CAUSEWAY GEOTECH

Saggart Reservoir – Ground Investigation

Client:	Irish Water
Client's Representative:	RPS Consulting Engineers
Report No.:	17-1375
Date:	June 2018
Status:	Final for Issue

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APPENDICES

Document Control Sheet

Report No.:		17-1375			
Project Title:		Saggart Reservoir			
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Prepared by:		**Reviewed by:**		**Approved by:**	
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The works were conducted in accordance with:

UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)

British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler)
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler)
P	Nominal 100mm diameter undisturbed piston sample
B	Bulk disturbed sample
LB	Large bulk disturbed sample
D	Small disturbed sample
C	Core sub-sample (displayed in the Field Records column on the logs)
L	Liner sample from dynamic sampled borehole
W	Water sample
ES / EW	Soil sample for environmental testing / Water sample for environmental testing
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained)
SPT (c)	Standard penetration test using 60 degree solid cone
x,x/x,x,x,x	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length. The length achieved is stated (mm) for any test increment less than 75mm
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm)
N=X/Z	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (mm)
V VR	Shear vane test (borehole) Hand vane test (trial pit) Shear strength stated in kPa V: undisturbed vane shear strength VR: remoulded vane shear strength
dd/mm/yy: 1.0 dd/mm/yy: dry	Date & water level at the borehole depth at the end of shift and the start of the following shift
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.

Saggart Reservoir Site Investigation

1 AUTHORITY

On the instructions of RPS Consulting Engineers Consulting Engineers, ("the Client's Representative"), acting on the behalf of Irish Water ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed construction of a new 150 Ml storage reservoir and associated works.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results. A discussion on the recommendations for construction is also provided.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client's Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, trial pits, slit trenches, soil and rock core sampling, environmental sampling, groundwater monitoring, in-situ and laboratory testing, and the preparation of a report on the findings including recommendations for construction.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted on the existing Saggart reservoir site complex near Saggart Village, Co. Dublin. The site is bordered to the west by Castle Road, to the south by agricultural lands, to the east by Pairc Mhuire Road and to the north by residential development. The site slopes gently westwards.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 20th February and 29th April 2018, comprised:

- twenty-seven light cable percussion boreholes most with rotary follow-on rotary drilling;
- a standpipe installation in eight boreholes;
- four machine dug trial pits;
- four slit trenches;
- in-situ testing including pump, variable head and soakaway tests;

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

4.2 Boreholes

Twenty-seven (BH01-BH24, BH01A, BH04A and BH23A) were put down by a combination of light cable percussion boring using Dando 2000 and Dando 2500 soil boring rigs, and rotary drilling using a Hanjin 8D rotary drilling rig.

The boreholes were put down initially by light cable percussion to virtual refusal on obstructions such as boulders. Rotary follow-on drilling was subsequently carried out, with core recovery in bedrock and overburden where specified. Where the cable percussion borehole had not been advanced onto competent strata, rotary percussive methods were employed to advance the borehole to completion/bedrock. Symmetrix cased full-hole drilling was used, with SPTs carried out at standard intervals as required.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Environmental samples were taken at standard intervals, as directed by the Client's Representative.

Standard penetration tests were carried out in accordance with BS EN 22476-3: 2005 at standard depth intervals throughout the overburden using the split spoon sampler ($SPT_{(s)}$) or solid cone attachment ($SPT_{(c)}$). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix K.

Where coring was carried out within bedrock strata, conventional coring methods were used with a metric T2-101 core barrel. Core was extracted in up to 1.5m lengths which produced core of nominal 84mm diameter and was placed in triple channel wooden core boxes.

Where coring was carried out within both the overburden strata and bedrock Geobor S Coring was used. The core was extracted in up to 1.5m lengths using a SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations.*

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded.

Where water was added to assist with boring, a note has been added to the log to account for same.

Appendix B presents the borehole logs, with core photographs presented in Appendix C.

4.3 Standpipe installations

A groundwater monitoring standpipe was installed in 8 boreholes (BH07, BH09, BH14, BH15, BH16, BH20, BH22 and BH23A).

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

4.4 Trial Pits

Four trial pits (TP01–TP04) were excavated using an 8t tracked excavator fitted with a 600mm wide bucket, to depths of 2.0m and 1.90m. All trial pits were excavated to allow completion of infiltration test.

Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata. Environmental samples were taken at 0.50m and 1.00m in trial pits TP02, TP03 and TP04.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix F presents the trial pit logs along with soakaway test results.

4.5 Slit trenches

Four slit trenches (ST01-ST04) were excavated using a combination of hand digging and mechanical excavation using a compact 3t tracked excavator fitted with a 600mm wide toothless bucket, to locate and identify buried services at the site.

Drawing of the trenches and the locations of services encountered during excavation are shown on the slit trench logs in Appendix D, with photographs presented in Appendix E.

4.6 Soakaway tests

A soakaway test was carried out at four locations (TP01-TP04) in accordance with BRE Digest 365 - Soakaways (BRE, 2016). The tests were conducted in similarly numbered trial pits.

Appendix F presents the results and analysis of the infiltration test. The absence of the outflow from the pits precluded calculation of infiltration coefficients.

4.7 Variable head permeability testing

In-situ permeability tests were carried out in BH07, BH09, BH14, BH15, BH16 and BH20 by variable head permeability methods, following development of the wells. Testing was carried out in accordance with the guidance as set out in BS EN ISO 22282-2: 2012

The permeabilities were calculated using Hvorslev's formula k=A/FT as defined in BS 5930:1999 (pg 52).

The results are presented in Appendix H.

4.8 Pump tests

Pump and step tests were carried in borehole BH16 after the installation of a 100mm groundwater well.

Monitoring of nearby standpipes was carried out using manual dip-meters and digital data loggers to measure "drawdown" of the groundwater during tests. Results have been provided to the Client's Representative and are presented in Appendix G.

4.9 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement (58 No.), Atterberg Limit tests (30 No.) and particle size distribution analysis (49 No. by wet sieve and 36 No. by sedimentation)
- **compaction related:** dry density/moisture content relationship (6 No.), Moisture Condition Value (MCV) at Natural Moisture Content (10 No.)
- **soil chemistry:** pH (20 No.) and water-soluble sulphate content (20 No.)

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: *BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990).*

The test results are presented in Appendix I.

5.2 Environmental laboratory testing of soils

57 No. of environmental samples were taken at a range of depths and testing was conducted, as indicated by the employer's representative, on selected environmental soil and water samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out on 24 No. of samples for a range of determinants, including:

- Metals
- Speciated total petroleum hydrocarbons (TPH)
- Speciated polycyclic aromatic hydrocarbons (PAH)
- Cyanides
- Asbestos screen
- pH.

Waste acceptance criteria (WAC) testing was carried out 15 No. of borehole and trial pit samples.

Results of environmental laboratory testing are presented in Appendix J.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping from the Geological Society of Ireland (GSI) indicate the superficial deposits underlying the site comprise Glacial Till. These deposits are underlain by coarse greywacke and shales of the Pollaphuca Formation.

6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Topsoil:** encountered typically in 200-400mm thickness
- **Made Ground (fill):** reworked sandy gravelly clay extending to a depth of 2.2m in BH20.
- **Fluvioglacial deposits:** typically, medium to very dense sands and gravels encountered as lenses within Glacial Till
- **Glacial Till:** sandy gravelly clay, frequently with low to medium cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.
- **Bedrock (Sandstone/Mudstone/Shale/Phyllite):** Rockhead was encountered at its shallowest depth of 10.50m in BH14 and at its greatest depth of 13.3m in BH20.

6.3 Groundwater

Groundwater was encountered during percussion boring through soil as water strikes. Table 1 below shows groundwater strikes struck during the ground investigation.

GI Location ID	Groundwater Strike (mbgl)
BH02	6.0
BH02	26.0
BH03	1.6
BH05	11.0

BH08	1.5
BH10	3.8
BH10	16.0
BH11	0.3
BH13	3.1
BH15	10.0
BH16	7.5
BH16	24.5
BH17	10.0
BH17	15.0
BH19	8.0
BH22	7.0
BH22	10.5
BH24	11.5
BH24	14.0

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

It should be noted that the casing used in supporting the borehole walls during drilling may have sealed out additional groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out. In addition, any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Seasonal variation in groundwater levels should also be factored into design considerations.

7 DISCUSSION

7.1 Proposed construction

It is proposed to construct a new 150MI storage reservoir along with associated infrastructure.

No further details were available to Causeway Geotech at the time of preparing this report and any designs based on the recommendations or conclusions within this report should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory holes. Causeway Geotech were commissioned to provide a geotechnical report, and it is outwith our remit to advise on structure design.

7.2 Recommendations for construction

7.2.1 Summary

Due to the loads anticipated at the base of the reservoir, the implementation of spread/raft foundations bearing on stiff glacial till or dense fluvioglacial sand/gravel at relatively shallow depths across the footprint of the proposed reservoir are considered most suitable foundation solution. The construction plans also show details of several buildings across the site, for which traditional foundations (strip/pad) are also considered suitable.

7.2.2 Soil strength parameters

When estimating the shear strength of fine soils (silt/clay), reference is made to the results of Standard Penetration Tests (SPT's) carried out within the boreholes. The undrained shear strength of fine soils can be estimated using the correlation developed by Stroud & Butler:

$$C_u = f_1 \times N$$

where f_1 is typically in the range 4 to 6. A median f_1 value of 5 is adopted for this report.

For granular soils (sand/gravel), a graphical relationship between SPT "N" value and angle of shearing resistance, φ, has been developed by Peck, Hanson and Thorburn. This is published in *Foundation Design and Construction* (Tomlinson, 2001) and is referenced in this report when deriving angles of shearing resistance for the gravel soils.

7.2.3 Foundations and reservoir tank construction

Foundations for any proposed structure and the reservoir base should transfer loading to below any Made Ground, firm glacial till or subsoil present. The recommended foundation construction and allowable bearing pressure (ABP) at the borehole locations are presented in Table 2.

Table 2: Construction recommendations

Borehole	Depth below EGL* to suitable bearing stratum	Estimated ABP (kPa)	Strata description	Proposed Foundation type	Groundwater
BH01a	2	300	Stiff Glacial Till	Spread/Raft	Water strike at 9.7m
BH02	1.2	225	Stiff Glacial Till	Spread/Raft	Water strike at 6.0m

Borehole	Depth below EGL* to suitable bearing stratum	Estimated ABP (kPa)	Strata description	Proposed Foundation type	Groundwater
BH03	2.6	300	Stiff Glacial Till	Spread/Raft	Water strike at 1.6m
BH04a	2	300	Stiff Glacial Till	Spread/Raft	Not Encountered
BH05	1.2	175	Stiff Glacial Till	Spread/Raft	Water strike at 11m
BH06	1.6	300	Stiff Glacial Till	Spread/Raft	Not Encountered
BH07	2.2	225	Stiff Glacial Till	Spread/Raft	Monitored at 6.69m
BH08	2	220	Stiff Glacial Till	Spread/Raft	Water strike at 12m
BH09	2	250	Stiff Glacial Till	Spread/Raft	Monitored at 0.97
BH10	3	175	Stiff Glacial Till	Spread/Raft	Water strike at 3.8m
BH11	2	250	Stiff Glacial Till	Spread/Raft	Water strike at 0.3m
BH12	2	300	Stiff Glacial Till	Spread/Raft	Not Encountered
BH13	2	150	Stiff Glacial Till	Spread/Raft	Water strike at 3.0m
BH14	1.2	300	Stiff Glacial Till	Spread/Raft	Monitored at 3.69m
BH15	2	300	Stiff Glacial Till	Spread/Raft	Monitored at 6.96m
BH16	1.2	300	Dense Sand	Spread/Raft	Monitored at 3.67m
BH17	1.2	300	Stiff Glacial Till	Spread/Raft	Water strike at 10.0m
BH18	1.2	300	Very Dense Gravel	Spread/Raft	Not Encountered
BH19	1.2	175	Stiff Glacial Till	Spread/Raft	Water strike at 8.0m
BH20	2.2	300	Very Dense Gravel	Spread/Raft	Monitored at 3.7m

Borehole	Depth below EGL* to suitable bearing stratum	Estimated ABP (kPa)	Strata description	Proposed Foundation type	Groundwater
BH21	1.2	200	Stiff Glacial Till	Spread/Raft	Not Encountered
BH22	1.2	200	Stiff Glacial Till	Spread/Raft	Water strike at 7.0m
BH23a	2.6	300	Stiff Glacial Till	Spread/Raft	Not Encountered
BH24	1.2	175	Stiff Glacial Till	Spread/Raft	Water strike at 11.5m

*Existing Ground Level

The base of foundation excavations should be thoroughly inspected; any soft soils should be removed with the resultant void backfilled with well graded well compacted granular fill material. A consistent bearing stratum should be provided for any building unit to limit the development of differential settlements.

Excavations for foundation slabs are likely to be relatively stable. However, any instability can be minimised by battering the side slopes at 2 vertical to 1 horizontal or in the case where cut is in gravels, 3/4:1.

Groundwater control, where required, will be possible by pumping from sumps formed in the base of excavation. Given the presence of shallow groundwater in some boreholes the site (possibly coincident with perched water sitting on top of the low permeability glacial tills), some groundwater control will be required.

