Design and Construction

Combined Ground Investigation Report (GIR) Cottam Parkway: Access Road and Car Park

Geotechnical Report No. CLM07b-LCC-RP-600-0001



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The LCC Geotechnical Team has used reasonable skill, care and diligence in the design and interpretation of the ground investigation, however, the inherent variability of ground conditions allows only definition of the actual conditions at the location and depths of exploratory holes and samples/tests therefrom, while at intermediate locations conditions can only be inferred.

New information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

DESIGN AND CONSTRUCTION

GEOTECHNICAL REPORT NO: CLM07b-LCC-RP-600-0001

Cottam Parkway Access road and carpark

Contents

1.	EXECUTIVE SUMMARY								
2.	INTR	ODUCTION	7						
	2.1	Scope and objective of the report	7						
	2.2 Description of the project								
	2.3	Geotechnical Category of the project							
	2.4	Other relevant information	8						
3.	EXIS	TING INFORMATION	9						
	3.1	Topographical maps (old and recent)	9						
	3.2	Geological maps and memoirs	9						
	3.3	Aerial photographs (old and recent)	10						
	3.4	Records of mines and mineral deposits	10						
	3.5	Land use and soil survey information	10						
	3.6	Archaeological and historical investigation	10						
	3.7	Existing ground investigations11							
	3.8	Consultation with Statutory Bodies and Agencies							
	3.9	Flood Records							
	3.10	Contaminated land	13						
	3.11	Other relevant information	16						
4.	FIELD	D AND LABORATORY STUDIES	16						
	4.1	Walkover survey							
	4.2	Geological mapping	17						
	4.3	Ground Investigation	17						
		4.3.1 Description of fieldwork	17						
		4.3.2 Ground Investigation Report	18						
		4.3.3 Results of in situ tests	18						
	4.4	Drainage studies	18						
	4.5	Geophysical surveys	18						
	4.6	Pile tests							
	4.7	Other field work							
	4.8	Laboratory investigation18							

		4.8.1	Description of tests	18			
		4.8.2	Copies of test results	19			
5.	GRO	UND SI	UMMARY	19			
	5.1	Groun	ndwater	20			
6.	GRO		ONDITIONS AND MATERIALS PROPERTIES	21			
	6.1	Topso	bil	21			
	6.2 Made ground, including details of any contamination / co areas						
	6.3	Upper	Cohesive Glacial Till	22			
		6.3.1	Atterberg limits and Moisture Content	22			
		6.3.2	Bulk Unit Weight	23			
		6.3.3	Undrained shear strength	23			
		6.3.4	CBR Values	25			
		6.3.5	Compressibility	25			
		6.3.6	Permeability				
	6.4	Granu	ılar Glacial Till				
		6.4.1	Particle Size Distribution				
		6.4.2	Natural Moisture Content	27			
		6.4.3	Bulk Unit Weight	27			
		6.4.4	Relative density	27			
		6.4.5	Permeability	27			
	6.5	Groun	nd Model				
	6.6	Groun	ndwater				
	6.7	Concr	ete				
	6.8	Carria	geway Cores	29			
	6.9	Conta	mination	29			
7.	GEO	TECHN	ICAL RISK	30			
8.	REFE		ES	33			

APPENDIX LIST:

Appendix A	Site location Plan
Appendix B	Site Walkover Photographs
Appendix C	Borehole Location Plans and Logs
Appendix D	CCG Factual Report 2021
Appendix E	Geotechnical and Chemical Test Results
Appendix F	Geotechnical Ground Model
Appendix G	PWD Carriageway Cores
Appendix H	HazWaste Report

1. EXECUTIVE SUMMARY

The Cottam Parkway scheme is a proposed new link road between the Cottam Link Road (currently under construction) and the proposed Cottam Railway Station. The scheme will involve the construction of a two-way single carriageway approximately 450m long with a proposed new car park which will serve the railway station. In addition, an unnamed watercourse, which is a tributary of Savick Brook, is to be culverted under the car park

The ground investigation comprised window sample boreholes following the alignment of the road with further boreholes and trial pits to inform the details for the car park area and culvert.

The investigation found topsoil to depths of 0.20m and 0.30m. The underlying material predominantly comprised brown, firm to stiff, slightly sandy, slightly gravelly, silty clay of low to intermediate plasticity. Sand deposits, described as medium dense, brown silty, clayey sand, were encountered in two boreholes.

Geotechnical testing found the shear strength of the clay, measured by hand vane, to be between 60kPa and 110kPa, with DCP testing indicating CBR values of between 2% and 44%.

Samples of excavated material were tested for contamination and the concentrations were found to be below the long-term human health risk assessment criteria. In addition, analysis indicates that if any material should be taken off site it would be classed as non-hazardous waste.

2. INTRODUCTION

2.1 Scope and objective of the report

This Ground Investigation Report (GIR) has been produced in accordance with Design Manual for Roads and Bridges CD 622 'Managing geotechnical risk'. The report is based on recent intrusive site investigation works combined with information from historical site investigations which impinge on the scheme.

The report will outline both the geotechnical and contamination information derived from the ground investigation and an evaluation of that information. The report will outline the range of geotechnical parameters encountered within the superficial deposits, which will be further developed into design parameters within the Geotechnical Design Report. In addition, an assessment of the contamination testing will be undertaken so that the contamination risk associated with the proposed works can be addressed.

2.2 Description of the project

The project involves the proposed construction of a new two-way single carriageway road, approximately 450m in length, to connect the Cottam Link Road, which is currently under construction, with the proposed Cottam Railway Station. The road will connect to the Cottam Link Road at Sidgreaves Lane Roundabout and will run south to cross the Lancaster Canal via a proposed three span bridge with embankments leading up to the bridge. The road then continues, at grade, to a proposed new car park which will serve the railway station. A general overview of the project can be seen in Figure 1. |A site location plan can be found in Appendix A.

A separate GIR report has been produced for the embankments and bridge and therefore this report only covers the highway and car park earthworks.



Figure 1: General overview of proposed project.

2.3 Geotechnical Category of the project

This section of the scheme only includes small and relatively simple structures, earthworks and geotechnical activities for which it is possible to ensure that the fundamental requirements will be satisfied on the basis of experience and qualitative geotechnical investigations. Although, as part of the larger Cottam Parkway scheme the project could be specified as a Category 2 project, in line with BS EN 1997-1:2004, 'Eurocode 7: Geotechnical design – Part 1: General rules'.

However, as this is not a Highways England scheme the category 2 only gives an indication of the expected complexity of the scheme.

2.4 Other relevant information

Not used.

3. EXISTING INFORMATION

3.1 Topographical maps (old and recent)

An overview of the historical maps indicates that the majority of the study area has been fields for arable and livestock farming since records began. Most of the surrounding roads were constructed prior to the first mapping in 1845. Sidgreaves Lane and Lea Lane are present on these early maps.

The Preston-Blackpool Railway and Lancaster Canal are both in evidence on the 1845 map.

Railway Cottages are first shown on the First Edition maps from circa 1894.

A Roman Road (Danes Pad) is labelled on several historical maps. It has an eastwest orientation and crosses Sidgreaves Lane to the south of the canal at approximately E349083:N431547.

The unnamed watercourse in the eastern field in the area of the proposed car park is shown on the 1845 map. It appears that the culvert beneath the railway has been extended since this earliest map was issued.

The maps show the presence of old clay pits and ponds within fields to the south of the canal, some of which appear to have been infilled.

Current maps indicate the presence of four ponds within 150 metres of the scheme.

3.2 Geological maps and memoirs

Geological information obtained from geological maps of the area and the Geology of Britain viewer found on the British Geological Survey (BGS) website indicates the superficial deposits found to be overlying the scheme are Till, Devensian – Diamicton formed in the Quaternary Period.

The underlying bedrock geology for the area was shown to consist of Sherwood Sandstone Group – Sandstone, a sedimentary bedrock formed in the Triassic and Permian Periods.

3.3 Aerial photographs (old and recent)

Aerial photographs from four sorties (1940s, 1960s, 1980s and 2010s) were examined as part of this study. They confirm the historical development of the scheme as detailed on the published maps.

The aerial photographs confirm the presence of ponds and other water bodies that exist today. The historical photographs also indicate infilled ponds and other depressions that lie within the footprint of the scheme.

3.4 Records of mines and mineral deposits

A review of the geological maps, the Coal Authority Gazetteer of England and Wales and LCC's Mineral Safeguarding Areas indicates that the scheme does not require any special measures in regard to minerals are mine workings.

3.5 Land use and soil survey information

It is indicated in the National Soil Resources Institute Report (NSRI) for the Preston Western Distributor (NSRI, 2015) that the soil across the Cottam Parkway Scheme and surrounding area consists of the Salop 711m Soil Association.

Salop 711m soils are described as slowly permeable seasonably waterlogged reddish fine loamy and clayey soils of moderate fertility. In addition, it is noted in the NSRI report that agriculture on such soils will typically consist of dairying on grassland and some cereal cultivation.

Reference to LCC's MapZone (2021) indicates that the entire route and surrounding land has an Agricultural Land Classification (ALC) of Category 3, which describes good to moderate quality agricultural land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield.

3.6 Archaeological and historical investigation

A Roman Road (Danes Pad) crosses the scheme in an east-west orientation south of Lancaster Canal.

3.7 Existing ground investigations

Preston Western Distributor, 2014-2015.

As part of a large scale ground investigation carried out in 2014 for the Preston Western Distributor scheme, Ian Farmer Associates was contracted by LCC to drill four cable percussion boreholes (BH221 – BH224), to depths of between 20.30mbgl and 22.80mbgl, and one window sample borehole (WS227), to a depth of 5.45mbgl. The boreholes were located to the north of the scheme approximately 35m to 110m west of the proposed bridge alignment. With one window sample borehole (WS227) drilled to a depth of 5.45mbgl within the location of the proposed bridge alignment. Locations of the exploratory holes are shown in Figure 2.



Figure 2: Location of 2014 ground investigation boreholes.

Standard penetration testing was undertaken during the GI and groundwater monitoring standpipes were subsequently installed.

Selected soil samples were taken from the boreholes for laboratory geotechnical and chemical testing. In situ geotechnical testing was also undertaken within each borehole. The investigation found glacial till deposits comprising layers of firm to stiff clay and medium dense to very dense sands overlying sandstone bedrock at 19.20mbgl.

Further details can be found in the PSSR: Cottam Parkway and Access Bridge and Road.

3.8 Consultation with Statutory Bodies and Agencies

The following statutory bodies and agencies have been consulted as part of the scheme:

- British Geological Survey (BGS);
- Coal Authority Gazetteer;
- Department for Environment, Food and Rural Affairs (DEFRA);
- Environment Agency (EA);
- Lancashire County Council (LCC);
- Multi-Agency Geographic Information for the Countryside (MAGIC); and,
- National Soil Resource Institute.

3.9 Flood Records

Consultation of the Environment Agency website indicates that the land along the line of the new road is in Flood Zone 1. Flood Zone 1 relates to land which has a less than 0.1% (1 in 1,000) annual probability of flooding.

The EA maps indicate that areas along the line of the canal towpath and Sidgreaves Lane are susceptible to surface water flooding. In addition, localised areas of medium risk are shown in the field where the proposed car park is located. Other areas within the scheme that are shown as susceptible to surface water flooding, as would be expected, are associated with ditch lines, watercourses and low-lying areas. These include the unnamed watercourse which crosses the area of the proposed car park, which is shown as medium to high risk, and ponds and infilled clay pits.

The LCC's MapZone facility indicates that the area is not susceptible to groundwater flooding.

3.10 Contaminated land

An initial Conceptual Site Model (CSM) was developed from the available information which has been used to identify potential sources, receptors and pathways present at the site.

Potential Contamination Sources

Potential sources of contamination identified by the desk study process include:

- Old clay pits and ponds infilled with unknown material;
- Contaminants associated with road use at existing crossings; and
- Slurry spreading on agricultural land.

In addition, the presence of the link road may act as a contaminant source for hydrocarbon drainage water and spillages as a result of road traffic collisions.

The principal contaminants of concern associated with the potential contamination sources are presented in Table 1.

		Metals				Others				Hydrocarb	ons		
Area of site	As	Cd	Cr	Cu	Pb	Ni	Zn	Sulphide	Asbestos	рН	Herbicides /Pesticides	Oil/fuel hydrocarbon s	PAHs
Farmland	~	~	~	1	~	✓	~	√	\checkmark	~	\checkmark	\checkmark	~
Highway	~	~	~	✓	~	√	~	~		~		\checkmark	~

Table 1: The principal contaminants of concern. Based on Waste Landfill DEFRA & EA(2002) CLR 8 Priority Contaminants for the Assessment of Land.

Potential Receptors

Potential human receptors were identified as:

- Construction workers involved in the road scheme;
- Maintenance workers associated with the road; and,
- Future public users of the open space associated with the road verges.
- Vegetation and Wildlife.

Potential controlled water receptors were identified as:

- Sherwood Sandstone (Principal aquifer);
- Glacial deposits (Secondary aquifer);
- Unnamed watercourse to be culverted under the proposed car park which is a tributary of Savick Brook; and,
- Run-off to watercourses from attenuated highway drainage.

Potential property receptors were identified as:

- Off-site properties adjacent to the route; and,
- Road structures associated with the existing and proposed highway scheme.

Based on the site's historical use as predominantly agricultural land, it is not considered likely to be affected by widespread or significant contamination. Nevertheless, as there are no records for the type of farming carried out it should be assumed that pesticides and herbicides have been used on the land in the past.

