F.0 GEOLOGY

APPENDIX F.1

FACTUAL REPORT ON GROUND INVESTIGATION

DONEGAL COUNTY COUNCIL

MEENABOLL LANDFILL
PROJECT SITE INVESTIGATION

FACTUAL REPORT ON
GROUND INVESTIGATION

Reference No. E02755 - December 2003

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DONEGAL COUNTY COUNCIL

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DONEGAL COUNTY COUNCIL

MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

FACTUAL REPORT ON
GROUND INVESTIGATION

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MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

FACTUAL REPORT ON GROUND INVESTIGATION

1 INTRODUCTION

On the instructions and under the supervision of Kirk McClure Morton (the Engineer), acting on behalf of Donegal County Council (the Employer) a site investigation has been carried out by Foundation and Exploration Services Limited (FES) at Meenaboll Townlands, Co. Donegal on the site of a proposed landfill site.

The objective of the investigation was to determine the ground and groundwater conditions at the site and to provide information that would assist the Engineer in the geotechnical aspects of the design of the proposed works. The scope of the investigation was determined by the Engineer.

A factual report was requested including exploratory hole and field testing records, laboratory test results and site plan. The exploratory hole and laboratory test data have also been provided as digital data to AGS format. Photographs of the rock core and selected trial pits have been presented separately in Appendix D.

The site work, which comprised eight rotary open-hole boreholes and five rotary open hole and cored boreholes, to a maximum depth of 21.70 metres (Boreholes BH1 to BH13), twenty two trial pits, fifty mackintosh probes and a geophysical survey was carried out between the 27th January and 2nd March 2003. A second phase of geophysical testing was carried out in August 2003

Interpretative reports on both phases of the geophysical survey carried out by Minerex Environmental Limited are provided in Appendix F, the Phase 1 report outlines information relating to a similar adjacent site (Area B) on which intrusive works were not carried as part of these works.

2 THE SITE AND GEOLOGY

2.1 Site Location and Description

The site is located on open moorland adjacent to Meenaboll Hill in north central County Donegal.

The approximate National Grid reference of the site is 199 700 E and 409 100 N.

At the time of the investigation the site comprised open moorland formed through the recent felling of forestry. The site slopes gently from the south-east to the north-west from approximately 1260 metres to 220 metres above Mallin Head datum, and is generally uneven. The site is crossed by many small drainage channels. A central stream/channel runs south-east to south-west through the site. The area of investigation is approximately square (although tapered in the west corner) measuring approximately 500 metres across.

The site is bounded to the north-west by a track with areas of forest beyond. To the north-east and south-west are areas of recent felled forest, Meenaboll Hill lies to the south-east.

2.2 Geology

The site is known to be underlain by (blanket bog) peat deposits over Glacial Drift which in turn rests on pelites and psammites.

The Irish Geological Survey Report (Solid Geology) for North Donegal shows the south-eastern section of the site to be underlain by Pre-Cambrian age (Dalradian) pelites and

psammites of the Upper Falcarragh Formation. The north-eastern corner of the site is possibly underlain by the Seesiag-Clonmass Formation.

Further background research such as a desk study was not required within the terms of reference for the work.

3 PROPOSED DEVELOPMENT

It is proposed to construct a landfill site within a section of the area under investigation.

4 METHOD OF INVESTIGATION

4.1 General

Prior to drilling and excavation a Cable Avoidance Tool (CAT) survey was undertaken at each of the exploratory hole locations. Services were not encountered.

Details of the in-situ sampling and testing carried out, together with the descriptions of the strata encountered are given on the borehole and trial pit records. An explanation of the symbols and abbreviations used on all the exploratory hole records, together with the method of strata description utilised, is given in the General Notes on Exploratory Hole Records (KS/01 to 06). The investigation was generally carried out in accordance with BS 5930 : 1999[1]

All samples were transported to the laboratories and offices of FES in Consett for examination and testing as scheduled by the Engineer.

The work was supervised on a full time basis by an experienced Site Agent from Foundation and Exploration Services Limited. A Geotechnical Engineer returned to site to monitor groundwater levels and install inertia pumps and groundwater monitoring dataloggers.

4.2 Rotary Drilling

Five boreholes (BH1, BH2, BH3, BH6 and BH10) were sunk by rotary open hole techniques and continued by rotary coring techniques from rockhead to depths below ground level of between 9.70m (BH6) and 21.70m (BH1) using a Mercedes Unimog mounted Knebel 77 drilling rig. The coring was carried out using a double tube T6116 size core barrel, with semi-rigid coreliner, impregnated diamond bits and water flush. Upon completion of the coring the boreholes were reamed out to 200mm diameter to allow the installation of groundwater monitoring standpipes. Open hole drilling was carried out using a 200mm down the hole hammer system.

An additional eight boreholes (BH4, BH5, BH7, BH8, BH9, BH11, BH12 and BH13) were sunk by rotary open hole techniques only to depths below ground level of between 10.00m (BH7, BH9, BH11, BH12 and BH13) and 15.00m (BH4).

During the course of drilling attention was given to recording any evidence of water inflow in order that the groundwater level beneath the site could be established. Water levels at breaks in boring were recorded where appropriate.

[1] BS 5930 : 1999, Code of Practice for Site Investigation. British Standards Institution.

The cores were logged by an engineering geologist geotechnical engineer from FES and photographed on site. The Solid Core Recovery (SCR) and Rock Quality Designation (RQD) have been determined using the modified proposal, as given in Norbury et al[2], that a "solid cylinder" should be defined as having a full diameter (but not necessarily a full circumference) without discontinuities and should be measured axially along the core. In a number of instances the logging geologist assessed that some core from one run was recovered with the core from the next run. In these cases the TCR, SCR and RQD have been determined assuming that the core had been recovered from the core run in which it had first been drilled. The borehole records are given in Figures BH1 to BH13 and core photographs are given in Appendix D. Selected core samples were preserved in aluminium foil, cling film and wax and sent to the laboratory for testing.

4.3 Mackintosh Probeholes

Fifty mackintosh probeholes were sunk using a manually operated sliding hammer in order to assess the thickness of the peat deposits at the site. The records, including blows per 100mm penetration, are given in Figures FT2/1 to FT2/50 in Appendix B.

4.4 Trial Pits

Twenty two trial pits were excavated by machine using a track mounted 360 degree excavator to a maximum depth below ground level of 4.50m. The pits were logged by a geotechnical engineer from FES who took samples as shown on the trial pit records (Figures TP1 to TP22 in Appendix A). Notes on excavation stability and any groundwater encountered are also given on the records.

During the course of excavation attention was given to recording any evidence of water inflow in order that the groundwater level beneath the site could be established. The depth at which water seepage or ingress was encountered has been noted on the trial pit records.

4.5 Field Testing

Forty falling head permeability tests were carried out in a number of the boreholes during the course of drilling. The results are given in Figures FT3/1 to FT3/40 in Appendix B. The standing water levels used for calculating the results of the tests have been taken from either the water level during drilling, the water level at the end of the test or from readings of groundwater levels in the standpipes, they may therefore, not reflect the true standing water level of the groundwater in the test section or strata being tested. Caution should be exercised when using these test results to derive parameters for design purposes. Such tests in boreholes test only a small volume of soil or rock and may be subject to disturbance or smear along the side of the borehole. Falling head tests are also very prone to silting up. The permeability value of the soil mass as a whole may be significantly different from the values derived from these tests.

A single packer permeability test was undertaken in Borehole BH2, the result is given in Figure FT4/1.

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[2] Norbury, D.R., Child, G.H., and Spink, T.W., 'A critical review of Sections 8 (BS 5930 : 1981), Soil and rock descriptions, Geological Society Engineering Geology Special Publication No 2, Proceedings of 20th Regional Meeting of the Engineering Group, Guildford, 1986.

4.6 Instrumentation

On completion of drilling, a slotted 100mm standpipe was installed in each of the boreholes.

Details of the installations are given on the relevant borehole records.

Observations of the water level in the standpipes were made both during and after the fieldwork period. The results are given on Figures FT1/1 to FT1/13 in Appendix B.

A geotechnical engineer from FES returned to site and installed within each standpipe a dedicated inertia pump and a Solinst MT10 pressure/temperature datalogger to record total water pressures and temperatures within the standpipes. A barometric pressure gauge was also installed at the site in order that the pressure readings within the standpipes may be adjusted for variations in atmospheric pressure. Details of the dataloggers installed and the depth of installation are given in Appendix B.

4.7 Survey

The ground levels at, and grid co-ordinates of, the exploratory hole positions were determined using a GPS System and related Mallin Head Datum and Irish National Grid co-ordinates respectively. The ground levels have been quoted to the nearest 0.05 m on the exploratory hole records and to the nearest 0.01 m on the Water Level Readings sheets. Grid co-ordinates are quoted to the nearest 1.00m on the exploratory hole records.

The positions of the exploratory holes were set out by reference to the site grid produced for the geophysical survey works.

5 RESULTS OF EXPLORATORY HOLES

5.1 General

Borehole records (Figures BH1 to BH13) and trial pit records (Figures TP1 to TP22) giving details of the strata encountered are provided later in the report. A site plan showing the approximate positions of the exploratory holes is presented in Figure SP1 in Appendix E.

The strata descriptions given in the borehole records, unless otherwise noted, are compiled from an examination of the disturbed samples only, together with the results of any field and laboratory testing. Relative density descriptions are based on the results of the SPT and have not been amended to take into account any overburden effects. The consistency of cohesive strata is based on visual assessment only. Where there is a degree of uncertainty regarding the relative density or consistency of the soil, the terms "probably" or "possibly" have been used and the descriptions should be treated with caution.

Any interpolation or extrapolation of strata from exploratory holes is an estimate only of the likely stratification and is subject to the interpretation of the reader. The records should be read in conjunction with the General Notes on Exploratory Hole Records. ***Particular attention is drawn to the comments made on groundwater and interpretation which are given in these Notes.*** There may be ground conditions at the site which have not been revealed by the investigation.

5.2 Strata Encountered

Excluding the Made Ground used to construct access roads, the boreholes and trial pits encountered the following general succession of strata:

Recent PEAT (present across the site and proved to depth locally of approximately 5 metres, but locally removed at some borehole locations to provide access).

GLACIAL DRIFT (proved to vary in thickness from 0.5 metres to 5.8 metres).

DALRADIAN PSAMMITES/SCHISTS

Aside the Made Ground, this concurs with the succession anticipated from published geological records.

5.3 Groundwater

Groundwater was encountered during drilling in all the boreholes and selected trial pits. Details of the individual groundwater strikes can be found on the relevant exploratory hole records.

Readings of groundwater levels in the standpipe piezometers are given in Figures FT1/1 to FT1/13 in Appendix B.

6 GEOTECHNICAL LABORATORY TESTING

6.1 Introduction

The following laboratory tests were scheduled by the Engineer and carried out by /or for FES in accordance with BS1377:1990 "Methods of test for Soils for civil engineering purposes" where applicable. The results are given in tabular and/or graphical form as appropriate in a later section of the report. ***Attention is drawn to the comments on interpretation of the results of the investigation on Sheet 1 of the General Notes on Exploratory Hole Records.*** Notes and keysheets also precede the laboratory test results.

All tests with the exception of selected rock testing and the chemical analyses were carried out in the Consett laboratory of FES and the tests for which the laboratory have UKAS accreditation are detailed on the Schedules preceding the laboratory test results in Appendix C.

The chemical analyses were undertaken by City Analytical Services Limited, whose laboratory is accredited for the tests undertaken.

Selected rock core testing was carried out in the laboratory of Fugro (Scotland) Limited, whose laboratory is accredited for the tests undertaken.

6.2 Index Properties

Liquid and plastic limit and natural moisture content determinations were made on sixteen samples of the cohesive soils in order to classify the plasticity and shrinkability of the materials and the results are given on the Summary of Classification Tests (Figures LT1/1 to LT1/3 in Appendix C).

6.3 Particle Size Analyses

Particle size analyses were undertaken on a total of six samples by sieving and sedimentation in order to classify the materials in respect to their grain size. The results are given as particle size distribution curves (Figures LT2/1 to LT2/6 in Appendix C).

6.4 Compaction Related

The moisture content and dry density relationship was determined in the standard one litre mould for three samples using the 2.5 kg compactive effort as specified. The results are given in Figures LT3/1 to LT3/3 in Appendix C.

The California Bearing Ratio (CBR) value was determined for two samples recompacted using the 2.5 kg compactive effort. The tests were carried out unsoaked and without surcharge. The results are given in Figures LT3/4 and LT3/5 in Appendix C.

6.5 Rock Tests

The point load index using the methods outlined by the ISRM Commission on Testing Methods, 1985, was determined for ten samples of rock core. The results are given in Figure LT8/4 in Appendix C.

The Unconfined Compressive Strength (UCS) four samples of rock core was determined using the method outlined in ISRM Suggested Methods - Rock Characterization, Testing and Monitoring - Editor E.T Brown, 1981. The results are given in Figure LT8/3.

The moisture contents and porosities of four samples of rock core were determined and the results are given on the Summary of Rock Classification Tests in Figure LT8/1.

The Brazilian Test Strength of four samples of rock core were determined by Fugro (Scotland) Limited and the results are given in Appendix C. In addition Fugro (Scotland) Limited also determined cation exchange value and magnesium soundness of four samples of rock core.

The Slate Durability properties of four samples were determined and the results are given in Figure LT8/2.

6.6 Chemical Analyses

Chemical analyses have been made on fourteen samples of soil. Five specimens were tested for their organic content, nine samples for their cation exchange capacity, six for their carbonate content and four specimens for total acid soluble sulphate content and pH value.

These tests were undertaken by City Analytical Services and the results are presented as their test certificates reference FESB 74332 and FES/75604 at the end of Appendix C.

C D LATIMER
PROJECT ENGINEER

I P JUDGE
PRINCIPAL ENGINEER

APPENDIX A

EXPLORATORY HOLE RECORDS

Notes on Limitations	Figure A
General Notes and Key Sheets on Exploratory Hole Records	Figures KS/01 to KS/06
Borehole Records	Figures BH1 to BH13
Trial Pit Records	Figures TP1 to TP22

GENERAL NOTES

1 OPERATING PROCEDURES

The procedure used for cable percussion boring, rotary drilling, trial pitting, sampling, in-situ and laboratory testing and sample descriptions are generally in accordance with BS5930:1999 'Code of practice for Site investigations', and BS1377:1990 'Methods of test for Soils for civil engineering purposes', unless stated otherwise.

2 GROUNDWATER

Exploratory hole water levels are recorded together with the depths at which seepages or inflows of water are detected. These observations are noted on the Records, but may be misleading for the following reasons:

a) The exploratory hole is rarely left open at the relevant depth for a sufficient time for the water level to reach equilibrium.

b) A permeable stratum may have been sealed off by the borehole casing.

c) Water may have been added to the borehole to facilitate progress.

d) The permeability may have been altered by the excavation/boring/drilling process.

Standpipes or piezometers should be installed when an accurate record of groundwater level is required, however, it should be noted that groundwater levels may vary significantly due to seasonal, climatic or man-made effects. Water levels recorded during the investigation and any advice or comment made accordingly may, therefore, not be appropriate to particular foundation, geotechnical design, or temporary works solutions. Long term monitoring of standpipes or piezometers is always recommended when water levels are likely to have a significant effect on design.

3 CHISELLING

The remarks in the Borehole Records contain information on the time spent advancing the borehole by 'Chiselling Techniques', and the depth of borehole over which it was required. Such information may be affected by a wide range of variable factors, unrelated to the geotechnical properties of the strata. Such factors include, but are not restricted to: plant, equipment and operator. The data should, therefore, only be used subjectively and with extreme caution.

4 IDENTIFICATION AND DESCRIPTION OF SOILS - SEE ALSO SHEET 3

The identification system follows the Company's Manual of Standing Instructions for Logging procedures which is based on Tables 12 and 13, BS 5930: 1999.

Relative density terms are given where supported by SPT N-values, with the exception of made ground. The fiels assessment of compactness or relative density for coarse grained soils is only given on trial pit records where visual inspection of the soils has been undertaken. Where the terms 'soft to firm', 'firm to stiff' etc. are used they indicate a strength based on inspection (and not supported by laboratory and in-situ testing) which is close to the borderline between the two terms and cannot be precisely defined by inspection only. Visual assessments of consistency may have been amended in the light of field or laboratory test results.

Where 'to' links two terms, as in 'slightly sandy to sandy' this again represents a borderline case, where the precise proportion of constituents cannot be determined by inspection only.

The name of the geological formation is only given where this can be determined with confidence (see Section 41.5 of BS 5930: 1999).

5 INTERPRETATION OF THE RESULTS OF THE INVESTIGATION

The description of ground conditions encountered and any engineering interpretation included in the report are based on the results of the boreholes and trial pits and the field and laboratory testing carried out. There may be ground conditions at the site which have not been revealed by the investigation and consequently have not been taken into account.

Any interpolation or extrapolation of strata between exploratory holes shown on any cross-sections or site plans is an estimate only of the likely stratification based on general experience of the ground conditions and is subject to the interpretation of the reader.

The term "TOPSOIL" is used in this report to describe the surface, usually organic rich, layer including turf, subsoil and weathered material with roots. The use of this term may not imply that the soil satisfies the requirements of Clause 3 of BS 3882 (1994), "Recommendations and Classification of Topsoil", or is suitable for general horticultural and agricultural purposes.

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of a Geotechnical Specialist is sought.

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FOUNDATION & EXPLORATION SERVICES	NOTES ON EXPLORATORY HOLE RECORDS	Contract No E02755
		Figure No KS0/01

IN-SITU TESTING AND SAMPLING

STANDARD PENETRATION TESTS

S( ) Standard Penetration Test (SPT). A 50 mm diameter split barrel sampler is driven 450 mm into the soil using a 63.6 kg hammer with a 760 mm drop. The penetration resistance (also known as the 'N' value) is expressed as the number of blows required to obtain 300 mm penetration below an initial seating drive of 150 mm which is taken through any ground which may be disturbed at the base of the borehole. The test is usually completed when the number of blows recorded during the test drive only reaches 50 in soils or 100 in weak rock. If a sample is not recovered in the sampler, a disturbed sample is taken on completion of the test and given the same depth as the top of the Standard Penetration Test drive.

C( ) Standard Penetration Test carried out with a 60E cone. The test is usually conducted in coarse granular soils or weak rock using the same procedure as for the SPT, but with a 50 mm diameter, 60E apex, solid cone fitted to the split barrel. A bulk disturbed sample is taken and given the same depth as the top of the test drive.

The depth on the borehole record at the left hand side of the 'depth' column is that at the start of the normal 450 mm penetration. Where the full penetration of 300 mm for the test drive is obtained, the penetration resistance ('N' value) is reported in the 'SPT Blows/N' column. If the full penetration of 300 mm in the test drive is not obtained, then the length of drive (test length in mm) and the penetration resistance (number of blows) are both reported. Blows through the initial seating drive (normally 150 mm) are not reported.

* in the 'Test Length' column denotes that the blows and penetration were all in the initial Seating Drive section.

OTHER IN-SITU TESTS

The following in-situ tests are reported on the **Borehole Records**, in the 'Test Length' and 'SPT Blows' columns where appropriate.

k In-Situ Permeability Test - refer to detailed test results for permeability values.

PMT Pressuremeter Test - refer to detailed test results for modulus values, etc.

VN/R( ) Borehole Shear Vane Test (Undrained Shear strength - c_u - in kPa) - refer also to detailed test results, N - 'Natural' or peak shear strength, R - Remoulded shear strength

The following in-situ tests are reported on **Trial Pit** and/or **Window Sample Records** in the 'Type' and 'Result' columns, where appropriate.

VN/R( ) Hand Shear Vane Test (Direct reading of Undrained Shear strength in kPa), N - Natural or Peak, R - Remoulded

PP( ) Pocket Penetrometer (Penetration resistance reported in kg/cm^2 or as equivalent c_u in kPa)

MX ( ) Mexecone Reading given as equivalent CBR% value to the nearest 0.5% at 75 mm intervals

CBR( ) California Bearing Ratio Test (CBR%) - refer also to detailed test results

PID( ) Photo-Ionisation Detector Readings in headspace of small disturbed chemical samples. Result given in ppm by volume.

SOIL SAMPLES

U General purpose open tube sample. Sample normally taken with open tube sampler approximately 0.1 m diameter and 0.45 m long and driven with 80 kg sinker bar and 56 kg sliding hammer, unless noted otherwise. "XX" in U100 blows column denotes the number of hammer blows. The height of hammer drop can be variable depending on operator technique. Depths are given to the top of the sample if full penetration and recovery are achieved, otherwise actual lengths of penetration and recovery are given in the appropriate columns.

U(X) General purpose open tube sample (X) mm diameter

TW(X) Thin wall (push) sample (X) mm diameter

P(X) Piston sample (X) mm diameter

CBR Sample taken in CBR Mould

D Small disturbed sample (jar with air tight lid)

B Bulk disturbed sample (polythene bag, tied at neck - size dependent on purpose)

W Water sample

Sample not recovered

CD Sample for chemical analysis in a plastic tub

K Sample for chemical analysis in an amber glass jar

VL Sample for chemical analysis in a glass vial

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FOUNDATION & EXPLORATORY SERVICES	NOTES ON EXPLORATORY HOLE RECORDS	Contract No E02755
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KEY TO BOREHOLE AND TRIAL PIT RECORDS

Identification and Description of Soils

	Basic Soil Type	Particle Size (mm)	Visual Identification	Particle Nature and Plasticity
VERY COARSE SOILS	BOULDERS	200	Only seen complete in pits or exposures.	Particle shape Angular Subangular Subrounded Rounded Flat Elongate Texture Rough Smooth Polished
	COBBLES	60	Often difficult to recover from boreholes.	
COARSE SOILS (Typically over 65% Sand and Gravel Sizes)	GRAVEL	coarse 20 medium fine 6	Easily visible to naked eye; particle shape can be described, grading can be described. Well graded: wide range of grain sizes, well distributed. Poorly graded: not well graded. (May be uniform: size of most particles lies between narrow limits; or gap graded; an intermediate size of particle is markedly under represented).	
	SAND	2 coarse 0.6 medium 0.2 fine	Visible to naked eye; no cohesion when dry; grading can be described. Well graded: wide range of grain sizes, well distributed. Poorly graded: not well graded. (May be uniform: size of most particles lies between narrow limits; or gap graded; an intermediate size of particle is markedly under represented).	
FINE SOILS (Typically over 35% Silt and Clay)	SILT	0.06 coarse 0.02 medium 0.006 fine	Only coarse silt visible with hand lens; exhibits little plasticity and marked dilatancy; slightly granular or silky to the touch. Disintegrates in water; lumps dry quickly; possesses cohesion but can be powdered easily between fingers.	
	CLAY/SILT	0.002	Intermediate behaviour between clay and silt. Slightly dilatant	
	CLAY		Dry lumps can be broken but not powdered between the fingers; they also disintegrate under water but more slowly than silt; smooth to the touch; exhibits plasticity but no dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying usually showing cracks. Intermediate and high plasticity clays show these properties to a moderate and high degree, respectively.	
ORGANIC SOILS	ORGANIC CLAY, SILT or SAND	Varies	Contains varying amounts of organic vegetable matter - defined by colour: grey - slightly organic; dark grey - organic; black - very organic.	EXAMPLES OF COMPOSITE TYPES (indicating preferred order for description)
	PEAT	Varies	Predominantly plant remains usually dark brown or black in colour, often with distinctive smell; low bulk density. Can contain disseminated or discrete mineral soils.	Loose brown very sandy subangular coarse GRAVEL with many pockets (<5 mm across) of soft grey clay. Firm brown thinly interlaminated SILT and CLAY. Dense light brown clayey fine and medium SAND.

Composite Soil Types (Mixtures of basic soil types)

Scale of secondary constituents with coarse and very coarse soils. Term either before or after constituent.

Term before	Principal	Term after	Approx % Secondary
Slightly (sandy*)	SAND, GRAVEL, COBBLES or BOULDERS	Used to describe components of secondary constituents. e.g. Gravel is medium subangular fine sandstone and mudstone.	<5
--(sandy*)			5 to 20†
Very (sandy*)			20† to 40†
--		and (sand*) or and (cobbles+)	50†

* Fine or coarse soil type as appropriate
\+ Very coarse soil type as appropriate
† or described as fine soil depending on mass behaviour

Scale of secondary constituents with fine soils. Terms either before or after principal constituent.

Term before	Principal	Term after	Approx % Secondary
Slightly (sandy*)	CLAY or SILT	Used to describe components of secondary constituents. e.g. gravelly sandy CLAY. Gravel is coarse rounded quartzite fragments.	<35
-- (sandy*)			35 to 65
Very (sandy*)			>65†

* Coarse soil type as appropriate
† or described as coarse soil depending on mass behaviour

Compactness/Strength

Term	Field Test
Loose	By inspection of voids and particle packing
Dense	

Standard Penetration Test in Borehole

No of blows	Relative Density
<4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
>50	Very Dense

Slightly cemented	Visual Examination: pick removes soil in lumps which can be abraded.	
Un-compact	Easily moulded or crushed in the fingers	
Compact	Can be moulded or crushed by strong pressure in the fingers	
Very soft	Finger easily pushed in up to 25 mm	c_u (kPa) <20
Soft	Finger pushed in up to 10 mm	20 to 40
Firm	Thumb makes impression easily	40 to 75
Stiff	Can be indented slightly by thumb	75 to 150
Very Stiff	Can be indented by thumbnail	150 to 300
Hard	Can be scratched by thumb nail	>300
Firm	Fibres already compressed together	
Spongy	Very compressible and open structure	
Plastic	Can be moulded in hand and smears fingers	

Structure

Term	Field Identification
Homogeneous	Deposit consists essentially of one type.
Inter-bedded or inter-laminated	Alternating layers of varying types. Pre-qualified by thickness term if in equal pro-portions. Other-wise thickness of and spacing between subordinate layers defined.
Hetero-geneous	A mixture of types.
Weathered	Particles may be weakened and may show concentric layering.
Fissured	Breaks into blocks along unpolished discontinuities.
Sheared	Breaks into blocks along polished discontinuities
Intact	No fissures.
Homogeneous	Deposit consists essentially of one type.
Inter-bedded or Inter-laminated	As described for coarse soils above.
Weathered	Usually has crumb or columnar structure.
Fibrous	Plant remains recognisable and retain some strength.
Pseudo-fibrous	Plant remains recognisable, strength lost.
Amorphous	Recognisable plant remains absent.

Interval Scales

Scale of Bedding Spacing

Term	Mean Spacing mm
Very thickly bedded	over 2000
Thickly bedded	2000-600
Medium bedded	600-200
Thinly bedded	200-60
Very thinly bedded	60-20
Thickly laminated	20-6
Thinly laminated	under 6

Spacing terms may also be used for distance between partings, isolated beds or laminae, desiccation cracks, rootlets etc.

Scale of spacing of other discontinuities

Term	Mean spacing mm
Very widely spaced	over 2000
Widely spaced	2000-600
Medium spaced	600-200
Closely spaced	200-60
Very closely spaced	60-20
Extremely closely spaced	under 20

KEY TO BOREHOLE AND TRIAL PIT RECORDS

Soil Types

Coarse grained, Non-cohesive

- Boulders
- Cobbles
- Gravel
- Sand

Fine grained, Cohesive

- Silt
- Clay

Other Soil Types

- Topsoil
- Peat
- Made Ground

Note: Composite soil types may be signified by combined symbols.

Rock Types

Sedimentary

- Sandstone
- Siltstone
- Conglomerate
- Chalk
- Limestone
- Breccia
- Coal
- Mudstone/Claystone/Shale

Metamorphic

- Coarse/Medium-grained
- Fine-grained

Igneous

- Coarse-grained
- Medium-grained
- Fine-grained

KEY TO SITE PLANS AND CROSS SECTIONS

- Borehole position
- Trial Pit Position
- A — A: Line of Section

Borehole Legend

- Highest recorded water level in piezometer or standpipe
- Length of piezometer/standpipe response zone (● Tip Depth)
- Highest recorded water level in hole
- Water strike
- S( ) — Standard Penetration test (SPT) "N" value using split spoon
- C( ) — Standard Penetration test (SPT) "N" value using solid 60° cone
- cu( ) — Undrained cohesion in kPa

		Input by	Date	Checked by	Date		
		RJE	04/03/02				

FOUNDATION & EXPLORATION SERVICES	NOTES ON EXPLORATORY HOLE RECORDS	Contract No E02755 Figure No KS0/04

ROCK CORES

DESCRIPTIVE ORDER

Strength, Structure, Colour, Texture, Grain Size, ROCK NAME, minor constituents and additional information, (geological formation - see comments under identification and description of soils), factual description of weathering state (if appropriate) and description of weathering state and discontinuities (if appropriate)

STRENGTH

Term	Field identification	Compressive Strength (MPa)
Very weak	Gravel sized lumps may be crushed between finger and thumb	<1.25
Weak	Gravel sized lumps can be broken in half under heavy hand pressure.	1.25 - 5.0
Moderately weak	Only thin slabs corners or edges can be broken off with heavy hand pressure.	5.0 - 12.5
Moderately strong	When held in hand rock can be broken by hammer blows.	12.5 - 50
Strong	When resting on a solid surface rock can be broken by hammer blows.	50 - 100
Very strong	Rock chipped by heavy hammer blows	100 - 200
Extremely strong	Rock rings on hammer blow. Only broken by sledge hammer	>200

DISCONTINUITIES

Bedding Spacing & Planar Structures*	Spacing (mm)	Discontinuity Spacing
	>6000	Extremely widely spaced
Very thickly bedded	>2000 2000-6000	Very widely spaced
Thickly bedded	600 - 2000	Widely spaced
Medium bedded	200 - 600	Medium spaced
Thinly bedded	60 - 200	Closely spaced
Very thinly bedded	20 - 60	Very closely spaced
Thickly laminated (Sedimentary) Very narrow (Metamorphic & Igneous)	6 - 20	Extremely closely spaced
Thinly laminated (Sedimentary) Very narrow (Metamorphic & Igneous)	<6	Extremely closely spaced

* For igneous and metamorphic rocks the appropriate descriptive term for planar structure should be used e.g. medium foliated gneiss, very narrowly cleaved slate, very thickly flow banded diorite.

WEATHERING

BS5930 : 1999 requires that standard descriptions of weathered rocks for engineering purposes should always include comments on the degree, extent and nature of any weathering effects at material or mass scales. This may allow subsequent classification and provide information for separating rock into zones of like character. Indications of weathering include

- changes in colour
- changes in fracture state
- reduction in strength
- presence, character and extent of weathering products

If a systematic classification following the guidelines given in BS 5930 : 1999 can be applied unambiguously, this is described in the text of the report. Otherwise, the rocks are not classified in terms of weathering beyond the approach described above.

ROCK CORES

ROCK CORE SIZES

The core barrels commonly used by the Company in site investigations are as follows:

Core Barrel Type	Borehole Diameter (mm)	Standard Core Size (mm)	Core Size using Rigid Plastic Liner (mm)	Casing Size or Type	Casing O.D (mm)	Casing I.D (mm)
BRITISH STANDARD SIZES (BS 4019,1966)						
NWM	75.7	54.7	51	NX	88.9	76.2
HWF	98.8	76.2	72	HX	114.3	100.0
HWAF	99.5	70.9	-	HX	114.3	100.0
PWF	120.0	92.1	87	PX	139.7	122.3
SWF	145.4	112.8	107	SX	168.3	147.7
UWF	173.7	139.8	132	UX	193.7	176.2
WIRELINE SIZES						
BQ	59.9	36.4	35			
NQ	75.7	47.6	45			
HQ	96.1	63.5	61			
PQ	122.7	85.0	82			
GEOBORE S	146.0	102.0	102	SX	168.3	147.7
THINWALL SIZES						
TNX	75.7	60.8	-	NX	88.9	76.2
T2 66	66.1	51.9	-	74	74.3	67.3
T2 76	76.1	61.9	-	84	84.3	77.3
T2 86	86.1	71.9	68	98	98.0	89.0
T2 101	101.1	83.9	80	113	113.0	104.0
T6 116	116.1	92.9	89	128	128.0	118.0
T6 131	131.1	107.9	104	143	143.0	133.3
NON STANDARD BARRELS						
4.12F TRIEFUS	105.2	74.7	72	PX	139.7	122.3
5.5x4C SINGLE TUBE	139.7	101.6	-	SX	168.3	147.7
B116	116	102	-	PX	139.7	122.3
B146	146	132	-	SX	168.3	147.7

Note: Core diameters may vary when different lining systems are in use.

ROCK CORE CHARACTERISTICS

TCR **Total Core Recovery.** The length of the total amount of core sample recovered, expressed as a percentage of the length of the core run.

SCR **Solid Core Recovery.** The length of solid core recovered, expressed as a percentage of the length of the core run.

Solid core is defined as that length of core which has a full diameter, but not necessarily a full circumference. Only natural fractures are considered. Drilling or handling induced fractures are ignored.

RQD **Rock Quality Designation.** The length of solid core recovered in pieces each more than 100 mm long as a percentage of the core run length.

I_f **Fracture Index.** The number of discontinuities expressed as 'fractures per metre', measured over any convenient length of consistent fracture characteristics.

Zones of atypical fracturing of restricted extent which occur within a rock unit of uniform fracture characteristics are identified within the Description of Strata.

NI - Not Intact NR - No Recovery NA - Not Applicable

I_s Corrected **point load strength index** $I_s(50)$ which is given in MPa.

		Input by	Date	Checked by	Date		
		RJE	04/03/02				

FOUNDATION & EXPLORATION SERVICES	NOTES ON EXPLORATORY HOLE RECORDS	Contract No E02755 Figure No KS0/06

Drilling Method Rotary Cored	**Borehole Diameter** 200mm to 21.70m	**Casing Diameter** 200mm to 21.70m	**BOREHOLE No.** BH1
Equipment Rotary Open Hole/Coring			**Coordinates** 199811.9 E
Drill Fluid Water/Air			**(National Grid)** 409050.3 N
Orientation (°) 90	**Logged by** CDL 25/02/2003	**Compiled by** dc 10/03/2003	**Ground Level** 249.65 m OD
Dates Drilled Start 11/02/2003		**Checked by** [illegible]	
End 14/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N Core Size (mm)	Fracture Index	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
11/02		(90)	0.00	1.10								Rotary open hole drilling between ground level and 10.45m. MADE GROUND: Gravel road construction.	(1.10)		
			1.00		D	1								1.10	248.55
			2.00		D	2						Very soft dark brown / black fibrous PEAT with many roots and vegetation fragments.			
		(90)	3.00	1.10-5.00	D	3							(3.90)		
			4.00		D	4									
												Light grey very clayey silty sandy fine		5.00	244.65

Remarks (See notes & keysheets)

1. Groundwater was recorded as standing level of between 0.40m and 0.90mbgl during permeability testing.
2. Open hole drilling by 200mm tricone rock roller. Coring using T6116 bits. Borehole reamed to depth to accommodate installation.
3. Temporary stone road constructed to access borehole location approximately 0.80m of peat removed during construction.
4. Variable head permeability testing carried out at 5.0m; 6.50m; 14.65m; 17.30m and 21.70mbgl.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH1 (1 of 6)

304/02

Drilling Method	Rotary Cored	Borehole Diameter / Casing Diameter	BOREHOLE No. BH1
Equipment	Rotary Open Hole/Coring		Coordinates 199811.9 E
Drill Fluid	Water/Air		(National Grid) 409050.3 N
Orientation (°)	90		Ground Level 249.65 m OD
Dates Drilled	Start 11/02/2003	Logged by CDL 25/02/2003	Compiled by dc 10/03/2003
	End 14/02/2003		Checked by 10/4/03

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
			5.00-5.45		D	5				C11			to coarse angular and subangular schist and psammite gravel. (Glacial Till)	5.00	244.65	
		(90)	5.00-6.50													
			6.00		D	6										
			6.50-6.95							C16						
			7.00		D	7										
		(90)	6.50-8.00											(4.85)		
11/02	8.00	1.40														
12/02	8.00	0.00	8.00-8.45		D	8				C20						
			8.00													
		(90)	8.00-9.85		D	9										
			9.00											9.85	239.80	
			10.00		D	10							Weathered SCHIST (drillers description)			

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH1 (2 of 6)

304:02

Drilling Method: Rotary Cored	Borehole Diameter / Casing Diameter	**BOREHOLE No. BH1**	
Equipment: Rotary Open Hole/Coring		Coordinates (National Grid)	199811.9 E, 409050.3 N
Drill Fluid: Water/Air		Ground Level	249.65 m OD
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Checked by: [illegible]
Dates Drilled: Start 11/02/2003, End 14/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No. TCR %	SCR %	RQD %	SPT Blows /N, Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
		(95)	9.85-10.45							Weathered SCHIST (as sheet 2)	(0.60)		
											10.45	239.20	
		(95)	10.45-11.95		99	96	93		2	Grey and light grey slightly locally slightly to moderately weathered fine grained PSAMMITE strong. Locally grading (300mm zones) into grey and dark grey pelite moderately weak. Occasional quartzite lenses where foliation present inclined at 35 degrees on 5mm - 20mm scale and sub-millimetre in pelite layers. 10.45m to 12.55m; medium to closely spaced foliation and parallel drilling induced, planar, rough, tight, clean fractures. Possible fractures cross cutting foliation, irregular and compound, tight and clean, healed quartz generally <1mm Between 11.00m to 11.05m; 1 inclined (c40 degrees) fracture zone infilled with fine and medium gravel sized fragments of finely cleaved micaceous pelite / fine psammite. 11.35m to 11.46m; 1 probably inclined planar, rough tight slightly polished fracture. 11.46m and 11.63m; 30mm inclined zone possibly drilling induced of irregular tight clean anastomised fractures. At 11.72m; 10mm zone of highly fractured rock, possible shearing associated with quartzite lenses. Below 12.00m; becoming friable dark grey slightly to moderately weathered sandstone/psammite.	(2.30)		
		(95)	11.95-12.75		97	53	41		NI	12.15m to 12.20m; 1 inclined (45 degree) 30mm highly fractured zone possibly drilling induced due to zone of weakness. 12.55m to 12.75m; non intact.	12.75	236.90	
		(95)	12.75-13.45		86	17	0		NI	Light grey slightly locally slightly to moderately weathered fine grained locally medium grained micaceous PSAMMITE/poorly developed SCHIST, strong. Foliation where present inclined at 35 degree on 5mm scale. 12.75m to 13.95m; non intact / highly fractured. Possible very closely spaced inclined planar and irregular rough clean fractures and irregular anastomised partially healed fractures with infilling of quartz <1mm.	(1.20)		
		(95)	13.45-14.65		41	4	0		NR	No Recovery.	13.95	235.70	
12/02	10.45	1.15									(0.70)		
13/02	1.20	(95)	14.65-14.85		100	0	0		NI	Green grey slightly weathered slightly friable medium grained irregular SANDSTONE / PSAMMITE moderately weak to moderately strong. 14.65m to 15.30m; non intact. Recovered as coarse gravel and cobble sized rock	14.65	235.00	
		(95)	14.85-14.95		100	0	0				(0.40)		

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH1 (3 of 6)

304/02

Drilling Method: Rotary Cored	Borehole Diameter / Casing Diameter	**BOREHOLE No. BH1**	
Equipment: Rotary Open Hole/Coring		Coordinates (National Grid): 199811.9 E, 409050.3 N	
Drill Fluid: Water/Air		Ground Level: 249.65 m OD	
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Checked by: 1/04/03
Dates Drilled: Start 11/02/2003, End 14/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	TCR %	No. SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
											fragments.	15.05	234.60	
		(95)	14.95-15.55		58	0	0				Light grey slightly weathered fine and medium grained micaceous SANDSTONE/PSAMMITE, strong.	(0.25)		
										NR	No Recovery	15.30	234.35	
												(0.25)		
												15.55	234.10	
									90	NI	Dark grey / black slightly to moderately weathered possible BASALT/DOLERITE strong to very strong with some 1mm-2mm diameter crystalline inclusions. Fractured. 15.55m to 15.85m; non intact / highly fractured recovered as medium and coarse gravel sized rock fragments.	(0.30)		
		(95)	15.55-16.65		27	0	0			NR	No Recovery	15.85	233.80	
												(0.80)		
		(95)	16.65-16.95		100	0	0			NI	Black locally dark grey slightly weathered possible BASALT / DOLERITE with some 1-2mm crystalline inclusions. Very strong, locally highly fractured. 16.65m to 17.50m; non intact highly fractured, recovered as coarse (rarely medium) gravel sized rock fragments with occasional partial core cylinders <100mm. Evidence of inclined c45 degree planar to irregular fractures and vertical tight rough, micaceous fractures.	16.65	233.00	
13/02	16.35	(95) 1.00	16.95-17.30		91	20	0							
14/02	16.35	1.40												
		(95)	17.30-18.50		100	42	38			2	17.50m to 18.30m; drilling induced fractures. Evidence of subvertical (70 degree) irregular compound, tight, partially quartz healed (<1mm). Fracture set locally cross cutting foliation and subhorizontal (c25 degrees)	(2.05)		
											18.30m to 18.70m; non intact / highly fractured, recovered as coarse angular gravel sized rock fragments.			
		(95)	18.50-18.70		100	0	0			NI		18.70	230.95	
											Grey locally dark grey slightly weathered fine grained PSAMMITE locally grading to (200-500mm scale) dark grey pelite. Strong, locally moderately weak to moderately strong. Locally micaceous, foliation inclined at 30 degrees on scale 5mm - 10mm in psammite and submillimetre in pelite. 18.70m to 21.70m; possible closely and very closely spaced drilling induced, inclined (45 degrees) planar, tight, rough clean parallel fractures and vertical and subvertical irregular anastomised locally healed with quartz (1mm - 4mm) fractures. 18.75m to 19.70m; non intact highly fractured recovered as coarse angular gravel and cobble sized fragments. Probable zone of compound subvertical partially healed fractures. 20.00m to 20.20m; non intact highly fractured pelite band.			
		(95)	18.70-20.20		100	24	8							

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH1 (4 of 6)

Drilling Method	Rotary Cored	Borehole Diameter	Casing Diameter	BOREHOLE No.	BH1
Equipment	Rotary Open Hole/Coring			Coordinates	199811.9 E
Drill Fluid	Water/Air			(National Grid)	409050.3 N
Orientation (°)	90	Logged by	Compiled by	Ground Level	249.65 m OD
Dates Drilled	Start 11/02/2003	CDL	dc		
	End 14/02/2003	25/02/2003	10/03/2003	Checked by	

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery Depth (m) From	To	Type TCR %	No. SCR %	RQD %	SPT Blows /N Core Size (mm)	Fracture Index	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
									1	20.20m to 20.85m; locally non intact with 1 inclined (70 degree) planar tight partially healed rough fracture. Evidence of subvertical cross cutting. Compound partially healed fractures with corresponding weakening of rock.	(3.00)		
		(95)	20.20	21.70	100	55	14						
										21.33m to 21.43m; 1 inclined 50 degree planar rough tight clean parallel fracture.			
14/02	16.35	1.20									21.70	227.95	
										End of Borehole			

Remarks
(See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

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Figure No. BH1 (5 of 6)

Drilling Method Rotary Cored	**Borehole Diameter**	**Casing Diameter**	**BOREHOLE No.** BH1
Equipment Rotary Open Hole/Coring Water/Air 90			**Coordinates** 199811.9 E **(National Grid)** 409050.3 N **Ground Level** 249.65 m OD
Dates Drilled Start 11/02/2003 End 14/02/2003	**Logged by** CDL 25/02/2003	**Compiled by** dc 10/03/2003	**Checked by** 11/3/03

Description	Depth (m)	Level m OD	
Concrete	0.50	249.15	Flush stopcock box cover. Pipe diameter 100mm to 21.70m.
Compacted Arisings	11.00	238.65	
Bentonite Seal	15.00	234.65	
Gravel Filter	21.70	227.95	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

Project
MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH1 (6 of 6)

Drilling Method: Rotary Cored	Borehole Diameter: 200mm to 12.35m	Casing Diameter: 200mm to 5.36m	**BOREHOLE No. BH2**
Equipment: Rotary Coring			Coordinates: 199721.4 E
Drill Fluid: Air/Water			(National Grid): 409146.8 N
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Ground Level: 242.05 m OD
Dates Drilled: Start 15/02/2003		Checked by: [illegible]	
End 16/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
15/02			0.00		D	1						Rotary open hole drilling to between ground level and 7.00m. MADE GROUND: Gravel road construction			
		(90)	0.00-0.80										(0.80)		
													0.80	241.25	
			1.00		D	2						Dark brown / black fibrous PEAT with many roots and vegetation fragments.			
			2.00		D	3									
		(90)	0.80-3.65										(2.85)		
			3.00		D	4									
			3.65-4.10								S11	Light grey very clayey / silty sandy fine to coarse angular and subangular schist and psammite GRAVEL.	3.65	238.40	
			4.00		D	5									
		(90)	3.65-5.40										(1.75)		
			5.00		D	6									

Remarks (See notes & keysheets)

1. Groundwater was encountered at 2.20m during drilling and rose to 1.60m after 20 mins.
2. Prior to boring a Cable Avoidance Tool (CAT) survey was carried out.
3. RQD & SCR assumes that many parallel and cross cutting irregular fractures are drilling induced along lines of weakness in the rock mass.
4. Rotary open hole drilling carried out using 200mm down the hole hammer, coring using T6116 bits. Borehole reamed to depth to accommodate installation.
5. Temporary stone road constructed to access location approximately 0.50m of peat removed during construction.
6. Variable head permeability testing carried out at 3.65m, 5.70m and 12.35mbgl. Single packer permeability

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH2 (1 of 4)

Drilling Method: Rotary Cored	Borehole Diameter / Casing Diameter	**BOREHOLE No. BH2**	
Equipment: Rotary Coring		Coordinates (National Grid)	199721.4 E, 409146.8 N
Drill Fluid: Air/Water		Ground Level	242.05 m OD
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Checked by: 11/3/03
Dates Drilled: Start 15/02/2003, End 16/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N, Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
15/02	5.36	2.30											
16/02	5.36	1.45 (90)	5.40-5.70							Weathered SCHIST (drillers description)	5.40	236.65	
			5.70-5.81						S25/ 30				
			6.00	D	7						(1.60)		
		(0)	5.70-7.00										
			7.00	D	8				90	Grey and light grey locally greenish grey slightly weathered interbedded fine and fine to medium grained PSAMMITE. Strong locally moderately strong. Locally grading to (300mm beds) dark grey pelite, moderately strong to moderately weak foliation inclined at 50-60 degrees on 2-10mm scale. 7.00m to 7.40m; non intact, and recovered as medium and coarse angular gravel sized rock fragments. 7.40m to 10.90m; very closely spaced inclined 50 - 65 degrees planar, tight, rough, clean parallel drilling induced fractures. Possible fracture set cross cutting foliation irregular inclined (45 degrees) to subvertical, irregular tight quartz healed (<1mm) fractures, locally drilling induced but rock mass weakened.	7.00	235.05	
		(0)	7.00-8.50	81	63	63							
		(0)	8.50-9.35	100	93	93					(5.35)		

Remarks (See notes & keysheets): carried out between 9.00m and 12.65m.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH2 (2 of 4)

304:02

Drilling Method: Rotary Cored	Borehole Diameter:	Casing Diameter:	**BOREHOLE No. BH2**
Equipment: Rotary Coring			Coordinates: 199721.4 E
Drill Fluid: Air/Water			(National Grid): 409146.8 N
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Ground Level: 242.05 m OD
Dates Drilled: Start 15/02/2003		Checked by: [illegible]	
End 16/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
		(0)	9.35	10.85			100	87	87						
		(0)	10.85	12.35			100	0	0			Below 10.90m; foliation generally inclined at 80 degrees. 10.90m to 12.35m; one possible compound subvertical (80 degrees) probably tight to open planar to irregular rough fracture. Evidence of 10mm zone of moderately weathered fine and medium angular rock fragments with clay matrix infilling fracture.			
16/02	5.36	1.24										End of Borehole	12.35	229.70	

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH2 (3 of 4)

Drilling Method: Rotary Cored	Borehole Diameter:	Casing Diameter:	**BOREHOLE No. BH2**
Equipment: Rotary Coring; Air/Water; 90			Coordinates (National Grid): 199721.4 E, 409146.8 N
Dates Drilled: Start 15/02/2003, End 16/02/2003	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Ground Level: 242.05 m OD
		Checked by: 1/04/03	

Description	Depth (m)	Level m OD	
Concrete	0.50	241.55	Upstanding cover. Pipe diameter 100mm to 12.35m.
Compacted Arisings	6.50	235.55	
Bentonite Seal	7.50	234.55	
Gravel Filter	12.35	229.70	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH2 (4 of 4)

Drilling Method: Rotary Cored	Borehole Diameter: 200mm to 12.65m	Casing Diameter: 200mm to 12.65m	**BOREHOLE No. BH3**
Equipment: Rotary Coring			Coordinates (National Grid): 199602.8 E, 409147.7 N
Drill Fluid: Air/Water			Ground Level: 233.25 m OD
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2002	Checked by: VB 11/04/03
Dates Drilled: Start 19/02/2003, End 25/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
19/02		(0)	0.00	0.30									MADE GROUND: Stone road construction	(0.30)		
		(0)	0.30	0.50									Very soft dark brown fibrous PEAT.	0.30 (0.20) 0.50	232.95 232.75	
			0.50	0.95						S23			Light grey very silty sandy fine to coarse angular and subangular schist and psammite GRAVEL. (Glacial Till)			
		(0)	0.50	1.50	D	1										
			1.00													
		(0)	1.50	2.00										(3.00)		
			2.00	2.45	D	2				S47						
		(0)	2.00	3.50												
			3.00		D	3										
			3.50	3.79						S48/ 135			Possible grey highly weathered fine grained PSAMMITE, weak. Recovered as slightly gravelly sand silt.	3.50	229.75	
			3.50		D	4										
			4.00		D	5										
		(0)	3.50	5.00										(2.80)		

Remarks (See notes & keysheets)

1. Groundwater was measured during permeability testing at between 0.12m and 0.70mbgl.
2. Prior to boring a Cable Avoidance Tool (CAT) survey was carried out.
3. RQD & SCR based upon assuming where possible the many parallel and cross cutting irregular fractures are drilling induced along lines of weakening within rock mass.
4. Variable head permeability testing carried out at 1.50m, 6.85m and 12.65mbgl.
5. Rotary open hole drilling was advanced using a 200mm down the hole hammer, coring using T6116 bits. Borehole reamed to depth to accommodate installation.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

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Figure No. BH3 (1 of 4)

Drilling Method: Rotary Cored	Borehole Diameter / Casing Diameter	**BOREHOLE No. BH3**	
Equipment: Rotary Coring		Coordinates (National Grid): 199602.8 E, 409147.7 N	
Drill Fluid: Air/Water		Ground Level: 233.25 m OD	
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2002	Checked by: 1/4/03
Dates Drilled: Start 19/02/2003, End 25/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
			5.00-5.07						S50/65						
			5.00	D	6										
		(0)	5.00-6.30												
			6.00	D	7										
												Grey moderately to highly weathered SCHIST.	6.30	226.95	
19/02		(0)	6.30-6.85										(0.55)		
20/02									90		NI	Grey and dark grey slightly weathered fine grained PSAMMITE, moderately strong. Foliation locally developed, inclined at 45 degrees on 5mm to 200mm scale. 6.85m to 7.35m; non intact / highly fractured. Recovered as medium and coarse gravel sized up to cobble sized rock fragments / incomplete core cylinders. Evidence within rock cylinders of subvertical irregular, compound partially healed microfractures and parallel planes of weakness.	6.85	226.40	
		(0)	6.85-8.15	96	17	0					10				
											NI	7.35m to 7.65m; evidence of very closely spaced inclined (45 degrees) conjugate parallel and perpendicular planar, smooth, clean fractures. Evidence of very closely and extremely closely spaced planar to irregular partially healed perpendicular fractures.	(1.90)		
20/02		(0)	8.15-8.45	100	0	0						7.65m to 8.50m; non intact / highly fractured. Recovered as medium and coarse gravel sized up to cobble sized rock fragments / incomplete core cylinders. Possible very closely and extremely closely spaced conjugate parallel and perpendicular, planar, tight, partially quartz healed (<1mm) fractures.			
25/02											12	8.50m to 8.75m; 3 conjugate inclined, planar, tight, rough, clean fractures. Evidence of planar irregular partially healed fracture. Set 1 at 50 degrees ; Set 2 rotated through 90 degrees at 40 degrees.	8.75	224.50	
											NR		(0.20)		
												No recovery	8.95	224.30	
		(0)	8.45-9.95	84	44	20					4	Dark grey slightly weathered fine and medium grained generally structureless PSAMMITE, strong. Rare millimetre scale highly micaceous foliation developed. 8.95m to 9.65m; 3 parallel inclined (50-60 degrees) planar to slightly irregular and slightly compound rough, tight, clean locally partially quartz healed (<1mm) fractures. Some evidence of weak foliation on 20mm scale and subvertical irregular compound fractures at 90 degrees to foliation. 9.65m to 9.95m; non intact / highly fractured. Recovered as coarse gravel sized up to cobble sized rock fragments.	(1.90)		
											NI				

Remarks (See notes & keysheets)

Scale 1:25

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Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

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Figure No. BH3 (2 of 4)

Drilling Method	Rotary Cored	Borehole Diameter	Casing Diameter	BOREHOLE No.	BH3
Equipment	Rotary Coring			Coordinates	199602.8 E
Drill Fluid	Air/Water			(National Grid)	409147.7 N
Orientation (°)	90			Ground Level	233.25 m OD
Dates Drilled	Start 19/02/2003	Logged by	Compiled by	Checked by	
	End 25/02/2003	CDL 25/02/2003	dc 10/03/2002		

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery Depth (m) From	To	Type TCR %	No. SCR %	RQD %	SPT Blows /N Core Size (mm)	Fracture Index	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
		(0)	9.95	11.35	93	54	36		2	Evidence of parallel weakness and vertical microfracture and conjugate perpendicular microfractures. 9.95m to 10.85m; medium to very closely spaced inclined (30 degrees) probably parallel, planar, rough, clean, probably drilling induced fractures. Evidence of parallel planes of weakness 10mm - 100mm scale. 10.15m to 10.40m; possible 2 No parallel inclined (60 degrees), planar to slightly irregular, tight, rough, clean, possibly drilling induced fractures.			
											10.85	222.40	
									NI	Dark greenish grey slightly weathered generally structureless PSAMMITE, strong, locally moderately strong to moderately weak. 10.85m to 11.15m; 1 inclined / subvertical (80 degree) clean, tight and planar, slightly rough, fracture. 11.15m to 12.00m; non intact / highly fractured. Recovered as coarse gravel sized up to cobble sized rock fragments / partial core cylinder. Where foliation developed evidence of inclined parallel and perpendicular planes of weakness and vertical / subvertical irregular microfractures.	(1.15)		
		(0)	11.35	12.65	100	52	46				12.00	221.25	
25/02									2	Purple grey and light blue grey banded slightly weathered to fresh, medium grained PSAMMITE, strong. Foliation weakly developed inclined 50 degrees on 30mm and 100mm scale. 12.00m to 12.65m; closely and medium spaced inclined (50 degrees) tight, clean, planar, rough parallel and perpendicular drilling induced fractures and vertical / subvertical microfractures.	(0.65)		
										End of Borehole	12.65	220.60	

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

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Figure No. BH3 (3 of 4)

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH3**
Equipment: Rotary Coring; Air/Water; 90			Coordinates (National Grid): 199602.8 E, 409147.7 N
Dates Drilled: Start 19/02/2003, End 25/02/2003	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2002	Checked by: [illegible]
			Ground Level: 233.25 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	232.75	Upstanding cover. Pipe diameter 50mm to 12.65m.
Compacted Arisings	7.00	226.25	
Bentonite Seal	8.00	225.25	
Gravel Filter	12.65	220.60	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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Figure No. BH3 (4 of 4)

Drilling Method: Rotary Cored	Borehole Diameter: 200mm to 15.00m	Casing Diameter: 200mm to 15.00m	**BOREHOLE No. BH4**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199954.9 E, 409224.4 N
Drill Fluid: Air			Ground Level: 254.05 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Checked by:
Dates Drilled: Start 11/02/2003, End 11/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N, Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
11/02			5.70-6.15						C16	MADE GROUND: Gravel road construction.	(0.70)		
											0.70	253.35	
										Dark brown / black fibrous PEAT with many roots and vegetation fragments.	(4.00)		
											4.70	249.35	
		(100)	0.00-10.00							Light grey very clayey / silty sandy fine to coarse angular to subangular schist and psammite GRAVEL. Driller reports 'very soft'. (Glacial Drift)			

Remarks (See notes & keysheets)

1. Groundwater was encountered at 1.10m during drilling and rose to 0.70m after 10 mins.
2. Prior to boring a Cable Avoidance Tool (CAT) survey was carried out.
3. Variable head permeability testing was carried out at 5.70m, 7.20m, 10.90m and 15.00mbgl.
4. Rotary open hole drilling from ground level to 15.00m using 200mm down the hole hammer.
5. Temporary road construction to access borehole, approximately 0.40m of peat removed.

Scale 1:25

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Figure No. BH4 (1 of 4)

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH4**
Equipment: Rotary Open Hole			Coordinates: 199954.9 E
Drill Fluid: Air			(National Grid): 409224.4 N
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Ground Level: 254.05 m OD
Dates Drilled: Start 11/02/2003 End 11/02/2003		Checked by: 11/4/03	

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
			5.70		D	1								
			7.20	7.20-7.65	D	2				C32		(5.20)		
											Grey fractured SCHIST (drillers description)	9.90	244.15	

Remarks (See notes & keysheets)

Scale 1:25

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Figure No. BH4 (2 of 4)

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH4**
Equipment: Rotary Open Hole			Coordinates 199954.9 E
Drill Fluid: Air			(National Grid) 409224.4 N
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Ground Level 254.05 m OD
Dates Drilled: Start 11/02/2003		Checked by: 14/04/03	
End 11/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
											Grey fractured SCHIST (drillers description)			
		(100)	10.00	15.00								(5.10)		
11/02	15.00	1.10												
											End of Borehole	15.00	239.05	

Remarks
(See notes & keysheets)

Scale 1:25

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Figure No. BH4 (3 of 4)

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH4**
Equipment: Rotary Open Hole; Air; 90			Coordinates (National Grid): 199954.9 E, 409224.4 N
Dates Drilled: Start 11/02/2003, End 11/02/2003	Logged by: N/A	Compiled by: dc 04/03/2003	Ground Level: 254.05 m OD
		Checked by: 1/04/03	

Description	Depth (m)	Level m OD	
Concrete	0.50	253.55	Upstanding cover. Pipe diameter 100mm to 15.00m.
Bentonite Grout	7.00	247.05	
Gravel Filter	15.00	239.05	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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Figure No. BH4 (4 of 4)

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH5**
Equipment: Rotary Open Hole			Coordinates: 199738.8 E
Drill Fluid: Air			(National Grid): 408912.0 N
Orientation (°): 90	Logged by: N/A	Compiled by: dc 07/03/2003	Ground Level: 248.35 m OD
Dates Drilled: Start 28/02/2003		Checked by: 1/04/03	
End 28/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type TCR %	No. SCR %	RQD %	SPT Blows /N Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
									Grey SCHIST (drillers description)	5.05	243.30	
		(99)	5.05	8.50						(3.45)		
									Purple grey SCHIST (drillers description)	8.50	239.85	
		(99)	8.50	10.00						(1.50)		
28/02									End of Borehole	10.00	238.35	

Remarks
(See notes & keysheets)

Scale 1:25

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Figure No. BH5 (2 of 3)

304:02

Drilling Method: Rotary Cored	Borehole Diameter / Casing Diameter	BOREHOLE No. BH5
Equipment: Rotary Open Hole; Air; 90		Coordinates (National Grid): 199738.8 E, 408912.0 N
Dates Drilled: Start 28/02/2003, End 28/02/2003	Logged by: N/A; Compiled by: dc 07/03/2003; Checked by: [illegible] 1/04/03	Ground Level: 248.35 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	247.85	Upstanding cover. Pipe diameter 50mm to 10.00m.
Compacted Arisings	4.50	243.85	
Bentonite Seal	5.50	242.85	
Gravel Filter	10.00	238.35	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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Project: MEENABOLL LANDFILL PROJECT
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Figure No. BH5 (3 of 3)

Drilling Method: Rotary Cored	Borehole Diameter: 200mm to 9.70m	Casing Diameter: 200mm to 9.70m	**BOREHOLE No. BH6**
Equipment: Rotary Coring			Coordinates: 199535.7 E
Drill Fluid: Air/Water			(National Grid): 409363.8 N
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Ground Level: 221.55 m OD
Dates Drilled: Start 18/02/2003, End 18/02/2003		Checked by: [illegible]	

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
18/02		(95)	0.00-0.70									Rotary open hole drilling to 4.70m. MADE GROUND: Stone road construction.	(0.70)		
													0.70	220.85	
			1.00	D	1							Dark brown / black fibrous PEAT with many roots and vegetation fragments.			
		(95)	0.70-3.00										(2.30)		
			2.00	D	2										
			3.00-3.22						S50/ 70				3.00	218.55	
			3.00	D	3							Light grey very clayey silty sandy fine to coarse angular and subangular schist and psammite GRAVEL.			
		(95)	3.00-4.00										(1.50)		
			4.00	D	4										
		(95)	4.00-4.50												
		(95)	4.50-4.70						S50/ 45			Weathered SCHIST (drillers description)	4.50 (0.20)	217.05	
			4.50-4.62						90				4.70	216.85	
												Light grey fresh to slightly weathered medium grained locally fine grained PSAMMITE strong locally pyritised. Foliation weakly developed inclined at 40-50 degrees.			

Remarks (See notes & keysheets)

1. Groundwater was encountered at 2.80m during drilling and rose to 0.50m after 20 mins.
2. Prior to boring a Cable Avoidance Tool (CAT) survey was carried out.
3. RQD & SCR assumes some foliation is parallel. Discontinuities are drilling induced.
4. Variable head permeability testing carried out 4.00m; 4.70m and 9.70mbgl. Temporary stone road constructed to access location approximately 0.40m of peat removed during construction.
5. Rotary open hole drilling carried out by 200mm down the hole hammer. Coring using T6116 bits. Borehole reamed to depth to accommodate installation.

