# APPENDIX 7.1 2018 SITE INVESTIGATION

***S.I. Ltd Contract No: 5490***

Client: Durkan Residential
Engineer: J. B. Barry and Partners Limited
Contractor: Site Investigations Ltd

# Portmarnock South – Phase 1B, Portmarnock, Co. Dublin Site Investigation Report

Prepared by:

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Contents:



Appendices:

## 1. Introduction

On the instructions of Durkan Residential, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Station Road, Portmarnock, Co. Dublin. The investigation was for the residential development of the site.

The fieldworks comprised a programme of cable percussive boreholes, trial pits with plate tests and soakaway tests. All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design. Laboratory testing has been performed on representative soil samples recovered from the trial pits and these were completed in accordance of BS1377: 1990.

This report presents the factual geotechnical data obtained from the field and laboratory testing with interpretation of the ground conditions discussed.

## 2. Fieldwork

The geotechnical fieldworks were started and completed in June 2018 and comprised the following:

- 4 No. cable percussive boreholes
- 6 No. trial pits
- 5 No. plate tests
- 2 No. soakaway tests

### 2.1. Cable Percussive Boreholes

Cable percussion boring was undertaken at 4 No. locations using a Dando 150 rig and constructed 200mm diameter boreholes. The boreholes terminated at similar depths between 6.80mbgl (BH02) and 8.30mbgl (BH04). It was not possible to collect undisturbed samples due to the granular soils encountered so bulk disturbed samples were recovered at regular intervals.

To test the strength of the stratum, Standard Penetration Tests (SPT's) were performed at 1.00m intervals in accordance with BS 1377 (1990). In soils with high gravel and cobble content it is appropriate to use a solid cone (60°) (CPT) instead of the split spoon and this was used throughout the testing. The test is completed over 450mm and the cone is driven 150mm into the stratum to ensure that the test is conducted over an undisturbed zone. The cone is then driven the remaining 300mm and the blows recorded to report the N-Value. The report shows the N-Value with the 75mm incremental blows listed in brackets (e.g. BH01 at 1.00mbgl where N=16-(2,3/3,5,4,4)). Where refusal of 50 blows across the test zone was

encountered was achieved during testing, the penetration depth is also reported (e.g. BH01 at 6.00mbgl where N=50-(6,7/50 for 200mm)).

The logs are presented in Appendix 1.

**2.2. Trial Pits**

6 No. trial pits were scheduled and excavated using a tracked excavator. The pits were logged and photographed by SIL geotechnical engineer and representative disturbed bulk samples were recovered as the pits were excavated, which were returned to the laboratory for geotechnical testing.

The trial pit logs and photographs are presented in Appendix 2.

**2.3. Plate Tests**

Plate tests were completed at 5 of the trial pits to assist with the roadways design and was completed by SIL geotechnical engineer. The tracked excavator was used to provide kentledge and pressure is added to a 600mm diameter plate on the soil via a hydraulic jack with the settlement of the plate measured using gauges. The rate of settlement is used to calculate the CBR value.

The results are provided in Appendix 3.

**2.4. Soakaway Tests**

Soakaway tests were completed using the tracked excavator and was logged by SIL geotechnical engineer. The soakaway test is used to identify possible areas for storm water drainage. The pit was filled with water and the level of the groundwater was recorded over time. As stipulated by BRE Special Digest 365, the pit should be filled three times and that the final cycle is used to provide the infiltration rate. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration. However, if the water level does not fall at a steady rate then the test is deemed to have failed and the area is unsuitable for storm water drainage.

The soakaway logs are presented in Appendix 4.

## 3. Laboratory Testing

Geotechnical laboratory testing was completed on representative soil samples in accordance with BS 1377 (1990). Testing included:

- 4 No. Moisture contents
- 4 No. Atterberg limits
- 4 No. Particle size gradings
- 2 No. pH and sulphate content

The laboratory test results are presented in Appendix 5.

## 4. Ground Conditions

### 4.1. Overburden

A generalised summary of the ground profile from BH01 is shown below. Reference should be made to the individual borehole and trial pit records in Appendices 1 and 2 for the full strata information at specific locations.

- **0.00m:** TOPSOIL.
- **0.10m:** Firm brown sandy slightly gravelly silty CLAY with low cobble content.
- **1.80m:** Stiff black slightly sandy gravelly silty CLAY with low cobble content.
- **7.10m:** Obstruction – possible boulder.
- **7.20m:** Borehole terminated due to obstruction.

The natural soils consist of over-consolidated lodgment till which is encountered across the North Dublin region with several papers discussing the engineering characteristics of the soil. The gravel and cobbles are generally subrounded to subangular and predominantly limestone in origin. The brown soils are the weathered surface of the underlying black clays. The SPT N-values show that the upper brown soil recorded values in the range of 13 to 17 and using a correlation of undrained shear strength ($C_u$) is equal to 5N, then this would give a $C_u$ range of 65 to 85kN/m$^2$ and be in the firm to stiff category of soils. The lower black clays recorded values of 22 to 26 at 2.00mbgl and this indicates a $C_u$ range of 110kN/m$^2$ to 130kN/m$^2$ and this increases with depth. BH03 encountered the black CLAY slightly deeper at 2.60mbgl and also recorded a higher N-value of 29, giving a $C_u$ value of 145kN/m$^2$.

The moisture content tests completed in the laboratory show values ranging from 14.8% to 17.5%. Atterberg limits tests were also completed on the samples and these showed clay soils with low plasticity dominated the site, with plasticity indices results ranging from 8 to 11%. The grading tests show typical poorly graded graphs for this type of soil with between 28 to 39% silt/clay content.

### 4.2. Groundwater

Groundwater details in the boreholes and trial pits during the fieldworks are noted on the logs in Appendices 1 and 2. Groundwater was not recorded in any of the boreholes and trial pits during the fieldworks period.

## 5.0. Recommendations and Conclusions

Please note the following caveats:

*The recommendations given, and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between the exploratory hole locations or below the final level of excavation, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for adjacent unexpected conditions that have not been revealed by the exploratory holes. It is further recommended that all bearing surfaces when excavated should be inspected by a suitably qualified Engineer to verify the information given in this report.*

*Excavated surfaces in clay strata should be kept dry to avoid softening prior to foundation placement. Foundations should always be taken to a minimum depth of 0.50mBGL to avoid the effects of frost action and possible seasonal shrinkage/swelling.*

*If it is intended that on-site materials are to be used as fill, then the necessary laboratory testing should be specified by the Client to confirm the suitability. Also, relevant lab testing should be specified where stability of side slopes to excavations is a concern, or where contamination may be an issue.*

### 5.1. Shallow Foundations

Due to the unknown depth of foundation and no longer-term groundwater information, this analysis assumes the groundwater will not influence the construction or performance of these foundations.

The boreholes recorded firm to stiff brown sandy slightly gravelly silty CLAY with low cobble content at 1.00mbgl. The SPT test results are consistent with values of 13 to 17 15 recorded at 1.00mbgl. Therefore, for the analysis an N-value of 13 was chosen for the purposes of design in this stratum, in accordance with Eurocode 7 (EC 7).

As discussed earlier, using a correlation proposed by Stroud and Butler, the SPT N-value can be used to calculate the undrained shear strength and this is Cu=5N. Therefore, using the value of 14, this indicates that the undrained shear strength of the CLAY is 65kN/m$^2$. This can be used to calculate the ultimate bearing capacity, and this has been calculated to be

350kN/m$^2$. Finally, a factor of safety is applied and with a factor of 3, an allowable bearing capacity of 115kN/m$^2$ would be anticipated using these SPT values.

If higher bearing capacities were required, then the lower black CLAY could be founded on. This recorded an SPT range of 22 to 26 at 2.00mbgl and using this value, an allowable bearing capacity of 200kN/m$^2$ would be anticipated.

As previously discussed, papers have been published about the North Dublin soils and there engineering characteristics. These values recorded on site would be slightly lower than expected for this type of soil with the brown clay normally providing approximately 150kN/m$^2$ allowable bearing capacity with the stiffer black clay offering 300kN/m$^2$ allowable bearing capacity. However, it would still be important that all founding strata be examined by a qualified engineer prior to the pouring of the foundations to confirm the suitability of the soil for the design foundations.

The following assumptions were made as part of these analyses. If any of these assumptions are not in accordance with detailed design or observations made during construction these recommendations should be re-evaluated.

- The foundation is to be 1m wide.
- Foundations are to be constructed on a level formation of uniform material type (described above).
- All man-made or filled material is to be removed prior to construction.
- The bulk unit weight of the material in this stratum has a minimum density of 19kN/m$^3$.

The trial pits indicate that excavations in the cohesive soils should be stable for a short while at least. However, regular inspection of temporary excavations should be completed during construction to ensure that all slopes are stable. Temporary support should be used on any excavation that will be left open for an extended period.

**5.2. Groundwater**

The caveats below relating to interpretation of groundwater levels should be noted:

*There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.*

*Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.*

*Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of groundwater monitoring using any constructed standpipes is required to provide more accurate information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall, nearby construction and tides.*

*Pumping tests would be required to determine likely seepage rates and persistence into excavations taken below the groundwater level. Deep trial pits also aid estimation of seepage rates.*

As discussed previously, water was not encountered during the fieldworks period. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. However, based on this information at the exploratory hole locations to date, it is considered likely that any seepages into excavations of the CLAY will be slow. If granular soils are encountered, then the possibility of water ingressing into an excavation increases.

If groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

**5.3. Pavement Design**

The plate test results in Appendix 3 indicate CBR values ranging from 4.2% to 19.5%.

The plate tests were completed at 0.75mbgl and inspection of the formation strata should be completed prior to construction of the pavement. Once the exact formation levels are finalised then additional in-situ testing could be completed to assist with the detailed pavement design.

**5.4. Soakaway Tests**

The test shows that the areas of the site tested are unsuitable for soakaway design. The BRE Digest stipulates that the pit should half empty within 24hrs, and extrapolation indicates this condition would not be satisfied. The test was terminated at the end of the first (of a possible three) fill/empty cycle since further testing would give even slower fall rates due to increased soil saturation. The unsuitability of the site for soakaways is further suggested by the soil descriptions of the materials in this area of the site where the soakaway was completed, i.e. clay and silt soils.

**5.5. Aggressive Ground Conditions**

The chemical test results in Appendix 5 indicate a general pH value between 8.06 and 8.23, which is close to neutral and below the level of 9, therefore no special precautions are required.

The maximum value obtained for water soluble sulphate was 116mg/l as $SO_3$. The BRE Special Digest 1:2005 – '*Concrete in Aggressive Ground'* guidelines require $SO_4$ values and after conversion ($SO_4 = SO_3 \times 1.2$), the maximum value of 139mg/l shows Class 1 conditions and no special precautions are required.

