

**Shelton Road / Willowbrook Road, Corby, NORTHANTS.**

**Results of Contamination Analyses on soil samples**

Determindand	Sample		CY 60 (TP 12) 0.4m	CY 60 (TP 12) 2.0m	CY 61 (TP 13) 2.0m	CY 61 (TP 13) 4.0m	CY 62 (TP 14) 2.80m	CY 62 (TP 14) 3.50m	STREAM Sed 2
	Units	mg/kg							
Arsenic (total)	mg/kg	27	17	19	19	17	19	21	35
Boron (water sol)	mg/kg	0.96	0.53	0.15	0.12	0.21	0.21	0.30	0.77
Cadmium (total)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (total)	mg/kg	110	55	40	40	40	40	50	70
Chromium (Hexavalent)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1
Copper (total)	mg/kg	50	25	20	20	20	20	15	15
Cyanide (complex)	mg/kg	<1	<1	<1	<1	<1	<1	<1	-
Cyanide (free)	mg/kg	<1	<1	<1	<1	<1	<1	<1	-
Cyanide (total)	mg/kg	-	-	-	-	-	-	-	<1
Lead (total)	mg/kg	35	20	10	15	15	15	15	70
Mercury (total)	mg/kg	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel (total)	mg/kg	30	40	35	40	40	40	30	40
PAH (total)	mg/kg	11	45	<1	3	2	2	<1	44
pH	pH units	8.4	8.2	8.1	8.1	8.0	8.0	8.1	8.3
Phenol (Monohydric) (total)	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Selenium (total)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1
Sulphate (total) (%SO4)	mg/kg	0.23	1.6	0.47	0.14	0.73	0.73	0.34	0.06
Sulphide (total)	mg/kg	90.0	2.1	1.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphur (total) (%)	%	0.50	0.32	0.91	1.00	0.32	0.32	0.37	-
Sulphur (Free)	mg/kg	190.0	210.0	20.0	<10	<10	<10	280.0	20
Thiocyanate (total)	mg/kg	<20	<20	<20	<20	<20	<20	<20	-
TPH	mg/kg	20	-	-	-	-	-	-	-
TOC	%	-	-	-	-	-	-	-	-
Zinc (total)	mg/kg	230	90	60	65	65	65	60	360

**Shelton Road / Willowbrook Road, Corby, NORTHANTS.**

**Results of Contamination Leachate Analyses of water samples**

Determinand	Sample	CY 20	CY 22	CY 25	CY 36	CY 42	CY 43	CY 46	CY 48
	Units	(BH 1) 4.80m	(BH 3) 3.00m	(BH 6) 3.70m	(BH 17) 14.05m	(BH 23) 6.75m	(BH 24) 9.50m	(BH 27) 10.00m	(BH 29) 9.00m
Arsenic	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	mg/l	0.50	0.09	0.75	0.58	0.45	0.3	1.80	0.09
Boron (water sol)	mg/l	-	-	-	-	-	-	-	-
BOD	mg/l	-	-	-	-	-	-	-	-
COD	mg/l	-	-	-	-	-	-	-	-
Cadmium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium (total)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium (Hexavalent)	mg/l	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	-
Copper	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide (complex)	mg/l	-	-	-	-	-	-	-	-
Cyanide (free)	mg/l	-	-	-	-	-	-	-	-
Cyanide (total)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH (total)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH	pH units	7.3	7.4	8.1	9.7	7.8	4.9	8.8	7.8
Phenol (Monohydric)	mg/l	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	<0.05	<0.05
Selenium	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulphate	mg/l	340	102	128	30	141	46	110	478
Sulphide	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphur	mg/l	-	-	41.0	-	-	-	-	157
Thiocyanate	mg/l	-	-	-	-	-	-	-	-
TPH	mg/l	-	-	-	-	-	-	-	-
Zinc	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01

I/S - Insufficient Sample

**Shelton Road / Willowbrook Road, Corby, NORTHANTS.**

**Results of Contamination Leachate Analyses of soil samples**

Determinand	Sample	CY 20	CY 22	CY 25	CY 36	CY 42	CY 43	CY 46	CY 48
	Units	(BH 1) 4.80m	(BH 3) 3.00m	(BH 6) 3.70m	(BH 17) 14.05m	(BH 23) 6.75m	(BH 24) 9.50m	(BH 27) 10.00m	(BH 29) 9.00m
Arsenic	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	mg/kg	5.00	0.90	7.5	5.80	4.50	2.5	18.00	0.90
Boron	(water sol) mg/kg	-	-	-	-	-	-	-	-
BOD	mg/kg	-	-	-	-	-	-	-	-
COD	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	(total) mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	(Hexavalent) mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyanide	(complex) mg/kg	-	-	-	-	-	-	-	-
Cyanide	(free) mg/kg	-	-	-	-	-	-	-	-
Cyanide	(total) mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mercury	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH	(total) mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
pH	pH units	-	-	-	-	-	-	-	-
Phenol (Monohydric)	mg/kg	<0.5	<0.5	<0.5	1.3	<0.5	<0.5	<0.5	<0.5
Selenium	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulphate	mg/kg	3400	1020	1280	300	1410	460	1100	4780
Sulphide	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphur	(total) mg/kg	-	-	410.0	-	-	-	-	1570
Thiocyanate	mg/kg	-	-	-	-	-	-	-	-
TPH	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1