Scale 1:25

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Figure No. BH6 (1 of 3)

304/02

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH6**
Equipment: Rotary Coring			Coordinates 199535.7 E
Drill Fluid: Air/Water			(National Grid) 409363.8 N
Orientation (°): 90	Logged by: CDL 25/02/2003	Compiled by: dc 10/03/2003	Ground Level 221.55 m OD
Dates Drilled: Start 18/02/2003 End 18/02/2003		Checked by: 17/4/03	

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery Depth (m) From To	Type	No. TCR %	SCR %	RQD %	SPT Blows /N Core Size (mm)	Fracture Index	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
		(90)	4.70-5.90		100	0	0			4.70m to 9.70m; possible closely locally very closely spaced planar inclined parallel healed fractures and drilling induced fractures. Locally some subvertical irregular healed fractures infilled with quartz (<11mm). 4.75m to 5.07m; 1 inclined 70 degree tight planar, rough possibly weakly quartz healed (<1mm) fracture. Locally slightly slickensided and anastomised.			
		(90)	5.90-6.70		100	99	89			At 6.05m; 1 inclined (70 degree) planar, healed, partially stylotised fracture. 6.61m to 6.65m; 1 inclined 25 degree planar, tight to clean partially slickensided fracture.			
		(90)	6.70-8.20		100	99	67		1	7.42m to 7.68m; 1 inclined 60 degree planar to irregular tight rough, clean fracture. 7.55m to 7.86m; 1 inclined 75 degree planar to slightly irregular tight clean fracture.	(5.00)		
		(90)	8.20-9.70		100	97	85			8.60m to 8.75m; 1 inclined tight planar to slightly irregular clean rough fracture. 8.98m to 9.03m; zone with 3 subhorizontal tight fractures/solution surfaces with quartzite lens.			
18/02											9.70	211.85	
										End of Borehole			

Remarks (See notes & keysheets)

Scale 1:25

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Figure No. BH6 (2 of 3)

Drilling Method Rotary Cored	**Borehole Diameter**	**Casing Diameter**	**BOREHOLE No.** BH6
Equipment Rotary Coring Air/Water 90			**Coordinates (National Grid)** 199535.7 E, 409363.8 N
Dates Drilled Start 18/02/2003, End 18/02/2003	**Logged by** CDL 25/02/2003	**Compiled by** dc 10/03/2003	**Checked by** [signature]
			Ground Level 221.55 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	221.05	Upstanding cover. Pipe diameter 100mm to 9.70m.
Compacted Arisings	4.00	217.55	
Bentonite Seal	5.00	216.55	
Gravel Filter	9.70	211.85	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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Project MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

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Figure No. BH6 (3 of 3)

309/02

Drilling Method Rotary Open Hole **Equipment** Rotary Open Hole **Drill Fluid** Air **Orientation (°)** 90 **Dates Drilled** Start 14/02/2003 End 14/02/2003	**Borehole Diameter** 200mm to 10.10m **Casing Diameter** 200mm to 3.00m **Logged by** N/A **Compiled by** dc 04/03/2003 **Checked by**	**BOREHOLE No.** BH7 **Coordinates** 199663.5 E **(National Grid)** 409331.3 N **Ground Level** 232.30 m OD	

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
14/02			0.00	0.45	D	1					C39	Light grey very clayey / silty sandy fine to coarse angular and subangular psammite and schist GRAVEL. (Glacial Drift)	(1.50)		
													1.50	230.80	
												Weathered SCHIST (drillers description)	(1.20)		
													2.70	229.60	
												Grey fractured SCHIST (drillers description)			

Remarks (See notes & keysheets)

1. Groundwater standing at between 1.30m and 1.90mbgl during permeability testing.
2. Temporary road constructed to gain access, approximately 0.80m of peat removed.
3. Open hole drilling to 10.10m using 200mm down the hole hammer.
4. Variable head permeability testing carried out at 2.50m and 10.10mbgl.

Scale 1:25

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Figure No. BH7 (1 of 4)

Drilling Method: Rotary Open Hole	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH7**
Equipment: Rotary Open Hole			Coordinates 199663.5 E
Drill Fluid: Air			(National Grid) 409331.3 N
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Ground Level 232.30 m OD
Dates Drilled: Start 14/02/2003		Checked by:	
End 14/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type TCR %	No. SCR %	RQD %	SPT Blows /N Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
		(100)	0.00	10.10						(7.40)		

Remarks
(See notes & keysheets)

Scale 1:25

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Project: MEENABOLL LANDFILL PROJECT
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Figure No. BH7 (2 of 4)

Drilling Method: Rotary Open Hole	Borehole Diameter:	Casing Diameter:	**BOREHOLE No. BH7**
Equipment: Rotary Open Hole			Coordinates: 199663.5 E
Drill Fluid: Air			(National Grid): 409331.3 N
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Ground Level: 232.30 m OD
Dates Drilled: Start 14/02/2003		Checked by: 1/04/03	
End 14/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
14/02	3.00	1.90													
												End of Borehole	10.10	222.20	

Remarks (See notes & keysheets)

Scale 1:25

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Figure No. BH7 (3 of 4)

Drilling Method	Rotary Open Hole	Borehole Diameter	Casing Diameter	BOREHOLE No.	BH7
Equipment	Rotary Open Hole Air 90			Coordinates (National Grid)	199663.5 E 409331.3 N
				Ground Level	232.30 m OD
Dates Drilled	Start 14/02/2003 End 14/02/2003	Logged by N/A	Compiled by dc 04/03/2003	Checked by	

Description	Depth (m)	Level m OD	
Concrete	0.50	231.80	Upstanding cover. Pipe diameter 100mm to 10.00m.
Bentonite Seal	3.50	228.80	
Gravel Filter	10.10	222.20	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

Project	Contract No.	E02755
MEENABOLL LANDFILL PROJECT SITE INVESTIGATION	Figure No.	BH7 (4 of 4)

Drilling Method: Rotary Open Hole	Borehole Diameter: 200mm to 10.20m	Casing Diameter: 200mm to 5.20m	**BOREHOLE No. BH8**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199831.2 E, 409239.9 N
Drill Fluid: Air			Ground Level: 246.95 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 05/03/2003	Checked by:
Dates Drilled: Start 13/02/2003, End 13/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
13/02			4.20	4.65							C33	MADE GROUND: Gravel road construction	(1.20)		
													1.20	245.75	
												Brown PEAT (drillers description)	(2.60)		
													3.80	243.15	
												Light grey very silty / clayey sandy fine to coarse angular and subangular psammite and schist GRAVEL. (Glacial Drift)			
			4.20		D	1							(1.30)		

Remarks (See notes & keysheets)

1. Groundwater strike at 4.10m and rose to 2.80m after 20 mins.
2. Temporary road construction to access positions, approximately 0.90m of peat removed.
3. Open hole drilling to 10.10m using 200mm down the hole hammer.
4. Variable head permeability testing carried out at 4.80m 6.10m and 10.20mbgl.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH8 (1 of 4)

Drilling Method: Rotary Open Hole	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH8**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199831.2 E, 409239.9 N
Drill Fluid: Air			Ground Level: 246.95 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 05/03/2003	Checked by: [illegible]
Dates Drilled: Start 13/02/2003, End 13/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
		(100)	0.00-10.20								Grey fractured SCHIST (drillers description)	5.10	241.85	
												(5.10)		

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH8 (2 of 4)

Drilling Method: Rotary Open Hole	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH8**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199831.2 E, 409239.9 N
Drill Fluid: Air			Ground Level: 246.95 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 05/03/2003	Checked by:
Dates Drilled: Start 13/02/2003, End 13/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type TCR %	No. SCR %	RQD %	SPT Blows /N, Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
13/02	5.26	2.80										
									End of Borehole	10.20	236.75	

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH8 (3 of 4)

Drilling Method: Rotary Open Hole	Borehole Diameter:	BOREHOLE No. BH8
Equipment: Rotary Open Hole Air 90	Casing Diameter:	Coordinates (National Grid): 199831.2 E, 409239.9 N Ground Level: 246.95 m OD
Dates Drilled: Start 13/02/2003 End 13/02/2003	Logged by: N/A Compiled by: dc 05/03/2003 Checked by: 10/07/03	

Description	Depth (m)	Level m OD	
Concrete	0.50	246.45	Upstanding cover. Pipe diameter 100mm to 10.10m.
Compacted Arisings	3.50	243.45	
Bentonite Seal	5.60	241.35	
Gravel Filter	10.20	236.75	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH8 (4 of 4)

309/02

Drilling Method: Rotary Open Hole	Borehole Diameter: 200mm to 10.00m	Casing Diameter: 200mm to 5.00m	**BOREHOLE No. BH9**
Equipment: Rotary Open Hole			Coordinates: 199476.4 E
Drill Fluid: Air			(National Grid): 409197.2 N
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Ground Level: 227.50 m OD
Dates Drilled: Start 17/02/2003		Checked by:	
End 17/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
17/02			2.50-2.95								C26	MADE GROUND: Gravel road construction	(1.80)		
													1.80	225.70	
												Brown PEAT (drillers description)	(0.60)		
			2.50		D	1							2.40	225.10	
												Light grey very silty / clayey sandy fine to coarse angular and subangular psammite and schist GRAVEL (Glacial Drift)	(1.10)		
			3.40-3.73								C26/ 175				
			3.40		D	2							3.50	224.00	
												Weathered SCHIST (drillers description)	(1.30)		
													4.80	222.70	
		(100)	0.00-10.00									Grey fractured SCHIST (drillers description)			

Remarks (See notes & keysheets)

1. Groundwater encountered at 21.65mbgl, stable after 20 mins.
2. Temporary road constructed to gain access, approximately 1.00m of peat removed.
3. Open hole drilling to 10.00m using 200mm down the hole hammer.
4. Variable head permeability testing carried out at 3.50m, 4.20m and 10.00mbgl.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH9 (1 of 3)

Drilling Method: Rotary Open Hole	Borehole Diameter / Casing Diameter	BOREHOLE No.	BH9
Equipment: Rotary Open Hole		Coordinates (National Grid)	199476.4 E, 409197.2 N
Drill Fluid: Air		Ground Level	227.50 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Checked by: [illegible]
Dates Drilled: Start 17/02/2003, End 17/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type TCR %	No. SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
17/02	5.00	1.65									(5.20)		
										End of Borehole	10.00	217.50	

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH9 (2 of 3)

304/02

Drilling Method: Rotary Open Hole	Borehole Diameter:	BOREHOLE No. BH9
Equipment: Rotary Open Hole Air 90	Casing Diameter:	Coordinates: 199476.4 E (National Grid): 409197.2 N Ground Level: 227.50 m OD
Dates Drilled: Start 17/02/2003 End 17/02/2003	Logged by: N/A Compiled by: dc 04/03/2003 Checked by: 01/04/03	

Description	Depth (m)	Level m OD	
Concrete	0.50	227.00	Upstanding cover. Pipe diameter 100mm to 10.00m.
Compacted Arisings	2.50	225.00	
Bentonite Seal	5.50	222.00	
Gravel Filter	10.00	217.50	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. BH9 (3 of 3)

Drilling Method: Rotary Cored	Borehole Diameter: 200mm to 10.15m	Casing Diameter: 200mm to 10.15m	**BOREHOLE No. BH10**
Equipment: Rotary Coring			Coordinates (National Grid): 199536.9 E, 408983.5 N
Drill Fluid			Ground Level: 237.15 m OD
Orientation (°): 90	Logged by: CL 12/03/2003	Compiled by: dc 07/03/2003	Checked by: [illegible]
Dates Drilled: Start 26/02/2003, End 26/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
26/02											90		MADE GROUND; Distubed Glacial Till.			
		(90)	0.00	1.00										(1.00)		
														1.00	236.15	
			1.00	1.45	D	1				S10			Light grey very silty/clayey sandy angular and subangular fine to coarse schist and psammite GRAVEL (Glacial Drift).			
		(90)	1.00	2.50												
			2.00		D	2								(2.20)		
			2.50	2.95						S14						
		(90)	2.50	3.20												
			3.00		D	3										
														3.20	233.95	
		(90)	3.20	3.60									Dark grey weathered SCHIST (Driller's description).	(0.40)		
			3.50		D	4								3.60	233.55	
		(90)	3.60	4.15	67		0		0				Grey slightly weathered fine grained PSAMMITE, strong locally interlaminated (5mm scale) with dark grey pelite moderately weak. Occasional bands/lenses (<20mm) of quartzite. Foliation weakly developed at 40 degrees on 1mm to 15mm scale. Between 3.60m and 6.00m; possible medium to closely spaced foliation inclined (40 degrees), planar to slightly irregular and clean locally possibly slightly polished. Rough drilling induced fractures along lines of weakness and subvertical anastomised partially quartz healed (<2mm) fractures. Stained non-drilling induces fractures are described individually. Between 3.60m and 3.73m; tight, planar, subvertical (80 degrees) rough iron stained fracture. Between 3.60m and 3.73m; vertical, irregular, possibly tight to open, rough, iron stained fracture.			
		(90)	4.15	4.95	100	48			29			4		(2.40)		

Remarks (See notes & keysheets)

1. Groundwater was encountered at 1.00m during drilling and rose to 0.70m after 20 mins.
2. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
3. A variable head permeability test was carried out at 2.50m, 3.60m and 11.80m.
4. Approximately 1.50m of peat and 0.10m of Glacial Till removed to gain access.
5. The borehole was advanced by open hole means by 200mm using a hammer and then progressed by rotary coring means.
6. RQD x SCR based upon assuming many schistocity parallel fractures and subvertical fractures are drilling induced.
7. Core runs 5 and 6 adjusted.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

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Figure No. BH10 (1 of 4)

Drilling Method: Rotary Cored	Borehole Diameter / Casing Diameter	**BOREHOLE No.**	**BH10**
Equipment: Rotary Coring		Coordinates (National Grid)	199536.9 E, 408983.5 N
Drill Fluid		Ground Level	237.15 m OD
Orientation (°): 90	Logged by: CL 12/03/2003	Compiled by: dc 07/03/2003	Checked by: 4/1/04
Dates Drilled: Start 26/02/2003, End 26/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
		(90)	4.95-5.95			97	53	0				Between 3.80m and 4.15m; non intact, fractured and poorly recovered. Recovered as coarse angular up to cobble sized rock fragments with some iron stained surfaces. Between 4.15m and 4.22m; probable inclined (40 degrees) planar, smooth to slightly polished fracture. Between 4.53m and 4.77m; one inclined (70 degrees) planar to slightly irregular possibly slightly open infilled with 1mm layer of sandy clay, iron stained fracture. Between 4.57m and 4.68m; one inclined truncated by adjoining fracture, planar, tight, rough slightly iron stained fracture. Beween 4.74m and 4.83m; two subvertical (80 degrees), planar to slightly irregular tight, rough, iron stained fractures with evidence of partial quartz healing (<1mm). Between 4.90m and 4.95m; highly fractured. Between 4.95m and 5.70m; possibly several vertical, irregular probably tight, rough, black iron stained and partially pyritised fractures. Between 5.20m and 5.80m; one vertical, irregular, tight, rough slightly iron stained fracture, probably composite. Between 5.95m and 6.00m; highly fractured.	6.00	231.15	
		(90)	5.95-7.15			100	85	67							
		(90)	7.15-8.65			99	99	95			1	Light pinkish grey slightly weathered to fresh fine grained PSAMMITE, strong with occasional bands/lenses of quartzite (5mm to 20mm scale). Foliation varies from 30 degrees to subhorizontal on 5mm to 15m scale. Evidence of overfolded structures and 's' vergence in quartzite bands. Between 6.00m and 10.15m; possible medium and closely spaced foliation parallel, planar, rough, clean drilling induced fractures. Between 6.40m and 6.50m; one composite, locally healed and possibly drilling induced, vertical/subvertical irregular, tight, iron stained fracture. Between 6.65m and 7.15m; highly fractured, but assumed all drilling induced along lines of weakness. Between 7.15m and 7.22m; one inclined, possibly tight, planar, rough and clean fracture.	(4.15)		
		(90)	8.65-10.15			100	100	97				Between 9.65m and 10.15m; highly fractured but drilling induced following pattern of irregular healed fractures.			

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH10 (2 of 4)

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH10**
Equipment: Rotary Coring			Coordinates 199536.9 E
Drill Fluid			(National Grid) 408983.5 N
Orientation (°): 90	Logged by: CL	Compiled by: dc	Ground Level 237.15 m OD
Dates Drilled: Start 26/02/2003	12/03/2003	07/03/2003	Checked by: 15/04/03
End 26/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Fracture Index	Description of Strata	Depth (Thickness) (m)	Level	Legend
26/02																
													End of Borehole	10.15	227.00	

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

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Figure No. BH10 (3 of 4)

304/02

Drilling Method: Rotary Cored	Borehole Diameter:	BOREHOLE No.: BH10
Equipment: Rotary Coring	Casing Diameter:	Coordinates (National Grid): 199536.9 E, 408983.5 N
Dates Drilled: Start 26/02/2003, End 26/02/2003	Logged by: CL 12/03/2003; Compiled by: dc 07/03/2003; Checked by: 01/4/03	Ground Level: 237.15 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	236.65	Upstanding cover. Pipe diameter 100mm to 10.15m.
Compacted Arisings	4.40	232.75	
Bentonite Seal	5.50	231.65	
Gravel Filter	10.15	227.00	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No.: E02755

Figure No.: BH10 (4 of 4)

Drilling Method: Rotary Open Hole	Borehole Diameter: 200mm to 10.00m	Casing Diameter: 200mm to 5.50m	**BOREHOLE No. BH11**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199669.8 E, 408992.9 N
Drill Fluid: Air			Ground Level: 244.75 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Checked by: [illegible] 01/04/03
Dates Drilled: Start 18/02/2003, End 18/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
18/02			3.00-3.38							C33/225	MADE GROUND: Gravel road construction	(1.00)		
												1.00	243.75	
											Brown PEAT (drillers description)	(1.70)		
												2.70	242.05	
			3.00	D	1						Light grey very silty / clayey sandy fine to coarse angular to subangular psammite and schist GRAVEL. (Glacial Drift)	(0.50)		
												3.20	241.55	
											Weathered SCHIST (drillers description)	(0.80)		
												4.00	240.75	
		(100)	0.00-10.00								Grey fractured SCHIST (drillers description)			

Remarks (See notes & keysheets)

1. Groundwater encountered at 2.00mbgl, stable after 20 mins.
2. Temporary road construction to gain access to positions, approximately 1.20m of peat removed.
3. Open hole drilling to 10.00m using 200mm down the hole hammer.
4. Variable head permeability testing carried out at 4.20m and 10.00mbgl.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
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Figure No. BH11 (1 of 3)

Drilling Method: Rotary Open Hole	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH11**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199669.8 E, 408992.9 N
Drill Fluid: Air			Ground Level: 244.75 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 04/03/2003	Checked by: 01/07/03
Dates Drilled: Start 18/02/2003, End 18/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
													(6.00)		
18/02	5.50	2.00										End of Borehole	10.00	234.75	

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
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Figure No. BH11 (2 of 3)

Drilling Method: Rotary Open Hole	Borehole Diameter / Casing Diameter	**BOREHOLE No. BH11**
Equipment: Rotary Open Hole; Air; 90		Coordinates (National Grid): 199669.8 E, 408992.9 N
Dates Drilled: Start 18/02/2003, End 18/02/2003	Logged by: N/A; Compiled by: dc 04/03/2003; Checked by: 01/04/03	Ground Level: 244.75 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	244.25	Upstanding cover. Pipe diameter 100mm to 7.00m.
Compacted Arisings	2.50	242.25	
Bentonite Seal	3.50	241.25	
Gravel Filter	7.00	237.75	
Compacted Arisings	10.00	234.75	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
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Figure No. BH11 (3 of 3)

Drilling Method: Rotary Cored	Borehole Diameter: 200mm to 10.00m	Casing Diameter: 200mm to 2.50m	**BOREHOLE No. BH12**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199687.5 E, 409067.2 N
Drill Fluid: Air			Ground Level: 243.15 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 07/03/2003	Checked by: 01/04/03
Dates Drilled: Start 01/03/2003, End 01/03/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
01/03		(99)	0.00-0.60								MADE GROUND: Gravel road construction.	(0.60)		
												0.60	242.55	
			1.00	D	1						Dark brown / black fibrous PEAT with many roots and vegetation fragments.			
		(99)	0.60-2.90									(2.30)		
			2.00	D	2									
			2.90-3.35							C30		2.90	240.25	
			3.00	D	3						Light grey very clayey silty sandy fine to coarse angular to subangular schist and psammite GRAVEL. (Glacial Drift)			
		(99)	2.90-3.90									(1.50)		
			4.00	D	4									
		(99)	3.90-4.20											
		(99)	4.20-4.40									4.40	238.75	
											Weathered grey SCHIST (drillers description)			
		(99)	4.40-5.60									(1.20)		

Remarks (See notes & keysheets)

1. Groundwater was encountered at 2.90m during drilling and rose to 2.40m after 20 mins.
2. Prior to boring a Cable Avoidance Tool (CAT) survey was carried out.
3. Variable head permeability testing carried out at 3.90m, 4.40m and 10.00mbgl.
4. Temporary road constructed, approximately 0.30m peat removed.
5. Rotary open hole drilling from ground level to 10.00m using 200mm down the hole hammer.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. BH12 (1 of 3)

Drilling Method: Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH12**
Equipment: Rotary Open Hole			Coordinates: 199687.5 E
Drill Fluid: Air			(National Grid): 409067.2 N
Orientation (°): 90	Logged by: N/A	Compiled by: dc	Ground Level: 243.15 m OD
Dates Drilled: Start 01/03/2003		07/03/2003	Checked by: 07/04/4
End 01/03/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From	To	Type TCR %	No. SCR %	RQD %	SPT Blows /N Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
			5.00		D	5						
									Purple grey SCHIST (drillers description)	5.60	237.55	
		(99)	5.60-10.00							(4.40)		
01/03	2.50	2.20										
									End of Borehole	10.00	233.15	

Remarks (See notes & keysheets)

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT
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Figure No. BH12 (2 of 3)

Drilling Method Rotary Cored	Borehole Diameter	Casing Diameter	**BOREHOLE No. BH12**
Equipment Rotary Open Hole			Coordinates 199687.5 E
Air			(National Grid) 409067.2 N
90			Ground Level 243.15 m OD
Dates Drilled Start 01/03/2003	Logged by N/A	Compiled by dc 07/03/2003	Checked by 01/04/03
End 01/03/2003			

Description	Depth (m)	Level m OD	
Concrete	0.50	242.65	Upstanding cover. Pipe diameter 50mm to 10.00m.
Compacted Arisings	4.50	238.65	
Bentonite Seal	5.50	237.65	
Gravel Filter	10.00	233.15	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FOUNDATION & EXPLORATION SERVICES

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MEENABOLL LANDFILL PROJECT
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Figure No. BH12 (3 of 3)

Drilling Method: Rotary Cored	Borehole Diameter: 200mm to 10.00m	Casing Diameter: 200mm to 2.70m	**BOREHOLE No. BH13**
Equipment: Rotary Open Hole			Coordinates (National Grid): 199545.6 E, 409044.3 N
Drill Fluid: Air			Ground Level: 237.00 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 07/03/2003	Checked by: [illegible] 21/07/03
Dates Drilled: Start 27/02/2003, End 27/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thickness) (m)	Level	Legend
27/02		(99)	0.00-0.70								MADE GROUND: Gravel road construction.	(0.70)		
												0.70	236.30	
		(99)	1.00 0.70-1.50	D	1						Light grey very clayey / silty sandy fine to coarse angular and subangular schist and psammite GRAVEL. (Glacial Drift)			
		(99)	1.50-1.70 1.50-1.95							S13		(2.00)		
			2.00	D	2									
		(99)	1.70-2.70											
												2.70	234.30	
		(99)	2.70-2.90								Weathered grey SCHIST.			
			3.00	D	3									
			4.00	D	4							(2.70)		
		(99)	2.90-5.40											
			5.00	D	5									

Remarks (See notes & keysheets)

1. Groundwater was encountered at 0.70m during drilling and rose to 0.40m after 20 mins.
2. Prior to boring a Cable Avoidance Tool (CAT) survey was carried out.
3. Temporary road construction to access borehole approximately 0.80m peat and 0.30m of glacial drift removed.
4. Rotary open hole drilling from ground level to 10.0mm by 200mm down the hole hammer.
5. Variable head permeability testing carried out at 1.70m, 2.90m and 10.00mbgl.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

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Figure No. BH13 (1 of 3)

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Drilling Method: Rotary Cored	Borehole Diameter / Casing Diameter	**BOREHOLE No. BH13**	
Equipment: Rotary Open Hole		Coordinates (National Grid)	199545.6 E, 409044.3 N
Drill Fluid: Air		Ground Level	237.00 m OD
Orientation (°): 90	Logged by: N/A	Compiled by: dc 07/03/2003	Checked by:
Dates Drilled: Start 27/02/2003, End 27/02/2003			

Date & Time	Casing Depth (m)	Water Depth (m) (Flush Return) %	Sample/Core Recovery: Depth (m) From–To	Type	No.	TCR %	SCR %	RQD %	SPT Blows /N	Core Size (mm)	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
		(99)	5.40-5.70								Grey SCHIST (drillers description)	5.40 (0.30) 5.70	231.60 231.30	
		(99)	5.70-6.30								Green grey SCHIST (drillers description)	(0.60) 6.30	230.70	
		(99)	6.30-7.55								Dark grey SCHIST (drillers description)	(1.25) 7.55	229.45	
		(99)	7.55-10.00								Purple grey SCHIST (drillers description)	(2.45) 10.00	227.00	
27/02	2.70	1.22									End of Borehole			

Remarks (See notes & keysheets)

Scale 1:25

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Figure No. BH13 (2 of 3)

Drilling Method Rotary Cored Equipment Rotary Open Hole Air 90 Dates Drilled Start 27/02/2003 End 27/02/2003	Borehole Diameter Casing Diameter Logged by N/A Compiled by dc 07/03/2003 Checked by 20/6/3	**BOREHOLE No. BH13** Coordinates 199545.6 E (National Grid) 409044.3 N Ground Level 237.00 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	236.50	Upstanding cover. Pipe diameter 50mm to 10.00m.
Compacted Arisings	4.50	232.50	
Bentonite Seal	5.50	231.50	
Gravel Filter	10.00	227.00	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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Figure No. BH13 (3 of 3)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP1
Surface Dimensions	1.00m x 2.00m		
Date Excavated	Start 07/02/2003		Coordinates 199655.4 E
	End 07/02/2003	90°	(National Grid) 409417.0 N
Logged by	Compiled by	Checked by	Ground Level 231.45 m OD
TJ	rej		
07/02/2003	12/02/2003		

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey, fibrous PEAT.	(1.60)		
			1.60	D	2	Firm to stiff blue grey slightly sandy slightly gravelly CLAY/very clayey SAND and GRAVEL. Sand is medium to coarse. Gravel is subangular to subrounded fine to coarse weathered schist.	1.60	229.85	
			1.60	B	3				
			2.50	D	4		(2.40)		
			3.50	D	5	At 3.90m; possible rockhead.			
			4.00	D	6	End of Trial Pit	4.00	227.45	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during excavation.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 3.90m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP1 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP2
Surface Dimensions	1.00m x 2.00m		
Date Excavated Start	07/02/2003		Coordinates 199932.4 E
End	07/02/2003	90°	(National Grid) 409345.3 N
Logged by TJ	Compiled by rej	Checked by	Ground Level 249.45 m OD
2/2003	12/02/2003		

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Some wood fragments up to 90mm.	(1.50)		
			1.50	D	2		1.50	247.95	
			1.50	B	3	Firm to stiff blue grey slightly sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is medium to coarse grained. Gravel is subangular to subrounded fine to coarse weathered schist and medium grained yellow sandstone.	(2.00)		
			2.50	D	4				
			3.50	D	5	At 3.40m; possible rockhead	3.50	245.95	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 3.40m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP2 (1 of 1)

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Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP3
Surface Dimensions	1.00m x 2.00m		
Date Excavated	Start 07/02/2003		Coordinates 199534.1 E
	End 07/02/2003	90°	(National Grid) 409145.9 N
Logged by	Compiled by	Checked by	Ground Level 232.30 m OD
TJ	rej		
07/02/2003	12/03/2003	01/4/03	

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown very soft slightly clayey fibrous PEAT. Wood fragments up to 60mm.	(1.00)		
			1.00	D	2		1.00	231.30	
			1.00	B	3	Firm to stiff blue grey slightly sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is medium to coarse grained. Gravel is subangular to subrounded fine to coarse weathered schist.			
			2.00	D	4				
			3.00	D	5		(3.50)		
			4.00	D	6				
						End of Trial Pit	4.50	227.80	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Trial pit moved to near survey point 33 at clients request.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP3 (1 of 1)

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Method of Excavation	JCB 3CX
Surface Dimensions	1.00m x 2.00m
Date Excavated	Start 06/02/2003
	End 06/02/2003

Plan: 90°

TRIAL PIT No. TP4

Coordinates	199724.4	E
(National Grid)	409071.8	N
Ground Level	245.10	m OD

Logged by	Compiled by	Checked by
TJ	rej	
[illegible]2/2003	12/02/2003	

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Large amounts of rootlets. Wood fragments up to 70mm.	(1.40)		
			1.50	D	2	Soft becoming firm grey blue with depth slightly sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse weathered schist, quartzite and medium grained yellow sandstone.	1.40	243.70	
			1.50	B	3				
			2.50	D	4		(3.10)		
			3.50	D	5				
			4.50	D	6	End of Trial Pit	4.50	240.60	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was encountered at 3.40m during excavation.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP4 (1 of 1)

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Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP5
Surface Dimensions	1.00m x 2.00m		Coordinates 200026.8 E
Date Excavated Start	05/02/2003	90°	(National Grid) 409230.8 N
End	05/02/2003		Ground Level 255.90 m OD
Logged by TJ 05/02/2003	Compiled by rej 12/02/2003	Checked by MJ 14/3	

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown very soft slightly clayey, fibrous PEAT. Strong organic smell. Wood fragments up to 70mm.			
			1.00	D	2				
			2.00	D	3		(4.00)		
			3.00	D	4				
						At 4.00m; possible rockhead	4.00	251.90	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were unstable during excavation.
2. Groundwater was encountered at 0.60m during excavation.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. The trial pit was terminated at 4.00m due to pit collapsing on all sides.
5. Possible bedrock encountered at 4.00m (no samples recovered).
6. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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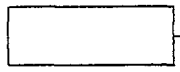
Figure No. TP5 (1 of 1)

Method of Excavation	JCB 3CX
Surface Dimensions	1.00m x 2.00m
Date Excavated Start	07/02/2003
End	07/02/2003

Plan



TRIAL PIT No. TP6

Coordinates	199905.8	E
(National Grid)	409270.8	N
Ground Level	249.70	m OD

Logged by	Compiled by	Checked by
TJ	rej	
07/02/2003	12/02/2003	14/2

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Wood fragments up to 30mm.	(1.50)		
			1.50	D	2				
			1.50	B	3	Firm to stiff blue grey slightly sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is medium to coarse grained. Gravel is angular to subrounded fine to coarse weathered schist.	1.50	248.20	
			2.50	D	4		(2.50)		
			3.50	D	5	At 3.90m; possible rockhead			
			4.00	D	6		4.00	245.70	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. On completion the trial pit was backfilled with compacted arisings.
5. Difficult to excavate possible rock at 3.90m.

Scale 1:25

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Figure No. TP6 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP7
Surface Dimensions	1.00m x 2.00m		Coordinates 199775.7 E
Date Excavated Start	07/02/2003	90°	(National Grid) 409309.7 N
End	07/02/2003		Ground Level 241.70 m OD
Logged by TJ 07/02/2003	Compiled by rej 12/02/2003	Checked by 11/4/03	

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Wood fragments up to 30mm in length.	(0.80)		
			0.80	D	2		0.80	240.90	
			0.80	B	3	Firm to stiff blue grey slightly sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is medium to coarse. Gravel is subangular to subrounded fine to coarse weathered schist and medium grained yellow sandstone.			
			1.00	D	4				
			2.00	D	5		(2.70)		
			3.50	D	6	At 3.50m; possible rockhead.	3.50	238.20	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was encountered at peat/clay boundary.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. On completion the trial pit was backfilled with compacted arisings.
5. Difficult to excavate possible rock at 3.50m.

Scale 1:25

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Figure No. TP7 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP8
Surface Dimensions	1.00m x 2.00m		
Date Excavated	Start 07/02/2003		Coordinates 199542.2 E
	End 07/02/2003	90°	(National Grid) 409259.4 N
Logged by IJ	Compiled by rej	Checked by	Ground Level 226.70 m OD
12/2003	12/02/2003	14/2	

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Wood fragments up to 70mm in length.	(1.30)		
			1.30	D	2		1.30	225.40	
			1.30	B	3	Firm to stiff grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is medium to coarse. Gravel is subangular to subrounded fine to coarse. Gravel consists of weathered schist and quartzite.			
			2.50	D	4		(3.20)		
			3.50	D	5				
			4.50	D	6		4.50	222.20	
						End of Trial Pit			

Remarks (See notes & keysheets)
1 The walls of the pit were stable during excavation.
2 Groundwater was not apparent during boring.
3 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4 On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP8 (1 of 1)

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Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP9
Surface Dimensions	1.00m x 2.00m		
Date Excavated Start	07/02/2003		Coordinates 199505.4 E
End	07/02/2003	90°	(National Grid) 409283.5 N
			Ground Level 222.65 m OD
Logged by TJ 07/02/2003	Compiled by rej 12/02/2003	Checked by	

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey spongy, fibrous PEAT. Wood pieces up to 70mm.	(0.80)		
			0.80	D	2		0.80	221.85	
			0.80	B	3	Grey blue very silty SAND and GRAVEL. Sand is medium to coarse grained. Gravel is fine to coarse weathered schist and quartzite.			
			2.00	D	4		(3.70)		
			3.00	D	5				
			4.00	D	6				
						End of Trial Pit	4.50	218.15	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP9 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP10
Surface Dimensions	1.00m x 2.00m		Coordinates 199743.9 E
Date Excavated Start	07/02/2003	90°	(National Grid) 409179.6 N
End	07/02/2003		Ground Level 242.15 m OD
Logged by TJ	Compiled by rej	Checked by	
07/02/2003	12/02/2003		

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy light brown becoming dark brown slightly clayey fibrous PEAT. Wood fragments up to 70mm.	(0.80)		
			0.80	D	2		0.80	241.35	
			0.80	B	3	Firm to stiff grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is medium to coarse. Gravel is subangular to subrounded fine to coarse weathered schist.			
			2.00	D	4		(2.20)		
						At 2.90m; possible rockhead.			
			3.00	D	5		3.00	239.15	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. On completion the trial pit was backfilled with compacted arisings.
5. Difficult to excavate possible rock at 2.90m.

Scale 1:25

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Figure No. TP10 (1 of 1)

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Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP11
Surface Dimensions	1.00m x 2.00m		
Date Excavated Start	05/02/2003		Coordinates 199814.3 E
End	05/02/2003	90°	(National Grid) 409195.7 N
			Ground Level 246.75 m OD
Logged by TJ 05/02/2003	Compiled by rej 13/02/2003	Checked by [illegible]	

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Strong organic odour noted. Wood fragments up to 70mm long.	(1.00)		
			1.00	D	2		1.00	245.75	
			1.00	B	3	Stiff grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to coarse grained. Gravel is subangular to angular fine to coarse weathered schist, quartzite and fine medium grained yellow sandstone. Between 1.00m and 1.30m: soft.			
			2.00	D	4		(3.00)		
			3.00	D	5	At 3.90m; possible rockhead.			
			4.00	D	6	End of Trial Pit	4.00	242.75	

Remarks (See notes & keysheets)

1. The walls of the pit were unstable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. On completion the trial pit was backfilled with compacted arisings.
5. Difficult to excavate possible rock at 3.90m.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

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Figure No. TP11 (1 of 1)

302:02

Method of Excavation JCB 3CX
Surface Dimensions 1.00m x 2.00m
Date Excavated Start 05/02/2003
End 05/02/2003

Logged by TJ 05/02/2003
Compiled by rej 13/02/2003
Checked by 14/2/03

Plan

TRIAL PIT No. TP12

Coordinates 199898.6 E
(National Grid) 409155.3 N
Ground Level 252.10 m OD

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Strong organic smell. Large wood fragments up to 70mm in length.			
			1.50	D	2		(4.00)		
			2.50	D	3				
						End of Trial Pit	4.00	248.10	

Remarks (See notes & keysheets)
1 The walls of the pit were unstable during excavation.
2 Groundwater was encountered at 2.50m during excavation.
3 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4 The trial pit was terminated at 4.00m due to instability.
5 On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP12 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP13
Surface Dimensions	1.00m x 2.00m		
Date Excavated Start	05/02/2003		Coordinates 199945.3 E
End	05/02/2003	90°	(National Grid) 409050.6 N
Logged by TJ 05/02/2003	Compiled by rej 13/02/2003	Checked by 14/3	Ground Level 255.35 m OD

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey spongy, fibrous PEAT. Strong organic odour noted. Wood fragments up to 70mm.			
			1.00	D	2				
							(3.00)		
			2.00	D	3				
			3.00	B	4		3.00	252.35	
						Stiff grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to coarse grained. Gravel is subangular to angular fine to coarse weathered schist, quartzite and medium grained yellow sandstone. Between 3.00m and 3.20m: soft.	(1.00)		
						At 3.90m; possible rockhead.			
			4.00	D	5		4.00	251.35	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 3.90m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

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Figure No. TP13 (1 of 1)

302/02

Method of Excavation JCB 3CX
Surface Dimensions 1.00m x 2.00m
Date Excavated Start 06/02/2003
End 06/02/2003

Logged by TJ 06/02/2003
Compiled by rej 13/02/2003
Checked by 17/4/03

Plan

TRIAL PIT No. TP14

Coordinates (National Grid) 199827.3 E 409058.9 N
Ground Level 250.10 m OD

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey spongy, fibrous PEAT. Strong organic odour. Wood fragments up to 70mm long.			
			1.50	D	2		(3.50)		
			2.50	D	3				
			3.50	D	4				
						Stiff grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to coarse grained. Gravel is subangular to subrounded fine to coarse and consists of weathered schist, quartzite and medium grained yellow sandstone.	3.50	246.60	
							(1.00)		
			4.50	D	5				
			4.50	B	6	End of Trial Pit	4.50	245.60	

Remarks (See notes & keysheets)
1 The walls of the pit were stable during excavation.
2 Groundwater was not apparent during boring.
3 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4 On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Project
MEENABOLL LANDFILL PROJECT
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Contract No. E02755

Figure No. TP14 (1 of 1)

Method of Excavation	JCB 3CX	Plan	**TRIAL PIT No. TP15**
Surface Dimensions	1.00m x 2.00m		Coordinates 199686.2 E
Date Excavated Start	06/02/2003	90°	(National Grid) 409167.4 N
End	06/02/2003		Ground Level 237.70 m OD
Logged by TJ 06/02/2003	Compiled by rej 12/02/2003	Checked by	

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Wood fragments up to 70mm long.	(0.90)		
			0.90	D	2		0.90	236.80	
			0.90	B	3	Firm to stiff grey blue sandy gravelly CLAY/very clayey very gravelly SAND. Sand is fine to coarse grained. Gravel is subangular to subrounded fine to coarse weathered schist and quartzite.			
			2.00	D	4		(3.10)		
			3.00	D	5				
						At 3.90m; possible rockhead			
			4.00	D	6		4.00	233.70	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was encountered at 3.00m on the peat/clay boundary.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 3.90m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. TP15 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP16
Surface Dimensions	1.00m x 2.00m		Coordinates 199490.5 E
Date Excavated Start	06/02/2003	90°	(National Grid) 409152.5 N
End	06/02/2003		Ground Level 229.85 m OD
Logged by TJ	Compiled by rej 12/02/2003	Checked by	

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.40	D	1	Spongy dark brown slightly clayey fibrous PEAT.	(0.40)		
			0.50	D	2	Firm to stiff grey blue sandy gravelly CLAY/very sandy very gravelly SAND. Sand is fine to medium grained. Gravel is subangular to subrounded fine to coarse weathered schist.	0.40	229.45	
			0.50	B	3				
			1.50	D	4				
			2.50	D	5		(3.10)		
			3.50	D	6	At 3.40m; possible rockhead.			
						End of Trial Pit	3.50	226.35	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 3.40m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Project: MEENABOLL LANDFILL PROJECT
SITE INVESTIGATION

Contract No. E02755

Figure No. TP16 (1 of 1)

Method of Excavation	JCB 3CX	Plan	**TRIAL PIT No. TP17**
Surface Dimensions	1.00m x 2.00m		
Date Excavated Start	06/02/2003		Coordinates 199508.5 E
End	06/02/2003	90°	(National Grid) 409076.6 N
			Ground Level 233.55 m OD
Logged by TJ 06/02/2003	Compiled by rej 12/02/2003	Checked by 14/4/03	

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.30	D	1	Spongy dark brown slightly clayey fibrous PEAT. Wood fragments up to 70mm.	(0.40)		
			0.40	D	2		0.40	233.15	
			0.40	B	3	Stiff to firm grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to coarse grained. Gravel is subangular to subrounded fine to coarse quartzite and weathered schist.			
			1.50	D	4		(2.60)		
			2.50	D	5				
						At 2.90m; possible rockhead.			
			3.00	D	6		3.00	230.55	
						End of Trial Pit			

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 2.90m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Project: MEENABOLL LANDFILL PROJECT
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Figure No. TP17 (1 of 1)

302/02

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP18
Surface Dimensions	1.00m x 2.00m		
Date Excavated Start	06/02/2003		Coordinates 199550.6 E
End	06/02/2003	90°	(National Grid) 409091.0 N
Logged by TJ	Compiled by rej	Checked by	Ground Level 235.45 m OD
02/2003	12/02/2003		

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Wood fragments up to 65mm.	(2.00)		
			1.50	D	2				
			2.00	B	3				
			2.00	D	4	Grey blue very gravelly very silty SAND. Some local green/brown soft CLAY. Sand is medium to coarse grained. Gravel is angular to subrounded fine to coarse weathered schist.	2.00	233.45	
			3.00	D	5		(2.50)		
			4.00	B	6				
						End of Trial Pit	4.50	230.95	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract No. E02755

Figure No. TP18 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP19
Surface Dimensions	1.00m x 2.00m		
Date Excavated Start	06/02/2003		Coordinates 199731.8 E
End	06/02/2003	90°	(National Grid) 408996.1 N
			Ground Level 247.40 m OD
Logged by TJ 06/02/2003	Compiled by rej 12/03/2003	Checked by [illegible]	

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Strong organic odour. Wood fragments up to 50mm long.	(2.00)		
			1.50	D	2				
			2.00	D	3		2.00	245.40	
			2.00	B	4	Firm becoming stiff with depth grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to coarse. Gravel is angular to subangular fine to coarse weathered schist, quartzite and medium grained yellow sandstone.	(1.50)		
			3.00	D	5				
						At 3.40m; possible rockhead.			
			3.50	D	6	End of Trial Pit	3.50	243.90	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during excavation.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 3.40m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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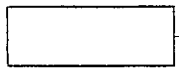
Figure No. TP19 (1 of 1)

Method of Excavation JCB 3CX
Surface Dimensions 1.00m x 2.00m
Date Excavated Start 06/02/2003
End 06/02/2003

Logged by TJ 02/2003
Compiled by rej 13/02/2003
Checked by 10/4/03

Plan



TRIAL PIT No. TP20

Coordinates (National Grid) 199811.3 E, 408944.8 N
Ground Level 253.15 m OD

In-situ Testing			Samples			Description of Strata	Depth (Thickness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Strong organic odour noted.	(2.00)		
			1.50	D	2				
			2.00	B	3				
			2.00	B	4	Firm becoming stiff with depth grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to medium grained. Gravel is angular to subrounded fine to coarse weathered schist, quartzite and yellow medium grained sandstone.	2.00	251.15	
			3.00	D	5	At 3.40m; possible rockhead.	(1.50)		
			3.50	D	6	End of Trial Pit	3.50	249.65	

Remarks (See notes & keysheets)
1 The walls of the pit were stable during excavation.
2 Groundwater was not apparent during boring.
3 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4 Difficult to excavate possible rock at 3.40m.
5 On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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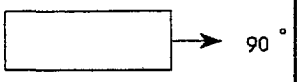
Figure No. TP20 (1 of 1)

Method of Excavation	JCB 3CX
Surface Dimensions	1.00m x 2.00m
Date Excavated Start	06/02/2003
End	06/02/2003

Plan



TRIAL PIT No. TP21

Coordinates	199694.3	E
(National Grid)	408863.9	N
Ground Level	248.95	m OD

Logged by	Compiled by	Checked by
TJ	rej	
06/02/2003	12/02/2003	01/4/03

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy light brown becoming darker with depth slightly clayey fibrous PEAT. Wood fragments up to 70mm.	(1.30)		
			1.30	D	2		1.30	247.65	
			1.30	B	3	Stiff to firm, grey blue sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to coarse grained. Gravel is subangular to subrounded fine to coarse weathered schist and yellow medium grained sandstone.			
			2.00	D	4		(2.90)		
			3.00	D	5				
			4.00	D	6	At 4.10m; possible rockhead.			
						End of Trial Pit	4.20	244.75	

Remarks (See notes & keysheets)

1 The walls of the pit were stable during excavation.
2 Groundwater was encountered on the peat/clay boundary.
3 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4 Difficult to excavate possible rock at 4.10m.
5 On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Figure No. TP21 (1 of 1)

Method of Excavation	JCB 3CX	Plan	TRIAL PIT No. TP22
Surface Dimensions	1.00m x 2.00m		Coordinates 199563.3 E
Date Excavated Start	06/02/2003	90°	(National Grid) 408942.5 N
End	06/02/2003		Ground Level 240.90 m OD
Logged by TJ	Compiled by rej	Checked by	
06/02/2003	12/02/2003	14/4/03	

In-situ Testing			Samples			Description of Strata	Depth (Thick-ness) (m)	Level	Legend
Depth (m)	Type	Result	Depth (m)	Type	No.				
			0.50	D	1	Spongy dark brown slightly clayey fibrous PEAT. Wood fragments up to 70mm.	(1.00)		
			1.00	D	2		1.00	239.90	
			1.00	B	3	Firm dark grey blue firm sandy gravelly CLAY/very clayey SAND and GRAVEL. Sand is fine to medium grained. Gravel is subangular to subrounded fine to coarse weathered schist.	(1.00)		
						At 1.90m; possible rockhead.			
			2.00	D	4	End of Trial Pit	2.00	238.90	

Remarks (See notes & keysheets)

1. The walls of the pit were stable during excavation.
2. Groundwater was not apparent during boring.
3. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
4. Difficult to excavate possible rock at 1.90m.
5. On completion the trial pit was backfilled with compacted arisings.

Scale 1:25

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Project: MEENABOLL LANDFILL PROJECT
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Figure No. TP22 (1 of 1)

APPENDIX B

FIELD TEST RESULTS

Water Level and Gas Readings in Standpipe Piezometers	Figures FT1/1 TO FT1/13
Mackintosh Probing Test Results	Figures FT2/1 to FT2/50
Variable Head Permeability Test Results	Figures FT3/1 to FT3/40
Packer Permeability Test Results	Figure FT4/1
Datalogger Installation Data Sheet	Figure FT5/1

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	21.70 m	Borehole No	BH1(1)
Datum	Ground Level	Datum Elevation	249.65 m OD	Response Zone	15.00-21.70m
Installation Date	15/02/2003	Commissioned by	CDL	Commission Date	19/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
25/02/2003	17:00	CDL	1.61	248.04	Ground level raised approximately 0.30m.
19/03/2003	17:00	CDL	1.61	248.04	Waterra inertia pump and solinst datalogger installed

		Input by	Date	Checked by	Date		
			01/04/2003		7/4/3		

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Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract: E02755

Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	12.35 m	Borehole No	BH2(1)
Datum	Ground Level	Datum Elevation	242.05 m OD	Response Zone	7.50-12.35m
Installation Date	17/02/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
25/02/2003	16:55	CDL	1.53	240.52	Ground level raised approximately 0.30m.
20/03/2003	09:10	CDL	1.68	240.37	Waterra inertia pump and solinst datalogger installed

		Input by	Date	Checked by	Date		
			01/04/2003		11/04/03		

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Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	12.65 m	Borehole No	BH3(1)
Datum	Ground Level	Datum Elevation	233.25 m OD	Response Zone	8.00-12.65m
Installation Date	25/02/2003	Commissioned by		Commission Date	

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
20/02/2003	00:00				Unable to open.
26/02/2003	10:05	CDL	-0.39	233.64	Artesian >0.39m above present ground level. Ground level reduced by 1.50m.

		Input by	Date	Checked by	Date		
			01/04/2003	NB	7/4/03		

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Contract: E02755

Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	15.00 m	Borehole No	BH4(1)
Datum	Ground Level	Datum Elevation	254.05 m OD	Response Zone	7.00-15.00m
Installation Date	11/02/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
25/02/2003	16:45	CDL	2.79	251.26	Ground level raised approximately 0.30m.
20/03/2003	11:20	CDL	2.70	251.35	Waterra inertia pump and solinst datalogger installed.

		Input by	Date	Checked by	Date		
			01/04/2003		16/4/3		

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Contract: E02755

Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	10.00 m	Borehole No	BH5(1)
Datum	Ground Level	Datum Elevation	248.55 m OD	Response Zone	5.50-10.00m
Installation Date	20/03/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
20/03/2003	10:50	CDL	0.04	248.51	Waterra inertia pump and solinst datalogger installed.

		Input by	Date	Checked by	Date		
			01/04/2003		1/4/03		

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Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	9.70 m	Borehole No	BH6(1)
Datum	Ground Level	Datum Elevation	221.55 m OD	Response Zone	5.00-9.70m
Installation Date	18/02/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
25/02/2003	15:05	CDL	-0.16	221.71	Present ground level reduced to 0.60m
20/03/2003	13:20	CDL	0.08	221.47	Waterra inertia pump and solinst datalogger installed

		Input by	Date	Checked by	Date		
			01/04/2003		1/04/03		

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Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	10.00 m	Borehole No	BH7(1)
Datum	Ground Level	Datum Elevation	232.30 m OD	Response Zone	3.50-10.00m
Installation Date	14/02/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
25/02/2003	17:30	CDL	0.79	231.51	Present ground level reduced by 0.80m
20/03/2003	13:45	CDL	0.76	231.54	Waterra inertia pump and solinst datalogger installed

		Input by	Date	Checked by	Date		
			01/04/2003	IB	01/04/13		

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Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	10.10 m	Borehole No	BH8(1)
Datum	Ground Level	Datum Elevation	246.95 m OD	Response Zone	5.60-10.10m
Installation Date	13/02/2003	Commissioned by		Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (*m below datum*)	Water Level (*m OD*)	Remarks and Samples Taken
25/02/2003	16:50	CDL	2.26	244.69	Ground level raised approximately 0.30m.
20/03/2003	00:00	CDL			Unable to open

		Input by	Date	Checked by	Date		
			01/04/2003		1/4/03		

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Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	10.00 m	Borehole No	BH9(1)
Datum	Ground Level	Datum Elevation	227.50 m OD	Response Zone	5.50-10.00m
Installation Date	20/03/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
20/03/2003	14:45	CDL	1.64	225.86	Waterra inertia pump installed

		Input by	Date	Checked by	Date		
			01/04/2003		1/4/3		

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Contract: E02755

Figure No:

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	10.15 m	Borehole No	BH10(1)
Datum	Ground Level	Datum Elevation	237.15 m OD	Response Zone	5.50-10.15m
Installation Date	20/03/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
20/03/2003	12:35	CDL	0.15	237.00	Waterra inertia pump installed.

		Input by	Date	Checked by	Date		
			01/04/2003				

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Contract: E02755

Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	7.00 m	Borehole No	BH11(1)
Datum	Ground Level	Datum Elevation	244.75 m OD	Response Zone	3.50-7.00m
Installation Date	18/02/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
25/02/2003	16:40	CDL	1.51	243.24	Ground level raised approximately 0.30m.
20/03/2003	10:30	CDL	1.51	243.24	

		Input by	Date	Checked by	Date		
			01/04/2003		1/4/03		

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Contract: E02755

Figure No

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	7.00 m	Borehole No	BH11(1)
Datum	Ground Level	Datum Elevation	244.75 m OD	Response Zone	3.50-7.00m
Installation Date	18/02/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
25/02/2003	16:40	CDL	1.51	243.24	Ground level raised approximately 0.30m.
20/03/2003	10:30	CDL	1.51	243.24	

		Input by	Date	Checked by	Date		
			01/04/2003		1/4/03		

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract: E02755

Figure No:

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	10.00 m	Borehole No	BH12(1)
Datum	Ground Level	Datum Elevation	243.15 m OD	Response Zone	5.50-10.00m
Installation Date	20/03/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
20/03/2003	09:50	CDL	1.42	241.73	Waterra inertia pump and solinst datalogger installed

		Input by	Date	Checked by	Date		
			01/04/2003		1/4/2		

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract: E02755

Figure No:

RECORD OF WATER LEVELS IN STANDPIPES AND PIEZOMETERS

Installation Details

Type	SP	Depth	10.00 m	Borehole No	BH13(1)
Datum	Ground Level	Datum Elevation	237.00 m OD	Response Zone	5.50-10.00m
Installation Date	20/03/2003	Commissioned by	CDL	Commission Date	20/03/2003

Reading Details

Date	Time	Operator	Depth to Water (m below datum)	Water Level (m OD)	Remarks and Samples Taken
20/03/2003	00:00	CDL			Unable to open

		Input by	Date	Checked by	Date		
			01/04/2003		1/04/3		

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL PROJECT SITE INVESTIGATION

Contract: E02755

Figure No

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA1	Easting	199655.3	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409415.6	Approved by:		Date:	
Operative	TJ	Ground Level	231.80	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	1		
0.45	2		
0.55	3		
0.65	1		
0.75	2		
0.85	2		
0.95	2		
1.05	2		
1.15	2		
1.25	2		
1.35	2		
1.45	2		
1.55	3		
1.65	3		
1.75	8		
1.85	29		

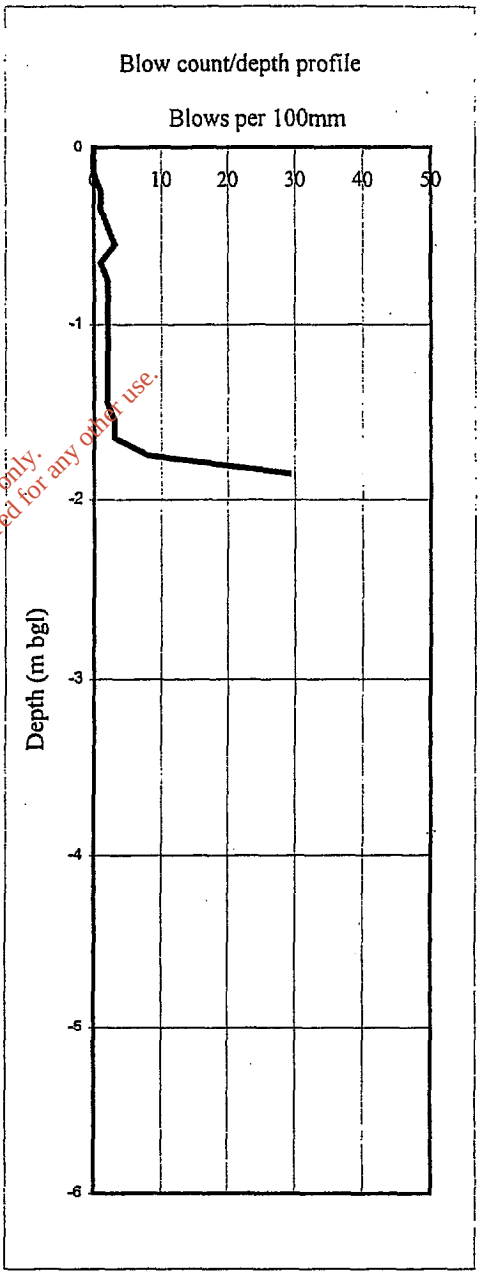


Figure FT 2/1

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA2	Easting	199738.4	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409362.8	Approved by:		Date:	
Operative	TJ	Ground Level	236.65	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	1		
0.45	1		
0.55	2		
0.65	2		
0.75	3		
0.85	36		

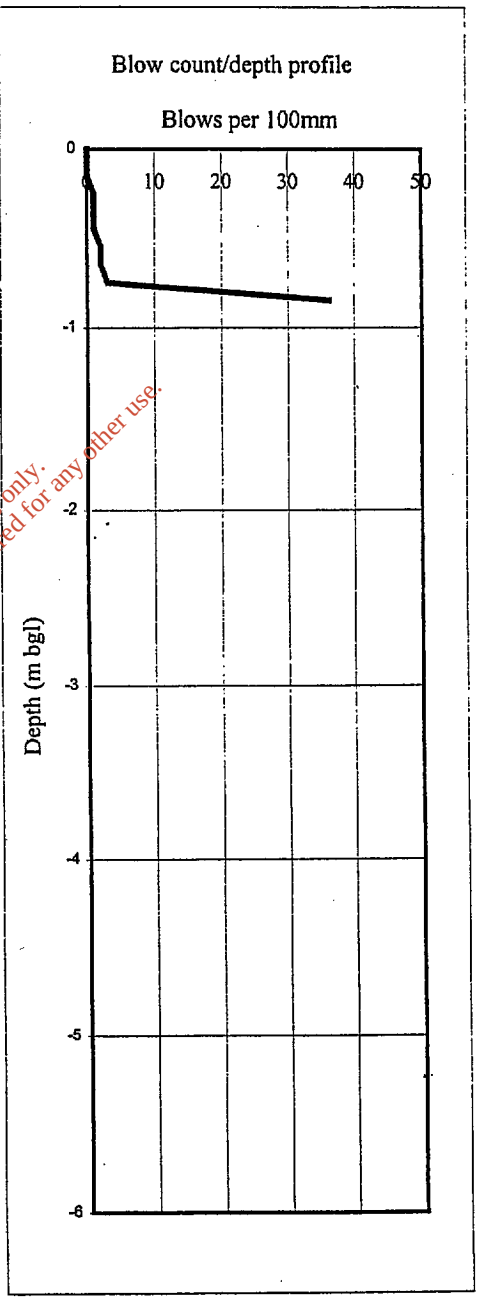


Figure FT 2/2

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA3	Easting	199849.2	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409346.5	Approved by:		Date:	
Operative	TJ	Ground Level	245.05	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	4		
0.55	1		
0.65	1		
0.75	1		
0.85	1		
0.95	1		
1.05	1		
1.15	2		
1.25	2		
1.35	2		
1.45	3		
1.55	3		
1.65	4		
1.75	3		
1.85	3		
1.95	4		
2.05	4		
2.15	5		
2.25	29		

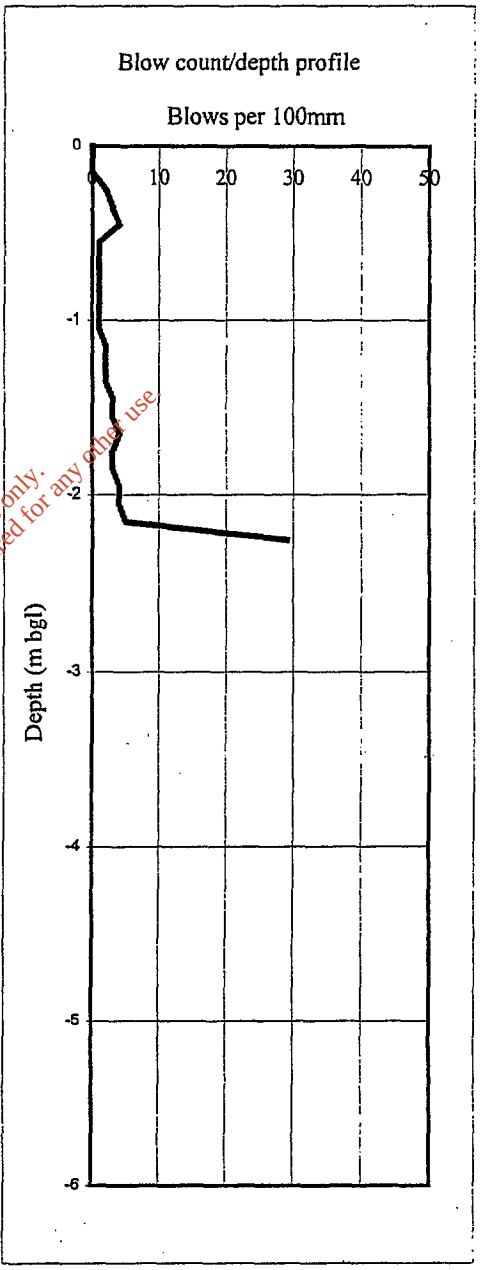


Figure FT 2/3

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA4	Easting	199927.4	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409294.1	Approved by:		Date:	
Operative	TJ	Ground Level	250.40	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	1		
0.45	0		
0.55	0		
0.65	0		
0.75	0		
0.85	0		
0.95	0		
1.05	2		
1.15	2		
1.25	3		
1.35	3		
1.45	2		
1.55	1		
1.65	2		
1.75	2		
1.85	3		
1.95	3		
2.05	5		
2.15	7		
2.25	31		

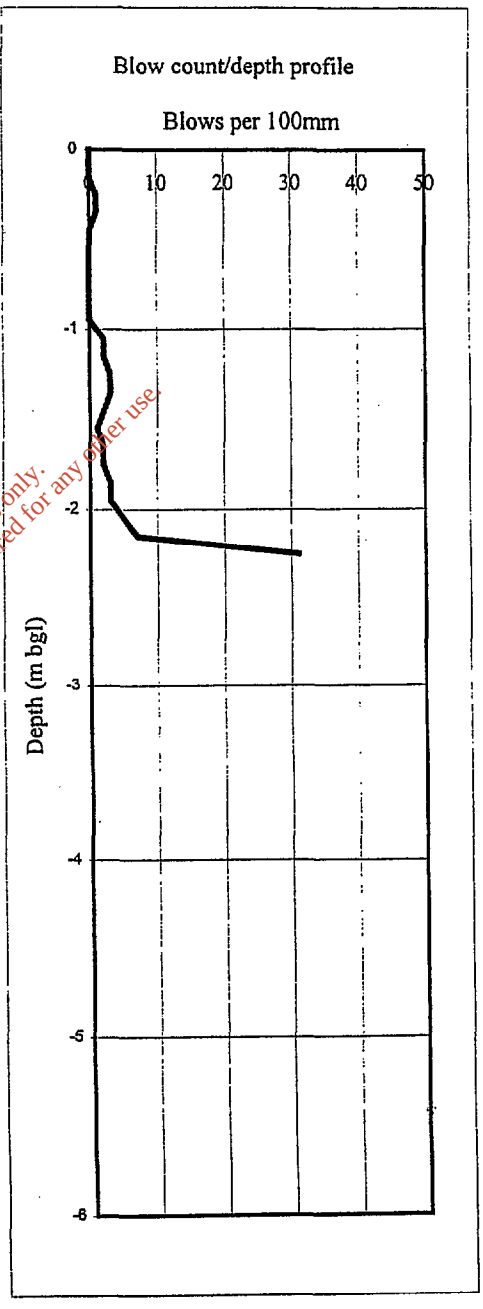


Figure FT 2/4

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA5	Easting	200041.9	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409274.4	Approved by:		Date:	
Operative	TJ	Ground Level	255.90	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	2		
0.45	1		
0.55	1		
0.65	0		
0.75	1		
0.85	1		
0.95	1		
1.05	1		
1.15	1		
1.25	0		
1.35	0		
1.45	0		
1.55	0		
1.65	0		
1.75	0		
1.85	0		
1.95	0		
2.05	0		
2.15	0		
2.25	1		
2.35	1		
2.45	1		
2.55	1		
2.65	0		
2.75	0		
2.85	0		
2.95	0		
3.05	1		
3.15	2		
3.25	3		
3.35	28		

