

Appendix F

Nicholls Colton Geotechnical Report

NICHOLLS COLTON

GEOTECHNICAL

INTERPRETATIVE REPORT
on
A GROUND INVESTIGATION
for
MONKHOUSE SCHOOL, SPALDING



On Behalf Of
WALDECK
4 Henley Way,
Doddington Road,
Lincoln,
LN6 3QR

REPORT NO: G14223

October 2014

CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE NO.</u>
<u>Factual Information</u>		
1.	Introduction	1
2.	Site Description	1
3.	Site Work	1
4.	In Situ Testing	2
5.	Laboratory Testing	2
6.	General Geology and Revealed Strata	3
7.	Groundwater	4
8.	Gas	4
<u>Assessment and Recommendations</u>		
9.	Proposed Works	5
10.	Soil Profile	5
11.	Excavations	6
12.	Foundations	6
13.	Ground Floor Slab	7
14.	Concrete Classification	7
15.	Preliminary Soil Contamination	7
16.	Summary and Conclusions	10
<u>Appendix</u>		
A.	Window Sample Borehole Logs	
B.	Foundation Pit Logs and Cross Sections	
C.	Laboratory Test Results - Geotechnical	
D.	Laboratory Test Results – Soil Contamination	
E.	Laboratory Test Results – Waste Acceptance Classification	
<u>Drawings</u>		
G14223-IR/01	Site Location Plan	
G14223-IR/02	Exploratory Hole Location Plan	

**GROUND INVESTIGATION FOR A PROPOSED BUILDING EXTENSION AT MONKHOUSE SCHOOL,
SPALDING, LINCOLNSHIRE.**

Factual Information

1. Introduction

- 1.1 This report has been prepared on instructions given by Waldeck, 4 Henley Way, Doddington Road, Lincoln, LN6 3QR (order no. 4800047843 dated 10th September 2014), on behalf of Lincolnshire County Council.
- 1.2 It is understood the proposed development involves a single storey classroom extension to the western face of the main school building.
- 1.3 The purpose of this investigation is to provide data regarding the ground conditions and existing building foundations at the site, so that suitable methods of design and construction may be adopted for the proposed works. As part of this work, a preliminary assessment of soil contamination has been carried out.
- 1.4 This investigation has been undertaken on the specific instructions of Waldeck on behalf of Lincolnshire County Council and no reliance should be made by third parties as to its adequacy or completeness in relation to future development requirements of the area under consideration. Similarly, Nicholls Colton Geotechnical and Nicholls Colton Group will accept no liability in relation to the use of data contained in this report by third parties.

2. Site Description

- 2.1 The site lies within the grounds of Monkhouse Primary School and is located 1.45km southwest of Spalding town centre (national grid reference 523227, 322447), as shown on the appended site location plan (Nicholls Colton Geotechnical drawing no. G14223-IR/01).
- 2.2 The site consists of a small paved area of playground with benches for seating located under an existing canopy adjoined to the western side of the current far western school building. The sites northern, eastern and southern boundaries are formed by the exterior walls of the current school building.
- 2.3 There is no significant change of gradient at the site and no obvious areas of contamination were identified upon the site walkover.

3. Site Work

- 3.1 Two 100mm diameter window sampler boreholes (WS1 and WS2) were drilled at the site to a depth of 5.00m bgl to allow inspection and in situ testing of the soils. Supplementary investigation was carried out by two hand excavated foundation inspection pits (TH1 and TH2) which were formed to a maximum depth of 1.20m bgl to allow inspection of the existing foundation construction.
- 3.2 The borehole logs and foundation pit cross sections are included in Appendices A and B respectively.

- 3.3 Fragmentary disturbed samples were recovered from all materials revealed within the exploratory boreholes. Geo-environmental samples were obtained specifically for contamination testing.
- 3.4 The positions of the window sample boreholes were determined and set out by Nicholls Colton Geotechnical. The locations of the foundation pits were determined by Waldeck and set out by Nicholls Colton Geotechnical. The final positions of the boreholes and trial pits are shown on the appended exploratory hole location plan (Nicholls Colton Geotechnical drawing no. G14223-IR/02).
- 3.5 The samples were taken to Nicholls Colton Analytical's laboratory for further examination and testing.
- 3.6 No gas or groundwater monitoring has been undertaken as part of this investigation.
- 3.7 The fieldwork was carried out on 18th September 2014.
- 3.8 Fieldwork was generally carried out in accordance with BS5930 (1999) "Code of Practice for Site Investigations", logged in accordance with BS EN ISO 14688-1:2004 and BS EN ISO 14688-2: 2004 and the work overseen by an experienced Geotechnical Engineer.

4. In Situ Testing

- 4.1 Standard Penetration Tests (SPT's) were carried out using the split spoon (S) attachment within the boreholes (WS1 and WS2). The tests were carried out in accordance with BS 1377: Part 9: 1990 and BS EN ISO 22476-3:2005 utilising calibrated equipment and a copy of the certificate is included within Appendix A.

5. Laboratory Testing

- 5.1 The laboratory testing schedules were prepared by Nicholls Colton Geotechnical.
- 5.2 Included in this report is information taken from the results of tests undertaken in Nicholls Colton Analytical's laboratory at 7-11 Harding Street, Leicester. This is UKAS accredited testing laboratory No. 0320. The results of the laboratory tests in this report do not include all data required by the documented test procedure. However, all such data has been recorded and will be stored for six years from the date of test. This data will be issued on the client's instructions.

The following accredited test procedures were carried out:

- Natural Moisture Content
- Liquid Limit
- Plastic Limit
- Plasticity limit
- Particle Size Distribution – Sieve Method

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

- 5.3 The geotechnical laboratory tests were carried out in the period 22nd to 30th September 2014.
- 5.4 The geotechnical laboratory testing has been carried out in accordance with BS 1377: 1990 using calibrated equipment specified within the British Standard.
- 5.5 The geotechnical laboratory test results are included in this report as Appendix C.
- 5.6 In addition to the laboratory testing outlined above four soil samples were tested for the presence of contaminants as listed below. The MCERTS accredited testing was undertaken by Nicholls Colton Analytical (NCA's) (UKAS Laboratory No. 0320).

(all values 'total' unless otherwise stated)

- Arsenic
 - Cadmium
 - Chromium
 - Copper
 - Lead
 - Mercury
 - Nickel
 - Zinc
 - pH value
 - Phenols
 - Polyaromatic Hydrocarbons (speciated)
- 5.7 A number of soil samples have also been tested at NCA's Laboratory for a sulphate suite (in accordance with BRE Special Digest 1, 2005) as listed below.
- Sulphate (Water & Acid Soluble)
 - Sulphur (Total)
 - pH Value
- 5.8 The contamination testing outlined above was carried out during the period 22nd to 30th September 2014.
- 5.9 The suite of contaminants was selected by Nicholls Colton Geotechnical.
- 5.10 The contamination test results are included in this report as Appendix D.
- 5.11 In addition to the laboratory testing outlined above one soil sample was tested against the Waste Acceptance Criteria (WAC) suite of contaminants for classification for potential off site disposal. The WAC testing was undertaken between 22nd and 30th September 2014 by Nicholls Colton Analytical (UKAS Laboratory No. 0320).
- 5.12 The Waste Acceptance Criteria (WAC) results are included in this report in Appendix E.