I/S - Insufficient Sample





**Shelton Road / Willowbrook Road, Corby, NORTHANTS.**

**Results of Contamination Analyses on water samples**

Determinand	Sample		MOAT		MOAT		STREAM		STREAM		CY 23 (BH 4)		CY 25 (BH 6)		CY 48 (BH 29)	
	Units	Sed 1	Wat 1	Wat 1	Wat 1	Sed 1	Wat 1	Wat 1	Sed 1	Wat 2	STREAM	STREAM	STREAM	STREAM	STREAM	STREAM
Arsenic	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	mg/l	0.07	0.03	0.08	0.13	-	0.08	-	0.08	-	-	-	-	-	-	-
Boron (water sol)	mg/l	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BOD	mg/l	-	2.30	1.70	-	-	1.40	-	1.40	<3	<3	<3	I/S	<3	<3	<3
COD	mg/l	-	30.00	11.00	-	-	86.00	-	86.00	<4	<4	<4	10.0	10.0	10.0	10.0
Cadmium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium (total)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium (Hexavalent)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide (complex)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	-	-	I/S	I/S	I/S	I/S	I/S
Cyanide (free)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	I/S	-	-	I/S	I/S	I/S	I/S	I/S
Cyanide (total)	mg/l	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH (Total)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH	pH units	7.2	7.0	7.5	7.5	7.5	7.5	7.5	7.5	8.8	8.8	7.5	8.2	8.2	7.3	7.3
Phenol (Monohydric)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulphate	mg/l	524	398	195	192	192	195	192	192	150	150	1975	245	245	2060	2060
Sulphide	mg/l	I/S	I/S	I/S	I/S	I/S	I/S	I/S	I/S	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphur	mg/l	170	130	58	57	57	58	57	57	-	-	550	60	60	631	631
Thiocyanate	mg/l	1.0	1.0	1.0	I/S	I/S	1.0	I/S	I/S	-	-	I/S	I/S	I/S	I/S	I/S
TPH	mg/l	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-
Zinc	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

I/S - Insufficient Sample

**Shelton Road / Willowbrook Road, Corby, NORTHANTS.**

**Results of Contamination Analyses on soil samples**

Determinand	Sample		CY 46 (BH 27)
	Units	Units	
Methane	VPM	2061	31552
Carbon Monoxide	VPM	<5	<5
Carbon Dioxide	VPM	25217	3841
Oxygen	VPM	159500	30500
Nitrogen	VPM	814000	937600
Hydrogen	VPM	<5	111
Assay: Total %		100.08	100.4

**GAS MONITORING RESULTS FOR BOREHOLE**

CY 0020

<b>TIME</b>	<b>DATE</b>	<b>CH<sub>4</sub> %</b>	<b>CO<sub>2</sub> %</b>	<b>O<sub>2</sub> %</b>	<b>H<sub>2</sub>S ppm</b>	<b>Atmos mBar</b>	<b>diff mBar</b>	<b>WL cover</b>	<b>WL mAOD</b>
12:25	15.03.1996	0.0	0.4	19.3	-	996	0	DRY	
12:26		0.0	0.7	19.1	-	996			
10:38	16.04.1996	0.0	5.9	7.7	0.1	998	0	DRY	
10:39		0.0	6.0	7.5	0.1	998			
10:40		0.0	6.1	7.2	0.2	998			

**MONITORING RESULTS FOR BOREHOLE**

**CY 0021**

<b>TIME</b>	<b>DATE</b>	<b>CH<sub>4</sub> %</b>	<b>CO<sub>2</sub> %</b>	<b>O<sub>2</sub> %</b>	<b>H<sub>2</sub>S ppm</b>	<b>Atmos mBar</b>	<b>diff mBar</b>	<b>WL cover</b>	<b>WL mAOD</b>
12:37	15.03.1996	0.6	0.3	0.5	-	995	0	DRY	
12:39		0.6	0.3	0.1	-	995			
10:50	16.04.1996	0.1	0.3	2.1	0.1	998	0	6.75	100.60
10:51		0.1	0.3	1.2	0.2	998			
10:52		0.2	0.4	0.4	0.3	998			

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**Appendix D**  
**Slope Stability Assessment**

### Introduction

The Willowbrook runs west to east along the northern boundary of the site at a level significantly lower than the site. There is therefore a steep slope down to the brook which at present is vegetated with rough scrub and trees.

Slope stability analysis of this slope has been carried out to determine whether the slope will remain stable and whether the stability is affected by loading applied at the top of the site due to development of the site.

The analysis has been carried out using the computer programme 'Slope' developed by Geosolve Ltd, Version 7.53 revision A13.B12.R22, 1995. Given the slope geometry, it is considered that failure would occur along a circular slip plane and therefore Bishop's Method of slip circle analysis has been used.

### Slope Models

#### Geometry

The slope geometry used for the analysis is based on site observation and measurement, photographic evidence and the available maps and plans.

The height of the slope is generally around 13m, and the slope angle is estimated at between 20° and 24°. Two simplified geometries have been analyzed based on the varying stratigraphy across the site. The locations of the analyzed slopes are shown on Figure D1.

Section E(i) represents the conditions at the western and eastern ends of the site, where the results of the site investigation have identified a layer of organic black silt (steelworks waste), which has been assumed to outcrop on the face of the slope. (Note: ~~This~~ was not possible to verify on site due to the overgrown vegetation and difficulty in accessing the slope.) A slope angle of 20° has been assumed based on photographic evidence and site measurements. *as well as the need not to disturb the slope geometry in any of the investigations*

Section E(ii) represents the conditions at the centre of the slope, where the boreholes have indicated that there is no steelworks waste. A slope angle of 24° has been assumed based on site measurements and existing survey plans.

