APPENDIX A

CALCULATIONS

Calculation of Joint Rotation & Eccentricity

Notes

1 Calculations based on TII Document CA/HA/BT/C11/54026/02/O pg 4/3

2 Input by user is in blue text

Ovalisation	d	0.8	mm	
Allowable deflection between 2 sides of tunnel	dall	0.4	mm	
Centroidal Radius	r	5595	mm	
Angle subtended by a segment,	β	56.8	degrees	
Calculations				
a = r + dall	a	5595.4		
b = r - dall	b	5594.6		
Chord length	L	5326		
	p	-0.0003		
	q	11190.8		
	r	-34243454.2		
	χ	3060.2	mm	
Original angle between segment and horiztonal	θ	61.58	degrees	
New angle of the segment to the horizontal	α	61.57	degrees	
Birdsmouthing between two segments	2(θ–α)	**0.009**	degrees	
Joint Rotation of Each Segment	(θ–α)	**0.005**	degrees	
t width at rotation = 0.581 degrees				
Max possible Contact Width		170	mm	
Packing thicknes		2.00	mm	
max strain (elastic)		0.67	mm	
Thickness of compressed packer		0.66	mm	
		0.69	mm	Opening caused by joint rotation ref 4/6A
Contact width	x	8270	mm	High Contact Width relates to very low rotation of joint angle (i.e. low birdsmouthing between two segments)
Min Contact width	x	170	mm	
Length of lining above packing		90	mm	
Lining thickness		350	mm	
Radial Joint Eccentricity	e	**28.3**	**mm**	=Min eccentricity due to linear distribution of load over length of packing

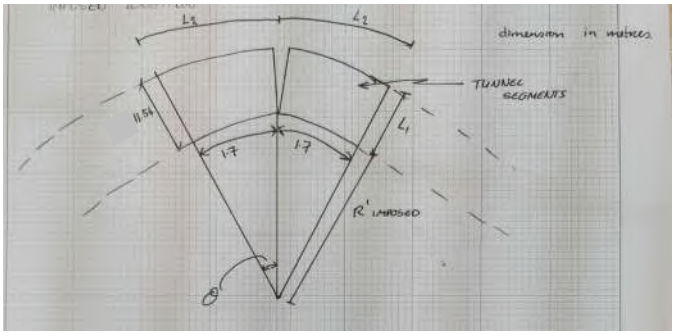
Assessment of Joint Opening due to Longitudinal Curvature of Tunnels

IMPOSED RADIUS OF CURVATURE (R') DUE TO DEVELOPMENT

L	10	m	Distance between points of inflect
δ	0.03	mm	Maximum displacement between points of inflection
$R' = (L/2)^2 / 2\delta$			**R' = Imposed radius of curvature**
R'	416.67	**km**	Imposed radius of curvature due to longitudinal tunnel deflection

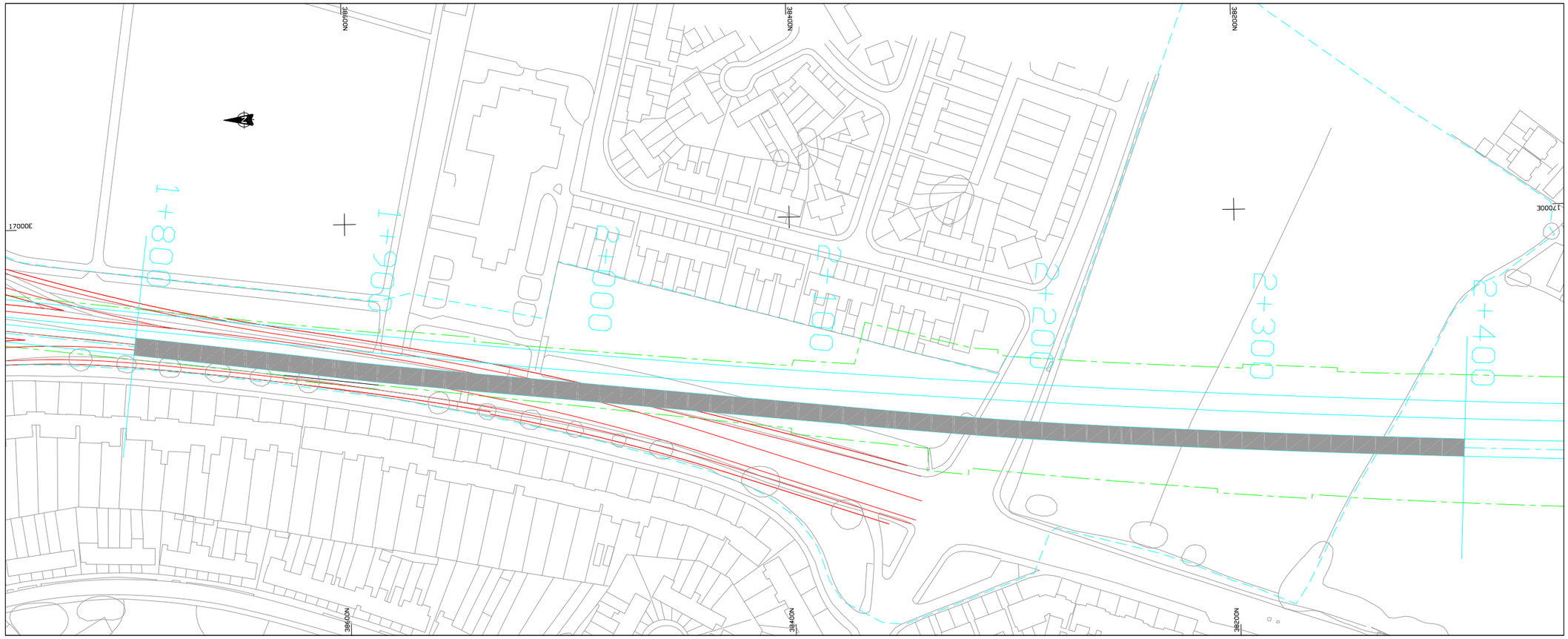
CHECK FOR OPENING OF TUNNEL JOINTS

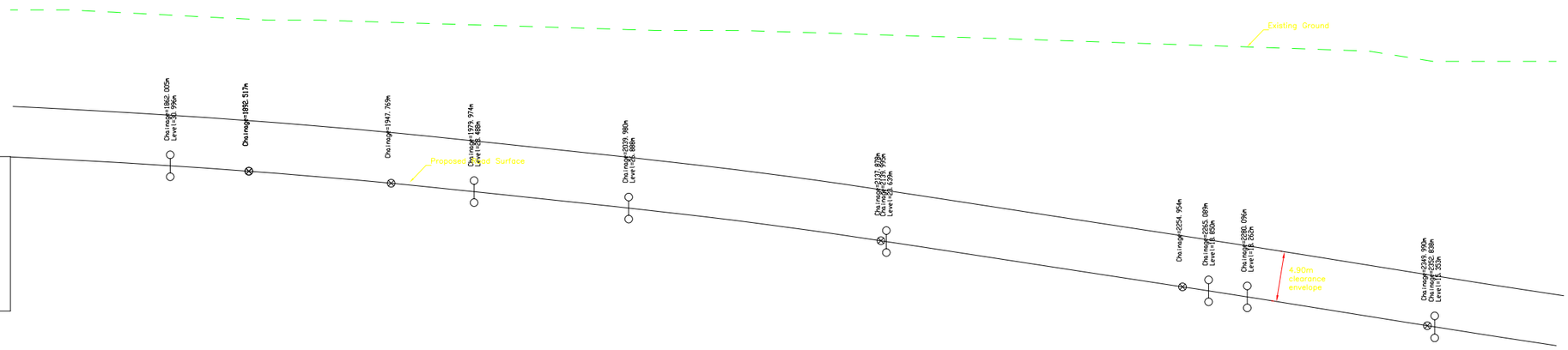
R'	416666667	**mm**
L1	1700.0	**mm**
θ '=L1/R'	4.08E-06	**radians**
Tunnel diameter	1.15E+04	**mm**
L2	1700.047	**=(R'+L1) θ**
Joint Opening	0.05	**mm**



APPENDIX B

AS-BUILT DRAWINGS OF DUBLIN PORT TUNNELS





DESIGN SPEED 80 kph

SCALES :

HORIZONTAL 1:1000

VERTICAL 1:250

Level Datum =8.000

CHAINAGE	PROPOSED LEVEL	EXISTING LEVEL
1800.000	31.859	46.000
1810.000	31.736	46.000
1820.000	31.607	46.000
1830.000	31.471	45.904
1840.000	31.330	45.775
1850.000	31.182	45.646
1860.000	31.028	45.517
1870.000	30.867	45.388
1880.000	30.696	45.258
1890.000	30.517	45.129
1900.000	30.328	45.000
1910.000	30.130	45.000
1920.000	29.923	45.000
1930.000	29.706	44.924
1940.000	29.481	44.848
1950.000	29.246	44.772
1960.000	29.003	44.696
1970.000	28.750	44.620
1980.000	28.488	44.544
1990.000	28.221	44.468
2000.000	27.954	44.392
2010.000	27.687	44.316
2020.000	27.421	44.240
2030.000	27.154	44.164
2040.000	26.887	44.088
2050.000	26.615	44.012
2060.000	26.331	44.009
2070.000	26.035	44.006
2080.000	25.727	44.001
2090.000	25.408	43.951
2100.000	25.078	43.872
2110.000	24.736	43.794
2120.000	24.382	43.715
2130.000	24.016	43.637
2140.000	23.639	43.558
2150.000	23.256	43.480
2160.000	22.873	43.401
2170.000	22.491	43.323
2180.000	22.108	43.244
2190.000	21.725	43.166
2200.000	21.342	43.087
2210.000	20.959	43.001
2220.000	20.576	42.916
2230.000	20.193	42.830
2240.000	19.810	42.745
2250.000	19.427	42.659
2260.000	19.045	42.574
2270.000	18.660	42.488
2280.000	18.266	42.403
2290.000	17.866	42.317
2300.000	17.466	42.232
2310.000	17.066	42.146
2320.000	16.666	42.061
2330.000	16.266	41.885
2340.000	15.866	41.488
2350.000	15.466	41.092
2360.000	15.068	41.000
2370.000	14.675	41.000
2380.000	14.289	41.000
2390.000	13.909	41.000
2400.000	13.536	41.000

HORIZONTAL ALIGNMENT
R=9997.955m L=92.517m
R=-2260.000m L=55.251m
L=190.109m
R=-2372.000m L=117.076m
R=-13075.000m L=95.036m
R=-7525.000m L=50.010m

VERTICAL ALIGNMENT
L=173.481m R=-15992.790m
L=117.969m R=-10900.970m
L=60.006m G=-2.667
L=100.015m R=-8608.247m
L=125.094m G=-3.829
L=15.007m R
L=72.742m G=-4.000
R=15991.974m L=159.808m

SUPERELEVATION
Left +2.5%
Right -2.5%

Note:
1. This drawing only to be used for the design element stated in the title box.

AS BUILT

Key:
— — — — Surface Limits
——— - ——— Subsurface Limits

Mark Chd By	Date	By	Rev.
DGP	04/07/06	DGP	10 – As Built Changes Added
	05/04/04	RAC	09 – Alignment Revised
GMacD	28/08/03	RAC	08 – Alignment Revised
07	22/01/02	LYT	DRAWING ISSUED FOR CONSTRUCTION
06	10/10/01	RAC	LONG SECTION PROFILE AMENDED.
05	06/07/01	CJC	DRAWING UPDATED TO PRELIMINARY DESIGN
04	05/01	CJC	ALIGNMENT REVISED.
03	27/3/01	SJD	DRAWING NUMBER UPDATED
02	02/01	CJC	NORTHBOUND ALIGNMENT REVISED.

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An tÚdarás um Bóithre Náisiúnta

Client
Dublin Corporation
Bárdas Átha Cliath

Title
CB 1.2 MAINLINE NB
PLAN AND PROFILE
CH.1+800 TO CH.2+400
SHEET 3 OF 8

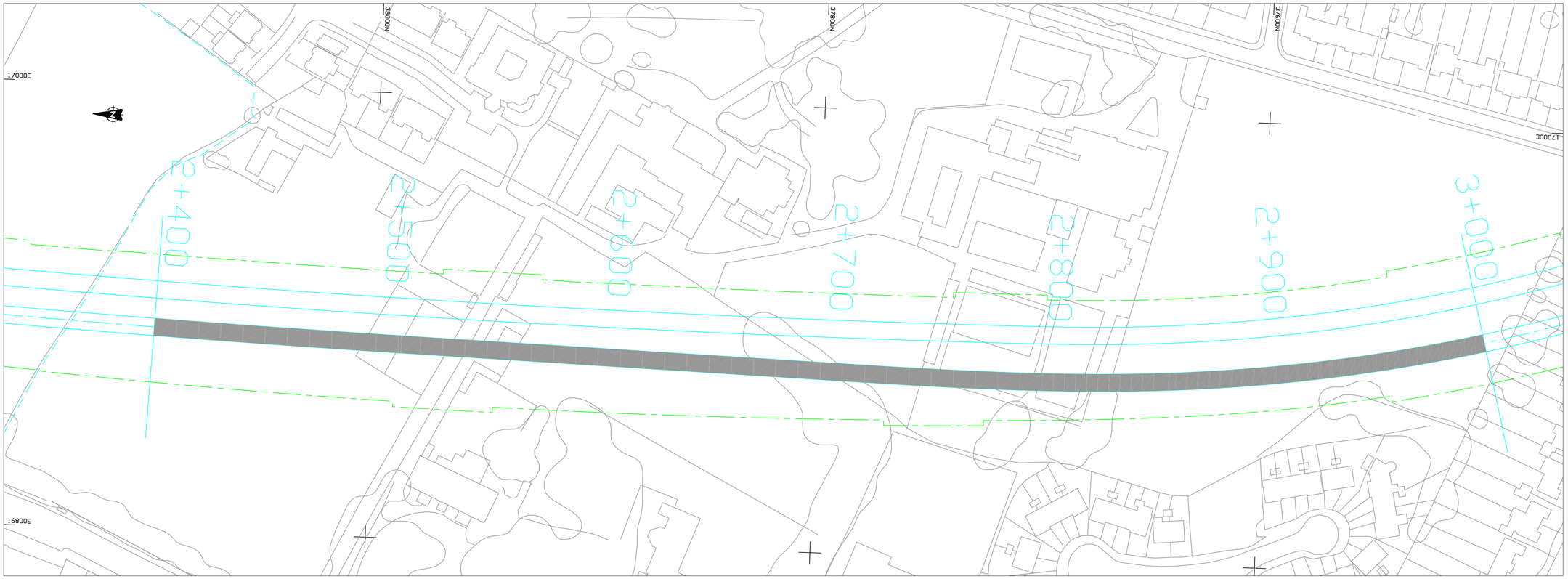
Scales 1:1000

Drn. CJC Date JAN 2002 Chd. RAC Passed RLG

Project No. 84.1469

Drawing No. DR/CB/PRO/C1/70032/10/X

Original Drawing Size : 594 x 841 – A1



DESIGN SPEED 80 kph

SCALES :

HORIZONTAL 1:1000

VERTICAL 1:250

Level Datum =-10.000

PROPOSED LEVEL	13.536 13.168 12.807 12.452 12.104 11.761 11.425 11.095 10.772 10.454 10.143 9.838 9.538 9.243 8.958 8.638 8.338 8.038 7.738 7.438 7.137 6.837 6.537 6.237 5.937 5.637 5.337 5.037 4.737 4.437 4.137 3.837 3.537 3.237 2.936 2.636 2.336 2.036 1.736 1.436 1.136 0.836 0.536 0.236 -0.064 -0.364 -0.664 -0.964 -1.264 -1.565 -1.865 -2.165 -2.465 -2.765 -3.065 -3.365 -3.665 -3.965 -4.265 -4.565 -4.865
EXISTING LEVEL	41.000 41.000 41.000 41.000 40.999 40.881 40.656 40.430 40.205 39.979 39.754 39.528 39.303 39.077 39.000 38.932 38.589 38.247 37.903 37.783 37.612 37.442 37.272 37.102 36.856 36.495 36.133 35.713 35.259 34.821 34.406 34.000 33.816 33.632 33.448 33.264 33.081 32.876 32.656 32.435 32.214 31.996 31.824 31.621 31.418 31.216 31.051 30.792 30.361 29.778 29.475 29.172 28.820 28.425 28.031 27.700 27.376 27.051 26.806 26.576 26.345
HORIZONTAL ALIGNMENT	R=-7525.000m L=113.660m; L=184.533m; A=1277.045 L=156.756m; R=-810.834m L=143.051m
VERTICAL ALIGNMENT	R=15991.974m L=159.808m; L=732.177m G=-3.001
SUPERELEVATION	+2.5% Left -2.5% Right +2.5% -2.5% +2.79% -2.79% Right +2.79% Left -2.79%
CHAINAGE	2400.000 2410.000 2420.000 2430.000 2440.000 2450.000 2460.000 2470.000 2480.000 2490.000 2500.000 2510.000 2520.000 2530.000 2540.000 2550.000 2560.000 2570.000 2580.000 2590.000 2600.000 2610.000 2620.000 2630.000 2640.000 2650.000 2660.000 2670.000 2680.000 2690.000 2700.000 2710.000 2720.000 2730.000 2740.000 2750.000 2760.000 2770.000 2780.000 2790.000 2800.000 2810.000 2820.000 2830.000 2840.000 2850.000 2860.000 2870.000 2880.000 2890.000 2900.000 2910.000 2920.000 2930.000 2940.000 2950.000 2960.000 2970.000 2980.000 2990.000 3000.000

Note:

1. This drawing only to be used for the design element stated in the title box.

AS BUILT

Key:

Surface Limits

Subsurface Limits

Mark	Date	By	Rev.
DGP	04/07/06	DGP	12 – As Built Changes Added
	12/11/04	AOH	11 – Amendment to typographical error superelevation
GMacD	05/04/04	AOH	10 – Alignment Revised
GMacD	26/08/03	RAC	09 – Alignment Revised
08	22/01/02	LYT	DRAWING ISSUED FOR CONSTRUCTION
07	10/10/01	RAC	LONG SECTION PROFILE AMENDED.
06	08/01	CJC	SUPERELEVATION REVISED TO COMPLY WITH DMRB
05	06/07/01	CJC	DRAWING UPDATED TO PRELIMINARY DESIGN
04	05/01	CJC	ALIGNMENT REVISED.
03	27/3/01	SJO	DRAWING NUMBER UPDATED

Project

DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An Údarás um Bóithre Náisiúnta

Client

Dublin Corporation

Bárdas Átha Cliath

Title

Cb 1.2 MAINLINE NB

PLAN AND PROFILE

CH.2+400 TO CH.3+000

SHEET 4 OF 8

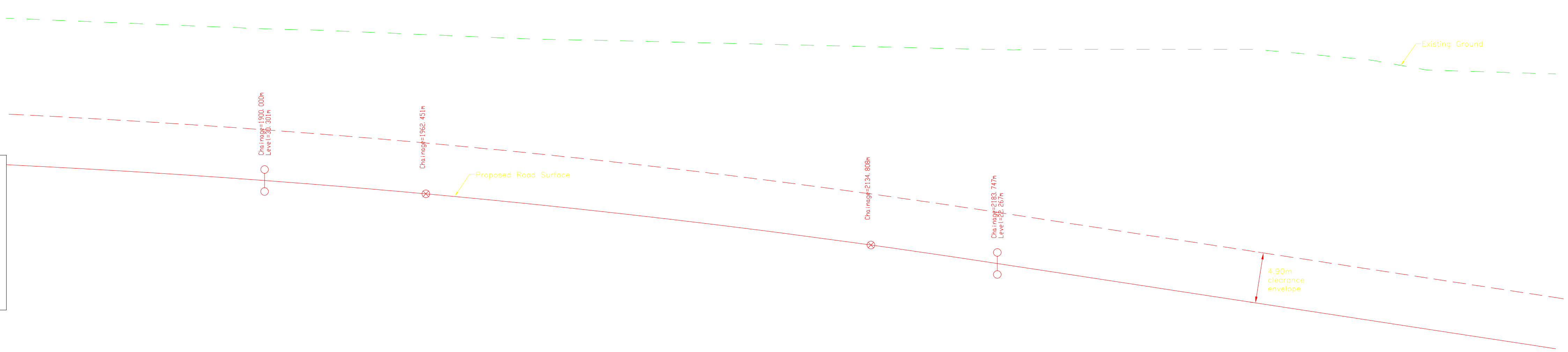
Scales 1:1000

Drn. CJC Date JAN 2002 Chd. RAC Passed RLG

Project No. 84.1469

Drawing No. DR/CB/PRO/C1/70033/12/X

Original Drawing Size : 594 x 841 – A1



DESIGN SPEED 80 kph

SCALES :

HORIZONTAL 1:1000

VERTICAL 1:250

Level Datum =9.000

CHAINAGE	PROPOSED LEVEL	EXISTING LEVEL
1800.000	31.831	46.000
1810.000	31.706	45.923
1820.000	31.575	45.820
1830.000	31.438	45.717
1840.000	31.294	45.614
1850.000	31.144	45.512
1860.000	30.988	45.409
1870.000	30.826	45.306
1880.000	30.657	45.203
1890.000	30.482	45.100
1900.000	30.301	44.998
1910.000	30.113	44.925
1920.000	29.918	44.876
1930.000	29.717	44.771
1940.000	29.508	44.666
1950.000	29.292	44.562
1960.000	29.070	44.457
1970.000	28.840	44.352
1980.000	28.604	44.248
1990.000	28.360	44.143
2000.000	28.109	44.038
2010.000	27.852	43.966
2020.000	27.588	43.927
2030.000	27.316	43.882
2040.000	27.038	43.823
2050.000	26.753	43.764
2060.000	26.460	43.706
2070.000	26.161	43.647
2080.000	25.855	43.588
2090.000	25.542	43.529
2100.000	25.221	43.470
2110.000	24.894	43.412
2120.000	24.560	43.353
2130.000	24.219	43.294
2140.000	23.871	43.235
2150.000	23.516	43.176
2160.000	23.154	43.118
2170.000	22.785	43.059
2180.000	22.409	43.000
2190.000	22.028	42.936
2200.000	21.646	43.000
2210.000	21.264	43.000
2220.000	20.882	43.000
2230.000	20.500	43.000
2240.000	20.118	43.000
2250.000	19.736	43.000
2260.000	19.354	43.000
2270.000	18.972	43.000
2280.000	18.590	43.000
2290.000	18.208	42.866
2300.000	17.826	42.636
2310.000	17.444	42.406
2320.000	17.062	42.176
2330.000	16.680	41.897
2340.000	16.298	41.456
2350.000	15.916	41.015
2360.000	15.534	40.927
2370.000	15.152	40.851
2380.000	14.770	40.775
2390.000	14.388	40.699
2400.000	14.006	40.623

HORIZONTAL ALIGNMENT: R=-19995.910m L=162.451m; R=-5998.773m L=172.357m; R=-7498.466m L=265.192m

VERTICAL ALIGNMENT: L=214.781m R=-15993.487m; L=283.747m R=-14352.598m; L=269.324m G=-3.820

SUPERELEVATION: Right +2.5% … +2.5%; Left -2.5% … -2.5%

Note:

1. This drawing only to be used for the design element stated in the title box.

AS BUILT

Key:

Surface Limits

Subsurface Limits

Mark / Chd By	Date	By	Rev.
DGP	04/07/06	DGP	09 – As Built Changes Added
	28/08/03	RAC	08 – Alignment Revised
01	22/01/02	LYT	DRAWING ISSUED FOR CONSTRUCTION
06	10/10/01	RAC	LONG SECTION PROFILE AMENDED.
05	06/07/01	CJC	DRAWINGS UPDATED TO PRELIMINARY DESIGN
04	05/01	CJC	ALIGNMENT REVISED.
03	27/3/01	SJD	DRAWING NUMBER UPDATED
02	02/01	CJC	NORTHBOUND ALIGNMENT REVISED.

Project

DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An tÚdarás um Bóithre Náisiúnta

Client

Dublin Corporation

Bárdas Átha Cliath

Title

CB 1.2 MAINLINE SB
PLAN AND PROFILE
CH.1+800 TO CH.2+400
SHEET 3 OF 8

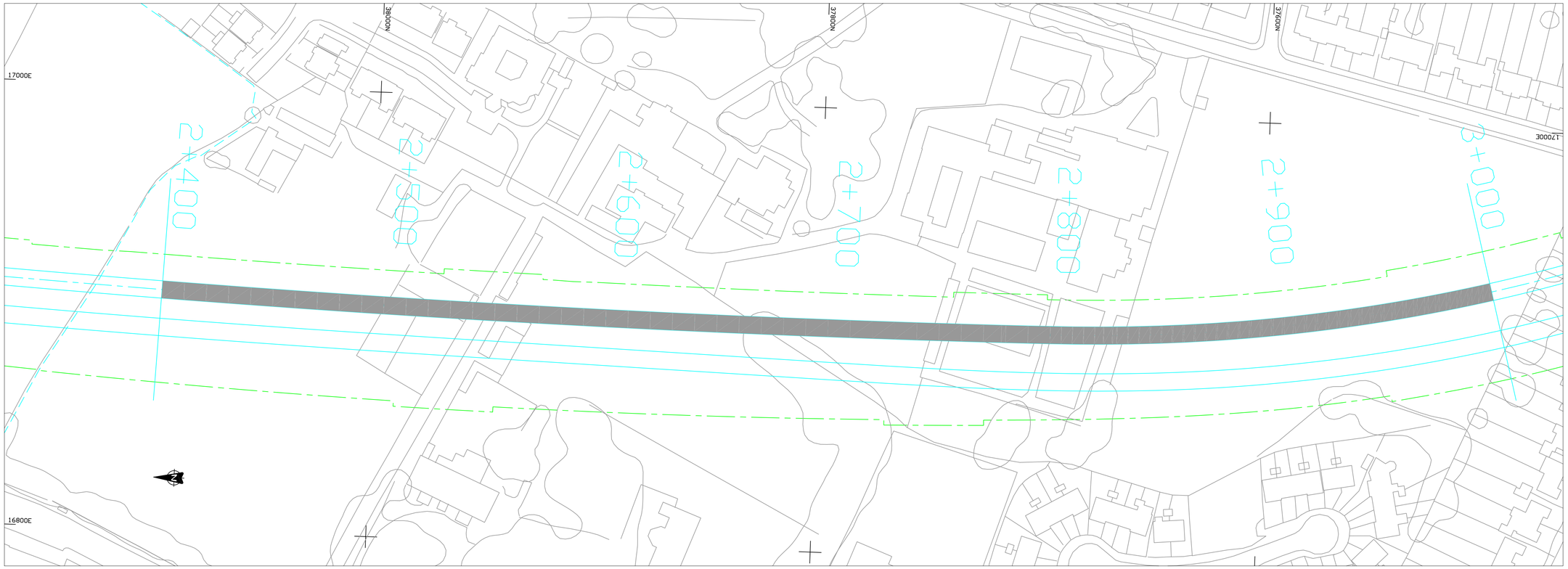
Scales 1:1000

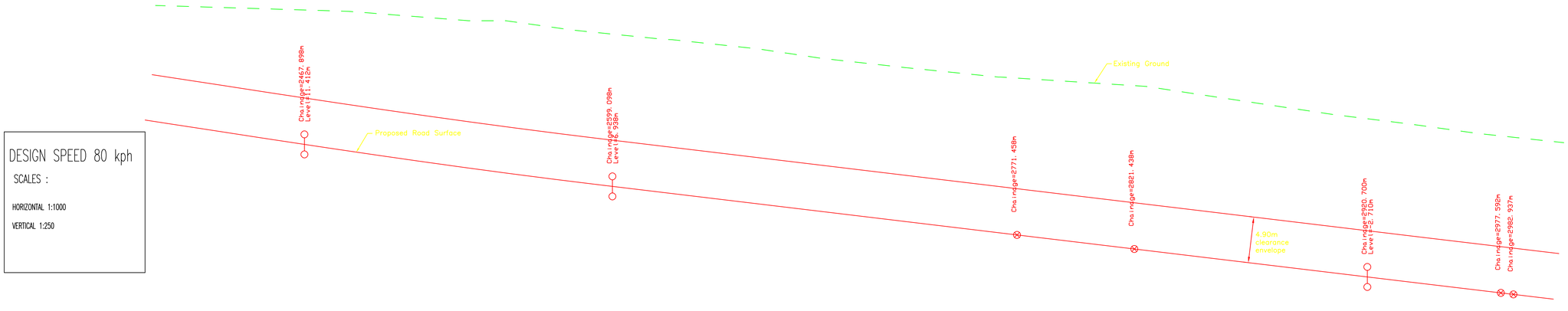
Drn. CJC | Date JAN 2002 | Chd. RAC | Passed RLG

Project No. 84.1469

Drawing No. DR/CB/PRO/C1/70040/09/X

Original Drawing Size : 594 x 841 – A1





DESIGN SPEED 80 kph

SCALES :

HORIZONTAL 1:1000

VERTICAL 1:250

Level Datum =-11.000

CHAINAGE	PROPOSED LEVEL	EXISTING LEVEL
2400.000	14.006	
2410.000	13.624	
2420.000	13.242	
2430.000	12.860	
2440.000	12.478	
2450.000	12.096	
2460.000	11.714	
2470.000	11.332	
2480.000	10.954	
2490.000	10.583	
2500.000	10.218	
2510.000	9.859	
2520.000	9.507	
2530.000	9.160	
2540.000	8.820	
2550.000	8.486	
2560.000	8.159	
2570.000	7.837	
2580.000	7.522	
2590.000	7.214	
2600.000	6.911	
2610.000	6.611	
2620.000	6.311	
2630.000	6.011	
2640.000	5.711	
2650.000	5.411	
2660.000	5.111	
2670.000	4.811	
2680.000	4.511	
2690.000	4.211	
2700.000	3.911	
2710.000	3.611	
2720.000	3.311	33.991
2730.000	3.011	33.737
2740.000	2.711	33.483
2750.000	2.411	33.229
2760.000	2.111	33.000
2770.000	1.811	32.839
2780.000	1.511	32.678
2790.000	1.211	32.517
2800.000	0.911	32.356
2810.000	0.611	32.195
2820.000	0.311	32.034
2830.000	0.011	31.701
2840.000	-0.289	31.321
2850.000	-0.589	30.942
2860.000	-0.889	30.568
2870.000	-1.189	30.193
2880.000	-1.489	29.819
2890.000	-1.789	29.445
2900.000	-2.089	29.070
2910.000	-2.389	28.749
2920.000	-2.689	28.441
2930.000	-2.989	28.132
2940.000	-3.288	27.800
2950.000	-3.587	27.453
2960.000	-3.885	27.105
2970.000	-4.183	26.812
2980.000	-4.480	26.543
2990.000	-4.777	26.274
3000.000	-5.073	26.005

HORIZONTAL ALIGNMENT
R=-7498.466m L=371.458m
A=44749.247 L=49.980m
R=-799.836m L=156.154m
A L
R L=17.063m

VERTICAL ALIGNMENT
L=284.151m G=-3.820
R=16000.000m L=131.200m
L=321.601m G=-3.000
R=199028.020m L=80.000m

SUPERELEVATION
+2.5% Right
-2.5% Left
Right
Left
+2.5%
-2.5%
+2.83%
-2.83%
Right
Left
+2.83%
-2.83%
Right
Left
+2.5%
-2.5%

Note:

1. This drawing only to be used for the design element stated in the title box.

AS BUILT

Key:

— — — — Surface Limits

——— – ——— Subsurface Limits

Mark Chd By	Date	By	Rev.
DGP	04/07/06	DGP	11 – As Built Changes Added
	25/09/04	KRG	10 – Alignment Revised (5–57)
GMacD	05/04/04	DRM	09 – Alignment Revised
GMacD	28/08/03	RAC	08 – Alignment Revised
07	22/01/02	LYT	DRAWING ISSUED FOR CONSTRUCTION
06	10/10/01	RAC	LONG SECTION PROFILE AMENDED.
05	06/07/01	CJC	DRAWING REVISED TO PRELIMINARY DESIGN
04	05/01	CJC	ALIGNMENT REVISED.
03	27/3/01	SJD	DRAWING NUMBER UPDATED
02	02/01	CJC	NORTHBOUND ALIGNMENT REVISED.

Project

DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

GCG

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY
An tÚdarás um Bóithre Náisiúnta

Client

Dublin Corporation
Bárdas Átha Cliath

Title

CB 1.2 MAINLINE SB
PLAN AND PROFILE
CH.2+400 TO CH.3+000
SHEET 4 OF 8

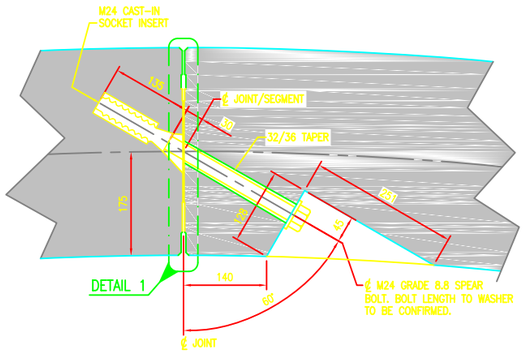
Scales 1:1000

Drn. CJC
Date JAN 2002
Chd. RAC
Passed RLG

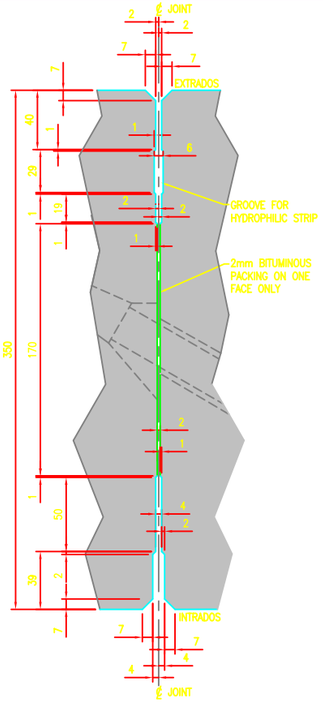
Project No. 84.1469

Drawing No. DR/CB/PRO/C1/70041/11/X

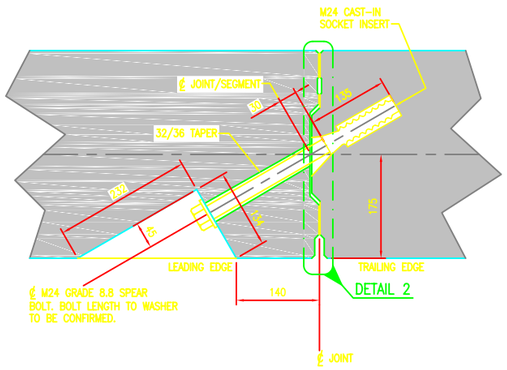
Original Drawing Size : 594 x 841 – A1



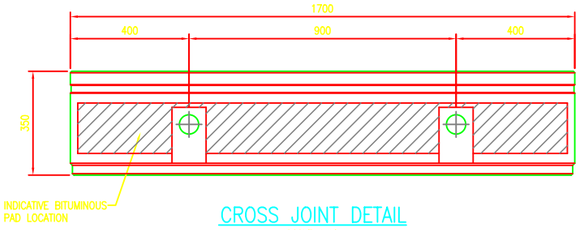
CROSS JOINT CONNECTION
SCALE 1:5



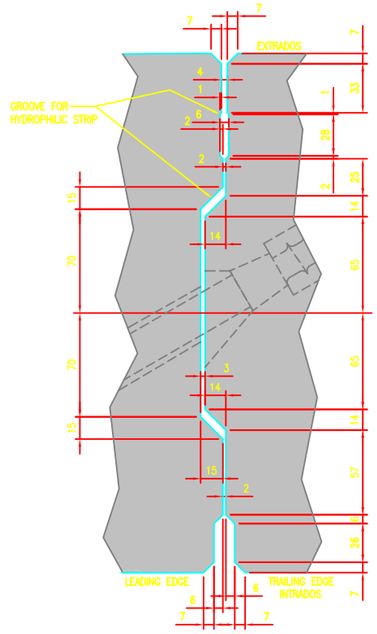
DETAIL 1
CROSS JOINT CONNECTION
SCALE 1:2



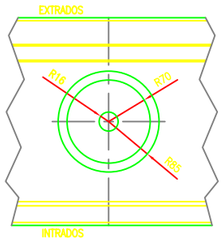
CIRCLE JOINT CONNECTION
SCALE 1:5



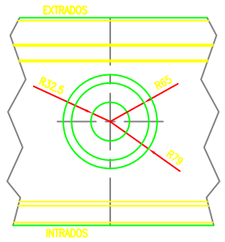
CROSS JOINT DETAIL
SCALE 1:10



DETAIL 2
CIRCLE JOINT CONNECTION
SCALE 1:2



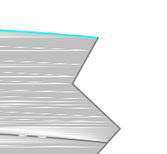
RECESS
LEADING EDGE
SCALE 1:5



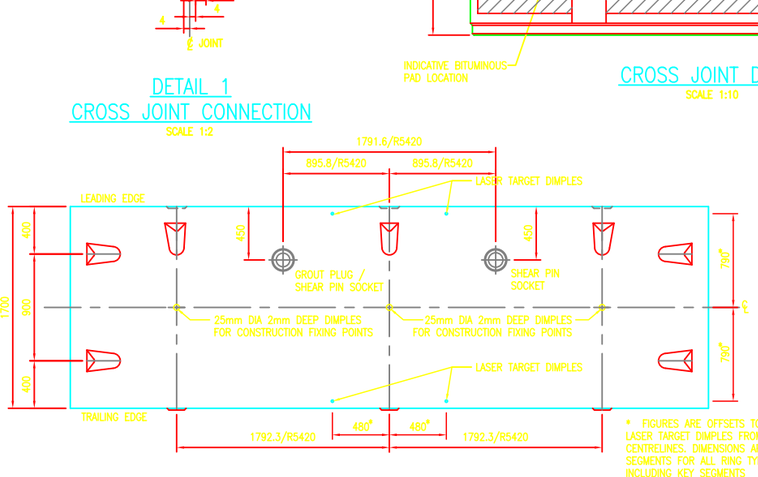
BUILDING BOSS
TRAILING EDGE
SCALE 1:5

OUTER CIRCLE JOINT BOLT POCKET DETAIL
SCALE 1:5

INNER CIRCLE JOINT BOLT POCKET DETAIL
SCALE 1:5

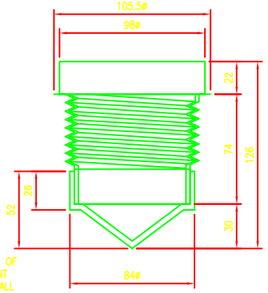


CROSS JOINT BOLT POCKET DETAIL
SCALE 1:5

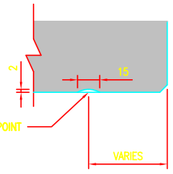


* FIGURES ARE OFFSETS TO CENTRE OF LASER TARGET DIMPLES FROM SEGMENT CENTRELINES. DIMENSIONS APPLY TO ALL SEGMENTS FOR ALL RING TYPES INCLUDING KEY SEGMENTS

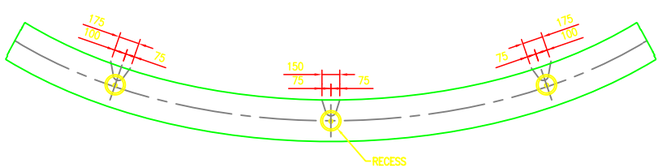
TYPICAL SEGMENT DETAIL – STANDARD RING DEVELOPED VIEW
SCALE 1:25



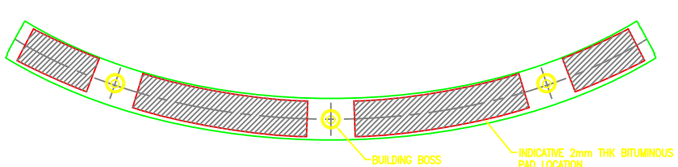
DETAIL 3 – GROUT PLUG
SCALE 1:2



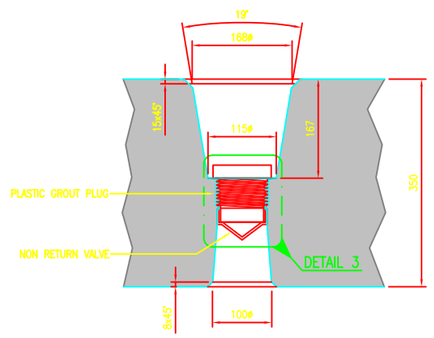
DETAIL OF LASER TARGET DIMPLE
SCALE 1:2



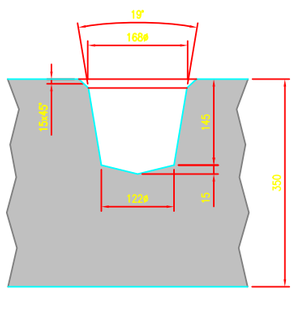
CIRCLE JOINT DETAIL – LEADING EDGE
SCALE 1:25



CIRCLE JOINT DETAIL – TRAILING EDGE
SCALE 1:25



GROUT PLUG/SHEAR PIN SOCKET DETAIL
SCALE 1:5



SHEAR PIN SOCKET DETAIL
SCALE 1:5

0 50 100 150 200mm
SCALE 1:2

0 100 200 300 400 500mm
SCALE 1:5

0 200 400 600 800 1000mm
SCALE 1:10

0 400 800 1200 1600 2000 2400mm
SCALE 1:25

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. CHARACTERISTIC STRENGTH OF CONCRETE TO BE CLASS 60.
3. MINIMUM PULL-OUT LOAD FOR BOLT/SOCKET TO BE 8 TONNES.
4. ALL MATERIALS USED HAVE BEEN APPROVED IN ACCORDANCE WITH THE SITE BASE QUALITY ASSURANCE PROCEDURES.
5. COVER TO BE 40mm NOMINAL, 35mm MINIMUM.
6. THIS DRAWING TO BE READ IN CONJUNCTION WITH DWG Nos. 41002, 41003, 41004, 41012 & 41013.
7. GRUMMET OR COMPRESSIBLE WASHER TO BE INSERTED WITH BOLTS. GRUMMET/WASHER TYPE TO BE CONFIRMED.
8. BOLT DIMENSIONS TO BE CONFIRMED DEPENDING ON SOCKET DETAILS.
9. GROUT SOCKET AS SHOWN OR SIMILAR APPROVED.
10. MAXIMUM GROUT PRESSURE TO BE 4.6 BAR.
11. OVER 80% OF THE BOLTS REMAINED IN PLACE ONCE RINGS BUILT AND GRANTED.
12. DIMPLES FOR CONSTRUCTION FIXING POINTS APPLICABLE TO ALL SEGMENTS FOR ALL RING TYPES EXCEPT KEY SEGMENTS
13. GROUT TO ACHIEVE CHARACTERISTIC STRENGTH PRIOR TO GANTRY WHEEL TRAVELLING OVER SEGMENT NIB

Rev.	Date	By	Rev.
09	9.11.06	CD	AS-BUILT ISSUE
08	--	MA	AS-BUILT CHANGES ADDED
07	9.02.02	SML	DRAWING ISSUED FOR CONSTRUCTION
06	2.2.02	GRD	NOTE ADDED
05	22.8.01	GRD	MINOR AMENDMENTS AT NCC REQUEST.
04	5.7.01	PRD	NMI COMMENTS INCORPORATED.
03	27.6.01	NDA	DEFINITIVE DESIGN
02	31.5.01	NDA	NMI COMMENTS INCORPORATED

Project: DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An tÚdarás um Bóithre Náisiúnta

Client: Dublin Corporation Bárdas Átha Cliath

Title: 10840 I.D. TUNNEL PRECAST CONCRETE LINING DETAILS

Scales: 1/25, 1/10, 1/5, 1/2

Drn: NDA Date: 14/5/01 Chk: Passed

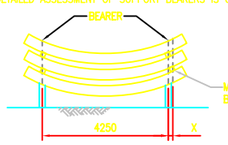
Project No.: 4958 Design Package: HWD 4.3

Drawing No.: DR/HA/BT/C11/41001/09/X

Original Drawing Size : 594 x 841 -- A1

DESIGN ASSUMPTIONS RELATING TO TEMPORARY LOADING CONDITIONS

1. MAXIMUM NUMBER OF SEGMENTS TO BE STACKED/LIFTED IS THREE UNLESS DETAILED ASSESSMENT OF SUPPORT BEARERS IS UNDERTAKEN.



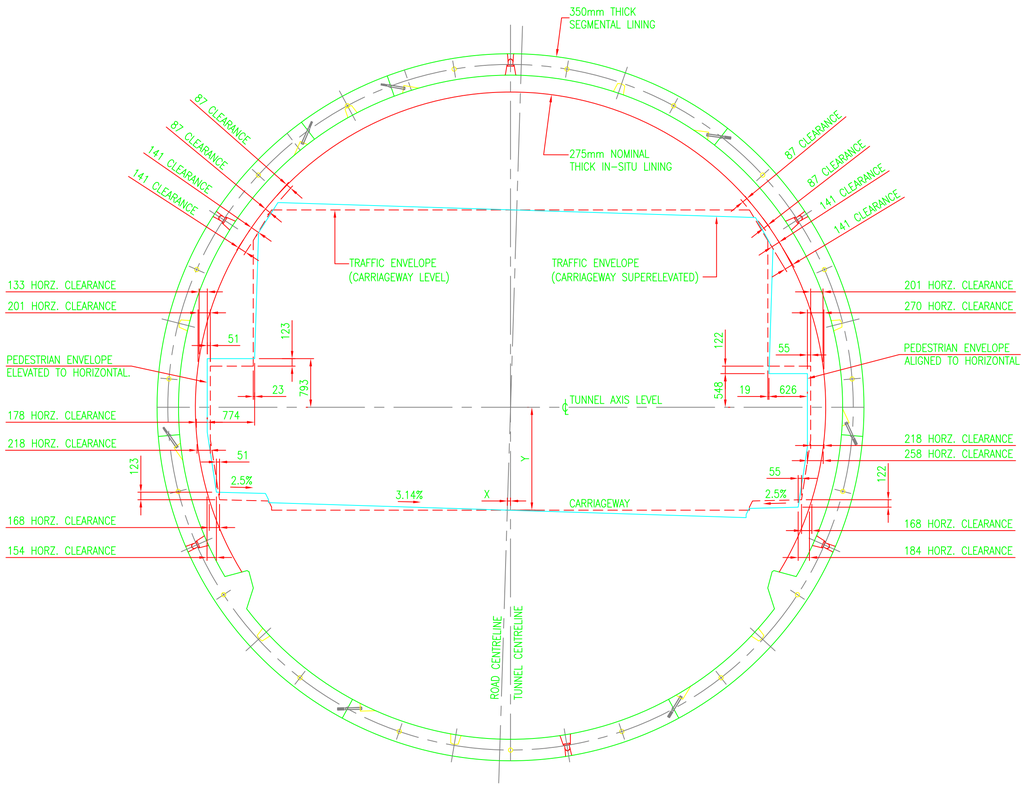
2 No. BEARERS MIN PER SEGMENT AT 4250mm SPACING. BEARERS TO BE MIN 1800mm LONG. 'X' MAXIMUM HORIZONTAL OFFSET IS 150mm. LIFTING POINTS TO MATCH BEARER POSITIONS ON LOWER SEGMENT. ALTERNATIVE ARRANGEMENTS TO BE AGREED BY THE CONTRACTOR'S DESIGNER.

2. MOULDS NOT TO BE STRUCK UNTIL CHARACTERISTIC STRENGTH OF 18N/mm2 IS ATTAINED. LIFTING LUGS ASSUMED TO BE PROVIDED AT QUARTER POINTS ON LEADING/TRAILING EDGES. MANUFACTURERS LIFTING METHOD TO BE AGREED.
3. SEGMENTS NOT TO BE STACKED 3 HIGH UNTIL CHARACTERISTIC STRENGTH OF 25N/mm2 IS ATTAINED.
4. ALL CIRCLE BOLTS TO SEGMENTS ABOVE AXIS LEVEL TO BE INSERTED AND RAM PRESSURE TO BE MAINTAINED ON SEGMENTS PRIOR TO REMOVAL OF ERECTOR PADS. RAM PRESSURE TO BE REMOVED ONLY AFTER COMPLETE RING HAS BEEN BOLTED. ALTERNATIVE SEQUENCE TO BE AGREED BY THE CONTRACTOR'S DESIGNER.
5. PLANE MIS-ALIGNMENT ON CIRCLE JOINT GREATER THAN PACKER THICKNESS MAY RESULT IN DAMAGE TO SEGMENT DURING RAM SHOVE.
6. SHOVE RAM THRUST OF 2655kN OVER 900mm SHOE LENGTH NOT TO BE EXCEEDED. LOADS IN EXCESS OF THIS VALUE MAY RESULT IN DAMAGE TO SEGMENTS.

AS-BUILT

Changes have been made to the 'For Construction' drawing.
This drawing should be read in conjunction with Field Change Request numbers:

FCR/NC/NTS/T04/38315/01/C	Change in segment lifting arrangements



DISPLACEMENT BETWEEN ROAD AND TUNNEL ALIGNMENT TO SUIT ROAD SUPERELEVATION (MAX. SHOWN)

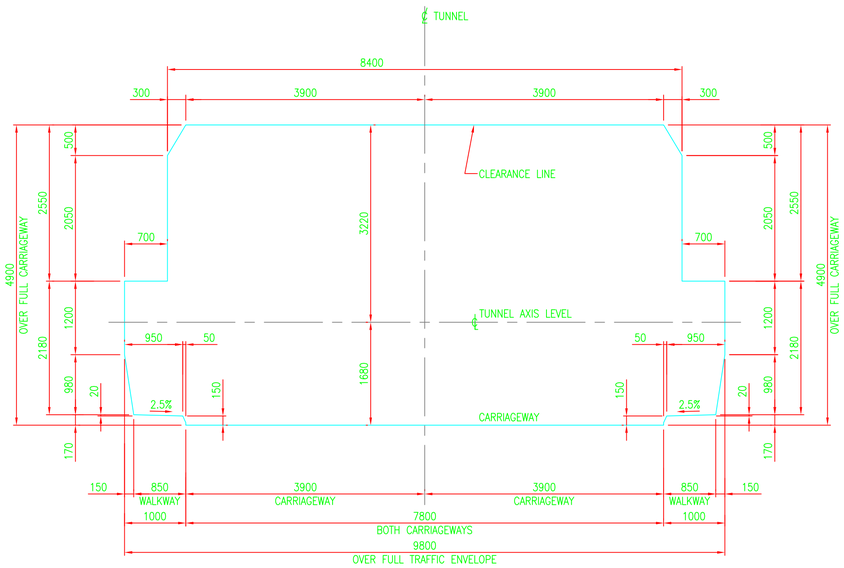
SCALE 1:50

NOTE:

CLEARANCES MAY VARY FROM THEORETICAL DUE TO DRIVING TOLERANCES AND DESIGN REALIGNMENTS. REFER TO WRIGGLE SURVEY IN AS-BUILT RECORDS.

SUPER ELEVATION	HORIZONTAL SHIFT FROM ROAD ALIGNMENT TO TUNNEL AXIS X	VERTICAL SHIFT FROM ROAD ALIGNMENT TO TUNNEL AXIS Y
0.50%	8.40mm	1679.98mm
1.00%	16.80mm	1679.92mm
1.50%	25.20mm	1679.81mm
2.00%	33.60mm	1679.66mm
2.50%	42.00mm	1679.47mm
2.80%	47.04mm	1679.34mm
3.14%	52.75mm	1679.17mm

SCHEDULE OF SHIFT BETWEEN TUNNEL CENTREPOINT AND CARRIAGEWAY CENTRELINE WITH VARYING SUPER ELEVATION



TRAFFIC ENVELOPE (BASED ON REFERENCE DESIGN CONTRACT DRAWING 26-03-TN-401)

SCALE 1:50

AS-BUILT

0 1 2 3 4 5m

SCALE 1:50

NOTES

1. NO ALLOWANCE FOR ROAD LAYING TOLERANCE IN SPECIFIED CLEARANCE. HOWEVER TOLERANCE ON ROAD SURFACE LEVEL TO BE ± 6mm FROM DESIGN POSITION IN ACCORDANCE WITH TABLE 7/1 OF VOLUME 1 OF THE NRA SPECIFICATION FOR ROAD WORKS.
2. NO ALLOWANCE FOR ROAD RESURFACING
3. WALKWAYS FALL 2.5% TO HORIZONTAL, TOWARDS THE CARRIAGEWAY, IRRELEVANT OF ROAD SUPER ELEVATION. WALKWAY ENVELOPE ORIENTATED TO HORIZONTAL.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING No DR/HA/BT/C11/41101.
5. TOLERANCE OF POSITION OF INNER LINING TO BE ± 50mm IN ACCORDANCE WITH BTS MODEL SPECIFICATION FOR TUNNELLING (1997) CLAUSE 360.1.
6. MINIMUM STRENGTH OF CONCRETE TO BE 10N/mm^2 PRIOR TO STRIKING SECONDARY LINING SHUTTER.
7. FINISH TO CONCRETE TO BE F3 AS EMPLOYERS REQUIREMENTS VOLUME 3, PART 3, CLAUSE 3.16.6.15, AND COATED AS CLAUSE 3.16.6.16.
8. LINING TO BE COATED WITH CERAMICOAT REFER TO DRAWING No's :- DR/HA/BT/C11/41054,41056,41061,41063.

Mark	Date	By	Rev.
07	9.11.06	CD	AS-BUILT ISSUE
06	-	MA	AS-BUILT CHANGES ADDED.
05	07.11.02	SJS	FOR CONSTRUCTION
04	15.07.02	CEG	NMI COMMENTS INCORPORATED
03	08.05.02	RJY	TRAFFIC ENVELOPE REALIGNED.
02	13.11.01	SRC	NMI COMMENTS INCORPORATED
01	18.09.01	BM	FIRST ISSUE

Chd. By

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO Consortium

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An Údarás um Bóithre Náisiúnta

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

Title
BORED TUNNEL
TUNNEL ALIGNMENT SETTING OUT RELATIVE TO CARRIAGEWAY ALIGNMENT

Scales 1:50

Drn. GD/BM Date 28/02/01 Chd. Passed

Project No. 4958

Design Package HWD 4.4.1

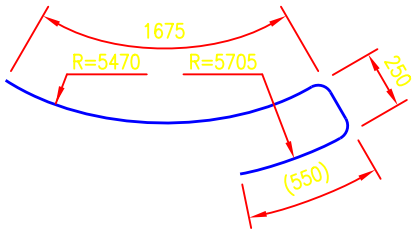
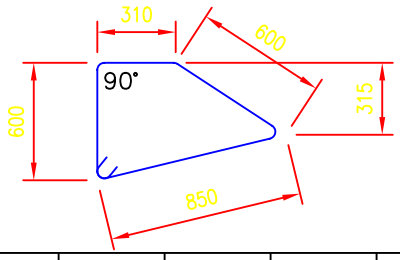
Drawing No. DR/HA/BT/C11/41018/07/X

Original Drawing Size : 594 x 841 - A1

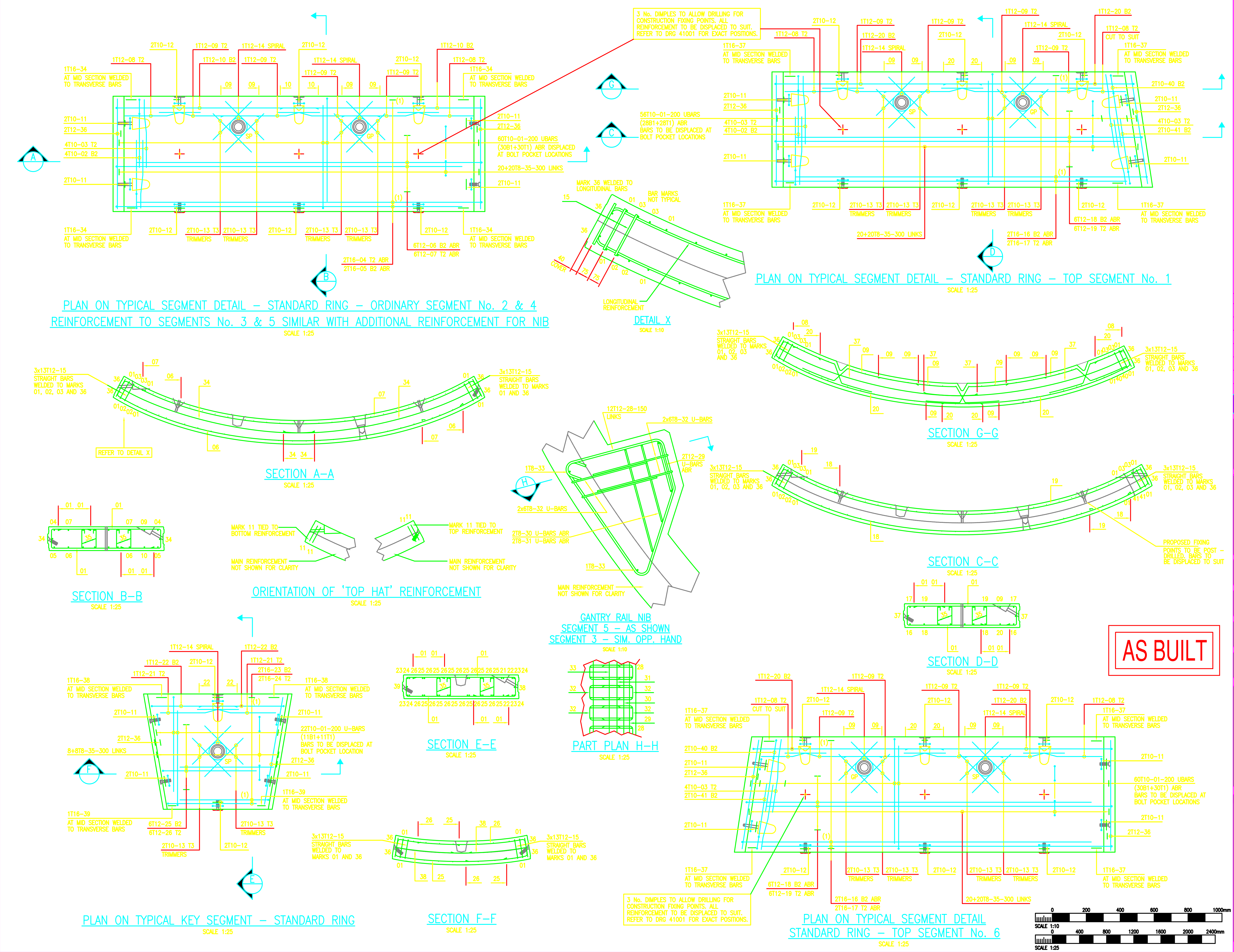
BAR SCHEDULE

Haswell ■ Consulting Engineers

Project No.	4958 – DUBLIN PORT TUNNEL	Bar Schedule Ref	RS/HA/BT/C11/41513/06/C 0 7
Package	10840 ID TUNNEL	Drawing Ref	DR/HA/BT/C11/41013
Structure	PRECAST CONCRETE LINING	Date Prepared	22/6/01 Date Revised 19/02/02
		Prepared By	NDA Checked by LLJ

Member	Bar mark	Type and size	No. of mbrs.	No. of bars in each	Total no.	Length of each bar ** mm	Shape code	A* mm	B* mm	C* mm	D* mm	E/R* mm
	26	T12		6	6	2425	99					
	35	T8		16	16	925	77	270	230			
	36	T12		4	4	1625	20					
	38	T16		1+1	2	1200	65	1200				5585
	39	T16		1+1	2	975	65	975				5585
NIB TO SEGMENTS 3 and 5	28	T12	2	12	24	2500	99					
	29	T12		2	4	2250	38	1000	300	(1000)		
	30	T8		2	4	2300	38	930	470	(930)		
	31	T8		2	4	2450	38	930	625	(930)		
	32	T8		2x6x2	48	1050	38	460	175	(460)		
	33	T8		1+1	4	1625	20					

* Specified in multiples of 5mm. ** Specified in multiples of 25mm. (This schedule is based on BS 4466).



NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. DO NOT SCALE THIS DRAWING. ONLY FIGURED DIMENSIONS ARE TO BE USED.
3. REFER TO GENERAL NOTES ON DWG No. 41001.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH DWG Nos. 41001, 41002, 41003, 41004 & 41012.
5. LAP LENGTHS:–
   T10 – 300mm T12 – 350mm T16 – 460mm
6. WELDS TO BE GRADE 50. MINIMUM AREA OF WELD TO BE 110mm2
7. ALL BARS TO BE GRADE 460 TYPE 2(T) U.N.O.
8. REINF'T DESIGNATIONS ARE AS BS.4466 : 1989
9. NOMINAL COVER 40mm. MINIMUM COVER 35mm
10. BAR LAYER NOTATIONS AS FOLLOWS:–
    B1 BOTTOM FACE OUTER LAYER
    B2 BOTTOM FACE SECOND LAYER
    T1 TOP FACE OUTER LAYER
    T2 TOP FACE SECOND LAYER
11. ABBREVIATIONS AS FOLLOWS:–
    ABR ALTERNATE BARS REVERSED
12. FOR REINFORCEMENT DETAILS REFER TO BAR BENDING SCHEDULE :– RS/HA/BT/C11/41513 SHEETS 1 TO 7.
13. THE ADEQUACY OF ALL REINFORCEMENT FOR LIFTING AND STIFFENING IS TO BE CONFIRMED BY THE CONTRACTOR

Mark Chd By	Date	By	Rev.
08	–	BM	AS BUILT CHANGES ADDED
07	19.02.02	SML	DRAWING ISSUED FOR CONSTRUCTION
06	02.02.02	GRD	BARS MARKED 02,03,40,41 AMENDED ON PLAN.
05	14.12.01	GML	MINOR COMMENTS INCORPORATED.
04	21.8.01	PRD	MINOR AMENDMENTS AT NCC REQUEST.
03	18.7.01	PRD	NMI COMMENTS INCORPORATED.
02	6.7.01	PRD	NMI COMMENTS INCORPORATED.

