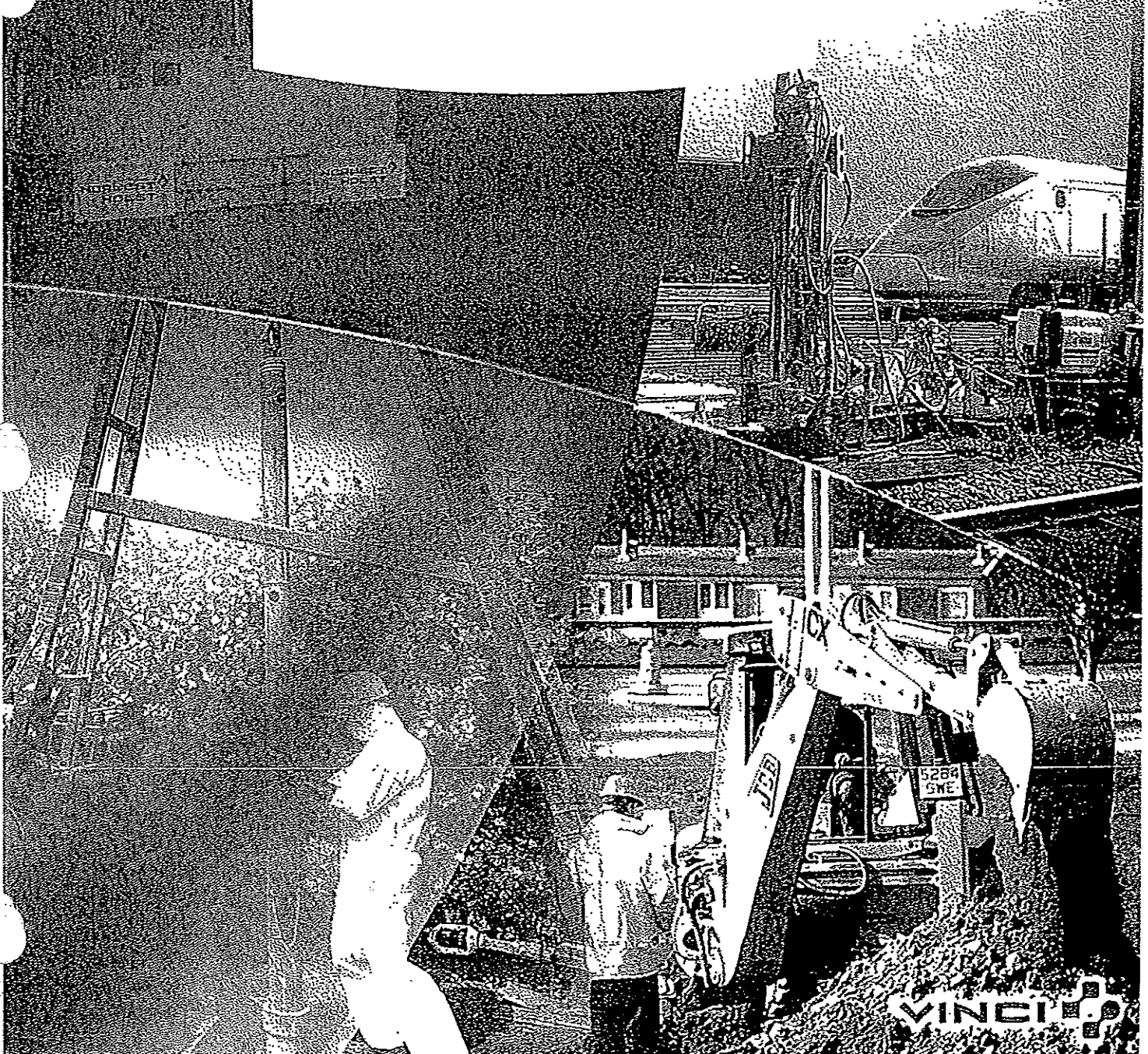


**REPORT ON A
GROUND INVESTIGATION
AT
ALDBROUGH GAS
STORAGE FACILITY**



**REPORT ON A
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STORAGE FACILITY**

**Client: Scottish and Southern
Energy Plc**

Engineer: Mott MacDonald

F No: F12963

Date: 29/09/2003

REPORT QUALITY ASSURANCE SHEET

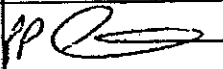
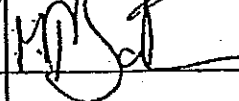
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Title:

REPORT ON A GROUND INVESTIGATION

AT

ALDBROUGH GAS STORAGE FACILITY

Report Version:	Author/Reviewer:	Status to be signed off:	Signatures:	Date:
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Distribution: Mott MacDonald

The report is not to be used for contractual or engineering purposes unless this sheet is signed where indicated by both the originator of the report and the approver, and the report is designated "Final" on this report quality assurance sheet. Opinions and interpretations expressed in the report are outside the scope of UKAS accreditation.

GROUND INVESTIGATION: ALDBROUGH GAS STORAGE FACILITY

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GROUND INVESTIGATION: ALDBROUGH GAS STORAGE FACILITY

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1.0 INTRODUCTION

In June 2003 Norwest Holst Soil Engineering Limited (NHSEL) were instructed by Mott MacDonald (The Engineer) acting for and on behalf of Scottish and Southern Energy Plc (The Employer) to carry out a ground investigation at Aldbrough in the East Riding of Yorkshire. It is proposed to construct a gas storage facility at depth on the site, with associated surface processing facilities. The investigation comprised the formation of cable percussive boreholes and mechanically excavated trial pits and trenches with associated in situ testing.

The fieldwork was carried out between 16th July 2003 and 28th July 2003. This report presents the results of the fieldwork and laboratory testing together with information on the ground and groundwater conditions.

2.0 PURPOSE, SCOPE AND REPORT FORMAT

2.1 Purpose

The purpose of this investigation was to determine the subsurface ground and groundwater conditions at the site of the proposed processing plant and gas pipeline.

2.2 Scope of Work

Our brief for this factual report comprised the following items:

1. To form exploratory holes on site.
2. To install water monitoring instruments.
3. To undertake laboratory tests on samples recovered from exploratory holes.

The sources of information used in the compilation of this report are detailed in the list of references on page 10.

2.3 Report Format

Our report is presented in the following format:

- Factual information comprising: -
 - Description of fieldwork
 - Exploratory hole logs
 - Laboratory test results
 - Maps and plans

3.0 DESK STUDY INFORMATION

3.1 Scope of Study

A formal comprehensive desk study was not requested by the Engineer for this investigation. The following sections however provide general details of site lo or

and description, together with the site geology as ascertained from published maps and memoirs.

3.2 Site Location and Description

The site is located on the Holderness coast in the East Riding of Yorkshire, approximately 18 km north of Kingston Upon Hull and 2.5 km south east of the village of Aldbrough (approximate National Grid reference TA 260 369). The proposed construction area on the site is comprised of gently undulating arable farm land. The field is bound to the west by Cess Dale Drain, to the south by East Newton Drain and by hedges to the north and east.

Levels vary between 10.056m and 13.25m AOD throughout the site.

The location of the site is indicated on Figure 1 in Section D of the report.

3.3 Geology

From the available information on the one inch to one statute mile scale Geological Survey map of the area (Sheet 73, Solid and Drift edition for Hornsea (1958)) the site is shown to be underlain by Quaternary boulder clay and local alluvial deposits. These in turn are underlain by the Rowe Chalk Formation of Cretaceous age.

3.4 Previous Investigations

The Engineer has supplied a summary of the findings of a site investigation carried out on the site in August 1992 by Foundation Exploration Services Ltd. This investigation comprised the formation of eleven trial pits.

4.0 FIELDWORK

4.1 Scope of Fieldwork

The scope of the fieldwork was specified by the Engineer and was undertaken in general accordance with BS 5930. The Engineer had responsibility for setting out a exploratory holes and for determining the in situ testing and sampling regime. NHSEI had responsibility for surveying the locations of all exploratory holes. Cable percussive boreholes were formed together with mechanically excavated trial pits. The exploratory hole locations are shown on the site plan included in Section D of this report.

4.2 Inspection Pits

In order to positively prove the absence of buried services a hand dug inspection pit was excavated to a depth of 1.20m at each of the exploratory hole locations. The base of each pit was scanned with a cable avoidance tool (CAT).

4.3 Cable Percussive Boreholes

A total of sixteen boreholes designated BH101 to BH113 and BH117 to BH119 inclusive were formed to depths between 5.00m and 10.50m using conventional light cable percussive techniques together with 150mm diameter temporary steel casings. The boreholes were all formed in order to obtain samples for laboratory testing and to provide geotechnical information for foundation design. Three of the boreholes were also used for the installation of standpipes.

102mm nominal diameter open tube samples (U100) were obtained at regular intervals throughout the boring operations where suitable cohesive materials were encountered. These were sealed with wax to prevent moisture loss and were transported to the Leeds laboratory of NHSEL.

In granular materials or where the presence of coarse material prevented the taking of open tube samples, Standard Penetration Tests were carried out using either a spoon sampler or a solid 60° cone. The results of these tests are given as a Standard Penetration "N" value at the appropriate position on the borehole logs, where the use of either the sampler or cone is also recorded.

Representative disturbed samples of all materials encountered were obtained and these were placed in sealed containers for transport to the laboratory.

The samples recovered from the boreholes were described by an Engineering Geologist, in accordance with the terminology included in Section A of this report. A detailed description of all strata encountered, groundwater conditions and the position and type of samples taken are included on the borehole logs contained in Section B of this report.

4.4 Trial Pits

Twenty nine trial pits designated TP201 to TP227 and TP232 to TP233 inclusive were excavated using a JCB 3CX mechanical backhoe excavator to depths between 2.00m and 4.00m below ground level. These trial pits were located around the site to assess the mass soil fabric of the near surface natural deposits.

The trial pits were not shored and were logged from the surface by an Engineering Geologist. The Engineering Geologist provided a detailed description of the ground conditions encountered in each pit and also obtained disturbed soil samples at regular intervals for geotechnical analysis. The strata encountered in the trial pits are described on the trial pit logs contained within section B of this report and the location of each of the trial pits is indicated on the site plan contained within Section D of this report.

4.5 Trial Trenches

Three Trial Trenches designated TPE01 to TPE03 were excavated using a JCB 3CX mechanical backhoe excavator to depths between 3.10m and 4.00m below ground level. These trenches were located in the south western area of the site in order to

delimit the extent of the sand and gravel deposits encountered on the site. These trenches were not shored and were logged from the surface by an Engineering Geologist. Details of the strata encountered in the trial trenches are described on the trial trench logs contained within Section B of this report. The location of the trial trenches are contained within Section D of this report.

4.6 In situ Testing

Hand vane shear tests were carried out in trial pits in each strata encountered to a depth of 1.20m. The results of these tests are shown on the trial pit logs contained within Section B of this report.

4.7 Installations/Instrumentation

A slotted 50mm diameter UPVC tube was installed in each of boreholes BH103, BH107 and BH117. The standpipes were slotted over a pre-determined length, with the slotted section surrounded by a pea gravel filter. A metal barrel cover was concreted into place on each of the installations and a plastic cap was placed onto each tube to facilitate long-term groundwater monitoring. A schematic indication of each installation is shown on the relevant borehole logs.

5.0 LABORATORY TESTING

5.1 Scope of Testing

All geotechnical (soils) testing was scheduled by the Engineer. The scope of the testing was required to enable comments regarding foundation design to be made.

5.2 Geotechnical Soils Testing

The programme of laboratory testing was carried out in accordance with BS137 (1990). The following testing was carried out at the Leeds laboratory of NHSEL which is registered as UKAS Testing laboratory No 1265.

The tests listed below were carried out and the results are given on the summary sheets with individual test plots presented in Section C of this report.

<u>B.S. TEST NO.</u>	<u>DESCRIPTION</u>
Part 2:3	Moisture Content
Part 2:4&5	Atterberg Limits
Part 2:9	Particle Size Distribution
Part 4:3	Dry Density/Moisture Content Relationship
Part 4:5	Moisture Condition Value
Part 4:7	California Bearing Ratio
Part 5:3	One-Dimensional Consolidation Properties
Part 7:8	Undrained Triaxial Compression (Definitive Method)
Part 7:9	Undrained Triaxial Compression with Multistage Loading

In addition chemical (sulphate and pH) testing was undertaken by ECoS Environmental of Bradford which is registered as UKAS testing laboratory 0618. Testing was undertaken in order to assess concrete requirements from BRE Special Digest No 1. Samples were prepared in general accordance with BS 1377, although final analysis of Total Sulphate was performed using ICP and aqueous extract using Ion Chromatography.

6.0 RESULTS OF THE INVESTIGATION

6.1 Scope of Commentary

The results of this investigation appear to broadly concur with the published geology as referenced in Section 3.3 of this report. The following sections are only intended to provide a summary of the ground conditions encountered during this investigation whilst the logs presented in Section B of this report give a detailed account of all strata observed.

6.2 Made Ground

No made ground was encountered in any of the exploratory holes formed on site.

6.3 Superficial Deposits

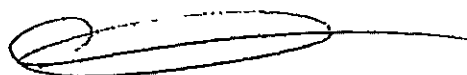
All exploratory holes encountered a sequence of superficial deposits which included slightly sandy slightly gravelly clay, sand and gravel and clayey gravelly sand. All exploratory holes were terminated within this strata.

6.4 Groundwater

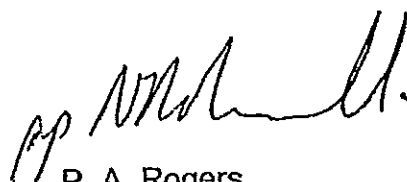
Groundwater was encountered in several of the boreholes and trial pits at various depths. A summary of exploratory hole groundwater inflows is given in Table 1 on page 9 of this report, whilst the logs given in Section B of the report provide full of all groundwater information.

**TABLE 1: SUMMARY OF GROUNDWATER INFLOWS RECORDED IN
EXPLORATORY HOLES**

Exploratory Hole I.D	Depth of Inflow (m.b.g.l)	Rate of Inflow	Level After 20 mins (m.b.g.l)	Stratum
BH102	7.20	Fast	4.22	CLAY
BH103	6.70	Fast	3.70	CLAY
BH106	8.60	Fast	4.05	CLAY
BH107	4.60	NR	NR	CLAY
BH111	2.20	Fast	2.00	SAND
BH111	4.00	Fast	3.70	CLAY
BH112	2.10	Damp	NR	CLAY
BH113	2.30	Fast	1.80	CLAY
BH118	2.40	Fast	1.38	SAND&GRAVEL
BH119	3.20	Fast	2.30	SAND
TP201	2.60	Seepage	NR	SAND&GRAVEL
TP202	2.00	Seepage	NR	SAND&GRAVEL
TP206	2.60	Seepage	NR	SAND&GRAVEL
TP214	2.70	Seepage	NR	CLAY
TP215	3.15	Seepage	NR	SAND
TP216	2.40	Seepage	NR	SAND
TP219	2.50	Seepage	NR	SAND&GRAVEL
TP220	2.00	Seepage	NR	SAND
TP232	2.30	Seepage	NR	SAND&GRAVEL
TP233	2.60	Seepage	NR	CLAY
Notes:				



C. Priestley
Assistant Geotechnical Engineer



P. A. Rogers
Senior Geotechnical Engineer

REPORT REFERENCES

- British Geological Survey one inch to one statute mile scale map of the area, sheet 73, Solid and Drift edition for Hornsea 1958.
- British Standards Institution (1999) BS 5930: Code of Practice for Site Investigation.
- British Standards Institution (1990) BS1377 Parts 1 to 9: Methods of Test for Soils For Civil Engineering Purposes.
- Norbury, D.R, Child, G.H and Spink, T.W 'A Critical Review of Section 8 (BS 5930 1981) - Soil and Rock Description'. Geological Society, Engineering Geology Special Publication No 2, 1986.

SUPPORTING FACTUAL DATA

SECTION A

**NOTES ON FIELDWORK, LOGGING AND
LABORATORY TESTING**

FIELDWORK PROCEDURES

SECTION A: NOTES ON FIELDWORK PROCEDURES

1.0 CABLE PERCUSSIVE BORING TECHNIQUES

Unless otherwise stated the light cable percussion technique of 'soft ground' boring has been employed in the formation of boreholes for this contract. In cohesive soils a clay cutter has been used to advance the boreholes whilst in granular deposits a shell has been employed. The combination of clay cutter and shell bring up disturbed material which is generally sufficiently representative to permit identification of the strata. Whilst these particular techniques allow the maximum data to be obtained on strata conditions, a degree of mixing of some layered soils (e.g thin layers of coarse and fine granular material) is inevitable.

2.0 ROUTINE SAMPLING

In the UK "undisturbed" samples of predominantly cohesive soils are generally obtained in a 102mm diameter open drive sampler as defined in the British Standard Code of Practice B.S. 5930 (1999) (ref 01). The British Standard notes however that conventional and lined open drive samplers do not produce Class 1 samples for laboratory testing and for this reason NHSEL has incorporated a taper into the cutting shoe of all its lined open drive samplers. This taper significantly reduces sample disturbance and for the majority of cohesive soils allows samples to be recovered which are suitable for laboratory machine testing. However it should be appreciated that no sample can be truly undisturbed when sampled in this manner and the effects of disturbance can best be seen in laminated clays in which the laminations may be turned downward on the margins of the sample due to the driving effects of the sampler. Where it is necessary to minimise the effects of sample disturbance e.g in 'sensitive' clays and silts, alternative sampling techniques may be specified and where used, are described in the report text.

In granular deposits and mixed cohesive-granular deposits where it is not possible to recover undisturbed samples, either large or small disturbed samples are normally obtained. The size of these samples are in accordance with the requirements of B.S. 5930 (1999) whilst the frequency of sampling is unique to this contract.

3.0 GROUNDWATER

The groundwater conditions entered on the exploratory hole records are those encountered at the time of the investigation. These however, may not represent the actual conditions or those which may apply in large excavations. The normal rate of boring does not always permit the recording of an equilibrium water level for any one water strike, particularly because the entry of water into a borehole may be reduced or even eliminated due to casing off a water bearing layer or due to a skin being formed on the borehole wall by the drilling tools. It should also be noted that groundwater conditions may vary seasonally and/or tidally and that the water levels as shown at the time of investigation should not necessarily be taken as being constant because they may be subject to such fluctuations.

4.0 IN SITU DYNAMIC PENETRATION TESTS

Standard or Cone Penetration Testing is generally employed where undisturbed samples cannot be obtained e.g in granular soils, fill and rock etc, in order to obtain an indication of the insitu density, compaction or hardness. Inherent difficulties are present in obtaining true S.P.T or C.P.T "N" values in water bearing fine grained granular deposits and careful consideration of the test technique and groundwater conditions are necessary before test results are used for design purposes.

The full procedure for carrying out the Standard Penetration Test (SPT) is given in BS 1377: 1990, Test 9:3.3 (ref 02). Essentially the test consists of driving a 50mm external diameter split barrel sampler into the soil using a 65kg hammer dropping 760mm. 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 for the 300mm test drive penetration is recorded on the borehole logs as the "N" value. A full record of the number of blows required to drive the sampler at 75mm intervals throughout the total 450mm drive is tabulated along with the groundwater level at the time of test. It is important to distinguish how the blow count relates to the penetration of the sampler and this may be achieved in the following manner:

- i) Where the test drive is terminated at 50 blows the number of blows for the partial test drive (usually 50) and the penetration of the sampler within the test drive are recorded. An approximate "N" value may be obtained by linear extrapolation of the number of blows recorded for the partial test drive.
- ii) If the total penetration is equal to or less than the 150mm seating drive then the number of blows (usually 25) and the depth of penetration within the initial seating penetration are recorded on the borehole logs.

The "N" value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels in accordance with Clause 41.3.2 of BS 5930: 1984 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

Standard Penetration Testing may also be performed in very stiff/hard clays in which it would be difficult to obtain undisturbed samples. In such cases the S.P.T "N" values may be used for design purposes based on correlations between "N" value and various soil parameters such as those proposed by Stroud and Butler (ref 03).

References:

- (01) BS5930:1999 Code of Practice for Site Investigation. British Standards Institution.
- (02) BS 1377: Part 9: Test 9.3.3 1990 Methods of Tests for Soils for Civil Engineering Purposes. British Standards Institution.
- (03) Stroud, M.A, Butler, F.G ' The Standard Penetration Test and the Engineering Properties of Glacial Materials' from the Engineering Behaviour of Glacial Materials Proc. of Symp. April 1975.

SUPPORTING FACTUAL DATA

SECTION A

**NOTES ON FIELDWORK, LOGGING AND
LABORATORY TESTING**

SOIL DESCRIPTION TERMINOLOGY

SECTION A: TERMINOLOGY USED IN SOIL DESCRIPTIONS

1.0 GENERAL PROCEDURES

Soil descriptions contained in this report have been produced in accordance with the procedure and principles given in BS 5930 (1999) (ref 01). The British Standard has largely adopted the extended descriptive approach proposed by Norbury, Child and Spink (ref 02), whose work provides additional amplification.

For a soil description the main soil characteristics should be given in a standard word order although the word order can be adjusted to enhance and clarify if appropriate. The main soil characteristics can be divided as follows:-

1	Mass Characteristics comprising state and structure	2	Material Characteristics comprising nature and state
1a	Density and Field Strength	2a	Colour
1b	Discontinuities	2b	Composite Soil Types: particle grading and composition, shape and size
1c	Bedding	2c	Principal Soil Type, name in capitals eg CLAY
	3		Stratum Name (optional)
	3.1		Geological Formation

For descriptions used in this report the soil colour is placed after the field strength or density ie stiff grey CLAY. Other word order is as described previously.

The basic soil categories covered by the following notes may be broadly summarised as:

- (i) Very coarse soils: greater than 60mm in diameter, ie cobbles and boulders.
- (ii) Coarse soils: 0.06mm to 60mm in diameter, ie sands and gravels.
- (iii) Fine soils: less than 0.06mm in diameter, ie clays and silts.
- (iv) Organic soils.
- (v) Man made "soils".

2.0 MASS CHARACTERISTICS OF SOILS

2.1 Cohesive Soils

For cohesive material the strength guide given in Table One on the following page shall be used. Unless specified for individual contracts no subdivision of material strength categories is used.

TABLE ONE: STRENGTH SCALE GUIDE FOR COHESIVE MATERIAL

Term	Field Identification	Undrained Shear Strength kN/m ²
Very Soft	Can be squeezed through fingers	<20
Soft	Easily remoulded by hand	20-40
Firm	Hard to remould by hand	40-75
Stiff	Indented slightly by thumb	75-150
Very Stiff	Indented by thumb nail	150-300
Hard	Can be scratched	>300
N.B. Clays with undrained strengths greater than 300 kN/m ² can be described as hard clays or as very weak mudstones as suggested by Spink and Norbury.		

2.2 Granular Soils

For granular deposits relative density may only be determined by the standard penetration test (S.P.T). The following table provides a scale of terms related to S.P.T 'N' values (see BS 1377:1990) (ref 03).

TABLE TWO: ASSESSMENT OF RELATIVE DENSITY FOR GRANULAR SOILS

Term	Field Identification (generally in trial pits)	S.P.T 'N' Values (blows for 300mm penetration)
Very loose	Can be excavated with a spade and 50mm wooden peg can be easily driven	0-4
Loose		4-10
Medium dense	-	10-30
Dense	Requires pick for excavation and 50mm wooden peg is hard to drive	30-50
Very dense		over 50
N.B. The field identification terms for very loose/loose material and dense/very dense material are very general and should be treated with caution.		

2.3 Discontinuities

The type of discontinuity should be described eg fissures, faults and shear planes together with their spacing as given in the following table. Discontinuity openness, and surface texture eg rough, smooth, polished, striated should be recorded although this need not always be added to the borehole log if the required level of detail is low.

2.4 Bedding

Bedding spacing is assessed using the thickness terms given in Table Three.

TABLE THREE: DESCRIPTIONS FOR DISCONTINUITIES AND BEDDING

DISCONTINUITIES		BEDDING	
Scale of Spacing Term	Mean Spacing mm	Scale of Bedding Term	Mean Thickness mm
Very widely	>2000	Very thickly bedded	>2000
Widely	2000-600	Thickly bedded	2000-600
Medium	600-200	Medium bedded	600-200
Closely	200-60	Thinly bedded	200-60
Very closely	60-20	Very thinly bedded	60-20
Extremely closely	<20	Thickly laminated	20-6
		Thinly laminated	<6
Note: Spacing terms are also used for describing the distance between partings, isolated beds, laminae or roots etc.		Note: Interbedded/interlaminated: alternating layers of different material type. These terms must be given a thickness if material is present in equal proportions. Otherwise the thickness of and spacing between subordinate layers must be defined.	

3.0 MATERIAL CHARACTERISTICS OF SOIL

An examination of insitu soil deposits, disturbed or undisturbed samples allows the material characteristics to be recorded. These characteristics include colour, particle shape, particle grading and particle composition.

3.1 Colour

The recorded colour should be based on the logger's general impression of the overall colour. For material with more than three colours the term multicoloured should be used. The term mottled should be applied to soils which exhibit two colours, one of which is subordinate to the other.

White, cream, grey, black, yellow, orange, red, brown, green and blue etc may be used but supplemented as necessary with: light, dark, mottled and reddish brownish etc. All coloration associated with chemical changes should be noted ie grey gleying on fissures.

3.2 Soil Types (Including Composite Soils)

3.2.1 Very Coarse Soils (Boulders and Cobbles)

Where the soil sample is considered large enough to be representative, material is described as follows:-

TABLE FOUR: DESCRIPTORS FOR VERY COARSE SOILS

	Main Name	Estimated Boulder/Cobble Content of Very Coarse Fraction
Over 50% of material is very coarse (>60mm)	BOULDERS	Over 50% is of boulder size (>200mm)
	COBBLES	Over 50% is of cobble size (200mm to 60mm)

Mixtures of very coarse and finer materials are described by combining terms for very coarse constituents with those for the finer constituents as follows:-

TABLE FIVE: DESCRIPTORS FOR MIXTURES OF VERY COARSE AND FINER SOILS

Term	Composition (Approx %)
BOULDERS (or COBBLES) with a little finer material (1)	Up to 5% finer material
BOULDERS (or COBBLES) with some finer material (1)	5% to 20% finer material
BOULDERS (or COBBLES) with much finer material (1)	20% to 50% finer material
FINER MATERIAL with many boulders (or cobbles)	50% to 20% boulders (or cobbles)
FINER MATERIAL with some boulders (or cobbles)	20% to 5% boulders (or cobbles)
FINER MATERIAL with occasional boulders (or cobbles)	Up to 5% boulders (or cobbles)
(1) The description of "finer material" is made in accordance with BS 5930 41.4.2 to 41.4.6 ignoring the very coarse fraction; the principal soil type name of the finer material may also be given in capital letters, e.g. sandy GRAVEL with occasional boulders; COBBLES with some sandy CLAY.	

3.2.2 Coarse Soils (Gravel and Sand)

A coarse soil (omitting any cobbles and boulders) contains 65% or more of SAND or GRAVEL. The following terms may be used to describe the coarse fraction:-

TABLE SIX: DESCRIPTORS FOR COARSE SOILS

Term	Principal Soil Type	Approximate Proportion of Secondary Constituent
Slightly sandy or gravelly	SAND or GRAVEL	Up to 5%
Sandy or gravelly		5% to 20%
Very sandy or gravelly	SAND and GRAVEL	Over 20%
-		About equal proportions

Fine Soils and Mixtures of Fine and Coarse Soils

Fine soil should be described as either a SILT or a CLAY. The use of silty CLAY or clayey SILT is not permitted.

For deposits that contain a mixture of soil types the descriptors given in Table Six are used. The dominant secondary fraction is placed immediately before the principal soil type. It should also be noted that the terms silty and clayey are mutually exclusive in a coarse soil. The use of the terms sandy and gravelly are however permitted.

TABLE SEVEN: DESCRIPTORS FOR FINE SOILS AND COMPOSITE SOIL TYPES

Term	Principal Soil Type	Approximate Proportion of Secondary Constituent	
		Coarse Soil	Coarse and/or Fine Soil
Slightly clayey or silty and/or sandy or gravelly Clayey or silty and/or sandy or gravelly Very clayey or silty and/or sandy or gravelly	SAND and/or GRAVEL		>5% 5% - 20% * >20% *
Very sandy or gravelly Sandy and/or gravelly Slightly sandy and/or gravelly	SILT or CLAY	>65% + 35% - 65% <35%	
* or described as fine soil depending on assessed engineering behaviour			
+ or described as coarse soil depending on assessed engineering behaviour			

3.3 Particle Shape and Grading

For coarser granular deposits (gravel and cobbles) the particle shape should be described as follows:-

TABLE EIGHT: DESCRIPTORS FOR PARTICLE SHAPE

Angularity	Form	Surface Texture
Angular Subangular Subrounded Rounded	Flat Elongated	Rough Smooth
Notes: Form and surface textural descriptors are optional.		

The distribution of particle sizes within sands and gravels should be described stating the predominant size fraction present eg fine to medium SAND.

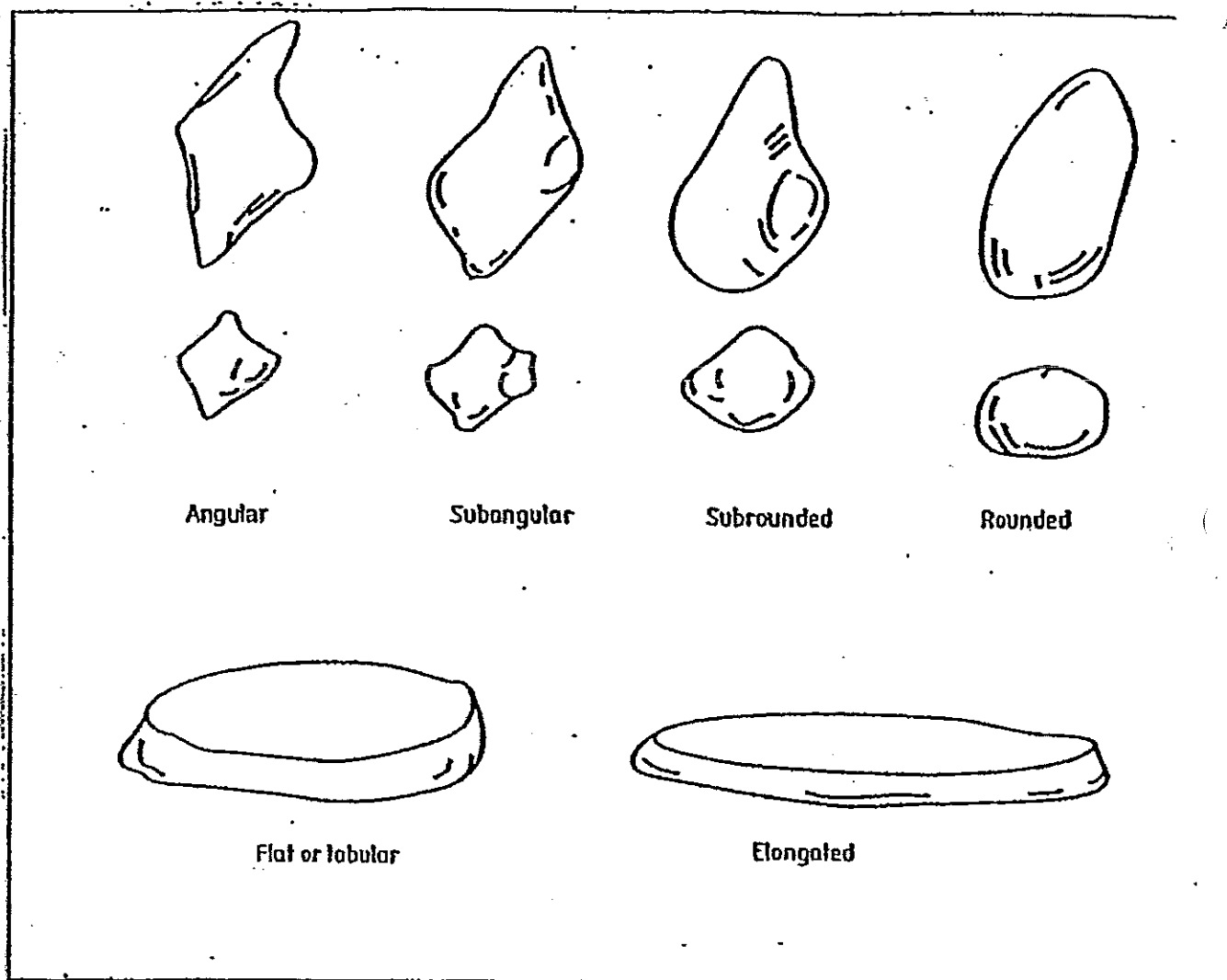


FIGURE ONE: PARTICLE ANGULARITY AND FORM TERMS

References:

- (01) BS 5930: (1999) Code of Practice for Site Investigation. British Standards Institution.
- (02) Norbury, D.R, Child, G.H and Spink, T.W 'A Critical Review of Section 8 (BS 5930: 1981) - Soil and Rock Description'. Geological Society, Engineering Geology Special Publication No 2, 1986.
- (03) BS 1377: 1990 Methods of Test for Soils for Civil Engineering Purposes. Part 5 British Standards Institution.

SUPPORTING FACTUAL DATA

SECTION A

**NOTES ON FIELDWORK, LOGGING AND
LABORATORY TESTING**

**AGGRESSIVE GROUND AND
GROUNDWATER CONDITIONS**

SECTION A: ASSESSMENT OF AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

Certain ground and groundwater conditions may be described as aggressive depending on their chemical composition which is related to previous industrial use. Where foundations are proposed to be constructed on industrial sites or on landfill sites in which the ground or groundwater may be contaminated with chemical waste, detailed consideration needs to be given to both the method of investigation and the severity of ground and groundwater conditions with respect to construction materials. For such sites it will usually be necessary to undertake a full chemical analysis in order to identify the potentially aggressive compounds.

On sites where new concrete foundations are to be constructed in natural ground it is usually only necessary to examine the sulphate content and pH level of the ground. The sulphate content of soils varies widely and can range from being virtually absent to extremely high concentrations in crystals eg gypsum. In between these two extremes sulphate may be disseminated throughout a soil or may be present in discrete bands or lenses. Because of this wide variation in the sulphate content of soils, the most reliable indication of possible aggressive conditions can be obtained by testing representative samples of groundwater. In order to take account of natural variations in the distribution of sulphates in the ground samples should be taken at a number of locations that are well spaced across the site and at different depths.

The methods for the determination of total sulphate of soil and the sulphate content of groundwater and 2:1 aqueous soil extracts are given in BS 1377: 1990: Part 3: Section 5 (ref 01). The results of tests performed in accordance with BS 1377 yield results which are expressed as percentage of dry weight retained or grammes/litre SO_3 .

The classification of natural sulphate conditions is based on BRE Special Digest 1 (2001) (ref 02). This digest makes most use of sulphate values expressed as grammes/litre SO_4 . In order to convert the results expressed as SO_3 (BS 1377) to SO_4 (BRE Digest) it is necessary to apply a multiplication factor of 1.2. In the following discussion of sulphate conditions values given in the tables are expressed in terms of SO_4 .

The current approach to the classification of aggressive ground conditions is based on the aggressive chemical environment for concrete or ACEC. This takes into account the type of site, sulfate concentration and ground water acidity and mobility. Different site assessment procedures are used for natural ground, for brownfield sites that contain industrial waste and pyritic ground. The reactions of sulfates in the presence of other ions, notably carbonate and magnesium is also taken into account. As with the previous Digest 363 there are 5 design sulfate classes (designated DS1 to DS5) for the site, although in the current digest these are subdivided into ACEC classes for each site.

In general when the results of sulphate determinations are assessed emphasis must be given to the samples which fall in the higher classes. Therefore if 8 out of 10 samples are found to be non aggressive and fall within Class DS1 and the remainder fall within Class DS2 it will be necessary to adopt the precautions appropriate to Class DS2 conditions for the whole site.

TABLE 1: AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) SITE CLASSIFICATION

Sulfate and Magnesium						Natural Soil		Brownfield(?)		ACEC class for site
Design Sulfate Class for site	2:1 water/soil extract		Groundwater		Total Potential Sulfate(?)	Static water	Mobile water	Static water	Mobile water	
1	2	3	4	5	6	7	8	9	10	11
	SO4 g/l	Mg g/l	SO4 g/l	Mg g/l	SO4 %	pH	pH	pH(4)	pH(4)	
DS-1	<1.2		<0.4		<0.24	All pH values		All pH values		AC-1s
						>5.5		>6.5		AC-1
						5.5		5.5-6.5		AC-2z
								4.5-5.5		AC-3z
DS-2	1.2-2.3		0.4-1.4		0.24-0.6	>3.5		>5.5		AC-1s
						>5.5		>6.5		AC-2
						3.5		5.5		AC-2s
						5.5		5.5-6.5		AC-3z
								4.5-5.5		AC-4z
								<4.5		AC-5z
DS-3	2.4-3.7		1.5-3.0		0.7-1.2	>3.5		>5.5		AC-2s
						>5.5		>6.5		AC-3
						3.5		5.5		AC-3s
						5.5		5.5-6.5		AC-4
								<5.5		AC-5
DS-4	3.8-6.7	1.2	3.1-6.0	1.0	1.3-2.4	>3.5		>5.5		AC-3s
						>5.5		>6.5		AC-4
						3.5		5.5		AC-4s
						5.5		6.5		AC-5
DS-4m	3.8-6.7	>1.2(1)	3.1-6.0	>1.0(1)	1.3-2.4	>3.5		>5.5		AC-3s
						>5.5		>6.5		AC-4m
						3.5		5.5		AC-4ms
						5.5		6.5		AC-5m
DS-5	>6.7	1.2	>6.0	1.0	>2.4	>3.5		>5.5		AC-4s
						3.5		All pH Values		AC-5
DS-5m	>6.7	>1.2(1)	>6.0	>1.0(1)	>2.4	>3.5		>5.5		AC-4r
						3.5		All pH Values		AC-5r

Notes

(1) The limit on water soluble magnesium does not apply to brackish groundwater (chloride content between 12g/l and 18g/l). This allows m to be omitted from the relevant ACEC classification.

(2) Applies only to sites where concrete will be exposed to sulfate ions (SO4) which may result from the oxidation of sulfides such as pyrite, following ground disturbance.

(3) 'Brownfield' is defined as sites which may contain chemical wastes remaining from previous industrial use or from imported wastes.

(4) An additional account is taken of hydrochloric and nitric acids by adjustment to surface content—see Section 6.1.2.

Explanation of suffix symbols to ACEC Class number

- Suffix s indicates that, as the water has been classified as Static, no Additional Protective Measures are generally necessary.
- Concrete placed in ACEC Classes which include the suffix z have primarily to resist acid conditions and may be made with cements from any of the Groups in Part 2, Table 3-but see the restrictions in the table on the use of Portland limestone cement.
- Suffix m relates to the higher levels of magnesium in Sulfate Classes 4 and 5.

The pH value of groundwater provides a crude measure of the potential aggressiveness due to the presence of organic acids. The standard procedure for measuring the acidity of soils and groundwater is the electrometric method using a pH meter and is described in BS 1377 (1990): Part 3: Section 5. The pH value of pure water is 7.0 and the presence of acid substances will yield results with values less than 7. It should be noted however that the pH of most natural waters depends mainly on the dissolved carbon dioxide content and therefore lies between pH values of 6.5 and 8.5. It is generally accepted that soils or groundwater with pH values in the range 6 to 9 may be classified as near neutral. It should be noted that the pH value of soil and groundwater can change with time and it is therefore necessary to carry out testing on fresh samples of soil or water.

The pH value of the soil or groundwater also needs to be taken into consideration when the recorded sulphate content is borderline between two classes or approaches the upper limit of a given class. In these circumstances if the pH value is below 5.5 the sample should be placed in the more severe class of the sulphate classification. This general approach may be justified on the grounds that the acids present will tend to break down the concrete surface and therefore make it more susceptible to sulphate attack. This will be especially so if the sample contains large amounts of sulphides since these can be converted to sulphuric acid.

The effect of groundwater on the ACEC class is shown in Table 2 below.

TABLE 2: INCREMENTAL RULES FOR TABLE 1 TO ADJUST THE ACEC CLASS TO TAKE ACCOUNT OF GROUNDWATER

Use	Concrete in contact with:	pH	Mobility of Water M = Mobile S = Static	Effect on ACEC Class of a site with respect to each Design Sulfate Class
Foundations including poured cast-in-situ piles. For piles made by special techniques using low water/cement ratio, slightly less stringent requirements may be applicable	Natural ground	-	S	For Design Sulfate Classes 2, 3 and 4 the ACEC Class is decreased by 1.
		>3.5	S	No further change.
		<3.5	S	The ACEC Class is increased by 1.
		>5.5	M	There is no change.
		<5.5	M	The ACEC Class is increased by 1 and suffix 2 is added
	Ground containing wastes or made-up ground (Brownfield sites)	-	S	For Design Sulfate Classes 2, 3 and 4 the ACEC Class is decreased by 1 with suffix 5 added.
		>5.5	S	There is no further change.
		<5.5	S	The ACEC Class is increased by 1 with suffix 5 added.
		>6.5	M	There is no further change.
		5.5-6.5	M	The ACEC Class is increased by 1 with suffix 2 added.
		4.5-5.5	M	The ACEC Class is increased by 2 with suffix 2 added.
		<4.5	M	The ACEC Class is increased by 3 with suffix 2 added.

Organic acids are often found in peaty or marshy soils in which the pH value is below 6.0. In such soils it will be necessary to take specific precautions to protect any concrete which would be exposed to organic acids. The recommended precautionary measures outlined in Tomlinson (1994) (ref 03) could be followed. In all cases where mineral acids are present the groundwater is likely to be aggressive with regard to foundation concrete and in these circumstances. The recommendations given in BRE Special Digest Parts 2, 3 and 4 will need to be followed.

Alkaline groundwater is not generally considered aggressive to concrete unless present in high concentrations. Unless the aggregate used in foundation concrete is of a reactive type, pH values of groundwater up to pH = 14 need not be considered as problematic.

References:

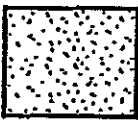
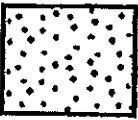
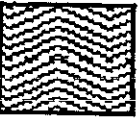
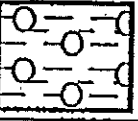
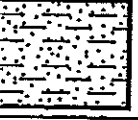
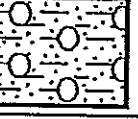
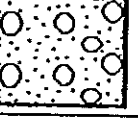
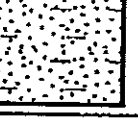
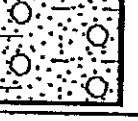
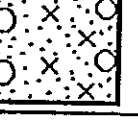
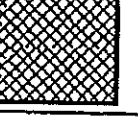
- (01) BS 1377: 1990 Methods of Test for Soils for Civil Engineering Purposes. Part 3: Chemical and Electrochemical Tests, British Standards Institution.
- (02) Building Research Establishment: 2001: Concrete in Aggressive Ground, Parts 1, 2, 3 and 4. BRE Special Digest 1. Building Research Station, Garston.
- (03) Tomlinson M.J: 1994: Foundation Design and Construction. 6th Edition, Pitman Advanced Publishing Programme.

SUPPORTING FACTUAL DATA

SECTION B

**EXPLORATORY HOLE RECORDS AND
FIELD DATA**

LEGEND AND NOTATION SHEET

Code	Description	Legend
104	CONCRETE	
501	GRAVEL	
ARISING	Cement and Arisings	
CL_G	CLAY with gravel	
CL_S	Sandy CLAY	
CL_SG	Sandy gravelly CLAY	
SANDGRAV	SAND and GRAVEL	
SD_C	Clayey SAND	
SD_CG	Clayey SAND with gravel	
SD_STG	Silty gravelly SAND	
SEAL	SEAL	

SUPPORTING FACTUAL DATA

SECTION B

**EXPLORATORY HOLE RECORDS AND
FIELD DATA**

BOREHOLE RECORDS

Contract No.	F12963	Method	Cable Percussion	Coordinates	S25925.90 E
Project	Aldbrough Gas Storage				437007.10 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.96m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	22/07/2003
				Date Completed	22/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
22/07/2003	0000	10.00	3.00	DRY	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.00	150	3.00								

GENERAL NOTES				SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.00m.				Depth	Type	Incremental blow count/penetration	Casing	Water Depth
				2.00	S	N=32 (4,6,7,8,9)	2.00	DRY
				4.00	S	N=35 (4,6,7,9,10)	3.00	
				6.55	S	N=32 (3,6,7,7,8,10)	3.00	

* Seating blows only.

NOTES: All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	ANAL CP HEADER
Version	3.01
Revised	25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525925.90 E
Project	Aldbrough Gas Storage				437007.10 N
		Drilling Rig	Dando 150	Ground Level	10.96m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	22/07/2003
Consultant	Molt MacDonald			Date Completed	22/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk and quartz.		0.30	10.66	D1 0.60			
Stiff locally very stiff dark orangish and dark reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk and mudstone.				U2 1.20 - 1.65	(95)		
		1.80	9.16	D3 1.80			
				D4 2.00 - 2.45	S32	S 2.00	2.45
				D5 2.80			
				U6 3.00 - 3.45	(100)		
				D7 3.60			
				D8 4.00 - 4.45	S35	S 4.00	4.45
				D9 4.80			
				U10 5.00 - 5.45	(105)		
				D11 6.00			
				D12 6.65 - 7.00	S32	S 6.65	7.00
				D13 7.60			
				U14 8.00 - 8.45	(77)		
				D15 9.00			
				U16 9.50 - 9.95	(58)		

Cable Percussion boring complete at 10.00 m.

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525964.20 E
Project	Aldbrough Gas Storage				436918.50 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.83m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	21/07/2003
				Date Completed	22/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
21/07/2003	1700	1.50	1.50	DRY	End of Shift				
22/07/2003	0000	10.50	9.50	4.20	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.50	150	9.50	22/07/2003	0000	7.20	4.22	20	Fast	7.00	9.00

GENERAL NOTES				SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.50m.				Depth	Type	Incremental blow count/penetration	Casing	Water Depth
				1.50	S	N=9 (1,1,2,2,2,3)	1.50	dry
				3.50	S	N=12 (1,2,2,3,3,4)	3.50	
				6.50	S	N=14 (1,2,3,3,4,4)	6.50	
				8.50	S	N=9 (0,1,1,2,3,3)	8.50	low

* Seating blows only.

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form ARJAL CP HEADER

Version 3.01

Revised 25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525964.20 E
Project	Aldbrough Gas Storage				436918.50 N
		Drilling Rig	Dando 150	Ground Level	10.83m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	21/07/2003
Consultant	Mott MacDonald			Date Completed	22/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of quartz, chalk and mudstone.		0.20	10.63	D1	0.30			
Firm locally stiff orange and grey slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of limestone and chalk.		B2	0.50 - 1.00					
Stiff dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, limestone and sandstone.		1.50	9.33	D3	1.50 - 1.95	S9	S	1.50
		B4	2.10 - 2.30					
		D5 U8	2.40 2.50 - 3.00	(60)				
		D7	3.20					
		D8	3.50 - 3.95	S12	S	3.50		
		D9 B10	4.10 4.20 - 4.50					
		U11	4.50 - 5.00	(73)				
		D12	5.00					
		D13	5.25					
		D14	5.50 - 5.95	S14	S	5.50		
		D15 B16	6.30 6.40 - 6.80					
		U17	7.00 - 7.50	(75)				
		D18	8.20					
		D20	8.50 - 8.95	S9	S	8.50		
B21	9.10 - 9.40							
D22	9.70							

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525991.00 E
Project	Aldbrough Gas Storage				436884.20 N
		Drilling Rig	Dando 150	Ground Level	10.98m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	17/07/2003
Consultant	Mott MacDonald			Date Completed	17/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
17/07/2003	0000	10.60	6.90	3.70	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.60	150	6.90	17/07/2003	0000	6.70	3.70	15	Fast	4.50	7.00

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.50m. 3. 50mm standpipe installed with slotted pipe from 7.00m to 1.00m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		1.50	C	N=19 (4,5,6,6,3,4)	1.50	DRY
		3.50	S	N=11 (1,1,2,2,3,4)	2.50	DRY
		5.50	S	N=13 (1,2,2,3,4,4)	4.50	DRY
		8.50	S	N=16 (2,3,3,4,4,5)	6.90	DRY

* Seating blows only.

NOTES: All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	3.01
Revised	23/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525991.00 E
Project	Aldbrough Gas Storage				436884.20 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.98m AOD
		Driller	LH	Orientation	Vertical
Consultant	Molt MacDonald	Logged by	OWP	Date Started	17/07/2003
				Date Completed	17/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy CLAY.		0.20	10.78	D1 0.50			
Firm reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of chalk and sandstone.		1.10	9.88	D2 1.30 B3 1.50 - 1.95	C19	C 1.50	
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, limestone, sandstone and mudstone.		2.30	8.68	D4 2.20 U5 2.50 - 3.00	(110)		
				D6 3.10 B7 3.20 - 3.50			
				D8 3.50 - 3.95	S11	S 3.50	
				D9 4.20 U10 4.50 - 5.00	(60)		
				D11 5.00 D12 5.10 B13 5.20 - 5.50			
				D14 5.50 - 5.95	S13	S 5.50	
				D15 6.50 U16 7.00 - 7.50	(120)		
				B17 7.70 - 8.00			
—at 8.30m becomes sandy				D18 8.30 D19 8.50 - 8.95	S16	S 8.50	
—at 9.30m becomes slightly sandy				D20 9.30 B21 9.70 - 10.00			

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525991.00 E
Project	Aldbrough Gas Storage				436884.20 N
		Drilling Rig	Dando 150	Ground Level	10.98m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	17/07/2003
Consultant	Mott MacDonald			Date Completed	17/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Stiff locally very stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine of chalk, limestone and mudstone.		10.50	0.48	U22 10.00 - 10.50 D23 10.50	(120)		
Cable Percussion boring complete at 10.50 m.							

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARJAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526011.70 E
Project	Aldbrough Gas Storage				437027.10 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	13.08m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	23/07/2003
				Date Completed	23/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
23/07/2003	0000	10.00	3.00	DRY	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.00	150	3.00								

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.00m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		2.00	S	N=30 (3,3,5,7,9,9)	1.00	
		4.00	S	N=18 (2,2,3,4,5,6)	3.00	
		7.55	S	N=26 (2,3,5,6,7,7)	3.00	
		• Seating blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form ARIAL CP HEADER

Version 3.01

Revised 23/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526011.70 E
Project	Aldbrough Gas Storage				437027.10 N
		Drilling Rig	Dando 150	Ground Level	13.08m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	23/07/2003
Consultant	Mott MacDonald			Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and quartz. Stiff, reddish brown mottled with grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone.		0.25	12.83	D1 0.50			
				U2 1.20 - 1.65	(55)		
				D3 1.65			
				D4 1.80			
				D5 2.00 - 2.45	S30	S 2.00	2.45
				D6 2.80			
				U7 3.05 - 3.50	(104)		
				D8 3.80			
				D9 4.00 - 4.45	S18	S 4.00	4.45
				D10 4.80			
				U11 5.00 - 5.45	(95)		
Stiff locally very stiff dark greyish brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, mudstone and sandstone.		5.80	7.28	D12 5.85			
				U13 6.00 - 6.45	(80)		
				D14 7.00			
				D15 7.55 - 8.00	S25	S 7.55	8.00
				D16 8.50			
				U17 9.00 - 9.45	(85)		

Cable Percussion boring complete at 10.00 m.

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

**Hole ID.
BH105**
Header

Contract No.	F12963	Method	Cable Percussion	Coordinates	526035.70 E
Project	Aldbrough Gas Storage				436954.10 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	13.25m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	22/07/2003
				Date Completed	23/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
22/07/2003	1700	6.00	4.50	DRY	End of Shift				
23/07/2003	0000	10.50	6.00	DRY	End of Hole				
23/07/2003	0730	6.00	4.50	DRY	Start of Shift				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.50	150	6.00								

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.50m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		1.50	S	N=12 (1,2,2,3,3,4)	1.50	DRY
		3.50	S	N=16 (1,2,3,4,4,5)	3.50	
		5.50	S	N=11 (1,2,2,3,3,3)	4.50	
		8.50	S	N=14 (1,2,3,3,4,4)	6.00	
		• Sealing blows only.				

NOTES: All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	3.01
Revised	25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526035.70 E
Project	Aldbrough Gas Storage				436954.10 N
		Drilling Rig	Dando 150	Ground Level	13.25m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	22/07/2003
Consultant	Mott MacDonald			Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Stiff brown slightly gravelly SANDY CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and quartz. Firm locally stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, limestone and sandstone.		0.30	12.95	D1 0.20			
				D2 0.60			
				B3 0.60 - 1.20			
				D4 1.50 - 1.95	S12	S 1.50	
				D5 2.25			
				U6 2.50 - 3.00	(120)		
				D7 3.10			
Firm locally stiff, brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk, mudstone and sandstone. —at 9.50m becomes greyish brown		6.70	6.55	B8 3.20 - 3.50			
				D9 3.50 - 3.95	S16	S 3.50	
				D10 4.25			
				U11 4.50 - 5.00	(120)		
				D12 5.10			
				B13 5.20 - 5.50			
				D14 5.50 - 5.95	S11	S 5.50	
				D15 6.50			
				U16 7.00 - 7.50	(50)		
				D17 7.50			
				D18 8.00			
				B19 8.10 - 8.40			
				D20 8.50 - 8.95	S14	S 8.50	
				D21 9.50			

NOTES: All depths in metres, all diameters in millimetres.
 See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form **ARIAL CP LOG**
 Version **3.02**
 Revised **23/12/2002**

Contract No.	F12963	Method	Cable Percussion	Coordinates	526035.70 E
Project	Aldbrough Gas Storage				436954.10 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	13.25m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	22/07/2003
				Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff, brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk, mudstone and sandstone.		10.50	2.75	U22 10.00 - 10.50	(63)		
Cable Percussion boring complete at 10.50 m.							

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526061.70 E
Project	Aldbrough Gas Storage				436882.60 N
		Drilling Rig	Dando 150	Ground Level	10.69m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	21/07/2003
Consultant	Mott MacDonald			Date Completed	21/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
21/07/2003	0000	10.45	9.50	4.05	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.45	160	9.50	21/07/2003	1425	8.60	4.05	20	Fast	7.10	9.50

GENERAL NOTES				SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.45m.				Depth	Type	Incremental blow count/penetration	Casing	Water Depth
				2.50	S	N=17 (1,2,3,4,5,5)	2.50	DRY
				4.50	S	N=13 (1,2,3,3,3,4)	4.50	DRY
				7.00	S	N=12 (1,2,2,3,3,4)	7.00	DRY
				10.00	S	N=13 (1,2,3,3,3,4)	9.50	DRY
				* Sealing blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Firm	ARIAL CP HEADOR
Version	3.01
Revised	25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526061.70 E
Project	Aldbrough Gas Storage				436882.60 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.69m AOD
Consultant	Mott MacDonald	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	21/07/2003
				Date Completed	21/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and quartz.		0.20	10.49	D1 0.30			
		0.50	10.19	D2 0.70			
				B3 1.00 - 1.20			
				U4 1.50 - 2.00	(45)		
				D5 2.20			
Stiff locally very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and chalk.		2.60	8.09	D6 2.60 - 2.95	S17	S 2.50	
				B7 2.50 - 2.65			2.95
				D8 3.10			
				B9 3.20 - 3.60			
				U10 3.60 - 4.00	(60)		
Stiff locally very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, limestone, mudstone and sandstone.		4.20	6.49	D11 4.00			
				D12 4.25			
				D13 4.50 - 4.95	S13	S 4.50	
							4.95
				D14 5.10			
				B15 5.20 - 5.50			
				U16 5.60 - 6.00	(50)		
				D17 6.00			
				D18 6.50			
				D19 7.00 - 7.45	S12	S 7.00	
							7.45
				D20 7.60			
				B21 8.00 - 8.40			
				U22 8.50 - 9.00	(40)		
				D23 9.50			

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526061.70 E
Project	Aldbrough Gas Storage				436882.60 N
		Drilling Rig	Dando 150	Ground Level	10.69m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	21/07/2003
Consultant	Mott MacDonald			Date Completed	21/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth		Installation
Stiff locally very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, limestone, mudstone and sandstone. Cable Percussion boring complete at 10.45 m.		10.45	0.24	D24	10.00 - 10.45	S13	S	10.00 10.45	

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526113.70 E
Project	Aldbrough Gas Storage				437072.70 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	13.22m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	23/07/2003
				Date Completed	24/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
23/07/2003	0000	5.00	3.00	DRY	End of Shift				
24/07/2003	0000	10.00	3.00	4.60	End of Hole				
24/07/2003	0000	5.00	3.00	4.60	Start of Shift				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.00	150	3.00	24/07/2003	0800	4.60	NR	NR		3.00	NR

GENERAL NOTES				SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.00m. 3. Standpipe installed with slotted pipe from 3.00m to 10.00m.				Depth	Type	Incremental blow count/penetration	Casing	Water Depth
				2.00	S	N=23 (2,3,5,6,6,6)	1.00	DRY
				4.00	S	N=18 (1,2,3,5,5,5)	3.00	
				6.65	S	N=18 (2,2,3,4,5,6)	3.00	
				9.50	S	N=26 (3,4,5,6,7,8)	3.00	

* Seating blows only.

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Contract No.	F12963	Method	Cable Percussion	Coordinates	526113.70 E
Project	Aldbrough Gas Storage				437072.70 N
		Drilling Rig	Dando 150	Ground Level	13.22m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	23/07/2003
Consultant	Mott MacDonald			Date Completed	24/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and sandstone.		0.30	12.92	D1 0.50			
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and mudstone.				U2 1.20 - 1.65	(68)		
				D3 1.65			
				D4 1.80			
—at 2.00m becomes mottled with grey				D5 2.00 - 2.45	S23	S 2.00	2.45
				D6 2.80			
				U7 3.00 - 3.45	(112)		
				D8 3.80			
				D9 4.00 - 4.45	S18	S 4.00	4.45
				D10 4.80			
—at 4.80m becomes brown				U11 5.00 - 5.45	(90)		
				D12 6.00			
				D13 6.65 - 7.00	S18	S 6.55	7.00
				D14 7.60			
—at 7.50m becomes greyish brown				U15 8.00 - 8.45	(122)		
				D16 9.00			
				D17 9.50 - 9.95	S26	S 9.50	9.95

Cable Percussion boring complete at 10.00 m.

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH108
Header

Contract No.	F12963	Method	Cable Percussion	Coordinates	526126.40 E
Project	Aldbrough Gas Storage				436990.30 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	13.03m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	23/07/2003
				Date Completed	23/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
23/07/2003	0000	10.60	3.10	NR	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.60	150	3.10								

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.50m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		1.50	S	N=14 (1,2,3,3,4,4)	1.50	
		3.50	S	N=20 (1,2,3,4,8,5)	3.10	
		6.50	S	N=14 (1,2,3,3,4,4)	3.10	
		8.50	S	N=17 (2,3,3,4,5,5)	3.10	DRY

* Seating blows only.

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form ARIAL CP HEADER
Version 3.01
Revised 25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526126.40 E
Project	Aldbrough Gas Storage				436990.30 N
		Drilling Rig	Dando 150	Ground Level	13.03m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	23/07/2003
Consultant	Mott MacDonald			Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk, mudstone and quartz.		0.25	12.78	D1 0.40 B2 0.50 - 1.00			
Firm locally stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.				D3 1.20			
				D4 1.50 - 1.95	S14	S 1.50	1.95
				D5 2.10 B6 2.20 - 2.50			
				U7 2.50 - 3.00	(100)		
				D8 3.00			
				D9 3.25			
				D10 3.50 - 3.95	S20	S 3.50	3.95
				D11 4.10 B12 4.20 - 4.50			
				U13 4.50 - 5.00	(100)		
				D14 5.00			
				D15 5.25			
				D16 5.50 - 5.95	S14	S 5.50	5.95
				D17 6.20 B18 6.40 - 6.80			
				U19 7.00 - 7.50	(75)		
				D20 8.00 B21 8.10 - 8.40			
				D22 8.50 - 8.95	S17	S 8.50	8.95
				D23 9.50			
—at 5.00m becomes brown							
—at 8.00m becomes greyish brown							

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002



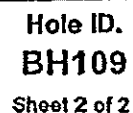
Hole ID.
BH108
Sheet 2 of 2

Contract No.	F12963	Method	Cable Percussion	Coordinates	526126.40 E
Project	Aldbrough Gas Storage				436990.30 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	13.03m AOD
		Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	23/07/2003
Consultant	Mott MacDonald			Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		10.50	2.63	U24 10.00 - 10.50	(80)		
Cable Percussion boring complete at 10.50 m.				D25 10.50			

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002



Contract No.	F12963	Method	Cable Percussion	Coordinates	526149.80 E
Project	Aldbrough Gas Storage				436911.30 N
		Drilling Rig	Dando 150	Ground Level	11.41m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	24/07/2003
Consultant	Mott MacDonald			Date Completed	24/07/2003

Contract No.	F12963	Method	Cable Percussion	Coordinates	525815.20 E
Project	Aldbrough Gas Storage				437086.50 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.13m AOD
		Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	22/07/2003
Consultant	Mott MacDonald			Date Completed	22/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
22/07/2003	0000	5.00	3.00	DRY	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	5.00	150	3.00								

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 5.00m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		2.00	S	N=22 (2,3,4,6,6,6)	1.00	DRY
		5.00	S	N=26 (3,4,6,6,7,7)	3.00	DRY
		* Seating blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Contract No.	F12963	Method	Cable Percussion	Coordinates	525815.20 E
Project	Aldbrough Gas Storage				437086.50 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.13m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	22/07/2003
				Date Completed	22/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and quartz.		0.30	6.83	D1 0.50			
Firm locally stiff mottled brown orange and grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and chert.		1.25	8.68	U2 1.00 - 1.45	(65)		
Stiff reddish brown with grey mottling, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, limestone and sandstone.				D3 1.45			
				D4 1.80		S22 S 2.00	
						2.45	
--at 2.80m becomes brown				D6 2.80			
				U7 3.00 - 3.45	(60)		
--at 3.80m becomes greyish brown				D8 3.80			
				D9 3.95 - 4.00	(65)		
				U10 4.00 - 4.45			
				D11 4.80			
Cable Percussion boring complete at 5.00 m.		5.00	6.13		S26	S 5.00	
						5.45	

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525883.00 E
Project	Aldbrough Gas Storage				436907.20 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.19m AOD
		Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	21/07/2003
Consultant	Mott MacDonald			Date Completed	21/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
21/07/2003	0000	5.00	5.00	4.00	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	5.00	150	5.00	21/07/2003	0000	2.20	2.00	10	Fast	2.00	3.00
				21/07/2003	0000	4.00	3.70	10	Fast	3.60	NS

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 5.00m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		2.00	S	N=14 (2,3,1,1,8,6)	2.00	DRY
		4.00	S	N=27 (2,2,6,7,7,7)	3.60	DRY
		5.00	S	N=28 (3,4,6,7,8,7)	5.00	4.50
		* Seating blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	3.01
Revised	23/11/2002

Contract No.	F12983	Method	Cable Percussion	Coordinates	525883.00 E
Project	Aldbrough Gas Storage				436907.20 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.19m AOD
Consultant	Mott MacDonald	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	21/07/2003
				Date Completed	21/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPTN & (U blows)	SPT type & depth		Install- ation	
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		0.60	9.59	D1	0.70					
Firm locally stiff orange and brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, slate, sandstone, mudstone and limestone.				U2	1.00 - 1.45	(60)				
				D3	1.45					
				D4	1.80					
				D5	2.20	S14	S	2.00		2.45
Brown very clayey very gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk, limestone and mudstone.		2.20	7.99							
		2.30	7.89							
				D6	2.70					
				U7	3.00 - 3.45	(75)				
Firm locally very stiff brown sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone. —at 2.95m becomes slightly sandy										
			D8	3.70						
						S27	S	4.00	4.45	
Cable Percussion boring complete at 5.00 m.		5.00	5.19	D10	5.00	S28	S	5.00	5.45	

NOTES: All depths in metres, all diameters in millimetres.
 See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525940.50 E
Project	Aldbrough Gas Storage				436791.20 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.52m AOD
Consultant	Molt MacDonald	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	16/07/2003
				Date Completed	16/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
16/07/2003	1700	5.50	4.50	2.10	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	5.50	150	4.50	16/07/2003	0000	2.10	NR	NR	Damp	NR	NR

GENERAL NOTES				SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 5.50m. 3. Minimum amount of water added from 2.50m to 4.00m to assist drilling.				Depth	Type	Incremental blow count/penetration	Casing	Water Depth
				2.00	C	N=22 (6,6,7,6,4,5)	2.00	DRY
				3.00	C	N=19 (3,4,4,5,4,6)	3.00	2.00
				4.00	S	N=11 (1,1,2,2,3,4)	4.00	DRY
				* Seating blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form ARIAL CP HEADER
Version 3.01
Revised 25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525940.50 E
Project	Aldbrough Gas Storage				436791.20 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.52m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	16/07/2003
				Date Completed	16/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth		Install- ation
Brown gravelly very clayey SAND. Gravel is subangular to subrounded fine to coarse of chalk, limestone and sandstone.		0.25	10.27						
Firm orange and greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded medium of sandstone.				D1 1.00 U2 1.00 - 1.50	(50)				
Firm locally soft orangish brown sandy gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk, limestone and sandstone.		1.30	9.22	D3 1.50 D4 1.80 B5 2.00 - 2.45	C22	C	2.00 2.45		
Medium dense dark grey brown and white SAND and subangular to subrounded fine to coarse GRAVEL of chalk, limestone and sandstone.		2.60	7.92	B6 2.60 - 3.00 B7 3.00 - 3.45	C19	C	3.00 3.45		
Firm brownish grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk and sandstone.		3.90	6.62	D8 4.00 - 4.45 D9 4.00 - 4.45 D10 4.80 U11 5.00 - 5.50	S11	S	4.00 4.45		
					(69)				
Cable Percussion boring complete at 5.50 m.		5.50	5.02	D12 5.50					

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3 02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526112.40 E
Project	Aldbrough Gas Storage				436816.80 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.06m AOD
Consultant	Mott MacDonald	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	21/07/2003
				Date Completed	21/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
21/07/2003	0000	5.00	4.00	1.80	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	5.00	150	4.00	21/07/2003	0000	2.30	1.80	15	Fast	2.20	4.00

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 5.00m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		2.00	S	N=24 (8,9,8,8,6)	1.50	DRY
		3.00	C	N=16 (3,4,3,4,4,5)	3.00	2.10
		* Seating blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	3.01
Revised	25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	526112.40 E
Project	Aldbrough Gas Storage				436816.80 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.06m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	21/07/2003
				Date Completed	21/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of quartz and chalk.		0.30	9.76	D1 0.50			
Stiff orangish and reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and mudstone. With some pockets of sand.				U2 1.00 - 1.45	(33)		
				D3 1.45			
				D4 1.80			
				D5 2.00 - 2.45	S24	S 2.00	
		2.30	7.76				2.45
Firm brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, limestone and sandstone.				D6 2.80			
					C16	C 3.00	
		3.20	6.86				3.45
Stiff locally very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, limestone, mudstone and sandstone.				D7 3.70			
				D8 4.00 - 4.25			
				U9 4.50 - 4.95	(88)		
Cable Percussion boring complete at 5.00 m.		5.00	5.06	D10 5.00			

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARUL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525912.20 E
Project	Aldbrough Gas Storage				437135.50 N
		Drilling Rig	Dando 150	Ground Level	10.40m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	24/07/2003
Consultant	Mott MacDonald			Date Completed	24/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
24/07/2003	0000	10.00	3.00	DRY	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.00	150	3.00								

GENERAL NOTES				SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.00m. 3. 50mm standpipe installed with slotted pipe from 3.00m to 9.00m.				Depth	Type	Incremental blow count/penetration	Casing	Water Depth
				2.00	S	N=9 (1,1,2,2,2,3)	1.00	DRY
				4.00	S	N=22 (3,3,4,6,6,6)	3.00	DRY
				6.50	S	N=23 (3,3,5,5,6,7)	3.00	DRY
				9.50	S	N=28 (3,4,6,6,7,7)	3.00	DRY
				* Seating blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	3.01
Revised	23/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525912.20 E
Project	Aldbrough Gas Storage				437135.50 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.40m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	24/07/2003
				Date Completed	24/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, quartz and mudstone. Stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and mudstone. With sandy pockets.		0.30	10.10	D1 0.60			
				U2 1.20 - 1.65	(60)		
				D3 1.65			
				D4 1.80			
				D5 2.00 - 2.45	S9	S 2.00	
				D6 2.80			
				U7 3.00 - 3.45	(50)		
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and mudstone. —at 6.50m becomes greyish brown		3.40	7.00	D8 3.45			
				D9 3.85			
				D10 4.00 - 4.45	S22	S 4.00	
				D11 4.80			
				U12 5.00 - 5.45	(80)		
				D13 6.00			
				D14 6.50 - 6.95	S23	S 6.50	
				D15 7.50			
				U16 8.00 - 8.45	(92)		
				D17 9.00			
				D18 9.50 - 9.95	S26	S 8.50	

Cable Percussion boring complete at 10.00 m.

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525888.60 E
Project	Aldbrough Gas Storage				436862.80 N
		Drilling Rig	Dando 150	Ground Level	10.51m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	24/07/2003
Consultant	Mott MacDonald			Date Completed	25/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
24/07/2003	0000	5.00	4.50	2.40	End of Shift				
25/07/2003	0000	10.50	4.50	NR	End of Hole				
25/07/2003	0000	5.00	4.50	NR	Start of Shift				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	10.50	150	4.50	24/07/2003	0000	2.40	1.38	20	Fast	1.50	4.00

GENERAL NOTES		SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 10.50m.		Depth	Type	Incremental blow count/penetration	Casing	Water Depth
		1.50	S	N=9 (1,1,2,2,2,3)	1.50	DRY
		2.50	C	N=13 (1,2,3,3,4,3)	2.50	1.70
		3.50	S	N=10 (2,3,2,2,3,3)	3.50	3.00
		5.50	S	N=15 (1,2,3,3,4,5)	4.50	DRY
		8.50	S	N=14 (1,2,3,3,4,4)	4.50	DRY
		* Seating blows only.				

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	2.01
Revised	25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525888.60 E
Project	Aldbrough Gas Storage				436862.80 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.51m AOD
		Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	24/07/2003
Consultant	Mott MacDonald			Date Completed	25/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		SPT N & (U blows)	SPT type & depth		Installation	
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk and quartz.		0.20	10.31	D1	0.30					
Firm to stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, limestone and sandstone.		0.50	10.01	D2	0.60					
				B3	0.80 - 1.20					
Firm orange and reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of chalk and sandstone.		1.55	8.96	D4	1.50 - 1.95	S9	S	1.50		
										1.95
					D5	2.20				
Medium dense brown very clayey SAND and subangular to rounded fine to coarse GRAVEL of chalk, sandstone, limestone and quartz.				B6	2.50 - 2.95	C13	C	2.50		
				B7	3.00 - 3.50			2.95		
				B8	3.50 - 3.95	S10	S	3.50		
		3.60	6.91					3.95		
				D9	4.25					
				U10	4.50 - 5.00	(100)				
				D11	5.10					
				B12	5.20 - 5.50					
				D13	5.50 - 5.95	S15	S	5.50		
								5.95		
			D14	6.50						
			U15	7.00 - 7.50	(50)					
			D16	7.50						
			B17	7.80 - 8.20						
			D18	8.40						
			D19	8.50 - 8.95	S14	S	8.50	8.95		
			D20	9.30						
			B21	9.50 - 9.80						

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	1.02
Revised	23/12/2002

Form	ARIAL CP LOG
Version	3.02
Revised	23/12/2002

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH119
Header

Contract No.	F12963	Method	Cable Percussion	Coordinates	525867.40 E
Project	Aldbrough Gas Storage				436954.50 N
Client	Scottish and Southern Energy PLC	Drilling Rig	Dando 150	Ground Level	10.37m AOD
		Driller	LH	Orientation	Vertical
Consultant	Mott MacDonald	Logged by	OWP	Date Started	25/07/2003
				Date Completed	25/07/2003

PROGRESS						BORING DETAILS			
Date	Time	Hole depth	Casing depth	Water depth	Remarks	Hard Strata from depth	Hard Strata to depth	Chiselling hours	Remarks
25/07/2003	0000	5.00	4.00	2.30	End of Hole				

CASING				WATER STRIKES							
Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.	Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
150	5.00	150	4.00	25/07/2003	0000	3.20	2.30	15	Fast	3.10	4.00

GENERAL NOTES				SPT DETAILS				
1. Inspection pit hand excavated from GL to 1.20m. 2. Cable Percussive boring complete at 5.00m.				Depth	Type	Incremental blow count/penetration	Casing	Water Depth
				2.00	S	N=17 (2,5,2,5,5,5)	1.00	
				3.00	C	N=11 (1,2,2,3,3,3)	3.00	
				5.00	S	N=27 (3,4,6,6,7,8)	4.00	

* Sealing blows only.

NOTES: All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form: ARIAL CP-HEADER
Version: 3.01
Revised: 25/11/2002

Contract No.	F12963	Method	Cable Percussion	Coordinates	525867.40 E
Project	Aldbrough Gas Storage				436954.50 N
		Drilling Rig	Dando 150	Ground Level	10.37m AOD
Client	Scottish and Southern Energy PLC	Driller	LH	Orientation	Vertical
		Logged by	OWP	Date Started	25/07/2003
Consultant	Mott MacDonald			Date Completed	25/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	SPT N & (U blows)	SPT type & depth	Installation
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		0.40	9.97	D1 0.50			
Firm orangish brown and grey sandy CLAY.				U2 1.20 - 1.65	(100)		
Medium dense reddish brown very clayey very gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and mudstone.		1.60	8.77	D3 1.80			
				D4 2.00 - 2.45	S17	S 2.00	
				B5 2.50 - 3.00			2.45
				B6 3.00 - 3.20	C11	C 3.00	
				W7 3.30			3.45
Firm becoming stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, sandstone and limestone.		3.90	6.47	D8 3.90 - 4.00			
				U9 4.00 - 4.45	(90)		
				D10 4.80			
Cable Percussion boring complete at 5.00 m.		5.00	5.37	D11 5.00 - 5.45	527	S 5.00	5.45

NOTES: All depths in metres, all diameters in millimetres.
 See header sheet for details of boring, progress and water strikes. See legend sheet for key to symbols.

Form ARIAL CP LOG
 Version 3.02
 Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525913.00 E
Project	Aldbrough Gas Storage				436939.60 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Silemaster	Ground Level	10.71m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	17/07/2003
				Date Completed	17/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of quartz chalk and limestone. With abundant rootlets.		0.25	10.46	D1 0.50	
Firm locally stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of limestone. With occasional subangular to subrounded cobbles of limestone.				D2 1.00 B3 1.00	
				D4 1.50	
—at 2.00m clay becomes brown				D5 2.00 B6 2.00	
				D7 2.50	
Greyish brown slightly clayey SAND and subangular to rounded fine to coarse GRAVEL of chalk, limestone and sandstone. With frequent subangular to subrounded cobbles of chalk and sandstone.		2.60	8.11	D8 3.00 B9 3.00	
Trial pit complete at 3.00 m.		3.00	7.71		

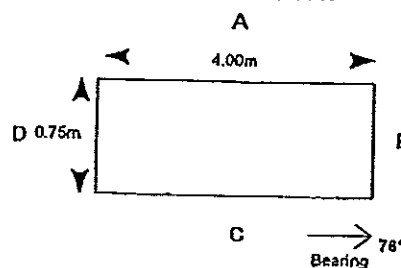
Stability Unstable on all faces from 2.60m

Shoring None

Groundwater Strike at 2.60m

Remarks 1. Trial pit abandoned at 3.00m due to sand and gravel stratum collapsing.

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	39.0	6.00	
1.00	100	35.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form JRAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525927.90 E
Project	Aldbrough Gas Storage				436886.40 N
		Equipment	JCB Sitemaster	Ground Level	10.26m AOD
Client	Scottish and Southern Energy PLC			Date Started	17/07/2003
		Logged by	OWP	Date Completed	17/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm brown slightly sandy slightly gravelly CLAY . Gravel is subangular to rounded, fine to medium of limestone and chalk. With abundant rootlets.		0.25	10.01	D1 0.50	
Firm locally stiff orange and grey slightly sandy slightly gravelly CLAY . Gravel is subangular to subrounded, fine to coarse of sandstone and limestone. With occasional subangular cobbles of sandstone.		1.00	9.26	D2 1.00 B3 1.00	
Soft, brown sandy gravelly CLAY . Gravel is subangular to subrounded, fine to coarse of chalk, limestone and sandstone.		1.80	8.46	D4 1.50 D5 2.00 B6 2.00 D7 2.00	
Dark brown slightly clayey SAND and subangular to subrounded fine to coarse GRAVEL of limestone, chalk and sandstone.		3.00	7.28	D8 3.00 B9 3.00	Excavation halted at 3.00m due to sides collapsing in sand and gravel strata
Trial pit complete at 3.00 m.					

Stability	Unstable on all faces from 1.80m	Sketch Plan of Trial Pit
Shoring	None	
Groundwater	Seepage at 2.00m. Water level settled in pit at 2.30m	
Remarks	1. Trial pit abandoned at 3.00m due to sand and gravel stratum collapsing.	

Depth	HV Peak	HV Remoulded	Remarks
0.20	54.0	35.00	
1.00	44.0	25.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form **ARIAL TP LOG**
Version **3.02**
Revised **23/12/2002**

SUPPORTING FACTUAL DATA

SECTION B

**EXPLORATORY HOLE RECORDS AND
FIELD DATA**

TRIAL PIT RECORDS

Contract No.	F12963	Method	Machine Excavated	Coordinates	525957.80 E
Project	Aldbrough Gas Storage				437022.00 N
		Equipment	JCB Sitemaster	Ground Level	11.09m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	18/07/2003
				Date Completed	18/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff, brown sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartz, limestone and chalk. With some rootlets.		0.25	10.84	D1 0.50	
Firm locally stiff mottled brown, orange and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, limestone and sandstone.		0.85	10.14	D2 1.00 B3 1.00	
				D4 1.50	
				D5 2.00 B6 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
		3.50	7.59	D10 3.50	
Trial pit complete at 3.50 m.					

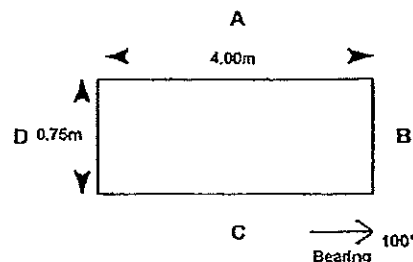
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	60.0	30.00	
0.80	130	45.00	
1.00	130	40.00	

NOTES: All depths in metres, all soil strengths in kPa.
 See legend sheet for key to symbols and abbreviations.
 All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3 02
Revised	23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525979.50 E
Project	Aldbrough Gas Storage				436974.30 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	12.65m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	18/07/2003
				Date Completed	18/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of limestone and chalk. With some rootlets.		0.16	12.49	D1	0.50	
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, limestone, sandstone and mudstone. With occasional subangular to subrounded cobbles of sandstone, dolerite and limestone. —at 1.20m becomes reddish brown with grey mottling				D2	1.00	
				B3	1.00	
				D4	1.50	
				D5	2.00	
				B6	2.00	
				D7	2.50	
				D8	3.00	
				B9	3.00	
Trial pit complete at 3.50 m.			3.50	9.15	D10	3.50

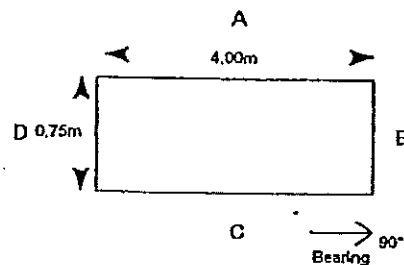
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.10	75.0	30.00	
1.00	130	35.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526005.60 E
Project	Aldbrough Gas Storage				436915.00 N
		Equipment	JCB Sitemaster	Ground Level	12.15m AOD
Client	Scottish and Southern Energy PLC			Date Started	22/07/2003
		Logged by	OWP	Date Completed	22/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm, brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk and dolerite.		0.30	11.85	D1 0.50	
Firm locally stiff dark orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, quartz, limestone, dolerite and sandstone.		1.07	11.08	D2 1.00 B3 1.00	
Stiff, reddish brown mottled with grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk, slate, limestone, mudstone and quartz. With occasional subangular to subrounded cobbles of chalk, limestone and dolerite.				D4 1.50 D5 2.00 B8 2.00 D7 2.50 D8 3.00 B9 3.00	
Trial pit complete at 3.50 m.		3.50	8.65	D10 3.50	

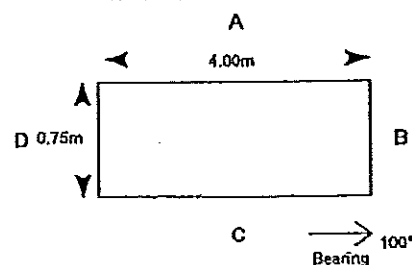
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	50.0	35.00	
1.00	96.0	50.00	
1.10	130	70.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form AAUL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526032.20 E
Project	Aldbrough Gas Storage				436861.90 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.47m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	22/07/2003
				Date Completed	22/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
Firm locally stiff brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk and chert.		0.47	10.00	D1	0.50	
Firm yellowish brown and grey sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, dolerite, limestone and quartz. With occasional subangular cobbles of mudstone. ---at 0.70m becomes light greyish brown		1.00	9.47	D2 B3	1.00 1.00	
Greyish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and quartzite. With some very clayey pockets. ---at 1.50m becomes reddish grey and orangish grey		1.90	8.57	D4 D5 B6	1.50 2.00 2.00	
Brown slightly clayey SAND and angular to rounded, fine to coarse GRAVEL of chalk, mudstone, sandstone, slate, dolerite, microgranite and limestone. With common subangular to subrounded cobbles of the above. ---at 2.50m becomes clayey		2.60	7.87	D7 D8 D9	2.50 3.00 3.00	
Stiff locally very stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk, sandstone and mudstone. Trial pit complete at 3.50 m.		3.50	6.97	D10	3.50	

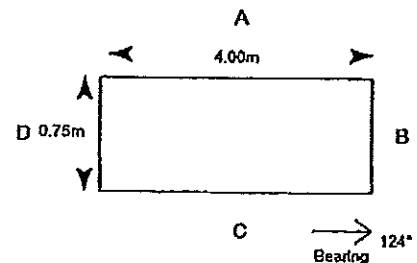
Stability Unstable on all sides from 1.90m to 2.60m

Shoring None

Groundwater Seepage from 1.90m to 2.60m

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	72.0	54.00	
0.50	24.0	52.00	
1.00	115	40.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARJAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526070.00 E
Project	Aldbrough Gas Storage				437054.90 N
		Equipment	JCB Sitemaster	Ground Level	13.35m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	18/07/2003
Consultant	Mott MacDonald			Date Completed	18/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of quartz, chalk and sandstone.		0.30	13.05	D1	0.50	
Stiff orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk and sandstone.		1.10	12.25	D2 B3	1.00 1.00	
Stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone. With occasional subangular to rounded cobbles of limestone, chalk and dolerite.				D4	1.50	
				D5 B8	2.00 2.00	
				D7	2.50	
				D8 B9	3.00 3.00	
		3.50	9.85	D10	3.50	
Trial pit complete at 3.50 m.						

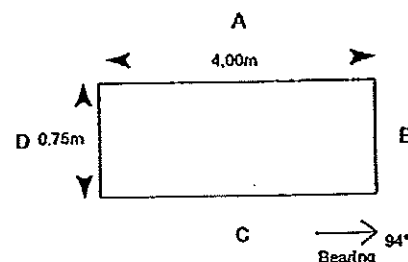
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	60.0	26.00	
1.00	107	39.00	
1.20	121	26.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526072.50 E
Project	Aldbrough Gas Storage				436998.00 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	13.59m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	18/07/2003
				Date Completed	18/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded, fine to coarse of chalk, mudstone and sandstone.		0.25	13.34	D1 0.50	
Firm locally stiff orangish brown and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk, limestone and sandstone.		0.95	12.64	D2 1.00 B3 1.00	
Firm locally stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of shale, chalk and sandstone. With occasional subangular to subrounded cobbles of dolerite, chalk and shale.				D4 1.50	
				D5 2.00 B6 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
				D10 3.50	
Trial pit complete at 3.50 m.		3.50	10.09		

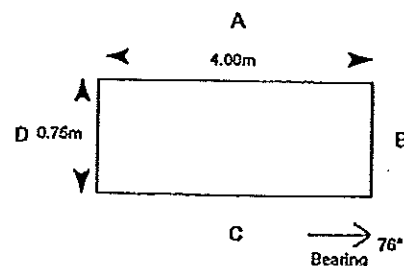
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	54.0	30.00	
0.95	127	50.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526092.80 E 436938.10 N
Project	Aldbrough Gas Storage	Equipment	JCB Sitemaster	Ground Level	12.54m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	22/07/2003
Consultant	Mott MacDonald			Date Completed	22/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		0.30	12.24	D1 0.50	
Firm locally stiff orangish brown and grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk and mudstone.		0.70	11.84	D2 1.00 B3 1.00	
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, sandstone and limestone. With occasional subangular to subrounded cobbles of limestone and chalk.				D4 1.50 D5 2.00 B6 2.00 D7 2.50 D8 3.00 B9 3.00	
Trial pit complete at 3.50 m.		3.50	9.04	D10 3.50	

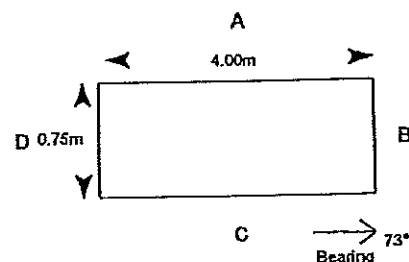
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	72.0	54.00	
0.50	84.0	52.00	
1.00	115	40.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form AR04, TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526127.10 E
Project	Aldbrough Gas Storage				436896.20 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.89m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	21/07/2003
				Date Completed	21/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
Firm locally stiff, brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and siltstone. With occasional rootlets.		0.25	10.64	D1	0.50	
Firm locally stiff orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of quartz, mudstone and chalk.		0.70	10.19	D2	1.00	
				B3	1.00	
				D4	1.50	
				D5	2.00	
				B6	2.00	
				D7	2.50	
				D8	3.00	
				B9	3.00	
Firm locally stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone. With occasional subangular to subrounded cobbles of chalk.						
Trial pit complete at 3.50 m.		3.50	7.39	D10	3.50	

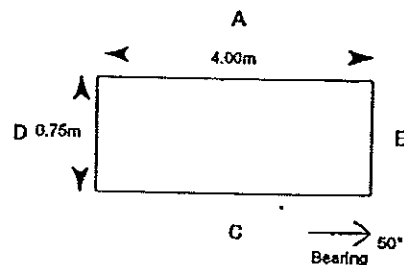
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	76.0	40.00	
0.50	110	50.00	
1.00	70.0	40.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526132.20 E
Project	Aldbrough Gas Storage				437019.70 N
		Equipment	JCB Sitemaster	Ground Level	13.11m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	22/07/2003
Consultant	Mott MacDonald			Date Completed	22/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk and mudstone.		0.30	12.81	D1 0.50	
Firm locally stiff orangish brown and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and limestone.		0.90	12.21	D2 1.00 B3 1.00	
Stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, sandstone, dolerite. With occasional subrounded cobbles of dolerite.				D4 1.50	
				D5 2.00 B5 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
		3.50	9.61	D10 3.50	
Trial pit complete at 3.50 m.					

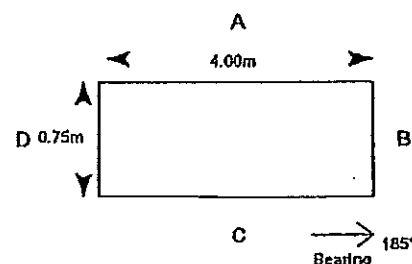
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	56.0	33.00	
0.50	59.0	37.00	
1.00	108	82.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG

Version 1.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526163.30 E
Project	Aldbrough Gas Storage				436927.00 N
		Equipment	JCB Sitemaster	Ground Level	12.00m AOD
Client	Scottish and Southern Energy PLC			Date Started	22/07/2003
		Logged by	OWP	Date Completed	22/07/2003
Consultant	Molt MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of dolerite, limestone and chalk. With some rootlets.		0.30	11.70		
		0.65	11.35	D1 0.50	
Firm locally stiff orangish brown and grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, quartz and mudstone.				D2 1.00 B3 1.00	
				D4 1.50	
Firm locally stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone, limestone and chert.				D5 2.00 B6 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
Trial pit complete at 3.50 m.		3.50	8.50	D10 3.50	

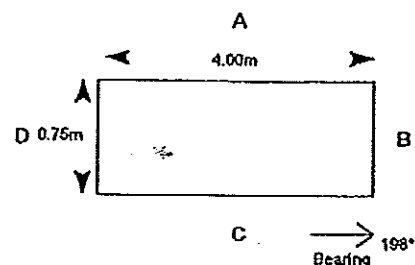
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	85.0	43.00	
0.50	60.0	39.00	
1.00	122	54.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525853.50 E
Project	Aldbrough Gas Storage				437116.00 N
		Equipment	JCB Sitemaster	Ground Level	10.49m AOD
Client	Scottish and Southern Energy PLC			Date Started	25/07/2003
		Logged by	OWP	Date Completed	25/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk.		0.30	10.19	D1 0.50	
Firm locally stiff orangish brown and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk.		0.80	9.69	D2 1.00 B3 1.00	
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and limestone. With occasional subangular to subrounded cobbles of chalk and chert.				D4 1.50	
				D5 2.00 B6 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
—at 3.00m becomes greyish brown					
Trial pit complete at 3.50 m.		3.50	6.99		

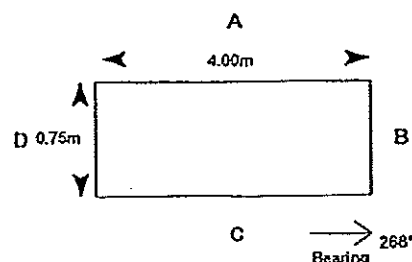
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	60.0	39.00	
0.50	49.0	28.00	
1.00	119	75.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525882.60 E
Project	Aldbrough Gas Storage				437016.20 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.33m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	18/07/2003
				Date Completed	18/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of quartz, chalk and sandstone. With common rootlets.		0.35	9.98	D1 0.50	
Firm locally stiff mottled brown orange and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and sandstone.		1.30	9.03	D2 1.00 B3 1.00	
Firm locally stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, gritstone and quartz. With occasional subangular to subrounded cobbles of chalk and gritstone.				D4 1.50	
				D5 2.00 B6 2.00	
--from 2.40m to 2.70m sandy				D7 2.50	
Firm locally stiff brown sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of chalk, limestone and sandstone.		2.80	7.53	D8 3.00 B9 3.00	
Trial pit complete at 3.50 m.		3.50	6.83	D10 3.50	

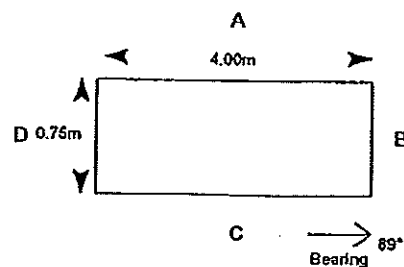
Stability Good

Shoring None

Groundwater Seepage from 2.40m to 2.70m

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	93.0	29.00	
1.00	72.0	15.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525855.10 E
Project	Aldbrough Gas Storage				436971.40 N
		Equipment	JCB Sitemaster	Ground Level	10.49m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	17/07/2003
Consultant	Mott MacDonald			Date Completed	17/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, chalk and limestone. With abundant rootlets.		0.35	10.14	D1 0.20	
		0.70	9.79	D2 0.50	
Soft locally firm dark brownish dark grey slightly sandy CLAY. Only occurs in western side of trench. (From side D exposed to 0.90m along walls A and C).				D3 1.00	
---on faces D, A, C from 0.35m to 0.70m soft locally firm dark brownish dark grey slightly sandy clay		1.30	9.19	B4 1.00	
		1.80	8.69	D5 1.50	
Firm orangish brown and grey sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of limestone and flint.				D6 2.00	
				B7 2.00	
Orangish brown very clayey slightly gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk, limestone and sandstone.				D8 2.50	
		2.85	7.64		
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, sandstone and limestone.		3.15	7.34	D9 3.00	
				B10 3.00	
Dark grey very clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and limestone.				D11 3.50	
		4.00	6.49		
Soft locally firm brown sandy CLAY.					
Trial pit complete at 4.00 m.					

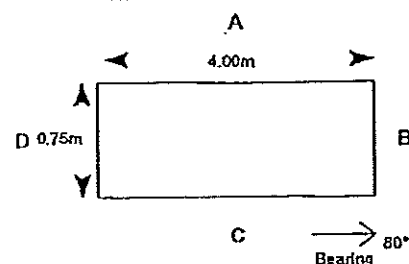
Stability Unstable on all faces from 2.85m to 3.15m

Shoring None

Groundwater Water flowing into hole from 2.85m to 3.15m

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	58.0	25.00	
0.70	66.0	30.00	
1.00	45.0	23.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG
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Contract No.	F12963	Method	Machine Excavated	Coordinates	525888.40 E
Project	Aldbrough Gas Storage				436844.40 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.92m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	21/07/2003
				Date Completed	21/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of mudstone, chalk, quartz. With occasional subrounded cobbles of sandstone.		0.30	10.62	D1 0.50	
Firm locally stiff brown mottled with orange and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk and sandstone. —at 1.00m becomes sandy		1.10	9.82	D2 1.00 B3 1.00	
Orangish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and limestone. With common subangular to subrounded cobbles of chalk and dolerite.		2.10	8.82	D4 1.50 D5 2.00 B6 2.00	
Brown clayey slightly gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk and sandstone.		2.40	8.52	D7 2.50	
Stiff to very stiff, brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of chalk and sandstone. With occasional subrounded cobbles of sandstone. Trial pit complete at 3.50 m.		3.50	7.42	D8 3.00 B9 3.00 D10 3.50	

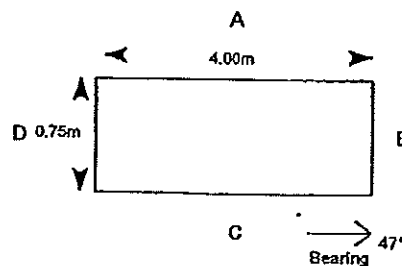
Stability Unstable on all faces from 1.10m to 1.40m

Shoring None

Groundwater Water flowing into pit from 1.10m to 2.40m

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	105	74.00	
0.75	40.0	40.00	
1.10	35.0	NR	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3.02
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Contract No.	F12963	Method	Machine Excavated	Coordinates	526043.10 E
Project	Aldbrough Gas Storage				436782.60 N
		Equipment	JCB Sitemaster	Ground Level	10.09m AOD
Client	Scottish and Southern Energy PLC			Date Started	21/07/2003
		Logged by	OWP	Date Completed	21/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and sandstone.		0.27	9.82	D1 0.50	
Firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, quartz and chalk.		0.85 0.95	9.24 9.14	D2 1.00 B3 1.00	
Firm orangish brown and grey slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse of sandstone, chalk and mudstone.				D4 1.50	
Firm orangish brown and grey sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, quartz and dolerite. With some subangular to subrounded cobbles of dolerite. With occasional pockets of sand.		2.00	8.09	D5 2.00 B6 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, mudstone and sandstone. With occasional subrounded cobbles.		3.50	6.59	D10 3.50	
Trial pit complete at 3.50 m.					

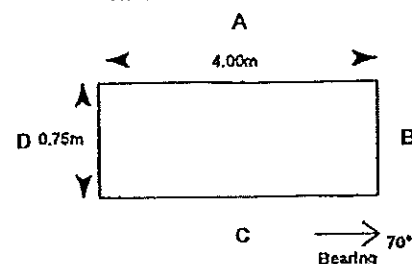
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	IV Peak	IV Remoulded	Remarks
0.20	92.0	57.00	
0.50	102	40.00	
0.80	51.0	47.00	
1.00	57.0	21.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525957.80 E
Project	Aldbrough Gas Storage				436823.90 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.69m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	23/07/2003
				Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone.		0.30	10.39		
		0.45	10.24	D1 0.50	
Firm locally orangish brown and grey lightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone.		0.80	9.89		
		1.15	9.64	D2 1.00 B3 1.00	
Soft orangish brown very sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and mudstone.		1.60	9.09	D4 1.50	
Orangish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone.				D5 2.00 B6 2.00	
Brown silty gravelly SAND. Gravel is subangular to rounded fine to coarse of chalk, mudstone, limestone, sandstone and dolerite. With frequent subangular to subrounded cobbles of chalk, mudstone, limestone, sandstone and dolerite.				D7 2.50	
				D8 3.00 B9 3.00	
Stiff dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, limestone, slate and dolerite. With occasional subangular cobbles of limestone.		3.60	7.19	D10 3.50	
Trial pit complete at 3.50 m.					

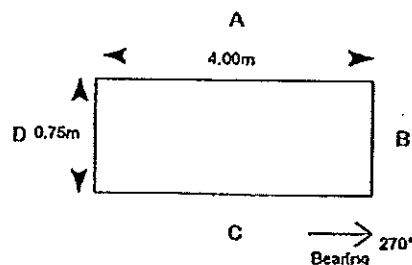
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	130	60.00	
0.40	21.0	45.00	
0.60	50.0	40.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526057.20 E 436831.20 N
Project	Aldbrough Gas Storage	Equipment	JCB Silemaster	Ground Level	10.24m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	21/07/2003
Consultant	Mott MacDonald			Date Completed	21/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk and sandstone. With some rootlets.		0.30	9.94	D1 0.50	
Firm locally stiff orangish brown with some grey mottling, sandy with very sandy pockets slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone.		1.00	9.24	D2 1.00 B3 1.00	
Orangish brown slightly clayey slightly gravelly SAND. Gravel is subangular to subrounded fine to coarse of slate.				D4 1.50	
		2.20	8.04	D5 2.00 B6 2.00	
Brown, clayey SAND and subangular to rounded fine to coarse GRAVEL of chalk, dolerite, sandstone and mudstone. With some subangular to subrounded cobbles of chalk, dolerite, sandstone and mudstone.		2.50	7.74	D7 2.50	
Stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, sandstone, mudstone and limestone.		3.50	6.74	D8 3.00 B9 3.00 D10 3.50	
Trial pit complete at 3.50 m.					

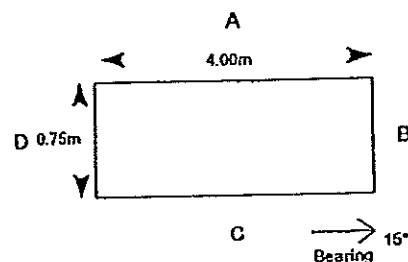
Stability Unstable on all faces from 2.20m to 2.50m

Shoring None

Groundwater Water flowing into pit from 2.20m to 2.50m

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	IV Peak	IV Remoulded	Remarks
0.20	69.0	54.00	
0.90	65.0	52.00	
1.10	32.0	NR	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG
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Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526198.00 E
Project	Aldbrough Gas Storage				436829.70 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.37m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	22/07/2003
				Date Completed	22/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
Firm locally stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of chalk, sandstone and quartz.		0.40	9.97	D1	0.50	
Firm locally stiff orangish brown slightly gravelly sandy CLAY. Gravel is subangular to rounded, fine to coarse of chalk, chert and sandstone.				D2 B3	1.00 1.00	
Orangish brown clayey slightly gravelly SAND. Gravel is subangular to rounded fine to coarse of chalk, chert and sandstone.		1.40	8.97	D4	1.50	
—at 2.00m becomes slightly clayey				D5 B6	2.00 2.00	
				D7	2.50	
Brown clayey SAND.		3.00	7.37	D8 B9	3.00 3.00	
Trial pit complete at 3.50 m.		3.50	6.87	D10	3.50	

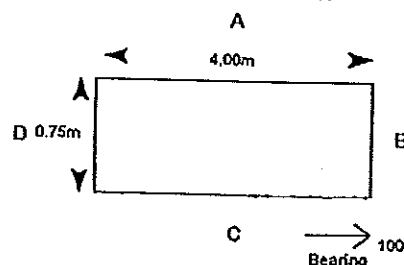
Stability Unstable on all faces from 1.40m

Shoring None

Groundwater Slight seepage from 2.00m

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	52.0	36.00	
1.00	59.0	35.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARAL TP LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526215.80 E 436958.40 N
Project	Aldbrough Gas Storage	Equipment	JCB Sitemaster	Ground Level	11.47m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	23/07/2003
Consultant	Mott MacDonald			Date Completed	23/07/2003

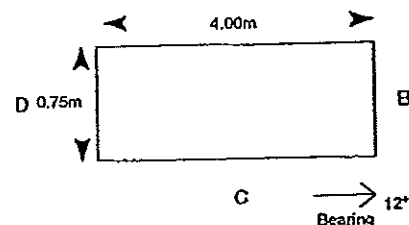
Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, quartz, mudstone and limestone.		0.40	11.07	D1	0.50	
Stiff dark orangish brown and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and limestone.		0.70	10.77	D2 B3	1.00 1.00	
Stiff locally very stiff reddish brown slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, mudstone, limestone, slate and sandstone. With occasional subangular to subrounded cobbles of chalk. —at 1.50m becomes mottled with grey				D4	1.50	
				D5 B6	2.00 2.00	
				D7	2.50	
				D8 B9	3.00 3.00	
				D10	3.50	
—at 3.50m becomes brown Trial pit complete at 3.50 m.		3.50	7.97			

Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit
A


Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	45.0	43.00	
0.60	50.0	39.00	
1.00	115	59.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526224.20 E
Project	Aldbrough Gas Storage				437035.40 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	11.71m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	23/07/2003
				Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		0.30	11.41	D1 0.60	
Firm locally stiff orangish brown and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		0.80	10.91	D2 1.00 B3 1.00	
Stiff locally very stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and limestone.				D4 1.50	
				D5 2.00 B6 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
Trial pit complete at 3.50 m.		3.50	8.21	D10 3.50	

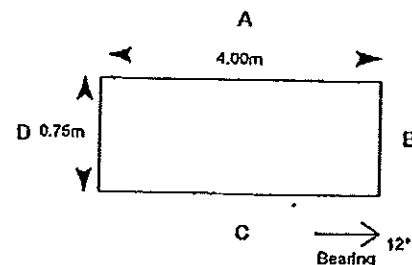
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	50.0	34.00	
0.50	94.0	45.00	
1.00	109	35.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526276.60 E
Project	Aldbrough Gas Storage				437128.50 N
		Equipment	JCB Sitemaster	Ground Level	12.20m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	23/07/2003
Consultant	Mott MacDonald			Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, mudstone and sandstone.		0.40	11.80	D1 0.50	
Firm locally stiff orangish brown and grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		0.65	11.54	D2 1.00 B3 1.00	
Stiff locally very stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, limestone, sandstone and dolerite.				D4 1.50	
				D5 2.00 B6 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
				D10 3.50	
—at 3.40m becomes brown		3.50	8.70		
Trial pit complete at 3.50 m.					

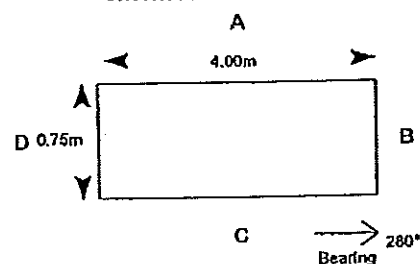
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	tV Peak	HV Remoulded	Remarks
0.20	130	76.00	
0.50	77.0	50.00	
1.00	112	44.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12983	Method	Machine Excavated	Coordinates	526186.20 E
Project	Aldbrough Gas Storage				437128.50 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	12.99m AOD
Consultant	Molt MacDonald	Logged by	OWP	Date Started	23/07/2003
				Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, chalk and quartz.		0.35	12.64		
Firm locally stiff orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and limestone.		0.70	12.29	D1 0.50	
				D2 1.00	
				B3 1.00	
				D4 1.50	
				D5 2.00	
				B6 2.00	
				D7 2.50	
				D8 3.00	
				B9 3.00	
Stiff locally very stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, sandstone, limestone and dolerite. With occasional subangular to subrounded cobbles of chalk and limestone. —at 1.20m becomes mottled with grey					
Trial pit complete at 3.50 m.		3.50	8.49	D10 3.50	

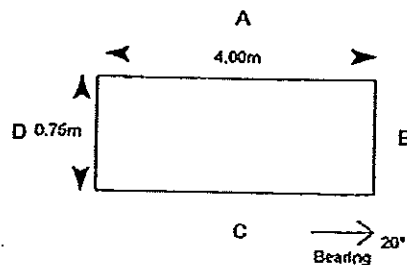
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	93.0	51.00	
0.50	81.0	NR	
1.00	115	34.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3.02
Revised	23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	526048.90 E
Project	Aldbrough Gas Storage				437113.60 N
		Equipment	JCB Sitemaster	Ground Level	11.77m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	23/07/2003
Consultant	Mott MacDonald			Date Completed	23/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and chalk.		0.35	11.42	D1	0.50	
Firm locally stiff orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and quartz.		0.80	10.97	D2	1.00	
				B3	1.00	
Stiff locally very stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, slate and limestone.				D4	1.50	
				D5	2.00	
				B6	2.00	
				D7	2.50	
				D8	3.00	
				B9	3.00	
				D10	3.50	
Trial pit complete at 3.50 m.		3.50	8.27			

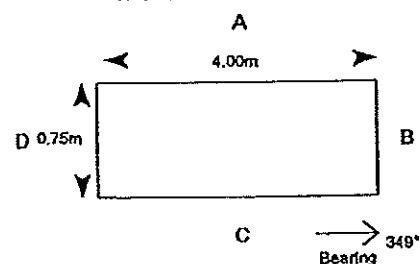
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	113	50.00	
0.50	99.0	45.00	
1.00	125	62.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525970.90 E
Project	Aldbrough Gas Storage				437155.10 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.82m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	25/07/2003
				Date Completed	25/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk.		0.25	10.57		
Firm locally stiff light orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk.		0.60	9.98	D1 0.50	
—at 0.64m becomes dark orangish brown				D2 1.00 B3 1.00	
Stiff reddish brown mottled with grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, sandstone, limestone and dolerite.				D4 1.50	
				D5 2.00 B8 2.00	
				D7 2.50	
				D8 3.00 B9 3.00	
—at 3.00m becomes sandy					
Trial pit complete at 3.50 m.		3.50	7.32	D10 3.50	

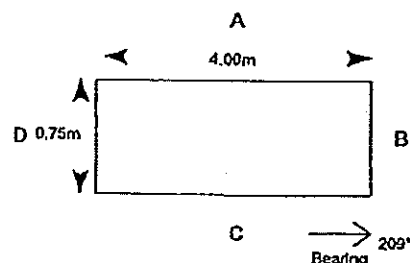
Stability Good

Shoring None

Groundwater None encountered

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	76.0	46.00	
0.50	71.0	46.00	
1.00	130	54.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525921.70 E
Project	Aldbrough Gas Storage				437071.20 N
		Equipment	JCB Sitemaster	Ground Level	10.33m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	25/07/2003
				Date Completed	25/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of chalk, mudstone and sandstone.		0.25	10.08		
		0.60	9.73	D1 0.50	
Firm locally stiff orangish brown and grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk.		0.80	9.43	W2 0.80 D3 1.00 B4 1.00	
Firm dark orangish brown and grey sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk.				D5 1.50	
				D6 2.00 B7 2.00	
Stiff reddish brown mottled with grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, limestone and slate. —at 2.30m becomes brown				D8 2.60	
				D9 3.00 B10 3.00	
—at 3.00m becomes greyish brown					
		3.50	6.83	D11 3.50	
Trial pit complete at 3.50 m.					

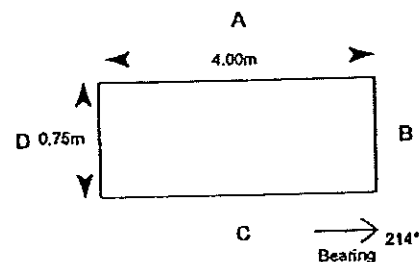
Stability Good

Shoring None

Groundwater Flowing in from broken land drain at 0.90m

Remarks

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	75.0	52.00	
0.50	58.0	36.00	
0.70	58.0	27.00	
1.00	115	47.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARUL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525874.00 E
Project	Aldbrough Gas Storage				436929.00 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	91.30m AOD
Consultant	Molt MacDonald	Logged by	OWP	Date Started	24/07/2003
				Date Completed	24/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and sandstone.		0.35	90.95	D1 0.50	
Soft locally firm light orangish brown and grey sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone and dolerite. ---at 0.80m becomes brown		1.00	90.30	D2 1.00 B3 1.00	
Brown slightly gravelly very clayey SAND. Gravel is subangular to rounded fine to medium of chalk and sandstone.		1.50	89.80	D4 1.50	
Brown clayey slightly gravelly SAND. Gravel is subangular fine to coarse of chalk. ---at 1.80m becomes grey		2.20	89.10	D5 2.00 B6 2.00	
Grey slightly clayey SAND and subangular to subrounded fine to coarse GRAVEL of chalk, sandstone, limestone and mudstone. Trial pit complete at 2.30 m.		2.30	89.00		

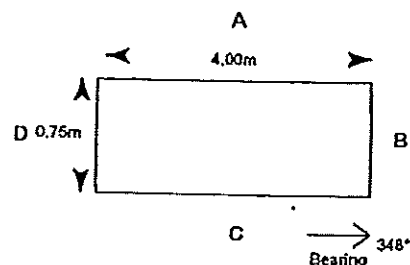
Stability All sides unstable from 1.00m

Shoring None

Groundwater Seepage from 1.50m to 2.30m

Remarks 1. Pit abandoned at 2.30m due to constant collapse of sand and gravel strata.

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	130	72.00	
0.50	75.0	38.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARJAL TP LOG
Version 3.02
Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	525885.80 E
Project	Aldbrough Gas Storage				436880.40 N
		Equipment	JCB Sitemaster	Ground Level	10.30m AOD
Client	Scottish and Southern Energy PLC			Date Started	24/07/2003
		Logged by	OWP	Date Completed	24/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff locally very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone, quartz and mudstone.		0.25	10.05	D1 0.50	
Firm locally stiff light greyish brown and orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of limestone and sandstone.		0.65	9.65	D2 1.00 D3 1.00	
Firm orangish brown and grey sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, limestone, mudstone and sandstone. With frequent subangular to subrounded cobbles of chalk and limestone.		1.40	8.90	D4 1.50	
Orangish brown very clayey very gravelly SAND. Gravel is subangular to subrounded fine to coarse of chalk, sandstone, mudstone limestone. With frequent subangular to subrounded cobbles of chalk, limestone and sandstone.		1.85	8.45	D5 2.00 B5 2.00	
Brown slightly clayey SAND and subangular to subrounded fine to coarse GRAVEL of sandstone, chalk, limestone and mudstone. With frequent subangular to subrounded cobbles of sandstone, chalk, limestone and mudstone.		2.40	7.90	D7 2.50	
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone, limestone and slate. With occasional angular to subrounded cobbles of chalk and limestone.		2.60	7.70		
Trial pit complete at 2.60 m.					

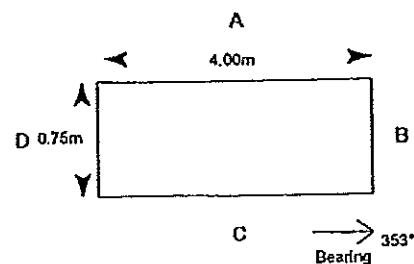
Stability All sides unstable from 1.40m to 2.40m

Shoring None

Groundwater Seepage from 2.40m to 2.60m

Remarks 1. Trial pit abandoned at 2.60m due to constant collapse of sand and gravel strata.

Sketch Plan of Trial Pit



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks
0.20	130	62.00	
0.50	75.0	45.00	
1.00	66.0	34.00	

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARIAL TP LOG
Version 3.02
Revised 23/12/2002

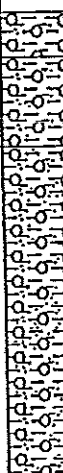
SUPPORTING FACTUAL DATA

SECTION B

**EXPLORATORY HOLE RECORDS AND
FIELD DATA**

TRIAL TRENCH RECORDS

Contract No.	F12963	Method	Machine Excavated	Coordinates	25884.00 E
Project	Aldbrough Gas Storage				36950.00 N
		Equipment	JCB Sitemaster	Ground Level	10.38m AOD
Client	Scottish and Southern Energy PLC			Date Started	28/07/2003
		Logged by	OWP	Date Completed	28/07/2003
Consultant	Mott MacDonald				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk, mudstone and quartz.		0.30	10.08		
Firm locally stiff orangish brown and grey slightly gravelly sandy CLAY.		0.90	9.48		
Stiff reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, sandstone and limestone. —4.00m from face B sand and gravel layer begins from 2.70m deep. At face D sand and gravel layer is from 2.30m to 2.90m		3.10	7.28		
Trial trench complete at 3.10 m.					

Stability Unstable on all sides from 2.30m to 2.90m

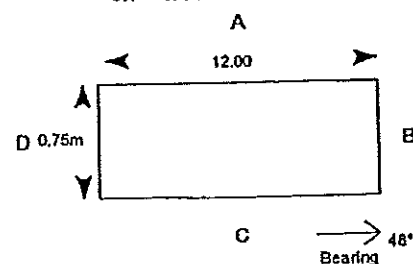
Shoring None

Groundwater Seepage from 2.30m to 2.90m

Remarks

1. General coordinates and ground level are averages taken from the details below: Coordinates Face D - 25888E, 36955N, Ground Level face D 98.892. Coordinates Face B - 25882E, 36946N, Ground Level face B - 98.661.

Sketch Plan of Trench



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARWL TT LOG

Version 3.02

Revised 23/12/2002

Contract No.	F12963	Method	Machine Excavated	Coordinates	261615.00 E
Project	Aldbrough Gas Storage				368305.00 N
Client	Scottish and Southern Energy PLC	Equipment	JCB Sitemaster	Ground Level	10.26m AOD
Consultant	Mott MacDonald	Logged by	OWP	Date Started	28/07/2003
				Date Completed	28/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk, mudstone and limestone.		0.30	9.96		
Stiff reddish brown sandy CLAY.					
Greyish brown SAND and subangular to rounded fine to coarse GRAVEL of chalk, mudstone, limestone, sandstone, quartz and dolerite.		1.70	8.66		
---at 2.00m from face D sand and gravel becoming brownish grey clayey gravelly sand. Gravel is subangular to subrounded fine to coarse of chalk, limestone, mudstone, sandstone and dolerite					
---at 13.00m from face D sand becomes stiff greyish brown slightly sandy slightly gravelly clay. Gravel is subangular to subrounded, fine to coarse of chalk, mudstone, sandstone and limestone		3.10	7.16		
Trial trench complete at 3.10 m.					

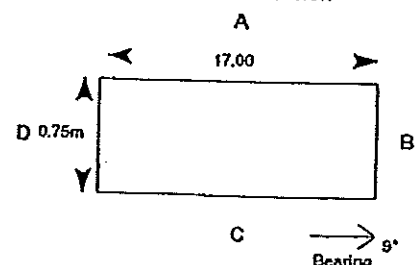
Stability All sides unstable from 0.00m to 3.10m due to undermining from 1.70m to 3.10m

Shoring None

Groundwater Water flowing from 1.70m to 3.10m

Remarks 1. General coordinates and ground level are averages taken from the details below: Coordinates Face D - 26161E, 36841N, Ground Level face D 98.757. Coordinates Face B - 26162E, 36820N, Ground Level face B - 98.549.

Sketch Plan of Trench



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

SUPPORTING FACTUAL DATA

SECTION B

**EXPLORATORY HOLE RECORDS AND
FIELD DATA**

GROUNDWATER MONITORING RESULTS

TABLE 2: GROUNDWATER LEVEL READINGS FOR EXPLORATORY HOLE INSTALLATIONS

Exploratory Hole I.D	Installation Type	Depth of Installation (m.b.g.)	Water Level (m.b.g.l)
BH103	S	7.00	3.20
BH107	S	10.00	3.10
BH117	S	9.00	0.83
Notes: P = Piezometer, S = Standpipe, G = Gas Well			

Contract No.	F12963	Method	Machine Excavated	Coordinates	26002.00 E 36900.00 N
Project	Aldbrough Gas Storage	Equipment	JCB Sitemaster	Ground Level	10.99m AOD
Client	Scottish and Southern Energy PLC	Logged by	OWP	Date Started	28/07/2003
Consultant	Mott MacDonald			Date Completed	28/07/2003

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling	Remarks
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of chalk, quartz and mudstone.		0.30	10.69		
Firm locally stiff orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and chert.		0.50	10.49		
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, chert, mudstone, limestone and sandstone. —at face D depth is from 1.50m to 1.60m. At face B, depth is 0.50m to 3.20m					
Greyish brown SAND and subangular to rounded fine to coarse GRAVEL of chalk, limestone, sandstone, mudstone, dolerite and chert - continues below face B to a depth of >4.00m under TP205.		3.20	7.79		
Trial trench complete at 4.00 m.		4.00	6.99		

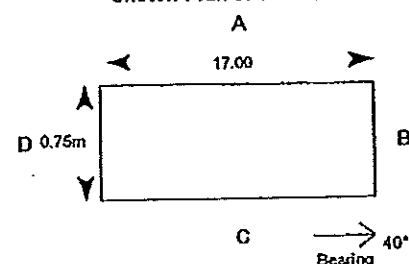
Stability Unstable on all sides from 3.20m to 4.00m

Shoring None

Groundwater Water flowing into pit from 3.20m to 4.00m

Remarks 1. General coordinates and ground level are averages taken from the details below: Coordinates Face D - 26007E, 36908N, Ground Level face D 99.728.
Coordinates Face B - 25997E, 36892N, Ground Level face B - 99.036.

Sketch Plan of Trench



Hand Vane Test Readings

Depth	HV Peak	HV Remoulded	Remarks

NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form ARSL 11100
Version 302
Revised 23/12/2002

SUPPORTING FACTUAL DATA

SECTION C

LABORATORY TESTING

KEY TO LABORATORY TEST RESULTS

Key to Laboratory Summary Sheets



Test status Any result in *italics* indicates a test that is not within the scope of the UKAS accreditation for this laboratory.

Common to all summaries

Sample Type	U	Undisturbed sample	B	Bulk disturbed sample
	P	Piston sample	BL	Block sample
	D	Small disturbed sample	C	Rock core
	AMAL	Amalgamated sample		

Summary of Laboratory Soil Tests: Index / Classification Tests

Particle density	p	Small pyknometer method	g	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will have been determined if requested		
Particle size (PSD)	i	Following value in silt column denotes combined clay and silt fraction		
Sulfate	t	Acid soluble (total) sulfate content as SO ₃ in %	a	Water soluble (aqueous extract) sulfate content as SO ₃ in g/l
	w	Sulfate content of water as SO ₃ in g/l		
Chloride	a	Acid soluble chlorides - chloride content	w	Water soluble chlorides - chloride ions content

Summary of Laboratory Soil Tests: Strength and Re-use Tests

Consol	Type	UU	Single stage unconsolidated quick undrained	UUM	Multi stage unconsolidated quick undrained
		UU3	Set of 3 unconsolidated quick undrained	CU	Single stage consolidated undrained
		CUM	Multi stage consolidated undrained	CU3	Set of 3 consolidated undrained
		CD	Single stage consolidated drained	CDM	Multi stage consolidated drained
		CD3	Set of 3 consolidated drained		
		Note that single stage tests are reported assuming $\phi = 0$ for total stress and $c' = 0$ for effective stress			
		SSB	Small shear box	LSB	Large shear box
Permeability	Type	p	Peak value	r	Residual value
		RS	Ring shear		
		Oed	One-dimensional oedometer	Hyd	Hydraulic cell consolidation
MCV	Type	m _v	coefficient of compressibility quoted for p ₀ to p ₀ + 100kPa, where determined		
		C	Constant head permeability	T	Triaxial permeability
		s	MCV value at natural or specified moisture content	int	Intercept of calibration line in MCV calibration

Summary of Laboratory Soil Tests: Rock Tests

Point Load	Type	D	Diametral	A	Axial
		L	Lump or block	I	Combined with type, invalid failure
		D(e)	Equivalent core diameter	Is	P/De ²
		Is(50)	F x Is	F	(De/50) ^{0.45}
		Is(50) point load strength index corrected for a diametral test of core diameter 50mm For Axial/Lump tests $De^2 = (4/Pi)*(W*D')$ For Diametral tests $De^2 = D*D'$			

Important note: summary sheets are provided for convenience and in no way replace individual test result sheets which, without exception, be regarded as the definitive result.

