

APPENDIX 5D

GROUND INVESTIGATION AT PROPOSED LANDFILL SITES

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**Ground Investigation
IGSL Contract No. 8969
Roadstone, Blessington, Co. Wicklow
On Behalf Of
John Barnett & Associates
Consulting Engineers**

Factual Report

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FOREWORD

Notes on Site Investigation Procedure

The following notes should be read in conjunction with the report. Any modifications to the procedures outlined below are indicated in the main text.

GENERAL

The recommendations made and opinions expressed in the Report are based on the "Boring Records, an examination of samples and results of the site and laboratory tests. No responsibility can be held for conditions which have not been revealed by the boreholes, for example, between borehole positions. Whilst the report may express an opinion on a possible configuration of strata both between borehole positions and below the maximum depth of the investigation, this is for guidance only and no liability can be accepted for its accuracy.

BORING TECHNIQUE

Unless otherwise stated the 'Shell and Auger' technique of soft ground boring has been employed. Whilst this technique allows the maximum data to be obtained on strata conditions, a degree of mixing of some layered soils, (e.g. thin layers of coarse and fine granular material) is inevitable. Specific attention is drawn to this factor where evidence of such a condition is available.

GROUND WATER

The ground water conditions entered on the Boring Records are those appertaining at the time of the investigation. The normal rate of boring does not usually permit the recording of an equilibrium water level for any one water strike. Moreover, ground water levels are subject to variations caused by seasonal effects or changes in local drainage conditions. The table of each Boring Record shows the ground water level at the quoted borehole and casing depths, usually at the start of the day's work. The word "none" indicates that ground water was sealed off by the borehole casing.

GAS MONITORING

Unless otherwise stated gas monitoring is carried out using a GA2000 infra red gas detector. The gases monitored for and levels noted are recorded and plotted on the relevant test data sheets. Unless stated otherwise no monitoring is carried out for gas pressure or to calculate gas flow rates.

ROUTINE SAMPLING

Undisturbed samples of predominantly cohesive soils are obtained in a 102mm diameter open-drive sampler, complying with the requirements of the British Standard Code of Practice B.S. 5930. Large disturbed samples of granular soils, or of soils in which undisturbed sampling is not possible or appropriate, are taken from the boring tools and sealed into polythene bags. Small disturbed samples are taken at frequent intervals and sealed into 0.5 kg glass jars or polythene bags for subsequent visual classification. Where encountered in sufficient quantity, samples of groundwater are taken.

Unless otherwise stated in the main text, disturbed soil samples may not be at their natural water content.

**REPORT ON A GROUND INVESTIGATION
AT
ROADSTONE QUARRIES, GLENDING, CO. WICKLOW
ON BEHALF OF
JOHN BARNETT & ASSOCIATES
CONSULTING ENGINEERS**

REPORT NO. 8969

OCTOBER 2003

INTRODUCTION

The site is located in the Roadstone Quarry at Glending, Blessington, Co. Wicklow.

An investigation of sub-soil conditions was ordered by the projects consulting engineers, John Barnett & Associates (JBA) , on behalf of their clients, Roadstone Limited.

As part of an ongoing site investigation IGSL were requested to remobilise to site and carry out additional boreholes and testing at locations specified by the projects engineers. Previous investigative works were carried out by IGSL in May 2003 and reported on in IGSL report no. 8669.

This programme of the investigation included,

- ✓ The construction of two exploratory boreholes to establish stratification. During the course of boring in-situ tests were performed at regular intervals and representative soil samples were recovered for visual examination and laboratory analysis.
- ✓ The excavation of four trial pits using a hydraulic excavator. All pits were logged and sampled by an IGSL engineer and a representative of JBA.
- ✓ The installation of combined gas and groundwater monitoring standpipes at selected borehole locations.
- ✓ The carrying out in situ tests at both locations including variable head permeability tests and in situ gas monitoring.
- ✓ The carrying out of laboratory soils testing (Geotechnical) as specified by the projects engineers.

This report deals with the factual findings of the ground investigation works.

II. FIELDWORK

The site is referred to as the Roadstone Glending site. The locations of all of the investigation points were marked on site by a representative of the projects engineers and are not included in this report.

The methods utilised during the course of the field investigations are outlined in the following sections.

Cable Tool Boreholes.

Conventional cable tool techniques (shell and auger) were employed at two locations across the site . All field work was carried out in accordance with BS5930.

Sampling and in - situ testing were performed to BS1377. Disturbed and undisturbed soil samples were taken at regular intervals or at changes in stratification while standard penetration tests (SPT's) were also carried out to establish relative in - situ soil strength.

Full details of stratification, testing, sampling, comments on groundwater and notes on any obstructions to normal boring encountered are given in the detailed borehole records enclosed in Appendix I to this report. It should be noted that the ground conditions necessitated the use of a considerable amount of hard strata boring and in places required the casing diameters to be increased from 200mm to 250mm.

Groundwater standpipes were installed in selected boreholes. Standpipes were installed to the specifications of the projects engineers. Where standpipes were not installed the boreholes were grouted with a cement bentonite based grout material. Variable head permeability tests were carried out in the standpipes and are reported on in Appendix III to this report.

At each location the borehole equipment was steam cleaned prior to drilling commencing. This was carried out to ensure that no cross contamination occurred between borehole positions.

III. TESTING

During the course of the investigation samples of the sub soils were taken from the boreholes and were returned to IGSL's laboratory where a programme of testing was scheduled by the projects engineers, John Barnett & Associates.

Geotechnical Testing – Soils

All of the geotechnical test data is included in Appendix IV to this report.

Tests carried out included

- ✓ Moisture Content Tests
- ✓ Atterburg Limits (Classification tests)
- ✓ Particle Size Distribution Tests (Wet Sieve)
- ✓ Sedimentation Analysis (by Hydrometer).
- ✓ Organic Content Tests
- ✓ PH and Sulphate Tests
- ✓ CBR Analysis

In Situ Tests

1. Standard Penetration Tests

The relative in-situ strength of the sub-soils was established at intervals by cone penetration test.

A solid conical point is hammered into the soil and the blow count for 300mm of penetration is recorded in four 75mm increments. Results are presented in the right - hand column of the boring and records.

SPT tests were carried out at intervals specified by JBA.

APPENDIX I
CABLE TOOL BOREHOLE

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REPORT NO: 8969 **GEOTECHNICAL BORING RECORD** **IGSL**

CONTRACT : Roadstone Wicklow BOREHOLE NO: BHL1
 Sheet 1 of 3

CLIENT : Roadstone GROUND LEVEL (mOD) - DATE STARTED: 01/08/2003
 ENGINEER : John Barrett & Associates BOREHOLE DIAMETER (mm) 200 DATE COMPLETED: 08/08/2003

CO-ORDINATES : E - BOREHOLE DEPTH (m) 25.00 BORED BY: M.Collins
 N - CASING DEPTH (m) 25.00

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES			FIELD TEST RESULTS	STAND PIPE DETAILS
					REF. NUMBER	SAMPLE TYPE	DEPTH (m)		
0	TOPSOIL			0.20					
0.20 - 5.50	Firm brown sandy gravelly CLAY with cobbles and boulders				8845	B	1.00	N=22	
					8846	B	3.00		
					8847	D	4.00	N=15	
					8848	B	5.00		
5.50 - 6.30	Very dense brown gray fine to coarse sandy GRAVEL with boulders			5.50					
					8849	B	7.00	N=83	
					8850	D	8.00		
					8851	B	9.00		
10	Continued next sheet							N=69/ 225mm	

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Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
6.30	6.50	1.00	
10.40	10.70	1.00	
11.60	11.80	1.00	
16.30	16.60	1.00	
23.00	23.50	2.00	

Water Strike Details

Water Strike	Casing Depth	Sealed At	Rise To	Time	Comments
21.50	21.50	-	20.00	20	
22.50	22.50	-	20.00	20	

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type
08/08/2003	25.00	21.00	25.00	SP

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments
08/08/2003	25.00	25.00	22.50	

Remarks: Borehole blowing from 22.5-25.0m

REPORT NO: 8969		GEOTECHNICAL BORING RECORD		IGSL	
CONTRACT : Roadstone Wicklow			BOREHOLE NO: BHL1 Sheet 2 of 3		
CLIENT : Roadstone		GROUND LEVEL (mOD) -		DATE STARTED: 01/08/2003	
ENGINEER : John Barrett & Associates		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED: 08/08/2003	
CO-ORDINATES : E - N -		BOREHOLE DEPTH (m) 25.00		BORED BY: M.Collins	
		CASING DEPTH (m) 25.00			

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES			FIELD TEST RESULTS	STAND PIPE DETAILS
					REF. NUMBER	SAMPLE TYPE	DEPTH (m)		
0	Very dense brown grey fine to coarse sandy GRAVEL with boulders								
11					8852	B	11.00		
12					8853	D	12.00		
13					8854	B	13.00	N=40/ 225mm	
15	Dense brown fine to coarse silty SAND			15.00	8855	B	15.00		
16.30	16.30						N=39/ 225mm		
17	Very dense brown grey fine to coarse sandy GRAVEL with boulders				8856	B	17.00		
19					8857	B	19.00	N=66	
20	Continued next sheet				8858	B	20.00		

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Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
6.30	6.50	1.00	
10.40	10.70	1.00	
11.60	11.80	1.00	
16.30	16.60	1.00	
23.00	23.50	2.00	

Water Strike Details

Water Strike	Casing Depth	Sealed At	Rise To	Time	Comments
21.50	21.50	-	20.00	20	
22.50	22.50	-	20.00	20	

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments
08/08/2003	25.00	25.00	22.50	

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type
08/08/2003	25.00	21.00	25.00	SP

Remarks: Borehole blowing from 22.5-25.0m

REPORT NO: 8969		GEOTECHNICAL BORING RECORD		IGSL	
CONTRACT : Roadstone Wicklow			BOREHOLE NO: BHL1 Sheet 3 of 3		
CLIENT : Roadstone ENGINEER : John Barrett & Associates		GROUND LEVEL (mOD) -		DATE STARTED: 01/08/2003 DATE COMPLETED: 08/08/2003	
CO-ORDINATES : E - N -		BOREHOLE DIAMETER (mm) 200		BORED BY: M.Collins	
		BOREHOLE DEPTH (m) 25.00			
		CASING DEPTH (m) 25.00			

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES			FIELD TEST RESULTS	STAND PIPE DETAILS
					REF. NUMBER	SAMPLE TYPE	DEPTH (m)		
0.0	Very dense brown grey fine to coarse sandy GRAVEL with boulders							N=50	
21.50					8859	W	21.50		
22.50					8860	W	22.50		
23.00					8861	B	23.00		
25.00					8862	B	25.00		
25.00	End of Borehole at 25.00 m						N=51		

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From (m)	To (m)	Hours	Comments
6.30	6.50	1.00	
10.40	10.70	1.00	
11.60	11.80	1.00	
16.30	16.60	1.00	
23.00	23.50	2.00	

Water Strike	Casing Depth	Sealed At	Rise To	Time	Comments
21.50	21.50	-	20.00	20	
22.50	22.50	-	20.00	20	

Date	Tip Depth	RZ Top	RZ Base	Type
08/08/2003	25.00	21.00	25.00	SP

Date	Hole Depth	Casing Depth	Depth to Water	Comments
08/08/2003	25.00	25.00	22.50	

Remarks: Borehole blowing from 22.5-25.0m

REPORT NO: 8969

GEOTECHNICAL BORING RECORD

IGSL

CONTRACT : Roadstone Wicklow

BOREHOLE NO: BHL2
Sheet 1 of 2

CLIENT : Roadstone
ENGINEER : John Barrett & Associates

GROUND LEVEL (mOD) -
BOREHOLE DIAMETER (mm) 250
BOREHOLE DEPTH (m) 20.00
CASING DEPTH (m) 20.00

DATE STARTED: 28/07/2003
DATE COMPLETED: 12/08/2003

CO-ORDINATES : E -
N -

BORED BY: M.Collins

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES			FIELD TEST RESULTS	STAND PIPE DETAILS
					REF. NUMBER	SAMPLE TYPE	DEPTH (m)		
0.00	TOPSOIL			0.10					
0.10	Brown grey fine to coarse sandy GRAVEL				5978	B	1.00		
1.80	Medium Dense grey brown fine to coarse slightly silty SAND			1.80					
3.50					5979	B	3.50		
5.80					5980	B	5.00	N=19	
5.80	Brown SILT/CLAY			5.80	5981	B	6.00	N=21	
6.20	Brown grey fine to coarse sandy GRAVEL with cobbles			6.20					
6.40	Stiff brown sandy gravelly CLAY with occasional cobbles			6.40					
7.00					5982	B	7.00		
8.50								N=31	
8.50	Stiff Brown SILT/CLAY			8.50	5984	U	8.90		
9.00					5983	B	9.00		
9.60	Brown fine to coarse slightly silty SAND			9.60					
10.00	Continued next sheet				5985	B	10.00		

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Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
12.20	14.00	3.50	
14.00	16.00	2.00	
17.00	19.00	2.00	

Water Strike Details

Water Strike	Casing Depth	Sealed At	Rise To	Time	Comments
16.00	16.00	-	11.50	20	

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type
17/08/2003	20.00	16.00	20.00	SP

Remarks:

REPORT NO: 8969 **GEOTECHNICAL BORING RECORD** **IGSL**

CONTRACT : Roadstone Wicklow BOREHOLE NO: BHL2
 Sheet 2 of 2

CLIENT : Roadstone GROUND LEVEL (mOD) - DATE STARTED: 28/07/2003
 ENGINEER : John Barrett & Associates BOREHOLE DIAMETER (mm) 250 DATE COMPLETED: 12/08/2003

CO-ORDINATES : E - BOREHOLE DEPTH (m) 20.00 BORED BY: M.Collins
 N - CASING DEPTH (m) 20.00

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES			FIELD TEST RESULTS	STAND PIPE DETAILS
					REF. NUMBER	SAMPLE TYPE	DEPTH (m)		
10.60	Brown fine to coarse slightly silty SAND	[Pattern]							
11.30	Very Dense brown grey fine to coarse sandy GRAVEL with cobbles and boulders (with bands of clay up to 12m and coarse sand blowing from 17.0m)	[Pattern]		10.60	5986	B	11.30	N=67	
12.30					5987	B	12.30		
15.30					5988	B	15.30	N=75	
17.00					5989	B	17.00	N=70	
19.00					5990	B	19.00	N=74	
20.00	End of Borehole at 20.00 m			20.00					

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Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
12.20	14.00	3.50	
14.00	16.00	2.00	
17.00	19.00	2.00	

Water Strike Details

Water Strike	Casing Depth	Sealed At	Rise To	Time	Comments
16.00	16.00	-	11.50	20	

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type
11/08/2003	20.00	16.00	20.00	SP

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

Remarks:

APPENDIX II
TRIAL PIT RECORDS

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REPORT NO. 8969

TRIAL PIT RECORD

IGSL

CONTRACT: Roadstone Quarry	Trial Pit No.:	TPL1
	Sheet:	Sheet 1 of 2
CLIENT: Roadstone	Excavation Method:	
ENGINEER: John Barnett & Associates	Date Started:	14/08/2003
CO-ORDINATES: E - N -	Date Completed:	14/08/2003
	Ground Level (mOD):	-

