KPMG

Future Analytics

Environmental Impact Assessment Report (EIAR)

Volume 3 Appendices

for a Strategic Housing Development (SHD)
at Holybanks, Swords, Co. Dublin

On behalf of

CAIRN HOMES PROPERTIES LTD.

March 2022

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1. Appendix 5.1 – Air Quality Legislation

Appendix 7.1 Air Quality Legislation

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years, the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regard to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ was to establish a target value of 25 µg/m^3, as an annual average (to be attained everywhere by 2010) and a limit value of 25 µg/m^3, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 µg/m^3 to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 µg/m^3). Where the AEI is currently greater than 22 µg/m^3 all appropriate measures should be employed to reduce this level to 18 µg/m^3 by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m^3 was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the

attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_X (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area. Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

2. Appendix 5.2 – Transport Infrastructure Ireland Significance Criteria

Appendix 7.2 Transport Infrastructure Ireland Significance Criteria

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration > 50 µg/m³	Annual Mean $PM_{2.5}$
Large	Increase / decrease g m³	Increase / decrease >4 days	Increase / decrease . g m³
Medium	Increase / decrease 2 - <4 µg/m³	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m³
Small	Increase / decrease 0.4 - <2 µg/m³	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m³
Imperceptible	Increase / decrease <0.4 µg/m³	Increase / decrease <1 day	Increase / decrease <0.25 µg/m³

Table A7.2.1 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration Note 1		
	Small	Medium	Large
Increase with Scheme			
A o e e ti e imit Va e ith heme µg/m³ of NO_2 or PM_{10} g m³ of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m³ of NO_2 or PM_{10}) (18.75 - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
A o e e ti e imit Va e ith heme µg/m³ of NO_2 or PM_{10} g m³ of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m³ of NO_2 or PM_{10}) (18.75 - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Note 1 Well Below Standard = <75% of limit value.

Table A7.2.2: Air Quality Impact Significance Criteria For Annual Mean NO_2 and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value ith heme da s	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value ith heme da s	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

Table A7.2.3: Air Quality Impact Significance Criteria For Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m^3 at a Receptor

3. Appendix 5.3 – Dust Management Plan

Appendix 7.3 Dust Management Plan

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK (IAQM (2014), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). The following measures will be incorporated into the Construction Management Plan (CMP) prepared for the site.

Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 7.2 for the windrose for Dublin Airport). As the prevailing wind is predominantly south-westerly to westerly, locating construction compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (IAQM, 2014; UK ODPM, 2002). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods were care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Site Roads/Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK ODPM, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Access gates to the site shall be located at least 10m from sensitive receptors where possible;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

Land Clearing/Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust;
- During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions.

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK ODPM, 2002).
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility shall be installed if feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;

- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

4. Appendix 8.1 – Geophysical Report

GEOPHYSICAL SURVEY

REPORT

Holybanks,

Swords,

County Dublin

Date:
10/12/2018

Licence: 18R0256

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124 Oaklawn West
Leixlip
County Kildare
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GEOPHYSICAL SURVEY SUMMARY SHEET
HOLYBANKS, SWORDS, COUNTY DUBLIN

Site Name	Holybanks, Swords	**Ref No.**	18057
Townland	Holybanks	**Licence No.**	18-R-0256
County	Dublin	**Licence Holder**	Joanna Leigh
ITM (centre)	E717715, N748182	**Purpose**	Pre-planning investigation
Client	IAC Ltd.	**Reference No.**	N/A

Closest RMP	DU011:080	**Classification**	Recorded ring-ditch
ITM	E707703, N748269	**Location**	In the northern half of the application area.
Townland	Holybanks		

Ground Conditions	The survey ground conditions were very poor comprising of uneven rutted ground in places, overgrown vegetation and modern litter and debris throughout the site, making data collection and interpretation problematic. Survey was conducted where possible.
Survey Type	Detailed gradiometer survey totalling c.6 hectare

Summary of Results

The data is dominated by modern responses resulting from debris and litter throughout the site. Rough ground conditions and overgrown vegetation restricted the area available for survey. However, some responses of interest were recorded.

In the east of the application area a circular response measuring c.11.5m in diameter has been identified. This is indicative of a circular feature and considered to be of archaeological potential. It is speculated that a ring-ditch feature has been identified here. This is located 170m to the east of the recorded ring-ditch (DU011-080).

Survey was conducted over the recorded ring-ditch (DU011:080) but no clear responses were recorded. It is possible that the modern magnetic interference in this area is masking the ring-ditch.

Fieldwork Staff	Joanna Leigh, Susan Curran & Rhonda McGovern		
Report Date	10/12/2018	**Report Author**	Joanna Leigh

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Geophysical Survey Report
Holybanks, Swords, Co. Dublin

1 Introduction

1.1 A geophysical survey has been conducted by J. M. Leigh Surveys at a site in the townland of Holybanks, Swords, Co. Dublin. The survey has been requested as part of a wider archaeological study by IAC Ltd., on behalf of Cairn PLC and is a pre-planning investigation.

1.2 The application area is contained within three fields (Fields 1-3) north of Swords, adjacent to Jugback Terrace and Glen Elian Road. Broad Meadow River forms the northern extent of the application area. Figure 1 is a location diagram of the application area at a scale of 1:3,000.

1.3 There is a recorded ring-ditch in the north of the application area (DU011-080), located in Field 1. Identified as a circular ditched feature of c.14m diameter from an aerial photograph taken in 1992. No further monuments are recorded within the application area. A recorded enclosure site (DU011-079) is located c.200m to the west of the application area.

1.4 The main aim of the survey was to identify any geophysical responses within the predefined survey area that may represent unknown archaeological features and to identify any responses indicating the nature and extent of ring-ditch. A detailed gradiometer survey was conducted under licence 18R0256 issued by the Department of Culture, Heritage and the Gaeltacht.

2 Survey ground conditions and further information

2.1 The survey ground conditions were very poor, comprising of uneven rutted ground in places, overgrown vegetation and modern litter and debris throughout Fields 1 and 2.

2.2 Although the site had been cut, modern material and areas of bramble vegetation and dense field boundaries reduced the area available for survey. Detailed survey Areas A, B and C were conducted in Fields 1 and 2.

2.3 Field 3 was completely overgrown with trees, dense shrub vegetation and tall grass and was not suitable for survey.

3 Survey Methodology

3.1 A detailed gradiometer survey detects subtle variations in the local magnetic field and measurements are recorded in nano-Tesla (nT). Some archaeological features such as ditches, large pits and fired features have an enhanced magnetic signal and can be detected through recorded survey.

3.2 Data was collected with a Bartington Grad 601-2 instrument. This is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey fast and effective.

3.3 The instrument is calibrated in the field to ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.01nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.

3.4 All data was collected in 'zigzag' traverses. Grid orientation remained constant throughout each field to facilitate the data display and interpretation.

3.5 Data was collected with a sample interval of 0.25m and a traverse interval of 1m, providing 6400 readings per 40m x 40m grid. The survey grid was set-out using a GPS VRS unit. Survey tie-in information is available upon request.

3.6 The survey methodology, data presentation and report content adheres to the European Archaeological Council (EAC) (2016) '*Guidelines for the use of Geophysics in Archaeology*'.

4 Data display

4.1 A summary greyscale image is presented in Figure 2 at a scale of 1:1,250.

4.2 An accompanying summary interpretation diagram is presented in Figure 3, also at a scale of 1:1,250.

4.3 Isolated ferrous responses highlighted in the interpretation diagram most likely represent modern ferrous litter and debris and are not of archaeological interest. These are not discussed in the text unless considered relevant.

4.4 Numbers in parenthesis in the text refer to specific responses highlighted in the interpretation diagrams.

4.5 The raw gradiometer data is presented in archive format in Appendix A1.01 and A1.02. The raw data is displayed as a greyscale image and xy-trace plot. The archive

plots are used to aid interpretation of the results, are used for reference only and are available upon request.

4.6 The display formats referred to above and the interpretation categories are discussed in the summary technical information section at the end of this report.

5 Survey Results (Figures 2 & 3)

Area A

5.1 Area A is dominated by modern magnetic disturbance and numerous ferrous responses. This results from modern debris noted throughout the field and is especially prevalent in the northern half of the field. No clear responses of possible archaeological interest can be identified within the magnetic noise recorded.

5.2 In the centre of the survey data, there are several broad responses (1). These have no clear pattern or form but it is possible that large archaeological pits are located here. However, this interpretation is cautious. It is also possible that more deeply buried modern debris is represented here. Given the modern disturbance recorded throughout the field, these responses are considered to be more likely modern than archaeological in origin.

5.3 The southern half of Area A comprises of parallel linear ploughing trends. This corresponds with the rutted ground visible during survey. The ploughing trends most likely represent more recent agricultural activity and are not considered to be of archaeological interest.

Area B

5.4 In the north of Area B there is a response (2) which forms a clear circular pattern. Although the magnetic strength of the response is low, its shape and form are suggestive of archaeology. It is considered likely that a circular ditched feature, measuring c.11.5m, has been identified and may represent a ring-ditch feature. This interpretation is speculative but must be considered.

5.5 A faint linear trend appears to extend south from (2). Although it is possible that this represents an associated feature, interpretation is tentative. The trend is at the limits of instrument detection and may represent modern activity in the field.

5.6 To the north of the possible ring-ditch (2) there are a series of responses and trends (3). These are located at the extent of the field, adjacent to a large metal fence. Magnetic disturbance from the fence and modern debris has complicated

interpretation and no clear archaeological pattern is evident. Nevertheless, these responses appear to have a magnetic signature typical of archaeological features. Although no clear interpretation can be provided, these may be of archaeological interest.

5.7 Parallel linear trends, similar to those in Area A, are indicative of modern ploughing activity.

Area C

5.8 Modern magnetic disturbance and isolated ferrous responses dominate survey Area C. No responses of potential archaeological interest were recorded here.

6 Conclusion

6.1 The data is dominated by modern responses resulting from debris and litter throughout the site. In addition, rough ground conditions complicated survey. However, some responses of interest were recorded.

6.2 In the east of the application area a circular response measuring c.11.5m in diameter has been identified. This is indicative of a circular feature and considered to be of archaeological potential. It is speculated that a ring-ditch feature is represented here. This is located 170m to the east of the recorded ring-ditch (DU011-080).

6.3 Survey was conducted over the recorded ring-ditch (DU011-080). No clear responses indicative of the ring-ditch feature were recorded. It is possible that the modern magnetic interference in this area is masking the ring-ditch, or that the true location of the feature is outside the extent of this survey data.

6.4 Consultation with a licensed archaeologist and with the Department of Culture, Heritage and the Gaeltacht is recommended to establish if any additional archaeological works, such as test trench investigation, may be required to establish the nature of the responses highlighted in this report.

Technical Information Section

Instrumentation & Methodology

Detailed Gradiometer Survey

This is conducted to clearly define any responses detected during scanning, or can be applied as a stand-alone methodology. Detailed survey is often applied with a sample interval of 0.25m and a traverse interval of 1m. This allows detection of potential archaeological responses. Data is collected in grids 40m x 40m, and data is displayed accordingly. A more detailed survey methodology may be applied where archaeological remains are thought likely. A survey with a grid size of 10m x 10m and a traverse interval of 0.5m will provide a data set with high resolution.

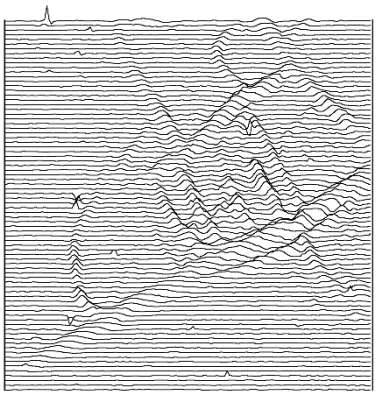
Bartington GRAD 601-2

The Bartington Grad 601-2 instrument is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey very fast and effective. The sensors have a separation of 1m allowing greater sensitivity.

Frequent realignment of the instruments and zero drift correction; ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.1nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.

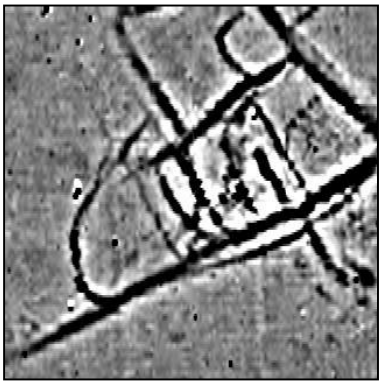
Gradiometer Data Display & Presentation

XY Trace



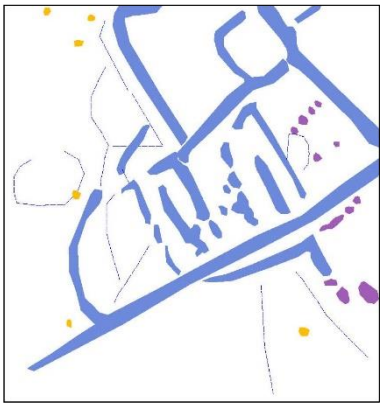
The data are presented as a series of linear traces, enabling a semi-profile display of the respective anomalies along the X and Y-axes. This display option is essential for distinguishing between modern ferrous materials (buried metal debris) and potential archaeological responses. The XY trace plot provides a linear display of the magnitude of the response within a given data set.

*Greyscale**



As with dot density plots, the greyscale format assigns a cell to each datum according to its location on the grid. The display of each data point is conducted at very fine increments, allowing the full range of values to be displayed within the given data set. This display method also enables the identification of discrete responses that may be at the limits of instrument detection. In the summary diagrams processed, interpolated data is presented. Raw un-interpolated data is presented in the archive drawings along with the xy-trace plots.

Interpretation



An interpretation of the data is made using many of the plots presented in the final report, in addition to examination of the raw and processed data. The project managers' knowledge and experience allows a detailed interpretation of the survey results with respect to archaeological potential.

**XY Trace and raw greyscale plots are presented in archive form for display of the raw survey data. Summary greyscale images of the interpolated data are included for presentation purposes and to assist interpretation.*

Glossary of Interpretation Terms

Archaeology

This category refers to responses which are interpreted as of clear archaeological potential, and are supported by further archaeological evidence such as aerial photography or excavation. The term is generally associated with significant concentrations of former settlement, such as ditched enclosures, storage pits and associated features.

? Archaeology

This term corresponds to anomalies that display typical archaeological patterns where no record of comparative archaeological evidence is available. In some cases, it may prove difficult to distinguish between these and evidence of more recent activity also visible in the data.

? Industrial

Such anomalies generally possess a strong magnetic response and may equate with archaeological features such as kilns, furnaces, concentrations of fired debris and associated industrial material.

Area of Increased Magnetic Response

These responses often lack any distinctive archaeological form, and it is therefore difficult to assign any specific interpretation. The resulting responses are site specific, possibly associated with concentrations of archaeological debris or more recent disturbance to underlying archaeological features.

Trend

This category refers to low-level magnetic responses barely visible above the magnetic background of the soil. Interpretation is tentative, as these anomalies are often at the limits of instrument detection.

Ploughing/Ridge & Furrow

Visible as a series of linear responses, these anomalies equate with recent or archaeological cultivation activity.

? Natural

A broad response resulting from localised natural variations in the magnetic background of the subsoil; presenting as broad amorphous responses most likely resulting from geological features.

Ferrous Response

These anomalies exhibit a typically strong magnetic response, often referred to as ‘iron spikes,’ and are the result of modern metal debris located within the topsoil.

Area of Magnetic Disturbance

This term refers to large-scale magnetic interference from existing services or structures. The extent of this interference may in some cases obscure anomalies of potential archaeological interest.

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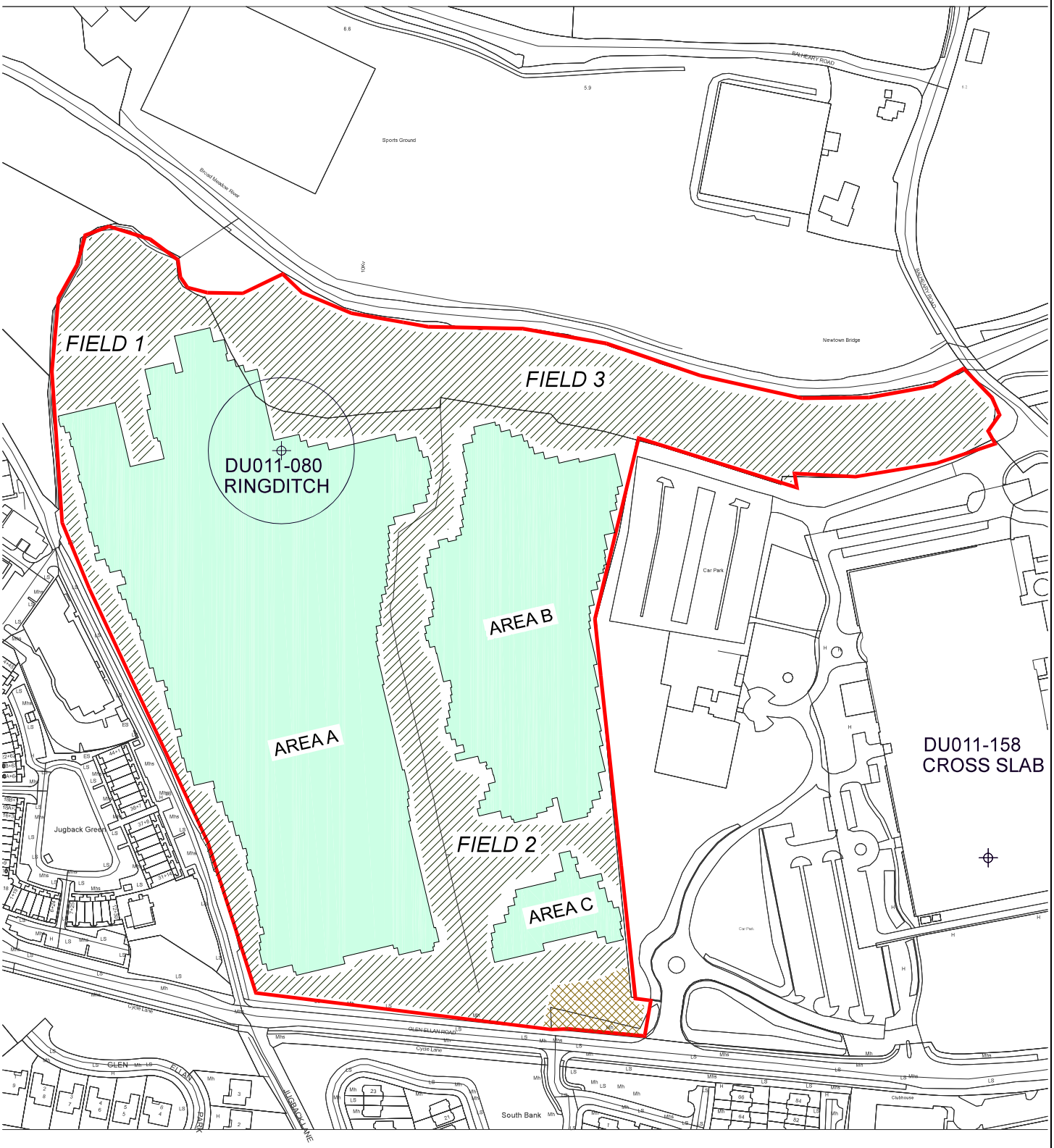
Figure 2	Summary Greyscale Image	A3P	1:1,250
Figure 3	Summary Interpretation Image	A3P	1:1,250

Archive Plots available as PDF's upon request

A1.01	Raw data Greyscale Image	A1P	1:500
A1.02	Raw data XY-Trace Plot	A1P	1:500



Application Area

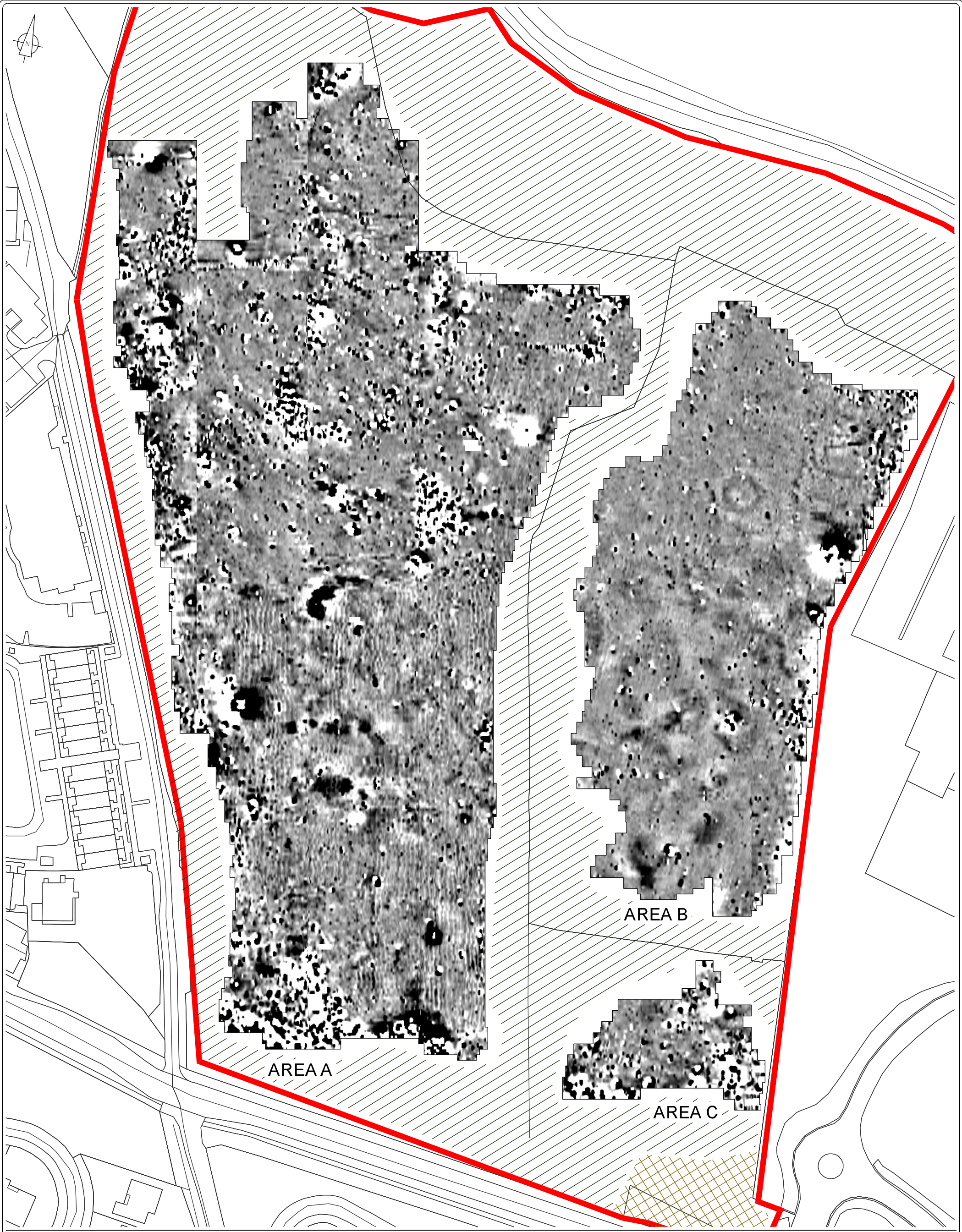
Detailed survey

Not suitable for survey
Overgrown vegetation / poor ground conditions

Not suitable for survey
Magnetically disturbed

0 metres 120

Client:	Project:	Title:		
IAC Ltd.	Geophysical Survey Holybanks, Swords, County Dublin	Site & Survey Location	J.M.Leigh surveys www.jmlsurveys.com	Scale @ A4: 1:3,000 Figure: 1 Licence No.: 18R0256 Issue Date: 10.12.2018



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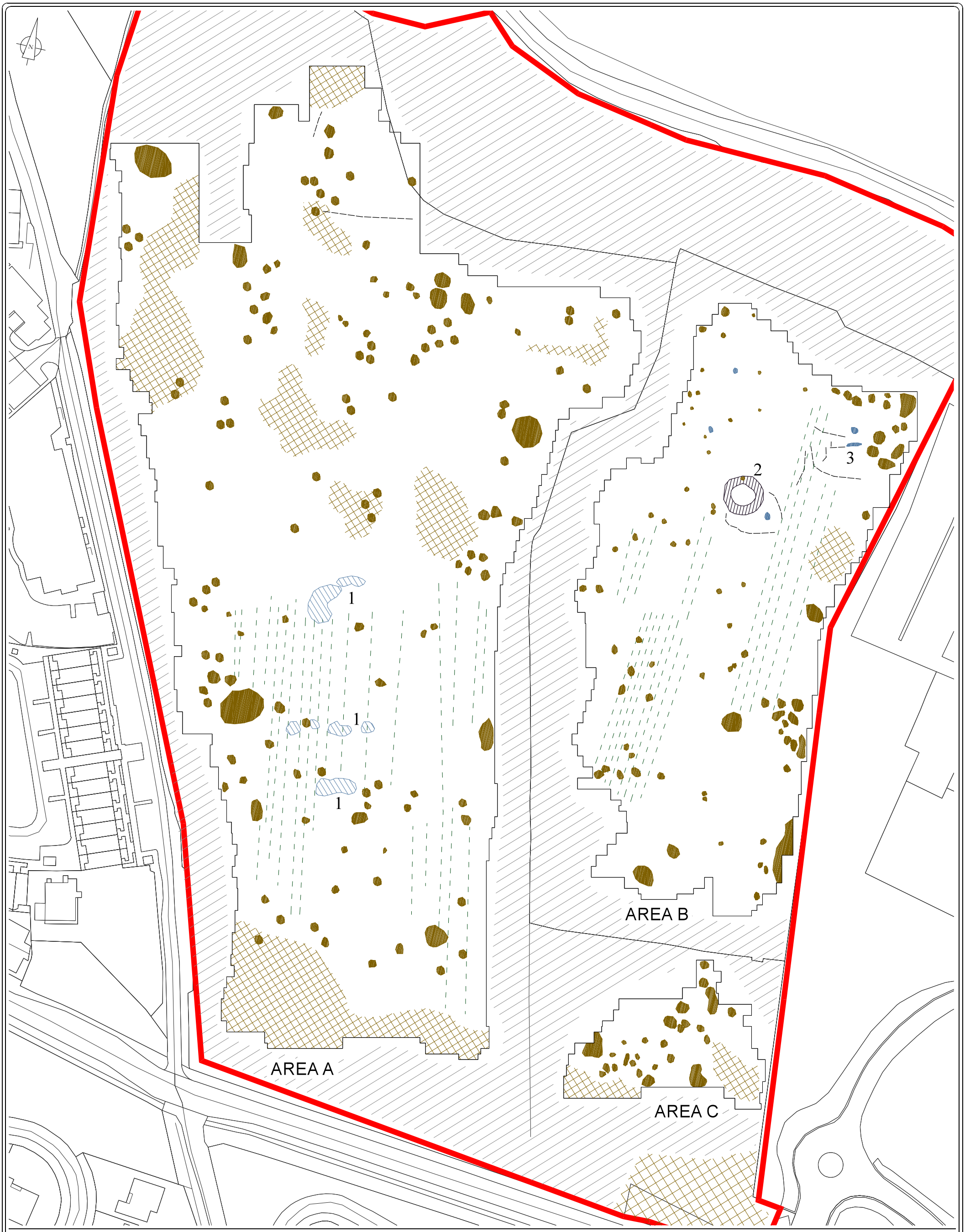
IAC Ltd.	Geophysical Survey Holybanks, Swords, County Dublin	Summary Greyscale Image	J.M.Leigh surveys www.jmlsurveys.com	Scale @ A3: 1:1,250 Figure: 2 Licence No.: 18R0256 Issue Date: 10.12.2018



Client:	Project:	Title:		
IAC Ltd.	Geophysical Survey Holybanks, Swords, County Dublin	Summary Interpretation	J.M.Leigh surveys www.jmlsurveys.com	Scale @ A3: 1:1,250 Figure: 3 Licence No.: 18R0256 Issue Date: 10.12.2018

5. Appendix 8.2 – Archaeological Testing

IAC Archaeology

ARCHAEOLOGICAL ASSESSMENT AT HOLYBANKS, NEWTOWN, AND BROADMEADOW, SWORDS, CO. DUBLIN

LICENCE NUMBER: 19E0053

I.T.M.: 717720, 748177

LICENCEE: LIZA KAVANAGH
AUTHORS: LIZA KAVANAGH AND MAEVE TOBIN

REPORT STATUS: FINAL
DATE: MARCH 2019

IAC PROJECT REF.: J3193

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ABSTRACT

Irish Archaeological Consultancy Ltd has prepared this report to study the impact, if any, on the archaeological and historical resource of a site at Holybanks, Newtown, and Broadmeadow north of Swords, Co. Dublin (ITM 717720, 748177). The report was undertaken by Liza Kavanagh and Maeve Tobin of IAC Ltd under licence 19E0053. It follows a previous desktop assessment by IAC Ltd and geophysical survey carried out by JM Leigh (licence 18R0256).

Archaeological testing was carried out over the course of five days from 18th of February 2019 using a mechanical excavator fitted with a flat grading bucket. The trenches targeted the zone of notification for recorded monument DU011-080 (ringditch), geophysical anomalies and open green space to fully investigate the archaeological potential of the site. It was not possible to excavate five of the proposed trenches due to access restrictions and overgrowth along the riverbank.

No archaeology was indicated by the geophysical survey or the programme of testing within the zone of notification for ringditch DU011-080. It is possible that the monument shown on the aerial photographs has been removed through agricultural activity or that location of this feature was mis-located at the time of its addition to the Record of Monuments and Places Another possibility is that the anomaly identified in the 1992 aerial photograph was associated with natural banding of river gravels that were recorded in this part of the site during the testing.

Testing revealed three areas of archaeological significance, which have been designated as Archaeological Areas 1–3 (AA 1–3), which clustered in the northeast quadrant of the development area, and included the ringditch (AA 1) identified during the geophysical survey (18R0256). A slot was excavated across this 3.7m wide ditch to reveal four deposits recorded to a depth of 1.4m. AA 2 was identified within the southeast end of T18, and comprised two shallow sub-circular pits. AA 3 comprised a linear feature containing a deposit of burnt stone to the north of AA 2 within the east-southeast end of T20. Ground works associated with the proposed development will have a direct significant impact on these remains.

It is acknowledged that preservation *in-situ* of archaeological remains is the preferable option wherever possible. Due consideration was given by the Design Team for the preservation *in-situ* of ringditch identified in AA 1. However, this is not possible due to the layout and design requirements of the proposed development. In particular, the preservation *in-situ* of AA 1–3 is difficult to accommodate particularly in respect of providing sufficient overlooking of open space for passive surveillance and also avoiding presenting rear facades of dwellings onto open space areas. The site is situated adjacent to a linear park and additional open space in this part of the development will lead to an over concentration of green open space in one area.

An associated difficulty relates to providing attenuation within the open space, which would not be possible in an area which contains archaeological features. Due to the

topography of the site and the limited areas of where attenuation can be located, maximising attenuation volume in the public open space is critical to ensure requirements of the Local Authorities standards and the Greater Dublin Strategic Drainage Study are met.

Given the difficulties of redesigning the layout of the development, as outlined above, coupled with the truncated nature of the remains on site, it is recommended that that preservation by record of the features in AA 1–3 would be an acceptable from of archaeological mitigation. This should be carried out by a licence eligible archaeologist in consultation with the National Monuments Service of the DoCHG.

While the results of the geophysical survey have been confirmed, and the site appears to be largely clear of archaeology, there remains the potential for smaller more ephemeral archaeological features (such as AA 2) to survive beneath the current ground surface outside of the investigated area. If present, ground works associated with the proposed development would have a direct negative impact on any such remains. It is therefore recommended that all ground disturbances, including topsoil stripping and site investigations, be monitored by a suitably qualified archaeologist.

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1 INTRODUCTION

1.1 GENERAL

The following report details the results of a programme of archaeological testing undertaken at Holybanks, Newtown, and Broadmeadow, north of Swords, Co. Dublin. This assessment has been carried out to ascertain the potential impact of the proposed development on the archaeological resource that may exist within the proposed development area. The assessment (licence 19E0053) was undertaken by Liza Kavanagh of Irish Archaeological Consultancy Ltd (IAC).

Test trenching commenced at the site on 18th of February 2019 and continued for five days. This was carried out using a 13-tonne 360 degree tracked excavator, equipped with a flat, toothless bucket, under strict archaeological supervision. A total of 58 trenches were mechanically investigated across the test area which measured 2,686 linear metres. The trenches targeted the zone of notification for recorded monument DU011-080 (ringditch), geophysical anomalies and open green space to fully investigate the archaeological potential of the site. It was not possible to excavate five of the proposed trenches due to access restrictions and overgrowth along the Broadmeadow River bank.

This report follows on from an archaeological desktop assessment (Tobin 2018) and geophysical survey (Leigh 2018, licence 18R0256). The data from the survey is dominated by modern responses resulting from debris and litter throughout the site. Construction waste was noted in T6, T7, T8 and T29 on the south side of the proposed development footprint.

While the geophysical survey did not identify any anomalies of archaeological potential within the zone of notification for ringditch DU011-080 it was targeted by six test trenches to investigate the location of the site. No archaeology was identified in this vicinity during testing. Three previously unrecorded archaeological areas (AA 1-3) were identified during testing clustered within an area measuring 70m by 50m in the northeast quadrant of site. The most significant of these, AA 1, comprises a previously unrecorded ringditch identified during the geophysical survey. This feature was targeted by hand-excavated test trenches. AA 2 was identified as two shallow sub-circular pits and AA 3 comprises a linear feature containing a deposit of burnt stone.

1.2 THE PROPOSED DEVELOPMENT

This project, comprising a proposed Strategic Housing Development, is at pre-planning stage. It is proposed to construct mixed residential units within the two larger fields of the application area with a green area surrounding the site of the recorded monument DU011-080. The southern banks of the Broadmeadow River will be sensitively landscaped to encompass a green open space with a pathway and paved seating areas.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1 SUMMARY OF DESKTOP ASSESSMENT

The test area is situated in the townlands of Holybanks, Newtown and Broadmeadow in the Parish of Swords and Barony of Nethercross (Figure 1). The site currently comprises large overgrown open fields on the southern banks of the Broadmeadow River; to the east of Jugback Terrace, north of Glen Ellen Road and west of the NMI Collection Resource Centre. The course of the river has been straightened and rerouted to the north of site during the 20th century. The footprint of the former winding watercourse forms the northern boundary of the townland and of the current development area. The Irish name for Holybanks is *An Bruach Naofa* meaning the 'Sacred Bank'. It should be noted however that the name Holybanks may also have derived from '*Hollybanks*' – denoting a predominant vegetation in the area.

A single Recorded Monument is known within the area of proposed development, ringditch DU011-080 (Figure 2). This was identified as a circular cropmark on an aerial photograph taken in 1992 on the former bank of the river. Within the wider area there are three further Recorded Monuments are located within 500m of the current site. These include enclosure DU011-079 180m to the west and ringfort DU011-079 and field system DU011-107 c. 230m to the north.

Newtown House, a Protected Structure (RPS 339, NIAH 11335009), is located outside and to the east of the proposed development area.

Prehistoric Period

The riverside location of the test area would indicate a heighted potential for prehistoric settlement evidence. Significant evidence for Neolithic settlement in proximity to the proposed development area has been uncovered during excavations at Lissenhall c. 1.3km to the northeast. Two Neolithic post-built structures (DU012-079001–2) were excavated during the construction of the M1 motorway. Both structures measured c. 9m by 5–6m. The structures were represented by postholes, hearths and fire pits and one them was associated with a possible platform area and fragments of Western Neolithic pottery.

A ringditch (DU011-080)(Plate 1) was noted on a 1992 aerial photo within the northern half of the proposed development area. The circular ditch appeared to have an entrance in the northwest quadrant. Situated on the southern banks of the Broad Meadow River this monument is located on a natural boundary and may have functioned as a territorial marker in addition to a memorial. No surface trace survives for these remains. Numerous other ringditches are recorded in the wider vicinity of site, with two (DU011-123 and DU011-130) present in Balheary Demesne 700–800m to the north-northeast. Site DU011-130 was subject to partial investigation in 2009 in advance of the Metro North project, at which time a cremation burial was identified in the eastern quadrant of the ditch and some pottery was noted (Channing 2009, licence 09E0463). A further ringditch (DU011-034019) was identified and excavated c. 1.2km to the south in Windmill Lands (archaeology.ie, licence 13E0267).

The most common Bronze Age site within the archaeological record is the burnt mound or *fulacht fia*. Numerous examples are recorded within North Dublin however no examples are known from the vicinity of the current development site. They are often found near to low-lying marshy areas or adjacent to streams or rivers, such as the current site.

Archaeological investigations in advance of residential developments and infrastructural projects have identified numerous previously unknown settlement and funerary sites in the wider vicinity of the current site. While most of the larger scale occupation activity recorded to the west in Mooretown and Oldtown is thought to be medieval in date, it likely has origins in the Iron Age. A kiln excavated c. 1.2km northwest at Oldtown (McLoughlin 2016, Licence 13E0283) has been dated to the Iron Age, suggesting that the nearby large enclosure (DU011-150), which was preserved *in-situ*, may also date to this period.

Early Medieval Period (AD400–1100)

Swords was an important centre of the ancient Gaelic kingdom of *Brega*, which, from the late Iron Age to the Norman intervention of 1169, approximately covered the same area of modern Fingal bounded by the Rivers Tolka to the south and Delvin to the north. During this period, *Brega*, was ruled by the *Ui Chernaig* branch of the dynasty known as *Sil nAedo Slaine*, a southern branch of the *Ui Neill* who gained control of the territory in the early 8th century (Bradley 1998). MacShamráin (2016) concludes that Swords formed part of the sub kingdom of *Gailenga Becca* until the expansion of the Hiberno-Norse kingdom of Dublin in the late 9th and 10th centuries.

The ringfort or rath is considered to be the most common indicator of settlement during the early medieval period. Ringforts are strongly associated with agricultural land and, as such, are rarely situated at higher altitudes. A double-ditched circular enclosure, recorded as a bivallate ringfort (DU011-078) was identified in an aerial photo from 1992, associated with a radiating field system (DU011-107), c. 230m north at Newtown. Further large enclosures have also been identified in aerial photography in the wider area although the nearest of these, DU011-079, is now located under a residential estate in Broadmeadow townland c. 180m to the west of site.

A monastic settlement, dedicated to St Colmcille, was likely founded in the 6th century on high ground to the west of the River Ward c. 1.2km south of the proposed development area (Gwynn and Hadcock 1988, 44). The name 'Swords' derives from the Irish *Sord Colmcille* or St. Colmcille's Well; *sord* meaning 'pure' (Joyce 1995, 566). Edmund O'Donovan (2016) suggests possible missionary activity in the area in the 6th century with the coming of Palladius and Secundus (O'Donovan 2016), while according to MacShamráin (2016) there is a strong possibility of Gaulish and British ecclesiastical links at Swords and the wider Fingal area. Evidence for substantial burial grounds originating in the early medieval period have also been identified in the wider area, such as that at Mount Gamble (DU011-101) 1.3km south (O'Donovan 2016). Geophysical survey and test trenching have also indicated the presence of a large enclosed burial ground at Oldtown (DU011-144001–4) c. 980m to the west. The survey results indicated a multiple enclosure site with the burials located within the

inner enclosure. The scale and layout of the Oldtown site is indicative of an idealised ecclesiastical enclosure probably laid out after the 7th century (Baker 2010). The radial divisions at Oldtown suggest different functions for the separate spaces and osteological analysis of a sample of the bone indicated the presence of men, women and children (ibid.). St. Cronan's Well (DU011-018) and Glassmore abbey (DU011-019) are located c. 400m south of the enclosure however Baker suggests that the site of *Glas Mór* church may be to the south of Swords.

The ecclesiastic settlement at Swords suffered a series of attacks during the 10th and 11th centuries although it held prominence as one of the resting places of Brian Boru's funeral procession following the Battle of Clontarf in 1014. The pattern of attack and counter attack continued as Swords found itself on the border of warring kingdoms. The value of Swords to the Hiberno-Norse of Dublin made it a prime target for the Kings of Meath, who repeatedly attacked Swords throughout the 11th and 12th centuries.

Medieval Period (AD1100–1600)

Prior to the Anglo-Norman Invasion, Fingal lay between the competing political and territorial zones of the kingdom of *Midhe* and the Hiberno-Norse kingdom of Dublin. In the mid-12th century, the monastic site at Swords and its possessions were transferred to the Archbishop of Dublin. Swords subsequently became one of the principal archiepiscopal manors of Dublin. The piecemeal conquest by the Anglo-Normans of Ireland, which commenced in 1169, had a fundamental impact on the Irish landscape. Following this the property of the monastery of Swords formed part of the lands of the See of Dublin, confirmed to Archbishop Laurence O'Toole in 1179 (McNeill 1950). In 1197, King Richard granted a charter to Swords, by which each burgess was to pay 12 pence annually for his burgage. In a later charter, he confirmed the burgesses of Swords in their burgages and gave them the liberties and free customs of Dublin, and established an annual rent of one shilling per burgage (Bradley 1988; Ball 1906).

During the 13th century, the archbishops of Dublin occasionally resided at Swords Castle (DU011-034001) c. 1km south of the proposed development area. Expenditure on the upkeep of the castle was recorded and in the 1270s, a sum of £100 was accounted for the 'repairs of houses, mills, and other expenses in the manor of Swords' implying that mills along the River Ward were in existence at least as early as the late 13th century (Stalley 2006).

The Broad Meadow River functioned as a natural boundary marker for centuries however it was also exploited to power milling activities during the medieval period. Several water mills are recorded along the course of the river in Counties Meath and Dublin (Murphy and Potterton 2010, 418–421). No medieval mills are recorded in the vicinity of the proposed development along the Broad Meadow River, however examples are known on the River Ward to the south, as noted above.

A possible medieval farmyard (RMP DU011-083) was identified c. 2.6km to the west in Saucerstown. An extensive cobbles surface and foundations of walls with associated

finds of Leinster cooking ware and glazed medieval pottery were exposed during the construction of a gas pipeline in 1988.

Post-medieval Period (AD1600-1900)

Swords was granted a charter and borough status during the reign of Elizabeth and it appears that the castle was retained by the archbishop well into the 17th century, if not beyond. During the Wars of the Catholic Confederation in 1641 Swords Castle was used as a rendezvous for Confederate forces and attacked and routed by the forces led by Sir Charles Coote. Following the execution of Charles I, the aristocracy of Fingal remained loyal to the Royalist cause. A rebel force was defeated by Charles Coote at Swords in 1642. By the 18th century Swords expanded into a market and post-town and in 1837 Lewis describes the population as comprising '3722 inhabitants, of which number, 2537 are in the town'.

The Loganim.ie archive records for Holybanks townland note that the placename was referred to in a lease date of 1698. It is not clear whether the name Holybanks derived from the Irish *An Bruach Naofa* meaning the 'Sacred Bank', or is merely referring to the local flora, i.e. 'Hollybanks'. There is no evidence for any structures or buildings within this parcel of land on the historic mapping however it is shown as an individual unit on both the Parish and Barony maps of the mid-17th century.

A substantial number of large demesnes are shown on the first edition OS mapping within the vicinity of the test area. Newtown House (RPS 339, NIAH 11335009) c. 50m to the east of the proposed development area and the former parkland is shown on the first edition 6-inch OS map of 1837 extending within the current site. Newtown Bridge (NIAH 11335017), crossing the Broad Meadow River to the immediate north of the proposed development area, was likely constructed in c. 1890 and later enlarged around 1930.

The Broad Meadow River provided power for many mills along its course and one example is shown on Rocque's Map of 1760 c. 330m to the northwest of the test area. Several buildings are shown on the earlier mapping which are labelled as a corn mill and flour mill on the 1837 OS map. A windmill is also illustrated on the 1760 mapping, further testifying to the agricultural industry of the area.

2.2 SUMMARY OF PREVIOUS ARCHAEOLOGICAL FIELDWORK

A review of the Excavations Bulletin (1970–2016) has shown that no archaeological investigations have been carried out within the current site or in the immediate vicinity. Several programmes of geophysical survey, test trenching, excavation and monitoring would have been carried out in the wider area in advance of proposed infrastructural and residential development.

Test trenching and geophysical survey were undertaken in the footprint of the proposed Metro North project in Lissenhall Little and Balheary Demesne townlands c. 570m to the east (Channing and Hession 2009, Licence 09E0464; Channing 2009, licence 09E0463). The remains of a former bridge arch and wall was noted extending

between Lissen Hall Bridge and Balheary Bridge. Further to the northeast a ringditch, linear ditch and cremation pit were also recorded in Lissenhall Little townland.

Monitoring carried out c. 550m north as part of the Lissenhall Water Scheme failed to reveal any archaeology (Byrne 2003, licence 03E0104). Similarly programmes of testing and monitoring carried out off Seatown West c. 700m to the southeast have not revealed any archaeology (O'Carroll 2005, Licence 05E0525; O'Connor 2003, licence 03E0053; and Meenan 2002, licence 02E0898).

Significant archaeological discoveries were however made further to the west in Mooretown and Oldtown. A large ecclesiastical enclosure, burials and an extensive medieval field system (DU011-144001-4) were identified at 900m to the west at Mooretown by geophysical survey (Licence 03R0095, 04E0023 and 05R0170) and confirmed by test trenching (Licence 03E1080, 04E0543). These features are mostly preserved *in-situ.* A large ditched enclosure (DU011-150) was identified through testing c. 1.2km northwest at Oldtown (McLoughlin 2013a, Licence 13E0283) and was preserved *in-situ.* Subsequent monitoring of topsoil removal at this site revealed an Iron Age cereal drying kiln, a metalled roadway shown on Rocque's map of 1760, and some linear ditches (McLoughlin 2013b and 2016, Licence 13E0283).

2.3 CARTOGRAPHIC ANALYSIS

The barony map for Nethercross shows 'Newtonne' townland traversed on an east-west axis by the Broad Meadow River. A parcel of land, annotated as plot 64, is outlined bordering the western extent of Newtown to the south of the river. There are no buildings or features of archaeological potential indicated within the test area.

Rocque's map of 1760 shows the proposed development area within a rural and undeveloped landscape to the north of a well-developed Swords Town. Newtown House is annotated to the immediate east as an L-shaped main building with a possible stables and gate lodge shown to the east and southeast respectively. A probable square walled garden is shown adjacent to the current plot near the banks of the Broad Meadow River. Four roads radiate north from Swords, one of which bounds the proposed development area to the west, forming the current Jugback Terrace. There are no buildings or features of archaeological potential shown within the current site footprint. The surrounding area is characterised by open fields and large houses, such as Mooretown and Oldtown to the west, 'Ballyhare' (Ballyheary) to the north and Little Lisshen Hall and Lissen Hall to the northeast. Several large mill buildings are shown on the northern banks of the river, fed by a mill race, 360m north and a windmill is present further away in 'Ballyhare'.

The first edition 6-inch OS map (1837) is the first accurate historic mapping coverage of the area containing the proposed development area. Although there are no major changes in the layout of the lands since the 1760 map the site is shown at a scale of the individual field. The western half of site comprises almost the entirety of Holybanks townland. The parcel of land is shown as comprising three large tree-lined sub-rectangular fields bordered to the north by a short section of the Broad Meadow River. As such the western and north limits of the proposed development area

comprise the townland boundaries with the adjacent lands at Broadmeadow and Newtown. The boundary dividing Holybanks from Newtown divides the current site footprint. The eastern half of the proposed development is located in Newtown townland and is shown within the shaded parkland associated with Newtown House (located outside of the current site), (Plate 2). The area mostly comprises open fields although part of an orchard is also shown. A path extends from the house towards the road by Newtown Bridge in the north. No buildings or features of archaeological potential are illustrated within the proposed development area.

There are no changes of note within the test area by the turn of the 20th century although the 25-inch OS map shows the site in greater detail than before. Several weirs are annotated on the river in Newtown townland. By the 1930s the Broad Meadow River has been rerouted into a wider straight channel to the north of site by the time of this map. Some of the internal field boundaries have also been removed.

2.4 SUMMARY OF GEOPHSYICAL RESULTS

A geophysical survey was carried out by Joanna Leigh within all available areas of the proposed development site in December 2018 under licence 18R0256. This involved a detailed gradiometry survey in an area totalling c. 6ha. The data is dominated by modern responses resulting from debris and litter throughout the site. Rough ground conditions and overgrown vegetation restricted the area available for survey. However, some responses of interest were recorded. In the east of the application area a circular response measuring c.11.5m in diameter was identified (Figure 4, Plate 3). This is indicative of a circular feature and considered to be of archaeological potential. It is speculated that a ringditch feature has been identified here. This is located 170m to the east of the recorded ringditch (DU011-080). Survey was conducted over the recorded ringditch (DU011-080) but no clear responses were recorded. Leigh noted that it was possible that the modern magnetic interference in this area was masking the ringditch.

3 ARCHAEOLOGICAL TESTING

3.1 GENERAL

The proposed development area is situated in the townlands of Holybanks, Newtown and Broadmeadow in the parish of Swords and the Barony of Nethercross. The site currently comprises large over-grown open fields on the southern banks of the Broadmeadow River; to the east of Jugback Terrace, north of the Glen Ellen Road and west of the NMI Collection Resource Centre. The course of the river has been straightened and rerouted in the 20th century. This area is now heavily overgrown and almost inaccessible. The area to the south of the development lands has been impacted by previous construction activities with deposits of overburden 1.2m in depth visible. The test area largely comprises undeveloped open green space, although it is recorded that an area in the northwest quadrant had been previously levelled to create a playing pitch. The highest point is to the south and the lands gently slope from here towards the river to the north.

Test trenching was carried out over the course of five days from 18th February 2019, using a 360° track machine excavator equipped with a flat, toothless bucket under strict archaeological supervision. A total of 58 trenches from a proposed 63 were excavated within the area of proposed development. The remaining five trenches were not excavated due to issues with access. The layout of test trenches was designed to investigate the archaeological potential of the zone of notification for the recorded monuments DU011-080 and geophysical anomalies noted by JM Leigh Surveys (18R0256) with further trenches scattered in the open areas (Figure 4). Any investigated deposits were preserved by record. This was by means of written, drawn and photographic records.

The test trenches were excavated to determine, as far as reasonably possible, the location, extent, date, character, condition, significance and quality of any surviving archaeological remains threatened by the proposed development. Test trenching was also carried out to clarify the nature and extent of existing disturbance and intrusions and to assess the degree of archaeological survival in order to formulate further mitigation strategies. These are designed to reduce or offset the impact of the proposed development scheme.

3.2 TESTING RESULTS

A total of 58 trenches were excavated across the site measuring 2,686 linear metres (Figure 3–5, Plates 4–18). A detailed table of the trench results is included in Appendix 1 and a description of the archaeological features are included in Appendix 2.

The topsoil is a dark greyish brown silty clay with occasional inclusions of small and medium sized stones and roots. Disturbance form previous construction activities is evident on the southern end of the development area. Variation in topsoil is notable in the northern part of site associated with substantial drainage works. On occasion in this locale the sod sits atop layers of marl and gravel with very little topsoil evident. A

lighter deposit of pale brown silt and silty clay was common throughout site, recognisable as ploughsoil.

The subsoil varies across site but is most commonly a dark red brown compact silty clay with decayed stone inclusions. Bands of fine sandy gravel were noted throughout the site also. The subsoil in the north side of the development area within the largest field varied to marl deposits of light grey and pinkish in colour. T17, T19, T20, T52 and T58 all contained sand and gravel deposits, riverine in composition.

3.2.1 Recorded Monument – DU011-080

A total of six test trenches (T47, T48, T51, T52, T57, and T58) targeted the zone of notification for recorded monument DU011-080 (Plates 1 and 7-8). No archaeological or deposits were identified by the geophysical survey or the programme of testing within the zone of notification for ringditch DU011-080. The trenches in this area did reveal banding through the natural subsoil reflective of riverine deposits, such as marl and gravels which were not the common subsoil type elsewhere in the footprint of the test area (Plate 8).

3.2.1 Previously Unrecorded Archaeological features

Three hand-excavated trenches investigated the probable ringditch identified as an 11.5m diameter circular geophysical response (Geophysical Anomaly 2). Under advice from the National Monuments Service the signature of the anomaly was targeted by two 5m x 1m hand-excavated trenches and the interior was investigated by a 1m x 1m hand-excavated trench. The ditch was revealed in both T13 and T15. A slot was excavated through the feature (C15.1) in T15 where it was shown to be a broad (3.7m wide) and deep (1.4m) steeply sloping ditch with a concave base, filled with four distinct deposits (Plate 9 and 10). The basal fill, a pale yellow with grey mottling clay (C15.5) was overlain by a deposit of plastic mid grey clayish silt with inclusions of stone, snail shell, charcoal and burnt bone (C15.4). A deposit of pale brown clay with charcoal and bone overlay this (C15.3) and was partially concealed beneath the uppermost deposit of plastic brownish silty clay (C15.2). No archaeological features were identified in the investigated trench in the interior of the enclosure. This area was designated as Archaeological Area 1 (AA 1) (Figure 5, Plates 9 and 10).

Approximately 30m to the northeast of AA 1 two sub-circular pits (C18.1 and C18.2) were identified in T18 (Plate 11). Pit C18.2 which was truncated on its southeast side by drain, C18.3. Pit C18.1 (0.8m by 0.7m by 0.12m) was filled with a gravelly red-orange clay fill. Pit C18.2 (0.9m by 0.8m by 0.12m) was filled with a charcoal stained stony silty clay. These pits have been designated as AA 2 (Figure 5, Plate 11).

To the north of AA 2, by c. 20m, a single linear feature with a rounded terminus (C20.1) was identified in T20. This feature (1m by 0.75m by 0.15) was orientated north–south with the north end marked by a deposit of red beige silt (0.05m thick) spreading over and partially concealing a deposit of grey charcoal flecked clay with burnt stone on the exposed south end (Plate 12). The south end of the feature

extended beyond the limit of the trench. It has been designated as AA 3 (Figure 5, Plate 12).

3.2.3 Non-Archaeological Features

A number of linear features representing former field boundaries, drains and furrows were noted within the footprint of the test area. A broad and wide ditch (C9.1) was noted in both T9 (Plate 13) and T31. These ditch features are shown to correspond with field boundary ditches evident on the first edition Ordnance Survey (OS) map of 1837 for the area (Figure 3). A further seven substantial linear features (min. 1.2m wide and 0.25m deep) were recorded in T10 (C10.1), T12 (C12.1), T17 (C17.1), T19 (C19.1), T30 (C30.1), T45 (C45.1) and T54 (C54.1) (Appendix 2, Plates 14–16). These features are broader than the average drain recorded on site with two of these features containing stone culverts. It is possible that these features represent former field boundaries not recorded on either the first (1837) or second (1907) edition historic OS maps. The approximate location of the development area as indicated on Rocque's map (1760) appears to be further sub-divided when compared to the 1837 map, indicating the removal of previous field boundaries, which may correspond with these drainage features, in the 18th century. One of these drains (C30.1) corresponds with geophysical anomaly 1 while a second (C19.1, Plate 9) corresponds with geophysical anomaly 3 (Leigh 2018, 18R0256).

A further 26 drainage features were also recorded within the footprint of the development area (Plates 17 and 18). This is not surprising considering the proximity to the river and previous use of the area as agricultural land. The majority of these drains were less than 0.5m wide and often were filled with stone and in some case a red clay pipe. Two furrows shallow furrows were noted in the development area, further evidence of the former agricultural use of the area, as well as at least two instances of root burning representing land clearance activities. Construction development to the south, east and west of the site was evident in the dumps of construction materials in T6, T7, T8 and T29 (Plate 19). The remains of a previously broken electric cable was noted in T2 and two live red-ducted ESB cables were noted traveling in an east-northeast–west-southwest direction through T53, T54 and T57.

4 CONCLUSIONS

Archaeological testing was carried out over the course of five days in February 2019 using a mechanical excavator fitted with a flat grading bucket. The trenches targeted the zone of notification for recorded monument DU011-080, geophysical anomalies and open green space to fully investigate the archaeological potential of the site.

No archaeology was indicated by the geophysical survey or the programme of testing within the zone of notification for ringditch DU011-080. It is possible that the monument shown on the aerial photographs has been removed through agricultural activity or that location of this feature was mis-located at the time of its addition to the Record of Monuments and Places. Another possibility is that the anomaly identified in the 1992 aerial photograph was associated with natural banding of river gravels that were recorded in this part of the site.

