

## **Appendix 7.1 Ground Investigation Report**



**GROUND  
INVESTIGATIONS  
IRELAND**

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# Ground Investigations Ireland

## Woodbrook

# Ground Investigation Report

### ***DOCUMENT CONTROL SHEET***

Project Title	Woodbrook
Engineer	Atkins
Project No	7757-05-18
Document Title	Ground Investigation Report

<b>Rev.</b>	<b>Status</b>	<b>Author(s)</b>	<b>Reviewed By</b>	<b>Approved By</b>	<b>Office of Origin</b>	<b>Issue Date</b>
A	Final	T McIntyre	C Finnerty	C Finnerty	Dublin	14 September 2018



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## 1.0 Preamble

On the instructions of Atkins Consulting engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between June and August 2018 at the site of the proposed development in Bray, Co. Dublin.

## 2.0 Overview

### 2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently greenfield and is situated to the north of Bray town. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

### 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 12 No. Trial Pits to a maximum depth of 3.0m BGL
- Carry out 6 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 3 No. Cable Percussion boreholes to a maximum depth of 10.0m BGL
- Installation of 3 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

## 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 JCB 3CX 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.

### **3.5. Surveying**

The exploratory hole locations have been recorded using a Trimble R10 GNSS 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.

### 3.6. 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.

## 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
- Granular Deposits
- Cohesive Deposits

**TOPSOIL:** Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.35m BGL.

**COHESIVE DEPOSITS:** Cohesive deposits were encountered beneath the TOPSOIL and were described typically as *brown sandy gravelly CLAY with occasional cobbles* overlying a *soft to firm greyish brown sandy gravelly CLAY with occasional cobbles*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the cohesive matrix. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

**GRANULAR DEPOSITS:** The granular deposits were encountered at the base of the cohesive deposits and were typically described as *Greyish brown very sandy slightly clayey sub angular to rounded fine to coarse GRAVEL with occasional cobbles and rare boulders*. The secondary sand/gravel and silt/clay constituents varied across the site and with depth while occasional or frequent cobble and boulder content also present where noted on the exploratory hole logs.

### 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 BH1A, BH2 and BH3 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 6 of this Report.

### **4.3. Soakaway Design**

Infiltration rates of  $3.137 \times 10^{-6}$  and  $2.298 \times 10^{-6}$  m/s respectively were calculated for the soakaway locations TP02 and TP06 for the design and construction of soakaways.

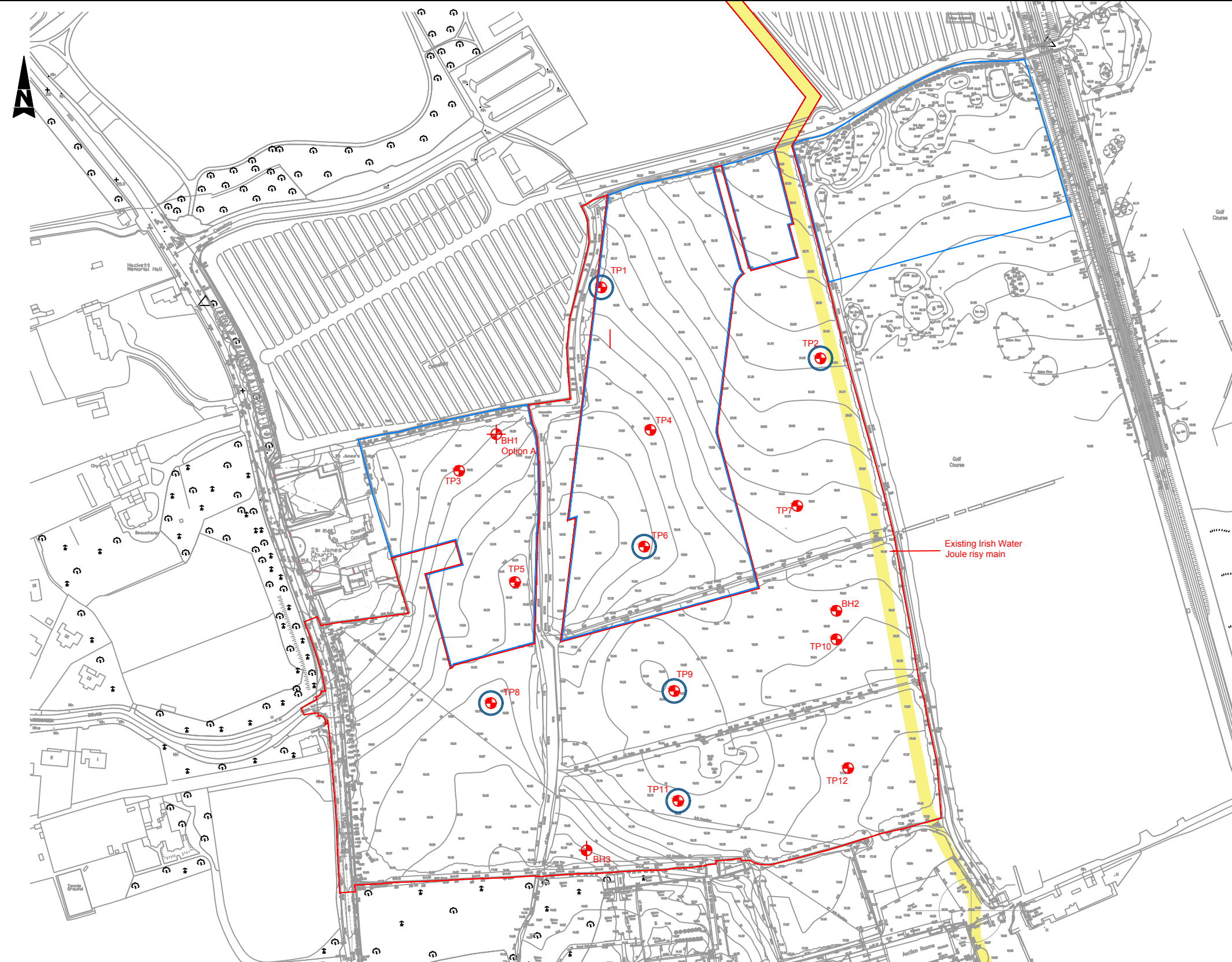
At the locations of TP01, TP06, TP09 and TP11 the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate.