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Ref. No.	Type	Depth (m)		
0.0	Stiff to hard medium dense very gravelly SAND containing occasional cobbles		0.60							
1.0	Loose to medium dense light brown/brown fine silty SAND with silt content increasing with depth also containing occasional thin laminations, possible made ground					6879 6880	B	1.00		
2.0						6881	B	2.00		
3.0						6882 6883	B	3.00		
4.0	Continued next sheet					6884	B	4.00		

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Groundwater Conditions: No groundwater was encountered during excavation

Stability: Trial pit remained open during excavation


Remarks: Soil became increasingly damp towards the base of the pit

REPORT NO. 8969

TRIAL PIT RECORD

IGSL

CONTRACT:	Roadstone Quarry	Trial Pit No.:	TPL1
		Sheet:	Sheet 2 of 2
CLIENT:	Roadstone	Excavation Method:	
ENGINEER:	John Barnett & Associates	Date Started:	14/08/2003
CO-ORDINATES:	E - N -	Date Completed:	14/08/2003
		Ground Level (mOD):	-

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (kPa)	Hand Penetrometer (kPa)
						Ref. No.	Type	Depth (m)		
4.0	Loose to medium dense light brown/brown fine silty SAND with silt content increasing with depth also containing occasional thin laminations, possible made ground End of Trial Pit at 4.30 m		4.30							
5.0										
6.0										
7.0										
8.0										

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Groundwater Conditions: No groundwater was encountered during excavation

Stability: Trial pit remained open during excavation

Remarks: Soil became increasingly damp towards the base of the pit

REPORT NO. 8969	TRIAL PIT RECORD	IGSL
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CONTRACT: Roadstone Quarry CLIENT: Roadstone ENGINEER: John Barnett & Associates CO-ORDINATES: E - N -	Trial Pit No.: TPL2 Sheet: Sheet 1 of 1 Excavation Method: Date Started: 14/08/2003 Date Completed: 14/08/2003 Ground Level (mOD): -
--	---

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Ref. No.	Type	Depth (m)		
0.0	Topsoil									
	Loose to medium dense light brown/brown fine silty SAND with silt content increasing with depth also containing occasional thin laminations, possible made ground		0.30							
1.0						6890 6891	B	1.00		
2.0							6892	B	2.00	
3.0					▽	6893 6894	B	3.00		
4.0	End of Trial Pit at 4.00 m		4.00							

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Groundwater Conditions: Groundwater seepage at 3.0m

Stability: Trial pit remained open during excavation

Remarks:

REPORT NO. 8969

TRIAL PIT RECORD

IGSL

CONTRACT: Roadstone Quarry		Trial Pit No.: TPL3
CLIENT: Roadstone		Sheet: Sheet 1 of 2
ENGINEER: John Barnett & Associates		Excavation Method:
CO-ORDINATES: E - N -		Date Started: 14/08/2003
		Date Completed: 14/08/2003
		Ground Level (mOD): -

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Ref. No.	Type	Depth (m)		
0.0	Topsoil									
0.60	Loose to medium dense light brown/brown fine silty SAND with silt content increasing with depth also containing occasional thin laminations, possible made ground		0.60			6873 6877	B	1.00		
2.00					6878	B	2.00			
3.00					6874 6875	B	3.00			
-4.0	Continued next sheet									


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Groundwater Conditions: No groundwater was encountered during excavation

Stability: Trial pit remained open during excavation

Remarks:

CONTRACT: Roadstone Quarry CLIENT: Roadstone ENGINEER: John Barnett & Associates CO-ORDINATES: E - N -	Trial Pit No.: TPL3 Sheet: Sheet 2 of 2 Excavation Method: Date Started: 14/08/2003 Date Completed: 14/08/2003 Ground Level (mOD): -
--	---

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Ref. No.	Type	Depth (m)		
4.0	Loose to medium dense light brown/brown fine silty SAND with silt content increasing with depth also containing occasional thin laminations, possible made ground End of Trial Pit at 4.20 m		4.20			6876	B	4.20		
5.0										
6.0										
7.0										
8.0										

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Groundwater Conditions: No groundwater was encountered during excavation

Stability: Trial pit remained open during excavation

Remarks:

REPORT NO. 8969

TRIAL PIT RECORD

IGSL

CONTRACT: Roadstone Quarry	Trial Pit No.: TPL4
	Sheet: Sheet 1 of 1
CLIENT: Roadstone	Excavation Method:
ENGINEER: John Barnett & Associates	Date Started: 14/08/2003
CO-ORDINATES: E - N -	Date Completed: 14/08/2003
	Ground Level (mOD): -

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (kPa)	Hand Penetrometer (kPa)
						Ref. No.	Type	Depth (m)		
0.0	Topsoil		0.30							
0.30	Loose to medium dense light brown/brown fine silty SAND with silt content increasing with depth also containing occasional thin laminations, possible made ground					6885 6886	B	1.00		
1.0						6887	B	2.00		
2.0							6888 6889	B	3.00	
3.0					▽					
4.0	End of Trial Pit at 4.00 m		4.00							

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Groundwater Conditions: Groundwater seepage at 3.0m

Stability: Trial pit became unstable from 3.0m

Remarks:

**APPENDIX III
IN SITU TEST RESULTS**

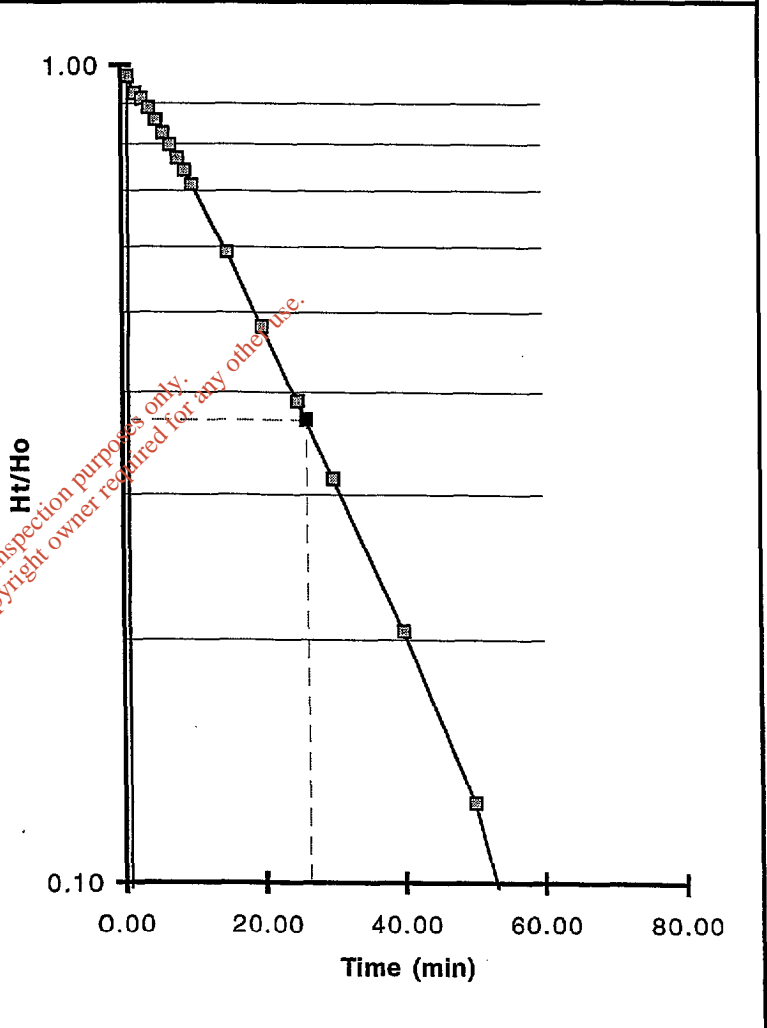
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Variable Head Permeability Test Report Sheet

I.G.S.L.

CONTRACT: Roadstone Wicklow			TEST RESPONSE ZONE DETAILS:		
CLIENT: Roadstone ENGINEER: John Barrett & Associates LOCATION: Blessington County Wicklow HOLE No. BHL1 TEST No. 1.00			Top (mbgl):	21.00	
			Bottom (mbgl):	25.00	
			Length (m):	4.00	
			*** Diameter (m):	0.200	
			Initial Standing Water Level (m below top of casing):	20.00	
	Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho	Height of casing or standpipe : above ground level (m)	
				0.50	
			Falling or Rising Head Test? Falling		

Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho
0.00	4.85	0.00
1	5.30	0.97
2	6.00	0.92
3	6.20	0.91
4	6.55	0.89
5	7.00	0.86
6	7.50	0.83
7	7.90	0.80
8	8.35	0.77
9	8.75	0.74
10	9.20	0.71
15	11.05	0.59
20	12.73	0.48
25	14.10	0.39
30	15.25	0.31
40	16.90	0.20
50	18.10	0.13
60	19.10	0.06
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00



**Diameter of standpipe/borehole (m)	0.2
** X-sectional area of BH/Standpipe	A= 0.03142
Shape Factor (note 5)	F= 7.75124
Time to reach Ht/Ho = 0.37 (sec)	T= 1577
Extrapolated Yes/No	No
Coefficient of Permeability (A/FT) (m/s)	K= 2.57E-06

Notes

- * Depth of water below top of casing/standpipe
- ** 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.
- *** This is normally the diameter of the borehole since the response zone includes the gravel surround

Time lag is taken as the elapsed time corresponding to a value of $H_t/H_o = 0.37$. If H_t/H_o does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Variable Head Permeability Test Report Sheet

I.G.S.L.

CONTRACT: Roadstone Wicklow

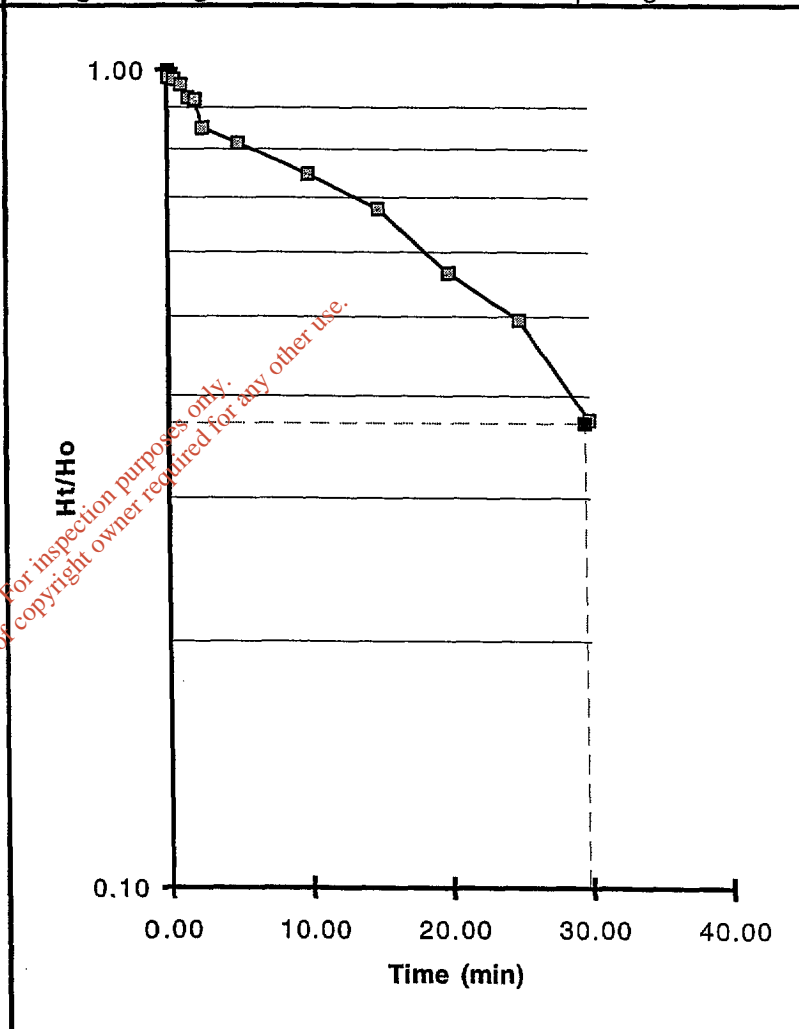
TEST RESPONSE ZONE DETAILS:

CLIENT: Roadstone
 ENGINEER: John Barrett & Associates
 LOCATION: Blessington County Wicklow
 HOLE No. BHL2
 TEST No. 1.00

Top (mbgl):	16.00
Bottom (mbgl):	20.00
Length (m):	4.00
*** Diameter (m):	0.250
Initial Standing Water Level (m below top of casing):	12.50
Height of casing or standpipe : above ground level (m)	1.00
Falling or Rising Head Test?	Falling

Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho
---------------------	---------------------	-------

0.03	2.60	1.00
0.06	2.65	0.99
0.09	2.70	0.99
0.12	2.75	0.98
0.15	2.82	0.98
0.5	2.86	0.97
1	3.00	0.96
1.5	3.35	0.92
2	3.40	0.92
2.5	4.10	0.85
5	4.45	0.81
10	5.10	0.75
15	5.80	0.68
20	6.90	0.57
25	7.60	0.49
30	8.80	0.37
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00



**Diameter of standpipe/borehole (m)		0.25
** X-sectional area of BH/Standpipe	A=	0.04909
Shape Factor (note 5)	F=	8.23939
Time to reach Ht/Ho = 0.37 (sec)	T=	1782
Extrapolated Yes/No		No
Coefficient of Permeability (A/FT) (m/s)	K=	3.34E-06

Notes

- * Depth of water below top of casing/standpipe
- ** 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.
- *** This is normally the diameter of the borehole since the response zone includes the gravel surround. Time lag is taken as the elapsed time corresponding to a value of Ht/Ho = 0.37. If Ht/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

**APPENDIX IV
LABORATORY TEST RECORDS**

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Determination of Moisture Content					
BS1377:Part 2:1990, clauses 3.2					
BH/TP No.	Sample No.	Depth (m)	Sample Type	Moisture Content %	Description
BH L1	8845	1.00	D	9.1	Grey brown slightly sandy slightly gravelly CLAY
BH L1	8846	3.00	D	9.0	Grey brown slightly sandy gravelly CLAY
BH L1	8849	7.00	D	5.5	Grey sandy GRAVEL
BH L1	8851	9.00	D	5.1	Grey sandy GRAVEL
BH L2	8978	1.00	D	14.6	Brown clayey/silty very sandy GRAVEL
BH L2	8979	3.50	D	24.0	Brown very silty SAND
BH L2	5981	6.00	D	23.8	Brown slightly sandy slightly gravelly CLAY
BH L2	5983	8.90	D	19.5	Brown slightly sandy gravelly CLAY
IGSL	Contract ROADSTONE WICKLOW				Contract No. 8969
	Compiled By		Date		Page
	D CONNOLLY		08/10/03		of

Summary of Classification Tests

BS1377:Part 2:1990, clauses 3.2, 4.3, 5.3 & 5.4

BH/TP No.	Sample No.	Depth (m)	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	<425µm %	Preparation	Description	Classification
BH L1	8846	3.00	D	9	26	12	14	25.4	WS	Grey brown slightly sandy gravelly CLAY	CL
BH L2	5979	3.50	D	24	27	NP		99.1	WS	Grey brown very silty SAND	ML
BH L2	5981	6.00	D	23.8	25	13	12	87.7	WS	Brown slightly sandy slightly gravelly CLAY	CL
BH L2	5983	8.90	D	19.5	30	16	14	50.1	WS	Brown sandy slightly gravelly CLAY	CL