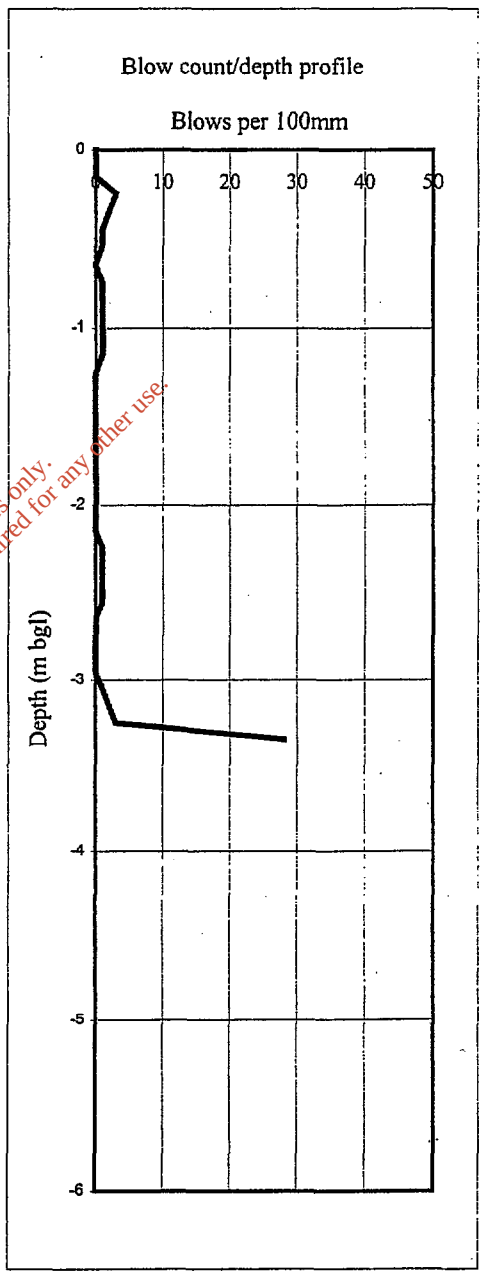


Figure FT 2/5

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA6	Easting	200056.6	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409204.0	Approved by:		Date:	
Operative	TJ	Ground Level	256.45	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	2		
0.45	3		
0.55	3		
0.65	3		
0.75	3		
0.85	1		
0.95	3		
1.05	1		
1.15	1		
1.25	1		
1.35	1		
1.45	2		
1.55	2		
1.65	3		
1.75	3		
1.85	3		
1.95	5		
2.05	3		
2.15	5		
2.25	4		
2.35	4		
2.45	4		
2.55	3		
2.65	5		
2.75	4		
2.85	5		
2.95	5		
3.05	5		
3.15	5		
3.25	8		
3.35	18		
3.45	30	rods tight in hole	

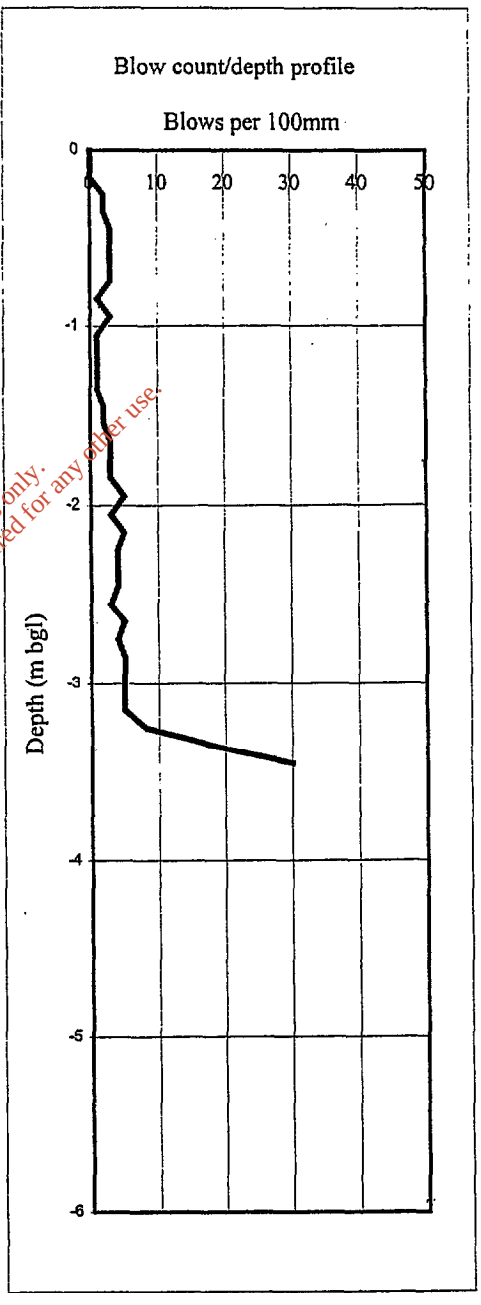


Figure FT 2/6

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA7	Easting	199975.3	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409263.3	Approved by:		Date:	
Operative	TJ	Ground Level	254.20	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	1		
0.45	0		
0.55	1		
0.65	1		
0.75	1		
0.85	1		
0.95	1		
1.05	1		
1.15	1		
1.25	1		
1.35	1		
1.45	2		
1.55	2		
1.65	2		
1.75	2		
1.85	2		
1.95	2		
2.05	3		
2.15	4		
2.25	4		
2.35	3		
2.45	4		
2.55	12		
2.65	26		
2.75	35		

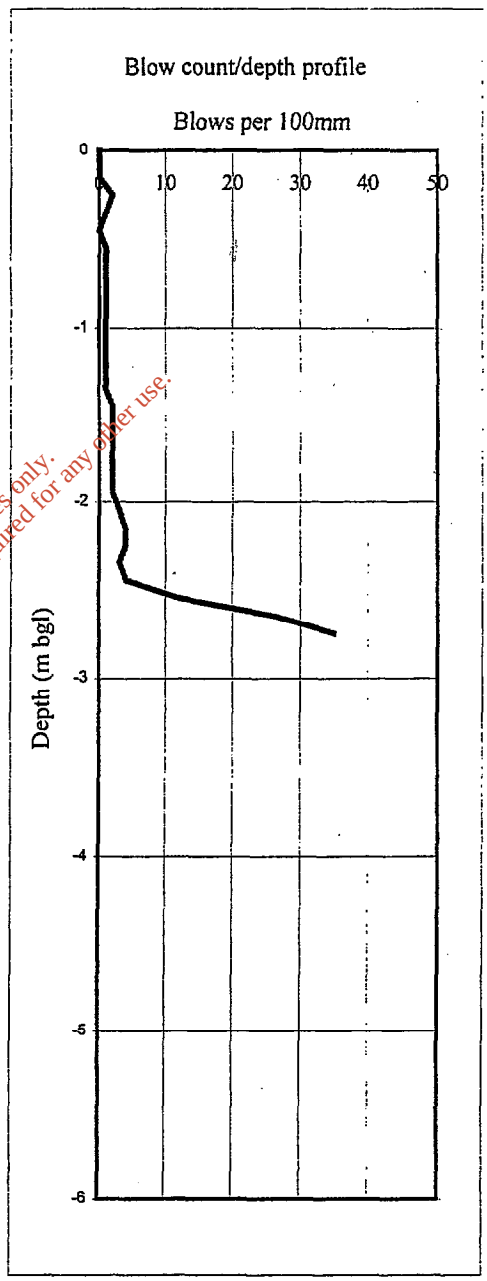


Figure FT 2/7

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA8	Easting	199864.3	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409277.8	Approved by:		Date:	
Operative	TJ	Ground Level	247.65	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	2		
0.45	2		
0.55	4		
0.65	1		
0.75	2		
0.85	1		
0.95	1		
1.05	2		
1.15	2		
1.25	3		
1.35	4		
1.45	5		
1.55	4		
1.65	3		
1.75	6		
1.85	4		
1.95	38		

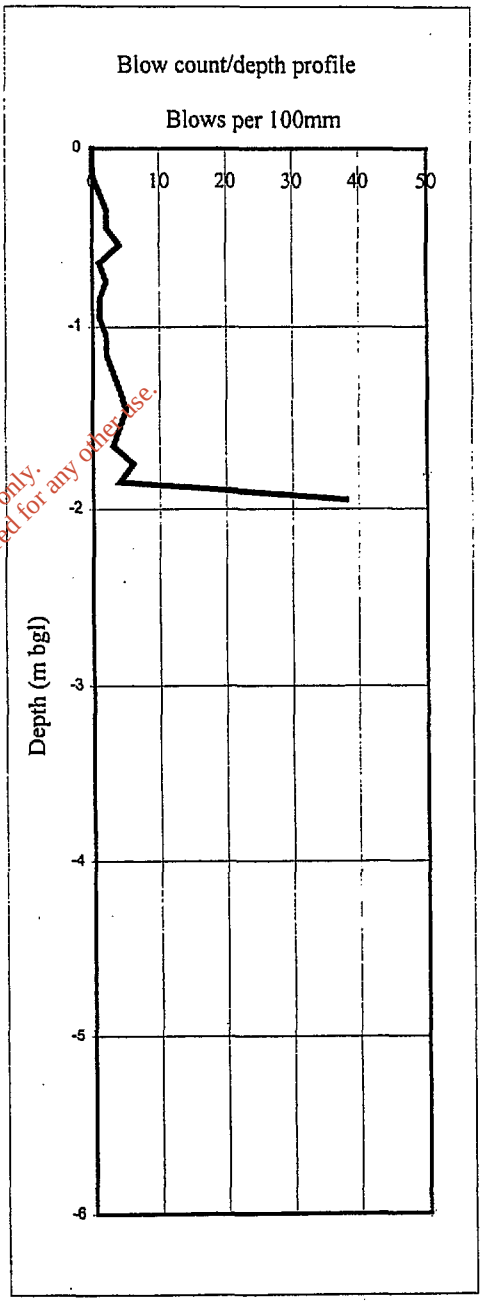


Figure FT 2/8

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA9	Easting	199778.6	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	409332.6	Approved by:		Date:	
Operative	TJ	Ground Level	241.15	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	5		
0.35	6		
0.45	3		
0.55	4		
0.65	5		
0.75	18		
0.85	38		

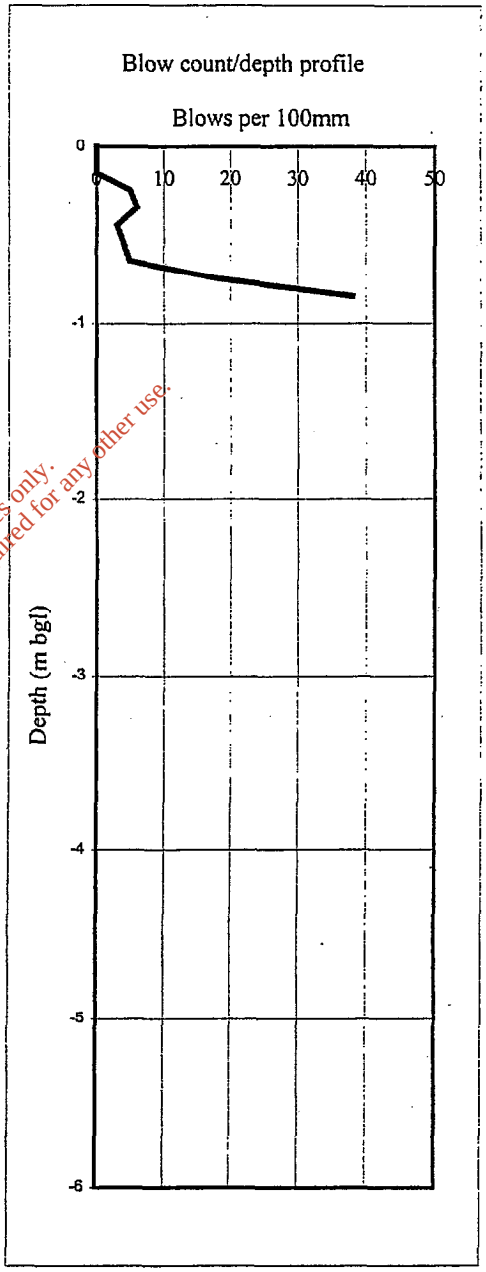


Figure FT 2/9

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA10	Easting	199668.3	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409343.5	Approved by:		Date:	
Operative	TJ	Ground Level	234.15	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	1		
0.45	1		
0.55	2		
0.65	1		
0.75	2		
0.85	1		
0.95	1		
1.05	2		
1.15	1		
1.25	1		
1.35	25		

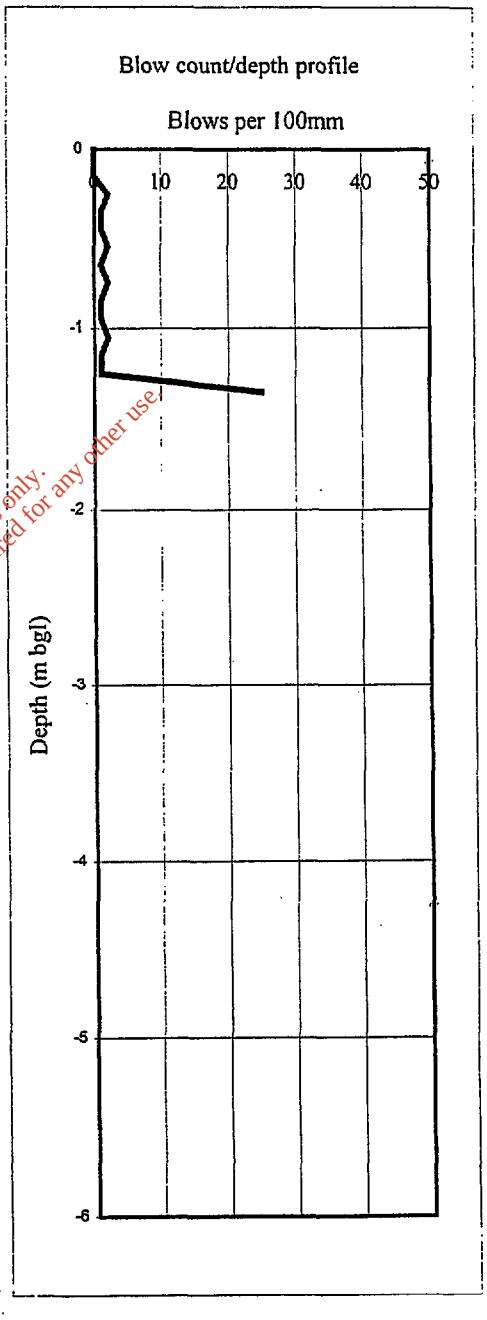


Figure FT 2/10

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA11	Easting	199626.2	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409377.6	Approved by:		Date:	
Operative	TJ	Ground Level	230.90	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	2		
0.45	2		
0.55	1		
0.65	1		
0.75	3		
0.85	5		
0.95	3		
1.05	12		
1.15	35		

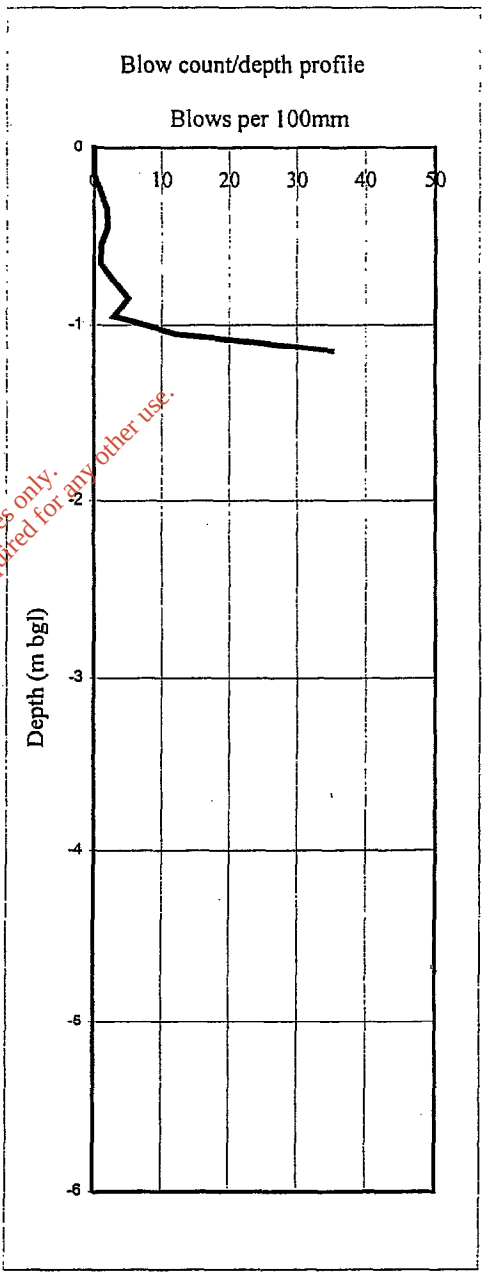


Figure FT 2/11

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA12	Easting	199532.0	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409320.3	Approved by:		Date:	
Operative	TJ	Ground Level	223.30	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	2		
0.55	4		
0.65	4		
0.75	4		
0.85	6		
0.95	6		
1.05	5		
1.15	6		
1.25	8		
1.35	8		
1.45	25		
1.49	50	50 for 40mm	

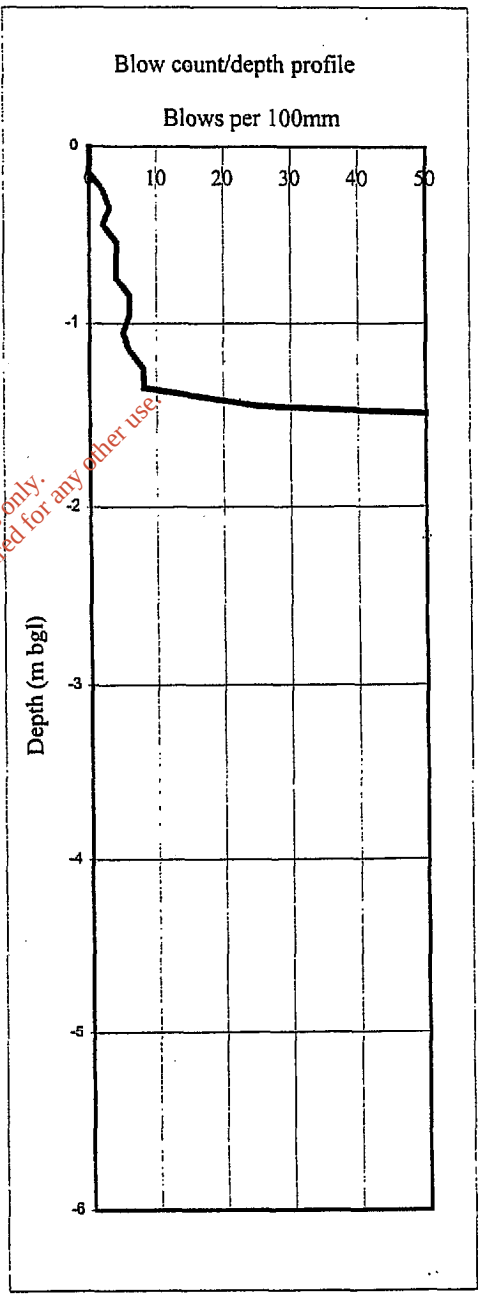


Figure FT 2/12

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA13	Easting	199643.5	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409305.2	Approved by:		Date:	
Operative	TJ	Ground Level	231.95	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	3		
0.45	4		
0.55	3		
0.65	3		
0.75	1		
0.85	2		
0.95	2		
1.05	2		
1.15	2		
1.25	2		
1.35	3		
1.45	4		
1.55	2		
1.65	3		
1.75	4		
1.85	8		
1.95	29		
2.03	50	50 for 75mm	

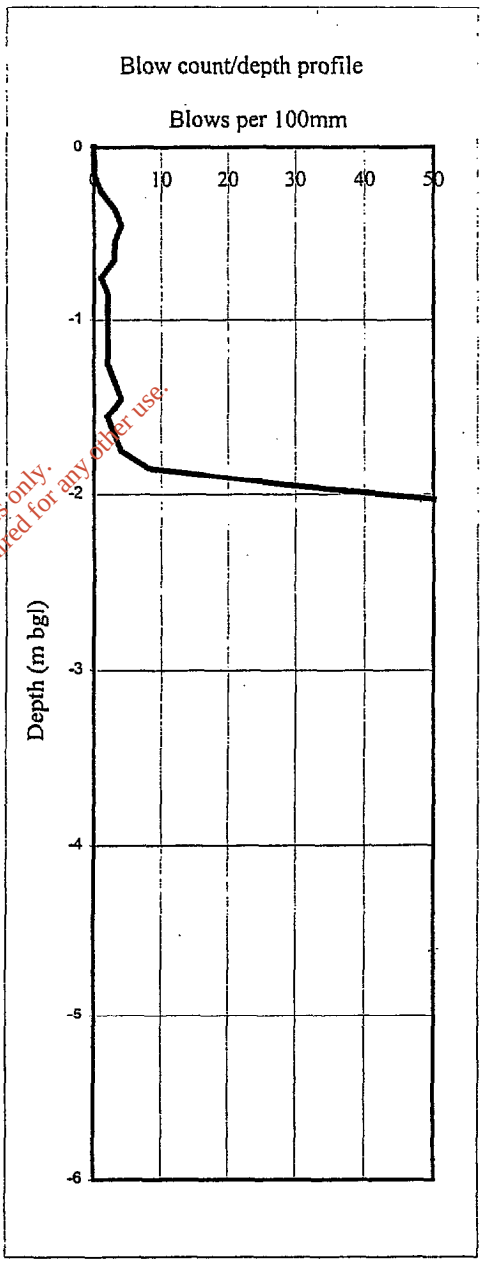


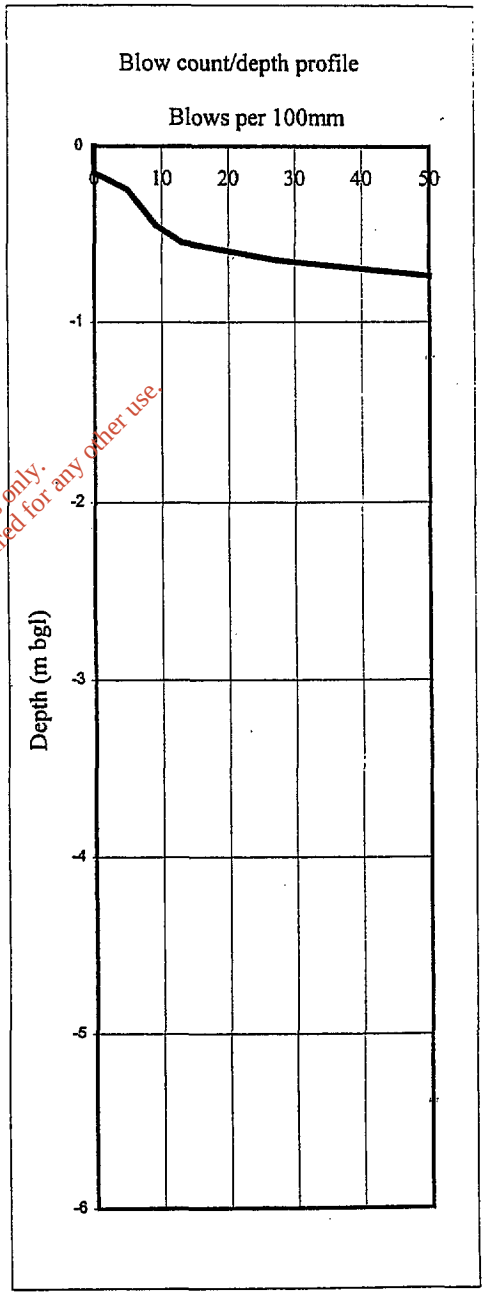
Figure FT 2/13

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA14	Easting	199686.1	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409279.7	Approved by:		Date:	
Operative	TJ	Ground Level	235.20	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	5		
0.35	7		
0.45	9		
0.55	13		
0.65	27		
0.74	50	50 for 90mm	



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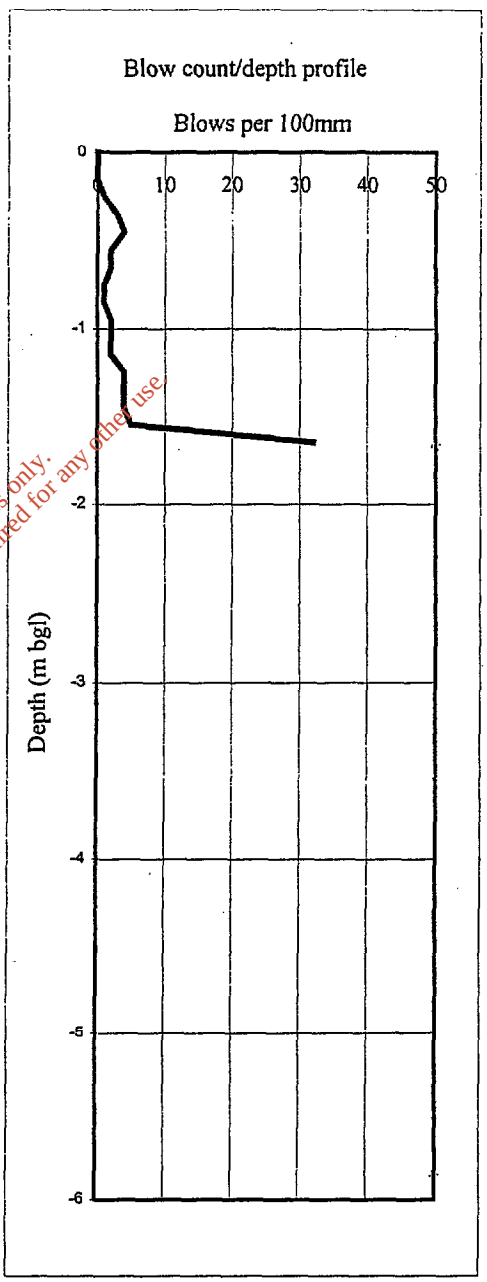
FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA15	Easting	199822.3	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409303.4	Approved by:		Date:	
Operative	TJ	Ground Level	244.75	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	3		
0.45	4		
0.55	2		
0.65	2		
0.75	1		
0.85	1		
0.95	2		
1.05	2		
1.15	2		
1.25	4		
1.35	4		
1.45	4		
1.55	5		
1.65	32		



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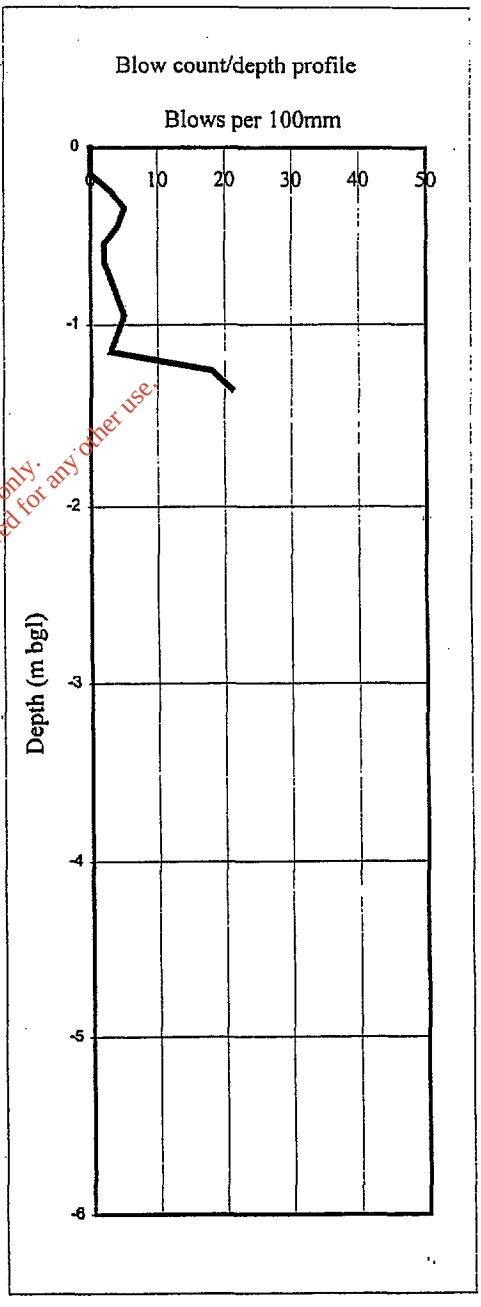
FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA16	Easting	199885.8	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409210.0	Approved by:		Date:	
Operative	TJ	Ground Level	250.35	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	5		
0.45	4		
0.55	2		
0.65	2		
0.75	3		
0.85	4		
0.95	5		
1.05	4		
1.15	3		
1.25	18		
1.35	21		



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FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA17	Easting	199987.0	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409195.0	Approved by:		Date:	
Operative	TJ	Ground Level	254.35	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3	3.85	6
0.35	2	3.95	7
0.45	1	4.05	5
0.55	0	4.15	8
0.65	1	4.25	8
0.75	1	4.35	8
0.85	1	4.45	16
0.95	1	4.55	40
1.05	1		
1.15	1		
1.25	1		
1.35	2		
1.45	2		
1.55	2		
1.65	2		
1.75	3		
1.85	3		
1.95	3		
2.05	3		
2.15	3		
2.25	4		
2.35	4		
2.45	4		
2.55	4		
2.65	4		
2.75	6		
2.85	6		
2.95	10		
3.05	10		
3.15	5		
3.25	4		
3.35	4		
3.45	3		
3.55	4		
3.65	5		
3.75	4		

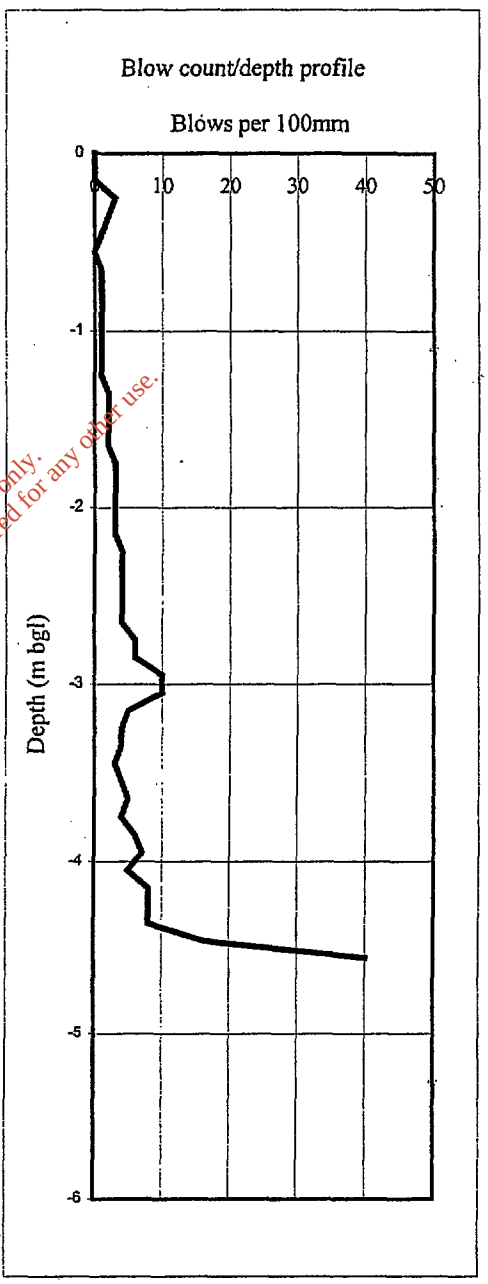


Figure FT 2/17

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA18	Easting	200065.8	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409133.4	Approved by:		Date:	
Operative	TJ	Ground Level	257.60	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	2		
0.45	2		
0.55	2		
0.65	2		
0.75	1		
0.85	2		
0.95	1		
1.05	2		
1.15	3		
1.25	3		
1.35	2		
1.45	3		
1.55	3		
1.65	28		

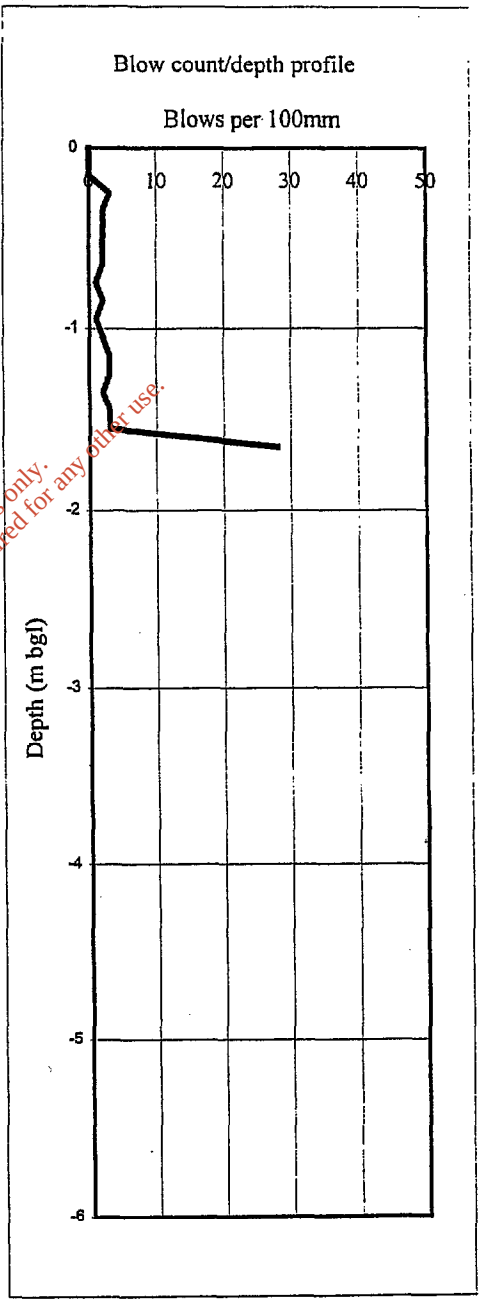


Figure FT 2/18

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA19	Easting	199958.1	Compiled by:	CDL	Date:	03/02/03
Date:	30/01/03	Northing	409153.7	Approved by:		Date:	
Operative	TJ	Ground Level	253.80	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1	3.85	5
0.35	2	3.95	7
0.45	3	4.05	12
0.55	2	4.15	9
0.65	1	4.25	19
0.75	2	4.35	23
0.85	1	4.45	40
0.95	3		
1.05	3		
1.15	2		
1.25	2		
1.35	3		
1.45	3		
1.55	3		
1.65	3		
1.75	4		
1.85	3		
1.95	3		
2.05	3		
2.15	4		
2.25	4		
2.35	4		
2.45	4		
2.55	6		
2.65	4		
2.75	5		
2.85	6		
2.95	5		
3.05	8		
3.15	5		
3.25	6		
3.35	10		
3.45	5		
3.55	6		
3.65	7		
3.75	7		

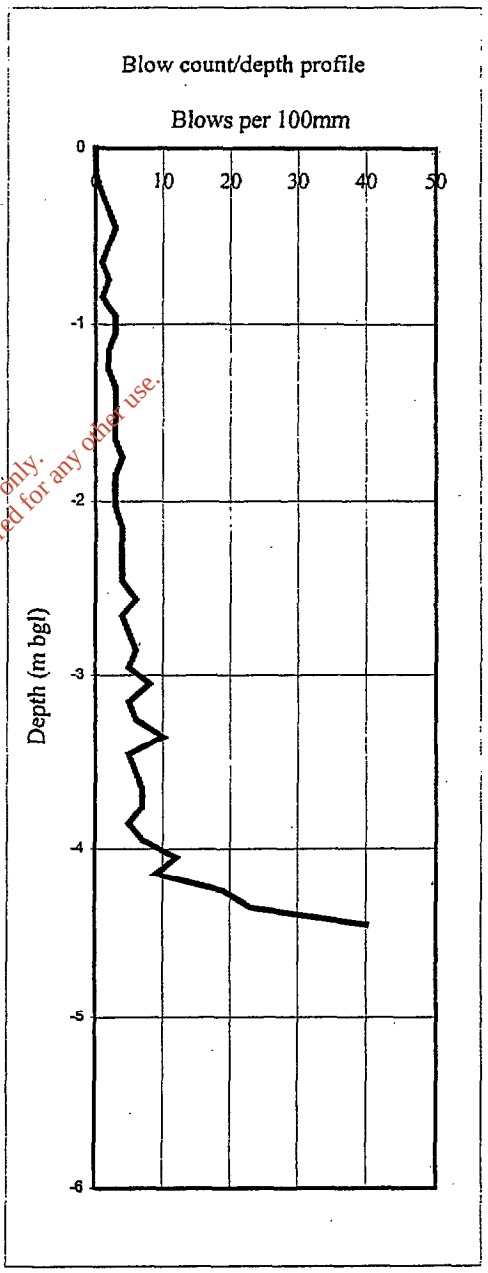


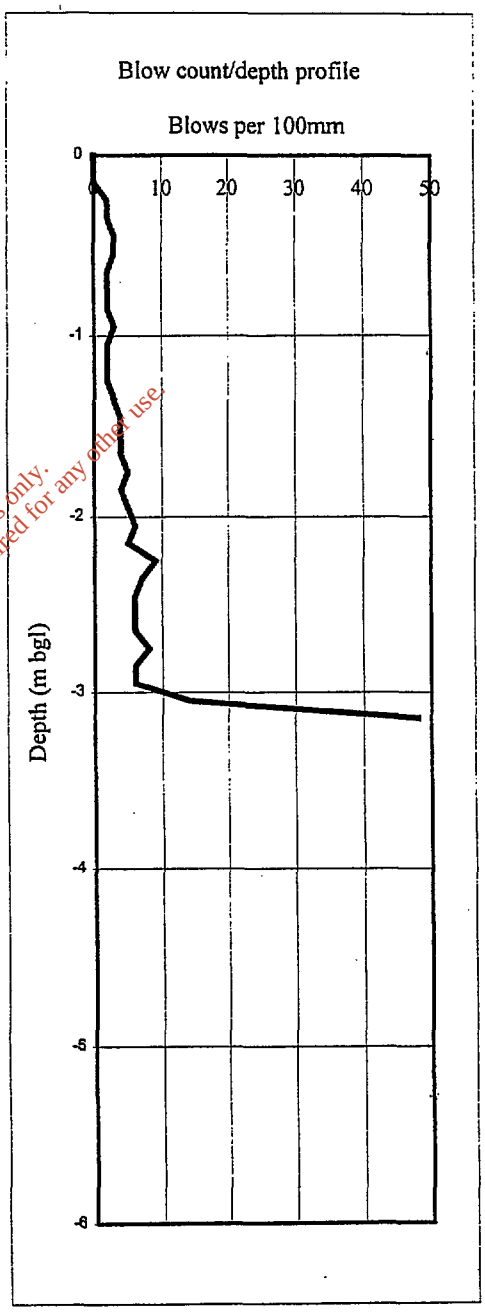
Figure FT 2/19

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA20	Easting	199854.6	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409164.2	Approved by:		Date:	
Operative	TJ	Ground Level	250.00	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	2		
0.45	3		
0.55	3		
0.65	2		
0.75	2		
0.85	2		
0.95	3		
1.05	2		
1.15	2		
1.25	2		
1.35	3		
1.45	4		
1.55	4		
1.65	4		
1.75	5		
1.85	4		
1.95	5		
2.05	6		
2.15	5		
2.25	9		
2.35	7		
2.45	6		
2.55	6		
2.65	6		
2.75	8		
2.85	6		
2.95	6		
3.05	14		
3.15	48	rods tight in hole	



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FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA21	Easting	199767.3	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409223.3	Approved by:		Date:	
Operative	TJ	Ground Level	243.90	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	4		
0.35	2		
0.45	3		
0.55	4		
0.65	4		
0.75	5		
0.85	5		
0.95	8		
1.05	12		
1.15	10		
1.25	12		
1.35	8		
1.45	9		
1.55	16		
1.65	24		
1.75	28	rods tight in hole	

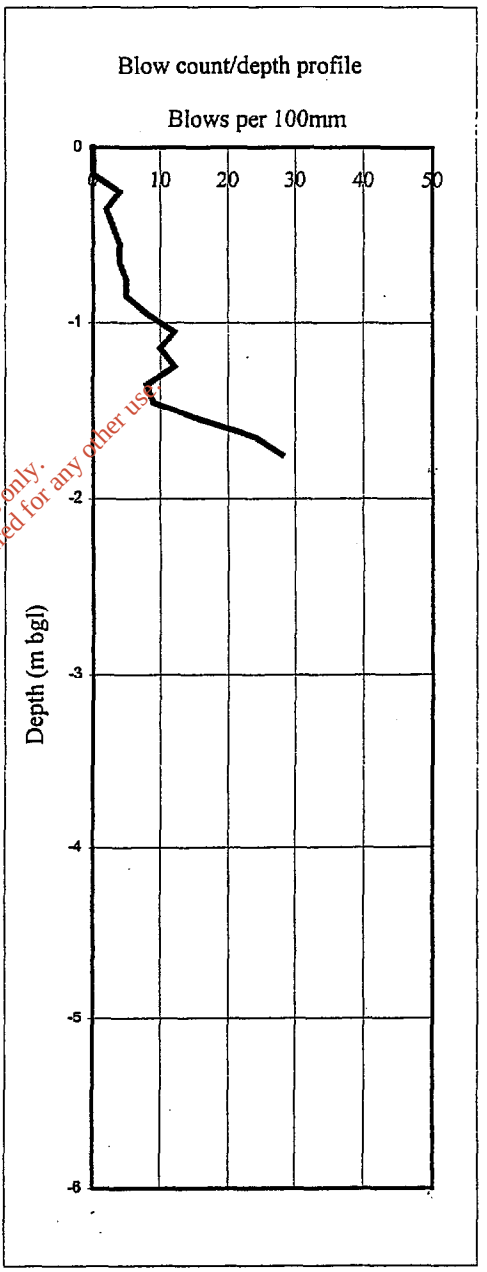


Figure FT 2/21

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA22	Easting	199655.3	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409236.9	Approved by:		Date:	
Operative	TJ	Ground Level	233.70	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	2		
0.55	2		
0.65	2		
0.75	2		
0.85	2		
0.95	2		
1.05	3		
1.15	3		
1.25	5		
1.35	6		
1.45	7		
1.55	7		
1.65	11		
1.75	20		
1.85	27		
1.95	36	Rods tight in hole	

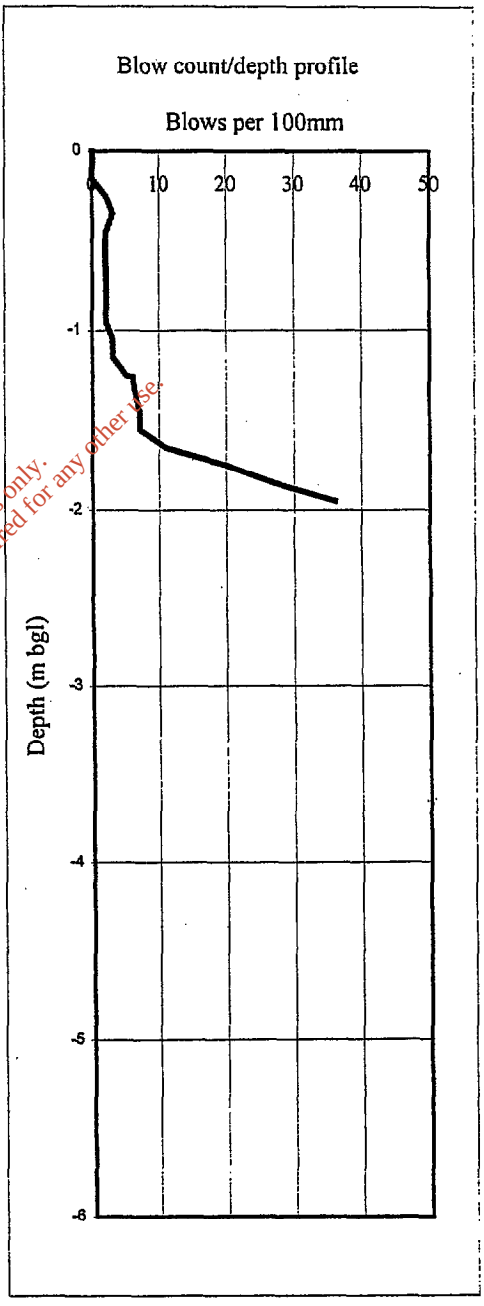


Figure FT 2/22

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA23	Easting	199575.3	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409293.0	Approved by:		Date:	
Operative	TJ	Ground Level	226.85	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	1		
0.45	1		
0.55	1		
0.65	1		
0.75	1		
0.85	1		
0.95	1		
1.05	18		
1.15	16		
1.25	17		
1.35	31	Rods tight in hole	

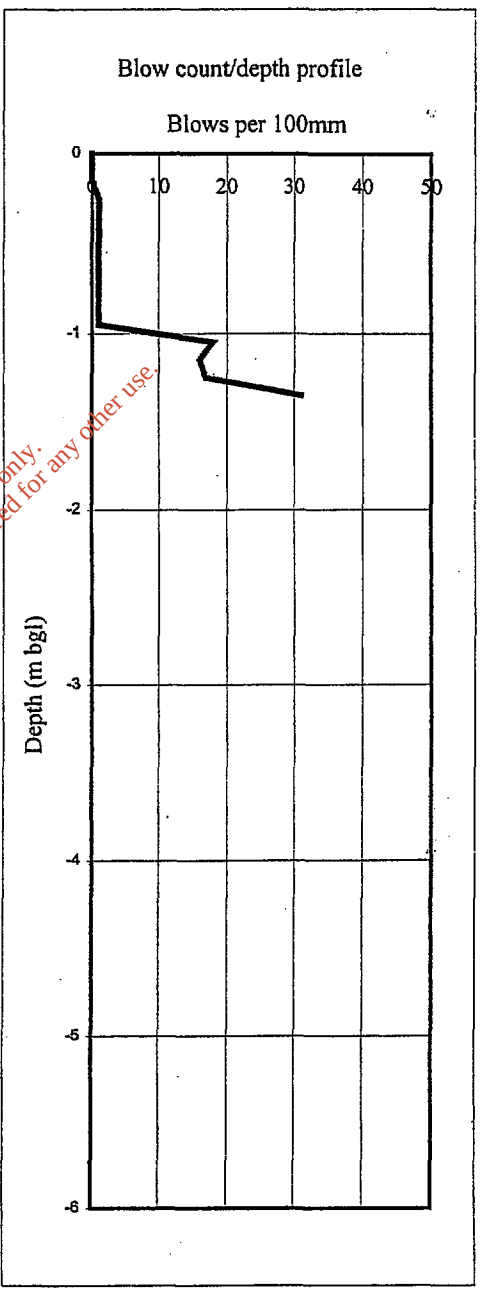


Figure FT 2/23

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA24	Easting	199501.4	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409278.5	Approved by:		Date:	
Operative	TJ	Ground Level	223.15	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	3		
0.45	4		
0.55	7		
0.65	10		
0.75	7		
0.85	6		
0.95	5		
1.05	1		
1.15	4		
1.25	7		
1.26	25	25 for 10mm - no penetration	

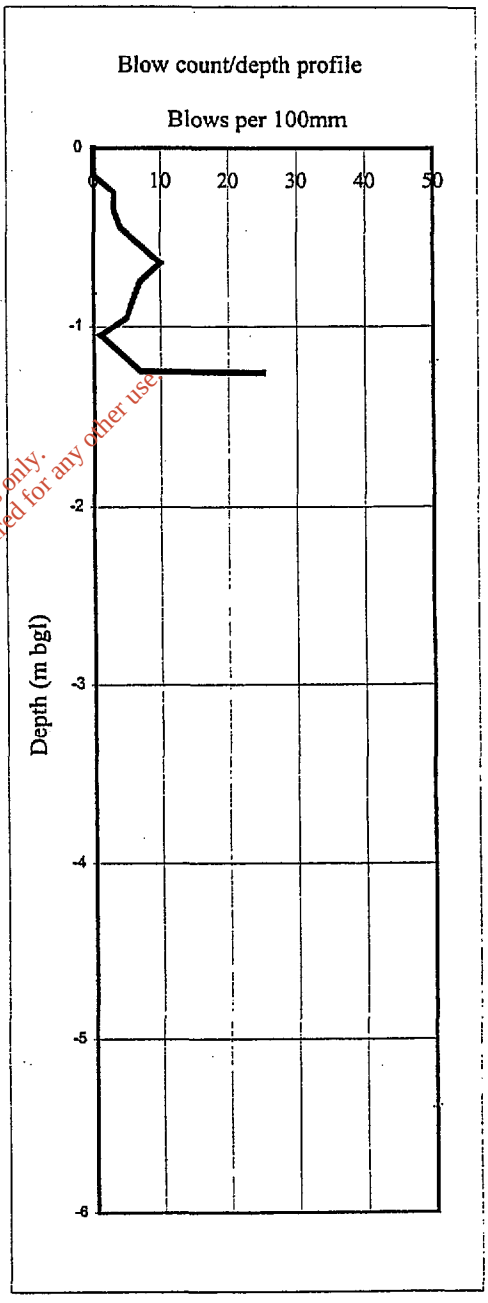


Figure FT 2/24

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA25	Easting	199585.0	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409224.5	Approved by:		Date:	
Operative	TJ	Ground Level	230.40	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	2		
0.45	3		
0.55	7		
0.65	6		
0.75	4		
0.85	3		
0.95	2		
1.05	3		
1.15	2		
1.25	3		
1.35	3		
1.45	5		
1.55	18		
1.65	24		
1.75	27		
1.85	31	Rods tight in hole	

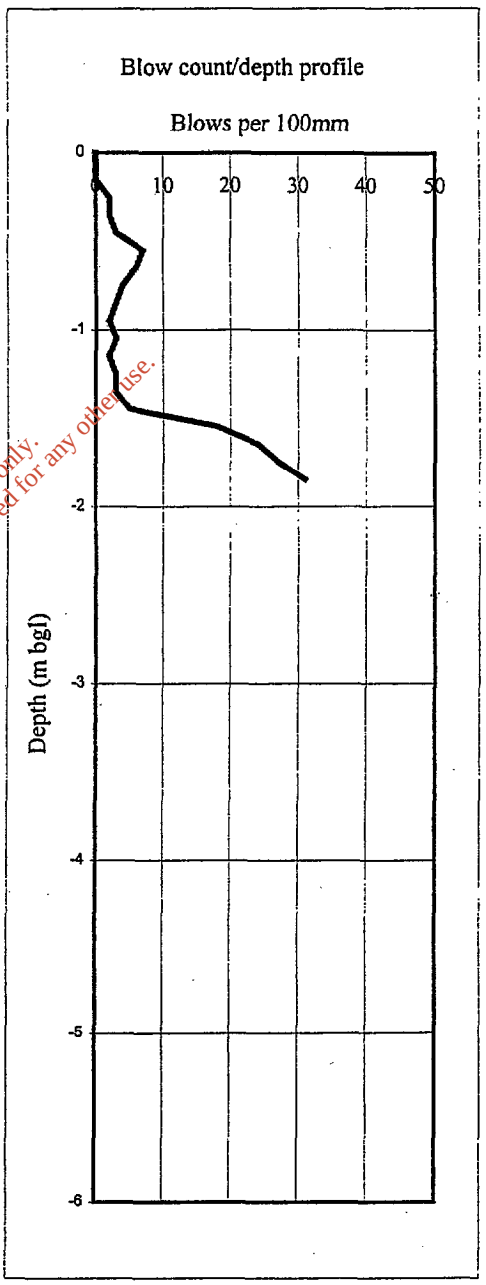


Figure FT 2/25

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA26	Easting	199698.3	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409210.8	Approved by:		Date:	
Operative	TJ	Ground Level	237.55	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	1		
0.55	2		
0.65	1		
0.75	1		
0.85	3		
0.95	4		
1.05	10		
1.15	10		
1.25	10		
1.35	10		
1.45	24		
1.55	36	Rods tight in hole	

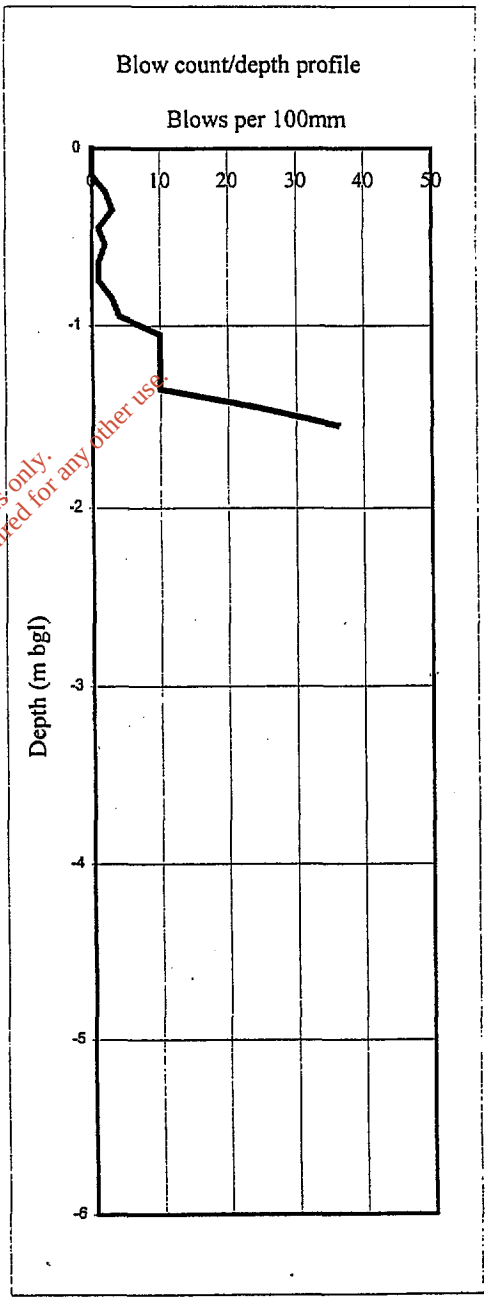


Figure FT 2/26

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA27	Easting	199780.4	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409157.3	Approved by:		Date:	
Operative	TJ	Ground Level	244.70	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	4		
0.35	4		
0.45	4		
0.55	6		
0.65	3		
0.75	3		
0.85	4		
0.95	23		
1.05	26		
1.08	25	25 for 30mm - no penetration	

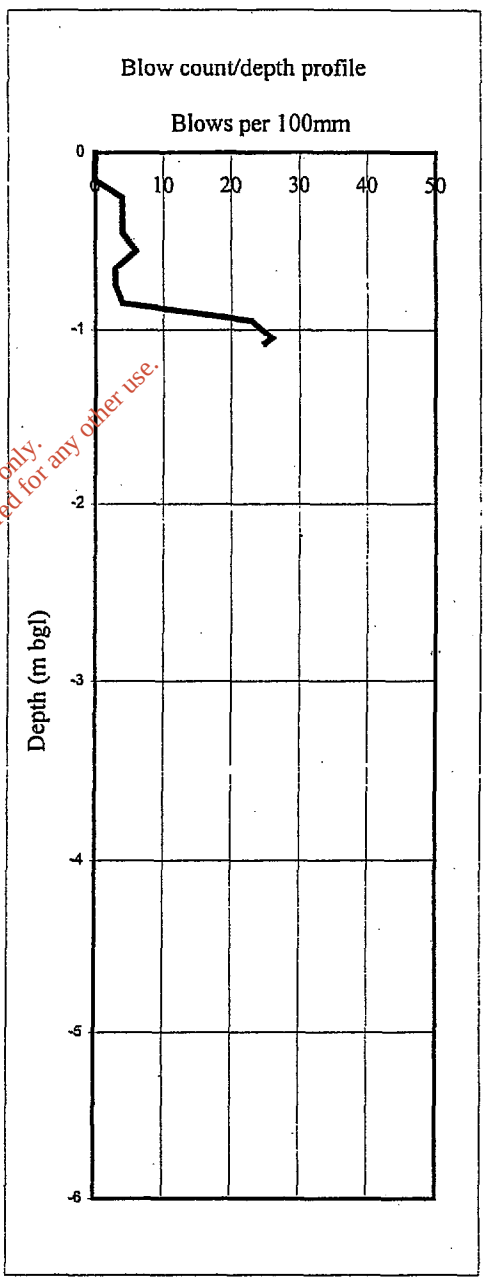


Figure FT 2/27

FOUNDATION & EXPLORATION SERVICES

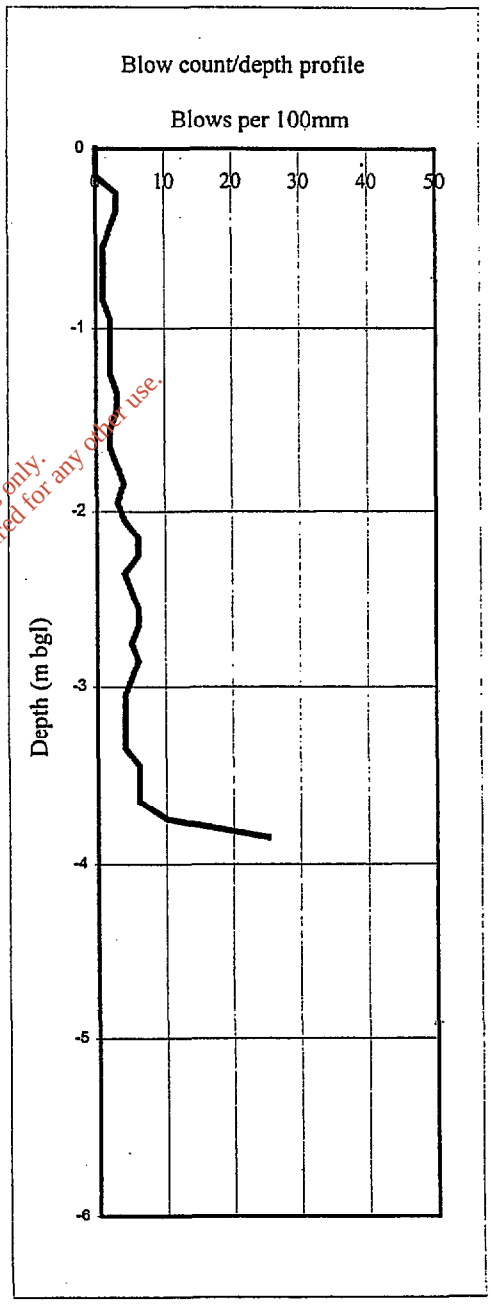
FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA28	Easting	199891.3	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409138.6	Approved by:		Date:	
Operative	TJ	Ground Level	251.65	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3	3.85	25
0.35	3		rods tight in hole
0.45	2		
0.55	1		
0.65	1		
0.75	1		
0.85	1		
0.95	2		
1.05	2		
1.15	2		
1.25	2		
1.35	3		
1.45	3		
1.55	2		
1.65	2		
1.75	3		
1.85	4		
1.95	3		
2.05	4		
2.15	6		
2.25	6		
2.35	4		
2.45	5		
2.55	6		
2.65	6		
2.75	5		
2.85	6		
2.95	5		
3.05	4		
3.15	4		
3.25	4		
3.35	4		
3.45	6		
3.55	6		
3.65	6		
3.75	10		



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FOUNDATION & EXPLORATION SERVICES

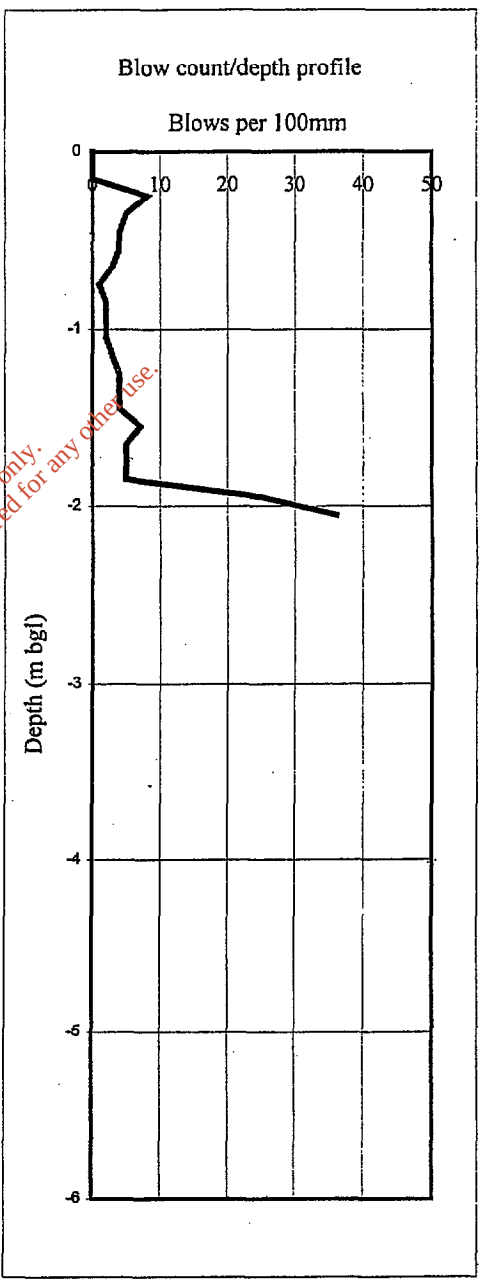
FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA29	Easting	199974.7	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409082.0	Approved by:		Date:	
Operative	TJ	Ground Level	255.80	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	8		
0.35	5		
0.45	4		
0.55	4		
0.65	3		
0.75	1		
0.85	2		
0.95	2		
1.05	2		
1.15	3		
1.25	4		
1.35	4		
1.45	4		
1.55	7		
1.65	5		
1.75	5		
1.85	5		
1.95	25		
2.05	36	Rods tight in hole	



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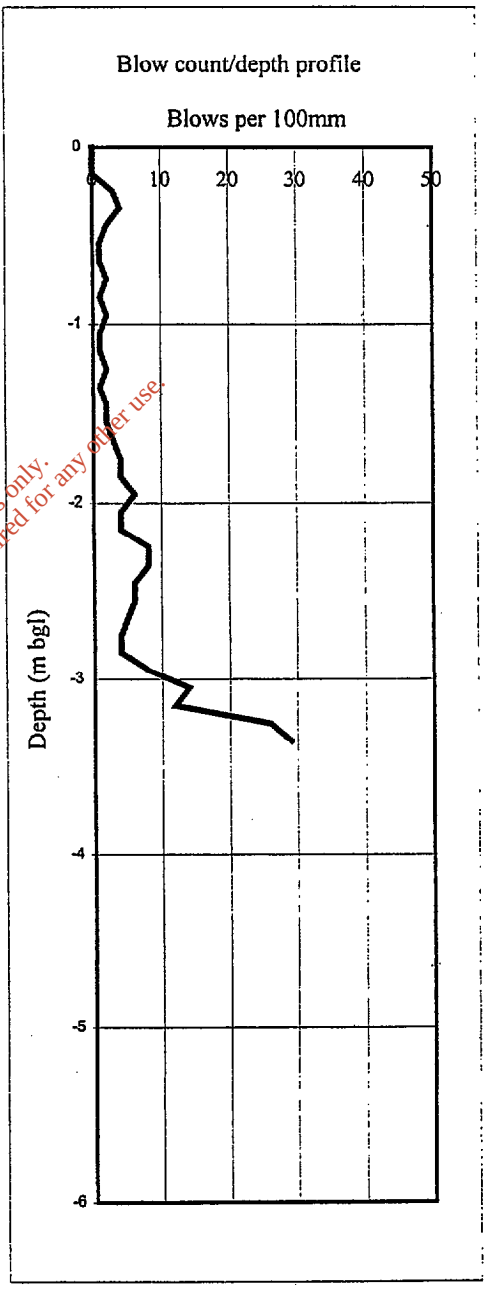
FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA30	Easting	199904.6	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409071.3	Approved by:		Date:	
Operative	TJ	Ground Level	253.50	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	4		
0.45	2		
0.55	1		
0.65	1		
0.75	2		
0.85	1		
0.95	2		
1.05	1		
1.15	1		
1.25	2		
1.35	1		
1.45	2		
1.55	2		
1.65	3		
1.75	4		
1.85	4		
1.95	6		
2.05	4		
2.15	4		
2.25	8		
2.35	8		
2.45	6		
2.55	6		
2.65	5		
2.75	4		
2.85	4		
2.95	8		
3.05	14		
3.15	12		
3.25	26		
3.35	29	Rods tight in hole	