Testing revealed three areas of archaeological significance, which have been designated as Archaeological Areas 1–3. These comprise: AA 1 - a previously unrecorded ringditch containing burnt and unburnt bone, AA 2 - two sub-circular pits, and AA 3 - a linear feature containing at least two deposits.

Numerous ringditches are recorded in the wider vicinity of site, with two (DU011-123 and DU011-130) present in Balheary Demesne 700–800m to the north-northeast. Site DU011-130 was subject to partial investigation in 2009 in advance of the Metro North project, at which time a cremation burial was identified in the eastern quadrant of the ditch and some pottery was noted (Channing 2009, licence 09E0463). A further ringditch (DU011-034019) was identified and excavated c. 1.2km to the south in Windmill Lands (archaeology.ie, licence 13E0267). Although a common feature in the Irish landscape ringditches are significant monument which may have served as both territorial markers as well as funerary monuments.

The archaeological features noted in AA 2 and AA 3 are in close proximity to the recently identified ringditch in AA 1, and as such there is potential that they are related to this activity.

The geophysical survey noted three anomalies of archaeological potential. Two of these (Geophysical Anomaly 1 and 3) were shown to correspond with two substantial field drainage features, and the third represents a previously unrecorded ringditch (AA 1). While the results of the geophysical survey have been confirmed, and the site appears to be largely clear of archaeology, there remains the potential for smaller more ephemeral archaeological features (such as AA 2) to survive beneath the current ground surface outside of the investigated area.

5 IMPACT ASSESSMENT AND MITIGATION STRATEGY

Impacts can be identified from detailed information about a project, the nature of the area affected and the range of archaeological resources potentially affected. Archaeological sites can be affected adversely in a number of ways: disturbance by excavation, topsoil stripping; disturbance by vehicles working in unsuitable conditions; and burial of sites, limiting access for future archaeological investigation.

5.1 IMPACT ASSESSMENT

Recorded Monument DU011-080

The site of the recorded ringditch DU011-080 was targeted by geophysical survey and six trenches. These investigations did not identify any trace of a monument at this location and as such there will be no impact on this site.

Previously Unrecorded Archaeological Features

Testing revealed three areas of archaeological significance clustered in the northeast quadrant, designated as Archaeological Areas 1–3 (AA 1–3). The most significant of these, AA 1, comprises a previously unrecorded ringditch identified during the geophysical survey. Ringditches are common monument in the Irish landscape most frequently interpreted as funerary sites and territory markers. The recognition of the commonality of these monuments is not to underplay their significance within the archaeological landscape and our interpretation of prehistoric culture and society.

AA 2 was identified within the southeast end of T18, as two shallow sub-circular pits. AA 3 comprises a linear feature containing a deposit of burnt stone to the north of AA 2 within the east-southeast end of T20. Interpretation of the dating and function of these pits would require further investigation and on current evidence they appear to be of local significance.

Ground works associated with the proposed development will have a direct significant impact on these remains and as such it is recommended that AA 1–3 be preserved by record (i.e. archaeological excavation) in advance of construction.

Furthermore while the results of the geophysical survey have been confirmed, and the site appears to be largely clear of archaeology, there remains the potential for smaller more ephemeral archaeological features (such as AA 2) to survive beneath the current ground surface outside of the investigated area. If present, ground works associated with the proposed development would have a direct negative impact on any such remains.

5.2 MITIGATION

We recommend the following actions in mitigation of the impacts above.

- While the investigations identified no evidence of at site within the zone of notification for DU011-080 it is recommended this area be subject to archaeological monitoring as part of the general monitoring works.

- It is acknowledged that preservation *in-situ* of archaeological remains is the preferable option wherever possible. Due consideration was given by the Design Team for the preservation *in-situ* of ringditch identified in AA 1 and associated remains. However, this is not possible due to the layout and design requirements of the proposed development. In particular, the preservation *in-situ* of AA 1–3 is difficult to accommodate particularly in respect of providing sufficient overlooking of open space for passive surveillance and also avoiding presenting rear facades of dwellings onto open space areas. The site is situated adjacent to a linear park and additional open space in this part of the development will lead to an over concentration of green open space in one area.

  An associated difficulty relates to providing attenuation within the open space, which would not be possible in an area which contains archaeological features. Due to the topography of the site and the limited areas of where attenuation can be located, maximising attenuation volume in the public open space is critical to ensure requirements of the Local Authorities standards and the Greater Dublin Strategic Drainage Study are met.

  Given the difficulties of redesigning the layout of the development, as outlined above, coupled with the truncated nature of the remains on site, it is recommended that that preservation by record of the features in AA 1–3 would be an acceptable from of archaeological mitigation. This should be carried out by a licence eligible archaeologist in consultation with the National Monuments Service of the Dept. of Culture, Heritage and the Gaeltacht.

- It is recommended that all ground disturbances associated with the proposed development, including topsoil stripping and site investigations, be monitored by a suitably qualified archaeologist. If any features of archaeological potential are discovered during the course of the works further archaeological mitigation may be required, such as preservation *in-situ* or by record. Any further mitigation will require approval from the National Monuments Service of the DoCHG.

It is the developer's responsibility to ensure that full financial provision is made available for the required field work and any post-excavation works. A letter stating same will be required as part of the licence application process.

Please note that all recommendations are subject to approval by the National Monument Section of the Heritage and Planning Division, Department of Culture, Heritage and the Gaeltacht.

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ELECTRONIC SOURCES

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www.archaeology.ie – DoCHG website listing all SMR sites with aerial photographs.

www.osiemaps.ie – Ordnance Survey aerial photographs dating to 1995, 2000 & 2005 and 6-inch/25-inch OS maps.
www.heritagemaps.ie – The Heritage Council web-based spatial data viewer which focuses on the built, cultural and natural heritage around Ireland and off shore.
www.googleearth.com – Aerial photographs of the proposed development area.

APPENDICES

APPENDIX 1 TRENCH RESULTS

TRENCH	LENGTH (m)	WIDTH (m)	DEPTH (m)	ORIENTATION	DETAILS
1	100	2	0.4	North-northwest–south-southeast	No archaeology found. Subsoil with gravel patches. Evidence of land clearance activities in the form a tree-bowl/root activity composed of an irregular hollow filled with occasionally charcoal flecked silty clay in the south end of the trench (Plate 4).
2	100	2	0.44	North-northwest–south-southeast	No archaeology found. Subsoil with gravel patches. Evidence of root burning mid-way along trench. Shallow drain remnant in south end of trench, 0.5m wide and 0.1m deep filled with compact mid-grey clay. Broken cable in south end of trench.
3	100	2	0.45	North-northwest–south-southeast	No archaeology found. Patches of marl noted mid-way in trench.
4	100	2	0.42	North-northwest–south-southeast	No archaeology found. Evidence of root burning noted in south end of the trench composed of charcoal flecked dark grey clay and small pebbles 0.3m by 0.2m and 0.05m deep.
5	100	2	0.5	North-northwest–south-southeast	No archaeology found. Patches of gravel and marl noted in subsoil. Drain noted on north end of trench. This linear feature, straight sided, 0.7m wide was filled with loose grey brown silty clay with root and small pebble inclusions.
6	60	2	0.66	West-southwest–east-northeast	No archaeology found. Disturbance from previous construction activities evident in the form of concrete block and plastic rubbish in topsoil/overburden mix. West end of trench is wet underfoot.
7	60	2	0.5	West-southwest–east-northeast	No archaeology found. Disturbance from previous construction activities evident in the form of concrete block and plastic rubbish mixed with topsoil. Redbrick and limestone stone drain evident in east end of trench, orientated east–west. A second drain of same construction noted in north section face of trench.
8	60	2	0.6	West-southwest–east-northeast	No archaeology found. Disturbance from previous construction activities evident in the form of concrete block and plastic rubbish inclusions in the topsoil/overburden mix. Stratigraphy in east end of trench shows a layer 0.5m deep of overburden and backfill overlying the topsoil.
9	50	2	0.45	Northeast–southwest	Possible archaeological feature found, warrants further investigation. **C9.1** Field Boundary Ditch, 4.1m wide and at least 0.6m deep, filled with grey brown charcoal flecked clay likely corresponding with field boundary on first edition maps (Plate 13) (See Appendix 2). Gravel deposits frequent in the north end of the trench.

TRENCH	LENGTH (m)	WIDTH (m)	DEPTH (m)	ORIENTATION	DETAILS
10	30	2	0.55	East–west	No archaeology found. Two drainage features noted. At the east end of the trench a north–south drainage feature 0.65m wide and 0.2m deep filled with dark grey clayey silt, with occasional charcoal flecks and pebble inclusions. The west end of the trench is marked with a northeast–southwest linear feature (**C10.1**) (1.1m wide and 0.32m deep) with sharp break of slope at top and base of gradually sloping side. Filled with dark grey brown compact clay and occasional stone. This drain is a more substantial feature than the shallow drain remains in the east end of the trench and possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area (See Appendix 2).
11	30	2	0.7	East–west	No archaeology found. Gravel patches noted in the subsoil. Narrow drain, "V-shaped" 0.45m wide and 0.35m deep, filled with compact dark brown clay.
12	50	2	0.6	Northeast–southwest	No archaeology found. **C12.1** drainage feature 1.8m wide and 0.45m deep, orientated northeast–southwest. Filled with light brown marl and clay and stone culvert, possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area (Plate 14) (See Appendix 2)
13	5	2		East–west	**Archaeological Area 1:** Ringditch identified as geophysical anomaly 2 by JM Leigh Surveys (18R0256). **C15.1** steeply sloping ditch 1.4m deep composed of four deposits in a concave shaped base (Plate 9 and 10) (See Appendix 2).
14	1	2		None	No archaeology found. Hand-dug trench 1m square.
15	5	2		North-northwest–south-southeast	**Archaeological Area 1:** Ringditch identified as geophysical anomaly 2 by JM Leigh Surveys (18R0256). **C15.1** steeply sloping ditch 1.4m deep composed of four deposits in a concave shaped base (Plate 14 and 15) (See Appendix 2).
16	20	2	0.7	Northeast–southwest	No archaeology found. Subsoil marked with bans of gravel (Plate 5).
17	20	2	1	North–south	No archaeology found. The stratigraphy in T17 likely represents the backfilling of the former course of the river. A layer of historic topsoil (0.5m deep), with redbrick and animal bone inclusions was overlain by a deposit of yellow beige grey clay (0.3m deep), sealed beneath topsoil. A shallow drainage feature **C17.1** (repeated in T19) 1.2m wide and 0.3m deep filled with historic topsoil west-southwest–east-northeast orientation which possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area (See Appendix 2).
18	50	2	0.55	Northwest–southeast	**Archaeological Area 2:** Possible archaeological features found, warrants further investigation. **C18.1** (Plate 11) sub-circular feature orange red-sandy clay adjacent to **C18.2** sub-circular feature filled with stony charcoal stained clay, truncated on southeast side by drainage feature willed with grey brown clay (**C18.3**) (See Appendix 2).
19	10	2	0.8	North-northwest–south-southeast	No archaeology found. Identified as geophysical anomaly 3 by JM Leigh Surveys (18R0256) was a linear feature, orientated northeast–southwest, filled with three deposits including a fill of charcoal ash and burnt clay, likely representing the backfilling of a drain in close proximity to former river course or possibly represents an earlier field

TRENCH	LENGTH (m)	WIDTH (m)	DEPTH (m)	ORIENTATION	DETAILS
					boundary, not evident on the first or second edition mapping for the area (**C19.1**, Plate 15, See Appendix 2).
20	30	2	0.8	West-northwest–east-southeast	**Archaeological Area 3:** Possible archaeological feature found, warrants further investigation. **C20.1** sub-oval feature with heat shattered stone and charcoal stained clay (Plate 12). Stone filled drain orientated northwest–southeast found midway in trench. Drainage feature 1.2m wide and 0.2m deep filled with yellow beige clay, orientated northeast–southwest.
21	10	2	0.8	East–west	No archaeology found.
22	30	2	0.9	North–south	No archaeology found.
23	10	2	0.8	West-southwest–east-northeast	No archaeology found.
24	20	2	1	West-northwest–east-southeast	No archaeology found.
25	100	2	0.48	North-northwest–south-southeast	No archaeology found. Narrow furrow 0.15m wide and 0.1m deep orientated northeast–southwest noted midway in trench. East–west orientated drainage feature filled with grey sandy clay.
26	60	2	0.44	North-northwest–south-southeast	No archaeology found.
27	20	2	0.48	North–south	No archaeology found.
28	92	2	0.48	North-northwest–south-southeast	No archaeology found.
29	100	2	0.5	North-northwest–south-southeast	No archaeology found. The south end of the trench is marked with a deposit of overburden from previous construction activity 1.2m deep (Plate 19). A stone filled drain east-west orientated traversed the southern half of the trench.
30	40	2	0.55	North-northeast–south-southwest	No archaeology found. Identified as geophysical anomaly 1 by JM Leigh Surveys (18R0256) a linear feature 1.2m wide and 0.4m deep (**C30.1**), filled with stone and grey clay (See Appendix 2) was recorded.
31	40	2	0.5	North-northwest–south-southeast	No archaeology found. Former field boundary ditch, 2m wide and 0.3m deep, orientated east-northeast–west-southwest, filled with dark grey brown silty clay with occasional stone crosses the northern half of the trench.
32	30	2	0.65	West-southwest–east-northeast	No archaeology found. Drain 0.6m wide and 0.32m deep filled with topsoil and stone noted mid-way along trench, orientated north–south.
33	60	2	0.6	North-northwest–south-southeast	No archaeology found. Drain, orientated east–west filled with beige grey silt and clay and occasional stone crossed trench in its northern half.

TRENCH	LENGTH (m)	WIDTH (m)	DEPTH (m)	ORIENTATION	DETAILS
34	50	2	0.45	North-northwest–south-southeast	No archaeology found. Three drains, two of which were repeated in neighbouring T35, crossed this trench. On the north end of the trench a shallow east–west orientated cut 0.48m wide and 0.1m deep was filled with grey silty clay. On the south end of the trench an east-northeast–west-southwest orientated drain consisting of stone filled base topped with grey silty clay extended into T35 also. A stone drain was noted to the north of this which did not repeat in the neighbouring trenches.
35	50	2	0.5	North-northwest–south-southeast	No archaeology found. Two drains, see T34 for details.
36	50	2	0.55	North-northwest–south-southeast	No archaeology found.
37	80	2	0.9	North-northeast–south-southwest	No archaeology found. Three drains. In south end of trench, an east-northeast–west-southwest orientated straight sided drainage feature, 0.46 and 0.25m deep was filled with grey brown silty clay. To the north an east–west red clay pipe was noted in a shallow cut filled with stone and grey silty clay. A northwest–southeast orientated drain filled with compact grey brown clay and occasional stone was noted in the north end of the trench. Maximum depth in excavated trench was 1.2m with an average of 0.9m.
38	22	2	0.65	West-southwest–east-northeast	No archaeology found.
39	19	2	0.85	West-southwest–east-northeast	No archaeology found. Red clay pipe backfilled into a shallow trench with stone and clay crossed the trench in a northeast–southwest direction.
40	50	2	0.65	North-northwest–south-southeast	No archaeology found. A stone filled drain crossed the south end of the trench in an east–west direction.
41	50	2	0.8	North-northeast–south-southwest	No archaeology found. A drain, 0.4m wide and 0.2m deep filled with stone and grey brown silty clay, crossed the north end of the trench in an east–west direction
42	50	2	0.9	West-southwest–east-northeast	No archaeology found (Plate 6).
43	50	2	0.9	West-southwest–east-northeast	No archaeology found. Maximum depth 1.2m
44	50	2	0.6	West-southwest–east-northeast	No archaeology found. Stone drain crossed the east end of the trench in a west-northwest–east-southeast direction (Plate 17).

TRENCH	LENGTH (m)	WIDTH (m)	DEPTH (m)	ORIENTATION	DETAILS
45	60	2	0.65	North-northeast–south-southwest	No archaeology found. Substantial drainage feature, east-southeast–west-northwest orientated, filled with dark grey brown silty clay (**C45.1**) which possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area (See Appendix 2).
46	30	2	0.6	West-southwest–east-northeast	No archaeology found. Gravel bands and sand deposits noted in the subsoil.
47	40	2	0.65	Northeast–southwest	No archaeology found. The north end of the trench was backfilled with a pinkish marl and clay with occasional stone inclusions to a maximum depth of 0.85m (Plate 8).
48	40	2	0.75	Northwest–southeast	No archaeology found. The north end of the trench was backfilled with a pinkish marl and clay with occasional stone inclusions to a maximum depth of 0.6m.
49	30	2	0.55	North-northeast–south-southwest	No archaeology found. Furrow 0.15 m wide and 0.1m deep, filled with topsoil, crossed the trench in a northwest–southeast direction.
50	20	2	0.85	North-northeast–south-southwest	No archaeology found.
51	40	2	0.8	West-northwest–east-southeast	No archaeology found. Variation in subsoil to grey sand and stone, riverine in appearance.
52	30	2	0.6	West-southwest–east-northeast	No archaeology found. Variation in subsoil between light pinkish marl and grey gravels.
53	50	2	0.5	North-northeast–south-southwest	No archaeology found. Gap of 1.5m unexcavated 3m from the north-northeast end of the trench to avoid excavation of ESB cables first identified in T54.
54	60	2	0.75	North-northeast–south-southwest	No archaeology found. Three drains and ESB cables were noted clustered together approximately midway along the trench. The most substantial of these was cut by the trench containing two red ducted ESB cables. This drain contained a stone built culvert within a linear 1.7m wide and 03m deep, orientated northwest–southeast (**C54.1**) which possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area (Plate 16) (See Appendix 2). To the south of it was an east–west orientated stone filled drain. South of this was a light grey marl filled drain 0.6m wide and 0.3m deep, orientated east–west.
55	36	2	0.55	Northeast–southwest	No archaeology found. Original trench altered to avoid overhead wires. Two stone filled drains were noted within the trench, one of which repeated in neighbouring T56.
56	36	2	0.7	Northeast–	No archaeology found. Trench shortened by 9m due to extensive over growth along its southwest side. Two stone drains

TRENCH	LENGTH (m)	WIDTH (m)	DEPTH (m)	ORIENTATION	DETAILS
				southwest	were noted in the trench, one of which was repeated with neighbouring T55 (Plate 18).
57	50	2	0.55	Northwest–southeast	No archaeology found. Gap of 1.5m unexcavated 12m from the north-northeast end of the trench to avoid excavation of ESB cables first identified in T54.
58	50	2	0.6	East–west	No archaeology found. Variation in subsoil to grey sand and stone, riverine in appearance (Plate 7).

APPENDIX 2 CONTEXTS

CONTEXT NO.	TRENCH NO.	DESCRIPTION
C1	All	Dark grey brown silty clay with occasional inclusions of small and medium sized stones as well as roots. Disturbance form previous construction activities evident on the southern end of the development area. Variation in topsoil noted in the area adjacent to the former river course here the ground has been subject to substantial drainage. Here the sod sits atop layers of marl and gravel with very little topsoil evident. A lighter deposit of pale brown silt ad silty clay was common throughout site, recognisable as plough-soil.
C2	All	Most commonly the subsoil was described as dark red brown compact silty clay with decayed stone inclusions. Bands of fine sandy gravel were noted throughout the site also. The subsoil in the north side of the development area within the largest field varied to marl deposits of light grey and pinkish in colour. T17, T19, T20, T52 and T58 all contained sand and gravel deposits, riverine in composition.
C9.1	T9	Recorded as 4.1m wide and at least 0.6m deep, this east–west linear feature, likely corresponds to the former field boundary identified on the First Edition OS maps but missing from subsequent mapping. A small slot was excavated through the feature revealing a sharp break of slope at the top and base of the cut, gradual to steeply sloping sides and a flat base. It is filled with a deposit of mid grey brown charcoal flecked silty clay with inclusions of animal bone and small stone.
C10.1	C10	A non-archaeological drainage feature, identified within T10, was recorded at C10.1. It is a northeast–southwest orientated linear feature consisting of a sharp break of slope at top and base of cut, gradually sloping sides and a flat base was filled with a deposit of dark grey brown compact clay with small inclusion of silt. Rare charcoal flecks and stone inclusions were noted also. Possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area.
C12.1	C12	A non-archaeological drainage feature, recorded as C12.1 was identified running northeast– southwest within T12. It consisted of a band of grey marl 0.13m deep cut by a steep sided, flat based linear containing a stone box culvert and backfilled with a light brown clay, 1.8m wide and 0.48m deep. Possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area.

C15.1	C13, C15	**Archaeological Area 1:** A ringditch was noted in the geophysical survey (JM Leigh 18R0256). This was identified by hand testing. The ditch was recorded as 3.7m wide and 1.4m deep. The break of slope at the top on the south side was gradual whereas on the north side it was sharper. The break of slope at the base was gradual. The sides were concave and slightly steeper on the north side than the south side. The base was concave.
C15.2	C13, C15	**Archaeological Area 1:** The ringditch contained four deposits. The uppermost deposit was a plastic brownish grey silty clay 3.4m wide and 0.2m deep. It was focused on the north side of the cut.
C15.3	C13, C15	**Archaeological Area 1:** The ringditch contained four deposits. The second deposit from the top was the most substantial at 3m wide and 0.4m deep. It was described as pale brown silty clay with occasional charcoal with bone inclusions.
C15.4	C13, C15	**Archaeological Area 1:** The ringditch contained four deposits. The third deposit from top was described as a plastic mid grey clayish silt with yellow mottling, moderate inclusions of stone as well as snail shell, charcoal and burnt bone. It measured 2.2m wide and between 0.04 and 0.7m deep.
C15.5	C13, C15	**Archaeological Area 1:** The ringditch contained four deposits. The basal deposit was described as pale yellow with grey mottling and moderate inclusions of yellow decayed stone, occasional charcoal and snail shell. It measures 2.9m wide and between 0.18-0.45m deep.
C17.1	C17, C19	A non-archaeological linear feature, orientated east-northeast–west-southwest cut through T17 and T19, where it was described, as consisting of a gradual break of slope at top and at base as well as gradually to gently sloping sides and a flat to gently concave base. It was filled with a deposit of historic topsoil, descried as a dark grey brown silty clay with animal bone and post-medieval pottery sherd inclusions. It marked the boundary within the trench between a silty clay subsoil and a sand and gravel subsoil. It is likely related to drainage associated with the former course of the river or possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area.
C18.1	C18	**Archaeological Area 2:** A potential archaeological feature warranting further investigation. A sub-circular cut with gently sloping sides, 0.8m long and 0.7m wide and 0.12m deep was filled with a gravelly clay fill, red orange in colour.
C18.2	C18	**Archaeological Area 2:** A potential archaeological feature warranting further investigation. A sub-circular cut with a gentle sloping sides filled with a charcoal stained stony silty clay, 0.9m long, 0.8m wide and 0.12m deep, cut on its southeast side by C18.3.
C18.3	C18	**Archaeological Area 2:** A non-archaeological feature which cut through the southeast edge of pit C18.2. It is described as a northeast–southwest drainage feature, 1.1m wide and 0.3m deep, with a broadly concave shaped cut filled with a base of stone and backfilled with grey brown silty clay.
C19.1	C19	A non-archaeological drainage feature backfilled with ash and burnt clay. The drainage feature 1.4m wide and 0.55m deep with gradual to steeply sloping sides and a flat base. Three fills were recorded within this cut. The basal deposit was a beige brown silty clay, 0.05m deep, sealed beneath the primary deposit of charcoal black and burnt red ash and clay. The upper deposit was very similar to the basal deposit, a beige brown silty clay. The feature was likely backfilled in the post-medieval period and related to drainage associated with former course of the river or possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area.

C20.1	C20	**Archaeological Area 3:** A potential archaeological feature warranting further investigation. A linear feature with a rounded terminus, 1m long and 0.75m wide. This cut was orientated north–south, the north end marked with a deposit of red beige silt, 0.05m deep which spread thinly over a sub-circular deposit on the southern side, 0.15m deep, filled with grey charcoal flecked clay and burnt stone. This deposit extended beyond the limit of the trench.
C30.1	C30	A non-archaeological feature drainage feature corresponding to geophysical anomaly 1 (JM Leigh 18R0256). It measured 1.2m wide and 0.4m deep. It had steeply sloping sides with a sharp break of slope at top and at base of the cut with a flat base. It was filled with a basal deposit of stone overlain with a light grey brown silty clay.
C45.1	C45	A non-archaeological drainage feature orientated northwest–southeast measured 1.75m wide and 0.4m deep. It is described as a linear cut with gradual break of slope at gradually sloping sides and flat base filled with dark grey brown silty clay with occasional charcoal flecks and decayed stone inclusions. It possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area.
C54.1	C54	A non-archaeological drainage feature orientated northwest–southeast measured 1.7m wide and 0.3m deep. A central stone culvert, 0.3m wide was backfilled beneath a deposit of dark grey brown silty clay. It possibly represents an earlier field boundary, not evident on the first or second edition mapping for the area.

APPENDIX 3 LEGISLATION PROTECTING THE ARCHAEOLOGICAL RESOURCE

PROTECTION OF CULTURAL HERITAGE

The cultural heritage in Ireland is safeguarded through national and international policy designed to secure the protection of the cultural heritage resource to the fullest possible extent (Department of Arts, Heritage, Gaeltacht and the Islands 1999, 35). This is undertaken in accordance with the provisions of the *European Convention on the Protection of the Archaeological Heritage* (Valletta Convention), ratified by Ireland in 1997.

THE ARCHAEOLOGICAL RESOURCE

The *National Monuments Act 1930 to 2014* and relevant provisions of the *National Cultural Institutions Act 1997* are the primary means of ensuring the satisfactory protection of archaeological remains, which includes all man-made structures of whatever form or date except buildings habitually used for ecclesiastical purposes. A National Monument is described as 'a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto' (National Monuments Act 1930 Section 2). A number of mechanisms under the National Monuments Act are applied to secure the protection of archaeological monuments. These include the Register of Historic Monuments, the Record of Monuments and Places, and the placing of Preservation Orders and Temporary Preservation Orders on endangered sites.

OWNERSHIP AND GUARDIANSHIP OF NATIONAL MONUMENTS

The Minister may acquire national monuments by agreement or by compulsory order. The state or local authority may assume guardianship of any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister or the local authority as guardian of that monument if the state or local authority agrees. Once the site is in ownership or guardianship of the state, it may not be interfered with without the written consent of the Minister.

REGISTER OF HISTORIC MONUMENTS

Section 5 of the 1987 Act requires the Minister to establish and maintain a Register of Historic Monuments. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. Any interference with sites recorded on the register is illegal without the permission of the Minister. Two months notice in writing is required prior to any work being undertaken on or in the vicinity of a registered monument. The register also includes sites under Preservation Orders and Temporary Preservation Orders. All registered monuments are included in the Record of Monuments and Places.

PRESERVATION ORDERS AND TEMPORARY PRESERVATION ORDERS

Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference with the site

illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister.

RECORD OF MONUMENTS AND PLACES

Section 12(1) of the 1994 Act requires the Minister for Arts, Heritage, Gaeltacht and the Islands (now the Minister for Culture, Heritage and the Gaeltacht) to establish and maintain a record of monuments and places where the Minister believes that such monuments exist. The record comprises a list of monuments and relevant places and a map/s showing each monument and relevant place in respect of each county in the state. All sites recorded on the Record of Monuments and Places receive statutory protection under the National Monuments Act 1994. All recorded monuments on the proposed development site are represented on the accompanying maps.

Section 12(3) of the 1994 Act provides that 'where the owner or occupier (other than the Minister for Arts, Heritage, Gaeltacht and the Islands) of a monument or place included in the Record, or any other person, proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such a monument or place, he or she shall give notice in writing to the Minister of Arts, Heritage, Gaeltacht and the Islands to carry out work and shall not, except in case of urgent necessity and with the consent of the Minister, commence the work until two months after giving of notice'.

Under the National Monuments (Amendment) Act 2004, anyone who demolishes or in any way interferes with a recorded site is liable to a fine not exceeding €3,000 or imprisonment for up to 6 months. On summary conviction and on conviction of indictment, a fine not exceeding €10,000 or imprisonment for up to 5 years is the penalty. In addition they are liable for costs for the repair of the damage caused.

In addition to this, under the *European Communities (Environmental Impact Assessment) Regulations 1989,* Environmental Impact Statements (EIS) are required for various classes and sizes of development project to assess the impact the proposed development will have on the existing environment, which includes the cultural, archaeological and built heritage resources. These document's recommendations are typically incorporated into the conditions under which the proposed development must proceed, and thus offer an additional layer of protection for monuments which have not been listed on the RMP.

THE PLANNING AND DEVELOPMENT ACT 2000

Under planning legislation, each local authority is obliged to draw up a Development Plan setting out their aims and policies with regard to the growth of the area over a five-year period. They cover a range of issues including archaeology and built heritage, setting out their policies and objectives with regard to the protection and enhancement of both. These policies can vary from county to county. The Planning and Development Act 2000 recognises that proper planning and sustainable

development includes the protection of the archaeological heritage. Conditions relating to archaeology may be attached to individual planning permissions.

APPENDIX 4 IMPACT ASSESSMENT & THE CULTURAL HERITAGE RESOURCE

POTENTIAL IMPACTS ON ARCHAEOLOGICAL AND HISTORICAL REMAINS

Impacts are defined as 'the degree of change in an environment resulting from a development' (Environmental Protection Agency 2003: 31). They are described as profound, significant or slight impacts on archaeological remains. They may be negative, positive or neutral, direct, indirect or cumulative, temporary or permanent.

Impacts can be identified from detailed information about a project, the nature of the area affected and the range of archaeological and historical resources potentially affected. Development can affect the archaeological and historical resource of a given landscape in a number of ways.

- Permanent and temporary land-take, associated structures, landscape mounding, and their construction may result in damage to or loss of archaeological remains and deposits, or physical loss to the setting of historic monuments and to the physical coherence of the landscape.

- Archaeological sites can be affected adversely in a number of ways: disturbance by excavation, topsoil stripping and the passage of heavy machinery; disturbance by vehicles working in unsuitable conditions; or burial of sites, limiting accessibility for future archaeological investigation.

- Hydrological changes in groundwater or surface water levels can result from construction activities such as de-watering and spoil disposal, or longer-term changes in drainage patterns. These may desiccate archaeological remains and associated deposits.

- Visual impacts on the historic landscape sometimes arise from construction traffic and facilities, built earthworks and structures, landscape mounding and planting, noise, fences and associated works. These features can impinge directly on historic monuments and historic landscape elements as well as their visual amenity value.

- Landscape measures such as tree planting can damage sub-surface archaeological features, due to topsoil stripping and through the root action of trees and shrubs as they grow.

- Ground consolidation by construction activities or the weight of permanent embankments can cause damage to buried archaeological remains, especially in colluviums or peat deposits.

- Disruption due to construction also offers in general the potential for adversely affecting archaeological remains. This can include machinery, site offices, and service trenches.

Although not widely appreciated, positive impacts can accrue from developments. These can include positive resource management policies, improved maintenance and access to archaeological monuments, and the increased level of knowledge of a site or historic landscape as a result of archaeological assessment and fieldwork.

PREDICTED IMPACTS

The severity of a given level of land-take or visual intrusion varies with the type of monument, site or landscape features and its existing environment. Severity of impact can be judged taking the following into account:

- The proportion of the feature affected and how far physical characteristics fundamental to the understanding of the feature would be lost;
- Consideration of the type, date, survival/condition, fragility/vulnerability, rarity, potential and amenity value of the feature affected;
- Assessment of the levels of noise, visual and hydrological impacts, either in general or site specific terms, as may be provided by other specialists.

APPENDIX 5 MITIGATION MEASURES & THE CULTURAL HERITAGE RESOURCE

POTENTIAL MITIGATION STRATEGIES FOR CULTURAL HERITAGE REMAINS

Mitigation is defined as features of the design or other measures of the proposed development that can be adopted to avoid, prevent, reduce or offset negative effects.

The best opportunities for avoiding damage to archaeological remains or intrusion on their setting and amenity arise when the site options for the development are being considered. Damage to the archaeological resource immediately adjacent to developments may be prevented by the selection of appropriate construction methods. Reducing adverse effects can be achieved by good design, for example by screening historic buildings or upstanding archaeological monuments or by burying archaeological sites undisturbed rather than destroying them. Offsetting adverse effects is probably best illustrated by the full investigation and recording of archaeological sites that cannot be preserved *in situ*.

DEFINITION OF MITIGATION STRATEGIES

ARCHAEOLOGICAL RESOURCE

The ideal mitigation for all archaeological sites is preservation *in situ*. This is not always a practical solution, however. Therefore a series of recommendations are offered to provide ameliorative measures where avoidance and preservation *in situ* are not possible.

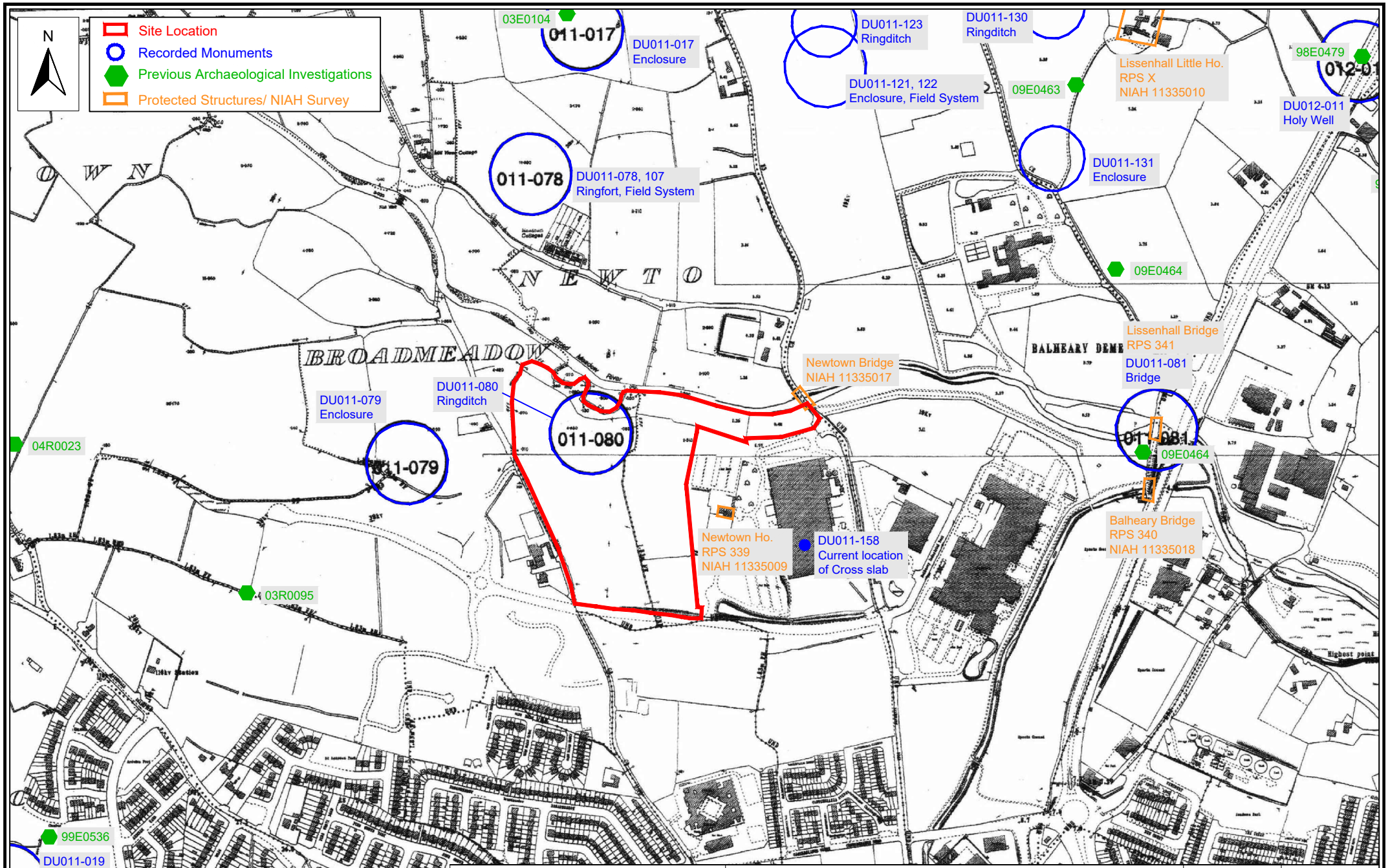
Full Archaeological Excavation involves the scientific removal and recording of all archaeological features, deposits and objects to the level of geological strata or the base level of any given development. Full archaeological excavation is recommended where initial investigation has uncovered evidence of archaeologically significant material or structures and where avoidance of the site is not possible. (CIfA 2014b)

Archaeological Test Trenching can be defined as 'a limited programme... of intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site on land or underwater. If such archaeological remains are present test trenching defines their character and extent and relative quality.' (CIfA 2014a)

Archaeological Monitoring can be defined as a 'formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons within a specified area or site on land or underwater, where there is possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.' (CIfA 2014c)

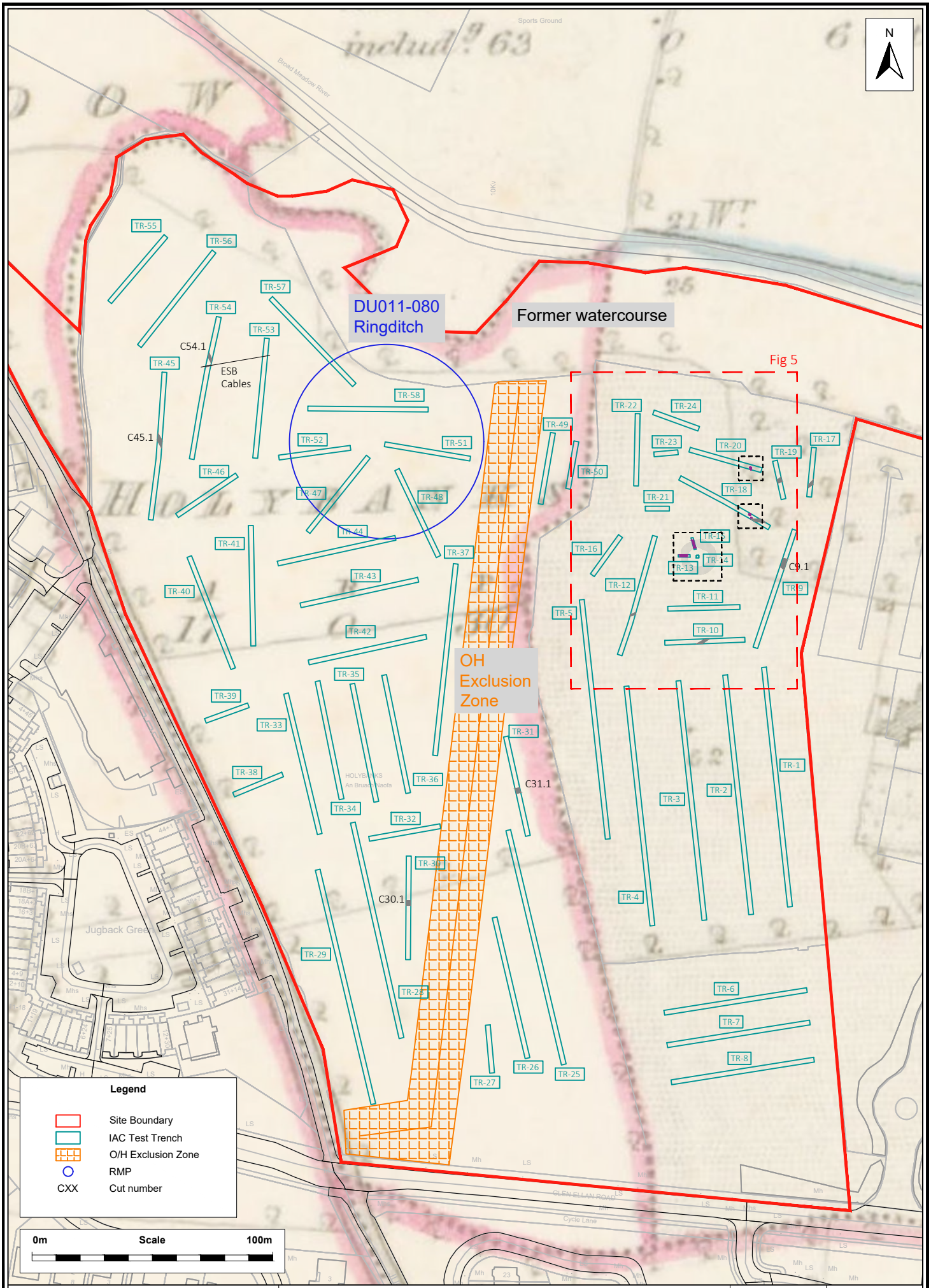
IAC Archaeology

Title	Site Location (Google Earth, May 2017)	Scale	NTS	Drawn by	MT
Project	Holybanks, Swords, Co. Dublin	Date	01.03.19	Checked by	LK
Client	Cairn PLC	Job no.	J3193	Fig. 1	Rev. -



IAC Archaeology

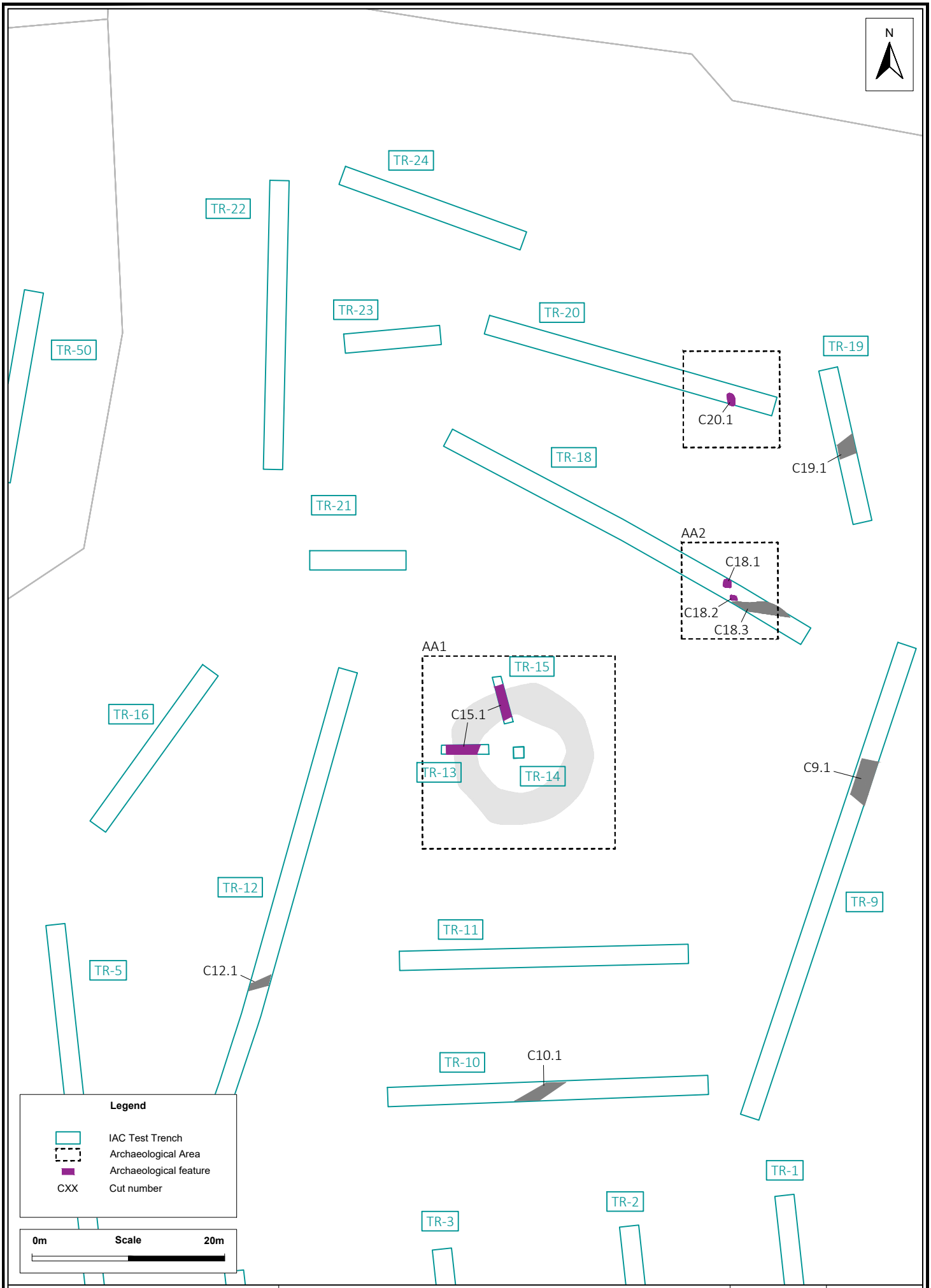
Title	Extract from the RMP map showing test area and previous investigations	Scale	NTS	Drawn by	MT
Project	Holybanks, Swords, Co. Dublin	Date	01.03.19	Checked by	LK
Client	Cairn PLC	Job no.	J3193	Fig. 2	Rev. -



IAC Archaeology	Title	Plan of trenches overlaid on extract from the first edition 6-inch OS map	Scale 1:2,000@A4	Drawn by KOM	
	Project	Holybanks, Swords, Co. Dublin	Date 01.03.19	Checked by LK	
	Client	Cairn Homes PLC	Job no. J3193	Fig. 3	Rev. -

IAC Archaeology

Title	Plan of trenches overlaid on extract from the first edition 6-inch OS map	Scale	1:2,000@A4	Drawn by	KOM
Project	Holybanks, Swords, Co. Dublin	Date	01.03.19	Checked by	LK
Client	Cairn Homes PLC	Job no.	J3193	Fig. 4	Rev. -



IAC Archaeology	Title	Plan of test trenches showing Archaeological Areas 1-3	Scale	1:500@A4	Drawn by KOM
	Project	Holybanks, Swords, Co. Dublin	Date	01.03.19	Checked by LK
	Client	Cairn Homes PLC	Job no.	J3193	Fig. 5 Rev. -

Plate 1 Site of recorded monument DU011-080, facing west

Plate 2 Eastern field showing Newtown House in background, facing southeast

Plate 3 Site of Geophysical Anomaly 2, facing west

Plate 4 T1, facing south

Plate 5 T16, facing north-northeast

Plate 6 T42, facing east-northeast

Plate 7 T58 investigating DU011-080, facing west

Plate 8 T47 Marl in vicinity of DU011-080, facing northwest

Plate 9 AA 1 in T15 ringditch, facing northwest

Plate 10 AA 1 C15.1 ringditch, facing northwest

Plate 11 AA 2 C18.1 Pit, facing northeast

Plate 12 AA 3 C20.1 Linear feature, facing southwest

Plate 13 T9 Field Boundary C9.1, facing northeast

Plate 14 T12 Drain C12.1, facing southwest

Plate 15 T19 Drain C19.1, facing north-northwest

Plate 16 T54 Drain C54.1, facing southwest

Plate 17 T44 Stone Drain, facing west

Plate 18 T56 Stone Drain, facing east-northeast

Plate 19 T29 Construction waste, facing north

6. Appendix 8.3 – SMR/RMP Sites within the Study Area

Appendix 8.3- SMR/RMP SITES WITHIN THE STUDY AREA

RMP No.	DU011-080
RMP Status	Scheduled for inclusion in next revision of RMP
Townland	Holybanks
Parish	Swords
Barony	Nethercross
ITM	717703, 748269
Classification	Ringditch
Dist. From Development	Within site
Description	A vertical, colour aerial photograph taken in 1992 (OS 8, Flight 24, 526) shows a cropmark of a circular ditched feature (diam. c. 14m). There is a gap in the NW. Located in a field south of the Broadmeadow River, bounded to the west by Applewood housing estate. Not visible at ground level.
Reference	www.archaeology.ie/ SMR file

RMP No.	DU011-079
RMP Status	Scheduled for inclusion in next revision of RMP
Townland	Broadmeadow
Parish	Swords
Barony	Nethercross
ITM	717393, 748214
Classification	Enclosure
Dist. From Development	180m west
Description	A colour vertical aerial photograph taken in 1992 (OS 8, 1526) shows a cropmark of a circular feature (diam. c. 28m) with traces of fosses radiating from the NW and E. This is probably a levelled ringfort with associated field system. Formerly located in a field of corn in a low-lying area south of the Broadmeadow River, it is now under the Applewood housing estate.
Reference	www.archaeology.ie/ SMR file

RMP No.	DU011-078, 107
RMP Status	Scheduled for inclusion in next revision of RMP
Townland	Newtown
Parish	Swords
Barony	Nethercross
ITM	717604, 748632
Classification	Ringfort,
Dist. From Development	230m north
Description	-078 Situated in a field north of the Broadmeadow River immediately west of Newtown Cottages. A vertical aerial photograph taken by the OS in 1992 (OS 8, 1526) shows a cropmark of a double-ditched, sub-circular enclosure (ext. diam. c. 40m) with ditches radiating from the NE and SE quadrants. This is possibly a levelled, bivallate ringfort with associated field system. Not visible at ground level. -107 Aerial photograph (GB94. FH.02) shows cropmark of a circular enclosure defined by two fosses, probably a ringfort (DU011-078). Cropmarks of an associated field system, comprising curvilinear and

	rectilinear components, extend from the enclosure. Not visible at ground level.
Reference	www.archaeology.ie/ SMR file

7. Appendix 8.4 – Architectural Heritage Sites within the Study Area

Appendix 8.4- ARCHITECTURAL HERITAGE SITES WITHIN THE STUDY AREA

RPS No.	907
NIAH No.	11335017
Townlands	Newtown / Balheary Demesne
Parish	Swords
Barony	Nethercross
I.T.M.	718080/748317
Classification	Newtown Bridge
Dist. From Development	Immediately northeast
Description	Single-arch skewed road bridge over river with rifle vaulting, faced with rock-faced limestone ashlar, c.1830s. Enlarged 1902 with flanking lintel headed openings. Concrete parapets over later spans added recently.
Reference	NIAH Survey/ Fingal County Development Plan/Site survey

RPS No.	n/a
NIAH No.	11335009
Townland	Newtown
Parish	Swords
Barony	Nethercross
I.T.M.	717942/748129
Classification	Newtown House
Dist. From Development	c. 50m east
Description	Detached five-bay two-storey over basement former house with dormer attic, c.1760, having three-bay central gabled breakfront and return to rear. Gutted by fire c.2012. Single- and two-storey extensions, c.1995, to rear. Formerly in use as offices and now derelict. ROOF: Now missing. Formerly L-shaped hipped slate roof with terracotta & concrete ridge tiles; rendered chimneys to centre of rear pitch with clay pots; hipped slated dormer roof to side elevation. WALLS: Cement rendered wall and quoins; render banding at eaves level. OPENINGS: Square headed window openings; patent reveals; granite sills; window frames missing and openings closed with steel mesh grilles; block and start stone door surround; doorway boarded up.