## **APPENDIX 1 - Site Location Plan**



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DO NOT SCALE



- GENERAL NOTES**
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
  2. ONLY WRITTEN DIMENSIONS SHALL BE USED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS
  3. ALL LEVELS ARE IN METRES AND ARE TO MALIN HEAD DATUM
  4. ALL COORDINATES ARE IN METRES AND ARE TO IRISH TRANSVERSE MERCATOR
  5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

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- LEGEND**
- PERCOLATION TEST IN ACCORDANCE WITH BRE365.
  - TRIAL PIT 2.5-3M DEPTH
  - ⊕ (BH1 - BH3) S+A (Cable Percussive)

- NOTES**
1. PERCOLATION TEST TO BE CARRIED OUT IN ACCORDANCE WITH BRE DIGEST 365 SOAKAWAY DESIGN.
  2. TRIAL PIT TO A DEPTH OF 2.5-3M AND TO LOG STRATA CLASSIFICATION INCLUDING DEPTH AND CHANGE IN STRATA.
  3. WATER STRIKE DEPTHS.
- ~ Depth 10m  
- all to be committed to groundwater monitoring wells (raised covers)

Rev	Description	By	Date	Chk'd	Auth

U:\3652517\4\_Dwg\44\_18\0418 Title\_Brook\Brook\_AEVAL.dwg

Atkins House, 150-155 Airside  
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Fax (+353) 091 779 830

Client: **AEVAL**

Project: **WOODBROOK DEVELOPMENT**

Purpose	FOR INFORMATION			
Title	PROPOSED GROUNDWATER MONITORING WELL			
Original Scale	Design/Drawn	Checked	Authorised	
NTS	GH	JN	JN	
Date	Date	Date	Date	
04/18	04/18	04/18	04/18	
Status	Drawing Number	Rev		
DR	5154251_EWE_SK_0005			

## **APPENDIX 2 – Trial Pit Records**



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP01**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.40m X 0.70m X 2.00	<b>Ground Level (mOD)</b> 19.91	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725776.1 E 720639.5 N	<b>Dates</b> 26/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.35	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				19.56	0.35 (0.20)	Firm brown slightly sandy slightly gravelly CLAY.		
				19.36	0.55	Dark greyish brown sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with occasional subrounded cobbles.		
					(1.05)			
				18.31	1.60 (0.40)	Soft to firm dark greyish brown very sandy slightly gravelly CLAY.		
				17.91	2.00	Trial pit terminated at scheduled depth. Complete at 2.00m		∇1
		Medium Seepage(1) at 1.95m.						

<b>Plan</b> .	<b>Remarks</b>  Groundwater encountered at 1.95m BGL. Trial pit side walls spalling. Soakaway completed in trial pit. Trial pit backfilled on completion.	<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 7757-05-18.TP01
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**Site**  
Woodbrook

**Trial Pit Number**  
**TP02**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.50m X 0.70m X 2.00m	<b>Ground Level (mOD)</b> 21.71	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725947.4 E 720584.4 N	<b>Dates</b> 26/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				21.31	0.40	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				20.71	1.00	Firm brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
				19.71	2.00	Brown slightly clayey gravelly fine to coarse SAND with some grey fine sand lenses.		
						Trial pit terminated at scheduled depth. Complete at 2.00m		

<b>Plan</b> .	<b>Remarks</b>  No Groundwater encountered. Trial pit stable. Soakaway completed in trial pit. Trial pit backfilled on completion.	
		<b>Scale (approx)</b> 1:25