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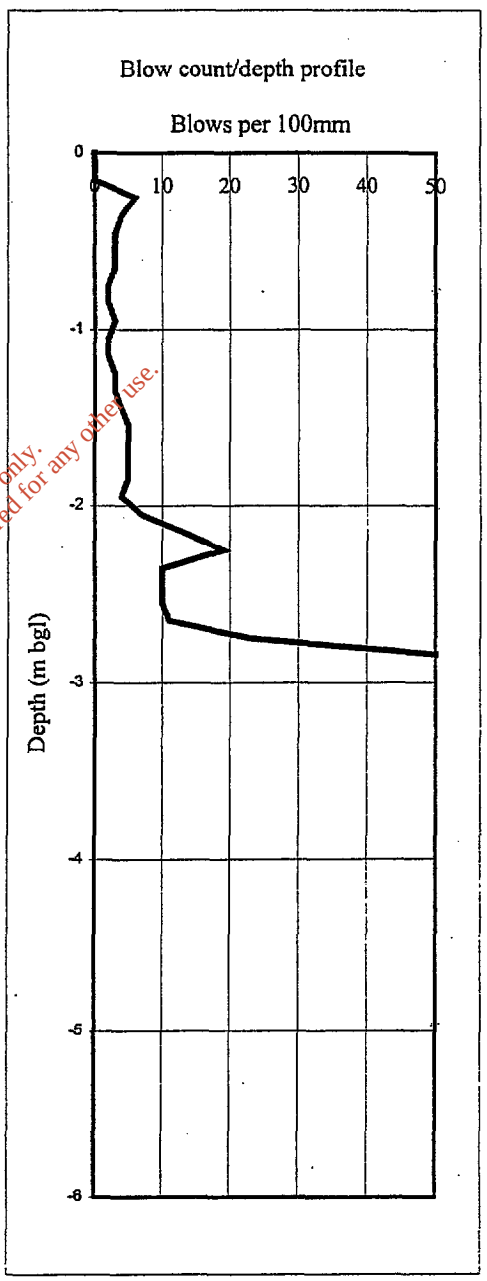
FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA31	Easting	199824.1	Compiled by:	CDL	Date:	03/02/03
Date:	29/01/03	Northing	409124.7	Approved by:		Date:	
Operative	TJ	Ground Level	248.2	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	6		
0.35	4		
0.45	3		
0.55	3		
0.65	3		
0.75	2		
0.85	2		
0.95	3		
1.05	2		
1.15	2		
1.25	3		
1.35	3		
1.45	4		
1.55	5		
1.65	5		
1.75	5		
1.85	5		
1.95	4		
2.05	7		
2.15	13		
2.25	19		
2.35	10		
2.45	10		
2.55	10		
2.65	11		
2.75	23		
2.84	50	50 for 80mm	



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FOUNDATION & EXPLORATION SERVICES

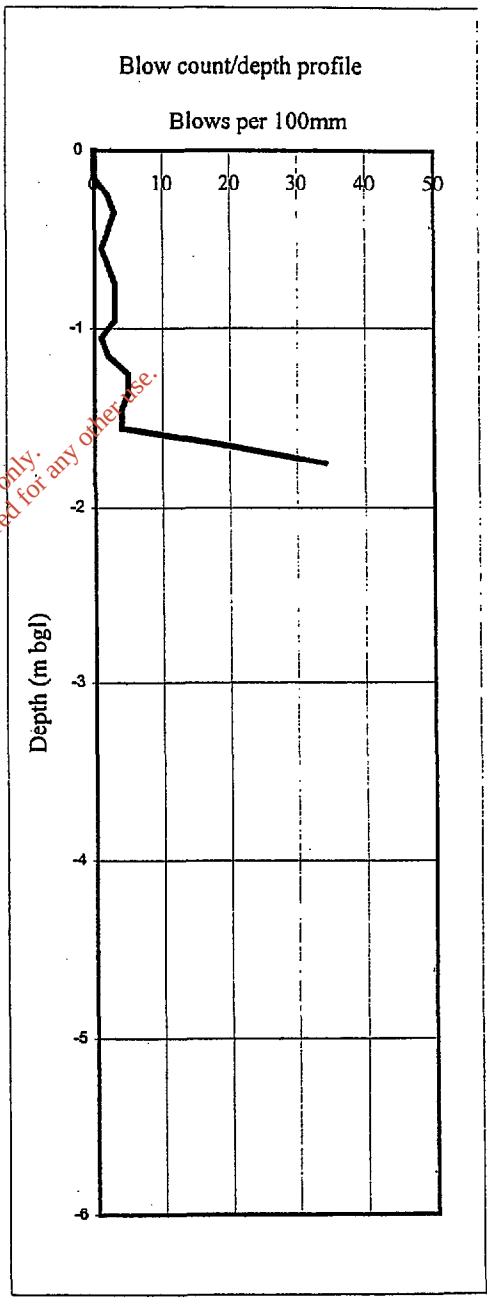
FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA32	Easting	199709.3	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409142.2	Approved by:		Date:	
Operative	TJ	Ground Level	240.65	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	2		
0.55	1		
0.65	2		
0.75	3		
0.85	3		
0.95	3		
1.05	1		
1.15	2		
1.25	5		
1.35	5		
1.45	4		
1.55	4		
1.65	20		
1.75	34	Rods tight in hole	



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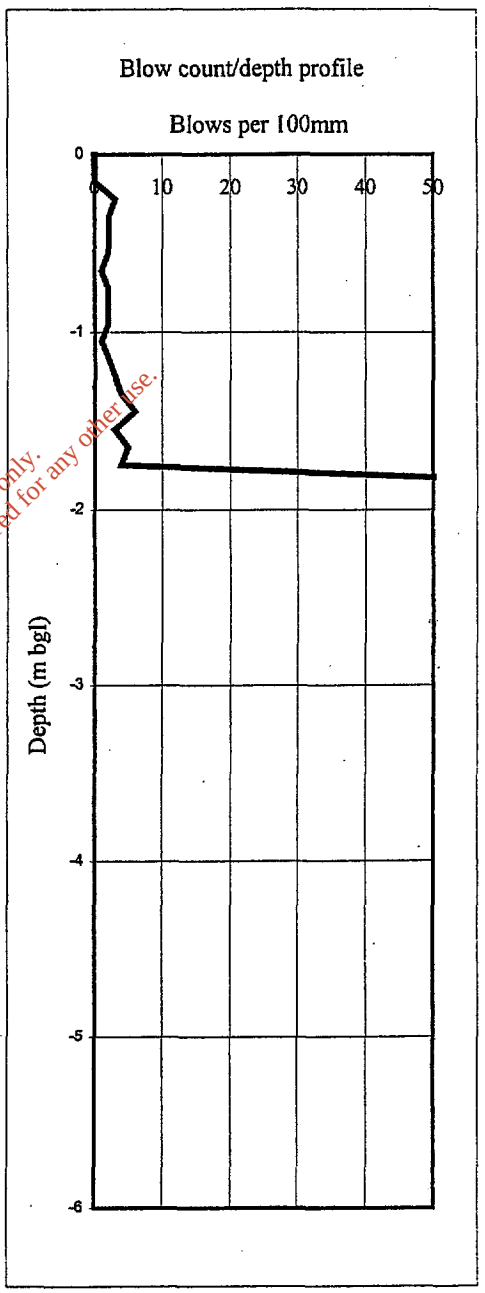
FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA33	Easting	199596.2	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409158.6	Approved by:		Date:	
Operative	TJ	Ground Level	234.20	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	2		
0.45	2		
0.55	2		
0.65	1		
0.75	2		
0.85	2		
0.95	2		
1.05	1		
1.15	2		
1.25	3		
1.35	4		
1.45	6		
1.55	3		
1.65	5		
1.75	4		
1.82	50	50 for 70mm	



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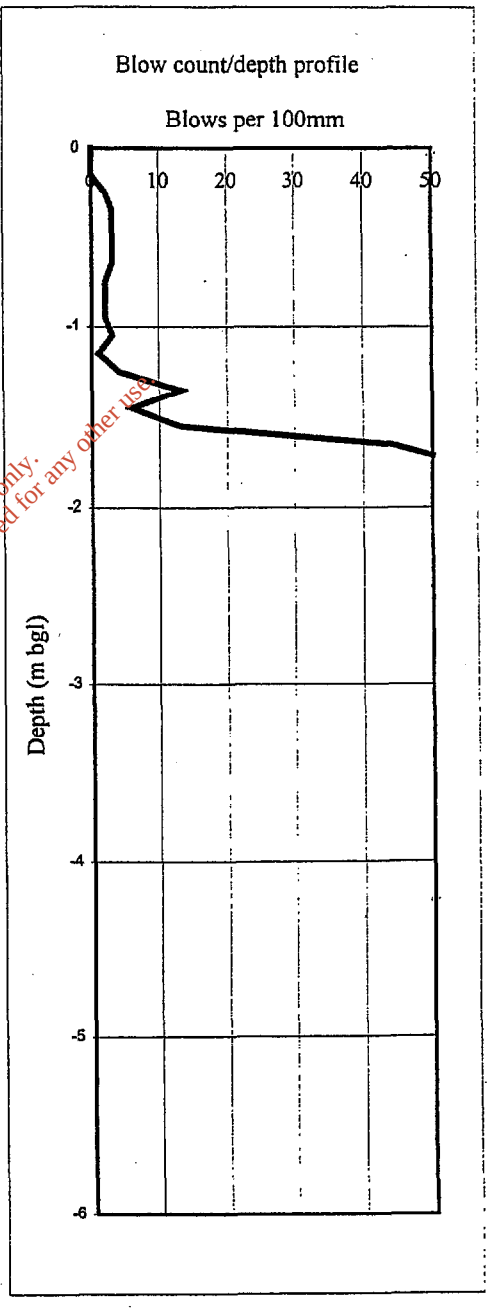
FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA34	Easting	199518.7	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409209.1	Approved by:		Date:	
Operative	TJ	Ground Level	228.15	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	3		
0.55	3		
0.65	3		
0.75	2		
0.85	2		
0.95	2		
1.05	3		
1.15	1		
1.25	4		
1.35	13		
1.45	6		
1.55	13		
1.65	44		
1.71	50	50 for 60mm	



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FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA35	Easting	199529.2	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	409140.3	Approved by:		Date:	
Operative	TJ	Ground Level	231.60	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	1		
0.45	2		
0.55	2		
0.65	1		
0.75	3		
0.85	3		
0.95	3		
1.05	44		
1.15	29		
1.25	30	Rods tight in hole	

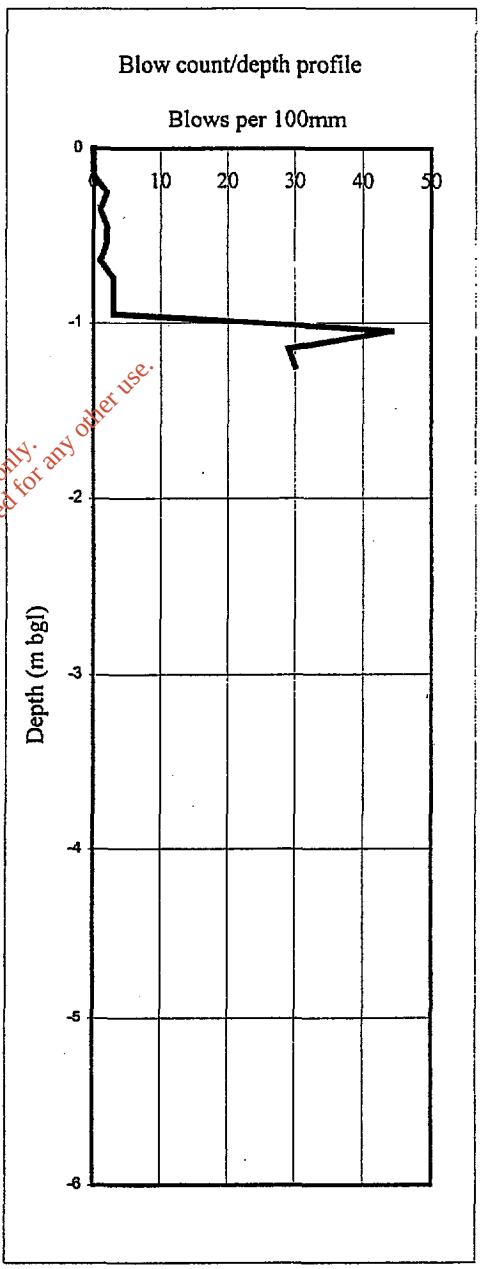


Figure FT 2/35

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA36	Easting	199681.6	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409101.6	Approved by:		Date:	
Operative	TJ	Ground Level	240.70	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	2		
0.55	2		
0.65	1		
0.75	2		
0.85	13		
0.95	25		
0.99	50	50 for 40mm	

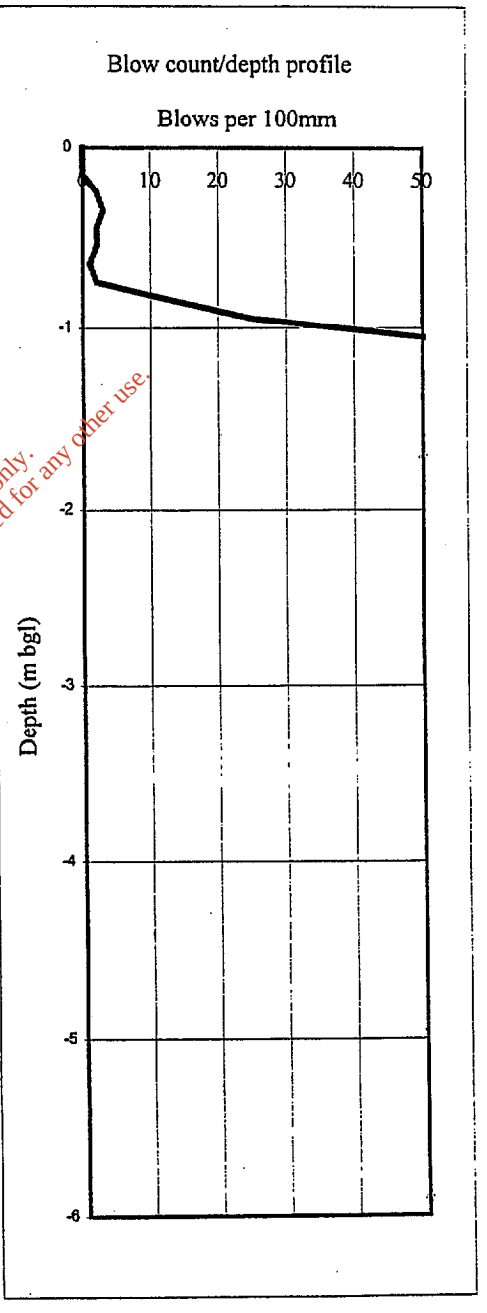


Figure FT 2/36

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA37	Easting	199724.4	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409071.8	Approved by:		Date:	
Operative	TJ	Ground Level	245.10	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	2		
0.55	1		
0.65	2		
0.75	2		
0.85	1		
0.95	1		
1.05	2		
1.15	3		
1.25	3		
1.35	12		
1.45	28		
1.55	36	Rods tight in hole	

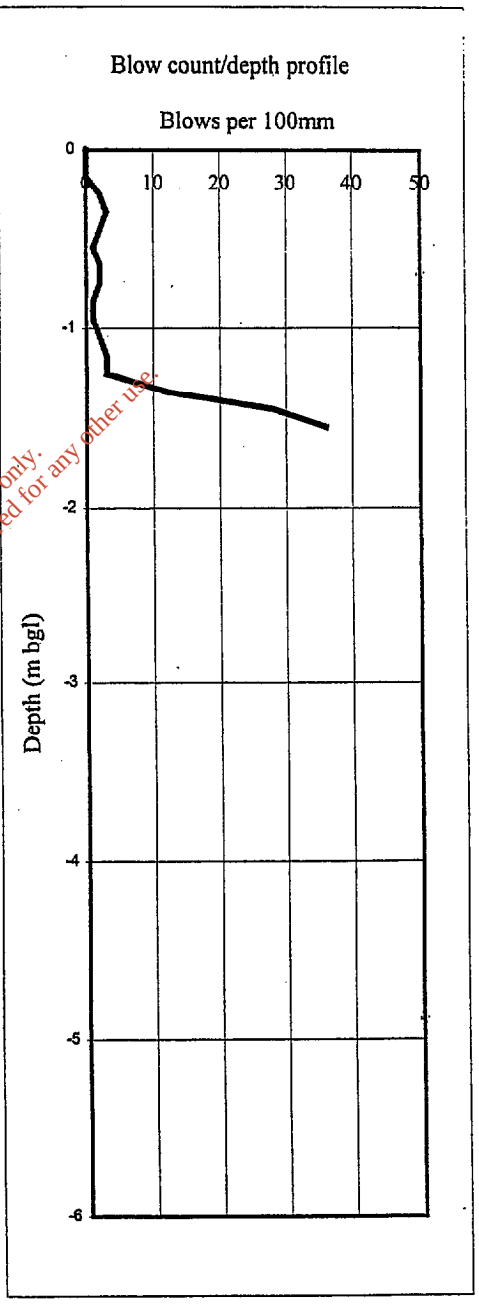


Figure FT 2/37

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA38	Easting	199875.6	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409033.3	Approved by:		Date:	
Operative	TJ	Ground Level	253.60	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	2		
0.45	2		
0.55	2		
0.65	1		
0.75	2		
0.85	3		
0.95	2		
1.05	2		
1.15	4		
1.25	3		
1.35	4		
1.45	4		
1.55	4		
1.65	4		
1.75	4		
1.85	17		
1.92	50	50 for 70mm	

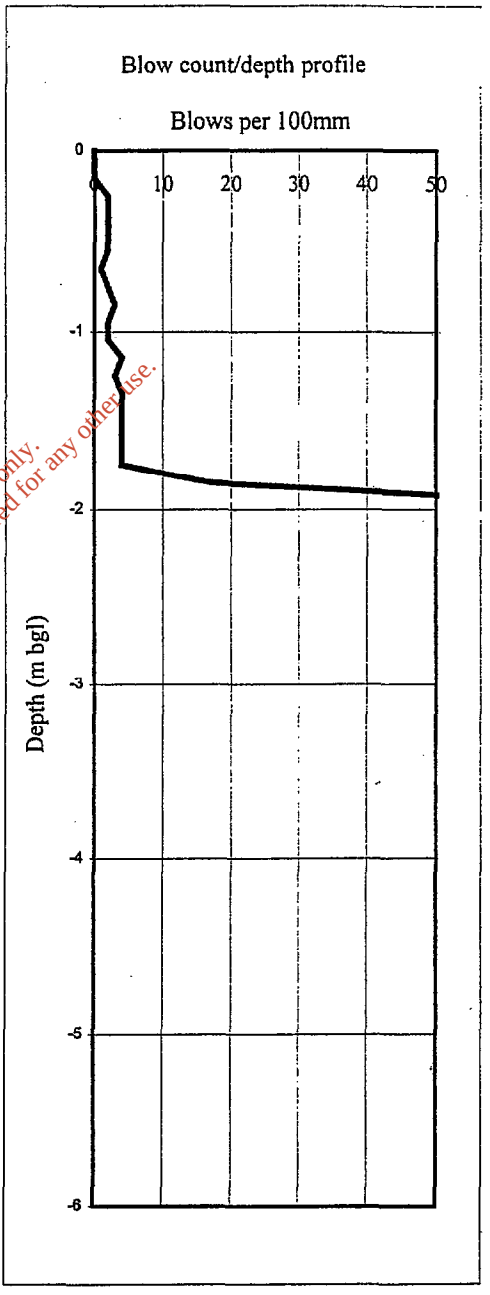


Figure FT 2/38

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA39	Easting	199889.2	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	408959.8	Approved by:		Date:	
Operative	TJ	Ground Level	257.30	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	4		
0.45	4		
0.55	4		
0.65	1		
0.75	2		
0.85	2		
0.95	2		
1.05	3		
1.15	2		
1.25	3		
1.35	4		
1.45	4		
1.55	5		
1.65	5		
1.75	40		

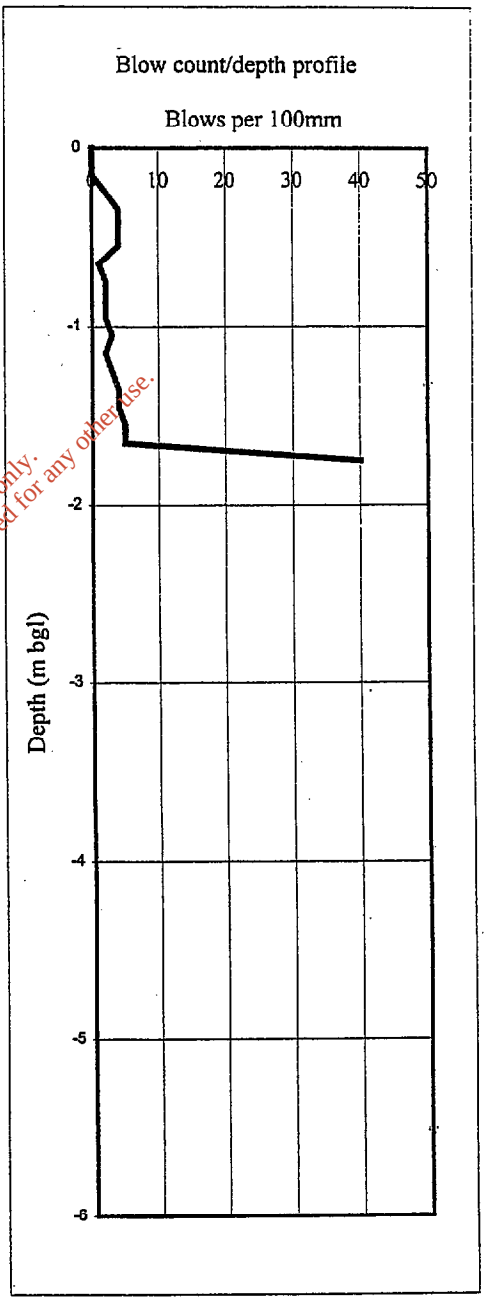


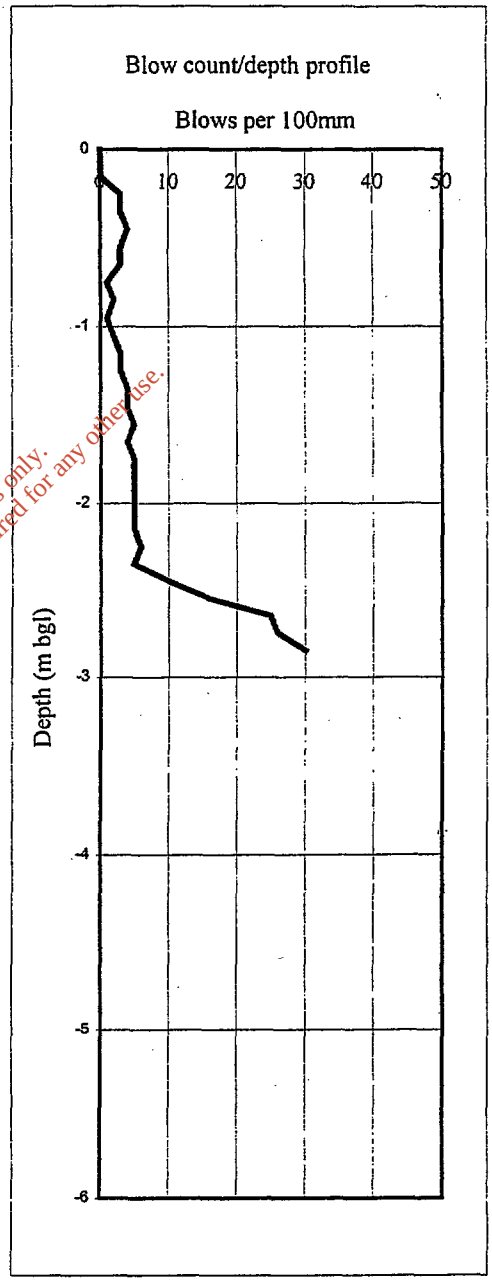
Figure FT 2/39

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA40	Easting	199807.2	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	409016.3	Approved by:		Date:	
Operative	TJ	Ground Level	250.60	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	3		
0.45	4		
0.55	3		
0.65	3		
0.75	1		
0.85	2		
0.95	1		
1.05	2		
1.15	3		
1.25	3		
1.35	4		
1.45	4		
1.55	5		
1.65	4		
1.75	5		
1.85	5		
1.95	5		
2.05	5		
2.15	5		
2.25	6		
2.35	5		
2.45	10		
2.55	16		
2.65	25		
2.75	26		
2.85	30	Rods tight in hole	



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FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA41	Easting	199696.3	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	409028.1	Approved by:		Date:	
Operative	TJ	Ground Level	244.45	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	2		
0.55	2		
0.65	2		
0.75	2		
0.85	3		
0.95	2		
1.05	3		
1.15	3		
1.25	3		
1.35	6		
1.45	4		
1.55	3		
1.65	14		
1.73	50	50 for 80mm	

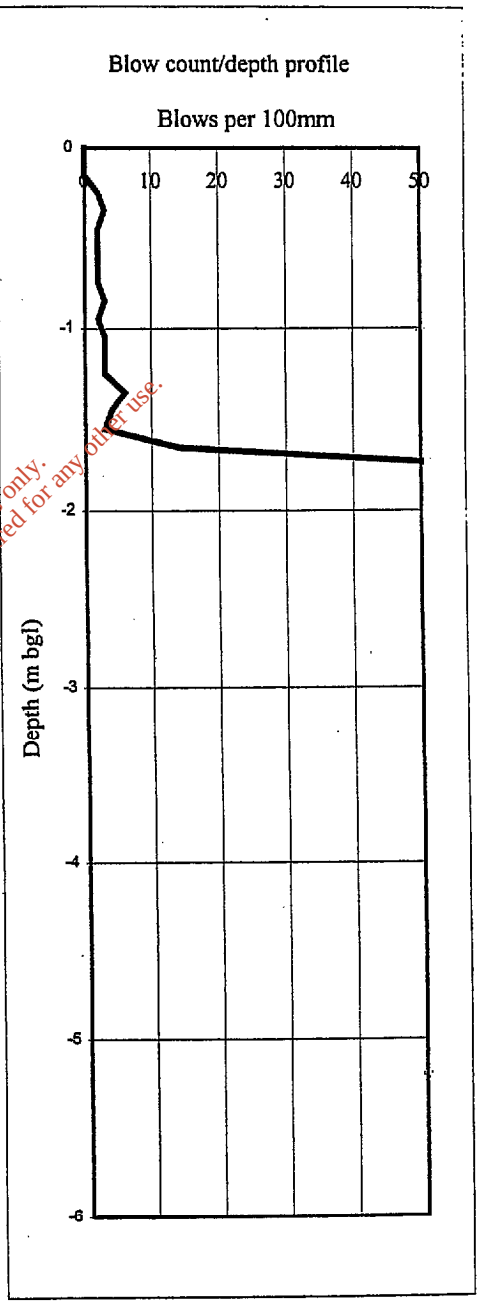


Figure FT 2/41

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA42	Easting	199586.2	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	409043.0	Approved by:		Date:	
Operative	TJ	Ground Level	239.60	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1		
0.35	2		
0.45	4		
0.55	2		
0.65	1		
0.75	1		
0.85	1		
0.95	1		
1.05	1		
1.15	1		
1.25	1		
1.35	3		
1.45	2		
1.55	1		
1.65	2		
1.75	3		
1.85	2		
1.95	3		
2.05	2		
2.15	17		
2.25	17		
2.35	13		
2.45	23		
2.55	43	Rods tight in hole	

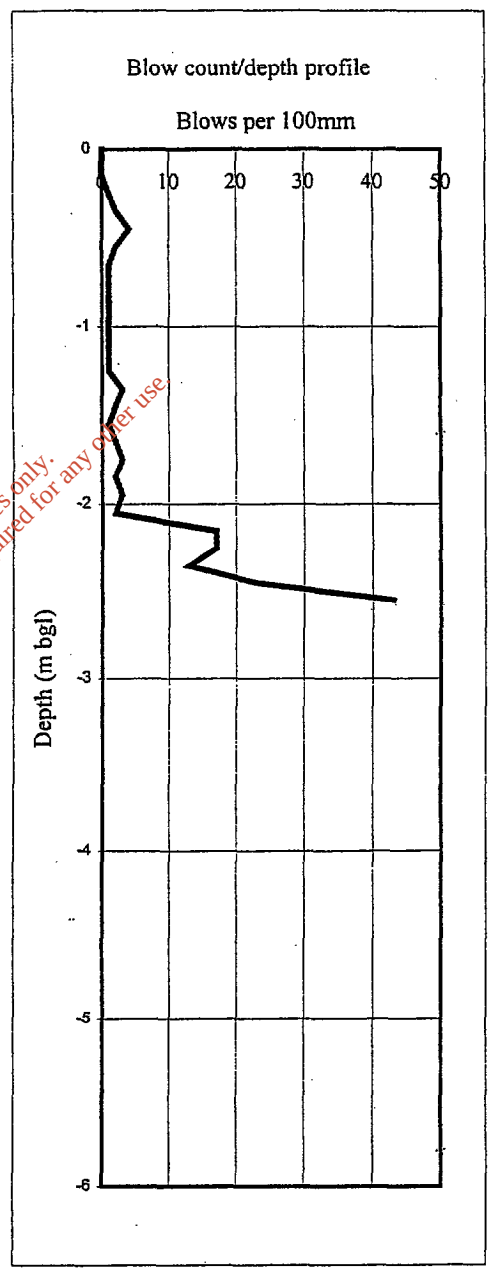


Figure FT 2/42

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA43	Easting	199514.6	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	409024.0	Approved by:		Date:	
Operative	TJ	Ground Level	236.10	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	7		
0.45	18		
0.54	50	50 for 90mm	

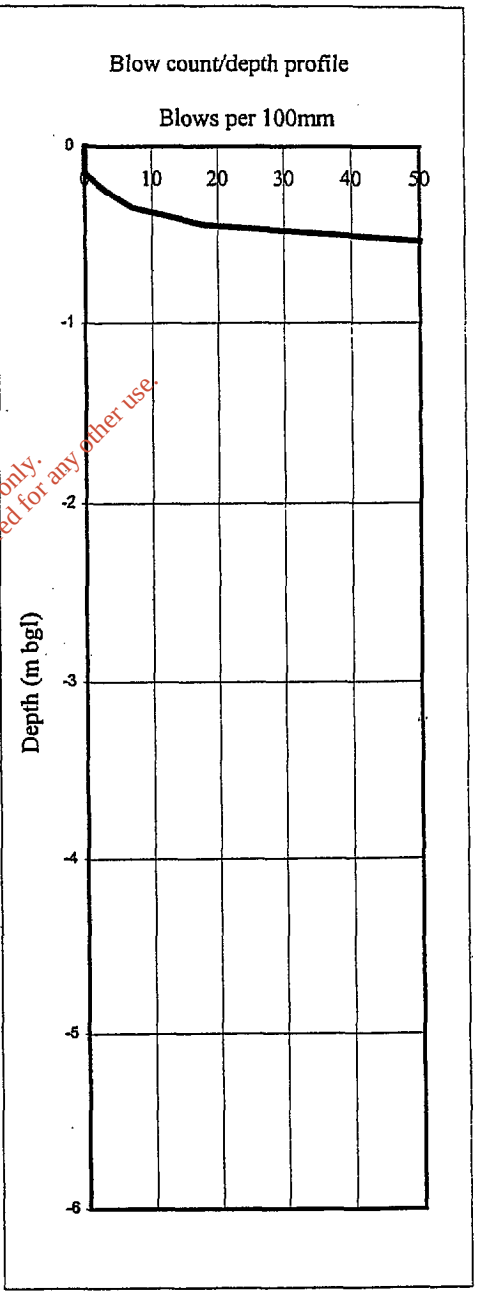


Figure FT 2/43

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA44	Easting	199601.2	Compiled by:	CDL	Date:	05/02/03
Date:	31/01/03	Northing	408978.2	Approved by:		Date:	
Operative	TJ	Ground Level	241.75	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	5		
0.55	3		
0.65	2		
0.75	1		
0.85	1		
0.95	3		
1.05	3		
1.15	3		
1.25	4		
1.35	3		
1.45	4		
1.55	6		
1.65	8		
1.75	10		
1.85	6		
1.95	8		
2.05	11		
2.15	8		
2.25	19		
2.35	36		

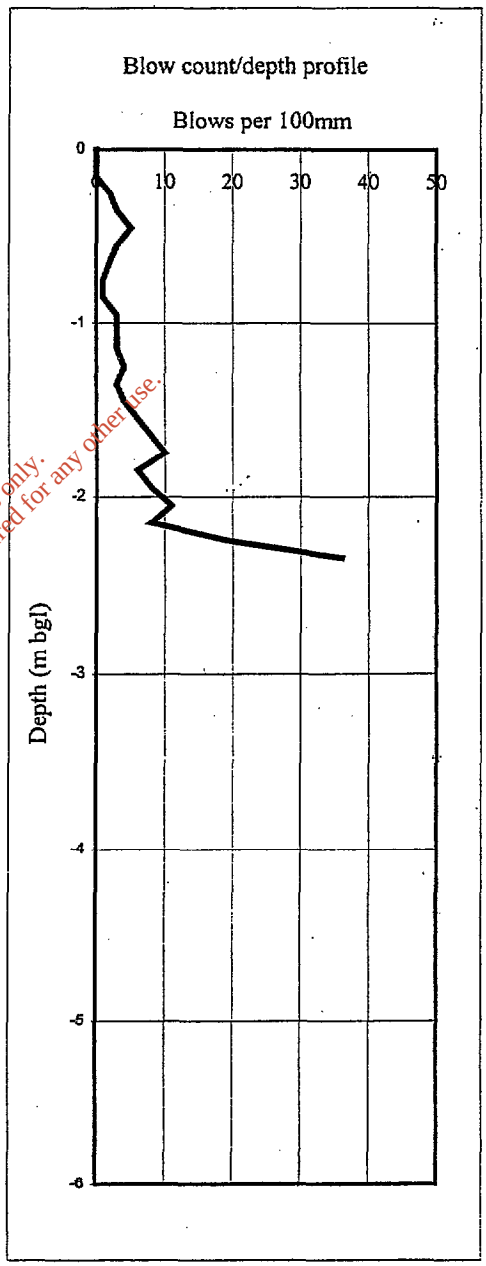


Figure FT 2/44

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED

Mackintosh Probing Record

E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA45	Easting	199601.2	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	408978.2	Approved by:		Date:	
Operative	TJ	Ground Level	241.75	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	3		
0.35	4		
0.45	4		
0.55	2		
0.65	2		
0.75	1		
0.85	1		
0.95	2		
1.05	2		
1.15	3		
1.25	2		
1.35	3		
1.45	3		
1.55	6		
1.65	12		
1.75	42		
1.81	50	50 for 60mm	

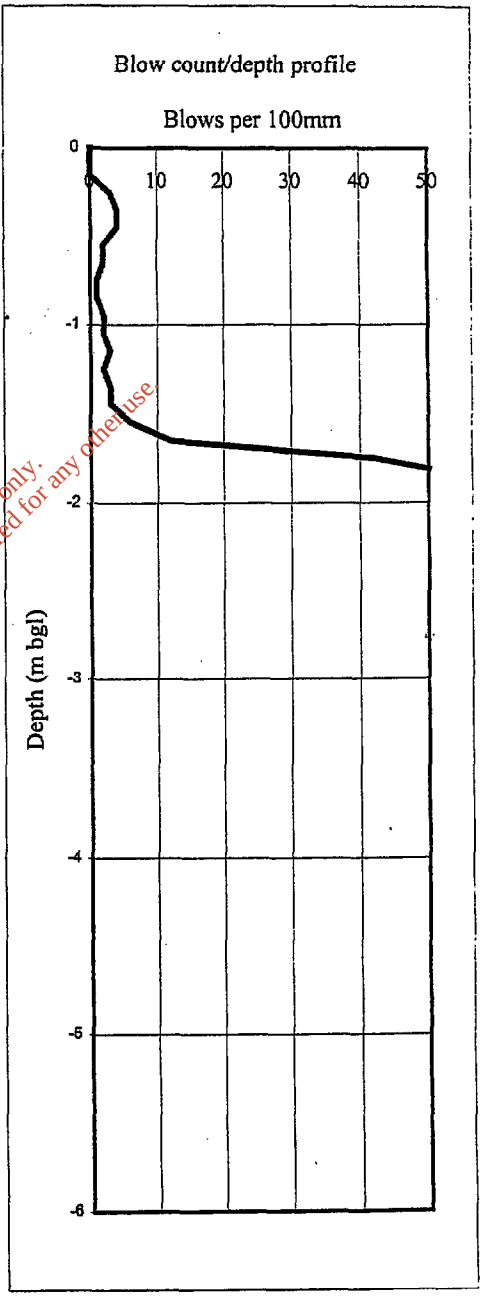


Figure FT 2/45

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA46	Easting	199816.8	Compiled by:	CDL	Date:	03/02/03
Date:	28/01/03	Northing	408942.0	Approved by:		Date:	
Operative	TJ	Ground Level	253.65	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	1	3.85	
0.35	3	3.95	
0.45	2	4.05	
0.55	2	4.15	
0.65	2	4.25	
0.75	2	4.35	
0.85	2	4.45	
0.95	3	4.55	
1.05	2	4.65	
1.15	2	4.75	
1.25	4	4.85	
1.35	4	4.95	
1.45	6	5.05	
1.55	7		
1.65	6		
1.71	7		
1.85	14		
1.95	9		
2.05	10		
2.15	20		
2.25	30	Rods tight in hole	

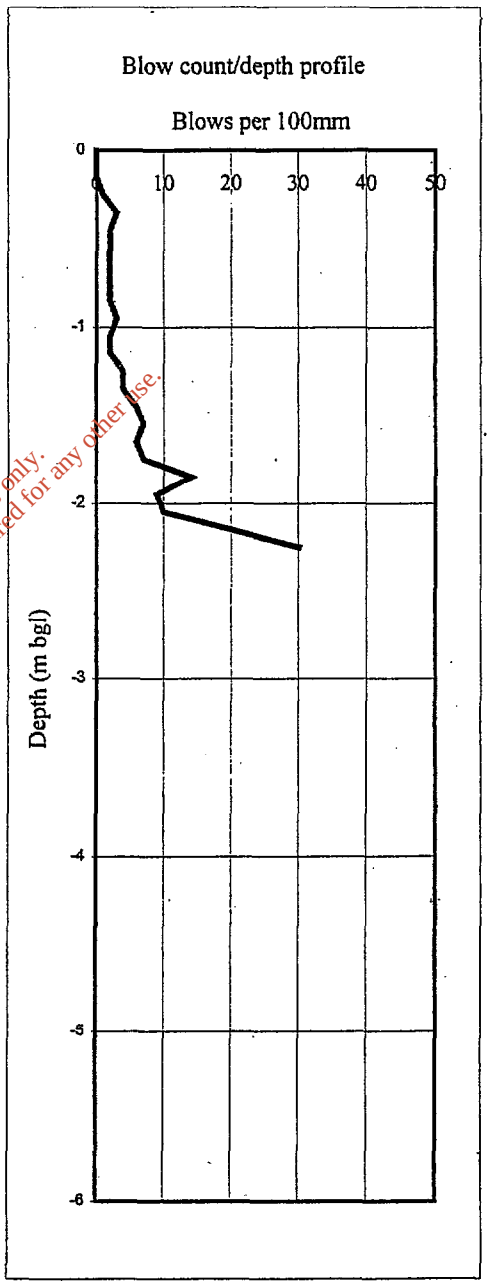


Figure FT 2/46

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA47	Easting	199720.4	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	408887.8	Approved by:		Date:	
Operative	TJ	Ground Level	249.65	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	4		
0.45	2		
0.55	3		
0.65	2		
0.75	2		
0.85	2		
0.95	1		
1.05	2		
1.15	3		
1.25	4		
1.35	3		
1.45	7		
1.55	15		
1.65	31		
1.75	32	Rods tight in hole	

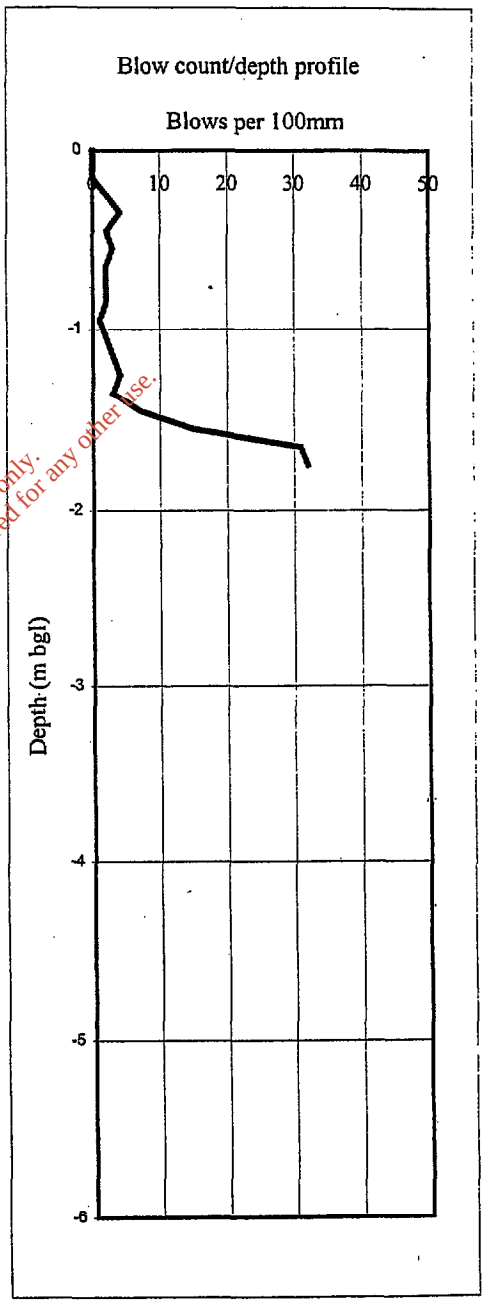


Figure FT 2/47

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA48	Easting	199636.5	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	408950.6	Approved by:		Date:	
Operative	TJ	Ground Level	243.70	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	4		
0.45	4		
0.55	2		
0.65	2		
0.75	3		
0.85	3		
0.95	3		
1.05	3		
1.15	3		
1.25	3		
1.35	2		
1.45	4		
1.55	3		
1.65	4		
1.75	24		
1.85	24		
1.95	30	Rods tight in hole	

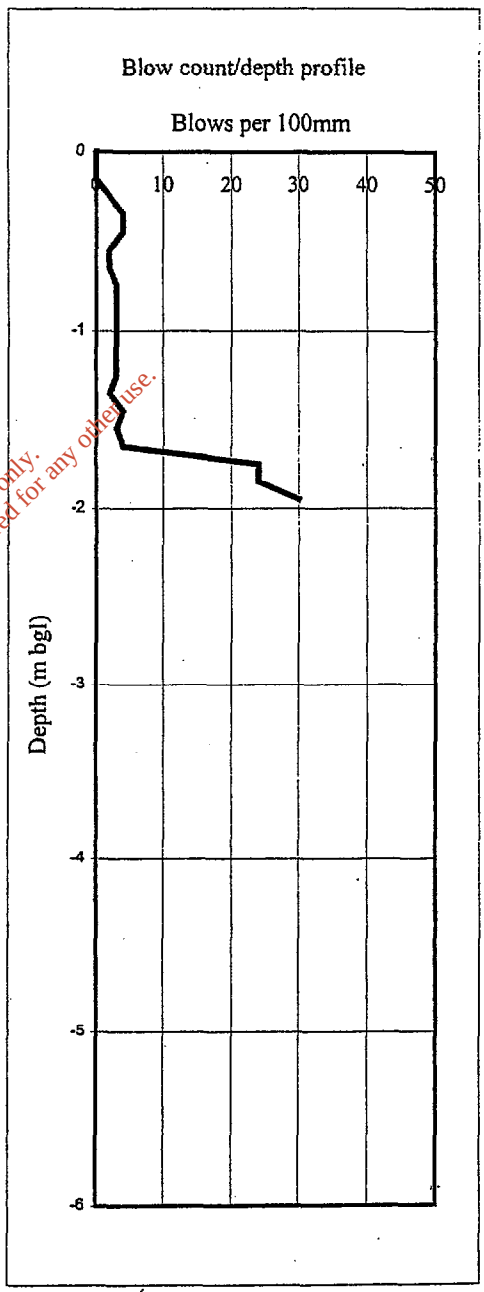


Figure FT 2/48

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA49	Easting	199527.7	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	408963.4	Approved by:		Date:	
Operative	TJ	Ground Level	238.45	remarks	Grey clay on cone tip		

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	3		
0.55	2		
0.65	2		
0.75	3		
0.85	1		
0.95	2		
1.05	1		
1.15	2		
1.25	4		
1.35	20		
1.45	14		
1.55	19		
1.65	19	Rods tight in hole	

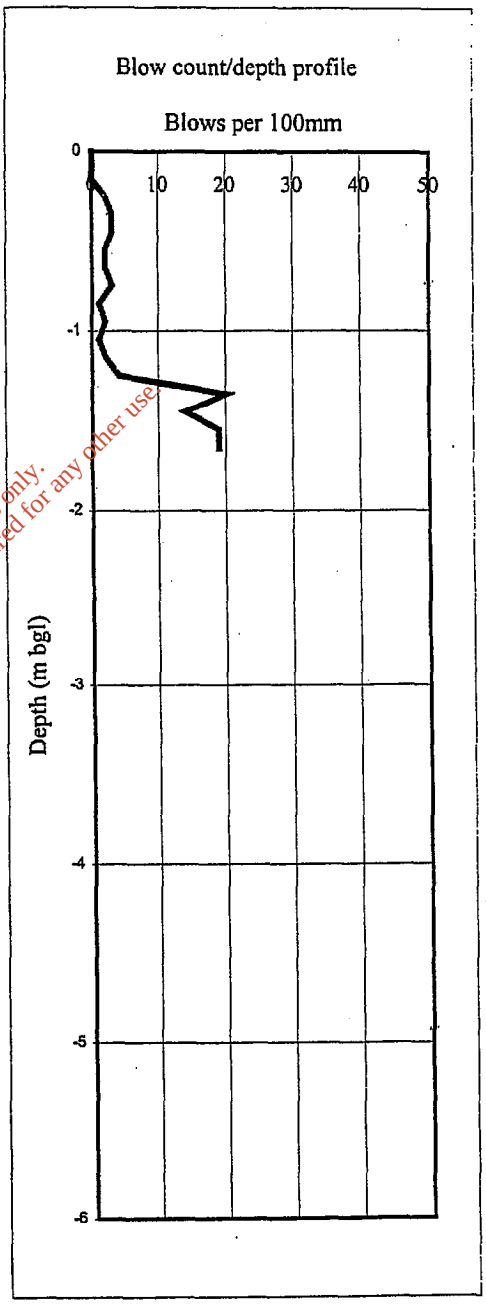


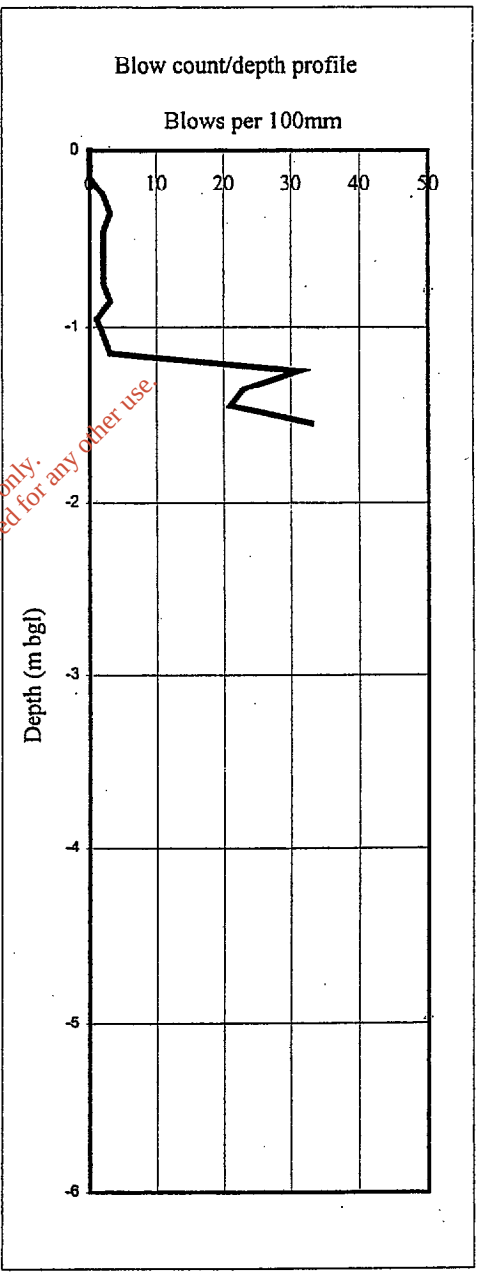
Figure FT 2/49

FOUNDATION & EXPLORATION SERVICES

FOUNDATION AND EXPLORATION SERVICES LIMITED
Mackintosh Probing Record
E02755 Meenaboll Landfill Site, Co. Donegal

Probe No.	PA50	Easting	199651.3	Compiled by:	CDL	Date:	03/02/03
Date:	27/01/03	Northing	408879.4	Approved by:		Date:	
Operative	TJ	Ground Level	246.50	remarks			

depth (metres)	blows	depth (metres)	blows
Cone 0.15m	hand pressure only		
0.25	2		
0.35	3		
0.45	2		
0.55	2		
0.65	2		
0.75	2		
0.85	3		
0.95	1		
1.05	2		
1.15	3		
1.25	31		
1.35	23		
1.45	21		
1.55	33	Rods tight in hole	



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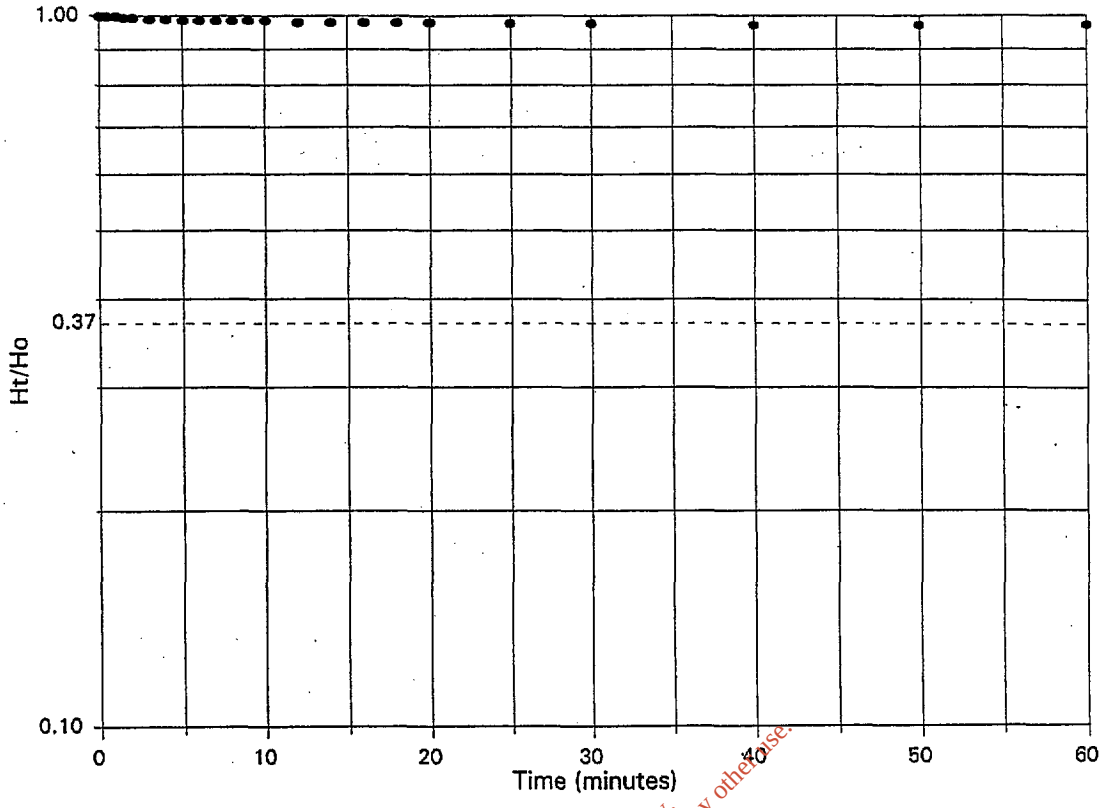
FOUNDATION & EXPLORATION SERVICES

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH1	Test No.	Test1	Depth (m)	5.00-5.00	Date	11/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.020	2.09	1.00
00:00:30	0.020	2.09	1.00
00:01:00	0.020	2.09	1.00
00:01:30	0.030	2.08	1.00
00:02:00	0.030	2.08	1.00
00:03:00	0.040	2.07	0.99
00:04:00	0.040	2.07	0.99
00:05:00	0.050	2.06	0.99
00:06:00	0.050	2.06	0.99
00:07:00	0.050	2.06	0.99
00:08:00	0.050	2.06	0.99
00:09:00	0.050	2.06	0.99
00:10:00	0.050	2.06	0.99
00:12:00	0.060	2.05	0.98
00:14:00	0.060	2.05	0.98
00:16:00	0.060	2.05	0.98
00:18:00	0.060	2.05	0.98
00:20:00	0.060	2.05	0.98
00:25:00	0.070	2.04	0.98
00:30:00	0.070	2.04	0.98
00:40:00	0.080	2.03	0.97
00:50:00	0.080	2.03	0.97
01:00:00	0.080	2.03	0.97

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.00 to 5.00	m
Casing Depth		5.00	m
Borehole Depth		5.00	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		2.11	m
Depth to Water: Start of Test (d0)		0.02	m
End of Test		0.08	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.165	m
Cross sectional area of borehole	(A) =	0.02138	m²
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.45	
General Time Lag Factors (H1) = 2.06	(t1) =	300	sec
(H2) = 2.05	(t2) =	1200	sec

Coefficient of Permeability using General Time Lag Approach

$$k = \frac{A}{F(t2-t1)} \log_e \frac{H1}{H2} = 2.5 \times 10^{-7} \text{ m/s}$$

Remarks

Water level in standpipe at 1.61m bgl 25/02/03

Standing water level assumed as level recorded in standpipe for calculation purposes. Calculation based on earlier data only

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/1

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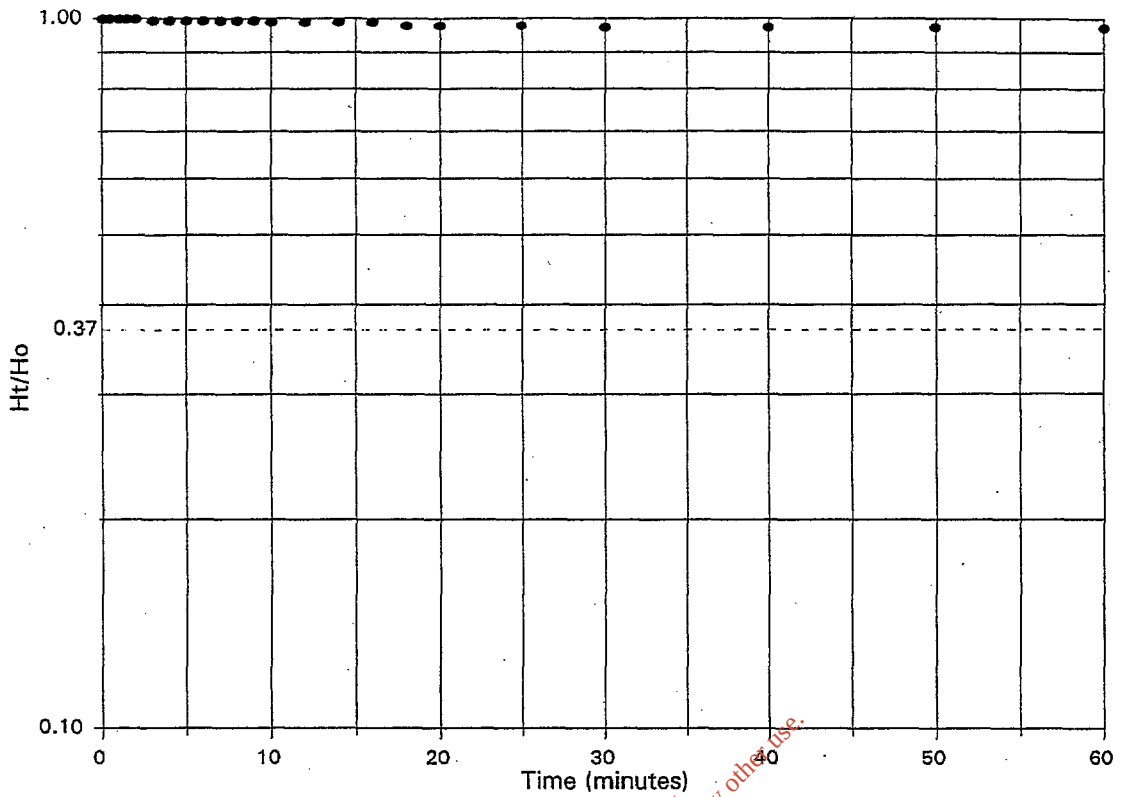
VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH1	Test No.	Test2	Depth (m)	6.50-6.50	Date	11/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.010	1.90	1.00
00:00:30	0.010	1.90	1.00
00:01:00	0.010	1.90	1.00
00:01:30	0.010	1.90	1.00
00:02:00	0.010	1.90	1.00
00:03:00	0.020	1.89	0.99
00:04:00	0.020	1.89	0.99
00:05:00	0.020	1.89	0.99
00:06:00	0.020	1.89	0.99
00:07:00	0.020	1.89	0.99
00:08:00	0.020	1.89	0.99
00:09:00	0.020	1.89	0.99
00:10:00	0.030	1.88	0.99
00:12:00	0.030	1.88	0.99
00:14:00	0.030	1.88	0.99
00:16:00	0.030	1.88	0.99
00:18:00	0.050	1.86	0.98
00:20:00	0.050	1.86	0.98
00:25:00	0.050	1.86	0.98
00:30:00	0.060	1.85	0.97
00:40:00	0.060	1.85	0.97
00:50:00	0.060	1.85	0.97
01:00:00	0.060	1.85	0.97

Test Details
(All water depths measured below Datum)

Depth of Test Section		6.50 to 6.50	m
Casing Depth		6.50	m
Borehole Depth		6.50	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		1.91	m
Depth to Water: Start of Test (d0)		0.01	m
End of Test		0.06	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.165	m
Cross sectional area of borehole	(A) =	0.02138	m²
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.45	
General Time Lag Factors (H1) = 1.89	(t1) =	300	sec
(H2) = 1.85	(t2) =	3600	sec

Coefficient of Permeability using General Time Lag Approach

$$k = \frac{A}{F(t2-t1)} \log_e \frac{H1}{H2} = 3.1 \times 10^{-7} \text{ m/s}$$

Remarks

Water level in standpipe at 1.61m bgl 25/02/03

Standing water level assumed as level recorded in standpipe for calculation purposes.Calculation based on earlier data only

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2002

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

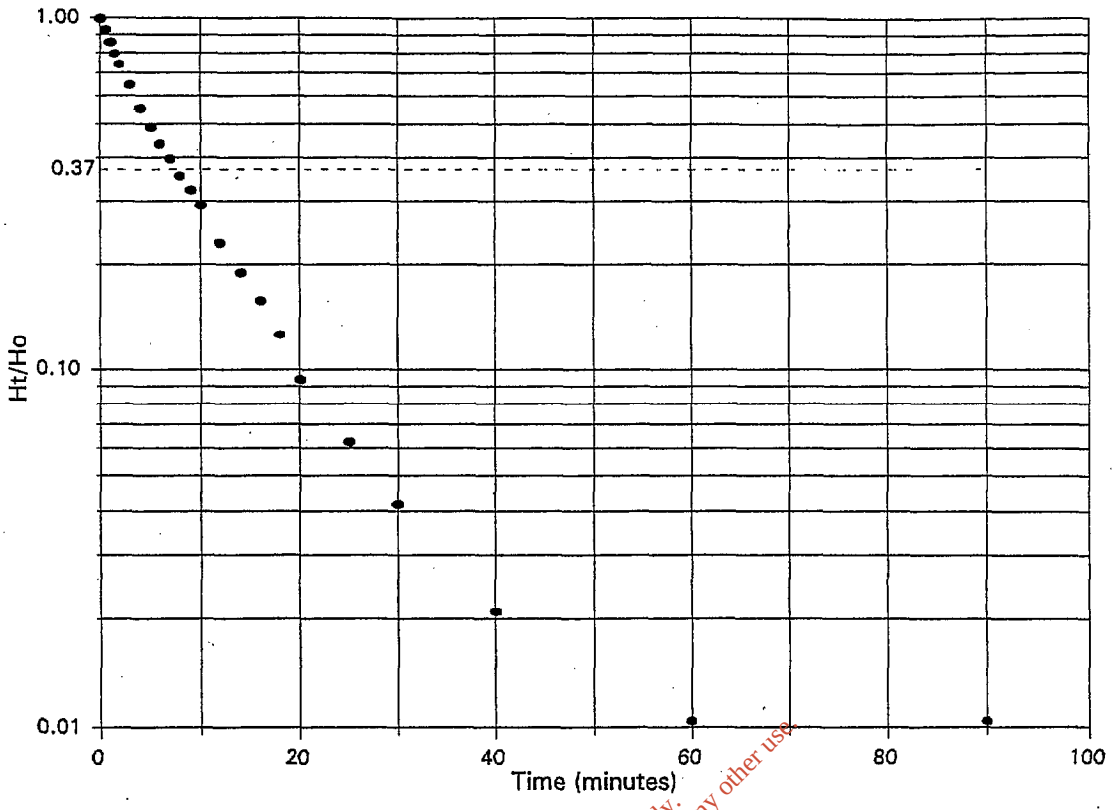
Contract No: E02755

Figure No: FT3/2

113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH1	Test No.	Test3	Depth (m)	10.45-14.65	Date	11/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.100	0.96	1.00
00:00:30	0.170	0.89	0.93
00:01:00	0.240	0.82	0.85
00:01:30	0.300	0.76	0.79
00:02:00	0.350	0.71	0.74
00:03:00	0.440	0.62	0.65
00:04:00	0.530	0.53	0.55
00:05:00	0.590	0.47	0.49
00:06:00	0.640	0.42	0.44
00:07:00	0.680	0.38	0.40
00:08:00	0.720	0.34	0.35
00:09:00	0.750	0.31	0.32
00:10:00	0.780	0.28	0.29
00:12:00	0.840	0.22	0.23
00:14:00	0.880	0.18	0.19
00:16:00	0.910	0.15	0.16
00:18:00	0.940	0.12	0.13
00:20:00	0.970	0.09	0.09
00:25:00	1.000	0.06	0.06
00:30:00	1.020	0.04	0.04
00:40:00	1.040	0.02	0.02
01:00:00	1.050	0.01	0.01
01:30:00	1.050	0.01	0.01

Test Details (All water depths measured below Datum)

Depth of Test Section		10.45 to 14.65	m
Casing Depth		10.45	m
Borehole Depth		14.65	m
Datum (mbgl, -ve means above gl)		-0.23	m
Depth to Standing Water Level (d1)		1.06	m
Depth to Water: Start of Test (d0)		0.10	m
End of Test		1.05	m
Test Type		Falling	
Response Zone Length	(L) =	4.20	m
Borehole diameter in test section	(D) =	0.116	m
Cross sectional area of borehole	(A) =	0.01057	m^2
Intake Factor (BS 5930 pg50, figure d)	(F) =	6.16	
Basic Time Lag Factor	(T) =	450	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 3.8 \times 10^{-6}\ m/s$$

Remarks

Water level in standpipe at 1.61m bgl 25/02/03

Final test level taken as rest level

For calculation purposes only

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

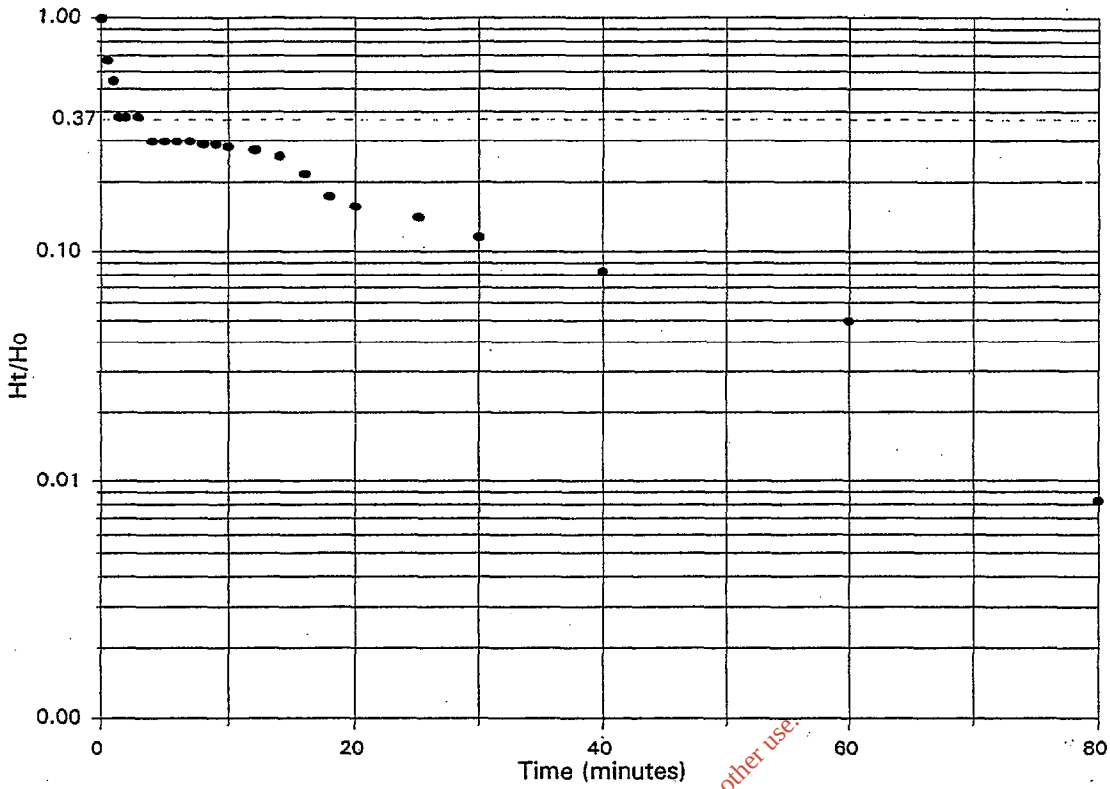
Contract No: E02755

Figure No: FT3/3

113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH1	Test No.	Test4	Depth (m)	16.35-17.30	Date	14/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.200	1.21	1.00
00:00:30	0.600	0.81	0.67
00:01:00	0.750	0.66	0.55
00:01:30	0.950	0.46	0.38
00:02:00	0.950	0.46	0.38
00:03:00	0.950	0.46	0.38
00:04:00	1.050	0.36	0.30
00:05:00	1.050	0.36	0.30
00:06:00	1.050	0.36	0.30
00:07:00	1.050	0.36	0.30
00:08:00	1.060	0.35	0.29
00:09:00	1.060	0.35	0.29
00:10:00	1.070	0.34	0.28
00:12:00	1.080	0.33	0.27
00:14:00	1.100	0.31	0.26
00:16:00	1.150	0.26	0.21
00:18:00	1.200	0.21	0.17
00:20:00	1.220	0.19	0.16
00:25:00	1.240	0.17	0.14
00:30:00	1.270	0.14	0.12
00:40:00	1.310	0.10	0.08
01:00:00	1.350	0.06	0.05
01:20:00	1.400	0.01	0.01

Test Details
(All water depths measured below Datum)

Depth of Test Section		16.35 to 17.30	m
Casing Depth		16.35	m
Borehole Depth		17.30	m
Datum (mbgl, -ve means above gl)		-0.40	m
Depth to Standing Water Level (d1)		1.41	m
Depth to Water: Start of Test (d0)		0.20	m
End of Test		1.40	m
Test Type		Falling	
Response Zone Length	(L) =	0.95	m
Borehole diameter in test section	(D) =	0.116	m
Cross sectional area of borehole	(A) =	0.01057	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.13	
Basic Time Lag Factor	(T) =	120	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 4.1 \times 10^{-5}\ \text{m/s}$$

Remarks

Water level in standpipe at 1.61m bgl 25/02/03

Final test level taken as rest level for calculation purposes

Calculation based on early data only

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

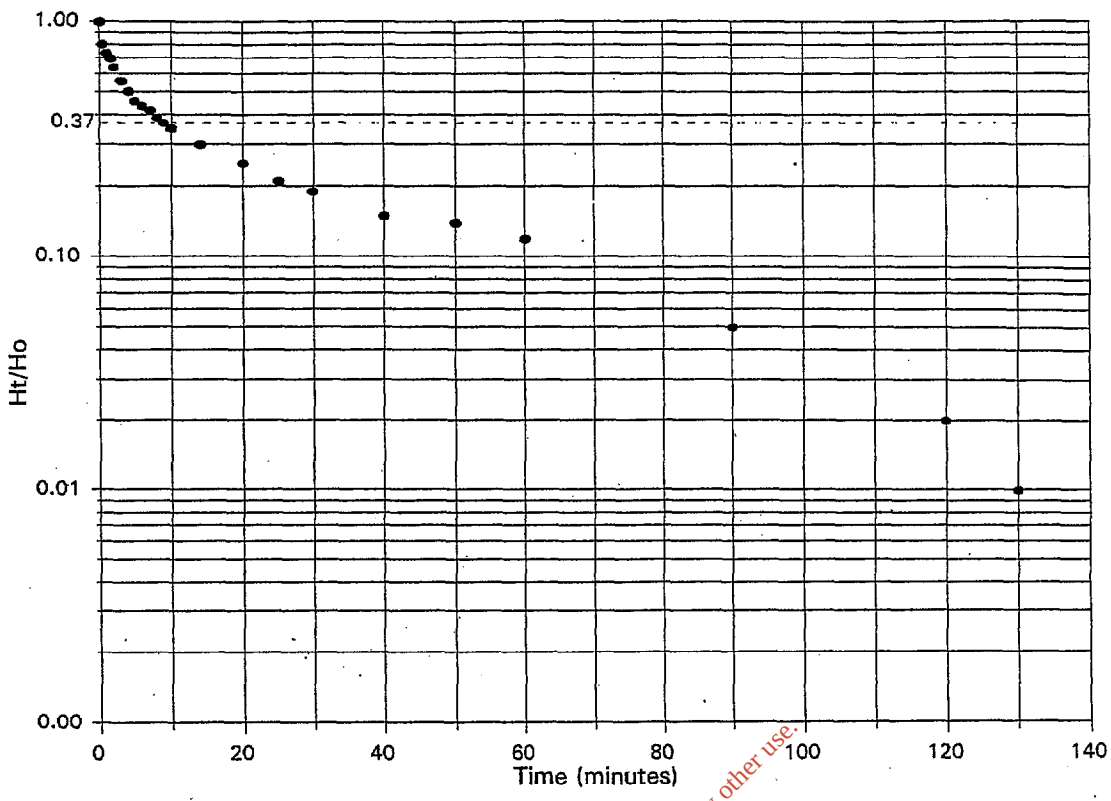
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/4 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH1	Test No.	Test5	Depth (m)	16.35-21.70	Date	14/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.200	1.01	1.00
00:00:30	0.400	0.81	0.80
00:01:00	0.470	0.74	0.73
00:01:30	0.510	0.70	0.69
00:02:00	0.570	0.64	0.63
00:03:00	0.650	0.56	0.55
00:04:00	0.700	0.51	0.50
00:05:00	0.750	0.46	0.46
00:06:00	0.770	0.44	0.44
00:07:00	0.790	0.42	0.42
00:08:00	0.820	0.39	0.39
00:09:00	0.840	0.37	0.37
00:10:00	0.860	0.35	0.35
00:14:00	0.910	0.30	0.30
00:20:00	0.960	0.25	0.25
00:25:00	1.000	0.21	0.21
00:30:00	1.020	0.19	0.19
00:40:00	1.060	0.15	0.15
00:50:00	1.070	0.14	0.14
01:00:00	1.090	0.12	0.12
01:30:00	1.160	0.05	0.05
02:00:00	1.190	0.02	0.02
02:10:00	1.200	0.01	0.01

Test Details
(All water depths measured below Datum)

Depth of Test Section		16.35 to 21.70	m
Casing Depth		16.35	m
Borehole Depth		21.70	m
Datum (mbgl, -ve means above gl)		-0.40	m
Depth to Standing Water Level (d1)		1.21	m
Depth to Water: Start of Test (d0)		0.20	m
End of Test		1.20	m
Test Type		Falling	
Response Zone Length	(L) =	5.35	m
Borehole diameter in test section	(D) =	0.116	m
Cross sectional area of borehole	(A) =	0.01057	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	7.43	
Basic Time Lag Factor	(T) =	540	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 2.6 \times 10^{-6}\ \text{m/s}$$

Remarks

Water level in standpipe at 1.61m bgl 25/02/03

Final test level taken as rest level for calculation purposes.

