rootlets; brown. Low plasticity [TOPSOIL].				St	
0.5	ALLUVIUM		ML	SILT with minor fine sand; brownish grey. Low plasticity.				St	
1.0			ML	Sandy SILT; brownish grey. Low plasticity. Sand, fine to medium.				St - VSt	
2.5			GW	Fine to coarse GRAVEL with some sand, minor cobbles; grey. Well graded, sub rounded - rounded. Sand, fine to coarse.				MD - D	
3.0				Depth of Excavation: 2.9 m Termination Condition: Target depth					
3.5									

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12

Test Pit met target depth
Scala Penetrometer met target depth
Standing groundwater was not encountered

TS = TOPSOIL

GEOSCIENCE TEST PIT LOG YALDHURST PARK TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 4-12-18

APPENDIX 3:

Borehole Logs

LOG OF BORING BH01

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.89 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 93.8 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.519081
Longitude : -43.521249

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
0	TOPSOIL		ML	SILT with minor organics and trace sand; dark brown. Low plasticity. Sand, fine [TOPSOIL].				S - F					
0.5	ALLUVIUM		ML	SILT with trace sand; Yellowish brown with orange mottles. Low plasticity. Sand, fine.				F - VSt					
1.0			SP	Silty fine SAND; yellowish brown with orange mottles. Poorly graded.				L - MD					
			ML	Sandy SILT; Yellowish brown. Low plasticity. Sand, fine.				F - VSt					
1.5			SP	Fine to medium SAND with trace silt; yellowish brown. Poorly graded.				L - MD					
			GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.					2,1,5,11,14,15 N=45				
2.0							M						
2.5													
3.0								MD - D	12,30,28,2 N=60+				
3.5													
4.0													
4.5													

Machine borehole met target depth at 10.89 m depth.

Standing groundwater was not encountered

GEOSCIENCE MACHINE BORING YALDHURST PARK BH LOGS.GPJ NZ DATA TEMPLATE 2.GDT 30-11-18

LOG OF BORING BH01

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.89 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 93.8 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.519081
Longitude : -43.521249

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%) 25 50 75	Notes
5.0	ALLUVIUM		GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.			M	MD - D	3,13,17,15,12,16 N=60+				
6.0									8,9,9,11,10,10 N=40				
7.0									20,40 N=60+				
8.5			SP	Fine to medium SAND with minor gravel; brownish grey. Poorly graded.				MD - D					
9.0													

Machine borehole met target depth at 10.89 m depth.

Standing groundwater was not encountered

GEOSCIENCE MACHINE BORING YALDHURST PARK BH LOGS.GPJ NZ DATA TEMPLATE 2.GDT 30-11-18

LOG OF BORING BH01

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.89 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 93.8 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.519081
Longitude : -43.521249

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%) 25 50 75	Notes
9.5	ALLUVIUM		GW	Sandy fine to course GRAVEL; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse.			M	MD - D	16,24,27,31,2 N=60+				
10.0													
10.5									16,24,27,31,2 N=60+				

End of Hole Depth: 10.89 m
Termination: Target depth

Machine borehole met target depth at 10.89 m depth.

Standing groundwater was not encountered

LOG OF BORING BH02

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.67 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 96 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.522091
Longitude : -43.523274

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
0.0	F		GW	Sandy GRAVEL with trace silt and organics; greyish brown. Well graded. Sand, fine to coarse [FILL].				L					
	BTS		ML	SILT with some sand and trace organics; dark brown. Low plasticity. Sand, fine [BTS].				S - F					
0.5	ALLUVIUM		SP	Silty fine SAND; yellowish brown with orange mottles. Poorly graded.				L - MD					
1.0													
1.5			ML	SILT with minor sand; Yellowish brown. Low plasticity. Sand, fine.				F - St	3,3,3,3,4,5 N=15				
2.0			SP	Silty fine SAND; yellowish brown with orange mottles. Poorly graded.			M	L - MD					
2.5				Becomes SAND with some silt from 2.5 m depth.									
3.0			GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.				MD - D	7,9,12,21,27 N=60+				
3.5													
4.0													
4.5													

Machine borehole met target depth at 10.67 m depth.

Dip test showed standing water at 9.0 m depth.

F = FILL
BTS = BURIED TOPSOIL

GEOSCIENCE MACHINE BORING YALDHURST PARK BH LOGS.GPJ NZ DATA TEMPLATE 2.GDT 30-11-18

LOG OF BORING BH02

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.67 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 96 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.522091
Longitude : -43.523274

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
5.0	ALLUVIUM		GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.			M	MD - D	6,13,20,16,21,3 N=60+			25 50 75	
6.0									5,8,7,9,10,8 N=34				
7.0									12,12,17,27,16 N=60+				
8.0							W						
9.0													

Machine borehole met target depth at 10.67 m depth.

Dip test showed standing water at 9.0 m depth.

F = FILL
BTS = BURIED TOPSOIL

GEOSCIENCE MACHINE BORING YALDHURST PARK BH LOGS.GPJ NZ DATA TEMPLATE 2.GDT 30-11-18

LOG OF BORING BH02

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.67 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 96 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.522091
Longitude : -43.523274

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%) 25 50 75	Notes
9.5	ALLUVIUM		GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.				MD - D	22,38 N=60+				
			ML	SILT with trace gravel and clay; yellowish brown. Low plasticity.				St - VSt					
10.0			GW	Sandy fine to course GRAVEL; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse.			S	MD - D					
10.5									15,45 N=60+				

End of Hole Depth: 10.67 m
Termination: Target depth

Machine borehole met target depth at 10.67 m depth.

Dip test showed standing water at 9.0 m depth.

F = FILL
BTS = BURIED TOPSOIL

LOG OF BORING BH03

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.8 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 96 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.524153
Longitude : -43.523375

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
0	T		ML	SILT with trace organics and sand; brown. Low plasticity. Sand, fine [TOPSOIL].				S - F					
	ALLUVIUM		ML	SILT with trace sand; Yellowish brown with orange mottles. Low plasticity. Sand, fine.				S - St					
0.5													
1.0			GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.									
1.5									10,12,10,8,10,14 N=42				
2.0							M						
2.5								MD - D					
3.0									17,27,40,20 N=60+				
3.5													
4.0													
4.5													

Machine borehole met target depth at 10.8 m depth.

Dip test showed standing water at 7.5 m depth.

T = TOPSOIL

LOG OF BORING BH03

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.8 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 96 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.524153
Longitude : -43.523375

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
5.0	ALLUVIUM		GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.			M	MD - D	20,26,30,30 N=60+			25 50 75	
6.0			SW	Gravelly fine to coarse SAND; brownish grey. Well graded.				MD - D	20,17,13,7,8,8 N=36				
6.5			GP	Sandy fine to medium GRAVEL with trace silt; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.									
7.0							W						
7.5						▼		MD - D	11,15,13,10,8,6 N=37				
8.0							S						
8.5													
9.0													

Machine borehole met target depth at 10.8 m depth.

T = TOPSOIL

Dip test showed standing water at 7.5 m depth.

LOG OF BORING BH03

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.8 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 96 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.524153
Longitude : -43.523375

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%) 25 50 75	Notes
9.5	ALLUVIUM		GP	Sandy fine to medium GRAVEL with trace silt; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.			S	MD - D	11,9,9,8,8,7 N=32				
10.0													
10.5									15,29,30,30 N=60+				

End of Hole Depth: 10.8 m
Termination: Target depth

Machine borehole met target depth at 10.8 m depth.

T = TOPSOIL

Dip test showed standing water at 7.5 m depth.