#### Groundwater

Groundwater has been modelled based on the results of groundwater monitoring in the boreholes along the northern boundary of the site. Measurements of groundwater levels have been used from boreholes sunk during this and previous investigations.

For Section E(i) 3 cases have been analyzed; 1) water table at the same level as the Willowbrook, 2) water table at level measured in boreholes with hydraulic surface sloping down towards the Willowbrook, and 3) water table at level measured in boreholes, with hydraulic surface following the slope face below that level. (Note: It was not possible to access the slope to check for evidence of a spring line, which would validate this model.)

For Section E(ii), no water was encountered in any of the boreholes. This was expected as the boulder clay forming the slope is generally impermeable. Two models have been analyzed; 1) water table at level of the Willowbrook, and 2) water table well below the toe of the slope, i.e. has no influence on the stability of the slope.

*Soil Parameters*

The soil parameters have been determined from the results of effective stress testing carried out in both the boulder clay and black silts (steelworks waste). Due to the variability of the material which resulted in insufficient recovery in some of the U100 samples and the limited amount of test data, conservative values have been assumed for analysis purposes. A summary of these results and the values used for analysis is presented in Table E1.

Description	Range	Value used in Analysis <sup>3</sup>
Grey/Brown Reworked Boulder Clay	$c' = 0-7\text{kPa}$ , $\phi' = 24.2^{\circ}-26.7^{\circ}$	$c' = 0\text{ kPa}$ , $\phi' = 26^{\circ}$ , $r_u = 0.1$
Black/Brown Silt (Steelworks Waste)	$c' = 0-1\text{kPa}$ , $\phi' = 33.4^{\circ}-39.5^{\circ}$	$c' = 0\text{ kPa}$ , $\phi' = 20^{\circ}$ , $r_u = 0.2$
Orange/Brown Reworked Boulder Clay	$c' = 2-5\text{kPa}$ , $\phi' = 29.7^{\circ}-31.9^{\circ}$	$c' = 0\text{ kPa}$ , $\phi' = 29^{\circ}$
Combined Boulder Clay <sup>2</sup>	$c' = 5-7\text{kPa}$ , $\phi' = 24.2^{\circ}-29.7^{\circ}$	$c' = 0\text{ kPa}$ , $\phi' = 26^{\circ}$ , $r_u = 0.1$

Notes:

1. Analysis carried out with values corresponding with lower bound values of cohesion or test results from location of section.
2. For the combined boulder clay material, the values used correspond to test results for material from the location of the section, i.e. BH24.
3. Values are modified based on the results of plasticity testing in cohesive materials.

*Loading*

The initial stability analyses were carried out at using a model of the existing conditions. If necessary, further analyses were also planned for the slope subjected to surcharge loading, with surcharges approximately equivalent to an access road and light industrial buildings, i.e. 10 kN/m<sup>2</sup> and 35kN/m<sup>2</sup>. The analysis was also carried out for loading placed set back from the top of the slope to assess, how close loading could be applied to the top of the slope.

*Assumptions*

The following assumptions have been made in analyzing the slope(s).

- Water level in Willowbrook is at 92.5m AOD
- The Willowbrook is 1.0m wide, 1.0m deep and set 0.5m from toe of slope
- Slope is assumed to have a constant gradient
- Ground at top of slope is horizontal
- All strata are horizontal

**Results of Slope Stability Analysis**

The results of the slope stability analyses are presented in the computer printouts and summarised in Table D1.

Table D1- Summary of Slope Stability Analyses

Slope	Run	Geometry	Notes	Factor of Safety
E(i)	1	Horizontal water table at 92.5mAOD	No Load	0.923
"	2	Hydraulic surface sloping down to Willowbrook	No Load	0.923

"	3	Horizontal water table at 94.25mAOD	No Load	0.923
	4	Horizontal water table at 92.5mAOD	No Load, slip circle set back to obtain FoS $\geq$ 1.3	1.327
	5	Hydraulic surface sloping down to Willowbrook	"	1.327
	6	Horizontal water table at 94.25mAOD	"	1.331
E(ii)	7	Horizontal water table at 92.5mAOD	No Load, slip induced 2m below surface #	1.012

Notes:

\* = ~~does not represent failure of the slope~~

# = 2m depth used to simulate the stabilizing effect of vegetation on the slope.

### Conclusions

The calculated factor of safety (FoS) for the existing slope at Section E(i) range is 0.923, with the slip plane passing through the steelworks waste. (Note: Lower factors of safety were observed for Section E(ii) for failures which represented localised surface sloughing. The factor of safety quoted represents overall failure of the slope.) Therefore the slope is considered to be marginally stable in its present condition, relying for stability on the presence of thick vegetation and rough woodland.