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell

Carl Bro
Intelligent Solutions

HBI
HAERTER AG

NRA NATIONAL ROADS AUTHORITY

Client
Dublin Corporation
Bárdas Átha Cliath

Title
10840 I.D. TUNNEL
PRECAST CONCRETE LINING
STANDARD RING
RC DETAILS

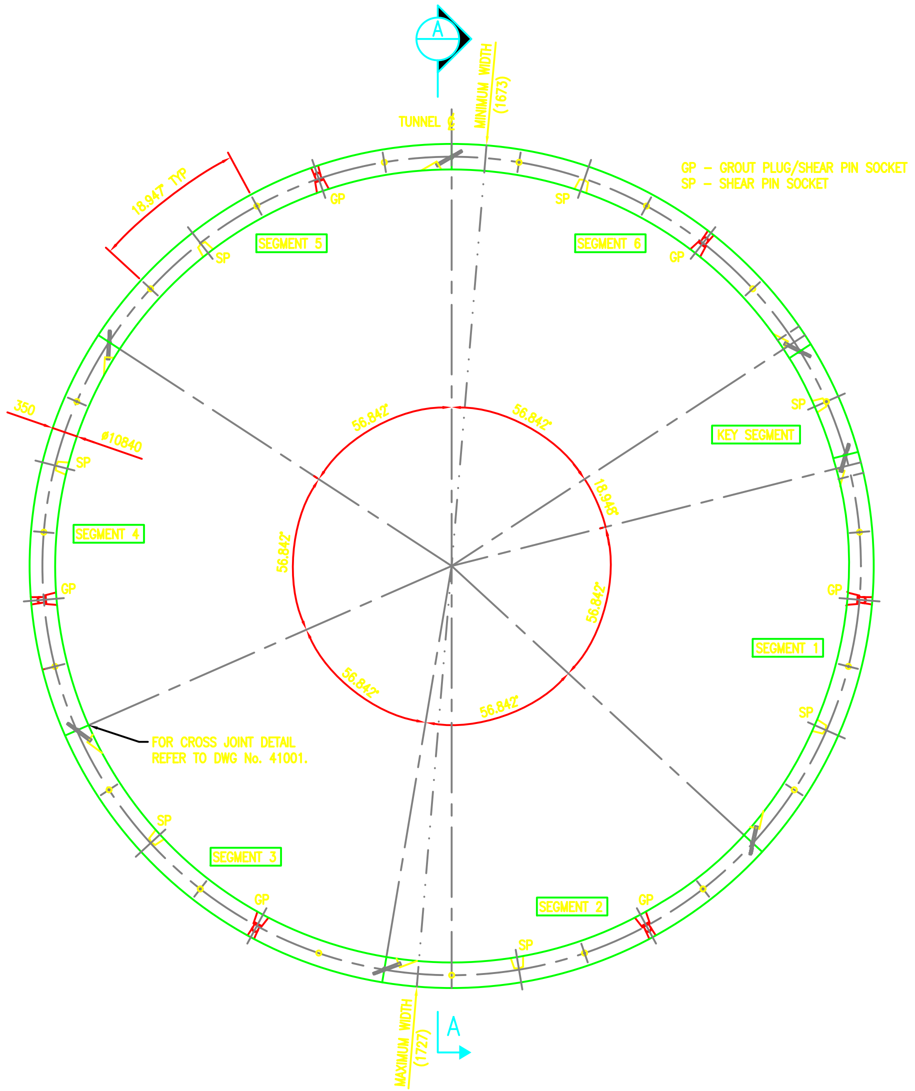
Scales 1/25, 1:10

Drn. NDA Date 22/05/01 Chd. Passed

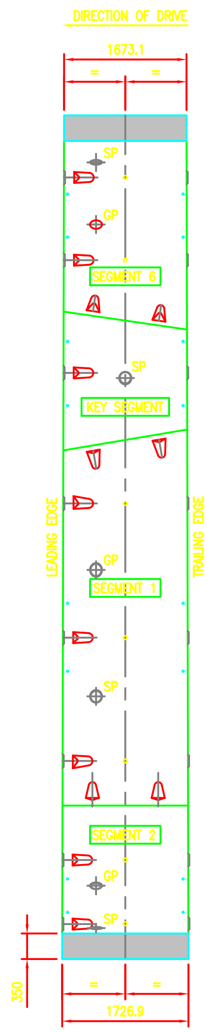
Project No. 4958 Design Package HWD 4.3

Drawing No. DR/HA/BT/C11/41013/08/X

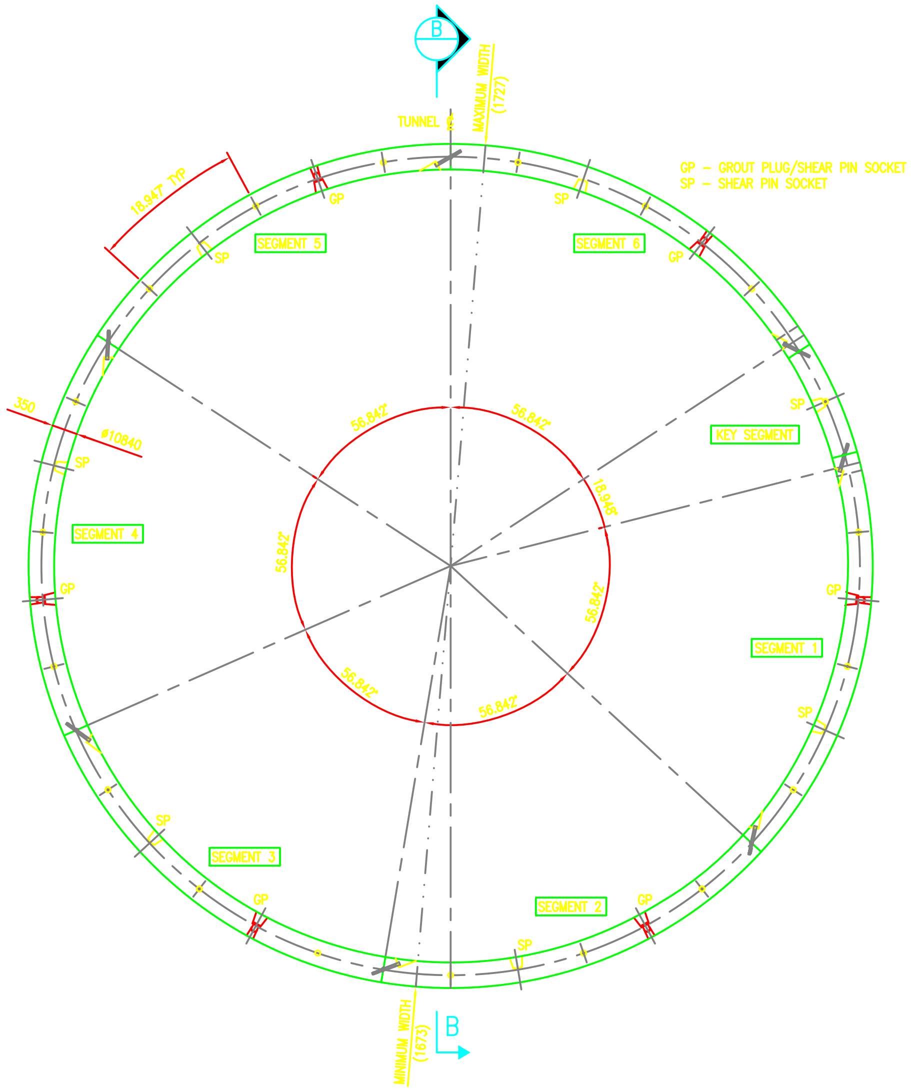
Original Drawing Size : 594 x 841 – A1



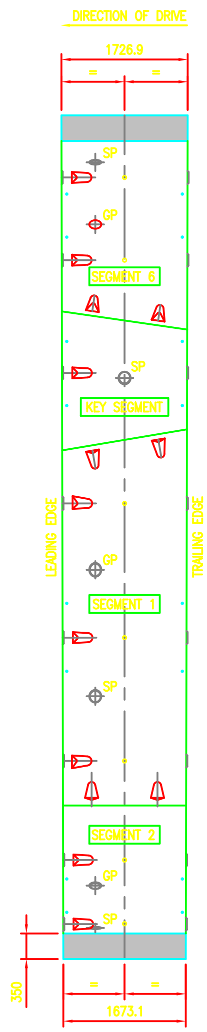
CROSS–SECTION – UP TAPER CONFIGURATION
(5 BOLT PITCH CLOCKWISE ROLL ON LEFT–HAND TAPER RING)
(VIEW IN DIRECTION OF DRIVE)
SCALE 1:50



SECTION A–A
SCALE 1:50



CROSS–SECTION – DOWN TAPER CONFIGURATION
(5 BOLT PITCH CLOCKWISE ROLL ON RIGHT–HAND TAPER RING)
(VIEW IN DIRECTION OF DRIVE)
SCALE 1:50



SECTION B–B
SCALE 1:50

AS BUILT

SCALE 1:50

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO NOTES ON DWG No. 41001.
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH DWG Nos. 41001, 41002, 41003, 41004 & 41013.
4. THIS DRAWING SHOWS STANDARD POSITIONS FOR UP/DOWN CONFIGURATIONS. RING TO BE ROLLED TO 19 POSITIONS AS REQUIRED TO FOLLOW ALIGNMENT.

Mark Chd By	Date	By	Rev.
7	–	BM	AS BUILT CHANGES ADDED
06	19.02.02	SML	DRAWING ISSUED FOR CONSTRUCTION
05	22.8.01	GRD	MINOR AMMENDMENTS AT NCC REQUEST.
04	17.7.01	NDA	FURTHER NMI COMMENTS INCORPORATED
03	5.7.01	PRD	NMI COMMENTS INCORPORATED
02	27.6.01	NDA	DEFINITIVE DESIGN
01	31.5.01	NDA	FIRST ISSUE

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell

Carl Bro
Intelligent Solutions

HBI
HAERTER AG

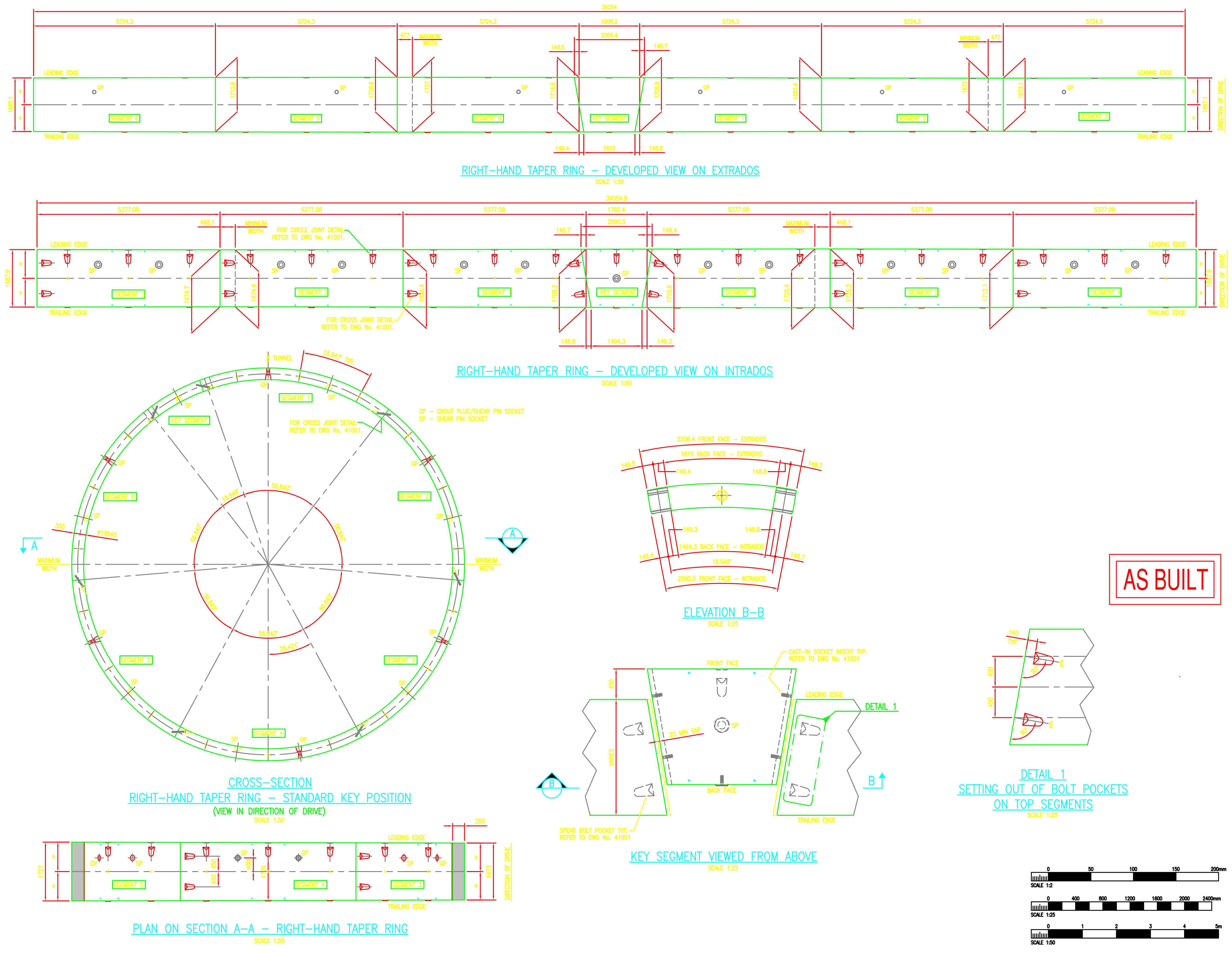
NRA NATIONAL ROADS AUTHORITY

Client
Dublin Corporation
Bárdas Átha Cliath

Title
10840 I.D. TUNNEL
PRECAST CONCRETE LINING
TAPER RING CONFIGURATION
FOR VERTICAL CURVES

Scales 1/50			
Drn. NDA	Date 22/05/01	Chd.	Passed
Project No. 4958		Design Package HWD 4.3	
Drawing No. DR/HA/BT/C11/41012/07/X			

Original Drawing Size : 594 x 841 – A1



NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO NOTES ON DWG No. 41001.
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH DWG Nos. 41001, 41002, 41003, 41012 & 41013.

Mark / Chd By	Date	By	Rev.
08	–	BM	AS BUILT CHANGES ADDED
07	19.02.02	SML	DRAWING ISSUED FOR CONSTRUCTION
06	2.2.02	GRD	DIMPLE POSITIONS ON SEGMENT 3 AMENDED
05	22.8.01	GRD	MINOR AMMENDMENTS AT NCC REQUEST
04	5.7.01	PRD	NMI COMMENTS INCORPORATED
03	27.6.01	RJY	DEFINITIVE DESIGN
02	31.5.01	NDA	NMI COMMENTS INCORPORATED

Project: DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell

Carl Bro – Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY

Client: Dublin Corporation – Bárdas Átha Cliath

Title: 10840 I.D. TUNNEL PRECAST CONCRETE LINING RIGHT-HAND TAPER RING GENERAL ARRANGEMENT

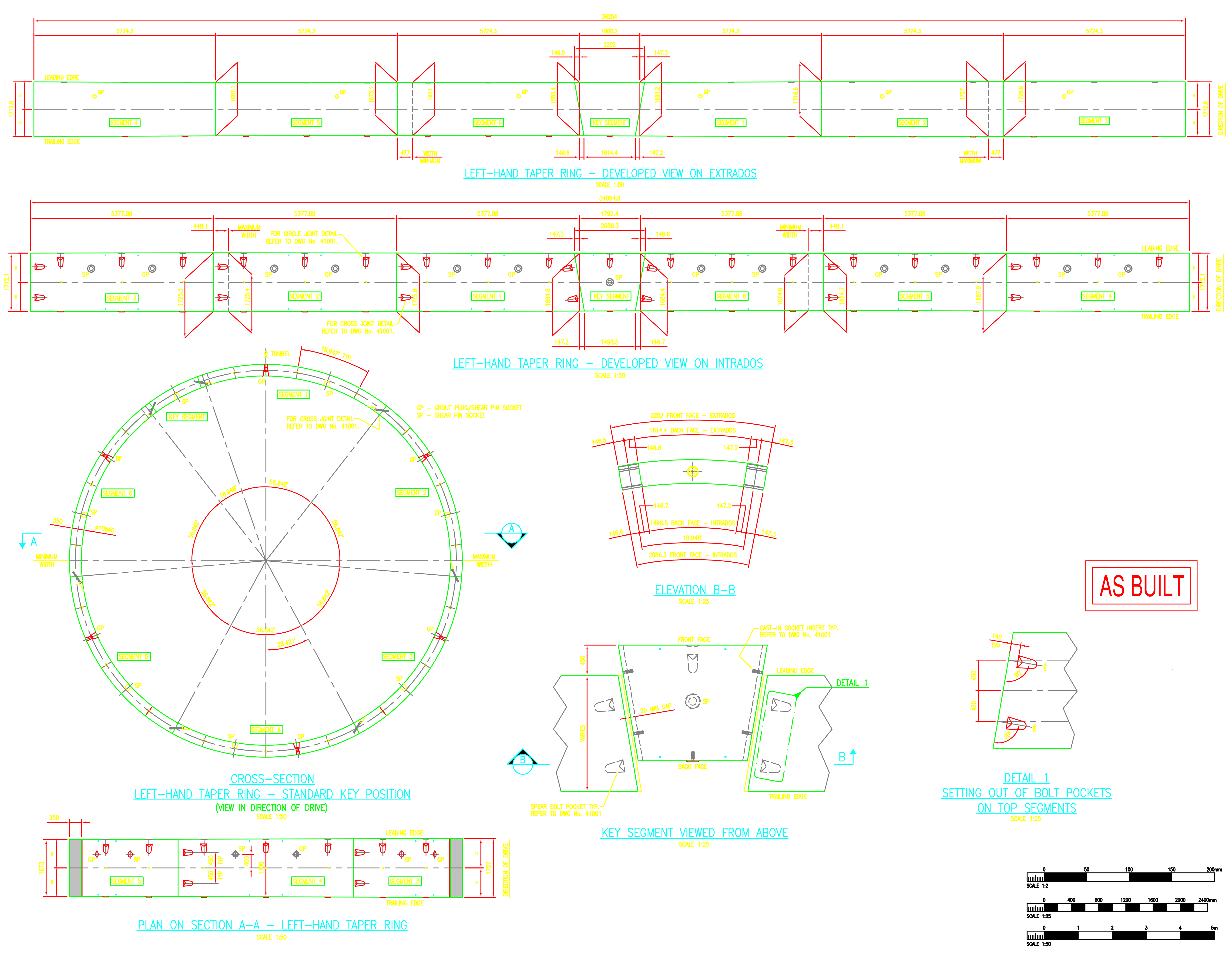
Scales: 1/50, 1/25, 1/2

Drn. NDA Date 14/05/01 Chd. Passed

Project No. 4958 Design Package HWD 4.3

Drawing No. DR/HA/BT/C11/41004/08/X

Original Drawing Size : 594 x 841 – A1



NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO NOTES ON DWG No. 41001.
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH DWG Nos. 41001, 41002, 41004, 41012 & 41013.

Mark Chd By	Date	By	Rev.
07	–	BM	AS BUILT CHANGES ADDED
06	19.02.02	SML	DRAWING ISSUED FOR CONSTRUCTION
05	22.8.01	GRD	MINOR AMMENDMENTS AT NCC REQUEST.
04	5.7.01	PRD	NMI COMMENTS INCORPORATED
03	27.6.01	RJY	DEFINITIVE DESIGN
02	31.5.01	NDA	NMI COMMENTS INCORPORATED
01	15.5.01	NDA	FIRST ISSUE

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell

Carl Bro
Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY

Client
Dublin Corporation
Bárdas Átha Cliath

Title
10840 I.D. TUNNEL
PRECAST CONCRETE LINING
LEFT-HAND TAPER RING
GENERAL ARRANGEMENT

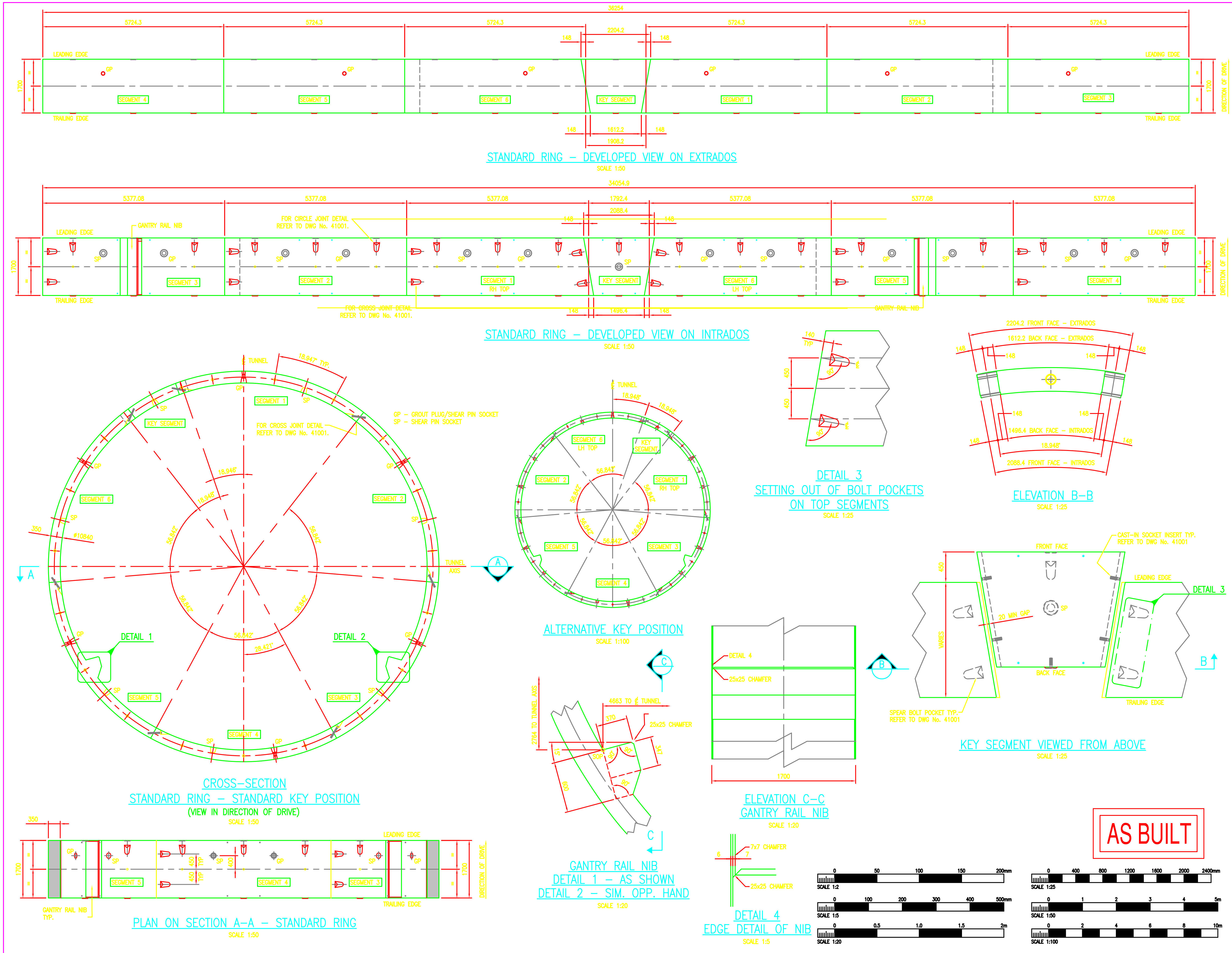
Scales 1/50, 1/25, 1/2

Drn. NDA Date 14/05/01 Chd. Passed

Project No. 4958 Design Package HWD 4.3

Drawing No. DR/HA/BT/C11/41003/07/X

Original Drawing Size : 594 x 841 – A1



NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO NOTES ON DWG No. 41001.
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH DWG Nos. 41001, 41003, 41004, 41012 & 41013.

Mark Chd By	Date	By	Rev.
07	–	BM	AS BUILT CHANGES ADDED
06	19.02.02	SML	DRAWING ISSUED FOR CONSTRUCTION
05	22.8.01	GRD	MINOR AMMENDMENTS AT NCC REQUEST.
04	5.7.01	PRD	NMI COMMENTS INCORPORATED
03	27.6.01	RJY	DEFINITIVE DESIGN.
02	31.5.01	NDA	NMI COMMENTS INCORPORATED
01	15.5.01	NDA	FIRST ISSUE

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO

Haswell

Carl Bro
Intelligent Solutions

HBI
HAERTER AG

NRA NATIONAL ROADS AUTHORITY

Client
Dublin Corporation
Bárdas Átha Cliath

Title
10840 I.D. TUNNEL
PRECAST CONCRETE LINING
STANDARD RING
GENERAL ARRANGMENT

Scales 1/100, 1/50, 1/25, 1/20, 1/2

Drn. NDA Date 14/05/01 Chd. Passed

Project No. 4958 Design Package HWD 4.3

Drawing No. DR/HA/BT/C11/41002/07/X

Original Drawing Size : 594 x 841 – A1

NORTH BOUND.

EMERGENCY CALL NICHE.		
REFERENCE	ROAD CHAINAGE	
ECN/206	2114.196	
ECN/207	FOR DETAILS SEE WA2 SECTION	
ECN/208	2525.799	
ECN/209	2774.258	
ECN/210	FOR DETAILS SEE CLOISTERS LAYBY	
ECN/211	3187.849	
ECN/212	3438.029	
ECN/213	3689.960	
ECN/214	3929.979	
ECN/215	FOR DETAILS SEE MARINO LAYBY	
ECN/216	4391.297	

FIRE FIGHTING NICHE.		
REFERENCE	ROAD CHAINAGE	
FFN/18	2008.695	
FFN/19	2097.134	
FFN/20	FOR DETAILS SEE WA2 SECTION	
FFN/21	2360.804	
FFN/22	2508.819	
FFN/23	2610.925	
FFN/24	2757.262	
FFN/25	2859.359	
FFN/26	FOR DETAILS SEE CLOISTERS LAYBY	
FFN/27	3068.694	
FFN/28	3172.479	
FFN/29	3293.281	
FFN/30	3417.577	
FFN/31	3538.392	
FFN/32	3671.246	
FFN/33	3790.364	
FFN/34	3909.554	
FFN/35	4026.998	
FFN/35b	4134.231	
FFN/36	FOR DETAILS SEE MARINO LAYBY	
FFN/37	4265.317	
FFN/38	4372.564	
FFN/39	4486.613	

FFN/35b TO BE FINALISED

PEDESTRIAN CROSS PASSAGES.		
REFERENCE	ROAD CHAINAGE	
PCP/06A	2107.360	
PCP/07A	2517.779	
PCP/08A	2765.731	
PCP/09A	3179.928	
PCP/10A	3429.639	
PCP/11A	3677.900	
PCP/12A	3919.783	
PCP/13A	4379.454	

HOSE REEL NICHE.		
REFERENCE	ROAD CHAINAGE	
HRN/17a	1951.708	
HRN/18a	2050.385	
HRN/19a	2150.715	
HRN/19b	2200.065	
HRN/20a	2302.090	
HRN/21a	2407.594	
HRN/21b	2451.818	
HRN/22a	2552.219	
HRN/23a	2659.42	
HRN/23b	2710.464	
HRN/24a	2802.347	
HRN/25a	2901.005	
HRN/25b	2943.521	
HRN/26a	FOR DETAILS SEE CLOISTERS LAYBY	
HRN/27a	3129.041	
HRN/28a	3227.75	
HRN/29a	3333.277	
HRN/29b	3375.847	
HRN/30a	3479.699	
HRN/31a	3592.118	
HRN/31b	3641.473	
HRN/32a	3731.665	
HRN/33a	3837.218	
HRN/33b	3881.478	
HRN/34a	3964.868	
HRN/35a	4084.035	
HRN/36a	FOR DETAILS SEE MARINO LAYBY	
HRN/37a	4301.949	
HRN/37b	4337.692	
HRN/38a	4432.995	
HRN/39a	FOR DETAILS SEE CUT & COVER SECTION	

SOUTH BOUND.

EMERGENCY CALL NICHE.		
REFERENCE	ROAD CHAINAGE	
ECN/104	1912.178	
ECN/105	2097.667	
ECN/106	FOR DETAILS SEE WA2 SECTION	
ECN/107	2504.138	
ECN/108	2752.532	
ECN/109	FOR DETAILS SEE CLOISTERS LAYBY	
ECN/110	3157.529	
ECN/111	3397.464	
ECN/112	3644.235	
ECN/113	3896.221	
ECN/114	FOR DETAILS SEE MARINO LAYBY	
ECN/115	4378.050	

FIRE FIGHTING NICHE.		
REFERENCE	ROAD CHAINAGE	
FFN/18	2000.648	
FFN/19	2114.664	
FFN/20	FOR DETAILS SEE WA2 SECTION	
FFN/21	2403.718	
FFN/22	2526.267	
FFN/23	2650.520	
FFN/24	2771.264	
FFN/25	2886.940	
FFN/26	FOR DETAILS SEE CLOISTERS LAYBY	
FFN/27	3084.333	
FFN/28	3176.254	
FFN/29	3296.988	
FFN/30	3417.828	
FFN/31	3542.130	
FFN/32	3664.723	
FFN/33	3788.978	
FFN/34	3914.949	
FFN/35	4035.831	
FFN/35b	4143.057	
FFN/36	FOR DETAILS SEE MARINO LAYBY	
FFN/37	4267.374	
FFN/38	4391.672	
FFN/39	4486.960	

PEDESTRIAN CROSS PASSAGES.		
REFERENCE	ROAD CHAINAGE	
PCP/06	2107.355	
PCP/07	2515.495	
PCP/08	2763.305	
PCP/09	3166.134	
PCP/10	3409.894	
PCP/11	3655.831	
PCP/12	3907.717	
PCP/13	4384.813	

HOSE REEL NICHE.		
REFERENCE	ROAD CHAINAGE	
HRN/17a	1945.411	
HRN/18a	2054.286	
HRN/19a	2154.700	
HRN/19b	2198.942	
HRN/20a	2316.176	
HRN/20b	2360.421	
HRN/21a	2467.554	
HRN/22a	2588.339	
HRN/23a	2710.893	
HRN/24a	2828.245	
HRN/25a	2940.637	
HRN/26a	3042.643	
HRN/27a	3129.437	
HRN/28a	3236.609	
HRN/29a	3357.436	
HRN/30a	3479.972	
HRN/31a	3604.233	
HRN/32a	3730.236	
HRN/33a	3830.667	
HRN/33b	3871.542	
HRN/34a	3975.416	
HRN/35a	4089.457	
HRN/36a	4223.943	
HRN/37a	4312.496	
HRN/37b	4349.920	
HRN/38a	4433.335	

VEHICLE CROSS PASSAGES AND ELECTRICAL NICHES NOT INCLUDED IN SCHEDULE

AS BUILT

NOTES

1. NICHE AND CROSS PASSAGE LOCATIONS BASED ON DRAWINGS DR/CB/PRO/C01/74039/03/O, THRU. 74042 INCLUSIVE.
2. DETAILS OF CUT AND COVER WORKS WITHIN SHAFT WA2 INDICATIVE ONLY.
3. DRAWING TO BE READ IN CONJUNCTION WITH DRAWINGS DR/HA/BT/C11/41050 AND 41051 DR/HA/BT/C11/41121 – 41130
4. ACTUAL LOCATION OF CROSS PASSAGE AND NICHES TO SUIT AS BUILT SEGMENT LAYOUT AND POSITION OF PEDESTRIAN CROSS PASSAGES ±0.85m
5. FIRE FIGHTING AND EMERGENCY CALL NICHES TO OFFSET FROM CROSS PASSAGES BY APPROXIMATELY 5 TO 7m FROM THE CENTRE LINE OF CROSS PASSAGES TO SUIT DESIGN AND CONSTRUCTION CONSIDERATIONS.
6. FFN NOT ADJACENT TO CROSS PASSAGE SHOULD BE LOCATED BETWEEN THOSE WHICH ARE ADJACENT TO MAINTAIN THE REQUIRED OF NO MORE THAN 150 METRES.
7. THE SPACING OF PCP IS A MAXIMUM OF 250 METRES.
8. ECN, FFN, HRN, AND PCP LOCATIONS ARE BASED ON ROAD ALIGNMENT
9. THE LEVELS & TUNNEL GRADES (SOUTHBOUND) USED IN THIS DRAWING FOR REVISION 12 HAVE BEEN BASED ON 137W ALIGNMENT.

Mark	Date	By	Rev.
13	–	BM	AS BUILT CHANGES ADDED
12	16.04.04	SRC	ECN, HRN AND FFN TABLES AMENDED FOR SOUTHBOUND
11	24.10.03	SRC	ISSUED FOR NMI REVIEW PCP TABLES AMENDED TO FOR 38379, ECN, FFN, HRN TABLES REVISED FFN/35b ADDED, LAYBYS RELOCATED
10	14.05.03	GEG	NICHES ADDED & REMOVED – PCP'S ALTERED
09	20.11.02	GEG	ISSUED FOR CONSTRUCTION
08	2.10.02	GEG	NICHE POSITIONS UPDATED
07	1.7.02	PRD	ISSUED FOR B&R APPROVAL. NMI COMMENTS INCORPORATED. MINOR AMENDMENTS.
06	31.5.02	GEG	ISSUED FOR NMI REVIEW
05	27.5.02	GEG	PCP/08 SOUTH BOUND CHAINAGE REVISED AND TUNNEL CHAINAGES ADDED

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO Consortium

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An Údarás um Bóithre Náisiúnta

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

Title
BORED TUNNEL
THEORETICAL CHAINAGE
SCHEDULE OF NICHE AND
CROSS PASSAGE LOCATIONS

Scales –

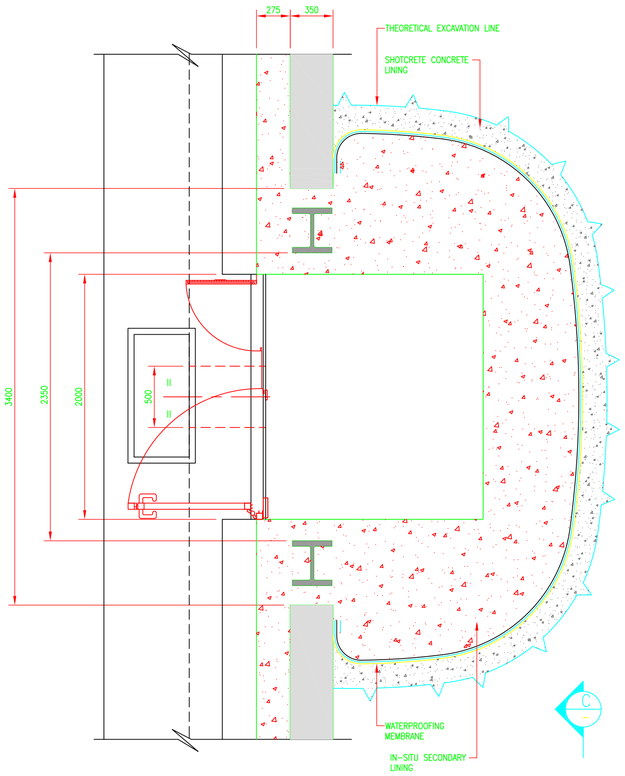
Drn.	Date	Chd.	Passed
RJY	27/9/01		

Project No.	Design Package
4958	HWD 4.5

Drawing No.
DR/HA/BT/C11/41052/13/X

Original Drawing Size : 594 x 841 – A1

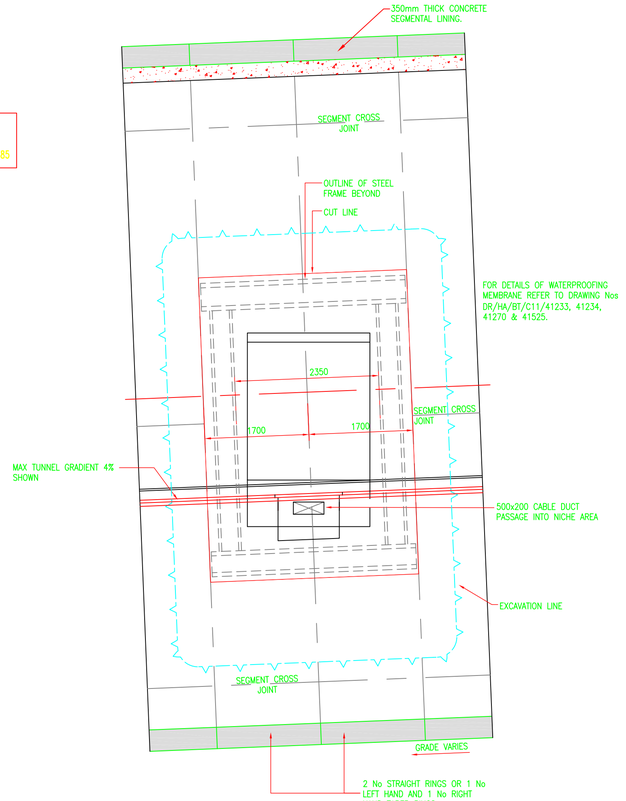
AS-BUILT



SECTION A-A

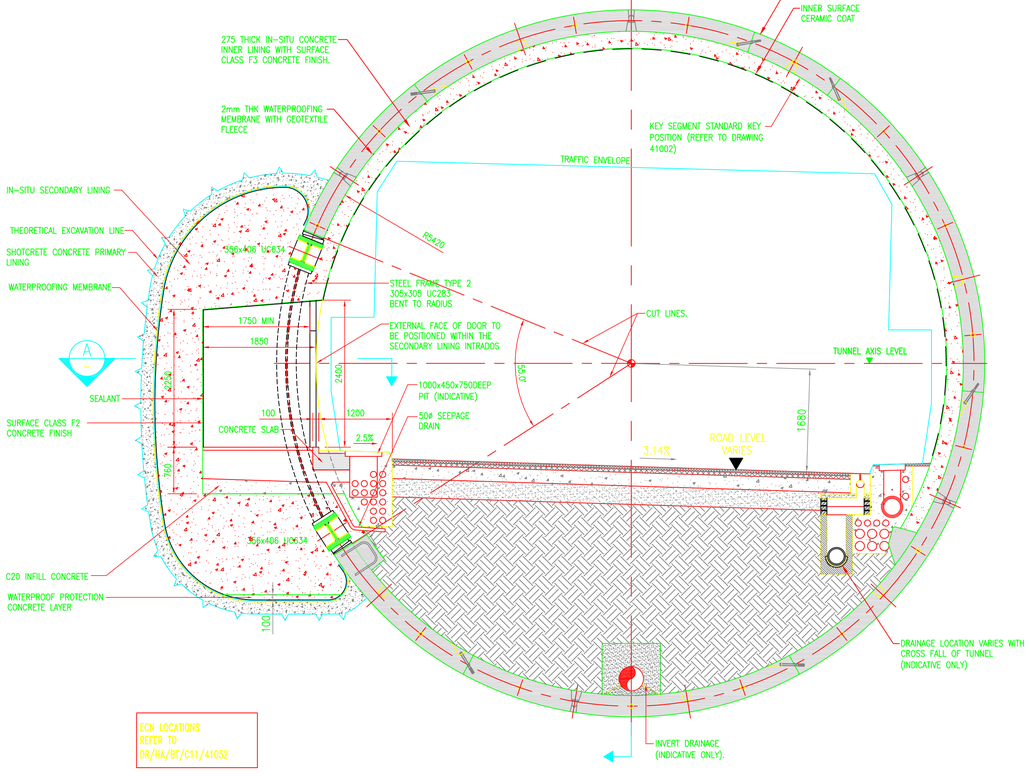
Scale 1: 25

FOR DOOR DETAILS REFER TO DRG: DR/CB/PRO/C01/76885



SECTION C-C

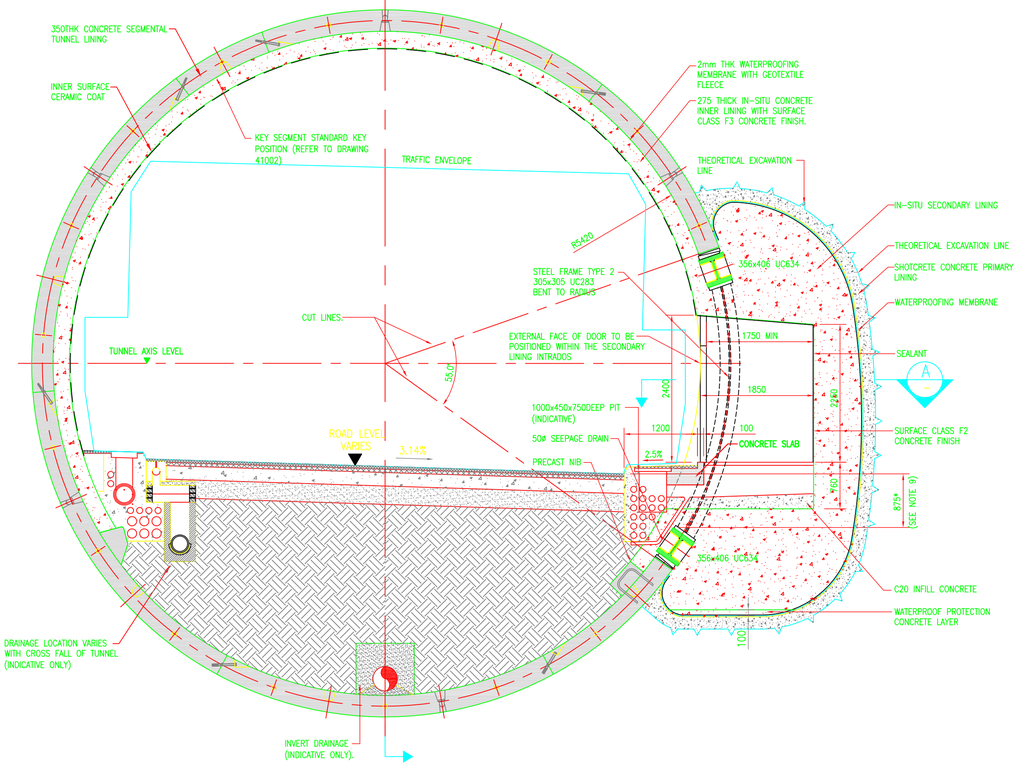
Scale 1: 50



ECN LOCATIONS REFER TO DR/HA/BT/C11/41052

NORTHBOUND TUNNEL
CROSS SECTION IN DIRECTION OF TRAFFIC

Scale 1: 50



SOUTHBOUND TUNNEL
CROSS SECTION AGAINST DIRECTION OF TRAFFIC

Scale 1: 50

0 400 800 1200 1600 2000 2400mm
SCALE 1:25

0 1 2 3 4 5m
SCALE 1:50

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH DR/HA/BT/C11/41121 – 41130 (INCLUSIVE) DR/HA/BT/C11/41525 DR/HA/BT/C11/41052 DR/HA/BT/C11/41060 DR/HA/BT/C11/41228 & 41234
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN MILLIMETRES.
3. ALL STRUCTURAL STEEL TO BE GRADE S355.
4. IN-SITU SECONDARY CONCRETE COMPRESSIVE STRENGTH 40N/mm².
5. FOR DETAILS OF STEELWORK FRAME REFER TO DRAWING No DR/HA/BT/C11/41060.
6. CARRIAGEWAY SERVICES ARE SHOWN AS INDICATIVE ONLY.
7. THE POSITION OF KEY SEGMENTS ARE OPPOSITE TO OPENING POSITIONS. UNLESS AS STATED IN NCR 39403.
8. FOR DETAILS OF REINFORCEMENT TO SECONDARY LINING REFER TO DRAWING DR/HA/BT/C11/41201.

Mark	Date	By	Rev.
12	16.11.06	CD	AS-BUILT ISSUE
11	09.05.05	MB	AS BUILT
10	24.10.03	SJS	ISSUED FOR NMI REVIEW NOTES ADDED
09	14.5.03	SRC	PROTECTION CONCRETE TO INVERT ADDED
08	20.11.02	GCG	ISSUED FOR CONSTRUCTION
07	1.7.02	PRD	ISSUED FOR BROWN & ROOT APPROVAL. NMI COMMENTS INCORPORATED.
06	31.05.02	SML	ISSUED FOR NMI REVIEW
05	27.05.02	SML	MAJOR AMENDMENTS

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO Consortium

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An Údarás um Bóithre Náisiúnta

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

Title
BORED TUNNEL
TYPICAL
EMERGENCY CALL NICHE
GENERAL ARRANGEMENT

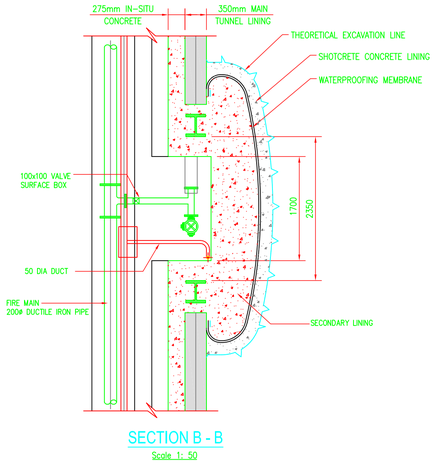
Scales 1:25 1:50
Drn. SRC Date 22/10/01 Chd. Passed

Project No. 4958
Design Package HWD 4.5

Drawing No. DR/HA/BT/C11/41054/12/X

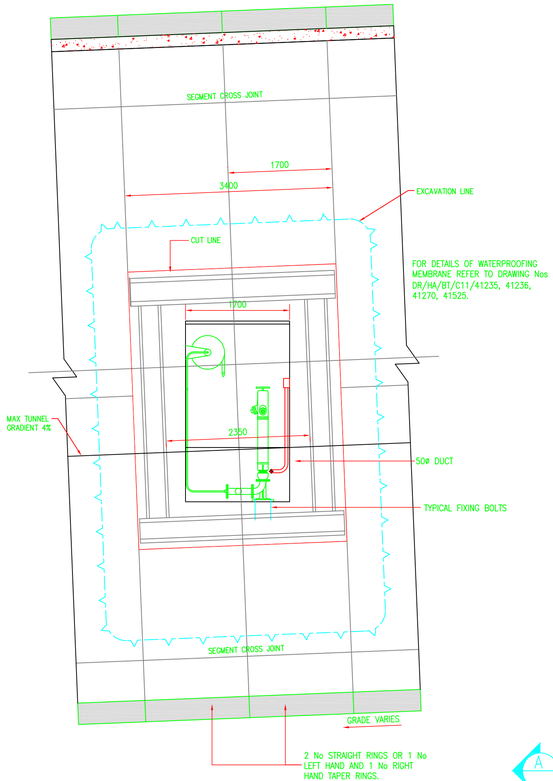
Original Drawing Size : 594 x 841 – A1

AS BUILT



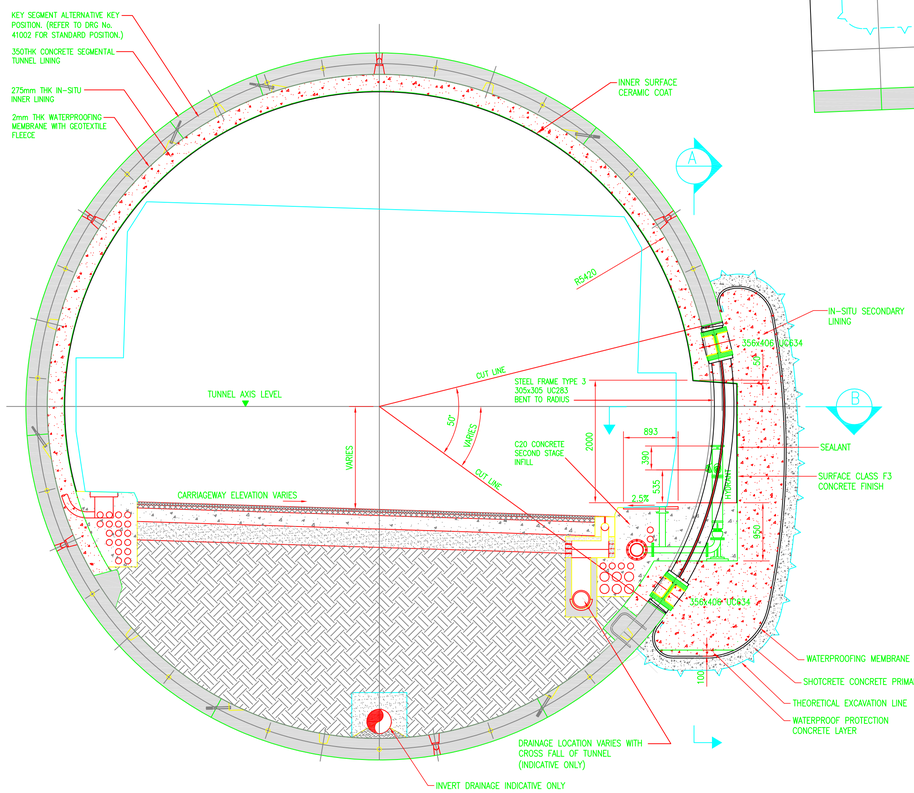
SECTION B - B

Scale 1: 50



SECTION A - A

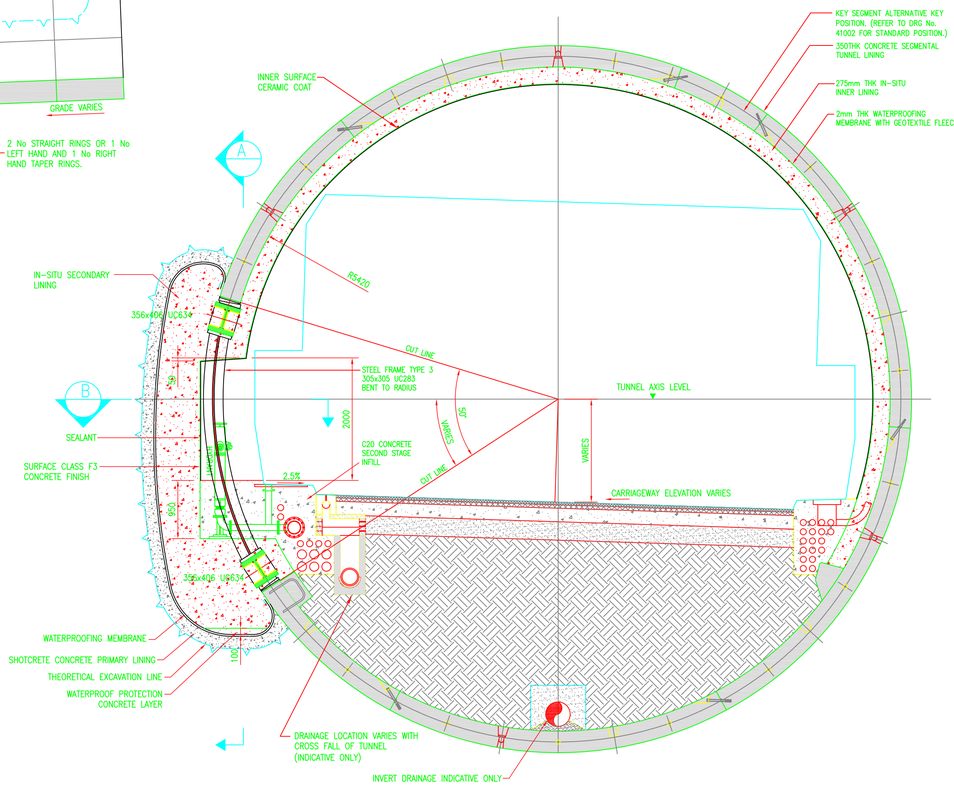
Scale 1: 50



NORTH BOUND TUNNEL CROSS SECTION
IN TRAFFIC DIRECTION

Scale 1: 50

FOR FIRE FIGHTING NICHE LOCATIONS SEE DRAWING DR/HA/BT/C11/41052



SOUTH BOUND TUNNEL CROSS SECTION
AGAINST TRAFFIC DIRECTION

Scale 1: 50

SCALE 1:50

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH DR/HA/BT/C11/41121 – 41130 (INCLUSIVE) DR/HA/BT/C11/41525 DR/HA/BT/C11/41052 DR/HA/BT/C11/41060 DR/HA/BT/C11/41230 & 41234
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN MILLIMETRES.
3. ALL STRUCTURAL STEEL TO BE GRADE S355.
4. IN-SITU SECONDARY CONCRETE COMPRESSIVE STRENGTH 40N/mm².
5. FOR DETAILS OF STEELWORK FRAME REFER TO DRAWING No DR/HA/BT/C11/41060.
6. CARRIAGEWAY SERVICES SHOWN AS INDICATIVE ONLY.
7. THE POSITION OF KEY SEGMENTS ARE OPPOSITE TO OPENING POSITIONS. UNLESS AS STATED IN NCR 39403.
8. FOR DETAILS OF REINFORCEMENT TO SECONDARY LINING REFER TO DRAWING DR/HA/BT/C11/41202 & 41205.

Mark	Date	By	Rev.
12	16.11.06	CD	AS-BUILT ISSUE
11	06.05.05	MB	AS BUILT
10	24.10.03	SJS	ISSUED FOR NMI REVIEW. NOTES ADDED, DOOR DELETED
09	14.5.03	SRC	PROTECTION CONCRETE TO INVERT ADDED
08	20.11.02	GEG	ISSUED FOR CONSTRUCTION
07	1.7.02	PRD	ISSUED FOR BROWN & ROOT APPROVAL. NMI COMMENTS INCORPORATED.
06	31.05.02	SML	ISSUED FOR NMI REVIEW
05	27.05.02	SML	MAJOR AMENDMENTS
04	28.03.02	SML	MAJOR REVISIONS TO FRAME & NICHE

Chd. By

Project
DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO Consortium

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An tÚdarás um Bóithre Náisiúnta

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

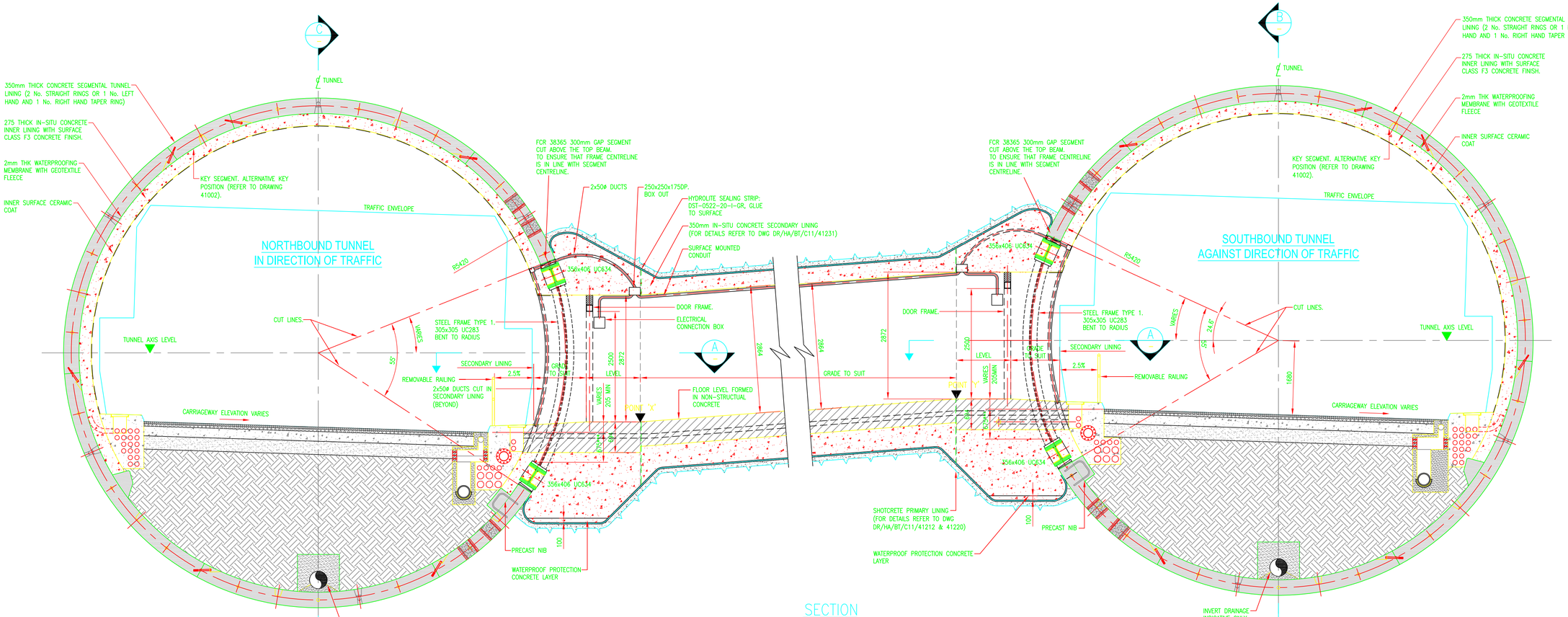
Title
BORED TUNNEL
TYPICAL
FIRE FIGHTING NICHE
GENERAL ARRANGEMENT

Scales 1:50
Drn. SRC Date. 01/10/01 Chd. Passed

Project No. 4958
Design Package HWD 4.5

Drawing No. DR/HA/BT/C11/41056/12/X

Original Drawing Size : 594 x 841 – A1



NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH DR/HA/BT/C11/41121 – 41130 (INCLUSIVE) DR/HA/BT/C11/41052, 41060, 41131, & 41525 DR/HA/BT/C11/41232 & 41238.
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN MILLIMETRES.
3. ALL STRUCTURAL STEEL TO BE GRADE S355.
4. IN-SITU SECONDARY CONCRETE COMPRESSIVE STRENGTH 40N/mm².
5. FOR DETAILS OF STEELWORK FRAME REFER TO DRAWING No DR/HA/BT/C11/41060.
6. CARRIAGEWAY SERVICES SHOWN AS INDICATIVE ONLY.
7. THE POSITION OF KEY SEGMENTS ARE OPPOSITE TO OPENING POSITIONS. UNLESS STATED IN NCR 39403.
8. FOR DETAILS OF REINFORCEMENT TO SECONDARY LINING REFER TO DRAWING DR/HA/BT/C11/41200 & 41207.

Mark	Date	By	Rev.
08	16.11.06	CD	AS-BUILT ISSUE
07	24.10.03	SRC	ISSUE FOR NMI REVIEW. POP SETTING OUT ALTERED TO FOR 38365,38367 & 38379 (ABOVE) POINT X & Y ADDITONAL DUCTING ADDED, SHEAR PLUGS AMENDED
06	14.05.03	SRC	ROOT-SHAPE AMENDED TO EXPOSED SIDE POINTS ADDED, POINTS 'B' & 'D' REVISED TO 'X' & 'Y'
05	20.11.02	GEG	ISSUED FOR CONSTRUCTION
04	1.7.02	PRD	ISSUED FOR BROWN & ROOT APPROVAL. NMI COMMENTS INCORPORATED.
03	31.05.02	GEG	ISSUE FOR NMI REVIEW
02	27.05.02	GEG	MAJOR AMENDMENTS
01	28.03.02	GEG	FIRST ISSUE

Project: DUBLIN PORT TUNNEL

NISHIMATSU MOWLEM IRISHENCO Consortium

Haswell Consulting Engineers

Carl Bro Intelligent Solutions

HBI HAERTER AG

NRA NATIONAL ROADS AUTHORITY An Údarás um Bóithre Náisiúnta

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

Title:

BORED TUNNEL TYPICAL PEDESTRIAN CROSS PASSAGE GENERAL ARRANGEMENT

Scales: 1:50, 1:25

Drn. GEG Date MAR. 2002 Chd. Passed

Project No. 4958

Design Package HWD4.5

Drawing No. DR/HA/BT/C11/41061/08/X

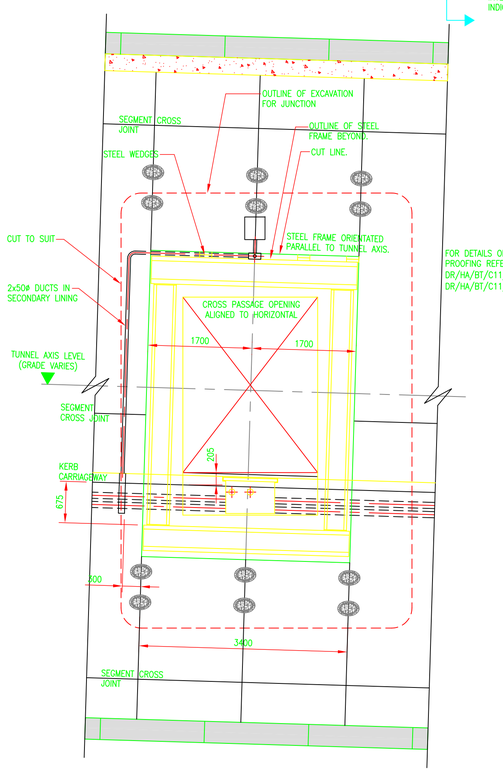
Original Drawing Size : 594 x 841 – A1

SECTION ALONG CENTRELINE

Scale 1: 50

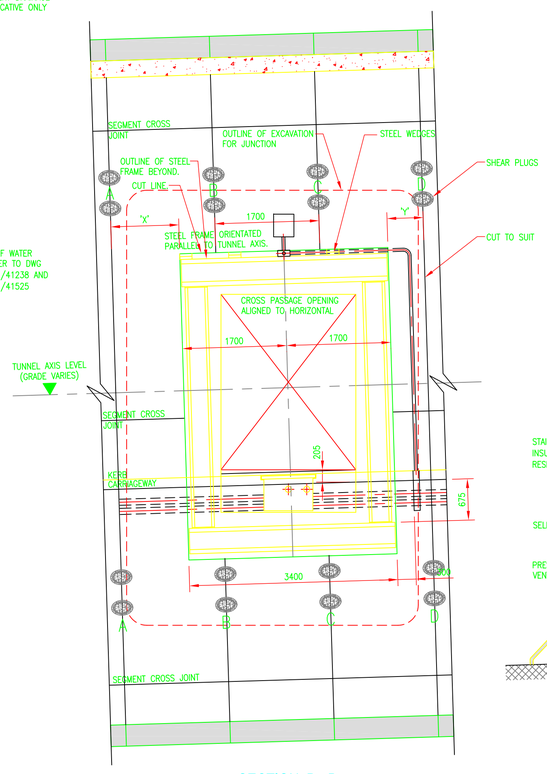
SECTION C - C

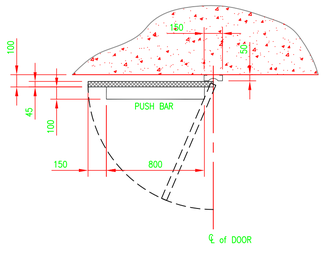
(DOORS AND RAILING REMOVED FOR CLARITY)
Scale 1: 50



SECTION B - B

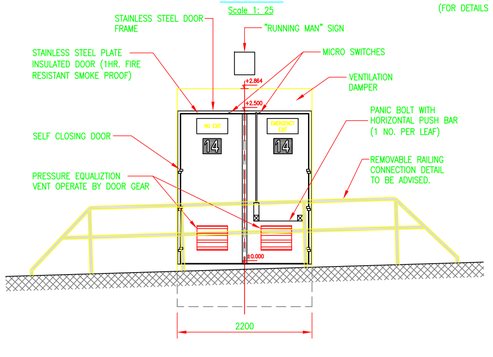
(DOORS AND RAILING REMOVED FOR CLARITY)
Scale 1: 50





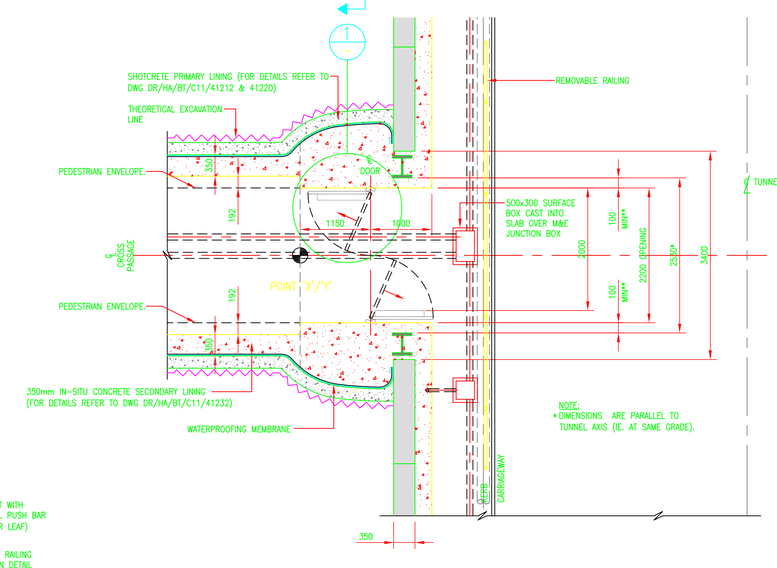
DETAIL 1

Scale 1: 25



ELEVATION CROSS PASSAGE DOORS

Scale 1: 50



SECTION A - A

Scale 1: 50

AS BUILT

SCALE 1:25 — 0 400 800 1200 1600 2000 2400mm

SCALE 1:50 — 0 1 2 3 4 5m

APPENDIX C

PLAXIS 3D RESULTS

PLAXIS 3D FINITE ELEMENT MODEL RESULTS

TABLE OF FIGURES

Abbreviations

- **SB =** Southbound Tunnel
- **NB =** Northbound Tunnel

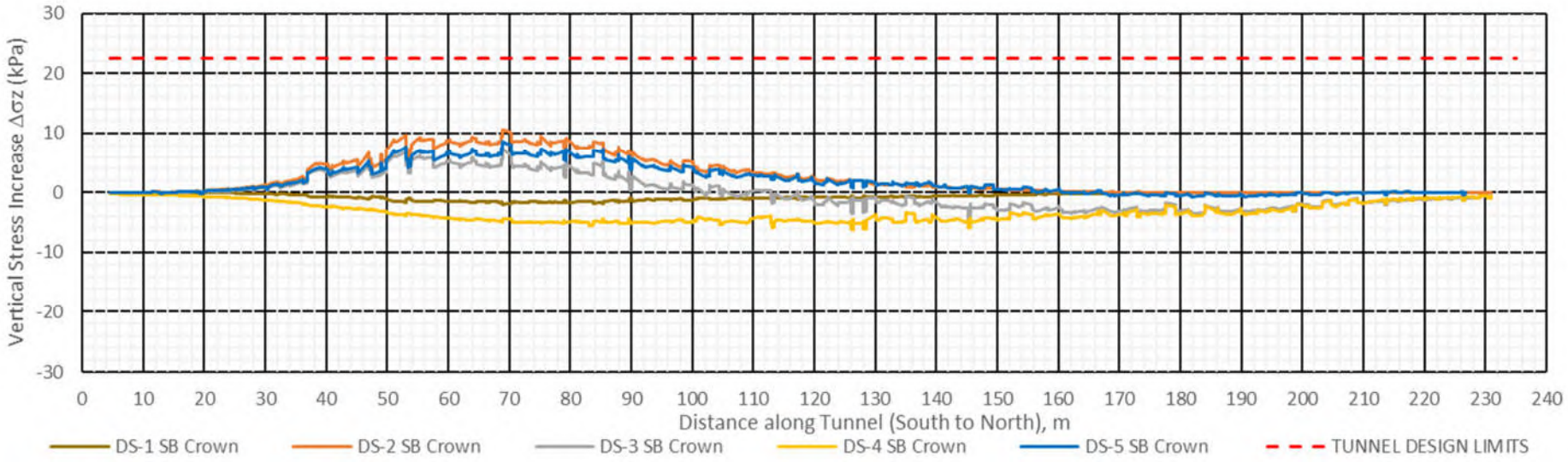


Figure C-1: Change in Total Stress on Tunnel Crown (Northbound) HSS - increase is + ive

