KRONOSPAN LTD

LOGYARD IMPROVEMENT KRONOSPAN, CHIRK, LL14 5NT

REPORT ON GROUND INVESTIGATION

Contract: 41793v2

Date: March 2016

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REPORT ON GROUND INVESTIGATION

carried out at

LOGYARD IMPROVEMENT KRONOSPAN,

CHIRK, LL14 5NT

Prepared for

KRONOSPAN LTD
Chirk
Wrexham
LL14 5NT

Contract No: 41793v

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Issue & Revision Record			
Contract Number:		**W15/41793**	
Contract Name:		**Logyard Improvements, Kronospan, Chirk**	
Client:		**Kronospan Ltd**	
Engineer:			
Report Title:		**Report on Ground Investigation.**	
Version	**Issue Date**	**Report / revision details**	**Distribution**
V1	22/12/2015	Draft report on ground investigation.	PDF copy to Kronospan Ltd
V2	02/03/2015	Final report on ground investigation	PDF copy to Kronospan Ltd

EXECUTIVE SUMMARY

It is understood that the proposed development comprises improvements to the existing log yard with the construction of new silos, chipper and fibre recycler at the existing Kronospan site at Chirk.

Geological records indicate the western part of the site to be underlain by Glaciofluvial deposits of sand and gravel and the eastern part to be underlain by Glacial Till. Bedrock comprises sandstone, siltstone and mudstone of the Bettisfield Formation, part of the Pennine Lower Coal Measures.

Site work comprised five cable percussion boreholes to depths about 25m.

The sequence encountered generally comprises of made ground overlaying superficial deposits comprising clay with horizons of coarse soils.

The investigation has identified granular made ground to depths of about 0.90m to 1.50m.

An upper mottled clay was encountered to depths in the range of 8.90m to 12.60m.

Sand and gravel horizons were encountered across much of the site separating the upper clay from a lower very stiff slightly gravelly clay.

Depending on structural loads the use of spread foundations may be viable in the vicinity of the proposed recycled fibre equipment and chipper in the vicinity of BH02 to BH03 and BH04 respectively. The viability of spread foundations for structural loads in these areas should be reviewed when design details become available.

The use of shallow spread foundations for the proposed silos will result in significant settlements due to the compressibility of the upper clay. On this basis shallow foundations may not be suitable to support these structures. Piled foundations are considered suitable to transfer structural loads to competent strata at depth to support the silos.

A Design Sulphate Class for the site may be taken as DS-1. AC-1 would be appropriate.

One value of total organic carbon (3.1%, BH02A at 1.00m) is above the limit values for inert waste. The remaining total organic carbon values are below inert Waste Landfill, stable non-reactive and hazardous waste landfill guidelines. The majority of the test results indicate that the material may be classified as inert waste however the results should be forwarded to the receiving landfill for final classification.

CONTENTS

1.0 INTRODUCTION

1.1 It is understood that the proposed development comprises the improvement to the existing log yard with the construction of a new silo, chipper and fibre recycler at Kronospan, Chirk.

1.2 On the instructions of Kronospan Ltd, a ground investigation was undertaken to determine ground conditions for the new facilities.

1.3 It is recommended that a copy of this report be submitted to the relevant authorities to enable them to carry out their own site assessments and provide any comments.

1.4 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.5 The comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.6 The comments on groundwater conditions are based on observations made at the time the site work was carried out. It should be noted that groundwater levels vary owing to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location

2.1.1 The site is situated at Kronospan Ltd, approximately 1 km to the northwest of the town centre of Chirk and may be located by Grid Reference SJ 285 386.

2.1.2 A site location plan is included in Appendix 1, Figure A1.1.

2.2 Site Description

2.1.1 The area of investigation is located on the northwest part of the existing Kronospan manufacturing site, west of the existing Saw Mill and Formalin Plant. The main site measures 100m by 300m and is roughly rectangular in shape.

2.1.2 The site comprised a sensibly level hardstanding area, occupied by a wood shredder along with a bark shredder and de-barker.

2.1.3 The site was bound to the north by a railway siding, to the west by stockpiles of wood chippings, to the east by a sawmill and Formalin Plant and to the south by a temporary portable office unit.

2.2 Geological Setting

2.2.1 Details of the geology underlying the site have been obtained from the British Geological Survey map, Sheet No. 121, 'Wrexham', solid and drift edition, 1:50,000 scale, published 1994.

2.2.2 The geological map indicates the site to be underlain by varying superficial deposits. The western part of the site is underlain by Glaciofluvial deposits of sand and gravel. The eastern part is underlain by Glacial Till.

2.2.3 The superficial deposits are underlain by bedrock of sandstone, siltstone and mudstone of the Bettisfield Formation, part of the Pennine Lower Coal Measures.

2.2.4 The site is within an urban area and, although not indicated as present on the site from the geological maps, the possibility that Made Ground exists on site cannot be discounted.

3.0 SITE WORK

3.1 The site work was carried out between 19th and 24th October 2015 and during a second visit on 3rd and 4th November 2015. The locations of exploratory holes were determined by the Engineer and the site work carried out on the basis of the practices set out in BS 10175:2011, ref. 8.2, BS 5930:2015 ref. 8.3 and ISO 1997:2007, ref 8.4.

3.2 Five boreholes, designated BH01 to BH05 with BH02A, were sunk by light cable percussion method at the positions shown on the site plan, Appendix 1, Figure A1.2. The depths of boreholes, descriptions of strata encountered and comments on groundwater conditions are given in the borehole records, Appendix 2.

3.3 Representative disturbed and undisturbed samples were taken at the depths shown on the borehole records and despatched to the laboratory. Standard penetration tests, ref. 8.4 were carried out in the boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are given in the borehole records.

3.4 Samples were collected for environmental purposes in amber glass jars and kept in a cool box.

3.5 Perforated standpipes, surrounded by pea shingle and protected by a stopcock cover were installed in boreholes BH01, BH02A and BH05, as detailed in the borehole records.

3.6 The ground levels at the borehole locations were not determined.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 All soil samples were prepared in accordance with BS1377: Part One: 1990 ref. 8.9 and representative sub-samples were taken for testing. The following tests were carried out:

- 17 No. Moisture contents
- 9 No. Plasticity indices
- 5 No. Particle size distribution by wet sieving
- 6 No Undrained shear strength
- 2 No. Oedometer consolidation
- 11 No. Water soluble sulphate
- 11 No pH value

4.1.2 The results of the testing are given in Appendix 3, Test Reports 41793/1 and 15-52258.

4.2 Waste Acceptance Criteria Testing

4.2.1 Waste Acceptance Criteria Suite (WAC) analysis was carried out on four samples of soil.

4.2.2 The results of these tests are shown in Appendix 4, Test Report 524697-1.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Sequence

5.1.1 The sequence encountered generally comprises made ground overlying superficial deposits comprising mottled clay and gravel and brown clay.

5.1.2 The general sequence of strata is shown on the nominal section; Figure A1.3.

5.2 Made Ground

5.2.1 Made ground was encountered at all locations to depths between 0.90m and 1.50m.

5.2.2 Concrete was encountered at surface in all exploratory holes with thicknesses in the range 0.30m to 0.40m.

5.2.3 Made ground of coarse soils was encountered beneath concrete. This material comprised sand and gravel. The material was described as grey, brown mottled sandy gravel and or grey brown mottled clayey gravelly sand. Anthropogenic fragments included limestone, brick, concrete and sandstone were noted.

5.2.4 Made ground of sand was encountered in BH02, BH04 and BH05. The thickness of sand varied from 0.70m to 1.10m.

5.2.5 Made ground of gravel was encountered in BH01, BH02A and BH03 with thicknesses in the range 0.50m to 1.20m.

5.2.6 The greatest thickness of made ground (1.40m and 1.50m) was encountered in BH02 and BH02A on the western part of the site.

5.2.7 BH02 was terminated on an obstruction at a depth of 1.40m.

5.2.8 Laboratory analysis of made ground has indicated a pH of 8.9 and a soluble SO_4 content of 180mg/l.

5.2.9 One SPT of greater than 50 blows for 50 mm penetration was recorded at 1.20m within BH02. This value reflects the obstruction at the base of this borehole.

5.2.10 The base of the made ground was proved at all locations apart from BH02 at depths in the range of 0.90m to 1.50m.

5.3 Superficial Deposits

5.3.1 Superficial deposits were encountered directly beneath the made ground apart from BH02 at depths in the range of 0.90m to 1.50m.

5.3.2 The superficial deposits generally comprised clay with horizons of coarse soils. The clay may be broadly sub-divided into upper soft and firm mottled clay and lower stiff and very stiff brown clay.

Upper Clay

5.3.3 Mottled clay was encountered at all locations apart from BH02, at depths between 1.00m to 2.40m.

5.3.4 The material generally comprised orange, brown mottled grey, sandy, silty clay. Consistencies were generally recorded as very soft and soft, with localised firm horizons.

5.3.5 BH03, BH04 and BH05 (located to north, east and southeast of the debarker) encountered firm locally stiff clay between 1.30m to 4.50m, 1.00m to 6.00m and 1.00m to 3.60m respectively.

5.3.6 The table below summarises in-situ and laboratory tests these strata.

Parameter	Number	Max	Min	Mean
NMC%	12	34	21	26
PL%	4	26	22	24
LL%	4	44	33	38
PI	4	18	11	14
SPT 'N'	30*	30	3	8
pH	7	9.4	7.6	8.1
SO_4 mg/l	7	170	16	88

* excluding greater than 50 blows

5.3.7 On the basis of Atterberg limit results the material classifies as low plasticity clay (one sample), low and intermediate plasticity clay (one sample) and intermediate plasticity clay (two samples).

5.3.8 Logging of the clay determined consistencies of very soft, soft and firm locally stiff.

5.3.9 Six triaxial tests recorded undrained shear strengths between 24 and 131 kN/m^2.

5.3.10 These values indicate a range of consistencies from soft through firm to stiff.

5.3.11 SPT 'N' values are plotted against depth in Figure A1.4.

5.3.12 Thirty one SPTs values in the range 3 to greater than 50 blows were recorded.

5.3.13 One SPT 'N' value recorded greater 50 blows for 235mm, this value was encountered at the 10.10m within BH04, and may represent the boundary between the mottled clay with the underlying very stiff clay.

5.3.14 SPT 'N' values may be used to provide an approximation of Cu values in clay (see Appendix A1.4).

5.3.15 The Cu values in the range of 18kN/m^2 to 180kN/m^2 may be derived from SPT 'N' values where full penetration was achieved. These have been based on an f_1 value about 6.

5.3.16 Two consolidation tests for the site have recorded coefficients of compressibility, m_v, of 0.30 to 0.45m^2/MN at the pressure stages rising from overburden. These values generally indicate high compressibility.

5.3.17 The consistencies of the clay determined by logging, laboratory measurement and derivation from in-situ tests are in general accordance.

5.3.18 The base of the mottled clay was proven at all locations, apart from BH02, at depths in the range of 8.90m to 12.60m.

Coarse Soils

5.3.19 Coarse soils were encountered in all boreholes, apart from BH02 and BH02A, at depths in the range of 0.90m and 12.60m.

5.3.20 Coarse soils generally comprised of gravel with localised sand horizons.

5.3.21 BH01 encountered sand between 0.90m to 2.40m and 4.70m to 5.00m. The sand comprised brown, clayey and gravelly.

5.3.22 Gravel was encountered at all locations apart from BH02 and BH02A at depths in the range of 8.90m to 12.60m. The material comprised brown, sandy, clayey and fine to coarse gravel with low cobble content.

5.3.23 The table below summarises in-situ and laboratory tests in the coarse soils:

Parameter	Number	Max	Min	Mean
SPT 'N'	4*	37	15	26
pH	2	8.4	8.2	8.3
SO_4 mg/l	2	120	46	83

* excluding greater than 50 blows

5.3.24 Particle size distribution tests (4 no.) indicate fine to coarse gravel. Secondary sand contents in the range of 8 to 27%. A fine constituent (silt and clay) in the range of 2 to 32% was recorded.

5.3.25 Thirteen SPT 'N' values recorded within granular deposits in the range 15 to greater than 50 blows, indicating a range of relative densities from medium dense, through dense to very dense.

5.3.26 Nine SPT 'N' values recorded greater 50 blows with penetration in the range of 20mm to 225mm, this value indicate relative densities of very dense.

5.3.27 The remaining four SPT values in the range of 15 to 37, indicate relative densities of medium dense and dense.

5.3.28 Dense and very dense strata were noted below 9.00m.

5.3.29 The base of the coarse soils was proven in BH01, BH03, BH04 and BH05 at depth in the range of 11.80m to 22.40m.

Lower Clay

5.3.30 Stiff and very stiff brown clay was encountered at all locations, except BH02, at depths in the range 9.60m to 12.40m.

5.3.31 These strata comprised of brown, slightly gravelly, slightly sandy clay with low cobble content.

5.3.32 Field logging indicates consistencies of stiff and very stiff.

5.3.33 The table below summarises in-situ and laboratory tests in this lower clay.

Parameter	Number	Max	Min	Mean
NMC%	5	19	10	15
PL%	5	17	12	14
LL%	5	38	25	30
PI	5	21	12	16
SPT 'N'	34	50	39	49
pH	4	8.9	8.3	8.5
SO_4 mg/l	4	54	15	29

5.3.34 On the basis of Atterberg limit results the material classifies as low plasticity clay (four samples) and intermediate plasticity clay (one sample).

5.3.35 SPT 'N' values are plotted against depth in Figure A1.4.

5.3.36 Thirty four SPT 'N' values recorded within lower brown clay in the range 39 to greater than 50 blows.

5.3.37 Thirty SPT 'N' values recorded of greater than 50 blows with penetration in the range of 85mm to 300mm.

5.3.38 The remaining four SPT values recorded values in range of 39 to 48.

5.3.39 Where full penetration was not obtained after 50 blows extrapolation of the test to 300mm penetration derives 'N' values from 51 to 176.

5.3.40 SPT 'N' values may be used to provide an approximation of Cu values in clay (see Appendix A1.4).

5.3.41 The Cu values in the range of 195kN/m^2 to 250kN/m^2 may be derived from SPT 'N' values where full penetration was achieved. These have been based on an f_1 value about 5.

5.3.42 The consistencies of the clay determined by logging and derivation from in-situ tests are in general accordance.

5.3.43 BH01, BH02A, BH03, BH04 and BH05 were terminated within the lower clay at depths in range 19.64m to 25.15m.

5.4 Groundwater

5.4.1 Groundwater was encountered in BH01 at a depth of 4.70m and rose to 4.00m after 20minutes. The strike was recorded at a clay over sand boundary.

5.4.2 Groundwater was encountered in BH05 at a depth of 12.60m and rose to 10.62m after 20minutes. The strike was recorded at a clay over gravel boundary.

5.4.3 Groundwater was not noted in the remaining boreholes during site work.

6.0 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS IN RELATION TO THE PROPOSED DEVELOPMENT

6.1 Proposed Development

6.1.1 It is understood that the proposed development is to consist of redevelopment of the log yard with the construction a new Silo, new recycled fibre equipment and a clipper.

6.1.2 The proposed layout is indicated on Figure A1.5A to C.

6.1.3 The proposed developments generally relate to the exploratory hole positions as follows:

- New Silo: BH01 (drawing Part 7000/455-B, Drawing 7C201106520020-B)
- New recycled fibre equipment: BH02 and BH03 (drawing 01011236_010 07092015)
- Chipper: BH04

6.1.4 New silos in the vicinity of BH01 are indicated to be between 25 and 32m in height. Details of a similar installation with comparable loads have indicated silos with diameter about 25m, loads across the base about 86kN/m^2 and perimeter loads in the order of 65kN/m^2.

6.1.5 As indicated by client, there will be a little machinery load associated with the proposed development in the vicinity of BH02 and BH03.

6.1.6 No loads are currently available for the proposed new chipper in the vicinity of BH04.

6.1.7 No proposed structures have been identified in the vicinity of BH05.

6.1.8 The ground conditions encountered are similar in the areas of the proposed structures and therefore assessment of the soil types below has therefore used all site data.

6.1.9 The comments and recommendations below do not fall within the requirements of EC7 (refs. 8.4) and should be reviewed as design details become available.

6.2 Foundations

6.2.1 The investigation has identified granular made ground generally to depths about 1.50m across the site.

6.2.2 The deepest made ground was encountered to a depth of 1.50m in BH02A.

Recycled fibre equipment/chipper

6.2.3 Depending on structural loads the use of spread foundations may be viable in the vicinity of the proposed recycled fibre equipment and chipper in the vicinity of BH02 to BH03 and BH04 respectively.

6.2.4 Spread footings should be taken through any Made Ground and placed in the underlying natural competent strata at a minimum depth of 0.75m based on clay of low volume change potential. However due to the depth of made ground within the proposed locations foundation may be locally need to be extended to depths up to 1.50m.

6.2.5 Square pad foundations with dimensions of 2m by 2m at nominal depth about 1m may be designed to an allowable bearing capacity about 100kN/m^2. Square pad with dimensions of 3m by 3m at nominal depths about 1m may be designed to an allowable bearing capacity about 50kN/m^2.

6.2.6 The allowable bearing capacity indicated above would provide an adequate factor of safety against shear failure and limit total settlements to the order of 25mm.

6.2.7 The viability of spread foundations for structural loads in these areas should be reviewed when design details become available.

Silo construction

6.2.8 The use of shallow spread foundations for the proposed silos will result in significant settlements due to the compressibility of the upper clay. On this basis shallow foundations may not be suitable to support these structures.

6.2.9 Piled foundations are considered suitable to transfer structural loads to competent strata at depth to support the silos. Guidelines for the design of piles are given in Appendix 5.

6.2.10 The carrying capacity of piles depends not only on their size and the ground conditions but also on their method of installation. Pile design and installation are continuously evolving processes and state-of-the-art methods are often employed before they reach the public domain, perhaps several years down the line. It is recommended that specialist Piling Contractors be contacted as to the suitability and carrying capacity of their piles in the ground conditions pertaining to the site.

6.2.11 The design of piled foundations may require additional ground investigation to greater depths.

6.3 Excavations

6.3.1 On the basis of observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to less than 1.00m should stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those in excess of 1.20m deep, in accordance with Health and Safety Regulations.

6.3.2 Groundwater should not be expected in shallow excavations for foundations or services. However, it is possible that perched groundwater could be present overlying clay. It is considered that this could be dealt with by pumping.

6.4 Chemical Attack on Buried Concrete

6.4.1 The site has been classified in accordance with BRE Special Digest 1, ref. 8.19, as brownfield without the presence of pyrite and laboratory testing undertaken accordingly. It is recommended that the guidelines given in BRE Special Digest 1, ref. 8.19, be adopted.

6.4.2 It is recommended that the groundwater should be regarded as mobile.

6.4.3 The result of chemical testing indicate sulphate concentrations in the made ground of 16 and 180mg/l as 2:1 water/soil extract, with pH values in the range of 7.6 and 9.4.

6.4.4 On the basis of the laboratory test results it is considered that a Design Sulphate Class for the site may be taken as DS-1. The site conditions would suggest that an ACEC class for the site of AC-1 would be appropriate.

6.5 Waste

6.5.1 An initial assessment of the likely waste classification for any material to be disposed of has been conducted on the basis of the Waste Acceptance Criteria analysis carried out.

6.5.2 One value of total organic carbon (3.1%, BH02A at 1.00m) is above the limit values for inert waste. The remaining total organic carbon values are below inert Waste Landfill, stable non-reactive and hazardous waste landfill guidelines.

6.5.3 The majority of the test results indicate that the material may be classified as inert waste however the results should be forwarded to the receiving landfill for final classification.

8.0 REFERENCES

8.1 CLR 4, 'Sampling strategies for contaminated land'. Report by The Centre for Research into the Built Environment, the Nottingham Trent University, DoE, 1994.

8.2 British Standards Institute: BS 10175 'Code of practice for the investigation of potentially contaminated sites', BSI 2011.

8.3 BS 5930:1999+A2:2010 '*Code of practice for site investigations*', British Standards Institute, 2010.

8.4 ISO 1997, Part 2:2007, 'Eurocode 7 – Geotechnical Design – Part 2, Ground Investigation and Design'

8.5 ISO 22476 – 3:2005, 'Geotechnical Investigation and Testing – Field Testing' Part 3, Standard Penetration Test.

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8.8 ISO 14688 Part 1:2002 and Part 2:2004, 'Geotechnical Investigation and Testing – Identification and Classification of Soil'.

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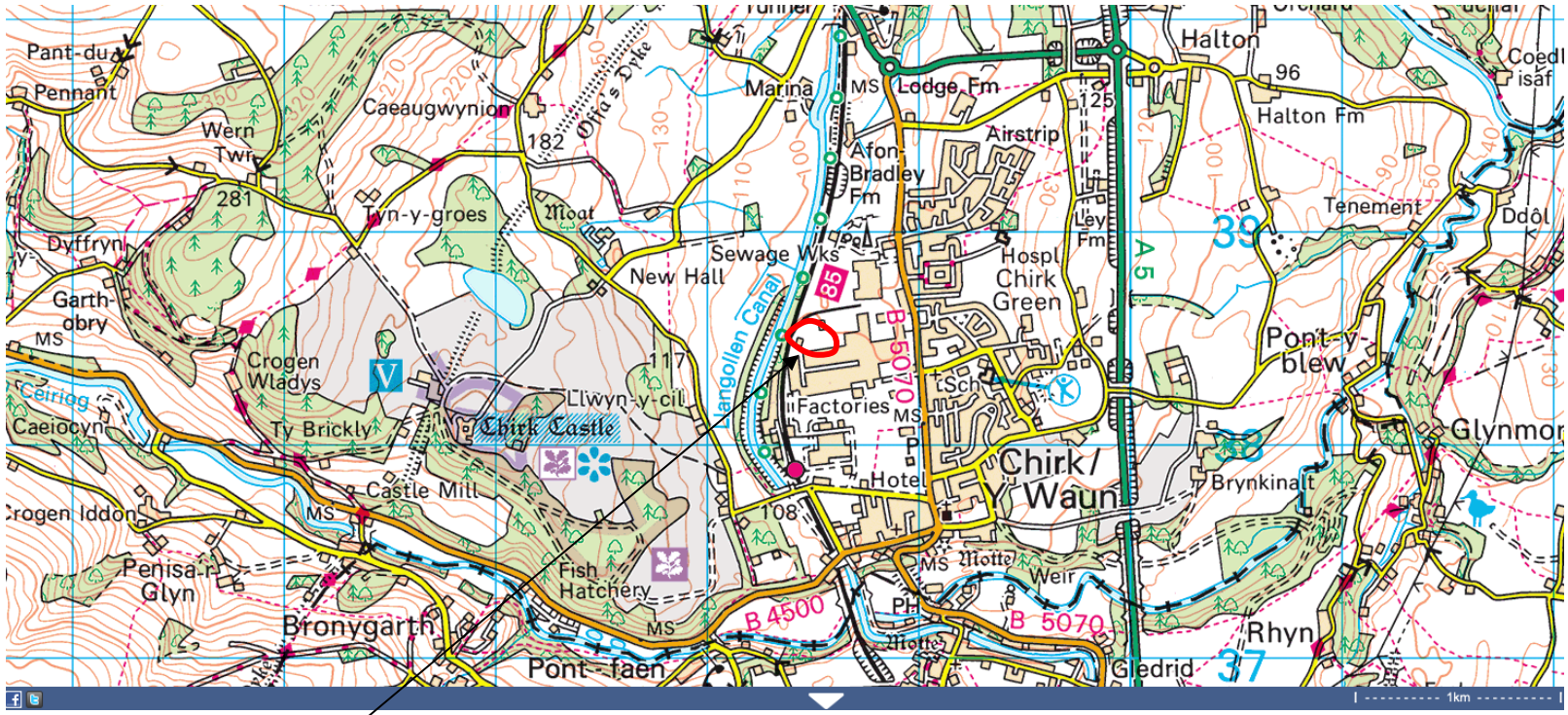
APPENDIX 1