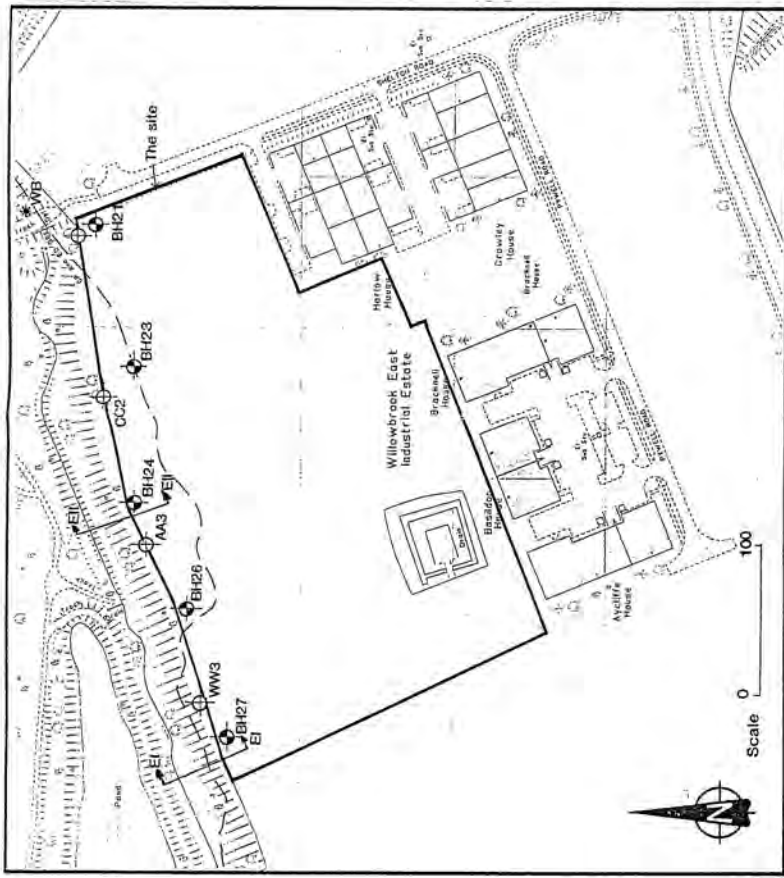
The FoS for the slope at Section E(ii) was calculated at 1.012. Lower factors of safety were calculated which represented minor surface sloughing, but this is considered to be unlikely due to the heavy vegetation covering the slope.

We would recommend the following actions be taken during redevelopment of the site, in order to avoid the necessity for extensive slope stabilization work. Otherwise, prior to development, consideration should be given to implementing remedial works to strengthen the slope

- the existing trees and vegetation should be left in-situ.
- the top of the slope should not be developed other than as landscaping, which should extend at least 17m back from the edge to obtain a FoS of 1.3 against slope failure.
- the closest development to the top of the slope should be car parking

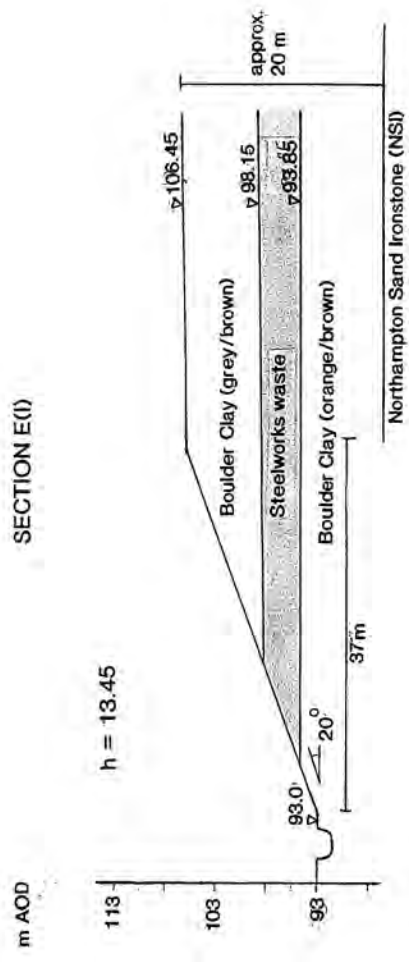
If necessary, it may be possible to locate buildings closer to the top of the slope, but this would require piled foundations.



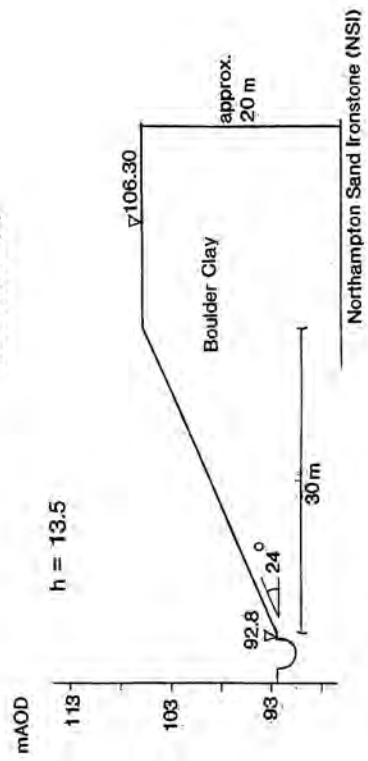


- Notes: Levels mAOD
- BH21 103.5
  - BH23 104.75
  - BH24 106.30
  - BH26 106.35
  - BH27 106.45
  - WW3 106.30
  - AA3 106.20
  - CC2 104.70
  - EE2 103.85
  - \*WB 92.8 (Willowbrook)
  - 92.5 stream water level

SECTION E(I)



SECTION E(II)



Scale 1:500



**FRANK GRAHAM**  
Consulting Engineers

Client

**CNT**

Job Title **Shelton Road, Corby, Northamptonshire**

Drawing Title

**Slope Stability Analysis Geometry**

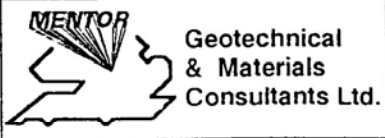
Rev	Amendments	Drawn	Chkd	Appr	Date
Scale	as shown				May 1996
Drawn	A.L.C.		J.S.		Approved B.W.
Job No	CKG/590196/000				Drawing No
					Figure D1
					Rev