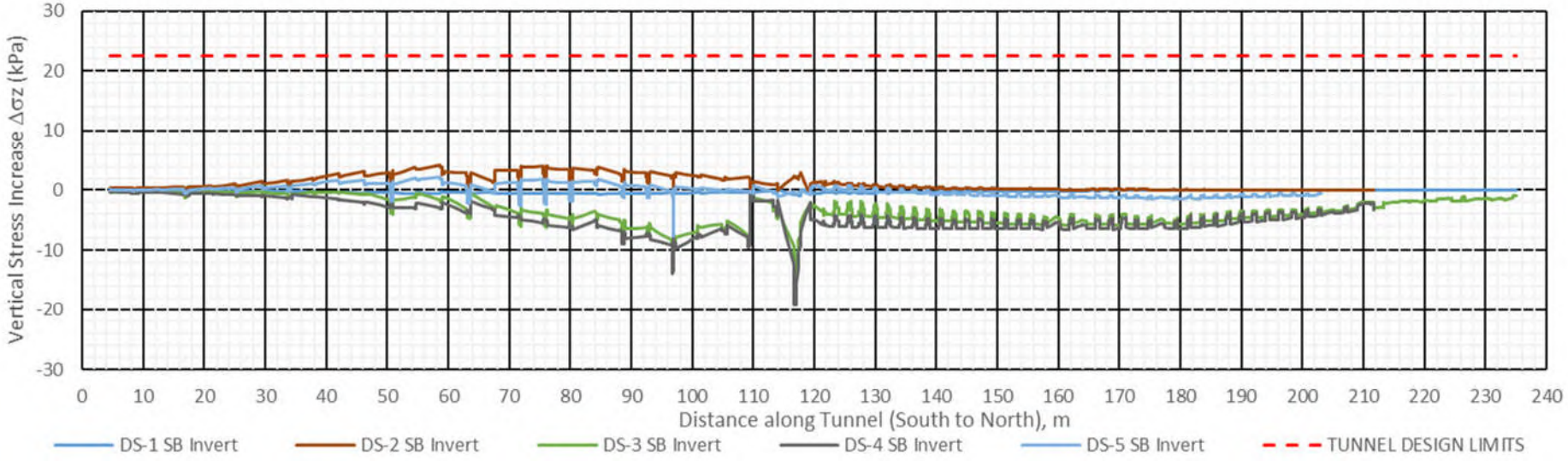


Figure C-2: Change in Total Stress on Tunnel Invert (Northbound) HSS - increase is + ive

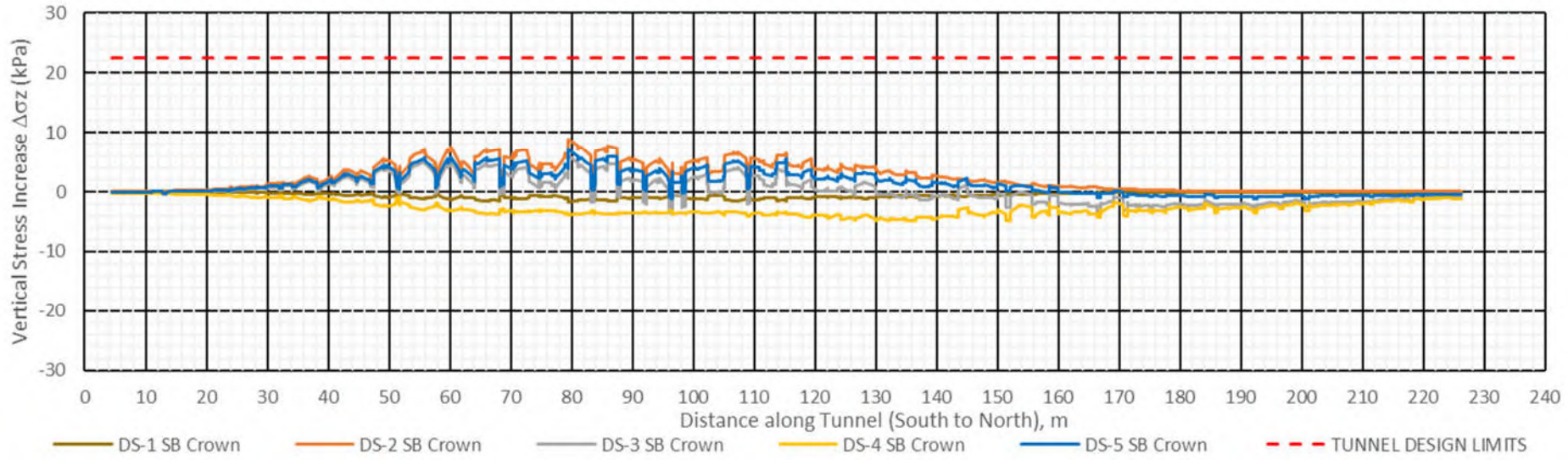


Figure C-3: Change in Total Stress on Tunnel Crown (Southbound) HSS - increase is + ive

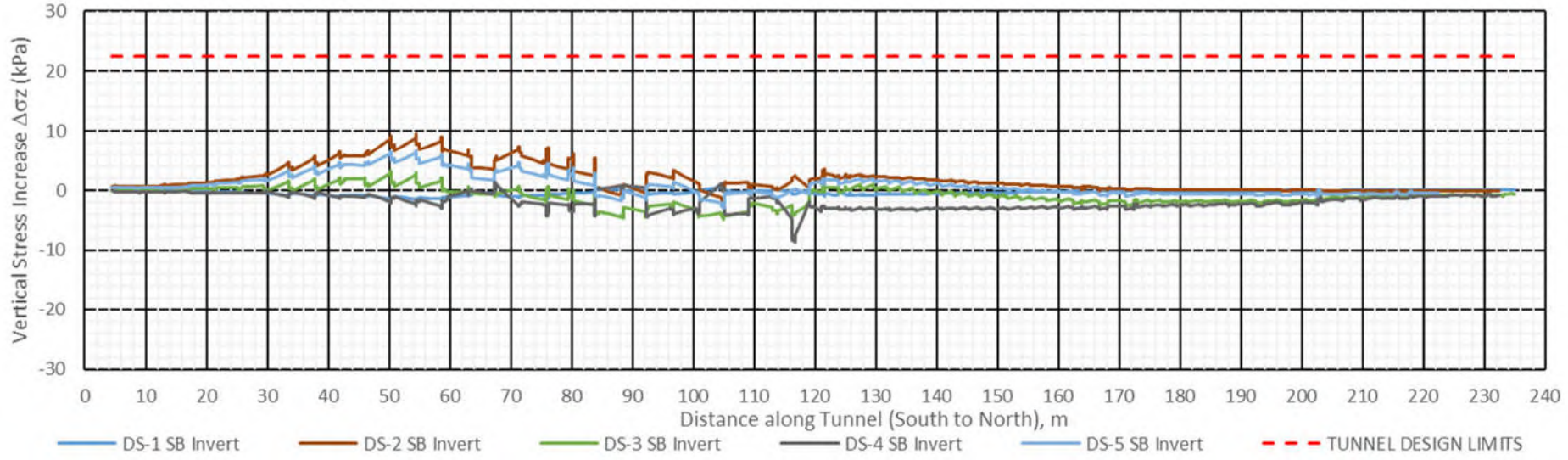


Figure C-4: Change in Total Stress on Tunnel Invert (Southbound) HSS - increase is + ive

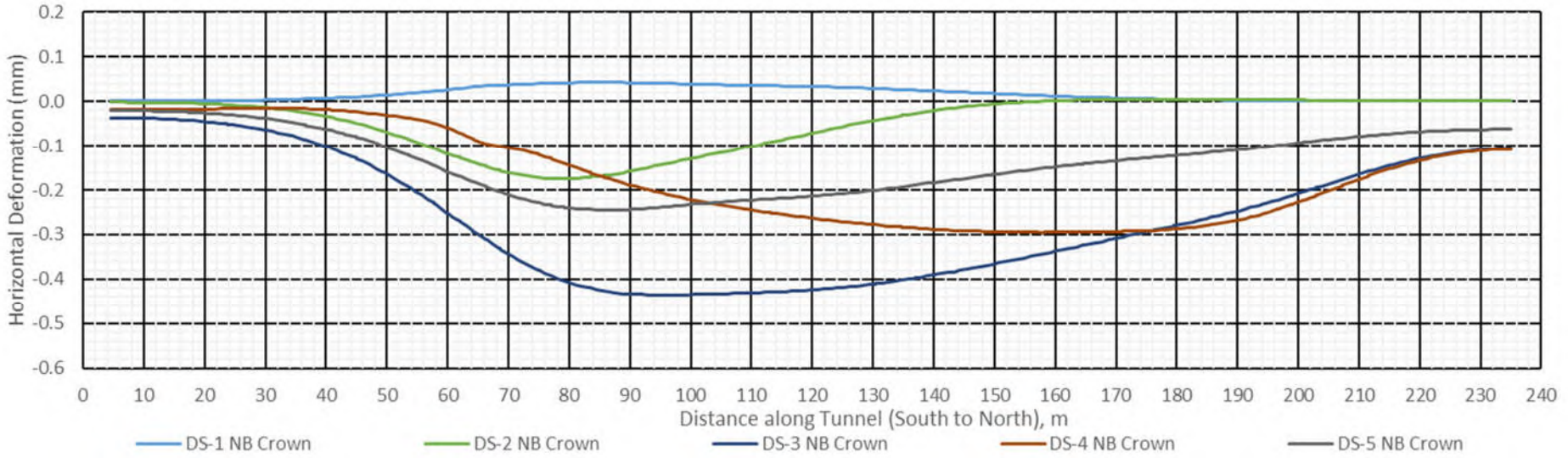


Figure C-5: Vertical Displacements on Tunnel Crown (Northbound) HSS

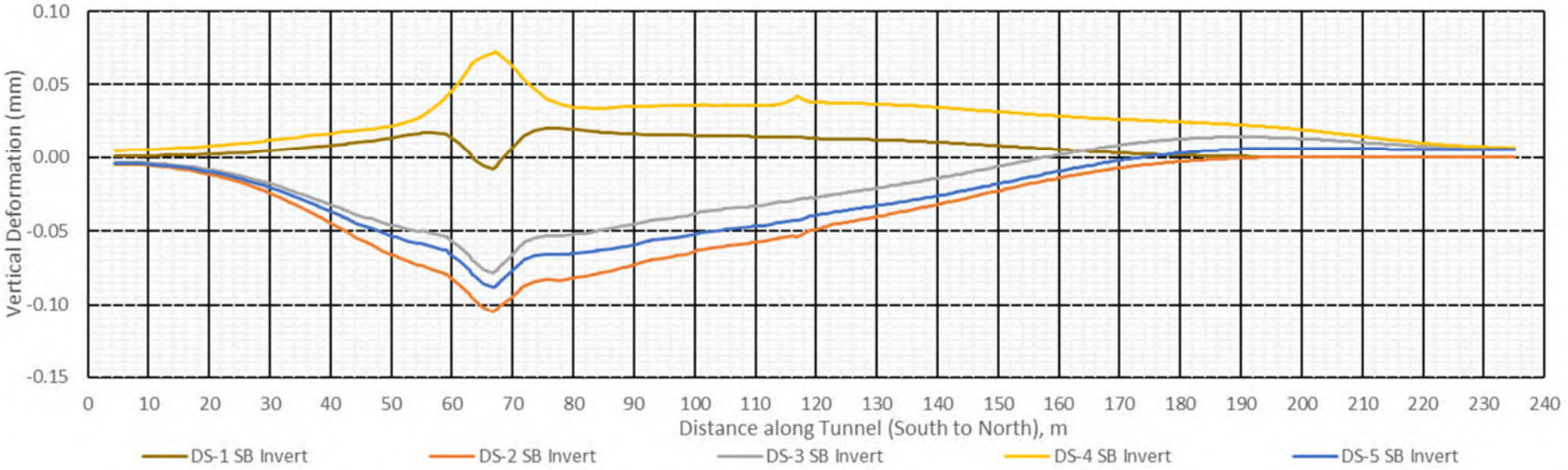


Figure C-6: Vertical Displacements on Tunnel Crown (Southbound) HSS

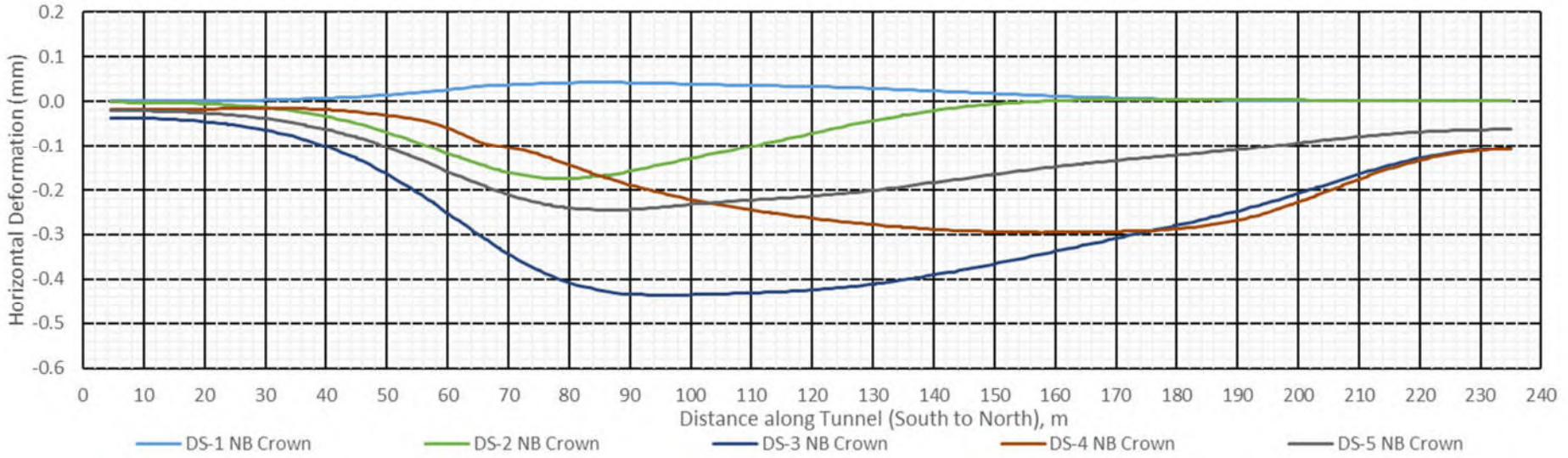


Figure C-7: Horizontal Displacements on Tunnel Crown (Northbound) HSS

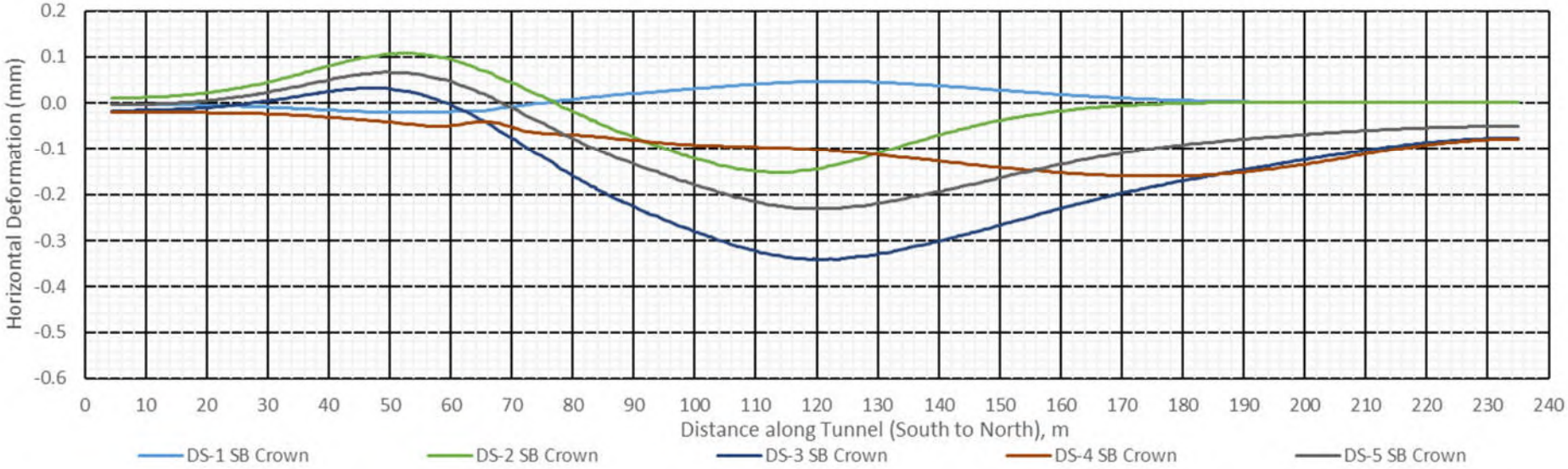


Figure C-8: Horizontal Displacements on Tunnel Crown (Southbound) HSS

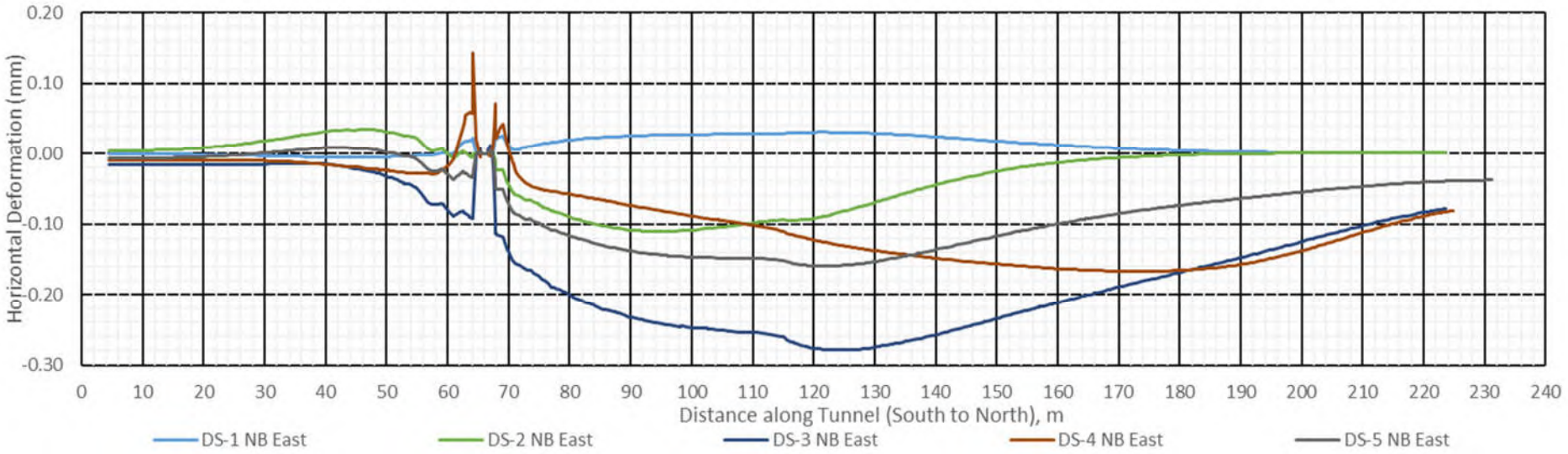


Figure C-9: Horizontal Displacements on Tunnel Eastern Edge (Northbound) HSS

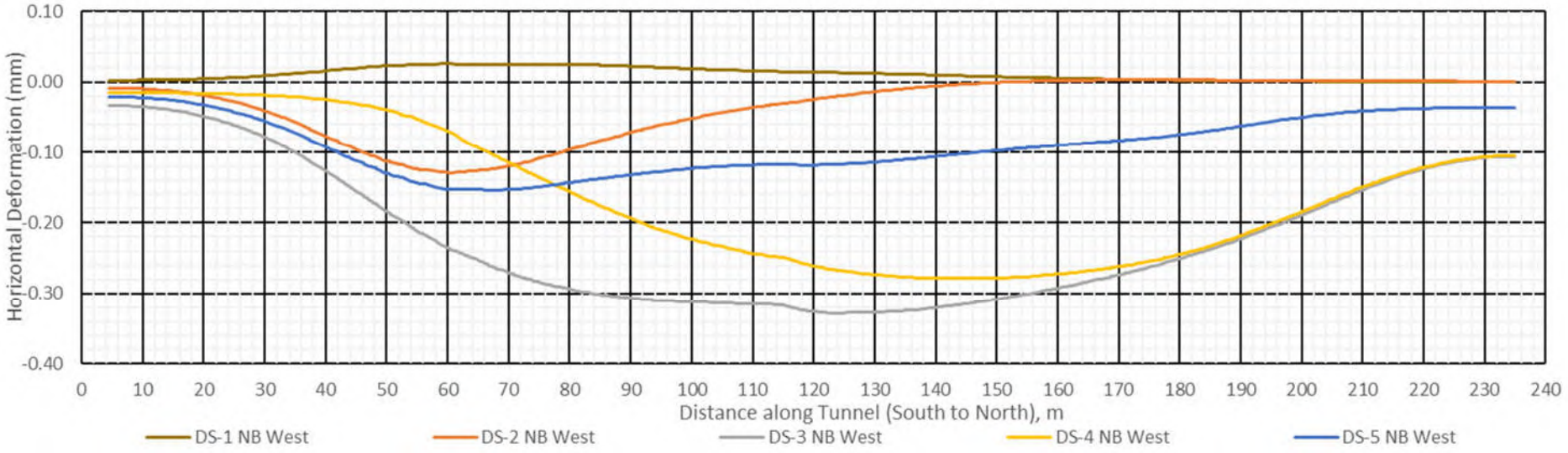


Figure C-10: Horizontal Displacements on Tunnel Western Edge (Northbound)) HSS

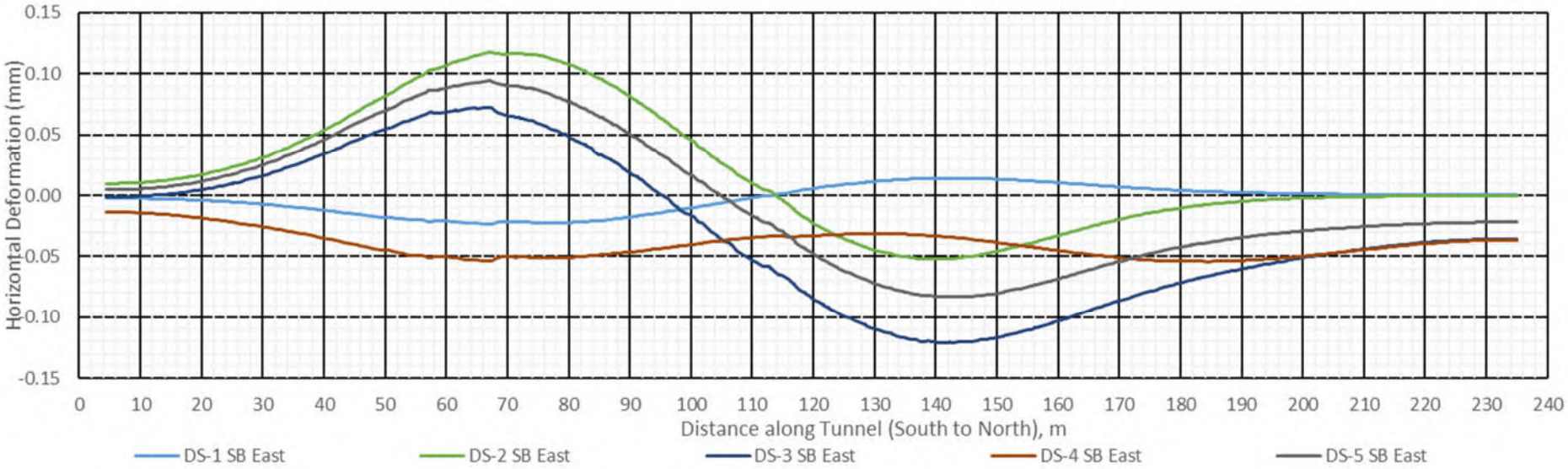


Figure C-11: Horizontal Displacements on Tunnel Eastern Edge (Southbound) HSS

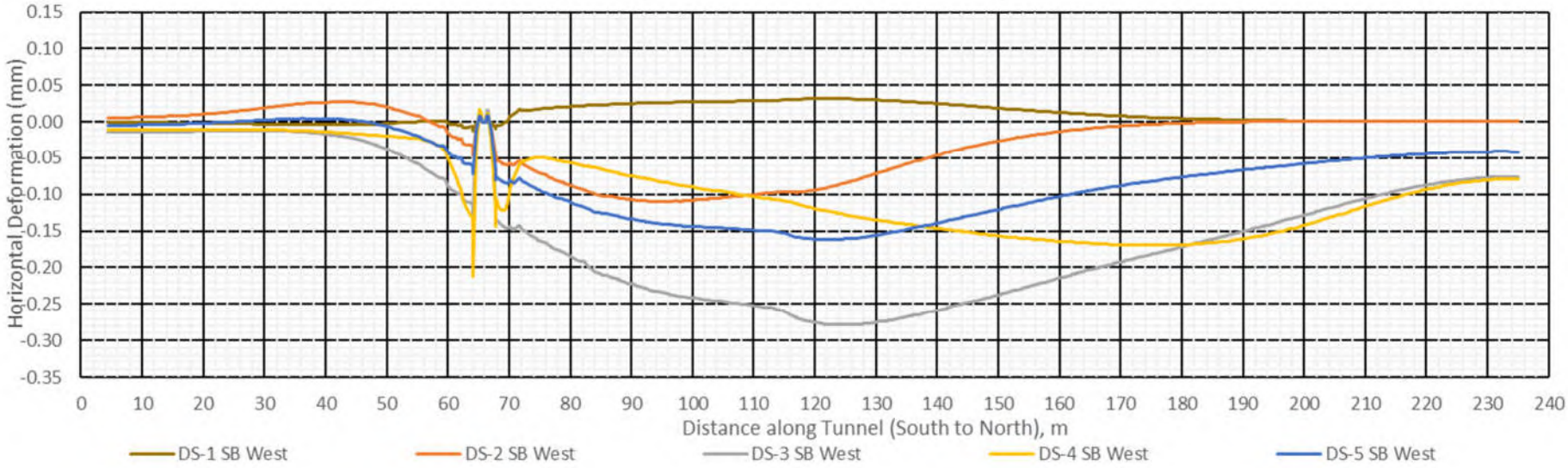


Figure C-12: Horizontal Displacements on Tunnel Western Edge (Southbound) HSS

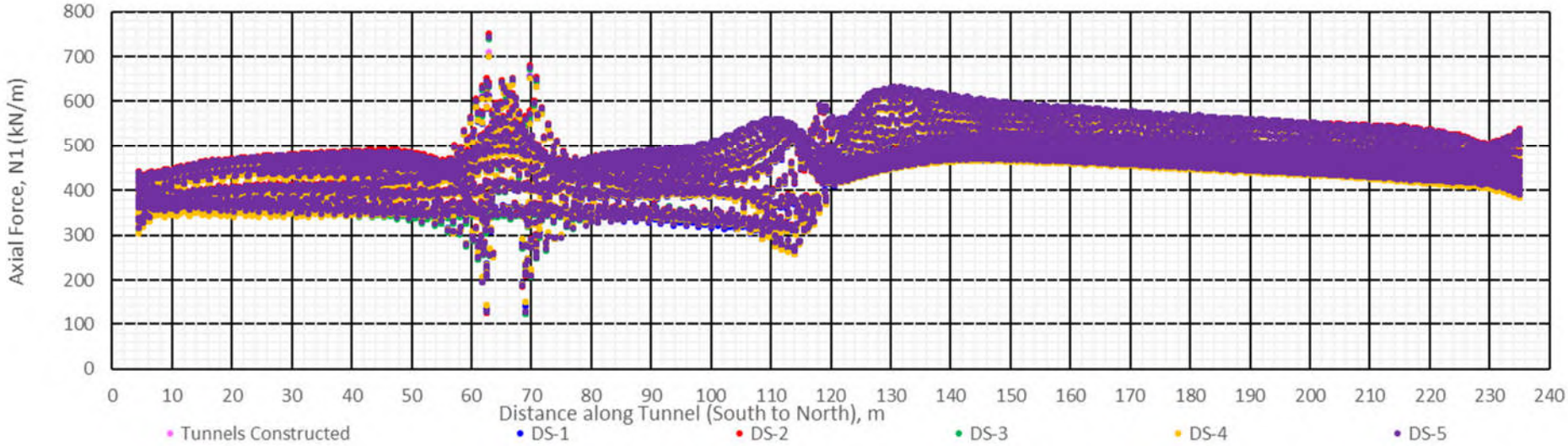


Figure C-13: Axial Force along DPTs (N1 i.e. Longitudinal Force) NB HSS

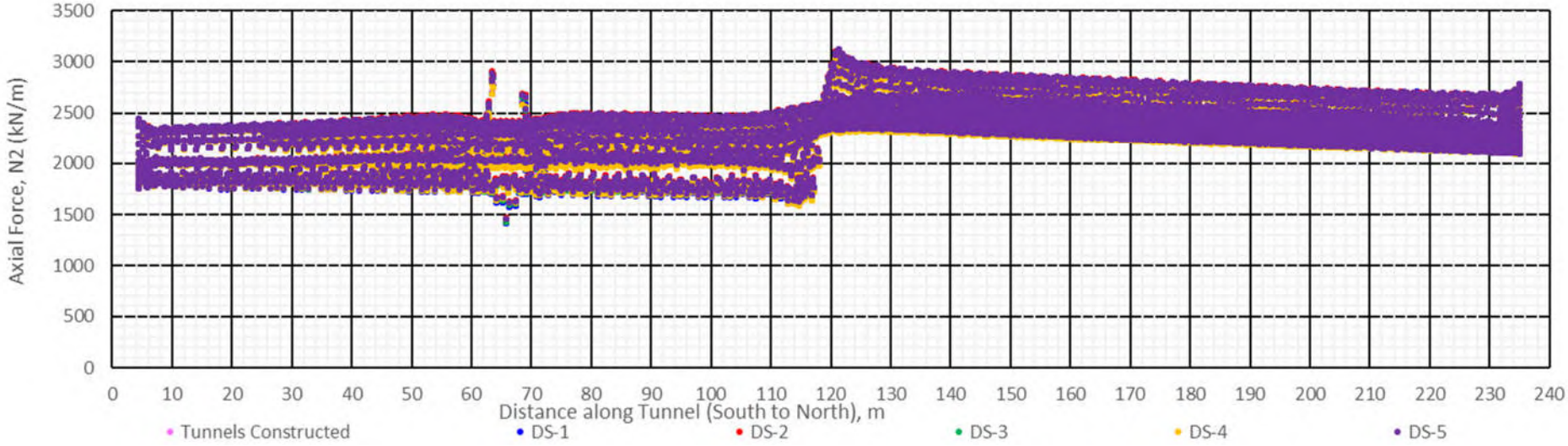


Figure C-14: Axial Force along DPTs (N2 i.e. Hoop Force) NB HSS

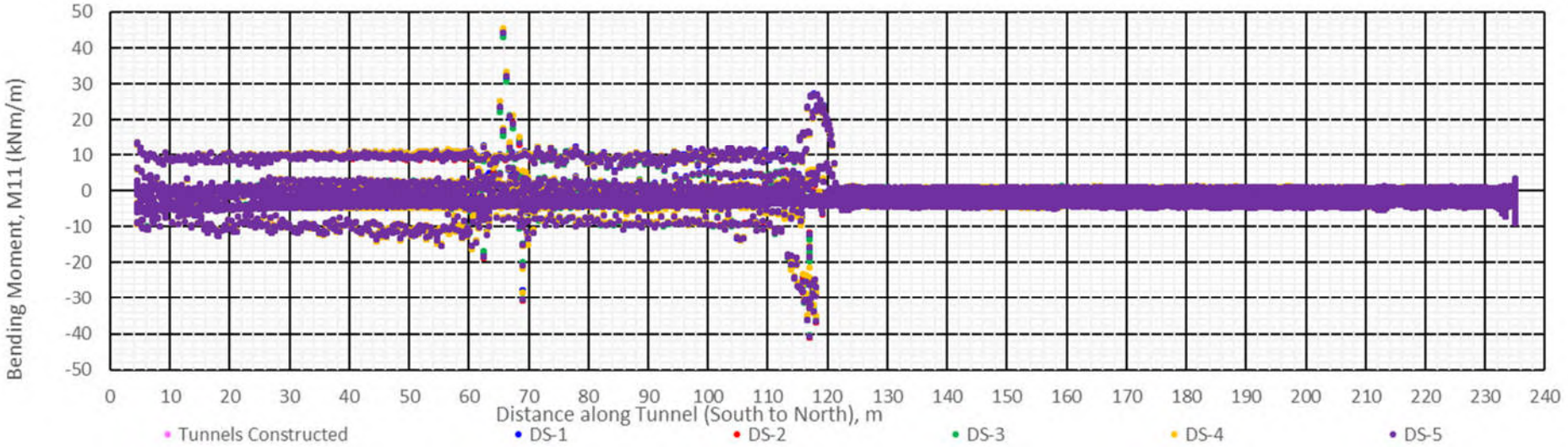


Figure C-15: Bending Moment along DPTs (M11 i.e. Longitudinally along tunnel) NB HSS

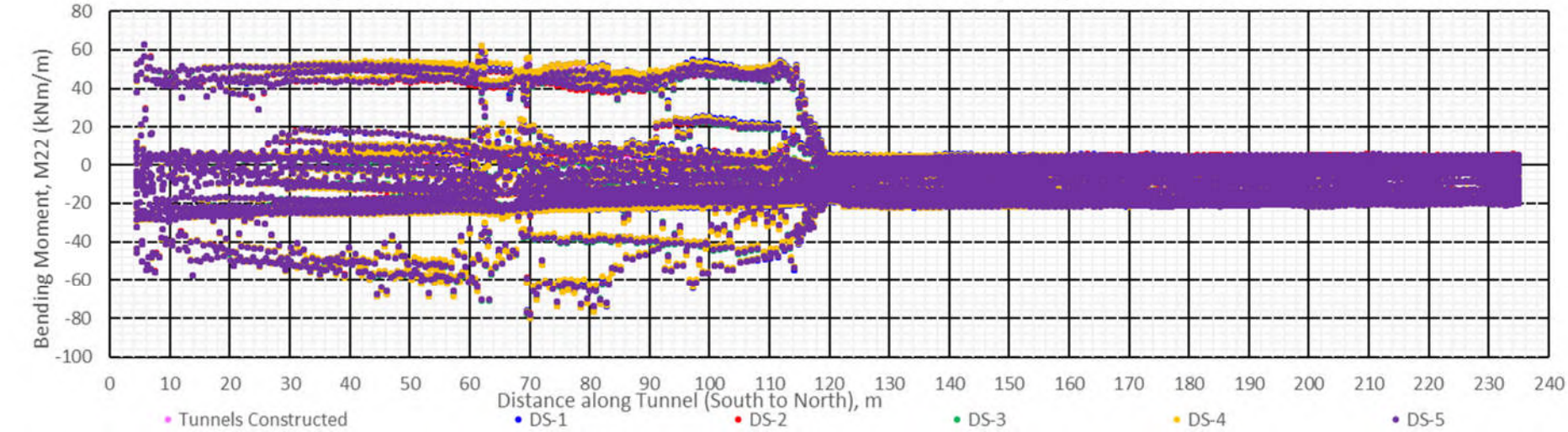


Figure C-16: Bending Moment along DPTs (M22 i.e. transversely across tunnel) SB HSS

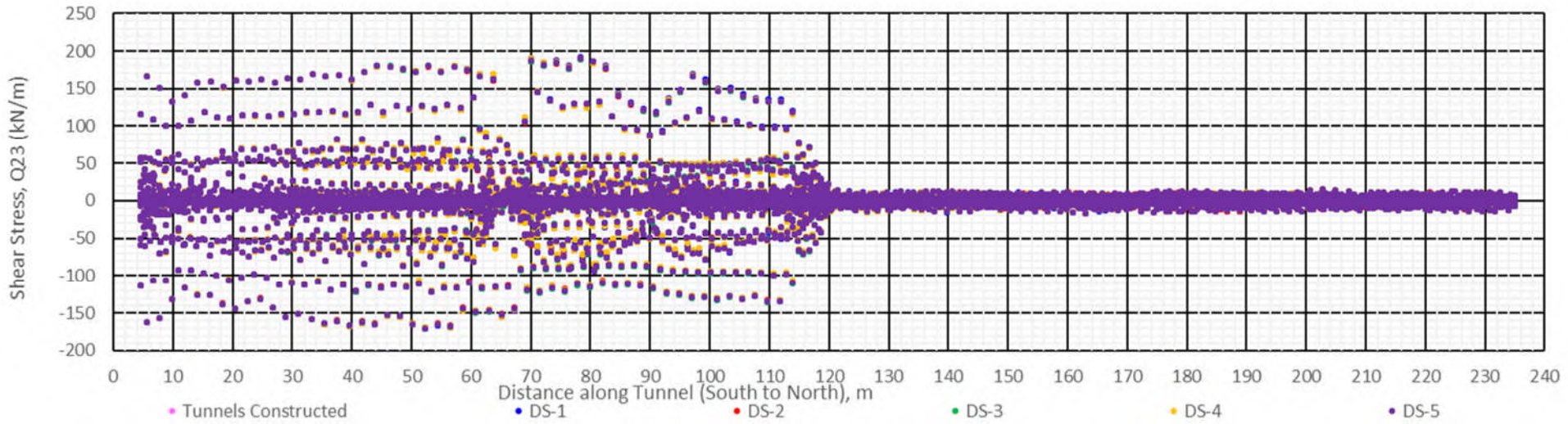


Figure C-17: Shear Force along DPTs (Q23 i.e. Transversely across tunnel) SB HSS

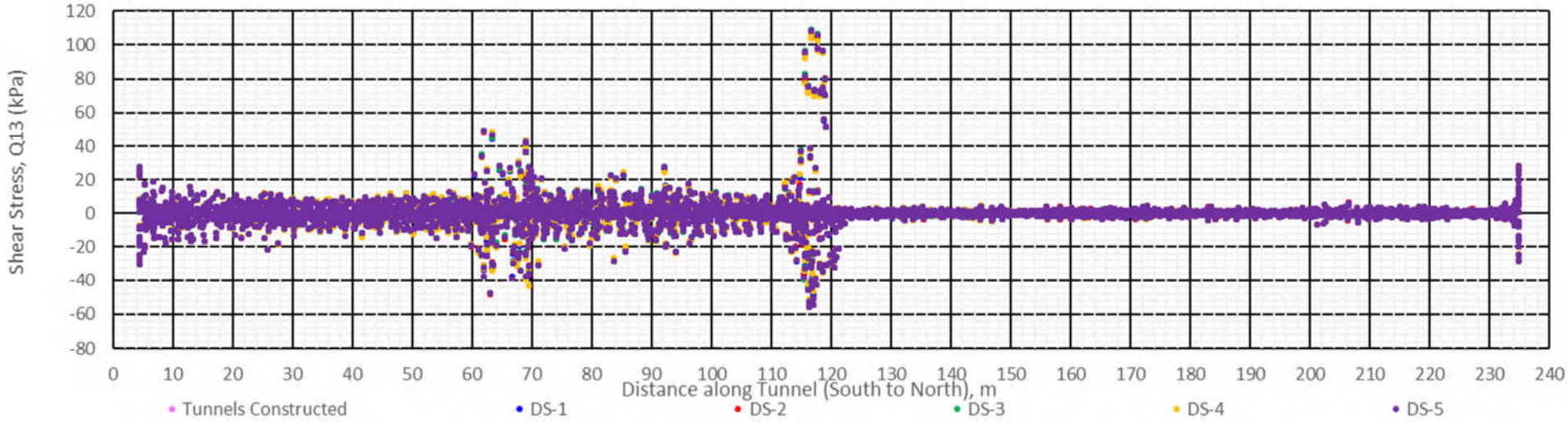


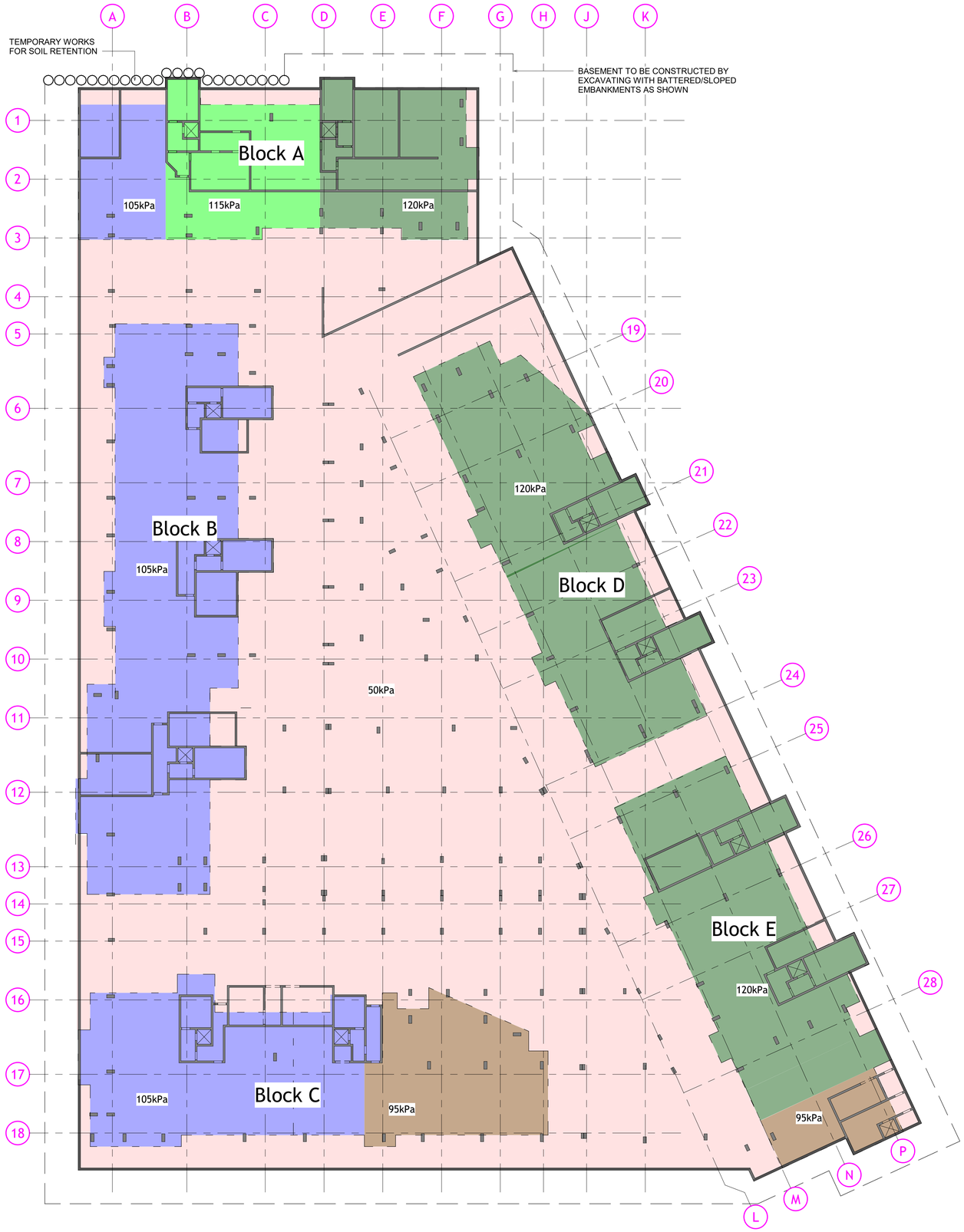
Figure C-18: Shear Force along DPTs (Q13 i.e. Longitudinally along tunnel) SB HSS

APPENDIX D

NOT USED

APPENDIX E

PUNCH CONSULTING CHARACTERISTIC BEARING PRESSURES BELOW BUILDINGS & BASEMENT



BASEMENT WALLS CONSTRUCTION:

- BASEMENT PERIMETER WALL 300mm RC
- BASEMENT INTERNAL WALL 250mm RC

BEARING PRESSURES:

- 135kPa
- 120kPa
- 115kPa
- 105kPa
- 97kPa
- 95kPa
- 92kPa
- 88kPa
- 70kPa
- 50kPa

GENERAL NOTES REFERENCE

Scale 1 : 50

Date Drawn: AUGUST 2020
Drawn By: HK
Colour Drawing:

bmtrada SYSTEM CERTIFICATION ISO 9001 CERTIFICATION
bsi. BIM Verified Design & Construction Capital/Delivery PAS 1192-2

Rev	Amendment	By	Date
P02	ISSUED FOR INFORMATION	VB	2022-02-04

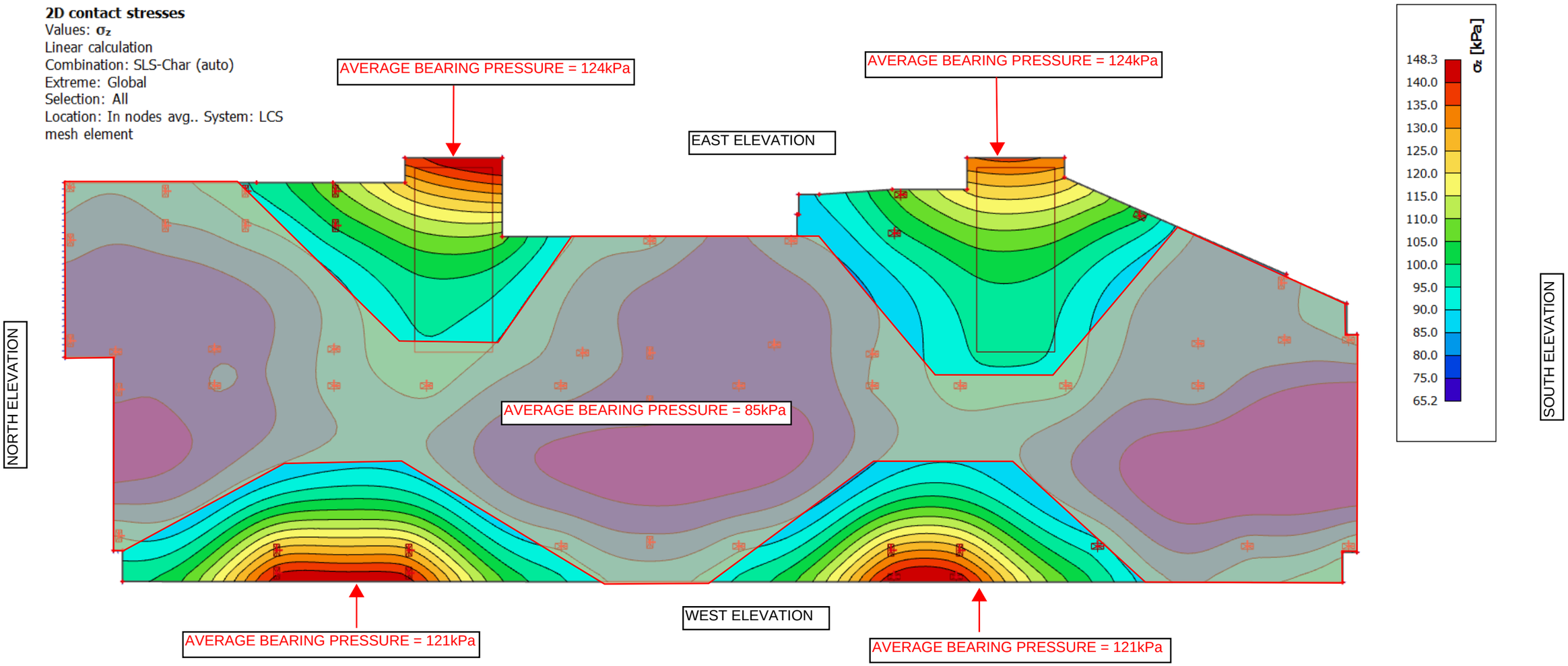
Client: EASTWISE

Job Title: HARTFIELD PLACE, SWORDS ROAD
Dwg Title: FOUNDATION BEARING PRESSURES
Job No: 202122 Model Ref: HARTPL-PUNCH-BT-M3-S-0001 Drawing Status: D1 - COSTING

PUNCH consulting engineers
Dublin | Limerick | Cork | Galway | Glasgow
Carnegie House Library Road, Dun Laoghaire, Co. Dublin, A96 C7W7, Ireland
IRL: +353 1 271 2200 www.punchconsulting.com

Scale @ A1:	As indicated
Technician Check:	HK
Engineer Check:	DG
Approved:	DC
Document No:	HARTPL-PUNCH-ZZ-B1-DR-S-2006
Revision No:	P02

2D contact stresses
Values: σ_z
Linear calculation
Combination: SLS-Char (auto)
Extreme: Global
Selection: All
Location: In nodes avg.. System: LCS
mesh element



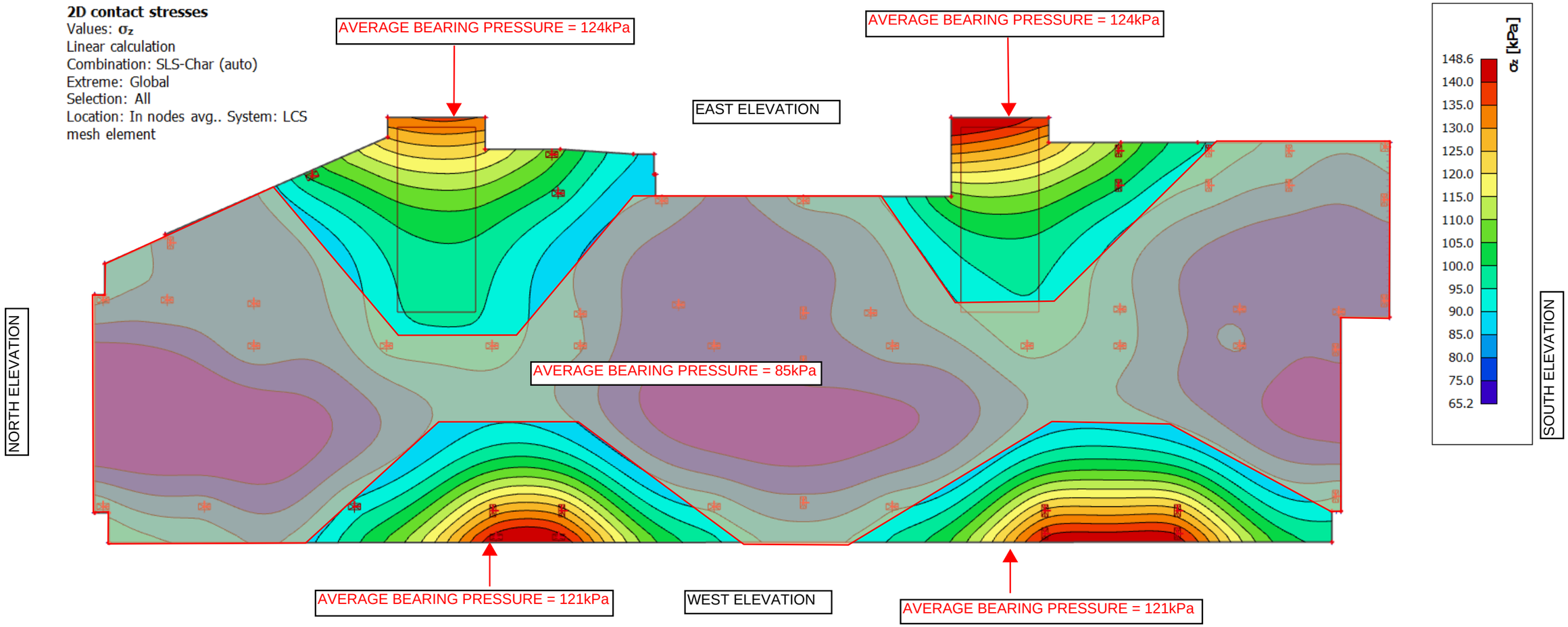
HARTFIELD PLACE
BLOCK F
Bearing Pressures

PUNCH consulting engineers

Sketch Ref:

Project No.	By	Date	SK No.
202 - 122	RH	14 - 07 - 23	

2D contact stresses
Values: σ_z
Linear calculation
Combination: SLS-Char (auto)
Extreme: Global
Selection: All
Location: In nodes avg.. System: LCS
mesh element



HARTFIELD PLACE
BLOCK G
Bearing Pressures

PUNCH consulting engineers

Sketch Ref:

Project No.	By	Date	SK No.
202 - 122	RH	14 - 07 - 23	

APPENDIX F

PLAXIS 3D RESULTS – CONSTRUCTION SEQUENCE

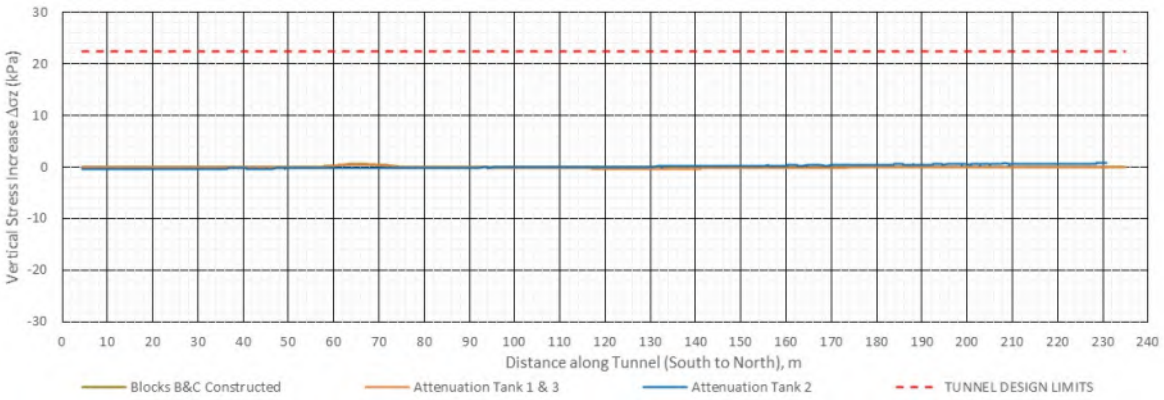


Figure F-1: Change in Total Stress on Tunnel Crown (Northbound) MC - increase is + ive: Blocks B&C (load applied), Attenuation tanks 1, 2, 3

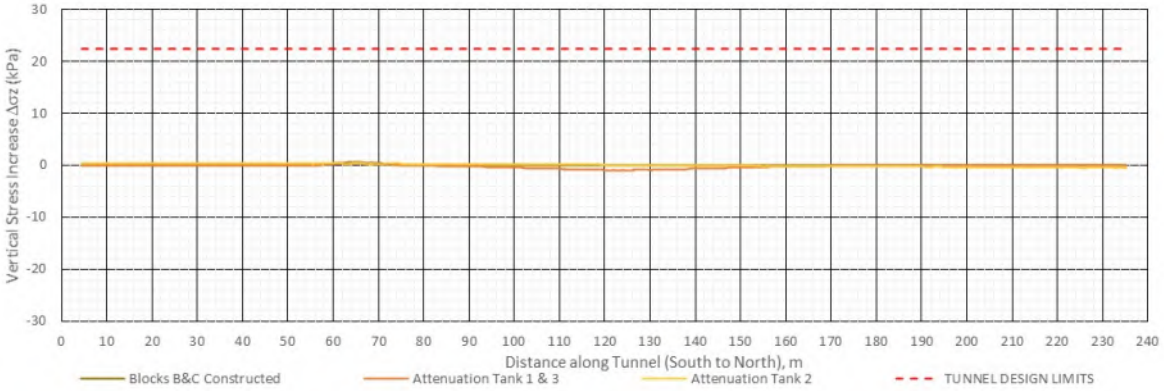


Figure F-2: Change in Total Stress on Tunnel Crown (Southbound) MC - increase is + ive: Blocks B&C (load applied), Attenuation tanks 1, 2, 3

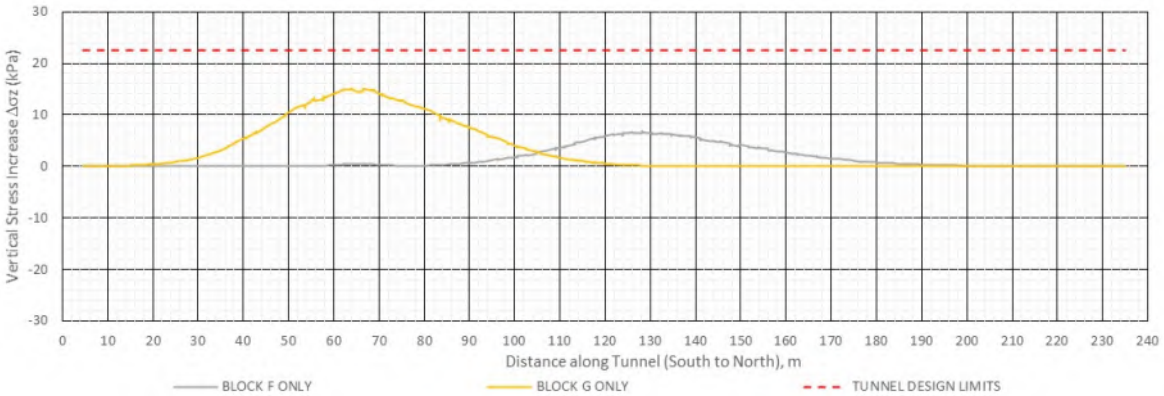


Figure F-3: Change in Total Stress on Tunnel Crown (Northbound) MC - increase is + ive: Blocks F & G

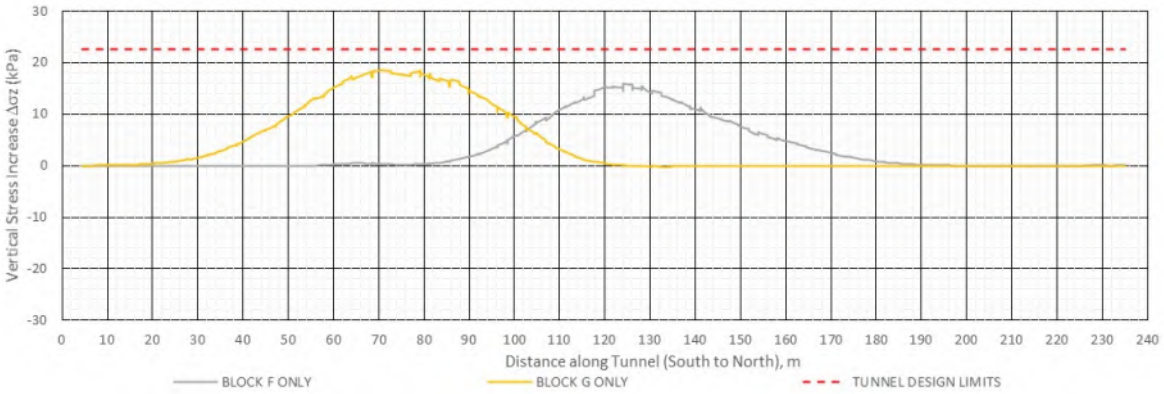


Figure F- 4: Change in Total Stress on Tunnel Crown (Southbound) MC - increase is + ive: Blocks F & G

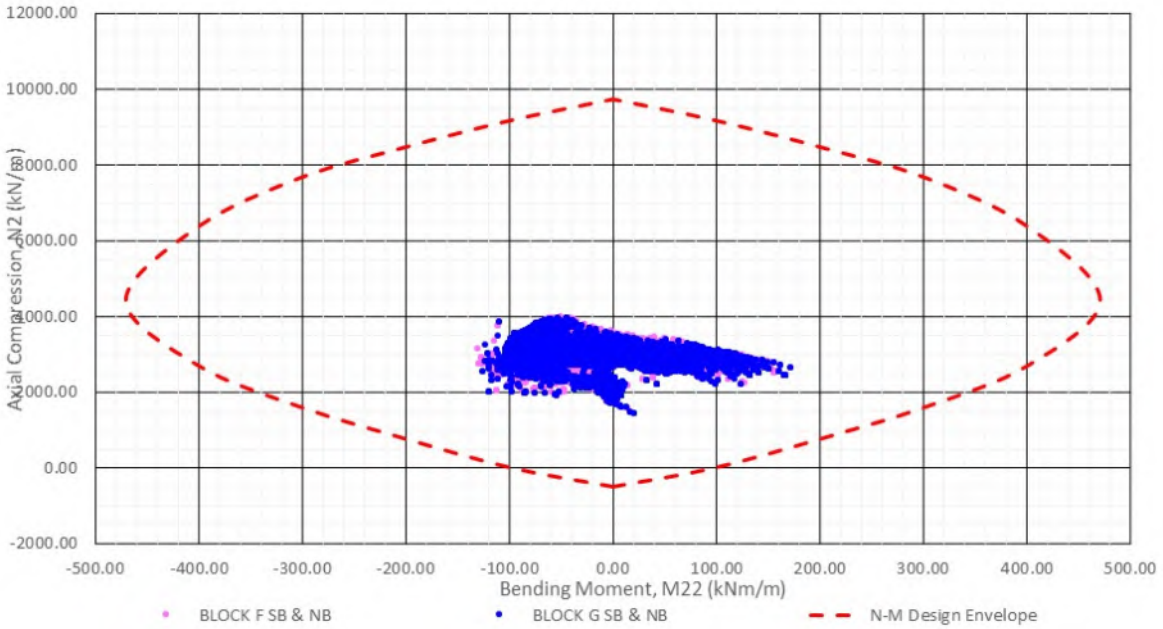


Figure F-5: Design N-M Interaction Chart for tunnel lining along transverse direction with Plaxis 3D results plotted - MC NB&SB: Blocks F & G

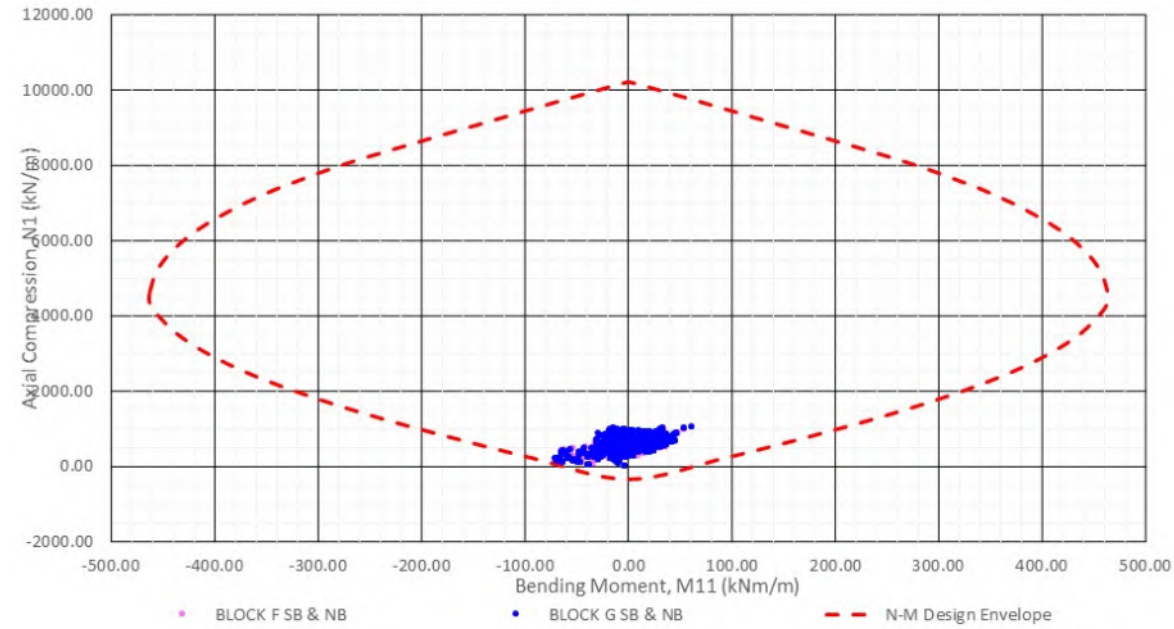


Figure F-6: Design N-M Interaction Chart for tunnel lining along longitudinal direction with Plaxis 3D results plotted -MC NB&SB: Blocks F & G

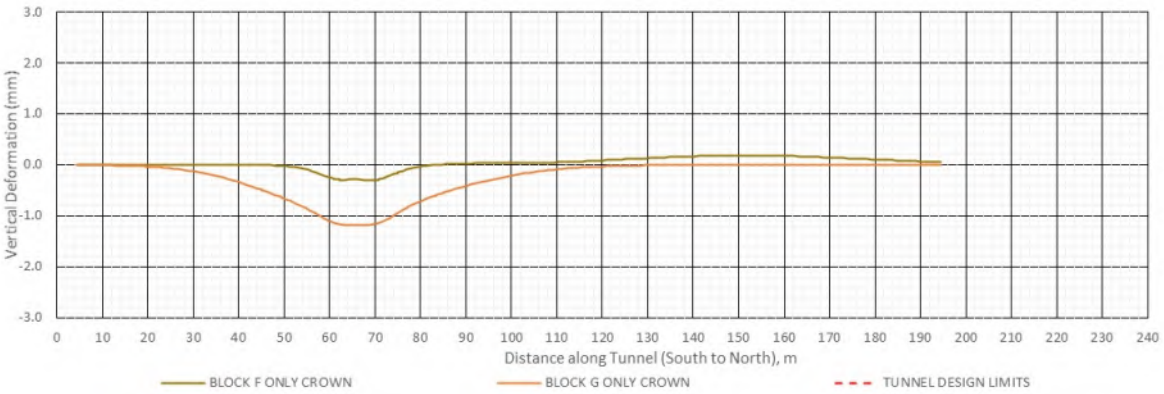


Figure F-7: Vertical Displacements on Tunnel Crown (Northbound) MC: Blocks F & G

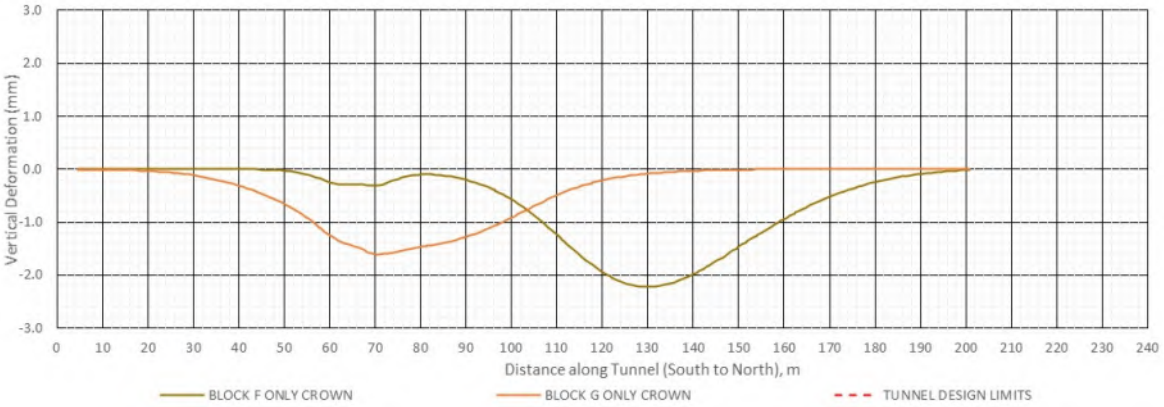


Figure F-8: Vertical Displacements on Tunnel Crown (Southbound) MC: Blocks F & G

APPENDIX G

GII 2010 GROUND INVESTIGATION REPORT

REPORT ON SITE INVESTIGATION

AT

SWORDS ROAD

WHITEHALL

DUBLIN 9

Prepared by: EurGeol Fergal Mc Namara P.Geo.