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SUPPORTING FACTUAL DATA

SECTION C

LABORATORY TESTING

LABORATORY TEST SUMMARY SHEETS (SOILS)

SUMMARY OF LABORATORY SOIL TESTS: INDEX/CLASSIFICATION TESTS

**NORWEST
HOLST**

Project

Aldbrough Gas Storage Facility

Contract no. F12963

Hole ID	Sample depth m	Sample type	Moisture Content	Bulk Density	Particle Density	Plastic Index	Particle size					Sulfate	pH	Chloride	Organic
			%	Mg/m ³			Clay	Silt	Sand	Gravel	Cobbles				
BH101	0.50	D	19			32	36	35	24	5	0				
BH101	1.20	U	19			25	38	42	13	7	0				
BH101	2.80	D					29	41	23	8	0				
BH101	3.00	U	13			19									
BH102	2.50	U	16			15	28	32	33	7	0				
BH102	4.50	U	17			20	31	29	22	18	0				
BH102	6.40	B	16			18	36	34	22	8	0				
BH102	8.20	D					27	34	31	8	0				
BH103	0.50	D	16			23	14	14	39	33	0				
BH103	2.50	U	14			19	32	36	24	8	0				
BH103	5.20	B	14			16	31	36	25	8	0				
BH104	1.20	U	18			23	37	37	21	5	0				
BH104	3.05	U	17			23									
BH104	6.00	U	20			25	33	45	21	1	0				
BH105	0.60	B	17			26	38	43	17	2	0				
BH105	2.50	U	16			23									
BH105	4.50	U	17			23									
BH105	10.00	U	16			18									
BH106	1.50	U	16			19									
BH106	3.20	B	22			19	32	42	20	6	0				
BH106	5.50	U	15			19									
							End								

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SUMMARY OF LABORATORY SOIL TESTS: INDEX/CLASSIFICATION TESTS

**NORWEST
HOLST**

Project Aldbrough Gas Storage Facility

Contract no. F12963

Hole ID	Sample depth m	Sample type	Moisture Content	Bulk Density	Particle Density	Plastic Index	Particle size					Sulfate	pH	Chloride	Organic
							Clay	Silt	Sand	Gravel	Cobbles				
			%	Mg/m³			%	%	%	%	%			%	%
BH106	8.50	U					11	12	70	7	0				
BH106	10.00	D	15			37									
BH107	0.50	D	20			25									
BH107	1.20	U	17			24									
BH107	1.80	D					36	44	15	5	0				
BH107	3.00	U	17			21									
BH107	5.00	U	17			19									
BH108	1.50	D	17			20	27	40	26	7	0				
BH108	2.50	U	17			22									
BH108	7.00	U	16			19									
BH109	0.60	D					36	41	19	4	0				
BH109	3.00	D	16			24									
BH109	5.50	D	12			20									
BH109	9.50	D	17			20									
BH110	1.00	U	23			25	31	40	19	11	0				
BH110	3.00	U	16			20									
BH111	1.00	U	18			12	7	12	37	44	0				
BH112	1.00	D	14			31	37	28	35	1	0				
BH112	1.80	D					11	10	28	50	0				
BH112	2.60	B						11'	27	62	0				
BH112	4.80	D	15			18	29	37	24	11	0				
								End							

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SUMMARY OF LABORATORY SOIL TESTS: INDEX/CLASSIFICATION TESTS

**NORWEST
HOLST**

Project

Aldbrough Gas Storage Facility

Contract no. F12963

Hole ID	Sample depth m	Sample type	Moisture Content	Bulk Density	Particle Density	Plastic Index	Particle size					Sulfate	pH	Chloride	Organic
							Clay	Silt	Sand	Gravel	Cobbles				
			%	Mg/m³			%	%	%	%	%			%	%
BH118	0.60	D	34			43	43	24	24	9	0				
BH118	0.80	B	34			42	45	26	27	3	0				
BH118	2.50	B					6	10	30	53	0				
BH118	5.10	B	12			19									
TP202	1.00	B	34			30									
TP204	1.00	B	19			27									
TP205	0.50	D	25			31									
TP205	2.00	B	16			23									
TP207	1.00	B	21			24									
TP208	0.50	D	30			32									
TP208	2.00	B	18			22									
TP208	3.00	B	17												
TP211	0.50	D	32												
TP211	1.00	B					30	42	20	8	0				
TP214	0.50	D	36			42									
TP219	1.00	B					15	9	73	2	0				
TP220	1.00	B					29	15	54	2	0				
TP220	2.00	B						61	93	1	0				
TP223	1.00	B	16			20									
TP224	1.00	B	20			25									
TP225	0.50	D	24			38									
								End							

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Approved:

[Signature]

Print date

**NORWEST
HOLST**

Contract no. F12963

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Part 6

SUMMARY OF LABORATORY SOIL TESTS: STRENGTH AND RE-USE TESTS

**NORWEST
HOLST**

Project Aldbrough Gas Storage Facility

Contract no. F12963

Hole ID	Sample depth m	Sample type	Moisture Content		Bulk Density	Triaxial / shearbox			Consol		Permeability		Compaction		MCV	CBR
			%	Mg/m³		Type	c kPa	φ °	Type	m _v m²/MN	Type	K m/s	OMC %	Max DD Mg/m³		
BH101	1.20	U	16	2.11	UUM		168	2.8								
BH101	3.00	U	15	2.16	UU		145	0								
BH102	2.50	U	14	2.21	UUM		123	4	Oed	0.13						
BH102	4.50	U	16	2.17	UUM		88	1.5	Oed	0.11						
BH103	2.50	U	14	2.21	UUM		187	0.1	Oed	0.13						
BH104	3.05	U	17	2.08	UUM		112	4.5	Oed	0.08						
BH104	6.00	U	21	2.06	UU		91	0	Oed	0.14						
BH105	0.60	B													10.1 s	
BH105	2.50	U	15	2.14	UUM		162	5.7								
BH105	4.50	U	17	2.14	UUM		109	0	Oed	0.14						
BH105	10.00	U	16	2.16	UU		93	0	Oed	0.11						
BH106	1.50	U	16	2.14	UUM		203	3.1								
BH106	3.50	U							Oed	0.16						
BH106	5.50	U							Oed	0.13						
BH107	1.20	U	17	2.15	UUM		142	2.5								
BH107	3.00	U							Oed	0.1						
BH107	5.00	U	17	2.16	UUM		60	1.1	Oed	0.11						
BH108	2.50	U	16	2.16	UUM		127	9.7	Oed	0.11						
BH108	7.00	U	16	2.17	UU		83	0	Oed	0.11						
BH110	1.00	U	22	2.06	UUM		74	7.6								
BH110	3.00	U	16	2.13	UUM		80	5.6	Oed	0.1						
									End							

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SUMMARY OF LABORATORY SOIL TESTS: STRENGTH AND RE-USE TESTS

**NORWEST
HOLST**

Project Aldbrough Gas Storage Facility

Contract no. F12963

Hole ID	Sample depth m	Sample type	Moisture Content	Bulk Density	Triaxial / shearbox			Consol		Permeability		Compaction		MCV	Top %
			%	Mg/m³	Type	c kPa	Ø °	Type	m _v m³/MN	Type	K m/s	OMC %	Max DD Mg/m³		
BH111	1.00	U	15	1.88	UUM	13	24.4	Oed							
TP202	1.00	B													2
TP204	1.00	AMAL												25.4% Int	3.2
TP205	1.00	B												23.7% Int	
TP207	1.00	B												26.0% Int	
TP207	2.00	B													
TP208	1.00	B												25.4% Int	
TP208	2.00	AMAL										16	1.8	23.5% Int	2.7
TP208	3.00	B													3.7
TP211	1.00	AMAL										16	1.79	26.5% Int	
TP212	1.00	AMAL										16	1.82	24.3% Int	
TP214	1.00	B													0.83
TP223	1.00	B													3.6
TP223	2.00	AMAL										15	1.83		
TP224	1.00	B													
TP225	1.00	B													2.3
TP227	1.00	B													2
TP233	1.00	B													1.2
								End							

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Approved:

[Signature]

CHEMICAL ANALYSIS



Project ALDBROUGH GAS STORAGE FACILITY

Contract no.

F12

Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Description	SO ₄ (g/l) a	SO ₄ (g/l) w	Mg (g/l)	NO ₃ (g/l)	pH	Cl (%) w	Cl (%) g
BH101	0.50	01	D			Very stiff dark brown CLAY	0.03				7.7		
BH101	2.80	05	D			Very stiff dark brown CLAY	0.05				8.4		
BH103	0.50	01	D				0.02				7.1		
BH105	0.60	03	B			Very stiff dark brown CLAY	0.1				8.2		
BH105	2.50	06	U			Very stiff dark brown CLAY	0.04				8.3		
BH107	3.00	07	U			Very stiff dark brown CLAY	0.03				8.4		
BH107	5.00	11	U			Very stiff light brown CLAY	0.23				8.3		
BH108	1.50	04	D			Soft dark brown CLAY	0.03				8.2		
TP207	2.00	06	B			Friable dark brown CLAY	0.12				8.1		
TP227	0.90	04	W					0.25			8		
TP233	2.00	06	B			Very soft dark brown CLAY	0.29				8		

KEY TO ABBREVIATIONS AND NOMENCLATURE

SO₄ a Water soluble sulfate content
 SO₄ w Ground water sulfate content
 Note: SO₄ derived by multiplying SO₃ by 1.2
 Mg Magnesium content

NO₃ Nitrate content
 pH Determination of pH value
 Cl w Water soluble chloride ion content
 Cl g Ground water chloride content

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Approved: 

SUPPORTING FACTUAL DATA

SECTION C

LABORATORY TESTING

LABORATORY DATA SHEETS (SOILS)



**Analytical Test Report
For**

**NORWEST HOLST SOIL ENGINEERING LIMITED
Parkside Lane
Dewsbury Road
LEEDS
West Yorkshire
LS11 5SX**

PROJECT ID: ALDBROUGH GAS STORAGE FACILITY

Report No.: R03/3013

**Copies To:
Mr S Kirk
File**

■ **ECOS ENVIRONMENTAL**
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www.soil-engineering.co.uk
E-mail: info@ecos.co.uk
A Division of Norwest Holst Soil Engineering Ltd
Registered in England No.980795
Registered Office: Parkside Lane, Dewsbury Road, Leeds LS11 5SX





What's so special about a UKAS report or certificate?

- Accreditation of testing is granted by the United Kingdom Accreditation Service (UKAS).
- It's your assurance that the work has been carried out to the highest standards.
- The laboratory issuing the test report has been stringently assessed by independent experts.
- You are assured that the agreed or specified methods and procedures have been followed.
- Measurements are traceable to national and international standards.

Comments:

Sampling & tests marked † in this report are not included in the UKAS Accreditation Schedule for the testing laboratory.

Any opinions and interpretations expressed herein are outside the scope of the testing laboratory's UKAS Accreditation.

The Coefficient of Variation CV_T (where $CV_T = \text{standard deviation}/\text{mean} \times 100$) is better than 15%

All analysis carried out using ECoS standard methods unless otherwise agreed

The test results in this report refer only to the actual samples on which testing has been performed.

This test report shall not be reproduced, except in full, without written approval of ECoS Environmental.

The laboratory cannot be held responsible for the condition or suitability of samples submitted for testing by a third party or for the competency of personnel other than its own staff.

Date submitted for analysis : 08/09/03

Your Job/Order Number : F12963

Analyst(s) : SV DS TIM

Report Approval

Approved signatories: J R Brown (Customer Services Manager)
E Dewell (Production Manager)
A Smith (Quality Manager)
A Buck (Technical Manager)

Signature : 

Report date : 19 September 2003

SOIL

ANALYTE	METHOD OF DETECTION	LIMIT OF DETECTION
pH	pH-meter	N/A
Sulphate (water soluble)	HPLC-IC	0.001 g/l SO ₄
Material > 2mm	Gravimetry	0.1 %

WATER

ANALYTE	METHOD OF DETECTION	LIMIT OF DETECTION
pH	pH-meter	N/A
Sulphate	HPLC-IC	1 mg/l SO ₄

Summary Of Results
Norwest Holst Soil Engineering Limited - Aldbrough Gas Storage Facility

ANALYTES	UNITS	BH108 (1.50m)	TP207 (2.00m)	TP233 (2.00m)	BH101 (0.50m)	BH101 (2.80m)	BH103 (0.50m)	BH105 (0.60m)	BH105 (2.50m)	BH107 (3.00m)	BH107 (5.00m)		
		S0329448	S0329449	S0329450	S0329451	S0329452	S0329453	S0329454	S0329455	S0329456	S0329457		
pH	N/A	8.2	8.1	8.0	7.7	8.4	7.1	8.2	8.3	8.4	8.3	#	#
Sulphate (water soluble)	g/l SO ₄	0.029	0.120	0.292	0.025	0.049	0.021	0.103	0.041	0.033	0.234	#	#
Material > 2mm	%	13.0	37.0	29.9	24.3	9.3	48.4	29.1	23.9	16.4	19.2	#	#

Results for soil samples expressed as dry weight
: Analyte not requested

Summary Of Results
Norwest Holst Soil Engineering Limited - Aldbrough Gas Storage Facility

ANALYTES	UNITS	TP227 (0.90m)											
		S0329461											
pH	N/A	8.0	#	#	#	#	#	#	#	#	#	#	#
Sulphate	mg/l SO4	251	#	#	#	#	#	#	#	#	#	#	#

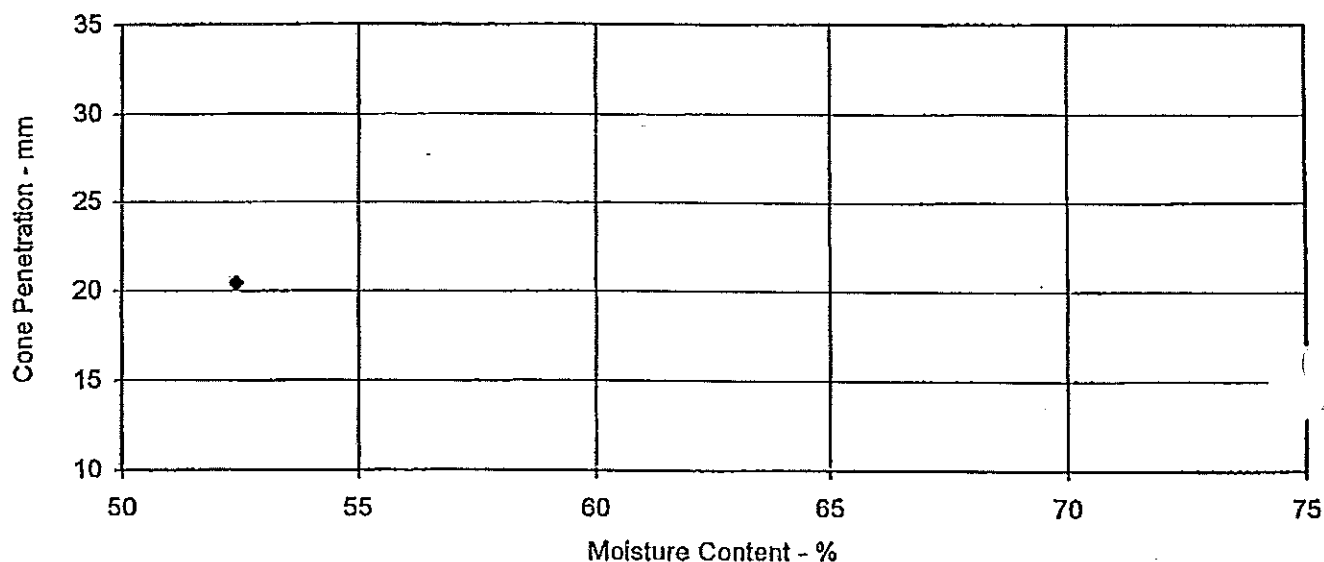
Water samples analysed as received
: Analyte not requested

LIQUID AND PLASTIC LIMIT TEST

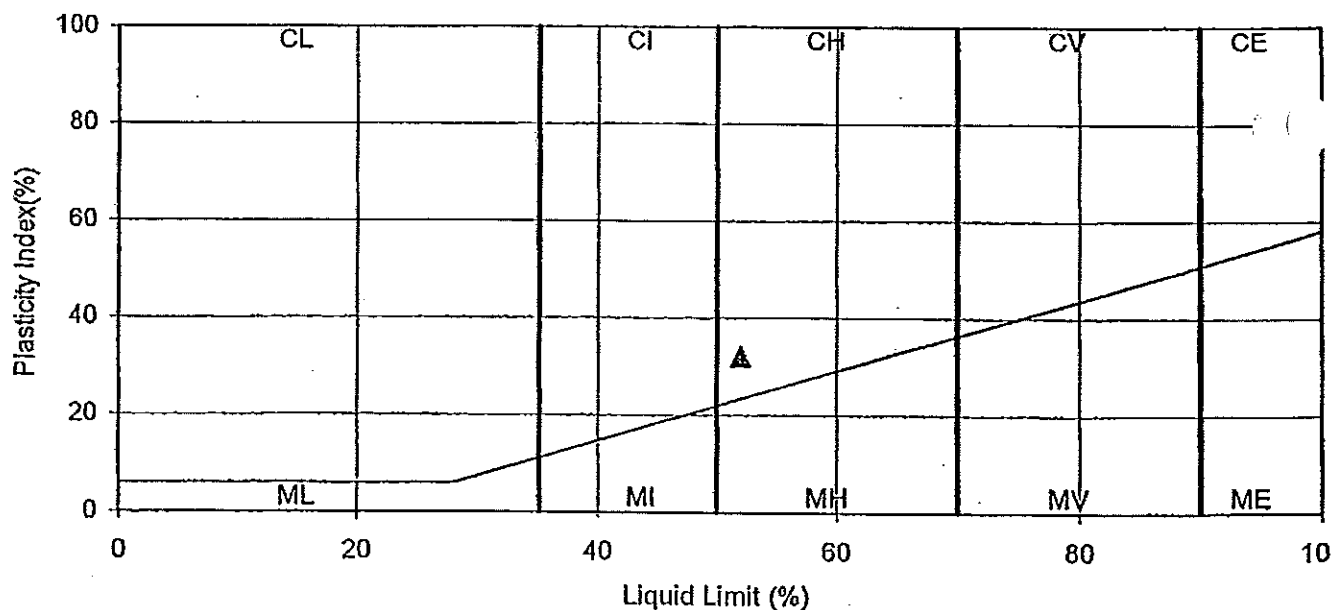
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	
Project	Aldbrough Gas Storage Facility	Sample no	A
Soil description	Brown sandy slightly gravelly CLAY	Depth	0.50
		Sample type	D
		Page	1 of 1



Natural moisture content:	19	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	52	Specimen depth:	0.50m
Plastic limit:	20	Remarks:	
Plasticity Index:	32		
Moisture content of soil passing 425µm	19		
Liquidity Index:	-0.03		



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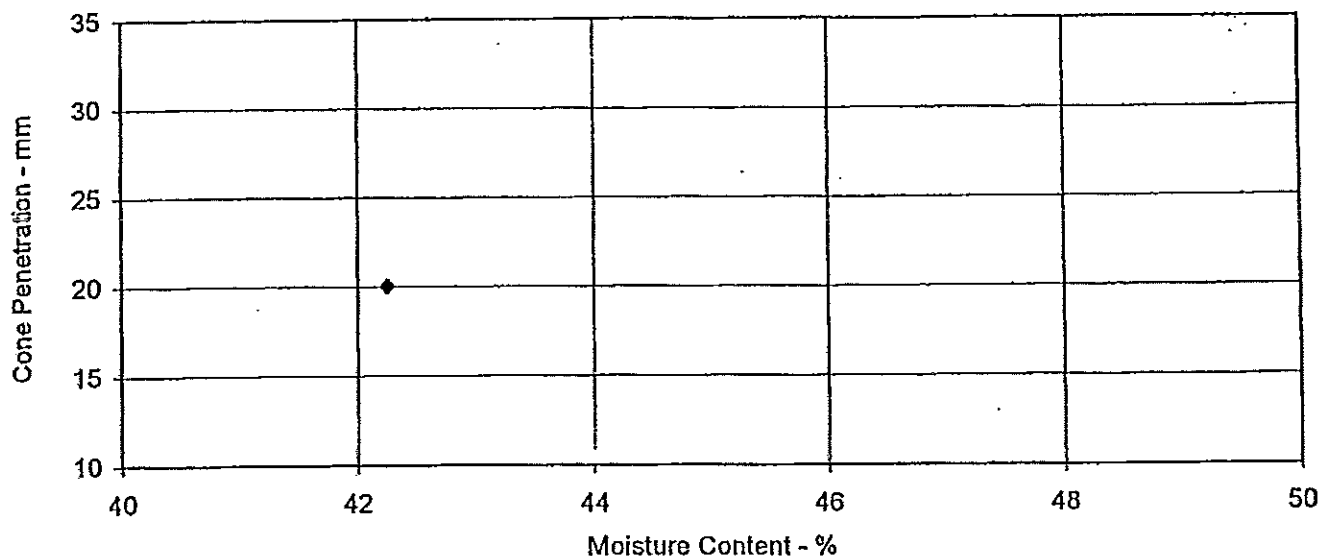
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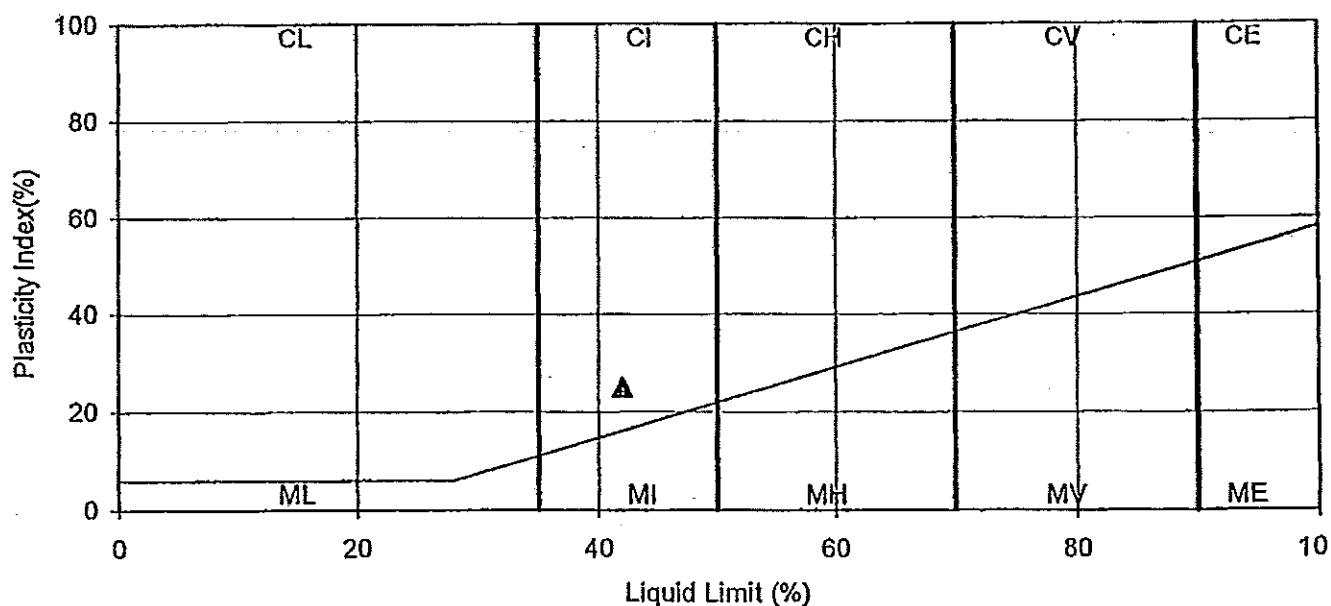
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HOLST**

Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH101
Project	Aldbrough Gas Storage Facility	Sample no	02
Soil description	Very stiff dark brown slightly gravelly CLAY	Depth	1.20
		Sample type	U
		Page	1 of 1



Natural moisture content:	19	Percentage retained on 425µm sieve:	7.3
Liquid limit:	42	Specimen depth:	1.27m
Plastic limit:	17	Remarks:	
Plasticity index:	25		
Moisture content of soil passing 425µm	20		
Liquidity index:	0.12		



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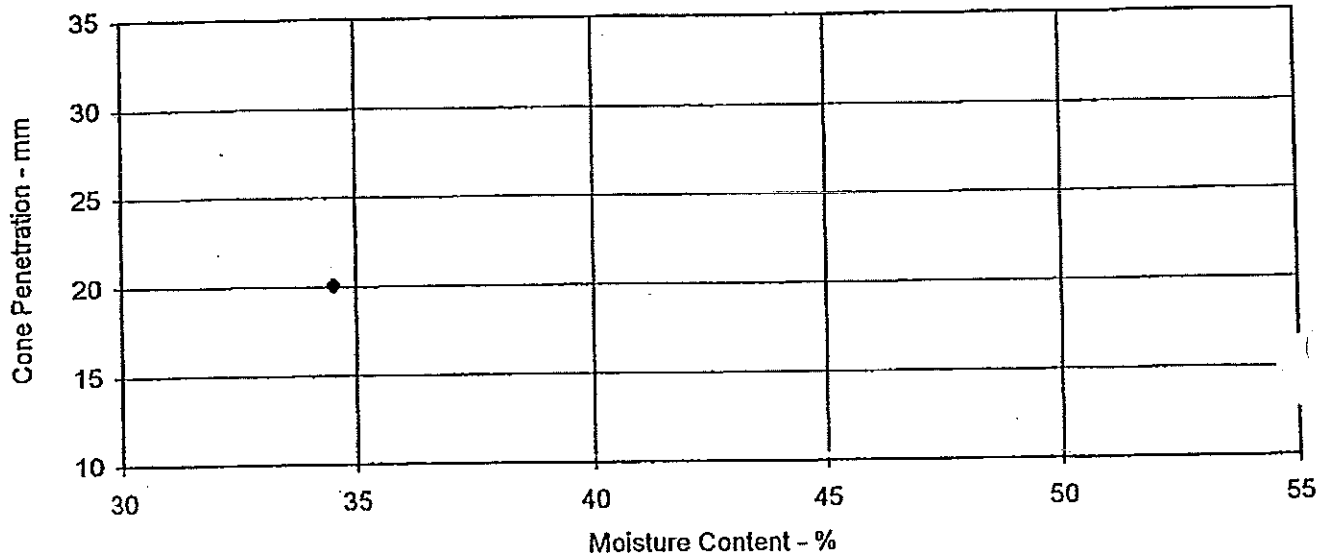
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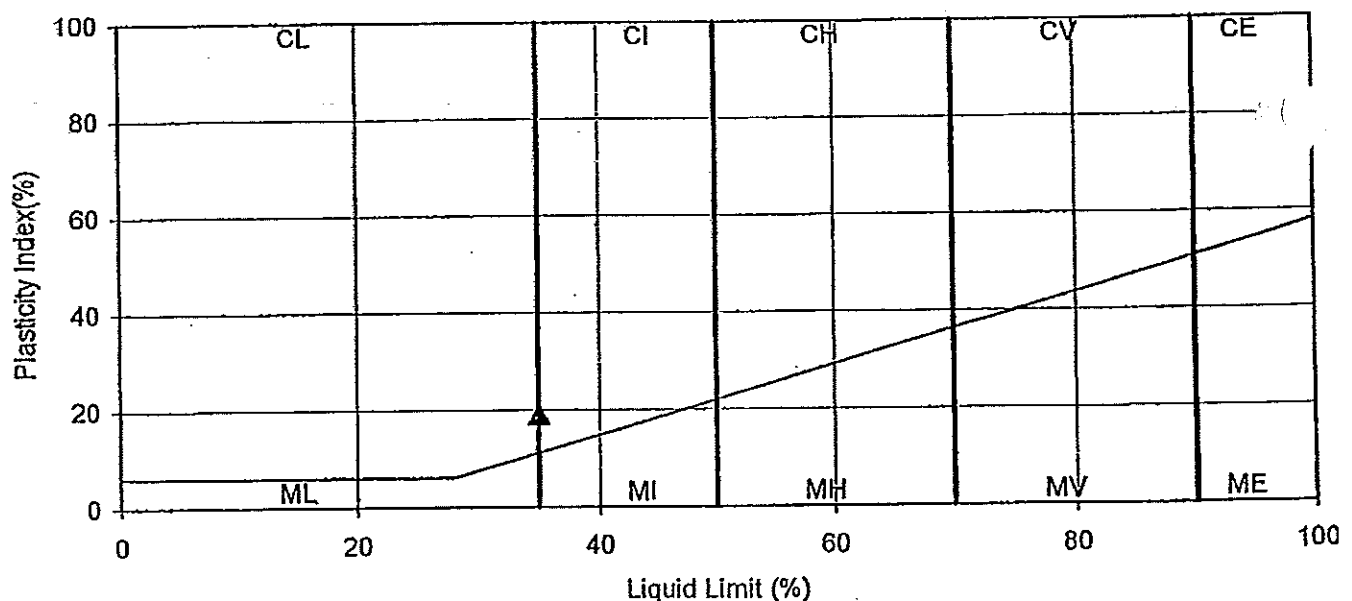
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Soft brown slightly sandy gravelly CLAY

Hole ID
Sample no
Depth 3.00
Sample type U
Page 1 of 1



Natural moisture content:	13	Percentage retained on 425µm sieve:	28.4
Liquid limit:	35	Specimen depth:	3.00m
Plastic limit:	16	Remarks:	
Plasticity Index:	19		
Moisture content of soil passing 425µm	17		
Liquidity Index:	0.05		



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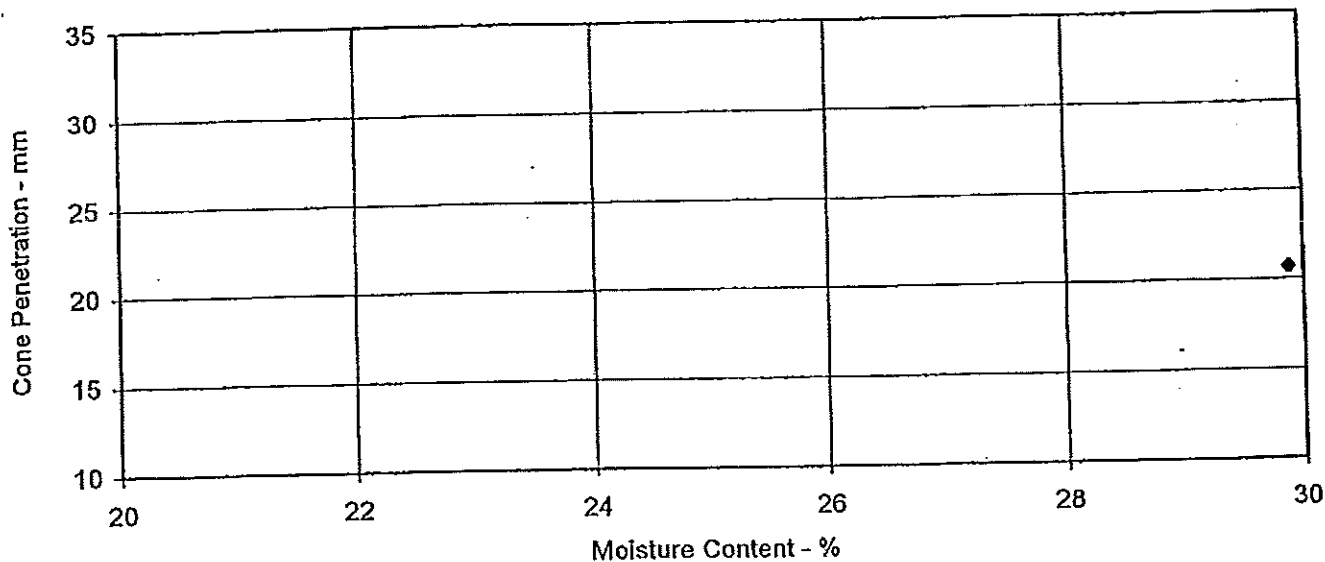
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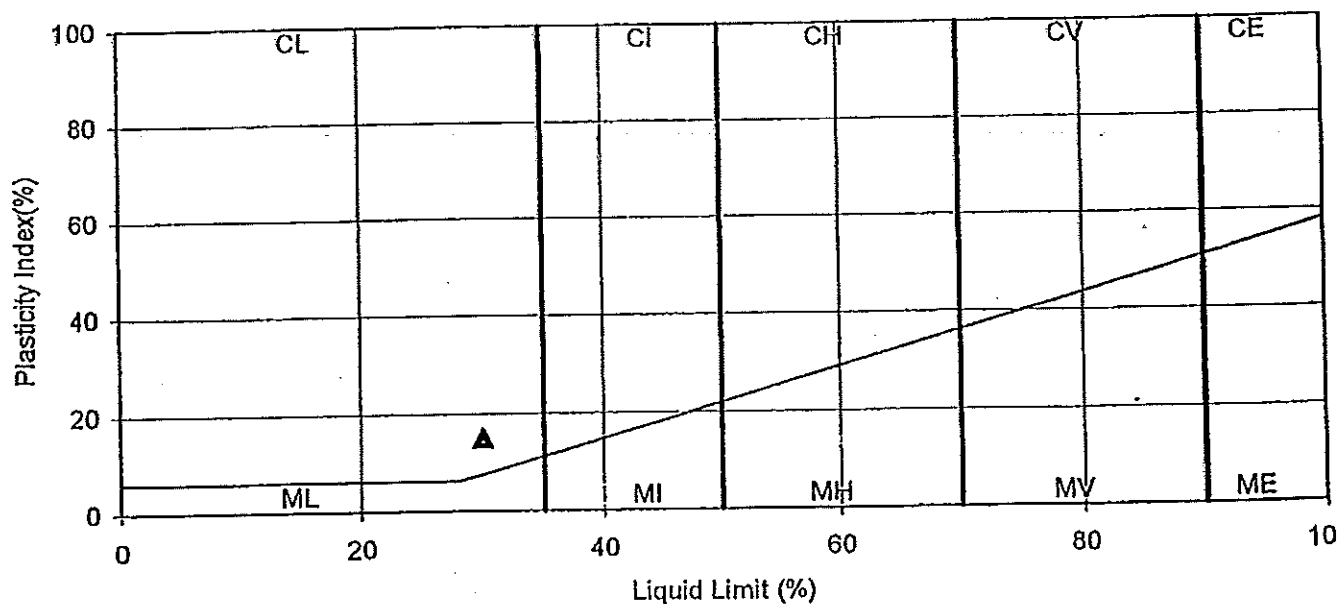
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH102
Project	Aldbrough Gas Storage Facility	Sample no	06
Soil description	Stiff dark brown slightly gravelly CLAY	Depth	2.50
		Sample type	U
		Page	1 of 1



Natural moisture content:	16	Estimated percentage retained on 425µm sieve:	2.7
Liquid limit:	30	Specimen depth:	2.50m
Plastic limit:	15	Remarks:	
Plasticity index:	15		
Moisture content of soil passing 425µm	17		
Liquidity index:	0.13		



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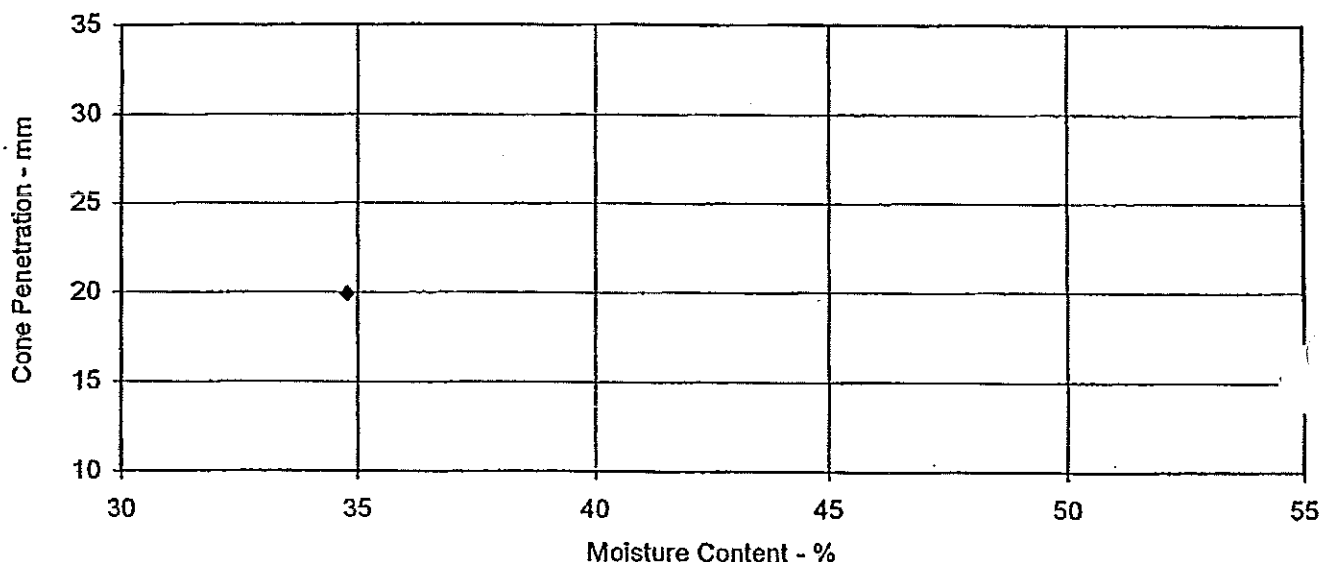
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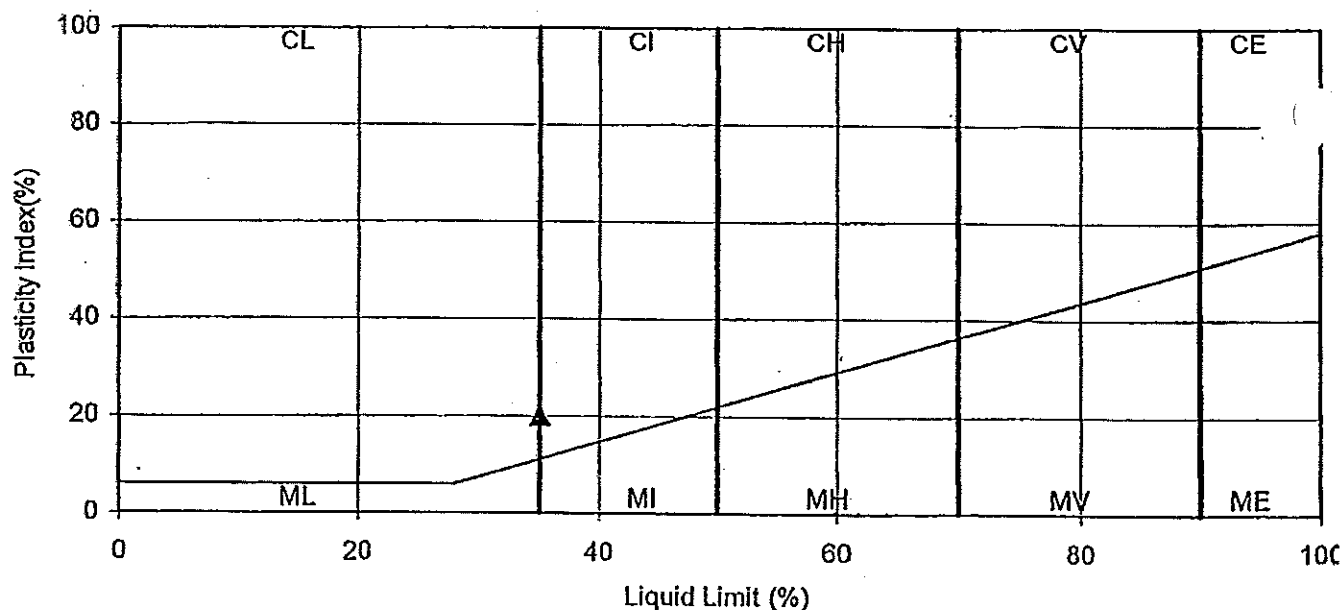
Test Method: BS1377; Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff brown slightly gravelly CLAY

Hole ID
Sample no 11
Depth 4.50
Sample type U
Page 1 of 1



Natural moisture content:	17	Percentage retained on 425µm sieve:	19.4
Liquid limit:	35	Specimen depth:	4.50m
Plastic limit:	15	Remarks:	
Plasticity Index:	20		
Moisture content of soil passing 425µm	21		
Liquidity index:	0.30		



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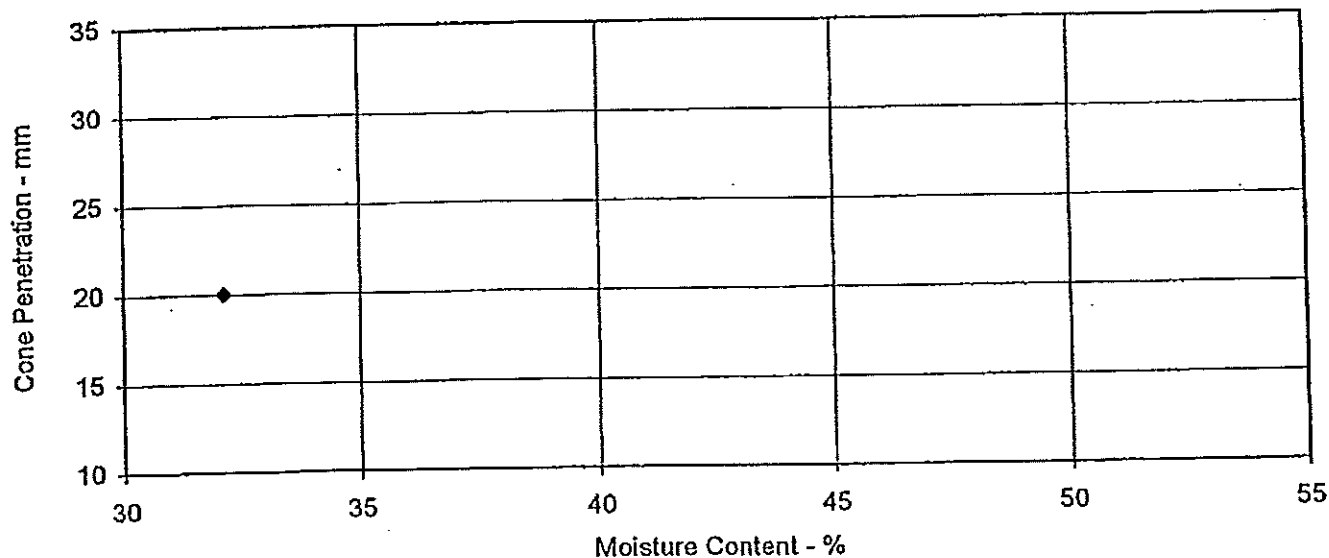
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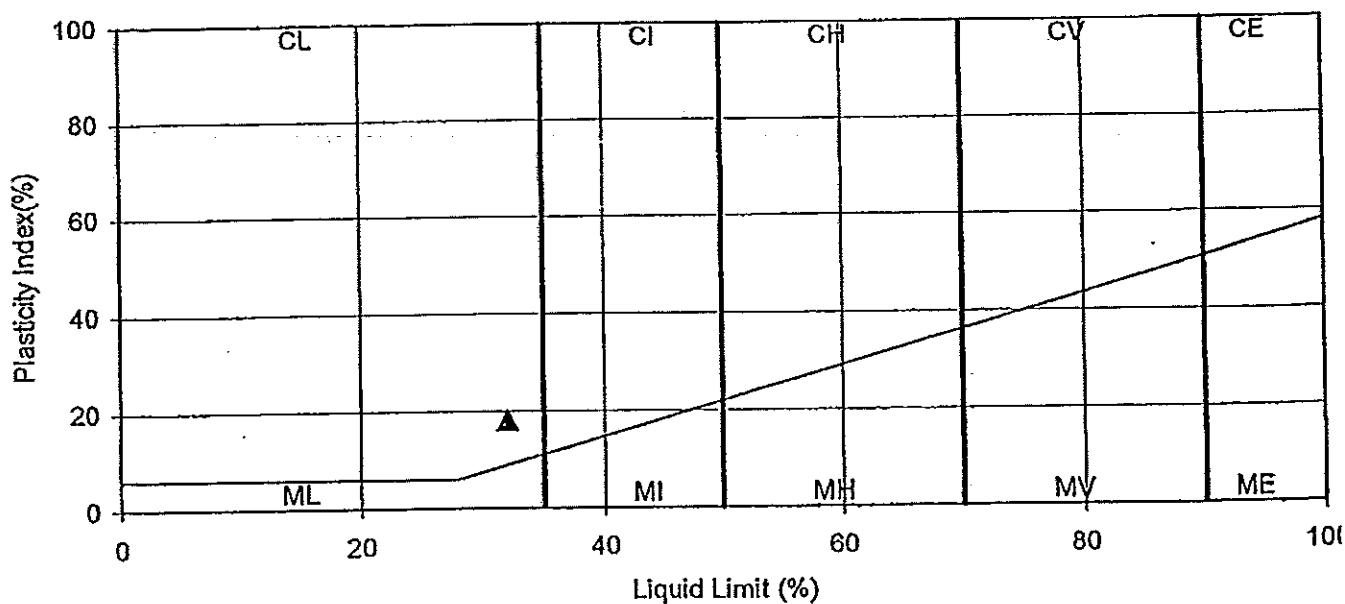
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Dark brown slightly sandy slightly gravelly CLAY

Hole ID BH102
Sample no 16
Depth 6.40
Sample type B
Page 1 of 1



Natural moisture content:	16	Estimated percentage retained on 425µm sieve:	4.4
Liquid limit:	32	Specimen depth:	6.40m
Plastic limit:	14	Remarks:	
Plasticity index:	18		
Moisture content of soil passing 425µm	17		
Liquidity index:	0.17		



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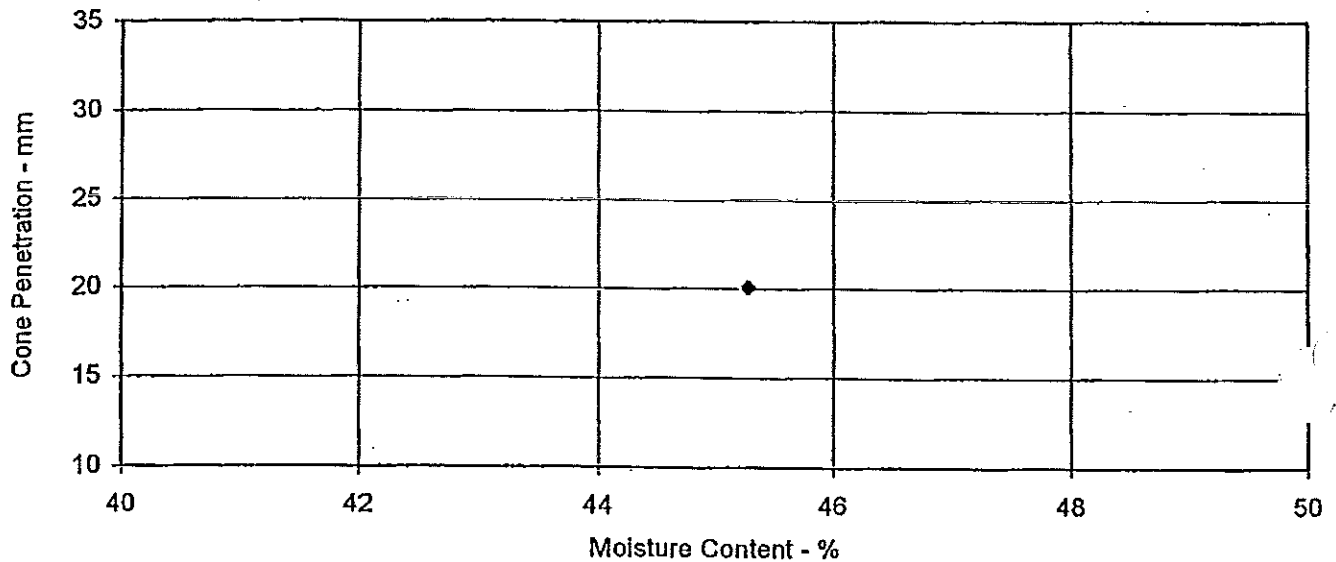
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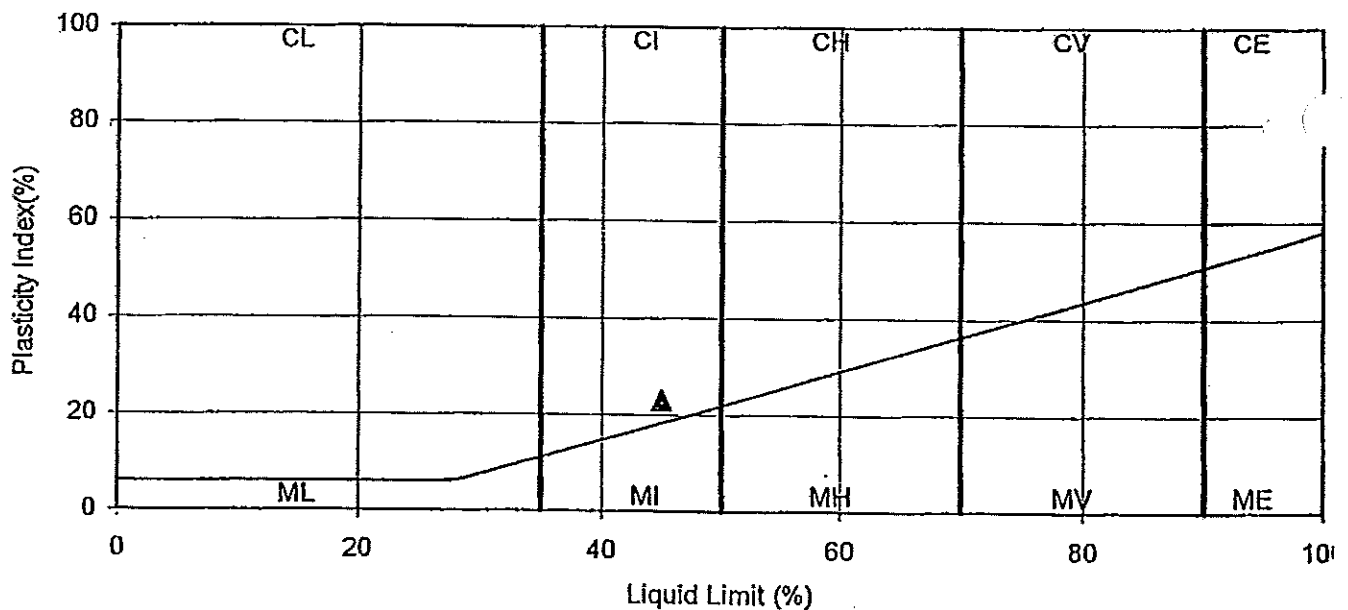
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	
Project	Aldbrough Gas Storage Facility	Sample no	
Soil description	Brown sandy gravelly CLAY	Depth	0.50
		Sample type	D
		Page	1 of 1



Natural moisture content:	16	Percentage retained on 425µm sieve:	41.8
Liquid limit:	45	Specimen depth:	0.50m
Plastic limit:	22	Remarks:	
Plasticity index:	23		
Moisture content of soil passing 425µm	27		
Liquidity Index:	0.22		



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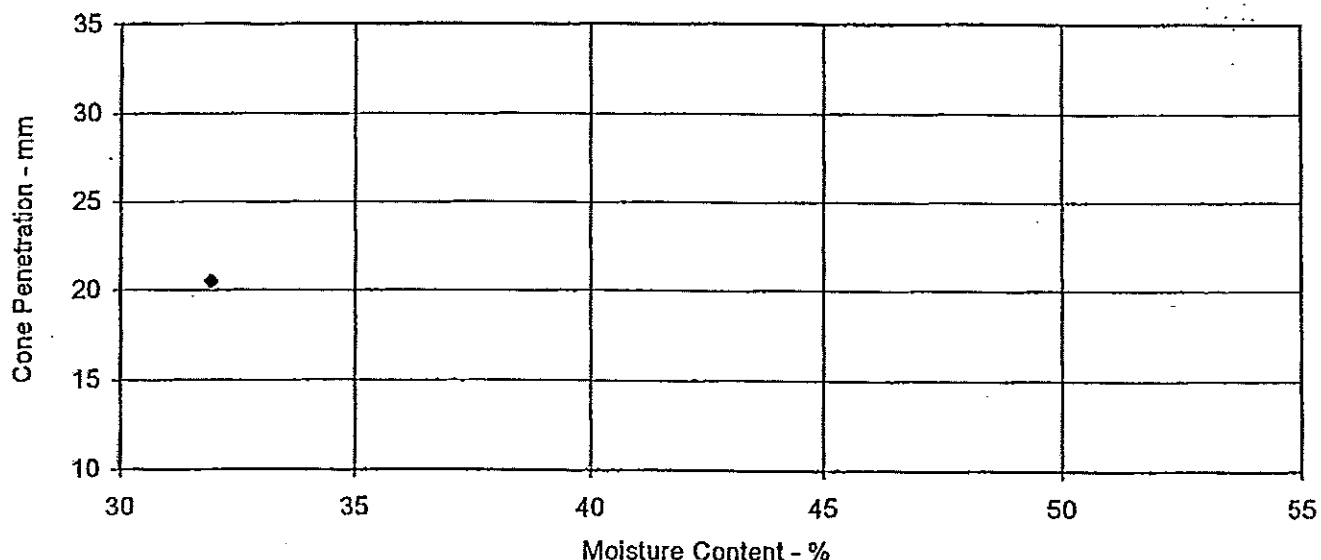
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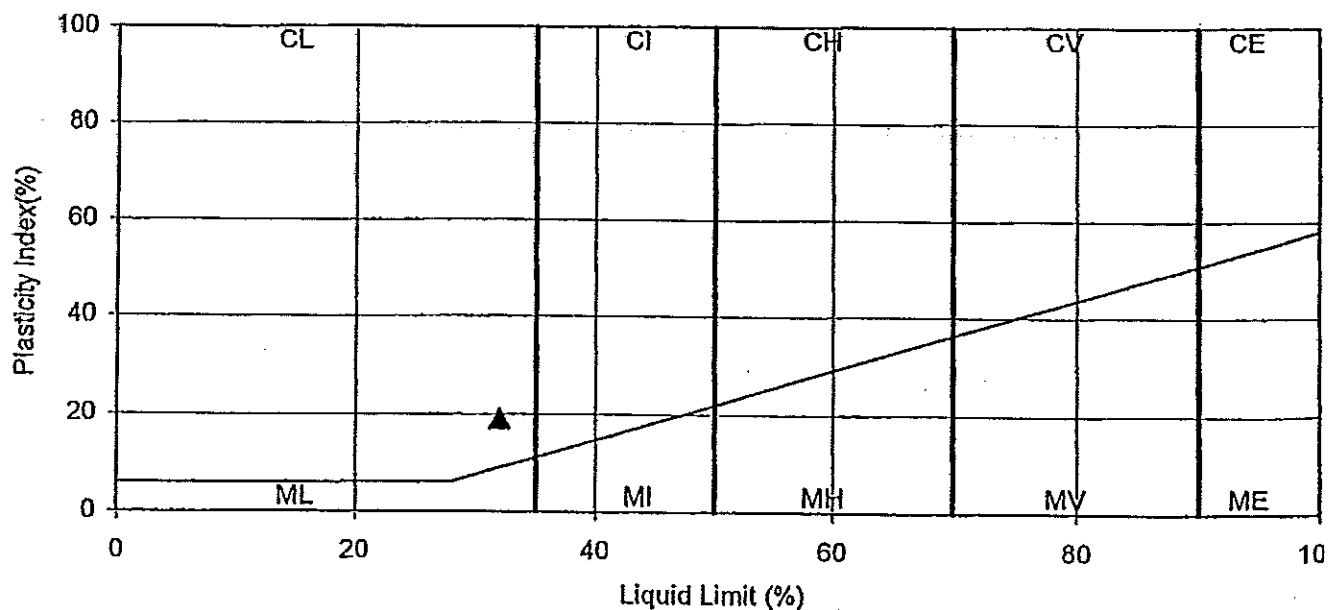
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Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown slightly gravelly CLAY

Hole ID BH102
Sample no 05
Depth 2.50
Sample type U
Page 1 of 1



Natural moisture content:	14	Percentage retained on 425µm sieve:	3.3
Liquid limit:	32	Specimen depth:	2.50m
Plastic limit:	13	Remarks:	
Plasticity index:	19		
Moisture content of soil passing 425µm	15		
Liquidity Index:	0.11		



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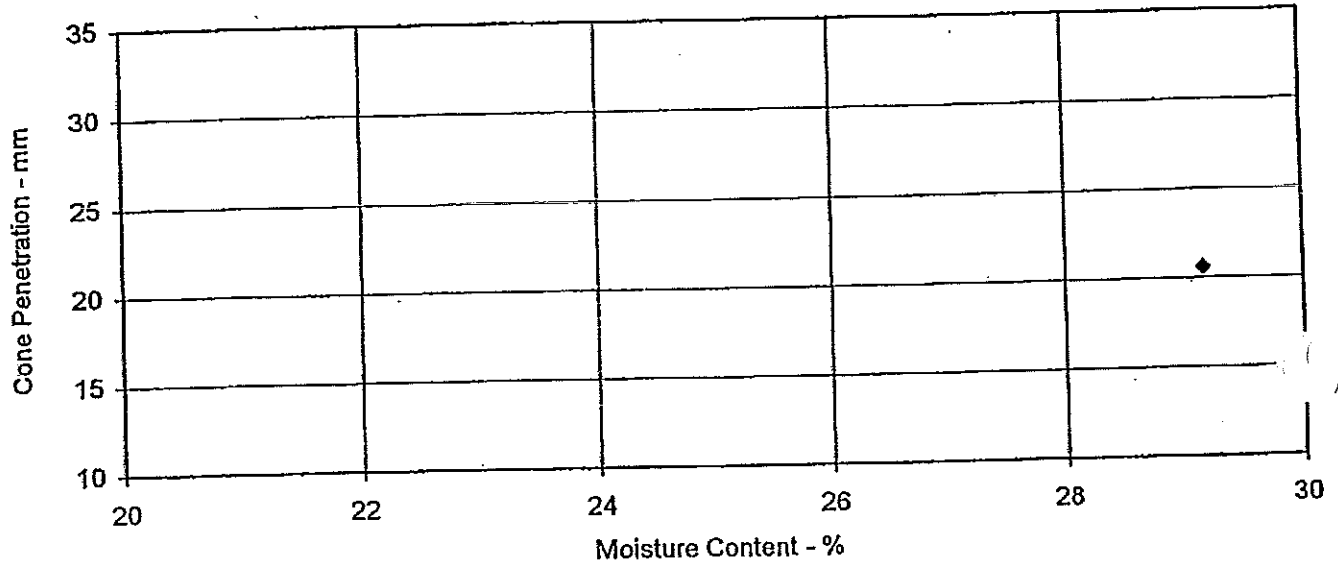
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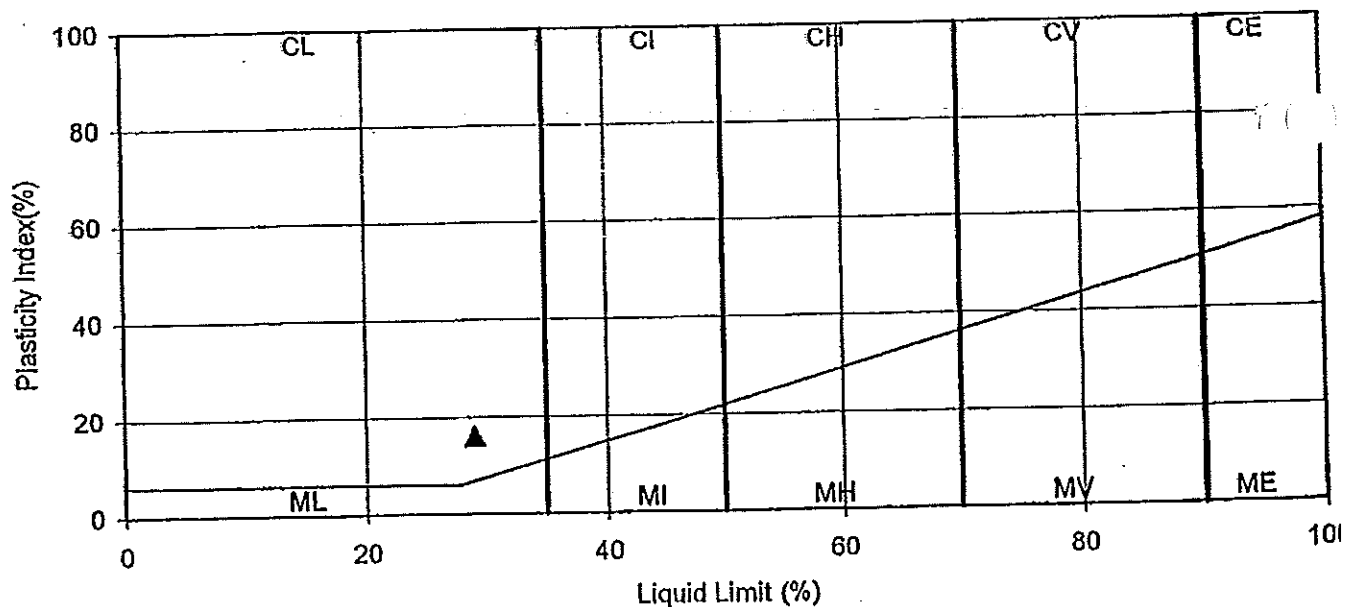
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly sandy slightly gravelly CLAY

Hole ID
Sample no
Depth 5.20
Sample type B
Page 1 of 1



Natural moisture content:	14	Percentage retained on 425µm sieve:	15.9
Liquid limit:	29	Specimen depth:	5.20m
Plastic limit:	13	Remarks:	
Plasticity index:	16		
Moisture content of soil passing 425µm	17		
Liquidity index:	0.25		



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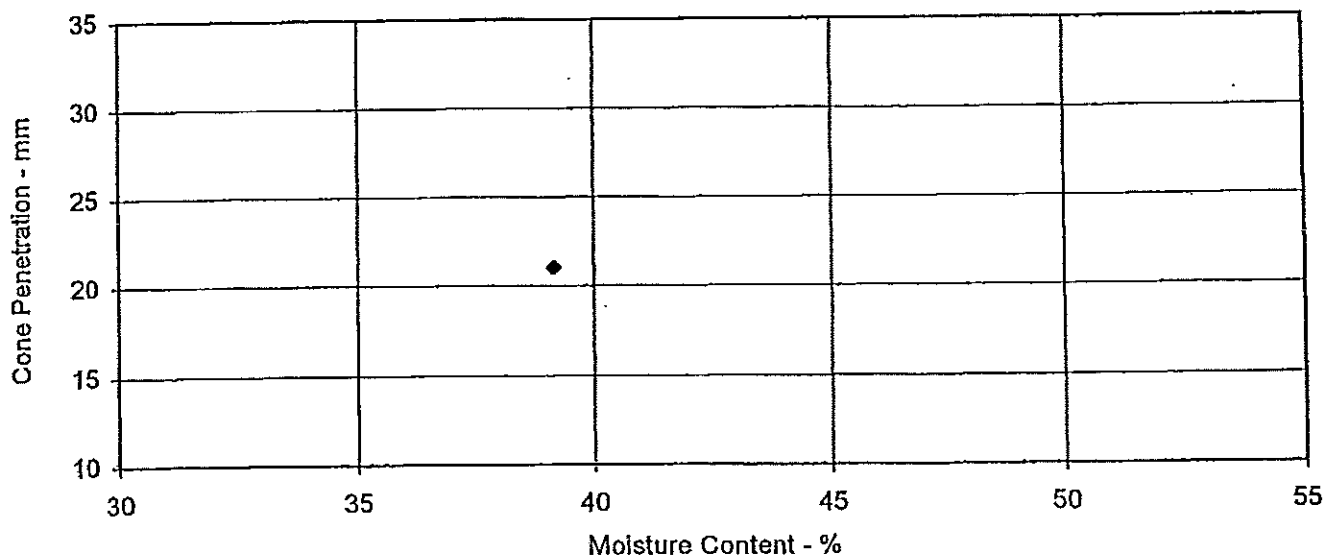
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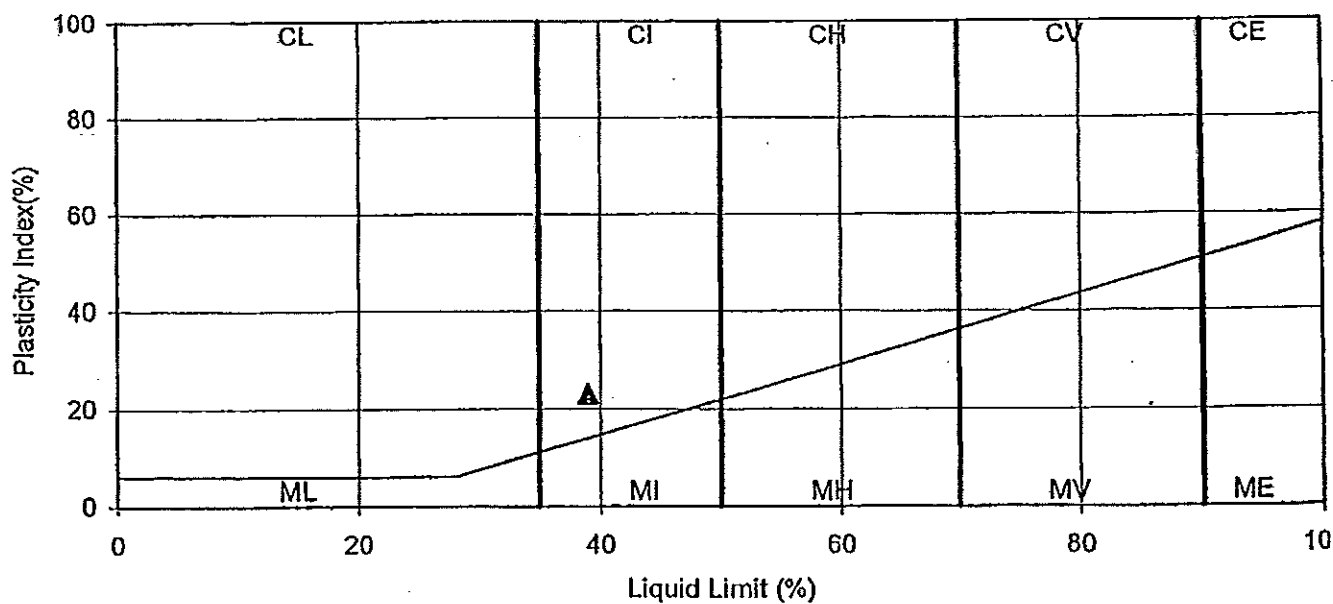
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly CLAY

Hole ID BH104
Sample no 02
Depth 1.20
Sample type U
Page 1 of 1



Natural moisture content:	18	Percentage retained on 425µm sieve:	11.0
Liquid limit:	39	Specimen depth:	1.21m
Plastic limit:	16	Remarks:	
Plasticity index:	23		
Moisture content of soil passing 425µm	20		
Liquidity Index:	0.17		



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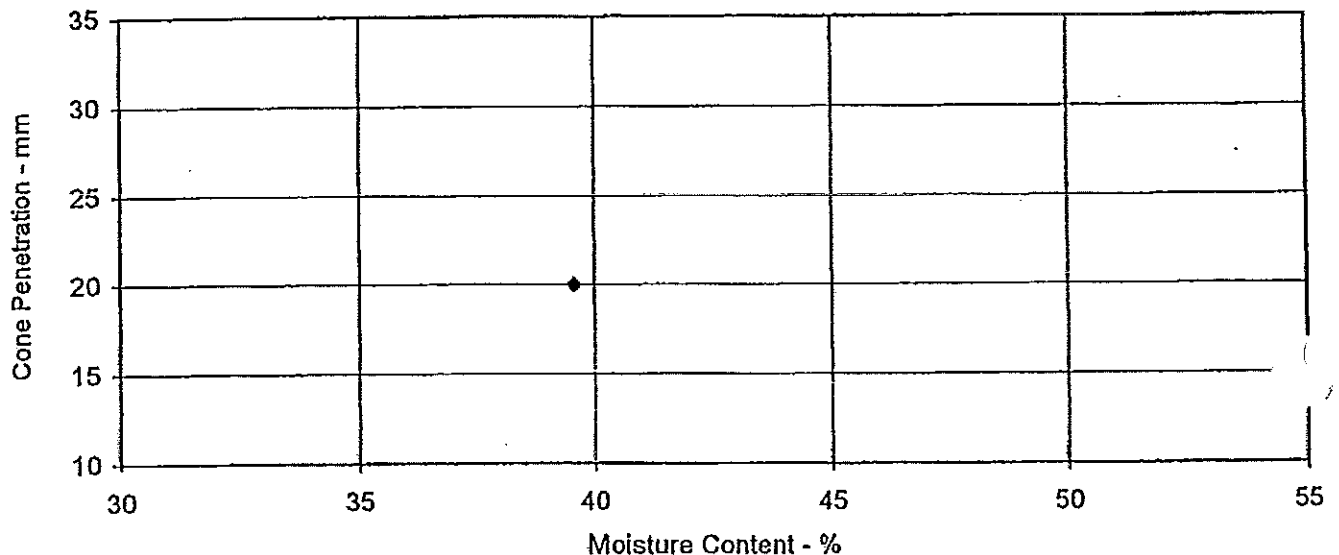
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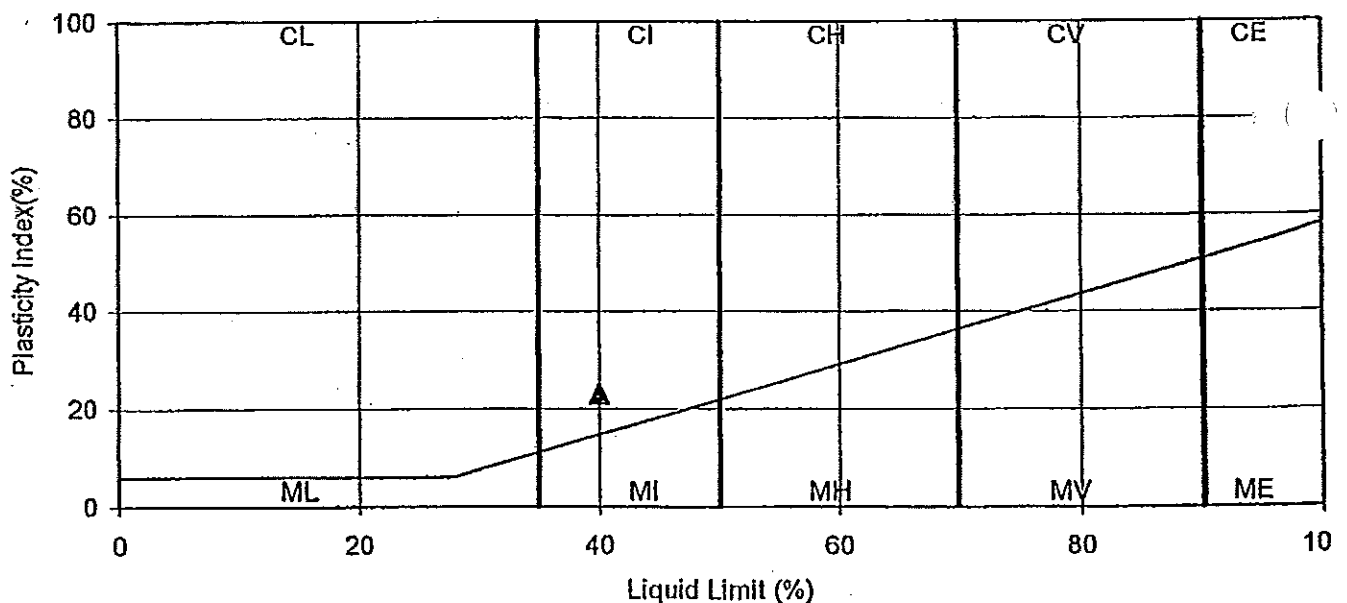
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample no
Depth 3.05
Sample type U
Page 1 of 1



Natural moisture content:	17	Percentage retained on 425µm sieve:	15.2
Liquid limit:	40	Specimen depth:	3.05m
Plastic limit:	17	Remarks:	
Plasticity index:	23		
Moisture content of soil passing 425µm	21		
Liquidity index:	0.17		



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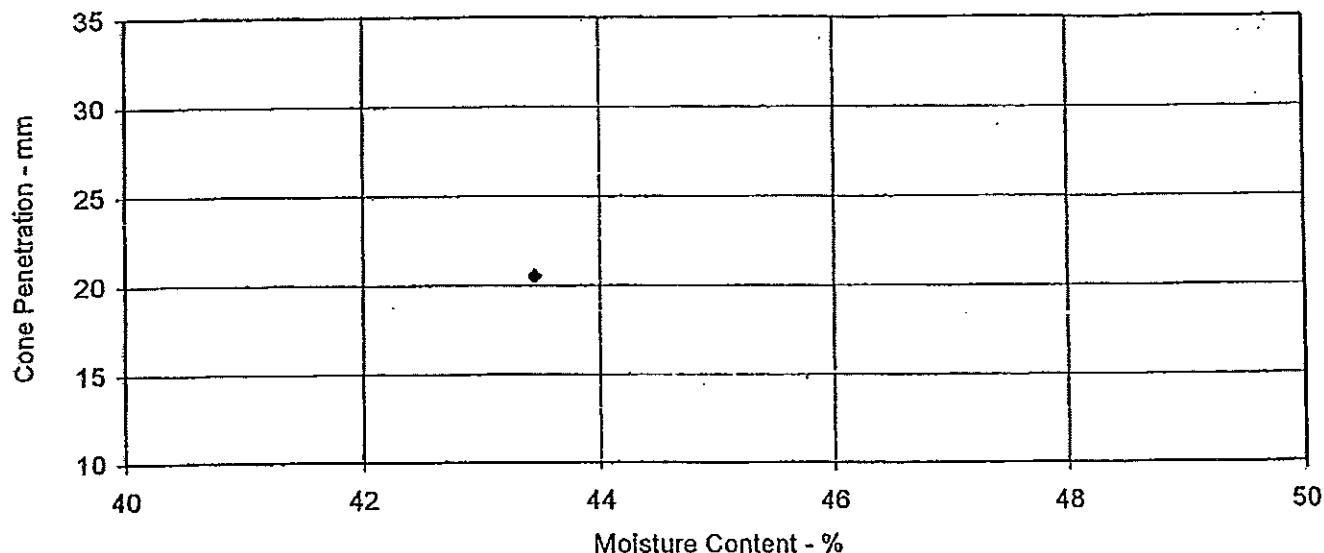
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LIQUID AND PLASTIC LIMIT TEST

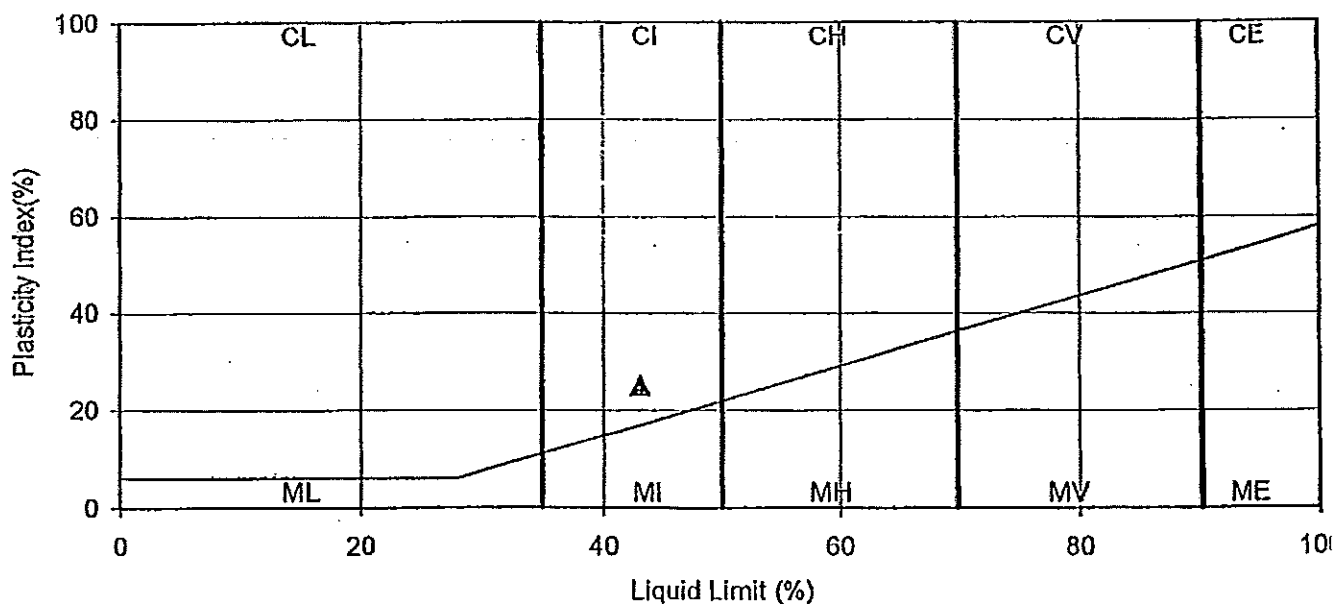
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH104
Project	Aldbrough Gas Storage Facility	Sample no	13
Soil description	Stiff dark brown slightly gravelly CLAY	Depth	6.00
		Sample type	U
		Page	1 of 1



Natural moisture content:	20	Estimated percentage retained on 425µm sieve:	0.9
Liquid limit:	43	Specimen depth:	6.00m
Plastic limit:	18	Remarks:	
Plasticity index:	25		
Moisture content of soil passing 425µm	21		
Liquidity index:	0.12		



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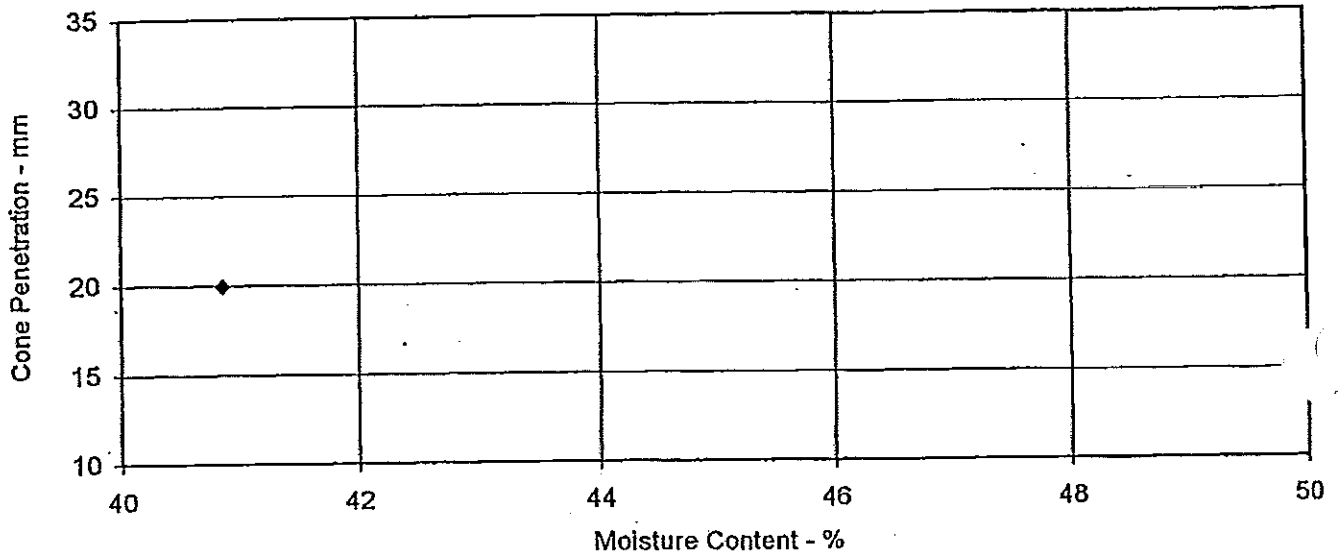
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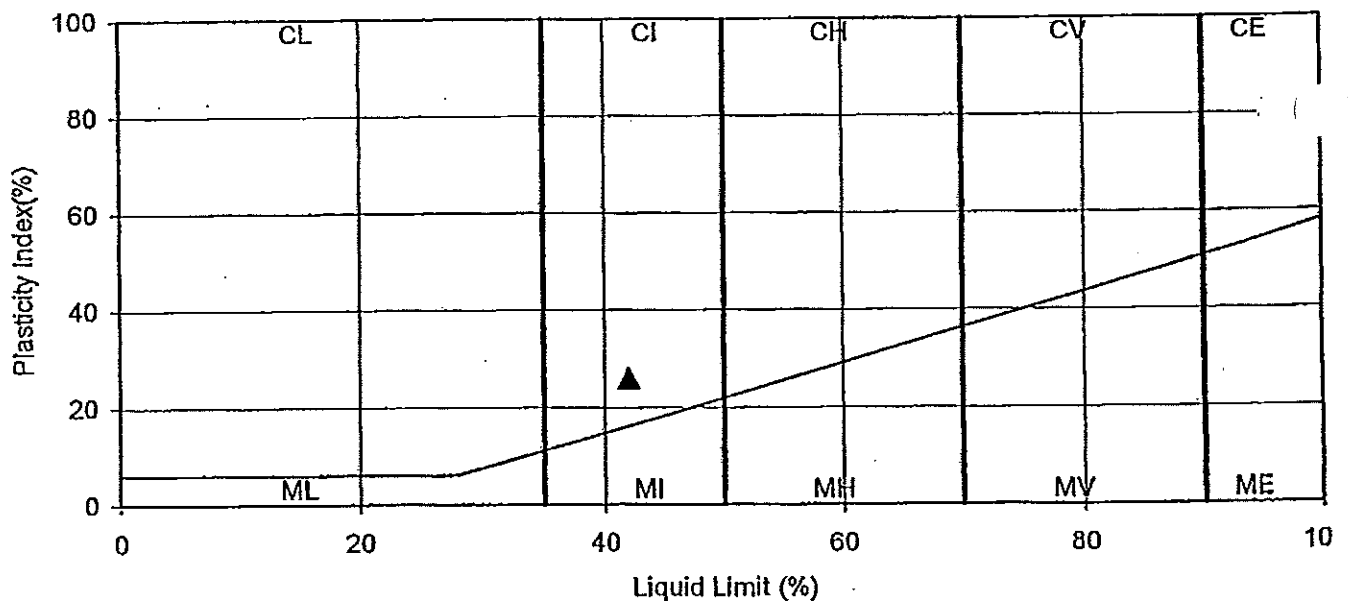
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly CLAY

Hole ID
Sample no
Depth 0.60
Sample type B
Page 1 of 1



Natural moisture content:	17	Percentage retained on 425µm sieve:	9.3
Liquid limit:	42	Specimen depth:	0.60m
Plastic limit:	16	Remarks:	
Plasticity index:	26		
Moisture content of soil passing 425µm	19		
Liquidity index:	0.12		



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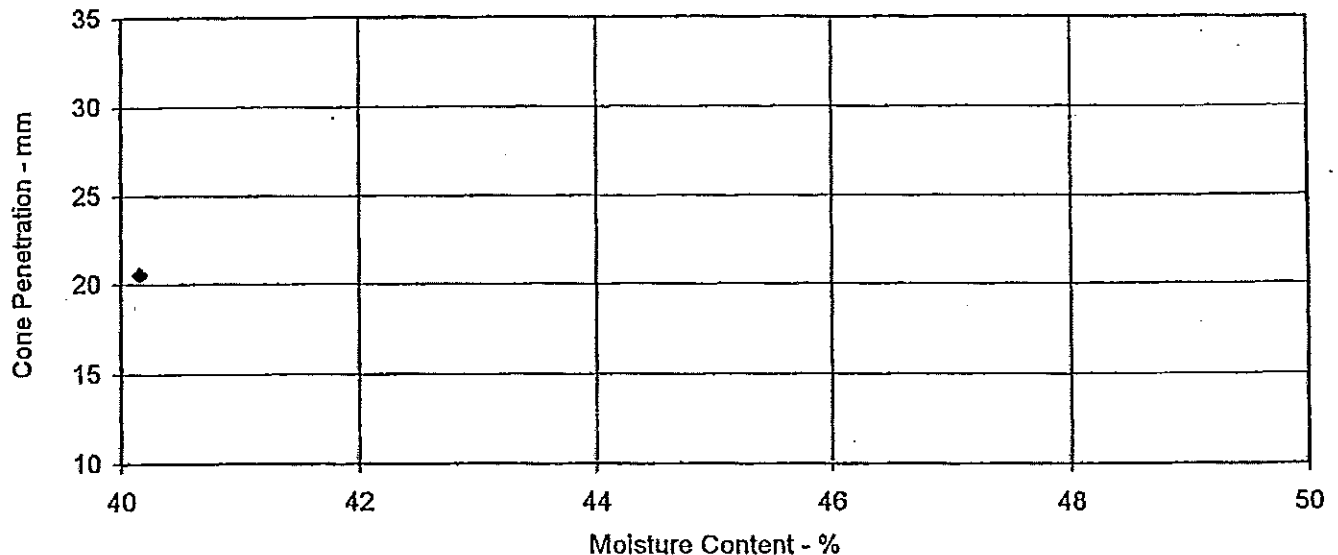
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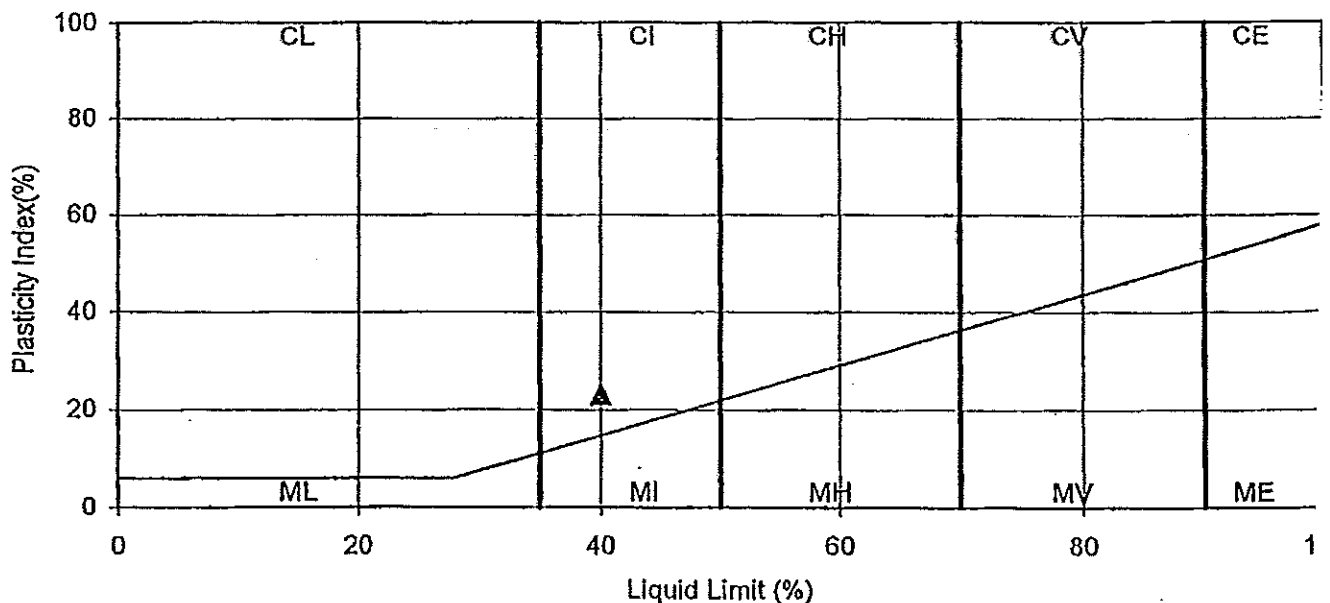
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH10
Project	Aldbrough Gas Storage Facility	Sample no	06
Soil description	Very stiff brown slightly gravelly CLAY	Depth	2.50
		Sample type	U
		Page	1 of 1



Natural moisture content:	16	Percentage retained on 425µm sieve:	8.2
Liquid limit:	40	Specimen depth:	2.59m
Plastic limit:	17	Remarks:	
Plasticity index:	23		
Moisture content of soil passing 425µm	18		
Liquidity index:	0.04		



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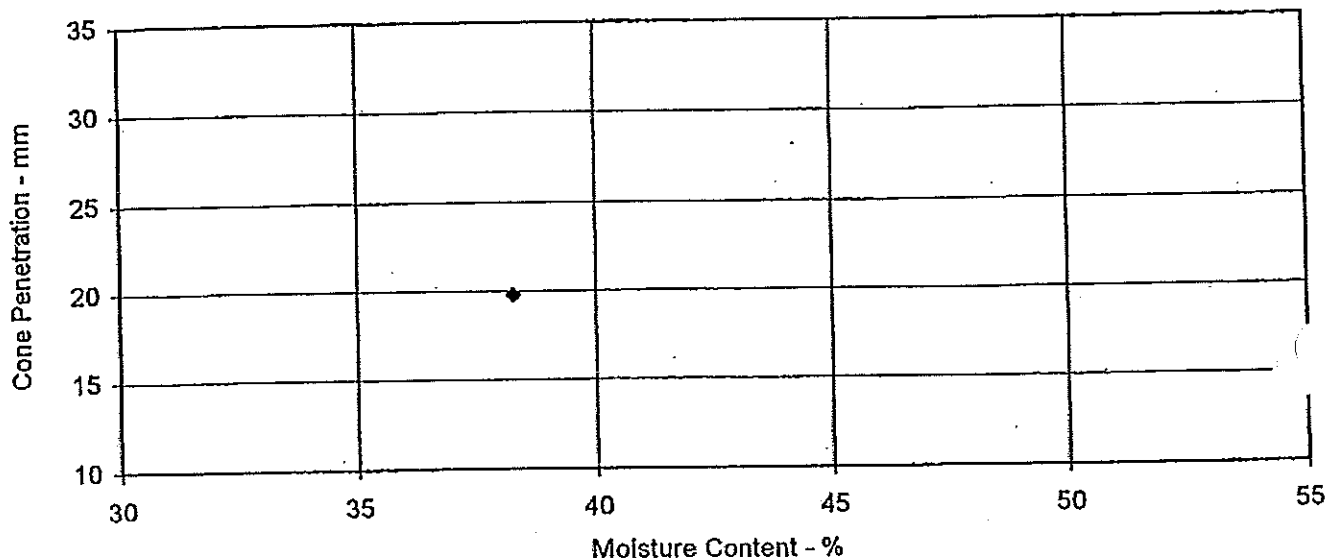
LIQUID AND PLASTIC LIMIT TEST

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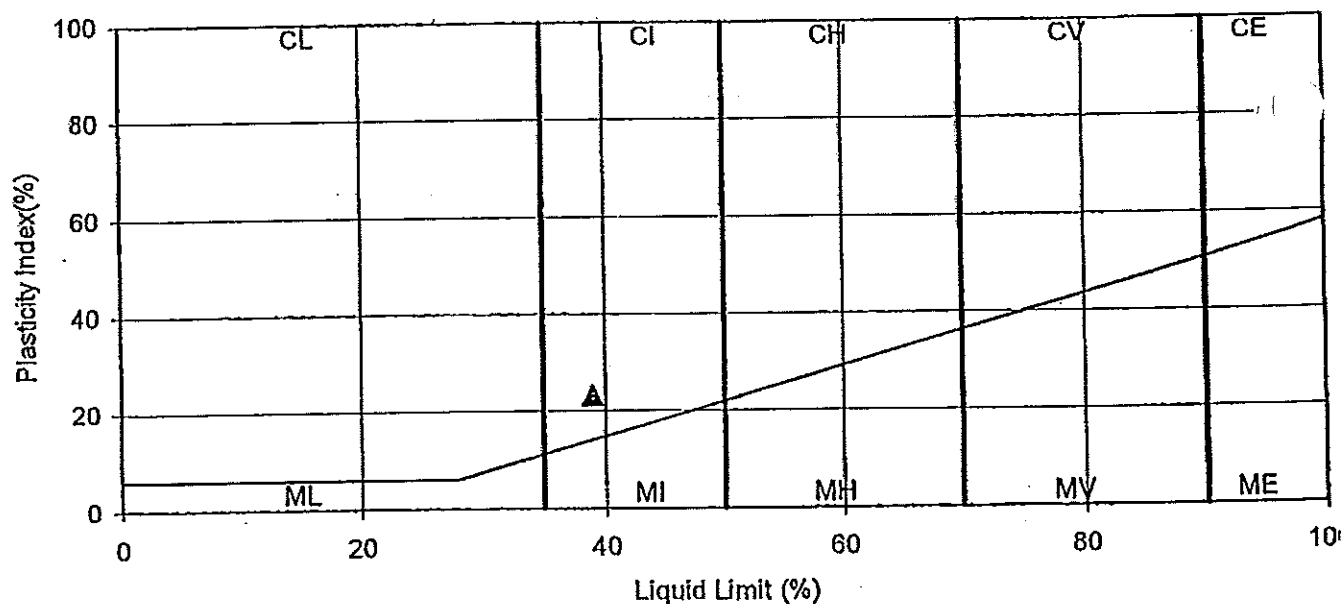
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample no T1
Depth 4.50
Sample type U
Page 1 of 1



Natural moisture content:	17	Estimated percentage retained on 425µm sieve:	1.7
Liquid limit:	39	Specimen depth:	4.61m
Plastic limit:	16	Remarks:	
Plasticity index:	23		
Moisture content of soil passing 425µm	17		
Liquidity index:	0.04		



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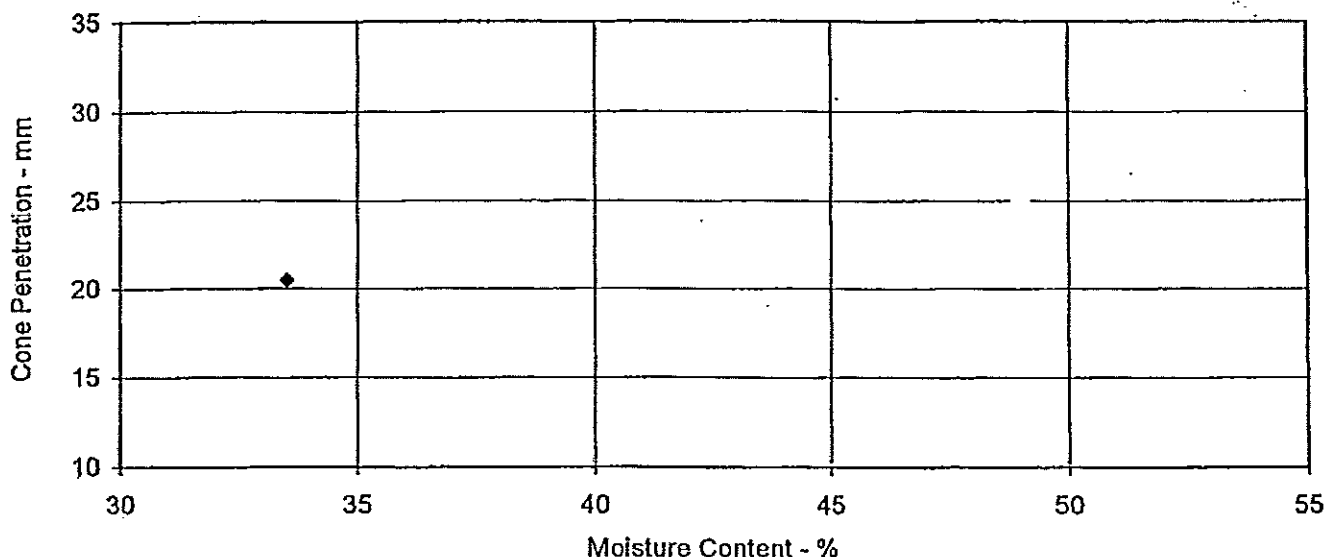
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LIQUID AND PLASTIC LIMIT TEST

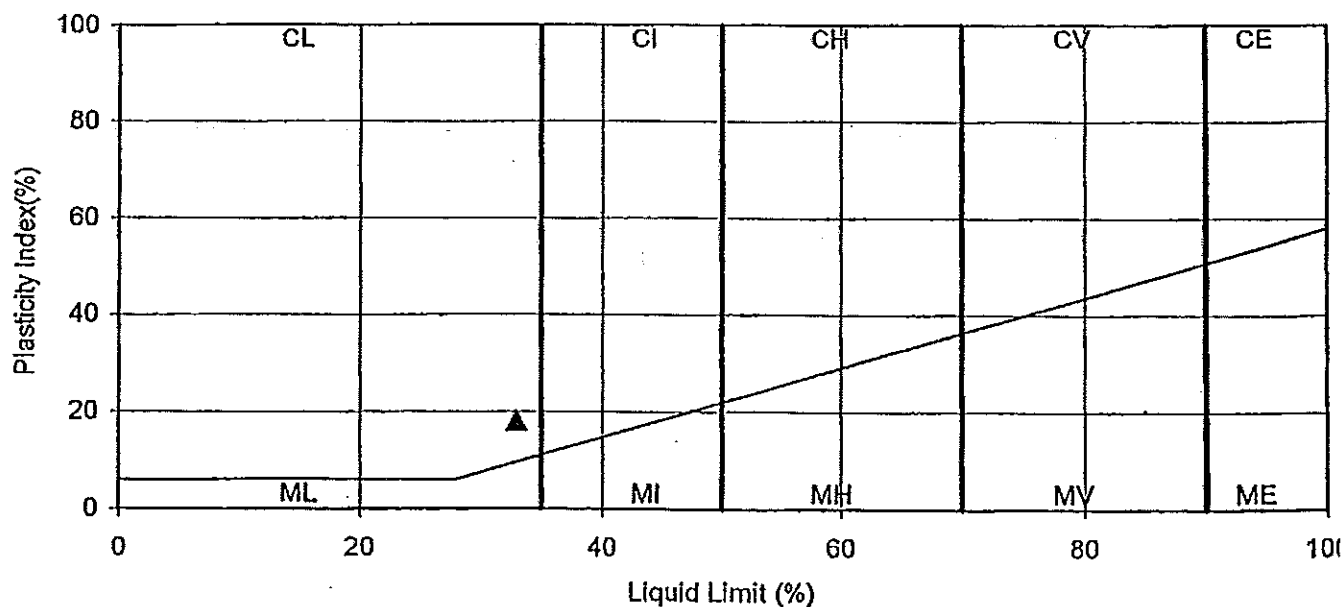
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH106
Project	Aldbrough Gas Storage Facility	Sample no	22
Soil description	Soft to firm dark brown slightly gravelly CLAY	Depth	10.00
		Sample type	U
		Page	1 of 1



Natural moisture content:	16	Estimated percentage retained on 425µm sieve:	7.1
Liquid limit:	33	Specimen depth:	10.00m
Plastic limit:	15	Remarks:	
Plasticity index:	18		
Moisture content of soil passing 425µm	17		
Liquidity index:	0.11		



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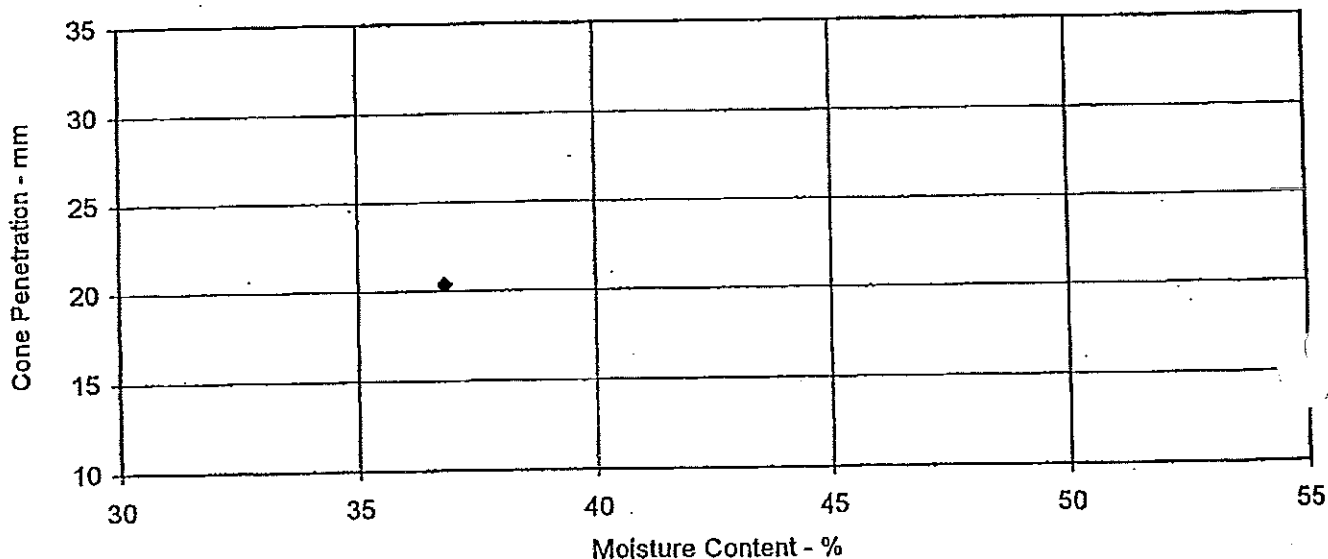
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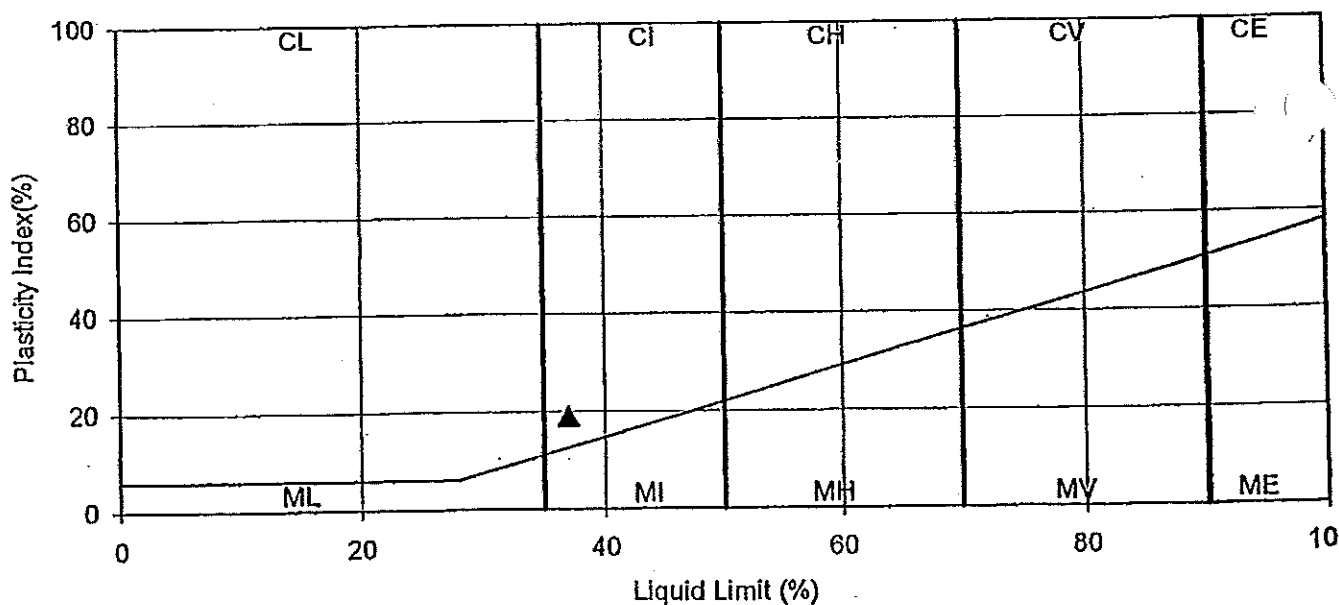
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff brown slightly gravelly CLAY

Hole ID
Sample no
Depth 1.50
Sample type U
Page 1 of 1



Natural moisture content:	16	Estimated percentage retained on 425µm sieve:	2.6
Liquid limit:	37	Specimen depth:	1.50m
Plastic limit:	18	Remarks:	
Plasticity index:	19		
Moisture content of soil passing 425µm	17		
Liquidity index:	-0.05		



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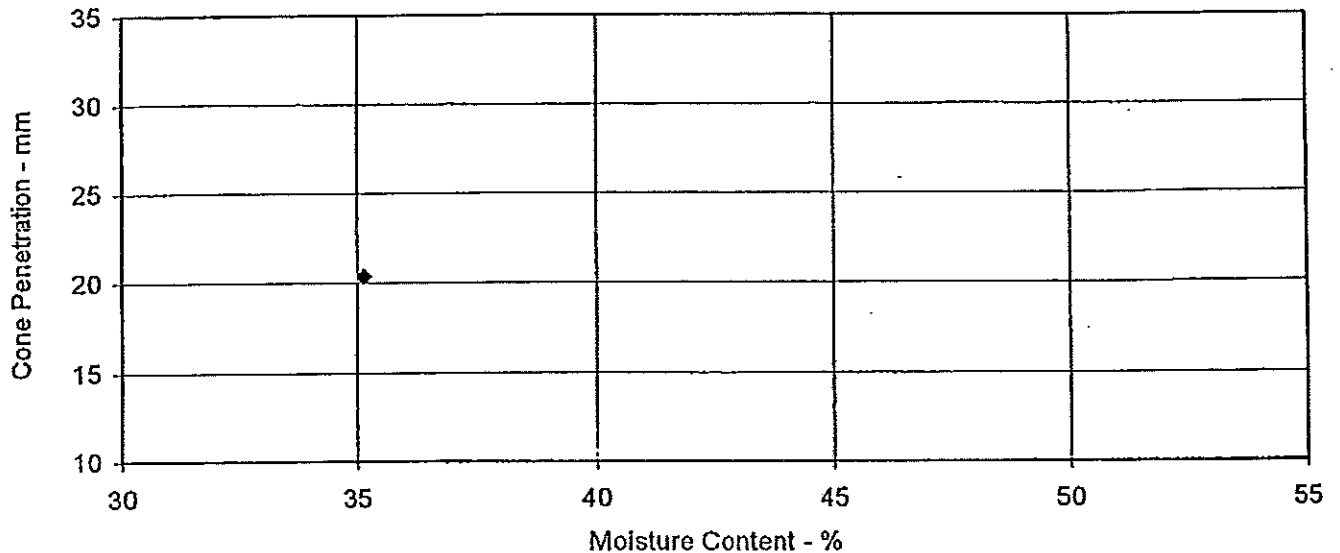
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LIQUID AND PLASTIC LIMIT TEST

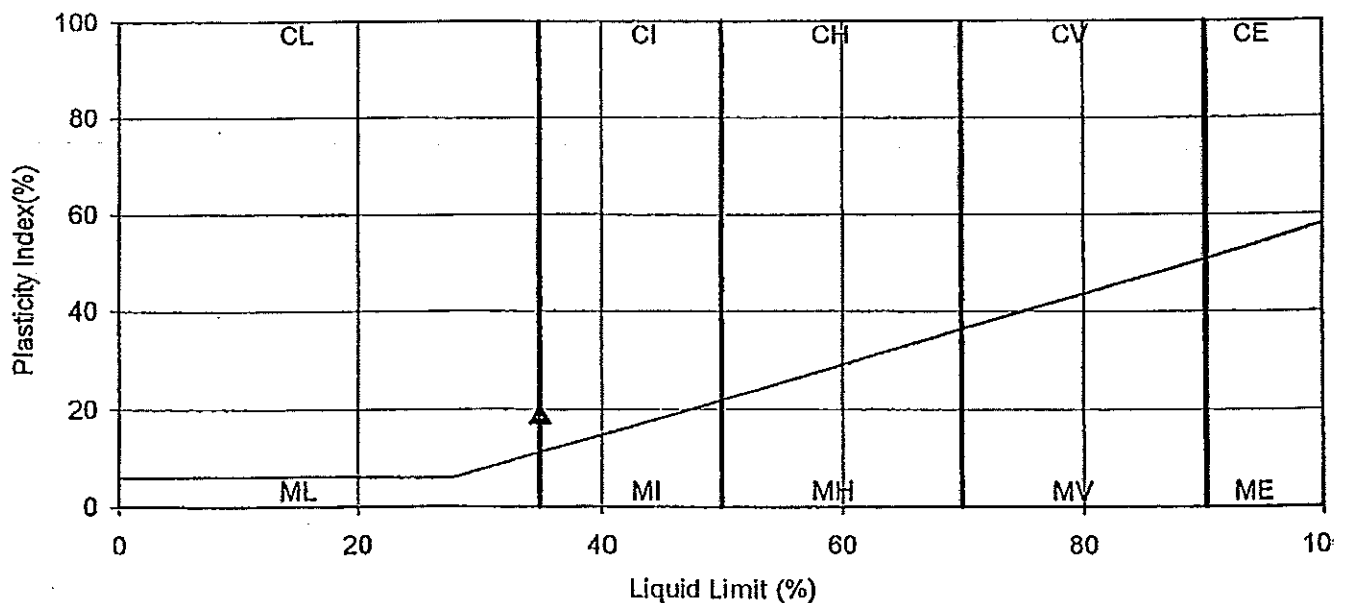
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH10
Project	Aldbrough Gas Storage Facility	Sample no	09
Soil description	Brown slightly sandy slightly gravelly CLAY	Depth	3.20
		Sample type	B
		Page	1 of 1



Natural moisture content:	22	Percentage retained on 425µm sieve:	9.8
Liquid limit:	35	Specimen depth:	3.20m
Plastic limit:	16	Remarks:	
Plasticity index:	19		
Moisture content of soil passing 425µm	24		
Liquidity index:	0.42		



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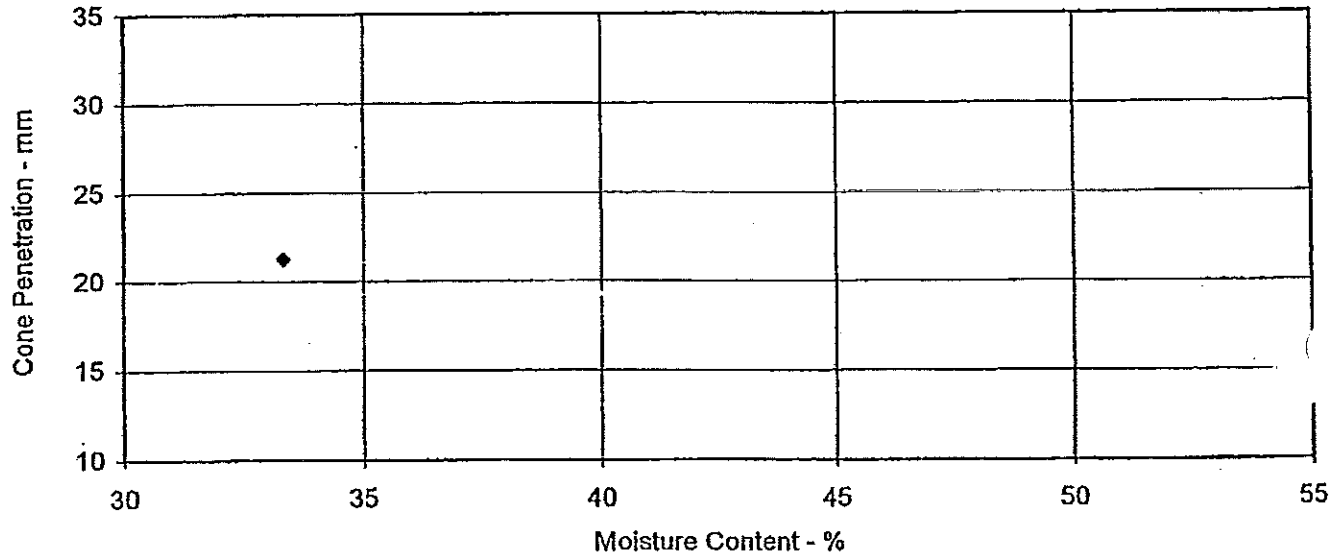
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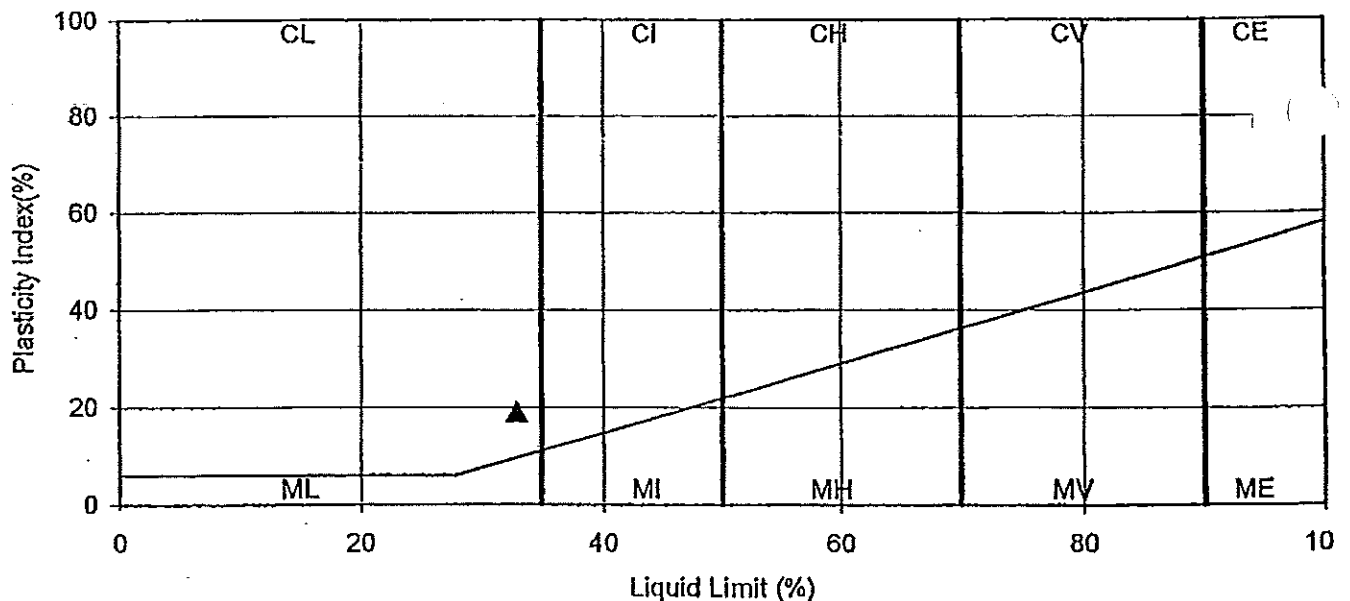
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm dark brown slightly gravelly CLAY

Hole ID
Sample no 6
Depth 5.50
Sample type U
Page 1 of 1



Natural moisture content:	15	Estimated percentage retained on 425µm sieve:	6.1
Liquid limit:	33	Specimen depth:	5.50m
Plastic limit:	14	Remarks:	
Plasticity index:	19		
Moisture content of soil passing 425µm	16		
Liquidity index:	0.11		



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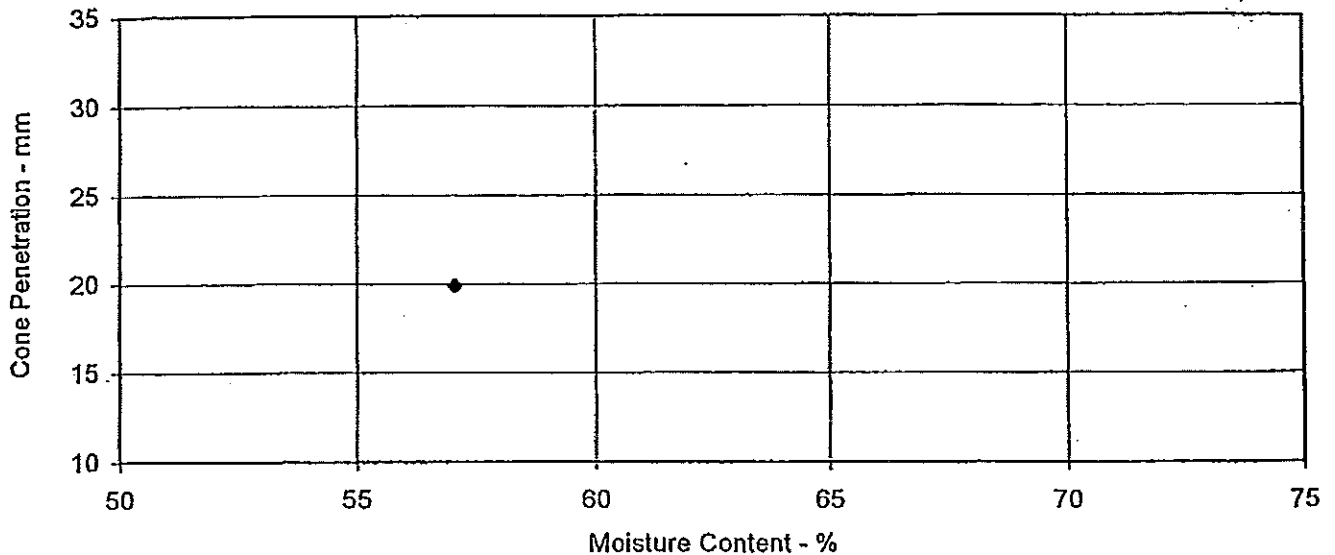
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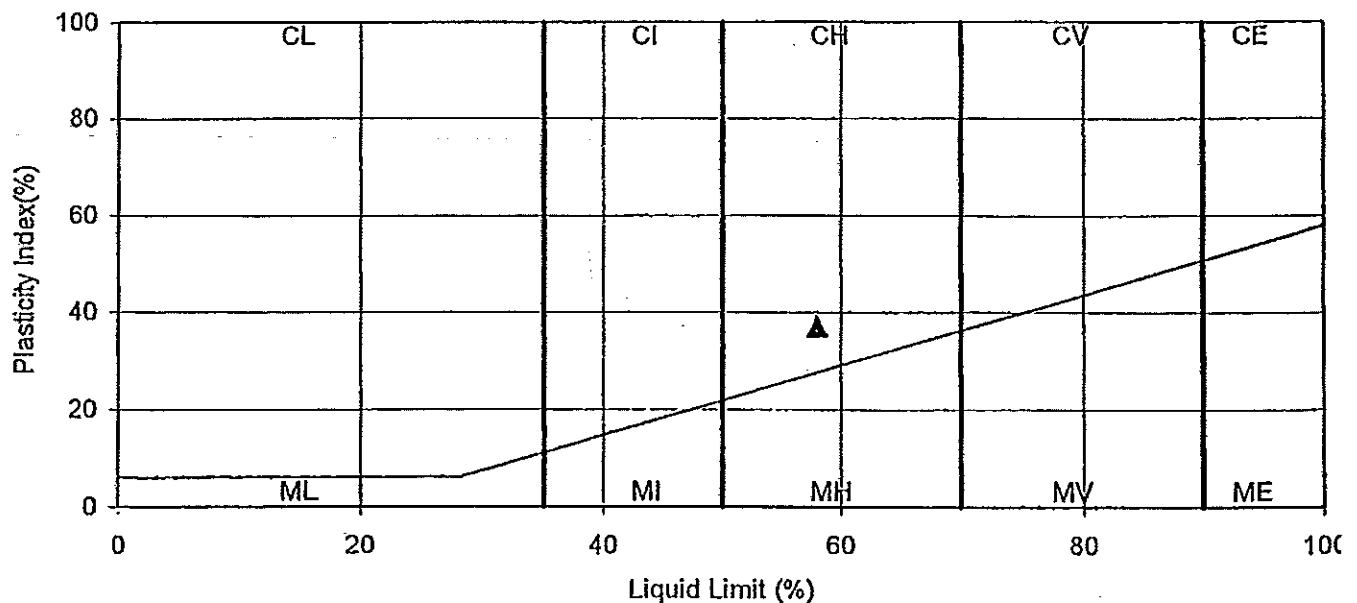
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH106
Project	Aldbrough Gas Storage Facility	Sample no	24
Soil description	Brown slightly gravelly CLAY	Depth	10.00
		Sample type	D
		Page	1 of 1



Natural moisture content:	15	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	58	Specimen depth:	10.00m
Plastic limit:	21	Remarks:	
Plasticity index:	37		
Moisture content of soil passing 425µm	15		
Liquidity index:	-0.16		



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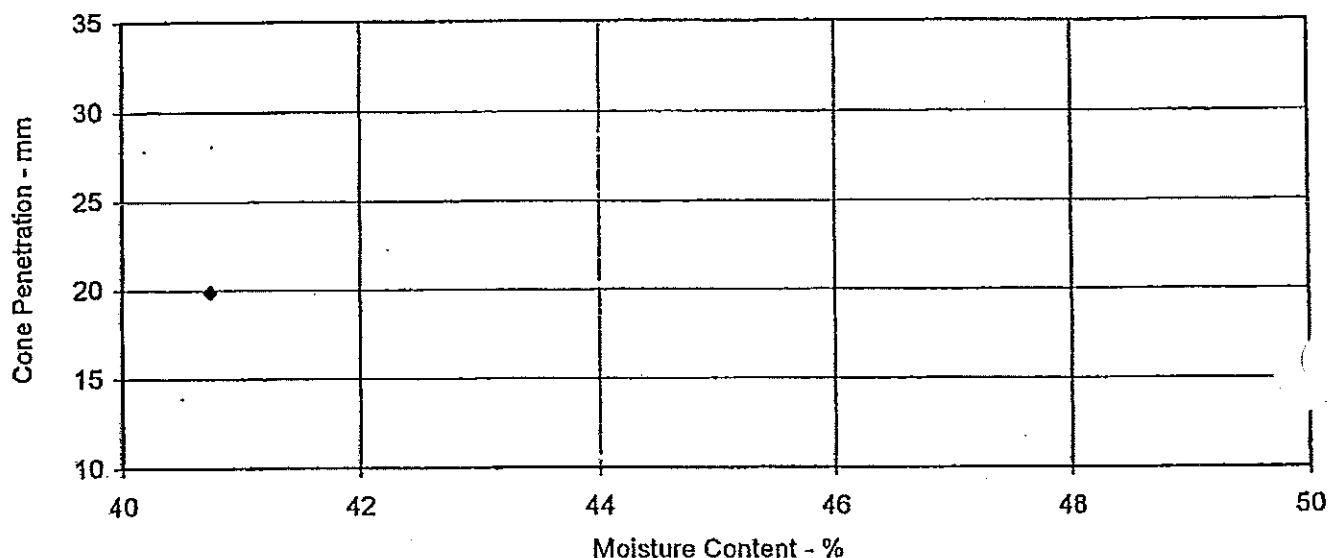
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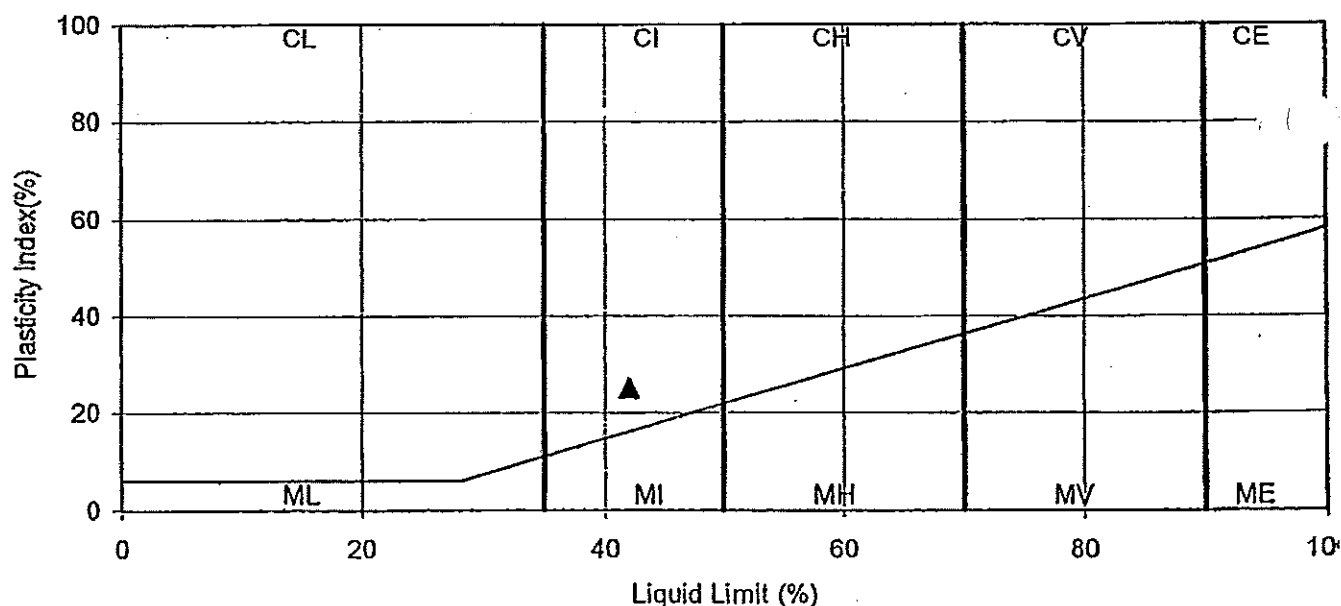
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown gravelly CLAY

