Ground Investigation
at

Bacton Low Rise, Gospel Oak, North London.

Factual Report

for
Rolton Group Ltd

Engineer : Rolton Group Ltd

Project Number : PC124991

September 2012

Issuing office :

Head Office Coventry
Geotechnics Limited
The Geotechnical Centre
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP
T: 024 7669 4664
F: 024 7669 4642
mail@geotechnics.co.uk

North West Office
Geotechnics Limited
The Geotechnical Centre
Unit 1, Borders Industrial Park
River Lane, Saltney
Chester
CH4 8RJ
T: 01244 671 117
F: 01244 671 122
mail@chester.geotechnics.co.uk

South West Office
Geotechnics Limited
The Geotechnical Centre
7 Pinbrook Units
Venny Bridge
Exeter
EX4 8JQ
T: 01392 463 110
F:01392 463 111
mail@exeter.geotechnics.co.uk

Ground Investigation
at

Factual Report

Bacton Low Rise, Gospel Oak, North London

for
Rolton Group Ltd

Engineer :
Rolton Group Ltd

Project No:
PC124991
September 2012

CONTENTS

LIST OF CONTENTS

APPENDICES

1.0 INTRODUCTION

A geotechnical and geoenvironmental investigation was undertaken by Geotechnics Ltd at the site of a proposed redevelopment of the Bacton Low Rise housing estate near Gospel Oak, North London. The investigation was carried out to the instructions of, and on behalf of, the Client, Rolton Group Ltd. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The Brief for the project is included in Appendix 1. The investigation comprised boreholes, in situ and laboratory testing and reporting. A geotechnical or geoenvironmental interpretation and evaluation of the data obtained was not commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 3 to 8 of this report. In addition, the report is presented in electronic PDF format separately on disc.

Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 9 to aid an understanding of the procedures followed and the context in which the report should be read.

4.0 THE SITE

4.1 Location

The site is located approximately 6km east south east of Junction 1 of the M1 motorway and 0.5km south west of Gospel Oak train station in the London Borough of Camden. The approximate Ordnance Survey National Grid Reference for the centre of the site is TQ 281 853 and an extract from the relevant 1:50,000 Scale O.S. Map (Sheet No. 176) is included as Appendix 2.

4.2 Description

The site is irregular in shape, covers an area of about 2.1ha and is predominately flat. It can be divided into two main areas.

The first area lies to the north and west of Wellesley Road and comprises a number of blocks of council flats up to 5 storeys in height and covering an area of approximately 1.75ha. There are several courtyards located amongst the flats and the ground surface is reinforced concrete, tarmac and occasional grassed areas.

The second area lies to the north east on the opposite side of Wellesley Road. It comprises offices and commercial units predominately used by Camden Council and is approximately 0.35ha in area. The ground surface is generally tarmac, with a concrete surface in the courtyard located in the centre of the council offices. The area is bordered by Wellesley Road to the south west and Vicars Road to the south east. To the north are railway tracks in a cutting approximately 7.0m below the site level with a large retaining wall separating the site from the railway which extends approximately 3.0m above ground level.

Photographs of the site taken during the fieldwork are presented in Appendix 3.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Client for ground investigation of the site in accordance with their requirements.

5.2 General

The procedures followed in this site investigation are based on *BS 5930:1999 + A2:2010 – Code of Practice for Site Investigations*. The soils and rocks encountered have been described in accordance with BS5930:1999 + A2:2010 and BS EN ISO 14688-1:2002 and BS EN ISO 14689-1:2003. The Borehole Records are included in Appendix 4 and their approximate positions are shown on the Exploratory Hole Location Plan in Appendix 4.

The Exploratory Hole locations were specified by the client. The levels shown on the Exploratory Hole Records were estimated from the Survey Drawing (Drawing No. 12-0083 GEO 01 P1, Dated June '12) provided by the Client and the depths quoted are in metres below ground level.

5.3 Boreholes

Nine (9 No.), 150mm diameter boreholes (numbered BH1 to BH9) were sunk by Cable Percussion Tool techniques to depths varying between 20.00 and 30.00m below ground level. The work was carried out between the 13th and 21st August 2012. An inspection pit was excavated at each borehole location using hand tools to a depth of 1.20m below ground level to check for the presence of underground services.

Representative disturbed D and B and driven open-tube thin-walled (UT) and thick-walled (U) samples of the soils encountered were obtained at regular intervals. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005 to obtain a measure of the engineering properties of the proved strata. In addition, environmental samples (E) were recovered at the depths indicated on the Borehole Records.

On encountering groundwater, boring operations were suspended for 20 minutes in order to record any rise in water level. Full details of groundwater observations during site work are included on the Borehole Records.