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Notes: NAT - tested as received WS - Wet sieved (425µm) NP - Non Plastic

IGSL	Contract ROADSTONE WICKLOW					Contract No. 8969	
	Compiled By		Date	Checked By		Date	Page
	D CONNOLLY		08/10/03				of

Plasticity Chart - Summary of Liquid & Plastic Limit Tests

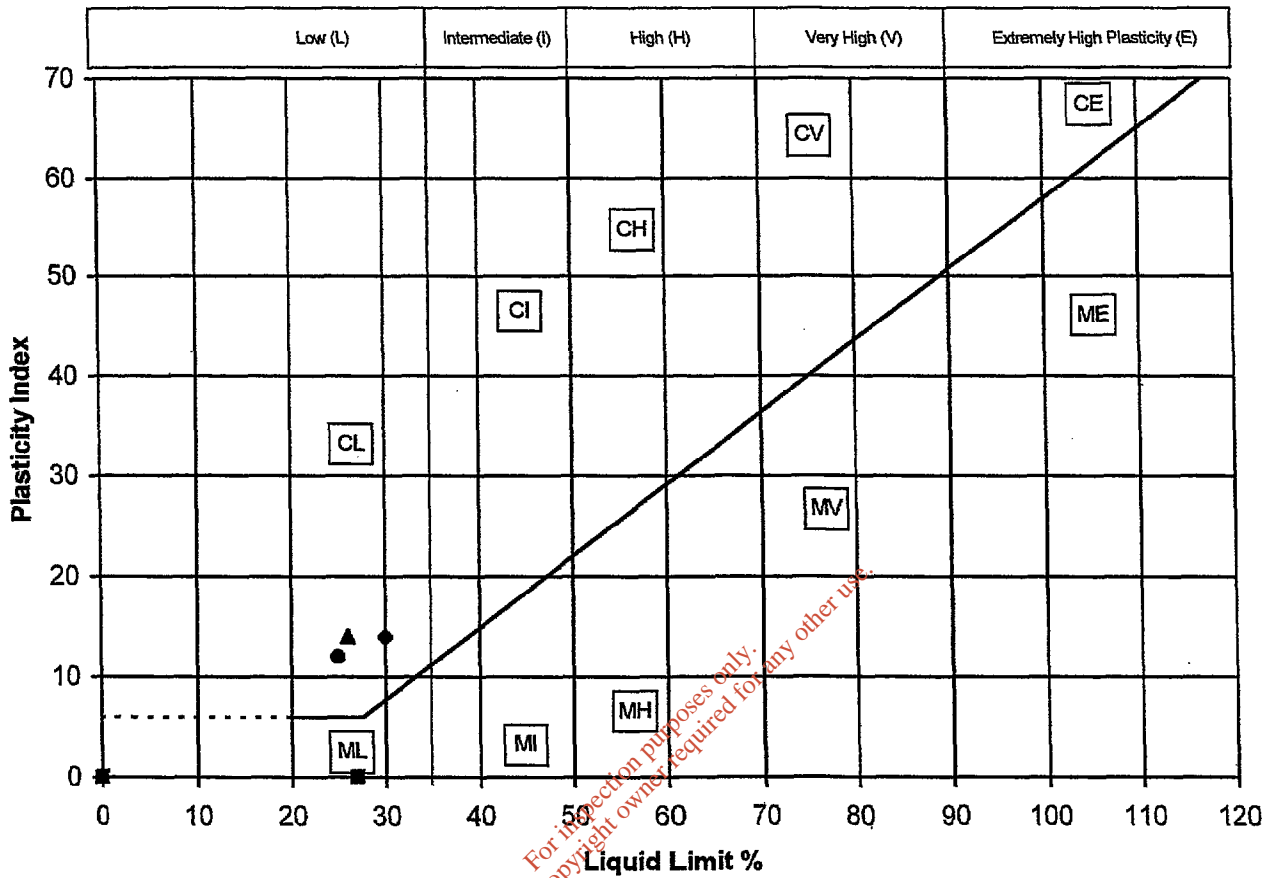
BS1377:Part 2:1990, clauses 3.2, 4 & 5

Chart in accordance with BS5930:1999, fig.18

Contract No. 8969

Contract:

ROADSTONE WICKLOW



Code	BH/TP	Sample	Depth (m)	MC%	LL%	PL%	PI%	%<425µm	Description
▲	BH L1	8846	3.00	9	26	12	14	25.4	Grey brown slightly sandy gravelly CLAY
■	BH L2	5979	3.50	24	27	NP	0	99.1	Grey brown very silty SAND
●	BH L2	5981	6.00	23.8	25	13	12	87.7	Brown slightly sandy slightly gravelly CLAY
◆	BH L2	5983	8.90	19.5	30	16	14	50.1	Brown sandy slightly gravelly CLAY
x									
+									
△									
□									
○									
◇									
▲									
■									
●									
◆									
x									
+									
△									

NP denotes specimen is non-plastic.

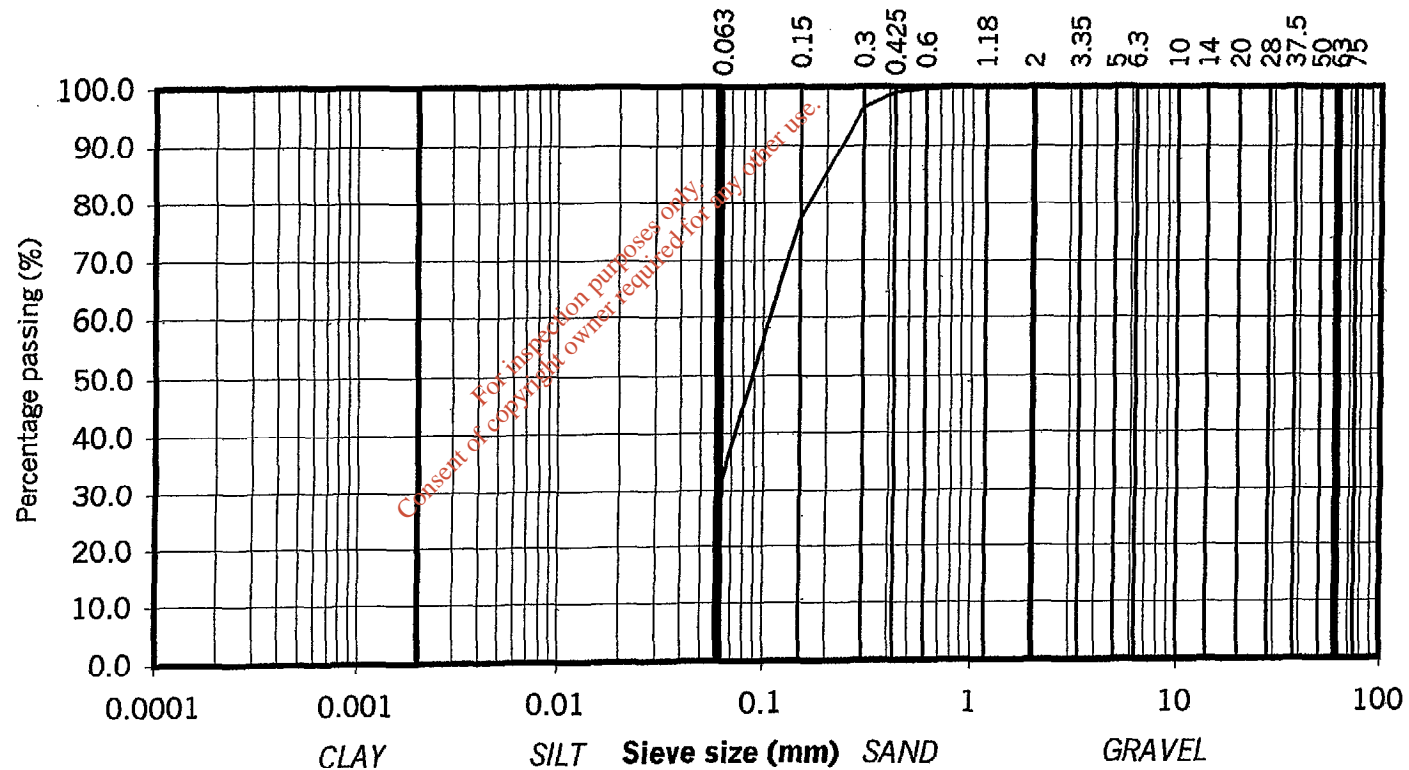
IGSL	Compiled by	Date	Checked by	Date	Page
	D CONNOLLY	08/10/03			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	100.0	GRAVEL
37.5	100.0	
28	100.0	
20	100.0	
14	100.0	
10	100.0	
6.3	100.0	
5	100.0	
3.35	100.0	SAND
2	99.9	
1.18	99.9	
0.6	99.6	
0.425	99.1	
0.3	96.5	SILT/CLAY
0.15	77.3	
0.063	32.2	
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 8969
 Contract: ROADSTONE WICKLOW
 BH/TP No: BH L2
 SAMPLE No.: 5979
 DEPTH (m): 3.50
 TEST METHOD: Wet sieve
 DESCRIPTION: Brown very silty, SAND



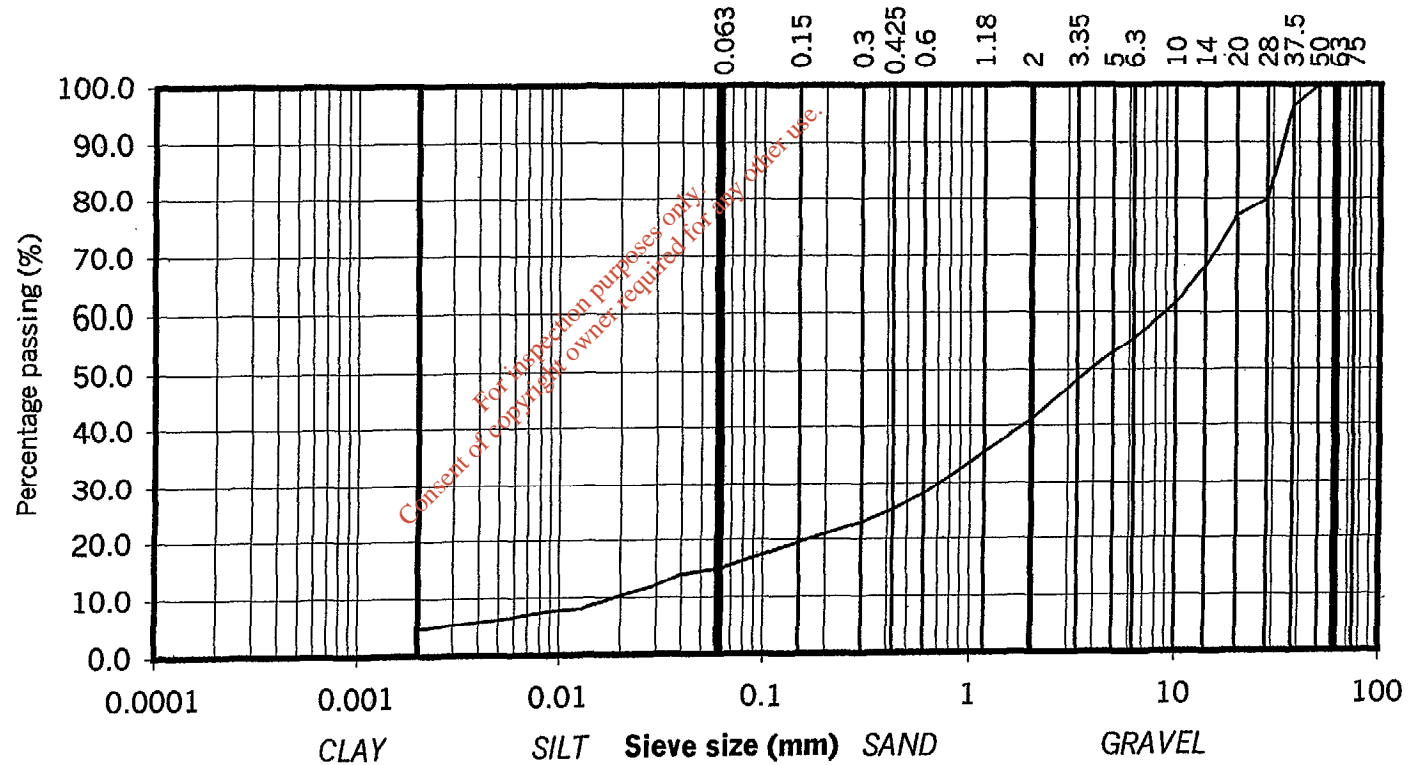
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	08/10/03			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	100.0	GRAVEL
37.5	96.2	
28	79.8	
20	76.9	
14	68.1	
10	61.3	
6.3	55.5	
5	53.1	
3.35	48.1	
2	41.1	
1.18	35.2	
0.6	28.1	
0.425	25.4	
0.3	23.0	SILT/CLAY
0.15	19.4	
0.063	15.2	
0.04	14.2	
0.03	12.2	
0.02	10.4	
0.013	8.1	
0.009	7.6	
0.005	6.2	
0.002	4.6	

Contract No: 8969
 Contract: ROADSTONE WICKLOW
 BH/TP No: BH L1
 SAMPLE No.: 8846
 DEPTH (m): 3.00
 TEST METHOD: Wet sieve and hydrometer
 DESCRIPTION: Grey brown slightly sandy, gravelly, CLAY