Calculation based on early test data only

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

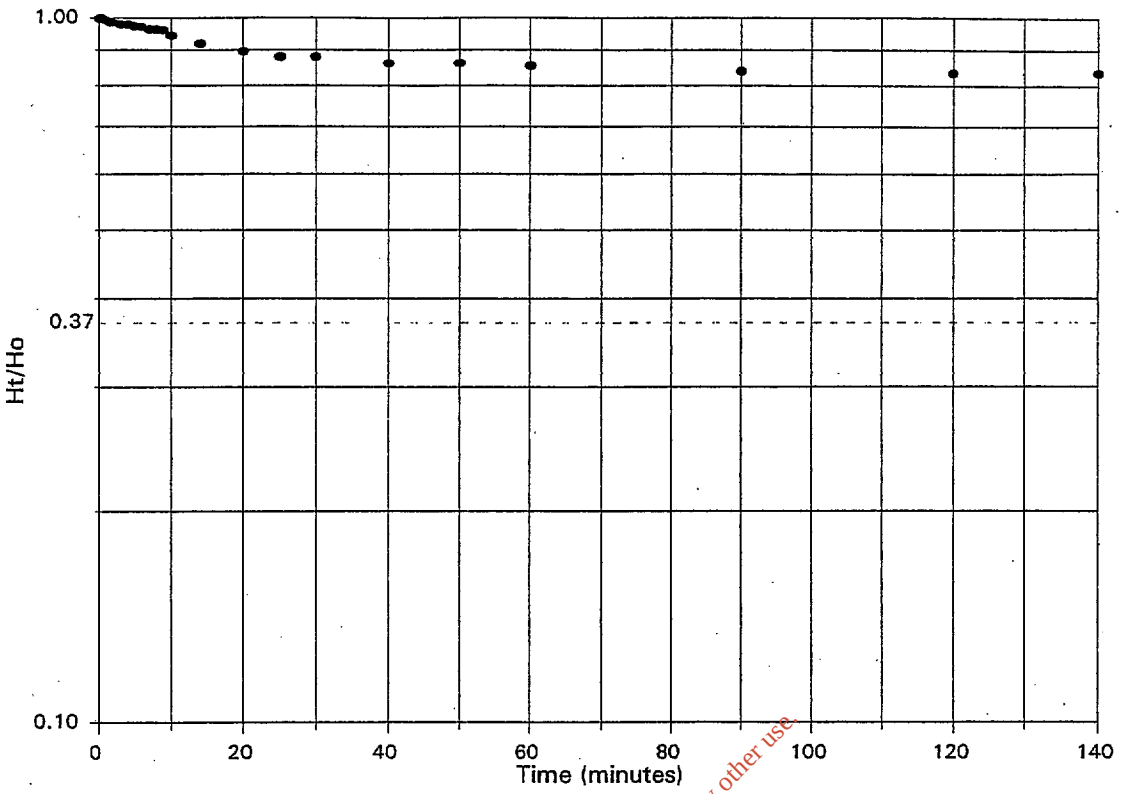
Contract No: E02755

Figure No: FT3/5

113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH2	Test No.	Test1	Depth (m)	3.13-3.65	Date	15/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.020	2.01	1.00
00:00:30	0.020	2.01	1.00
00:01:00	0.030	2.00	1.00
00:01:30	0.050	1.98	0.99
00:02:00	0.050	1.98	0.99
00:03:00	0.060	1.97	0.98
00:04:00	0.060	1.97	0.98
00:05:00	0.070	1.96	0.98
00:06:00	0.080	1.95	0.97
00:07:00	0.090	1.94	0.97
00:08:00	0.090	1.94	0.97
00:09:00	0.100	1.93	0.96
00:10:00	0.130	1.90	0.95
00:14:00	0.180	1.85	0.92
00:20:00	0.230	1.80	0.90
00:25:00	0.260	1.77	0.88
00:30:00	0.260	1.77	0.88
00:40:00	0.300	1.73	0.86
00:50:00	0.300	1.73	0.86
01:00:00	0.310	1.72	0.86
01:30:00	0.340	1.69	0.84
02:00:00	0.350	1.68	0.84
02:20:00	0.350	1.68	0.84

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.13 to 3.65	m
Casing Depth		3.13	m
Borehole Depth		3.65	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		2.03	m
Depth to Water: Start of Test (d0)		0.02	m
End of Test		0.35	m
Test Type		Falling	
Response Zone Length	(L) =	0.52	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	1.94	
General Time Lag Factors (H1) = 1.96	(t1) =	300	sec
(H2) = 1.90	(t2) =	600	sec

Coefficient of Permeability using General Time Lag Approach

$$k = \frac{A}{F(t2-t1)} \log_e \frac{H1}{H2} = 1.7 \times 10^{-6} \text{ m/s}$$

Remarks

Water level in standpipe at 1.53m bgl 25/02/03

Test terminated no further fall. Water level in standpipe assumed as rest level, possible silted up, calculation on earlier data

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

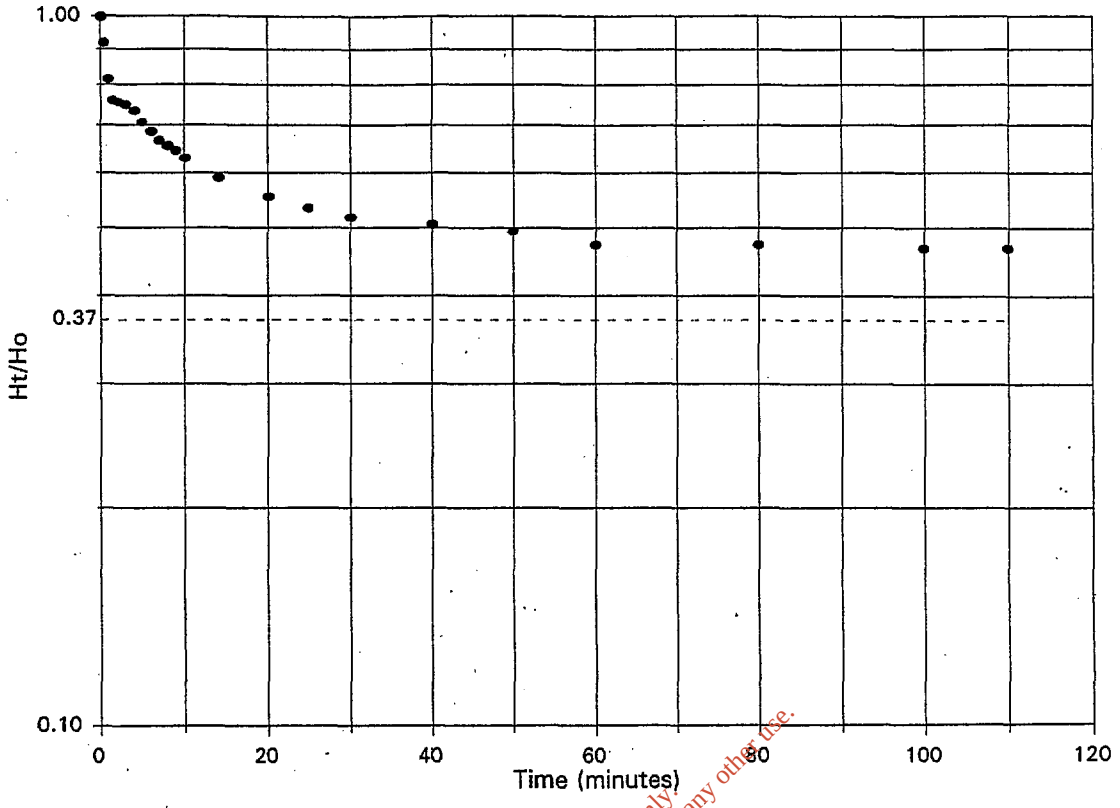
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/6 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH2	Test No.	Test2	Depth (m)	5.36-5.70	Date	16/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.150	1.88	1.00
00:00:30	0.300	1.73	0.92
00:01:00	0.500	1.53	0.81
00:01:30	0.600	1.43	0.76
00:02:00	0.610	1.42	0.76
00:03:00	0.620	1.41	0.75
00:04:00	0.650	1.38	0.73
00:05:00	0.700	1.33	0.71
00:06:00	0.740	1.29	0.69
00:07:00	0.780	1.25	0.66
00:08:00	0.800	1.23	0.65
00:09:00	0.820	1.21	0.64
00:10:00	0.850	1.18	0.63
00:14:00	0.920	1.11	0.59
00:20:00	0.990	1.04	0.55
00:25:00	1.030	1.00	0.53
00:30:00	1.060	0.97	0.52
00:40:00	1.080	0.95	0.51
00:50:00	1.100	0.93	0.49
01:00:00	1.140	0.89	0.47
01:20:00	1.140	0.89	0.47
01:40:00	1.150	0.88	0.47
01:50:00	1.150	0.88	0.47

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.36 to 5.70	m
Casing Depth		5.36	m
Borehole Depth		5.70	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		2.03	m
Depth to Water: Start of Test (d0)		0.15	m
End of Test		1.15	m
Test Type		Falling	
Response Zone Length	(L) =	0.34	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	1.64	
Basic Time Lag Factor	(T) =	510	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 3.8 \times 10^{-5} \text{ m/s}$$

Remarks

Water level in standpipe at 1.53m bgl 25/02/03

Test terminated no further fall, possible silting up. Level in standpipe assumed as rest level. Calculation based on eary data.

Geology of Test Weathered Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2002

FOUNDATION & EXPLORATION SERVICES

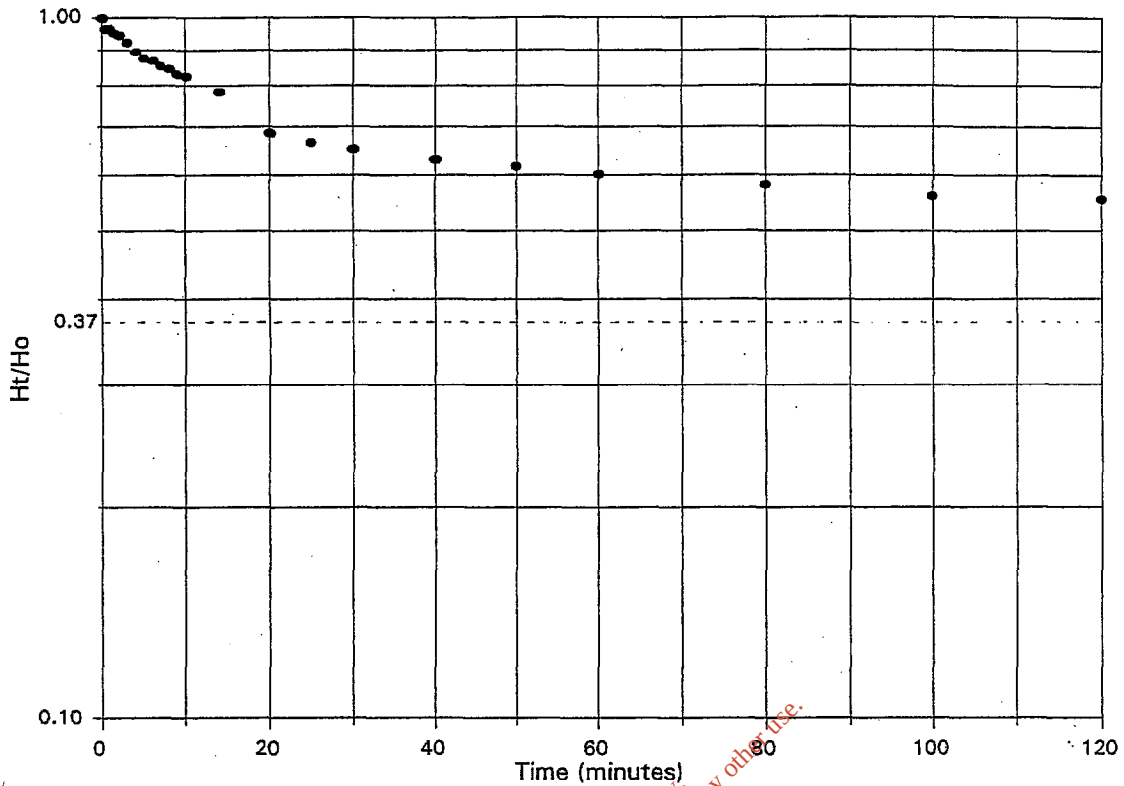
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/7

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH2	Test No.	Test3	Depth (m)	5.36-12.35	Date	16/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.600	1.43	1.00
00:00:30	0.650	1.38	0.97
00:01:00	0.650	1.38	0.97
00:01:30	0.670	1.36	0.95
00:02:00	0.680	1.35	0.94
00:03:00	0.710	1.32	0.92
00:04:00	0.750	1.28	0.90
00:05:00	0.780	1.25	0.87
00:06:00	0.790	1.24	0.87
00:07:00	0.810	1.22	0.85
00:08:00	0.820	1.21	0.85
00:09:00	0.840	1.19	0.83
00:10:00	0.850	1.18	0.83
00:14:00	0.910	1.12	0.78
00:20:00	1.050	0.98	0.69
00:25:00	1.080	0.95	0.66
00:30:00	1.100	0.93	0.65
00:40:00	1.130	0.90	0.63
00:50:00	1.150	0.88	0.62
01:00:00	1.170	0.86	0.60
01:20:00	1.200	0.83	0.58
01:40:00	1.230	0.80	0.56
02:00:00	1.240	0.79	0.55

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.36 to 12.35	m
Casing Depth		5.36	m
Borehole Depth		12.35	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		2.03	m
Depth to Water: Start of Test (d0)		0.60	m
End of Test		1.24	m
Test Type		Falling	
Response Zone Length	(L) =	6.99	m
Borehole diameter in test section	(D) =	0.137	m
Cross sectional area of borehole	(A) =	0.01474	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	9.50	
General Time Lag Factors (H1) = 1.38	(t1) =	60	sec
(H2) = 1.25	(t2) =	300	sec

Coefficient of Permeability using General Time Lag Approach

$$k = \frac{A}{F(t2-t1)} \log_e \frac{H1}{H2} = 6.4 \times 10^{-7} \text{ m/s}$$

Remarks

Water level in standpipe at 1.53m bgl 25/02/03
Rest level assumed as level within standpipe for calculation
Purposes. Calculation based on early data.
Geology of Test Weathered Schist and Fractured Schist

		Input by	Date	Checked by	Date		
		cdl	04/03/2003	IPJ	06/03/2003		

FOUNDATION & EXPLORATION SERVICES

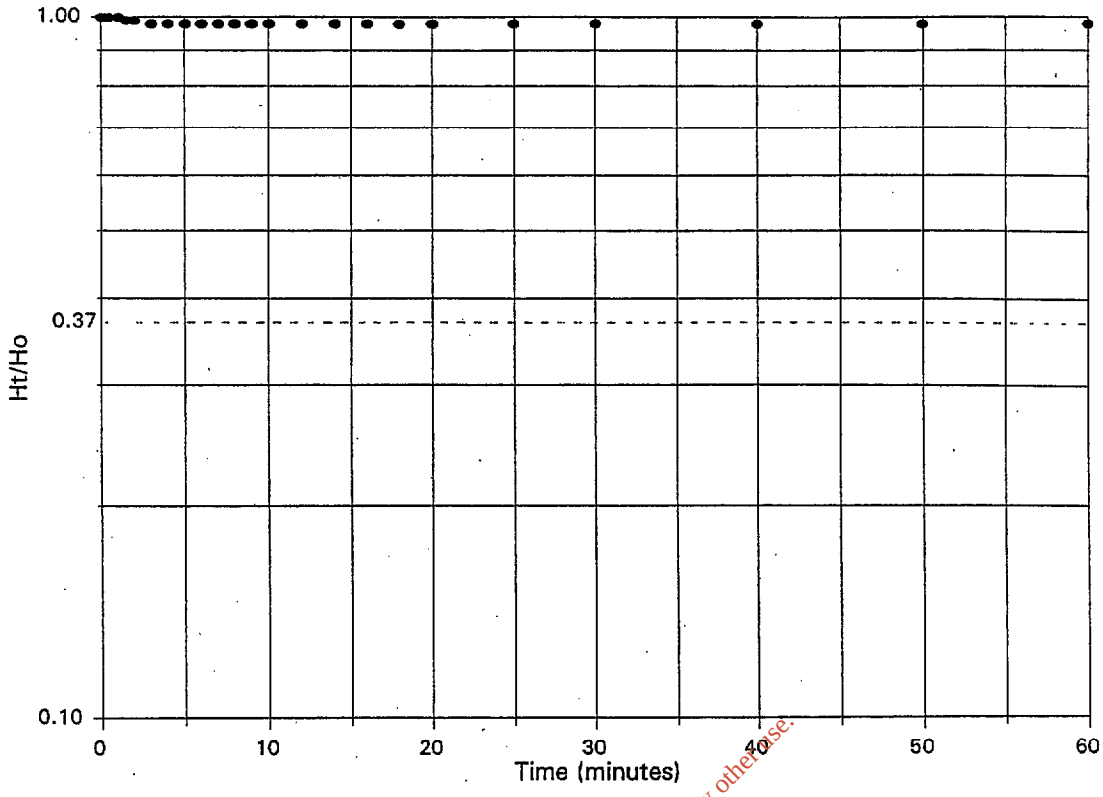
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/8 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH3	Test No.	Test1	Depth (m)	1.30-1.30	Date	19/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.00	1.00
00:00:30	0.000	1.00	1.00
00:01:00	0.000	1.00	1.00
00:01:30	0.010	0.99	0.99
00:02:00	0.010	0.99	0.99
00:03:00	0.020	0.98	0.98
00:04:00	0.020	0.98	0.98
00:05:00	0.020	0.98	0.98
00:06:00	0.020	0.98	0.98
00:07:00	0.020	0.98	0.98
00:08:00	0.020	0.98	0.98
00:09:00	0.020	0.98	0.98
00:10:00	0.020	0.98	0.98
00:12:00	0.020	0.98	0.98
00:14:00	0.020	0.98	0.98
00:16:00	0.020	0.98	0.98
00:18:00	0.020	0.98	0.98
00:20:00	0.020	0.98	0.98
00:25:00	0.020	0.98	0.98
00:30:00	0.020	0.98	0.98
00:40:00	0.020	0.98	0.98
00:50:00	0.020	0.98	0.98
01:00:00	0.020	0.98	0.98

Test Details
(All water depths measured below Datum)

Depth of Test Section		1.30 to 1.30	m
Casing Depth		1.30	m
Borehole Depth		1.30	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		1.00	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.02	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.55	

Coefficient of Permeability using

$$k = \frac{A}{FT} =$$

Remarks

Borehole artesian >0.40m agl on 25/02/03.Test probably invalid

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

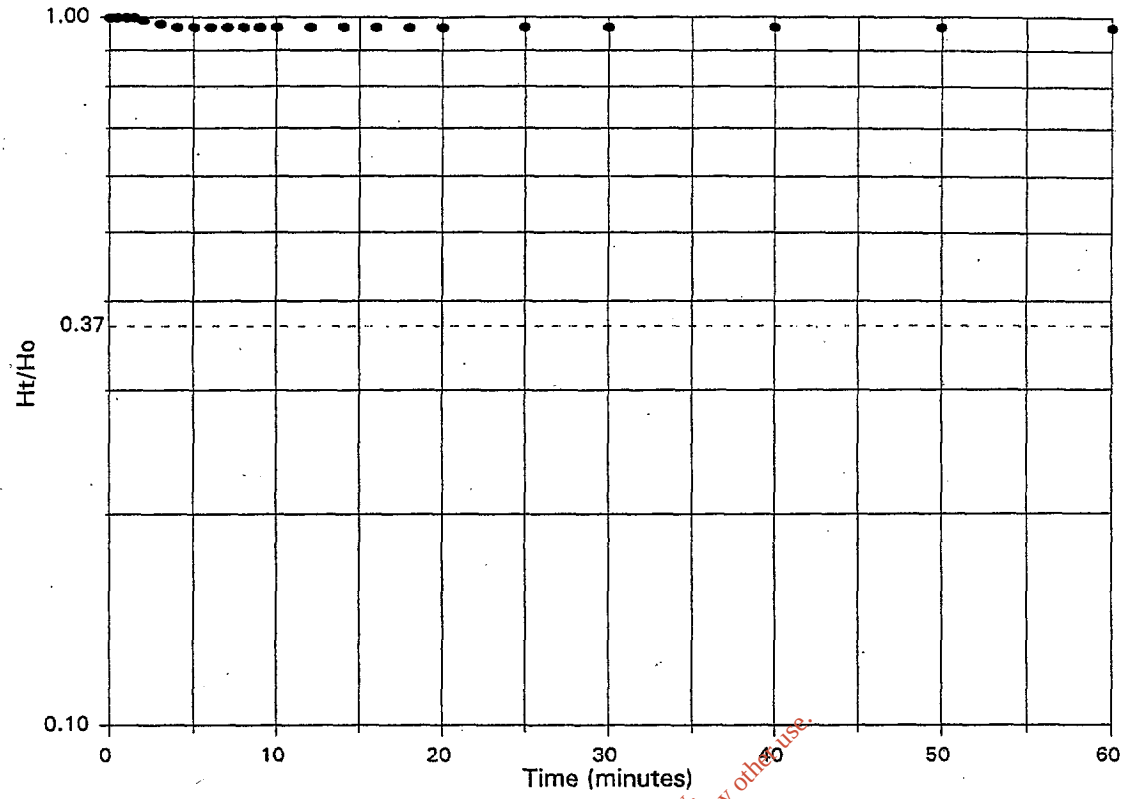
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/9 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH3	Test No.	Test2	Depth (m)	4.00-6.85	Date	19/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.00	1.00
00:00:30	0.000	1.00	1.00
00:01:00	0.000	1.00	1.00
00:01:30	0.000	1.00	1.00
00:02:00	0.010	0.99	0.99
00:03:00	0.020	0.98	0.98
00:04:00	0.030	0.97	0.97
00:05:00	0.030	0.97	0.97
00:06:00	0.030	0.97	0.97
00:07:00	0.030	0.97	0.97
00:08:00	0.030	0.97	0.97
00:09:00	0.030	0.97	0.97
00:10:00	0.030	0.97	0.97
00:12:00	0.030	0.97	0.97
00:14:00	0.030	0.97	0.97
00:16:00	0.030	0.97	0.97
00:18:00	0.030	0.97	0.97
00:20:00	0.030	0.97	0.97
00:25:00	0.030	0.97	0.97
00:30:00	0.030	0.97	0.97
00:40:00	0.030	0.97	0.97
00:50:00	0.030	0.97	0.97
01:00:00	0.030	0.97	0.97

Test Details
(All water depths measured below Datum)

Depth of Test Section		4.00 to 6.85	m
Casing Depth		4.00	m
Borehole Depth		6.85	m
Datum (mbgl, -ve means above gl)		-0.63	m
Depth to Standing Water Level (d1)		1.00	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.03	m
Test Type		Falling	
Response Zone Length	(L) =	2.85	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	5.34	

Coefficient of Permeability using

$$k = \frac{A}{F\,T} =$$

Remarks

Borehole artesian >0.40m agl on 25/02/03.Test probably invalid

Geology of Test Glacial Till and upper Weathered Schist

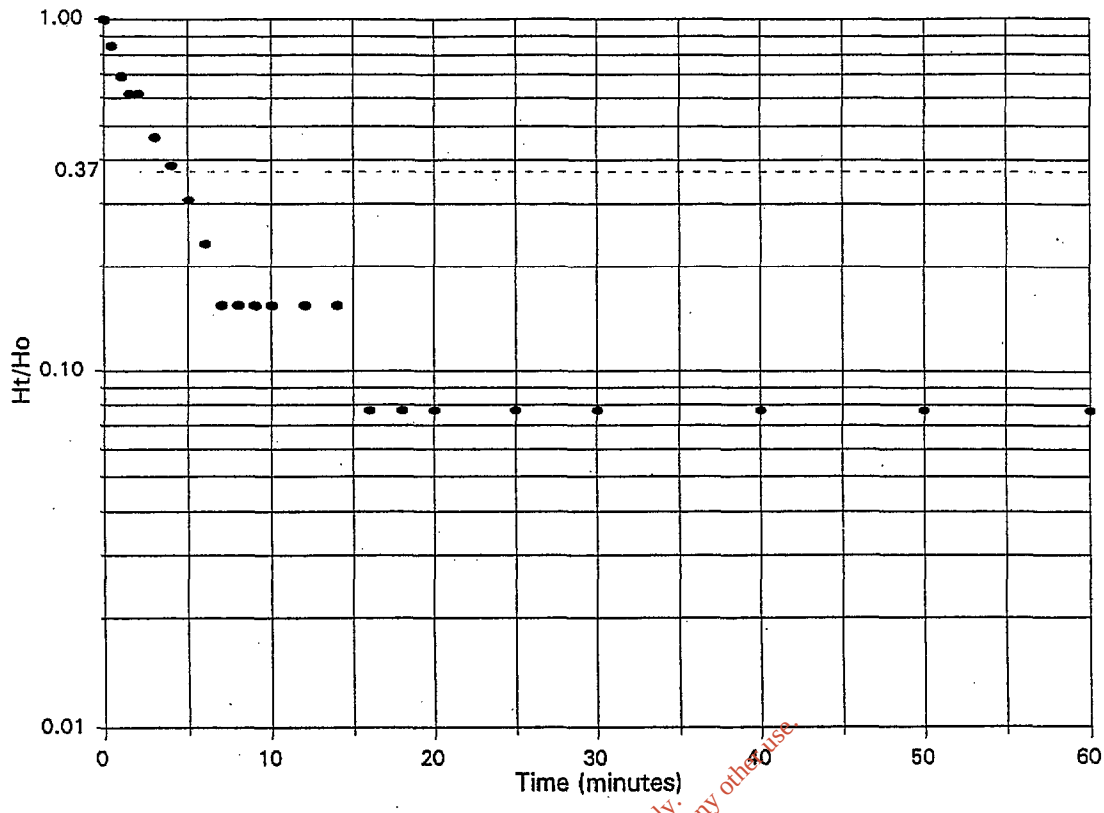
Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

Project	Contract No
MEENABOLL LANDFILL SITE, CO. DONEGAL	E02755
	Figure No FT3/10

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH3	Test No.	Test3	Depth (m)	8.45-12.65	Date	25/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	0.13	1.00
00:00:30	0.020	0.11	0.85
00:01:00	0.040	0.09	0.69
00:01:30	0.050	0.08	0.62
00:02:00	0.050	0.08	0.62
00:03:00	0.070	0.06	0.46
00:04:00	0.080	0.05	0.38
00:05:00	0.090	0.04	0.31
00:06:00	0.100	0.03	0.23
00:07:00	0.110	0.02	0.15
00:08:00	0.110	0.02	0.15
00:09:00	0.110	0.02	0.15
00:10:00	0.110	0.02	0.15
00:12:00	0.110	0.02	0.15
00:14:00	0.110	0.02	0.15
00:16:00	0.120	0.01	0.08
00:18:00	0.120	0.01	0.08
00:20:00	0.120	0.01	0.08
00:25:00	0.120	0.01	0.08
00:30:00	0.120	0.01	0.08
00:40:00	0.120	0.01	0.08
00:50:00	0.120	0.01	0.08
01:00:00	0.120	0.01	0.08

Test Details (All water depths measured below Datum)

Depth of Test Section		8.45 to 12.65	m
Casing Depth		8.45	m
Borehole Depth		12.65	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		0.13	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.12	m
Test Type		Falling	
Response Zone Length	(L) =	4.20	m
Borehole diameter in test section	(D) =	0.116	m
Cross sectional area of borehole	(A) =	0.01057	m^2
Intake Factor (BS 5930 pg50, figure d)	(F) =	6.16	
Basic Time Lag Factor	(T) =	250	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} =$$

Remarks

Borehole artesian >0.40m agl on 25/02/03.Test possibly invalid

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

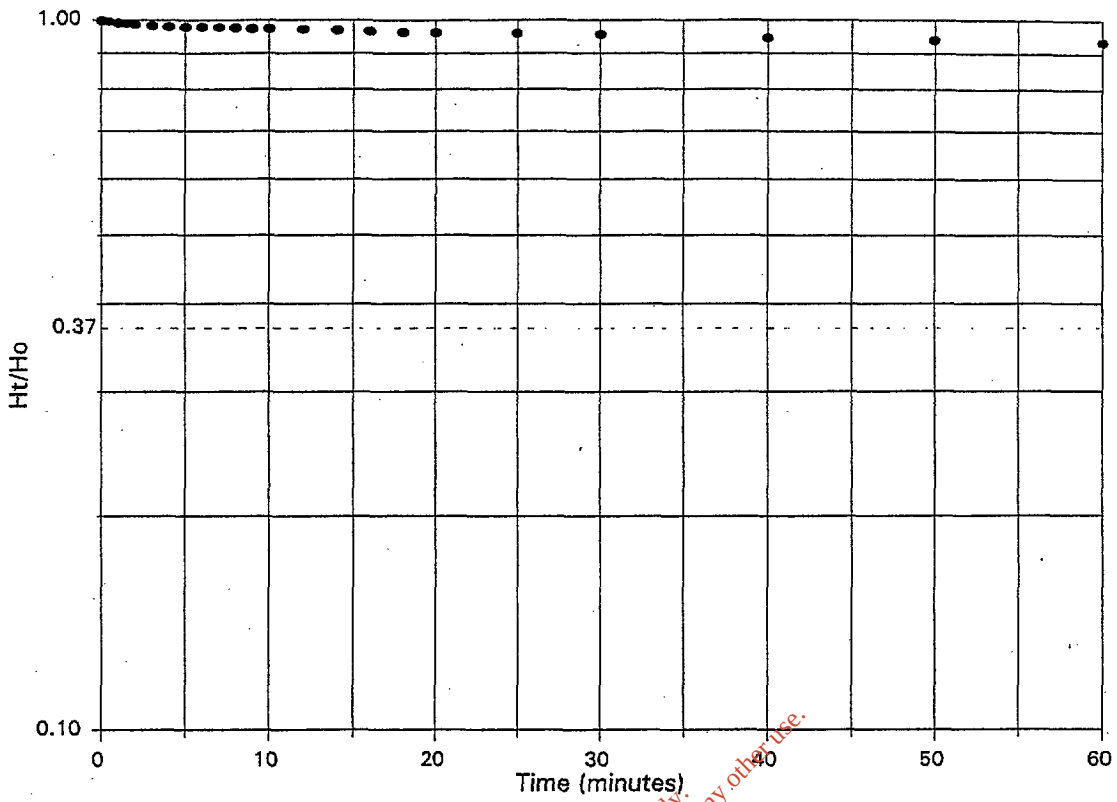
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/11

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH4	Test No.	Test1	Depth (m)	5.70-5.70	Date	11/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	3.19	1.00
00:00:30	0.010	3.18	1.00
00:01:00	0.020	3.17	0.99
00:01:30	0.030	3.16	0.99
00:02:00	0.040	3.15	0.99
00:03:00	0.050	3.14	0.98
00:04:00	0.060	3.13	0.98
00:05:00	0.065	3.13	0.98
00:06:00	0.065	3.13	0.98
00:07:00	0.070	3.12	0.98
00:08:00	0.075	3.12	0.98
00:09:00	0.080	3.11	0.97
00:10:00	0.085	3.11	0.97
00:12:00	0.095	3.10	0.97
00:14:00	0.100	3.09	0.97
00:16:00	0.105	3.09	0.97
00:18:00	0.110	3.08	0.97
00:20:00	0.120	3.07	0.96
00:25:00	0.130	3.06	0.96
00:30:00	0.140	3.05	0.96
00:40:00	0.170	3.02	0.95
00:50:00	0.190	3.00	0.94
01:00:00	0.210	2.98	0.93

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.70 to 5.70	m
Casing Depth		5.70	m
Borehole Depth		5.70	m
Datum (mbgl, -ve means above gl)		-0.40	m
Depth to Standing Water Level (d1)		3.19	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.21	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.165	m
Cross sectional area of borehole	(A) =	0.02138	m²
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.45	
General Time Lag Factors (H1) = 3.17	(t1) =	60	sec
(H2) = 3.13	(t2) =	300	sec

Coefficient of Permeability using General Time Lag Approach

$$k = \frac{A}{F(t2-t1)} \log_e \frac{H1}{H2} = 2.8 \times 10^{-6} \text{ m/s}$$

Remarks

Water level in standpipe at 2.79m bgl 25/02/03

Rest level assumed as level in standpipe for calculation purposes

Calculation based on early data

Geology of Test Glacial Till

		Input by	Date	Checked by	Date		
		cdl	04/03/2003	IPJ	06/03/2003		

FOUNDATION & EXPLORATION SERVICES

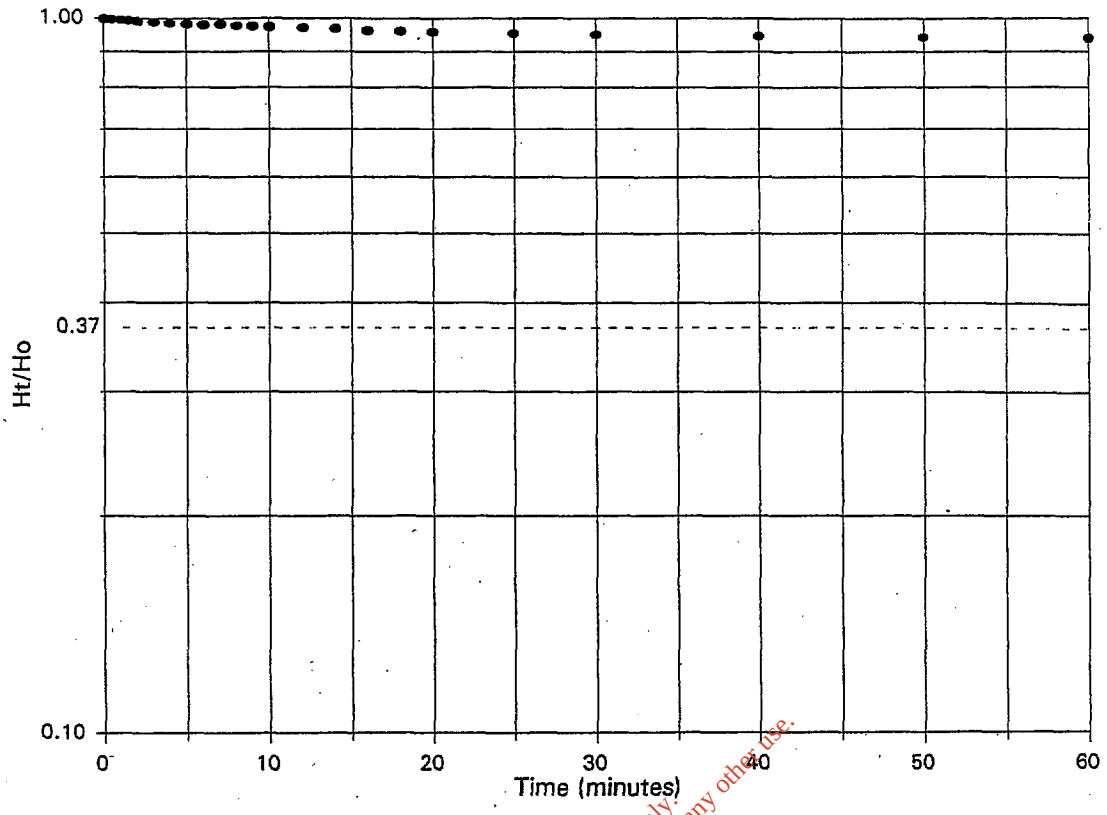
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/12

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH4	Test No.	Test2	Depth (m)	7.20-7.20	Date	11/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	3.29	1.00
00:00:30	0.005	3.29	1.00
00:01:00	0.010	3.28	1.00
00:01:30	0.015	3.28	1.00
00:02:00	0.025	3.27	0.99
00:03:00	0.035	3.26	0.99
00:04:00	0.045	3.25	0.99
00:05:00	0.050	3.24	0.98
00:06:00	0.055	3.24	0.98
00:07:00	0.050	3.24	0.98
00:08:00	0.070	3.22	0.98
00:09:00	0.075	3.22	0.98
00:10:00	0.080	3.21	0.98
00:12:00	0.090	3.20	0.97
00:14:00	0.100	3.19	0.97
00:16:00	0.115	3.18	0.97
00:18:00	0.125	3.17	0.96
00:20:00	0.135	3.16	0.96
00:25:00	0.150	3.14	0.95
00:30:00	0.165	3.13	0.95
00:40:00	0.175	3.12	0.95
00:50:00	0.185	3.11	0.94
01:00:00	0.195	3.10	0.94

Test Details
(All water depths measured below Datum)

Depth of Test Section		7.20 to 7.20	m
Casing Depth		7.20	m
Borehole Depth		7.20	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		3.29	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.20	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.165	m
Cross sectional area of borehole	(A) =	0.02138	m^2
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.45	
General Time Lag Factors (H1) = 3.28	(t1) =	60	sec
(H2) = 3.24	(t2) =	300	sec

Coefficient of Permeability using General Time Lag Approach

$$k = \frac{A}{F(t2-t1)} \log_e \frac{H1}{H2} = 2.4 \times 10^{-6} \text{ m/s}$$

Remarks

Water level in standpipe at 2.79m bgl 25/02/03

Rest level assumed as level in standpipe for calculation purposes

Calculation based on early data.

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

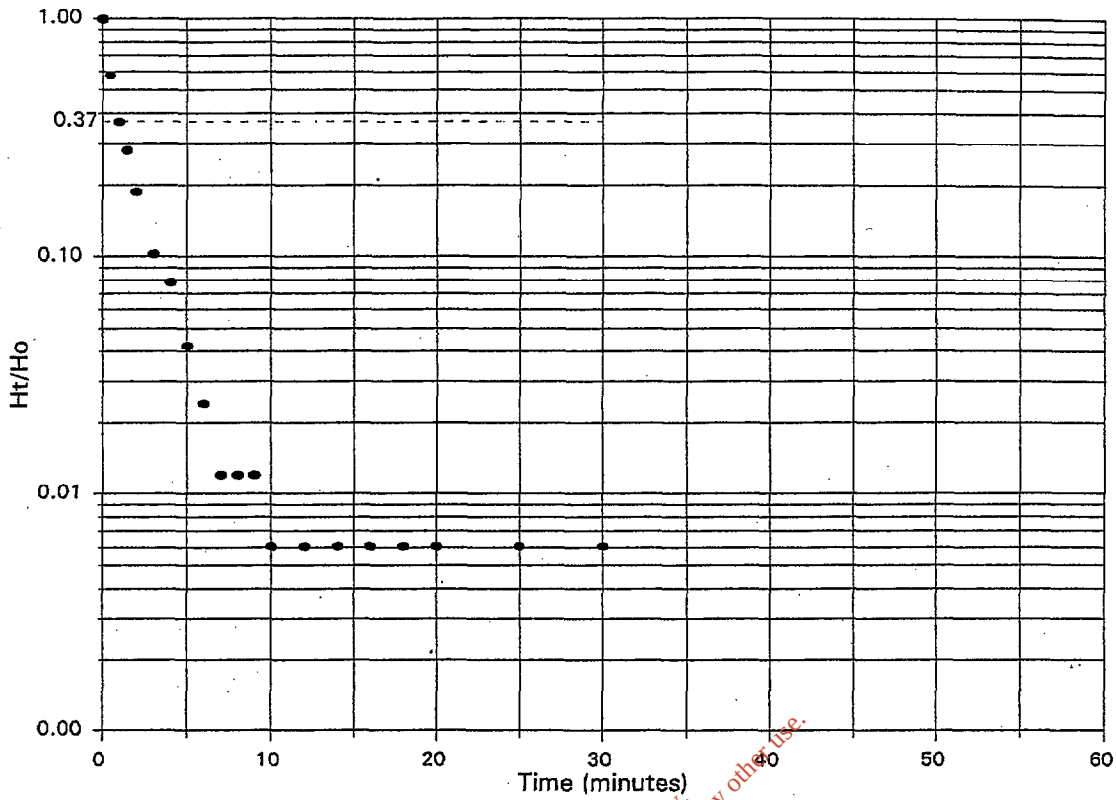
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/13 11/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH4	Test No.	Test3	Depth (m)	9.90-10.90	Date	11/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.66	1.00
00:00:30	0.700	0.96	0.58
00:01:00	1.050	0.61	0.37
00:01:30	1.200	0.46	0.28
00:02:00	1.350	0.31	0.19
00:03:00	1.490	0.17	0.10
00:04:00	1.530	0.13	0.08
00:05:00	1.590	0.07	0.04
00:06:00	1.620	0.04	0.02
00:07:00	1.640	0.02	0.01
00:08:00	1.640	0.02	0.01
00:09:00	1.640	0.02	0.01
00:10:00	1.650	0.01	0.01
00:12:00	1.650	0.01	0.01
00:14:00	1.650	0.01	0.01
00:16:00	1.650	0.01	0.01
00:18:00	1.650	0.01	0.01
00:20:00	1.650	0.01	0.01
00:25:00	1.650	0.01	0.01
00:30:00	1.650	0.01	0.01
00:40:00			
00:50:00			
01:00:00			

Test Details
(All water depths measured below Datum)

Depth of Test Section		9.90 to 10.90	m
Casing Depth		9.90	m
Borehole Depth		10.90	m
Datum (mbgl, -ve means above gl)		-0.90	m
Depth to Standing Water Level (d1)		1.66	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.00	m
Test Type		Falling	
Response Zone Length	(L) =	1.00	m
Borehole diameter in test section	(D) =	0.165	m
Cross sectional area of borehole	(A) =	0.02138	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.51	
Basic Time Lag Factor	(T) =	60	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 1.4 \times 10^{-4}\ \text{m/s}$$

Remarks

Water level in standpipe at 2.79m bgl 25/02/03

Test terminated no further fall, assumed rest level as test end level for calculation purposes, possible silting up.

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

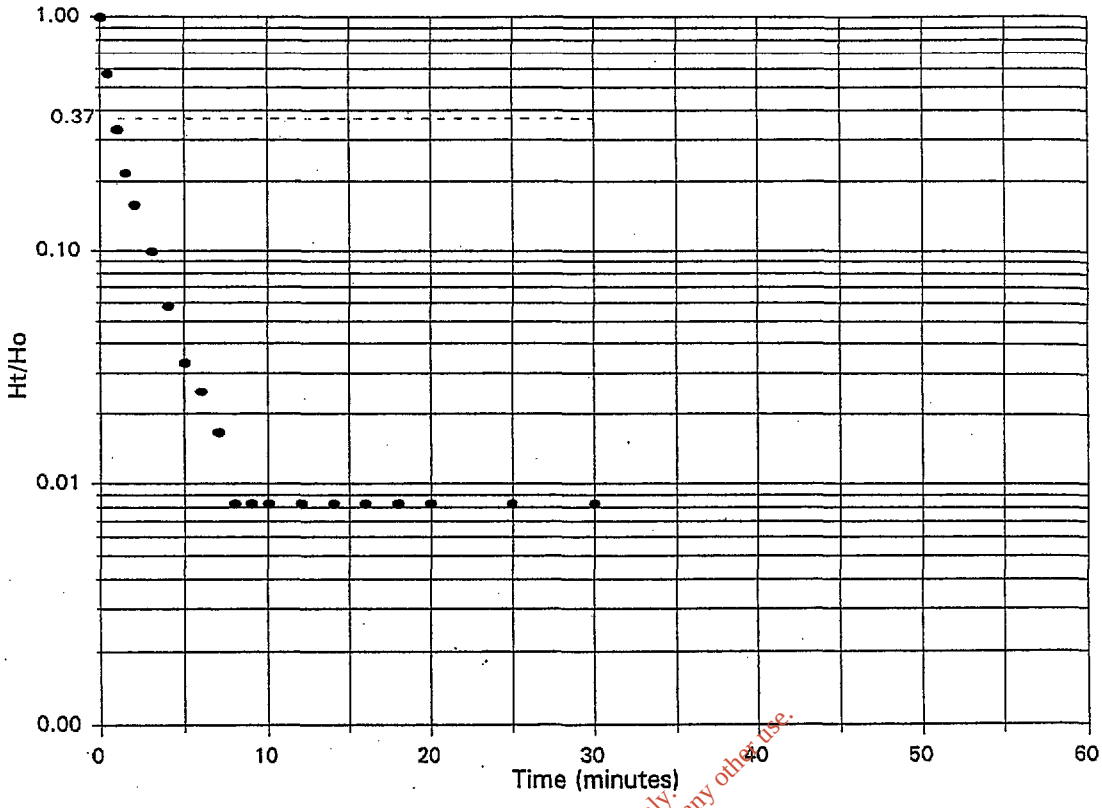
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/14

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH4	Test No.	Test4	Depth (m)	9.90-15.00	Date	11/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.21	1.00
00:00:30	0.520	0.69	0.57
00:01:00	0.810	0.40	0.33
00:01:30	0.950	0.26	0.21
00:02:00	1.020	0.19	0.16
00:03:00	1.090	0.12	0.10
00:04:00	1.140	0.07	0.06
00:05:00	1.170	0.04	0.03
00:06:00	1.180	0.03	0.02
00:07:00	1.190	0.02	0.02
00:08:00	1.200	0.01	0.01
00:09:00	1.200	0.01	0.01
00:10:00	1.200	0.01	0.01
00:12:00	1.200	0.01	0.01
00:14:00	1.200	0.01	0.01
00:16:00	1.200	0.01	0.01
00:18:00	1.200	0.01	0.01
00:20:00	1.200	0.01	0.01
00:25:00	1.200	0.01	0.01
00:30:00	1.200	0.01	0.01
00:40:00			
00:50:00			
01:00:00			

Test Details
(All water depths measured below Datum)

Depth of Test Section		9.90 to 15.00	m
Casing Depth		9.90	m
Borehole Depth		15.00	m
Datum (mbgl, -ve means above gl)		-0.90	m
Depth to Standing Water Level (d1)		1.21	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.00	m
Test Type		Falling	
Response Zone Length	(L) =	5.10	m
Borehole diameter in test section	(D) =	0.165	m
Cross sectional area of borehole	(A) =	0.02138	m^2
Intake Factor (BS 5930 pg50, figure d)	(F) =	7.77	
Basic Time Lag Factor	(T) =	55	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 5.0 \times 10^{-5}\ m/s$$

Remarks

Water level in standpipe at 2.79m bgl 25/02/03

Test terminated no further fall, assumed rest level as test end level for calculation purposes, possible silting up. Early data used.

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

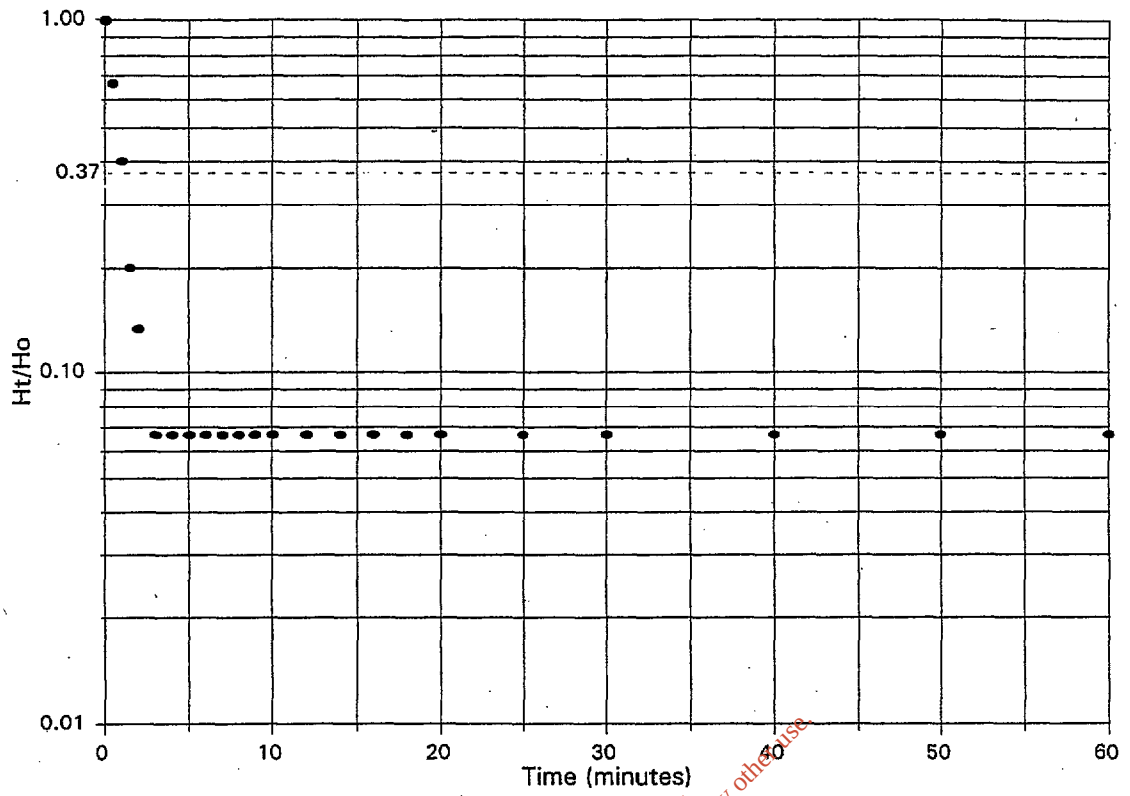
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/15

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH5	Test No.	Test1	Depth (m)	1.40-1.60	Date	28/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.030	0.15	1.00
00:00:30	0.080	0.10	0.67
00:01:00	0.120	0.06	0.40
00:01:30	0.150	0.03	0.20
00:02:00	0.160	0.02	0.13
00:03:00	0.170	0.01	0.07
00:04:00	0.170	0.01	0.07
00:05:00	0.170	0.01	0.07
00:06:00	0.170	0.01	0.07
00:07:00	0.170	0.01	0.07
00:08:00	0.170	0.01	0.07
00:09:00	0.170	0.01	0.07
00:10:00	0.170	0.01	0.07
00:12:00	0.170	0.01	0.07
00:14:00	0.170	0.01	0.07
00:16:00	0.170	0.01	0.07
00:18:00	0.170	0.01	0.07
00:20:00	0.170	0.01	0.07
00:25:00	0.170	0.01	0.07
00:30:00	0.170	0.01	0.07
00:40:00	0.170	0.01	0.07
00:50:00	0.170	0.01	0.07
01:00:00	0.170	0.01	0.07

Test Details
(All water depths measured below Datum)

Depth of Test Section		1.40 to 1.60	m
Casing Depth		1.40	m
Borehole Depth		1.60	m
Datum (mbgl, -ve means above gl)		-0.20	m
Depth to Standing Water Level (d1)		0.18	m
Depth to Water: Start of Test (d0)		0.03	m
End of Test		0.17	m
Test Type		Falling	
Response Zone Length	(L) =	0.20	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	1.43	
Basic Time Lag Factor	(T) =	65	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 3.4 \times 10^{-4}\ \text{m/s}$$

Remarks

End Test depth assumed as rest water level for calculation purposes only.

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	07/03/2002	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

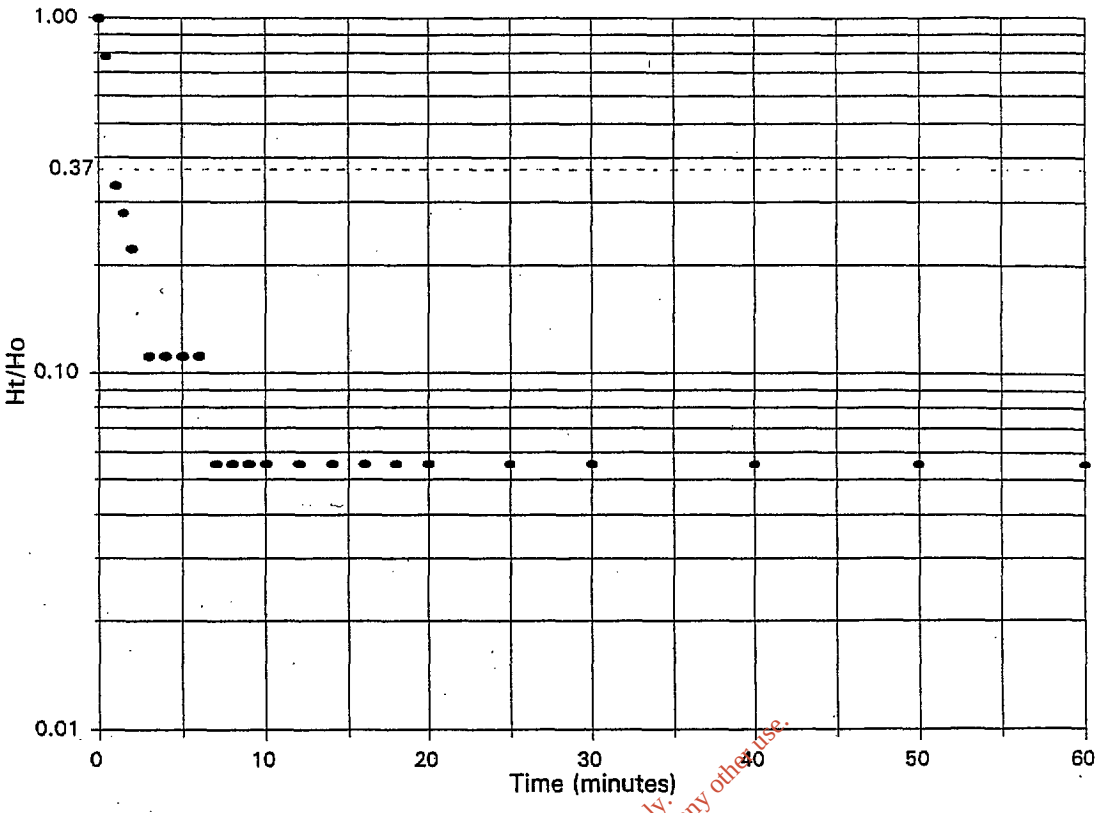
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT13/16 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH5	Test No.	Test2	Depth (m)	2.50-2.60	Date	28/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.030	0.18	1.00
00:00:30	0.070	0.14	0.78
00:01:00	0.150	0.06	0.33
00:01:30	0.160	0.05	0.28
00:02:00	0.170	0.04	0.22
00:03:00	0.190	0.02	0.11
00:04:00	0.190	0.02	0.11
00:05:00	0.190	0.02	0.11
00:06:00	0.190	0.02	0.11
00:07:00	0.200	0.01	0.06
00:08:00	0.200	0.01	0.06
00:09:00	0.200	0.01	0.06
00:10:00	0.200	0.01	0.06
00:12:00	0.200	0.01	0.06
00:14:00	0.200	0.01	0.06
00:16:00	0.200	0.01	0.06
00:18:00	0.200	0.01	0.06
00:20:00	0.200	0.01	0.06
00:25:00	0.200	0.01	0.06
00:30:00	0.200	0.01	0.06
00:40:00	0.200	0.01	0.06
00:50:00	0.200	0.01	0.06
01:00:00	0.200	0.01	0.06

Test Details
(All water depths measured below Datum)

Depth of Test Section		2.50 to 2.60	m
Casing Depth		2.50	m
Borehole Depth		2.60	m
Datum (mbgl, -ve means above gl)		-0.60	m
Depth to Standing Water Level (d1)		0.21	m
Depth to Water: Start of Test (d0)		0.03	m
End of Test		0.20	m
Test Type		Falling	
Response Zone Length	(L) =	0.10	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m^2
Intake Factor (BS 5930 pg50, figure d)	(F) =	1.31	
Basic Time Lag Factor	(T) =	55	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 4.4 \times 10^{-4} \text{ m/s}$$

Remarks

End Test depth assumed as rest water level for calculation purposes only.