8. Appendix 9.1 – Verified Photomontages

Verified Photomontages

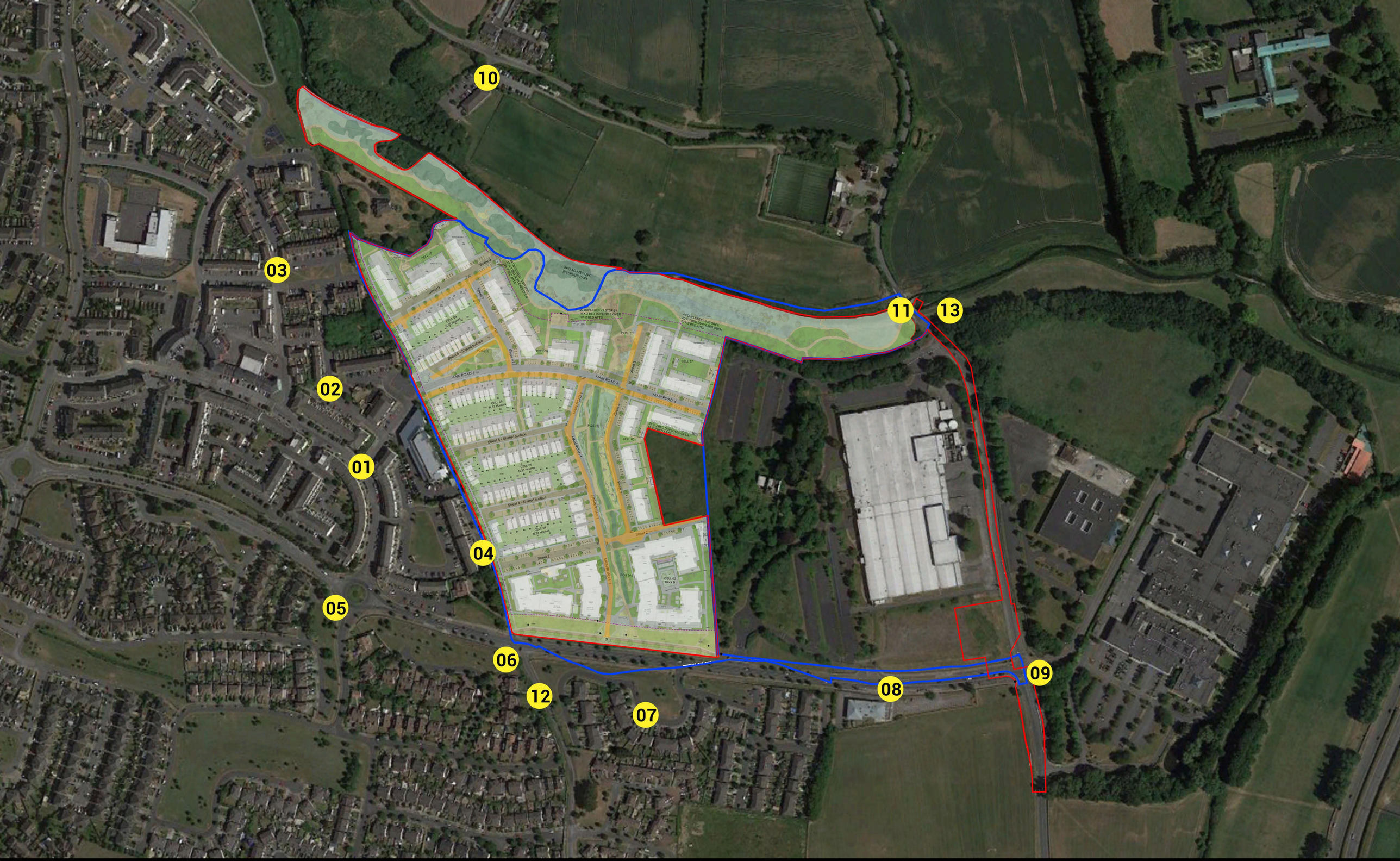
Proposed

SHD at Holybanks, Swords

Prepared by Model Works Ltd
for Cairn Homes Properties Ltd

March 2022

MODEL WORKS



MODEL WORKS

project: SHD at Holybanks, Swords.

viewpoint: **Map**

issued: 16-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS	*project:*	SHD at Holybanks, Swords.	*photography:*	17-06-2019 15:26 Canon 5D Mark II 24 mm Lens	*location:*	E 317590.734 N 248111.928	*viewpoint:* **View 01 Baseline** *issued:* 20-02-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:26
Canon 5D Mark II
24 mm Lens

location:
E 317590.734 N 248111.928

viewpoint: **View 01 Proposed**

issued: 20-02-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

.MODEL WORKS	*project:*	SHD at Holybanks, Swords.	*photography:*	17-06-2019 15:50 Canon 5D Mark II 24 mm Lens	*location:*	E 317567.211 N 248208.307	*viewpoint:* **View 02 Baseline** *issued:* 20-02-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:50
Canon 5D Mark II
24 mm Lens

location:
E 317567.211 N 248208.307

viewpoint: **View 02 Proposed**

issued: 20-02-2021

Angle of View 73° Horizontal (24 mm Lens) | Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:53
Canon 5D Mark II
24 mm Lens

location:
E 317498.853 **N** 248322.000

viewpoint: **View 03 Baseline**

issued: 20-02-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:53
Canon 5D Mark II
24 mm Lens

location:
E 317498.853 **N** 248322.000

viewpoint: **View 03 Proposed**

issued: 15-12-2021

Angle of View 73° Horizontal (24 mm Lens) | Angle of View 39° Horizontal (50 mm Lens)

.MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:13
Canon 5D Mark II
24 mm Lens

location: E 317723.992 N 248015.157

viewpoint: **View 04 Baseline**

issued: 20-02-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:13
Canon 5D Mark II
24 mm Lens

location:
E 317723.992 N 248015.157

viewpoint: **View 04 Proposed**

issued: 21-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:02
Canon 5D Mark II
24 mm Lens

location:
E 317572.849 N 247974.275

viewpoint: **View 05 Baseline**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 15:02
Canon 5D Mark II
24 mm Lens

location:
E 317572.849 N 247974.275

viewpoint: **View 05 Proposed**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens) | Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 14:57
Canon 5D Mark II
24 mm Lens

location: E 317745.507 N 247931.519

viewpoint: **View 06 Baseline**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

.MODEL WORKS	*project:*	SHD at Holybanks, Swords.	*photography:*	17-06-2019 14:57 Canon 5D Mark II 24 mm Lens	*location:*	E 317745.507 N 247931.519	*viewpoint:* **View 06 Proposed** *issued:* 21-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

Trees shown at 15 years maturity

MODEL WORKS	*project:*	SHD at Holybanks, Swords.	*photography:*	17-06-2019 14:57 Canon 5D Mark II 24 mm Lens	*location:*	E 317745.507 N 247931.519	*viewpoint:* **View 06 Proposed** *issued:* 22-03-2022

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 14:47
Canon 5D Mark II
24 mm Lens

location: E 317887.214 N 247861.661

viewpoint: **View 07 Baseline**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 14:47
Canon 5D Mark II
24 mm Lens

location:
E 317887.214 N 247861.661

viewpoint: **View 07 Proposed**

issued: 17-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

Trees shown at 15 years maturity

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 17-06-2019 14:47
Canon 5D Mark II
24 mm Lens

location:
E 317887.214 N 247861.661

viewpoint: **View 07 Proposed**

issued: 23-03-2022

Angle of View 73° Horizontal (24 mm Lens) | Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 19-06-2019 09:22
Canon 5D Mark II
24 mm Lens

location:
E 318148.027 **N** 247894.517

viewpoint: **View 08 Baseline**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 19-06-2019 09:22
Canon 5D Mark II
24 mm Lens

location:
E 318148.027 **N** 247894.517

viewpoint: **View 08 Proposed**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 19-06-2019 09:26
Canon 5D Mark II
24 mm Lens

location:
E 318293.669 N 247916.523

viewpoint: **View 09 Baseline**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 19-06-2019 09:26
Canon 5D Mark II
24 mm Lens

location:
E 318293.669 N 247916.523

viewpoint: **View 09 Proposed**

issued: 13-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS	*project:*	SHD at Holybanks, Swords.	*photography:*	17-06-2019 16:33 Canon 5D Mark II 24 mm Lens	*location:*	E 317738.181 N 248515.954	*viewpoint:* **View 10 Baseline** *issued:* 20-02-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

.MODEL WORKS	*project:*	SHD at Holybanks, Swords.	*photography:*	17-06-2019 16:33 Canon 5D Mark II 24 mm Lens	*location:*	E 317738.181 N 248515.954	*viewpoint:* **View 10 Proposed** *issued:* 20-02-2021

Angle of View 73° Horizontal (24 mm Lens) | Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 19-06-2019 09:35
Canon 5D Mark II
24 mm Lens

location:
E 318154.338 N 248287.845

viewpoint: **View 11 Baseline**

issued: 20-02-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

.MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 19-06-2019 09:35
Canon 5D Mark II
24 mm Lens

location:
E 318154.338 N 248287.845

viewpoint: **View 11 Proposed**

issued: 15-12-2021

Angle of View 73° Horizontal (24 mm Lens) | Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 06-07-2019 11:26
Canon 5D Mark II
24 mm Lens

location: E 317778.526 N 247894.081

viewpoint: **View 12 Baseline**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 06-07-2019 11:26
Canon 5D Mark II
24 mm Lens

location:
E 317778.526 N 247894.081

viewpoint: **View 12 Proposed**

issued: 20-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

Trees shown at 15 years maturity

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 06-07-2019 11:26
Canon 5D Mark II
24 mm Lens

location:
E 317778.526 N 247894.081

viewpoint: **View 12 Proposed**

issued: 22-03-2022

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 26-11-2021 12:09
Canon 5D Mark II
24 mm Lens

location: E 318184.105 N 248286.291

viewpoint: **View 13 Baseline**

issued: 09-12-2021

Angle of View 73° Horizontal (24 mm Lens)

Angle of View 39° Horizontal (50 mm Lens)

MODEL WORKS

project: SHD at Holybanks, Swords.

photography: 26-11-2021 12:09
Canon 5D Mark II
24 mm Lens

location: E 318184.105 N 248286.291

viewpoint: **View 13 Proposed**

issued: 22-12-2021

9. Appendix 10.1 – Site Investigation Report

S.I. Ltd Contract No: 5415

Client: Cairn Homes
Engineer: Waterman Moylan
Contractor: Site Investigations Ltd

Hollybank,
Swords, Co. Dublin
Site Investigation Report

Prepared by:

.....
Stephen Letch

Issue Date:	12/10/2017
Status	Final
Revision	1

Contents:

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1.	Introduction	1
2.	Fieldwork	1
3.	Laboratory Testing	3
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Appendices:

1. Cable Percussive Borehole Logs
2. Trial Pit and Dynamic Probe Logs and Photographs
3. Laboratory Test Results
4. Survey Data

1. Introduction

On the instructions of Waterman Moylan, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Glen Ellan Road, Swords, County Dublin. The investigation was for a new residential development of the site, Hollybank, and was completed on behalf of the Client, Cairn Homes.

The fieldworks comprised a programme of cable percussive boreholes, trial pits, dynamic probes and California Bearing Ratio tests. All fieldwork was carried out in accordance with Eurocode 7: Geotechnical Design and the IEI Specification & Related Documents for Ground Investigation in Ireland (2006). Laboratory testing has been performed on representative soil samples recovered from the trial pits and these were completed in accordance of BS1377: 1990.

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

2. Fieldwork

The geotechnical fieldworks were started and completed in September 2017 and comprised the following:

- 8 No. cable percussive boreholes
- 17 No. trial pits
- 17 No. dynamic probes
- 8 No. California Bearing Ratio tests

2.1. Cable Percussive Boreholes

Cable percussion boring was undertaken at 8 No. locations using a Dando 150 rig and constructed a 200mm diameter borehole. BH02 terminated at 3.00mbgl on a shallow obstruction but the remaining boreholes all terminated at 5.00mbgl or deeper. It was not possible to collect undisturbed samples due to the gravel and cobble content of the strata so bulk disturbed samples were recovered at regular intervals.

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

(e.g. BH01 at 1.00mbgl where N=17-(1,2/3,3,5,6)). Where refusal of 50 blows across the test zone was encountered was achieved during testing, the penetration depth is also reported (e.g. BH01 at 5.00mbgl where N=50-(25 for 10mm / 50 for 5mm)).

The logs are presented in Appendix 1.

2.2. Trial Pits and Dynamic Probes

17 No. trial pits were completed using a wheeled excavator and were logged by SIL geotechnical engineer. Representative disturbed bulk samples were recovered as the pits were excavated and they were returned to the laboratory for geotechnical testing.

Adjacent to the trial pits, dynamic probes were completed using a track mounted Competitor 130 machine. The testing complies with the requirements of BS1377: Part 9 (1990) and Eurocode 7: Part 3. The configuration utilised standard DPH (Heavy) probing method comprising a 50kg weight, 500mm drop height and a 43.7mm diameter (90°) cone. The number of blows required to drive the cone each 100mm increment into the sub soil is recorded in accordance with the standards. The dynamic probe provides no information regarding soil type or groundwater conditions.

The dynamic probe results can be used to analyse the strength of the soil strata encountered by the probe. 'Proceedings of the Trinity College Dublin Symposium of Field and Laboratory Testing of Soils for Foundations and Embankments' presents a paper by Foirbart that is most relevant to Irish soil conditions and within this paper the following equations were included:

Granular Soils: DPH N_{100} x 2.5 = SPT N value

Cohesive Soils: C_u = 15 x DPH N_{100} + 30 kN/m^2

These equations present a relationship between the probe N_{100} value and the SPT N value for granular soils and the undrained shear strength of cohesive soils.

The trial pit and dynamic probes results are presented on one log and are presented in Appendix 2 with the trial pit photographs.

2.3. California Bearing Ratio tests

At 8 No. locations, undisturbed cylindrical mould samples were taken to complete California Bearing Ratio tests in the laboratory. The results facilitate the designing of the access roads and associated areas. These tests were completed to BS1377: 1990: Part 4, Clause 7 ‘Determination of California Bearing Ratio’. The results are presented as part of Appendix 3 with the laboratory test data.

2.4. Surveying

Following the completion of the works, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and is provided along with a site plan in Appendix 4.

3. Laboratory Testing

Geotechnical laboratory testing is currently ongoing on representative soil samples in accordance with BS 1377 (1990). Testing included:

- 3 No. Moisture content
- 3 No. Atterberg limits
- 3 No. Particle size gradings
- 3 No. pH, sulphate and chloride content

Environmental testing was completed by ALS Environmental Ltd. and consisted of the following:

- 3 No. Rilta Analysis

The laboratory test results are presented in Appendix 4.

4. Ground Conditions

4.1. Overburden

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

- **0.00m:** TOPSOIL.
- **0.50m:** Stiff grey brown sandy slightly gravelly silty CLAY with low cobble content.
- **2.50m:** Very stiff black sandy slightly gravelly silty CLAY with low cobble content.
- **4.80m:** Obstruction - possible boulders.
- **5.00m:** Borehole terminated due to obstruction.

MADE GROUND was not recorded in the boreholes but was recorded to shallow depths at TP05 and TP14 (0.70mbgl) but was also recorded to greater depths in TP17 to 1.90mbgl. The MADE GROUND generally consists of cohesive soils with cobbles and boulders and timber, plastic, red brick and concrete fragments.

The natural overburden deposits are of glacial origin and the particle size gradings display characteristic poorly-graded 'straight-line' profiles for the glacial material. The trial pits did encounter some granular soils to the North of the site but was not recorded to the South.

4.2. Groundwater

Groundwater details in the boreholes and trial pits during the fieldworks are noted on the logs in Appendices 1 and 2. Groundwater was encountered in seven of the eight boreholes ranging in depth from 2.40mbgl to 5.80mbgl. Water was also recorded in TP01 and TP02 at 2.30mbgl and 2.70mbgl respectively.

5.0. Recommendations and Conclusions

Please note the following caveats:

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

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

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

5.1. Shallow Foundations

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

The boreholes recorded firm brown or grey sandy gravelly silty CLAY with low cobble content at 1.00mbgl. The SPT test results are generally consistent with values between 10 and 12 recorded at 6 locations with BH01 (17) and BH03 (27) recording higher N-values. Therefore, for the analysis an N-value of 10 was chosen for the purposes of design in this stratum, in accordance with Eurocode 7 (EC 7).

Using an equation proposed by Stroud and Butler, the SPT N-value can be used to calculate the shear strength and this is Cu=5N. Therefore, using the value of 10, this indicates that the undrained shear strength of the CLAY is 50kN/m^2. This can be used to calculate the allowable bearing capacity (ABC) and using a factor of safety of 3 an ABC of 90kN/m^2 would be anticipated.

The trial pits and the probes show that the soil does strengthen between 1.00mbgl and 2.00mbgl and therefore, if these capacities are too low then the foundations could be placed on the stiffer soils between 1mbgl and 2mbgl.

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

- The foundation is to be 1m wide.
- Foundations are to be constructed on a level formation of uniform material type (described above).
- All man-made or filled material is to be removed prior to construction.
- The bulk unit weight of the material in this stratum has a minimum density of 19kN/m^3.
- Based on groundwater observations this analysis assumes the groundwater will not influence the construction or performance of these foundations.
- All founding strata to be inspected by a suitably qualified Engineer prior to pouring the foundations.

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

5.2. Groundwater

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

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

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

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

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

As discussed previously there were water strikes in seven of the boreholes and two of the trial pits. These strikes were all recorded at depth though with the shallowest water strike at 2.30mbgl in TP01 and this was recorded as a seepage. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. However, based on this information at the exploratory hole locations to date, it is considered likely that any seepages into excavations of the CLAY will be slow. If granular soils are encountered then the possibility of water ingressing into an excavation increases.

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

5.3. Pavement Design

The summary of the CBR test results in Appendix 3 indicates values generally between 6.2% and 7.7%.

The CBR tests samples were collected at 0.60mbgl and inspection of the formation strata should be completed prior to construction of the pavement. Once the exact formation levels are finalised then additional in-situ testing could be completed to assist with the detailed pavement design.

5.4. Contamination

Environmental testing was carried out on three samples from the investigation and the results are shown in Appendix 3. For material to be removed from site, Rilta testing was carried out to determine whether the material on the site could be accepted as ‘inert material’ by an Irish landfill. The results were compared with the published waste acceptance limits of BS EN 12457-2.

The disposal suite results indicate that the material would generally be able to be treated as Inert Waste. However, discussions about the acceptance of the material must be undertaken with individual landfills before removal of any material from site.

Only three samples were tested for analysis and although no major contamination was noted at the fieldwork locations, any localised contamination may have been missed. Therefore, a testing regime designed by an environmental engineer should be designed on any material that is to be removed from site to ensure that the material stays within the landfill acceptance criteria.

5.5. Aggressive Ground Conditions

The chemical tests results in Appendix 3 indicate a general pH value between 8.30 and 8.47, which is close to neutral and below the level of 9, therefore no special precautions are required.

The maximum value obtained for water soluble sulphate was 126mg/l as SO_3. The BRE Special Digest 1:2005 – '*Concrete in Aggressive Ground'* guidelines require SO_4 values and after conversion ($SO_4 = SO_3 \times 1.2$), the maximum value of 151mg/l shows Class 1 conditions and no special precautions are required.

Appendix 1

Cable Percussive Borehole Logs

Contract No: 5415	# Cable Percussion Borehole Log				Corehole No: **BH01**
Contract:	Hollybank	Easting:	717608.793	Date Started:	15/09/2017
Location:	Swords, Co. Dublin	Northing:	748363.439	Date Completed:	15/09/2017
Client:	Cairn Homes	Elevation:	7.25	Logged By:	S. Letch
Engineer:	Waterman Moylan	Rig Type:	Dando 150	Drilled By:	M. Cunniffe

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Stiff grey brown sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		7.0	6.75					
1.0				6.5		1.00 1.00	C B	N=17 (1,2/3,3,5,6) MC08		
1.5				6.0						
2.0				5.5		2.00 2.00	C B	N=21 (2,2/3,5,6,7) MC09		
2.5	2.50	Very stiff black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		5.0	4.75					
3.0				4.5		3.00 3.00	C B	N=46 (3,7/10,11,13,12) MC10		
3.5				4.0						
4.0				3.5		4.00 4.00	C B	N=47 (5,9/10,12,12,13) MC11		
4.5				3.0						
	4.80	Obstruction - possible boulder.		2.5	2.45					
5.0	5.00	End of Borehole at 5.00m			2.25	5.00	C	50 (25 for 10mm/50 for 5mm)		
5.5				2.0						
6.0				1.5						
6.5				1.0						
7.0				0.5						
7.5				0.0						
8.0				-0.5						
8.5				-1.0						
9.0				-1.5						
9.5				-2.0						
				-2.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
4.80	5.00	01:00	4.00	3.60	-	15/09	5.00	4.00				0.00	5.00	Arisings	Termination due to boulder obstruction.

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

Contract No: 5415	Cable Percussion Borehole Log	Corehole No: BH02

Contract:	Hollybank	Easting:	717663.420	Date Started:	15/09/2017
Location:	Swords, Co. Dublin	Northing:	748294.172	Date Completed:	15/09/2017
Client:	Cairn Homes	Elevation:	9.42	Logged By:	S. Letch
Engineer:	Waterman Moylan	Rig Type:	Dando 150	Drilled By:	M. Cunniffe

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Firm becoming stiff grey sandy gravelly clayey SILT with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		9.0	8.92					
1.0				8.5		1.00 1.00	C B	N=11 (1,1/2,2,3,4) MC05		
1.5				8.0						
2.0				7.5		2.00 2.00	C B	N=24 (2,2/4,5,7,8) MC06		
2.5				7.0						
	2.70	Obstruction - possible boulder.			6.72	2.70	B	MC07		
3.0	3.00	End of Borehole at 3.00m		6.5	6.42	3.00	C	50 (25 for 10mm/50 for 5mm)		
3.5				6.0						
4.0				5.5						
4.5				5.0						
5.0				4.5						
5.5				4.0						
6.0				3.5						
6.5				3.0						
7.0				2.5						
7.5				2.0						
8.0				1.5						
8.5				1.0						
9.0				0.5						
9.5				0.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
2.70	3.00	01:00				15/09	3.00	Dry				0.00	3.00	Arisings	Termination due to boulder obstruction.

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

Contract No: 5415	# Cable Percussion Borehole Log				Corehole No: **BH03**
Contract:	Hollybank	Easting:	717845.956	Date Started:	21/09/2017
Location:	Swords, Co. Dublin	Northing:	748256.318	Date Completed:	21/09/2017
Client:	Cairn Homes	Elevation:	5.94	Logged By:	
Engineer:	Waterman Moylan	Rig Type:		Drilled By:	

Depth (m) Scale	Depth (m) Depth	Stratum Description	Legend	Level (mOD) Scale	Level (mOD) Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Stiff grey sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		5.5	5.44					
1.0				5.0		1.00 1.00	C B	N=27 (2,4/5,7,7,8) MC36		
1.5				4.5						
2.0	2.10	Very stiff black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		4.0	3.84	2.00 2.00	C B	N=30 (2,3/6,7,8,9) MC37		
2.5				3.5						
3.0				3.0		3.00 3.00	C B	N=34 (3,4/5,9,10,10) MC38		
3.5				2.5						
4.0				2.0		4.00 4.00	C B	N=41 (2,5/8,10,11,12) MC39		
4.5				1.5						
5.0	5.00	Obstruction - possible boulder.		1.0	0.94	5.00	C	50 (4,20/50 for 40mm)		
5.5	5.50	End of Borehole at 5.50m		0.5	0.44					
6.0				0.0						
6.5				-0.5						
7.0				-1.0						
7.5				-1.5						
8.0				-2.0						
8.5				-2.5						
9.0				-3.0						
9.5				-3.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
5.00	5.50	01:00	2.40	2.00	-	21/09	5.50	5.00				0.00	5.50	Arisings	Termination due to boulder obstruction.

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

Contract No: 5415	# Cable Percussion Borehole Log				Corehole No: **BH04**
Contract:	Hollybank	Easting:	717631.220	Date Started:	14/09/2017
Location:	Swords, Co. Dublin	Northing:	748202.211	Date Completed:	14/09/2017
Client:	Cairn Homes	Elevation:	9.92	Logged By:	S. Letch
Engineer:	Waterman Moylan	Rig Type:	Dando 150	Drilled By:	M. Cunniffe

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Firm brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone.		9.5	9.42					
1.0				9.0		1.00 1.00	C B	N=10 (1,1/1,2,3,4) MC01		
1.5	1.50	Firm becoming stiff grey sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		8.5	8.42					
2.0				8.0		2.00 2.00	C B	N=13 (2,1/2,2,4,5) MC02		
2.5				7.5						
3.0				7.0		3.00 3.00	C B	N=23 (2,2/3,5,7,8) MC03		
3.5	3.50	Very stiff black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		6.5	6.42					
4.0				6.0		4.00 4.00	C B	N=33 (4,6/7,8,8,10) MC04		
4.5				5.5						
	4.70	Obstruction - possible boulder.			5.22					
5.0	5.00	End of Borehole at 5.00m		5.0	4.92	5.00	C	50 (25 for 10mm/50 for 10mm)		
5.5				4.5						
6.0				4.0						
6.5				3.5						
7.0				3.0						
7.5				2.5						
8.0				2.0						
8.5				1.5						
9.0				1.0						
9.5				0.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
4.70	5.00	01:00	4.00	3.80	-	14/09	5.00	4.00				0.00	5.00	Arisings	Termination due to boulder obstruction.

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

Contract No: 5415	# Cable Percussion Borehole Log				Corehole No: **BH05**
Contract:	Hollybank	Easting:	717822.927	Date Started:	20/09/2017
Location:	Swords, Co. Dublin	Northing:	748206.474	Date Completed:	21/09/2017
Client:	Cairn Homes	Elevation:	7.67	Logged By:	
Engineer:	Waterman Moylan	Rig Type:		Drilled By:	

Depth (m) Scale	Depth (m) Depth	Stratum Description	Legend	Level (mOD) Scale	Level (mOD) Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Firm becoming stiff grey sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		7.5	7.17					
1.0				7.0		1.00 1.00	C B	N=11 (1,1/2,2,3,4) MC30		
1.5				6.5						
2.0				6.0		2.00 2.00	C B	N=22 (1,3/4,5,6,7) MC31		
2.5	2.40	Stiff becoming very stiff black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		5.5	5.27					
3.0				5.0		3.00 3.00	C B	N=29 (2,4/5,7,8,9) MC32		
3.5				4.5						
4.0				4.0		4.00 4.00	C B	N=33 (3,4/6,8,9,10) MC33		
4.5				3.5						
5.0				3.0		5.00 5.00	C B	N=42 (2,5/8,10,12,12) MC34		
5.5				2.5						
6.0	6.00	End of Borehole at 6.00m		2.0	1.67	6.00 6.00	C B	N=53 (3,6/9,12,14,18) MC35		
6.5				1.5						
7.0				1.0						
7.5				0.5						
8.0				0.0						
8.5				-0.5						
9.0				-1.0						
9.5				-1.5						
				-2.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
			3.00	2.80	-	20/09 21/09 21/09	3.00 3.00 6.00	3.00 2.50 5.00				0.00	6.00	Arisings	Terminated at scheduled depth.

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

Contract No: 5415	# Cable Percussion Borehole Log				Corehole No: **BH06**
Contract:	Hollybank	Easting:	717849.380	Date Started:	19/09/2017
Location:	Swords, Co. Dublin	Northing:	748120.667	Date Completed:	19/09/2017
Client:	Cairn Homes	Elevation:	13.46	Logged By:	
Engineer:	Waterman Moylan	Rig Type:		Drilled By:	

Depth (m) Scale	Depth (m) Depth	Stratum Description	Legend	Level (mOD) Scale	Level (mOD) Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Firm grey sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		13.0	12.96					
1.0				12.5		1.00 1.00	C B	N=12 (1,1/2,3,3,4) MC18		
1.5				12.0						
2.0				11.5		2.00 2.00	C B	N=21 (2,2/4,6,5,6) MC19		
	2.20	Stiff brown sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.			11.26					
2.5				11.0						
3.0				10.5		3.00 3.00	C B	N=28 (2,3/5,6,8,9) MC20		
3.5				10.0						
4.0				9.5		4.00 4.00	C B	N=36 (3,5/7,9,10,10) MC21		
4.5	4.50	Very stiff black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		9.0	8.96					
5.0				8.5		5.00 5.00	C B	N=43 (2,6/8,10,12,13) MC22		
5.5				8.0						
6.0	6.00	End of Borehole at 6.00m		7.5	7.46	6.00 6.00	C B	N=58 (3,8/10,14,16,18) MC23		
6.5				7.0						
7.0				6.5						
7.5				6.0						
8.0				5.5						
8.5				5.0						
9.0				4.5						
9.5				4.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
			5.50	5.40	-	19/09	6.00	5.50				0.00	6.00	Arisings	Terminated at scheduled depth.

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

Contract No: 5415	# Cable Percussion Borehole Log				Corehole No: **BH07**
Contract:	Hollybank	Easting:	717714.458	Date Started:	18/09/2017
Location:	Swords, Co. Dublin	Northing:	748040.428	Date Completed:	18/09/2017
Client:	Cairn Homes	Elevation:	13.32	Logged By:	S. Letch
Engineer:	Waterman Moylan	Rig Type:	Dando 150	Drilled By:	M. Cunniffe

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Level (mOD) Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		13.0	12.82	0.50	B	MC12		
1.0				12.5		1.00	C	N=12 (1,1/2,2,3,5)		
1.5				12.0		1.50	B	MC13		
2.0	2.00	Stiff becoming very stiff black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		11.5	11.32	2.00	C	N=19 (2,2/3,4,5,7)		
2.5				11.0		2.50	B	MC14		
3.0				10.5		3.00	C	N=35 (3,5/7,9,9,10)		
3.5				10.0						
4.0				9.5		4.00 4.00	C B	N=42 (4,6/8,10,12,12) MC15		
4.5				9.0						
5.0				8.5		5.00 5.00	C B	N=52 (4,8/10,12,14,16) MC16		
5.5				8.0						
6.0	6.00	End of Borehole at 6.00m		7.5	7.32	6.00 6.00	C B	50 (3,18/50 for 25mm) MC17		
6.5				7.0						
7.0				6.5						
7.5				6.0						
8.0				5.5						
8.5				5.0						
9.0				4.5						
9.5				4.0						
				3.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
5.90	6.00	01:00	5.50	5.20	-	18/09	6.00	5.50				0.00	6.00	Arisings	Terminated at scheduled depth.

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

Contract No: 5415	Cable Percussion Borehole Log	Corehole No: BH08

Contract:	Hollybank	Easting:	717873.791	Date Started:	19/09/2017
Location:	Swords, Co. Dublin	Northing:	748077.087	Date Completed:	19/09/2017
Client:	Cairn Homes	Elevation:	12.51	Logged By:	
Engineer:	Waterman Moylan	Rig Type:		Drilled By:	

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.								
0.5	0.50	Firm grey sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		12.0	12.01					
1.0				11.5		1.00 1.00	C B	N=10 (1,2/2,3,2,3) MC24		
1.5				11.0						
2.0	2.00	Firm becoming stiff brown sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		10.5	10.51	2.00 2.00	C B	N=12 (1,1/2,3,4,3) MC25		
2.5				10.0						
3.0				9.5		3.00 3.00	C B	N=19 (2,2/3,4,5,7) MC26		
3.5				9.0						
4.0	3.80	Very stiff brown black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		8.5	8.71	4.00 4.00	C B	N=33 (1,4/6,8,9,10) MC27		
4.5	4.60	Very stiff black sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		8.0	7.91					
5.0				7.5		5.00 5.00	C B	N=44 (6,8/10,11,11,12) MC28		
5.5				7.0						
6.0	6.00	End of Borehole at 6.00m		6.5	6.51	6.00 6.00	C B	50 (9,14/50 for 210mm) MC29		
6.5				6.0						
7.0				5.5						
7.5				5.0						
8.0				4.5						
8.5				4.0						
9.0				3.5						
9.5				3.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed:	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
			5.80	5.50	-	19/09	6.00	5.80				0.00	6.00	Arisings	Terminated at scheduled depth.

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

Appendix 2

Trial Pit and Dynamic Probe Logs and Photographs

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP01**
Contract:	Hollybank	Easting:	717593.680	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748316.185	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	8.51	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
		TOPSOIL.							
	0.20	Firm light brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone.			8.31				
0.5				8.0					
	0.70	Grey brown silty sandy angular to rounded, fine to coarse GRAVEL of limestone with high cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of limestone.			7.81				
1.0				7.5		1.00	B		
1.5				7.0					
2.0				6.5		2.00	B		
2.5	2.50	Grey silty sandy angular to rounded, fine to coarse GRAVEL of limestone with high cobble content and some clay/silt bands. Sand is fine to coarse. Cobbles are subangular to rounded of limestone.		6.0	6.01	2.80	B		
3.0	3.00	**Pit terminated at 3.00m**		5.5	5.51				
3.5				5.0					
4.0				4.5					
4.5				4.0					

Probe: 2, 3, 4, 4, 5, 6, 5, 6, 9, 13, 15, 17, 17, 17, 17, 16, 16, 17, 17, 18, 23, 35

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	2.30 Seepage	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP02**
Contract:	Hollybank	Easting:	717632.703	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748256.648	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	9.31	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples Depth	Samples Type	Probe	Water Strike
0.20	TOPSOIL.	9.11			1, 2, 2, 2, 3, 2, 3, 3, 6	
0.90	Firm light brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone.	8.41	1.00	B	12, 16, 23, 26, 28, 35	
2.70	Grey brown silty sandy subangular to rounded, fine to coarse GRAVEL of limestone with high cobble and low boulder content. Sand is fine to coarse. Cobbles and boulders are subangular to subrounded of limestone (up to 500mm diameter).	6.61	2.00	B		
3.00	Grey brown silty sandy subangular to rounded, fine to coarse GRAVEL of limestone with high cobble and low boulder content and dark grey clay bands. Sand is fine to coarse. Cobbles and boulders are subangular to subrounded of limestone (up to 500mm diameter).	6.31	2.90	B		▼

Pit terminated at 3.00m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	2.70 Seepage	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP03**
Contract:	Hollybank	Easting:	717726.797	Date:	27/09/2017
Location:	Swords, Co. Dublin	Northing:	748227.917	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	9.22	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.20	TOPSOIL.							
	1.70	Firm brown slightly sandy gravelly silty CLAY with high cobble and boulder content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles and boulders are angular to subangular of limestone (up to 400mm diameter).		9.0, 8.5, 8.0	9.02	1.00	B	1, 2, 3, 12, 15, 24, 23, 18, 20, 26, 28, 35	
	2.40	Firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone.		7.5, 7.0	7.52	2.00	B		
	3.00	Grey brown silty sandy subangular to rounded, fine to coarse GRAVEL of limestone with high cobble content and frequent clay bands. Sand is fine to coarse. Cobbles are subangular to rounded of limestone.		6.5	6.82	2.80	B		
		Pit terminated at 3.00m		6.0, 5.5, 5.0, 4.5	6.22				

Level (mbgl) Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP04**
Contract:	Hollybank	Easting:	717802.210	Date:	27/09/2017
Location:	Swords, Co. Dublin	Northing:	748276.115	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	6.04	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples Depth	Samples Type	Probe	Water Strike
0.20	TOPSOIL.	5.84			1, 2, 3, 7, 10, 17, 17, 19, 25, 35	
0.80	Firm brown sandy silty CLAY. Sand is fine to coarse.	5.24	1.00	B		
1.30	Firm grey brown sandy slightly gravelly silty CLAY with low cobble content and frequent pockets of gravel. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subrounded to rounded of limestone.	4.74	1.50	B		
1.80	Stiff grey brown slightly sandy gravelly silty CLAY with high cobble and boulder content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	4.24	2.20	B		
3.00	Stiff becoming very stiff grey sandy slightly gravelly silty CLAY with high cobble and boulder content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	3.04				
	Pit terminated at 3.00m					

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP05**
Contract:	Hollybank	Easting:	717810.993	Date:	27/09/2017
Location:	Swords, Co. Dublin	Northing:	748222.897	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	7.45	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples Depth	Samples Type	Probe	Water Strike
0.20	TOPSOIL.		7.25			2, 2	
0.70	MADE GROUND: dark brown sandy gravelly silty clay with some pottery fragments.		6.75			13, 20, 20, 22, 23, 24, 22, 26, 28, 35	
2.10	Grey brown silty sandy subangular to rounded, fine to coarse GRAVEL of limestone with high cobble and medium boulder content. Sand is fine to coarse. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).		5.35	1.00 2.00	B B		
3.00	Stiff grey sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).		4.45	2.50	B		
	Pit terminated at 3.00m						

Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Scale: 7.0, 6.5, 6.0, 5.5, 5.0, 4.5, 4.0, 3.5, 3.0, 2.5

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP06**
Contract:	Hollybank	Easting:	717625.987	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748161.701	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	10.93	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.20	TOPSOIL.			10.73			2, 4	
0.5	0.80	Firm brown slightly sandy gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subrounded to rounded of limestone.		10.5	10.13			3, 2, 2, 3, 3, 2, 2, 2	
1.0	1.50	Firm becoming stiff light brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone.		10.0	9.43	1.00	B	3, 5, 6, 9, 7, 8, 7, 6, 7	
2.0	3.00	Stiff becoming very stiff brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.		9.5, 9.0, 8.5, 8.0	7.93	2.00	B	11, 11, 13, 16, 12, 11, 10, 10, 11, 11, 11, 12, 12, 14, 20, 35	
3.0		**Pit terminated at 3.00m**							
3.5, 4.0, 4.5				7.5, 7.0, 6.5, 6.0					

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP07**
Contract:	Hollybank	Easting:	717663.978	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748112.404	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	14.07	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.20	TOPSOIL.		14.0	13.87			1, 1, 2, 2, 2, 1, 2, 3, 3	
0.5		Firm light brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone.		13.5					
	0.90				13.17				
1.0		Grey brown silty sandy subangular to rounded, fine to coarse GRAVEL of limestone with high cobble and boulder content. Sand is fine to coarse. Cobbles and boulders are subangular to subrounded of limestone (up to 400mm diameter).		13.0		1.00	B	8, 16, 22, 23, 25, 35	
1.5				12.5					
2.0				12.0					
2.5				11.5		2.50	B		
3.0	3.00	**Pit terminated at 3.00m**		11.0	11.07				
3.5				10.5					
4.0				10.0					
4.5				9.5					

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP08**
Contract:	Hollybank	Easting:	717698.097	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748155.594	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	10.16	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Samples Depth	Samples Type
0.30	TOPSOIL.		
1.10	Firm light brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone.	1.00	B
2.40	Firm becoming stiff brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.	2.00	B
3.00	Grey brown silty sandy subangular to rounded, fine to coarse GRAVEL of limestone with high cobble content. Sand is fine to coarse. Cobbles are subangular to rounded of limestone.	2.80	B
	Pit terminated at 3.00m		

Level (mOD) Scale: 10.0, 9.5, 9.0, 8.5, 8.0, 7.5, 7.0, 6.5, 6.0, 5.5

Level (mOD) Depth: 9.86, 9.06, 7.76, 7.16

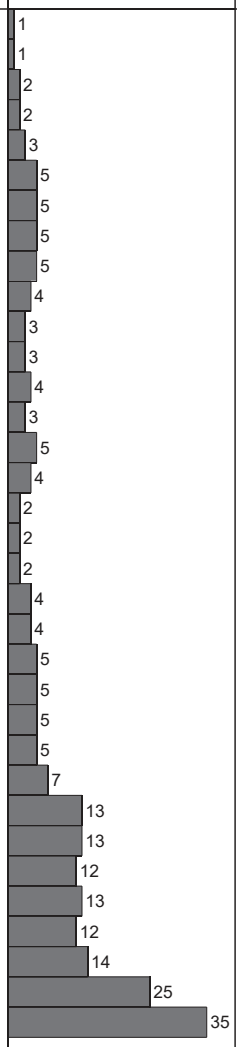
Probe: 1, 1, 2, 4, 5, 5, 5, 5, 4, 4, 4, 6, 8, 5, 4, 3, 2, 4, 8, 12, 18, 12, 11, 15, 9, 10, 8, 7, 7, 15, 15, 17, 20, 35

Water Strike

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP09**
Contract:	Hollybank	Easting:	717785.379	Date:	27/09/2017
Location:	Swords, Co. Dublin	Northing:	748160.575	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	9.97	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.20	TOPSOIL.			9.77				
	0.90	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subrounded to rounded of limestone.			9.07				
	3.00	Light brown very silty slightly gravelly fine to coarse SAND with frequent silt bands.			6.97	1.00 2.50	B B		
		Pit terminated at 3.00m							



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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP10**
Contract:	Hollybank	Easting:	717873.933	Date:	27/09/2017
Location:	Swords, Co. Dublin	Northing:	748147.926	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	12.44	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.30	TOPSOIL.			12.14			1, 2, 2, 4, 6, 8, 12, 12, 15, 13, 14, 15, 19, 16, 17, 17, 20, 21, 24, 35	
	0.90	Firm brown sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.			11.54	1.00	B		
	1.90	Stiff brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.			10.54	2.00	B		
	3.00	Very stiff grey brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are angular to subrounded of limestone.			9.44				
		Pit terminated at 3.00m							

Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Level (mOD) Scale: 12.0, 11.5, 11.0, 10.5, 10.0, 9.5, 9.0, 8.5, 8.0, 7.5

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP11**
Contract:	Hollybank	Easting:	717743.796	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748104.831	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	14.27	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples Depth	Samples Type	Probe	Water Strike
0.20	TOPSOIL.	14.07			1	
0.40	Soft brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone.	13.87			2	
	Firm brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.		1.00	B	2, 2, 2, 2, 2, 2, 2, 3, 5, 3, 3, 2, 2	
1.50	Firm becoming stiff grey sandy slightly gravelly silty CLAY with high cobble and medium boulder content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to rounded of limestone (up to 400mm diameter).	12.77	2.00	B	3, 3, 3, 2, 2, 2, 1, 1, 5, 5, 2, 2	
3.00	**Pit terminated at 3.00m**	11.27			11, 11, 11, 12, 14, 12, 13, 12, 35	

Probe scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5; Level (mOD) scale: 14.0, 13.5, 13.0, 12.5, 12.0, 11.5, 11.0, 10.5, 10.0, 9.5

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP12**
Contract:	Hollybank	Easting:	717812.038	Date:	27/09/2017
Location:	Swords, Co. Dublin	Northing:	748070.366	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	13.53	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.20	TOPSOIL.			13.33			2, 2, 2, 2, 3, 4, 6, 4, 2, 4, 3, 5, 6, 8, 8, 10, 20, 30, 35	
0.5		Firm brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone.		13.0					
	0.80	Firm becoming stiff brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.			12.73				
1.0				12.5		1.00	B		
1.5				12.0					
	1.70	Stiff becoming very stiff light brown slightly sandy gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.			11.83				
2.0				11.5		2.00	B		
2.5				11.0					
3.0	3.00	**Pit terminated at 3.00m**		10.5	10.53				
3.5				10.0					
4.0				9.5					
4.5				9.0					

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP13**
Contract:	Hollybank	Easting:	717707.802	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	747999.822	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	13.70	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples Depth	Samples Type	Probe	Water Strike
0.20	TOPSOIL.		13.50			2, 1	
0.90	Firm brown sandy gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subrounded to rounded of limestone.		12.80	1.00	B	2, 2, 1, 2, 1, 2, 3, 2, 3, 2, 2, 3, 1, 1, 2, 3, 4, 5, 8, 7, 6, 8, 11, 13, 35	
1.80	Firm light brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of limestone.		11.90	2.00	B		
3.00	Stiff grey brown sandy slightly gravelly silty CLAY with high cobble content and frequent gravel pockets. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.		10.70				
	Pit terminated at 3.00m						

Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Level (mOD) Scale: 13.5, 13.0, 12.5, 12.0, 11.5, 11.0, 10.5, 10.0, 9.5, 9.0

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP14**
Contract:	Hollybank	Easting:	717764.277	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748021.529	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	13.61	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.20	TOPSOIL.		13.5	13.41			2, 3, 3, 4, 6, 8, 4, 2, 2, 1, 1, 1, 3, 2, 3, 2, 3, 4, 4, 4, 6, 7, 7, 7, 8, 7, 6, 9, 11, 10, 12, 15, 19, 35	
	0.70	MADE GROUND: grey brown slightly sandy gravelly silty clay with high cobble content.		13.0	12.91				
		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone.		12.5		1.00	B		
				12.0					
				11.5		2.50	B		
				11.0					
	3.00	**Pit terminated at 3.00m**		10.5	10.61				
				10.0					
				9.5					
				9.0					

Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

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

Contract No: 5415	# Trial Pit and Dynamic Probe Log				Trial Pit No: **TP15**
Contract:	Hollybank	Easting:	717828.563	Date:	26/09/2017
Location:	Swords, Co. Dublin	Northing:	748028.279	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	13.12	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples Depth	Type	Probe	Water Strike
	0.20	TOPSOIL.		13.0	12.92			1, 1, 1, 2, 2, 1, 2, 1	
	0.90	Firm light brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone.		12.5	12.22	0.80	B	3, 3, 2, 2, 3, 4, 4, 5, 4, 6, 4, 4, 5, 7, 8, 9, 12, 15, 13, 11, 12, 12, 14, 15, 13, 19, 24, 35	
	3.00	Firm becoming stiff light brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.		12.0	10.12	1.50	B		
		Pit terminated at 3.00m		11.5		3.00	B		
				11.0					
				10.5					
				10.0					
				9.5					
				9.0					
				8.5					

Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP16**
Contract:	Hollybank	Easting:	717879.885	Date:	25/09/2017
Location:	Swords, Co. Dublin	Northing:	748022.537	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	12.57	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples Depth	Samples Type	Probe	Water Strike
0.20	TOPSOIL.	12.37			2, 2, 1, 1, 1, 2, 2, 1, 2, 3, 3, 3, 2, 3, 4, 3, 5, 5, 4, 6, 7, 6, 8, 10, 17, 35	
1.30	Firm light brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subrounded to rounded of limestone.	11.27	1.00	B		
2.20	Firm becoming stiff light brown sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.	10.37	1.50	B		
3.00	Stiff brown sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.	9.57	2.50	B		
	Pit terminated at 3.00m					

Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Level (mOD) Scale: 12.5, 12.0, 11.5, 11.0, 10.5, 10.0, 9.5, 9.0, 8.5, 8.0

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

Contract No: 5415	**Trial Pit and Dynamic Probe Log**				Trial Pit No: **TP17**
Contract:	Hollybank	Easting:	717851.855	Date:	25/09/2017
Location:	Swords, Co. Dublin	Northing:	747971.646	Excavator:	JCB 3CX
Client:	Cairn Homes	Elevation:	15.23	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples Depth	Samples Type	Probe	Water Strike
0.10	TOPSOIL.		15.13			3	
0.30	MADE GROUND: brown slightly sandy gravelly silty clay with high cobble content, pockets of gravel and some timber fragments.		14.93			4, 5	
	MADE GROUND: brown slightly sandy gravelly silty clay with medium cobble content, pockets of gravel and some concrete and red brick fragments.			1.00	B	8, 9, 11, 9, 8, 12, 15, 10, 8, 9, 11, 15	
1.50	MADE GROUND: grey slightly sandy gravelly silty clay with some timber fragments.		13.73	1.70	B	17, 25, 35	
1.90	Firm becoming stiff grey sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of limestone. Cobbles are subangular to rounded of limestone.		13.33	2.40	B		
3.00	**Pit terminated at 3.00m**		12.23				

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

TP01 Pit

TP01 Sidewall

TP01 Spoil

TP02 Pit

TP02 Sidewall

TP02 Spoil

TP03 Pit

TP03 Sidewall

TP03 Spoil

TP04 Pit

TP04 Sidewall

TP04 Spoil

TP05 Pit

TP05 Sidewall

TP05 Spoil

TP06 Pit

TP06 Sidewall

TP06 Spoil

TP07 Pit

TP07 Sidewall

TP07 Spoil

TP08 Pit

TP08 Sidewall

TP08 Spoil

TP09 Pit

TP09 Sidewall

TP09 Spoil

TP10 Pit

TP10 Sidewall

TP10 Spoil

TP11 Pit

TP11 Sidewall

TP11 Spoil

TP12 Pit

TP12 Sidewall

TP12 Spoil

TP13 Pit

TP13 Sidewall

TP13 Spoil

TP14 Pit

TP14 Sidewall

TP14 Spoil

TP15 Pit

TP15 Sidewall

TP15 Spoil

TP16 Pit

TP16 Sidewall

TP16 Spoil

TP17 Pit

TP17 Sidewall

TP17 Spoil

Appendix 3

Laboratory Test Results

Classification Tests

Client	Cairn Homes
Site	Hollybank, Swords
S.I. File No	5415 / 17
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	11th October 2017

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Min. Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
BH02	1.00	MC04	17/1823	B	11.8	28	23	5			49.0		ML
BH05	1.00	MC06	17/1824	B	21.9	36	22	14			72.1		CI
BH07	0.50	MC08	17/1825	B	16.9	34	22	12			84.3		CL

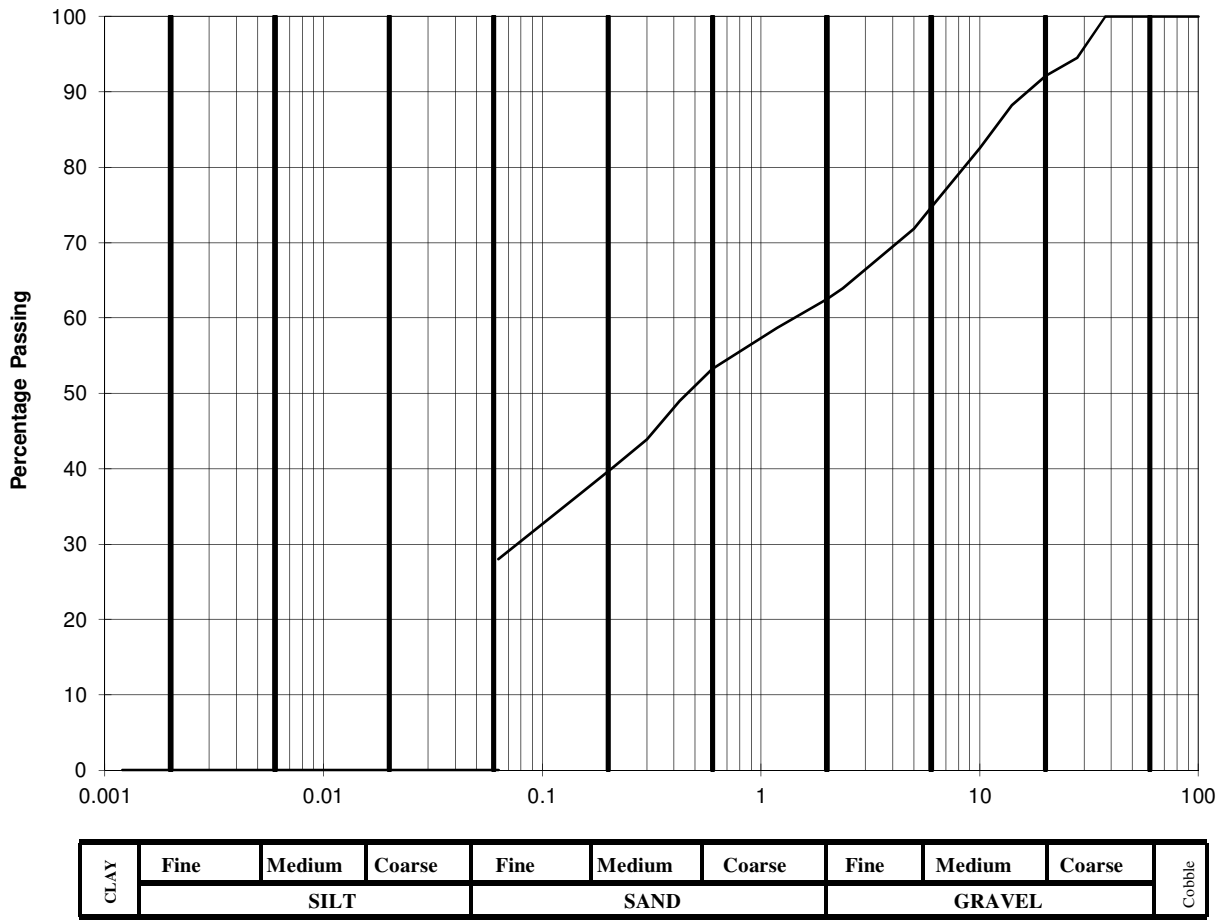
_____Paddy McGonagle
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	94.5		
20	92.1		
14	88.2		
10	82.5		
6.3	75.4		
5.0	71.8		
2.36	63.9		
2.00	62.5		
1.18	58.7		
0.600	53.2		
0.425	49		
0.300	43.9		
0.212	40.2		
0.150	36.8		
0.063	28		

Cobbles, %	0
Gravel, %	38
Sand, %	35
Clay / Silt, %	28



Client :	Cairn Homes	Lab. No :	17/1823	Hole ID :	BH 02
Project :	Hollybank, Swords	Sample No :	MC04	Depth, m :	1.00

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

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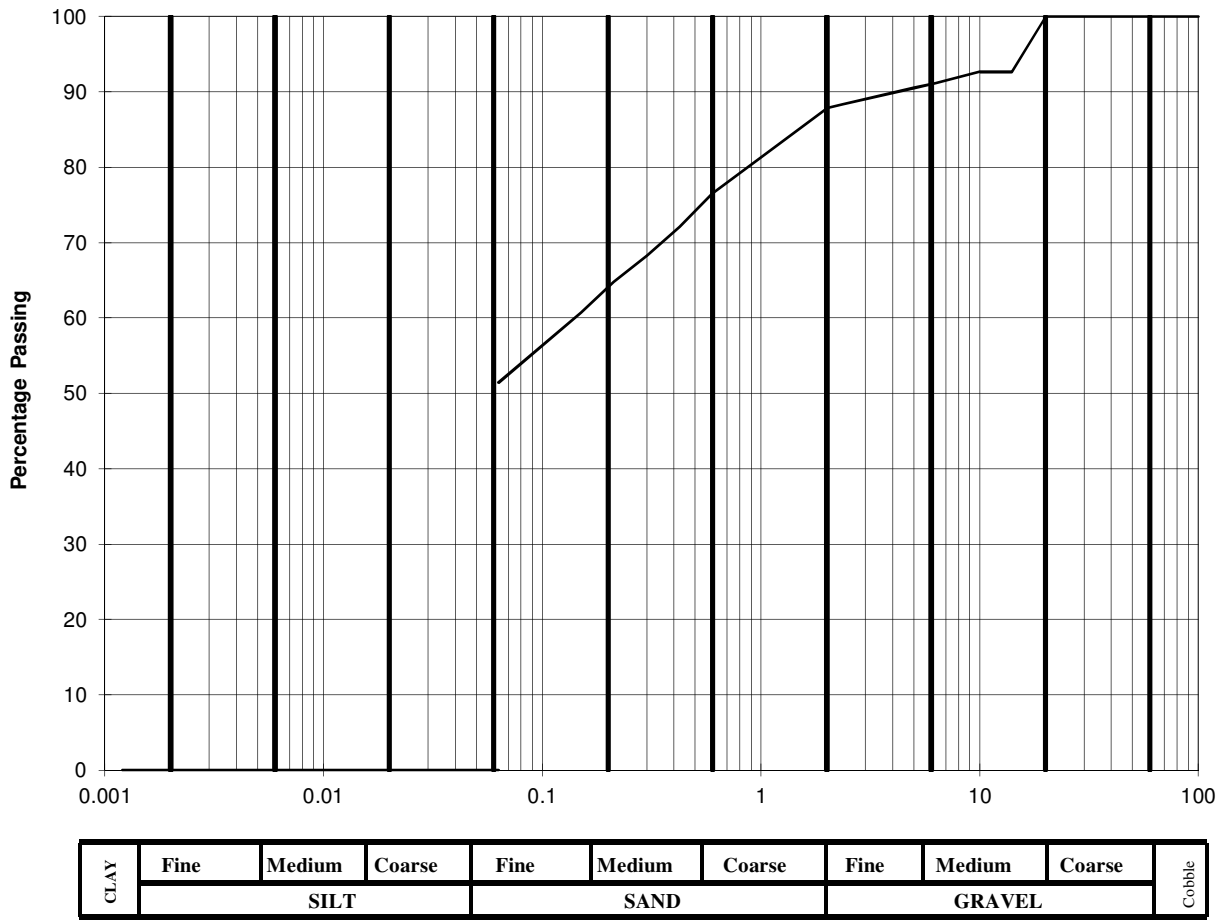
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	92.6		
10	92.6		
6.3	91.1		
5.0	90.5		
2.36	88.3		
2.00	87.8		
1.18	82.9		
0.600	76.5		
0.425	72.1		
0.300	68.3		
0.212	64.8		
0.150	60.7		
0.063	51		

Cobbles, %	0
Gravel, %	12
Sand, %	37
Clay / Silt, %	51



Client :	Cairn Homes	Lab. No :	17/1824	Hole ID :	BH 05
Project :	Hollybank, Swords	Sample No :	MC06	Depth, m :	1.00

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

5415-17
Printed 12/10/2017

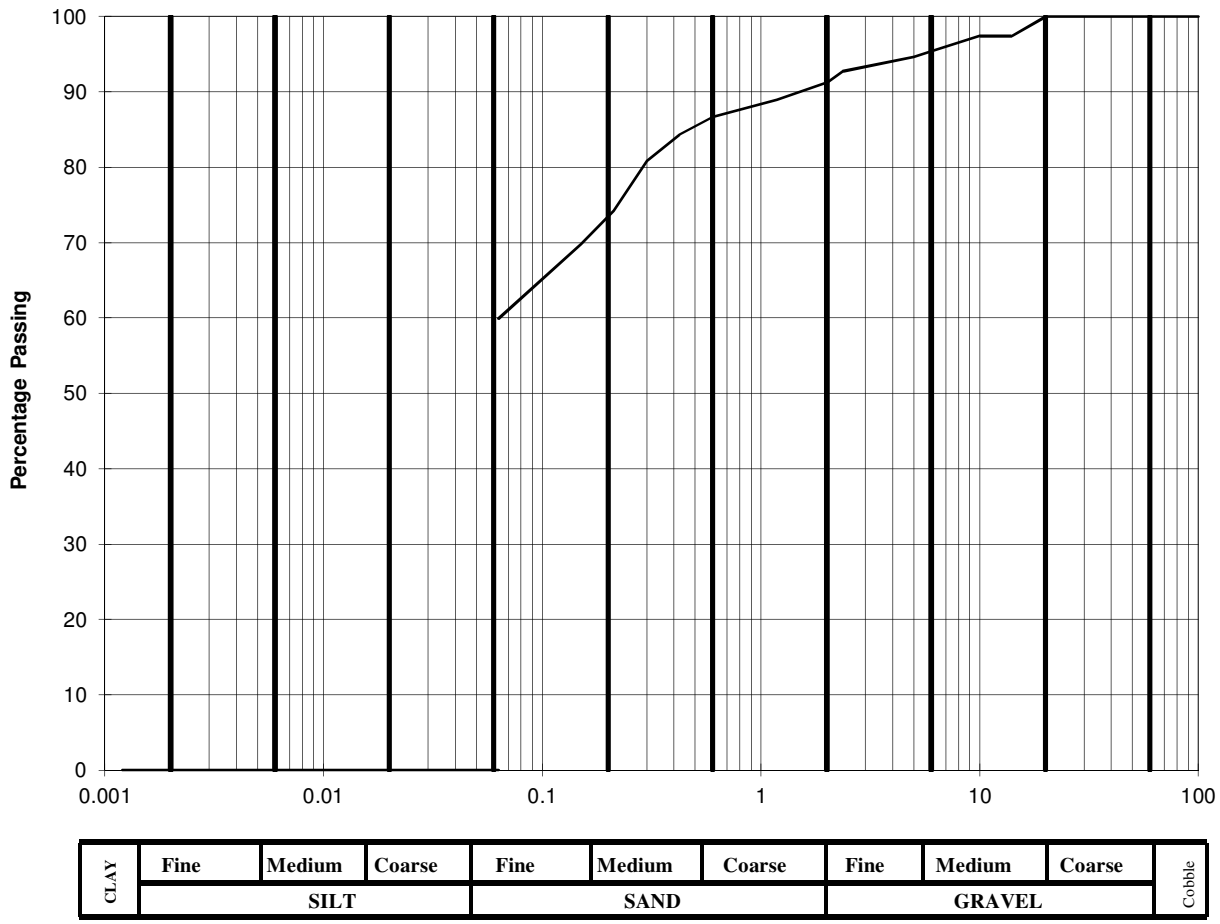
_____Paddy McGonagle
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	97.4		
10	97.4		
6.3	95.5		
5.0	94.6		
2.36	92.7		
2.00	91.2		
1.18	88.9		
0.600	86.6		
0.425	84.3		
0.300	80.8		
0.212	74.2		
0.150	69.8		
0.063	60		

Cobbles, %	0
Gravel, %	9
Sand, %	31
Clay / Silt, %	60



Client :	Cairn Homes	Lab. No :	17/1825	Hole ID :	BH 07
Project :	Hollybank, Swords	Sample No :	MC08	Depth, m :	0.50

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

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Printed 12/10/2017

_____Paddy McGonagle
Site Investigations Ltd

California Bearing Ratio (CBR) In accordance with BS1377: Part 4: Method 7

Client	Cairn Homes
Site	Hollybank, Swords
S.I. File No	5415 / 17
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	11th October 2017

CBR No	Depth (mBGL)	Sample No	Sample Type	Lab Ref	Moisture Content (%)	CBR Value (%)	Location / Remarks
CBR01	0.60	MK01	CBR	17/1826	16.3	6.6	
CBR02	0.60	MK02	CBR	17/1827	12.8	6.8	
CBR03	0.60	MK03	CBR	17/1828	6.8	7.3	
CBR04	0.60	MK04	CBR	17/1829	12.8	6.6	
CBR05	0.60	MK05	CBR	17/1830	9.0	7.7	
CBR06	0.60	MK06	CBR	17/1831	17.5	6.9	
CBR07	0.60	MK07	CBR	17/1832	12.0	6.2	
CBR08	0.60	MK08	CBR	17/1833	13.4	7.0	

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Chemical Testing
In accordance with BS 1377: Part 3

Client	Cairn Homes
Site	Hollybank, Swords
S.I. File No	5415 / 17
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	11th October 2017

Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) g/L	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) %	Organic Content **%**	Chloride ion Content (water:soil ratio 2:1) **%**	% passing 2mm	Remarks
BH02	1.00	MC04	17/1823	8.43	0.119	0.074		0.19	62.5	
BH05	1.00	MC06	17/1824	8.30	0.126	0.110		0.24	87.8	
BH07	0.50	MC08	17/1825	8.47	0.116	0.106		0.26	91.2	

Printed 12/10/2017

_____Paddy McGonagle
Site Investigations Ltd.

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Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Site Investigations Ltd
The Grange
Carhugar
12th Lock Road
Lucan
Co. Dublin

Attention: Stephen Letch

CERTIFICATE OF ANALYSIS

Date:	10 October 2017
Customer:	D_SITEINV_NCS
Sample Delivery Group (SDG):	170930-79
Your Reference:	5415
Location:	Hollybank, Swords
Report No:	427686

We received 3 samples on Saturday September 30, 2017 and 3 of these samples were scheduled for analysis which was completed on Tuesday October 10, 2017. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Approved By:

Sonia McWhan

Operations Manager

ALS Life Sciences Limited. Registered Office: Units 7 & 8 Hawarden Business Park, Manor Road, Hawarden, Deeside, CH5 3US. Registered in England and Wales No. 4057291.