DRAWINGS

Figure A1.1

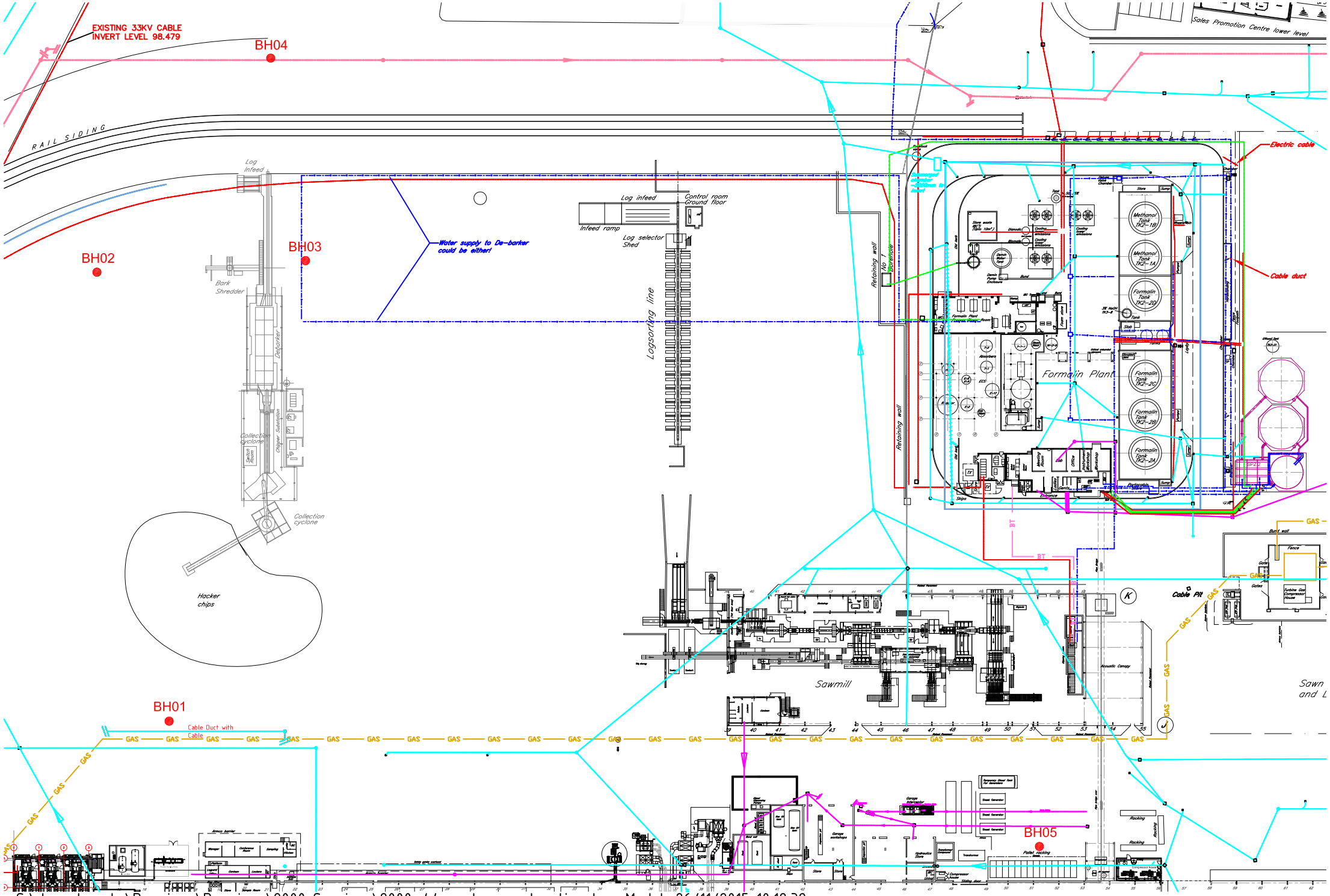
N



Site

PROJECT: 41793 Kronospan, Chirk
FIGURE No. A1.1 **SCALE: As Indicated**
TITLE: Site Location Plan
IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists

Figure A1.2



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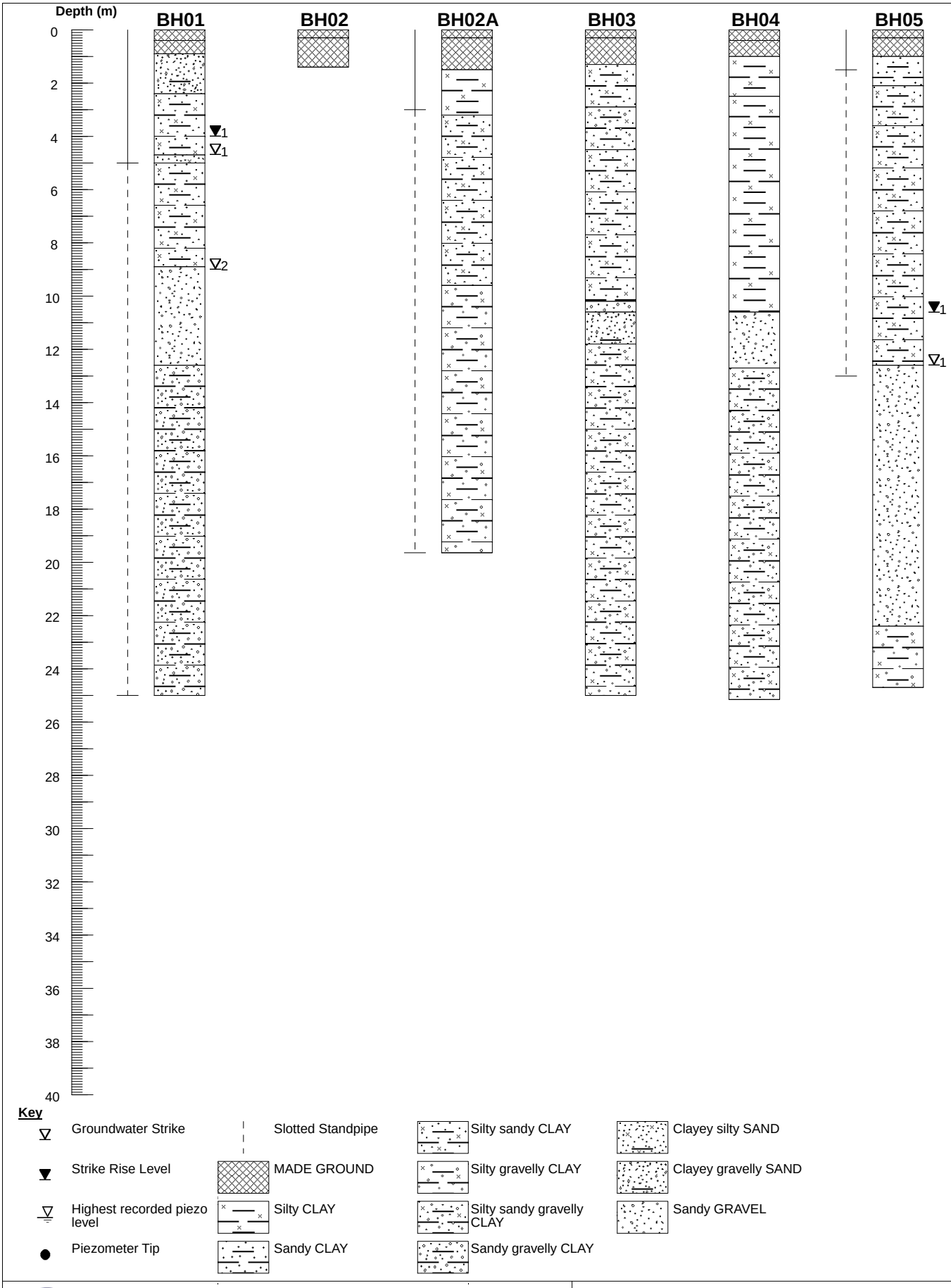


IAN FARMER ASSOCIATES

Nominal Section

Site	Date Drawn	Date Checked	Sheet	Job Number
Kronospan Log Yard Improvements	22/12/2015		1/1	41793
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
Kronospan Limited			1:200[V]	Figure A1.3

Figure A1.4

Figure A1.4 Kronospan
SPT 'N' value versus depth

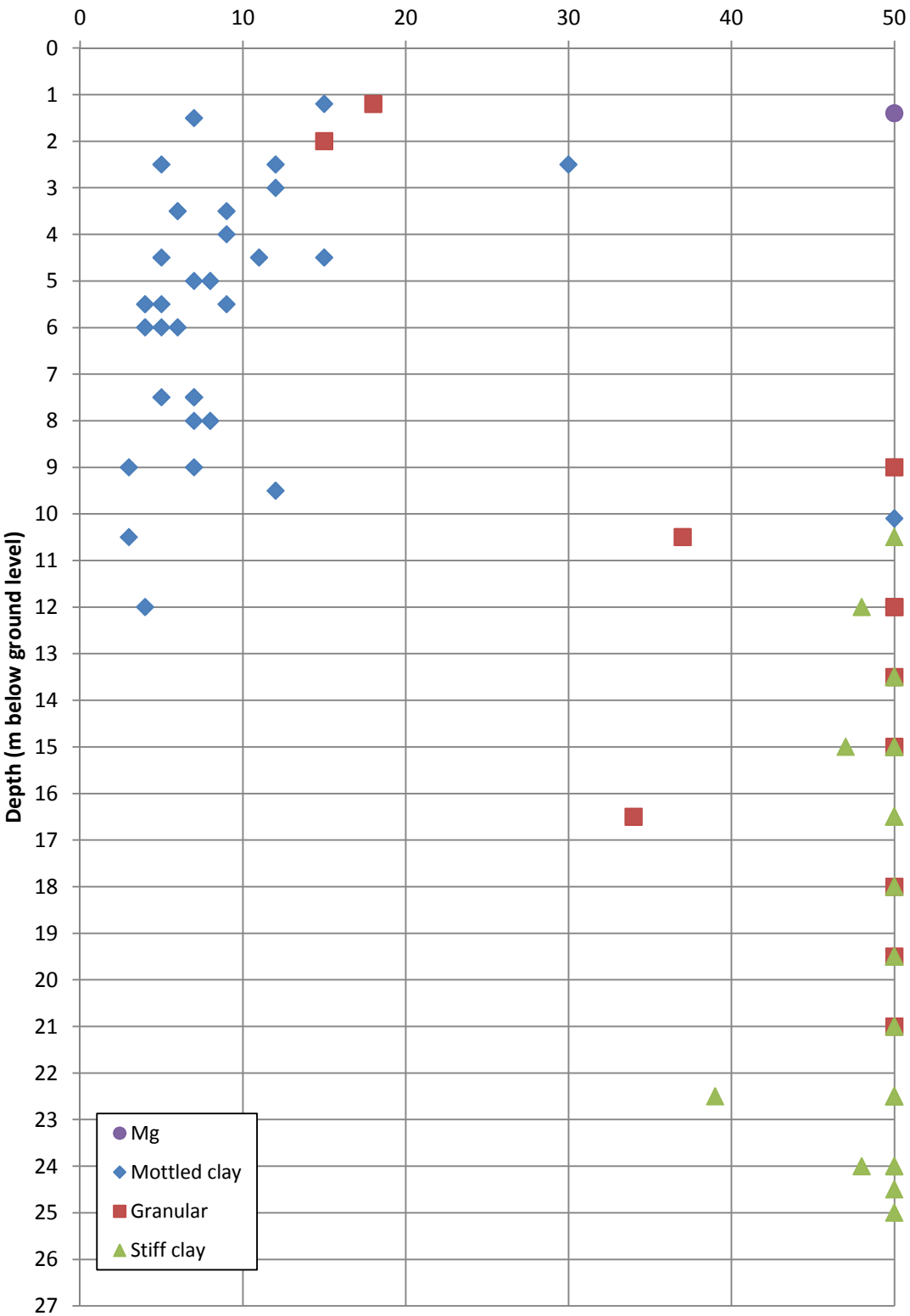
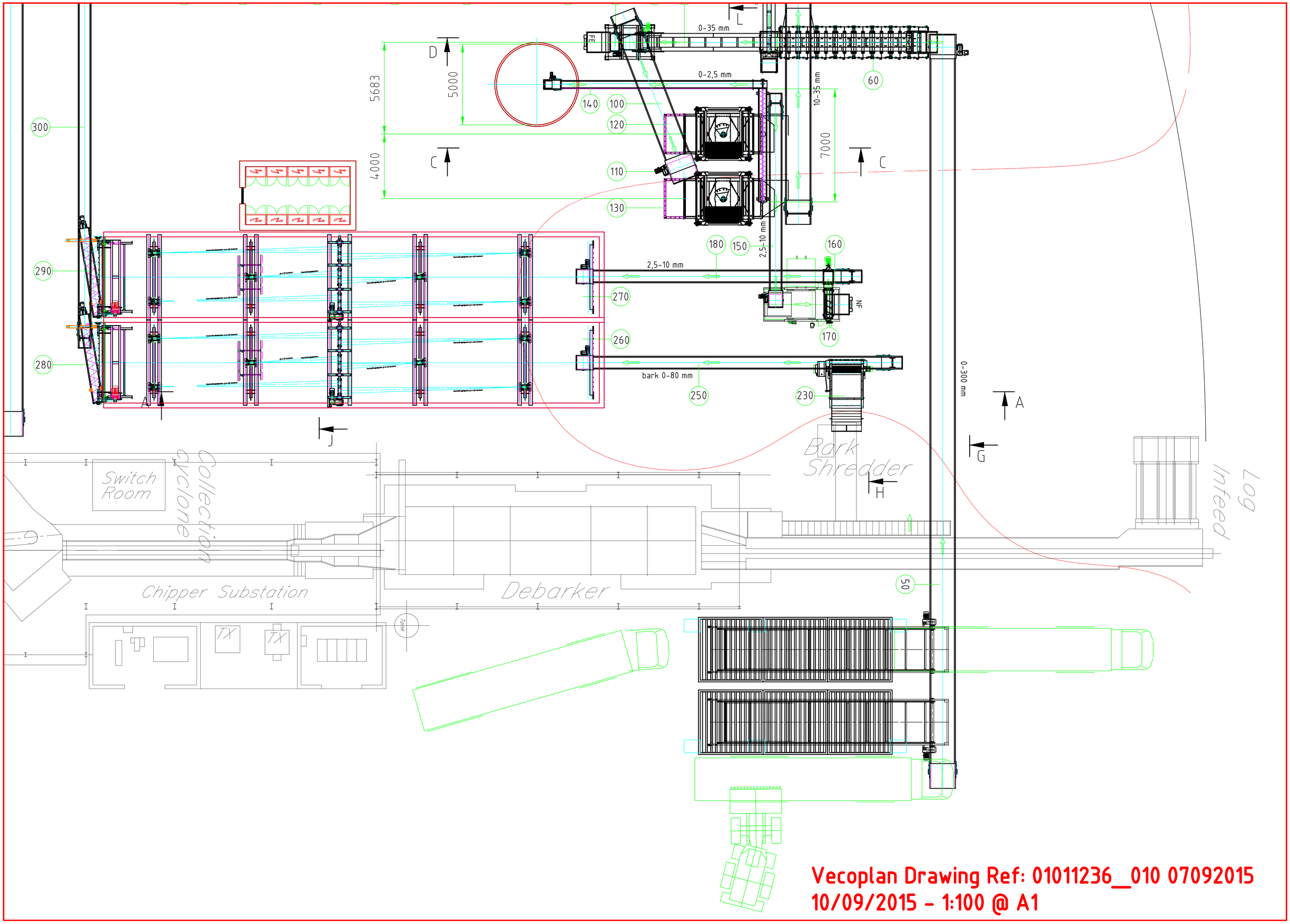


Figure A1.5



Vecoplan Drawing Ref: 01011236_010 07092015
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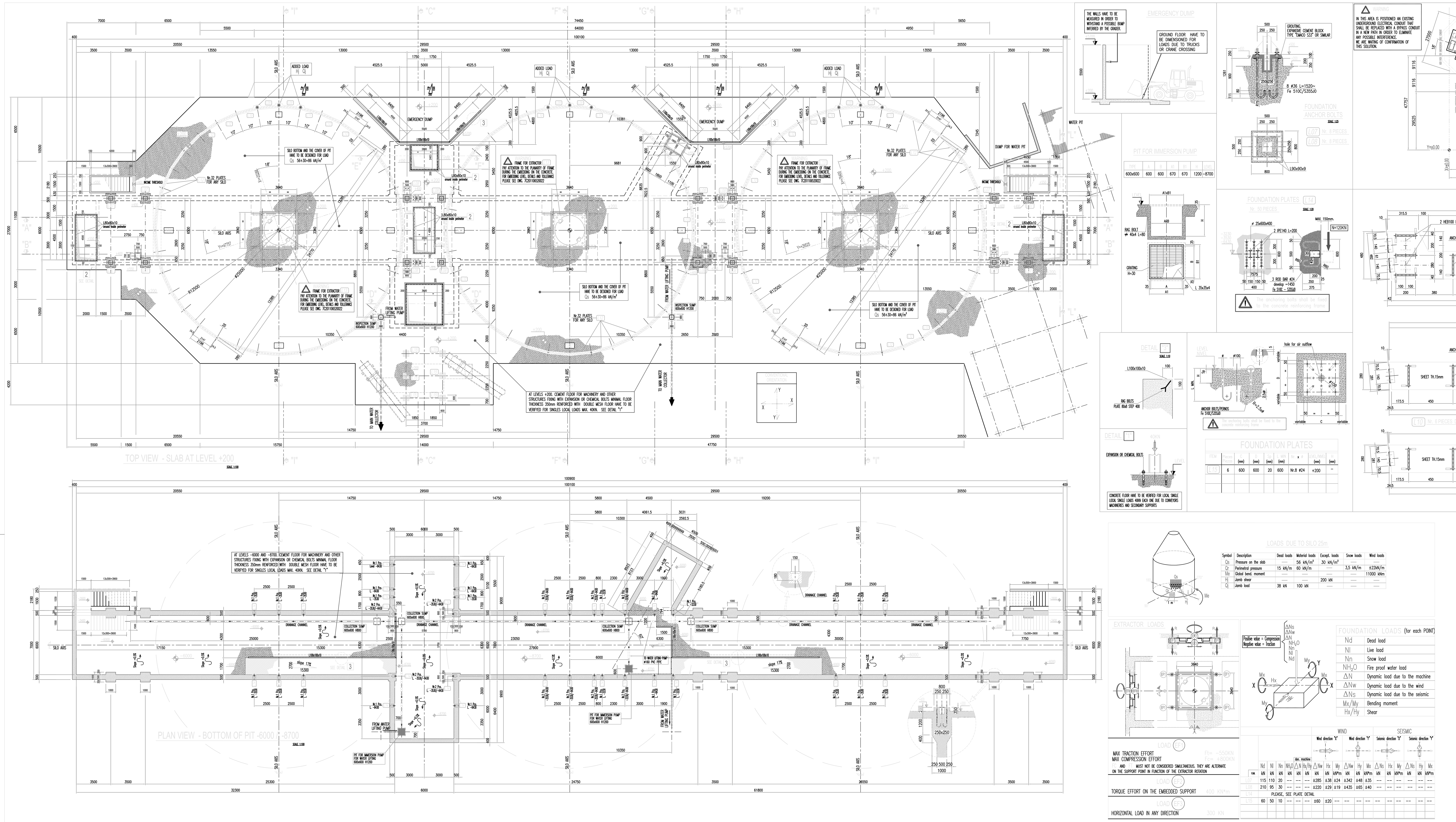


WARNING

ALL THE PROFILES,SHEET AND THE RAG BOLTS THAT YOU FIND ON THIS DRAWING ARE CUSTOMER SUPPLY.

FOUNDATIONS SIZING, QUANTITY OF REINFORCING BARS ETC. SHALL BE CALCULATED BY YOUR CIVIL ENGINEER ACCORDING TO THE "PAL" FOUNDATION DRAWINGS BY KEEPING TO THE OVERALL DIMENSIONS OF WALLS, PITS AND PLATES TO BE EMBEDDED IN CONCRETE AS WELL AS TO THE LOADS INDICATED ON THE DIFFERENT ITEMS.

THIS DRAWING IS ONLY A MECHANICAL DRAWING AND IT IS NOT POSSIBLE TO USE IT A CIVIL FOUNDATION PROJECT DRAWING. THE CIVIL RESPONSIBLE FOR FOUNDATIONS(CONTRACTOR) SHOULD PREPARE A NEW DRAWING WITH ALL THE NECESSARIES DETAILS FOR A CORRECT DIMENSIONING OF THE REINFORCED CONCRETE.

PAL DISCLAIMS ALL RESPONSIBILITY FOR A MISSING STRUCTURAL VERIFICATION OF THE FOUNDATIONS BY THE CUSTOMER.

GENERAL NOTES

CUSTOMER SUPPLY : ALL FOUNDATION PLATES AND ANCHORING BOLTS IN THIS DRAWING

ALL DIMENSIONS IN THIS DRAWING ARE IN MILLIMETERS

ACCORDING TO: CNR-UNI 10011

MATERIALS: (IF NOT OTHERWISE SHOWN)

UNI 7070-82	EN 10025	DIN 17100	ASTM	BS
Fe 430 B	S 275 JR	St 44-2	A 283 Gr.D	Gr. 43 A

FOUNDATIONS SIZING, QUANTITY OF REFORCING BARS ETC. ARE TO BE CALCULATE BY YOUR CIVIL ENGINEER ACCORDING TO THE "PAL" FOUNDATION DRAWINGS BY KEEPING TO THE OVERALL DIMENSIONS OF WALLS, PITS AND PLATES TO BE EMBEDDED IN CONCRETE AS WELL AS TO THE LOADS INDICATED ON THE DIFFERENT ITEMS.
LOADS HAVE BEEN CALCULATED ACCORDING TO FOLLOWING MAIN AMBIENT CONDITIONS:

- EARTHQUAKES:......... NOT CONSIDERED
- WIND PRESSURE:..... according to legislation BS 6399-2 reference speed = 23m/s
- SNOW LOAD:........... according to legislation BS 6399-3 reference load = 1kN/m²

PAL DISCLAIMS ALL RESPONSIBILITY FOR A MISSING STRUCTURAL VERIFICATION OF THE FOUNDATIONS BY THE CUSTOMER.

WELDINGS: WHERE NOT INDICATED, THE WELDINGS SHALL BE DONE CONTINUOUSLY AND: SP = 0,5xS2 H = 0,7xS2 S1 ⩾ S2

ALL WELDINGS MUST BE AT THROUGH PENETRATION, CONTINUOUS, WITHOUT SLASHES, UNIFORMS.

DRAWING LIST

FOR SECTIONS	SEE DWG. N° 7C201106520021
FRAME FOR ESTRACTOR	SEE DWG. N° 7C201106520022
COVER SYSTEM FOR HOLES IN THE PIT ROOF	SEE DWG. N° 7C201106520023

Rev.	Date	Designed	Checked	Approved	Description
B	20-01-2012	ABI	PUNTO DWG	MF	UPDATED WHERE "B" INDICATED
A	17-12-2011	PUNTODWG	MF	GN	ISSUE

PAL

DRAWING no. 7C201106520020 - REV. B

P A L s.r.l. 31047 Ponte di Piave (TV) - ITALY - Phone +.0422.852 300 - FAX +.0422.853 444 - E-mail info@pal.it - Web www.pal.it

FINAL
FOR YOUR ENGINEERING

SCALES 1:100

CUSTOMER : SONAE UK LTD | ORDER :
PAL KEY : 2011-065 | PASSWORD : SIUK-PHOENIX

TITLE
NEW RECYCLING CLEANING SYSTEM
FOUNDATIONS AREA "3"-SILO DN25 M
PLAN VIEWS AND LOADS

RCF Dump

Vertical Conveyor

RCF
Silo Height: 25m

RCF
Silo Height: 25m

130 Atro t/hr

Vertical Conveyor

100 Atro t/hr

Collection cyclone

Switch Room

Chipper Substation

Air Graders

10 to 12 Trucks / hr

130 Atro t/hr

RCF - 130 Atro t/hr
Chips - 100 Atro t/hr
Sawdust
Boiler Fuel / Bark

CHIPS
Silo Height: 25m - 32m

CHIPS
Silo Height: 25m - 32m

Vertical Conveyor

200 Atro t/hr

BOILER FUEL
Silo Height: 22m

SAW DUST
silo Height: 22m

Vertical Conveyor

BH01

Cable Duct with Cable

GAS GAS GAS GAS GAS GAS GAS GAS GAS

SW manhole

GAS

S:\departments\Drawings\Drawings\7000 Buildings_Drains_&_Roads\7000_455_B.dwg, Model, 17/12/2015 13:11:10,
A3, 1:326.792, Kronospan Chirk

APPENDIX 2

SITE WORK

APPENDIX 2

GENERAL NOTES ON SITE WORKS

A2.1 SITE WORK

A2.1.1 General

Site work is carried out in general accordance with the guidelines given in ISO 1997, 8.4 and BS 5930, ref 8.3.

A2.1.2 Light Cable Percussion Boring

For routine soil exploration to depths in excess of 3m, the light cable percussion rig is generally employed for boring through soils and weak rocks, refs 8.3, 8.4 and 8.5. It consists of a powered winch and tripod frame, with running wheels that are permanently attached so that the rig may be towed behind a suitable vehicle. The rig is towed into position and set up using its own winching system.

The locations of services are checked to make sure the borehole is not situated unacceptably near any services. Regardless of the proximity of services, a CAT scan is undertaken at the borehole location and a trial hole dug to 1.20m by hand.

Boreholes are advanced in soil by the percussive action of the cable tool. The force of the cylindrical tool as it is dropped a short distance cuts a plug of cohesive soil that is removed by the tool.

In non-cohesive soils, the borehole is advanced by a 'shell', otherwise known as a 'bailer' or 'sand pump', which incorporates a clack valve. Material is transferred into the shell and retained by the clack valve. The water level in a borehole is maintained above that in the surrounding granular soil to allow for temporary reductions in the head of water as the shell is withdrawn from the borehole. Water should flow from the borehole into the surrounding soil at all times to prevent 'piping' and loosening the soil at the base of the hole. The casing is always advanced with the borehole in granular soil so that material is drawn from the base rather than the borehole sides.

Obstructions to boring are overcome by fitting a serrated chiselling ring to the base of the percussion tool. For large obstructions, a heavy chisel with a hardened cutting edge may have to be used.

Disturbed samples are taken in polythene bags, jars or tubs that are sealed against air or water loss.