Signed:…… **Date: 10th May, 2010.**

File No: 2442-02-10

Contents

1.0 Preamble

On the instructions of Colm Doyle of DBFL Consulting Engineers, a site investigation consisting of four no. rotary cored boreholes was carried out between 6th April and the 19th April 2010 on the above site.

2.0 Overview

2.1 Background

It is proposed to construct a new multi storey apartment development on the site.

2.2 Purpose and Scope

The purpose of the site investigation was to determine the depth to bedrock at the chosen locations and the nature and quality of the rock by means of rotary coring. The scope of the work undertaken for this study included the following:

- Visit project site to observe existing conditions
- Carrying out of the subsurface exploration programme consisting of 4 no. rotary cored boreholes.
- Detailed logs as per specification

3.0 Subsurface Exploration

3.1 General

Four number 100mm diameter rotary cored boreholes were proposed in positions designed to give a rock profile over the site in the vicinity of the port tunnel. Competent Bedrock was encountered at 25.50mBGL at the location of RC1, 22.00mBGL at the location of RC2, 21.00mBGL at the location of RC3 and 26.30mBGL at the location of RC4. The bedrock generally consisted of strong dark grey medium grained LIMESTONE with minor black calcareous MUDSTONE.

Recovery was generally 75% to 95% and the rock was slightly to moderately weathered. Poor recovery was encountered in RC2 of 15% due to weaker black calcareous mudstone in this area being washed away. Rotary cored borehole logs from the Dublin Port Tunnel site investigation were supplied to GII by the engineer for comparison. The nearest borehole to RC1 and RC4 is rotary cored borehole 262 which notes competent LIMESTONE bedrock at 26.00mBGL. Bedrock consists of

LIMESTONES with minor calcareous mudstone, this is consistent with the findings in this report from RC1 and RC4. The nearest boreholes to RC2 and RC3 are rotary cored boreholes 211 and 507 which note competent LIMESTONE bedrock at 20.00mBGL and 24.17mBGL respectively consisting of LIMESTONES with minor calcareous mudstones. This is consistent with the findings in this report from RC2 and RC3.

The locations of the exploratory holes are shown on the accompanying site plan.

Detailed logs of the boreholes can be found at the rear of this report.

****

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC1

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 12/04/2010 End date: 14/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with sand seams			1 2 3 4 5 6 7 8 9						

Continued next sheet

Remarks:

Rotary openhole borehole to 23.10mBGL then hole continued by rotary coring techniques.
Driller notes that between 30.00 and 31.00mBGL, 0.60m of core was lost downhole from the core barrel.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC1

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 12/04/2010 End date: 14/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with sand seams			11 12 13 14 15 16 17 18 19						

Continued next sheet

Remarks:

Rotary openhole borehole to 23.10mBGL then hole continued by rotary coring techniques.
Driller notes that between 30.00 and 31.00mBGL, 0.60m of core was lost downhole from the core barrel.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC1

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 12/04/2010 End date: 14/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with sand seams			21 22 23						
Recovery consists of stiff dark grey black sandy gravelly CLAY with cobbles and boulders		23.10	24			0	0	78	23.10
						0	0	61	24.60
Band of grey brown fine SAND		25.10	25						
Strong dark grey LIMESTONE with interbanding layers of calcareous mudstone, calcite veining present, fresh to slightly weathered		25.50	26	Mostly Non-Intact	N.I				
				Fractures range from medium to closely spaced, sub-horizontal to 20degrees, planar, rough to smooth, tight to open and clay coated	8	47	56	77	26.10
			27			38	38	95	27.60
			28	Mostly Non-Intact	N.I				
			29	Fractures range from medium to closely spaced, 30degrees, planar, rough to smooth, tight to open and clay coated	10	67	88	100	28.60

Continued next sheet

Remarks:

Rotary openhole borehole to 23.10mBGL then hole continued by rotary coring techniques.
Driller notes that between 30.00 and 31.00mBGL, 0.60m of core was lost downhole from the core barrel.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC1

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 12/04/2010 End date: 14/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
Strong dark grey LIMESTONE with interbanding layers of calcareous mudstone, calcite veining present, fresh to slightly weathered						30	40	43	30.00
		31.00	31						
End of Borehole Log at 31.00 m			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						

Remarks:

Rotary openhole borehole to 23.10mBGL then hole continued by rotary coring techniques.
Driller notes that between 30.00 and 31.00mBGL, 0.60m of core was lost downhole from the core barrel.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC2

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 06/04/2010 End date: 12/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with boulders and sand bands									

Continued next sheet

Remarks:

Rotary openhole borehole to 22.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC2

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 06/04/2010 End date: 12/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with boulders and sand bands			11 12 13 14 15 16 17 18 19						

Continued next sheet

Remarks:

Rotary openhole borehole to 22.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC2

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 06/04/2010 End date: 12/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with boulders and sand bands			21						
Weak to medium strong dark grey decomposed LIMESTONE driller notes black mudstone bands which washed away during coring process, calcite veining present and moderately weathered		22.00	22	Insufficient recovery to determine fracture pattern due to washed away core	N.I	10	30	65	22.00
			23			8	10	15	23.10
			24						
			25						
			26						
			27						
			28						
			29						

Continued next sheet

Remarks:

Rotary openhole borehole to 22.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC2

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 06/04/2010 End date: 12/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
Weak to medium strong dark grey decomposed LIMESTONE driller notes black mudstone bands which washed away during coring process, calcite veining present and moderately weathered		31.00	31						
End of Borehole Log at 31.00 m			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						

Remarks:

Rotary openhole borehole to 22.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC3

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 15/04/2010 End date: 19/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with sand seams									

Continued next sheet

Remarks:

Rotary openhole borehole to 21.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC3

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 15/04/2010 End date: 19/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with sand seams			11 12 13 14 15 16 17 18 19						

Continued next sheet

Remarks:

Rotary openhole borehole to 21.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC3

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 15/04/2010 End date: 19/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay with sand seams									
Medium strong to strong dark grey LIMESTONE with interbanding layers of black calcareous mudstone, calcite veining present, fresh to slightly weathered		21.00	21	Fractures range from close to very closely spaced, 20degrees, smooth, tight to open and clay coated. Non intact from 24.20 to 24.60mBGL	14	39	67	81	21.00
			22			16	27	73	23.10
			23						
			24						
Strong to very strong dark grey LIMESTONE, calcite veining present, fresh to slightly weathered		24.60	25	Fractures range from medium to closely spaced, sub-horizontal to 30degrees, undulating, rough to smooth, tight to open	9	58	69	81	24.60
			26			57	69	85	26.10
			27						
			28			36	78	85	27.60
			29			29	29	49	29.10
Continued next sheet				Fractures range from very close to extremely closely spaced,					

Remarks:

Rotary openhole borehole to 21.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC3

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 15/04/2010 End date: 19/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
Strong to very strong dark grey LIMESTONE, calcite veining present, fresh to slightly weathered		30.60	31	sub-horizontal, undulating, rough to smooth, tight to open	20				
End of Borehole Log at 30.60 m			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						

Remarks:

Rotary openhole borehole to 21.00mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC4

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 14/04/2010 End date: 15/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay									

Continued next sheet

Remarks:

Rotary openhole borehole to 22.60mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC4

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 14/04/2010 End date: 15/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay			11 12 13 14 15 16 17 18 19						

Continued next sheet

Remarks:

Rotary openhole borehole to 22.60mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC4

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 14/04/2010 End date: 15/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
OVERBURDEN - driller notes boulder clay			21 22						
Recovery consists of stiff dark grey black sandy gravelly CLAY with cobbles and boulders		22.60	23 24 25 26			0	0	70	22.60
						0	0	100	23.10
						0	0	100	24.60
Strong to very strong dark grey LIMESTONE with interbanding layers of black calcareous mudstone, calcite veining present and fresh to slightly weathered		26.30	27 28 29	Fractures range from medium to closely spaced, 45degrees, undulating, rough to smooth, tight to open and clay coated	7	59	67	91	26.20
						73	90	93	27.60
				Fractures range from very close to closely spaced, sub-horizontal to 20degrees, planar, rough to smooth, tight to open and clay coated	18	17	55	76	28.60

Continued next sheet

Remarks:

Rotary openhole borehole to 22.60mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND

BOREHOLE RECORD (Rotary core)

Project Name: Swords Road **Hole ID:** RC4

Client:
Consultant: DBFL
Location: Whitehall, Dublin
Start date: 14/04/2010 End date: 15/04/2010
Type of drilling: RC Hole diameter: 63 mm

Co-ordinates: -
-
Elevation: -
Project no. 2442-02-10
Drilled by: T. Collins
Logged by: N. Sheehan

Strata Description	Legend	Depth	Level mAOD	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
Strong to very strong dark grey LIMESTONE with interbanding layers of black calcareous mudstone, calcite veining present and fresh to slightly weathered				Fractures range from medium to closely spaced, sub-horizontal to 20degrees, planar, rough to smooth, tight to open	9	66	86	100	29.90
		31.00	31						
End of Borehole Log at 31.00 m									
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						

Remarks:

Rotary openhole borehole to 22.60mBGL then hole continued by rotary coring techniques.

KEY

TCR	Total Core Recovery.
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FSI	Fracture Spacing Index

GROUND INVESTIGATIONS IRELAND


SWORDS ROAD
Engineer
DBFL
Contractor
Ground Investigations Ireland Ltd.
HOLE ID:
BH: RC 1
FROM:
23·10 m
TO:
26·60 m
BOX NO.
1 of 3
DATE:
13/04/10
Date refers to start date of drilling:
23·10
24·60
26·10
26·60
BEECH LAWN


SWORDS ROAD
Engineer
DBFL
Contractor
Ground Investigations Ireland Ltd.
HOLE ID:
BH: RC 1
FROM:
26·60 m
TO:
30·00 m
BOX NO.
2 of 3
DATE:
13/04/10
Date refers to start date of drilling:
26·60
27·60
28·60
30·00
BEECH LAWN


23.10 m - 26.60m
SWORDS ROAD
Engineer
DBFL
Contractor
Ground Investigations Ireland Ltd.
HOLE ID:
BH: RC 1
FROM:
30.00 m
TO:
31.00 m
BOX NO.
3 of 3
DATE:
14/04/10
Date refers to start date of drilling.
30.00 m
31.00 m
BEECH LAWN


BEECH LAWN
SWORDS ROAD
Engineer
DBFL
Contractor
Ground Investigations Ireland Ltd.
HOLE ID:
BH: RC 2
FROM:
22.00 m
TO:
31.00 m
BOX NO.
1 of 1
DATE:
12/04/10
Date refers to start date of drilling.
22.00 m
23.10 m
31.00 m
BEECH LAWN


SWORDS ROAD
Engineer DBFL
Contractor Ground Investigations Ireland Ltd.
HOLE ID: BH: RC 3
FROM: 21·00 m
TO: 24·60 m
BOX NO. 1 of 3
DATE: 16/04/10
Date refers to start date of drilling
21·00 m
23·10 m
24·60 m

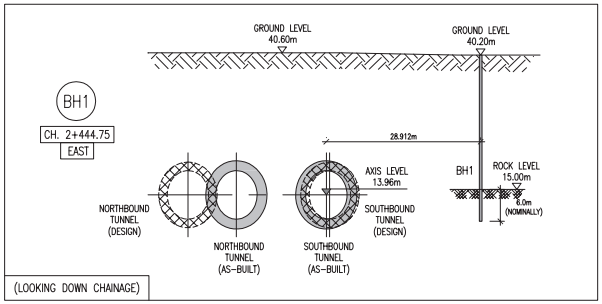

BEECH LAWN
BH-3
SWORDS ROAD
Engineer DBFL
Contractor Ground Investigations Ireland Ltd.
HOLE ID: BH: RC 3
FROM: 24·60 m
TO: 27·95 m
BOX NO. 2 of 3
DATE: 19/04/10
Date refers to start date of drilling
24·60 m
26·10 m
27·60 m
27·95 m

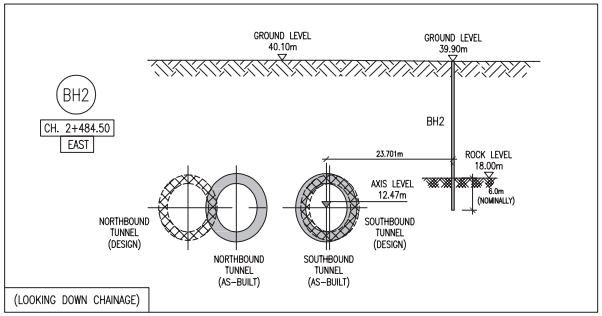

SWORDS ROAD
Engineer DBFL
Contractor Ground Investigations Ireland Ltd.
HOLE ID: BH: RC3
FROM: 27.95 m
TO: 30.60 m
BOX NO. 3 of 3
DATE: 19/04/10
Date refers to start date of drilling
27.95 m
29.10
30.60m

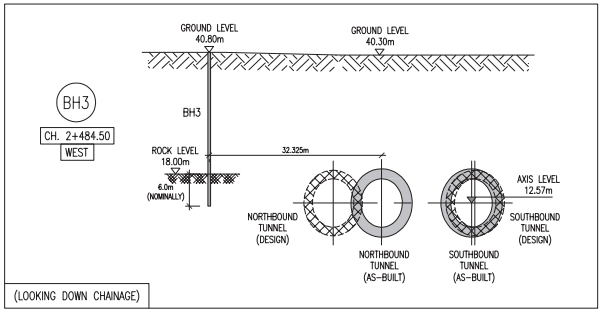

SWORDS ROAD
Engineer DBFL
Contractor Ground Investigations Ireland Ltd.
HOLE ID: BH: RC4
FROM: 22.60 m
TO: 25.55 m
BOX NO. 1 of 3
DATE: 14/04/10
Date refers to start date of drilling
22.60 m
23.10 m
24.60
2555

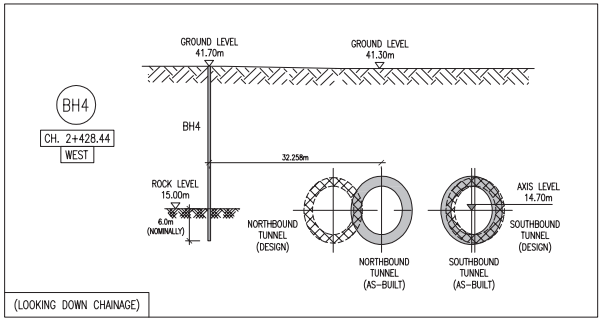

Box-2
27.95m – 30.60m
SWORDS ROAD
Engineer
DBFL
Contractor
Ground Investigations Ireland Ltd.
HOLE ID:
BH: RC4
FROM:
25.55 m
TO:
28.60 m
BOX NO.
2 of 3
DATE:
15/04/10
Date refers to start date of drilling
25.55 m
26.20
27.60 m
28.60 m
BEECH LAWN


22.60m – 25.55m
BEECH LAWN
SWORDS ROAD
Engineer
DBFL
Contractor
Ground Investigations Ireland Ltd.
HOLE ID:
BH: RC4
FROM:
28.60 m
TO:
31.00 m
BOX NO.
3 of 3
DATE:
15/04/10
28.60 m
31.00m









ON ORIGINAL

0 5 10 15 20 30 40 50mm

NOTES:
1. ALL DIMENSIONS AND LEVELS IN METRES, EXCEPT IF NOTED OTHERWISE.
2. ALL LEVELS TO MALIN HEAD DATUM.
3. CO-ORDINATE SYSTEM IS: NATIONAL GRID.

NOTE:
ROCK LEVELS TAKEN FROM DPTO DRAWING:
DR/NC/NCT/C10
DR/36117/04/0
AND ARE INDICATIVE ONLY.

REV.	DATE	DESCRIPTION	BY	CHKD

FOR INFORMATION

DESIGNED	CRH	PREPARED	KJ/LE
DATE	MAR 2010	CHECKED	CFH

DBFL Consulting Engineers
Dublin Office: Herbert House, Haddington Road, Dublin 2, Ireland. Phone: +353 1 400 4000 Fax: +353 1 400 4080
Waterford Office: Unit 8, The Chandlery, 1-2 O'Connell Street, Waterford, Ireland. Phone: +353 51 309 500 Fax: +353 51 844 918
DBFL Consulting Engineers www.dbfl.ie

PROJECT
RESIDENTIAL DEVELOPMENT AT COLLINS AVENUE AND SWORDS ROAD JUNCTION

DRG. TITLE
BOREHOLE PLAN & SECTIONS

ARCHITECT
FENTON SIMONS & ASSOCIATES

SCALE	1:500	FILE REF.	073073-9105

DRG. NO. 073073-9105

APPENDIX H

GII 2020 GROUND INVESTIGATION REPORT

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Ground Investigations Ireland

Swords Road Whitehall Development

Eastwise Construction Ltd

Ground Investigation Report

August 2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

DOCUMENT CONTROL SHEET

Project Title	Swords Road Whitehall Development
Engineer	AECOM
Client	Eastwise Construction Ltd
Project No	9429-02-20
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Draft	M Sutton	A McDonnell	F McNamara	Dublin	25 August 2020

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

CONTENTS

APPENDICES

1.0 Preamble

On the instructions of Aecom Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between March and June 2020 at the site of the proposed residential development on Swords Road Whitehall, Dublin.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development comprising seven multi story blocks of apartments and an eighth low level building housing a creche at the site including associated services, access roads and car parking. The site is currently brownfield with grass and low-level vegetation covering the majority of the site. The proposed construction is envisaged to consist of conventional or piled foundations and pavement make up with some local excavations for services and plant. A basement is proposed as part of the proposed scheme which will require excavation of approximately 4m BGL in parts of the site.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 13 No. Trial Pits to a maximum depth of 4.5m BGL
- Carry out 3 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 10 No. Cable Percussion boreholes to a maximum depth of 8m BGL
- Carry out 3 No. Rotary Geobore Follow on boreholes to a maximum depth of 37m BGL
- Installation of 3 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Factual Report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a 13T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 3 of this Report.

3.4. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 5 of this Report.

3.5. Rotary Boreholes

The rotary coring was carried out by a track mounted Comacchio Geo 405 rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The Comacchio Geo 405 is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The Comacchio Geo 405 utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids.

It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 5 of this Report.

3.6. Surveying

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.7. Groundwater/Gas Monitoring Installations

Groundwater and or Gas Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.8. TRL Dynamic Cone Penetrometer

The TRL DCP tests were carried out at locations specified by the Consulting Engineer to determine a CBR design value for the design of external pavements. The testing was carried out below the Topsoil or existing pavement at the depths detailed on the test report. The test consists of dropping a 10kg weight on an anvil to drive a small diameter cone and recording the blows for a given penetration. The results of the DCP testing is included in Appendix 4 of this Report.

3.9. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Environmental & Chemical testing as required by the specification, including the Rilta Suite pH and sulphate testing was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.
Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer and California Bearing Ratio (CBR) tests were carried out in NMTL's Geotechnical Laboratory in Carlow. Specialist shear strength testing consisting of quick undrained, consolidated undrained triaxial, carried out on undisturbed U100 samples cut from Geobore core.
Rock strength testing including Point Load (Is_{50}) and Unconfined Compressive Strength (UCS) testing was carried out in Pro Soils Geotechnical Laboratory in the UK.
The results of the laboratory testing are included in Appendix 6 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil/Surfacing
- Made Ground
- Cohesive Deposits
- Bedrock

TOPSOIL: Topsoil was encountered in the majority of exploratory holes and was present to a maximum depth of 0.65m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil/Surfacing and were present to a depth of between 0.2m and 1.5m BGL. These deposits were described generally as *brown sandy slightly gravelly Clay with occasional cobbles or grey sandy angular Gravel.* In some pits *occasional*

fragments of concrete, red brick, wood, ceramic, metal and cloth were noted. TP05, TP05A and TP05B encountered a concrete slab at depths of between 0.90m and 1.20m BGL where the trial were terminated.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown sandy gravelly CLAY with occasional cobbles and boulders* overlying a *stiff black sandy gravelly CLAY with occasional cobbles and boulders*. A second sequence of brown overlying black CLAY was also encountered at depth in BH05 and BH09 that were drilled to prove rock level. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was firm to stiff becoming stiff or very stiff in the majority of the exploratory holes. These deposits had some or occasional cobble and boulder content where noted on the exploratory hole logs.

BEDROCK: Boreholes BH05 and BH09 recovered Medium strong to very strong grey/dark grey fine to medium grained laminated LIMESTONE interbedded with weak black fine grained laminated Mudstone. This is typical of the Calp Formation, which is noted on the geological mapping to the east of the proposed site.

The depth to rock varies from 22.0m BGL in BH05 to a maximum of 32.3m BGL in BH09. The total core recovery is good, typically 100%. The SCR and RQD both vary with some areas recovered as non-intact.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH01, BH06 and BH10 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 7 of this Report.

4.3. Laboratory Testing

4.3.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low to intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 8.9% and 43.9% generally with fines contents of 26.6 to 57.1%.

The CBR testing on remoulded samples gave results ranging between 0.1% and 14.3% for the cohesive deposits.

The results from all the completed laboratory testing including MCV and triaxial testing is included in Appendix 6 of this report.

4.3.1. Chemical Laboratory Testing

The pH and sulphate testing carried out indicate that pH results are near neutral and that the water soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

4.3.1. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.
The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.
As part of the suite a leachate is generated from the solid sample which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).
While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. A waste classification report is recommended to be carried out to provide an interpretation of the laboratory data should any material be required to be disposed of off site.

4.3.1. Rock Laboratory Testing

The rock testing carried out on samples recovered from the boreholes reported Unconfined Compressive Strength (UCS) values ranging between 36.9 and 105.2 MPa while the point load testing gave Is50 values ranging between 0.25 to 6.10 MPa.

The results from the completed laboratory testing is included in Appendix 6 of this report.

APPENDIX 1 - Site Location Plan

Borehole

Trial Pit

Indicative Site Boundary

Client:

AECOM

Project Code:

9429-02-20

Project Title:

Whitehall Swords Road Extension

Drawing Title:

Investigation Location Plan

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

0 10 20 30 40 50 m

Drawn By:	Date:
MS	10/08/2020

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP01
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 5.20 X 1.20 X 4.50	**Ground Level (mOD)** 42.39	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716756.1 E 738158.8 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	MADE GROUND: Grey slightly sandy angular to sub-angular fine to coarse Gravel.		
				42.14	0.25			
					(0.20)	Soft brown slightly sandy slightly gravelly CLAY.		
				41.94	0.45			
0.70	B					Firm to stiff grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
0.70	T							
1.00	SV 115kPa		101,90,70/Av. 87.00					
					(1.45)			
1.60	B							
1.60	T							
				40.49	1.90	Stiff dark grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles.Gravel is sub-angular to sub-rounded fine to coarse.		
					(0.50)			
2.40	B			39.99	2.40	Very stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
2.40	T							
					(2.10)			
4.00	B							

Plan

Remarks

Trial pit complete at 4.50m BGL
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP01

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP01
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 5.20 X 1.20 X 4.50	**Ground Level (mOD)** 42.39	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716756.1 E 738158.8 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.00	T			37.89	4.50	Complete at 4.50m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP01

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP02
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 4.60 X 1.20 X 3.20	**Ground Level (mOD)** 42.38	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716730.1 E 738109.8 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				42.08	0.30			
0.50 0.50	B T					Firm grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
1.00	SV 101kPa							
					(1.80)			
1.50 1.50	B T							
				40.28	2.10			
						Stiff dark grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
					(1.10)			
2.70 2.70	B T							
				39.18	3.20			
						Complete at 3.20m		

Plan

Remarks

Trial pit complete at 3.2m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP03
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 4.60 X 1.20 X 3.20	**Ground Level (mOD)** 40.79	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716721.6 E 738061.4 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	MADE GROUND: Grey sandy angular to sub-angular fine to coarse Gravel.		
				40.59	0.20			
0.50 0.50	B T				(0.70)	Soft brown slightly sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse.		
				39.89	0.90			
1.00	SV 101kPa		76,77,77/Av. 76.67			Firm grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
					(1.40)			
1.80 1.80	B T							
				38.49	2.30			
						Stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
					(0.70)			
2.70 2.70	B T							
				37.79	3.00			
						Complete at 3.00m		

Plan

Remarks

Trial pit complete at 3.0m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP03

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP04
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 4.30 X 1.20 X 3.00	**Ground Level (mOD)** 41.77	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716800.4 E 738132.1 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				41.57	0.20			
					(0.20)	MADE GROUND: Dark grey slightly sandy gravelly Clay with occasional fragments of red brick and concrete.		
				41.37	0.40			
0.50 0.50	B T				(0.70)	MADE GROUND: Dark grey slightly sandy gravelly Clay with many sub-angular to sub-rounded cobbles and occasional fragments of cloth and metal.		
				40.67	1.10			
					(1.20)	Firm to stiff grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
1.80 1.80	B T							
				39.47	2.30			
2.50 2.50	B T				(0.70)	Stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
				38.77	3.00			
						Complete at 3.00m		

Plan

Remarks

Trial pit complete at 3.0m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP04

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP05
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 2.40 X 1.20 X 1.20	**Ground Level (mOD)** 40.29	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716864.2 E 738100.3 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Dark brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				40.09	0.20	MADE GROUND: Dark greyish brown slightly sandy gravelly Clay with occasional fragments of cloth and concrete.		
0.50 0.50	B T				(0.60)			
				39.49	0.80	MADE GROUND: Greyish brown slightly sandy gravelly Clay with rare fragments of concrete.		
1.00 1.00 1.00	SV 86kPa B T		60,70,65/Av. 65.00		(0.40)			
				39.09	1.20	Obstruction: CONCRETE.		
						Complete at 1.20m		

Plan

Remarks

Trial pit complete at 1.2m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP05

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP05A
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 2.20 X 1.20 X 0.90	**Ground Level (mOD)** 39.94	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716877.8 E 738099.1 N	**Dates** 06/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Dark brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
0.50 0.50	B T			39.54	0.40	MADE GROUND: Dark greyish brown slightly sandy gravelly CLAY with occasional fragments of metal and concrete.		
					(0.50)			
				39.04	0.90	Obstruction: CONCRETE.		
						Complete at 0.90m		

Plan

Remarks

Trial pit complete at 0.9m BGL.
No Groundwater encountered during excavation.
Trial pit sidewalls spalling.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP05A

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP05B
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 2.20 X 1.20 X 0.90	**Ground Level (mOD)** 39.93	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716880.3 E 738107.7 N	**Dates** 06/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Dark brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				39.63	0.30			
0.50 0.50	B T				(0.60)	MADE GROUND: Dark greyish brown slightly sandy gravelly CLAY with occasional fragments of plastic and ceramic.		
				39.03	0.90	Obstruction: CONCRETE.		
						Complete at 0.90m		

Plan

Remarks

Trial pit complete at 0.9m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP05A

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP05C
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 3.70 X 1.20 X 3.00	**Ground Level (mOD)** 40.41	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716853.3 E 738107.1 N	**Dates** 06/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				40.16	0.25	MADE GROUND: Dark grey slightly sandy gravelly Clay with occasional fragments of red brick.		
					(0.30)			
				39.86	0.55	MADE GROUND: Greyish brown slightly sandy slightly gravelly Clay with occasional fragments of clay pipe.		
					(0.35)			
0.90 0.90	B T			39.51	0.90	Firm grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
					(1.20)			
2.00 2.00	B T			38.31	2.10	Stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
					(0.90)			
2.90 2.90	B T			37.41	3.00	Complete at 3.00m		

Plan

Remarks

Trial pit complete at 3.0m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP05C

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP06
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 6.00 X 1.20 X 4.30	**Ground Level (mOD)** 41.57	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716798.2 E 738099.6 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	SV 75kPa		50,50,70/Av. 56.67	41.32	(0.25) 0.25	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				41.07	(0.25) 0.50	MADE GROUND: Brown slightly sandy slightly gravelly CLAY.		
0.60 0.60	B T			41.02	0.55	MADE GROUND: Dark grey slightly sandy clayey angular to sub-angular fine to coarse Gravel.		
						Firm grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
1.50 1.50	B T				(1.85)			
				39.17	2.40	Stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
2.70 2.70	B T				(0.60)			
				38.57	3.00	Very stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
3.70 3.70	B T				(1.30)			

Plan

Remarks

Trial pit complete at 4.30m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.
Soakaway completed adjacent to Trial pit.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP06

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP06
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 6.00 X 1.20 X 4.30	**Ground Level (mOD)** 41.57	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716798.2 E 738099.6 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				37.27	4.30	Obstruction: Presumed boulder. Complete at 4.30m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP06

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP07
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 4.40 X 1.20 X 3.40	**Ground Level (mOD)** 40.64	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716790 E 738033.8 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.60)	Dark brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				40.04	0.60			
0.70 0.70	B T				(0.35)	MADE GROUND: Dark brown slightly sandy slightly gravelly CLAY with occasional fragments of wood and ceramic.		
				39.69	0.95			
1.40 1.40	B T				(2.45)	Soft brown slightly sandy slightly gravelly CLAY with rare sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		▽1
			ss(1) at 2.80m.					
3.30 3.30	B T			37.24	3.40	Complete at 3.40m		

Plan

Remarks

Trial pit complete at 3.40m BGL.
Groundwater encountered - Slight Seepage at 2.80m BGL.
Trial pit collapsed from 1.60m to 2.90m BGL.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP07

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP08
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 4.20 X 1.20 X 3.20	**Ground Level (mOD)** 39.78	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716841.8 E 738022.4 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.65)	Dark brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
0.70 0.70	B T			39.13	0.65	Firm grey mottled brown slightly sandy gravelly CLAY with sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
1.00	SV 86kPa		60,70,65/Av. 65.00					
1.50 1.50	B T				(1.85)			
				37.28	2.50	Stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
2.80 2.80	B T				(0.70)			
				36.58	3.20	Complete at 3.20m		

Plan

Remarks

Trial pit complete at 3.20m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.
Soakaway completed adjacent to Trial pit.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP08

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP09
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 4.30 X 1.20 X 3.20	**Ground Level (mOD)** 40.37	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716762.6 E 738021 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				39.97	0.40	MADE GROUND: Greyish brown slightly sandy slightly gravelly CLAY with rare fragments of red brick.		
0.60	B				(0.30)			
0.60	T			39.67	0.70	Firm grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
1.00	SV 82kPa		65,60,62/Av. 62.33					
					(1.90)			
1.90	B							
1.90	T							
				37.77	2.60	Stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
2.80	B				(0.60)			
2.80	T							
				37.17	3.20	Complete at 3.20m		

Plan

Remarks

Trial pit complete at 3.20m BGL.
No Groundwater encountered during excavation.
Trial pit stable.
Trial pit backfilled on completion.
Soakaway completed adjacent to Trial pit.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP09

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Trial Pit Number** TP10
Machine : 13.5T Excavator **Method :** Trial Pit	**Dimensions** 4.50 X 1.20 X 3.00	**Ground Level (mOD)** 40.69	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716848.7 E 738129.3 N	**Dates** 05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				40.54	0.15			
					(0.10)	MADE GROUND: Dark grey slightly sandy very clayey angular to sub-angular fine to coarse Gravel.		
				40.44	0.25			
					(0.15)	MADE GROUND: Dark greyish brown slightly sandy gravelly Clay with occasional fragments of metal.		
				40.29	0.40			
0.50 0.50	B T					MADE GROUND: Grey mottled brown slightly sandy gravelly CLAY with some sub-angular to sub-rounded cobbles and some patches of dark grey clay.(Reworked Ground)		
					(1.10)			
1.40 1.40	B T							
				39.19	1.50	Firm to stiff grey mottled brown slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
					(0.70)			
				38.49	2.20	Stiff dark grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles. Gravel is sub-angular to sub-rounded fine to coarse.		
					(0.80)			
2.80 2.80	B T							
				37.69	3.00	Complete at 3.00m		

Plan

Remarks

Trial pit complete at 3.00m BGL.
No Groundwater encountered during excavation.
Trial pit collapsed below 0.60m BGL.
Trial pit backfilled on completion.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	9429-02-20.TP10

Swords Road, Whitehall – Trial Pit Photographs

TP01

TP01

TP02

TP02

TP03

TP03

TP04

TP04

TP05

TP05

TP05A

TP05A

TP05B

TP05B

TP05C

TP05C

TP06

TP06

TP07

TP07

TP08

TP08

TP09

TP09

TP10

APPENDIX 3 – Soakaway Test Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

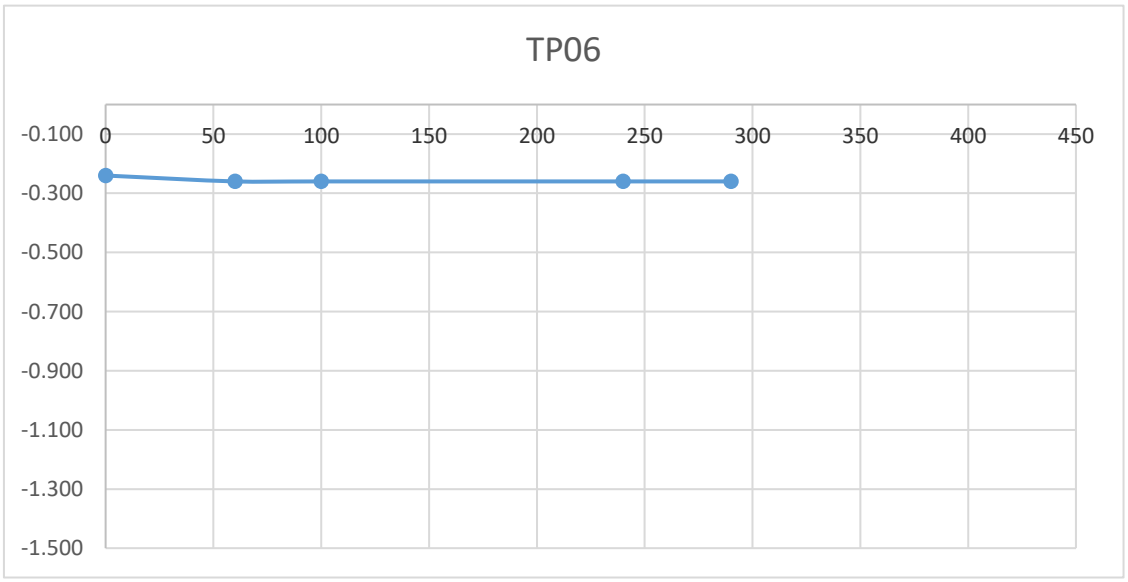
TP06

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.3m x 0.60m x 0.9m (L x W x D)

Date	Time	Water level (m bgl)
06/03/2020	0	-0.240
06/03/2020	60	-0.260
06/03/2020	100	-0.260
06/03/2020	240	-0.260
06/03/2020	290	-0.260

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.24	0.900	0.660	0.405	0.735



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

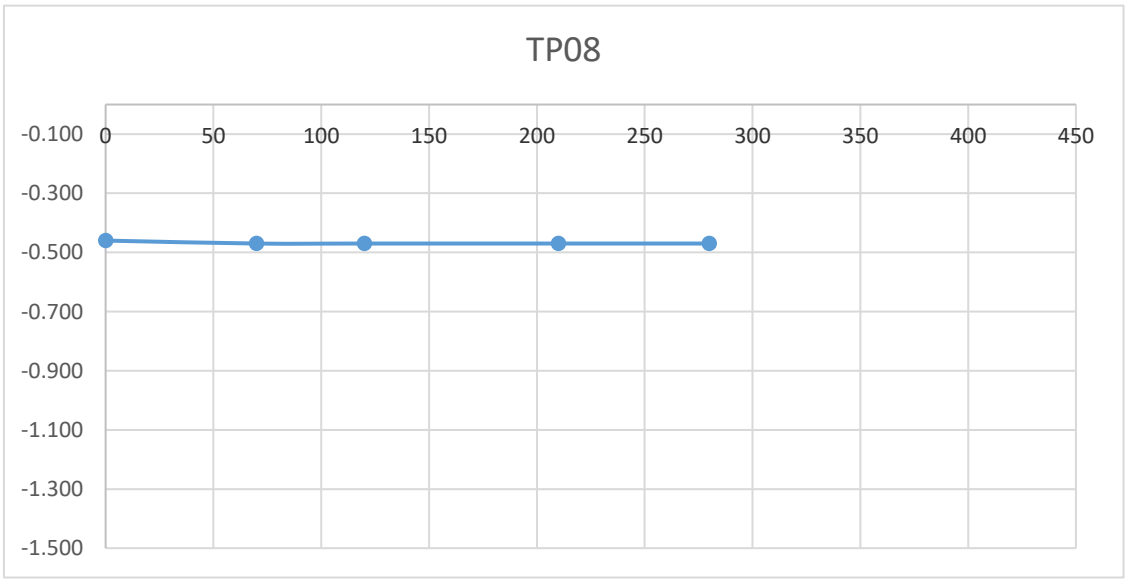
TP08

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.4m x 0.60m 1.5m (L x W x D)

Date	Time	Water level (m bgl)
06/03/2020	0	-0.460
06/03/2020	70	-0.470
06/03/2020	120	-0.470
06/03/2020	210	-0.470
06/03/2020	280	-0.470

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.46	1.500	1.040	0.72	1.24



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

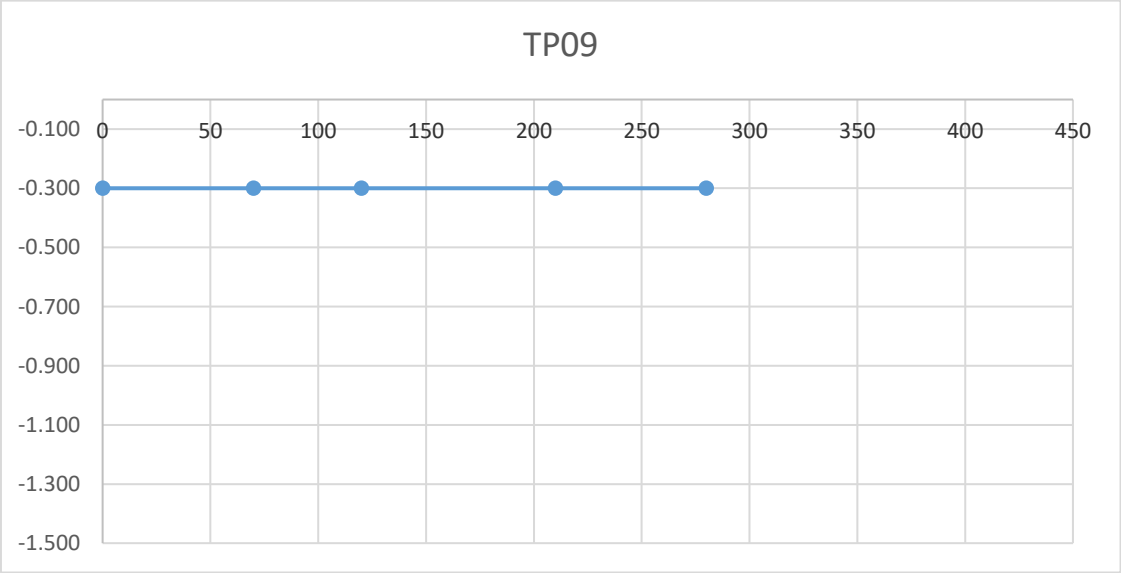
TP09

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.2m x 0.60m 1.5m (L x W x D)

Date	Time	Water level (m bgl)
06/03/2020	0	-0.300
06/03/2020	70	-0.300
06/03/2020	120	-0.300
06/03/2020	210	-0.300
06/03/2020	280	-0.300

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.30	1.500	1.200	0.6	1.2



APPENDIX 4 – TRL Dynamic Cone Penetration Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

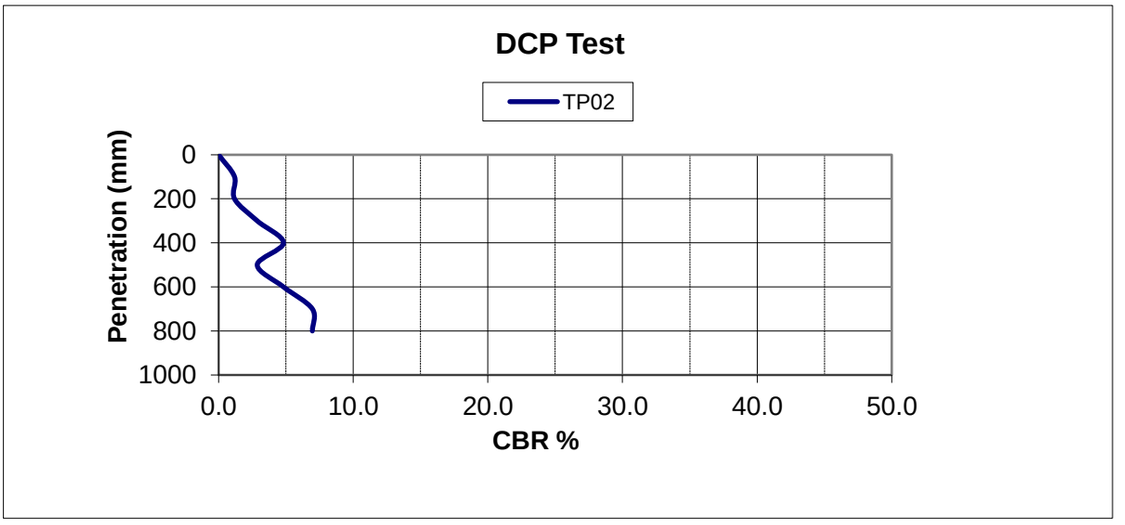
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP02
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	1	100.0	1.2
300	2	50.0	2.9
400	3	33.3	4.8
500	2	50.0	2.9
600	3	33.3	4.8
700	4	25.0	7.0
800	4	25.0	7.0
900	7	14.3	14.2
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

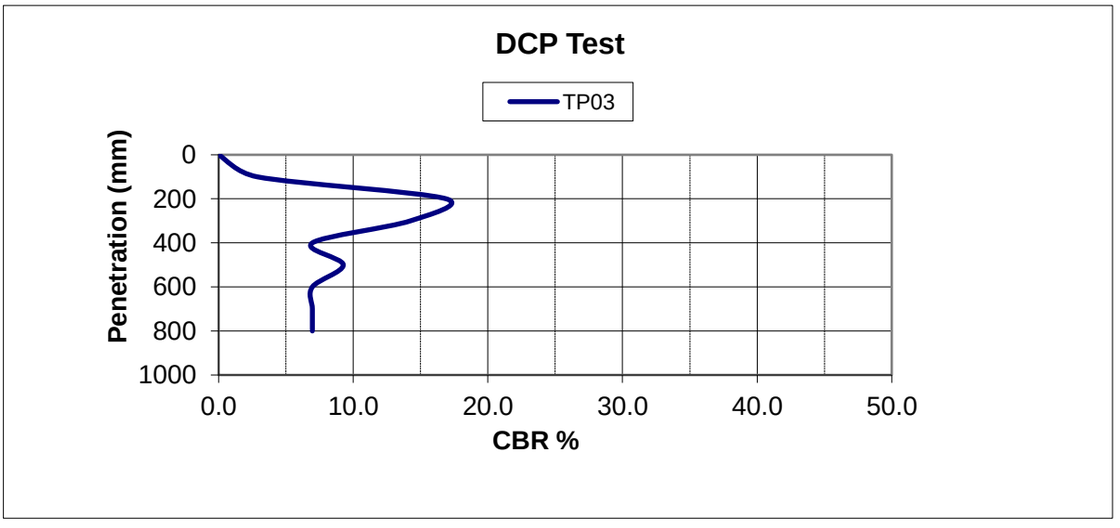
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP03
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	2	50.0	2.9
200	8	12.5	16.9
300	7	14.3	14.2
400	4	25.0	7.0
500	5	20.0	9.3
600	4	25.0	7.0
700	4	25.0	7.0
800	4	25.0	7.0
900	6	16.7	11.7
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

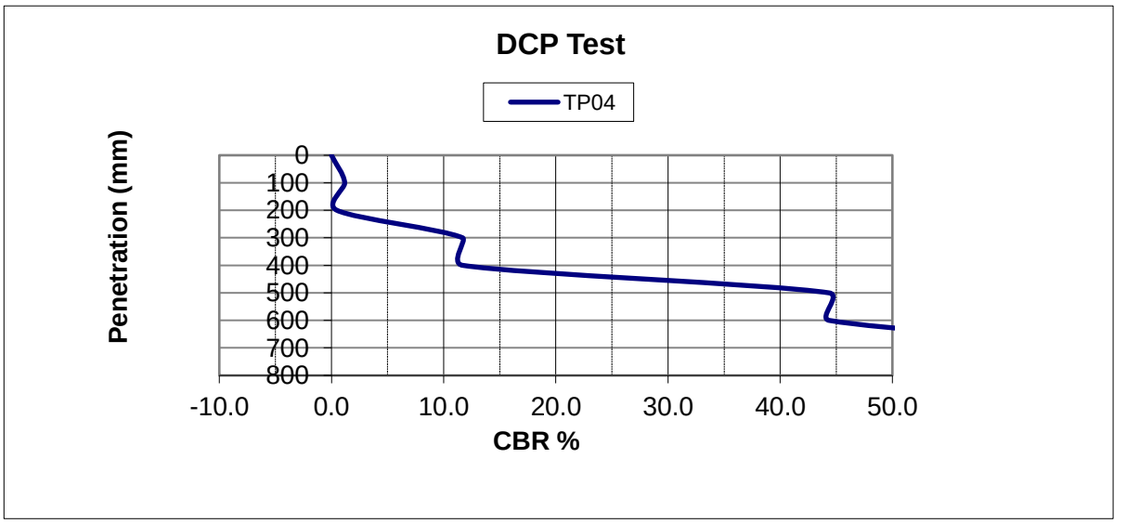
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP04
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	0	200.0	0.5
300	6	16.7	11.7
400	6	16.7	11.7
500	17	5.9	44.4
600	17	5.9	44.4
700	25	4.0	72.7
800	-	-	-
900	-	-	-
1000	-	-	-
1100	-	-	-
1200	-	-	-
1300	-	-	-
1400	-	-	-
1500	-	-	-

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

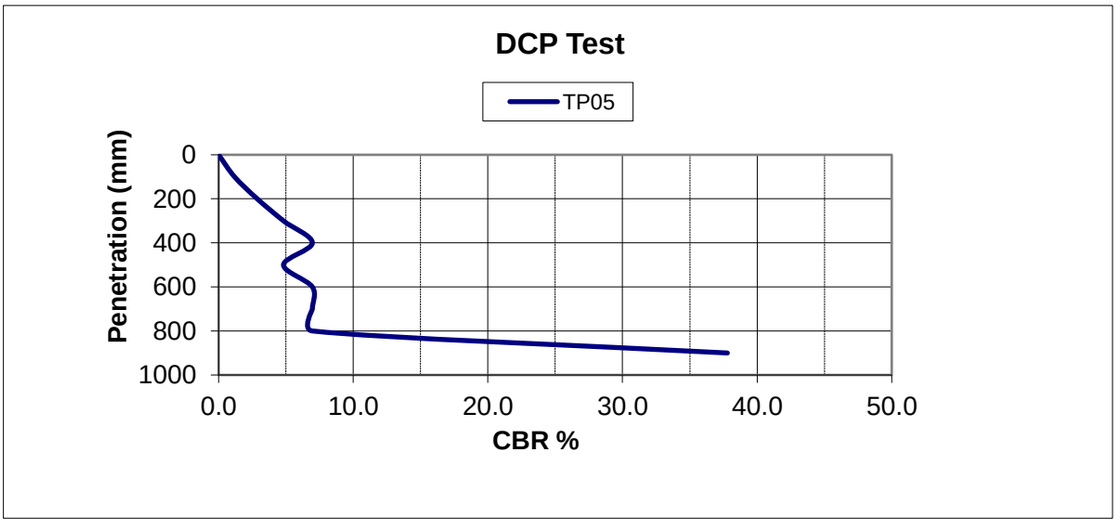
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP05
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	2	50.0	2.9
300	3	33.3	4.8
400	4	25.0	7.0
500	3	33.3	4.8
600	4	25.0	7.0
700	4	25.0	7.0
800	4	25.0	7.0
900	15	6.7	37.8
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

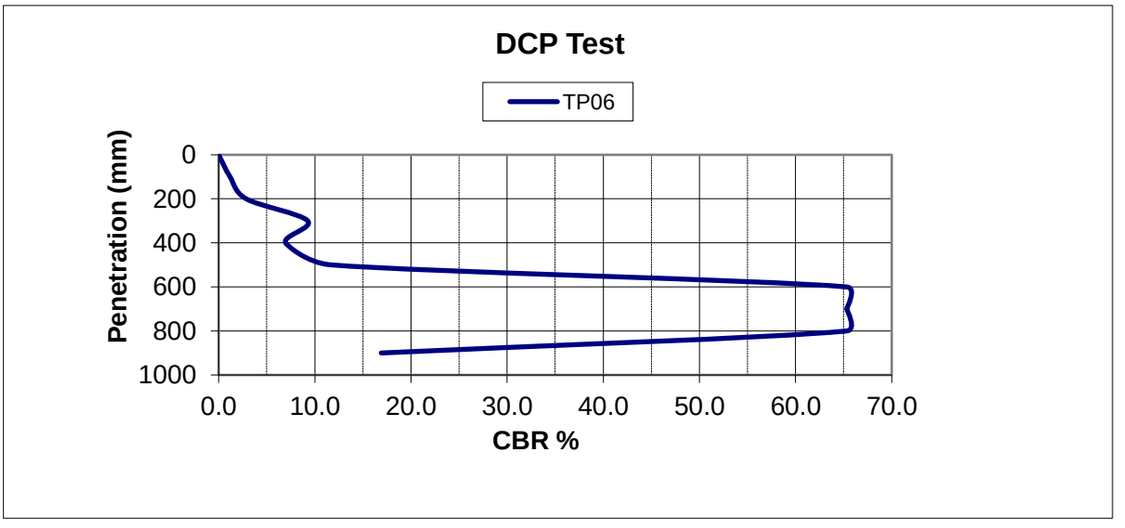
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP06
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	2	50.0	2.9
300	5	20.0	9.3
400	4	25.0	7.0
500	6	16.7	11.7
600	23	4.3	65.3
700	23	4.3	65.3
800	23	4.3	65.3
900	8	12.5	16.9
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

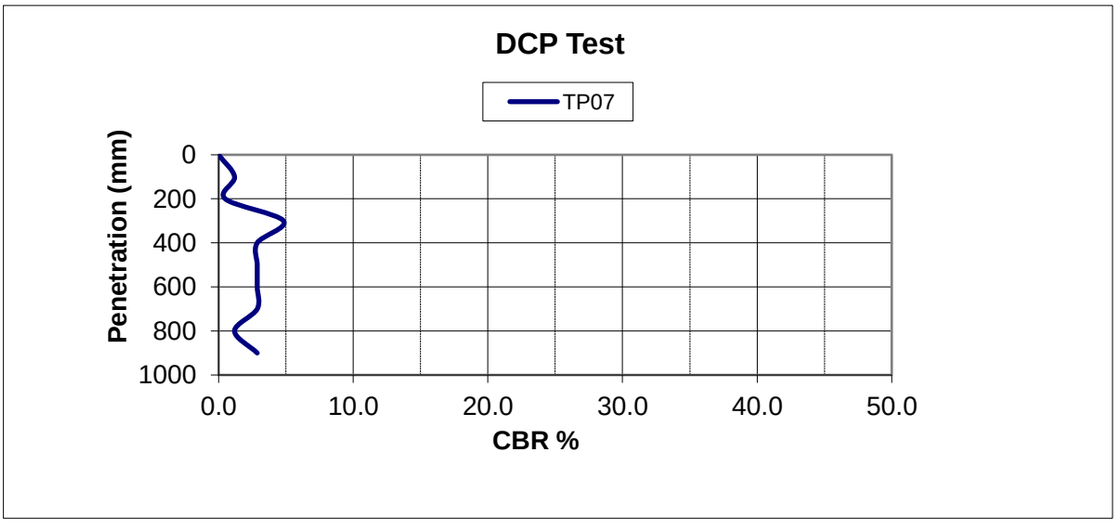
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP07
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	0	200.0	0.5
300	3	33.3	4.8
400	2	50.0	2.9
500	2	50.0	2.9
600	2	50.0	2.9
700	2	50.0	2.9
800	1	100.0	1.2
900	2	50.0	2.9
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

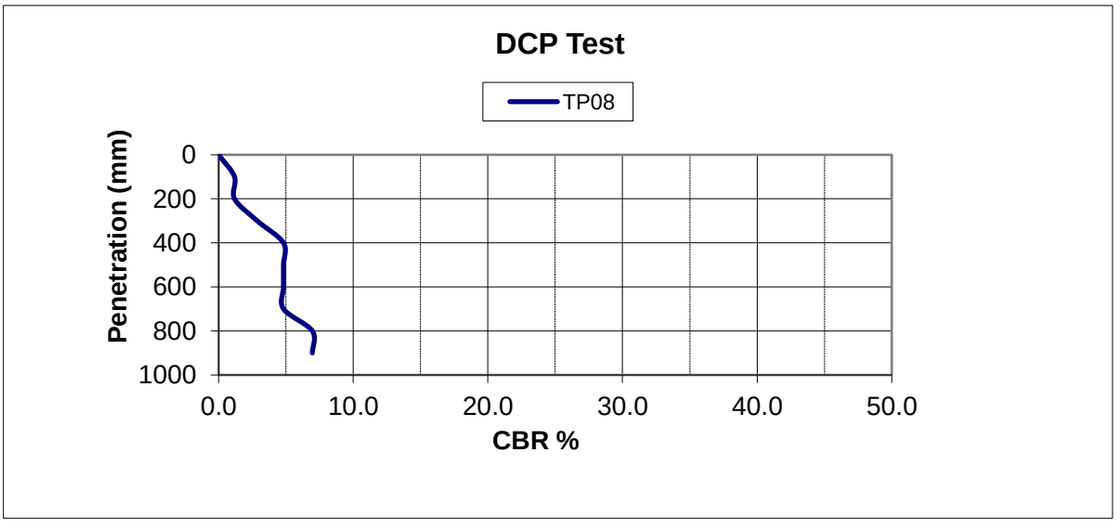
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP08
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	1	100.0	1.2
300	2	50.0	2.9
400	3	33.3	4.8
500	3	33.3	4.8
600	3	33.3	4.8
700	3	33.3	4.8
800	4	25.0	7.0
900	4	25.0	7.0
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

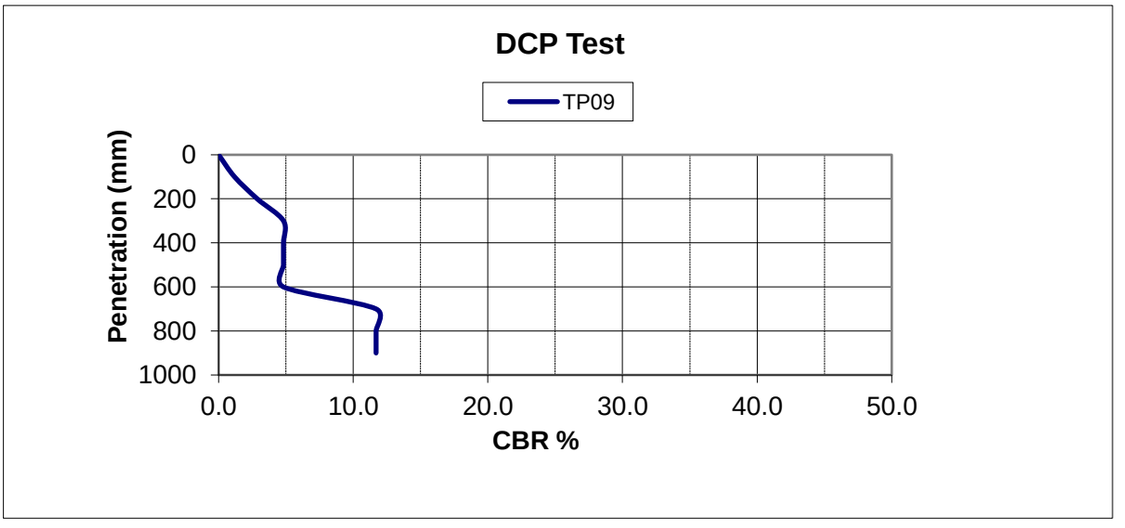
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP09
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	2	50.0	2.9
300	3	33.3	4.8
400	3	33.3	4.8
500	3	33.3	4.8
600	3	33.3	4.8
700	6	16.7	11.7
800	6	16.7	11.7
900	6	16.7	11.7
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

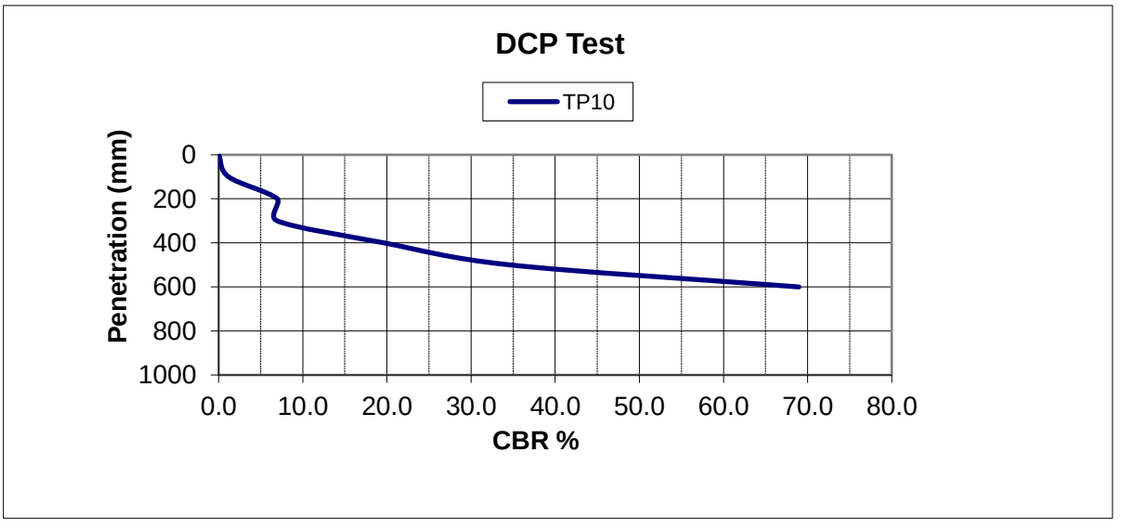
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Swords Road, Whitehall	**Test Type**	Dynamic Cone Penetration Test
Job No.	9429-02-20	**Test Reference**	TP10
Client	AECOM	**By**	T McIntyre
		Date	06/03/2020
Initial Depth	Ground level		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	4	25.0	7.0
300	4	25.0	7.0
400	9	11.1	19.7
500	14	7.1	34.6
600	24	4.2	69.0
700	-	-	-
800	-	-	-
900	-	-	-
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



APPENDIX 5 - Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH01
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm to 5.60m	**Ground Level (mOD)** 42.29	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716774.9 E 738180.3 N	**Dates** 24/06/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(1.20)	MADE GROUND: Dark grey slightly sandy slightly silty slightly gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone, crushed brick and concrete fragments.			
1.00-1.45 1.00	SPT(C) N=12 B			2,3/7,1,2,2	41.09	1.20	Firm-stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.			
2.00-2.45 2.00	SPT(C) N=15 B			3,4/4,4,3,4		(2.30)				
3.00-3.45 3.00	SPT(C) N=11 B			2,3/3,2,3,3					▼1	
				Water strike(1) at 3.50m, rose to 3.00m in 20 mins.	38.79	3.50			▽1	
4.00-4.45 4.00	SPT(C) N=31 B			5,6/7,7,10,7		(2.10)	Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.			
5.00-5.45 5.00	SPT(C) N=43 B			8,9/11,9,11,12	36.69	5.60	Refusal at 5.60m			

Remarks
Groundwater encountered at 3.50m BGL.
Refusal at 5.60m BGL; obstruction possible hard strata or boulder.
Slotted pipe installed from 5.60m BGL to 1.50m BGL with pea gravel filter zone from 5.60m BGL to 1.00m BGL and bentonite seal and from 1.00m BGL to GL, finished with an upright cover.
Chiselling from 5.60m to 5.60m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH02
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm to 7.80m	**Ground Level (mOD)** 42.71	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716740.1 E 738129.8 N	**Dates** 16/06/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.30)	Stiff brown slightly sillty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
1.00-1.45 1.00	SPT(C) N=20 B			2,4/4,5,6,5	41.41	1.30			
						(0.90)	Very stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.		
2.00-2.45 2.00	SPT(C) N=36 B			2,5/7,8,9,12	40.51	2.20			
3.00-3.45 3.00	SPT(C) N=42 B			3,7/9,9,12,12			Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
4.00-4.45 4.00	SPT(C) N=50 B			7,7/12,13,13,12					
5.00-5.34 5.00	SPT(C) 50/190 B			10,11/17,18,15		(5.60)			
6.00-6.07 6.00	SPT(C) 25*/70 50/0 B			25/50					
7.00-7.05 7.00	SPT(C) 25*/50 50/0 B			25/50					
					34.91	7.80	Refusal at 7.80m		

Remarks
No groundwater encountered during drilling.
Refusal at 7.80m BGL; obstruction possible hard strata or boulder.
Borehole backfilled upon completion.
Chiselling from 7.80m to 7.80m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH02

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH03
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm to 7.40m	**Ground Level (mOD)** 42.02	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716780.9 E 738118.9 N	**Dates** 17/06/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.80)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with broken brick fragments. Gravel is subangular to subrounded fine to coarse.		
					41.22	0.80			
1.00-1.45 1.00	SPT(C) N=12 B			1,2/2,3,3,4		(1.50)	Firm-stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.		
2.00-2.45 2.00	SPT(C) N=31 B			4,7/7,7,8,9					
					39.72	2.30			
3.00-3.45 3.00	SPT(C) N=41 B			4,10/11,10,10,10			Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
4.00-4.45 4.00	SPT(C) N=44 B			8,9/9,9,15,11					
						(5.10)			
5.00-5.34 5.00	SPT(C) 50/190 B			7,14/15,21,14					
6.00-6.21 6.00	SPT(C) 50/60 B			16,23/50					
7.00-7.07 7.00	SPT(C) 25*/70 50/0 B			25/50					
					34.62	7.40	Refusal at 7.40m		

Remarks
No groundwater encountered during drilling.
Refusal at 7.40m BGL; obstruction possible hard strata or boulder.
Borehole backfilled upon completion.
Chiselling from 7.40m to 7.40m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH03

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH04
Machine : Dando 2000, Beretta T44 **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.40m 148mm to 13.00m	**Ground Level (mOD)** 42.01	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716718.8 E 738088.6 N	**Dates** 17/06/2020-18/06/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.40)	Firm brown slightly sillty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
1.00 1.00-1.45	B SPT(C) N=9			1,4/1,3,2,3	40.61	1.40			
						(1.10)	Stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of limestone. Gravel is subangular to subrounded fine to coarse.		
2.00 2.00-2.45	B SPT(C) N=23			2,5/7,7,3,6	39.51	2.50			
3.00 3.00-3.45	B SPT(C) N=38			5,5/8,9,8,13			Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
4.00 4.00-4.40	B SPT(C) 50/245			9,12/13,14,18,5					
5.00 5.00-5.22	B SPT(C) 50/70			16,24/50		(4.90)			
6.00 6.00-6.32	B SPT(C) 50/170			20,22/17,26,7					
7.00 7.00-7.14	B SPT(C) 33*/75 50/60			33/50					
	TCR / **SCR**	**RQD**	**FI**		34.61	7.40	Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
7.50 8.05-8.35	100			U					
9.00	100								

Remarks
No groundwater encountered during cable percussion drilling.
Cable percusion drillng to 7.40m BGL with rotary follow on to 13.00m BGL.
Borehole backfilled upon completion.
Chiselling from 7.40m to 7.40m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH04

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH04
Machine : Dando 2000, Beretta T44 **Flush :** Polymer **Core Dia :** 102 mm **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.40m 148mm to 13.00m	**Ground Level (mOD)** 42.01	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716718.8 E 738088.6 N	**Dates** 17/06/2020-18/06/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(5.60)			
10.50-10.80					U					
10.50	100									
12.00	100									
13.00						29.01	13.00	Complete at 13.00m		