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP03**

<b>Machine</b> : JCB JCX	<b>Dimensions</b> 2.90m X 0.70m X 3.00m	<b>Ground Level (mOD)</b> 18.43	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
<b>Method</b> : Trial Pit	<b>Location</b> 725665.2 E 720495.3 N	<b>Dates</b> 26/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B				(0.25)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
					18.18	0.25	Firm brown slightly sandy slightly gravelly CLAY	
					(0.35)			
					17.83	0.60	Soft to firm greyish brown sandy gravelly CLAY.	
					(0.60)			
					17.23	1.20	Dark greyish brown very gravelly slightly clayey fine to coarse SAND with occasional subrounded cobbles.	
2.20	B				(0.55)			
					16.68	1.75	Greyish brown very sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with occasional subrounded cobbles.	
			Slight seepage(1) at 2.50m.		(1.25)			
			Slight seepage(2) at 2.70m.					
			Slow ingress(3) at 3.00m, rose to 2.90m in 20 mins.					
				15.43	3.00	Complete at 3.00m		

<p><b>Plan</b></p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p>	<p><b>Remarks</b></p> <p>Groundwater encountered at 2.50m, 2.70m and 3.00m BGL. Trial pit stable. Trial pit backfilled on completion.</p>			
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"><b>Scale (approx)</b> 1:25</td> <td style="width: 30%;"><b>Logged By</b> Tmcl</td> <td style="width: 40%;"><b>Figure No.</b> 7757-05-18.TP03</td> </tr> </table>	<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 7757-05-18.TP03
<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 7757-05-18.TP03		



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP04**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.90m X 0.70m X 3.00m	<b>Ground Level (mOD)</b> 18.35	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725813.1 E 720528.3 N	<b>Dates</b> 26/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.65	B			18.10	(0.25)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
					0.25 (0.20)	Firm brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
1.30	B			17.90	0.45 (0.20)	Brown slightly sandy clayey subangular to subrounded fine to coarse GRAVEL.		
					0.65	Dark greyish brown slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL.		
					(0.65)			
					17.05	1.30	Soft to firm greyish brown sandy gravelly CLAY.	
				16.65	(0.40)			
					1.70	Grey sandy subrounded to rounded fine to coarse GRAVEL.		
					(1.05)			
				15.60	2.75 (0.25)	Grey slightly gravelly slightly silty fine SAND.		
				15.35	3.00	Complete at 3.00m		

<b>Plan</b> .	<b>Remarks</b>  No Groundwater encountered. Trial pit stable. Trial pit backfilled on completion.	
		<b>Scale (approx)</b> 1:25



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP05**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.70m X 0.70m X 2.50	<b>Ground Level (mOD)</b> 16.39	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725708.8 E 720410.1 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B				15.99	0.40 (0.40)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.	
					15.79	0.60 (0.20)	Firm brown slightly sandy slightly gravelly CLAY.	
					15.29	1.10 (0.50)	Brown slightly sandy clayey subangular to rounded fine to coarse GRAVEL with some subrounded cobbles.	
					14.89	1.50 (0.40)	Brown gravelly slightly clayey fine to coarse SAND with occasional subangular cobbles.	
2.00	B				14.19	2.20 (0.70)	Dark brown slightly gravelly slightly clayey fine to coarse SAND.	
					13.89	2.50 (0.30)	Brown very sandy slightly clayey subrounded to rounded fine to coarse GRAVEL with occasional subrounded cobbles.	
							Complete at 2.50m	

<b>Plan</b> .	<b>Remarks</b>  No Groundwater encountered. Trial pit side walls spalling. Trial pit backfilled on completion.	
		<b>Scale (approx)</b> 1:25



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP06**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.30m X 0.70m X 2.00m	<b>Ground Level (mOD)</b> 17.43	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725805.4 E 720435.7 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				17.13	(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				16.63	(0.50)	Soft to firm brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
				16.13	(0.50)	Soft to firm dark dark brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles and boulders.		
				15.63	(0.20)	Brown slightly gravelly slightly clayey fine to medium SAND.		
				15.43	2.00	Trial pit terminated at scheduled depth. Complete at 2.00m		

<b>Plan</b>	<b>Remarks</b>	
.	No Groundwater encountered. Trial pit side walls spalling. Soakaway completed in trial pit. Trial pit backfilled on completion.	
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	<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl
	<b>Figure No.</b> 7757-05-18.TP06	





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**Site**  
Woodbrook

**Trial Pit Number**  
**TP07**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 3.40m X 0.70m X 2.50m	<b>Ground Level (mOD)</b> 19.90	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725927.9 E 720469.6 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.50	B				(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.			
					19.60	0.30	Firm brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
					19.30	0.60	Soft to firm dark brown slightly sandy gravelly CLAY with occasional subrounded cobbles.		
					18.70	1.20	Soft to firm grey mottled brown sandy gravelly CLAY with occasional subangular to subrounded cobbles.		
1.90	B				17.90	2.00	Brown gravelly slightly clayey fine to coarse SAND with occasional cobbles.		
					17.80	2.10	Brown very gravelly slightly clayey fine to coarse SAND with occasional cobbles.		
					17.40	2.50	Complete at 2.50m		

<b>Plan</b> .	<b>Remarks</b>  No Grounwater encountered. Trial pit stable. Trial pit backfilled on completion.		
	<table border="1"> <tr> <td><b>Scale (approx)</b> 1:25</td> <td><b>Logged By</b> Tmcl</td> <td><b>Figure No.</b> 7757-05-18.TP07</td> </tr> </table>	<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl
<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 7757-05-18.TP07	