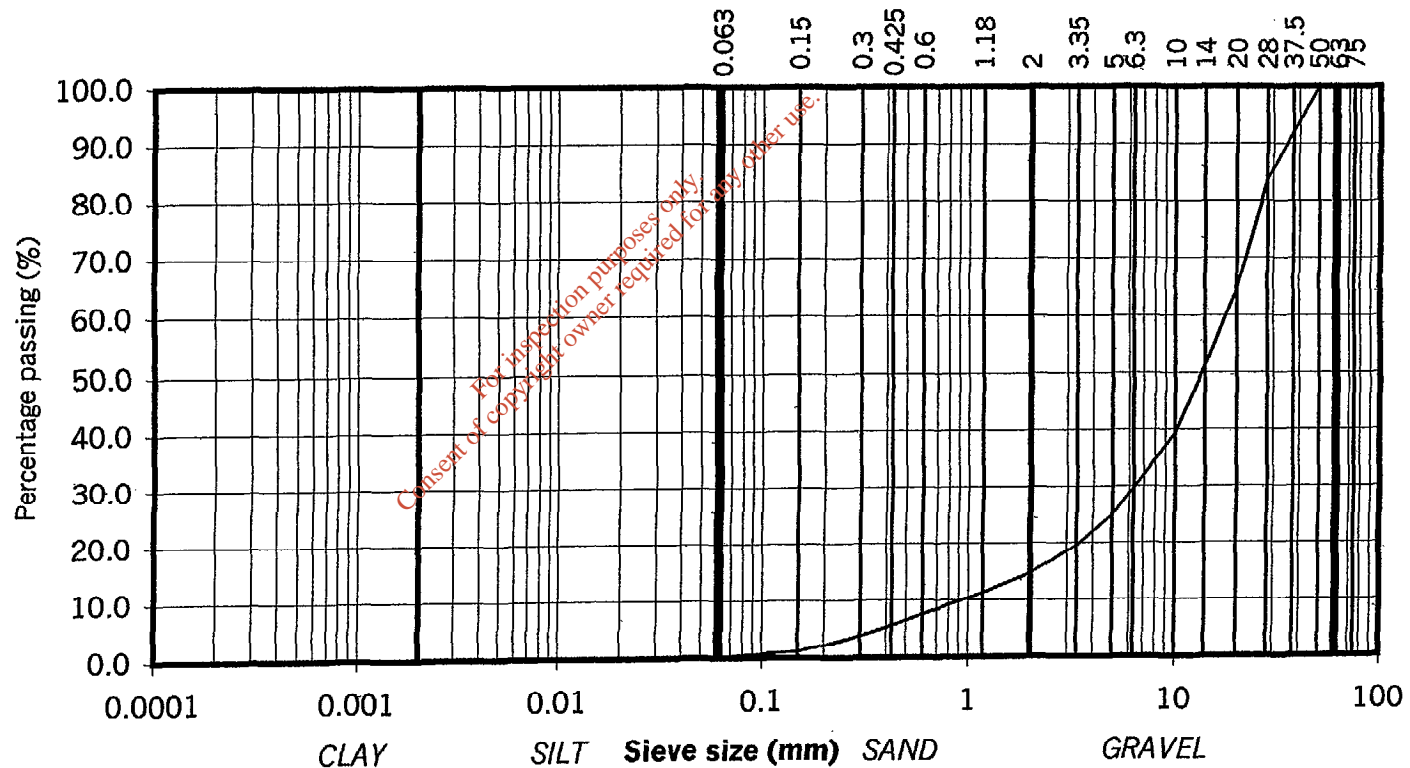
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	08/10/03			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	100.0	
37.5	92.0	
28	83.6	
20	64.5	
14	51.4	
10	39.3	
6.3	29.7	
5	24.9	
3.35	19.5	GRAVEL
2	14.6	
1.18	11.2	
0.6	7.5	
0.425	5.6	
0.3	3.8	
0.15	1.2	
0.063	0.2	
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	SILT/CLAY
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 8969
 Contract: ROADSTONE WICKLOW
 BH/TP No: BH L1
 SAMPLE No.: 8849
 DEPTH (m): 7.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Grey sandy, GRAVEL



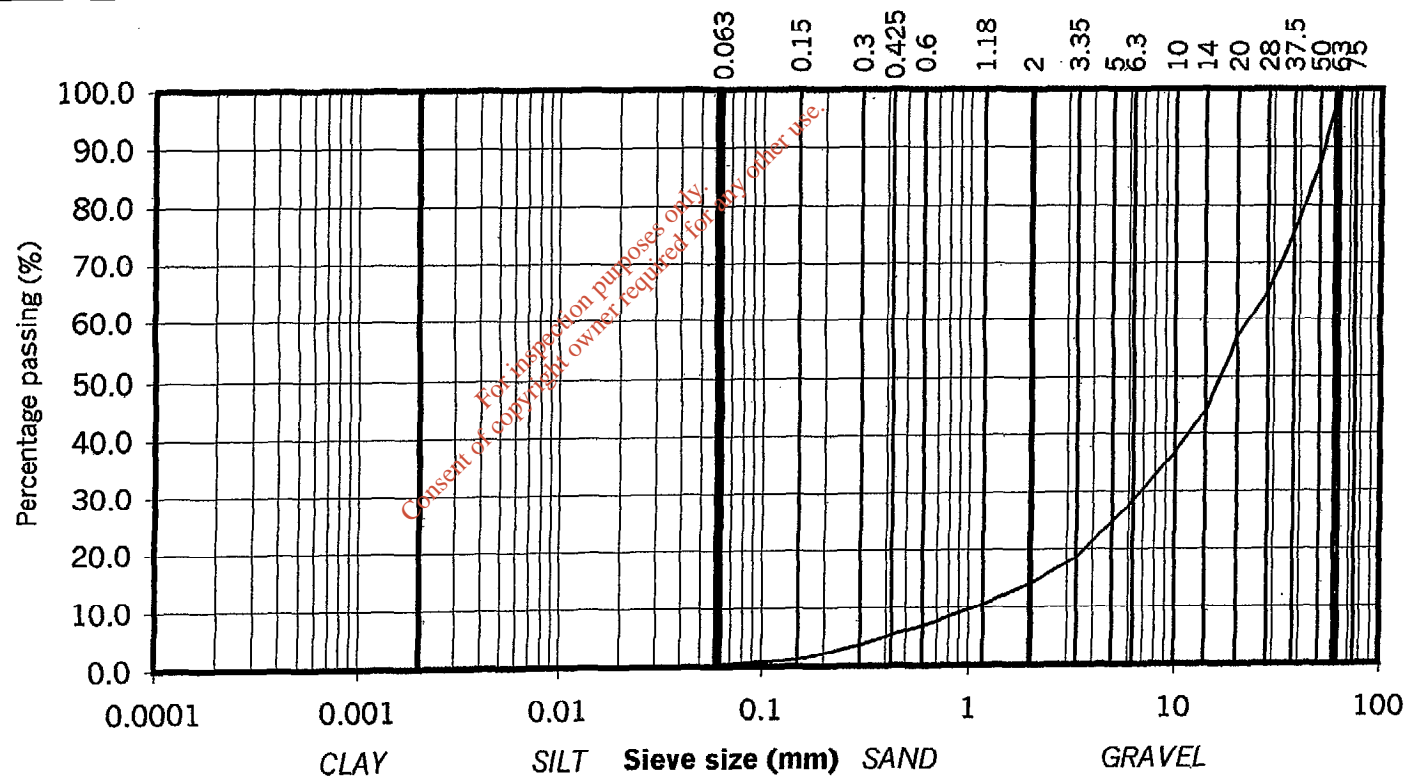
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	08/10/03			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	87.2	GRAVEL
37.5	75.1	
28	64.7	
20	56.7	
14	44.0	
10	36.8	
6.3	28.4	
5	24.7	
3.35	18.4	
2	14.0	
1.18	10.5	
0.6	6.9	
0.425	5.3	
0.3	3.6	
0.15	1.1	SILT/CLAY
0.063	0.4	
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 8969
 Contract: ROADSTONE WICKLOW
 BH/TP No: BH L1
 SAMPLE No.: 8851
 DEPTH (m): 9.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Grey sandy, GRAVEL



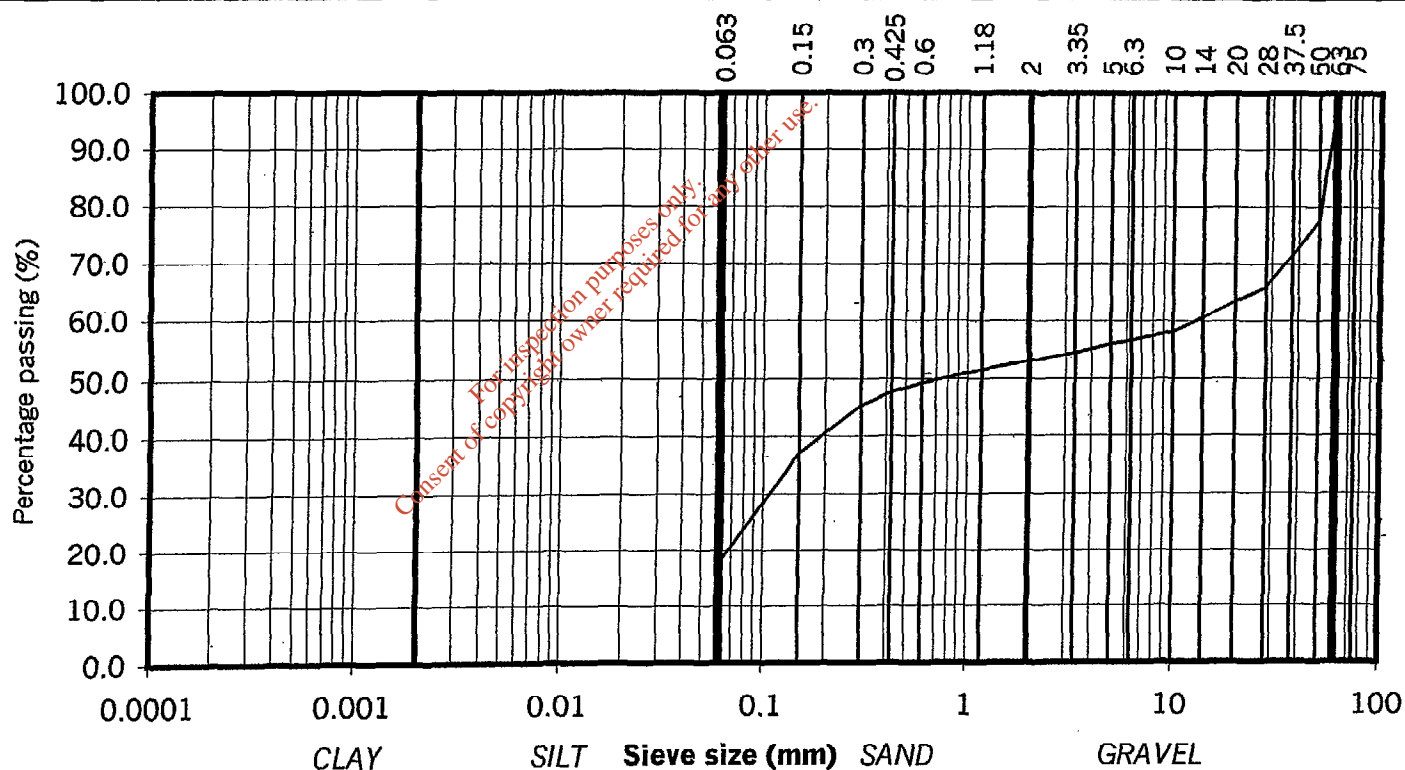
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	08/10/03			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing		
75	100.0	GRAVEL	
63	100.0		
50	77.5		
37.5	71.5		
28	65.9		
20	63.5		
14	60.6		
10	58.1		
6.3	56.5		
5	56.0		SAND
3.35	54.5		
2	53.0		
1.18	51.5		
0.6	49.2		
0.425	47.7		
0.3	45.3		
0.15	37.2		
0.063	18.5	SILT/CLAY	
0.04	#N/A		
0.03	#N/A		
0.02	#N/A		
0.013	#N/A		
0.009	#N/A		
0.005	#N/A		
0.002	#N/A		

Contract No: 8969
 Contract: ROADSTONE WICKLOW
 BH/TP No: BH L2
 SAMPLE No.: 5978
 DEPTH (m): 1.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Grey brown clayey/silty, very sandy, GRAVEL



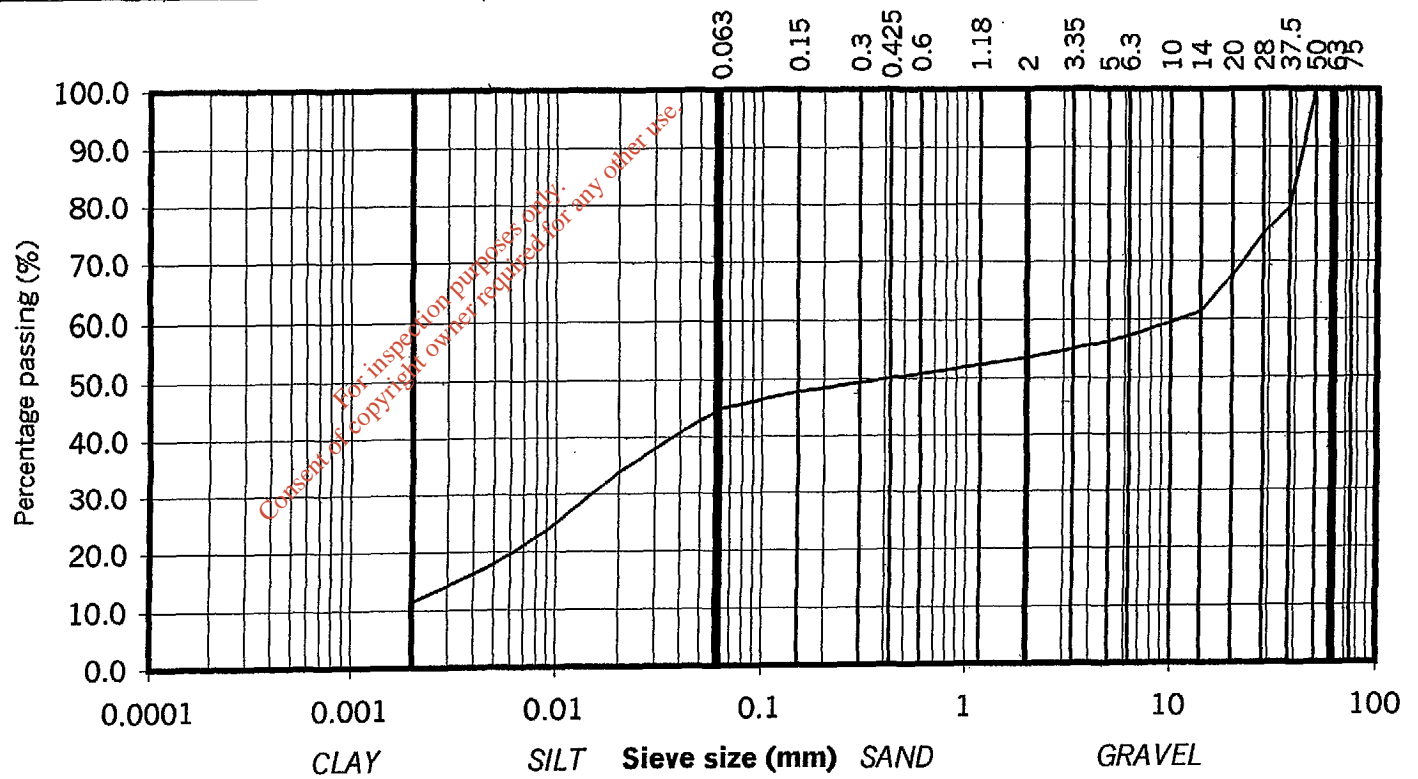
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	08/10/03			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	100.0	
37.5	79.3	
28	74.9	
20	67.4	
14	61.2	
10	59.3	
6.3	57.1	
5	56.2	
3.35	55.0	GRAVEL
2	53.5	
1.18	52.2	
0.6	50.7	
0.425	50.1	
0.3	49.3	SAND
0.15	47.7	
0.063	44.9	
0.04	40.9	
0.03	38.0	
0.02	34.0	SILT/CLAY
0.013	28.3	
0.009	23.6	
0.005	17.9	
0.002	11.4	

Contract No: 8969
 Contract: ROADSTONE WICKLÓW
 BH/TP No: BH L2
 SAMPLE No.: 5983
 DEPTH (m): 8.90
 TEST METHOD: Wet sieve and hydrometer
 DESCRIPTION: Brown slightly sandy, gravelly, CLAY



IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	08/10/03			

Report No.	CALIFORNIA BEARING RATIO									I.G.S.L.		
Contract: ROADSTONE WICKLOW				DATE: 08/10/03				CONTRACT No 8969				
Location	Sample No.	Depth of Sample	Sample Description	Water Content %	Test Code	Water Content		Bulk Density Mg/M3	% Passing 20mm	C.B.R.		
						Top %	Bottom %			Top %	Base %	Average %
BH L1	8845	1.00	Grey brown slightly sandy slightly gravelly CLAY	9.1	L	9.2	9.0	2.29	78.1	2.2	3.3	2.8

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Test Code: U.-Undisturbed Sample	L.-2.5Kg. Rammer	A/5.-5% Air Voids Ratio	V.- Vibrating Hammer
D.-Dynamic Compaction	H.-4.5Kg. Rammer	A10.-10% Air Voids Ratio	M.- Method Number
St.-Static compaction		RN29.- Road Note 29 (St. 95% H.)	