7.2.4 Floor slabs/reservoir tank base

Floor slabs or reservoir base slabs should not bear directly onto Made Ground, firm glacial till or other soft soils that may be encountered at the time of construction. Therefore, the use of ground bearing floor slabs is only appropriate following the removal of any of the soils mentioned above. Any soft or unsuitable soils should be removed and replaced using well-graded well-compacted granular fill.

However, for buildings, a suspended floor slab should be adopted where the difference in levels of the proposed floor and the base of Made Ground/soft soils is greater than 600mm.

7.2.5 Excavations for services

For the installation of services ducts/trenches, it is suggested that open trenching will be the most practicable construction method. Generally speaking, the ground conditions should render the use of open trenching by backhoe excavator possible.

Where working in open trenches, it is thought that trench support systems, by way of a trench box (or possibly sheet piles), will be required to maintain trench stability and safe working conditions. Groundwater control at these locations should be possible by means of sump pumping.

To preclude the eventuality of differential settlements in pipes, they should be laid on a consistent stratum of appropriate allowable bearing capacity and protected with appropriate fill cover.

Where ducts and chambers must be installed in areas where localised soft spots are encountered, the use of geogrid reinforcement along the base of the very soft/soft soil (e.g. peat) below the trench base is recommended. This will stiffen the base of the trench and help control longitudinal differential settlement.

Backfilling of trenches may be completed by using compacted Cl 804 granular fill and reinstated as appropriate.

7.2.6 Soil aggressivity

An assessment of the Aggressive Chemical Environment for Concrete (ACEC) was undertaken through reference to the Building Research Establishment (BRE) Special Digest 1 (2017).

As noted by BRE Special Digest 1, sulphates in the soil and groundwater are the chemical agents most likely to attack concrete. The extent to which sulphates affect concrete is linked to their concentrations, the type of ground, the presence of groundwater, the type of concrete and the form of construction in which concrete is used.

BRE Special Digest 1 identifies four different categories of site which require specific procedures for investigation for aggressive ground conditions:

- Sites not subjected to previous industrial development and not perceived as containing pyrite;
- Sites not subjected to previous industrial development and perceived as containing pyrite;
- Brownfield sites not perceived as containing pyrite;
- Brownfield sites perceived as containing pyrite.

For the purposes of this report the site was classified as not having been subject to previous industrial development and not perceived as containing pyrite.

The results of chemical tests (pH and water soluble sulphate contents) on soil samples indicate Design Sulphate Class DS-1 and ACEC Class AC-1 – reference Table C1 of BRE Special Digest 1 (Building Research Establishment, 2005). The Special Digest does not require any measures to protect underground concrete elements greater that 140mm thick.

7.3 Infiltration drainage

Infiltration tests were carried out in trial pits TP01-TP04, however the absence of outflow from the pits precluded calculation of infiltration coefficients. The low-permeability fine-grained soils are considered as such poor infiltration media, and would be deemed unsuitable for the implementation of infiltration drainage systems.

7.4 Material re-use

In assessing the reusability of soil several approaches may be considered. Most commonly, the following parameters are used:

a) moisture content and the plastic limit / moisture content ratio of potential Cohesive Fill: an upper bound ratio of 1.2 is often adopted.

b) undrained shear strength (undisturbed and remoulded) of potential Cohesive Fill: a lower bound strength of 50kPa is often adopted.

c) Moisture Condition Value (MCV) of potential Cohesive Fill: a lower bound MCV of 8 is often adopted.

d) California Bearing Ratio (CBR) of potential Cohesive Fill: a lower bound CBR of 2% is often adopted.

e) measured SPT *N* value of potential Cohesive Fill: a lower bound value of 12 is often adopted, using the published relationships between *N* value and c_u, Clayton (1995). However, the individual blow counts need to be examined to allow assessment of whether *N* values have been elevated by the presence of coarse gravel or cobbles.

f) particle size distribution, in particular the fines content, of potential Granular Fill.

g) moisture content of potential Granular Fill as reflected by laboratory test results and the records of groundwater strikes in coarse grained soils

h) coefficient of uniformity, C_u, of granular material.

Allowance will also have to be made of construction expedients and their impact on the proportion of reusable soil, including:

- the effects of weathering of the near surface soils
- the presence of moisture susceptible soils
- the difficulties of separating layers and lenses of potential Granular and Cohesive Fill

- the presence of groundwater in lenses and layers of coarse grained soils.

Note that not all the aforementioned parameters are applicable in each case, more so a combination of those most applicable.

In assessing its suitability for use as fill, reference is made to the in-situ test results and the laboratory testing conducted on representative disturbed samples obtained from the trial pits and boreholes during the ground investigation.

It is likely given the low strength, high natural moisture content and occasional organic nature of the upper 1-2m of soils, that these soils will not be suitable for re-use as fill.

From assessment of the Dry Density/moisture content relationships and Moisture Condition Value Single Point tests, Glacial Till (brown sandy gravelly CLAY) may be suitable for re-use as cohesive general fill once the moisture content has been reduced to Optimum Moisture Content (OMC) - measured as between 7.7 to 9.5%. Seasonal variations in the groundwater table will affect the natural moisture content of these soils and as such will affect their suitability for re-use, therefore any earthworks should ideally be undertaken during the summer months.

The lower stiff glacial till soils will be suitable for re-use as general fill. It should be noted that the field logs make note of low cobble content across the area in concern; these would have tended not to have been included in the samples taken for testing and as such have not been considered in the above assessment. Certain pockets of coarse soils encountered may fall under classification of starter layers.

Dense sands and gravels encountered as lenses within the glacial till will also be suitable for re-use as general granular fill once the fines content has been reduced on site prior to placing.

The above assessment is based on the information gleaned from the investigation points. When carrying out excavation works, further on-site testing should be conducted to verify the type/classification and suitability of fill material.

7.5 Site contamination and waste disposal

Selected soil samples were analysed for a range of potential contaminants including:

- Metals;
- Speciated total petroleum hydrocarbons (TPH);
- Speciated polycyclic aromatic hydrocarbons (PAH);
- Cyanides;
- Sulphates and sulphide;
- Phenols; and

- Asbestos screening

Selected samples were also tested for a Waste Acceptance Criteria (WAC) suite to assess the potential categorisation of waste from the site.

In the initial examination of the potential risk of site contamination, the laboratory results have been compared to the following available assessment criteria relevant to the proposed land use:

- the Environment Agency Soil Guideline Values (SGVs) published, in 2009. These relate to arsenic, mercury, selenium, cadmium, benzene, toluene, ethylbenzene, xylenes, and phenol.

The results from the samples tested do not identify significantly elevated concentrations above the SGVs where criteria are available for commercial land use criteria.

The results of the waste acceptance criteria (WAC) testing have been compared with the European Union Directive limits for Inert waste landfill, Stable, Non-reactive hazardous waste in non-hazardous landfill and hazardous waste landfill criteria.

From the samples tested for WAC analysis material from the site may potentially be classified as inert/non-hazardous. It is noted however that any material excavated for off-site disposal would have to be classified under the guidance in the National Hazardous Waste Management Plan (EPA, 2014).

8 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930: 2015: Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description. British Standards Institution.

BS EN ISO 14688-2:2004+A1:2013: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

Building Research Establishment (2005) BRE Special Digest 1, Concrete in aggressive ground.

Building Research Establishment (2007), BRE Digest 365: Soakaways.

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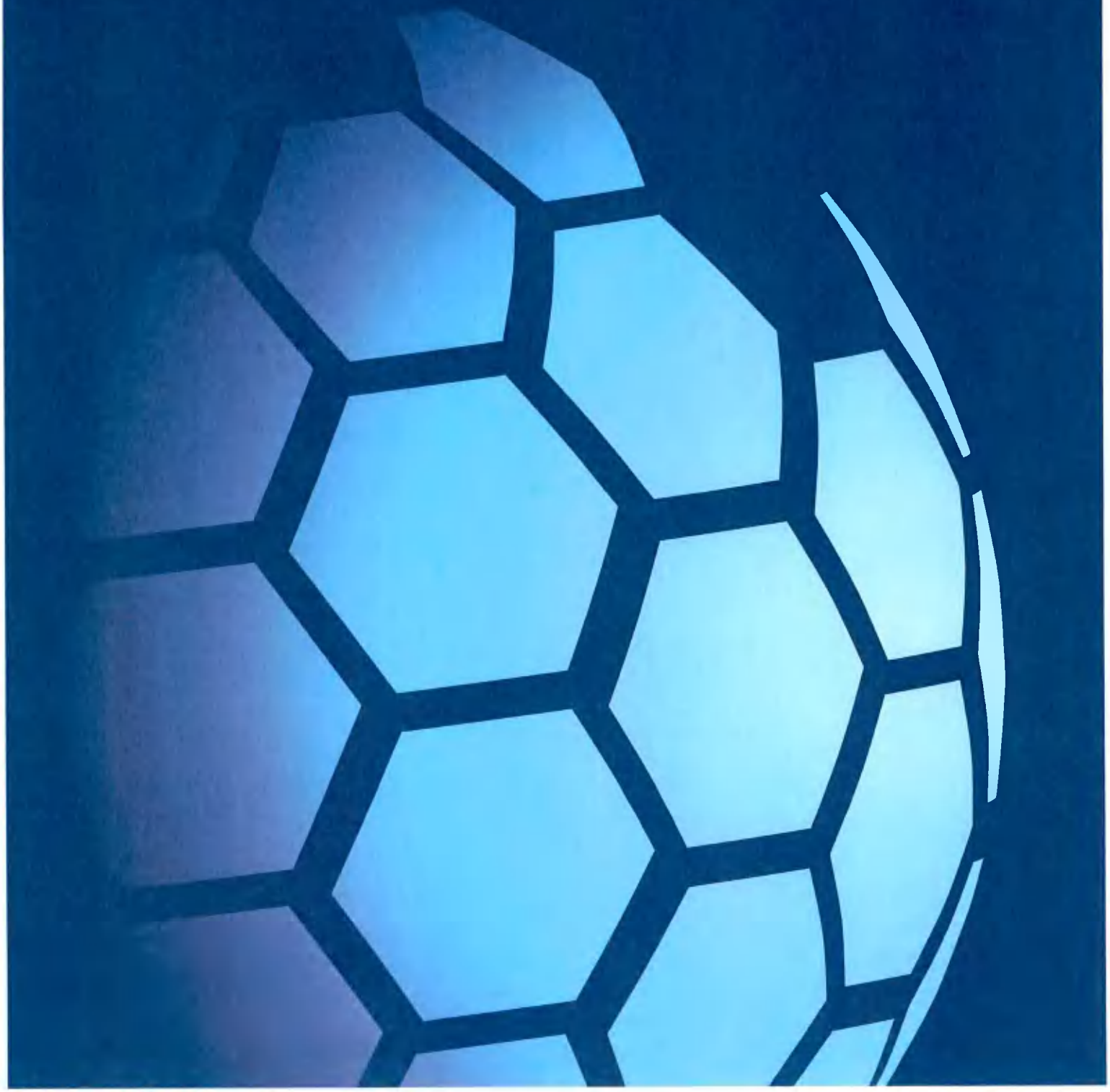
APPENDIX A

SITE LOCATION PLAN



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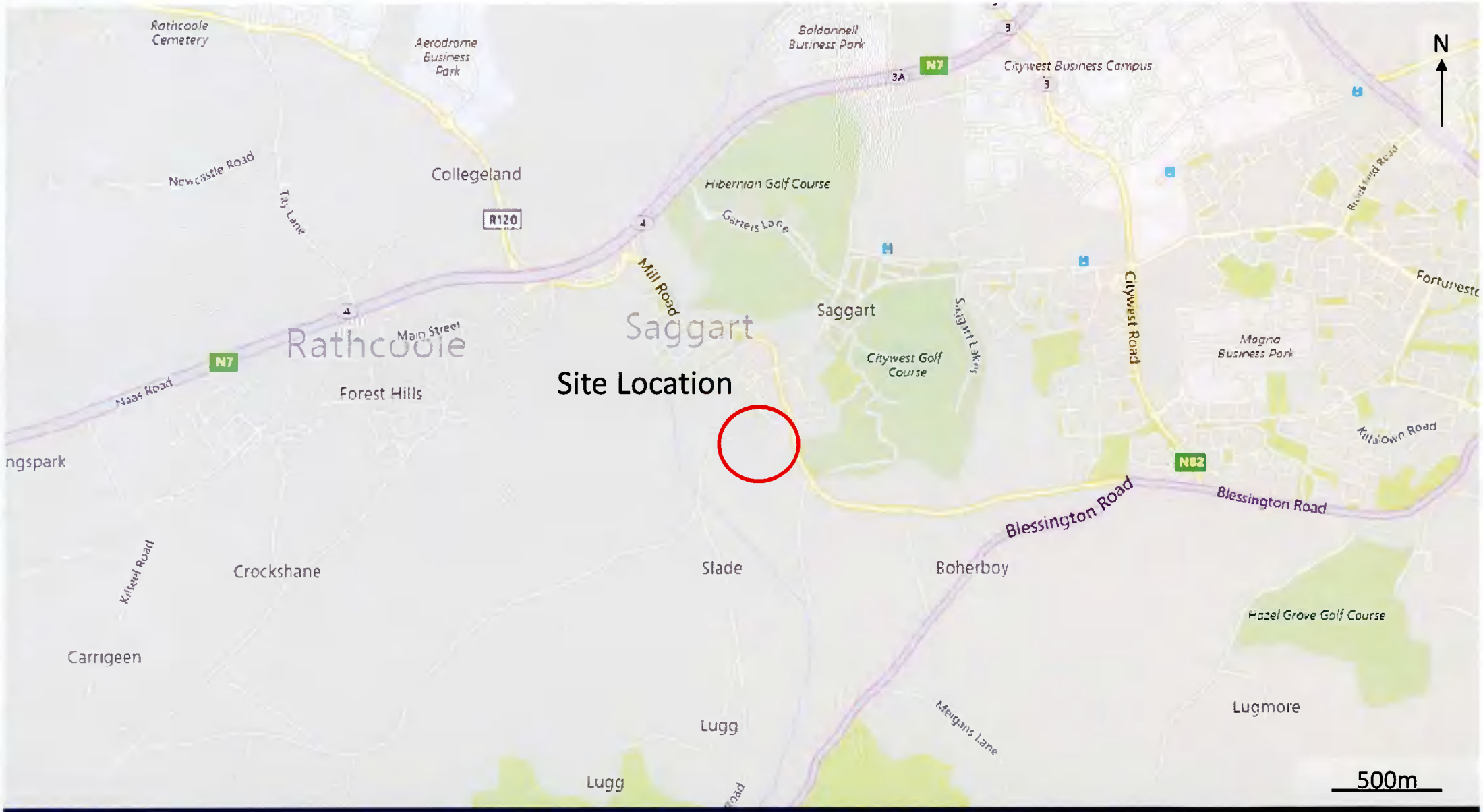