Remarks

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH04

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH05
Machine : Dando 2000, Beretta T44 **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.00m 148mm to 37.00m	**Ground Level (mOD)** 41.45	**Client** Eastwise	**Job Number** 9429-02-20
	Location (dGPS) 716777.9 E 738074.8 N	**Dates** 17/06/2020-02/07/2020	**Project Contractor** GII	**Sheet** 1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.60)	Firm-stiff brown slightly sillty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
1.00 1.00-1.45	B SPT(C) N=15			2,2/3,3,4,5	39.85	1.60			
						(0.70)	Stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.		
2.00 2.00-2.45	B SPT(C) N=22			3,4/6,5,5,6	39.15	2.30			
3.00 3.00-3.45	B SPT(C) N=38			6,7/8,9,11,10			Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
4.00 4.00-4.45	B SPT(C) N=41			7,8/9,9,11,12					
5.00 5.00-5.34	B SPT(C) 50/190			10,11/19,18,13		(5.70)			
6.00 6.00-6.33	B SPT(C) 50/180			21,20/19,19,12					
7.00 7.00-7.07	B SPT(C) 25*/70			25/50 50/0					
7.00	TCR: 0	SCR	RQD	FI			7.00 to 8.00 No recovery		
8.00 8.30-8.70	U				33.45	8.00			
9.50	TCR: 100					(3.00)	Very stiff grey slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		

Remarks
No groundwater encountered during drilling.
Cable percussion drilling to 7.00m BGL with rotary drilling to 37.00m BGL.
Rotary core follow on complete at 37.00m BGL.
Borehole backfilled upon completion.
Chiselling from 7.00m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH05

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH05
Machine : Dando 2000, Beretta T44 **Flush :** Polymer **Core Dia :** 102 mm **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.00m 148mm to 37.00m	**Ground Level (mOD)** 41.45	**Client** Eastwise	**Job Number** 9429-02-20
	Location (dGPS) 716777.9 E 738074.8 N	**Dates** 17/06/2020-02/07/2020	**Project Contractor** GII	**Sheet** 2/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	86									
11.00	90					30.45	11.00 (0.55)	Grey subangular to subrounded fine to coarse GRAVEL.		
12.50 12.75-13.05	100				U	29.90	11.55 (2.45)	Very stiff grey slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
14.00 14.60-15.00	97				U	27.45	14.00	Very stiff dark brown slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
15.50	86						(5.00)			
17.00 17.50-17.80	100				U					
18.50 18.80-19.05	10				U	22.45	19.00	Very stiff grey slightly sandy gravelly CLAY with some subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
20.00										

Remarks

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH05

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH05
Machine : Dando 2000, Beretta T44 **Flush :** Polymer **Core Dia :** 102 mm **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.00m 148mm to 37.00m	**Ground Level (mOD)** 41.45	**Client** Eastwise	**Job Number** 9429-02-20
	Location (dGPS) 716777.9 E 738074.8 N	**Dates** 17/06/2020-02/07/2020	**Project Contractor** GII	**Sheet** 3/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100						(3.00)			
21.50										
22.00	100	24	24			19.45	22.00	Medium strong-strong thinly bedded-thickly laminated fine grained argillaceous LIMESTONE with rare mudstone beds. Partially weathered to unweathered. From 22.00 to 24.30 - 2 sets of fractures. F1: 40-50 degrees closely spaced planar smooth closed with occasional brown staining and clay smearing. F2: 5-15 degrees medium spaced undulating smooth closed with clay smearing.		
23.00	100	70	70	8			(4.00)			
24.30								From 24.30 to 24.90 - Non Intact core		
24.50				N.I.						
24.90	100	56	56	7				From 24.90 to 26.00 - 1 set of fractures. F1: 40-50 degrees closely spaced planar smooth closed with occasional brown staining and clay smearing.		
26.00	100	0	0	N.I.		15.45	26.00	Medium strong-strong thinly bedded-thickly laminated fine grained argillaceous LIMESTONE with calcite veining interbedded with extremely weak-very weak black calcareous mudstone beds. Partially weathered to unweathered. From 26.00 to 27.80 - Non Intact core		
27.50										
27.80	93	60	55					Frm 27.80 - 2 sets of fractures. F1: 40-50 degrees closely spaced planar smooth closed with occasional brown staining and clay smearing. F2: 5-15 degrees medium spaced undulating smooth closed with clay smearing.		
29.00	100	76	72							

Remarks

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH05

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH05
Machine : Dando 2000, Beretta T44 **Flush :** Polymer **Core Dia :** 102 mm **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.00m 148mm to 37.00m	**Ground Level (mOD)** 41.45	**Client** Eastwise	**Job Number** 9429-02-20
	Location (dGPS) 716777.9 E 738074.8 N	**Dates** 17/06/2020-02/07/2020	**Project Contractor** GII	**Sheet** 4/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
30.50	100	50	50	10			(11.00)			
32.00	100	45	45							
33.50	100	52	52							
35.00	100	55	55							
36.50	70	0	0							
37.00						4.45	37.00	Complete at 37.00m		

Remarks

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH05

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH06
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm to 8.00m	**Ground Level (mOD)** 41.64	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716695 E 738068.6 N	**Dates** 17/06/2020-18/06/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.40)	MADE GROUND: Black slightly sandy slightly gravelly Clay fill with brick and rubbish fragments. . Gravel is subangular to subrounded fine to coarse.			
					41.24	0.40				
1.00-1.45 1.00	SPT(C) N=10 B			3,4/2,2,2,4			Firm brown slightly sillty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.			
						(2.10)				
2.00	B									
					39.14	2.50	Stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.			
						(0.60)				
3.00-3.45 3.00	SPT(C) N=22 B			6,4/5,5,5,7	38.54	3.10	Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.			
4.00-4.45 4.00	SPT(C) N=41 B			4,8/8,10,11,12						
5.00-5.45 5.00	SPT(C) N=46 B			5,9/11,11,12,12						
						(4.90)				
6.00-6.33 6.00	SPT(C) 50/180 B			14,22/18,20,12						
7.00-7.14 7.00	SPT(C) 31*/75 50/60 B			31/50						
8.00-8.07 8.00	SPT(C) 25*/70 50/0 B			25/50	33.64	8.00	Refusal at 8.00m			

Remarks
No groundwater encountered during drilling.
Refusal at 8.00m BGL; obstruction possible hard strata or boulder.
Slotted pipe installed from 8.00m BGL to 1.50m BGL with pea gravel filter zone from 8.00m BGL to 1.00m BGL and bentonite seal from 1.00m BGL to GL, finished with an upright cover.
Chiselling from 8.00m to 8.00m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH06

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH07
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm to 7.00m	**Ground Level (mOD)** 40.96	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716735.8 E 738044.8 N	**Dates** 17/06/2020-18/06/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.10)	Firm brown slightly sillty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
1.00-1.45 1.00	SPT(C) N=17 B			1,4/4,5,3,5	39.86	1.10			
						(1.30)	Stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.		
2.00-2.45 2.00	SPT(C) N=25 B			3,4/6,6,7,6	38.56	2.40			
3.00-3.45 3.00	SPT(C) N=15 B			3,3/3,4,4,4			Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
4.00-4.45 4.00	SPT(C) N=43 B			8,8/11,7,13,12					
						(4.60)			
5.00-5.40 5.00	SPT(C) 50/245 B			9,11/14,14,13,9					
6.00-6.27 6.00	SPT(C) 50/115 B			17,20/26,24					
7.00-7.07 7.00	SPT(C) 25*/70 50/0 B			25/50	33.96	7.00	Refusal at 7.00m		

Remarks
No groundwater encountered during drilling.
Refusal at 7.00m BGL; obstruction possible hard strata or boulder.
Borehole backfilled upon completion.
Chiselling from 7.00m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH07

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH08
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm to 7.00m	**Ground Level (mOD)** 40.88	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716781.1 E 738036.1 N	**Dates** 25/06/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.10)	MADE GROUND: Brown slightly sandy slightly silty slightly gravelly Clay with occasional subangular to subrounded cobbles of predominantly limestone and red brick fragments. Gravel is subangular to subrounded fine to coarse.		
1.00-1.45 1.00	SPT(C) N=7 B			1,1/2,1,2,2	39.78	1.10			
2.00-2.45 2.00	SPT(C) N=9 B			3,2/2,3,3,1		(3.20)	Firm greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.		
3.00-3.45 3.00	SPT(C) N=14 B			2,4/2,4,4,4					
4.00-4.45 4.00	SPT(C) N=36 B			11,5/6,7,10,13	36.58	4.30			
5.00-5.34 5.00	SPT(C) 50/190 B			16,13/12,17,21		(2.70)	Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
6.00-6.07 6.00	SPT(C) 25*/0 50/70 B			25/50					
7.00-7.15 7.00	SPT(C) 33*/75 50/70 B			33/50	33.88	7.00	Refusal at 7.00m		

Remarks
No Groundwater encountered during drilling.
Refusal at 7.00m BGL; obstruction possible hard strata or boulder.
Borehole backfilled upon completition.
Chiselling from 7.00m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH08

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH09
Machine : Dando 2000 **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.20m 148mm to 34.00m	**Ground Level (mOD)** 40.29	**Client** Eastwise	**Job Number** 9429-02-20
	Location (dGPS) 716872.7 E 738108.8 N	**Dates** 22/06/2020-02/07/2020	**Project Contractor** GII	**Sheet** 1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00-1.07	B SPT(C) 25*/0 50/70			25/50		(1.80)	MADE GROUND: Dark grey slightly sandy slightly silty slightly gravelly Clay with occasional subangular to subrounded cobbles of limestone, concrete, red brick and tarmac fragments. Gravel is subangular to subrounded fine to coarse.		
2.00 2.00-2.45	B SPT(C) N=9			2,2/2,2,2,3	38.49	1.80 (0.50)	MADE GROUND: Dark grey/ black slightly sandy slightly gravelly Clay with occasional subangular to subrounded cobbles of limestone, mortar and plastic fragments. Gravel is subangular to subrounded fine to coarse.		
3.00 3.00-3.45	B SPT(C) N=22			4,6/6,6,6,4	37.99 37.79	2.30 (0.20) 2.50 (1.00)	Firm greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.		
	0 -				36.79	3.50	Stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
4.00 4.00-4.45	B SPT(C) N=49			6,8/12,12,13,12			Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
5.00 5.00-5.35	B SPT(C) 68/200			8,18/18,22,28					
6.00 6.00-6.20	B SPT(C) 50/50			29,37/50					
7.00 7.00-7.07	B 50/70 SPT(C) 34*/0			34/50					
	TCR / **SCR**	**RQD**	**FI**						
7.20	0 -						7.20m to 8.00m no recovery		
8.00	93 -								
9.65-10.00 9.50				U		(12.00)			

Remarks
SPT Fail at 1.00m BGL due to obstruction.
No Groundwater encountered during drilling.
Cable percussion drilling to 7.20m BGL with rotary follow on to 34.00m BGL.
Borehole backfilled upon completition.
Chiselling from 7.20m to 7.20m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH09

Ground Investigations Ireland Ltd
www.gii.ie

Site	Borehole Number
Swords Road, Whitehall	BH09

Machine : Dando 2000	Casing Diameter	Ground Level (mOD)	Client	Job Number
Flush :	200mm to 7.20m 148mm to 34.00m	40.29	Eastwise	9429-02-20
Core Dia : mm	Location (dGPS)	Dates	Project Contractor	Sheet
Method : Cable Percussion with Rotary Core follow on	716872.7 E 738108.8 N	22/06/2020-02/07/2020	GII	2/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100	-								
11.00										
11.70-12.00	100	-			U					
12.50										
	100	-								
14.00										
14.40-14.70					U					
	100	-								
15.50						24.79	15.50	Very stiff brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
	100	-								
17.00										
	100	-								
18.50										
	100	-								
19.70-20.00					U					
20.00										

Remarks

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH09

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH09
Machine : Dando 2000 **Flush :** **Core Dia :** mm **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.20m 148mm to 34.00m	**Ground Level (mOD)** 40.29	**Client** Eastwise	**Job Number** 9429-02-20
	Location (dGPS) 716872.7 E 738108.8 N	**Dates** 22/06/2020-02/07/2020	**Project Contractor** GII	**Sheet** 3/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(9.00)			
20.30-20.70	93	-			U					
21.15-21.45					U					
21.50	80	-								
23.00	93	-								
24.50	100	-				15.79	24.50	Grey slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with many subangular to subrounded cobbles of predominantly limestone.		
							(1.20)			
26.00	83	-				14.59	25.70	Very stiff dark grey slightly sandy gravelly CLAY with some subangular to subrounded cobbles of predominantly limestone. Gravel is subangular to subrounded fine to coarse.		
27.40-27.90					U					
27.50	100	-								
29.00	100	-					(6.60)			

Remarks

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH09

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH09
Machine : Dando 2000 **Flush :** **Core Dia :** mm **Method :** Cable Percussion with Rotary Core follow on	**Casing Diameter** 200mm to 7.20m 148mm to 34.00m	**Ground Level (mOD)** 40.29	**Client** Eastwise	**Job Number** 9429-02-20
	Location (dGPS) 716872.7 E 738108.8 N	**Dates** 22/06/2020-02/07/2020	**Project Contractor** GII	**Sheet** 4/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
30.50	100	-								
32.00	100	27	27			7.99	32.30 (1.70)	Medium strong to strong thinly bedded-thickly laminated fine grained grey argillaceous LIMESTONE interbbeded with weak black calcareous mudstone. Partially weathered. 2 sets of fractures. F1: 40-50 degrees very closely to closely spaced planar smooth closed with occasional clay smearing. F2: 30-40 degrees very closely to closely spaced undulating to planar smooth to rough closed.		
33.50	100	78	78							
34.00						6.29	34.00	Complete at 34.00m		

Remarks

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH09

Ground Investigations Ireland Ltd
www.gii.ie

Site Swords Road, Whitehall			**Borehole Number** BH10
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm to 7.20m	**Ground Level (mOD)** 39.90	**Client** Eastwise	**Job Number** 9429-02-20
	Location 716878.8 E 738078.8 N	**Dates** 23/06/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(1.50)	MADE GROUND: brown slightly sandy slightly gravelly Clay with red brick fragments. Gravel is subangular to subrounded fine to coarse.			
1.00-1.45 1.00	SPT(C) N=10 B			1,1/1,3,3,3	38.40	1.50				
						(1.00)	Soft to firm greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles of limestone. Gravel is subangular to subrounded fine to coarse.			
2.00-2.45 2.00	SPT(C) N=7 B			2,2/1,1,2,3	37.40	2.50				
3.00-3.45 3.00	SPT(C) N=30 B			3,4/6,6,9,9			Very stiff dark grey/ black slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders of predominantly limestone. Gravel is subangular to subrounded fine to coarse.			
4.00-4.45 4.00	SPT(C) N=44 B			7,9/9,11,11,13						
						(4.70)				
5.00-5.45 5.00	SPT(C) N=50 B			8,10/12,12,12,14						
6.00-6.27 6.00	SPT(C) 50/115 B			16,16/23,27						
7.00-7.06 7.00	SPT(C) 25*/0 50/60 B			25/50	32.70	7.20	Refusal at 7.20m			

Remarks
No Groundwater encountered during drilling.
Refusal at 7.20m BGL; obstruction possible hard strata or boulder.
Slotted pipe installed from 7.20m BGL to 1.50m BGL with pea gravel filter zone from 7.20m BGL to 1.00m BGL and bentonite seal from 1.00m BGL to GL, finished with an upright cover.
Chiselling from 7.20m to 7.20m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 9429-02-20.BH10

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH04 - 7.50 to 10.50 m BGL

BH04 - 10.50 to 13.00m BGL

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH05 – 7.00 to 12.50m BGL

BH05 – 12.50 to 17.00m BGL

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH05 – 17.00 to 21.50m BGL

BH05 – 21.50 to 26.00m BGL

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH05 – 26.00 to 30.50m BGL

BH05 – 30.50 to 35.00m BGL

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH05 – 35.00 to 37.00m BGL

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH09 – 7.20 to 12.50m BGL

BH09 – 12.50 to 17.00m BGL

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH09 – 17.00 to 21.50m BGL

BH09 – 21.50 to 26.00m BGL

Whitehall, Swords Road Extension – Aecom
9429-02-20 RC Photographs

BH09 – 26.00 to 30.50m BGL

BH09 – 30.50 to 34.00m BGL

APPENDIX 6 – Laboratory Testing

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
TP01	0.70	T	13.9											
TP01	1.60	T	14.1		56.8	30	21	9						
TP01	2.40	B/T	9.3											
TP02	0.50	T	15.2											
TP02	1.50	B	16.0		61.7	28	19	9						
TP02	2.70	T	8.2											
TP03	0.50	T	32.4											
TP03	1.80	T	11.5											
TP03	2.70	B	14.5		54.3	30	16	14						
TP04	0.50	T	14.4		45.1	39	21	18						
TP04	1.80	T	12.7											
TP05C	0.90	T												missing
TP05C	2.00	T	10.9											
TP05C	2.90	T	15.1											
TP06	0.60	T	14.5		44.5	37	20	17						
TP06	1.50	T	12.4											
TP06	2.70	T	11.9											
TP06	3.70	T	11.9											
TP07	0.70	T	35.3		71.4	49	29	20						
TP07	1.40	T	19.6											
TP07	3.30	B/T	15.3											
TP08	0.70	B/T	14.6		64.8	40	23	17						
TP08	1.50	T	11.4											
TP08	2.80	T	10.4											
TP09	1.90	B/T	12.6		61.2	29	18	11						
TP09	2.80	T	8.8											
NMTL		Notes :									Job ref No.	NMTL 3243	GII Project ID	9255-11-19
19/08/2020		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Whitehall, Swords		

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
TP10	0.50	B	18.4		55.1	35	23	12						
TP10	1.40	T	14.68											
TP10	2.80	T	9.51											
BH01	1.00	B	19.6											
BH01	2.00	B	15.0		65.2	32	17	15						
BH01	3.00	B	14.2											
BH01	4.00	B	14.4											
BH01	5.00	B	14.8											
BH02	1.00	B	16.7											
BH02	2.00	B	14.3											
BH02	3.00	B	10.2											
BH02	4.00	B	11.9											
BH02	5.00	B	11.1		65.8	28	15	13						
BH02	6.00	B	14.0		57.8	28	14	14						
BH02	7.00	B	8.9											
BH03	1.00	B	13.7											
BH03	2.00	B	14.6		58.9	31	16	15						
BH03	3.00	B	12.0											
BH03	4.00	B	11.6											
BH03	5.00	B	13.1		63.7	29	14	15						
BH03	6.00	B	11.1											
BH03	7.00	B	9.6											
BH04	1.00	B	13.2											
BH04	2.00	B	14.5											
BH04	3.00	B	12.7											
NMTL		Notes :									Job ref No.	NMTL 3243	GII Project ID	9255-11-19
19/08/2020		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Whitehall, Swords		

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
BH04	4.00	B	9.7											
BH04	5.00	B	12.6											
BH04	6.00	B	11.6											
BH04	7.00	B	12.1											
BH04	10.5-10.9	C	9.3		59.6	34	17	17						
BH05	1.00	B	17.8		51.7	38	20	18						
BH05	2.00	B	14.3		57.8	30	15	15						
BH05	3.00	B	12.2											
BH05	4.00	B	13.4		50.7	29	15	14						
BH05	5.00	B	10.4											
BH05	6.00	B	12.0											
BH05	7.00	B	13.9											
BH05	8.3-8.7	C	7.8		51.4	32	18	14						
BH05	14.6-15.0	C	9.9		66.2	33	18	15						
BH06	1.00	B	24.7											
BH06	2.00	B	14.5											
BH06	3.00	B	11.2											
BH06	4.00	B	12.6											
BH06	5.00	B	12.0											
BH06	6.00	B	10.6											
BH06	7.00	B	12.2		59.5	28	14	14						
BH06	8.00	B	9.5											
BH07	1.00	B	18.4											
BH07	2.00	B	19.1											
BH07	3.00	B	12.9											
BH07	4.00	B	11.7											
NMTL		Notes :									Job ref No.	NMTL 3243	GII Project ID	9255-11-19
19/08/2020		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Whitehall, Swords		

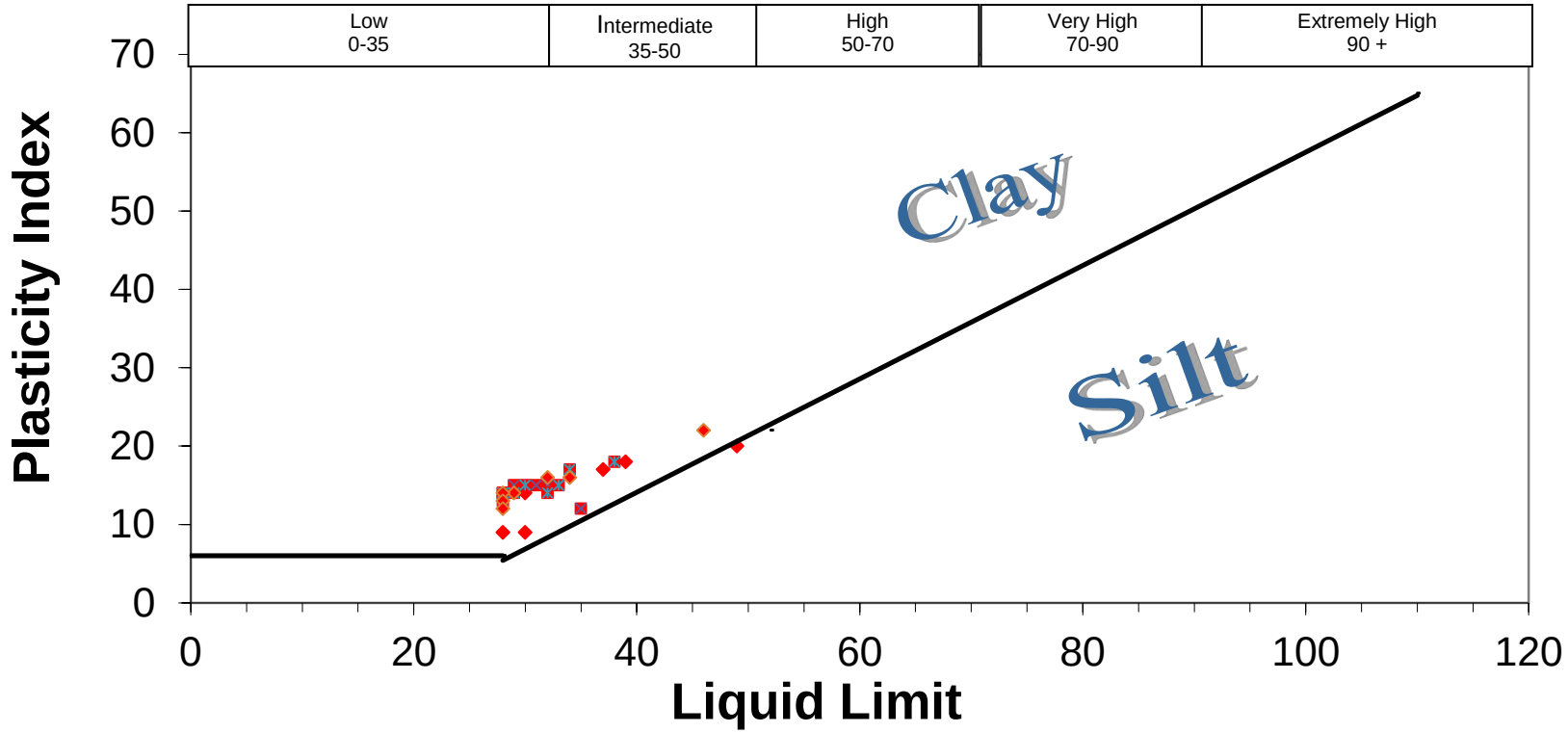
National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
BH07	5.00	B	12.6											
BH07	6.00	B	11.0											
BH07	7.00	B	14.5		57.2	29	15	14						
BH08	1.00	B	21.5											
BH08	2.00	C	29.9		76.9	46	24	22						
BH08	3.00	B	14.5											
BH08	4.00	B	13.7											
BH08	5.00	B	10.6											
BH08	6.00	B	15.4											
BH08	7.00	B	13.5											
BH09	3.00	B	12.4		53.9	28	14	14						
BH09	4.00	B	11.4											
BH09	5.00	B	12.0		59.2	28	15	13						
BH09	6.00	B	12.3											
BH09	7.00	B	13.7											
BH09	9.65-10.0	C	7.6		48.9	34	18	16						
BH09	14.6-15.0	C	10.7		85.6	32	16	16						
BH10	2.00	B	11.0											
BH10	3.00	B	12.9		55.8	28	16	12						
BH10	4.00	B	11.7											
BH10	5.00	B	15.2											
BH10	6.00	B	11.0											
BH10	7.00	B	8.2											

NMTL		Notes :	Job ref No.	NMTL 3243 GII Project ID	9255-11-19
19/08/2020		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.	Location	Whitehall, Swords	

NMTL LTD	**Contract:** Whitehall, Swords
Unit 18c, Tullow Industrial Estate	**Client:** Ground Investigations Ireland Ltd
Tullow	**Engineer:** Mike Sutton
County Carlow	**GII Project ID** 9255-11-19
Tel: 00353 59 9180822	**Date:** 19/08/2020
Mob: 00353 872575508	**Tested By:** Tzr/Sb/Ms **Checked:** Bc
billa@nmtl.ie	**Job ref No.** NMTL 3243

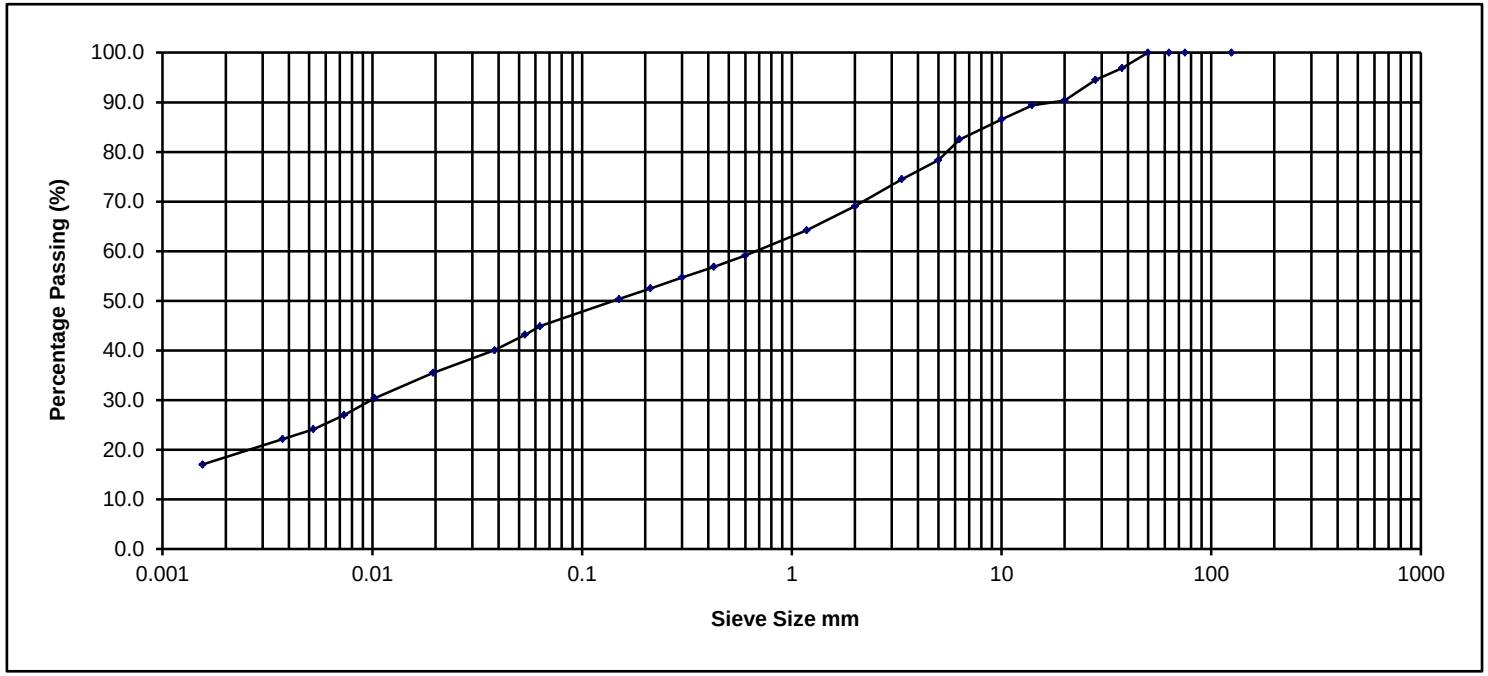


NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	96.9
28.000	94.5
20.000	90.4
14.000	89.4
10.000	86.6
6.300	82.5
5.000	78.3
3.350	74.5
2.000	69.1
1.180	64.2
0.600	59.1
0.425	56.8
0.300	54.7
0.212	52.5
0.150	50.4
0.063	44.9
0.053	43.2
0.038	40.1
0.019	35.5
0.010	30.4
0.007	27.0
0.005	24.1
0.004	22.2
0.002	17.0



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
17.0		27.8			24.2			30.9		0.0	0.0

Sample Description	Brown slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	TP01
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	1.60m
				Date sample tested	08/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	96.5
28.000	89.7
20.000	88.1
14.000	86.3
10.000	82.3
6.300	78.4
5.000	76.2
3.350	73.4
2.000	68.1
1.180	62.8
0.600	56.9
0.425	54.3
0.300	51.8
0.212	49.3
0.150	46.8
0.063	40.7

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		40.7			27.5			31.9		0.0	0.0

Sample Description	Grey slightly sandy slightly gravelly SILT/CLAY.					Project No.	NMTL 3243
						BH/TP No.	TP03
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	04/08/2020	Depth	2.70m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	91.6
14.000	83.4
10.000	77.7
6.300	70.6
5.000	65.7
3.350	61.7
2.000	56.1
1.180	51.6
0.600	47.0
0.425	45.1
0.300	43.2
0.212	41.4
0.150	39.5
0.063	34.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		34.9			21.1			43.9		0.0	0.0

Sample Description	Light brown/grey slightly sandy gravelly SILT/CLAY.					Project No.	NMTL 3243
						BH/TP No.	TP04
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	T
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	0.50m
				Date sample tested	08/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	94.1
63.000	94.1
50.000	90.6
37.500	87.2
28.000	83.2
20.000	79.5
14.000	74.6
10.000	71.7
6.300	66.7
5.000	63.1
3.350	59.5
2.000	53.8
1.180	49.6
0.600	46.1
0.425	44.5
0.300	42.9
0.212	41.3
0.150	39.6
0.063	35.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		35.4			18.3			40.3		5.9	0.0

Sample Description	Light brown/grey slightly sandy gravelly SILT/CLAY, with some cobbles.	Project No.	NMTL 3243
		BH/TP No.	TP06
Project	Whitehall, Swords GII Project ID-9225-11-19	Sample No.	B
Operator Tzr	Checked Nc Approved Bc Date sample tested 05/08/2020	Depth	0.60m

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	97.3
50.000	94.7
37.500	93.1
28.000	91.5
20.000	89.2
14.000	85.3
10.000	81.7
6.300	75.3
5.000	72.7
3.350	70.4
2.000	65.7
1.180	60.8
0.600	55.4
0.425	52.9
0.300	50.3
0.212	47.6
0.150	44.9
0.063	38.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		38.4			27.3			31.6		2.7	0.0

Sample Description	Light brown slightly sandy slightly gravelly SILT/CLAY, with occasional cobbles.					Project No.	NMTL 3243
						BH/TP No.	TP07
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	06/08/2020	Depth	3.30m

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	99.3
28.000	93.4
20.000	91.1
14.000	88.3
10.000	85.1
6.300	82.4
5.000	79.9
3.350	77.6
2.000	73.3
1.180	69.5
0.600	66.2
0.425	64.8
0.300	63.4
0.212	61.9
0.150	60.3
0.063	56.2
0.052	54.0
0.037	50.6
0.019	42.7
0.010	34.2
0.007	29.8
0.005	24.5
0.004	20.7
0.002	14.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
14.1		42.1			17.1			26.7		0.0	0.0

Sample Description	Brown slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	TP08
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	0.70m
				Date sample tested	04/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	97.6
28.000	94.4
20.000	90.1
14.000	88.7
10.000	84.4
6.300	79.8
5.000	77.4
3.350	74.1
2.000	68.6
1.180	63.8
0.600	58.0
0.425	55.1
0.300	52.1
0.212	48.8
0.150	45.4
0.063	36.7

Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		36.7			31.9			31.4		0.0	0.0

Sample Description: Light brown slightly gravelly slightly sandy SILT/CLAY.

Project: Whitehall, Swords

GII Project ID-9225-11-19

Operator	Checked	Approved	Date sample tested
Tzr	Nc	Bc	07/08/2020

Project No.	NMTL 3243
BH/TP No.	TP10
Sample No.	B
Depth	0.50m

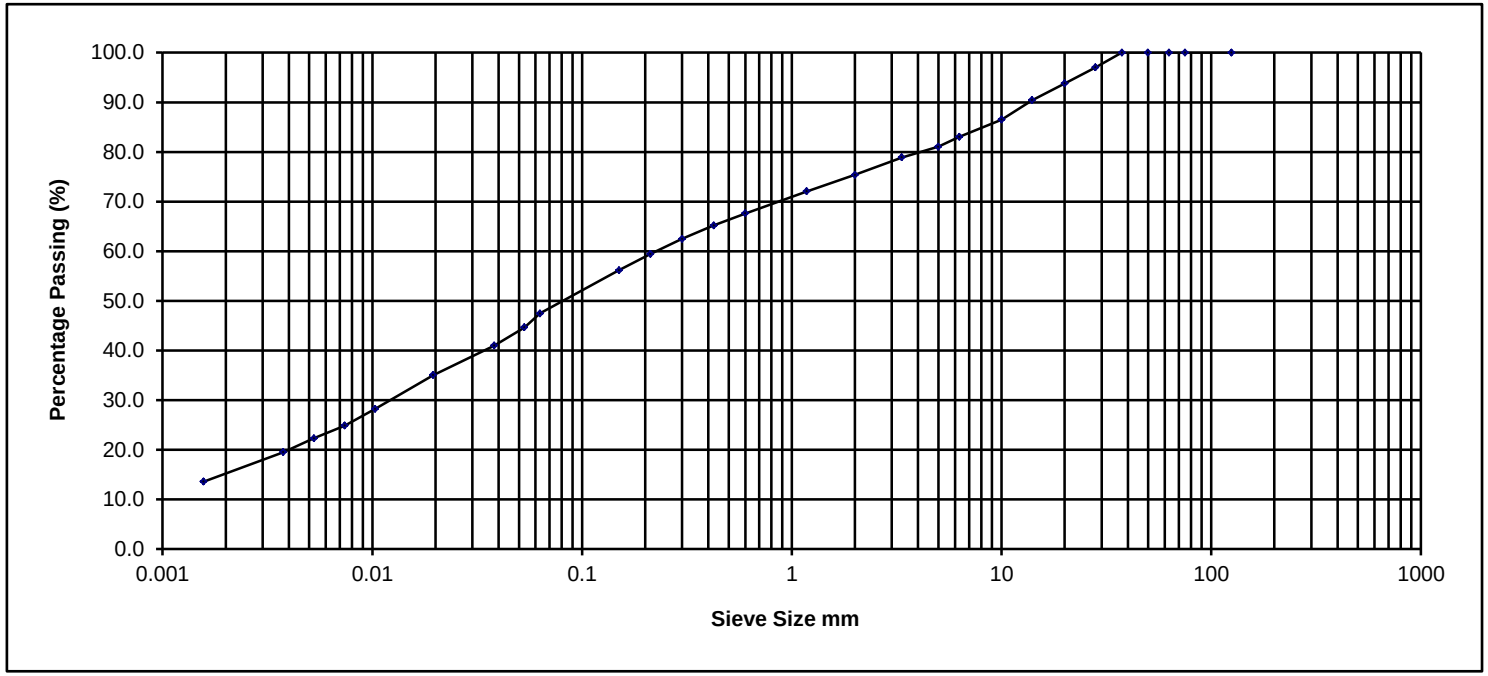
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	97.0
20.000	93.8
14.000	90.4
10.000	86.5
6.300	83.1
5.000	81.0
3.350	78.9
2.000	75.4
1.180	72.1
0.600	67.6
0.425	65.2
0.300	62.5
0.212	59.4
0.150	56.2
0.063	47.5
0.053	44.6
0.038	41.0
0.019	35.0
0.010	28.3
0.007	24.9
0.005	22.3
0.004	19.5
0.002	13.6



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
13.6		33.9			27.9			24.6		0.0	0.0

Sample Description	Light brown, orange grey slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH01
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	2.0m
				Date sample tested	01/08/2020		

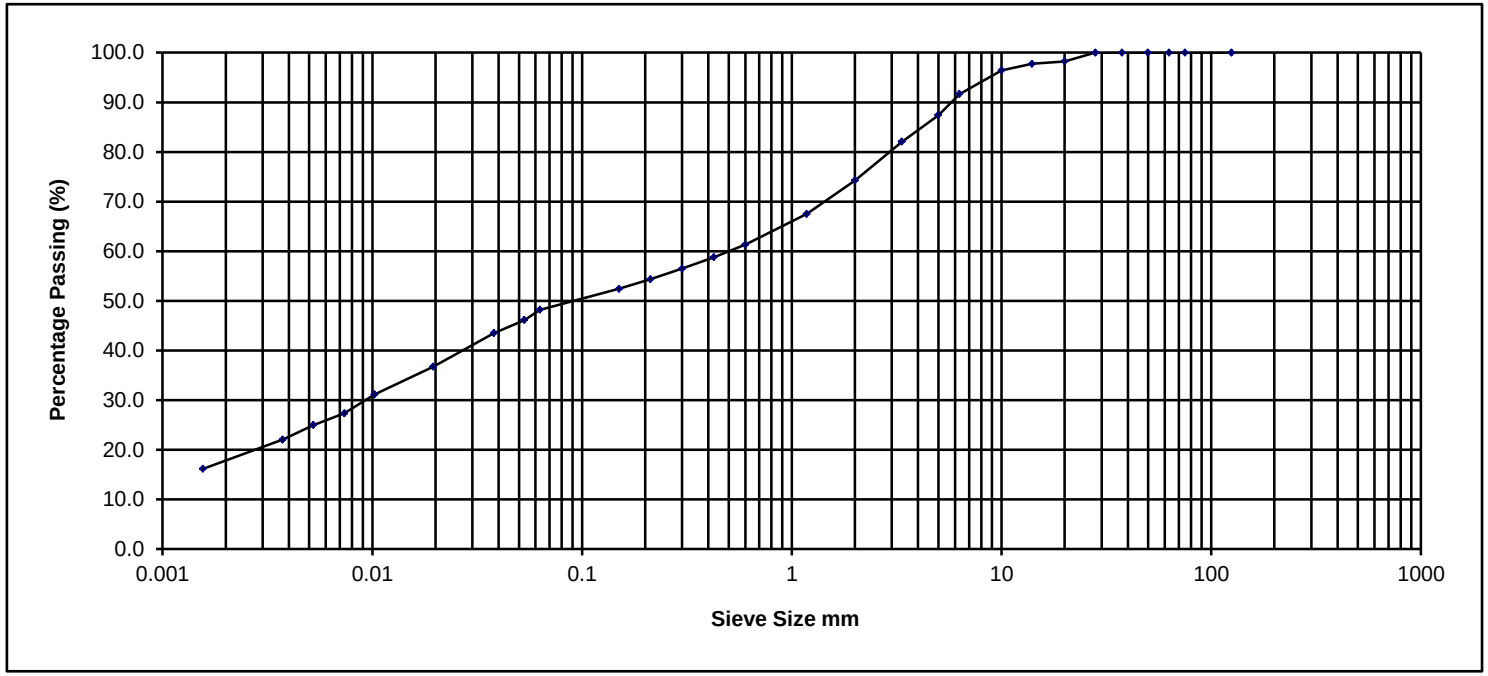
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	98.3
14.000	97.8
10.000	96.4
6.300	91.7
5.000	87.4
3.350	82.1
2.000	74.3
1.180	67.5
0.600	61.3
0.425	58.8
0.300	56.5
0.212	54.4
0.150	52.4
0.063	48.2
0.053	46.1
0.038	43.5
0.019	36.7
0.010	31.2
0.007	27.3
0.005	25.0
0.004	22.0
0.002	16.2



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
16.2		32.0			26.1			25.7		0.0	0.0

Sample Description	Grey slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH02
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	6.0m
				Date sample tested	01/08/2020		

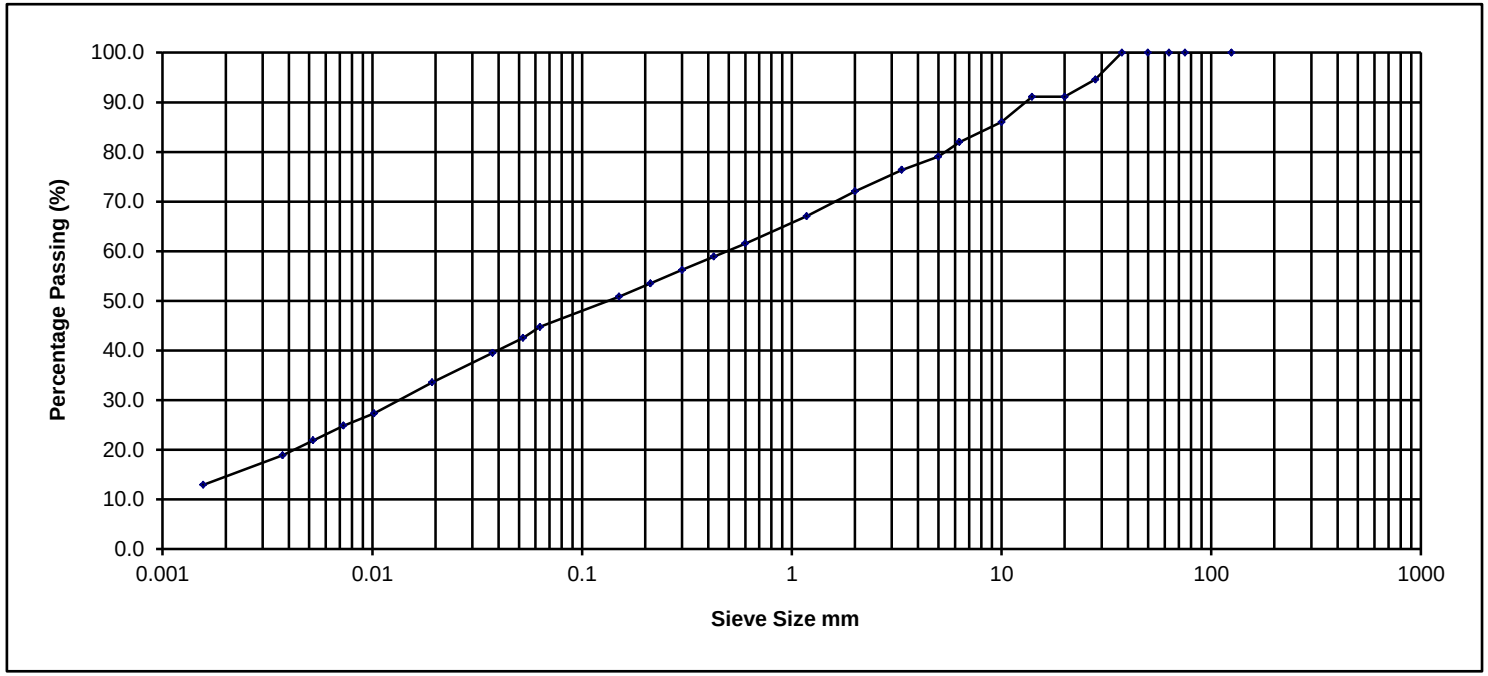
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	94.6
20.000	91.1
14.000	91.1
10.000	86.0
6.300	82.0
5.000	79.1
3.350	76.4
2.000	72.1
1.180	67.1
0.600	61.6
0.425	58.9
0.300	56.2
0.212	53.5
0.150	50.9
0.063	44.8
0.052	42.5
0.037	39.5
0.019	33.6
0.010	27.4
0.007	24.9
0.005	21.9
0.004	18.9
0.002	12.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
12.9		31.8			27.3			27.9		0.0	0.0

Sample Description	Light brown slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH03
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	01/08/2020	Depth	2.0m

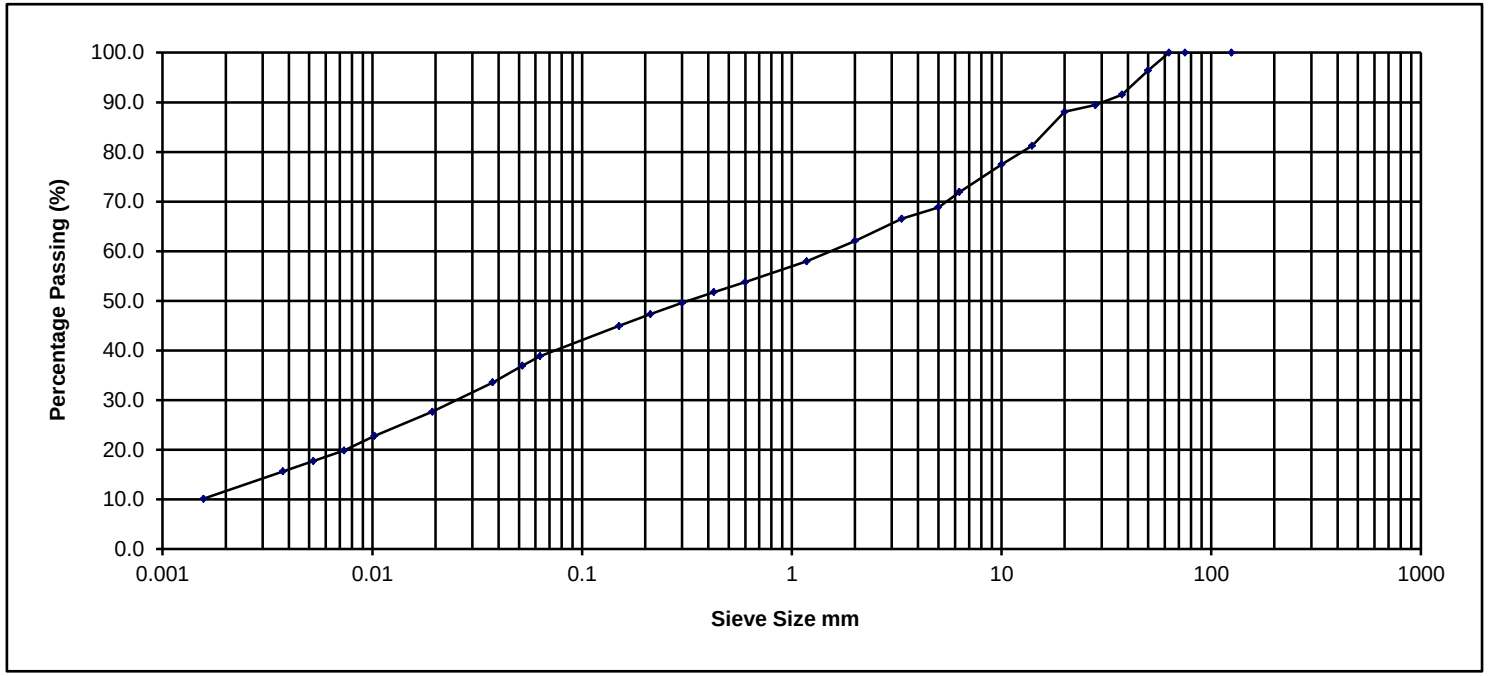
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	96.4
37.500	91.5
28.000	89.5
20.000	88.1
14.000	81.3
10.000	77.5
6.300	71.9
5.000	68.8
3.350	66.5
2.000	62.1
1.180	58.0
0.600	53.8
0.425	51.7
0.300	49.6
0.212	47.3
0.150	44.9
0.063	38.9
0.052	37.0
0.037	33.6
0.019	27.7
0.010	22.8
0.007	19.9
0.005	17.7
0.004	15.6
0.002	10.1



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
10.1		28.7			23.2			37.9		0.0	0.0

Sample Description	Light brown/grey slightly sandy gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH05
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	1.0m
				Date sample tested	01/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	96.6
28.000	93.5
20.000	91.1
14.000	87.2
10.000	84.8
6.300	80.6
5.000	78.9
3.350	75.6
2.000	70.5
1.180	65.7
0.600	60.3
0.425	57.8
0.300	55.3
0.212	52.7
0.150	50.1
0.063	43.3
0.053	40.7
0.038	37.4
0.019	32.3
0.010	26.9
0.007	23.8
0.005	21.2
0.004	17.9
0.002	12.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
12.3		31.0			27.2			29.5		0.0	0.0

Sample Description	Light brown/orange slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH05
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	01/08/2020	Depth	2.0m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	87.9
28.000	86.3
20.000	83.9
14.000	81.4
10.000	78.5
6.300	74.6
5.000	70.7
3.350	67.9
2.000	62.7
1.180	57.7
0.600	52.8
0.425	50.7
0.300	48.7
0.212	46.6
0.150	44.6
0.063	39.3
0.054	37.6
0.038	34.6
0.020	29.4
0.010	25.6
0.007	22.4
0.005	20.9
0.004	18.2
0.002	12.7

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
12.7		26.6			23.4			37.3		0.0	0.0

Sample Description	Grey slightly sandy gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH05
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	4.0m
				Date sample tested	01/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	97.8
20.000	94.7
14.000	92.6
10.000	89.5
6.300	85.6
5.000	82.7
3.350	79.5
2.000	73.8
1.180	68.5
0.600	62.4
0.425	59.5
0.300	56.7
0.212	53.8
0.150	51.1
0.063	44.8
0.053	42.6
0.038	39.1
0.020	32.5
0.010	27.0
0.007	24.3
0.005	22.1
0.004	19.7
0.002	13.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
13.4		31.4			29.0			26.2		0.0	0.0

Sample Description	Grey slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH06
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	7.0m
				Date sample tested	01/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	95.7
20.000	93.4
14.000	88.2
10.000	86.1
6.300	82.0
5.000	78.1
3.350	75.1
2.000	70.3
1.180	65.7
0.600	60.0
0.425	57.2
0.300	54.3
0.212	51.6
0.150	49.0
0.063	43.7
0.054	42.0
0.038	38.7
0.020	33.0
0.010	27.9
0.007	24.6
0.005	22.3
0.004	19.2
0.002	13.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
13.0		30.8			26.6			29.7		0.0	0.0

Sample Description	Grey slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH07
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	7.0m
				Date sample tested	01/08/2020		

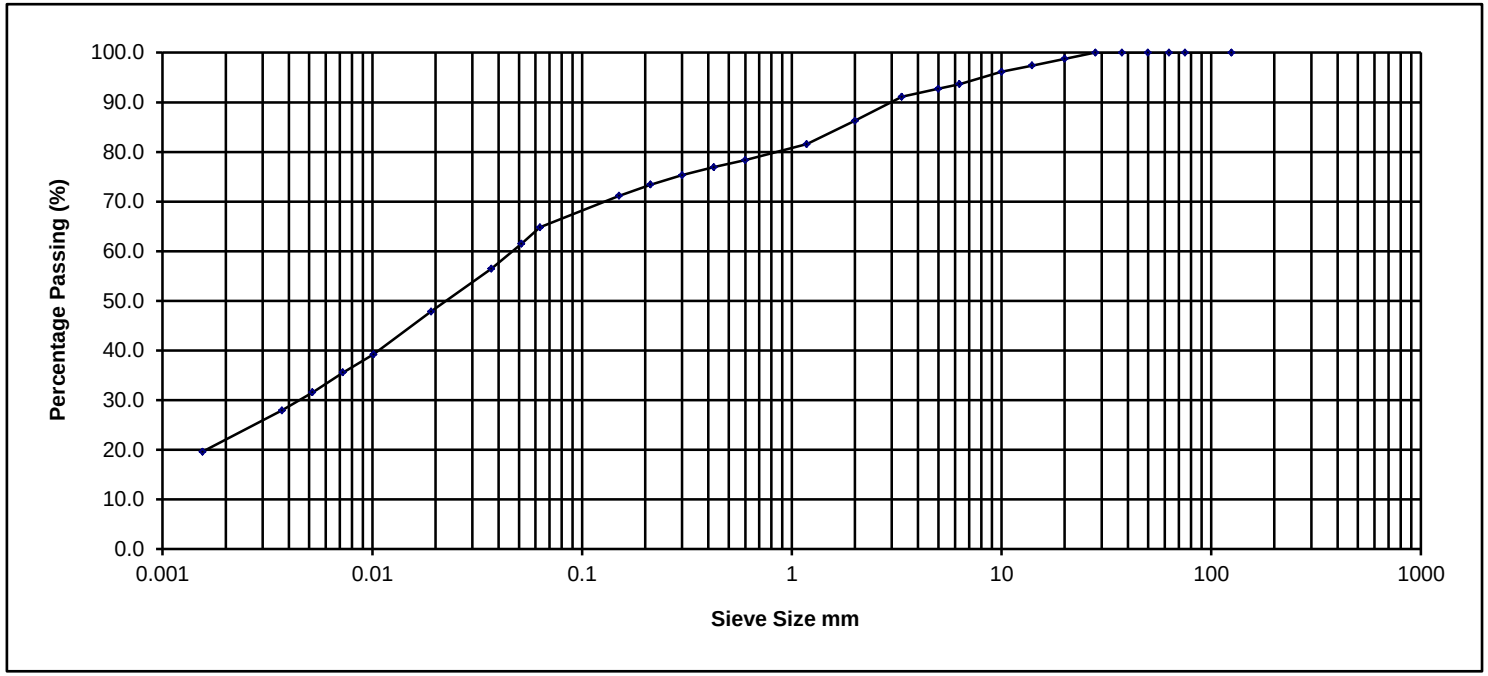
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	98.8
14.000	97.4
10.000	96.1
6.300	93.7
5.000	92.7
3.350	91.1
2.000	86.3
1.180	81.6
0.600	78.3
0.425	76.9
0.300	75.3
0.212	73.4
0.150	71.2
0.063	64.8
0.051	61.5
0.037	56.5
0.019	47.9
0.010	39.2
0.007	35.6
0.005	31.6
0.004	27.9
0.002	19.6



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
19.6		45.2			21.5			13.7		0.0	0.0

Sample Description	Light brown slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH08
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	2.0m
				Date sample tested	01/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	98.6
20.000	97.1
14.000	93.1
10.000	89.0
6.300	84.0
5.000	78.3
3.350	74.0
2.000	67.3
1.180	61.9
0.600	56.4
0.425	53.9
0.300	51.6
0.212	49.4
0.150	47.3
0.063	42.2
0.053	40.1
0.038	37.8
0.019	32.3
0.010	27.9
0.007	25.1
0.005	22.5
0.004	19.9
0.002	15.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
15.0		27.2			25.2			32.7		0.0	0.0

Sample Description	Grey slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH09
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	3.0m
				Date sample tested	01/08/2020		

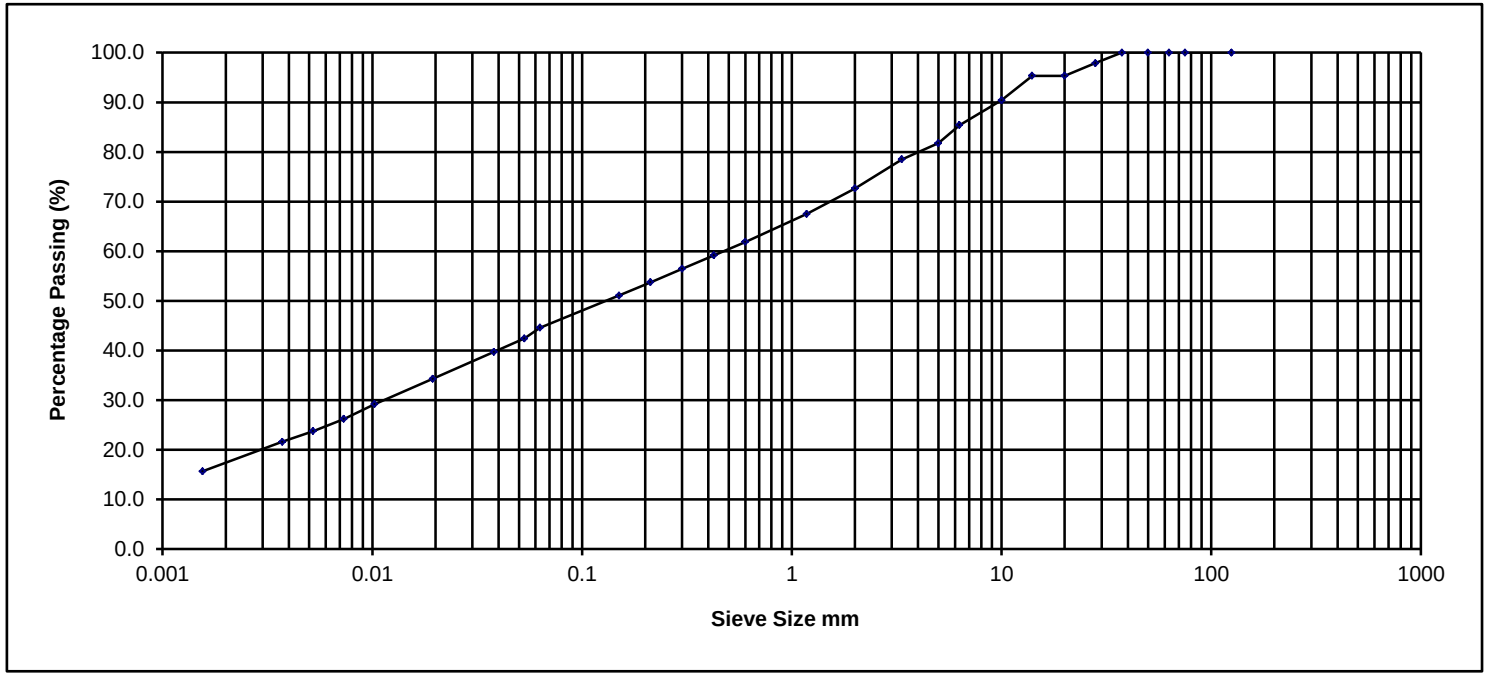
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	97.9
20.000	95.4
14.000	95.4
10.000	90.4
6.300	85.4
5.000	81.8
3.350	78.5
2.000	72.6
1.180	67.5
0.600	61.9
0.425	59.2
0.300	56.5
0.212	53.7
0.150	51.1
0.063	44.6
0.053	42.4
0.038	39.7
0.019	34.3
0.010	29.2
0.007	26.2
0.005	23.8
0.004	21.6
0.002	15.7



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
15.7		28.9			28.1			27.4		0.0	0.0

Sample Description	Grey slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH09
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	5.0m
				Date sample tested	01/08/2020		

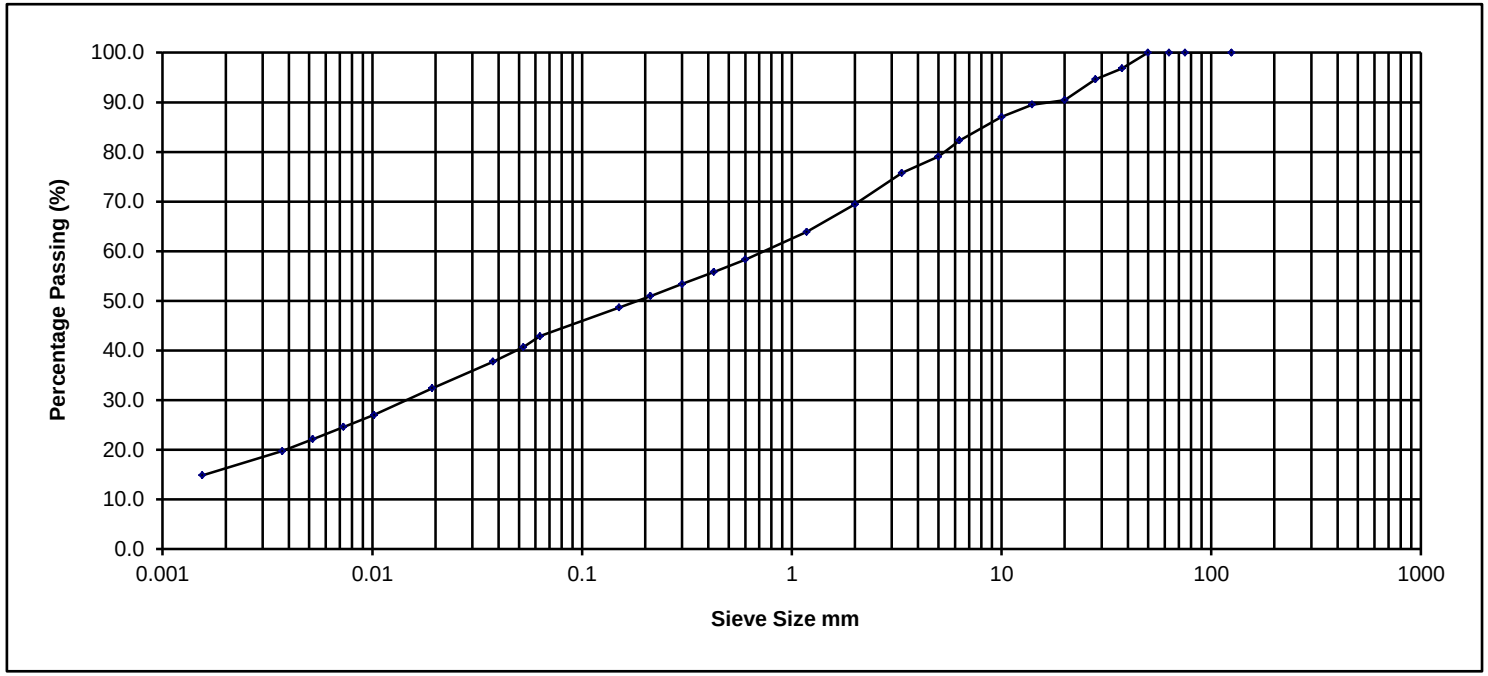
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	96.8
28.000	94.6
20.000	90.4
14.000	89.6
10.000	87.0
6.300	82.3
5.000	79.1
3.350	75.8
2.000	69.4
1.180	63.9
0.600	58.3
0.425	55.8
0.300	53.4
0.212	51.0
0.150	48.7
0.063	42.9
0.053	40.7
0.038	37.8
0.019	32.4
0.010	27.0
0.007	24.6
0.005	22.2
0.004	19.7
0.002	14.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
14.9		28.0			26.6			30.6		0.0	0.0

Sample Description	Grey slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH10
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	3.0m
				Date sample tested	01/08/2020		

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	93.2
28.000	92.2
20.000	91.4
14.000	86.6
10.000	84.0
6.300	80.0
5.000	76.9
3.350	73.5
2.000	69.1
1.180	65.4
0.600	61.6
0.425	59.6
0.300	57.6
0.212	55.3
0.150	52.7
0.063	46.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		46.2			22.9			30.9		0.0	0.0

Sample Description	Grey/brown slightly sandy slightly gravelly silty CLAY.			Project No.	NMTL 3243
				BH/TP No.	BH04
Project	Whitehall, Swords		GII Project ID-9225-11-19	Sample No.	C
Operator Tzr	Checked Nc	Approved Bc	Date sample tested 11/08/2020	Depth	10.5-10.90m

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	94.7
28.000	93.9
20.000	91.6
14.000	82.4
10.000	78.6
6.300	73.5
5.000	68.9
3.350	65.7
2.000	61.2
1.180	57.3
0.600	53.4
0.425	51.4
0.300	49.3
0.212	46.9
0.150	44.3
0.063	37.8

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		37.8			23.4			38.8		0.0	0.0

Sample Description	Grey/brown slightly sandy gravelly silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH05
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	C
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	11/08/2020	Depth	8.30-8.70m

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	97.2
20.000	95.2
14.000	90.9
10.000	87.8
6.300	84.4
5.000	82.8
3.350	80.0
2.000	76.0
1.180	72.2
0.600	68.2
0.425	66.2
0.300	63.7
0.212	60.5
0.150	56.8
0.063	47.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		47.4			28.6			24.0		0.0	0.0

Sample Description: Grey/brown slightly gravelly slightly sandy silty CLAY.