Depth (m)	w (%)	wt (%)	wp (%)	Ip (%)	Bulk Density (Mgm <sup>-3</sup> )	STRENGTH				CHEMICAL			Soil Type	Remarks
						Type	Total Minor Principal Stress (kPa)	Principal Stress Difference (kPa)	Undrained Shear Strength (kPa)	φ (deg)	pH	Soil SO <sub>3</sub> (%)		
3.00	17	34	14	20									F	
4.00													F	MCT - Separation sheet
7.00	62	71	55	16									F	
9.00													F	PSD - Separation sheet
10.00														PSD - Separation sheet

Notes:

- |  |   |  |
|--|---|--|
| U38 Triaxial test set of three 38mm diameter samples           | VH Hand shear vane test                           | MDD Maximum Dry Density                        |
| U1 Triaxial test on a 106mm dia sample at single cell pressure | VB Borehole shear vane test                       | CBR California Bearing Ratio test              |
| UM Triaxial test on a 106mm dia sample - Multistage test       | PSD Particle Size Distribution                    | SST Soil Swell Test - Filter paper method      |
| UCS Unconfined compression test on soil                        | ODC One-Dimensional Consolidation Test            | SG Specific Gravity (Particle Density)         |
| UCR Unconfined compression test on rock                        | OGC Organic Matter Content (BS 1377:Part 3: 1990) | MCT Multistage Consolidated Undrained Triaxial |
| * Sulphate test on 2:1 water-soil extract                      | OMC Optimum Moisture Content                      |  |

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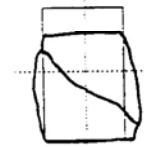
	SPECIMEN 1	SPECIMEN 2	SPECIMEN 3
Borehole	CY42	CY42	CY42
Sample	U12	U12	U12
Depth (m)	4.0	4.0	4.0

CONSOLIDATION : ISOTROPIC				
Cell pressure (kPa)		350	400	500
Back pressure (kPa)		300	300	300
Effective cell pressure (kPa)		50	100	200
Pore pressure on completion (kPa)		300	300	300
Pore pressure dissipation (%)		100	100	100
Moisture content (%)		73	72	71
Bulk density (Mg/m <sup>3</sup> )		1.58	1.61	1.63
Dry density (Mg/m <sup>3</sup> )		0.91	0.93	0.95
Voids ratio		1.846	1.783	1.723
Degree of saturation (%)		100	100	100
Cvi (m <sup>2</sup> /year)		120.00	29.86	4.74
Mvi (m <sup>2</sup> /MN)		0.18	0.15	0.19
Permeability (m/s)		6.85E-09	1.43E-09	2.81E-10

Mode of failure:



Specimen 1



Specimen 2



Specimen 3

Filename: 012\_104P.XLS

Approved by: MSD Date: 18-4-96

SUMMARY OF  
ISOTROPICALLY CONSOLIDATED UNDRAINED  
TRIAxIAL COMPRESSION TEST : SET OF THREE SPECIMENS



TESTING  
No. 0919



	SPECIMEN 1	SPECIMEN 2	SPECIMEN 3
Borehole	CY42	CY42	CY42
Sample	U12	U12A	U12
Depth (m)	4.0	4.0	4.0

SHEARING			
Initial pore pressure (kPa)	300	300	300
Initial effective cell pressure (kPa)	50	100	200
Rate of strain (%/hour)	1.20	1.20	1.20
<b>At peak deviator stress</b>			
Corrected deviator stress (kPa)	113	203	291
Membrane correction applied (kPa)	3	3	3
Drain correction applied (kPa)	10	10	10
Axial strain (%)	11.12	12.81	13.57
Volumetric strain (%)	21.00	41.00	116.00
Major principal effective stress (kPa)	142	262	375
Minor principal effective stress (kPa)	29	59	84
Principal effective stress ratio	4.88	4.43	4.46
e 50 (%)	1.15	1.08	0.53
Secant modulus at e 50 (kPa)	4905	9401	27500
<b>At peak principal effective stress ratio</b>			
Corrected deviator stress (kPa)	94	183	264
Membrane correction applied (kPa)	3	3	3
Drain correction applied (kPa)	10	10	10
Axial strain (%)	4.17	5.96	5.86
Volumetric strain (%)	30.00	53.00	127.00
Major principal effective stress (kPa)	114	230	337
Minor principal effective stress (kPa)	20	47	73
Principal effective stress ratio	5.72	4.90	4.62
e 50 (%)	0.82	0.91	0.38
Secant modulus at e 50 (kPa)	5771	10091	34812