REPORT NO.	SULPHATE ANALYSIS	IGSL
------------	--------------------------	-------------

CONTRACT: **ROADSTONE WICKLOW**

BH/TP NO.	DEPTH (M)	SAMPLE NO.	SAMPLE TYPE	TEST CODE	SULPHUR TRIOXIDE		(so3 X 1.2)	pH VALUE
					WATER SO3 g/L	TOTAL SOIL so3 %	TOTAL SOIL so 4 %	
BH L1	1.00	8845	D	S				
BH L2	3.50	5979	D	S		0.01	0.012	8.0

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TEST CODE: W = WATER S = SOIL A = AQUEOUS SOIL EXTRACT(2:1)

REPORT NO.		CHEMICAL ANALYSIS				IGSL
CONTRACT: ROADSTONE WICKLOW						
BOREHOLE NO.	SAMPLE NO.	DEPTH (METRES)	SAMPLE TYPE	% PASSING 2mm	ORGANIC CONTENT OF MATERIAL PASSING 2 mm %	REMARKS
BH L1	8845	1.00	D	46.3	1.37	
BH L2	5981	6.00	D	98.2	1.33	

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REPORT NO.							SULPHATE ANALYSIS		IGSL
CONTRACT: ROADSTONE WICKLOW									
BH/TP NO.	DEPTH (M)	SAMPLE NO.	SAMPLE TYPE	TEST CODE	SULPHUR TRIOXIDE		(so3 X 1.2)	pH VALUE	
					WATER SO3 g/L	TOTAL SOIL so3 %	TOTAL SOIL so 4 %		
BH L1	1.00	8845	D	S		0.018	0.022	7.8	
BH L2	3.50	5979	D	S		0.01	0.012	8.0	

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TEST CODE: W = WATER S = SOIL A = AQUEOUS SOIL EXTRACT(2:1)

05 MAR 2004

IGSL Limited
Glending Quarry, Blessington
Project No. 9486
On Behalf Of
John Barnett & Associates
Consulting Engineers

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FOREWORD

Notes on Site Investigation Procedure

The following notes should be read in conjunction with the report. Any modifications to the procedures outlined below are indicated in the main text.

GENERAL

The recommendations made and opinions expressed in the Report are based on the "Boring Records, an examination of samples and results of the site and laboratory tests. No responsibility can be held for conditions which have not been revealed by the boreholes, for example, between borehole positions. Whilst the report may express an opinion on a possible configuration of strata both between borehole positions and below the maximum depth of the investigation, this is for guidance only and no liability can be accepted for its accuracy.

BORING TECHNIQUE

Unless otherwise stated the 'Shell and Auger' technique of soft ground boring has been employed. Whilst this technique allows the maximum data to be obtained on strata conditions, a degree of mixing of some layered soils, (e.g. thin layers of coarse and fine granular material) is inevitable. Specific attention is drawn to this factor where evidence of such a condition is available.

GROUND WATER

The ground water conditions entered on the Boring Records are those appertaining at the time of the investigation. The normal rate of boring does not usually permit the recording of an equilibrium water level for any one water strike. Moreover, ground water levels are subject to variations caused by seasonal effects or changes in local drainage conditions. The table of each Boring Record shows the ground water level at the quoted borehole and casing depths, usually at the start of the day's work. The word "none" indicates that ground water was sealed off by the borehole casing.

GAS MONITORING

Unless otherwise stated gas monitoring is carried out using a GA2000 infra red gas detector. The gases monitored for and levels noted are recorded and plotted on the relevant test data sheets. Unless stated otherwise no monitoring is carried out for gas pressure or to calculate gas flow rates.

ROUTINE SAMPLING

Undisturbed samples of predominantly cohesive soils are obtained in a 102mm diameter open-drive sampler, complying with the requirements of the British Standard Code of Practice B.S. 5930. Large disturbed samples of granular soils, or of soils in which undisturbed sampling is not possible or appropriate, are taken from the boring tools and sealed into polythene bags. Small disturbed samples are taken at frequent intervals and sealed into 0.5 kg glass jars or polythene bags for subsequent visual classification. Where encountered in sufficient quantity, samples of groundwater are taken.

Unless otherwise stated in the main text, disturbed soil samples may not be at their natural water content.

**REPORT ON A GROUND INVESTIGATION
AT
ROADSTONE QUARRIES, GLENDING, CO. WICKLOW
ON BEHALF OF
JOHN BARNETT & ASSOCIATES
CONSULTING ENGINEERS**

REPORT NO. 9486

MARCH 2003/4

INTRODUCTION

The site is located in the Roadstone Quarry at Glending, Blessington, Co. Wicklow.

An investigation of sub-soil conditions was ordered by the projects consulting engineers, John Barnett & Associates (JBA) , on behalf of their clients, Roadstone Limited.

As part of an ongoing site investigation IGSL were requested to remobilise to site and carry out additional boreholes and testing at locations specified by the projects engineers. Previous investigative works were carried out by IGSL in May 2003 and October 2003 and reported on in IGSL report no.s 8669 and 8969 respectively.

This programme of the investigation included,

- ✓ The construction of one exploratory borehole to establish stratification. During the course of boring in-situ tests were performed at regular intervals and representative soil samples were recovered for visual examination and laboratory analysis.
- ✓ The excavation of two trial pits using a hydraulic excavator. All pits were logged and sampled by an IGSL engineer and a representative of JBA.
- ✓ The carrying out of laboratory soils testing (Geotechnical) as specified by the projects engineers.

This report deals with the factual findings of the ground investigation works.

II. FIELDWORK

The site is referred to as the Roadstone Glending site. The locations of all of the investigation points were marked on site by a representative of the projects engineers and are not included in this report.

The methods utilised during the course of the field investigations are outlined in the following sections.

Cable Tool Boreholes.

Conventional cable tool techniques (shell and auger) were employed at one location across the site . All field work was carried out in accordance with BS5930.

Sampling and in - situ testing were performed to BS1377. Disturbed and undisturbed soil samples were taken at regular intervals or at changes in stratification while standard penetration tests (SPT's) were also carried out to establish relative in - situ soil strength.

Full details of stratification, testing, sampling, comments on groundwater and notes on any obstructions to normal boring encountered are given in the detailed borehole records enclosed in Appendix I to this report.

It should be noted that the ground conditions on previous works at Glending had necessitated the use of a considerable amount of hard strata boring and in places required the casing diameters to be increased from 200mm to 250mm. In this phase of works only 250mm diameter casing was used to drill the borehole.

III. TESTING

During the course of the investigation samples of the sub soils were taken from the boreholes and were returned to IGSL's laboratory where a programme of testing was scheduled by the projects engineers, John Barnett & Associates.

Geotechnical Testing – Soils

All of the geotechnical test data is included in Appendix III to this report.

Tests carried out included

- ✓ Moisture Content Tests
- ✓ Particle Size Distribution Tests (Wet Sieve)
- ✓ Sedimentation Analysis (by Hydrometer).

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Appendix I – Cable Tool Borehole Records

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REPORT NO: 9486 **GEOTECHNICAL BORING RECORD** **IGSL Ltd.**

CONTRACT : Blessington Quarry BOREHOLE NO: BHL3
 Sheet 1 of 2

CLIENT : Roadstone Dublin Ltd. GROUND LEVEL (mOD) - DATE STARTED: 10/02/2004
 ENGINEER : John Barnett & Associates BOREHOLE DIAMETER (mm) 250 DATE COMPLETED: 13/02/2004

CO-ORDINATES : E - BOREHOLE DEPTH (m) 20.00 BORED BY: J O'Hara
 N - CASING DEPTH (m) 20.00

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES			FIELD TEST RESULTS	STAND PIPE DETAILS
					REF. NUMBER	SAMPLE TYPE	DEPTH (m)		
0	Made Ground (consisting of clay fill)	[Cross-hatched pattern]							
1.50	Grey brown fine to coarse slightly sandy GRAVEL with cobbles	[Dotted pattern]		1.50	4231	B	2.00		
3.00					4232	B	3.00		
4.40					4233	B	4.00		
4.40	Brown slightly sandy gravelly CLAY with some cobbles	[Horizontal dashed pattern]		4.40	4234	B	5.00		
5.80	Grey brown fine to coarse slightly sandy GRAVEL with occasional cobbles and boulders	[Dotted pattern]		5.80	4235	B	6.00		
7.00					4236	B	7.00		
8.00					4237	B	8.00		
9.00					4238	B	9.00		
10.00					4239	B	10.00		

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Continued next sheet

From (m)	To (m)	Hours	Comments
0.00	1.50	1.00	
1.50	2.50	1.25	
2.50	4.40	0.75	
5.80	6.50	1.50	
10.80	11.20	0.75	
12.40	12.90	1.50	

Water Strike	Casing Depth	Sealed At	Rise To	Time	Comments
13.30	13.20	-	-	-	Very Slow

Date	Hole Depth	Casing Depth	Depth to Water	Comments
13/02/2004	20.00	-	16.00	Borehole end

Date	Tip Depth	RZ Top	RZ Base	Type

REPORT NO: 9486

GEOTECHNICAL BORING RECORD

IGSL Ltd.

CONTRACT : Blessington Quarry

BOREHOLE NO: BHL3
Sheet 2 of 2

CLIENT : Roadstone Dublin Ltd.
ENGINEER : John Barnett & Associates

GROUND LEVEL (mOD) -
BOREHOLE DIAMETER (mm) 250
BOREHOLE DEPTH (m) 20.00
CASING DEPTH (m) 20.00

DATE STARTED: 10/02/2004
DATE COMPLETED: 13/02/2004

CO-ORDINATES : E -
N -

BORED BY: J O'Hara

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES			FIELD TEST RESULTS	STAND PIPE DETAILS
					REF. NUMBER	SAMPLE TYPE	DEPTH (m)		
10.00	Grey brown fine to coarse slightly sandy GRAVEL with occasional cobbles and boulders	[Pattern]			4240	B	11.00		
11.00					4241	B	12.00		
12.00					4242	B	13.00		
13.00					4243	B	14.00		
14.00	Grey brown fine to medium SAND	[Pattern]		13.30	4244	B	15.00		
15.00					4245	B	16.00		
16.00					4246	B	17.00		
16.50	Grey fine to medium sandy GRAVEL	[Pattern]		16.50	4247	B	18.00		
17.00					4248	B	19.00		
17.40	Grey brown fine to medium SAND and occasional fine gravel	[Pattern]		17.40	4249	B	20.00		
18.00									
20.00	End of Borehole at 20.00 m								

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From (m)	To (m)	Hours	Comments
0.00	1.50	1.00	
1.50	2.50	1.25	
2.50	4.40	0.75	
5.80	6.50	1.50	
10.80	11.20	0.75	
12.40	12.90	1.50	

Water Strike	Casing Depth	Sealed At	Rise To	Time	Comments
13.30	13.20	-	-	-	Very Slow

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments
13/02/2004	20.00	-	16.00	Borehole end

Appendix II – Trial Pit Records

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REPORT NO. 9486

TRIAL PIT RECORD

IGSL Ltd.

CONTRACT: Blessington Quarry

Trial Pit No.: TPL5

Sheet: Sheet 1 of 1

CLIENT: Roadstone Dublin Ltd.

Excavation Method: JCB

ENGINEER: John Barnett & Associates

Date Started: 13/02/2004

Date Completed: 13/02/2004

CO-ORDINATES: E -
N -

Ground Level (mOD): -

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Ref. No.	Type	Depth (m)		
0.0	Made Ground consisting of topsoil with roots, glass, metal, plastic and brick									
0.40	Made Ground consisting of loose grey brown very sandy gravel with many cobbles and boulders and occasional plastic, metal, glass and brick		0.40							
1.0						J2923	B	1.00		
2.0						J2924	B	2.00		
2.10	Loose grey brown very sandy GRAVEL with many cobbles and boulders and occasional.		2.10							
3.0	End of Trial Pit at 3.00 m		3.00			J2925	B	3.00		
4.0										

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Groundwater Conditions: No groundwater encountered during excavation

Stability: Trial pit unstable from 1.5m

Remarks:

REPORT NO. 9486

TRIAL PIT RECORD

IGSL Ltd.

CONTRACT: Blessington Quarry

Trial Pit No.: TPL6

Sheet: Sheet 1 of 1

CLIENT: Roadstone Dublin Ltd.