# Appendix 1
# Cable Percussive Borehole Logs

| Contract No: 5490 | **Cable Percussion Borehole Log** | | | Borehole No: **BH01** |
|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date Started: | 13/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Date Completed: | 13/06/2018 |
| Client: | Durkan Residential | Elevation: | | Drilled By: | T. Tindall |
| Engineer: | J. B. Barry and Partners Limited | Borehole Diameter: | 200mm | Status: | FINAL |

| Depth (m) Scale | Depth | Stratum Description | Legend | Level (mOD) Scale | Depth | Samples and Insitu Tests Depth | Type | Result | Water Strike | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 0.10 | TOPSOIL. Firm brown sandy slightly gravelly silty CLAY with low cobble content. | | -0.5 | | 0.50 | B | TT16 | | |
| 1.0 | | | | -1.0 | | 1.00 | C | N=16 (2,3/3,5,4,4) | | |
| 1.5 | | | | -1.5 | | 1.50 | B | TT17 | | |
| 2.0 | 1.80 | Stiff black slightly sandy gravelly silty CLAY with low cobble content. | | -2.0 | | 2.00 | C | N=24 (4,4/6,7,5,6) | | |
| 2.5 | | | | -2.5 | | 2.50 | B | TT18 | | |
| 3.0 | | | | -3.0 | | 3.00 | C | N=25 (4,5/5,5,7,8) | | |
| 3.5 | | | | -3.5 | | 3.50 | B | TT19 | | |
| 4.0 | | | | -4.0 | | 4.00 | C | N=27 (5,6/5,7,6,9) | | |
| 4.5 | | | | -4.5 | | 4.50 | B | TT20 | | |
| 5.0 | | | | -5.0 | | 5.00 | C | N=41 (8,11/13,9,10,9) | | |
| 5.5 | | | | -5.5 | | 5.50 | B | TT21 | | |
| 6.0 | | | | -6.0 | | 6.00 | C | 50 (6,7/50 for 200mm) | | |
| 6.5 | | | | -6.5 | | 6.50 | B | TT22 | | |
| 7.0 | 7.10 | Obstruction - possible boulder. | | -7.0 | | 7.00 | C | 50 (25 for 75mm/50 for 5mm) | | |
| | 7.20 | End of Borehole at 7.20m | | | | 7.20 | C | 50 (25 for 5mm/50 for 10mm) | | |
| 7.5 | | | | -7.5 | | | | | | |
| 8.0 | | | | -8.0 | | | | | | |
| 8.5 | | | | -8.5 | | | | | | |
| 9.0 | | | | -9.0 | | | | | | |
| 9.5 | | | | -9.5 | | | | | | |

| Chiselling: From: | To: | Time: | Water Strikes: Strike: | Rose: | Depth Sealed | Water Details: Date: | Hole Depth: | Water Depth: | Installation: From: | To: | Pipe: | Backfill: From: | To: | Type: | Remarks: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.10 | 7.20 | 01:00 | | | | 13/06 | 7.20 | Dry | | | | 0.00 | 7.20 | Arisings | Borehole terminated due to obstruction. |

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

| Contract No: 5490 | **Cable Percussion Borehole Log** | | | Borehole No: **BH02** |
|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date Started: | 14/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Date Completed: | 14/06/2018 |
| Client: | Durkan Residential | Elevation: | | Drilled By: | T. Tindall |
| Engineer: | J. B. Barry and Partners Limited | Borehole Diameter: | 200mm | Status: | FINAL |

| Depth (m) Scale | Depth | Stratum Description | Legend | Level (mOD) Scale | Depth | Samples and Insitu Tests Depth | Type | Result | Water Strike | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 0.10 | TOPSOIL. Firm brown sandy slightly gravelly silty CLAY with low cobble content. | | -0.5 | | 0.50 | B | TT23 | | |
| 1.0 | | | | -1.0 | | 1.00 | C | N=17 (3,4/4,4,5,4) | | |
| 1.5 | | | | -1.5 | | 1.50 | B | TT24 | | |
| 2.0 | 1.70 | Stiff black slightly sandy gravelly silty CLAY with low cobble content. | | -2.0 | | 2.00 | C | N=26 (5,7/11,5,5,5) | | |
| 2.5 | | | | -2.5 | | 2.50 | B | TT25 | | |
| 3.0 | | | | -3.0 | | 3.00 | C | N=25 (4,4/6,7,6,6) | | |
| 3.5 | | | | -3.5 | | 3.50 | B | TT26 | | |
| 4.0 | | | | -4.0 | | 4.00 | C | N=40 (8,7/7,9,11,13) | | |
| 4.5 | | | | -4.5 | | 4.50 | B | TT27 | | |
| 5.0 | | | | -5.0 | | 5.00 | C | N=42 (6,6/8,11,13,10) | | |
| 5.5 | | | | -5.5 | | 5.50 | B | TT28 | | |
| 6.0 | | | | -6.0 | | 6.00 | C | N=49 (12,12/12,12,13,12) | | |
| 6.5 | | | | -6.5 | | 6.50 | B | TT29 | | |
| 7.0 | 6.70 6.80 | Obstruction - possible boulder. End of Borehole at 6.80m | | -7.0 | | 6.80 | C | 50 (25 for 5mm/50 for 10mm) | | |
| 7.5 | | | | -7.5 | | | | | | |
| 8.0 | | | | -8.0 | | | | | | |
| 8.5 | | | | -8.5 | | | | | | |
| 9.0 | | | | -9.0 | | | | | | |
| 9.5 | | | | -9.5 | | | | | | |

| Chiselling: From: | To: | Time: | Water Strikes: Strike: | Rose: | Depth Sealed | Water Details: Date: | Hole Depth: | Water Depth: | Installation: From: | To: | Pipe: | Backfill: From: | To: | Type: | Remarks: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.70 | 6.80 | 01:00 | | | | 14/06 | 6.80 | Dry | | | | 0.00 | 6.80 | Arisings | Borehole terminated due to obstruction. |

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

| Contract No: 5490 | **Cable Percussion Borehole Log** | Borehole No: **BH03** |
|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date Started: | 12/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Date Completed: | 12/06/2018 |
| Client: | Durkan Residential | Elevation: | | Drilled By: | T. Tindall |
| Engineer: | J. B. Barry and Partners Limited | Borehole Diameter: | 200mm | Status: | FINAL |

| Depth (m) | | Stratum Description | Legend | Level (mOD) | | Samples and Insitu Tests | | | Water Strike | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| Scale | Depth | | | Scale | Depth | Depth | Type | Result | | |
| 0.5 | | Firm brown sandy slightly gravelly silty CLAY with low cobble content. | | -0.5 | | 0.50 | B | TT09 | | |
| 1.0 | | | | -1.0 | | 1.00 | C | N=13 (2,2/3,3,3,4) | | |
| 1.5 | | | | -1.5 | | 1.50 | B | TT10 | | |
| 2.0 | | | | -2.0 | | 2.00 | C | N=15 (3,4/3,4,4,4) | | |
| 2.5 | 2.60 | | | -2.5 | | 2.50 | B | TT11 | | |
| 3.0 | | Stiff black slightly sandy gravelly silty CLAY with low cobble content. | | -3.0 | | 3.00 | C | N=29 (4,4/6,7,7,9) | | |
| 3.5 | | | | -3.5 | | 3.50 | B | TT12 | | |
| 4.0 | | | | -4.0 | | 4.00 | C | N=34 (5,5/5,8,10,11) | | |
| 4.5 | | | | -4.5 | | 4.50 | B | TT13 | | |
| 5.0 | | | | -5.0 | | 5.00 | C | N=41 (7,8/8,11,13,9) | | |
| 5.5 | | | | -5.5 | | 5.50 | B | TT14 | | |
| 6.0 | | | | -6.0 | | 6.00 | C | N=50 (6,9/50 for 275mm) | | |
| 6.5 | | | | -6.5 | | 6.50 | B | TT15 | | |
| 7.0 | 6.80<br>6.90 | Obstruction - possible boulder.<br>End of Borehole at 6.90m | | -7.0 | | 6.90 | C | 50 (25 for 5mm/50 for 10mm) | | |
| 7.5 | | | | -7.5 | | | | | | |
| 8.0 | | | | -8.0 | | | | | | |
| 8.5 | | | | -8.5 | | | | | | |
| 9.0 | | | | -9.0 | | | | | | |
| 9.5 | | | | -9.5 | | | | | | |

| Chiselling: | | | Water Strikes: | | | Water Details: | | | Installation: | | | Backfill: | | | Remarks: | Legend: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| From: | To: | Time: | Strike: | Rose: | Depth Sealed | Date: | Hole Depth: | Water Depth: | From: | To: | Pipe: | From: | To: | Type: | | B: Bulk<br>D: Disturbed<br>U: Undisturbed<br>ES: Environmental<br>W: Water<br>C: Cone SPT<br>S: Split spoon SPT |
| 6.80 | 6.90 | 01:00 | | | | 12/06 | 6.90 | Dry | | | | 0.00 | 6.90 | Arisings | Borehole terminated due to obstruction. | |

| Contract No: 5490 | **Cable Percussion Borehole Log** | | | Borehole No: **BH04** |
|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date Started: | 11/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Date Completed: | 11/06/2018 |
| Client: | Durkan Residential | Elevation: | | Drilled By: | T. Tindall |
| Engineer: | J. B. Barry and Partners Limited | Borehole Diameter: | 200mm | Status: | FINAL |

| Depth (m) Scale | Depth | Stratum Description | Legend | Level (mOD) Scale | Depth | Samples and Insitu Tests Depth | Type | Result | Water Strike | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.10 | TOPSOIL. | | | | | | | | |
| 0.5 | | Firm brown sandy slightly gravelly silty CLAY with low cobble content. | | -0.5 | | 0.50 | B | TT01 | | |
| 1.0 | | | | -1.0 | | 1.00 | C | N=13 (3,3/4,3,3,3) | | |
| 1.5 | | | | -1.5 | | 1.50 | B | TT02 | | |
| | 1.70 | | | | | | | | | |
| 2.0 | | Stiff black slightly sandy gravelly silty CLAY with low cobble content. | | -2.0 | | 2.00 | C | N=22 (4,5/5,5,6,6) | | |
| 2.5 | | | | -2.5 | | 2.50 | B | TT03 | | |
| 3.0 | | | | -3.0 | | 3.00 | C | N=20 (4,4/5,5,5,5) | | |
| 3.5 | | | | -3.5 | | 3.50 | B | TT04 | | |
| 4.0 | | | | -4.0 | | 4.00 | C | N=21 (4,5/4,6,5,6) | | |
| 4.5 | | | | -4.5 | | 4.50 | B | TT05 | | |
| 5.0 | | | | -5.0 | | 5.00 | C | N=22 (3,4/4,7,5,6) | | |
| 5.5 | | | | -5.5 | | 5.50 | B | TT06 | | |
| 6.0 | | | | -6.0 | | 6.00 | C | N=18 (4,4/4,4,5,5) | | |
| 6.5 | | | | -6.5 | | 6.50 | B | TT07 | | |
| 7.0 | | | | -7.0 | | 7.00 | C | N=18 (4,6/4,5,4,5) | | |
| 7.5 | | | | -7.5 | | 7.50 | B | TT08 | | |
| 8.0 | | | | -8.0 | | 8.00 | C | 50 (11,14/50 for 10mm) | | |
| | 8.20 | | | | | | | | | |
| | 8.30 | Obstruction - possible boulder. | | | | 8.30 | C | 50 (25 for 5mm/50 for 10mm) | | |
| 8.5 | | End of Borehole at 8.30m | | -8.5 | | | | | | |
| 9.0 | | | | -9.0 | | | | | | |
| 9.5 | | | | -9.5 | | | | | | |

| Chiselling: From: | To: | Time: | Water Strikes: Strike: | Rose: | Depth Sealed | Water Details: Date: | Hole Depth: | Water Depth: | Installation: From: | To: | Pipe: | Backfill: From: | To: | Type: | Remarks: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8.20 | 8.30 | 01:00 | | | | 11/06 | 8.30 | Dry | | | | 0.00 | 8.30 | Arisings | Borehole terminated due to obstruction. |

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

# Appendix 2
# Trial Pit Logs and Photographs

| Contract No: 5490 | **Trial Pit Log** | | | | Trial Pit No: **TP01** |
|---|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date: | 05/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Excavator: | JCB 3CX |
| Client: | Durkan Residential | Elevation: | | Logged By: | M. Kaliski |
| Engineer: | J. B. Barry and Partners Limited | Dimensions (LxWxD) (m): | 3.00 x 0.60 x 3.00 | Status: | FINAL |

| Level (mbgl) | | Stratum Description | Legend | Level (mOD) | | Samples / Field Tests | | | Water Strike |
|---|---|---|---|---|---|---|---|---|---|
| Scale: | Depth | | | Scale: | Depth: | Depth | Type | Result | |
| 0.5 | | Firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. | | -0.5 | | | | | |
| 1.0 | | | | -1.0 | | 1.00 | B | PM01 | |
| 1.5 | | | | -1.5 | | | | | |
| | 1.80 | | | | | | | | |
| 2.0 | | Stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | -2.0 | | 2.00 | B | PM02 | |
| 2.5 | | | | -2.5 | | | | | |
| | 3.00 | **Pit terminated at 3.00m** | | | | | | | |

| Termination: | Pit Wall Stability: | Groundwater Rate: | Remarks: | Key: |
|---|---|---|---|---|
| Scheduled depth. | Pit walls stable. | Dry | Plate test completed at 0.75m. | B = Bulk disturbed<br>D = Small disturbed<br>CBR = Undisturbed CBR<br>ES = Environmental |

| Contract No: 5490 | **Trial Pit Log** | | | | Trial Pit No: **TP02** |
|---|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date: | 05/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Excavator: | JCB 3CX |
| Client: | Durkan Residential | Elevation: | | Logged By: | M. Kaliski |
| Engineer: | J. B. Barry and Partners Limited | Dimensions (LxWxD) (m): | 3.00 x 0.60 x 3.00 | Status: | FINAL |