Based on an assessment of the risk posed by ground gas to nearby property receptors it is considered unlikely that significant risks will be present along the scheme route due to the following:

- There is expected to be minimal made ground on site which could represent a potential source of ground gases.
- Although the majority of underlying natural bedrock geology is unlikely to represent a source of ground gases, there is a low possibility that areas with deeper topsoil deposits could contain low levels of biogenic methane and carbon dioxide.

Risks of aggressive ground conditions impacting existing and proposed concrete road infrastructure, including the proposed bridge, are considered to be very low due to the following:

- There is minimal made ground at the site, which could represent a potential source of aggressive chemicals.
- Reference to guidance on assessing aggressive ground risk to concrete (BRE 2005) indicates that the underlying natural geology is unlikely to contain pyrite or sulphate minerals which may lead to attack on buried concrete.

Potential Pollutant Pathways

The following pathways were considered relevant for human receptors:

- Direct dermal contact and/or ingestion; and,
- Ingestion and/or inhalation of dust.
- Inhalation of outdoor vapour

The following pathways were considered relevant for controlled water receptors:

- Unsaturated zone transport of pore-water to groundwater;
- Saturated zone transport of soluble contaminants in groundwater;
- Unsaturated zone transport of soluble contaminants to surface water (i.e. runoff and interflow);
- Preferential contaminant migration along drains, ducts, culverts, pipes and/or associated with bedding material; and,
- Unnamed watercourse (tributary of Savick Brook)

Potential Pollutant Linkages

The initial Conceptual Site Model (CSM) developed during the desk study identified several sources, pathways and receptors and, as such, Potential Pollutant Linkages (PPLs) are considered likely to exist at the site. Following uncertainty analysis of the source, pathway and receptor components, the following key uncertainties were considered to warrant further consideration by way of assessment activities:

- The extent, thickness and chemical quality of made ground present on the site;
- The location, extent, thickness and chemical quality of fill deposits associated with infilled ponds and clay pits on site; and,
- The presence and chemical quality of groundwater within the Secondary aquifer associated with the glacial deposits.

3.11 Other relevant information

As part of the PWD investigation, a series of cores was taken through the existing carriageway to establish the construction, depth and condition of the road pavement where the scheme ties into the current network. Cores C7 to C10 and X3 were located on Sidgreaves Lane, south of Quaker Lodge. The pavement construction was found to have been built up over many years with layers of surface course within the lower bituminous construction. The cores were found to be between 40mm and 135mm thick. In order to determine the presence of any tarbound material, Core X3 was sent for chemical analysis and compared with criteria from the ADEPT Guidance Note 'Managing Reclaimed Asphalt – Highways and Pavements' which showed that the material testing was non-hazardous and can be treated as inert waste. However, as only one core was tested at this location there is the possibility of tarbound material being discovered when the carriageway works are undertaken.

4. FIELD AND LABORATORY STUDIES

4.1 Walkover survey

Several site walkovers have been undertaken along the proposed route. It was noted that during wet weather the fields were waterlogged and several large ponds were identified.

Two trees were identified along the scheme along with hedgerows along the sides of Sidgreaves Lane. In addition, the treeline alongside the railway may affect the scheme.

A large plastic pipe which protrudes from the railway embankment at the south of the eastern field was observed.

The walkover did not identify any visible or olfactory evidence of contamination.

Photographs taken during the walkover can be found in Appendix B.

4.2 Geological mapping

No geological mapping was undertaken as part of the ground investigation.

4.3 Ground Investigation

The intrusive investigation and laboratory testing were undertaken in accordance with Eurocode 7, BS5930 and BS1377.

The aim of the ground investigation was to determine the ground conditions in the scheme area to enable the production of geotechnical design recommendations.

The intrusive investigation was designed to supplement the existing ground investigation information that is available in the vicinity of the scheme and thus enable a ground model for the scheme to be produced.

Geotechnical and chemical testing was undertaken on samples taken from the boreholes.

It may be advantageous to undertake additional investigations once more detailed design information becomes available or should any changes be made to the proposed route.

4.3.1 Description of fieldwork

The intrusive investigation was undertaken by CC Geotechnical Ltd in March 2021. The investigation comprised fifteen window sample boreholes (WS04 to WS18) and six machine dug trial pits (TP01 to TP06) along the line of the proposed scheme:

- Three window sample boreholes (WS04 WS06) were situated along the proposed route of the road and were drilled to a depth of 4.00mbgl,
- Seven window sample boreholes (WS07 to WS10 and WS15 to WS18) were drilled to 3.00mbgl in the location of the proposed car park.
- Three window sample boreholes around the culverted watercourse (WS11 to WS14) were taken to 6.00mbgl with the exception of WS13 which was terminated at 2.90mbgl on refusal due to a suspected boulder.
- The six trial pits within the proposed car park area were taken to 2.00mbgl.

The borehole location plans and borehole logs are included in Appendix C.

4.3.2 Ground Investigation Report

A copy of the factual report can be found in Appendix D.

4.3.3 Results of in situ tests

The in-situ testing consisted of Standard Penetration Tests (SPT), Dynamic Cone Penetration testing (DCP) and Hand Vane Tests (HVT), the results of which are described further in Section 6.

4.4 Drainage studies

Three Falling Head permeability tests (FH8/9 between WS08 & WS09, FH13/12 between WS13 & WS12 and FH17/18 between WS17 & WS18) were undertaken at locations between the window sample boreholes at the proposed car park site.

4.5 Geophysical surveys

Not used.

4.6 Pile tests

Not used.

4.7 Other field work

Not used.

4.8 Laboratory investigation

Geotechnical laboratory testing was undertaken on soil samples that were recovered during the investigation. Plasticity testing of clay samples and the determination of particle size distribution of granular deposits were undertaken in order to classify the material likely to be encountered during the construction phase, to establish acceptability for re-use.

Chemical analysis was undertaken to determine any need for precautions with regard to disposal of waste material and to inform the acceptability (if required) for re-use within the scheme.

4.8.1 Description of tests

All soil samples were prepared in accordance with BS1377: Part One: 2016 and representative sub-samples were taken for testing. The following tests have been carried out across the road and car park scheme:

- Moisture content;
- Atterberg Limits;
- Particle size distribution (PSD) tests with sedimentation;
- pH and total sulphate: and,
- Chemical soil testing.

pH and Total Sulphate

Testing for pH values and total sulphate content (SO₄) was undertaken on thirteen samples with a further eight samples tested for water soluble sulphate content.

Contamination/Chemical testing

No evidence of contaminated material had been identified during the intrusive investigation or had been entered on the preliminary logs. However, it was decided that chemical testing should be undertaken on selected soil samples with the intention of establishing whether any excavated material would be acceptable for re-use within the scheme as fill to landscaping areas or re-use in open spaces.

Thirteen samples, representative of all surface strata encountered were submitted for laboratory analysis for asbestos, metals, semi-metals and inorganics, and also Polycyclic Aromatic Hydrocarbon (PAH) and Total Petroleum Hydrocarbon (TPH) analysis.

4.8.2 Copies of test results

A full copy of the geotechnical and chemical test results can be found in Appendix E.

5. GROUND SUMMARY

Details and locations of earthworks requirements will be included in the detailed recommendations within the GDR.

The ground conditions discovered in the intrusive investigation comprised predominantly grassed soft grey, slightly sandy, slightly gravelly, silty organic clay topsoil to a depth of between 0.25mbgl and 0.30mbgl overlying brown, firm to stiff, slightly sandy, slightly gravelly, silty clay to the base of the holes between 2.90mbgl and 6.00mbgl.

Stiff clay was encountered within the trial pits at depths of between 0.25mbgl and 2.00mbgl. It was described as stiff (very stiff in TP04) brown mottled grey, slightly sandy, slightly gravelly, silty clay. In TP05 the clay was described as friable and with a low cobble content.

Sand was observed in three boreholes (WS05, WS06 and WS11) and was described as medium dense, brown silty, clayey (gravelly) sand. The sand layers were encountered between 1.00mbgl to 1.40mbgl and 2.90mbgl to 3.10mbgl in WS05, between 0.95mbgl to 1.20mbgl in WS06 and between 0.75mbgl and 1.10mbgl in WS11. A sand lens was also described within the clay in TP02 at a depth of between 1.20mbgl and 1.30mbgl.

The strata recorded within the window sample boreholes and trial pits is summarised in Table 2.

Horizon	Horizon Strata Description		Depth to base (mbgl)
Topsoil	Grassed soft grey, slightly sandy, slightly gravelly, silty organic clay	0.00	0.20-0.30
Firm to stiff clay	Brown slightly sandy, slightly gravelly, silty clay	0.20 - 0.30	2.90-6.00
Stiff (very stiff) clay	Stiff (very stiff) Brown mottled grey, slightly sandy, slightly clay gravelly, silty clay		2.00
Sand	Medium dense, brown silty, clayey sand	0.75 2.90	1.10-1.40 3.10

Table 2: Summary of Ground Conditions.

A copy of the geotechnical ground model can be found in Appendix F.

5.1 Groundwater

Groundwater was encountered in four boreholes (WS05, WS06, WS12 and WS14) In WS05 and WS06 the groundwater was encountered at 1.00mbgl and 0.95mbgl, respectively, at the top of the sand layer. In WS12 and WS14 the entries were recorded at depths of 4.10mbgl and 3.50mbgl, respectively, within the clay and were described as a slight seepage.

Standpipes were installed in four boreholes (WS05, WS09, WS14 and WS18). Monitoring of the standpipes began in April 2021 and monitoring over a period of six months has indicated that the water levels in the standpipes varied by up to 2.30m. Groundwater monitoring will continue for a further six months to acquire data from the autumn and winter months. Table 3 shows a summary of the groundwater monitoring results.

Borehole	Borehole (mAOD)	Response Zone (mbgl)	Response Zone (mbgl)	Strata	Minimum depth (mbgl)	Maximum depth (mbgl)	Difference (m)
					Level (mAOD)	Level (mAOD)	
WS05	21.60	1.00 - 4.00	20.60 -	Clay	0.27	1.74	1.47
			17.60	and sand	21.33	19.86	
WS09	20.73	0.50 - 3.00	20.23 -	Clay	0.33	1.65	1.32
			17.73		20.40	19.08	
WS14	16.89	1.00 - 6.00	15.89 -	Clay	0.46	1.47	1.01
			10.89		16.43	15.42	
WS18	19.47	0.50 - 3.00	18.97 -	Clay	0.58	2.88	2.30
			16.47		18.90	16.60	

 Table 3: Groundwater Monitoring Results.

6. GROUND CONDITIONS AND MATERIALS PROPERTIES

As outlined in the ground conditions for this section of the scheme the natural horizon comprises of mainly cohesive deposits.

The ground conditions and material properties are based upon in situ and laboratory test results from the ground investigation undertaken in March 2021.

6.1 Topsoil

Topsoil depths were found to be between 0.25mbgl and 0.30mbgl. The topsoil was generally described as grass over a soft grey slightly sandy, slightly gravelly silty organic clay with frequent rootlets. Borehole WS10 was described as containing brick inclusions which may indicate made ground.

6.2 Made ground, including details of any contamination / contaminated areas

Made ground was not encountered in boreholes or trial pits along the route, apart from WS10, which was described as containing brick inclusions in the topsoil.

During the intrusive investigation no evidence of the presence of hazardous substances was noted, however, to mitigate potential risks to construction workers from contamination on site, due consideration should be given to the current best practice and guidance with regards to the use of Personal Protective Equipment (PPE).

It is likely that localised areas of made ground will be present directly alongside and beneath the existing roads that the route crosses.

6.3 Upper Cohesive Glacial Till

Results from the testing classify the majority of the cohesive glacial till as a firm to stiff low plasticity clay with some areas of intermediate plasticity clay. An area of very stiff clay was found to be present in TP4. A summary of the in situ and laboratory testing for the Upper Cohesive Glacial Till is shown in Table 4.

Test Type	Number of	Results			
	Results	Min	Мах	Mean	
Natural Moisture content (%)	40	14	32	18	
Liquid Limit (%)	25	29	49	35	
Plasticity Index (%)	25	14	28	18	
SPT (Uncorrected N Value)	49	11	26	16	

Table 4: Summary of in situ and laboratory results for Upper Cohesive Glacial Till.

6.3.1 Atterberg limits and Moisture Content

Atterburg testing was performed on samples of the natural cohesive horizon and showed the clay to be mainly low plasticity (CL) with moisture contents ranging between 14% and 19%.

Intermediate plasticity (CI) clays were encountered in WS11, WS12, WS14, TP2 and TP3, with two samples from TP1 and TP5 found to be borderline low/intermediate plasticity (CL/CI). In WS11, WS12, and WS14 the areas of intermediate plasticity correlate with the depths where higher moisture contents were recorded 24% to 32%. In WS14 where the highest moisture content of 32% was recorded, there is a correlation with a water seepage at 3.50mbgl. Moisture content values are shown in Figure 3.



Figure 3: Moisture Content values with depth.

There is also a correlation between moisture content, plasticity index and low N-values (see section 6.6.4).

6.3.2 Bulk Unit Weight

Bulk unit weight testing was not undertaken on samples from the boreholes. BS8002 (2015) gives suggested values for characteristic weight density and so for the firm to stiff clay values of between18kN/m³ and 22kN/m³ have been assumed.

6.3.3 Undrained shear strength

The U100 sample recovered during the site investigation were deemed unsuitable for undrained triaxial testing. Therefore, the correlation of c_u and SPT has been used to show the variation in strength with depth, after Stroud (1975), where $c_u=f_1xN$. The constant f_1 is a function of PI. Using the mean Plasticity Index value of 18% an f_1 factor of 5.75 is indicated by Stroud (1975).