6. General Geology and Revealed Strata

- 6.1 Geological sources (including the Geological Survey of Great Britain (England and Wales) indicate the area of the site to be underlain by Tidal Flat Deposits comprising clay and silt of Recent age which overlie the solid geology of the Oxford Clay Formation of Jurassic age.
- 6.2 Given the existing use of the site as a school the presence of a significant quantity of made ground is not anticipated.

6.3 The exploratory boreholes revealed a general downward strata succession of:

MADE GROUND

- Concrete slab
- Weak sand cement mix with sand and gravel sub-base
- Reworked clay with brick fragments

SUPERFICIAL DEPOSITS

- Firm brown slightly sandy CLAY
- Orange brown SAND

7. Groundwater

- 7.1 Both window sample boreholes encountered water during drilling operations.
- 7.2 A groundwater seepage was encountered within borehole WS1 at a depth of 1.00m. No level was formed on completion of drilling operations.
- 7.3 Borehole WS2 encountered a groundwater seepage at a depth of 1.00m. A water level of 1.90m was recorded upon the completion of drilling operations.
- 7.4 No long term monitoring of groundwater levels has been undertaken as part of this investigation.
- 7.5 It should be noted that groundwater levels may differ at times from those reported due to seasonal variations or other effects.

8. Gas

- 8.1 No gas monitoring has been undertaken as part of this investigation.

Assessment and Recommendations

9. Proposed Works

- 9.1 It is understood the proposed development involves a single storey classroom extension to the western face of the main school building.
- 9.2 The purpose of this report was to obtain preliminary data regarding the ground conditions at the site, so that methods of design and construction could be considered for the development.

10. Soil Profile

10.1 *Made Ground*

- 10.1.1 All of the exploratory holes recorded a surfacing of made ground covering the site comprising concrete slab (0.05m in thickness) bedded onto a weak cement mix overlying sand and gravel based sub-base materials. The hardstanding construction was encountered to a maximum depth of 0.50m (foundation pit TH2).
- 10.1.2 The foundation pits encountered clay based made ground materials underlying the concrete slab and sub base surfacing comprising brown clay with fragments of brick or reworked clay within foundation pits TH1 and TH2 to maximum depths of 0.70m and 0.80m respectively.
- 10.1.3 No made ground materials were encountered underlying the surface construction within boreholes WS1 and WS2.
- 10.1.4 No olfactory evidence of contamination was noted within any of the made ground materials encountered at the site.
- 10.1.5 The existing foundations appear to comprise traditional strip footings bearing on the natural granular soils below the site at depths of 0.90m (TH1) to 0.95m (TH2). Details are included on the section and photographs included in Appendix B.

10.2 *Superficial Deposits – Tidal Flat Deposits*

- 10.2.1 Both window sample boreholes and hand excavated pits have fully penetrated the made ground materials to reveal the underlying superficial deposits. These typically comprise of firm to stiff brown slightly silty or sandy clay encountered at shallow depths (typically less than 0.85m) overlying loose to medium dense brown or grey fine sand with shell fragments. These natural soils are considered representative of the Tidal Flat Deposits anticipated within the locality and they have been recorded to a maximum depth of 5.00m within boreholes WS1 and WS2. The shallower foundation pits have only penetrated marginally into these deposits.
- 10.2.2 In situ Standard Penetration Tests (SPTs) undertaken within the boreholes confirm the loose to medium dense condition of the granular soils with SPT 'N' values ranging from N=5 to N=14. The testing was undertaken utilising calibrated equipment with a copy of the SPT Hammer Energy certificate included in Appendix A.

- 10.2.3 A plasticity index test has been undertaken in the laboratory on a disturbed sample of the cohesive soils within WS2 (depth 0.60-0.70m) and the results indicate compliance with the definition of CI soils (i.e. soils of an intermediate plasticity) after the classification system of BS 5930:1999. These deposits are considered to be of medium volume change potential in accordance with NHBC Standards Chapter 4.2: 2014, based on the amended plasticity indices.
- 10.2.4 Particle size distribution testing undertaken on a sample of the granular soils obtained from borehole WS2 (1.20 to 2.00m) confirm the field description of the silty fine sands typically encountered within the exploratory holes.
- 10.2.5 The solid geology of the Oxford Clay Formation was not encountered within any of the exploratory holes.

11. Excavations

- 11.1 Based on the ground conditions revealed during the fieldwork it is anticipated that excavations for proposed foundations and drainage systems should generally be readily achieved adopting standard excavation plant.
- 11.2 Random falls should be anticipated from the faces of near vertically sided unsupported excavations carried out at the site. Such falls will be prevalent within any made ground materials and natural granular soils and will be aggravated by groundwater entries, if encountered. It is recommended that where personnel are required to enter excavations in such materials, continuous support should be provided to the full depth of the excavation.
- 11.3 Groundwater entries were encountered during drilling operations within both window sample boreholes at a depth of 1.00m. Should groundwater be encountered, initially traditional sump and pump methods of dewatering should be used, if required. However, factors such as the length of time excavations are left open and the depth of excavation will affect the efficiency / viability of such a dewatering technique.

12. Foundations

- 12.1 It is understood the proposed development involves a single storey classroom extension to the western face of the main school building.
- 12.2 It is anticipated that the underlying natural granular soils of the Superficial Deposits will provide a suitable founding stratum for the proposed development.
- 12.3 As a guide, for 0.60 metre wide strip/trench fill footings, bearing on the natural granular sand at a minimum depth of 0.75mbgl (ensuring all made ground is fully penetrated), an allowable net bearing pressure of at least approximately 75kN/m² is considered appropriate (equivalent to 45kN/m run). These values incorporate a factor of safety of three and total settlements are not expected to exceed approximately 20mm, thereby keeping differential settlements within acceptable limits.
- 12.4 Given the presence of the loose natural granular soils and the potential for both cohesive and granular soils to be present within the foundation excavations, it is recommended that mesh reinforcement is incorporated into all foundations in order to protect against differential settlement.

- 12.5 It is recommended that close liaison occurs between the geotechnical engineer, the structural engineer and the site ground workers with respect to the above to ensure that the design loads for the proposed extension does not exceed the bearing capacity of the proposed formation.
- 12.6 The trial pits have indicated foundation depths of the existing building to be between 0.90m and 0.95m and it is recommended that the foundations of any proposed extension are set at the same level as the existing building.

13. Ground Floor Slab

- 13.1 Following removal of all made ground from below the proposed footprint it should prove suitable to adopt a cast in situ ground bearing floor slab, although it is recommended that the depth of any imported granular material required to build up levels to formation should not exceed 600mm, in accordance with NHBC Standards (considered to be an appropriate guide in this respect) and that the formation is proof rolled prior to stone import.

14. Concrete Classification

- 14.1 The results of water soluble sulphate, total sulphate and pH testing carried out on selected soil samples taken during the investigation have been compared with the recommendations outlined in BRE Special Digest 1:2005 in order to provide guidance on the classification for below ground concrete. For the purposes of this assessment the site is considered a 'Brownfield' location with 'mobile ground water conditions'.
- 14.2 The results of the water soluble sulphate tests on the soil samples have recorded values in the range 12mg/l to 130mg/l as SO₄. The pH values of the soil samples lie within the range 7.0 to 8.4.
- 14.3 On the basis of the test results obtained it is considered appropriate to adopt a Basic Sulphate Class of DS-1, together with an Aggressive Chemical Environment of Concrete (ACEC) of AC-1.
- 14.4 Mobile groundwater conditions have been assumed for this determination.
- 14.5 Consideration should be given to the properties of any imported soils and further testing to confirm this concrete classification may be prudent.