| Level (mbgl) Scale: | Depth | Stratum Description | Legend | Level (mOD) Scale: | Depth: | Samples / Field Tests Depth | Type | Result | Water Strike |
|---|---|---|---|---|---|---|---|---|---|
| | | TOPSOIL. | | | | | | | |
| | 0.20 | Firm brown slightly sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | | | | | | |
| 0.5 | | | | -0.5 | | | | | |
| 1.0 | | | | -1.0 | | 1.00 | B | PM11 | |
| 1.5 | | | | -1.5 | | | | | |
| | 1.80 | Stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | | | | | | |
| 2.0 | | | | -2.0 | | 2.00 | B | PM12 | |
| 2.5 | | | | -2.5 | | | | | |
| | 3.00 | **Pit terminated at 3.00m** | | | | | | | |

| Termination: | Pit Wall Stability: | Groundwater Rate: | Remarks: | Key: |
|---|---|---|---|---|
| Scheduled depth. | Pit walls stable. | Dry | Plate test completed at 0.75m. | B = Bulk disturbed<br>D = Small disturbed<br>CBR = Undisturbed CBR<br>ES = Environmental |

| Contract No: 5490 | **Trial Pit Log** | | | | Trial Pit No: **TP03** |
|---|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date: | 05/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Excavator: | JCB 3CX |
| Client: | Durkan Residential | Elevation: | | Logged By: | M. Kaliski |
| Engineer: | J. B. Barry and Partners Limited | Dimensions (LxWxD) (m): | 3.00 x 0.60 x 3.00 | Status: | FINAL |

| Level (mbgl) Scale: | Depth | Stratum Description | Legend | Level (mOD) Scale: | Depth: | Samples / Field Tests Depth | Type | Result | Water Strike |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | | Firm brown slightly sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | -0.5 | | | | | |
| 1.0 | | | | -1.0 | | 1.00 | B | PM09 | |
| 1.5 | | | | -1.5 | | | | | |
| | 1.90 | | | | | | | | |
| 2.0 | | Stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | -2.0 | | 2.00 | B | PM10 | |
| 2.5 | | | | -2.5 | | | | | |
| | 3.00 | **Pit terminated at 3.00m** | | | | | | | |

| Termination: | Pit Wall Stability: | Groundwater Rate: | Remarks: | Key: |
|---|---|---|---|---|
| Scheduled depth. | Pit walls stable. | Dry | Plate test completed at 0.75m. | B = Bulk disturbed<br>D = Small disturbed<br>CBR = Undisturbed CBR<br>ES = Environmental |

| Contract No: 5490 | **Trial Pit Log** | | | | Trial Pit No: **TP04** |
|---|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date: | 05/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Excavator: | JCB 3CX |
| Client: | Durkan Residential | Elevation: | | Logged By: | M. Kaliski |
| Engineer: | J. B. Barry and Partners Limited | Dimensions (LxWxD) (m): | 3.00 x 0.60 x 3.00 | Status: | FINAL |

| Level (mbgl) Scale: | Depth | Stratum Description | Legend | Level (mOD) Scale: | Depth: | Samples / Field Tests Depth | Type | Result | Water Strike |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | | MADE GROUND: brown black slightly sandy slightly gravelly silty CLAY with trace of red brick. | | -0.5 | | | | | |
| 1.0 | | | | -1.0 | | | | | |
| | 1.10 | Firm brown slightly sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | | | | | | |
| 1.5 | | | | -1.5 | | 1.50 | B | PM07 | |
| 2.0 | | | | -2.0 | | | | | |
| 2.5 | 2.50 | Stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | -2.5 | | 2.50 | B | PM08 | |
| | 3.00 | **Pit terminated at 3.00m** | | | | | | | |

| Termination: | Pit Wall Stability: | Groundwater Rate: | Remarks: | Key: |
|---|---|---|---|---|
| Scheduled depth. | Pit walls stable. | Dry | Plate test completed at 0.75m. | B = Bulk disturbed<br>D = Small disturbed<br>CBR = Undisturbed CBR<br>ES = Environmental |

| Contract No: 5490 | **Trial Pit Log** | | | | Trial Pit No: **TP05** |
|---|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date: | 05/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Excavator: | JCB 3CX |
| Client: | Durkan Residential | Elevation: | | Logged By: | M. Kaliski |
| Engineer: | J. B. Barry and Partners Limited | Dimensions (LxWxD) (m): | 3.00 x 0.60 x 3.00 | Status: | FINAL |

| Level (mbgl) Scale: | Depth | Stratum Description | Legend | Level (mOD) Scale: | Depth: | Samples / Field Tests Depth | Type | Result | Water Strike |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | | Firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. | | -0.5 | | | | | |
| 1.0 | | | | -1.0 | | 1.00 | B | PM05 | |
| 1.5 | | | | -1.5 | | | | | |
| 2.0 | | | | -2.0 | | | | | |
| | 2.30 | | | | | | | | |
| 2.5 | | Stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | -2.5 | | 2.50 | B | PM06 | |
| | 3.00 | **Pit terminated at 3.00m** | | | | | | | |

| Termination: | Pit Wall Stability: | Groundwater Rate: | Remarks: | Key: |
|---|---|---|---|---|
| Scheduled depth. | Pit walls stable. | Dry | Plate test completed at 0.75m. | B = Bulk disturbed<br>D = Small disturbed<br>CBR = Undisturbed CBR<br>ES = Environmental |

| Contract No: 5490 | **Trial Pit Log** | | | | Trial Pit No: **TP06** |
|---|---|---|---|---|---|
| Contract: | Portmarnock South Phase 1B | Easting: | | Date: | 05/06/2018 |
| Location: | Portmarnock, Co. Dublin | Northing: | | Excavator: | JCB 3CX |
| Client: | Durkan Residential | Elevation: | | Logged By: | M. Kaliski |
| Engineer: | J. B. Barry and Partners Limited | Dimensions (LxWxD) (m): | 3.00 x 0.60 x 3.00 | Status: | FINAL |

| Level (mbgl) Scale: | Depth | Stratum Description | Legend | Level (mOD) Scale: | Depth: | Samples / Field Tests Depth | Type | Result | Water Strike |
|---|---|---|---|---|---|---|---|---|---|
| | | TOPSOIL. | | | | | | | |
| | 0.40 | | | | | | | | |
| 0.5 | | Firm brown slightly sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | -0.5 | | | | | |
| 1.0 | | | | -1.0 | | 1.00 | B | PM03 | |
| 1.5 | | | | -1.5 | | | | | |
| | 1.80 | | | | | | | | |
| 2.0 | | Stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm diameter). | | -2.0 | | 2.00 | B | PM04 | |
| 2.5 | | | | -2.5 | | | | | |
| | 3.00 | **Pit terminated at 3.00m** | | | | | | | |

| Termination: | Pit Wall Stability: | Groundwater Rate: | Remarks: | Key: |
|---|---|---|---|---|
| Scheduled depth. | Pit walls stable. | Dry | - | B = Bulk disturbed<br>D = Small disturbed<br>CBR = Undisturbed CBR<br>ES = Environmental |

**TP01 Pit**

**TP01 Sidewall**

**TP01 Spoil**

**TP02 Pit**

**TP02 Sidewall**

**TP02 Spoil**

**TP03 Pit**

**TP03 Sidewall**

**TP03 Spoil**


**TP04 Pit**

**TP04 Sidewall**

**TP04 Spoil**

**TP05 Pit**

**TP05 Sidewall**

**TP05 Spoil**

**TP06 Pit**

## TP06 Sidewall

## TP06 Spoil

# Appendix 3
# Plate Test Results

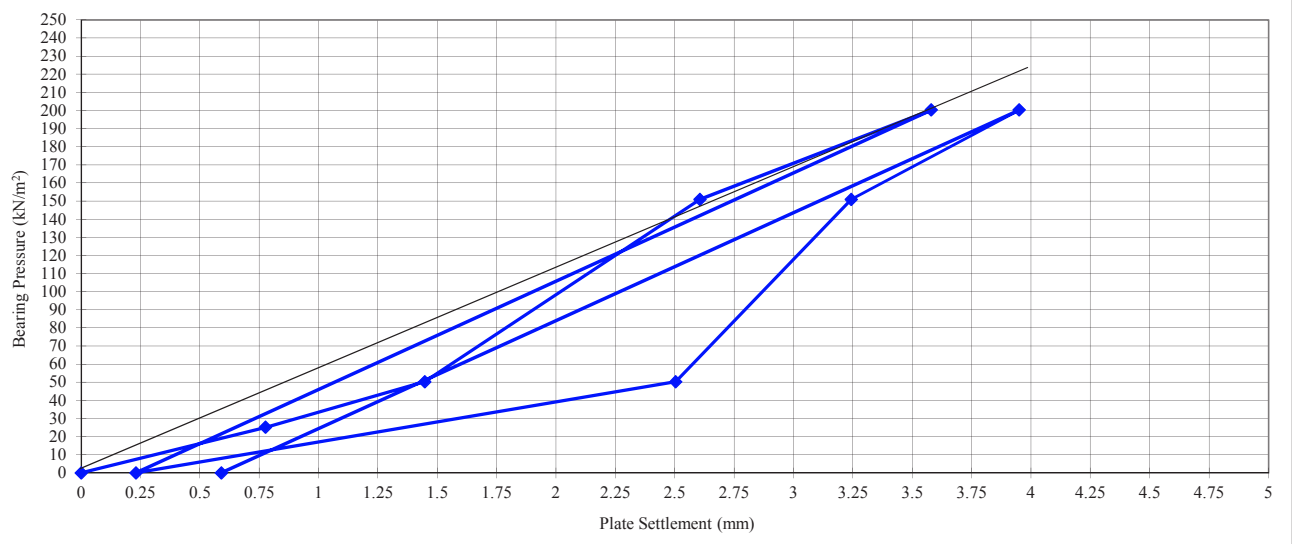
# Plate Bearing Test in accordance with BS 1377: Part 9 and Part 2 HD 25/94

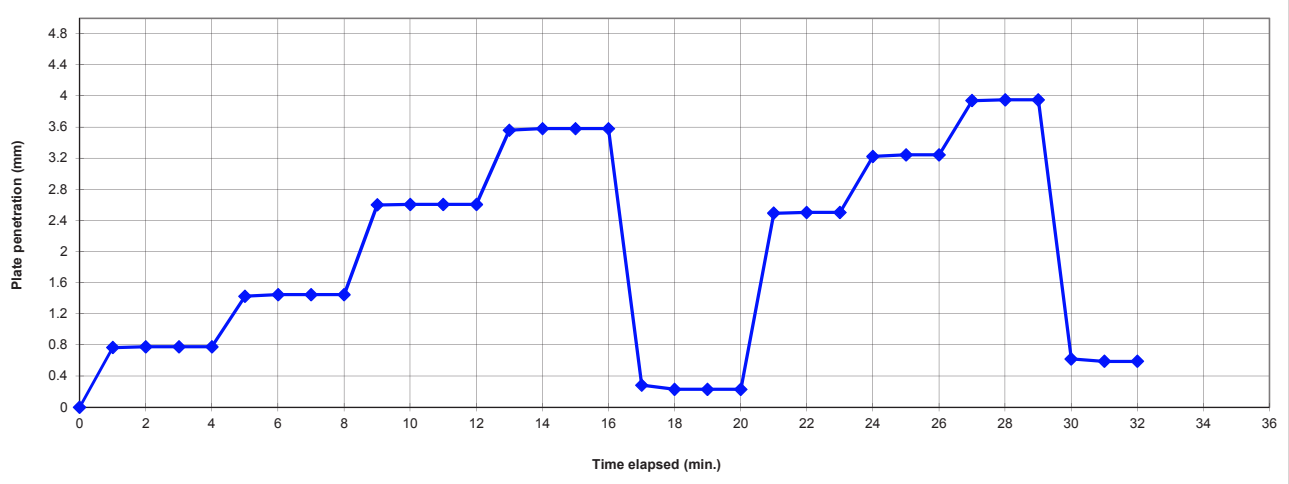
Site Investigations Ltd., Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Tel: 01 6108768 Email:siltd@indigo.ie

| | |
|---|---|
| Client | D RES Developments Ltd. |
| Site | St. Marnock's, Portmarnock, Co. Dublin |
| Date | 05-Jun-18 |
| Location: | CBR01 @ TP01 |
| *Plate Diameter:* | *600mm* |
| *Type of reaction Load* | *20 tonne excavator* |
| *Material Type:* | *slightly sandy slightly gravelly silty CLAY* |
| *Depth test carried out:* | *0.75m BGL* |
| *CBR value is as per specification for 762mm Plate* | |

| | |
|---|---|
| 1.25mm settlement (graph) for 762mm Plate (kPa) | **71** |
| Equivalent CBR Value-Initial loading (%) | **11.8** |
| Mod. of subgrade Reaction k for 600mm Plate(kPa) | **60** |
| Correction factor for 600mm Plate | **0.85** |

| Pressure Stages | Bearing Pressure ($kN/m^2$) | Plate Settlement (mm) |
|---|---|---|
| Initial | 0.0 | 0.00 |
| | 25 | 0.78 |
| | 50 | 1.45 |
| | 151 | 2.61 |
| | 200 | 3.58 |
| | 0.0 | 0.23 |
| Reload | 50 | 2.50 |
| | 151 | 3.24 |
| | 200 | 3.95 |
| Final Condition | 0.0 | 0.59 |




06/06/2018

Site Investigatins Ltd.