SPTs were taken within the cohesive material at a range of depths. The N values ranged from 11 to 26 with an average of 16. Two N values from WS13 of 37 and 50 at 2.00mbgl and 2.90mbgl, respectively, were discounted as these were found to be over a boulder.

Therefore, using Stroud the correlation of c_u and SPT, after Stroud (1975) an average undrained shear strength of 92kN/m² is correlated.

However, the logs and the graph in Figure 4 show a variation of N values with depth. The graph and logs appear to indicate that the N values increase slightly to 2.00mbgl, with the majority of the logs indicating a decrease in N values to 3.00 - 5.00mbgl.



Figure 4: SPT N values with depth.

Using the mean Plasticity Index value of 15% generating an f_1 factor of 7 for the cohesive glacial till above 3.00mbgl, with an average SPT value of 17 blows, this correlates to an undrained shear strength of 119kN/m². Below 3.00mbgl the mean Plasticity Index increases to 25% generating an f_1 factor of 4.75 for the cohesive glacial till below 3.00mbgl, which correlates to an undrained shear strength of 62kN/m².

Hand Vane testing was undertaken on soil at various depths within the boreholes and trial pits. The testing recorded readings of between 60kPa and >110kPa, generally increasing with depth.

6.3.4 CBR Values

Dynamic Cone Penetrometer (DCP) testing was carried out in Trial Pits TP1 to TP6 and produced equivalent California Bearing Ratio (CBR) results ranging from 2% to 44%, indicating increased strength with depth down to 1.40mbgl. The results are shown in Figure 5.

The average of these tests was 13% with a lower quartile value of 6%. Theoretical equivalent CBR values were also calculated from shear strength (c_u) values derived from the relationship between SPT N-values and Plasticity Index (after Stroud) and assuming 1% CBR = 30kN/m². These were found to be between 2% and 4.6%, with all but two of these results being above 3%. Two outliers of 1.7% and 1.9% were found at depths greater than 4.00mbgl.





6.3.5 Compressibility

Samples were not available for oedometer testing; therefore, compressibility of the soil has been calculated using the relationship between m_v , PI and SPT values where $m_v=1/f_2N$ and f_2 is a function of Plasticity Index (after Stroud). Using an average Plasticity Index of 18% and an average SPT value of 16, leads to a m_v value of $0.1m^2/MN$.

6.3.6 Permeability

The two Falling Head permeability tests were undertaken with the upper cohesive glacial till strata:

- FH8/9 between WS08 & WS09 within cohesive strata
- FH17/18 between WS17 & WS18) -- within cohesive strata

The tests indicate a coefficient of permeability (k), of 6.23×10^{-8} m/s, and 4.83×10^{-8} m/s respectively.

Observations of groundwater strikes and groundwater monitoring indicate the cohesive layer shows generally a very slow response, this coupled with the results from the falling head tests indicates very low permeability typical of silt and interlaminated silt/sand/clay (CIRIA C750).

6.4 Granular Glacial Till

Borehole log information indicates that medium dense sand layers, ranging between 0.20m and 0.45m in thickness, were discovered, at a depth of between 1.00mbgl and 1.40mbgl, and 2.90mbgl and 3.10mbgl, in WS05, between 0.95mbgl and 1.20mbgl in WS06 and between 0.75mbgl and 1.10mbgl in WS11. A small sand lens was also discovered in TP02 between 1.20mbgl and 1.30mbgl. Table 5 shows a summary of the in situ and laboratory results for the granular Glacial Till.

Test Type	Number of	Results			
	Results	Min	Max	Mean	
Natural Moisture content (%)	1	15	15	15	
SPT (Uncorrected N Value)	4	11	18	14	

 Table 5: Summary of in situ and laboratory results for granular Glacial Till.

6.4.1 Particle Size Distribution

One Determination of Particle Size Distribution test was carried out on a sample of granular material from WS05 at 1.20mbgl. The results found the percentage of dry mass proportions to be Gravel 2%, Sand 64%, Silt 22%, Clay 12%, with a description of brown very silty, clayey, slightly gravelly sand.

6.4.2 Natural Moisture Content

One moisture content analysis was undertaken on the sample recovered from WS05 at 1.20mbgl. This indicated a natural water content of 15%.

6.4.3 Bulk Unit Weight

Bulk unit weight values were not obtained in the ground investigation from the sand bands. In absence of reliable test results, BS8002 (2015) suggests values for a medium dense sand, below the water table, ranging between 18kN/m³ and 20.5kN/m³.

6.4.4 Relative density

Standard penetration tests indicate a medium dense granular Glacial Till. The uncorrected SPT N values range between 11 and 18 for the silty, clayey sand. The horizon can generally be classified as a medium dense silty, clayey sand.

6.4.5 Permeability

One Falling Head permeability test was undertaken with the granular glacial till strata:

• FH13/12 between WS13 & WS12

The tests indicated a coefficient of permeability (k) of 1.41×10^{-7} m/s.

Observations of groundwater strikes, and groundwater monitoring indicate the granular layer shows generally a slow response, this coupled with the results from the falling head test indicates very low permeability typical of silt and interlaminated silt/sand/clay (CIRIA C750).

6.5 **Ground Model**

Stratum*	Depth (mbgl)	c _u (kPa) ¹	CBR (%) ²	φ' (deg) ³	γ (kN/m³)4	m _v (m²/MN) ⁵
Topsoil	0.20 – 0.30	-	-	-	-	-
Upper Cohesive Glacial Till	0.20 - 6.00	60 – 139	2 – 44	24 – 27	18 – 22	0.108
Granular Glacial Till	0.75 – 3.10	-	-	31	18 – 20.5	-
¹ From in situ hand	d vane tests and	laboratory	testing (after	Stroud – T	omlinson)	

Table 6 summarises the characteristic geotechnical parameters for the proposed road and car park.

² From DCP tests and shear strength correlation

BS8002 (2015) and Tomlinson (2001)

BS8002 (2015)

⁵ Laboratory testing (after Stroud – Tomlinson)

Table 6: Characteristic geotechnical parameters from testing and empirical data.

6.6 Groundwater

Groundwater regimes have been established within the superficial and solid deposits in the location of the proposed link road and carpark, by observation of groundwater strikes during drilling and monitoring of four boreholes from the 2021 ground investigation in the period April 2021 to September 2021. The groundwater monitoring information shows that groundwater levels varied by up to 2.88m with the highest water levels, of between 0.27mbgl and 0.58mbgl, found in May. The results indicate that the groundwater is likely localised perched water within the Glacial Till deposits.

It is expected that groundwater levels will fluctuate with seasonal variations and be in hydraulic connectivity with nearby watercourses and monitoring will continue to cover the autumn and winter seasons.

6.7 Concrete

The results from the 13 pH values and total sulphate content (SO₄) tests, and the 8 water soluble sulphate content tests, found that the pH ranged from 5.8 to 8.3, the total sulphate content ranged from <0.02% to 0.05% and the water soluble sulphate content ranged from <0.02g/l to 0.04g/l.

A concrete assessment was carried out for the proposed culvert structure in accordance with BRE Special Digest 1:2005 'Concrete in aggressive ground', Table C1. Based on the assessment, a Design Sulphate Class of DS-1 is required along with an ACEC class of AC-1.

6.8 Carriageway Cores

Information on the materials encountered from the cores taken during the PWD investigation can be found on the core reports in Appendix G.

6.9 Contamination

The results of the analysis of the samples submitted for laboratory analysis for asbestos, metals, semi-metals and inorganics, and also Polycyclic Aromatic Hydrocarbon (PAH) and Total Petroleum Hydrocarbon (TPH) analysis were compared with long-term human health risk assessment criteria derived Category 4 Screening Levels (C4SL) and Suitable for Use Levels (S4UL) for the scenario of a Public Open Space – Public Park.

No asbestos was found within the samples and none of the soil chemical testing results exceeded the screening criteria.

Based on the relatively low soil concentrations recorded and the absence of any identified potential historical sources of contamination, it is considered that the risk to controlled waters posed by the site is low and no remedial measures are considered necessary.

In addition, all the chemical analysis results were compared with waste regulations using HazWasteOnline software and all the samples were found to be nonhazardous. Therefore, it is anticipated that should any material need to be taken off-site it would be classed as non-hazardous.

A copy of the HazWaste Report can be found in Appendix H.

7. GEOTECHNICAL RISK

A risk register has been developed to show potential geotechnical risks associated with the scheme and mitigation measures which are to be put in place to deal with the identified risks.

The risks have been evaluated with reference to the risk evaluation matrix suggested in CD 622 Managing Geotechnical Risk.

		Severity						
	Likelihood	1	2	3	4	5		
		Minor	Moderate	Serious	Major	Catastrophic		
1	Extremely unlikely	1	2	3	4	5		
2	Unlikely	2	4	6	8	10		
3	Likely	3	6	9	12	15		
4	Extremely likely	4	8	12	16	20		
5	Almost certain	5	10	15	20	25		

Table 7: Geotechnical Risk Register Methodology – Likelihood v Severity.

	Potential severity of harm occurring						
1	Minor	Minor damage or loss – (no human injury)					
2	Moderate	Moderate damage or loss – (Slight injury or illness)					
3	Serious	Substantial damage or loss – (Serious injury or illness)					
4	Major	Major damage or loss – (Fatal injury)					
5	Catastrophic	Catastrophic loss or damage – (Multiple fatalities)					

Table 8: Geotechnical Risk Register Methodology – Potential Severity of Harm Occurring.

Risk Classification						
Low (1-8)	Ensure assumed control measures are maintained and reviewed					
	as necessary					
Medium (9-19)	Additional control measures to reduce risk rating to a level that is					
	equivalent to a test of "reasonably required" for					
High (20-25)	Activity not permitted. Hazard to be avoided or risk to be reduced					
	to tolerable level.					

 Table 9: Geotechnical Risk Register Methodology – Risk Classification.

Hazard	Consequence	Likelihood	Severity	Risk	Mitigation	Likelihood	Severity	Residual
								Risk
Ground variability and made ground/unforeseen ground conditions	 Unacceptable ground movement/settlement. Safety of workers/disposal costs. 	3	4	12	 Ground conditions and geotechnical characteristics have been determined based on the desk studies, ground investigations, factual reports. 	2	4	8
					 Areas of potential contamination have been identified during the desk study and SI. 			
					Supply contractors with all SI information.			
					 Contractors to report unforeseen ground conditions and suspected contamination areas. 			
Unidentified in-filled ponds or depressions, presenting areas of weak and compressible ground filled with unidentified material	 Potential for areas of weak ground, which may give rise to high and differential settlement over and above that anticipated. Potential for bearing failures if not treated. 	3	2	6	• Should any infilled ponds or peat areas be encountered beneath proposed earthworks then some form of treatment may be required prior to construction i.e. geotextiles/ excavate and replace.	2	2	4
Groundwater during construction.	 Dewatering required during construction causing delays in the programme. Requirement for drainage measures. 	2	3	6	 An in-depth review of piezometer readings has been undertaken in GIR to locate areas of risk of rising groundwater during construction. Fortunately, none of the areas surveyed were found to be at risk. Contractor to determine acceptable method for dealing with groundwater. 	1	3	3

Hazard	Consequence	Likelihood	Severity	Risk	Mitigation	Likelihood	Severity	Residual
								Risk
Aggressive Ground Soil Chemistry	Deterioration of Buried Concrete	2	4	8	 Geo-environmental testing has been assessed to determine suitable concrete classification. Contractor to review chemical testing information 	1	4	4
Severing underground services	 Injury/Death of Operatives and Delay to Contract 	3	5	15	• Ensure all services are located prior to excavating	1	5	5
Variability of construction material	 Failure of construction elements Excessive Settlement Long-term Maintenance Issues 	2	4	8	• Contractor to ensure compliance with specification	1	4	4

Table 10: Geotechnical Risk Register.

8. REFERENCES

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- 6. Design Manual for Roads and Bridges CD 622 Revision 1 (March 2020) Managing geotechnical risk.
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Cottam Parkway Site Location

County Council



Date Created: 16/12/2021





View from the road of the proposed carpark location.

E349121:N431338


Newly installed drain in Sidgreaves Lane E349118:N431381



First access gate for window samples in eastern fields.

E349116:N431397



Second access gate for window samples in eastern fields.

E349116:N431397



View from the road of the proposed carpark location.

E349121:N431338



View from the road of the proposed carpark location.

E349121:N431338



View from the road of the proposed carpark location.

E349121:N431338



Access gate for window samples in western fields.

E349105:N431413



Secondary gate access to south eastern fields.

E349457:N431415



Pond D.

E349500:N431298



Boggy Ground in south eastern field

E349399:N431300



Trees in south eastern field.

E349259:N431300



Stream in south eastern field.

E349344:N431300



Abandoned fencing and unidentified pipe next to railway embankment.

E349344:N431300



Culvert where stream runs underneath railway. One large crack is noted from the crest of the arch to the top of the bridgework.

E349347:N431303



Shallow ditch orientated east-west. Approximately E349267:N431318



Distant image of stream. E349338:N431329



Shallow ditch initially orientated east-west however diverges south towards the railway.

Approximately E349360:N431340



Boggy ground.

E349392:N431315



Shallow ditch orientated north-south towards railway.

Approximately E349275:N431328



Image of stream at the location where it travels underground. E349339:N431352



Localised depressions close to the location of an unidentified tree.

E349197:N431353



Medium depth dich orientated northeast-southwest between stream and Lea Road.