LOG OF BORING BH04

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.91 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 93.8 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.523697
Longitude : -43.521794

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
0	TOPSOIL		ML	SILT with trace organics and sand; dark brown. Low plasticity. Sand, fine [TOPSOIL].				S - F					
0.5	ALLUVIUM		ML	SILT with some sand; Yellowish brown with orange mottles. Low plasticity. Sand, fine.				F - St					
1.0			SP	Silty fine SAND; yellowish brown with orange mottles. Poorly graded.				L - MD					
1.5			ML	SILT with trace sand; Yellowish brown. Low plasticity. Sand, fine.				F - St					
2.0			GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.			M		6,9,10,14,14,22 N=60+				
2.5													
3.0								MD - D					
3.5									14,20,23,23,14 N=60+				
4.0													
4.5													

Machine borehole met target depth at 10.91 m depth.

Standing groundwater was not encountered

LOG OF BORING BH04

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.91 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 93.8 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.523697
Longitude : -43.521794

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%) 25 50 75	Notes
5.0	ALLUVIUM		GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.			M	MD - D	17,15,20,20,20 N=60+				
6.0									10,10,10,13,11,5 N=39				
7.0									8,13,11,11,13,17 N=52				
8.0													
8.5													
9.0													

Machine borehole met target depth at 10.91 m depth.

Standing groundwater was not encountered

GEOSCIENCE MACHINE BORING YALDHURST PARK BH LOGS.GPJ NZ DATA TEMPLATE 2.GDT 30-11-18

LOG OF BORING BH04

Geotechnical Investigation
Yaldhurst Park
Yaldhurst, Christchurch
15518.000.000

Client : Infinity Yaldhurst Limited
Date : 23/11/2018
Hole Depth : 10.91 m
Drilling Method : Rotosonic
Drilling Contractor : McMillan Drilling Group Ltd
Core Diameter : 83 mm
Hammer Efficiency : 93.8 %
Logged By/Reviewed By : HF / DEB
Latitude : 172.523697
Longitude : -43.521794

Depth (m)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Pocket Pen. UCS (kPa)	Torvane Shear (kPa)	Total Core Recovery (%) 25 50 75	Notes
9.5	ALLUVIUM		GP	Sandy fine to medium GRAVEL; brownish grey. Poorly graded, subangular to subrounded. Sand, fine to medium.			M	MD - D	17,22,30,30 N=60+				
10.0													
10.5									8,12,18,22,20 N=60+				

End of Hole Depth: 10.91 m
Termination: Target depth

Machine borehole met target depth at 10.91 m depth.

Standing groundwater was not encountered

APPENDIX 4:

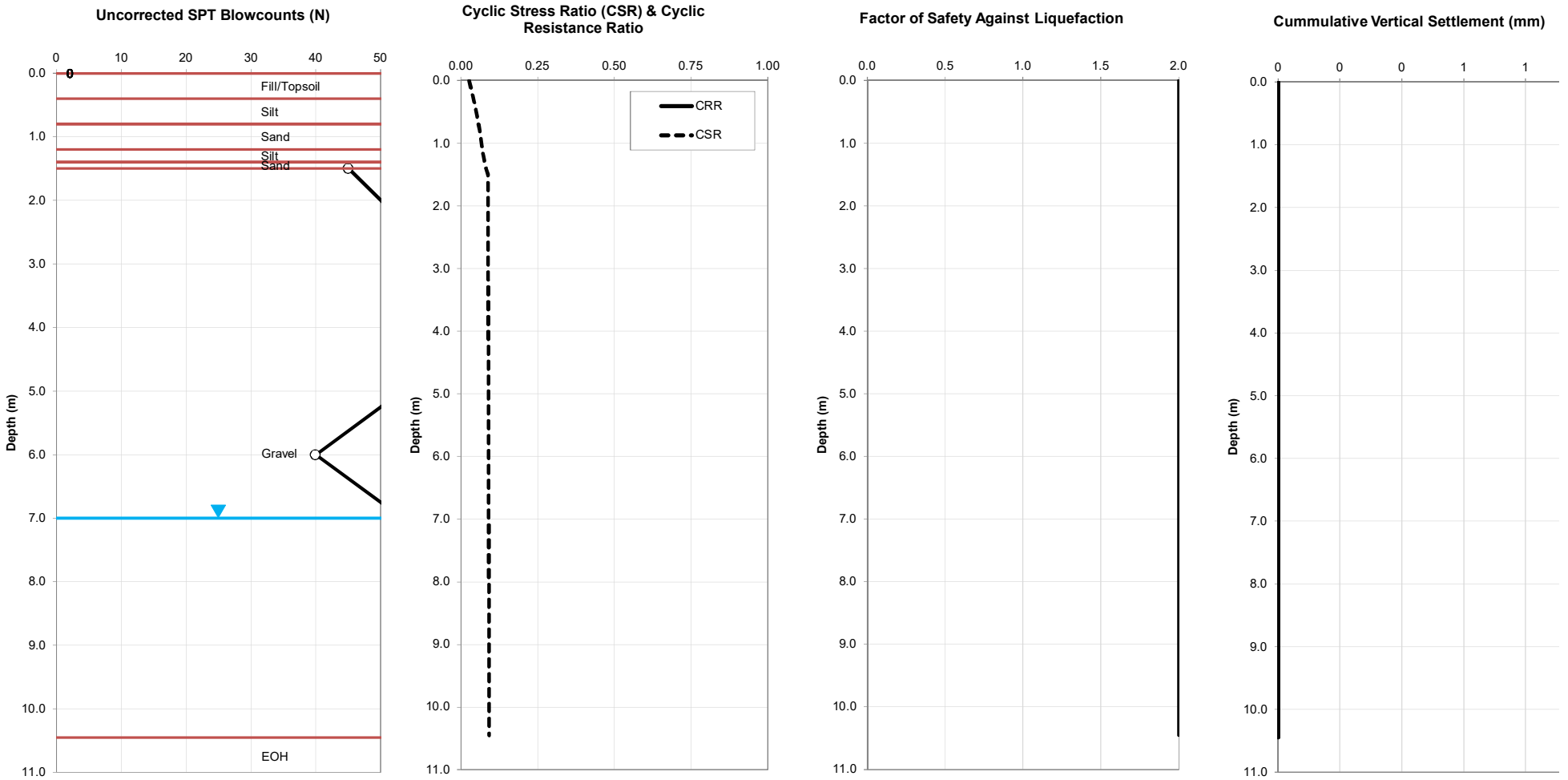
Liquefaction Analysis

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_01
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 1
Magnitude: 7.5
PGA (g): 0.13
Analysis Method: Idriss and Boulanger (2008,2010)