June 2018 Bing Maps, 2018

Site Location Plan

Project No.:	17-1375	**Client:**	Irish Water
Project Name:	Saggart Reservoir Site Investigation	**Client's Representative:**	RPS Consulting Engineers

Legend Key

- Locations By Type - CP
- Locations By Type - CP+RC
- Locations By Type - TP

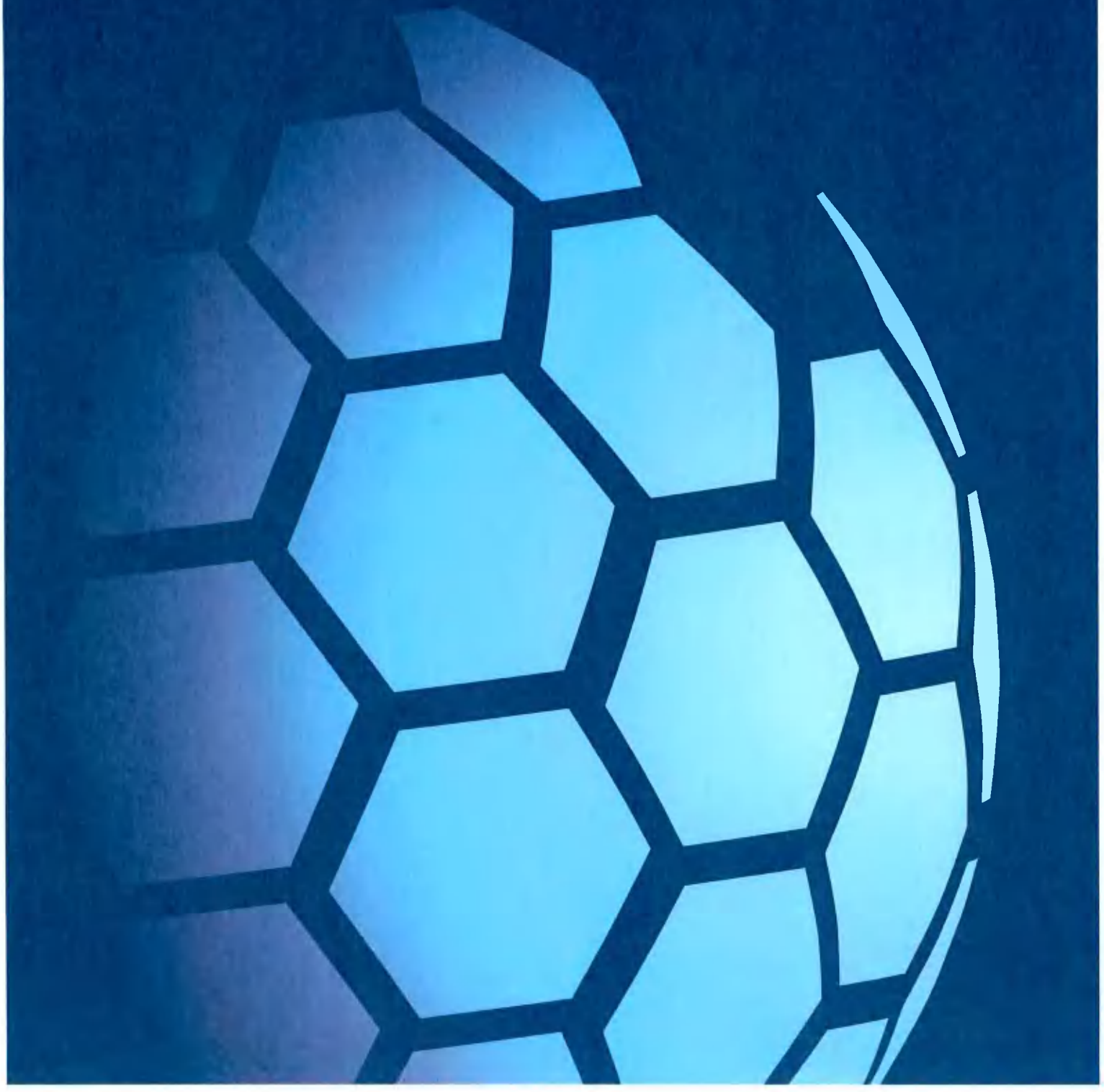
Title:
Exploratory Hole Location Plan

Last Revised:	**Scale:**
15/06/2018	1:2500

CAUSEWAY GEOTECH

APPENDIX B

BOREHOLE LOGS



Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	1.90

Project No.: 17-1375

Project Name: Saggart Reservoir Site Investigation

Borehole No.: BH01

Coordinates: 303507.38 E 226194.37 N

Client: Irish Water

Sheet 1 of 1

Client's Representative: RPS Consulting Engineers

Scale: 1:50

Ground Level: 139.27 mOD

Dates: 21/02/2018 - 20/03/2018

Driller: DMcA

Logger: MFG

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 1.00	B1							Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
0.50	ES4									
1.00	ES5					(1.90)				
1.00 - 1.90	B2									
1.20 - 1.65	SPT (S) N=15			N=15 (2,3/3,3,4,5)						
1.60	D3									
					137.37	1.90		End of Borehole at 1.90m		

Remarks

Hand dug inspection pit excavated from 0-1.20m.

Terminated on refusal at 1.90m. Moved to rebore position BH01A.

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
1.90	200

Chiselling Details

From (m)	To (m)	Time (hh:mm)
1.90	1.90	01:00

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH01A
Coordinates:	**Client:**	Sheet 1 of 2
303507.38 E	Irish Water	
226194.37 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 139.27 mOD	**Dates:** 22/02/2018	**Driller:** DMcA
		Logger: MFG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	6.60
Roatry Drilling	Hanjin 8D	6.60	11.00
Rotary Coring	Hanjin 8D	11.00	14.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular.		
						(3.00)				
1.90 - 2.90	B1									
2.00 - 2.45	SPT (S) N=32	2.00		N=32 (3,5/7,7,9,9)						
2.40	D7									
2.90 - 3.70	B2									
3.00 - 3.45	SPT (S) N=21	3.00	2.10	N=21 (4,4/5,5,5,6)	136.27	3.00		Stiff brown slightly sandy gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular.		
3.40	D8					(0.90)				
3.70 - 3.90	B3									
3.90 - 4.90	B4				135.37	3.90		Very dense grey sandy clayey angular fine to coarse GRAVEL with and occasional bands of stiff brown sandy gravelly clay.		
4.00 - 4.29	SPT (S)	4.00	3.60	50 (12,13/50 for 140mm)						
4.30	D9									
4.90 - 5.90	B5					(2.00)				
5.00 - 5.20	SPT (S)	5.00	4.10	50 (25 for 110mm/50 for 95mm)						
5.30	D10									
5.90 - 6.60	B6				133.37	5.90		Very dense grey subangular medium GRAVEL with bands of stiff black sandy gravelly clay with low cobble and boulder content.		
6.00 - 6.21	SPT (S)	6.00	4.80	50 (25 for 105mm/50 for 105mm)		(0.70)				
6.30	D11					6.60		BOULDER		
					132.67	(0.30)				
					132.37	6.90		Very stiff dark brown slightly sandy slightly gravelly CLAY. (Driller's Description)		
						(2.80)				
8.50 - 8.95	SPT (S) N=48	8.50		N=48 (6,9/9,11,14,14)						
					129.57	9.70		Weathered ROCK (Driller's description)		
						(1.30)				

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm:ss)
T2-101					6.60	6.60	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	3.90	6.60	6.60	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH01A
Coordinates:	**Client:**	Sheet 2 of 2
303507.38 E	Irish Water	
226194.37 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 139.27 mOD	**Dates:** 22/02/2018	**Driller:** DMcA
		Logger: MFG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	6.60
Roatry Drilling	Hanjin 8D	6.60	11.00
Rotary Coring	Hanjin 8D	11.00	14.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Weathered ROCK (Driller's description)		
	100 39	39	20+ 6		128.27	11.00		Weak to medium strong interbedded SANDSTONE and thinly laminated MUDSONE. Distinctly weathered: slightly reduced strength, much closer fracture spacing. Rust oxidation staining on fracture surfaces. Discontinuities: 1. 5 to 10 degree joints, closely spaced (60/80/250), stepped, rough). 2. 45 degree joints, closely spaced (80/100/350), planar, rough. 3. 75 to 90 degree bedding fractures, very closely spaced, stepped, smooth.		
12.00	100 0	0				(3.00)				
13.00	100 10	10	20+							
14.00					125.27	14.00		End of Borehole at 14.00m		

TCR SCR RQD FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101					6.60	6.60	01.00
Flush Type	**Water Added**		**Casing Details**				
	From (m)	To (m)	To (m)	Diam (mm)			

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH02
Coordinates:	**Client:**	Sheet 1 of 3
303806.00 E	Irish Water	
226123.94 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 147.57 mOD	**Dates:** 29/04/2018	**Driller:** DMC+JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	15.50
Geobor S	Hanjin 8D	15.50	18.50
Rotary Coring	Hanjin 8D	18.50	26.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.40	B1					(0.40)		TOPSOIL		
0.40 - 1.40	B2				147.17	0.40				
0.50	ES38							Stiff brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
1.00	ES39					(1.30)				
1.20 - 1.65	SPT (S) N=25			N=25 (3,4/5,6,6,8)						
1.40 - 1.70	B3									
1.60	D21									
1.70 - 2.70	B4				145.87	1.70				
2.00 - 2.45	SPT (S) N=38	2.00	1.30	N=38 (3,6/7,8,10,13)				Dense greyish brown very sandy slightly clayey rounded fine to coarse GRAVEL. Sand is fine to coarse.		
2.40	D22									
2.70 - 3.70	B5									
	B6									
3.00 - 3.45	SPT (S) N=43	3.00	2.10	N=43 (1,5/10,11,11,11)						
3.40	D23									
3.70 - 4.70	B7									
4.00 - 4.45	SPT (S) N=39	4.00	2.70	N=39 (3,4/7,8,11,13)		(5.00)				
4.40	D24									
4.70 - 5.70	B8									
5.00 - 5.45	SPT (S) N=38	5.00	3.60	N=38 (3,4/6,9,10,13)						
5.40	D25									
5.70 - 6.70	B9									
6.00 - 6.45	SPT (S) N=46	6.00	4.20	N=46 (2,5/8,10,12,16) Water strike at 6.00m						
6.40	D26									
6.70 - 7.30	B10				140.87	6.70		Dense greyish very gravelly slightly clayey brown fine to coarse SAND.		
7.00 - 7.45	SPT (S) N=46	7.00	4.70	N=46 (3,5/9,10,13,14)		(0.60)				
7.30 - 8.10	B11				140.27	7.30		Very stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
7.40	D27									
8.00 - 8.45	SPT (S) N=31	8.00	4.90	N=31 (3,4/6,8,8,9)						
8.10 - 9.10	B12									
8.40	D28									
						(4.20)				
9.00 - 9.36	SPT (S)	9.00	5.10	50 (4,9/50 for 215mm)						
9.10 - 9.60	B13									
9.30	D29									
10.00 - 10.50	B14									
10.00 - 10.45	SPT (S) N=47	10.00	4.70	N=47 (10,10/10,12,12,13)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6LT2-101	6.00	6.00	20	6.00	1.90	2.60	01:00
	26.00	26.00	20	26.00	5.70	6.20	01:00
					11.60	12.00	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	1.70	15.50		