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16282588	BH02		1.00 - 1.00	27/09/2017
16282590	BH05		1.00 - 1.00	27/09/2017
16282591	BH07		0.50 - 0.50	27/09/2017

Maximum Sample/Coolbox Temperature (°C) :

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

16.2

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)			16282588			16282590			16282591		
Customer Sample Reference			BH02			BH05			BH07		
AGS Reference											
Depth (m)			1.00 - 1.00			1.00 - 1.00			0.50 - 0.50		
Container			1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)
Sample Type			S	S	S	S	S	S	S	S	S
Anions by Kone (w)	All	NDPs: 0 Tests: 3	X			X			X		
CEN Readings	All	NDPs: 0 Tests: 3	X			X			X		
Chromium III	All	NDPs: 0 Tests: 3		X			X			X	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 3	X			X			X		
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 3	X			X			X		
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 3		X			X			X	
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 3		X			X			X	
Fluoride	All	NDPs: 0 Tests: 3	X			X			X		
GRO by GC-FID (S)	All	NDPs: 0 Tests: 3			X			X			X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 3		X			X			X	
Loss on Ignition in soils	All	NDPs: 0 Tests: 3		X			X			X	
Mercury Dissolved	All	NDPs: 0 Tests: 3	X			X			X		
Metals in solid samples by OES	All	NDPs: 0 Tests: 3		X			X			X	
Mineral Oil	All	NDPs: 0 Tests: 3		X			X			X	
PAH by GCMS	All	NDPs: 0 Tests: 3		X			X			X	

Validated

CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)				16282588			16282590			16282591	
Customer Sample Reference				BH02			BH05			BH07	
AGS Reference											
Depth (m)				1.00 - 1.00			1.00 - 1.00			0.50 - 0.50	
Container			1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)
Sample Type			S	S	S	S	S	S	S	S	S
PCBs by GCMS	All	NDPs: 0 Tests: 3		X			X			X	
Phenols by HPLC (W)	All	NDPs: 0 Tests: 3	X			X			X		
Sample description	All	NDPs: 0 Tests: 3		X			X			X	
Total Dissolved Solids on Leachates	All	NDPs: 0 Tests: 3	X			X			X		
Total Organic Carbon	All	NDPs: 0 Tests: 3		X			X			X	
TPH CWG GC (S)	All	NDPs: 0 Tests: 3		X			X			X	

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Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
16282588	BH02	1.00 - 1.00	Dark Brown	Sandy Clay Loam	Stones	N/A
16282590	BH05	1.00 - 1.00	Dark Brown	Sandy Clay Loam	Stones	Glass & Stones
16282591	BH07	0.50 - 0.50	Dark Brown	Sandy Clay Loam	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.			BH02	BH05	BH07			
Depth (m)			1.00 - 1.00	1.00 - 1.00	0.50 - 0.50			
Sample Type			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
Date Sampled			27/09/2017	27/09/2017	27/09/2017			
Sample Time			.	.	.			
Date Received			30/09/2017	30/09/2017	30/09/2017			
SDG Ref			170930-79	170930-79	170930-79			
Lab Sample No.(s)			16282588	16282590	16282591			
AGS Reference								
Component	**LOD/Units**	**Method**						
Moisture Content Ratio (% of as received sample)	%	PM024	10	19	14			
Loss on ignition	<0.7 %	TM018	1.4 M	3.06 M	3.52 M			
Mineral oil >C10-C40	<1 mg/kg	TM061	22.9	15.3	25.6			
Organic Carbon, Total	<0.2 %	TM132	0.231 M	0.509 M	0.654 M			
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #	<0.6 #	<0.6 #			
PCB congener 28	<3 µg/kg	TM168	<3 M	<3 M	<3 M			
PCB congener 52	<3 µg/kg	TM168	<3 M	<3 M	<3 M			
PCB congener 101	<3 µg/kg	TM168	<3 M	<3 M	<3 M			
PCB congener 118	<3 µg/kg	TM168	<3 M	<3 M	<3 M			
PCB congener 138	<3 µg/kg	TM168	<3 M	<3 M	<3 M			
PCB congener 153	<3 µg/kg	TM168	<3 M	<3 M	<3 M			
PCB congener 180	<3 µg/kg	TM168	<3 M	<3 M	<3 M			
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168	<21	<21	<21			
Chromium, Trivalent	<0.9 mg/kg	TM181	10.1	11.1	15.7			
Antimony	<0.6 mg/kg	TM181	<0.6 #	1.01 #	<0.6 #			
Arsenic	<0.6 mg/kg	TM181	7.74 M	13.5 M	11.5 M			
Barium	<0.6 mg/kg	TM181	48.8 #	67.5 #	104 #			
Cadmium	<0.02 mg/kg	TM181	0.983 M	2.28 M	1.28 M			
Chromium	<0.9 mg/kg	TM181	10.1 M	11.1 M	15.7 M			
Copper	<1.4 mg/kg	TM181	14.6 M	33.2 M	21.3 M			
Lead	<0.7 mg/kg	TM181	10.8 M	23.4 M	32.8 M			
Mercury	<0.14 mg/kg	TM181	0.295 M	0.425 M	0.301 M			
Molybdenum	<0.1 mg/kg	TM181	1.67 #	3.18 #	2.65 #			
Nickel	<0.2 mg/kg	TM181	24.1 M	50.9 M	30.4 M			
Selenium	<1 mg/kg	TM181	<1 #	<1 #	<1 #			
Zinc	<1.9 mg/kg	TM181	49.5 M	85.9 M	72.8 M			

Validated

CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	BH02	BH05	BH07			
Customer Sample Ref.			BH02	BH05	BH07			
Depth (m)			1.00 - 1.00	1.00 - 1.00	0.50 - 0.50			
Sample Type			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
Date Sampled			27/09/2017	27/09/2017	27/09/2017			
Sample Time			.	.	.			
Date Received			30/09/2017	30/09/2017	30/09/2017			
SDG Ref			170930-79	170930-79	170930-79			
Lab Sample No.(s)			16282588	16282590	16282591			
AGS Reference								
Naphthalene	<9 µg/kg	TM218	<9 M	<9 M	23.3 M			
Acenaphthylene	<12 µg/kg	TM218	<12 M	<12 M	<12 M			
Acenaphthene	<8 µg/kg	TM218	<8 M	<8 M	130 M			
Fluorene	<10 µg/kg	TM218	<10 M	<10 M	101 M			
Phenanthrene	<15 µg/kg	TM218	<15 M	<15 M	929 M			
Anthracene	<16 µg/kg	TM218	<16 M	<16 M	86.9 M			
Fluoranthene	<17 µg/kg	TM218	<17 M	<17 M	642 M			
Pyrene	<15 µg/kg	TM218	<15 M	<15 M	521 M			
Benz(a)anthracene	<14 µg/kg	TM218	<14 M	<14 M	214 M			
Chrysene	<10 µg/kg	TM218	<10 M	<10 M	194 M			
Benzo(b)fluoranthene	<15 µg/kg	TM218	<15 M	<15 M	204 M			
Benzo(k)fluoranthene	<14 µg/kg	TM218	<14 M	<14 M	72.6 M			
Benzo(a)pyrene	<15 µg/kg	TM218	<15 M	<15 M	112 M			
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	<18 M	<18 M	42.8 M			
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23 M	<23 M	<23 M			
Benzo(g,h,i)perylene	<24 µg/kg	TM218	<24 M	<24 M	65.5 M			
Coronene	<200 µg/kg	TM218	<200	<200	<200			
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	<118	<118	3340			

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Validated

CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	BH02	BH05	BH07			
Customer Sample Ref.			BH02	BH05	BH07			
Depth (m)			1.00 - 1.00	1.00 - 1.00	0.50 - 0.50			
Sample Type			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
Date Sampled			27/09/2017	27/09/2017	27/09/2017			
Sample Time			.	.	.			
Date Received			30/09/2017	30/09/2017	30/09/2017			
SDG Ref			170930-79	170930-79	170930-79			
Lab Sample No.(s)			16282588	16282590	16282591			
AGS Reference								
GRO Surrogate % recovery**	%	TM089	66	65	102			
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	488 M	<44 M	<44 M			
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 #	<5 #	<5 #			
Benzene	<10 µg/kg	TM089	<10 M	<10 M	<10 M			
Toluene	<2 µg/kg	TM089	<2 M	<2 M	<2 M			
Ethylbenzene	<3 µg/kg	TM089	<3 M	<3 M	<3 M			
m,p-Xylene	<6 µg/kg	TM089	<6 M	<6 M	<6 M			
o-Xylene	<3 µg/kg	TM089	<3 M	<3 M	<3 M			
sum of detected mpo xylene by GC	<9 µg/kg	TM089	<9	<9	<9			
sum of detected BTEX by GC	<24 µg/kg	TM089	<24	<24	<24			
Aliphatics >C5-C6	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C6-C8	<10 µg/kg	TM089	15.5	<10	<10			
Aliphatics >C8-C10	<10 µg/kg	TM089	72.2	<10	<10			
Aliphatics >C10-C12	<10 µg/kg	TM089	205	<10	<10			
Aliphatics >C12-C16	<100 µg/kg	TM173	798	1050	<100			
Aliphatics >C16-C21	<100 µg/kg	TM173	<100	776	<100			
Aliphatics >C21-C35	<100 µg/kg	TM173	6120	141	11000			
Aliphatics >C35-C44	<100 µg/kg	TM173	<100	<100	583			
Total Aliphatics >C12-C44	<100 µg/kg	TM173	6920	1970	11600			
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC8-EC10	<10 µg/kg	TM089	47.7	<10	<10			
Aromatics >EC10-EC12	<10 µg/kg	TM089	137	<10	<10			
Aromatics >EC12-EC16	<100 µg/kg	TM173	<100	<100	<100			
Aromatics >EC16-EC21	<100 µg/kg	TM173	<100	<100	1750			
Aromatics >EC21-EC35	<100 µg/kg	TM173	1530	1030	4860			
Aromatics >EC35-EC44	<100 µg/kg	TM173	5630	3610	1230			
Aromatics >EC40-EC44	<100 µg/kg	TM173	3330	2190	212			
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	7160	4640	7830			
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	14600	6610	19400			
GRO >C5-C6	<10 µg/kg	TM089	<10	<10	<10			
GRO >C6-C7	<10 µg/kg	TM089	<10	<10	<10			
GRO >C7-C8	<10 µg/kg	TM089	<10	<10	<10			

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Validated

CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.			BH02	BH05	BH07			
Depth (m)			1.00 - 1.00	1.00 - 1.00	0.50 - 0.50			
Sample Type			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
Date Sampled			27/09/2017	27/09/2017	27/09/2017			
Sample Time			-	-	-			
Date Received			30/09/2017	30/09/2017	30/09/2017			
SDG Ref			170930-79	170930-79	170930-79			
Lab Sample No.(s)			16282588	16282590	16282591			
AGS Reference								
Component	**LOD/Units**	**Method**						
GRO >C8-C10	<10 µg/kg	TM089	121	<10	<10			
GRO >C10-C12	<10 µg/kg	TM089	342	<10	<10			

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Validated

CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Hollybank, Swords
Mass Sample taken (kg)	0.103	**Natural Moisture Content (%)**	14.5
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	87.4
Particle Size <4mm	>95%		

Case	
SDG	170930-79
Lab Sample Number(s)	16282588
Sampled Date	27-Sep-2017
Customer Sample Ref.	BH02
Depth (m)	1.00 - 1.00

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill**	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	0.231	3	5	6
Loss on Ignition (%)	1.4	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	22.9	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C_2 Conc^n in 10:1 eluate (mg/l)**		**A_2 10:1 conc^n leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.00397	<0.0002	0.0397	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	<0.0003	<0.0003	<0.003	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00333	<0.0005	0.0333	<0.005	0.5	10	30
Nickel	<0.0004	<0.0004	<0.004	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
Antimony	0.000229	<0.0001	0.00229	<0.001	0.06	0.7	5
Selenium	<0.0005	<0.0005	<0.005	<0.005	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	60	<10	600	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	04-Oct-2017
pH (pH Units)	8.79
Conductivity (µS/cm)	62.50
Temperature (°C)	18.10
Volume Leachant (Litres)	0.887

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Hollybank, Swords
Mass Sample taken (kg)	0.114	**Natural Moisture Content (%)**	26.6
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	79
Particle Size <4mm	>95%		

Case	
SDG	170930-79
Lab Sample Number(s)	16282590
Sampled Date	27-Sep-2017
Customer Sample Ref.	BH05
Depth (m)	1.00 - 1.00

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	0.509	3	5	6
Loss on Ignition (%)	3.06	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	15.3	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C_2** Conc^n in 10:1 eluate (mg/l)		**A_2** 10:1 conc^n leached (mg/kg)		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.00454	<0.0002	0.0454	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	<0.0003	<0.0003	<0.003	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00368	<0.0005	0.0368	<0.005	0.5	10	30
Nickel	<0.0004	<0.0004	<0.004	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
Antimony	0.000178	<0.0001	0.00178	<0.001	0.06	0.7	5
Selenium	<0.0005	<0.0005	<0.005	<0.005	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	79.9	<10	799	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	04-Oct-2017
pH (pH Units)	8.11
Conductivity (µS/cm)	98.00
Temperature (°C)	18.30
Volume Leachant (Litres)	0.876

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Hollybank, Swords
Mass Sample taken (kg)	0.109	**Natural Moisture Content (%)**	21.1
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	82.6
Particle Size <4mm	>95%		

Case	
SDG	170930-79
Lab Sample Number(s)	16282591
Sampled Date	27-Sep-2017
Customer Sample Ref.	BH07
Depth (m)	0.50 - 0.50

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	0.654	3	5	6
Loss on Ignition (%)	3.52	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	25.6	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C_2** Conc^n in 10:1 eluate (mg/l)		**A_2** 10:1 conc^n leached (mg/kg)		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.00348	<0.0002	0.0348	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.000656	<0.0003	0.00656	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00116	<0.0005	0.0116	<0.005	0.5	10	30
Nickel	0.000527	<0.0004	0.00527	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
Antimony	0.000282	<0.0001	0.00282	<0.001	0.06	0.7	5
Selenium	<0.0005	<0.0005	<0.005	<0.005	0.1	0.5	7
Zinc	0.00124	<0.001	0.0124	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	41.3	<10	413	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	04-Oct-2017
pH (pH Units)	8.65
Conductivity (µS/cm)	48.90
Temperature (°C)	16.50
Volume Leachant (Litres)	0.881

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Determination of PAH by GCMS Microwave extraction	The determination of PAH in soil samples by microwave extraction and GC-MS		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

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CERTIFICATE OF ANALYSIS

SDG:	170930-79	**Client Reference:**	5415	**Report Number:**	427686
Location:	Hollybank, Swords	**Order Number:**	73/B/17	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	16282588	16282590	16282591
Customer Sample Ref.	BH02	BH05	BH07
AGS Ref.			
Depth	1.00 - 1.00	1.00 - 1.00	0.50 - 0.50
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (w)	10-Oct-2017	10-Oct-2017	10-Oct-2017
CEN 10:1 Leachate (1 Stage)	04-Oct-2017	04-Oct-2017	04-Oct-2017
CEN Readings	05-Oct-2017	05-Oct-2017	05-Oct-2017
Chromium III	10-Oct-2017	10-Oct-2017	10-Oct-2017
Dissolved Metals by ICP-MS	10-Oct-2017	10-Oct-2017	10-Oct-2017
Dissolved Organic/Inorganic Carbon	06-Oct-2017	06-Oct-2017	06-Oct-2017
EPH CWG (Aliphatic) GC (S)	09-Oct-2017	09-Oct-2017	09-Oct-2017
EPH CWG (Aromatic) GC (S)	09-Oct-2017	09-Oct-2017	09-Oct-2017
Fluoride	06-Oct-2017	06-Oct-2017	06-Oct-2017
GRO by GC-FID (S)	10-Oct-2017	10-Oct-2017	10-Oct-2017
Hexavalent Chromium (s)	09-Oct-2017	09-Oct-2017	09-Oct-2017
Loss on Ignition in soils	10-Oct-2017	10-Oct-2017	10-Oct-2017
Mercury Dissolved	09-Oct-2017	09-Oct-2017	09-Oct-2017
Metals in solid samples by OES	10-Oct-2017	10-Oct-2017	10-Oct-2017
Mineral Oil	10-Oct-2017	10-Oct-2017	10-Oct-2017
PAH by GCMS	10-Oct-2017	10-Oct-2017	10-Oct-2017
PCBs by GCMS	09-Oct-2017	09-Oct-2017	09-Oct-2017
Phenols by HPLC (W)	09-Oct-2017	09-Oct-2017	09-Oct-2017
Sample description	03-Oct-2017	03-Oct-2017	03-Oct-2017
Total Dissolved Solids on Leachates	06-Oct-2017	06-Oct-2017	06-Oct-2017
Total Organic Carbon	10-Oct-2017	10-Oct-2017	10-Oct-2017
TPH CWG GC (S)	10-Oct-2017	10-Oct-2017	10-Oct-2017

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

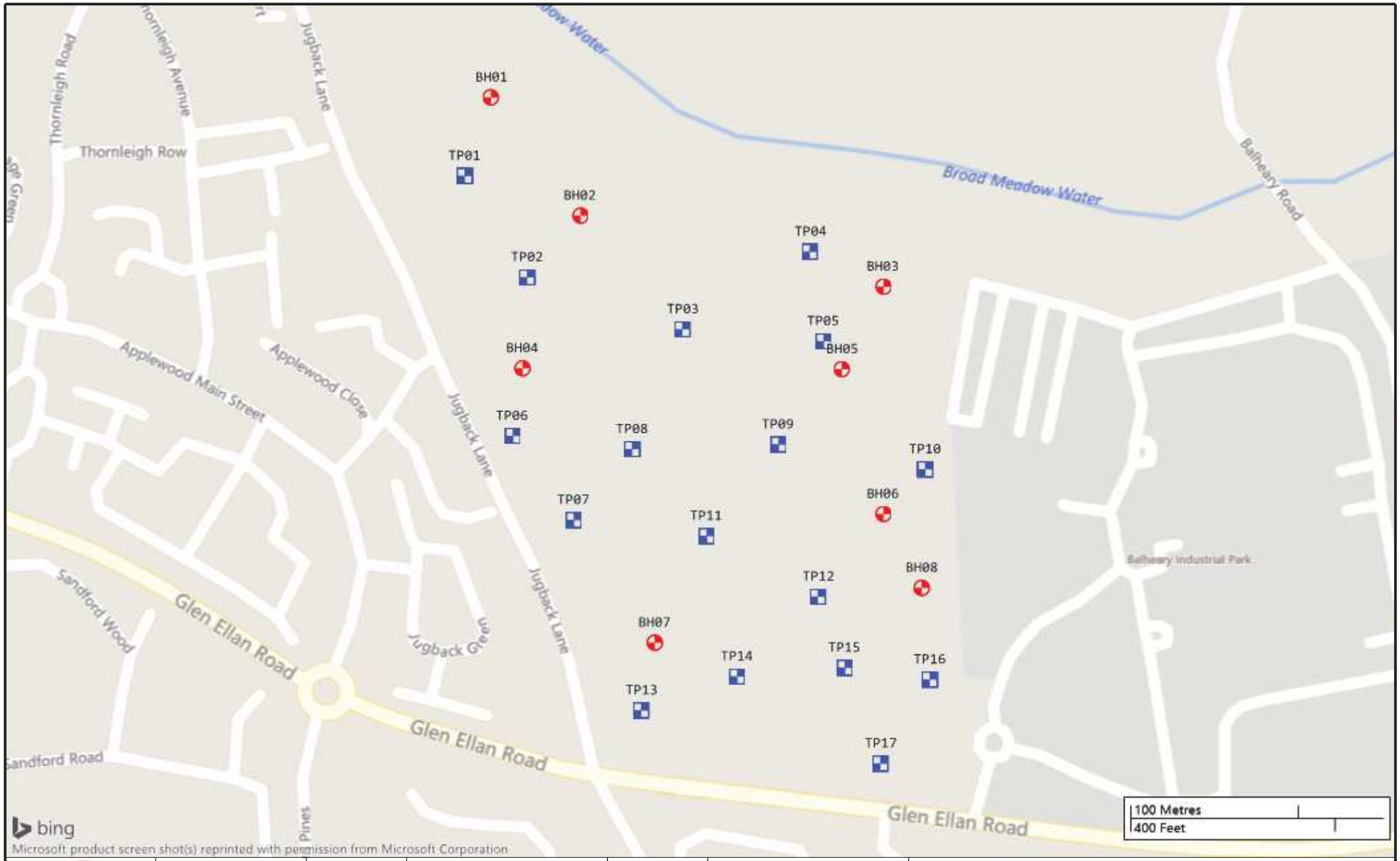
The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 4

Survey Data

Site Survey

Location	Irish National Grid		Level	Irish Transverse Mercator	
	Easting	Northing		Easting	Northing
Cable Percussion Boreholes					
BH01	717608.793	748363.439	7.25	317683.411	248340.257
BH02	717663.420	748294.172	9.42	317738.050	248270.975
BH03	717845.956	748256.318	5.94	317920.625	248233.114
BH04	717631.220	748202.211	9.92	317705.844	248178.994
BH05	717822.927	748206.474	7.67	317897.592	248183.259
BH06	717849.380	748120.667	13.46	317924.052	248097.434
BH07	717714.458	748040.428	13.32	317789.102	248017.177
BH08	717873.791	748077.087	12.51	317948.468	248053.845
Trial Pits					
TP01	717593.680	748316.185	8.51	317668.295	248292.992
TP02	717750.929	748074.592	14.54	317825.580	248051.348
TP03	717726.797	748227.917	9.22	317801.441	248204.706
TP04	717802.210	748276.115	6.04	317876.870	248252.915
TP05	717810.993	748222.897	7.45	317885.655	248199.686
TP06	717625.987	748161.701	10.93	317700.611	248138.475
TP07	717663.978	748112.404	14.07	317738.610	248089.168
TP08	717698.097	748155.594	10.16	317772.736	248132.367
TP09	717785.379	748160.575	9.97	317860.037	248137.350
TP10	717873.933	748147.926	12.44	317948.610	248124.699
TP11	717743.796	748104.831	14.27	317818.445	248081.594
TP12	717812.038	748070.366	13.53	317886.702	248047.122
TP13	717707.802	747999.822	13.70	317782.445	247976.562
TP14	717764.277	748021.529	13.61	317838.931	247998.274
TP15	717828.563	748028.279	13.12	317903.231	248005.026
TP16	717879.885	748022.537	12.57	317954.564	247999.283
TP17	717851.855	747971.646	15.23	317926.529	247948.381



Site Investigations Ltd The Grange 12th Lock Road Lucan Co. Dublin T: 01 6108768 e: info@siteinvestigations.ie	Contract No:	5415	Client:	Cairn Homes	Legend Key
	Contract Name:	Hollybank	Engineer:	Waterman Moylan	Locations By Type - CP
	Location:	Swords, Co. Dublin	Scale:	1:3000	Locations By Type - TP
	Title:	Site Plan	Drawn By:	SL	

Site Investigations Ltd The Grange 12th Lock Road Lucan Co. Dublin T: 01 6108768 e: info@siteinvestigations.ie	Contract No:	5415	Client:	Cairn Homes	Legend Key Locations By Type - CP Locations By Type - TP
	Contract Name:	Hollybank	Engineer:	Waterman Moylan	
	Location:	Swords, Co. Dublin	Scale:	1:3000	
	Title:	Site Plan	Drawn By:	SL	

10. Appendix 10.2 – Additional Site Investigation Report

S.I. Ltd Contract No: 5588

Client: Cairn Homes
Engineer: Waterman Moylan
Contractor: Site Investigations Ltd

Hollybank,
Swords, Co. Dublin
Additional Site Investigation Report

Prepared by:

.....
Stephen Letch

Issue Date:	18/04/2019
Status	Final
Revision	1

Contents:

		Page No.
1.	Introduction	1
2.	Fieldwork	1

Appendices:

1. Soakaway Logs and Photographs
2. Survey Data

1. Introduction

In October 2017 and on the instructions of Waterman Moylan, Site Investigations Ltd (SIL) completed a ground investigation at Glen Ellan Road, Swords, County Dublin. The investigation was for a new residential development of the site, Hollybank, and was completed on behalf of the Client, Cairn Homes. Following this initial investigation, additional soakaway tests were requested in December 2018 but these tests failed to pass the specification. This report covers further investigation into the drainage of the site.

The fieldworks comprised a programme of shallow soakaway tests. All fieldwork was carried out in accordance with Eurocode 7: Geotechnical Design and the IEI Specification & Related Documents for Ground Investigation in Ireland (2006).

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

2. Fieldwork

The fieldworks were started and completed in April 2019 and comprised the following:

- 11 No. soakaway tests

2.1. Soakaway Tests

At 11 No. locations, soakaway tests were scheduled to be completed. Following the initial soakaway tests encountering groundwater at 1.80mbgl, these tests were scheduled to be completed at shallower depths to test the drainage of the upper soils. The soakaway test is used to identify possible areas for storm water drainage. The pit is excavated and with water three times to ensure that the ground is saturated and then the fall rate of the groundwater is recorded over the third and final cycle to provide the infiltration rate. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration.

Unfortunately, the drainage of the soil is very poor with all eleven tests failing to pass the BRE specification. All the tests failed on the first fill cycle and as three cycles are required for an f-value then it is deemed that these soils are unsuitable for soakaway design.

It should also be noted that these soils are over consolidated glacial tills and have very low permeability values due to the compression that was placed on them during the glacial re-advance following the initial deposition of the soil.

The logs and photographs are provided in Appendix 1.

2.2. Surveying

Following the completion of the works, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is provided along with a site plan in Appendix 2.

Appendix 1

Soakaway Logs and Photographs

SOAKAWAY TEST

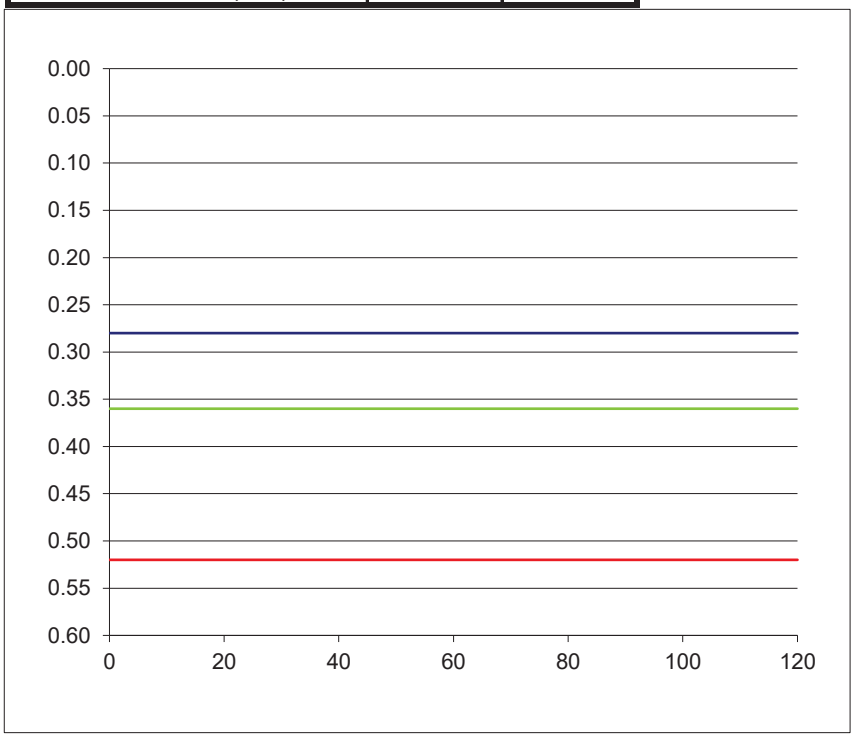
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA01
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.20	TOPSOIL.
0.20	0.60	Soft brown sandy slightly gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.28
0.5	0.28
1	0.28
1.5	0.28
2	0.28
2.5	0.28
3	0.28
3.5	0.28
4	0.28
4.5	0.28
5	0.28
6	0.28
7	0.28
8	0.28
9	0.28
10	0.28
12	0.28
14	0.28
16	0.28
18	0.28
20	0.28
25	0.28
30	0.28
40	0.28
50	0.28
60	0.28
75	0.28
90	0.28
120	0.28

Pit Dimensions (m)		
Length (m)	1.85	m
Width (m)	0.65	m
Depth	0.60	m
Water		
Start Depth of Water	0.28	m
Depth of Water	0.32	m
75% Full	0.360	m
25% Full	0.520	m
75%-25%	0.16	m
Volume of water (75%-25%)	**0.192**	m3
Area of Drainage	**3**	m2
Area of Drainage (75%-25%)	**2.0025**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

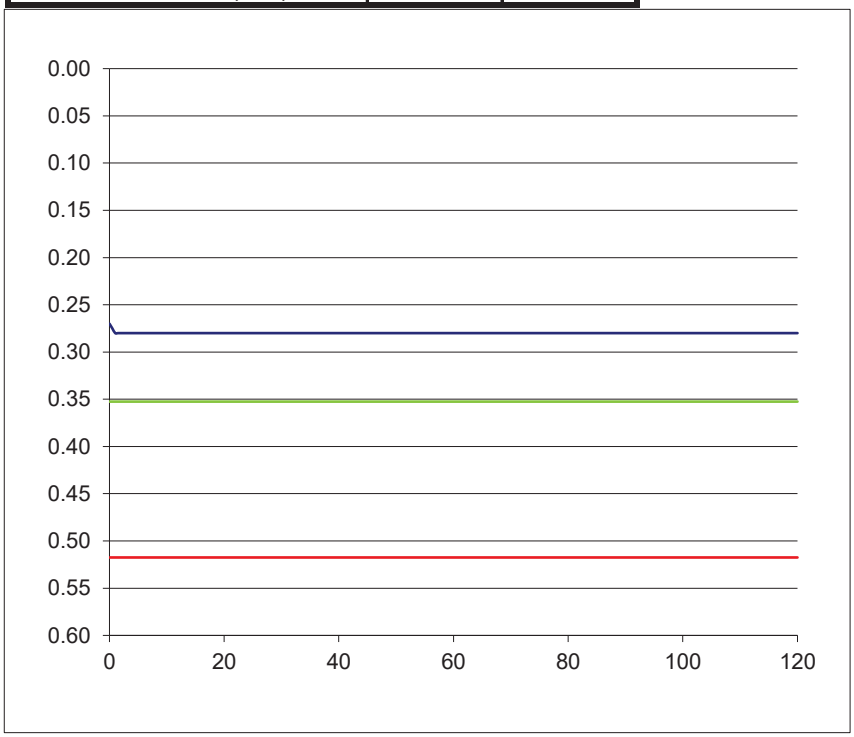
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA02
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.20	TOPSOIL.
0.20	0.60	Soft brown sandy slightly gravelly silty CLAY.

Elapsed Time (mins)	Fall of Water (m)
0	0.27
0.5	0.28
1	0.28
1.5	0.28
2	0.28
2.5	0.28
3	0.28
3.5	0.28
4	0.28
4.5	0.28
5	0.28
6	0.28
7	0.28
8	0.28
9	0.28
10	0.28
12	0.28
14	0.28
16	0.28
18	0.28
20	0.28
25	0.28
30	0.28
40	0.28
50	0.28
60	0.28
75	0.28
90	0.28
120	0.28

Pit Dimensions (m)		
Length (m)	1.70	m
Width (m)	0.65	m
Depth	0.60	m
Water		
Start Depth of Water	0.27	m
Depth of Water	0.33	m
75% Full	0.353	m
25% Full	0.518	m
75%-25%	0.17	m
Volume of water (75%-25%)	**0.182**	m3
Area of Drainage	**2.82**	m2
Area of Drainage (75%-25%)	**1.8805**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

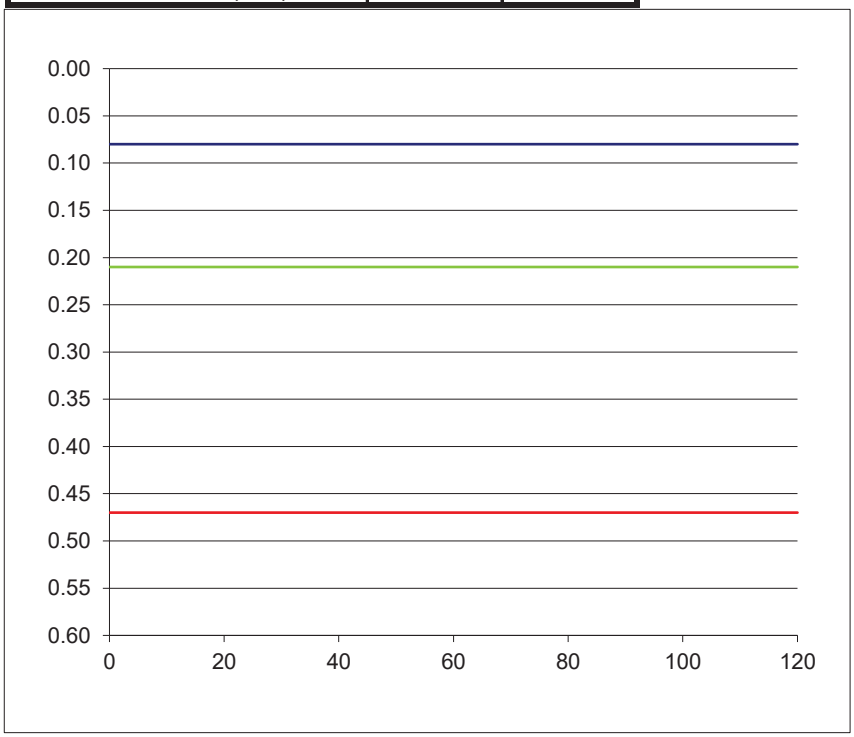
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA03
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.10	TOPSOIL.
0.10	0.60	Soft brown slightly sandy gravelly silty CLAY with medium cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.08
0.5	0.08
1	0.08
1.5	0.08
2	0.08
2.5	0.08
3	0.08
3.5	0.08
4	0.08
4.5	0.08
5	0.08
6	0.08
7	0.08
8	0.08
9	0.08
10	0.08
12	0.08
14	0.08
16	0.08
18	0.08
20	0.08
25	0.08
30	0.08
40	0.08
50	0.08
60	0.08
75	0.08
90	0.08
120	0.08

Pit Dimensions (m)		
Length (m)	1.80	m
Width (m)	0.65	m
Depth	0.60	m
Water		
Start Depth of Water	0.08	m
Depth of Water	0.52	m
75% Full	0.210	m
25% Full	0.470	m
75%-25%	0.26	m
Volume of water (75%-25%)	**0.304**	m3
Area of Drainage	**2.94**	m2
Area of Drainage (75%-25%)	**2.444**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

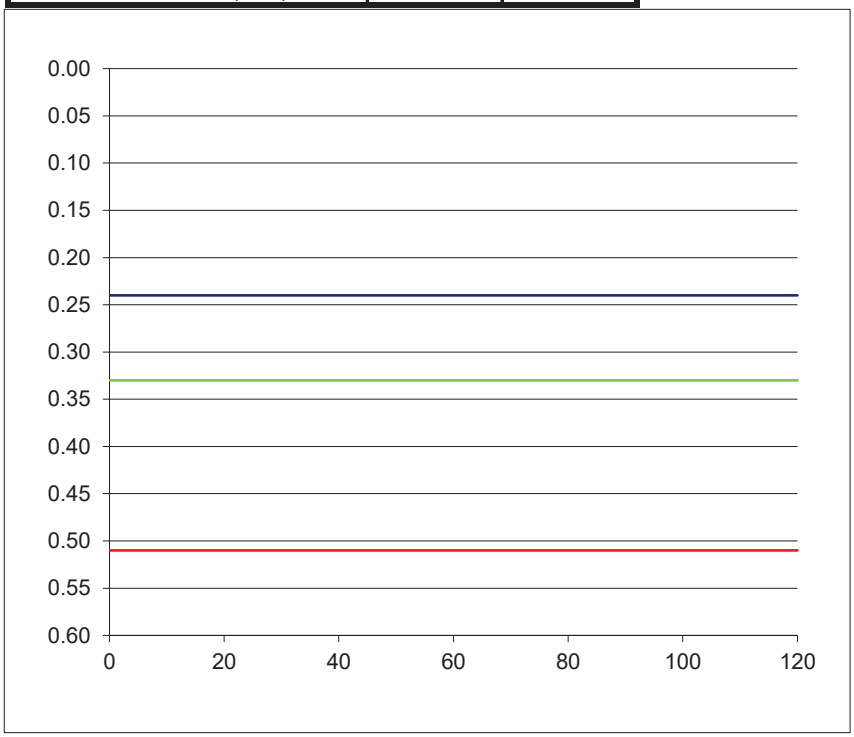
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA04
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.10	TOPSOIL.
0.10	0.60	Soft brown slightly sandy slightly gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.24
0.5	0.24
1	0.24
1.5	0.24
2	0.24
2.5	0.24
3	0.24
3.5	0.24
4	0.24
4.5	0.24
5	0.24
6	0.24
7	0.24
8	0.24
9	0.24
10	0.24
12	0.24
14	0.24
16	0.24
18	0.24
20	0.24
25	0.24
30	0.24
40	0.24
50	0.24
60	0.24
75	0.24
90	0.24
120	0.24

Pit Dimensions (m)		
Length (m)	1.95	m
Width (m)	0.65	m
Depth	0.60	m
Water		
Start Depth of Water	0.24	m
Depth of Water	0.36	m
75% Full	0.330	m
25% Full	0.510	m
75%-25%	0.18	m
Volume of water (75%-25%)	**0.228**	m3
Area of Drainage	**3.12**	m2
Area of Drainage (75%-25%)	**2.2035**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

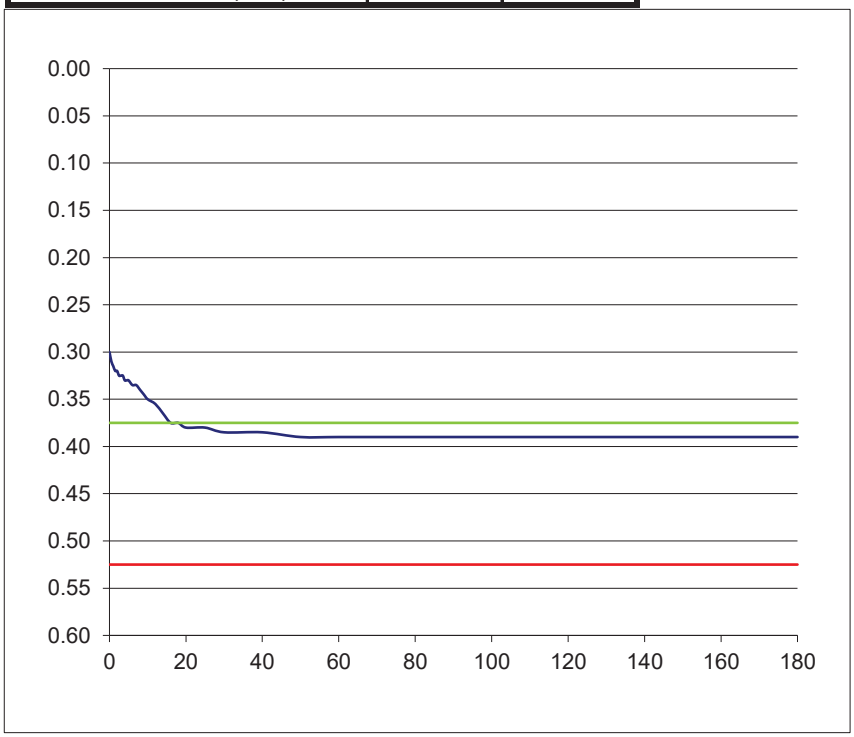
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA05
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.20	TOPSOIL.
0.20	0.60	Soft brown sandy gravelly silty CLAY.

Elapsed Time (mins)	Fall of Water (m)
0	0.30
0.5	0.31
1	0.32
1.5	0.32
2	0.32
2.5	0.33
3	0.33
3.5	0.33
4	0.33
4.5	0.33
5	0.33
6	0.34
7	0.34
8	0.34
9	0.35
10	0.35
12	0.36
14	0.37
16	0.38
18	0.38
20	0.38
25	0.38
30	0.39
40	0.39
50	0.39
60	0.39
75	0.39
90	0.39
120	0.39
150	0.39
180	0.39

Pit Dimensions (m)		
Length (m)	1.80	m
Width (m)	0.65	m
Depth	0.60	m
Water		
Start Depth of Water	0.30	m
Depth of Water	0.30	m
75% Full	0.375	m
25% Full	0.525	m
75%-25%	0.15	m
Volume of water (75%-25%)	**0.176**	m3
Area of Drainage	**2.94**	m2
Area of Drainage (75%-25%)	**1.905**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

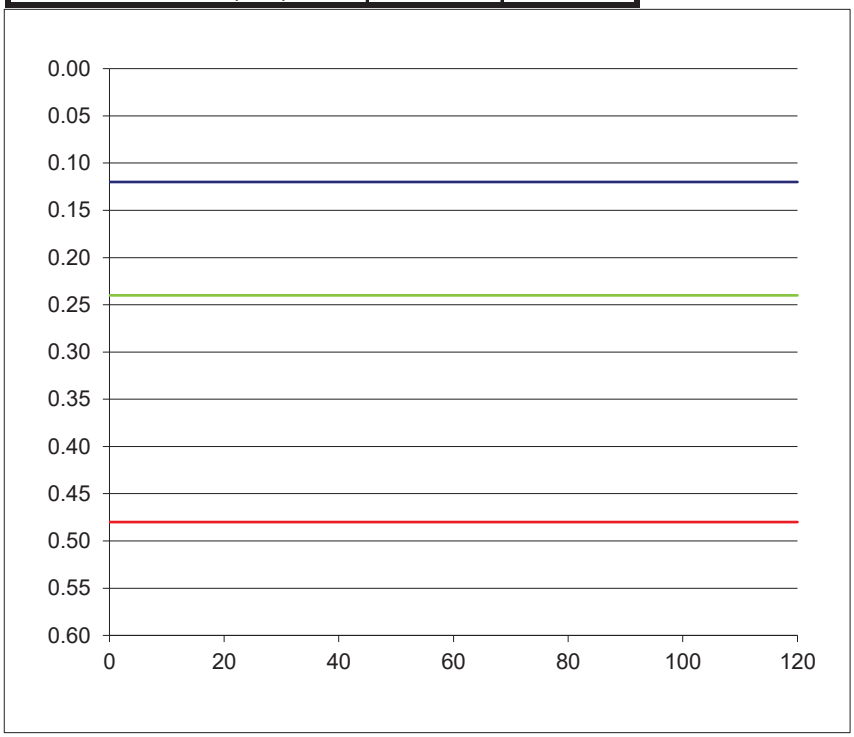
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA06
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.10	TOPSOIL.
0.10	0.60	Soft dark brown sandy gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.12
0.5	0.12
1	0.12
1.5	0.12
2	0.12
2.5	0.12
3	0.12
3.5	0.12
4	0.12
4.5	0.12
5	0.12
6	0.12
7	0.12
8	0.12
9	0.12
10	0.12
12	0.12
14	0.12
16	0.12
18	0.12
20	0.12
25	0.12
30	0.12
40	0.12
50	0.12
60	0.12
75	0.12
90	0.12
120	0.12

Pit Dimensions (m)		
Length (m)	1.75	m
Width (m)	0.65	m
Depth	0.60	m
Water		
Start Depth of Water	0.12	m
Depth of Water	0.48	m
75% Full	0.24	m
25% Full	0.48	m
75%-25%	0.24	m
Volume of water (75%-25%)	**0.273**	m3
Area of Drainage	**2.88**	m2
Area of Drainage (75%-25%)	**2.2895**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

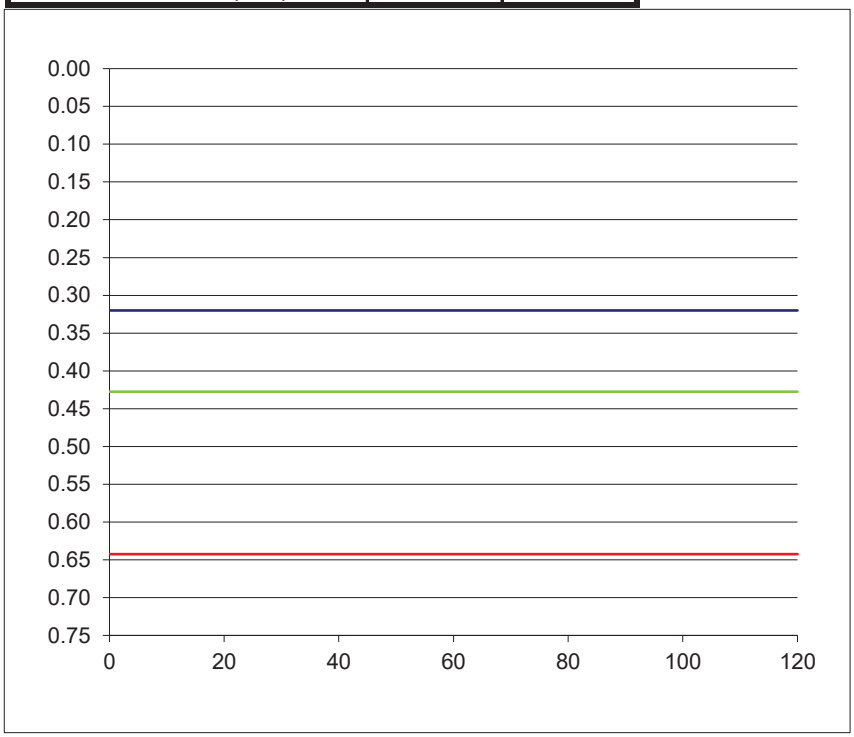
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA07
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.20	TOPSOIL.
0.20	0.75	Soft dark brown sandy gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.32
0.5	0.32
1	0.32
1.5	0.32
2	0.32
2.5	0.32
3	0.32
3.5	0.32
4	0.32
4.5	0.32
5	0.32
6	0.32
7	0.32
8	0.32
9	0.32
10	0.32
12	0.32
14	0.32
16	0.32
18	0.32
20	0.32
25	0.32
30	0.32
40	0.32
50	0.32
60	0.32
75	0.32
90	0.32
120	0.32

Pit Dimensions (m)		
Length (m)	2.00	m
Width (m)	0.65	m
Depth	0.75	m
Water		
Start Depth of Water	0.32	m
Depth of Water	0.43	m
75% Full	0.43	m
25% Full	0.64	m
75%-25%	0.22	m
Volume of water (75%-25%)	**0.280**	m3
Area of Drainage	**3.975**	m2
Area of Drainage (75%-25%)	**2.4395**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** or **Fail**

m/min **m/s**

SOAKAWAY TEST

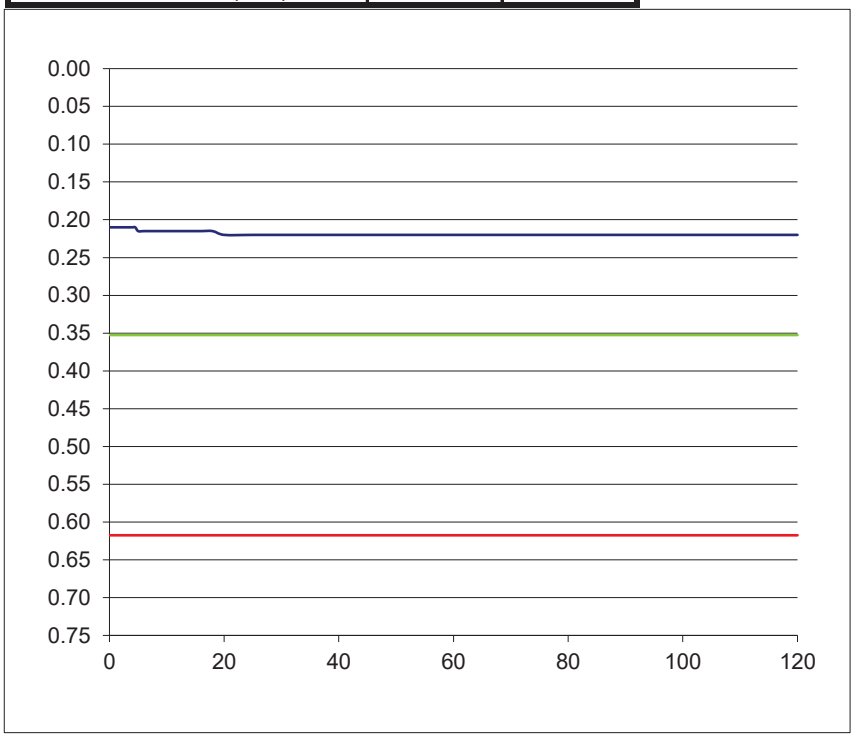
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA08
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.20	TOPSOIL.
0.20	0.75	Soft dark brown sandy gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.21
0.5	0.21
1	0.21
1.5	0.21
2	0.21
2.5	0.21
3	0.21
3.5	0.21
4	0.21
4.5	0.21
5	0.22
6	0.22
7	0.22
8	0.22
9	0.22
10	0.22
12	0.22
14	0.22
16	0.22
18	0.22
20	0.22
25	0.22
30	0.22
40	0.22
50	0.22
60	0.22
75	0.22
90	0.22
120	0.22

Pit Dimensions (m)		
Length (m)	2.00	m
Width (m)	0.65	m
Depth	0.75	m
Water		
Start Depth of Water	0.22	m
Depth of Water	0.53	m
75% Full	0.35	m
25% Full	0.62	m
75%-25%	0.27	m
Volume of water (75%-25%)	**0.345**	m3
Area of Drainage	**3.975**	m2
Area of Drainage (75%-25%)	**2.7045**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

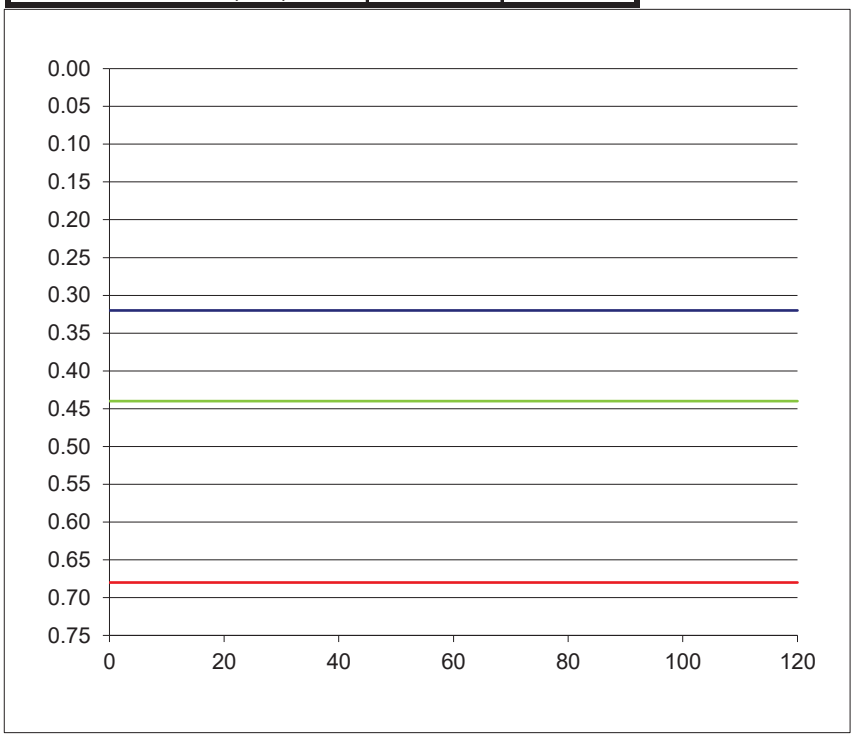
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA09
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.80	Soft dark brown sandy gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.32
0.5	0.32
1	0.32
1.5	0.32
2	0.32
2.5	0.32
3	0.32
3.5	0.32
4	0.32
4.5	0.32
5	0.32
6	0.32
7	0.32
8	0.32
9	0.32
10	0.32
12	0.32
14	0.32
16	0.32
18	0.32
20	0.32
25	0.32
30	0.32
40	0.32
50	0.32
60	0.32
75	0.32
90	0.32
120	0.32

Pit Dimensions (m)		
Length (m)	1.90	m
Width (m)	0.65	m
Depth	0.80	m
Water		
Start Depth of Water	0.32	m
Depth of Water	0.48	m
75% Full	0.44	m
25% Full	0.68	m
75%-25%	0.24	m
Volume of water (75%-25%)	**0.296**	m3
Area of Drainage	**4.08**	m2
Area of Drainage (75%-25%)	**2.459**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

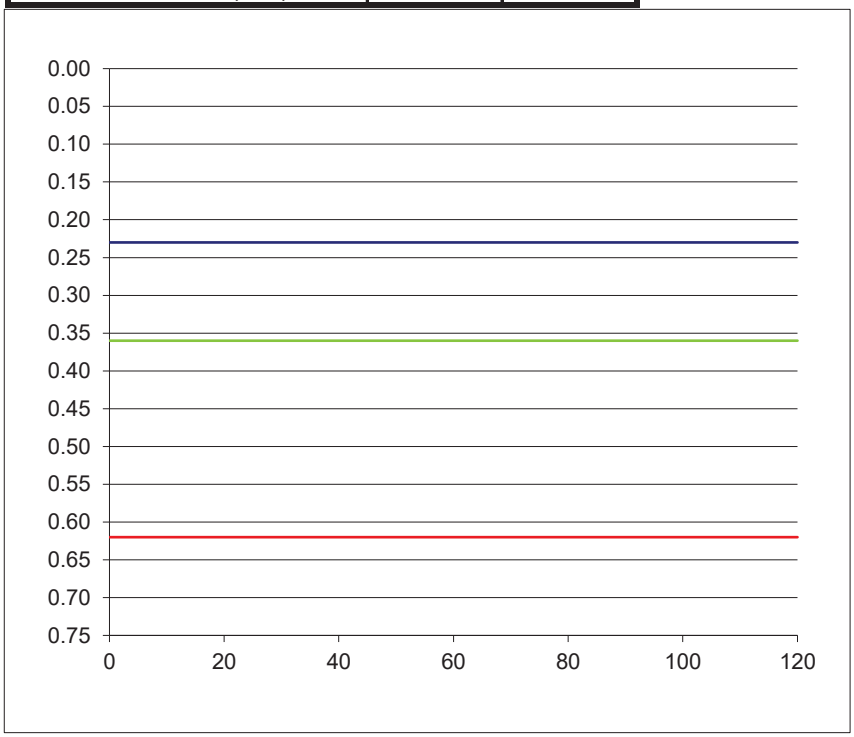
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA10
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.75	Soft dark brown sandy gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	0.23
0.5	0.23
1	0.23
1.5	0.23
2	0.23
2.5	0.23
3	0.23
3.5	0.23
4	0.23
4.5	0.23
5	0.23
6	0.23
7	0.23
8	0.23
9	0.23
10	0.23
12	0.23
14	0.23
16	0.23
18	0.23
20	0.23
25	0.23
30	0.23
40	0.23
50	0.23
60	0.23
75	0.23
90	0.23
120	0.23

Pit Dimensions (m)		
Length (m)	1.70	m
Width (m)	0.65	m
Depth	0.75	m
Water		
Start Depth of Water	0.23	m
Depth of Water	0.52	m
75% Full	0.36	m
25% Full	0.62	m
75%-25%	0.26	m
Volume of water (75%-25%)	**0.287**	m3
Area of Drainage	**3.525**	m2
Area of Drainage (75%-25%)	**2.327**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SOAKAWAY TEST

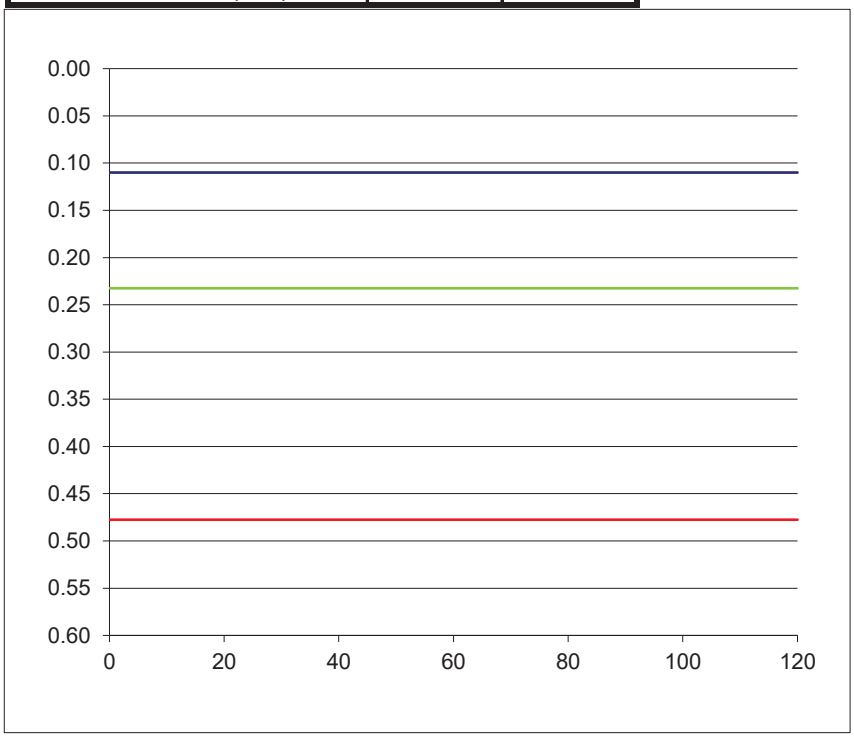
Project Reference:	5588
Contract name:	Hollybank
Location:	Swords, Co. Dublin
Test No:	SA11
Date:	15/04/2019

Ground Conditions

From	To	
0.00	0.20	TOPSOIL.
0.20	0.60	Soft brown slightly sandy slightly gravelly silty CLAY.