Undisturbed samples are generally taken in cohesive materials at changes in strata and at one metre intervals to 5 metres then at 1.5 metre intervals to the full depths of the borehole. The general purpose open-tube sampler is suitable for firm to stiff clays, but is often used to retrieve disturbed samples of weak rocks, soft or hard clay and also clayey sand or silts. This has been adopted for routine use, and usually consists of a 100mm internal diameter tube (U100), which is capable of taking soil samples up to 450mm in length. The undisturbed samples are sealed at each end using micro-crystalline wax to prevent drying.

Standard penetration tests are generally carried out in non-cohesive soils but also in stiff clays and soft rocks at frequencies similar to that of undisturbed sampling.

$$\text{'N' value} = 2 \times N_{100}$$

A2.2 IN-SITU TESTS

A2.2.1 Standard Penetration Test

The Standard Penetration Test is carried out in accordance with the proposals recommended by ISO 1997, ref 8.4, BS 1377, Part 9, 1990 ref 8.9 and ISO 22476 ref 8.5

The standard penetration test, **SPT**, covers the determination of the resistance of soils to the penetration of a split barrel sampler. A 50mm diameter split barrel sampler is driven 450mm into the soil using a 63.5kg hammer with a 760mm drop. The penetration resistance is expressed as the

number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows to achieve the standard penetration of 300mm is reported as the 'N' value.

The test is generally carried out in fine soils, however, it may also be carried out in coarse granular soils, weak rocks and glacial tills using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone replacing the split spoon sampler, **CPT.**

When attempting the standard penetration test in very dense material or weathered rocks it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

- Where the seating drive has been completed, the test drive is terminated if 50 blows are reached before the full penetration of 300mm is achieved. The penetration for 50 blows is recorded and an approximate N value obtained by linear extrapolation of the number of blows for the partial test drive.
- If the seating drive of 150mm is not achieved within the first 25 blows, the penetration after 25 blows is recorded and the test drive then commenced.
- For tests in soft rocks, the test drive should be terminated after 100 blows where the penetration of 300mm has not been achieved.

The N-value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels as follows:

Term	SPT N-Value : Blows/300mm Penetration
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

A2.3 SAMPLES

U represents undisturbed 100mm diameter sample, the number of blows to obtain the sample also recorded.

U NR indicates undisturbed sample not recovered

B represents large bulk disturbed samples

D represents small disturbed sample

E represents environmental contamination sample

V represents vial contamination sample

W represents water sample

$\underline{\nabla}$ represents water strike

$\underline{\blacktriangledown}$ represents level to which water rose

A2.4 DESCRIPTION OF SOILS

A2.4.1 General

The procedures and principles given in ISO 14688 Parts 1 and 2, ref 8.8, supplemented by section 6 of BS 5930, ref. 8.3 have been used in the soil descriptions contained within this report.

SPT Hammer Certificate

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	DB1
Test Date:	05/12/2014
Report Date:	12/5/2014
File Name:	DB1.spt
Test Operator:	MG

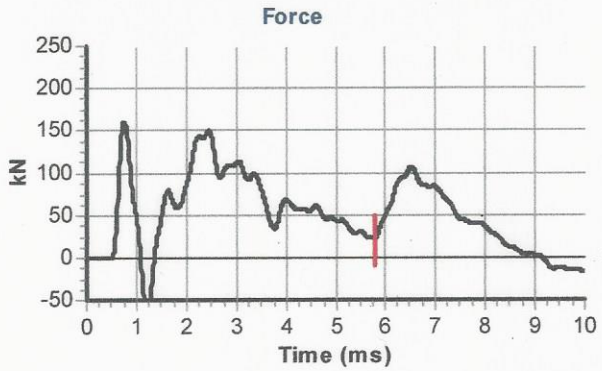
Instrumented Rod Data

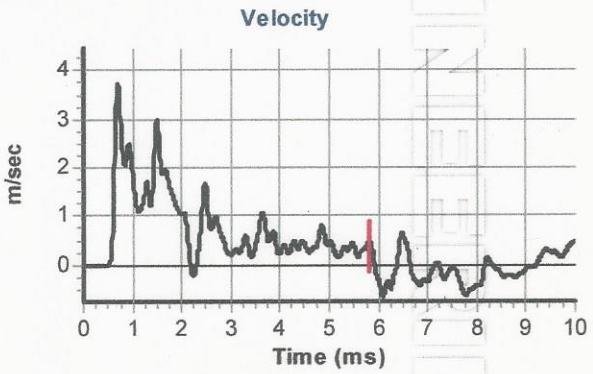
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.1
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7079
Accelerometer No.2:	7080

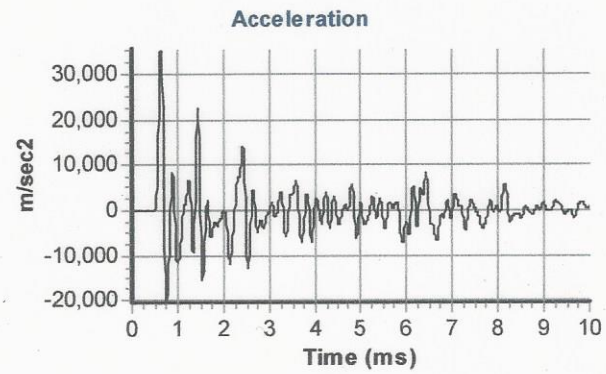
SPT Hammer Information

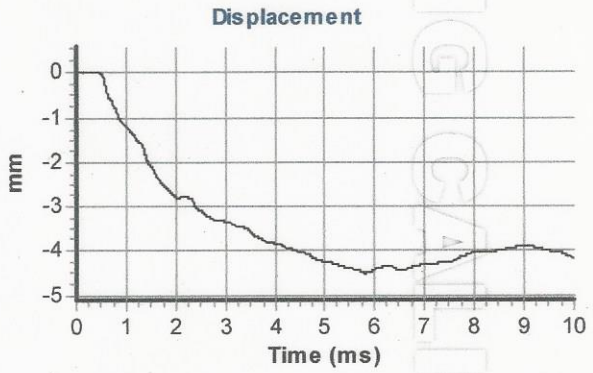
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	13.0

Comments / Location
CALIBRATION









Calculations

Area of Rod A (mm2):	918
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	355

Energy Ratio E_r (%): **75**

Signed: M.GARDNER
Title: FITTER

The recommended calibration interval is 12 months

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	DB2
Test Date:	04/11/2014
Report Date:	11/4/2014
File Name:	DB2.spt
Test Operator:	MG

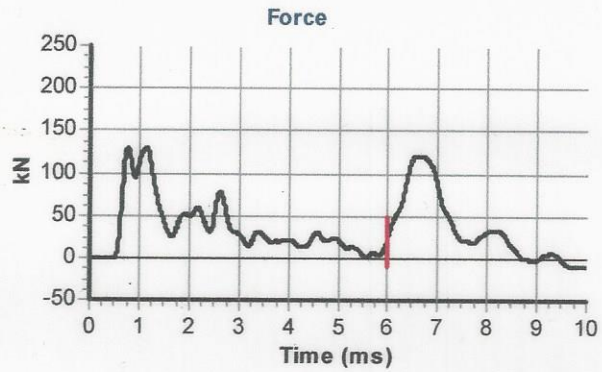
Instrumented Rod Data

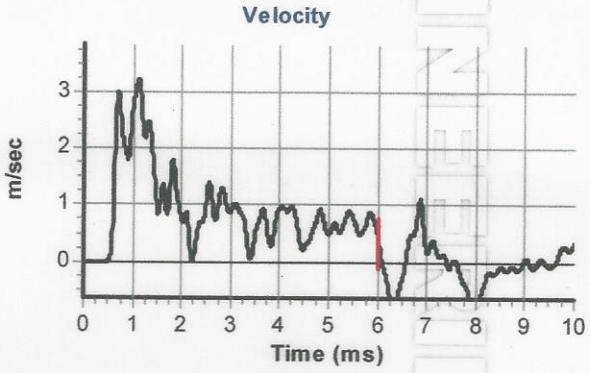
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.1
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7079
Accelerometer No.2:	7080

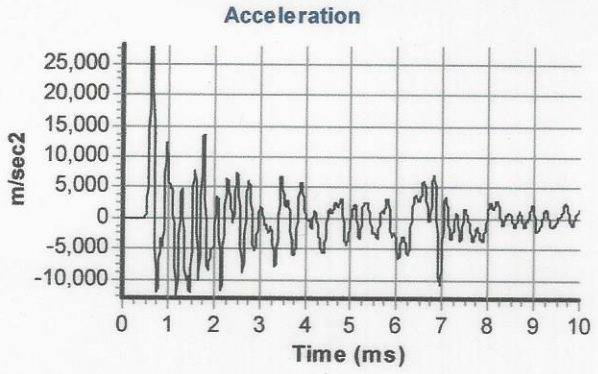
SPT Hammer Information

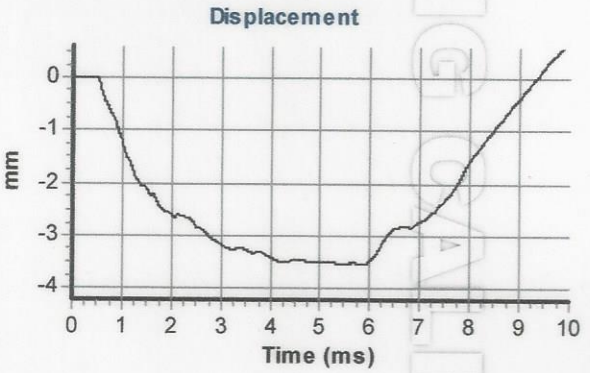
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	13.0

Comments / Location
CALIBRATION









Calculations

Area of Rod A (mm2):	918
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	330

Energy Ratio E_r (%): **70**

The recommended calibration interval is 12 months

Signed: M.GARDNER
Title: FITTER

Borehole Records

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.00m 150mm cased to 24.00m		Kronospan Limited	41793
	Location	**Dates** 22/10/2015-24/10/2015	**Engineer**	**Sheet** 1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.40)	MADE GROUND: Concrete.			
0.40	E1					0.40				
0.40-1.00	B2					(0.50)	MADE GROUND: Grey, mottled brown, sandy GRAVEL with low cobble content. Gravel is angular to subangular, fine to coarse including limestone, concrete and sandstone. Cobbles are angular to subangular of concrete and limestone.			
						0.90				
1.00	D3						Medium dense, brown, mottled yellow, clayey, gravelly SAND. Gravel is angular to subangular, fine to coarse of mudstone.			
1.00	E4									
1.20-1.65	SPT(C) N=18	1.20	DRY	3,4/4,5,4,5						
1.20-1.65	B5									
						(1.50)				
2.00-2.45	SPT(C) N=15	1.70	DRY	2,3/4,4,3,4						
2.00-2.45	B6									
						2.40	Soft, orange brown, mottled grey, silty, sandy CLAY.			
2.80	D7									
3.00-3.45	U8 (P/0.45)	3.00	0.00	35 blows			At 3.00m: low strength.			
3.50	D9					(2.30)				
4.00-4.45	SPT N=9	4.00	DRY	1,2/2,2,2,3			Below 4.00m: firm.		▼1	
4.00-4.45	B10									
4.00-4.45	D11								▽1	
				Water strike(1) at 4.70m, rose to 4.00m in 20 mins, sealed at 7.00m.		4.70	Loose, grey, slightly clayey, silty SAND.			
						(0.30)				
5.00-5.45	B12					5.00	Soft, brown, mottled grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to subangular, fine to coarse of mudstone, sandstone and siltstone. (driller notes sand bands).			
5.00-5.45	SPT N=8	4.70	4.10	1,1/2,2,2,2						
5.00-5.45	D13									
5.80	D14									
6.50-6.95	U15 (P/0.45)	6.20	6.00	23 blows			At 6.50m: low strength.			
						(3.90)				
7.00	D16									
7.50	D17									
8.00-8.45	SPT N=7	7.70	DRY	1,2/2,1,2,2						

Remarks
Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH01

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.00m 150mm cased to 24.00m		Kronospan Limited	41793
	Location	**Dates** 22/10/2015-24/10/2015	**Engineer**	**Sheet** 2/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
8.00-8.45	B18									
8.00-8.45	D19									
						8.90				
8.90	D20						Very dense brown, sandy, clayey, angular to subrounded, fine to coarse GRAVEL with low cobble content. Gravel includes mudstone and sandstone. Cobbles are subangular of mudstone and sandstone.		▽2	
9.00-9.45	B21			Water strike(2) at 9.00m.						
9.00-9.29	SPT(C) 50/135	9.00	8.10	8,14/27,23						
10.00-10.19	SPT(C) 25*/93 51/95	10.00	9.30	17,8/35,16						
10.00	D22									
10.00-10.95	B23									
						(3.70)				
11.00	D24									
12.00-12.45	B25			22/10/2015:9.30m 23/10/2015:10.80m						
12.00-12.08	SPT(C) 25*/30 50/50	12.00	10.80	25/50						
						12.60				
13.00	D26						Very stiff brown, slightly gravelly, slightly sandy CLAY with low cobble content. Cobbles are subrounded, including mudstone. Gravel is angular to subrounded, fine to coarse including mudstone and sandstone. Between 12.70m and 17.20m: driller notes sand and gravel bands.			
13.50-13.75	SPT(C) 25*/100 50/145	13.50	11.00	18,7/26,24						
13.50-13.95	B27									
14.50	D28									
15.00-15.29	SPT(C) 19*/115 50/170	15.00	11.60	10,9/20,23,7						
15.00-15.45	B29									

Remarks
Chiselling from 9.30m to 9.60m for 1.00 hour. Chiselling from 10.20m to 10.50m for 1.00 hour. Chiselling from 12.10m to 12.40m for 1.50 hours. Chiselling from 13.80m to 14.00m for 0.75 hours.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH01

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.00m 150mm cased to 24.00m		Kronospan Limited	41793
	Location	**Dates** 22/10/2015-24/10/2015	**Engineer**	**Sheet** 3/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
16.00	D30									
16.50-16.82	SPT(C) 25*/90	16.50	11.90	19,6/18,19,13						
16.50-16.95	50/225 B31									
17.50	D32									
18.00-18.45	SPT(C) 50/295	18.00	DRY	9,11/11,13,14,12						
18.00-18.45	B33									
						(12.40)				
19.00	D34									
19.50-19.87	SPT(C) 50/220	19.50	DRY	11,14/15,18,17						
19.50-19.95	B35									
20.50	D36									
21.00-21.32	SPT(C) 25*/140	21.00	DRY	13,12/19,22,9						
21.00-21.45	50/180 B37									
				23/10/2015:DRY						
22.00	D38									
22.50-22.79	SPT(C) 25*/110	22.50	DRY	15,10/19,12,8						
22.50-22.95	39/175 B39									
23.50	D40									
24.00-24.22	48/125 SPT(C) 25*/95	24.00	DRY	19,6/22,26						

Remarks
Chiselling from 21.20m to 21.50m for 0.75 hours. Chiselling from 22.00m to 22.60m for 1.50 hours.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH01

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.00m 150mm cased to 24.00m		Kronospan Limited	41793
	Location	**Dates** 22/10/2015-24/10/2015	**Engineer**	**Sheet** 4/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
24.00-24.45	B41					25.00	Complete at 25.00m			

Remarks
Chiselling from 24.10m to 24.40m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH01

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH02

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion			Kronospan Limited	41793
	Location	**Dates** 22/10/2015	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30) 0.30	MADE GROUND: Concrete.		
0.50 0.50-1.00	E2 B1						MADE GROUND: Firm, grey mottled brown, clayey, gravelly SAND. Gravel is angular to subangular, fine to coarse including limestone, concrete and mudstone.		
1.00-1.40	B3					(1.10)			
1.40-1.53 1.40	SPT(C) 25*/75 50/50 B4			25/50		1.40	Terminated at 1.40m		

Remarks
Borehole terminated at 1.40m: due to obstruction and clients instruction.
Borehole relocated to BH02A.
Chiselling from 1.40m to 1.40m for 3.00 hours. Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH02

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH02A

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 10.50m 150mm cased to 20.00m		Kronospan Limited	41793
	Location	**Dates** 23/10/2015-24/10/2015	**Engineer**	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
						(0.30)	MADE GROUND: Concrete.
						0.30	
0.50	E2						MADE GROUND: Grey, mottled reddish brown, slightly sand GRAVEL. Gravel is angular to subangular, fine to coarse including limestone, sandstone and concrete, with low cobble content. Cobbles are angular if limestone, mudstone and concrete.
0.50-1.00	B1						
						(1.20)	
1.00-1.50	B3						
						1.50	
1.50	E4						Soft, reddish brown, silty CLAY.
1.50-1.95	U5 (P/0.45)	1.50	DRY	30 blows			
2.00	D6						
2.00-2.50	B7						
						(1.70)	
2.50-2.95	SPT N=5	2.50	DRY	2,2/1,2,1,1			
2.50-2.95	D8						
2.50-3.00	B9						
3.00-3.50	B10						
						3.20	
							Soft, grey sandy, silty CLAY.
3.50-3.95	U11 (P/0.45)	3.50	DRY	40 blows			At 3.50m: medium strength..
4.00	D12						
4.00-4.50	B13						
4.50-4.95	SPT N=5	4.50	DRY	1,1/1,2,1,1			
4.50-4.95	D14						
4.50-5.00	B15						
5.00-5.50	B16						
5.50-5.95	SPT N=4	5.50	DRY	1,1/1,1,1,1			
5.50-5.95	D17						
5.50-6.00	B18						
6.00-6.45	SPT N=5	6.00	DRY	1,2/1,1,2,1			
6.00-6.45	D19						
6.00-6.50	B20						
						(6.40)	
6.80-7.30	B21						
				23/10/2015:10.00m			
				24/10/2015:10.00m			
7.50-7.95	SPT N=7	7.50	DRY	1,2/1,2,2,2			
7.50-7.95	D22						
7.50-8.00	B23						

Remarks
Mornig water 10.00m.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH02A

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH02A

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 10.50m 150mm cased to 20.00m		Kronospan Limited	41793
	Location	**Dates** 23/10/2015-24/10/2015	**Engineer**	**Sheet** 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
8.30-8.80	B24									
9.00-9.45 9.00-9.45 9.00-9.50	SPT N=7 D25 B26	9.00	DRY	1,1/1,2,2,2						
						9.60	Very stiff, reddish brown, slightly gravelly, silty CLAY with low cobble content. Gravel is angular to subangular, fine to coarse including mudstone. Cobbles are subrounded of mudstone.			
9.80-10.30	B27									
10.50-10.69 10.50-10.95 10.50-11.00	SPT 25*/80 50/105 D28 B29	10.50	DRY	20,5/25,25						
11.30-11.80	B30									
12.00-12.33 12.00 12.00-12.50	SPT(C) 48/180 B31 B32	12.00	DRY	11,12/15,20,13						
12.58-13.30	B33									
13.50-13.69 13.50 13.50-14.00	SPT(C) 25*/30 50/160 B34 B35	13.50	DRY	15,10/20,25,5						
14.30-14.80	B36									
						(10.04)				
15.00-15.26 15.00 15.00-15.50	SPT(C) 25*/90 50/165 B37 B38	16.50	DRY	10,15/25,20,5						
15.80-16.30	B39									

Remarks

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH02A

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH02A

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 10.50m 150mm cased to 20.00m		Kronospan Limited	41793
	Location	**Dates** 23/10/2015-24/10/2015	**Engineer**	**Sheet** 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
16.50-16.73	SPT(C) 25*/75 50/150	18.00	DRY	25/30,20						
16.50	B40									
16.50-17.00	B41									
17.30-17.80	B42									
18.00-18.43	SPT(C) 50/152	19.50	DRY	14,11/15,17,18						
18.00-18.50	B43									
18.80-19.30	B44									
19.50-19.64	SPT(C) 25*/40 50/95	19.50	DRY	25/30,20 24/10/2015:DRY		19.64	Complete at 19.64m			
19.50	B45									

Remarks

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH02A

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH03

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 200mm cased to		Kronospan Limited	41793
	Location	**Dates** 19/10/2015-21/10/2015	**Engineer**	**Sheet** 1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Concrete.		
						0.30			
0.50	E1						MADE GROUND: Brown, sandy GRAVEL with low cobble content. Gravel is angular to subangular, fine to coarse including concrete, sandstone and limestone. Cobbles are angular of concrete.		
0.50-1.00	B2								
						(1.00)			
1.00	E3								
1.20-1.65	SPT(C) N=15	1.20	DRY	4,4/5,4,3,3					
1.20-1.65	B4					1.30			
1.20-1.65	D5						Firm, brown, mottled grey, slightly sandy, silty CLAY.		
1.50	E6								
2.00-2.45	U7 (P/0.45)	1.70	DRY	66 blows			At 2.00m: medium strength.		
						(1.60)			
2.50	D8								
						2.90			
3.00-3.45	SPT N=12	3.00	DRY	1,2/2,2,3,5			Firm brown, mottled grey, slightly gravelly, slightly sandy, silty CLAY. Gravel is angular to subrounded, fine to coarse including mudstone and sandstone.		
3.00-3.45	B9								
3.00-3.45	D10								
						(1.60)			
4.00-4.45	U11 (P/0.45)	4.00	DRY	43 blows					
4.50	D12			19/10/2015:DRY		4.50	Soft, locally firm, brown mottled grey, slightly sandy, silty CLAY.		
				20/10/2015:DRY			Between 4.50m and 4.80m: silty, gravelly. Gravel is angular to subrounded, fine to coarse including sandstone and mudstone.		
5.00-5.45	SPT N=7	4.70	DRY	1,2/1,2,2,2					
5.00-5.45	B13								
5.00-5.45	D14								
6.00	D15								
6.50-6.95	U16 (P/0.45)	6.20	DRY	32 blows					
7.00	D17								
						(5.70)			
7.50	D18								
8.00-8.45	SPT N=8	7.70	DRY	1,2/1,2,2,3					

Remarks
Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH03

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH03

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 200mm cased to		Kronospan Limited	41793
	Location	**Dates** 19/10/2015-21/10/2015	**Engineer**	**Sheet** 2/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
8.00-8.45	B19								
8.00-8.45	D20								
9.00	D21								
9.00-9.45	U22 (P/0.45)	9.20	DRY	35 blows			At 9.50m: high strength.		
10.00	D23								
10.20	D24					10.20			
						(0.40)	Very stiff, brown, very sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse including mudstone.		
10.50-10.95	SPT(C) N=37	10.50	DRY	4,7/8,8,10,11		10.60			
10.50-10.95	B25						Dense, brown, clayey, sandy, angular to subrounded, fine to coarse GRAVEL including mudstone.		
						(1.20)			
11.50	D26								
11.80	D27					11.80			
							Very stiff, reddish brown, very sandy, slightly gravelly, silty CLAY with low cobble content. Gravel is angular to subangular, fine to coarse including mudstone and sandstone. Cobbles are angular to subrounded of mudstone.		
12.00-12.45	U28 (P/0.36)	12.00		126 blows					
12.50	D29								
13.00	D30								
13.50-13.85	SPT 50/200	13.50	DRY	7,10/12,13,17,8					
13.50-13.95	B31								
13.50-13.95	D32								
14.00	D33								
15.00-15.37	SPT(C) 47/220	15.00	MOIST	10,13/16,16,15					
15.00-15.45	B34								

Remarks
Chiselling from 13.60m to 13.90m for 0.75 hours.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH03

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH03

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 200mm cased to		Kronospan Limited	41793
	Location	**Dates** 19/10/2015-21/10/2015	**Engineer**	**Sheet** 3/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
16.00	D35								
16.50-16.79	SPT(C) 25*/125 50/160	16.50	DRY	14,11/22,23,5					
16.50-16.95	B36								
17.50	D37			20/10/2015:DRY					
				21/10/2015:DRY					
18.00-18.35	SPT(C) 25*/125 50/220	18.00	DRY	13,12/15,16,19					
18.00-18.45	B38					(13.20)			
19.00	D39								
19.50-19.90	SPT(C) 50/250	19.50	DRY	11,12/14,14,15,7					
19.50-19.95	B40								
20.50	D41								
21.00-21.45	SPT(C) N=50	21.00	DRY	14,11/16,19,15					
21.00-21.45	B42								
22.00	D43								
22.50-22.87	SPT(C) 50/220	22.50	DRY	9,14/14,18,18					
22.50-22.95	B47								
23.50	B44								
23.50	D45								
24.00-24.31	SPT(C) 22*/143 50/170	24.00	DRY	11,11/20,23,7					

Remarks
Chiselling from 16.70m to 17.00m for 1.00 hour. Chiselling from 18.30m to 18.60m for 1.00 hour. Chiselling from 21.40m to 21.60m for 0.75 hours.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH03

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH03

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 200mm cased to		Kronospan Limited	41793
	Location	**Dates** 19/10/2015- 21/10/2015	**Engineer**	**Sheet** 4/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
24.00-24.45	B46								
25.00	D48			21/10/2015:DRY		25.00	Complete at 25.00m		

Remarks
Chiselling from 24.20m to 24.50m for 0.75 hours.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH03