Excavation Method: JCB

ENGINEER: John Barnett & Associates

Date Started: 13/02/2004

Date Completed: 13/02/2004

CO-ORDINATES: E -
N -

Ground Level (mOD): -

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water Strike (m)	Samples			Vane Test (kPa)	Hand Penetrometer (kPa)
						Ref. No.	Type	Depth (m)		
0.0	Made Ground consisting of topsoil		0.10							
	Made Ground consisting of loose grey brown very sandy gravel with many cobbles and boulders, many tyres some metal and occasional glass and brick									
1.0						J2926	B	1.00		
2.0						J2927	B	2.00		
3.0						J2928	B	3.00		
4.0	End of Trial Pit at 4.00 m		4.00			J2929	B	4.00		

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Groundwater Conditions: No groundwater encountered during excavation

Stability: Trial pit unstable from 1.5m

Remarks:

Appendix III – Laboratory Test Records

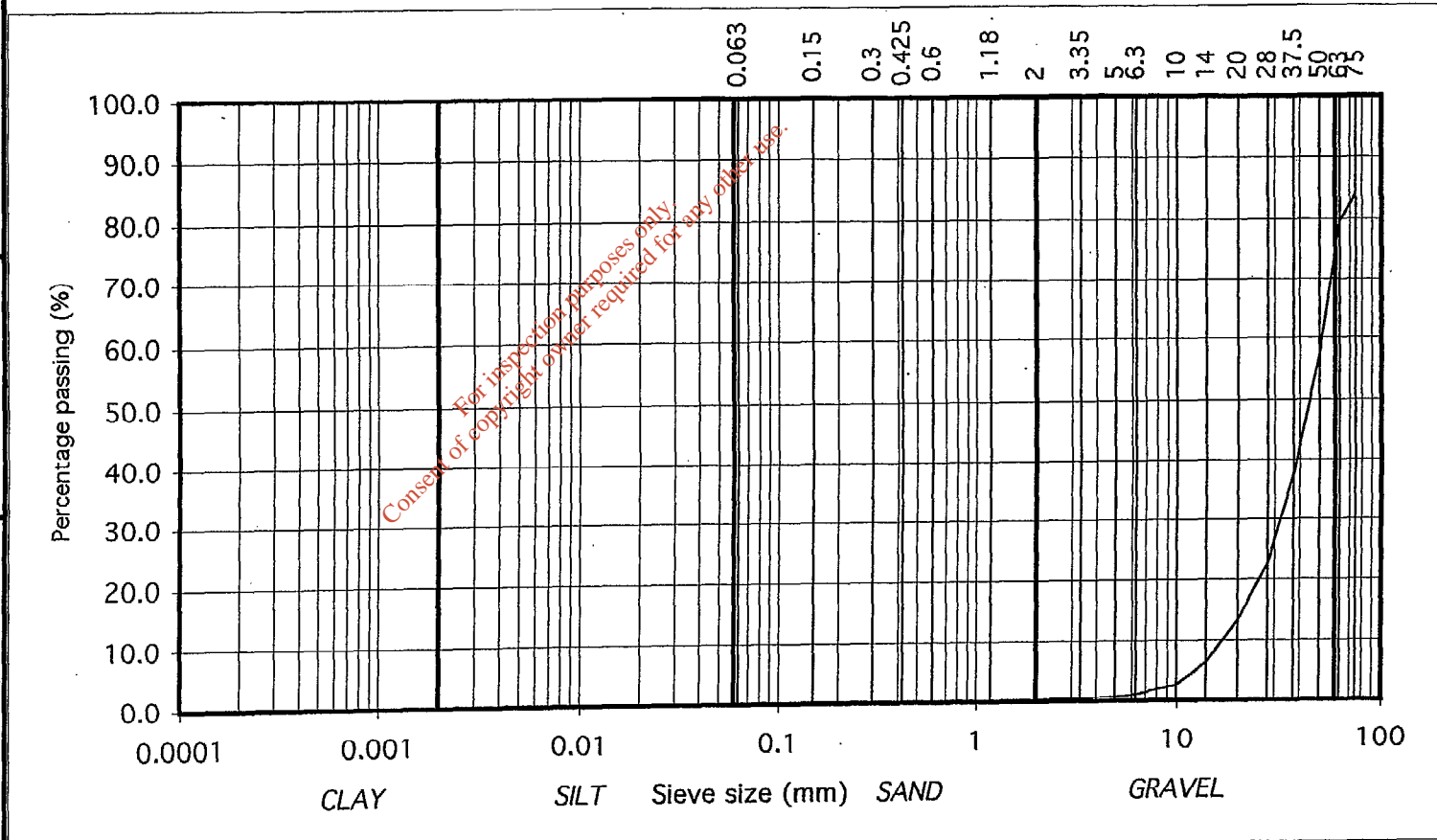
For inspection purposes only.
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Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	83.7	COBBLES
63	79.6	
50	57.4	GRAVEL
37.5	37.4	
28	22.3	
20	13.2	
14	6.2	
10	2.6	
6.3	1.0	
5	0.6	
3.35	0.4	
2	0.2	
1.18	0.2	
0.6	0.1	
0.425	0.1	
0.3	0.1	
0.15	0.1	SILT/CLAY
0.063	0.0	
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4232
 DEPTH (m): 3.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Grey GRAVEL with many cobbles



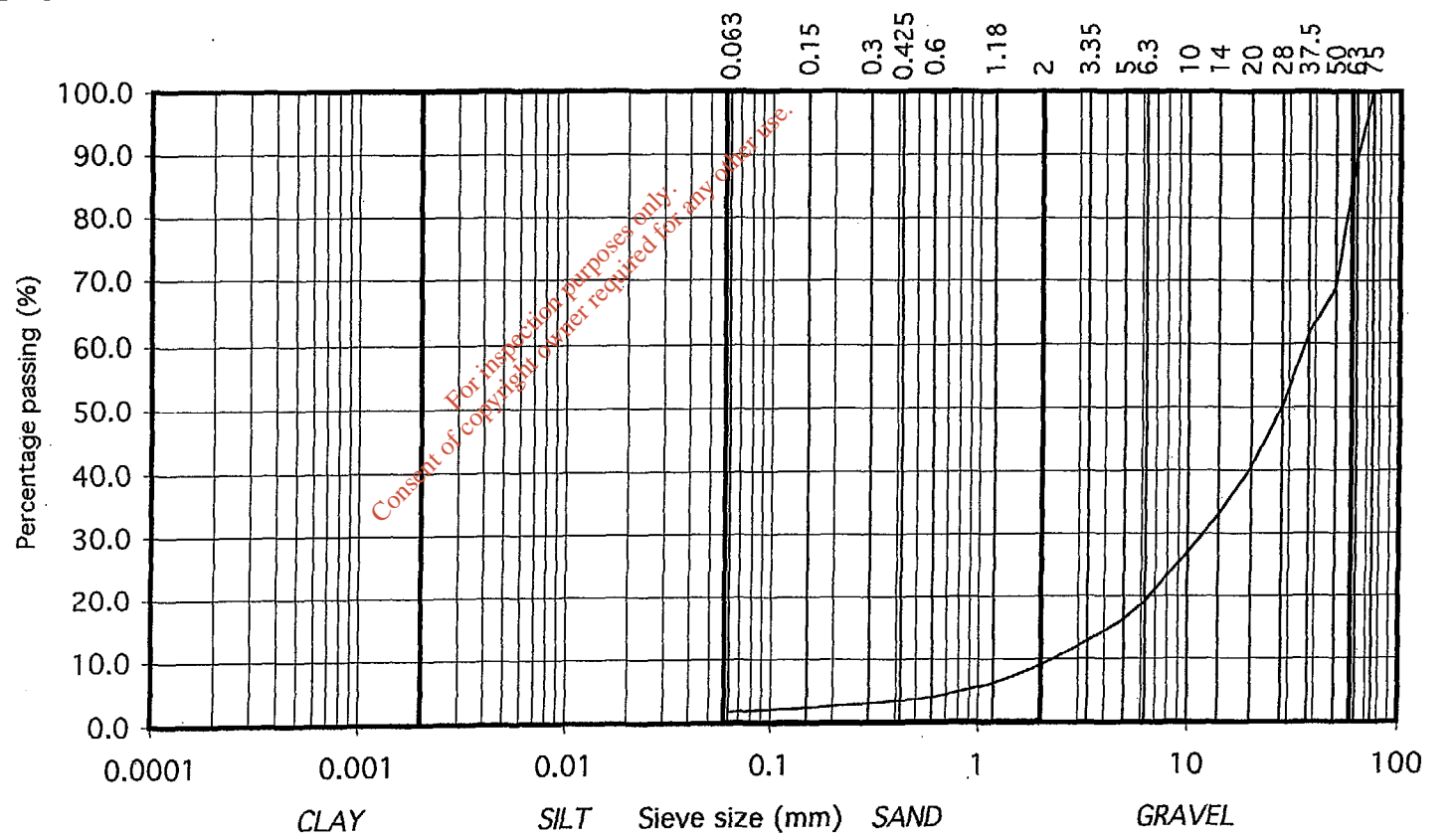
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	89.2	
50	68.8	GRAVEL
37.5	61.5	
28	49.9	
20	40.4	
14	32.9	
10	26.9	
6.3	19.1	
5	16.1	SAND
3.35	12.8	
2	8.8	
1.18	6.1	
0.6	3.9	
0.425	3.3	SILT/CLAY
0.3	2.8	
0.15	2.3	
0.063	1.8	
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4235
 DEPTH (m): 6.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Brown slightly clayey/silty, sandy, GRAVEL with some cobbles



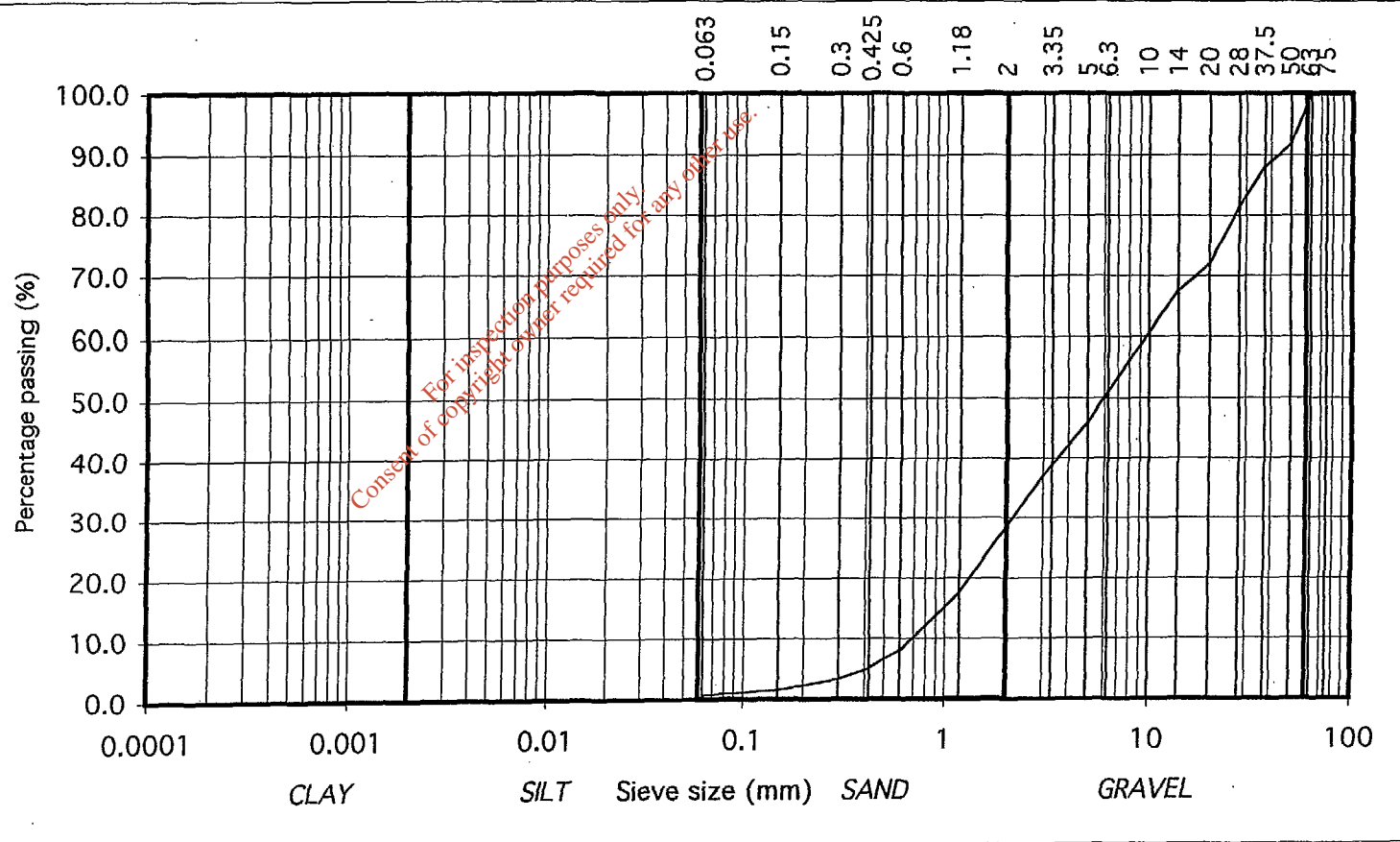
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	91.7	
37.5	88.0	
28	81.4	
20	71.8	
14	67.3	
10	60.7	
6.3	51.0	
5	45.8	
3.35	38.8	
2	28.3	
1.18	17.4	
0.6	7.9	
0.425	5.0	
0.3	3.2	
0.15	1.5	
0.063	0.6	
0.04	#N/A	SAND
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	
		SILT/CLAY

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4237
 DEPTH (m): 8.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Grey slightly clayey/silty, very sandy, GRAVEL



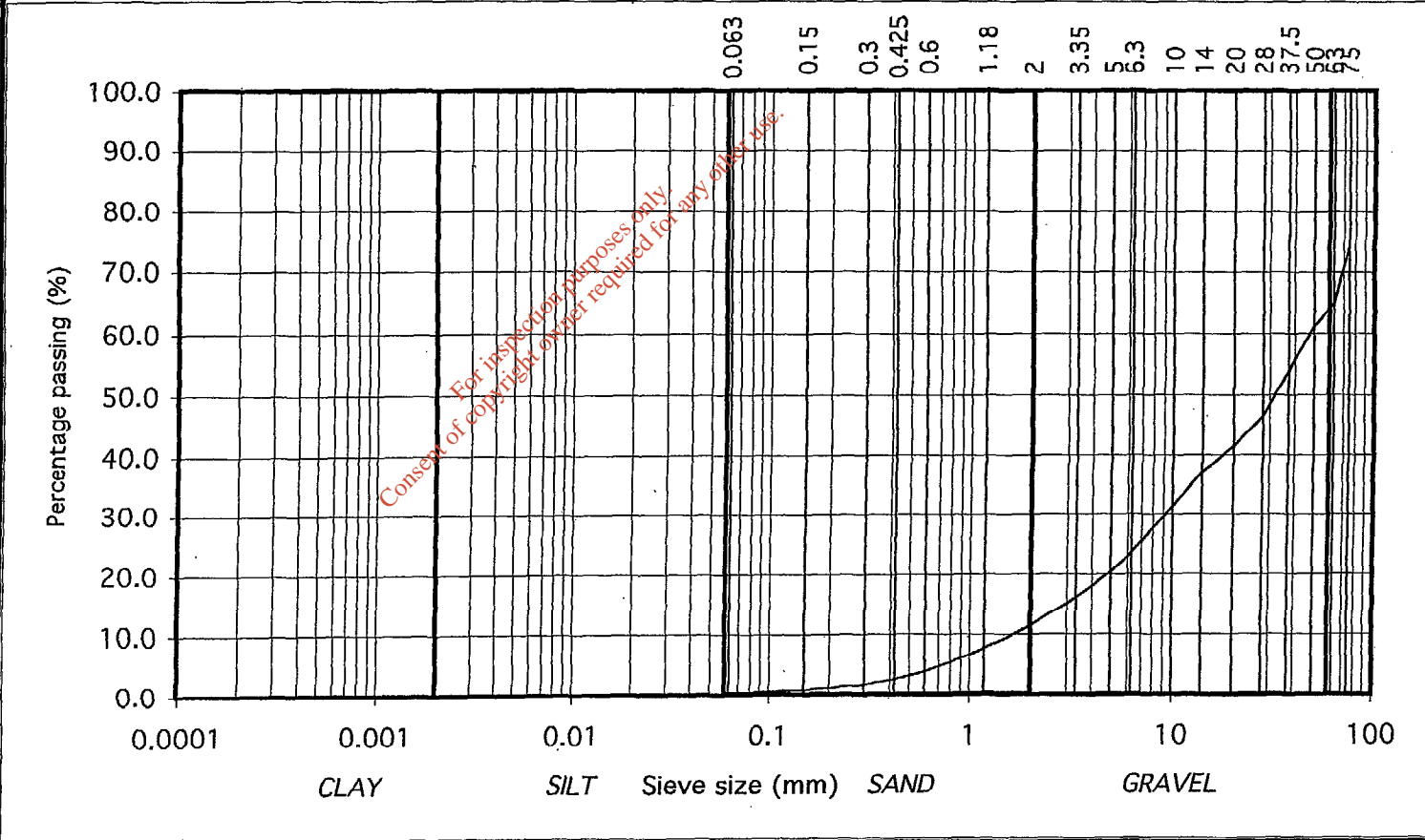
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	73.9	COBBLES
63	64.7	
50	61.1	GRAVEL
37.5	54.0	
28	46.3	
20	41.5	
14	37.0	
10	31.1	
6.3	23.5	
5	20.3	SAND
3.35	15.9	
2	11.2	
1.18	7.6	
0.6	3.7	
0.425	2.5	SILT/CLAY
0.3	1.6	
0.15	0.7	
0.063	0.2	
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4239
 DEPTH (m): 10.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Grey sandy, GRAVEL with many cobbles