Elapsed Time (mins)	Fall of Water (m)
0	0.11
0.5	0.11
1	0.11
1.5	0.11
2	0.11
2.5	0.11
3	0.11
3.5	0.11
4	0.11
4.5	0.11
5	0.11
6	0.11
7	0.11
8	0.11
9	0.11
10	0.11
12	0.11
14	0.11
16	0.11
18	0.11
20	0.11
25	0.11
30	0.11
40	0.11
50	0.11
60	0.11
75	0.11
90	0.11
120	0.11

Pit Dimensions (m)		
Length (m)	1.80	m
Width (m)	0.65	m
Depth	0.60	m
Water		
Start Depth of Water	0.11	m
Depth of Water	0.49	m
75% Full	0.233	m
25% Full	0.478	m
75%-25%	0.25	m
Volume of water (75%-25%)	**0.287**	m3
Area of Drainage	**2.94**	m2
Area of Drainage (75%-25%)	**2.3705**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



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

SA01 Pit

SA01 Sidewall

SA01 Spoil

SA02 Pit

SA02 Sidewall

SA02 Spoil

SA03 Pit

SA03 Sidewall

SA03 Spoil

SA04 Pit

SA04 Sidewall

SA04 Spoil

SA05 Pit

SA05 Sidewall

SA05 Spoil

SA06 Pit

SA06 Sidewall

SA06 Spoil

SA07 Pit

SA07 Sidewall

SA07 Spoil

SA08 Pit

SA08 Sidewall

SA08 Spoil

SA09 Pit

SA09 Sidewall

SA09 Spoil

SA10 Pit

SA10 Sidewall

SA10 Spoil

SA11 Pit

SA11 Sidewall

SA11 Spoil

Appendix 2

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Boreholes					
SA01	717645.358	748329.515	8.09	317719.984	248306.326
SA02	717598.842	748261.667	9.17	317673.459	248238.463
SA03	717678.758	748264.889	9.58	317753.392	248241.686
SA04	717844.870	748271.232	5.69	317919.539	248248.031
SA05	717762.467	748232.056	8.41	317837.119	248208.846
SA06	717829.356	748185.099	8.86	317904.023	248161.880
SA07	717693.851	748188.483	9.35	317768.489	248165.263
SA08	717797.173	748135.760	12.69	317871.833	248112.530
SA09	717714.120	748113.908	13.52	317788.763	248090.672
SA10	717769.604	748080.324	14.25	317844.259	248057.082
SA11	717752.296	747998.336	13.27	317826.948	247975.076

Legend Key

Locations By Type - IP

Contract No:	5588
Contract Name:	Hollybank
Location:	Swords, Co. Dublin
Client:	Cairn Homes
Engineer:	Waterman Moylan
Title:	Site Plan
Scale:	1:2500
Drawn By:	SL

Site Investigations Ltd
The Grange
12th Lock Road
Lucan
Co. Dublin
T: 01 6108768
e: info@siteinvestigations.ie

11. Appendix 10.3 – Site Investigation Report

S.I. Ltd Contract No: 5769

Client: Cairn Homes PLC
Engineer: Waterman Moylan
Contractor: Site Investigations Ltd

Hollybank,
Swords, Co. Dublin
Site Investigation Report

Prepared by:

.....
Stephen Letch

Issue Date:	30/10/2020
Status	Final
Revision	1

Contents:

		Page No.
1.	Introduction	1
2.	Site Location	1
3.	Fieldwork	1
4.	Laboratory Testing	3
5.	Ground Conditions	4
6.	Recommendations and Conclusions	5

Appendices:

1. Cable Percussive Borehole Logs
2. Trial Pit Logs and Photographs
3. Dynamic Probe Logs
4. Geotechnical Laboratory Test Results
5. Environmental Laboratory Test Results
6. Survey Data

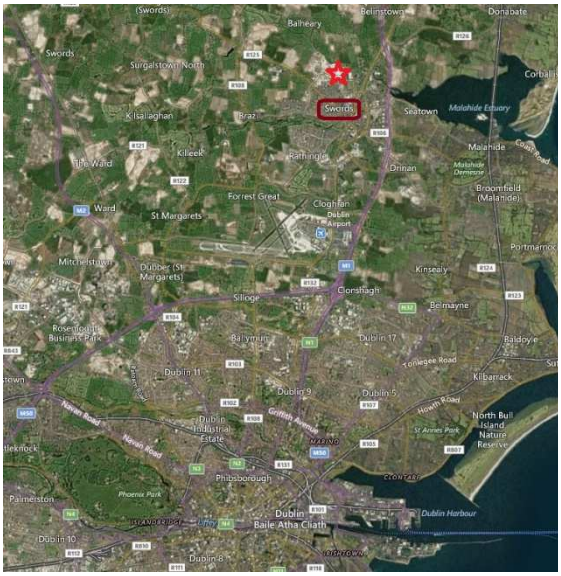
1. Introduction

In 2017, on the instructions of Waterman Moylan, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Hollybank, Swords, Co. Dublin. The investigation was completed for a proposed residential development on the site and following the subsequent planning application, the plan for the development was revised. Subsequently, SIL were requested to complete an additional investigation to this new design layout and this report covers that investigation. It was completed on behalf of the Client, Cairn Homes PLC in October 2020.

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

2. Site Location

The site is bordered by Glen Ellan Road and Jugback Lane to the north of Swords town centre in north Co. Dublin. The map on the left shows the location of Swords in Dublin and the location of the site to the north of Swords is shown on the right.



3. Fieldwork

The fieldworks comprised a programme of cable percussive borehole logs, trial pits and dynamic probes. All fieldwork was carried out in accordance with Eurocode 7: Geotechnical Design and IEI Specification & Related Documents for Ground Investigation in Ireland (2006).

The fieldworks comprised the following:

- 6 No. cable percussive borehole logs

- 8 No. trial pits
- 143 No. dynamic probes

3.1. Cable Percussive Borehole Logs

Cable percussion boring was undertaken at 6 No. locations using a Dando 150 rig and constructed 200mm diameter boreholes. The boreholes were completed at the southern part of the site where the proposed development is for multi-storey apartment blocks. The boreholes all terminated at the scheduled depth of 8.00mbgl. It was not possible to collect undisturbed samples due to the granular soils encountered so bulk disturbed samples were recovered at regular intervals.

To test the strength of the stratum, Standard Penetration Tests (SPT's) were performed at 1.00m intervals in accordance with BS 1377 (1990). In soils with high gravel and cobble content it is appropriate to use a solid cone (60°) (CPT) instead of the split spoon and this was used throughout the testing. The test is completed over 450mm and the cone is driven 150mm into the stratum to ensure that the test is conducted over an undisturbed zone. The cone is then driven the remaining 300mm and the blows recorded to report the N-Value. The report shows the N-Value with the 75mm incremental blows listed in brackets (e.g. BH101 at 1.00mbgl where N=14-(3,3/3,4,3,4)). Where refusal of 50 blows across the test zone was encountered was achieved during testing, the penetration depth is also reported (e.g. BH103 at 6.00mbgl where N=50-(6,6/50 for 240mm)).

At BH101 and BH106, groundwater standpipes were installed to allow for long term monitoring. These are formed of a slotted standpipe with a gravel pack surround to allow for the groundwater to ingress into the pipe and stabilise. Bentonite seals were placed above the pipes to ensure that water does not migrate into the hole from the surface.

The logs are presented in Appendix 1.

3.2. Trial Pits

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

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

3.3. Dynamic Probes

With the adjusted plan for the site, 143 No. dynamic probes were completed using a track mounted Competitor 130 machine. The testing complies with the requirements of BS1377: Part

9 (1990) and Eurocode 7: Part 3. The configuration utilised standard DPH (Heavy) probing method comprising a 50kg weight, 500mm drop height and a 50mm diameter (90°) cone. The number of blows required to drive the cone each 100mm increment into the sub soil is recorded in accordance with the standards. The dynamic probe provides no information regarding soil type or groundwater conditions.

The dynamic probe results can be used to analyse the strength of the soil strata encountered by the probe. 'Proceedings of the Trinity College Dublin Symposium of Field and Laboratory Testing of Soils for Foundations and Embankments' presents a paper by Foirbart that is most relevant to Irish soil conditions and within this paper the following equations were included:

Granular Soils: DPH N_{100} x 2.5 = SPT N value

Cohesive Soils: C_u = 15 x DPH N_{100} + 30 kN/m^2

These equations present a relationship between the probe N_{100} value and the SPT N value for granular soils and the undrained shear strength of cohesive soils.

The dynamic probe logs are presented in Appendix 3.

3.4. Surveying

Following completion of all the fieldworks, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with a site plan in Appendix 6.

4. Laboratory Testing

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

- 4 No. Moisture contents
- 4 No. Atterberg limits
- 4 No. Particle size gradings
- 4 No. pH values
- 4 No. sulphate content
- 4 No. chloride content

Environmental laboratory testing was completed by ALS Environmental Ltd, and consisted of:

- 2 No. Suite I Analysis
- 4 No. Loss on ignition

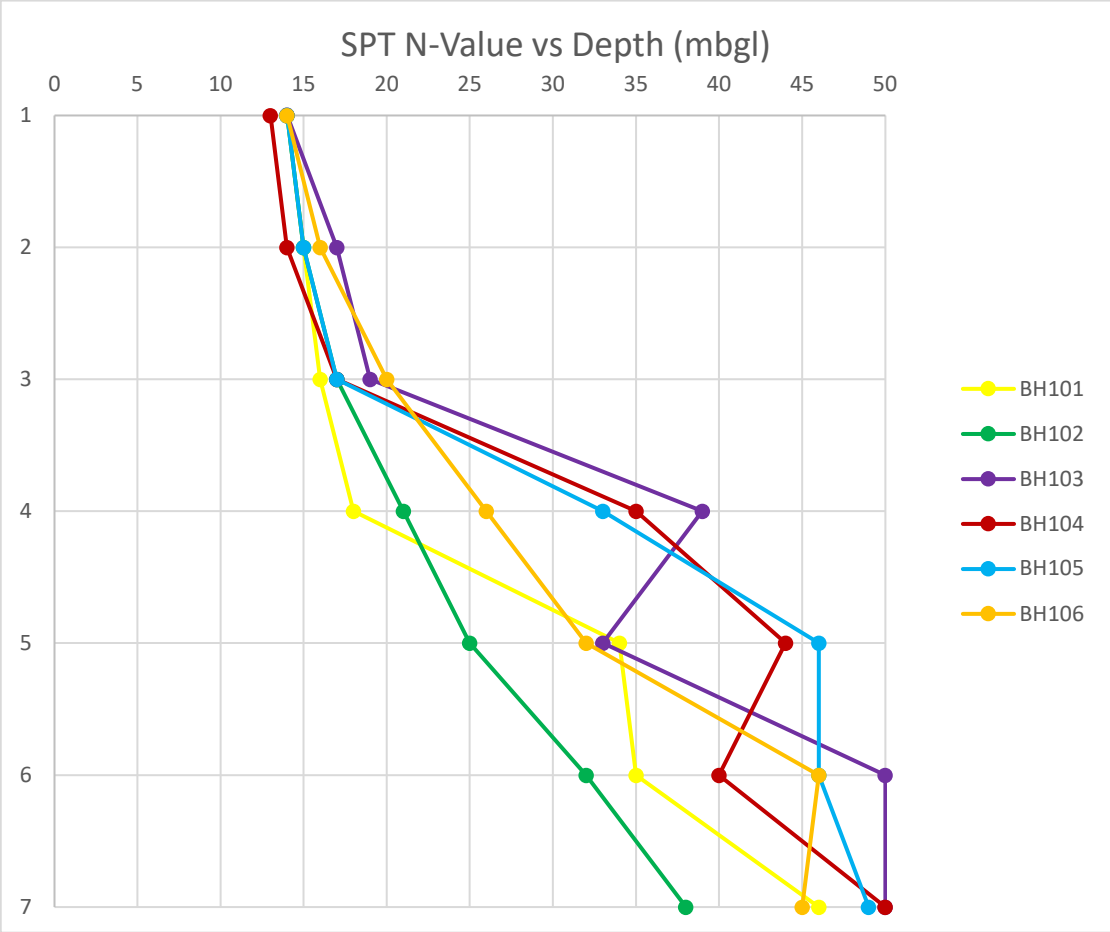
The geotechnical laboratory test results are presented in Appendix 4 with the environmental results in Appendix 5.

5. Ground Conditions

5.1. Overburden

The natural ground conditions are dominated by brown and brown grey slightly sandy slightly gravelly silty CLAY with cobbles and boulders overlying black slightly sandy slightly gravelly silty CLAY with cobbles and boulders. The natural soils consist of over-consolidated lodgement till which is encountered across the North Dublin region with several papers discussing the engineering characteristics of the soil. The brown soils are the weathered surface of the underlying black clays and the gravel and cobbles are generally subrounded to subangular and predominantly limestone in origin. The underlying black soil across the site is between 1.80mbgl (TP08) in the north east of the site and 4.90mbgl (BH01) in the south west.

The SPT blow counts are consistent as the graph below shows. The N-values range from 13 to 14 at 1.00mbgl and then increase to between 14 and 17 and then 16 to 20 at 2.00mbgl and 3.00mbgl respectively. There is a notable increase in BH103 to BH106 when the black boulder CLAY was encountered with values of 26 to 39 recorded whereas BH101 and BH102 recorded lower values of 18 and 21 respectively at 4.00mbgl in the brown boulder CLAY.



The laboratory tests of the cohesive soils confirm that CLAY soils dominate the site with low to intermediate plasticity indexes of 12 to 15% recorded. The particle size distribution curves show poorly sorted straight-line curves with 53% to 66% fines content.

5.2. Groundwater

Groundwater details in the boreholes and trial pits during the fieldworks are noted on the logs in Appendices 1 and 2. Two groundwater ingresses were recorded during the fieldworks period in BH101 at 3.80mbgl and TP103 at 2.90mbgl with a slow ingress rate. The remaining investigation locations remained dry during the fieldworks.

6. Recommendations and Conclusions

Please note the following caveats:

The recommendations given, and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between the exploratory hole locations or below the final level of excavation, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for adjacent unexpected conditions that have not been revealed by the exploratory holes.

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

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

6.1. Foundations

Due to the unknown depth of foundation and no longer-term groundwater information, this analysis assumes the groundwater will not influence the construction or performance of these foundations. It is further recommended that all bearing surfaces when excavated should be inspected by a suitably qualified Engineer to verify the information given in this report.

6.1.1. Apartment Blocks

The designed development includes for multi-storey apartment blocks to the south of the site and this is where the boreholes were completed. For this report, bearing capacities will be provided at 1.00mbgl, 2.00mbgl, 3.00mbgl and 4.00mbgl for each borehole to assist with the design.

Using a correlation proposed by Stroud and Butler between SPT N-values and plasticity indices, the SPT N-value can be used to calculate the undrained shear strength and for the soils encountered on site, this is Cu=6N. This can be used to calculate the ultimate bearing capacity, and finally, a factor of safety of 3 is applied to calculate the allowable bearing capacity (ABC) of the soils at these depths.

Depth/ mbgl	**BH101**		**BH102**		**BH103**		**BH104**		**BH105**		**BH106**	
	SPT	ABC	SPT	ABC	SPT	ABC	SPT	ABC	SPT	ABC	SPT	ABC
1.00	14	150	14	150	14	150	13	140	14	150	14	150
2.00	15	160	15	160	17	180	14	150	15	160	16	160
3.00	16	160	17	180	19	200	17	180	17	180	20	210
4.00	18	190	21	220	39	400	35	365	33	340	26	270

All capacities are kN/m^2 and are calculated with 1.00m of soil overburden, i.e. capacities at 4.00mbgl assume 3.00m of soil removed and foundations 1.00m below basement level.

The black boulder CLAY recorded higher SPT N-values as would be anticipated and therefore offers higher bearing capacities.

6.1.2. Dynamic Probes

For analysis of bearing capacities from the dynamic probes, the N_{100} values are used as follows in cohesive soils. The undrained shear strength (C_u) is calculated using the N_{100} value as per the equation in Section 3.3. This can then be used in calculations to work out the ultimate bearing capacity (ULS) and when a factor of safety of 3 is applied, the allowable bearing capacity (ABC) can be provided. The table below shows the allowable bearing capacities for N_{100} values 1 to 10 at 1.00mbgl with all values in kN/m^2.

N_{100} Value	C_u	ULS	ABC
1	45	250	85
2	60	330	110
3	75	400	135
4	90	480	160
5	105	555	185
6	120	630	210
7	135	705	235
8	150	780	260
9	165	855	285
10	180	930	310

The probe N_{100} values are generally good at 1.00mbgl with only 7 No. probes recording values of 1 and 35 No. probes recording values of 2. However, there are areas where values of 0 and 1 were recorded as deep as 2.40mbgl and 2.80mbgl respectively and therefore, each probe should be analysed and foundations lowered if soft spots are encountered on site.

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

- Foundations are to be constructed on a level formation of uniform material type (described above).
- The bulk unit weight of the material in this stratum has a minimum density of 19kN/m^3.
- All bearing capacity calculations allow for a settlement of 25mm.

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

6.2. Groundwater

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

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

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

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

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

As discussed previously, groundwater was only encountered in BH101 at 3.80mbgl and a slow ingress in TP103 at 2.90mbgl.

There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. However, based on this information at the exploratory hole locations to date, it is considered likely that any shallow ingress into excavations of the CLAY will be slow. If localised granular soils are encountered in shallow excavations, then the possibility of water ingressing into an excavation increase.

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

6.3. Contamination

Environmental testing was carried out on two samples from the investigation and the results are shown in Appendix 5. For material to be removed from site, Suite I testing was carried out to determine if the material is hazardous or non-hazardous and then the leachate results were compared with the published waste acceptance limits of BS EN 12457-2 to determine whether the material on the site could be accepted as 'inert material' by an Irish landfill.

The Waste Classification report created using HazWasteOnline™ software shows that the material tested can be classified as non-hazardous material.

Following this analysis of the solid test results, the leachate disposal suite results indicate that the soils tested would be able to be treated as Inert Waste.

Two samples were tested for analysis but it cannot be discounted that any localised contamination may have been missed. Any MADE GROUND excavated on site should be stockpiled separately to natural soils to avoid any potential cross contamination of the soils. Additional testing of these soils may be requested by the individual landfill before acceptance and a testing regime designed by an environmental engineer would be recommended to satisfy the landfill.

6.4. Aggressive Ground Conditions

The chemical test results in Appendix 4 indicate a general pH value between 8.30 and 8.40, which is close to neutral and below the level of 9, therefore no special precautions are required.

The maximum value obtained for water soluble sulphate was 131mg/l as SO_3. The BRE Special Digest 1:2005 – '*Concrete in Aggressive Ground'* guidelines require SO_4 values and after

conversion (SO_4 = SO_3 x 1.2), the maximum value of 157mg/l shows Class 1 conditions and no special precautions are required.

Appendix 1

Cable Percussive Borehole Logs

Contract No: 5769	# Cable Percussion Borehole Log	Borehole No: **BH101**

Contract:	Hollybank	Easting:	717699.038	Date Started:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748009.013	Date Completed:	05/10/2020
Client:	Cairn Homes PLC	Elevation:	13.31	Drilled By:	T. Tindall
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			13.11					
		Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.				0.50	ES	TT01		
						1.00	B	TT02		
						1.00	C	N=14 (3,3/3,4,3,4)		
						2.00	B	TT03		
						2.00	C	N=15 (3,4/4,4,3,4)		
						3.00	B	TT04		
						3.00	C	N=16 (3,3/4,4,4,4)		
						4.00	B	TT05		
						4.00	C	N=18 (3,3/4,5,5,4)		
	4.90	Very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			8.41	5.00	B	TT06		
						5.00	C	N=34 (4,6/6,8,9,11)		
						6.00	B	TT07		
						6.00	C	N=35 (5,5/6,8,8,13)		
						7.00	B	TT08		
						7.00	C	N=46 (4,6/8,11,13,14)		
	8.00	End of Borehole at 8.00m			5.31					

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
			3.80	2.80	4.90	05/10	8.00	Dry	0.00	1.50	Solid	0.00	1.00	Bentonite	-
									1.50	8.00	Slotted	1.00	8.00	Gravel	

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

Contract No: 5769	**Cable Percussion Borehole Log**	Borehole No: **BH102**

Contract:	Hollybank	Easting:	717739.775	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	747995.675	Date Completed:	07/10/2020
Client:	Cairn Homes PLC	Elevation:	12.84	Drilled By:	T. Tindall
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			12.64					
		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with low cobble content.		12.5		0.50	ES	TT17		
0.5				12.0						
1.0						1.00	B	TT18		
						1.00	C	N=14 (3,3/3,3,4,4)		
1.5				11.5						
2.0				11.0		2.00	B	TT19		
						2.00	C	N=15 (3,3/4,4,3,4)		
2.5				10.5						
3.0				10.0		3.00	B	TT20		
						3.00	C	N=17 (3,4/4,4,4,5)		
3.5				9.5						
4.0				9.0		4.00	B	TT21		
						4.00	C	N=21 (3,3/4,4,6,7)		
4.5	4.40	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.		8.5	8.44					
5.0				8.0		5.00	B	TT22		
						5.00	C	N=25 (5,4/5,5,7,8)		
5.5				7.5						
6.0				7.0		6.00	B	TT23		
						6.00	C	N=32 (4,5/5,7,9,11)		
6.5				6.5						
7.0				6.0		7.00	B	TT24		
						7.00	C	N=38 (5,5/6,8,11,13)		
7.5				5.5						
8.0	8.00	End of Borehole at 8.00m		5.0	4.84					
8.5				4.5						
9.0				4.0						
9.5				3.5						
				3.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
						07/10	8.00	Dry				0.00	8.00	Arisings	-

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

Contract No: 5769	**Cable Percussion Borehole Log**	Borehole No: **BH103**

Contract:	Hollybank	Easting:	717777.734	Date Started:	06/10/2020
Location:	Swords, Co. Dublin	Northing:	748014.477	Date Completed:	06/10/2020
Client:	Cairn Homes PLC	Elevation:	13.64	Drilled By:	T. Tindall
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.		13.5	13.44					
0.5		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with low cobble content.		13.0		0.50	ES	TT09		
1.0				12.5		1.00 1.00	B C	TT10 N=14 (3,3/3,3,4,4)		
1.5				12.0						
2.0				11.5		2.00 2.00	B C	TT11 N=17 (3,3/4,4,4,5)		
2.5				11.0						
3.0				10.5		3.00 3.00	B C	TT12 N=19 (3,4/4,4,5,6)		
3.5	3.70			10.0	9.94					
4.0		Very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.		9.5		4.00 4.00	B C	TT13 N=39 (5,5/7,9,13,10)		
4.5				9.0						
5.0				8.5		5.00 5.00	B C	TT14 N=33 (4,6/6,8,8,11)		
5.5				8.0						
6.0				7.5		6.00 6.00	B C	TT15 N=50 (6,6/50 for 240mm)		
6.5				7.0						
7.0				6.5		7.00 7.00	B C	TT16 N=50 (5,7/50 for 235mm)		
7.5				6.0						
8.0	8.00	End of Borehole at 8.00m		5.5	5.64					
8.5				5.0						
9.0				4.5						
9.5				4.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
						06/10	8.00	Dry				0.00	8.00	Arisings	-

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

Contract No: 5769	**Cable Percussion Borehole Log**	Borehole No: **BH104**

Contract:	Hollybank	Easting:	717818.977	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748031.269	Date Completed:	12/10/2020
Client:	Cairn Homes PLC	Elevation:	12.94	Drilled By:	T. Tindall
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			12.74					
		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with low cobble content.		12.5		0.50	ES	TT41		
0.5										
1.0				12.0		1.00 1.00	B C	TT42 N=13 (2,3/3,3,4,3)		
1.5				11.5						
2.0				11.0		2.00 2.00	B C	TT43 N=14 (3,4/3,4,4,3)		
2.5				10.5						
3.0				10.0		3.00 3.00	B C	TT44 N=17 (3,3/4,4,4,5)		
3.5				9.5						
	3.70	Very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			9.24					
4.0				9.0		4.00 4.00	B C	TT45 N=35 (5,7/8,7,9,11)		
4.5				8.5						
5.0				8.0		5.00 5.00	B C	TT46 N=44 (5,5/8,10,13,13)		
5.5				7.5						
6.0				7.0		6.00 6.00	B C	TT47 N=40 (6,7/9,9,10,12)		
6.5				6.5						
7.0				6.0		7.00 7.00	B C	TT48 N=50 (8,9/50 for 275mm)		
7.5				5.5						
8.0	8.00	End of Borehole at 8.00m		5.0	4.94					
8.5				4.5						
9.0				4.0						
9.5				3.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
						12/10	8.00	Dry				0.00	8.00	Arisings	-

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

Contract No: 5769	# Cable Percussion Borehole Log	Borehole No: **BH105**

Contract:	Hollybank	Easting:	717867.506	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748009.768	Date Completed:	09/10/2020
Client:	Cairn Homes PLC	Elevation:	12.68	Drilled By:	T. Tindall
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.		12.5	12.48					
		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with low cobble content.				0.50	ES	TT33		
0.5				12.0						
1.0						1.00	B	TT34		
				11.5		1.00	C	N=14 (3,3/3,3,4,4)		
1.5										
				11.0						
2.0						2.00	B	TT35		
				10.5		2.00	C	N=15 (3,3/4,3,4,4)		
2.5										
				10.0						
3.0						3.00	B	TT36		
				9.5		3.00	C	N=17 (3,4/4,5,4,4)		
3.5	3.50	Very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			9.18					
				9.0						
4.0						4.00	B	TT37		
				8.5		4.00	C	N=33 (4,6/7,7,8,11)		
4.5										
				8.0						
5.0						5.00	B	TT38		
				7.5		5.00	C	N=46 (5,7/9,13,11,13)		
5.5										
				7.0						
6.0						6.00	B	TT39		
				6.5		6.00	C	N=46 (7,8/10,11,13,12)		
6.5										
				6.0						
7.0						7.00	B	TT40		
				5.5		7.00	C	N=49 (8,8/11,12,12,14)		
7.5										
				5.0						
8.0	8.00	End of Borehole at 8.00m			4.68					
				4.5						
8.5										
				4.0						
9.0										
				3.5						
9.5										
				3.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
						09/10	8.00	Dry				0.00	8.00	Arisings	-

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

Contract No: 5769	**Cable Percussion Borehole Log**	Borehole No: **BH106**

Contract:	Hollybank	Easting:	717863.616	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748048.217	Date Completed:	08/10/2020
Client:	Cairn Homes PLC	Elevation:	12.83	Drilled By:	T. Tindall
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			12.63					
		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with low cobble content.				0.50	ES	TT25		
						1.00	B	TT26		
						1.00	C	N=14 (2,3/3,3,4,4)		
						2.00	B	TT27		
						2.00	C	N=16 (3,3/4,3,4,5)		
						3.00	B	TT28		
						3.00	C	N=20 (3,4/4,5,5,6)		
	3.70	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			9.13					
						4.00	B	TT29		
						4.00	C	N=26 (4,4/6,6,6,8)		
						5.00	B	TT30		
						5.00	C	N=32 (5,5/5,7,9,11)		
						6.00	B	TT31		
						6.00	C	N=46 (6,8/9,13,13,11)		
						7.00	B	TT32		
						7.00	C	N=45 (7,7/10,11,11,13)		
	8.00	End of Borehole at 8.00m			4.83					

Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5

Level (mOD): 12.5, 12.0, 11.5, 11.0, 10.5, 10.0, 9.5, 9.0, 8.5, 8.0, 7.5, 7.0, 6.5, 6.0, 5.5, 5.0, 4.5, 4.0, 3.5, 3.0

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
						08/10	8.00	Dry	0.00	1.50	Solid	0.00	1.00	Bentonite	-
									1.50	8.00	Slotted	1.00	8.00	Gravel	

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

Appendix 2

Trial Pit Logs and Photographs

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP101**
Contract:	Hollybank	Easting:	717594.205	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748257.711	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	9.20	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.							
	0.20	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).		9.0	9.00				
0.5				8.5					
1.0						1.00	B	PM10	
	1.20	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).		8.0	8.00				
1.5				7.5					
2.0						2.00	B	PM11	
				7.0					
2.5	2.50	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			6.70				
				6.5		2.80	B	PM12	
	3.00	**Pit terminated at 3.00m**			6.20				

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

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP102**
Contract:	Hollybank	Easting:	717636.728	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748329.938	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	8.52	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.		8.5					
	0.40	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			8.12				
0.5				8.0					
1.0				7.5		1.00	B	PM08	
	1.20	Grey silty very sandy fine to coarse, subangular to subrounded GRAVEL of limestone with high cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of limestone.			7.32				
1.5				7.0					
2.0				6.5		2.00	B	PM09	
2.5				6.0					
	3.00	**Pit terminated at 3.00m**			5.52				

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

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP103**
Contract:	Hollybank	Easting:	717671.220	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748198.270	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	9.73	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.		9.5					
	0.40	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			9.33				
0.5				9.0					
1.0						1.00	B	PM06	
				8.5					
1.5									
				8.0					
	1.90	Stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			7.83				
2.0				7.5					
2.5						2.50	B	PM07	
				7.0					▼
	3.00	**Pit terminated at 3.00m**			6.73				

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	2.90 Slow	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP104**
Contract:	Hollybank	Easting:	717725.647	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748194.038	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	8.86	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.							
	0.30	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			8.56				
0.5				8.5					
				8.0					
1.0						1.00	B	PM03	
				7.5					
1.5									
	1.70	Stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			7.16				
				7.0					
2.0						2.00	B	PM04	
				6.5					
2.5	2.50	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			6.36				
				6.0		2.80	B	PM05	
	3.00	**Pit terminated at 3.00m**			5.86				

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

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP105**
Contract:	Hollybank	Easting:	717699.425	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748083.810	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	14.45	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.							
	0.30	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			14.15				
0.5				14.0					
1.0				13.5		1.00	B	PM01	
1.5				13.0					
2.0				12.5					
2.5				12.0		2.50	B	PM02	
				11.5					
	3.00	**Pit terminated at 3.00m**			11.45				

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

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP106**
Contract:	Hollybank	Easting:	717805.064	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748123.603	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	13.59	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.		13.5					
	0.40	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			13.19				
0.5				13.0		0.80	B	PM18	
1.0	1.00	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			12.59				
				12.5					
1.5				12.0					
2.0						2.00	B	PM19	
				11.5					
2.5				11.0					
	3.00	**Pit terminated at 3.00m**			10.59				

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

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP107**
Contract:	Hollybank	Easting:	717849.251	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748187.314	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	8.68	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.		8.5					
	0.40	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			8.28				
0.5				8.0					
1.0						1.00	B	PM16	
				7.5					
1.5									
				7.0					
	1.80	Grey silty very sandy fine to coarse, subangular to subrounded GRAVEL of limestone with high cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of limestone.			6.88				
2.0									
				6.5					
2.5						2.50	B	PM17	
				6.0					
	3.00	**Pit terminated at 3.00m**			5.68				

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

Contract No: 5769	**Trial Pit Log**				Trial Pit No: **TP108**
Contract:	Hollybank	Easting:	717873.490	Date:	05/10/2020
Location:	Swords, Co. Dublin	Northing:	748253.099	Excavator:	JCB 3CX
Client:	Cairn Homes PLC	Elevation:	5.99	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.60 x 3.00	Status:	FINAL

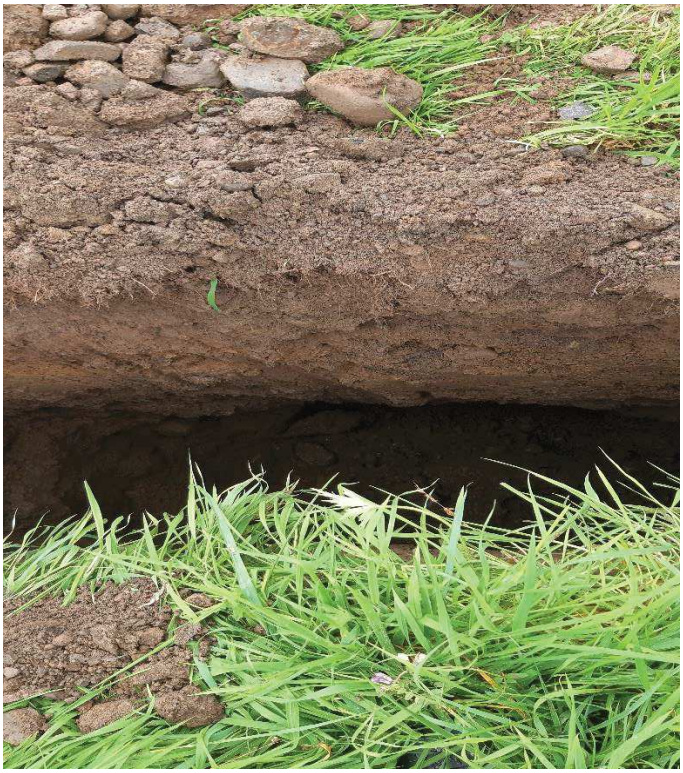
Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.							
	0.30	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			5.69				
0.5				5.5					
1.0				5.0		1.00	B	PM13	
	1.20	Stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			4.79				
1.5				4.5		1.50	B	PM14	
	1.80	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).			4.19				
2.0				4.0					
2.5				3.5		2.50	B	PM15	
	3.00	**Pit terminated at 3.00m**			2.99				

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

TP101 Sidewall

TP101 Spoil

TP102 Sidewall



TP102 Spoil

TP103 Sidewall

TP103 Spoil

TP104 Sidewall

TP104 Spoil

TP105 Sidewall

TP105 Spoil

TP106 Sidewall

TP106 Spoil

TP107 Sidewall

TP107 Spoil

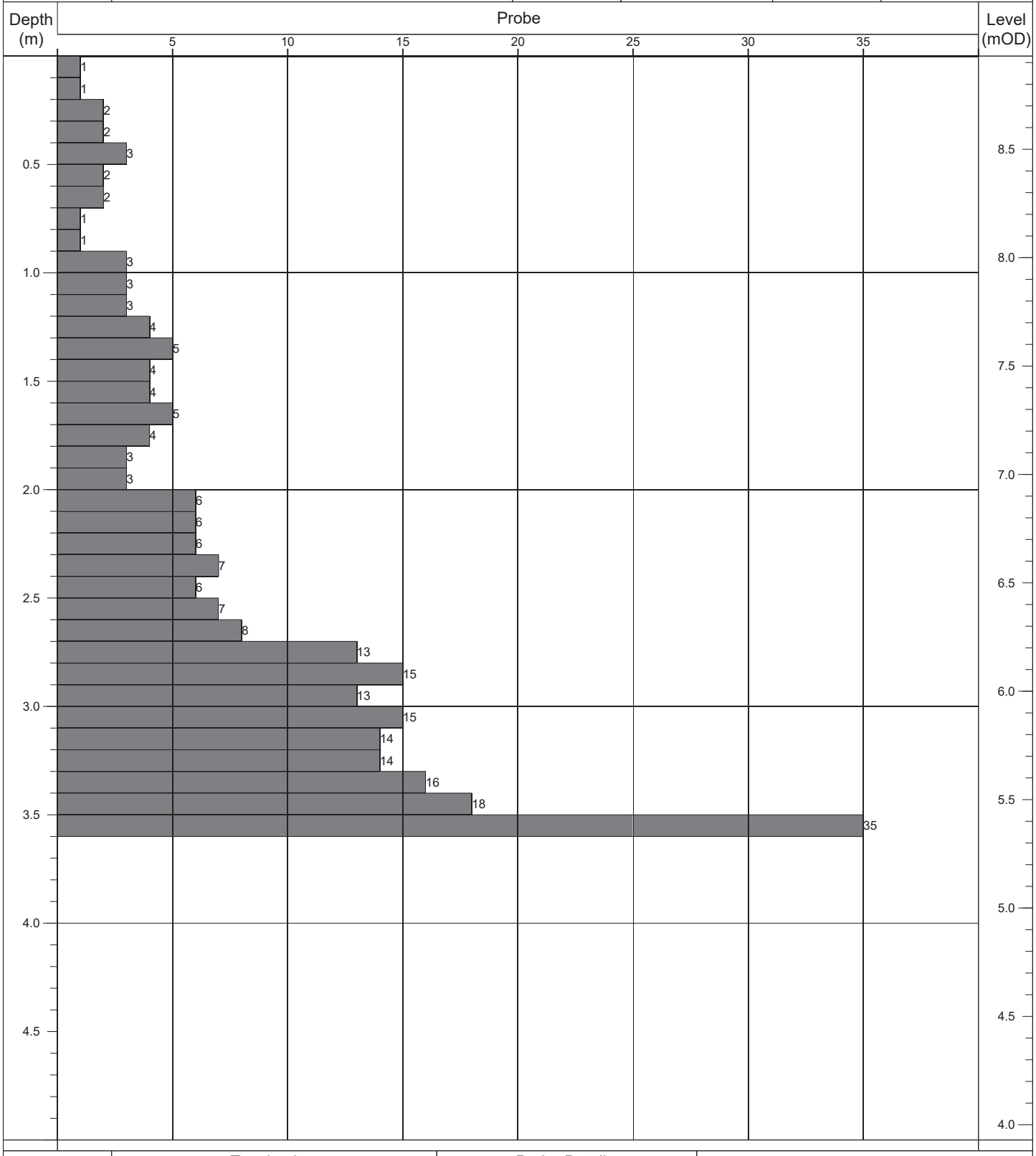
TP108 Sidewall

TP108 Spoil

Appendix 3

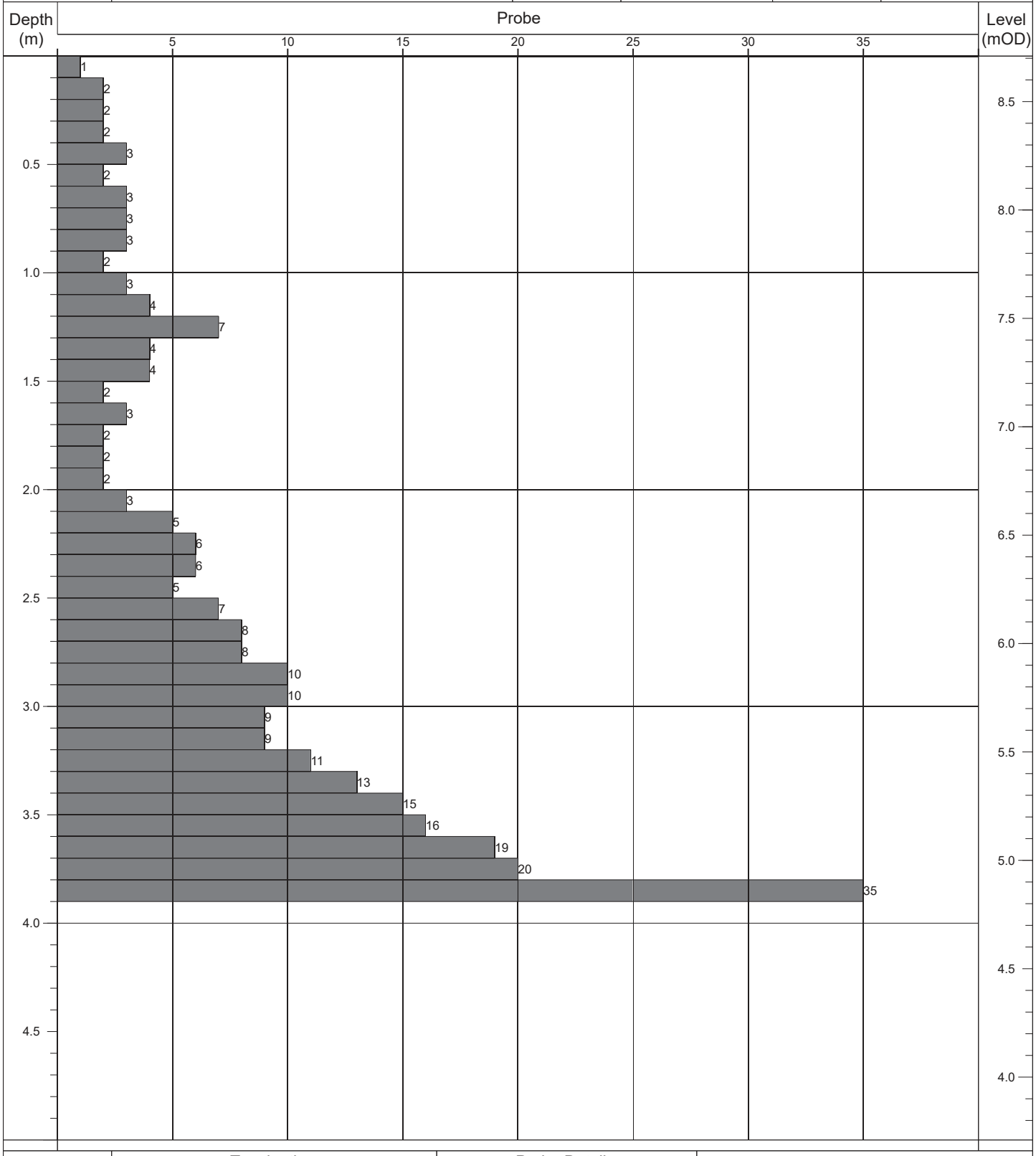
Dynamic Probe Logs

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP001**
Contract:	Hollybank	Easting:	717531.598	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748355.336	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.93	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



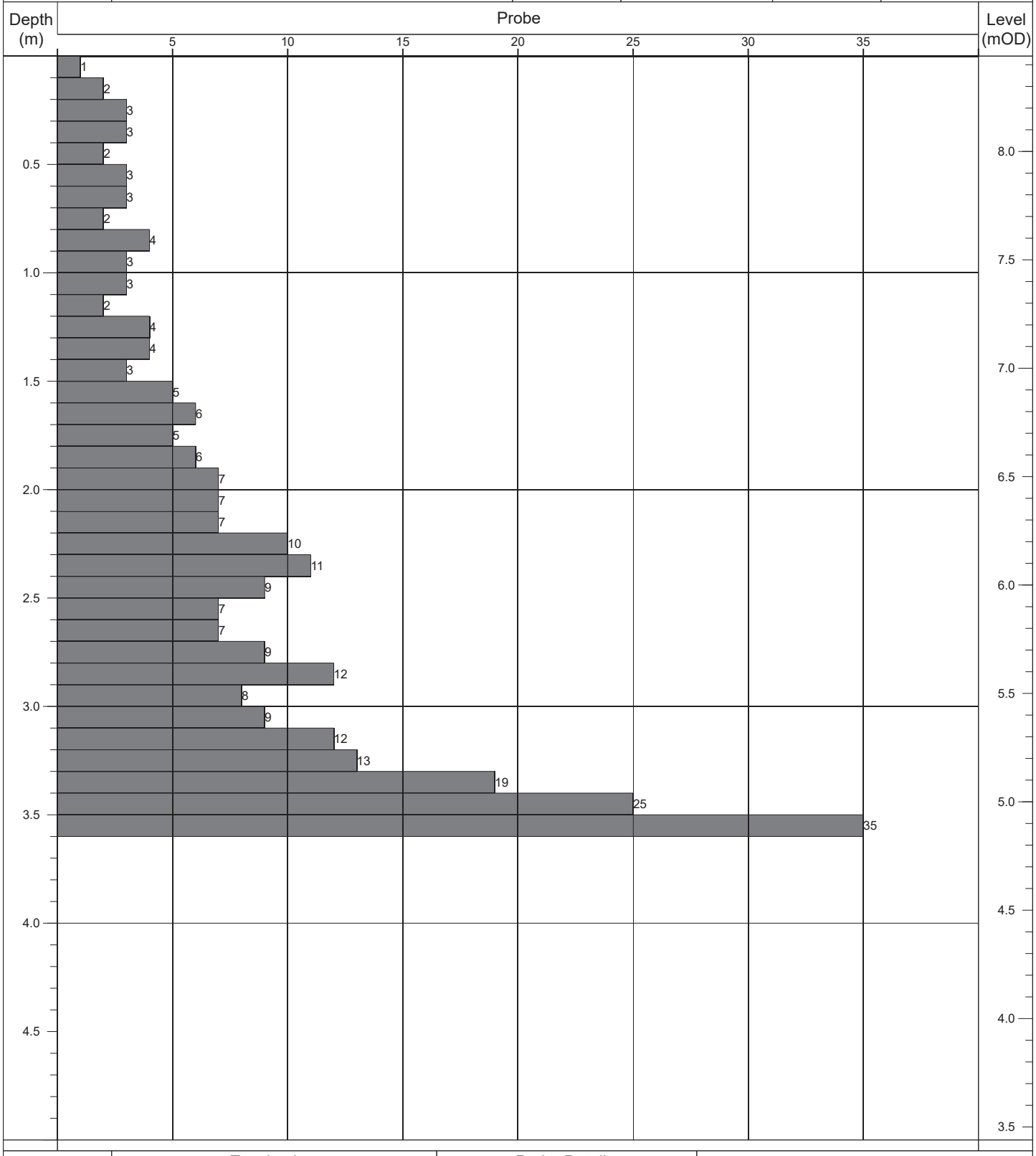
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP002**
Contract:	Hollybank	Easting:	717541.212	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748340.669	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.71	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



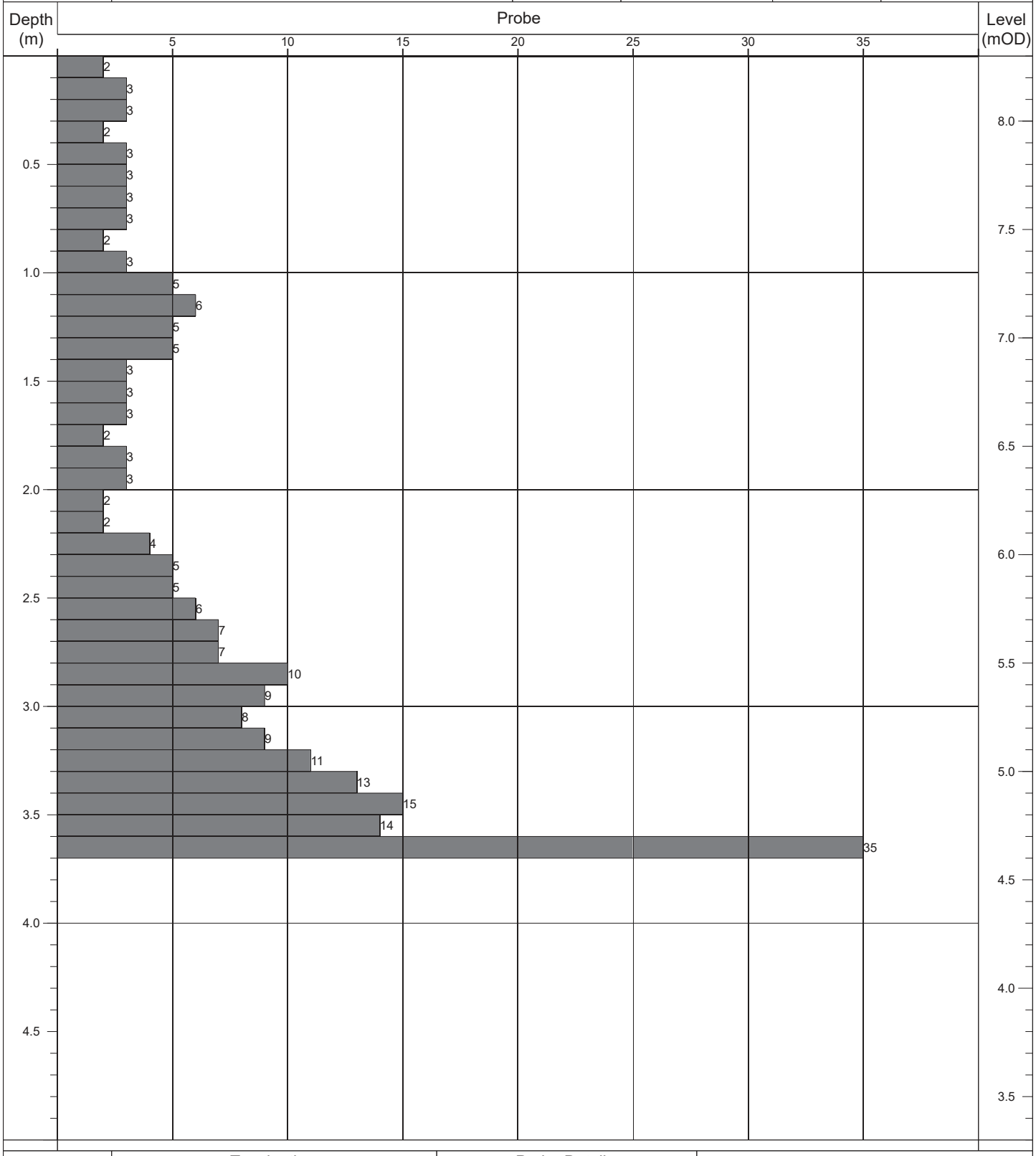
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP003**
Contract:	Hollybank	Easting:	717548.002	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748324.724	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.44	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



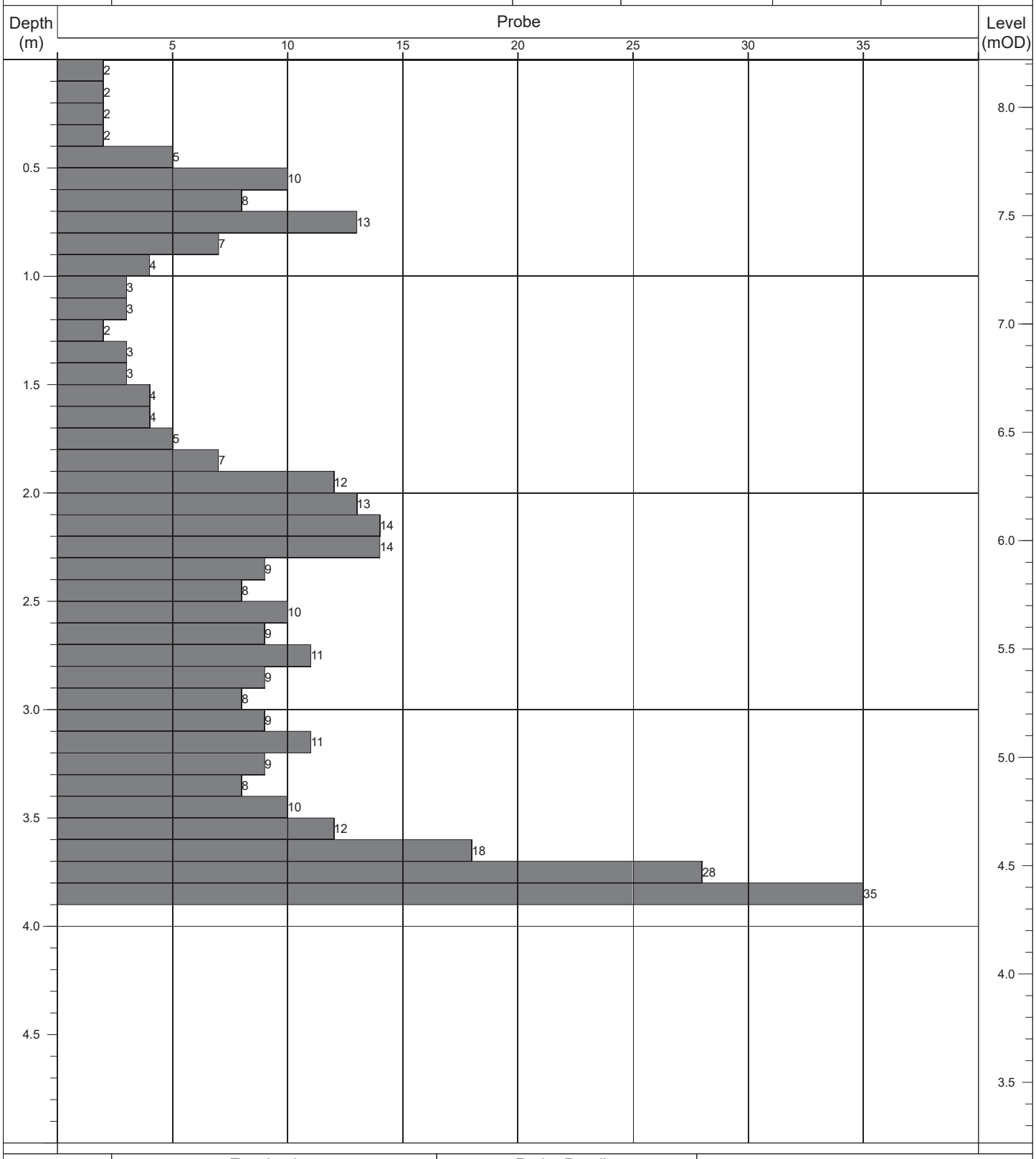
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP004**
Contract:	Hollybank	Easting:	717560.112	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748312.457	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.30	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