Filename: 012\_104P.XLS

Date: 18-4-94

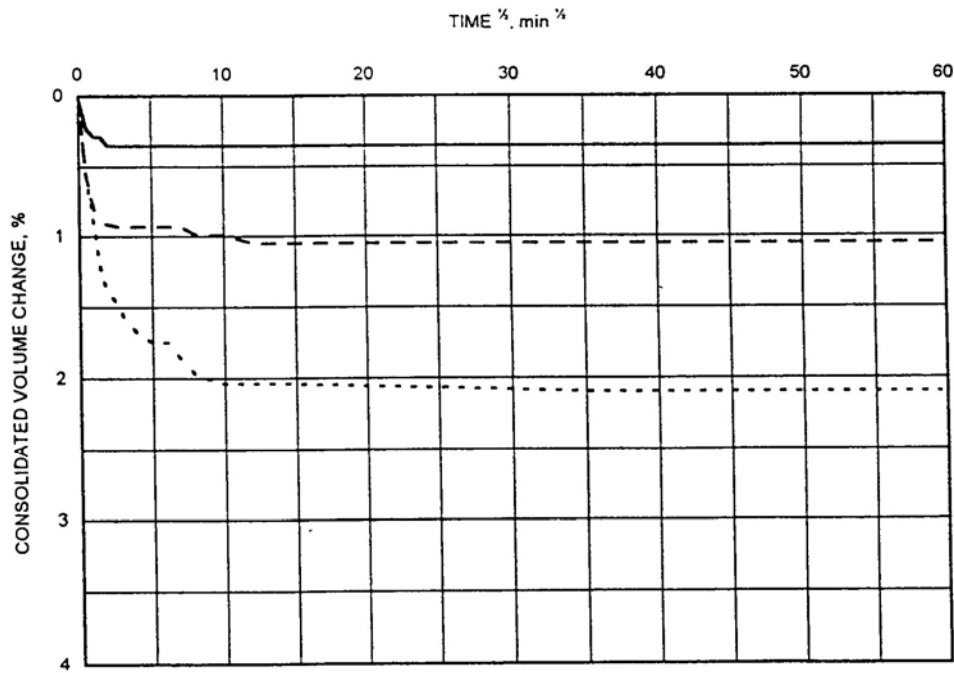
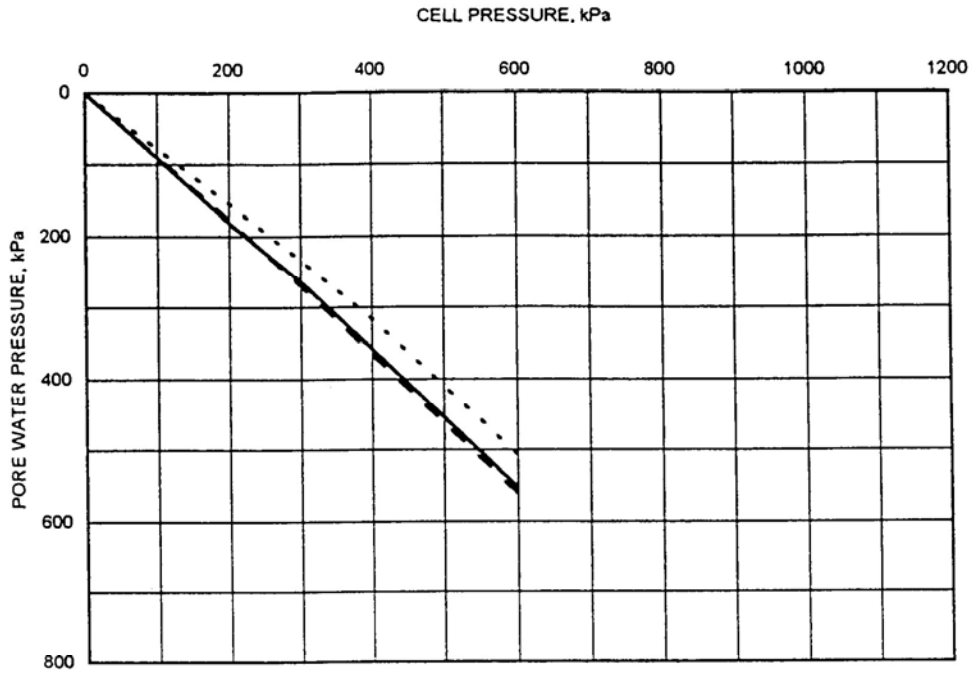
Approved by: MSD

FINAL CONDITIONS			
Moisture content (%)	73	72	71
Bulk density (Mg/m <sup>3</sup> )	1.58	1.61	1.63
Dry density (Mg/m <sup>3</sup> )	0.91	0.93	0.95