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	07/03/2002	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

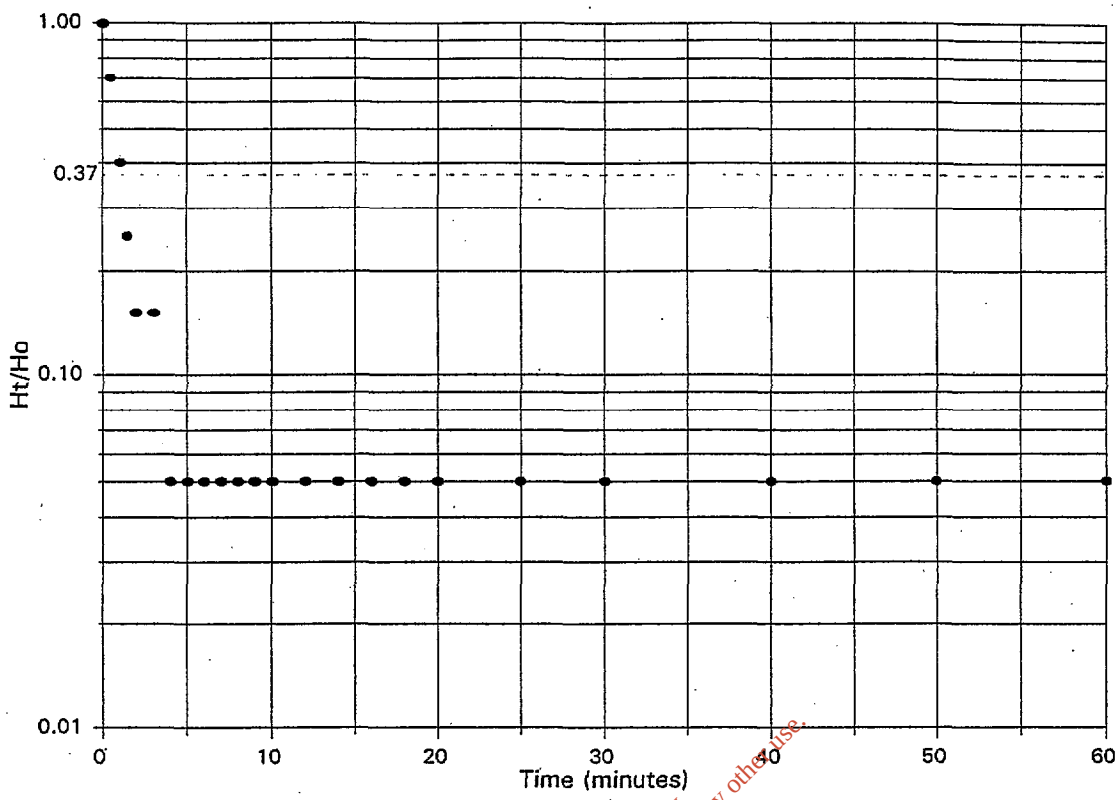
Project: MEENABOLL LANDFILL SITE, CO. DONE

Contract No: E02755

Figure No: FT3/17

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH5	Test No.	Test3	Depth (m)	2.50-10.00	Date	28/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.150	0.20	1.00
00:00:30	0.210	0.14	0.70
00:01:00	0.270	0.08	0.40
00:01:30	0.300	0.05	0.25
00:02:00	0.320	0.03	0.15
00:03:00	0.320	0.03	0.15
00:04:00	0.340	0.01	0.05
00:05:00	0.340	0.01	0.05
00:06:00	0.340	0.01	0.05
00:07:00	0.340	0.01	0.05
00:08:00	0.340	0.01	0.05
00:09:00	0.340	0.01	0.05
00:10:00	0.340	0.01	0.05
00:12:00	0.340	0.01	0.05
00:14:00	0.340	0.01	0.05
00:16:00	0.340	0.01	0.05
00:18:00	0.340	0.01	0.05
00:20:00	0.340	0.01	0.05
00:25:00	0.340	0.01	0.05
00:30:00	0.340	0.01	0.05
00:40:00	0.340	0.01	0.05
00:50:00	0.340	0.01	0.05
01:00:00	0.340	0.01	0.05

Test Details
(All water depths measured below Datum)

Depth of Test Section		2.50 to 10.00	m
Casing Depth		2.50	m
Borehole Depth		10.00	m
Datum (mbgl, -ve means above gl)		-0.60	m
Depth to Standing Water Level (d1)		0.35	m
Depth to Water: Start of Test (d0)		0.15	m
End of Test		0.34	m
Test Type		Falling	
Response Zone Length	(L) =	7.50	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	10.91	
Basic Time Lag Factor	(T) =	72	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 4.0 \times 10^{-5}\ \text{m/s}$$

Remarks

End Test depth assumed as rest water level for calculation purposes only.

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

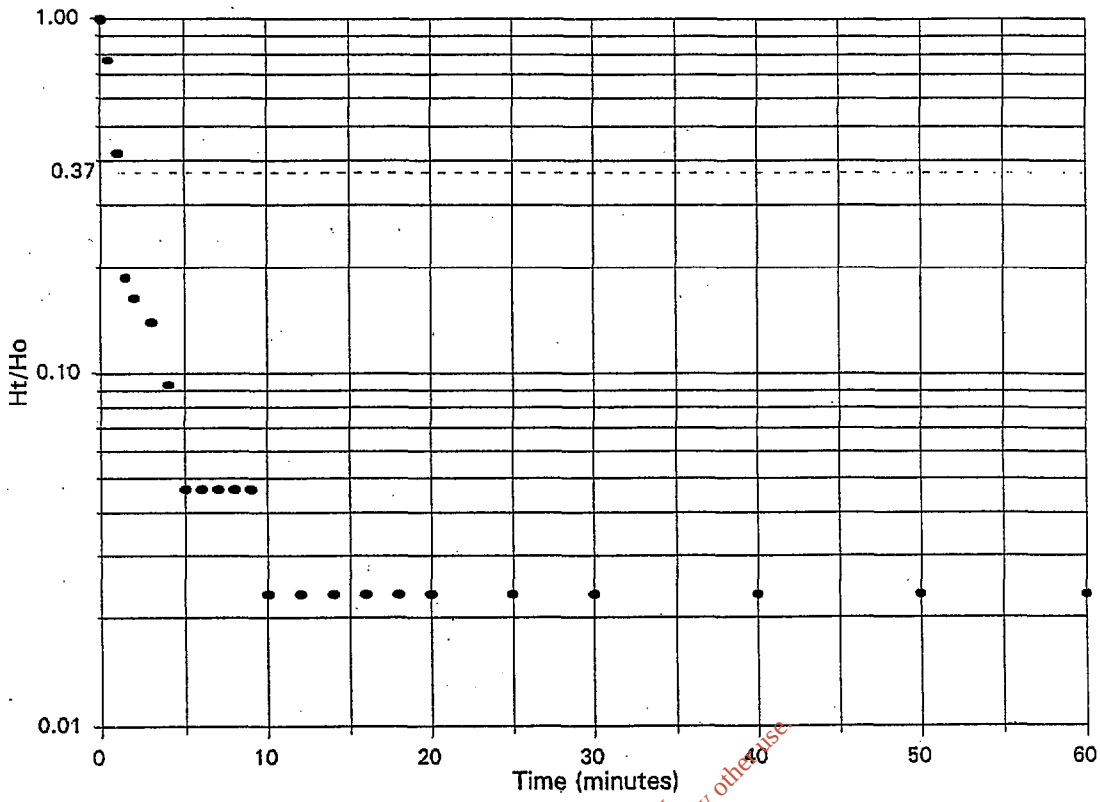
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/18 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH6	Test No.	Test1	Depth (m)	2.90-4.00	Date	18/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.050	0.43	1.00
00:00:30	0.150	0.33	0.77
00:01:00	0.300	0.18	0.42
00:01:30	0.400	0.08	0.19
00:02:00	0.410	0.07	0.16
00:03:00	0.420	0.06	0.14
00:04:00	0.440	0.04	0.09
00:05:00	0.460	0.02	0.05
00:06:00	0.460	0.02	0.05
00:07:00	0.460	0.02	0.05
00:08:00	0.460	0.02	0.05
00:09:00	0.460	0.02	0.05
00:10:00	0.470	0.01	0.02
00:12:00	0.470	0.01	0.02
00:14:00	0.470	0.01	0.02
00:16:00	0.470	0.01	0.02
00:18:00	0.470	0.01	0.02
00:20:00	0.470	0.01	0.02
00:25:00	0.470	0.01	0.02
00:30:00	0.470	0.01	0.02
00:40:00	0.470	0.01	0.02
00:50:00	0.470	0.01	0.02
01:00:00	0.470	0.01	0.02

Test Details
(All water depths measured below Datum)

Depth of Test Section		2.90 to 4.00	m
Casing Depth		2.90	m
Borehole Depth		4.00	m
Datum (mbgl, -ve means above gl)		-0.23	m
Depth to Standing Water Level (d1)		0.48	m
Depth to Water: Start of Test (d0)		0.05	m
End of Test		0.47	m
Test Type		Falling	
Response Zone Length	(L) =	1.10	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.87	
Basic Time Lag Factor	(T) =	66	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 1.7 \times 10^{-4} \text{ m/s}$$

Remarks

Water level in standpipe 25/02/06 at +0.16 agl or 0.09m **below test datum. Final test level assumed as standing** groundwater level for calculation purposes. Early data used.

Geology of Test Glacial Drift

Input by	Date	Checked by	Date
cdl	27/02/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

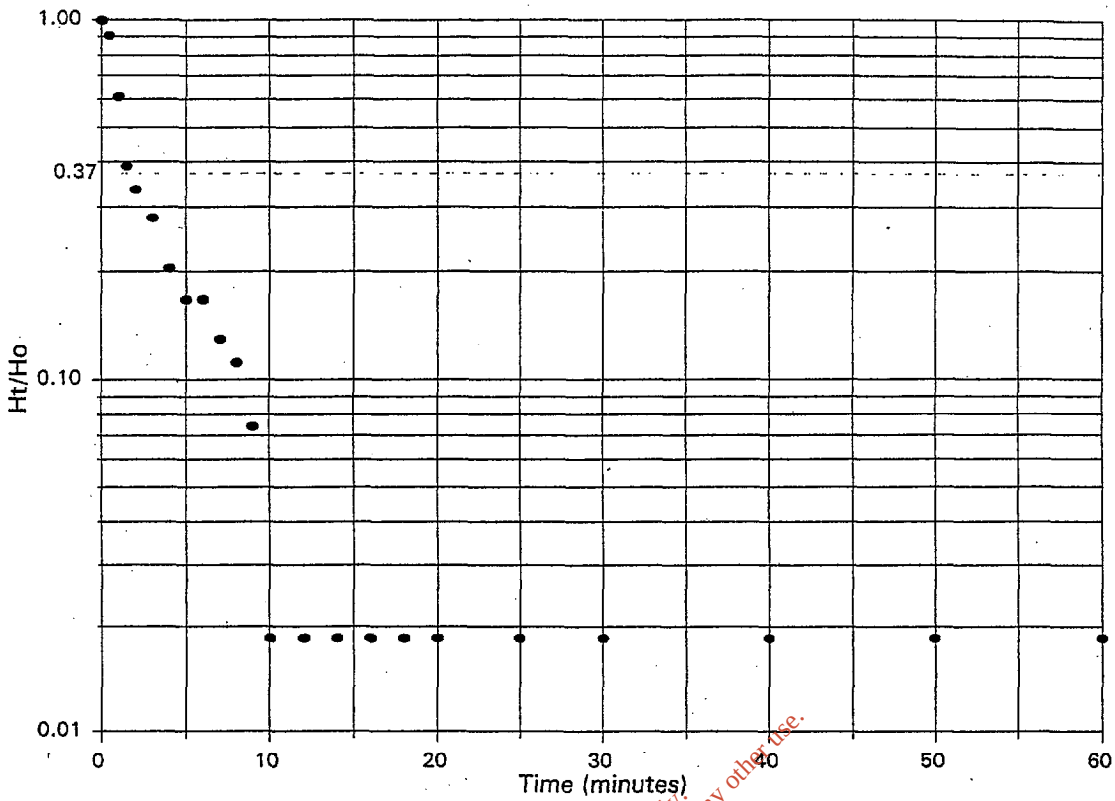
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/19

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH6	Test No.	Test2	Depth (m)	2.90-4.70	Date	18/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.040	0.54	1.00
00:00:30	0.090	0.49	0.91
00:01:00	0.250	0.33	0.61
00:01:30	0.370	0.21	0.39
00:02:00	0.400	0.18	0.33
00:03:00	0.430	0.15	0.28
00:04:00	0.470	0.11	0.20
00:05:00	0.490	0.09	0.17
00:06:00	0.490	0.09	0.17
00:07:00	0.510	0.07	0.13
00:08:00	0.520	0.06	0.11
00:09:00	0.540	0.04	0.07
00:10:00	0.570	0.01	0.02
00:12:00	0.570	0.01	0.02
00:14:00	0.570	0.01	0.02
00:16:00	0.570	0.01	0.02
00:18:00	0.570	0.01	0.02
00:20:00	0.570	0.01	0.02
00:25:00	0.570	0.01	0.02
00:30:00	0.570	0.01	0.02
00:40:00	0.570	0.01	0.02
00:50:00	0.570	0.01	0.02
01:00:00	0.570	0.01	0.02

Test Details
(All water depths measured below Datum)

Depth of Test Section		2.90 to 4.70	m
Casing Depth		2.90	m
Borehole Depth		4.70	m
Datum (mbgl, -ve means above gl)		-0.23	m
Depth to Standing Water Level (d1)		0.58	m
Depth to Water: Start of Test (d0)		0.04	m
End of Test		0.57	m
Test Type		Falling	
Response Zone Length	(L) =	1.80	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	3.91	
Basic Time Lag Factor	(T) =	100	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 8.0 \times 10^{-5}\ \text{m/s}$$

Remarks

Water level in standpipe 25/02/06 at +0.16 agl or 0.09m **below test datum. Final test level assumed as standing** groundwater level for calculation purposes.

Geology of Test Glacial Drift and upper weathered Schist

		Input by	Date	Checked by	Date
		cdl	27/02/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

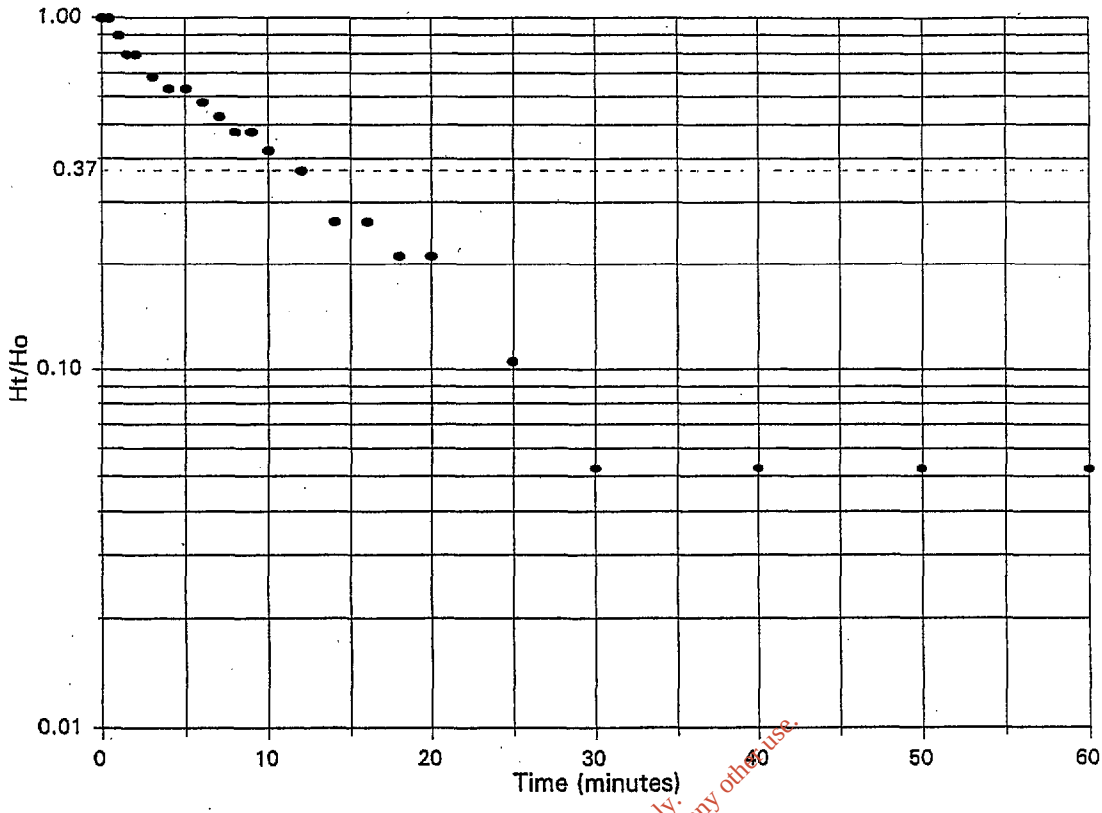
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/20

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH6	Test No.	Test3	Depth (m)	2.90-9.70	Date	18/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.030	0.19	1.00
00:00:30	0.030	0.19	1.00
00:01:00	0.050	0.17	0.89
00:01:30	0.070	0.15	0.79
00:02:00	0.070	0.15	0.79
00:03:00	0.090	0.13	0.68
00:04:00	0.100	0.12	0.63
00:05:00	0.100	0.12	0.63
00:06:00	0.110	0.11	0.58
00:07:00	0.120	0.10	0.53
00:08:00	0.130	0.09	0.47
00:09:00	0.130	0.09	0.47
00:10:00	0.140	0.08	0.42
00:12:00	0.150	0.07	0.37
00:14:00	0.170	0.05	0.26
00:16:00	0.170	0.05	0.26
00:18:00	0.180	0.04	0.21
00:20:00	0.180	0.04	0.21
00:25:00	0.200	0.02	0.11
00:30:00	0.210	0.01	0.05
00:40:00	0.210	0.01	0.05
00:50:00	0.210	0.01	0.05
01:00:00	0.210	0.01	0.05

Test Details (All water depths measured below Datum)

Depth of Test Section		2.90 to 9.70	m
Casing Depth		2.90	m
Borehole Depth		9.70	m
Datum (mbgl, -ve means above gl)		-0.23	m
Depth to Standing Water Level (d1)		0.22	m
Depth to Water: Start of Test (d0)		0.03	m
End of Test		0.21	m
Test Type		Falling	
Response Zone Length	(L) =	6.80	m
Borehole diameter in test section	(D) =	0.143	m
Cross sectional area of borehole	(A) =	0.01606	m^2
Intake Factor (BS 5930 pg50, figure d)	(F) =	9.38	
Basic Time Lag Factor	(T) =	720	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 2.4 \times 10^{-6} \text{ m/s}$$

Remarks

Water level in standpipe 25/02/06 at +0.16 agl or 0.09m **below test datum. Final test level assumed as standing GW level** for calculation purposes. Note:Artersian Conditions may invalidate

Geology of Test Glacial Drift and upper weathered Schist and Schist

Input by	Date	Checked by	Date
cdl	27/02/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

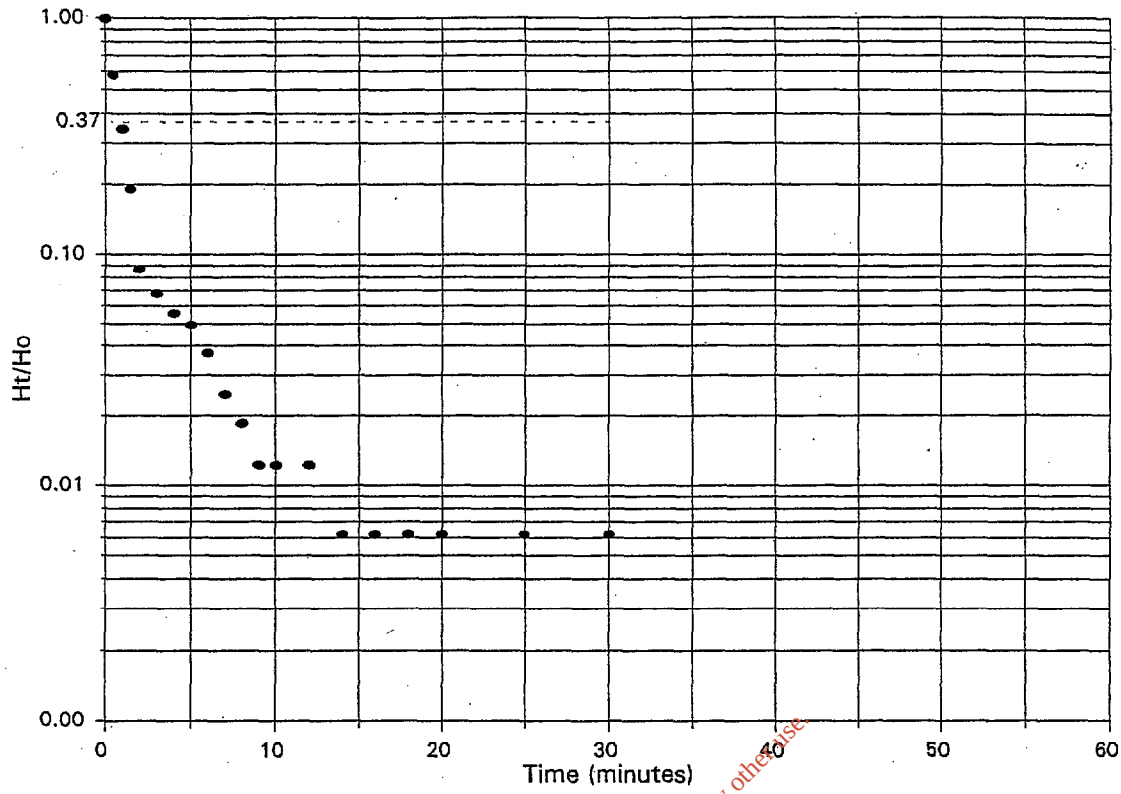
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/21

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH7	Test No.	Test 1	Depth (m)	1.50-2.50	Date	14/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.62	1.00
00:00:30	0.680	0.94	0.58
00:01:00	1.060	0.56	0.35
00:01:30	1.310	0.31	0.19
00:02:00	1.480	0.14	0.09
00:03:00	1.510	0.11	0.07
00:04:00	1.530	0.09	0.06
00:05:00	1.540	0.08	0.05
00:06:00	1.560	0.06	0.04
00:07:00	1.580	0.04	0.02
00:08:00	1.590	0.03	0.02
00:09:00	1.600	0.02	0.01
00:10:00	1.600	0.02	0.01
00:12:00	1.600	0.02	0.01
00:14:00	1.610	0.01	0.01
00:16:00	1.610	0.01	0.01
00:18:00	1.610	0.01	0.01
00:20:00	1.610	0.01	0.01
00:25:00	1.610	0.01	0.01
00:30:00	1.610	0.01	0.01
00:40:00			
00:50:00			
01:00:00			

Test Details (All water depths measured below Datum)

Depth of Test Section		1.50 to 2.50	m
Casing Depth		1.50	m
Borehole Depth		2.50	m
Datum (mbgl, -ve means above gl)		-0.90	m
Depth to Standing Water Level (d1)		1.62	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.00	m
Test Type		Falling	
Response Zone Length	(L) =	1.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.72	
Basic Time Lag Factor	(T) =	57	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 2.0 \times 10^{-4}\ \text{m/s}$$

Remarks

Test terminated - no further fall, end point of test assumed as rest water level for calculation purposes.

Geology of Test Weathered Schist

Input by	Date	Checked by	Date
cdl	24/02/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

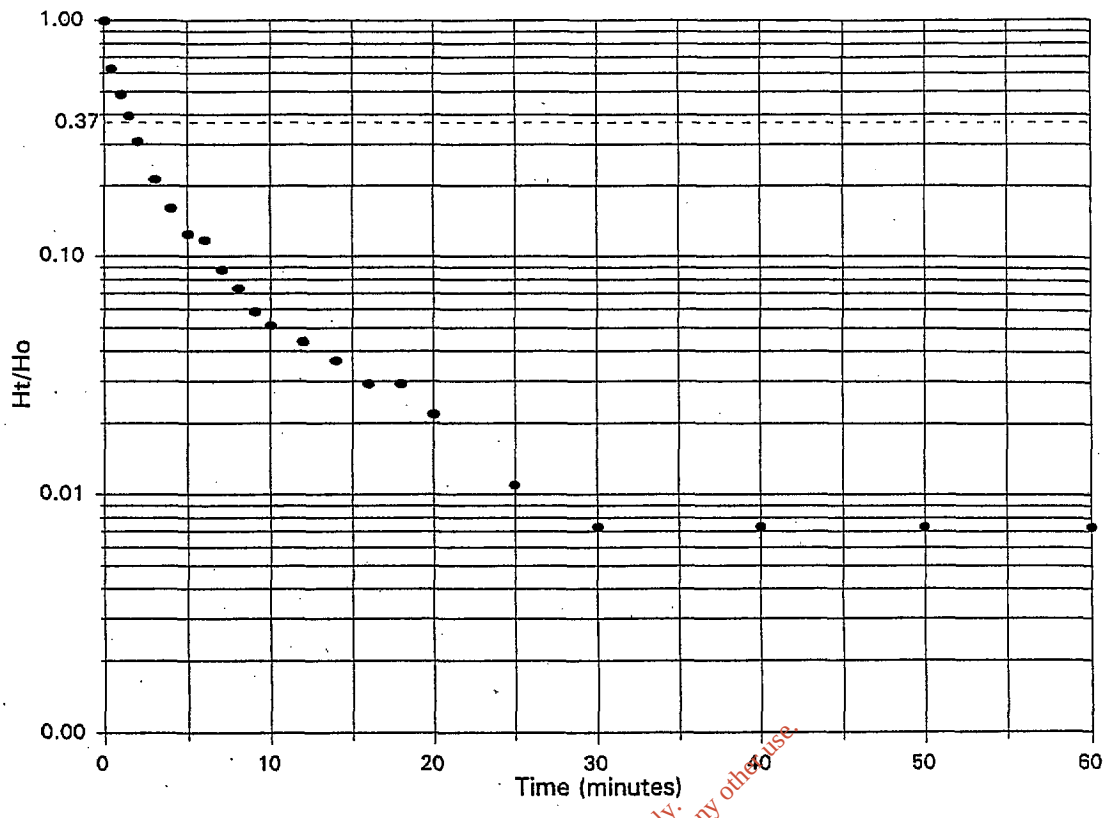
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E0755

Figure No: FT3/22 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH7	Test No.	Test 2	Depth (m)	3.00-10.10	Date	14/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.37	1.00
00:00:30	0.510	0.86	0.63
00:01:00	0.700	0.67	0.49
00:01:30	0.830	0.54	0.39
00:02:00	0.950	0.42	0.31
00:03:00	1.080	0.29	0.21
00:04:00	1.150	0.22	0.16
00:05:00	1.200	0.17	0.12
00:06:00	1.210	0.16	0.12
00:07:00	1.250	0.12	0.09
00:08:00	1.270	0.10	0.07
00:09:00	1.290	0.08	0.06
00:10:00	1.300	0.07	0.05
00:12:00	1.310	0.06	0.04
00:14:00	1.320	0.05	0.04
00:16:00	1.330	0.04	0.03
00:18:00	1.330	0.04	0.03
00:20:00	1.340	0.03	0.02
00:25:00	1.355	0.02	0.01
00:30:00	1.360	0.01	0.01
00:40:00	1.360	0.01	0.01
00:50:00	1.360	0.01	0.01
01:00:00	1.360	0.01	0.01

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.00 to 10.10	m
Casing Depth		3.00	m
Borehole Depth		10.10	m
Datum (mbgl, -ve means above gl)		-0.10	m
Depth to Standing Water Level (d1)		1.37	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		1.36	m
Test Type		Falling	
Response Zone Length	(L) =	7.10	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	10.46	
Basic Time Lag Factor	(T) =	97	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 3.1 \times 10^{-5}\ \text{m/s}$$

Remarks

Test terminated - no further fall, end point of test assumed as rest water level for calculation purposes.

Geology of Test Fractured Schest

Input by	Date	Checked by	Date
cdl	24/02/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

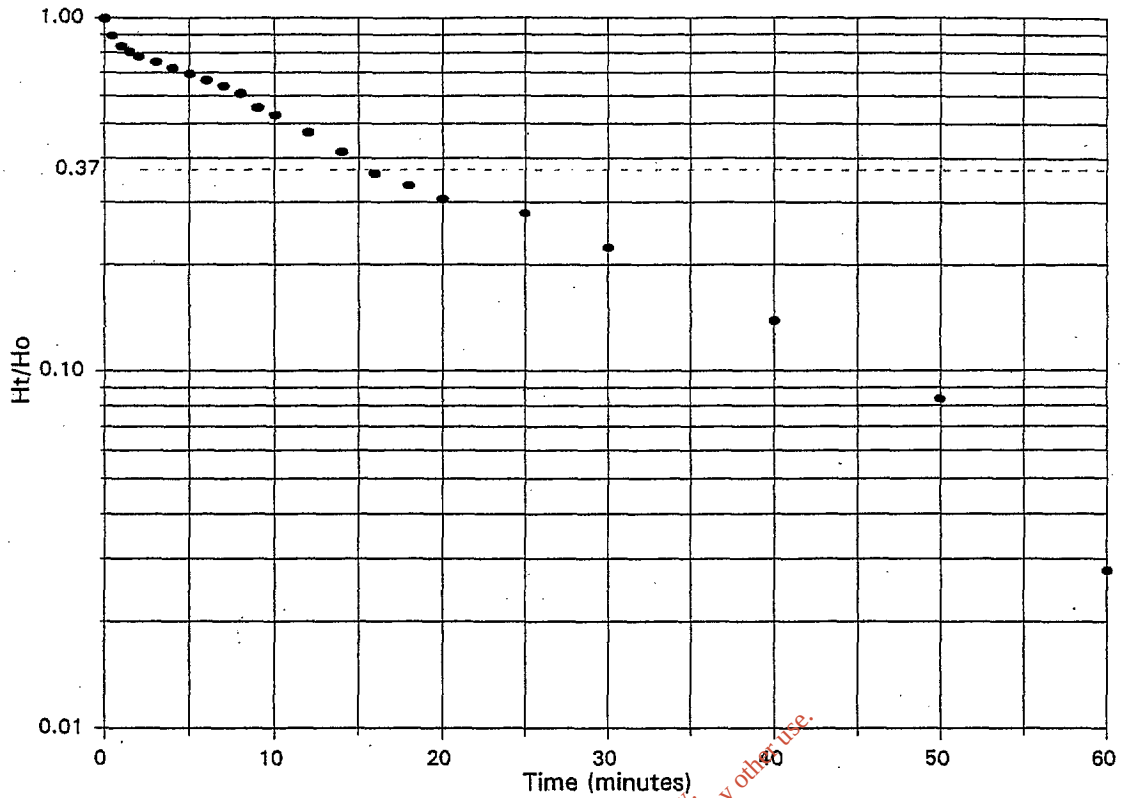
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/23

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	Test No.	Depth (m)	Date
BH8	Test 1	4.80-5.50	12/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	0.18	1.00
00:00:30	0.020	0.16	0.89
00:01:00	0.030	0.15	0.83
00:01:30	0.035	0.15	0.81
00:02:00	0.040	0.14	0.78
00:03:00	0.045	0.14	0.75
00:04:00	0.050	0.13	0.72
00:05:00	0.055	0.13	0.69
00:06:00	0.060	0.12	0.67
00:07:00	0.065	0.12	0.64
00:08:00	0.070	0.11	0.61
00:09:00	0.080	0.10	0.56
00:10:00	0.085	0.10	0.53
00:12:00	0.095	0.09	0.47
00:14:00	0.105	0.08	0.42
00:16:00	0.115	0.07	0.36
00:18:00	0.120	0.06	0.33
00:20:00	0.125	0.06	0.31
00:25:00	0.130	0.05	0.28
00:30:00	0.140	0.04	0.22
00:40:00	0.155	0.02	0.14
00:50:00	0.165	0.01	0.08
01:00:00	0.175	0.01	0.03

Test Details
(All water depths measured below Datum)

Depth of Test Section		4.80 to 5.50	m
Casing Depth		4.80	m
Borehole Depth		5.50	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		0.18	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.18	m
Test Type		Falling	
Response Zone Length	(L) =	0.70	m
Borehole diameter in test section	(D) =	0.165	m
Cross sectional area of borehole	(A) =	0.02138	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.04	
Basic Time Lag Factor	(T) =	1000	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 1.0 \times 10^{-5}\ \text{m/s}$$

Remarks

Test terminated - no further fall, end point of test assumed
as rest water level for calculation purposes, possible silting-up
Standing water at 2.26m bgl on 25/02/03
Geology of Test Glacial Till and Weathered Fractured Schest

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

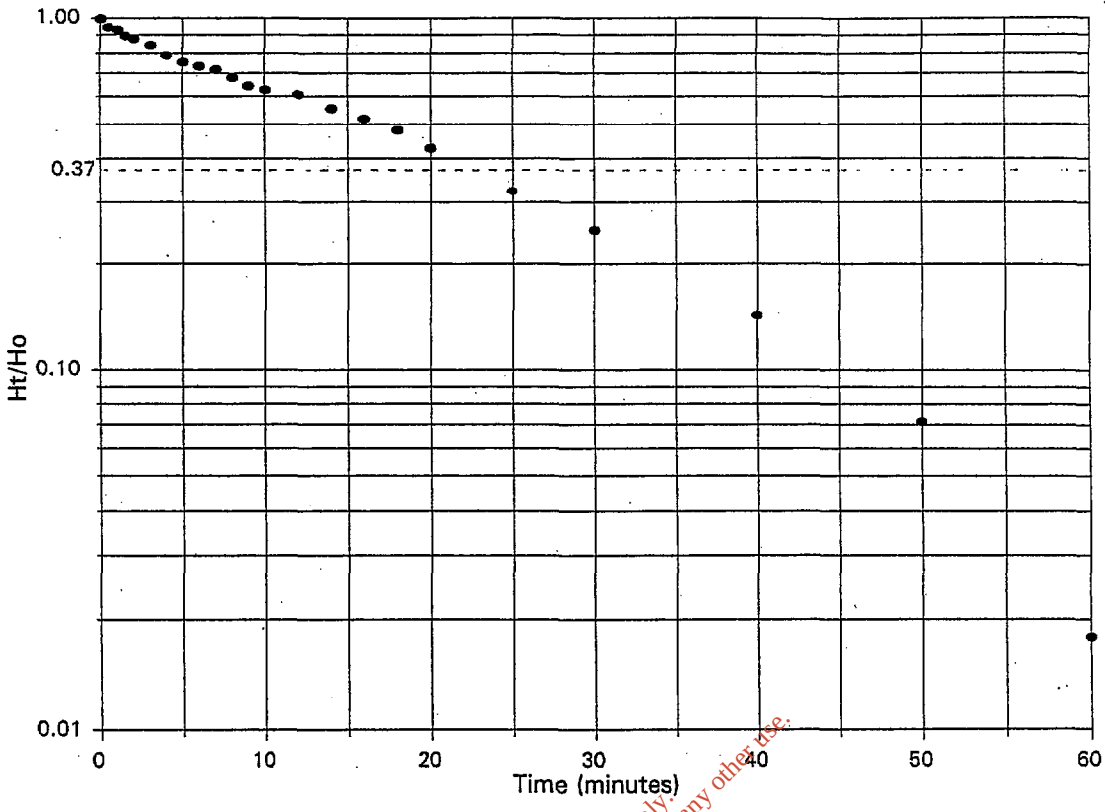
Contract No: E02755

Figure No: FT3/24

113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH8	Test No.	Test2	Depth (m)	5.10-6.10	Date	13/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	0.28	1.00
00:00:30	0.015	0.27	0.95
00:01:00	0.020	0.26	0.93
00:01:30	0.030	0.25	0.89
00:02:00	0.035	0.25	0.88
00:03:00	0.045	0.24	0.84
00:04:00	0.060	0.22	0.79
00:05:00	0.070	0.21	0.75
00:06:00	0.075	0.21	0.73
00:07:00	0.080	0.20	0.71
00:08:00	0.090	0.19	0.68
00:09:00	0.100	0.18	0.64
00:10:00	0.105	0.18	0.63
00:12:00	0.110	0.17	0.61
00:14:00	0.125	0.16	0.55
00:16:00	0.135	0.15	0.52
00:18:00	0.145	0.14	0.48
00:20:00	0.160	0.12	0.43
00:25:00	0.190	0.09	0.32
00:30:00	0.210	0.07	0.25
00:40:00	0.240	0.04	0.14
00:50:00	0.260	0.02	0.07
01:00:00	0.275	0.01	0.02

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.10 to 6.10	m
Casing Depth		5.10	m
Borehole Depth		6.10	m
Datum (mbgl, -ve means above gl)		-0.80	m
Depth to Standing Water Level (d1)		0.28	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.28	m
Test Type		Falling	
Response Zone Length	(L) =	1.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.72	
Basic Time Lag Factor	(T) =	1360	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 8.5 \times 10^{-6} \text{ m/s}$$

Remarks

Test terminated - no further fall, end point of test assumed
as rest water level for calculation purposes, possible silting-up
Standing water at 2.26m bgl on 25/02/03
Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

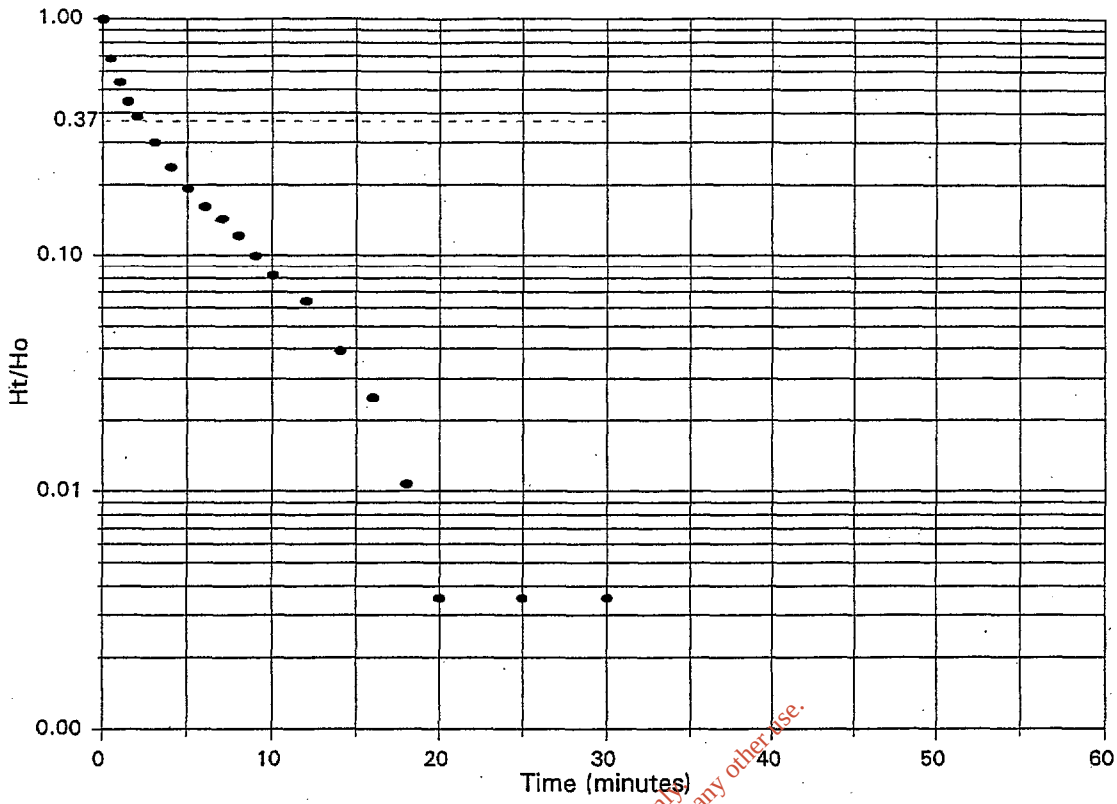
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/25

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH8	Test No.	Test 3	Depth (m)	5.10-10.20	Date	13/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	2.81	1.00
00:00:30	0.900	1.91	0.68
00:01:00	1.300	1.51	0.54
00:01:30	1.550	1.26	0.45
00:02:00	1.730	1.08	0.38
00:03:00	1.970	0.84	0.30
00:04:00	2.150	0.66	0.23
00:05:00	2.270	0.54	0.19
00:06:00	2.360	0.45	0.16
00:07:00	2.410	0.40	0.14
00:08:00	2.470	0.34	0.12
00:09:00	2.530	0.28	0.10
00:10:00	2.580	0.23	0.08
00:12:00	2.630	0.18	0.06
00:14:00	2.700	0.11	0.04
00:16:00	2.740	0.07	0.02
00:18:00	2.780	0.03	0.01
00:20:00	2.800	0.01	0.00
00:25:00	2.800	0.01	0.00
00:30:00	2.800	0.01	0.00
00:40:00			
00:50:00			
01:00:00			

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.10 to 10.20	m
Casing Depth		5.10	m
Borehole Depth		10.20	m
Datum (mbgl, -ve means above gl)		-0.90	m
Depth to Standing Water Level (d1)		2.81	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.00	m
Test Type		Falling	
Response Zone Length	(L) =	5.10	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	8.15	
Basic Time Lag Factor	(T) =	130	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 3.0 \times 10^{-5}\ \text{m/s}$$

Remarks

Test terminated - no further fall, end point of test assumed as rest water level for calculation purposes, possible silting-up

Standing water at 2.26m bgl on 25/02/03

Geology of Test Fractured Schist

		Input by	Date	Checked by	Date		
		cdl	04/03/2003	IPJ	06/03/2003		

FOUNDATION & EXPLORATION SERVICES

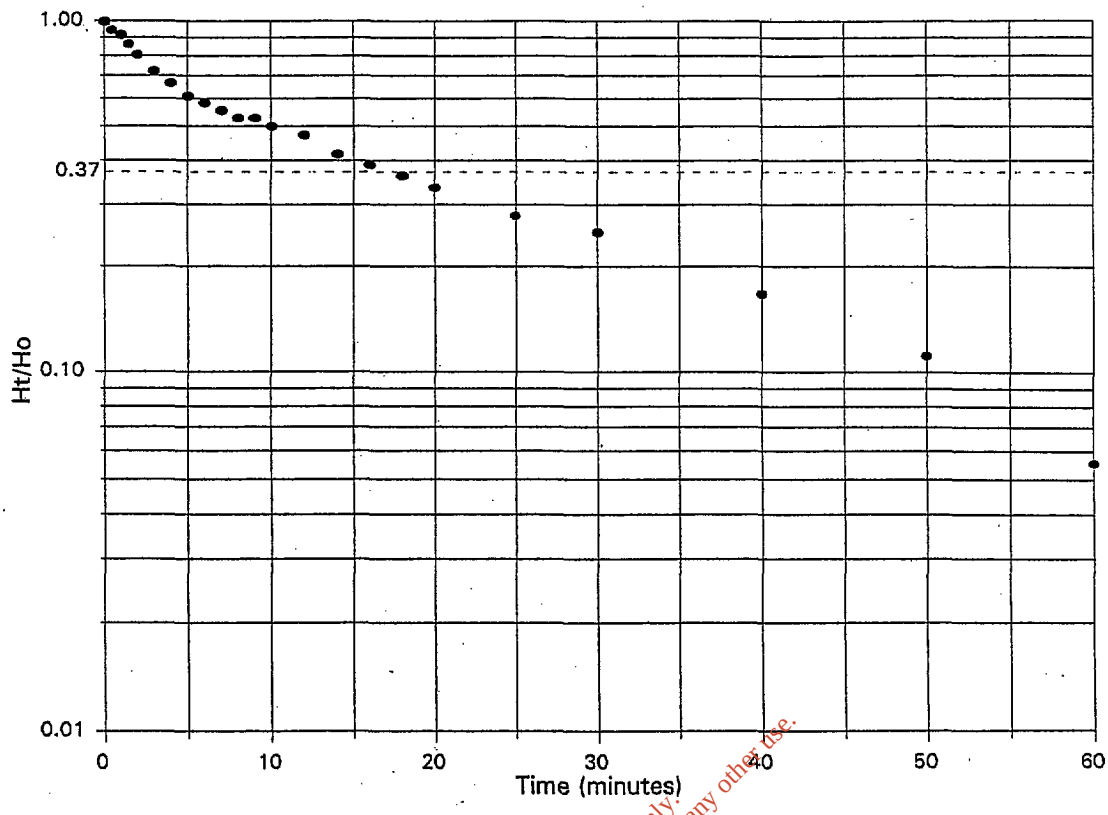
Project: MEENABOLL LANDFILL SITE, CO.DONEGAL

Contract No: E02755

Figure No: FT3/26

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH9	Test No.	Test1	Depth (m)	3.50-3.50	Date	17/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	0.18	1.00
00:00:30	0.010	0.17	0.94
00:01:00	0.015	0.17	0.92
00:01:30	0.025	0.16	0.86
00:02:00	0.035	0.15	0.81
00:03:00	0.050	0.13	0.72
00:04:00	0.060	0.12	0.67
00:05:00	0.070	0.11	0.61
00:06:00	0.075	0.11	0.58
00:07:00	0.080	0.10	0.56
00:08:00	0.085	0.10	0.53
00:09:00	0.085	0.10	0.53
00:10:00	0.090	0.09	0.50
00:12:00	0.095	0.09	0.47
00:14:00	0.105	0.08	0.42
00:16:00	0.110	0.07	0.39
00:18:00	0.115	0.07	0.36
00:20:00	0.120	0.06	0.33
00:25:00	0.130	0.05	0.28
00:30:00	0.135	0.04	0.25
00:40:00	0.150	0.03	0.17
00:50:00	0.160	0.02	0.11
01:00:00	0.170	0.01	0.06

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.50 to 3.50	m
Casing Depth		3.50	m
Borehole Depth		3.50	m
Datum (mbgl, -ve means above gl)		-1.10	m
Depth to Standing Water Level (d1)		0.18	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.17	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m^2
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.55	
Basic Time Lag Factor	(T) =	1000	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 5.7 \times 10^{-5}\ m/s$$

Remarks

Test terminated - no further fall, end point of test assumed as rest water level for calculation purposes. Possible silting-up.

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

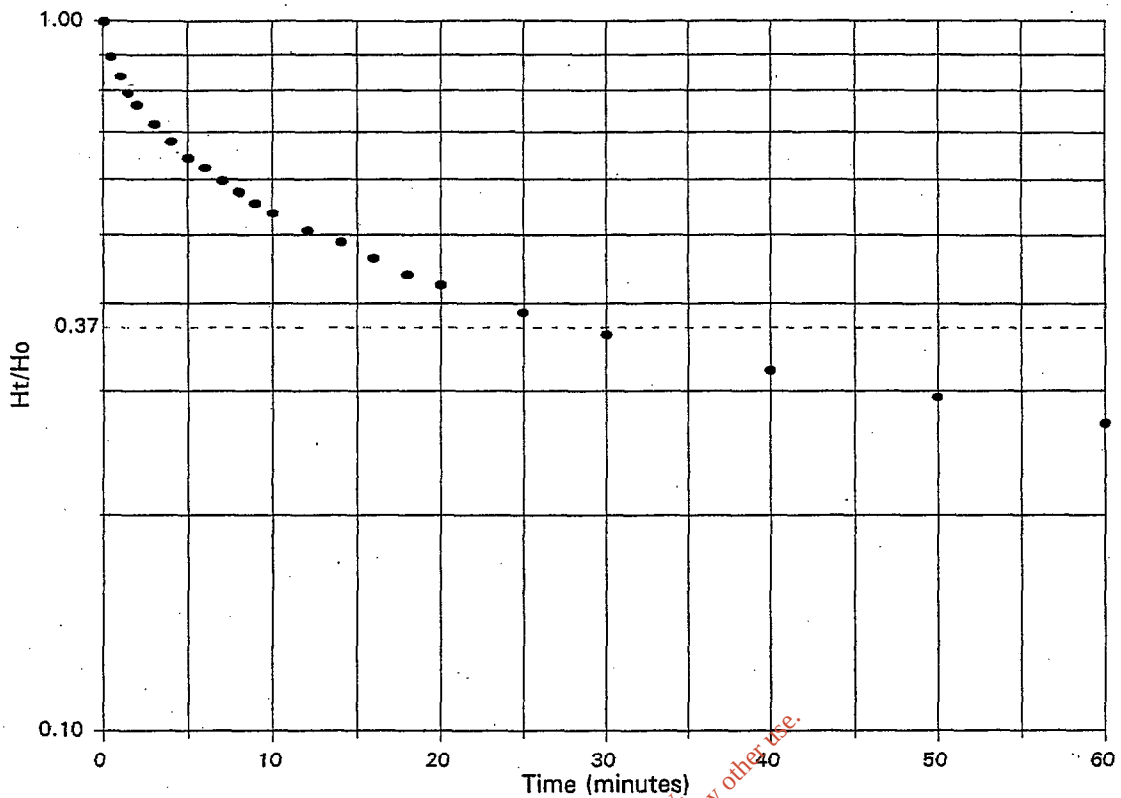
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/27

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH9	Test No.	Test2	Depth (m)	3.50-3.50	Date	17/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	3.30	1.00
00:00:30	0.350	2.95	0.89
00:01:00	0.540	2.76	0.84
00:01:30	0.680	2.62	0.79
00:02:00	0.780	2.52	0.76
00:03:00	0.930	2.37	0.72
00:04:00	1.060	2.24	0.68
00:05:00	1.180	2.12	0.64
00:06:00	1.250	2.05	0.62
00:07:00	1.330	1.97	0.60
00:08:00	1.400	1.90	0.58
00:09:00	1.470	1.83	0.55
00:10:00	1.530	1.77	0.54
00:12:00	1.630	1.67	0.51
00:14:00	1.690	1.61	0.49
00:16:00	1.770	1.53	0.46
00:18:00	1.850	1.45	0.44
00:20:00	1.900	1.40	0.42
00:25:00	2.020	1.28	0.39
00:30:00	2.110	1.19	0.36
00:40:00	2.240	1.06	0.32
00:50:00	2.330	0.97	0.29
01:00:00	2.410	0.89	0.27

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.50 to 3.50	m
Casing Depth		4.80	m
Borehole Depth		4.80	m
Datum (mbgl, -ve means above gl)		-1.70	m
Depth to Standing Water Level (d1)		3.30	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		2.41	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.55	
General Time Lag Factors (H1) = 2.76	(t1) =	60	sec
(H2) = 2.12	(t2) =	300	sec

Coefficient of Permeability using General Time Lag Approach

$$k = \frac{A}{F(t2-t1)} \log_e \frac{H1}{H2} = 6.3 \times 10^{-5} \text{ m/s}$$

Remarks

Starting water level assumed to be that taken prior to test

for calculation purpose only. Possible siltinmg-up in later stages.

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

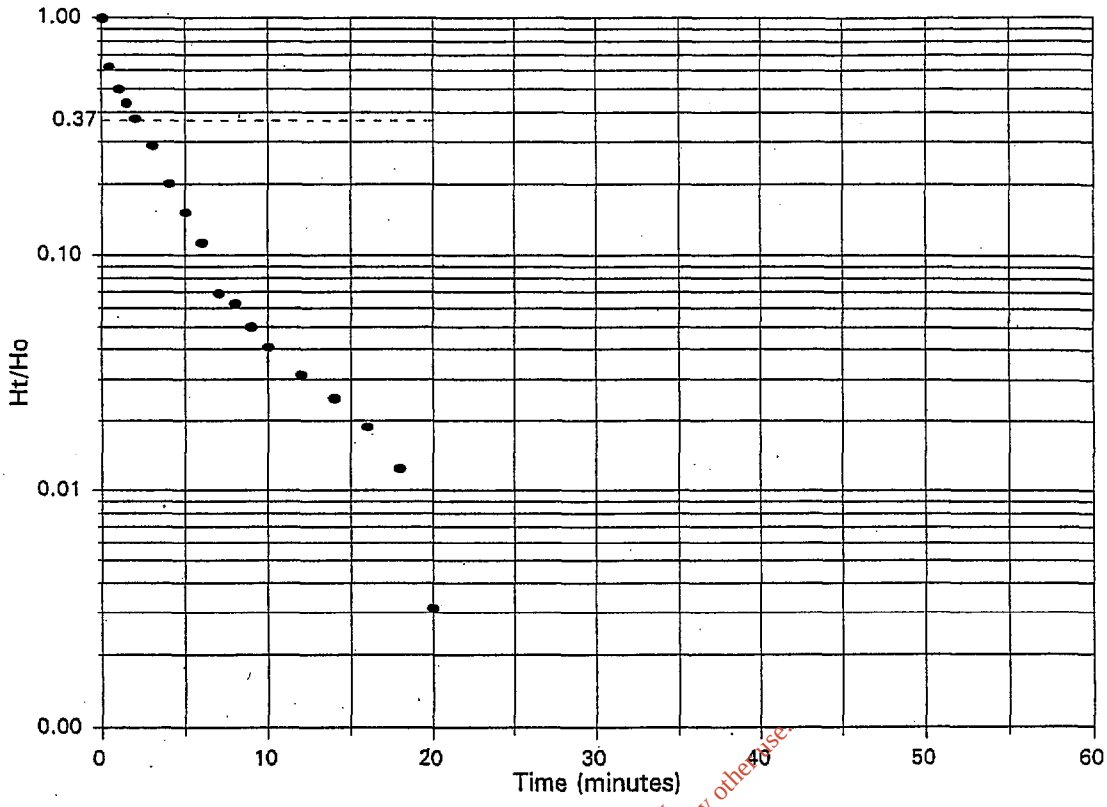
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/28

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH9	Test No.	Test3	Depth (m)	5.00-10.00	Date	17/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.60	1.00
00:00:30	0.600	1.00	0.63
00:01:00	0.800	0.80	0.50
00:01:30	0.900	0.70	0.44
00:02:00	1.000	0.60	0.38
00:03:00	1.140	0.46	0.29
00:04:00	1.280	0.32	0.20
00:05:00	1.360	0.24	0.15
00:06:00	1.420	0.18	0.11
00:07:00	1.490	0.11	0.07
00:08:00	1.500	0.10	0.06
00:09:00	1.520	0.08	0.05
00:10:00	1.535	0.07	0.04
00:12:00	1.550	0.05	0.03
00:14:00	1.560	0.04	0.03
00:16:00	1.570	0.03	0.02
00:18:00	1.580	0.02	0.01
00:20:00	1.595	0.01	0.00
00:25:00			
00:30:00			
00:40:00			
00:50:00			
01:00:00			

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.00 to 10.00	m
Casing Depth		5.00	m
Borehole Depth		10.00	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		1.60	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.00	m
Test Type		Falling	
Response Zone Length	(L) =	5.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	8.03	
Basic Time Lag Factor	(T) =	130	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 3.0 \times 10^{-5}\ \text{m/s}$$

Remarks
End point of test assumed
as rest water level for calculation purposes.

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/06/2003

FOUNDATION & EXPLORATION SERVICES

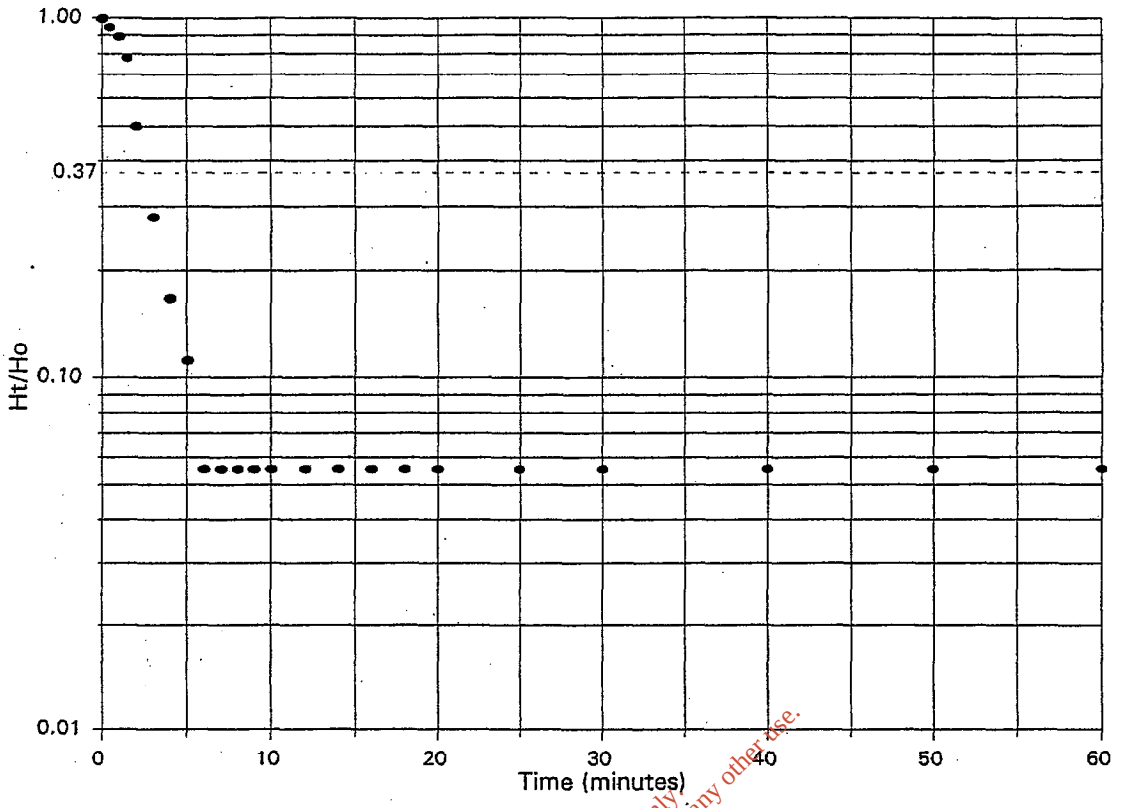
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/29

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH10	Test No.	Test1	Depth (m)	2.10-2.50	Date	26/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.020	0.18	1.00
00:00:30	0.030	0.17	0.94
00:01:00	0.040	0.16	0.89
00:01:30	0.060	0.14	0.78
00:02:00	0.110	0.09	0.50
00:03:00	0.150	0.05	0.28
00:04:00	0.170	0.03	0.17
00:05:00	0.180	0.02	0.11
00:06:00	0.190	0.01	0.06
00:07:00	0.190	0.01	0.06
00:08:00	0.190	0.01	0.06
00:09:00	0.190	0.01	0.06
00:10:00	0.190	0.01	0.06
00:12:00	0.190	0.01	0.06
00:14:00	0.190	0.01	0.06
00:16:00	0.190	0.01	0.06
00:18:00	0.190	0.01	0.06
00:20:00	0.190	0.01	0.06
00:25:00	0.190	0.01	0.06
00:30:00	0.190	0.01	0.06
00:40:00	0.190	0.01	0.06
00:50:00	0.190	0.01	0.06
01:00:00	0.190	0.01	0.06

Test Details
(All water depths measured below Datum)

Depth of Test Section		2.10 to 2.50	m
Casing Depth		2.10	m
Borehole Depth		2.50	m
Datum (mbgl, -ve means above gl)		-0.40	m
Depth to Standing Water Level (d1)		0.20	m
Depth to Water: Start of Test (d0)		0.02	m
End of Test		0.19	m
Test Type		Falling	
Response Zone Length	(L) =	0.40	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	1.74	
Basic Time Lag Factor	(T) =	155	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 1.2 \times 10^{-4}\ \text{m/s}$$

Remarks

End Test depth assumed as rest water level for calculation **purposes only.**

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

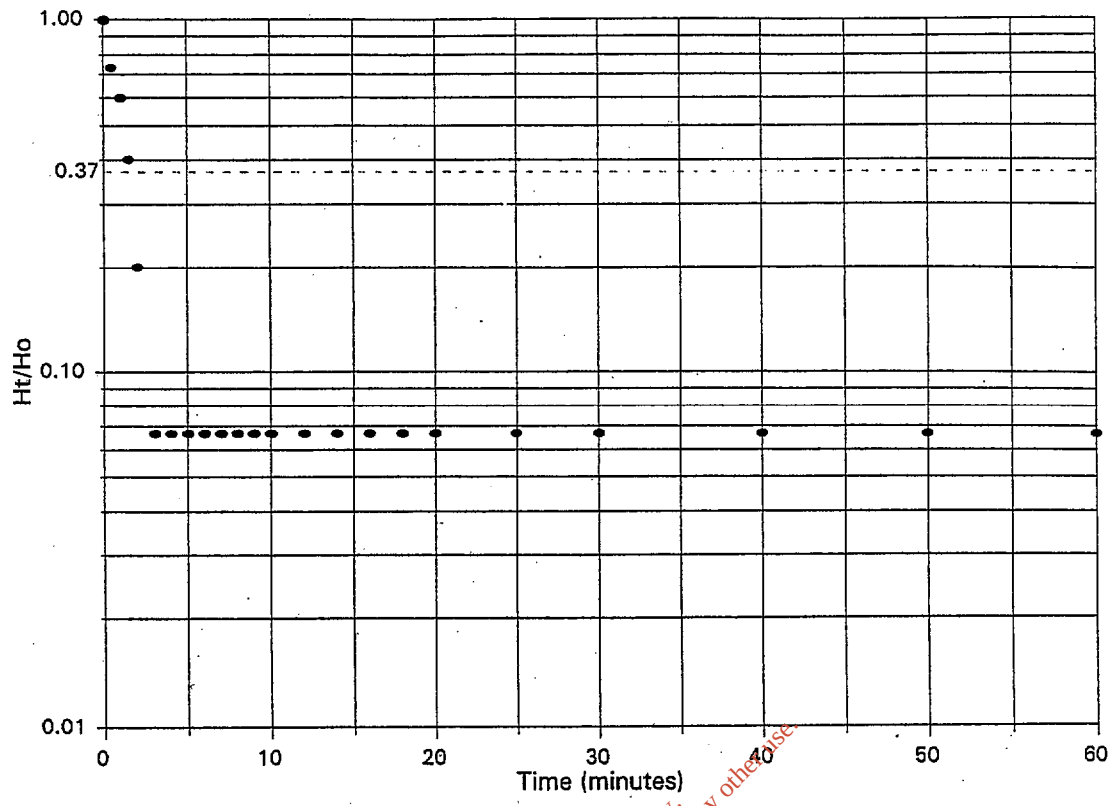
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/30

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH10	Test No.	Test2	Depth (m)	3.60-3.60	Date	26/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.020	0.15	1.00
00:00:30	0.060	0.11	0.73
00:01:00	0.080	0.09	0.60
00:01:30	0.110	0.06	0.40
00:02:00	0.140	0.03	0.20
00:03:00	0.160	0.01	0.07
00:04:00	0.160	0.01	0.07
00:05:00	0.160	0.01	0.07
00:06:00	0.160	0.01	0.07
00:07:00	0.160	0.01	0.07
00:08:00	0.160	0.01	0.07
00:09:00	0.160	0.01	0.07
00:10:00	0.160	0.01	0.07
00:12:00	0.160	0.01	0.07
00:14:00	0.160	0.01	0.07
00:16:00	0.160	0.01	0.07
00:18:00	0.160	0.01	0.07
00:20:00	0.160	0.01	0.07
00:25:00	0.160	0.01	0.07
00:30:00	0.160	0.01	0.07
00:40:00	0.160	0.01	0.07
00:50:00	0.160	0.01	0.07
01:00:00	0.160	0.01	0.07

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.60 to 3.60	m
Casing Depth		3.60	m
Borehole Depth		3.60	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		0.17	m
Depth to Water: Start of Test (d0)		0.02	m
End of Test		0.16	m
Test Type		Falling	
Response Zone Length	(L) =	0.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure b)	(F) =	0.55	
Basic Time Lag Factor	(T) =	94	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 6.1 \times 10^{-4}\ \text{m/s}$$

Remarks

End Test depth assumed as rest water level for calculation **purposes only.**

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

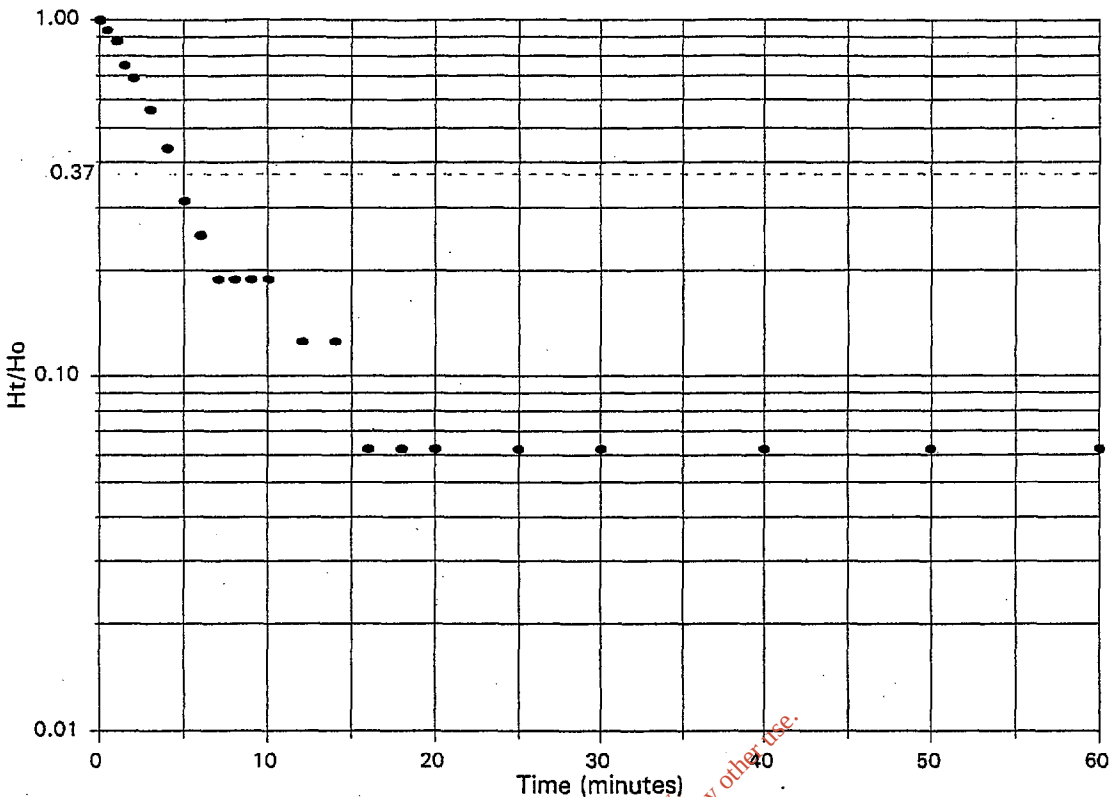
Contract No: E02755

Figure No: FT3/31

113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH10	Test No.	Test3	Depth (m)	3.60-10.15	Date	26/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.020	0.16	1.00
00:00:30	0.030	0.15	0.94
00:01:00	0.040	0.14	0.87
00:01:30	0.060	0.12	0.75
00:02:00	0.070	0.11	0.69
00:03:00	0.090	0.09	0.56
00:04:00	0.110	0.07	0.44
00:05:00	0.130	0.05	0.31
00:06:00	0.140	0.04	0.25
00:07:00	0.150	0.03	0.19
00:08:00	0.150	0.03	0.19
00:09:00	0.150	0.03	0.19
00:10:00	0.150	0.03	0.19
00:12:00	0.160	0.02	0.12
00:14:00	0.160	0.02	0.12
00:16:00	0.170	0.01	0.06
00:18:00	0.170	0.01	0.06
00:20:00	0.170	0.01	0.06
00:25:00	0.170	0.01	0.06
00:30:00	0.170	0.01	0.06
00:40:00	0.170	0.01	0.06
00:50:00	0.170	0.01	0.06
01:00:00	0.170	0.01	0.06

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.60 to 10.15	m
Casing Depth		3.60	m
Borehole Depth		10.15	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		0.18	m
Depth to Water: Start of Test (d0)		0.02	m
End of Test		0.17	m
Test Type		Falling	
Response Zone Length	(L) =	6.55	m
Borehole diameter in test section	(D) =	0.116	m
Cross sectional area of borehole	(A) =	0.01057	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	8.71	
Basic Time Lag Factor	(T) =	210	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 5.8 \times 10^{-6} \text{ m/s}$$

Remarks

End Test depth assumed as rest water level for calculation purposes only.