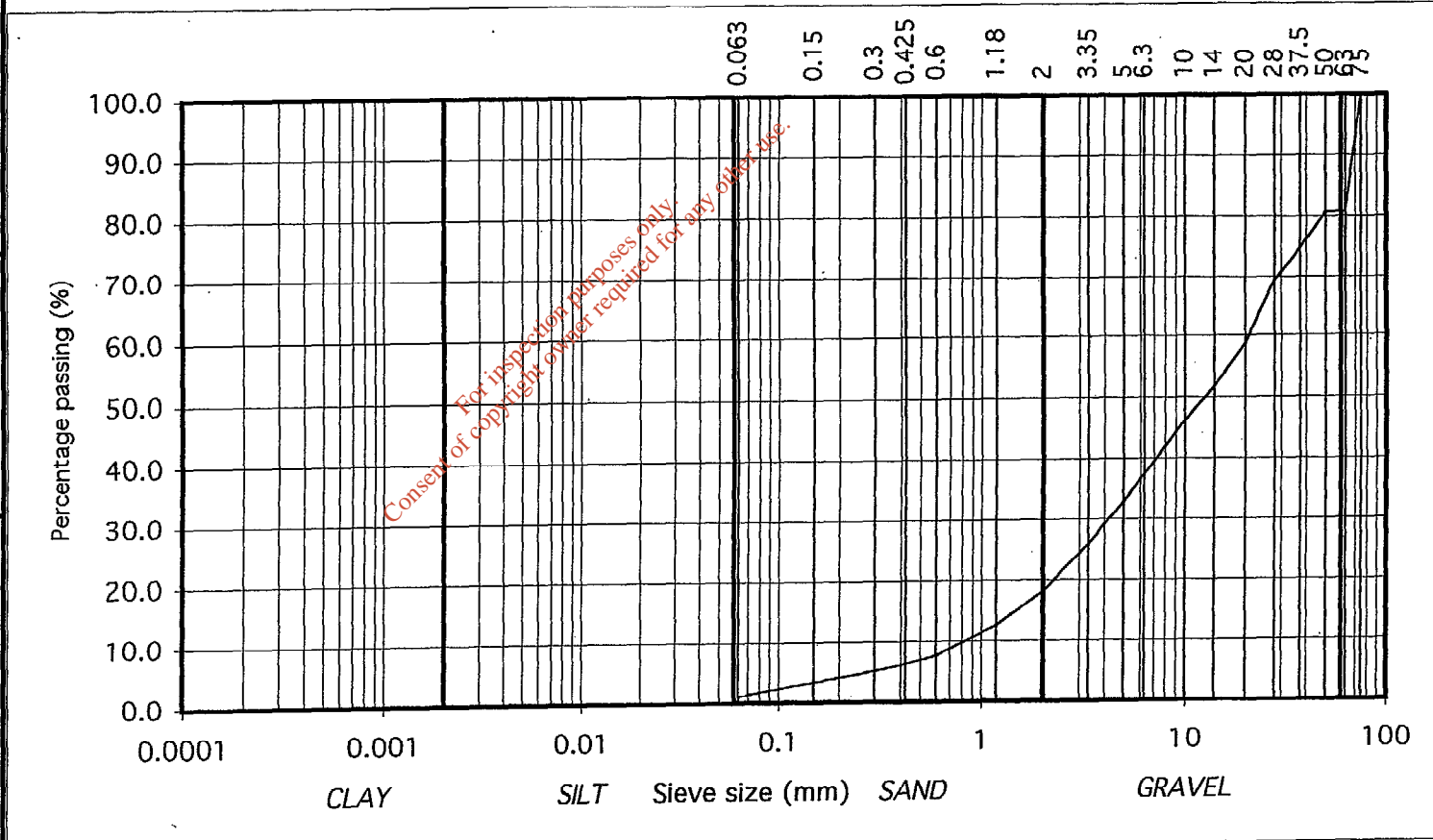
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	80.7	
50	80.6	GRAVEL
37.5	74.5	
28	69.3	
20	58.6	
14	51.6	
10	46.1	
6.3	37.4	
5	32.8	SAND
3.35	25.8	
2	18.1	
1.18	12.5	
0.6	7.6	
0.425	6.1	SILT/CLAY
0.3	5.0	
0.15	3.3	
0.063	1.0	
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4241
 DEPTH (m): 12.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Brown slightly clayey/silty, sandy, GRAVEL with some cobbles



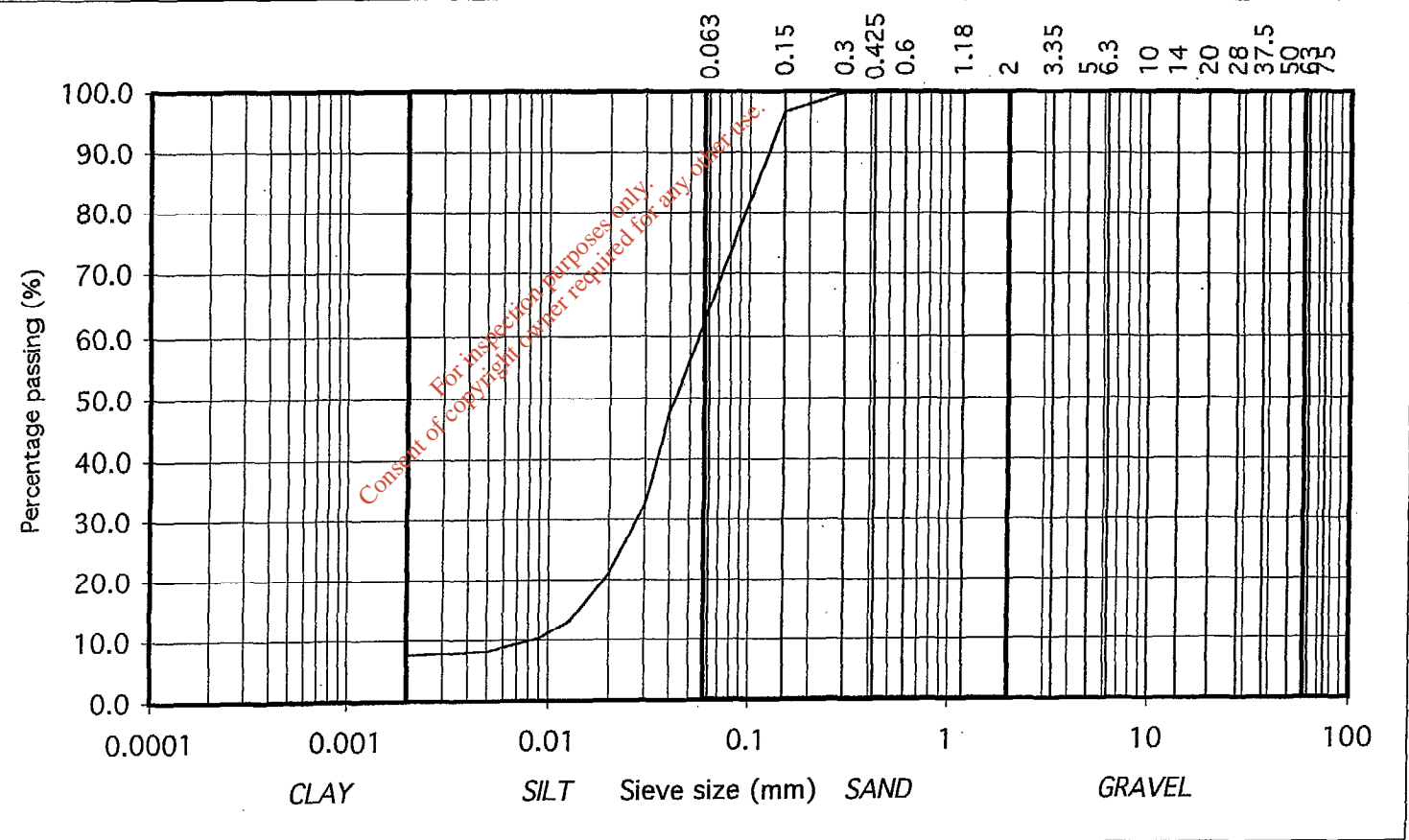
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4243
 DEPTH (m): 14.00
 TEST METHOD: Wet sieve and hydrometer
 DESCRIPTION: Brown sandy, SILT/CLAY

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	100.0	GRAVEL
37.5	100.0	
28	100.0	
20	100.0	
14	100.0	
10	100.0	
6.3	100.0	
5	100.0	SAND
3.35	100.0	
2	100.0	
1.18	100.0	
0.6	100.0	
0.425	100.0	SILT/CLAY
0.3	99.8	
0.15	96.7	
0.063	64.0	
0.04	47.5	
0.03	32.1	
0.02	20.8	
0.013	13.2	
0.009	10.1	
0.005	8.0	
0.002	7.5	



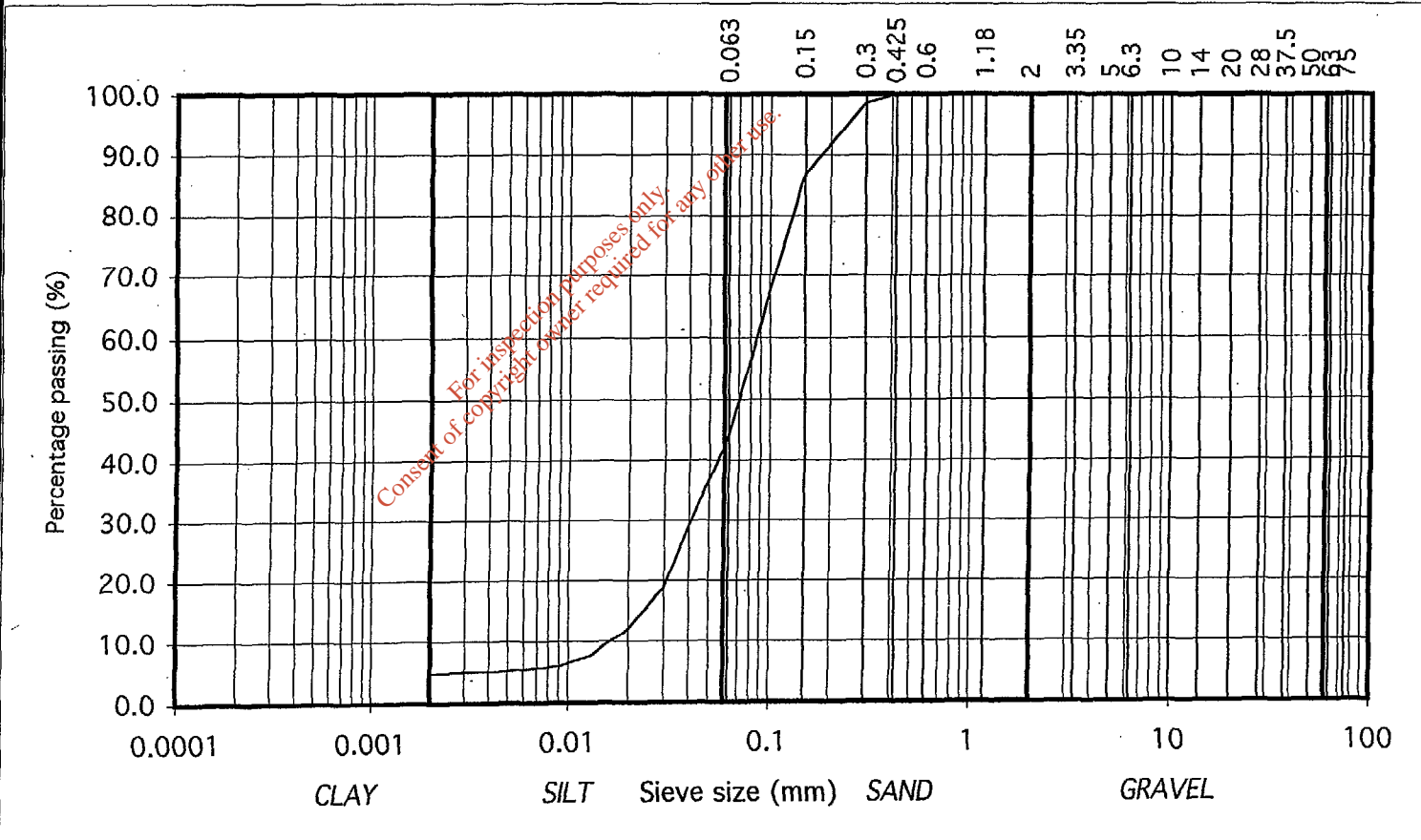
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4247
 DEPTH (m): 18.00
 TEST METHOD: Wet sieve and hydrometer
 DESCRIPTION: Brown sandy, SILT/CLAY

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	100.0	GRAVEL
37.5	100.0	
28	100.0	
20	100.0	
14	100.0	
10	100.0	
6.3	100.0	
5	100.0	SAND
3.35	100.0	
2	100.0	
1.18	100.0	
0.6	100.0	SILT/CLAY
0.425	100.0	
0.3	98.5	
0.15	86.8	
0.063	44.0	
0.04	28.8	
0.03	18.6	
0.02	11.9	
0.013	7.7	
0.009	5.9	
0.005	5.2	
0.002	4.8	