On completion standpipes were installed in Boreholes BH1, BH2, BH3, BH4, BH5, BH7 and BH9. (see Section 5.4). Boreholes BH6 and BH8 were backfilled with arisings and an upper 2.00m bentonite seal.

5.4 Instrumentation and Monitoring

Long term monitoring of the gas and groundwater levels was made possible by the installation of standpipes as follows:

Exploratory Hole	Standpipe Slotted pipe & Filter Zone (m)
BH1	2.00 to 8.00
BH2	2.00 to 8.00
BH3	2.00 to 5.00
BH4	2.00 to 5.00
BH5	2.00 to 5.00
BH7	2.00 to 5.00
BH9	2.00 to 5.00

Monitoring of the gas and groundwater levels at the site took place on 13th September 2012.

At each position a record of the groundwater level was taken. In addition to the groundwater levels, the following parameters were measured and recorded in each standpipe using a GA2000 Gas Analyser:-

- Concentrations (% Vol) of CH_4, O_2, CO_2, along with (% LEL) CH_4, H_2S , CO
- Flow Rate
- Differential Pressure
- Barometric Pressure
- Air Temperature

The results of the monitoring are presented in Appendix 6.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was specified by the Client in order to relate to the proposed development. The tests, where appropriate, conform *to BS 1377 - Methods of Test for Soils for Civil Engineering Purposes (1990)* and were carried out in Geotechnics Limited's UKAS accredited Laboratory (Testing No. 1365). Any descriptions, opinions and

interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

BS 1377 (1990) Test No.		**Test Description**
Part 2		
3.2	27 No.	Moisture Content Determination
Part 3		
5.3, 5.5	31 No.	Sulphate Analysis – Water Extract
9.5	31 No.	pH Determination
Part 7		
9	27 No.	Shear Strength Measurement - 100mm diameter (Multi-Stage) Quick Undrained Triaxial Compression Test.

The results of these tests are presented in Appendix 7.

6.2 Contamination

Selected samples of soil were tested in at the laboratories of Derwentside Environmental Testing for a number of determinands in order to check on potential site contamination. The determinands were specified by the Engineer.

Soil
Soil samples were tested for the following determinands:-

pH
Organic matter
Cyanide (Total)
Boron
Soluble Sulphate
Chromium VI
Arsenic
Cadmium
Chromium
Hexavalent Chromium
Copper
Lead
Mercury
Nickel
Selenium
Zinc
TPH (Total)
Speciated PAH (EPA16)
Phenols

The results are presented in Appendix 8.

Signed for and on behalf of Geotechnics Limited.

S J Chapman
BSc(Hons),FGS.
Graduate Engineer

T N Hardie
BSc,MSc,DIC,CEng,MICE.
Principal Engineer

APPENDIX I

The Brief

1.0 INTRODUCTION

Site consists of 2 parcels of land:
First site: Camden Council offices, car park and building materials storage area, small office block and car parking in front.
Second site: Council owned flats in 9 blocks arranged around courtyards and with vehicle access.
The sites are fully occupied by workers and residents.

The sites are to be redeveloped with new blocks of flats. Rolton Group is appointed by EC Harris (working for Camden Council) to design and undertake suitable site investigation for geotechnical and geo-environmental purposes.

2.0 SITE HISTORY

A school and terraced housing until redeveloped with offices and flats in the 1960s.

3.0 PROBABLE GROUND CONDITIONS

Anticipated 2-3m of made ground overlying London Clay which will be present to in excess of 50m.

The made ground is likely to consist of reworked natural soils plus historic ash, clinker and demolition materials (brick, concrete etc).

Serious contamination presence is unlikely. Metals and Polyaromatic hydrocarbons are likely to be present at slightly elevated concentrations.

Groundwater is unlikely to be seriously impacted. Seepages are unlikely to be strong in upper strata.

Landfill gas or other hazardous gases are unlikely to be present at significant concentrations.

Existing ground conditions are as described below. Exploratory holes are to be fully reinstated, with flush stop-cock covers to boreholes with installations.

4.0 BURIED SERVICES

The sites are served by a large number of live services – see separate plans. Hand-dug starter holes will be essential.

No London Underground lines in the vicinity.