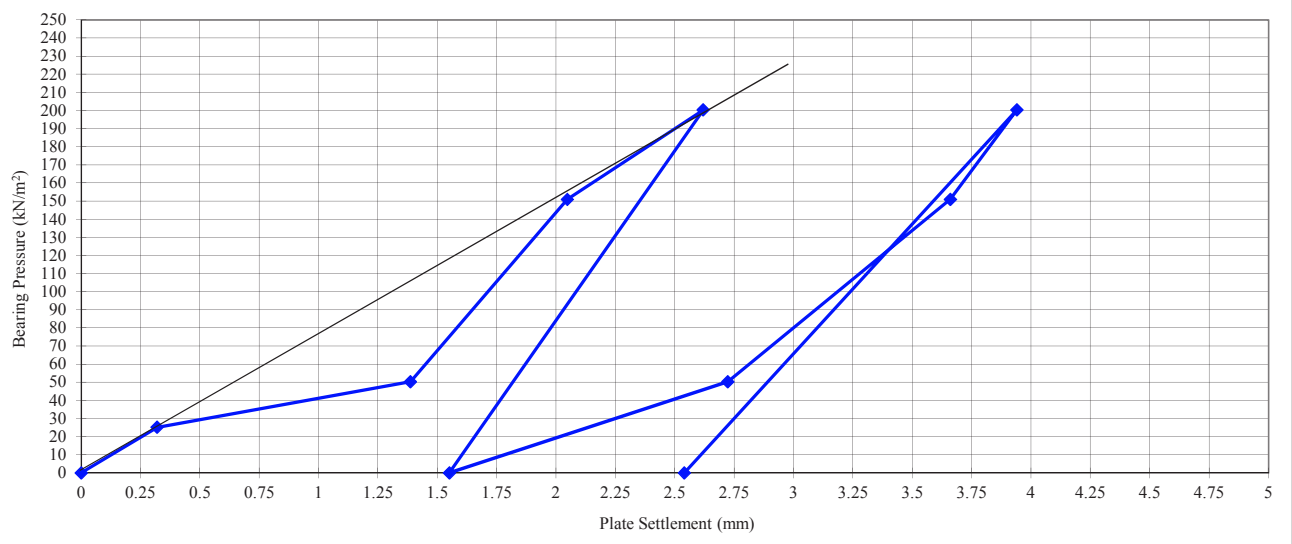
# Plate Bearing Test in accordance with BS 1377: Part 9 and Part 2 HD 25/94

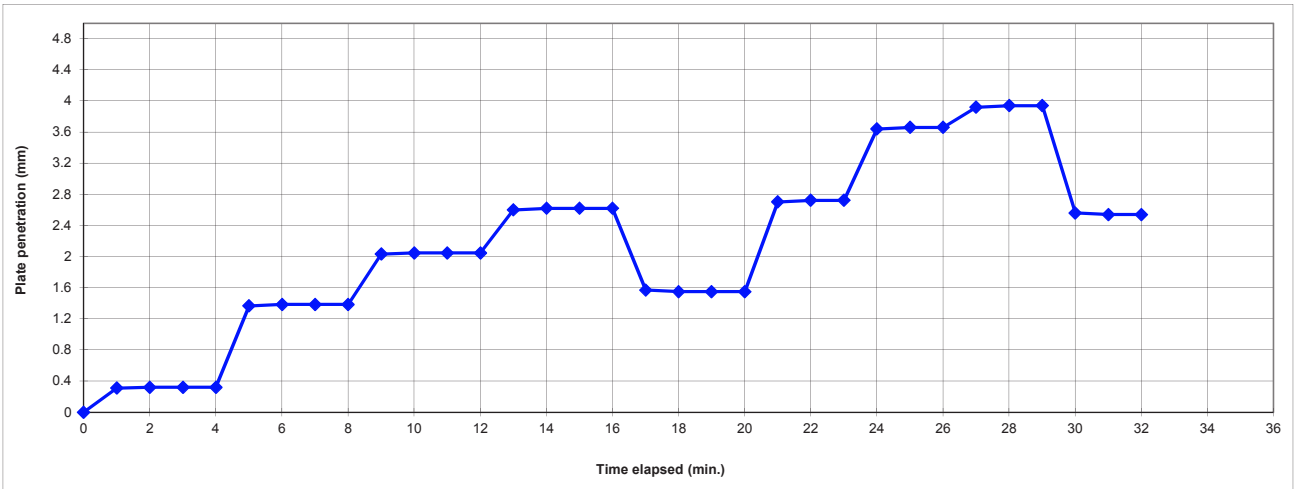
Site Investigations Ltd., Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Tel: 01 6108768 Email:siltd@indigo.ie

| | |
|---|---|
| Client | D RES Developments Ltd. |
| Site | St. Marnock's, Portmarnock, Co. Dublin |
| Date | 05-Jun-18 |
| Location: | CBR02 @ TP02 |
| *Plate Diameter:* | *600mm* |
| *Type of reaction Load* | *20 tonne excavator* |
| *Material Type:* | *slightly sandy slightly gravelly silty CLAY* |
| *Depth test carried out:* | *0.75m BGL* |
| *CBR value is as per specification for 762mm Plate* | |

| | |
|---|---|
| 1.25mm settlement (graph) for 762mm Plate (kPa) | **95** |
| Equivalent CBR Value-Initial loading (%) | **19.5** |
| Mod. of subgrade Reaction k for 600mm Plate(kPa) | **81** |
| Correction factor for 600mm Plate | **0.85** |

| Pressure Stages | Bearing Pressure ($kN/m^2$) | Plate Settlement (mm) |
|---|---|---|
| Initial | 0.0 | 0.00 |
| | 25 | 0.32 |
| | 50 | 1.39 |
| | 151 | 2.05 |
| | 200 | 2.62 |
| | 0.0 | 1.55 |
| Reload | 50 | 2.72 |
| | 151 | 3.66 |
| | 200 | 3.94 |
| Final Condition | 0.0 | 2.54 |




06/06/2018

Site Investigatins Ltd.

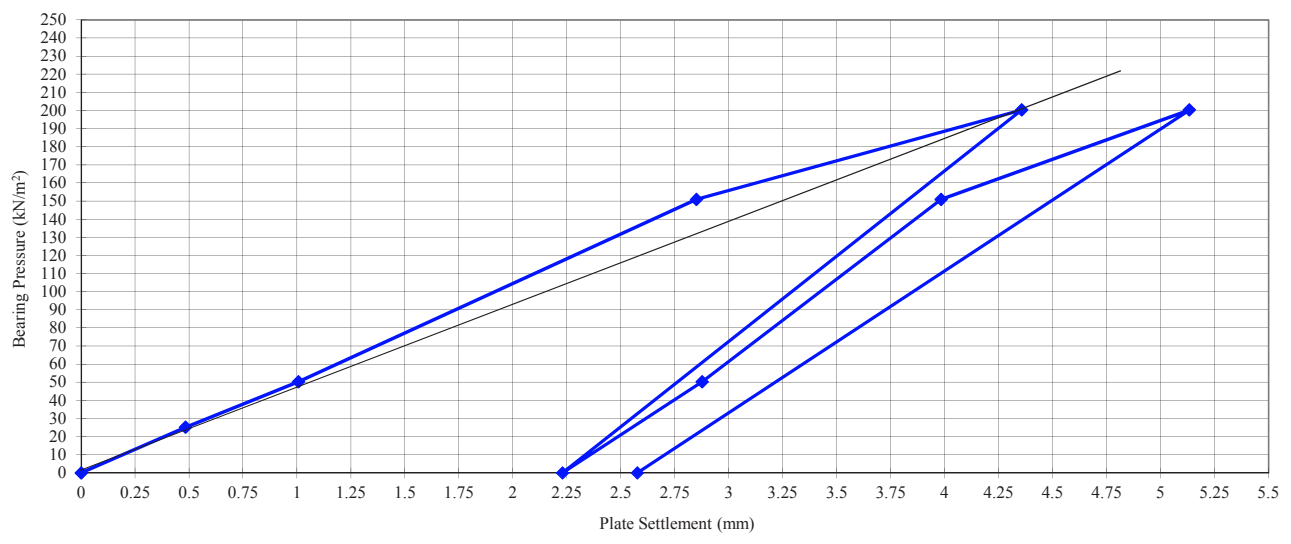
## Plate Bearing Test in accordance with BS 1377: Part 9 and Part 2 HD 25/94

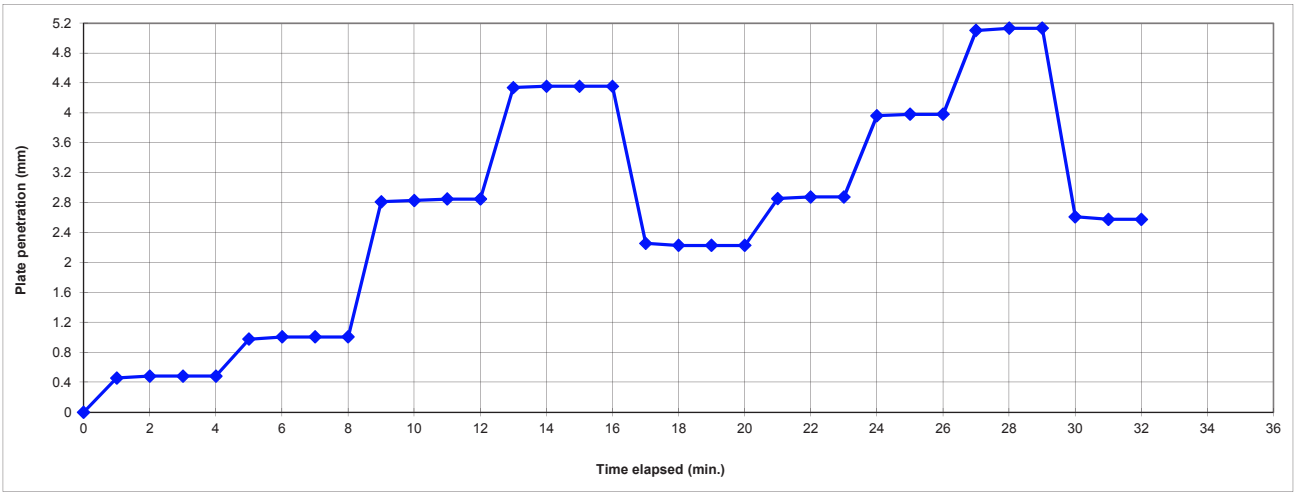
Site Investigations Ltd., Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Tel: 01 6108768 Email:siltd@indigo.ie

| | |
|---|---|
| Client | D RES Developments Ltd. |
| Site | St. Marnock's, Portmarnock, Co. Dublin |
| Date | 06-Jun-18 |
| Location: | CBR03 @ TP03 |
| *Plate Diameter:* | *600mm* |
| *Type of reaction Load* | *20 tonne excavator* |
| *Material Type:* | *slightly sandy slightly gravelly silty CLAY* |
| *Depth test carried out:* | *0.75m BGL* |
| *CBR value is as per specification for 762mm Plate* | |

| | |
|---|---|
| 1.25mm settlement (graph) for 762mm Plate (kPa) | **58** |
| Equivalent CBR Value-Initial loading (%) | **8.3** |
| Mod. of subgrade Reaction k for 600mm Plate(kPa) | **49** |
| Correction factor for 600mm Plate | **0.85** |

| Pressure Stages | Bearing Pressure ($kN/m^2$) | Plate Settlement (mm) |
|---|---|---|
| Initial | 0.0 | 0.00 |
| | 25 | 0.48 |
| | 50 | 1.01 |
| | 151 | 2.85 |
| | 200 | 4.36 |
| | 0.0 | 2.23 |
| Reload | 50 | 2.88 |
| | 151 | 3.98 |
| | 200 | 5.13 |
| Final Condition | 0.0 | 2.58 |




06/06/2018

Site Investigatins Ltd.