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP08**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.40m X 0.70m X 2.00	<b>Ground Level (mOD)</b> 15.81	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725689.9 E 720316.1 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				15.46	0.35	Firm to stiff brown slightly sandy slightly gravelly CLAY.		
				15.01	0.80	Brown very sandy slightly clayey subangular to rounded fine to coarse GRAVEL with some subrounded cobbles.		
				14.01	1.80	Soft to firm brown sandy slightly gravelly CLAY with occasional subrounded cobbles.		
				13.81	2.00	Trial pit terminated at scheduled depth. Complete at 2.00m		

<b>Plan</b>	<b>Remarks</b>			
<p>• • • • •</p> <p>• • • • •</p> <p>• • • • •</p> <p>• • • • •</p> <p>• • • • •</p> <p>• • • • •</p>	<p>No Groundwater encountered. Trial pit side walls spalling. Soakaway completed in trial pit. Trial pit backfilled on completion.</p>			
	<table border="1"> <tr> <td><b>Scale (approx)</b> 1:25</td> <td><b>Logged By</b> Tmcl</td> <td><b>Figure No.</b> 7757-05-18.TP08</td> </tr> </table>	<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 7757-05-18.TP08
<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 7757-05-18.TP08		



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP09**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.40m X 0.70m X 1.90m	<b>Ground Level (mOD)</b> 19.41	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725832.8 E 720325.1 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00	B			19.06	0.35	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
					0.65	Soft to firm brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
1.80	B			18.41	1.00	Soft to firm greyish brown sandy gravelly CLAY.		
					0.20	Soft to firm greyish brown slightly sandy gravelly CLAY.		
				17.71	1.70			
				17.51	1.90	Trial pit terminated at scheduled depth. Complete at 1.90m		

<b>Plan</b>	<b>Remarks</b>		
.	No Groundwater encountered.		
.	Trial pit side walls spalling.		
.	Soakaway completed in trial pit.		
.	Trial pit backfilled on completion.		
.	<b>Scale (approx)</b>	<b>Logged By</b>	<b>Figure No.</b>
.	1:25	Tmcl	7757-05-18.TP09



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP10**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.40m X 0.70m X 2.40m	<b>Ground Level (mOD)</b> 18.54	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725957.4 E 720361.8 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B			18.24	(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					(0.20)	Firm brown slightly sandy slightly gravelly CLAY.		
1.50	B		Slight seepage(1) at 1.90m.  Medium ingress(2) at 2.20m.	18.04	(0.50)	Soft to firm dark greyish brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles and boulders.		
					(1.10)			
				16.94	(0.80)	Greyish brown sandy slightly clayey subrounded to rounded fine to coarse GRAVEL with occasional subrounded cobbles and boulders.		∇1 ∇2
				16.14	2.40	Trial pit terminated due to excessive groundwater. Complete at 2.40m		

<b>Plan</b> .	<b>Remarks</b>  Groundwater encountered at 1.90m and 2.20m BGL. Trial pit side walls spalling. Trial pit backfilled on completion.	
		<b>Scale (approx)</b> 1:25



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP11**

<b>Machine</b> : JCB JCX <b>Method</b> : Trial Pit	<b>Dimensions</b> 2.40m X 0.70m X 1.90m	<b>Ground Level (mOD)</b> 18.87	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
	<b>Location</b> 725836 E 720237.6 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00	B			18.57	0.30 (0.30)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.90 (0.90)	Soft to firm brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
				17.67	1.20 (0.70)	Soft to firm dark brown slightly sandy gravelly CLAY.		
1.80	B			16.97	1.90	Trial pit terminated at scheduled depth. Complete at 1.90m		

<b>Plan</b> .	<b>Remarks</b>  No Groundwater encountered. Trial pit stable. Soakaway completed in trial pit. Trial pit backfilled on completion.	
		<b>Scale (approx)</b> 1:25



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**Site**  
Woodbrook

**Trial Pit Number**  
**TP12**

<b>Machine</b> : JCB JCX	<b>Dimensions</b> 2.50m X 0.70m X 2.90m	<b>Ground Level (mOD)</b> 17.69	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
<b>Method</b> : Trial Pit	<b>Location</b> 725968.8 E 720265.1 N	<b>Dates</b> 25/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00	B				0.30	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					0.20	Firm brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles		
					0.50	Soft to firm dark greyish brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles		
2.00	B		Slight seepage(1) at 1.70m.		1.10	Soft to firm grey mottled brown slightly sandy gravelly CLAY with occasional subrounded cobbles.		
					1.70	Greyish brown gravelly slightly clayey SAND.		∇1
					2.30	Grey very sandy slightly clayey subangular to rounded fine to coarse GRAVEL.		∇2
			Slow ingress(2) at 2.40m.		2.90	Complete at 2.90m		

<p><b>Plan</b></p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p> <p style="text-align: center;">. . . . .</p>	<p><b>Remarks</b></p> <p>Grounwater encountered at 1.70m and 2.40m. Trial pit stable. Trial pit backfilled on completion.</p>	
<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 7757-05-18.TP12