15. Preliminary Soil Contamination

- 15.1 No desk study has been undertaken as part of this investigation (it is outside the scope of this report).
- 15.2 Three samples of the near surface natural soils obtained from the exploratory holes during this investigation have been tested to determine the presence, if any, of various potential contaminants. The results are appended to this report (Appendix D).
- 15.3 This investigation has been carried out to provide an initial indication of the degree and range of contamination present. The following sections describe the results obtained.

- 15.4 In the absence of any desk study information indicating previous site usage, but considering the long established nature of the school site, a screening suite of potential contaminants has been adopted to provide a preliminary assessment of soil contamination.
- 15.5 Guidance published by the Department of Environment Food and Rural Affairs (DEFRA) and the Environment Agency has been utilised to review the results of the soil contamination analyses. In particular, the Contaminated Land Exposure Assessment (CLEA) Model has been considered.
- 15.6 DEFRA has published a series of Soil Guideline Value (SGV) reports for a number of contaminants. The current set of SGV's was published by DEFRA during the period March to July 2009. The SGV reports contain the background toxicological and physico-chemical data utilised by DEFRA to calculate the individual SGV's.
- 15.7 DEFRA have calculated the current SGV's using the CLEA v.1.04 and v.1.06 software (the software was subject to minor changes during 2009).

At present, DEFRA have published SGV's for the following –

- Arsenic
 - Cadmium
 - Mercury (elemental, organic and methyl)
 - Nickel
 - Selenium
 - Benzene
 - Ethylbenzene
 - Phenol
 - Toluene
 - Xylene (o-, m-, and p-).
 - Dioxins and dioxin-like PCB's
- 15.8 Given the relatively small size of the published data supplied by DEFRA, additional authoritative advice has been provided to industry and regulators by Land Quality Management (LQM) and the Chartered Institute of Environmental Health (CIEH). For a large set of contaminants not covered by the SGV's, LQM / CIEH have published Generic Assessment Criteria (GAC's).
- 15.9 The 2nd Edition LQM / CIEH GAC's were published in July 2009. The GAC's have been calculated using the CLEA v.1.04 software (the CLEA software was the subject of minor up-dates during the latter half of 2009).
- 15.10 The 2nd Edition of the LQM / CIEH document contains the following GAC's –
- Beryllium
 - Boron
 - Cadmium (note – this was simultaneously published as an SGV by DEFRA).
 - Chromium (III and VI)
 - Copper
 - Vanadium
 - Zinc
 - Petroleum Hydrocarbon Fractions (16 Fractions)
 - Polyaromatic Hydrocarbons (US EPA 16)
 - Chloroalkanes and Alkenes (8 No.)

- Explosives (2 No.)
 - Pesticides (5 No.)
 - Chlorobenzenes (6 No.)
 - Phenol and Chlorophenols (3 no.)
 - Other (2 No.)
- 15.11 Additional GAC's have also been published by the Environmental Industries Commission (EIC) and the Association of Geotechnical Specialists (AGS), under the aegis of CL:AIRE, in January 2010. These GAC include antimony, barium, molybdenum and a large group of hydrocarbons, halogenated organics, phenols, phthalates and other organics.
- 15.12 DEFRA has recently published a new series of assessment criteria values (Category 4 Screening Levels (C4SL's)) and it is noteworthy that the value for lead is significantly lower than the former Soil Guideline Value (450 mg/kg) and in house GAC (373mg/kg). The C4SL value of 200mg/kg has therefore been adopted for lead.
- 15.13 Exceedance of a DEFRA SGV implies that an unacceptable human health risk *may* be present, and therefore either further site specific risk assessment is required, or intervention (remedial) works are necessary.
- 15.14 Similarly, exceedance of an LQM / CIEH (or EIC / AGS) GAC implies that an unacceptable human health risk *may* be present, and therefore either further site specific risk assessment is required, or intervention (remedial) works are necessary.
- 15.15 SGVs and GACs are set according to the proposed end use of the land. For the purpose of this report the results of the contamination test results were compared against 'residential without plant uptake' land use figures. Given the proposed end use of the site this is considered to be a conservative approach.
- 15.16 The concentration of the individual contaminants has been compared to the published SGVs, GACs or C4SL's as an initial screen, to determine the degree if any of contamination present.
- 15.17 Where no SGV or LQM/CIEH (or EIC / AGS) GACs are available the CLEA v.1.06 software has been utilised to derive generic values in-house by Nicholls Colton Geotechnical.
- 15.18 The individual contaminants were recorded at concentrations below the relevant SGVs, GACs or C4SL's for a residential without plant uptake land use.
- 15.19 On this basis, it is considered that no specific remedial measures will be required with respect to the protection of future occupiers or ground workers from soil contamination.
- 15.20 It is recommended that the results of the testing and this assessment be submitted to the local Environmental Health Department to ensure any specific guidelines or requirements which they may have are fully satisfied.

16. Summary and Conclusions

- 16.1 The exploratory holes have confirmed the absence of significant horizons of made ground across the site; typically a surfacing (hardstanding construction) overlies natural clays and sands. These natural deposits should provide a suitable formation for new low-rise construction on this site utilising traditional strip/trench fill foundations.
- 16.2 On the basis of the soil contamination assessment it is considered that specific remedial measures will not be necessary with respect to protection of future occupiers.



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BSc FGS
Principal Geo-Environmental Engineer
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APPENDIX A

Window Sample Borehole Logs

SYMBOLS USED IN BOREHOLE LOGS

S	-	Standard Penetration Test using split tube sampler
C	-	Standard Penetration Test using solid steel cone
N	-	blow count for 300 mm penetration in Standard Penetration Test, where the full 300 mm penetration could not be achieved the number of blows for a smaller depth is shown e.g. 50/150 which means 50 blows for 150mm penetration.
U	-	undisturbed nominal 105 mm diameter sample from borehole, obtained by percussive sampling methods unless otherwise stated
(20)	-	blow count to drive U sample (in N column on log)
B	-	large (bulk) sample of disturbed soil from borehole
D	-	small disturbed sample of soil from borehole
SD	-	very small disturbed sample of soil from borehole
G	-	Environmental sample, small disturbed sample of soil from borehole (taken in amber glass jar for contamination testing)
E	-	Environmental sample, consisting of an amber glass jar and a plastic tub
W	-	sample of groundwater from borehole
TCR	-	total core recovery - percentage of rotary core run recovered
SCR	-	solid core recovery - percentage of rotary core run recovered as intact core
RQD	-	Rock Quality Designation - percentage of rotary core run recovered as intact lengths of 100mm or more
FS	-	Fracture Spacing per core run (mm) - minimum spacing maximum spacing average spacing
FI	-	Fracture Index (number of fractures per core run)
NI	-	Non Intact

GROUNDWATER



- Water strike



- Water level

The information concerning groundwater noted on the borehole logs has been obtained (unless otherwise stated) only during the period of drilling the borehole.

To obtain complete data on groundwater conditions at any site (including fluctuations in level), observations and readings in properly constructed standpipes or piezometers are required over a period of several months. Information noted on the logs for this site therefore may be incomplete. In particular, groundwater levels either higher or lower than those found during this investigation may occur, and in some cases where no groundwater was encountered, this may be a temporary condition.



Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling UK Ltd
Unit 8
Victory park way
Victory road
Derby
DE24 8ZF

Hammer Ref: 110.54RL
Test Date: 17/05/2014
Report Date:
File Name: 110.54RL.spt
Test Operator: TP

Instrumented Rod Data

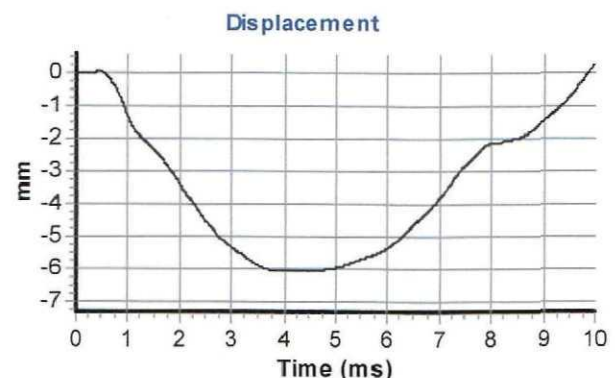
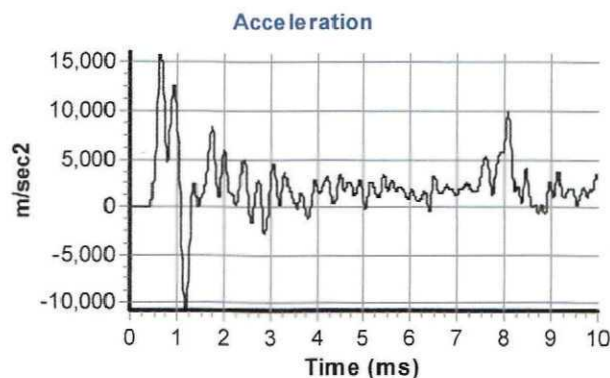
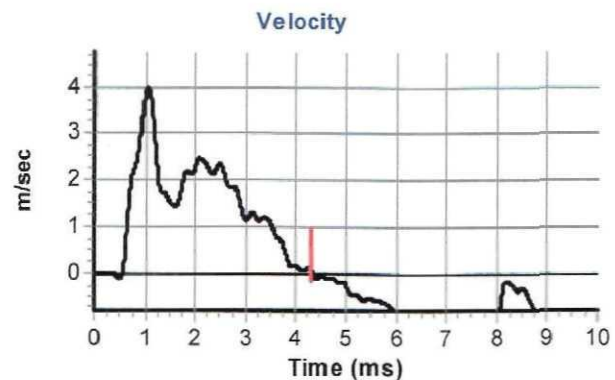
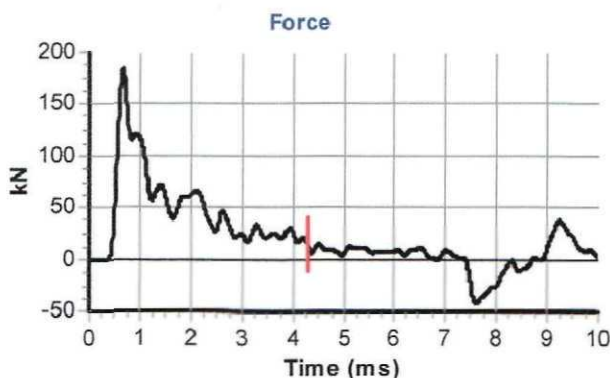
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.9
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 6455
Accelerometer No.2: 6457

Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
String Length L (m): 14.0

Comments / Location

Window sample rig tested at Dynamic sampling yard.



Calculations

Area of Rod A (mm²): 1021
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 381

Energy Ratio E_r (%): **80**

Signed: T.parker
Title: Manager

The recommended calibration interval is 12 months

BOREHOLE RECORD - WS1

(Window Sampler)

Site
Monkhouse School, Spalding

Client
Waldeck

Boring diameter:
100 mm to 5.00m

Casing diameter:

Project No.:
G14223

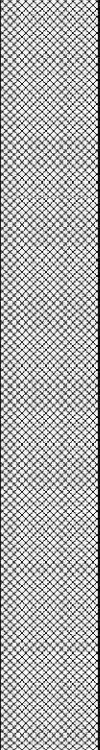
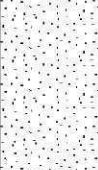
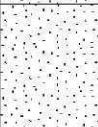
Logged by: PB

Ground Level:

Date: 18/09/2014

Location: -

Scale: 1:50

Samples & In situ Tests			Water	Level (m)	Depth (m)	Strata Description	Legend	Backfill
Ref:	Depth (m)	Result						
E1	0.50				0.05	MADE GROUND - concrete slab.		
D2	0.60-1.00				0.30	MADE GROUND - weak sand cement mix with sand and gravel sub base.		
E2	0.80				0.60	Firm brown slightly sandy CLAY.		
B3	1.00-2.00							
S	1.20	N=9				Loose orange brown silty fine SAND.		
S	2.00	N=5						
B4	2.20-3.00				2.20	Loose grey silty fine SAND.		
S	3.00	N=8				. . . becoming fine to medium with occasional shell fragments.		
D5	3.50-4.00							
S	4.00	N=12				. . . becoming medium dense from 4.00m.		
D6	4.00-4.90							
					5.00	End of Borehole at 5.00 m		

Sheet 1 of 1

Remarks and Water Observations

- Concrete slab removed and sand cement broken out.
- Hand dug starter pit to 1.20m.
- Groundwater seepage encountered at 1.00m. No water level formed after drilling, however samples recovered as extremely wet from below 2.00m.
- Hole terminated at 5.00m due to blowing sands.
- Borehole collapsed back to 1.75m on completion.
- Borehole backfilled with arisings and surface reinstated upon completion.

BOREHOLE RECORD - WS2

(Window Sampler)

Site
Monkhouse School, Spalding

Client
Waldeck

Boring diameter:
150 mm to 5.00m

Casing diameter:

Project No.:
G14223

Logged by: PB

Ground Level:

Date: 18/09/2014

Location: -

Scale: 1:50

Samples & In situ Tests			Water	Level (m)	Depth (m)	Strata Description	Legend	Backfill
Ref:	Depth (m)	Result						
E1	0.20				0.05	MADE GROUND - concrete slab.		
D2	0.30-0.40				0.30			
E2	0.35				0.60	MADE GROUND - weak sand cement mix with sand and gravel sub base.		
D3	0.60-0.70				0.85			
B4	0.85-1.00					Stiff dark brown slightly silty CLAY with occasional rootlets.		
S	1.20	N=7				Firm brown slightly sandy CLAY.		
B5	1.20-2.00					Loose orange brown and grey silty fine SAND.		
S	2.00	N=10			2.50			
D6	2.00-2.50					Medium dense locally loose grey silty fine to medium SAND with occasional shell fragments.		
S	3.00	N=13						
D7	3.50-3.80							
S	4.00	N=10						
D8	4.00-5.00							
S	5.00	N=14			5.00	End of Borehole at 5.00 m		