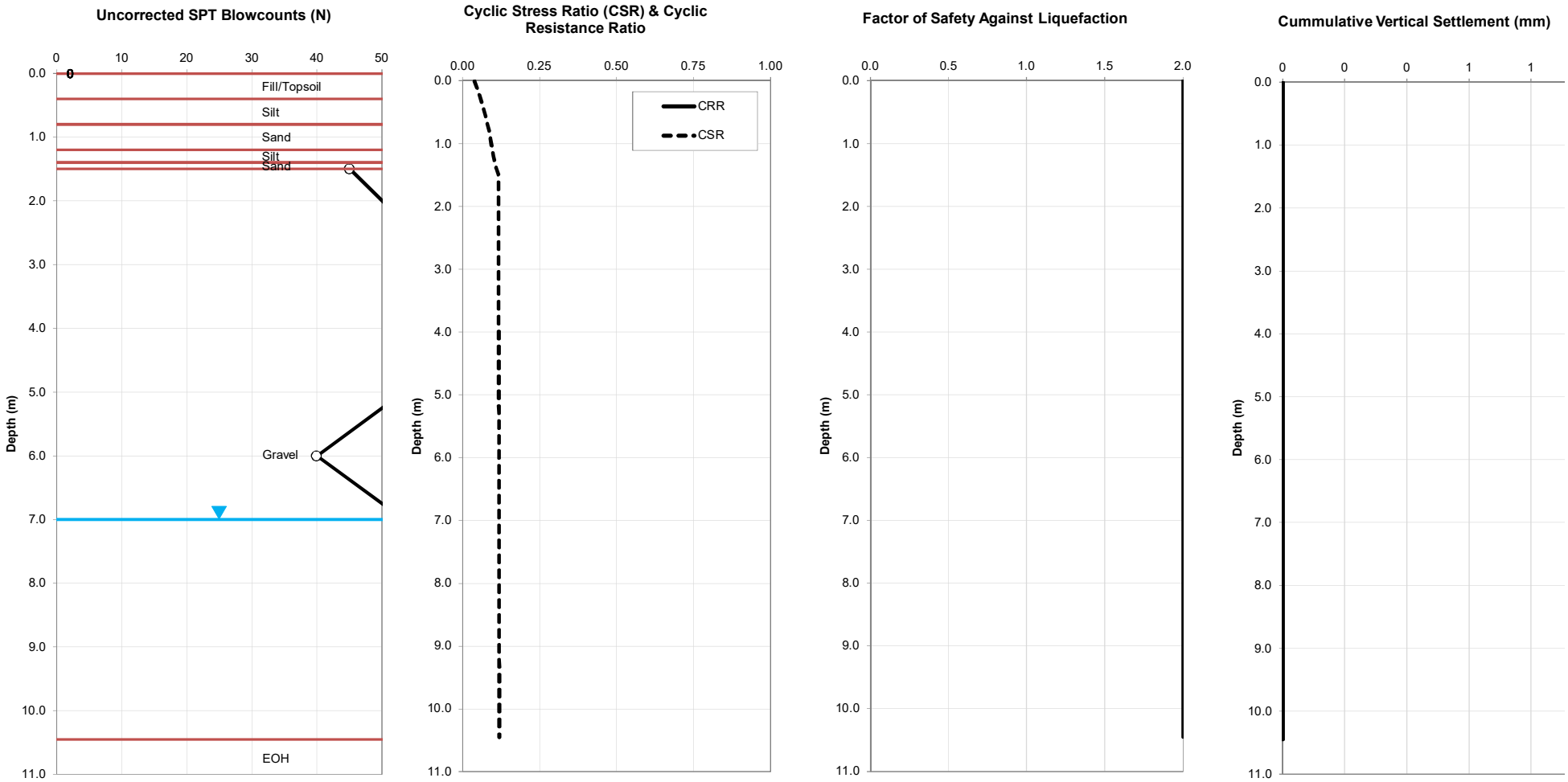
Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_01
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

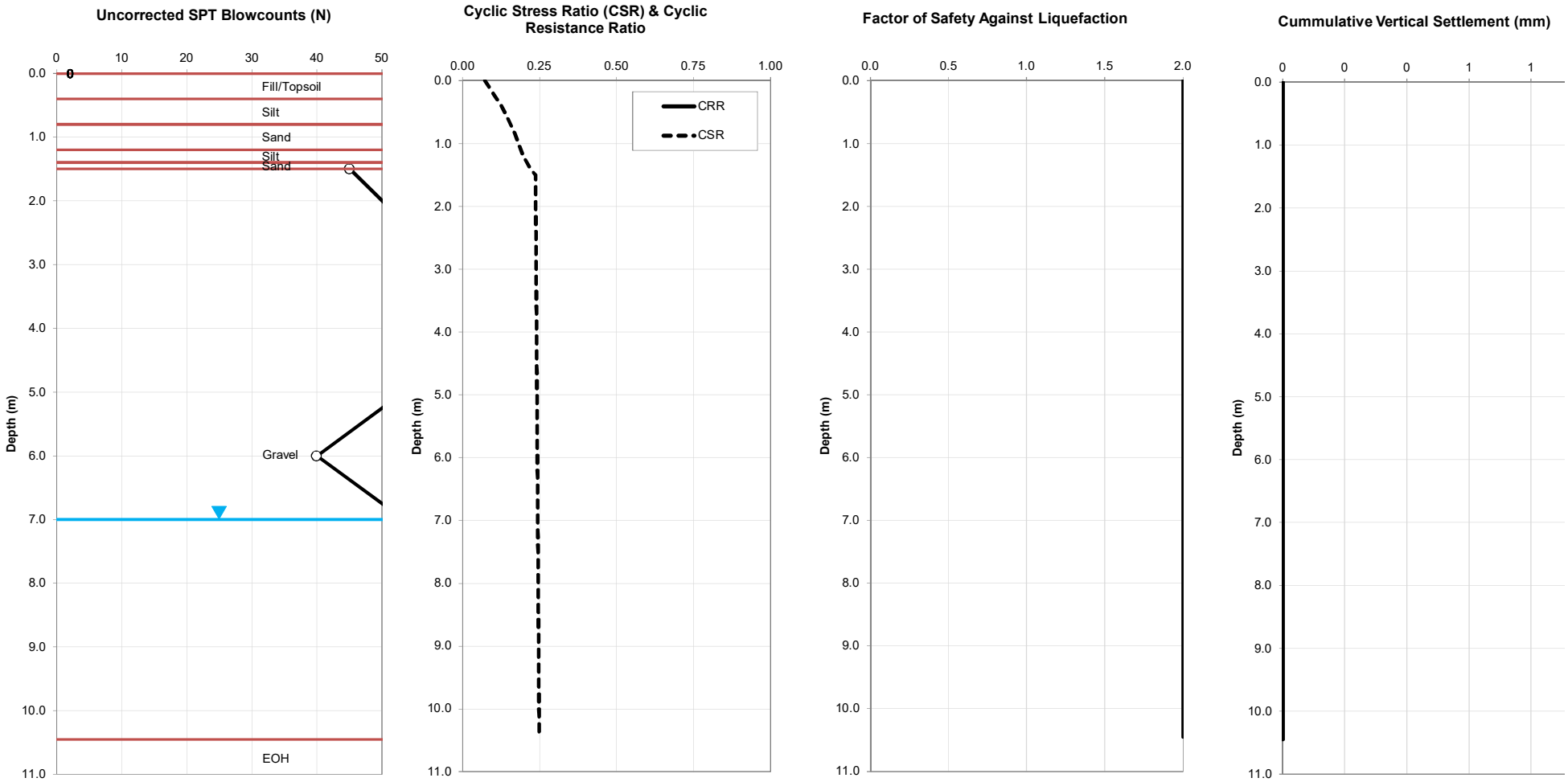
Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_01
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
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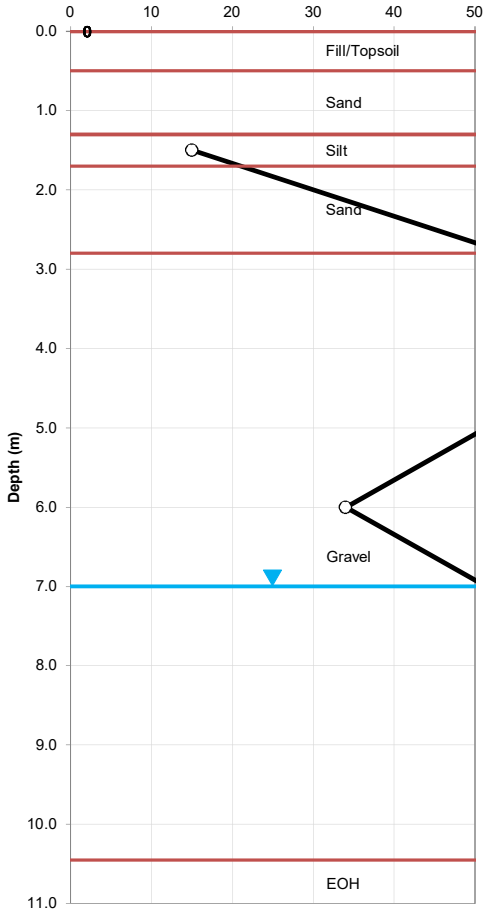
03 328 9012