# Woodbrook, Bray - Trial Pit Photographs

TP01



TP02



TP02





TP03



TP03



TP04



TP04



TP05



TP05



TP06



TP06



TP07



TP07



TP08



TP08



TP09



TP09



TP10



TP10





TP11



TP11



TP12



TP12



## **APPENDIX 3 – Cable Percussion Borehole Records**



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**Site**  
Woodbrook

**Borehole Number**  
**BH01**

<b>Machine</b> : Dando2000	<b>Casing Diameter</b> 200mm to 5.00m	<b>Ground Level (mOD)</b> 18.95	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
<b>Method</b> : Cable Percussion	<b>Location</b> 725691.3 E 720522.8 N	<b>Dates</b> 27/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00	B				18.65	(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
						0.30	Brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
2.00	B				17.25	(1.40)			
						1.70	Brown slightly sandy very gravelly CLAY with occasional subrounded cobbles.		▼1
3.00	B				15.95	(1.30)			▼1
						3.00	Brown slightly sandy slightly gravelly CLAY.		▼1
4.00	B					(2.00)			
5.00	B				13.95	5.00	End of Borehole. Complete at 5.00m		

Water strike(1) at 3.10m, rose to 2.40m in 20 mins, sealed at 3.60m.

<b>Remarks</b> Groundwater encountered at 3.10m BGL. Standpipe installed, borehole backfilled to 3.40m with bentonite ,slotted standpipe installed from 3.40m to 1.90m with a gravel filter, sealed standpipe from 1.90m to ground level with a raised cover.	<b>Scale (approx)</b>	<b>Logged By</b>
	1:50	Tmcl
	<b>Figure No.</b> 7757-05-18.BH01	



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**Site**  
Woodbrook

**Borehole Number**  
**BH02**

<b>Machine</b> : Dando2000	<b>Casing Diameter</b>	<b>Ground Level (mOD)</b> 19.16	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
<b>Method</b> : Cable Percussion	<b>Location</b> 725957.9 E 720383.4 N	<b>Dates</b> 28/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00	B				18.76	0.40	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
						(1.00)	Brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles and boulders.		
2.00	B				17.76	1.40	Brown slightly sandy gravelly CLAY with occasional subrounded cobbles and boulders.		
						(1.60)			
3.00	B				16.16	3.00	Brown slightly sandy very gravelly CLAY with occasional cobbles.		▼1
4.00	B			Water strike(1) at 3.98m, rose to 3.50m in 20 mins, sealed at 2.40m.	15.16	4.00	Brown slightly sandy slightly gravelly CLAY.		▼1
						(1.00)			
5.00	B				14.16	5.00	End of Borehole. Complete at 5.00m		

<b>Remarks</b> Groundwater encountered at 3.98m BGL. Stanpipe installed, slotted stanpipe installed from 5.0m to 3.50m with a gravel filter, sealed from 3.50m to ground level with a raised cover.	<b>Scale (approx)</b>	<b>Logged By</b>
	1:50	Tmcl
	<b>Figure No.</b> 7757-05-18.BH02	



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**Site**  
Woodbrook

**Borehole Number**  
**BH03**

<b>Machine</b> : Dando2000	<b>Casing Diameter</b>	<b>Ground Level (mOD)</b> 15.90	<b>Client</b> Castlethorn	<b>Job Number</b> 7757-05-18
<b>Method</b> : Cable Percussion	<b>Location</b> 725764.2 E 720201.8 N	<b>Dates</b> 29/06/2018	<b>Project Contractor</b> Ground Investigations Ireland	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00	B				15.50	0.40	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
						0.80	Brown slightly sandy slightly gravelly CLAY with occasional subrounded cobbles.		
2.00	B				14.70	1.20	Brown slightly sandy very gravelly CLAY with occasional subrounded cobbles.		
						0.80	Brown slightly sandy gravelly CLAY with occasional subrounded cobbles.		
3.00	B				13.90	2.00	Brown slightly sandy gravelly CLAY with occasional subrounded cobbles.		
						1.00	Greyish brown sandy slightly clayey subangular to rounded fine to coarse GRAVEL.		
4.00	B				12.90	3.00	Greyish brown sandy slightly clayey subangular to rounded fine to coarse GRAVEL.		
						1.00	Brown sandy slightly gravelly CLAY with occasional lenses of fine to coarse sand.		▼1
5.00	B				11.90	4.00	Brown sandy slightly gravelly CLAY with occasional lenses of fine to coarse sand.		▼1
						1.00	End of Borehole. Complete at 5.00m		▼1
				Water strike(1) at 5.00m, rose to 4.40m in 20 mins.	10.90	5.00			

<b>Remarks</b> Groundwater encountered at 5.0m BGL. Standpipe installed, slotted from 5.0m to 3.5m with a gravel filter, sealed from 3.50m to ground level with a raised cover	<b>Scale (approx)</b>	<b>Logged By</b>
	1:50	Tmcl
	<b>Figure No.</b> 7757-05-18.BH03	