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH04

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.20m 150mm cased to 25.00m		Kronospan Limited	41793
	Location	**Dates** 19/10/2015-21/10/2015	**Engineer**	**Sheet** 1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.40) 0.40	MADE GROUND: Concrete.		
0.50 0.50-1.00	E2 B1					(0.60) 1.00	MADE GROUND: Brown and grey, gravelly, clayey SAND with low cobble content. Gravel is angular to subangular, fine to coarse including concrete, limestone, sandstone. Cobbles are angular to subrounded including sandstone and concrete.		
1.00 1.00-1.50	E4 B3						Firm, grey, mottled brown, silty CLAY.		
1.50-1.95	U5 (P/0.45)	1.50	DRY	60 blows		(1.50)	At 1.50m: high strength.		
2.00 2.00-2.50	D7 B6								
2.50-2.95 2.50-3.00	D9 B8			19/10/2015:ADDED 20/10/2015:DRY		2.50	Firm, grey, sandy, silty CLAY.		
2.50-2.95	SPT N=12	2.50	DRY	2,2/3,3,3,3					
3.50-3.95 3.50-3.95 3.50-4.00	SPT N=9 D11 B10	3.50	DRY	2,2/2,2,2,3					
4.50-4.95 4.50-4.95 4.50-5.00	SPT N=11 D13 B12	4.50	DRY	2,2/3,2,3,3					
5.50-5.95 5.50-5.95 5.50-6.00	SPT N=9 D15 B14	5.50	DRY	1,2/2,3,2,2					
6.00-6.45 6.00-6.45 6.00-6.50	SPT N=6 D17 B16	6.00	DRY	1,1/1,2,1,2			Below 6.00m: soft.		
6.80-7.30	B18					(8.10)			
7.50-7.95 7.50-7.95 7.50-8.00	SPT N=7 D19 B20	7.50	DRY	2,2/1,2,2,2					

Remarks
Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH04

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH04

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.20m 150mm cased to 25.00m		Kronospan Limited	41793
	Location	**Dates** 19/10/2015-21/10/2015	**Engineer**	**Sheet** 2/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
8.30-8.80	B21								
9.00-9.45 9.00-9.50	U23 (P/0.0) B22	9.00	DRY	120 blows					
9.50-9.95 9.50-9.95 9.50-10.00	SPT N=12 D25 B24	9.50	DRY	3,3/3,3,3,3					
10.00-10.50 10.10-10.49 10.10	B26 SPT(C) 50/235 B27	10.10	DRY	11,13/14,16,17,3					
10.50-10.95 10.50-11.00	U29 (P/0.0) B28	10.50	DRY	100 blows		10.60	Dense brown, sandy, angular to subrounded, fine to coarse GRAVEL with low cobble content. Gravel includes mudstone and sandstone. Cobbles are subangular of mudstone.		
11.30-11.80	B30					(2.10)			
12.00-12.17 12.00-12.50	SPT(C) 25*/75 50/90 B31	12.00	DRY	25/30,20		12.70			
12.80-13.30	B32						Stiff, reddish brown, slightly gravelly, slightly sandy, silty CLAY. Gravel is subrounded of mudstone and sandstone, with occasional cobbles. Cobbles are subrounded of mudstone.		
13.50-13.88 13.50-14.00	SPT(C) 50/230 B33	13.50	DRY	11,12/15,15,15,5					
14.30-14.80	B34								
15.00-15.39 15.00-15.50	SPT(C) 50/235 B35	15.00	DRY	13,12/14,16,16,4					
15.80-16.30	B36								

Remarks
Chiselling from 12.00m to 12.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH04

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH04

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.20m 150mm cased to 25.00m		Kronospan Limited	41793
	Location	**Dates** 19/10/2015-21/10/2015	**Engineer**	**Sheet** 3/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
16.50-16.83	SPT(C) 50/180	16.50	DRY	11,11/15,15,20					
16.50-17.00	B37								
17.30-17.80	B38								
18.00-18.31	SPT(C) 25*/85 50/225	18.00	DRY	15,10/20,25,5					
18.00-18.50	B39								
18.80-19.30	B40					(12.45)			
19.50-20.00	B41			20/10/2015:ADDED					
				21/10/2015:16.70m					
19.50-19.62	SPT(C) 25*/30 50/85	19.50	DRY	25/30,20					
20.30-20.80	B42								
21.00-21.13	SPT(C) 25*/40 50/85	21.00	DRY	25/30,20					
21.00-21.50	B43								
21.80-22.30	B44								
22.30-22.80	B45								
22.50-22.70	SPT(C) 25*/85 50/115	22.50	DRY	15,10/20,30					
24.00-24.28	SPT(C) 25*/95 50/180	24.00	DRY	12,13/17,19,14					

Remarks
Chiselling from 21.00m to 21.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH04

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH04

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 12.20m 150mm cased to 25.00m		Kronospan Limited	41793
	Location	**Dates** 19/10/2015-21/10/2015	**Engineer**	**Sheet** 4/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
24.00-24.50	B46								
24.50-25.00	B47								
25.00	B48			21/10/2015:DRY		25.15			
25.00-25.15	SPT(C) 25*/40 50/105	25.00	DRY	25/27,23			Complete at 25.15m		

Remarks

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH04

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH05

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 15.00m 150mm cased to 21.00m		Kronospan Limited	41793
	Location	**Dates** 03/11/2015-05/11/2015	**Engineer**	**Sheet** 1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	MADE GROUND: CONCRETE.			
0.30-0.80	B1					0.30	MADE GROUND: Brown, clayey, gravelly SAND with low cobble content. Gravel is angular to subrounded, fine to coarse including concrete, mudstone and sandstone. Cobbles are angular including sandstone and limestone.			
0.80-1.30	B2					(0.70)				
						1.00	Firm, dark brown, very sandy CLAY.			
1.50-1.95	SPT N=7	1.50	DRY	1,2/2,1,2,2		(1.10)				
1.50-1.95	D4									
1.50-2.00	B3									
2.00-2.50	B5					2.10	Firm, locally soft, greenish grey, slightly gravelly, sandy, silty CLAY. Gravel is angular to subrounded, fine to coarse including mudstone.			
2.50-2.95	SPT(C) N=30	2.50	DRY	7,8/7,7,8,8			At 2.50m: locally stiff.			
2.50-3.00	B6					(1.50)				
3.00-3.50	B7									
3.50-3.95	SPT N=6	3.50	DRY	1,1/1,2,2,1		3.60	Soft, locally firm, grey, silty, sandy CLAY.			
3.50-3.95	D9									
3.50-4.30	B8									
4.00-4.45	B10									
4.50-4.95	SPT N=15	4.50	DRY	3,4/4,3,4,4			At 4.50m: firm.			
4.50-4.95	D12									
4.50-5.00	B11									
5.00-5.50	B13									
5.50-5.95	SPT N=5	5.50	DRY	1,1/1,2,1,1						
5.50-5.95	D15									
5.50-6.00	B14									
6.00-6.45	SPT N=4	6.00	DRY	1,1/1,1,1,1						
6.00-6.45	D17									
6.00-6.50	B16									
6.80-7.30	B18									
7.50-7.95	SPT N=5	7.50	DRY	1,2/1,1,2,1						
7.50-7.95	D20									
7.50-8.00	B19									

Remarks
Chiselling from 2.30m to 2.50m for 1.00 hour. Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH05

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH05

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 15.00m 150mm cased to 21.00m		Kronospan Limited	41793
	Location	**Dates** 03/11/2015-05/11/2015	**Engineer**	**Sheet** 2/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
8.20-8.70	B21					(9.00)				
9.00-9.45	SPT N=3	9.00	DRY	1,0/1,0,1,1			Below 9.00m: very soft.			
9.00-9.45	D23									
9.00-9.50	B22									
9.80-10.30	B24									
10.50-10.95	SPT N=3	10.50	DRY	1,0/0,1,1,1					▼1	
10.50-10.95	D26									
10.50-11.00	B25									
11.30-11.80	B27									
12.00-12.45	SPT N=4	12.00	DRY	1,1/1,1,1,1						
12.00-12.45	D29									
12.00-12.50	B28									
				Water strike(1) at 12.60m, rose to 10.62m in 10 mins.		12.60			▽1	
12.80-13.30	B30						Very dense, grey sandy, angular to subrounded, fine to coarse GRAVEL with low cobble content. Gravel includes mudstone and sandstone. Cobbles and boulders are subrounded including mudstone.			
13.50-13.58	SPT(C) 25*/30	13.50	DRY	25/50						
13.50-14.00	B31									
14.30-14.80	B32									
15.00-15.50	B33			03/11/2015:14.47m						
				04/11/2015:9.95m						
15.00-15.18	SPT(C) 25*/80	15.00	DRY	20,5/30,20						
15.80-16.30	B34									

Remarks
Chiselling from 12.80m to 12.90m for 1.00 hour. Chiselling from 15.10m to 15.30m for 1.00 hour. Water added from 15.80m.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH05

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH05

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 15.00m 150mm cased to 21.00m		Kronospan Limited	41793
	Location	**Dates** 03/11/2015-05/11/2015	**Engineer**	**Sheet** 3/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
16.50-16.95 16.50-16.95 16.50-17.00	SPT N=34 D36 B35	16.50	DRY	5,6/8,8,9,9						
17.30-17.80	B37					(9.80)				
18.00-18.38 18.00-18.50	SPT(C) 50/225 B38	18.50	DRY	10,12/15,17,15,3						
18.80-19.30	B39									
19.50-19.80 19.50-20.00	SPT(C) 50/150 B40	19.50	DRY	17,8/20,25,5						
20.30-20.80	B41									
21.00-21.50	B42			04/11/2015:0.00m						
21.00-21.05	SPT(C) 25*/30 50/20	21.00	DRY	05/11/2015:0.00m 25/50						
21.80-22.30	B43									
						22.40				
22.50-22.88 22.50-22.95 22.50-23.00	SPT 50/230 D45 B44	22.50	DRY	10,12/15,15,15,5			Very stiff, reddish brown, slightly gravelly, silty CLAY. Gravel is angular to subrounded, fine to coarse including mudstone.			
23.30-23.80	B46									
						(2.30)				

Remarks
Chiselling from 21.00m to 21.10m for 1.00 hour.

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH05

IAN FARMER ASSOCIATES

Site	Borehole Number
Kronospan Log Yard Improvements	BH05

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 15.00m 150mm cased to 21.00m		Kronospan Limited	41793
	Location	**Dates** 03/11/2015-05/11/2015	**Engineer**	**Sheet** 4/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
24.00	U47 (P/0.0)	24.00	DRY	120 blows						
24.50-24.70	SPT(C) 25*/85 50/115	24.00	DRY	10,15/24,26		24.70				
24.50-24.70	B48						Complete at 24.70m			

Remarks

Scale (approx)	Logged By
1:40	TO

Figure No. 41793.BH05

APPENDIX 3

LABORATORY TESTS

APPENDIX 3

GENERAL NOTES ON LABORATORY TESTS ON SOILS

A3.1 GENERAL

A3.1.1 Where applicable all tests are carried out in accordance with the relevant British Standard. The laboratory test procedures are as below:

Test Name	Procedures BS1377:1990 Part:Clause
Moisture Content	2:3
Liquid Limit	2:4
Plastic Limit and Plastic Index	2:5
Particle Size Distribution	9.2
Sedimentation	9.4
Mass Loss on Ignition	3.4
Sulphate content	3:5
pH Value	3:9
Compaction Test	4:3
California Bearing Ratio	4:7
Consolidation	5:3
Bulk Density	7:2*
Laboratory Vane Tests	7:3*
Triaxial Compression	
Total Stress Single-Stage	7:8
Total Stress Multi-Stage	7:9
Desiccation	Note 1*

Note 1 - BRE Information paper IP4 issued February 1993
* Tests are not included in UKAS accreditation

A3.1.2 Where an external laboratory carried out testing, their report, including test methods is included in this Appendix.

A3.1.3 A summary sheet of laboratory test results undertaken by Ian Farmer Laboratories is included, however where copies of the individual test results are required these will be provided on request.

A3.1.4 Any discussion in this report is based on the values and results obtained from the appropriate tests. Due allowance should be made, when considering any result in isolation, of the possible inaccuracy of any such individual result. Details of the accuracy of results are included in this section, where applicable.

A3.2 MOISTURE CONTENT

A3.2.1 Unless stated to the contrary, the moisture content of a soil sample was determined by the standard oven drying method, BS 1377, Part 1, Test 3. The result is reported to an accuracy of ±0.5%

A3.3 ATTERBERG LIMITS

A3.3.1 The Liquid Limit, **LL**, is the moisture content at which the soil passes from the liquid to plastic state. Unless stated to the contrary, the Liquid Limit was determined using the four point, cone penetrometer method, Test 4. The value is reported to the nearest whole number, to an accuracy of ±0.5%.

A3.3.2 The Plastic Limit, **PL**, is the moisture content at which soil passes from the plastic to solid state and becomes too dry to remain in a plastic condition. The Plastic Limit was determined using the method described in Test 5. The value is reported to the nearest whole number, to an accuracy of ±0.5%.

A3.3.3 The Plasticity Index, **PI**, is the numerical difference between the liquid and plastic limits, corresponding to the range of moisture contents over which a soil is in a plastic state. The determination of the Plasticity Index is covered by Test 5.

A3.4 SOIL CLASSIFICATION

A3.4.1 Classification of soils is usually undertaken by means of the Plasticity Classification Chart, sometimes called the A-Line Chart. This is graphical plot of PI against LL with the A-Line defined as PI = 0.73(LL - 20).

A3.4.2 This line is defined from experimental evidence and does not represent a well defined boundary between soil types, but forms a useful reference datum. When the values of LL and PI for inorganic clays are plotted on the chart they generally lie just above the A-Line in a narrow band parallel to it, while silts and organic clays plot below this line.

A3.4.3 Clays and silts are divided into five zones of plasticity:

Low Plasticity (L)	LL less than 35
Intermediate Plasticity (I)	LL between 35 and 50
High Plasticity (H)	LL between 50 and 70
Very High Plasticity (V)	LL between 70 and 90
Extremely High Plasticity (E)	LL greater than 90

A3.4.4 In general, clays of high plasticity are likely to have a lower permeability, are more compressible and consolidate over a longer period of time under load than clays of low plasticity. Clays of high plasticity are more difficult to compact as fill material.

A3.5 SHEAR STRENGTH TESTS

A3.5.1 The shear strength tests have been carried out in accordance with the procedures given in BS1377, Part 7.

The type of test referred to is:

A3.5.2 U1(100) - Undrained triaxial compression test on single specimen of 100mm diameter at a lateral pressure approximately equal to overburden pressure.

A3.5.3 UM(100) - Multi-stage undrained triaxial compression test on a specimen of 100mm diameter. An initial low cell pressure is applied and the deviator stress increased until failure is imminent. The cell pressure is then increased and the procedure repeated until the failure stress at three different cell pressures have been determined.

A3.5.4 U1(38) - Undrained triaxial compression test on a single specimen of 38mm diameter at a lateral pressure approximately equal to overburden pressure.

A3.5.5 U(38) - Undrained triaxial compression test on set of three specimens of 38mm diameter at three differential lateral pressures.

A3.5.6 Consolidated undrained triaxial – The Effective Stress Parameters were determined in accordance with the procedure detailed in BS1377: Part 8:1990 Clause 7 and the samples were prepared in accordance with clause 4.

A3.5.7 Small shearbox – The peak, and in some cases residual, shear stress parameters were determined in accordance with the procedure detailed in BS1377: Part 7: 1990 Clause 4 and the samples were prepared in accordance with clause 4.

A3.6 CHEMICAL TESTS

A3.6.1 The total sulphate content of soil was determined using the gravimetric method detailed in BS1377: Part 3:1990, Test 5. The results are recorded to an accuracy of ±0.1%.

A3.6.2 The water soluble sulphate content of soil was determined using the gravimetric method detailed in BS1377: Part 3: 1990, Test 5. The results are recorded to an accuracy of ±0.1g/l.

A3.6.3 The sulphate content of groundwater was determined using the gravimetric method detailed in BS1377: Part 3: 1990, Test 5. The results are record to an accuracy of ±0.1g/l.

A3.6.4 The pH value was determined electrometrically using the procedures given in BS 1377: Part 3: 1990, Test 9. The results are recorded to an accuracy of ±0.1 pH units.

A3.6.5 The total sulphur content of soil was determined using the ignition in oxygen method detailed in TRL Report 447, Test 4B.

A3.6.6 The organic content of soil was determined in accordance with the chemical method detailed in BS1377: Part 3:1990 Clause 3. The sample was prepared in accordance with Clause 3.4.2.

A3.6.7 The organic content of soil was determined in accordance with the loss on ignition method detailed in BS1377: Part 3:1990 Clause 4. The sample was prepared in accordance with Clause 4.3.2.

A3.7 COMPACTION TESTS

A3.7.1 Whenever soil is placed as fill, it is generally necessary to compact it into a dense state. Laboratory compaction tests are carried out to provide the basis for control procedures. Compaction tests provide the following information.

A3.7.2 The relationship between the dry density and moisture content for a given degree of compactive effort.

A3.7.3 The moisture content for the most efficient compaction. This is defined as the **Optimum Moisture Content, OMC**, being the moisture content of the soil at which a specified amount of compaction will produce the maximum dry density.

A3.7.4 The **Maximum Dry Density**, being the dry density obtained using a specified amount of compaction at the optimum moisture content.

A3.7.5 There are three basic laboratory compaction tests, these being as follows:

Type of test (BS1377:1990 Part 4)	**Container**	**Rammer**			
		mass (kg)	**drop (mm)**	**No of Layers**	**Blows Per Layer**
Light compaction	BS mould (1l) CBR mould	2.5 2.5	300 300	3 3	27 62
Heavy compaction	BS mould (1l) CBR mould	4.5 4.5	450 450	5 5	27 62
Vibrating hammer	CBR mould	32 to	vibro	3	(1 min)

A3.7.6 The **California Bearing Ratio** is determined using the penetration test procedure detailed in BS1377: Part 4: 1990 Clause 7.4. The samples are prepared in accordance with BS1377: Part 4: 1990 Clause 7.2.4.4 method 5 using a 2.5kg/4.5kg rammer / intermediate effort. The force penetration curves are given in the corresponding figures. The curves include the percentage retained on the 20mm test sieve.

IAN FARMER ASSOCIATES

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Ian Farmer Associates (1998) Ltd
17 Rivington Court
Warrington
Cheshire
WA1 4RT

F.A.O. Mr A Latimer

TEST REPORT - 41793/1

Site :	Kronospan Log Yard Improvements
Job Number :	41793
Originating Client :	Kronospan Limited
Originating Reference :	41793
Date Sampled :	Not given
Date Scheduled :	11/11/2015
Date Testing Started :	18/11/2015
Date Testing Finished :	03/12/2015

Remarks :

- First Report for above Job Number
- Samples will be disposed of 28 days after the report is issued unless otherwise agreed
- This report may contain results from tests which are not included within the scope of the UKAS accreditation. Please see final sheet for details.

Data Input By: J Clark. Jemma Clark

Position : Laboratory Administrator Date : 03/12/2015

Authorised By: D. Smith Daniel Smith

Position : Laboratory Supervisor Date : 03/12/2015

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY AND LIQUIDITY INDEX

Borehole/ Trial Pit	Depth (m)	Sample	Natural / Sieved	Natural Moisture Content %	Sample Passing 425µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
					Percentage %	Moisture Content %						
BH01	3.00	U8	Natural	25	100	25	44	26	18	-0.06	CI	Brown silty CLAY
BH01	6.50	U15	Natural	27	100	27		NP				Grey SILT
BH01	13.00	D26	Sieved	14	20	50	28	13	15	2.47	CL	Brown sandy gravelly CLAY
BH01	19.00	D34	Sieved	17	76	20	38	17	21	0.14	CI	Brown sandy gravelly CLAY
BH02A	2.00	D6	Natural	22	97	23	39	23	16	0.00	CI	Brown silty gravelly CLAY
BH02A	3.50	U11	Natural	26								Grey SILT
BH02A	7.50	D22	Natural	24	100	24		NP				Grey SILT
BH02A	10.50	B29	Natural	19	84	22	25	13	12	0.75	CL	Brown sandy gravelly CLAY
BH03	2.00	U7	Natural	30								Brown silty CLAY
BH03	5.00	D14	Natural	26	100	26		NP				Grey SILT
BH03	9.50	U22	Natural	21	100	21	35	24	11	-0.27	CL/CI	Grey silty CLAY
BH03	17.50	D37	Natural	10	95	11	27	12	15	-0.07	CL	Brown sandy gravelly CLAY
BH03	23.50	D45	Natural	15	89	16	34	16	18	0.00	CL	Brown sandy gravelly CLAY
BH04	1.50	U5	Natural	28								Brown silty CLAY
BH04	6.00	D17	Natural	34	100	34		NP				Grey silty CLAY
BH05	1.50	D4	Sieved	24	60	37		NP				Grey sandy gravelly CLAY
BH05	9.00	D23	Sieved	30	100	30	33	22	11	0.73	CL	Grey SILT

Method of Preparation : BS 1377:PART 1:1990:7.4 Preparation of samples for classification tests BS 1377:PART 2:1990:4.2 & 5.2 Sample preparations

Method of Test : BS 1377:PART 2:1990:3.2 Determination of moisture content 4.3 Determination of the liquid limit 5.3 Determination of the plastic limit and plasticity index

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

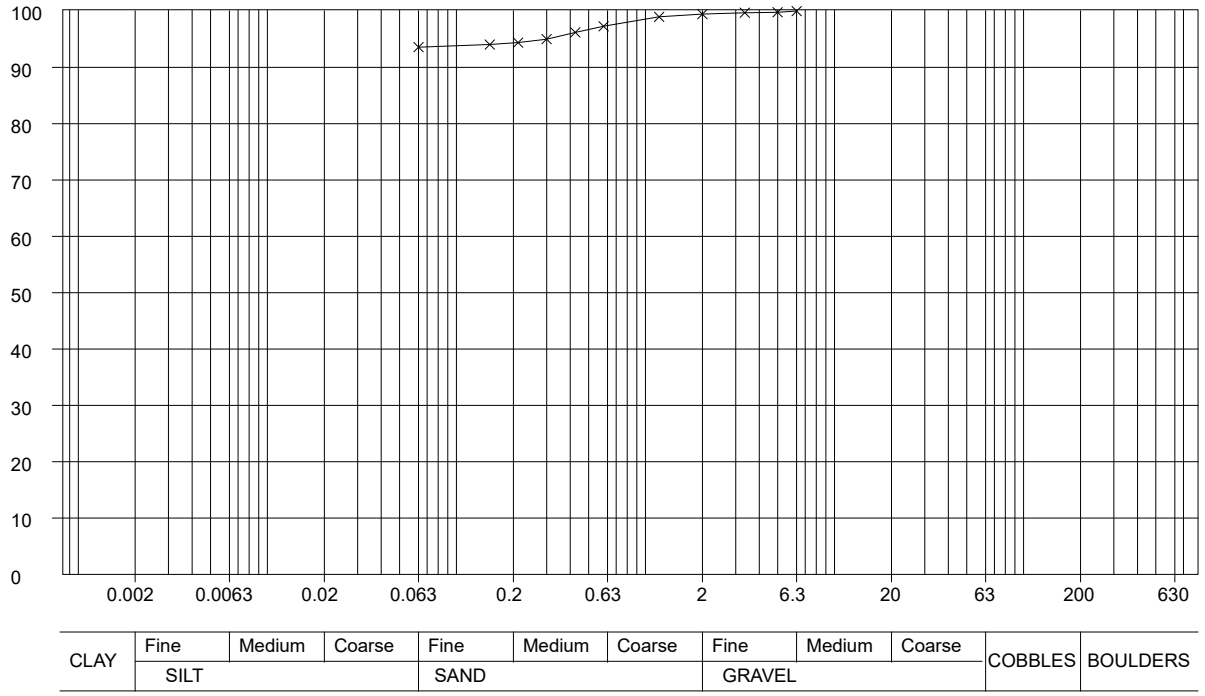
Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
BH01	5.00	B12	N/A	Brown gravelly sandy silty CLAY



Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	99
1.18 mm	99
600 µm	97
425 µm	96
300 µm	95
212 µm	94
150 µm	94
63 µm	94

Grading Analysis	
D85	-
D60	-
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	1%
Sand	6%
Silt/Clay	93%

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 7.4.5 Particle size tests

Preparation Details : Sample washed with no dispersant used, Oven Dried at 105 - 110°C