5.0 PROPOSED DRILLING WORKS

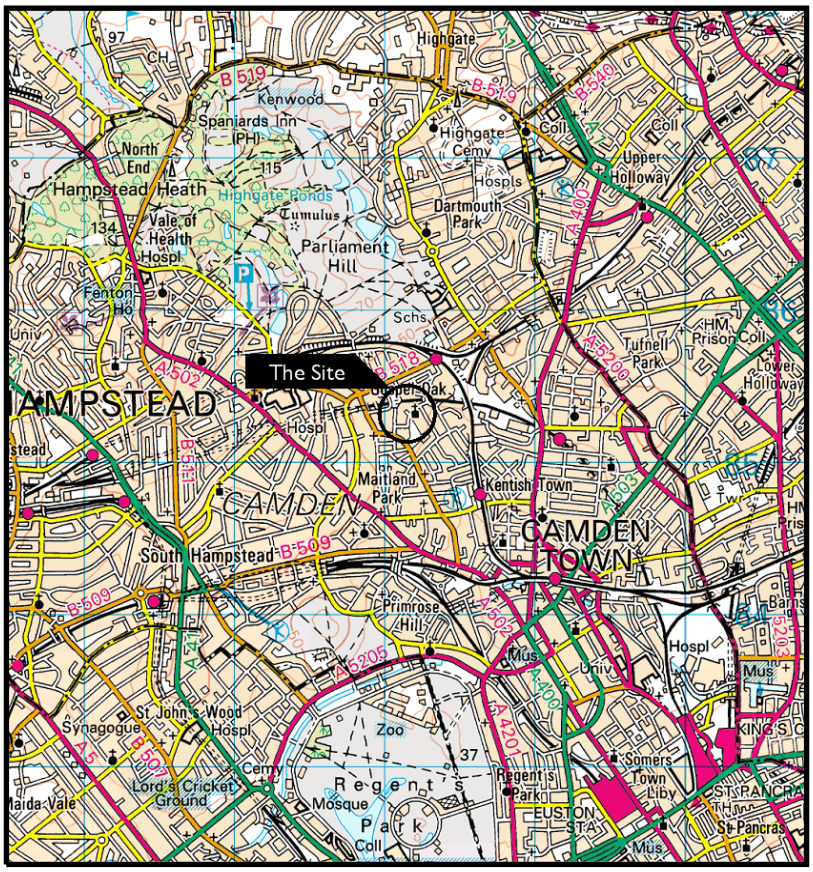
See separate plans for site layout and borehole locations. Drilling is to be by percussion techniques (shell and auger).

Borehole Ref	Depth	Existing Ground Surface	Installation All to have gas taps and stop-cock covers cemented flush with ground surface	Sampling and Testing
1	**30m**	Tarmac parking area	10m (2m grouted; 8m slotted)	All boreholes: Environmental samples at around 300mm, 1m and 2m depth and metre intervals in made ground and at any change in strata. Generally alternate SPTs and U100s at 1.5m intervals in clay; SPTs at 1.5m intervals in granular deposits. Groundwater samples as encountered and bulk samples at any change in strata.
2	20m	Tarmac parking area	10m (2m grouted; 8m slotted)	
3	**30m**	Cycle store area	5m (2m grouted; 3m slotted)	
4	20m	Tarmac car park	5m (2m grouted; 3m slotted)	
5	**30m**	Driveway access to garages	5m (2m grouted; 3m slotted)	
6	20m	Grass covered POS	NA	
7	20m	Tarmac car parking	5m (2m grouted; 3m slotted)	
8	20m	Tarmac car parking	NA	
9	**30m**	Tarmac car parking	5m (2m grouted; 3m slotted)	

APPENDIX 2

Site Location Plan

SITE LOCATION PLAN



Ground Investigation
at
Bacton Low Rise, Gospel Oak, North London.
for
Rolton Group Ltd