## **APPENDIX 4 – Groundwater Monitoring**



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## GROUNDWATER MONITORING

### Woodbrook

<b>BOREHOLE</b>	<b>DATE</b>	<b>TIME</b>	<b>GROUNDWATER (mBGL )</b>	<b>Comments</b>
<b>BH1</b>	16/07/2018	17.00	2.18	Depths from Ground level
<b>BH2</b>	16/07/2018	17.05	2.37	
<b>BH3</b>	16/07/2018	17.15	4.55	





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## GROUNDWATER MONITORING

### Woodbrook Bray

<b>BOREHOLE</b>	<b>DATE</b>	<b>TIME</b>	<b>GROUNDWATER (mBGL )</b>	<b>Comments</b>
BH1	16/08/2018	12:02:00	2.28m	
BH2	16/08/2018	12:11:00	3.32m	
BH3	16/08/2018	12:25:00	5.00m	No Water



**GROUND  
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IRELAND**

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## GROUNDWATER MONITORING

### Woodbrook

<b>BOREHOLE</b>	<b>DATE</b>	<b>TIME</b>	<b>GROUNDWATER (mBGL )</b>	<b>Comments</b>
				Depths from Ground level
<b>BH1</b>	13/09/2018	11.14	2.36	
<b>BH2</b>	13/09/2018	11.21	3.08	
<b>BH3</b>	13/09/2018	11.27	5.00	No Groundwater

## **APPENDIX 5 – Soakaway Results**

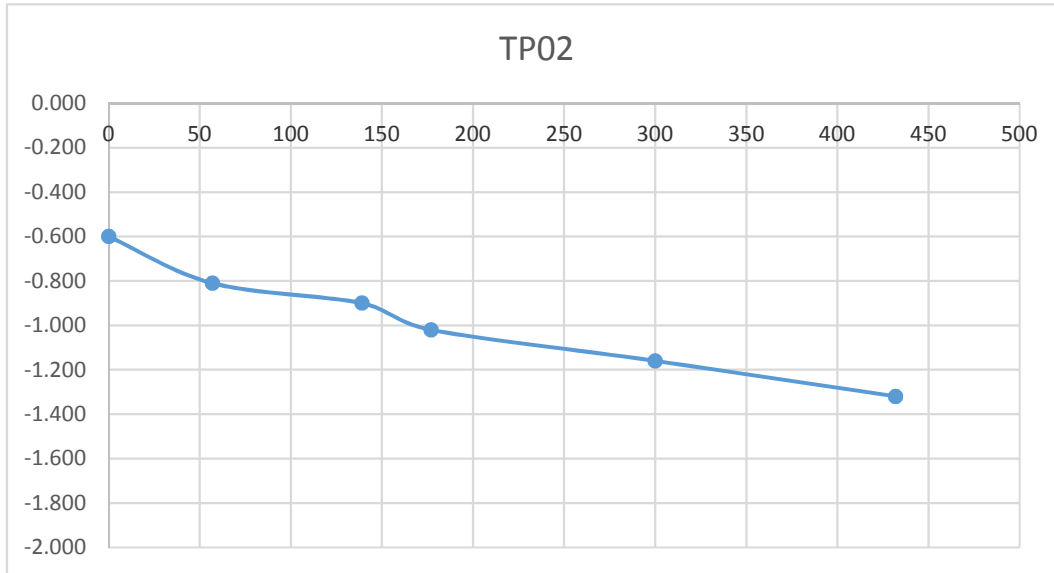
**TP02**

**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 2.50m x 0.70m 2.00m (L x W x D)**

Date	Time	Water level (m bgl)
14/09/2016	0	-0.600
14/09/2016	57	-0.810
14/09/2016	139	-0.900
14/09/2016	177	-1.020
14/09/2016	300	-1.160
14/09/2016	432	-1.320

<b>Start depth</b> <b>0.60</b>	<b>Depth of Pit</b> <b>2.00m</b>	<b>Diff</b> <b>1.400</b>	<b>75% full</b> <b>0.95</b>	<b>25%full</b> <b>1.65</b>
Length of pit (m) 2.500	Width of pit (m) 0.700		75-25Ht (m) 0.700	Vp75-25 (m3) 1.23
Tp75-25 (from graph) (s) <b>62686</b>			50% Eff Depth 0.700	ap50 (m2) 6.23
<b>f = 3.137E-06 m/s</b>				