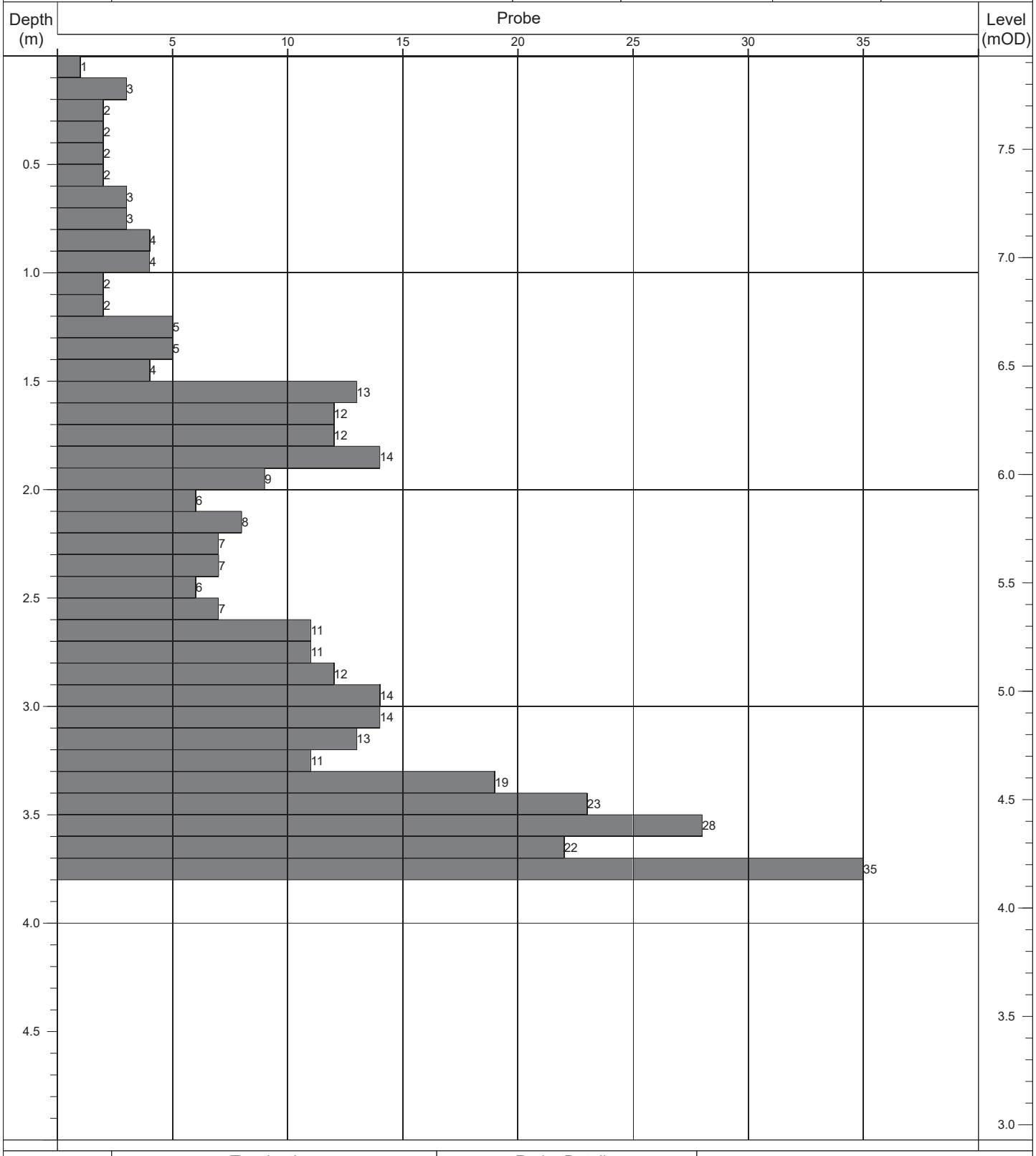
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP005**
Contract:	Hollybank	Easting:	717568.568	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748326.123	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.22	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



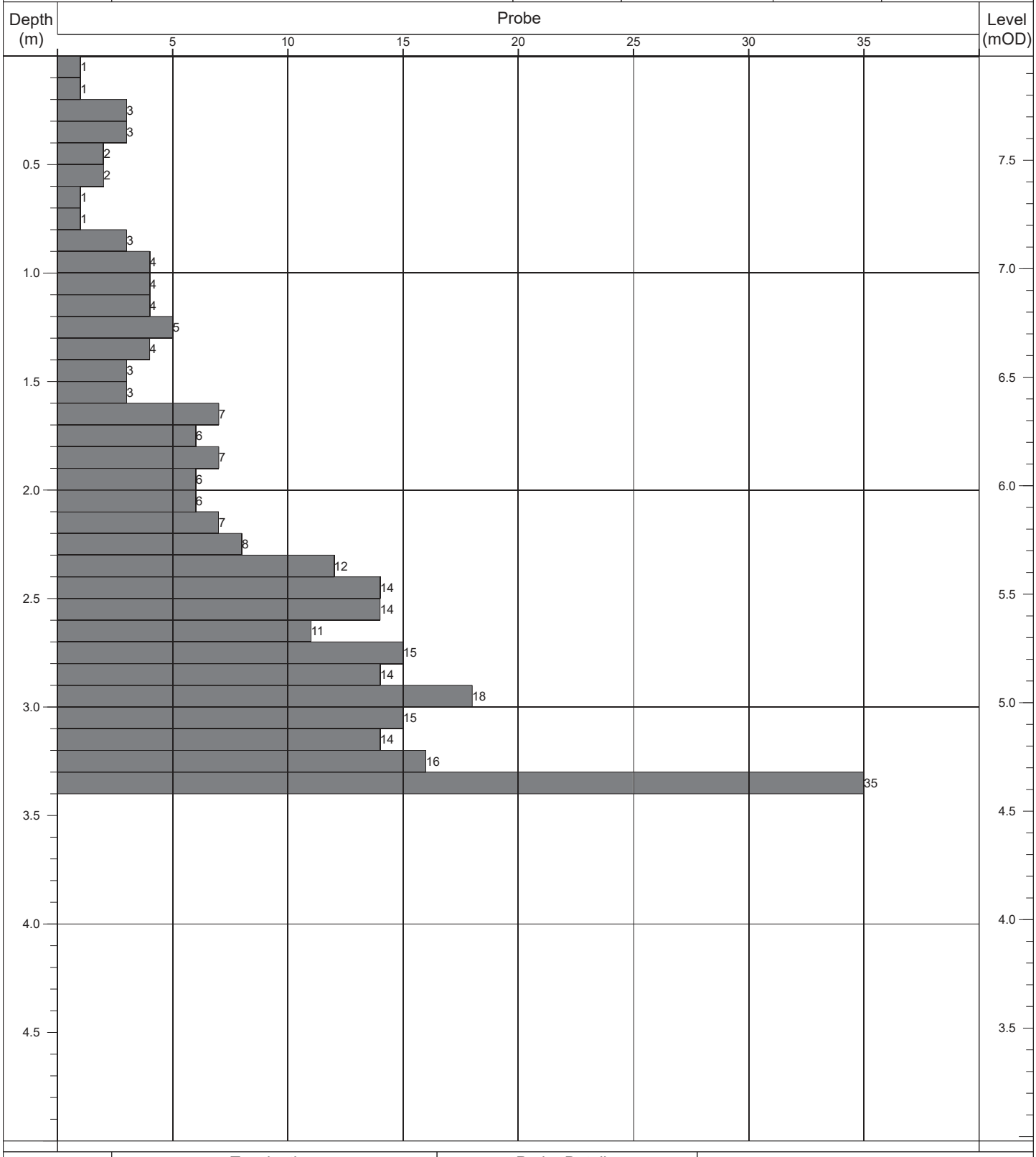
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP006**
Contract:	Hollybank	Easting:	717580.059	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748332.528	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.93	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



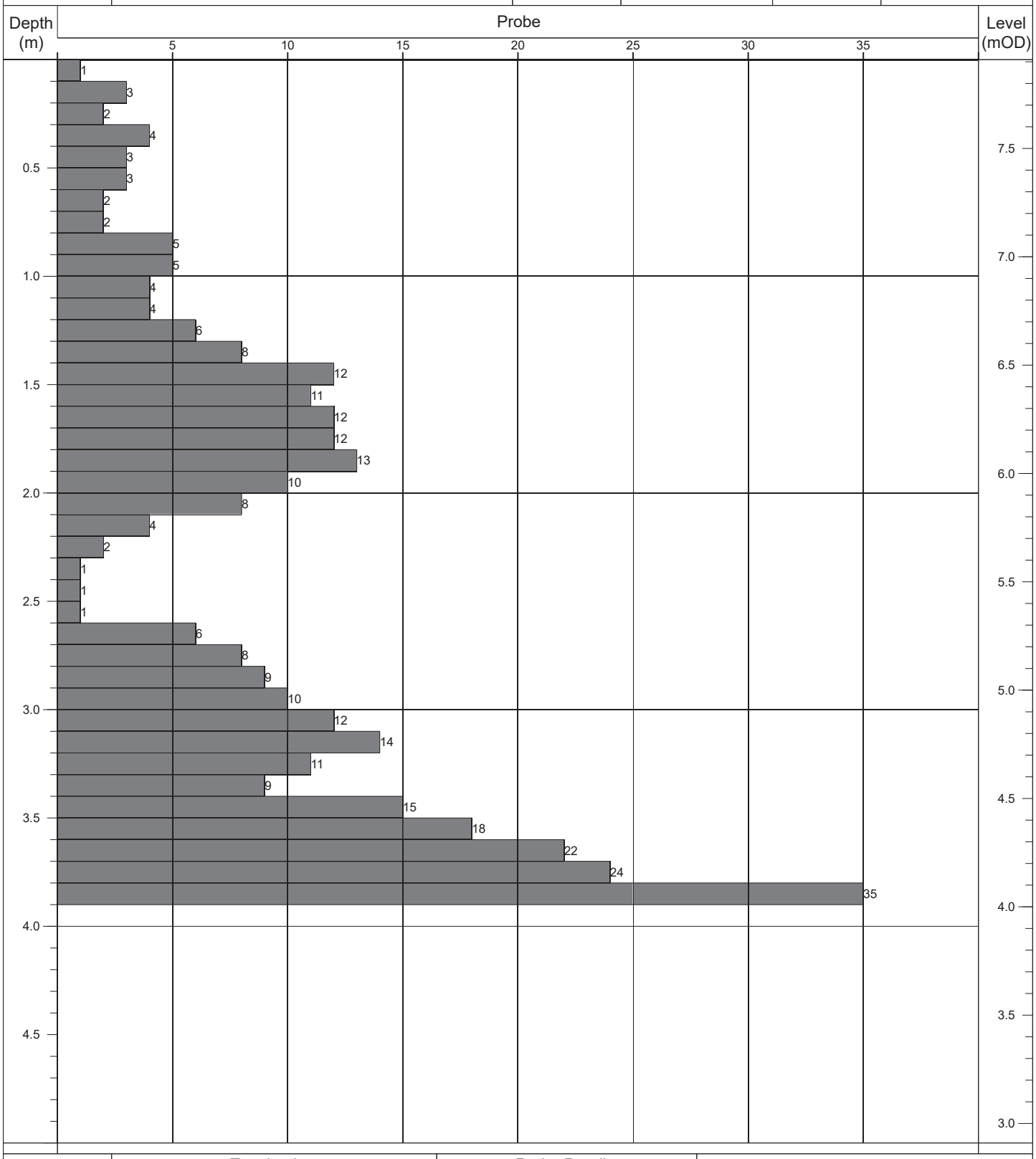
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP007**
Contract:	Hollybank	Easting:	717590.263	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748339.946	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.98	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



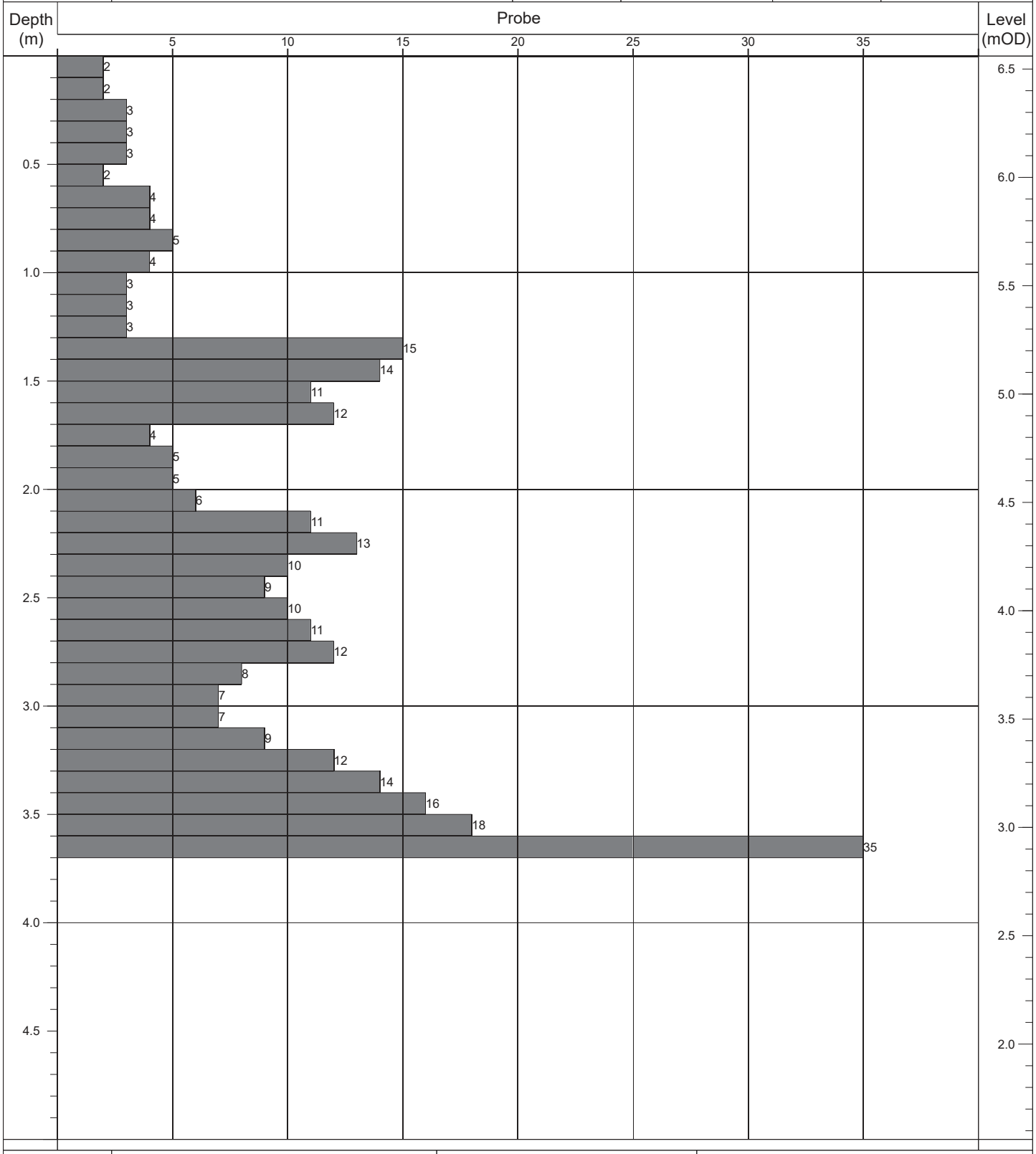
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP008**
Contract:	Hollybank	Easting:	717603.527	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748347.895	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.91	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



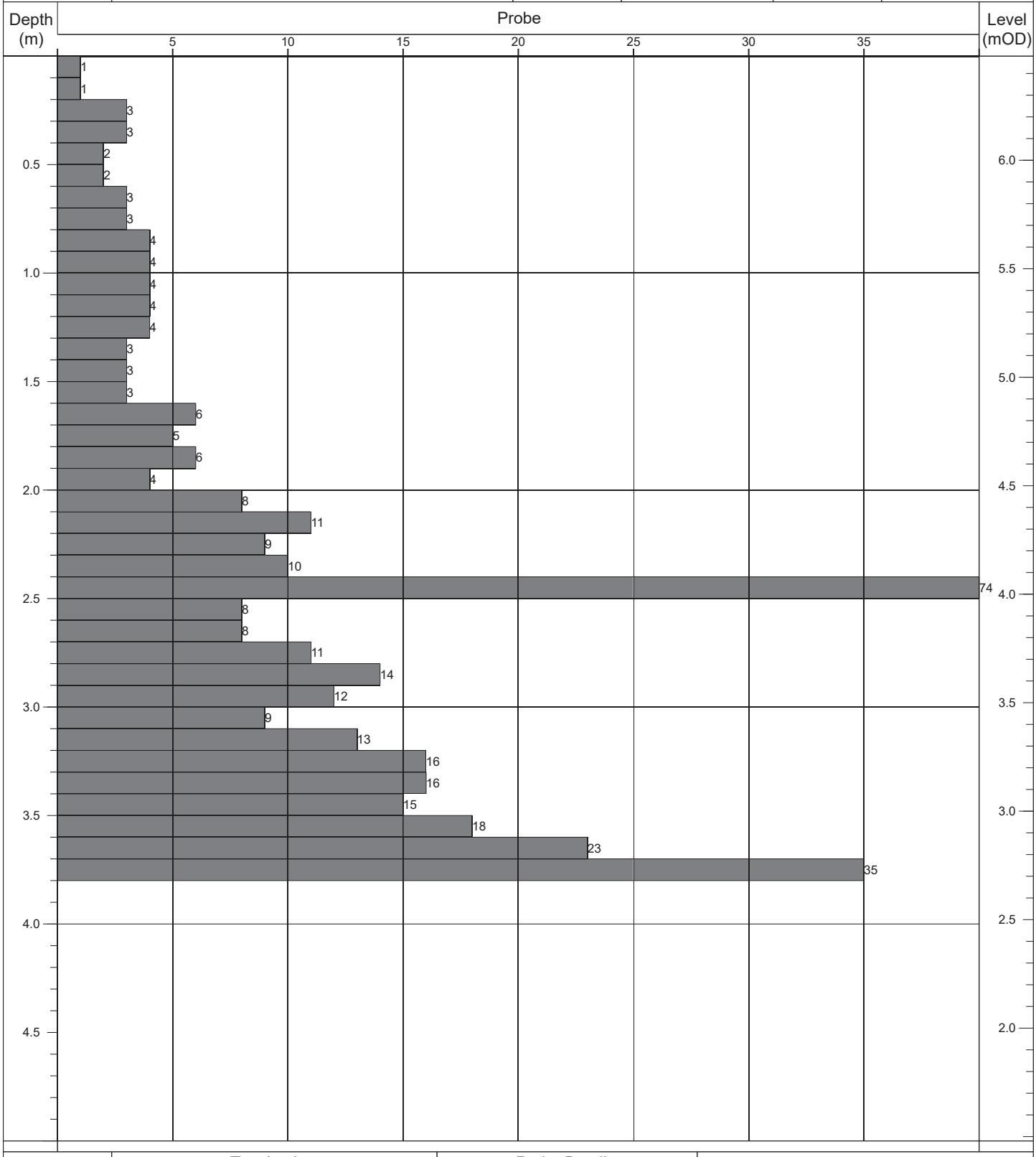
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP009**
Contract:	Hollybank	Easting:	717611.085	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748380.992	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.56	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



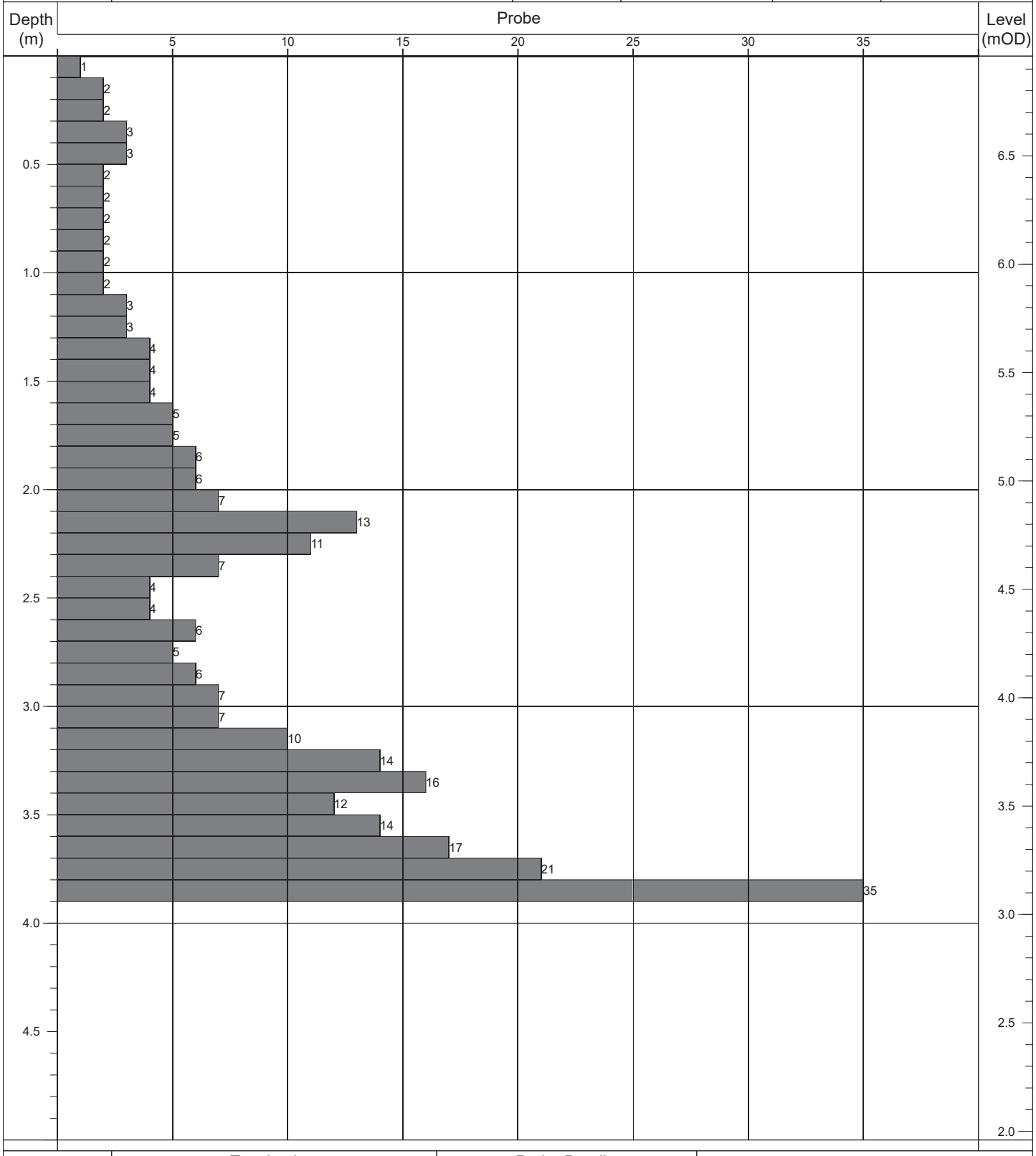
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP010**
Contract:	Hollybank	Easting:	717629.721	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748375.199	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.48	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



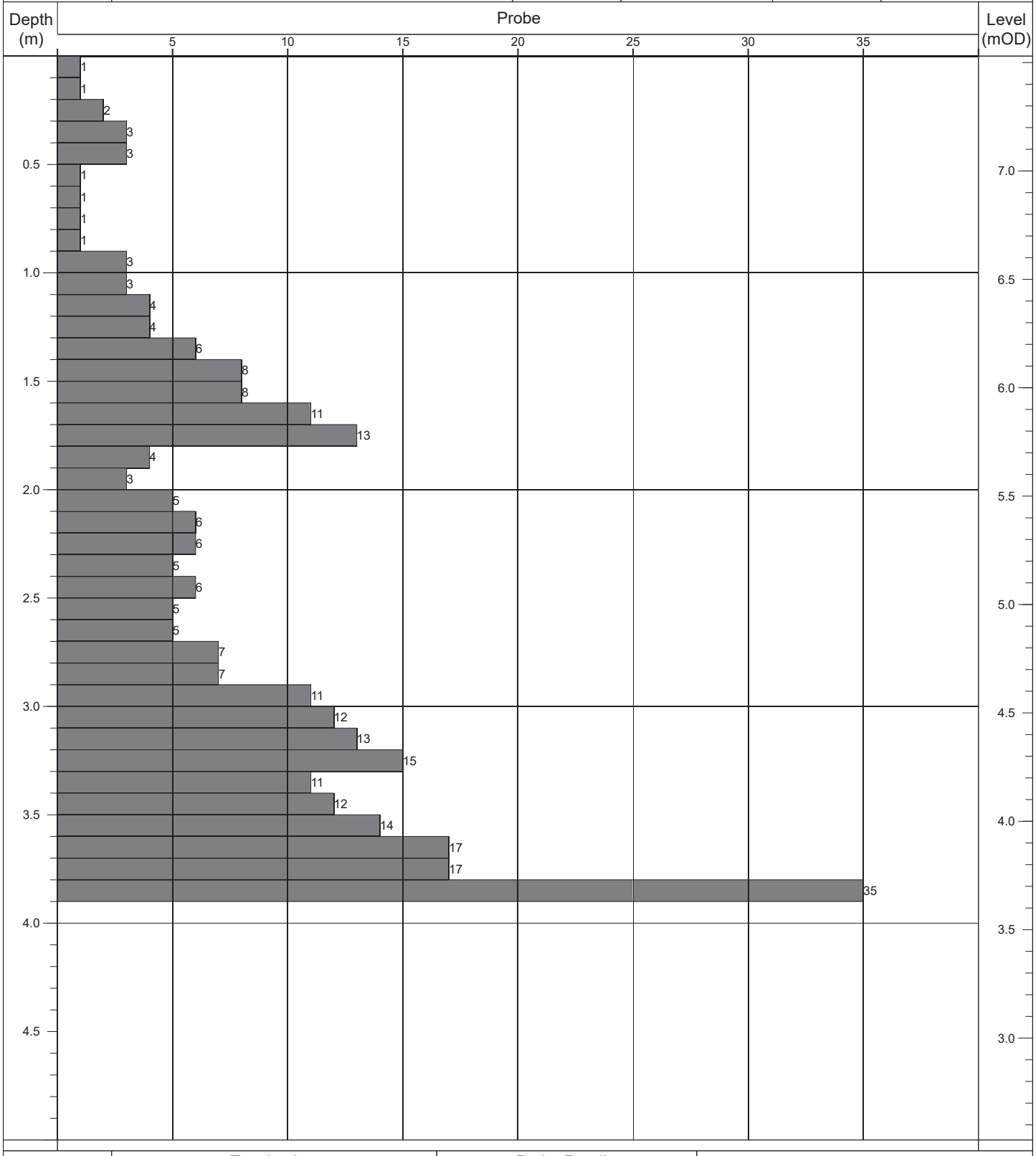
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP011**
Contract:	Hollybank	Easting:	717628.243	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748358.476	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.96	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



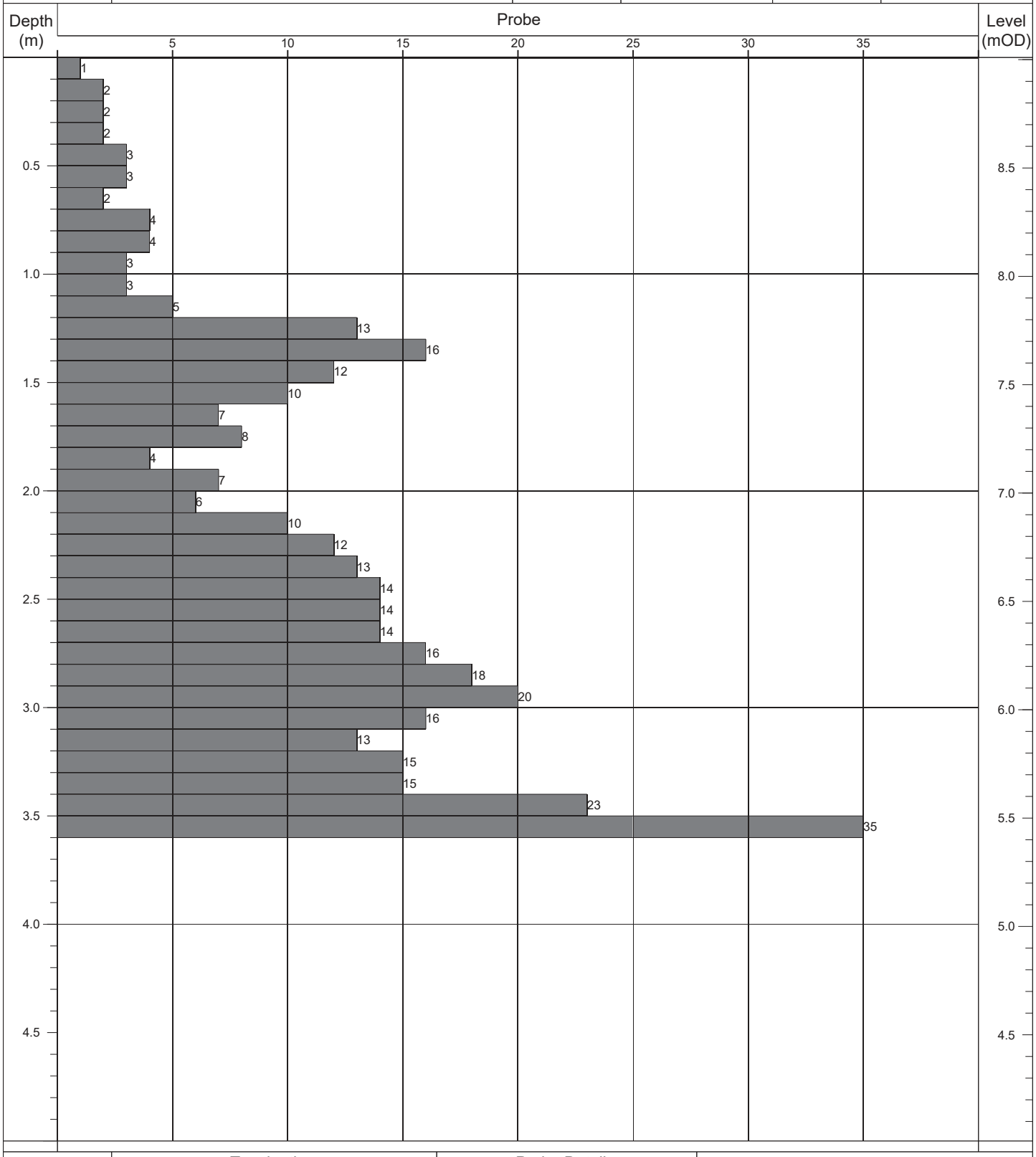
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP012**
Contract:	Hollybank	Easting:	717629.234	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748348.875	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.53	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



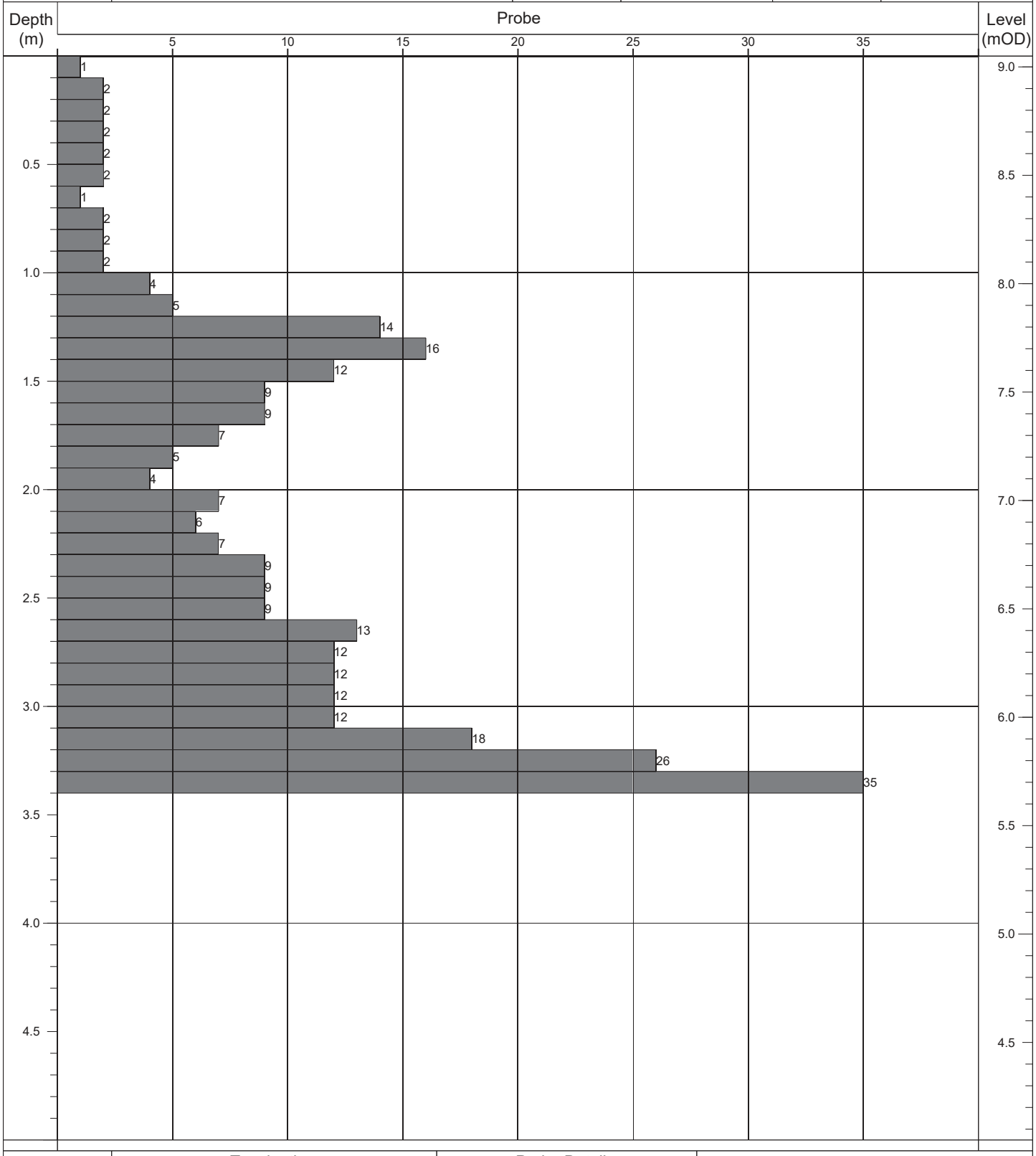
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP013**
Contract:	Hollybank	Easting:	717563.555	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748281.425	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.01	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



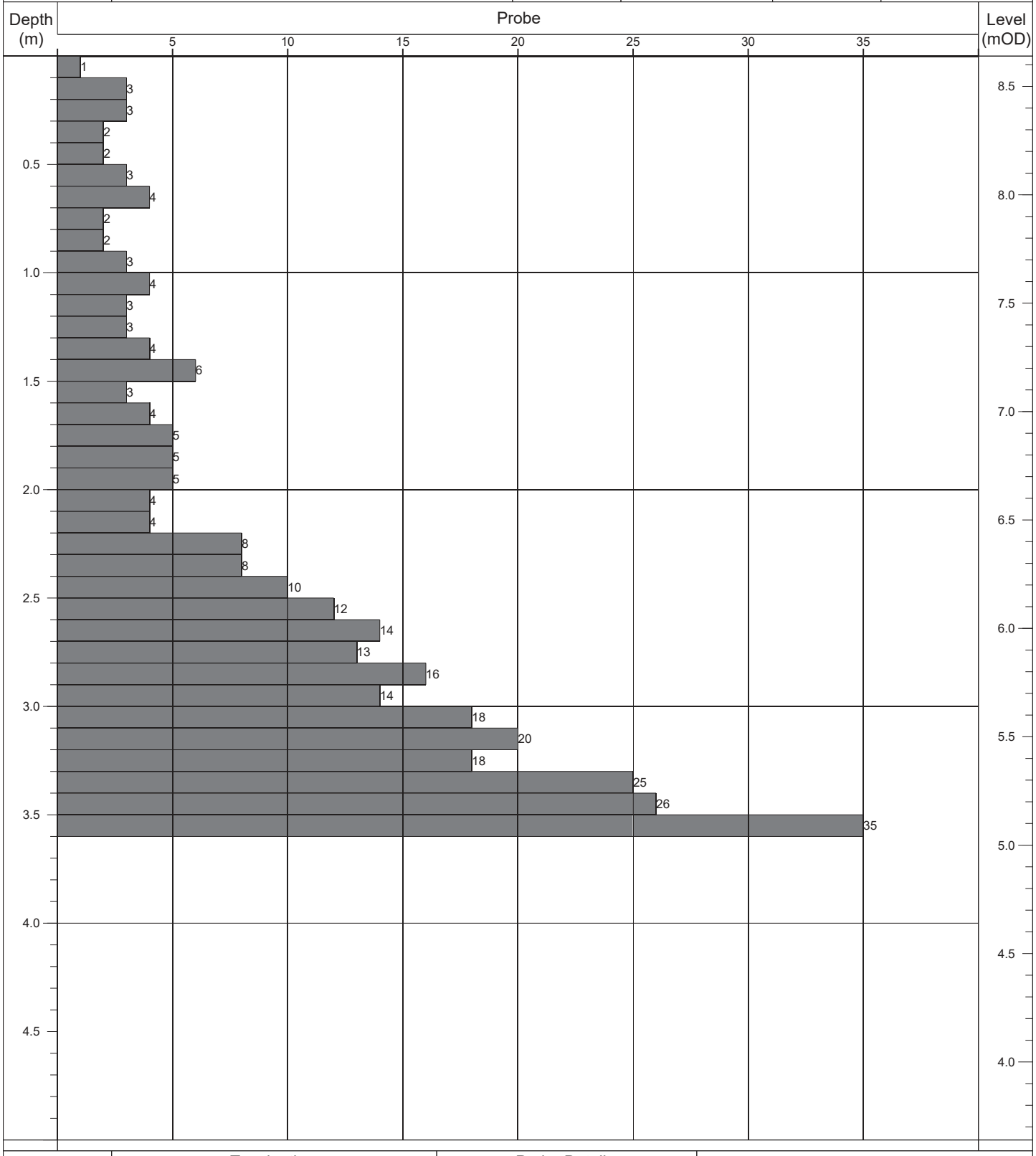
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP014**
Contract:	Hollybank	Easting:	717587.106	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748267.596	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.05	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



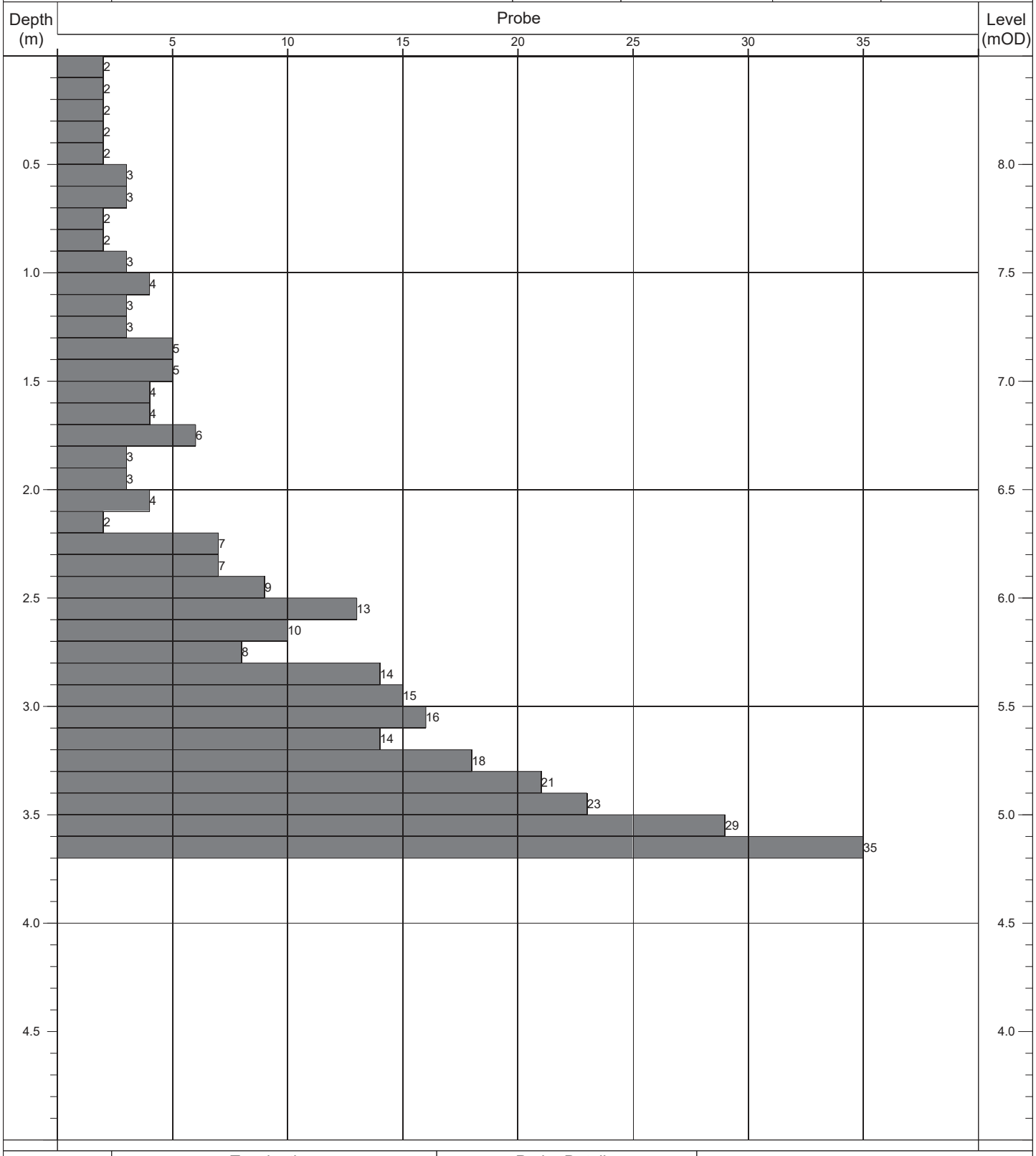
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP015**
Contract:	Hollybank	Easting:	717583.222	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748287.800	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.64	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



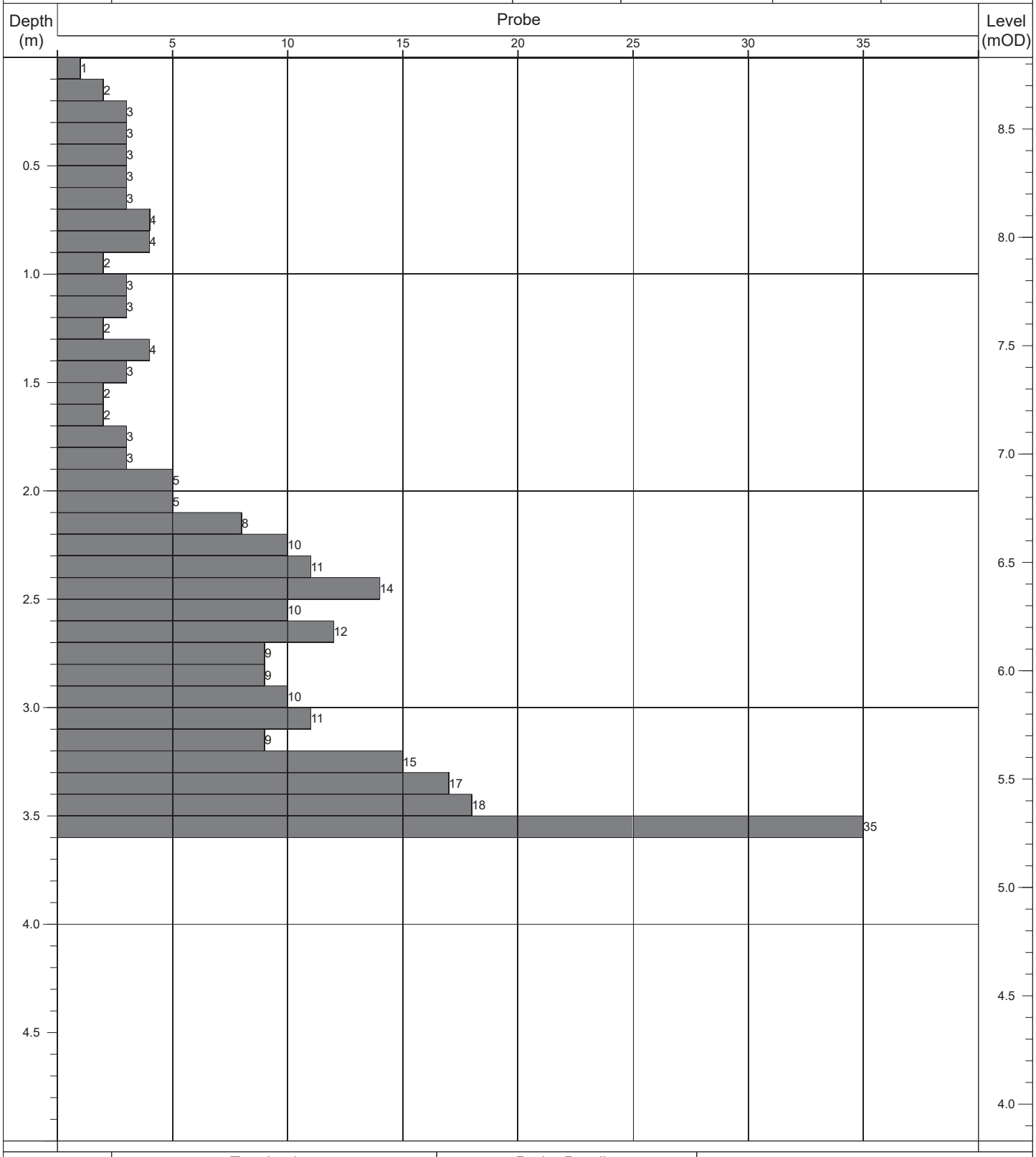
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP016**
Contract:	Hollybank	Easting:	717591.137	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748291.565	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.50	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



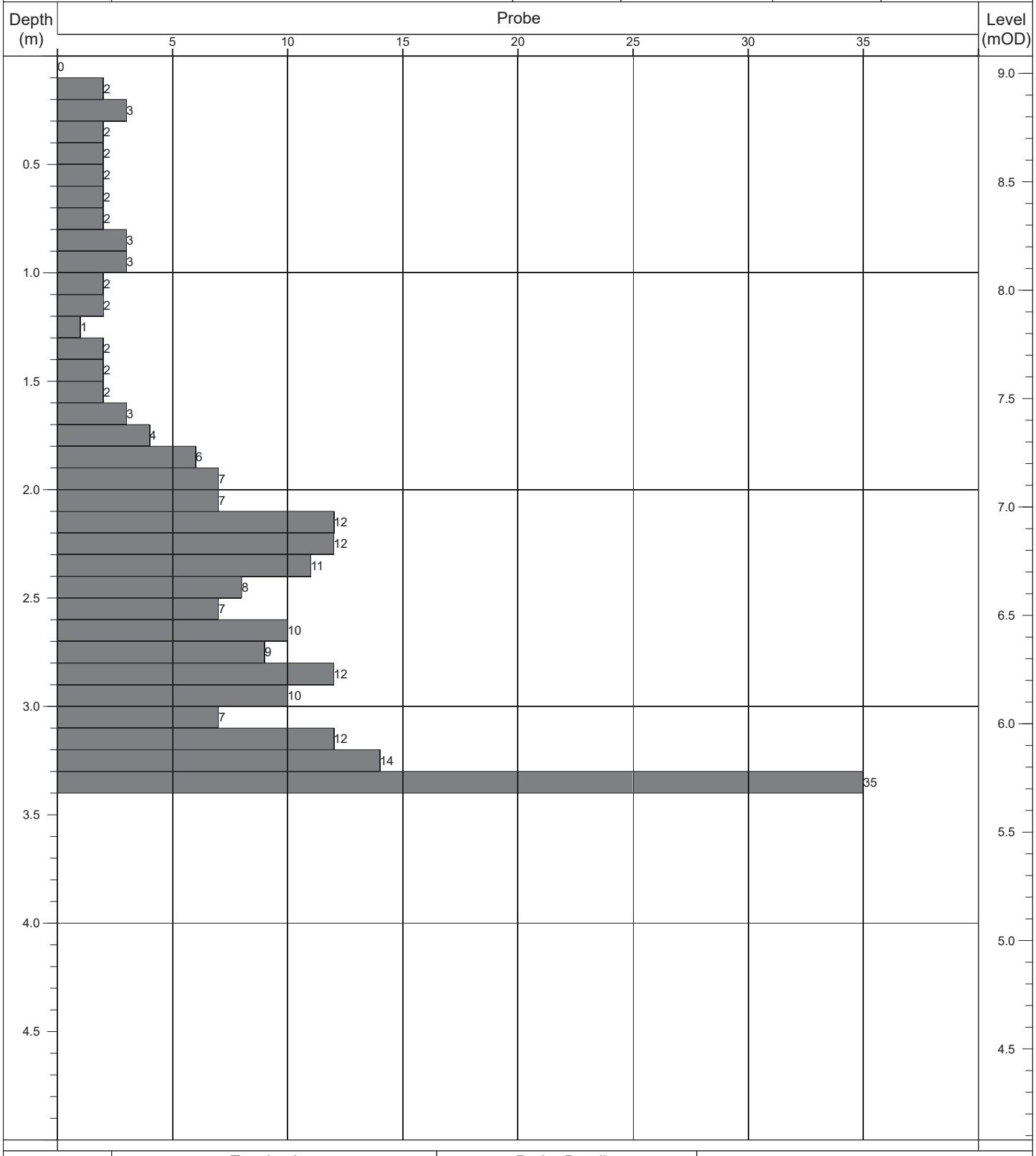
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP017**
Contract:	Hollybank	Easting:	717602.602	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748293.839	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.83	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



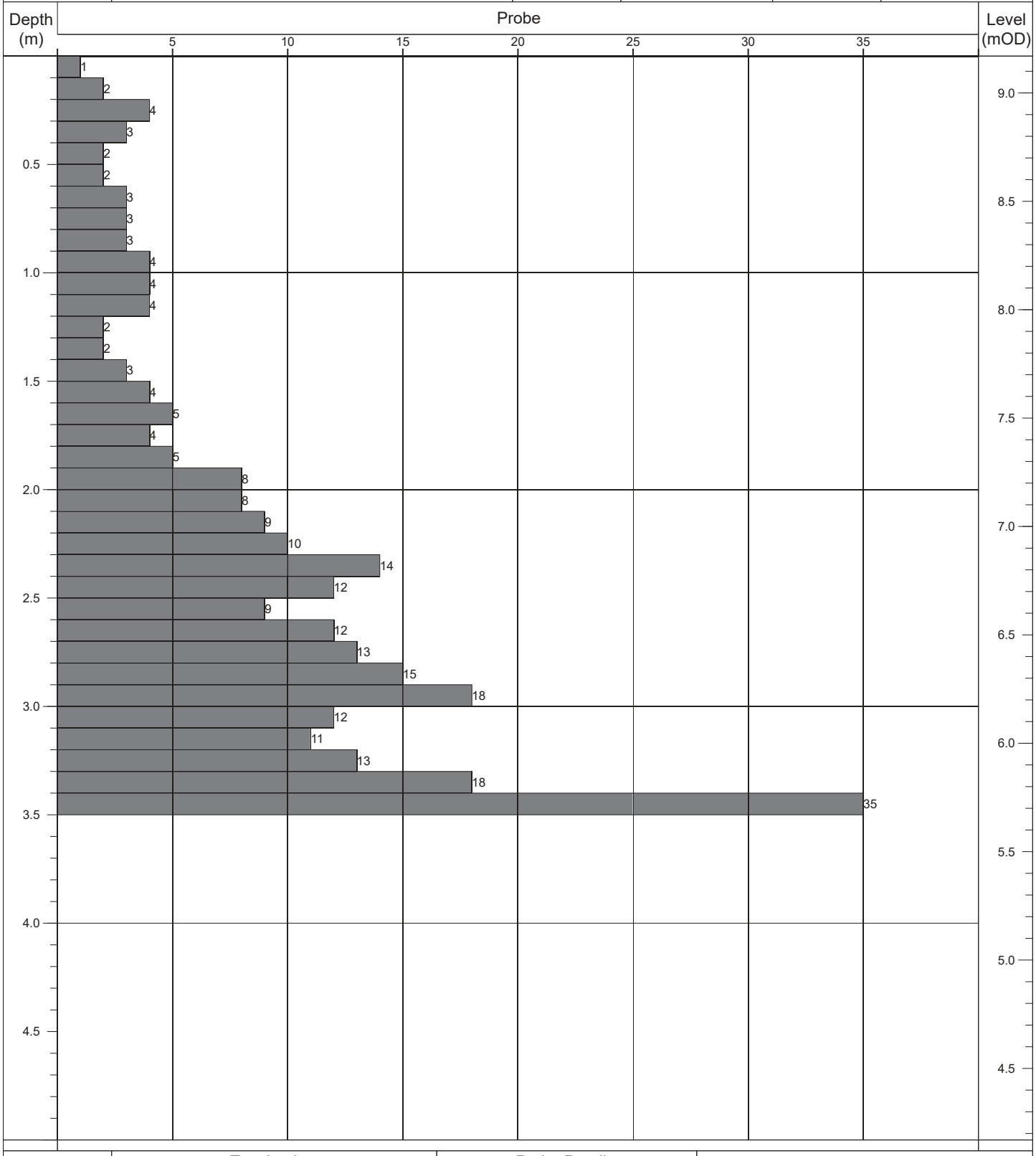
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP018**
Contract:	Hollybank	Easting:	717608.394	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748311.913	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.08	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



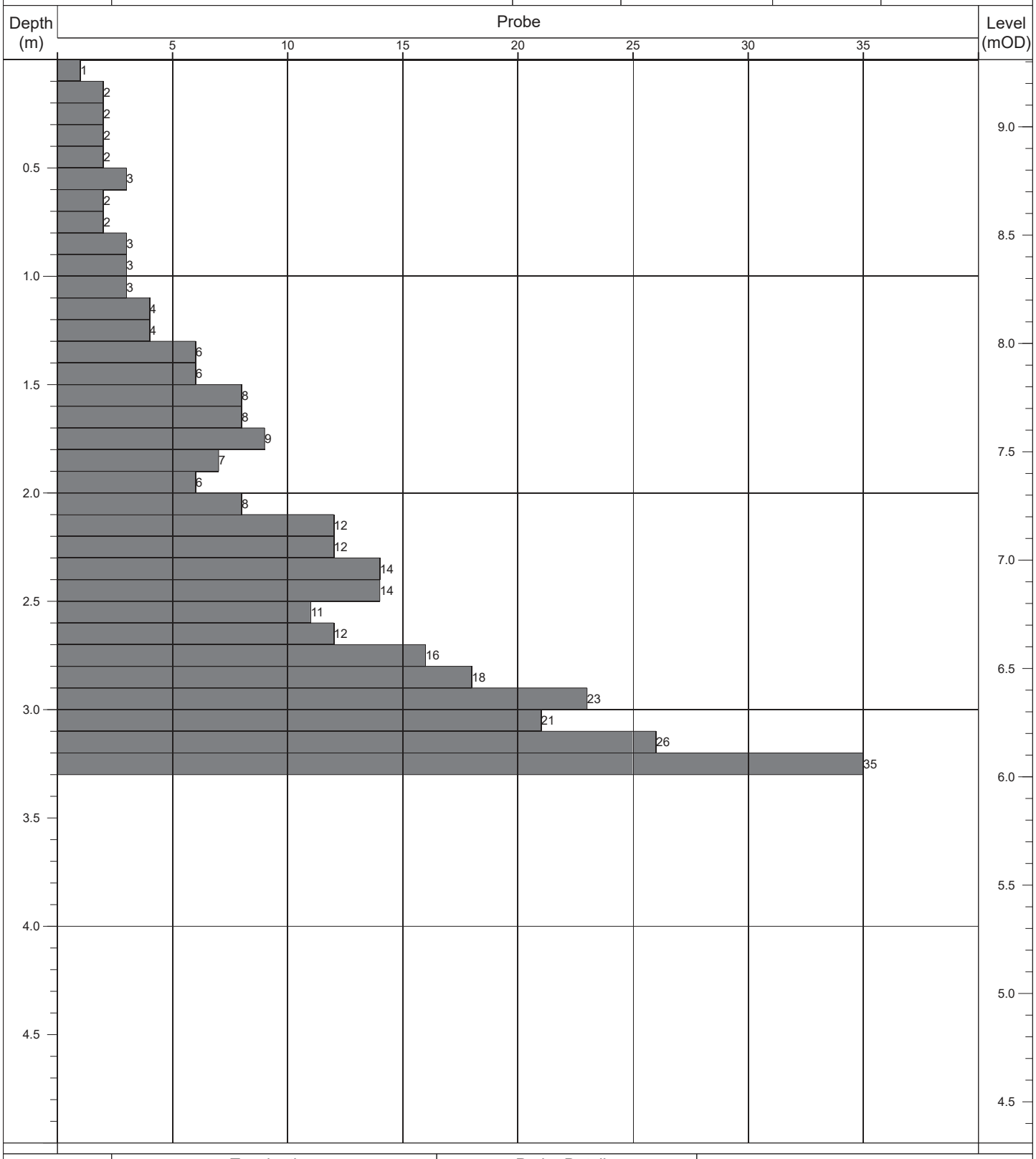
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP019**
Contract:	Hollybank	Easting:	717624.148	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748314.052	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.17	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