geotechnics

APPENDIX 3

Site Photographs

PHOTOGRAPHS

Project Number : PC124991

Project : Bacton Low Rise, Gospel Oak, North London

North East Area, BH1, looking east

North East Area, BH2, looking west

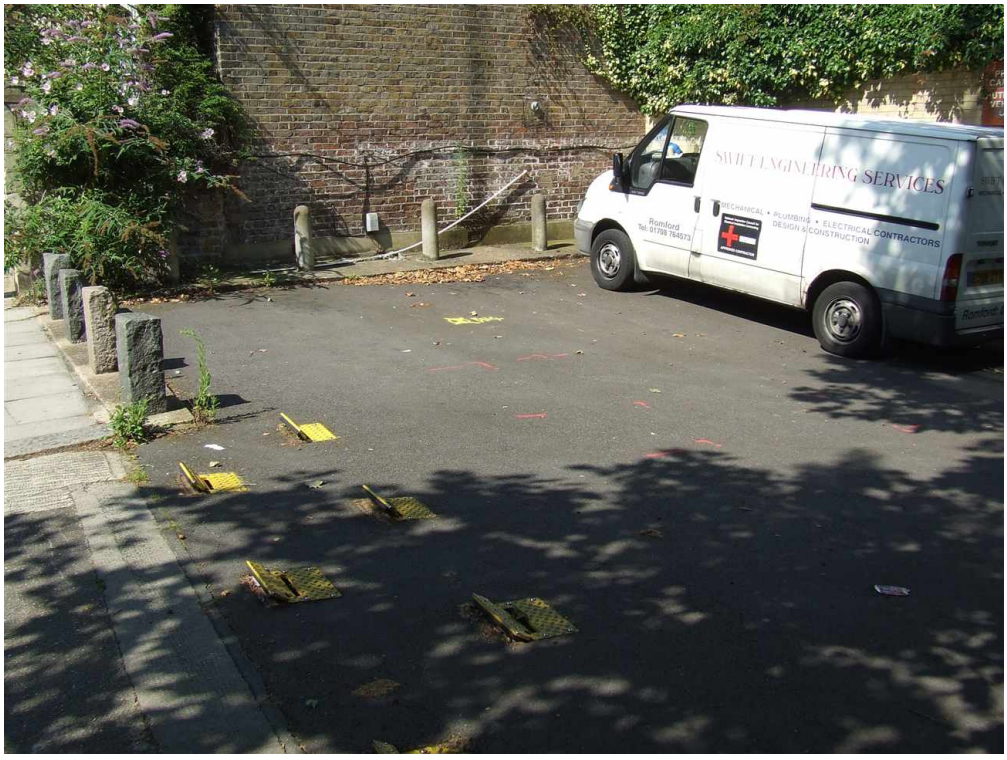
geotechnics

PHOTOGRAPHS

Project Number : PC124991

Project : Bacton Low Rise, Gospel Oak, North London

North East Area, BH3, looking north



North East Area, BH4, looking west

PHOTOGRAPHS

Project Number : PC124991

Project : Bacton Low Rise, Gospel Oak, North London

South West Area, BH5, looking north east

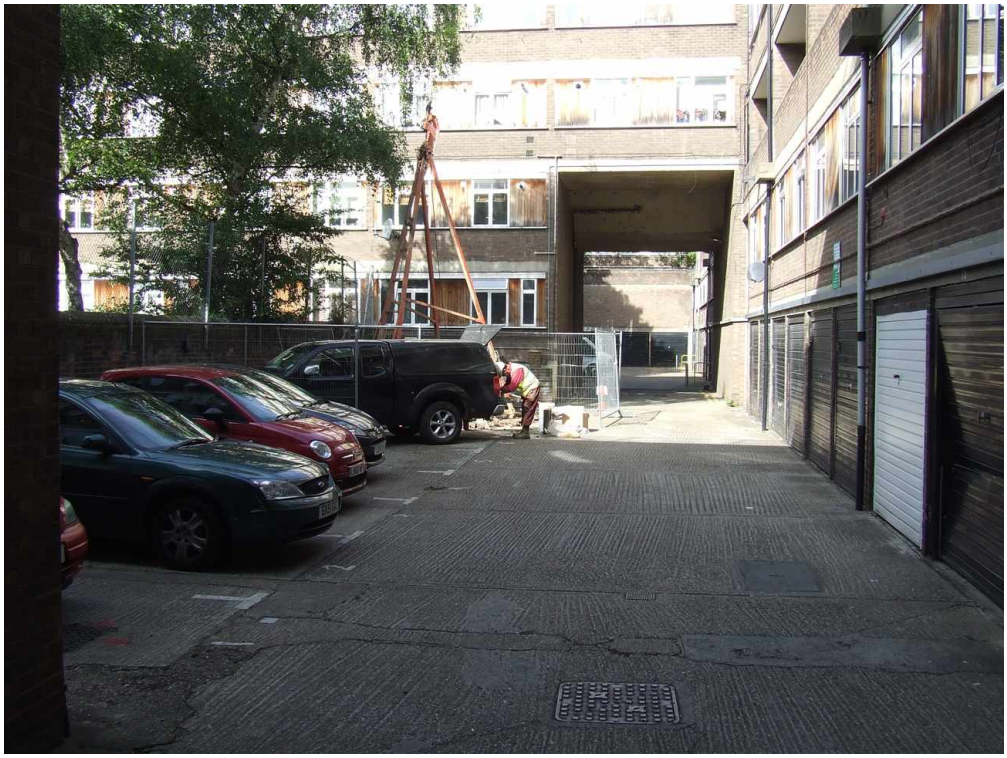
South West Area, BH6, looking north

PHOTOGRAPHS

Project Number : PC124991

Project : Bacton Low Rise, Gospel Oak, North London

South West Area, BH7, looking south east



South West area, BH8, looking west

PHOTOGRAPHS

Project Number : PC124991

Project : Bacton Low Rise, Gospel Oak, North London

South West Area, BH9, looking south

APPENDIX 4

Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike

Depth Water Rose To

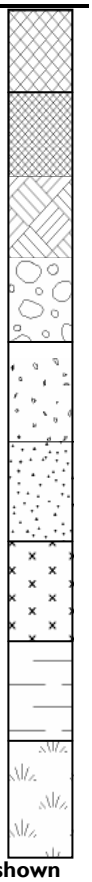
Instrumentation

Seal

Filter

Seal

Strata



Made Ground Type 1

Type 2

Topsoil

Cobbles and Boulders

Gravel

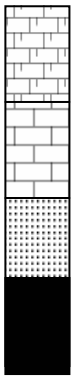
Sand

Silt

Clay

Peat

Note: Composite soil types shown by combined symbols



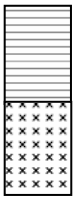
Chalk

Limestone

Sandstone

Coal

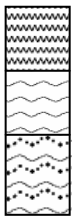
Strata, Continued



Mudstone

Siltstone

Metamorphic Rock

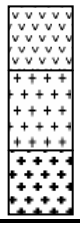


Fine Grained

Medium Grained

Coarse Grained

Igneous Rock



Fine Grained

Medium Grained

Coarse Grained

Backfill Materials

Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (mm)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD – Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON**
Engineer **ROLTON GROUP**
Borehole **BH1**
Project No **PC124991**

Client **ROLTON GROUP**
Ground Level **42.45** m OD

Sampling			Properties			Strata			Scale 1:50
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
						Tarmac. ** [MADE GROUND]	G.L. 0.10		42.45 42.35
0.30	D					**Concrete. ** [MADE GROUND]**	0.30		42.15
0.30	E						0.50		41.95
0.50- 0.70	B					**Orangish brown mottled grey and black slightly clayey very gravelly sand. Gravel is angular to subangular fine to coarse quartzite, flint and brick. [MADE GROUND]**	0.70		41.75
0.50	D								
0.70- 1.00	B								
0.70	D								
1.00	D								
1.00	E								
1.20- 1.65	D	1.20 (DRY)			S7				