Hole ID
Sample no
Depth 0.50
Sample type D
Page 1 of 1



Natural moisture content:	20	Percentage retained on 425µm sieve:	12.0
Liquid limit:	42	Specimen depth:	0.50m
Plastic limit:	17	Remarks:	
Plasticity Index:	25		
Moisture content of soil passing 425µm	22		
Liquidity Index:	0.20		



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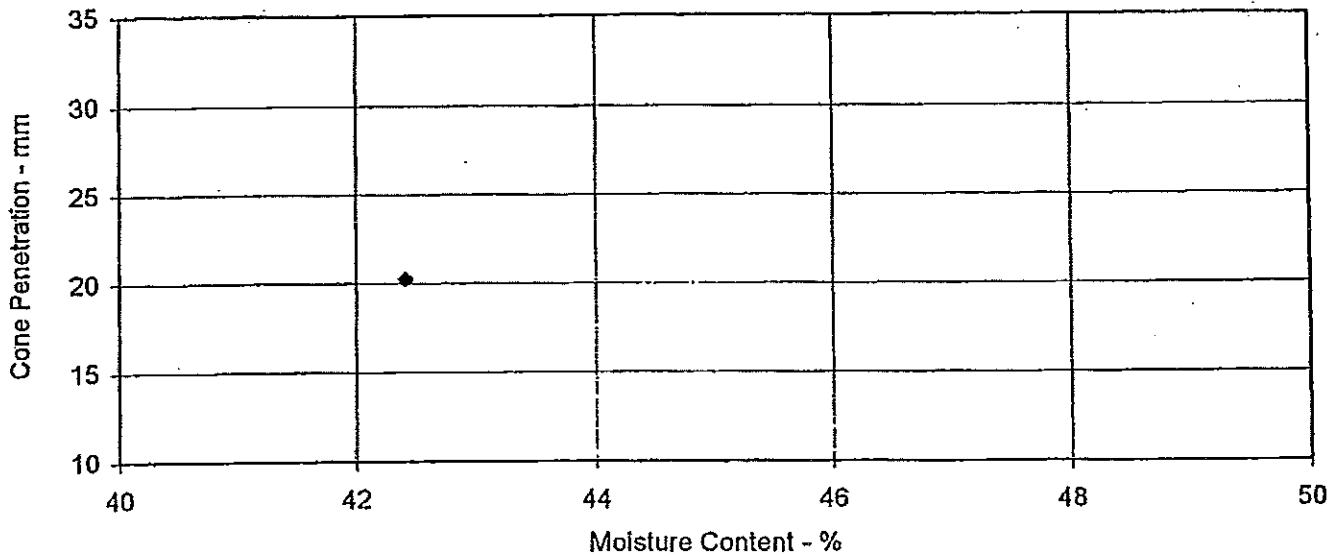
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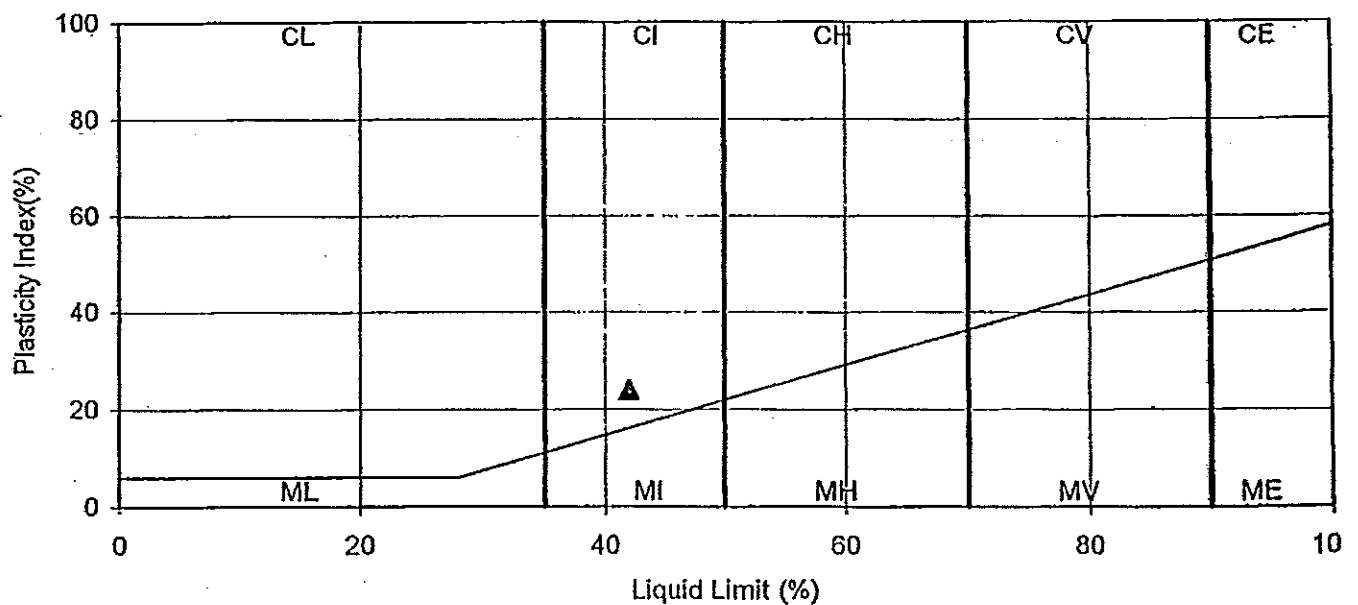
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly CLAY

Hole ID BH107
Sample no 02
Depth 1.20
Sample type U
Page 1 of 1



Natural moisture content:	17	Percentage retained on 425µm sieve:	12.1
Liquid limit:	42	Specimen depth:	1.20m
Plastic limit:	18	Remarks:	
Plasticity index:	24		
Moisture content of soil passing 425µm	19		
Liquidity index:	0.04		



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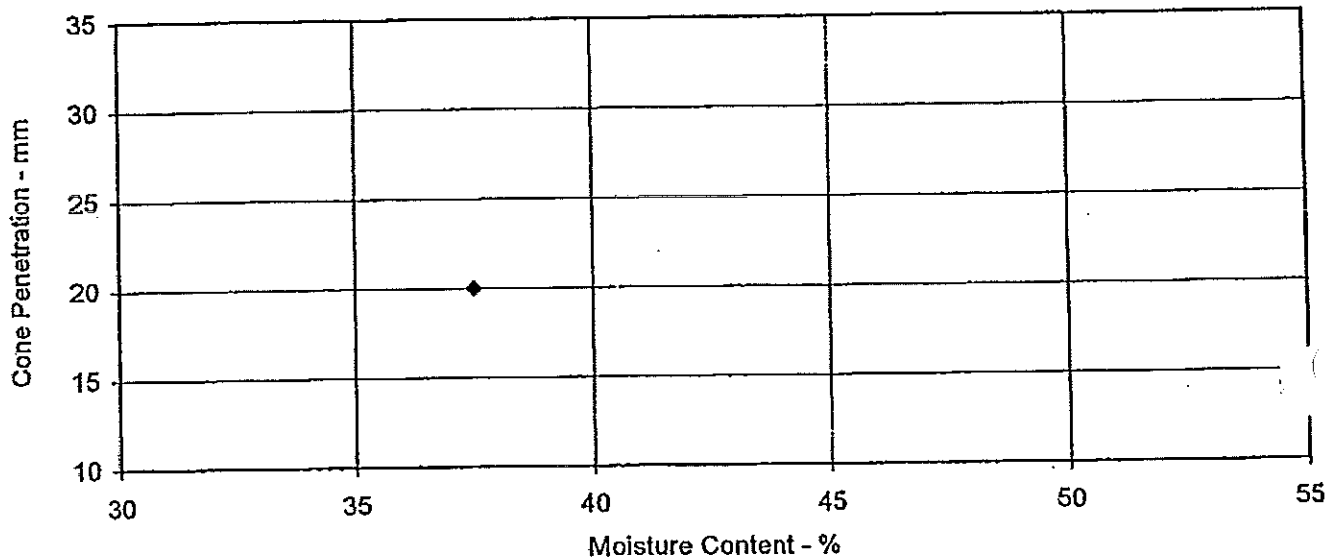
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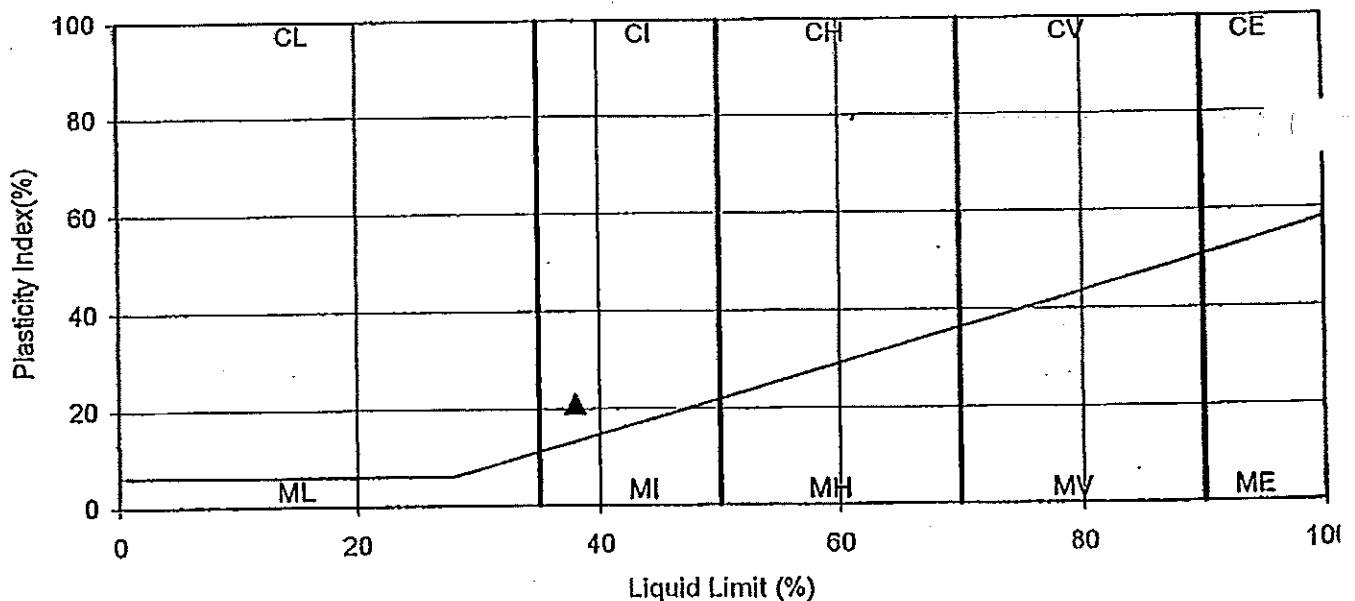
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample no
Depth 3.00
Sample type U
Page 1 of 1



Natural moisture content:	17	Estimated percentage retained on 425µm sieve:	7.5
Liquid limit:	38	Specimen depth:	3.00m
Plastic limit:	17	Remarks:	
Plasticity index:	21		
Moisture content of soil passing 425µm	19		
Liquidity Index:	0.10		



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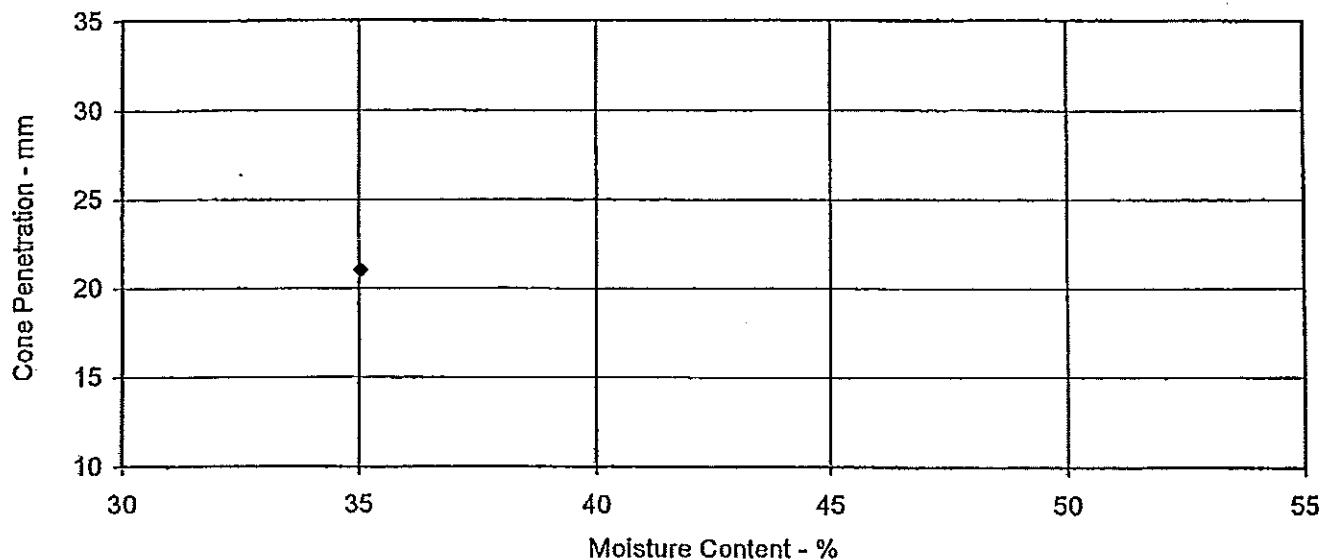
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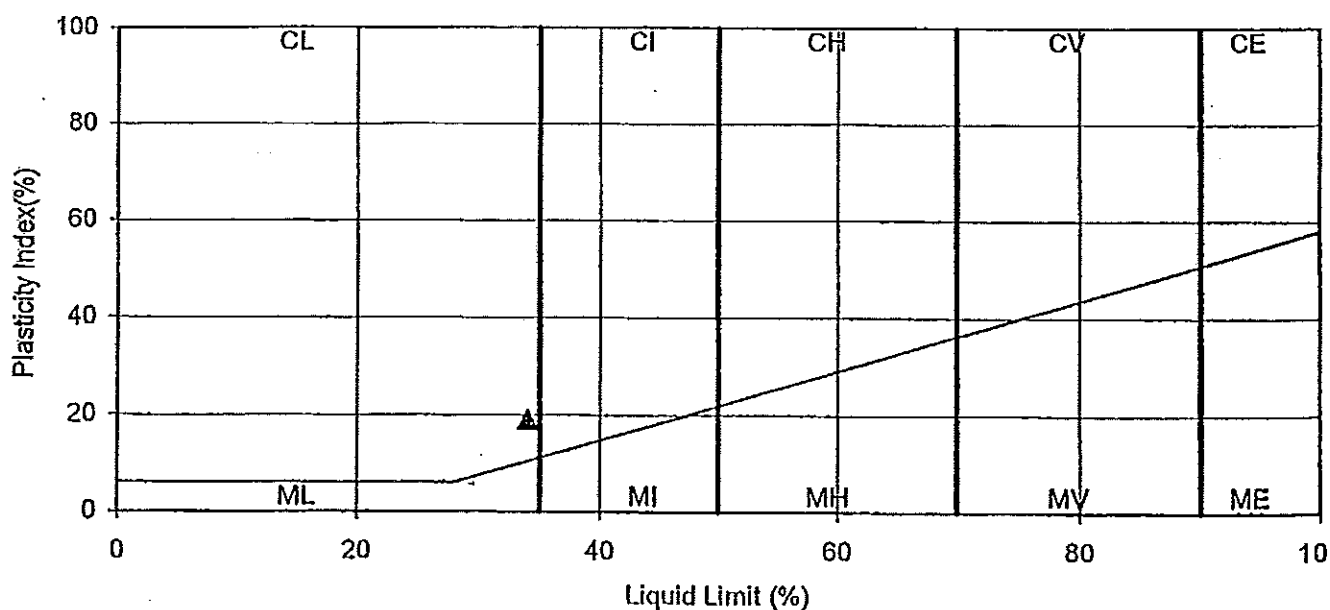
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Soft to firm brown slightly gravelly CLAY

Hole ID BH10
Sample no 11
Depth 5.00
Sample type U
Page 1 of 1



Natural moisture content:	17	Estimated percentage retained on 425µm sieve:	2.7
Liquid limit:	34	Specimen depth:	5.00m
Plastic limit:	15	Remarks:	
Plasticity index:	19		
Moisture content of soil passing 425µm	17		
Liquidity Index:	0.11		



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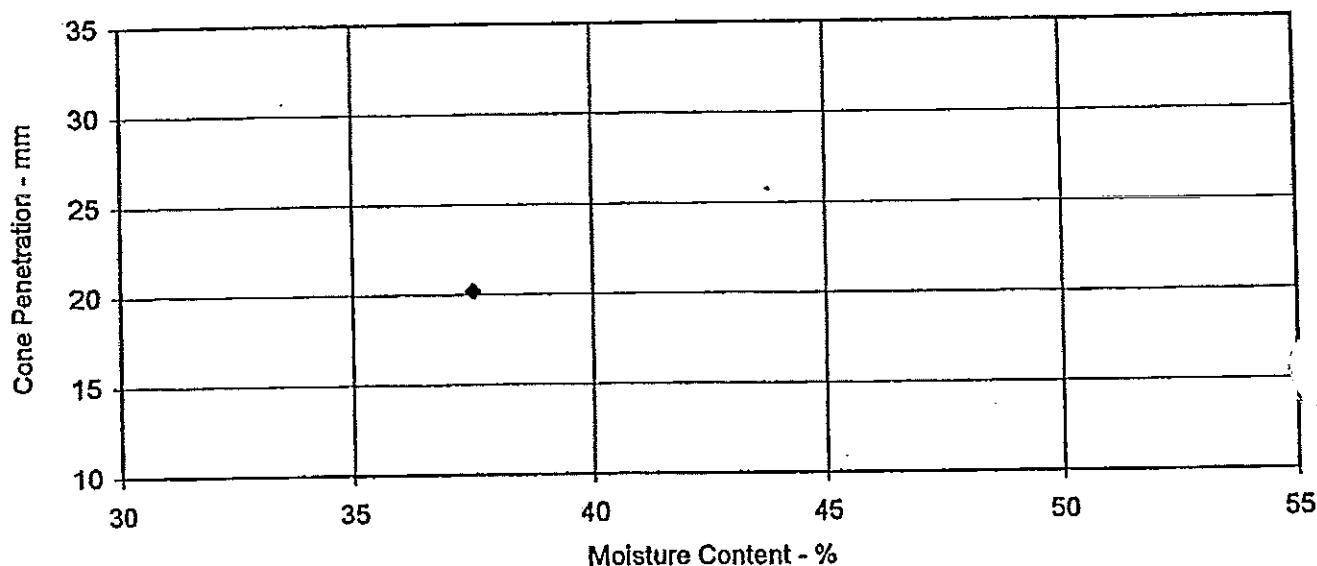
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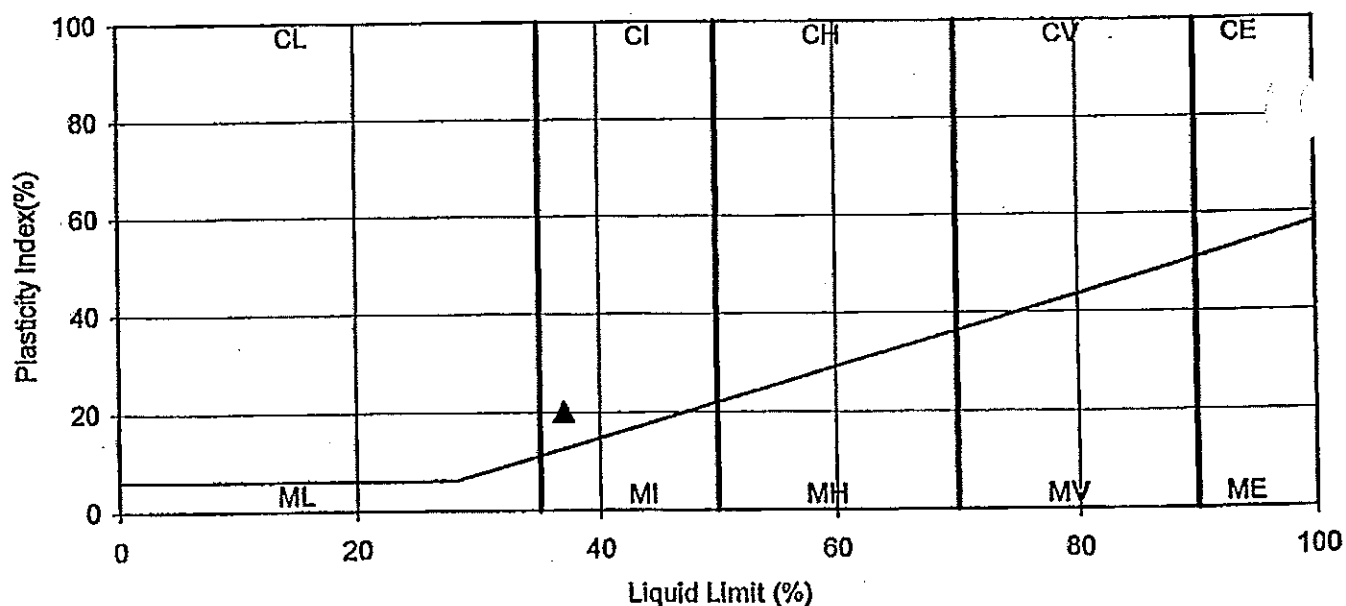
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly CLAY.

Hole ID B1
Sample no 04
Depth 1.50 m
Sample type D
Page 1 of 1



Natural moisture content:	17	Estimated percentage retained on 425µm sieve:	3.6
Liquid limit:	37	Specimen depth:	1.50m
Plastic limit:	17	Remarks:	Insufficient specimen to perform 4 point test.
Plasticity index:	20		
Moisture content of soil passing 425µm	18		
Liquidity Index:	0.05		



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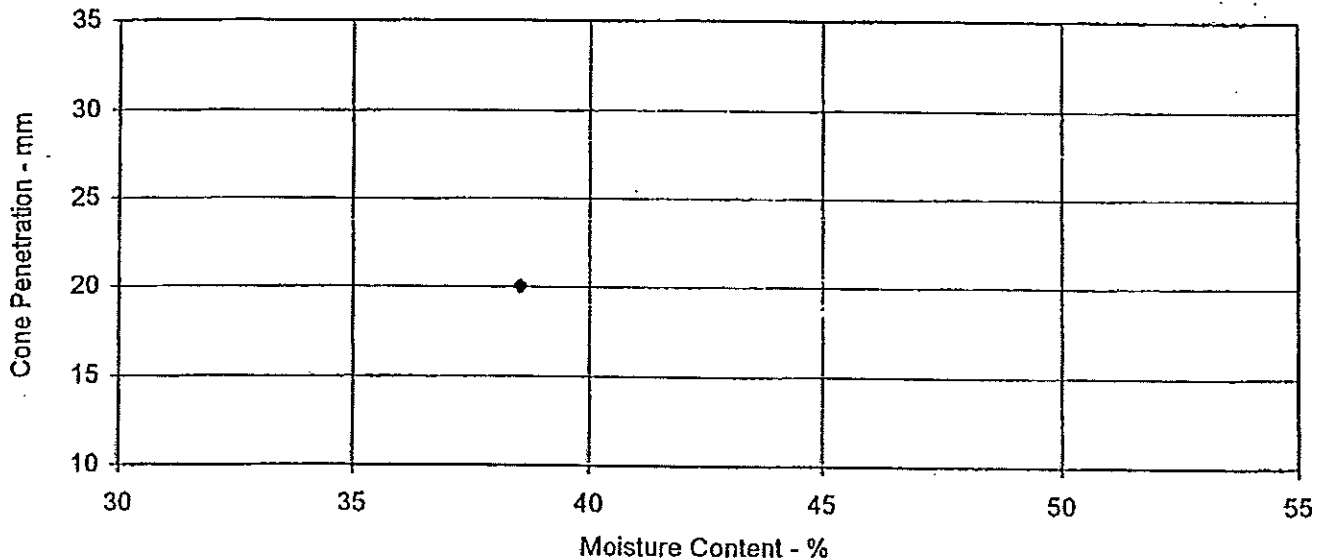
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LIQUID AND PLASTIC LIMIT TEST

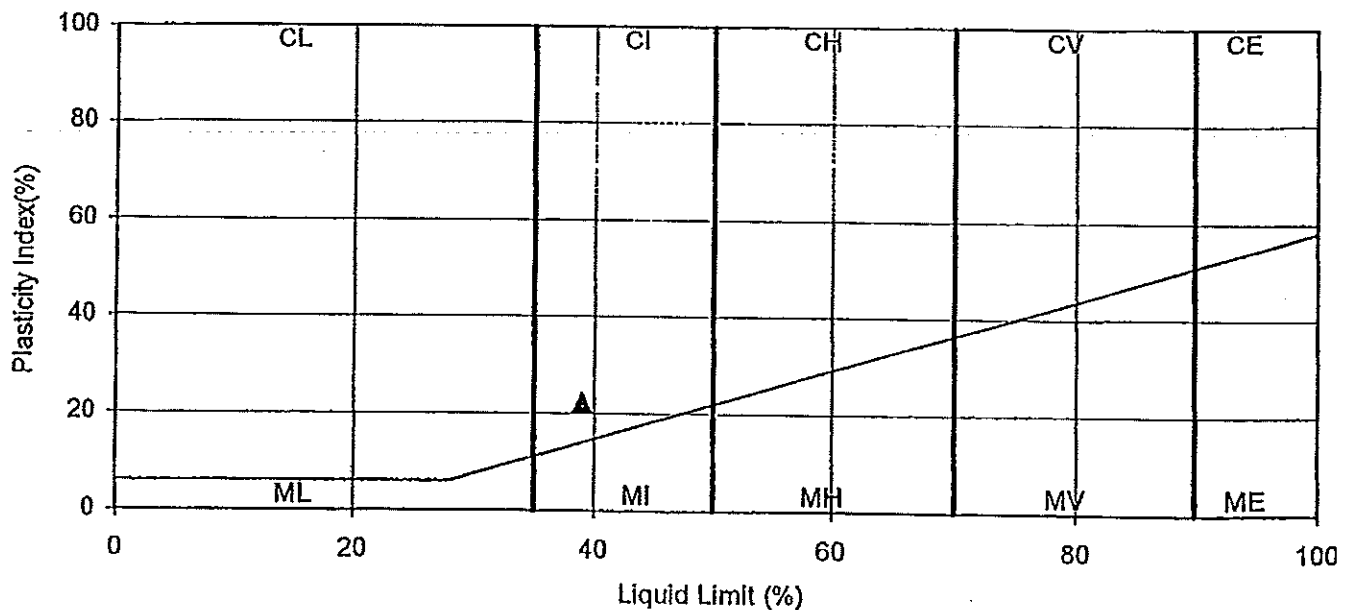
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH108
Project	Aldbrough Gas Storage Facility	Sample no	07
Soil description	Stiff dark brown gravelly CLAY	Depth	2.50
		Sample type	U
		Page	1 of 1



Natural moisture content:	17	Percentage retained on 425µm sieve:	58.8
Liquid limit:	39	Specimen depth:	2.50m
Plastic limit:	17	Remarks:	
Plasticity index:	22		
Moisture content of soil passing 425µm	41		
Liquidity index:	1.09		



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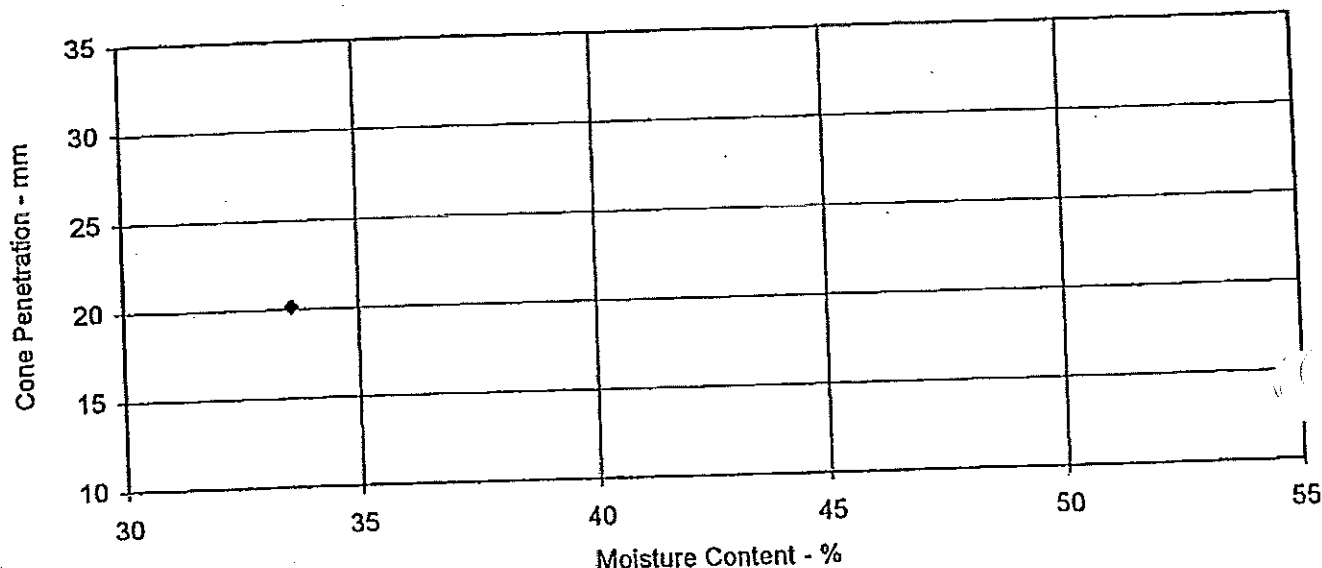
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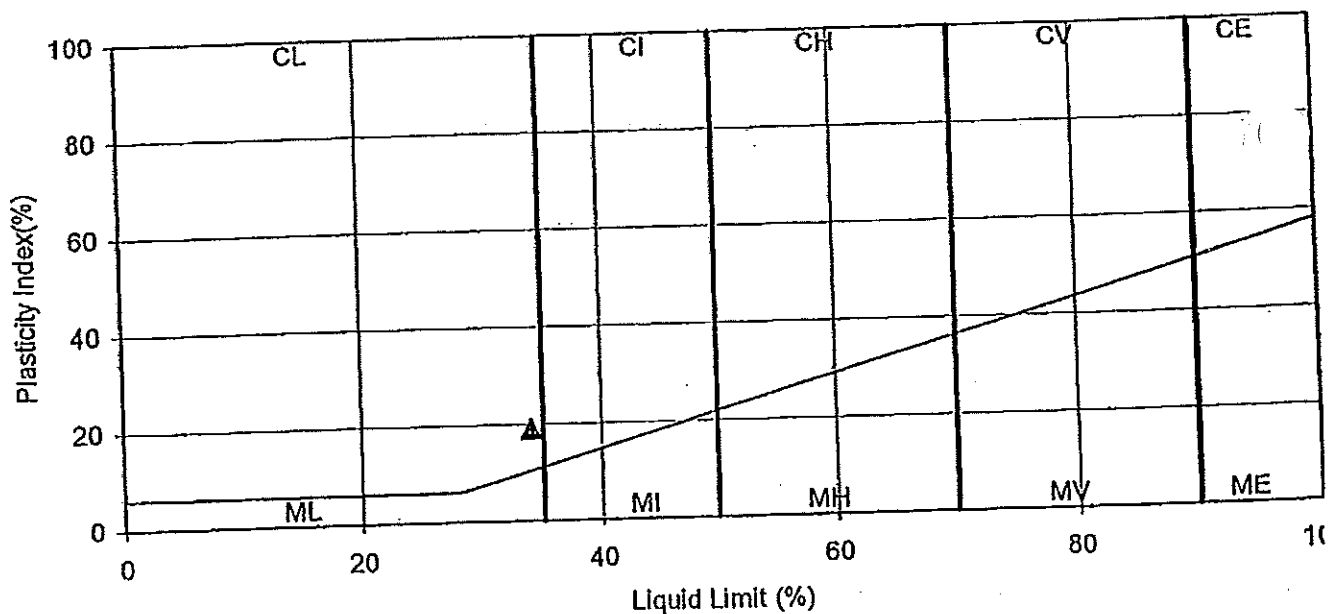
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample no
Depth 7.00
Sample type U
Page 1 of 1



Natural moisture content:	16	Percentage retained on 425µm sieve:	14.3
Liquid limit:	34	Specimen depth:	7.00m
Plastic limit:	15	Remarks:	
Plasticity index:	19		
Moisture content of soil passing 425µm	19		
Liquidity index:	0.21		



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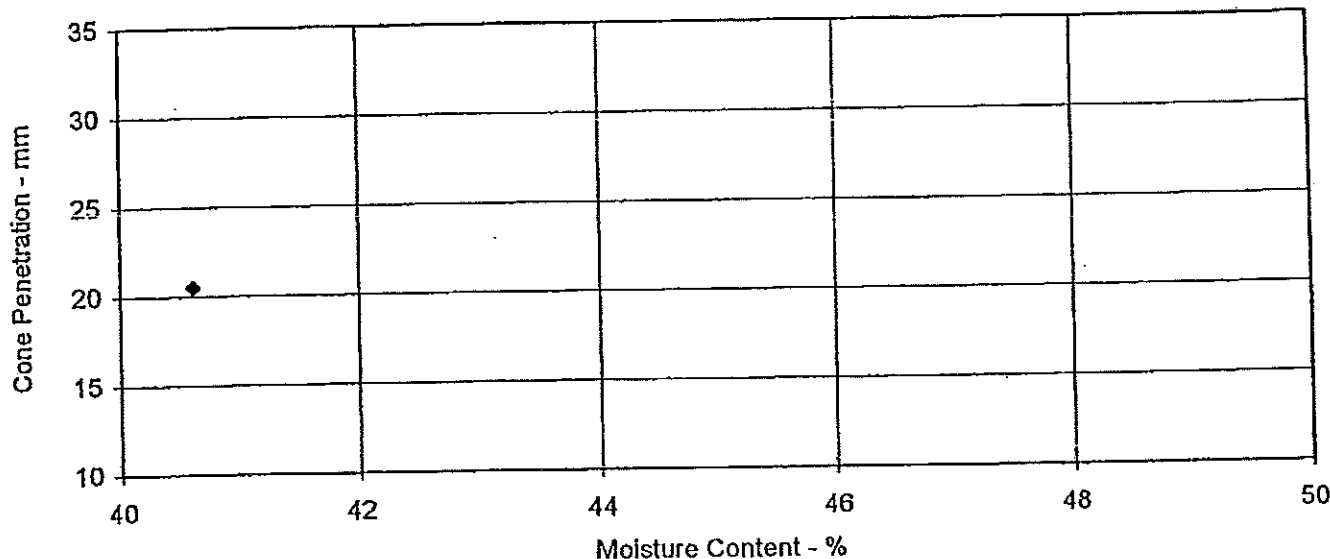
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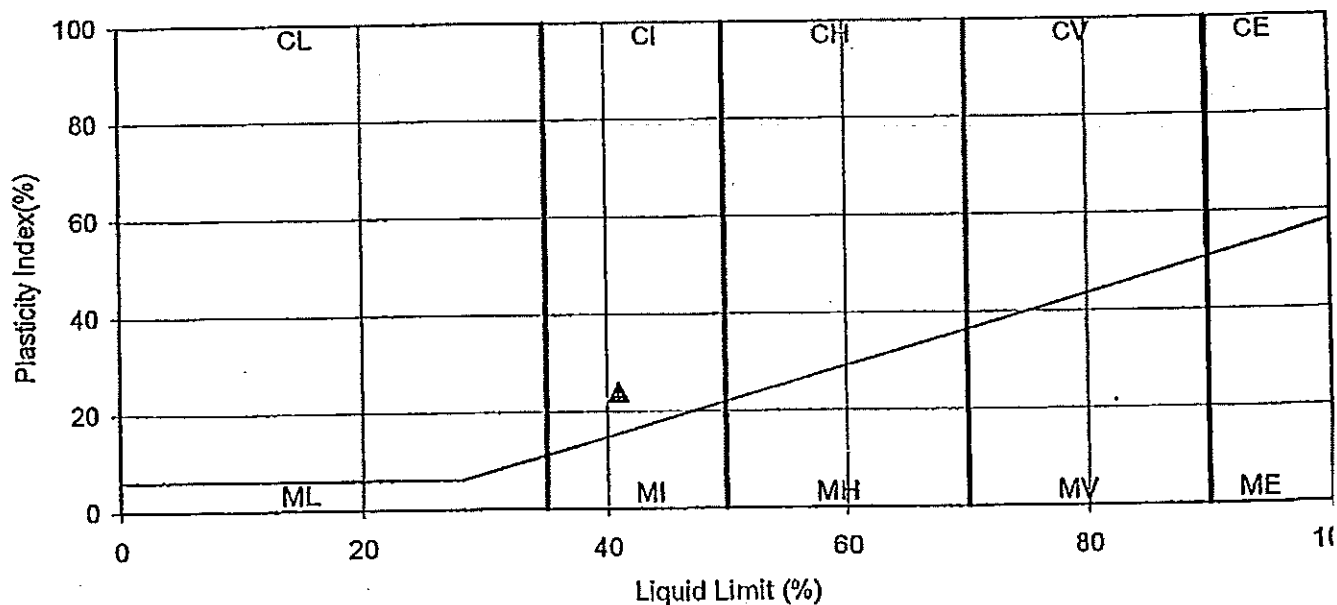
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH101
Project	Aldbrough Gas Storage Facility	Sample no.	08
Soil description	Brown sandy slightly gravelly CLAY	Depth	3.00
		Sample type	D
		Page	1 of 1



Natural moisture content:	16	Percentage retained on 425µm sieve:	11.3
Liquid limit:	41	Specimen depth:	3.00m
Plastic limit:	17	Remarks:	
Plasticity index:	24		
Moisture content of soil passing 425µm	18		
Liquidity index:	0.04		



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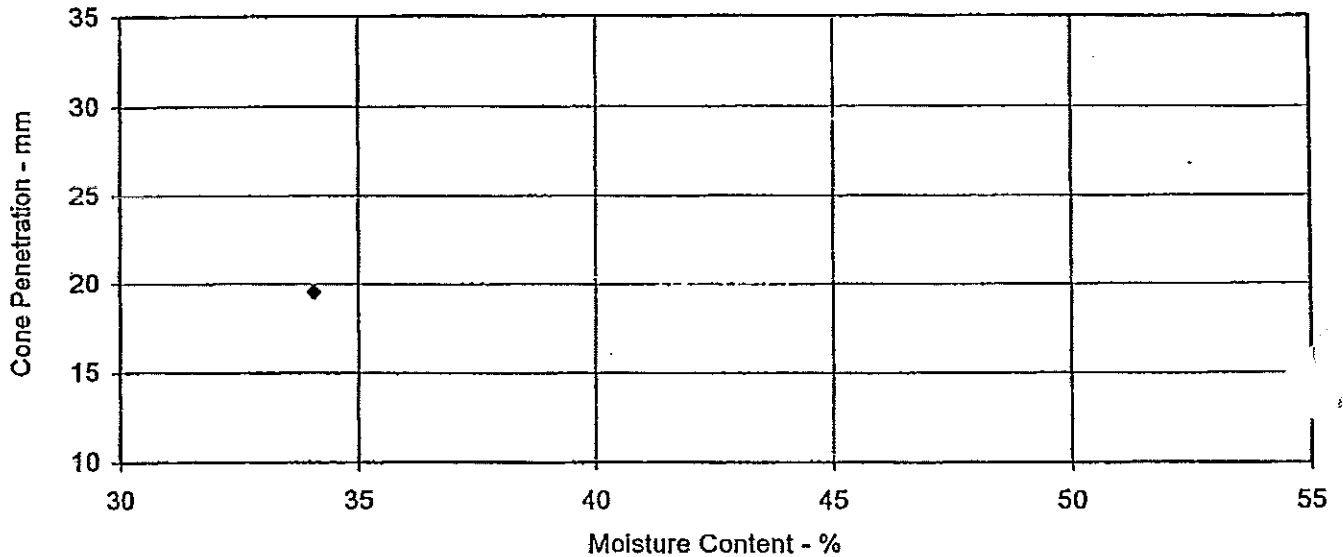
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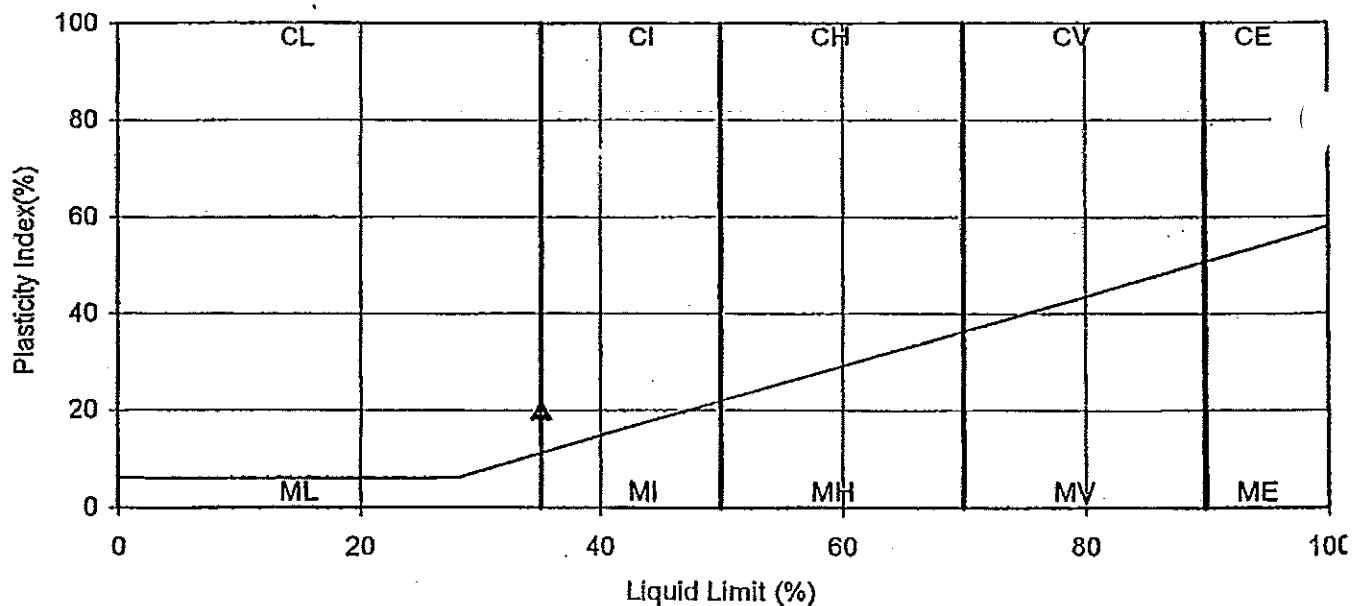
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Dark brown slightly gravelly CLAY

Hole ID
Sample no
Depth 5.50
Sample type D
Page 1 of 1



Natural moisture content:	12	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	35	Specimen depth:	5.50m
Plastic limit:	15	Remarks:	
Plasticity Index:	20		
Moisture content of soil passing 425µm	12		
Liquidity Index:	-0.15		



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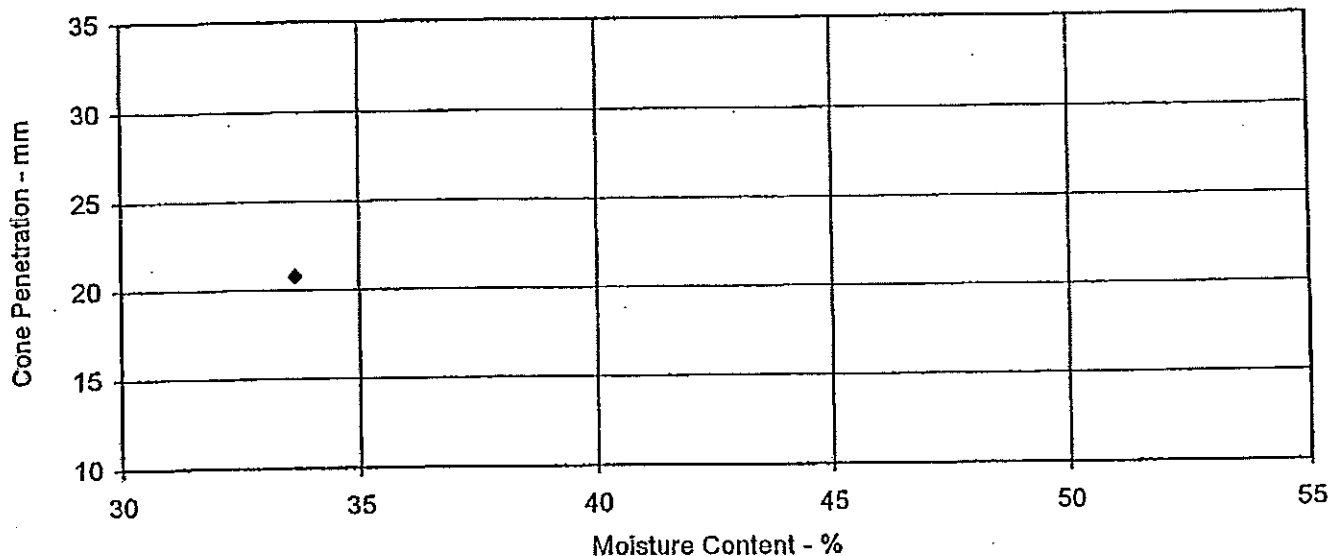
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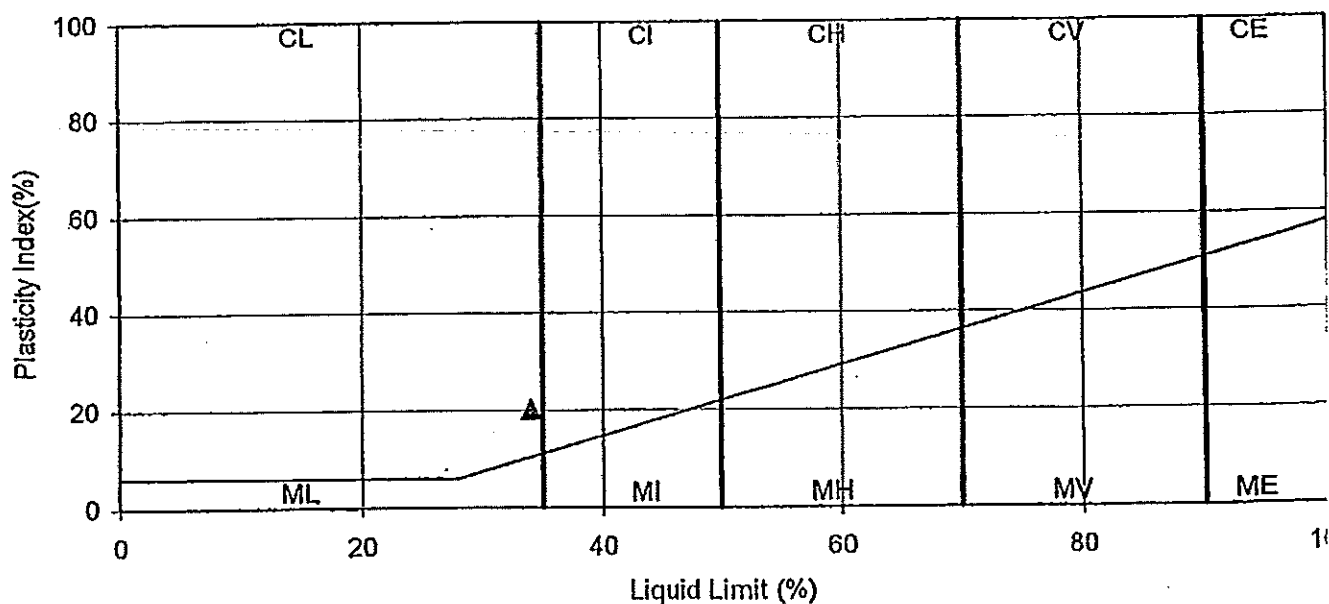
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH10
Project	Aldbrough Gas Storage Facility	Sample no	24
Soil description	Dark brown slightly gravelly CLAY	Depth	9.50
		Sample type	D
		Page	1 of



Natural moisture content:	17	Estimated percentage retained on 425µm sieve:	2.2
Liquid limit:	34	Specimen depth:	9.50m
Plastic limit:	14	Remarks:	
Plasticity index:	20		
Moisture content of soil passing 425µm	17		
Liquidity Index:	0.15		



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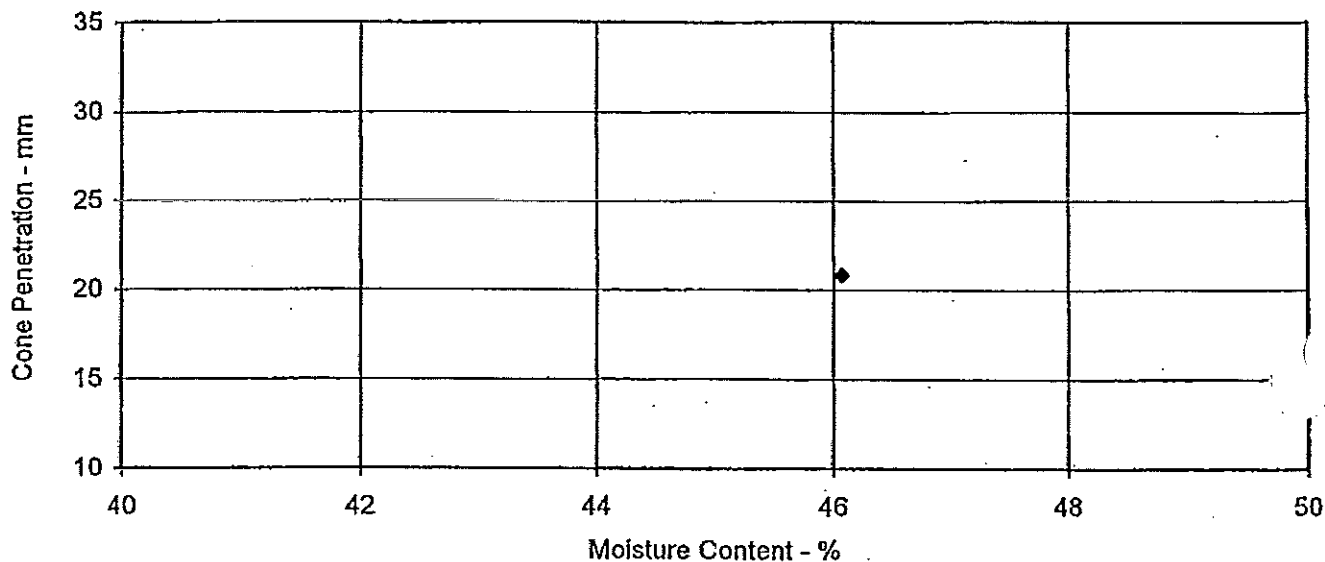
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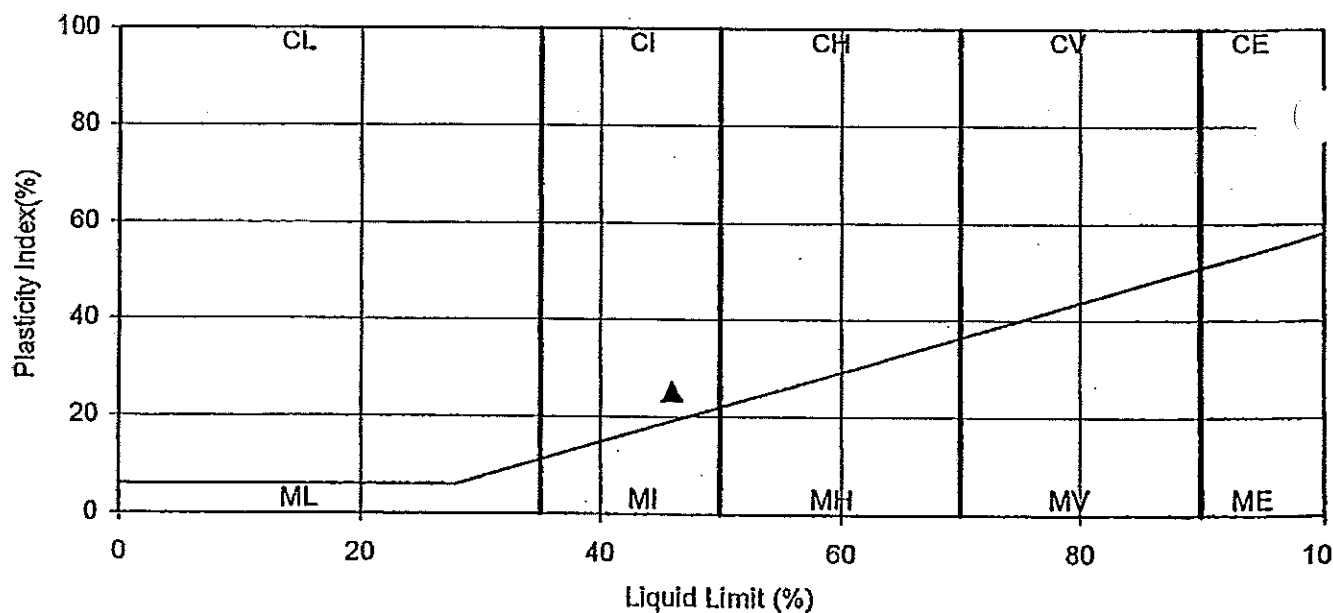
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	
Project	Aldbrough Gas Storage Facility	Sample no	2
Soil description	Very stiff brown slightly gravelly CLAY	Depth	1.00
		Sample type	U
		Page	1 of 1



Natural moisture content:	23	Estimated percentage retained on 425µm sieve:	1.8
Liquid limit:	46	Specimen depth:	1.00m
Plastic limit:	21	Remarks:	
Plasticity index:	25		
Moisture content of soil passing 425µm	23		
Liquidity Index:	0.08		



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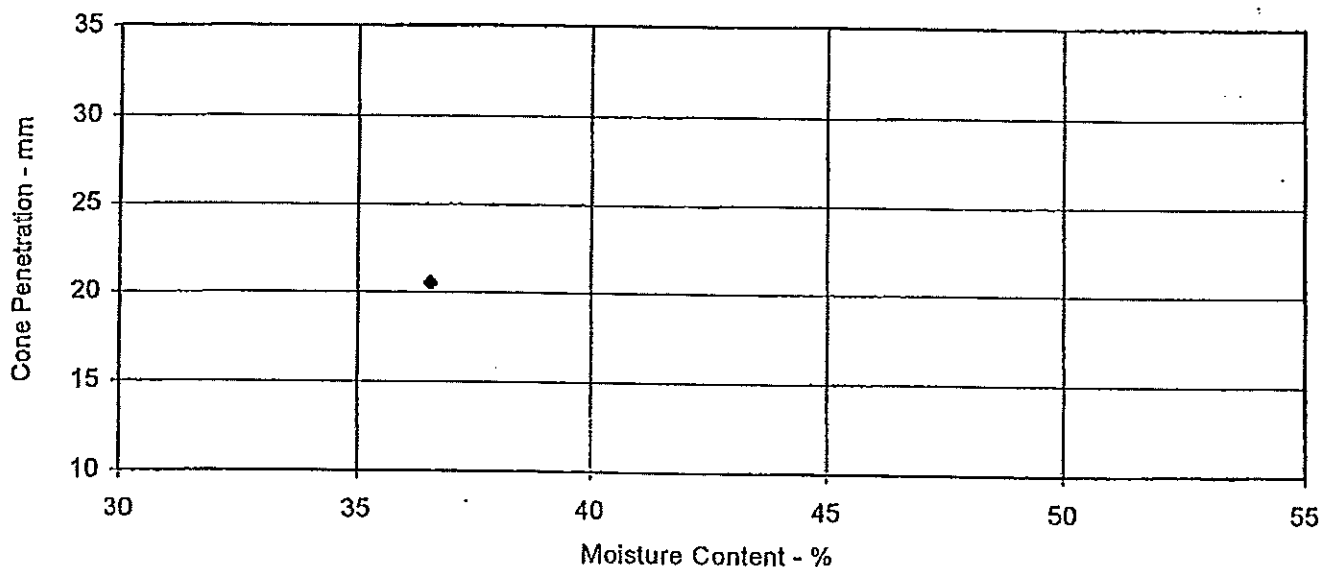
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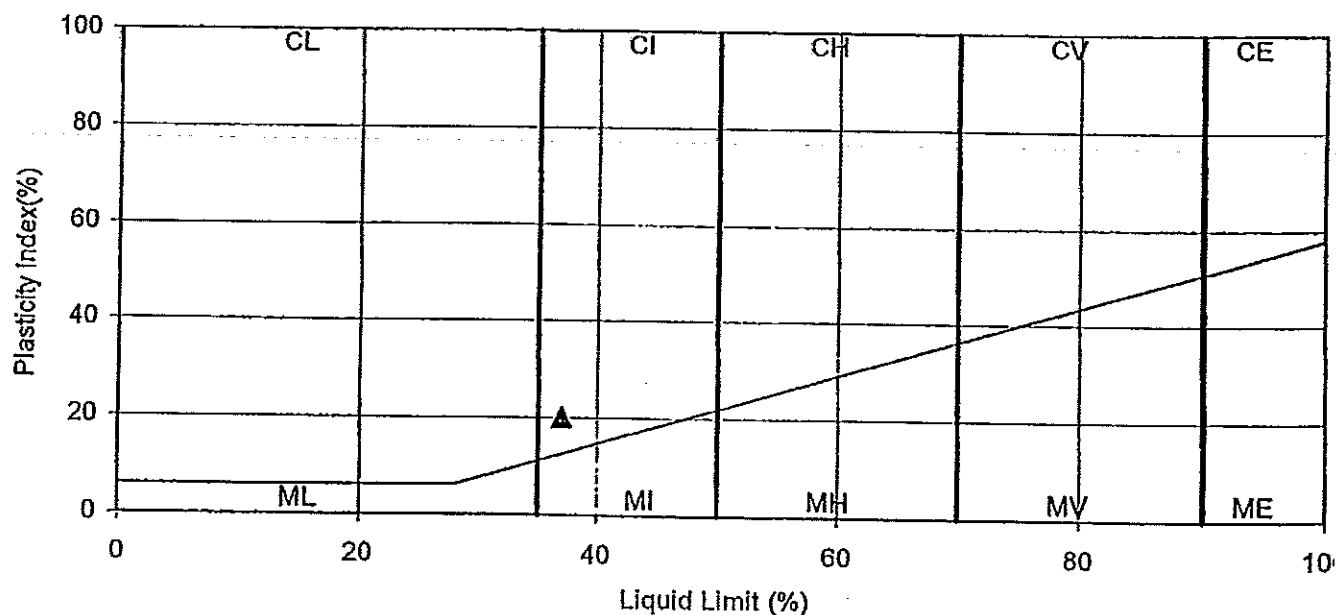
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH11
Project	Aldbrough Gas Storage Facility	Sample no	7
Soil description	Stiff brown slightly gravelly CLAY	Depth	3.00
		Sample type	U
		Page	1 of 1



Natural moisture content:	16	Percentage retained on 425µm sieve:	16.1
Liquid limit:	37	Specimen depth:	3.00m
Plastic limit:	17	Remarks:	
Plasticity index:	20		
Moisture content of soil passing 425µm	19		
Liquidity index:	0.10		



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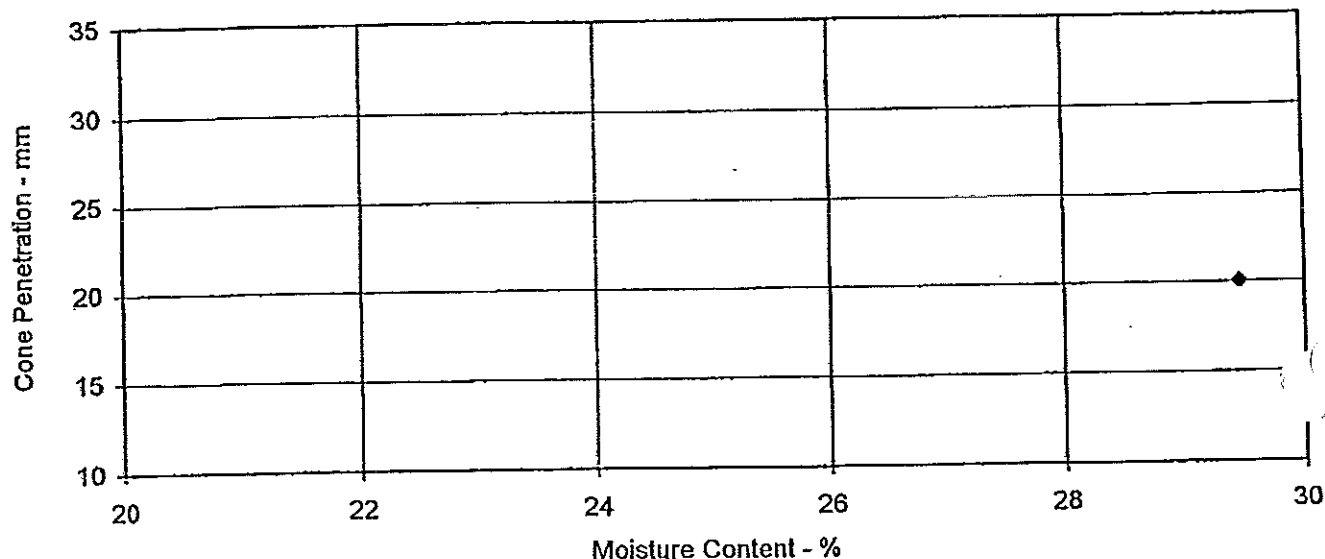
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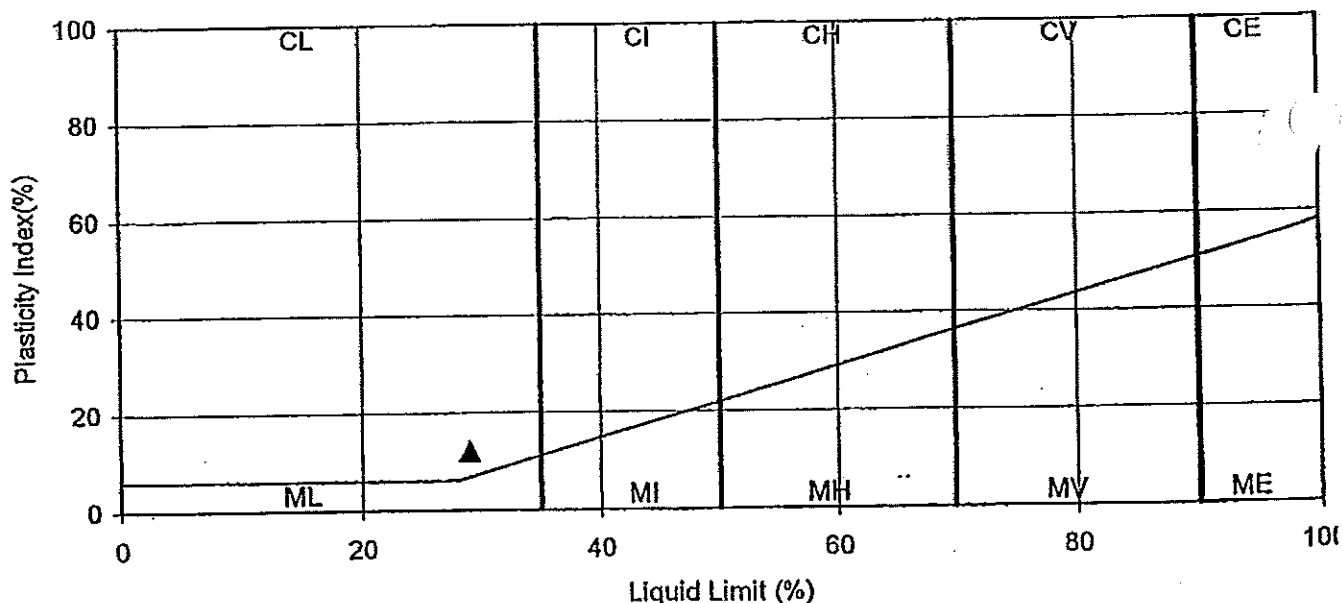
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Soft brown mottled sandy gravelly CLAY

Hole ID
Sample no
Depth 1.00
Sample type U
Page 1 of 1



Natural moisture content:	18	Percentage retained on 425µm sieve:	44.5
Liquid limit:	29	Specimen depth:	1.00m
Plastic limit:	17	Remarks:	
Plasticity index:	12		
Moisture content of soil passing 425µm	33		
Liquidity index:	1.33		



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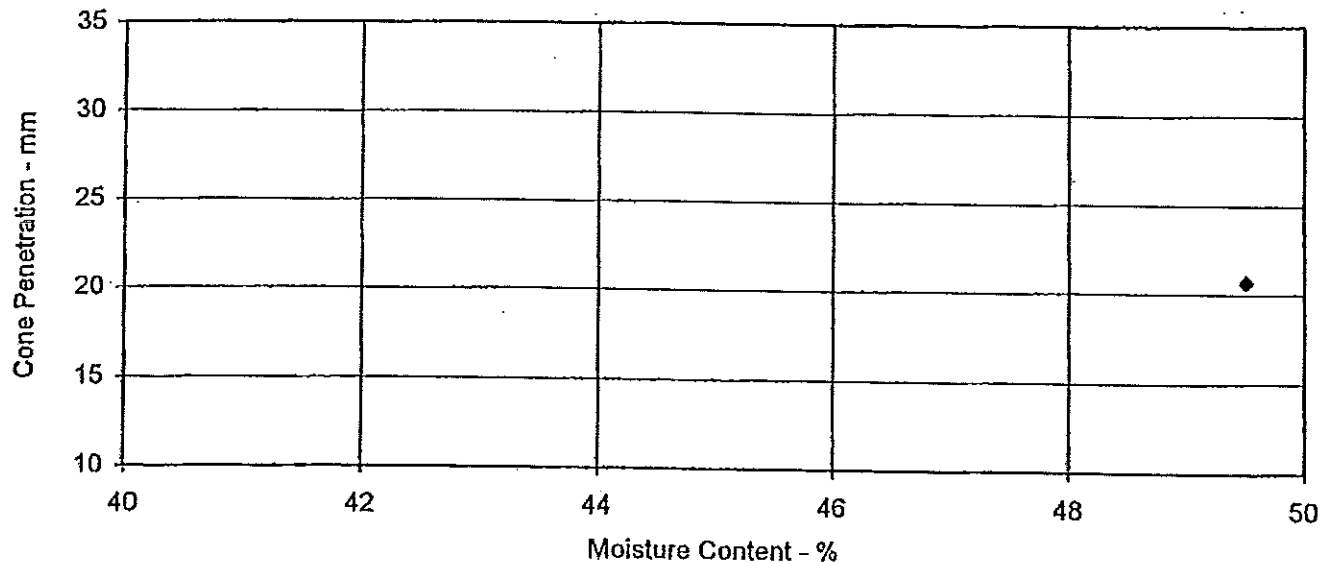
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LIQUID AND PLASTIC LIMIT TEST

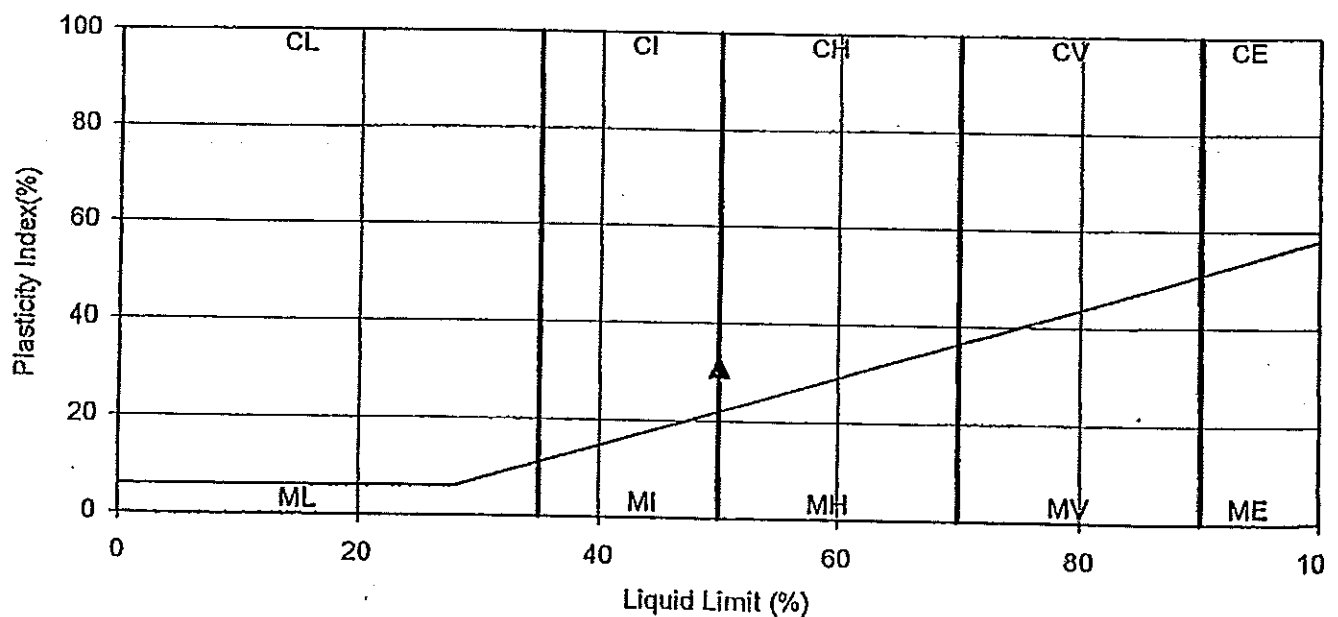
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Test Method: BS1377: Part 2: 1990; Clause 4.4 and 5

Contract no.	F12963	Hole ID	BH11
Project	Aldbrough Gas Storage Facility	Sample no	01
Soil description	Brown sandy slightly gravelly CLAY	Depth	1.00
		Sample type	D
		Page	1 of 1



Natural moisture content:	14	Percentage retained on 425µm sieve:	9.7
Liquid limit:	50	Specimen depth:	1.00m
Plastic limit:	19	Remarks:	
Plasticity index:	31		
Moisture content of soil passing 425µm	16		
Liquidity index:	-0.10		



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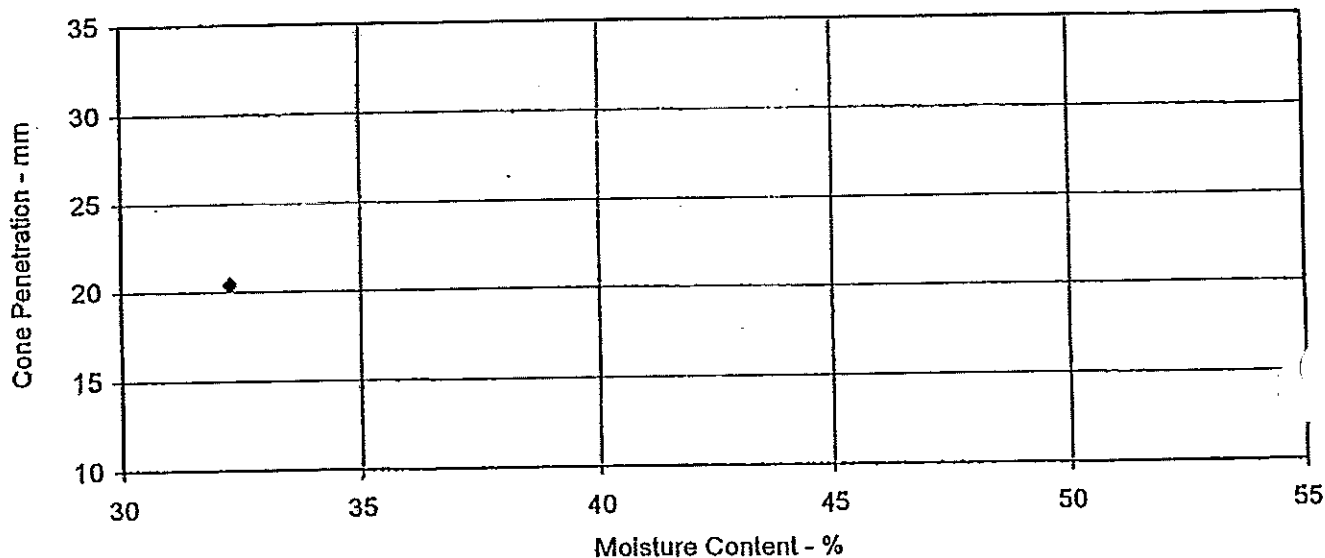
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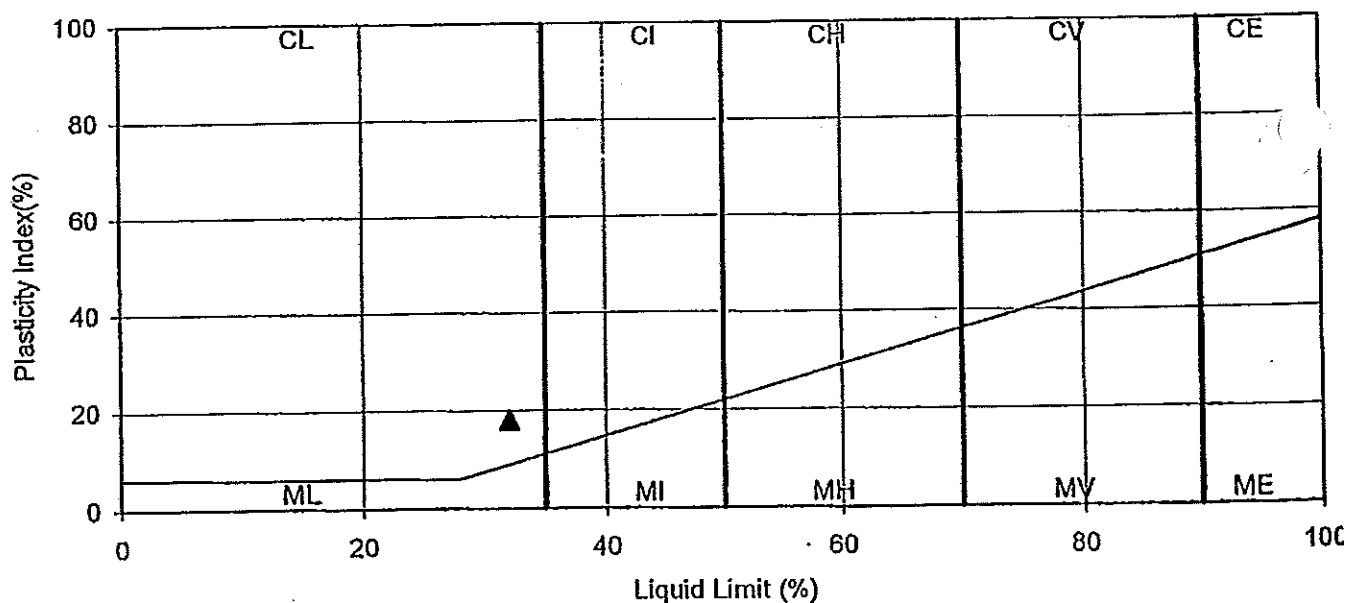
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Dark brown slightly gravelly CLAY

Hole ID
Sample no
Depth 4.80
Sample type D
Page 1 of 1



Natural moisture content:	15	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	32	Specimen depth:	4.80m
Plastic limit:	14	Remarks:	
Plasticity index:	18		
Moisture content of soil passing 425µm	15		
Liquidity index:	0.06		



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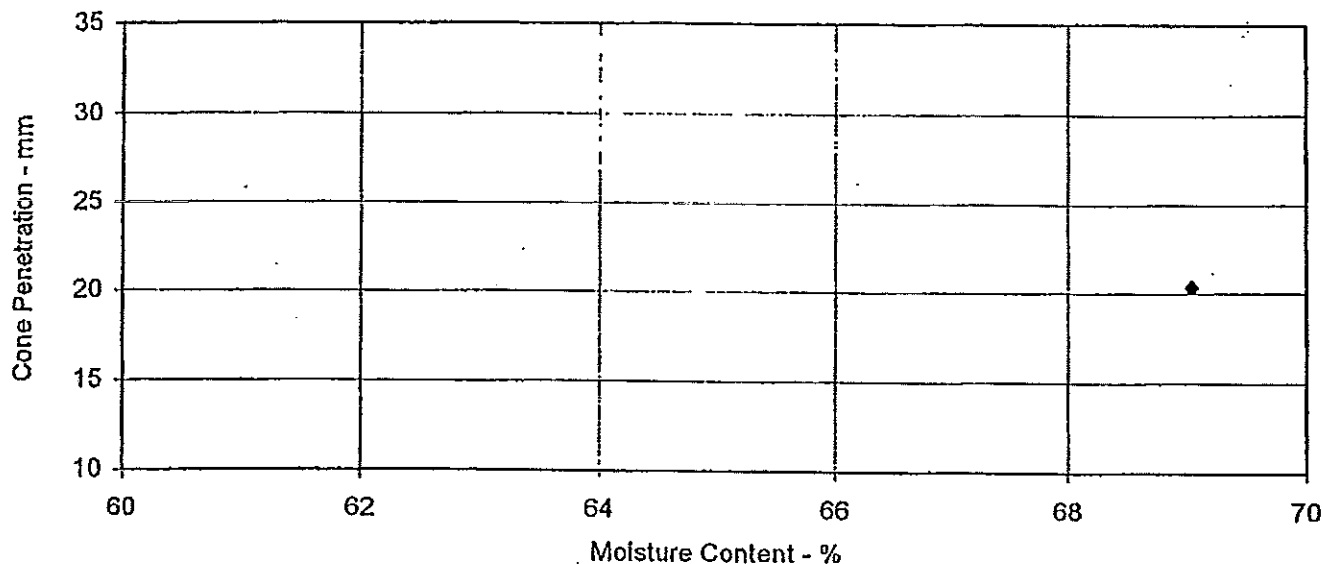
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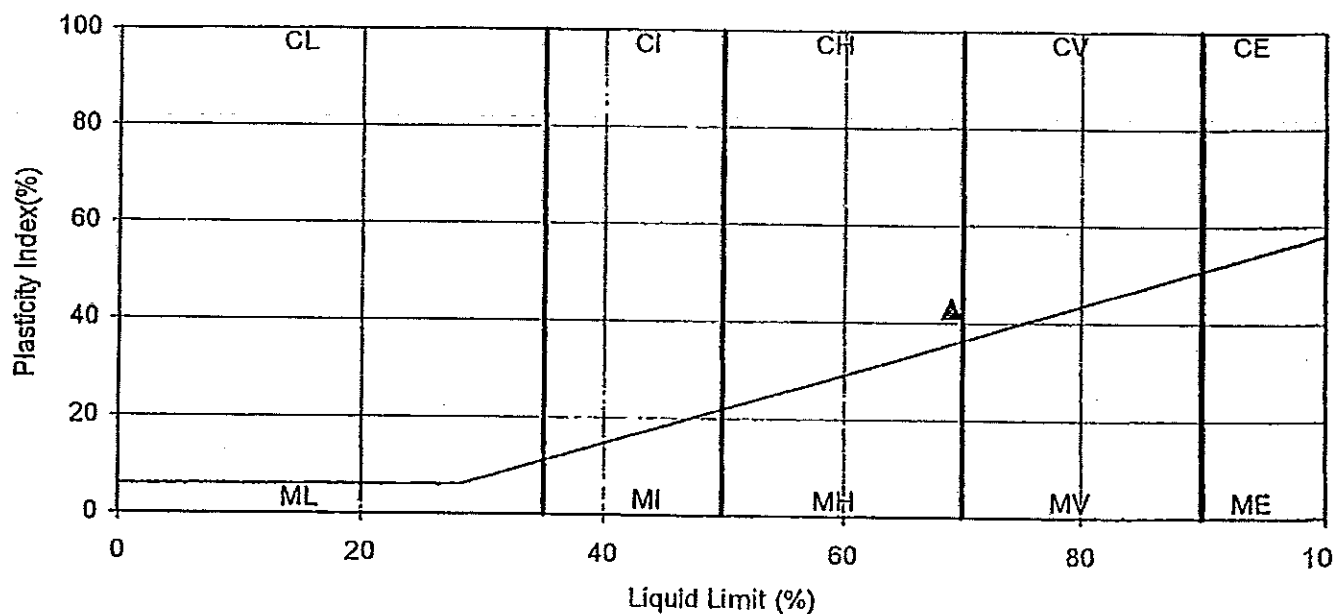
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly sandy gravelly CLAY

Hole ID BH11
Sample no 02
Depth 0.60
Sample type D
Page 1 of



Natural moisture content:	34	Estimated percentage retained on 425µm sieve:	29.0
Liquid limit:	69	Specimen depth:	0.60m
Plastic limit:	26	Remarks:	
Plasticity index:	43		
Moisture content of soil passing 425µm	48		
Liquidity Index:	0.51		



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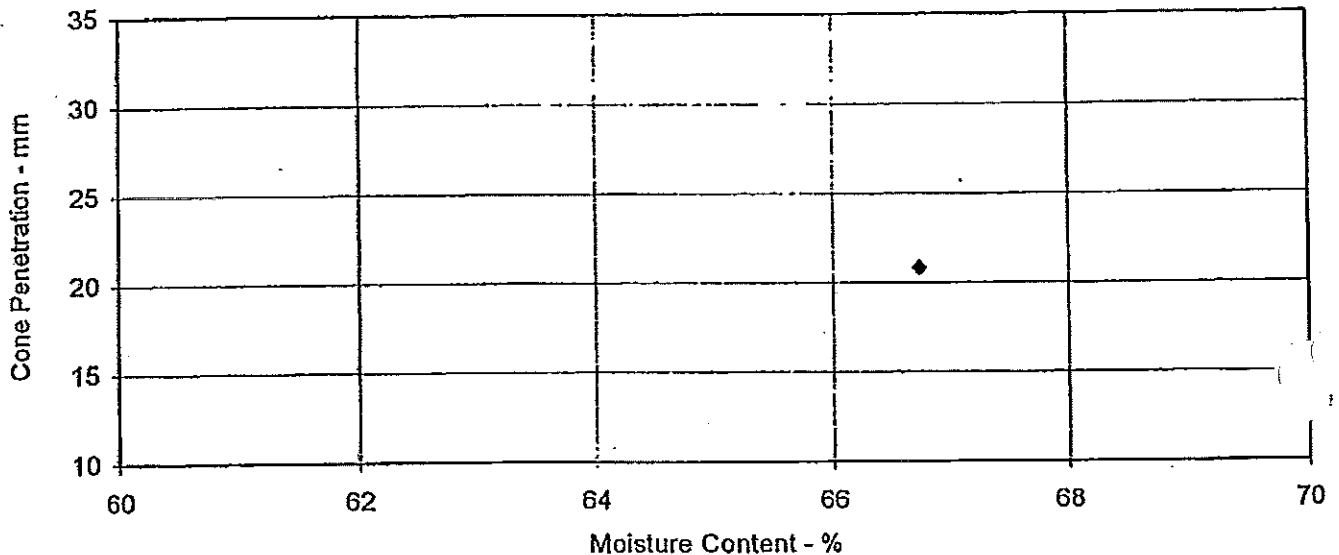
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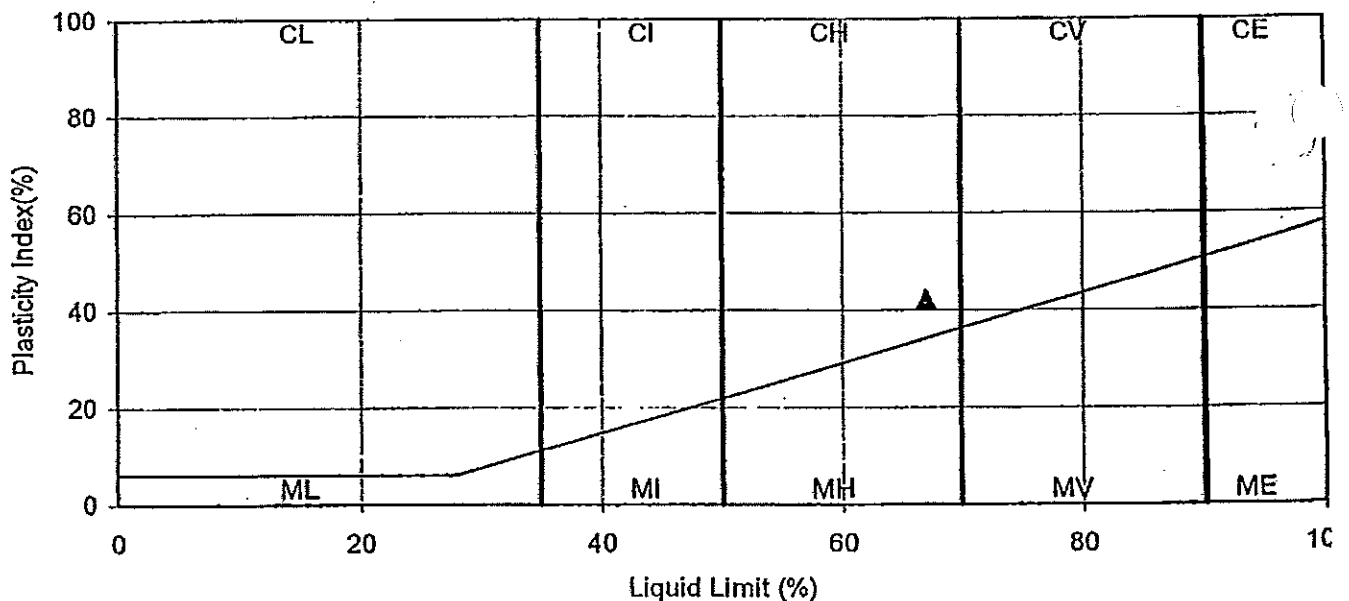
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly CLAY

Hole ID
Sample no
Depth 0.80
Sample type B
Page 1 of 1



Natural moisture content:	34	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	67	Specimen depth:	0.80m
Plastic limit:	25	Remarks:	
Plasticity index:	42		
Moisture content of soil passing 425µm	34		
Liquidity index:	0.21		



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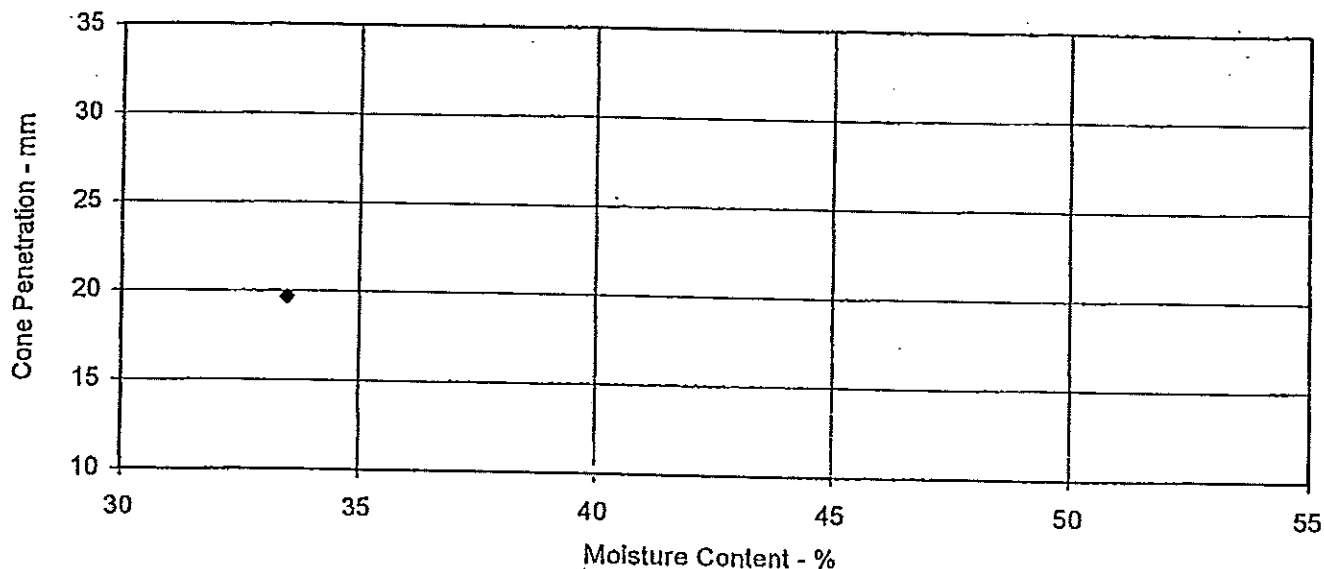
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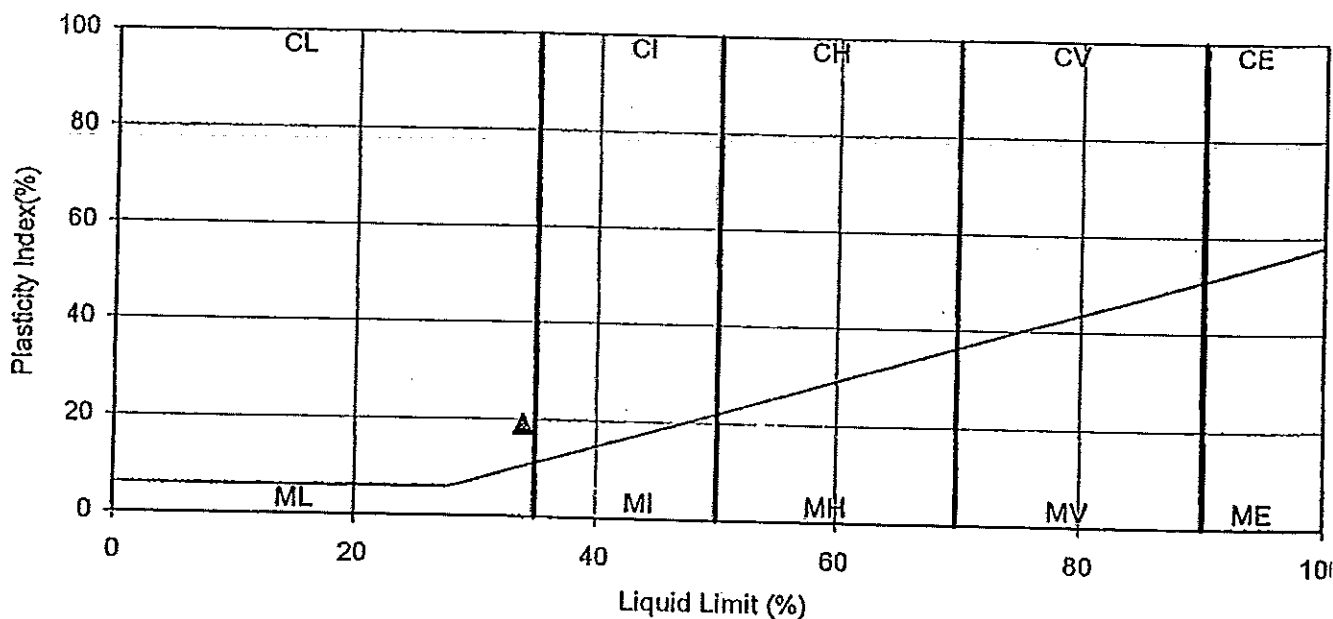
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Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly CLAY

Hole ID BH1
Sample no 12
Depth 5.10
Sample type B
Page 1 of



Natural moisture content:	12	Percentage retained on 425µm sieve:	13.5
Liquid limit:	34	Specimen depth: 5.10m	
Plastic limit:	15	Remarks:	
Plasticity index:	19		
Moisture content of soil passing 425µm	14		
Liquidity index:	-0.05		



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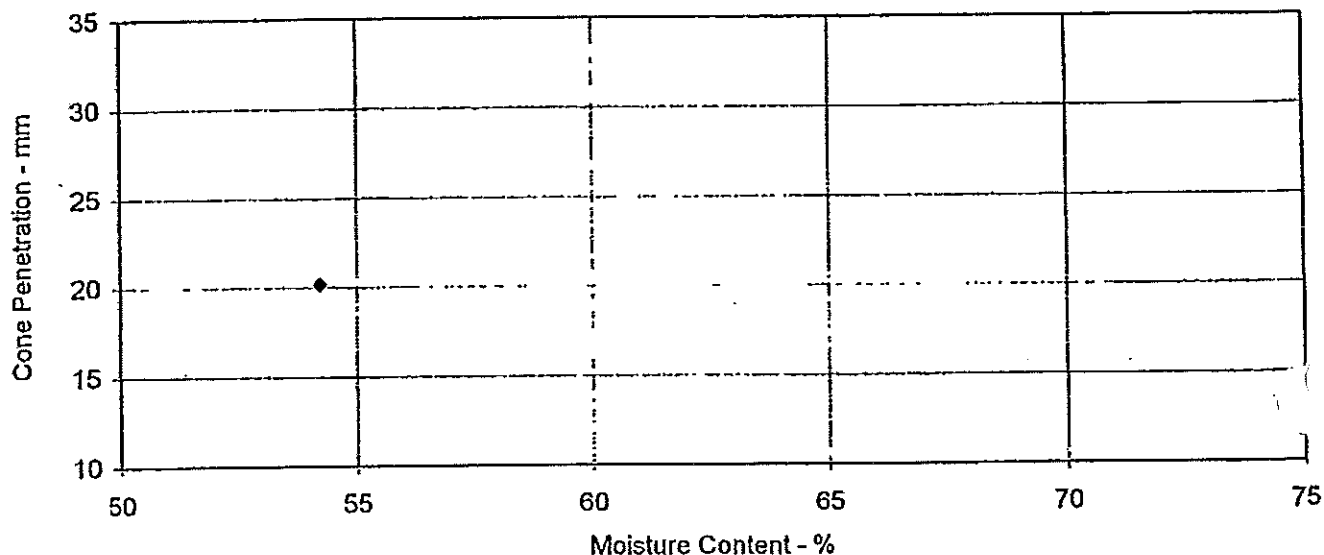
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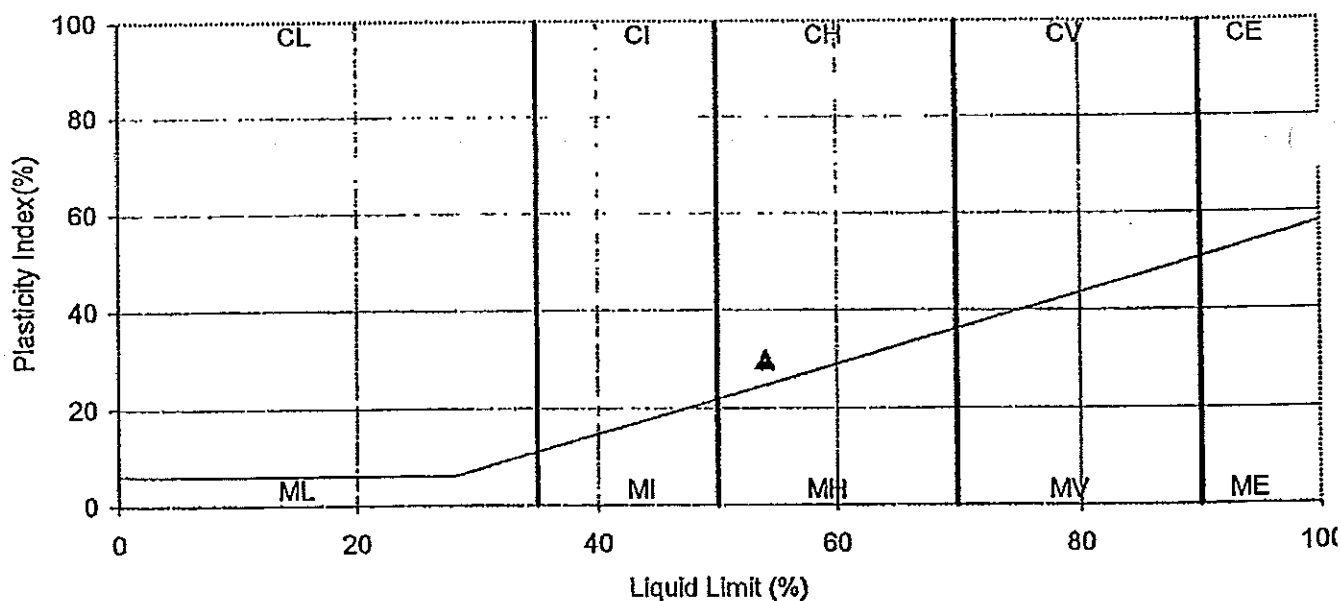
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	TP200
Project	Aldbrough Gas Storage Facility	Sample no	
Soil description	Greyish brown mottled orangish brown slightly sandy CLAY.	Depth	1.00
		Sample type	B
		Page	1 of 1



Natural moisture content:	34	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	54	Specimen depth:	1.00m
Plastic limit:	24	Remarks:	
Plasticity index:	30		
Moisture content of soil passing 425µm	34		
Liquidity index:	0.33		



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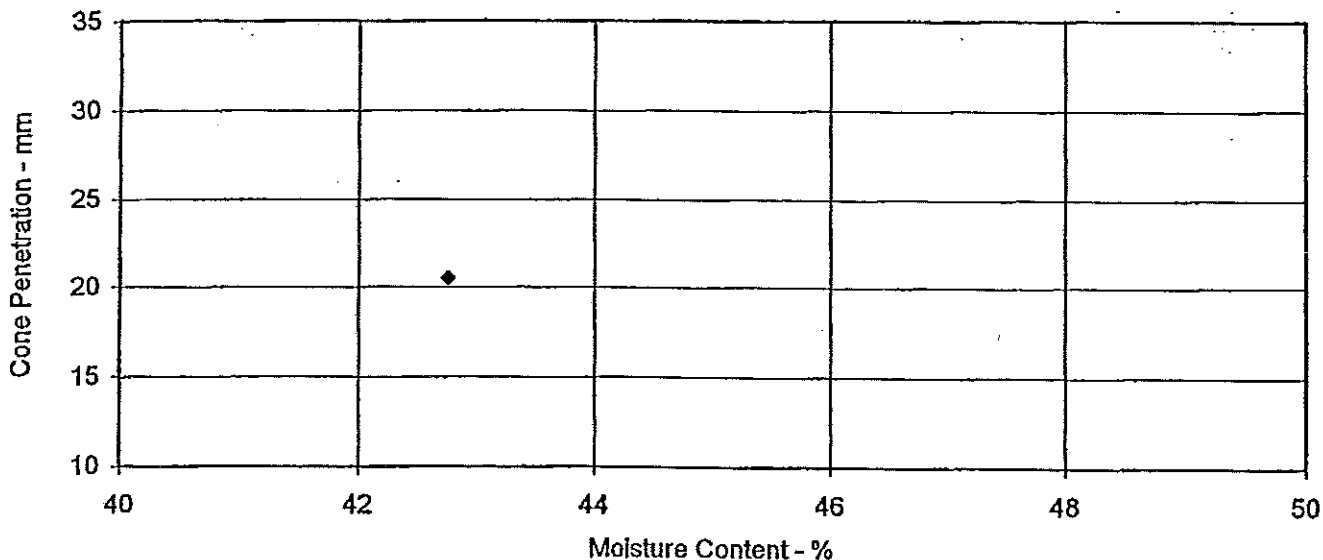
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LIQUID AND PLASTIC LIMIT TEST

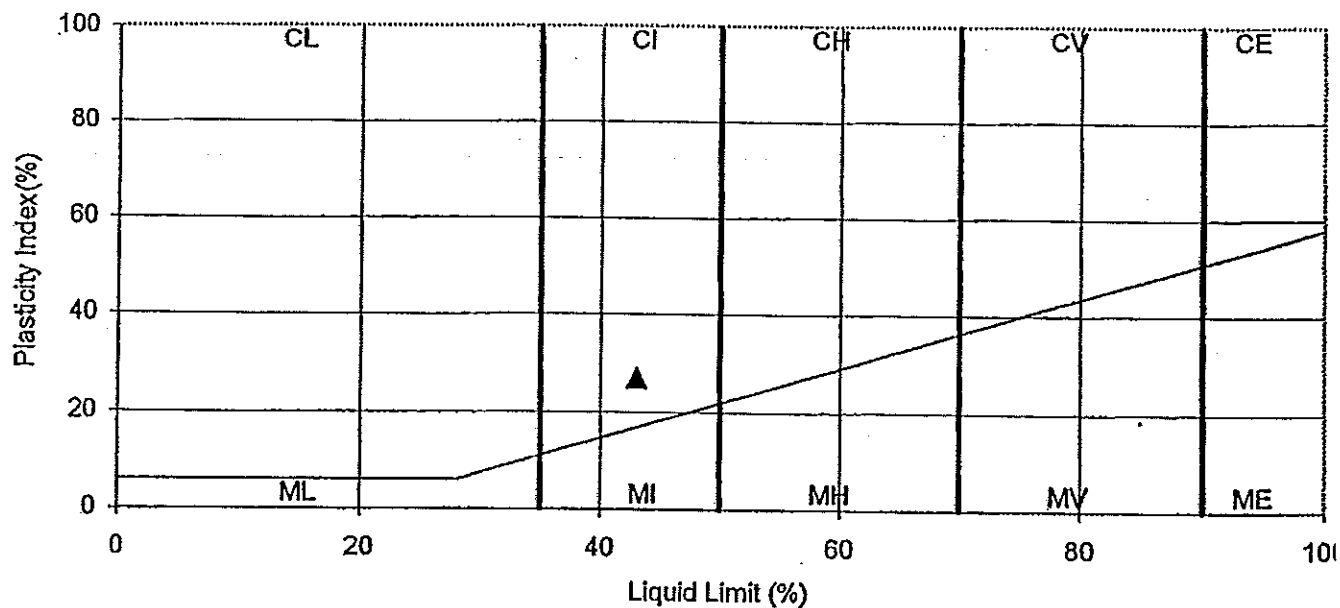
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	TP204
Project	Aldbrough Gas Storage Facility	Sample no	03
Soil description	Reddish brown slightly sandy slightly gravelly CLAY.	Depth	1.00
		Sample type	B
		Page	1 of 1



Natural moisture content:	19	Percentage retained on 425µm sieve:	8.4
Liquid limit:	43	Specimen depth:	1.00m
Plastic limit:	16	Remarks:	
Plasticity index:	27		
Moisture content of soil passing 425µm	21		
Liquidity index:	0.19		



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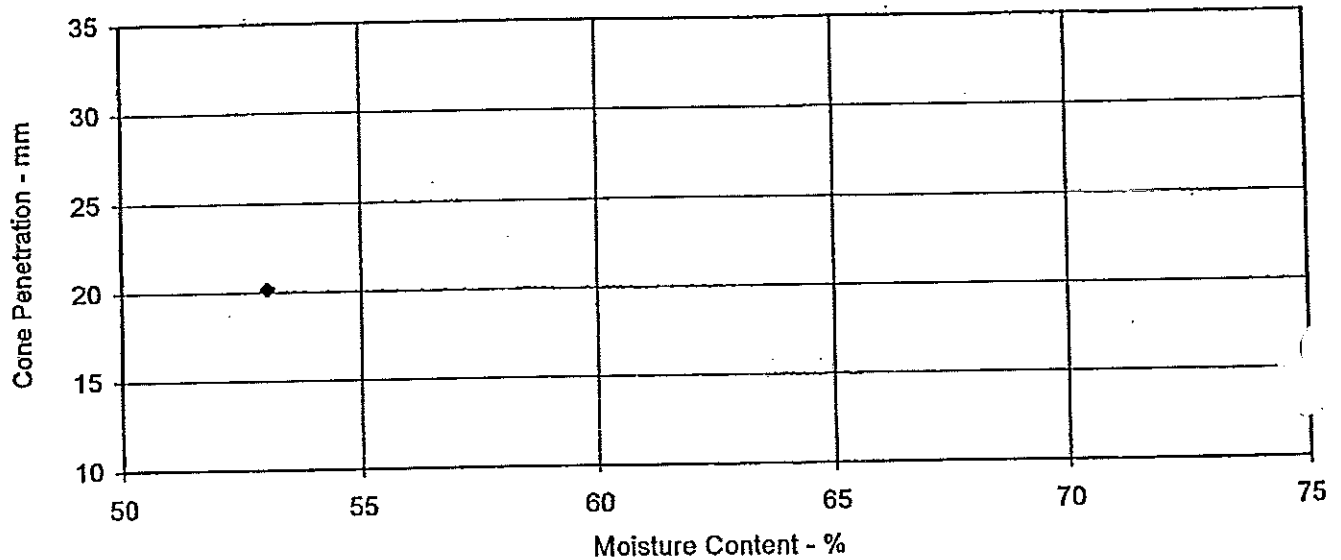
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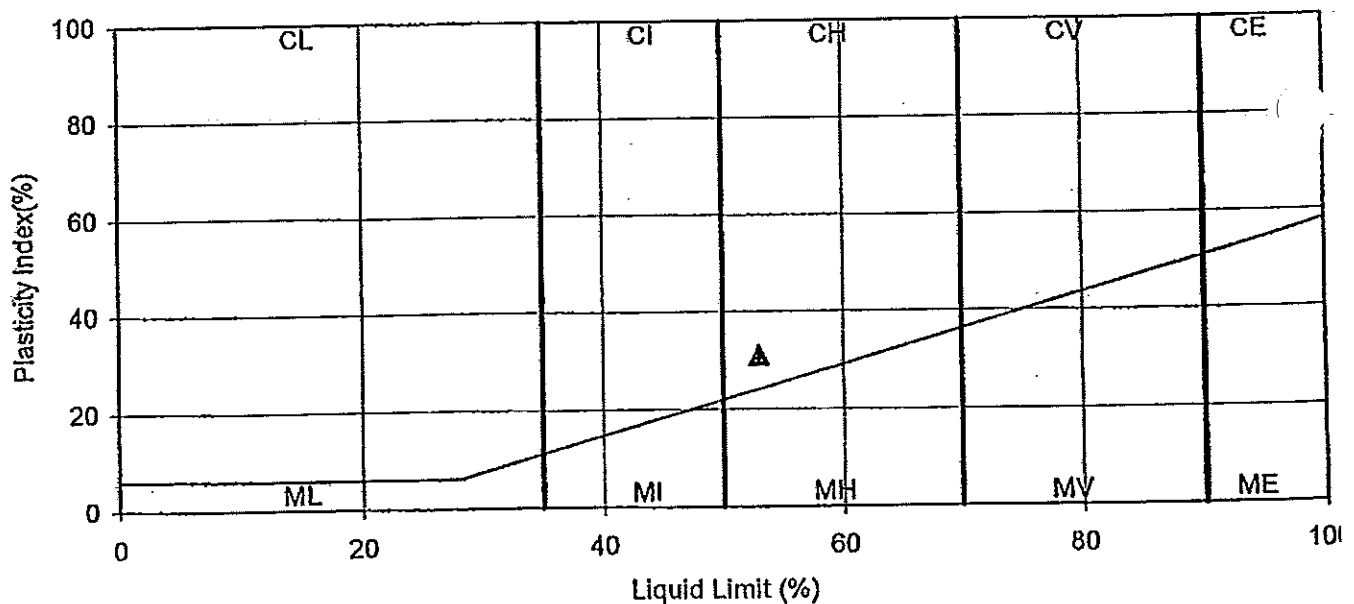
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly CLAY

Hole ID
Sample no
Depth 0.50
Sample type D
Page 1 of 1



Natural moisture content:	25	Estimated percentage retained on 425µm sieve:	1.8
Liquid limit:	53	Specimen depth:	0.50m
Plastic limit:	22	Remarks:	
Plasticity index:	31		
Moisture content of soil passing 425µm	25		
Liquidity index:	0.10		



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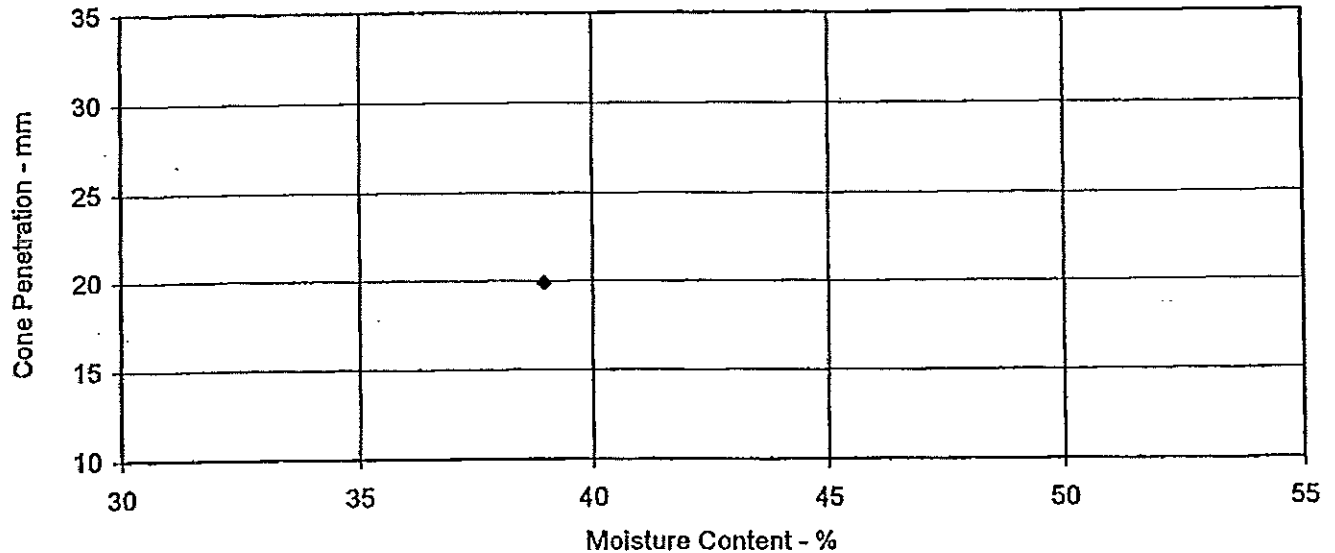
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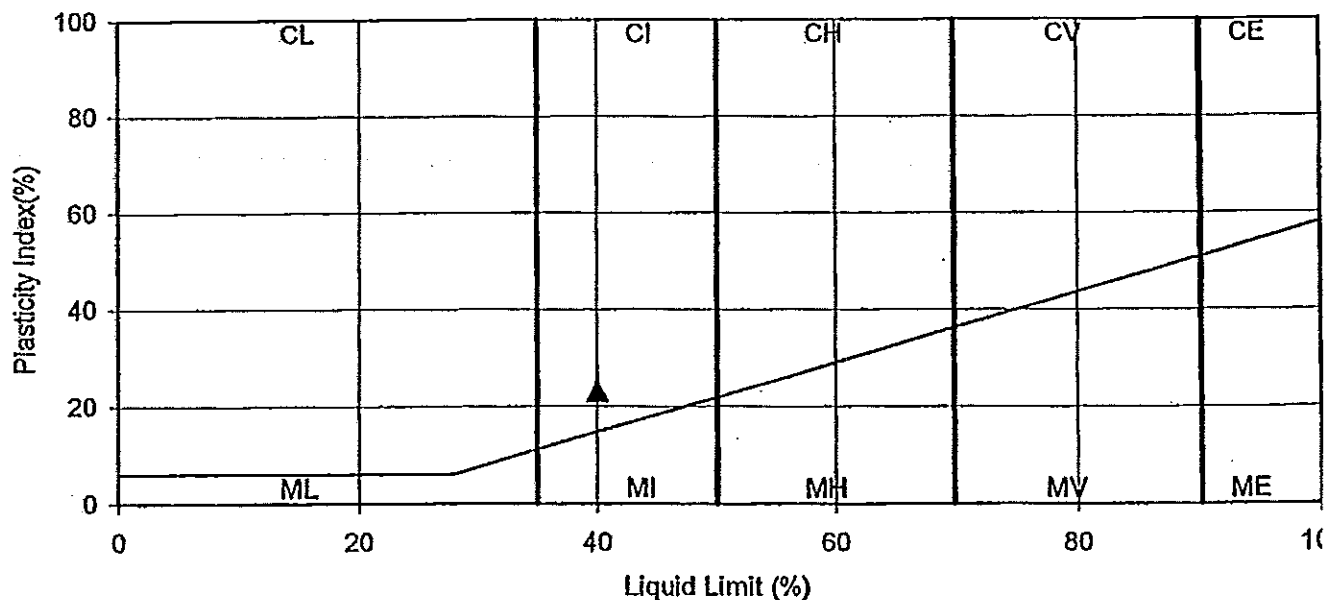
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly sandy slightly gravelly CLAY

Hole ID TP201
Sample no 06
Depth 2.00
Sample type B
Page 1 of 1



Natural moisture content:	16	Percentage retained on 425µm sieve:	14.8
Liquid limit:	40	Specimen depth:	2.00m
Plastic limit:	17	Remarks:	
Plasticity index:	23		
Moisture content of soil passing 425µm	18		
Liquidity Index:	0.04		



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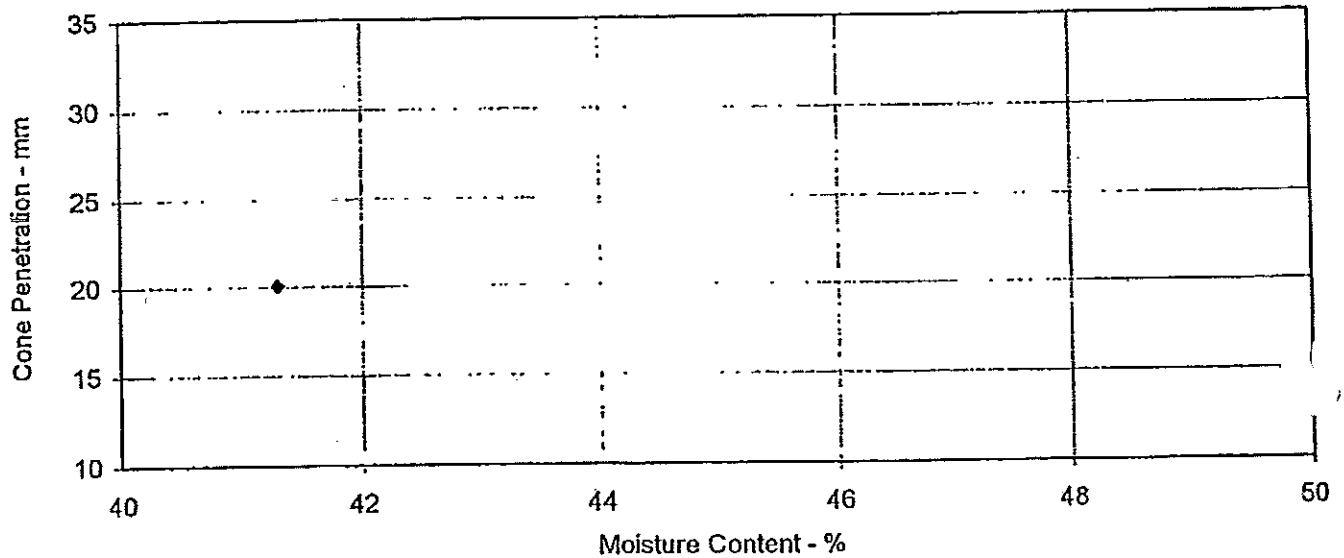
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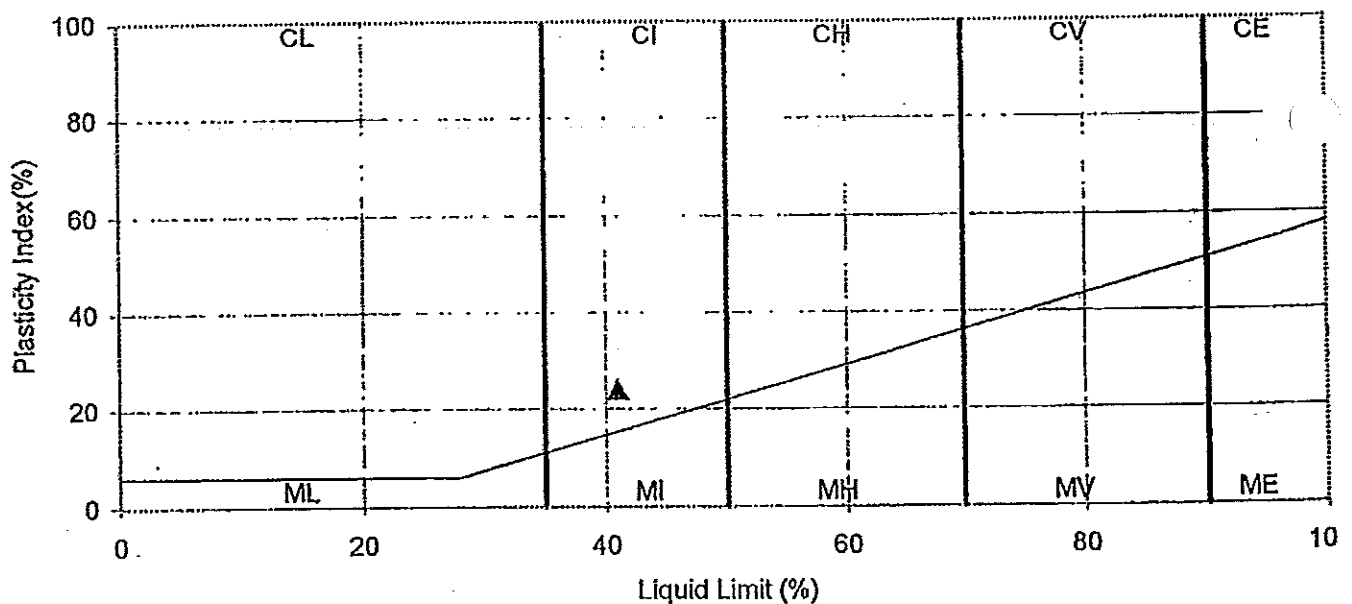
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly CLAY.