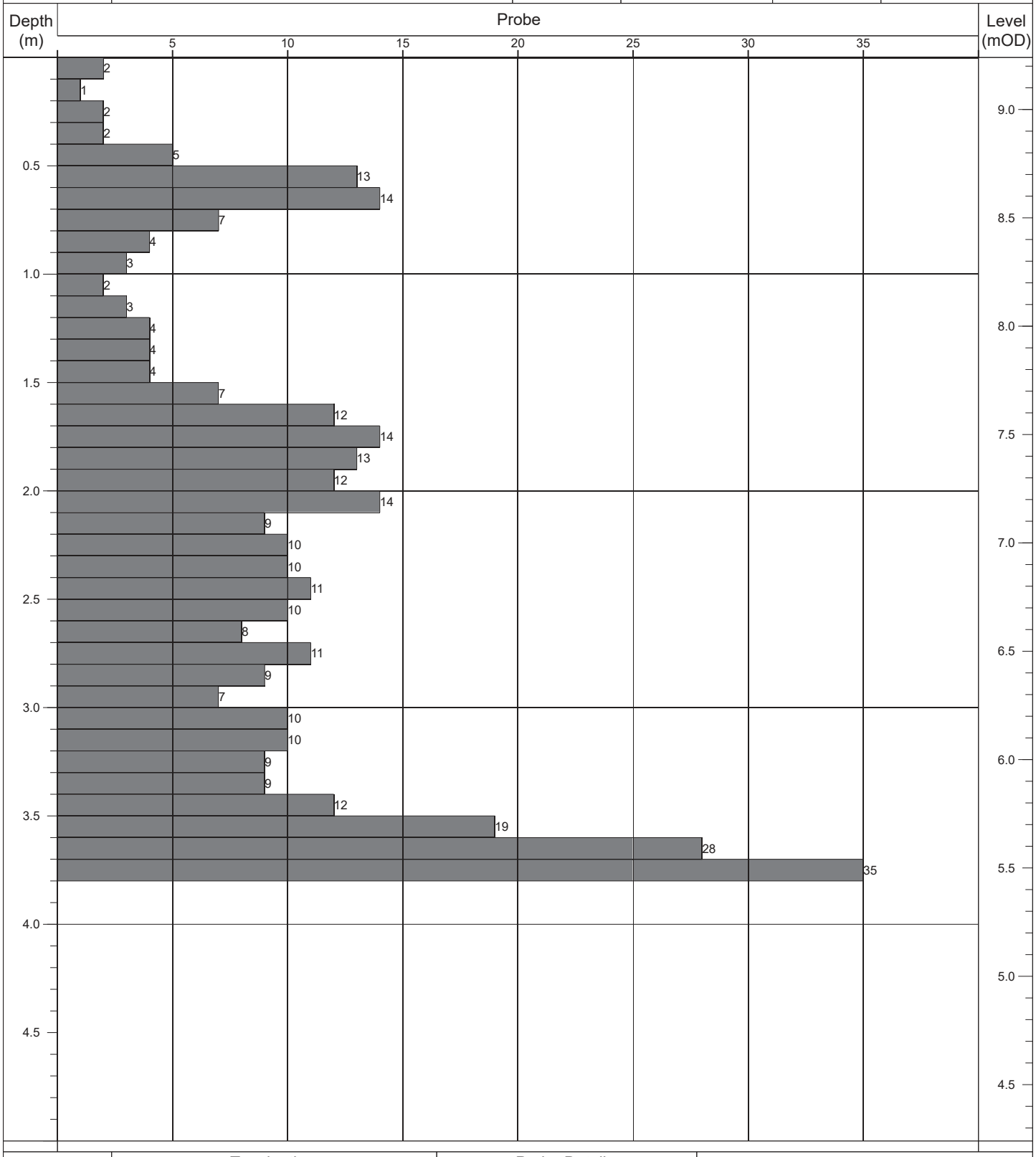
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.50m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP020**
Contract:	Hollybank	Easting:	717587.420	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748252.354	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.31	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



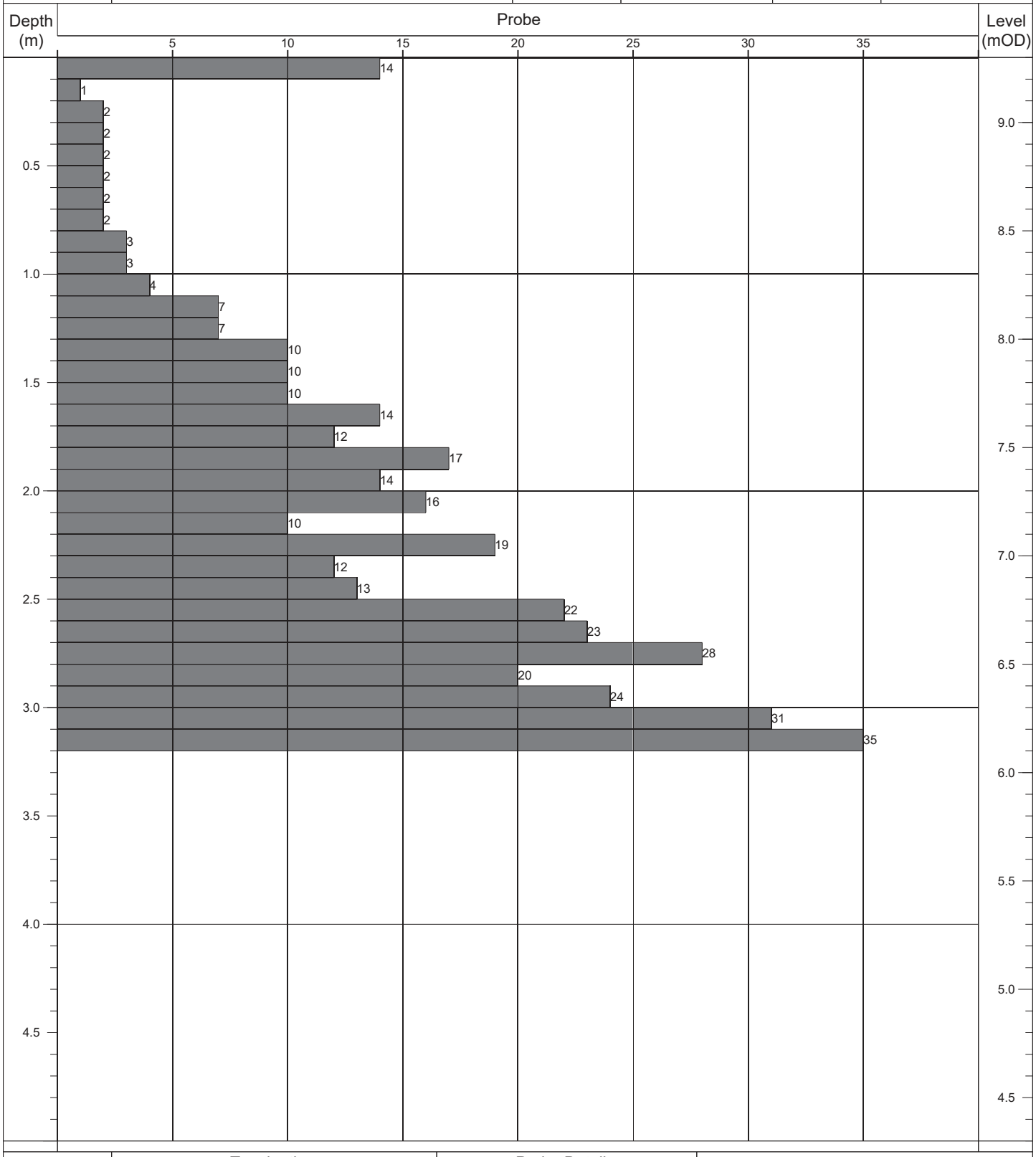
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP021**
Contract:	Hollybank	Easting:	717595.069	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748253.367	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.24	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



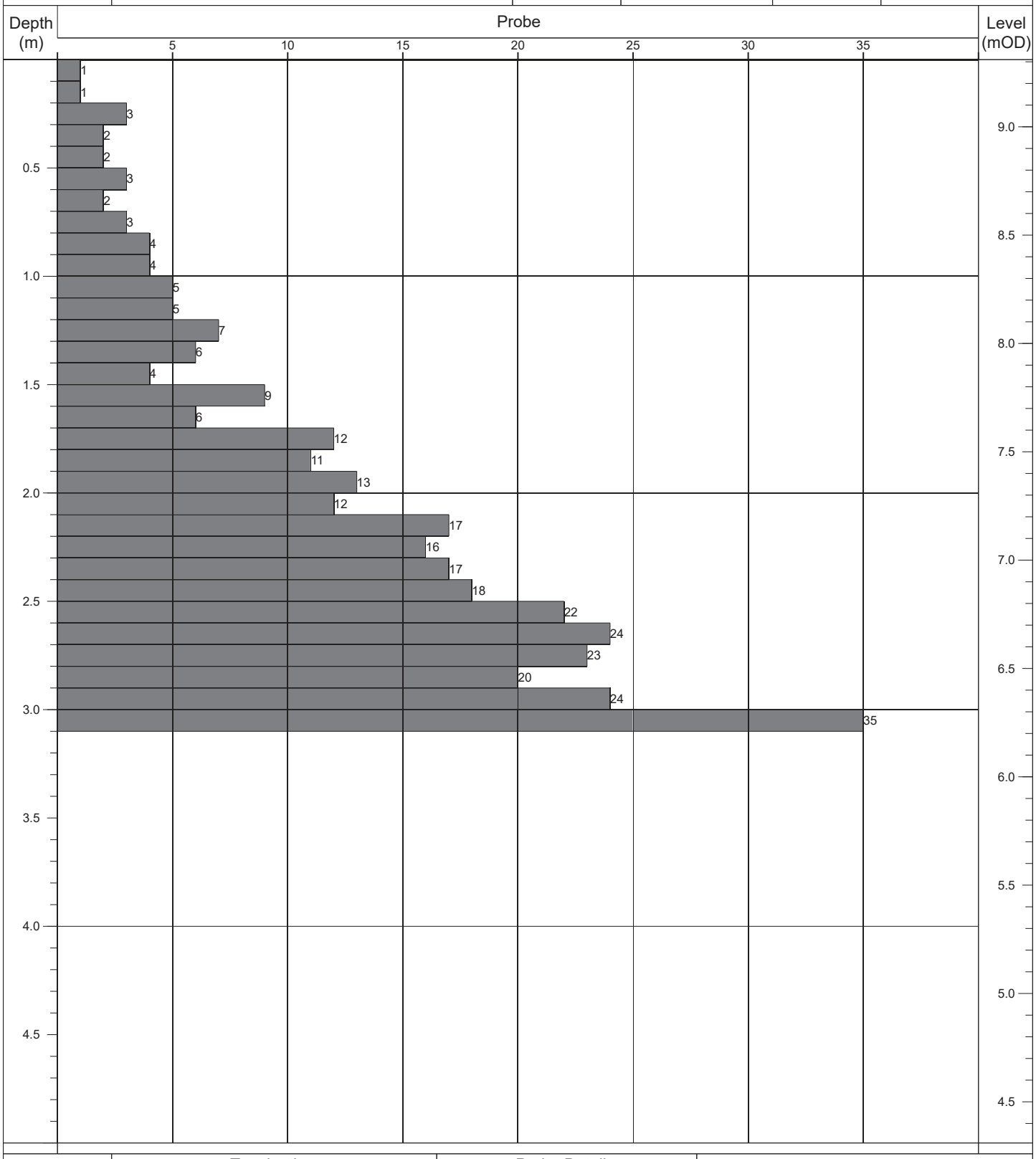
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	Dynamic Probe Log				Probe No: DP022
Contract:	Hollybank	Easting:	717611.726	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748263.540	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.30	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



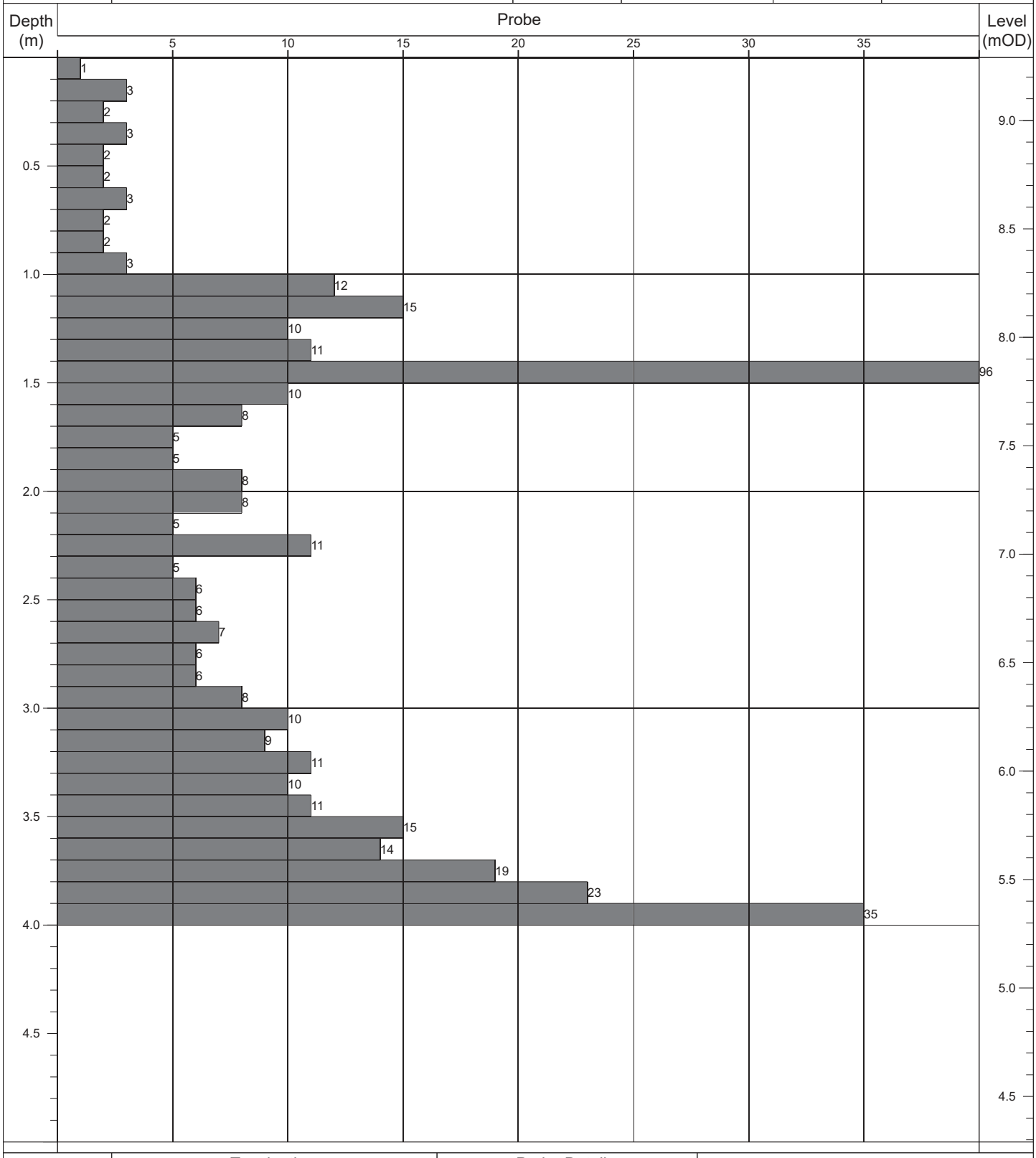
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP023**
Contract:	Hollybank	Easting:	717619.173	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748267.676	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.31	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



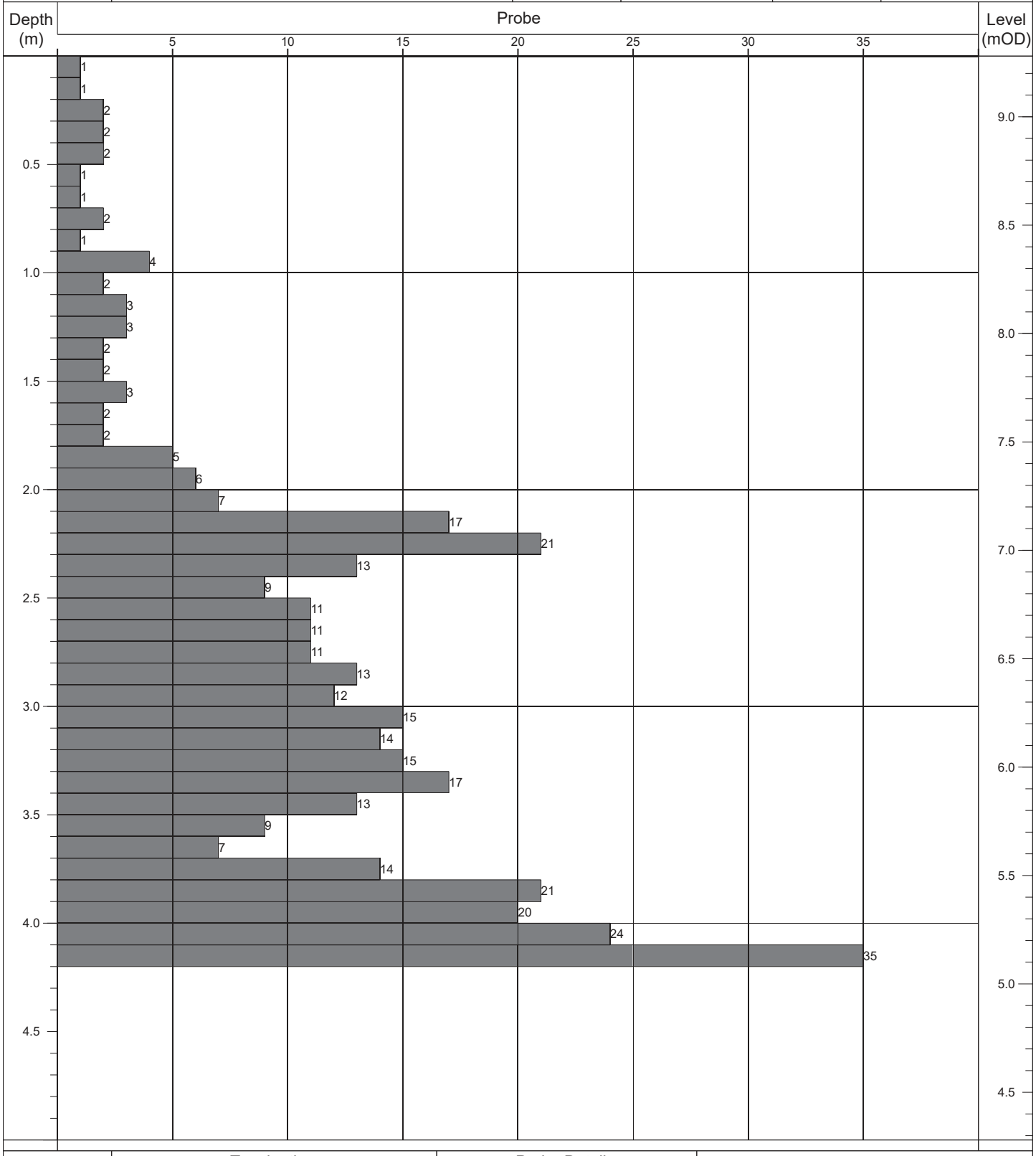
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP024**
Contract:	Hollybank	Easting:	717632.445	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748275.424	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.29	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



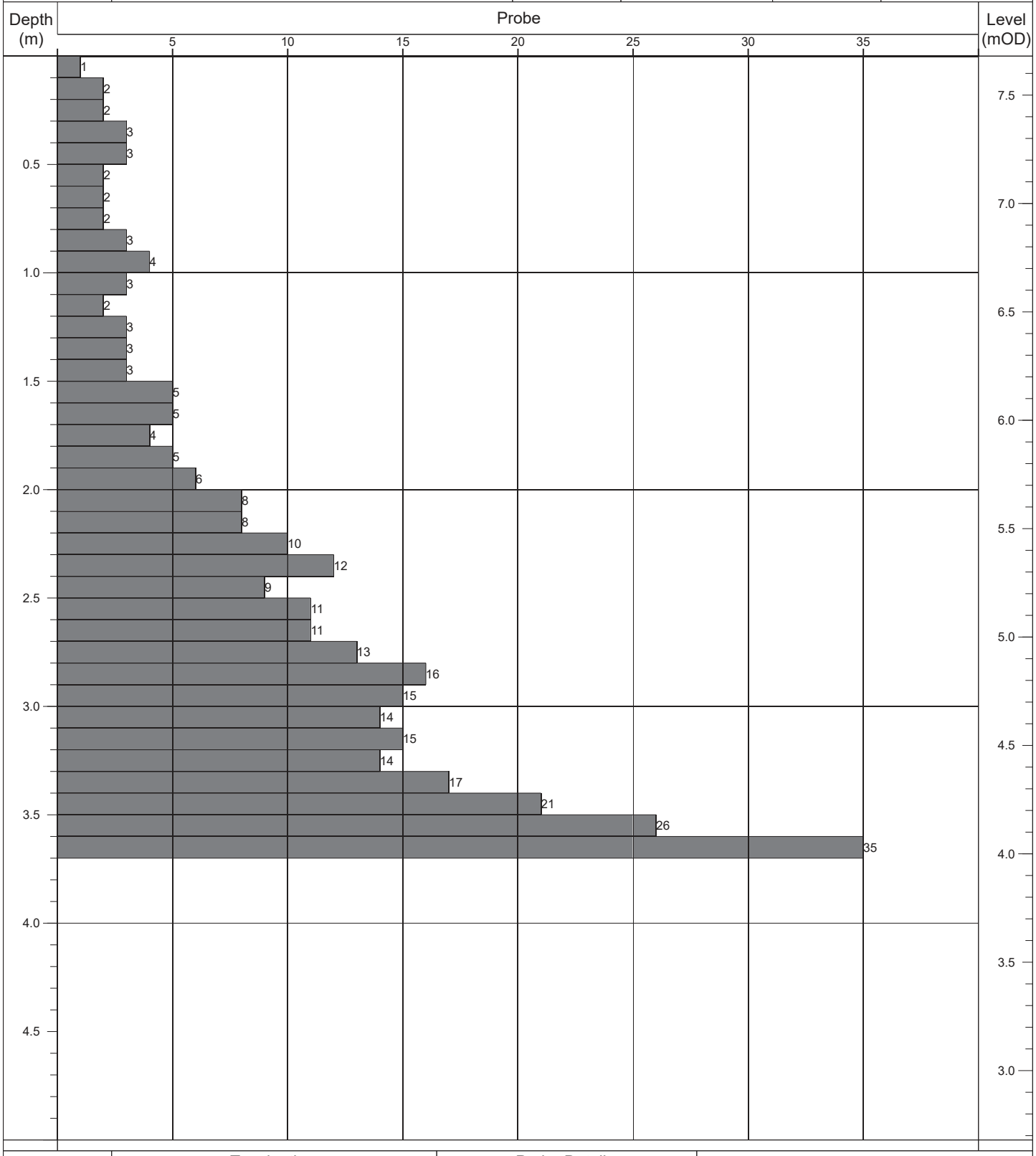
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP025**
Contract:	Hollybank	Easting:	717643.985	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748285.411	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.28	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



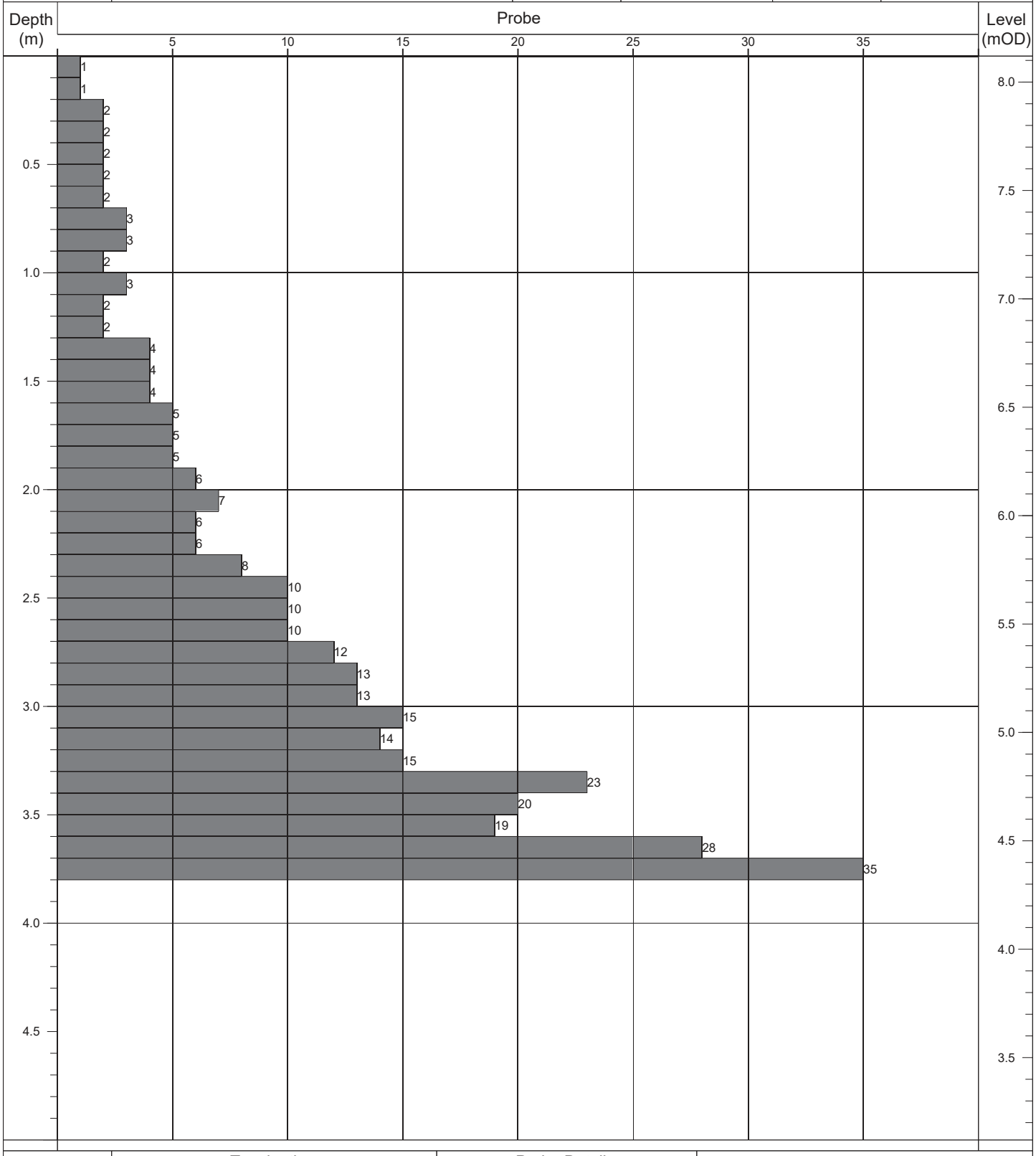
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP026**
Contract:	Hollybank	Easting:	717655.775	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748332.878	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.68	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



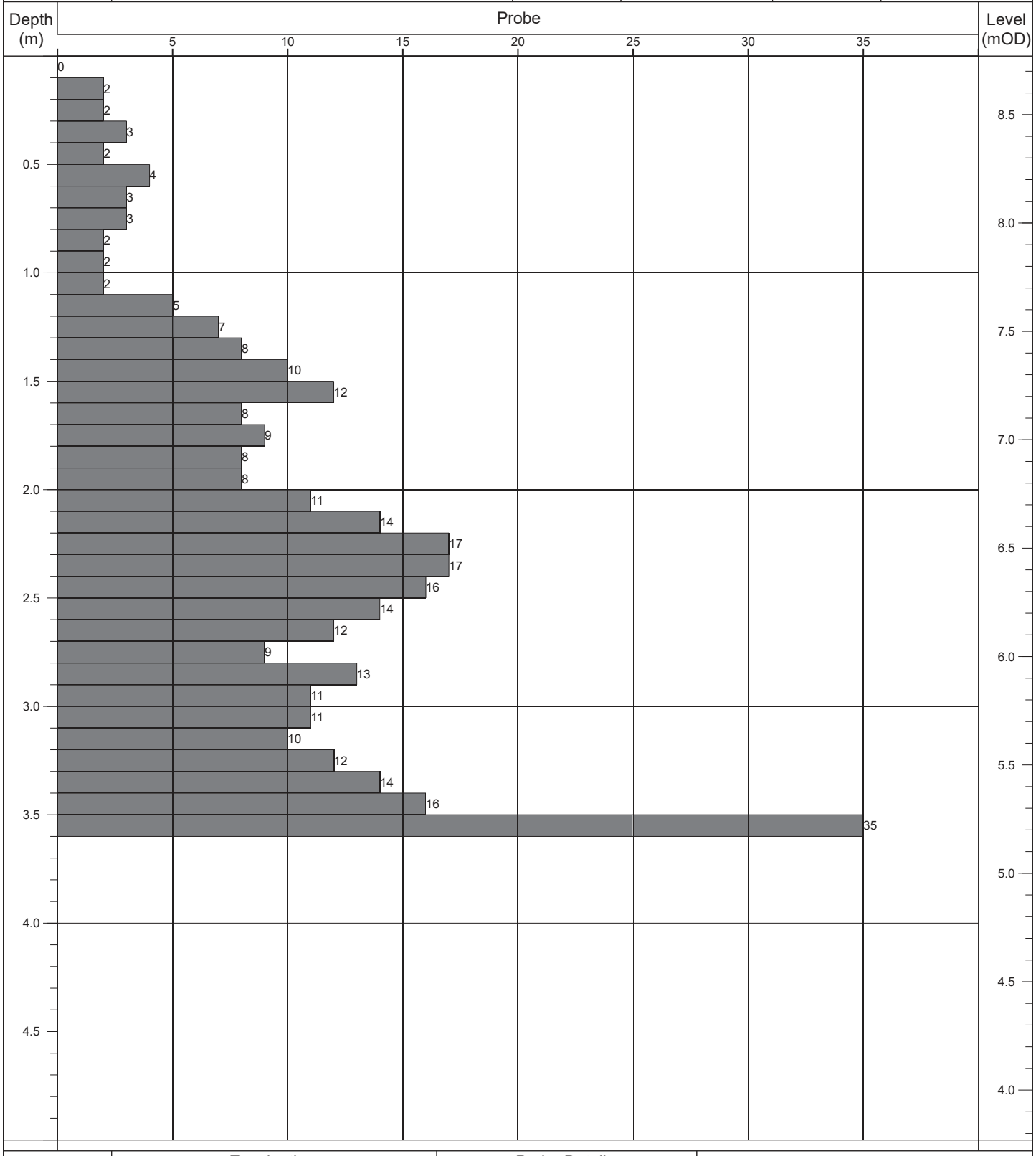
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP027**
Contract:	Hollybank	Easting:	717660.742	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748323.352	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.12	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



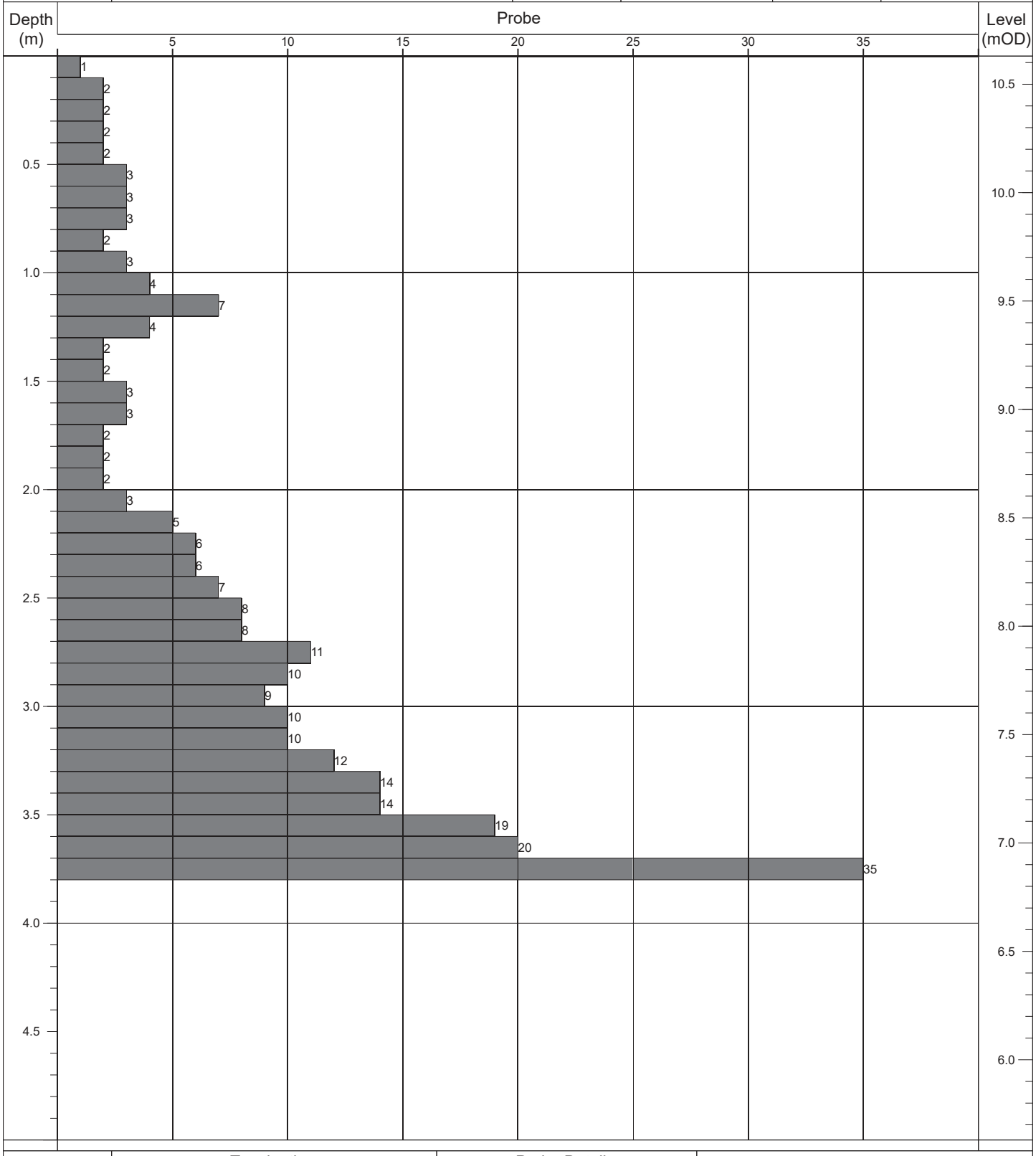
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP028**
Contract:	Hollybank	Easting:	717667.837	Date Started:	08/10/2020
Location:	Swords, Co. Dublin	Northing:	748310.381	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.77	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



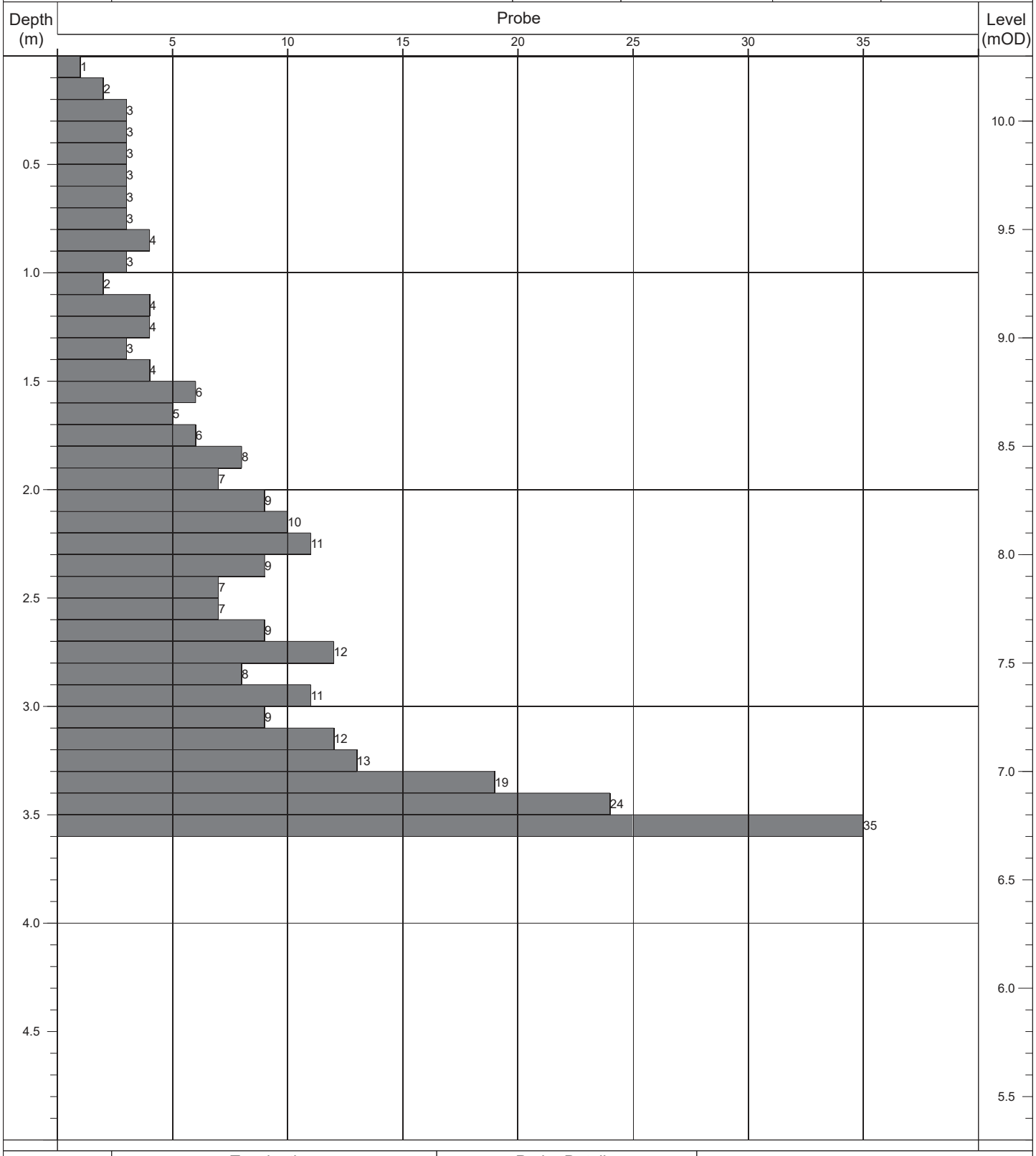
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP029**
Contract:	Hollybank	Easting:	717607.887	Date Started:	06/10/2020
Location:	Swords, Co. Dublin	Northing:	748184.915	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.63	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



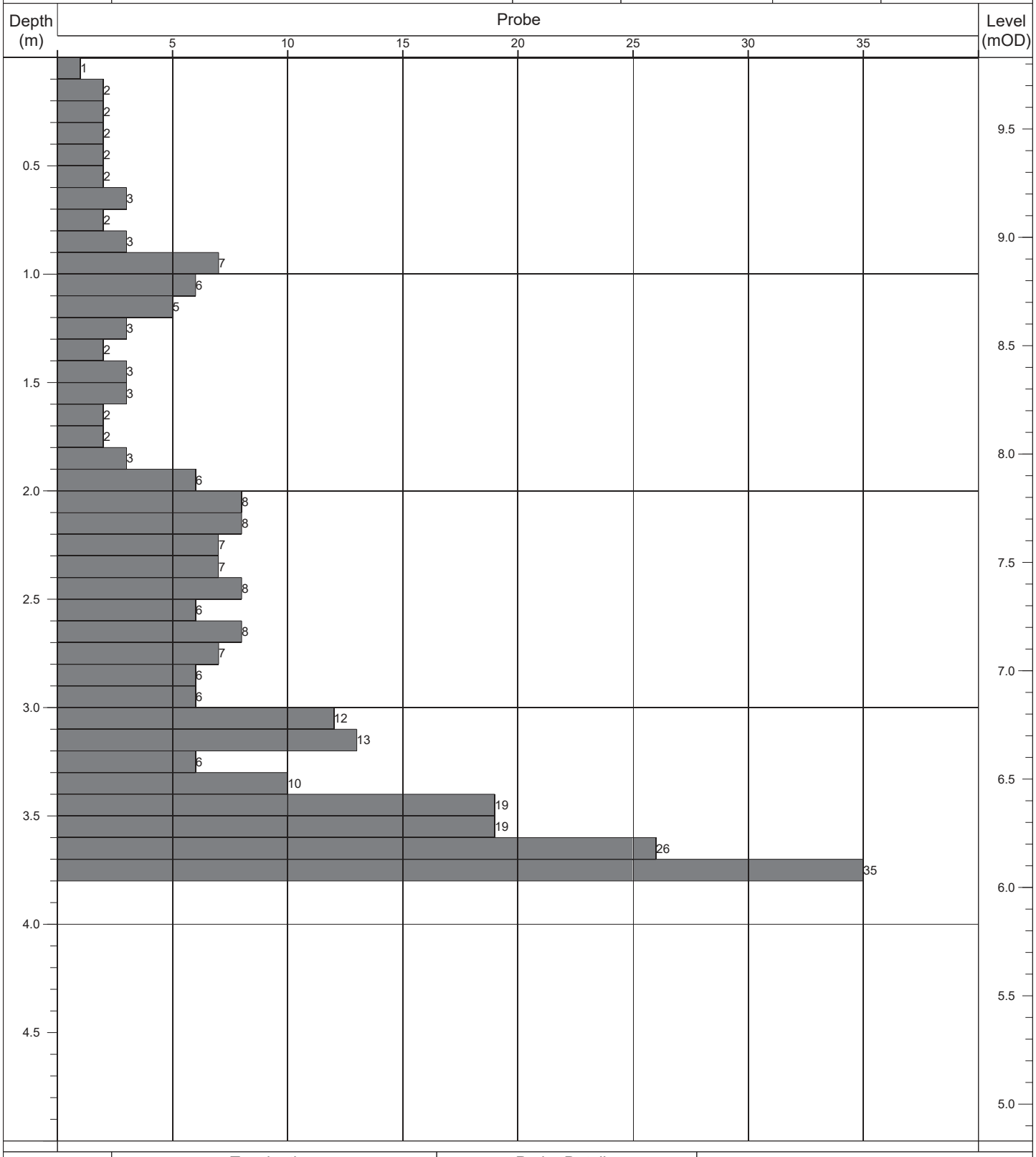
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP030**
Contract:	Hollybank	Easting:	717601.356	Date Started:	06/10/2020
Location:	Swords, Co. Dublin	Northing:	748197.470	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.30	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



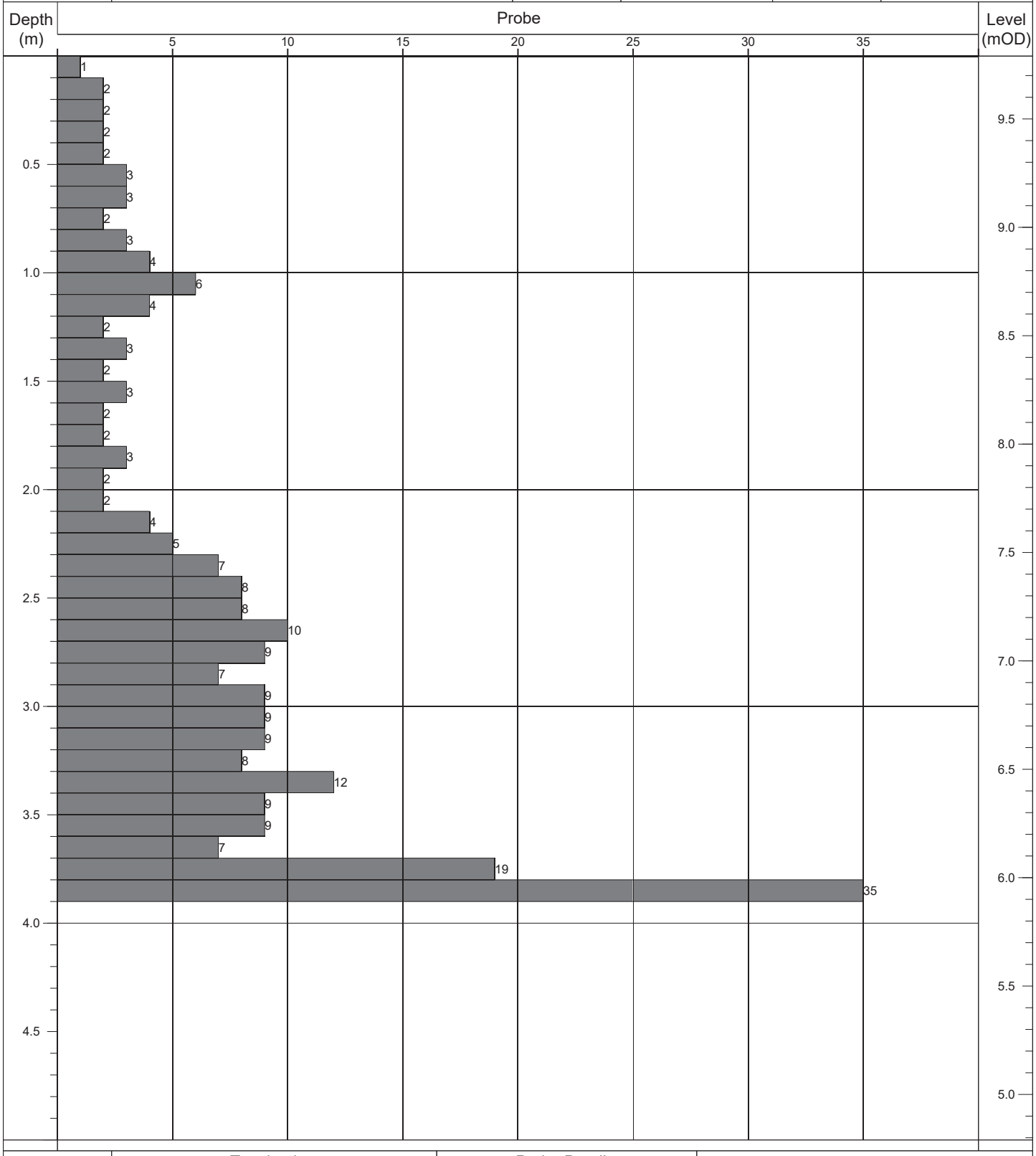
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP031**
Contract:	Hollybank	Easting:	717620.592	Date Started:	06/10/2020
Location:	Swords, Co. Dublin	Northing:	748207.962	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.83	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



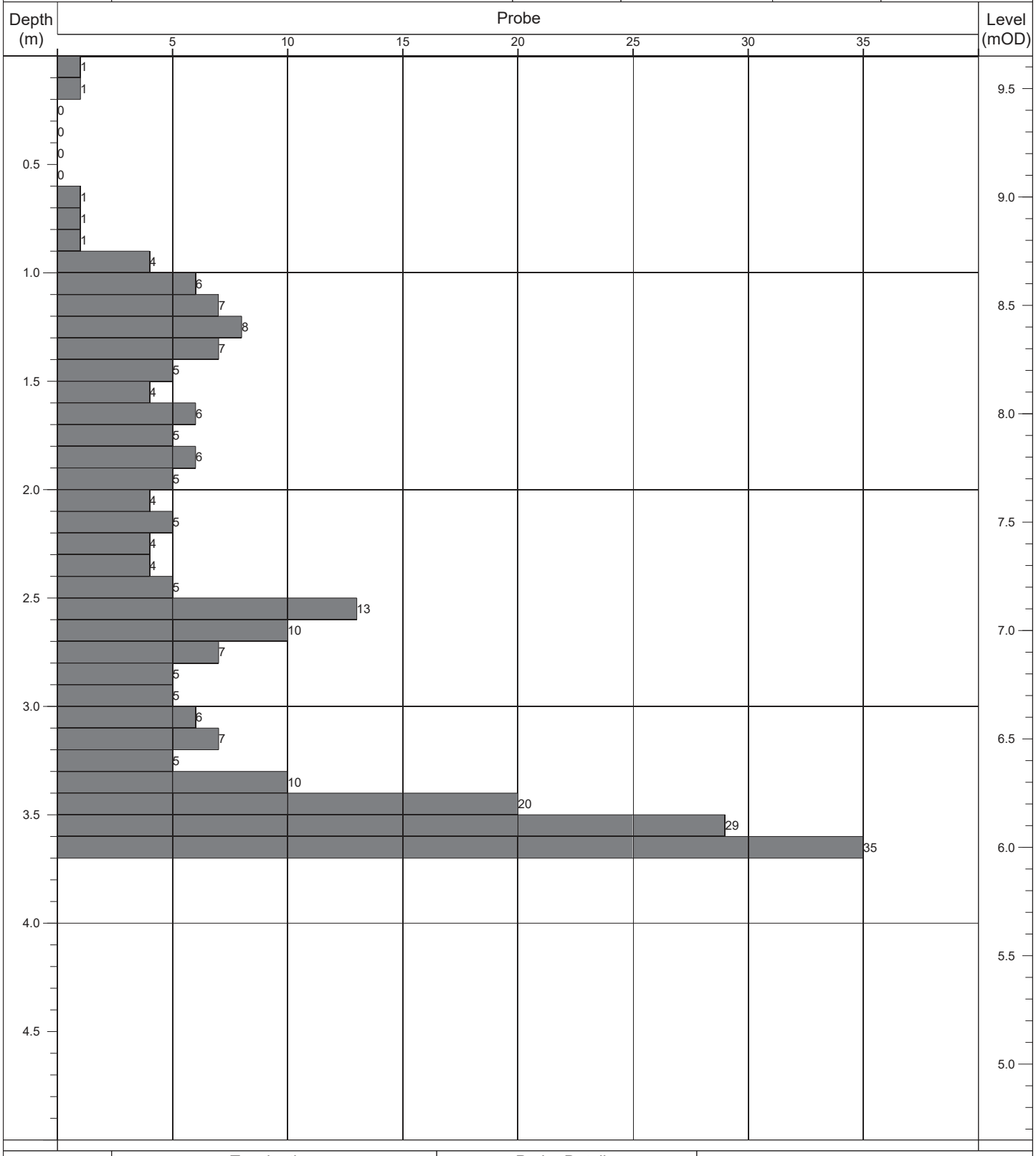
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP032**
Contract:	Hollybank	Easting:	717633.367	Date Started:	06/10/2020
Location:	Swords, Co. Dublin	Northing:	748211.647	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.79	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



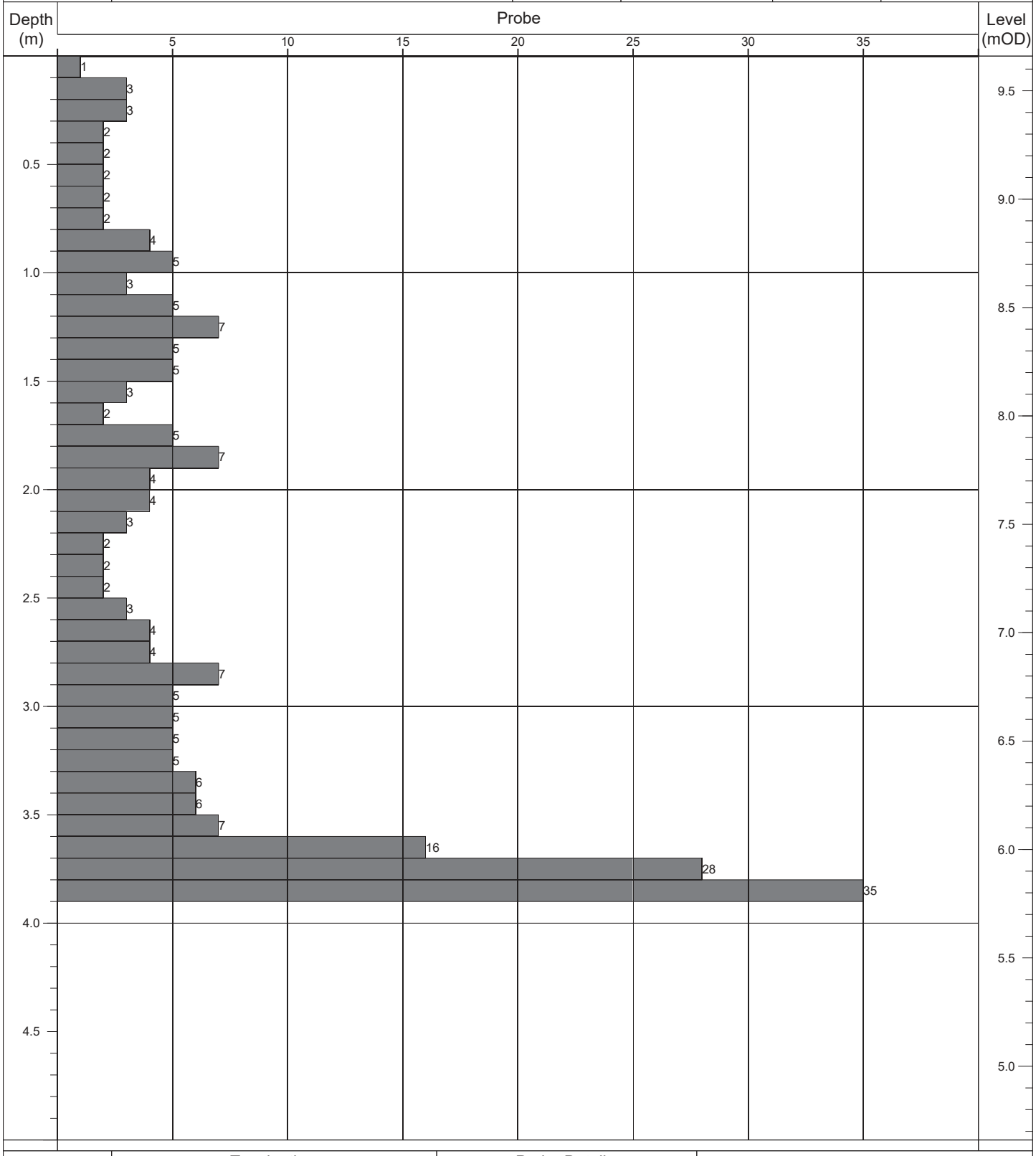
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP033**
Contract:	Hollybank	Easting:	717647.498	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748214.032	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.65	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