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

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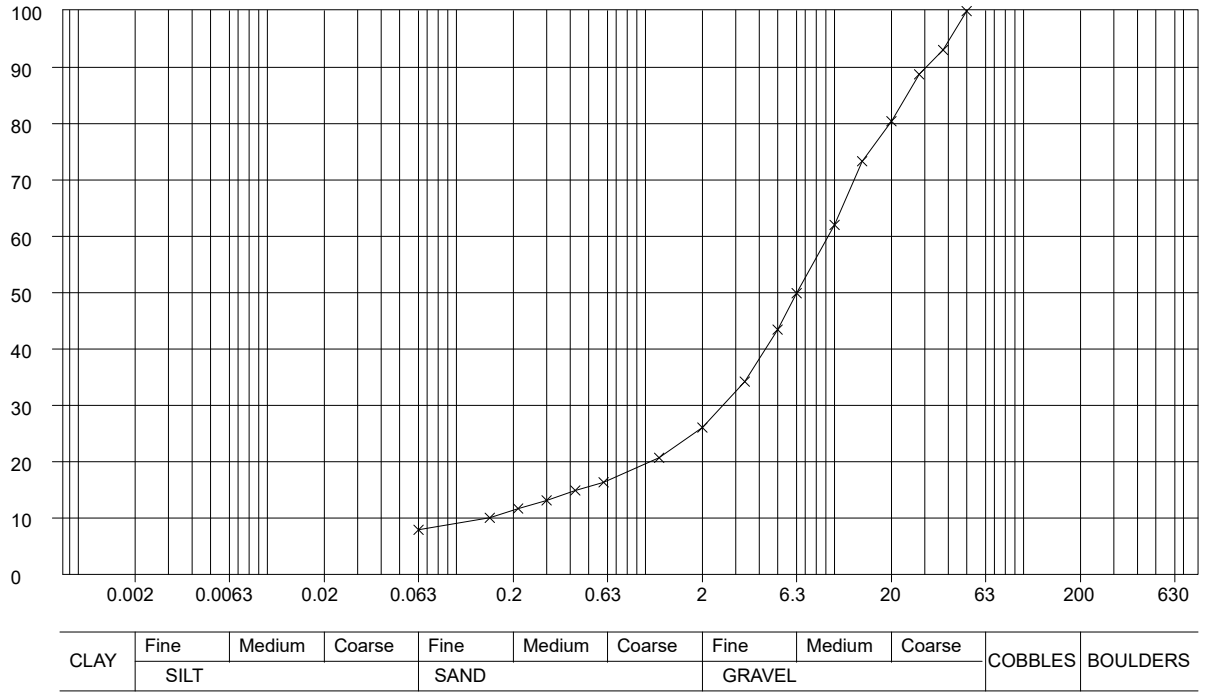
DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
BH01	9.00	B21	N/A	Brown silty clayey sandy GRAVEL



Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	93
28 mm	89
20 mm	80
14 mm	73
10 mm	62
6.3 mm	50
5 mm	43
3.35 mm	34
2 mm	26
1.18 mm	21
600 µm	16
425 µm	15
300 µm	13
212 µm	12
150 µm	10
63 µm	8

Grading Analysis	
D85	24.4 mm
D60	9.4 mm
D10	148.0 µm
Uniformity Coefficient	63.4

Particle Proportions	
Cobbles + Boulders	0%
Gravel	74%
Sand	18%
Silt/Clay	8%

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 7.4.5 Particle size tests

Preparation Details : Sample washed with no dispersant used, Oven Dried at 105 - 110°C

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

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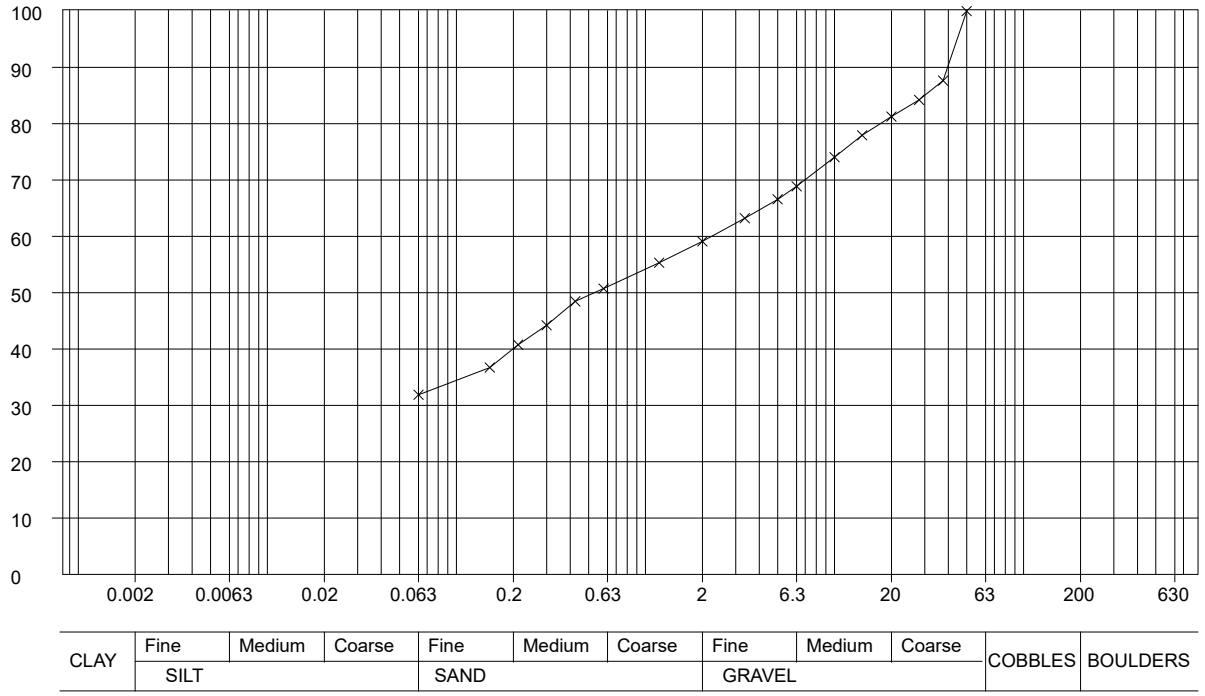
DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
BH03	10.50	B25	N/A	Brown sandy silty clayey GRAVEL



Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	88
28 mm	84
20 mm	81
14 mm	78
10 mm	74
6.3 mm	69
5 mm	67
3.35 mm	63
2 mm	59
1.18 mm	55
600 µm	51
425 µm	48
300 µm	44
212 µm	41
150 µm	37
63 µm	32

Grading Analysis	
D85	30.1 mm
D60	2.3 mm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	41%
Sand	27%
Silt/Clay	32%

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 7.4.5 Particle size tests

Preparation Details : Sample washed with no dispersant used, Oven Dried at 105 - 110°C

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

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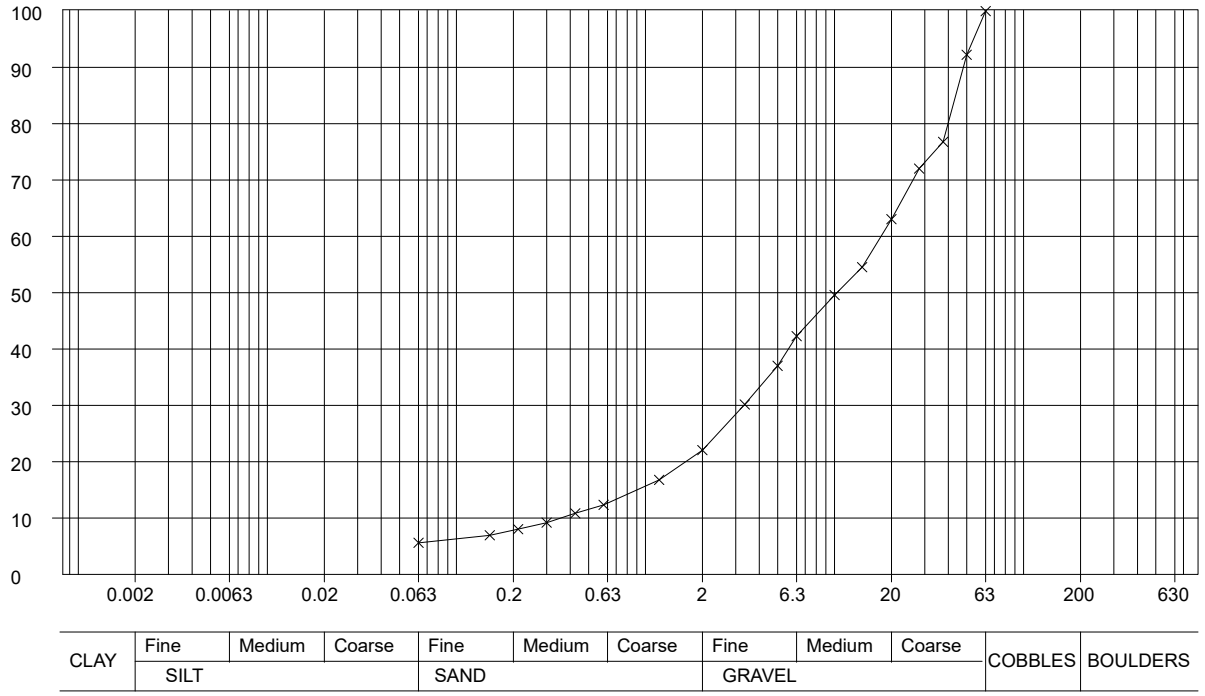
DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
BH04	11.30	B30	N/A	Brown silty clayey sandy GRAVEL includes cobbles



Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	92
37.5 mm	77
28 mm	72
20 mm	63
14 mm	55
10 mm	50
6.3 mm	42
5 mm	37
3.35 mm	30
2 mm	22
1.18 mm	17
600 µm	12
425 µm	11
300 µm	9
212 µm	8
150 µm	7
63 µm	6

Grading Analysis	
D85	44.2 mm
D60	17.8 mm
D10	361.0 µm
Uniformity Coefficient	49.4

Particle Proportions	
Cobbles + Boulders	2%
Gravel	76%
Sand	16%
Silt/Clay	6%

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 7.4.5 Particle size tests

Preparation Details : Sample washed with no dispersant used, Oven Dried at 105 - 110°C

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

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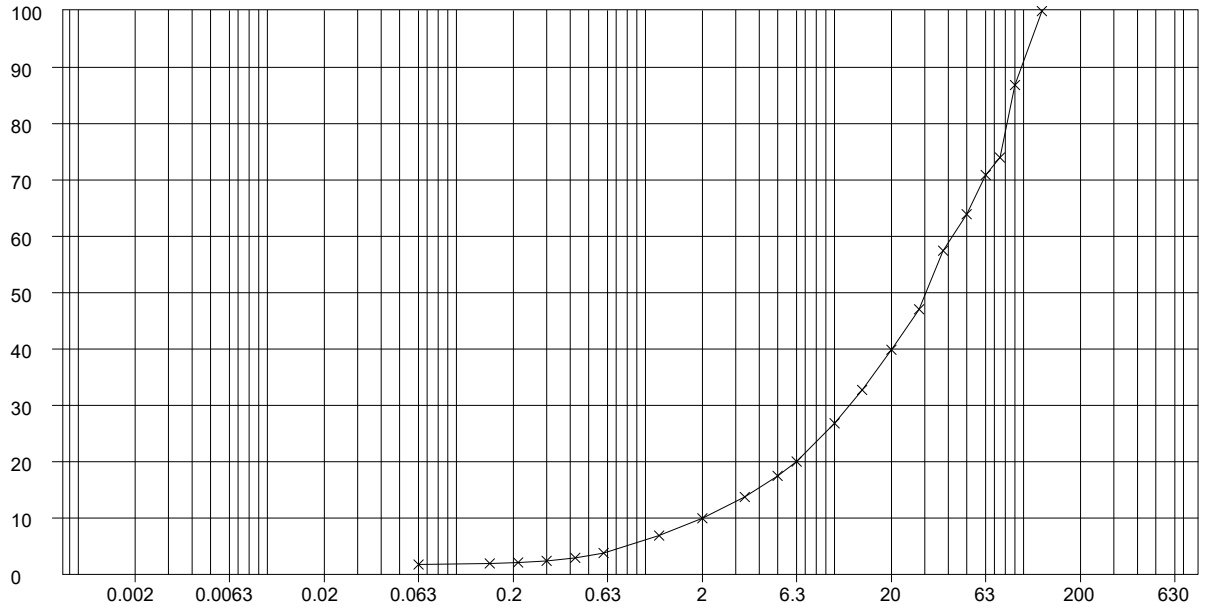
DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
BH05	13.50	B31	N/A	Brown silty clayey sandy GRAVEL includes cobbles



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Grading Analysis	
D85	87.8 mm
D60	42.4 mm
D10	2.0 mm
Uniformity Coefficient	21.1

Particle Proportions	
Cobbles + Boulders	31%
Gravel	59%
Sand	8%
Silt/Clay	2%

Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	87
75 mm	74
63 mm	71
50 mm	64
37.5 mm	57
28 mm	47
20 mm	40
14 mm	33
10 mm	27
6.3 mm	20
5 mm	17
3.35 mm	14
2 mm	10
1.18 mm	7
600 µm	4
425 µm	3
300 µm	2
212 µm	2
150 µm	2
63 µm	2

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 7.4.5 Particle size tests

Preparation Details : Sample washed with no dispersant used, Oven Dried at 105 - 110°C

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

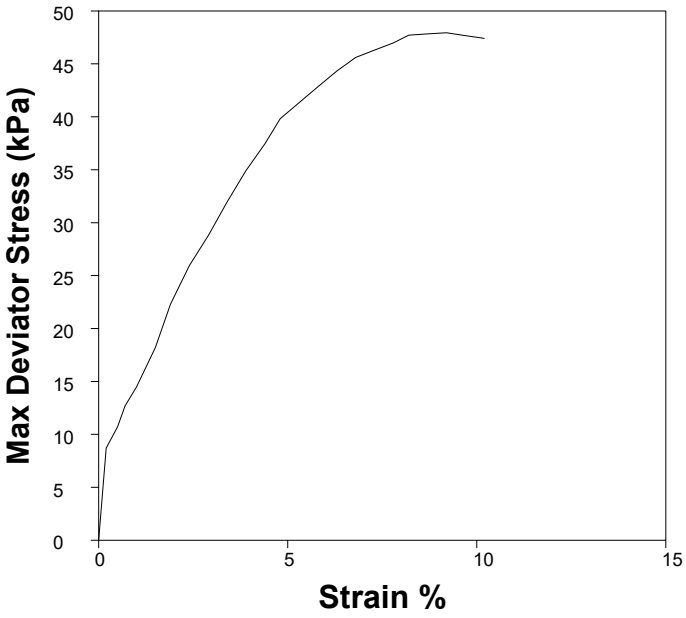
Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

DETERMINATION OF MOISTURE CONTENT, DENSITY AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

Borehole / Trial Pit	Depth (m)	Sample	Description
BH01	3.00	U8	Brown silty CLAY



Initial Specimen	Length of Sample (mm)	387
	Depth from top of sample (mm)	21
	Condition of Sample:	Undisturbed
	Orientation:	Vertical
Test Type		Single Stage
Length of Specimen (mm)		206.3
Diameter of Specimen (mm)		105.9
Moisture Content (%)		25
Bulk Density (Mg/m³)		1.85
Dry Density (Mg/m³)		1.48
Membrane Thickness (mm)		0.37
Membrane Type		Latex
Rate of Strain (%/min)		1.94
Test Results	Measured Cell Pressure (kPa)	60
	Strain at Failure (%)	9.2
	Membrane Correction (kPa)	0.7
	Corrected Deviator Stress (kPa)	47
	Shear Stress (kPa)	**24**
	Mode of Failure (B/P/C)	**Compound**

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of Moisture Content.
BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Remarks : Membrane Type: Latex

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

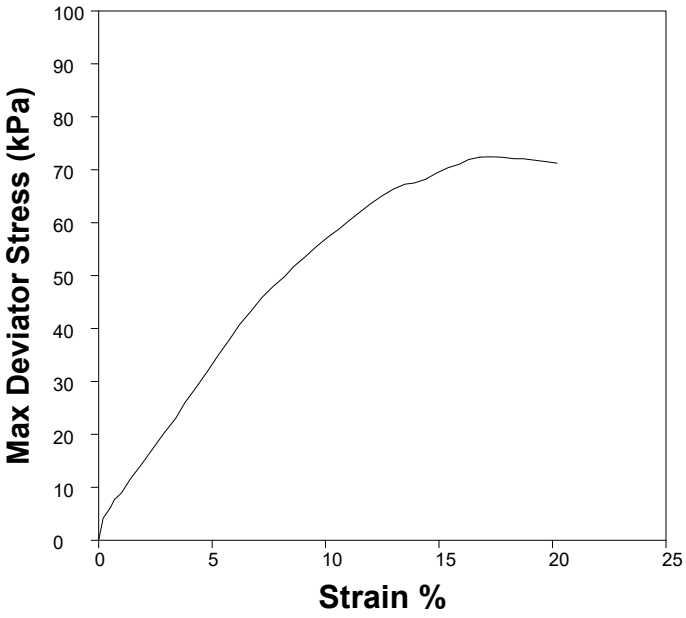
Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

DETERMINATION OF MOISTURE CONTENT, DENSITY AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

Borehole / Trial Pit	Depth (m)	Sample	Description
BH01	6.50	U15	Grey SILT



Initial Specimen	Length of Sample (mm)	301
	Depth from top of sample (mm)	21
	Condition of Sample:	Undisturbed
	Orientation:	Vertical
Test Type		Single Stage
Length of Specimen (mm)		208.2
Diameter of Specimen (mm)		104.3
Moisture Content (%)		122
Bulk Density (Mg/m³)		1.92
Dry Density (Mg/m³)		0.86
Membrane Thickness (mm)		0.31
Membrane Type		Latex
Rate of Strain (%/min)		1.92
Test Results	Measured Cell Pressure (kPa)	130
	Strain at Failure (%)	17.3
	Membrane Correction (kPa)	1.0
	Corrected Deviator Stress (kPa)	71
	Shear Stress (kPa)	**36**
	Mode of Failure (B/P/C)	**Plastic**

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of Moisture Content.
BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Remarks : Membrane Type: Latex

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

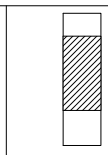
Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

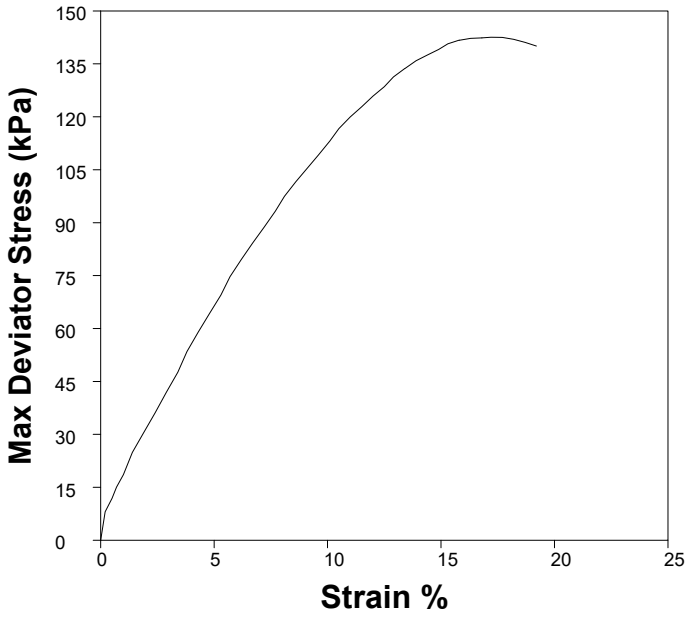
DETERMINATION OF MOISTURE CONTENT, DENSITY AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

Borehole / Trial Pit	Depth (m)	Sample	Description
BH02A	3.50	U11	Grey SILT



Initial Specimen		
	Length of Sample (mm)	371
	Depth from top of sample (mm)	22
	Condition of Sample:	Undisturbed
	Orientation:	Vertical

Test Type		Single Stage
Length of Specimen (mm)		208.7
Diameter of Specimen (mm)		106.2
Moisture Content (%)		26
Bulk Density (Mg/m³)		1.85
Dry Density (Mg/m³)		1.47
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.92
Test Results	Measured Cell Pressure (kPa)	70
	Strain at Failure (%)	17.2
	Membrane Correction (kPa)	1.1
	Corrected Deviator Stress (kPa)	141
	Shear Stress (kPa)	**71**
	Mode of Failure (B/P/C)	**Compound**



Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of Moisture Content.
BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Remarks : Membrane Type: Latex

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

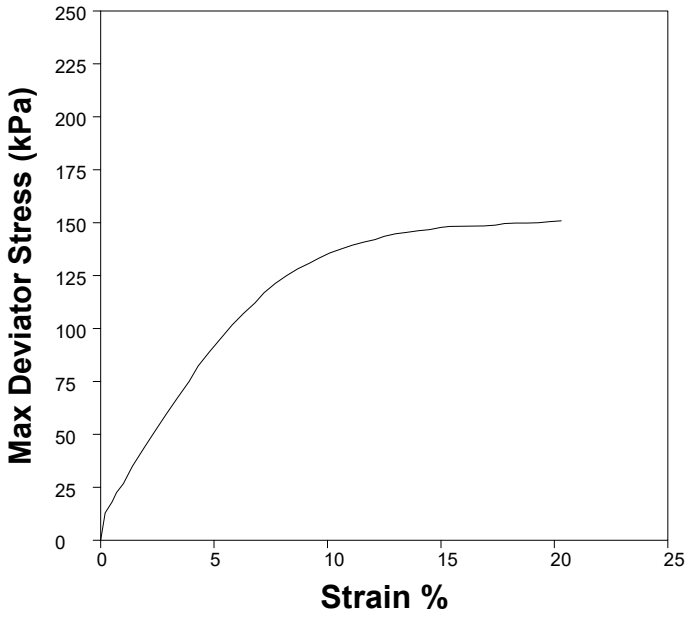
Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

DETERMINATION OF MOISTURE CONTENT, DENSITY AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

Borehole / Trial Pit	Depth (m)	Sample	Description
BH03	2.00	U7	Brown silty CLAY



Initial Specimen	Length of Sample (mm)	452
	Depth from top of sample (mm)	53
	Condition of Sample:	Undisturbed
	Orientation:	Vertical
Test Type		Single Stage
Length of Specimen (mm)		207.4
Diameter of Specimen (mm)		101.5
Moisture Content (%)		30
Bulk Density (Mg/m³)		2.03
Dry Density (Mg/m³)		1.57
Membrane Thickness (mm)		0.31
Membrane Type		Latex
Rate of Strain (%/min)		1.93
Test Results	Measured Cell Pressure (kPa)	40
	Strain at Failure (%)	20.3
	Membrane Correction (kPa)	1.2
	Corrected Deviator Stress (kPa)	150
	Shear Stress (kPa)	**75**
	Mode of Failure (B/P/C)	**Compound**

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of Moisture Content.
BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Remarks : Membrane Type: Latex

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Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

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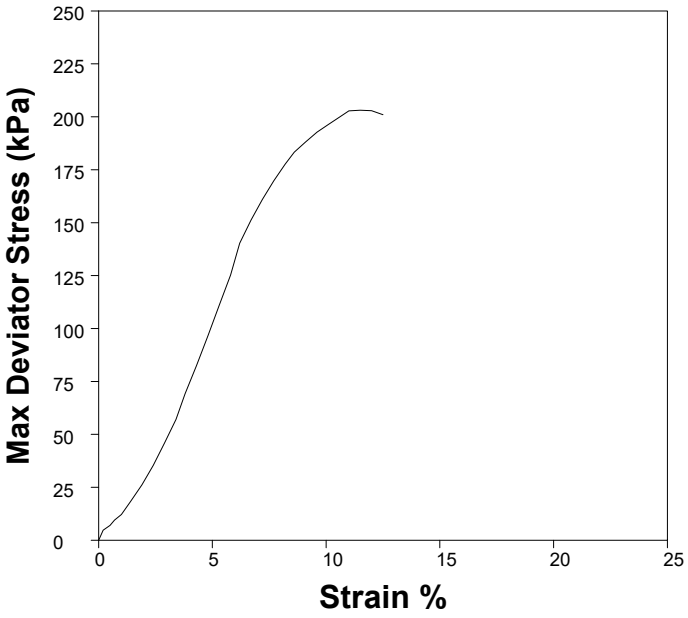
DETERMINATION OF MOISTURE CONTENT, DENSITY AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

Borehole / Trial Pit	Depth (m)	Sample	Description
BH03	9.50	U22	Grey silty CLAY



Initial Specimen	Length of Sample (mm)	378
	Depth from top of sample (mm)	71
	Condition of Sample:	Undisturbed
	Orientation:	Vertical
Test Type		Single Stage
Length of Specimen (mm)		208.2
Diameter of Specimen (mm)		104.6
Moisture Content (%)		21
Bulk Density (Mg/m³)		2.04
Dry Density (Mg/m³)		1.68
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.92
Test Results	Measured Cell Pressure (kPa)	180
	Strain at Failure (%)	11.5
	Membrane Correction (kPa)	0.8
	Corrected Deviator Stress (kPa)	202
	Shear Stress (kPa)	**101**
	Mode of Failure (B/P/C)	**Compound**

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of Moisture Content.
BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Remarks : Membrane Type: Latex