E349398:N431385



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Car Park Borehole Plan



Date Created: 01/03/2021



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			Contract Numb	er:	Date Sta	arted:		Log	ged By:	C	Checked By:		Status:			w30	0
			CCG-C-21-12	2093	26/0)3/2()21		SP		СВ		FINAL	_	Sheet '	1 of 1	
Dynan	nic Sam	pling	Easting:		vortning ۲۵۰): 1388		Gro	una Levei: 20 97mΔOΓ		Plant Used: Dando Terri	er Ria		IG	Scale:	1.25	
DUI Weather: Dr		Jy	343101.0	, 	4J	tion	Ao inotru			, h				ray Poti		1.25	
weather: Dry	Samples a	& In Situ Te	stina	!'	ermina	lion: I	AS INSTRU	icie	u Stra	ata De	etails		IMEL N/R, EN	argy Rau	10: N/R	Groun	dwater
Depth	Sample ID	1	Fest Result	Leve	el Dep	th (m)	Legend	1	0		Strata De	scription				Water	Backfill/
0.00 - 1.00	UT							s	Soft grey sligh	ntly sa	andy slightly	gravelly	silty organic (CLAY.	-		
0.15	ES							G n	Gravel is fine nudstone and	to me I sano	dium subang dstone. Freq	gular to uent roo	well rounded otlets, grassed	at	-		
-				20.7	2 0	.25	X	s	urface (TOPS	SOIL)	, andu aliabtu			Cravalia	1		
0.40	ES						×	i fi	ne to mediun	n sub	rounded to v	vell rour	nded mudston	e and	·		
-		HVP=110					×	i s	andstone.						-		
[(0	.70)	×_×	<u></u>							E		
-							$\frac{1}{x} = \frac{1}{x}$	<u></u>							-		
-							÷ ×	×							-		
1.00				20.0	02 0	.95		×	Aedium dense	e hroi	wn silty clave		ר		- , I		
1.00 - 2.00	UT						×				WIT SILLY OLAYC	<i>y</i> 0/ 111					
-		SPT(S)N=	16 (2,3/3,4,5,4)	19.7	7 1.	.20	× ×							<u> </u>	_		
-			(),				×	≍ S	ne to coarse	subro	sandy slightly	y gravel stone.	lly silty CLAY.	Gravel is	5 - -		
-							×	×							-		
- 1.50	D	HVP=110					×	×							-		
-							×	×							-		
-							×	×							-		
-							×	×							-		
		SPT(S)N=	19 (2 2/4 5 4 6)				×	×							- 2		
2.00 - 0.00			13 (2,2/4,3,4,0)				×	×									
-							×	×							-		
-							×	×							-		
[×	×							[
-		HVP=110					×								-		
-					(2	.80)	×	1.12							-		
							×	1							-		
							$\frac{1}{x} = \frac{1}{x}$	<u></u>							-		
-3.00 - 4.00	UT	SPT(S)N=	16 (2,3/3,4,5,4)				÷ ×	×							- 3		
-								×							-		
								×							-		
							× 	×									
-							×	×							-		
- 3.50	D	HVP=110					X 	×							-		
							×	×							-		
-							×	×							-		
-							×	X							-		
-		SPT(S)N=	14 (2,1/3,2,4,5)	16.9	97 4.	.00	×	~			End of Boreh	ole at 4.00	0m		- 4		
-																	
-															-		
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-															-		
-															-		
E																	
[
<u> </u>															- 5		
Sta	art & End o	of Shift Obs	casing (m) Water (Bo m) Den	rehole E	Diame	eter Ca	asing	g Diameter	Rema	arks:						
Date		pehni (III)	Salaring (III) Water (/ur (11)	Jia (fi		rai (f									
													Motor Ot	ikos			
l		hiselling				b	nstallation	n		Strike	(m) Casing (r	n) Seale	vvater Str d (m) Time (mins	Rose to	(m) Rem	arks	
From (m) To	(m) Du	ration Re	emarks	То	p (m) I	Base	(m) T	уре	Dia (mm)	0.9	95		0	1			
											CC GEOTEC	INICAL	LTD 0151 545 2	2750 www	v.ccgeot	echnical.	com

			Contract N	ame:					Client	t:					Boreho	le ID:	
		-	Cottam P	arkway	Statio	on										Men	7
			Contract N	umber:	Date	e Started		Lo	gged By:	C	hecked By:		Status:			w30	
			CCG-C-2	1-12093	3	24/03/20)21		SP		СВ		FINAL	-	Sheet ?	1 of 1	
Dynan	nic Sam	pling	Easting:		Nor	thing:		Gr	ound Level:	PI	ant Used:	Ξ.	Rig Crew:	~	Scale:	4.05	
Bor	enole L	og	3491	39.4	-	431362	2.6		20.70mAOL	ם נ	ando Terrie	er Rig	AR/CM	G		1:25	
Weather: Dry	y	<u> </u>			Terr	nination:	As instr	ucte	ed		SP	T Ham	mer: N/R, Ene	rgy Rati	o: N/R	-	
Dopth	Samples		sting	L	evel	Depth (m)	Logon	4	Str	ata Det	alls Strata Daa	orintion				Groun Water	dwater Backfill/
0.00 - 1.00	UT		est i tesuit	(m.	AOD)	(Thickness)		u X	Soft arev sliał	ntlv sar	ndv slightly g	ravelly	silty organic C	LAY.		Strike	Installation
-	_								Gravel is fine	to mec	lium subang	ular to	well rounded	-4	-		
0.20	ES			20	0.50	0.20	<u>~~~~~</u>		surface (TOP	SOIL)	sione. Frequ	entro	oliels, grassed	ลเ	Æ		
-								×	Stiff brown slig	ghtly s	andy slightly	grave	lly silty CLAY. G	Gravel is	-		
-		HVP=100					×	×		500100		rioun			-		
0.60	ES						×	×							-		
-							×	×							-		
-							×	×							-		
-							×	×							[
-1.00 - 2.00	UT	SPT(S)N= HVP=110	15 (2,3/3,4,4,4	·)			×	×							- 1		
- 1.10	ES						×	×							-		
-							×	×							-		
-							×	×							-		
- 1.50	D						×	×							-		
-						(2.80)	×	×							-		
-							×	- <u>×</u>							[
-							×	×							-		
			04 /0 0/4 4 0 7				×	X									
2.00 - 3.00		HVP=110	21 (3,3/4,4,0,7)			×	X									
-							×	×							-		
-							×	X							-		
-							×								-		
- 2.50	D						×								-		
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-							 	-							-		
-		SPT(S)N=	16 (3,3/3,4,4,5	5) 17	7.70	3.00	<u></u>				End of Boreho	e at 3.0	Om		- 3		
-		HVP=110									End of Boreno	e at 0.0			Ē		
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Date St	art & End Time	of Shift Obs Depth (m)	ervations Casing (m) Wa	ater (m) D	Boreh Pepth (ole Diame (m) Dia (r	nm) De	Jasi pth	ng Diameter (m) Dia (mm)	Remai	KS:						
		Ī															
										C1-11	(m) 0		Water Stril	kes		ork-	
From (m) To	(m) (m)	Chiselling	marks		Top (r	n) Base	nstallatio	on Tvné	e Dia (mm)	SILIKE ((III) Casing (m) seale	u (m) lime (mins)	rtuse to (in) Kem	arks	
	, Du				-٣ (١	, 2000											
										C	C GEOTECH	NICAL	LTD 0151 545 27	750 www	.ccgeot	echnical.	com

			Contrac	t Name:	0.				Clier	nt:					Boreho	le ID:	
()		-	Cottan	n Parkwa	y Sta	tion	-l.				Le alua d Duu	LCC	Chattan			MSN	8
			Contrac			ate Starte	a:	ľ	ogged By:		пескеа ву:		Status:			1100	U
			CCG-C	5-21-120	193	24/03/	2021		5P		CB		FINAL		Sheet '	1 of 1	
Dynan	nic Sam	npling	Easting	: 10201 2		ortning: 1313/	0.4		20 51mAO	יין ח ח	ant Used: ando Terrie	ar Ria	Rig Crew:	·	Scale:	1.25	
DUI	enole L	ug	54	5201.2		4010	0.4	atru						m. Datie		1.25	
weather.	Samples	& In Situ Tes	tina			IIIIIauoi	. As III	Istruc	Sieu	trata Det	ails	паш	IIIel. N/K, Ellel	yy Ralio	J. IN/K	Groun	dwater
Depth	Sample ID	Te	est Result			Depth (n (Thicknes) s) Leg	gend			Strata Des	cription				Water Strike	Backfill/ Installation
0.00 - 1.00	UT) (-/		Soft grey slig	htly sar	ndy slightly g	ravelly	silty organic C	LAY.	-		
- 0.10 [ES				20.34	0.20			Gravel is fine mudstone an	e to mec id sands	lium subang stone. Frequ	ular to ent roo	well rounded otlets, grassed a	at	-		
-					20.5	0.20	×	<u></u>	surface (TOF	SOIL)	andv cliabtly	gravol		ravalie	4		
-							×	<u></u>	fine to mediu	m subro	ounded to we	ell rour	ided sandstone		-		
0.50	ES	HVP=110					×	<u>></u>							-		
-							×	<u></u>							-		
-							×	<u>></u>							-		
-							×	<u></u>							-		
- 1.00	ES	SPT(S)N=2	1 (2,2/4,5	5,5,7)			×	<u></u>							- 1		
1.00 - 2.00	UT		(· · ·				×	<u></u>							-		
-								<u></u>							-		
-							×	<u></u>							-		
4.50		10/0-110						<u></u>							-		
- 1.50		HVP=110				(2.80	×	<u>></u>							-		
-						(2.00	/ ×	<u></u>							-		
-							~	<u></u>	-						-		
-							~	<u></u>	-						-		
-2.00 - 3.00	UT	SPT(S)N=1	5 (2,2/3,5	5,3,4)				<u>~~</u> ~							- 2		
-							\rightarrow	<u>~~</u>							-		
-							\rightarrow	<u>~~</u>							-		
-								<u>></u>							-		
2.50	D	HVP=110						<u>></u>							-		
-								<u>></u>							-		
-							×	<u>></u>							-		
-							×	${\sim}$							-		
-		SDT(S)N-1	1 (1 2/2 3	3 3)	17 51	1 3 00	×	<u>~~</u> >							- 2		
-			1 (1,2/2,3	,0,0)	17.5	5.00					End of Borehol	e at 3.00)m		- 3		
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<u> </u>															- 5		
Date	art & End	of Shift Obse Depth (m) (ervations Casing (m)	Water (m	Bore	ehole Diar h (m) Dia	neter (mm)	Ca Dent	sing Diameter h (m) Dia (mm)	Remar	rks:	_					
Duio					, 2001		ı)			1							
													Water Strik	es			
l		Chiselling					Install	ation		Strike ((m) Casing (m) Seale	d (m) Time (mins)	Rose to (m) Rem	arks	
From (m) To	o (m) Du	ration Rer	narks		Тор	(m) Bas	e (m)	Ту	pe Dia (mm)								
										<u> </u>				E0		oobele -!	
											C GEOTECH	NICAL	LID 0151 545 27	50 WWW	.ccgeot	ecnnical.	com

			Contract Nam	e:					Clien	nt:					Boreho	ole ID:	
		-	Cottam Park	way St	ation							LCC			,	wso	na
			Contract Num	per:	Jate S	started:		Logge	d By:	C	hecked By:	5	Status:	.		••50	55
			CCG-C-21-1	2093	24	1/03/20)21		SP		СВ		FINA	L	Sheet	1 of 1	
Dynar	nic Sam	pling	Easting:	1	ارNorthi	ng: 21240		Groun	d Level:		lant Used: Jando Torri			10	Scale:	1.25	
	enole L	og	549202.	-				20.	.7 SIIAOL							1.23	
weather: Dr	Samples	& In Situ Te	estina	!'	ermir	hation: /	As Instru	lcted	St	rata Dei	5F tails	'i Hamn	ner: N/R, Ene	ergy Rati	0: N/R	Grou	ndwater
Depth	Sample ID	-	Test Result	Leve		Depth (m)	Legend	1	01		Strata Des	scription				Water	Backfill/
0.00 - 1.00	UT			(mAC		nickness)		Soft	t grey slig	htly sa	ndy slightly g	ravelly	silty organic	CLAY.	-	Suike	Installation
-								Gra	vel is fine	to me	dium subang stone Frequ	jular to v	vell rounded	t at	-		
0.25	ES	HVP=60		20.5	5	0.20	×	surf	ace (TOP	SOIL)					Æ		
-							×		n becomin AY. Gravel	ng stiff I is fine	to medium	ly sandy subangu	slightly grav	unded	-		
-							 	f muc	dstone and	d sand	stone.				-		
0.65	ES	HVP=100					×	*							-		
0.05	ES						\sim \sim	×							E		
-								× •							-		
		HVP=110	10 (0 0/0 0 0 0 0)				<u>~</u>	×							÷,		
-1.00 - 2.00		5P1(5)N=	-12 (2,3/3,3,3,3)				×	×							- 1		
1.20	ES						×	×							-		
-							×	×							-		
-							×	×							-		·
- 1.50	D						×	×							-		
-					((2.80)	×	×							-		
-							×	×							-		
							×	×							-		
-2.00 - 3.00	UT	SPT(S)N=	13 (2,2/3,3,3,4)				×	×							- 2		
-		HVP=110					×	×							-		
[×	×							E		
-							×	×							-		
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-							×	1×							-		
-							×	×							-		
-							X	×							-		
-		SPT(S)N= HVP=110	13 (2,2/2,3,4,4)	17.7	'3	3.00	ંં				End of Boreho	le at 3.00r	n		- 3		
-															-		
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- 3.50	D														-		
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SI	tart & End	l of Shift Obs	servations	Bo	rehole	Diame	ter C	asing D	Diameter	Rema	rks:						
Date	Time	Depth (m)	Casing (m) Water	(m) Dep	oth (m)) Dia (n	nm) Dep	oth (m)	Dia (mm)								
L		2bios III and				<u> </u>	notelle *			Strike	(m) Casing (m	n) Sealed	Water Str (m) Time (mins	rikes s) Rose to (m)Rem	arks	
From (m) To	(m) Du	ration Re	emarks	То	p (m)	Base	(m) T	уре	Dia (mm)		, , , , , , , , , , , , , , , , , , , ,						
					0.00 0.50	0.5 3.0	0 PL 0 SLC	_AIN DTTED	19 19								
					-				-	0	CC GEOTECH	INICAL L	TD 0151 545 2	2750 www	.ccgeot	echnical	.com