1.70- 1.90	B					**Soft greyish brown mottled black sandy gravelly clay. Gravel is angular to rounded fine to coarse quartzite, flint and brick. With a slight hydrocarbon odour. [MADE GROUND]**	1.70		40.75
1.70	D								
2.00	D						2.00		40.45
2.00	E								
2.20- 2.65	U53	1.50 (DRY)	54	23		**Very soft dark grey mottled bluish grey and orange slightly sandy slightly gravelly slightly organic clay. Gravel is angular to subrounded fine to coarse flint, quartzite, brick and slag. With a slight hydrocarbon odour. [MADE GROUND] At 1.00m, mottling absent. Below 1.20m, becoming greenish grey mottled bluish grey.**	2.65		39.80
2.65	D								
2.70- 3.10	B								
3.90- 4.35	D	1.50 (DRY)			S23	**Soft orangish brown mottled black sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint, quartzite and brick. [MADE GROUND]**			
						Stiff brown mottled bluish grey slightly gravelly CLAY. Gravel is subrounded fine to medium flint. At 2.20m, medium strength			
						Stiff fissured brown mottled grey CLAY. Fissures are extremely closely spaced, randomly orientated and stained bluish grey. At 2.65m, with rare subangular medium claystone gravel Below 3.90m, becoming laminated in parts.			
5.40- 5.85	U55	1.50 (DRY)				**At 4.10m, driller notes presence of claystone layer. Below 5.85m, slightly micaceous, fissures becoming extremely closely to very closely spaced smooth, dull and occasionally stained orange.**			
5.85	D								
7.00- 7.45	D	1.50 (DRY)			S15				
8.00	D					**Below 8.00m, becoming dark brownish grey with occasional fine to medium gravel sized silt pockets. Fissures generally subhorizontal to subvertical, dull, some polished.**			
8.20- 8.65	UT70	1.50 (DRY)	115	30		**At 8.20m, high strength**			
8.65	D								
9.80-10.25	D	1.50 (DRY)			S20	**Below 9.80m, becoming very stiff.**			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20		Inspection Pit	DC	G.L.			16/08/12	08:00						None encountered during boring.
30.00	0.15	Cable Percussion	DC	14.80	1.50	DRY	16/08/12	18:00						
				14.80	1.50	DRY	17/08/12	08:00						
				30.00	1.50	DRY	17/08/12	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth.
**** Drillers description.**
E sample = 1 x vial, 1 x plastic jar and 1 amber jar
A 50mm standpipe was installed to 10.00m with a slotted section from 2.00m to 10.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 10.00m, gravel filter up to 2.00m, bentonite seal up to 0.30m, concrete up to ground level.
Chiselling: 15.90-16.30m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by **SC / CO**