IAN FARMER ASSOCIATES

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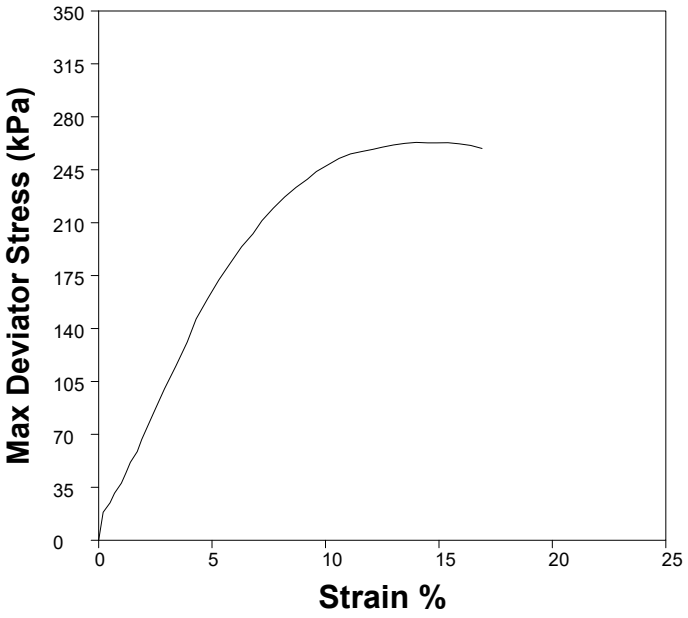
Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

Job Number 41793

DETERMINATION OF MOISTURE CONTENT, DENSITY AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

Borehole / Trial Pit	Depth (m)	Sample	Description
BH04	1.50	U5	Brown silty CLAY



Initial Specimen	Length of Sample (mm)	453
	Depth from top of sample (mm)	50
	Condition of Sample:	Undisturbed
	Orientation:	Vertical
Test Type		Single Stage
Length of Specimen (mm)		207.4
Diameter of Specimen (mm)		102.2
Moisture Content (%)		28
Bulk Density (Mg/m³)		2.03
Dry Density (Mg/m³)		1.59
Membrane Thickness (mm)		0.27
Membrane Type		Latex
Rate of Strain (%/min)		1.93
Test Results	Measured Cell Pressure (kPa)	30
	Strain at Failure (%)	14
	Membrane Correction (kPa)	0.8
	Corrected Deviator Stress (kPa)	262
	Shear Stress (kPa)	**131**
	Mode of Failure (B/P/C)	**Compound**

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of Moisture Content.
BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Remarks : Membrane Type: Latex

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

Site : Kronospan Log Yard Improvements

Client : Kronospan Limited

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ONE-DIMENSIONAL CONSOLIDATION TEST

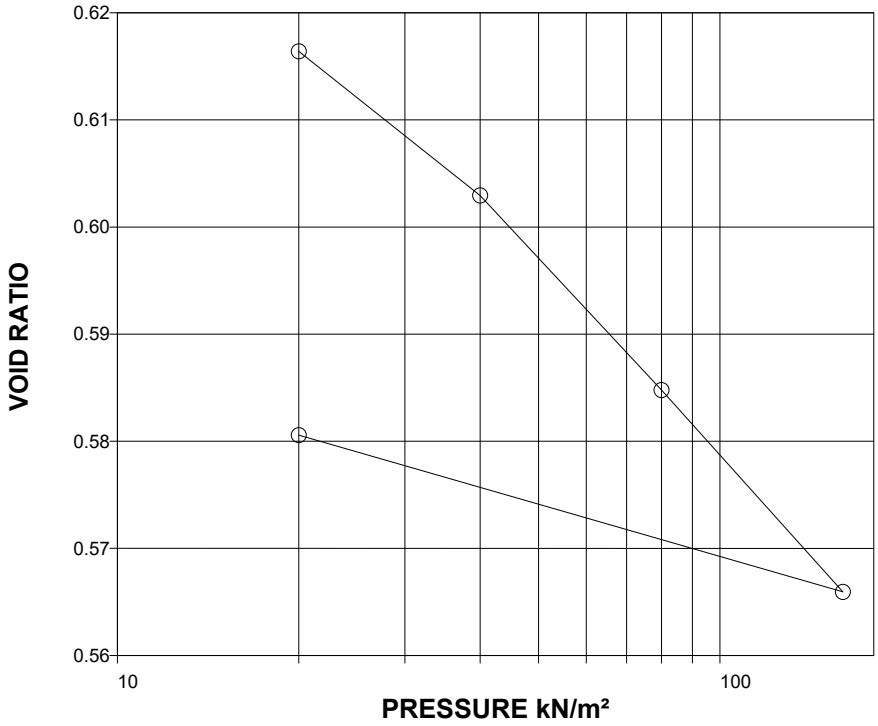
Borehole / Trial Pit	Depth (m)	Sample	Description
BH03	2.00	U7	Brown silty CLAY

Initial Specimen

Length of Sample (mm)	450
Depth from top of sample (mm)	50
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.02
Particle Density (Mg/m³)	2.65 (Assumed)
Swelling Pressure (kN/m²)	
Lab Temp (°C)	20

	Inital	Final
Height (mm)	19.69	18.77
Wet Weight (g)	178.12	176.17
Moisture Content (%)	29	27
Bulk Density (Mg/m³)	2.05	2.12
Dry Density (Mg/m³)	1.60	1.68
Void Ratio	0.656	0.577
Degree of Saturation (%)	115.13	121.71



Pressure kN/m²	m_v m²/MN	c_v m²/year	Void Ratio
20	1.2	20	0.616
40	0.45	7.7	0.603
80	0.30	9.0	0.585
160	0.19	9.3	0.566
20	0.10	22	0.581

Pressure kN/m²	m_v m²/MN	c_v m²/year	Void Ratio

Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

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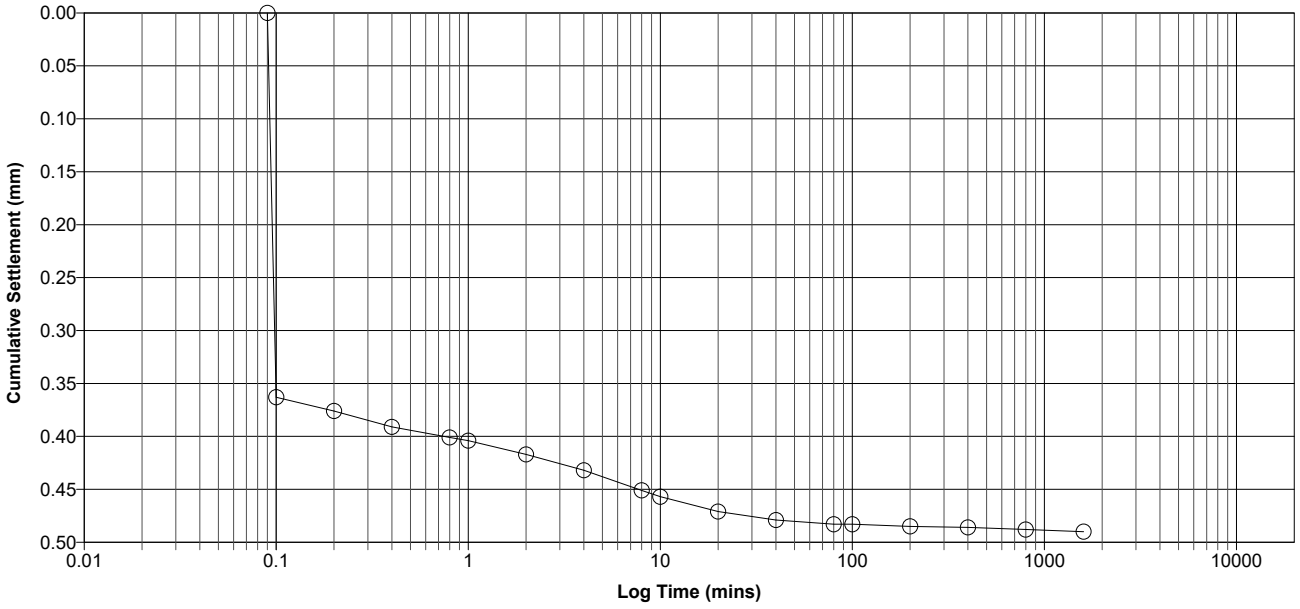
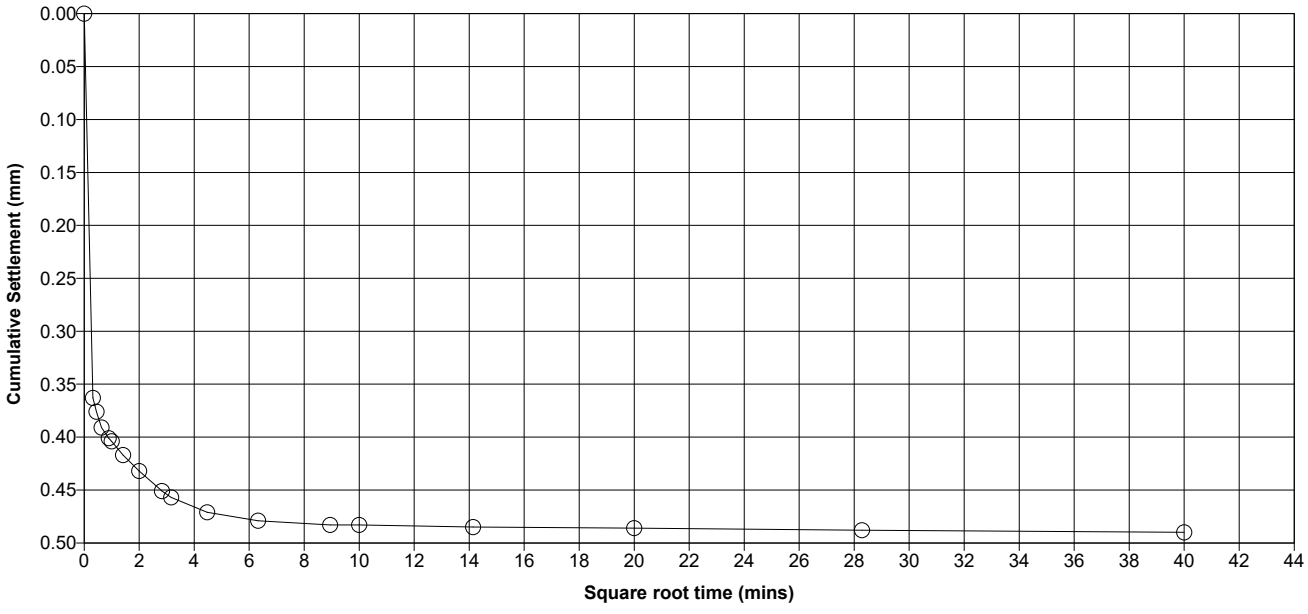
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH03	2.00	U7	1	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

Laboratory Test Report - 41793/1

Site : Kronospan Log Yard Improvements

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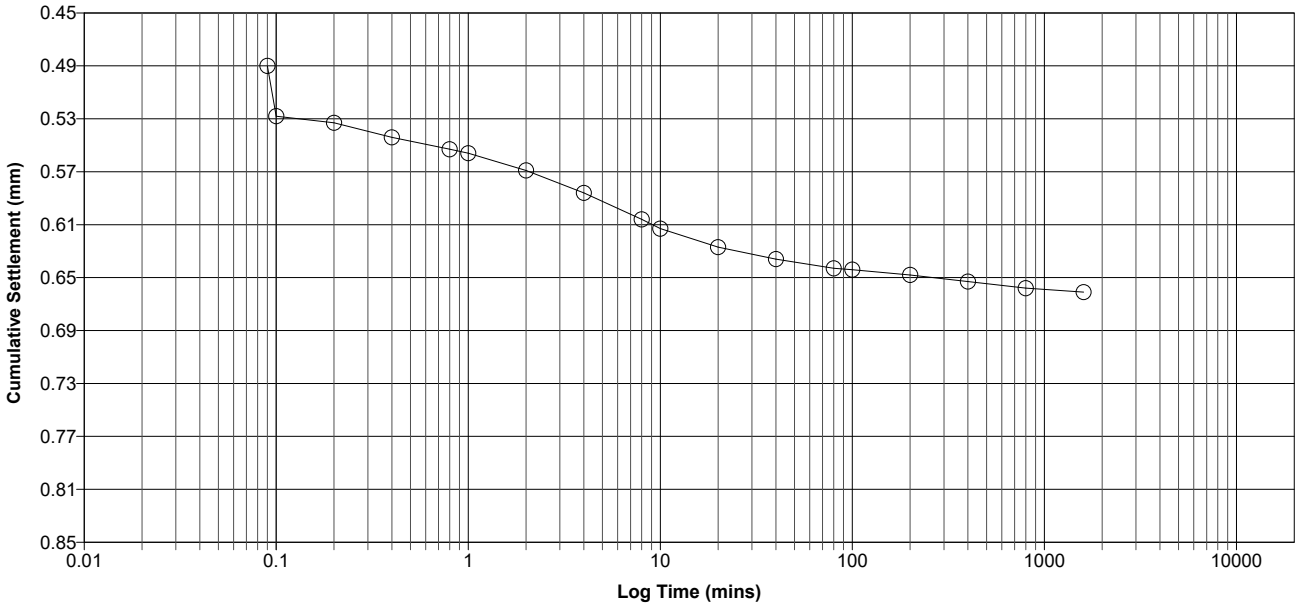
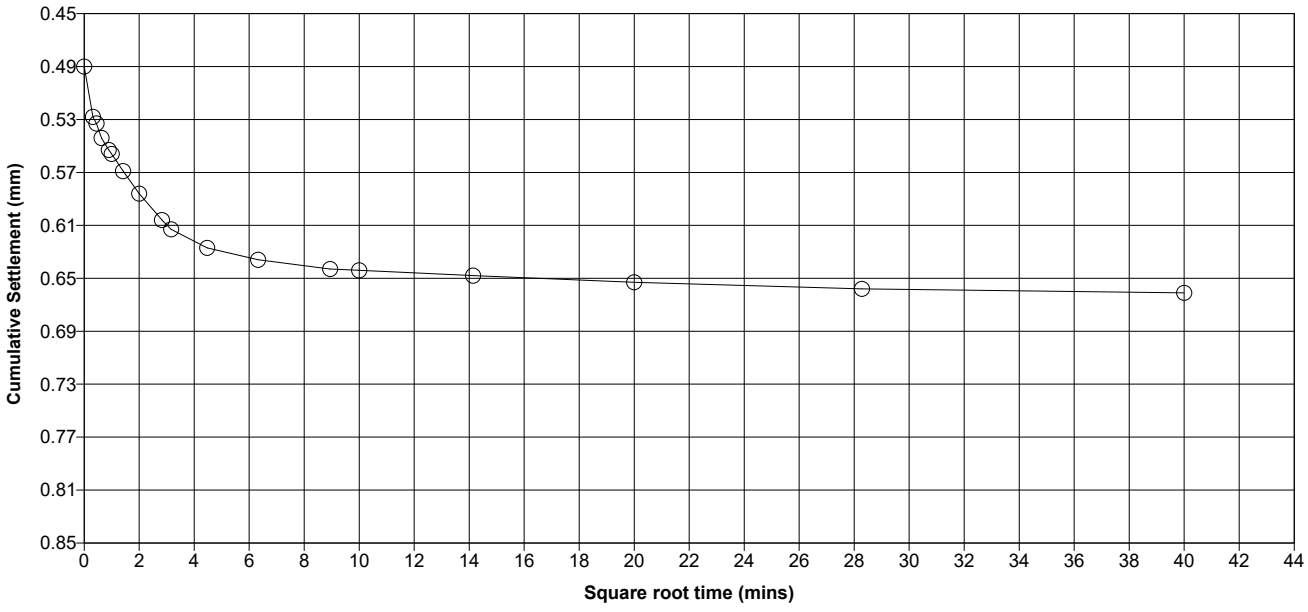
Job Number 41793

ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH03	2.00	U7	2	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

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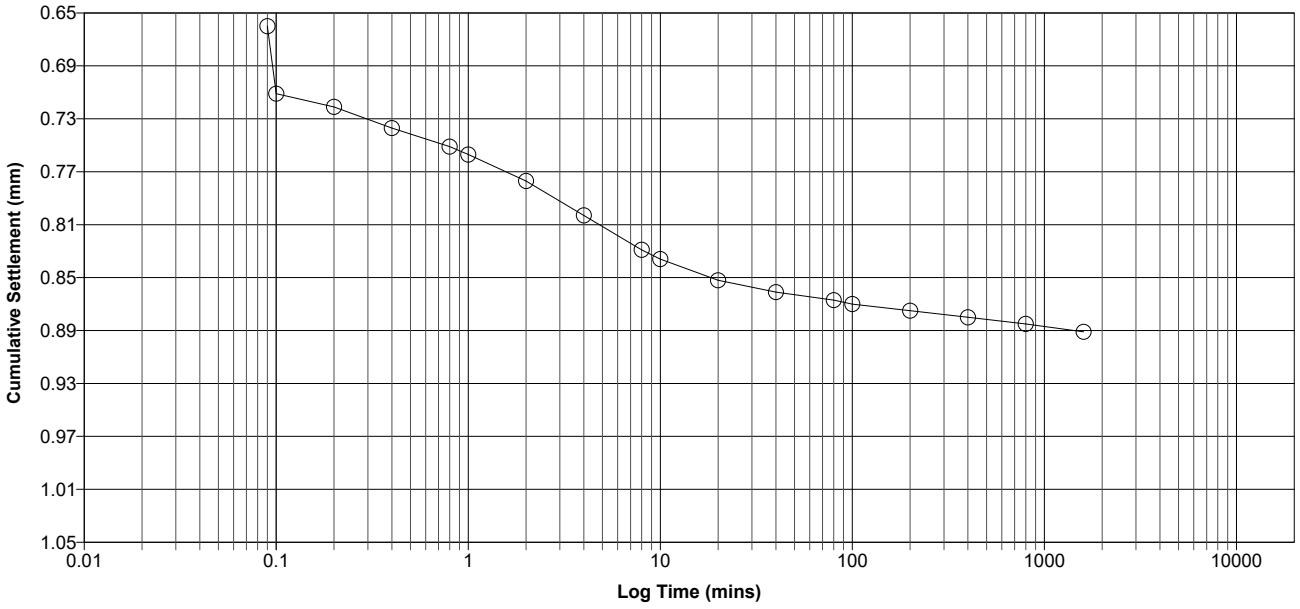
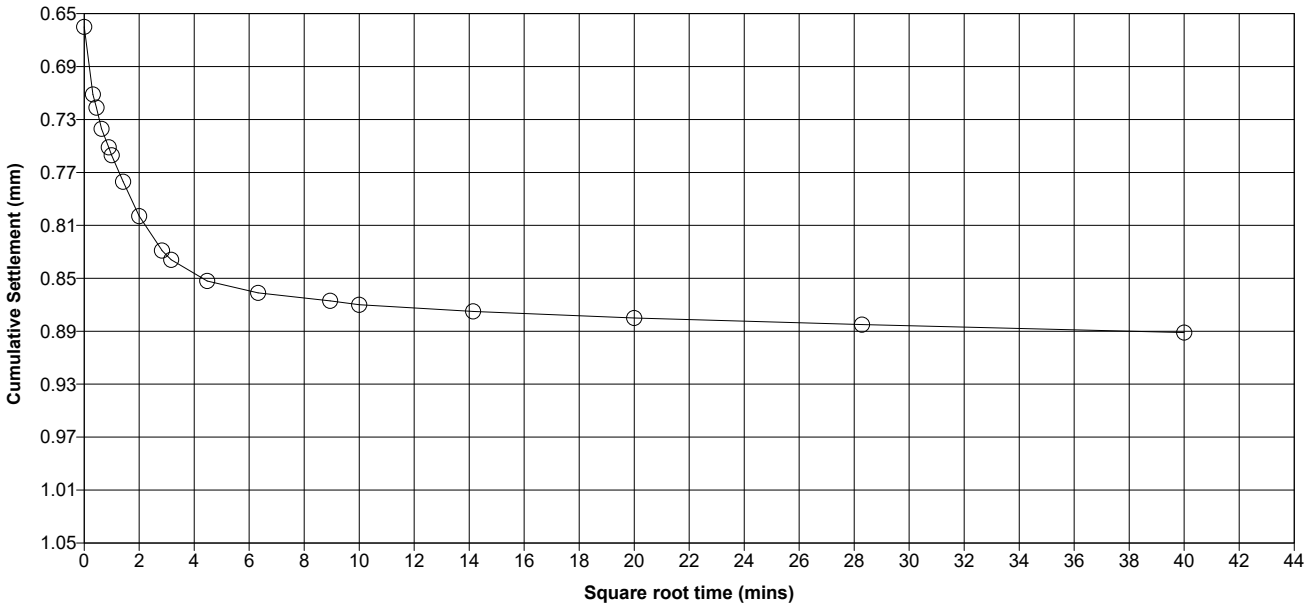
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH03	2.00	U7	3	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

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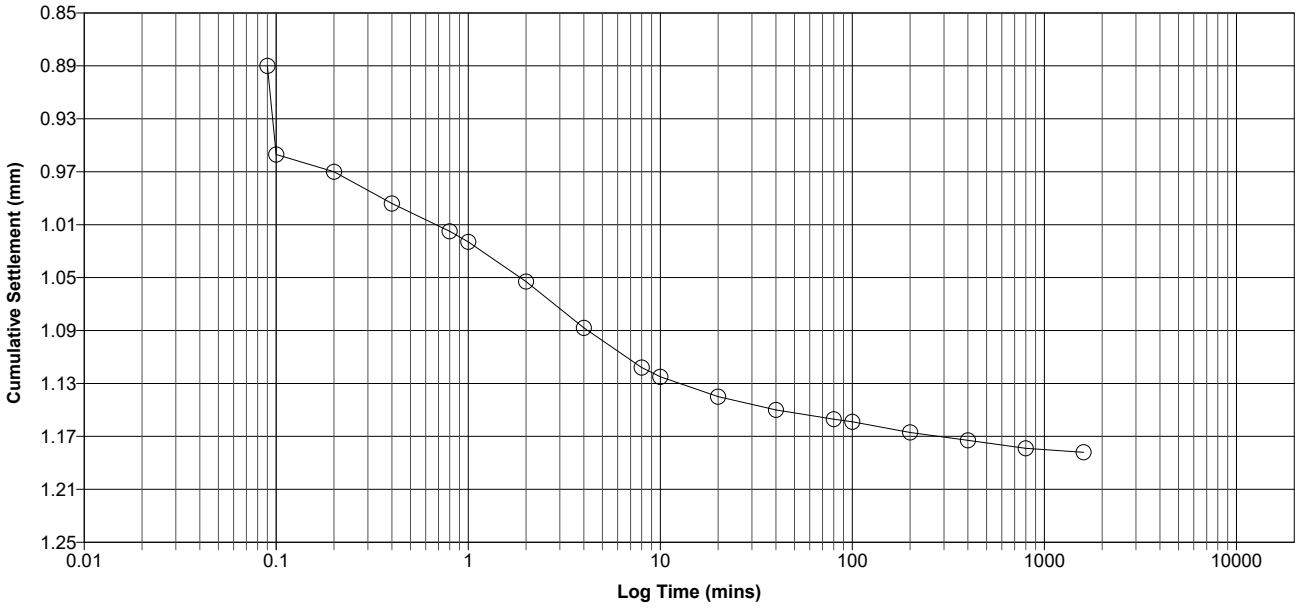
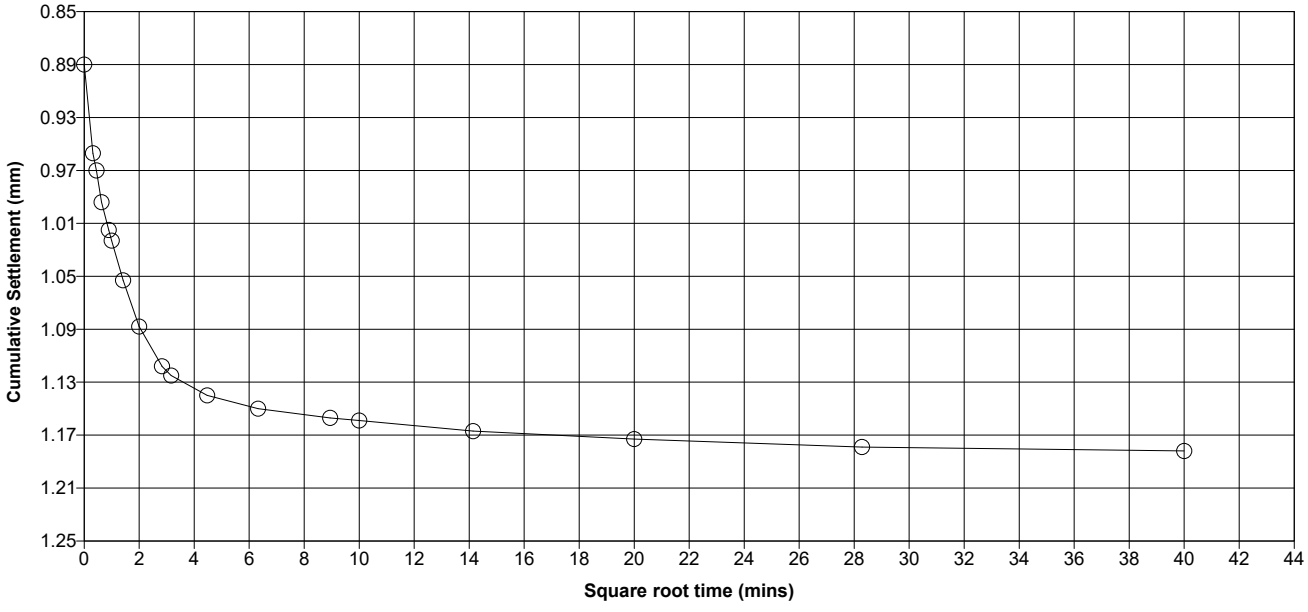
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH03	2.00	U7	4	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