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH02
Coordinates:	**Client:**	Sheet 2 of 3
303806.00 E	Irish Water	
226123.94 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 147.57 mOD	**Dates:** 29/04/2018	**Driller:** DMC+JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	15.50
Geobor S	Hanjin 8D	15.50	18.50
Rotary Coring	Hanjin 8D	18.50	26.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.40	D30 D32							Very stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
11.00 - 11.50	B15									
11.00 - 11.45	SPT (S) N=51	11.00	3.60	N=51 (10,10/11,12,13,15)						
11.40	D31 D33				136.07	11.50		Very stiff brown slightly sandy gravelly CLAY with thin lenses of sandy gravel. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
12.00 - 12.50	B16					(1.00)				
12.00 - 12.34	SPT (S)	12.00	4.20	50 (6,10/50 for 190mm)						
12.30	D34				135.07	12.50		Very stiff dark grey slightly sandy slightly gravelly CLAY. Gravel is subangular fine to coarse of limestone. Sand is fine to coarse.		
12.50 - 13.00	B17					(0.50)				
13.00 - 13.50	B18				134.57	13.00		Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
13.00 - 13.44	SPT (S)	13.00	5.70	50 (6,7/50 for 285mm)		(0.50)				
13.30	D35				134.07	13.50		Very dense brown sandy slightly clayey subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
14.00 - 14.50	B19									
14.00 - 14.44	SPT (S)	14.00	7.10	N=52 (7,8/52 for 285mm)						
14.50	D36					(2.00)				
15.00 - 15.50	B20									
15.00 - 15.42	SPT (S)	15.00	7.90	N=50 (3,5/50 for 265mm)						
15.50	D37				132.07	15.50		Medium dense sandy subangular to subrounded fine to coarse GRAVEL with occasional cobbles and boulders. Sand is fine to coarse. Cobbles and boulders are subrounded.		
						(1.50)				
					130.57	17.00		Very stiff brownish grey sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies. Cobbles are subangular		
	100					(7.00)				
20.00										

TCR	SCR	RQD	FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6LT2-101					1.90	2.60	01:00
					5.70	6.20	01:00
					11.60	12.00	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			18.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH02
Coordinates:	**Client:**	Sheet 3 of 3
303806.00 E	Irish Water	
226123.94 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 147.57 mOD	**Dates:** 29/04/2018	**Driller:** DMC +JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	15.50
Geobor S	Hanjin 8D	15.50	18.50
Rotary Coring	Hanjin 8D	18.50	26.50

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
	100										
21.50											
	100										
23.00											
	100										
						123.57	24.00		Stiff light brown sandy very gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies. Cobbles are subangular		
24.50									*24.00m - 26.00m: clay is dry and compacted with low moisture content*		
	100						(2.50)				
26.00											
	60				Water strike at 26.00m						
26.50						121.07	26.50		End of Borehole at 26.50m		

TCR	SCR	RQD	FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6LT2-101	6.00	6.00	20	6.00	1.90	2.60	01:00
	26.00	26.00	20	26.00	5.70	6.20	01:00
					11.60	12.00	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			26.50	152

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH03
Coordinates:	**Client:**	Sheet 1 of 2
303529.39 E	Irish Water	
226088.91 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 139.30 mOD	**Dates:** 07/03/2018	**Driller:** DMC+JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	2.30
Rotary Drilling	Hanjin 8D	2.30	5.50
Rotary Coring	Hanjin 8D	5.60	6.00
Open Hole Drilling	Hanjin 8D	6.00	11.70

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.30	B7					(0.30)		TOPSOIL.		
0.30 - 1.30	B6				139.00	0.30		Firm brown slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is fine to medium.		
0.50	ES2									
1.00	ES1									
1.20 - 1.65	SPT (S) N=11			N=11 (2,3/2,3,3,3)		(2.30)				
1.30 - 2.30	B5									
1.60	D4			Water strike at 1.60m						
2.00 - 2.26	SPT (S)			50 (4,8/50 for 115mm)						
2.30	D3				136.70	2.60 (0.30)		Large BOULDER		
2.60 - 2.82	SPT (S)			50 (25 for 145mm/50 for 70mm)	136.40	2.90		Stiff slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Sand is fine to coarse.		
4.00 - 4.45	SPT (S)			23 (6,7/7,8,8,)		(2.60)				
	100				133.80	5.50 (0.50)		Very stiff dark grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies predominately limestone.		
6.00					133.30	6.00		Very stiff slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.		
7.00 - 7.45	SPT (S)			50 (5,12/18,18,14,)	132.30	(1.00) 7.00		Very stiff black slightly sandy slightly gravelly CLAY with low cobbie content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.		
8.50 - 8.88	SPT (S)			49 (6,13/49 for 225mm)		(4.70)				
10.00 - 10.38	SPT (S)			49 (6,13/49 for 225mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101	1.60	1.60	20	1.40	2.30	2.60	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH03
Coordinates:	**Client:**	Sheet 2 of 2
303529.39 E	Irish Water	
226088.91 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 139.30 mOD	**Dates:** 07/03/2018	**Driller:** DMC+JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	2.30
Rotary Drilling	Hanjin 8D	2.30	5.50
Rotary Coring	Hanjin 8D	5.60	6.00
Open Hole Drilling	Hanjin 8D	6.00	11.70

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff black slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.		
11.70 - 12.08	SPT (S)			50 (2,10/50 for 225mm)	127.60	11.70		End of Borehole at 11.70m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101	1.60	1.60	20	1.40	2.30	2.60	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	1.80

Project No.: 17-1375

Project Name: Saggart Reservoir Site Investigation

Borehole No.: BH04

Coordinates: 303495.47 E 226147.58 N

Client: Irish Water

Sheet 1 of 1

Client's Representative: RPS Consulting Engineers

Scale: 1:50

Ground Level: 138.58 mOD

Dates: 23/04/2018

Driller: DM

Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.30	B4					(0.30)		TOPSOIL.		
0.30 - 1.30	B5				138.28	0.30		Firm brown sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subangular fine to medium.		
0.50	ES2									
1.00	ES1					(1.50)				
1.20 - 1.65	SPT (S) N=15	1.20		N=15 (2,3/4,3,4,4)						
1.30 - 1.80	B6									
1.60	D3									
					136.78	1.80		End of Borehole at 1.80m		

Remarks

Hand dug inspection pit excavated from 0-1.20m.

Terminated on refusal at 1.80m. Moved to rebore position BH04A.

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
1.80	200

Chiselling Details

From (m)	To (m)	Time (hh:mm)
1.80	1.90	01:00

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH04A
Coordinates:	**Client:**	Sheet 1 of 2
303495.47 E	Irish Water	
226147.58 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 138.58 mOD	**Dates:** 22/02/2018	**Driller:** DMC+JG **Logger:** CH+SG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	4.20
Rotary Drilling	Hanjin 8D	4.20	11.50
Rotary Coring	Hanjin 8D	11.50	12.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.30)		TOPSOIL.		
					138.28	0.30		Stiff brown slightly sandy slightly gravelly CLAY with low to medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are angular.		
1.80 - 2.80	B3									
2.00 - 2.44	SPT (S)	2.00		N=49 (2,3/49 for 290mm)		(3.60)				
2.40	D6									
2.80 - 3.90	B2									
3.00 - 3.45	SPT (S) N=29	3.00		N=29 (3,5/8,7,6,8)						
3.40	D5									
3.90 - 4.20	B1				134.68	3.90 (0.30)		Stiff black slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
4.20 - 4.65	SPT (S) N=50	4.00		N=50 (4,5/6,14,17,13)	134.38	4.20		Very stiff slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
4.60	D4									
5.50 - 5.89	SPT (C)			N=50 (6,8/50 for 240mm)						
7.00 - 7.39	SPT (C)			N=50 (5,6/50 for 240mm)		(7.30)				
8.50 - 8.78	SPT (C)			N=43 (6,9/43 for 125mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101					2.40	2.70	00:30
					3.90	4.20	01.00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH04A
Coordinates:	**Client:**	Sheet 2 of 2
303495.47 E	Irish Water	
226147.58 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 138.58 mOD	**Dates:** 22/02/2018	**Driller:** DMC+JG
		Logger: CH+SG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	4.20
Rotary Drilling	Hanjin 8D	4.20	11.50
Rotary Coring	Hanjin 8D	11.50	12.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
	100				127.08	11.50 (0.50)		Very stiff grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies predominately sandstone and slatey mudstone. Cobbles are subangular.		
12.00					126.58	12.00		End of Borehole at 12.00m		

TCR	SCR	RQD	FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101					2.40	2.70	00:30
					3.90	4.20	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH05
Coordinates:	**Client:**	Sheet 1 of 2
303489.30 E	Irish Water	
226104.44 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 137.01 mOD	**Dates:** 06/03/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	2.30
Rotary Drilling	Hanjin 8D	2.30	13.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 1.20	B7					(0.20)		TOPSOIL.		
0.20 - 1.20	B6				136.81	0.20		Stiff brown CLAY with cobbles and boulders. Cobbles and boulders are subrounded.		
0.50	ES2									
1.00	ES1									
1.20 - 1.65	SPT (S) N=19			N=19 (2,3/5,4,5,5)		(2.10)				
1.60	D4									
2.00 - 2.43	SPT (S)			N=50 (4,4/50 for 280mm)						
2.20 - 2.30	B5				134.71	2.30		Very stiff slightly silty slightly gravelly sandy CLAY. (Driller's description)		
2.30	D3									
2.60 - 2.96	SPT (C)			N=50 (6,9/50 for 210mm)						
4.00 - 7.00	B8									
4.00 - 4.34	SPT (S)			N=51 (7,9/51 for 190mm)						
5.50 - 5.92	SPT (S)			N=50 (9,10/50 for 265mm)						
						(10.70)				
7.00 - 10.00	B9									
7.00 - 7.28	SPT (S)			N=41 (9,11/41 for 135mm)						
8.50 - 8.76	SPT (S)			N=44 (10,13/44 for 110mm)						
10.00 - 10.33	SPT (S)			N=50 (8,11/50 for 180mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Flush Type

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
11.00	11.00		

Water Added	
From (m)	To (m)

Casing Details	
To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
2.30	2.60	01:00

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH05
Coordinates:	**Client:**	Sheet 2 of 2
303489.30 E	Irish Water	
226104.44 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 137.01 mOD	**Dates:** 06/03/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	2.30
Rotary Drilling	Hanjin 8D	2.30	13.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff slightly silty slightly gravelly sandy CLAY. (Driller's description)		
				Water strike at 11.0m						
11.50 - 11.88	SPT (S)			N=50 (9,13/50 for 225mm)						
					124.01	13.00		End of Borehole at 13.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Flush Type

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
11.00	11.00		

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)

Chiselling Details

From (m)	To (m)	Time (hh:mm)
2.30	2.60	01:00

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH06
Coordinates:	**Client:**	Sheet 1 of 2
303589.07 E	Irish Water	
226243.29 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 143.12 mOD	**Dates:** 20/02/2018	**Driller:** DMcA+GT **Logger:** MFG+SG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Rotary Drilling	Beretta T44	3.00	3.80
Geobor S	Beretta T44	3.80	12.80

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 1.00	B1							Firm brown slightly sandy slightly gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subrounded.		
0.50	ES8					(1.60)				
1.00	ES9									
1.00 - 2.60	B2									
1.20 - 1.65	SPT (S) N=13			N=13 (3,3/3,4,3,3)						
1.60	D5				141.52	1.60		Very stiff brownish grey sandy gravelly CLAY with high boulder content and low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded.		
1.60 - 2.60	B3									
2.00 - 2.40	SPT (S)	2.00		N=50 (5,7/50 for 255mm)						
2.40	D6					(1.40)				
2.60 - 3.00	B4									
3.00 - 3.30	SPT (S)	3.00		N=50 (11,13/50 for 145mm)	140.12	3.00		Very stiff blackish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular.		
3.30	D7					(0.80)				
	100				139.32	3.80		Very stiff brownish black slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are of various lithologies predominately limestone and sandstone.		
5.30										
	100					(4.30)				
6.80										
	100									
8.30					135.02	8.10		Firm to stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
	93					(1.90)				
9.80										
					133.12	10.00		Medium strong greenish grey thinly laminated coarse grained cemented SANDSTONE. Partially weathered: slightly reduced strength, black reddish		
	TCR SCR RQD FI									

Remarks
Hand dug inspection pit excavated from 0-1.20m.
Cored from 3.80m to 12.80m using Geobore S.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L					3.00	3.30	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			3.00	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH06
Coordinates:	**Client:**	Sheet 2 of 2
303589.07 E	Irish Water	
226243.29 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 143.12 mOD	**Dates:** 20/02/2018	**Driller:** DMcA +GT
		Logger: MFG+SG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Rotary Drilling	Beretta T44	3.00	3.80
Geobor S	Beretta T44	3.80	12.80

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
	100	25	20	6			(1.00)		Medium strong greenish grey thinly laminated coarse grained cemented SANDSTONE. Partially weathered: slightly reduced strength, black reddish discolouration on fracture surface with clay. Fine sediment in fractures and joints.		
						132.12	11.00		Discontinuities: 1. 45 degree joints closely spaced (100/100/160), stepping, rough. Oxidation staining on joint surface.		
11.30				10					Weak thinly laminated grey slaty MUDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing. Black and orange staining on fracture and joint surfaces with clay sediment in joints.		
	100	20	20				(1.80)		Discontinuities: 1. 5 to 10 degree joints closely spaced (60/100/120), stepped, smooth, orange staining. 2. 75 to 80 degree bedding fractures, very closely spaced (20/40/60), planar, smooth, black and orange staining.		
				7							
12.80						130.32	12.80		End of Borehole at 12.80m		