			Contract Name					Clien	nt:				Boreho	ole ID:	
((-	Cottam Parkw	ay Sta	ation							21.1	, I	WS1	0
			Contract Numb	er: D	ate Star	ted:				Checked By:		Status:		W U I	U
			CCG-C-21-12	2093	24/0	3/20	21	SP		CB		FINAL	Sheet	1 of 1	
Dynan	nic Sam	npling	249299 7		431	309	4	18.35mAOI		Plant Osed: Dando Terrie	r Ria	AR/CMG	Scale:	1.25	
Weather: Dr	,	og	040200.1	<u> </u>	orminati	on: /		etod					tio: NI/P	1.20	
weather. Dry	Samples	& In Situ Tes	tina	1	emmau	011. <i>F</i>	AS INSUU	St	rata D	etails		ner. N/K, Energy Ka	110. IN/R	Groun	dwater
Depth	Sample ID	Te	est Result	Leve	Deptr	r (m) ness)	Legend			Strata Deso	cription			Water Strike	Backfill/ Installation
- 0.00 - 1.00	UT				0) (XXX	Soft grey slig	htly s	andy slightly g	ravelly	silty organic CLAY	-		
0.15	ES			18.1	5 0	20		to well round	າs of b ed mເ	orick. Gravel is udstone and sa	fine to andston	medium subangular e. Frequent rootlets.	Ē		
-				10.1	0.2	-0	×	grassed at su	urface	(TOPSOIL)	gravelly	silty CLAX Gravel			
0.40	ES	HVP=100					×	fine to mediu	m sub	prounded to we	ell round	ded mudstone and	-		
-								sandstone.					-		
[×						E		
0.70	ES						×						-		
-							×						-		
-1 00 - 2 00		SPT(S)N=1	1 (1 2/2 3 3 3)										-1		
1.00 - 2.00			1 (1,212,0,0,0)					<					- '		
1.20	ES						\sim \times						-		
Ē							\sim \sim \sim						Ē		
-								~					-		
- 1.50	D												-		
Ē					(2.8	s0)		~					Ē		
-							×—						-		
-							×	< -					-		
2.00 - 3.00	UT	SPT(S)N=2	20 (5 for				×	< -					2		
-		HVP=110	5,5)				×	< -					-		
-							×	< - -					-		
							×— — ~	2					E		
- 2.50	D						× <u> </u>	<u>∼</u>					-		
-							× <u> </u>	<u>∼</u>					-		
							× <u> </u>	<u>∼</u>					E		
-							×	₹					-		
-		007(0)N-4		45.0		~	X 						-		
		HVP=110	0 (2,2/3,4,5,4)	15.5	5 5.0	0				End of Borehole	e at 3.00r	n	3		
-													-		
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Date	art & End of Time	of Shift Obse Depth (m)	ervations Casing (m) Water (i	Bor m) Dept	ehole Di th (m) D	amet ia (m	ter Ca m) Dept	ising Diameter h (m) Dia (mm)	Rem	arks:					
												Water Strikes			
	()	Chiselling	I	1_	() I =	In	stallation		Strik	e (m) Casing (m)	Sealed	(m) Time (mins) Rose to	(m) Rem	narks	
rom (m) To	(m) Du	Iration Ren	narks	Тор	o (m) B	ase ((m) Ty	/pe Dia (mm)							
									<u> </u>	CC GEOTECHI		TD 0151 545 2750 ww	w.ccaeot	technical	com
									1						

			Contract Name	:					Clien	nt:						Boreho	ole ID:	
			Cottam Parkv	vay St	ation						01			01.1			WS1	1
				er: IL	Jate St	arted:	024	Logg	ed By:	ľ	Cnec		i	Status:	1		101	•
		un line er	Easting:	2093	Z4/	03/20)21	Grou	or nd Level:		Plant				<u> </u>	Sheet	1 of 2	
Bor	nic Sarr rehole L	ipiing oa	349333.3	;	43	9. 1347	.0	010u 1	7.64mAOI	D	Dano	do Terrie	er Rig	AR/CN	IG	ocale.	1:25	
Weather: Dr	y	- 3		1	Fermina	ation: /	As instru	icted				SP	T Hamr	ner: N/R, Ene	ergy Rat	tio: N/R		
	Samples	& In Situ Te	esting					-	St	rata D	etails						Grour	dwater
Depth	Sample ID		Test Result	Lev (mAC	el De DD) ^{(Thi}	pth (m) ckness)	Legend				5	Strata Des	cription				Water Strike	Backfill/ Installation
0.00 - 1.00	UT							GI Sc	oft grey slig avel is fine	htly sa to me	andy edium	slightly g ı subang	ravelly ular to ו	silty organic (well rounded	CLAY.	-		
0.20	ES				(0).35)		m	udstone an	d san	dston	ne. Frequ	ent roo	tlets, grassed	lat	-		
-				17.2	29 0).35	XX	50		li se de de	,				0			
0.50	_						× 	is	fine to med	lignuy lium s	ubro	unded to	well ro	unded mudst	one and	-		
0.50	ES				(0	0.40)	×	x sa	ndstone.							-		
-				100			×	×								-		
				16.8	9 U).75	×_×	GI	reyish brow	n ver	y clay	ey grave	lly SAN	ID. Gravel is	fine to			
-					(0).35)	×		arse subar	iyulal	Sanu	ISIONE.				-		
- 1.00 1.00 - 2.00	ES UT	SPT(S)N=	=11 (1,1/2,2,3,4)	100		10	×	×								- 1		
[HVP=100		10.0	94 1	.10	×—	× St	iff brown sli e to mediu	ightly m sub	sand	y slightly	gravell ell roun	y silty CLAY. ded mudston	Gravel i e and	s -		
-							×	× sa	ndstone.	in out	Joan		Sirrouri		ound	-		
							×	×								-		
- 1.50	D						×	×								-		
-							×	×								-		
		SPT(S)N=	=20 (2 3/4 5 5 6)				×	×								-		
-			20 (2,0, 1,0,0,0)				×	×								-		
-2.00 - 3.00	UT	HVP=110					×	×								- 2		
							×	×								-		
-							×	×								-		
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- 2.50	D	HVP=110					×	×								-		
-							×	×								-		
							× ×	×								[
-							× ×	×								-		
-3 00 - 4 00		SPT(S)N=	=13 (1 2/2 3 3 5)				× ×	×								- 3		
5.00 - 4.00			10 (1,2/2,0,0,0)		(4	.90)	× ×	×								- 3		
-							×	×								-		
							×	×								Ē		
-							×	×								-		
- 3.50	D	HVP=110					×	×								-		
							×	×								-		
-							×	×								-		
							×	×								-		
-4.00 - 5.00	UT	SPT(S)N=	=11 (1,2/3,2,3,3)				×	×								- 4		
-							×	×								-		
							×	×								Ē		
-							×	×								-		
4.50	D	HVP=90					×	×								-		
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-							×	×								-		
Ē							×	×								-		
-5.00 - 6.00	UT	SPT(S)N=	=16 (3,4/4,4,4,4)				X	×			~	ontinued	avt choot					
St	tart & End	of Shift Ob	servations	Bo	rehole I	Diame	ter Ca	asing	Diameter	Rem	arks:		SAL SHEEL				l	<u> </u>
Date	Time	Depth (m)	Casing (m) Water (m) Dep	oth (m)	Dia (n	nm) Dep	th (m) Dia (mm)	-								
														141				
		Chiselling		_		Ir	Istallation	n		Strike	e (m)	Casing (m) Sealed	Water Str I (m) Time (mins	ikes)Rose to	(m) Ren	narks	
From (m) To	o (m) Du	iration Re	emarks	То	p (m)	Base	(m) T	ype	Dia (mm)					0		Dry		
										1	CC G	SEOTECH	NICAL L	TD 0151 545 2	2750 ww	w.ccgeo	technical.	com

					Contrac	t Name:						Clien	nt:						Boreho	le ID:	
					Cottan	Parkw	ay St	atior			1.				LCC				1	MQ1	1
					Contrac		er: L	Jate	Started:	01	LC	ogged By:		check	ed By:	Stati				W 01	•
					CCG-(-21-12	093	24	4/03/20)21		SP		Nentl	CB	Dia		-	Sheet 2	2 of 2	
Dyn	amic	Sam	pling	ľ	⊑asung 34	.9333 3		uorun 2	ing. 131347	0		17 64mAOI		Dand	o Terrier Ri		AR/CM	G	Scale.	1.25	
Weather [.]	Drv		og					Termi	nation	As inst	ruct	ed	- 1-	Jana	SPT Ha	mmer.	N/R Ene	erov Ratio	n' N/R		
Troduion.	Sai	nples &	& In Situ	ı Testii	ng		- I'		nation. ,		laot	St	rata De	tails	orrina			ngy ruan	5. 14/10	Groun	dwater
Depth	Sa	nple ID		Tes	st Result		Leve (mAC	el DD) (Depth (m) Thickness)	Leger	nd			St	rata Descriptio	on				Water Strike	Backfill/ Installation
-										×	×	Stiff brown sli	ightly s	sandy	slightly grav	elly silt	y CLAY. (Gravel is	-		
-										×	- <u>×</u>	sandstone.	in subi	ound		unueu	muustone	5 anu	-		
-										×	- <u>×</u>								-		
-										×	- <u>×</u>								_		
-			HVP=9	90						×	- <u>×</u>								-		
										×	- <u>×</u>								-		
-										×	- <u>×</u>								-		
-										×	- <u>×</u>								-		
-			SPT(S)N=26	6 (4,5/4,6	,7,9)	11.6	64	6.00	÷	<u></u>			End o	of Borehole at 6.	.00m			-6		
-				110															-		
-																			-		
-																			-		
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Deta	Start 8	Endo	of Shift	Obser	vations	Moto - /	Bo	rehol	e Diame	ter (Casi	ing Diameter	Rema	arks:					1		1
Date		ine I	Depth (m) Ca	asıng (m)	vvater (n	Dep	om (m	וט (n (n	im) De	pth	(m) Dia (mm)	-								
													<u> </u>				Wator Stri	kes			
			Chisellin	lg					I	nstallati	on		Strike	(m) C	Casing (m) Sea	iled (m)	Time (mins)) Rose to (m) Rem	arks	
From (m)	To (m)	Du	ration	Rem	arks		То	p (m)	Base	(m)	Тур	e Dia (mm)					U		Dry		
																י מדו ו	151 545 2	750 www	CCGROT	echnical	com
				I										JU 00					Julyant	connical.(

					Contrac	t Name:	•						Clien	nt:			~~				Boreh	ole ID:	
	\square				Cottam	Parkwa	ay St) Ctartadi			aaad	Dia			Lead Dur		Ctatur			-	WS1	2
							r: L	Jate າ	Started:	: 121	LO	ggea	SD		nec			Status		1			
		Com	nling		asting	-21-120	193		5/05/20	121	Gr	ound	J evel:		Plant	Used:		Ria C			Sheet Scale:	1 of 2	
E	Boreh	ole Lo	piing ca		.usting: 349	9341.0	ľ	401111	431312	2.0		17.1	8mAOI		Dano	do Terrie	er Rig	i tig O	LN/A	S	Could.	1:25	
Weather:	Drv		- 3					ermi	nation:	As in	Istruct	ed				SP	T Hami	ner: N	I/R. En	erov Rat	io: N/R		
	, Sa	mples &	& In Situ	Testin	g								St	rata De	etails				. ,	55		Grour	ndwater
Depth	Sa	mple ID		Test	Result		Leve (mAC	el)D) (Depth (m) Thickness)	Leg	gend				S	Strata Deso	cription					Water Strike	Backfill/ Installation
- 0.00 - 1.	.00	UT								X		Soft g	grey slig	htly sa	indy	slightly g	ravelly	silty c	rganic	CLAY.	-		
0.20		ES							(0.30)			muds	stone an	d sand	dston	ne. Freque	ent roo	tlets, g	grasse	d at	-		
-							16.8	88	0.30			surfa Stiff I	ce (TOP	ightly	sand	v sliahtly	aravell	v siltv		Gravel i	-		
-										×	<u>×</u> ×	fine t	o mediu	m sub	roun	ded to su	bround	led m	udston	e and			
-										×	<u>×</u> ×	sand	stone.								-		
- 0.60		ES	HVP=1	10						×	<u>×</u> ×										-		
-										×	<u>× </u>										-		
-										×	<u>×</u> ×										-		
-1.00 - 2.	.00	UT	SPT(S))N=16	(1,2/3,4,	4,5)				×	<u>×</u> ×										-1		
1.10		ES								×	<u>× </u>										-		
-										×	<u>× </u>										-		
-										×	<u>×</u> X										-		
- 1.50		D								×	<u>×</u> X										-		
-										×	<u>×</u> ×										-		
-			HVP=1	10						×	<u>×</u> X										-		
-										×	<u>×</u> X										-		
-2 00 3	00	шт	ODT(C)	N-16	100101	4.5)				×	<u></u>										-		
-2.00 - 3.	.00	01	3F1(3))IN-10	(2,3/3,4,	4,5)				×	<u></u>												
-										×	× X										-		
										×	× X										Ē		
-										×	<u></u>										-		
-										×_	<u>.~</u> ×										-		
-			HVP=1	10					(5.70)	×_	<u>∝</u> 										-		
-										×_	<u>∝</u> 										-		
-										×	×										-		
- 3.00		D	SPT(S))N=19	(2,2/3,4,	6,6)				×	×										- 3		
3.00 - 4.	.00	UT								×	<u></u>										-		
-										×	×										-		
-										×	<u>x</u>										-		
-			HVP=1	10						×	<u>x</u>										-		
-											<u></u>										-		
-										×	<u>×</u>										-		
										×	<u> </u>										-		
-										×	<u> </u>										-		
-4.00 - 5.	.00	UI	SPT(S))N=14	(2,3/3,3,	4,4)				×	<u>× ×</u>										- 4		
-											<u>×</u> ×										-		
-											<u>× ×</u>										-		
-										$\overline{}$	<u>× ×</u>										-		
4.50		D									<u>× ×</u>										-		
-											<u>× ×</u>										-		
			HVP=8	0							<u>× ×</u>										-		
-											<u>× ×</u>										-		
-5.00 - 6.	.00	UT	SPT(S))N=17	(2,4/4,5,	4,4)					<u> </u>				C	ontinued ne	ext sheet						
	Start &	& End c	of Shift (Observ	/ations		Bo	reho	e Diame	ter	Casi	ing Dia	ameter	Rema	arks:						I	1	1
Date	T	ime [Depth (r	m) Ca	sing (m)	Water (m	i) Dep	oth (n	n) Dia (n	nm)	Depth	(m) [Dia (mm)										
			big - W				_		<u> </u>		ati-			Strike	(m)	Casing (m)) Sealed	V I (m) Ti	/ater St me (min	rikes s) Rose to	(m) Rer	narks	
From (m)	To (m)) Dui	ration	y Rema	irks		То	p (m)	Base	(m)	auon Typ	e [C	Dia (mm)	4.1	0	<u> </u>			0		Slig	ht seepag	le
										T													
															CC G	BEOTECHI	NICAL	TD 01	51 545	2750 ww	w.ccgeo	technical.	com