Hole ID
Sample no
Depth 1.00
Sample type B
Page 1 of 1



Natural moisture content:	21	Estimated percentage retained on 425µm sieve:	2.3
Liquid limit:	41	Specimen depth:	1.00m
Plastic limit:	17	Remarks:	
Plasticity Index:	24		
Moisture content of soil passing 425µm	22		
Liquidity index:	0.21		



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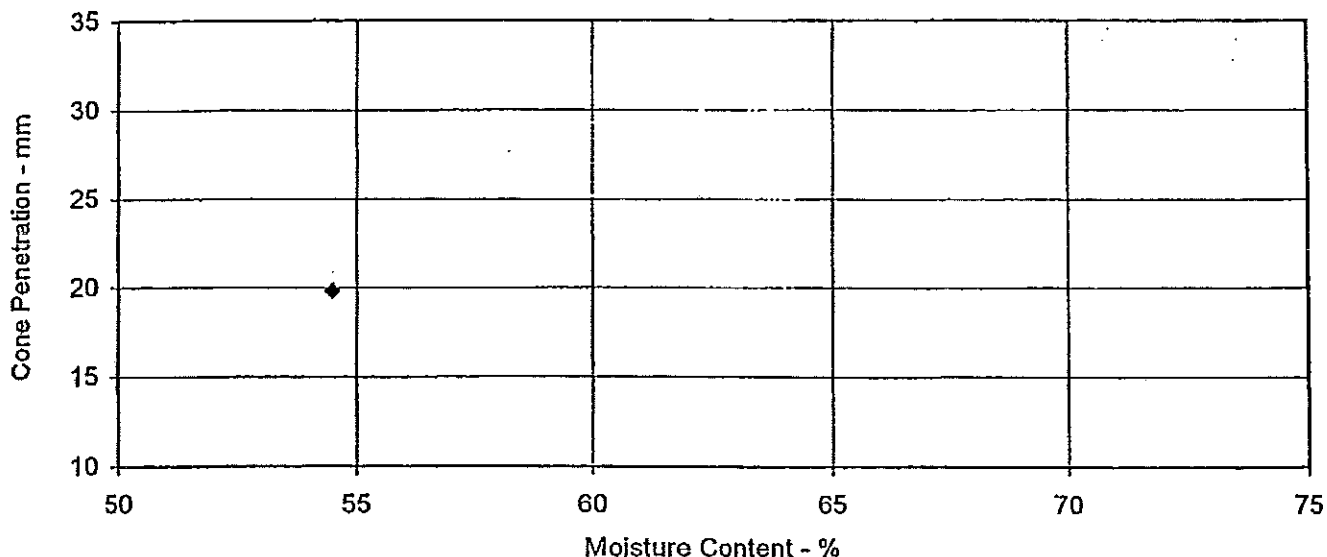
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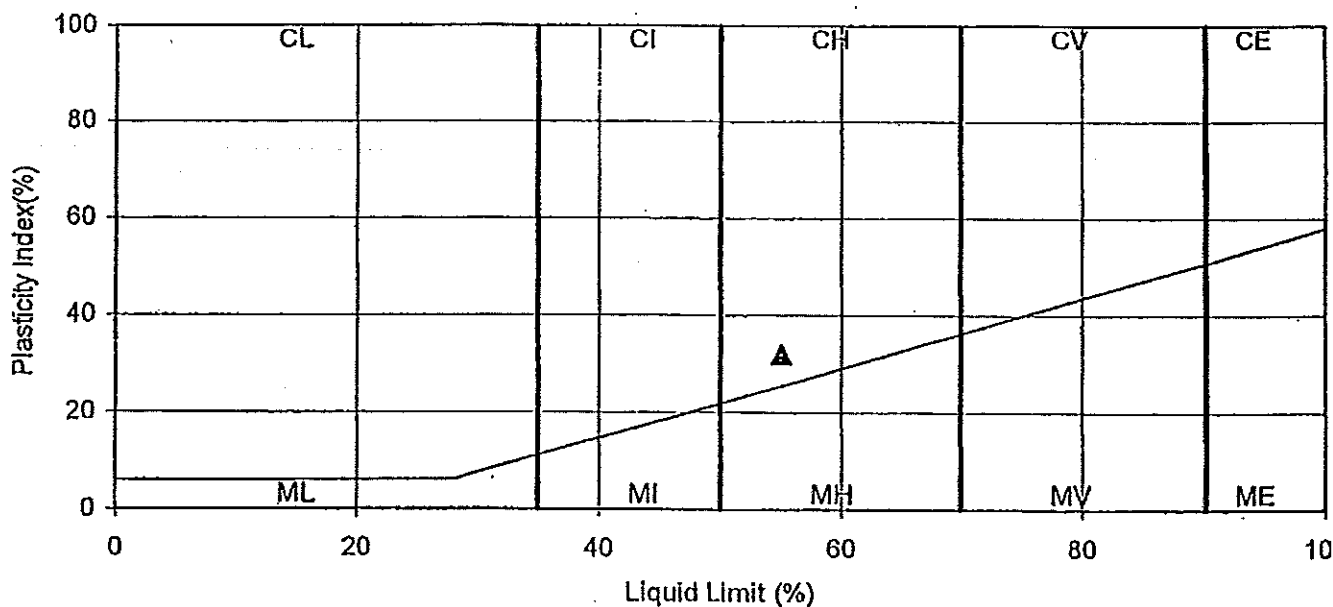
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Orangish brown CLAY

Hole ID TP20:
Sample no 01
Depth 0.50
Sample type D
Page 1 of 1



Natural moisture content:	30	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	55	Specimen depth:	0.50m
Plastic limit:	23	Remarks:	
Plasticity index:	32		
Moisture content of soil passing 425µm	30		
Liquidity index:	0.22		



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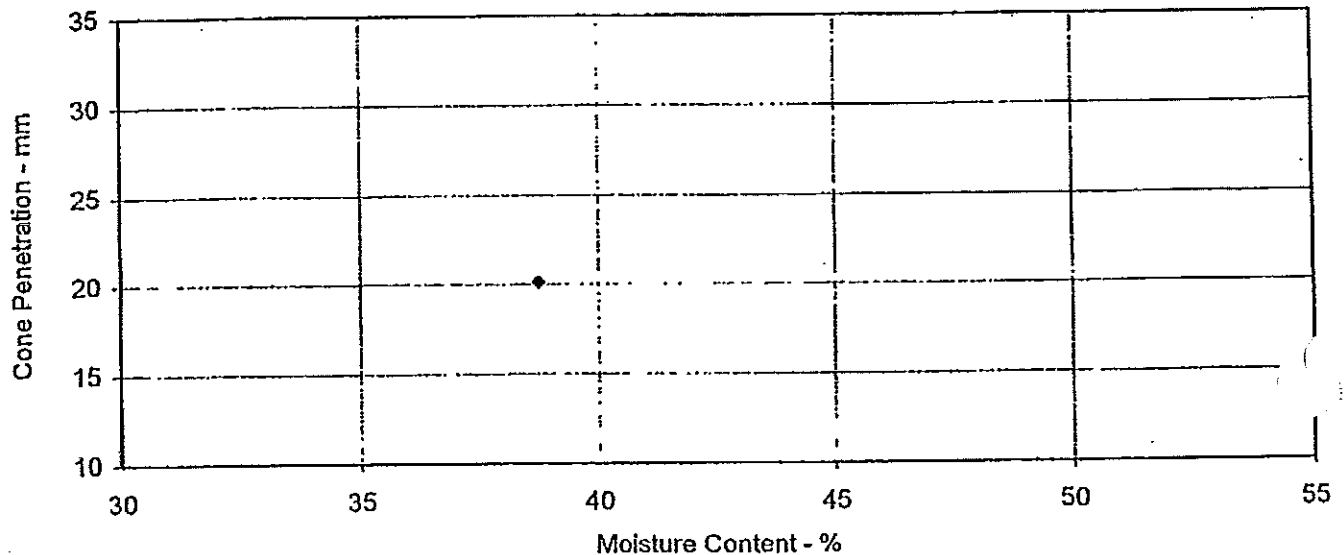
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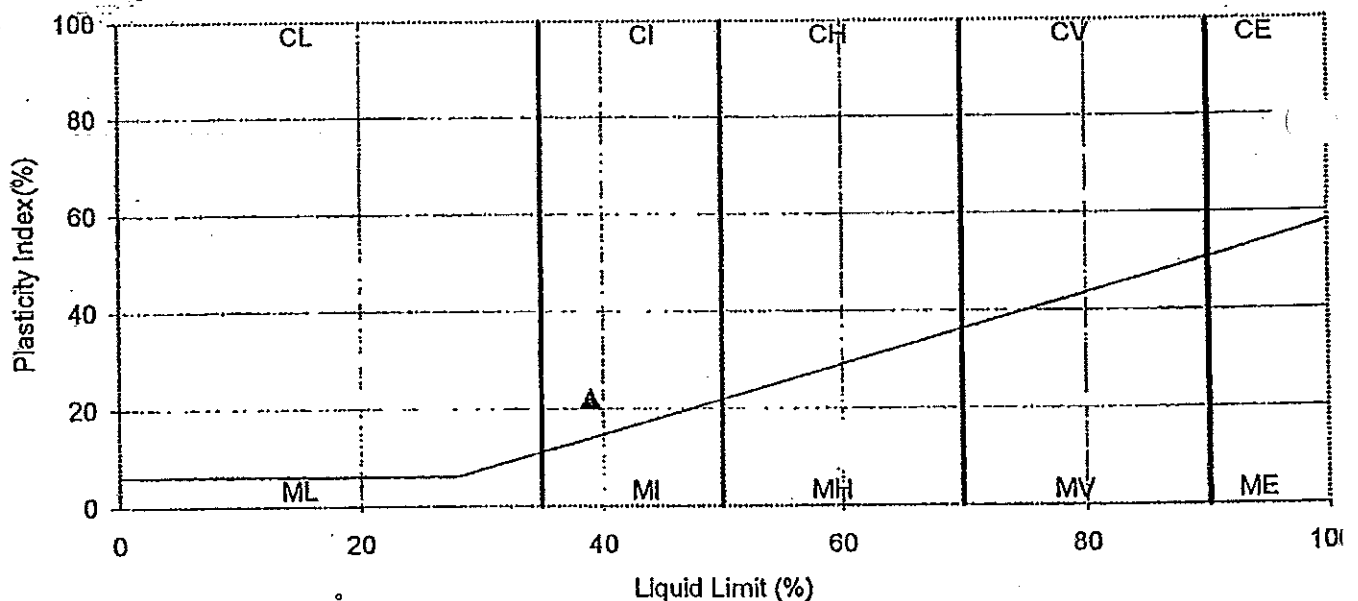
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly sandy CLAY.

Hole ID
Sample no
Depth 2.00
Sample type B
Page 1 of 1



Natural moisture content:	18	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	39	Specimen depth:	2.00m
Plastic limit:	17	Remarks:	Insufficient specimen to perform 4 point test.
Plasticity Index:	22		
Moisture content of soil passing 425µm	18		
Liquidity index:	0.05		



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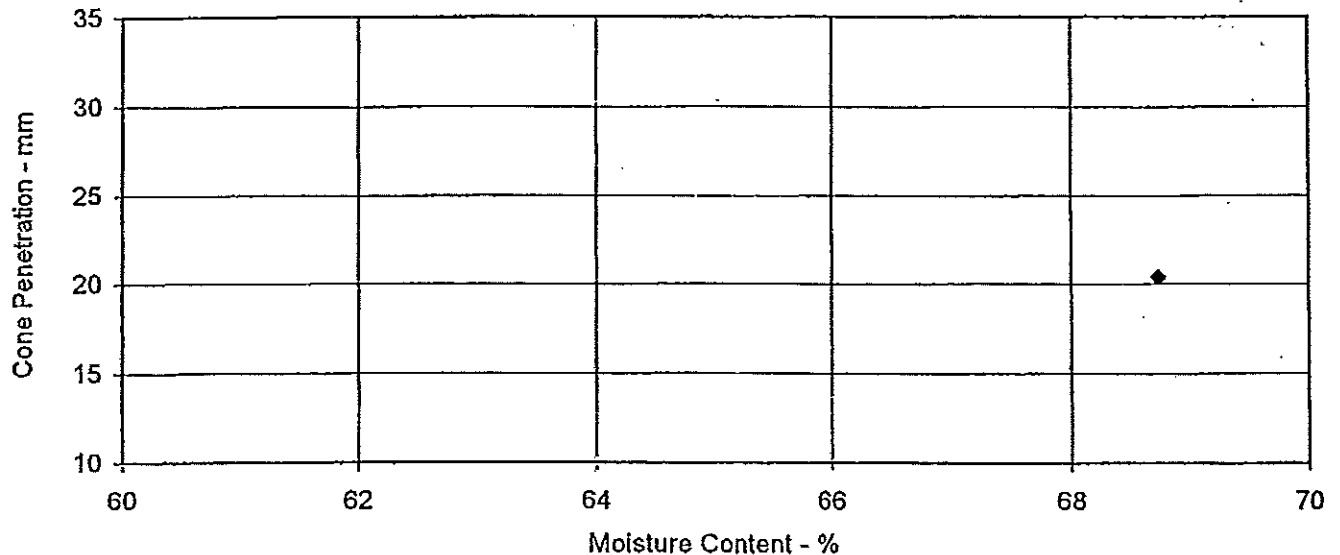
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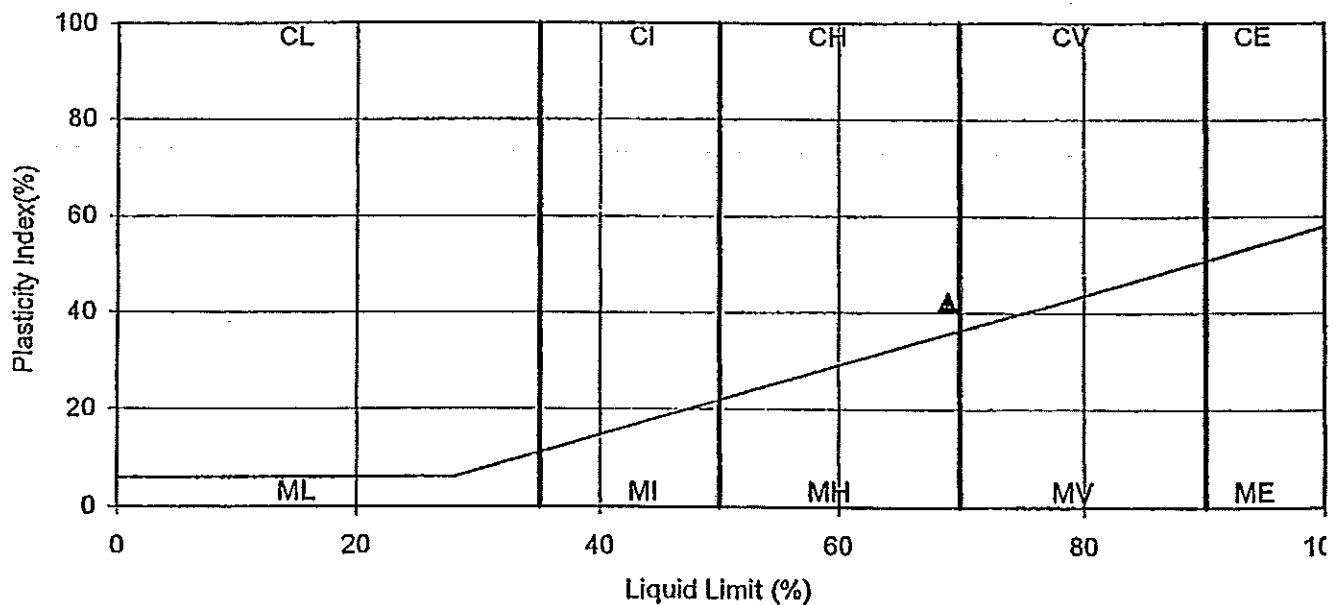
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	TP21
Project	Aldbrough Gas Storage Facility	Sample no	01
Soil description	Brown CLAY	Depth	0.50
		Sample type	D
		Page	1 of



Natural moisture content:	36	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	69	Specimen depth:	0.50m
Plastic limit:	27	Remarks:	
Plasticity Index:	42		
Moisture content of soil passing 425µm	36		
Liquidity index:	0.21		



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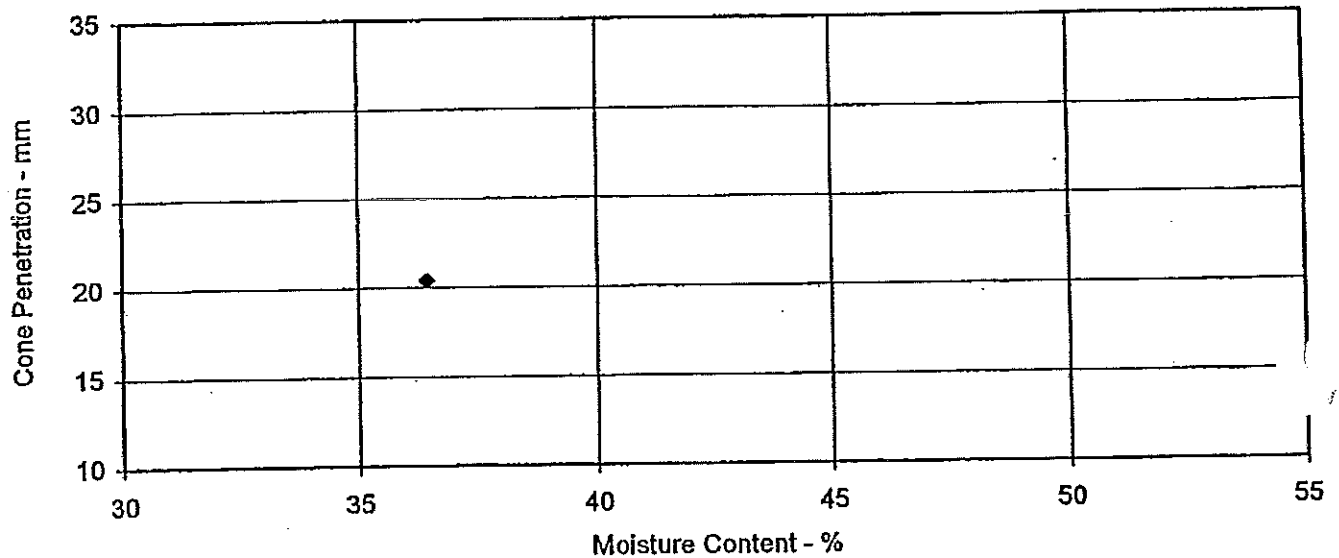
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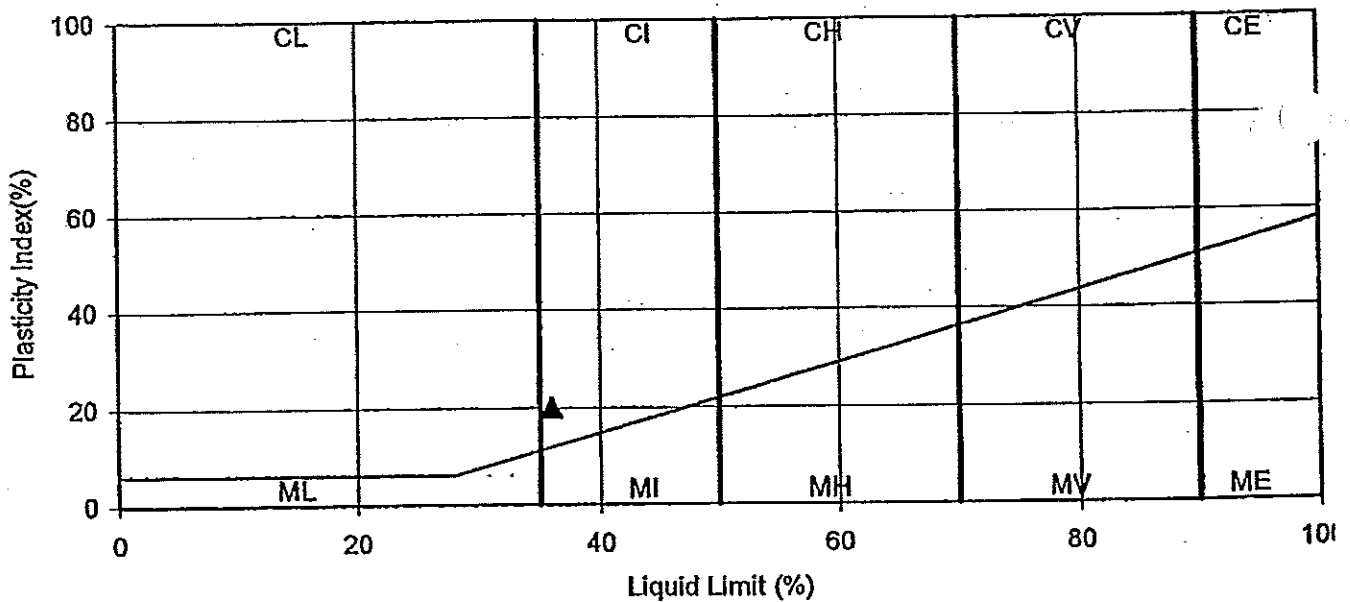
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly CLAY

Hole ID
Sample no
Depth 1.00
Sample type B
Page 1 of 1



Natural moisture content:	16	Percentage retained on 425µm sieve:	11.5
Liquid limit:	36	Specimen depth:	1.00m
Plastic limit:	16	Remarks:	
Plasticity index:	20		
Moisture content of soil passing 425µm	18		
Liquidity index:	0.10		



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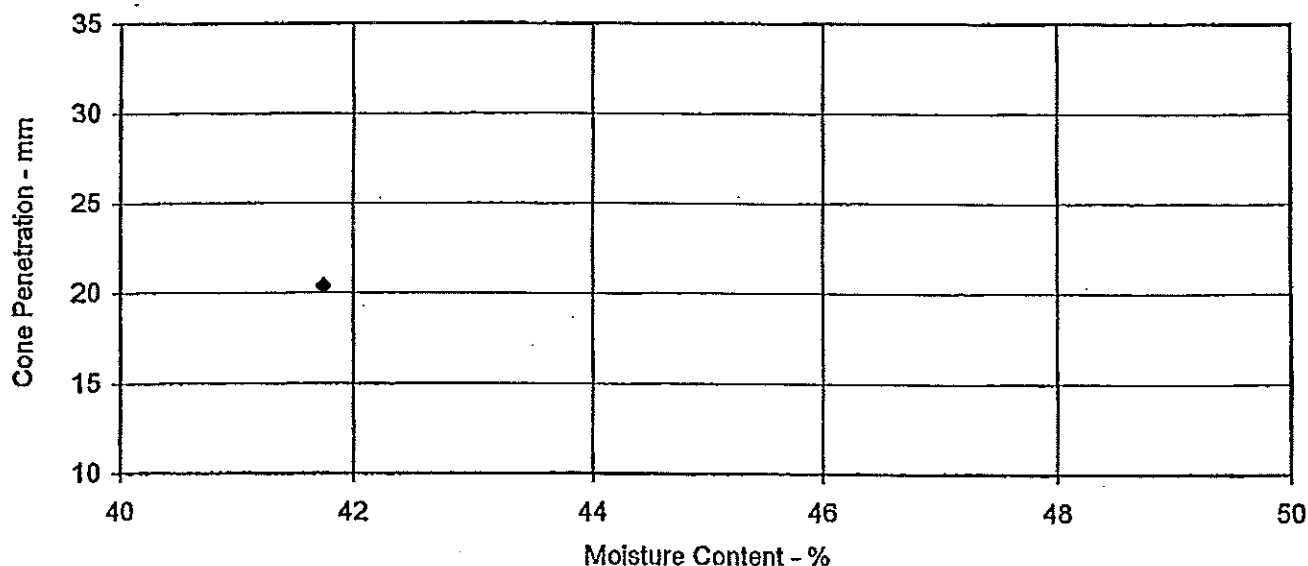
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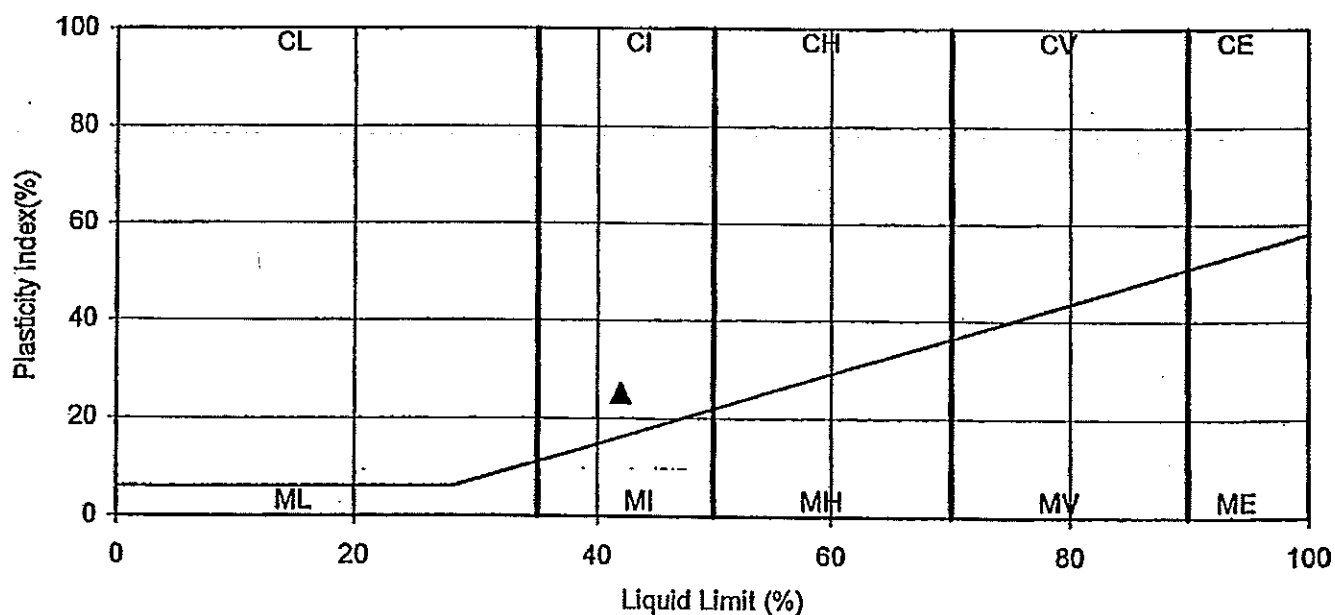
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	TP224
Project	Aldbrough Gas Storage Facility	Sample no	03
Soil description	Brown slightly gravelly CLAY.	Depth	1.00
		Sample type	B
		Page	1 of 1



Natural moisture content:	20	Estimated percentage retained on 425µm sieve:	1.3
Liquid limit:	42	Specimen depth:	1.00m
Plastic limit:	17	Remarks:	
Plasticity index:	25		
Moisture content of soil passing 425µm	20		
Liquidity index:	0.12		



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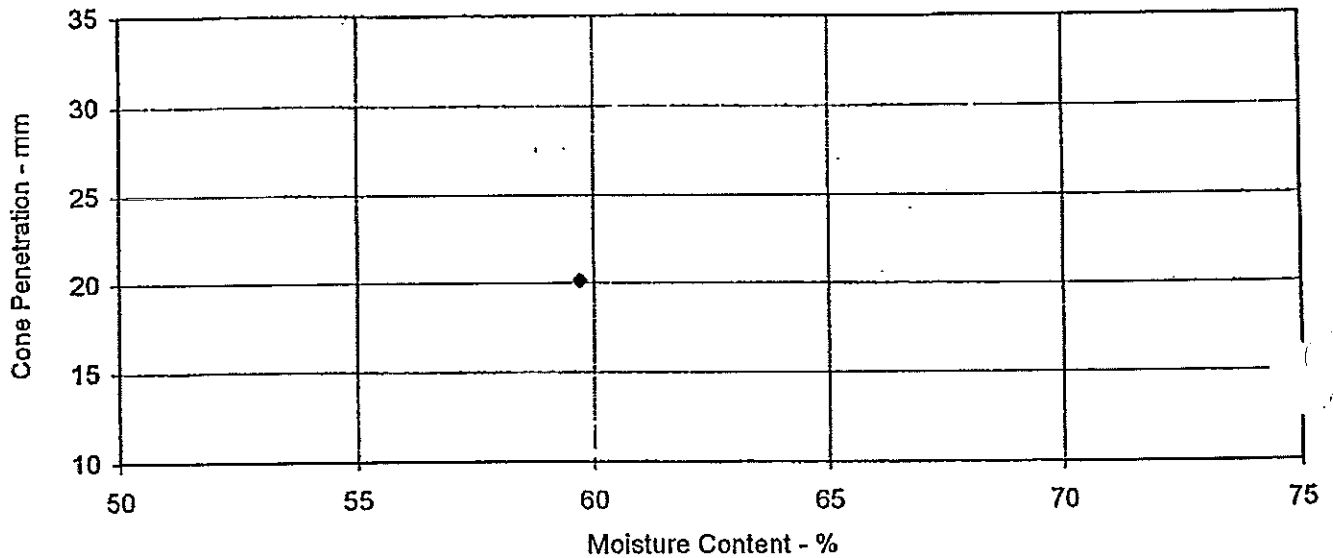
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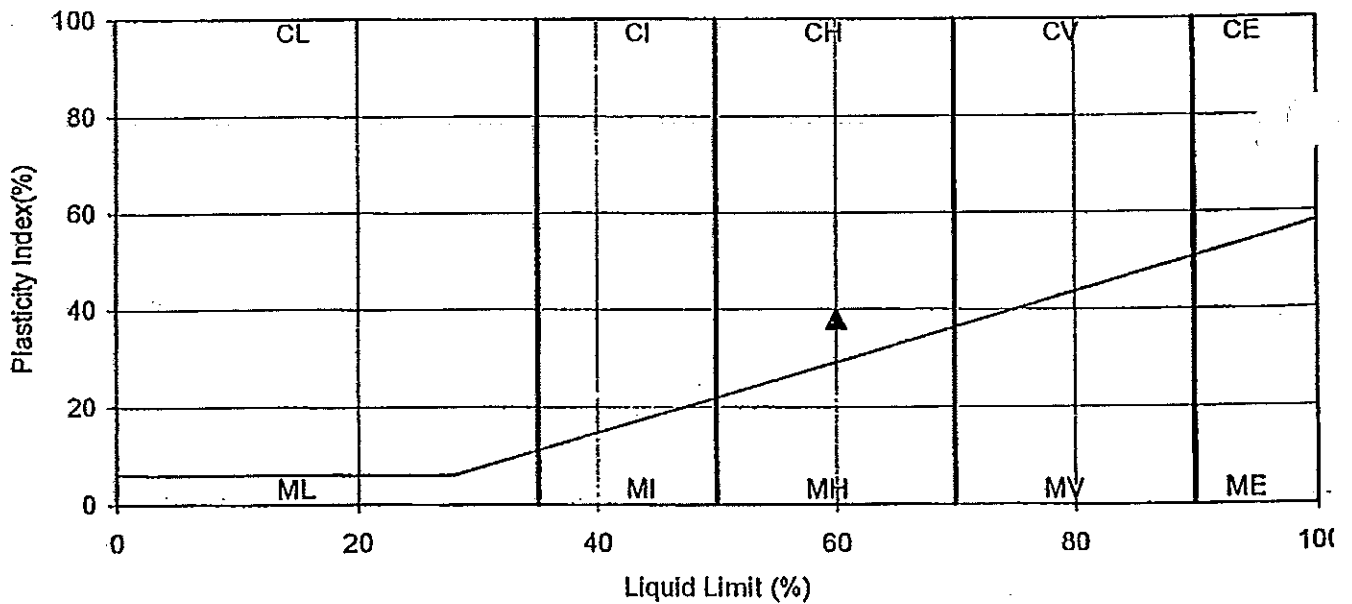
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Orangish brown slightly gravelly CLAY

Hole ID
Sample no
Depth 0.50
Sample type D
Page 1 of 1



Natural moisture content:	24	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	60	Specimen depth:	0.50m
Plastic limit:	22	Remarks:	
Plasticity index:	38		
Moisture content of soil passing 425µm	24		
Liquidity index:	0.05		



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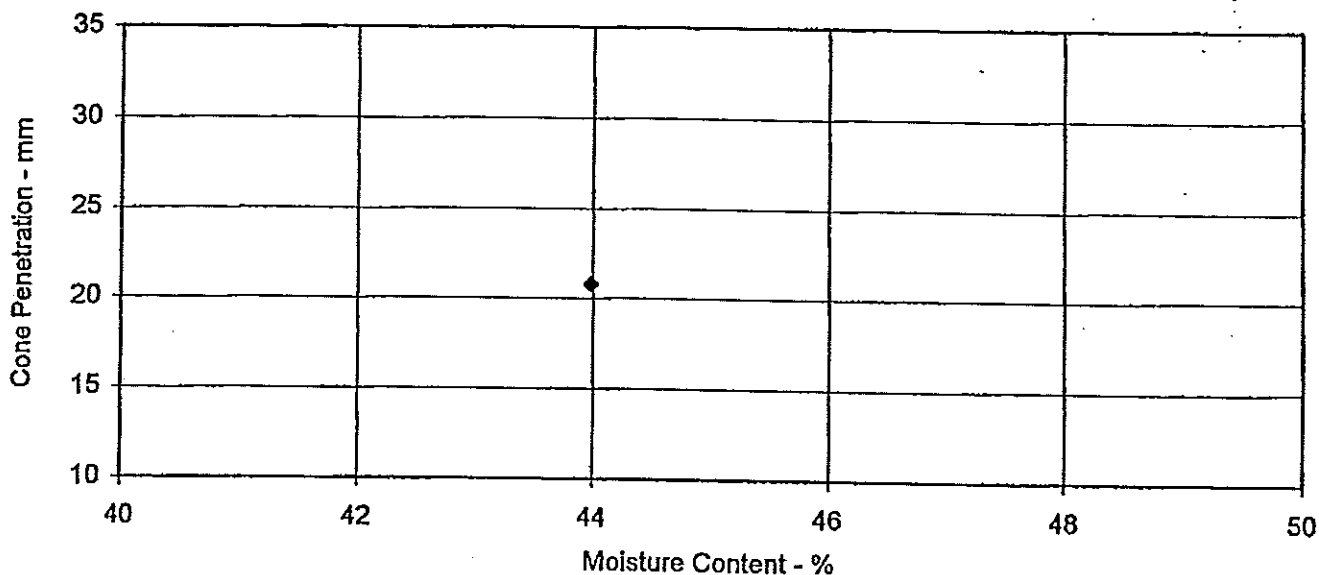
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LIQUID AND PLASTIC LIMIT TEST

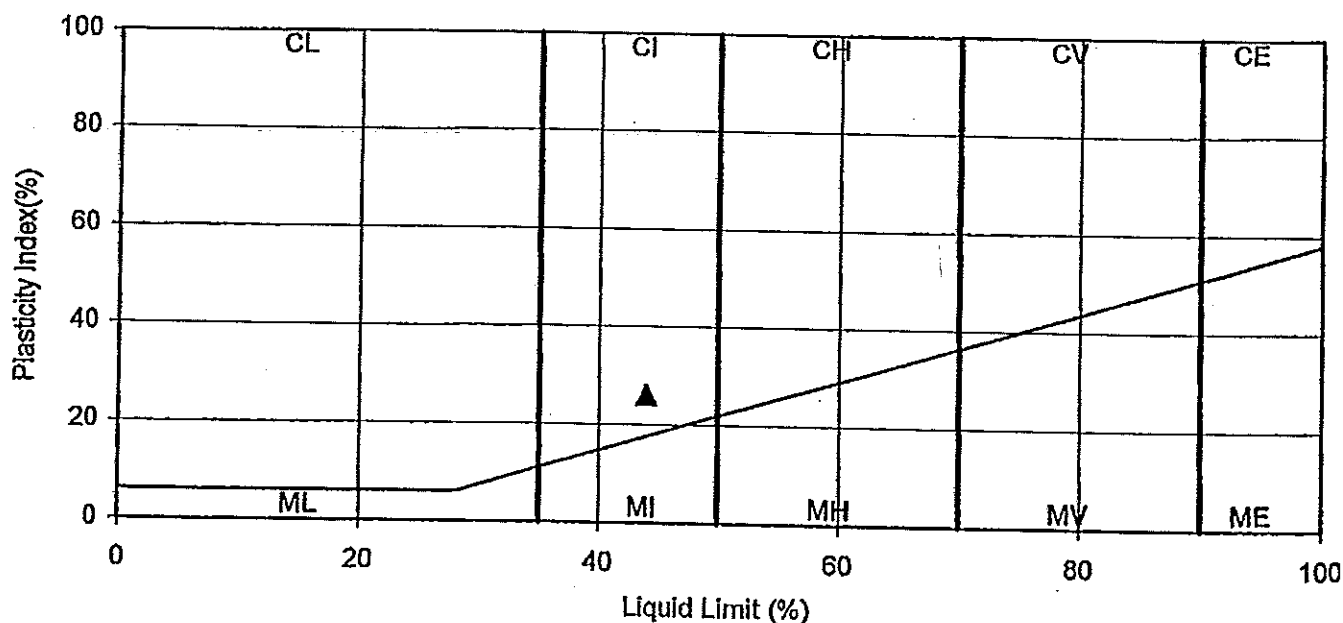
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Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no.	F12963	Hole ID	TP225
Project	Aldbrough Gas Storage Facility	Sample no	03
Soil description	Brown slightly gravelly CLAY.	Depth	1.00
		Sample type	B
		Page	1 of 1



Natural moisture content:	17	Estimated percentage retained on 425µm sieve:	0.9
Liquid limit:	44	Specimen depth:	1.00m
Plastic limit:	18	Remarks:	
Plasticity index:	26		
Moisture content of soil passing 425µm	17		
Liquidity index:	-0.04		



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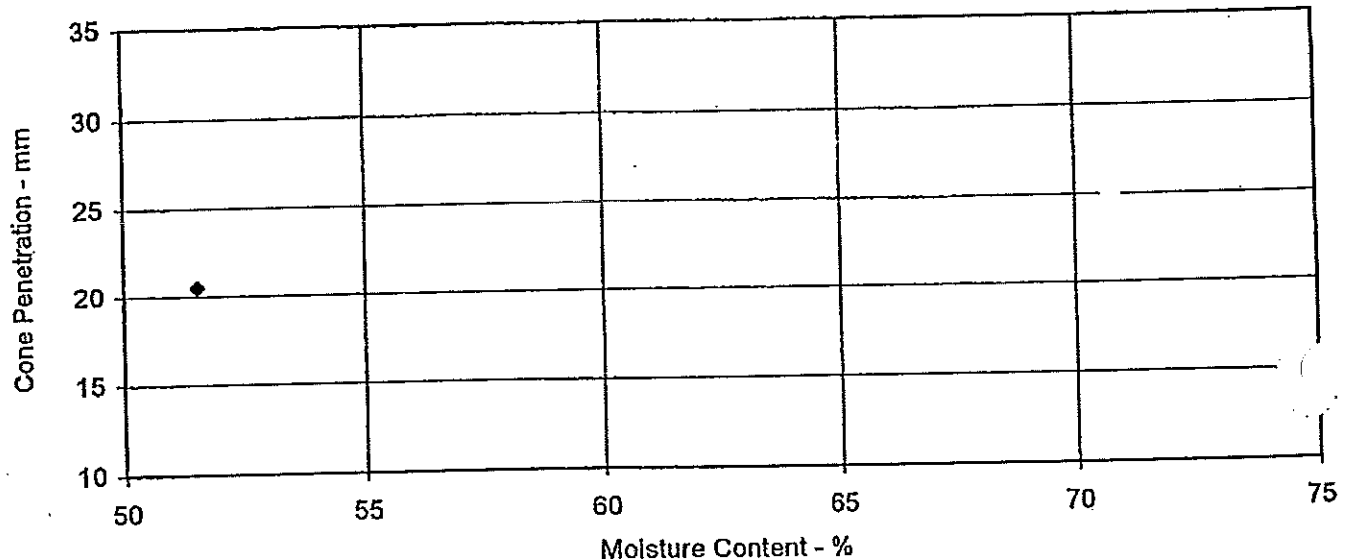
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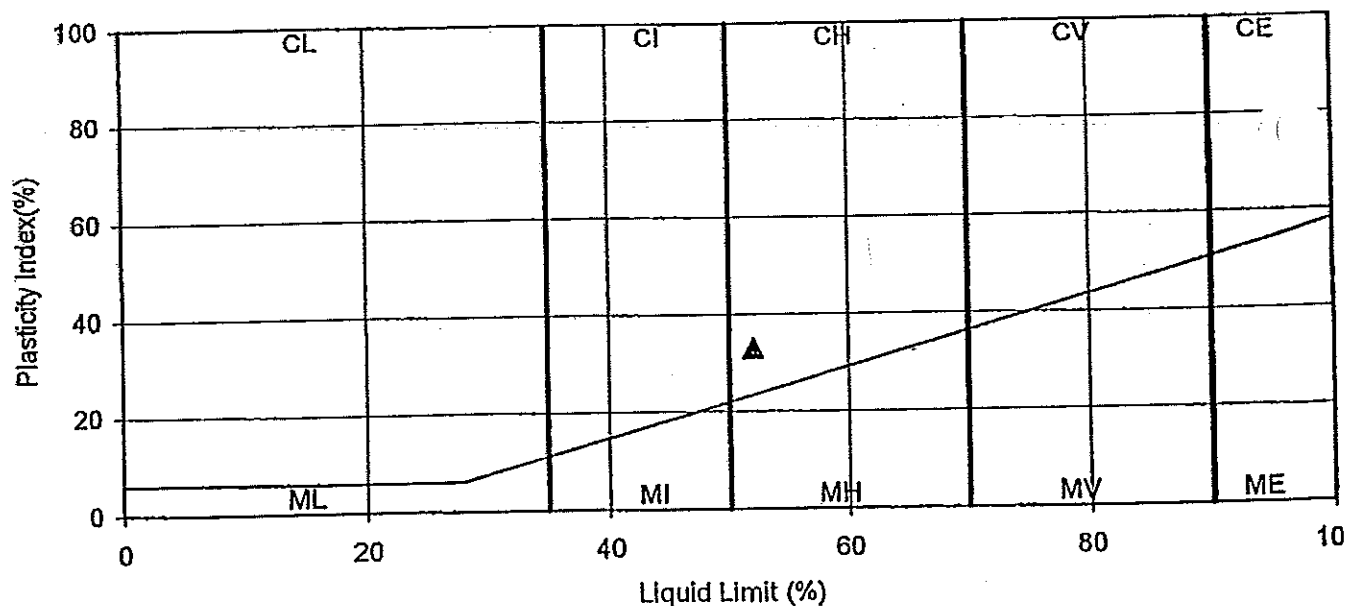
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly sandy CLAY

Hole ID
Sample no
Depth 0.50
Sample type D
Page 1 of



Natural moisture content:	27	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	52	Specimen depth:	0.50m
Plastic limit:	19	Remarks:	
Plasticity index:	33		
Moisture content of soil passing 425µm	27		
Liquidity index:	0.24		



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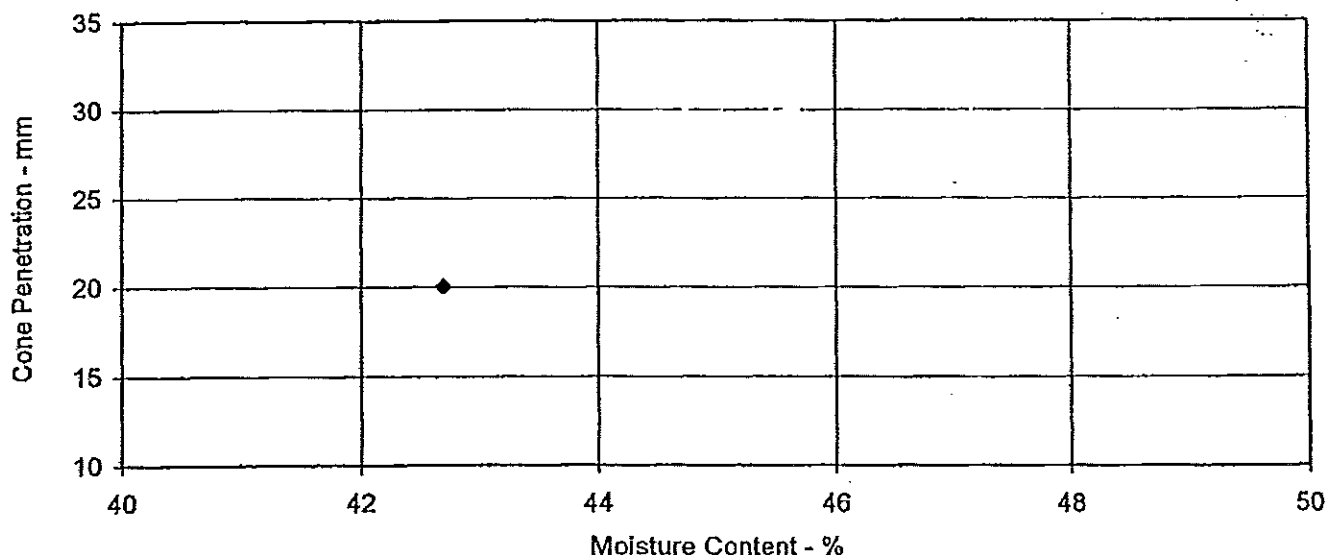
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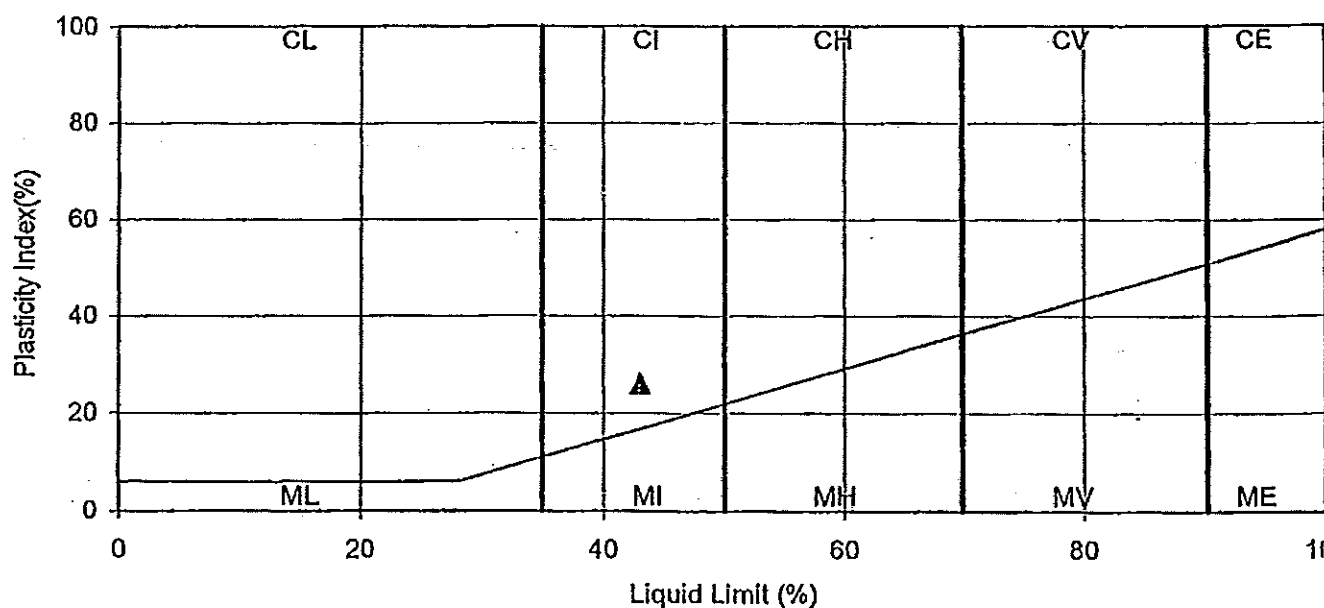
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown mottled grey slightly gravelly CLAY

Hole ID TP227
Sample no 04
Depth 1.00
Sample type B
Page 1 of 1



Natural moisture content:	21	Estimated percentage retained on 425µm sieve:	1.6
Liquid limit:	43	Specimen depth:	1.00m
Plastic limit:	17	Remarks:	
Plasticity index:	26		
Moisture content of soil passing 425µm	21		
Liquidity index:	0.15		



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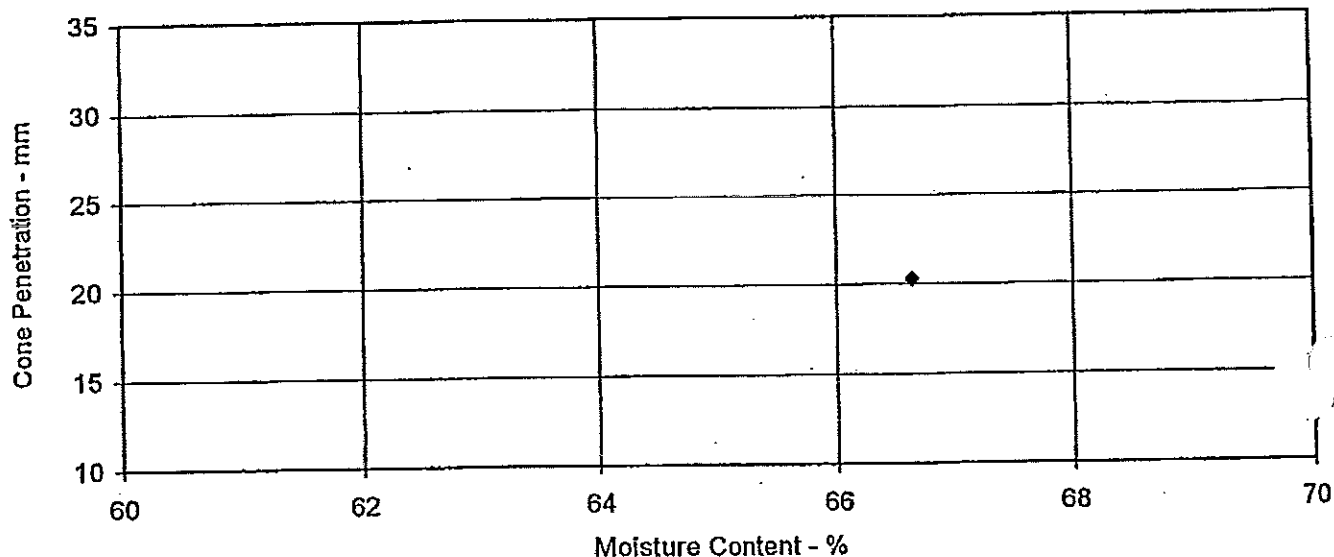
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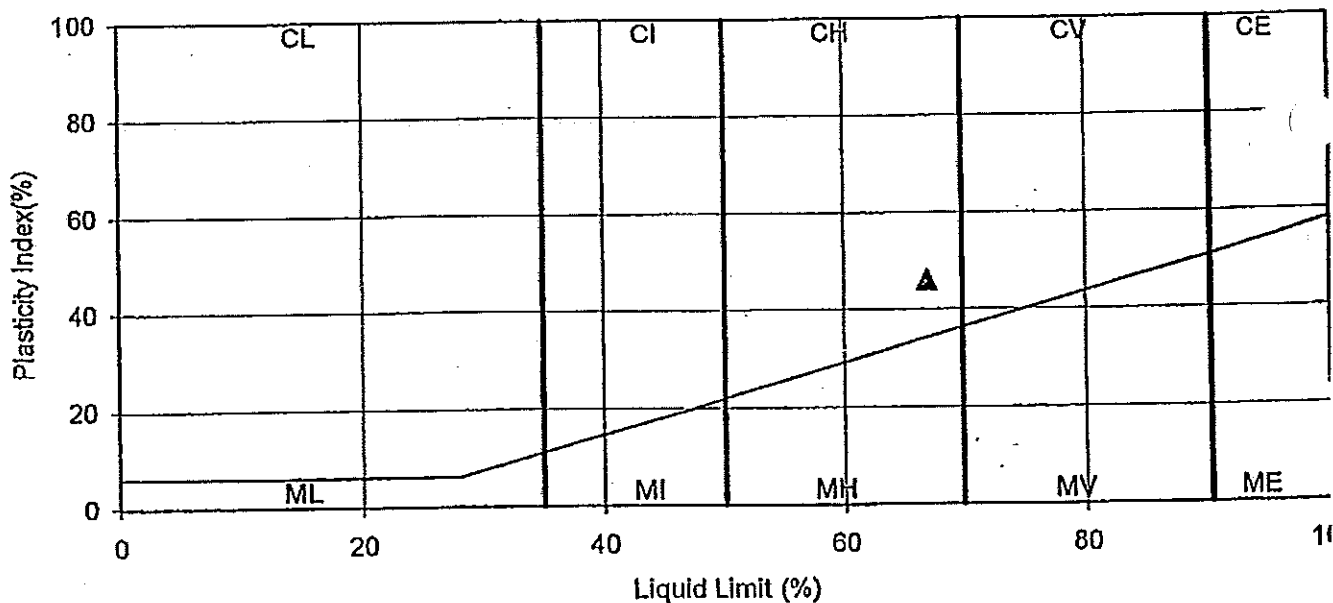
Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Greyish brown slightly sandy CLAY

Hole ID
Sample no
Depth 0.50
Sample type D
Page 1 of



Natural moisture content:	30	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	67	Specimen depth:	0.50m
Plastic limit:	21	Remarks:	
Plasticity index:	46		
Moisture content of soil passing 425µm	30		
Liquidity index:	0.20		



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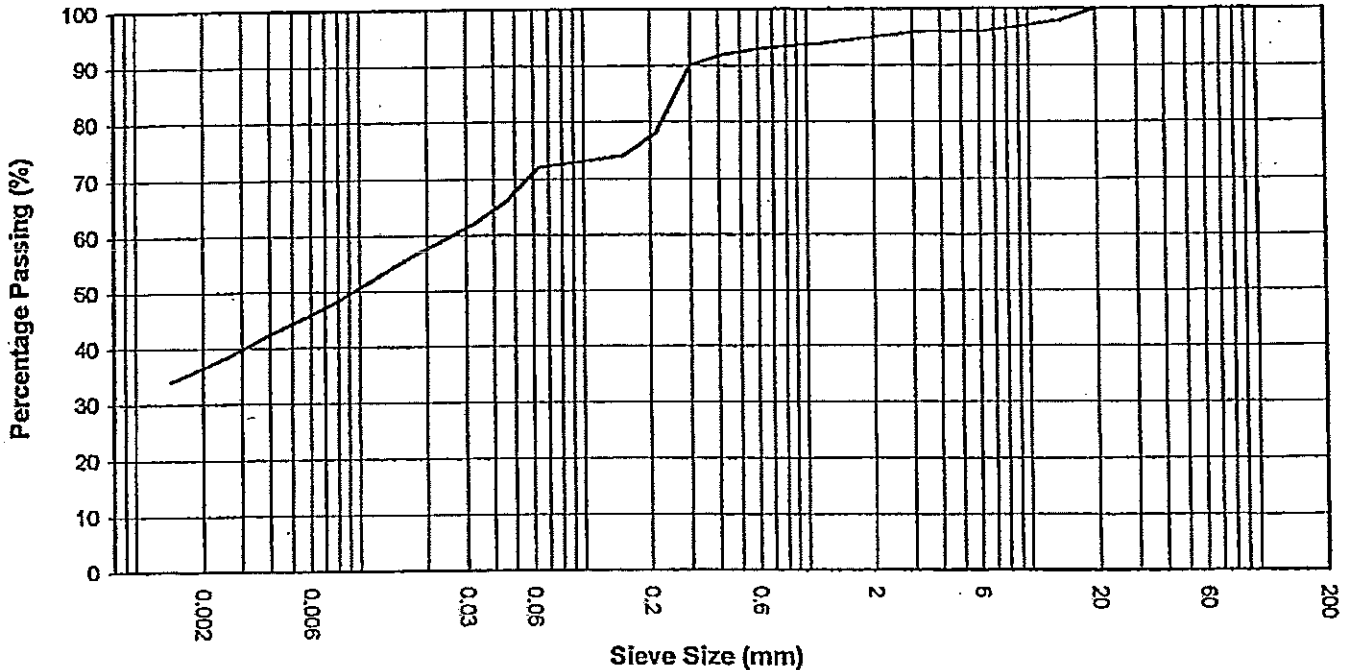
PARTICLE SIZE DISTRIBUTION

**NORWEST
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BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly slightly sandy CLAY.

Hole ID BH101
Sample no. 01
Depth 0.50
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 36
Silt: 35
Sand: 24
Gravel: 5
Cobbles: 0

Specimen depth 0.50m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	96	0.0454	66
63.0	100	3.35	96	0.0326	62
50.0	100	2.00	95	0.0234	59
37.5	100	1.18	94	0.0167	56
28.0	100	0.600	93	0.0077	48
20.0	100	0.425	92	0.0043	43
14.0	98	0.300	90	0.0028	39
10.0	97	0.212	78	0.0014	34
6.3	96	0.150	74		
		0.063	72		

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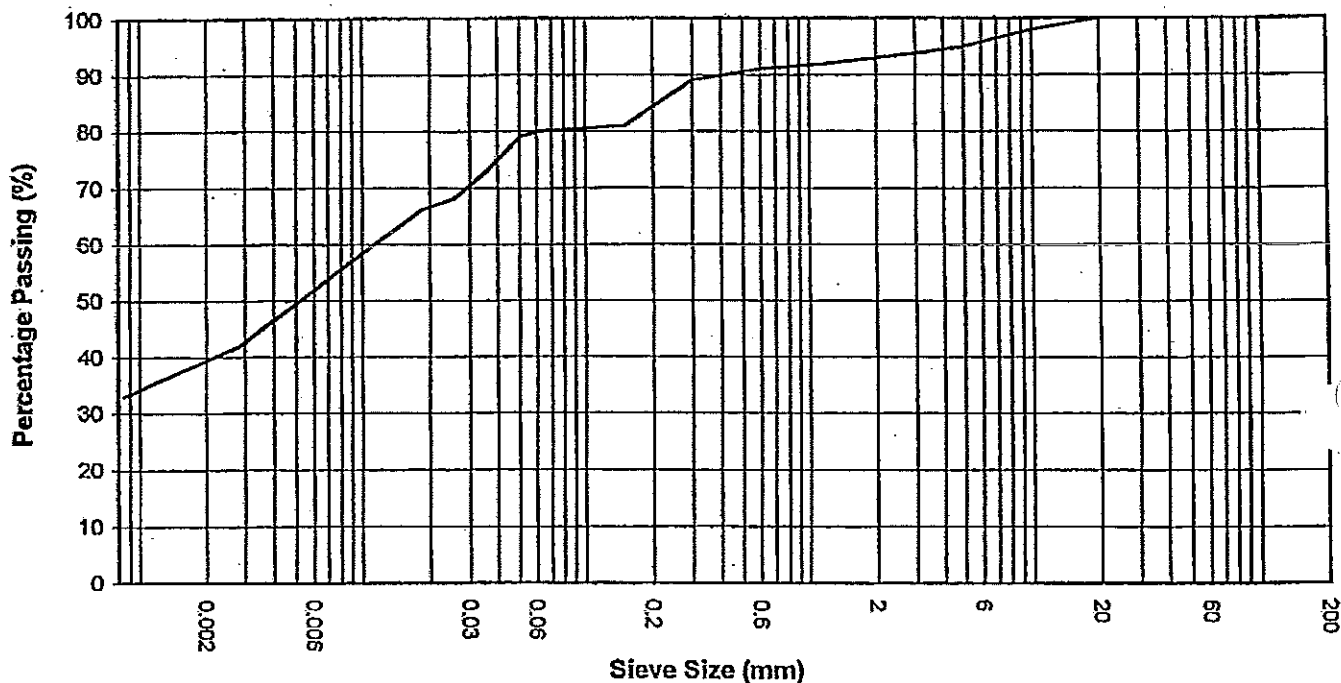
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown slightly gravelly slightly sandy CLAY.

Hole ID
Sample no. U2
Depth 1.20
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 38
Silt: 42
Sand: 13
Gravel: 7
Cobbles: 0

Specimen depth 1.20m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	95	0.0503	79
63.0	100	3.35	94	0.0360	73
50.0	100	2.00	93	0.0257	68
37.5	100	1.18	92	0.0182	66
28.0	100	0.600	91	0.0083	56
20.0	100	0.425	90	0.0041	47
14.0	99	0.300	89	0.0028	42
10.0	98	0.212	85	0.0008	33
6.3	96	0.150	81		
		0.063	80		

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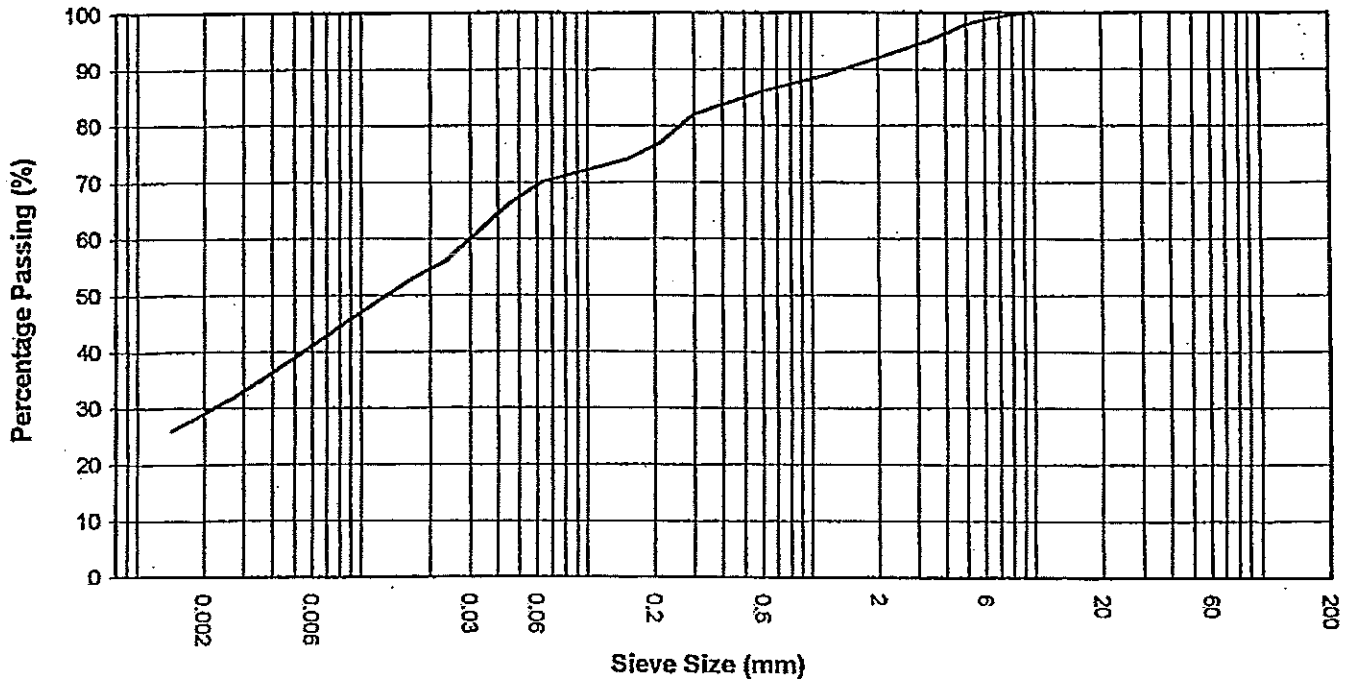
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Dark brown slightly gravelly slightly sandy CLAY.

Hole ID BH101
Sample no. 05
Depth 2.80
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 29
Silt: 41
Sand: 23
Gravel: 8
Cobbles: 0

Specimen depth 2.80m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	98	0.0444	66
63.0	100	3.35	95	0.0321	61
50.0	100	2.00	92	0.0232	56
37.5	100	1.18	89	0.0167	53
28.0	100	0.600	86	0.0077	44
20.0	100	0.425	84	0.0039	36
14.0	100	0.300	82	0.0027	32
10.0	100	0.212	77	0.0014	26
6.3	99	0.150	74		
		0.063	70		

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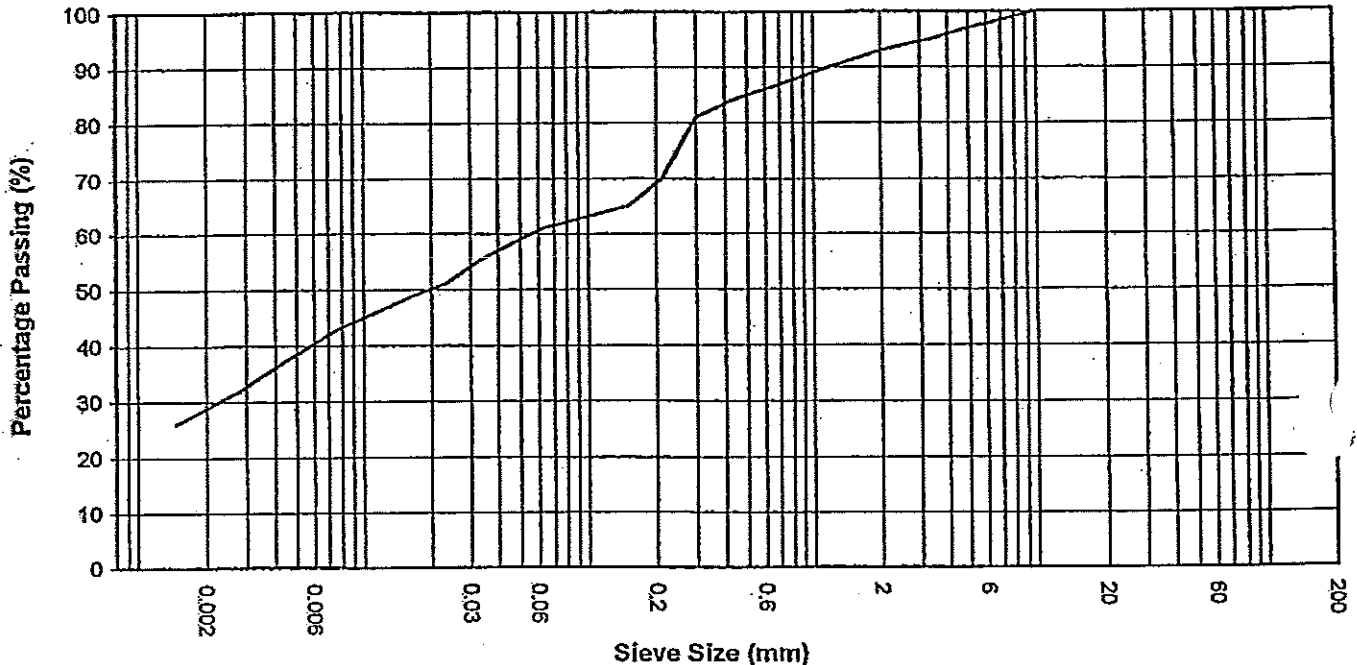
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm to stiff dark brown slightly gravelly slightly sandy CLAY.

Hole ID
Sample no.
Depth 2.5m
Sample type U
Page 1 of



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLI
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 28
Silt: 32
Sand: 33
Gravel: 7
Cobbles: 0

Specimen depth 2.50m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	97	0.0452	58
63.0	100	3.35	95	0.0325	55
50.0	100	2.00	93	0.0234	51
37.5	100	1.18	90	0.0168	49
28.0	100	0.600	86	0.0077	43
20.0	100	0.425	84	0.0043	37
14.0	100	0.300	81	0.0028	32
10.0	100	0.212	70	0.0015	26
6.3	98	0.150	65		
		0.063	61		

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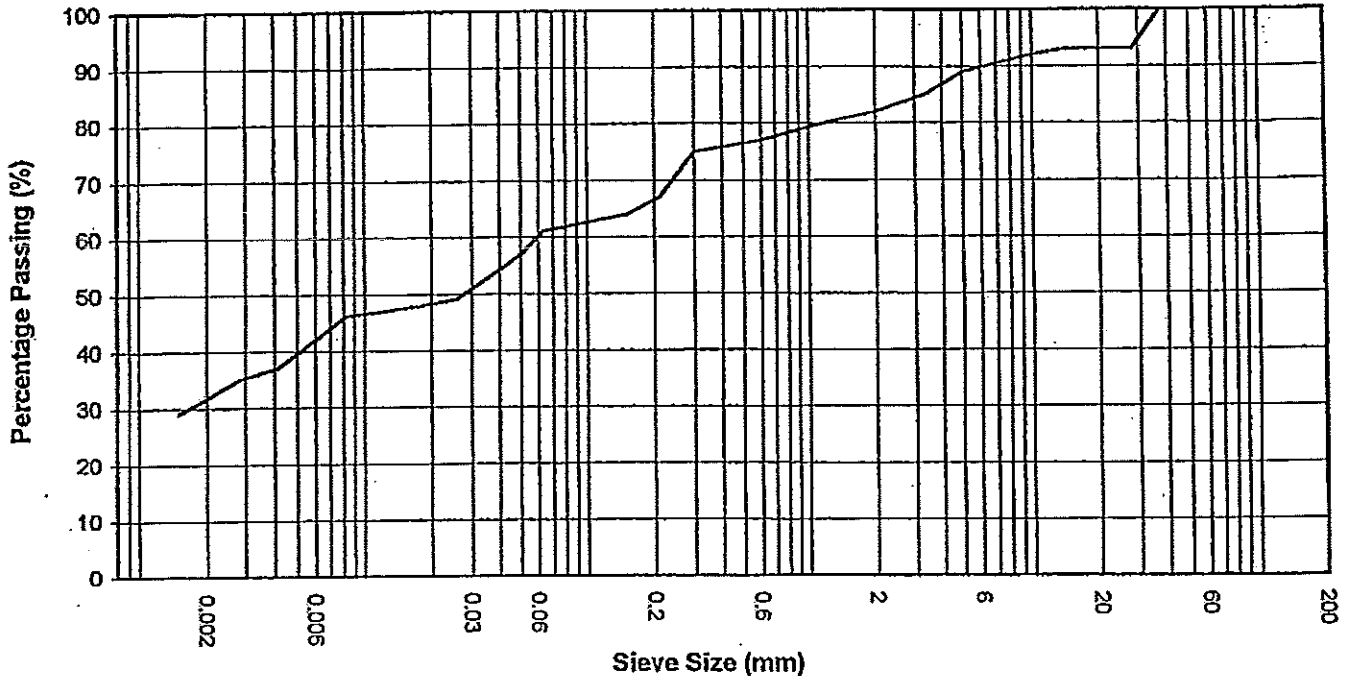
PARTICLE SIZE DISTRIBUTION

**NORWEST
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BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm to stiff brown slightly gravelly slightly sandy CLAY.

Hole ID BH102
Sample no. 11
Depth 4.50
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 31
Silt: 29
Sand: 22
Gravel: 18
Cobbles: 0

Specimen depth 4.50m

Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	89	0.0502	57
63.0	100	3.35	85	0.0359	53
50.0	100	2.00	82	0.0256	49
37.5	100	1.18	80	0.0182	48
28.0	93	0.600	77	0.0082	46
20.0	93	0.425	76	0.0041	37
14.0	93	0.300	75	0.0028	35
10.0	92	0.212	67	0.0015	29
6.3	90	0.150	64		
		0.063	61		

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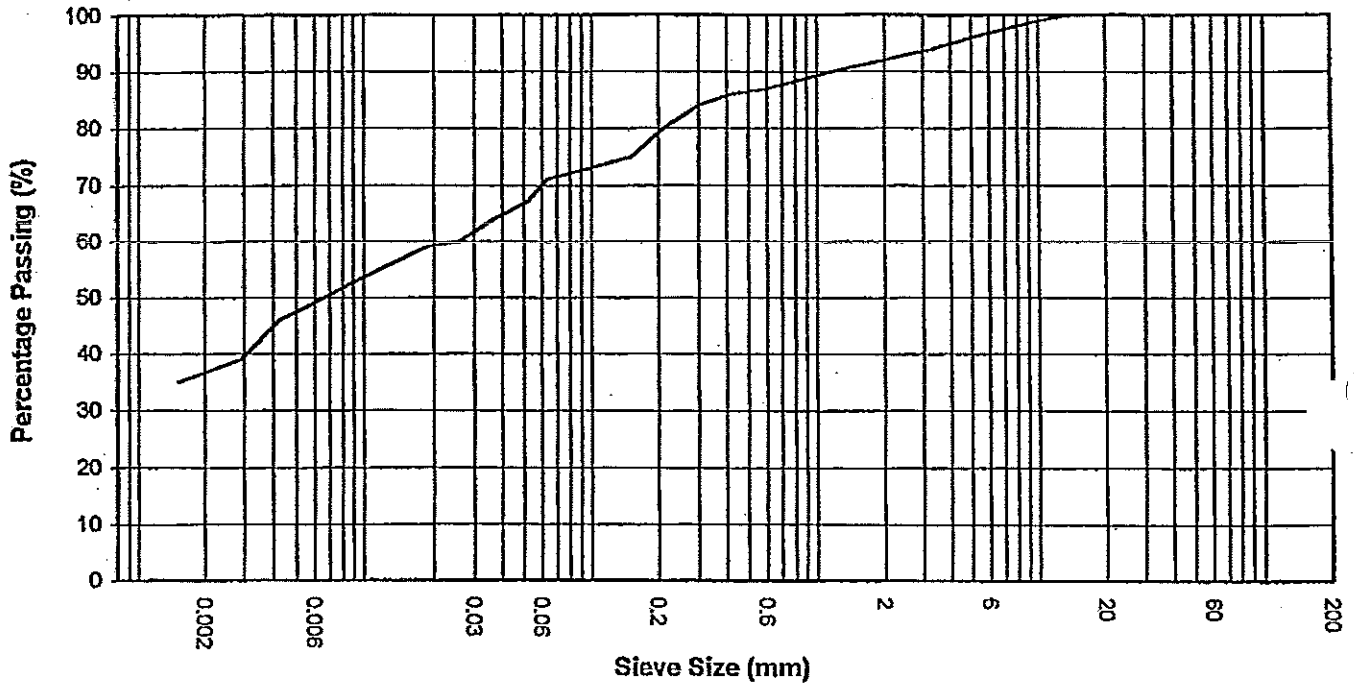
PARTICLE SIZE DISTRIBUTION

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BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly slightly sandy CLAY.

Hole ID
Sample no.
Depth 6.40
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

		Specimen depth	6.40m	Specimen ref.	
PARTICLE SIZE	%	General remarks			
Clay:	36				
Silt:	34				
Sand:	22				
Gravel:	8				
Cobbles:	0				
		Particle density:	2.85	Mg/m³	Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	96	0.0515	67
63.0	100	3.35	94	0.0366	64
50.0	100	2.00	92	0.0261	60
37.5	100	1.18	90	0.0185	59
28.0	100	0.600	87	0.0084	52
20.0	100	0.425	86	0.0043	46
14.0	100	0.300	84	0.0029	39
10.0	99	0.212	80	0.0015	35
6.3	97	0.150	75		
		0.063	71		

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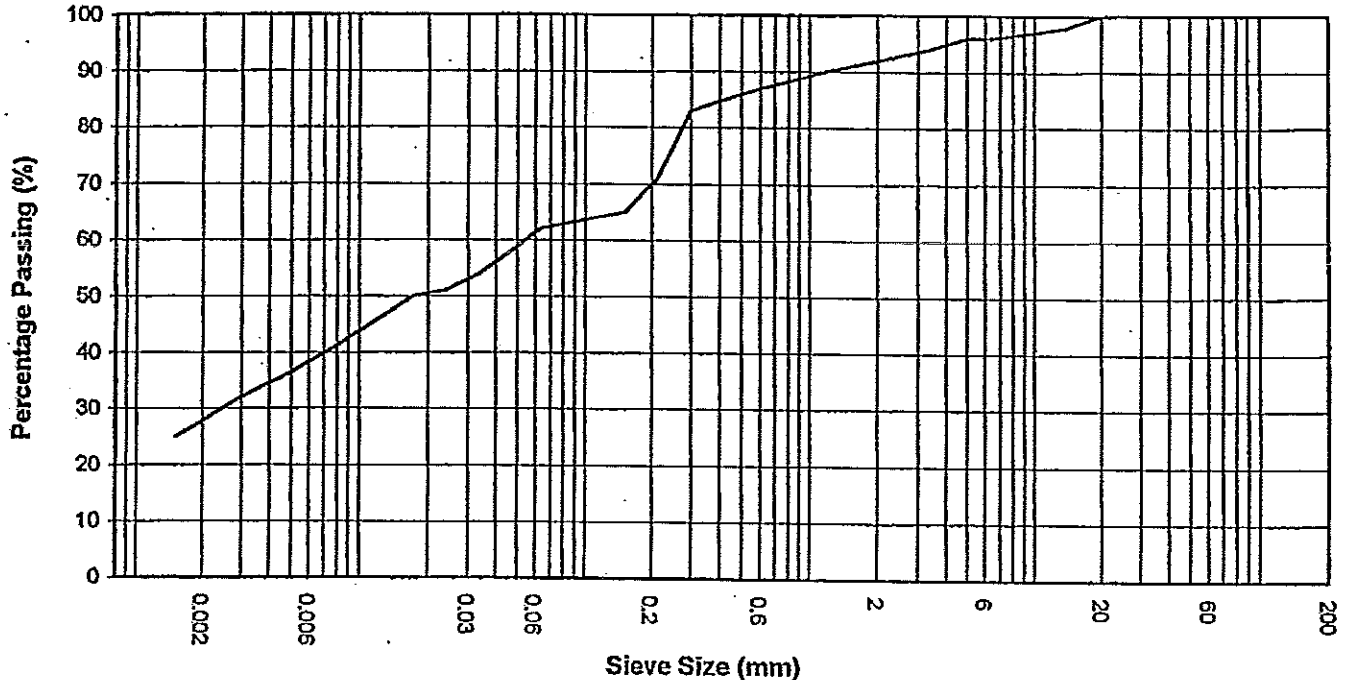
PARTICLE SIZE DISTRIBUTION

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BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Dark brown slightly gravelly sandy CLAY.

Hole ID BH102
Sample no. 19
Depth 8.20
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 27
Silt: 34
Sand: 31
Gravel: 8
Cobbles: 0

Specimen depth 8.20m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	96	0.0469	58
63.0	100	3.35	94	0.0337	54
50.0	100	2.00	92	0.0241	51
37.5	100	1.18	90	0.0171	50
28.0	100	0.600	87	0.0079	41
20.0	100	0.425	85	0.0048	36
14.0	98	0.300	83	0.0030	32
10.0	97	0.212	71	0.0015	25
6.3	96	0.150	65		
		0.063	62		

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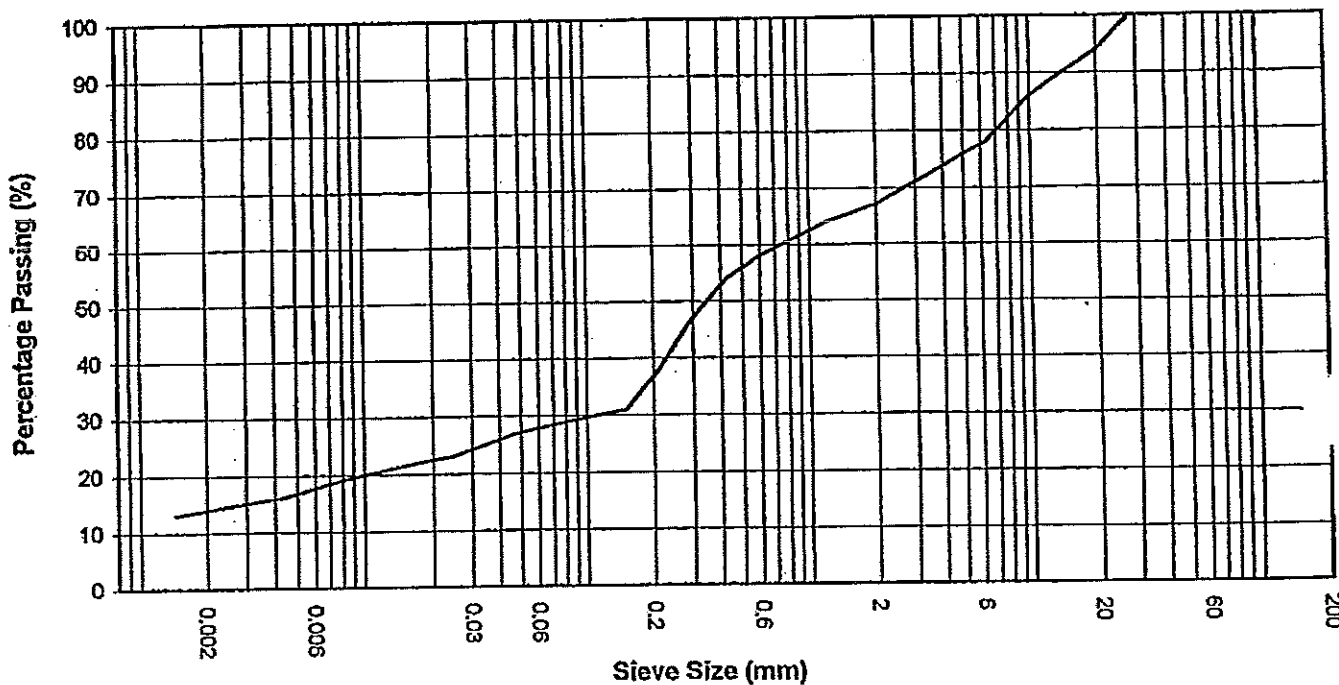
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown gravelly sandy CLAY.

Hole ID
Sample no. 01
Depth 0.50
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 14
Silt: 14
Sand: 39
Gravel: 33
Cobbles: 0

Specimen depth 0.50m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	76	0.0478	27
63.0	100	3.35	72	0.0343	25
50.0	100	2.00	67	0.0246	23
37.5	100	1.18	64	0.0176	22
28.0	100	0.600	58	0.0080	19
20.0	94	0.425	54	0.0043	16
14.0	90	0.300	47	0.0028	15
10.0	86	0.212	38	0.0015	13
6.3	78	0.150	31		
		0.063	28		

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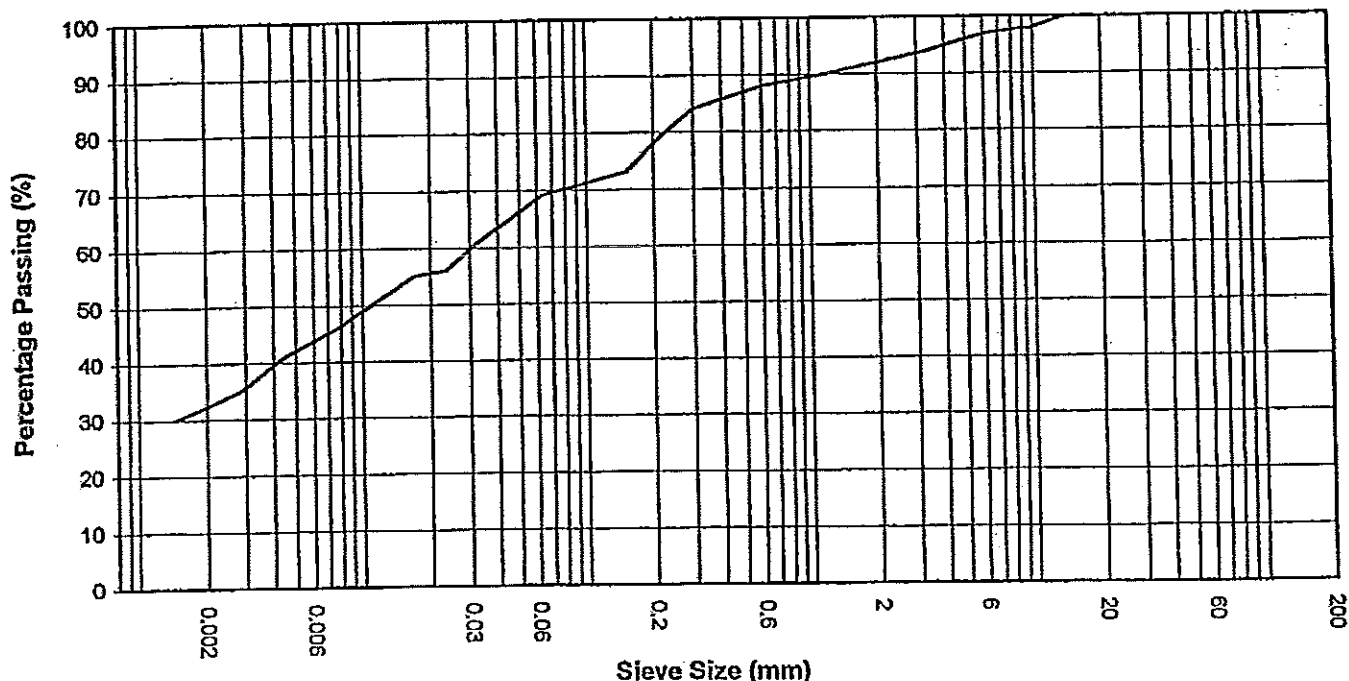
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown slightly gravelly slightly sandy CLAY.

Hole ID BH103
Sample no. 05
Depth 2.50
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 32
Silt: 36
Sand: 24
Gravel: 8
Cobbles: 0

Specimen depth 1.50m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	96	0.0454	65
63.0	100	3.35	94	0.0327	61
50.0	100	2.00	92	0.0236	56
37.5	100	1.18	90	0.0168	55
28.0	100	0.600	88	0.0078	46
20.0	100	0.425	86	0.0045	41
14.0	100	0.300	84	0.0029	35
10.0	98	0.212	79	0.0015	30
6.3	97	0.150	73		
		0.063	69		

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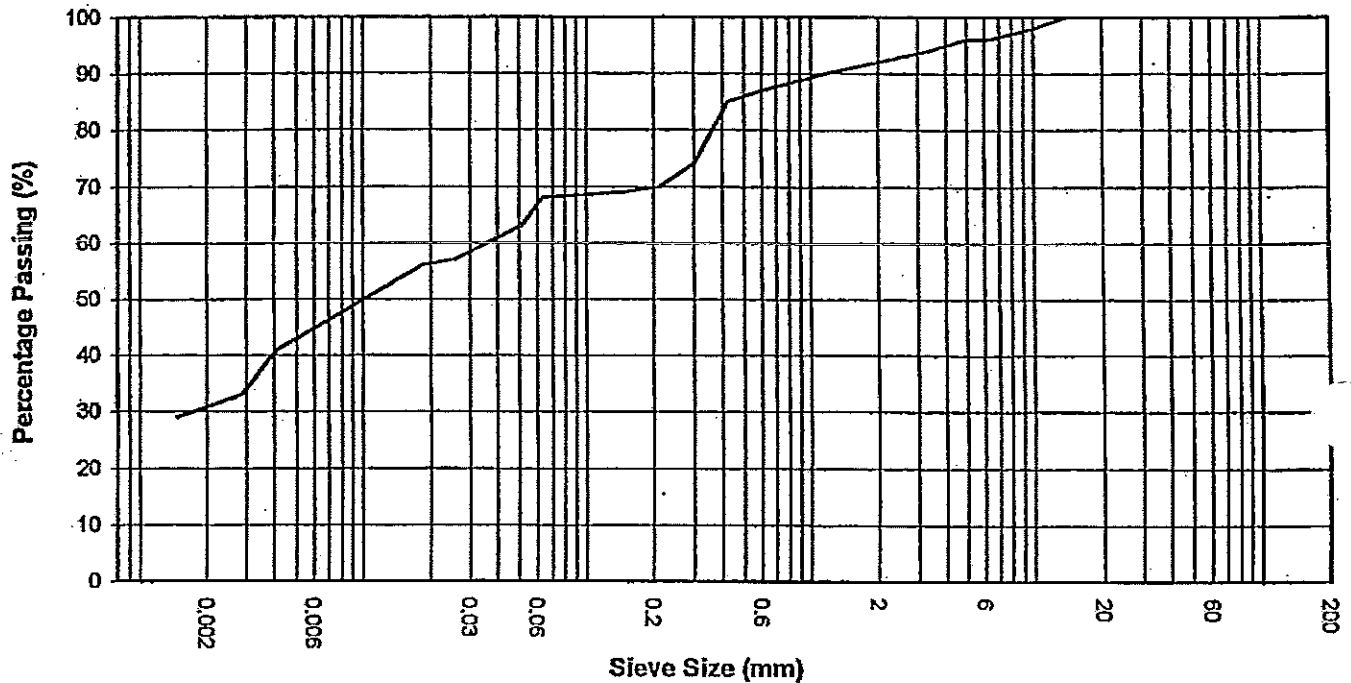
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PARTICLE SIZE DISTRIBUTION

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BS 1377: Part 2: 1990: 9.2, 9.5

Contract no.	F12963	Hole ID	E
Project	Aldbrough Gas Storage Facility	Sample no.	15
Soil description	Brown slightly gravelly slightly sandy CLAY.	Depth	5.20
		Sample type	B
		Page	1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

		Specimen depth	5.20m	Specimen ref.	
PARTICLE SIZE	%	General remarks			
Clay:	31				
Silt:	36				
Sand:	25				
Gravel:	8				
Cobbles:	0				
		Particle density:	2.65	Mg/m³	Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	96	0.0508	63
63.0	100	3.35	94	0.0362	60
50.0	100	2.00	92	0.0257	57
37.5	100	1.18	90	0.0182	56
28.0	100	0.600	87	0.0083	48
20.0	100	0.425	85	0.0041	41
14.0	100	0.300	74	0.0029	33
10.0	98	0.212	70	0.0015	29
6.3	96	0.150	69		
		0.063	68		

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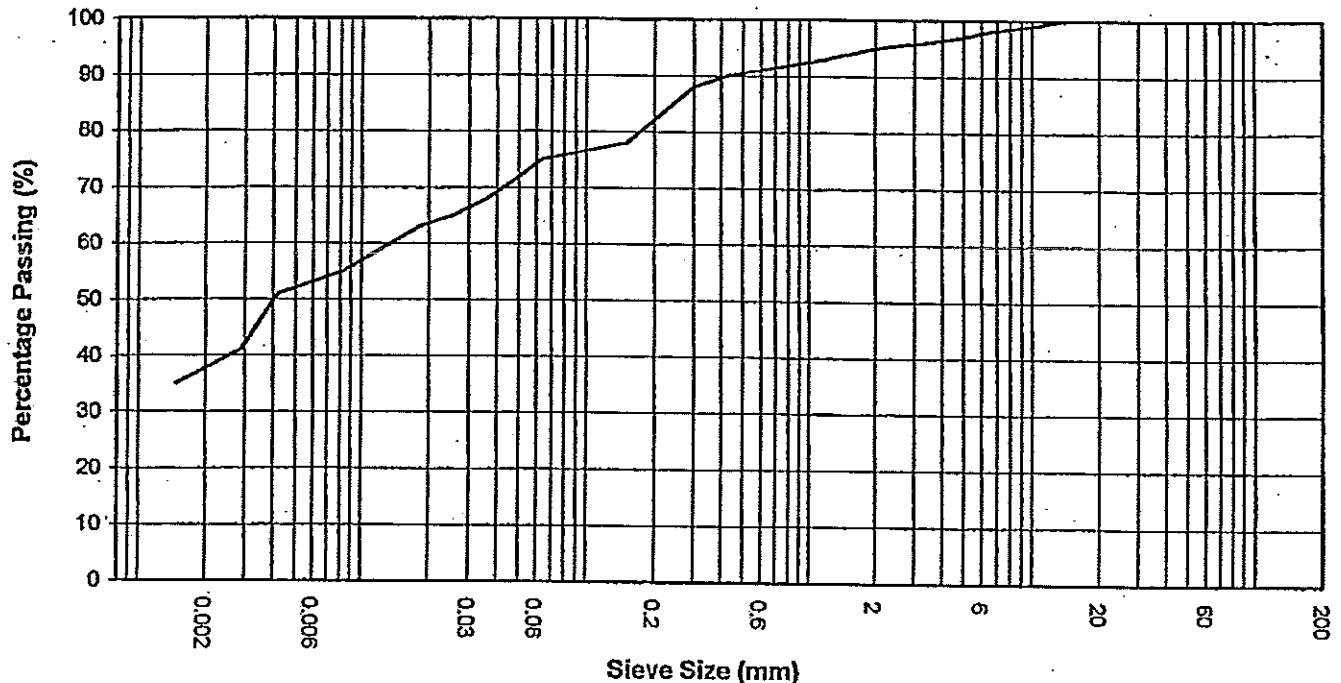
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly slightly sandy CLAY.

Hole ID BH104
Sample no. 02
Depth 1.20
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 37
Silt: 37
Sand: 21
Gravel: 5
Cobbles: 0

Specimen depth 1.20m

Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	97	0.0506	72
63.0	100	3.35	96	0.0361	68
50.0	100	2.00	95	0.0257	65
37.5	100	1.18	93	0.0182	63
28.0	100	0.600	91	0.0083	55
20.0	100	0.425	90	0.0042	51
14.0	100	0.300	88	0.0029	41
10.0	99	0.212	83	0.0015	35
6.3	98	0.150	78		
		0.063	75		

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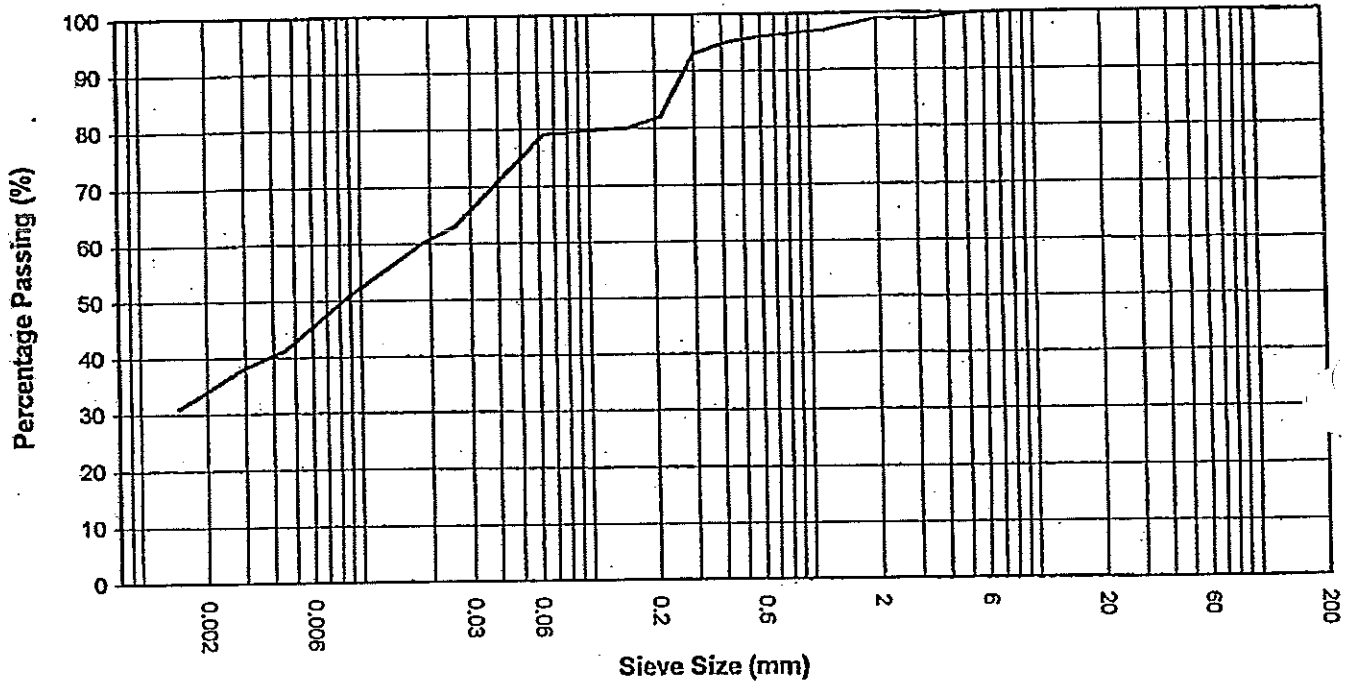
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm to stiff dark brown slightly sandy CLAY.

Hole ID
Sample no. 13
Depth 6.00
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

		Specimen depth	6.00m	Specimen ref.	
PARTICLE SIZE	%	General remarks			
Clay:	33				
Silt:	45				
Sand:	21				
Gravel:	1				
Cobbles:	0				
		Particle density:	2.65	Mg/m³	Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	100	0.0502	75
63.0	100	3.35	99	0.0360	69
50.0	100	2.00	99	0.0257	63
37.5	100	1.18	97	0.0183	60
28.0	100	0.600	96	0.0083	50
20.0	100	0.425	95	0.0044	41
14.0	100	0.300	93	0.0029	38
10.0	100	0.212	82	0.0015	31
6.3	100	0.150	80		
		0.063	79		

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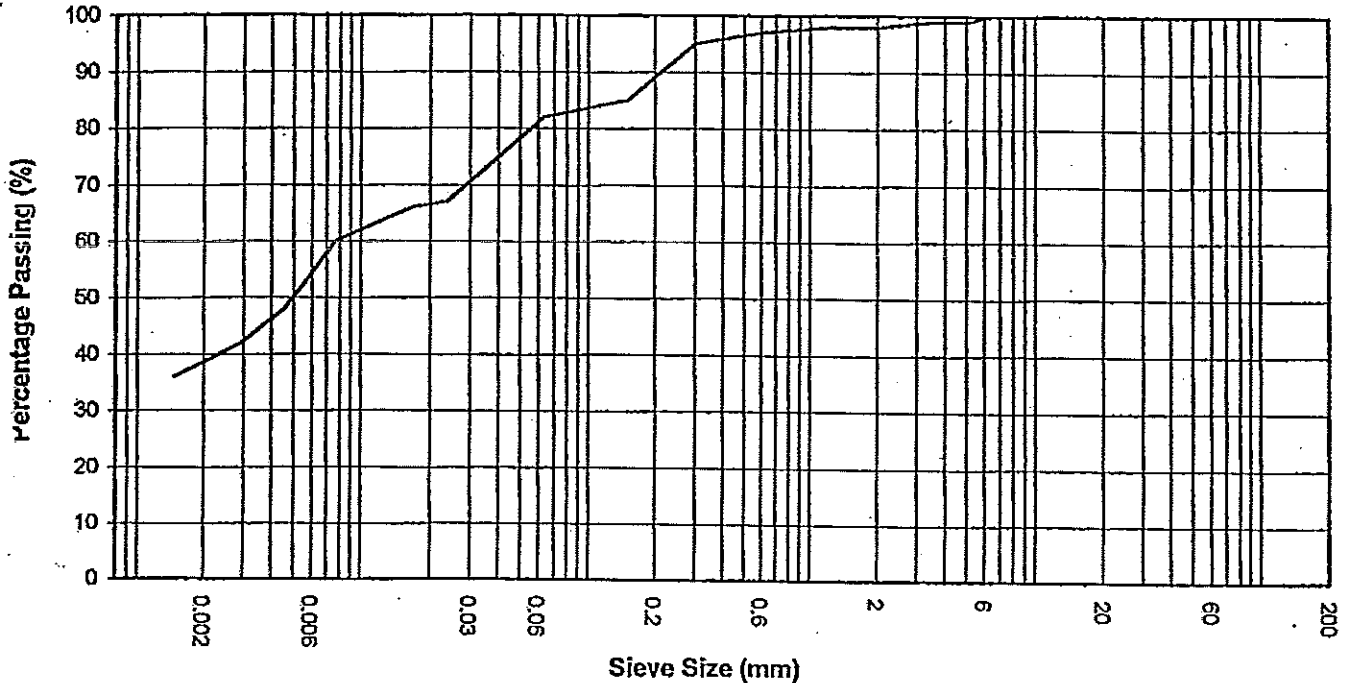
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly slightly sandy CLAY.

Hole ID BH105
Sample no. 03
Depth 0.60
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 38
Silt: 43
Sand: 17
Gravel: 2
Cobbles: 0

Specimen depth 0.60m

Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	99	0.0456	77
63.0	100	3.35	99	0.0329	72
50.0	100	2.00	98	0.0237	67
37.5	100	1.18	98	0.0168	66
28.0	100	0.600	97	0.0077	60
20.0	100	0.425	96	0.0046	48
14.0	100	0.300	95	0.0029	42
10.0	100	0.212	90	0.0015	36
6.3	100	0.150	85		
		0.063	82		

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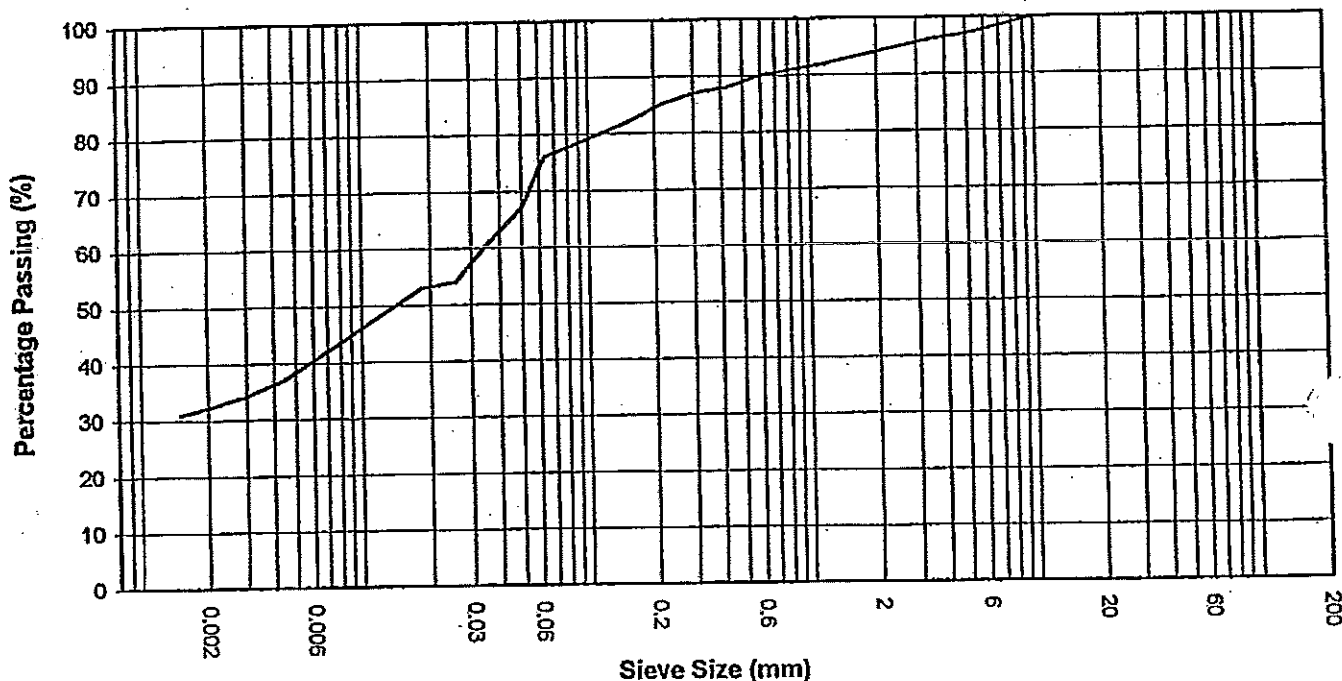
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly slightly sandy CLAY.

Hole ID
Sample no. 09
Depth 3.20
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE		%	Specimen depth	3.20m	Specimen ref.	
Clay:		32	General remarks			
Silt:		42				
Sand:		20				
Gravel:		6				
Cobbles:		0				
Particle density:		2.65	Mg/m³	Assumed		

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	97	0.0499	67
63.0	100	3.35	96	0.0358	61
50.0	100	2.00	94	0.0257	54
37.5	100	1.18	92	0.0182	53
28.0	100	0.600	90	0.0083	44
20.0	100	0.425	88	0.0044	37
14.0	100	0.300	87	0.0029	34
10.0	100	0.212	85	0.0015	31
6.3	98	0.150	82		
		0.063	76		

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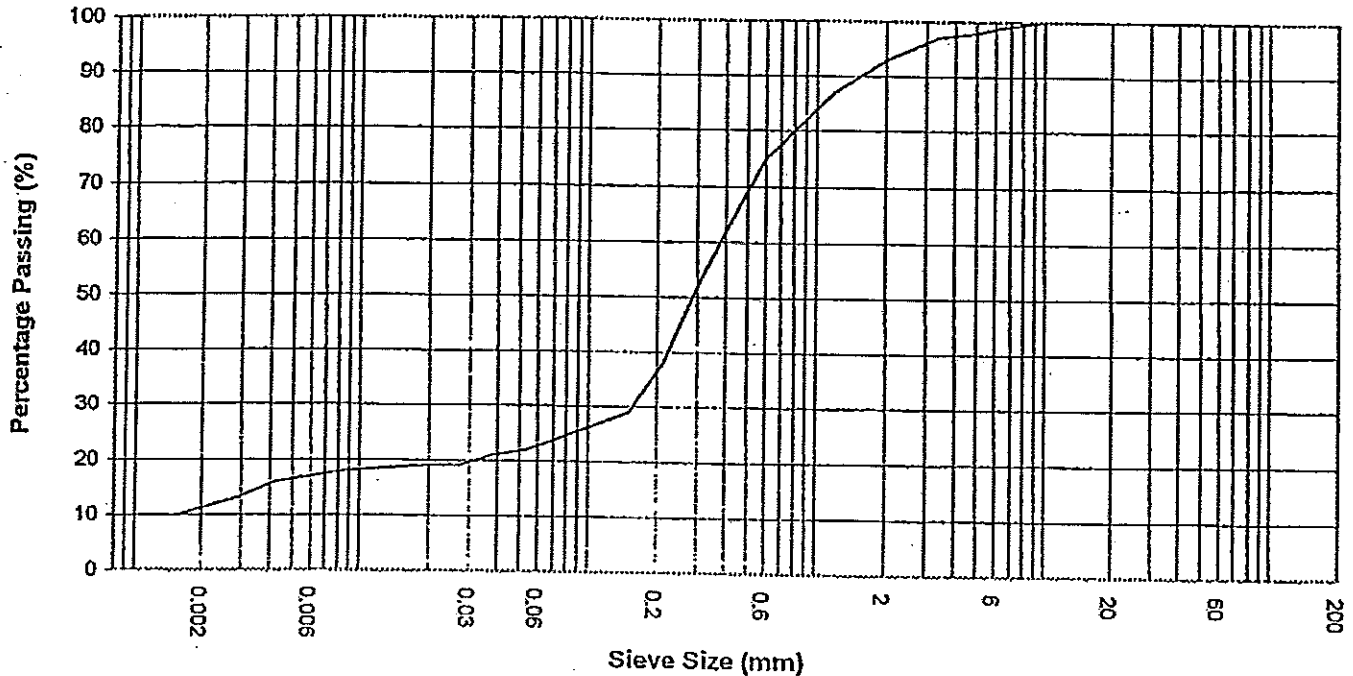
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Soft dark brown slightly clayey SAND.

Hole ID BH1
Sample no. 22
Depth 8.5
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBL
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 11
Silt: 12
Sand: 70
Gravel: 7
Cobbles: 0

Specimen depth 8.50m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	98	0.0531	22
63.0	100	3.35	97	0.0377	21
50.0	100	2.00	93	0.0269	19
37.5	100	1.18	87	0.0190	19
28.0	100	0.600	75	0.0085	18
20.0	100	0.425	64	0.0042	16
14.0	100	0.300	52	0.0029	13
10.0	100	0.212	38	0.0015	10
6.3	99	0.150	29		
		0.063	23		

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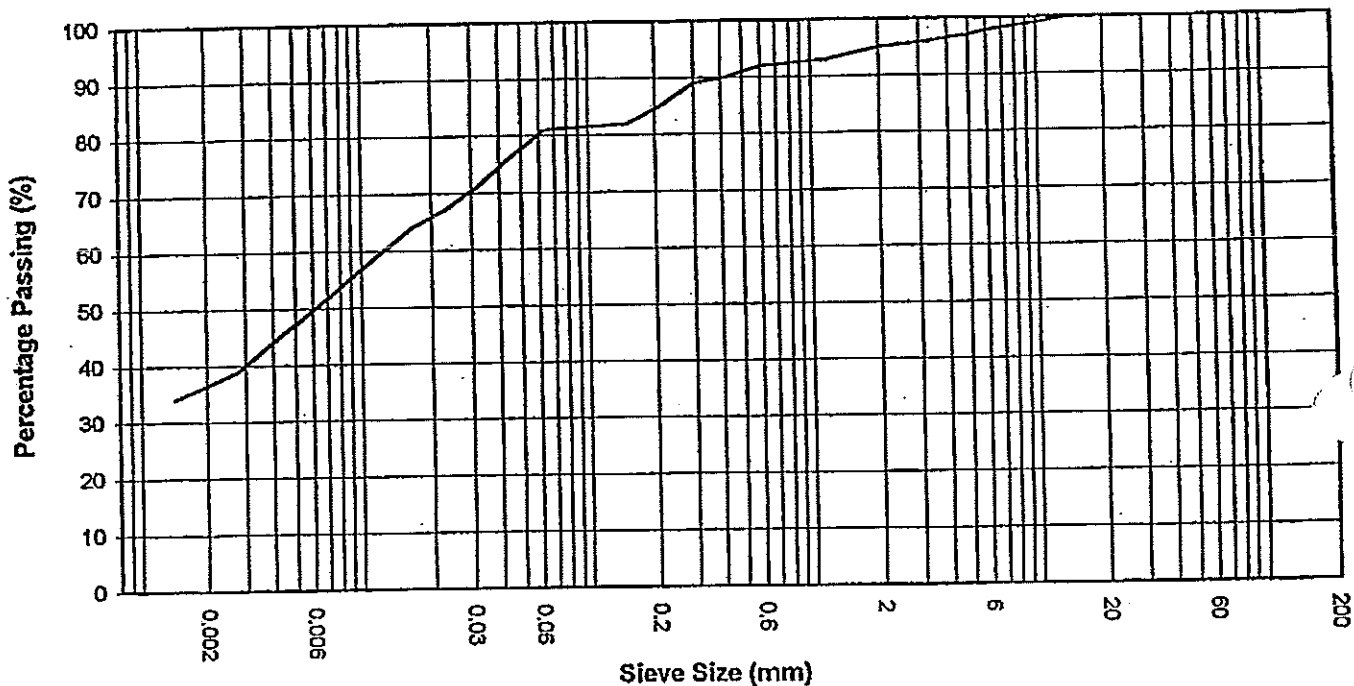
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly slightly sandy CLAY.

Hole ID
Sample no. U4
Depth 1.80
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 36
Silt: 44
Sand: 15
Gravel: 5
Cobbles: 0

Specimen depth 1.80m

Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	97	0.0441	76
63.0	100	3.35	96	0.0318	71
50.0	100	2.00	95	0.0229	67
37.5	100	1.18	93	0.0164	64
28.0	100	0.600	92	0.0077	53
20.0	100	0.425	90	0.0043	45
14.0	100	0.300	89	0.0028	39
10.0	99	0.212	85	0.0014	34
6.3	98	0.150	82		
		0.063	81		

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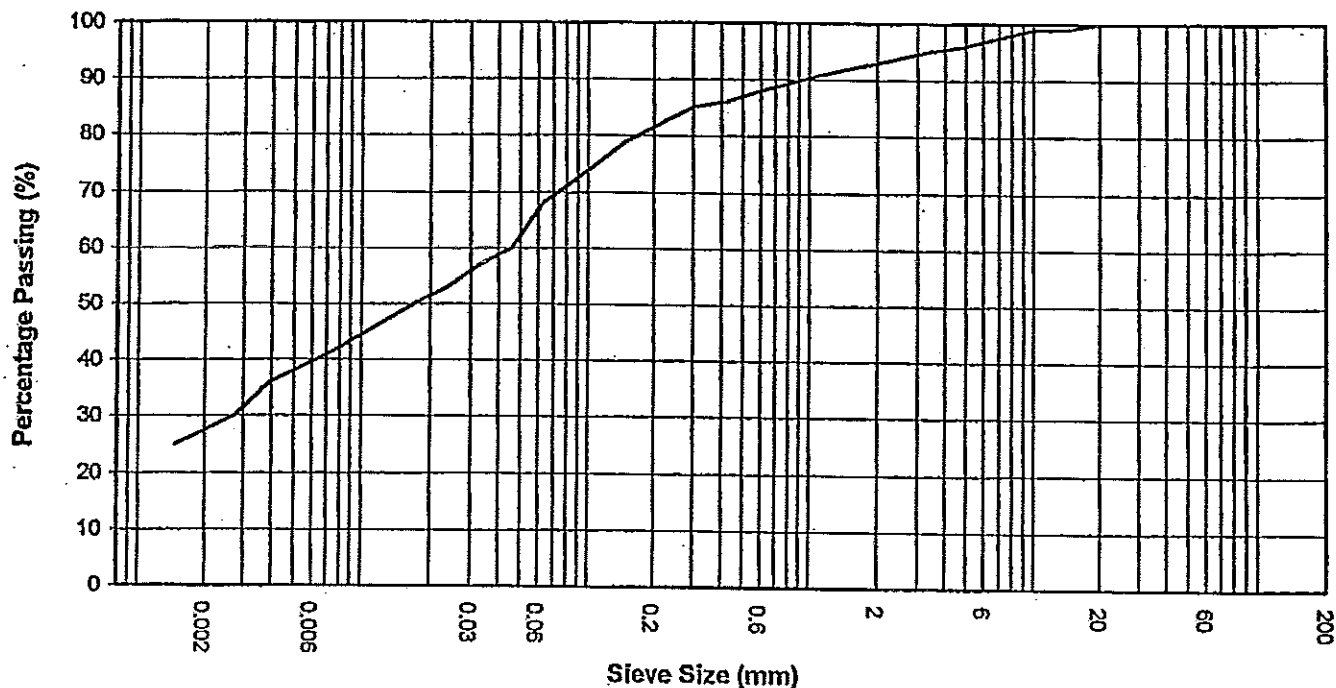
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PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no.	F12963	Hole ID	BH108
Project	Aldbrough Gas Storage Facility	Sample no.	04
Soil description	Brown slightly gravelly slightly sandy CLAY.	Depth	1.50
		Sample type	D
		Page	1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE	%
Clay:	27
Silt:	40
Sand:	26
Gravel:	7
Cobbles:	0

Specimen depth: 1.50m

Specimen ref.

General remarks

Particle density:

2.65

Mg/m³

Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	96	0.0459	60
63.0	100	3.35	95	0.0330	57
50.0	100	2.00	93	0.0237	53
37.5	100	1.18	91	0.0170	50
28.0	100	0.600	88	0.0079	42
20.0	100	0.425	86	0.0040	36
14.0	99	0.300	85	0.0028	30
10.0	99	0.212	82	0.0015	25
6.3	97	0.150	79		
		0.063	68		

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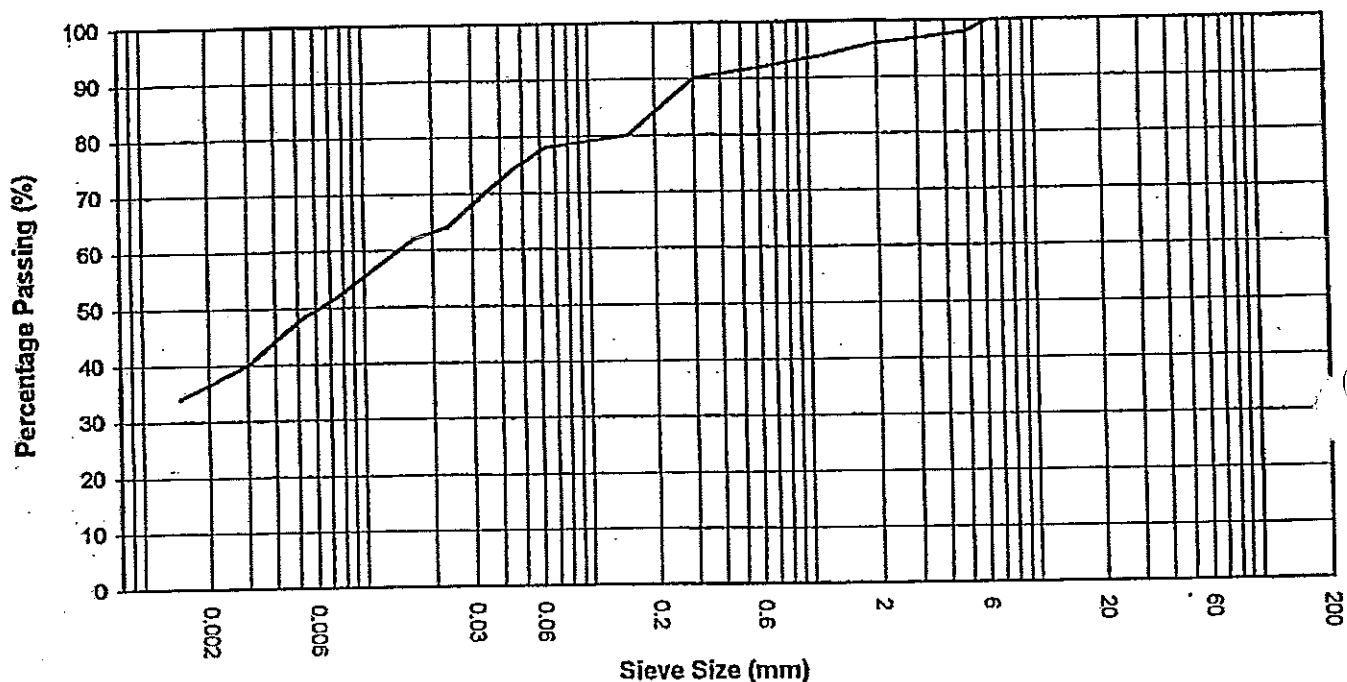
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Dark brown slightly gravelly slightly sandy CLAY.

Hole ID
Sample no. 02
Depth 0.60
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 36
Silt: 41
Sand: 19
Gravel: 4
Cobbles: 0

Specimen depth 0.60m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	98	0.0450	74
63.0	100	3.35	97	0.0324	69
50.0	100	2.00	96	0.0233	64
37.5	100	1.18	94	0.0166	62
28.0	100	0.600	92	0.0077	52
20.0	100	0.425	91	0.0052	48
14.0	100	0.300	90	0.0030	40
10.0	100	0.212	85	0.0015	34
6.3	100	0.150	80		
		0.063	78		

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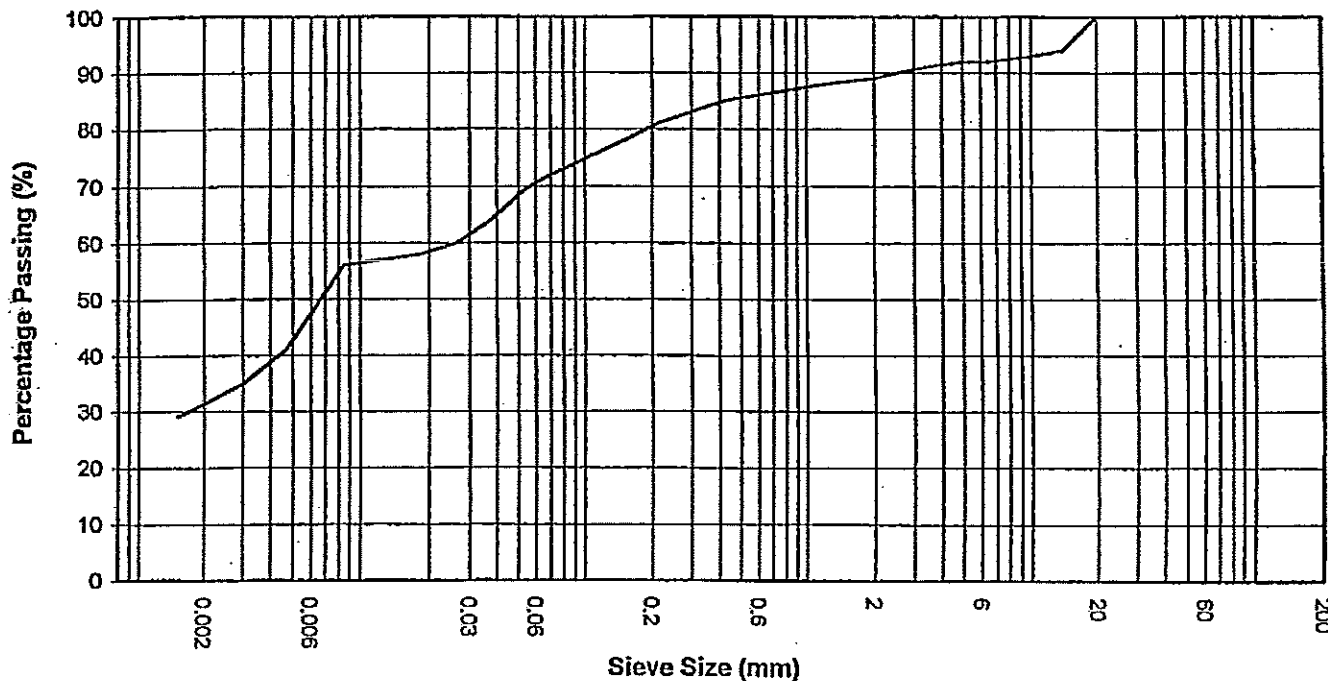
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly slightly sandy CLAY.

Hole ID BH110
Sample no. 02
Depth 1.00
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 31
Silt: 40
Sand: 19
Gravel: 11
Cobbles: 0

Specimen depth 1.00m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	92	0.0523	69
63.0	100	3.35	91	0.0373	64
50.0	100	2.00	89	0.0265	60
37.5	100	1.18	88	0.0188	58
28.0	100	0.600	86	0.0084	56
20.0	100	0.425	85	0.0047	41
14.0	94	0.300	83	0.0030	35
10.0	93	0.212	81	0.0015	29
6.3	92	0.150	78		
		0.063	71		

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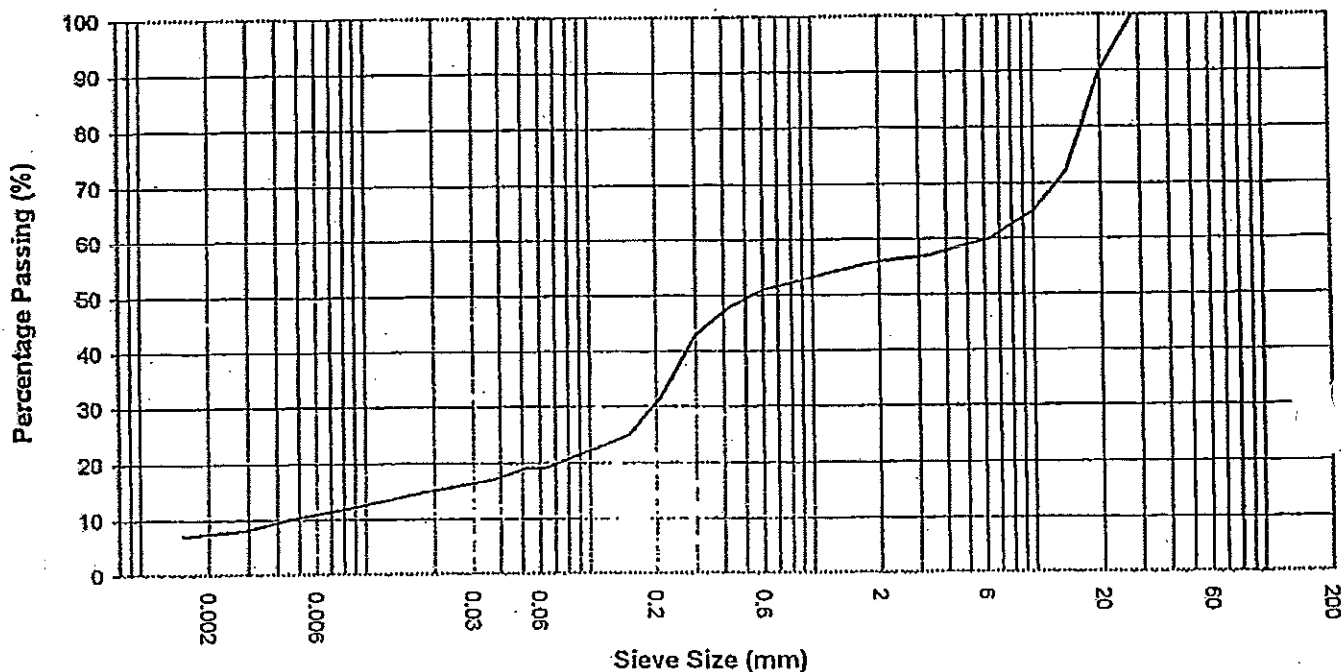
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly clayey SAND and GRAVEL.

Hole ID
Sample no. 12
Depth 1.00
Sample type U
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLI
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 7
Silt: 12
Sand: 37
Gravel: 44
Cobbles: 0

Specimen depth 1.00m Specimen ref.
General remarks
Sample size was insufficient to be representative of particle size distribution
Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	59	0.0520	19
63.0	100	3.35	57	0.0371	17
50.0	100	2.00	56	0.0265	16
37.5	100	1.18	54	0.0188	15
28.0	100	0.600	51	0.0085	12
20.0	90	0.425	48	0.0044	10
14.0	72	0.300	43	0.0029	8
10.0	65	0.212	32	0.0015	7
6.3	60	0.150	25		
		0.063	19		

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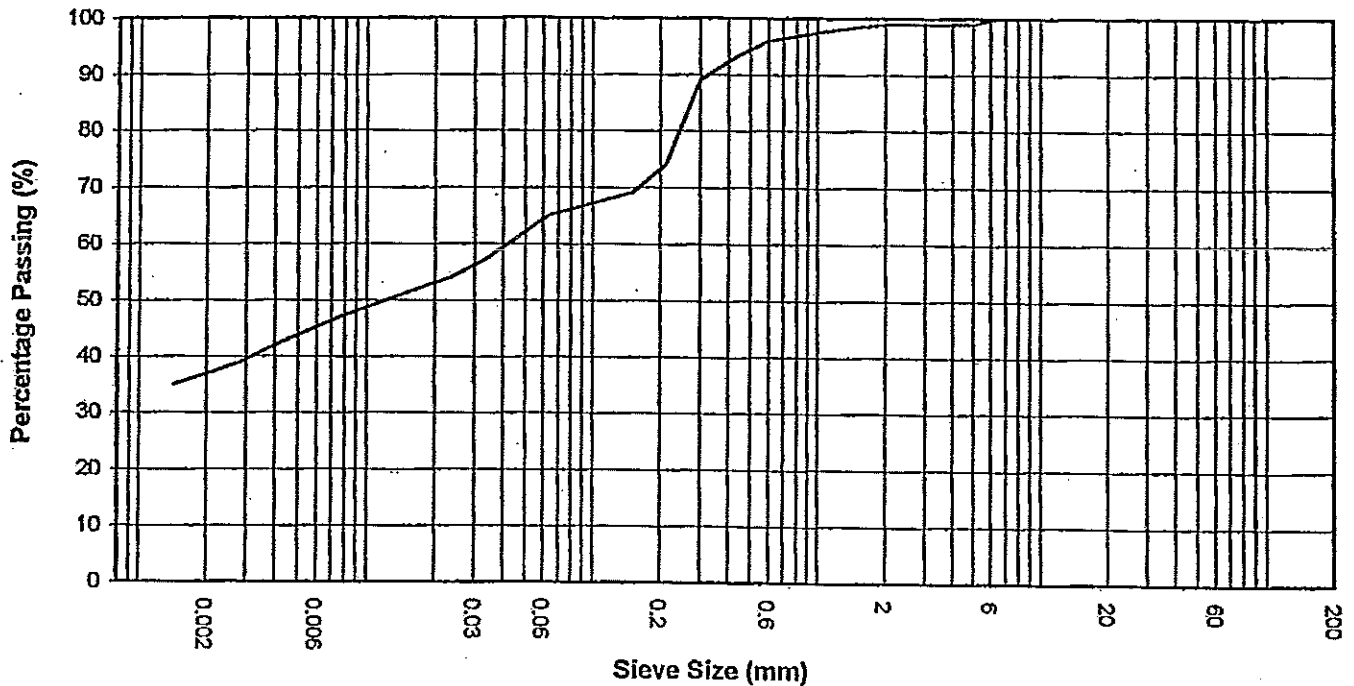
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown sandy CLAY.