**SUMMARY OF  
ISOTROPICALLY CONSOLIDATED UNDRAINED  
TRIAXIAL COMPRESSION TEST : SET OF THREE SPECIMENS**



TESTING  
No. 0919



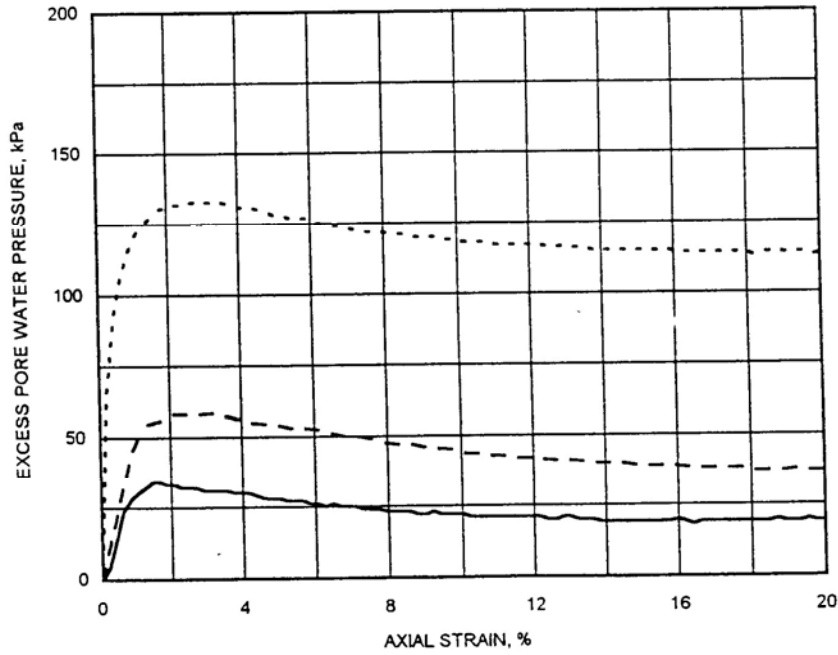
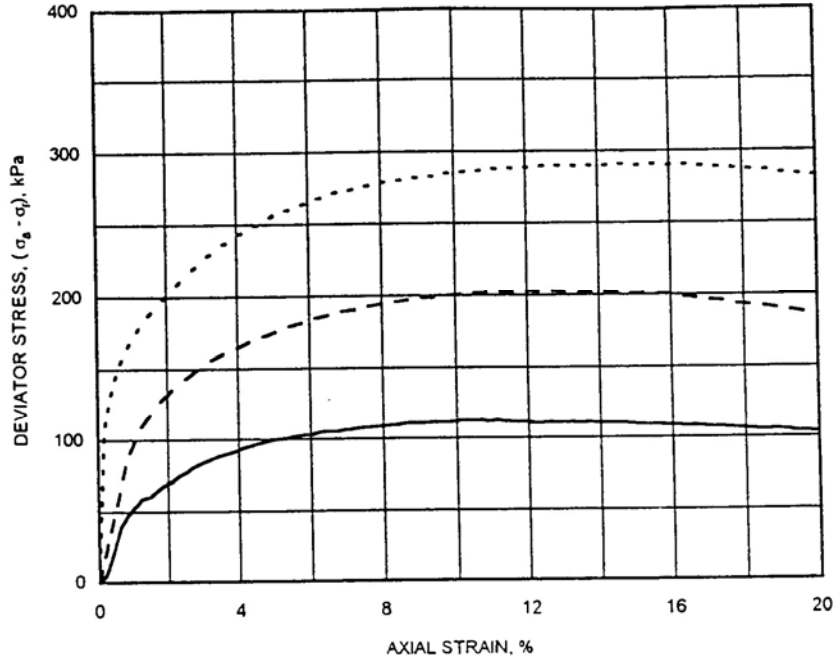
Specimen 1 —	$\sigma_r$ : 50kPa	$\sigma_a$ : 50kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0
Specimen 2 - -	$\sigma_r$ : 100kPa	$\sigma_a$ : 100kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0
Specimen 3 - . . .	$\sigma_r$ : 200kPa	$\sigma_a$ : 200kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0

ISOTROPICALLY CONSOLIDATED UNDRAINED  
TRIAxIAL COMPRESSION TEST : SET OF THREE SPECIMENS



TESTING  
No. 0919

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File name: 012\_104A.ORG  
Date: 18/11/06  
Approved by: MSD  
Checked by:



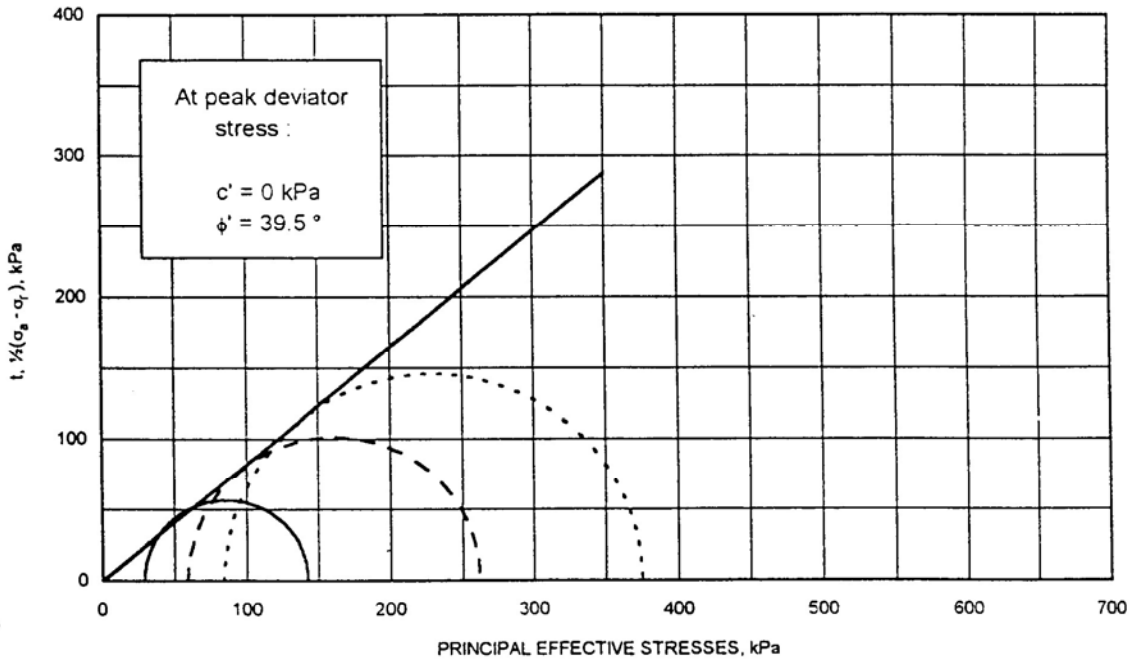
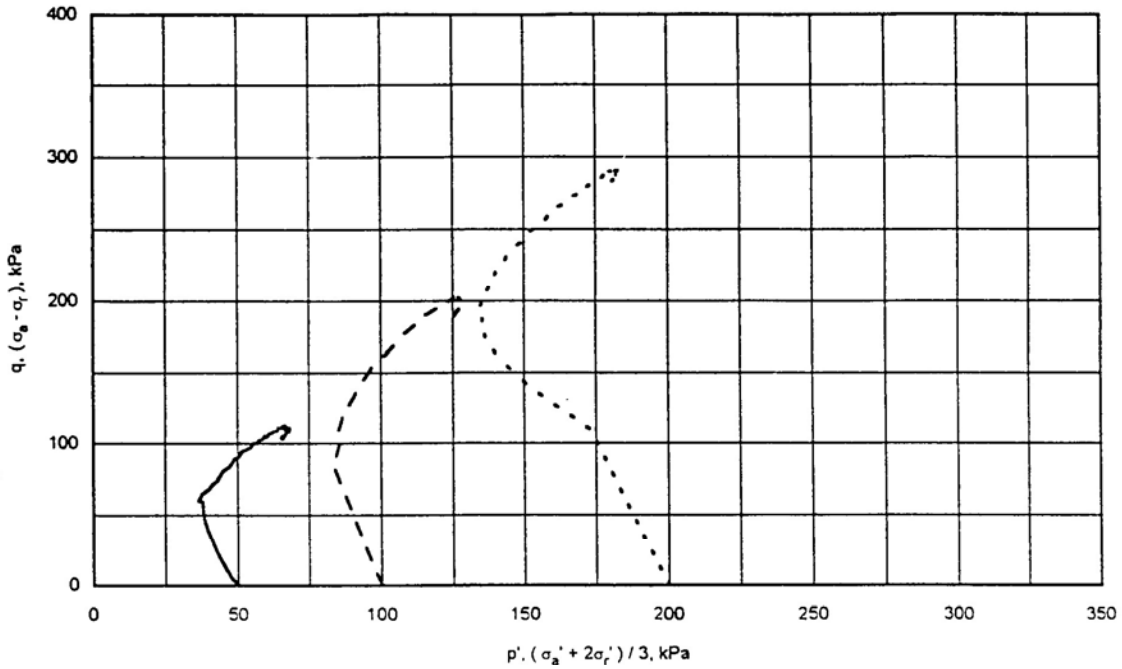
Specimen 1 —	$\sigma'_r$ : 50kPa	$\sigma'_a$ : 50kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0
Specimen 2 - -	$\sigma'_r$ : 100kPa	$\sigma'_a$ : 100kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0
Specimen 3 . . .	$\sigma'_r$ : 200kPa	$\sigma'_a$ : 200kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0

ISOTROPICALLY CONSOLIDATED UNDRAINED  
TRIAXIAL COMPRESSION TEST : SET OF THREE SPECIMENS



TESTING  
No. 0919

Date: 18/4/16  
 Date: 18-4-96  
 Checked by: DGC  
 Approved by: MSD  
 Template Issue  
 Filename: 012\_104B OKG



Specimen 1	—	$\sigma_r'$ : 50kPa	$\sigma_a'$ : 50kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0
Specimen 2	- -	$\sigma_r'$ : 100kPa	$\sigma_a'$ : 100kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0
Specimen 3	· · · ·	$\sigma_r'$ : 200kPa	$\sigma_a'$ : 200kPa	Borehole: CY42	Sample: U12	Depth (m): 4.0

ISOTROPICALLY CONSOLIDATED UNDRAINED  
TRIAXIAL COMPRESSION TEST : SET OF THREE SPECIMENS



TESTING  
No. 0919

Date: 18/4/96  
 Checked by: JKS  
 Approved by: MSD  
 Filename: 012\_104C.ORG  
 Date: 18/4/96

LABORATORY TEST RESULTS FOR

CY 43 (BH 24)

No.	w (%)	wl (%)	wp (%)	lp (%)	Bulk Density (Mgm <sup>-3</sup> )	STRENGTH				CHEMICAL			Soil Type	Remarks
						Type	Total Minor Principal Stress (kPa)	Principal Stress Difference (kPa)	Undrained Shear Strength (kPa)	ϕ (deg)	pH	Soil SO <sub>3</sub> (%)		
0.50	19												F	PI - not possible. -IS -due to gravel.
3.50													F	PSD - Separat: sheet
00													F	MCT - Separat: sheet
0.00													F	MCT - Separat: sheet
50													F	PSD - Separat: sheet
10.50	21	49	21	28									F	

Notes:

- USS Triaxial test set of three 38mm diameter samples
- U1 Triaxial test on a 106mm dia sample at single cell pressure
- UM Triaxial test on a 106mm dia sample - Multistage test
- UCS Unconfined compression test on soil
- UCR Unconfined compression test on rock
- \* Sulphate test on 2:1 water-soil extract

- VH Hand shear vane test
- VB Borehole shear vane test
- PSD Particle Size Distribution
- ODC One-Dimensional Consolidation Test
- OGC Organic Matter Content (BS 1377:Part 3: 1990)
- OMC Optimum Moisture Content

- MDD Maximum Dry Density
- CBR California Bearing Ratio test
- SST Soil Suction Test - Filter paper method
- SG Specific Gravity (Particle Density)
- MCT Multistage Consolidated Undrained Triaxial
- IS Insufficient Sample

Client

Commission for the New Towns / F.G.C.E.L.



Geotechnical & Materials Consultants Ltd.

Report

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