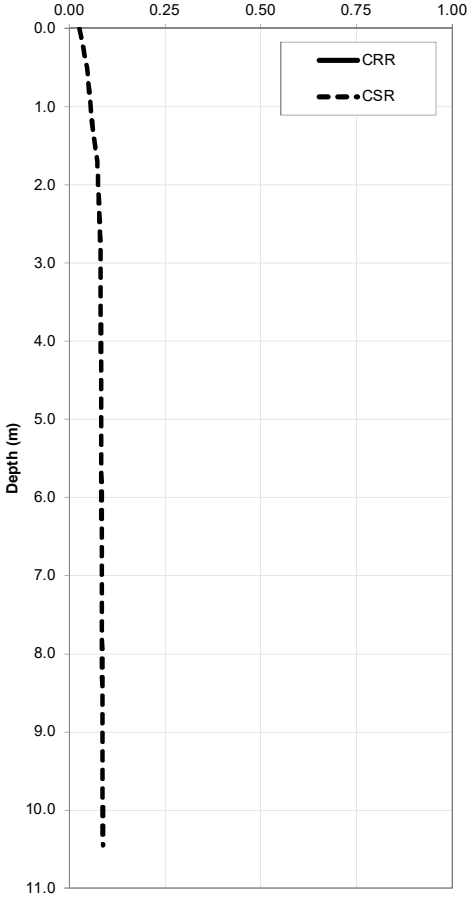
Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_02
Total Depth: 10.45 m

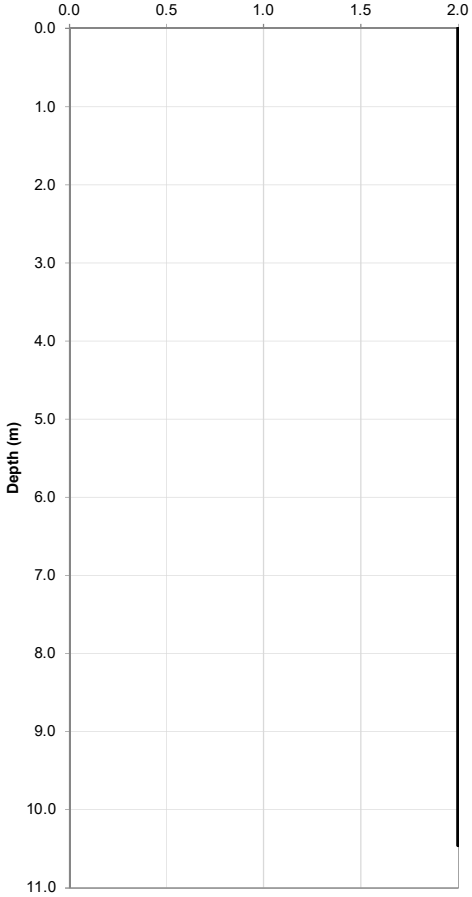
Uncorrected SPT Blowcounts (N)



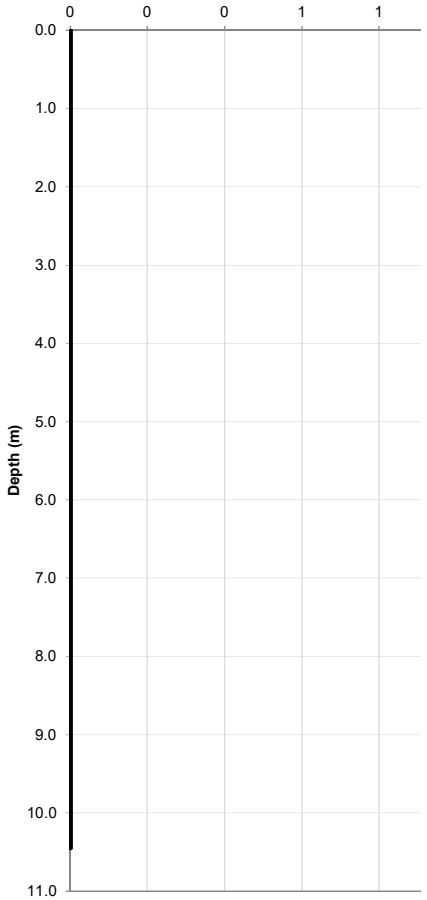
Cyclic Stress Ratio (CSR) & Cyclic Resistance Ratio



Factor of Safety Against Liquefaction



Cummulative Vertical Settlement (mm)



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 1
Magnitude: 7.5
PGA (g): 0.13
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
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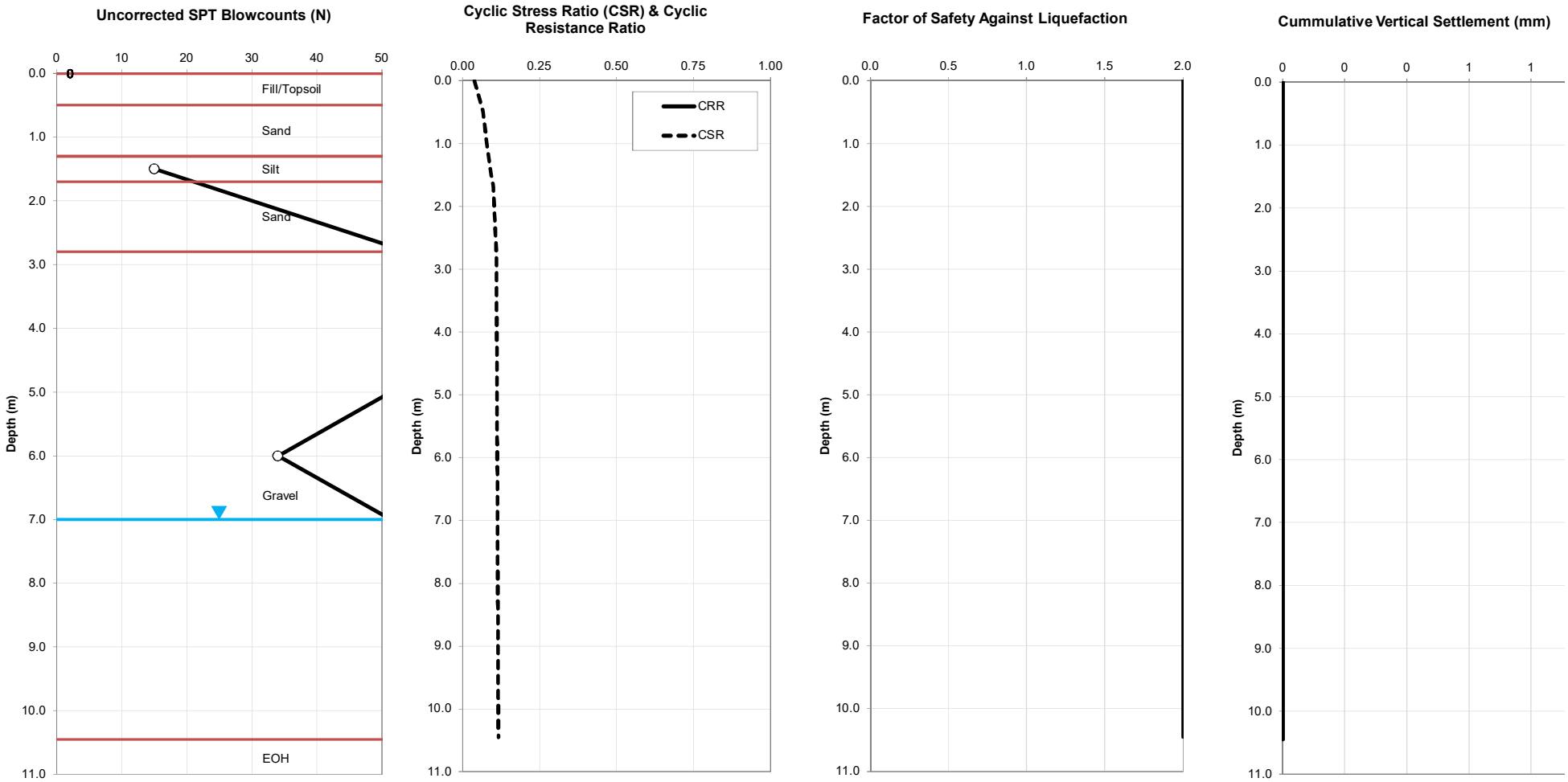
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_02
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
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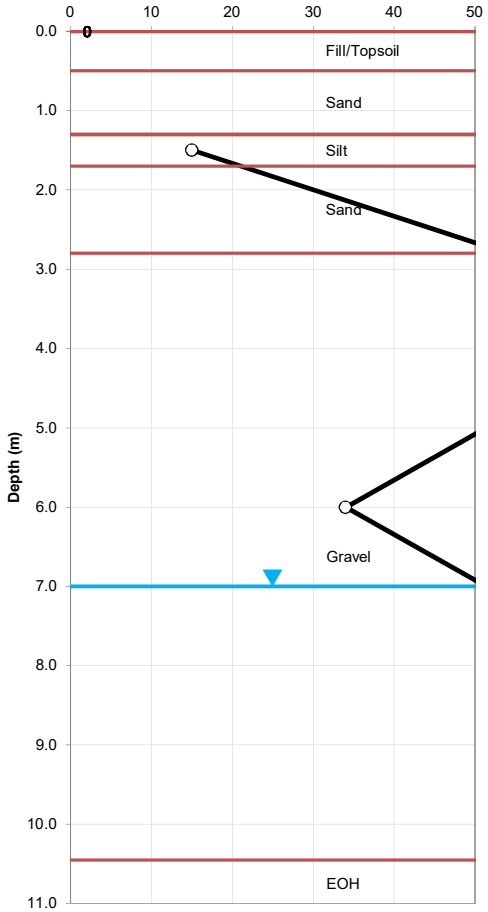
03 328 9012