Project: Whitehall, Swords

GII Project ID-9225-11-19

Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	11/08/2020

Project No.	NMTL 3243
BH/TP No.	BH05
Sample No.	C
Depth	14.60-15.0m

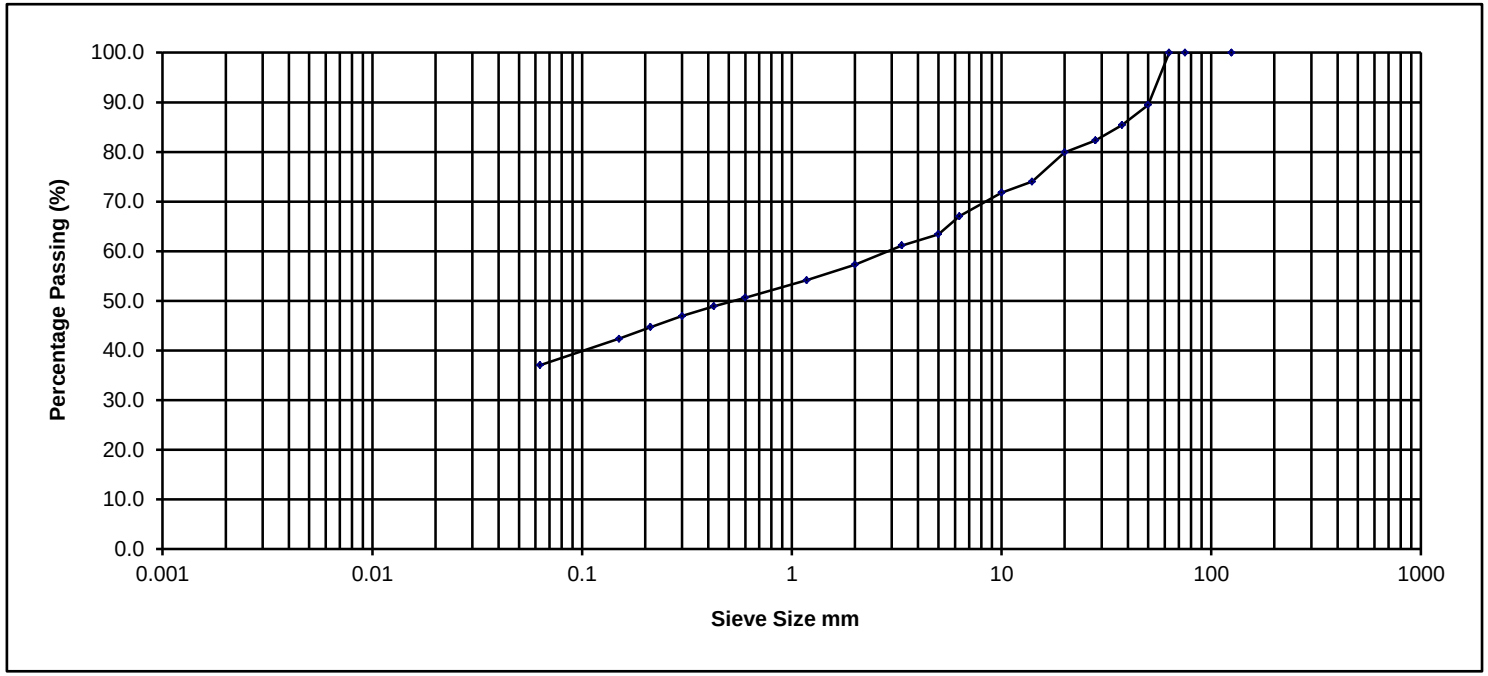
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	89.5
37.500	85.4
28.000	82.3
20.000	79.9
14.000	74.0
10.000	71.8
6.300	67.1
5.000	63.4
3.350	61.2
2.000	57.3
1.180	54.2
0.600	50.7
0.425	48.9
0.300	47.0
0.212	44.7
0.150	42.4
0.063	37.0



Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		37.0			20.2			42.7		0.0	0.0

Sample Description	Grey/brown slightly sandy gravelly silty CLAY.			Project No.	NMTL 3243
				BH/TP No.	BH09
Project	Whitehall, Swords		GII Project ID-9225-11-19	Sample No.	C
Operator Tzr	Checked Nc	Approved Bc	Date sample tested 11/08/2020	Depth	9.65-10.0m

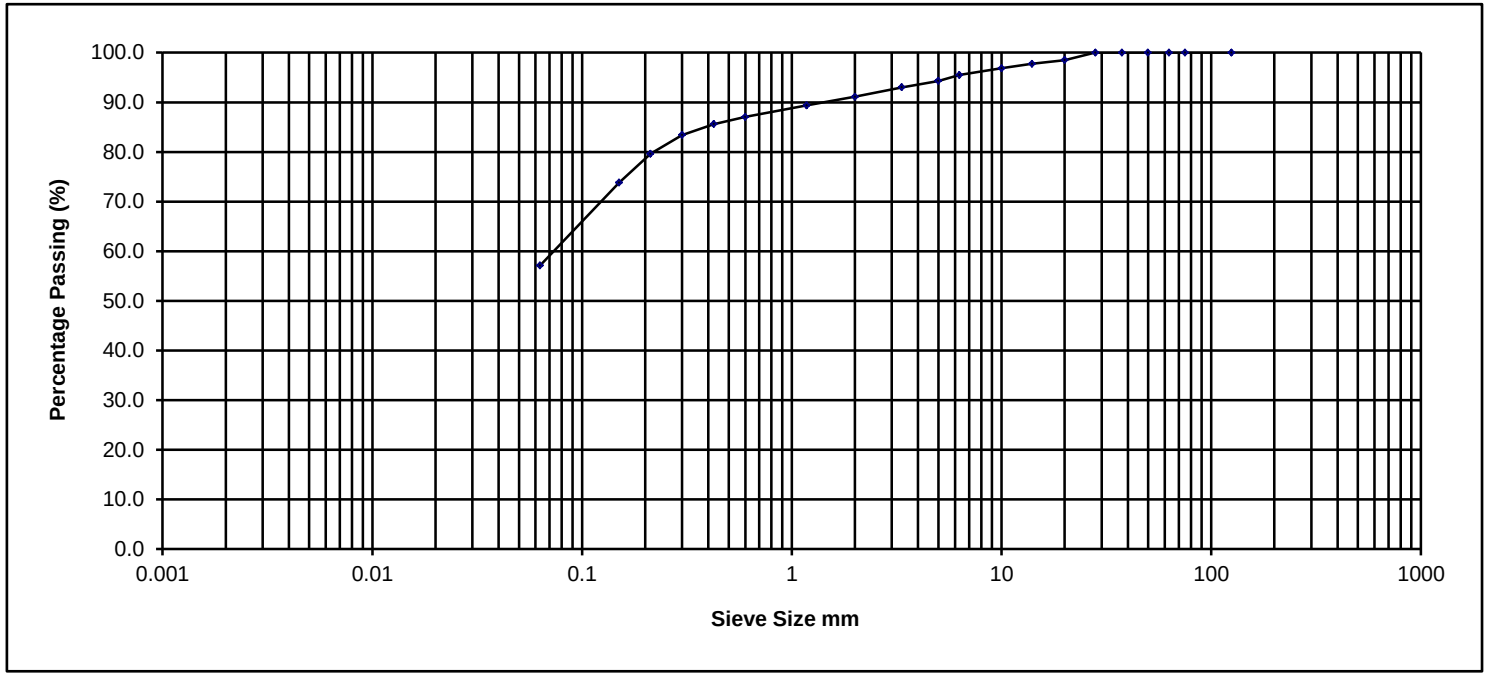
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	98.5
14.000	97.7
10.000	96.9
6.300	95.5
5.000	94.3
3.350	93.0
2.000	91.1
1.180	89.4
0.600	87.0
0.425	85.6
0.300	83.4
0.212	79.6
0.150	73.8
0.063	57.1



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		57.1			34.0			8.9		0.0	0.0

Sample Description	Grey/brown slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3243
						BH/TP No.	BH09
Project	Whitehall, Swords			GII Project ID-9225-11-19		Sample No.	C
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	19.7-20.0m
				Date sample tested	11/08/2020		

NM TL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

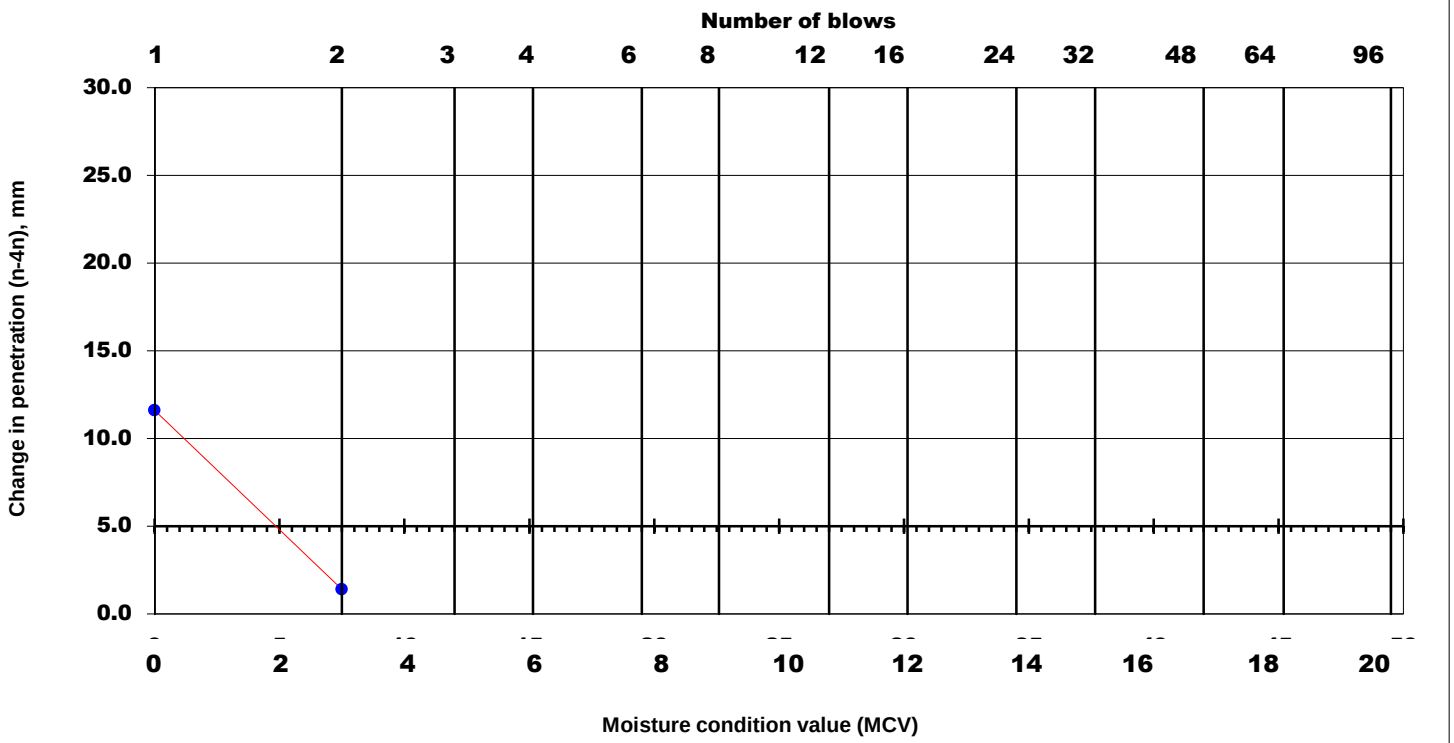
Single sample mass		
Initial sample mass	1495	g
Moisture content	13.9	%
Dry mass	1312.0	g
Mass retained on 20mm sieve	g	28.7 %

* Delete as appropriate

Project Name:	Job ref.	NMTL_3243
Whitehall, Swords	GII Project ID	9255-11-19
	TP/BH	TP01
Soil description:	Sample no.	B
Light brown slightly sandy slightly gravelly clayey SILT	Depth	0.70m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	07/08/2020
	Date Sampled	N/A
	Date Received	29/07/2020

MCV **1.9** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	49.4	11.6
2	39.0	1.4
3	37.9	
4	37.8	
6	37.8	
8	37.6	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

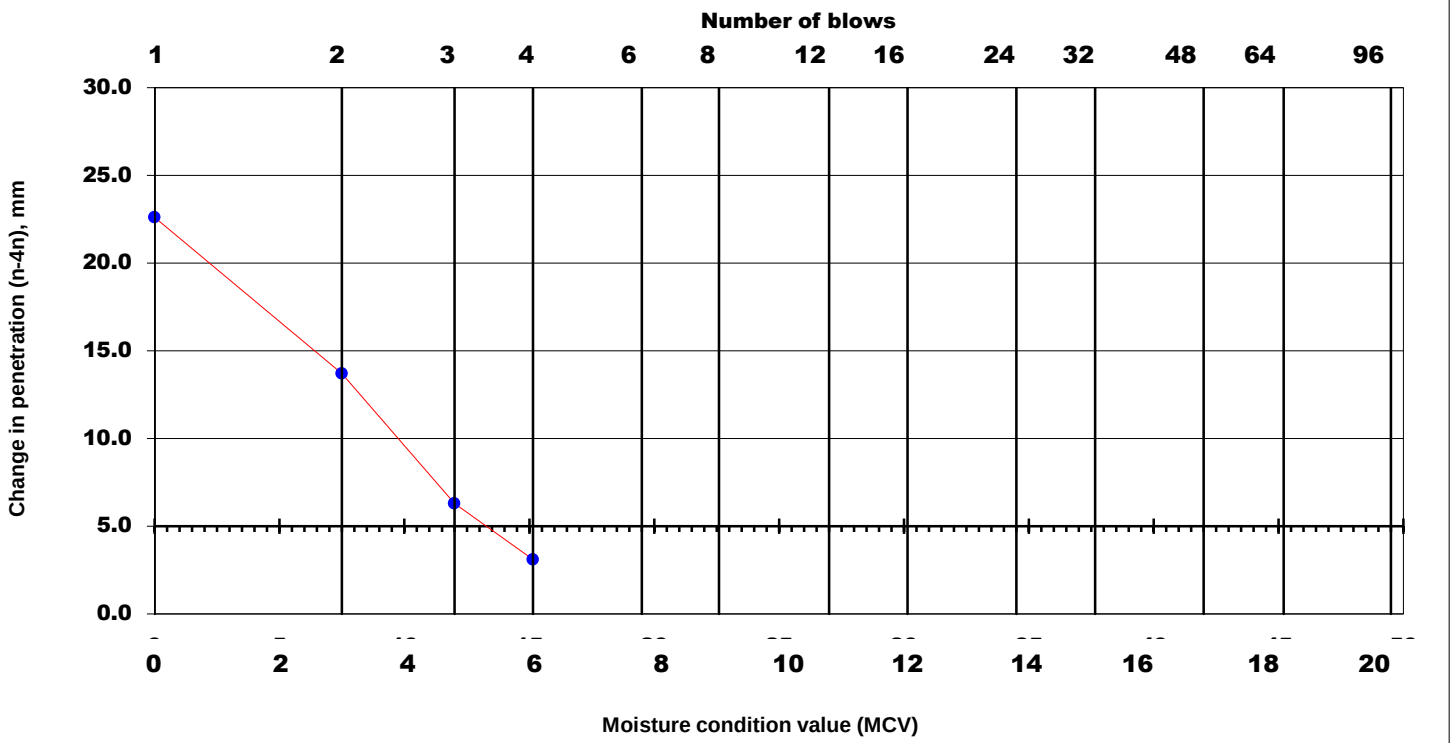
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1492	g
Moisture content	12.3	%
Dry mass	1329.0	g
Mass retained on 20mm sieve	g	16 %

* Delete as appropriate

Project Name: Whitehall, Swords		Job ref.	NMTL_3243
		GII Project ID	9255-11-19
		TP/BH	TP01
Soil description:		Sample no.	B
Light brown slightly sandy slightly gravelly SILT/CLAY		Depth	2.40m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	13/08/2020
		Date Sampled	N/A
MCV	**5.4** **Natural**	Date Received	12/08/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	62.2	22.6
2	50.6	13.7
3	43.1	6.3
4	39.6	3.1
6	37.1	
8	36.9	
12	36.8	
16	36.5	
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Ms	Nc	Bc

NMTL Ltd

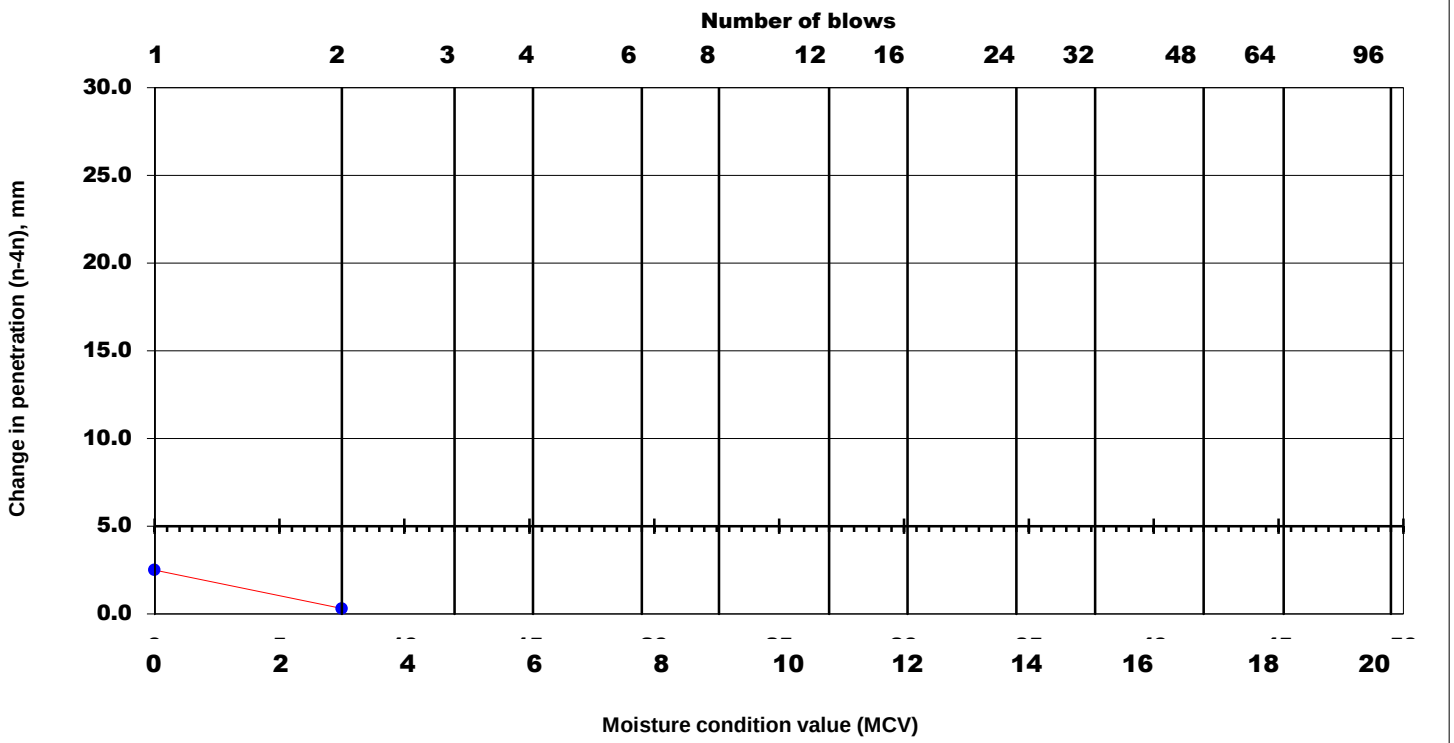
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1491	g
Moisture content	16.0	%
Dry mass	1285.0	g
Mass retained on 20mm sieve	g	14.3 %

* Delete as appropriate

Project Name:	Job ref.	NMTL_3243
Whitehall, Swords	GII Project ID	9255-11-19
	TP/BH	TP02
Soil description:	Sample no.	B
Light brown slightly sandy slightly gravelly SILT/CLAY	Depth	1.50m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	04/08/2020
	Date Sampled	N/A
MCV N/A **Natural**	Date Received	29/07/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	42.6	2.5
2	40.4	0.3
3	40.4	
4	40.1	
6	40.1	
8	40.1	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1481	g
Moisture content	32.4	%
Dry mass	1118.8	g
Mass retained on 20mm sieve	g	8.4 %

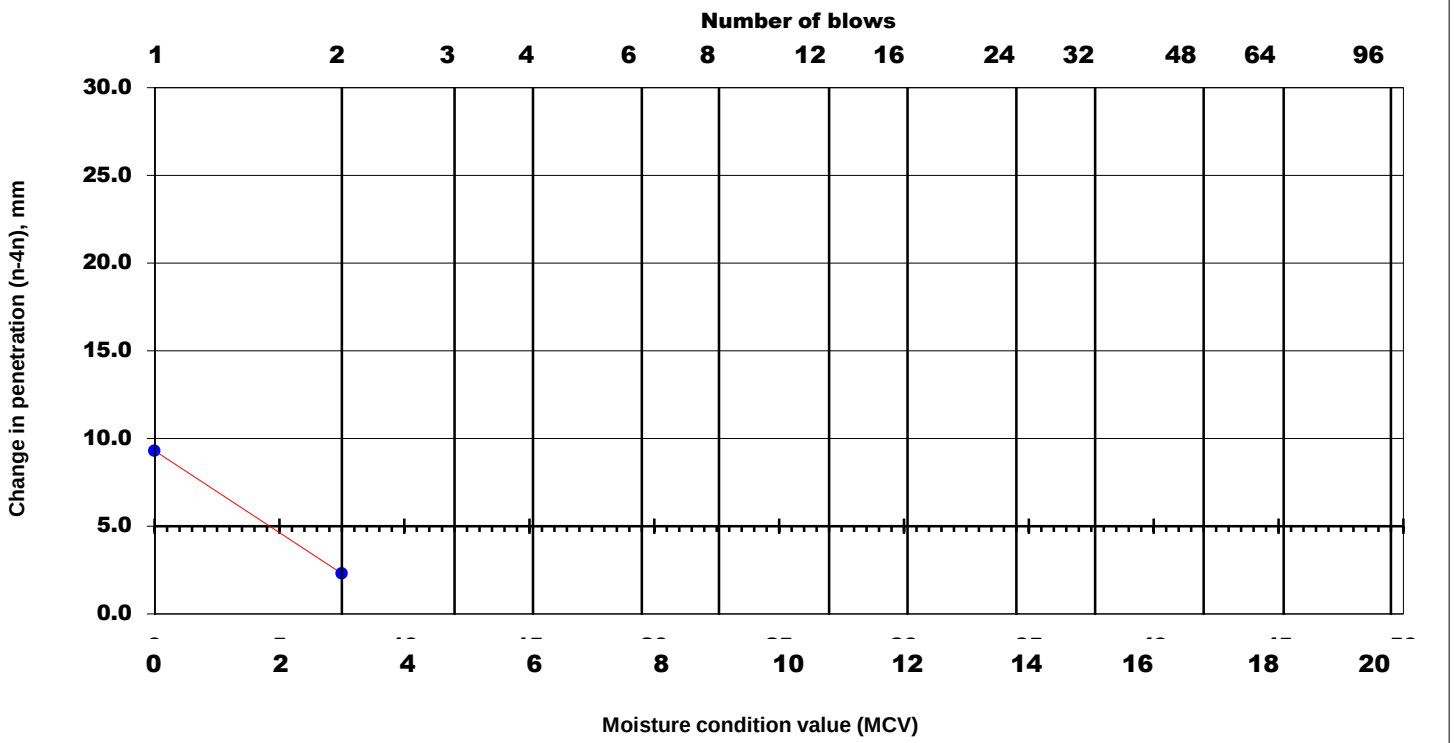
* Delete as appropriate

Project Name: Whitehall, Swords	
Soil description: Light brown slightly sandy slightly gravelly SILT/CLAY	
Test method	BS 1377 : Part 4 : 1990 : 5

Job ref.	NMTL_3243
GII Project ID	9255-11-19
TP/BH	TP03
Sample no.	B
Depth	0.50m
Date Tested	07/08/2020
Date Sampled	N/A
Date Received	29/07/2020

MCV **1.8** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	63.2	9.3
2	55.6	2.3
3	54.3	
4	53.9	
6	53.8	
8	53.3	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

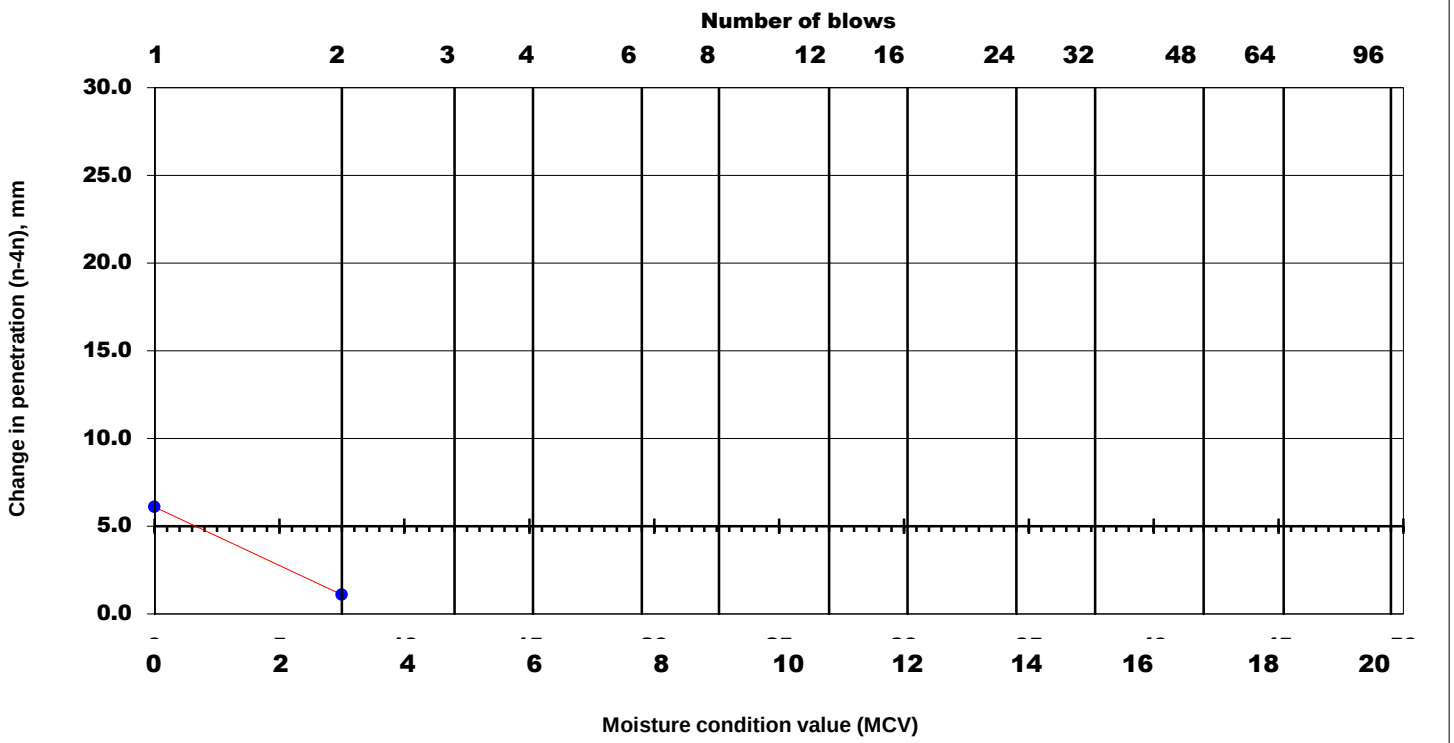
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1491	g
Moisture content	14.4	%
Dry mass	1303.5	g
Mass retained on 20mm sieve	g	11.9 %

* Delete as appropriate

Project Name: Whitehall, Swords		Job ref.	NMTL_3243
		GII Project ID	9255-11-19
		TP/BH	TP03
Soil description:		Sample no.	B
Grey slightly sandy gravelly silty CLAY		Depth	2.70m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	04/08/2020
		Date Sampled	N/A
MCV	**0.7** **Natural**	Date Received	29/07/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	43.8	6.1
2	38.6	1.1
3	38.1	
4	37.7	
6	37.5	
8	37.5	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

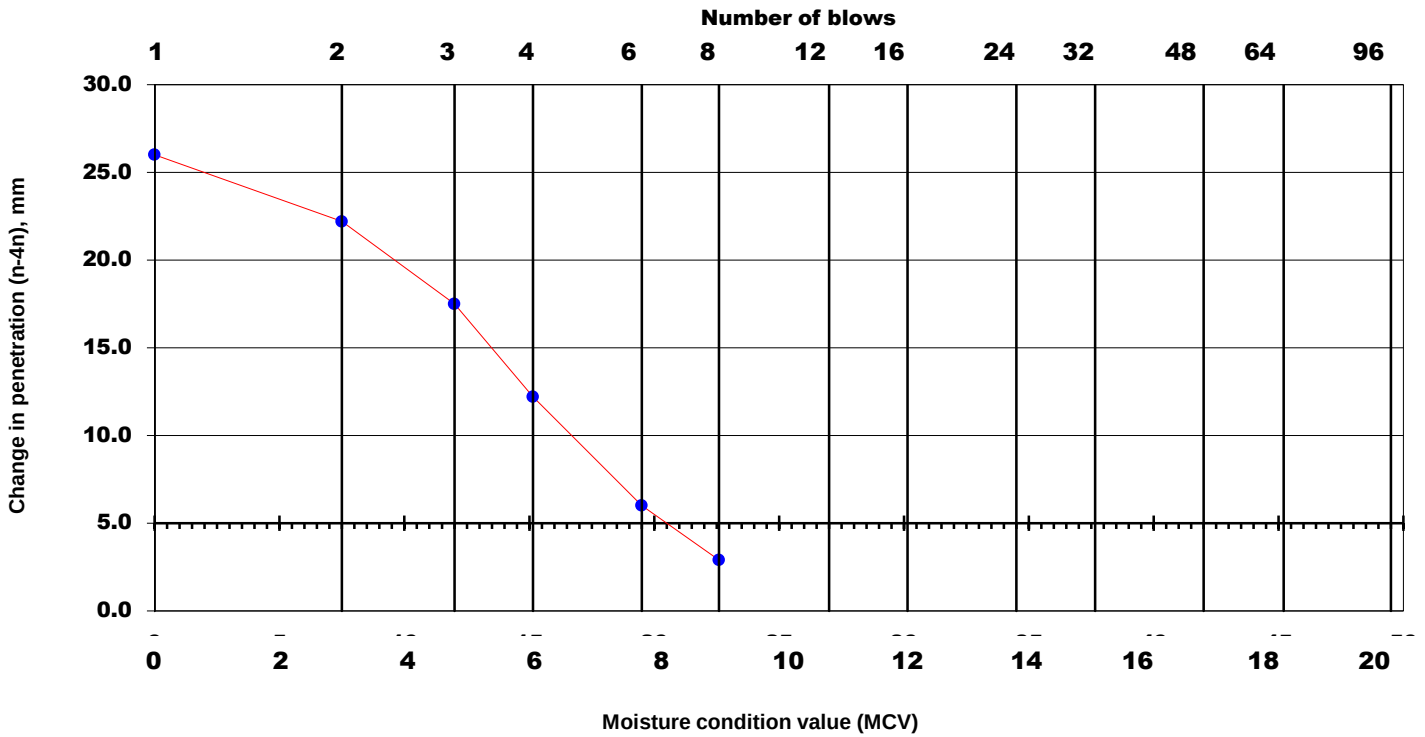
Single sample mass		
Initial sample mass	1494	g
Moisture content	14.5	%
Dry mass	1305.0	g
Mass retained on 20mm sieve	g	8.39 %

* Delete as appropriate

Project Name:	Job ref.	NMTL_3243
Whitehall, Swords	GII Project ID	9255-11-19
	TP/BH	TP04
Soil description:	Sample no.	T
Light brown/grey slightly sandy gravelly SILT/CLAY.	Depth	0.50m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	08/08/2020
	Date Sampled	N/A
	Date Received	29/07/2020

MCV **8.2** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	76.7	26.0
2	63.1	22.2
3	56.1	17.5
4	50.7	12.2
6	44.4	6.0
8	40.9	2.9
12	38.6	
16	38.5	
24	38.4	
32	38.0	
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

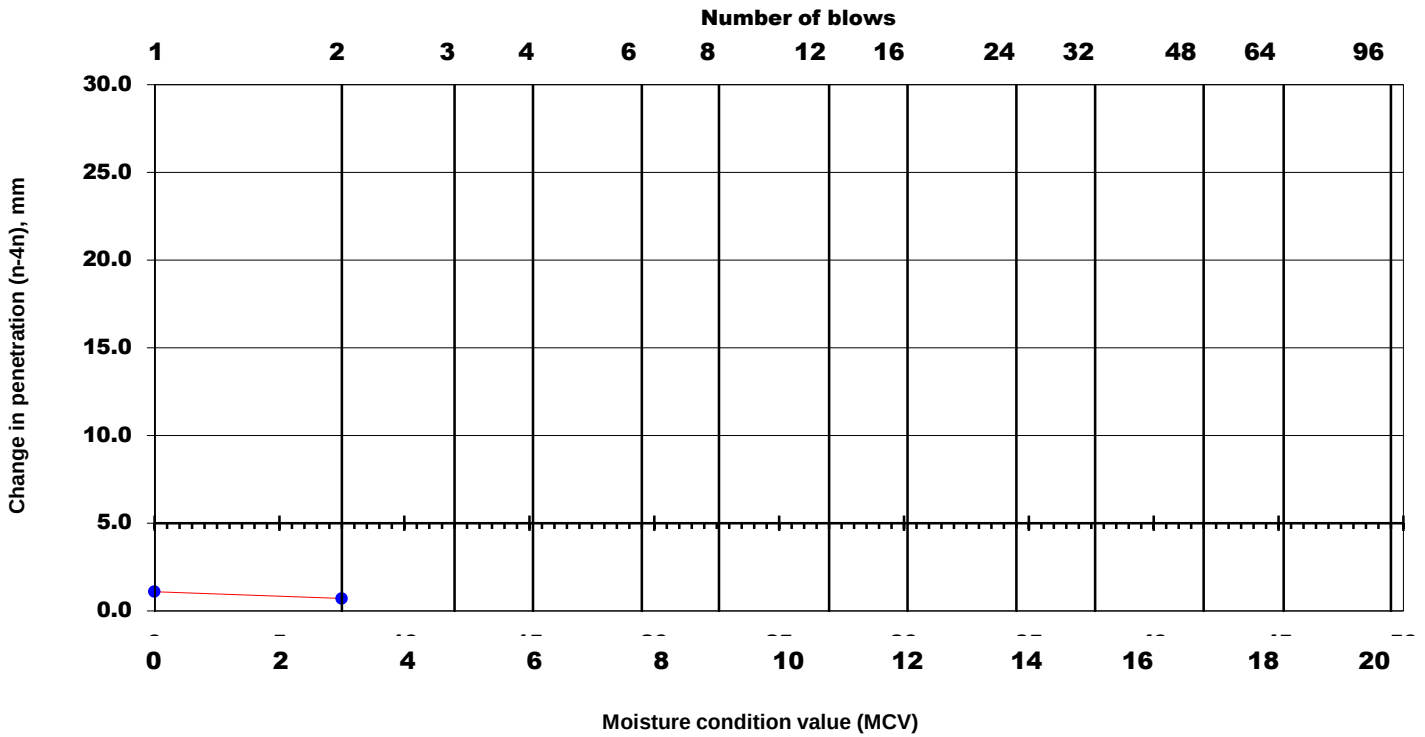
Single sample mass		
Initial sample mass	1478	g
Moisture content	20.2	%
Dry mass	1230.0	g
Mass retained on 20mm sieve	11.2	%

* Delete as appropriate

Project Name:	Job ref.	NMTL_3243
Whitehall, Swords	GII Project ID	9255-11-19
	TP/BH	TP05C
Soil description:	Sample no.	T
Light brown slightly sandy slightly gravelly SILT/CLAY.	Depth	0.90m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	04/08/2020
	Date Sampled	N/A
	Date Received	29/07/2020

MCV **N/A** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	44.0	1.1
2	43.4	0.7
3	42.9	
4	42.9	
6	42.8	
8	42.7	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

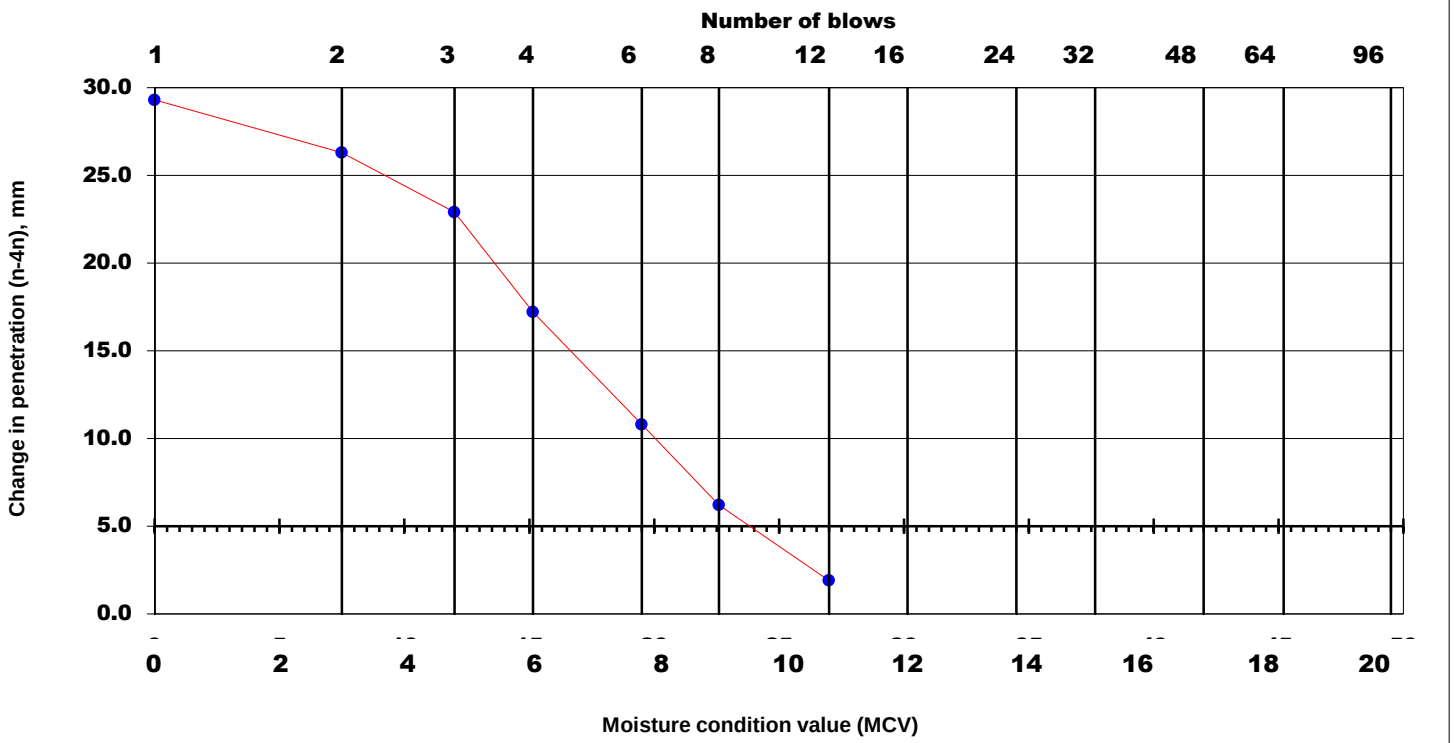
Single sample mass		
Initial sample mass	1490	g
Moisture content	14.5	%
Dry mass	1301.1	g
Mass retained on 20mm sieve	g	psd %

* Delete as appropriate

Project Name:	Job ref.	NMTL_3243
Whitehall, Swords	GII Project ID	9255-11-19
	TP/BH	TP06
Soil description:	Sample no.	B
Light brown/grey slightly sandy slightly gravelly SILT/CLAY.	Depth	0.60m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	05/08/2020
	Date Sampled	N/A
	Date Received	29/07/2020

MCV **9.5** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	84.3	29.3
2	70.1	26.3
3	62.2	22.9
4	55.0	17.2
6	48.4	10.8
8	43.8	6.2
12	39.3	1.9
16	37.8	
24	37.6	
32	37.6	
48	37.4	
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

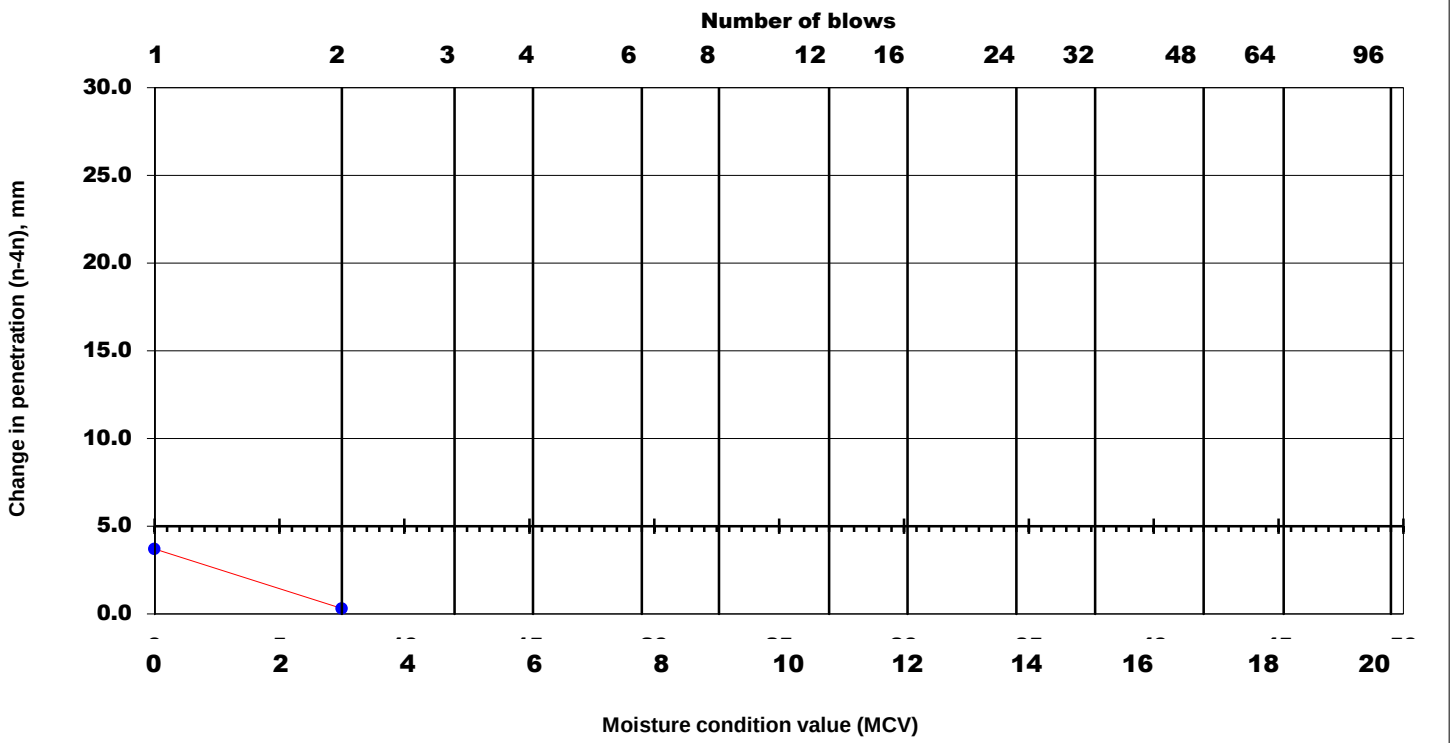
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1489	g
Moisture content	35.3	%
Dry mass	1100.2	g
Mass retained on 20mm sieve	10.39	%

* Delete as appropriate

Project Name: Whitehall, Swords		Job ref.	NMTL_3243
		GII Project ID	9255-11-19
		TP/BH	TP07
Soil description:		Sample no.	B
Brown/grey slightly sandy slightly gravelly SILT/CLAY.		Depth	0.70m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	06/08/2020
		Date Sampled	N/A
MCV	**N/A** **Natural**	Date Received	29/07/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	60.3	3.7
2	56.8	0.3
3	56.7	
4	56.6	
6	56.5	
8	56.5	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



NMTL Ltd

Operator	Checked	Approved
Tch	Nc	Bc

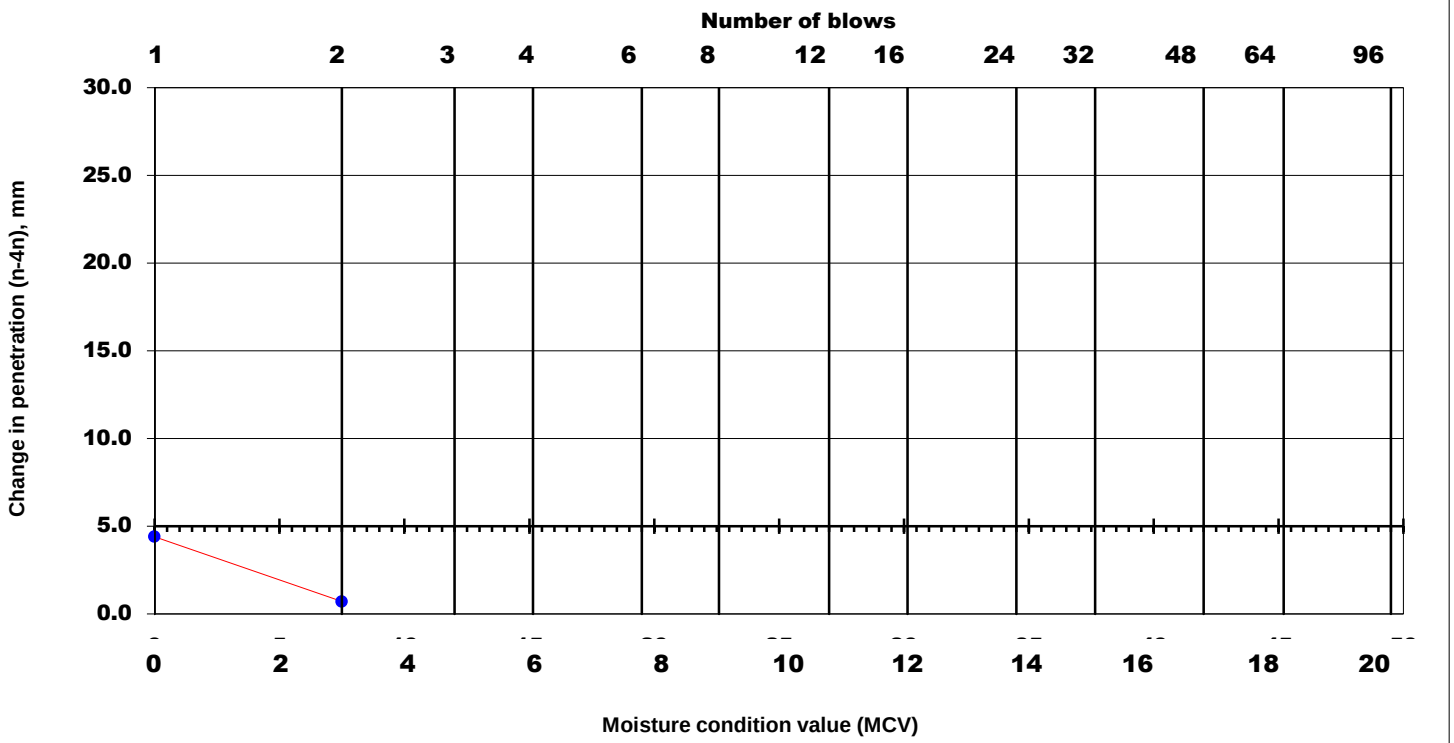
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1496	g
Moisture content	15.4	%
Dry mass	1296.0	g
Mass retained on 20mm sieve	g	14.3 %

* Delete as appropriate

Project Name:	Job ref.	NMTL_3243
Whitehall, Swords	GII Project ID	9255-11-19
	TP/BH	TP07
Soil description:	Sample no.	B
Light brown slightly sandy slightly gravelly SILT/CLAY	Depth	3.30m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	06/08/2020
	Date Sampled	N/A
MCV **N/A** **Natural**	Date Received	29/07/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	44.7	4.4
2	40.9	0.7
3	40.4	
4	40.3	
6	40.3	
8	40.2	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

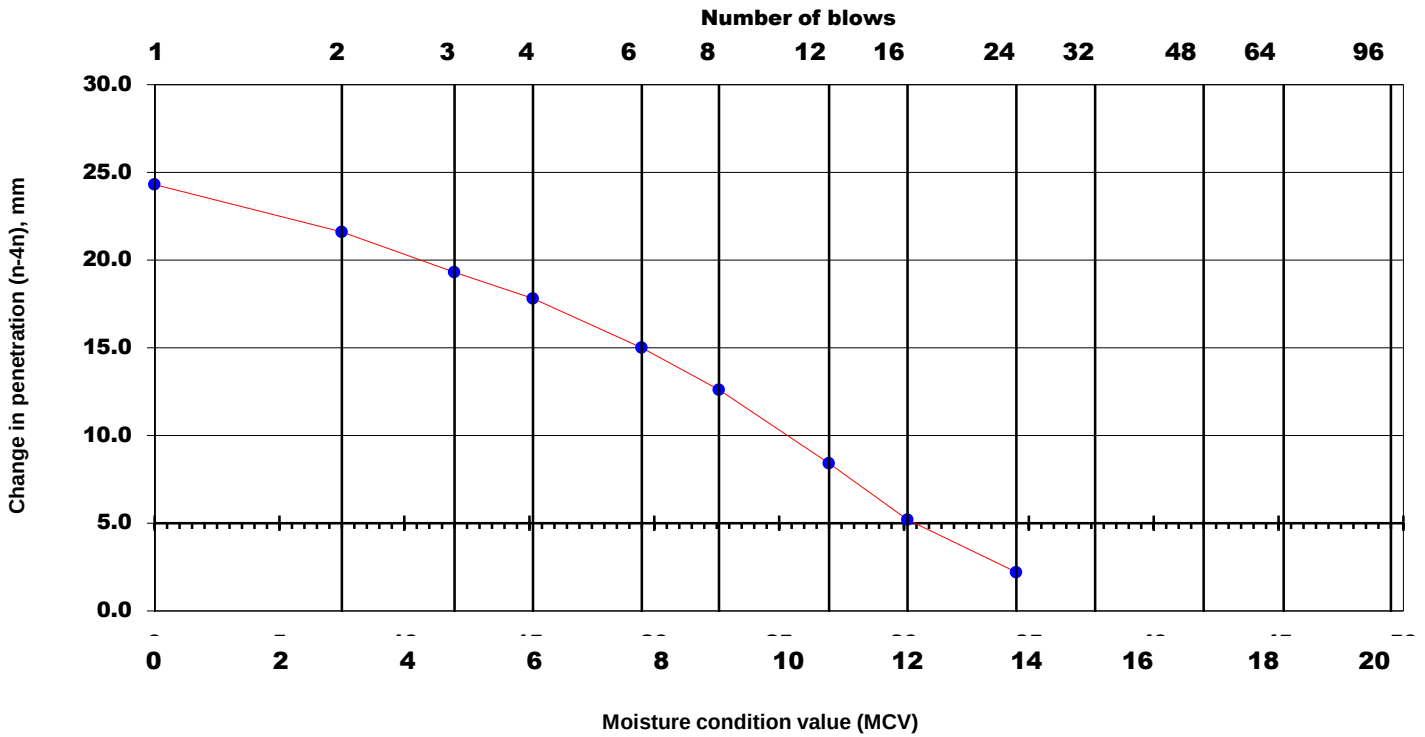
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1493	g
Moisture content	14.7	%
Dry mass	1301.9	g
Mass retained on 20mm sieve	g	psd %

* Delete as appropriate

Project Name: Whitehall, Swords		Job ref.	NMTL_3243
		GII Project ID	9255-11-19
		TP/BH	TP08
Soil description:		Sample no.	B
Brown slightly sandy slightly gravelly SILT/CLAY		Depth	0.70m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	04/08/2020
		Date Sampled	N/A
MCV	**12.2** **Natural**	Date Received	29/07/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	87.2	24.3
2	74.7	21.6
3	67.6	19.3
4	62.9	17.8
6	56.9	15.0
8	53.1	12.6
12	48.3	8.4
16	45.1	5.2
24	41.9	2.2
32	40.5	
48	39.9	
64	39.9	
96	39.7	
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

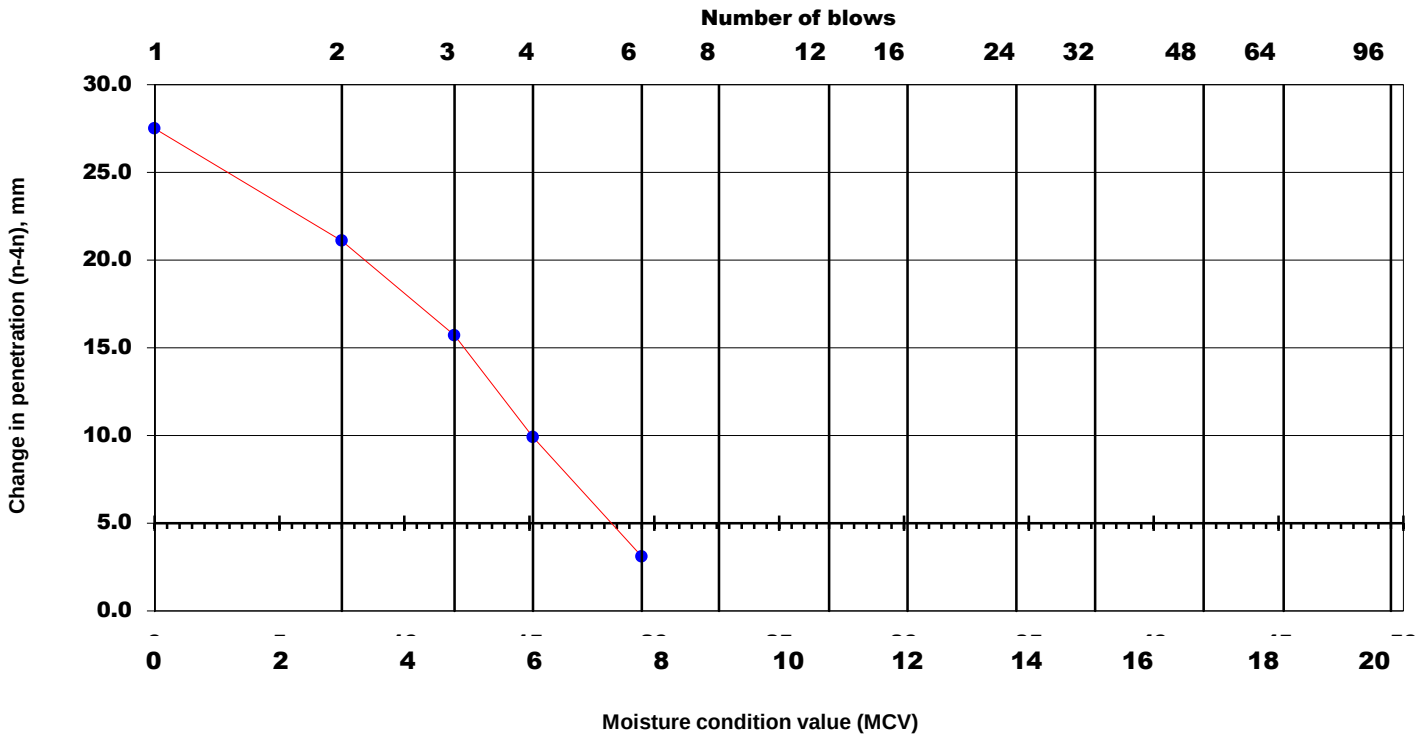
Single sample mass		
Initial sample mass	1494	g
Moisture content	12.6	%
Dry mass	1327.3	g
Mass retained on 20mm sieve	g	6.2 %

* Delete as appropriate

Project Name:	Job ref.	NMTL_3243
Whitehall, Swords	GII Project ID	9255-11-19
	TP/BH	TP09
Soil description:	Sample no.	B
Brown slightly sandy slightly gravelly SILT/CLAY	Depth	1.90m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	06/08/2020
	Date Sampled	N/A
	Date Received	29/07/2020

MCV **7.3** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	72.6	27.5
2	56.9	21.1
3	50.9	15.7
4	45.1	9.9
6	38.3	3.1
8	35.8	
12	35.2	
16	35.2	
24	35.2	
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

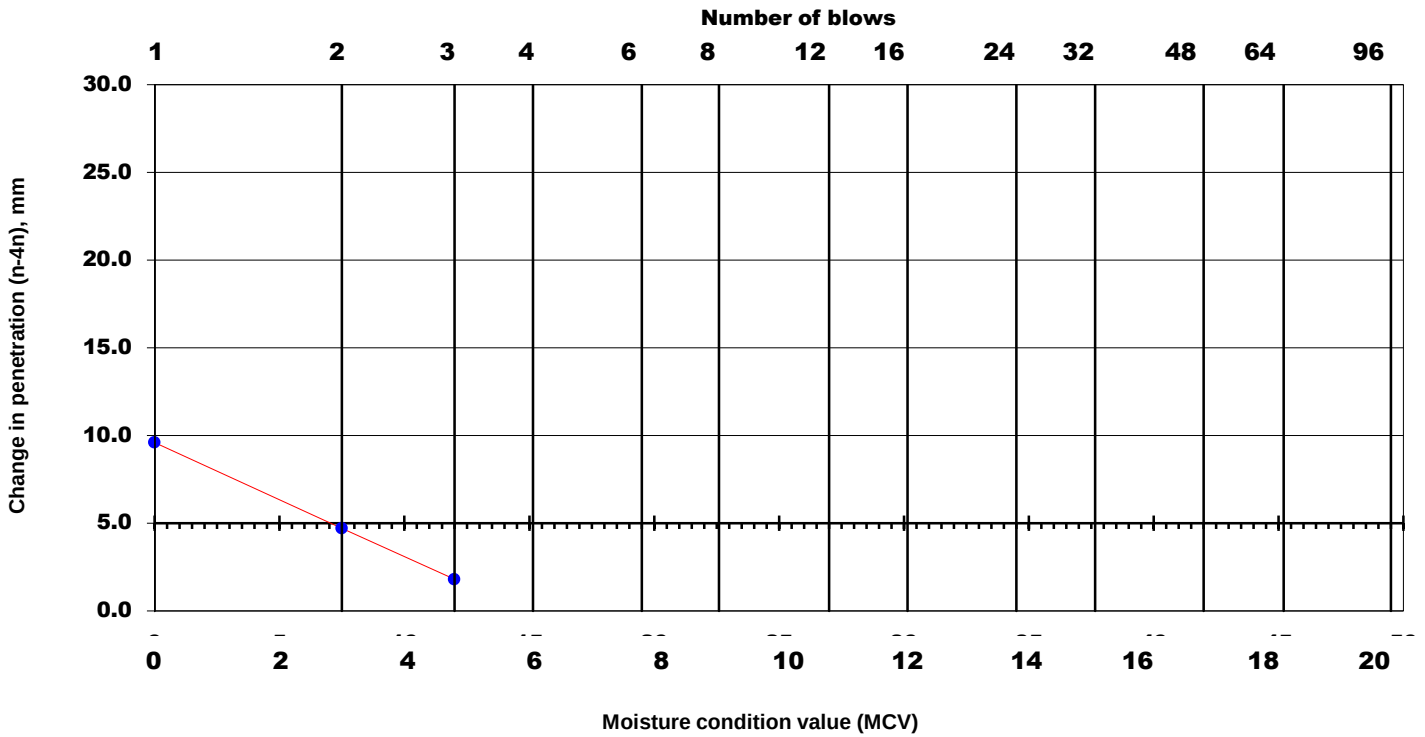
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass		
Initial sample mass	1497	g
Moisture content	18.4	%
Dry mass	1263.9	g
Mass retained on 20mm sieve	g	9.9 %

* Delete as appropriate

Project Name: Whitehall, Swords		Job ref.	NMTL_3243
		GII Project ID	9255-11-19
		TP/BH	TP10
Soil description:		Sample no.	B
Light brown slightly gravelly slightly sandy SILT/CLAY.		Depth	0.50m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	07/08/2020
		Date Sampled	N/A
MCV	**2.9** **Natural**	Date Received	29/07/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	52.4	9.6
2	46.8	4.7
3	43.8	1.8
4	42.8	
6	42.1	
8	42.1	
12	42.0	
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Light brown slightly slightly gravelly SILT/CLAY

Date: 7-Aug-20

Test Method: BS 1377: Part 4 : 1990 :7.4

Force Measuring Device: VJT 08211 — Test 1

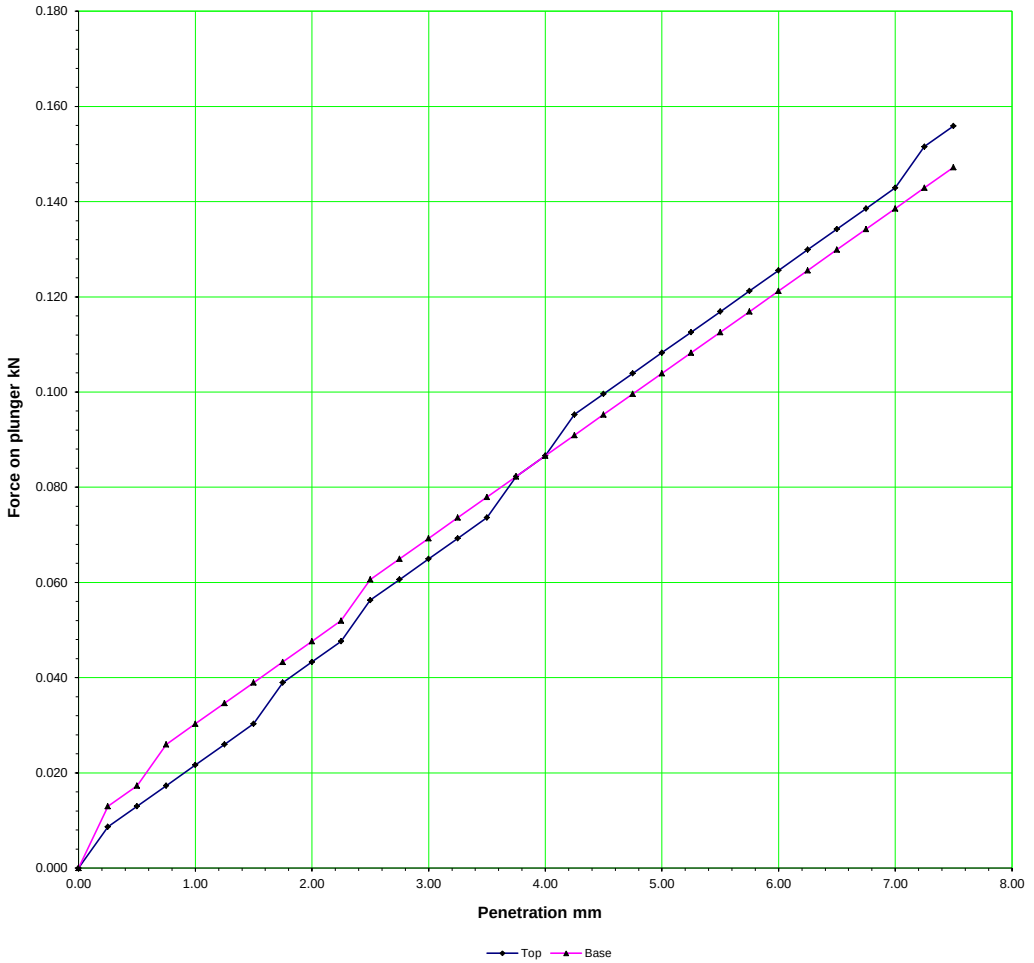
Preperatic: Remoulded with 2.5 kg rammer at natural moisture content

Surcharge: 10 kPa — Mean Calibration: 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	2.0	3.0	0.009	0.013		
0.50	3.0	4.0	0.013	0.017		
0.75	4.0	6.0	0.017	0.026		
1.00	5.0	7.0	0.022	0.030		
1.25	6.0	8.0	0.026	0.035		
1.50	7.0	9.0	0.030	0.039		
1.75	9.0	10.0	0.039	0.043		
2.00	10.0	11.0	0.043	0.048		
2.25	11.0	12.0	0.048	0.052		
2.50	**13.0**	**14.0**	**0.056**	**0.061**	**0.43**	**0.46**
2.75	14.0	15.0	0.061	0.065		
3.00	15.0	16.0	0.065	0.069		
3.25	16.0	17.0	0.069	0.074		
3.50	17.0	18.0	0.074	0.078		
3.75	19.0	19.0	0.082	0.082		
4.00	20.0	20.0	0.087	0.087		
4.25	22.0	21.0	0.095	0.091		
4.50	23.0	22.0	0.100	0.095		
4.75	24.0	23.0	0.104	0.100		
5.00	**25.0**	**24.0**	**0.108**	**0.104**	**0.54**	**0.52**
5.25	26.0	25.0	0.113	0.108		
5.50	27.0	26.0	0.117	0.113		
5.75	28.0	27.0	0.121	0.117		
6.00	29.0	28.0	0.126	0.121		
6.25	30.0	29.0	0.130	0.126		
6.50	31.0	30.0	0.134	0.130		
6.75	32.0	31.0	0.139	0.134		
7.00	33.0	32.0	0.143	0.139		
7.25	35.0	33.0	0.152	0.143		
7.50	36.0	34.0	0.156	0.147		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	5090
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1889.0	1868.0	1810.0	Length mm	127.0
Mass of dry soil + container	g	1677.0	1651.0	1616.0		
Weight of container	g	146.0	143.0	189.0		
Mass of moisture	g	212.0	217.0	194.0	Average MC %	13.94
Dry weight	g	1531.0	1508.0	1427.0	Density Mg/m3	2.21
Moisture content	%	13.85	14.39	13.59	Dry Density Mg/m3	1.94



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	7-Aug-20	Project No.	NMTL 3243
Checked	Nc		Trial Pit No.	TP01
Approved	Bc		Sample No.	B
			Depth	0.70m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Grey slightly slightly gravelly SILT/CLAY