TCR	SCR	RQD	FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.
Cored from 3.80m to 12.80m using Geobore S.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L					3.00	3.30	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH07
Coordinates:	**Client:**	Sheet 1 of 2
303569.28 E	Irish Water	
226115.31 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 141.58 mOD	**Dates:** 27/02/2018 - 27/03/2018	**Driller:** DMC+JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.70
Rotary Coring	Hanjin 8D	3.70	16.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.30	B6					(0.30)		TOPSOIL		
0.30 - 1.30	B7				141.28	0.30		Firm to stiff brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies. Cobbles are subangular.		
0.50	ES2									
1.00	ES1									
1.20 - 1.51	SPT (S)			7 (2,2/7 for 160mm)						
1.30 - 2.30	B8									
1.60	D5									
						(3.40)				
2.20 - 2.65	SPT (S) N=26	2.00		N=26 (2,2/5,9,6,6)						
2.30 - 3.30	B9									
2.60	D4									
3.00 - 3.45	SPT (S) N=50	3.00		N=50 (5,5/7,9,12,22)						
3.30 - 3.70	B10									
3.40	D3									
					137.88	3.70 (0.30)		BOULDER		
4.00 - 7.00				B11	137.58	4.00		Stiff dark grey silty gravelly CLAY with cobbles and boulders. (Driller's description)		
4.00 - 4.15				25 (8,25/25 for 0mm)						
5.50 - 5.78				50 (9,20/50 for 125mm)						
7.00 - 10.00				B12		(7.50)				
8.50 - 8.85				50 (8,11/50 for 200mm)						
10.00 - 12.50				B13						
10.00 - 10.18				25 (12,27/25 for 35mm)						
	TCR	SCR	RQD	FI						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (mm)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101					3.70	4.00	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			3.70	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH07
Coordinates:	**Client:**	Sheet 2 of 2
303569.28 E	Irish Water	
226115.31 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 141.58 mOD	**Dates:** 27/02/2018 - 27/03/2018	**Driller:** DMC +JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.70
Rotary Coring	Hanjin 8D	3.70	16.00

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
									Stiff dark grey silty gravelly CLAY with cobbles and boulders. (Driller's description)		
						130.08	11.50 (0.50)		Sandy GRAVEL with pieces of rock. (Driller's description)		
						129.58	12.00 (0.50)		Boulder (Driller's description)		
	42					129.08	12.50		Stiff brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies predominately shale.		
13.50							(3.00)				
	0	0	0								
15.50						126.08	15.50		Weak brownish red SHALE/MUDSTONE. Partially weathered; reduced strength, highly fractured staining on fracture surface. Discontinuities: 1. 30 to 40 degree bedding fractures very closely spaced (05/08/12 planar, smooth, stained. 2. Subvertical fractures planar, smooth, stained.		
	0	60	60				(0.50)				
16.00						125.58	16.00		End of Borehole at 16.00m		
	TCR	SCR	RQD	FI							

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101					3.70	4.00	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH08
Coordinates:	**Client:**	Sheet 1 of 1
303589.06 E	Irish Water	
226087.01 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 141.45 mOD	**Dates:** 08/03/2018 - 30/03/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.40
Rotary Drilling	Hanjin 8D	3.40	10.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.20	B6					(0.20)		TOPSOIL.		
0.20 - 1.20	B7				141.25	0.20		Firm becoming stiff light brown slightly sandy gravelly CLAY with occasional cobbles and boulders. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
0.50	ES2									
1.00	ES1									
1.20 - 2.20	B8									
1.20 - 1.65	SPT (S) N=12	1.00		N=12 (2,3/3,2,3,4) Water strike at 1.50m						
1.60	D5					(3.20)				
2.00 - 2.45	SPT (S) N=22	2.00	0.90	N=22 (3,4/6,5,5,6)						
2.20 - 3.10	B9									
2.40	D4									
3.00 - 3.45	SPT (S) N=37	3.00	1.10	N=37 (4,7/6,7,10,14)						
3.10 - 3.40	B10									
3.40	D3				138.05	3.40		Very stiff dark slightly sandy slightly gravelly boulder CLAY. Sand is fine to coarse. Gravel is subanguar fine to coarse of mixed lithologies.		
4.00 - 7.00	B11									
5.50 - 5.92	SPT (S)			N=50 (11,13/50 for 265mm)						
						(6.60)				
7.00 - 10.00	B12									
7.00 - 7.32	SPT (S)			N=50 (12,15/50 for 170mm)						
8.50 - 8.78	SPT (S)			25 (13,18/25 for 125mm)						
10.00 - 10.28	SPT (S)			25 (12,18/25 for 135mm)	131.45	10.00		End of Borehole at 10.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
1.50	1.50	20	0.60	3.40	3.50	01.00

Flush Type

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)
		10.00	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH09
Coordinates:	**Client:**	Sheet 1 of 2
303567.28 E	Irish Water	
226046.24 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 139.14 mOD	**Dates:** 11/04/2018 - 16/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	2.70
Rotary Drilling	Hanjin 8D	2.70	12.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.30	B5					(0.30)		TOPSOIL		
0.30 - 1.30	B6				138.84	0.30		Firm brown slightly sandy slightly gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.		
0.50	ES2									
1.00	ES1					(1.50)				
1.20 - 1.65	SPT (S) N=15			N=15 (2,3/4,3,4,4)						
1.30 - 1.80	B7									
1.60	D4									
1.80 - 2.70	B8				137.34	1.80		Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.		
2.00 - 2.45	SPT (S) N=28			N=28 (3,5/6,7,7,8)						
2.40	D3					(0.90)				
2.70 - 2.90	B9				136.44	2.70 (0.30)		BOULDER		
					136.14	3.00		Very stiff dark greyish brown sandy gravelly CLAY with cobbles and boulder. (Driller's description)		
4.00 - 7.00	B10					(9.00)				
7.00 - 10.00	B11									
8.50 - 8.93	SPT (S)			N=50 (8,8/50 for 275mm)						
10.00 - 12.00	B12									
10.00 - 10.30	SPT (S)			36 (11,11/36 for 145mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Flush Type

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
2.00	2.90	01.00

Water Added	
From (m)	To (m)

Casing Details	
To (m)	Diam (mm)
2.70	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH09
Coordinates:	**Client:**	Sheet 2 of 2
303567.28 E	Irish Water	
226046.24 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 139.14 mOD	**Dates:** 11/04/2018 - 16/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	2.70
Rotary Drilling	Hanjin 8D	2.70	12.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff dark greyish brown sandy gravelly CLAY with cobbles and boulder. (Driller's description)		
11.50 - 11.69	SPT (S)			25 (14,25/25 for 40mm)						
					127.14	12.00		End of Borehole at 12.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
				2.00	2.90	01:00

Flush Type

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)
		12.00	152

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH10
Coordinates:	**Client:**	Sheet 1 of 2
303637.24 E	Irish Water	
226042.46 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 142.31 mOD	**Dates:** 10/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	4.50
Rotary Drilling	Hanjin 8D	4.50	18.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.60	B6					(0.60)		MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
0.50	ES2				141.71	0.60				
0.60 - 1.60	B7							Firm brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
1.00	ES1									
1.20 - 1.65	SPT (S) N=10			N=10 (1,2/2,3,2,3)						
1.60	D5					(2.00)				
1.60 - 2.60	B8									
2.00 - 2.45	SPT (S) N=14	2.00		N=14 (2,3/4,3,3,4)						
2.40	D4									
2.60 - 3.80	B9				139.71	2.60		Stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
3.00 - 3.45	SPT (S) N=19	3.00		N=19 (2,2/4,4,4,7)						
3.40	D3					(1.20)				
3.80 - 4.50	B10			Water strike at 3.80m	138.51	3.80		Very stiff dark grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
4.00 - 4.34	SPT (S)	4.00	3.90	N=50 (9,11/50 for 185mm)						
						(2.00)				
5.50 - 8.50	B11									
					136.51	5.80		Very stiff dark greyish brown sandy gravelly silty CLAY with cobbles and boulder. (Driller's description)		
7.00 - 7.45	SPT (S) N=30			N=30 (5,5/6,8,8,8)						
8.50 - 11.50	B12									

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
3.80	3.80	20	3.70
16.00			

Chiselling Details

From (m)	To (m)	Time (hh:mm)
4.00	4.50	02:00

Flush Type

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
4.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH10
Coordinates:	**Client:**	Sheet 2 of 2
303637.24 E	Irish Water	
226042.46 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 142.31 mOD	**Dates:** 10/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	4.50
Rotary Drilling	Hanjin 8D	4.50	18.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff dark greyish brown sandy gravelly silty CLAY with cobbles and boulder. (Driller's description)		
11.50 - 14.50	B13							*Clay damp at 12.00 to 14.00m*		
						(9.20)				
14.50 - 18.00	B14									
14.50 - 14.83	SPT (S)			N=50 (8,11/50 for 180mm)						
					127.31	15.00		Dark grey sandy clayey GRAVEL (Driller's description).		
				Water Strike at 16.00m						
						(3.00)				
					124.31	18.00		End of Borehole at 18.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
3.80 16.00	3.80	20	3.70	4.00	4.50	02:00

Flush Type

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH11
Coordinates:	**Client:**	Sheet 1 of 2
303648.96 E	Irish Water	
226092.19 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 144.40 mOD	**Dates:** 09/03/2018 - 01/04/2018	**Driller:** DMC+JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	2.50
Symmetrix	Hanjin 8D	2.50	2.90
Geobor S	Hanjin 8D	2.90	12.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.30	B5					(0.30)		TOPSOIL.		
0.30 - 1.30	B6			Water strike at 0.30m	144.10	0.30		Firm light brown slightly sandy slightly gravelly CLAY with cobbles and boulders. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mixed lithologies. Cobbles and boulders are subangular.		
0.50	ES2									
1.00	ES1									
1.20 - 1.65	SPT (S) N=14	1.00		N=14 (2,2/3,4,3,4)		(1.70)				
1.30 - 2.30	B7									
1.60	D4									
2.00 - 2.45	SPT (S) N=27	2.00		N=27 (2,3/5,9,6,7)	142.40	2.00		Very stiff brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies. Cobbles are angular.		
2.30 - 2.90	B8					(0.75)				
2.40	D3									
2.90 - 3.12	SPT (C) 100			23 (24,27/23 for 75mm)	141.65	2.75		Stiff brownish grey sandy gravelly CLAY with medium cobble content and low boulder content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies. Cobbles and boulders are angular to subangular.		
3.50	86					(2.75)				
5.00	86				138.90	5.50		Grey sandy clayey subangular fine to coarse GRAVEL of mixed lithologies with medium cobble content. Sand is fine to coarse. Cobbles are subangular.		
6.50	70					(2.50)				
8.00	70				136.40	8.00		Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL of mixed lithologies with low cobble and boulder content. Sand is fine to coarse. Cobbles and boulders are subangular.		
9.50					134.90	9.50		Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles and boulders are subangular.		
						(0.60)				
					134.30	10.10		Grey sandy clayey subangular fine to coarse GRAVEL with medium cobble		

TCR | SCR | RQD | FI

Remarks
Hand dug inspection pit excavated from 0-1 20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L	0.30	0.30			2.50	2.90	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			2.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH11
Coordinates:	**Client:**	Sheet 2 of 2
303648.96 E	Irish Water	
226092.19 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 144.40 mOD	**Dates:** 09/03/2018 - 01/04/2018	**Driller:** DMC +JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	2.50
Symmetrix	Hanjin 8D	2.50	2.90
Geobor S	Hanjin 8D	2.90	12.00

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
	83						(1.90)		Grey sandy clayey subangular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are subangular.		
12.00						132.40	12.00		End of Borehole at 12.00m		

	TCR	SCR	RQD	FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L	0.30	0.30			2.50	2.90	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			12.00	152

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	3.60
Rotary Drilling	Hanjin 8D	3.60	12.00

Project No.: 17-1375
Project Name: Saggart Reservoir Site Investigation
Borehole No.: BH12
Coordinates: 303595.52 E, 226150.43 N
Client: Irish Water
Sheet 1 of 2
Client's Representative: RPS Consulting Engineers
Scale: 1:50
Driller: DMC+JG
Ground Level: 142.69 mOD
Dates: 26/02/2018 - 28/03/2018
Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.20	B6					(0.20)		TOPSOIL.		
0.20 - 1.20	B8				142.49	0.20		Firm brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
0.50	ES2					(1.00)				
1.00	ES1									
1.20 - 2.20	B9				141.49	1.20		Stiff becoming very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mixed lithologies. Cobbles are subangular.		
1.20 - 1.65	SPT (S) N=18			N=18 (2,2/4,5,5,4)						
1.60	D5									
2.00 - 2.45	SPT (S) N=34	2.00		N=34 (2,4/9,8,8,9)						
2.20 - 3.20	B10					(2.40)				
2.40	D4									
3.00 - 3.42	SPT (S)	3.00		N=50 (2,3/50 for 265mm)						
3.20 - 3.60	B11									
3.40	D3									
4.00 - 7.00	B11				139.09	3.60		Very stiff dark brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium.		
4.00 - 4.26	SPT (S)			50 (8,18/50 for 115mm)						
5.50 - 5.71	SPT (S)			50 (22,3/50 for 60mm)						
7.00 - 10.00	B12					(8.40)				
7.00 - 7.18	SPT (S)			50 (14,20/50 for 35mm)						
8.50 - 8.78	SPT (S)			50 (8,20/50 for 125mm)						
10.00 - 12.00	B13									
10.00 - 10.40	SPT (S)			N=50 (9,10/50 for 245mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)
3.60	3.90	01:00