Figure **1 of 3**
20/09/2012

geotechnics

BOREHOLE RECORD – Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON**
Engineer **ROLTON GROUP**
Borehole **BH1**
Project No **PC124991**

Client **ROLTON GROUP**
Ground Level **42.45** m OD

Sampling			Properties			Strata			Scale 1:50
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
10.30-10.70	B								
11.30-11.75	U80	1.50 (DRY)	157	28		At 11.30m, very high strength			
11.75	D								
12.80-13.25	D	1.50 (DRY)			S27				
14.30-14.75	U120	1.50 (DRY)	115	26		At 14.30m, high strength			
14.75	D					At 14.75m, with some fine to coarse gravel sized fragments of claystone.			
15.90-16.70	D					At 15.90m, claystone boulder.** Recovered as dark grey fine to coarse claystone gravel.			
16.70-17.15	D	1.50 (DRY)			S29	At 16.70m, with occasional fine to medium gravel sized silt pockets of rare shell fragments.			
18.20-18.50	UT130	1.50 (DRY)							
18.50	D					Below 18.50m, silt pockets absent.			
19.70-20.15	D	1.50 (DRY)			S33				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks **Driller notes claystone boulder pushed ahead of borehole from 15.9 to 16.7m, pushed aside at 16.7m.**

Logged by **SC / CO**

Figure **2 of 3**
20/09/2012

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

geotechnics

BOREHOLE RECORD - Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON**
Engineer **ROLTON GROUP**
Borehole **BH1**
Project No **PC124991**

Client **ROLTON GROUP**
Ground Level **42.45** m OD

Sampling			Properties			Strata			Scale 1:50
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
21.20-21.65	U120	1.50 (DRY)	125	28		At 21.20m, high strength			
21.65	D								
22.70-23.15	D	1.50 (DRY)			S32				
24.20-24.50	U130	1.50 (DRY)							
24.50	D					Below 24.85m, fissures subhorizontal and extremely closely spaced polished with an occasional silt dusting.			
25.70-26.15	D	1.50 (DRY)			S30				
27.40-27.85	UT110	1.50 (DRY)	165	26		Below 27.00m, fissure spacing increasing becoming randomly orientated, smooth, dull and clean. At 27.40m, very high strength			
27.85	D								
29.00-29.45	D	1.50 (DRY)			S33				
30.00	D					End of Borehole	30.00		12.45

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by **SC / CO**

Figure **3 of 3**
20/09/2012

geotechnics

Fieldwork Results - SPT Results Summary

Project BACTON LOW RISE, GOSPEL OAK, NORTH LONDON **Project No** PC124991

Client ROLTON GROUP

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10 20 30 40 50
BH1	1.20	41.25	S	-	1	1	1	2	2	2	7	*
BH1	3.90	38.55	S	-	1	1	2	10	6	5	23	*
BH1	7.00	35.45	S	-	2	3	3	3	4	5	15	*
BH1	9.80	32.65	S	-	3	3	4	5	5	6	20	*
BH1	12.80	29.65	S	-	3	3	5	5	8	9	27	*
BH1	16.70	25.75	S	-	5	6	6	9	6	8	29	*
BH1	19.70	22.75	S	-	5	5	7	8	9	9	33	*
BH1	22.70	19.75	S	-	5	6	7	8	8	9	32	*
BH1	25.70	16.75	S	-	6	6	6	7	8	9	30	*
BH1	29.00	13.45	S	-	7	7	8	8	8	9	33	*

Remarks
In accordance with BS EN ISO22476-3:2005

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

BOREHOLE RECORD - Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON**
Engineer **ROLTON GROUP**
Borehole **BH2**
Project No **PC124991**
Client **ROLTON GROUP**
Ground Level **43.45** m OD