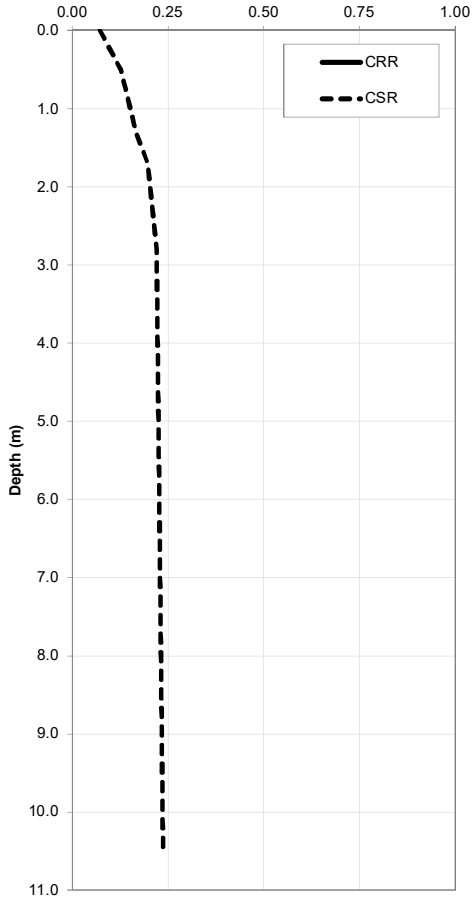
Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_02
Total Depth: 10.45 m

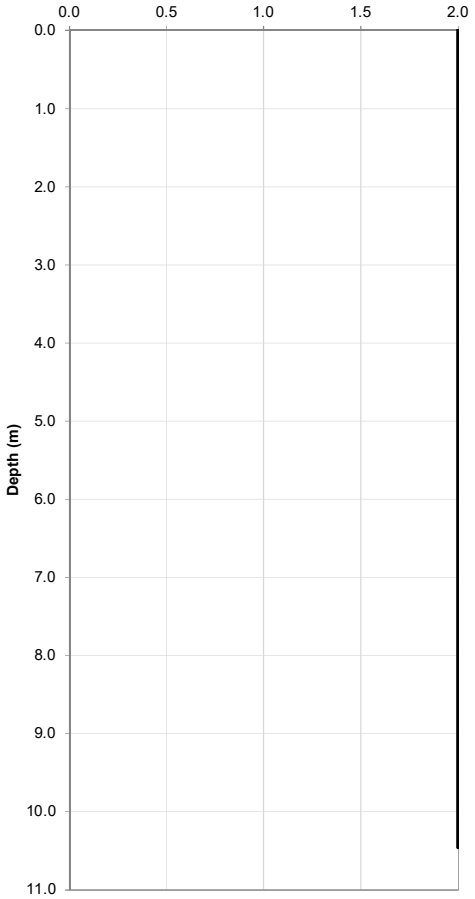
Uncorrected SPT Blowcounts (N)



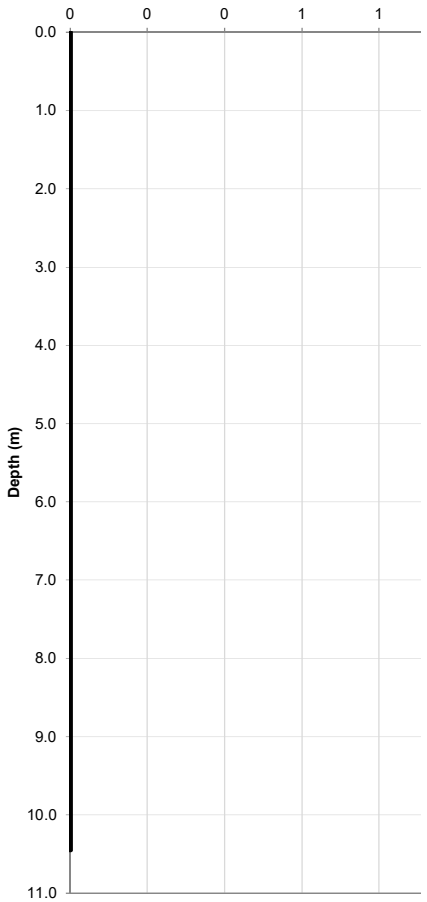
Cyclic Stress Ratio (CSR) & Cyclic Resistance Ratio



Factor of Safety Against Liquefaction



Cummulative Vertical Settlement (mm)