Flush Type

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
3.60	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH12
Coordinates:	**Client:**	Sheet 2 of 2
303595.52 E	Irish Water	
226150.43 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 142.69 mOD	**Dates:** 26/02/2018 - 28/03/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 25000	0.00	3.60
Rotary Drilling	Hanjin 8D	3.60	12.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff dark brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium.		
11.50 - 11.80	SPT (S)			50 (25 for 115mm/50 for 190mm)						
					130.69	12.00		End of Borehole at 12.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					3.60	3.90	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Rotary Drilling	Hanjin 8D	3.00	15.00

Project No.: 17-1375

Project Name: Saggart Reservoir Site Investigation

Borehole No.: BH13

Coordinates: 303614.55 E, 226192.26 N

Client: Irish Water

Client's Representative: RPS Consulting Engineers

Ground Level: 143.72 mOD

Dates: 19/02/2018

Sheet 1 of 2

Scale: 1:50

Driller: DMcA+JG

Logger: MFG

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 1.00	B3							Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
0.50	ES1									
1.00	ES2					(2.00)				
1.00 - 2.00	B4									
1.20 - 1.65	SPT (S) N=10			N=10 (3,2/2,3,2,3)						
1.60	D6									
2.00 - 3.00	B5				141.72	2.00		Stiff light brown slightly sandy slightly gravelly CLAY with high cobble and boulder content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles and boulders are angular.		
2.00 - 2.45	SPT (S) N=17	2.00		N=17 (3,4/4,5,4,4)						
2.40	D7					(1.00)				
3.00 - 3.30	SPT (S)	3.00		50 (22,3/50 for 150mm) Water Strike at 3.10m	140.72	3.00		Very stiff dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular is fine to coarse of mixed lithologies.	▼	
3.40	D8									
4.00 - 7.00	B9									
4.00 - 4.40	SPT (S)			N=50 (20,25/50 for 255mm)						
5.50 - 5.92	SPT (S)			N=50 (13,22/50 for 275mm)						
						(6.70)				
7.00 - 9.70	B10									
7.00 - 7.42	SPT (S)			N=50 (12,18/50 for 275mm)						
8.50 - 8.93	SPT (S)			N=50 (14,20/50 for 275mm)						
10.00 - 12.00	B11				134.02	9.70		Dark brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
10.00 - 10.41	SPT (S)			N=50 (15,25/50 for 260mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Flush Type

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
3.10		5	3.00

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
3.00	200

Chiselling Details

From (m)	To (m)	Time (hh:mm)
3.10	3.20	00:30

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH13
Coordinates:	**Client:**	Sheet 2 of 2
303614.55 E	Irish Water	
226192.26 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 143.72 mOD	**Dates:** 19/02/2018	**Driller:** DMcA+JG
		Logger: MFG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Rotary Drilling	Hanjin 8D	3.00	15.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Dark brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
						(2.30)				
					131.72	12.00		Weathered SANDSTONE (Driller's description)		
						(1.00)				
					130.72	13.00		SANDSTONE (Driller's description)		
						(2.00)				
					128.72	15.00		End of Borehole at 15.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
3.10		5	3.00

Chiselling Details

From (m)	To (m)	Time (hh:mm)
3.10	3.20	00:30

Flush Type

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
13.00	150

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH14
Coordinates:	**Client:**	Sheet 1 of 2
303674.70 E	Irish Water	
226195.89 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 145.65 mOD	**Dates:** 18/04/2018	**Driller:** SS+JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	6.20
Geobor S	Hanjin 8D	6.20	14.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.20)		TOPSOIL		
					145.45	0.20		Very stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
0.50	D3									
	ES1									
0.80 - 1.20	B9									
1.00	ES2									
1.20 - 1.65	SPT (S) N=46			N=46 (13,10/11,12,13,10)						
1.50	D4									
1.80 - 2.20	B10									
2.00 - 2.45	SPT (S) N=30			N=30 (8,8/7,8,7,8)		(3.90)				
2.50	D5									
2.80 - 3.20	B11									
3.00 - 3.45	SPT (S) N=34			N=34 (5,9/9,8,7,10)						
3.50	D6									
3.80 - 4.20	B12									
					141.55	4.10		BOULDER recovered through chiseling as dark grey angular gravel.		
4.50	D7					(1.10)				
4.80 - 5.20	B13									
					140.45	5.20		Stiff to very stiff brown sandy gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
5.50	D8					(0.60)				
5.80 - 6.20	B14				139.85	5.80		Very stiff brownish grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.		
6.00 - 6.10	SPT (S)			50 (50 for 80mm/50 for 15mm)		(0.40)				
					139.45	6.20		Stiff brownish grey sandy very gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies. Cobbles are subangular.		
	100					(0.90)				
					138.55	7.10		Stiff yellowish brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies		
8.00										
				NA						
	100					(3.40)				
9.50										
	100	26	12							
	TCR	SCR	RQD	FI						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
SK6L	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					4.10	5.30	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	1.30	6.20		

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH14
Coordinates:	**Client:**	Sheet 2 of 2
303674.70 E	Irish Water	
226195.89 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 145.65 mOD	**Dates:** 18/04/2018	**Driller:** SS+JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	6.20
Geobor S	Hanjin 8D	6.20	14.00

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						135.15	10.50		Stiff yellowish brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies		
				18			(0.50)		Very weak yellowish brown SANDSTONE. Distinctly weathered: pervasive yellowish brown discolouration, reduced strength, closer fracture spacing.		
11.00						134.65	11.00		Discontinuities: 1. 50 to 70 degree fractures, very closely spaced (30/45/50) undulating, smooth, patchy brown staining on fracture surfaces.		
	100	82	60	3					Weak yellowish brown SANDSTONE. Distinctly weathered: pervasive yellowish brown discolouration, reduced strength. Discontinuities: 1. 0 to 20 degree joints, medium spaced (300/420/860) planar, smooth patchy yellowish brown staining on joint surfaces with clay. 2. 80 to 90 degree joints at 12.20m to 12.50m and 13.00m to 13.50m undulating, smooth, patchy yellowish brown staining on joint surface with clay.		
				12							
12.50							(3.00)				
				4							
	100	68	62	12							
				4							
14.00						131.65	14.00		End of Borehole at 14.00m		
	TCR	SCR	RQD	FI							

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L					4.10	5.30	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH15
Coordinates:	**Client:**	Sheet 1 of 2
303710.39 E	Irish Water	
226135.62 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 145.76 mOD	**Dates:** 30/03/2018 - 17/04/2018	**Driller:** SS+JG
		Logger: CH+JG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	7.00
Rotary Drilling	Hanjin 8D	7.00	14.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
					145.56	(0.20) 0.20		TOPSOIL.		
0.50	D8					(0.40)		Firm brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse with occasional boulders.		
0.80 - 1.20	ES15 B1				145.16	0.60		Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
1.00	ES16					(0.60)				
1.20 - 1.65	SPT (S) N=16			N=16 (3,4/4,3,4,5)	144.56	1.20		Stiff to very stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.		
1.50	D9									
1.80 - 2.20	B2					(1.40)				
2.00 - 2.37	SPT (S)			50 (13,11/50 for 220mm)						
2.50	D10				143.16	2.60		Very stiff brown slightly sandy slightly gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
2.80 - 3.20	B3									
3.00 - 3.20	SPT (S)			50 (19,6/50 for 50mm)						
3.50	D11									
3.80 - 4.20	B4					(3.00)				
4.50	D12									
4.80 - 5.20	B5									
5.50	D13									
5.80 - 6.20	B6				140.16	5.60		Very stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
6.00 - 6.30	SPT (S)			50 (11,13/50 for 150mm)						
6.50	D14					(1.40)				
6.80 - 7.00	B7									
7.00 - 10.00	B17				138.76	7.00		Very stiff dark grey sandy gravelly CLAY with cobbles (Driller's description)		
7.00 - 7.43	SPT (S)			N=50 (13,11/50 for 279mm)						
						(2.00)				
8.50 - 8.95	SPT (S) N=45			N=45 (7,8/9,10,11,15)						
					136.76	9.00		Very stiff light brown sandy gravelly CLAY (Driller's description)		
						(1.00)				
10.00 - 13.00	B18				135.76	10.00		Dense dark grey sandy GRAVEL (Driller's description)		
10.00 - 10.30	SPT (S)			50 (10,11/50 for 145mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Flush Type

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
10.00	10.00	10	10.00

Water Added

From (m)	To (m)
2.60	7.00

Casing Details

To (m)	Diam (mm)

Chiselling Details

From (m)	To (m)	Time (hh:mm)
0.00	1.20	00:45
4.60	5.30	00:30

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH15
Coordinates:	**Client:**	Sheet 2 of 2
303710.39 E	Irish Water	
226135.62 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 145.76 mOD	**Dates:** 30/03/2018 - 17/04/2018	**Driller:** SS+JG
		Logger: CH+JG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	7.00
Rotary Drilling	Hanjin 8D	7.00	14.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(3.00)		Dense dark grey sandy GRAVEL (Driller's description)		
13.00 - 14.00	B19				132.76	13.00				
						(1.00)		CONGLOMERATE (Driller's description)		
					131.76	14.00		End of Borehole at 14.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Flush Type

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
10.00	10.00	10	10.00

Water Added	
From (m)	To (m)

Casing Details	
To (m)	Diam (mm)
14.00	200

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
0.00	1.20	00:45
4.60	5.30	00:30

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH16
Coordinates:	**Client:**	Sheet 1 of 3
303813.97 E	Irish Water	
226143.19 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 146.37 mOD	**Dates:** 28/03/2018 - 19/04/2018	**Driller:** DMC+JG
		Logger: AOK

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	7.50
Rotary Drilling	Hanjin 8D	7.50	25.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 1.20	B10							Stiff brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subangular.		
0.50	ES2					(1.20)				
1.00	ES1									
1.20 - 2.20	B11				145.17	1.20		Dense brown gravelly very silty fine to coarse SAND.		
1.20 - 1.65	SPT (S) N=33			N=33 (3,5/7,8,9,9)						
1.60	D3					(1.30)				
2.00 - 2.45	SPT (S) N=32			N=32 (2,3/6,8,8,10)						
2.20 - 2.50	B12									
2.40	D4				143.87	2.50		Very stiff greyish brown sandy slightly gravelly CLAY . Sand is fine to coarse. Gravel is subangular fine to coarse.		
2.50 - 3.50	B13									
3.00 - 3.45	SPT (S) N=46			N=46 (3,4/7,11,12,16)						
3.40	D5									
3.50 - 4.50	B14									
4.00 - 4.45	SPT (S) N=46			N=46 (3,4/7,11,12,16)						
4.40	D6									
4.50 - 5.50	B15					(4.40)				
5.00 - 5.45	SPT (S) N=50			N=50 (4,5/9,10,13,18)						
5.40	D7									
5.50 - 5.90	B									
6.00 - 6.32	SPT (S)			50 (7,12/50 for 170mm)						
6.30	D8									
6.90 - 7.50	B17				139.47	6.90		Very stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine.		
7.00 - 7.45	SPT (S) N=44			N=44 (4,6/9,11,12,12)		(0.60)				
7.40	D9				138.87	7.50		Dark grey sandy GRAVEL with cobbles (Driller's description)		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	7.50	24.50	10	7.50	7.50	7.60	01:00
	24.50	24.50	10	24.50			

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	1.20	7.50		

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH16
Coordinates:	**Client:**	Sheet 2 of 3
303813.97 E	Irish Water	
226143.19 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 146.37 mOD	**Dates:** 28/03/2018 - 19/04/2018	**Driller:** DMC+JG
		Logger: AOK

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	7.50
Rotary Drilling	Hanjin 8D	7.50	25.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Dark grey sandy GRAVEL with cobbles (Driller's description)		
						(11.00)				
					127.87	18.50		Very stiff dark brownish grey sandy gravelly CLAY with cobbles (Driller's description)		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
7.50	24.50	10	7.50
24.50	24.50	10	24.50

Chiselling Details

From (m)	To (m)	Time (hh:mm)
7.50	7.60	01:00

Flush Type

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
18.50	200
25.00	152

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH16
Coordinates:	**Client:**	Sheet 3 of 3
303813.97 E	Irish Water	
226143.19 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 146.37 mOD	**Dates:** 28/03/2018 - 19/04/2018	**Driller:** DMC+JG
		Logger: AOK