				Contract Na	me:					Clien	nt:					Boreho	le ID:	
			-	Cottam Pa	rkway	Statio	n		1.				LCC	_			121	2
			. 7	Contract Nu	mber:	Date	Started	:	Lo	gged By:	С	hecked By:		Status:			W31	2
				CCG-C-21	-12093	3 2	3/03/20)21		SP		СВ		FIN	AL	Sheet 2	2 of 2	
Dy	nam	nic Sam	pling	Easting:	1.0	North	ning: 421215	0	Gr	ound Level:		lant Used: Jando Torri		Rig Crew:	10	Scale:	1.25	
\\/aathar			og	54954	1.0	Tarm	431312	1.U							40 norm / Doti		1.25	
vveatner	: Dry	Samples	& In Situ Te	stina		Ierm	ination:	as inst	ructe	ea Sti	rata Det	ails	'i Hami	mer: N/R, E	nergy Rati	0: N/R	Groun	dwater
Depth	 ו	Sample ID		Fest Result	L	evel	Depth (m)	Leger	nd	01		Strata Des	cription				Water	Backfill/
-					(112	AOD)	(1110101000)	×	×	Stiff brown sli	ightly s	andy slightly	gravell	y silty CLAY	. Gravel is	; _	ouno	motalidition
5.50	1	D	HVP=100	ſest Result	(m.	1.18	6.00			Stiff brown sli fine to mediuu sandstone.	ightly s m subr	Strata Des andy slightly ounded to su End of Boreho	eription gravell ubround	y silty CLAY led mudstor	? Gravel is ne and	6 	Strike	Detcklij/ Installation
- - -																-		
-																-		
-																Ē		
-																-		
-																		
-																- 10		
	Sta	art & End /	 of Shift ∩he	servations		Boreho	le Diame	ter	Casi	ng Diameter	Rema	rks [.]				10		
Date		Time	Depth (m)	Casing (m) Wat	er (m) D	Depth (r	n) Dia (r	nm) De	epth	(m) Dia (mm)				Water S	Strikes			
		(m) 2	Chiselling			T (nstallati	ion		Strike 4.10	(m) Casing (m)	n) Sealed	t (m) Time (mi 0	ns) Rose to	(m) Rem Sliat	arks It seepage	e
From (m)	То	(m) Du	ration Re	emarks		Гор (m) Base	(m)	Туре	e Dia (mm)							soopayi	-
											-			TD 0151 545	5 2750 wave		echnical	om
L											<u>ر</u>				, 21 30 WWW	licigeot	ecnnical.(

				Contrac	t Name:	01					Client:							Borehole ID:			
					Contract Number: Date Started:							LOG Logged By: Checked By: Status:								WS1	3
					CCG-0	2-21-12	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	22/03/2021				Ground Level:		Checked By:		5	FINA	I		•	
					Easting:			vorthi	thing:		G			Plant	t Used:	R	Rig Crew:		Sheet Scale:	Sheet 1 of 1	
	Bore	hole L		34	9342.8		431341.3				17.45mAOD Dando Terrier Rig LN/AS					S		1:25			
Weather: Dry									ermination: Refusal on suspected boulder. SPT Hammer: N/R, Energy Rati												
		Samples	& In Situ	u Testin	g		Strata Details											Groun	dwater		
Depth	1 00	Sample ID	Test Result			(mAC	D) (Thickness)	Lege	end	Strata Description								Strike	Installation	
0.10	.00	ES							(0.30)			Gravel is fir	e to m	ediun	n subangu	avery s	ell rounded	ULAI.	Ē		
-							47.4		0.00			surface (TC	PSOIL	1astor _)	ne. Freque	ent rootie	ets, grassed	at	-		
0.45							17.1	5	0.30	××		Stiff brown	slightly um su	ightly sandy slightly gravelly silty CLAY. Gravel is m subrounded to subangular sandstone.				S -			
		ES	HVP=1	110						— — ×				Diodi		Jangala			-		
										— <u>×</u>									-		
-										— <u>×</u>									-		
0.90		FS								×									-		
-1.00 - 2.00		UT	SPT(S)N=13 (1,1/3,3,3,4)						×									- 1			
										×									Ē		
-										×	<u> </u>								-		
										×									-		
- 1.50		D	HVP=1	110						×	<u> </u>								-		
									(2.60)	×									E		
-										×	- ×								-		
Ē										×									Ē		
-2.00 - 2	.90	UT	SPT(S	5)N=37	(2,5/5,7	,17,8)				×									- 2		
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-										×	××								-		
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- 2.50		D								× ×	××								-		
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-			HVP=1	110						×— — ×	×								-		
			SPT(S	N=50	(1 9/50	for	1/ 5	5	2 00	<u>~</u>	X								-		
-			275mn	n)	(1,0,00		1		2.00					End	d of Borehole	e at 2.90m			- 3		
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	Sta	t & End (of Shift	Observ	/ations		Bo	rehole	e Diame	ter	Cas	ing Diameter	Rem	narks:	:				5		
Date	T	Time	Depth ((m) Ca	sing (m)	Water (r	n) Dep	oth (m) Dia (n	nm) D	epth	(m) Dia (mm)								
			Chicolling								tion		Strik	te (m)	Casing (m)	Sealed (Water Str m) Time (mins	rikes s) Rose to	(m) Rem	arks	
From (m)	To (m) Du	ration	Rema	irks		То	p (m)	Base	(m)	Тур	e Dia (mm	1)								
														cc d	GEOTECH	NICAL LT	D 0151 545 2	2750 wwv	v.ccgeot	echnical.	com
			Contract Name	:					Client	t:			_			Boreho	le ID:				
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(()	_	Cottam Parkw	ay Sta	ation			1.00				LC(tu			NS1	4			
					Jate 5		121	Log	Igea By:		neci		Sta		1	'					
	· 0		Easting:	093	Z3	na:	121	Cro			lont		Dia	Crow		Sheet 1	l of 2				
Dyna B	amic Sar orehole I	npiing oa	349349.2		4 vorum	19. 31307	.8		16.89mAOE		Danc	do Terrier F	Ria	LN/A	S	Scale.	1:25				
Weather: I	Drv	-09	0.00.001		ermir	nation.	As instru	ucte	d			SPT H	lammer	- N/R En	erov Rat	io [.] N/R	0				
	Samples	& In Situ Tes	sting						Str	rata De	tails			,			Grour	ndwater			
Depth	Sample II	т с	est Result	Leve (mAO	el D D) (T	epth (m) hickness)	Legend	d			S	Strata Descript	tion				Water Strike	Backfill/ Installation			
0.00 - 1.0	00 UT								Soft grey sligh	htly sa	indy :	slightly grav	elly silt	y organic Lrounded	CLAY.	-					
-				16.6	9	0.20		۲ 🖉	nudstone and	d sand	Iston	e. Frequent	rootlet	s, grasse	d at	,					
0.25	ES						×	\S	Stiff brown slig	ghtly s	sand	y slightly gra	avelly s	ilty CLAY.	Gravel is	_/[
-		HVP=90					×	j⊥ ≚	ine to mediur	m subr	round	ded to well r	oundeo	d mudstor	ne and	-					
-	50						×	×								-					
0.60	ES						×	×								-					
-							×	×								-					
							×	×								-					
-1.00 - 2.0	00 UT	SPT(S)N=	15 (1,3/3,3,4,5)				×	×								- 1		· ·· .			
1 20	ES						×	×								-					
1.20							×	×								-					
-							×	×								-					
- 1.50	D						×	×								-					
-							×	×								-					
E							X	×													
-							X	×								-					
-2.00 - 3.0	00 UT	SPT(S)N=	17 (1,3/3,4,5,5)				X	×								- 2					
-		HVP=110					X	×								-					
-							×	×								-					
ŀ							×	×								-					
- 2.50	D						×	×								-		I I			
					((5.80)	×	×								-					
							×	×								-		Ŧ			
-							×	×								-		Ē			
		SDT(S)N-	13 (1 3/2 3 / /)				×	×								-		Ē			
5.00 - 4.0		HVP=110	13 (1,3/2,3,4,4)				×	×										E			
-							×	×								-		E			
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-							×— –	×								-					
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							×	×								-					
-4.00 - 5.0	00 UT	SPT(S)N= HVP=80	13 (2,3/3,3,4,3)				×— —	×								- 4					
-							×— –	×								-					
-							× ×	×								-					
-							×— –	×								-					
4.50	D						×— –	×								-					
-							× ×	×								-					
							$\sim \sim$	×								-					
-							$\sim \sim$	×								-					
5.00 - 6.0	00 UT	SPT(S)N=	12 (2,2/3,3,3,3)					<u>×</u>			Co	ontinued next s	heet			- 5		<u> </u>			
Dete	Start & End	of Shift Obs		Bo	rehole	Diame	ter C	asin	g Diameter	Rema	arks:							1			
Date	Lime	Depth (m)	casing (m) Water (n) Dep	un (m)) Dia (n	nm) Dep	oth (I	m) וטם (mm)												
														Water St	rikee						
		Chiselling		+		 r	nstallatio	n		Strike	(m)	Casing (m) Se	ealed (m) Time (min	s) Rose to	(m) Rem	arks				
From (m)	To (m) D	uration Re	marks	Top	o (m) .00	Base	(m) T 0 PI	Гуре L д і м	Dia (mm)	3.5	U			0		Sligh	ii seepag	le			
				1	.00	6.00	o slo	OTTE	ED 19	<u> </u>		EOTECHINA		0164 645	2750		ochnice'	com			
						1					000			0101 045	2130 WWV	v.ucyeot	ecnnical.	COIII			

			Contract Name:				Clien	nt:				Boreho	le ID:	
	((Cottam Parkw	ay Stati	on				LC	C		_ ,		
		7	Contract Number	er: Dat	te Started	:	Logged By:	C	Checked By:	Sta	atus:		VV514	
			CCG-C-21-12	093	23/03/2	021	SP		CB		FINAL	Sheet	2 of 2	
Dyna	mic Sam	pling	Easting:	Noi	rthing:	(Ground Level:	F	Plant Used:	Ri	g Crew:	Scale:		
Во	orehole L	og	349349.2		431307	7.8	16.89mAOI	ם נ	Dando Terrier I	Rig	LN/AS		1:25	
Weather: D	ry			Ter	mination:	As instru	cted		SPT H	Hamme	r: N/R, Energy R	atio: N/R		
	Samples	& In Situ Tes	ting	Level	Depth (m)		Str	rata De	tails				Groundwa Water E	ater Backfill/
Depth	Sample ID	HVP=100	est Result	(mAOD)	(Thickness)	Legend	Stiff brown sli	iahtly	Strata Descrip	ption	silty CLAX Grave	lie	Strike Ins	stallation
Depth	Sample ID	HVP=110	ang est Result	Level (mAOD) 10.89	6.00		Stiff brown sli fine to medium sandstone.	ightly s m subi	Strata Descrip sandy slightly gr rounded to well	at 6.00m	illy CLAY. Grave d mudstone and	l is6	Water In Strike In ** * * * * * * * * * * * *	
- - - - - - - - - -														
L												- 10		
	Start & End	 of Shift Obe	ervations	Boreł	l Iole Diame	eter Ca	sing Diameter	Rema	arks:			10		
Date	Time	Depth (m)	Casing (m) Water (r	n) Depth	(m) Dia (r	nm) Dep	th (m) Dia (mm)	Strike	(m) Casing (m) S	Sealed (n	Water Strikes	to (m) Rem	arks	
From (m) T	<u>o (m)</u> Du	ration Rer	marks	Тор (m) Base	(m) Ty	/pe Dia (mm)	3.5	0	,	0	Sligh	nt seepage	
				0.00			AIN 19	1						
				1.00	6.0	U SLO	19		CC GEOTECHNIC	CAL LT	0 0151 545 2750 w	ww.ccgeot	echnical.com	n