Sheet 1 of 1

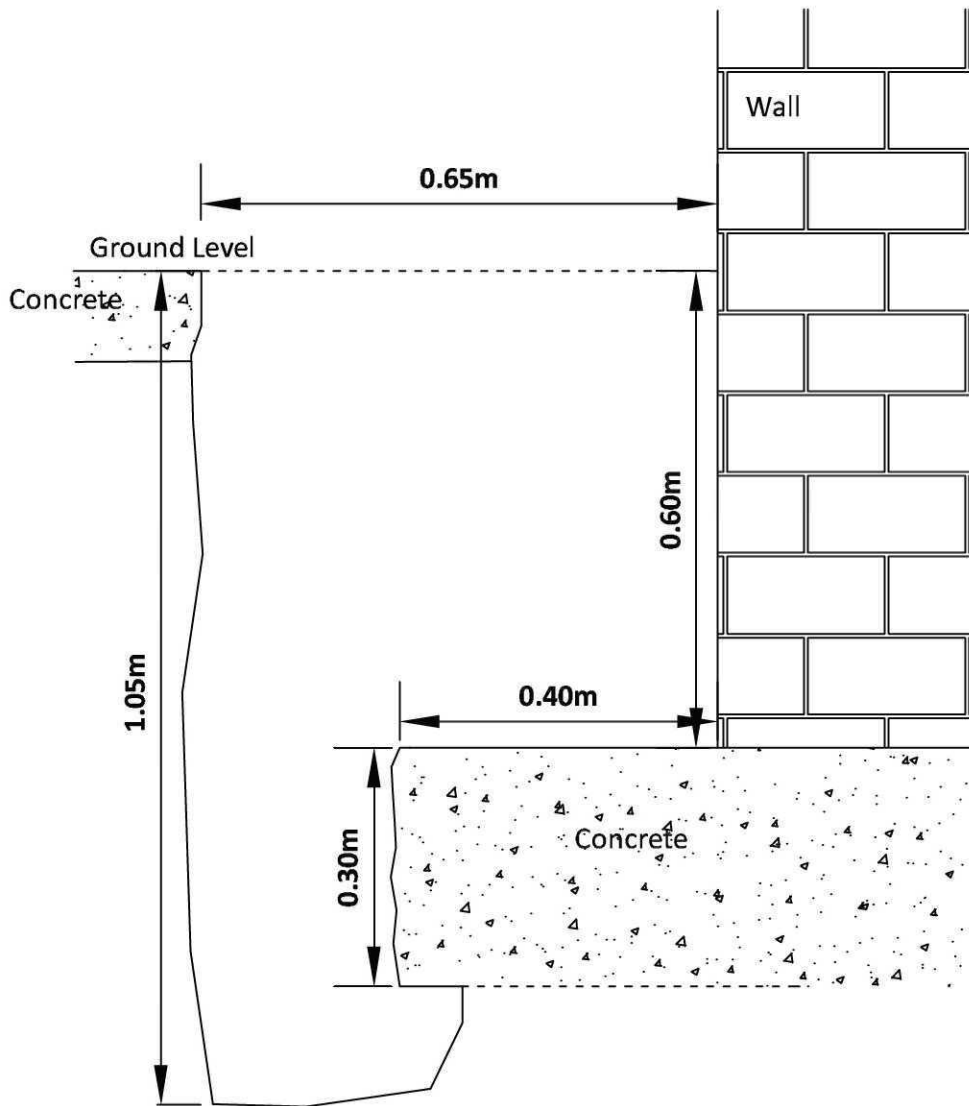
Remarks and Water Observations

- Concrete slab removed and sand cement broken out.
- Hand dug starter pit to 1.20m.
- Groundwater seepage encountered at 1.00m. Samples recovered wet with a water level of 1.90m recorded upon completion of drilling.
- Hole terminated at 5.00m due to blowing sands.
- Borehole collapsed back to 2.76m on completion.
- Borehole backfilled with arisings and surface reinstated upon completion.

APPENDIX B

Foundation Pit Logs and Cross Sections

TH1



Strata 1: GL to 0.25m
MADE GROUND - Concrete and sub base.

Strata 2: 0.25 to 0.70m
MADE GROUND - Brown firm slightly sandy slightly gravelly clay with occasional brick fragments.

Strata 3: 0.70 to 1.05m
Brown fine SAND.

Notes:

1. All dimensions in metres.
2. Trial pit excavated by hand.
3. Trial pit backfilled with arisings upon completion and surface reinstated.



Client.
Waldeck

Project no.
G14223

Project.
Monkhouse School, Spalding.

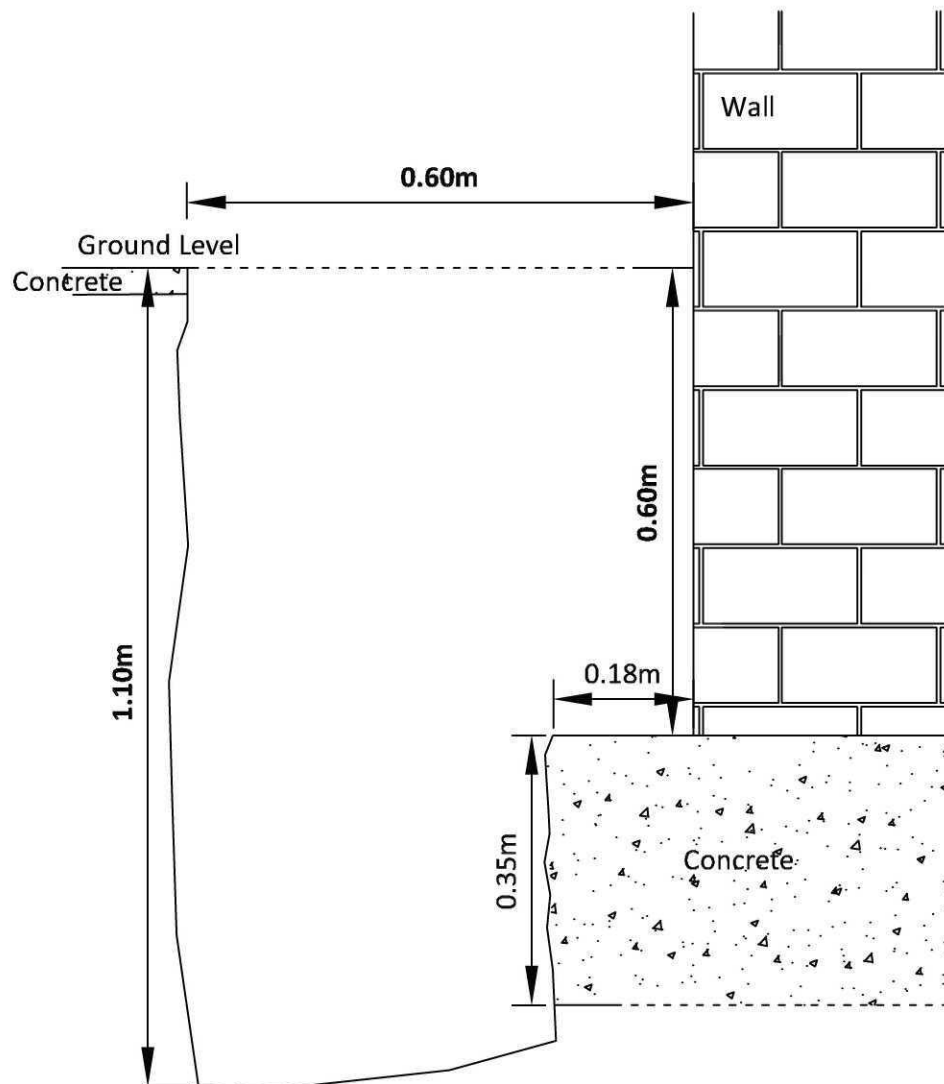
Drawing No.
G14223-TH1

Title.
Foundation Pit TH1

Scale.
NTS

Date.
October 2014

TH2



Strata 1: GL to 0.50m
MADE GROUND - Concrete slab and sub base.