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
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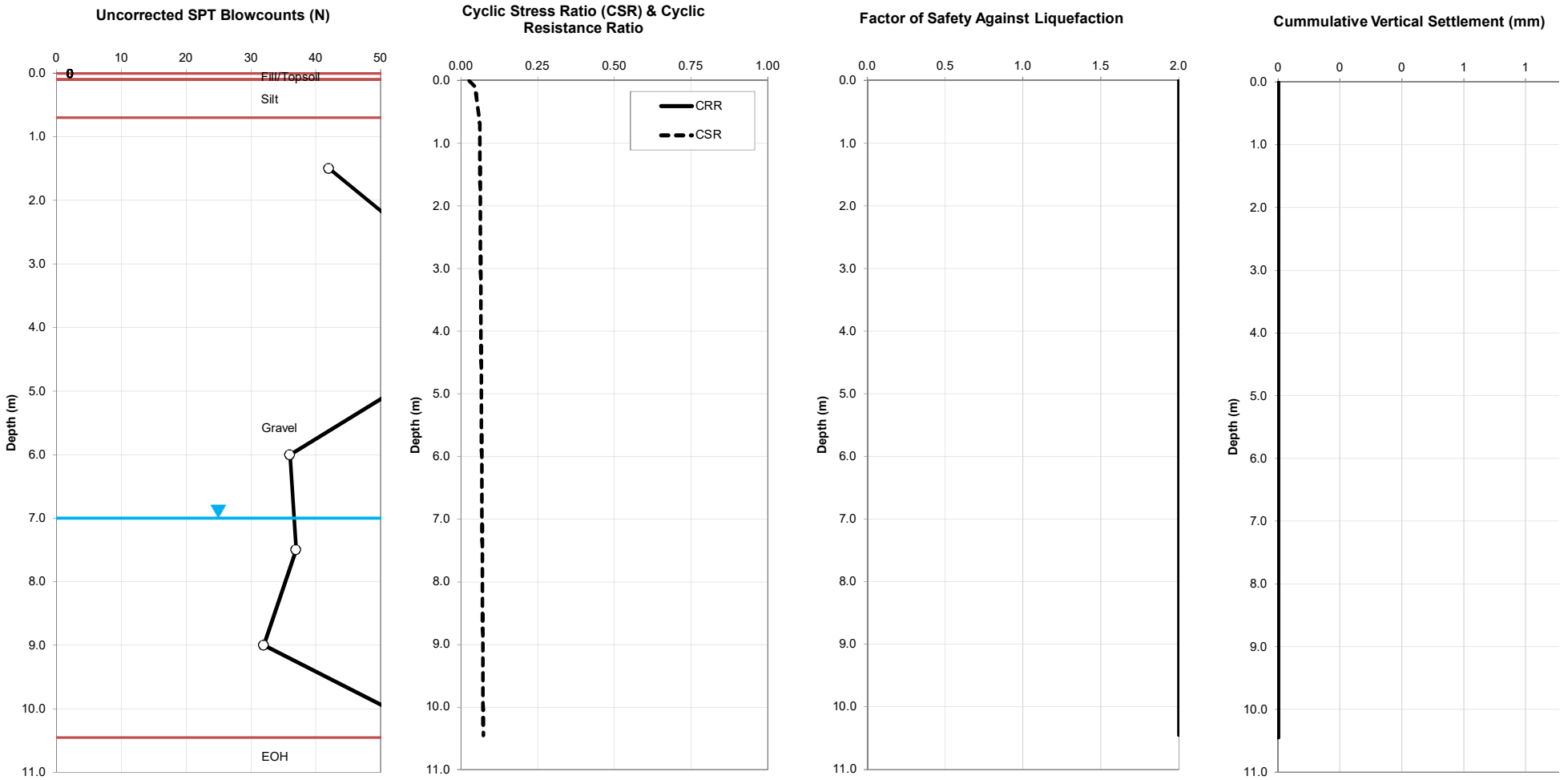
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_03
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: D3566132
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 1
Magnitude: 7.5
PGA (g): 0.13
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
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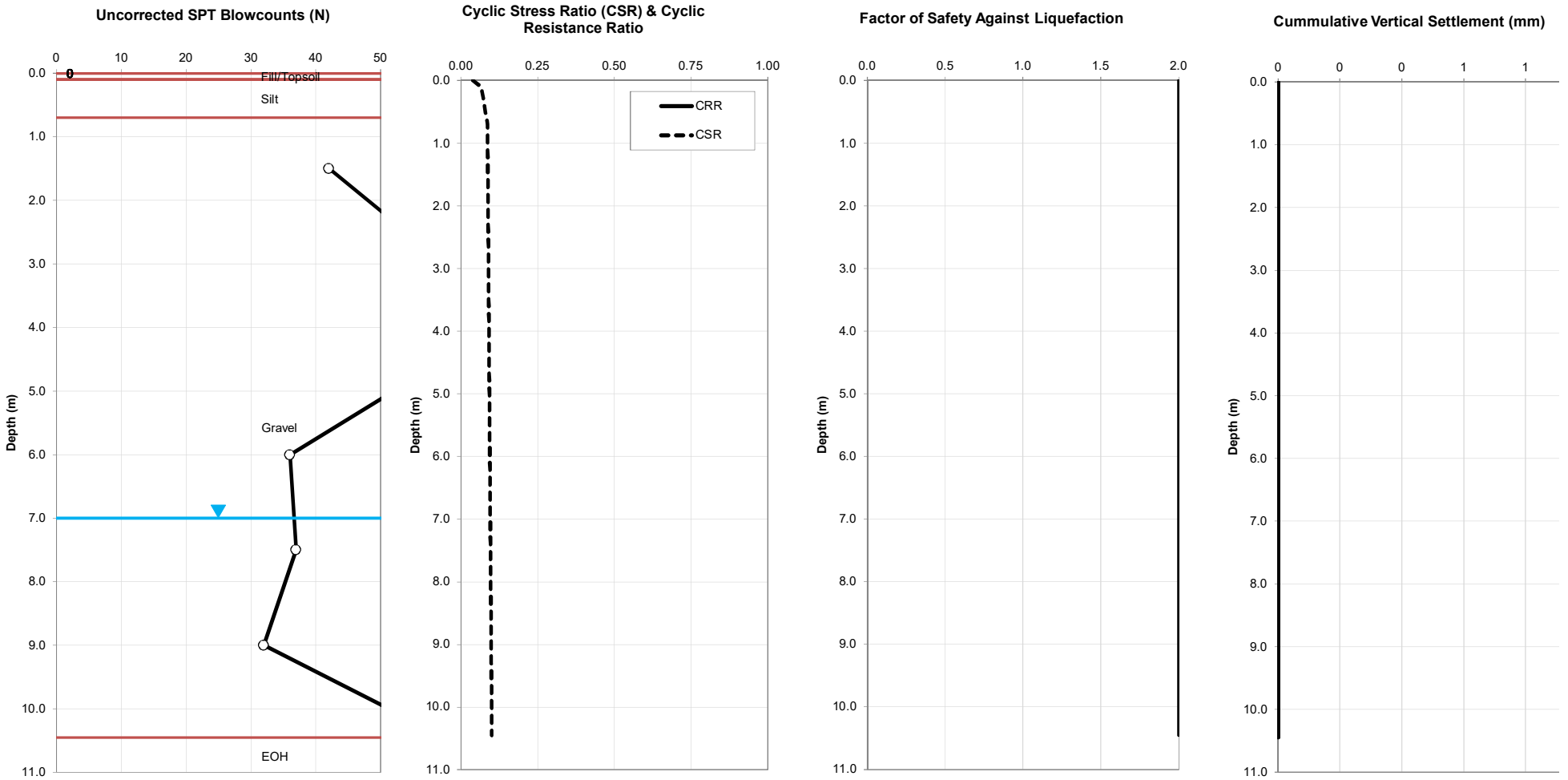
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_03
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: D3566132
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