Geology of Test Fractured Schist

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

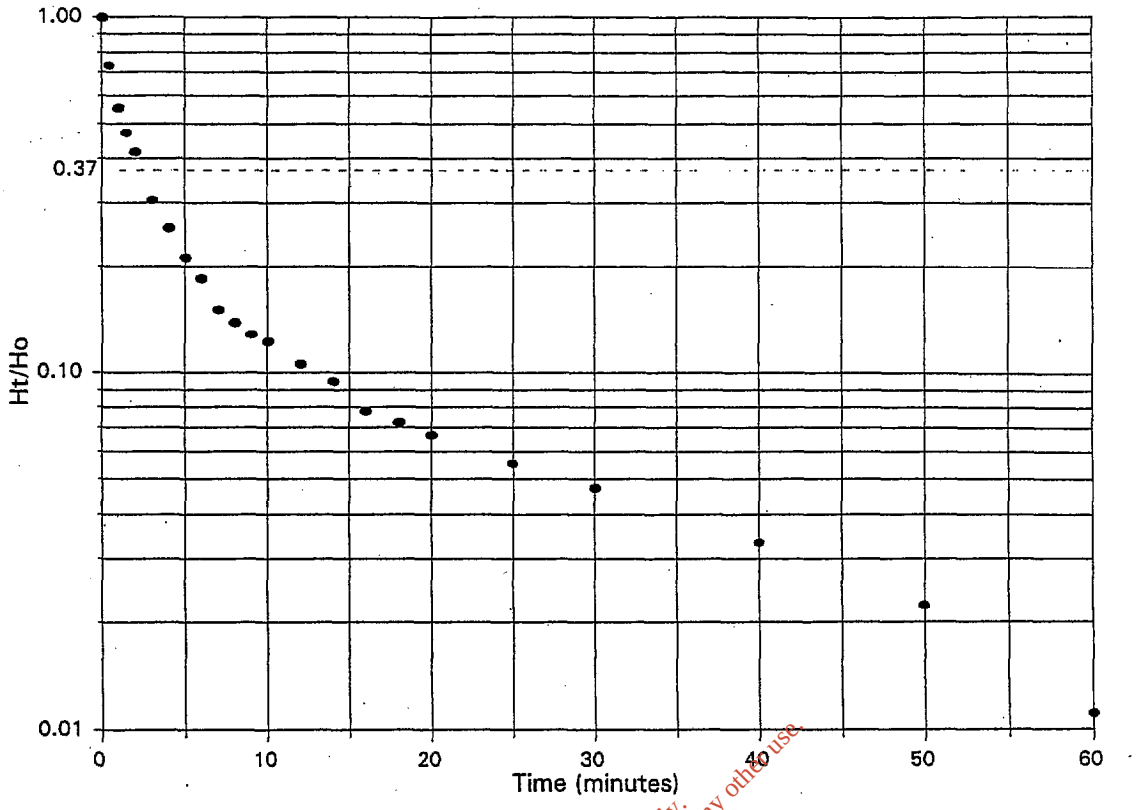
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/32

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH11	Test No.	Test1	Depth (m)	3.20-4.20	Date	18/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	1.80	1.00
00:00:30	0.480	1.32	0.73
00:01:00	0.800	1.00	0.56
00:01:30	0.950	0.85	0.47
00:02:00	1.050	0.75	0.42
00:03:00	1.250	0.55	0.31
00:04:00	1.340	0.46	0.26
00:05:00	1.420	0.38	0.21
00:06:00	1.470	0.33	0.18
00:07:00	1.530	0.27	0.15
00:08:00	1.550	0.25	0.14
00:09:00	1.570	0.23	0.13
00:10:00	1.580	0.22	0.12
00:12:00	1.610	0.19	0.11
00:14:00	1.630	0.17	0.09
00:16:00	1.660	0.14	0.08
00:18:00	1.670	0.13	0.07
00:20:00	1.680	0.12	0.07
00:25:00	1.700	0.10	0.06
00:30:00	1.715	0.08	0.05
00:40:00	1.740	0.06	0.03
00:50:00	1.760	0.04	0.02
01:00:00	1.780	0.02	0.01

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.20 to 4.20	m
Casing Depth		3.20	m
Borehole Depth		4.20	m
Datum (mbgl, -ve means above gl)		-0.80	m
Depth to Standing Water Level (d1)		1.80	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		1.78	m
Test Type		Falling	
Response Zone Length	(L) =	1.00	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.72	
Basic Time Lag Factor	(T) =	145	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 8.0 \times 10^{-5} \text{ m/s}$$

Remarks

Test terminated - no further fall, end point of test assumed
as rest water level for calculation purposes possible silting-up
Standing water level 1.51 mbgl 25/02/03. Early data used.
Geology of Test Weathered Schist

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

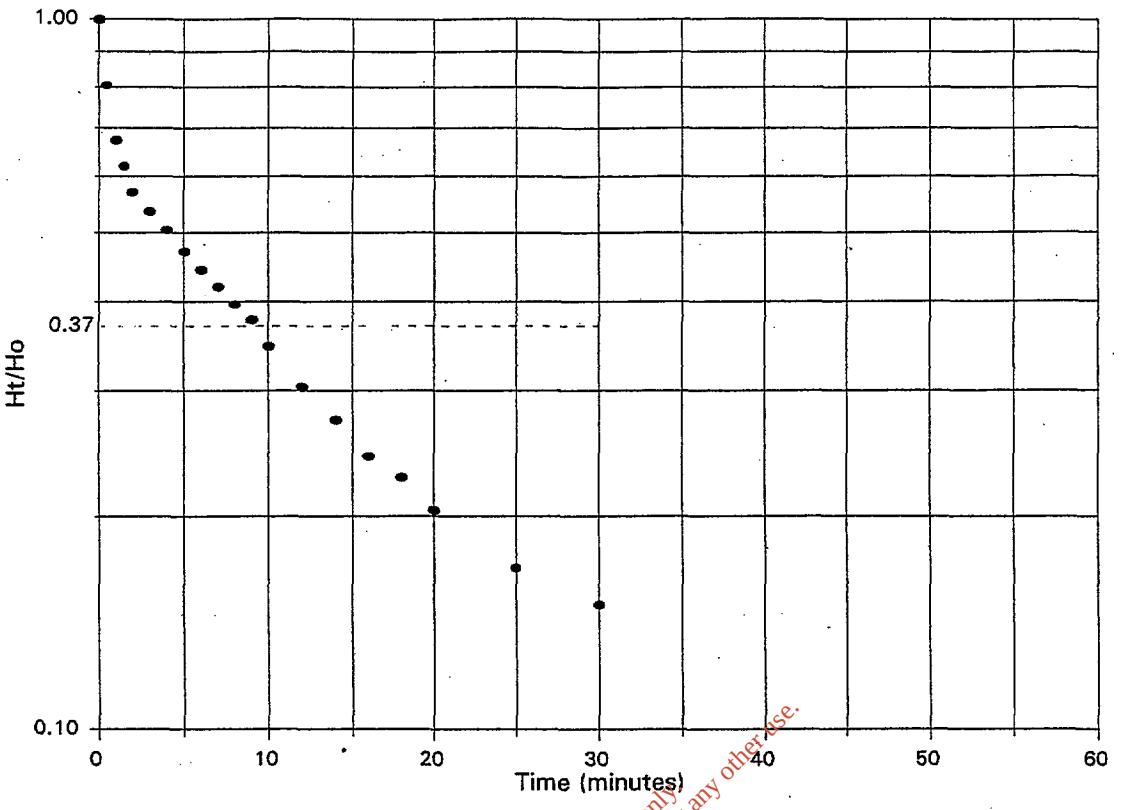
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/33 1/1/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH11	Test No.	Test1	Depth (m)	5.50-10.00	Date	18/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.000	2.60	1.00
00:00:30	0.510	2.09	0.80
00:01:00	0.850	1.75	0.67
00:01:30	0.990	1.61	0.62
00:02:00	1.120	1.48	0.57
00:03:00	1.210	1.39	0.53
00:04:00	1.290	1.31	0.50
00:05:00	1.380	1.22	0.47
00:06:00	1.450	1.15	0.44
00:07:00	1.510	1.09	0.42
00:08:00	1.570	1.03	0.40
00:09:00	1.620	0.98	0.38
00:10:00	1.700	0.90	0.35
00:12:00	1.810	0.79	0.30
00:14:00	1.890	0.71	0.27
00:16:00	1.970	0.63	0.24
00:18:00	2.010	0.59	0.23
00:20:00	2.070	0.53	0.20
00:25:00	2.160	0.44	0.17
00:30:00	2.210	0.39	0.15
00:40:00			
00:50:00			
01:00:00			

Test Details
(All water depths measured below Datum)

Depth of Test Section		5.50 to 10.00	m
Casing Depth		5.50	m
Borehole Depth		4.20	m
Datum (mbgl, -ve means above gl)		-0.50	m
Depth to Standing Water Level (d1)		2.60	m
Depth to Water: Start of Test (d0)		0.00	m
End of Test		0.00	m
Test Type		Falling	
Response Zone Length	(L) =	4.50	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	7.43	
Basic Time Lag Factor	(T) =	570	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 7.4 \times 10^{-6}\ \text{m/s}$$

Remarks

Borehole Collapsed during falling head test back to 7.00m bgl
Standing water level 1.51 mbgl 25/02/03. Early data used.
Rest water level before test used for calculation purposes.
Geology of Test *Weathered Schist*

Input by	Date	Checked by	Date
cdl	04/03/2003	IPJ	06/03/2003

FOUNDATION & EXPLORATION SERVICES

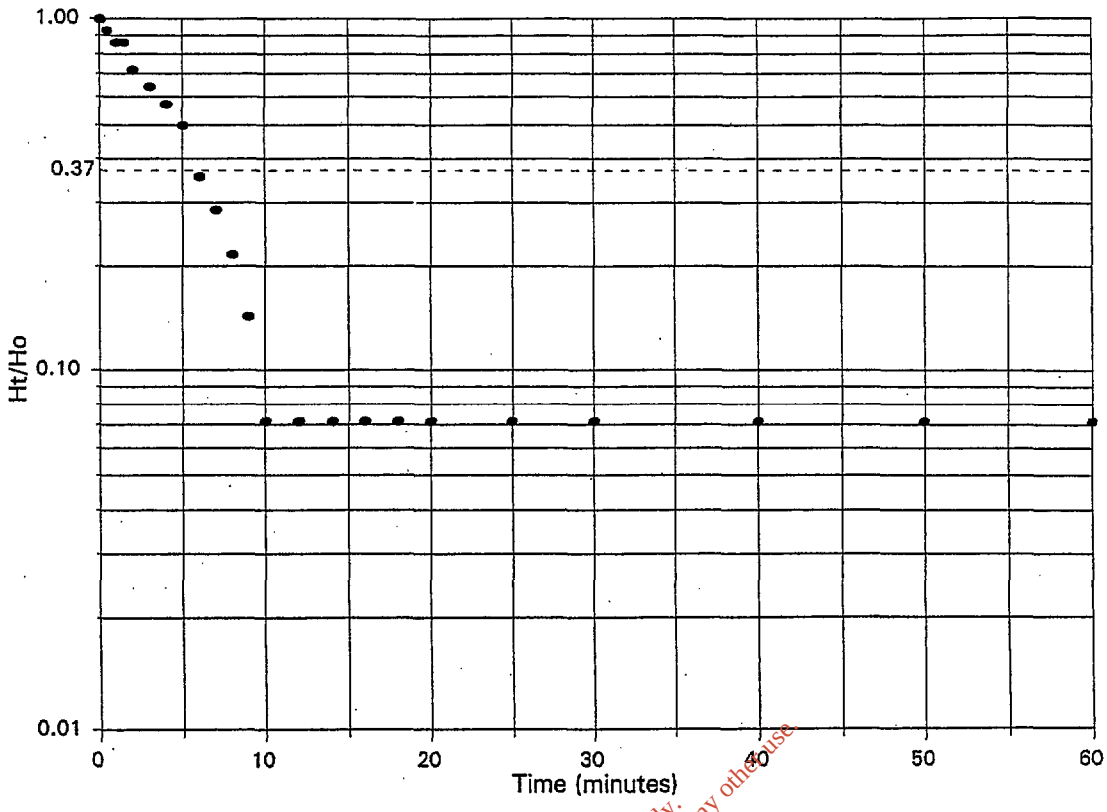
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/34

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH12	Test No.	Test1	Depth (m)	3.60-3.90	Date	01/03/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.010	0.14	1.00
00:00:30	0.020	0.13	0.93
00:01:00	0.030	0.12	0.86
00:01:30	0.030	0.12	0.86
00:02:00	0.050	0.10	0.71
00:03:00	0.060	0.09	0.64
00:04:00	0.070	0.08	0.57
00:05:00	0.080	0.07	0.50
00:06:00	0.100	0.05	0.36
00:07:00	0.110	0.04	0.29
00:08:00	0.120	0.03	0.21
00:09:00	0.130	0.02	0.14
00:10:00	0.140	0.01	0.07
00:12:00	0.140	0.01	0.07
00:14:00	0.140	0.01	0.07
00:16:00	0.140	0.01	0.07
00:18:00	0.140	0.01	0.07
00:20:00	0.140	0.01	0.07
00:25:00	0.140	0.01	0.07
00:30:00	0.140	0.01	0.07
00:40:00	0.140	0.01	0.07
00:50:00	0.140	0.01	0.07
01:00:00	0.140	0.01	0.07

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.60 to 3.90	m
Casing Depth		3.60	m
Borehole Depth		3.90	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		0.15	m
Depth to Water: Start of Test (d0)		0.01	m
End of Test		0.14	m
Test Type		Falling	
Response Zone Length	(L) =	0.30	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	1.58	
Basic Time Lag Factor	(T) =	358	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 5.6 \times 10^{-5}\ \text{m/s}$$

Remarks

End Test depth assumed as rest water level for calculation purposes only.

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

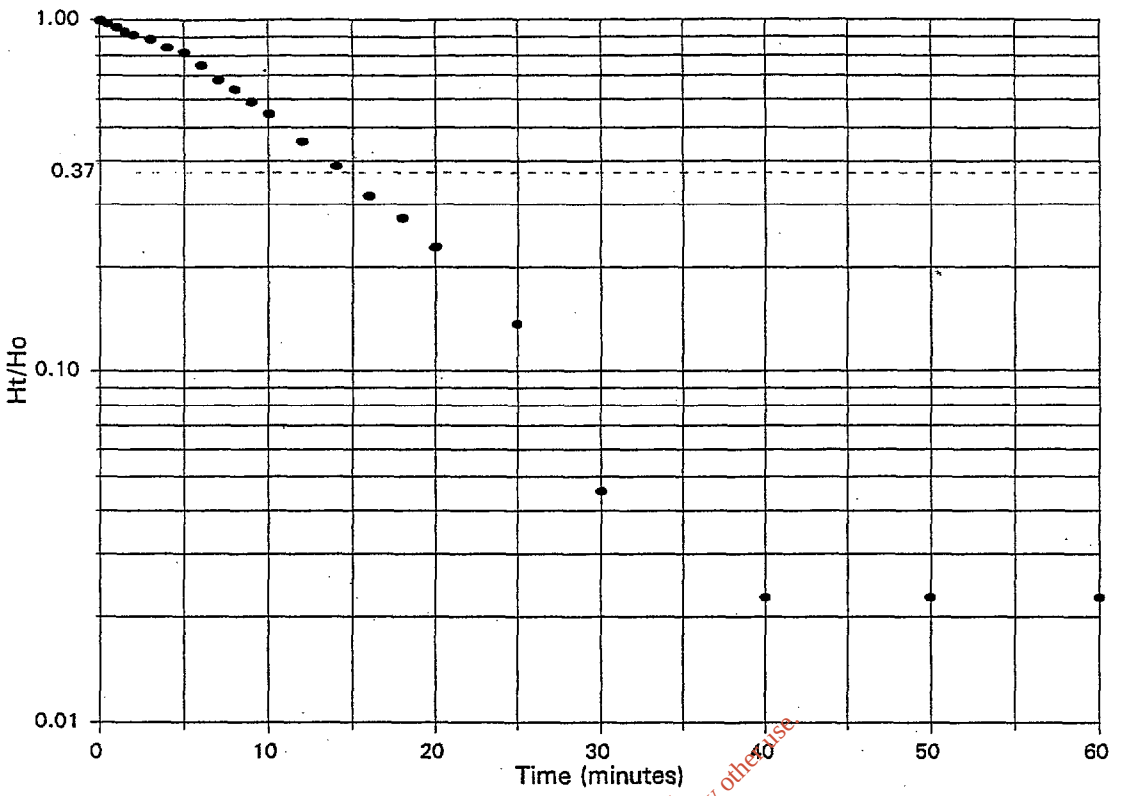
Contract No: E02755

Figure No: FT3/35

113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH12	Test No.	Test2	Depth (m)	3.60-4.40	Date	01/03/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.010	0.44	1.00
00:00:30	0.020	0.43	0.98
00:01:00	0.030	0.42	0.96
00:01:30	0.040	0.41	0.93
00:02:00	0.050	0.40	0.91
00:03:00	0.060	0.39	0.89
00:04:00	0.080	0.37	0.84
00:05:00	0.090	0.36	0.82
00:06:00	0.120	0.33	0.75
00:07:00	0.150	0.30	0.68
00:08:00	0.170	0.28	0.64
00:09:00	0.190	0.26	0.59
00:10:00	0.210	0.24	0.55
00:12:00	0.250	0.20	0.45
00:14:00	0.280	0.17	0.39
00:16:00	0.310	0.14	0.32
00:18:00	0.330	0.12	0.27
00:20:00	0.350	0.10	0.23
00:25:00	0.390	0.06	0.14
00:30:00	0.430	0.02	0.05
00:40:00	0.440	0.01	0.02
00:50:00	0.440	0.01	0.02
01:00:00	0.440	0.01	0.02

Test Details
(All water depths measured below Datum)

Depth of Test Section		3.60 to 4.40	m
Casing Depth		3.60	m
Borehole Depth		4.40	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		0.45	m
Depth to Water: Start of Test (d0)		0.01	m
End of Test		0.44	m
Test Type		Falling	
Response Zone Length	(L) =	0.80	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.40	
Basic Time Lag Factor	(T) =	875	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 1.5 \times 10^{-5}\ \text{m/s}$$

Remarks

End Test depth assumed as rest water level for calculation purposes only.

Geology of Test Glacial Till

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

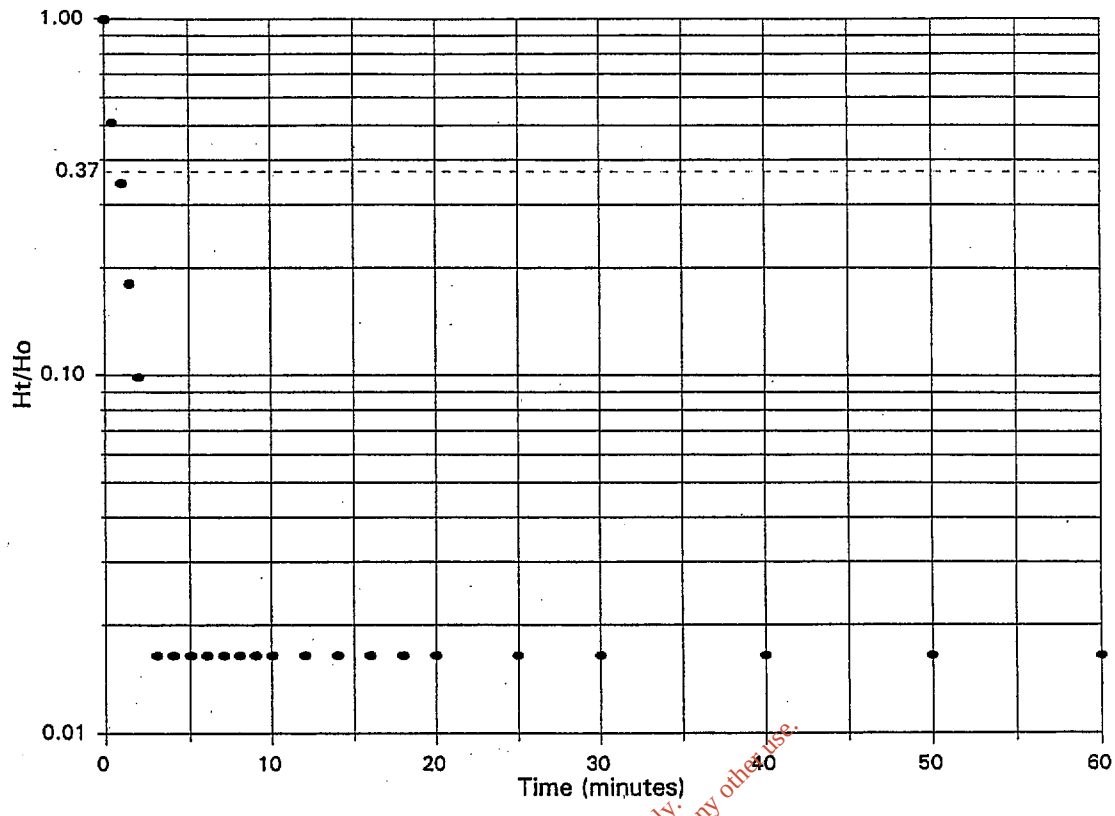
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/36 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH12	Test No.	Test3	Depth (m)	3.60-10.00	Date	01/03/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	1.500	0.61	1.00
00:00:30	1.800	0.31	0.51
00:01:00	1.900	0.21	0.34
00:01:30	2.000	0.11	0.18
00:02:00	2.050	0.06	0.10
00:03:00	2.100	0.01	0.02
00:04:00	2.100	0.01	0.02
00:05:00	2.100	0.01	0.02
00:06:00	2.100	0.01	0.02
00:07:00	2.100	0.01	0.02
00:08:00	2.100	0.01	0.02
00:09:00	2.100	0.01	0.02
00:10:00	2.100	0.01	0.02
00:12:00	2.100	0.01	0.02
00:14:00	2.100	0.01	0.02
00:16:00	2.100	0.01	0.02
00:18:00	2.100	0.01	0.02
00:20:00	2.100	0.01	0.02
00:25:00	2.100	0.01	0.02
00:30:00	2.100	0.01	0.02
00:40:00	2.100	0.01	0.02
00:50:00	2.100	0.01	0.02
01:00:00	2.100	0.01	0.02

Test Details (All water depths measured below Datum)

Depth of Test Section		3.60 to 10.00	m
Casing Depth		3.60	m
Borehole Depth		10.00	m
Datum (mbgl, -ve means above gl)		-0.30	m
Depth to Standing Water Level (d1)		2.11	m
Depth to Water: Start of Test (d0)		1.50	m
End of Test		2.10	m
Test Type		Falling	
Response Zone Length	(L) =	6.40	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	9.67	
Basic Time Lag Factor	(T) =	55	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{FT} = 5.9 \times 10^{-5} \text{ m/s}$$

Remarks

End Test depth assumed as rest water level for calculation

Purposes only. Water pumped into borehole for 15mins,

unable to raise water level above -1.50m datum.

Geology of Test Glacial Till and Fractured Schist

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

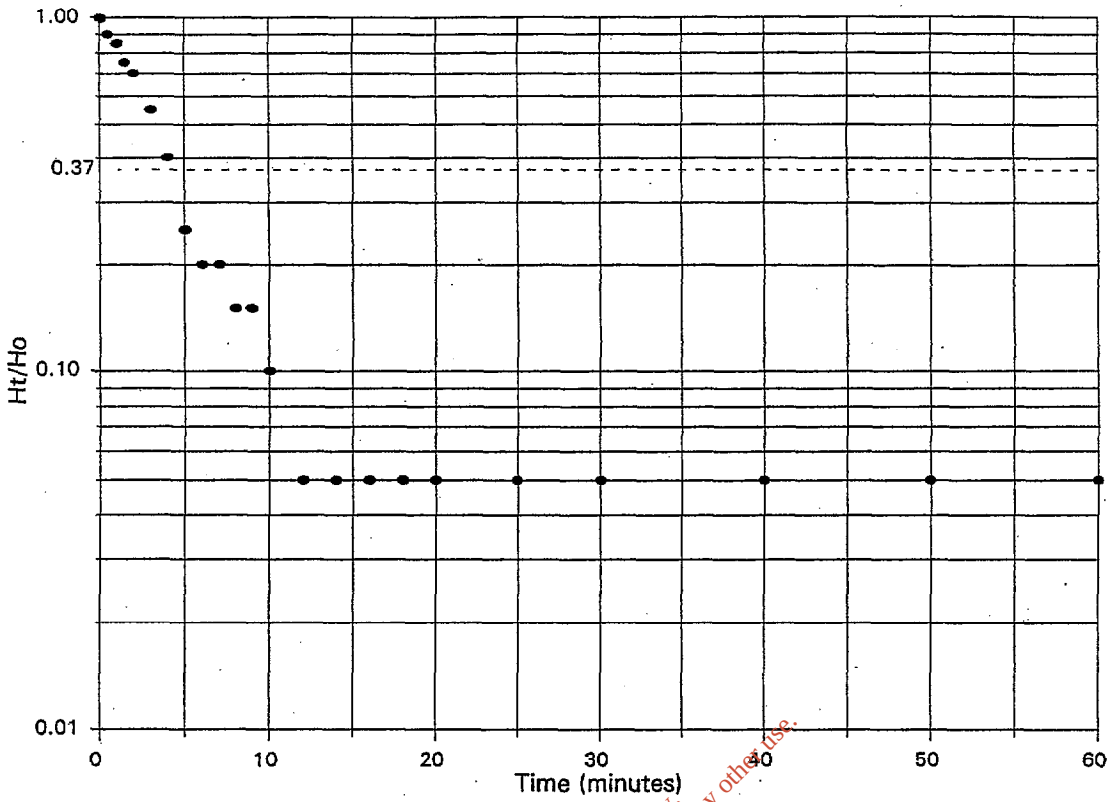
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/37 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH13	Test No.	Test1	Depth (m)	1.00-1.70	Date	27/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.010	0.20	1.00
00:00:30	0.030	0.18	0.90
00:01:00	0.040	0.17	0.85
00:01:30	0.060	0.15	0.75
00:02:00	0.070	0.14	0.70
00:03:00	0.100	0.11	0.55
00:04:00	0.130	0.08	0.40
00:05:00	0.160	0.05	0.25
00:06:00	0.170	0.04	0.20
00:07:00	0.170	0.04	0.20
00:08:00	0.180	0.03	0.15
00:09:00	0.180	0.03	0.15
00:10:00	0.190	0.02	0.10
00:12:00	0.200	0.01	0.05
00:14:00	0.200	0.01	0.05
00:16:00	0.200	0.01	0.05
00:18:00	0.200	0.01	0.05
00:20:00	0.200	0.01	0.05
00:25:00	0.200	0.01	0.05
00:30:00	0.200	0.01	0.05
00:40:00	0.200	0.01	0.05
00:50:00	0.200	0.01	0.05
01:00:00	0.200	0.01	0.05

Test Details
(All water depths measured below Datum)

Depth of Test Section		1.00 to 1.70	m
Casing Depth		1.00	m
Borehole Depth		1.70	m
Datum (mbgl, -ve means above gl)		-0.80	m
Depth to Standing Water Level (d1)		0.21	m
Depth to Water: Start of Test (d0)		0.01	m
End of Test		0.20	m
Test Type		Falling	
Response Zone Length	(L) =	0.70	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	2.24	
Basic Time Lag Factor	(T) =	258	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 5.4 \times 10^{-5}\ \text{m/s}$$

Remarks
End Test depth assumed as rest water level for calculation **purposes only.**

Geology of Test Glacial Drift

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

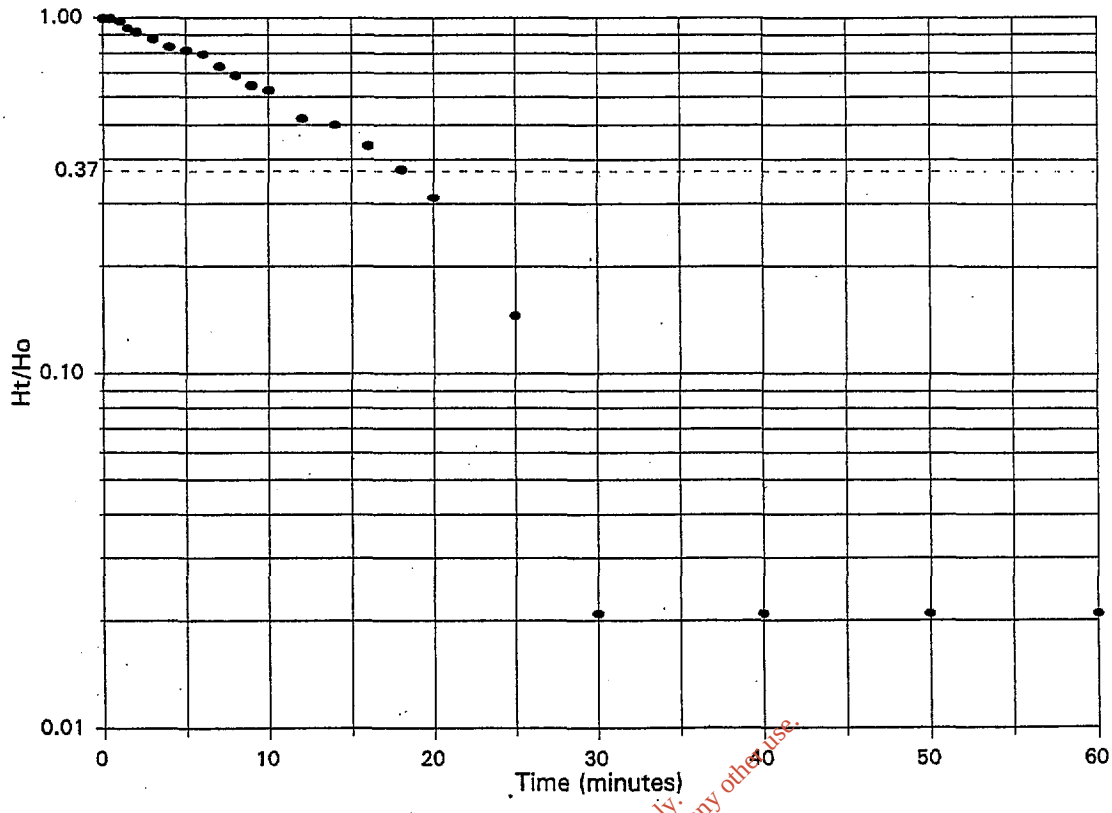
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/38 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH13	Test No.	Test2	Depth (m)	2.70-2.90	Date	27/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.030	0.48	1.00
00:00:30	0.030	0.48	1.00
00:01:00	0.040	0.47	0.98
00:01:30	0.060	0.45	0.94
00:02:00	0.070	0.44	0.92
00:03:00	0.090	0.42	0.88
00:04:00	0.110	0.40	0.83
00:05:00	0.120	0.39	0.81
00:06:00	0.130	0.38	0.79
00:07:00	0.160	0.35	0.73
00:08:00	0.180	0.33	0.69
00:09:00	0.200	0.31	0.65
00:10:00	0.210	0.30	0.63
00:12:00	0.260	0.25	0.52
00:14:00	0.270	0.24	0.50
00:16:00	0.300	0.21	0.44
00:18:00	0.330	0.18	0.38
00:20:00	0.360	0.15	0.31
00:25:00	0.440	0.07	0.15
00:30:00	0.500	0.01	0.02
00:40:00	0.500	0.01	0.02
00:50:00	0.500	0.01	0.02
01:00:00	0.500	0.01	0.02

Test Details (All water depths measured below Datum)

Depth of Test Section		2.70 to 2.90	m
Casing Depth		2.70	m
Borehole Depth		2.90	m
Datum (mbgl, -ve means above gl)		-0.45	m
Depth to Standing Water Level (d1)		0.51	m
Depth to Water: Start of Test (d0)		0.03	m
End of Test		0.50	m
Test Type		Falling	
Response Zone Length	(L) =	0.20	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m²
Intake Factor (BS 5930 pg50, figure d)	(F) =	1.43	
Basic Time Lag Factor	(T) =	1080	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 2.0 \times 10^{-5}\ m/s$$

Remarks

End Test depth assumed as rest water level for calculation **purposes only.**

Geology of Test Weathered Schist

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

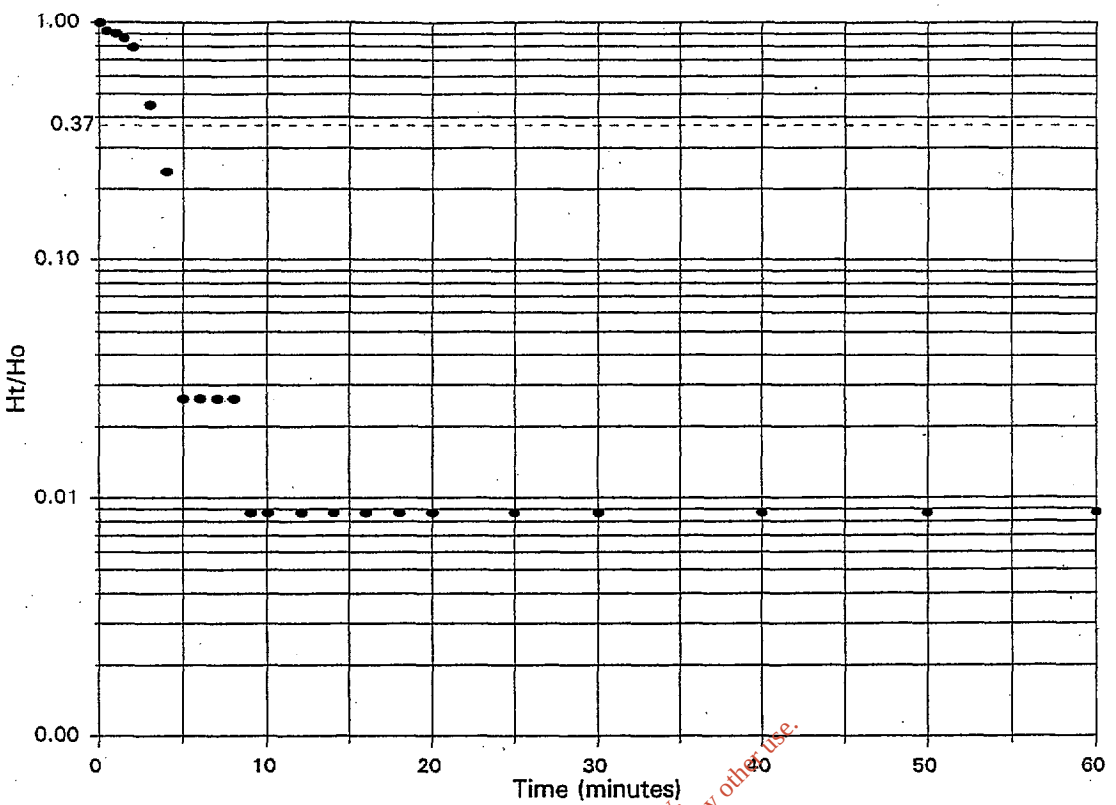
Project: MEENABOLL LANDFILL SITE, CO. DONEGAL

Contract No: E02755

Figure No: FT3/39 113/01

VARIABLE HEAD PERMEABILITY TEST

Borehole No.	BH13	Test No.	Test3	Depth (m)	2.70-10.00	Date	27/02/2003



Time Elapsed (hh:mm:ss)	Depth of Water below Datum (m)	Ht	Ht/Ho
00:00:00	0.080	1.15	1.00
00:00:30	0.170	1.06	0.92
00:01:00	0.190	1.04	0.90
00:01:30	0.240	0.99	0.86
00:02:00	0.320	0.91	0.79
00:03:00	0.710	0.52	0.45
00:04:00	0.960	0.27	0.23
00:05:00	1.200	0.03	0.03
00:06:00	1.200	0.03	0.03
00:07:00	1.200	0.03	0.03
00:08:00	1.200	0.03	0.03
00:09:00	1.220	0.01	0.01
00:10:00	1.220	0.01	0.01
00:12:00	1.220	0.01	0.01
00:14:00	1.220	0.01	0.01
00:16:00	1.220	0.01	0.01
00:18:00	1.220	0.01	0.01
00:20:00	1.220	0.01	0.01
00:25:00	1.220	0.01	0.01
00:30:00	1.220	0.01	0.01
00:40:00	1.220	0.01	0.01
00:50:00	1.220	0.01	0.01
01:00:00	1.220	0.01	0.01

Test Details
(All water depths measured below Datum)

Depth of Test Section		2.70 to 10.00	m
Casing Depth		2.70	m
Borehole Depth		10.00	m
Datum (mbgl, -ve means above gl)		-0.45	m
Depth to Standing Water Level (d1)		1.23	m
Depth to Water: Start of Test (d0)		0.08	m
End of Test		1.22	m
Test Type		Falling	
Response Zone Length	(L) =	7.30	m
Borehole diameter in test section	(D) =	0.2	m
Cross sectional area of borehole	(A) =	0.03142	m^2
Intake Factor (BS 5930 pg50, figure d)	(F) =	10.69	
Basic Time Lag Factor	(T) =	200	sec

Coefficient of Permeability using Basic Time Lag Approach

$$k = \frac{A}{F\,T} = 1.5 \times 10^{-5}\ m/s$$

Remarks
End Test depth assumed as rest water level for calculation purposes only.

Geology of Test Weathered Schist and Fractured Schist

Input by	Date	Checked by	Date
cdl	10/07/2003	IPJ	28/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL SITE, CO. DONGAL

Contract No: E02755

Figure No: FT3/40

PACKER TEST - FIELD DATA

Type of test:	Single Packer		**Borehole No:**	**BH2**	Test No	1
(a) top of test section:	9	m	Depth:	9	Sheet	1
(b) bottom of test section:	12.35	m	Date of test:	17/02/03	Operator:	NE
© centre of test section:	10.65	m	G.L. (m O.D.)	NR	Casing Diameter (mm):	200
(d) bottom of hole at time of test:	12.35	m	Checked by:	IPJ	Date Checked:	01/04/03
(e) bottom of casing:	5.36	m	Packer Type:	Single		Single/Double
(f) initial groundwater level	1.28	m	Dia. of hole in test area	116		mm
(g) groundwater level after test	1	m	Type of Rock	Fractured Schist		
(h) gauge height above ground level	0.5	m				

Period	Time, mins		5	10	15	20	Interval	5
Gauge Pressure:	Packer Pressure	80 PSI	80 PSI	80 PSI	80 PSI	80 PSI		
	Water level in borehole/casing	1.28	see note					
4.5	Flowmeter reading	389284	389286	389290	389305	389342	Average flow q litres/min	
psi	Water take, litres		2	4	15	37	2.9	
Period	Time, mins						Interval	
Gauge Pressure:	Packer Pressure							
	Water level in borehole/casing							
	Flowmeter reading						Average flow q litres/min	
	Water take, litres							
Period	Time, mins						Interval	
Gauge Pressure:	Packer Pressure							
	Water level in borehole/casing							
	Flowmeter reading						Average flow q litres/min	
	Water take, litres							
Period	Time, mins						Interval	
Gauge Pressure:	Packer Pressure							
	Water level in borehole/casing							
	Flowmeter reading						Average flow q litres/min	
	Water take, litres							
Period	Time, mins						Interval	
Gauge Pressure:	Packer Pressure							
	Water level in borehole/casing							
	Flowmeter reading						Average flow q litres/min	
	Water take, litres							

No of 53mm diameter wireline rods used: 3

Remarks: * - delete as appropriate

Unable to seal packer, water flowing around packer and up casing during test.
Packer deflated and reflated at 10.00m bgl, still unable to create seal, test abondoned

FOUNDATION & EXPLORATION SERVICES	Meenaboll Landfill Site, Co. Donegal	CONTRACT No : E02755
		FIGURE: FT4/1

Packer testBH2_1.xls

E02755 Meenaboll Landfill Site, Co. Donegal

Borehole No.	Date	Time	Cover lvl	Casing lvl	Water lvl	Base dip	Waterra	Solinst	Logger No.	Logger tip	Remarks
BH1	19/03/03	17:00	0.54	0.54	-1.61	21.50 bc	Y	Y	**39977**	8.61 bgl	
BH2	20/03/03	09:10	0.42	0.28	-1.68	12.35 bc	Y	Y	**39983**	8.68 bgl	
BH3	Wrong padlock unable to open - evidence has been artesian due to staining,										
BH4	20/03/03	11:20	0.4	-0.06	-2.7	15.05 bc	Y	Y	**39985**	9.70 bgl	
BH5	20/03/03	10:50	0.53	0.41	-0.04	10.57 bc	Y	Y	**39984**	7.04 bgl	not artesian
BH6	20/03/03	13:20	0.41	0.37	0.08	9.35 bc	Y	Y	**39944**	6.92 bgl	Close to artesian conditions
BH7	20/03/03	13:45	0.41	0.34	-0.76	9.80 bc	Y	Y	**39976**	8.10 bgl	No Lock
BH8	Cover sunk unable to open										
BH9	20/03/03	14:45	0.18	0.16	-1.64	10.50 bc	Y	N			
BH10	20/03/03	12:35	0.21	0.05	-0.15	10.37 bc	Y	Y	**39986**	7.15 bgl	Close to artesian conditions
BH11	20/03/03	10:30		0.5	-1.51	7.31 bc	N	N			Cover badly sunk
BH12	20/03/03	09:50	0.49	0.41	-1.42	10.44 bc	Y	Y	**39981**	8.52 bgl	Cover broken partially sunk
BH13	Wrong padlock unable to open										
			39979								
Unused loggers			39955								

APPENDIX C

GEOTECHNICAL LABORATORY TEST RESULTS

Geotechnical Testing Schedules of UKAS Accreditation	
General Notes on Laboratory Test Results	Figures LKS/01 to LKS/02
Summary of Classification Tests	Figures LT1/1 to LT1/3
Particle Size Distribution Curves	Figures LT2/1 to LT2/46
Compaction Related Test Results	Figures LT3/1 to LT3/5
Rock Test Results	Figures LT8/1 to LT8/4
Rock Test Results – Carried out by Fugro	
Results of Chemical Analyses	

GENERAL NOTES ON LABORATORY TEST RESULTS

1. TEST METHODS

The tests reported on the following sheets have been carried out in accordance with the methods given in BS 1377 : 1990 'Methods of test for Soils for civil engineering purposes, subject to a small number of variances as described below under the respective headings. These notes also serve as keysheets to any notation used in reporting the laboratory tests.

2. KEY TO NOTATION OF SAMPLE TYPE

D: Disturbed sample.

B: Bulk disturbed sample.

U: General purpose open drive tube sample.

P: Piston sample.

TW: Thin wall sample.

RC: Rotary core sample.

3. CLASSIFICATION TESTS

% passing 425µm: this figure is only correctly reported when 'WS' is shown in the 'Method' of preparation column. For 'HP' and 'AR', the reported figure is an estimate only.

WS: sample prepared by Wet Sieving.

HP: sample prepared by Hand Picking (removal) of gravel sized fragments.

AR: sample tested As Received.

NP: non-plastic.

4. COMPACTION RELATED TESTS

Sample preparation : **Individual** indicates test carried out on individual sub-samples.

Single indicates test carried out on a single sample.

Assumed values of particle density are reported in brackets e.g. (2.67)

5. SAMPLE DESCRIPTIONS

The sample descriptions shown on the test report sheets are the technician's visual descriptions of the test samples, in accordance with Clause 9.1 of Part 1 of BS 1377 : 1990 and do not necessarily comply with the requirements of BS 5930 : 1983. For a more comprehensive description of the soil samples to BS 5930, reference should be made to the exploratory hole records, or an engineering description can be provided on request.

6. INTERPRETATION OF TEST RESULTS

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of an appropriately qualified and experienced specialist is sought.

		Input by RJE	Date	Checked by	Date		
FOUNDATION & EXPLORATION SERVICES		NOTES ON LABORATORY TEST RESULTS				Contract No E02755	
						Figure No LKS/01	

SCHEDULE OF UKAS ACCREDITED LABORATORY TESTS FOR SOILS FOR CIVIL ENGINEERING PURPOSES

Types of Test/Properties Measured Range of Measurement		Standard Specification Equipment/Techniques Used
Physical Tests	Moisture content - oven drying method	BS 1377: Part 2: 1990
	Saturation moisture content of chalk	BS 1377: Part 2: 1990
	Liquid limit - cone penetrometer	BS 1377: Part 2: 1990
	Liquid limit - cone penetrometer - one point method	BS 1377: Part 2: 1990
	Plastic limit	BS 1377: Part 2: 1990
	Plasticity index and liquidity index	BS 1377: Part 2: 1990
	Density - linear measurement	BS 1377: Part 2: 1990
	Density - immersion in water	BS 1377: Part 2: 1990
	Density - water displacement	BS 1377: Part 2: 1990
	Particle density - gas jar	BS 1377: Part 2: 1990
	Particle size distribution - wet sieving	BS 1377: Part 2: 1990
	Particle size distribution - dry sieving	BS 1377: Part 2: 1990
	Particle size distribution - sedimentation - pipette method	BS 1377: Part 2: 1990
	Dry density/moisture content relationship (2.5kg rammer)	BS 1377: Part 4: 1990
	Dry density/moisture content relationship (4.5kg rammer)	BS 1377: Part 4: 1990
	Dry density/moisture content relationship (vibrating hammer)	BS 1377: Part 4: 1990
	Moisture condition value (MCV)	BS 1377: Part 4: 1990
	Chalk crushing value	BS 1377: Part 4: 1990
	One-dimensional consolidation properties	BS 1377: Part 5: 1990
Mechanical Tests	California Bearing Ratio (CBR) (loads from 0.2 to 25kN)	BS 1377: Part 4: 1990
	Unconfined compressive strength - load frame method (loads from 0.2 to 25kN)	BS 1377: Part 7: 1990
	Undrained shear strength - triaxial compression without measurement of pore pressure (loads from 0.2 to 25kN)	BS 1377: Part 7: 1990
	Undrained shear strength - triaxial compression with multistage loading and without measurement of pore pressure (loads from 0.2 to 25kN)	BS 1377: Part 7: 1990

SCHEDULE OF UKAS ACCREDITED LABORATORY TESTS FOR ROCKS

Types of Test/Properties Measured Range of Measurement		Standard Specification Equipment/Techniques Used
Physical Tests	Water Content	ISRM Suggested Methods – Rock Characterization Testing and Monitoring. Ed. E T Brown - 1981
	Porosity and density - by saturation and calliper techniques	ISRM Suggested Methods – Rock Characterization Testing and Monitoring. Ed. E T Brown - 1981
	Porosity and density - by saturation and buoyancy techniques	ISRM Suggested Methods – Rock Characterization Testing and Monitoring. Ed. E T Brown - 1981
	Slake-durability index	ISRM Suggested Methods – Rock Characterization Testing and Monitoring. Ed. E T Brown - 1981
Mechanical Tests	Point load strength and anisotropy indices (loads from 0 to 46kN)	ISRM Commission on Testing Methods, Suggested Method for Determining Point Load Strength 1985

SUMMARY OF SOIL CLASSIFICATION TESTS

BS 1377: Part 2: 1990

Hole	Type	Depth	Sample No.	Classification Tests									Description
				Bulk Density (Mg/m^3)	Moisture Content (%)	Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% passing 425 μm	Method	
TP9	D	0.80	2		23				NP		42	WS	Grey SAND with a little silt and a little gravel
TP9	D	2.00	4		28				NP		50	WS	Grey SAND with a little silt and a little gravel
TP9	D	4.00	6		25				NP		46	WS	Grey SAND with a little silt and a little gravel
TP15	D	0.90	2		26				NP		57	WS	Grey SAND with some silt and a little gravel
TP15	D	2.00	4		19			26	18	8	71	WS	Grey CLAY/SILT with some sand and a little gravel
TP15	D	4.00	6		17				NP		29	WS	Grey SAND with some silt and a little gravel
TP16	D	0.50	2		20				NP		57	WS	Grey SAND with some silt and a little gravel
TP16	D	1.50	4		17			28	23	5	56	WS	Grey green SAND with some silt and a little gravel

Input by CM Date 31/03/2003 Checked by R Date 31/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

Figure No: LT1/1

102/02

SUMMARY OF SOIL CLASSIFICATION TESTS

BS 1377: Part 2: 1990

Hole	Type	Depth	Sample No.	Classification Tests									Description
				Bulk Density (Mg/m^3)	Moisture Content (%)	Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% passing 425 μm	Method	
TP16	D	3.50	6		22				NP		50	WS	Grey SAND with a little silt and a little gravel
TP17	D	0.40	2		31				NP		53	WS	Grey green SAND with a little silt a little gravel and a little organic matter
TP17	D	1.50	4		21				NP		49	WS	Grey SAND with a little silt a little gravel and a few rootlets
TP17	D	3.00	6		22				NP		52	WS	Grey SAND with a little silt and some gravel
TP18	D	2.00	4		67				NP		55	WS	Black SAND with a little silt with a little gravel and a little organic matter
TP18	D	3.00	5		28				NP		68	WS	Grey brown SAND with a little silt and a little gravel
TP18	B	4.00	6		31				NP		40	WS	Grey SAND with a little silt and some gravel

Input by CM | Date 31/03/2003 | Checked by | Date 31/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No E02755

Figure No LT1/2

102/02

SUMMARY OF SOIL CLASSIFICATION TESTS

BS 1377: Part 2: 1990

Hole	Type	Depth	Sample No.	Classification Tests									Description
				Bulk Density (Mg/m^3)	Moisture Content (%)	Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% passing 425 μm	Method	
TP22	D	1.00	2		39				NP		53	WS	Grey SAND with a little silt and a little gravel

Input by	Date	Checked by	Date
CM	31/03/2003		31/03/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

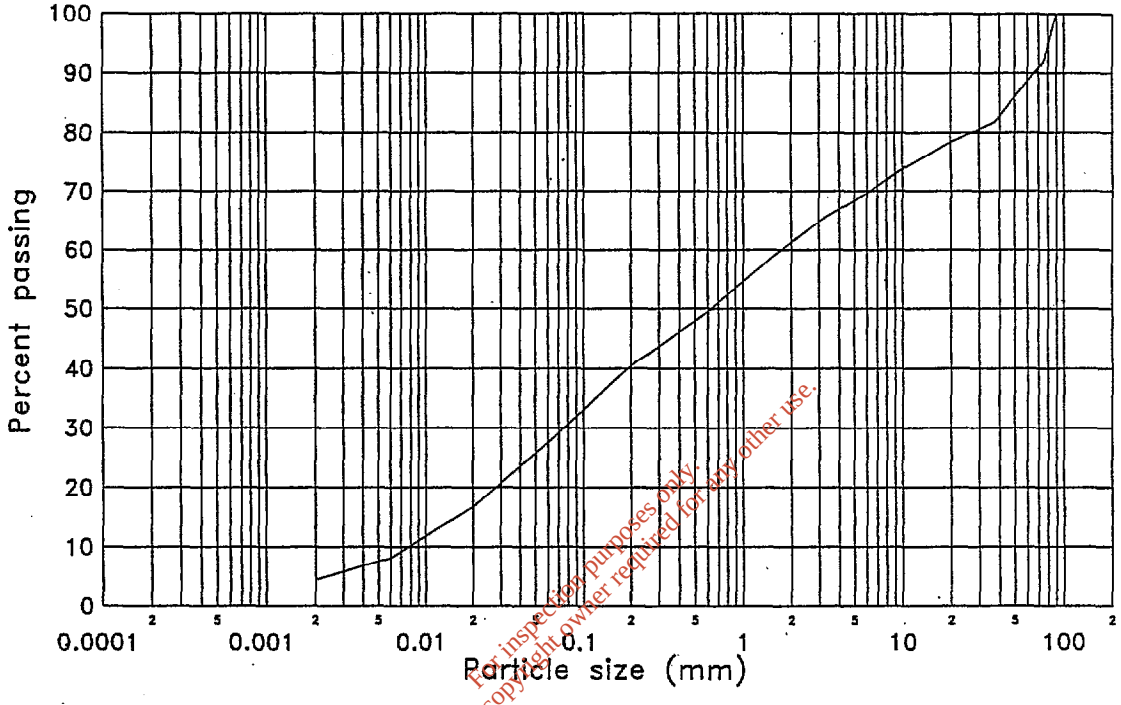
Figure No: LT1/ 3

102/02

PARTICLE SIZE DISTRIBUTION

B.S. 1377: Part 2: 1990: 9.2/~~9.3~~/9.4/~~9.5~~

Sample Details			
Borehole No: TP9	Sample No: 3	Sample Type: B	Depth: 0.80



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

%CLAY	%SILT	%SAND	%GRAVEL	%COBBLES
4	24	33	31	8

Loss on Pretreatment:	Not Applicable	Description
Test Date:	17/03/2003	Brown SAND with much gravel much silt and some cobbles
Uniformity Coefficient:	224.3	

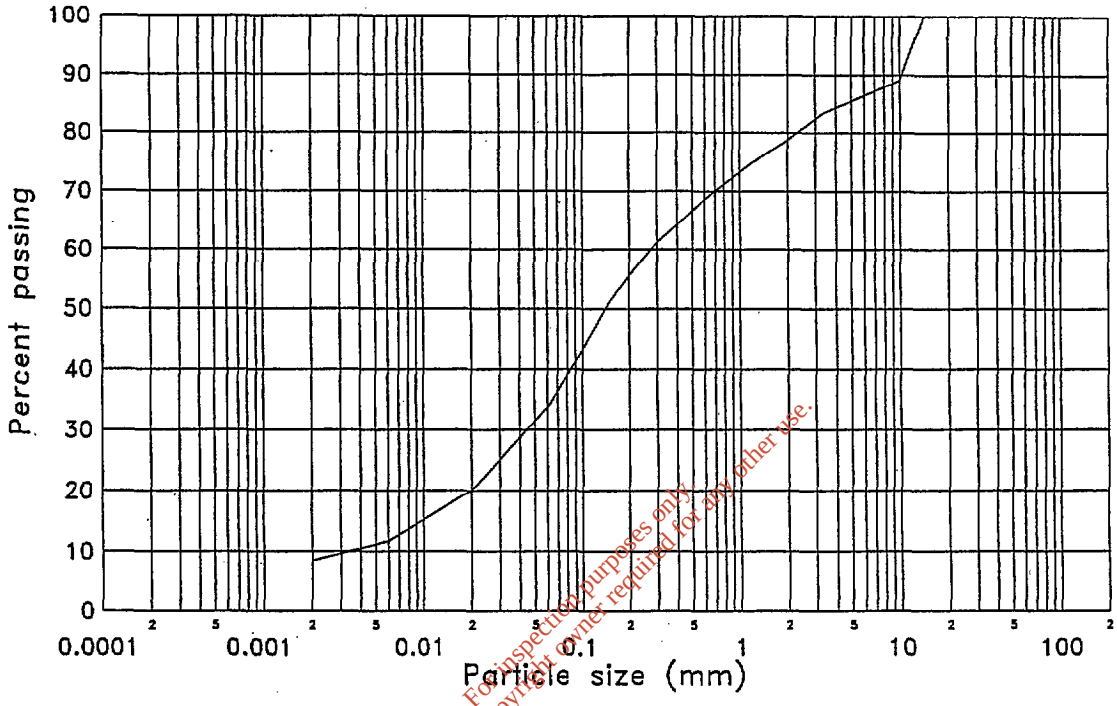
		Input by	Date	Checked by	Date		
			20/03/2003		31.3.03		

FOUNDATION & EXPLORATION SERVICES	Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION	Contract No: E02755	
		Figure No: LT2/1	105/03

PARTICLE SIZE DISTRIBUTION

B.S. 1377: Part 2: 1990: 9.2/~~9.3~~/9.4/~~9.5~~

Sample Details			
Borehole No: TP15	Sample No: 3	Sample Type: B	Depth: 0.90



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

%CLAY	%SILT	%SAND	%GRAVEL	%COBBLES
8	26	45	21	0

Loss on Pretreatment:	Not Applicable	Description
Test Date:	11/03/2003	Grey SAND with much silt and much gravel
Uniformity Coefficient:	80.4	