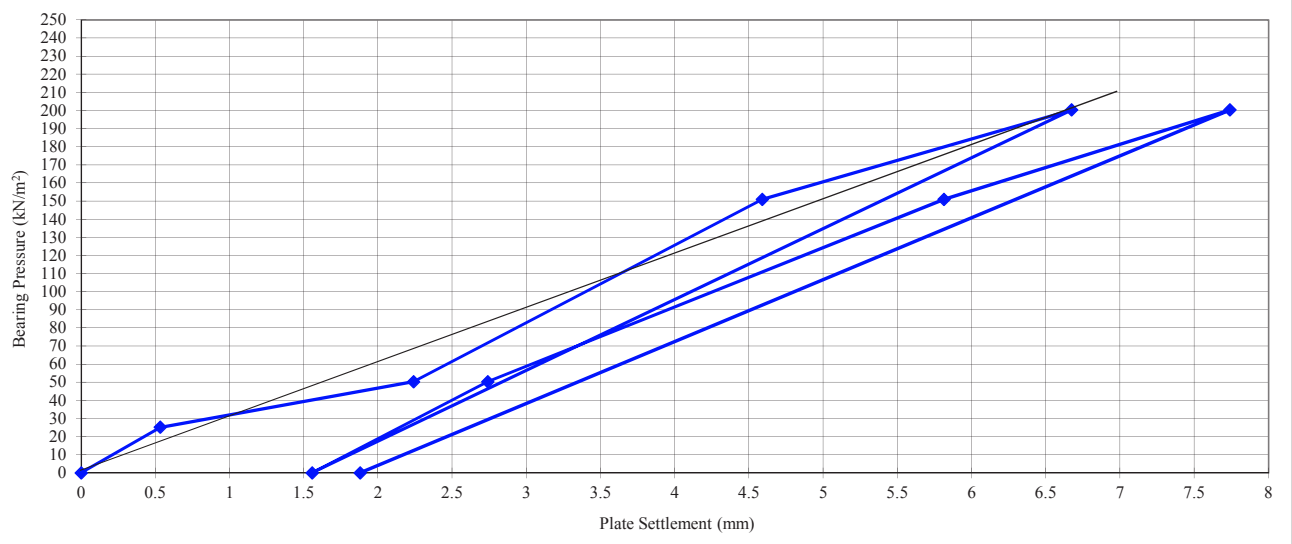
# Plate Bearing Test in accordance with BS 1377: Part 9 and Part 2 HD 25/94

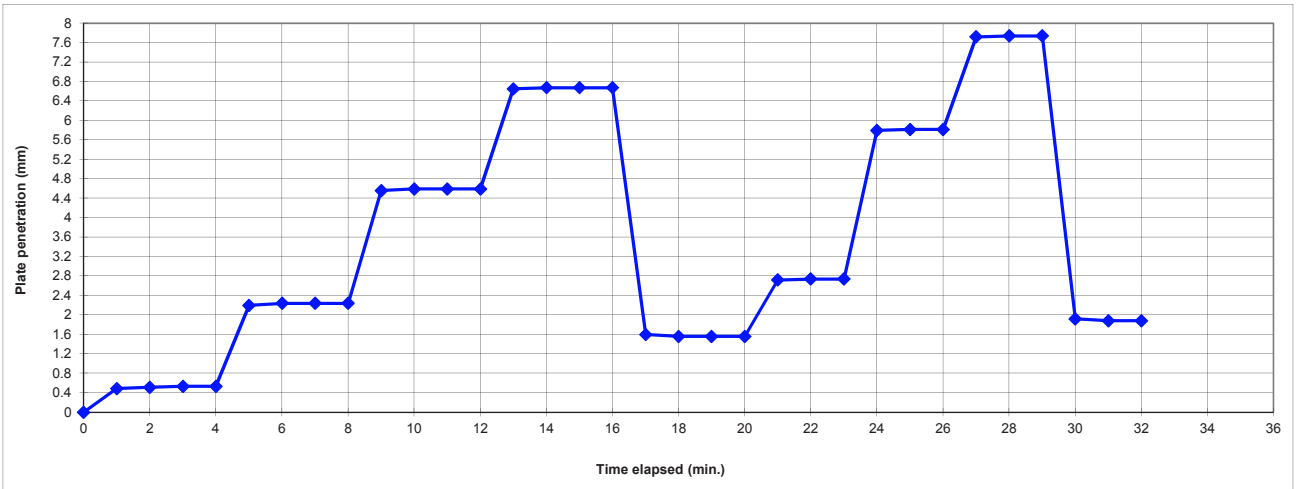
Site Investigations Ltd., Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Tel: 01 6108768 Email:siltd@indigo.ie

| | |
|---|---|
| Client | D RES Developments Ltd. |
| Site | St. Marnock's, Portmarnock, Co. Dublin |
| Date | 05-Jun-18 |
| Location: | CBR04 @ TP04 |
| *Plate Diameter:* | *600mm* |
| *Type of reaction Load* | *20 tonne excavator* |
| *Material Type:* | *MADE GROUND: slightly sandy slightly gravelly silty CLAY with some red brick* |
| *Depth test carried out:* | *0.75m BGL* |
| *CBR value is as per specification for 762mm Plate* | |

| | |
|---|---|
| 1.25mm settlement (graph) for 762mm Plate (kPa) | **39** |
| Equivalent CBR Value-Initial loading (%) | **4.2** |
| Mod. of subgrade Reaction k for 600mm Plate(kPa) | **33** |
| Correction factor for 600mm Plate | **0.85** |

| Pressure Stages | Bearing Pressure ($kN/m^2$) | Plate Settlement (mm) |
|---|---|---|
| Initial | 0.0 | 0.00 |
| | 25 | 0.53 |
| | 50 | 2.24 |
| | 151 | 4.59 |
| | 200 | 6.67 |
| | 0.0 | 1.56 |
| Reload | 50 | 2.74 |
| | 151 | 5.81 |
| | 200 | 7.74 |
| Final Condition | 0.0 | 1.88 |




06/06/2018

Site Investigatins Ltd.

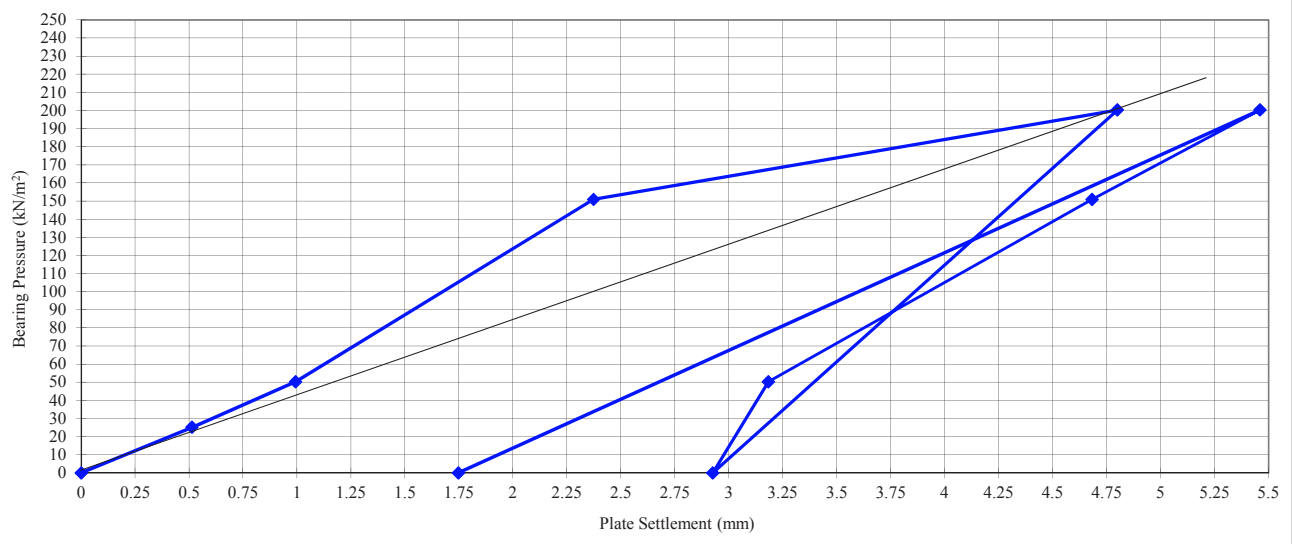
## Plate Bearing Test in accordance with BS 1377: Part 9 and Part 2 HD 25/94

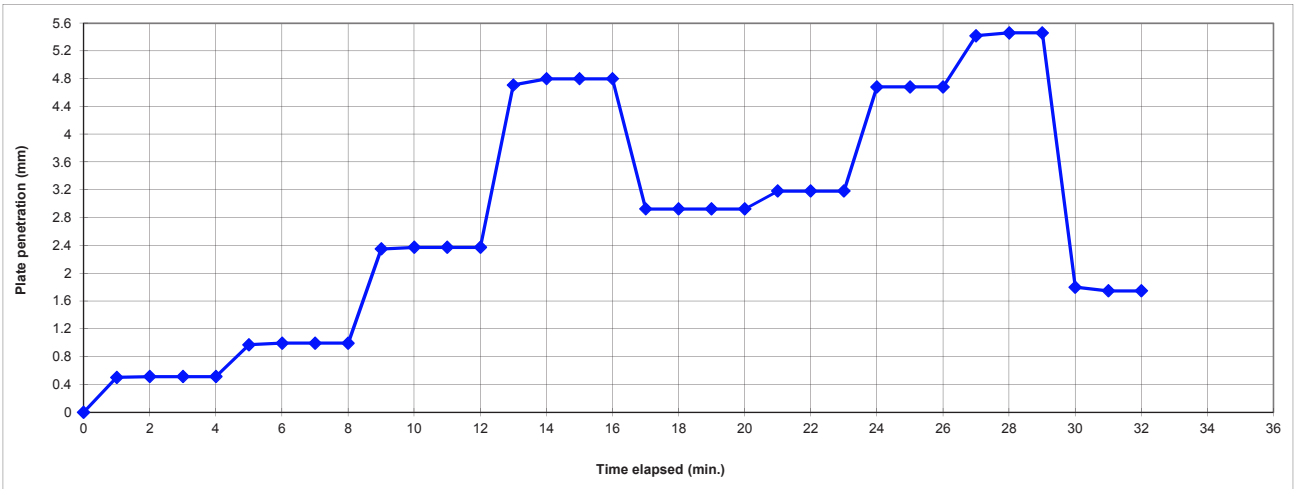
Site Investigations Ltd., Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Tel: 01 6108768 Email:siltd@indigo.ie

| | | |
|---|---|---|
| Client | D RES Developments Ltd. | |
| Site | St. Marnock's, Portmarnock, Co. Dublin | |
| Date | 06-Jun-18 | |
| Location: | CBR05 @ TP05 | |
| *Plate Diameter:* | | *600mm* |
| *Type of reaction Load* | | *20 tonne excavator* |
| *Material Type:* | *slightly sandy slightly gravelly silty CLAY* | |
| *Depth test carried out:* | | *0.75m BGL* |
| *CBR value is as per specification for 762mm Plate* | | |

| | |
|---|---|
| 1.25mm settlement (graph) for 762mm Plate (kPa) | **52** |
| Equivalent CBR Value-Initial loading (%) | **6.9** |
| Mod. of subgrade Reaction k for 600mm Plate(kPa) | **44** |
| Correction factor for 600mm Plate | **0.85** |

| Pressure Stages | Bearing Pressure ($kN/m^2$) | Plate Settlement (mm) |
|---|---|---|
| Initial | 0.0 | 0.00 |
| | 25 | 0.51 |
| | 50 | 0.99 |
| | 151 | 2.37 |
| | 200 | 4.80 |
| | 0.0 | 2.93 |
| Reload | 50 | 3.18 |
| | 151 | 4.68 |
| | 200 | 5.46 |
| Final Condition | 0.0 | 1.75 |




06/06/2018

Site Investigatins Ltd.