Hole ID BH112
Sample no. 01
Depth 1.00
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 37
Silt: 28
Sand: 35
Gravel: 1
Cobbles: 0

Specimen depth 1.00m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	99	0.0458	61
63.0	100	3.35	99	0.0330	57
50.0	100	2.00	99	0.0236	54
37.5	100	1.18	98	0.0168	52
28.0	100	0.600	96	0.0077	47
20.0	100	0.425	93	0.0045	43
14.0	100	0.300	89	0.0028	39
10.0	100	0.212	74	0.0014	35
6.3	100	0.150	69		
		0.063	65		

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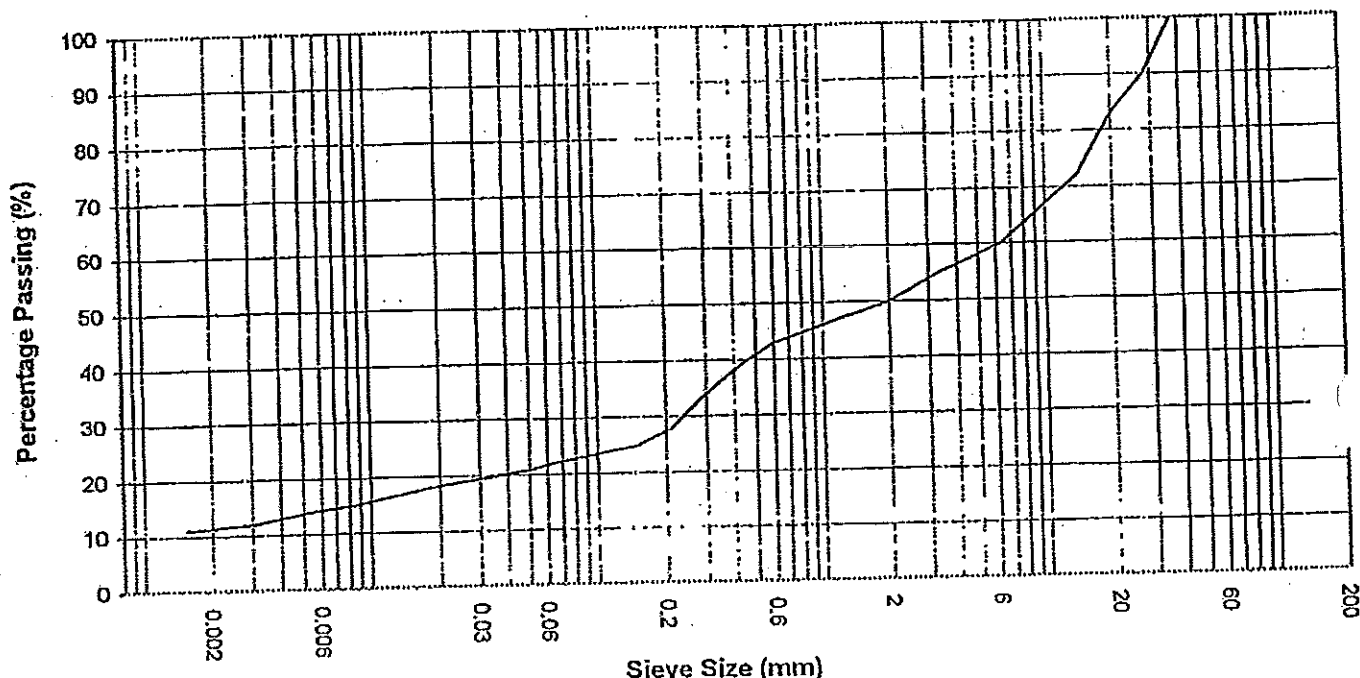
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly sandy gravelly CLAY.

Hole ID
Sample no. 04
Depth 1.80
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE		%	Specimen depth	1.80m	Specimen ref.
Clay:		11	General remarks Sample size was insufficient to be representative of particle size distribution		
Silt:		10			
Sand:		28			
Gravel:		50			
Cobbles:		0			
Particle density:		2.65	Mg/m ³	Assumed	

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	58	0.0517	21
63.0	100	3.35	55	0.0368	20
50.0	100	2.00	50	0.0261	19
37.5	100	1.18	47	0.0185	18
28.0	90	0.600	43	0.0084	15
20.0	83	0.425	39	0.0053	14
14.0	72	0.300	34	0.0032	12
10.0	67	0.212	28	0.0016	11
6.3	60	0.150	25		
		0.063	22		

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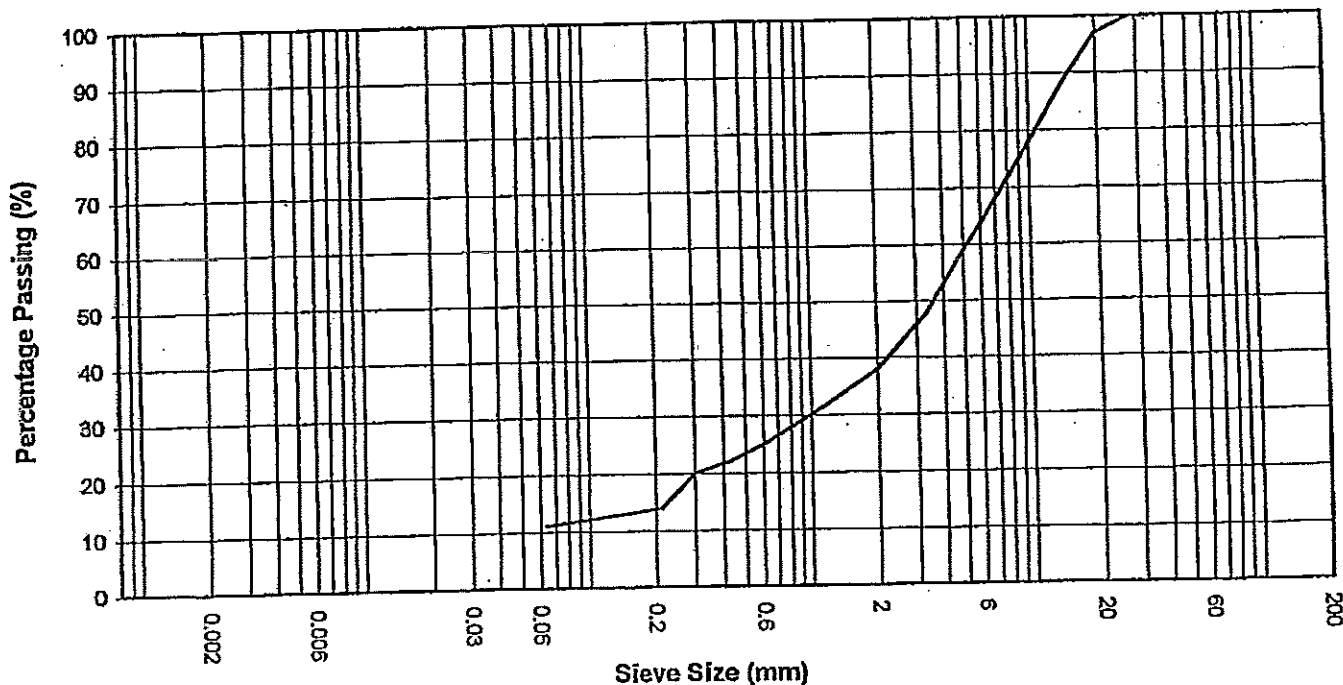
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly sandy GRAVEL.

Hole ID BH112
Sample no. 06
Depth 2.60
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE		%	Specimen depth	2.60m	Specimen ref.
Silt and clay:		11	General remarks		
Sand:		27			
Gravel:		62			
Cobbles:		0			

WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	59
63.0	100	3.35	48
50.0	100	2.00	38
37.5	100	1.18	32
28.0	100	0.600	25
20.0	97	0.425	22
14.0	88	0.300	20
10.0	78	0.212	14
6.3	65	0.150	13
		0.063	11

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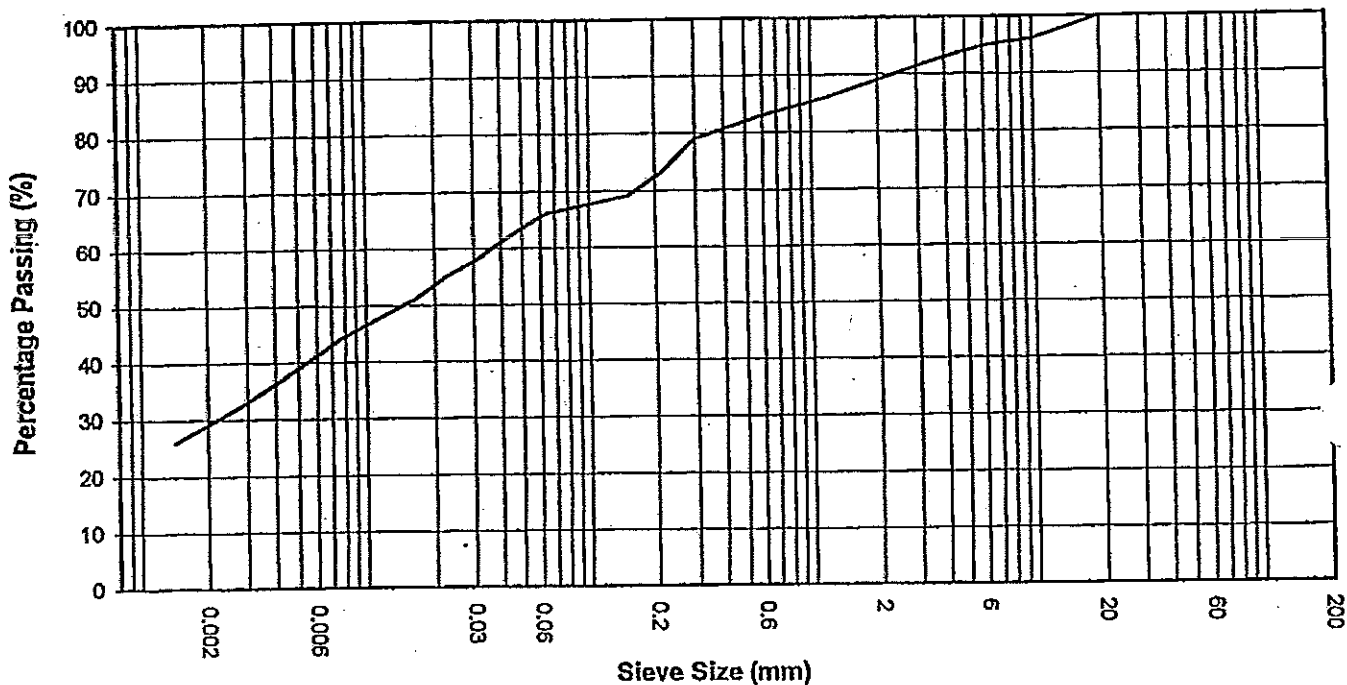
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Dark brown slightly gravelly slightly sandy CLAY.

Hole ID B1
Sample no. 10
Depth 4.80 m
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE		%	Specimen depth	4.80m	Specimen ref.
Clay:		29	General remarks		
Silt:		37			
Sand:		24			
Gravel:		11			
Cobbles:		0			
			Particle density:	2.65	Mg/m ³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	94	0.0432	62
63.0	100	3.35	92	0.0313	58
50.0	100	2.00	89	0.0225	55
37.5	100	1.18	86	0.0163	51
28.0	100	0.600	83	0.0075	44
20.0	100	0.425	81	0.0040	36
14.0	98	0.300	79	0.0027	32
10.0	96	0.212	73	0.0014	26
6.3	95	0.150	69		
		0.063	66		

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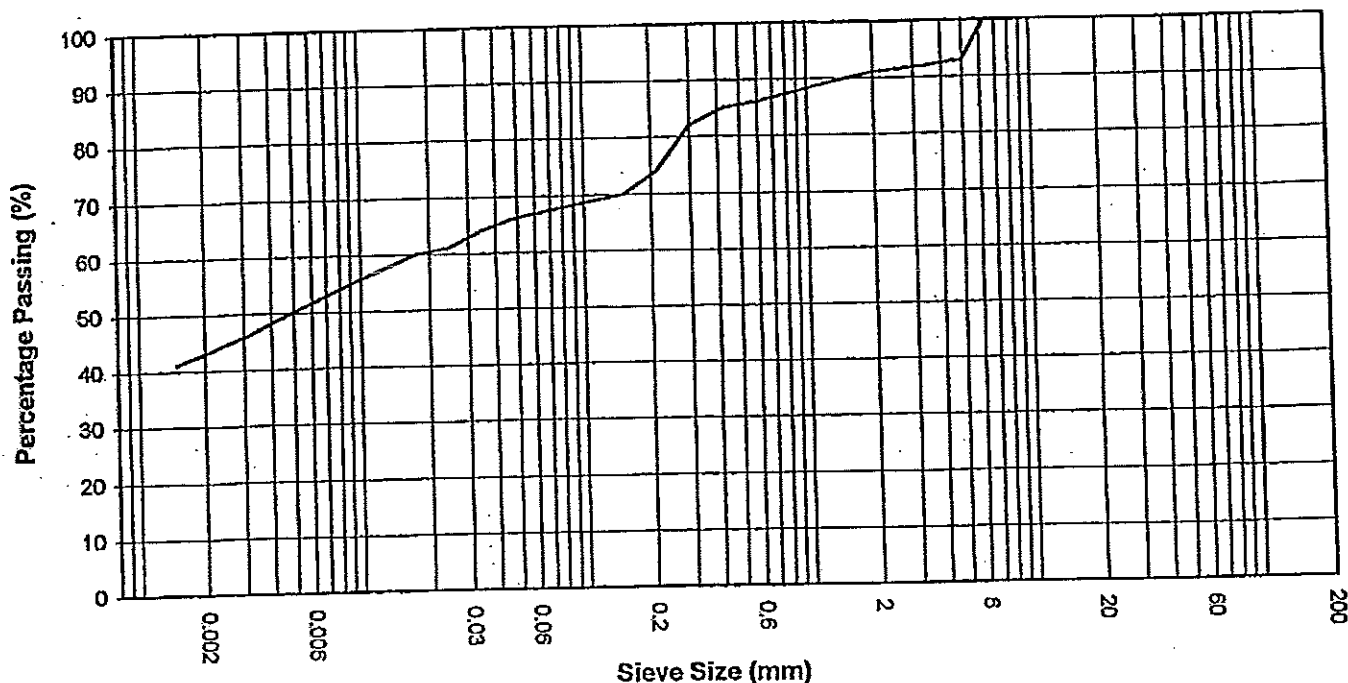
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly slightly sandy CLAY.

Hole ID BH118
Sample no. 02
Depth 0.60
Sample type D
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 43
Silt: 24
Sand: 24
Gravel: 9
Cobbles: 0

Specimen depth 0.60m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	93
63.0	100	3.35	92
50.0	100	2.00	91
37.5	100	1.18	89
28.0	100	0.600	86
20.0	100	0.425	85
14.0	100	0.300	82
10.0	100	0.212	74
6.3	100	0.150	70
		0.063	67

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing
0.0483	66
0.0343	64
0.0245	61
0.0174	60
0.0091	55
0.0056	51
0.0031	46
0.0015	41

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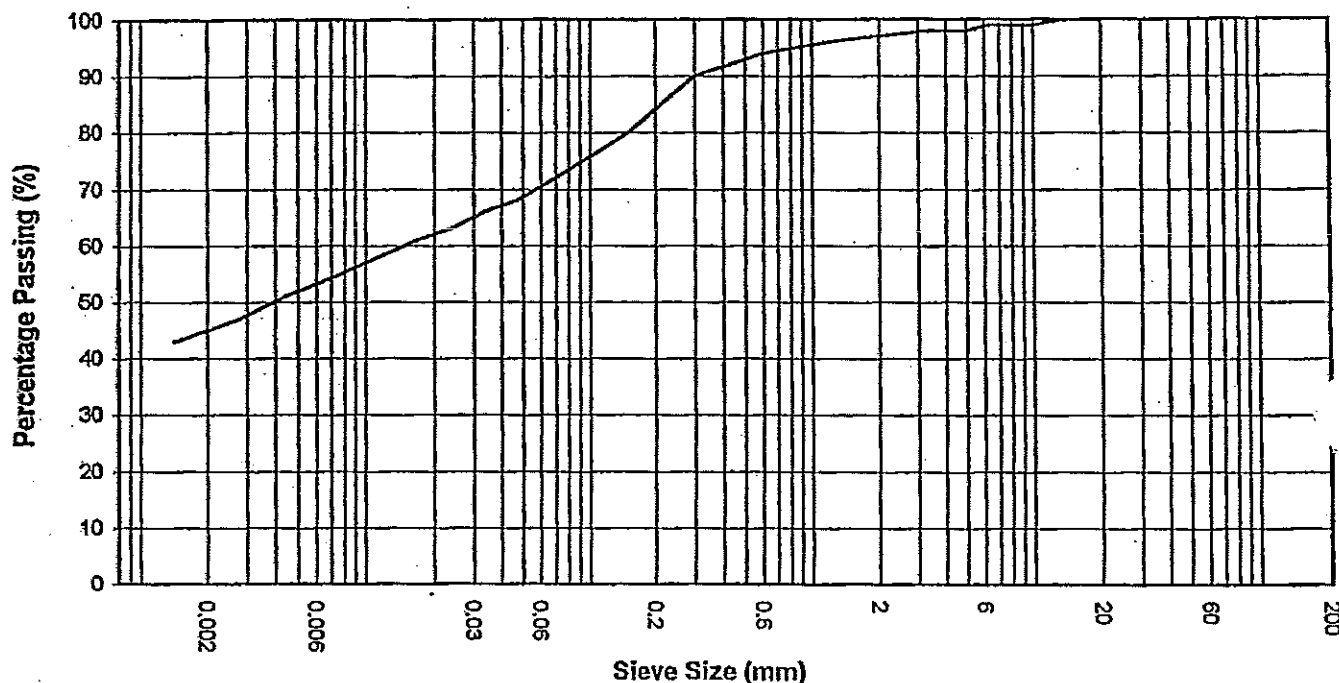
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly gravelly slightly sandy CLAY.

Hole ID B
Sample no. 05
Depth 0.80 m
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 45
Silt: 26
Sand: 27
Gravel: 3
Cobbles: 0

Specimen depth 0.80m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA

SEDIMENTATION DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	98	0.0467	68
63.0	100	3.35	98	0.0333	66
50.0	100	2.00	97	0.0238	63
37.5	100	1.18	96	0.0169	61
28.0	100	0.600	94	0.0077	55
20.0	100	0.425	92	0.0044	51
14.0	100	0.300	90	0.0028	47
10.0	99	0.212	85	0.0014	43
6.3	99	0.150	80		
		0.063	71		

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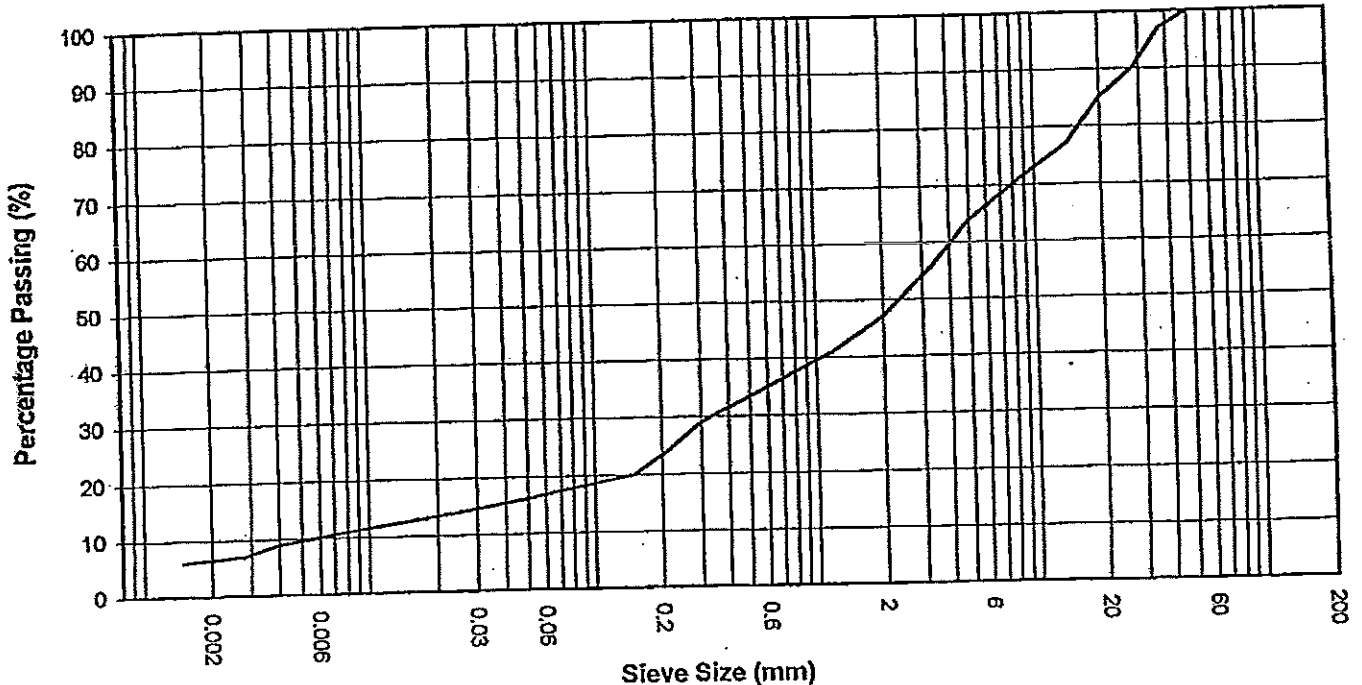
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly clayey sandy GRAVEL.

Hole ID BH118
Sample no. 06
Depth 2.50 m
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 6
Silt: 10
Sand: 30
Gravel: 53
Cobbles: 0

Specimen depth 2.50m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA

SEDIMENTATION DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	64	0.0483	16
63.0	100	3.35	56	0.0346	15
50.0	100	2.00	47	0.0248	14
37.5	97	1.18	41	0.0176	13
28.0	90	0.600	35	0.0081	11
20.0	85	0.425	32	0.0041	9
14.0	77	0.300	29	0.0028	7
10.0	73	0.212	24	0.0015	6
6.3	67	0.150	20		
		0.063	17		

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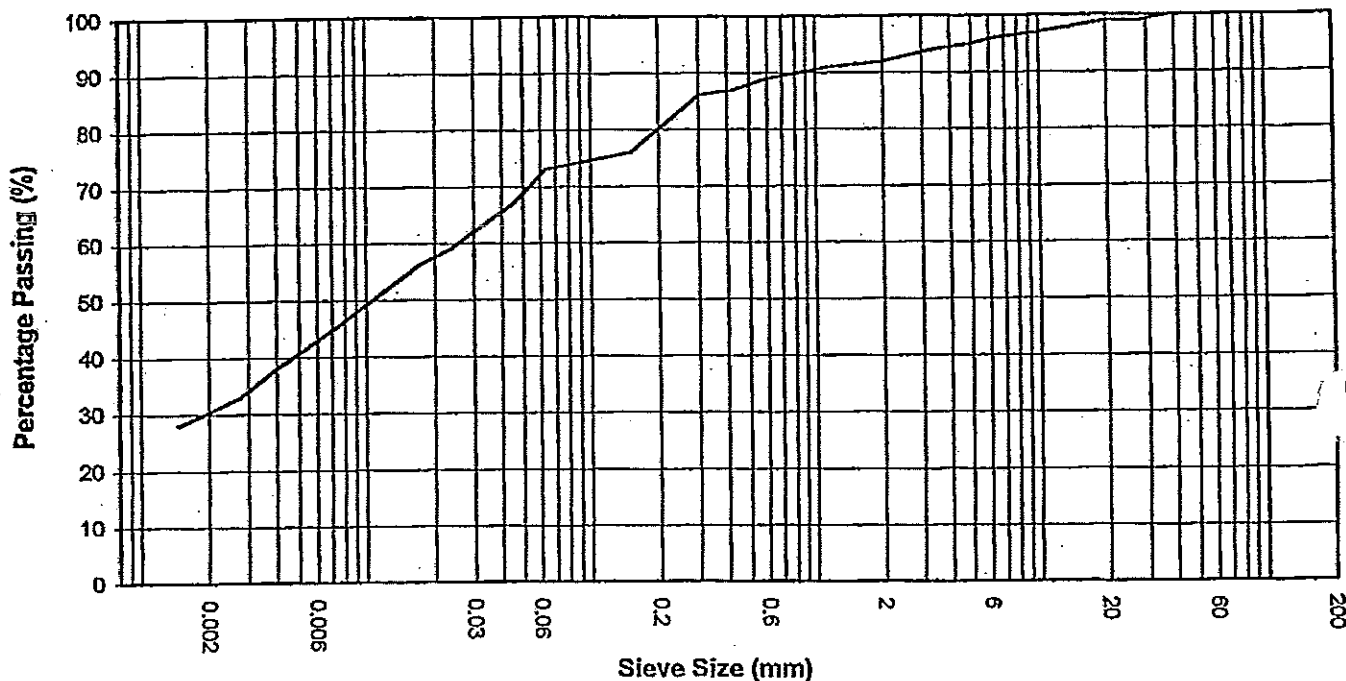
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly slightly sandy CLAY.

Hole ID T
Sample no. 03
Depth 1.00 m
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE

Clay: 30
Silt: 42
Sand: 20
Gravel: 8
Cobbles: 0

Specimen depth: 1.00m

Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA

SEDIMENTATION DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	95	0.0454	67
63.0	100	3.35	94	0.0327	63
50.0	100	2.00	92	0.0235	59
37.5	100	1.18	91	0.0168	56
28.0	99	0.600	89	0.0078	46
20.0	99	0.425	87	0.0040	38
14.0	98	0.300	86	0.0027	33
10.0	97	0.212	81	0.0015	28
6.3	96	0.150	76		
		0.063	73		

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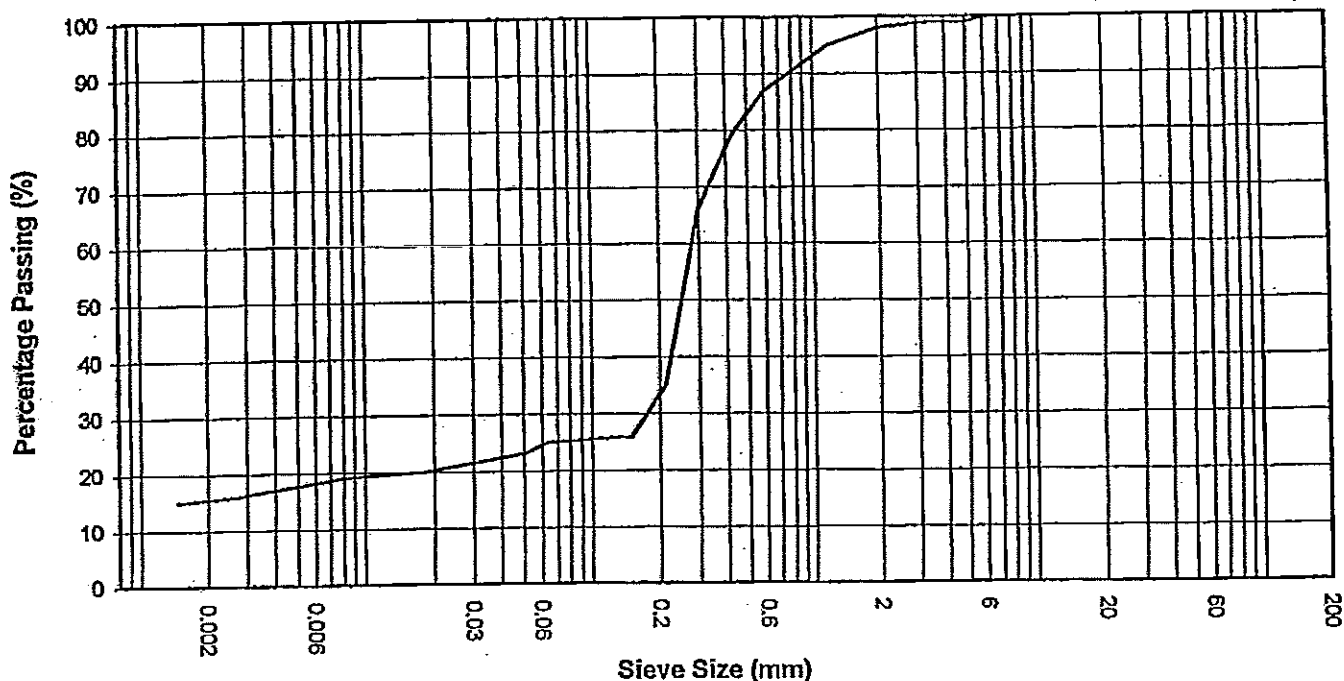
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown and grey slightly gravelly slightly clayey SAND.

Hole ID TP219
Sample no. 03
Depth 1.00 m
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 15
Silt: 9
Sand: 73
Gravel: 2
Cobbles: 0

Specimen depth 1.00m Specimen ref.
General remarks
Sample size was insufficient to be representative of particle size distribution
Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	99	0.0502	23
63.0	100	3.35	99	0.0358	22
50.0	100	2.00	98	0.0255	21
37.5	100	1.18	95	0.0181	20
28.0	100	0.600	87	0.0082	19
20.0	100	0.425	79	0.0041	17
14.0	100	0.300	66	0.0028	16
10.0	100	0.212	35	0.0015	15
6.3	100	0.150	26		
		0.063	25		

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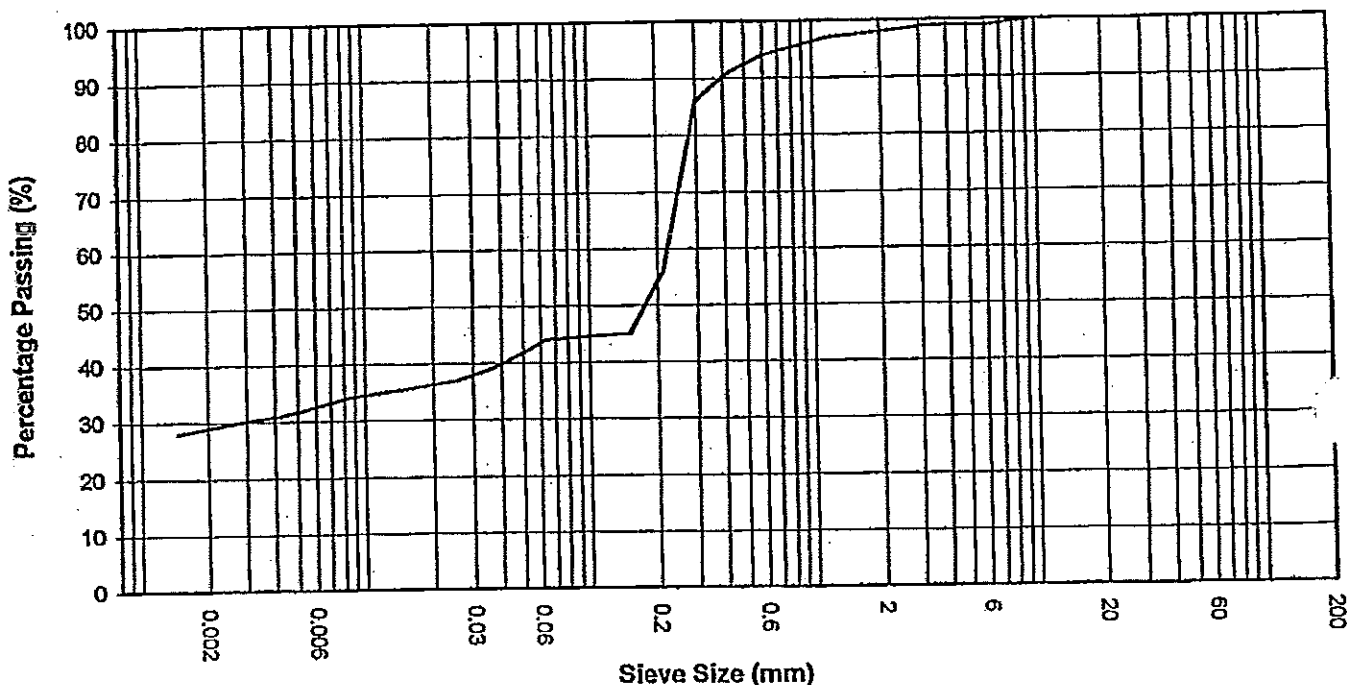
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2, 9.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Orangish brown and grey slightly gravelly very sandy CLAY.

Hole ID T
Sample no. U3
Depth 1.00 m
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE %
Clay: 29
Silt: 15
Sand: 54
Gravel: 2
Cobbles: 0

Specimen depth 1.00m Specimen ref.

General remarks

Particle density: 2.65 Mg/m³ Assumed

WET SIEVE DATA

SEDIMENTATION DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	99
63.0	100	3.35	99
50.0	100	2.00	98
37.5	100	1.18	97
28.0	100	0.600	94
20.0	100	0.425	91
14.0	100	0.300	86
10.0	100	0.212	56
6.3	99	0.150	45
		0.063	44

Equivalent particle diameter mm	Cumulative % passing
0.0510	42
0.0363	39
0.0259	37
0.0183	36
0.0083	34
0.0042	31
0.0028	30
0.0015	28

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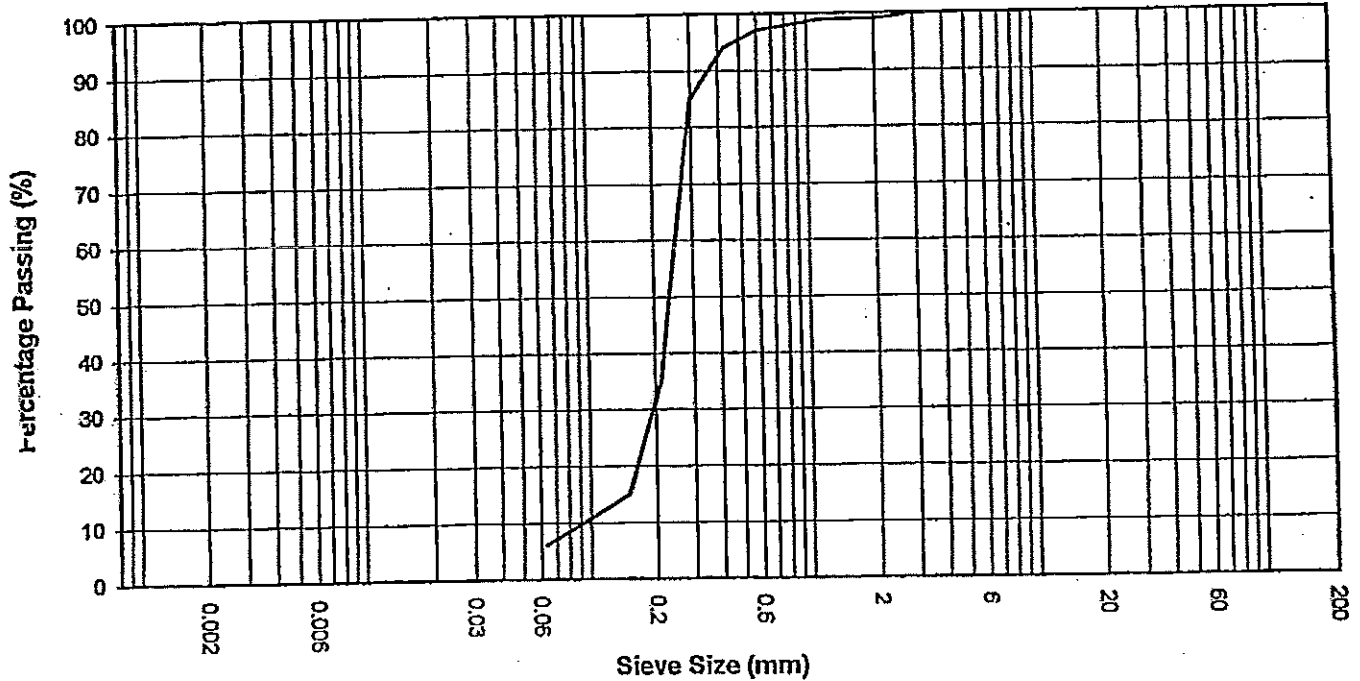
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2

Tract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly clayey SAND.

Hole ID TP220
Sample no. 06
Depth 2.00 m
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE	%	Specimen depth	2.00m	Specimen ref.
Silt and clay:	6	General remarks		
Sand:	93			
Gravel:	1			
Cobbles:	0			

WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	99
37.5	100	1.18	99
28.0	100	0.600	97
20.0	100	0.425	94
14.0	100	0.300	85
10.0	100	0.212	35
6.3	100	0.150	15
		0.063	6

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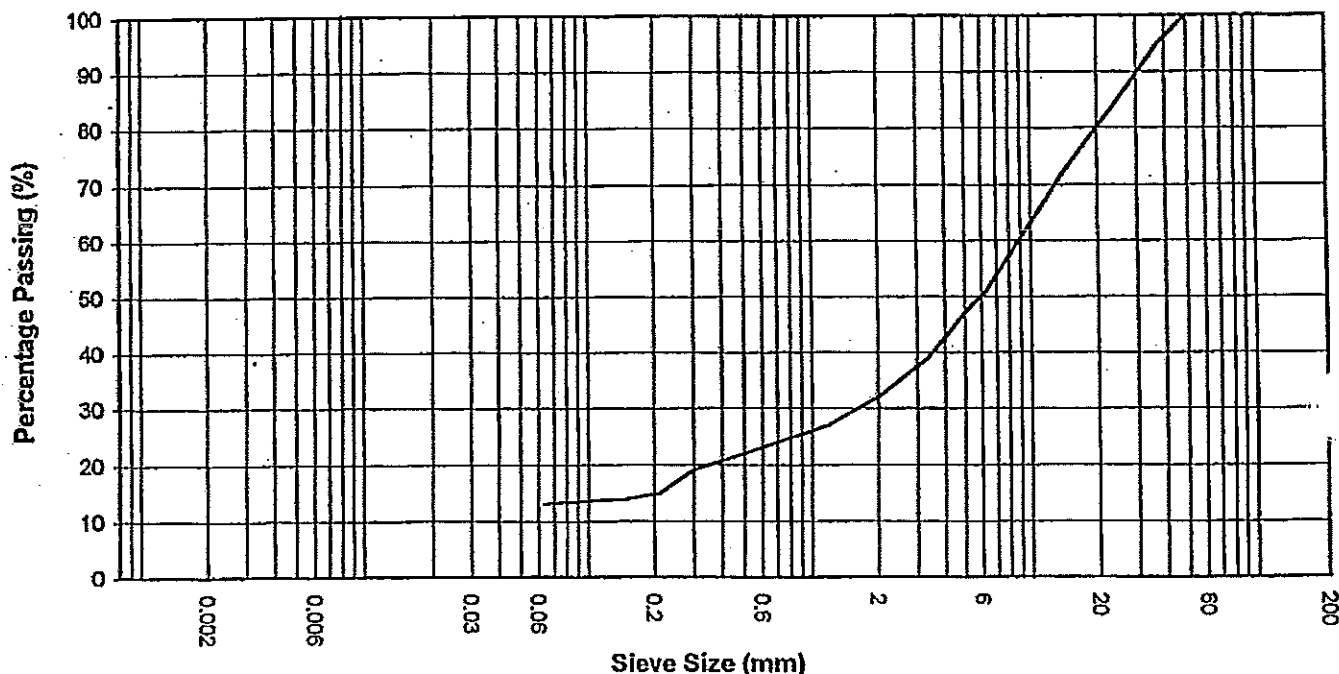
PARTICLE SIZE DISTRIBUTION

**NORWEST
HOLST**

BS 1377: Part 2: 1990: 9.2

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Brown slightly clayey slightly sandy GRAVEL.

Hole ID
Sample no. 06
Depth 2.00
Sample type B
Page 1 of 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLE
	SILT			SAND			GRAVEL			

PARTICLE SIZE	%	Specimen depth	2.00m	Specimen ref.
Silt and clay:	13	General remarks		
Sand:	19			
Gravel:	68			
Cobbles:	0			

WET SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	47
63.0	100	3.35	39
50.0	100	2.00	32
37.5	95	1.18	27
28.0	88	0.600	23
20.0	80	0.425	21
14.0	72	0.300	19
10.0	63	0.212	15
6.3	51	0.150	14
		0.063	13

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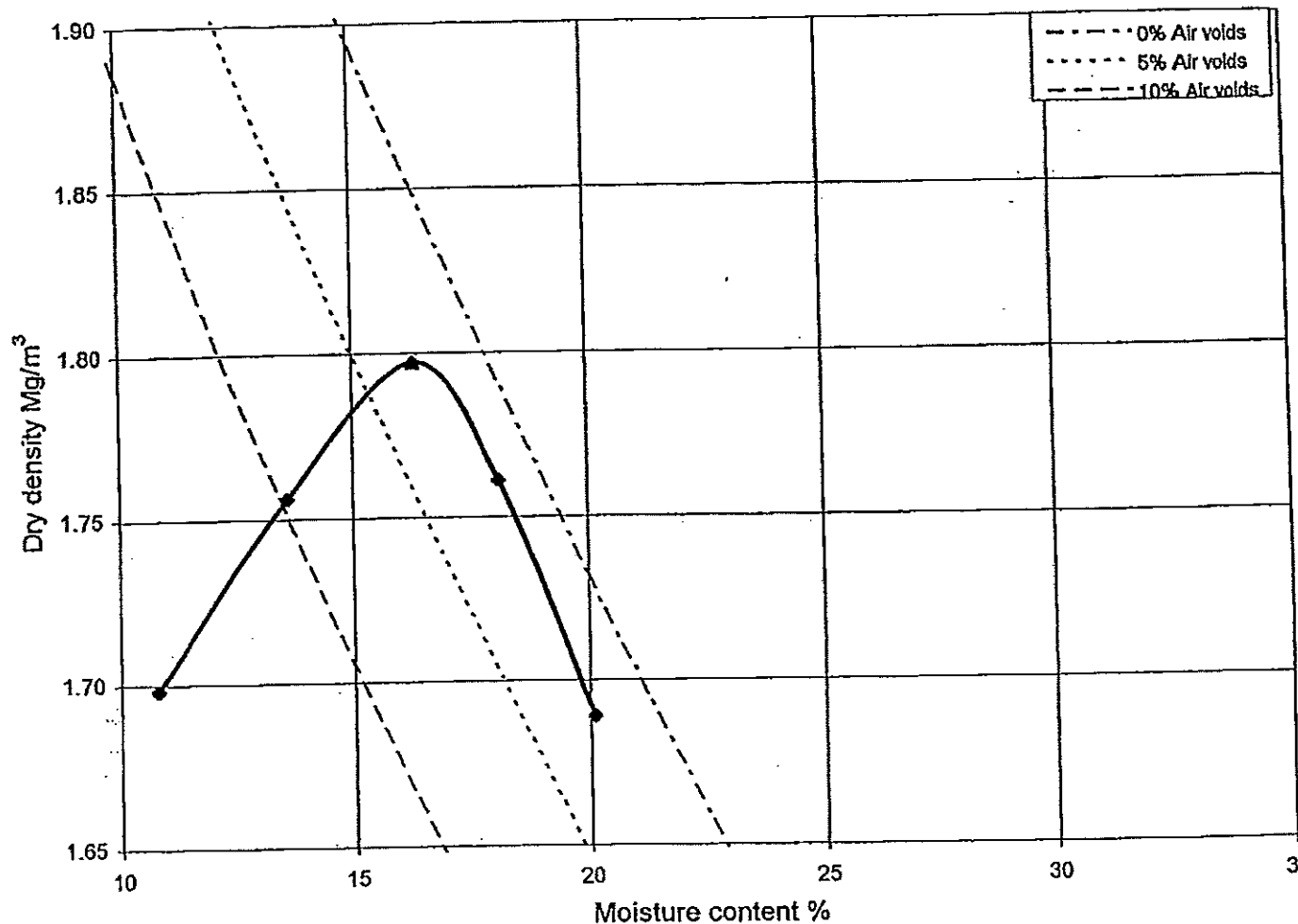
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil Description Reddish brown slightly gravelly CLAY.

Hole ID TP208
Sample no. 06
Depth 2.00 m
Sample type AMAL
Page 1 of 1



Maximum dry density 1.80 Mg/m³
Optimum moisture content 16 %
Corrected maximum dry density for removal of gravel 1.80 Mg/m³

Method of compaction 2.5 kg Rammer

Batches tested Separate batches tested
Particle density Assumed 2.65 Mg/m³
Gravel retained on 20mm sieve 1 %
Gravel retained on 37.5mm sieve 0 %

Experimental points	
Moisture content %	Dry Density Mg/m³
10.8	1.70
13.6	1.76
16.3	1.80
18.1	1.76
20.1	1.69

Amalgamation TP208,06,B,2.00m+TP207,06,B,2.00m.
General remarks

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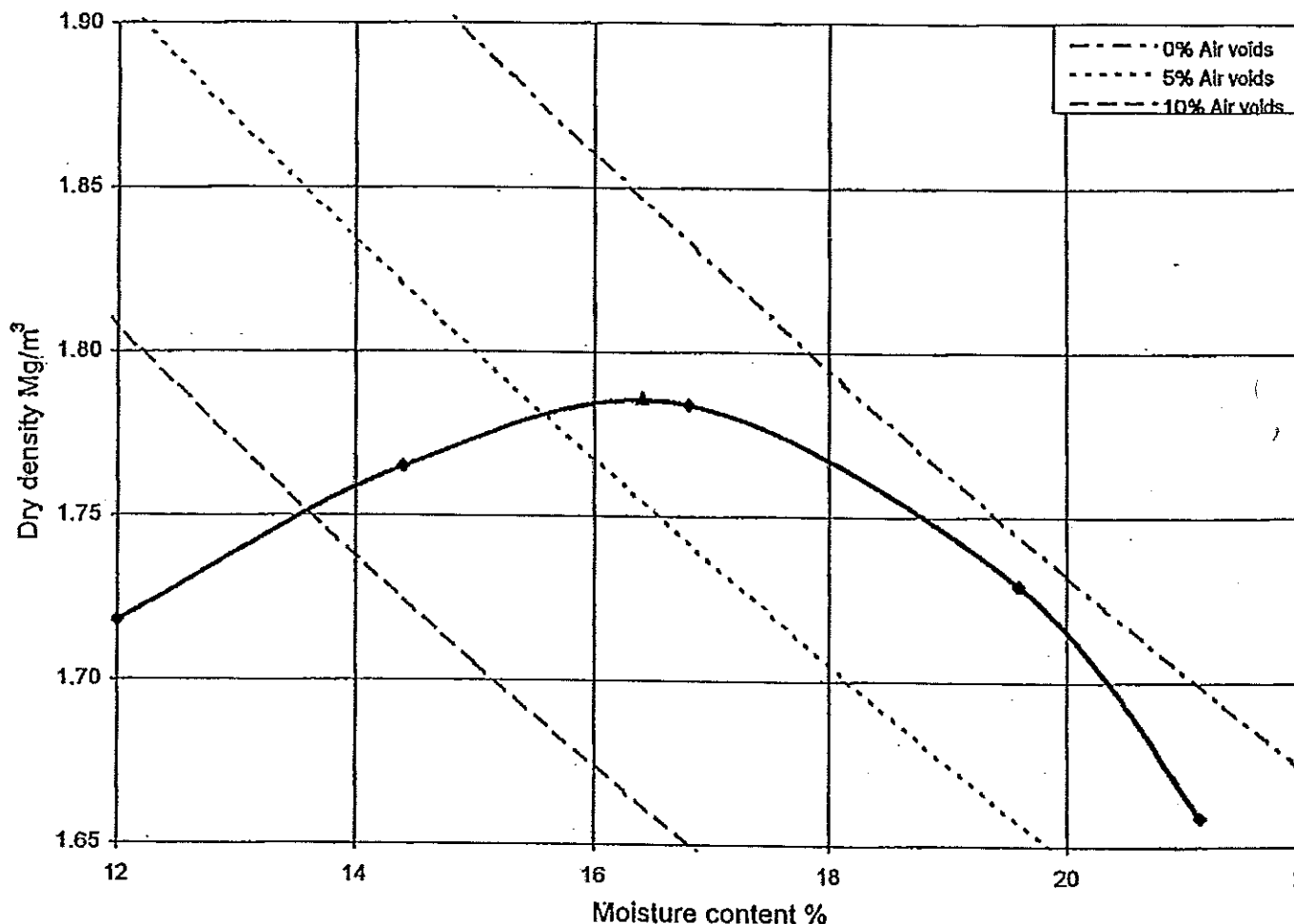
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil Description Reddish brown slightly gravelly CLAY.

Hole ID
Sample no. 03
Depth 1.00
Sample type AMAL
Page 1 of 1



Maximum dry density 1.79 Mg/m³
Optimum moisture content 16 %
Corrected maximum dry density for removal of gravel 1.79 Mg/m³

Method of compaction 2.5 kg Rammer

Batches tested Single specimen
Particle density Assumed 2.65 Mg/m³
Gravel retained on 20mm sieve 1 %
Gravel retained on 37.5mm sieve 0 %

Experimental points

Moisture content %	Dry Density Mg/m³
12.0	1.72
14.4	1.77
16.8	1.78
19.6	1.73
21.1	1.66

Nat

Amalgamation TP211,03,B,1.00m+TP211,06,B,2.00m.
General remarks Test performed on specimen unsuitable due to gravel content.

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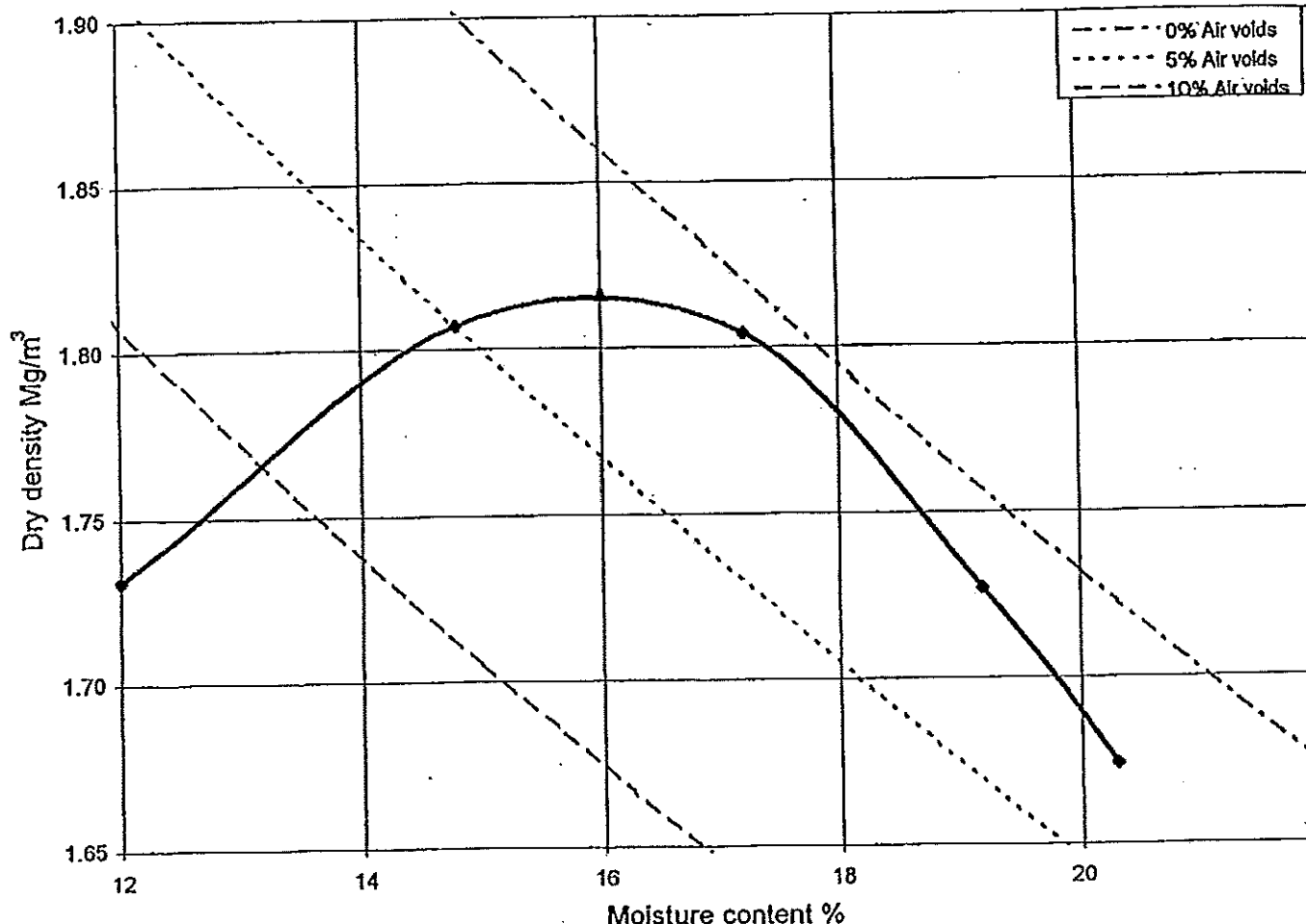
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil Description Brown slightly gravelly CLAY.

Hole ID TP212
Sample no. 03
Depth 1.00
Sample type AMAL
Page 1 of 1



Maximum dry density 1.82 Mg/m³
Optimum moisture content 16 %
Corrected maximum dry density for removal of gravel 1.82 Mg/m³

Method of compaction 2.5 kg Rammer

Batches tested Single specimen
Particle density Assumed 2.65 Mg/m³
Gravel retained on 20mm sieve 1 %
Gravel retained on 37.5mm sieve 0 %

Experimental points

Moisture content %	Dry Density Mg/m³
12.0	1.73
14.8	1.81
17.2	1.80
19.2	1.73
20.3	1.67

Nat

Amalgamation TP212,03,B,1.00m+TP212,06,B,2.00m.

General remarks Test performed on specimen unsuitable due to gravel content.

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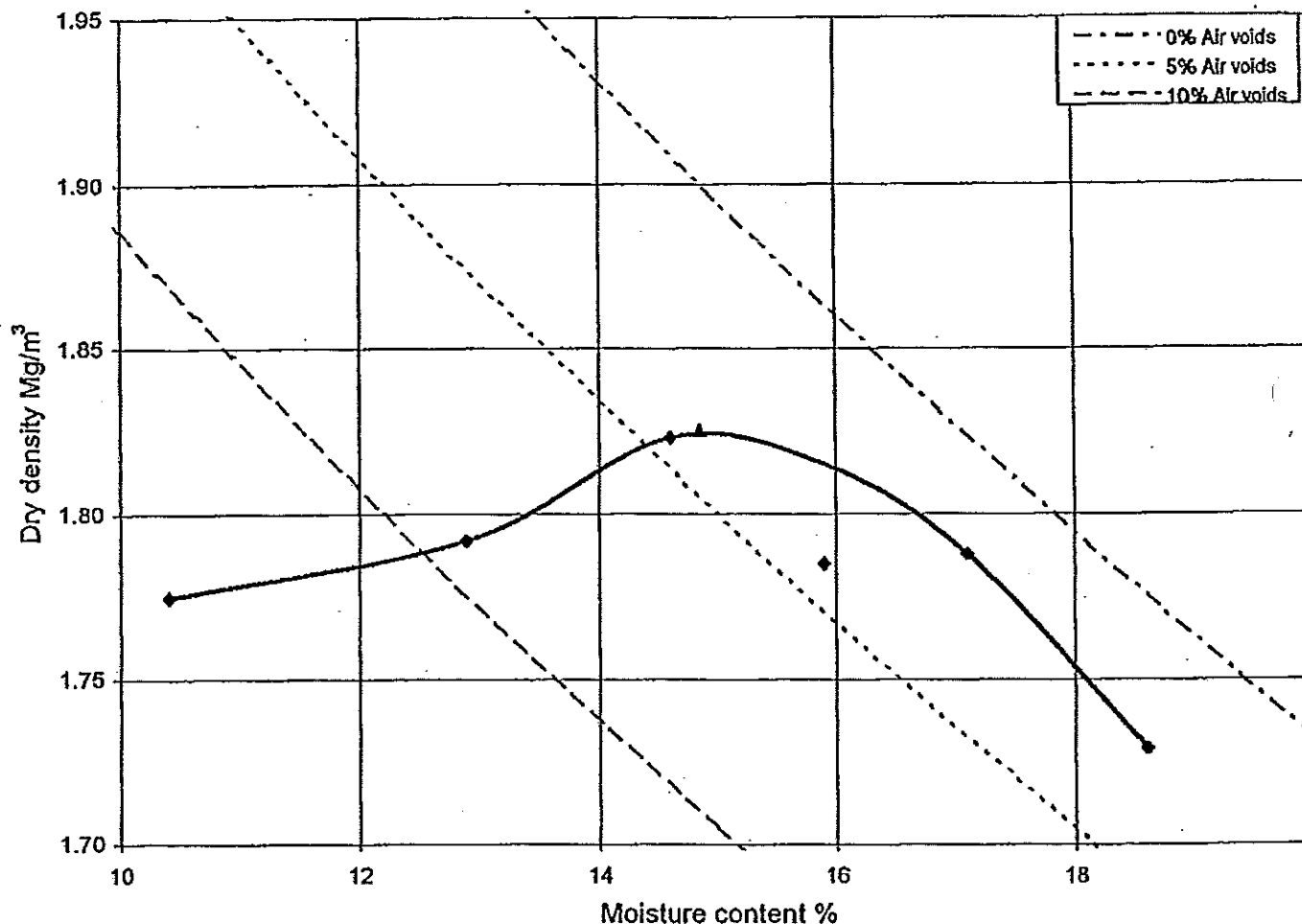
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil Description Reddish brown slightly gravelly CLAY.

Hole ID T1
Sample no. 00
Depth 2.00
Sample type AMAL
Page 1 of 1



Maximum dry density 1.83 Mg/m³
Optimum moisture content 15 %
Corrected maximum dry density for removal of gravel 1.83 Mg/m³

Method of compaction 2.5 kg Rammer

Batches tested Separate batches tested
Particle density Assumed 2.65 Mg/m³
Gravel retained on 20mm sieve 0 %
Gravel retained on 37.5mm sieve 0 %

Experimental points

Moisture content %	Dry Density Mg/m³
10.4	1.78
12.9	1.79
14.6	1.82
15.9	1.79
17.1	1.79
18.6	1.73

Nat

Amalgamation TP223,06,B,2.00m+TP223,09,B,3.00m.
General remarks

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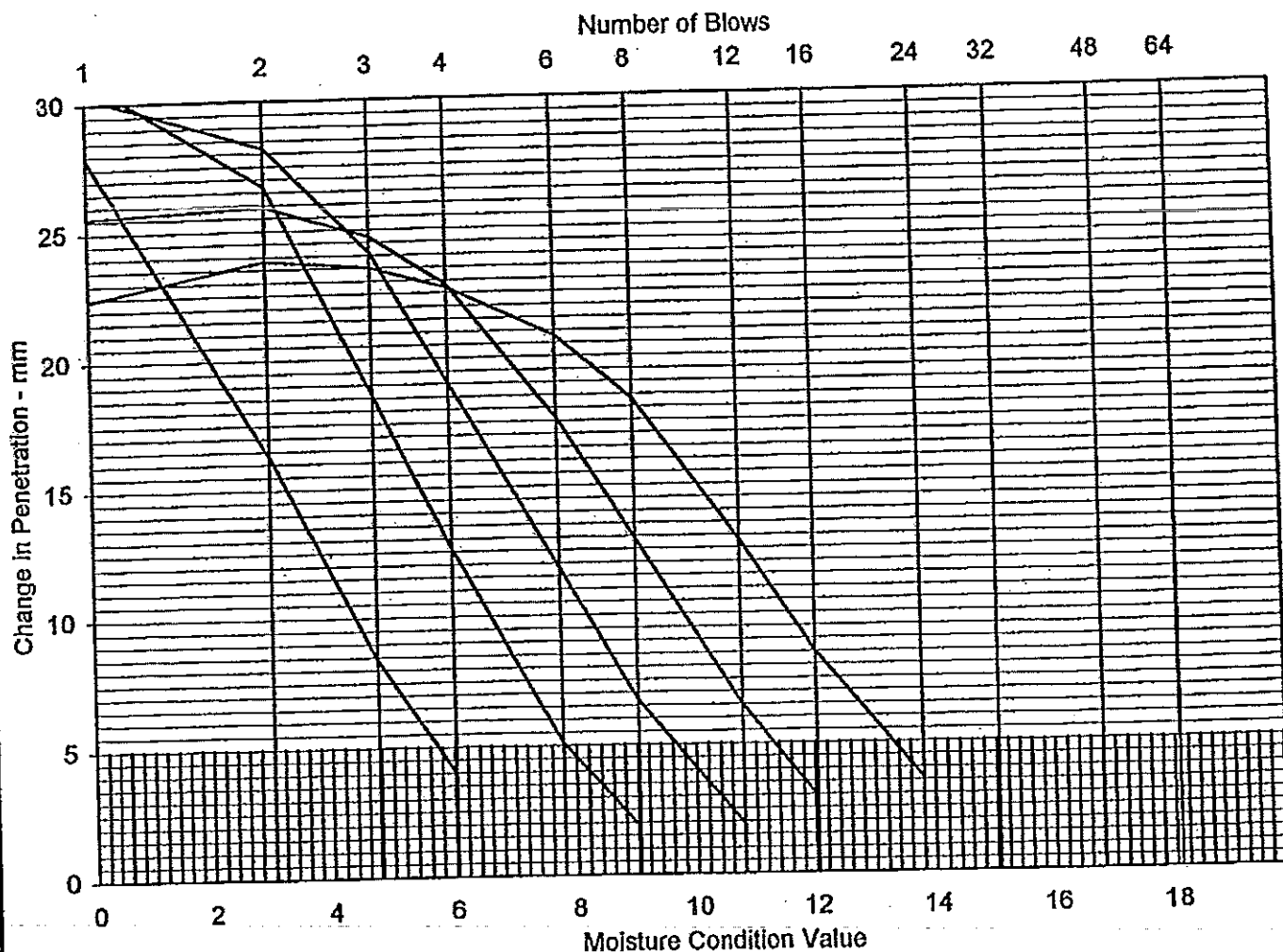
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no: F12963
Project: Aldbrough Gas Storage Facility
Description: Reddish brown slightly sandy gravelly CLAY.

Hole ID: TP204
Sample type: AMAL
Sample no.: 03
Depth: 1.00 m
Page: 1 of 2



Specimen number	1	2	3	4	5	
Moisture condition value MCV	11.1	13.1	9.4	7.6	5.5	
Moisture content	16.3	15.4	17.8	19.3	21.2	%
Bulk density after compaction	2.15	2.19	2.12	2.08	2.04	Mg
Dry density after compaction	1.85	1.90	1.80	1.74	1.68	Mg
Hand vane strength after compaction	>124	Too stiff	82	66	42	kPa
Method of determining MCV	Steepest fit line Steepest fit line Steepest fit line Steepest fit line Steepest fit line					
Gravel retained on 20mm sieve	0.3	%				

Remarks: Separate batches tested Specimen depth: 1.00m

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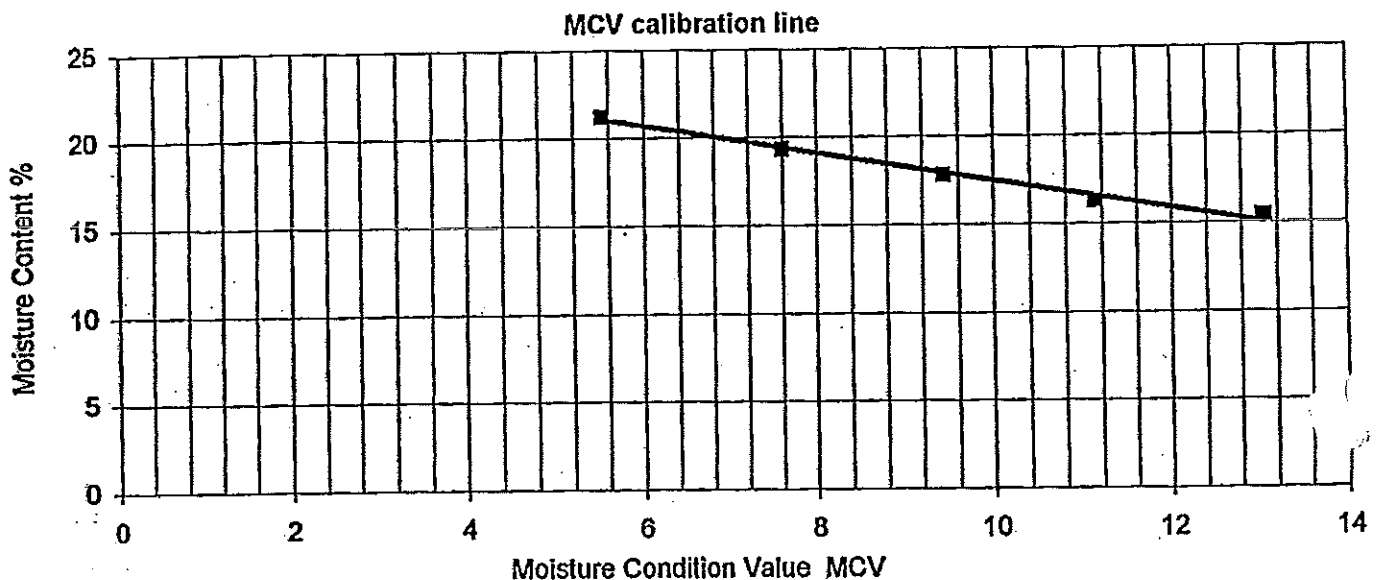
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

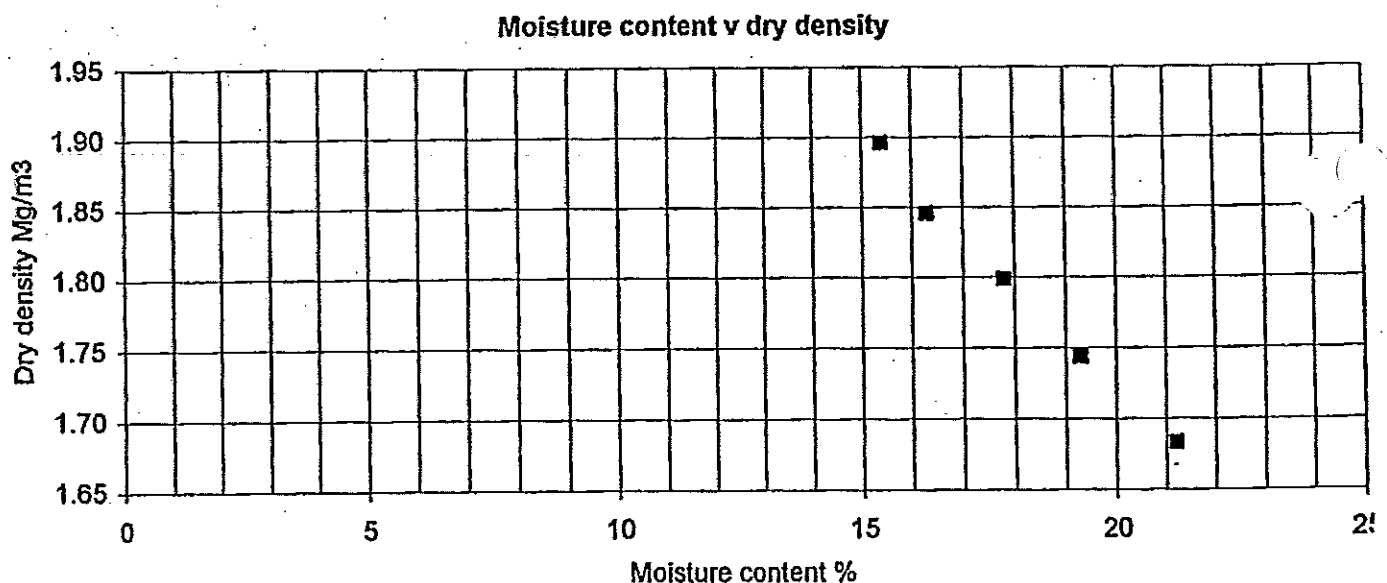
Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown slightly sandy gravelly CLAY.

Hole ID T
Sample type AMAL
Sample no. 03
Depth 1.00 m
Page 2 of 2



Characteristics of calibration line	determined using linear regression	
Intercept	25.4	
Slope	-0.786	
Sensitivity	1.272	MCV per MC%
Correlation	-0.994	



Remarks Separate batches tested Specimen depth 1.00m

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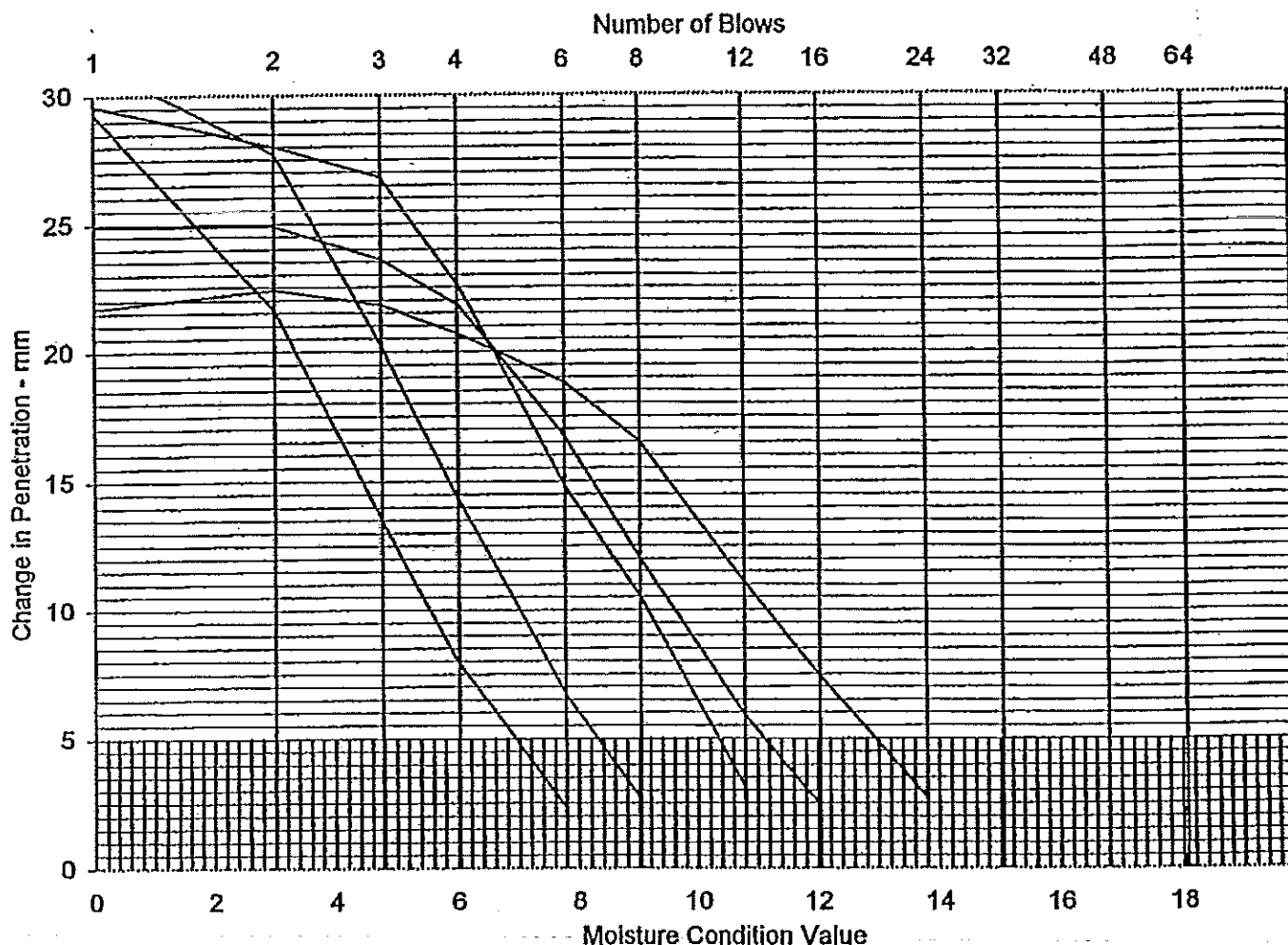
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown slightly gravelly CLAY.

Hole ID TP207
Sample type B
Sample no. 03
Depth 1.00
Page 1 of 2



Specimen number	1	2	3	4	5	
Moisture condition value MCV	8.0	6.6	12.8	10.9	10.0	
Moisture content	19.9	20.3	15.5	17.1	18.2	%
Bulk density after compaction	2.08	2.05	2.19	2.16	2.11	Mg.
Dry density after compaction	1.73	1.71	1.90	1.84	1.78	Mg.
Hand vane strength after compaction	55	50	Too stiff	>140	94	kPa
Method of determining MCV	Steepest fit line Steepest fit line Steepest fit line Steepest fit line Steepest fit line					

Gravel retained on 20mm sieve 0.7 %

Remarks Separate batches tested Specimen depth 1.00m

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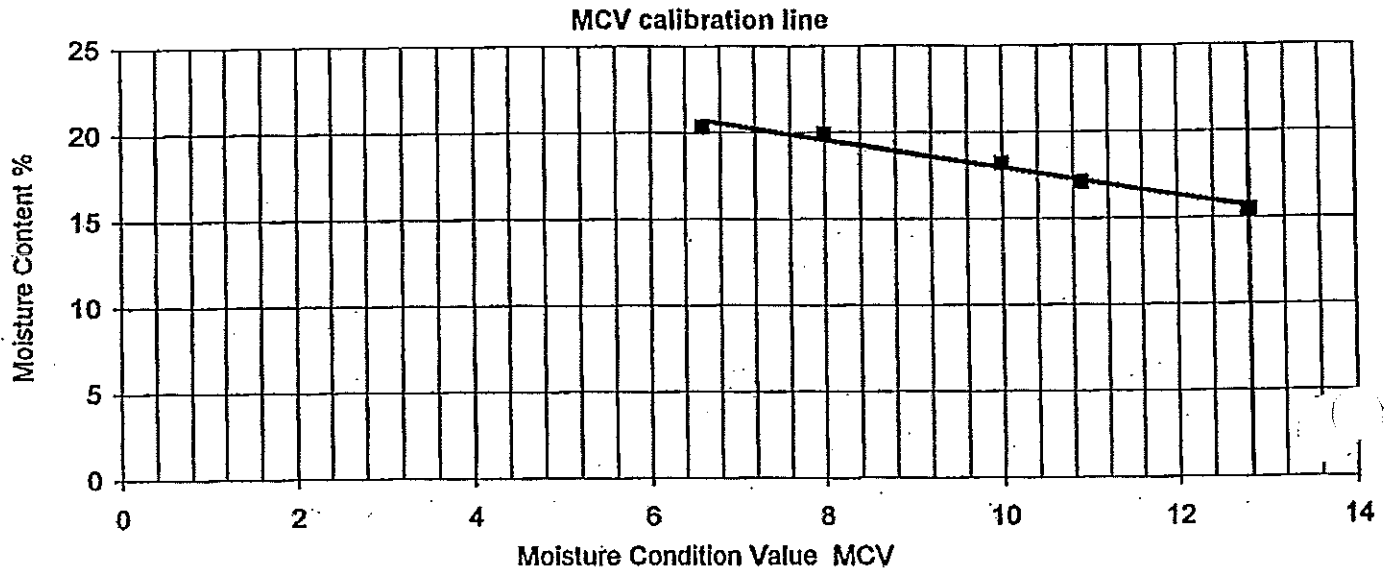
MOISTURE CONDITION VALUE

**NORWEST
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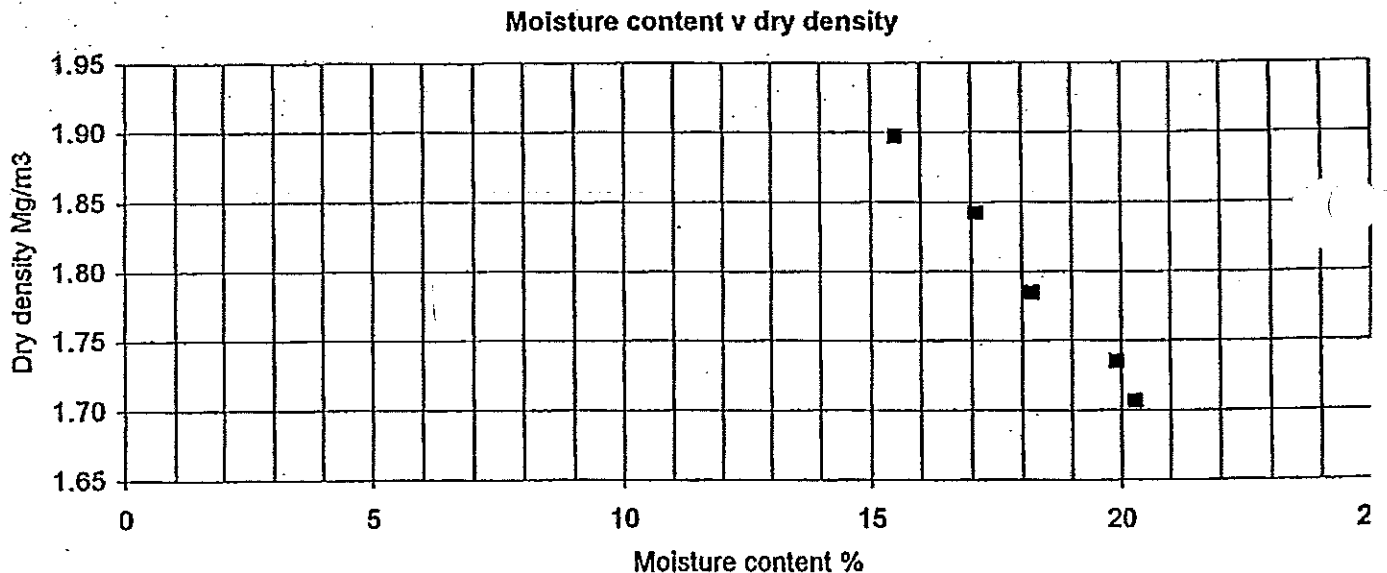
Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown slightly gravelly CLAY.

Hole ID
Sample type
Sample no. 03
Depth 1.00
Page 2 of 2



Characteristics of calibration line	determined using linear regression	
Intercept	26.0	
Slope	-0.808	
Sensitivity	1.238	MCV per MC%
Correlation	-0.988	



Remarks Separate batches tested Specimen depth 1.00m

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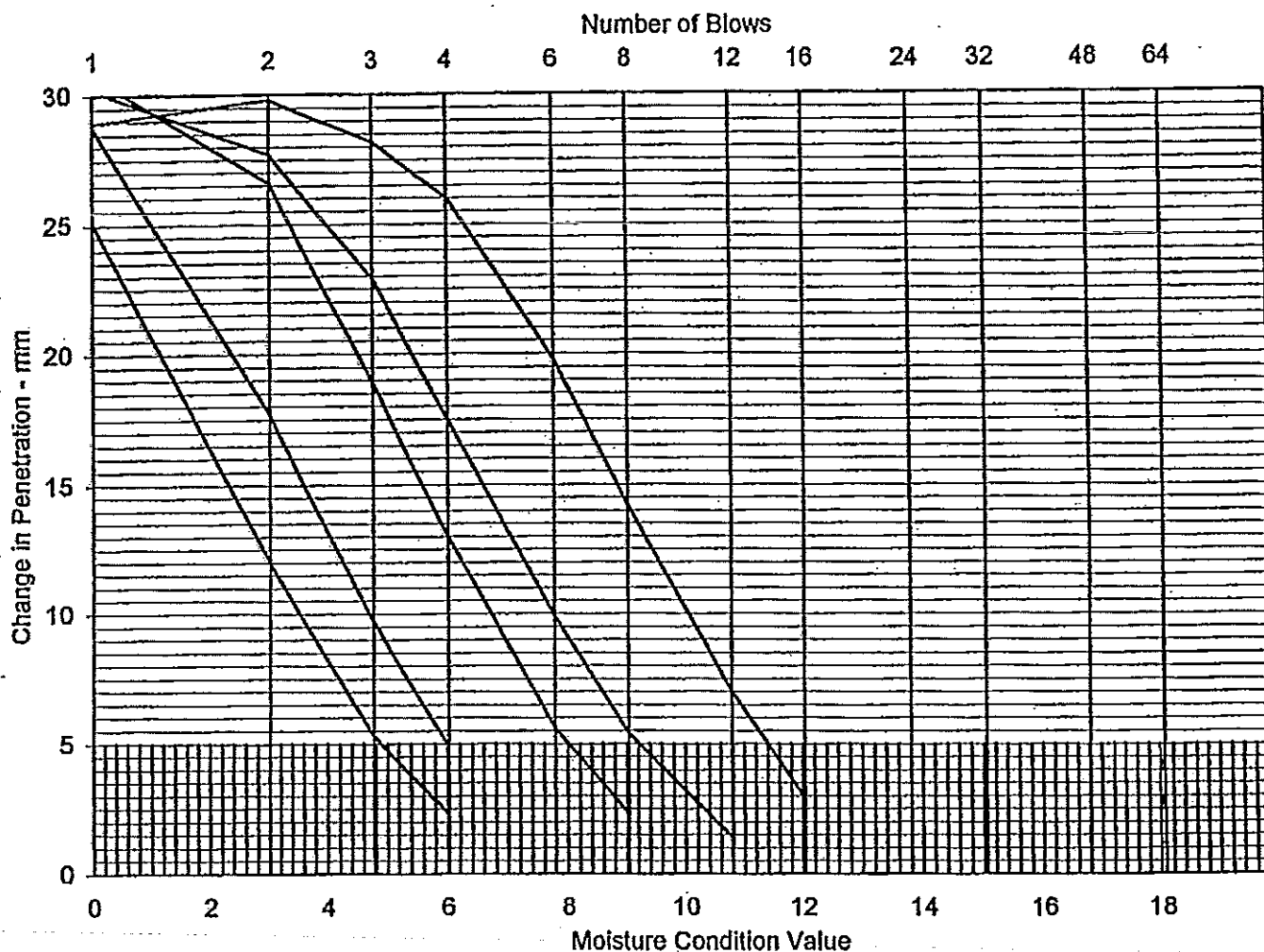
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown gravelly CLAY.

Hole ID TP208
Sample type B
Sample no. 03
Depth 1.00 m
Page 1 of 2



Specimen number	1	2	3	4	5	
Moisture condition value MCV	7.7	5.8	4.6	8.9	11.1	
Moisture content	19.9	20.4	22.3	18.5	17.1	%
Bulk density after compaction	2.07	2.04	2.01	2.12	2.15	Mg/
Dry density after compaction	1.73	1.69	1.65	1.79	1.84	Mg/
Hand vane strength after compaction	54	36	28	92	120	kPa
Method of determining MCV	Steepest fit line Steepest fit line Steepest fit line Steepest fit line Steepest fit line					
Gravel retained on 20mm sieve	1.3	%				

Remarks Separate batches tested Specimen depth 1.00m

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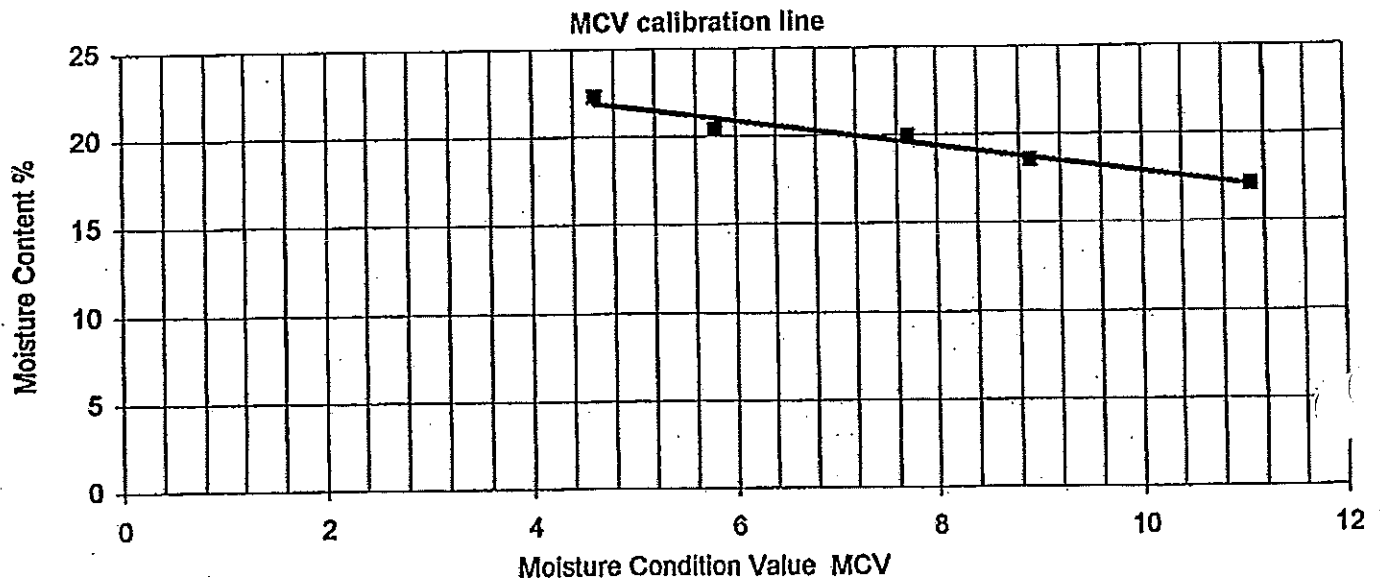
MOISTURE CONDITION VALUE

**NORWEST
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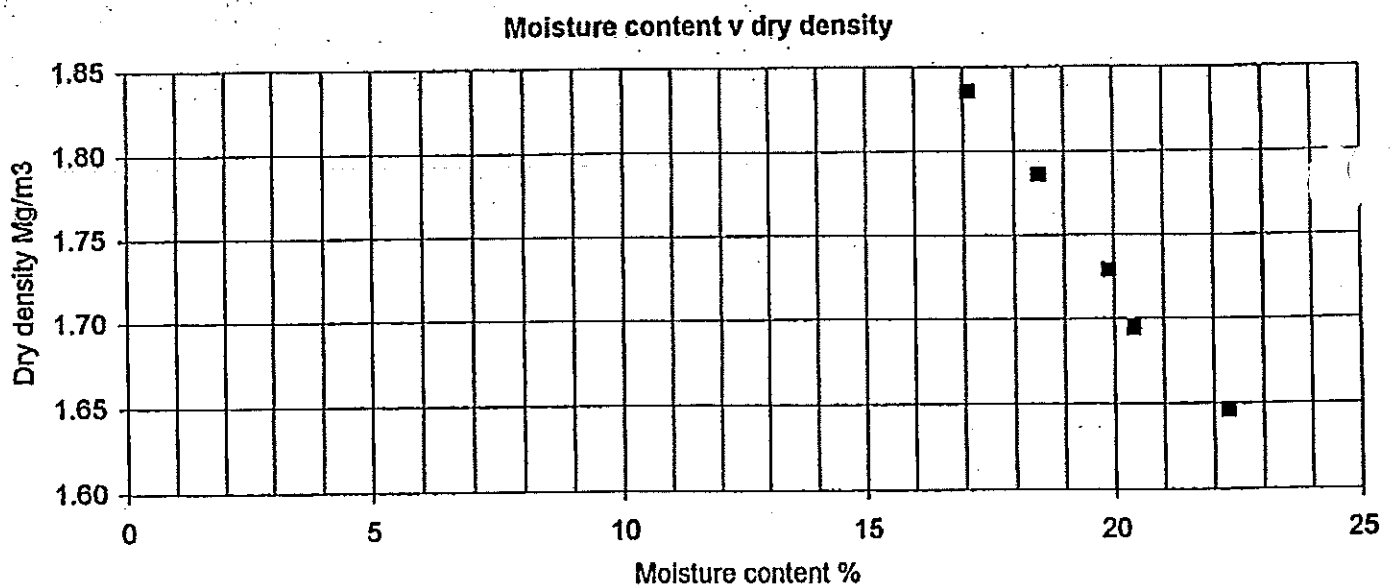
Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown gravelly CLAY.

Hole ID
Sample type B
Sample no. 03
Depth 1.00 m
Page 2 of 2



Characteristics of calibration line	determined using linear regression	
Intercept	25.4	
Slope	-0.755	
Sensitivity	1.325	MCV per MC%
Correlation	-0.978	



Remarks Separate batches tested Specimen depth 1.00m

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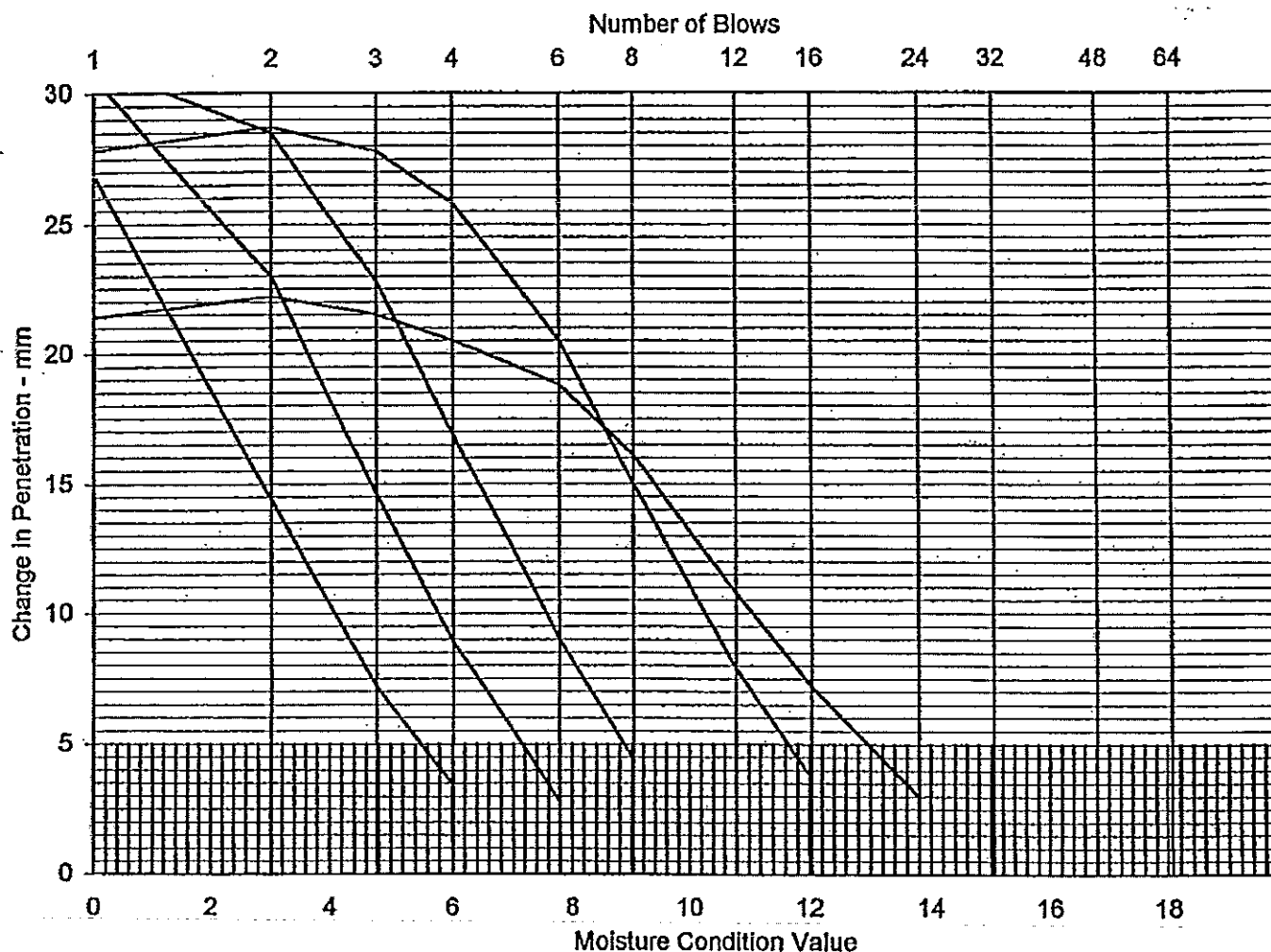
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Brown slightly gravelly CLAY.

Hole ID TP208
Sample type AMAL
Sample no. 06
Depth 2.00 m
Page 1 of 2



Specimen number	1	2	3	4	5	
Moisture condition value MCV	11.3	12.7	8.5	6.8	5.3	
Moisture content	15.6	14.4	17.0	18.6	19.9	%
Bulk density after compaction	2.18	2.22	2.14	2.09	2.06	Mg/n
Dry density after compaction	1.89	1.94	1.83	1.76	1.71	Mg/n
Hand vane strength after compaction	Too stiff	Too stiff	96	55	35	kPa
Method of determining MCV	Steepest fit line Steepest fit line Steepest fit line Steepest fit line Steepest fit line					
Gravel retained on 20mm sieve	1.5	%				

Remarks Separate batches tested Specimen depth 2.00m

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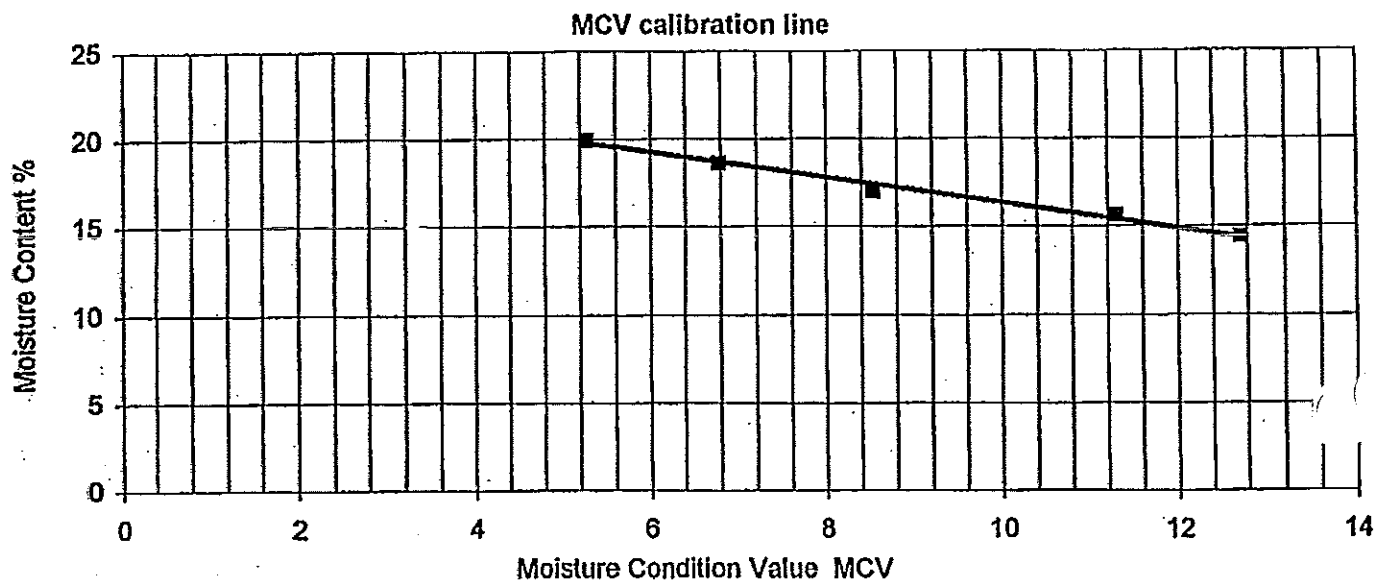
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

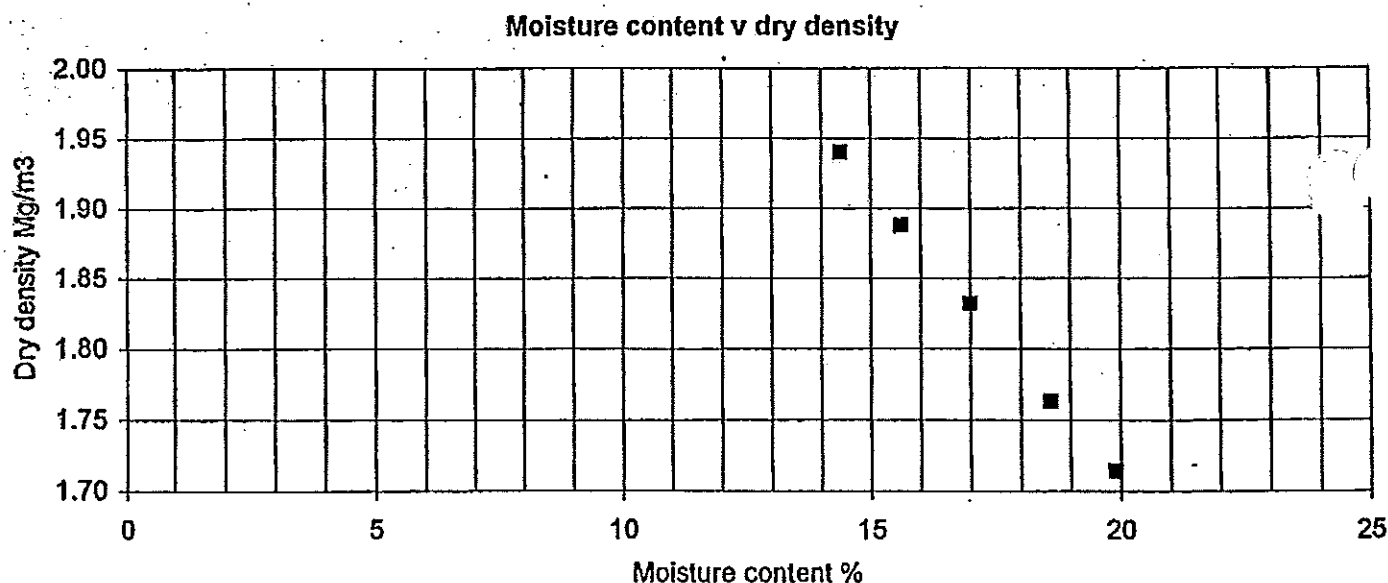
Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Brown slightly gravelly CLAY.

Hole ID
Sample type AMAL
Sample no. 06
Depth 2.00
Page 2 of 2



Characteristics of calibration line	determined using linear regression	
Intercept	23.5	
Slope	-0.714	
Sensitivity	1.401	MCV per MC%
Correlation	-0.994	



Remarks Separate batches tested Specimen depth 2.00m

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Approved:

S. Smith

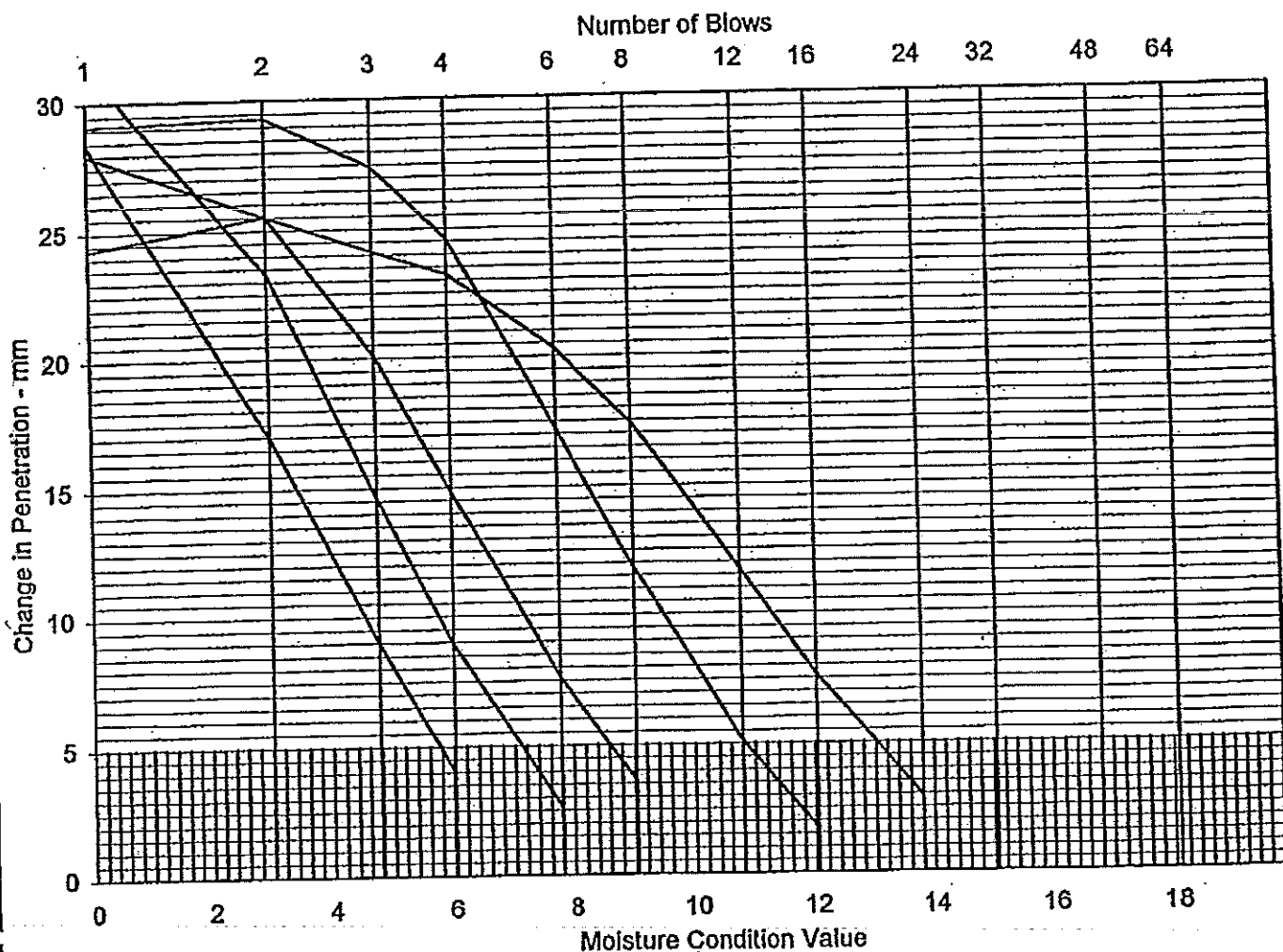
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown slightly gravelly CLAY.

Hole ID TP211
Sample type AMAL
Sample no. 03
Depth 1.00 m
Page 1 of 2



Specimen number	1	2	3	4	5	
Moisture condition value MCV	10.6	12.8	8.3	6.7	5.7	
Moisture content	16.6	15.2	18.5	19.7	21.3	%
Bulk density after compaction	2.15	2.20	2.11	2.08	2.03	Mg/
Dry density after compaction	1.84	1.91	1.78	1.74	1.67	Mg/
Hand vane strength after compaction	101	Too stiff	82	47	32	kPa
Method of determining MCV	Steepest fit line Steepest fit line Steepest fit line Steepest fit line Steepest fit line					
Gravel retained on 20mm sieve	1.3	%				

Remarks Separate batches tested Specimen depth 1.00m

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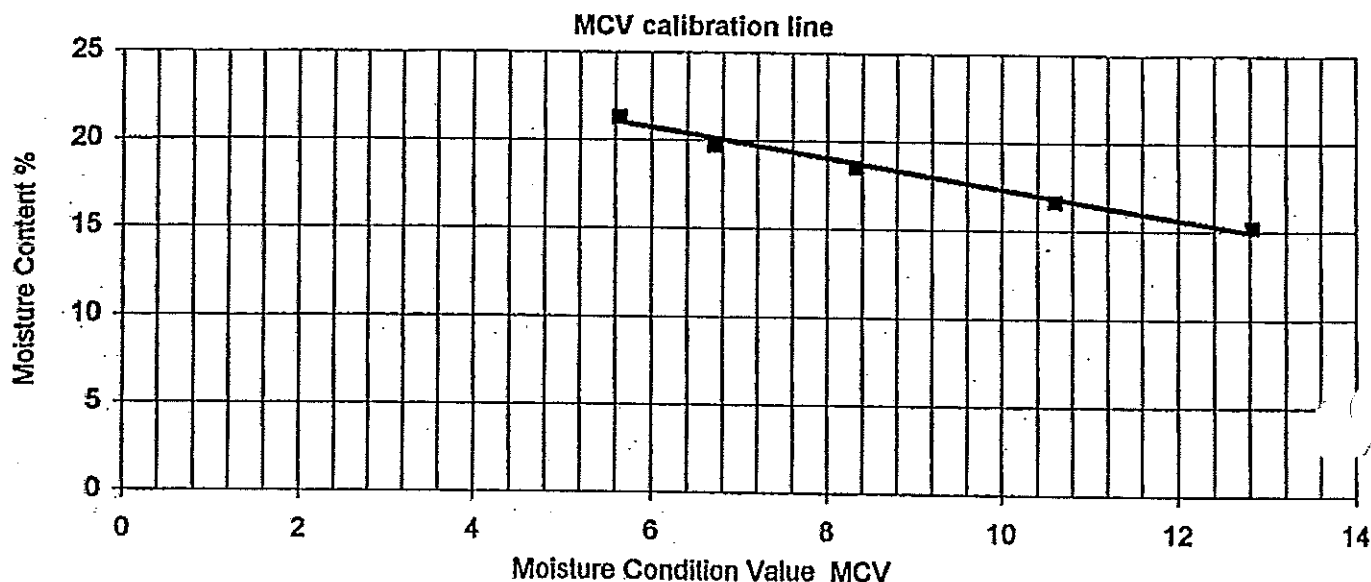
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown slightly gravelly CLAY.

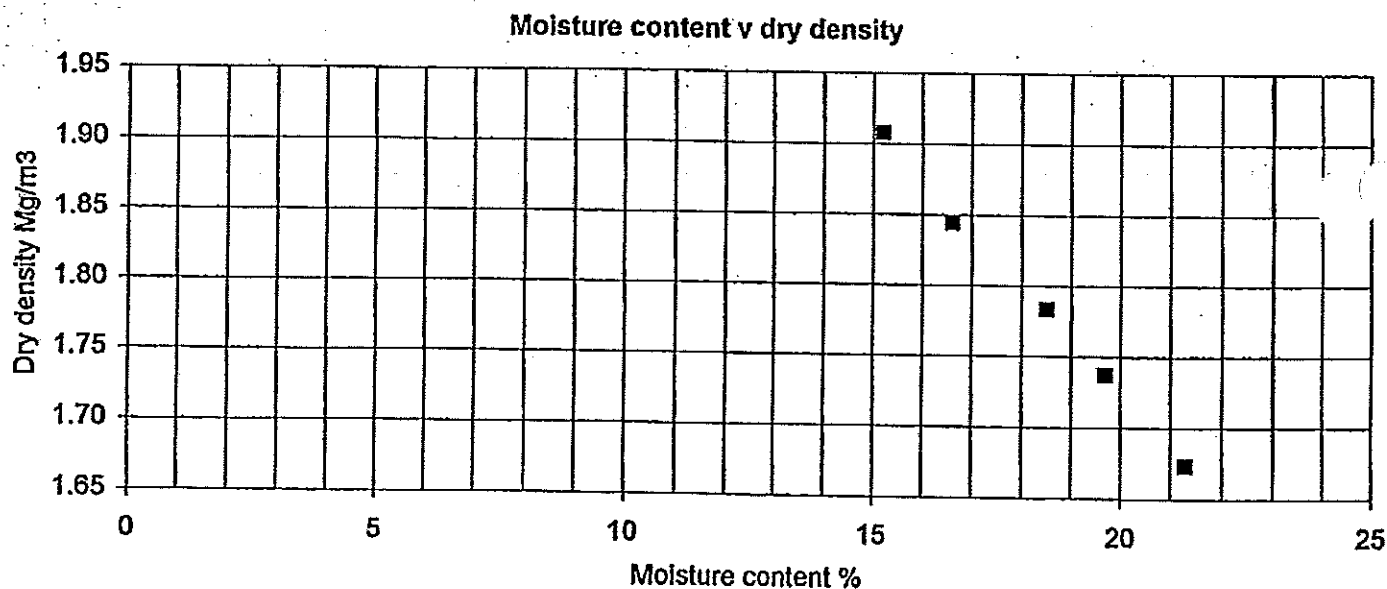
Hole ID
Sample type AMAL
Sample no. 03
Depth 1.00
Page 2 of 2



Characteristics of calibration line

determined using linear regression

Intercept	25.5	
Slope	-0.824	
Sensitivity	1.213	MCV per MC%
Correlation	-0.992	



Remarks Separate batches tested

Specimen depth 1.00m

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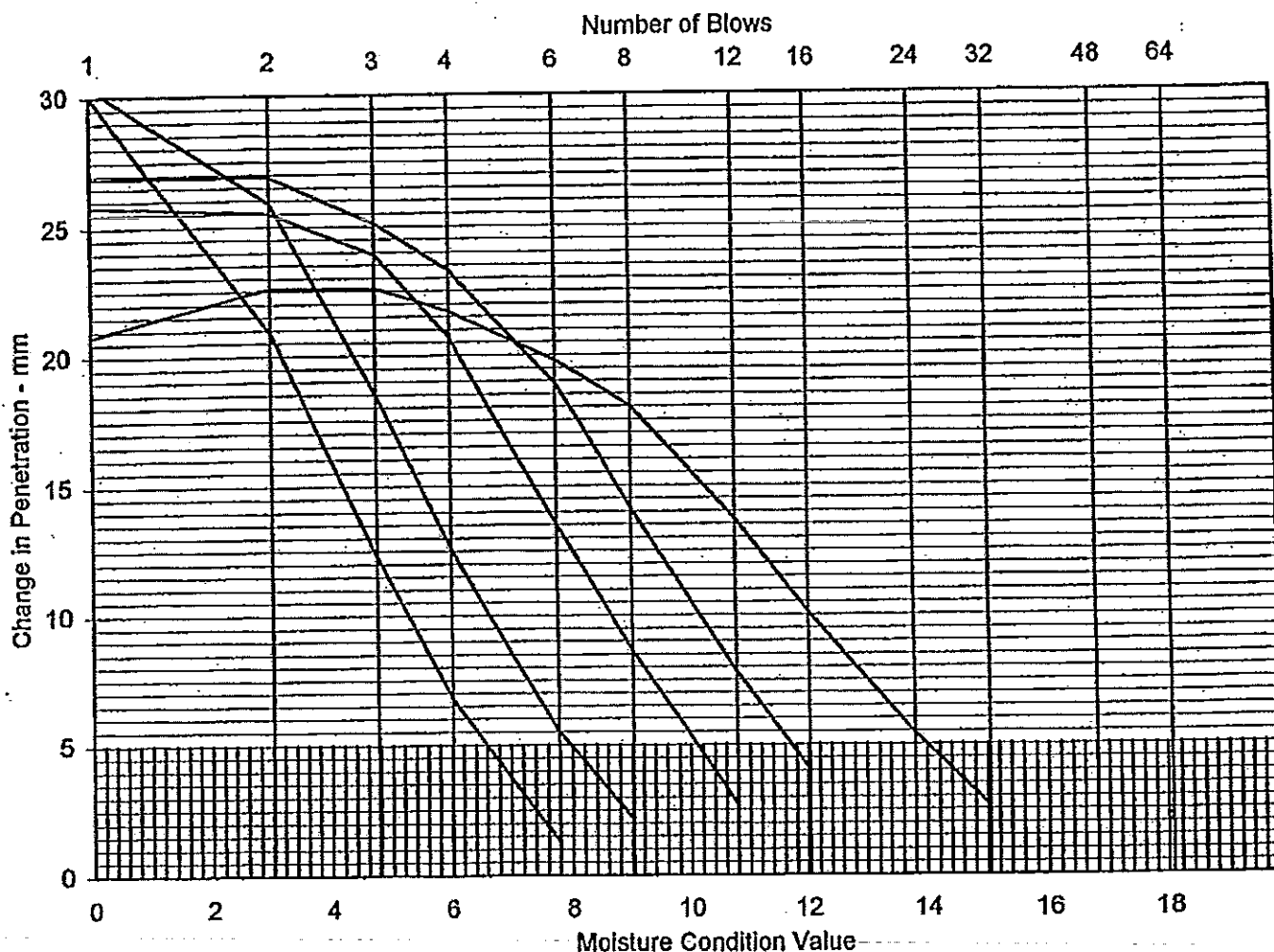
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Brown slightly gravelly CLAY.

Hole ID TP212
Sample type AMAL
Sample no. 03
Depth 1.00 m
Page 1 of 2



Specimen number	1	2	3	4	5	
Moisture condition value MCV	9.9	7.6	6.3	11.4	13.8	
Moisture content	17.4	18.7	19.9	16.1	14.4	%
Bulk density after compaction	2.14	2.10	2.05	2.18	2.22	Mg/r
Dry density after compaction	1.82	1.77	1.71	1.88	1.94	Mg/r
Hand vane strength after compaction	109	74	46	>120	Too stiff	kPa
Method of determining MCV	Steepest fit line Steepest fit line Steepest fit line Steepest fit line Steepest fit line					
Gravel retained on 20mm sieve	1.0	%				

Remarks Separate batches tested Specimen depth 1.00m

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Approved: *S. Hark*

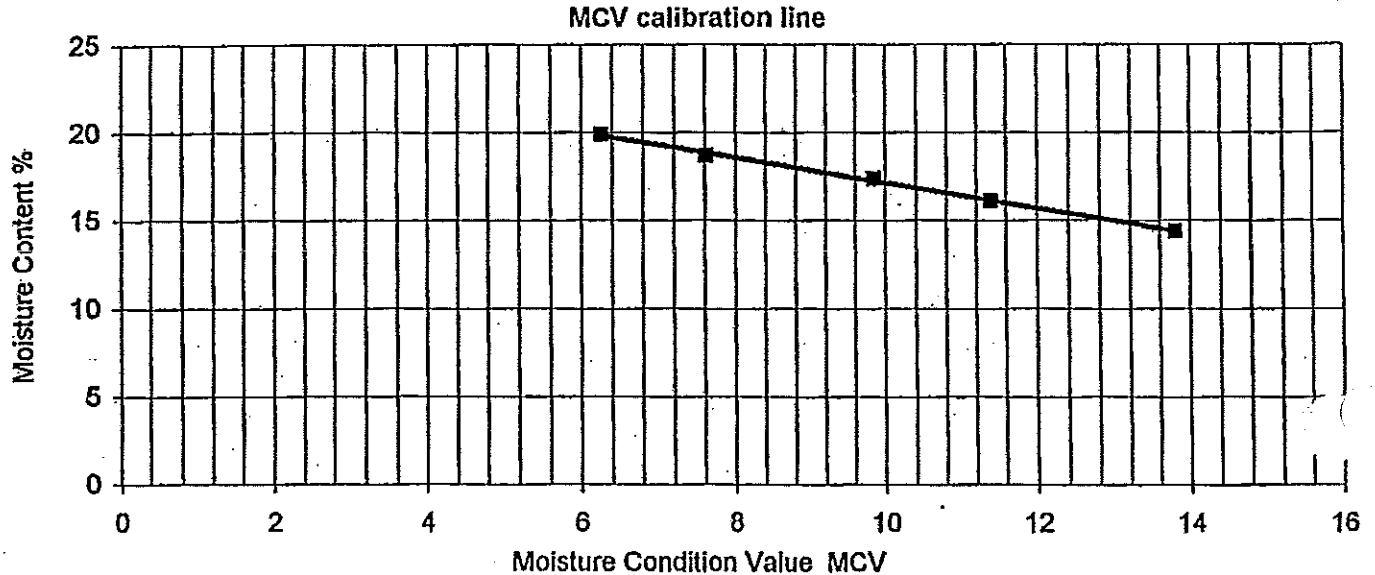
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

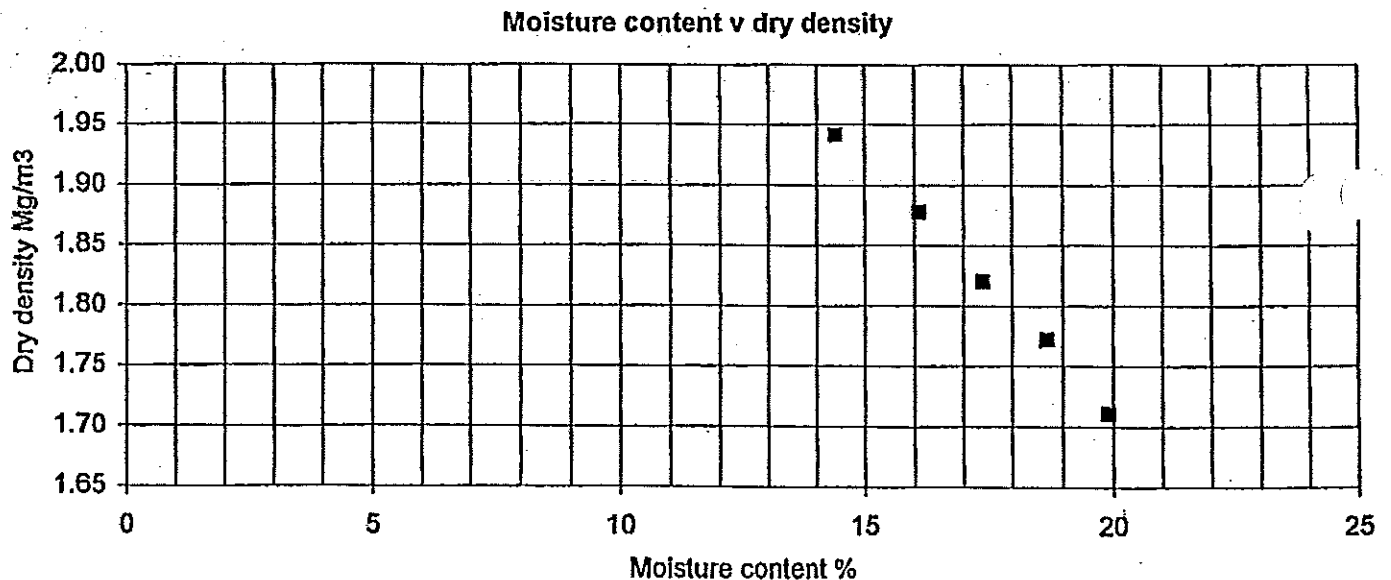
Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Brown slightly gravelly CLAY.

Hole ID
Sample type
Sample no. 03
Depth 1.00 m
Page 2 of 2



Characteristics of calibration line	determined using linear regression	
Intercept	24.3	
Slope	-0.719	
Sensitivity	1.391	MCV per MC%
Correlation	-0.999	



Remarks Separate batches tested Specimen depth 1.00m

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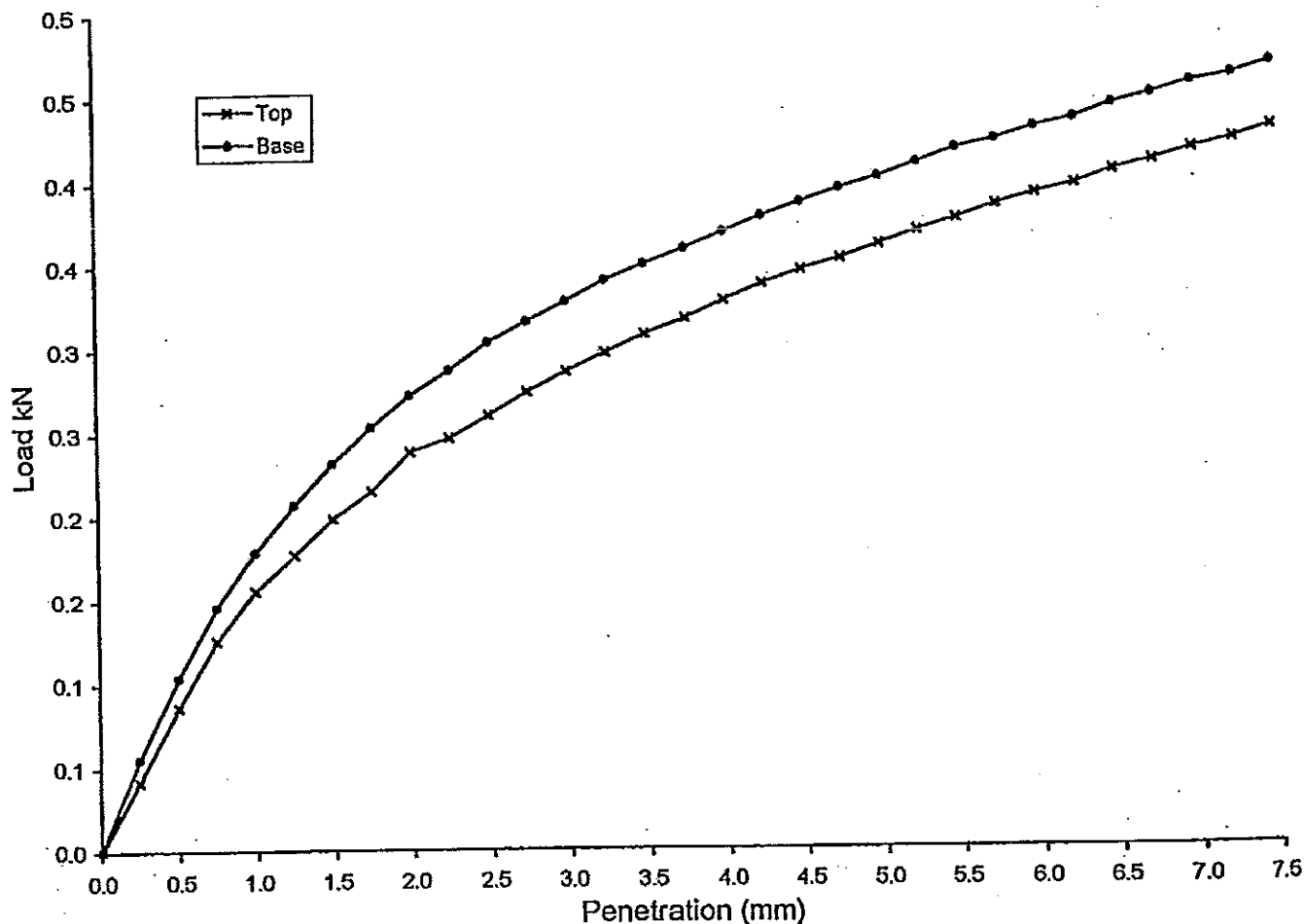
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Grey, brown and orangish brown slightly sandy slightly gravelly CLAY.