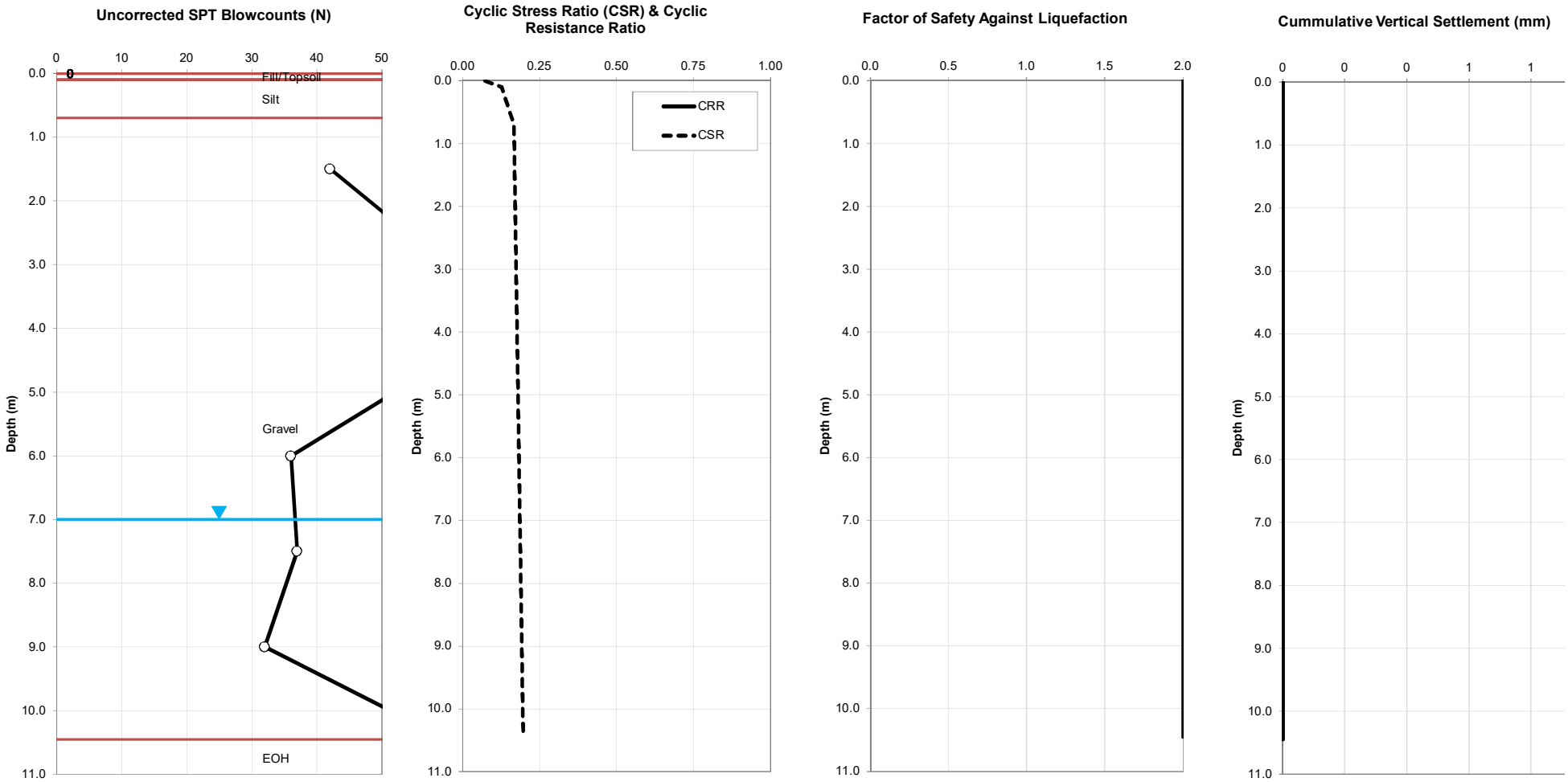
Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_03
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: D3566132
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

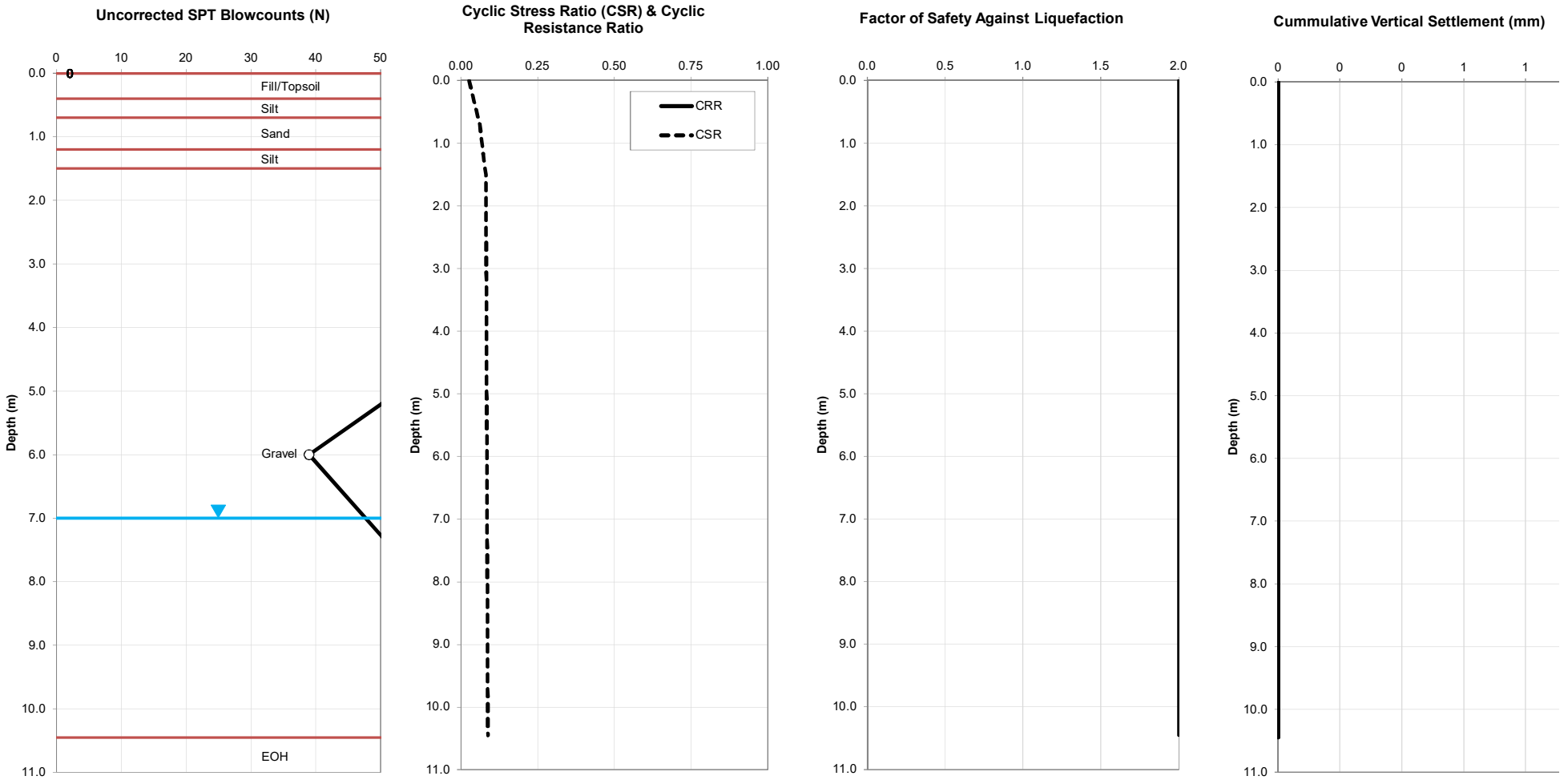
Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_04
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 1
Magnitude: 7.5
PGA (g): 0.13
Analysis Method: Idriss and Boulanger (2008,2010)