Strata 2: 0.50 to 0.80m
MADE GROUND - Dark brown firm clay.

Strata 3: 0.80 to 1.10m
Brown fine SAND.

Notes:

1. All dimensions in metres.
2. Trial pit excavated by hand.
3. Trial pit backfilled with arisings upon completion and surface reinstated.



Client.
Waldeck

Project no.
G14223

Project.
Monkhouse School, Spalding.

Drawing No.
G14223-TH2

Title.
Foundation Pit TH2

Scale.
NTS

Date.
September 2014

FOUNDATION PIT PHOTOGRAPHS

Description: TH1



FOUNDATION PIT PHOTOGRAPHS

Description: TH1 detail



FOUNDATION PIT PHOTOGRAPHS

Description: TH2.



FOUNDATION PIT PHOTOGRAPHS

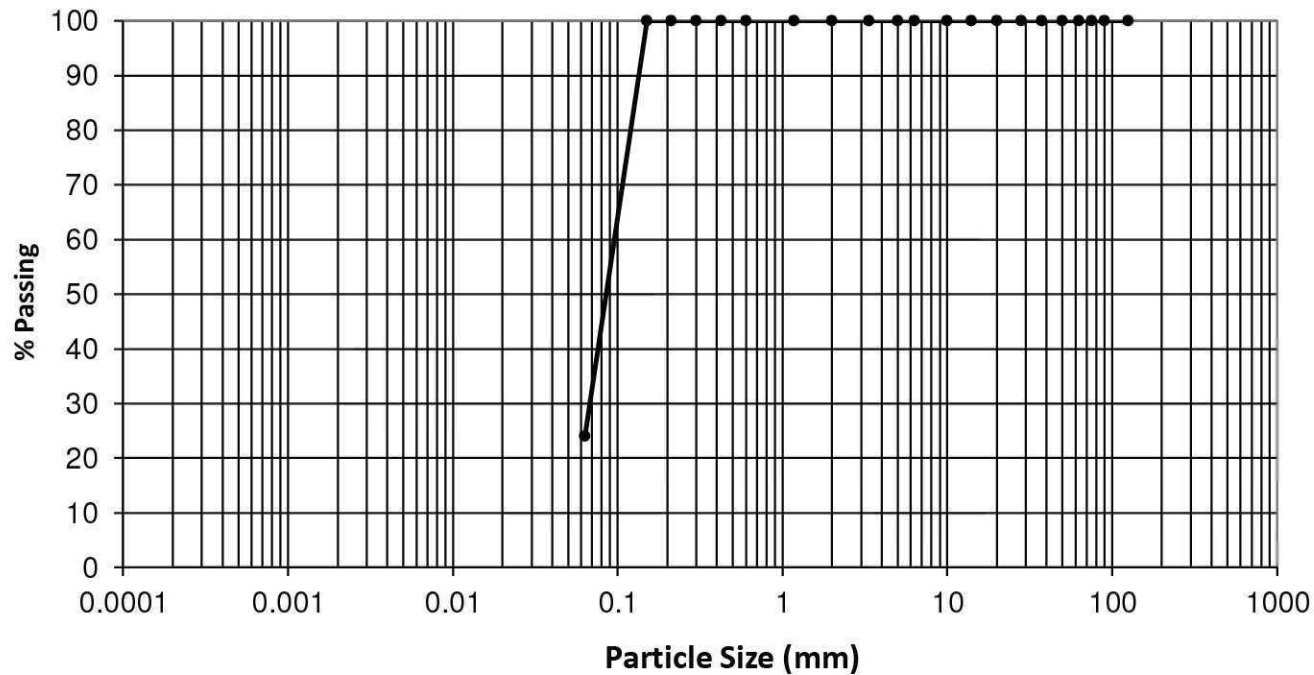
Description: TH2 detail



APPENDIX C

Laboratory Test Results - Geotechnical

B.S.1377 1990 PART 2 PARTICLE SIZE ANALYSIS



	F	M	C	F	M	C	F	M	C		
CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS

Key: F - Fine; M - Medium; C - Coarse

Sieve Size	Percentage Passing	Group % retained
125	100	Cobbles
90	100	
75	100	
63	100	
50	100	Gravel
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	0
2	100	
1.18	100	Sand
0.6	100	
0.425	100	
0.3	100	
0.212	100	
0.15	100	
0.063	24	
		76
		Fines
		24

N.C.A

Site Ref:
Monkhouse Primary School, Spalding

Job No: G14223-01
Hole No. WS2
Sample No: B5
Depth (m): 1.20-2.00

Date:
30/09/2014

TEST RESULTS SUMMARY SHEET

SITE: Monkhouse School, Spalding

NATURAL MOISTURE CONTENT AND ATTERBERG LIMIT TEST RESULTS

Tests carried out in accordance with B.S.1377:Part 2: 1990

Hole No.	Depth (m)	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 µm Sieve (%)	Group Symbol
WS2	0.60-0.70	25	43	20	23	100	CI

WS = Window Sample Borehole

NICHOLLS COLTON GEOTECHNICAL

Report No: G14223

Date: October 2014

APPENDIX D

Laboratory Test Results - Soil Contamination



Nicholls Colton Analytical
7 - 11 Harding Street
Leicester
LE1 4DH

Nicholls Colton Geotechnical
7-11 Harding Street
Leicester
LE1 4DH

Analytical Test Report: G14223-01/001

Your Project Reference:	Monkhouse School, Spalding	Samples Received on:	22.09.2014
Your Order Number:	G14223-01	Testing Instruction Received:	22.09.2014
Report Issue Number:	1	Sample Tested:	22 to 30.09.2014
Samples Analysed:	7 Soils	Report issued:	30.09.2014

Signed


James Gane
Manager - Data Logistics
Nicholls Colton Analytical

Notes:

General

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report.

Moisture Content was determined in accordance with NCA method statement MS - CL - Sample Prep, oven dried at <30 °C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with NCA method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

With the exception of Sulphate, Sulphur and Lol which are crushed over the 2mm test sieve, concentrations are reported as a percentage mass of the dry soil passing the 10mm BS test sieve. As received samples have been corrected for moisture content but not stone content.

Samples were supplied by customer.

Deviant Samples

Samples were received in suitable containers **Yes**

A date and time of sampling was provided **Yes**

Some sample handling times were exceeded prior to analysis of determinants **Yes**

Where samples do not meet one or more of the above criteria they will be classed as deviant, this means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Environment Agency document "Guidance for waste destined for disposal in landfills", Version 2, June 2006.