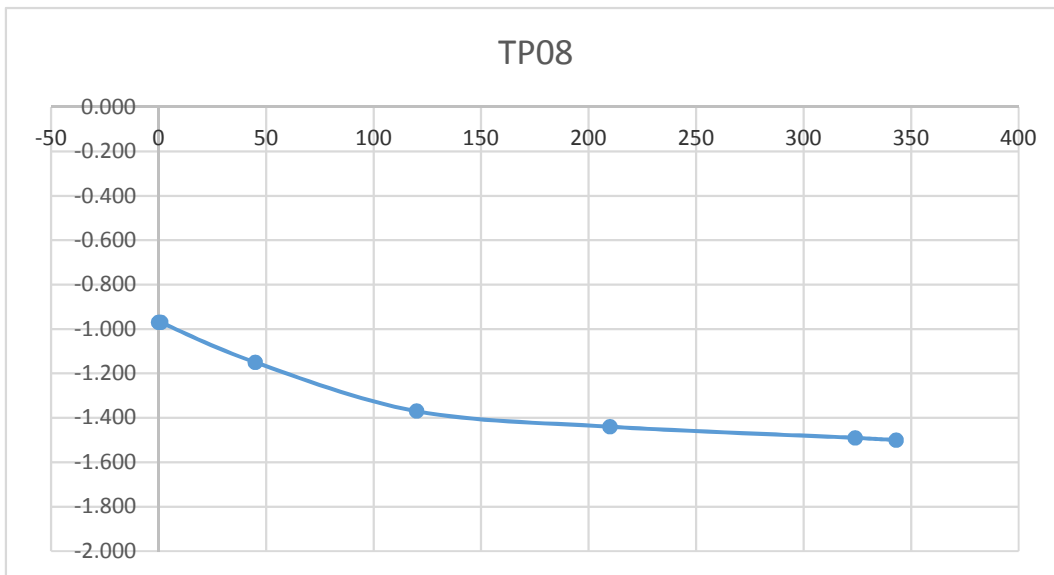
**TP08**

**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 2.40m x 0.70m 2.00m (L x W x D)**

Date	Time	Water level (m bgl)
14/09/2016	0	-0.970
14/09/2016	1	-0.970
14/09/2016	45	-1.150
14/09/2016	120	-1.370
14/09/2016	210	-1.440
14/09/2016	324	-1.490
14/09/2016	343	-1.500

<b>Start depth</b> 0.97	<b>Depth of Pit</b> 2.000	<b>Diff</b> 1.030	<b>75% full</b> 1.2275	<b>25%full</b> 1.7425
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.400	0.700		0.515	0.87
Tp75-25 (from graph) (s)		<b>77250</b>	50% Eff Depth	ap50 (m2)
<b>f =</b>		<b>2.298E-06</b>	0.515	4.873
		<b>m/s</b>		



**TP01**

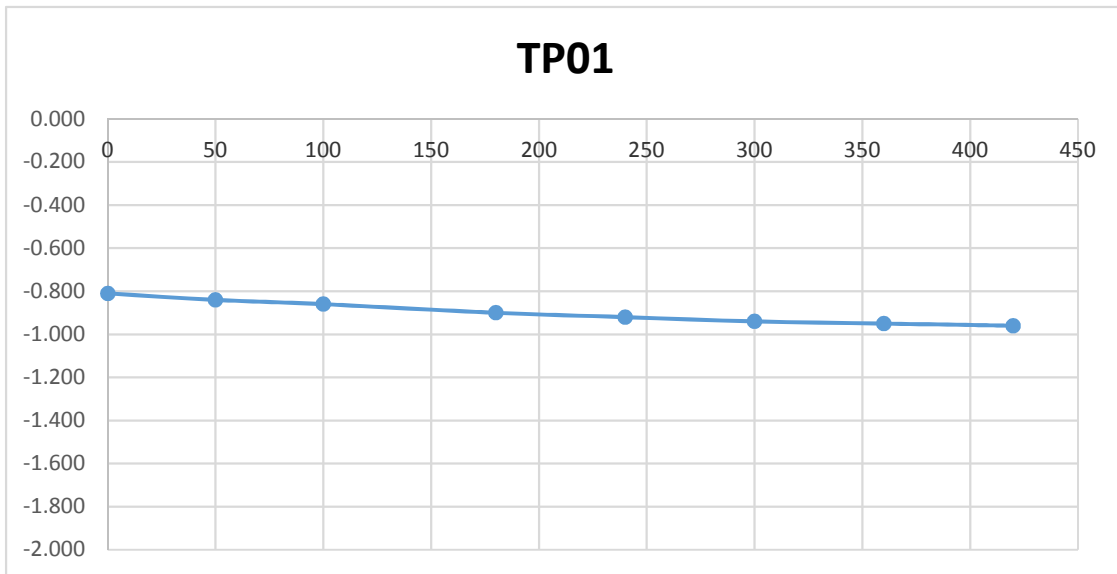
**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 2.40m x 0.70m 2.0m (L x W x D)**

Date	Time	Water level (m bgl)
14/09/2016	0	-0.810
14/09/2016	50	-0.840
14/09/2016	100	-0.860
14/09/2016	180	-0.900
14/09/2016	240	-0.920
14/09/2016	300	-0.940
14/09/2016	360	-0.950
14/09/2016	420	-0.960