Date 13-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT-08211 Test 1

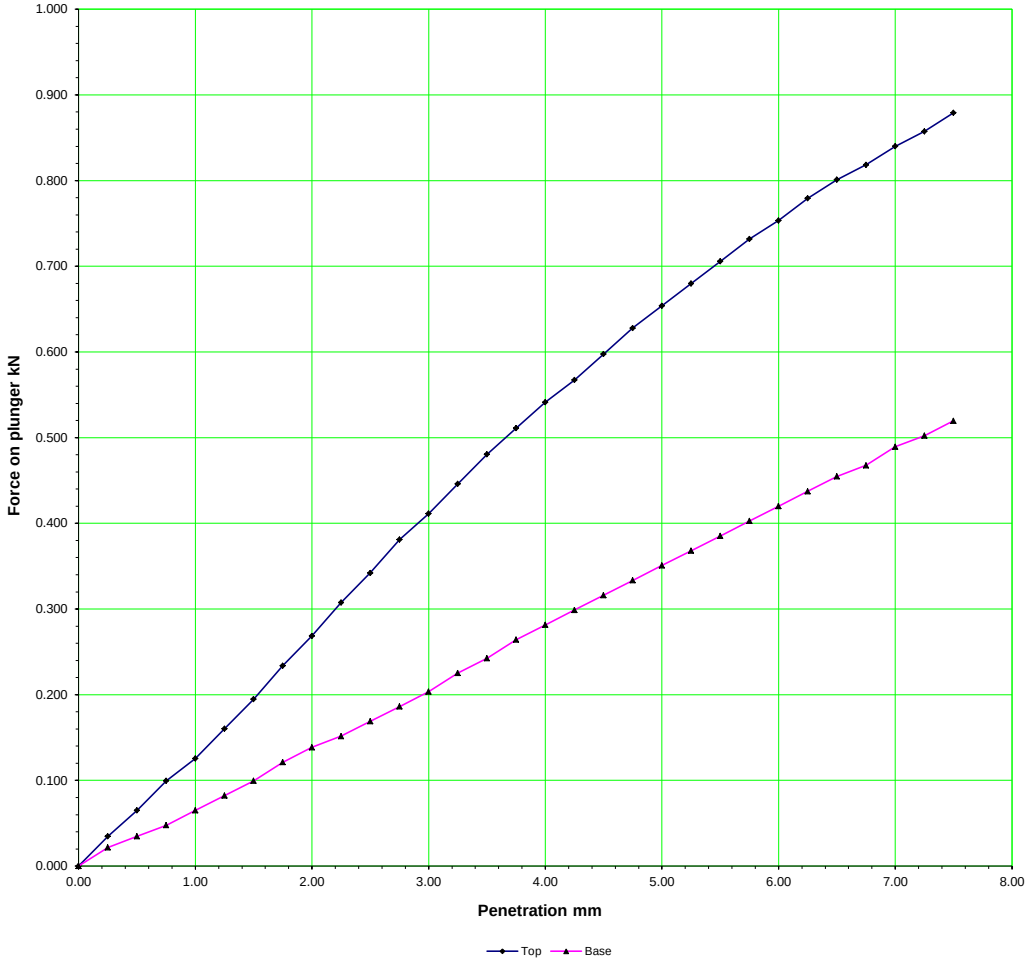
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	8.0	5.0	0.035	0.022		
0.50	15.0	8.0	0.065	0.035		
0.75	23.0	11.0	0.100	0.048		
1.00	29.0	15.0	0.126	0.065		
1.25	37.0	19.0	0.160	0.082		
1.50	45.0	23.0	0.195	0.100		
1.75	54.0	28.0	0.234	0.121		
2.00	62.0	32.0	0.268	0.139		
2.25	71.0	35.0	0.307	0.152		
2.50	**79.0**	**39.0**	**0.342**	**0.169**	**2.59**	**1.28**
2.75	88.0	43.0	0.381	0.186		
3.00	95.0	47.0	0.411	0.204		
3.25	103.0	52.0	0.446	0.225		
3.50	111.0	56.0	0.481	0.242		
3.75	118.0	61.0	0.511	0.264		
4.00	125.0	65.0	0.541	0.281		
4.25	131.0	69.0	0.567	0.299		
4.50	138.0	73.0	0.598	0.316		
4.75	145.0	77.0	0.628	0.333		
5.00	**151.0**	**81.0**	**0.654**	**0.351**	**3.27**	**1.75**
5.25	157.0	85.0	0.680	0.368		
5.50	163.0	89.0	0.706	0.385		
5.75	169.0	93.0	0.732	0.403		
6.00	174.0	97.0	0.753	0.420		
6.25	180.0	101.0	0.779	0.437		
6.50	185.0	105.0	0.801	0.455		
6.75	189.0	108.0	0.818	0.468		
7.00	194.0	113.0	0.840	0.489		
7.25	198.0	116.0	0.857	0.502		
7.50	203.0	120.0	0.879	0.520		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	5140
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1845.0	2024.0	1718.0	Length mm	127.0
Mass of dry soil + container	g	1659.0	1822.0	1545.0		
Weight of container	g	145.0	146.0	156.0		
Mass of moisture	g	186.0	202.0	173.0	Average MC %	12.26
Dry weight	g	1514.0	1676.0	1389.0	Density Mg/m3	2.23
Moisture content	%	12.29	12.05	12.46	Dry Density Mg/m3	1.99



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	13-Aug-20	Trial Pit No.	TP01
Checked	Nc		Sample No.	B
Approved	Bc		Depth	2.40m

Project No. NMTL 3243

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Light brown slightly slightly gravelly SILT/CLAY

Date 4-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

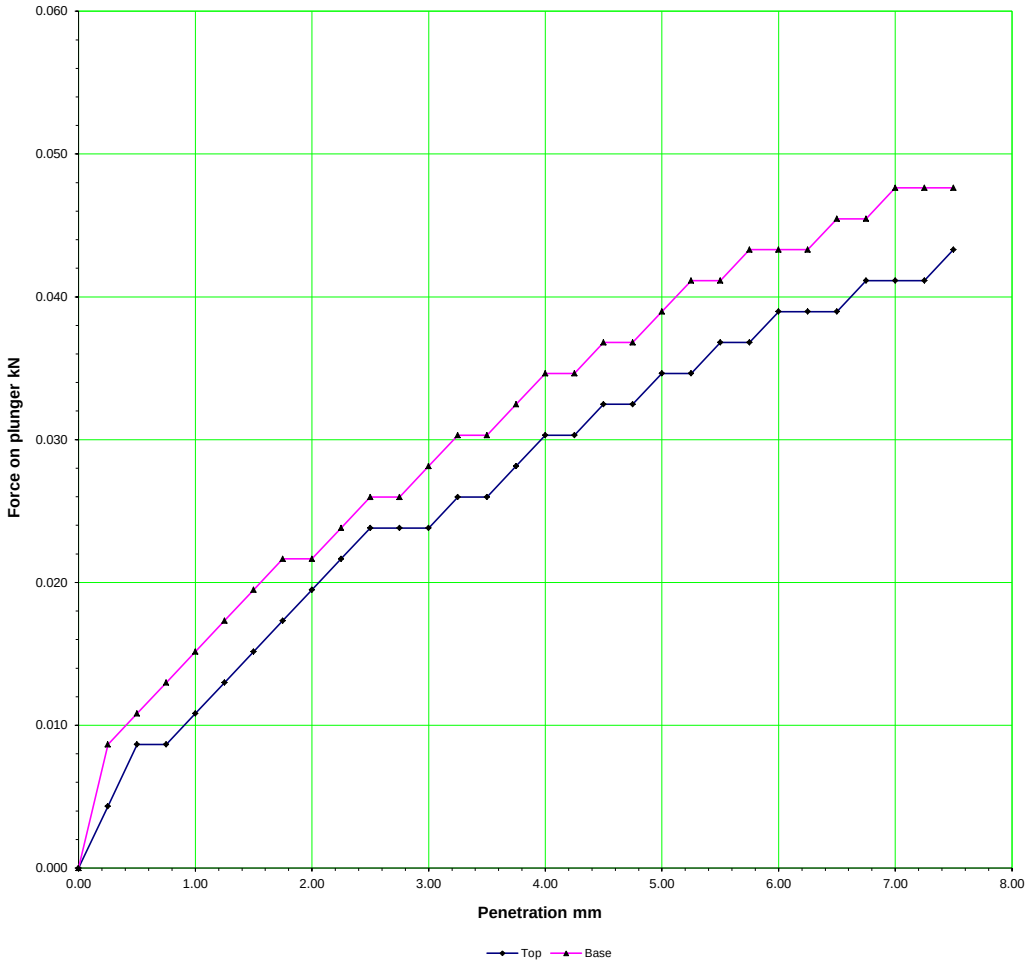
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	1.0	2.0	0.004	0.009		
0.50	2.0	2.5	0.009	0.011		
0.75	2.0	3.0	0.009	0.013		
1.00	2.5	3.5	0.011	0.015		
1.25	3.0	4.0	0.013	0.017		
1.50	3.5	4.5	0.015	0.019		
1.75	4.0	5.0	0.017	0.022		
2.00	4.5	5.0	0.019	0.022		
2.25	5.0	5.5	0.022	0.024		
2.50	**5.5**	**6.0**	**0.024**	**0.026**	**0.18**	**0.20**
2.75	5.5	6.0	0.024	0.026		
3.00	5.5	6.5	0.024	0.028		
3.25	6.0	7.0	0.026	0.030		
3.50	6.0	7.0	0.026	0.030		
3.75	6.5	7.5	0.028	0.032		
4.00	7.0	8.0	0.030	0.035		
4.25	7.0	8.0	0.030	0.035		
4.50	7.5	8.5	0.032	0.037		
4.75	7.5	8.5	0.032	0.037		
5.00	**8.0**	**9.0**	**0.035**	**0.039**	**0.17**	**0.19**
5.25	8.0	9.5	0.035	0.041		
5.50	8.5	9.5	0.037	0.041		
5.75	8.5	10.0	0.037	0.043		
6.00	9.0	10.0	0.039	0.043		
6.25	9.0	10.0	0.039	0.043		
6.50	9.0	10.5	0.039	0.045		
6.75	9.5	10.5	0.041	0.045		
7.00	9.5	11.0	0.041	0.048		
7.25	9.5	11.0	0.041	0.048		
7.50	10.0	11.0	0.043	0.048		

Moisture content after test		Top	Middle	Base	Specimen wt g	4995
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1928.0	1904.0	1596.0	Length mm	127.0
Mass of dry soil + container	g	1684.0	1660.0	1394.0		
Weight of container	g	145.0	145.0	147.0		
Mass of moisture	g	244.0	244.0	202.0	Average MC %	16.05
Dry weight	g	1539.0	1515.0	1247.0	Density Mg/m3	2.17
Moisture content	%	15.85	16.11	16.20	Dry Density Mg/m3	1.87



NM TL Ltd	**Project:** Whitehall, Swords		Date	Project No. NMTL 3243
		Operator	Ms 4-Aug-20	Trial Pit No. TP02
	GII Project ID: 9225-11-19	Checked	Nc	Sample No. B
		Approved	Bc	Depth 1.50m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Light brown slightly slightly gravelly SILT/CLAY

Date 7-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

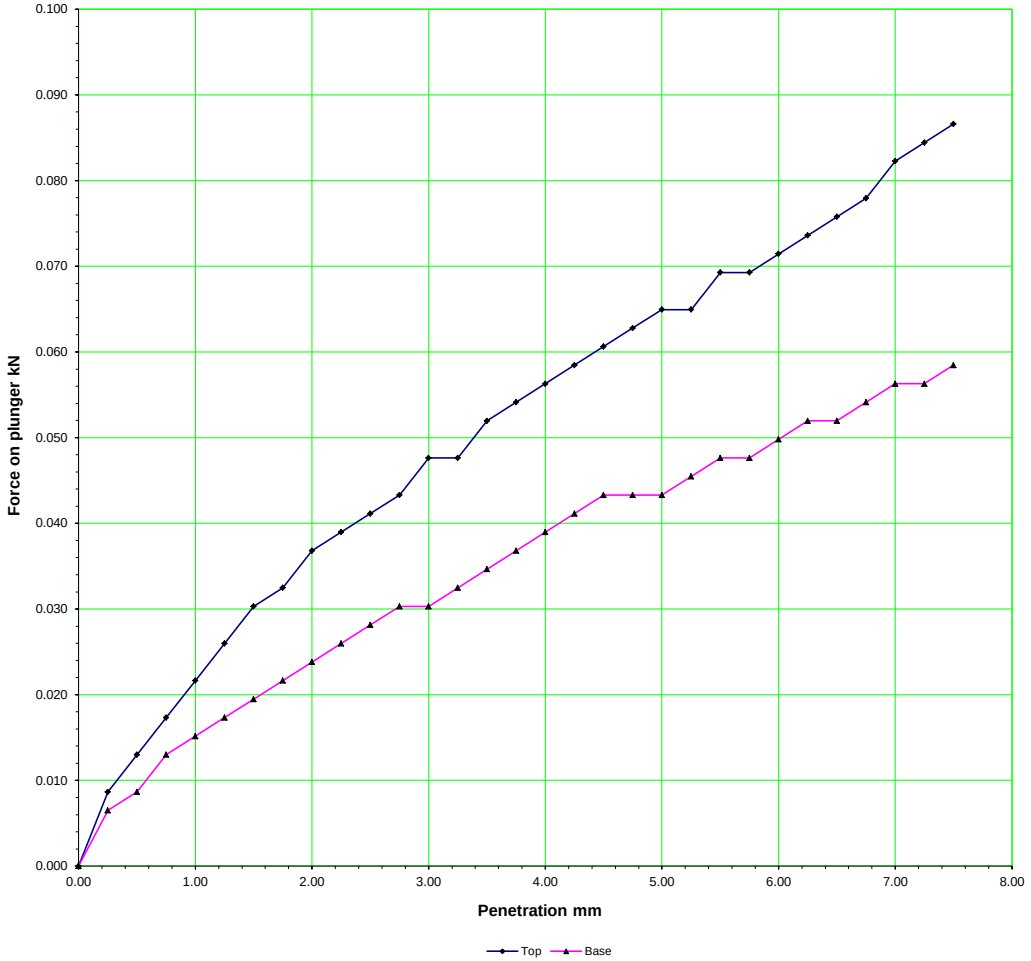
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Bottom	Force on plunger kN Top	Bottom	California Bearing Ratio Results % Top	Base
0.00	0.0	0.0	0.000	0.000		
0.25	2.0	1.5	0.009	0.006		
0.50	3.0	2.0	0.013	0.009		
0.75	4.0	3.0	0.017	0.013		
1.00	5.0	3.5	0.022	0.015		
1.25	6.0	4.0	0.026	0.017		
1.50	7.0	4.5	0.030	0.019		
1.75	7.5	5.0	0.032	0.022		
2.00	8.5	5.5	0.037	0.024		
2.25	9.0	6.0	0.039	0.026		
2.50	**9.5**	**6.5**	**0.041**	**0.028**	**0.31**	**0.21**
2.75	10.0	7.0	0.043	0.030		
3.00	11.0	7.0	0.048	0.030		
3.25	11.0	7.5	0.048	0.032		
3.50	12.0	8.0	0.052	0.035		
3.75	12.5	8.5	0.054	0.037		
4.00	13.0	9.0	0.056	0.039		
4.25	13.5	9.5	0.058	0.041		
4.50	14.0	10.0	0.061	0.043		
4.75	14.5	10.0	0.063	0.043		
5.00	**15.0**	**10.0**	**0.065**	**0.043**	**0.32**	**0.22**
5.25	15.0	10.5	0.065	0.045		
5.50	16.0	11.0	0.069	0.048		
5.75	16.0	11.0	0.069	0.048		
6.00	16.5	11.5	0.071	0.050		
6.25	17.0	12.0	0.074	0.052		
6.50	17.5	12.0	0.076	0.052		
6.75	18.0	12.5	0.078	0.054		
7.00	19.0	13.0	0.082	0.056		
7.25	19.5	13.0	0.084	0.056		
7.50	20.0	13.5	0.087	0.058		

Moisture content after test		Top	Middle	Base	Specimen wt g	4250
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1540.0	1644.0	1544.0	Length mm	127.0
Mass of dry soil + container	g	1199.0	1287.0	1199.0		
Weight of container	g	144.0	191.0	147.0		
Mass of moisture	g	341.0	357.0	345.0	Average MC %	32.56
Dry weight	g	1055.0	1096.0	1052.0	Density Mg/m3	1.84
Moisture content	%	32.32	32.57	32.79	Dry Density Mg/m3	1.39



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	7-Aug-20	Trial Pit No.	TP03
Checked	Nc		Sample No.	B
Approved	Bc		Depth	0.50m

Project No. NMTL 3243

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Grey slightly slightly gravelly SILT/CLAY

Date 4-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

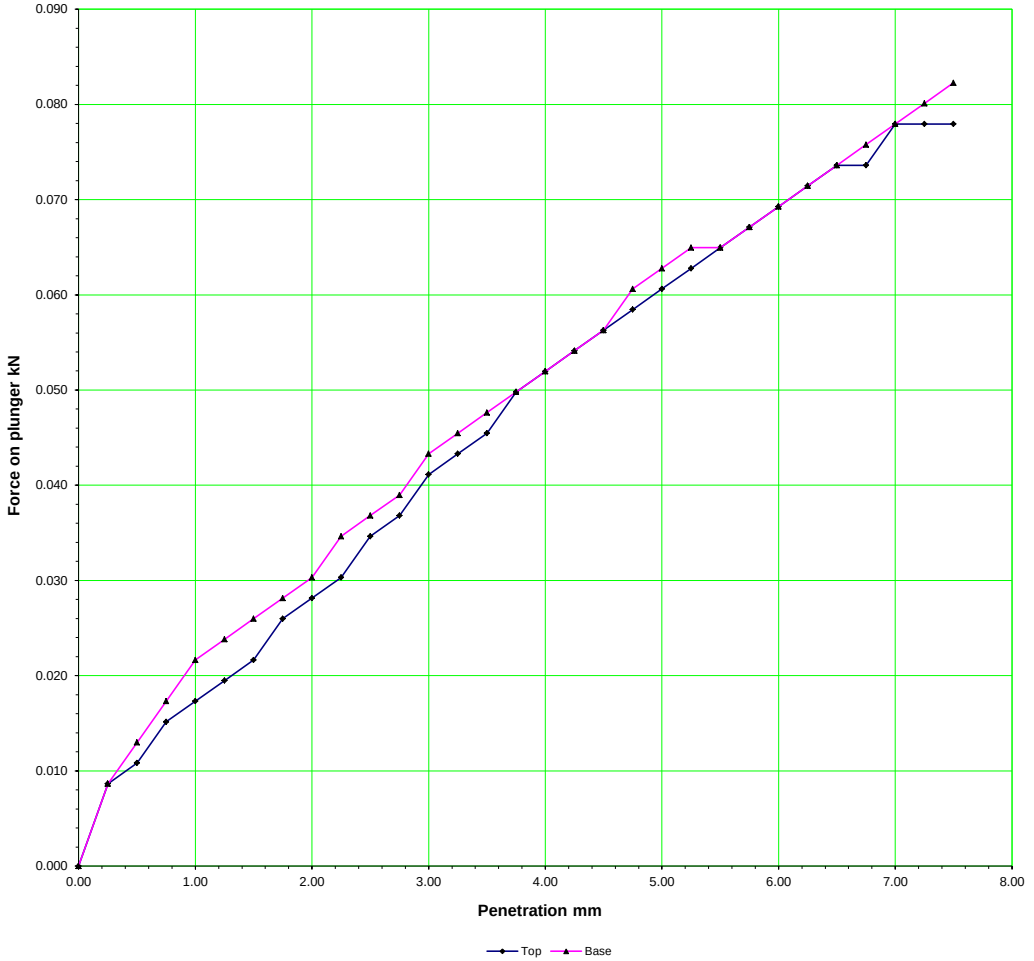
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	2.0	2.0	0.009	0.009		
0.50	2.5	3.0	0.011	0.013		
0.75	3.5	4.0	0.015	0.017		
1.00	4.0	5.0	0.017	0.022		
1.25	4.5	5.5	0.019	0.024		
1.50	5.0	6.0	0.022	0.026		
1.75	6.0	6.5	0.026	0.028		
2.00	6.5	7.0	0.028	0.030		
2.25	7.0	8.0	0.030	0.035		
2.50	**8.0**	**8.5**	**0.035**	**0.037**	**0.26**	**0.28**
2.75	8.5	9.0	0.037	0.039		
3.00	9.5	10.0	0.041	0.043		
3.25	10.0	10.5	0.043	0.045		
3.50	10.5	11.0	0.045	0.048		
3.75	11.5	11.5	0.050	0.050		
4.00	12.0	12.0	0.052	0.052		
4.25	12.5	12.5	0.054	0.054		
4.50	13.0	13.0	0.056	0.056		
4.75	13.5	14.0	0.058	0.061		
5.00	**14.0**	**14.5**	**0.061**	**0.063**	**0.30**	**0.31**
5.25	14.5	15.0	0.063	0.065		
5.50	15.0	15.0	0.065	0.065		
5.75	15.5	15.5	0.067	0.067		
6.00	16.0	16.0	0.069	0.069		
6.25	16.5	16.5	0.071	0.071		
6.50	17.0	17.0	0.074	0.074		
6.75	17.0	17.5	0.074	0.076		
7.00	18.0	18.0	0.078	0.078		
7.25	18.0	18.5	0.078	0.080		
7.50	18.0	19.0	0.078	0.082		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	5065
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1996.0	1821.0	1771.0	Length mm	127.0
Mass of dry soil + container	g	1764.0	1613.0	1572.0		
Weight of container	g	149.0	190.0	191.0		
Mass of moisture	g	232.0	208.0	199.0	Average MC %	14.46
Dry weight	g	1615.0	1423.0	1381.0	Density Mg/m3	2.20
Moisture content	%	14.37	14.62	14.41	Dry Density Mg/m3	1.92



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	4-Aug-20	Project No.	NMTL 3243
Checked	Nc		Trial Pit No.	TP03
Approved	Bc		Sample No.	B
			Depth	2.70m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Light brown/grey slightly slightly gravelly SILT/CLAY

Date: 4-Aug-20

Test Method: BS 1377: Part 4 : 1990 :7.4

Force Measuring Device: VJT 08211 — Test 1

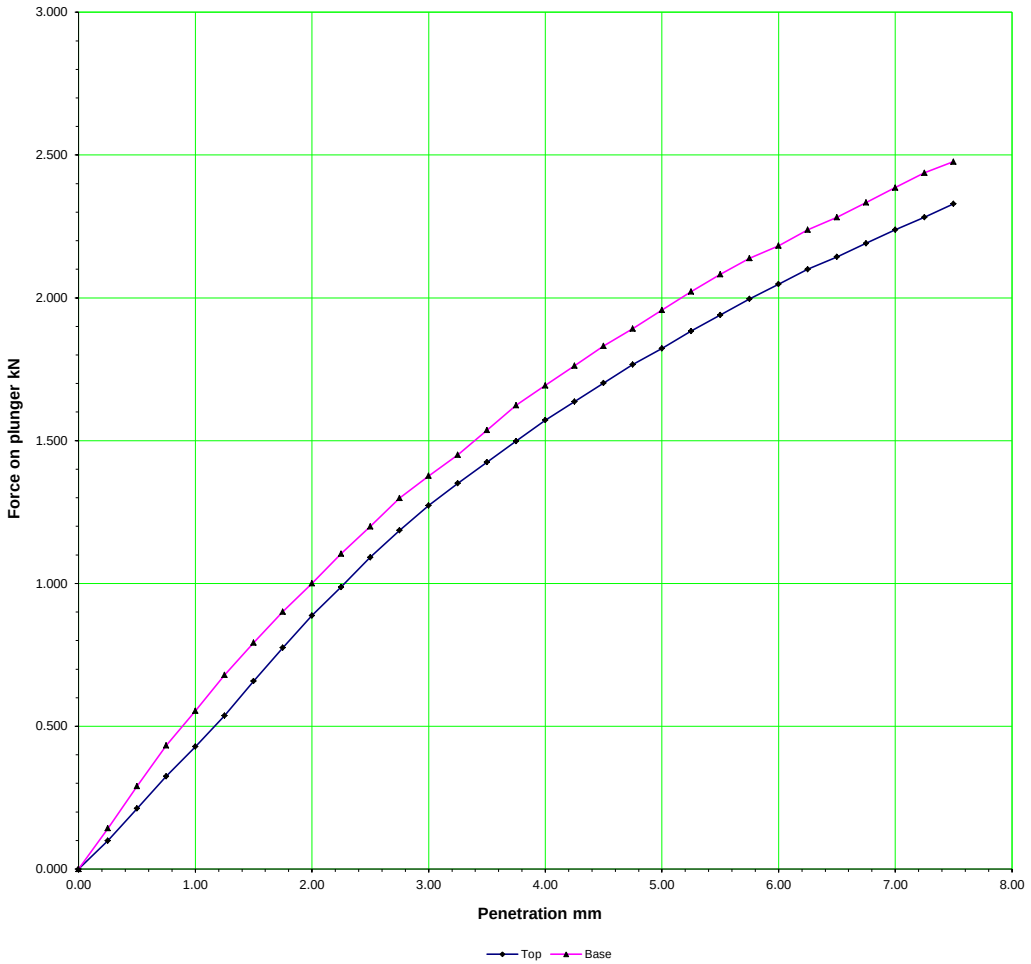
Preperatic: Remoulded with 2.5 kg rammer at natural moisture content

Surcharge: 10 kPa — Mean Calibration: 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	23.0	33.0	0.100	0.143		
0.50	49.0	67.0	0.212	0.290		
0.75	75.0	100.0	0.325	0.433		
1.00	99.0	128.0	0.429	0.554		
1.25	124.0	157.0	0.537	0.680		
1.50	152.0	183.0	0.658	0.792		
1.75	179.0	208.0	0.775	0.901		
2.00	205.0	231.0	0.888	1.000		
2.25	228.0	255.0	0.987	1.104		
2.50	**252.0**	**277.0**	**1.091**	**1.199**	**8.27**	**9.09**
2.75	274.0	300.0	1.186	1.299		
3.00	294.0	318.0	1.273	1.377		
3.25	312.0	335.0	1.351	1.451		
3.50	329.0	355.0	1.425	1.537		
3.75	346.0	375.0	1.498	1.624		
4.00	363.0	391.0	1.572	1.693		
4.25	378.0	407.0	1.637	1.762		
4.50	393.0	423.0	1.702	1.832		
4.75	408.0	437.0	1.767	1.892		
5.00	**421.0**	**452.0**	**1.823**	**1.957**	**9.11**	**9.79**
5.25	435.0	467.0	1.884	2.022		
5.50	448.0	481.0	1.940	2.083		
5.75	461.0	494.0	1.996	2.139		
6.00	473.0	504.0	2.048	2.182		
6.25	485.0	517.0	2.100	2.239		
6.50	495.0	527.0	2.143	2.282		
6.75	506.0	539.0	2.191	2.334		
7.00	517.0	551.0	2.239	2.386		
7.25	527.0	563.0	2.282	2.438		
7.50	538.0	572.0	2.330	2.477		

Moisture content after test		Top	Middle	Base	Specimen wt g	4870
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1690.0	1989.0	1714.0	Length mm	127.0
Mass of dry soil + container	g	1499.0	1758.0	1519.0		
Weight of container	g	191.0	142.0	191.0		
Mass of moisture	g	191.0	231.0	195.0	Average MC %	14.53
Dry weight	g	1308.0	1616.0	1328.0	Density Mg/m3	2.11
Moisture content	%	14.60	14.29	14.68	Dry Density Mg/m3	1.85



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	4-Aug-20	Trial Pit No.	TP06
Checked	Nc		Sample No.	B
Approved	Bc		Depth	0.60m

Project No. NMTL 3243

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Grey slightly slightly gravelly SILT/CLAY

Date 7-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

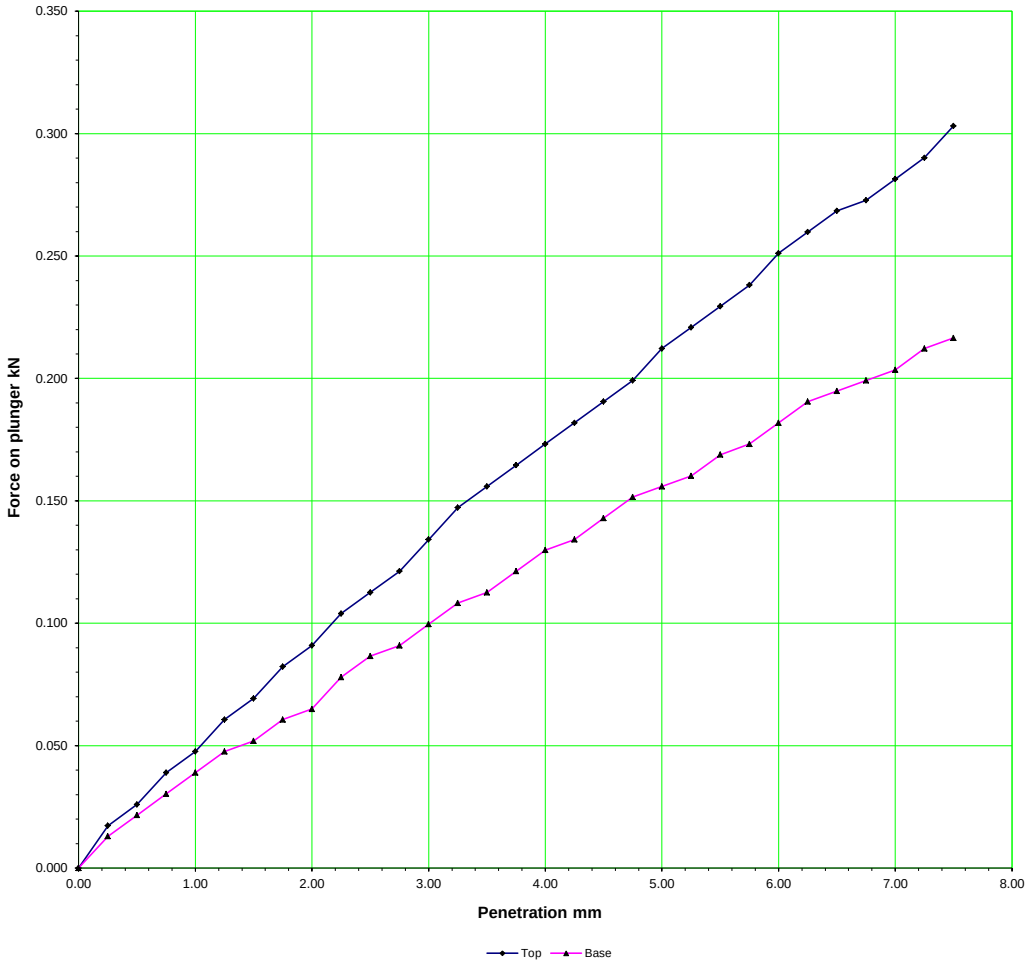
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	4.0	3.0	0.017	0.013		
0.50	6.0	5.0	0.026	0.022		
0.75	9.0	7.0	0.039	0.030		
1.00	11.0	9.0	0.048	0.039		
1.25	14.0	11.0	0.061	0.048		
1.50	16.0	12.0	0.069	0.052		
1.75	19.0	14.0	0.082	0.061		
2.00	21.0	15.0	0.091	0.065		
2.25	24.0	18.0	0.104	0.078		
2.50	**26.0**	**20.0**	**0.113**	**0.087**	**0.85**	**0.66**
2.75	28.0	21.0	0.121	0.091		
3.00	31.0	23.0	0.134	0.100		
3.25	34.0	25.0	0.147	0.108		
3.50	36.0	26.0	0.156	0.113		
3.75	38.0	28.0	0.165	0.121		
4.00	40.0	30.0	0.173	0.130		
4.25	42.0	31.0	0.182	0.134		
4.50	44.0	33.0	0.191	0.143		
4.75	46.0	35.0	0.199	0.152		
5.00	**49.0**	**36.0**	**0.212**	**0.156**	**1.06**	**0.78**
5.25	51.0	37.0	0.221	0.160		
5.50	53.0	39.0	0.229	0.169		
5.75	55.0	40.0	0.238	0.173		
6.00	58.0	42.0	0.251	0.182		
6.25	60.0	44.0	0.260	0.191		
6.50	62.0	45.0	0.268	0.195		
6.75	63.0	46.0	0.273	0.199		
7.00	65.0	47.0	0.281	0.204		
7.25	67.0	49.0	0.290	0.212		
7.50	70.0	50.0	0.303	0.217		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	5240
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	2084.0	1875.0	1799.0	Length mm	127.0
Mass of dry soil + container	g	1890.0	1685.0	1628.0		
Weight of container	g	193.0	138.0	188.0		
Mass of moisture	g	194.0	190.0	171.0	Average MC %	11.86
Dry weight	g	1697.0	1547.0	1440.0	Density Mg/m3	2.27
Moisture content	%	11.43	12.28	11.88	Dry Density Mg/m3	2.03



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	7-Aug-20	Project No.	NMTL 3243
Checked	Nc		Trial Pit No.	TP06
Approved	Bc		Sample No.	B
			Depth	3.70m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Grey/brown slightly slightly gravelly clayey SILT

Date 4-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

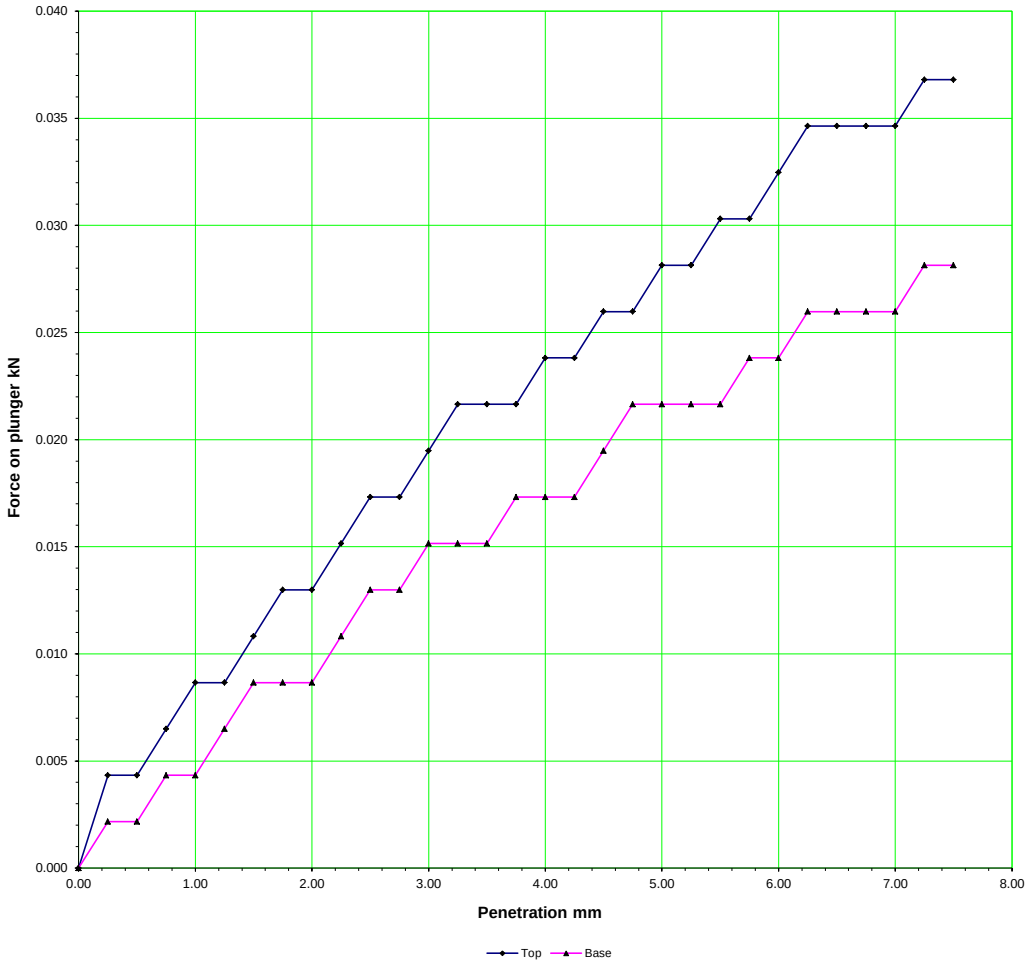
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	1.0	0.5	0.004	0.002		
0.50	1.0	0.5	0.004	0.002		
0.75	1.5	1.0	0.006	0.004		
1.00	2.0	1.0	0.009	0.004		
1.25	2.0	1.5	0.009	0.006		
1.50	2.5	2.0	0.011	0.009		
1.75	3.0	2.0	0.013	0.009		
2.00	3.0	2.0	0.013	0.009		
2.25	3.5	2.5	0.015	0.011		
2.50	**4.0**	**3.0**	**0.017**	**0.013**	**0.13**	**0.10**
2.75	4.0	3.0	0.017	0.013		
3.00	4.5	3.5	0.019	0.015		
3.25	5.0	3.5	0.022	0.015		
3.50	5.0	3.5	0.022	0.015		
3.75	5.0	4.0	0.022	0.017		
4.00	5.5	4.0	0.024	0.017		
4.25	5.5	4.0	0.024	0.017		
4.50	6.0	4.5	0.026	0.019		
4.75	6.0	5.0	0.026	0.022		
5.00	**6.5**	**5.0**	**0.028**	**0.022**	**0.14**	**0.11**
5.25	6.5	5.0	0.028	0.022		
5.50	7.0	5.0	0.030	0.022		
5.75	7.0	5.5	0.030	0.024		
6.00	7.5	5.5	0.032	0.024		
6.25	8.0	6.0	0.035	0.026		
6.50	8.0	6.0	0.035	0.026		
6.75	8.0	6.0	0.035	0.026		
7.00	8.0	6.0	0.035	0.026		
7.25	8.5	6.5	0.037	0.028		
7.50	8.5	6.5	0.037	0.028		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	4105
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1628.0	1699.0	1252.0	Length mm	127.0
Mass of dry soil + container	g	1250.0	1295.0	962.0		
Weight of container	g	185.0	145.0	145.0		
Mass of moisture	g	378.0	404.0	290.0	Average MC %	35.37
Dry weight	g	1065.0	1150.0	817.0	Density Mg/m3	1.78
Moisture content	%	35.49	35.13	35.50	Dry Density Mg/m3	1.32



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	4-Aug-20	Project No.	NMTL 3243
Checked	Nc		Trial Pit No.	TP07
Approved	Bc		Sample No.	B
			Depth	0.70m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Light brown slightly slightly gravelly SILT/CLAY

Date: 6-Aug-20

Test Method: BS 1377: Part 4 : 1990 :7.4

Force Measuring Device: VJT 08211 — Test 1

Preperatic: Remoulded with 2.5 kg rammer at natural moisture content

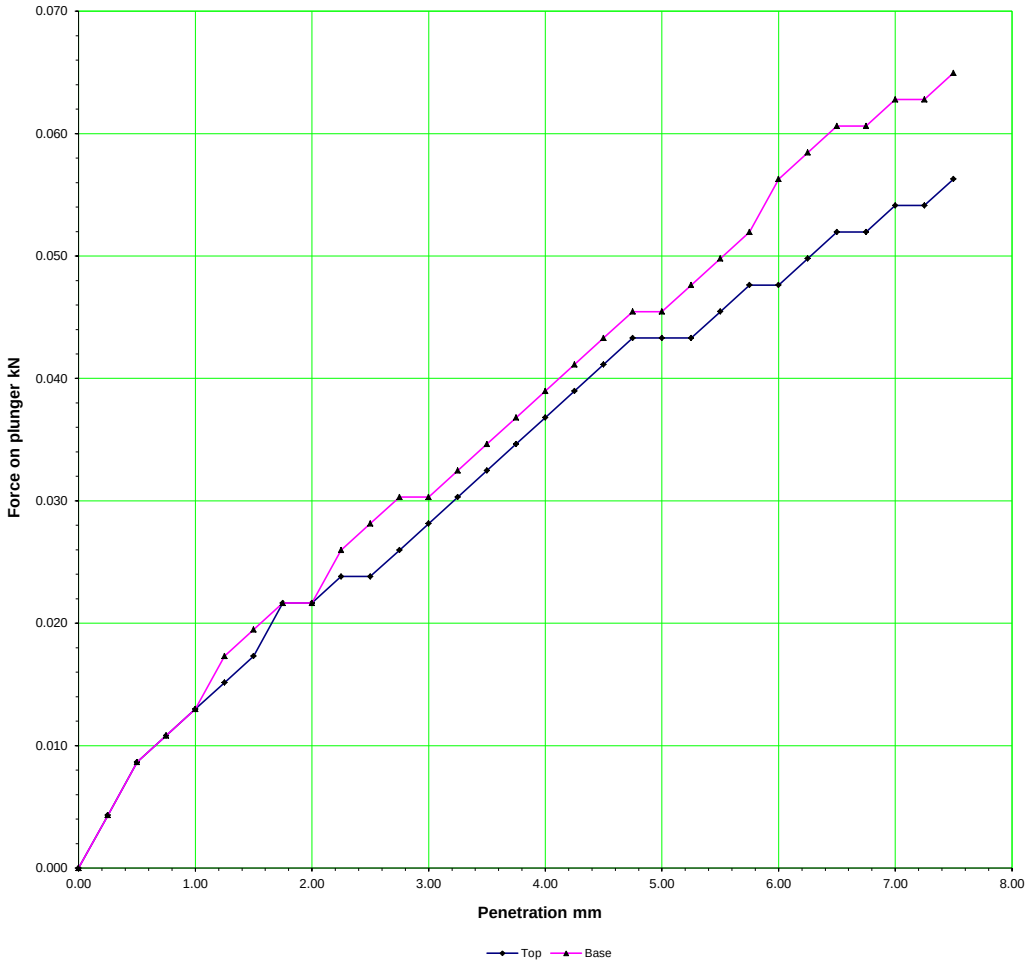
Surcharge: 10 kPa — Mean Calibration: 4.33 N/Div

Penetration of plunger: Force Gauge reading — Force on plunger: 4.33 N/Div

California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Bottom	Force on plunger kN Top	Bottom	California Bearing Ratio Results % Top	Base
0.00	0.0	0.0	0.000	0.000		
0.25	1.0	1.0	0.004	0.004		
0.50	2.0	2.0	0.009	0.009		
0.75	2.5	2.5	0.011	0.011		
1.00	3.0	3.0	0.013	0.013		
1.25	3.5	4.0	0.015	0.017		
1.50	4.0	4.5	0.017	0.019		
1.75	5.0	5.0	0.022	0.022		
2.00	5.0	5.0	0.022	0.022		
2.25	5.5	6.0	0.024	0.026		
2.50	**5.5**	**6.5**	**0.024**	**0.028**	**0.18**	**0.21**
2.75	6.0	7.0	0.026	0.030		
3.00	6.5	7.0	0.028	0.030		
3.25	7.0	7.5	0.030	0.032		
3.50	7.5	8.0	0.032	0.035		
3.75	8.0	8.5	0.035	0.037		
4.00	8.5	9.0	0.037	0.039		
4.25	9.0	9.5	0.039	0.041		
4.50	9.5	10.0	0.041	0.043		
4.75	10.0	10.5	0.043	0.045		
5.00	**10.0**	**10.5**	**0.043**	**0.045**	**0.22**	**0.23**
5.25	10.0	11.0	0.043	0.048		
5.50	10.5	11.5	0.045	0.050		
5.75	11.0	12.0	0.048	0.052		
6.00	11.0	13.0	0.048	0.056		
6.25	11.5	13.5	0.050	0.058		
6.50	12.0	14.0	0.052	0.061		
6.75	12.0	14.0	0.052	0.061		
7.00	12.5	14.5	0.054	0.063		
7.25	12.5	14.5	0.054	0.063		
7.50	13.0	15.0	0.056	0.065		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	5035
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1923.0	2048.0	1513.0	Length mm	127.0
Mass of dry soil + container	g	1685.0	1798.0	1335.0		
Weight of container	g	147.0	146.0	166.0		
Mass of moisture	g	238.0	250.0	178.0	Average MC %	15.28
Dry weight	g	1538.0	1652.0	1169.0	Density Mg/m3	2.18
Moisture content	%	15.47	15.13	15.23	Dry Density Mg/m3	1.90



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	6-Aug-20	Project No.	NMTL 3243
Checked	Nc		Trial Pit No.	TP07
Approved	Bc		Sample No.	B
			Depth	3.30m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Brown slightly slightly gravelly SILT/CLAY

Date 4-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device S86-010304 Test 1

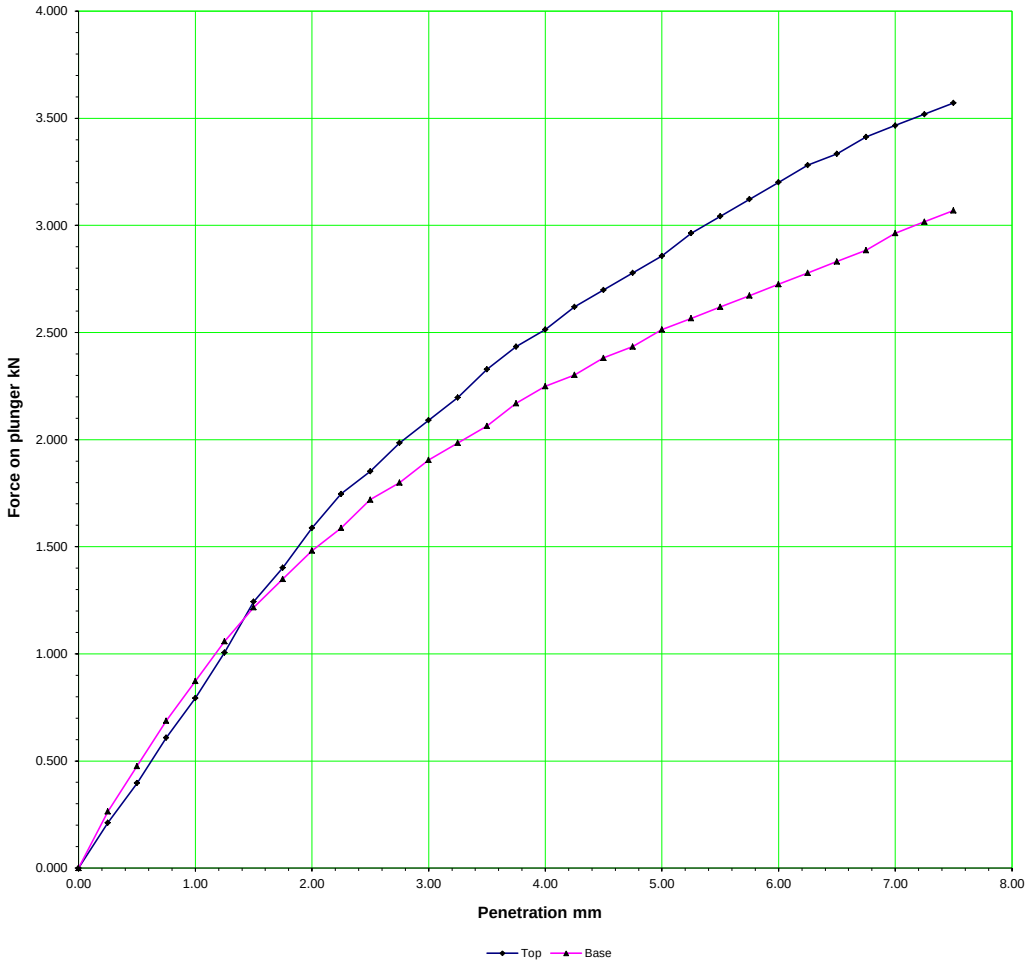
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 26.46 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	8.0	10.0	0.212	0.265		
0.50	15.0	18.0	0.397	0.476		
0.75	23.0	26.0	0.609	0.688		
1.00	30.0	33.0	0.794	0.873		
1.25	38.0	40.0	1.005	1.058		
1.50	47.0	46.0	1.244	1.217		
1.75	53.0	51.0	1.402	1.349		
2.00	60.0	56.0	1.588	1.482		
2.25	66.0	60.0	1.746	1.588		
2.50	**70.0**	**65.0**	**1.852**	**1.720**	**14.03**	**13.03**
2.75	75.0	68.0	1.985	1.799		
3.00	79.0	72.0	2.090	1.905		
3.25	83.0	75.0	2.196	1.985		
3.50	88.0	78.0	2.328	2.064		
3.75	92.0	82.0	2.434	2.170		
4.00	95.0	85.0	2.514	2.249		
4.25	99.0	87.0	2.620	2.302		
4.50	102.0	90.0	2.699	2.381		
4.75	105.0	92.0	2.778	2.434		
5.00	**108.0**	**95.0**	**2.858**	**2.514**	**14.29**	**12.57**
5.25	112.0	97.0	2.964	2.567		
5.50	115.0	99.0	3.043	2.620		
5.75	118.0	101.0	3.122	2.672		
6.00	121.0	103.0	3.202	2.725		
6.25	124.0	105.0	3.281	2.778		
6.50	126.0	107.0	3.334	2.831		
6.75	129.0	109.0	3.413	2.884		
7.00	131.0	112.0	3.466	2.964		
7.25	133.0	114.0	3.519	3.016		
7.50	135.0	116.0	3.572	3.069		

Moisture content after test		Top	Middle	Base	Specimen wt g	4570
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1930.0	1579.0	1620.0	Length mm	127.0
Mass of dry soil + container	g	1704.0	1403.0	1437.0		
Weight of container	g	189.0	186.0	187.0		
Mass of moisture	g	226.0	176.0	183.0	Average MC %	14.67
Dry weight	g	1515.0	1217.0	1250.0	Density Mg/m3	1.98
Moisture content	%	14.92	14.46	14.64	Dry Density Mg/m3	1.73



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	4-Aug-20	Trial Pit No.	TP08
Checked	Nc		Sample No.	B
Approved	Bc		Depth	0.70m

Project No. NMTL 3243

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Brown slightly slightly gravelly SILT/CLAY

Date: 4-Aug-20

Test Method: BS 1377: Part 4 : 1990 :7.4

Force Measuring Device: VJT 08211 — Test 1

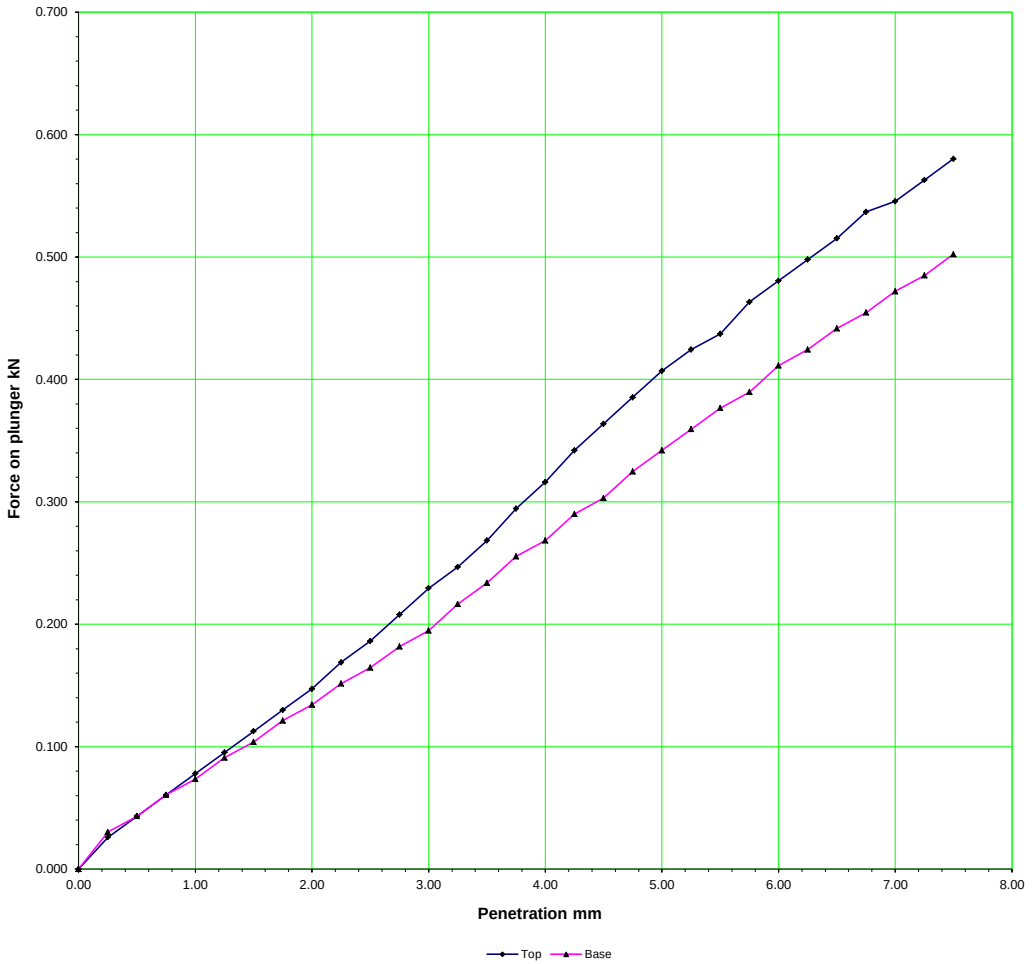
Preperatic: Remoulded with 2.5 kg rammer at natural moisture content

Surcharge: 10 kPa — Mean Calibration: 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	6.0	7.0	0.026	0.030		
0.50	10.0	10.0	0.043	0.043		
0.75	14.0	14.0	0.061	0.061		
1.00	18.0	17.0	0.078	0.074		
1.25	22.0	21.0	0.095	0.091		
1.50	26.0	24.0	0.113	0.104		
1.75	30.0	28.0	0.130	0.121		
2.00	34.0	31.0	0.147	0.134		
2.25	39.0	35.0	0.169	0.152		
2.50	**43.0**	**38.0**	**0.186**	**0.165**	**1.41**	**1.25**
2.75	48.0	42.0	0.208	0.182		
3.00	53.0	45.0	0.229	0.195		
3.25	57.0	50.0	0.247	0.217		
3.50	62.0	54.0	0.268	0.234		
3.75	68.0	59.0	0.294	0.255		
4.00	73.0	62.0	0.316	0.268		
4.25	79.0	67.0	0.342	0.290		
4.50	84.0	70.0	0.364	0.303		
4.75	89.0	75.0	0.385	0.325		
5.00	**94.0**	**79.0**	**0.407**	**0.342**	**2.04**	**1.71**
5.25	98.0	83.0	0.424	0.359		
5.50	101.0	87.0	0.437	0.377		
5.75	107.0	90.0	0.463	0.390		
6.00	111.0	95.0	0.481	0.411		
6.25	115.0	98.0	0.498	0.424		
6.50	119.0	102.0	0.515	0.442		
6.75	124.0	105.0	0.537	0.455		
7.00	126.0	109.0	0.546	0.472		
7.25	130.0	112.0	0.563	0.485		
7.50	134.0	116.0	0.580	0.502		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	5145
Container No.		Tray	963	Tray	Diameter mm	152
Mass of wet soil + container	g	2075.0	1963.0	1543.0	Length mm	127.0
Mass of dry soil + container	g	1862.0	1762.0	1384.0		
Weight of container	g	146.0	145.0	144.0		
Mass of moisture	g	213.0	201.0	159.0	Average MC %	12.56
Dry weight	g	1716.0	1617.0	1240.0	Density Mg/m3	2.23
Moisture content	%	12.41	12.43	12.82	Dry Density Mg/m3	1.98



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date
Operator	Ms	4-Aug-20
Checked	Nc	
Approved	Bc	

Project No.	NMTL 3243
Trial Pit No.	TP09
Sample No.	B
Depth	1.90m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Light brown slightly gravelly slightly sandy SILT/CLAY.

Date 7-Aug-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

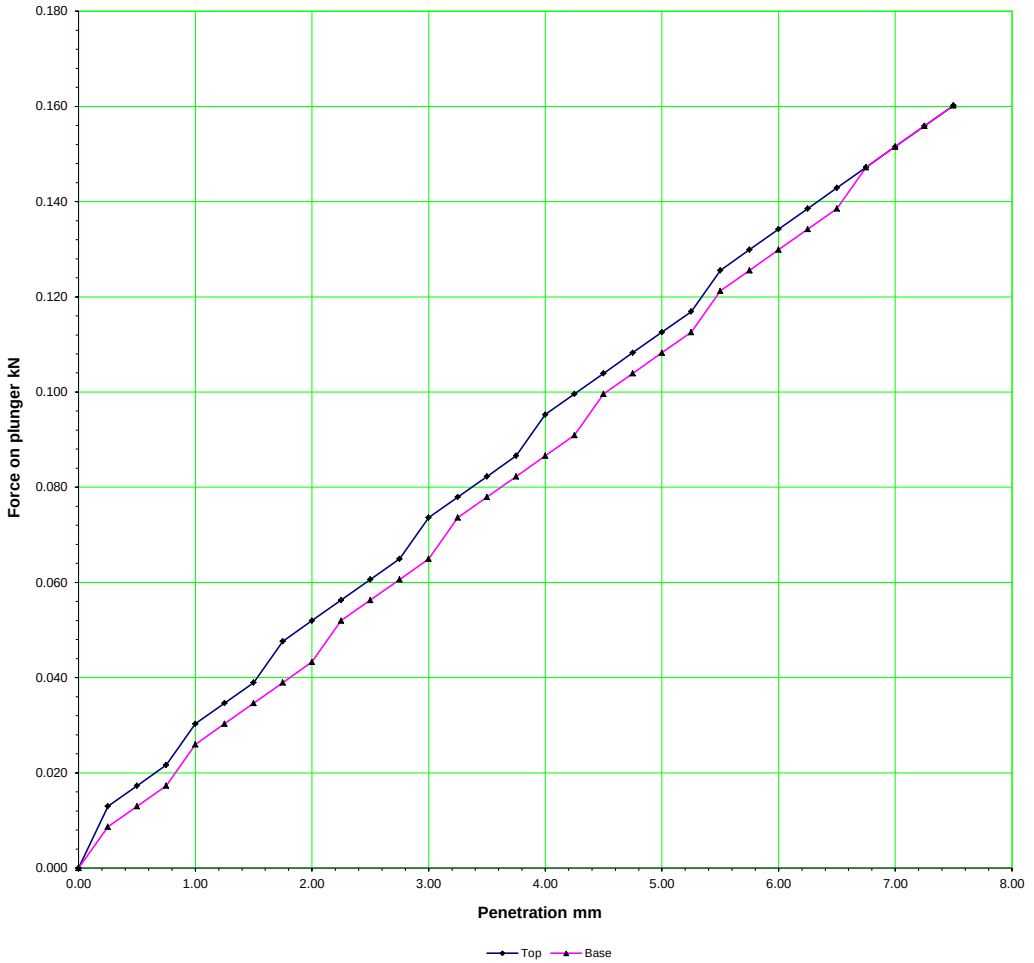
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	3.0	2.0	0.013	0.009		
0.50	4.0	3.0	0.017	0.013		
0.75	5.0	4.0	0.022	0.017		
1.00	7.0	6.0	0.030	0.026		
1.25	8.0	7.0	0.035	0.030		
1.50	9.0	8.0	0.039	0.035		
1.75	11.0	9.0	0.048	0.039		
2.00	12.0	10.0	0.052	0.043		
2.25	13.0	12.0	0.056	0.052		
2.50	**14.0**	**13.0**	**0.061**	**0.056**	**0.46**	**0.43**
2.75	15.0	14.0	0.065	0.061		
3.00	17.0	15.0	0.074	0.065		
3.25	18.0	17.0	0.078	0.074		
3.50	19.0	18.0	0.082	0.078		
3.75	20.0	19.0	0.087	0.082		
4.00	22.0	20.0	0.095	0.087		
4.25	23.0	21.0	0.100	0.091		
4.50	24.0	23.0	0.104	0.100		
4.75	25.0	24.0	0.108	0.104		
5.00	**26.0**	**25.0**	**0.113**	**0.108**	**0.56**	**0.54**
5.25	27.0	26.0	0.117	0.113		
5.50	29.0	28.0	0.126	0.121		
5.75	30.0	29.0	0.130	0.126		
6.00	31.0	30.0	0.134	0.130		
6.25	32.0	31.0	0.139	0.134		
6.50	33.0	32.0	0.143	0.139		
6.75	34.0	34.0	0.147	0.147		
7.00	35.0	35.0	0.152	0.152		
7.25	36.0	36.0	0.156	0.156		
7.50	37.0	37.0	0.160	0.160		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	4840
Container No.		Tray	963	Tray	Diameter mm	152
Mass of wet soil + container	g	2083.0	1637.0	1642.0	Length mm	127.0
Mass of dry soil + container	g	1788.0	1402.9	1417.0		
Weight of container	g	190.0	141.0	189.0		
Mass of moisture	g	295.0	234.1	225.0	Average MC %	18.44
Dry weight	g	1598.0	1261.9	1228.0	Density Mg/m3	2.10
Moisture content	%	18.46	18.55	18.32	Dry Density Mg/m3	1.77



NM TL Ltd

Project: Whitehall, Swords

GII Project ID: 9225-11-19

		Date		
Operator	Ms	7-Aug-20	Project No.	NMTL 3243
Checked	Nc		Trial Pit No.	TP10
Approved	Bc		Sample No.	B
			Depth	0.50m

National Materials Testing Laboratory Ltd
Unit 18C Tullow Industrial Estate
Tel.: 059 9180822

Certificate of Test

Determination of the Undrained Shear Strength in Triaxial Compression

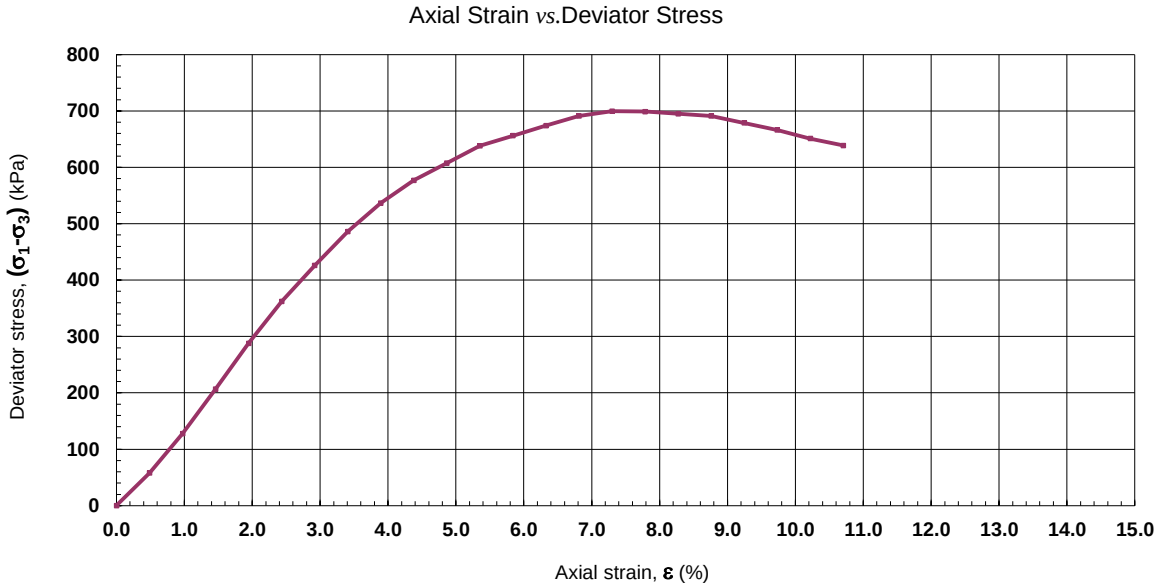
BS 1377 : Part 7 : 1990 Clause 8

Client Name:	**Ground Investigations Ireland Ltd**	Contract:	**Whitehall, Swords**
Address:	**Catherinestown House**	Site Address:	**N/A**
	Hazelhatch	**GII Project ID: 9225-11-19**	
	Newcastle, Co. Dublin		

Sample No.: **BH04** **Core** Depth: **10.5-10.90m** File Reference: **NMTL 3243**

Sample Description:	**Very stiff grey/brown slightly sandy slightly gravelly silty CLAY.**		
Location:	**Whitehall, Swords**	Date Sampled:	**N/A**
Sample Type:	**Core**	Sampled by:	**Ground Investigations Ireland Ltd**
Client Sample Ref.:	**BH04-C-10.5-10.95m**	Sampling Cert. Recd.:	**No**
Source / Supplier:	**GII**	Date Received:	**27 July 2020**
Specification:	**BS 1377: Part 7: 1990 Clause 8**	Date Tested:	**11 August 2020**

Specimen					**Test**		
Length:	**205.5**	mm	Diameter:	**102.1** mm	Membrane type:	**Latex**	
Area:	**8192.1**	mm^2	Volume:	**1683.5** cm^3	Membrane thickness:	**0.3**	mm
Mass:	**3873.0**	g			Membrane correction:	**1.02**	
Moisture content:	**8.9**	%			Sample state:	**Undisturbed**	
Bulk density:	**2.30**	Mg m^{-3}			Number of stages:	**Single**	
Dry density:	**2.11**	Mg m^{-3}			Rate of strain:	**1.0**	% min^{-1}
Preparation Method:	**BS 1377: Part 1: 1990 Clause 8 .3.1**				Cell pressure: σ_3	**130**	kPa



Maximum Corrected Deviator Stress at Failure:	$(\sigma_1-\sigma_3)_f$	**699.6**	**kPa**
Strain at Failure:	ε	**7.30**	**%**
Maximum Cohesion / Shear Strength:	C_u	**349.8**	**kPa**
Type of Failure:		**Brittle**	

Signed

For NMTL Ltd

Authorised Signatories
☐ N Chana
☐ B Chana

19 August 2020

Remarks: Specimen prepared with high speed diamond cutting wheel

Original to: **Client Rep.**
Copy 1 to: **File copy**

National Materials Testing Laboratory Ltd
Unit 18C Tullow Industrial Estate
Tel.: 059 9180822