Input by	Date	Checked by	Date
	14/03/2003		31.3.03

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

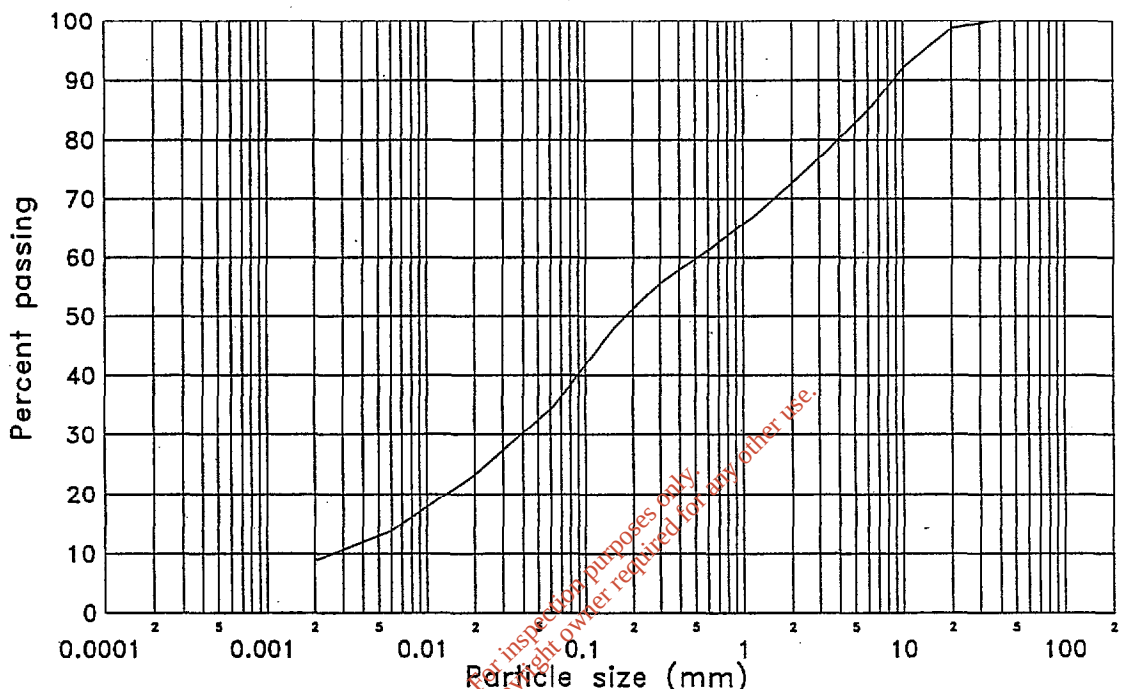
Figure No: LT2/2

105/03

PARTICLE SIZE DISTRIBUTION

B.S. 1377: Part 2: 1990: 9.2/~~9.3~~/9.4/~~9.5~~

Sample Details			
Borehole No: TP16	Sample No: 3	Sample Type: B	Depth: 0.50



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

%CLAY	%SILT	%SAND	%GRAVEL	%COBBLES
9	26	38	27	0

Loss on Pretreatment:	Not Applicable
Test Date:	11/03/2003
Uniformity Coefficient:	199.8

Description: Grey green SAND with much silt and much gravel

Input by	Date	Checked by	Date
[illegible]	14/03/2003	[illegible]	31.3.03

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

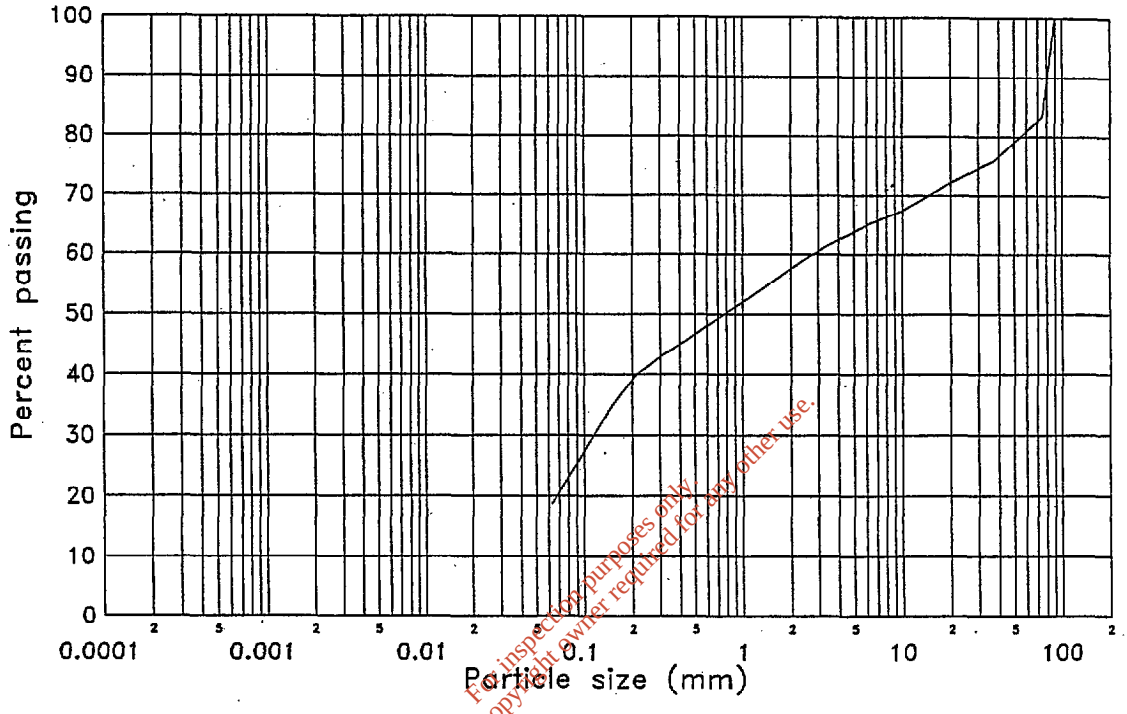
Figure No: LT2/3

105/03

PARTICLE SIZE DISTRIBUTION

B.S. 1377: Part 2: 1990: 9.2/~~9.3/9.4/9.5~~

Sample Details			
Borehole No: TP17	Sample No: 3	Sample Type: B	Depth: 0.40



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

%CLAY	%SILT	%SAND	%GRAVEL	%COBBLES
Incl. with silt	19	39	25	17

Loss on Pretreatment:	Not Applicable	Description
Test Date:	11/03/2003	Grey green SAND with much gravel some silt and some cobbles
Uniformity Coefficient:	75.0	

Insufficient material to comply with BS1377
Treat results with caution

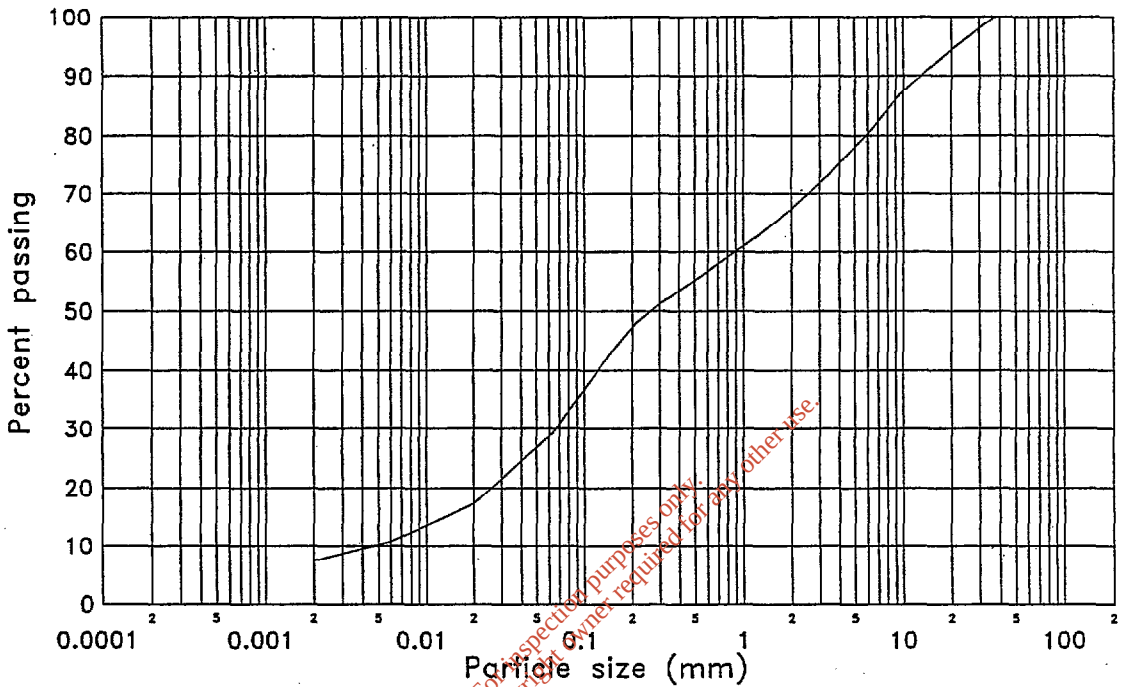
		Input by lm	Date 14/03/2003	Checked by	Date 8.4.03
FOUNDATION & EXPLORATION SERVICES	Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION			Contract No: E02755	Figure No: LT2/4

105/03

PARTICLE SIZE DISTRIBUTION

B.S. 1377: Part 2: 1990: 9.2/~~9.3~~/9.4/~~9.5~~

Sample Details			
Borehole No: TP18	Sample No: 3	Sample Type: B	Depth: 2.00



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

%CLAY	%SILT	%SAND	%GRAVEL	%COBBLES
7	22	38	33	0

Loss on Pretreatment:	Not Applicable	Description
Test Date:	17/03/2003	Brown SAND with much gravel and much silt
Uniformity Coefficient:	189.3	

Input by	Date	Checked by	Date
MM	20/03/2003		31.3.03

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

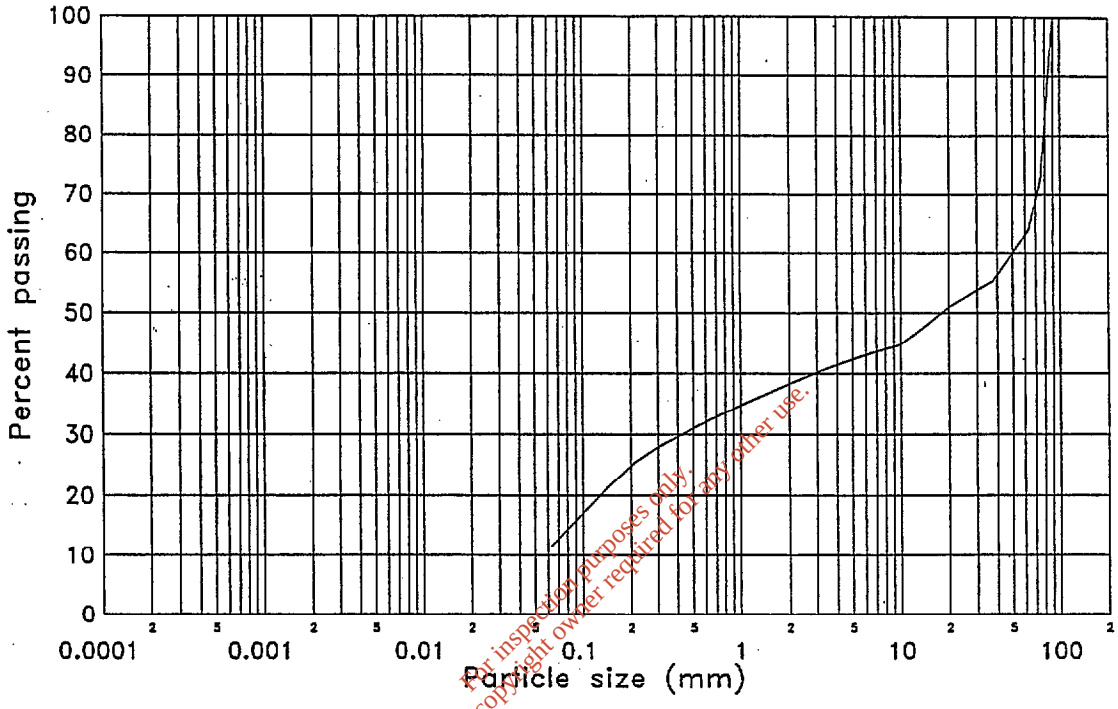
Figure No: LT2/5

105/03

PARTICLE SIZE DISTRIBUTION

B.S. 1377: Part 2: 1990: 9.2/~~9.3/9.4/9.5~~

Sample Details			
Borehole No: TP22	Sample No: 3	Sample Type: B	Depth: 1.00



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

%CLAY	%SILT	%SAND	%GRAVEL	%COBBLES
Incl. with silt	12	26	26	36

Loss on Pretreatment:	Not Applicable	Description
Test Date:	13/03/2003	Grey green COBBLES with much sand and some silt
Uniformity Coefficient:	918.0	

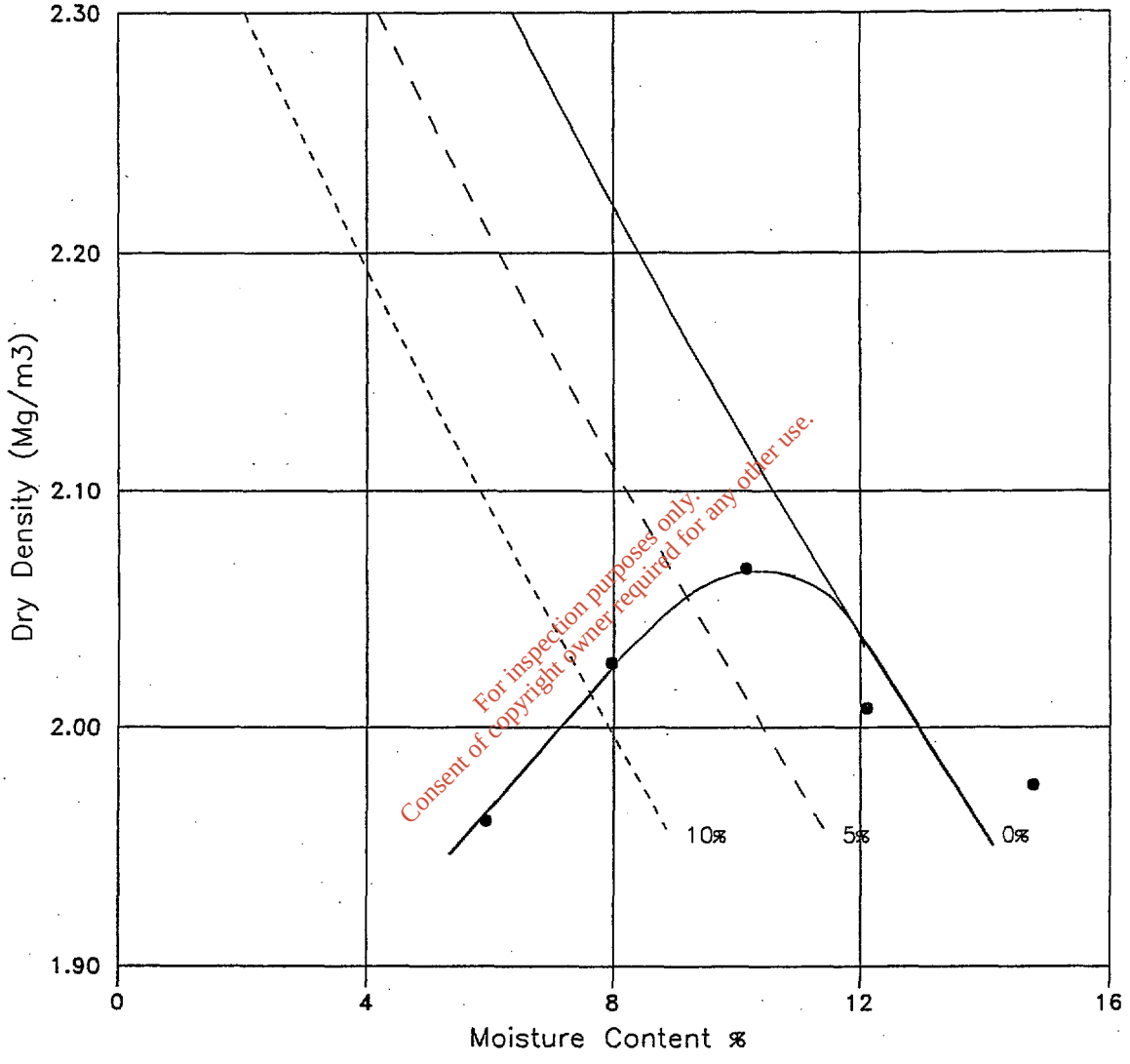
Insufficient material to comply with BS1377
Treat results with caution

		Input by GM	Date 17/03/2003	Checked by	Date 8.9.03		
FOUNDATION & EXPLORATION SERVICES		Project MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION				Contract No E02755	
						Figure No LT2/6	105/03

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP TEST

B.S. 1377: Part 4: 1990: 3.3/~~3.4/3.5/3.6/3.7~~

Sample Details			
Borehole No: TP16	Sample No: 3	Sample Type: B	Depth: 0.50



SUMMARY

Test Date			Type of Compaction	2.5kg Compaction	
Sample Preparation	Single sample		**Maximum Dry Density**	2.07	Mg/m^3
Particle Density (assumed)	(2.70)	Mg/m^3	**Optimum Moisture Content**	10	%
Moisture Content	15	%			
Material retained on			Description		
37.5mm sieve	0	%	Grey green SILT with some sand with a little gravel		
20mm sieve	2	%			

Input by	Date	Checked by	Date
CM	17/3/03.		31.3.03.

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

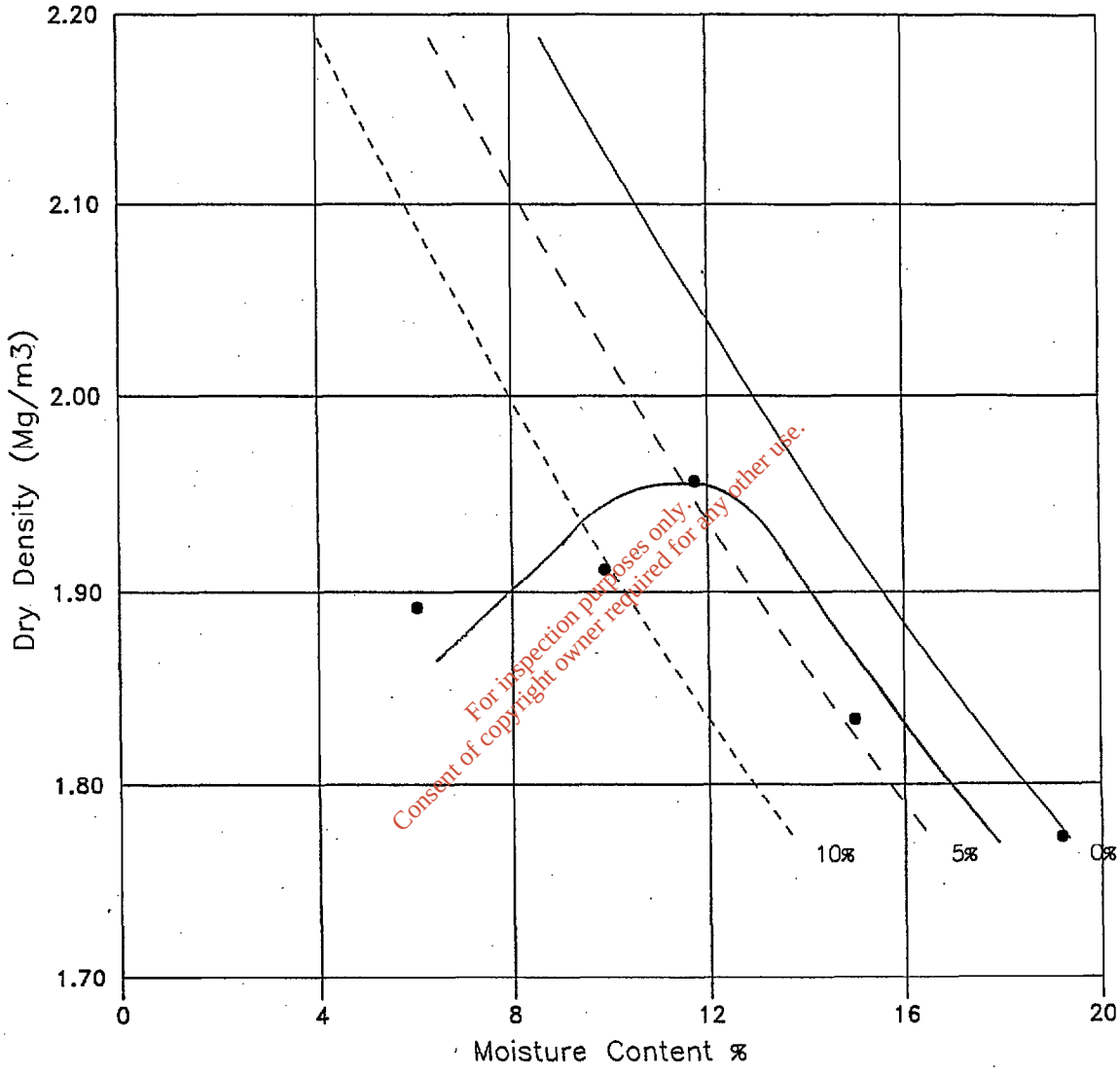
Figure No: LT3/1

106/01

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP TEST

B.S. 1377: Part 4: 1990: 3.3/~~3.4/3.5/3.6/3.7~~

Sample Details			
Borehole No: TP17	Sample No: 3	Sample Type: B	Depth: 0.40



SUMMARY

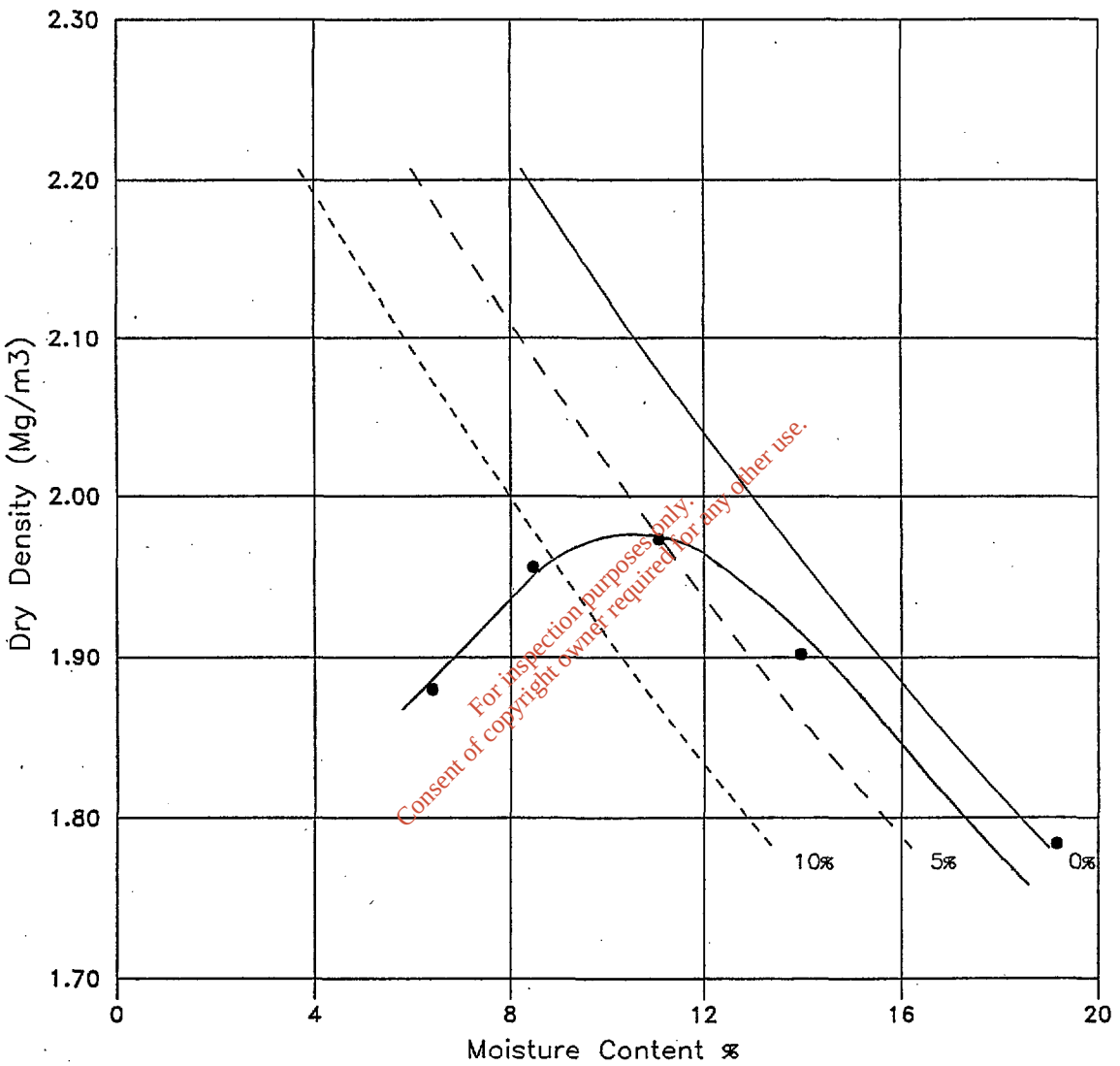
Test Date			Type of Compaction	2.5kg Compaction	
Sample Preparation	Single sample		Maximum Dry Density	1.96	Mg/m^3
Particle Density (assumed)	(2.70)	Mg/m^3	Optimum Moisture Content	12	%
Moisture Content	19	%			
Material retained on			Description		
37.5mm sieve	39	%	Grey green SILT with some sand and some gravel		
20mm sieve	44	%			

		Input by GM	Date 17/3/03	Checked by	Date 31.3.03		
FOUNDATION & EXPLORATION SERVICES		Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION				Contract No: E02755	
						Figure No: LT3/2	106/01

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP TEST

B.S. 1377: Part 4: 1990: 3.3/~~3.4/3.5/3.6/3.7~~

Sample Details			
Borehole No: TP15	Sample No: 3	Sample Type: B	Depth: 0.90



SUMMARY

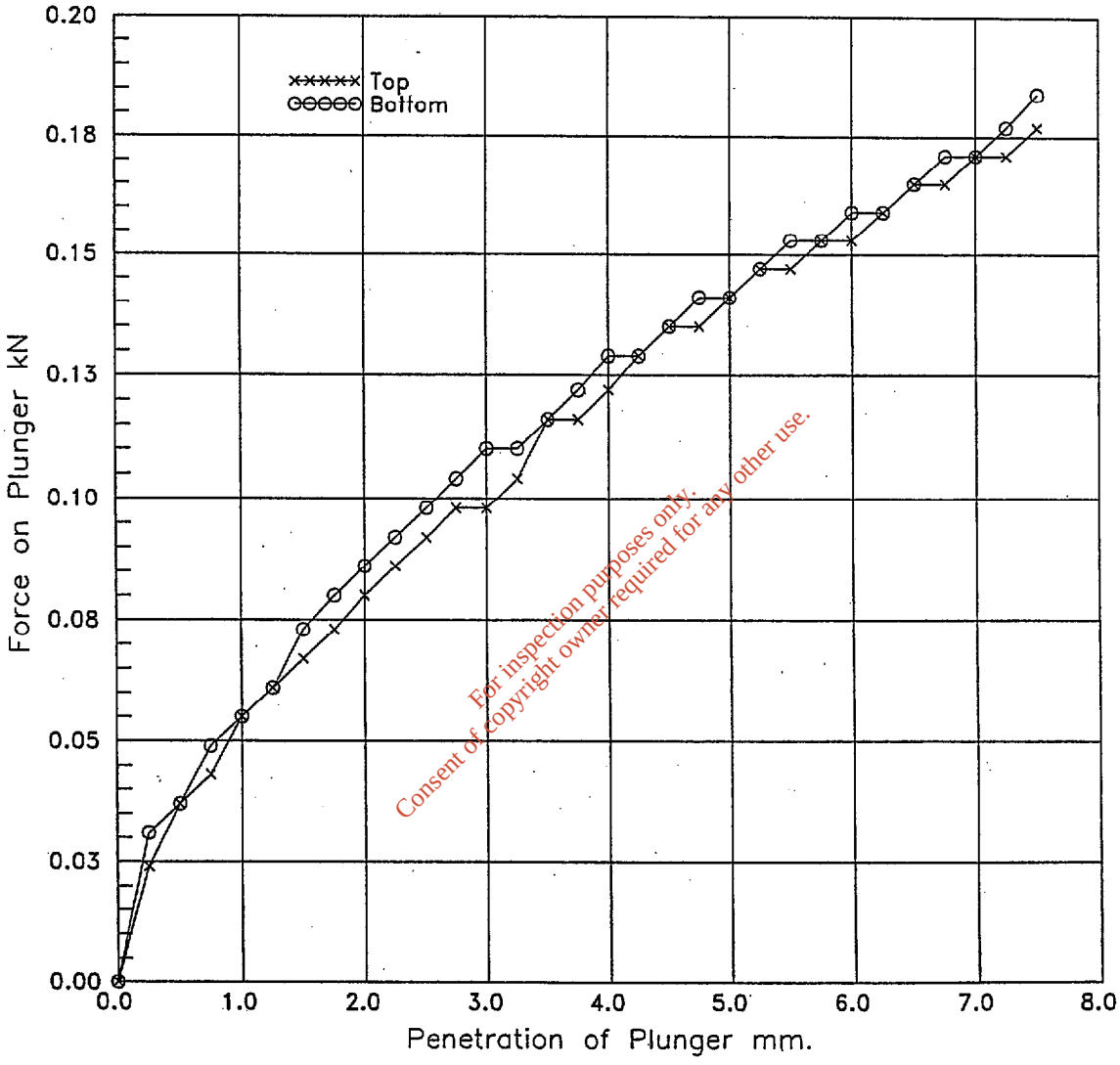
Test Date			Type of Compaction	2.5kg Compaction	
Sample Preparation	Single sample		**Maximum Dry Density**	1.97	Mg/m^3
Particle Density (assumed)	(2.70)	Mg/m^3	**Optimum Moisture Content**	11	%
Moisture Content	19	%			
Material retained on			Description		
37.5mm sieve	0	%	Grey organic SILT with some sand		
20mm sieve	0	%			

		Input by MM	Date 17/3/03	Checked by	Date 31.3.03
FOUNDATION & EXPLORATION SERVICES	Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION			Contract No E02755	
				Figure No LT3/3	106/01

CALIFORNIA BEARING RATIO TEST

B.S. 1377: Part 4: 1990: 7.4

Sample Details			
Borehole No: TP9	Sample No: 3	Sample Type: B	Depth: 0.80



17/03/2003 **SUMMARY**

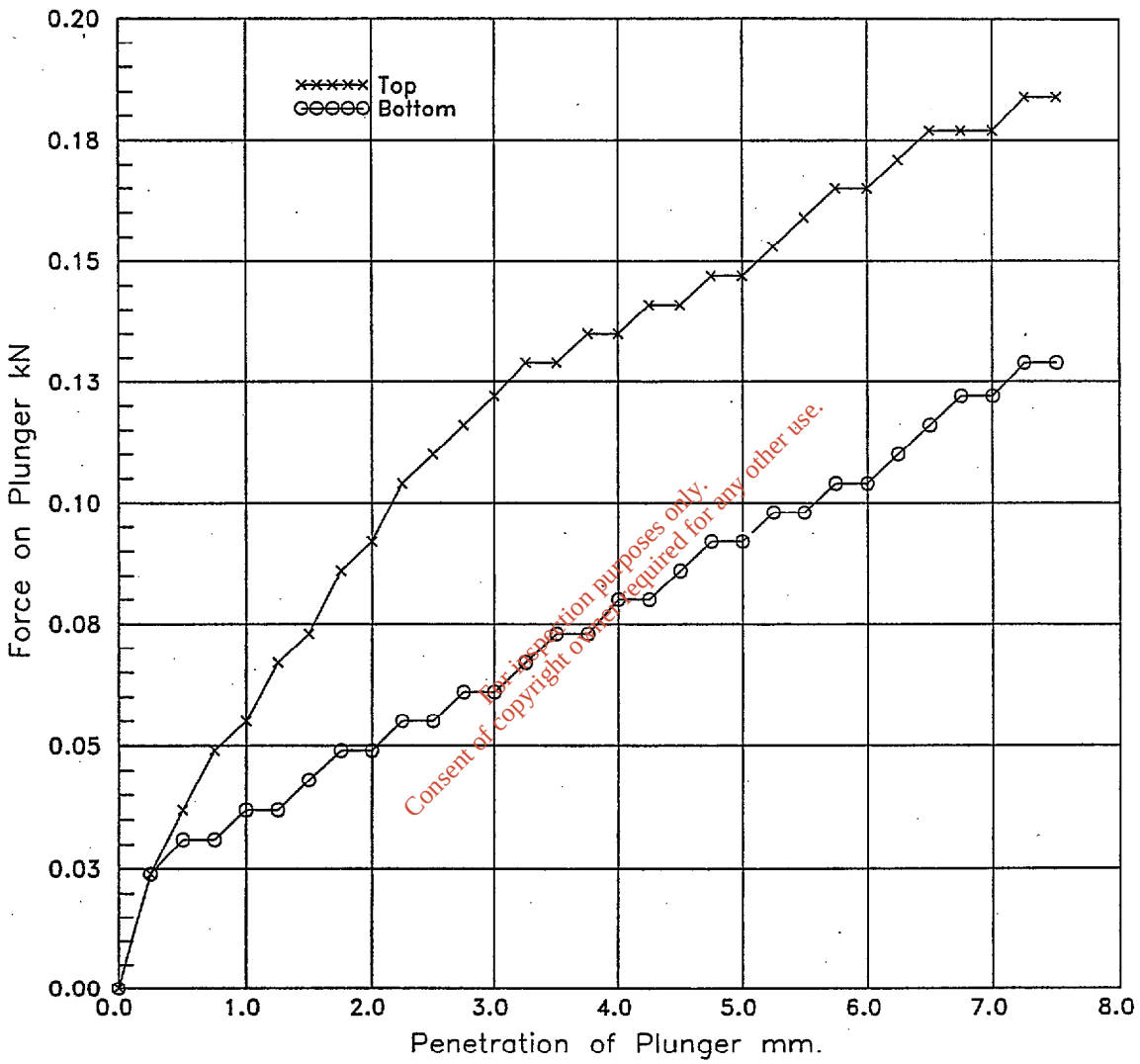
Compaction Method	2.5kg	Rammer	Final	w%	CBR%
Preparation	7.2.4		TOP	22	0.70
Surcharge	5.0	kg	BASE	23	0.76
Soaking Time		days	AVERAGE		0.73
Swelling		mm			
Initial Bulk Density	2.11	Mg/m^3	Description		
Initial Dry Density	1.72	Mg/m^3	Brown SAND with some clay and some gravel		
Initial Moisture Content	23	%			
Material retained on 20mm sieve	25	%			

		Input by fm	Date 20/03/2003	Checked by	Date 31.3.03
FOUNDATION & EXPLORATION SERVICES	Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION			Contract No: E02755	Figure No: LT3/4

CALIFORNIA BEARING RATIO TEST

B.S. 1377: Part 4: 1990: 7.4

Sample Details			
Borehole No: TP18	Sample No: 3	Sample Type: B	Depth: 2.00



17/03/2003 **SUMMARY**

Compaction Method	2.5kg	Rammer	Final	w%	CBR%
Preparation	7.2.4				
Surcharge	5.0	kg	TOP	21	0.83
Soaking Time		days	BASE	20	0.45
Swelling		mm	AVERAGE		
Initial Bulk Density	2.12	Mg/m^3			
Initial Dry Density	1.76	Mg/m^3	Description		
Initial Moisture Content	20	%	Brown SAND with some clay and a little gravel		
Material retained on 20mm sieve	6	%			

		Input by MM	Date 20/03/2003	Checked by	Date 31.3.03
FOUNDATION & EXPLORATION SERVICES	Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION			Contract No: E02755	Figure No: LT3/5

SUMMARY OF ROCK CLASSIFICATION TESTS

Hole	Depth	Sample No.	Rock Classification Tests								
			Water Cont. %	Bulk Dens. Mg/m³	Dry Dens. Mg/m³	Porosity %	Saturation Moisture Content %	Chalk Crushing Value	Retained 10mm sieve %	Slake Durability Index %	Description
BH2	7.65	-	0.29		2.75	1.3				99.5	Grey PSAMMITE
BH3	7.35	-								99.4	
BH3	8.50	-	0.45		2.94	3.0					Grey PSAMMITE
BH6	5.90	-			3.01	0.7					Grey PSAMMITE
BH6	6.46	-								99.6	
BH10	4.15	-								99.5	
BH10	6.15	-			2.70	0.9					Grey PSAMMITE

Input by CM | Date 17/04/2003 | Checked by [illegible] | Date 17/04/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No E02755

Figure No LT8/1

110/01

UNIAXIAL COMPRESSIVE STRENGTH TEST RESULTS

Hole	Type	Depth	Sample No.	UCS Tests										
				Length (mm)	Diameter (mm)	Moisture Content (%)	Mass (g)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Load at Failure (kN)	Load Rate (MPa/min)	UCS (Corrected) (MPa)	Mode of Failure	Remarks
BH2	C	9.45	-	202.13	89.50	0.28	3484.95	2.74	2.73	153.70	3.817	24.43		Grey PSAMMITE, moderately strong Machine: Wykeham Farrance
BH3	C	8.95	-	123.21	89.48	0.24	2332.01	3.01	3.00	201.10	5.420	31.98 (30.33)		Grey PSAMMITE, moderately strong Machine: Wykeham Farrance
BH6	C	5.90	-	204.59	89.35	0.10	3865.39	3.01	3.01	350.70	8.028	55.93		Grey PSAMMITE, strong Machine: Wykeham Farrance
BH10	C	4.15	-	194.01	89.26	0.52	3384.10	2.79	2.77	301.60	8.193	48.20		Grey PSAMMITE, moderately strong Machine: Wykeham Farrance
														
														
														
														
														
														

Input by	Date	Checked by	Date
	08/04/2003		08/04/2003

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

Figure No: LT8/3

109/01

POINT LOAD TEST RESULTS

Hole	Depth	Sample No.	Point Load Results									Description
			Test Type	Moisture Condit^{n} & Direction	Length/ Width (mm)	Platen Sep^{n} at Failure	Load P (kN)	De^2 / De (mm)	Point Load I_s	Correct^{n} Factor F	Point Load I_s50 (MPa)	
BH2	7.65	-	D	AR PL	110	92	8.05	8464 92	0.95	1.32	1.25	Grey PSAMMITE
			A	AR PD	89	43	16.33	4900 70	3.35	1.16	3.89	
BH2	9.45	-	D	AR PL	142	92	9.37	8464 92	1.11	1.32	1.46	Grey PSAMMITE
BH3	7.35	-	D	AR PL	200	91	10.19	8281 91	1.23	1.31	1.61	Grey PSAMMITE
BH3	8.50	-	D	AR PL	120	91	12.24	8281 91	1.48	1.31	1.94	Grey PSAMMITE
BH3	10.70	-	A	AR PD	90	71	51.13	8100 90	6.28	1.30	8.20	Grey PSAMMITE
BH6	5.90	-	D	AR PL	260	91	50.00	8281 91	6.04	1.31	7.91	Grey PSAMMITE
			A	AR PD	89	46	48.06	5184 72	9.22	1.18	10.88	
BH6	6.60	-	D	AR PL	100	90	50.00	8100 90	6.17	1.30	8.04	Grey PSAMMITE
			A	AR PD	89	74	36.78	8464 92	4.39	1.31	5.76	
BH10	4.15	-	A	AR PD	89	59	14.71	6724 82	2.20	1.25	2.75	Grey PSAMMITE
			D	AR PL	125	91	18.38	8281 91	2.22	1.31	2.91	

Key

Type of Test: D - diametral, A - axial, I - irregular lump
Moisture Condition: A - air dried, S - saturated, AR - as received
Direction: PL - parallel, PD - perpendicular, R - random

		Input by	Date	Checked by	Date		
			08/04/2003		08/04/2003		

FOUNDATION & EXPLORATION SERVICES

Project: MEENABOLL LANDFILL, CO. DONEGAL GROUND INVESTIGATION

Contract No: E02755

Figure No: LT8/4

112/01

LABORATORY TEST CERTIFICATE
GLASGOW MATERIALS LABORATORY

1 Queenslie Court
Summerlee Street
Queenslie
Glasgow
G33 4DB
Tel :0141 774 8828
Fax :0141 774 6112
www.fugro.co.uk

Certificate No **32812 - 01A**

To : **Mr C. Latermer**

Client : **FES Ireland**

Dear Sirs,

SOUNDNESS – MAGNESIUM SULPHATE – BS 812 : PART 121 : 1989

Introduction

We refer to a core sample delivered to our Glasgow laboratory on April 2003.

Material & Source

Sampling	:	Sampled by Client
Sampling Certificate	:	Held by Client
Sample Reference	:	BH 10 @ 4.15 - 4.62
Material	:	Crushed Rock
Designation	:	Crushed Rock
Date Sampled	:	Unknown
Date Tested	:	21st April 2003 Onwards
Source	:	Unknown

Test Results;

MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 1	**83%**
MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 2	**85%**
MAGNESIUM SULPHATE SOUNDNESS VALUE	**84%**

Approved for Issue

Date 09/05/03

Approved Signatory

☐ R J Mooney
Laboratory Manager

☑ C Ferrie
Laboratory Supervisor

LABORATORY TEST CERTIFICATE
GLASGOW MATERIALS LABORATORY

1 Queenslie Court
Summerlee Street
Queenslie
Glasgow
G33 4DB
Tel :0141 774 8828
Fax :0141 774 6112
www.fugro.co.uk

Certificate No **32812 - 01B**

To : **Mr C. Latermer**

Client : **FES Ireland**

Dear Sirs,

SOUNDNESS – MAGNESIUM SULPHATE – BS 812 : PART 121 : 1989

Introduction

We refer to a core sample delivered to our Glasgow laboratory on April 2003.

Material & Source

Sampling	:	Sampled by Client
Sampling Certificate	:	Held by Client
Sample Reference	:	BH 6 @ 6.60 - 6.70
Material	:	Crushed Rock
Designation	:	Crushed Rock
Date Sampled	:	Unknown
Date Tested	:	21st April 2003 Onwards
Source	:	Unknown

Test Results;

MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 1	**90%**
MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 2	**91%**
MAGNESIUM SULPHATE SOUNDNESS VALUE	**91%**

Approved for Issue

Date 09/05/03

Approved Signatory

☐ R J Mooney
Laboratory Manager

☐ C Ferrie
Laboratory Supervisor

LABORATORY TEST CERTIFICATE
GLASGOW MATERIALS LABORATORY

1 Queenslie Court
Summerlee Street
Queenslie
Glasgow
G33 4DB
Tel :0141 774 8828
Fax :0141 774 6112
www.fugro.co.uk

Certificate No 32812 - 01C

To : Mr C. Latermer

Client : FES Ireland

Dear Sirs,

SOUNDNESS – MAGNESIUM SULPHATE – BS 812 : PART 121 : 1989

Introduction

We refer to a core sample delivered to our Glasgow laboratory on April 2003.

Material & Source

Sampling	:	Sampled by Client
Sampling Certificate	:	Held by Client
Sample Reference	:	BH 2 @ 7.65 - 8.10
Material	:	Crushed Rock
Designation	:	Crushed Rock
Date Sampled	:	Unknown
Date Tested	:	21st April 2003 Onwards
Source	:	Unknown

Test Results;

MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 1	**74%**
MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 2	**71%**
MAGNESIUM SULPHATE SOUNDNESS VALUE	**73%**

Approved for Issue

Date 09/05/03

Approved Signatory

☐ R J Mooney
Laboratory Manager

☑ C Ferrie
Laboratory Supervisor

LABORATORY TEST CERTIFICATE
GLASGOW MATERIALS LABORATORY

1 Queenslie Court
Summerlee Street
Queenslie
Glasgow
G33 4DB
Tel :0141 774 8828
Fax :0141 774 6112
www.fugro.co.uk

Certificate No 32812 - 01D

To : Mr C. Latermer

Client : FES Ireland

Dear Sirs,

SOUNDNESS – MAGNESIUM SULPHATE – BS 812 : PART 121 : 1989

Introduction

We refer to a core sample delivered to our Glasgow laboratory on April 2003.

Material & Source

Sampling	:	Sampled by Client
Sampling Certificate	:	Held by Client
Sample Reference	:	BH 3 @ 7.55
Material	:	Crushed Rock
Designation	:	Crushed Rock
Date Sampled	:	Unknown
Date Tested	:	21st April 2003 Onwards
Source	:	Unknown

Test Results;

MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 1	**65%**
MAGNESIUM SULPHATE SOUNDNESS VALUE OF SAMPLE 2	**64%**
MAGNESIUM SULPHATE SOUNDNESS VALUE	**65%**

Approved for Issue

Date 09/05/03

Approved Signatory

☐ R J Mooney
Laboratory Manager

☑ C Ferrie
Laboratory Supervisor

LABORATORY TEST CERTIFICATE
GLASGOW MATERIALS LABORATORY

1 Queenslie Court
Summerlee Street
Queenslie
Glasgow
G33 4DB
Tel :0141 774 8828
Fax :0141 774 6112
www.fugro.co.uk

Certificate No 32812 - 01E

To : Mr C. Latermer

Client : FES Ireland

Dear Sirs,

LABORATORY TESTING OF ROCK

Introduction

We refer to a core sample delivered to our Glasgow laboratory on April 2003.

Material & Source

Sampling	:	Sampled by Client
Sample Reference	:	See Report Plates
Description	:	See Attached
Date Sampled	:	Unknown
Date Tested	:	21st April 2003 Onwards
Source	:	Unknown

Test Results;

As Detailed On Page 2 to Page 6 Inclusive

Comments;

Approved for Issue

Date 09/05/03

Approved Signatory

☐ R J Mooney
Laboratory Manager

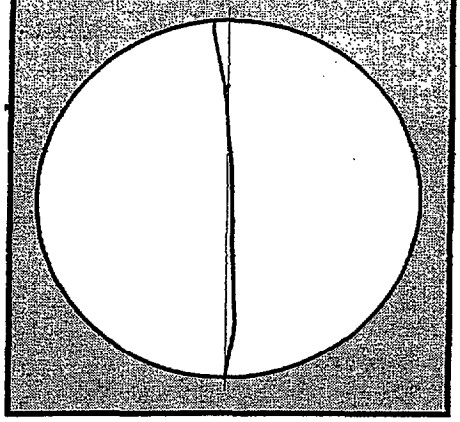
☑ C Ferrie
Laboratory Supervisor

FES IRELAND,
ROCK TESTING

Date:25/04/03
Drawn by: TM

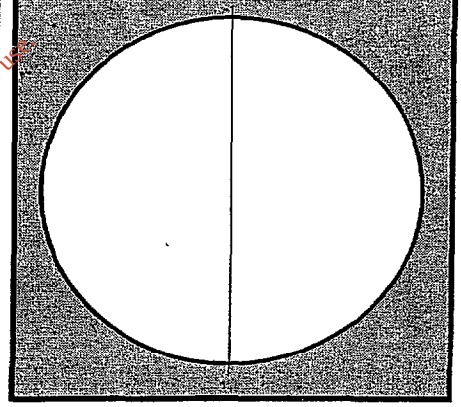
BOREHOLE		2
CORE RUN		N/A
DEPTH		9.71
SAMPLE DIAMETER	mm	89.50
SAMPLE HEIGHT	mm	52.00
WATER CONTENT	%	0.3
DEGREE OF SATURATION	%	N/A
STRESS RATE	kN/s	1.5
TEST DURATION	min	2.57
DATE OF TESTING		24-Apr-03
LOAD FRAME USED		ADR
ORIENTATION OF LOADING		Diam
TENSILE STRENGTH	MPa	7.46

SAMPLE FAILURE SHAPE



BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE

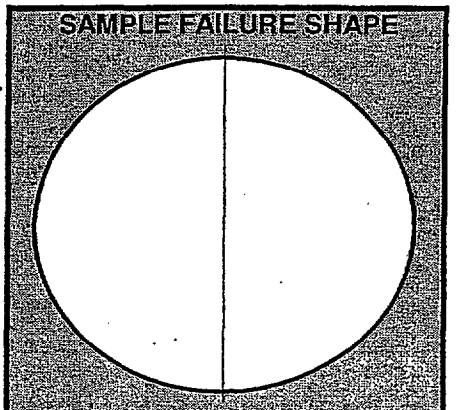


Template Issue: 1
Filename:_209P.XLS

Date: 6/5/03
Date : 6/5/03
Checked by:
Approved by :

BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE



Tested in accordance with ISRM Suggested Methods

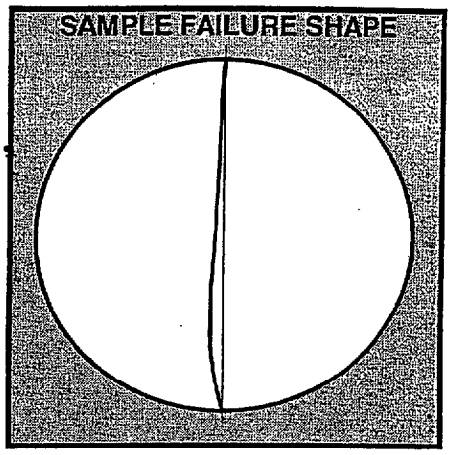
SUMMARY OF INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

FES IRELAND,
ROCK TESTING

Date:25/04/03
Drawn by: TM

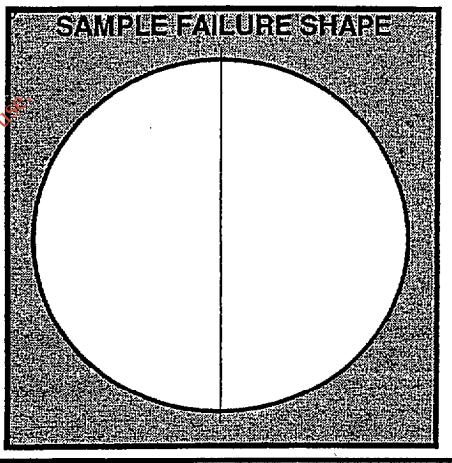
BOREHOLE		3
CORE RUN		N/A
DEPTH		10.40
SAMPLE DIAMETER	mm	89.74
SAMPLE HEIGHT	mm	42.82
WATER CONTENT	%	0.6
DEGREE OF SATURATION	%	N/A
STRESS RATE	kN/s	1.5
TEST DURATION	min	3.05
DATE OF TESTING		24-Apr-03
LOAD FRAME USED		ADR
ORIENTATION OF LOADING		Diam
TENSILE STRENGTH	MPa	10.63

SAMPLE FAILURE SHAPE



BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE



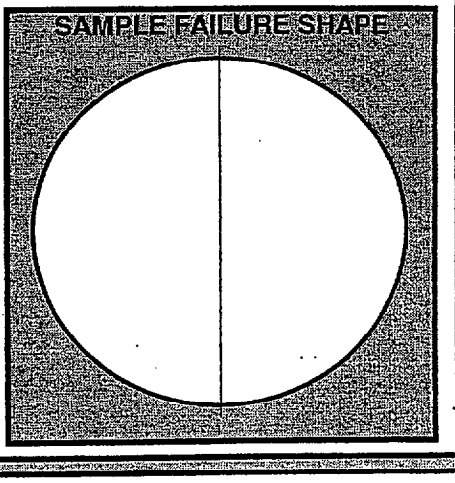
Template Issue: 1
Filename:_209P.XLS

Date: 25/4/03
Date : 25/4/03

Checked by:
Approved by :

BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE



Tested in accordance with ISRM Suggested Methods

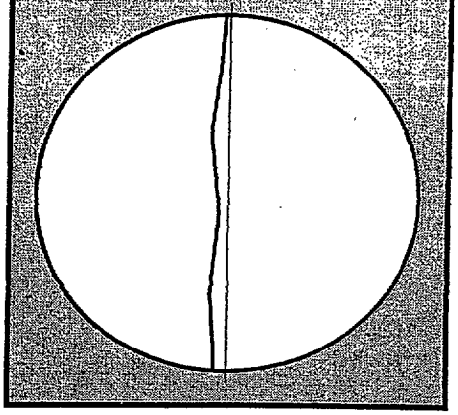
SUMMARY OF INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

FES IRELAND,
ROCK TESTING

Date:25/04/03
Drawn by: TM
Template Issue: 1
Filename:_209P.XLS
Date: 16/4/03
Checked by:
Date: 09/5/03
Approved by:

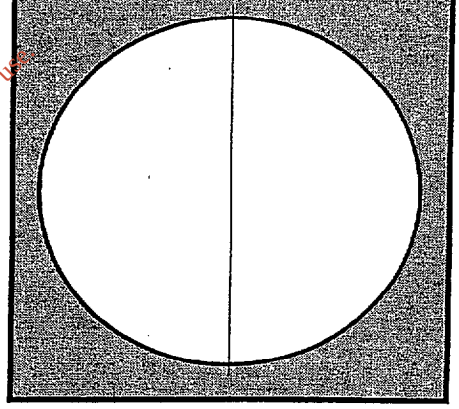
BOREHOLE		6
CORE RUN		N/A
DEPTH		6.12
SAMPLE DIAMETER	mm	89.52
SAMPLE HEIGHT	mm	56.10
WATER CONTENT	%	0.7
DEGREE OF SATURATION	%	N/A
STRESS RATE	kN/s	1.5
TEST DURATION	min	3.01
DATE OF TESTING		24-Apr-03
LOAD FRAME USED		ADR
ORIENTATION OF LOADING		Diam
TENSILE STRENGTH	MPa	18.38

SAMPLE FAILURE SHAPE



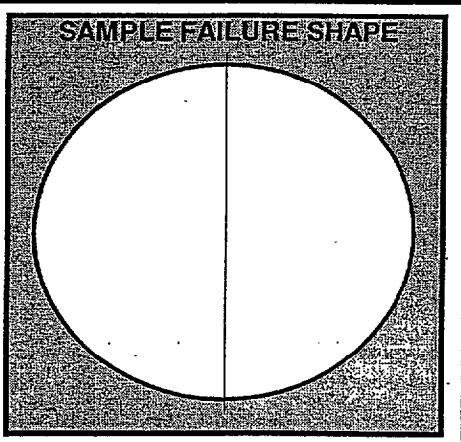
BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE



BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE



Tested in accordance with ISRM Suggested Methods

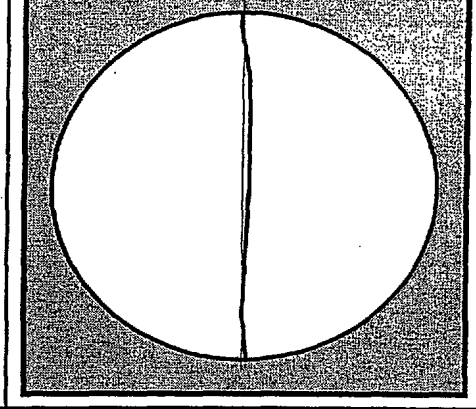
SUMMARY OF INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

FES IRELAND,
ROCK TESTING

Date:25/04/03
Drawn by: TM
Template Issue: 1
Filename:_209P.XLS
Date:
Date :
Checked by:
Approved by :

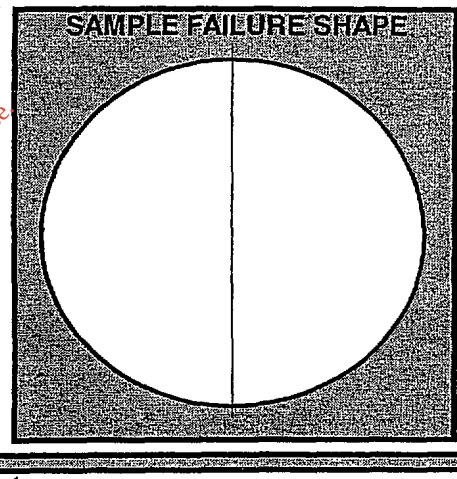
BOREHOLE		10
CORE RUN		N/A
DEPTH		7.60
SAMPLE DIAMETER	mm	89.36
SAMPLE HEIGHT	mm	40.82
WATER CONTENT	%	0.4
DEGREE OF SATURATION	%	N/A
STRESS RATE	kN/s	1.5
TEST DURATION	min	2.58
DATE OF TESTING		24-Apr-03
LOAD FRAME USED		ADR
ORIENTATION OF LOADING		Diam
TENSILE STRENGTH	MPa	7.43

SAMPLE FAILURE SHAPE



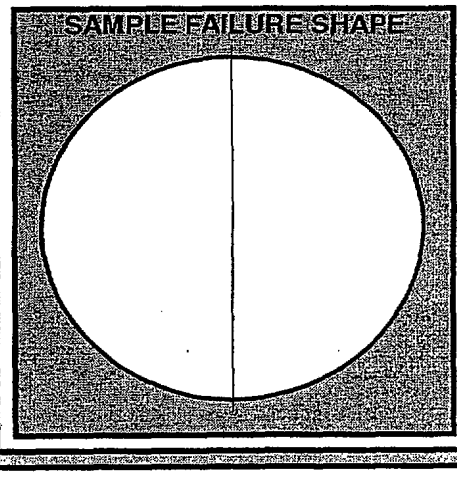
BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE



BOREHOLE		
CORE RUN		
DEPTH		
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
WATER CONTENT	%	
DEGREE OF SATURATION	%	
STRESS RATE	kN/s	
TEST DURATION	min	
DATE OF TESTING		
LOAD FRAME USED		
ORIENTATION OF LOADING		
TENSILE STRENGTH	MPa	

SAMPLE FAILURE SHAPE



Tested in accordance with ISRM Suggested Methods

SUMMARY OF INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Drawn by: TM Date: 24/04/03

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	BULK DENSITY (Mg/m^3)	DRY DENSITY (Mg/m^3)
2	N/A	9.71	0.3	2.63	2.62
3	N/A	10.40	0.6	2.73	2.71
6	N/A	6.12	0.7	2.76	2.74
10	N/A	7.60	0.4	2.68	2.67

Tested in accordance with "ISRM Suggested Methods"

Checked by : Date: 01/05/03 Template Issue: 1

Approved by : Date : 1/5/03 Filename:_01a.XLS

SUMMARY OF MOISTURE CONTENT AND DENSITY TEST RESULTS

LABORATORY TEST CERTIFICATE
GLASGOW MATERIALS LABORATORY

1 Queenslie Court
Summerlee Street
Queenslie
Glasgow
G33 4DB
Tel :0141 774 8828
Fax :0141 774 6112
www.fugro.co.uk

Certificate No **32812 - 02**

To : **Mr C. Latermer**

Client : **FES Ireland**
6 Kilbelin
New Bridge
Co. Kildair

Dear Sirs,

LABORATORY TESTING OF SOIL

Introduction

We refer to soil samples delivered to our Glasgow laboratory on 24th Aprill 2003.

Material & Source

Sampling	:	Sampled by Client
Sample Reference	:	See Report Plates
Description	:	See Attached
Date Sampled	:	Unknown
Date Tested	:	15th May 2003 Onwards
Source	:	N4 / N6 Cappagh Hill

Test Results;

As Detailed On Page 2 to Page 3 Inclusive

Comments;

Approved for Issue

Date 22/05/03

Approved Signatory

☑ R J Mooney
Technical Services Manager

☐ C Ferrie
Laboratory Supervisor

BOREHOLE	SAMPLE	DEPTH	METHYLENE BLUE VALUE (g/kg)
RC1	EDDL	6.6	4.2
RC4	N/A	10.0	4.0
RC7	N/A	5.0	6.2

Filename: _001P.XLS

Date: 22/03/13

Approved by:

Tested in accordance with BS EN 933 : Part 9 : 1999

SUMMARY OF METHYLENE BLUE VALUE TEST RESULTS

SEVERN TRENT

CAS

CITY ANALYTICAL SERVICES LTD

25 April 2003

Mr J Ashworth
Foundation & Exploration Services (Consett)
Armstrong House
Unit 43 No 1 Industrial Est
Medomsley Road
Consett
County Durham
DH8 6TW

Test Report : FES /75604

Dear Mr Ashworth

Please find enclosed the results of the analysis carried out on the samples submitted from Meenaboll Landfill on Friday 11 April 2003.

I trust you will find these satisfactory but should you have any queries please contact me.

Yours sincerely

K Burrell
AUTHORISED SIGNATORY

INVESTOR IN PEOPLE

Business of the Year Winner 2001

Unless otherwise stated, CAS Ltd was not responsible for sampling. Information about methods and performance characteristics of the determinations are available on request. Unless otherwise agreed, as received soils will be disposed of after 30 days; dried soils after 30 days and waters/leachates after 10 days from the issue of the final report. Soil analysis is carried out on air-dried and ground test portions of the sample. Determinations marked $ were subcontracted.

AGS

SEVERN TRENT STL
Environmental Leadership

A part of Severn Trent Laboratories Limited.
Registered in England 2050581

City Analytical Services Limited
Rayner House, 80 Lockhurst Lane, Coventry CV6 5PZ
Tel +44 (0)24 7658 4800 Fax +44 (0)24 7658 4848 • *info@cityanalytical.co.uk*

Soil Analysis

FES /75604
Meenaboll Landfill
Your Reference:- E02755
Your Order:- C60784

CAS Number:			360455	360456	360457	360458
Sample Ref			BH2	BH10	BH6	BH3
Detname	Method	Units	7.65m	4.15m	6.46m	7.55m
Calcium (Total)*	CASQ	mg/kg	2000	36000	19000	5800
Cation Exchange Capacity*		me/100g	< 10	11	< 10	< 10
Moisture @ 30°C*	33A	%	< 0.10	0.97	0.20	1.5
Stones %*		%	100	100	100	100

Key
N/S - Not Scheduled
I/S - Insufficient Sample

STL
A part of Severn Trent Laboratories Limited.
Registered in England 2050581

City Analytical Services Limited
Rayner House, 80 Lockhurst Lane, Coventry CV6 5PZ
Tel +44 (0)24 7658 4800 Fax +44 (0)24 7658 4848 • info@cityanalytical.co.uk

Soil Analysis

FES /74332
Meenaboll Landfill
Your Reference:- E02755
Your Order:- C60634

CAS Number:			350654	350655	350656	350657	350658	350659	350660	350661	350662	350663
Sample Ref			TP9/3	TP9/5	TP15/3	TP15/5	TP16/3	TP16/5	TP17/3	TP18/3	TP18/4	TP18/5
Detname	**Method**	**Units**	**0.80m**	**3.00m**	**0.90m**	**3.00m**	**0.50m**	**2.50m**	**0.60m**	**2.00m**	**2.00m**	**3.00m**
Cation Exchange Capacity*		me/100g	28	N/S	39	N/S	18	N/S	< 10	27	N/S	N/S
Carbonate as CO2*	10	%	N/S	N/S	< 0.10	N/S	< 0.10	N/S	N/S	N/S	N/S	N/S
Moisture @ 30°C*	33A	%	18	17	16	14	11	19	16	16	36	13
Organic Matter*	36	%	N/S	1.1	0.90	N/S	0.40	N/S	N/S	N/S	3.0	0.50
Sulphate (Total) as SO3	45	%	N/S	< 0.01	N/S	< 0.01	N/S	< 0.01	N/S	N/S	N/S	N/S
pH	39	pH units	N/S	5.5	N/S	5.6	N/S	5.8	N/S	N/S	N/S	N/S
Stones %*		%	7.1	15	9.3	38	23	15	22	21	13	25

Key
N/S - Not Scheduled
I/S - Insufficient Sample

Soil Analysis

FES /74332
Meenaboll Landfill
Your Reference:- E02755
Your Order:- C60634

CAS Number:			350654	350655	350656	350657	350658	350659	350660	350661	350662	350663
Sample Ref			TP9/3	TP9/5	TP15/3	TP15/5	TP16/3	TP16/5	TP17/3	TP18/3	TP18/4	TP18/5
Detname	**Method**	**Units**	**0.80m**	**3.00m**	**0.90m**	**3.00m**	**0.50m**	**2.50m**	**0.60m**	**2.00m**	**2.00m**	**3.00m**
Cation Exchange Capacity*		me/100g	28	N/S	39	N/S	18	N/S	< 10	27	N/S	N/S
Carbonate as CO2*	10	%	N/S	N/S	< 0.10	N/S	< 0.10	N/S	N/S	N/S	N/S	N/S
Moisture @ 30°C*	33A	%	18	17	16	14	11	19	16	16	36	13
Organic Matter*	36	%	N/S	1.1	0.90	N/S	0.40	N/S	N/S	N/S	3.0	0.50
Sulphate (Total) as SO3	45	%	N/S	< 0.01	N/S	< 0.01	N/S	< 0.01	N/S	N/S	N/S	N/S
pH	39	pH units	N/S	5.5	N/S	5.6	N/S	5.8	N/S	N/S	N/S	N/S
Stones %*		%	7.1	15	9.3	38	23	15	22	21	13	25

Key
N/S - Not Scheduled
I/S - Insufficient Sample