Hole ID TP202
Sample no. 03
Sample depth 1.00 m
Sample type B
Page 1 of 1



CBR values %				Natural moisture content	29 %
Penetration	Top	Base	Accepted CBR	Moisture content - top	30 %
2.50 mm	2	2.3	2.1	Moisture content - base	29 %
5.00 mm	1.8	2		Bulk density	1.92 Mg/m³
Curve correction	No	No		Dry density	1.49 Mg/m³

Seating load - top	10	N	Method of compaction	2.5kg rammer
Seating load - base	10	N		
Surcharge	6.7	kg	Soaking period	4 days
Gravel retained on 20mm sieve	2	%	Amount of swell	0.9 mm
Gravel retained on 37.5mm sieve	0	%		

Specimen no. 1 Specimen depth 1.00 m

General remarks

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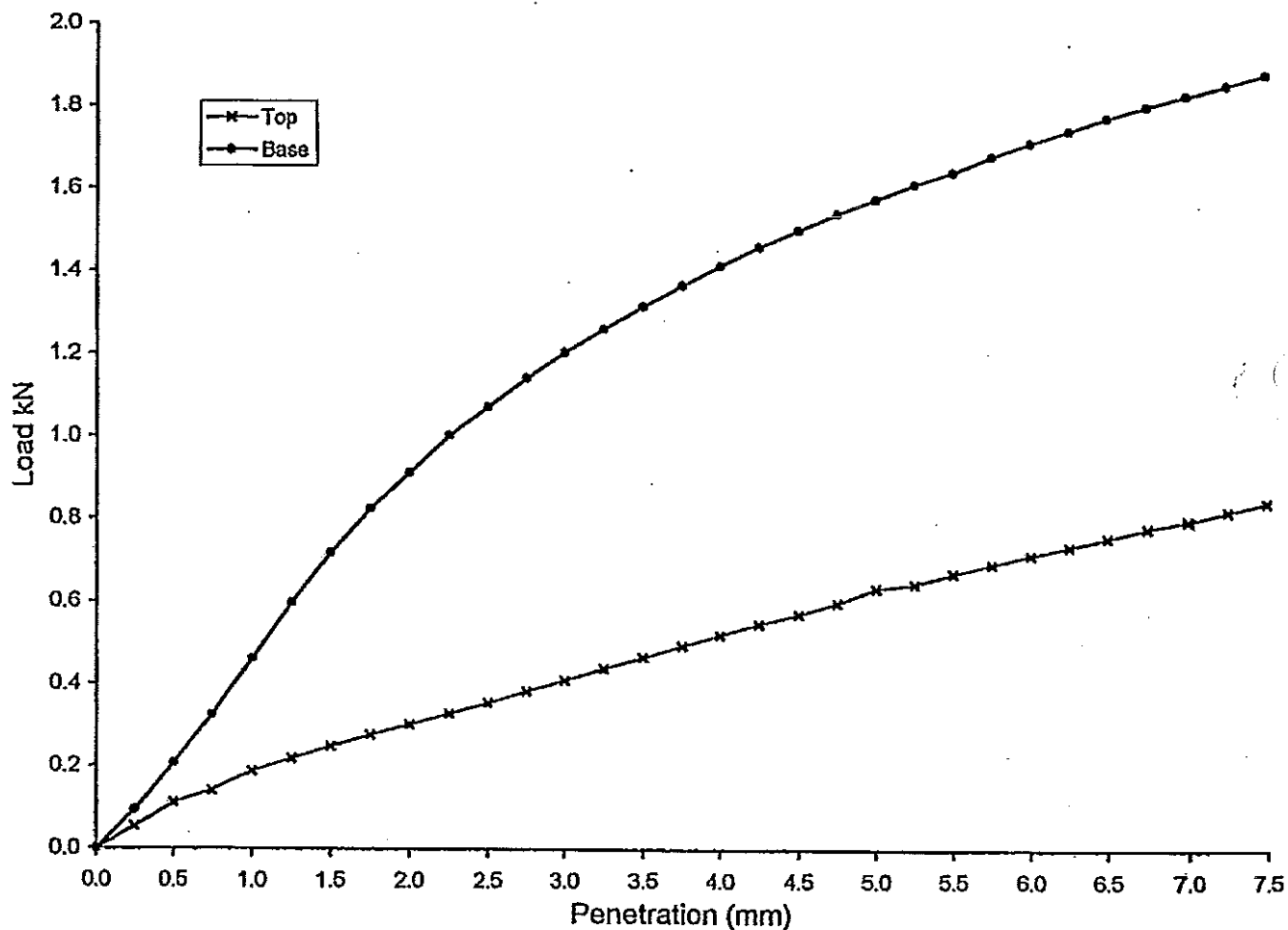
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no: F12963
Project: Aldbrough Gas Storage Facility
Soil description: Reddish brown slightly sandy gravelly CLAY.

Hole ID: TP
Sample no.: 03
Sample depth: 1.00 m
Sample type: AMAL
Page: 1 of 1



CBR values %					
Penetration	Top	Base	Accepted CBR	Natural moisture content	17 %
2.50 mm	2.7	8.1	N/A	Moisture content - top	19 %
5.00 mm	3.2	7.9		Moisture content - middle	18 %
Curve correction	No	No		Moisture content - base	18 %
				Bulk density	2.07 Mg/m³
				Dry density	1.77 Mg/m³
Seating load - top				10	N
Seating load - base				10	N
Surcharge				6.7	kg
Gravel retained on 20mm sieve				1	%
Gravel retained on 37.5mm sieve				0	%
				Method of compaction	2.5kg rammèr
				Soaking period	4 days
				Amount of swell	2 mm

Specimen no. 1 Specimen depth 1.00 m
Amalgamation TP204,03,B,1.00m+TP204,06,B,2.00m.
General remarks

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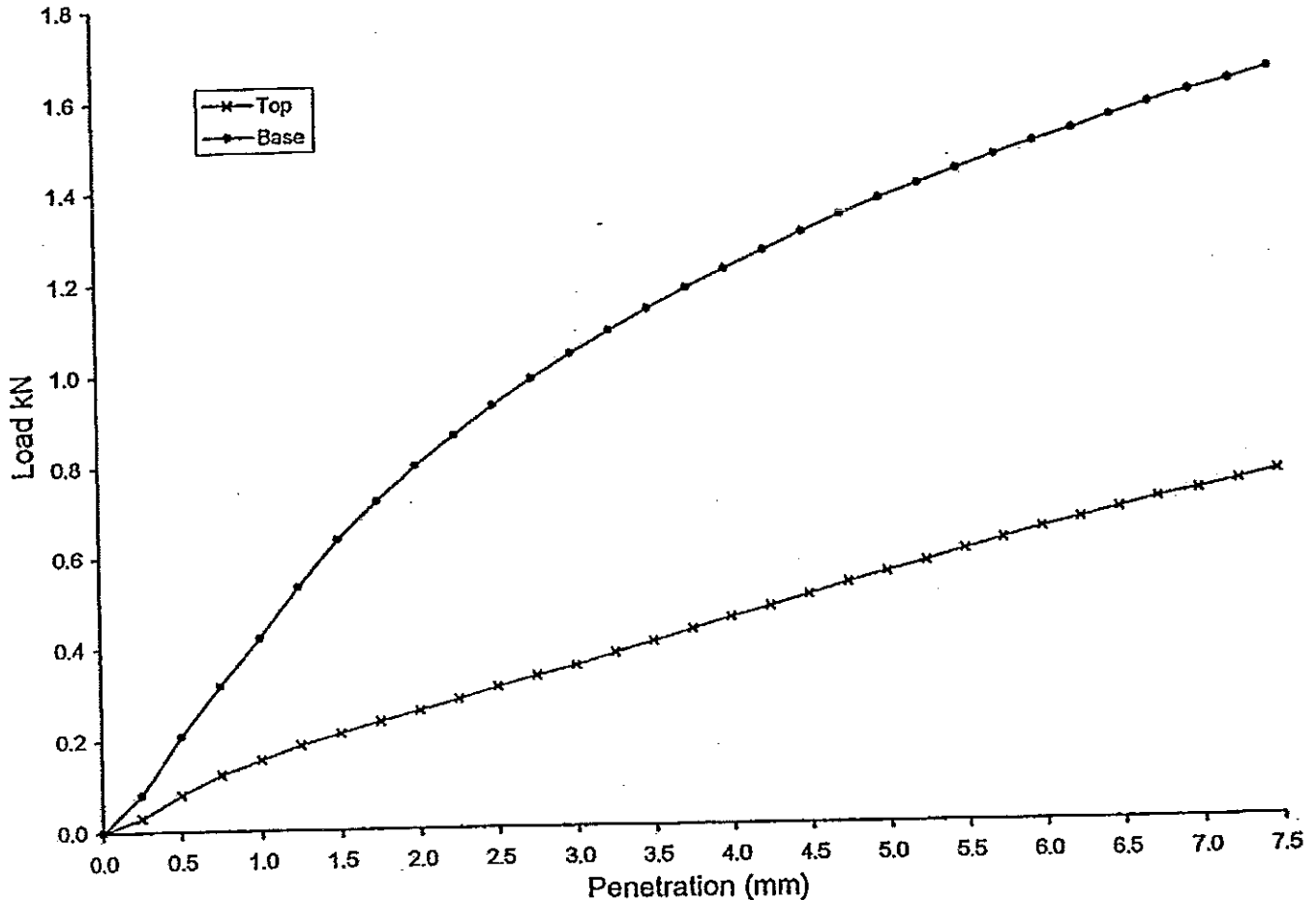
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly sandy slightly gravelly CLAY.

Hole ID TP207
Sample no. 06
Sample depth 2.00 m
Sample type B
Page 1 of 1



CBR values %				Natural moisture content		17 %
Penetration	Top	Base	Accepted CBR	Moisture content - top		19 %
2.50 mm	2.3	7	N/A	Moisture content - middle		18 %
5.00 mm	2.7	6.8		Moisture content - base		19 %
Curve correction	No	No		Bulk density		2.08 Mg/m³
				Dry density		1.78 Mg/m³
Seating load - top			10 N	Method of compaction 2.5kg rammer		
Seating load - base			10 N			
Surcharge			6.0 kg	Soaking period		4 days
Gravel retained on 20mm sieve			2 %	Amount of swell		2 mm
Gravel retained on 37.5mm sieve			0 %			

Specimen no. 1 Specimen depth 2.00 m

General remarks

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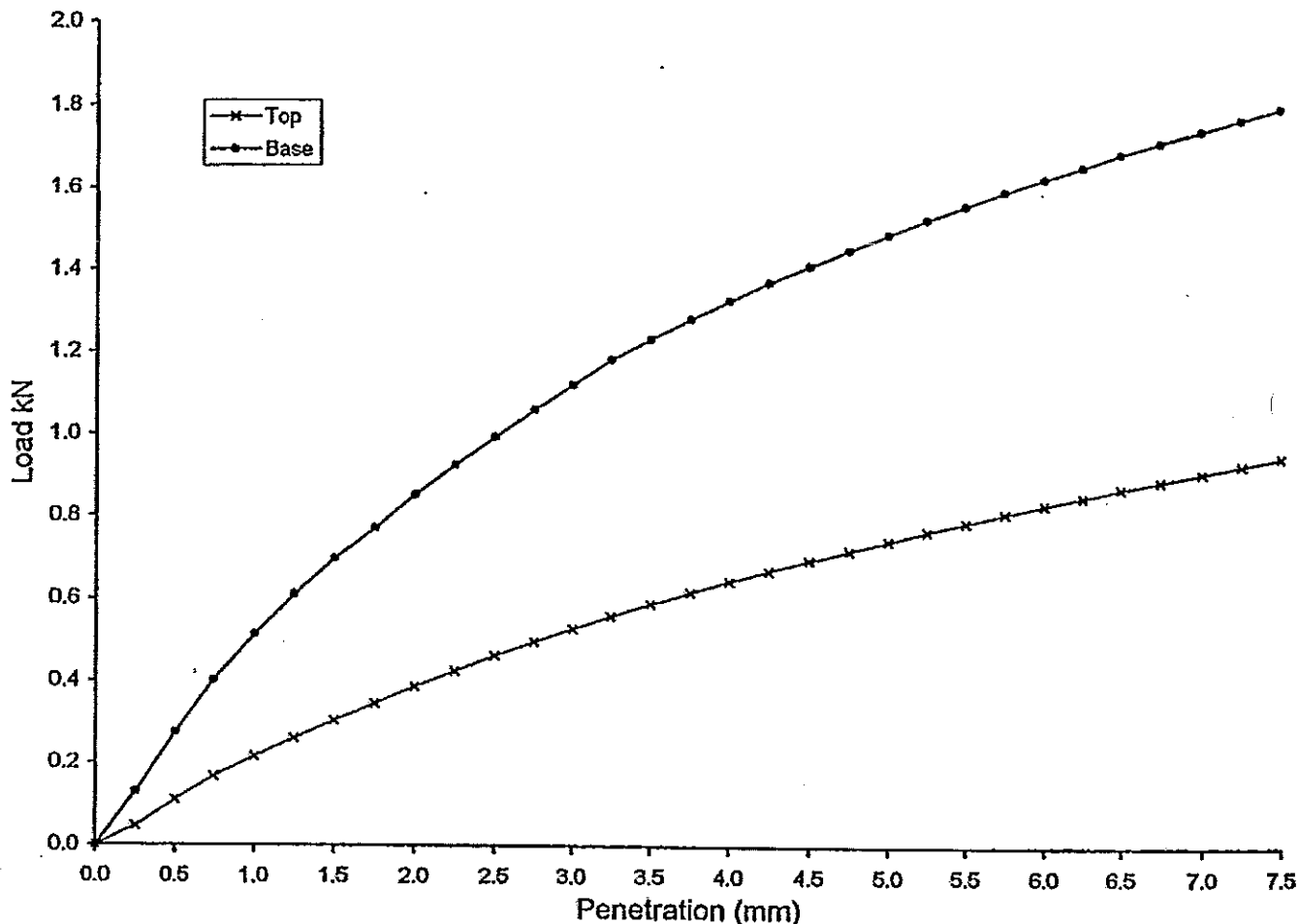
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CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no.	F12963	Hole ID	T7
Project	Aldbrough Gas Storage Facility	Sample no.	
Soil description	Brown slightly sandy slightly gravelly CLAY.	Sample depth	3.00 m
		Sample type	B
		Page	1 of 1



CBR values %				Natural moisture content	
Penetration	Top	Base	Accepted CBR	Moisture content - top	16 %
2.50 mm	3.5	7.5	N/A	Moisture content - base	18 %
5.00 mm	3.7	7.4		Bulk density	2.04 Mg/m³
Curve correction	No	No		Dry density	1.76 Mg/m³
Seating load - top				Method of compaction	
10 N				2.5kg rammer	
Seating load - base					
10 N					
Surcharge					
6.4 kg					
Gravel retained on 20mm sieve				Soaking period	
0 %				5 days	
Gravel retained on 37.5mm sieve				Amount of swell	
0 %				1.4 mm	

Specimen no. 1 Specimen depth 3.00 m

General remarks

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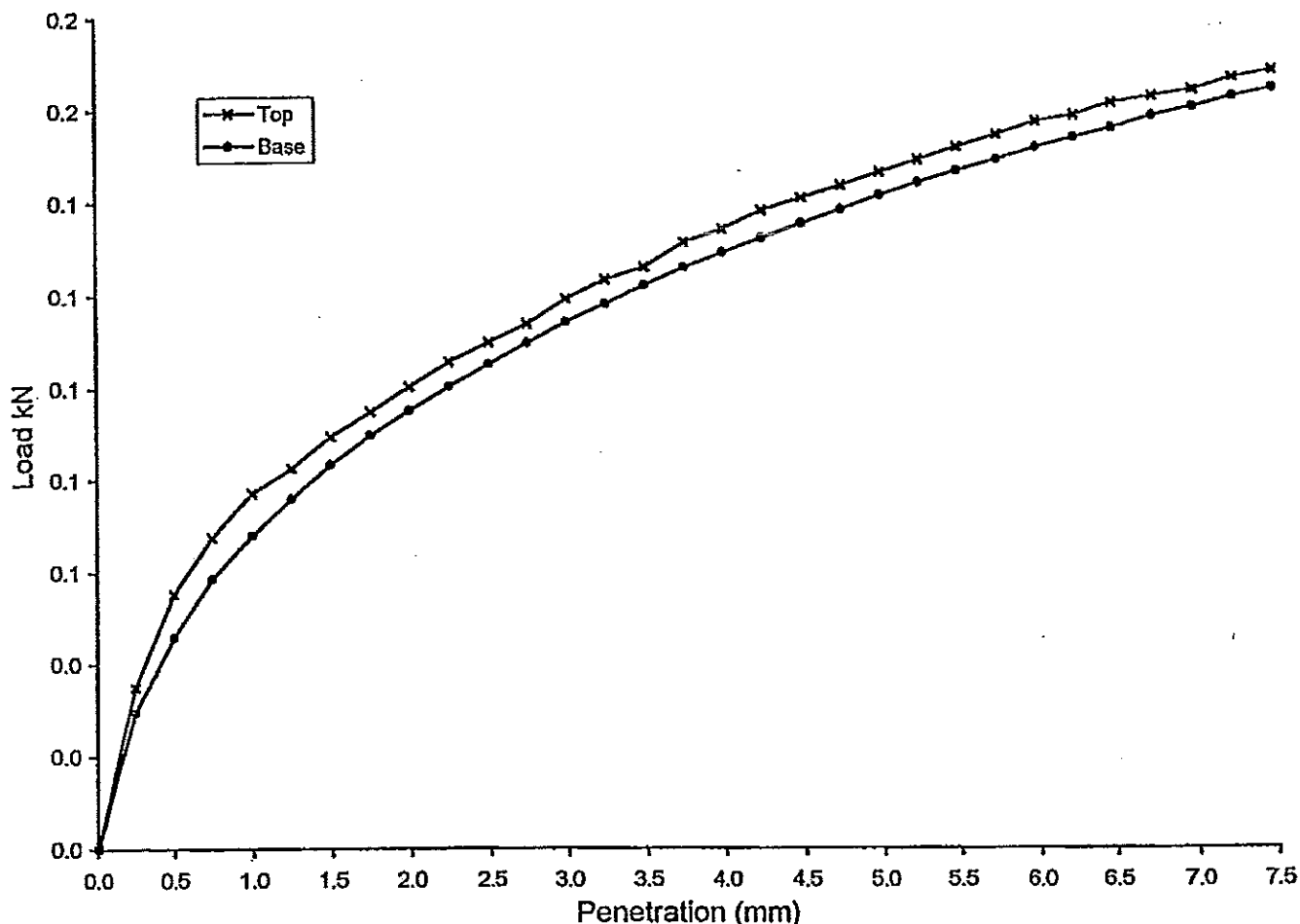
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Greyish brown slightly sandy slightly gravelly CLAY.

Hole ID TP214
Sample no. 03
Sample depth 1.00 m
Sample type B
Page 1 of 1



CBR values %				Natural moisture content	
Penetration	Top	Base	Accepted CBR	38 %	
2.50 mm	0.83	0.79	0.81	Moisture content - top	
5.00 mm	0.73	0.7		36 %	
Curve correction	No	No		Moisture content - middle	
				37 %	
				Moisture content - base	
				36 %	
				Bulk density	
				1.81 Mg/m³	
				Dry density	
				1.31 Mg/m³	
Seating load - top				Method of compaction	
10 N				2.5kg rammer	
Seating load - base				Soaking period	
10 N				4 days	
Surcharge				Amount of swell	
6.7 kg				0.1 mm	
Gravel retained on 20mm sieve					
0 %					
Gravel retained on 37.5mm sieve					
0 %					

Specimen no. 1 Specimen depth 1.00 m

General remarks Top test performed below calibrated range of load ring.

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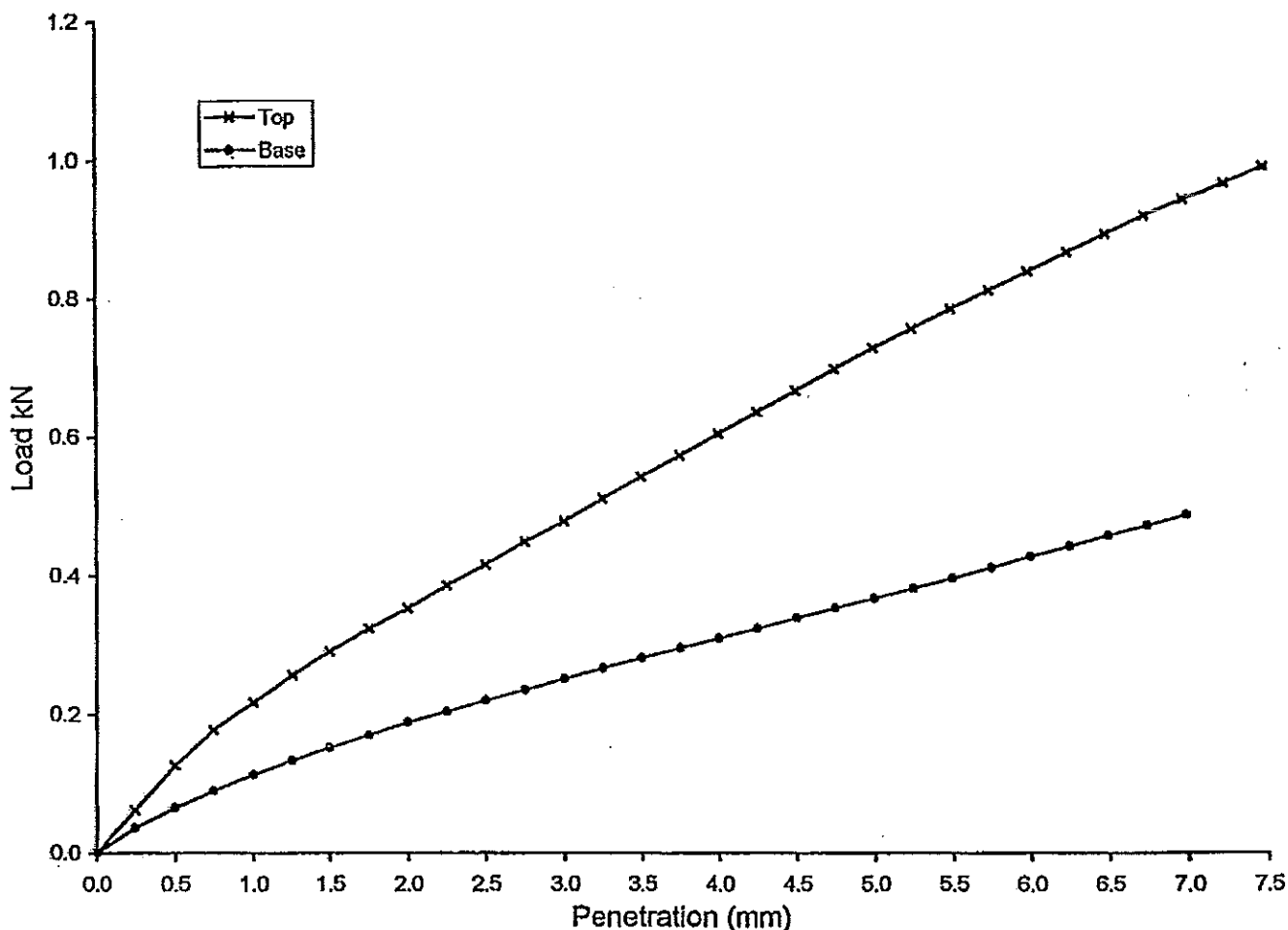
CALIFORNIA BEARING RATIO TEST

NORWEST
HOLST

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown gravelly CLAY.

Hole ID TP2
Sample no. 03
Sample depth 1.00 m
Sample type B
Page 1 of 1



CBR values %				Natural moisture content	
Penetration	Top	Base	Accepted CBR	Moisture content - top	16 %
2.50 mm	3.2	1.7	N/A	Moisture content - base	19 %
5.00 mm	3.6	1.8		Bulk density	2.10 Mg/m ³
Curve correction	No	No		Dry density	1.81 Mg/m ³
Seating load - top	10	N		Method of compaction	2.5kg rammer
Seating load - base	10	N		Soaking period	4 days
Surcharge	6.7	kg		Amount of swell	1.8 mm
Gravel retained on 20mm sieve	0	%			
Gravel retained on 37.5mm sieve	0	%			

Specimen no. 1 Specimen depth 1.00 m

General remarks Bottom test terminated due to approaching ring limit.

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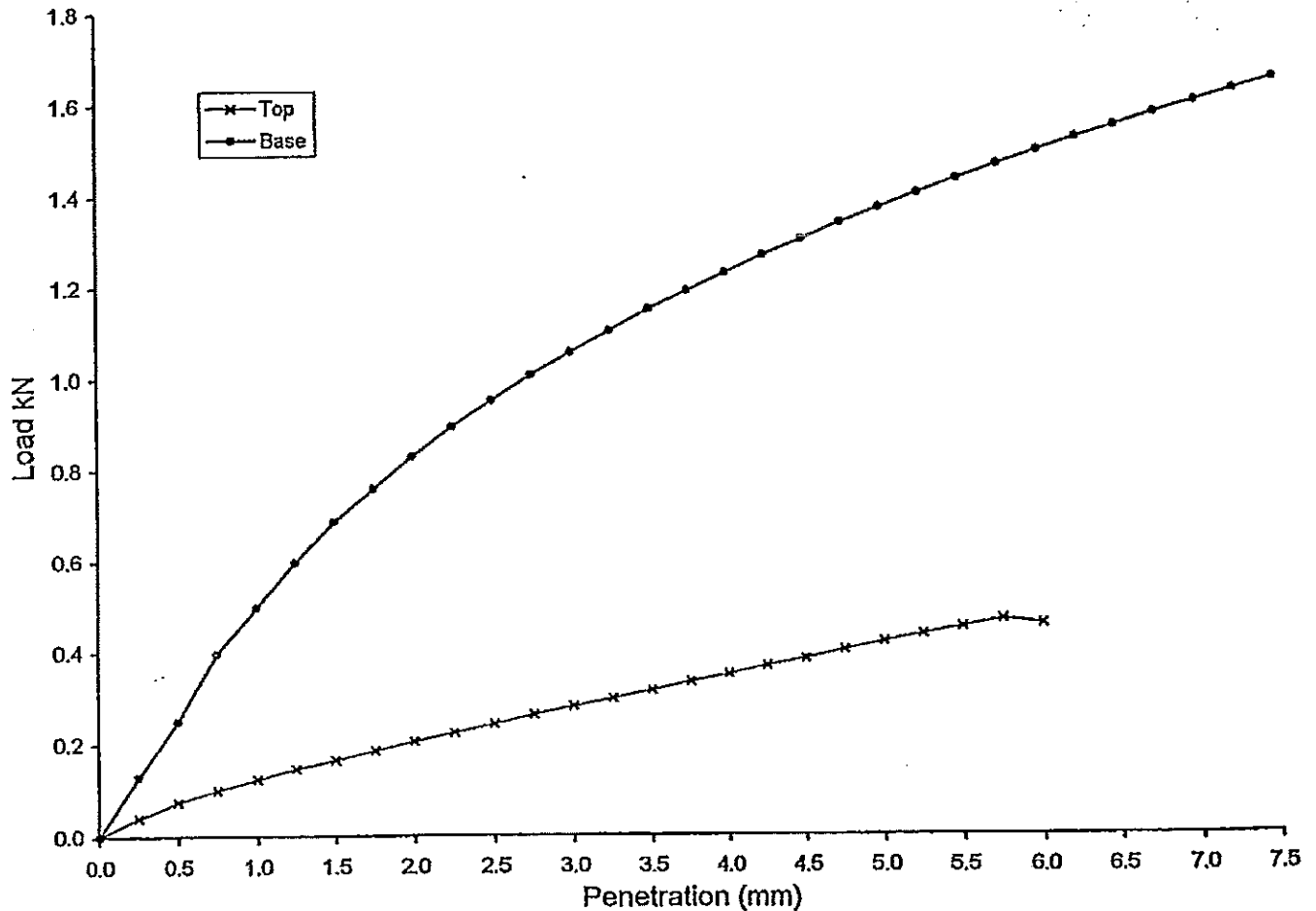
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly CLAY.

Hole ID TP224
Sample no. 03
Sample depth 1.00 m
Sample type B
Page 1 of 1



CBR values %				Natural moisture content		19 %
Penetration	Top	Base	Accepted CBR	Moisture content - top		19 %
2.50 mm	1.8	7.2	N/A	Moisture content - middle		19 %
5.00 mm	2.1	6.8		Moisture content - base		21 %
Curve correction	No	No		Bulk density		2.08 Mg/m³
				Dry density		1.75 Mg/m³

Seating load - top	10	N	Method of compaction	2.5kg rammer
Seating load - base	10	N		
Surcharge	6.0	kg		
Gravel retained on 20mm sieve	2	%	Soaking period	4 days
Gravel retained on 37.5mm sieve	0	%	Amount of swell	1.7 mm

Specimen no. 1 Specimen depth 1.00 m

General remarks

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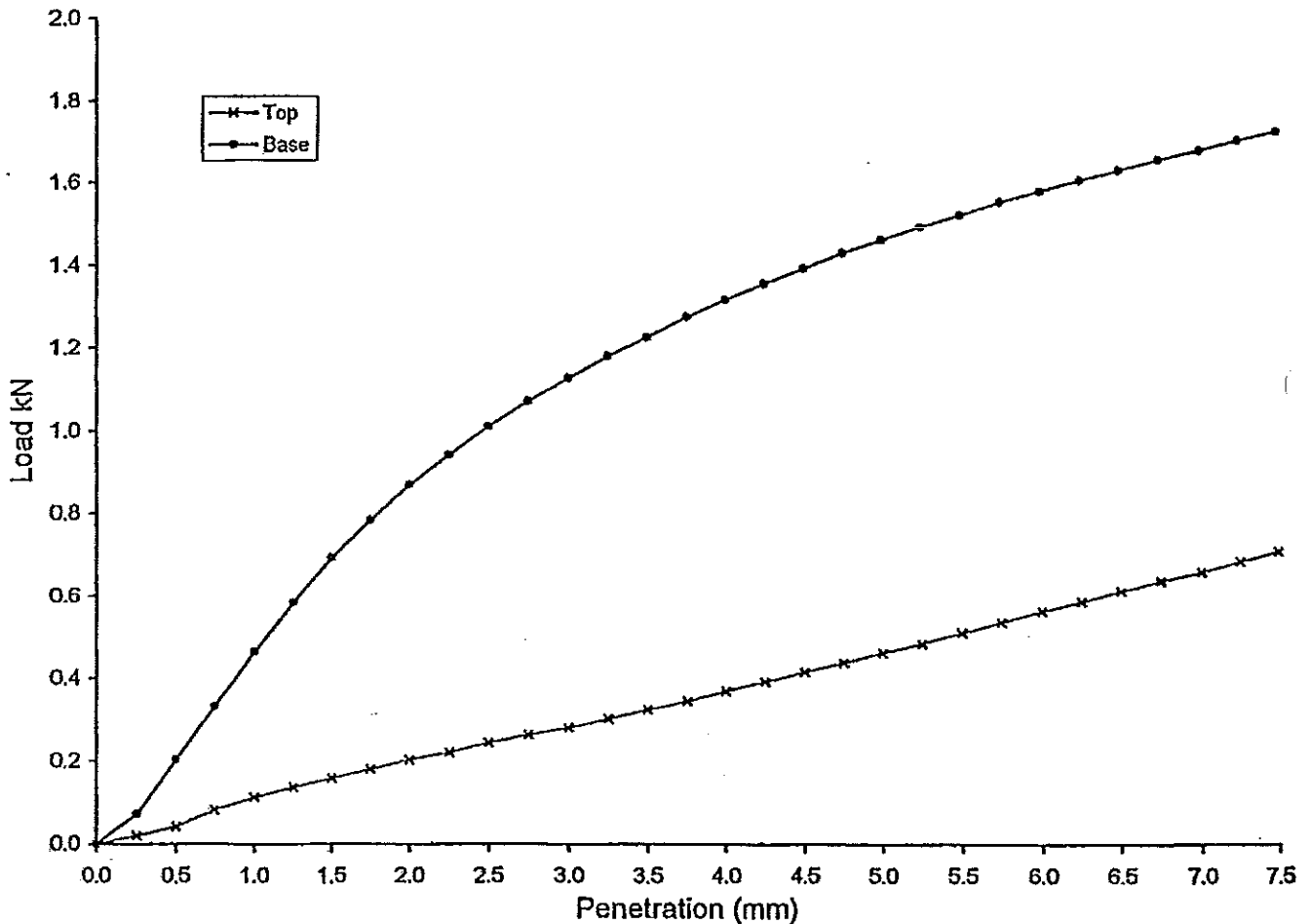
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly CLAY.

Hole ID TF
Sample no. 1
Sample depth 1.00 m
Sample type B
Page 1 of 1



CBR values %				Natural moisture content		18 %	
Penetration	Top	Base	Accepted CBR	Moisture content - top		21 %	
2.50 mm	1.9	7.6	N/A	Moisture content - middle		18 %	
5.00 mm	2.3	7.3		Moisture content - base		18 %	
Curve correction	No	No		Bulk density		2.08 Mg/m³	
				Dry density		1.76 Mg/m³	
Seating load - top				10	N	Method of compaction 2.5kg rammer	
Seating load - base				10	N		
Surcharge				6.0	kg		
Gravel retained on 20mm sieve				0	%	Soaking period	4 days
Gravel retained on 37.5mm sieve				0	%	Amount of swell	0 mm

Specimen no. 1 Specimen depth 1.00 m

General remarks

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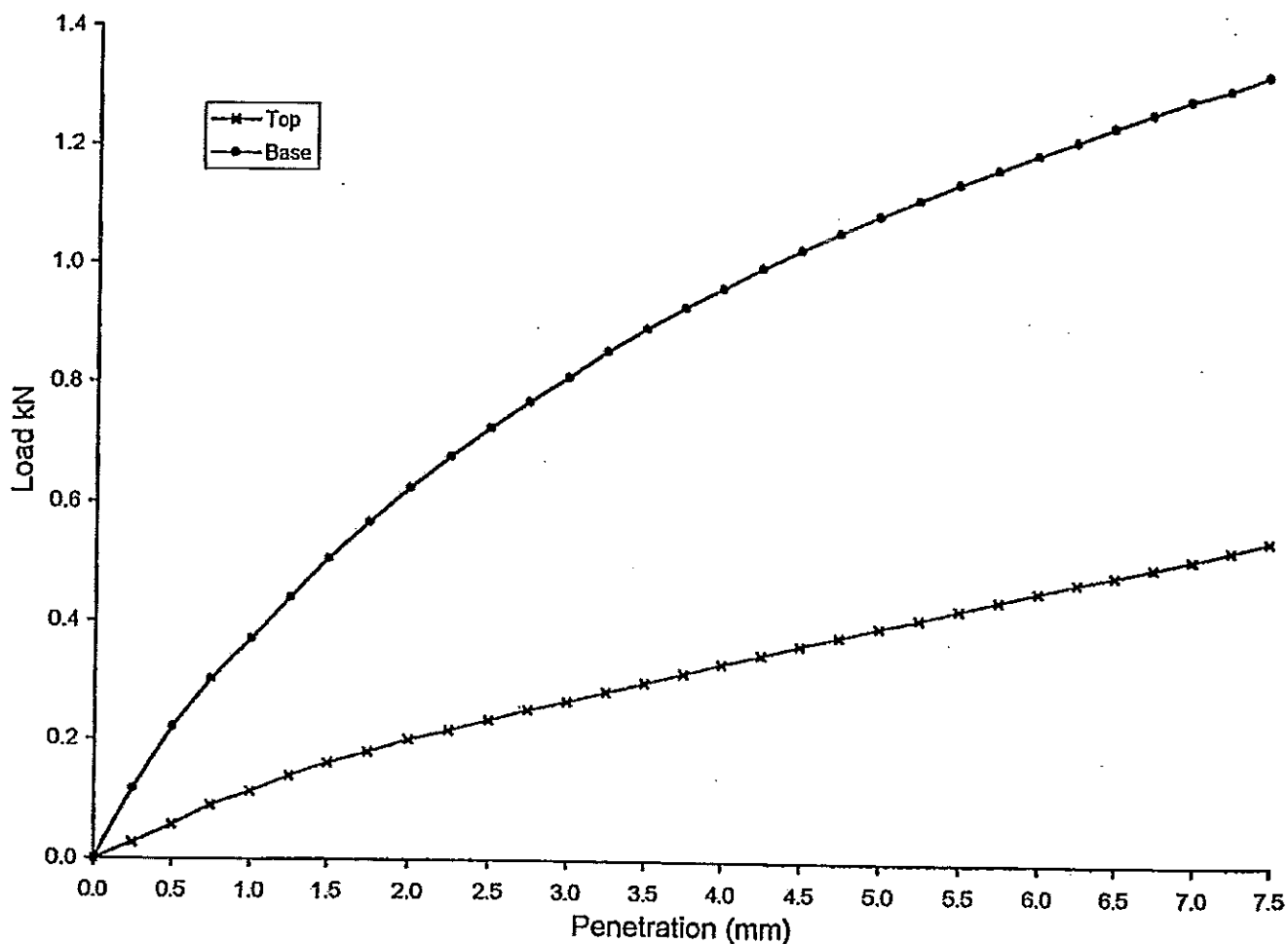
Approved: *S. Perda*

CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no.	F12963	Hole ID	TP227
Project	Aldbrough Gas Storage Facility	Sample no.	04
Soil description	Brown slightly gravelly CLAY.	Sample depth	1.00 m
		Sample type	B
		Page	1 of 1



CBR values %					
Penetration	Top	Base	Accepted CBR	Natural moisture content	19 %
2.50 mm	1.8	5.5	N/A	Moisture content - top	21 %
5.00 mm	2	5.4		Moisture content - middle	20 %
Curve correction	No	No		Moisture content - base	20 %
				Bulk density	2.07 Mg/m³
				Dry density	1.74 Mg/m³
Seating load - top			10 N	Method of compaction	2.5kg rammer
Seating load - base			10 N		
Surcharge			6.7 kg		
Gravel retained on 20mm sieve			0 %	Soaking period	4 days
Gravel retained on 37.5mm sieve			0 %	Amount of swell	1.2 mm
Specimen no.	1	Specimen depth	1.00 m		

Specimen no. 1 Specimen depth 1.00 m

General remarks

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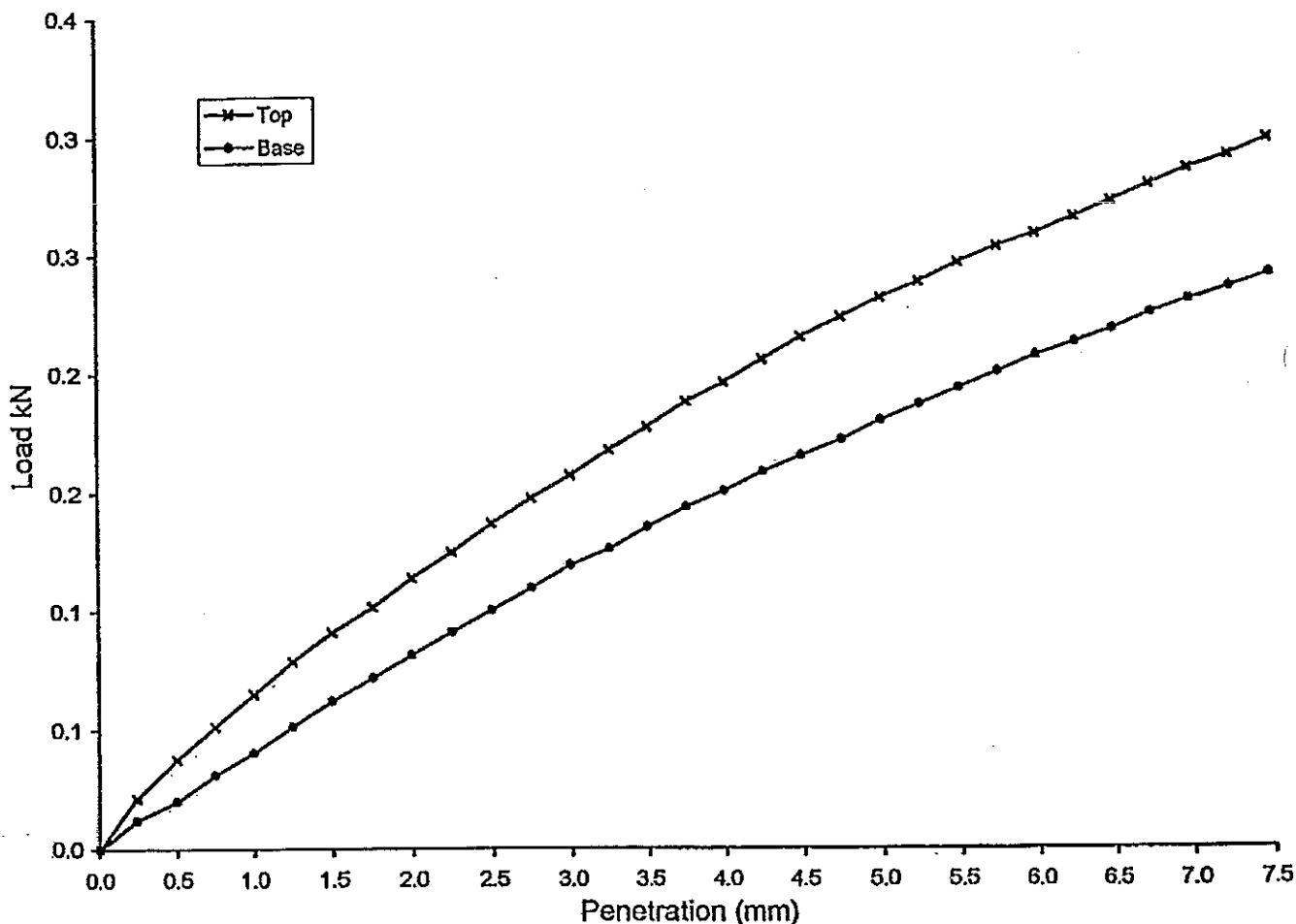
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Light brown sandy gravelly CLAY.

Hole ID TP2
Sample no. 03
Sample depth 1.00 m
Sample type B
Page 1 of 1



CBR values %				Natural moisture content	
Penetration	Top	Base	Accepted CBR	Moisture content - top	24 %
2.50 mm	1	0.76	N/A	Moisture content - base	24 %
5.00 mm	1.2	0.9		Bulk density	1.98 Mg/m³
Curve correction	No	No		Dry density	1.61 Mg/m³
Seating load - top	10	N		Method of compaction	2.5kg rammer
Seating load - base	10	N		Soaking period	4 days
Surcharge	6.7	kg		Amount of swell	0.4 mm
Gravel retained on 20mm sieve	5	%			
Gravel retained on 37.5mm sieve	1	%			

Specimen no. 1 Specimen depth 1.00 m

General remarks Top test to 4.00mm and bottom test to 5.75mm performed below calibrated range of load ring.

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Approved:

S. Smith

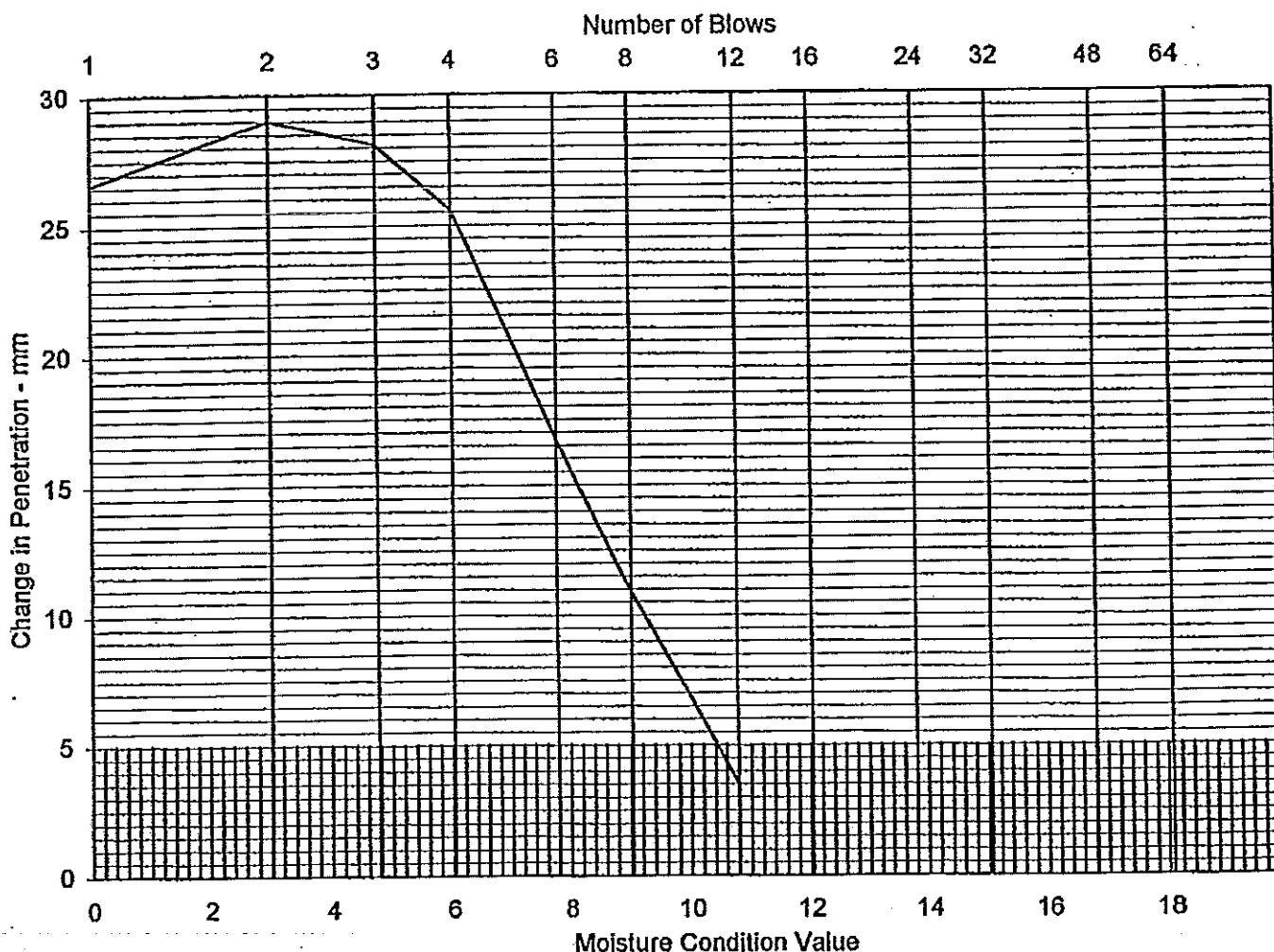
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.4

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Brown mottled slightly gravelly CLAY.

Hole ID BH105
Sample type B
Sample no. 03
Depth 0.60
Page 1 of 1



Specimen number	1	
Moisture condition value MCV	10.1	
Moisture content	20.8	%
Bulk density after compaction	2.09	Mg/r
Dry density after compaction	1.73	Mg/r
Hand vane strength after compaction	69	kPa
Method of determining MCV	Steepest fit line	
Gravel retained on 20mm sieve	0.0	%

Remarks Separate batches tested Specimen depth 0.60m

Norwest Holst Soil Engineering Limited

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Approved: *S. Patel*

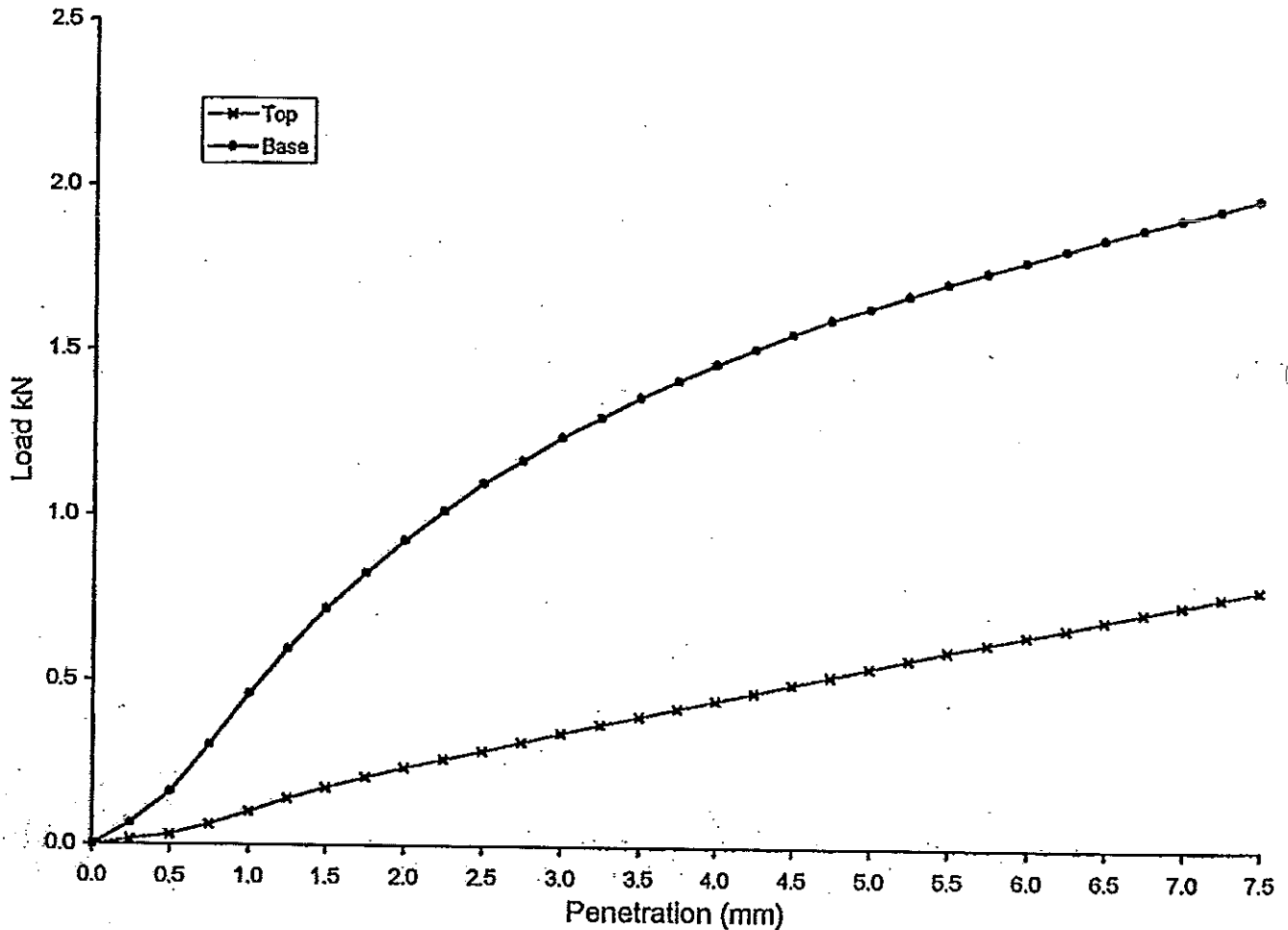
CALIFORNIA BEARING RATIO TEST

**NORWEST
HOLST**

Test Method: BS1377: Part 4: 1990: Clause 7

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Reddish brown slightly gravelly CLAY.

Hole ID TP1
Sample no. 06
Sample depth 2.00 m
Sample type AMAL
Page 1 of 1



CBR values %				Natural moisture content	
Penetration	Top	Base	Accepted CBR	17 %	
2.50 mm	2.2	8.3		Moisture content - top	
5.00 mm	2.7	8.2		18 %	
Curve correction	No	No		Moisture content - base	
				17 %	
				Bulk density	
				2.10 Mg/m³	
				Dry density	
				1.80 Mg/m³	
Seating load - top				Method of compaction	
Seating load - base				2.5kg rammer	
Surcharge					
Gravel retained on 20mm sieve				Soaking period	
Gravel retained on 37.5mm sieve				4 days	
				Amount of swell	
				0.7 mm	

Specimen no. 1 Specimen depth 2.00 m
Amalgamation TP208,06,B,2.00m+TP207,06,B,2.00m.
General remarks

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Approved: *S. Smith*

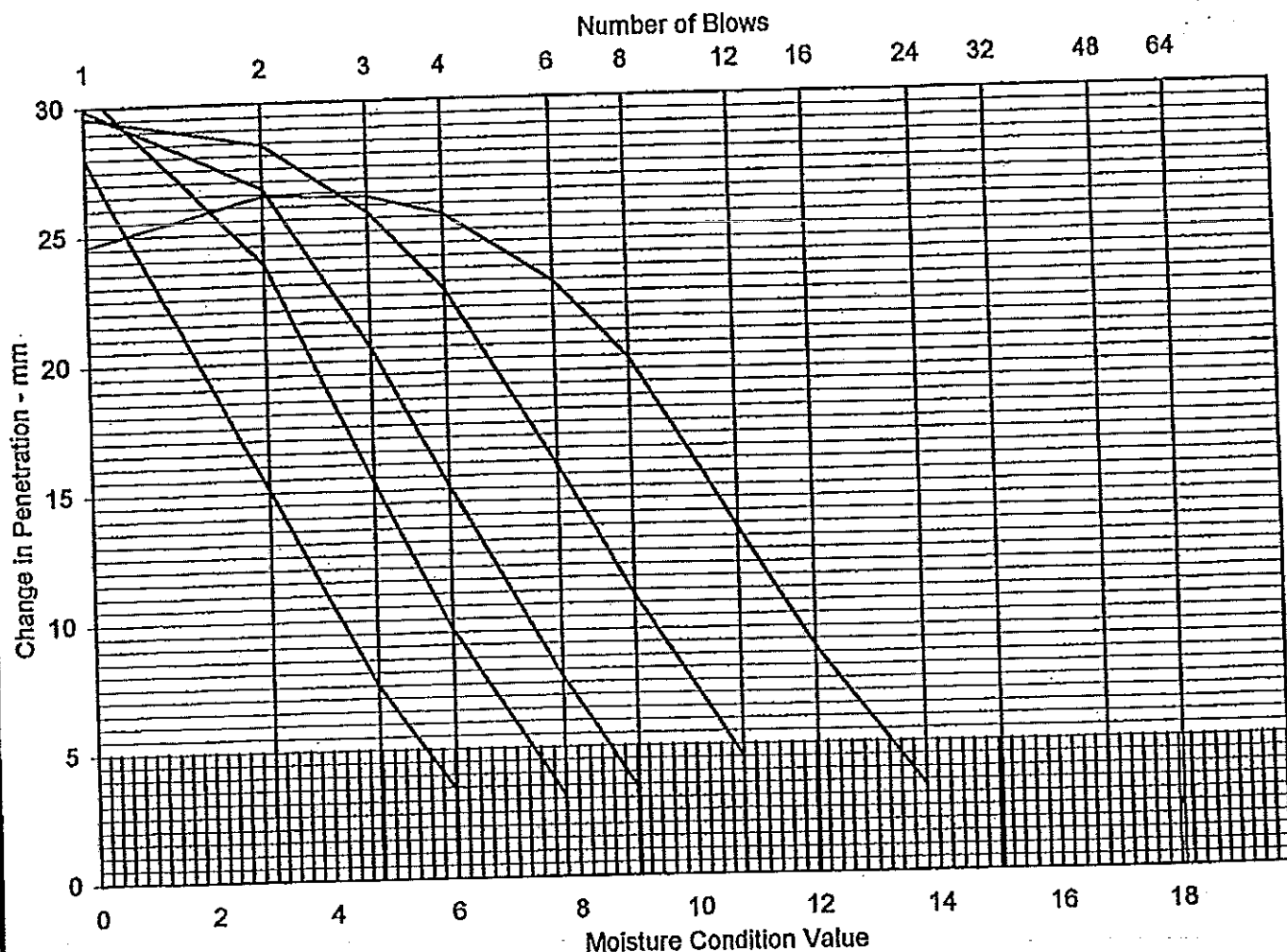
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown slightly gravelly CLAY.

Hole ID TP205
Sample type B
Sample no. 03
Depth 1.00 m
Page 1 of 2



Specimen number	1	2	3	4	5	
Moisture condition value MCV	10.5	13.0	8.4	6.9	5.4	
Moisture content	16.6	15.1	18.0	19.0	20.3	%
Bulk density after compaction	2.15	2.20	2.12	2.07	2.04	Mg/
Dry density after compaction	1.85	1.91	1.80	1.74	1.69	Mg/
Hand vane strength after compaction	94	>124	24	18	13	kPa
Method of determining MCV	Steepest fit line Steepest fit line Steepest fit line Steepest fit line Steepest fit line					
Gravel retained on 20mm sieve	3.5	%				

Remarks Separate batches tested Specimen depth 1.00m

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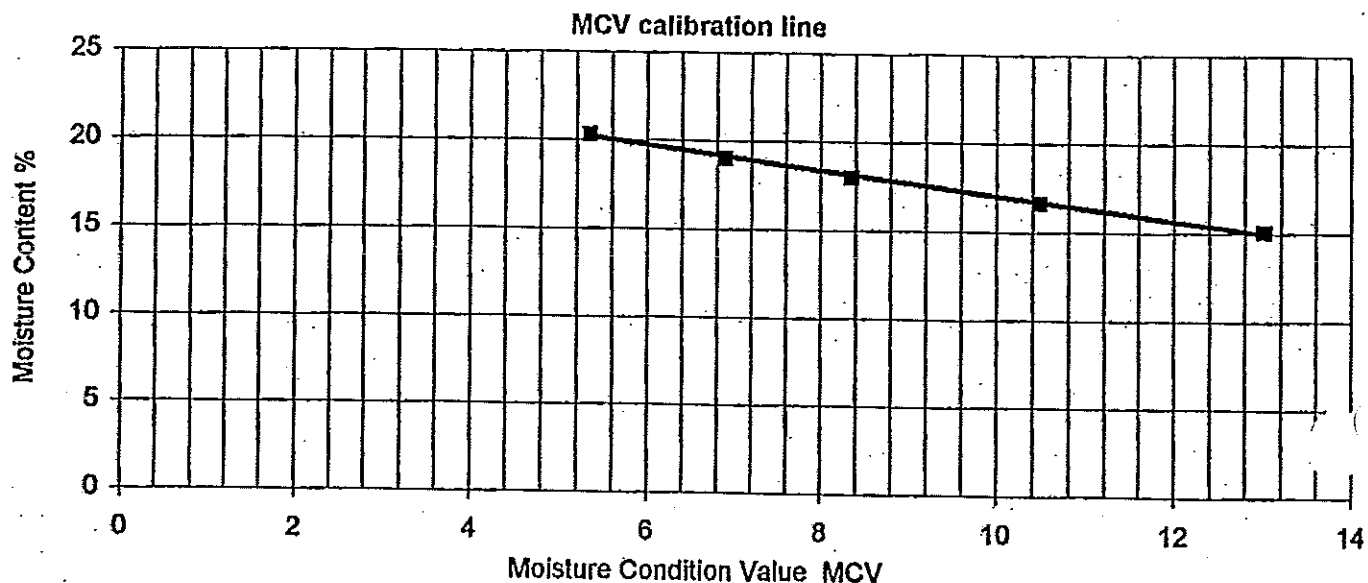
MOISTURE CONDITION VALUE

**NORWEST
HOLST**

Test method: BS1377: Part 4: 1990: Clause 5.5

Contract no. F12963
Project Aldbrough Gas Storage Facility
Description Reddish brown slightly gravelly CLAY.

Hole ID 7
Sample type
Sample no. 03
Depth 1.00 m
Page 2 of 2



Characteristics of calibration line

determined using linear regression

Intercept

23.7

Slope

-0.673

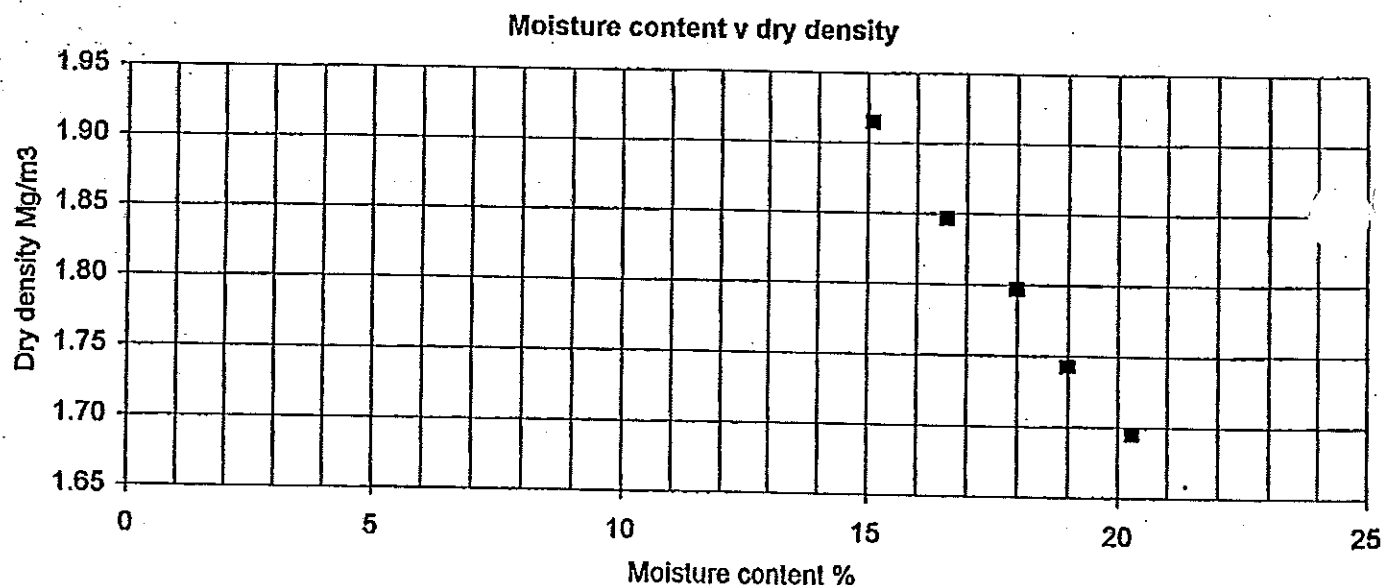
Sensitivity

1.486

MCV per MC%

Correlation

-0.998



Remarks Separate batches tested

Specimen depth 1.00m

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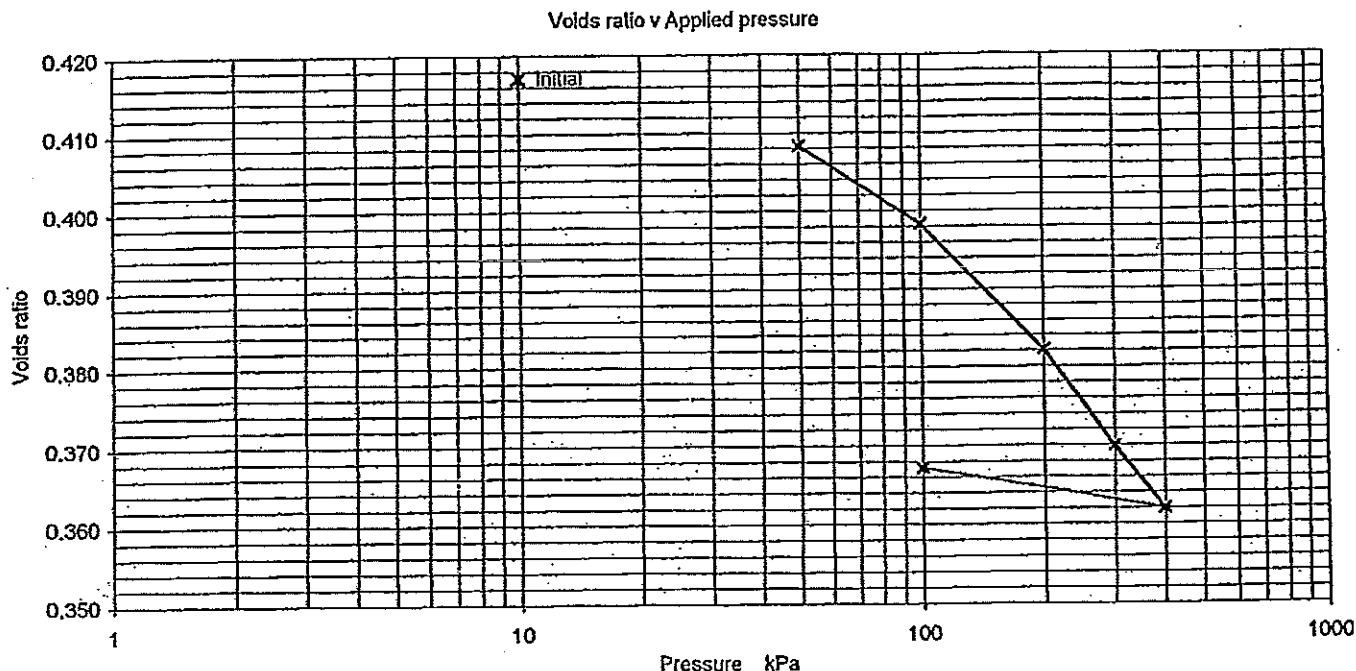
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID BH102
Sample ref. 06
Sample dept 2.50 m
Sample type U
Page 1 of 1



Specimen details			Laboratory coefficients			
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$	Voids ratio
Trimmings moisture content	15	%				
Diameter	75.0	mm				
Height	18.87	mm				
Density	2.17	Mg/m^3	50	0.127	6.549	0.408
Dry density	1.87	Mg/m^3	100	0.142	4.501	0.398
Initial moisture content	16	%	200	0.116	4.874	0.382
Voids ratio	0.42		300	0.088	3.134	0.370
Saturation	101.65	%	400	0.058	N/D	0.362
Particle density Assumed	2.65	Mg/m^3	100			0.367
Specimen depth	2.58	m				
Specimen ref.						
Final moisture content	15	%				
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure						
	0.13	m^2/MN				

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6

Specimen cut and tested in an horizontal orientation. N/D is value not determined, where it is not possible to identify end of primary.

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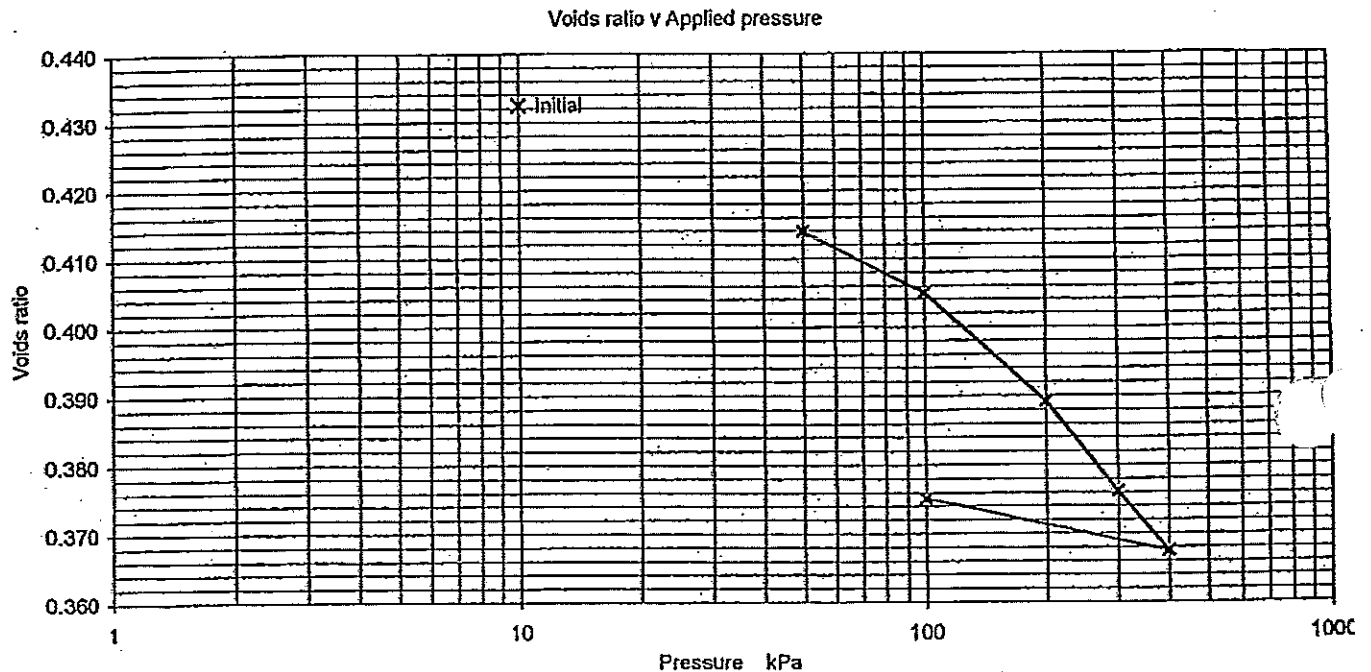
OEDOMETER CONSOLIDATION

**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff brown slightly gravelly CLAY

Hole ID
Sample ref. 11
Sample dept 4.50
Sample type U
Page 1 of 1



Specimen details			Laboratory coefficients				
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		Voids ratio
					log time	root time	
Trimblings moisture content	16	%					
Diameter	75.0	mm					
Height	18.84	mm					
Density	2.17	Mg/m ³	50	0.264	12.379	35.621	0.414
Dry density	1.85	Mg/m ³	100	0.127	2.436	2.708	0.405
Initial moisture content	17	%	200	0.113	2.234	2.464	0.389
Volds ratio	0.43		300	0.094	1.320	1.593	0.376
Saturation	104.18	%	400	0.064	1.163	1.309	0.367
Particle density Assumed	2.65	Mg/m ³	100				
Specimen depth	4.60	m					
Specimen ref.							
Final moisture content	16	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure	0.11	m^2/MN					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6

Specimen cut and tested in an horizontal orientation.

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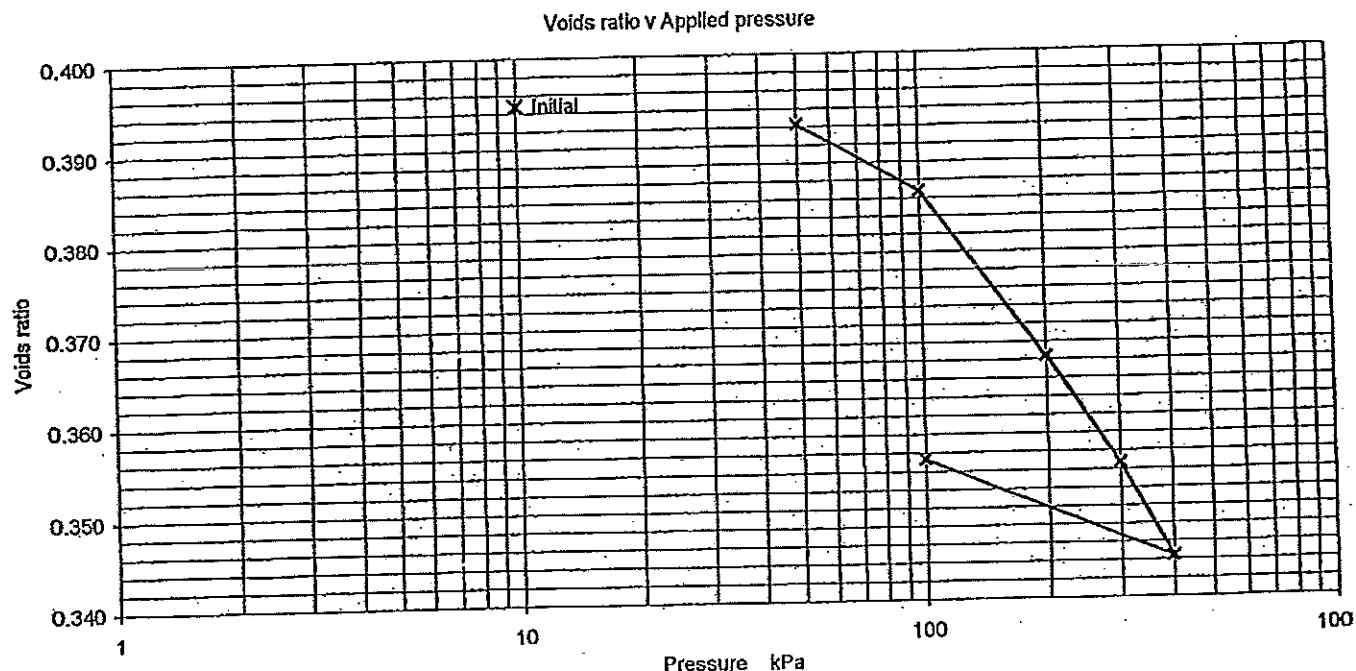
OEDOMETER CONSOLIDATION

**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown slightly gravelly CLAY

Hole ID BH103
Sample ref. 05
Sample dept 2.50
Sample type U
Page 1 of 1



Specimen details			Laboratory coefficients			
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$	Voids ratio
Trimmings moisture content	14	%				
Diameter	74.9	mm				
Height	18.90	mm				
Density	2.19	Mg/m ³				
Dry density	1.90	Mg/m ³				
Initial moisture content	15	%				
Voids ratio	0.39					
Saturation	100.70	%				
Particle density Assumed	2.65	Mg/m ³				
Specimen depth	2.66	m				
Specimen ref.						
Final moisture content	15	%				
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure						
	0.13	m^2/MN				

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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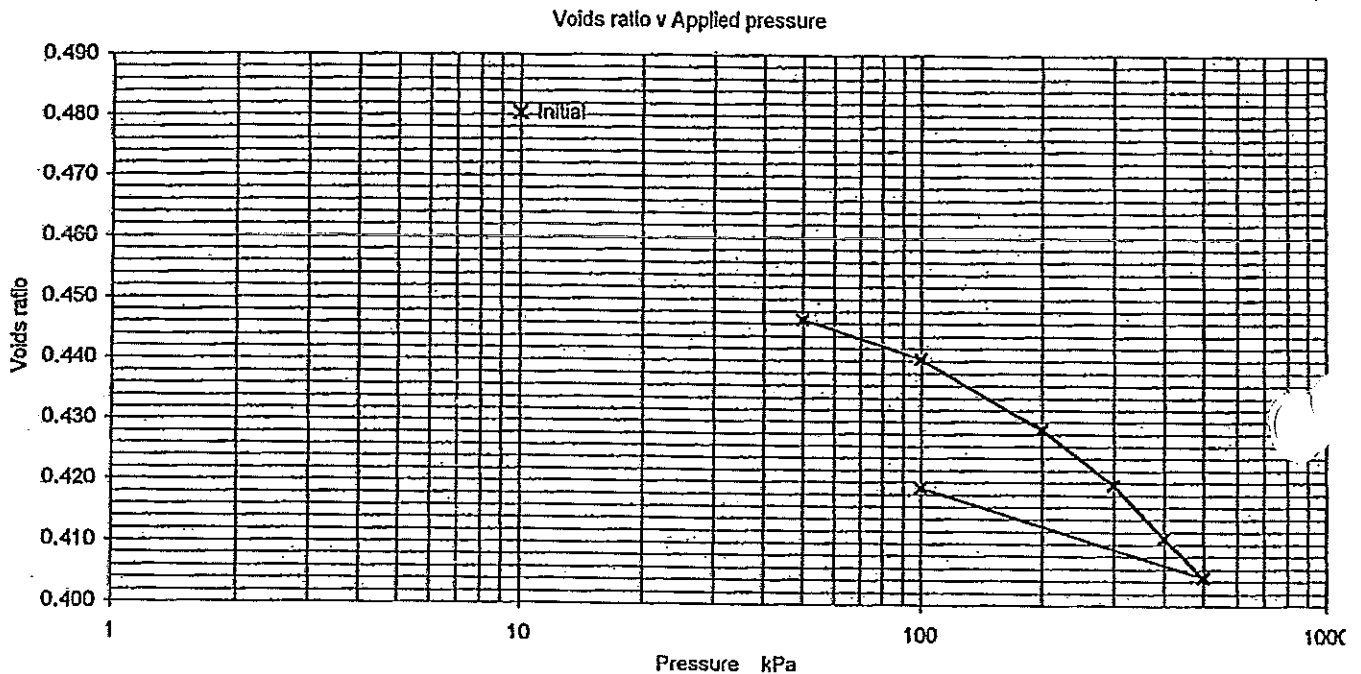
OEDOMETER CONSOLIDATION

**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample ref. U
Sample dept 3.05
Sample type U
Page 1 of 1



Specimen details

Trimnings moisture content	18	%
Diameter	74.9	mm
Height	18.81	mm
Density	2.13	Mg/m ³
Dry density	1.79	Mg/m ³
Initial moisture content	19	%
Voids ratio	0.48	
Saturation	104.80	%
Particle density Assumed	2.65	Mg/m ³
Specimen depth	3.15	m
Specimen ref.		
Final moisture content	19	%

Laboratory coefficients

Pressure kPa	Compressibility m_v m ² /MN	Consolidation c_v m ² /year		Voids ratio
		log time	root time	
50	0.467	Swelled	Swelled	0.447
100	0.088	21.741	24.817	0.440
200	0.080	12.453	10.187	0.429
300	0.064	5.667	5.694	0.420
400	0.061	2.939	3.087	0.411
500	0.045	N/D	6.005	
1000				0.405

Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure 0.08 m²/MN

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6

Specimen cut and tested in an horizontal orientation. N/D is value not determined, where it is not possible to identify end of primary.
Specimen swelled on stage 1.

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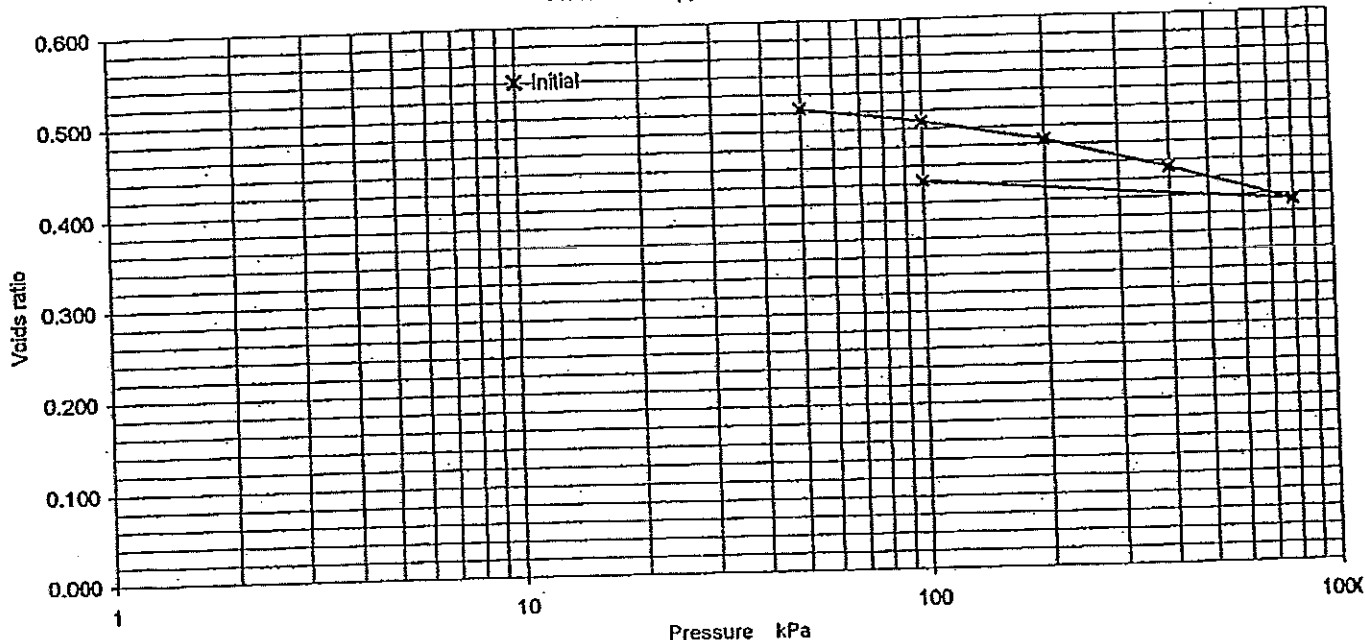
**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown CLAY

Hole ID BH104
Sample ref. 13
Sample dept 6.00
Sample type U
Page 1 of 1

Voids ratio v Applied pressure



Specimen details			Laboratory coefficients				Voids ratio
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		
Trimmings moisture content	21	%			log time	root time	
Diameter	75.0	mm					
Height	18.90	mm					
Density	2.10	Mg/m ³	50	0.480	9.479	14.523	0.505
Dry density	1.72	Mg/m ³	100	0.221	3.069	2.926	0.488
Initial moisture content	22	%	200	0.156	3.265	3.308	0.465
Voids ratio	0.54		400	0.112	3.597	3.299	0.432
Saturation	107.82	%	800	0.068	4.968	4.538	0.393
Particle density - Assumed	2.65	Mg/m ³	100				0.423
Specimen depth	6.07	m					
Specimen ref.							
Final moisture content	20	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure				0.14	m^2/MN		

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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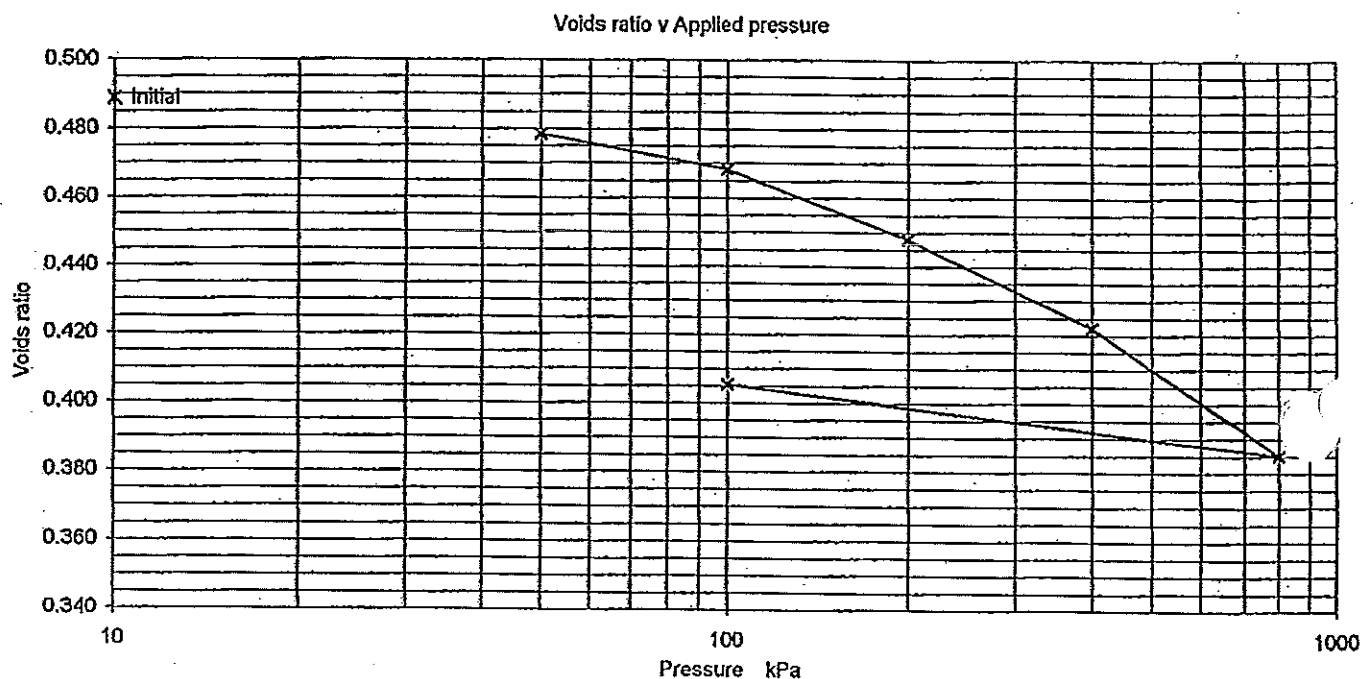
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990; Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample ref. 11
Sample depth 4.50
Sample type U
Page 1 of 1



Specimen details

Trimming moisture content	17	%
Diameter	74.9	mm
Height	18.91	mm
Density	2.12	Mg/m ³
Dry density	1.78	Mg/m ³
Initial moisture content	19	%
Voids ratio	0.49	
Saturation	103.01	%
Particle density Assumed	2.65	Mg/m ³
Specimen depth	4.56	m
Specimen ref.		
Final moisture content	17	%

Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure

0.14 m²/MN

Laboratory coefficients

Pressure kPa	Compressibility m_v m ² /MN	Consolidation c_v m ² /year		Voids ratio
		log time	root time	
50	0.141	33.883	27.062	0.479
100	0.139	4.488	4.327	0.468
200	0.137	3.153	3.921	0.448
400	0.089	2.746	2.893	0.422
800	0.065	2.768	2.424	0.405
100				

Specimen prepared as per BS1377: Part 1: 1990; Clause 8.6
Specimen cut and tested in an horizontal orientation.

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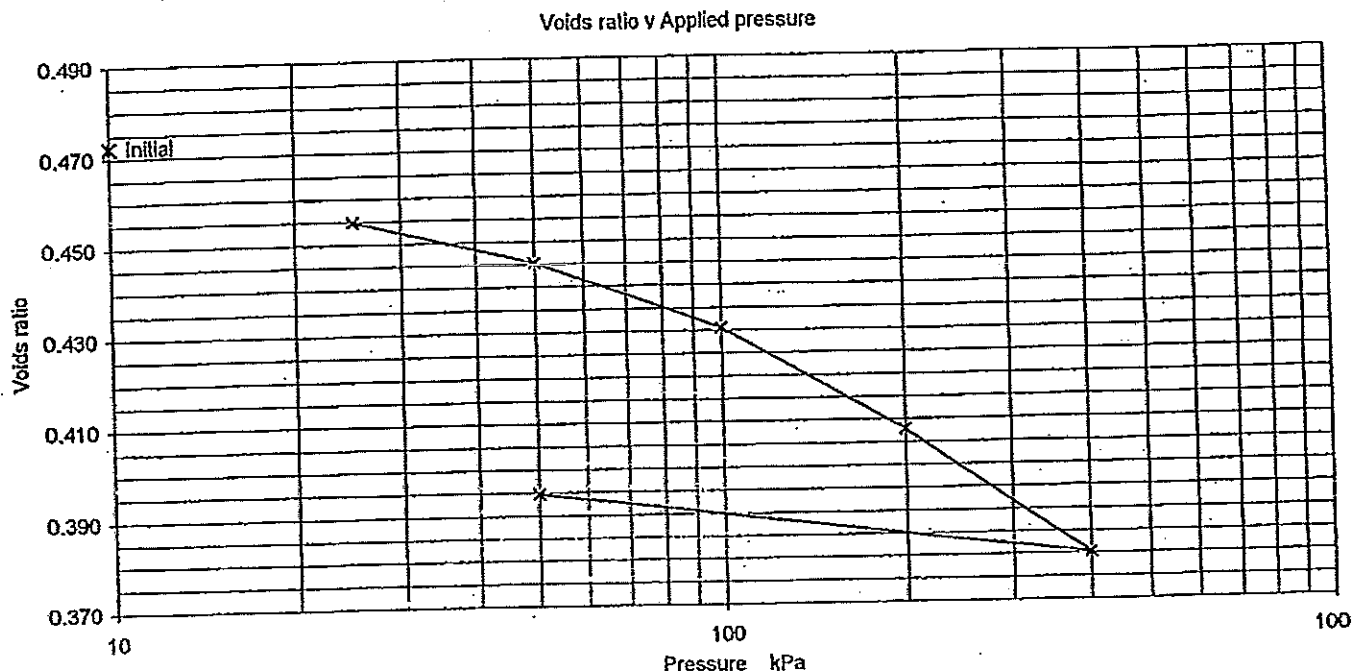
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no.	F12963	Hole ID	BH105
Project	Aldbrough Gas Storage Facility	Sample ref.	22
Soil description	Soft to firm dark brown slightly gravelly CLAY	Sample depth	10.00
		Sample type	U
		Page	1 of 1



Specimen details			Laboratory coefficients				Voids ratio
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		
Trimmings moisture content	18	%			log time	root time	
Diameter	74.9	mm					
Height	18.87	mm					
Density	2.12	Mg/m ³	25	0.492	7.202	6.424	0.455
Dry density	1.80	Mg/m ³	50	0.266	1.552	1.497	0.445
Initial moisture content	18	%	100	0.204	2.030	2.176	0.431
Voids ratio	0.47		200	0.159	2.010	2.210	0.408
Saturation	101.01	%	400	0.098	2.295	2.168	0.380
Particle density Assumed	2.65	Mg/m ³	50				0.395
Specimen depth	10.05	m					
Specimen ref.							
Final moisture content	16	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure							
	0.11	m ² /MN					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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Approved: *SKK*

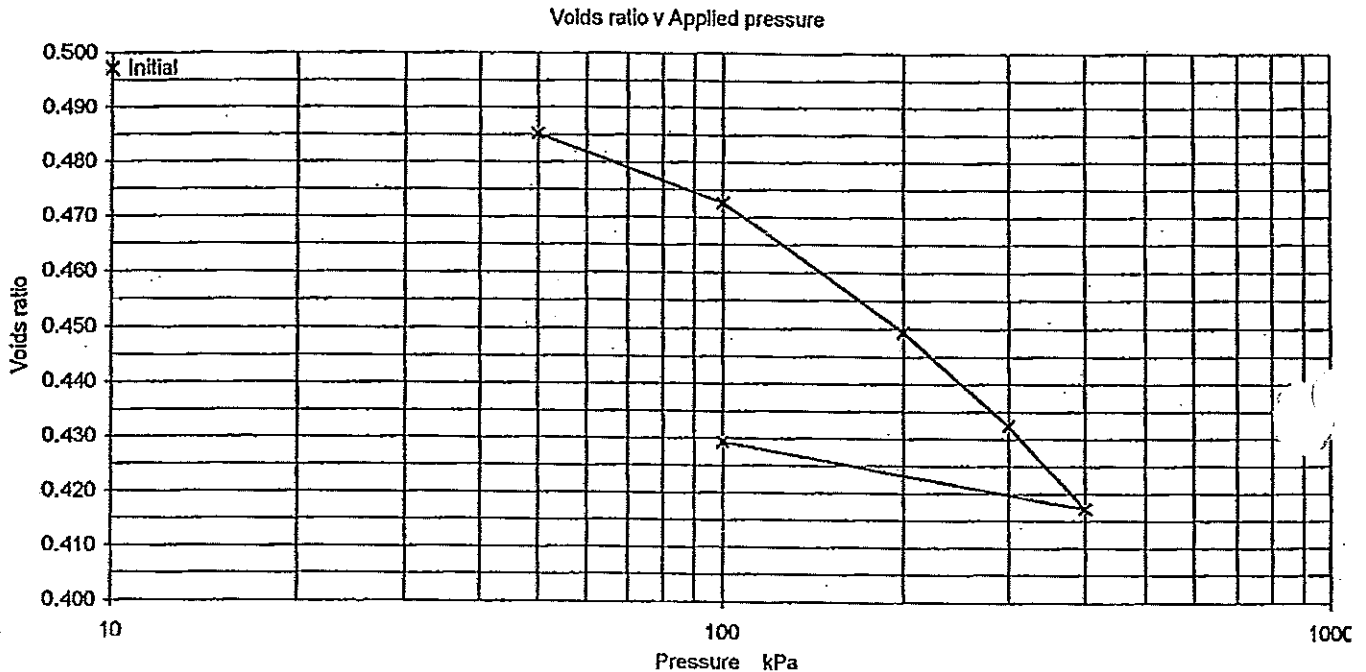
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff brown slightly gravelly CLAY

Hole ID
Sample ref. 10
Sample depth 3.50
Sample type U
Page 1 of 1



Specimen details

Trimings moisture content	20	%
Diameter	74.9	mm
Height	18.83	mm
Density	2.11	Mg/m ³
Dry density	1.77	Mg/m ³
Initial moisture content	19	%
Voids ratio	0.50	
Saturation	101.27	%
Particle density Assumed	2.65	Mg/m ³
Specimen depth	3.55	m
Specimen ref.		
Final moisture content	18	%

Laboratory coefficients

Pressure kPa	Compressibility m_v m ² /MN	Consolidation c_v m ² /year		Voids ratio
		log time	root time	
50	0.164	9.329	11.388	0.485
100	0.169	8.062	6.609	0.473
200	0.157	2.036	2.662	0.449
300	0.117	1.550	1.789	0.432
400	0.106	0.798	0.831	0.417
100				

Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure

0.16 m²/MN

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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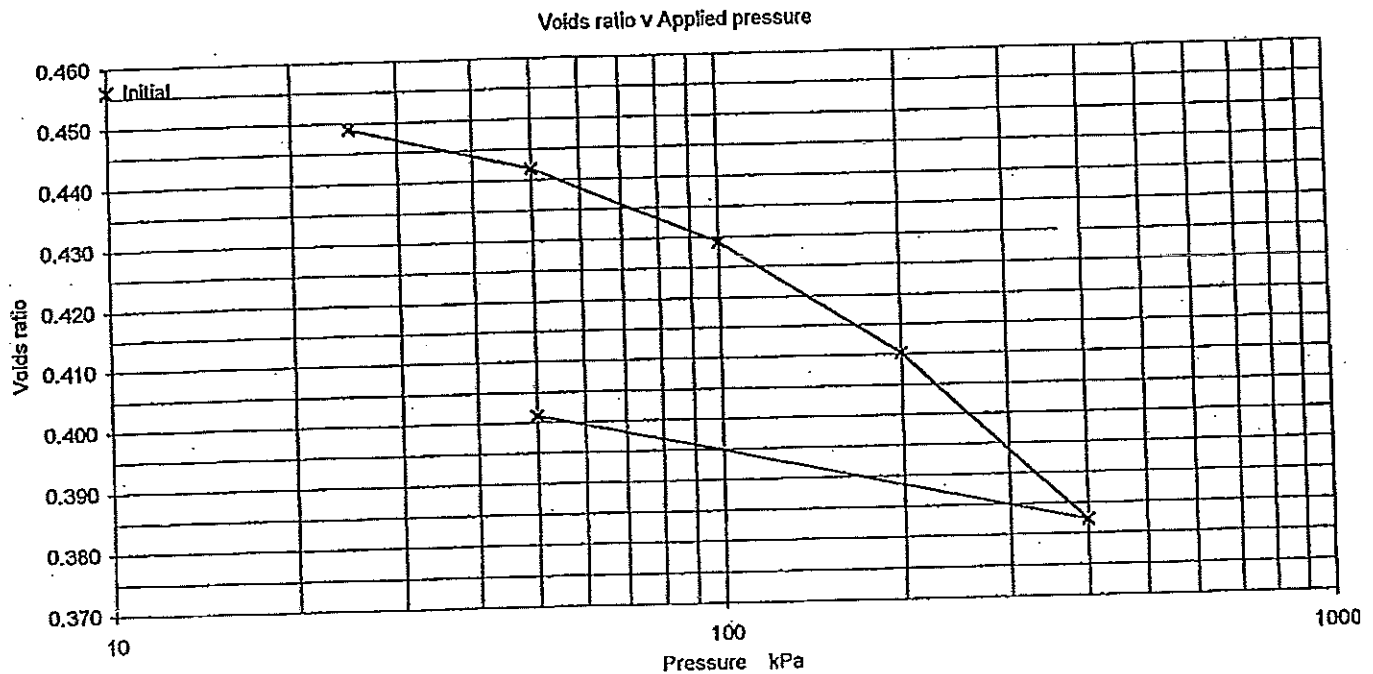
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no.	F12963	Hole ID	BH106
Project	Aldbrough Gas Storage Facility	Sample ref.	16
Soil description	Firm dark brown slightly gravelly CLAY	Sample depth	5.50
		Sample type	U
		Page	1 of 1



Specimen details			Laboratory coefficients				Voids ratio
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		
Trimmings moisture content	11	%			log time	root time	
Diameter	75.0	mm					
Height	18.91	mm					
Density	2.17	Mg/m ³	25	0.204	8.640	7.249	0.449
Dry density	1.82	Mg/m ³	50	0.196	1.784	2.391	0.442
Initial moisture content	19	%	100	0.176	1.680	1.616	0.429
Voids ratio	0.46		200	0.132	1.667	1.649	0.410
Saturation	110.41	%	400	0.099	1.521	1.581	0.382
Particle density Assumed	2.65	Mg/m ³	50				0.401
Specimen depth	5.56	m					
Specimen ref.							
Final moisture content	17	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure	0.13	m^2/MN					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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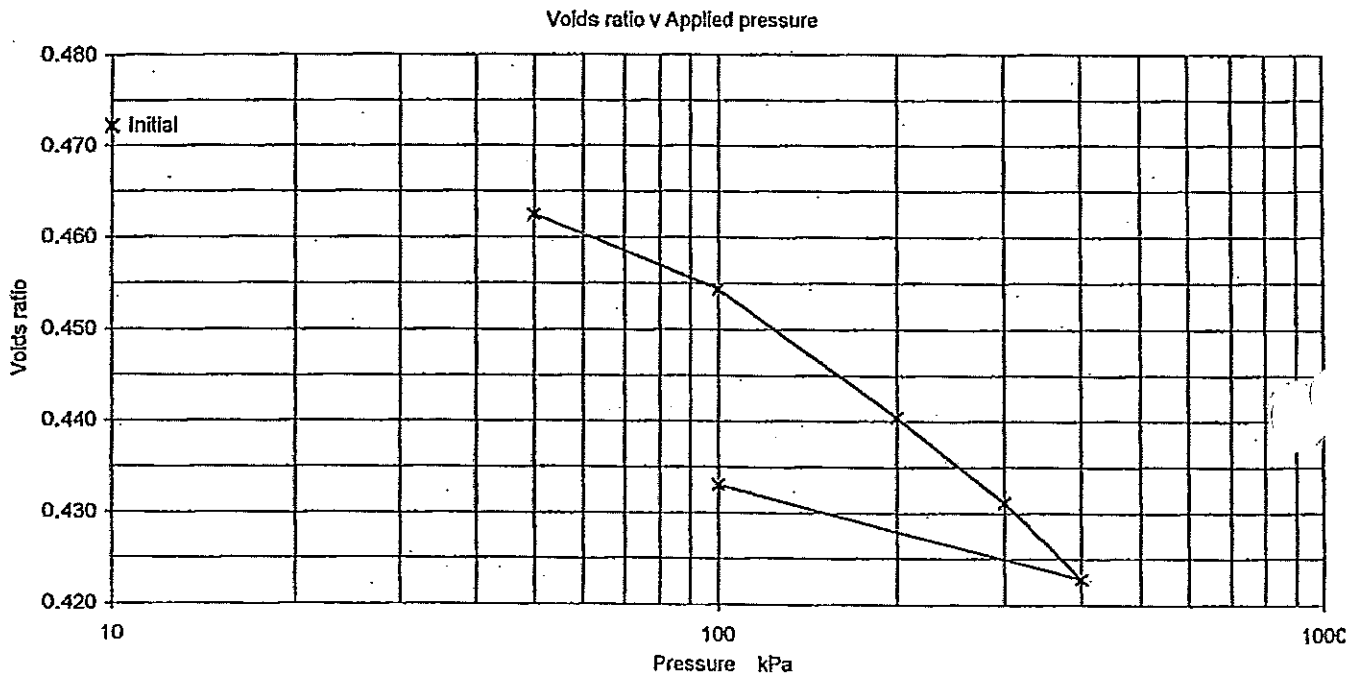
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample ref. 07
Sample depth 3.00
Sample type U
Page 1 of 1



Specimen details

Trimmings moisture content	18	%
Diameter	75.0	mm
Height	18.87	mm
Density	2.12	Mg/m ³
Dry density	1.80	Mg/m ³
Initial moisture content	18	%
Voids ratio	0.47	
Saturation	101.01	%
Particle density Assumed	2.65	Mg/m ³
Specimen depth	3.07	m
Specimen ref.		
Final moisture content	18	%

Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure

0.10 m²/MN

Laboratory coefficients

Pressure kPa	Compressibility m_v m ² /MN	Consolidation c_v m ² /year		Voids ratio
		log time	root time	
50	0.138	23.861	30.911	0.462
100	0.110	7.741	11.642	0.454
200	0.095	9.554	8.188	0.440
300	0.064	8.005	5.446	0.431
400	0.058	4.099	3.711	0.422

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6

Specimen cut and tested in an horizontal orientation.

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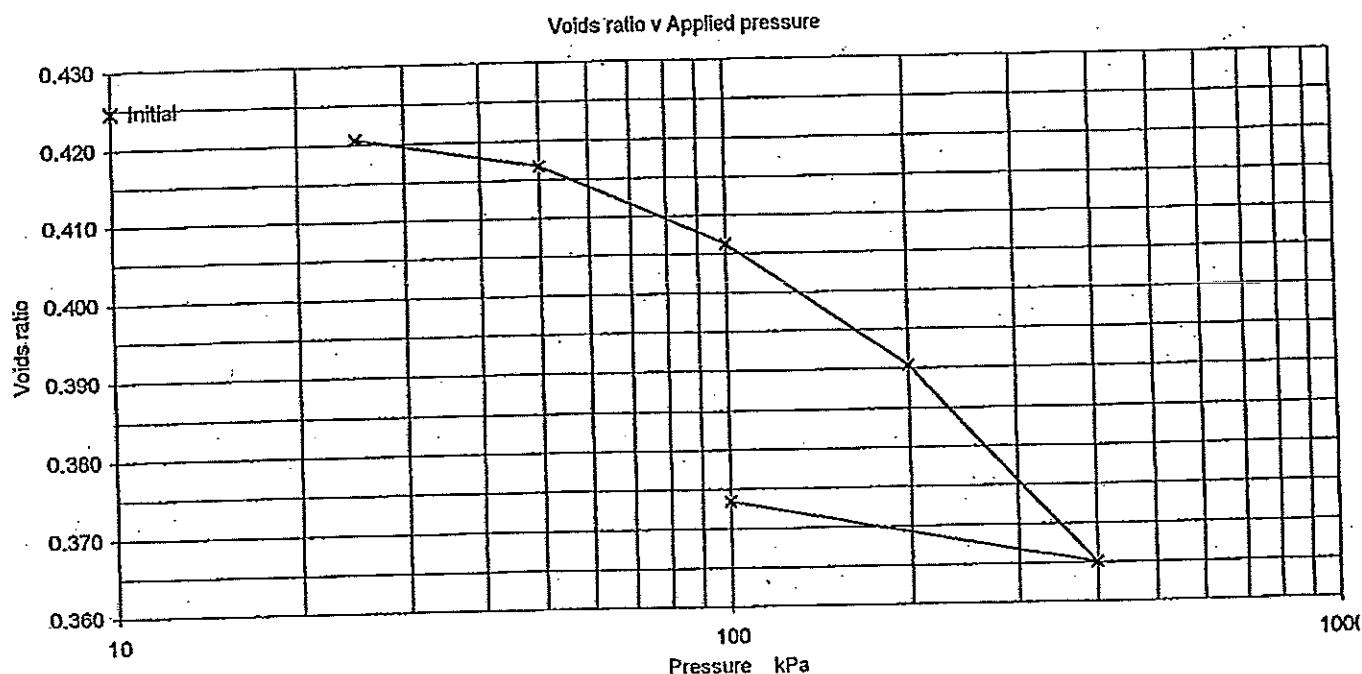
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Soft to firm brown slightly gravelly CLAY

Hole ID BH107
Sample ref. 11
Sample depth 5.00
Sample type U
Page 1 of 1



Specimen details			Laboratory coefficients				Voids ratio
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		
Trimmings moisture content	17	%			log time	root time	
Diameter	75.0	mm					
Height	18.87	mm					
Density	2.16	Mg/m ³	25	0.122	31.215	27.033	0.421
Dry density	1.86	Mg/m ³	50	0.108	5.042	4.536	0.417
Initial moisture content	16	%	100	0.147	3.273	3.958	0.406
Voids ratio	0.42		200	0.113	2.813	2.813	0.390
Saturation	99.83	%	400	0.091	2.187	2.314	0.365
Particle density Assumed	2.65	Mg/m ³	100				0.373
Specimen depth	5.07	m					
Specimen ref.							
Final moisture content	15	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure							
	0.11	m^2/MN					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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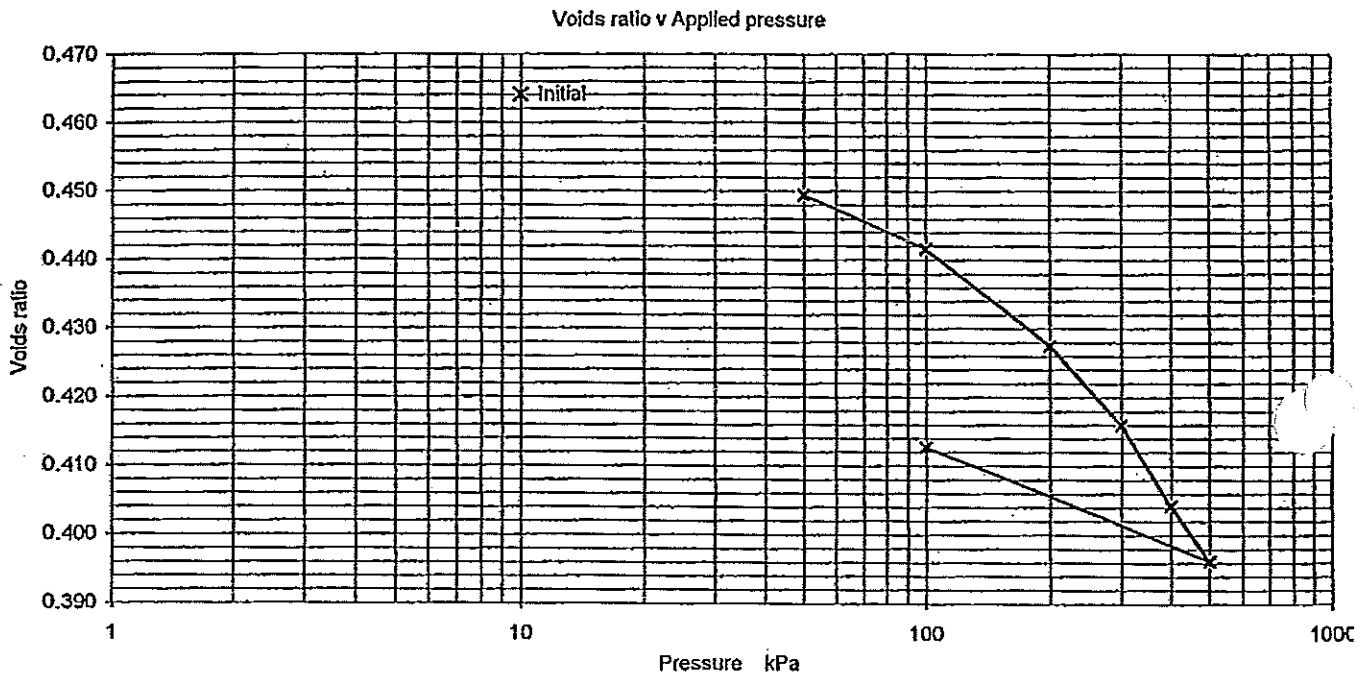
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**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID
Sample ref. U/
Sample dept 2.50
Sample type U
Page 1 of 1



Specimen details			Laboratory coefficients				
Trimmings moisture content	17	%	Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		Voids ratio
Diameter	74.9	mm			log time	root time	
Height	18.95	mm			Swelled	Swelled	0.449
Density	2.14	Mg/m ³	50	0.204	10.110	11.736	0.442
Dry density	1.81	Mg/m ³	100	0.109	5.332	5.318	0.428
Initial moisture content	18	%	200	0.098	3.166	3.416	0.416
Voids ratio	0.46		300	0.081	1.419	1.394	0.404
Saturation	102.78	%	400	0.083	0.678	0.653	0.395
Particle density Assumed	2.65	Mg/m ³	500	0.057			
Specimen depth	2.57	m	100				
Specimen ref.							
Final moisture content	18	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure							
	0.11	m^2/MN					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6

Specimen cut and tested in an horizontal orientation.

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Approved: *[Signature]*

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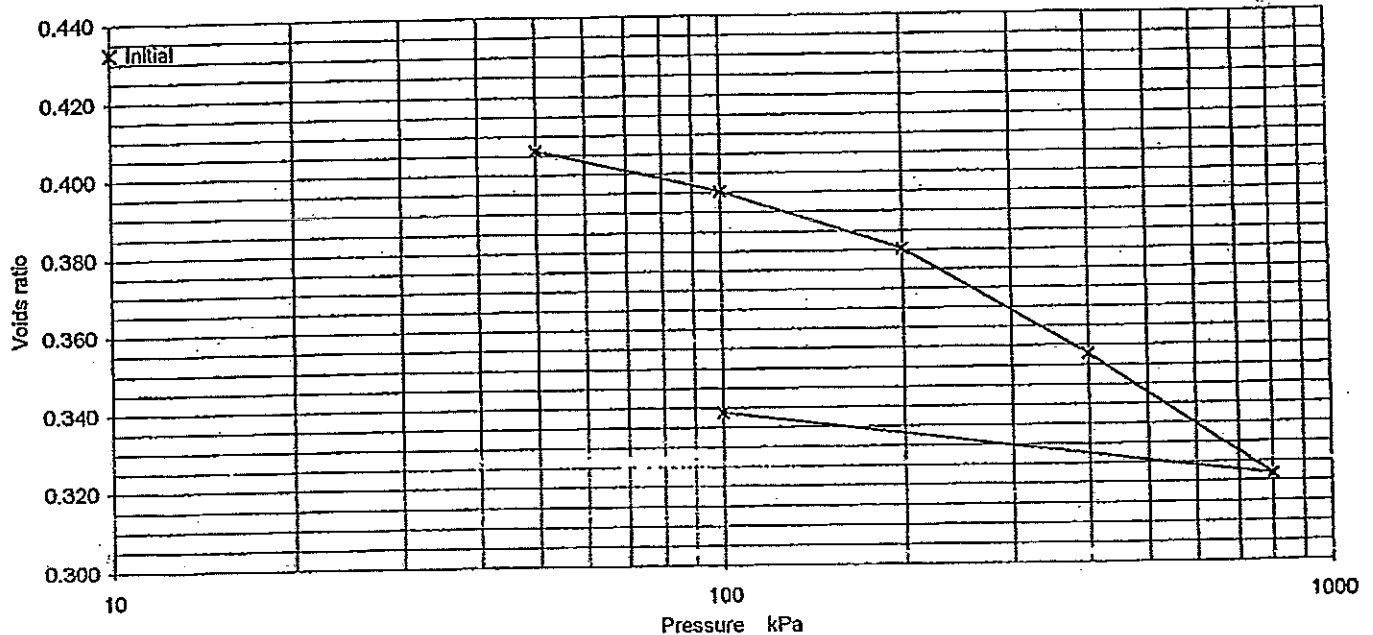
**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID BH108
Sample ref. 19
Sample depth 7.00 m
Sample type U
Page 1 of 1

Voids ratio v Applied pressure



Specimen details			Laboratory coefficients				
			Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		Voids ratio
					log time	root time	
Trimmrings moisture content	16	%					
Diameter	74.9	mm					
Height	18.86	mm					
Density	2.15	Mg/m ³	50	0.374	12.620	15.319	0.406
Dry density	1.85	Mg/m ³	100	0.157	4.429	3.617	0.395
Initial moisture content	16	%	200	0.108	4.209	4.306	0.380
Voids ratio	0.43		400	0.100	3.309	3.141	0.353
Saturation	98.05	%	800	0.057	2.732	3.432	0.322
Particle density Assumed	2.65	Mg/m ³	100				0.339
Specimen depth	7.08	m					
Specimen ref.							
Final moisture content	15	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure							
	0.11	m^2/MN					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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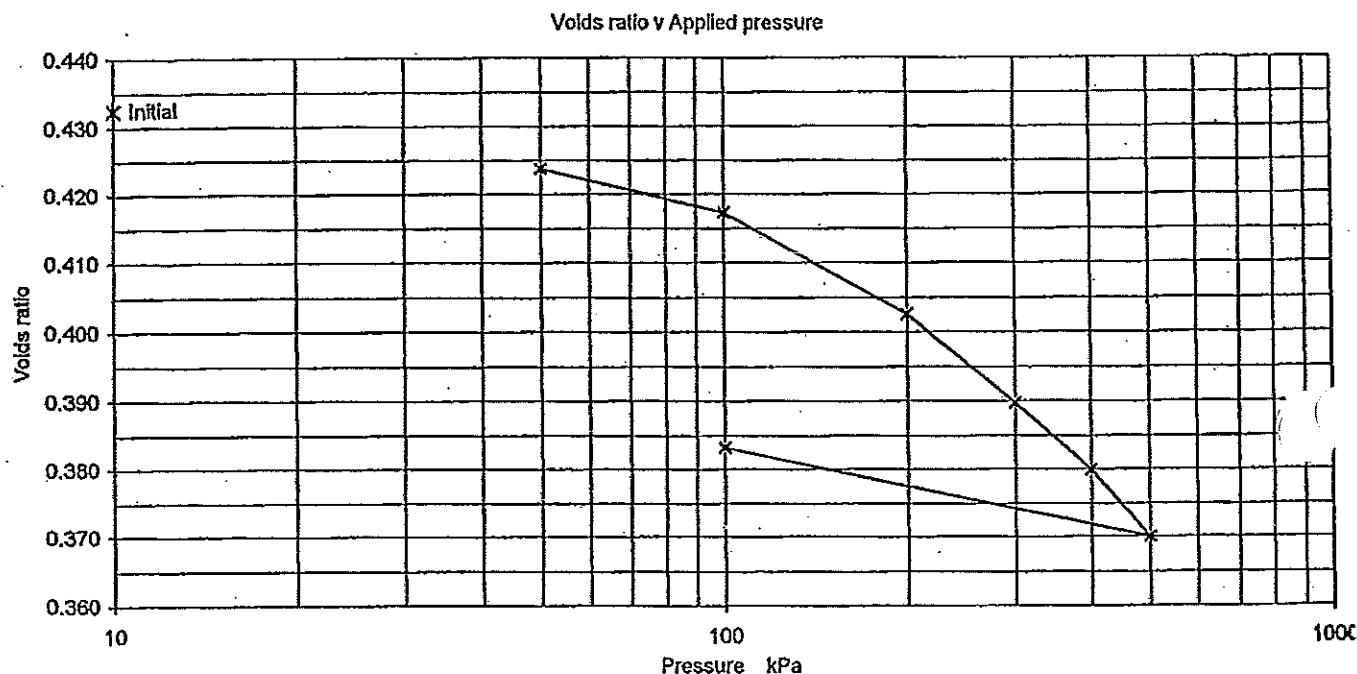
OEDOMETER CONSOLIDATION

**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff brown mottled slightly gravelly CLAY

Hole ID
Sample ref.
Sample depth 3.00
Sample type U
Page 1 of 1



Specimen details			Laboratory coefficients				
Trimmings moisture content	17	%	Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		Voids ratio
Diameter	74.9	mm			log time	root time	
Height	18.78	mm			Swelled	Swelled	0.424
Density	2.15	Mg/m ³	50	0.124	6.073	6.225	0.417
Dry density	1.85	Mg/m ³	100	0.091	2.993	3.448	0.403
Initial moisture content	16	%	200	0.104	2.374	2.897	0.390
Voids ratio	0.43		300	0.091	1.795	1.926	0.380
Saturation	98.05	%	400	0.071	1.172	1.203	
Particle density Assumed	2.65	Mg/m ³	500	0.072			
Specimen depth	3.07	m	100				
Specimen ref.							
Final moisture content	16	%					
Coefficient of volume compressibility for a pressure increment of 100kPa in excess of the present effective overburden pressure							
	0.10	m^2/MN					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6

Specimen cut and tested in an horizontal orientation.

Specimen swelled on stage 1.

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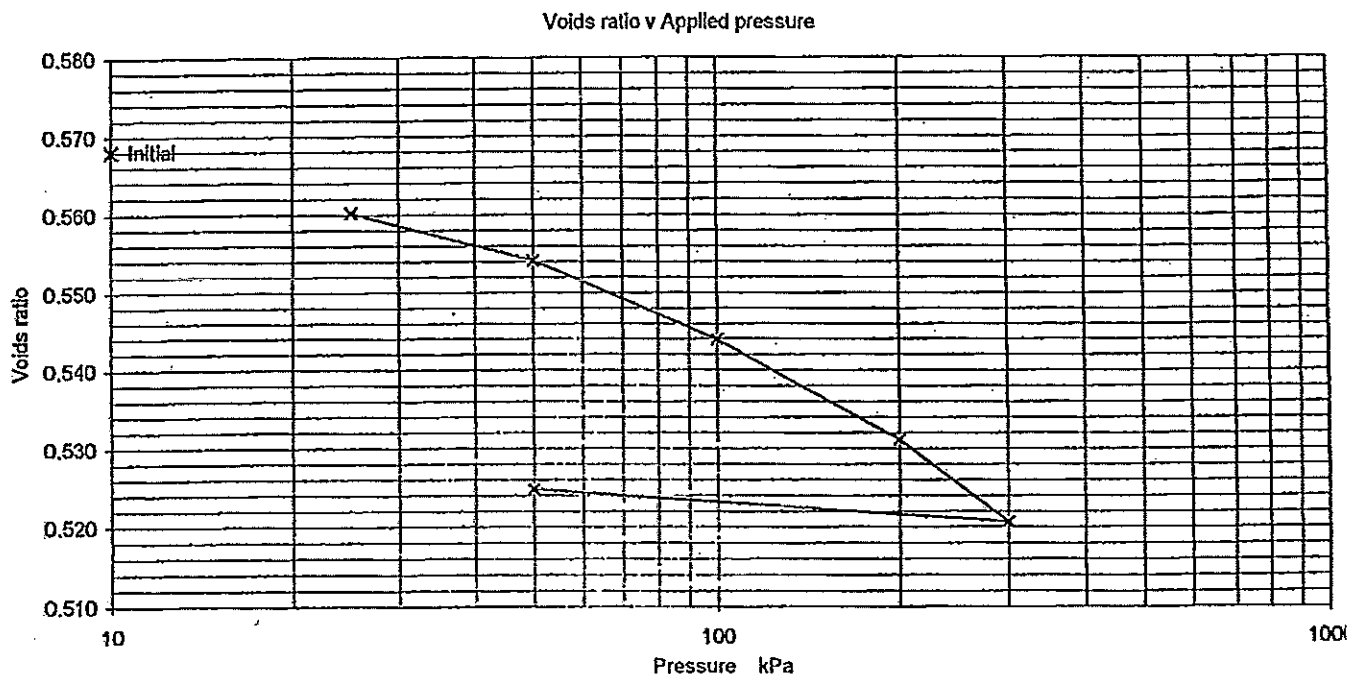
OEDOMETER CONSOLIDATION

**NORWEST
HOLST**

Test method: BS1377: Part 5: 1990: Clause 3

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Soft brown very sandy CLAY.

Hole ID BH111
Sample ref. 02
Sample depth 1.00
Sample type U
Page 1 of 1



Specimen details			Laboratory coefficients				
Trimmings moisture content	10	%	Pressure kPa	Compressibility m_v m^2/MN	Consolidation c_v $m^2/year$		Voids ratio
Diameter	74.9	mm			log time	root time	
Height	18.83	mm					
Density	1.96	Mg/m ³	25	0.210	0.795	1.549	0.560
Dry density	1.69	Mg/m ³	50	0.156	1.662	3.266	0.554
Initial moisture content	16	%	100	0.131	1.396	2.374	0.544
Voids ratio	0.57		200	0.084	2.673	2.299	0.531
Saturation	74.64	%	300	0.068	2.971	2.364	0.521
Particle density Assumed	2.65	Mg/m ³	50				0.525
Specimen depth	1.14	m					
Specimen ref.							
Final moisture content	18	%					

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6
Specimen cut and tested in an horizontal orientation.

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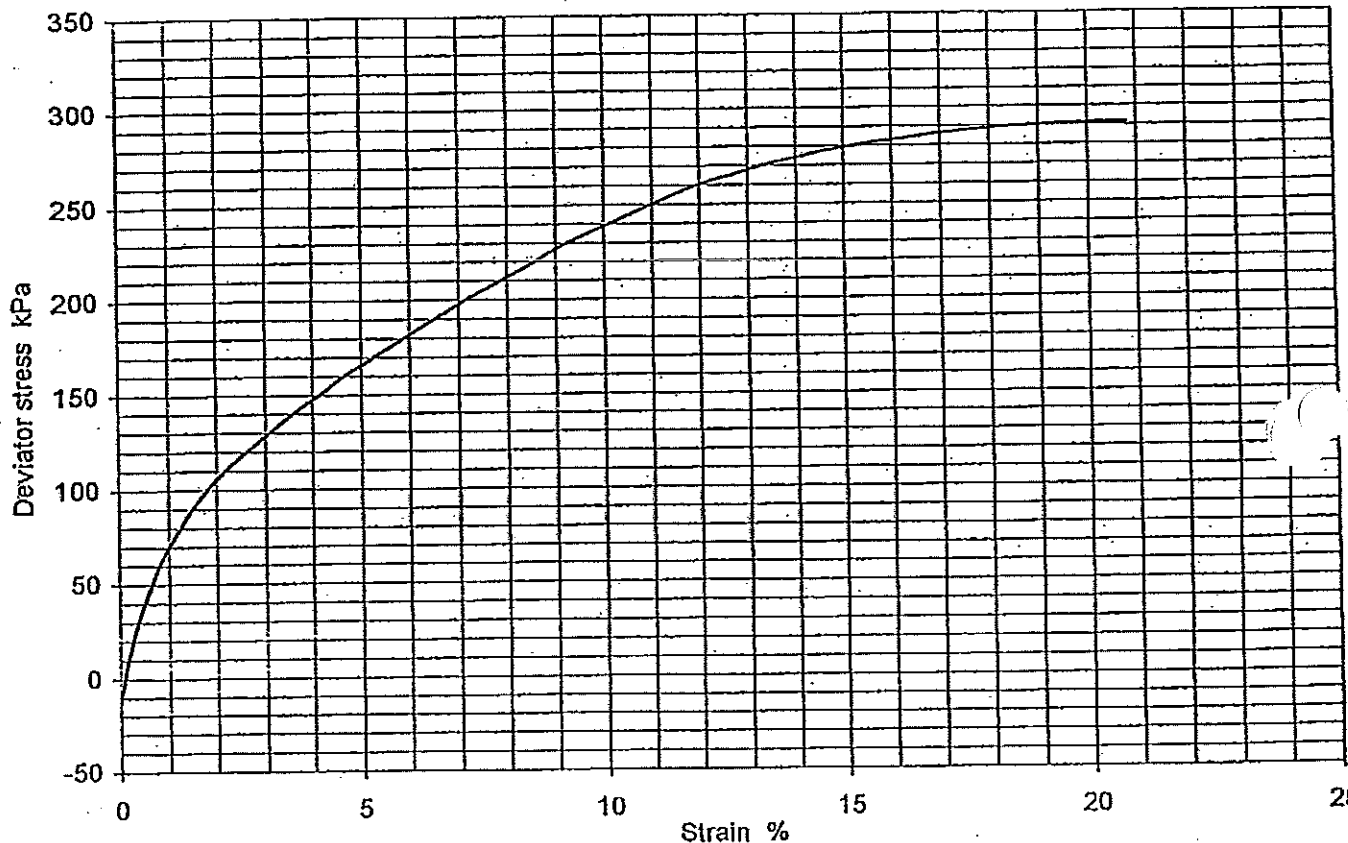
UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990; Clause 8

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown slightly gravelly CLAY.