Nicholls Colton Analytical
7 - 11 Harding Street
Leicester
LE1 4DH

G14223-01/001

Project Reference - Monkhouse School, Spalding

Analytical Test Results - NCG Soil Suite

NCA Reference			14-31299	14-31300	14-31301
Client Sample Reference			E1	E2	E2
Client Sample Location			WS1	WS1	WS2
Depth (m)			0.50	0.80	0.35
Date of Sampling			18.09.2014	18.09.2014	18.09.2014
Time of Sampling			AM	AM	AM
Sample Matrix			Clay	Clay	Clay
Determinant	Units	Accreditation			
Arsenic	(mg/kg)	MCERTS	< 10	< 10	10.3
Cadmium	(mg/kg)	MCERTS	0.5	0.4	0.9
Chromium (Total)	(mg/kg)	MCERTS	11.7	12.0	19.1
Copper	(mg/kg)	MCERTS	9.4	8.0	10.5
Lead	(mg/kg)	MCERTS	13.8	14.7	26.0
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	17.2	16.9	23.9
Zinc	(mg/kg)	MCERTS	48.2	45.3	65.0
Phenols (Total)	(mg/kg)	MCERTS	<1.2	<1.2	<1.2
pH	pH Units	MCERTS	7.0	8.4	8.1
Acenaphthene	(mg/kg)	MCERTS	<0.1	<0.1	<0.1
Acenaphthylene	(mg/kg)	UKAS	<0.1	<0.1	<0.1
Anthracene	(mg/kg)	UKAS	<0.1	<0.1	<0.1
Benzo (a) anthracene	(mg/kg)	MCERTS	<0.1	<0.1	0.2
Benzo (a) pyrene	(mg/kg)	MCERTS	<0.1	<0.1	<0.1
Benzo (b) fluoranthene	(mg/kg)	MCERTS	<0.1	<0.1	0.2
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	<0.1	<0.1	0.1
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.2	<0.1	0.5
Chrysene	(mg/kg)	MCERTS	0.1	<0.1	0.3
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	<0.1	<0.1	<0.1
Fluoranthene	(mg/kg)	MCERTS	0.3	0.1	0.4
Fluorene	(mg/kg)	MCERTS	<0.1	<0.1	<0.1
Indeno (1, 2, 3-cd) pyrene	(mg/kg)	MCERTS	<0.1	<0.1	0.1
Naphthalene	(mg/kg)	MCERTS	<0.1	<0.1	<0.1
Phenanthrene	(mg/kg)	MCERTS	0.2	0.2	0.2
Pyrene	(mg/kg)	MCERTS	0.2	0.1	0.4
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	2.0	1.7	3.0



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Leicester
LE1 4DH

G14223-01/001

Project Reference - Monkhouse School, Spalding

Analytical Test Results - BRE Suite

NCA Reference			14-31302	14-31303	14-31304	14-31305
Client Sample Reference			B4	D6	D3	D6
Client Sample Location			WS1	WS1	WS2	WS2
Depth (m)			2.2-3.0	4.0-4.9	0.6-0.7	2.0-2.5
Date of Sampling			18.09.2014	18.09.2014	18.09.2014	18.09.2014
Time of Sampling			AM	AM	AM	PM
Sample Matrix			Sand	Sand	Clay	Clay
Determinant	Units	Accreditation				
Water soluble sulphate	(mg/l)	None	130	12	25	87
Acid Soluble Sulphate	(%)	None	0.07	0.03	0.03	0.05
Total Sulphur	(%)	None	0.15	0.02	0.01	0.06
pH Value	pH Units	MCERTS	8.0	8.4	8.4	7.5



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G14223-01/001

Project Reference - Monkhouse School, Spalding

Certificate Of Analysis - WAC Suite

NCA Reference	14-31301
---------------	----------

Client Sample Reference	E2, WS2
Sample Description	Dark brown silty clay.
Depth (m)	0.35
Date of Sampling	18.09.2014
Time of Sampling	AM
Sample Matrix	Clay
Moisture Content (%)	19
Stone content (%)	0

	Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
--	-------------------	----------------------	---	--------------------------

Solid Analysis

Total Organic Carbon	%	MCERTS	1.4	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.0	-	-	10.0
BTEX	mg/kg	MCERTS	<0.3	6.00	-	-
PCB's (7 Congeners)	mg/kg	-	<0.04	1.00	-	-
Mineral Oil (>C ₁₀ to C ₄₀)	mg/kg	-	89	500	-	-
PAH	mg/kg	-	3.1	100	-	-
pH	units	MCERTS	8.1	-	> 6	-

Eluate Analysis

Arsenic	mg/kg	-	0.04	0.50	2	25
Barium	mg/kg	-	0.31	20	100	300
Cadmium	mg/kg	-	< 0.03	0.04	1	5
Chromium (total)	mg/kg	-	< 0.03	0.5	10	70
Copper	mg/kg	-	< 0.10	2.0	50	100
Mercury	mg/kg	-	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	-	0.08	0.5	10.0	30
Nickel	mg/kg	-	< 0.03	0.4	10.0	40
Lead	mg/kg	-	< 0.10	0.5	10.0	50
Antimony	mg/kg	-	< 0.01	0.06	0.7	5
Selenium	mg/kg	-	< 0.10	0.1	0.5	7
Zinc	mg/kg	-	< 0.10	4	50	200
Chloride	mg/kg	-	28	800	15000	25000
Fluoride	mg/kg	-	21.9	10	150	500
Sulphate (as SO ₄)	mg/kg	-	23	1000	20000	50000
Phenol Index	mg/kg	-	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	-	109	500	800	1000



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LE1 4DH

G14223-01/001

Project Reference - Monkhouse School, Spalding

Sample Descriptions

NCA Reference	Client Sample Reference	Sample Location	Description	Moisture Content (%)	Stone Content (%)
14-31299	E1	WS1	Brown clay.	24	0
14-31300	E2	WS1	Brown clay.	23	0
14-31301	E2	WS2	Dark brown silty clay.	19	0

NCA Reference	Client Sample Reference	Sample Location	Description	% Passing 2mm BS test sieve
14-31302	B4	WS1	Brown silty sand.	100
14-31303	D6	WS1	Brown sand.	100
14-31304	D3	WS2	Brown clay.	100
14-31305	D6	WS2	Brown clay.	100



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Leicester
LE1 4DH

G14223-01/001

Project Reference - Monkhouse School, Spalding

Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Soil	Metals	Air Dried	In house method statement - MS - CL - ICP metals
Soil	PAH	Air Dried	In house method statement - MS - CL - PAH
Soil	Phenols	As Received	In house method statement - MS - CL - Phenols (Skalar)
Soil	pH	As Received	In house method statement - MS - CL - pH (Soil)
Soil	Sulphate	Air Dried	In house method statement - MS - CL - Anions (Aquakem)
Soil	Acid Sulphate	Air Dried	In house method statement - MS - CL - BRE
Soil	Total Sulphur	Air Dried	In house method statement - MS - CL - BRE



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G14223-01/001

Project Reference - Monkhouse School, Spalding

WAC Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Soil	TOC	Air Dried	In house method statement - MS - CL - TOC
Soil	LoI	Air Dried	BS 1377, Part 3, 1990
Soil	BTEX	As Received	In house method statement - MS - CL - VOC and BTEX
Soil	PCB	As Received	In house method statement - MS - CL - PCB
Soil	Mineral Oil	As Received	In house method statement - MS - CL - TPH
Soil	PAH	Air Dried	In house method statement - MS - CL - PAH
Soil	pH	Air Dried	In house method statement - MS - CL - pH (Soil)
Eluate	Metals	Leached	In house method statement - MS - CL - Water Metals
Eluate	Anions	Leached	In house method statement - MS - CL - Anions (Aquakem)
Eluate	Phenol Index	Leached	In house method statement - MS - CL - Phenols (Skalar)
Eluate	DOC	Leached	In house method statement - MS - CL - DOC