# Appendix 4
# Soakaway Test Results

# SOAKAWAY TEST

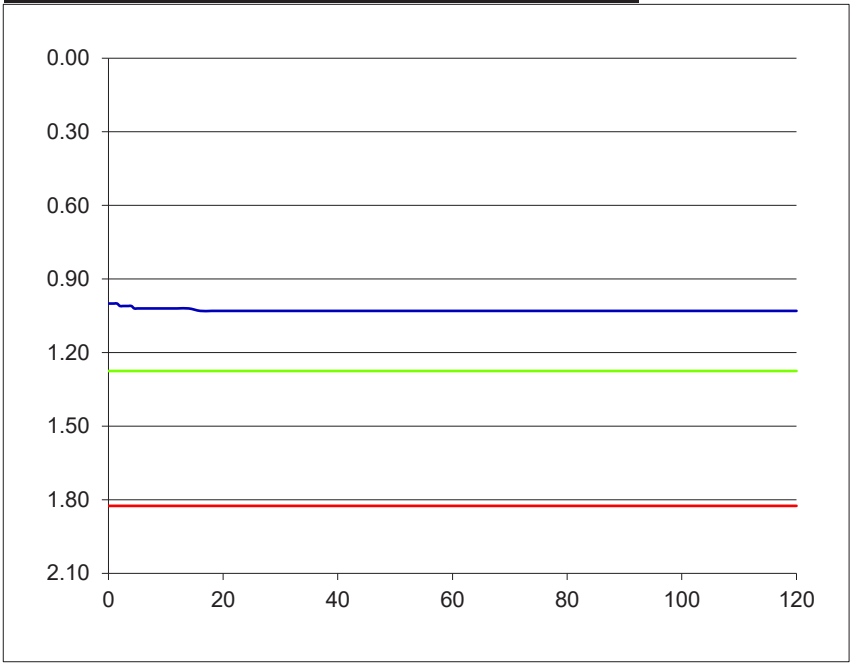
| | |
|---|---|
| **Project Reference:** | 5490 |
| **Contract name:** | Portmarnock South - Phase 1B |
| **Location:** | Portmarnock, Co. Dublin |
| **Test No:** | PT01 |
| **Date:** | 05/06/2018 |

**Ground Conditions**

| From | To | |
|---|---|---|
| 0.00 | 1.10 | MADE GROUND: brown black slightly sandy slightly gravelly silty clay with trace of red brick. |
| 1.10 | 2.10 | Firm brown slightly sandy slightly gravelly silty CLAY with low cobble and boulder content. |

| Elapsed Time (mins) | Fall of Water (m) |
|---|---|
| 0 | 1.00 |
| 0.5 | 1.00 |
| 1 | 1.00 |
| 1.5 | 1.00 |
| 2 | 1.01 |
| 2.5 | 1.01 |
| 3 | 1.01 |
| 3.5 | 1.01 |
| 4 | 1.01 |
| 4.5 | 1.02 |
| 5 | 1.02 |
| 6 | 1.02 |
| 7 | 1.02 |
| 8 | 1.02 |
| 9 | 1.02 |
| 10 | 1.02 |
| 12 | 1.02 |
| 14 | 1.02 |
| 16 | 1.03 |
| 18 | 1.03 |
| 20 | 1.03 |
| 25 | 1.03 |
| 30 | 1.03 |
| 40 | 1.03 |
| 50 | 1.03 |
| 60 | 1.03 |
| 75 | 1.03 |
| 90 | 1.03 |
| 120 | 1.03 |

| **Pit Dimensions (m)** | | |
|---|---|---|
| Length (m) | 2.00 | m |
| Width (m) | 0.40 | m |
| Depth | 2.10 | m |
| **Water** | | |
| Start Depth of Water | 1.00 | m |
| Depth of Water | 1.10 | m |
| 75% Full | 1.275 | m |
| 25% Full | 1.825 | m |
| 75%-25% | 0.55 | m |
| Volume of water (75%-25%) | **0.44** | m3 |
| Area of Drainage | **10.08** | m2 |
| Area of Drainage (75%-25%) | **3.44** | m2 |
| Time | | |
| 75% Full | N/A | min |
| 25% Full | N/A | min |
| Time 75% to 25% | **N/A** | min |
| Time 75% to 25% (sec) | **N/A** | sec |




**f =** **Fail** m/min or **Fail** m/s

# SOAKAWAY TEST

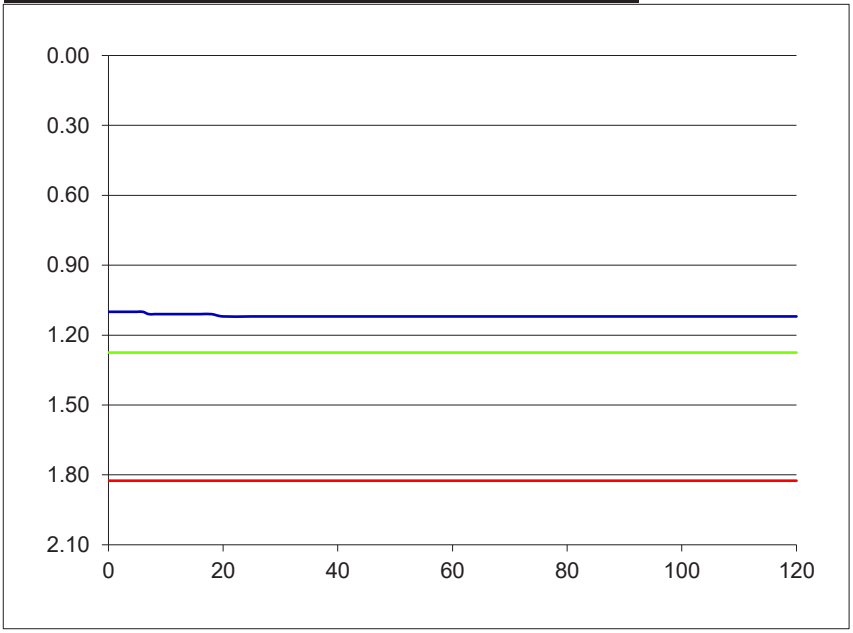
| | |
|---|---|
| **Project Reference:** | 5490 |
| **Contract name:** | Portmarnock South - Phase 1B |
| **Location:** | Portmarnock, Co. Dublin |
| **Test No:** | PT02 |
| **Date:** | 05/06/2018 |

**Ground Conditions**

| From | To | |
|---|---|---|
| 0.00 | 0.10 | TOPSOIL. |
| 0.10 | 1.70 | Firm brown sandy slightly gravelly silty CLAY with low cobble and boulder content. |
| 1.70 | 2.10 | Stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content. |

| Elapsed Time (mins) | Fall of Water (m) |
|---|---|
| 0 | 1.10 |
| 0.5 | 1.10 |
| 1 | 1.10 |
| 1.5 | 1.10 |
| 2 | 1.10 |
| 2.5 | 1.10 |
| 3 | 1.10 |
| 3.5 | 1.10 |
| 4 | 1.10 |
| 4.5 | 1.10 |
| 5 | 1.10 |
| 6 | 1.10 |
| 7 | 1.11 |
| 8 | 1.11 |
| 9 | 1.11 |
| 10 | 1.11 |
| 12 | 1.11 |
| 14 | 1.11 |
| 16 | 1.11 |
| 18 | 1.11 |
| 20 | 1.12 |
| 25 | 1.12 |
| 30 | 1.12 |
| 40 | 1.12 |
| 50 | 1.12 |
| 60 | 1.12 |
| 75 | 1.12 |
| 90 | 1.12 |
| 120 | 1.12 |

| **Pit Dimensions (m)** | | |
|---|---|---|
| Length (m) | 2.20 | m |
| Width (m) | 0.40 | m |
| Depth | 2.10 | m |
| **Water** | | |
| Start Depth of Water | 1.00 | m |
| Depth of Water | 1.10 | m |
| 75% Full | 1.275 | m |
| 25% Full | 1.825 | m |
| 75%-25% | 0.55 | m |
| Volume of water (75%-25%) | **0.484** | m3 |
| Area of Drainage | **10.92** | m2 |
| Area of Drainage (75%-25%) | **3.74** | m2 |
| Time | | |
| 75% Full | N/A | min |
| 25% Full | N/A | min |
| Time 75% to 25% | **N/A** | min |
| Time 75% to 25% (sec) | **N/A** | sec |




**f =** **Fail** **m/min** or **Fail** **m/s**

# Appendix 5
# Laboratory Test Results

# Classification Tests

| | |
|---|---|
| Client | Durkan Residential |
| Site | Portmarnock South - Phase 1B |
| S.I. File No | 5490 / 18 |
| Test Lab | Site Investigations Ltd, Carhugar, The Grange, 12th Lock Rd, Lucan, Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie |
| Report Date | 21st June 2018 |

| Hole ID | Depth | Sample No | Lab Ref No. | Sample Type | Natural Moisture Content % | Liquid Limit % | Plastic Limit % | Max. Dry Density $Mg/m^3$ | Min. Dry Density $Mg/m^3$ | Particle Density $Mg/m^3$ | % passing 425um | Comments | **Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP01 | 1.00 | PM01 | 18/351 | B | 17.5 | 32 | 21 | | | | 54.0 | | CL |
| TP03 | 1.00 | PM09 | 18/352 | B | 16.4 | 30 | 22 | | | | 56.8 | | CL |
| TP05 | 1.00 | PM05 | 18/353 | B | 15.2 | 34 | 23 | | | | 62.2 | | CL |
| TP06 | 1.00 | PM03 | 18/354 | B | 14.8 | 28 | 19 | | | | 63.7 | | CL |



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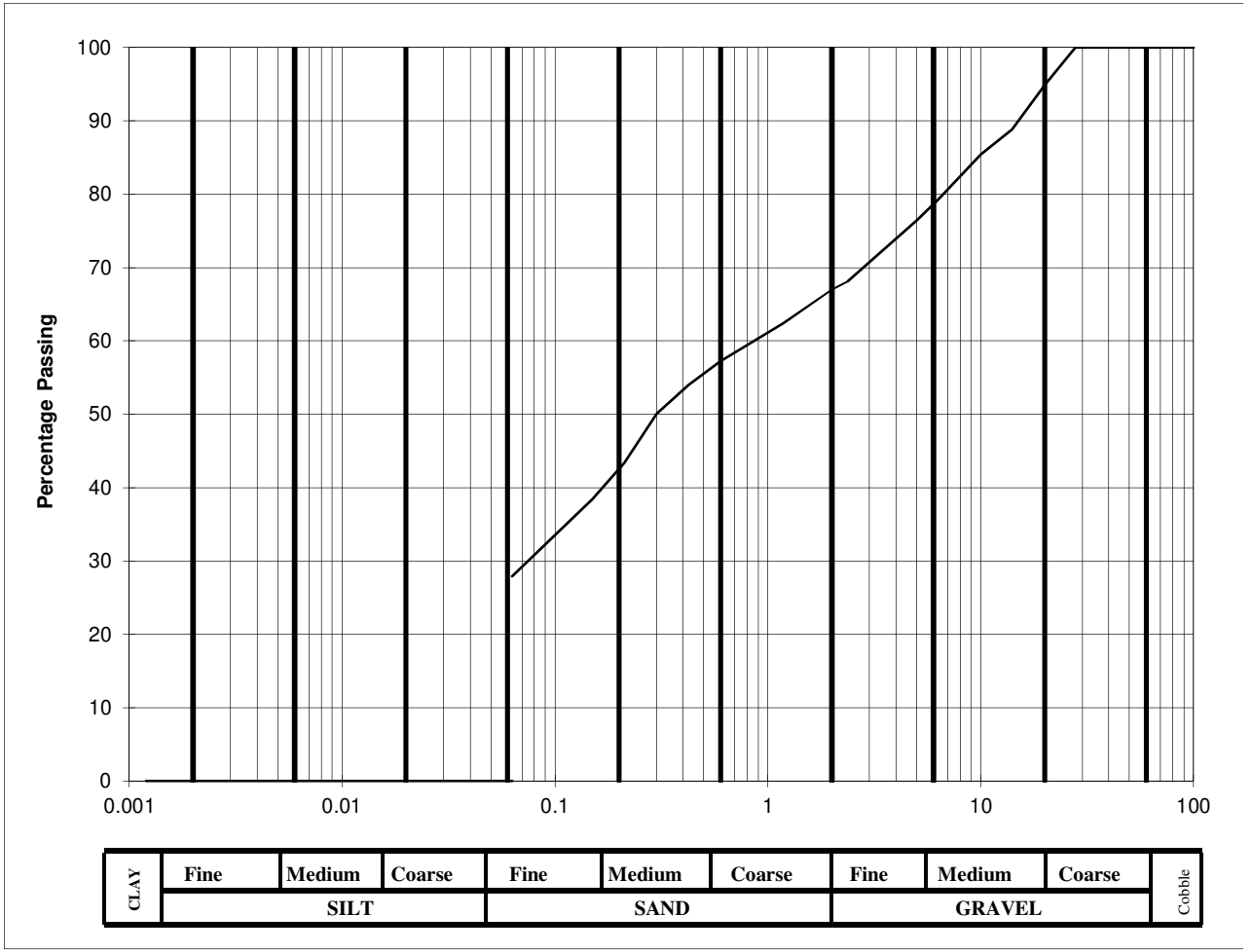
# BS 1377 Particle Size Analysis