Hole ID
Sample no.
Depth 3.00
Sample type U
Page 1 of 1



Shear strength parameters

c 145 kPa
 ϕ 0.0°
Apparent c 145 kPa

Test type	Undisturbed	Single stage		Mode of failure
Specimen number	1			Specimen 1
Cell pressure	kPa 50			Compound
Deviator stress	kPa 291.59			
Corrected deviator stress	kPa 290			
Membrane correction	kPa 1.30			
Membrane thickness	mm 0.348			
Moisture content	% 15			
Bulk density	Mg/m ³ 2.16			
Dry density	Mg/m ³ 1.89			
Diameter	mm 103.0			
Length	mm 197.0			
Failure strain	% 20.3			
Cu	kPa 145			
Rate of strain	2.03 %/minute	Specimen depth	3.00 m	
High density rubber latex membrane used				
Remarks				
Scheduled as multistage test. No observed failure of first stage so run until termination.				

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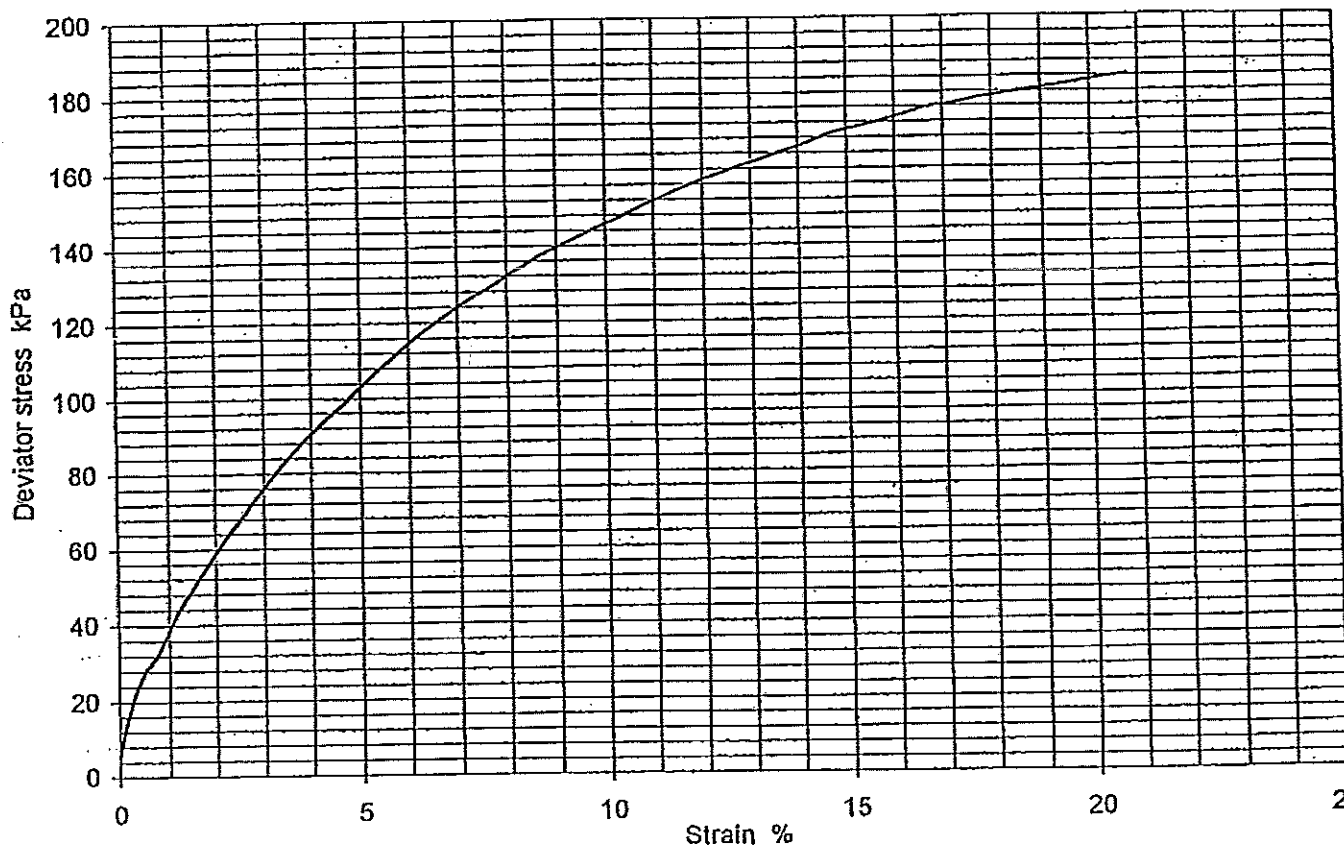
UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 8

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm to stiff dark brown CLAY.

Hole ID BH104
Sample no. 13
Depth 6.00
Sample type U
Page 1 of 1



Shear strength parameters
 c 91 kPa
 ϕ 0.0 °
 Apparent c 91 kPa

Test type	Undisturbed	Single stage	Mode of failure
Specimen number	1		Specimen 1
Cell pressure kPa	0		Compound
Deviator stress kPa	184.09		
Corrected deviator stress kPa	183		
Membrane correction kPa	1.31		
Membrane thickness mm	0.348		
Moisture content %	21		
Bulk density Mg/m ³	2.06		
Dry density Mg/m ³	1.70		
Diameter mm	104.2		
Length mm	197.4		
Failure strain %	20.8		
Cu kPa	91		
Rate of strain	2.03 %/minute	Specimen depth 6.15 m	
High density rubber latex membrane used			
Remarks			
Scheduled as multistage test. No observed failure of first stage so run until termination.			

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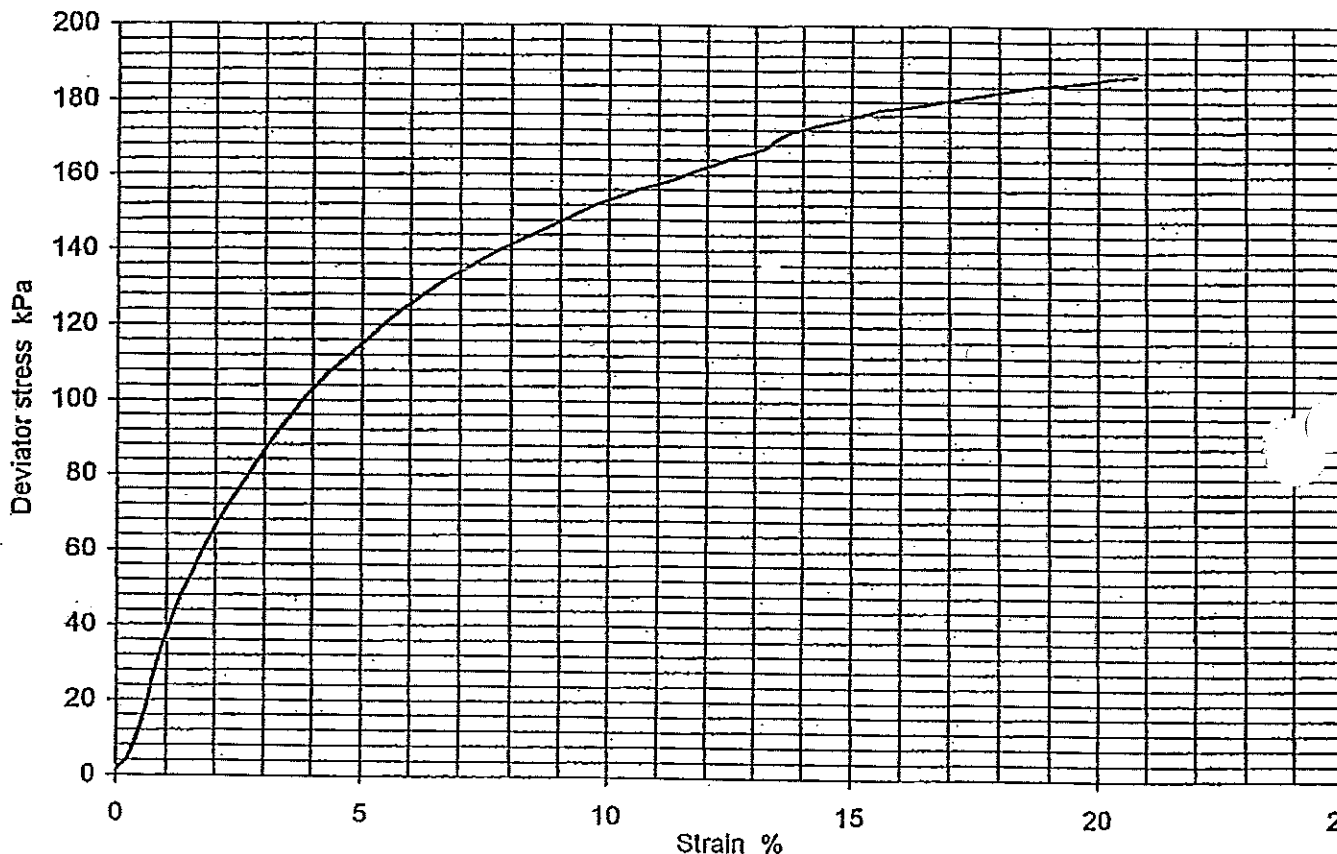
UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (DEFINITIVE METHOD)

**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 8

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm to stiff dark brown slightly gravelly CLAY.

Hole ID
Sample no. 2
Depth 10.00
Sample type U
Page 1 of 1



Shear strength parameters

c 93 kPa
 ϕ 0.0 °
Apparent c 93 kPa

Test type		Undisturbed	Single stage		Mode of failure
Specimen number		1			Specimen 1
Cell pressure	kPa	100			Compound
Deviator stress	kPa	186.91			
Corrected deviator stress	kPa	186			
Membrane correction	kPa	1.24			
Membrane thickness	mm	0.328			
Moisture content	%	16			
Bulk density	Mg/m ³	2.16			
Dry density	Mg/m ³	1.86			
Diameter	mm	103.7			
Length	mm	197.2			
Failure strain	%	20.8			
Cu	kPa	93			
Rate of strain	2.03 %/minute	Specimen depth		10.14 m	
High density rubber latex membrane used					
Remarks					
Scheduled as multistage test. No observed failure of first stage so run until termination.					

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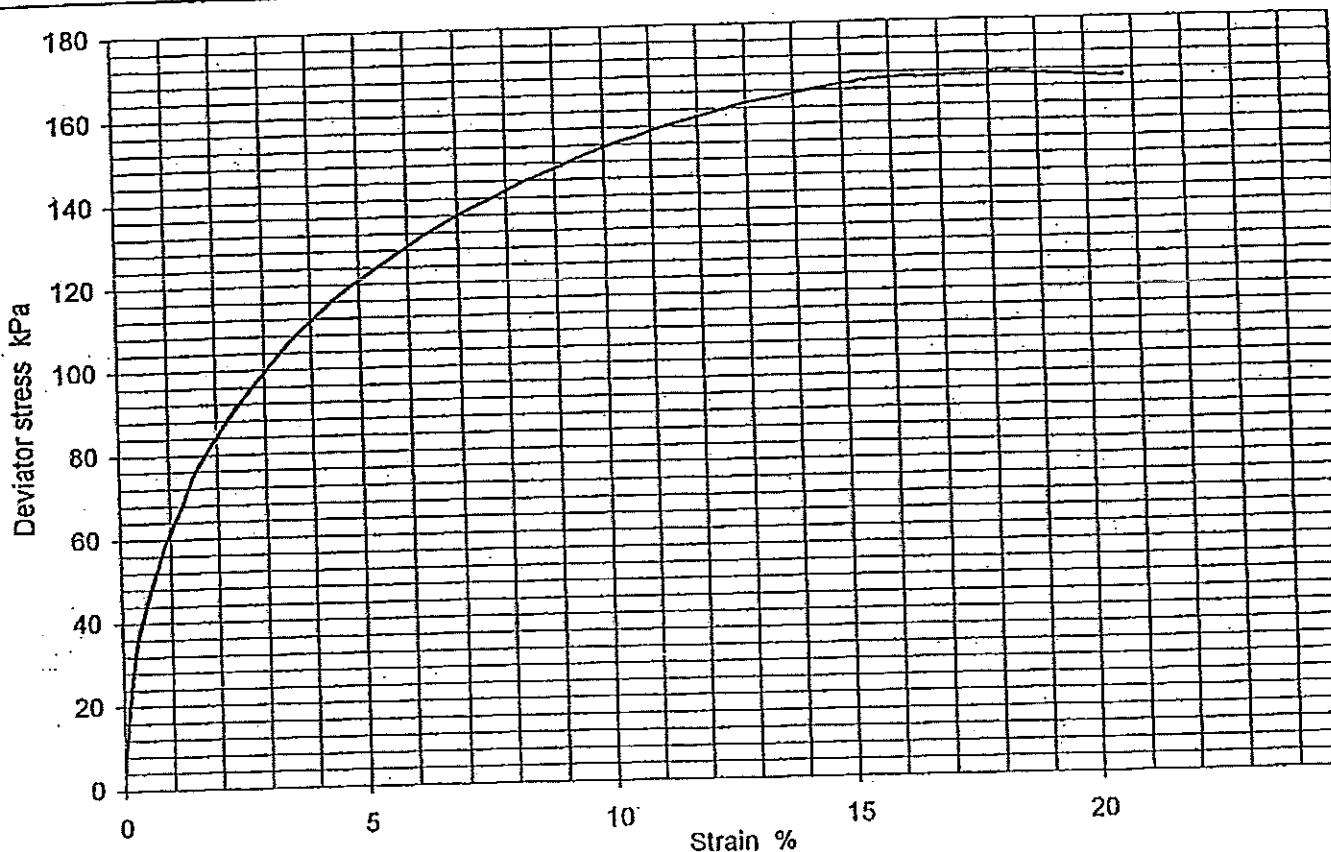
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**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 8.

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm dark brown slightly gravelly CLAY.

Hole ID BH108
Sample no. 19
Depth 7.00
Sample type U
Page 1 of 1



Shear strength parameters

c 83 kPa
 ϕ 0.0 °
Apparent c 83 kPa

Test type		Undisturbed	Single stage		Mode of failure
Specimen number		1			Specimen 1
Cell pressure	kPa	80			Compound
Deviator stress	kPa	167.15			
Corrected deviator stress	kPa	166			
Membrane correction	kPa	1.19			
Membrane thickness	mm	0.348			
Moisture content	%	16			
Bulk density	Mg/m ³	2.17			
Dry density	Mg/m ³	1.87			
Diameter	mm	104.0			
Length	mm	197.0			
Failure strain	%	18.3			
Cu	kPa	83			
Rate of strain	2.03 %/minute	Specimen depth 7.17 m			
High density rubber latex membrane used					
Remarks					
Scheduled as multistage test. No observed failure of first stage so run until termination.					

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UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

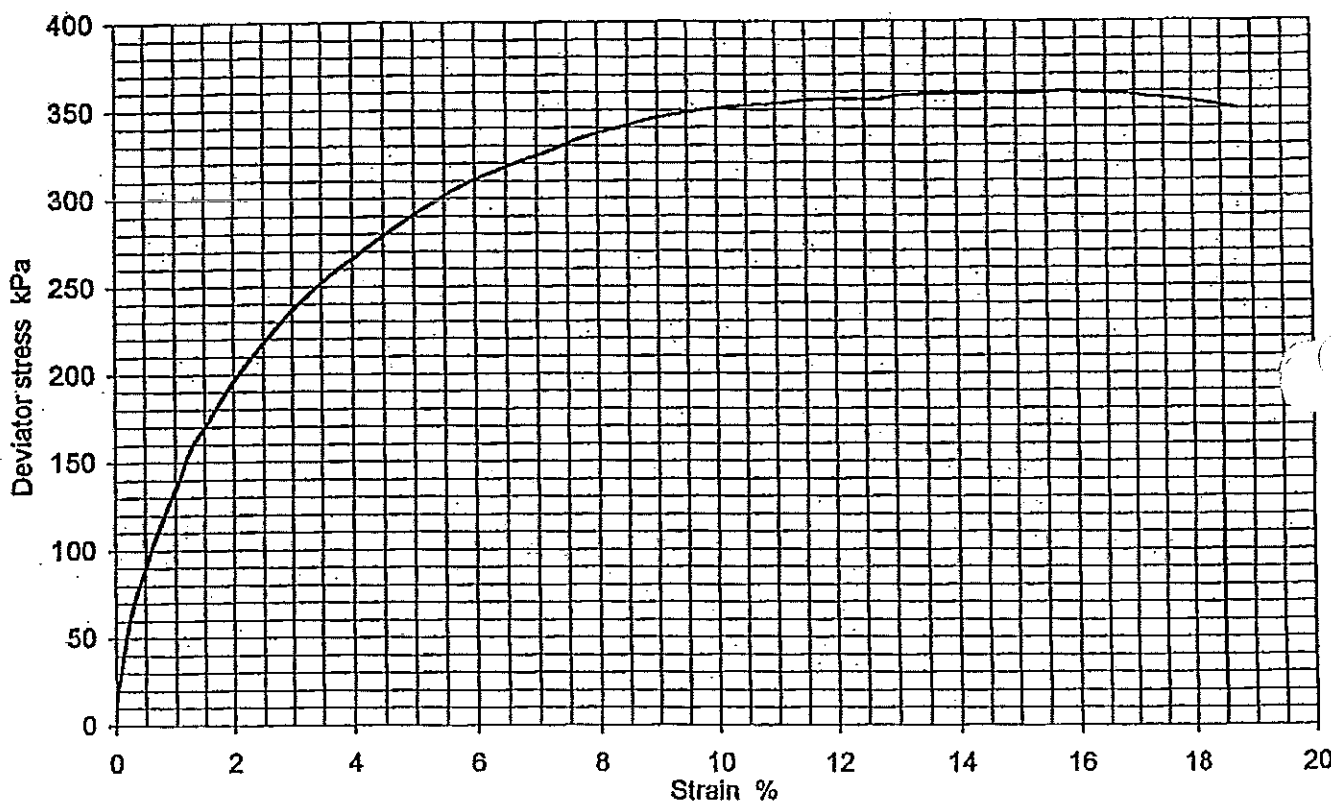
**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown gravelly CLAY.

Hole ID BH
Sample no. 02
Depth 1.20 m
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 168 kPa
 ϕ 2.8 °
Apparent c 179 kPa

Test type	Undisturbed	Multi stage			Mode of failure
Specimen number	1	2	3		Specimen 1
Cell pressure kPa	20	40	60		Compound 
Deviator stress kPa	355.48	358.97	359.69		
Corrected deviator stress kPa	355	358	359		
Membrane correction kPa	0.81	0.96	1.01		
Membrane thickness mm	0.328				
Moisture content %	16				
Bulk density Mg/m ³	2.11				
Dry density Mg/m ³	1.82				
Diameter mm	103.4				
Length mm	197.5				
Failure strain %	11.6	14.7	15.7		
Cu kPa	177	179	179		

Rate of strain 2.03 %/minute

Specimen depth 1.27 m

High density rubber latex membrane used

Remarks

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UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

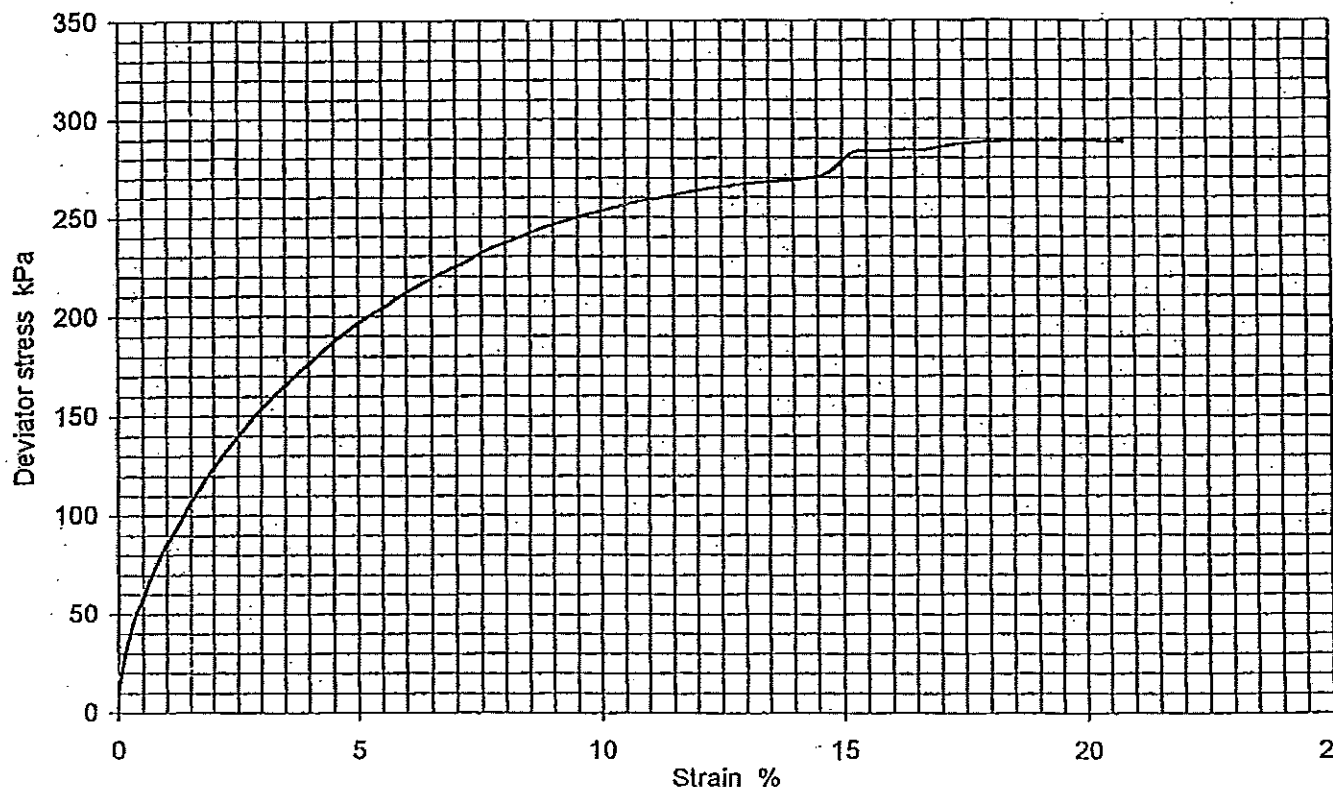
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HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff dark brown slightly gravelly CLAY

Hole ID BH102
Sample no. 06
Depth 2.50
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 123 kPa

ϕ 4.0 °

Apparent c 140 kPa

Test type		Multi stage			Mode of failure
Specimen number		1	2	3	Specimen 1
Cell pressure	kPa	40	80	160	Compound
Deviator stress	kPa	269.28	284.35	289.25	
Corrected deviator stress	kPa	268	283	288	
Membrane correction	kPa	0.93	1.05	1.17	
Membrane thickness	mm	0.328			
Moisture content	%	14			
Bulk density	Mg/m ³	2.21			
Dry density	Mg/m ³	1.94			
Diameter	mm	103.8			
Length	mm	197.1			
Failure strain	%	14.2	16.7	19.3	
Cu	kPa	134	142	144	
Rate of strain 2.03 %/minute		Specimen depth 2.65 m			
High density rubber latex membrane used					
Remarks					

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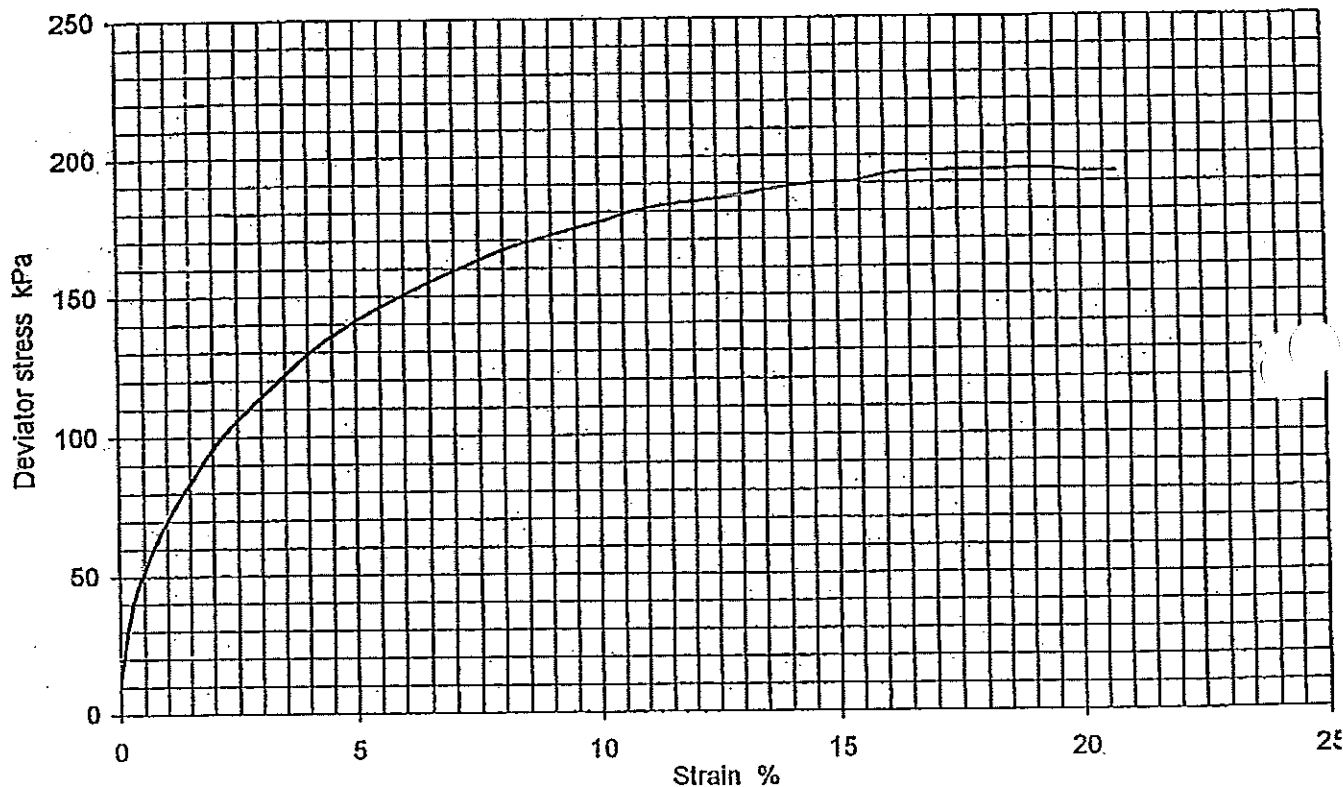
**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm to stiff brown slightly gravelly CLAY

Hole ID
Sample no. 11
Depth 4.50
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 88 kPa
 ϕ 1.5 °
Apparent c 94 kPa

Test type		Undisturbed	Multi stage		Mode of failure
Specimen number		1	2	3	Specimen 1
Cell pressure	kPa	60	120	240	Compound
Deviator stress	kPa	184.02	190.33	194.83	
Corrected deviator stress	kPa	183	189	194	
Membrane correction	kPa	0.82	0.97	1.13	
Membrane thickness	mm	0.324			
Moisture content	%	16			
Bulk density	Mg/m ³	2.17			
Dry density	Mg/m ³	1.88			
Diameter	mm	103.7			
Length	mm	197.5			
Failure strain	%	12.2	15.2	18.7	
Cu	kPa	92	95	97	
Rate of strain 2.03 %/minute		Specimen depth 4.69 m			
High density rubber latex membrane used					
Remarks					

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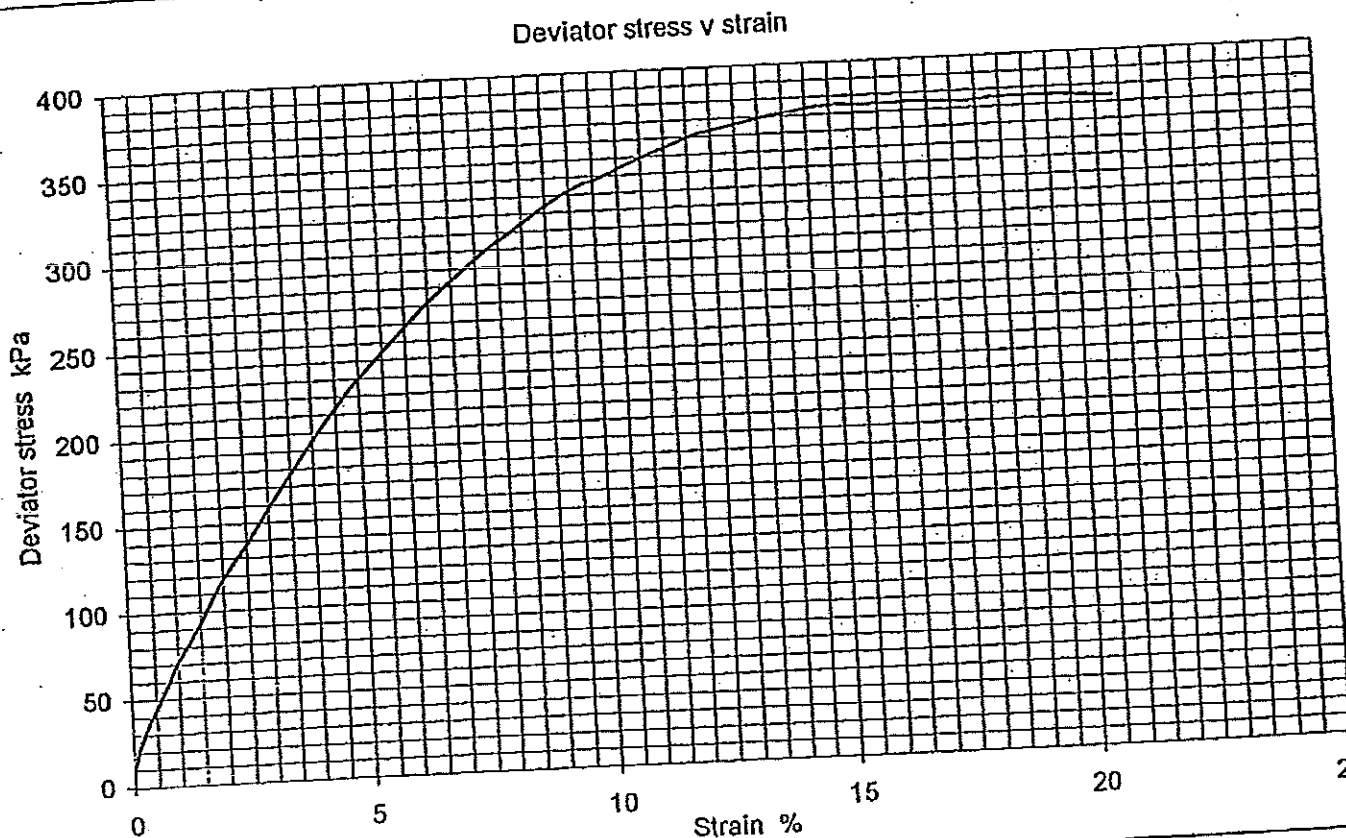
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**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown slightly gravelly CLAY

Hole ID BH103
Sample no. 05
Depth 2.50 m
Sample type U
Page 1 of 1



Shear strength parameters

c 187 kPa
 ϕ 0.1°
Apparent c 187 kPa

		Apparent c			187 kPa	Mode of failure
		Undisturbed	Multi stage			
Test type		1	2	3		Specimen 1
Specimen number		40	80	160		Compound
Cell pressure	kPa	374.87	374.86	375.31		
Deviator stress	kPa	374	374	374		
Corrected deviator stress	kPa	1.12	1.20	1.33		
Membrane correction	kPa					
Membrane thickness	mm	0.372				
Moisture content	%	14				
Bulk density	Mg/m ³	2.21				
Dry density	Mg/m ³	1.94				
Diameter	mm	103.6				
Length	mm	196.6				
Failure strain	%	15.3	16.8	19.3		
Cu	kPa	187	187	187		
Rate of strain	2.03 %/minute	Specimen depth		2.70 m		
High density rubber latex membrane used						
Remarks						

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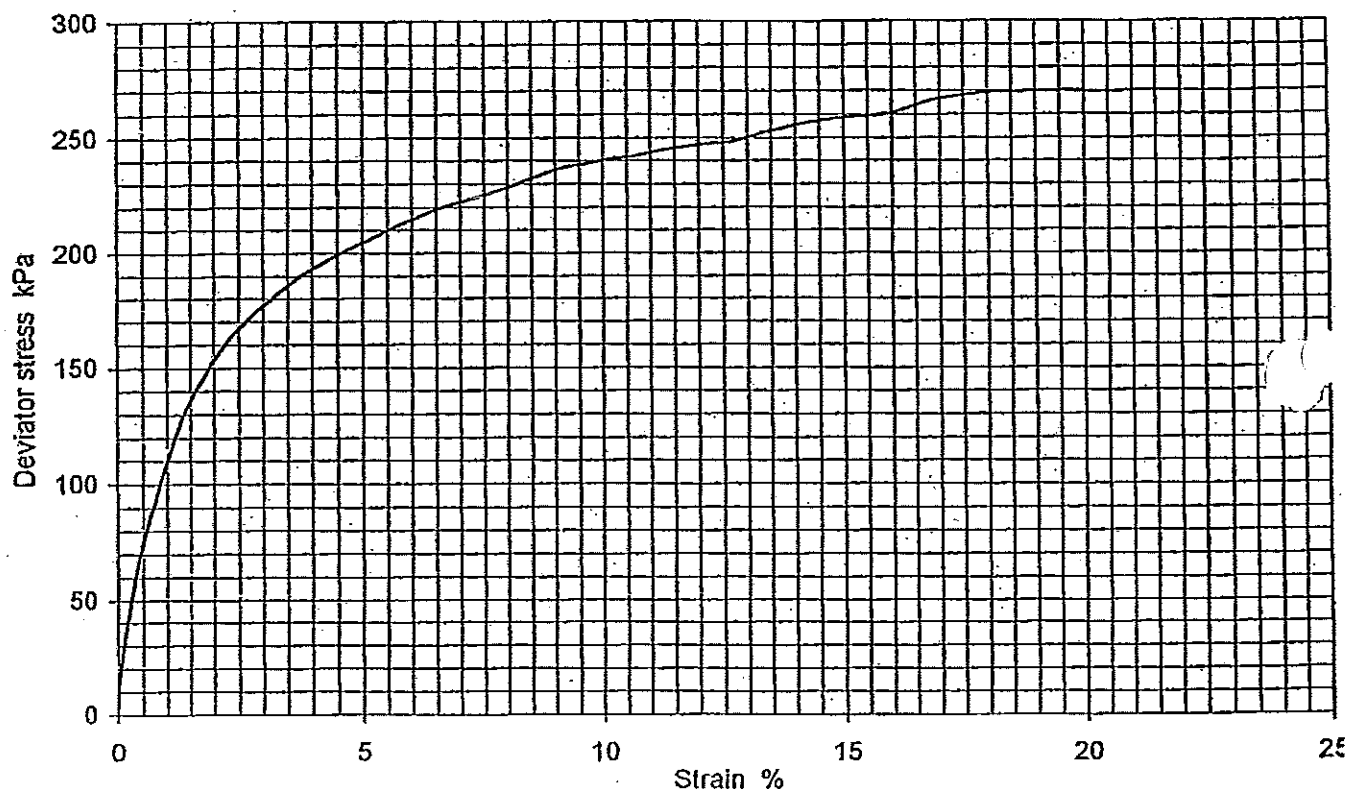
Test Method: BS1377: Part 7: 1990: Clause 9

**NORWEST
HOLST**

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff dark brown slightly gravelly CLAY.

Hole ID
Sample no. 6.
Depth 3.05
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 112 kPa
 ϕ 4.5 °
Apparent c 129 kPa

Test type		Undisturbed		Multi stage		Mode of failure	
		1	2	3	Specimen 1		
Specimen number							
Cell pressure	kPa	40	80	160			
Deviator stress	kPa	248.27	259.69	269.90	Compound		
Corrected deviator stress	kPa	247	259	269			
Membrane correction	kPa	0.99	1.16	1.37			
Membrane thickness	mm	0.372					
Moisture content	%	17					
Bulk density	Mg/m ³	2.08					
Dry density	Mg/m ³	1.77					
Diameter	mm	102.6					
Length	mm	197.0					
Failure strain	%	12.7	15.7	19.8			
Cu	kPa	124	129	134			
Rate of strain 2.03 %/minute		Specimen depth 3.25 m					
High density rubber latex membrane used							
Remarks							

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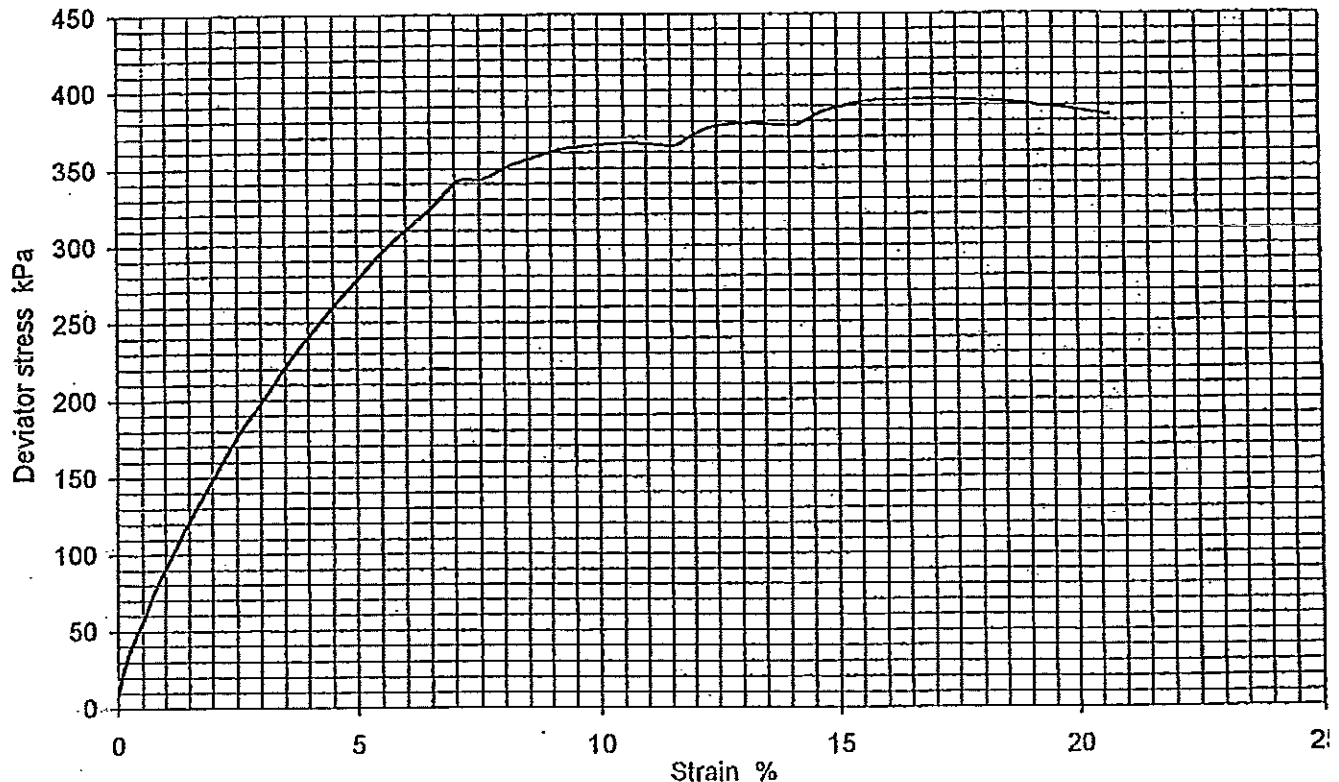
Test Method: BS1377: Part 7: 1990; Clause 9

**NORWEST
HOLST**

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly CLAY.

Hole ID BH101
Sample no. 06
Depth 2.50
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 162 kPa

ϕ 5.7°

Apparent c 189 kPa

Test type		Undisturbed		Multi stage		Mode of failure	
		1		2		3	
Specimen number		40		80		160	
Cell pressure	kPa	366.10		378.44		393.96	
Deviator stress	kPa	365		377		393	
Corrected deviator stress	kPa	0.85		1.00		1.21	
Membrane correction	kPa	0.372					
Membrane thickness	mm	15					
Moisture content	%	2.14					
Bulk density	Mg/m ³	1.86					
Dry density	Mg/m ³	104.2					
Diameter	mm	197.8					
Length	mm	10.6		13.1		17.2	
Failure strain	%	183		189		196	
Cu	kPa						
Rate of strain		2.02 %/minute		Specimen depth		2.63 m	
High density rubber latex membrane used							
Remarks							

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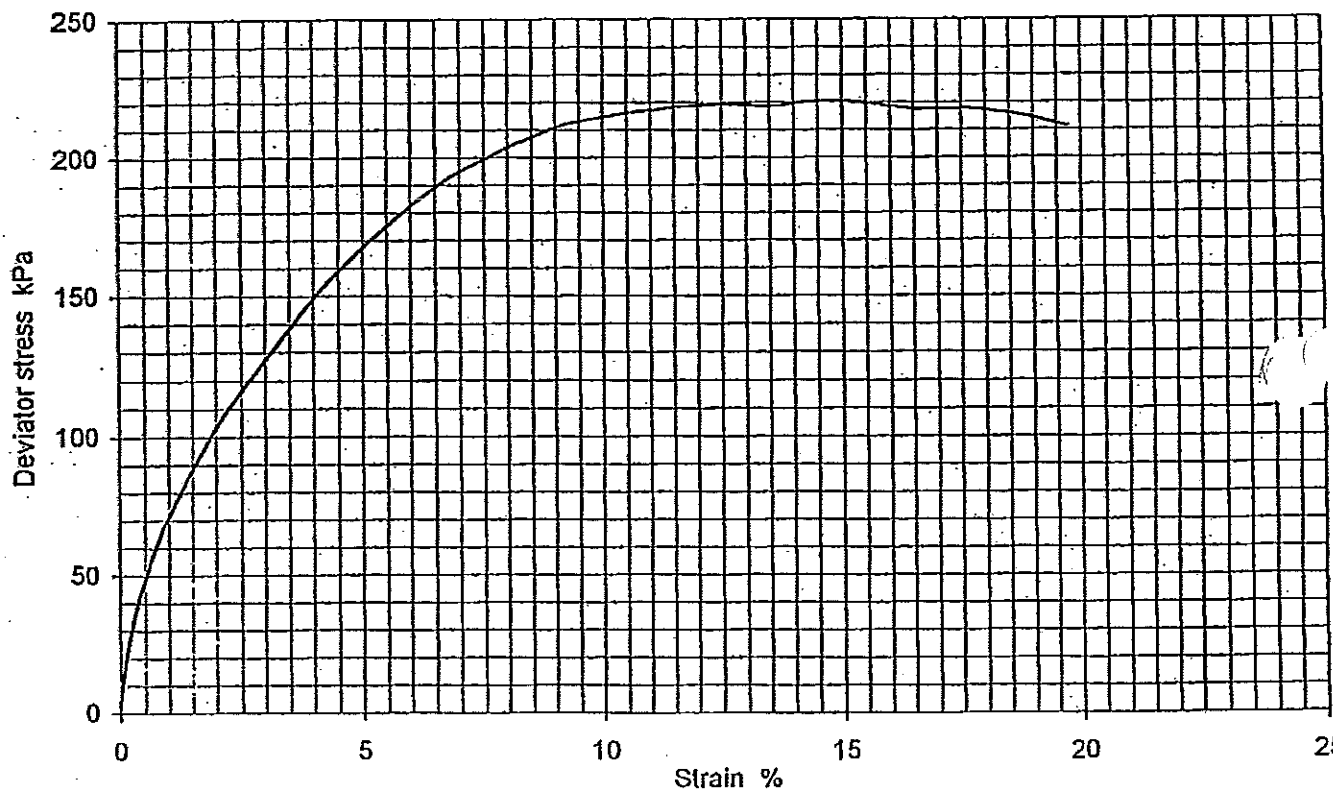
**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff brown slightly gravelly CLAY

Hole ID 1
Sample no. 11
Depth 4.50
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 109 kPa
 ϕ 0.0 °
Apparent c 109 kPa

Test type		Undisturbed			Multi stage			Mode of failure		
		1			2			3		
Specimen number								Specimen 1		
Cell pressure	kPa	60			120			240		
Deviator stress	kPa	219.42			220.29			217.72		
Corrected deviator stress	kPa	218			219			216		
Membrane correction	kPa	0.97			1.08			1.24		
Membrane thickness	mm	0.372								
Moisture content	%	17								
Bulk density	Mg/m ³	2.14								
Dry density	Mg/m ³	1.83								
Diameter	mm	103.9								
Length	mm	197.5								
Failure strain	%	12.7			14.7			17.7		
Cu	kPa	109			110			108		
Rate of strain		2.02 %/minute		Specimen depth		4.66 m				
High density rubber latex membrane used										
Remarks										

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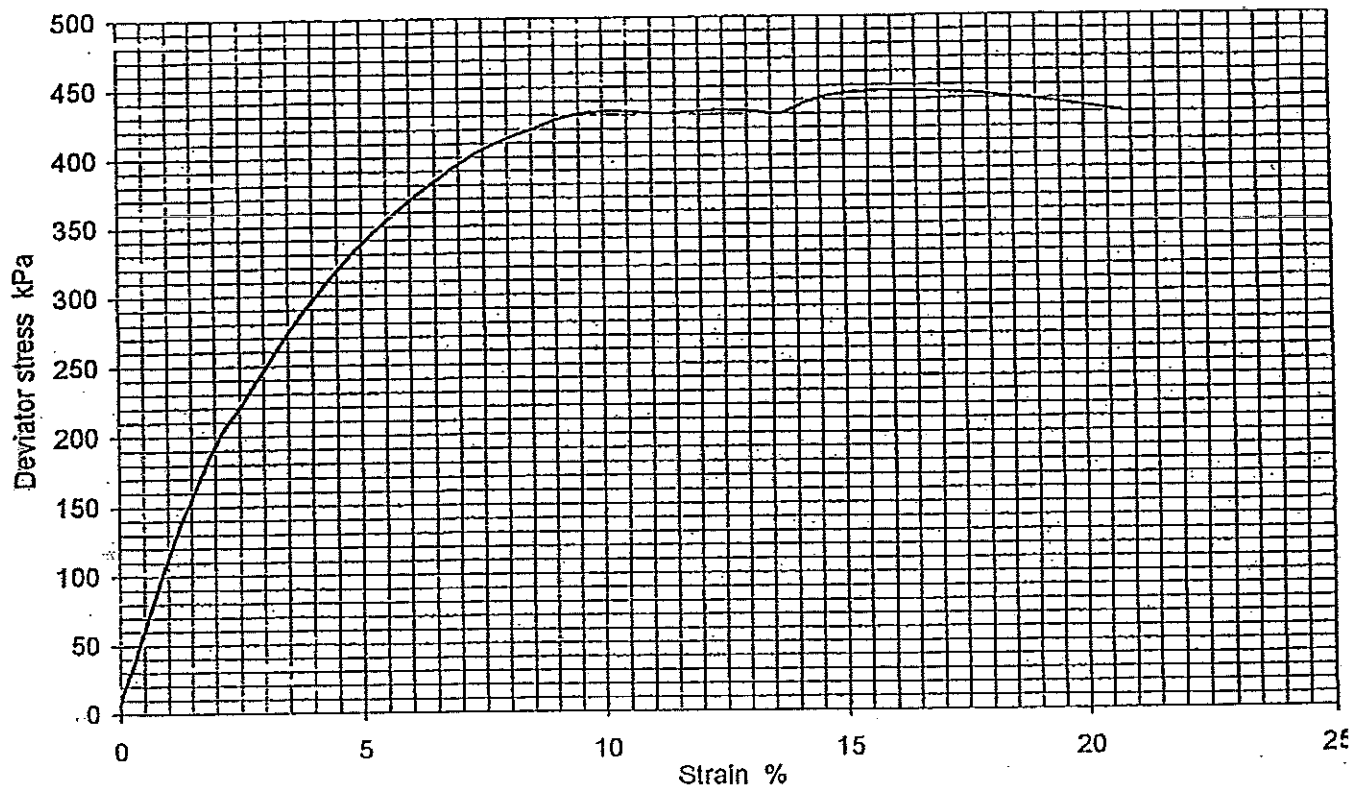
**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly CLAY.

Hole ID BH106
Sample no. 04
Depth 1.50
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 203 kPa

ϕ 3.1 °

Apparent c 218 kPa

Test type		Undisturbed	Multi stage		Mode of failure
Specimen number		1	2	3	Specimen 1
Cell pressure	kPa	40	80	160	Compound
Deviator stress	kPa	432.72	432.64	445.96	
Corrected deviator stress	kPa	432	432	445	
Membrane correction	kPa	0.77	0.91	1.06	
Membrane thickness	mm	0.348			
Moisture content	%	16			
Bulk density	Mg/m ³	2.14			
Dry density	Mg/m ³	1.84			
Diameter	mm	104.2			
Length	mm	197.1			
Failure strain	%	10.1	12.7	15.7	
Cu	kPa	216	216	222	
Rate of strain 2.03 %/minute		Specimen depth 1.65 m			
High density rubber latex membrane used					
Remarks					

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Approved: *[Signature]*

UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

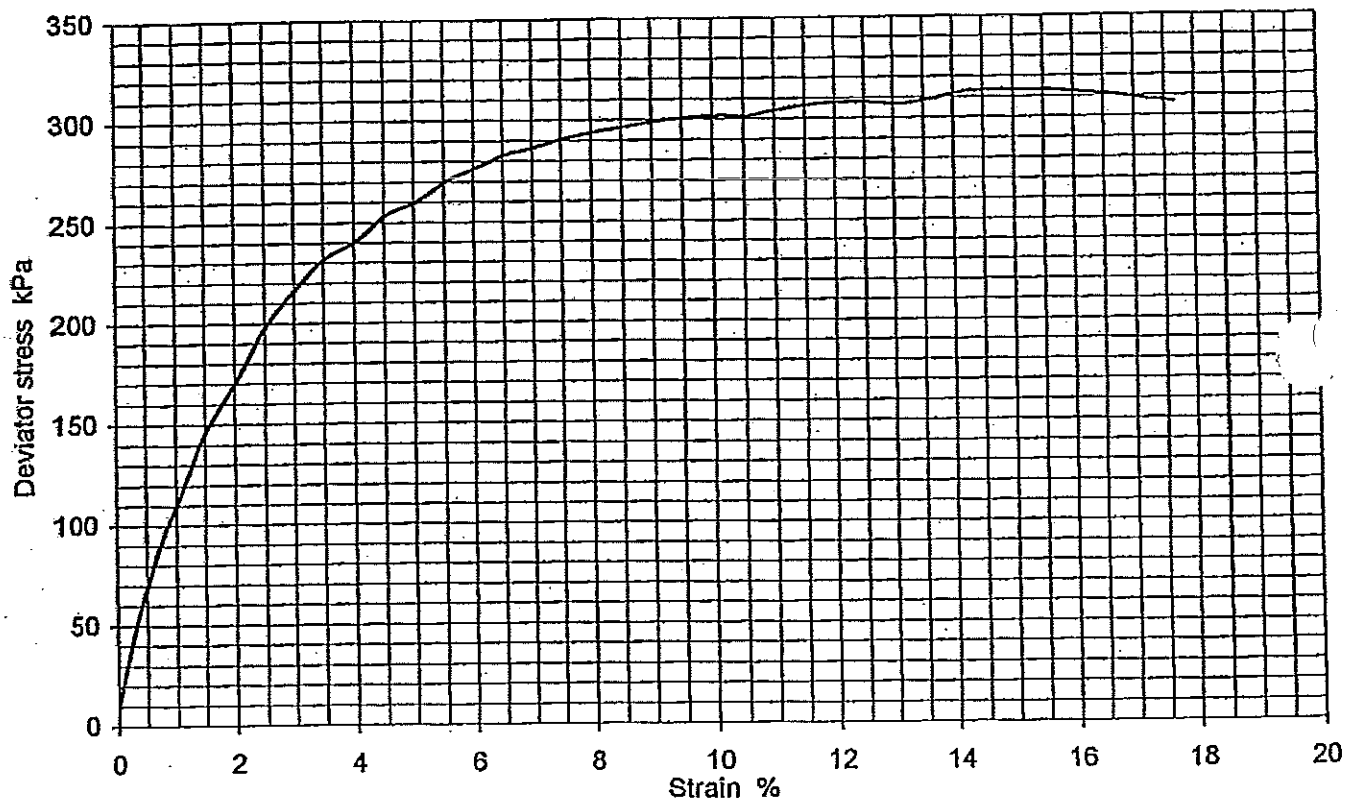
Test Method: BS1377: Part 7: 1990: Clause 9

**NORWEST
HOLST**

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly CLAY.

Hole ID BH
Sample no. 02
Depth 1.20 m
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c

142 kPa

ϕ

2.5 °

Apparent c

153 kPa

Test type	Undisturbed	Multi stage			Mode of failure
Specimen number	1	2	3		Specimen 1
Cell pressure	40	80	160		Compound
Deviator stress	301.82	307.82	313.60		
Corrected deviator stress	301	307	312		
Membrane correction	0.84	0.99	1.10		
Membrane thickness	0.372				
Moisture content	17				
Bulk density	2.15				
Dry density	1.83				
Diameter	102.1				
Length	198.2				
Failure strain	10.1	12.6	14.6		
Cu	150	153	156		

Rate of strain 2.02 %/minute Specimen depth 1.25 m

High density rubber latex membrane used

Remarks

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UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

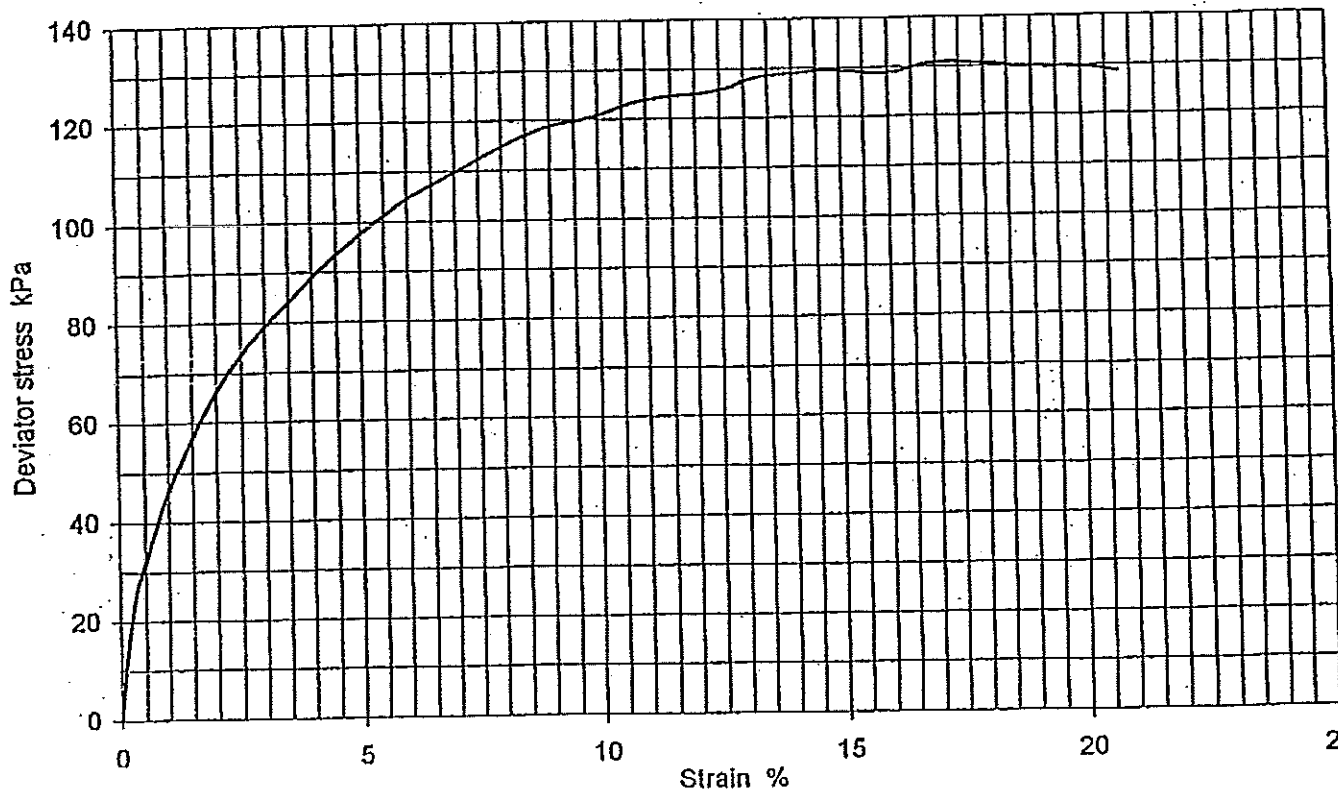
**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm brown slightly gravelly CLAY

Hole ID BH107
Sample no. 11
Depth 5.00
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 60 kPa
 ϕ 1.1°
Apparent c 64 kPa

Test type		Undisturbed	Multi stage		Mode of failure	
		1	2	3	Specimen 1	
Specimen number		70	140	210	Compound	
Cell pressure	kPa	125.10	129.58	130.79		
Deviator stress	kPa	124	128	130		
Corrected deviator stress	kPa	0.97	1.11	1.25		
Membrane correction	kPa	0.372				
Membrane thickness	mm	17				
Moisture content	%	2.16				
Bulk density	Mg/m ³	1.84				
Dry density	Mg/m ³	101.4				
Diameter	mm	197.4				
Length	mm	12.2	14.7	17.2		
Failure strain	%	62	64	65		
Cu	kPa					
Rate of strain	2.03 %/minute	Specimen depth 5.14 m				
High density rubber latex membrane used						
Remarks						

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Approved:

UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

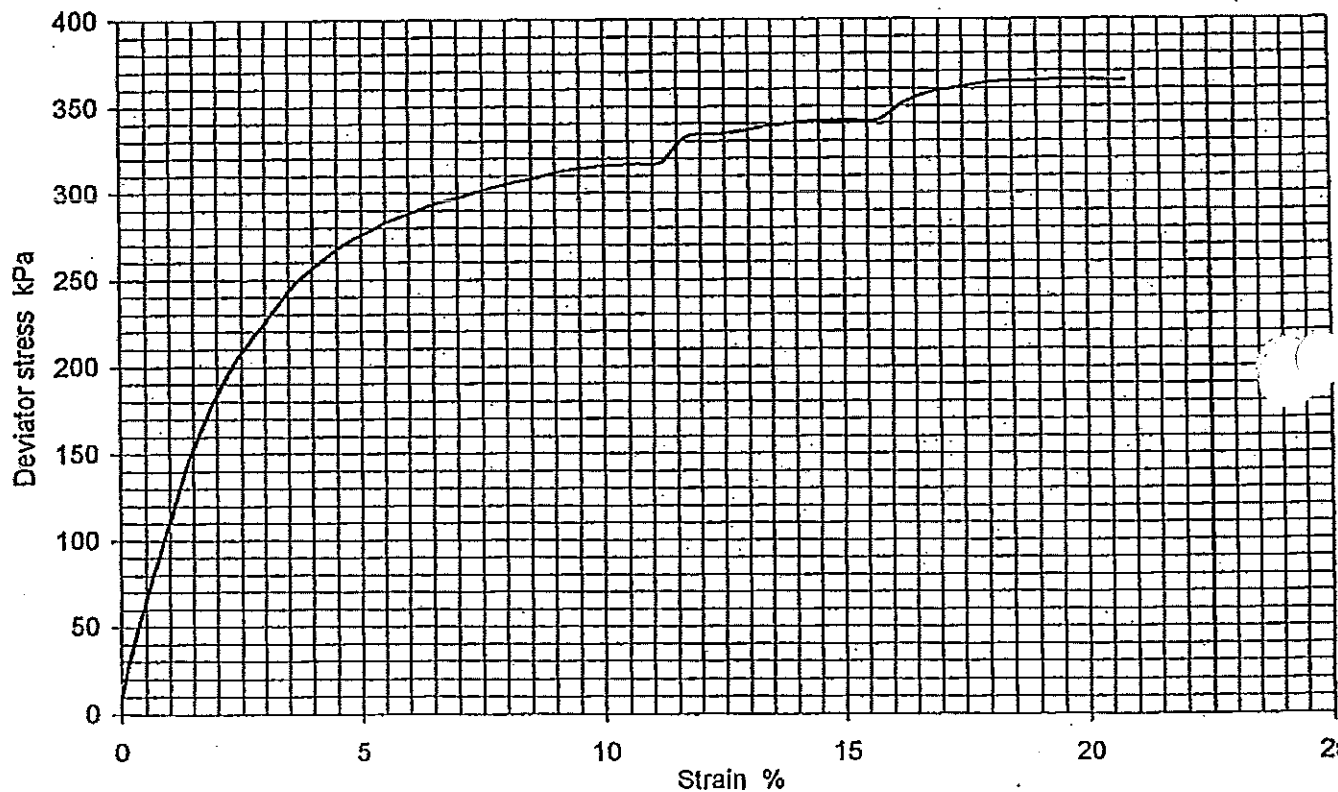
Test Method: BS1377: Part 7: 1990: Clause 9

**NORWEST
HOLST**

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Very stiff brown slightly gravelly CLAY.

Hole ID
Sample no. 07
Depth 2.50
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 127 kPa
 ϕ 9.7°
Apparent c 170 kPa

Test type		Undisturbed			Multi stage			Mode of failure	
		1			2			Specimen/	
Specimen number									
Cell pressure	kPa	40			80				
Deviator stress	kPa	317.70			341.92				
Corrected deviator stress	kPa	317			341				
Membrane correction	kPa	0.78			0.98				
Membrane thickness	mm	0.328							
Moisture content	%	16							
Bulk density	Mg/m ³	2.16							
Dry density	Mg/m ³	1.85							
Diameter	mm	104.1							
Length	mm	196.9							
Failure strain	%	11.2			15.2				
Cu	kPa	158			170				
Rate of strain	2.03 %/minute								
High density rubber latex membrane used									
Remarks									

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Approved: *[Signature]*

UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

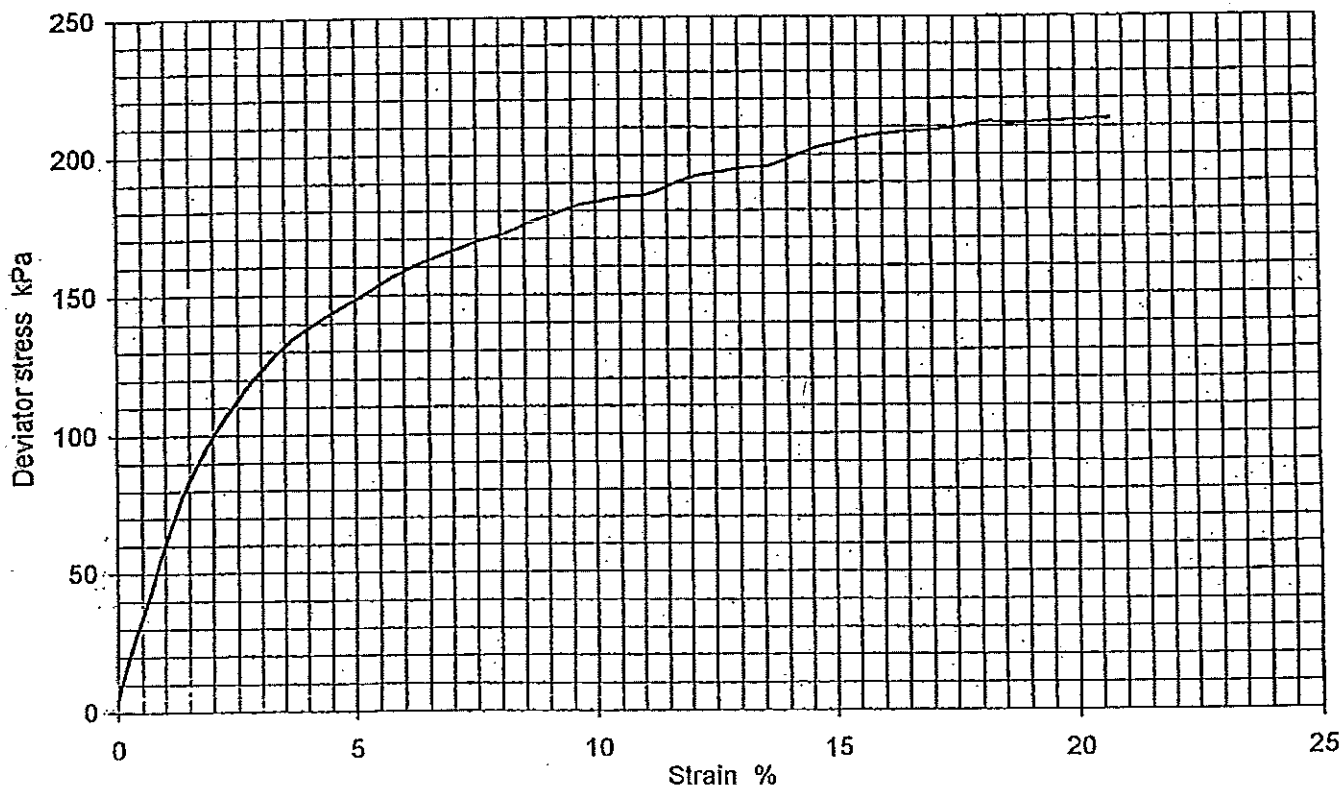
**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Stiff brown slightly gravelly CLAY

Hole ID BH110
Sample no. 07
Depth 3.00
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 80 kPa
 ϕ 5.6 °
Apparent c 99 kPa

Test type		Undisturbed			Multi stage			Mode of failure	
		1			2			Specimen 1	
Specimen number									
Cell pressure	kPa	40			80				
Deviator stress	kPa	186.03			196.24				
Corrected deviator stress	kPa	185			195				
Membrane correction	kPa	0.83			0.97				
Membrane thickness	mm	0.348							
Moisture content	%	16							
Bulk density	Mg/m ³	2.13							
Dry density	Mg/m ³	1.85							
Diameter	mm	103.3							
Length	mm	197.7							
Failure strain	%	11.1			13.7				
Cu	kPa	93			98				
Rate of strain	2.02 %/minute								
High density rubber latex membrane used									
Remarks									

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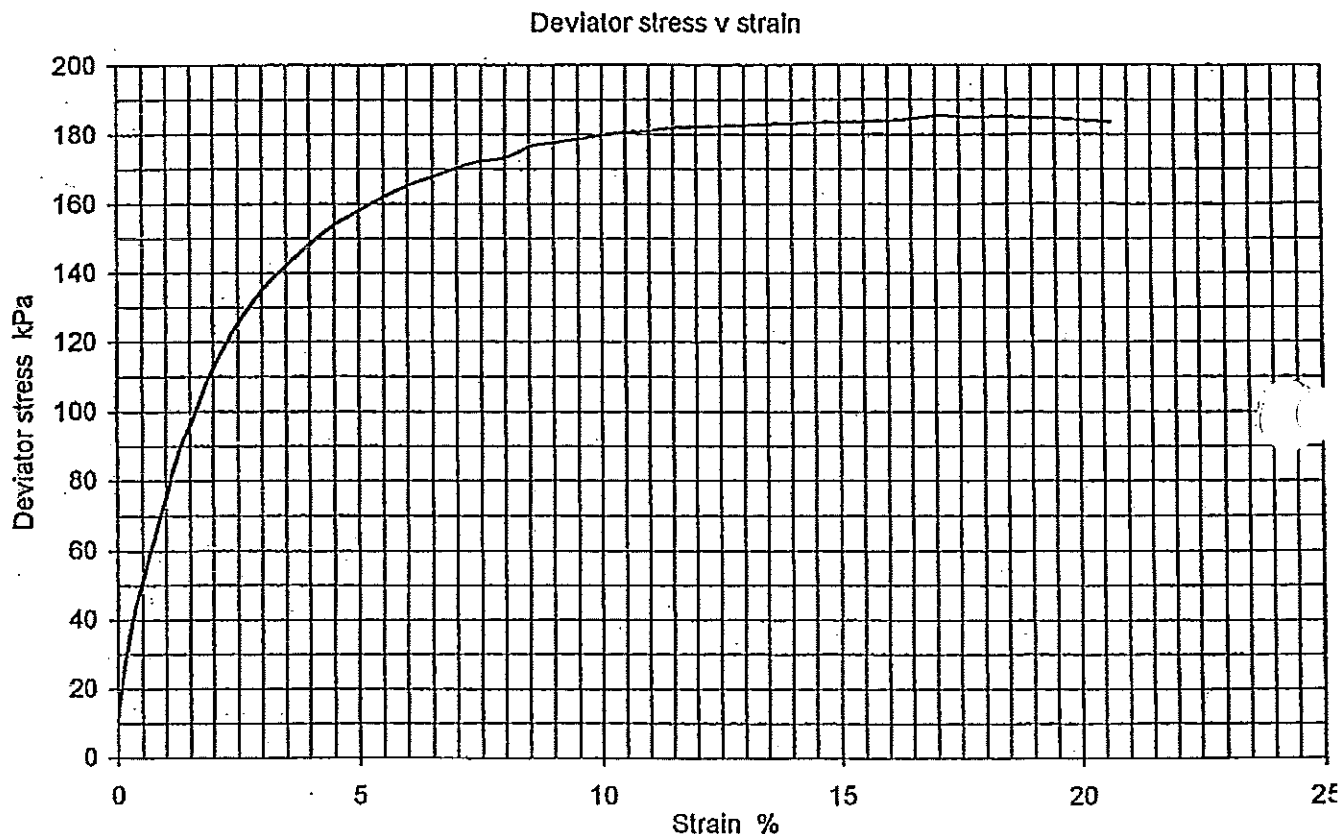
UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Firm brown slightly gravelly CLAY.

Hole ID
Sample no. U2
Depth 1.00
Sample type U
Page 1 of 1



Shear strength parameters

c 74 kPa
 ϕ 7.6 °
Apparent c 90 kPa

Test type		Undisturbed	Multi stage		Mode of failure
		1	2	3	Specimen 1
Specimen number					Compound
Cell pressure	kPa	20	40	60	
Deviator stress	kPa	173.53	181.04	185.45	
Corrected deviator stress	kPa	173	180	184	
Membrane correction	kPa	0.61	0.78	1.08	
Membrane thickness	mm	0.328			
Moisture content	%	22			
Bulk density	Mg/m ³	2.06			
Dry density	Mg/m ³	1.69			
Diameter	mm	103.3			
Length	mm	198.3			
Failure strain	%	8.1	11.1	17.1	
Cu	kPa	86	90	92	
Rate of strain 2.02 %/minute		Specimen depth 1.07 m			
High density rubber latex membrane used					
Remarks					

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Approved:

UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

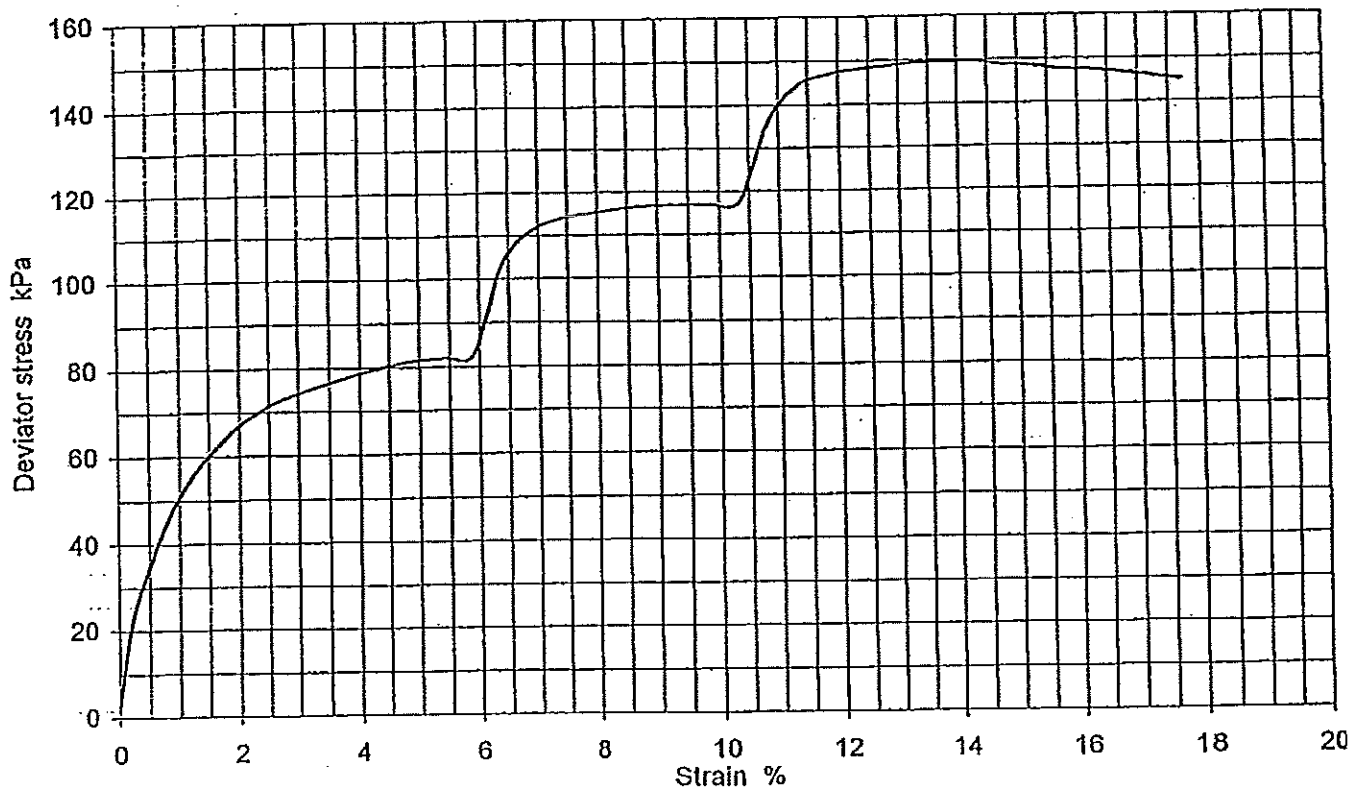
**NORWEST
HOLST**

Test Method: BS1377: Part 7: 1990: Clause 9

Contract no. F12963
Project Aldbrough Gas Storage Facility
Soil description Soft to firm brown mottled very sandy CLAY.

Hole ID BH111
Sample no. 02
Depth 1.00
Sample type U
Page 1 of 1

Deviator stress v strain



Shear strength parameters

c 13 kPa
φ 24.4 °
Apparent c 58 kPa

Test type		Undisturbed	Multi stage		Mode of failure
		1	2	3	Specimen 1
Specimen number					Compound
Cell pressure	kPa	20	40	60	
Deviator stress	kPa	82.67	117.51	149.64	
Corrected deviator stress	kPa	82	117	149	
Membrane correction	kPa	0.50	0.78	0.99	
Membrane thickness	mm	0.348			
Moisture content	%	15			
Bulk density	Mg/m ³	1.88			
Dry density	Mg/m ³	1.64			
Diameter	mm	104.1			
Length	mm	203.1			
Failure strain	%	5.9	10.3	14.3	
Cu	kPa	41	58	74	
Rate of strain 1.97 %/minute		Specimen depth 1.14 m			
High density rubber latex membrane used					
Remarks					

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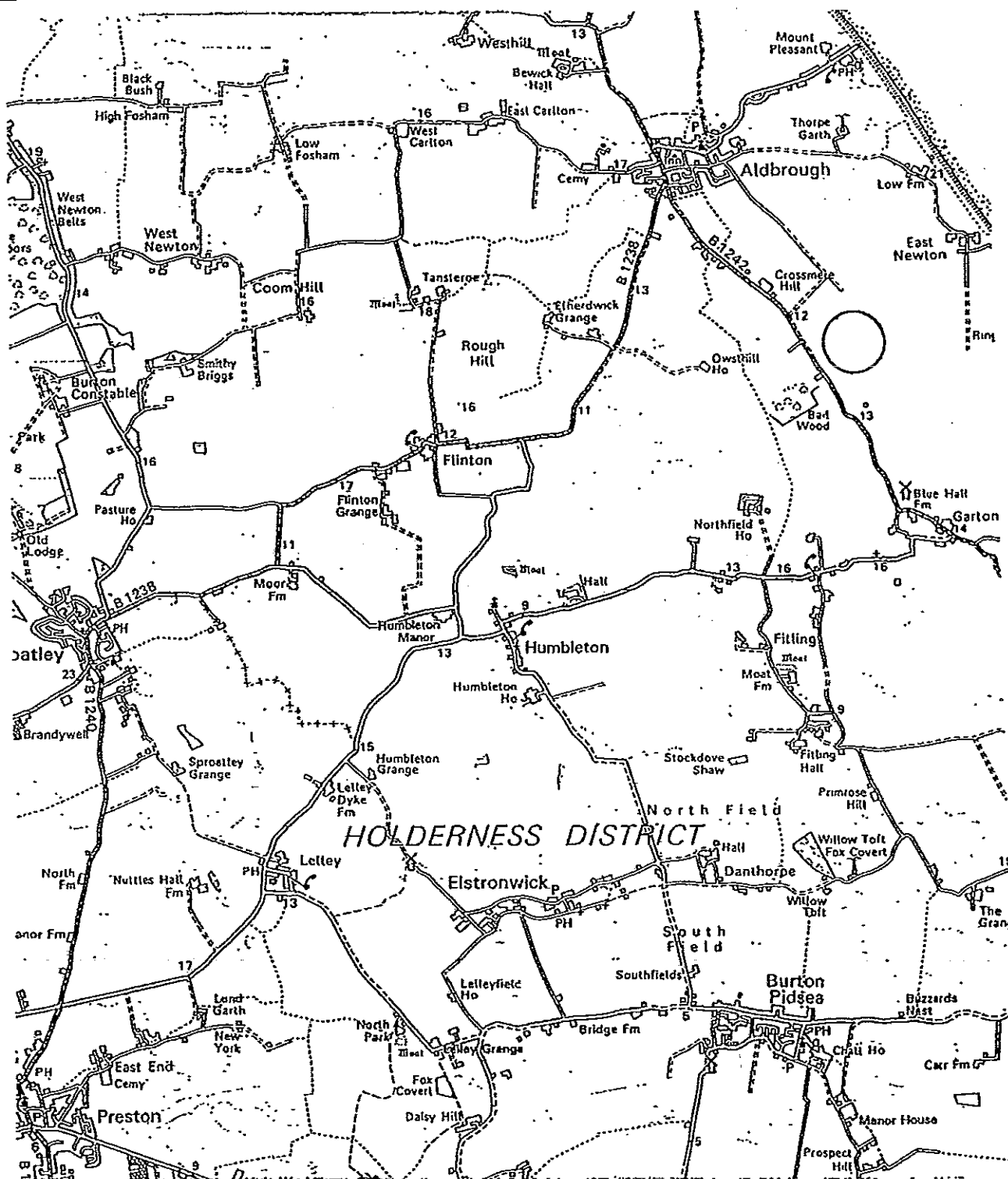
Approved:

SUPPORTING FACTUAL DATA

SECTION D

SITE PLANS

SITE LOCATION PLAN



Denotes Site Location

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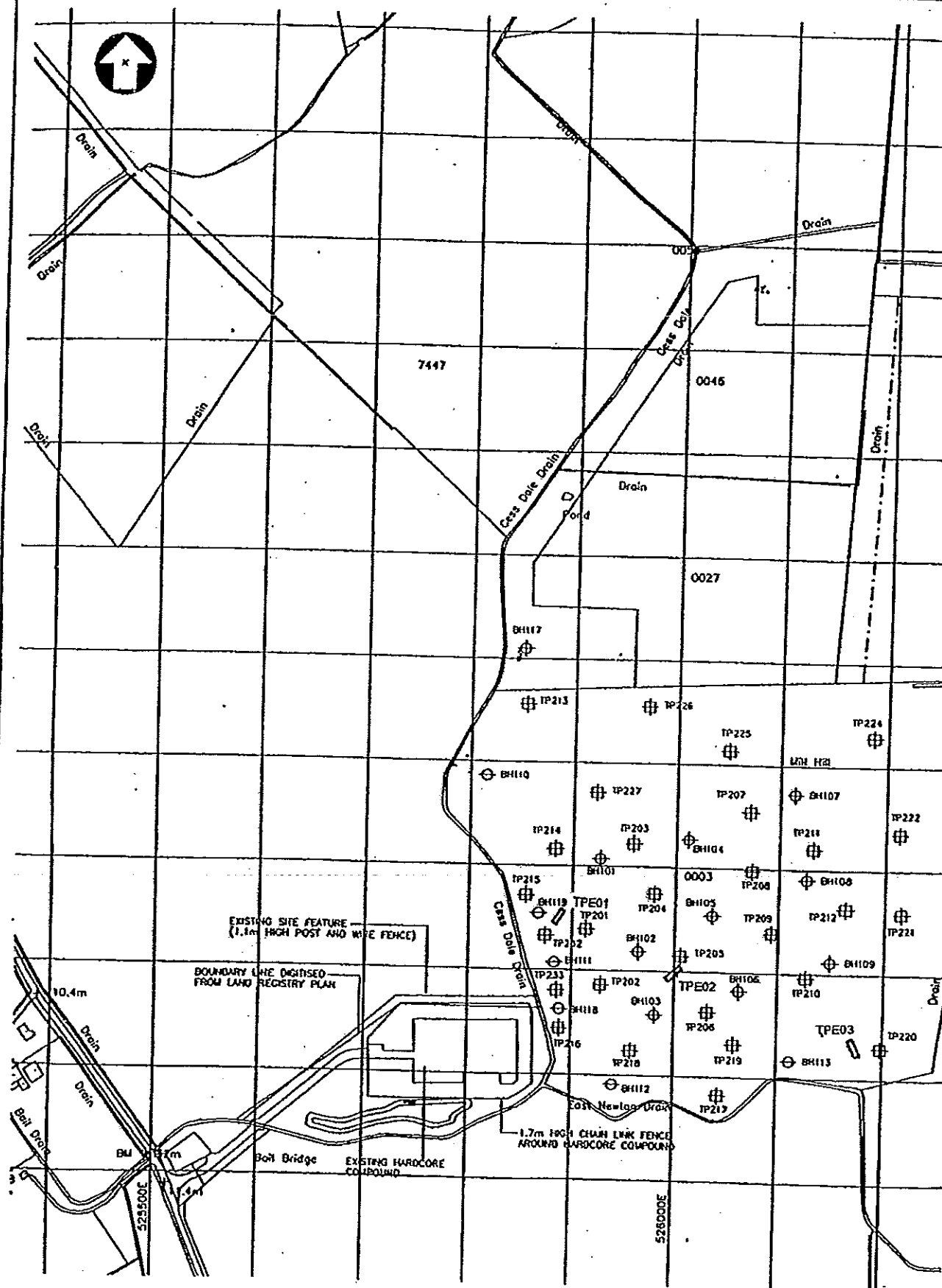
SITE: ALDBROUGH GAS STORAGE FACILITY	CONTRACT No: F12963	SCALE: 1:50,000
TITLE: SITE LOCATION PLAN	DATE: 06/09/2003	FIGURE: 01

SUPPORTING FACTUAL DATA

SECTION D

SITE PLANS

**EXPLORATORY HOLE
LOCATION PLAN**



[illegible]

SUPPORTING FACTUAL DATA

SECTION E

PHOTOGRAPHS

TRIAL PIT PHOTOGRAPHS

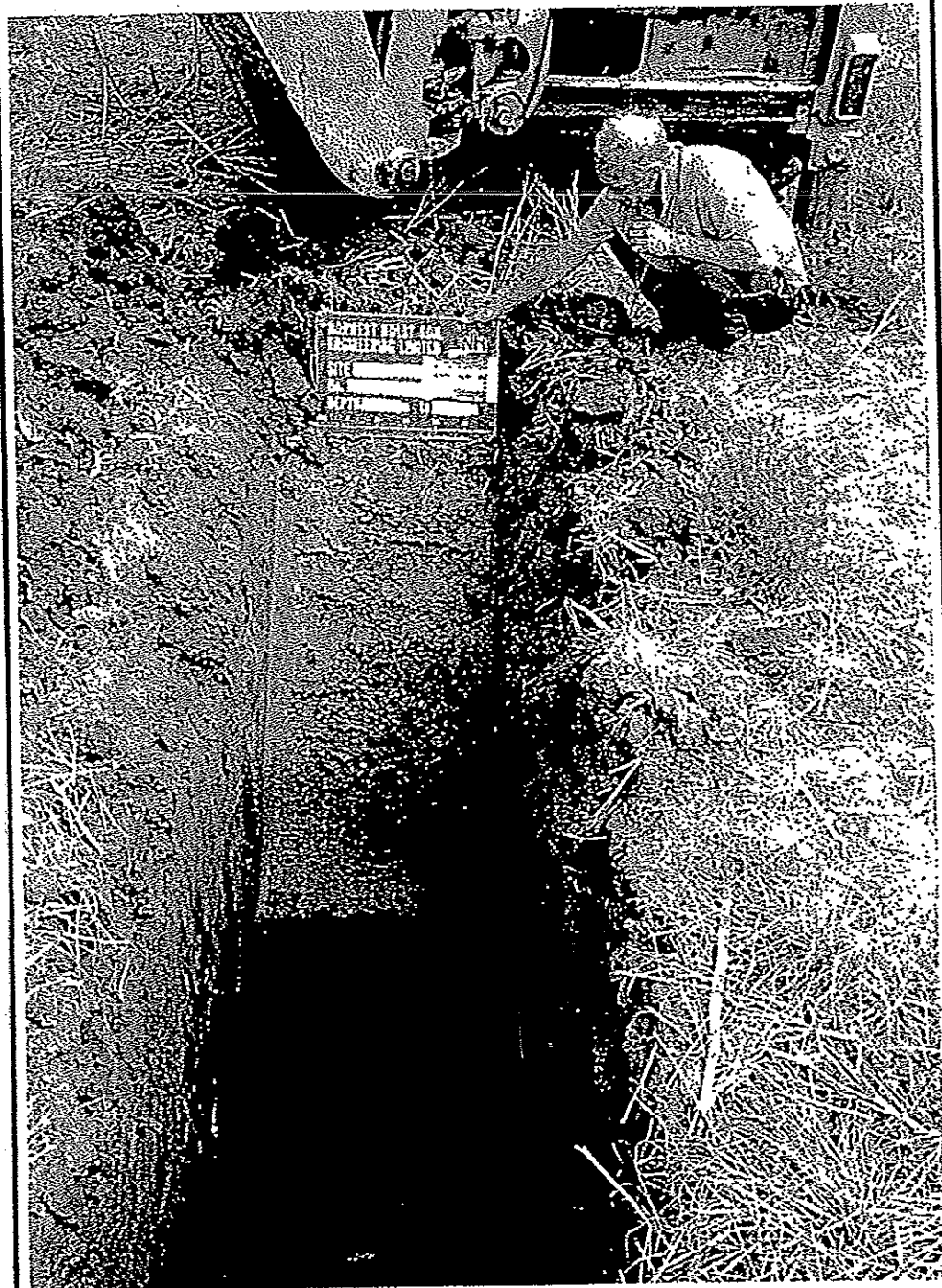


SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS:

TP201



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TP201

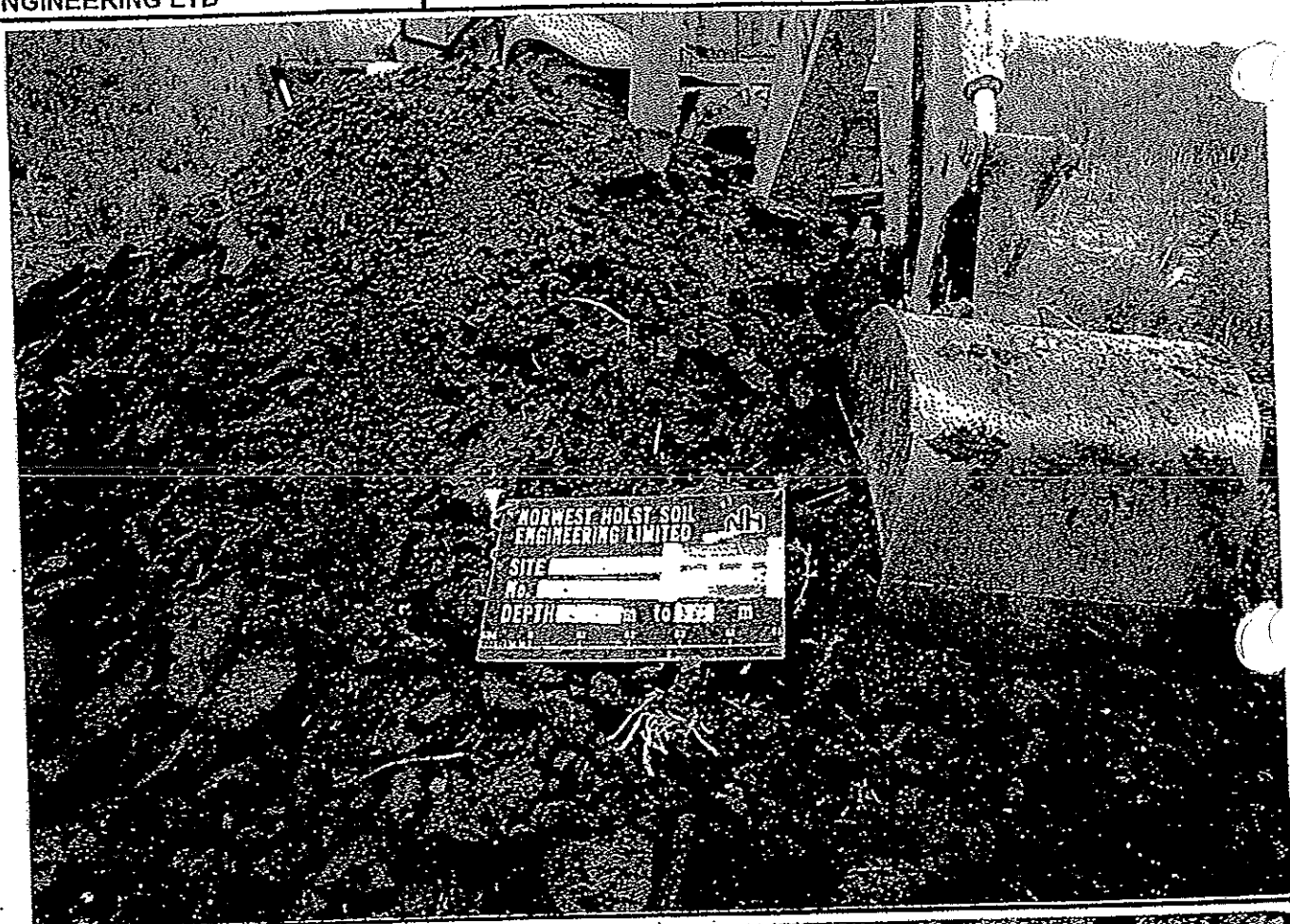




SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

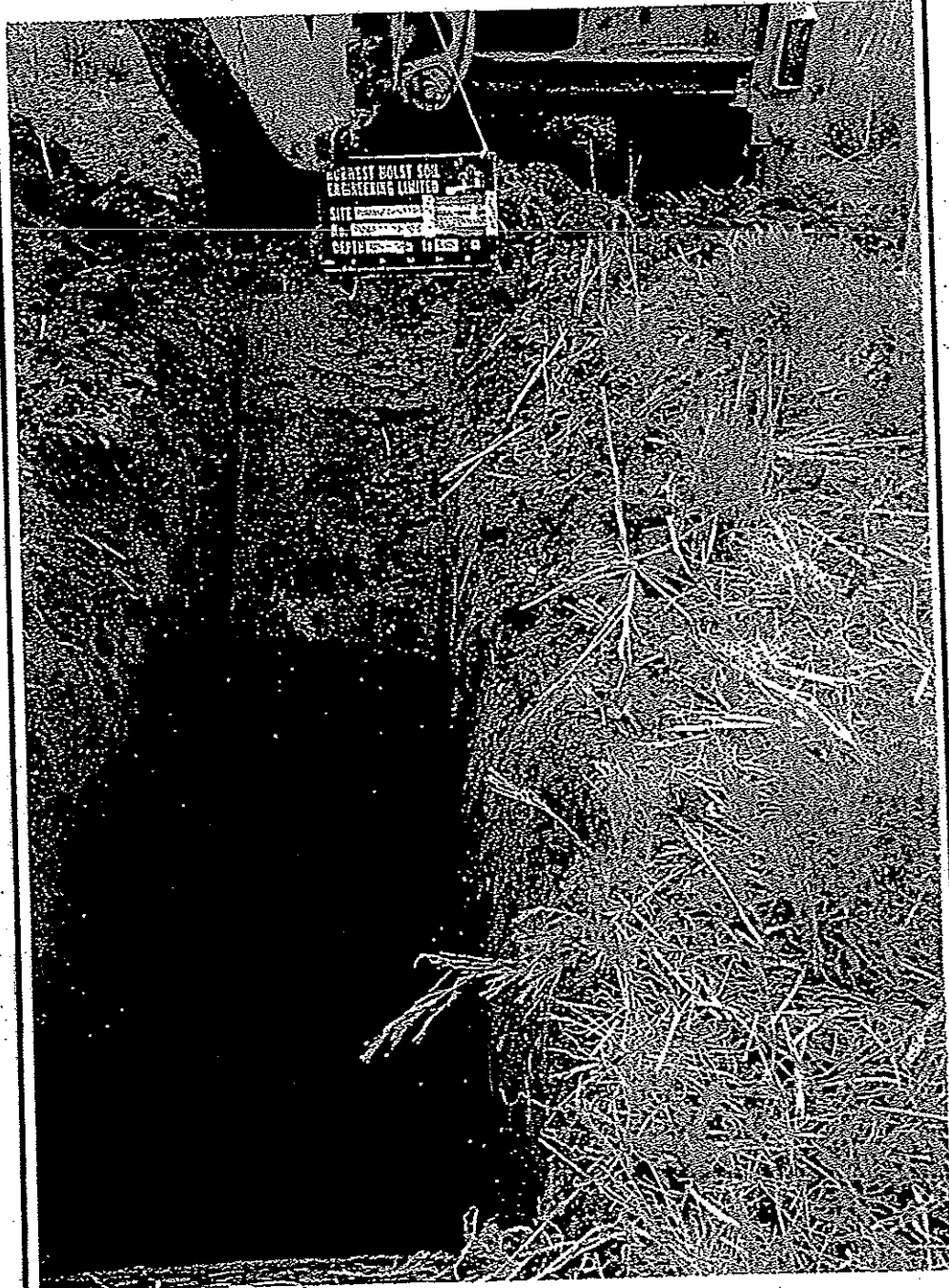
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NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
HOLST

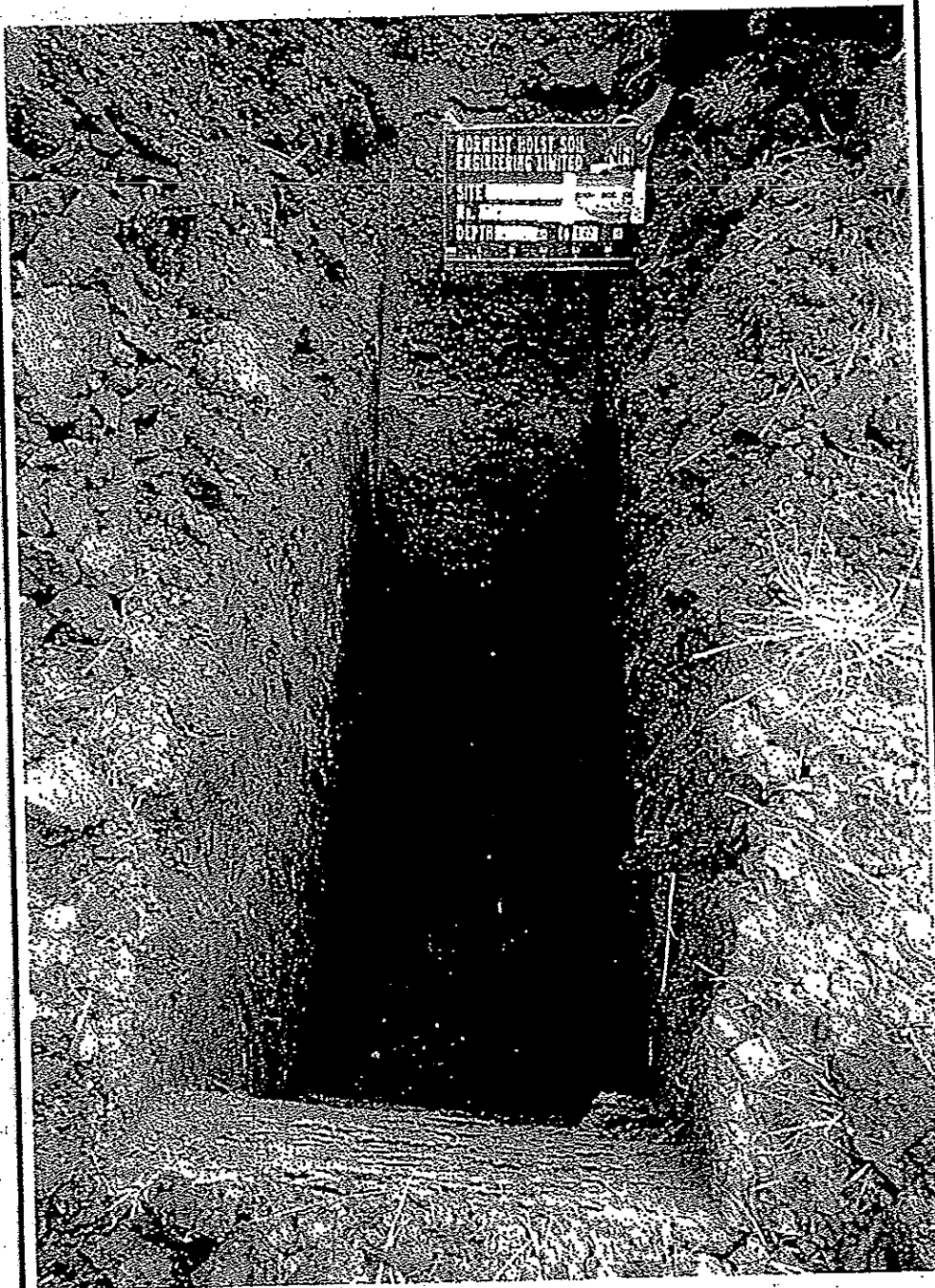


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CONTRACT No :F12963

PHOTOGRAPH
DETAILS
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

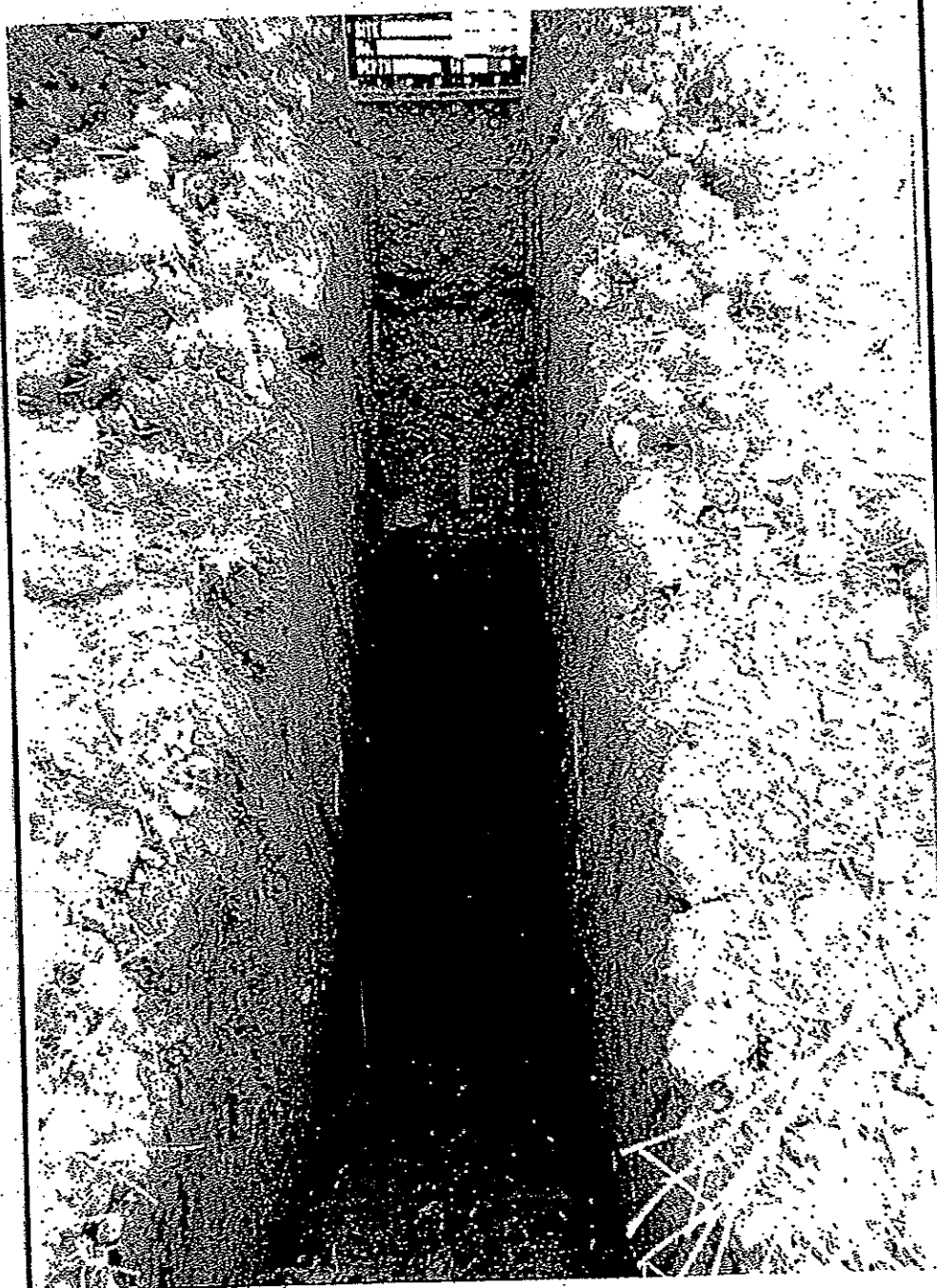
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DETAILS
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ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

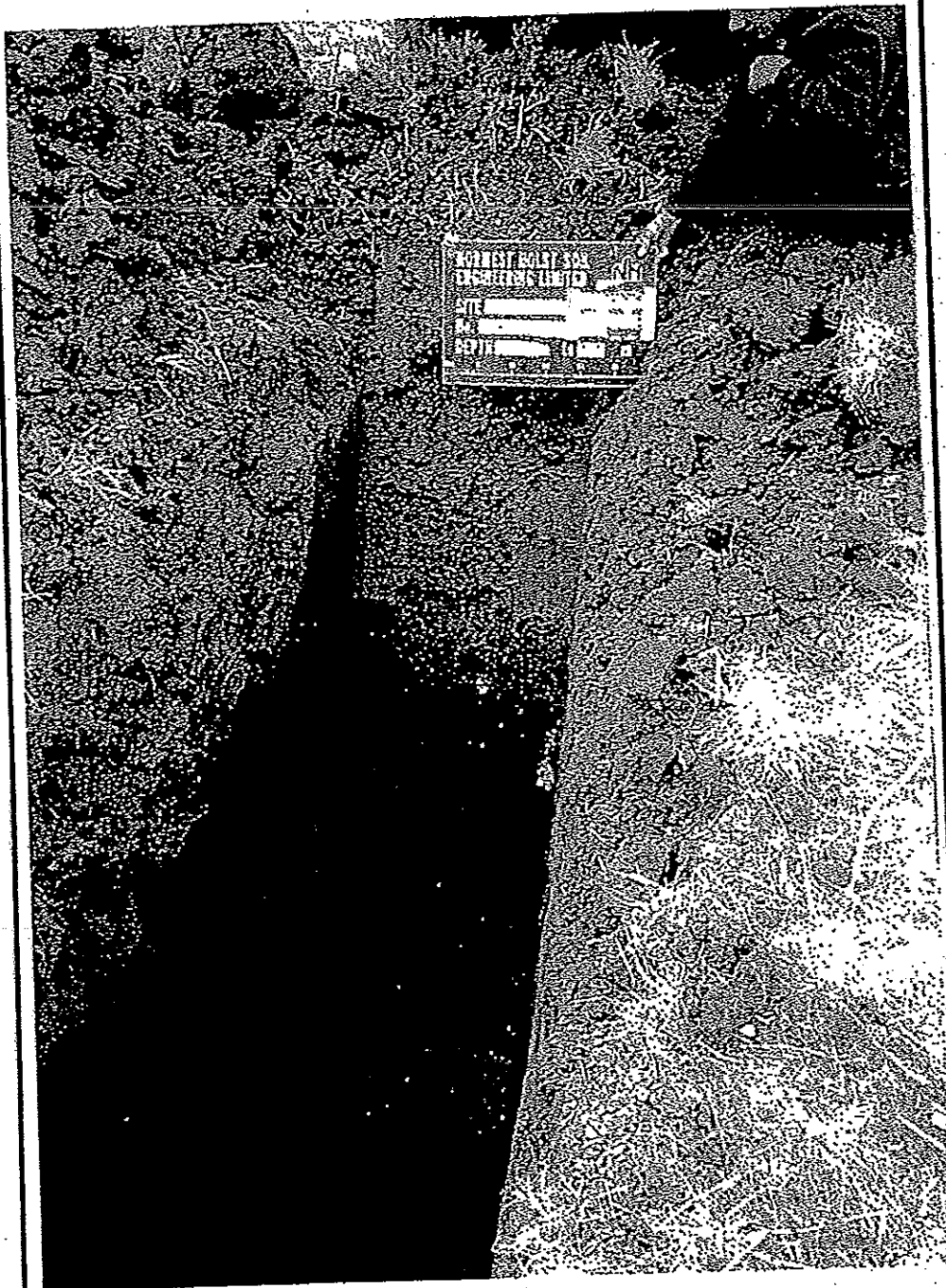
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DETAILS
TP205



NORWEST HOLST SOIL
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PHOTOGRAPHIC RECORD

NORWEST
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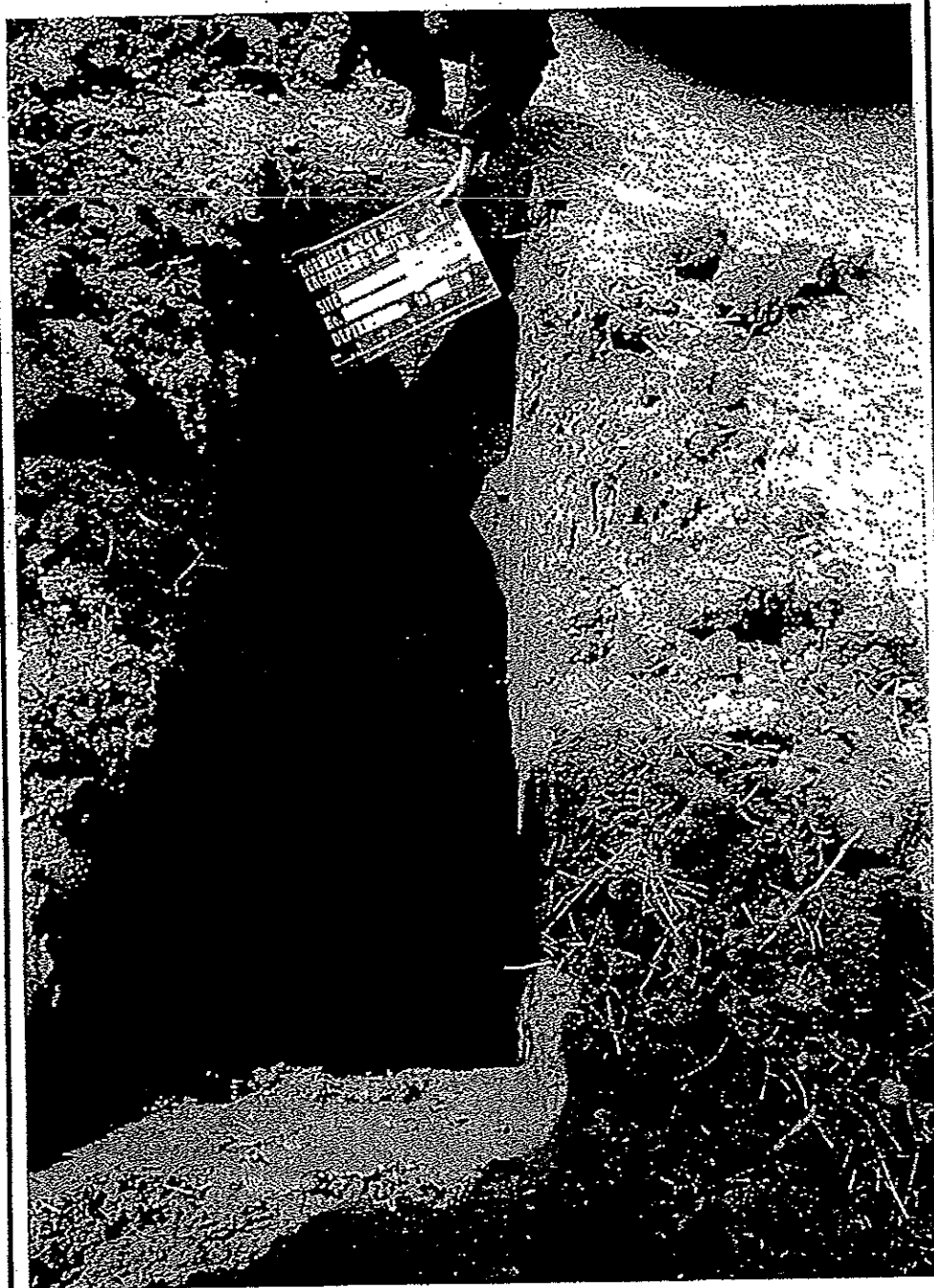


SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
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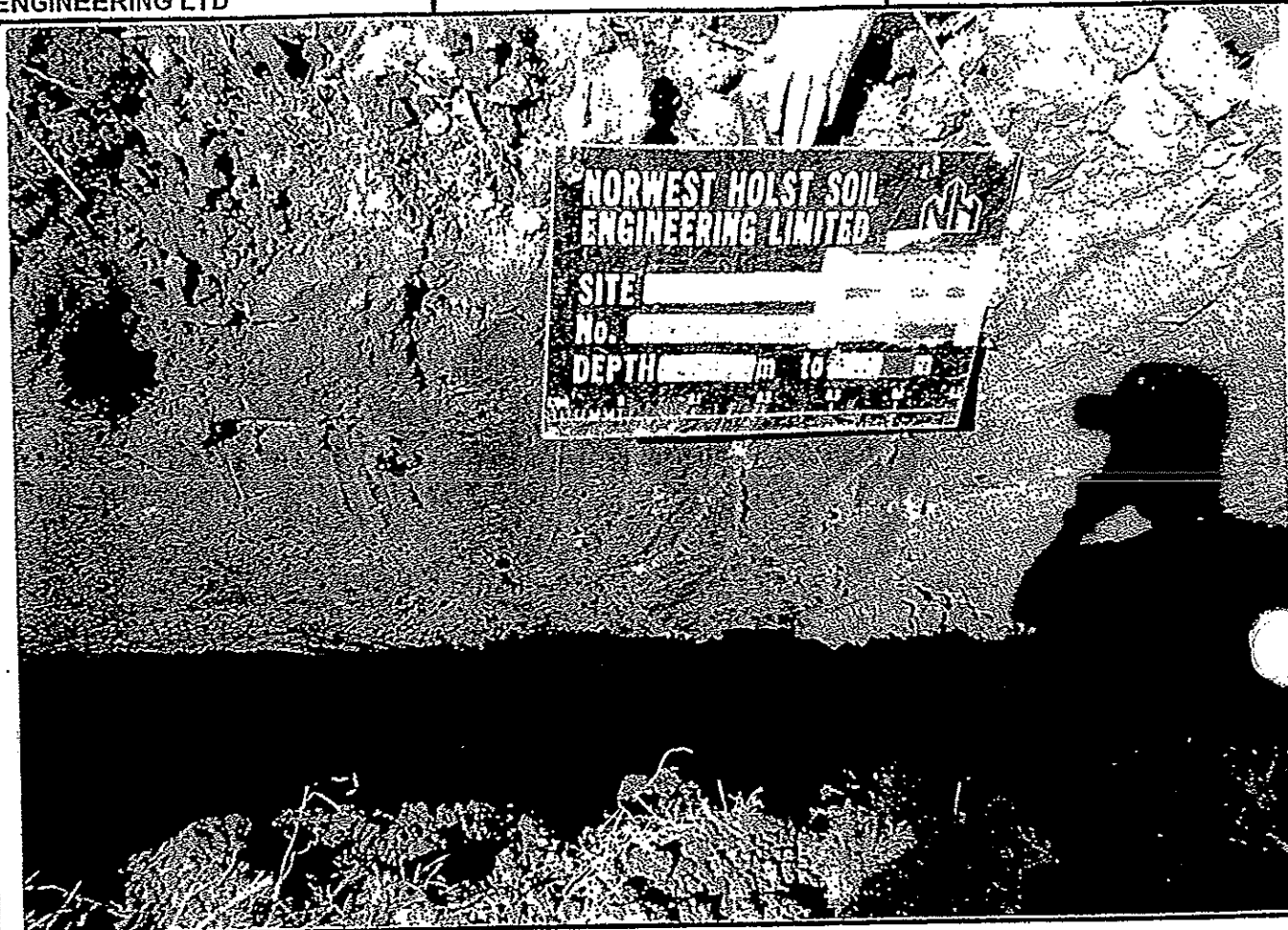




SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP208





SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

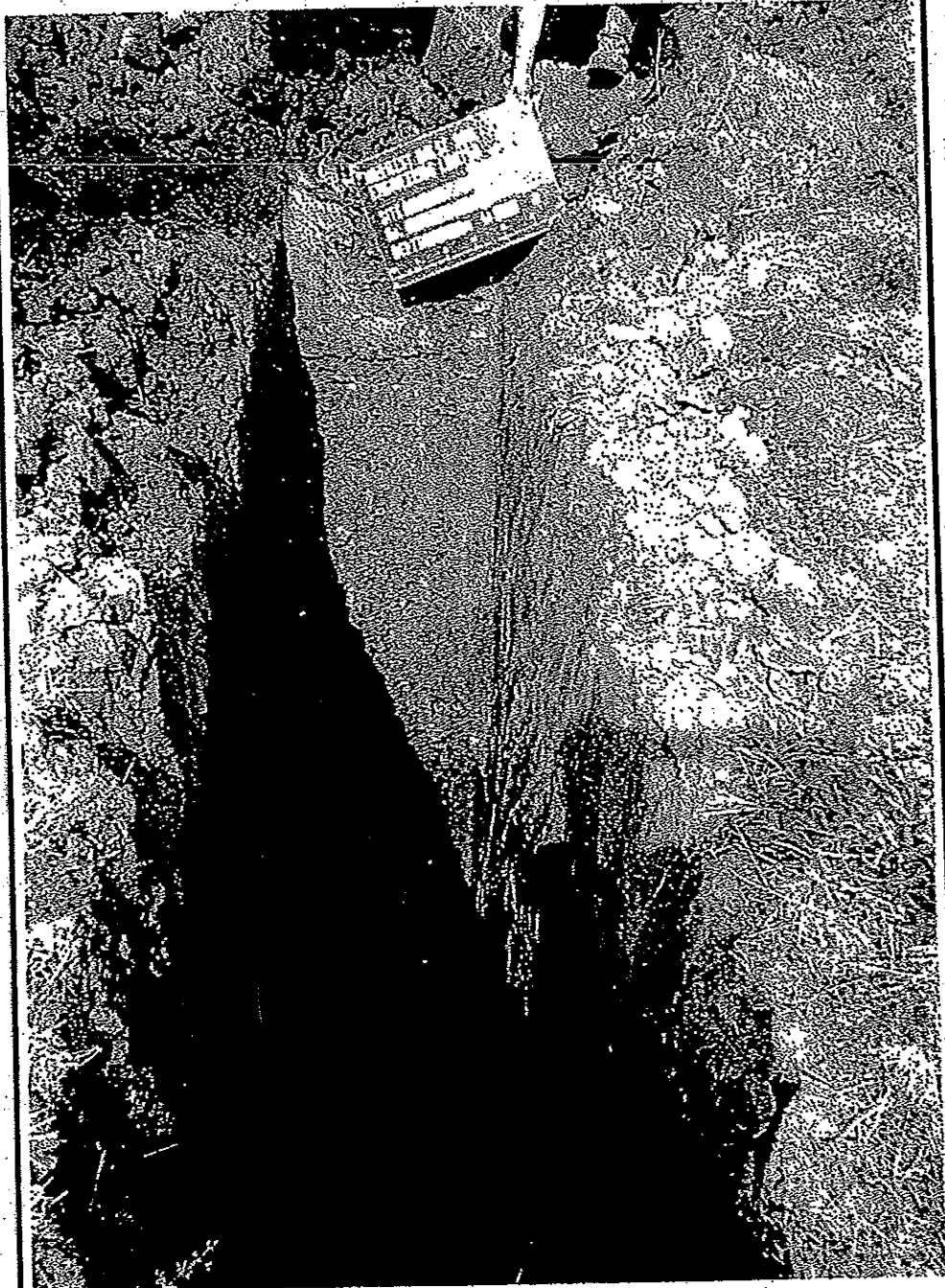
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NORWEST HOLST SOIL
ENGINEERING LTD

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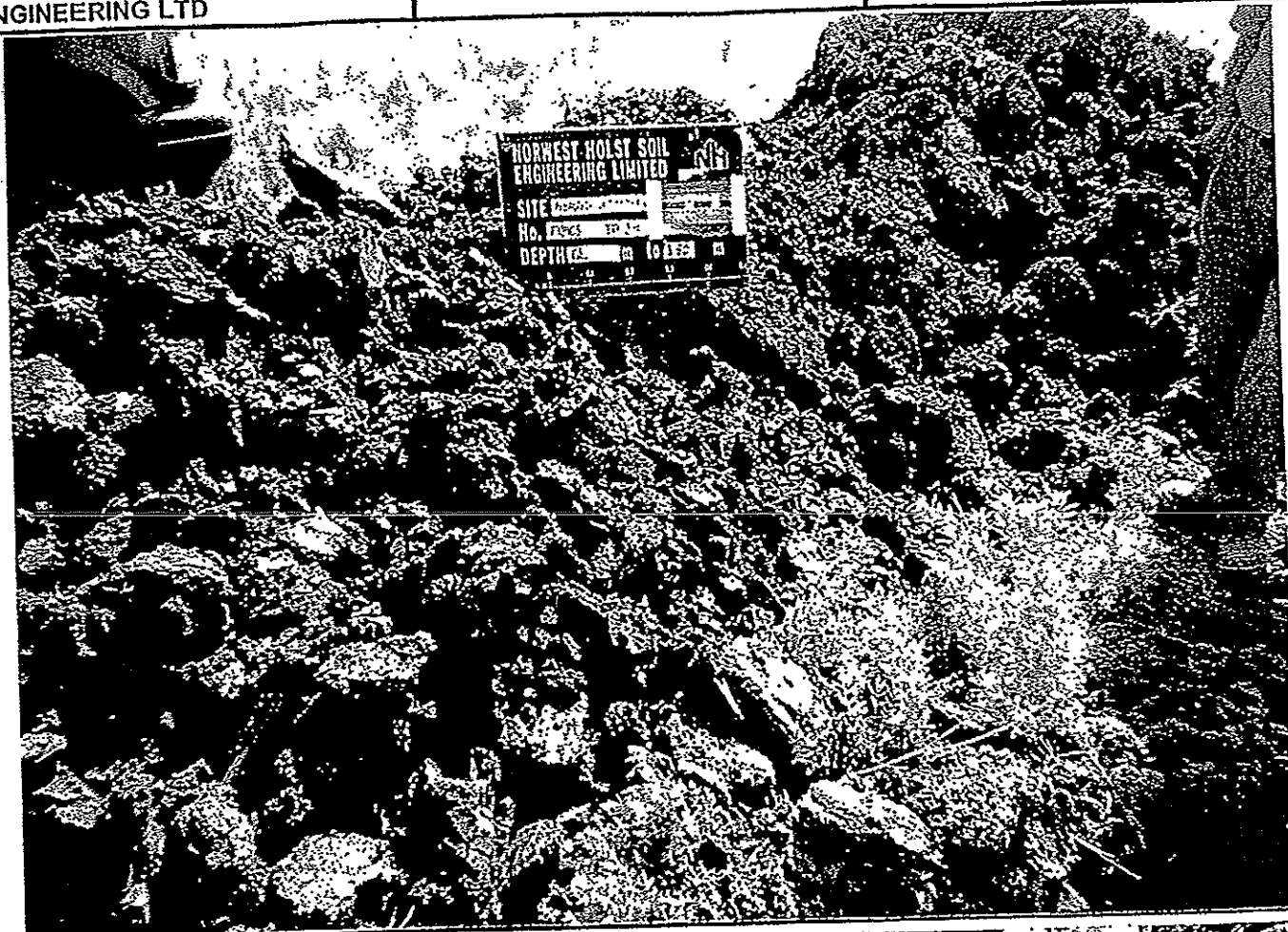
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP210.