				Contract N	lame:	<u>.</u>				Client:			~~		E	Boreho	le ID:	
(-	Cottam F	arkway	/ Statio	ON Started				Che	Cked By:		atus:			WS1	5
				CCG-C-2	21-1209	3	22/03/20)21	Logged D	y. P	Cile	CB	51	FINAI		0		U
Dyn	amic Sa	moli	na	Easting:	21-1200	Nor	thina:	,21	Ground Le	evel:	Plan	it Used:	Ri			Sheet ? Scale:	l of 1	
E B	Borehole	Log	ing	3493	363.0		431336	5.7	17.70r	mAOD	Dar	ndo Terrier	Rig	LN/AS			1:25	
Weather:	Dry					Terr	nination:	As instru	icted			SPT	Hamme	er: N/R, Energ	gy Ratio	: N/R		
	Sampl	es & In	Situ T	esting			Denth (m)			Strat	ta Details	3					Groun	dwater
Depth		D		Test Result	(r	mAOD)	(Thickness)	Legend	Soft are	v olight	hroond	Strata Descr	ription	tu organia Cl			Strike	Installation
0.10	ES						(0.30)		Gravel	is fine to	o mediui	m subangu	lar to we	ell rounded	.AI.	-		
-							(0.00)		surface	ne and (TOPS)	sandsto OIL)	ne. Freque	nt rootle	ts, grassed a	t	-		
0.40	ES					17.40	0.30	~ ~	Stiff bro	wn sligh	htly san	dy slightly g	ravelly s	silty CLAY. Gr	ravel is	-		
- 0.40								~~~~	sandsto	neulum one.	Subioui		riounde		anu	-		
-		нν	′P=11(C				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	×							-		
								\sim	× *-									
-								\sim	× *-							-		
- - 1 00	ES	90		-22 (1 2/6 8 4	1)			\sim	× *-							-		
1.00 - 2.	00 UT		1(0)1	1-22 (1,2/0,0,4,•	+)			~~~~	× •							- '		
-								\sim	× *-							-		
-								\sim	× *-							-		
-									× •							-		
- 1.50	D	ΗV	'P=11(0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	×							-		
[(2.70)		× •							[
-								~~~~	× •							-		
-								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	× 							-		
-2.00 - 3.	00 UT	SP	T(S)N	=19 (1,2/3,4,6,	6)			\sim	× *-							- 2		
-								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	× 							-		
								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	× •							-		
-								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	×							-		
2.50	D	нν	′P=11(	C				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	×							Ē		
[								$\sim$	× *-							-		
-								$\sim$	× *-							-		
								$\sim$	× *-							-		
-		SP	T(S)N	=14 (1,3/2,4,4,4	4)	14.70	3.00	<u>~</u>	× *·		<b></b>	d of Porobolo	at 2.00m			- 3		
-					,						EII		at 5.00m			-		
-																-		
-																-		
E																-		
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-																- 5		
Dat-	Start & Er	nd of S	hift Ol	bservations	later (r-)	Boreh	ole Diame	ter C	asing Diam	eter R	Remarks	:				1		1
Date	ime		ui (m	J Casing (m) W	ater (m)	Depth (	un) Dia (n		ui (m) Dia	(iiim)								
										⊢				Water Strike	es			
		Chis	elling				II	nstallatio	n	s	Strike (m)	) Casing (m)	Sealed (r	n) Time (mins) F	Rose to (r	m) Rem	arks	
From (m)	To (m)	Duratio	on R	Remarks		Top (r	n) Base	(m) T	ype Dia	(mm)								
										⊢	00	GEOTECHN		0151 545 275	50 www	CCOPOT	echnical	com
												SECTEORN		2 0 10 1 040 2/0		Julyeot	connical.(	

			Contract	Name:	<u></u>				Client	t:		~~		E	Boreho	le ID:	
111		_	Cottam	Parkway	Statio	on Otented		1	and Day		L	.00	Chatan			WS1	6
			Contract	Number:	Dat	e Started		LO	ggea By:				Status:				U
				-21-1209	3	22/03/20	J21		SP		CB		FINAL		Sheet '	1 of 1	
Dynan	nic Sam	pling	Easting:	110 5	Nor	tning: 121210	1	Gro	10.22mAOE	ייין הו נ	ant Used:	r Dia			Scale:	1.25	
DUI Weether: Dr		ug	043	413.5		40101c	/. 1 A a inatr			ם נ				Datia		1.25	
weather: Dry	Samples	& In Situ Tes	stina		Terr	nination:	As instr	UCLE	ea Str	ata Deta	ails	Ham	mer: N/R, Energy	Ratio	D: N/R	Groun	dwater
Depth	Sample ID	Т	est Result	L		Depth (m) (Thickness)	Legen	d			Strata Desc	ription				Water	Backfill/
0.00 - 1.00	UT			(1	IAOD)	(1110101000)			Soft grey sligh	ntly san	idy slightly gi	avelly	silty organic CLA	Y.	-	ounto	motalidation
0.15	ES					(0.30)		8 I	Gravel is fine mudstone and	to med d sands	lium subangu stone. Freque	ular to ent roo	well rounded otlets, grassed at		-		
-				1	8.93	0.30			surface (TOP	SOIL)					_		
-							×	I	Stiπ brown slig	subrou	andy slightly unded to sub	gravei angula	ar mudstone and	vel is	-		
-							×		sandstone.						-		
0.60	ES	HVP=110					×	X							-		
-							×	X							-		
-							×	X							-		
-1.00 - 2.00	UT	SPT(S)N=	11 (1,2/2,3,3	3,3)			×								- 1		
-		HVP=110					×								-		
1.20	ES						×										
-							×								-		
1.50						×								-			
- 1.50							×								-		
-						(2.70)	×								-		
-							×								-		
							×								Ē		
-2.00 - 3.00	UT	SPT(S)N= HVP=110	17 (1,3/3,4,4	4,6)			× ×								- 2		
-							× ×								Ē		
-							× ×								-		
-							× ×	_X							-		
2.50	D						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-×							Ē		
							$\rightarrow$ $\times$	×							Ē		
-							$\rightarrow$ $\times$	×							-		
-							<u>~</u>	×							-		
-		SPT(S)N=2	20 (1.3/3.5.6	5.6) 1	6.23	3.00	~	×							- 3		
-		HVP=110									End of Borenoie	e at 3.00	m		-		
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-		-f 01/16-01			Den /		 			D -					- 5		
Standard State	art & End	of Shift Obs Depth (m)	ervations Casing (m)	Water (m) [	Boreh Depth	ole Diame (m) Dia (r	nm) De	Jasir pth (	ng Diameter (m) Dia (mm)	Remar	KS:						
													Water Strikes				
	(	Chiselling					nstallatio	on		Strike (	m) Casing (m)	Seale	d (m) Time (mins) Ros	se to (r	m) Rem	arks	
From (m) To	(m) Du	iration Re	marks		lop (r	n) Base	(m) 1	Гуре	e Dia (mm)								
								C			LTD 0151 545 2750	www	ccaeot	echnical (	com		
															229301		

			Contract	Name:	<u>.</u>				Clien	t:		~ ~		I	Boreho	le ID:	
111			Cottam I	Parkway	Statio	on - Otented		1	and Day		Le alua d Duu		Chatan			WS1	7
			Contract	Number:	Dat	e Started		LO	gged By:	C	пескеа ву:		Status:			101	1
				21-1209	3	22/03/20	J21		SP		СВ		FINAL		Sheet '	1 of 1	
Dynar	nic Sam	npling	Easting:	110 5	Nor	tning: 421210	5	Gro	10.36mAOE	ייין חור	ant Used:	n Dia		ľ	Scale:	1.25	
DUI Weether: Dr	enole L	JUY	545	440.0	Tar	mination				ם כ				v Datia		1.20	
weather: Dr	Samples	& In Situ Te	stina		Ten	nination:	AS INSU	ucle	Str	rata Deta	ails	і пап	mer: N/R, Energ	y Raiic	D: IN/R	Groun	dwater
Depth	Sample ID	, T	Test Result	L	evel	Depth (m) (Thickness)	Legen	d			Strata Des	cription				Water Strike	Backfill/ Installation
0.00 - 1.00	UT				<u>AOD)</u>	(			Soft grey sligh	htly sar	ndy slightly g	ravelly	silty organic CL	AY.	-		
0.20	ES					(0.30)		8	Gravel is fine mudstone and	to med d sands	lium subang stone. Frequ	ular to ent roo	well rounded otlets, grassed at		-		
0.20				1	9.06	0.30			surface (TOP	SOIL)					_		
-							×		Stiff brown slig	ghtly sa m subro	andy slightly ounded to we	grave ell rour	ity silty CLAY. Gra ided mudstone a	avel is ind	-		
0.50	ES	HVP=90					×		sandstone.						-		
-							×								-		
-							×								-		
- 0.80	ES						×								-		
[ -1 00 - 2 00	υт	SPT(S)N=	15 (1.2/3.3.4	.5)			×								- 1		
-		HVP=110		,0)			× ×								-		
-							× ×								-		
-							$\rightarrow$ $\times$	×							-		
-							× ×	-×							-		
- 1.50	D						× ×	-×							-		
-						(2.70)		×							-		
-							×	×							-		
-							× ×	×							-		
-2.00 - 3.00	UT	SPT(S)N=	22 (5 for				×	×							2		
-		78mm/5,5 HVP=110	,0,0)				×	×							-		
-							×	×							-		
-							×	×							-		
2 50							×	×							-		
2.50							×	×							-		
-							×	×							-		
-							×	×							-		
-							×	X							_		
-		SPT(S)N= HVP=110	15 (2,3/3,3,4	,5) 1	6.36	3.00	<u></u>				End of Borehol	e at 3.0	Dm		- 3		
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	art & End	of Shift Oh	servations	<u> </u>	Boroh	lole Diama			na Diametor	Roma	rke:				5		
Date	Time	Depth (m)	Casing (m) V	Vater (m) [	Depth	(m) Dia (r	nm) De	pth (	(m) Dia (mm)	rtemar	NƏ.						
													Water Strikes	s			
	(	Chiselling	I		<b>T</b> . '		nstallatio	on		Strike (	(m) Casing (m	) Seale	d (m) Time (mins) Ro	ose to (r	m) Rem	arks	
rom (m) To	o(m) Du	Iration Re	emarks		Iop (r	n) Base	(m) 1	туре	e Dia (mm)								
										C GEOTECH	NICAI	LTD 0151 545 2754	0 www	CCGeot	echnical 4	com	
											2 2201200			- •• •• ••			- ••••

			Contract Name	:					Client	t:					Boreho	le ID:	
	(   (	-	Cottam Park	vay S	statio	n Otented		1			L	-CC	24-4			WS1	8
				er:	Date	Started		Log	ged By:	Cr	пескеа Ву:		Status:				U
			CCG-C-21-1	2093	2		)21		SP		СВ		FINA	_	Sheet '	1 of 1	
Dyna	amic Sarr	npling	Easting:		Nortr	11ng: 121252	2.2	Grou	UND LEVEI:	ויין היי	ant Used: ando Torric			2	Scale:	1.25	
		uy	040472.3	,	<b>T</b>	401000	).Z	'								1.25	
weather: L	Samples	& In Situ Tes	tina		Term	ination:	AS INSU	uclec	J Str	ata Deta	ails		ner: N/R, Ene	ergy Rau	0. N/R	Grour	ndwater
Depth	Sample ID		est Result	Le	vel	Depth (m)	Legen	d			Strata Deso	cription				Water	Backfill/
0.00 - 1.0	0 UT			(mA	(00)	(THICKNESS)		s s	oft grey sligh	ntly san	dy slightly g	ravelly :	silty organic	CLAY.	-	Juike	Installation
0.00	50					(0.30)		G	Fravel is fine	to med	ium subangi tone Freque	ular to v ent root	vell rounded	lat	-		
0.20	ES			19	17	0 30		sı sı	urface (TOP	SOIL)			, <b>g</b>		_		
-						0.00	×	_ ⊖ S _∵∃ fii	tiff brown slig ne to coarse	ghtly sa subrou	andy slightly unded to sub	gravelly	y silty CLAY.	Gravel is	- -		
-		HVP=110					×								-		
0.60	ES							4							E		
-								×							-		
-							$\overline{}$	×							-		
								×							-		
-1.00 - 2.0		HVP=110	13 (1,2/3,3,3,4)				×	×							-1		
1.20	ES						×	×							-		
-							×	×							-		
							×	×							-		
- 1.50	D						×	×							-		I · ∓·.
-						(2.70)	×	×							-		
-							×	×							-		
-							×	×							-		
-2.00 - 3.0	0 UT	SPT(S)N=	17 (2,3/3,3,5,6)				×	×							- 2		
[		HVP=110					×	×							[		I · ∓·.
-							×	×							-		I · ∓·.
							×	×							E		I · ∓·.
- 2.50	D						×	×							-		
-							×	×							-		
							×	×							-		
-							×	×							-		
-				10	47	2.00	×	×							-		
		HVP=110	10 (2,2/4,3,4,5)	10.	.47	3.00					End of Borehol	e at 3.00r	n		- 3		
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	Start & End	of Shift Obs	ervations		oreho	le Diama	ter C	Casing	n Diameter I	Remar	ks:				- 5		
Date	Time	Depth (m)	Casing (m) Water	m) De	epth (r	n) Dia (r	nm) De	pth (n	n) Dia (mm)	i torrial							
										Strike (	m) Casing (m)	Sealed	Water Str (m) Time (mine	ikes	m)Rem	arks	