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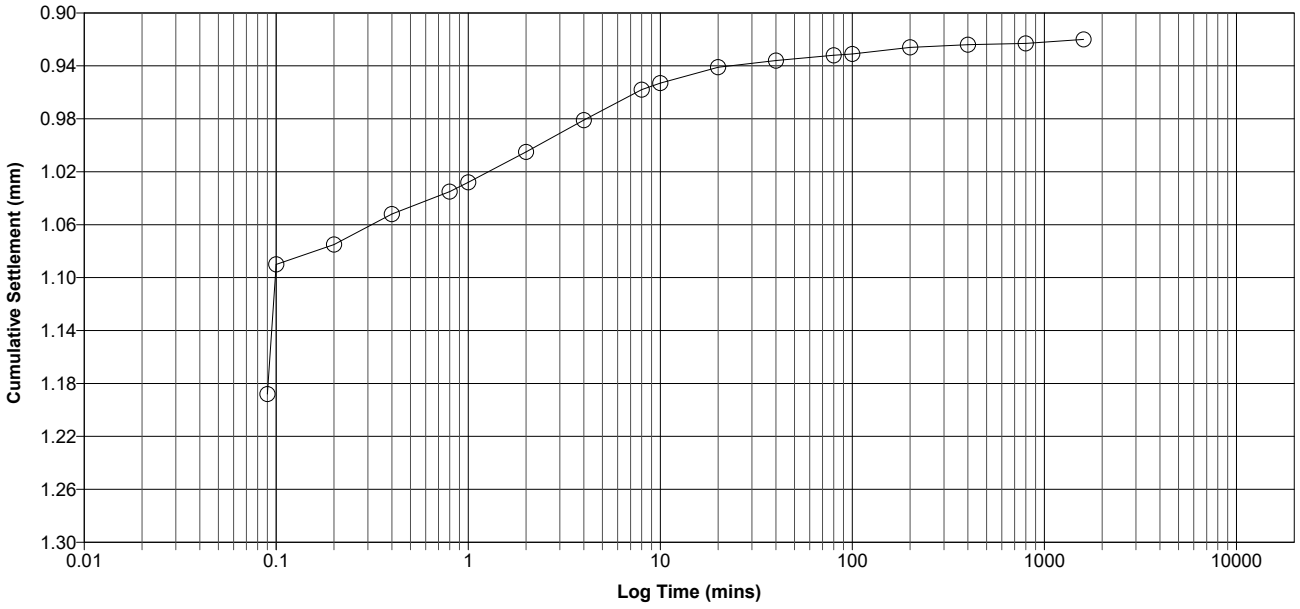
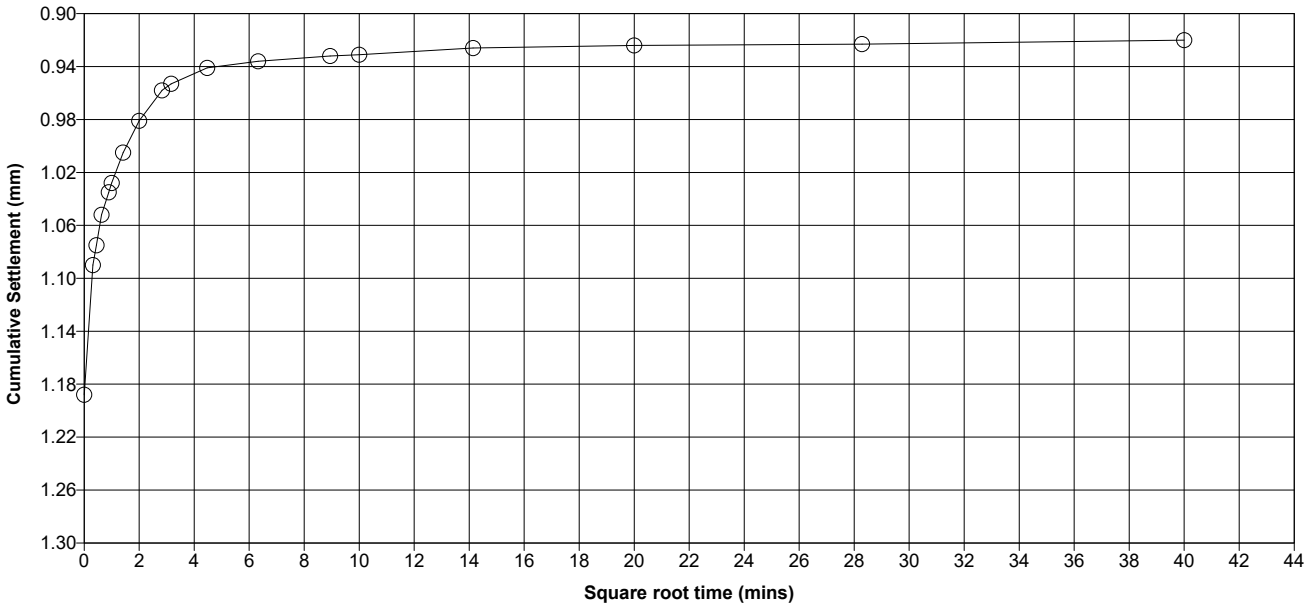
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH03	2.00	U7	5	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

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Site : Kronospan Log Yard Improvements

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ONE-DIMENSIONAL CONSOLIDATION TEST

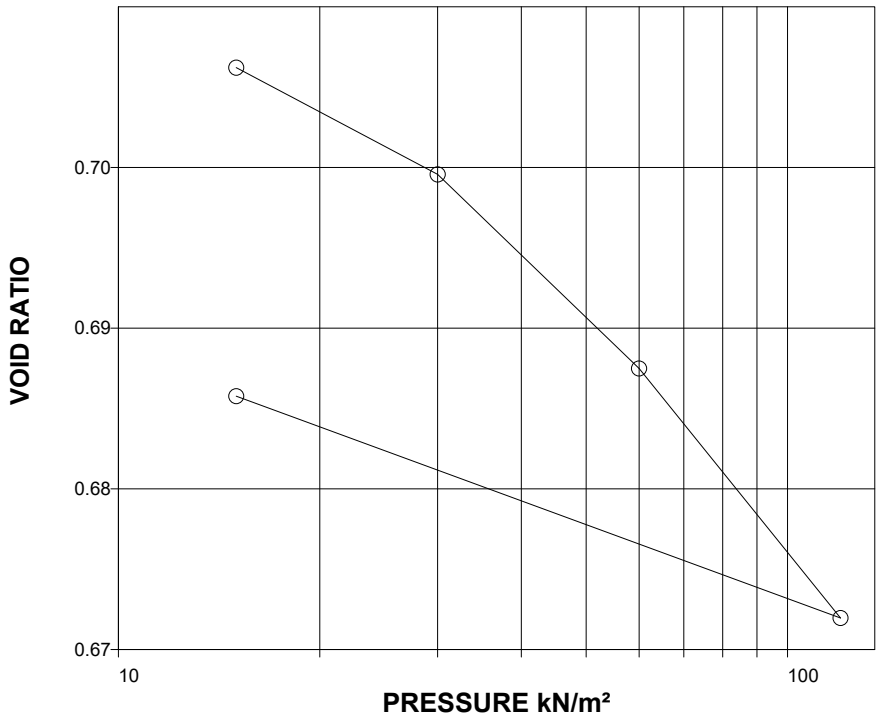
Borehole / Trial Pit	Depth (m)	Sample	Description
BH04	1.50	U5	Brown silty CLAY

Initial Specimen

Length of Sample (mm)	450
Depth from top of sample (mm)	50
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.12
Particle Density (Mg/m³)	2.65 (Assumed)
Swelling Pressure (kN/m²)	
Lab Temp (°C)	20

	Inital	Final
Height (mm)	19.82	19.53
Wet Weight (g)	171.74	172.73
Moisture Content (%)	26	29
Bulk Density (Mg/m³)	1.96	2.00
Dry Density (Mg/m³)	1.55	1.55
Void Ratio	0.710	0.710
Degree of Saturation (%)	97.79	106.75



Pressure kN/m²	m_v m²/MN	c_v m²/year	Void Ratio
15	0.17	77	0.706
30	0.30	38	0.700
60	0.26	30	0.687
120	0.17	47	0.672
15	0.10	33	0.686

Pressure kN/m²	m_v m²/MN	c_v m²/year	Void Ratio

Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

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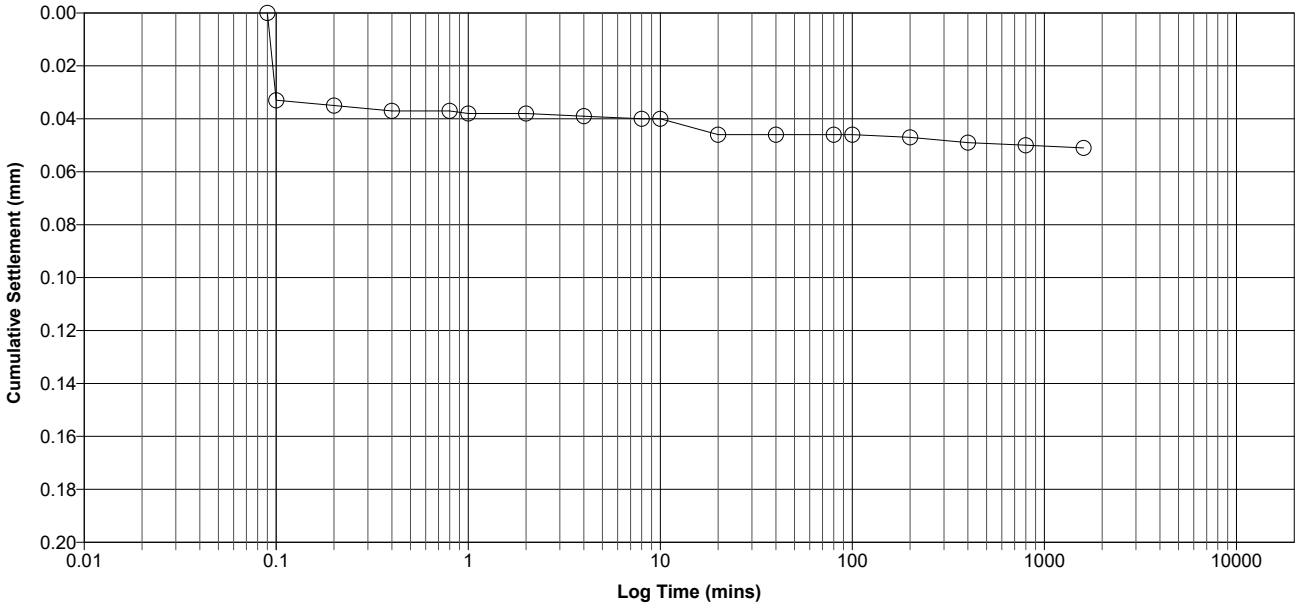
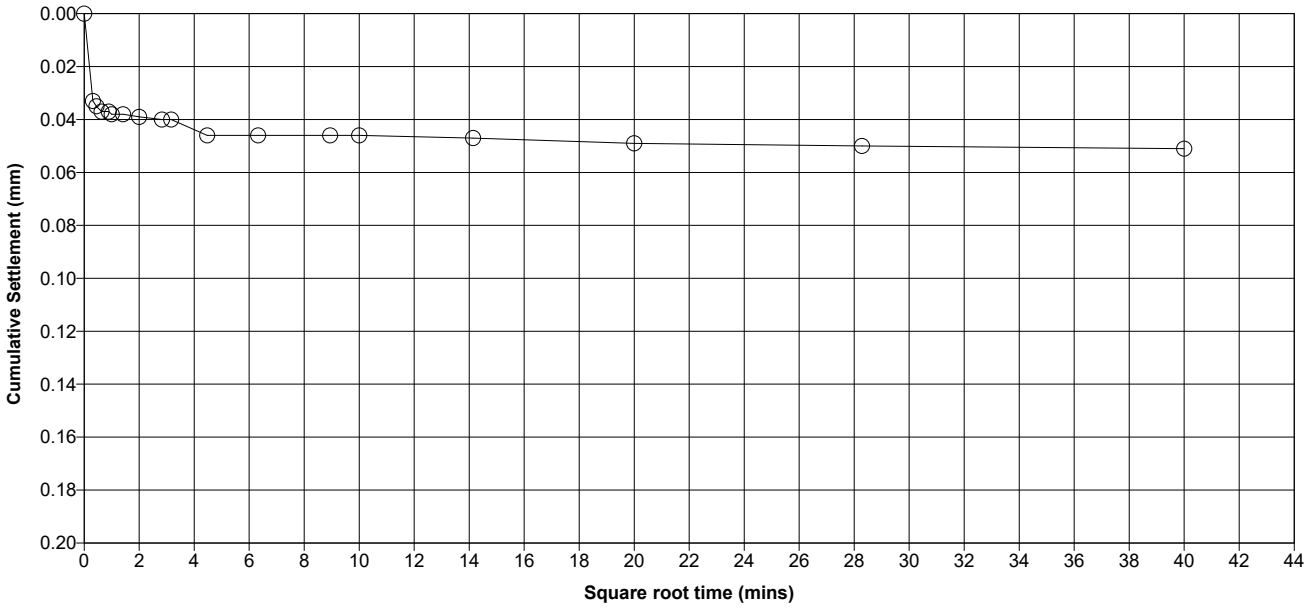
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH04	1.50	U5	1	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

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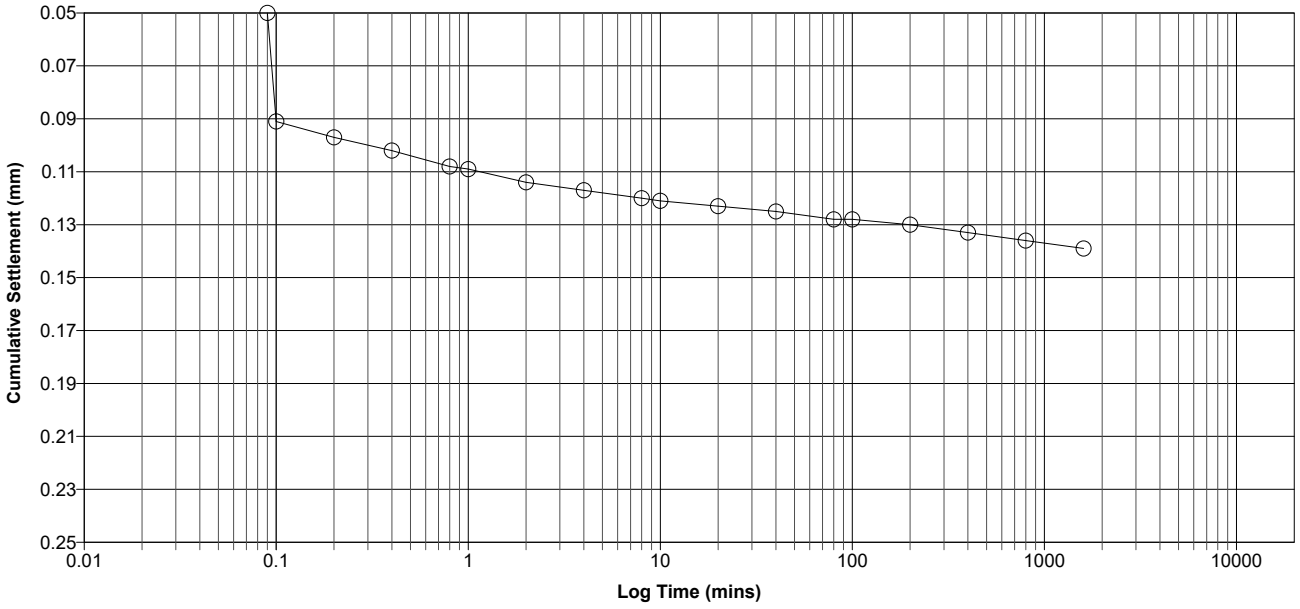
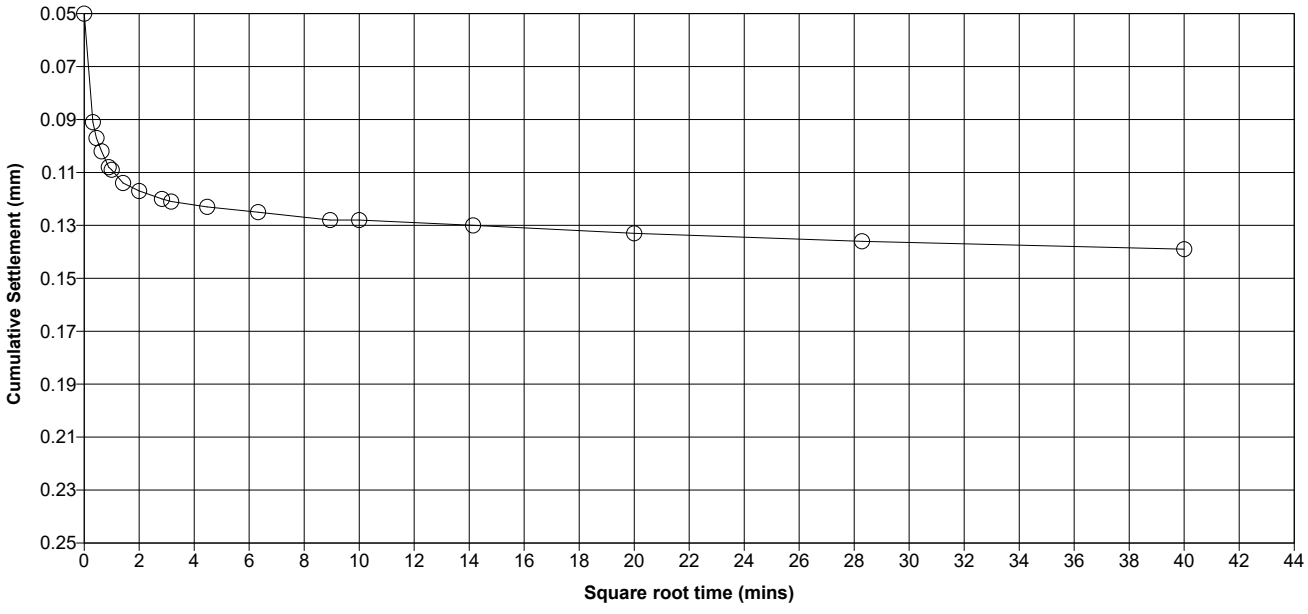
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH04	1.50	U5	2	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

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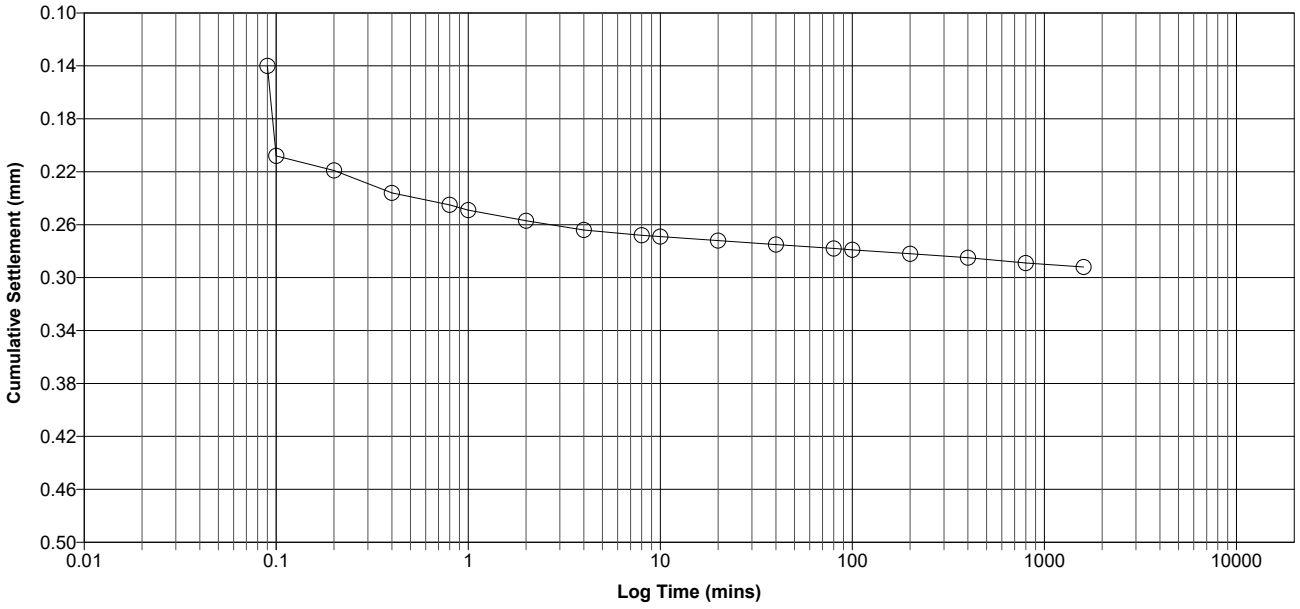
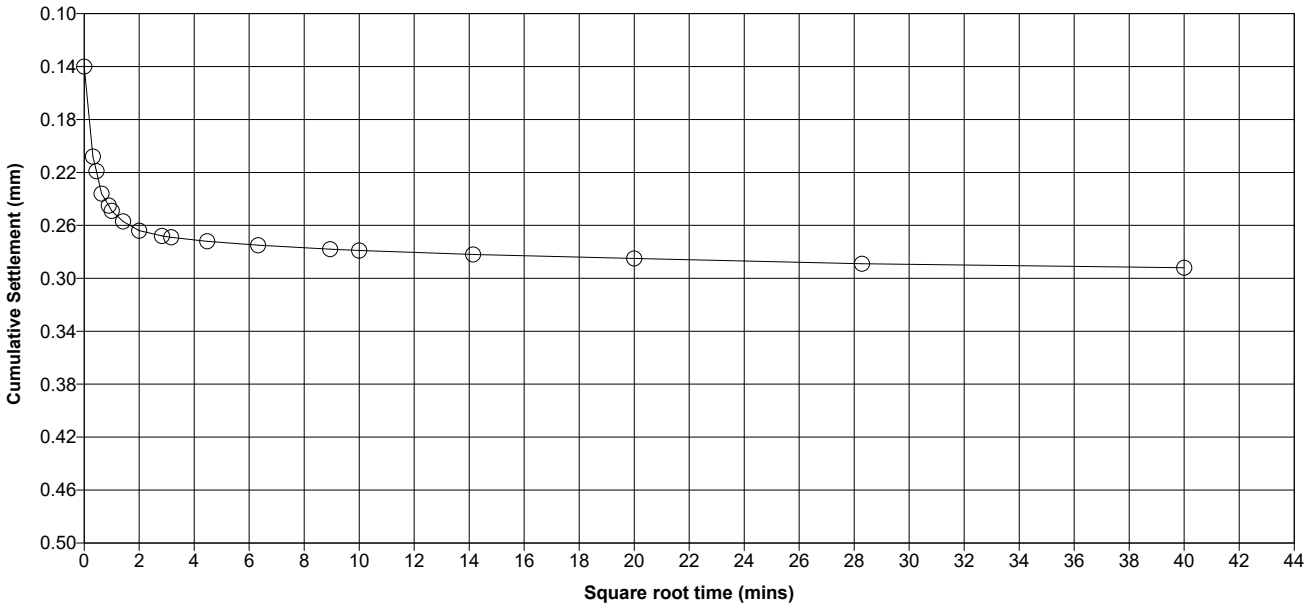
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH04	1.50	U5	3	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