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS:

TP211

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
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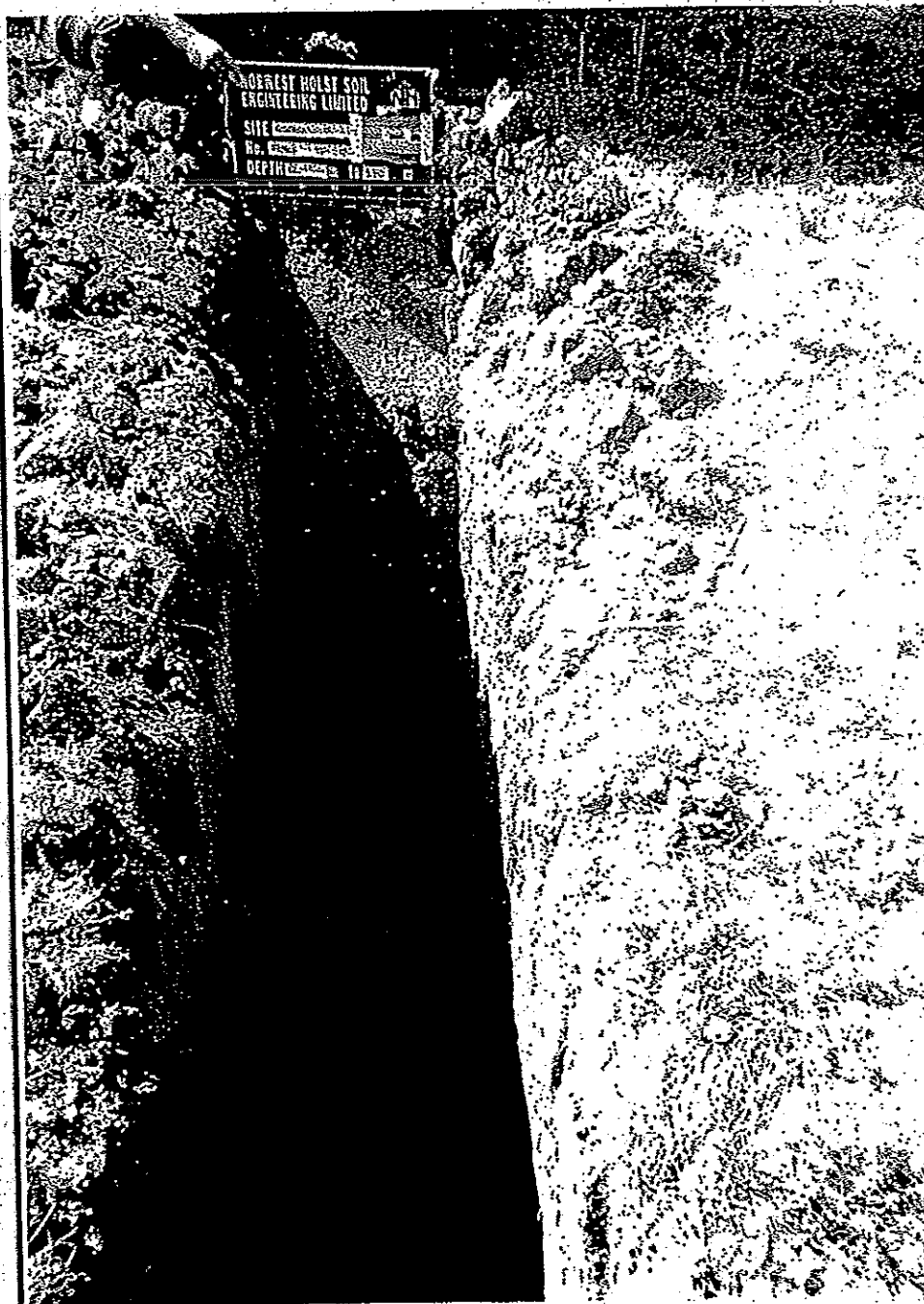
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NORWEST HOLST SOIL
ENGINEERING LTD

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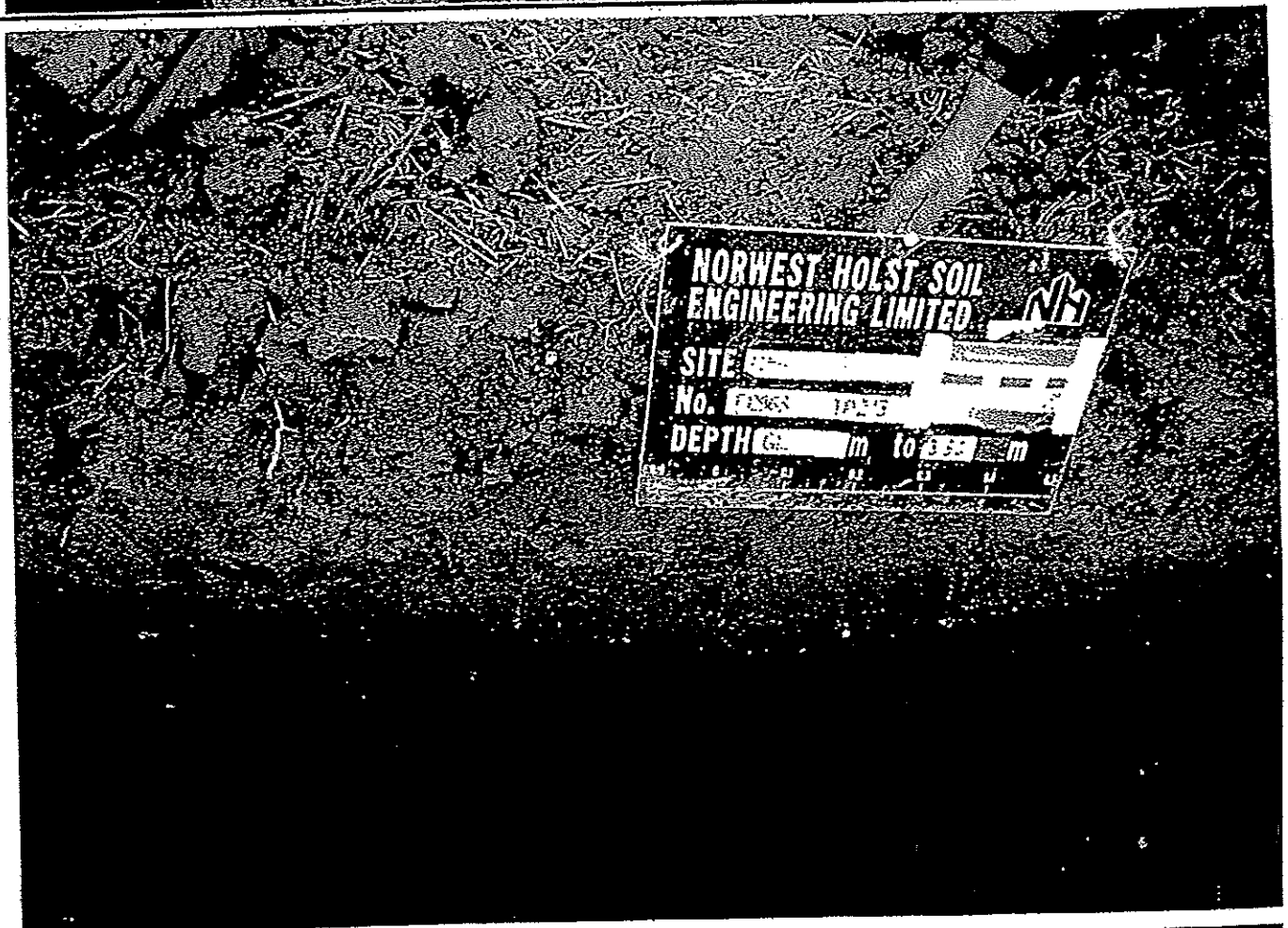
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TP212

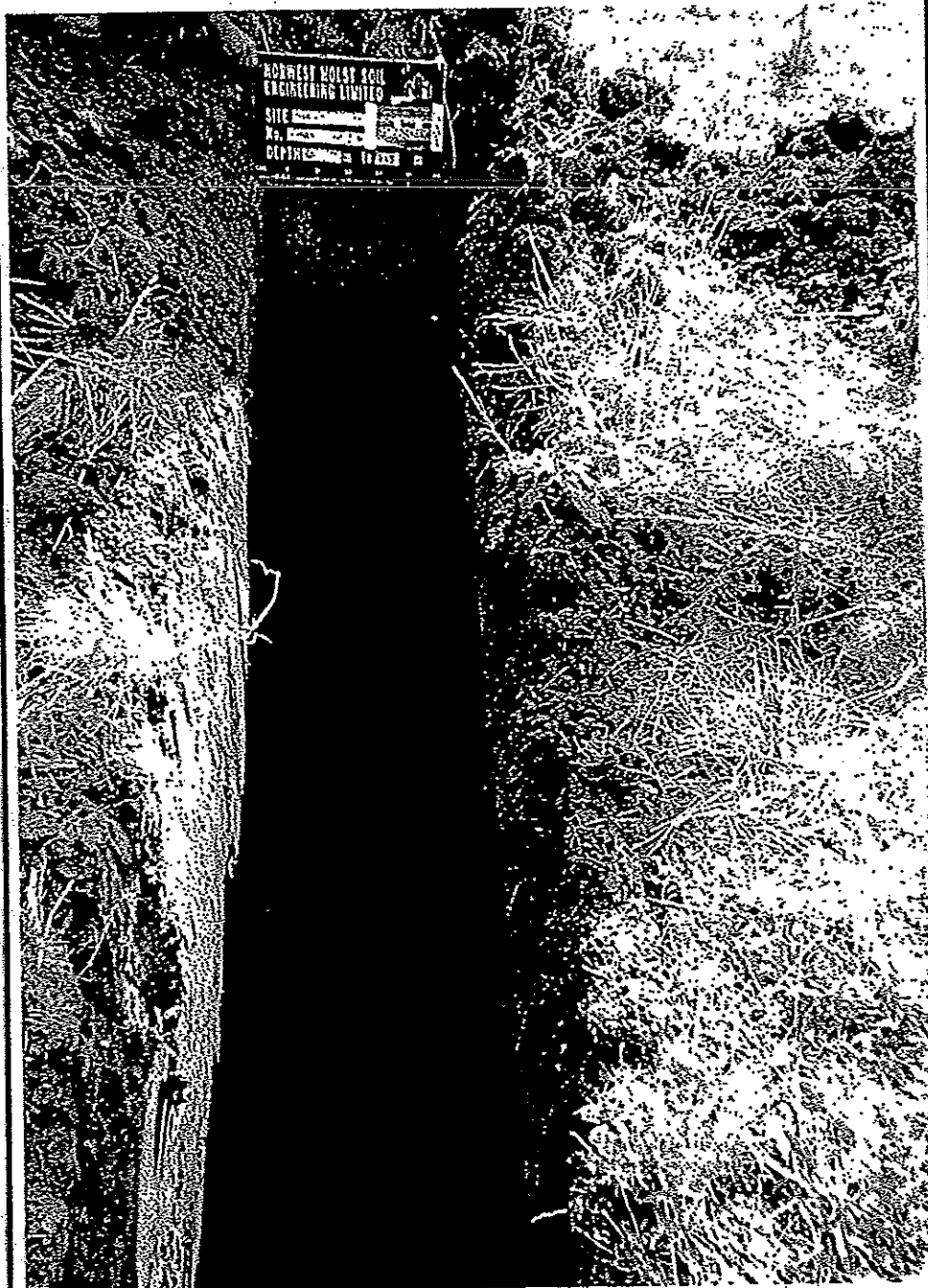


SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS:

TP213



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TP213



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS

TP214

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

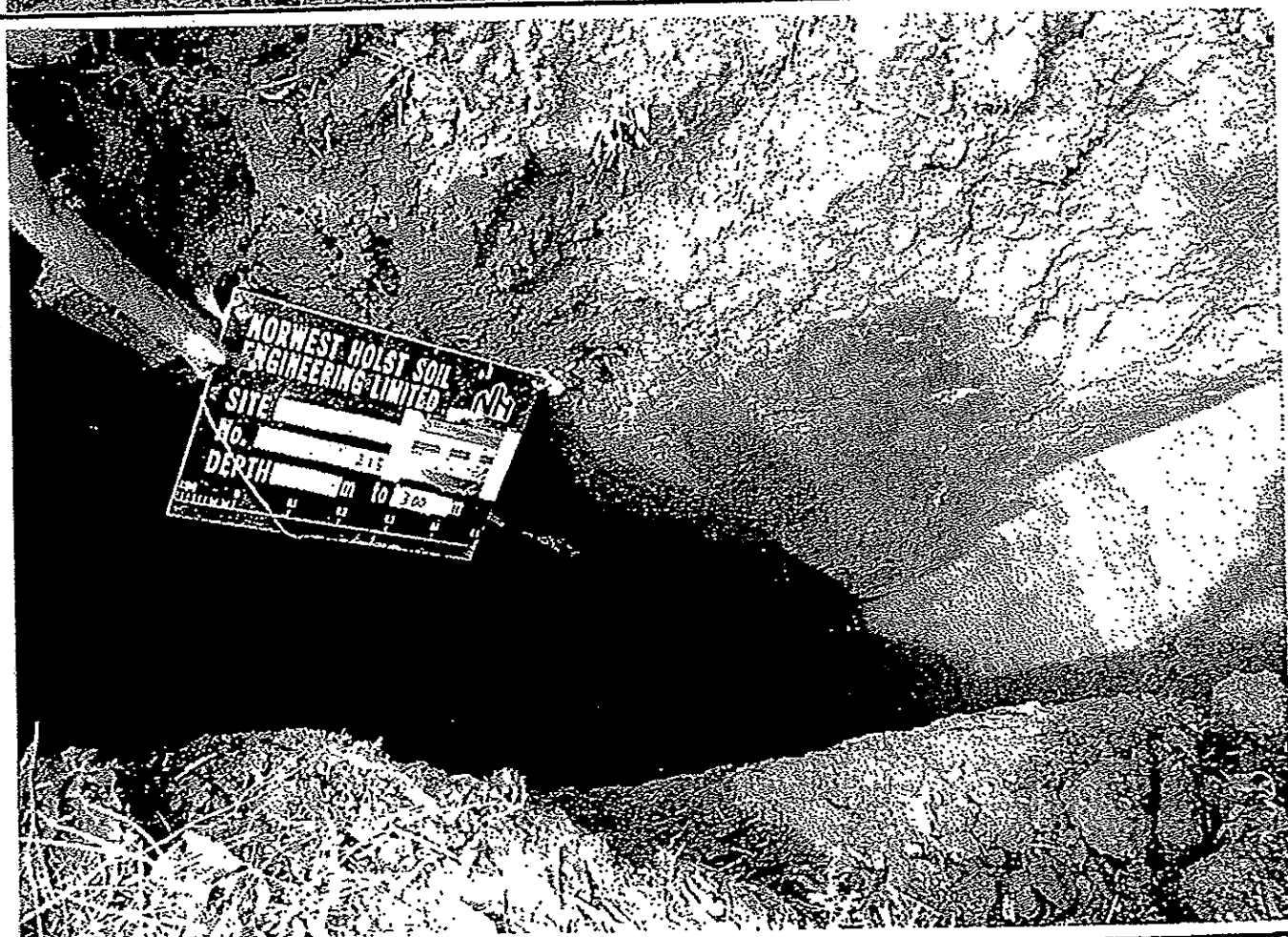
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HOLST



SITE : ALDBROUGH GAS STORAGE

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PHOTOGRAPH
DETAILS
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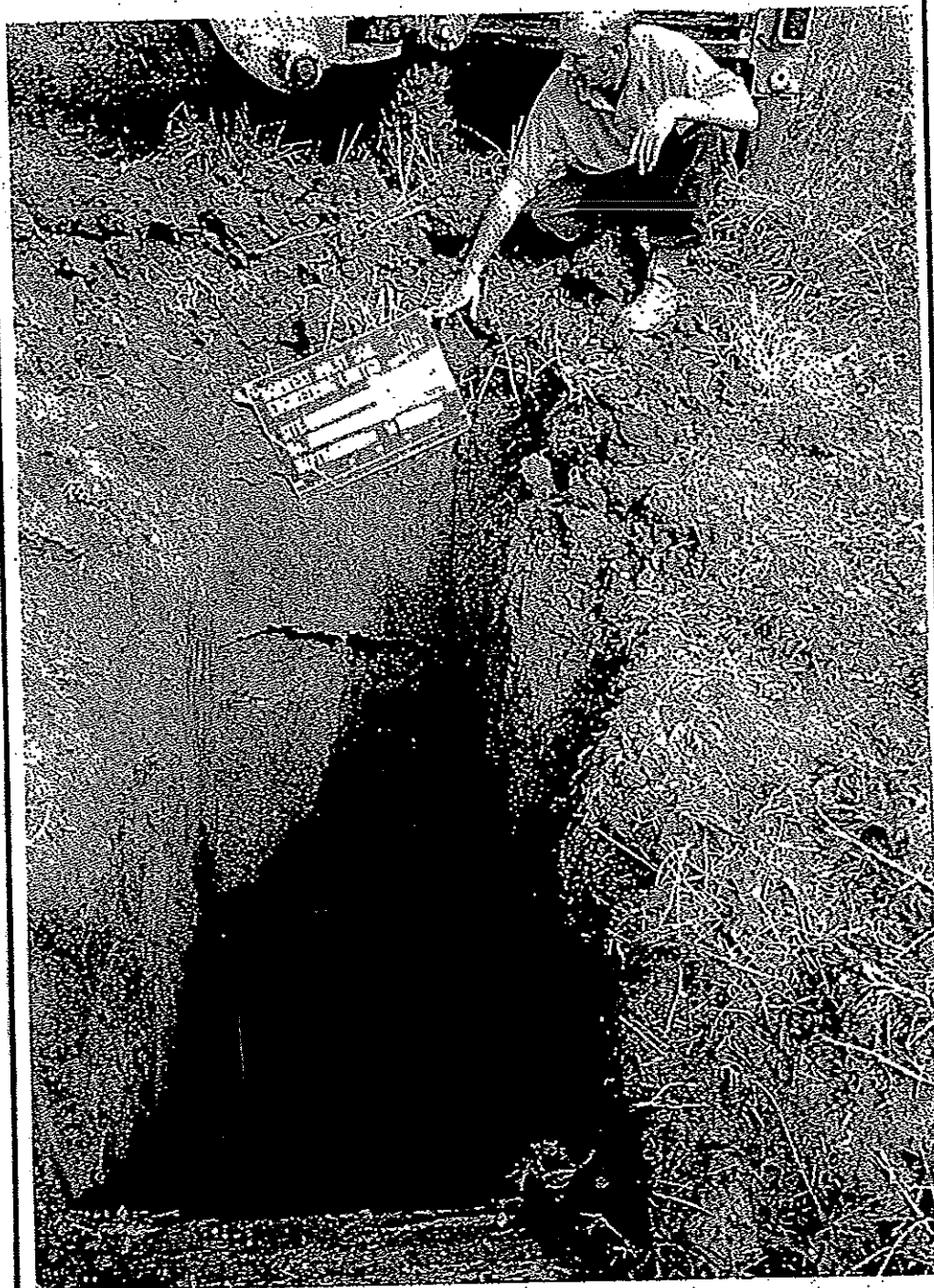


SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

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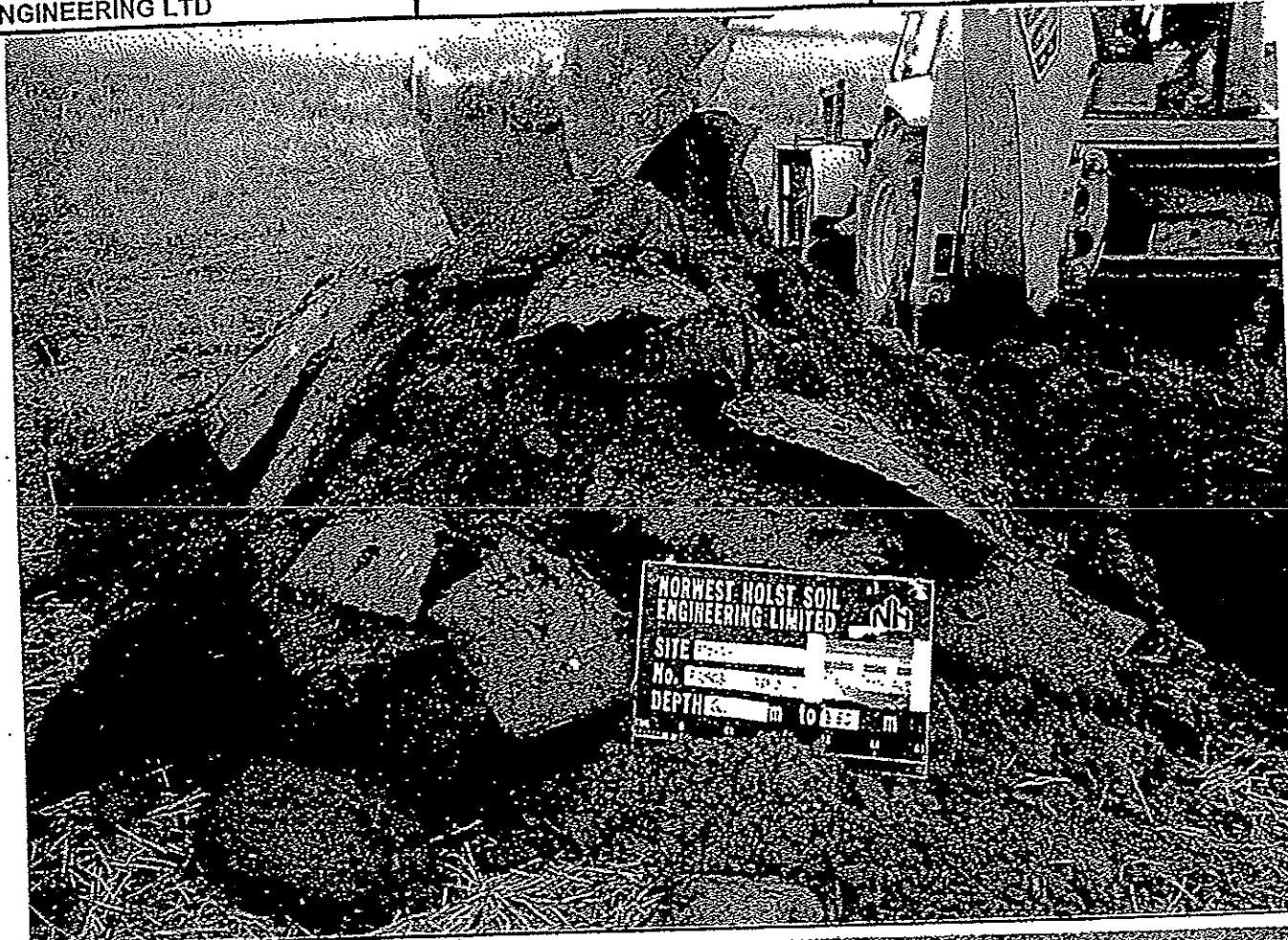
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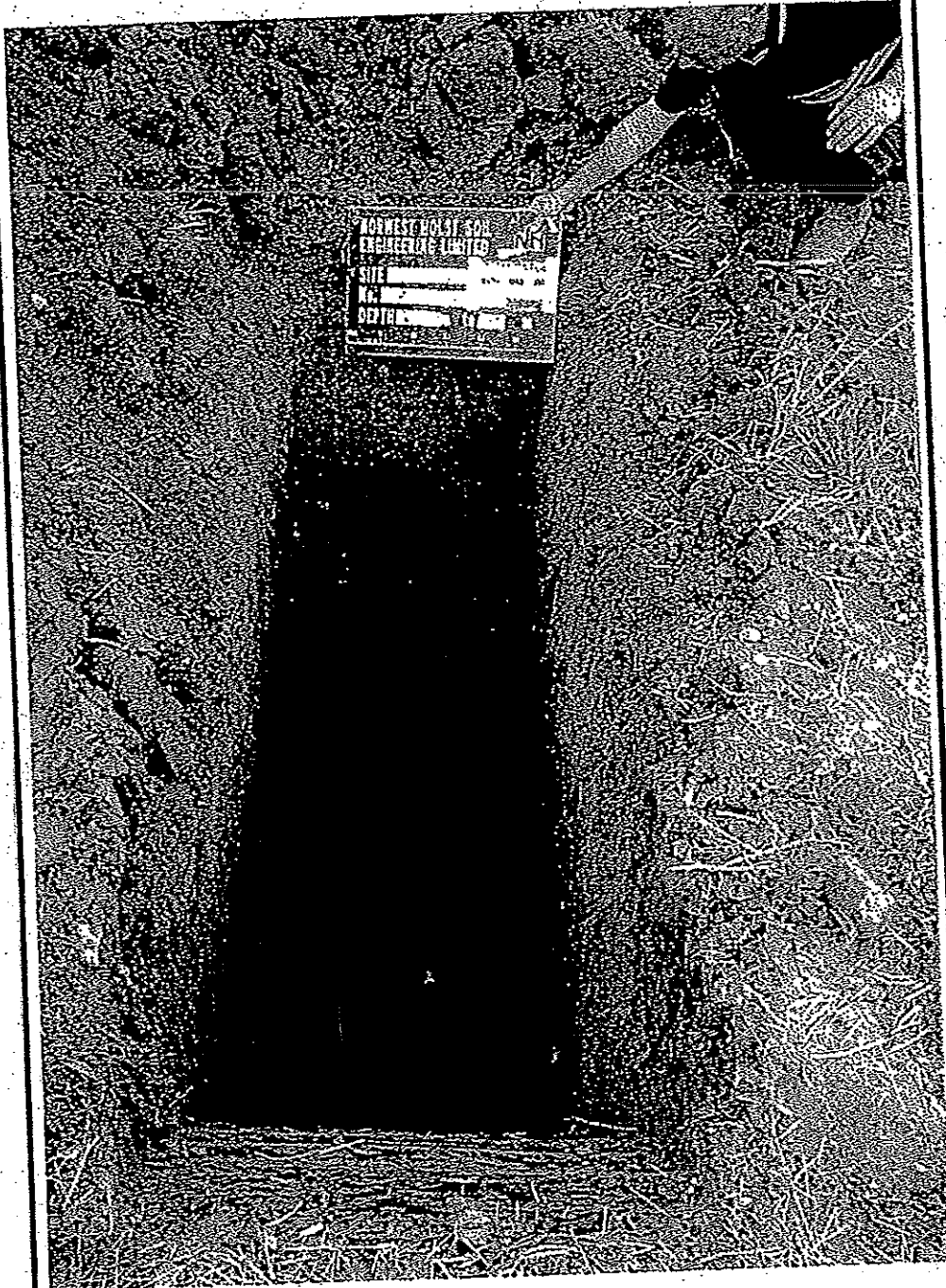
PHOTOGRAPH
DETAILS
TP215



NORWEST HOLST SOIL
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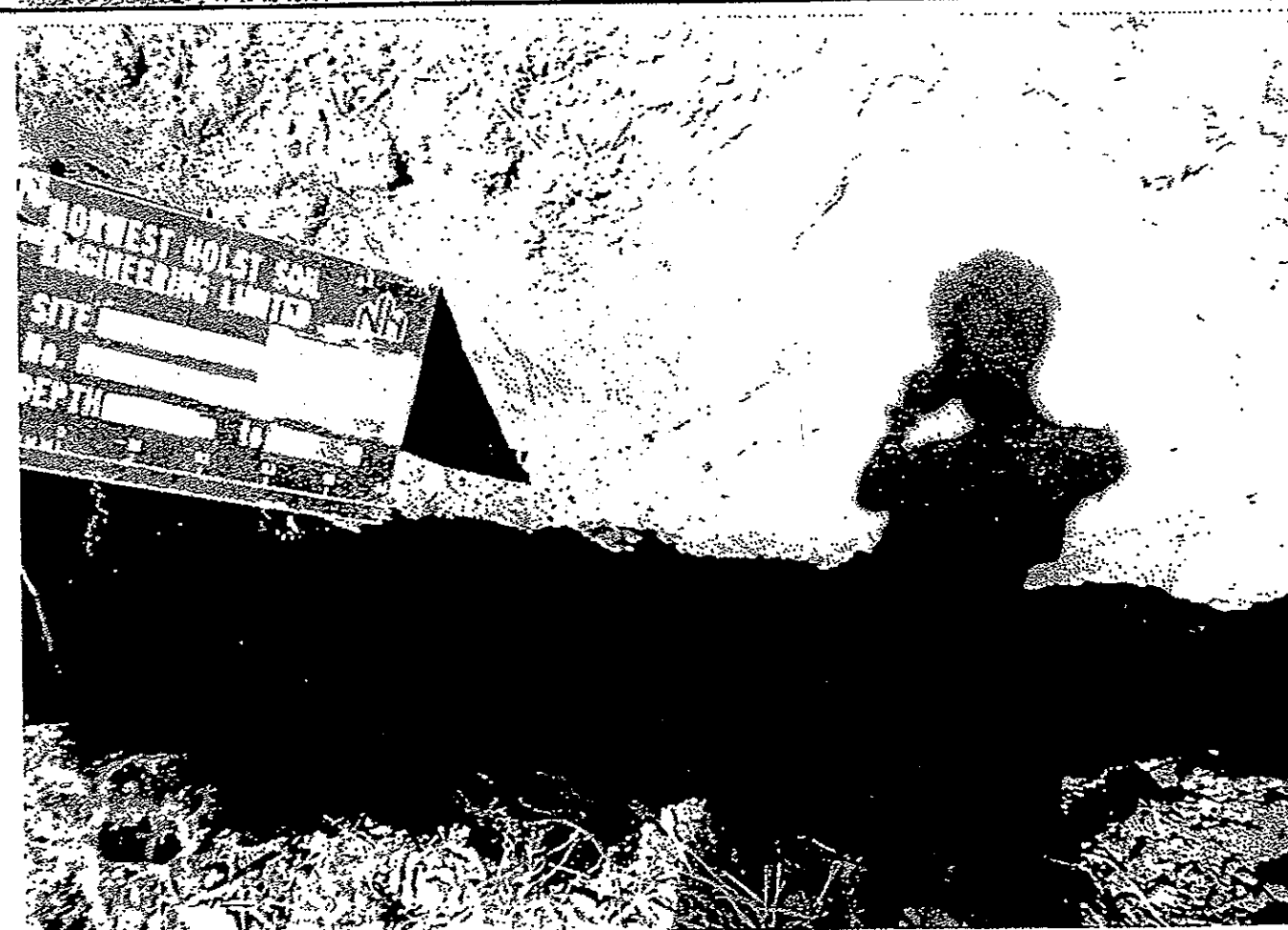
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TP216



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS:

TP217

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

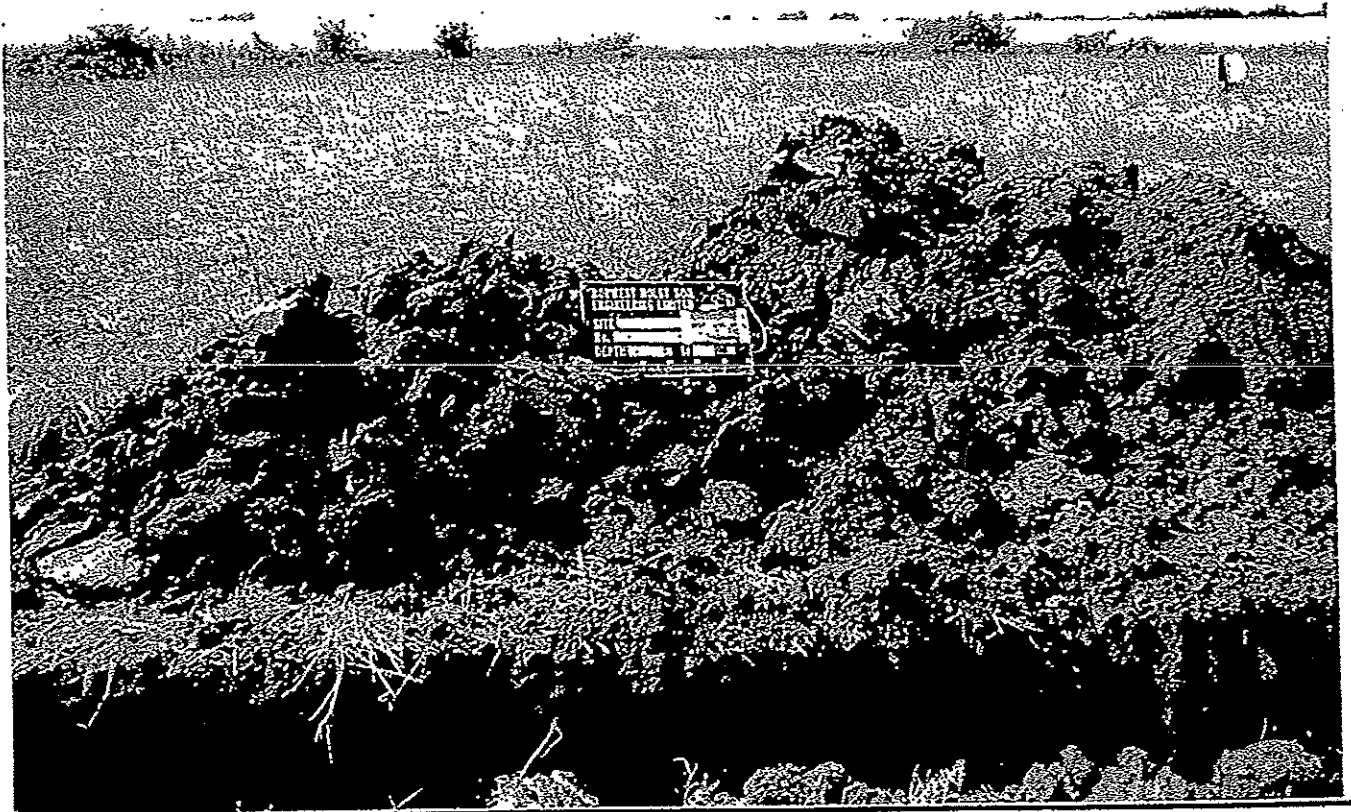
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP217



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS:

TP218

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP218



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

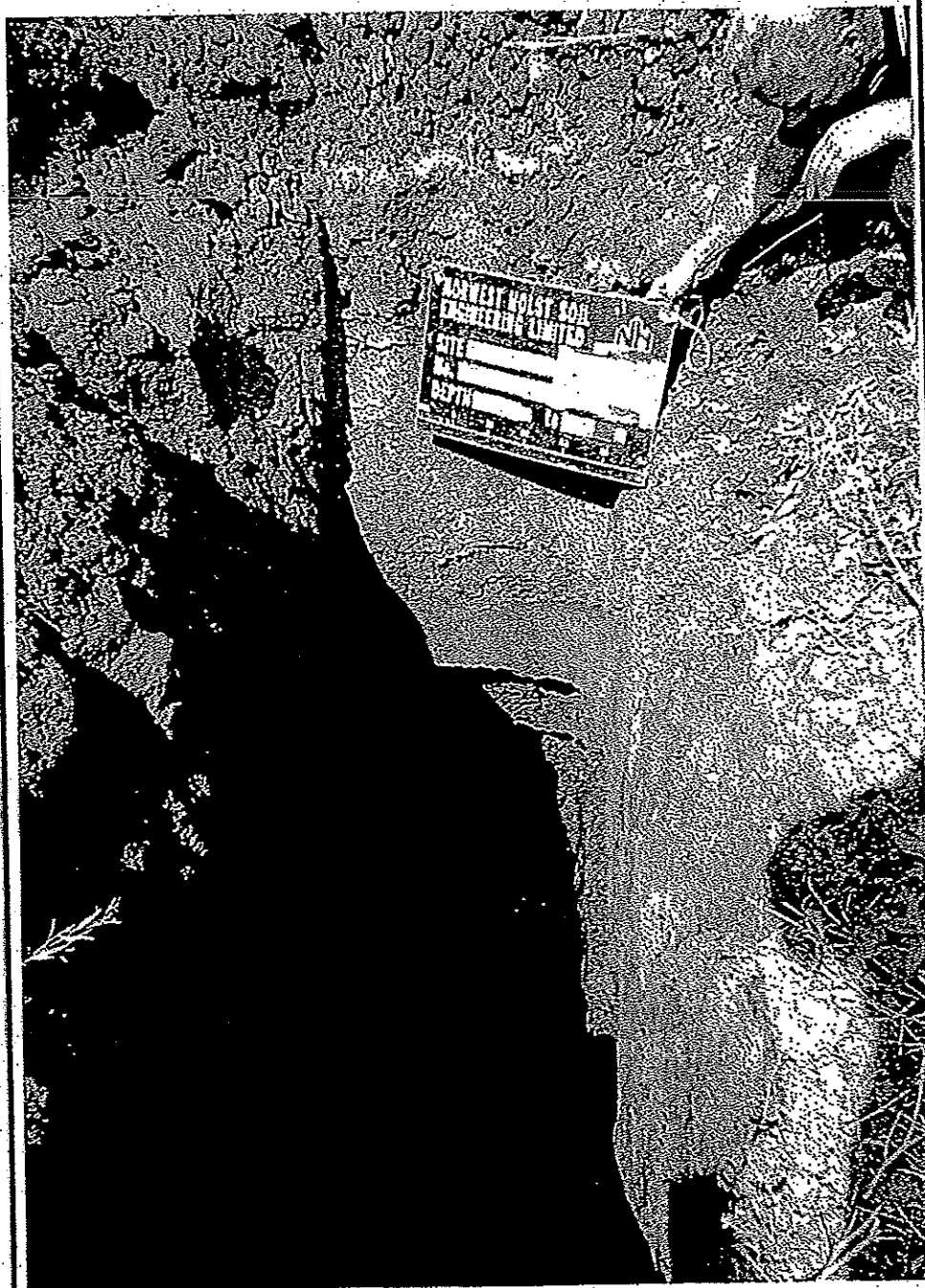
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NORWEST HOLST SOIL
ENGINEERING LTD

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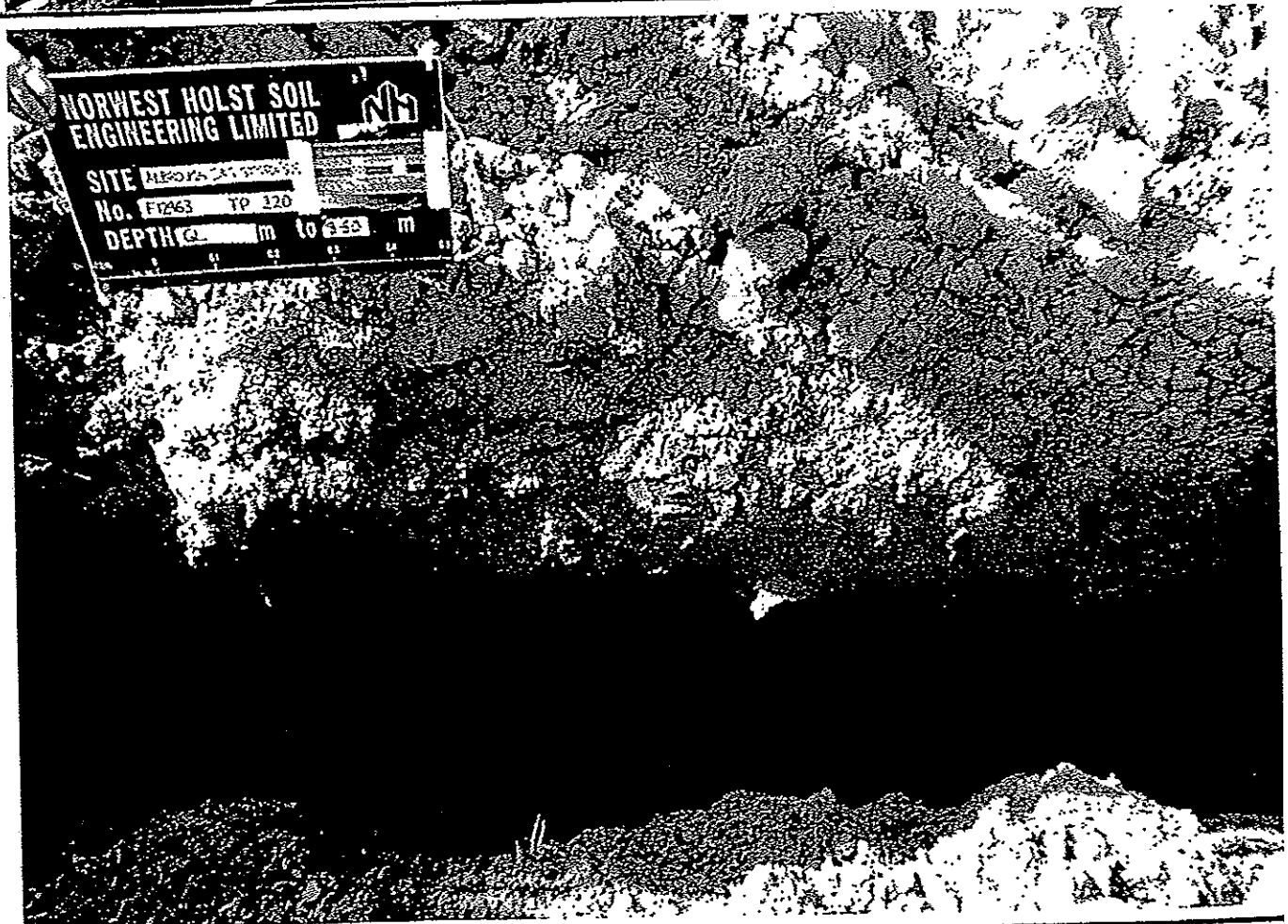
NORWEST
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP219



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS

TP220

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

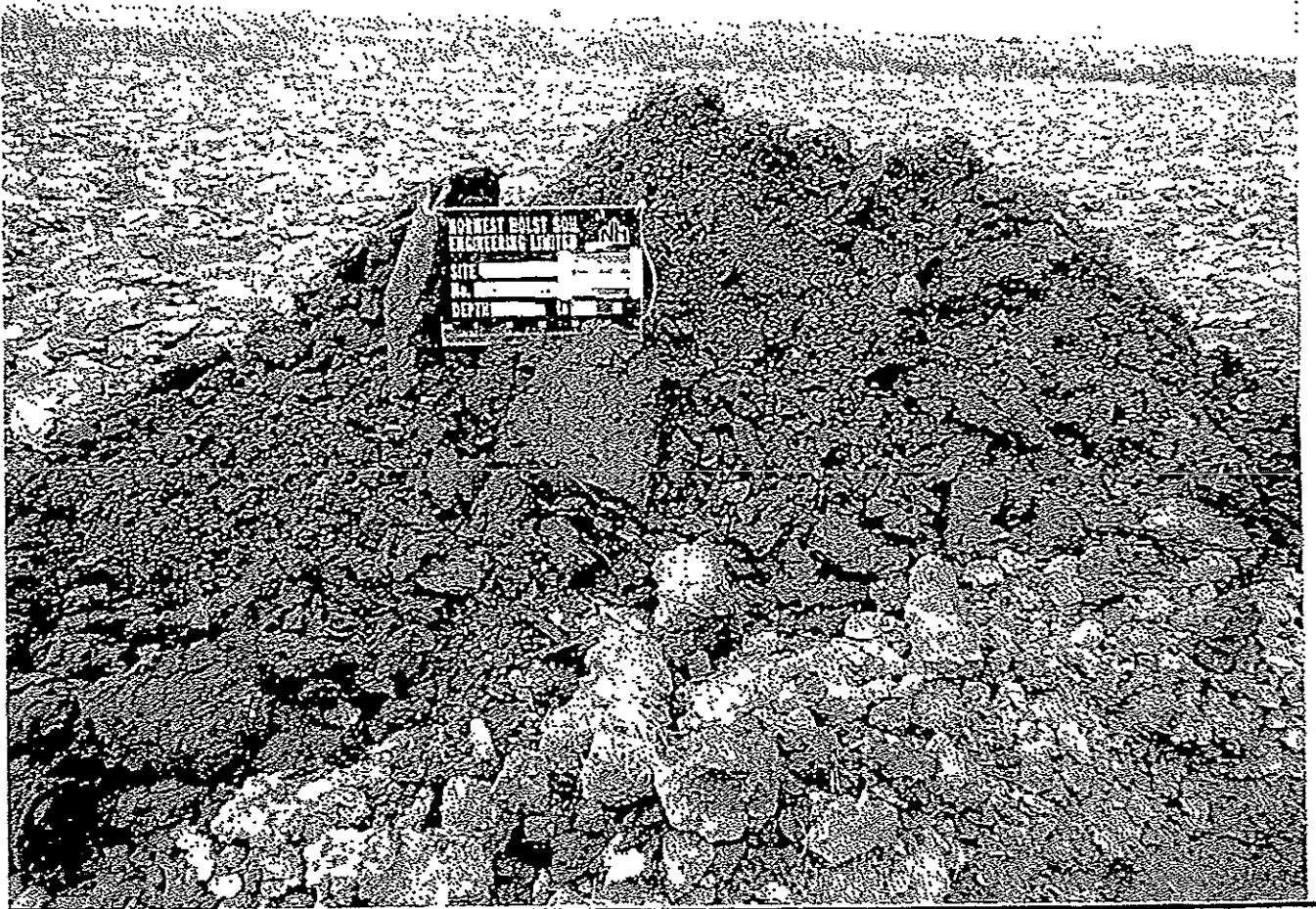
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP220



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH DETAILS:

TP221

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TP221



NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

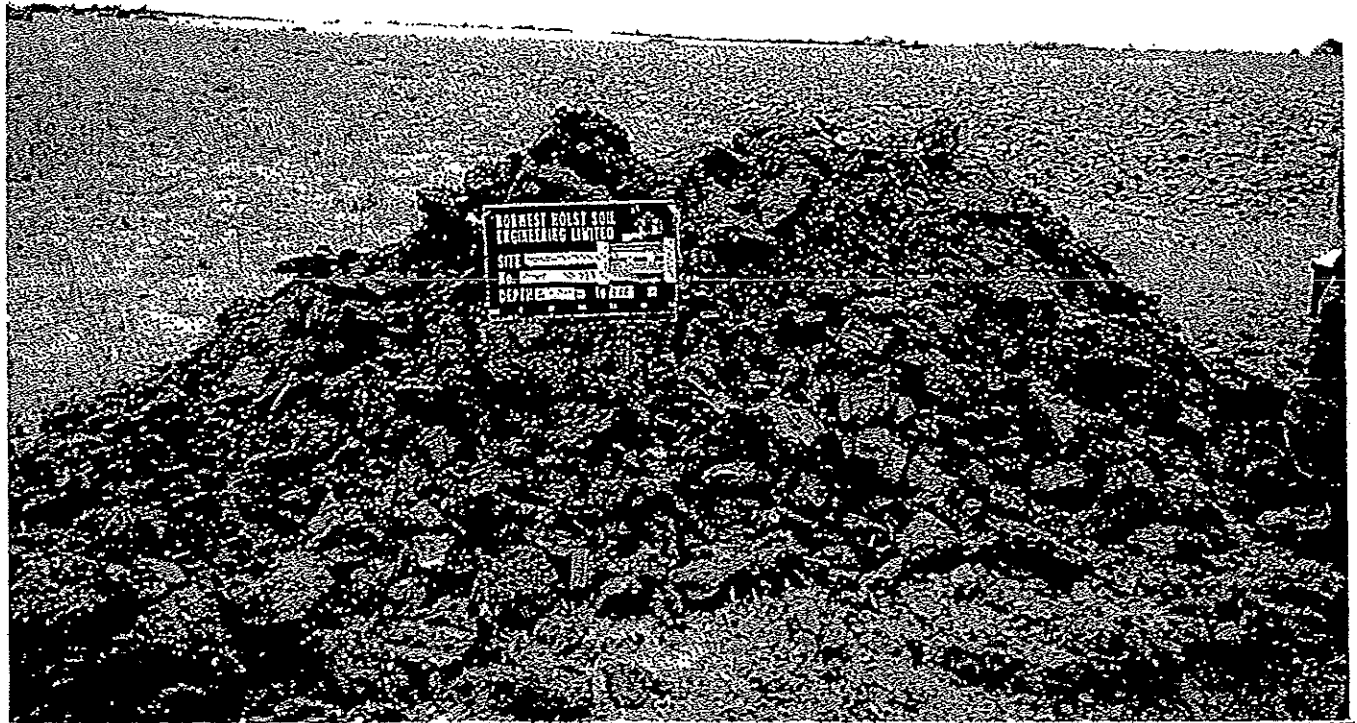
NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP222



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

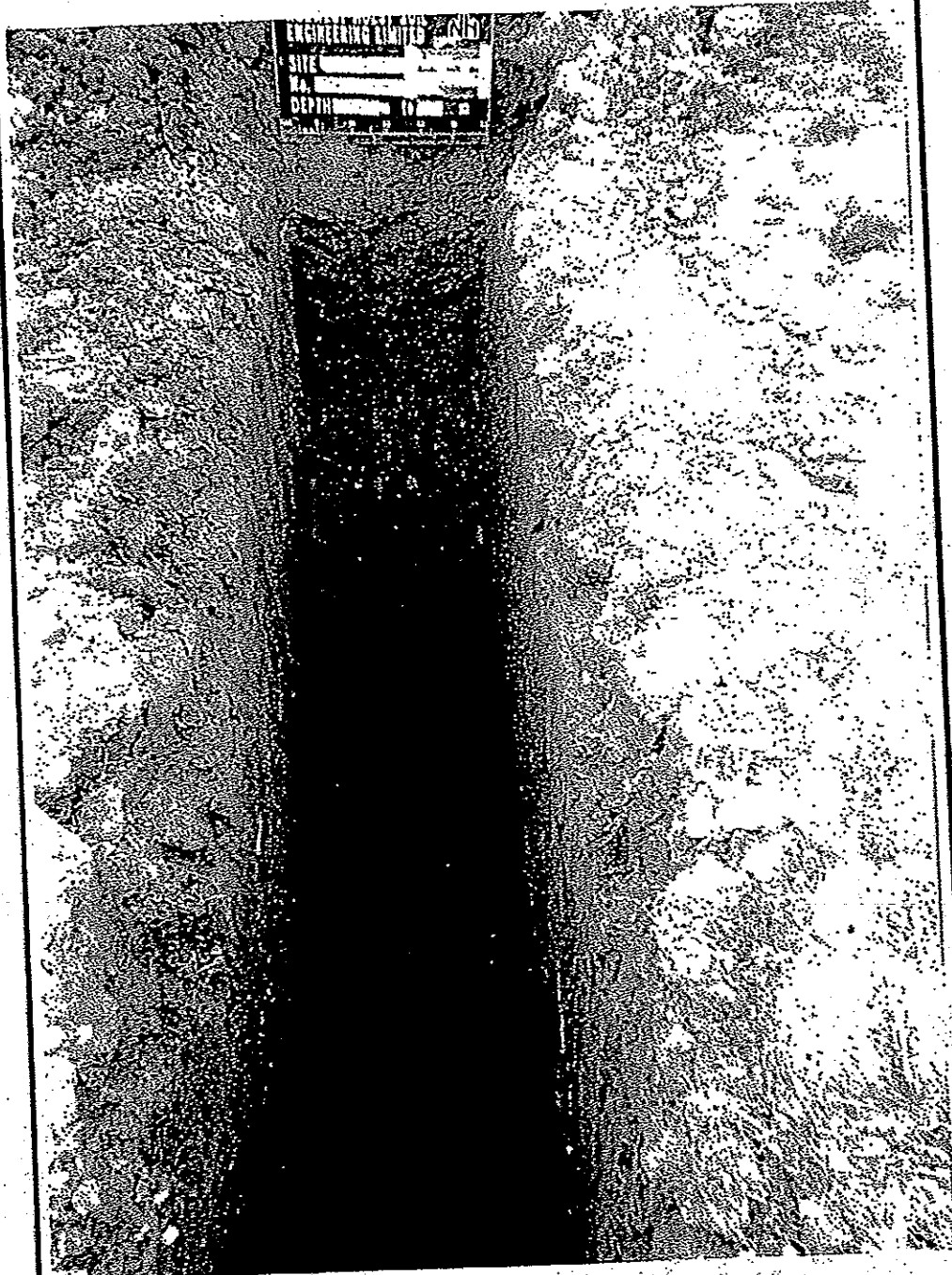
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NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE
CONTRACT No : F12963

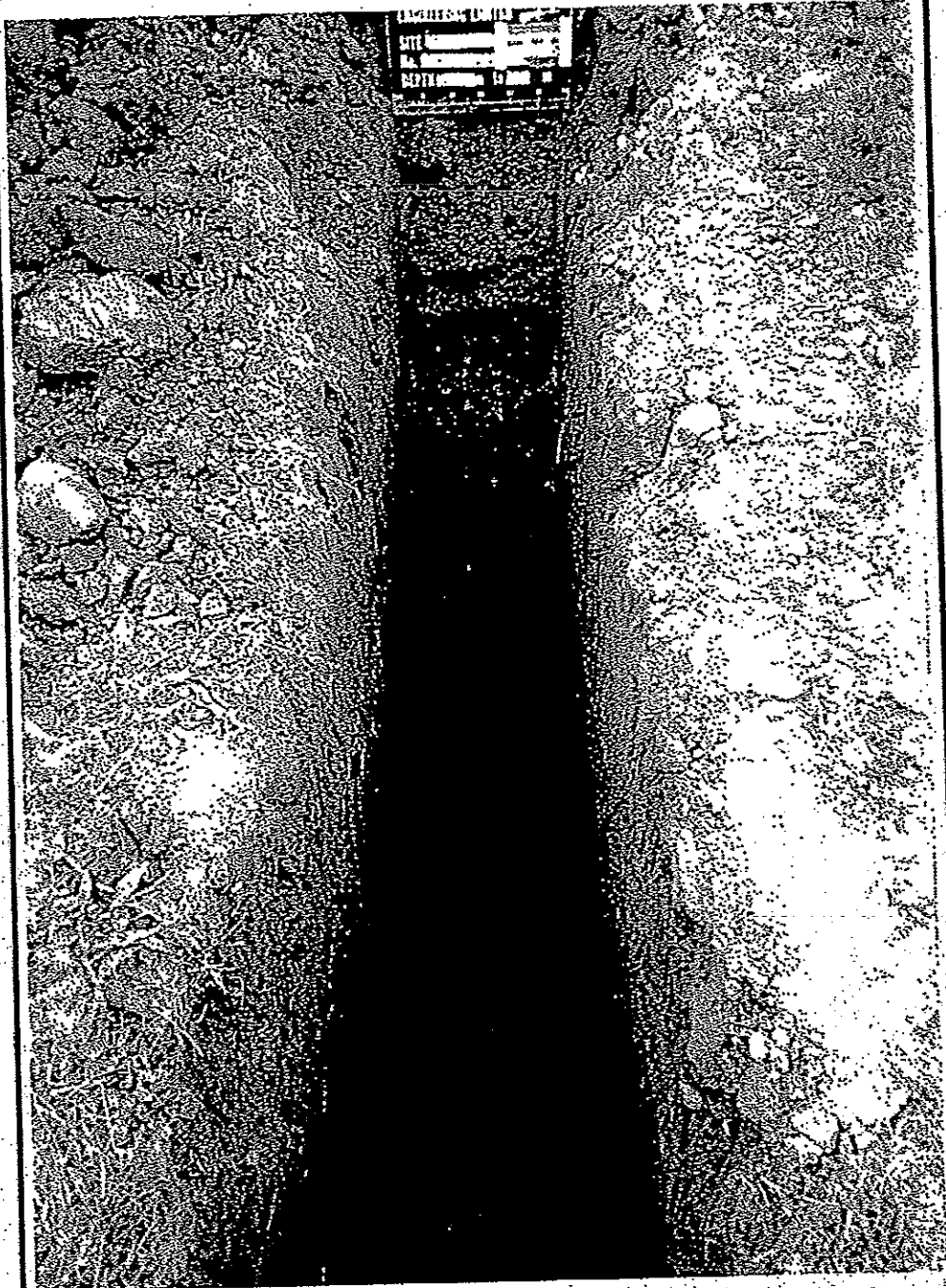
PHOTOGRAPH
DETAILS
TP223



NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TP224



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

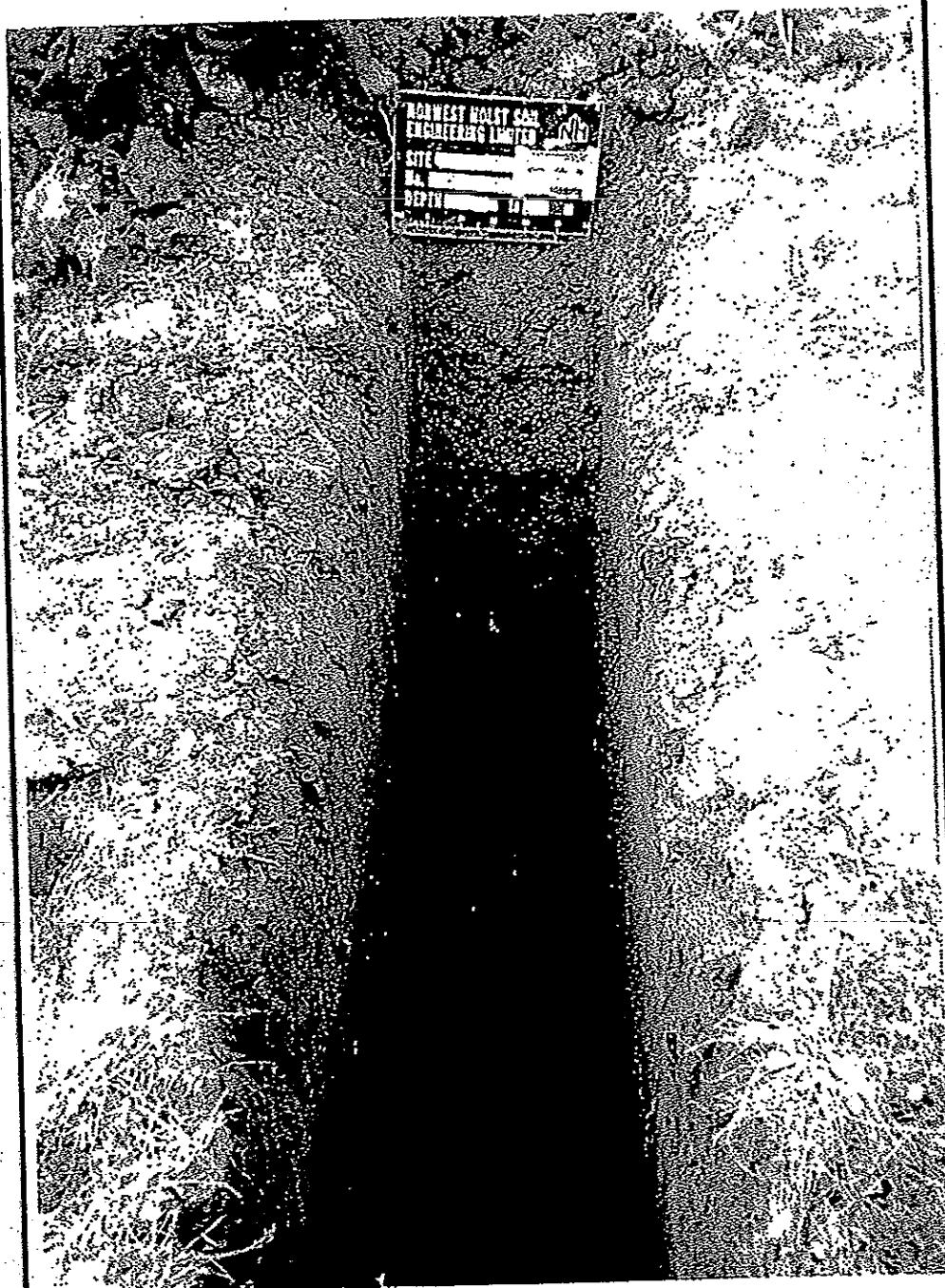
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NORWEST HOLST SOIL
ENGINEERING LTD

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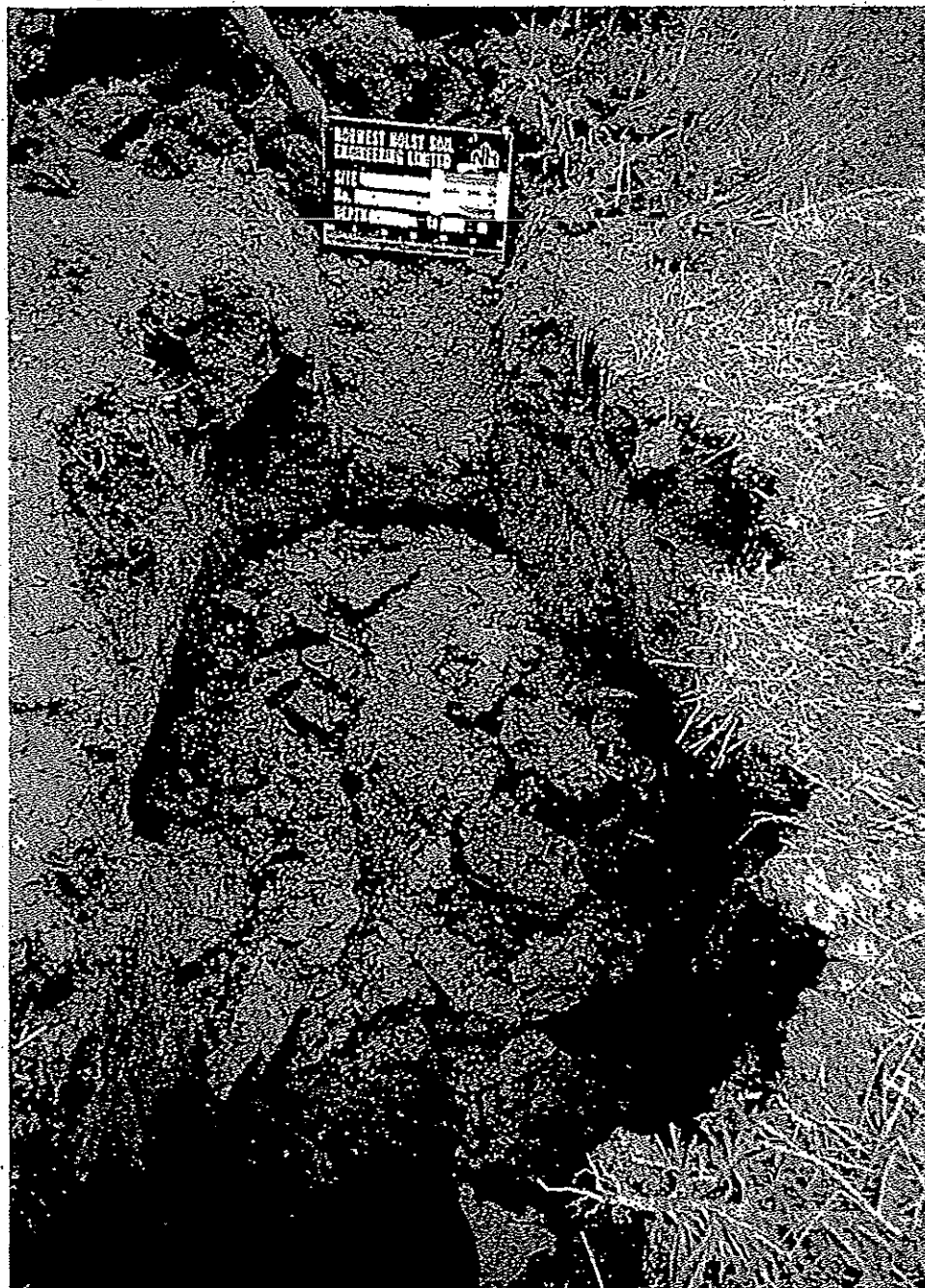
NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP225

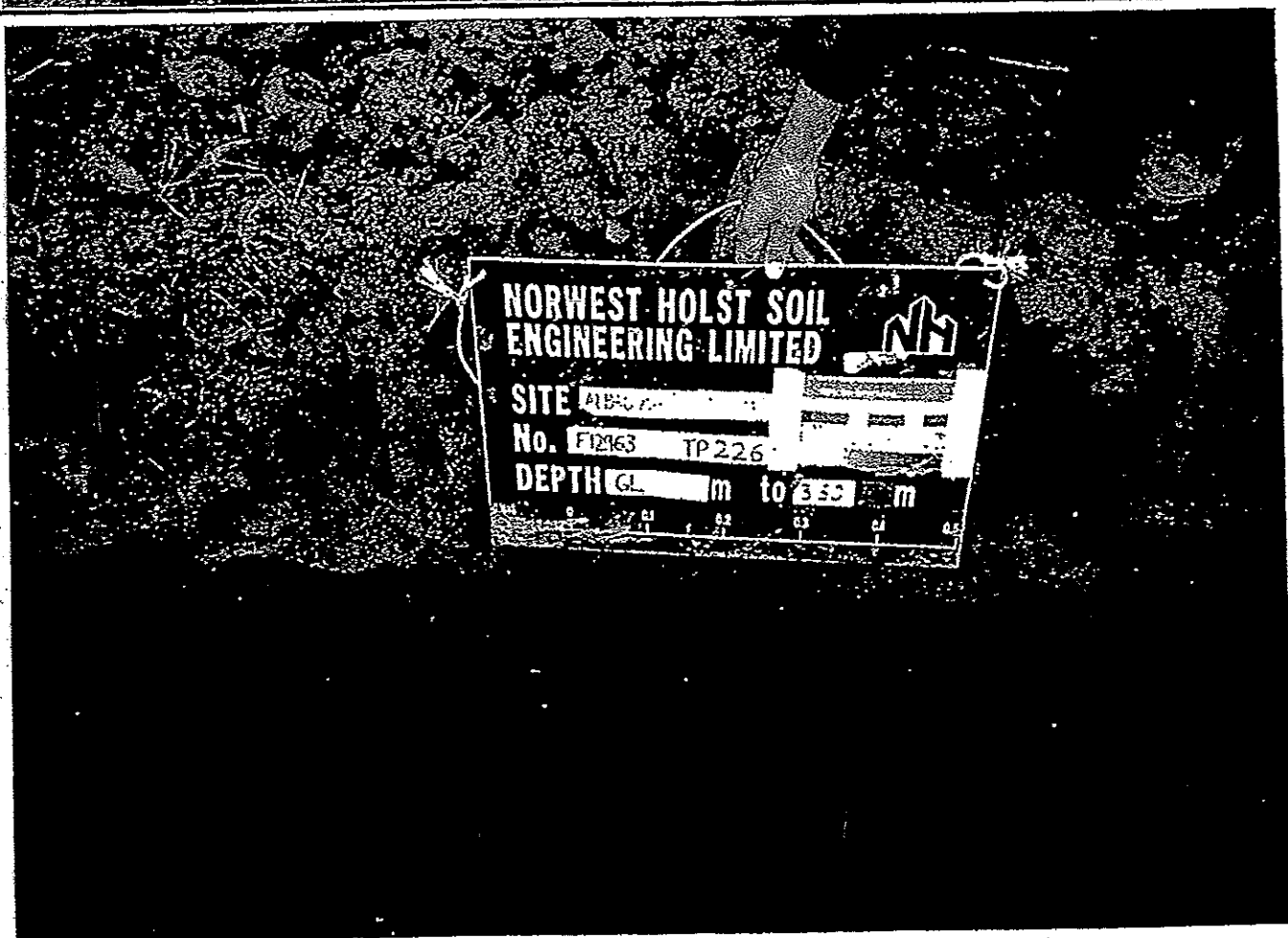


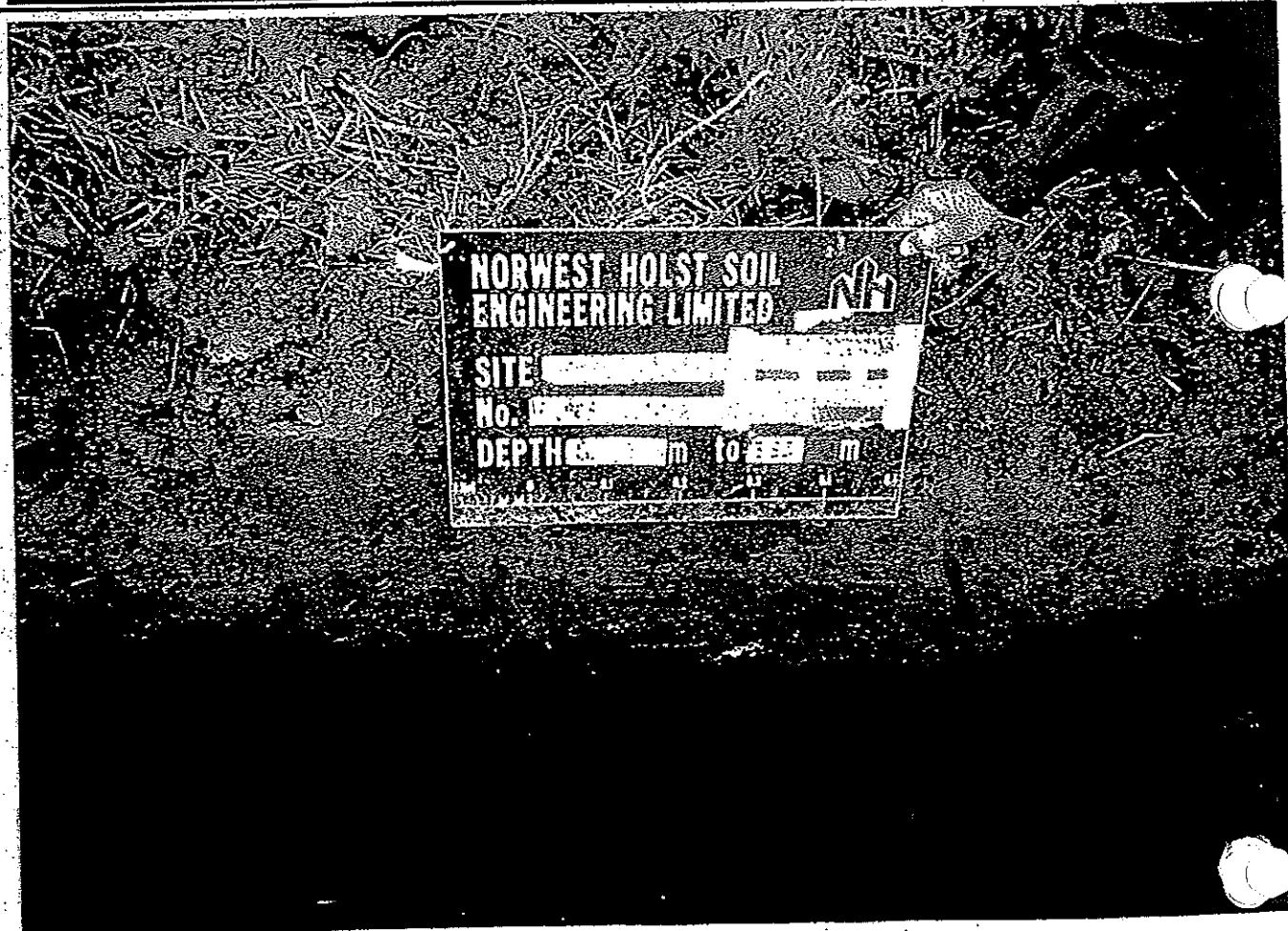
SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP232





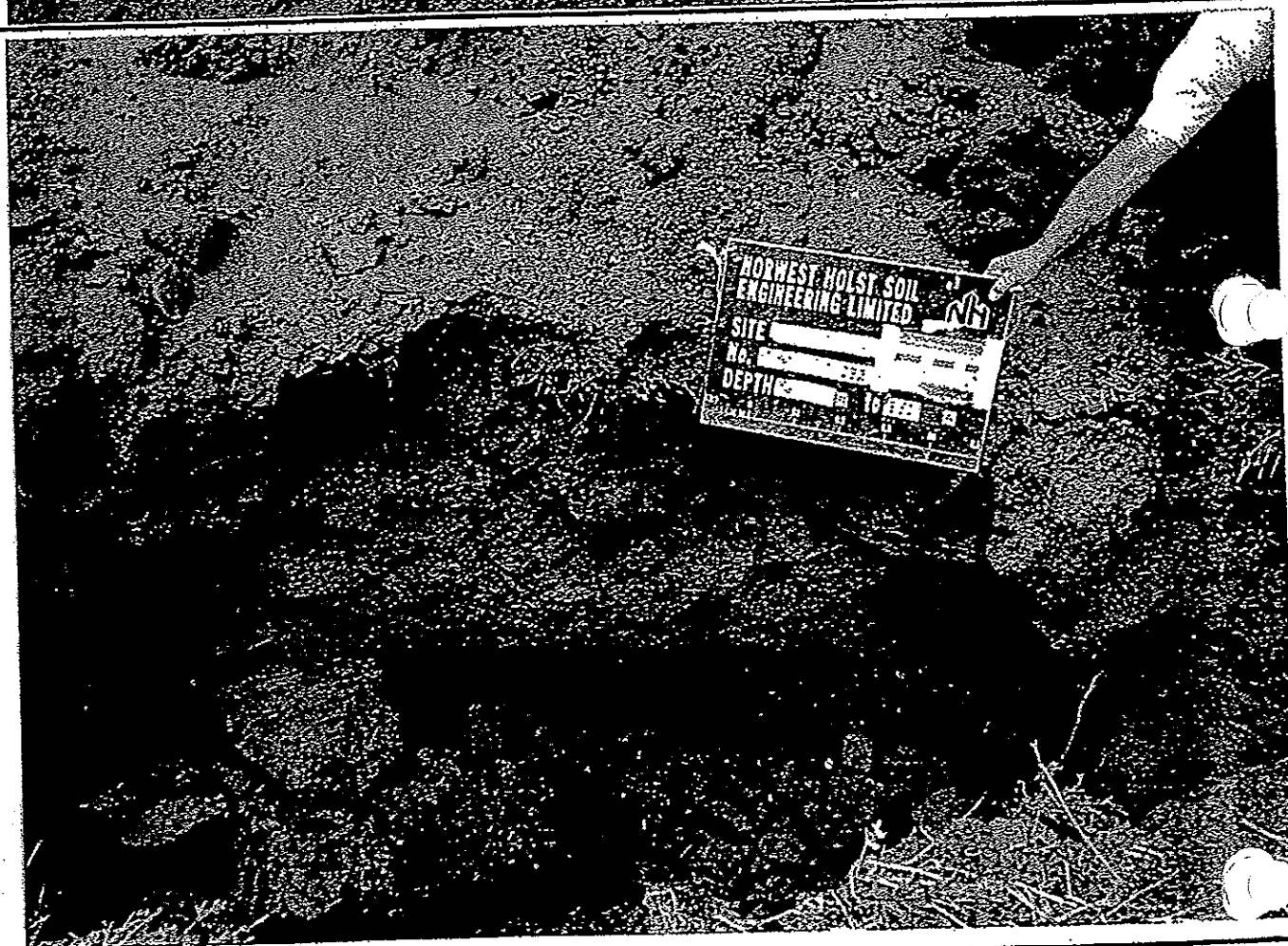




SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP227



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

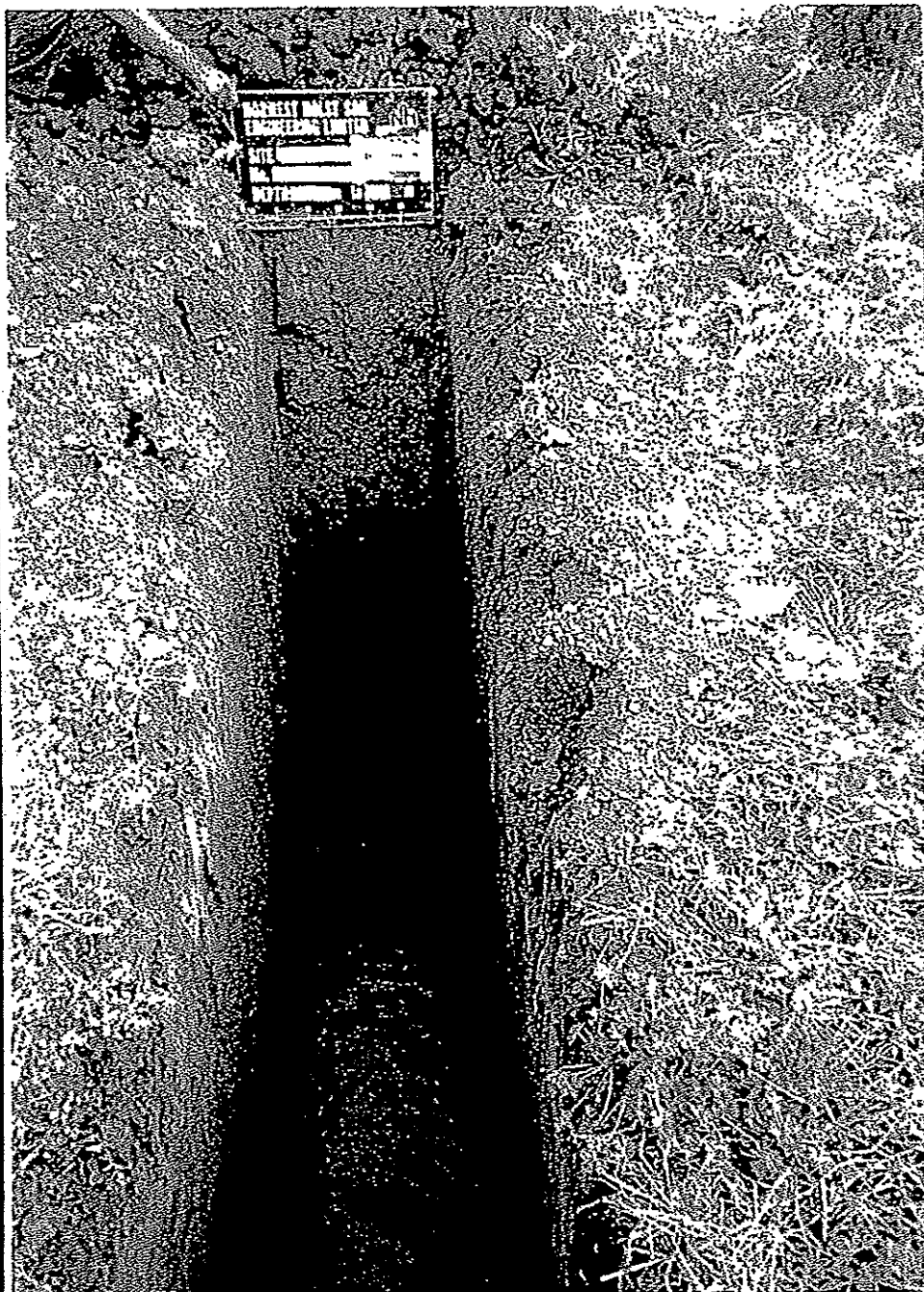
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TP232

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

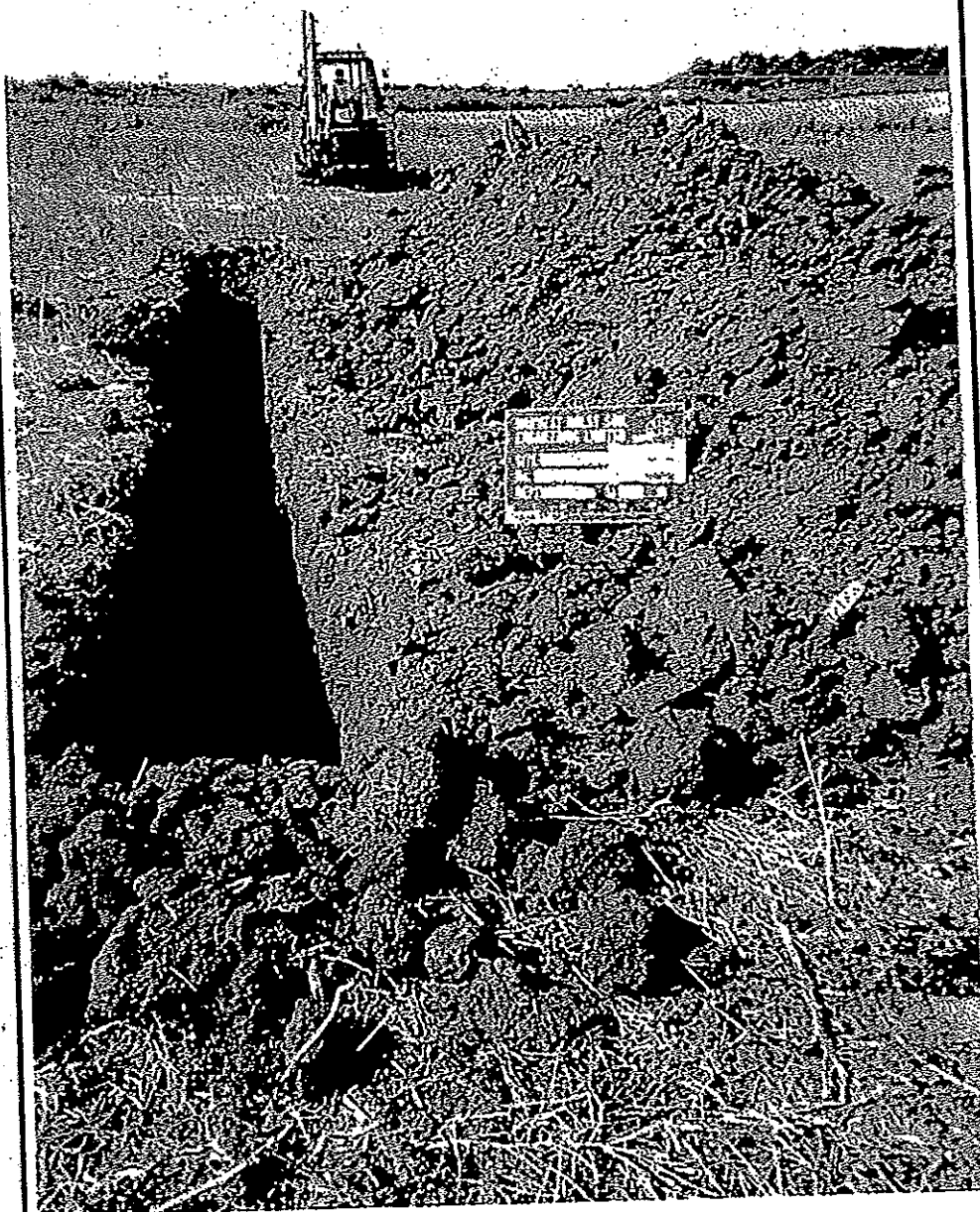
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PHOTOGRAPH
DETAILS
TP233

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

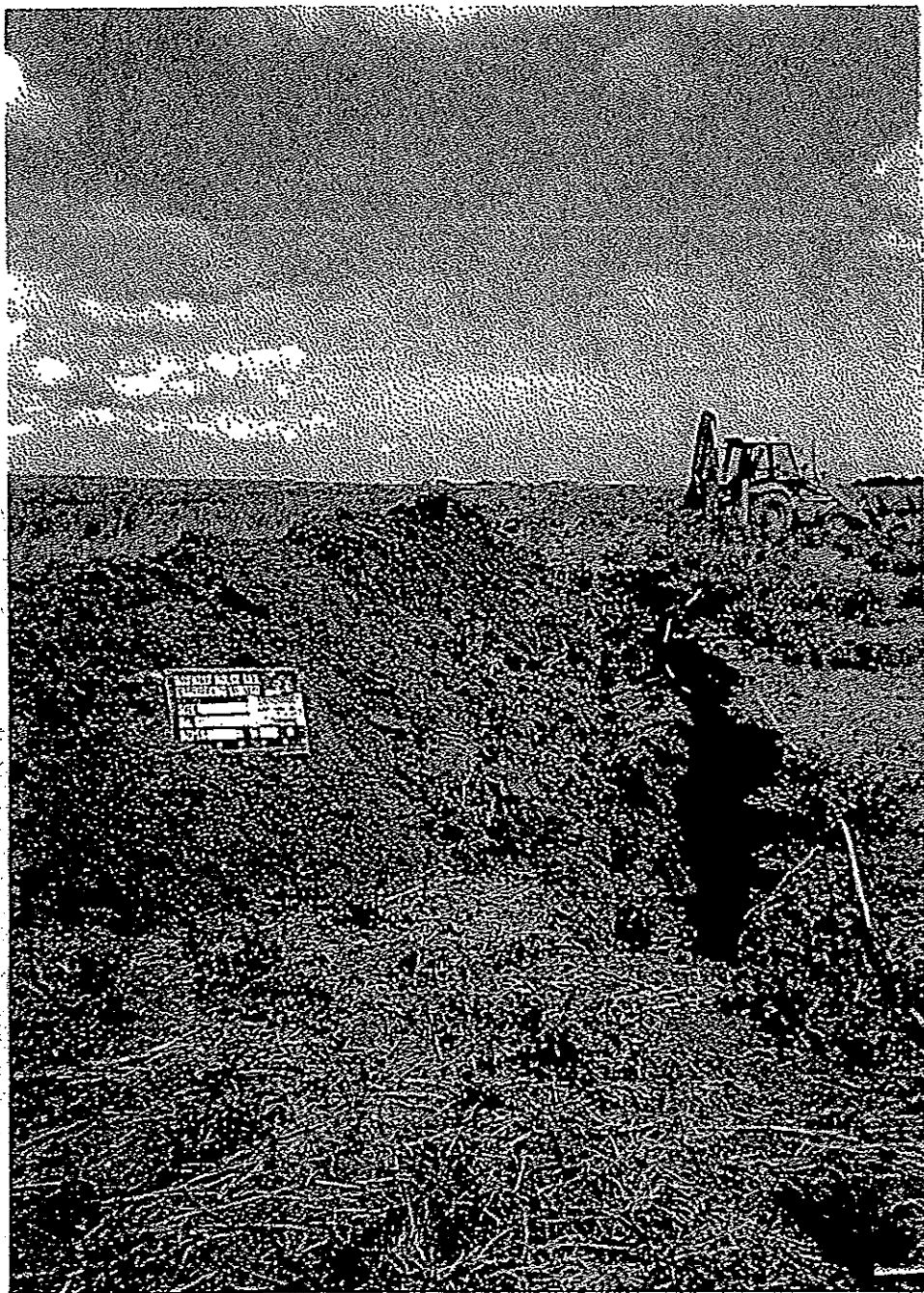
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CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TPE01



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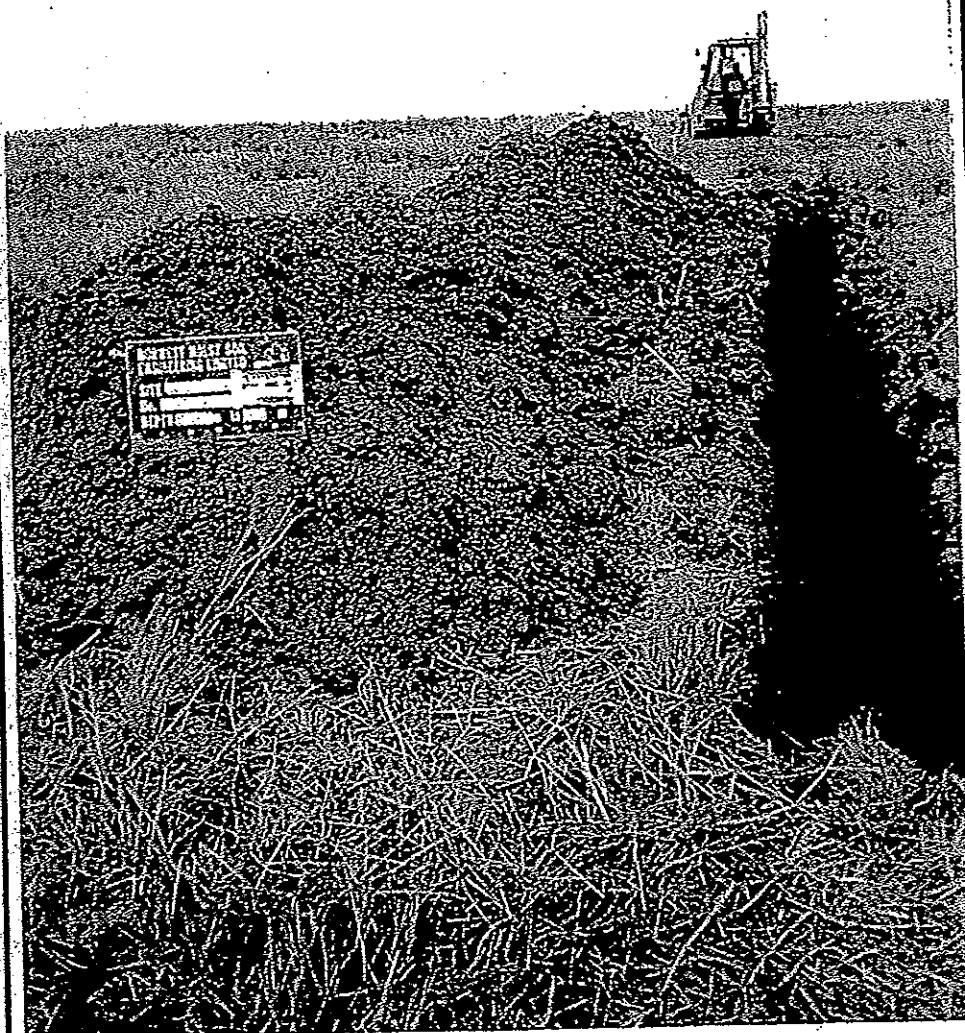
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PHOTOGRAPH
DETAILS
TPE02

NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TPE03



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

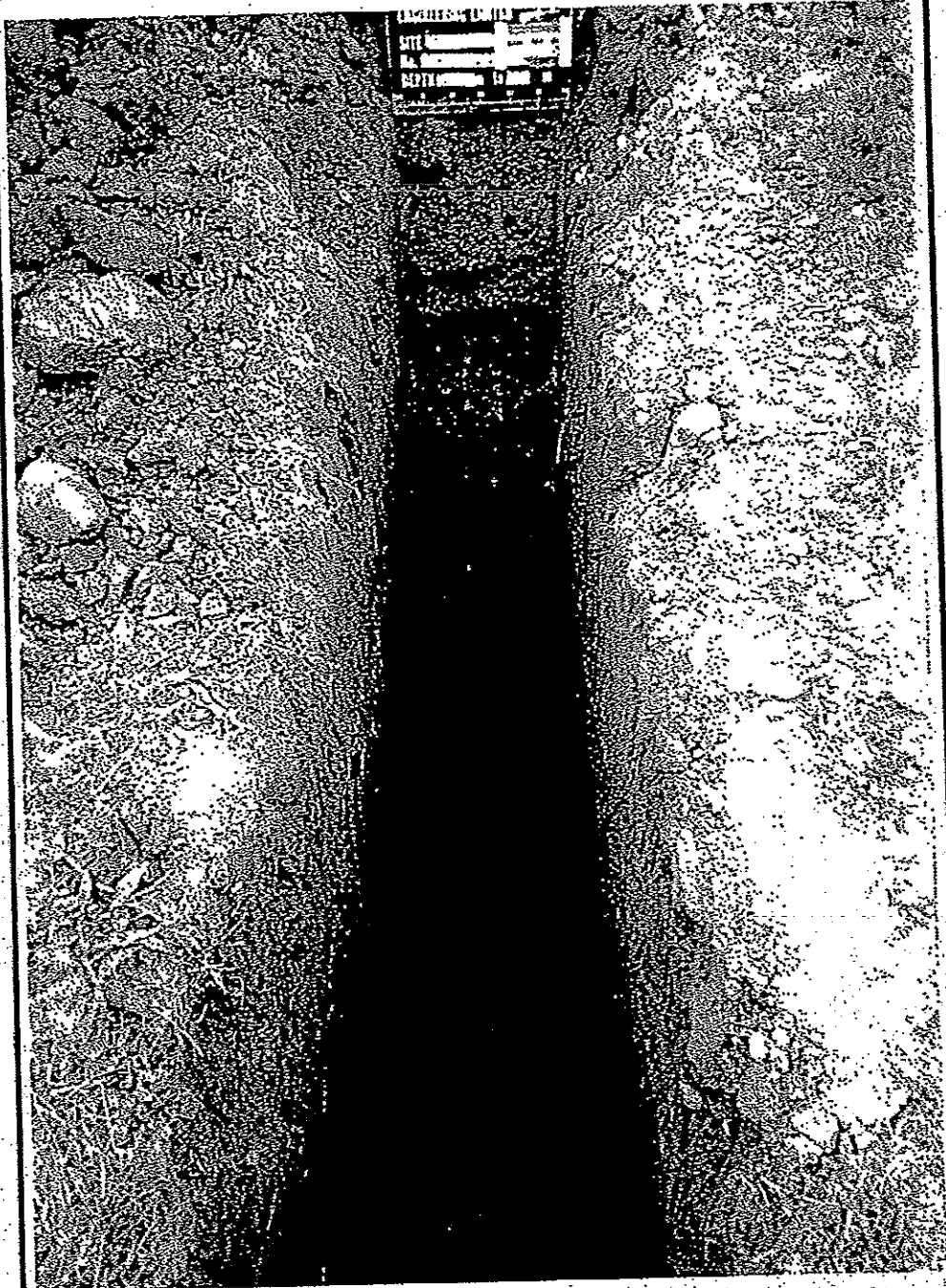
PHOTOGRAPH DETAILS

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NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

NORWEST
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TP224



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

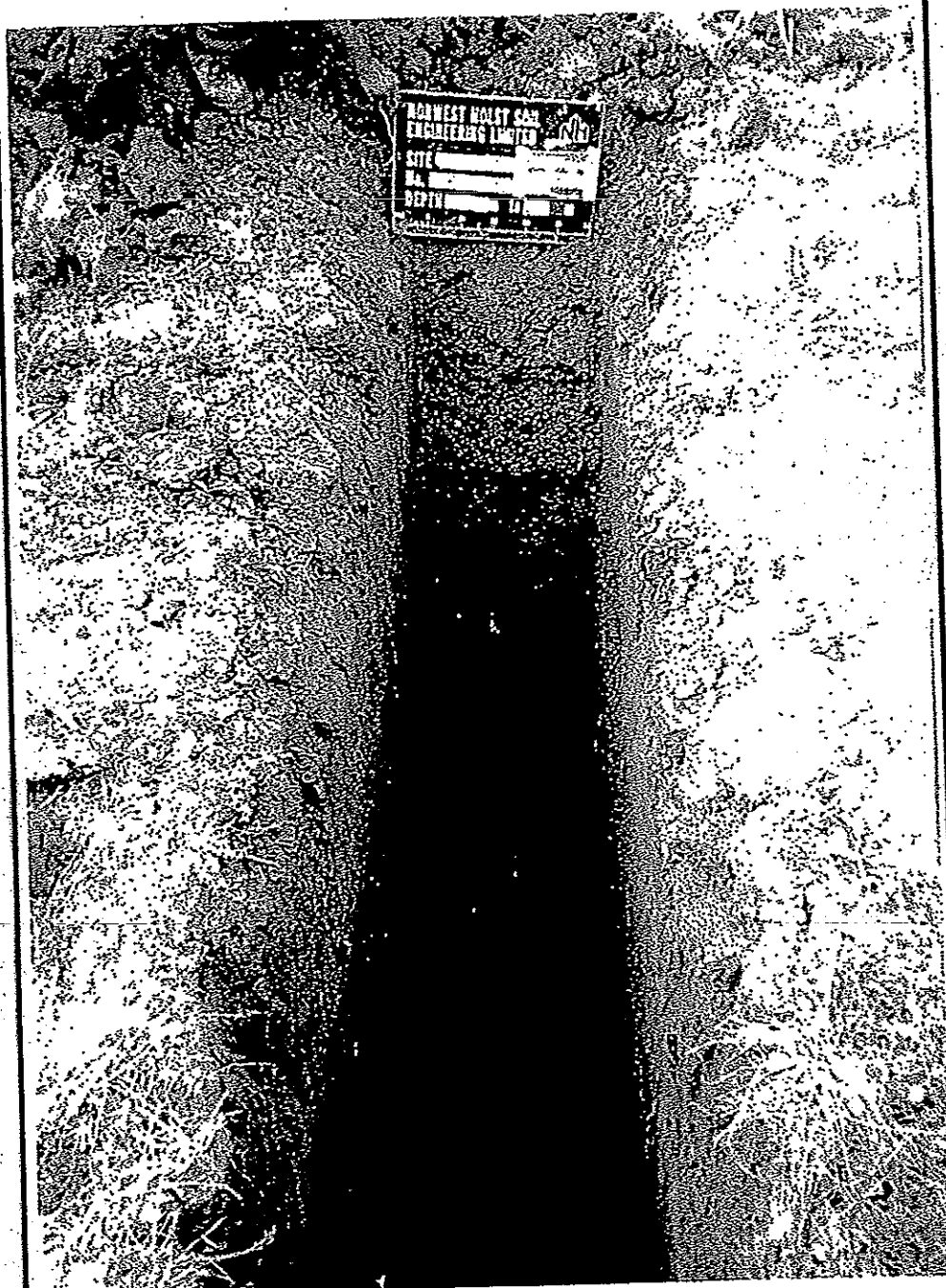
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NORWEST HOLST SOIL
ENGINEERING LTD

PHOTOGRAPHIC RECORD

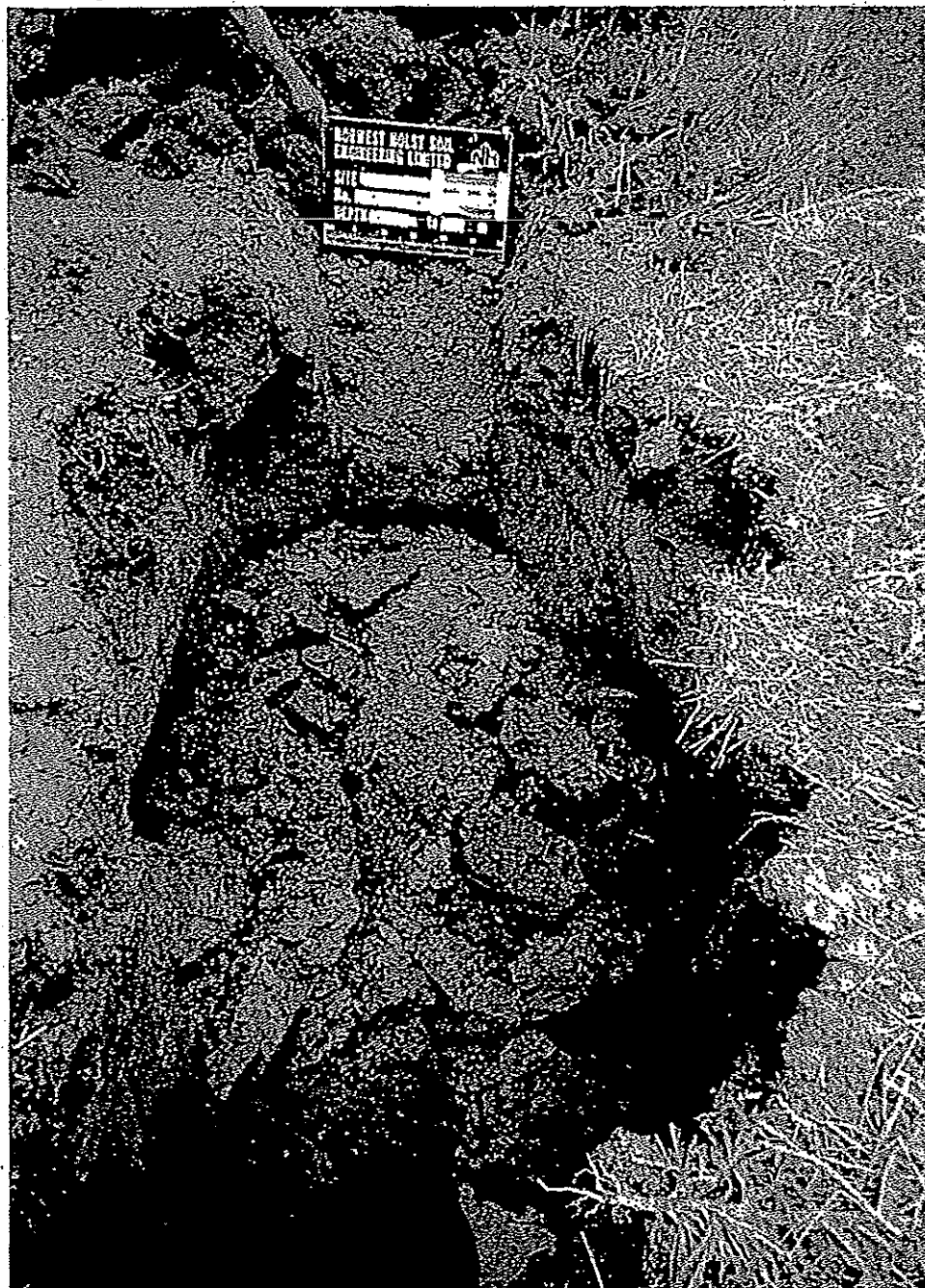
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SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPHY
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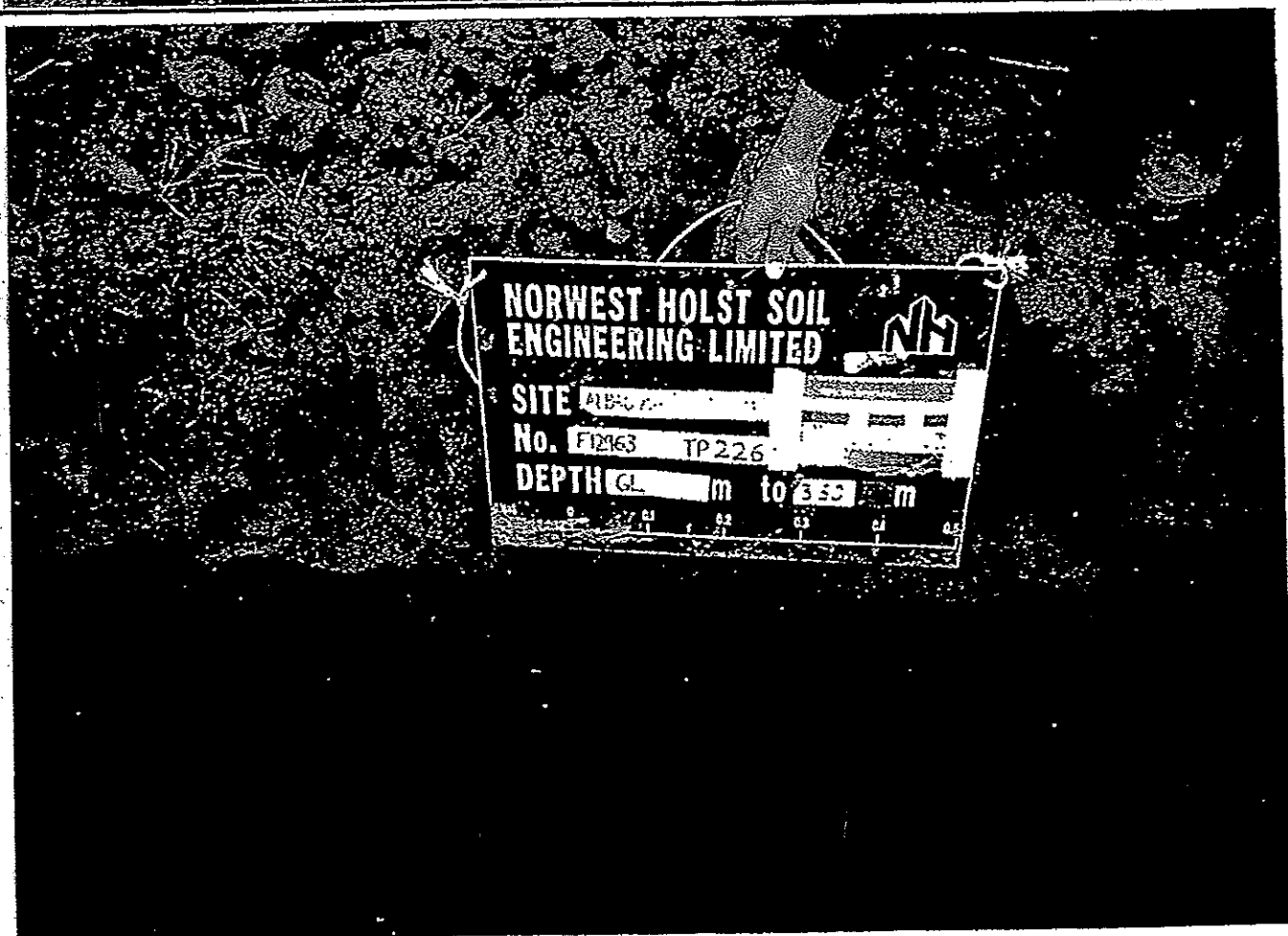


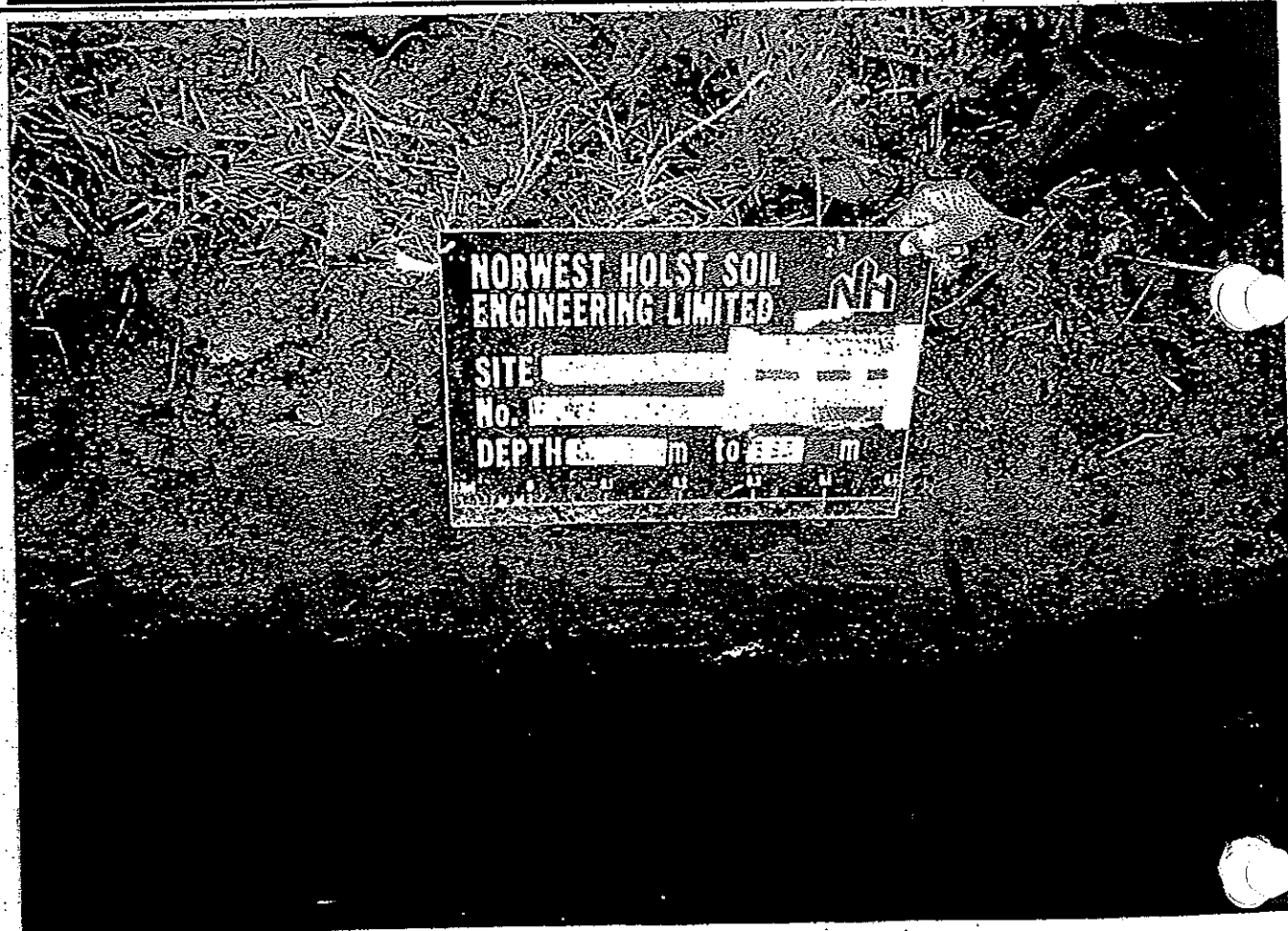
SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
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TP232









SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TP227



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

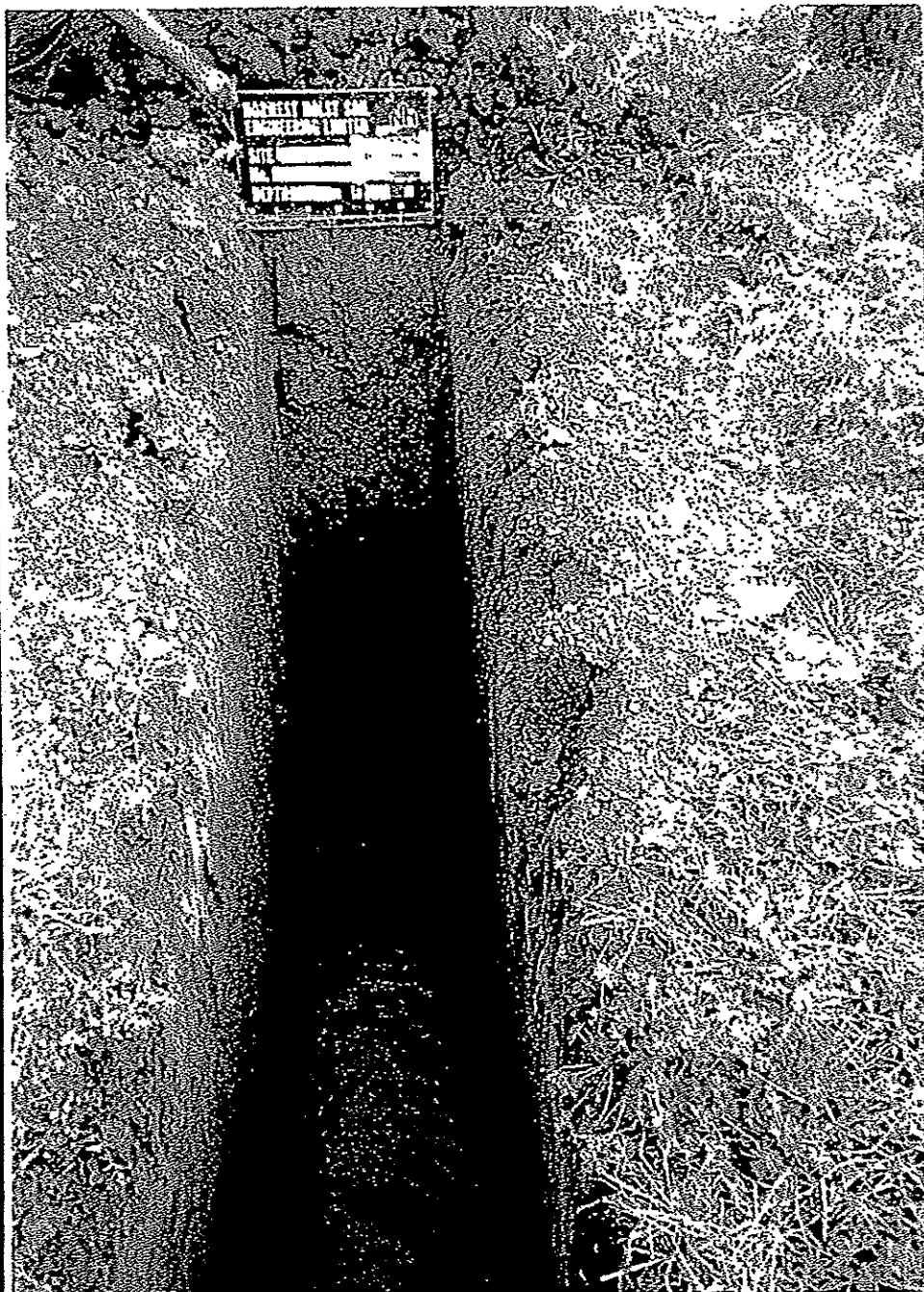
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NORWEST HOLST SOIL
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PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

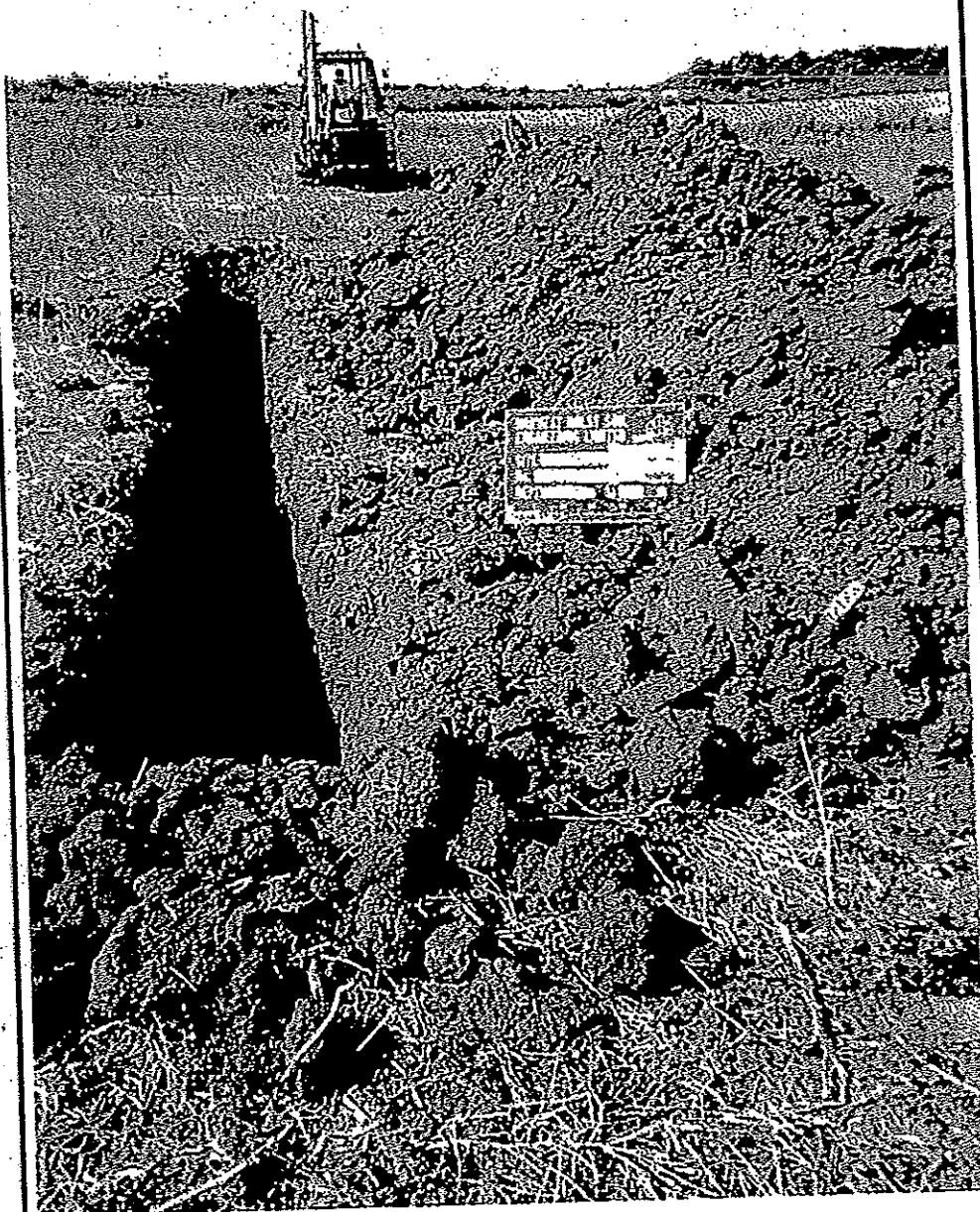
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PHOTOGRAPH
DETAILS
TP233

NORWEST HOLST SOIL
ENGINEERING LTD

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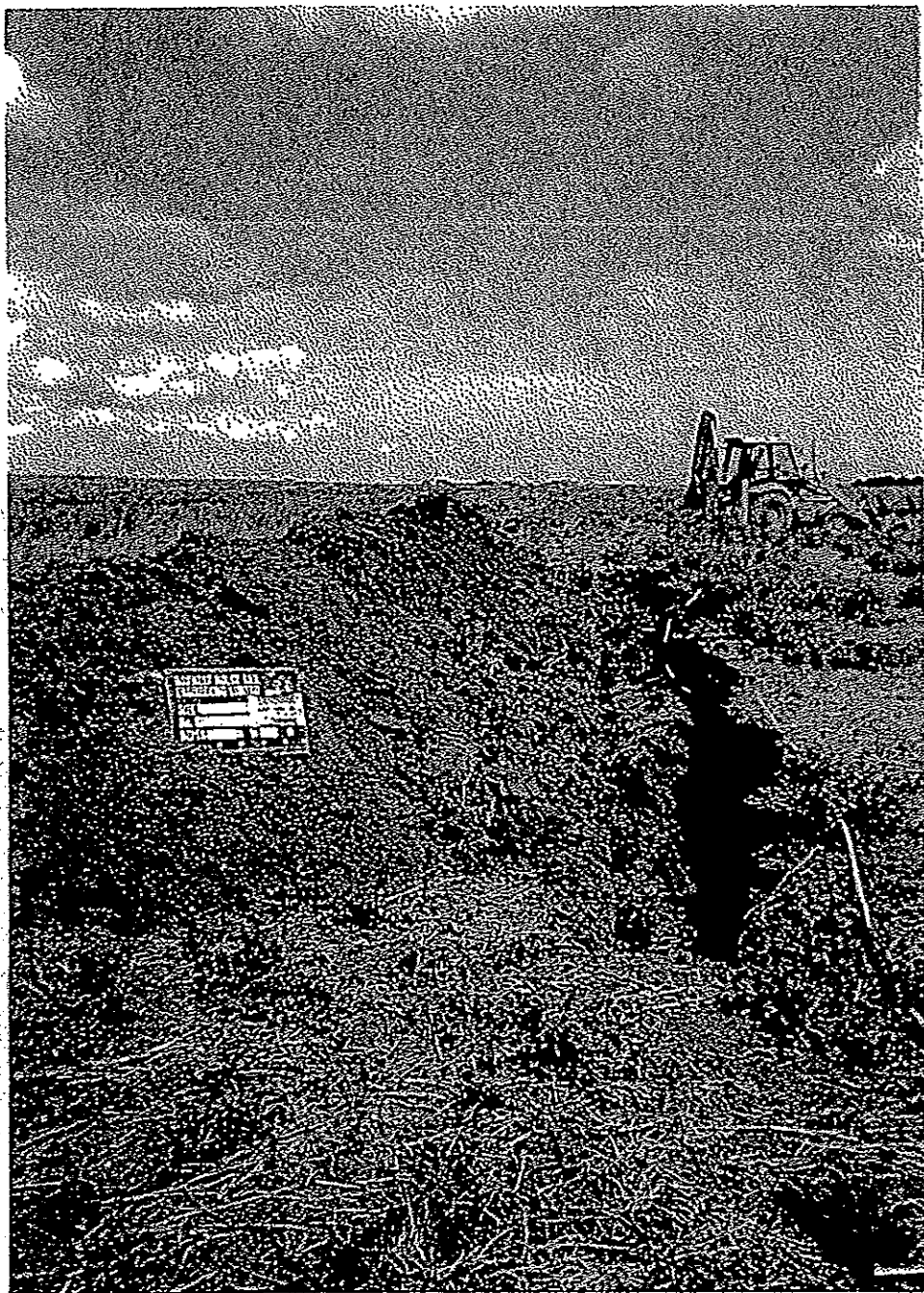
NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TPE01



SITE : ALDBROUGH GAS STORAGE

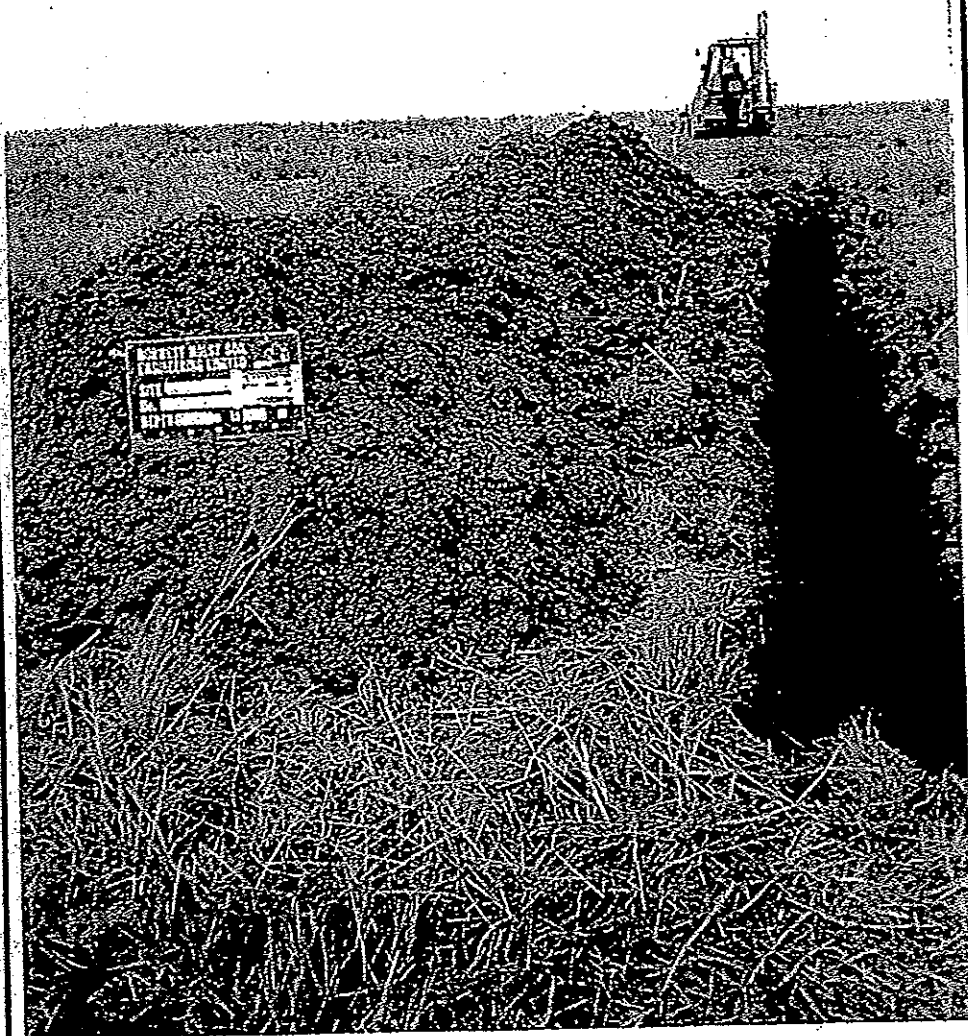
CONTRACT No :F12963

PHOTOGRAPH
DETAILS
TPE02

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PHOTOGRAPHIC RECORD

NORWEST
HOLST



SITE : ALDBROUGH GAS STORAGE

CONTRACT No : F12963

PHOTOGRAPH
DETAILS
TPE03