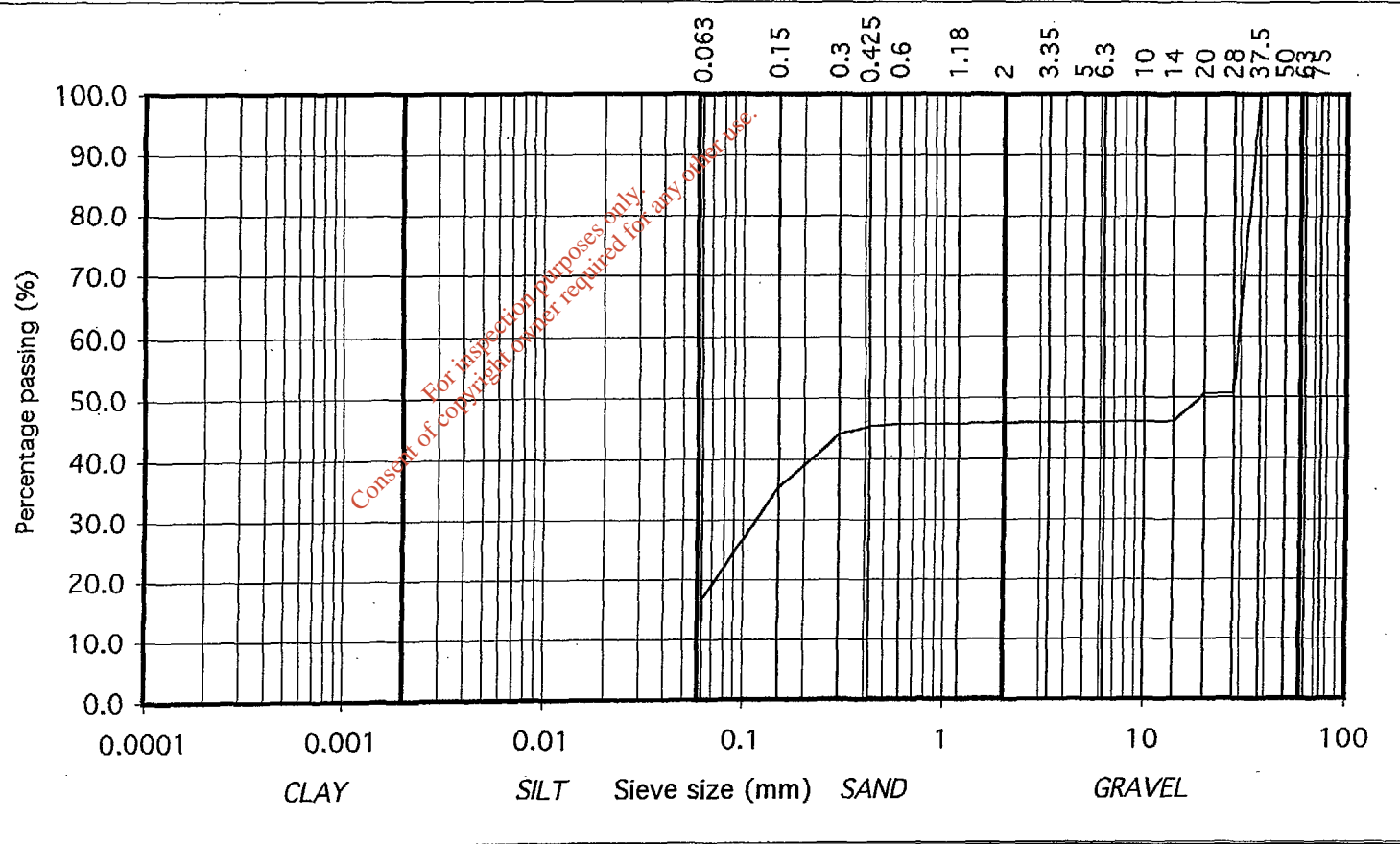
IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			

Determination of Particle Size Distribution

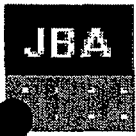
BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100.0	COBBLES
63	100.0	
50	100.0	GRAVEL
37.5	100.0	
28	50.5	
20	50.5	
14	45.9	
10	45.9	
6.3	45.8	
5	45.8	
3.35	45.8	
2	45.7	
1.18	45.6	SAND
0.6	45.5	
0.425	45.3	
0.3	44.0	
0.15	35.4	
0.063	16.5	SILT/CLAY
0.04	#N/A	
0.03	#N/A	
0.02	#N/A	
0.013	#N/A	
0.009	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 9486
 Contract: BLESSINGTON QUARRY (JBA)
 BH/TP No: L3
 SAMPLE No.: 4245
 DEPTH (m): 16.00
 TEST METHOD: Wet sieve
 DESCRIPTION: Brown clayey/silty, very sandy, GRAVEL



IGSL	Compiled by:	Date:	Checked by:	Date:	Page no:
	D CONNOLLY	27/2/04			



John Barnett and Associates Ltd.

Unit 7, Dundrum Business Pk.,
Windy Arbour, Dublin 14, Ireland.

Tel: +353 1 2964667 Fax: +353 1 2964676 www.csa.ie

Trialpit No
TP L 10
Sheet 1 of 1

Co-ords: -
Level: -

Date
01/03/2004

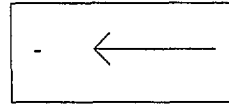
Project Name: Dorans Pit Ground Investigation

Dimensions: -

Scale
1:25

Location: Blessington, Co. Wicklow.

Depth
3.00m



Logged By
DL

Client: Roadstone Dublin Ltd.

JBA Project No. 2901-04

Samples & In Situ Testing				Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Waterstrike	Results				
1				1			MADE GROUND, comprising clayey sandy gravel with some cobble and some brick, tile, plastic, metal and timber. (MADE GROUND)
2				2			
				2.30			Brown clayey SAND and GRAVEL with some cobble. Gravel and cobbles are sub-rounded to rounded. (SANDS & GRAVELS)
3				3.00	3		Trialpit Complete at 3.00 m
4				4			

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Remarks: Excavated adjacent to TP L/5

Stability: Unstable sides

Groundwater: Trial pit dry

Shoring:

TP L 10



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Windy Arbour, Dublin 14, Ireland.
Tel: +353 1 2964667 Fax: +353 1 2964676 www.csa.ie

Trialpit No
TP L 11
Sheet 1 of 1

Co-ords: -
Level: -

Date
01/03/2004

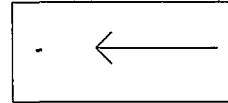
Project Name: Dorans Pit Ground Investigation

Dimensions: -

Scale
1:25

Location: Blessington, Co. Wicklow.

Depth
2.60m



Logged By
DL

Client: Roadstone Dublin Ltd.

JBA Project No. 2901-04

Samples & In Situ Testing				Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Waterstrike	Results				
1				1			Brown clayey SAND and GRAVEL with some cobble. Gravel and cobble are sub-rounded to rounded. (SANDS & GRAVELS)
2				2			
2.60				2.60			
3				3			
4				4			

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Trialpit Complete at 2.60 m

Remarks: Excavated adjacent to TP L/6

Stability: Unstable sides

Groundwater: Trial pit dry

Shoring:

TP L 11



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Trialpit No
TP L/12
Sheet 1 of 2

Co-ords: -
Level: -

Date
01/03/2004

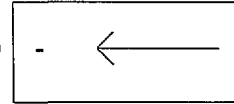
Project Name: Dorans Pit Ground Investigation

Dimensions: -

Scale
1:25

Location: Blessington, Co. Wicklow.

Depth
5.50m



Logged By
DL

Client: Roadstone Dublin Ltd.

JBA Project No. 2901-04

Samples & In Situ Testing				Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Waterstrike	Results				
1				1.40		XXXXXX	Brown slightly sandy, slightly gravelly SILT. (MADE GROUND)
2						XXXXXX	Brown fine sandy SILT/silty fine SAND (SANDS & GRAVELS)
3							
4							

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Continued next sheet

Remarks:

Stability: Sides stand vertical

Groundwater: Slight seepage at 2.1m depth

Shoring:

TP L/12



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Trialpit No
TP L/12
Sheet 2 of 2

Co-ords: -
Level: -

Date
01/03/2004

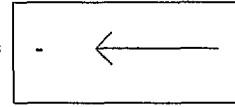
Project Name: Dorans Pit Ground Investigation

Dimensions: -

Scale
1:25

Location: Blessington, Co. Wicklow.

Depth
5.50m



Logged By
DL

Client: Roadstone Dublin Ltd.

JBA Project No. 2901-04

Samples & In Situ Testing				Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Waterstrike	Results				
				5.50			Brown fine sandy SILT/silty fine SAND (SANDS & GRAVELS)
							Trialpit Complete at 5.50 m
6				6			
7				7			
8				8			
9				9			

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Remarks:

Stability: Sides stand vertical

Groundwater: Slight seepage at 2.1m depth

Shoring:

TP L/12



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Windy Arbour, Dublin 14, Ireland.
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Trialpit No
TP L/13
Sheet 1 of 1

Co-ords: -
Level: -

Date
01/03/2004

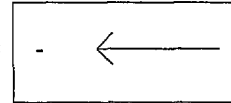
Project Name: Dorans Pit Ground Investigation

Dimensions: -

Scale
1:25

Location: Blessington, Co. Wicklow.

Depth
2.20m



Logged By

Client: Roadstone Dublin Ltd.

JBA Project No. 2901-04

Samples & In Situ Testing				Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Waterstrike	Results				
				0.60			Firm to stiff sandy CLAY with occasional gravel. (TOPSOIL)
				2.20			Brown clayey sandy GRAVEL with some cobble. Gravel sub-rounded to rounded. (SANDS & GRAVELS)
Trialpit Complete at 2.20 m							

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Remarks:

Stability: Sides unstable

Groundwater: Trial pit dry

Shoring:

TP L/13



John Barnett and Associates Ltd.

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Trialpit No
TP L 14
Sheet 1 of 1

Co-ords: -
Level: -

Date
01/03/2004

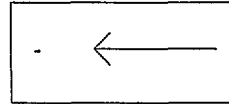
Project Name: Dorans Pit Ground Investigation

Dimensions: -

Scale
1:25

Location: Blessington, Co. Wicklow.

Depth
2.50m



Logged By

Client: Roadstone Dublin Ltd.

JBA Project No. 2901-04

Samples & In Situ Testing				Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Waterstrike	Results				
1				1			Brown slightly clayey sandy GRAVEL with some to much cobble. Gravel and cobble sub-rounded to rounded (SANDS & GRAVELS)
2				2			
2.50				2.50			
3				3			
4				4			

For inspection purposes only.
Consent of copyright owner required for any other use.

Trialpit Complete at 2.50 m

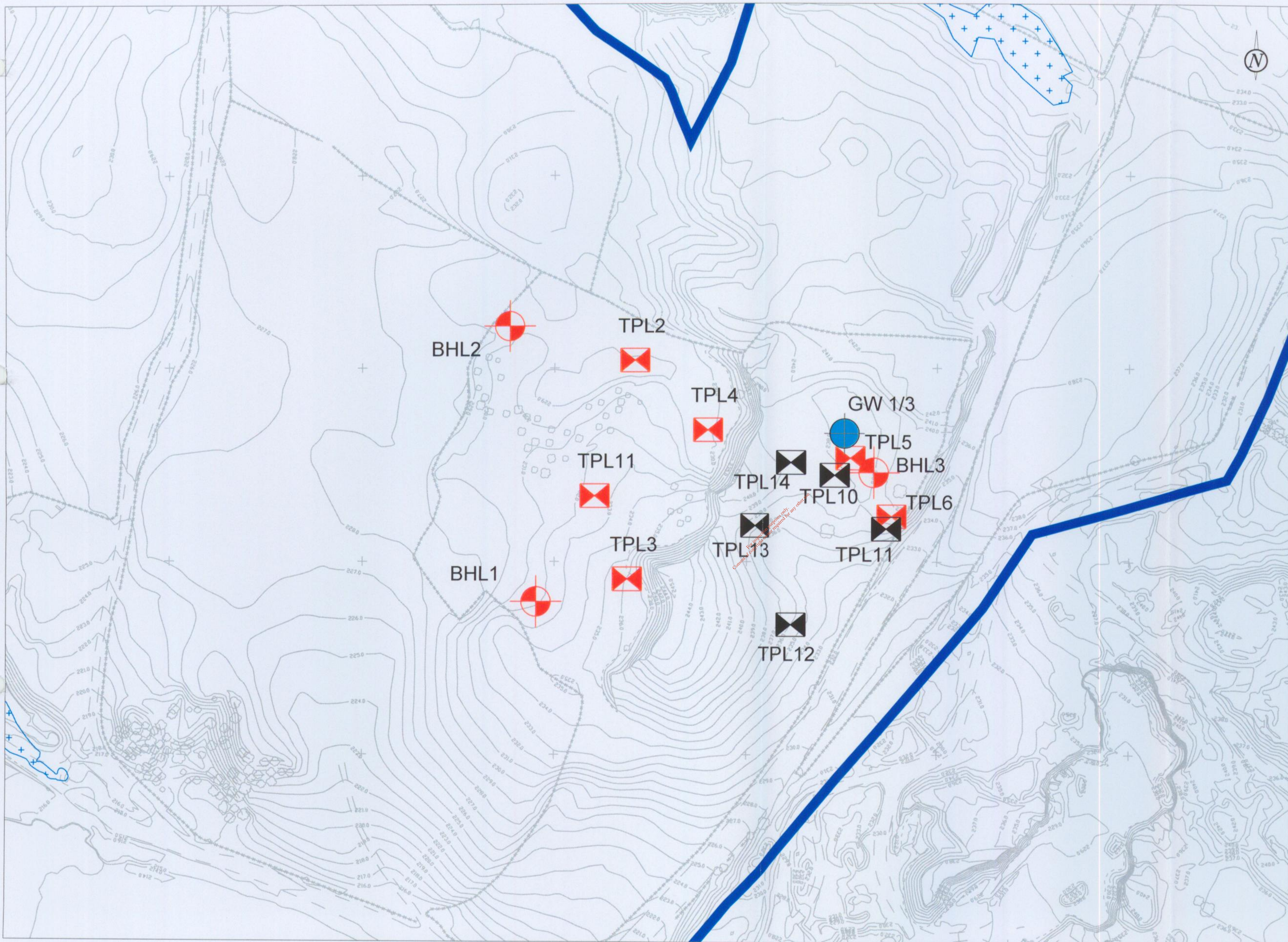
Remarks:

Stability: Sides unstable

Groundwater: Trial pit dry

Shoring:

TP L 14



Trail Pit Locations

TPL1	E 298021 N 215934	Ground Level 232
TPL2	E 298042 N 216004	Ground level 229
TPL3	E 298038 N 215891	Ground Level 236
TPL4	E 298080 N 215968	Ground Level 230
TPL5	E 298155 N 215953	Ground Level 238
TPL6	E 298176 N 215923	Ground Level 238
TPL10	E 298147 N 215945	Ground Level 238
TPL11	E 298173 N 215917	Ground Level 233
TPL12	E 298124 N 215868	Ground Level 236
TPL13	E 298104 N 215919	Ground Level 237
TPL14	E 298124 N 215951	Ground Level 237

Borehole Locations

BHL1	E 297990 N 215879	Ground Level 231.7
BHL2	E 297977 N 216022	Ground level 239.5
BHL3	E 298137 N 215946	Ground Level 237.9

Groundwater Well Locations

GW 1/3	E 298147 N 215984	Ground Level 237.7
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Notes:
 Locations of Trial Pits TP10 - TP14 approximate only

Excavated and Logged by Irish Geotechnical Services Limited.

Excavated and Logged by John Barnett & Associates.

roadstone

ROADSTONE DUBLIN LTD.
 FORTUNESTOWN
 TALLAGHT
 DUBLIN 24

JBA

JOHN BARNETT & ASSOCIATES
 7 DUNDUM BUSINESS PARK
 WINDY ARBOUR
 DUBLIN 14

Legend

	Roadstone Dublin Landholding
	Trial Pit Location
	Groundwater Wells
	Boreholes

Rev.	Date	By	Description
1	Mar 04	SMD/PM	
0	Dec 03	SMD/PM	

Site:	Lands at Blessington, Co. Wicklow		
Project:	Remediation of Unauthorised Landfill Sites		
Title:	Proposed Landfill Site - Ground Investigation Locations		
Drawn: SMD/PM	Scale: 1:2000	APP. 5D	
Job. No: 2901/09	Date: Dec 2003		