Sampling			Properties			Strata			Scale 1:50
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		43.45
						Tarmac. **	0.08		43.37
						[MADE GROUND]			
0.30- 0.50	B						0.30		43.15
0.30	D					Concrete. **	0.50		42.95
0.30	E					[MADE GROUND]			
0.50- 1.00	B								
0.50	D					Light brown mottled grey black, orange and yellow slightly clayey very gravelly sand. Gravel is angular to subangular fine to coarse brick, concrete and clinker.			
1.00	D						1.00		42.45
1.00	E								
1.10	D						1.20		42.25
1.20- 1.65	D	1.20 (DRY)			S6	[MADE GROUND]			
						Very soft brown mottled black, orange and yellow sandy gravelly clay. Gravel is angular to rounded fine to coarse clinker, brick and concrete.			
2.00	D					[MADE GROUND]	2.00		41.45
2.00	E								
						Soft greyish brown mottled black, orange and yellow sandy gravelly slightly organic clay. Gravel is angular to subrounded fine to coarse flint, quartzite, brick and clinker.			
2.70- 3.15	U50	1.50 (DRY)	55	33		[MADE GROUND]			
						At 1.10m, becoming slightly gravelly.			
						Soft greyish brown mottled bluish grey and orange slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse flint and quartz.	3.15		40.30
3.15	D					[POSSIBLE MADE GROUND]			
3.20- 3.60	B								
						Firm brown mottled bluish grey slightly sandy CLAY.			
						At 2.70m, medium strength			
4.20- 4.65	D	1.50 (DRY)			S13	Firm fissured brown mottled bluish grey CLAY with some sand and fine gravel sized gypsum crystals. Fissures are extremely to very closely spaced randomly orientated, smooth, dull and occasionally stained orange.			
						Below 4.20m, thinly laminated in parts.			
						At 5.70m, fissures slightly polished with light			
5.70- 6.15	U70	1.50 (DRY)	96	31		blue grey staining.			
						At 5.70m, high strength			
6.15	D								
						Below 7.00m, becoming stiff.			
7.20- 7.65	D	1.50 (DRY)			S17				
8.70- 9.00	UT100	1.50 (DRY)							
9.00	D					Below 9.00m, becoming very stiff and dark greyish brown in colour.			
9.20- 9.50	B					At 9.00m, recovered with angular to subrounded fine to coarse gravel sized fragments of claystone.			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20		Inspection Pit	DC	G.L.			20/08/12	08:00						None encountered during boring.
20.00	0.15	Cable Percussion	DC	20.00	1.50	DRY	20/08/12	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth, 0.5 hours breaking out concrete.
** Drillers description.
E sample = 1 x vial, 1 x plastic jar and 1 amber jar
At 8.70m, UT shoe damaged
A 50mm standpipe was installed to 10.00m with a geowrapped slotted section from 2.00m to 10.00m with flush lockable protective cover. Backfill details from base of hole: arisings up to 12.00m, bentonite seal up to 10.00m, gravel filter up to 2.00m, bentonite seal up to 0.30m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by **CO**

Figure **1 of 2**

20/09/2012

geotechnics

BOREHOLE RECORD - Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON** Engineer **ROLTON GROUP** Borehole **BH2** Project No **PC124991**

Client **ROLTON GROUP** Ground Level **43.45** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
10.20-10.65	D	1.50 (DRY)			S24	Below 10.20m, light bluish grey mottling absent.			
11.60	D					At 11.60m, recovered as angular to subrounded fine to coarse gravel sized fragments of light grey claystone.			
11.80-12.25	U90	1.50 (DRY)							
12.25	D					Below 12.25m, fissures becoming very closely spaced, randomly orientated, smooth, dull and with a slight silt dusting.			
13.30-13.75	D	1.50 (DRY)			S31				
14.80-15.25	U95	1.50 (DRY)							
15.25	D					Below 15.25m, with rare fine to medium gravel sized shell fragments, fissure spacing increasing and silt dusting absent.			
16.30-16.75	D	1.50 (DRY)			S29				
17.80	D					At 17.80m, recovered as angular to subrounded fine to coarse gravel sized fragments of light grey claystone.			
18.00-18.45	UT125	1.50 (DRY)							
18.45	D								
18.70	D					At 18.70m, recovered as angular to subrounded fine to coarse gravel sized fragments of light grey claystone.			
19.50-19.95	D	1.50 (DRY)			S36				
						End of Borehole	20.00		23.45

Boring

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by **CO**

Figure **2 of 2**

20/09/2012

geotechnics

Fieldwork Results - *SPT Results Summary*

Project BACTON LOW RISE, GOSPEL OAK, NORTH LONDON **Project No** PC124991

Client ROLTON GROUP

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
BH2	1.20	42.25	S	-	1	1	2	1	2	1	6	*
BH2	4.20	39.25	S	-	1	2	3	3	3	4	13	*
BH2	7.20	36.25	S	-	2	3	4	4	4	5	17	*
BH2	10.20	33.25	S	-	3	4	4	7	7	6	24	*
BH2	13.30	30.15	S	-	3	5	8	8	6	9	31	*
BH2	16.30	27.15	S	-	2	5	5	7	8	9	29	*
BH2	19.50	23.95	S	-	4	7	7	8	9	12	36	*

Driller	David Cowling
Hammer No.	EQU436
Energy Ratio, Er (%)	74.00
Calibration Date	23/03/2012

Remarks
Equipment checked and calibration carried out in accordance with BS EN ISO 22476-3: 2005

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

BOREHOLE RECORD - Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON** Engineer **ROLTON GROUP** Borehole **BH3** Project No **PC124991**