From (m)	( To (m) Du	Chiselling Iration Re	marks	Т	op (m	) Base	nstallatic (m) 1	on Type	Dia (mm)	Sanc (		, couled		.,	,		
					0.00	0.5	0 P 0 SIC		19 D 19								
						0.0				С	C GEOTECH	NICAL L	TD 0151 545 2	2750 www	.ccgeot	echnical.	com

			Contract Name:	~				Clie	nt:				Trial	Pit ID	):	
(		-	Contract Number	ay St	atior	Stortod				Chookod		Status		٦	FP01	
			CCG-C-21-12	093	ate,	23/03/20	)21	Logged BY:		Checked	⊳y: CB	Siaius: FINIΔI				
			Easting:		North	hina:	21	Ground Level:		Plant Use	d:	Date Printed:	Shee Scal	et 1 of e:	f 1	
Tria	al Pit Lo	bg	349157.0			431325	.0	20.56mAO	D	8T Tracke	ed Machine	26/05/202	1		1:25	
Weather: Dry	/				Hole	Termina	tion: As i	nstructed			Stability: S	table				
0.5		I O:4 7	<b>4</b> '					01	- 4 -	Deteile	·					
Sa	amples &		esting	Redu	iced	Depth (m)	1.	Str	ata	Details	<u> </u>			_	Vater	Backfill
Depths	Sample ID	le	est Result	Lev	/el	(Thickness)	Legen	Grev slightly	sano	Strata dv slightly g	Description				>	
0.10	B							,,		-,		,	′ -			
0.20	ES			20.	32	0.25		Stiff brown m	nottle	ed arev sliah	tlv sandv sli	ahtlv aravellv silt	v			
0.30	В						×	CLAY. Grave	l is fi	ine to coarse	e sub-angula	ar to rounded	,			
- 0.50	ES	H۱	/P=75kPa				×		iu sa	Indstone			-			
							— — ×						[			
0.70	D						×	**					-			
-							×						Ē			
- 1.00	ES	HV	P=100kPa				×_~_~							1		
-						(1.75)	×	- X								
1.20	В						×	×					-			
							×	×					-			
- 1.50	в	HV	′P=110kPa				×	X					[			
-							×	iii X					-			
1.70	D						×	× · · · ×					[			
-							×	× · · · ×					-			
2 00	в	HV	/P=110kPa	18	57	2 00	×	<u></u>					Ę,	,		
2.00		110		10.	57	2.00				End of T	rial Pit at 2.00r	n	- 4	2		
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F																
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Dimensior	is:						General F	Rem	narks:							
Final Depth:	2.00m															
		₄	length (m)	_		<b>&gt;</b>										
		4	2.00m													
<b>▲</b>																
لې (۳	00m		Orientation:	•												
Widt	<del>.</del> .		◀													
								Strike (m)	1	Casing (m)	W Sealed (m	ater Strikes	Rose to (	al (m	emarks	
↓									Ť			0		T	P DRY	
Inclination:	lination: °									CC GEOTE	CHNICAL LTD (	151 545 2750 www.co	geotechnical.c	om		

			Contract Name:					Client:				Trial P	'it ID:	
		Ť	Cottam Parkw	ay St	tatio	n				LCC	Otation		ΤPΛ	2
			Contract Numbe	er:	Date	e Started:	204	Logged By:	Checked	By:	Status:		11 0	2
			CCG-C-21-12	093	N 1 4	23/03/20	J21	SP	Disatility	CB	FINAL	Sheet	1 of 1	
Tria	al Pit I o	a	Easung: 349247.9		Non	431322	0	19.96mAOD	8T Track	ed Machine	26/05/2021	Scale:	1.25	5
Weather: Dry	/	9	0.020		Hole	Termina	tion: As	instructed		Stability: S	Stable			·
										,				
Sa	mples & I	n Situ ⁻	Testing					Strata	a Details				ater	Backfill
Depths	Sample ID	Т	est Result	Red Le	uced vel	Depth (m) (Thickness)	Legen	d	Strata	a Descriptior	ı		×	Dacitin
-								Grey slightly sa medium sub-an	ndy slightly g aular to roun	ravelly silty ded mudsto	CLAY. Gravel is fine ne and sandstone	e to		
- 0.15 0.20	ES B					(0.30)		(TOPSOIL)	5			-		
0.20	D			19	.66	0.30		Stiff brown mott	led grey sligl	ntly sandy sl	ightly gravelly silty			
-							×	CLAY. Gravel is	fine to coars andstone	e sub-angul	ar to rounded	-		
- 0.50	ES ES	Н	VP=75кРа				×	×				-		
0.70	D						×	×				-		
							×	X				-		
-							×	×				-		
- 1.00 -	В	H\	/P=110kPa				×	- <u>×</u>				- 1		
1 20						(1.70)	×	×		1 00 mb mb mb		-		
-							×	Lens of SAND. Not	water bearing at 1.20	<u>- 1.30</u> mbgi		-		
-							×	X				-		
- 1.50	ES	H\	/P=110kPa				×	×				-		
-							×	X				-		
- 1.80	D						×	X				-		
-							×	×				-		
2.00	в			17	.96	2.00	<u>× - , -</u> ,	<u>×</u>	End of	Trial Pit at 2.00				
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	•	•	2.60m											
ب با	00m		Orientation:	0										
Widt			◀											
									0	V	Vater Strikes	D		
								Strike (m)	casing (m)	Sealed (m	0	Rose to (m)	TP DR	ks Y
	L						]							
Inclination	•							CC GEOTE	CHNICAL LTD	0151 545 2750 www.ccge	otechnical.cor	n		

			Contract Name:					C	Client:				T	rial Pit	ID:	
( (		-	Cottam Parkw	ay St	tation	ortod		Loggod Dyr		Chaokad	LCC	Statuc			TP03	3
			CCG-C-21-12	, 093	23	.arteu. /03/2(	)21	Logged By. SP		(	Dy. CB	FINAI				
			Easting:		Northin	a:		Ground Leve	əl:	Plant Use	ed:	Date Printed:	5	Sheet 1 Scale:	of 1	
Tria	al Pit Lo	g	349285.0		43	3 1336	6.5	19.28m	AOD	8T Tracke	ed Machine	26/05/2021			1:25	
Weather: Dry	/		-		Hole Te	rmina	tion: As i	nstructed			Stability: S	stable				
	manles 9	I	Taatina	1					Ctrata	Deteile						
Danatha				Red	uced De	epth (m)			Strata	Details	Description				Vater	Backfill
Deptris	Sample ID	1		Le	vel (Th	ickness)	Legenc	Grey sligi	ntly sand	y slightly g	ravelly silty	ı organic CLAY. Gra	avel is	-		
0.15	в				((	0.30)		fine to me	edium su e (TOPS	b-rounded OIL)	to rounded	mudstone and		-		
0.15 0.25	D ES			18	98 (	0.30			<b>\</b>	· ,						
0.40	ES					0.00	×	Stiff brow	n mottleo avel is fii	d grey sligh າe to coars	itly sandy sli e sub-angul	ghtly gravelly silty ar to sub-rounded	1	-		
0.50	В	H	VP=80kPa		(0	0.40)	×	mudstone	e and sar	ndstone	-					
0.60	D						×							-		
-				18.	.58 0	0.70	×	Stiff dark	brown sl	ightly sand	y slightly gra	avelly silty CLAY.	one	†		
-							×	sandston	e and gra	anite	angular to st		lone,			
- 1.00	в	H\	/P=110kPa				×	×						-1		
-							×	*. ×								
-							×	×								
- 1.30	ES				(*	1.30)	×	×						-		
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/idth	1.00		۹													
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								Strike	(m) C	Casing (m)	Sealed (m	) Time (mins)	Rose	to (m)	Remarks	6
↓ ★												v				
										00.0505		0454 545 0750		laal		
Inclination:	•									CC GEOTE	CHNICAL LTD	1151 545 2750 www.ccg	geotechn	ical.com		

			Contract Name:						Client:				Trial	Pit ID:	
(   f		-	Cottam Parkwa	ay Sta	ation	Stortod		oggod Dy		Chookod	LCC	Statua		TP0	4
			CCG-C-21-12	ng 3	Date 3	3/03/20	121	Logged By	P	Спескеа	ву: CB	Status: FINAI			
			Easting:		Northir	na:		Ground Le	vel:	Plant Use	ed:	Date Printed:	Shee	t1of1	
Tria	al Pit Lo	g	349324.7		4	131322	.8	17.82r	nAOD	8T Track	ed Machine	26/05/202	1	1:25	;
Weather: Dry	/			ŀ	Hole T	erminat	tion: As i	nstructed		ł	Stability: S	stable	•		
0.5			· 4 ·						04	- Dataila					
Sa	amples &		esting	Reduc	iced [	Depth (m)			Strat	a Details	- De serie tier			Vater	Backfill
Depths	Sample ID	Ie	st Result	Leve	rel (T	Thickness)	Legend	Grey sli	ghtly sa	Strata Indy slightly g	a Description	n Drganic CLAY. Gr	avel is		
-						(0.30)		fine to n sandsto	nedium ne (TOI	sub-rounded PSOIL)	to rounded	nudstone and	-		
0.20	ES			17 5	52	0.30				,					
0.40	ES				~	0.00	×	Very stif	f brown s fine to	slightly sand	ly slightly gra angular mud	velly silty CLAY. stone, sandstone	and		
-		H∨	/P=90kPa				×	granite					Ē		
0.60	В						×	×					-		
- 0.80							×	×					-		
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1.00	В	HV	P=110kPa				×	×					- 1		
-						(1.70)	×	×					-		
- 1.30	ES						×	×					-		
-							× 	×					-		
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th (m	00m		Orientation:	>											
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								Strike	e (m)	Casing (m)	W Sealed (m	/ater Strikes	Rose to (m	1) Remark	s
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			Contract Name:						Client:				Trial	Pit ID:	
1 ( )		-	Cottam Parkwa	ay St	ation	Ctartadi		Lowerd Di		Chasks	LCC	Ctature		TPO	)5
				no3	Date		121	соддеа ву	D	Checked	CB	Status: EINIAI			
			Easting:	093	2 North	24/03/20	JZ I	Ground Le		Plant I Is		Date Printed:	Shee	et 1 of 1	
Tria	al Pit Lo	a	349381.3		North	431309	.8	17.86	mAOD	8T Trac	ked Machine	26/05/202 ²	1	1:25	5
Weather: Dry	1	0			Hole	Terminat	tion: As i	nstructed			Stability: \$	Stable			
	molee 9		Conting						Strat	a Dotoila	ł				
Depths				Redu	uced	Depth (m)	Legen	4	Strat	a Details	ta Description	2		Mater	Backfill
Depuis	Sample ID	16	stresuit	Lev	vel	(Thickness)	Legen	Grey sli	ightly sa	indy slightly	gravelly silty	organic CLAY with	h -		
0.10	ES					(0.30)		frequen frequen	t rootlet	s. Gravel is one and sar	fine to mediu Idstone (Gras	m sub-angular to sed TOPSOIL)	-		
- 0.20	в			17	56	0.30		8			( -	,	-		
0.40	ES					0.00	×	Stiff bro	wn sligh obble co	ntly sandy sl ontent. Grave	ightly gravelly el is fine to co	/ silty friable CLA) parse sub-rounded	rwith - d to -		
- 0.50	В	H∨	/P=80kPa				×	rounded	d mudste	one and sar	dstone		-		
-							×						-		
- 0.70	D		D-110kDa				×	×					-		
0.90	в	110					×	×					-		
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-						(1.70)	×	×					-		
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1 40	П						×	×					-		
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			Contract Name:						Client:				Trial	Pit ID:	
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				r: 002	Date	Started:	101	Logged By	/: D	Checked	ву:	Status:			00
			CCG-C-21-12	093	A	24/03/20	)21	Crever d La	P	Diant Line		FINAL Data Drintadu	She	et 1 of 1	
Tria	al Pit I o	a	349425 1		NOT	431336	6	19 08	mAOD	8T Track	₂u. ed Machine	26/05/2021	J	e. 1.:	25
Weather [:] Dry	/	9	01012011		Hole	Terminal	tion As	instructed	11/1012		Stability: S	Stable			
Woulder Dry	,				11010						otability: c				
Sa	mples &	In Situ 1	Testing						Strata	Details				iter	Bockfill
Depths	Sample ID	Te	est Result	Red Le	uced vel	Depth (m) (Thickness)	Legen	d		Strata	a Descriptior	1		Ň	Dackin
-								Grey sli	ghtly san coarse su	dy slightly g b-angular to	ravelly silty rounded m	organic CLAY. Gra udstone and sand	avel is _ Istone -		
0.15	B					(0.30)			OIL)	Ū			-		
0.23	ES			18	.78	0.30		Stiff bro	wn slight	ly sandy slig	htly gravelly	silty CLAY. Grave	el is		
0.40	В						X	fine to c	oarse su	b-angular to	rounded m	udstone, sandstor	ne -		
- 0.50	D						×		inte				-		
0.60	ES	H	/Р=/5кРа				×	×					-		
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h (m	DOm		Orientation:	•											
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								Strik	e (m)	Casing (m)	Sealed (m	) Time (mins) 0	Rose to (	m) Rem TP D	arks IRY
	aliantian. 9											151 545 2750			
Inclination:	0									UU GEOTE	CHINICAL LTD (	101 040 2/50 WWW.CC	geotecnnical.c	JUIII	