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	7.50
Rotary Drilling	Hanjin 8D	7.50	25.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(6.00)		Very stiff dark brownish grey sandy gravelly CLAY with cobbles (Driller's description)		
					121.87	24.50 (0.50)		Weathered SANDSTONE (Driller's description)		
					121.37	25.00		End of Borehole at 25.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					7.50	7.60	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH17
Coordinates:	**Client:**	Sheet 1 of 2
303717.11 E	Irish Water	
226044.94 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.12 mOD	**Dates:** 09/04/2018 - 23/04/2018	**Driller:** DMC+JG
		Logger: CH+JG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	5.40
Symmetrix	Hanjin 8D	5.40	20.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.20	B7					(0.20)		TOPSOIL		
0.20 - 1.20	B8				147.92	0.20		Stiff to very stiff brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
0.50	ES2									
1.00	ES1									
1.20 - 2.20	B9									
1.20 - 1.65	SPT (S) N=35			N=35 (3,5/7,8,9,11)		(2.60)				
1.60	D6									
2.00 - 2.45	SPT (S) N=33	2.00	1.10	N=33 (3,4/6,8,9,10)						
2.20 - 2.80	B10									
2.40	D5									
2.80 - 3.50	B11				145.32	2.80		Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
3.00 - 3.45	SPT (S) N=25	3.00	1.70	N=25 (2,6/3,4,8,10)		(0.70)				
3.40	D4									
3.50 - 4.50	B12				144.62	3.50		Very stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fie to coarse. Gravel is subangular fine to coarse.		
4.00 - 4.45	SPT (S) N=31	4.00	1.30	N=31 (3,5/6,7,9,9)						
4.40	D3									
4.50 - 5.40	B13					(2.40)				
5.00 - 5.16	SPT (C)	5.00	1.90	50 (25 for 85mm/50 for 80mm)						
					142.22	5.90		Stiff dark slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.		
7.00 - 10.00				B14						
						(4.10)				
10.00 - 13.00				B15 Water strike at 10.00m	138.12	10.00 (0.50)		Sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to		

TCR | SCR | RQD | FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
10.00	10.00	20	10.00
15.00	15.00		

Chiselling Details

From (m)	To (m)	Time (hh:mm)
5.40	5.40	01.00

Flush Type

Water Added

From (m)	To (m)
1.60	5.40

Casing Details

To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH17
Coordinates:	**Client:**	Sheet 2 of 2
303717.11 E	Irish Water	
226044.94 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level:	**Dates:**	**Driller:** DMC +JG
148.12 mOD	09/04/2018 - 23/04/2018	**Logger:** CH+JG

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	5.40
Symmetrix	Hanjin 8D	5.40	20.50

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						137.62	10.50		Sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse		
									Stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.		
							(4.50)				
13.00 - 16.00					B16						
					Seepage at 15.00m	133.12	15.00		Stiff dark brown silty slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.		
16.00 - 19.00					B17						
							(5.50)				
19.00 - 20.50					B18						
						127.62	20.50		End of Borehole at 20.50m		
	TCR	SCR	RQD	FI							

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
10.00	10.00	20	10.00
15.00	15.00		

Chiselling Details

From (m)	To (m)	Time (hh:mm)
5.40	5.40	01:00

Flush Type

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
20.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH18
Coordinates:	**Client:**	Sheet 1 of 2
303772.31 E	Irish Water	
226037.74 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.74 mOD	**Dates:** 09/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Rotary Drilling	Hanjin 8D	3.00	15.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.40	B4					(0.40)		TOPSOIL		
0.40 - 1.40	B5				148.34	0.40		Stiff brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
0.50	ES2									
1.00	ES1					(1.00)				
1.20 - 1.65	SPT (S) N=30			N=30 (2,3/5,7,9,9)						
1.40 - 2.40	B6				147.34	1.40		Very dense brownish grey very sandy clayey angular fine to coarse GRAVEL Sand is fine to coarse.		
1.60	D3 D8									
2.00 - 2.14	SPT (C)	2.00	1.10	N=50 (25 for 85mm/50 for 60mm)		(1.60)				
2.40 - 3.00	B7									
3.00 - 3.14	SPT (C)	3.00	1.70	N=50 (25 for 75mm/50 for 60mm)	145.74	3.00		MADE GROUND: Worked CLAY (Driller's description)		
						(2.50)				
5.50 - 8.50	B9				143.24	5.50		Very stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse		
						(1.00)				
7.00 - 7.08	SPT (S)	7.00		N=50 (25 for 75mm/50 for 0mm)	142.24	6.50		Very stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded		
8.50 - 11.50	B10					(7.50)				
8.50 - 8.80	SPT (S)	8.50		N=50 (14,19/50 for 150mm)						
10.00 - 10.26	SPT (S)	10.00		N=46 (10,16/46 for 115mm)						

Remarks
Hand dug inspection pit excavated

Core Barrel

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
				1.80	3.00	02:30

Flush Type

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)
1.40	3.00	3.00	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH18
Coordinates:	**Client:**	Sheet 2 of 2
303772.31 E	Irish Water	
226037.74 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.74 mOD	**Dates:** 09/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Rotary Drilling	Hanjin 8D	3.00	15.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded		
11.50 - 15.00	B11									
11.50 - 11.72	SPT (S)	11.50		N=50 (25 for 75mm/50 for 145mm)						
13.00 - 13.00	SPT (S)	13.00		N=50 (25 for 0mm/50 for 0mm)						
					134.74	14.00		Stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded		
14.50 - 14.69	SPT (S)	14.50		N=25 (17,8/25 for 40mm)		(1.00)				
					133.74	15.00		End of Borehole at 15.00m		

Remarks
Hand dug inspection pit excavated

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					1.80	3.00	02:30
Flush Type	**Water Added**		**Casing Details**				
	From (m)	To (m)	To (m)	Diam (mm)			

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH19
Coordinates:	**Client:**	Sheet 1 of 2
303769.40 E	Irish Water	
226097.06 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 147.95 mOD	**Dates:** 04/04/2018 - 25/04/2018	**Driller:** DMC+JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Geobor S	Hanjin 8D	3.00	11.00
Rotary Drilling	Hanjin 8D	11.00	20.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.40	B5					(0.40)		TOPSOIL		
0.40 - 1.40	B6				147.55	0.40		Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular fine to coarse.		
0.50	ES2									
1.00	ES1									
1.20 - 1.65	SPT (S) N=21			N=21 (2,3/5,5,6,5)						
1.40 - 2.40	B7									
1.60	D4					(2.60)				
2.00 - 2.45	SPT (S) N=25	2.00	1.20	N=25 (3,4/5,7,6,7)						
2.40	D3									
					144.95	3.00		Grey slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are angular of mixed lithologies		
						(1.00)				
	86				143.95	4.00		Very stiff brownish grey sandy gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies. Cobbles and boulders are angular of mixed lithologies		
5.00										
	100					(3.60)				
6.50										
	80				140.35	7.60				
						(0.40)		Greyish brown sandy clayey angular to subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse		
8.00				Waterstrike at 8.0m	139.95	8.00		Greyish brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of mixed lithologies with low boulder content. Sand is fine to coarse. Boulders are angular of sandstone	▼	
	20					(3.00)				
	TCR SCR RQD FI									

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L	8.00	8.00	20	8.00	2.40	3.00	01:30

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	1.70	3.00		

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH19
Coordinates:	**Client:**	Sheet 2 of 2
303769.40 E	Irish Water	
226097.06 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 147.95 mOD	**Dates:** 04/04/2018 - 25/04/2018	**Driller:** DMC +JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	3.00
Geobor S	Hanjin 8D	3.00	11.00
Rotary Drilling	Hanjin 8D	11.00	20.00

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
									Greyish brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of mixed lithologies with low boulder content. Sand is fine to coarse. Boulders are angular of sandstone		
11.00 - 12.00 11.00 - 12.00 11.00	B8				B8	136.95	11.00		Dense GRAVEL with COBBLES and BOULDERS. (Driller's description)		
14.00 - 17.00	B9						(9.00)				
17.00 - 20.00	B10										
						127.95	20.00		End of Borehole at 20.00m		

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5 20.0 20.5

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L	8.00	8.00	20	8.00	2.40	3.00	01:30

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			20.00	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH20
Coordinates:	**Client:**	Sheet 1 of 2
303765.59 E	Irish Water	
226127.61 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 146.75 mOD	**Dates:** 26/04/2018	**Driller:** DMcA+JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	9.30
Symmetrix	Hanjin 8D	9.30	9.50
Geobor S	Hanjin 8D	9.50	17.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.20	B1					(0.20)		TOPSOIL.		
0.20 - 1.20	B2				146.55	0.20		Possible MADE GROUND: Stiff brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
0.50	ES21									
1.00	ES22									
1.20 - 2.20	B3					(2.00)				
1.20 - 1.65	SPT (S) N=29			N=29 (3,4/6,7,7,9)						
1.60	D12									
2.00 - 2.38	SPT (C)	2.00	1.30	N=50 (4,5/50 for 235mm)						
2.20 - 3.20	B4				144.55	2.20		Dense brown very sandy clayey GRAVEL. Gravel is subangular fine to coarse. Cobbles are subangular.		
2.40	D13									
						(1.00)				
3.00 - 3.45	SPT (S) N=41	3.00	1.90	N=41 (3,6/7,9,11,14)						
3.20 - 4.20	B5				143.55	3.20		Dense brownish grey very sandy clayey angular fine to coarse GRAVEL. Sand is fine to coarse.		
3.40	D14									
4.00 - 4.38	SPT (S)	4.00	2.60	50 (5,6/50 for 225mm)						
4.20 - 5.20	B6									
4.30	D15									
5.00 - 5.32	SPT (S)	5.00	1.80	49 (6,9/49 for 170mm)						
5.20 - 6.20	B7									
5.30	D16									
						(5.20)				
6.00 - 6.30	SPT (S)	6.00	2.20	50 (6,11/50 for 150mm)						
6.20 - 7.20	B8									
6.30	D17									
7.00 - 7.26	SPT (S)	7.00	2.90	50 (7,13/50 for 105mm)						
7.20 - 8.20	B9									
7.30	D18									
8.00 - 8.30	SPT (S)	8.00	3.70	50 (6,15/50 for 150mm)						
8.20 - 8.40	B10									
8.40	D19				138.35	8.40		Very stiff dark grey slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
8.40 - 8.90	B11									
8.90 - 9.22	SPT (S)	8.50	5.60	50 (7,12/50 for 175mm)		(0.90)				
9.40	D20					9.30 (0.20)		Stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content.		
						9.50 (0.15)		Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.		
					137.45	9.65				
	100				137.25	(1.05)		Soft grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies		
					137.10			Stiff grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular		
	TCR	SCR	RQD	FI						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L					1.90	2.20	01:00
					8.90	8.90	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	2.20	8.40	9.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH20
Coordinates:	**Client:**	Sheet 2 of 2
303765.59 E	Irish Water	
226127.61 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 146.75 mOD	**Dates:** 26/04/2018	**Driller:** DMcA +JG
		Logger: CH+TH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	9.30
Symmetrix	Hanjin 8D	9.30	9.50
Geobor S	Hanjin 8D	9.50	17.00

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						136.05	10.70 (0.30)		Stiff grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies		
									Firm grey gravelly very sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies		
11.00						135.75	11.00		Stiff grey sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies. Cobbles are subangular		
	100						(1.20)				
						134.55	12.20 (0.30)		Grey slightly sandy clayey subangular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Cobbles are subangular		
12.50						134.25	12.50 (0.30)		Stiff grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse		
						133.95	12.80 (0.50)		Stiff light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies		
	100	0	0	20		133.45	13.30		Weak narrowly foliated yellowish brown SHALE. Distinctly weathered: closer fracture spacing, reduced strength, yellowish orange discolouration		
				10					Discontinuity Set 1: 0-30 degree joints, closely spaced (90/180/290), planar, smooth, yellowish brown staining on joint surfaces with clay infill		
14.00				20					Discontinuity Set 2: 60-80 degree foliation fractures, very closely spaced, (20/50/70), planar, smooth, strong orangish brown staining on fracture surfaces		
	100	0	0	18			(2.60)				
				20							
15.50				20							
	100	18	13	12		130.85	15.90 (1.10)		Weak yellowish brown SANDSTONE. Distinctly weathered: reduced strength, pervasive yellowish brown discolouration		
									Discontinuity Set 1: 0-30 degree joints, closely spaced, (130/190/240), planar, smooth, patchy brown staining on joint surfaces with clay infill		
17.00						129.75	17.00		Discontinuity Set 2: 80-90 degree joints, probably closely spaced, planar, smooth, patchy orange mottled brown staining on joint surfaces		
									End of Borehole at 17.00m		
	TCR	SCR	RQD	FI							

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L					1.90	2.20	01:00
					8.90	8.90	01:00

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
			17.00	152

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH21
Coordinates:	**Client:**	Sheet 1 of 2
303761.50 E	Irish Water	
226216.78 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 145.85 mOD	**Dates:** 10/04/2018	**Driller:** SS+JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	8.50
Rotary Drilling	Hanjin 8D	8.50	11.50
Rotary Coring	Hanjin 8D	11.50	13.85