APPENDIX E

Laboratory Test Results – Waste Acceptance Criteria



Nicholls Colton Analytical
7 - 11 Harding Street
Leicester
LE1 4DH

G14223-01/001

Project Reference - Monkhouse School, Spalding

Certificate Of Analysis - WAC Suite

NCA Reference	14-31301
---------------	----------

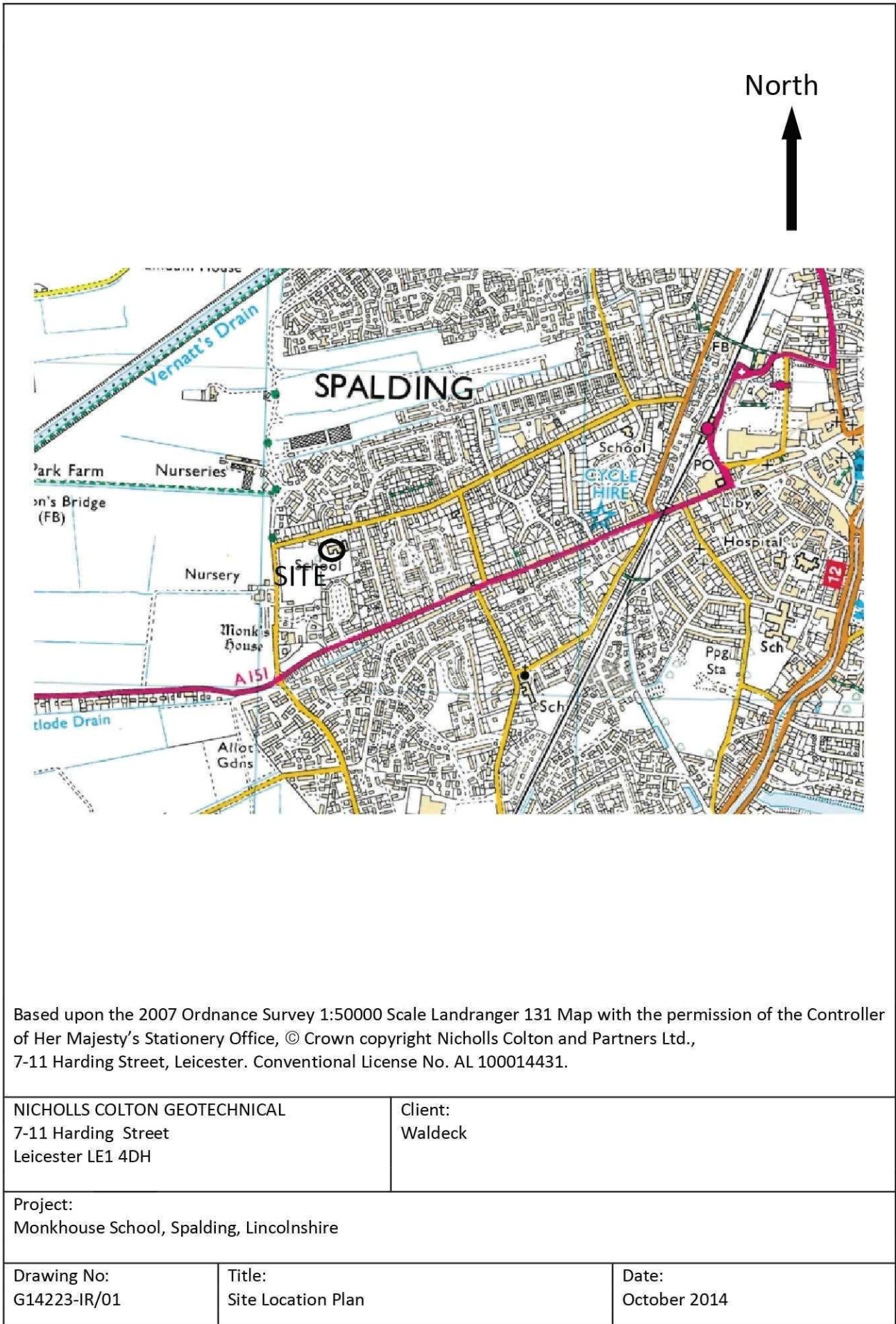
Client Sample Reference	E2, WS2
Sample Description	Dark brown silty clay.
Depth (m)	0.35
Date of Sampling	18.09.2014
Time of Sampling	AM
Sample Matrix	Clay
Moisture Content (%)	19
Stone content (%)	0

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	1.4	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.0	-	-	10.0
BTEX	mg/kg	MCERTS	<0.3	6.00	-	-
PCB's (7 Congeners)	mg/kg	-	<0.04	1.00	-	-
Mineral Oil (>C ₁₀ to C ₄₀)	mg/kg	-	89	500	-	-
PAH	mg/kg	-	3.1	100	-	-
pH	units	MCERTS	8.1	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	-	0.04	0.50	2	25
Barium	mg/kg	-	0.31	20	100	300
Cadmium	mg/kg	-	< 0.03	0.04	1	5
Chromium (total)	mg/kg	-	< 0.03	0.5	10	70
Copper	mg/kg	-	< 0.10	2.0	50	100
Mercury	mg/kg	-	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	-	0.08	0.5	10.0	30
Nickel	mg/kg	-	< 0.03	0.4	10.0	40
Lead	mg/kg	-	< 0.10	0.5	10.0	50
Antimony	mg/kg	-	< 0.01	0.06	0.7	5
Selenium	mg/kg	-	< 0.10	0.1	0.5	7
Zinc	mg/kg	-	< 0.10	4	50	200
Chloride	mg/kg	-	28	800	15000	25000
Fluoride	mg/kg	-	21.9	10	150	500
Sulphate (as SO ₄)	mg/kg	-	23	1000	20000	50000
Phenol Index	mg/kg	-	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	-	109	500	800	1000

DRAWINGS

G14223-IR/1 Site Location Plan

G14223-IR/2 Exploratory Hole Location Plan





Key:



Trial Pit



Window Sample
Borehole



Client.
Waldeck

Project no.
G14223

Project.
Monkhouse School, Spalding, Lincolnshire

Drawing No.
G14223-IR/02

Title.
Exploratory Hole Location Plan

Scale.
NTS

Date.
October 2014

Appendix G

Welland & Deeping IDB Response

Garry Dunnett

From: Nick Morris <Nick@wellandidb.org.uk>
Sent: 22 August 2014 10:56
To: Garry Dunnett
Subject: RE: 14-3072 Monkhouse Primary School, Spalding
Attachments: SKMBT_C22014082210360.pdf

Morning Garry

The Boards piped Pennygate Road Drain runs along the southside of Pennygate and along the northern frontage of Monkhouse Primary School – see attached plan.

We have no records of any recent (or historical) flooding within this area.

I hope this information is of use to you.

Best wishes,

Nick

From: Garry Dunnett [mailto:garry.Dunnett@waldeckconsulting.com]
Sent: 20 August 2014 11:20
To: Nick Morris
Subject: 14-3072 Monkhouse Primary School, Spalding

F.A.O. Nick Morris

Dear Sir,

We are Consulting Engineers appointed to undertake a flood risk assessment for a proposed extension at the above mentioned site.

Therefore it would be much appreciated if you could supply us with any records of recent (or historical) flooding that may have occurred within the area in question.

If there is a fee for the supply of the requested information, please could you inform us prior to sending us the relevant information.

I have attached a copy of a site location plan for your assistance, but should you have any queries regarding the above, please do not hesitate to call.

Regards,

Garry

Garry Dunnett
Project Engineer

For and on behalf of Waldeck

T: 01733 807313

E: garry.Dunnett@waldeckconsulting.com

A: Waldeck, 21 Cross Street Court, Cross Street, Peterborough, PE1 1XA



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VAT Registration number: 694865763.

Nick Morris
Operations Engineer



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Nurseries

Edward Road Dyke

Drain

Nurseries

Nurseries

The Spalding
Monkshouse
Primary School