Client **ROLTON GROUP** Ground Level **43.78** m OD

Sampling			Properties			Strata			Scale 1:50
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
						G.L.			**43.78**
						Asphalt. ** [MADE GROUND]	**0.07**		**43.71**
0.30	**D**								
0.50	**D**					**Concrete. ** [MADE GROUND]**	**0.40**		**43.38**
1.00	**E**					**Firm orange brown mottled red and blue sandy gravelly clay. Gravel is angular to subrounded fine to coarse brick, concrete, slate and flint. [MADE GROUND]**			
1.20- 1.65	**D**	**NIL (DRY)**			**S10**		**1.30**		**42.48**
2.00	**E**					**Firm orange brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse flint and quartz.**			
2.70- 3.15	**U30**	**NIL (DRY)**	**72**	**31**		**Firm to stiff fissured brown mottled bluish grey CLAY. Fissures are extremely to very closely spaced, randomly orientated, smooth and dull with a slight silt dusting and occasional orange staining. At 2.70m, medium strength**	**2.50**		**41.28**
3.20	**D**								
4.20- 4.65	**D**	**2.50 (DRY)**			**S15**	**Below 4.20m, becoming thinly laminated in places.**			
5.70- 6.15	**U40**	**2.50 (DRY)**							
6.20	**D**					**At 6.20m, becoming slightly micaceous and with occasional orange staining on fissure surfaces.**			
7.20- 7.65	**D**	**2.50 (DRY)**			**S21**				
8.70- 9.15	**U70**	**2.50 (DRY)**							
9.20	**D**					**Below 9.20m, becoming very stiff and greyish brown in colour. Orange staining on fissure surfaces absent.**			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20		**Inspection Pit**	**CR/PJ**	**G.L.**			**16/08/12**	**08:00**						**None encountered during boring.**
30.20	**0.15**	**Cable Percussion**	**CR/PJ**	**7.20**	**2.50**	**DRY**	**16/08/12**	**18:00**						
				7.20	**2.50**	**DRY**	**17/08/12**	**08:00**						
				30.20	**2.50**	**DRY**	**17/08/12**	**18:00**						

Remarks

Inspection pit hand excavated to 1.20m depth.
**** Drillers description.**
E sample = 1 x vial, 1 x plastic jar and 1 amber jar
A 50mm standpipe was installed to 5.00m with a geowrapped slotted section from 1.00m to 5.00m with flush lockable protective cover. Backfill details from base of hole: arisings up to 7.00m, bentonite seal up to 5.00m, gravel filter up to 1.00m, bentonite seal up to 0.30m, concrete up to ground level.

Logged by **SC/CO**

Figure **1 of 4**
20/09/2012

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

geotechnics

BOREHOLE RECORD - Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON** Engineer **ROLTON GROUP** Borehole **BH3** Project No **PC124991**

Client **ROLTON GROUP** Ground Level **43.78** m OD

Sampling			Properties			Strata			Scale 1:50
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
10.20-10.65	D	2.50 (DRY)			S41	Between 10.20-10.65m, recovered with subangular medium to coarse claystone gravel. At 10.30m, driller notes thin mudstone band.			
11.70-12.15	U70	2.50 (DRY)							
12.20	D								
13.20-13.65	D	2.50 (DRY)			S29	Below 13.20m, becoming dark grey in colour and occasional silt partings.			
14.70-15.15	U80	2.50 (DRY)							
15.20	D								
15.50	D								
16.20-16.65	D	2.50 (DRY)			S27				
						At 17.50m, driller notes thin mudstone band.			
17.70-18.15	U80	2.50 (DRY)							
18.20	D								
19.20-19.65	D	2.50 (DRY)			S38				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by **SC/CO**

Figure **2 of 4**

20/09/2012

geotechnics

BOREHOLE RECORD - Cable Percussion

Project **BACTON LOW RISE, GOSPEL OAK, NORTH LONDON**
Engineer **ROLTON GROUP**
Borehole **BH3**
Project No **PC124991**

Client **ROLTON GROUP**
Ground Level **43.78** m OD

Sampling | Properties | Strata — Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
20.70-21.15	U80	2.50 (DRY)							
21.20	D								
22.20-22.65	D	2.50 (DRY)			43				
23.70-24.15	U85	2.50 (DRY)							
24.20	D					Below 24.20m, fissures becoming randomly orientated occasionally subhorizontal very closely spaced, smooth, occasionally polished with black mottling.			
25.20-25.65	D	2.50 (DRY)			S50/ 295				
26.70-27.15	U85	2.50 (DRY)							
27.20	D								
28.20-28.63	D	2.50 (DRY)			S50/ 280				
29.70-30.15	U100	2.50 (DRY)							

Boring | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by **SC/CO**

Figure **3 of 4**
20/09/2012

geotechnics