**\*Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.81	2.000	1.190	1.1075	1.7025



**TP11**

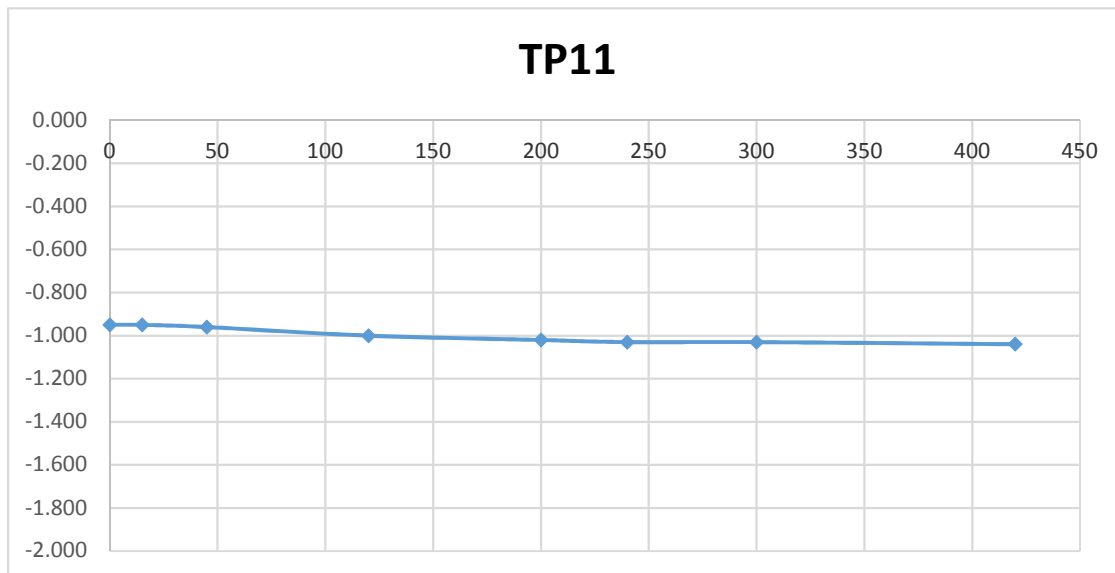
**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 2.4m x 0.70m 1.9m (L x W x D)**

Date	Time	Water level (m bgl)
14/09/2016	0	-0.950
14/09/2016	15	-0.950
14/09/2016	45	-0.960
14/09/2016	120	-1.000
14/09/2016	200	-1.020
14/09/2016	240	-1.030
14/09/2016	300	-1.030
14/09/2016	420	-1.040

**\*Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.95	1.900	0.950	1.1875	1.6625



**TP09**

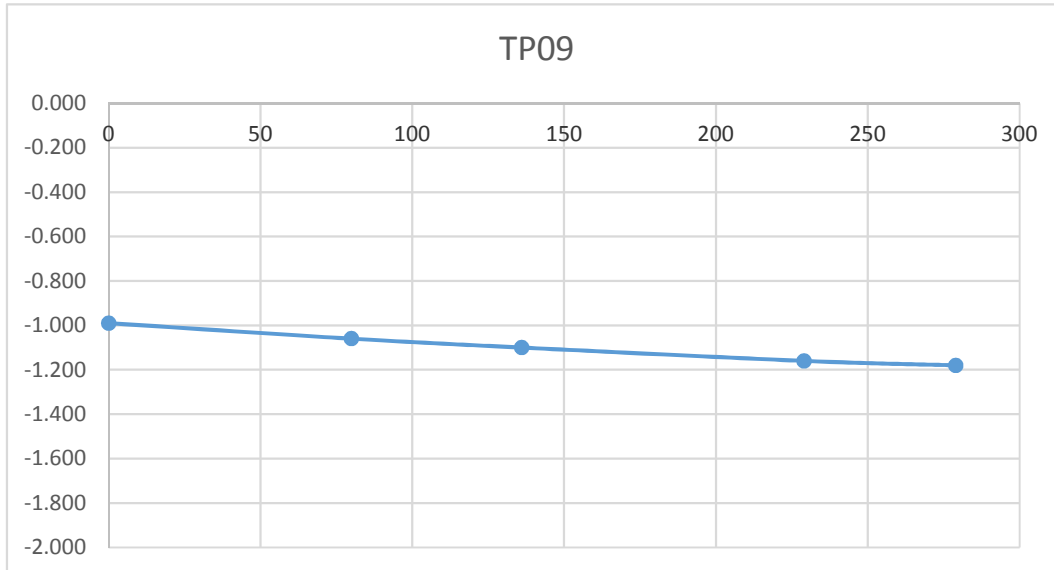
**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 12.40m x 0.70m 1.90m (L x W x D)**

Date	Time	Water level (m bgl)
14/09/2016	0	-0.990
14/09/2016	80	-1.060
14/09/2016	136	-1.100
14/09/2016	229	-1.160
14/09/2016	279	-1.180

\*Soakaway failed - Pit backfilled

Start depth	Depth of Pit	Diff	75% full	25%full
0.99	1.900	0.910	1.2175	1.6725





**TP06**

**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 2.30m x 0.70m 2.00m (L x W x D)**

Date	Time	Water level (m bgl)
14/09/2016	0	-0.970
14/09/2016	40	-1.020
14/09/2016	80	-1.070
14/09/2016	120	-1.120
14/09/2016	270	-1.230
14/09/2016	309	-1.240

\*Soakaway failed - Pit backfilled

Start depth	Depth of Pit	Diff	75% full	25%full
0.97	2.000	1.030	1.2275	1.7425