Certificate of Test

Determination of the Undrained Shear Strength in Triaxial Compression

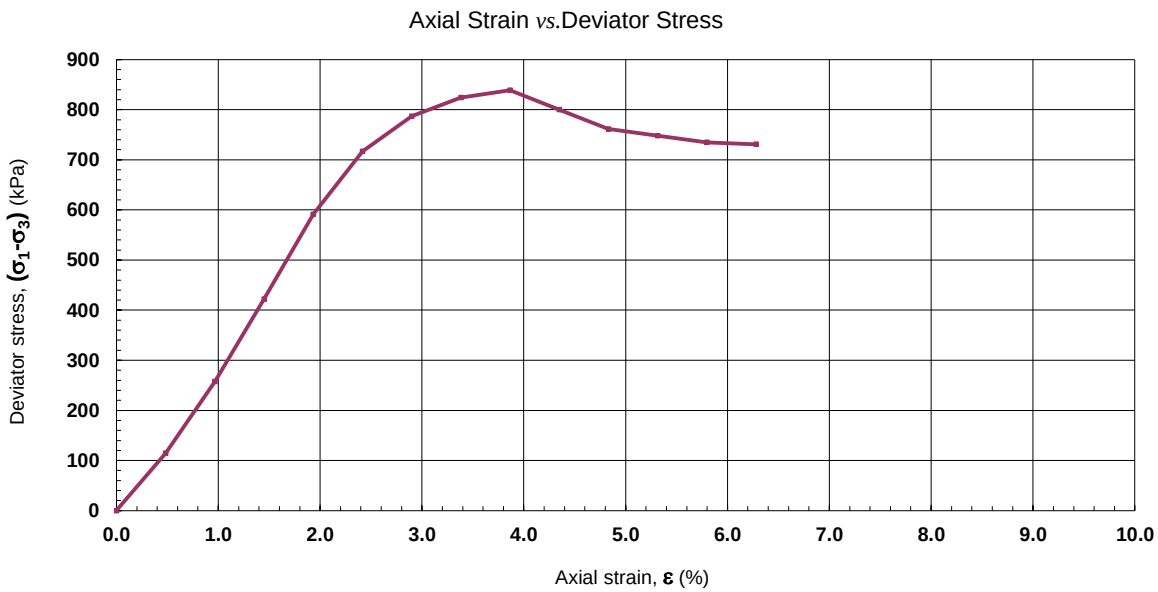
BS 1377 : Part 7 : 1990 Clause 8

Client Name:	**Ground Investigations Ireland Ltd**	Contract:	**Whitehall, Swords**
Address:	**Catherinestown House**	Site Address:	**N/A**
	Hazelhatch	**GII Project ID: 9225-11-19**	
	Newcastle, Co. Dublin		

Sample No.: **BH05** **Core** Depth: **8.30-8.70m** File Reference: **NMTL 3243**

Sample Description:	**Very stiff grey/brown slightly sandy slightly gravelly silty CLAY.**		
Location:	**Whitehall, Swords**	Date Sampled:	**N/A**
Sample Type:	**Core**	Sampled by:	**Ground Investigations Ireland Ltd**
Client Sample Ref.:	**BH05-C-8.30-8.70m**	Sampling Cert. Recd.:	**No**
Source / Supplier:	**GII**	Date Received:	**27 July 2020**
Specification:	**BS 1377: Part 7: 1990 Clause 8**	Date Tested:	**11 August 2020**

Specimen					**Test**		
Length:	**207.0**	mm	Diameter:	**101.1** mm	Membrane type:	**Latex**	
Area:	**8029.3**	mm^2	Volume:	**1662.1** cm^3	Membrane thickness:	**0.3**	mm
Mass:	**3886.0**	g			Membrane correction:	**0.54**	
Moisture content:	**7.5**	%			Sample state:	**Undisturbed**	
Bulk density:	**2.34**	Mg m^{-3}			Number of stages:	**Single**	
Dry density:	**2.18**	Mg m^{-3}			Rate of strain:	**1.0**	% min^{-1}
Preparation Method:	**BS 1377: Part 1: 1990 Clause 8 .3.1**				Cell pressure: σ_3	**100**	kPa



Maximum Corrected Deviator Stress at Failure:	$(\sigma_1-\sigma_3)_f$	**839.0**	**kPa**
Strain at Failure:	ε	**3.86**	**%**
Maximum Cohesion / Shear Strength:	C_u	**419.5**	**kPa**
Type of Failure:		**Brittle**	

Signed

For NMTL Ltd

Authorised Signatories
☐ N Chana
☐ B Chana

19 August 2020

Remarks: Specimen prepared with high speed diamond cutting wheel

Original to: **Client Rep.**
Copy 1 to: **File copy**

National Materials Testing Laboratory Ltd
Unit 18C Tullow Industrial Estate
Tel.: 059 9180822

Certificate of Test

Determination of the Undrained Shear Strength in Triaxial Compression

BS 1377 : Part 7 : 1990 Clause 8

Client Name:	**Ground Investigations Ireland Ltd**	Contract:	**Whitehall, Swords**
Address:	**Catherinestown House**	Site Address:	**N/A**
	Hazelhatch	**GII Project ID: 9225-11-19**	
	Newcastle, Co. Dublin		

Sample No.: **BH09** **Core** Depth: **19.7-20.0m** File Reference: **NMTL 3243**

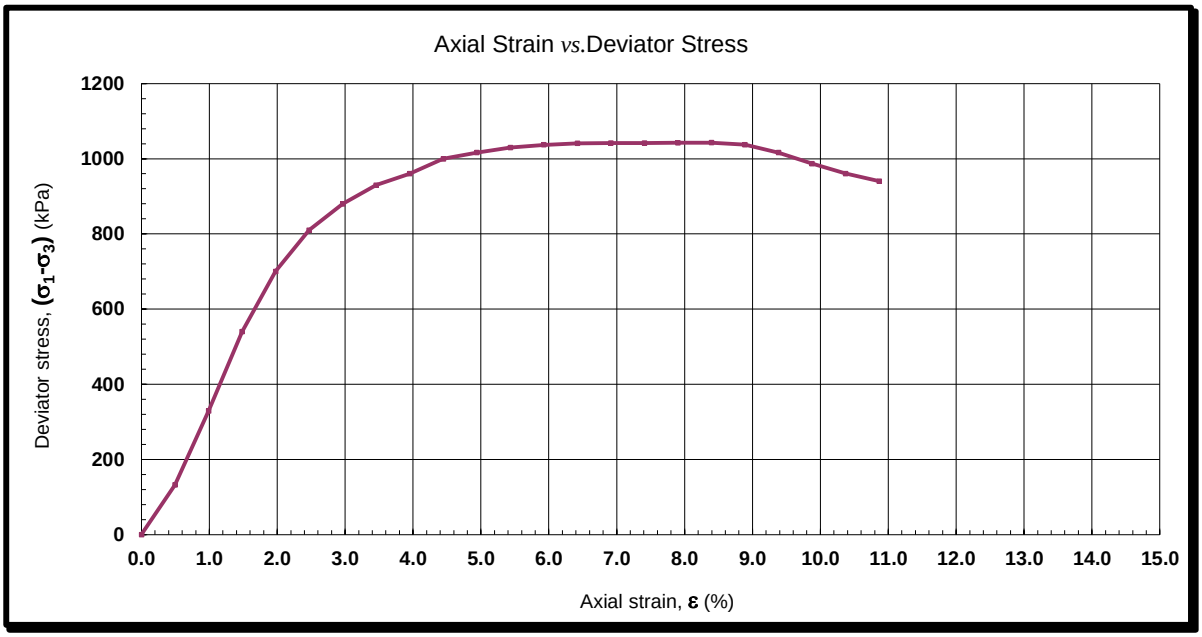
Sample Description:	**Very stiff grey slightly sandy slightly gravelly silty CLAY.**		
Location:	**Whitehall, Swords**	Date Sampled:	**N/A**
Sample Type:	**Core**	Sampled by:	**Ground Investigations Ireland Ltd**
Client Sample Ref.:	**BH09-C-19.7-20.0m**	Sampling Cert. Recd.:	**No**
Source / Supplier:	**GII**	Date Received:	**27 July 2020**
Specification:	**BS 1377: Part 7: 1990 Clause 8**	Date Tested:	**11 August 2020**

Specimen

Length:	**202.5**	mm	Diameter:	**100.7**	mm
Area:	**7962.7**	mm^2	Volume:	**1612.5**	cm^3
Mass:	**3795.0**	g			
Moisture content:	**10.9**	%			
Bulk density:	**2.35**	Mg m^{-3}			
Dry density:	**2.12**	Mg m^{-3}			
Preparation Method:	**BS 1377: Part 1: 1990 Clause 8 .3.1**				

Test

Membrane type:	**Latex**	
Membrane thickness:	**0.3**	mm
Membrane correction:	**1.18**	
Sample state:	**Undisturbed**	
Number of stages:	**Single**	
Rate of strain:	**1.0**	% min^{-1}
Cell pressure: σ_3	**220**	kPa



Maximum Corrected Deviator Stress at Failure:	$(\sigma_1-\sigma_3)_f$	**1042.9**	**kPa**
Strain at Failure:	ε	**8.40**	**%**
Maximum Cohesion / Shear Strength:	C_u	**521.5**	**kPa**
Type of Failure:		**Brittle**	

Signed

For NMTL Ltd

Authorised Signatories
☐ N Chana
☐ B Chana

19 August 2020

Remarks: Specimen prepared with high speed diamond cutting wheel

Original to: **Client Rep.**
Copy 1 to: **File copy**

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	2.32	2.35
Specimen Length	mm	202.00	Dry Density	Mg/m3	2.14	2.16
Specimen Diameter	mm	101.24	Moisture	%	8.64	9.01
Area	mm2	8049.17	Saturation	%	88.80	96.92
Volume	cc	1625.93	Sg(Assumed)	2.70		
Initial Voids ratio	e	0.2627				

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base
0	0	0
1	50	0.12
2	100	0.49
3	150	0.83
4	200	0.89
5	300	0.93
6	420	0.97

Isotropic Consolidation Stage

		Stage 1
Cell Pressure	kPa	420
Pore Pressure	kPa	392.4
Back Pressure	kPa	300
Drainage Method		One End & Radial Boundary
t100 (min)		22.1
Coef. Of Consolidation Cv	m2/year	9.507
Coef. Of Compressibility Mv	m2/MN	0.100
Permeability k	m/sec	2.935E-10

		Stage 1
Deviator Stress (kPa)		1035.7
External Axial Strain (%)		16.33
Shear Stress (kPa)		517.8
Peak Stress Ratio		4.75
Pore Water Pressure (kPa)		-256.6
Radial Effective Stress (kPa)		376.6
Axial Effective Stress (kPa)		1412.3
Effective angle of friction (Degrees)		35.4
Cohesion c' (kPa)	Assumed	0
Rate of strain mm/min		0.0067
Sample Description		**Very stiff grey/brown slightly sandy gravelly silty CLAY. Plastic Failure**

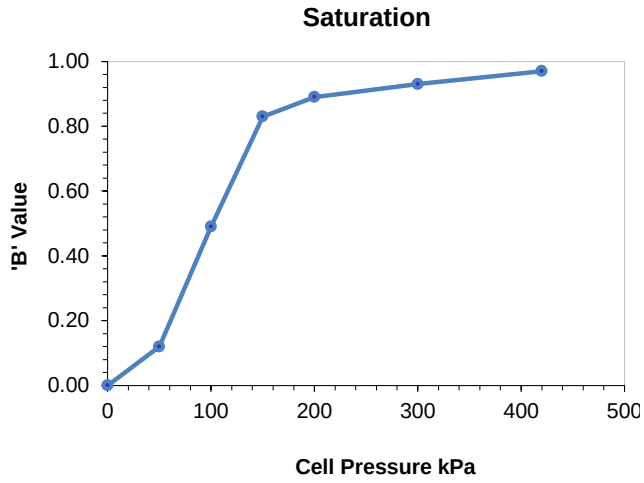
NM TL Ltd

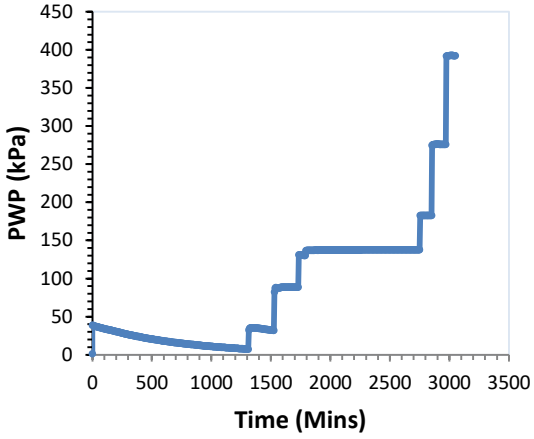
Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018

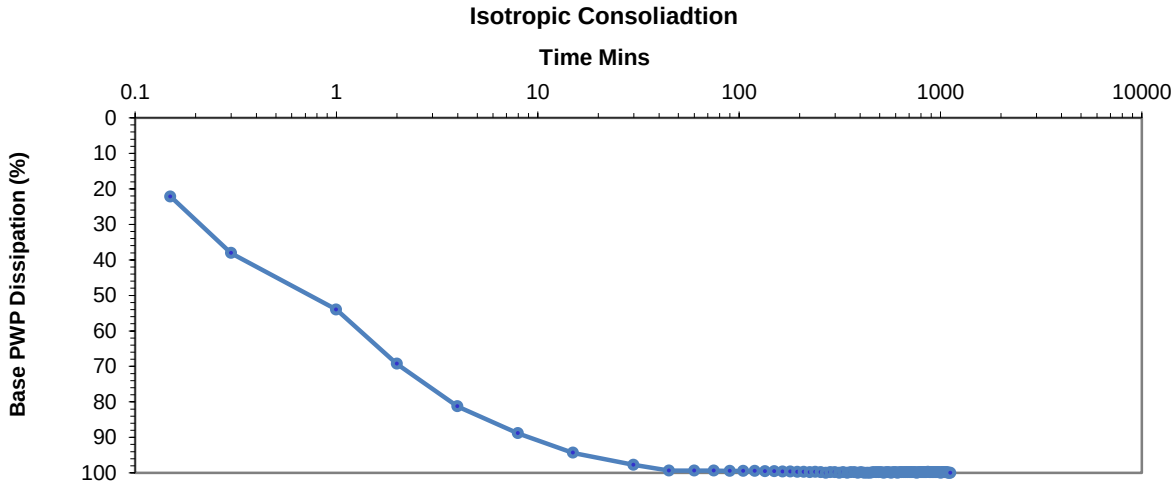
Project: Whitehall, Swords

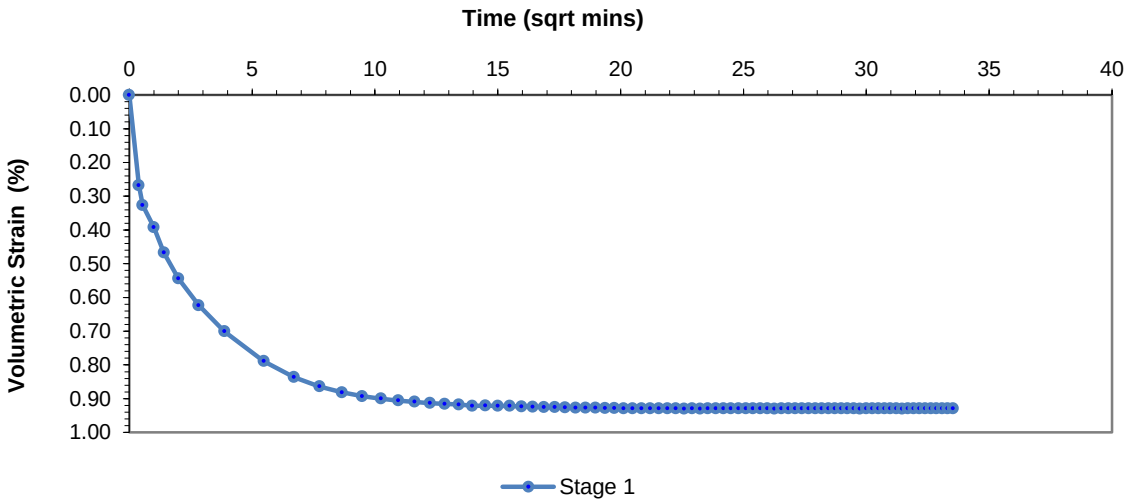
Project No.	NMTL-3243
Borehole No.	BH09
Sample No.	Core
Depth.	9.65-10.0m

19/08/2020



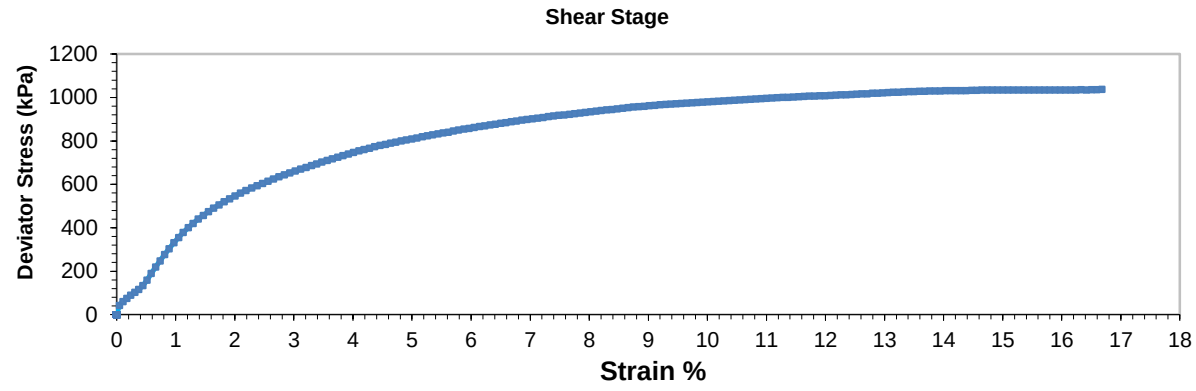


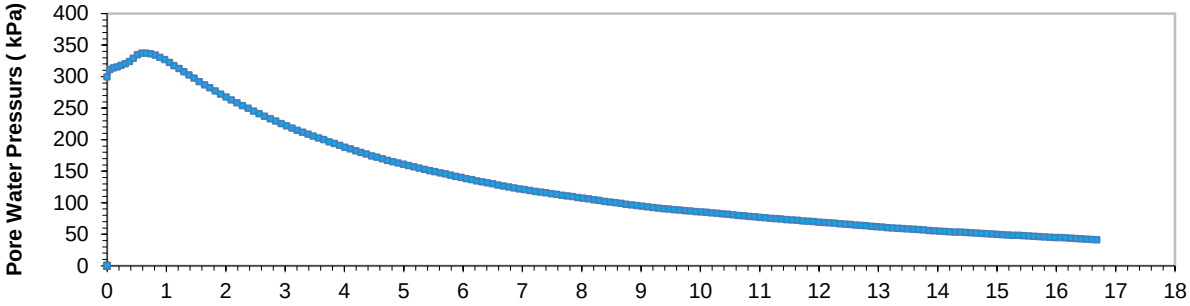


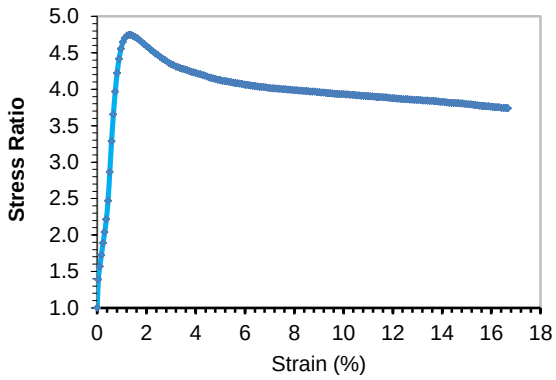


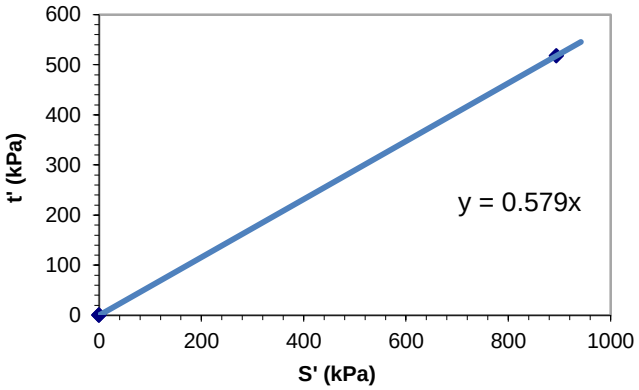
NM TL Ltd	**Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018**	Project No. NMTL-3243
		Borehole No BH09
	Project: Whitehall, Swords	Sample No. Core
		Depth. 9.65-10.0m

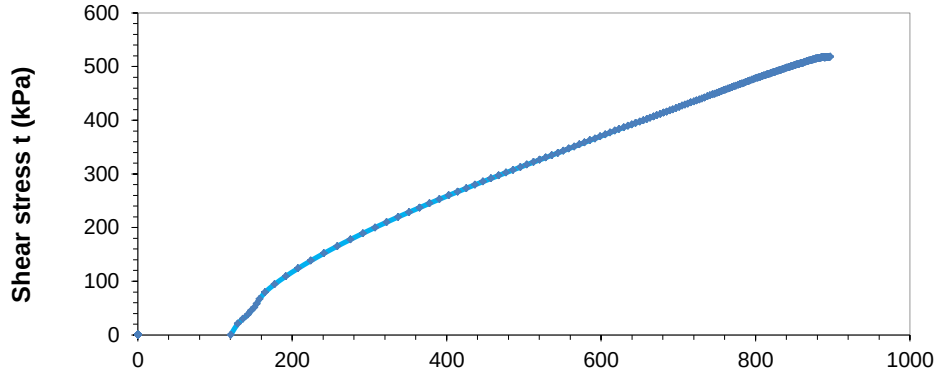
19/08/2020











NM TL Ltd	**Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018**	Project No. NMTL-3243
	Project: Whitehall, Swords	Borehole No. BH09
		Sample No. Core
		Depth. 9.65-10.0m

19/08/2020

SPECIMEN AFTER TEST

Soil Description **Very stiff grey/brown slightly sandy gravelly silty CLAY.**

NM TL Ltd	**Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018**	Project No. NMTL-3243
		Borehole No. BH09
	Project: Whitehall, Swords	Sample No. Core
		Depth. 9.65-10.0m

19/08/2020

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	2.30	2.34
Specimen Length	mm	201.83	Dry Density	Mg/m3	2.08	2.12
Specimen Diameter	mm	101.18	Moisture	%	10.28	10.40
Area	mm2	8040.69	Saturation	%	93.71	101.90
Volume	cc	1622.88	Sg(Assumed)	2.70		
Initial Voids ratio	e	0.2962				

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base
0	0	0
1	50	0.37
2	100	0.66
3	150	0.89
4	200	0.96
5	300	0.96
6	470	1.00

Isotropic Consolidation Stage

		Stage 1
Cell Pressure	kPa	470
Pore Pressure	kPa	452.9
Back Pressure	kPa	300
Drainage Method		One End & Radial Boundary
t100 (min)		56.3
Coef. Of Consolidation Cv	m2/year	3.733
Coef. Of Compressibility Mv	m2/MN	0.104
Permeability k	m/sec	1.207E-10

	Stage 1
Deviator Stress (kPa)	786.7
External Axial Strain (%)	15.22
Shear Stress (kPa)	393.3
Peak Stress Ratio	4.35
Pore Water Pressure (kPa)	-134.6
Radial Effective Stress (kPa)	304.6
Axial Effective Stress (kPa)	1091.3
Effective angle of friction (Degrees)	34.3
Cohesion c' (kPa) Assumed	0
Rate of strain mm/min	0.0067
Sample Description	**Very stiff grey/brown slightly gravelly slightly sandy silty CLAY. Plastic Failure**

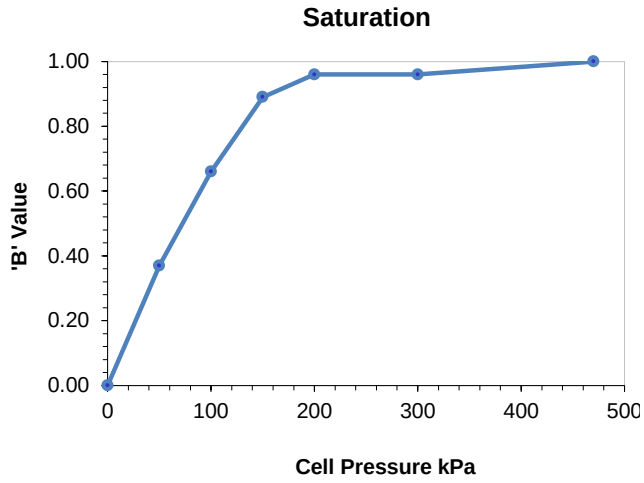
NM TL Ltd

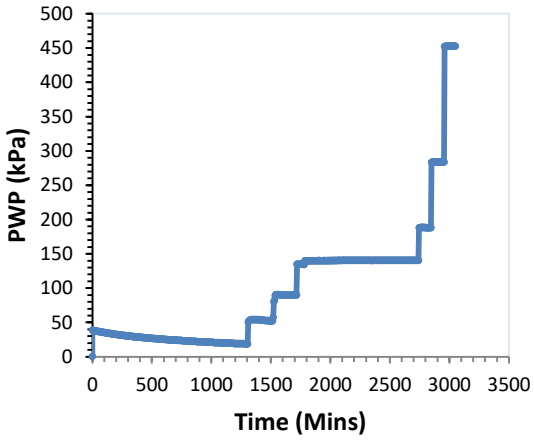
Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018

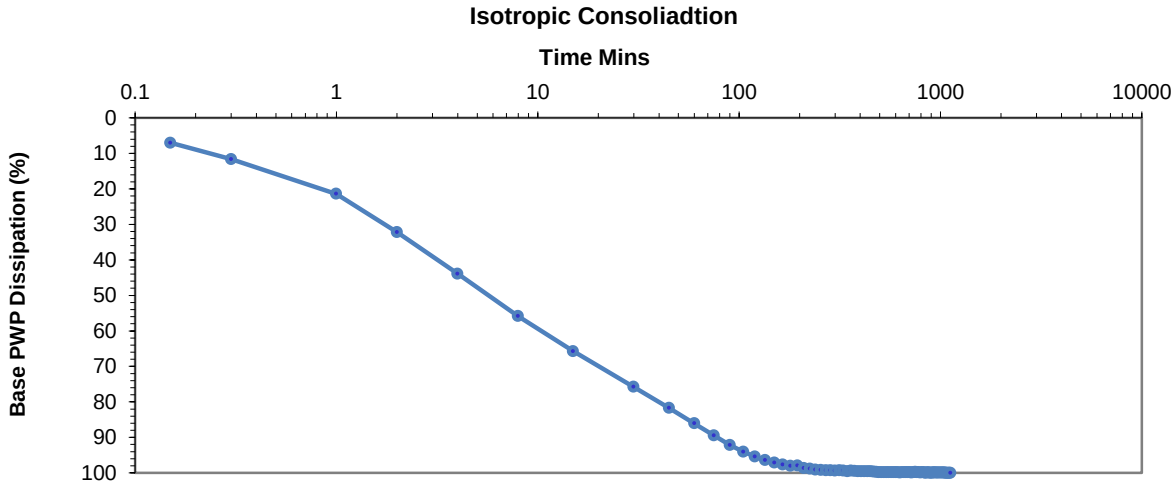
Project: Whitehall, Swords

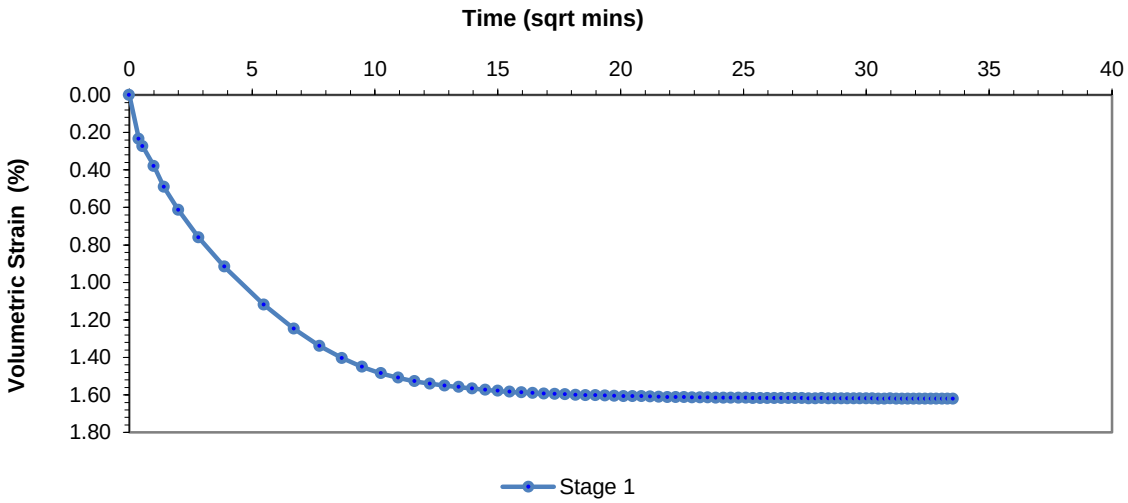
Project No.	NMTL-3243
Borehole No.	BH05
Sample No.	Core
Depth.	14.6-15.0m

19/08/2020



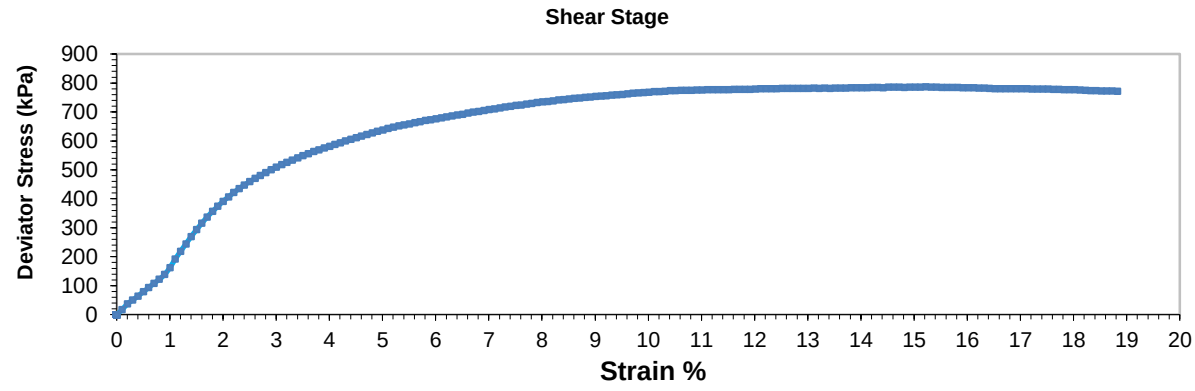


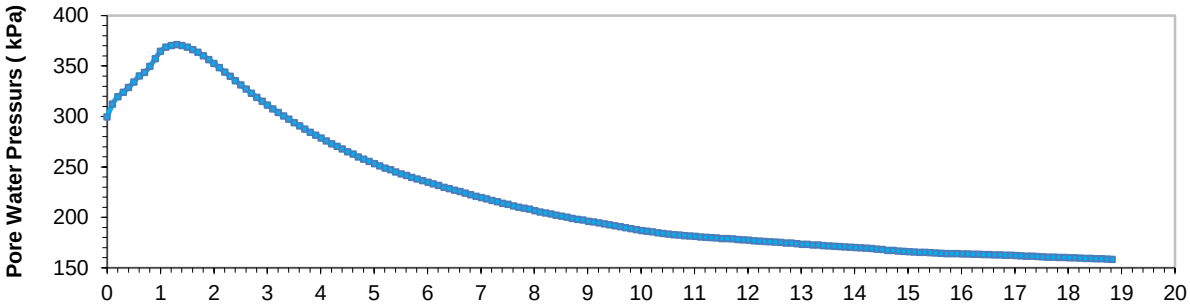


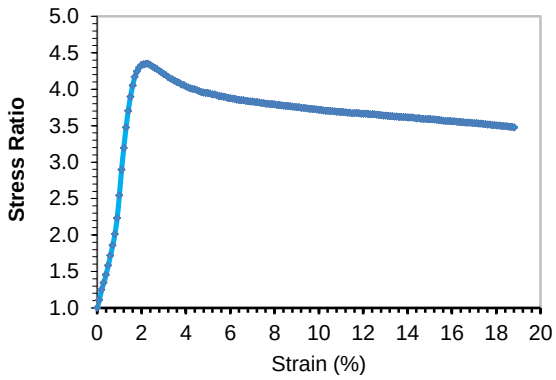


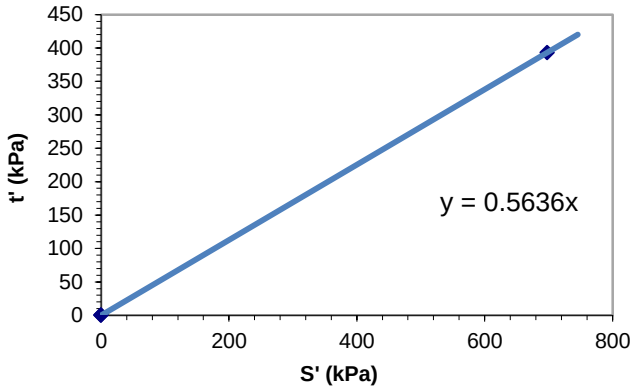
NM TL Ltd	**Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018**	Project No. NMTL-3243
		Borehole No BH05
	Project: Whitehall, Swords	Sample No. Core
		Depth. 14.6-15.0m

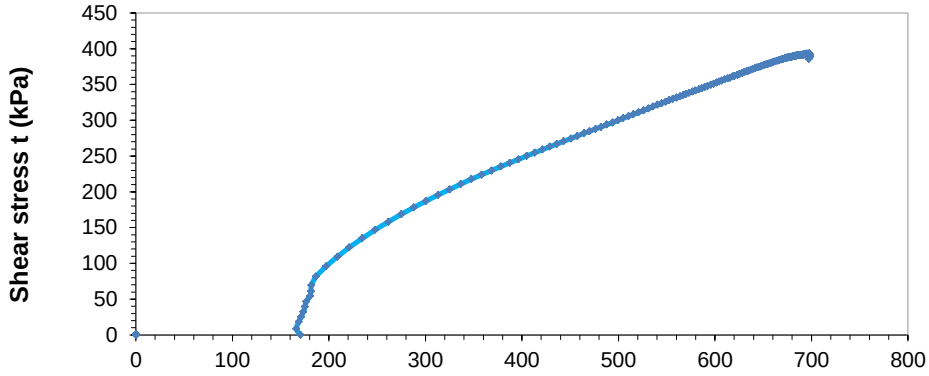
19/08/2020











NM TL Ltd	**Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018**	Project No. NMTL-3243
		Borehole No. BH05
	Project: Whitehall, Swords	Sample No. Core
		Depth. 14.6-15.0m

19/08/2020

SPECIMEN AFTER TEST

Soil Description **Very stiff grey/brown slightly gravelly slightly sandy silty CLAY.**

NM TL Ltd	**Consolidated Undrained SingleTriaxial test with PWP measurement.Testesd in accordance with BS:EN ISO 17892-9-2018**	Project No. NMTL-3243
		Borehole No. BH05
	Project: Whitehall, Swords	Sample No. Core
		Depth. 14.6-15.0m

19/08/2020

LABORATORY REPORT

4043

Contract Number: PSL20/3995

Report Date: 13 August 2020

Client's Reference: 9429-02-20

Client Name: Ground Investigations Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: Chris Byrne

Contract Title: Swords Road, Whitehall

Date Received: 5/8/2020
Date Commenced: 5/8/2020
Date Completed: 13/8/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)

L Knight (Senior Technician)
S Eyre (Senior Technician)
S Royle (Laboratory Manager)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

DETERMINATION OF UNCONFINED COMPRESSIVE STRENGTH

ISRM Suggested Methods, pp 111 –116, 1981.

Hole Number	Sample Number	Sample Type	Top Depth (m)	Base Depth (m)	Sample Diameter (mm)	Sample Length (mm)	Height Ratio	Initial Mass (g)	Bulk Density (Mg/m)	Moisture Content (%)	Dry Density (Mg/m)	Load Failure (kN)	UCS (MPa)	Failure Mode	Date Tested	Remarks
BH05		C	23.30	23.75	100	180	1.8	3834	2.71	0.9	2.69	290.2	36.9	Brittle	07/08/20	
BH05		C	32.30	32.75	100	180	1.8	4014	2.84	0.5	2.82	826.5	105.2	Brittle	07/08/20	
BH09		C	32.85	33.10	100	145	1.5	3194	2.80	0.4	2.79	318.7	40.6	Brittle	07/08/20	

PSL Professional Soils Laboratory	Swords Road, Whitehall	Contract No: PSL20/3995 Client Ref: 9429-02-20

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH05	23.30		A	Perp	100	50	5000	6366.20	79.79	-	7.34	1.15	1.234	1.42	Valid	
BH05	28.25		A	Perp	100	65	6500	8276.06	90.97	-	8.52	1.03	1.309	1.35	Valid	
BH05	32.30		A	Perp	100	60	6000	7639.44	87.40	-	13.40	1.75	1.286	2.26	Valid	
BH05	35.20		A	Perp	100	60	6000	7639.44	87.40	-	24.69	3.23	1.286	4.16	Valid	
BH09	33.60		A	Perp	100	63	6300	8021.41	89.56	-	5.11	0.64	1.300	0.83	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Swords Road, Whitehall

Contract No:

PSL20/3995

Client Ref:

9429-02-20

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH05	23.30		D	Par	-	100	10000	100.00	-	33.19	3.319	1.366	4.53	Valid	
BH05	28.25		D	Par	-	100	10000	100.00	-	19.87	1.987	1.366	2.71	Valid	
BH05	32.30		D	Par	-	100	10000	100.00	-	44.65	4.465	1.366	6.10	Valid	
BH05	35.20		D	Par	-	100	10000	100.00	-	36.07	3.607	1.366	4.93	Valid	
BH09	33.60		D	Par	-	100	10000	100.00	-	1.84	0.184	1.366	0.25	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL Professional Soils Laboratory

Swords Road, Whitehall

Contract No:

PSL20/3995

Client Ref:

9429-02-20

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Mike Sutton
Date :	30th March, 2020
Your reference :	9429-02-20
Our reference :	Test Report 20/3675 Batch 1
Location :	Whitehall, Swords Road Extension
Date samples received :	9th March, 2020
Status :	Final report
Issue :	1

Eight samples were received for analysis on 9th March, 2020 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton
EMT Job No: 20/3675

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	16-18	22-24						LOD/LOR	Units	Method No.
Sample ID	TP01	TP02	TP03	TP07	TP10								
Depth	2.4	0.5	0.5	0.7	0.5								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	05/03/2020	05/03/2020	05/03/2020	05/03/2020	05/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/03/2020	09/03/2020	09/03/2020	09/03/2020	09/03/2020								
Antimony	2	2	2	3	2						<1	mg/kg	TM30/PM15
Arsenic #	8.8	9.4	13.0	19.4	10.7						<0.5	mg/kg	TM30/PM15
Barium #	85	57	152	111	59						<1	mg/kg	TM30/PM15
Cadmium #	2.4	2.3	2.9	2.2	1.5						<0.1	mg/kg	TM30/PM15
Chromium #	27.3	25.5	43.2	43.9	42.0						<0.5	mg/kg	TM30/PM15
Copper #	32	27	31	63	27						<1	mg/kg	TM30/PM15
Lead #	16	15	29	104	28						<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM30/PM15
Molybdenum #	4.7	3.3	4.6	4.9	4.0						<0.1	mg/kg	TM30/PM15
Nickel #	40.1	38.3	45.6	57.1	34.1						<0.7	mg/kg	TM30/PM15
Selenium #	8	<1	<1	<1	<1						<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	1085	359	528	708	354						<50	mg/kg	TM50/PM29
Zinc #	84	64	145	151	76						<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	0.19						<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	0.06						<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	0.06						<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.09	<0.03	<0.03	0.10	0.28						<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	0.09						<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	<0.03	0.10	0.23						<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03	0.09	0.16						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06	0.09	0.10						<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02	0.09	0.08						<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	0.18	0.14						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	0.09	0.07						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04	<0.04	0.06	<0.04						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	0.06	<0.04						<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
PAH 6 Total #	<0.22	<0.22	<0.22	0.49	0.44						<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	<0.64	0.86	1.46						<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	0.13	0.10						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	0.05	0.04						<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1	<1	<1						<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	82	94	98	96	99						<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	<2	<2	<2	<2	<2						<2	ug/kg	TM15/PM10
Benzene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Toluene #	<3	<3	<3	-	<3						<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
m/p-Xylene #	<5	<5	<5	<5	<5						<5	ug/kg	TM15/PM10
o-Xylene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton
EMT Job No: 20/3675

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	16-18	22-24						LOD/LOR	Units	Method No.
Sample ID	TP01	TP02	TP03	TP07	TP10								
Depth	2.4	0.5	0.5	0.7	0.5								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	05/03/2020	05/03/2020	05/03/2020	05/03/2020	05/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/03/2020	09/03/2020	09/03/2020	09/03/2020	09/03/2020								
Surrogate Recovery Toluene D8	91	95	97	88	92						<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	65	89	93	62	78						<0	%	TM15/PM10
Mineral Oil (C10-C40)	<30	<30	<30	32	<30						<30	mg/kg	TM5/PM8/PM16
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	<4	<4	<4	<4	<4						<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	<7	<7	<7	32	<7						<7	mg/kg	TM5/PM8/PM16
>C35-C40	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40	<26	<26	<26	32	<26						<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>C10-C25	<10	<10	<10	<10	<10						<10	mg/kg	TM5/PM8/PM16
>C25-C35	<10	<10	<10	27	<10						<10	mg/kg	TM5/PM8/PM16
Aromatics													
>C5-EC7 #	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	<4	<4	<4	<4	<4						<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>EC35-EC40	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40	<26	<26	<26	<26	<26						<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40)	<52	<52	<52	<52	<52						<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 #	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1						<0.1	mg/kg	TM36/PM12
>EC10-EC25	<10	<10	<10	<10	<10						<10	mg/kg	TM5/PM8/PM16
>EC25-EC35	<10	<10	<10	<10	<10						<10	mg/kg	TM5/PM8/PM16
PCB 28 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	<35	<35	<35	<35						<35	ug/kg	TM17/PM8
Natural Moisture Content	9.9	16.5	25.6	26.8	14.6						<0.1	%	PM4/PM0

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton
EMT Job No: 20/3675

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	16-18	22-24						LOD/LOR	Units	Method No.
Sample ID	TP01	TP02	TP03	TP07	TP10								
Depth	2.4	0.5	0.5	0.7	0.5								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	05/03/2020	05/03/2020	05/03/2020	05/03/2020	05/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/03/2020	09/03/2020	09/03/2020	09/03/2020	09/03/2020								
Moisture Content (% Wet Weight)	9.0	14.1	20.4	21.1	12.7						<0.1	%	PM4/PM0
Ammoniacal Nitrogen as N	<0.6	<0.6	<0.6	<0.6	<0.6						<0.6	mg/kg	TM38/PM20
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3						<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0583	0.0212	0.0772	0.0207	0.0301						<0.0015	g/l	TM38/PM20
Chromium III	27.3	25.5	43.2	43.9	42.0						<0.5	mg/kg	NONE/NONE
Total Cyanide #	<0.5	<0.5	0.8	0.9	<0.5						<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	0.70	0.51	0.82	3.73	0.68						<0.02	%	TM21/PM24
Sulphide	<10	<10	<10	<10	<10						<10	mg/kg	TM107/PM45
Elemental Sulphur	3	<1	<1	4	2						<1	mg/kg	TM108/PM114
pH #	8.66	8.55	8.24	8.25	8.55						<0.01	pH units	TM73/PM11
Mass of raw test portion	0.1007	0.1079	0.1121	0.115	0.1058							kg	NONE/PM17
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09							kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton
EMT Job No: 20/3675

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	16-18	22-24						LOD/LOR	Units	Method No.
Sample ID	TP01	TP02	TP03	TP07	TP10								
Depth	2.4	0.5	0.5	0.7	0.5								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	05/03/2020	05/03/2020	05/03/2020	05/03/2020	05/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/03/2020	09/03/2020	09/03/2020	09/03/2020	09/03/2020								
Dissolved Antimony #	<0.002	<0.002	<0.002	<0.002	0.003						<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	<0.02	<0.02	0.03						<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025						<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	<0.025	<0.025	<0.025						<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.004	<0.003	<0.003	0.007	0.003						<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.04	<0.03	<0.03	0.07	0.03						<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005						<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015						<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015						<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007						<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07						<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.031	0.013	0.002	0.008	0.010						<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.31	0.13	0.02	0.08	0.10						<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	<0.002	<0.002	<0.002	<0.002						<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	0.005	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	0.05	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	<0.003	<0.003	<0.003	0.004	0.003						<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	<0.03	<0.03	0.04	0.03						<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001						<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM26/PM0
Fluoride	0.5	0.5	0.3	0.5	0.4						<0.3	mg/l	TM173/PM0
Fluoride	5	5	3	5	4						<3	mg/kg	TM173/PM0
Sulphate as SO4 #	4.8	4.1	20.0	4.3	13.7						<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	48	41	200	43	137						<5	mg/kg	TM38/PM0
Chloride #	<0.3	<0.3	<0.3	0.4	<0.3						<0.3	mg/l	TM38/PM0
Chloride #	<3	<3	<3	4	<3						<3	mg/kg	TM38/PM0
Dissolved Organic Carbon	<2	3	4	5	4						<2	mg/l	TM60/PM0
Dissolved Organic Carbon	<20	30	40	50	40						<20	mg/kg	TM60/PM0
pH	8.33	8.26	8.16	8.26	8.16						<0.01	pH units	TM73/PM0
Total Dissolved Solids #	79	72	114	132	103						<35	mg/l	TM20/PM0
Total Dissolved Solids #	790	720	1141	1320	1030						<350	mg/kg	TM20/PM0

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton
EMT Job No: 20/3675

Report : EN12457_2

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	16-18	22-24						Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Sample ID	TP01	TP02	TP03	TP07	TP10											
Depth	2.4	0.5	0.5	0.7	0.5											
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T											
Sample Date	05/03/2020	05/03/2020	05/03/2020	05/03/2020	05/03/2020											
Sample Type	Soil	Soil	Soil	Soil	Soil											
Batch Number	1	1	1	1	1											
Date of Receipt	09/03/2020	09/03/2020	09/03/2020	09/03/2020	09/03/2020											
Solid Waste Analysis																
Total Organic Carbon #	0.70	0.51	0.82	3.73	0.68						3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.017	<0.017	<0.017	<0.017	<0.017						6	-	-	<0.017	mg/kg	TM15/PM10
Sum of 7 PCBs #	<0.035	<0.035	<0.035	<0.035	<0.035						1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30	<30	32	<30						500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 #	<0.22	<0.22	<0.22	0.49	0.44						-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	<0.64	<0.64	<0.64	0.86	1.46						100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic #	<0.025	<0.025	<0.025	<0.025	<0.025						0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	0.04	<0.03	<0.03	0.07	0.03						20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005	<0.005	<0.005	<0.005						0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015	<0.015	<0.015	<0.015						0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07	<0.07	<0.07	<0.07						2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum #	0.31	0.13	0.02	0.08	0.10						0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	<0.02	<0.02	<0.02	<0.02	<0.02						0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05	<0.05	<0.05	<0.05						0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	<0.02	<0.02	<0.02	<0.02	0.03						0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	0.05	<0.03	<0.03	<0.03	<0.03						0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	<0.03	<0.03	<0.03	0.04	0.03						4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids #	790	720	1141	1320	1030						4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	<20	30	40	50	40						500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1007	0.1079	0.1121	0.115	0.1058						-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	89.3	83.7	80.0	78.3	85.5						-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.889	0.882	0.878	0.875	0.885						-	-	-		l	NONE/PM17
Eluate Volume	0.8	0.8	0.8	0.8	0.8						-	-	-		l	NONE/PM17
pH #	8.66	8.55	8.24	8.25	8.55						-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	5	5	3	5	4						-	-	-	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	48	41	200	43	137						1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride #	<3	<3	<3	4	<3						800	15000	25000	<3	mg/kg	TM38/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton
EMT Job No: 20/3675

SVOC Report : **Solid**

EMT Sample No.	1-3	4-6	7-9	16-18	22-24								
Sample ID	TP01	TP02	TP03	TP07	TP10								
Depth	2.4	0.5	0.5	0.7	0.5						Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	05/03/2020	05/03/2020	05/03/2020	05/03/2020	05/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/03/2020	09/03/2020	09/03/2020	09/03/2020	09/03/2020						LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Methylphenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Nitrophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4-Dichlorophenol #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4-Dimethylphenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4,5-Trichlorophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Methylphenol	<10	<10	<10	24	<10						<10	ug/kg	TM16/PM8
4-Nitrophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Pentachlorophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Phenol #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
PAHs													
2-Chloronaphthalene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Methylnaphthalene #	22	<10	<10	24	<10						<10	ug/kg	TM16/PM8
Phthalates													
Bis(2-ethylhexyl) phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Butylbenzyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Di-n-butyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Di-n-Octyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Diethyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Dimethyl phthalate #	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Other SVOCs													
1,2-Dichlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
1,2,4-Trichlorobenzene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
1,3-Dichlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
1,4-Dichlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Nitroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4-Dinitrotoluene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,6-Dinitrotoluene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
3-Nitroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Bromophenylphenylether #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Chloroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Chlorophenylphenylether	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Nitroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Azobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Bis(2-chloroethoxy)methane	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Bis(2-chloroethyl)ether	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Carbazole	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Dibenzofuran #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Hexachlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Hexachlorobutadiene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Hexachloroethane	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Isophorone #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
N-nitrosodi-n-propylamine #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Nitrobenzene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Surrogate Recovery 2-Fluorobiphenyl	123	123	118	121	128						<0	%	TM16/PM8
Surrogate Recovery p-Terphenyl-d14	117	119	117	117	130						<0	%	TM16/PM8

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton
EMT Job No: 20/3675

VOC Report : **Solid**

EMT Sample No.	1-3	4-6	7-9	16-18	22-24						LOD/LOR	Units	Method No.
Sample ID	TP01	TP02	TP03	TP07	TP10								
Depth	2.4	0.5	0.5	0.7	0.5								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	05/03/2020	05/03/2020	05/03/2020	05/03/2020	05/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/03/2020	09/03/2020	09/03/2020	09/03/2020	09/03/2020								
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2						<2	ug/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<2	<2	<2	<2	<2						<2	ug/kg	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Vinyl Chloride	<2	<2	<2	<2	<2						<2	ug/kg	TM15_A/PM10
Bromomethane	<1	<1	<1	<1	<1						<1	ug/kg	TM15/PM10
Chloroethane #	<2	<2	<2	<2	<2						<2	ug/kg	TM15/PM10
Trichlorofluoromethane #	<2	<2	<2	<2	<2						<2	ug/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<6	<6	<6	<6	<6						<6	ug/kg	TM15/PM10
Dichloromethane (DCM) #	<30	<30	<30	<30	<30						<30	ug/kg	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
2,2-Dichloropropane	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
Bromochloromethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Chloroform #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,1,1-Trichloroethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Carbon tetrachloride #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
1,2-Dichloroethane #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
Benzene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,2-Dichloropropane #	<6	<6	<6	<6	<6						<6	ug/kg	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Bromodichloromethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
cis-1-3-Dichloropropene	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
Toluene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
trans-1-3-Dichloropropene	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,1,2-Trichloroethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,3-Dichloropropane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Dibromochloromethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,2-Dibromoethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Chlorobenzene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,1,1,2-Tetrachloroethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
m/p-Xylene #	<5	<5	<5	<5	<5						<5	ug/kg	TM15/PM10
o-Xylene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Styrene	<3	<3	<3	<3	<3						<3	ug/kg	TM15_A/PM10
Bromoform	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
Bromobenzene	<2	<2	<2	<2	<2						<2	ug/kg	TM15/PM10
1,2,3-Trichloropropane #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
Propylbenzene #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
2-Chlorotoluene	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
4-Chlorotoluene	<3	<3	<3	<3	<3						<3	ug/kg	TM15/PM10
tert-Butylbenzene #	<5	<5	<5	<5	<5						<5	ug/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<6	<6	<6	<6	<6						<6	ug/kg	TM15/PM10
sec-Butylbenzene #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
4-Isopropyltoluene #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
1,3-Dichlorobenzene #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
1,4-Dichlorobenzene #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
n-Butylbenzene #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
1,2-Dichlorobenzene #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<7	<7	<7	<7	<7						<7	ug/kg	TM15/PM10
Hexachlorobutadiene	<4	<4	<4	<4	<4						<4	ug/kg	TM15/PM10
1,2,3-Trichlorobenzene #	<7	<7	<7	<7	<7						<7	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	91	95	97	88	92						<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	65	89	93	62	78						<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland

Reference: 9429-02-20

Location: Whitehall, Swords Road Extension

Contact: Mike Sutton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
20/3675	1	TP01	2.4	1-3	No interpretation possible
20/3675	1	TP02	0.5	4-6	No interpretation possible
20/3675	1	TP03	0.5	7-9	No interpretation possible
20/3675	1	TP07	0.7	16-18	No interpretation possible
20/3675	1	TP10	0.5	22-24	No interpretation possible

Client Name: Ground Investigations Ireland
Reference: 20/02/9429
Location: Whitehall, Swords Road Extension
Contact: Mike Sutton

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/3675	1	TP01	2.4	2	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3675	1	TP02	0.5	5	18/03/2020	**General Description (Bulk Analysis)**	soil-stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3675	1	TP03	0.5	8	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3675	1	TP07	0.7	17	18/03/2020	**General Description (Bulk Analysis)**	Soil/Stone
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3675	1	TP10	0.5	23	18/03/2020	**General Description (Bulk Analysis)**	soil-stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD

Client Name: Ground Investigations Ireland

Reference: 9429-02-20

Location: Whitehall, Swords Road Extension

Contact: Mike Sutton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
20/3675	1	TP01	2.4	1-3	VOC	Analysis taken from a previously sampled container.
20/3675	1	TP07	0.7	16-18	VOC	Analysis taken from a previously sampled container.

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/3675

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/3675

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes

EMT Job No: 20/3675

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 20/3675

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM0	No preparation is required.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

EMT Job No: 20/3675

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM108	Determination of Elemental Sulphur by Reversed Phase High Performance Liquid Chromatography with Ultra Violet spectroscopy.	PM114	End over end extraction of dried and crushed soil samples for organic analysis. The solvent mix varies depending on analysis required			AD	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	
TM15_A	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Mike Sutton
Date :	22nd July, 2020
Your reference :	9429-02-20
Our reference :	Test Report 20/9186 Batch 1
Location :	Whitehall Swords Road
Date samples received :	14th July, 2020
Status :	Final report
Issue :	1

Ten samples were received for analysis on 14th July, 2020 of which ten were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall Swords Road
Contact: Mike Sutton
EMT Job No: 20/9186

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3	4	5	6	7	8	9	10	LOD/LOR	Units	Method No.
Sample ID	TP01	TP08	BH01	BH03	BH03	BH05	BH07	BH08	BH09	BH07			
Depth	0.70	0.80	4.00	2.00	5.00	1.00	2.00	3.00	4.00	1.50			
COC No / misc													
Containers	T	T	T	T	T	T	T	T	T	T			
Sample Date	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020	10/07/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/07/2020	14/07/2020	14/07/2020	14/07/2020	14/07/2020	14/07/2020	14/07/2020	14/07/2020	14/07/2020	14/07/2020			
Chloride (2:1 Ext BRE) #	0.008	0.008	0.013	0.006	0.013	0.006	0.030	0.006	0.013	0.006	<0.002	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0478	0.0202	0.1036	0.0287	0.2592	0.1264	0.0978	0.0532	0.2981	0.0271	<0.0015	g/l	TM38/PM20
pH #	8.62	8.74	8.36	8.61	8.13	8.25	8.46	8.44	8.16	8.76	<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall Swords Road
Contact: Mike Sutton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/9186						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/9186

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/9186

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Mike Sutton
Date :	28th July, 2020
Your reference :	9429-02-20
Our reference :	Test Report 20/9618 Batch 1
Location :	Whitehall Swords
Date samples received :	22nd July, 2020
Status :	Final report
Issue :	1

One sample was received for analysis on 22nd July, 2020 of which one was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall Swords
Contact: Mike Sutton
EMT Job No: 20/9618

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1										LOD/LOR	Units	Method No.
Sample ID	TP08												
Depth	0.70												
COC No / misc													
Containers	T												
Sample Date	20/07/2020												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	22/07/2020												
Chloride (2:1 Ext BRE) #	0.004										<0.002	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0089										<0.0015	g/l	TM38/PM20
pH #	8.48										<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall Swords
Contact: Mike Sutton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/9618						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/9618

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/9618

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Mike Sutton
Date :	22nd July, 2020
Your reference :	9429-02-20
Our reference :	Test Report 20/9144 Batch 1
Location :	Whitehall, Swords, Road Extension
Date samples received :	14th July, 2020
Status :	Final report
Issue :	1

Three samples were received for analysis on 14th July, 2020 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 10 Lower Grosvenor Place, London, SW1W 0EN
Company Registration No: 11371415

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords, Road Extension
Contact: Mike Sutton
EMT Job No: 20/9144

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-10	11-16,18-19	21-30								LOD/LOR	Units	Method No.
Sample ID	BH01	BH06	BH10										
Depth													
COC No / misc													
Containers	V H HN HCL Z P BOD G	V H HN HCL Z BOD G	V H HN HCL Z P BOD G										
Sample Date	13/07/2020	13/07/2020	13/07/2020										
Sample Type	Ground Water	Ground Water	Ground Water										
Batch Number	1	1	1										
Date of Receipt	14/07/2020	14/07/2020	14/07/2020										
Dissolved Antimony #	<2	<2	<2								<2	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	2.7	3.4								<2.5	ug/l	TM30/PM14
Dissolved Barium #	108	76	99								<3	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5								<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5								<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7								<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5								<5	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1								<1	ug/l	TM30/PM14
Dissolved Molybdenum #	3	14	6								<2	ug/l	TM30/PM14
Dissolved Nickel #	8	12	10								<2	ug/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3								<3	ug/l	TM30/PM14
Dissolved Zinc #	6	4	10								<3	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1	<0.1	<0.1								<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.013	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Fluorene #	<0.014	<0.014	<0.014								<0.014	ug/l	TM4/PM30
Phenanthrene #	<0.011	<0.011	<0.011								<0.011	ug/l	TM4/PM30
Anthracene #	<0.013	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012	<0.012	<0.012								<0.012	ug/l	TM4/PM30
Pyrene #	<0.013	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.015	<0.015	<0.015								<0.015	ug/l	TM4/PM30
Chrysene #	<0.011	<0.011	<0.011								<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018	<0.018	<0.018								<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016	<0.016	<0.016								<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.011	<0.011	<0.011								<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.011	<0.011	<0.011								<0.011	ug/l	TM4/PM30
PAH 16 Total #	<0.195	<0.195	<0.195								<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	82	88	87								<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1								<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5								<0.5	ug/l	TM15/PM10
Toluene #	<5	<5	<5								<5	ug/l	TM15/PM10
Ethylbenzene #	<1	<1	<1								<1	ug/l	TM15/PM10
m/p-Xylene #	<2	<2	<2								<2	ug/l	TM15/PM10
o-Xylene #	<1	<1	<1								<1	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	107	106	108								<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	108	105	108								<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords, Road Extension
Contact: Mike Sutton
EMT Job No: 20/9144

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-10	11-16,18-19	21-30										
Sample ID	BH01	BH06	BH10										
Depth													
COC No / misc													
Containers	V H HN HCL Z P BOD G	V H HN HCL Z BOD G	V H HN HCL Z P BOD G										
Sample Date	13/07/2020	13/07/2020	13/07/2020										
Sample Type	Ground Water	Ground Water	Ground Water										
Batch Number	1	1	1										
Date of Receipt	14/07/2020	14/07/2020	14/07/2020										

Please see attached notes for all abbreviations and acronyms

				LOD/LOR	Units	Method No.
TPH CWG						
Aliphatics						
>C5-C6 #	<10	<10	<10	<10	ug/l	TM36/PM12
>C6-C8 #	<10	<10	<10	<10	ug/l	TM36/PM12
>C8-C10 #	<10	<10	<10	<10	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	ug/l	TM5/PM16/PM30
>C12-C16 #	<10	<10	<10	<10	ug/l	TM5/PM16/PM30
>C16-C21 #	<10	<10	<10	<10	ug/l	TM5/PM16/PM30
>C21-C35 #	<10	<10	<10	<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics						
>C5-EC7 #	<10	<10	<10	<10	ug/l	TM36/PM12
>EC7-EC8 #	<10	<10	<10	<10	ug/l	TM36/PM12
>EC8-EC10 #	<10	<10	<10	<10	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	ug/l	TM5/PM16/PM30
>EC12-EC16 #	<10	<10	<10	<10	ug/l	TM5/PM16/PM30
>EC16-EC21 #	<10	<10	<10	<10	ug/l	TM5/PM16/PM30
>EC21-EC35 #	<10	<10	<10	<10	ug/l	TM5/PM16/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	ug/l	TM5/TM36/PM12/PM16/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	ug/l	TM17/PM30
Sulphate as SO4 #	384.0	370.7	302.1	<0.5	mg/l	TM38/PM0
Chloride #	16.6	97.5	20.8	<0.3	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.23	0.24	0.14	<0.03	mg/l	TM38/PM0
Electrical Conductivity @25C #	1418	1388	1066	<2	uS/cm	TM76/PM0
pH #	7.46	7.62	7.75	<0.01	pH units	TM73/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords, Road Extension
Contact: Mike Sutton
EMT Job No: 20/9144

SVOC Report : **Liquid**

EMT Sample No.	1-10	11-16,18-19	21-30									
Sample ID	BH01	BH06	BH10									
Depth										Please see attached notes for all abbreviations and acronyms		
COC No / misc												
Containers	V H HN HCL Z P BOD G	V H HN HCL Z BOD G	V H HN HCL Z P BOD G									
Sample Date	13/07/2020	13/07/2020	13/07/2020									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1									
Date of Receipt	14/07/2020	14/07/2020	14/07/2020									
SVOC MS										LOD/LOR	Units	Method No.
Phenols												
2-Chlorophenol #	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1							<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10							<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1							<1	ug/l	TM16/PM30
Phenol	<1	<1	<1							<1	ug/l	TM16/PM30
PAHs												
2-Chloronaphthalene #	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1							<1	ug/l	TM16/PM30
Phthalates												
Bis(2-ethylhexyl) phthalate	<5	<5	<5							<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1							<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5							<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1							<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1							<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1							<1	ug/l	TM16/PM30
Other SVOCs												
1,2-Dichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1							<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1							<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1							<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1							<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1							<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
Surrogate Recovery 2-Fluorobiphenyl	108	113	103							<0	%	TM16/PM30
Surrogate Recovery p-Terphenyl-d14	126	112	109							<0	%	TM16/PM30

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords, Road Extension
Contact: Mike Sutton
EMT Job No: 20/9144

VOC Report : **Liquid**

EMT Sample No.	1-10	11-16,18-19	21-30									
Sample ID	BH01	BH06	BH10									
Depth												
COC No / misc												
Containers	V H HN HCL Z P BOD G	V H HN HCL Z BOD G	V H HN HCL Z P BOD G									
Sample Date	13/07/2020	13/07/2020	13/07/2020									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1									
Date of Receipt	14/07/2020	14/07/2020	14/07/2020									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2	<2	<2								<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1								<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3								<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1								<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1								<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3								<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3								<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3								<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<5	<5	<5								<5	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3								<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3								<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1								<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2								<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2								<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2								<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3								<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2								<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2								<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5								<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3								<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2								<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3								<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2								<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2								<2	ug/l	TM15/PM10
Toluene #	<5	<5	<5								<5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2								<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2								<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3								<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2								<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2								<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2								<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2								<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2								<2	ug/l	TM15/PM10
Ethylbenzene #	<1	<1	<1								<1	ug/l	TM15/PM10
m/p-Xylene #	<2	<2	<2								<2	ug/l	TM15/PM10
o-Xylene #	<1	<1	<1								<1	ug/l	TM15/PM10
Styrene	<2	<2	<2								<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2								<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4								<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2								<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3								<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3								<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3								<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2								<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3								<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3								<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2								<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3								<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	107	106	108								<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	108	105	108								<0	%	TM15/PM10

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9429-02-20
Location: Whitehall, Swords, Road Extension
Contact: Mike Sutton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/9144						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/9144

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/9144

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			

EMT Job No: 20/9144

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

APPENDIX 7 – Groundwater Monitoring

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

GROUNDWATER MONITORING

Whithall Swords Road Extension

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
BH01	30/06/2020	17.13	1.77	
BH06	30/06/2020	17.23	5.21	
BH10	30/06/2020	17.17	1.76	

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

GROUNDWATER MONITORING

Whitehall, Swords

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
BH01	13/07/2020	14:02	1.52	
BH06	13/07/2020	15:05	4.15	
BH10	13/07/2020	14:45	1.74	

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

GROUNDWATER MONITORING

Whithall Swords Road Extension

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
BH01	13/08/2020	8.03	1.86	
BH06	13/08/2020	8.09	3.65	
BH10	13/08/2020	8.20	1.57	