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
					145.75	(0.10) 0.10		TOPSOIL		
								Firm becoming stiff brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.50	D1									
	ES18									
0.80 - 1.20	B10									
1.00	ES19									
1.20 - 1.65	SPT (S) N=13			N=13 (2,3/6,3,2,2)						
1.50	D2									
1.80 - 2.20	B11									
2.00 - 2.45	SPT (S) N=22			N=22 (5,5/4,5,6,7)		(3.70)				
2.50	D3									
2.80 - 3.20	B12									
3.00 - 3.45	SPT (S) N=30			N=30 (8,6/6,7,8,9)						
3.50	D4									
3.80 - 4.20	B13				142.05	3.80				
4.00 - 4.45	SPT (C) N=45			N=45 (9,9/10,14,11,10)				Dense brown very sandy clayey subrounded fine to coarse GRAVEL. Sand is fine to coarse.		
4.50	D5									
4.80 - 5.20	B14									
5.00 - 5.45	SPT (C) N=65			N=65 (10,13/17,17,16,15)						
						(3.10)				
5.50	D6									
5.80 - 6.20	B15									
6.00 - 6.14	SPT (C)			50 (25 for 85mm/50 for 50mm)						
6.50	D7									
6.80 - 7.20	B16									
7.00 - 7.11	SPT (S)			50 (50 for 90mm/50 for 20mm)	138.95	6.90		Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse.		
7.50	D8									
						(1.60)				
7.80 - 8.50	B17									
8.00 - 8.09	SPT (S)			50 (50 for 80mm/50 for 10mm)						
8.50	D9				137.35	8.50		Stiff light brown sandy gravelly CLAY with cobbles. (Driller's description)		
						(3.00)				

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101					4.60	4.90	00:30

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	1.20	8.50	8.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH21
Coordinates:	**Client:**	Sheet 2 of 2
303761.50 E	Irish Water	
226216.78 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 145.85 mOD	**Dates:** 10/04/2018	**Driller:** SS+JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	8.50
Rotary Drilling	Hanjin 8D	8.50	11.50
Rotary Coring	Hanjin 8D	11.50	13.85

Depth (m)	Sample / Tests		Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
									Stiff light brown sandy gravelly CLAY with cobbles. (Driller's description)		
	100					134.35	11.50 (1.00)		Stiff brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies predominately limestone.		
12.50	100	10	0	20		133.35	12.50 (1.35)		Weak brownish grey SHALE/MUDSTONE. Partially weathered: reduced strength, highly fractured red staining on fracture surface. Discontinues: 1. 30 to 40 degree bedding fractures extremely closely spaced (05/08/12) planar, smooth, stained. 2. Subvertical fractures, planar, smooth, stained.		
13.50	100	0	0								
13.85						132.00	13.85		End of Borehole at 13.85m		

TCR | SCR | RQD | FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101					4.60	4.90	00:30
Flush Type	**Water Added**		**Casing Details**				
	From (m)	To (m)	To (m)	Diam (mm)			

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH22
Coordinates:	**Client:**	Sheet 1 of 2
303808.04 E	Irish Water	
226219.41 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 144.76 mOD	**Dates:** 10/04/2018	**Driller:** SS+JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	7.50
Rotary Drilling	Hanjin 8D	7.50	12.70
Rotary Coring	Hanjin 8D	12.70	14.70

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
								Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.
0.50	D8 ES15							
0.80 - 1.20	B1							
1.00	ES16							
1.20 - 1.65	SPT (S) N=23			N=23 (6,6/6,7,6,4)		(2.40)		
1.50	D9							
1.80 - 2.20	B2							
2.00 - 2.45	SPT (S) N=20			N=20 (6,5/5,6,4,5)				
					142.36	2.40		
2.50	D10							Brownish grey very sandy clayey subrounded fine to coarse GRAVEL. Sand is fine to coarse.
2.80 - 3.20	B3					(0.60)		
3.00 - 3.08	SPT (S)			50 (250 for 75mm/50 for 0mm)	141.76	3.00		Very dense grey very sandy clayey subrounded fine to coarse GRAVEL. Sand is fine to coarse.
3.50	D11							
3.80 - 4.20	B4							
4.00 - 4.19	SPT (C)			50 (17,8/50 for 40mm)				
4.50	D12							
4.80 - 5.20	B5					(3.30)		
5.00 - 5.40	SPT (C)			N=50 (10,11/50 for 245mm)				
5.50	D13							
5.80 - 6.20	B6							
					138.46	6.30		
6.50	D14							Very stiff dark grey sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.
6.80 - 7.20	B7							
7.00 - 10.00	B17 B19					(1.20)		
						7.50		
7.00 - 7.11	SPT (S)			50 (50 for 85mm/50 for 25mm) Water strike at 7.00m	137.26			Very stiff dark grey sandy gravelly CLAY with cobbles (Driller's description)
8.50 - 8.65	SPT (S)			50 (25 for 125mm/50 for 30mm)				
						(3.00)		
10.00 - 12.00	B18 B20							

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101	7.00 10.50	7.00 1.50					

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
	1.20	7.50	7.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH22
Coordinates:	**Client:**	Sheet 2 of 2
303808.04 E	Irish Water	
226219.41 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 144.76 mOD	**Dates:** 10/04/2018	**Driller:** SS+JG
		Logger: CH+ST

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	7.50
Rotary Drilling	Hanjin 8D	7.50	12.70
Rotary Coring	Hanjin 8D	12.70	14.70

Depth (m)	Sample / Tests		Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
					Water strike at 10.50m	134.26	10.50		Very stiff dark grey sandy gravelly CLAY with cobbles (Driller's description)	▼	
									Highly fractured SHALE (Driller's description)		
							(1.50)				
						132.76	12.00		Sandy CONGLOMERATE (Driller's description)		
							(0.70)				
						132.06	12.70 (0.20)		Stiff brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies predominately shale.		
	100	0	0			131.86	12.90		Weak brownish grey SHALE/MUDSTONE. Partially weathered reduced strength highly fractured, red staining, on fracture surface. Discontinuities: 1. 30 to 40 degree bedding fractures extremely closely spaced (05/08/12) planar, smooth, stained.		
13.70				20			(1.80)		2. Subvertical fractures, planar, smooth, stained.		
	100	8	0								
14.70						130.06	14.70		End of Borehole at 14.70m		

TCR	SCR	RQD	FI

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
T2-101	7.00	7.00					
	10.50	1.50					

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH23
Coordinates:	**Client:**	Sheet 1 of 1
303708.89 E	Irish Water	
226094.11 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.00 mOD	**Dates:** 13/03/2018	**Driller:** DMC
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	1.20

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.20	B5				147.80	(0.20) 0.20		TOPSOIL.		
0.20 - 1.20	B4							Stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are subangular.		
0.50	ES2					(1.00)				
1.00	ES1									
1.20 - 1.65	SPT (S) N=19			N=19 (3,4/5,5,4,5)	146.80	1.20		End of Borehole at 1.20m		
1.60	D3									

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
1.20	1.20	01:00

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH23A
Coordinates:	**Client:**	Sheet 1 of 2
303708.89 E	Irish Water	
226094.11 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.00 mOD	**Dates:** 22/03/2018 - 05/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	5.50
Rotary Drilling	Hanjin 8D	5.50	20.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.20)		TOPSOIL.		
					147.80	0.20		Stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are subangular.		
						(1.00)				
1.20 - 1.50	B1				146.80	1.20		Stiff brown slightly sandy gravelly CLAY. Gravel is angular fine. Sand is fine to coarse.		
1.50 - 1.70	B2				146.50	(0.30) 1.50		Loose brown slightly sandy subrounded fine to coarse GRAVEL with occasional cobbles and boulders. Sand is fine to coarse. Cobbles and boulders are rounded.		
1.70 - 2.60	B3									
1.70 - 2.15	SPT (S) N=9	1.50	1.10	N=9 (4,5/5,2,1,1)						
2.10	D7					(1.10)				
2.60 - 3.60	B4				145.40	2.60		Very stiff dark brown gravelly slightly sandy CLAY with occasional cobbles and boulders. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies. Cobbles and boulders are angular.		
3.00 - 3.45	SPT (S) N=33	3.00	1.90	N=33 (3,5/6,6,8,13)						
3.40	D8									
3.60 - 4.60	B5									
4.00 - 4.45	SPT (C) N=33	4.00	2.70	N=33 (4,6/8,9,4,12)		(2.90)				
4.40	D9									
4.60 - 5.20	B6									
5.00 - 5.30	SPT (C)	5.00	3.60	50 (6,9/50 for 155mm)						
5.40	D10				142.50	5.50		Very stiff dark greyish brown sandy gravelly CLAY with cobbles and boulder (Driller's description)		
7.00 - 7.30	SPT (S)			50 (9,16/50 for 150mm)						
8.50 - 8.64	SPT (S)			50 (25 for 105mm/50 for 30mm)						
10.00 - 10.24	SPT (S)			50 (25 for 125mm/50 for 115mm)						

Remarks

Hand dug inspection pit excavated from 0-1.20m.

Attempted to core 15.50 to 18.00m but only recovered some gravel and cobbles.

Core Barrel

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
				1.70	1.90	00:30
				5.20	5.50	01:00

Flush Type

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)
		5.50	200

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH23A
Coordinates:	**Client:**	Sheet 2 of 2
303708.89 E	Irish Water	
226094.11 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.00 mOD	**Dates:** 22/03/2018 - 05/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	5.50
Rotary Drilling	Hanjin 8D	5.50	20.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Very stiff dark greyish brown sandy gravelly CLAY with cobbles and boulder (Driller's description)		
11.50 - 11.80	SPT (S)			59 (12,16/59 for 150mm)						
13.00 - 13.22	SPT (S)			50 (13,17/50 for 75mm)						
14.50 - 14.71	SPT (S)			25 (15,19/25 for 60mm)						
						(14.50)				
					128.00	20.00		End of Borehole at 20.00m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Attempted to core 15.50 to 18.00m but only recovered some gravel and cobbles.

Core Barrel

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
1.70	1.90	00:30
5.20	5.50	01:00

Flush Type

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH24
Coordinates:	**Client:**	Sheet 1 of 2
303828.93 E	Irish Water	
226100.83 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.72 mOD	**Dates:** 05/04/2018 - 11/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	4.50
Rotary Drilling	Hanjin 8D	4.50	18.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.40	B5					(0.40)		TOPSOIL		
0.40 - 1.40	B6				148.32	0.40		Firm to stiff light brown sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
1.20 - 1.65	SPT (S) N=19			N=19 (2,3/4,4,5,6)		(1.30)				
1.40 - 1.70	B7									
1.60	D1									
1.70 - 2.60	B8				147.02	1.70		Stiff brown slightly sandy gravelly CLAY with high cobble content and occasional boulders. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.		
2.00 - 2.45	SPT (S) N=38	2.00	1.30	N=38 (3,4/6,7,9,16)		(0.90)				
2.40	D2									
2.60 - 3.00	B9				146.12	2.60		Very stiff dark grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
3.00 - 4.00	B10									
3.00 - 3.45	SPT (S) N=44	3.00	2.60	N=44 (4,6/7,11,12,14)						
3.40	D3					(1.90)				
4.00 - 4.50	D11									
4.00 - 4.32	SPT (C)	4.00	3.80	50 (7,11/50 for 170mm)						
4.20	D4				144.22	4.50		Very stiff dark grey sandy gravelly CLAY with cobbles. (Driller's description)		
4.50 - 7.50	B12 B13									
5.50 - 5.68	SPT (S)			50 (10,15/50 for 35mm)						
7.00 - 7.42	SPT (S)			N=50 (10,15/50 for 265mm)						
7.50 - 10.50	B14					(7.00)				
8.50 - 8.76	SPT (S)			50 (11,17/50 for 110mm)						
10.00 - 10.16	SPT (S)			50 (25 for 120mm/50 for 40mm)						

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
11.50	11.50	10	11.50
14.00	18.50	10	14.00

Chiselling Details

From (m)	To (m)	Time (hh:mm)
1.90	2.00	00:30
4.50	4.50	01:00

Flush Type

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)

Project No.:	Project Name:	Borehole No.:
17-1375	Saggart Reservoir Site Investigation	BH24
Coordinates:	**Client:**	Sheet 2 of 2
303828.93 E	Irish Water	
226100.83 N	**Client's Representative:** RPS Consulting Engineers	**Scale:** 1:50
Ground Level: 148.72 mOD	**Dates:** 05/04/2018 - 11/04/2018	**Driller:** DMC+JG
		Logger: CH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2500	0.00	4.50
Rotary Drilling	Hanjin 8D	4.50	18.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50 - 13.50	B15 B16							Very stiff dark grey sandy gravelly CLAY with cobbles. (Driller's description)		
					137.22	11.50				
						(0.75)		Dark grey gravelly SAND (Driller's description)		
					136.47	12.25		Very stiff dark grey sandy gravelly CLAY (Driller's description)		
13.00 - 13.14	SPT (S)			50 (25 for 100mm/50 for 40mm)		(1.75)				
14.00 - 18.50	B17				134.72	14.00		Dark grey sandy slightly clayey subangular fine to coarse GRAVEL.		
						(4.50)				
					130.22	18.50		End of Borehole at 18.50m		

Remarks
Hand dug inspection pit excavated from 0-1.20m.

Core Barrel

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
11.50	11.50	10	11.50
14.00	18.50	10	14.00

Chiselling Details

From (m)	To (m)	Time (hh:mm)
1.90	2.00	00:30
4.50	4.50	01:00

Flush Type

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
16.00	152
18.50	100