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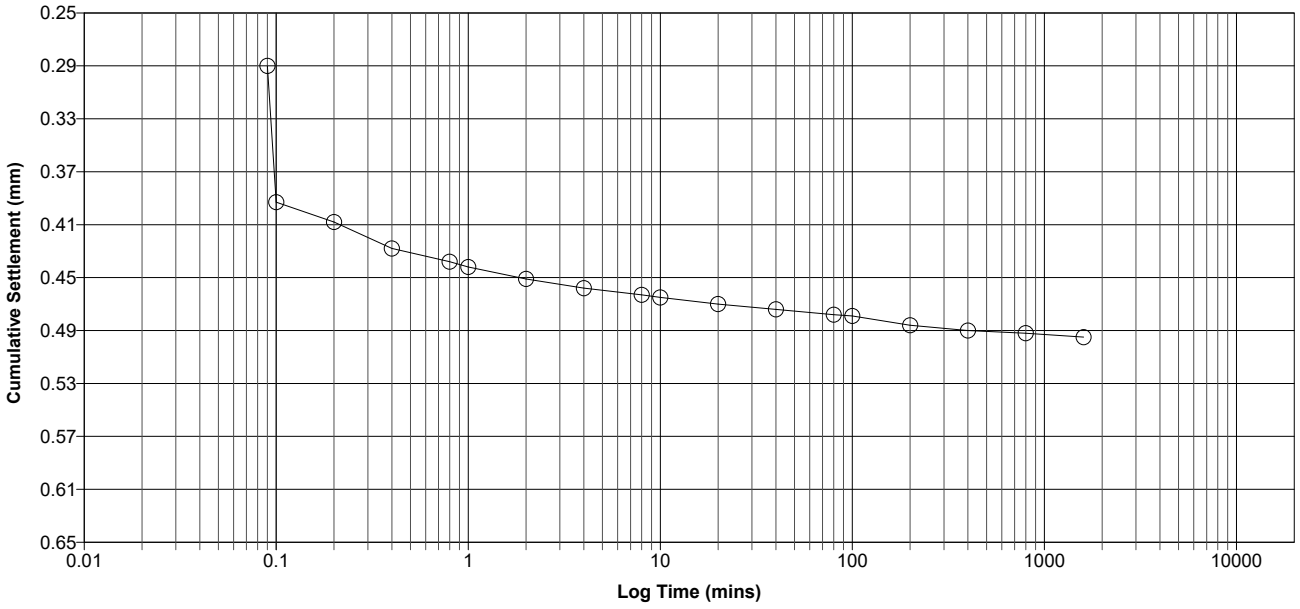
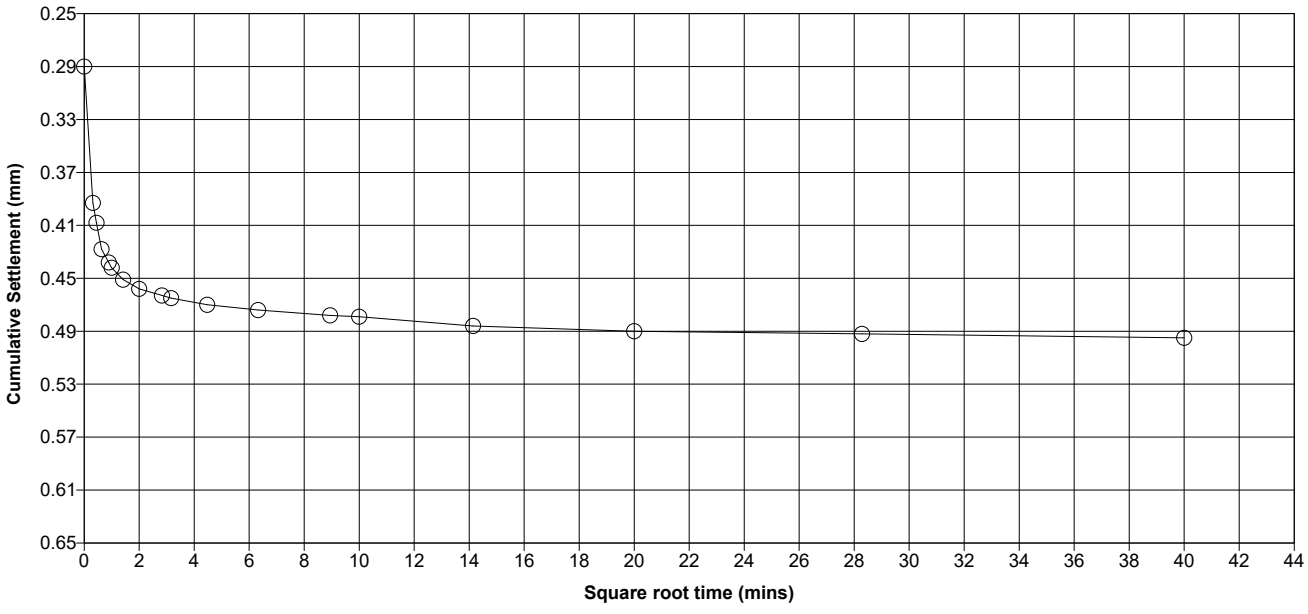
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH04	1.50	U5	4	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

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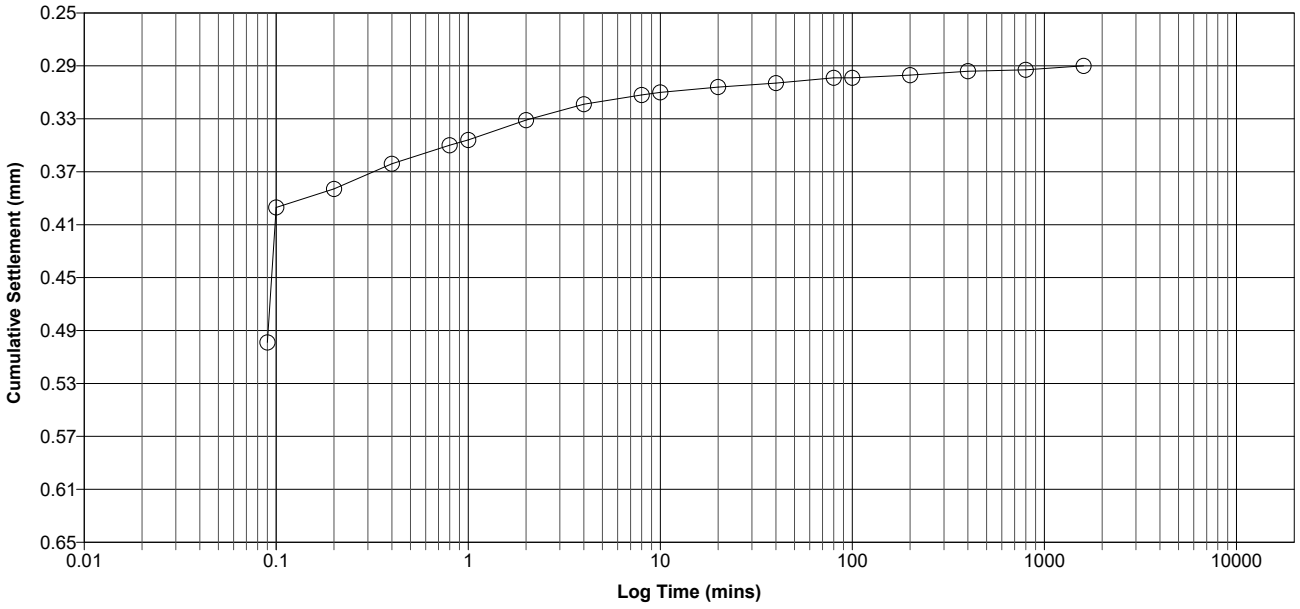
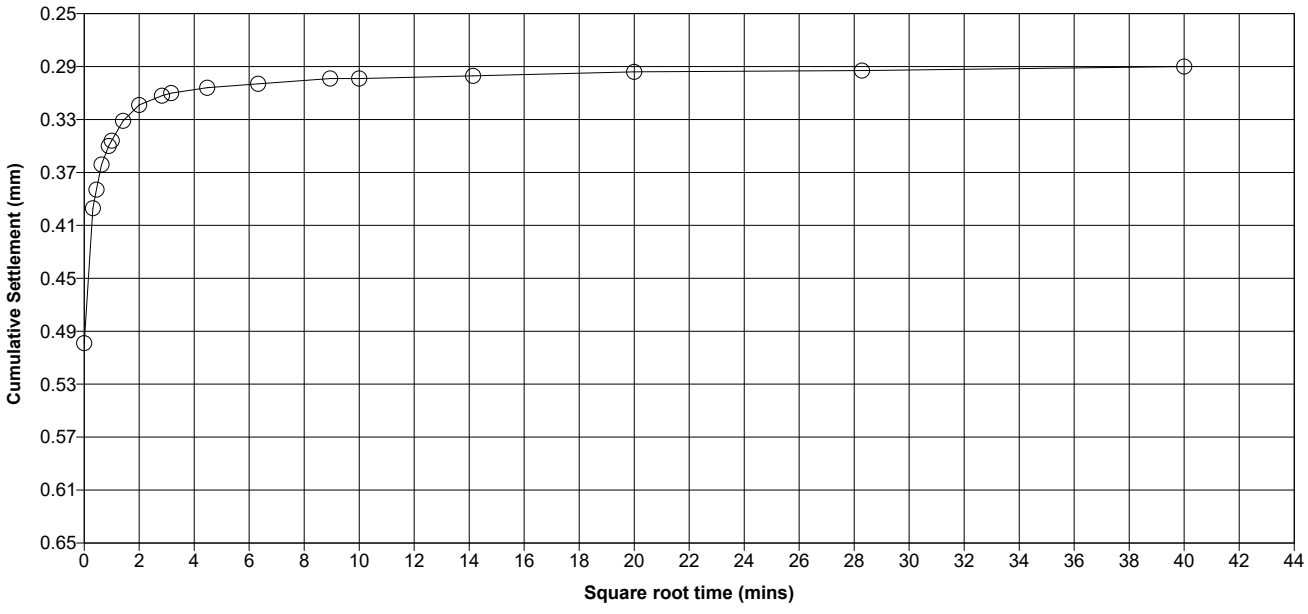
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH04	1.50	U5	5	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Square-root-time method

Remarks :Square-root-time

IAN FARMER ASSOCIATES

Test Report : **41793/1**

Site : Kronospan Log Yard Improvements
Job Number : 41793
Originating Client : Kronospan Limited

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

The following tests contained within this report are not UKAS Accredited.

Date of Issued : 03/12/2015

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 15-52258

08-Dec-15

Client	Ian Farmer Associates 4 Faraday Close District 15 Pattinson North Industrial Est Washington Tyne & Wear NE38 8QJ
Our Reference	15-52258
Client Reference	41793
Order No	(not supplied)
Contract Title	KRONDSPAN
Description	11 Soil samples.
Date Received	02-Dec-15
Date Started	03-Dec-15
Date Completed	08-Dec-15
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 15-52258
Client Ref 41793
Contract Title KRONDSPAN

			Lab No	909766	909767	909768	909769	909770	909771	909772	909773	909774	909775
			Sample ID	BH01	BH01	BH01	BH02A	BH02A	BH02A	BH03	BH03	BH04	BH04
			Depth	1.00	5.00	9.00	5.00	2.50	10.50	2.50	5.00	0.50	5.50
			Other ID	3	13	21	1	8	29	8	14	1	15
			Sample Type	D	D	B	B	D	B	D	D	B	D
			Sampling Date	22/10/2015	22/10/2015	22/10/2015	23/10/2015	23/10/2015	23/10/2015	19/10/2015	20/10/2015	19/10/2015	20/10/2015
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**										
Inorganics													
pH	DETSC 2008#			8.2	7.6	8.4	9.4	7.7	8.4	8.1	8.3	8.9	8.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	120	150	46	64	16	26	57	160	180	140

Key: # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-52258
Client Ref 41793
Contract Title KRONDSPAN

Lab No	909776
Sample ID	BH05
Depth	1.50
Other ID	3
Sample Type	B
Sampling Date	03/11/2015
Sampling Time	n/s

Test	Method	LOD	Units	
Inorganics				
pH	DETSC 2008#			7.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	170

Key: # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 15-52258
Client Ref 41793
Contract KRONDSPAN

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
909766	BH01 1.00 SOIL	22/10/15	PT 1L		
909767	BH01 5.00 SOIL	22/10/15	PT 1L		
909768	BH01 9.00 SOIL	22/10/15	PT 1L		
909769	BH02A 5.00 SOIL	23/10/15	PT 1L		
909770	BH02A 2.50 SOIL	23/10/15	PT 1L		
909771	BH02A 10.50 SOIL	23/10/15	PT 500ml		
909772	BH03 2.50 SOIL	19/10/15	PT 1L		
909773	BH03 5.00 SOIL	20/10/15	PT 1L		
909774	BH04 0.50 SOIL	19/10/15	PT 1L		
909775	BH04 5.50 SOIL	20/10/15	PT 1L		
909776	BH05 1.50 SOIL	03/11/15	PT 1L		

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

APPENDIX 4

CHEMICAL TESTS

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Report Number: 524697-1

Date of Report: 25-Nov-2015

Customer: Ian Farmer Associates
17 Rivington Court
Warrington
Cheshire
WA1 4RT

Customer Contact: Ms Hannah Hadwin

Customer Job Reference: 41793
Customer Purchase Order: 49648
Customer Site Reference: Kronospan
Date Job Received at SAL: 11-Nov-2015
Date Analysis Started: 12-Nov-2015
Date Analysis Completed: 25-Nov-2015

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with Section 25 of the SAL Quality Manual

UKAS TESTING 1549

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Bianca Prince
Customer Service Manager

Issued by :
Bianca Prince
Customer Service Manager

Waste Acceptance Criteria

Customer Sample Reference : BH01
SAL Sample Reference : 524697 001
Project Site : Kronospan
Customer Reference : 41793
Top Depth : 1.20
Depth : 2.00
Date Sampled : 11-NOV-2015
Test Portion Mass (g) : 175
Type : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Acid Neutralising Capacity (pH 4)	Titration	2.0	Mol/kg	N	<2.0			
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Loss on Ignition	Grav	0.1	%	N	3.2			10.0
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	U	<0.00035	1.0		
pH	Probe			M	9.8		>6.0	
Total Organic Carbon	OX/IR	0.1	%	N	0.3	3.0	5.0	6.0
TPH C10-C40 (sum)	Calc	1	mg/kg	N	<1	500.0		

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.044	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.027	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	13	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.019	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	96	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	2.3	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.054	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry	1.0	mg/kg	N	<1.0	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.0073	0.1	0.5	7.0
Sulphate	Calc / Discrete Analyser	5.0	mg/kg	N	85	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	460	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.025	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

Waste Acceptance Criteria

Customer Sample Reference : BH02A
SAL Sample Reference : 524697 002
Project Site : Kronospan
Customer Reference : 41793
Depth : 1.00
Date Sampled : 11-NOV-2015
Test Portion Mass (g) : 175
Type : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Acid Neutralising Capacity (pH 4)	Titration	2.0	Mol/kg	N	<2.0			
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Loss on Ignition	Grav	0.1	%	N	2.0			10.0
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	U	<0.00035	1.0		
pH	Probe			M	8.8		>6.0	
Total Organic Carbon	OX/IR	0.1	%	N	3.1	**3.0**	5.0	6.0
TPH C10-C40 (sum)	Calc	1	mg/kg	N	4	500.0		

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.052	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.027	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	19	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.025	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.017	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	45	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	0.59	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.034	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry	1.0	mg/kg	N	<1.0	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc / Discrete Analyser	5.0	mg/kg	N	49	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	520	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.026	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

Waste Acceptance Criteria

Customer Sample Reference : BH03
SAL Sample Reference : 524697 003
Project Site : Kronospan
Customer Reference : 41793
Test Portion Mass (g) : 175
Date Sampled : 11-NOV-2015
Depth : 0.50
Type : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Acid Neutralising Capacity (pH 4)	Titration	2.0	Mol/kg	N	<2.0			
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	(110) <0.080	6.0		
Loss on Ignition	Grav	0.1	%	N	3.0			10.0
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	U	<0.00035	1.0		
pH	Probe			M	8.9		>6.0	
Total Organic Carbon	OX/IR	0.1	%	N	0.7	3.0	5.0	6.0
TPH C10-C40 (sum)	Calc	1	mg/kg	N	2	500.0		

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.019	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.049	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.039	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	0.00041	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	21	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.025	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	98	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	2.4	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.58	**0.5**	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry	1.0	mg/kg	N	<1.0	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.017	0.1	0.5	7.0
Sulphate	Calc / Discrete Analyser	5.0	mg/kg	N	84	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	660	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.027	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

Waste Acceptance Criteria

Customer Sample Reference : BH04
SAL Sample Reference : 524697 004
Project Site : Kronospan
Customer Reference : 41793
Test Portion Mass (g) : 175
Top Depth : 1.00
Depth : 2.00
Date Sampled : 11-NOV-2015
Type : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Acid Neutralising Capacity (pH 4)	Titration	2.0	Mol/kg	N	<2.0			
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Loss on Ignition	Grav	0.1	%	N	4.5			10.0
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	U	<0.00035	1.0		
pH	Probe			M	8.1		>6.0	
Total Organic Carbon	OX/IR	0.1	%	N	0.7	3.0	5.0	6.0
TPH C10-C40 (sum)	Calc	1	mg/kg	N	8	500.0		

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0069	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.14	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	0.00032	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	52	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.014	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	110	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	8.4	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.18	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry	1.0	mg/kg	N	<1.0	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc / Discrete Analyser	5.0	mg/kg	N	94	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	1000	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.040	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

SAL Reference: 524697
Project Site: Kronospan
Customer Reference: 41793

Soil Analysed as Soil
BTEX

				SAL Reference	**524697 001**	**524697 002**	**524697 003**	**524697 004**
				Customer Sample Reference	**BH01**	**BH02A**	**BH03**	**BH04**
				Test Sample	**M105**	**M105**	**M105**	**M105**
				Depth	**2.00**	**1.00**	**0.50**	**2.00**
				Top Depth	**1.20**			**1.00**
				Date Sampled	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Benzene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	(13) <10	(13) <10	(13,110) <20	(13) <10
Toluene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	<10	(110) <20	<10
EthylBenzene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	<10	(110) <20	<10
Meta/Para-Xylene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	<10	(110) <20	<10
Ortho-Xylene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	<10	(110) <20	<10

SAL Reference: 524697
Project Site: Kronospan
Customer Reference: 41793

Soil Analysed as Soil
MCERTS Preparation

				SAL Reference	**524697 001**	**524697 002**	**524697 003**	**524697 004**
				Customer Sample Reference	**BH01**	**BH02A**	**BH03**	**BH04**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Depth	**2.00**	**1.00**	**0.50**	**2.00**
				Top Depth	**1.20**			**1.00**
				Date Sampled	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	**9.2**	**4.9**	**9.3**	**18**

SAL Reference: 524697
Project Site: Kronospan
Customer Reference: 41793

Soil Analysed as Soil
Total and Speciated USEPA16 PAH

				SAL Reference	**524697 001**	**524697 002**	**524697 003**	**524697 004**
				Customer Sample Reference	**BH01**	**BH02A**	**BH03**	**BH04**
				Test Sample	**M105**	**M105**	**M105**	**M105**
				Depth	**2.00**	**1.00**	**0.50**	**2.00**
				Top Depth	**1.20**			**1.00**
				Date Sampled	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Naphthalene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Acenaphthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Fluorene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Phenanthrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Anthracene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(a)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Chrysene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(b/k)Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(a)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Indeno(123-cd)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1
Coronene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1
Phenol	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1

SAL Reference: 524697
Project Site: Kronospan
Customer Reference: 41793

Soil Analysed as Soil
TPH

				SAL Reference	**524697 001**	**524697 002**	**524697 003**	**524697 004**
				Customer Sample Reference	**BH01**	**BH02A**	**BH03**	**BH04**
				Test Sample	**M105**	**M105**	**M105**	**M105**
				Depth	**2.00**	**1.00**	**0.50**	**2.00**
				Top Depth	**1.20**			**1.00**
				Date Sampled	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Total Petroleum Hydrocarbons	GC/FID	1	mg/kg	M	<1	**4**	**2**	**8**
Total Petroleum Hydrocarbons (C35-C40)	GC/FID	1	mg/kg	N	<1	<1	<1	<1

SAL Reference: 524697
Project Site: Kronospan
Customer Reference: 41793

Soil Analysed as Soil
PCB EC7

				SAL Reference	**524697 001**	**524697 002**	**524697 003**	**524697 004**
				Customer Sample Reference	**BH01**	**BH02A**	**BH03**	**BH04**
				Test Sample	**M105**	**M105**	**M105**	**M105**
				Depth	**2.00**	**1.00**	**0.50**	**2.00**
				Top Depth	**1.20**			**1.00**
				Date Sampled	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**	**11-NOV-2015**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Polychlorinated biphenyl BZ#28	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#52	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#101	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#118	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#153	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#138	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#180	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	<0.05	<0.05	<0.05	<0.05

Index to symbols used in 524697-1

Value	Description
8:1	Leachate to BS EN 12457-3 (8:1)
2:1	Leachate to BS EN 12457-3 (2:1)
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
AR	As Received
13	Results have been blank corrected.
110	LOD raised due to low internal standard recovery.
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.

APPENDIX 5

DESIGN CONSIDERATIONS

APPENDIX 5

GEOTECHNICAL DESIGN CONSIDERATIONS

A5.1 ASSESSMENT OF GRANULAR SOIL CONDITION

A5.1.1 SPT 'N' values reported on the borehole logs are as measured in the field with no corrections applied.

A5.1.2 However for general design in sands the 'N' values should be normalised to 60% by the following equation:-

A5.1.3 N60 = Er/60.N where:-

N is the blow count and

Er is the energy ratio of the specific test equipment

A5.1.4 Further corrections for rod length and overburden pressure in sands may be applied in accordance with BS EN ISO 22476-3, ref 9.6.

A5.2 ASSESSMENT OF COHESIVE SOIL CONDITION

A5.2.1 In accordance with BS EN ISO 22475-1, ref. 8.7, and BS5930, ref.8.3, the thick walled U100 sample is considered as a Class B sampling technique and will only produce Class 3 to 5 quality samples in accordance with EN 1997-2:2007, ref.8.4.

A5.2.2 Laboratory strength and consolidation testing should only be carried out on Class 1 quality samples, which can be obtained from a Class A sampling technique, ref. 9.5. This is due to possible disturbance during sampling, giving a weaker strength in testing.

A5.2.3 Therefore laboratory test values for c_u and m_v obtained from thick walled U100 samples should only be used as guidance and not used as absolute values for the shear strength and compressibility properties of the clay and only used to provide guidance to descriptive strength on the borehole records.

A5.2.4 Work undertaken by Stroud, ref. 8.11 determined a relationship between SPT 'N' values, plasticity undrained shear strength and compressibility of many over-consolidated clays. Further work by Stroud and Butler, ref.8.12, in which data was analysed from sites covering a wide range of glacial deposits, confirmed there to be a correlation between the 'N' value plasticity undrained shear strength and compressibility.

A5.2.5 The relationship was of the form:

$$Cu = f_1 \times N$$

and

$$mv = 1/(f_2 \times N)$$

Where c_u = Un-drained shear strength

m_v = Coefficient of compressibility

f_1 and f_2 = Factors

A5.2.6 It was determined by Stroud that f_1 varied between 4kPa for material of high plasticity and 6kPa for material of low plasticity. Similarly f_2 varied between 400kPa and 600kPa.

A5.3 GUIDELINES FOR THE DESIGN OF PILES FIRST APPROXIMATION OF WORKING LOAD

A5.3.1 PILING PARAMETERS – GENERAL

The ultimate carrying capacity, Qu, of a particular pile is taken as the sum of the ultimate shaft friction resistance, Qs, and the ultimate end bearing resistance, Qb. This may be expressed as follows:-

$$Qu = Qs + Qb$$

$$= f.As + q.Ab$$

where f = unit shaft resistance

As = embedded surface area of pile

q = unit end bearing resistance

Ab = effective cross-sectional area of pile base

A5.3.2 COHESIVE SOILS

A5.3.2.1 Shaft Resistance

The ultimate shaft resistance, f, for piles in both compression or tension in cohesive soils is determined by applying a factor to the undrained shear strength, Cs, which exists in the soils along the embedded length of the pile, and is given by:-

$$f = \alpha.Cs$$

Where α is an adhesion factor, which for straight-shafted bored piles may be taken as 0.45 to 0.60.

Ultimate unit shaft friction should not exceed 100kN/m².

A5.3.2.2 End Bearing

For piles terminating in cohesive soils, the ultimate unit end bearing resistance q, is given by:-

$$q = Nc.Cb$$

where Cb is the undrained shear strength at the base of the pile

and Nc is a bearing capacity factor

The value of Nc for a cohesive material is variable, depending on the depth of the penetration of the pile into the bearing stratum. Generally, Nc could be taken to have a value of 9, except in the case of large diameter short piles where a lesser value should be used.

A5.3.3 COHESIONLESS SOILS

A5.3.3.1 Shaft Resistance

For piles driven in cohesionless soils the ultimate unit shaft resistance, f, may be calculated using the following method, which gives:-

$$f = 0.5\,\gamma' (D+d)\, Ks \tan \delta$$

where γ' = average effective unit weight of soil surrounding the pile

D = depth to the pile toe or to the base of the granular stratum whichever is the lesser

d = depth to the top of the granular stratum

δ = angle of friction between pile and soil (see below)

Ks = a coefficient (see below)

TABLE OF VALUES FOR Ks AND δ

Pile Type	δ	Ks		
		Relative Density		Tension Piles
		Low	High	
Steel	20°	0.5	1.5	0.5
Concrete	0.75ϕ	1.0	2.0	0.5

The value of ϕ may be interpreted from standard penetration tests.

For bored and cast-in-place piles, δ = 22° and Ks = 1 should be used to allow for loosening of the soil during boring.

It has been found that the ultimate unit shaft resistance does not exceed 100kN/m² and therefore this value should not be exceeded in design.

A5.3.3.2 End Bearing

The unit ultimate end bearing resistance (q) of piles in cohesionless soils may be calculated as follows:-

$$q = \square'.D.Nq$$

where $\square'$ = average effective unit weight of soil surrounding the pile

D = depth to pile toe

Nq = bearing capacity factor

Values for Nq, where piles penetrate the bearing stratum by more than five diameters, may be taken from work carried out by Berezantsev, ref.8.20. In addition, the ultimate unit base resistance should not exceed a value of 11,000kN/m². For bored and cast-in-place piles the value of Nq used should correspond to loose soil conditions.

A5.3.4 FACTORS OF SAFETY

A5.3.4.1 Cohesive and Non-cohesive Soils

For cohesive and non-cohesive soils a factor of safety of 3 may be used to obtain the allowable or safe carrying capacity of piles from the ultimate carrying capacity.