***Site Investigations Limited***

| BS Sieve size, mm | Percent passing | Hydrometer analysis | |
|---|---|---|---|
| | | Diameter, mm | % passing |
| **100** | 100 | **0.0630** | |
| **90** | 100 | **0.0200** | |
| **75** | 100 | **0.0060** | |
| **63** | 100 | **0.0020** | |
| **50** | 100 | | |
| **37.5** | 100 | | |
| **28** | 100 | | |
| **20** | 94.9 | | |
| **14** | 88.8 | | |
| **10** | 85.4 | | |
| **6.3** | 79.2 | | |
| **5.0** | 76.4 | | |
| **2.36** | 68.1 | | |
| **2.00** | 67 | | |
| **1.18** | 62.4 | | |
| **0.600** | 57.2 | | |
| **0.425** | 54 | | |
| **0.300** | 50.1 | | |
| **0.212** | 43.4 | | |
| **0.150** | 38.5 | | |
| **0.063** | 28 | | |

| | |
|---|---|
| Cobbles, % | 0 |
| Gravel, % | 33 |
| Sand, % | 39 |
| Clay / Silt, % | 28 |




| | |
|---|---|
| Client : | Durkan Residential |
| Project : | Portmarnock South - Phase 1B |

| | |
|---|---|
| Lab. No : | 18/351 |
| Sample No : | PM01 |

| | |
|---|---|
| Hole ID : | TP 01 |
| Depth, m : | 1.00 |

| | |
|---|---|
| Material description : | sandy slightly gravelly silty CLAY |
| Remarks : | Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour.<br>Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt |

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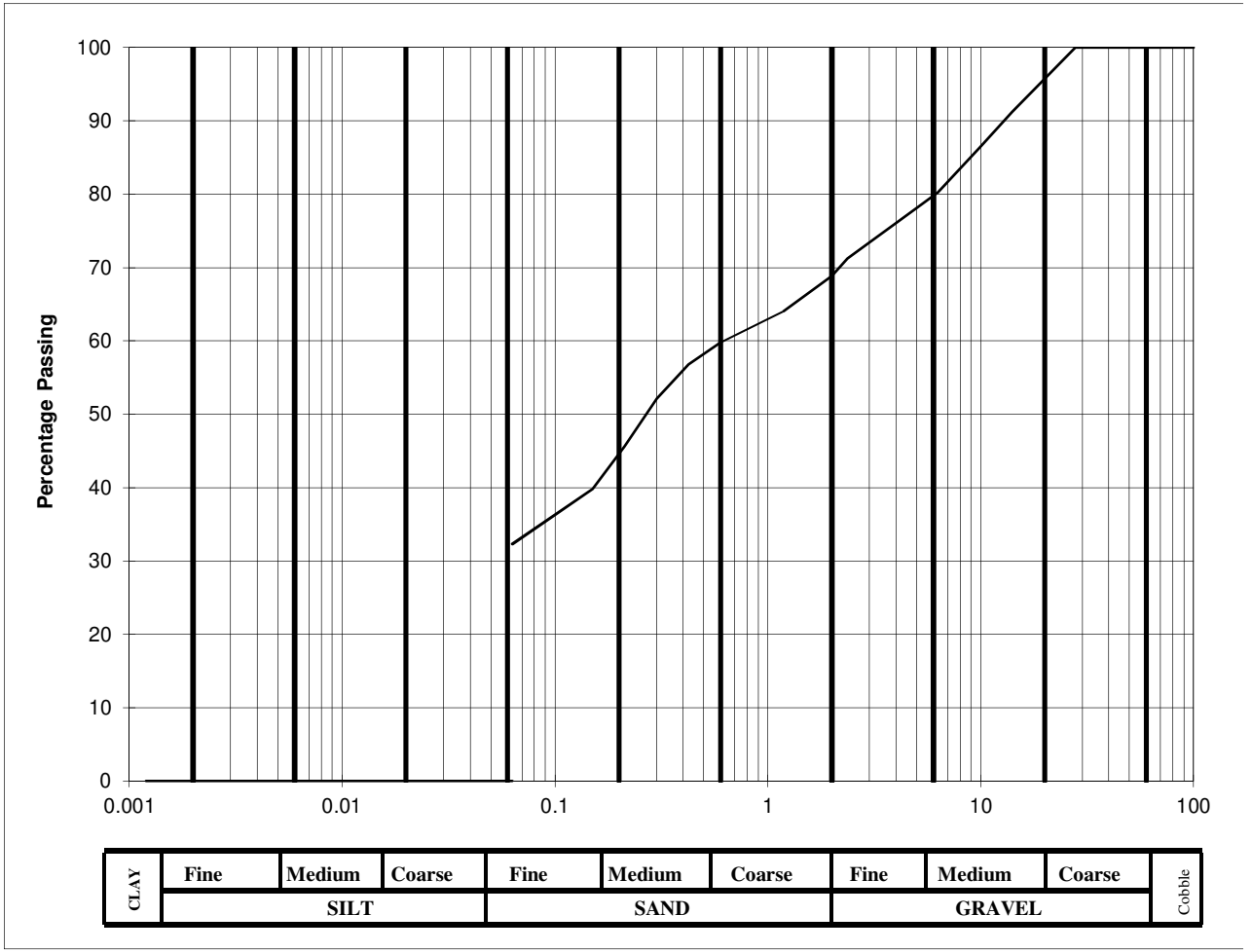
# BS 1377 Particle Size Analysis

***Site Investigations Limited***

| BS Sieve size, mm | Percent passing | Hydrometer analysis | |
|---|---|---|---|
| | | Diameter, mm | % passing |
| **100** | 100 | **0.0630** | |
| **90** | 100 | **0.0200** | |
| **75** | 100 | **0.0060** | |
| **63** | 100 | **0.0020** | |
| **50** | 100 | | |
| **37.5** | 100 | | |
| **28** | 100 | | |
| **20** | 95.8 | | |
| **14** | 91.2 | | |
| **10** | 86.5 | | |
| **6.3** | 80.2 | | |
| **5.0** | 78.1 | | |
| **2.36** | 71.2 | | |
| **2.00** | 68.9 | | |
| **1.18** | 64 | | |
| **0.600** | 59.8 | | |
| **0.425** | 56.8 | | |
| **0.300** | 52.1 | | |
| **0.212** | 45.6 | | |
| **0.150** | 39.8 | | |
| **0.063** | 32 | | |

| | |
|---|---|
| Cobbles, % | 0 |
| Gravel, % | 31 |
| Sand, % | 37 |
| Clay / Silt, % | 32 |




| | |
|---|---|
| Client : | Durkan Residential |
| Project : | Portmarnock South - Phase 1B |

| | |
|---|---|
| Lab. No : | 18/352 |
| Sample No : | PM09 |

| | |
|---|---|
| Hole ID : | TP 03 |
| Depth, m : | 1.00 |

| | |
|---|---|
| Material description : | sandy slightly gravelly silty CLAY |
| Remarks : | Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour.<br>Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt |

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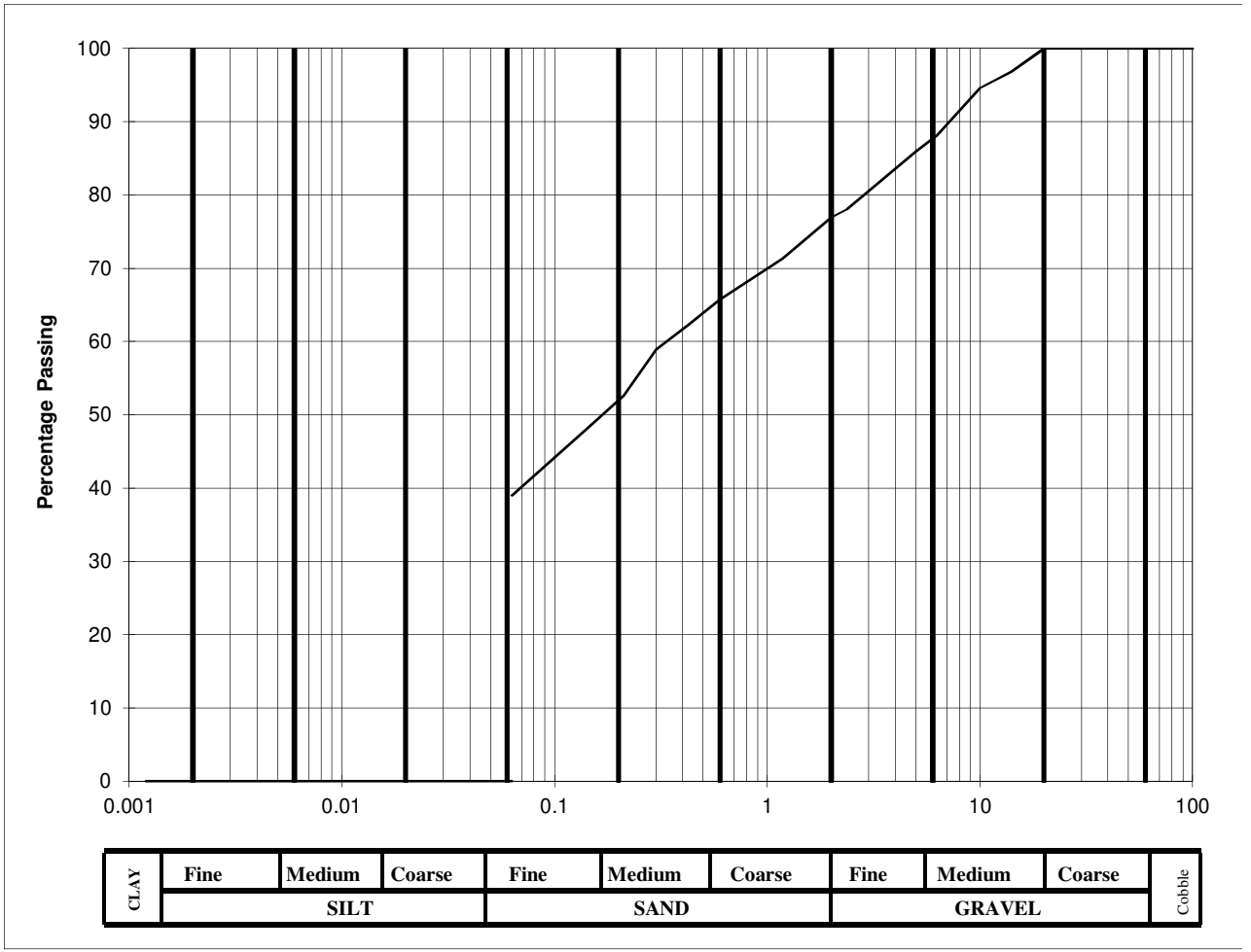
# BS 1377 Particle Size Analysis

***Site Investigations Limited***

| BS Sieve size, mm | Percent passing | Hydrometer analysis | |
|---|---|---|---|
| | | Diameter, mm | % passing |
| **100** | 100 | **0.0630** | |
| **90** | 100 | **0.0200** | |
| **75** | 100 | **0.0060** | |
| **63** | 100 | **0.0020** | |
| **50** | 100 | | |
| **37.5** | 100 | | |
| **28** | 100 | | |
| **20** | 100 | | |
| **14** | 96.8 | | |
| **10** | 94.6 | | |
| **6.3** | 88.1 | | |
| **5.0** | 85.9 | | |
| **2.36** | 78 | | |
| **2.00** | 76.9 | | |
| **1.18** | 71.3 | | |
| **0.600** | 65.7 | | |
| **0.425** | 62.2 | | |
| **0.300** | 58.9 | | |
| **0.212** | 52.6 | | |
| **0.150** | 48.7 | | |
| **0.063** | 39 | | |

| | |
|---|---|
| Cobbles, % | 0 |
| Gravel, % | 23 |
| Sand, % | 38 |
| Clay / Silt, % | 39 |




| | | | | | |
|---|---|---|---|---|---|
| Client : | Durkan Residential | Lab. No : | 18/353 | Hole ID : | TP 05 |
| Project : | Portmarnock South - Phase 1B | Sample No : | PM05 | Depth, m : | 1.00 |

| | |
|---|---|
| Material description : | sandy slightly gravelly silty CLAY |
| Remarks : | Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour.<br>Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt |