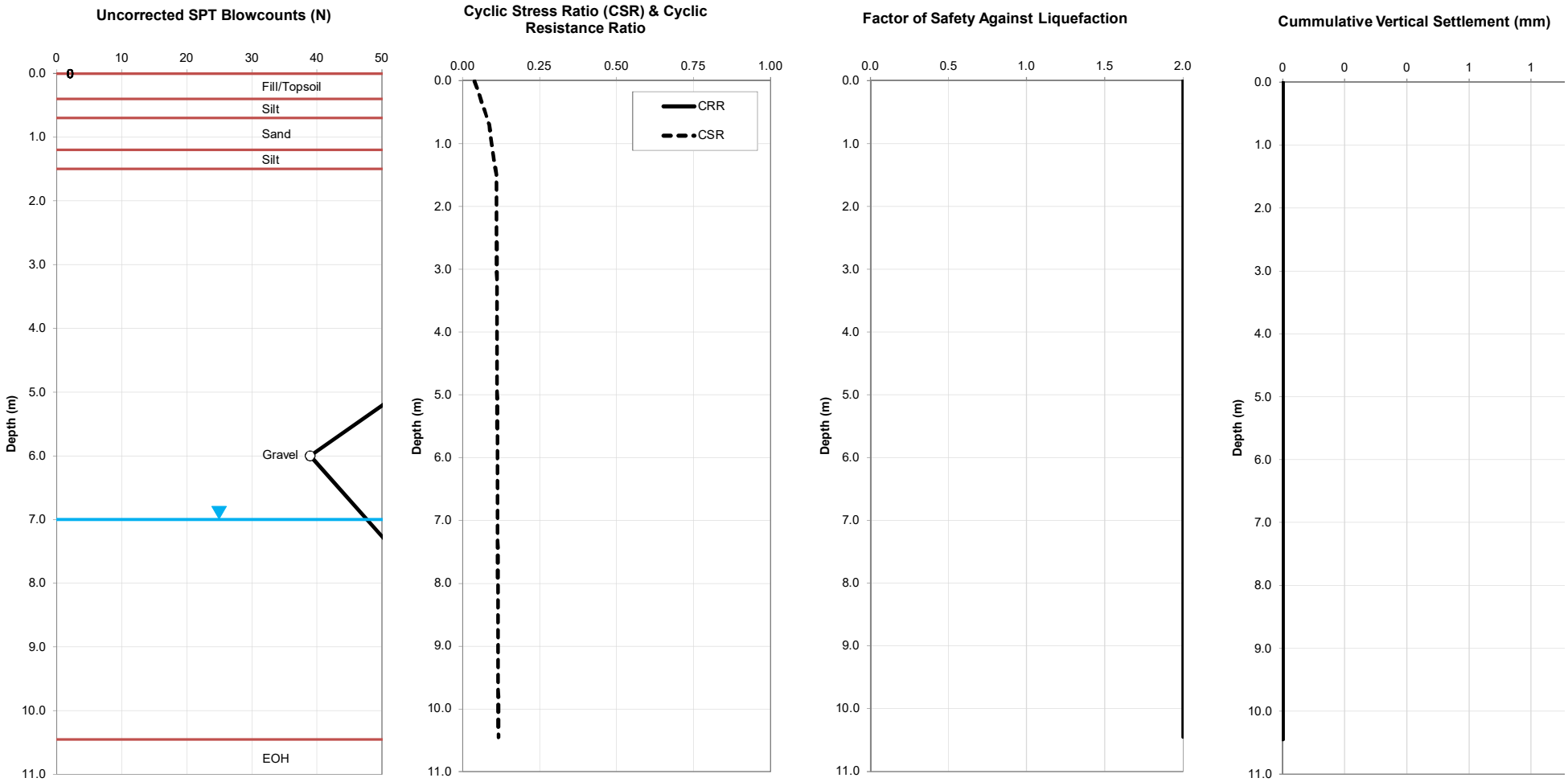
Groundwater Depth (m): 7
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_04
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 7
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Vertical Settlement Method: Ishihara & Yoshimine (1992)
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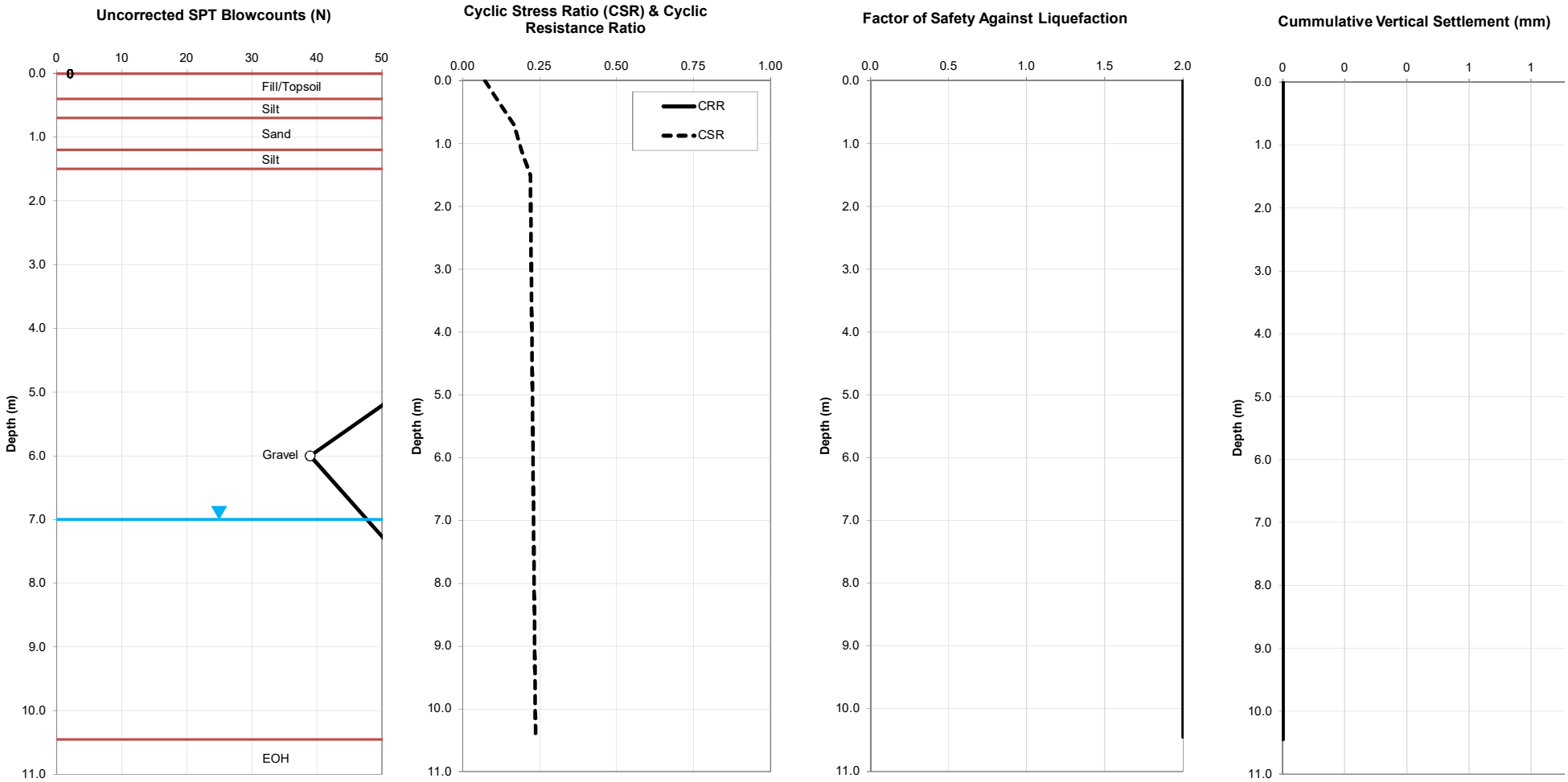
Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: Subdivision Development
Project Location: Yaldhurst Park

Borehole: BH_04
Total Depth: 10.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 15518.000.000
Author: HF
Reviewer: DEB
Date: 1/12/2018

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 7
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Vertical Settlement Method: Ishihara & Yoshimine (1992)
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