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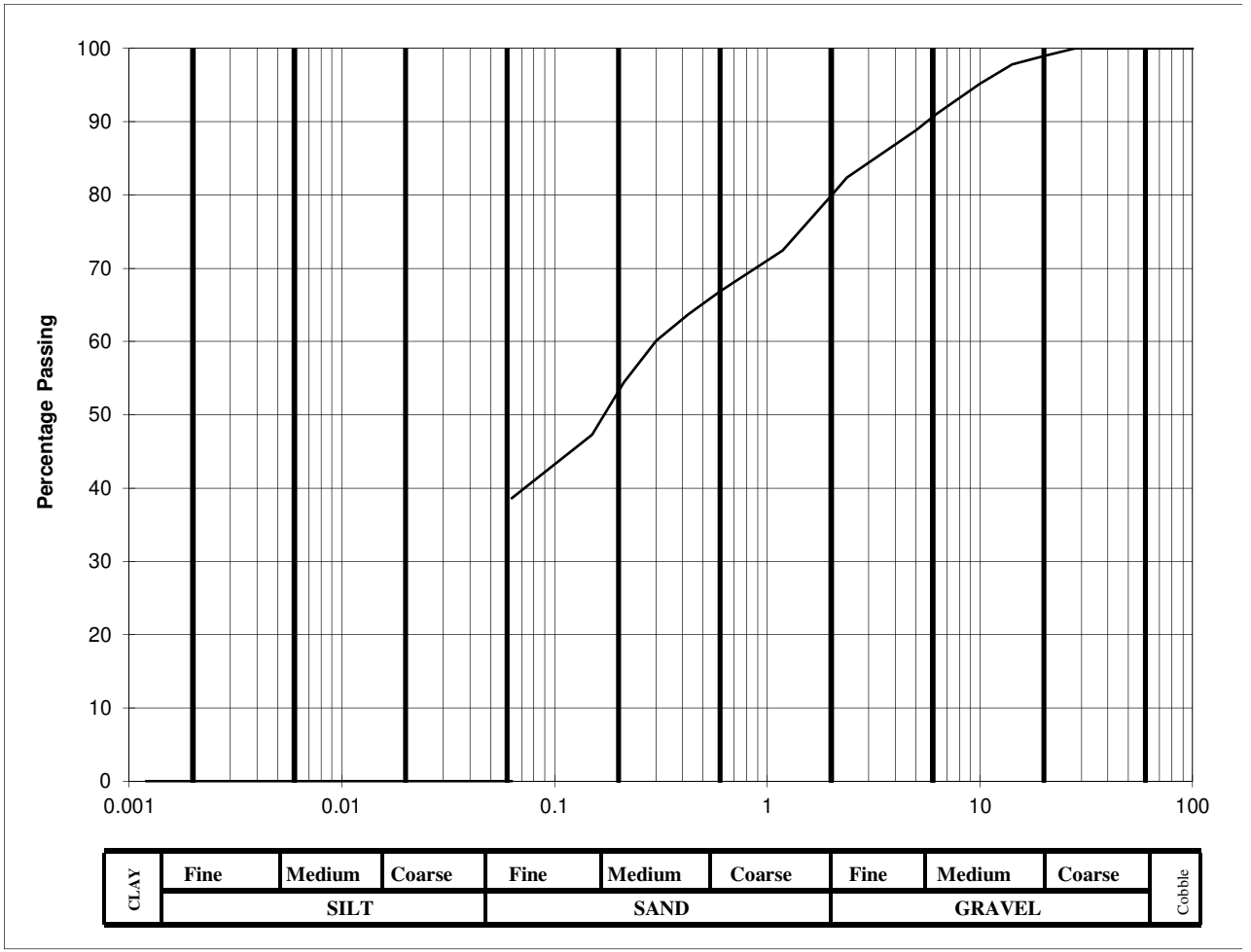
# BS 1377 Particle Size Analysis

***Site Investigations Limited***

| BS Sieve size, mm | Percent passing | Hydrometer analysis | |
|---|---|---|---|
| | | Diameter, mm | % passing |
| **100** | 100 | **0.0630** | |
| **90** | 100 | **0.0200** | |
| **75** | 100 | **0.0060** | |
| **63** | 100 | **0.0020** | |
| **50** | 100 | | |
| **37.5** | 100 | | |
| **28** | 100 | | |
| **20** | 98.9 | | |
| **14** | 97.7 | | |
| **10** | 95.2 | | |
| **6.3** | 91.1 | | |
| **5.0** | 88.8 | | |
| **2.36** | 82.4 | | |
| **2.00** | 79.9 | | |
| **1.18** | 72.4 | | |
| **0.600** | 66.8 | | |
| **0.425** | 63.7 | | |
| **0.300** | 60.1 | | |
| **0.212** | 54.4 | | |
| **0.150** | 47.3 | | |
| **0.063** | 39 | | |

| | |
|---|---|
| Cobbles, % | 0 |
| Gravel, % | 20 |
| Sand, % | 41 |
| Clay / Silt, % | 39 |




| | |
|---|---|
| Client : | Durkan Residential |
| Project : | Portmarnock South - Phase 1B |

| | |
|---|---|
| Lab. No : | 18/354 |
| Sample No : | PM03 |

| | |
|---|---|
| Hole ID : | TP 06 |
| Depth, m : | 1.00 |

| | |
|---|---|
| Material description : | sandy slightly gravelly silty CLAY |
| Remarks : | Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour.<br>Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt |

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# Chemical Testing
# In accordance with BS 1377: Part 3

| | |
|---|---|
| Client | Durkan Residential |
| Site | Portmarnock South - Phase 1B |
| S.I. File No | 5490 / 18 |
| Test Lab | Site Investigations Ltd, Carhugar, The Grange, 12th Lock Rd, Lucan, Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie |
| Report Date | 21st June 2018 |

| Hole Id | Depth (mBGL) | Sample No | Lab Ref | pH Value | Sulphate Content Acid Soluble ($SO_3$) g/L | Sulphate Content Acid Soluble ($SO_3$) % | Organic Content % | Chloride ion Content (soil:water ratio 2:1) % | % passing 2mm | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| TP01 | 1.00 | PM01 | 18/351 | 8.06 | 0.106 | 0.065 | | | 67.0 | |
| TP05 | 1.00 | PM05 | 18/353 | 8.23 | 0.116 | 0.082 | | | 76.9 | |

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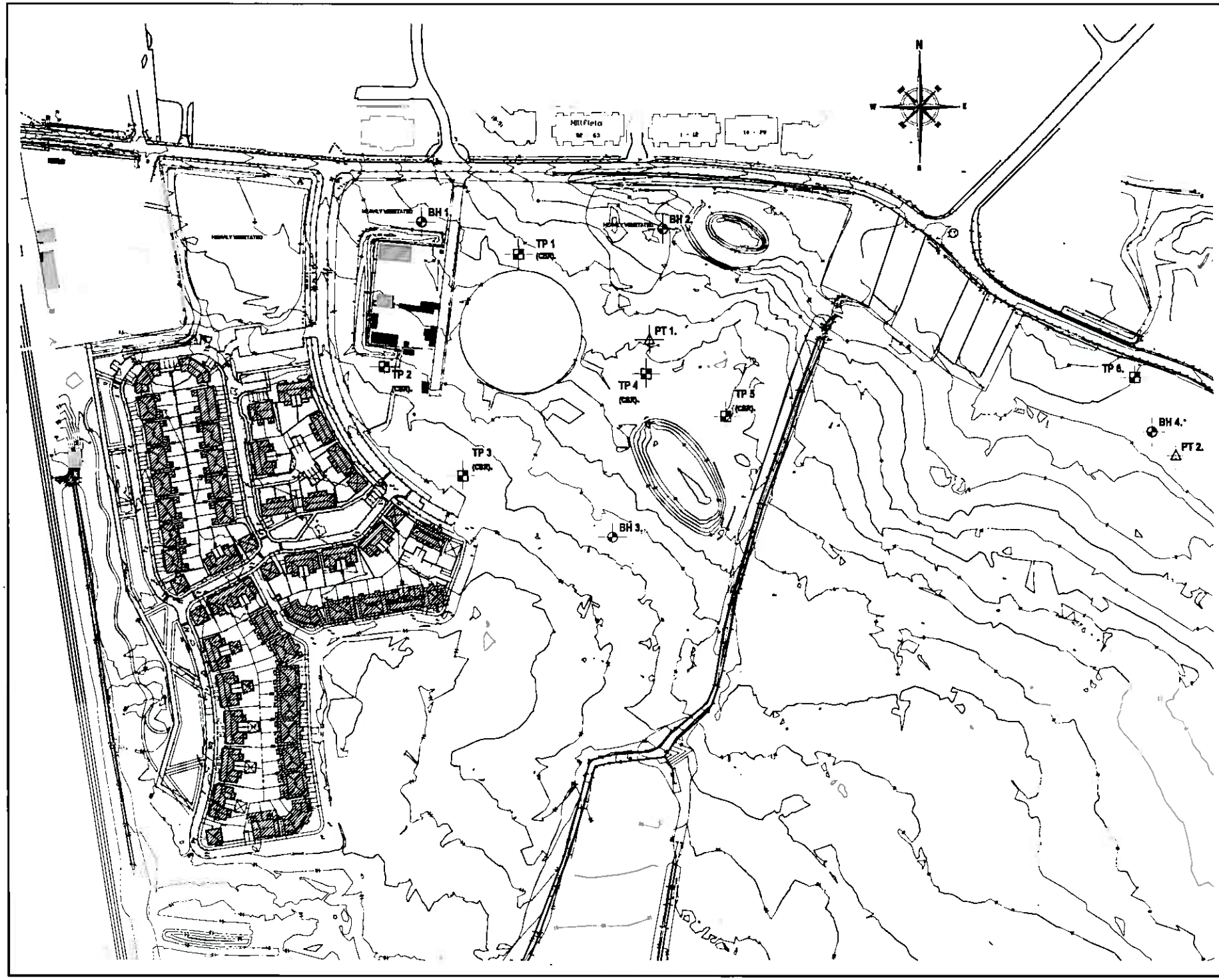
# Appendix 6
# Site Plan






NOTES :

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

LEGEND :

TRIAL PIT LOCATION SHOWN THUS TP 1

BOREHOLE LOCATION SHOWN THUS BH 1

PERCOLATION TEST LOCATION SHOWN THUS PT 1.

[illegible]

[illegible]
ALL TRIAL PITS TO BE EXCAVATED TO A DEPTH OF 3.0m.

PERCOLATION TESTS TO BE CARRIED OUT IN ACCORDANCE WITH BRE DIGEST 365.

| TRIAL PIT CO-ORDINATES SCHEDULE. | | |
|---|---|---|
| REF. | EASTING. | NORTHING. |
| TP 1 (CBR). | [illegible] | [illegible] |
| TP 2 (CBR). | [illegible] | [illegible] |
| TP 3 (CBR). | [illegible] | [illegible] |
| TP 4 (CBR). | [illegible] | [illegible] |
| TP 5 (CBR). | [illegible] | [illegible] |
| TP 6 (CBR). | [illegible] | [illegible] |
| TP 7. | [illegible] | [illegible] |

| BOREHOLE CO-ORDINATES SCHEDULE. | | |
|---|---|---|
| REF. | EASTING. | NORTHING. |
| BH 1. | [illegible] | [illegible] |
| BH 2. | [illegible] | [illegible] |
| BH 3. | [illegible] | [illegible] |
| BH 4. | [illegible] | [illegible] |

| PERCOLATION TEST CO-ORDINATES. | | |
|---|---|---|
| REF. | EASTING. | NORTHING. |
| PT 1. | [illegible] | [illegible] |
| PT 2. | [illegible] | [illegible] |

| | | | |
|---|---|---|---|
| INITIAL ISSUE | BH | 10.05.18 | P1 |
| Description | Drawn | Date | Rev. |

Client :
St. Mamock's II DAC and
Clear Real Estate Investments plc.

Project :
PORTMARNOCK SOUTH
PHASE 1B.

Consulting Engineers :
J. B. Barry and Partners Limited
Consulting Engineers

| | | | |
|---|---|---|---|
| Drawn By: BH | | Date: MAY 2018 | |
| Checked By: AM | Date: MAY 2018. | Approved By: JCB | Date: MAY 2018. |
| Document Original Size: Y17205 | | Status: PRELIMINARY | |

Drawing Title :
SITE INVESTIGATION

Scale: 1:1000 @ A1

Drawing No. Y17205-C-112

Rev. P1