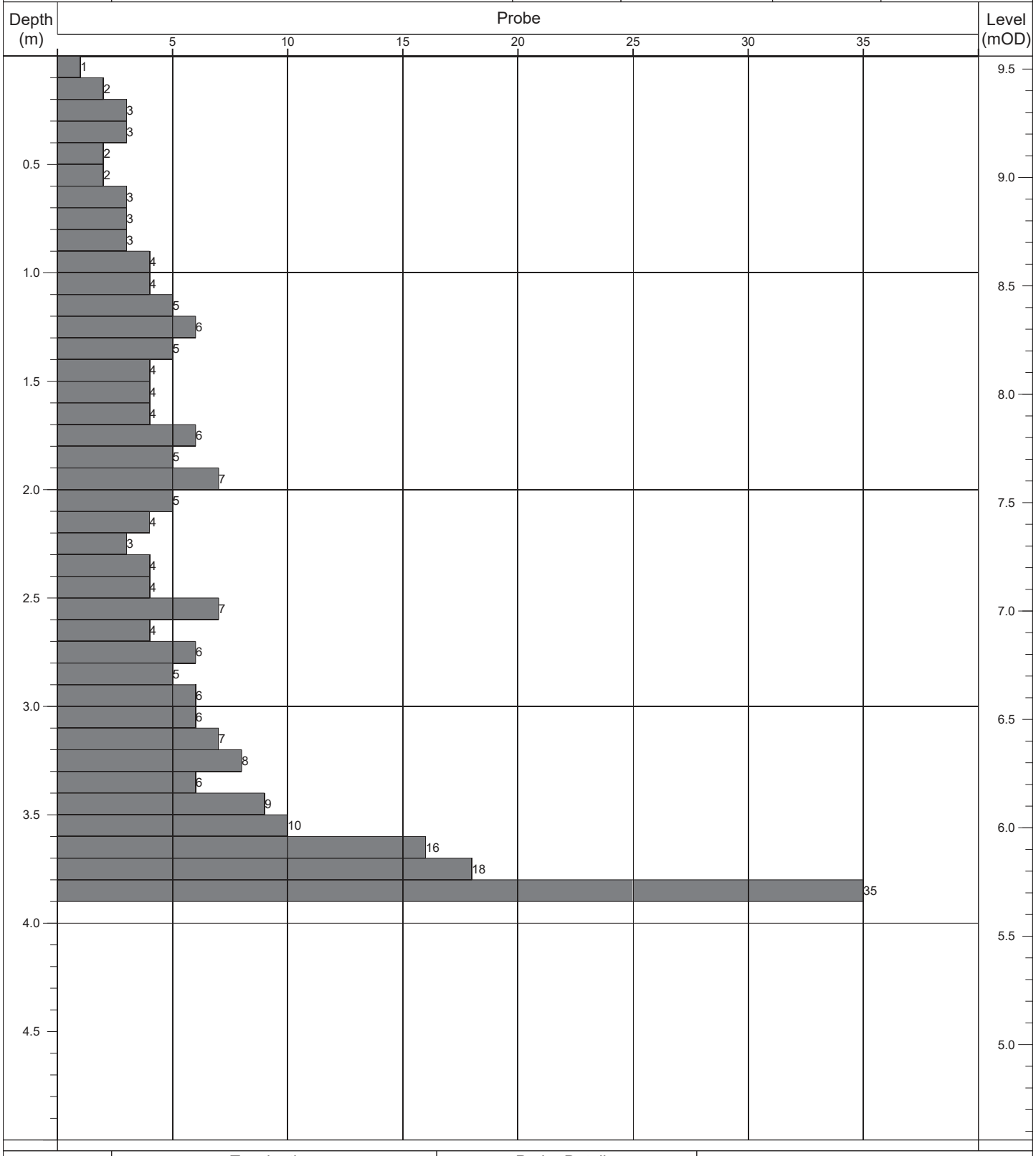
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP034**
Contract:	Hollybank	Easting:	717657.172	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748217.311	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.66	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



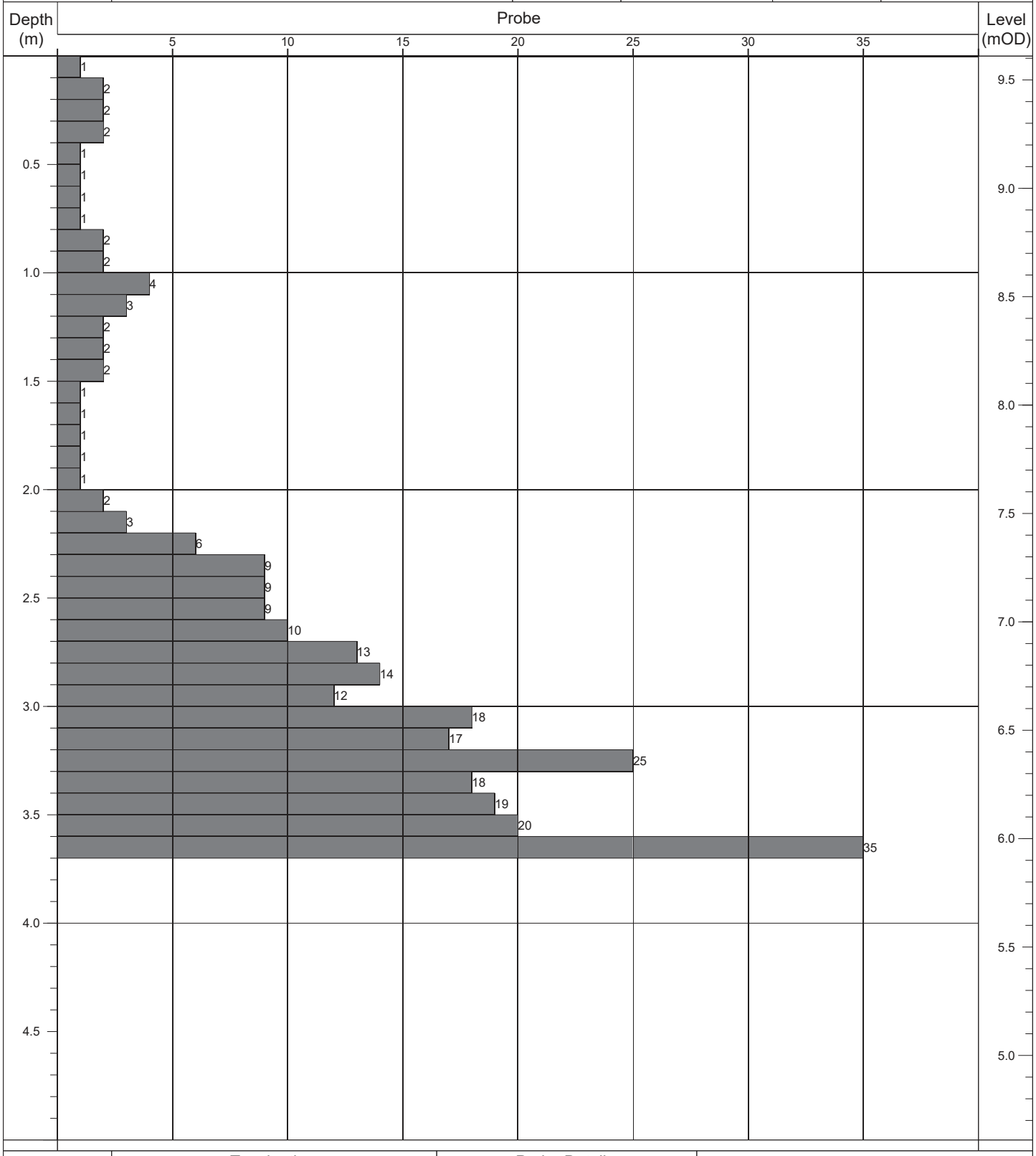
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP035**
Contract:	Hollybank	Easting:	717671.900	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748222.899	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.56	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



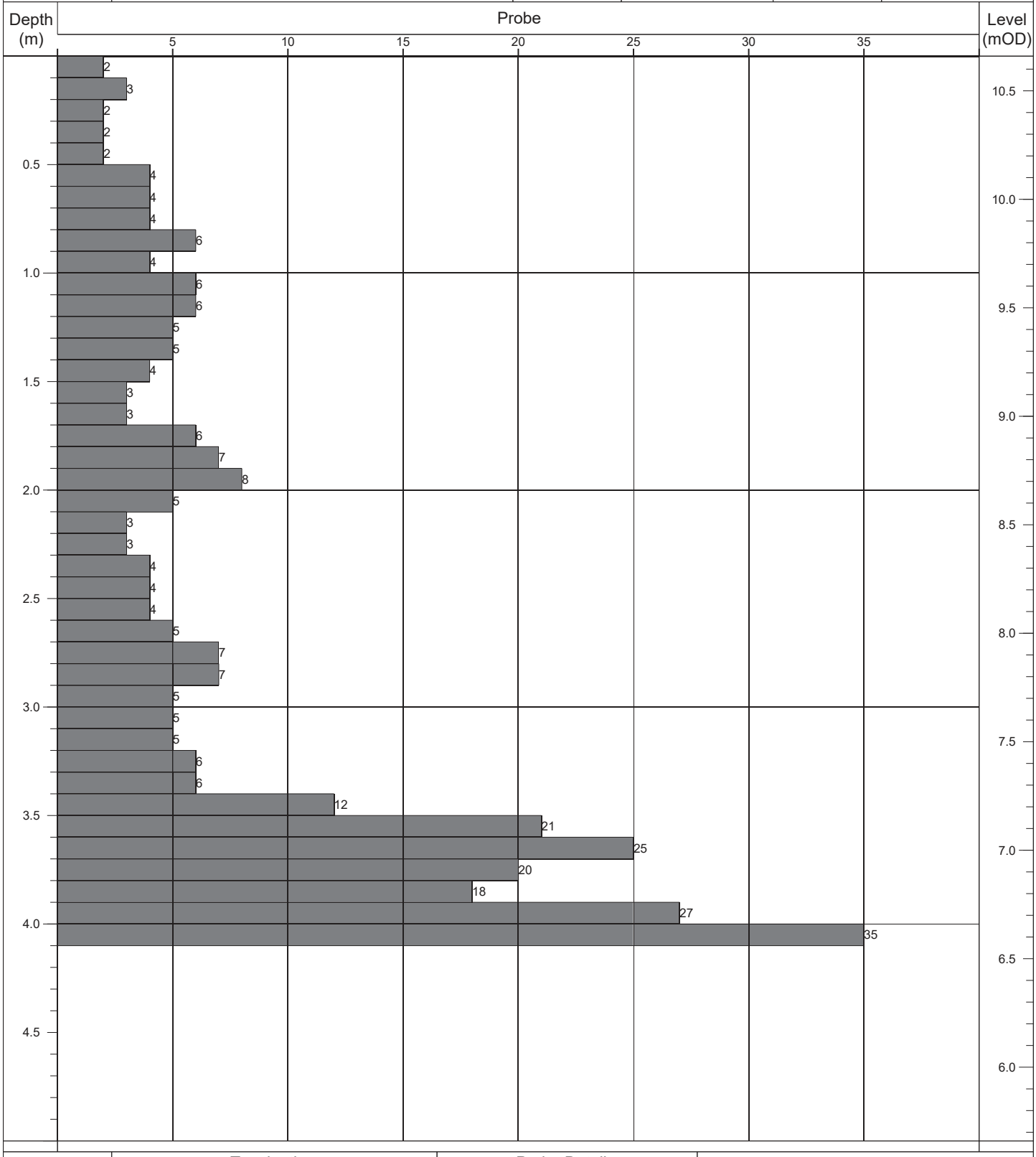
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP036**
Contract:	Hollybank	Easting:	717674.236	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748205.165	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.61	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



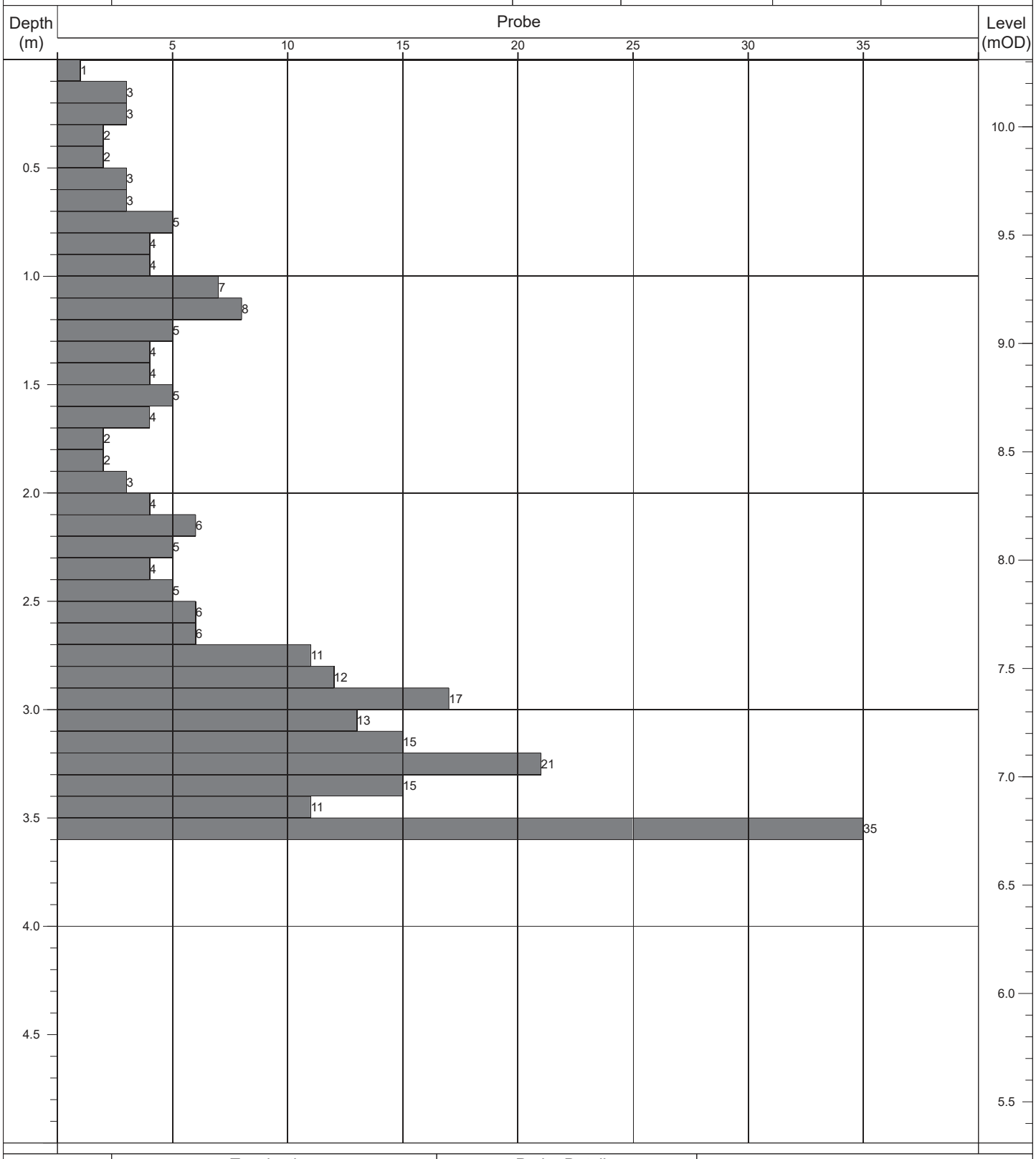
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP037**
Contract:	Hollybank	Easting:	717623.608	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748169.160	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.66	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



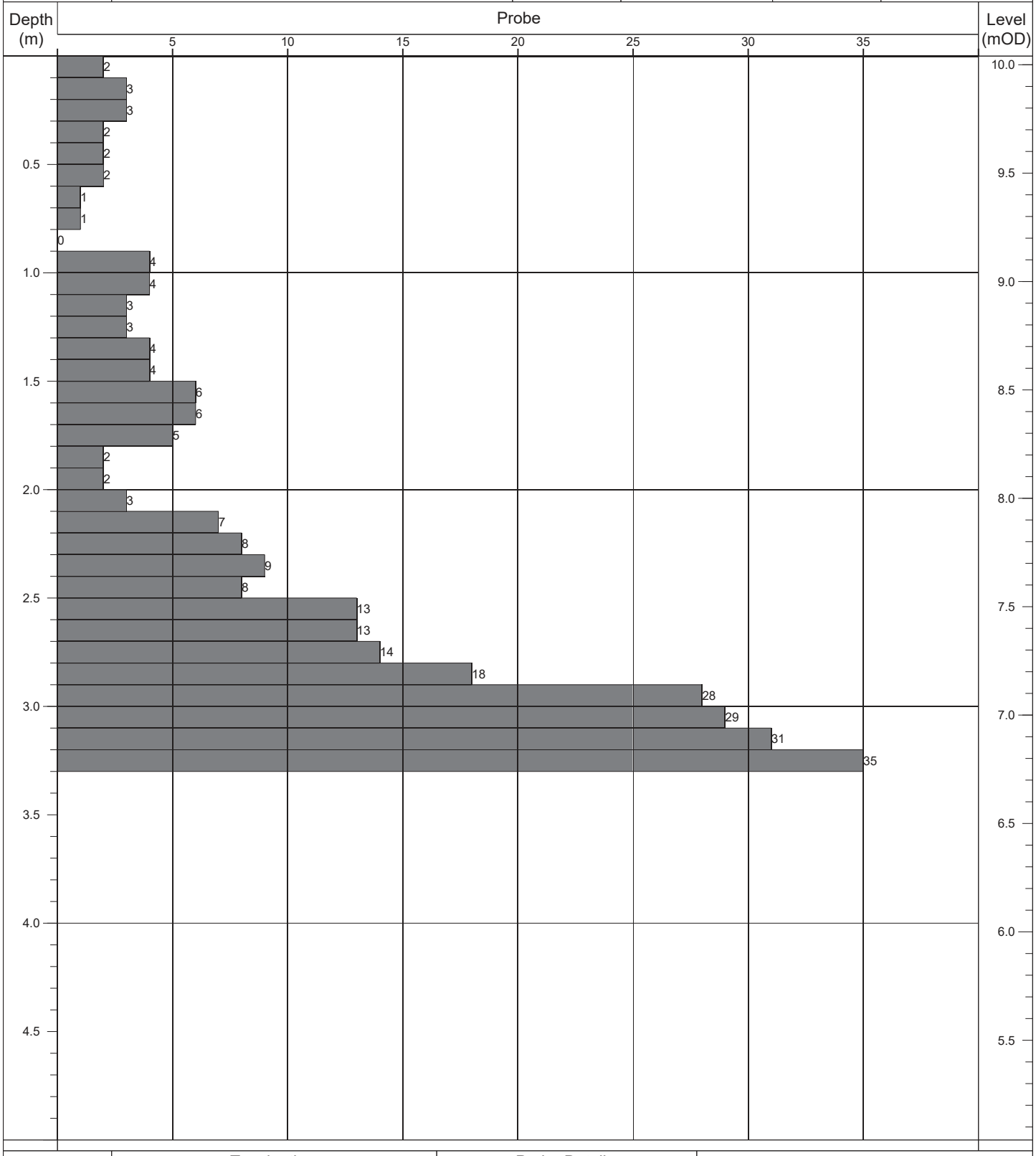
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP038**
Contract:	Hollybank	Easting:	717637.422	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748171.238	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.31	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



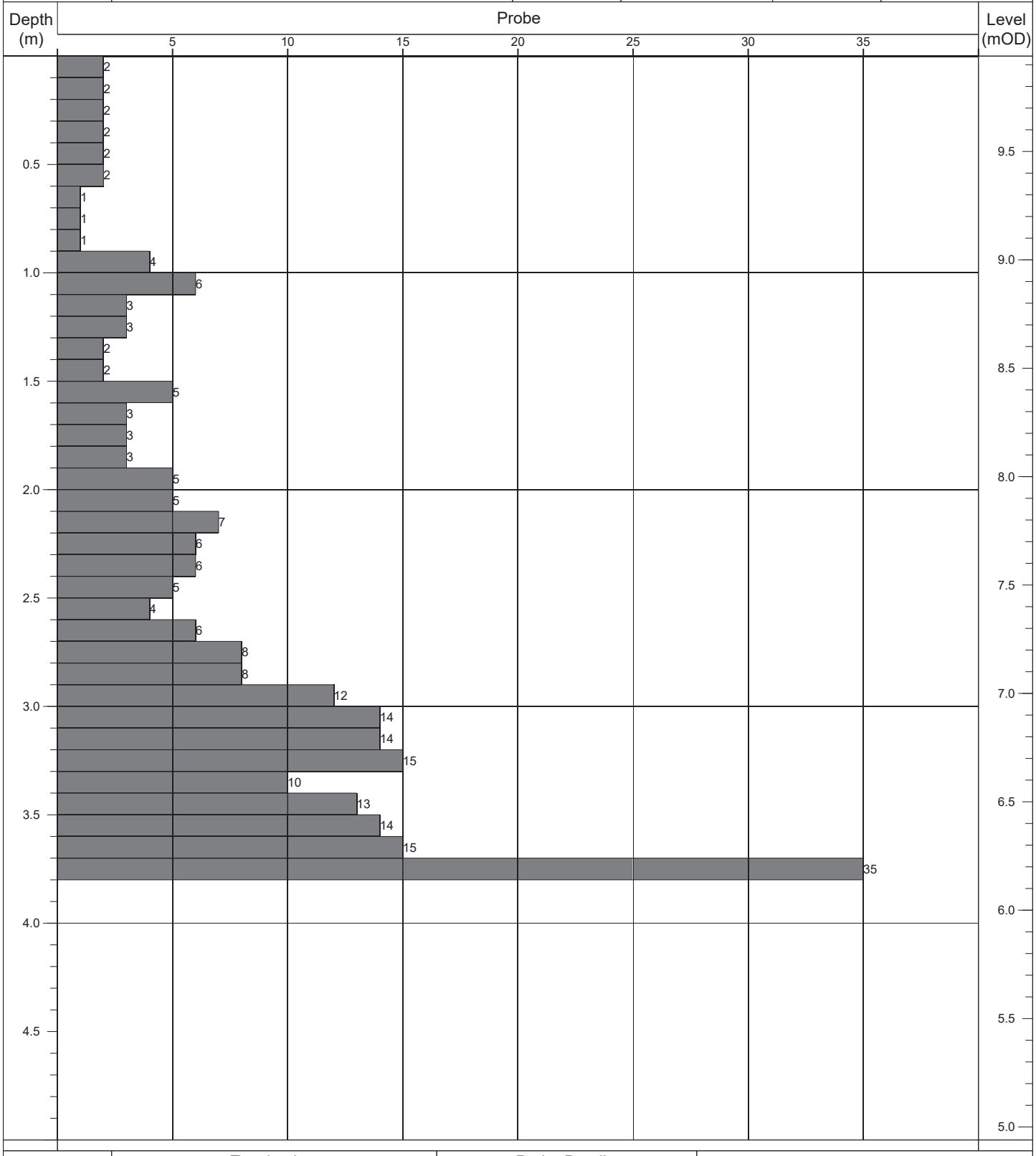
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP039**
Contract:	Hollybank	Easting:	717655.466	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748175.278	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.04	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



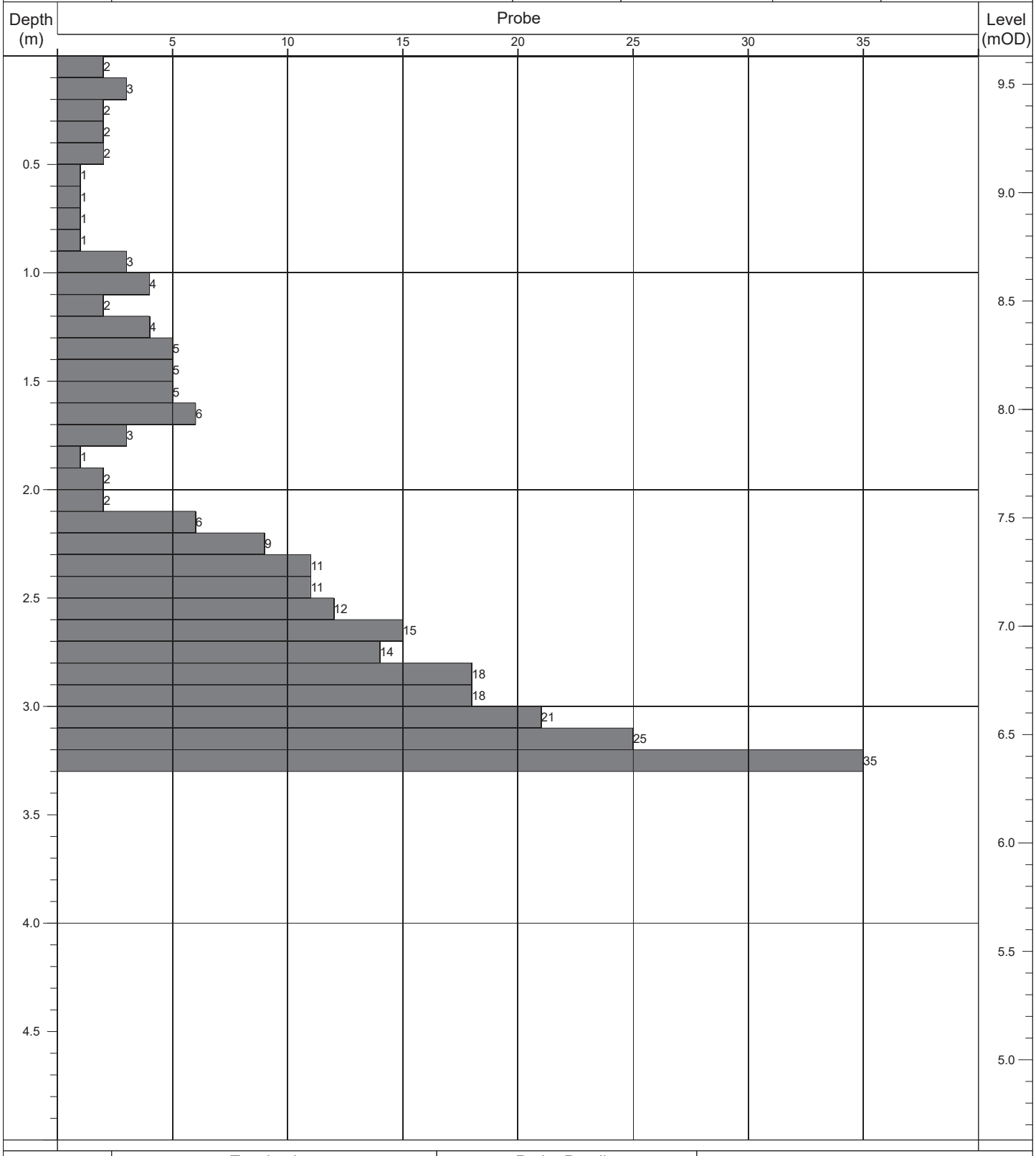
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP040**
Contract:	Hollybank	Easting:	717665.410	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748176.993	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.94	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



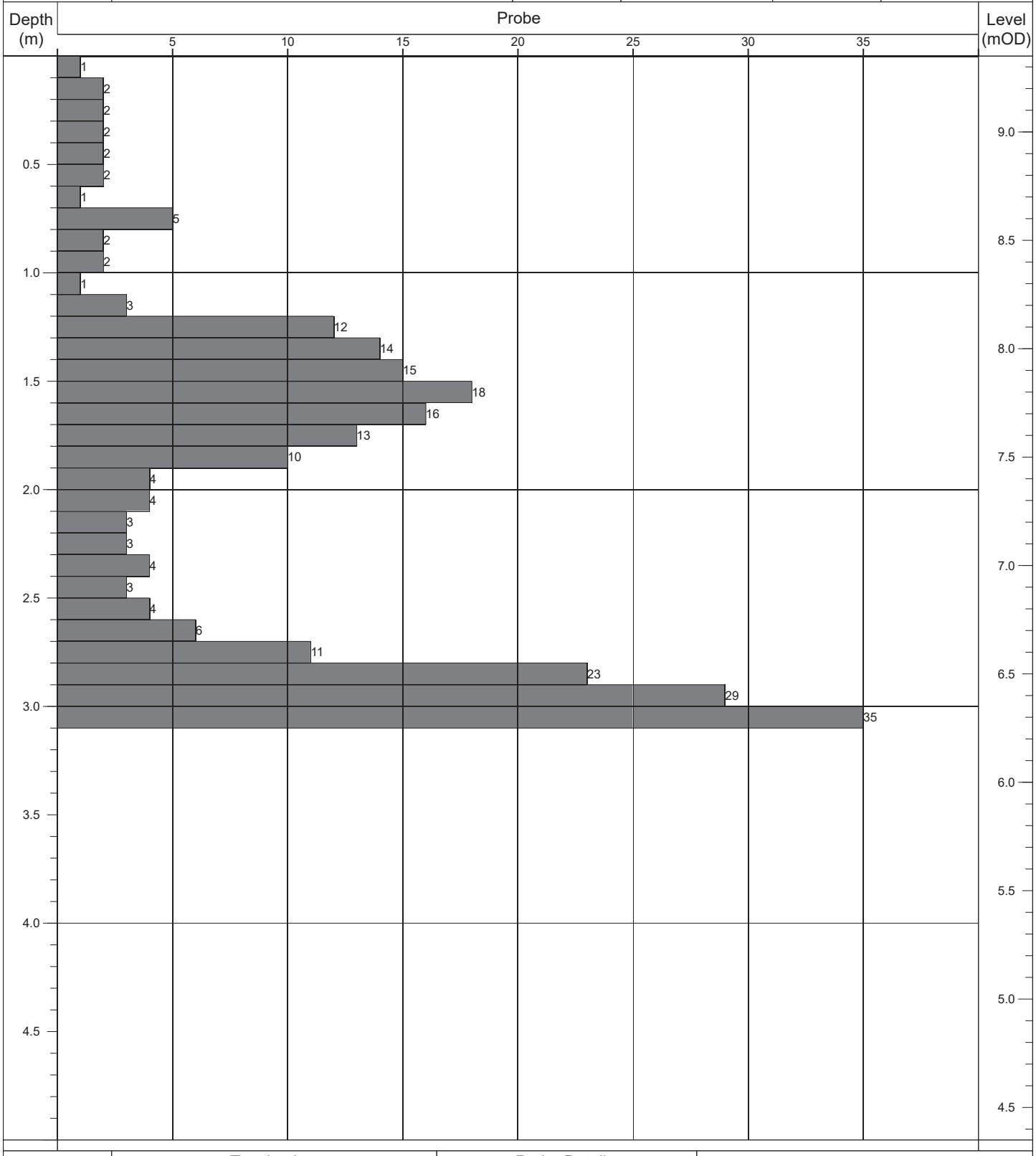
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP041**
Contract:	Hollybank	Easting:	717678.472	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748181.942	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.63	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



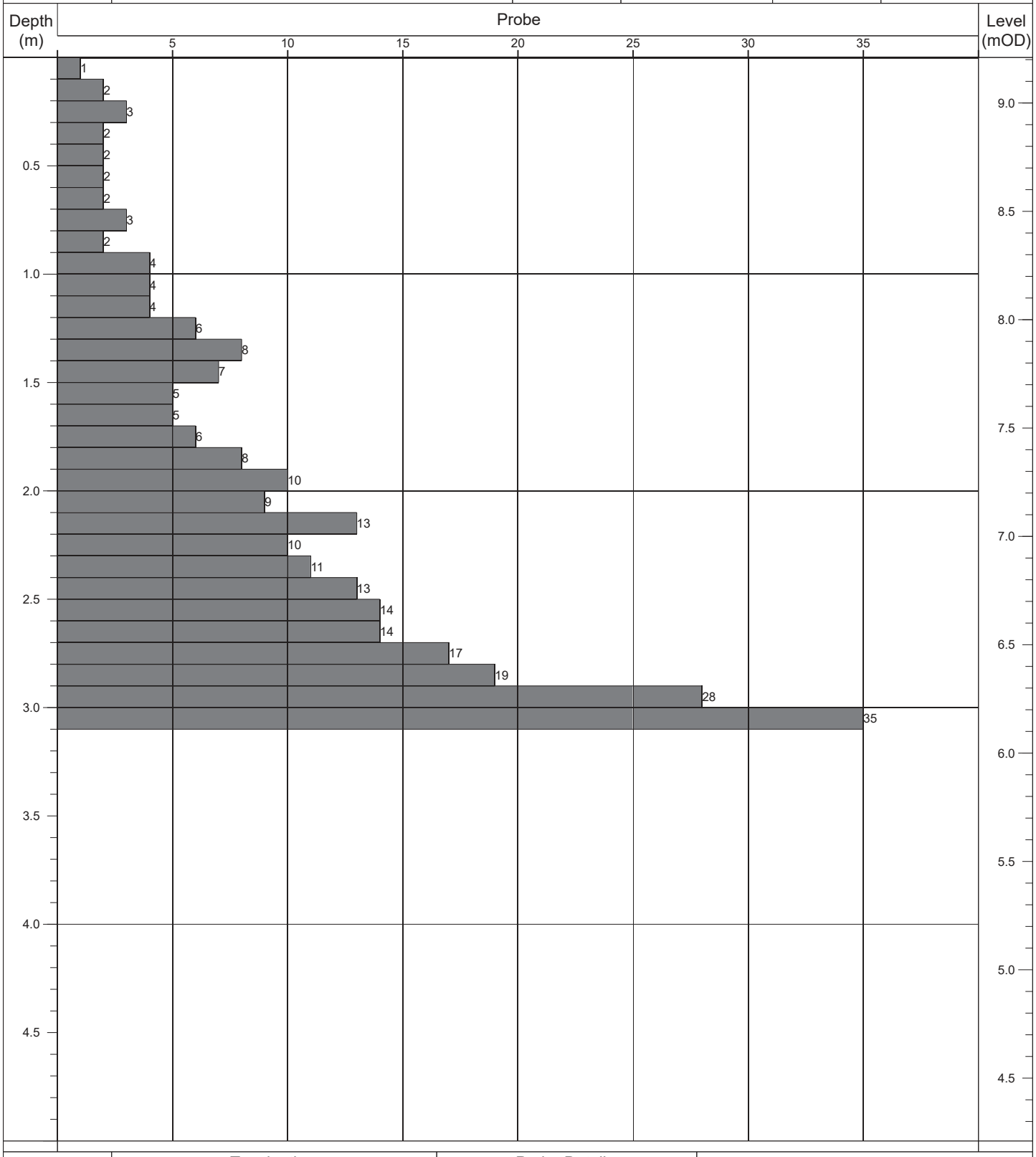
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP042**
Contract:	Hollybank	Easting:	717693.830	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748222.344	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.35	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



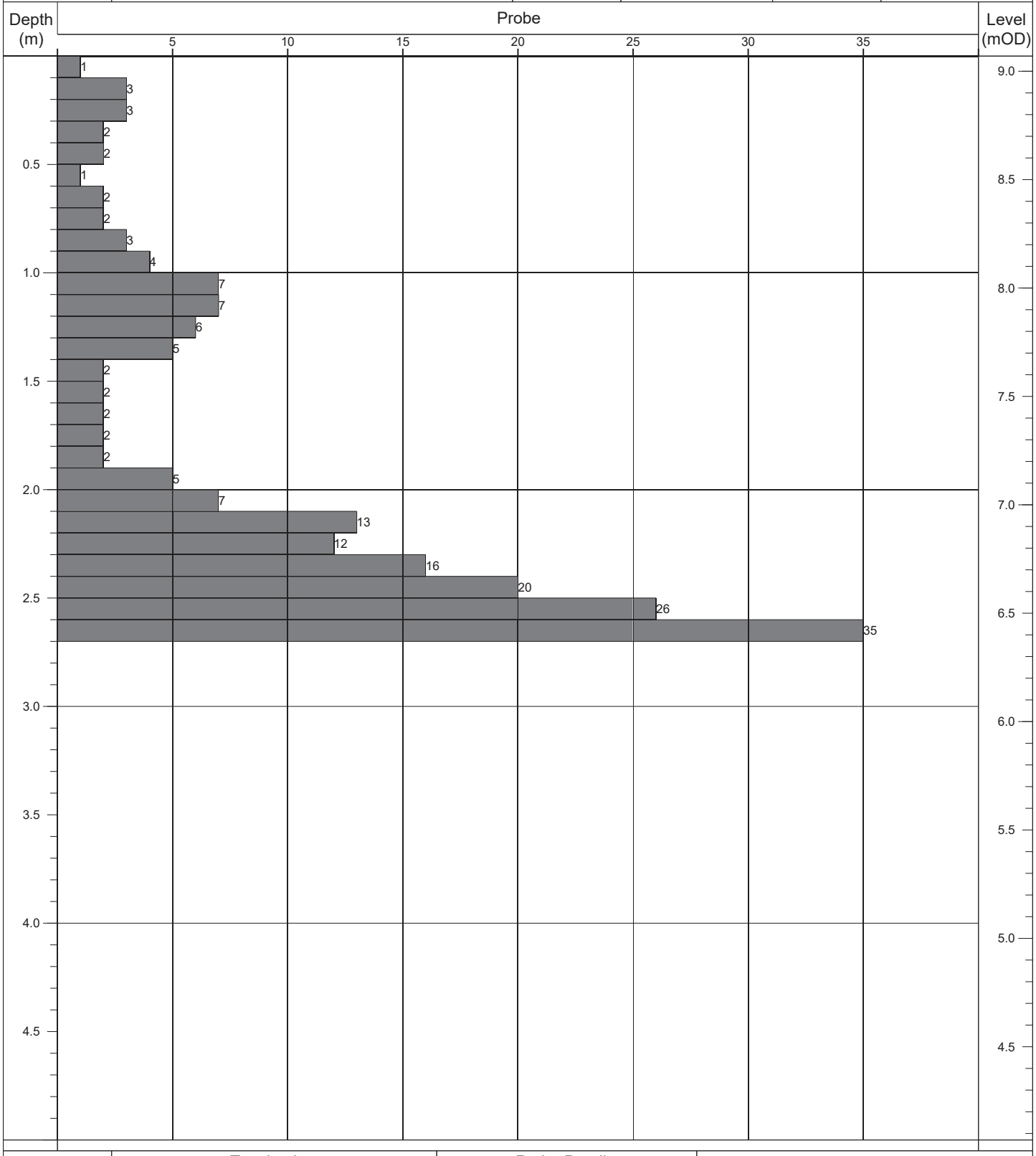
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP043**
Contract:	Hollybank	Easting:	717706.974	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748222.284	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.21	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



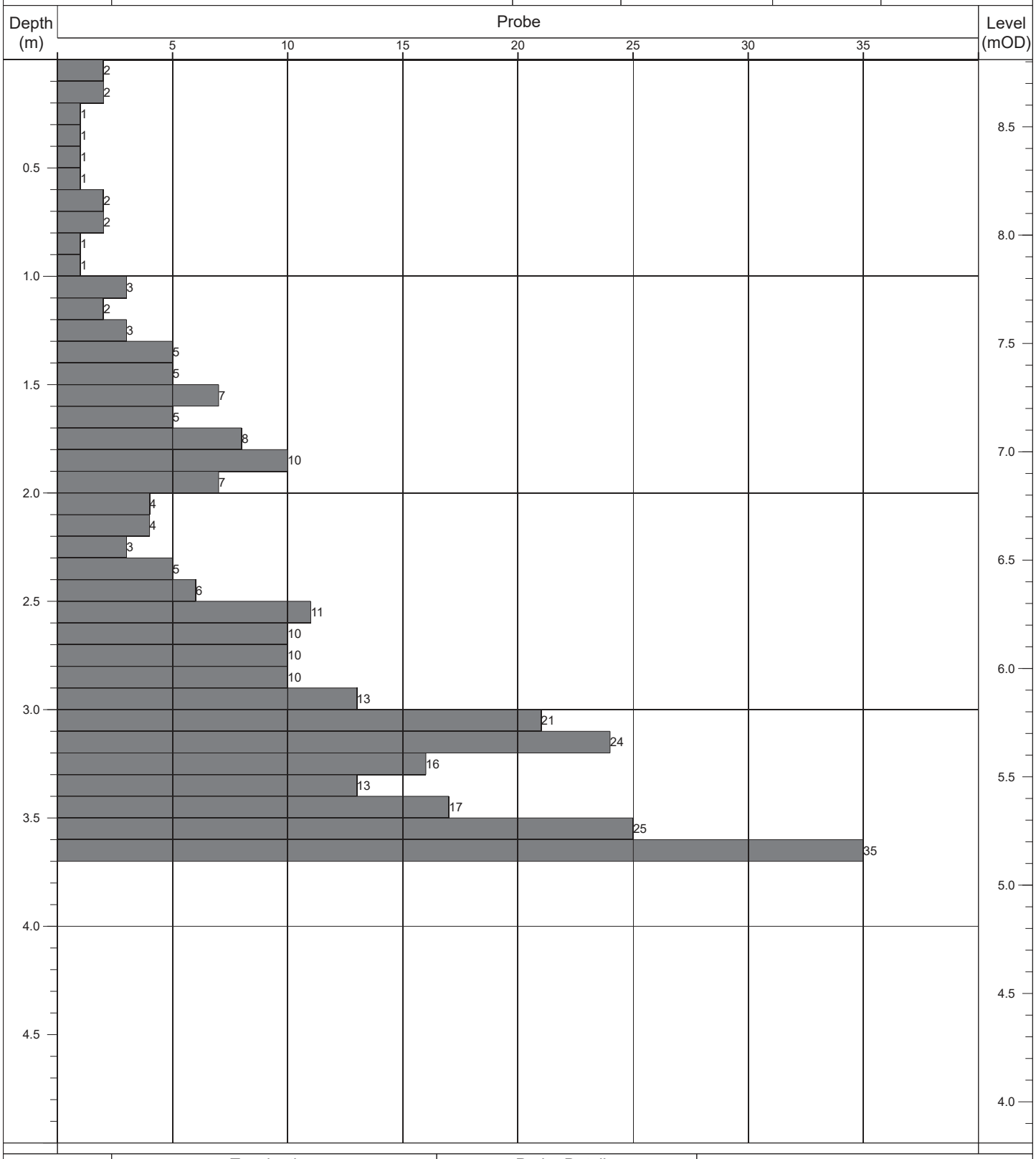
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP044**
Contract:	Hollybank	Easting:	717721.294	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748217.927	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.07	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



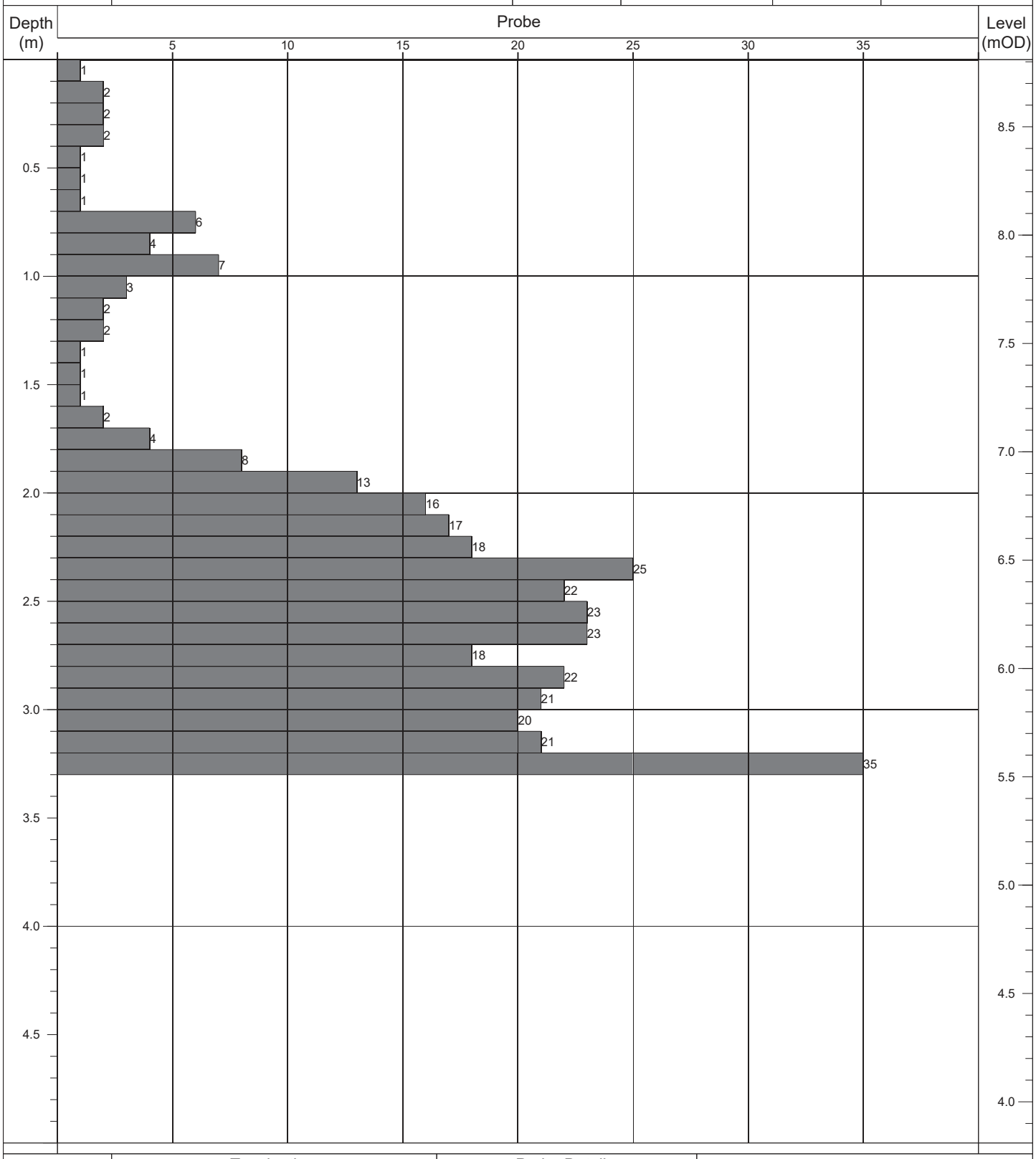
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP045**
Contract:	Hollybank	Easting:	717738.174	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748214.072	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.81	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



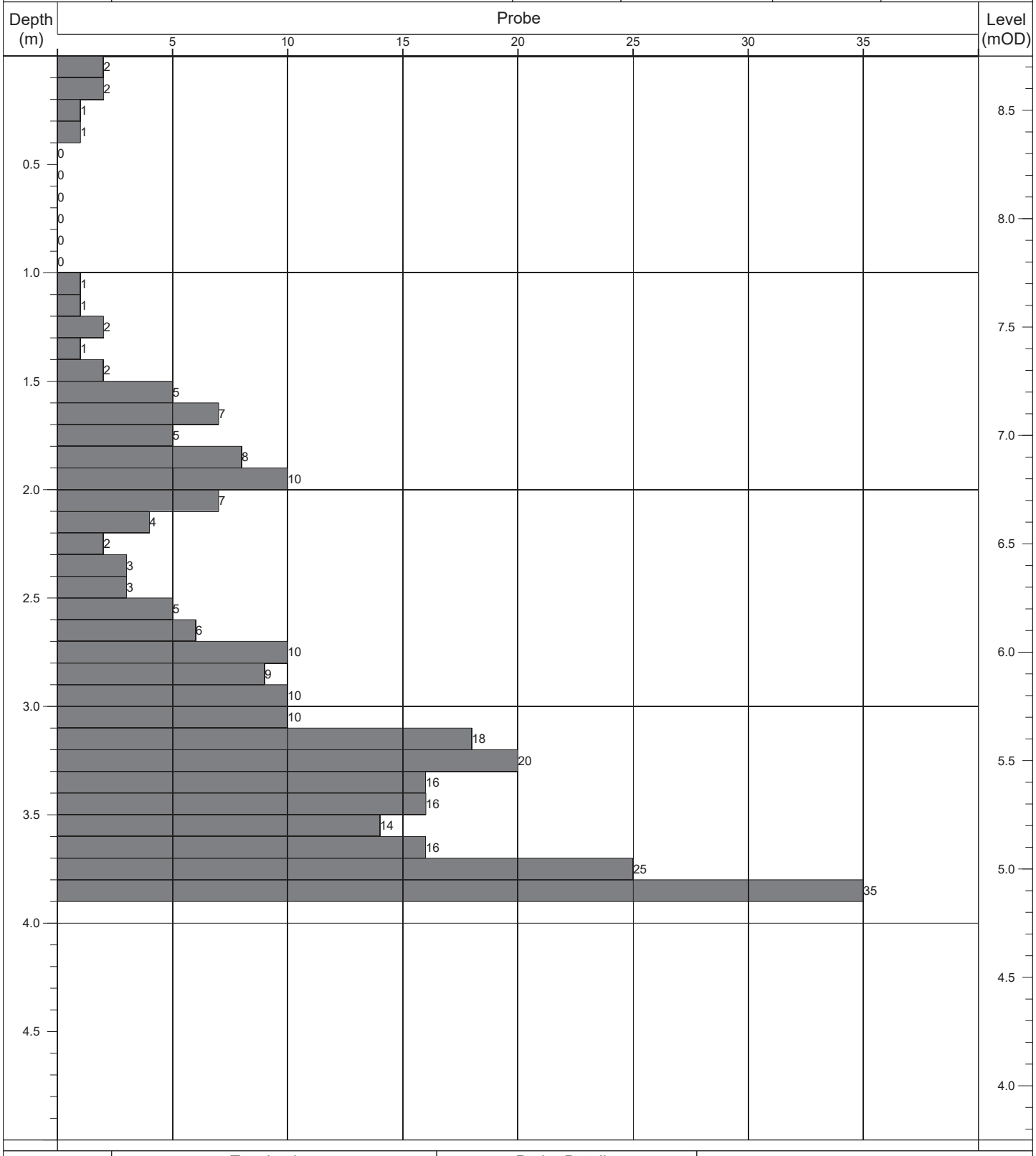
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP046**
Contract:	Hollybank	Easting:	717738.249	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748204.809	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.81	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



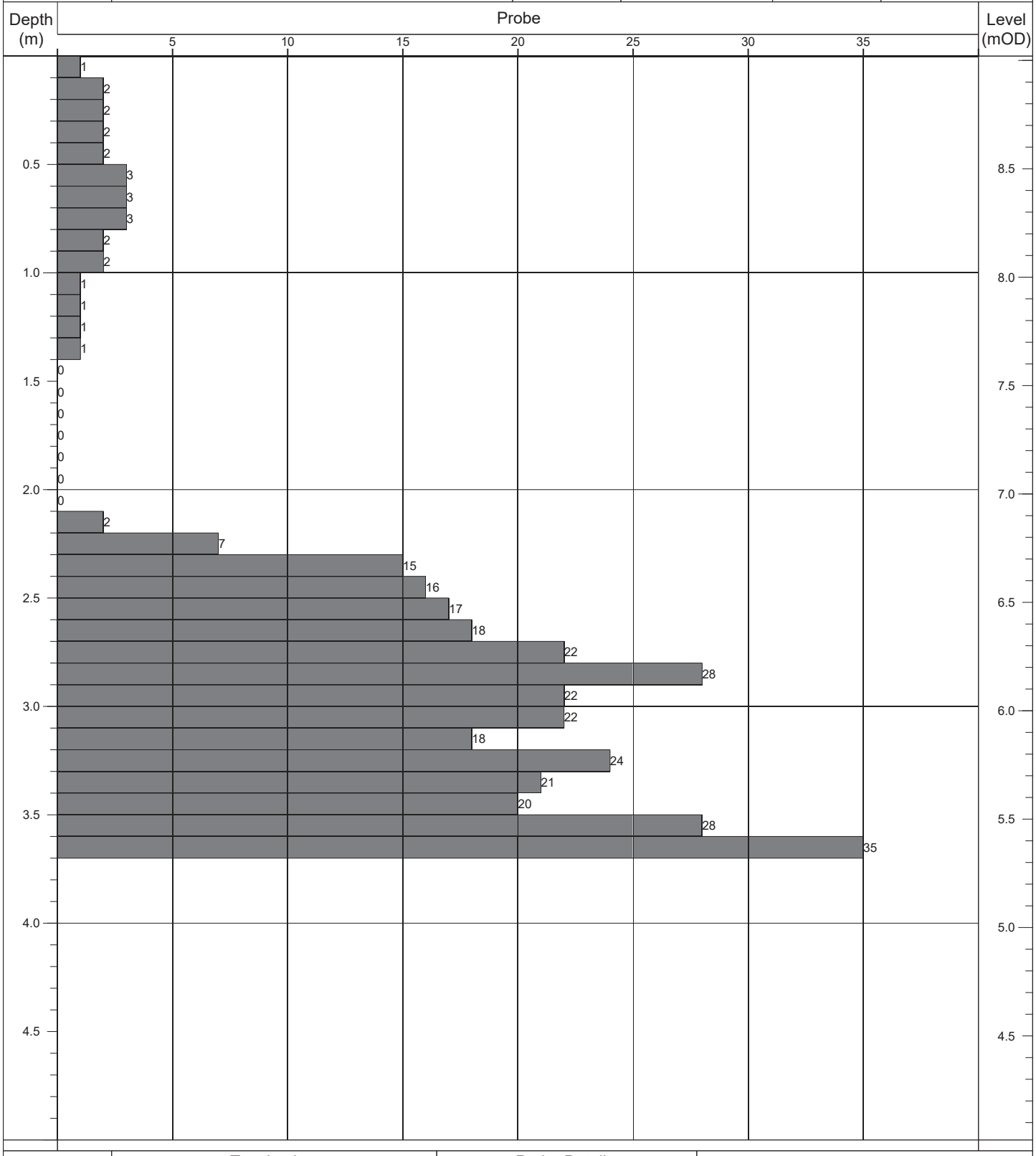
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP047**
Contract:	Hollybank	Easting:	717729.464	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748189.521	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.75	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



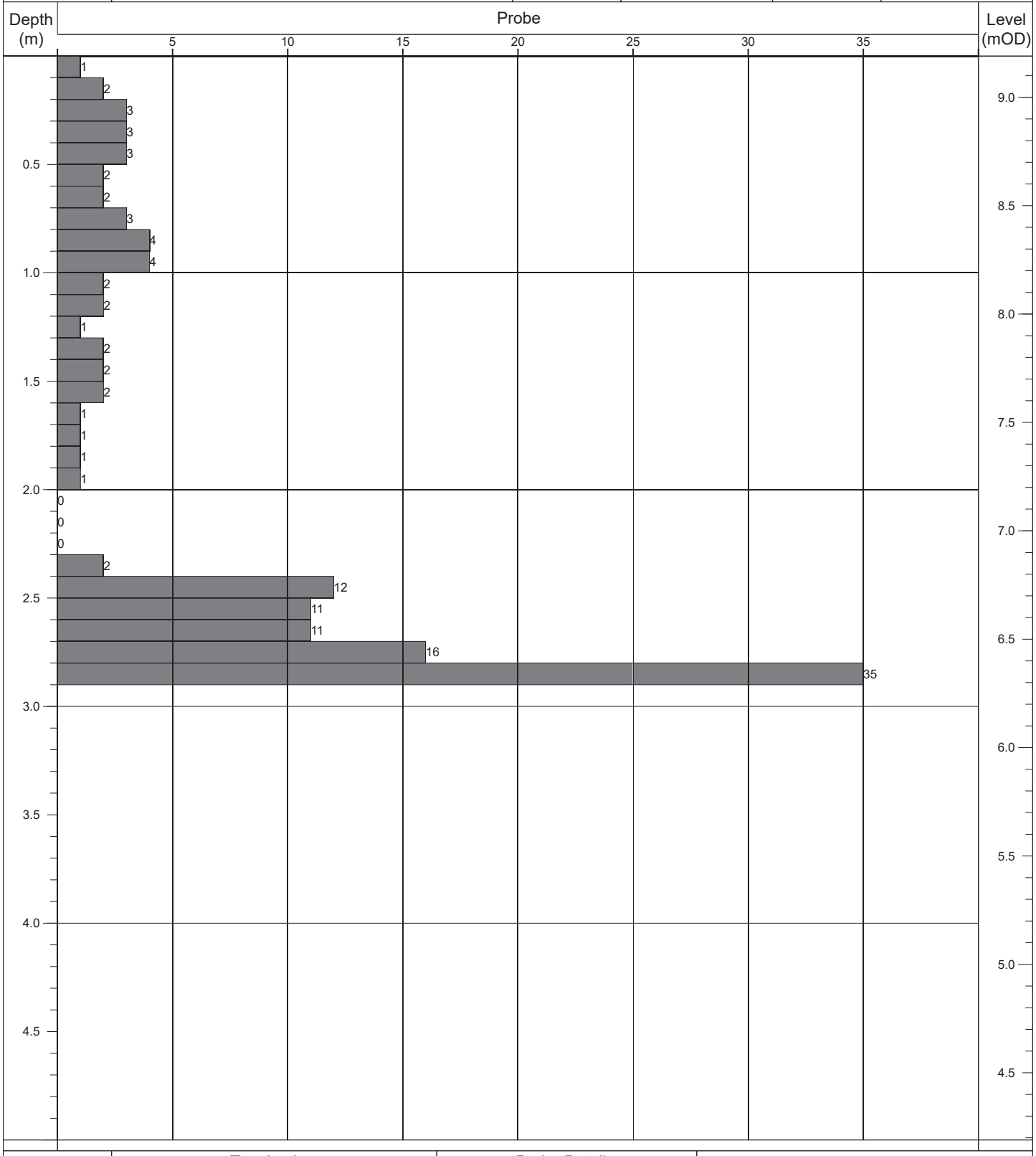
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP048**
Contract:	Hollybank	Easting:	717715.346	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748185.553	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.02	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



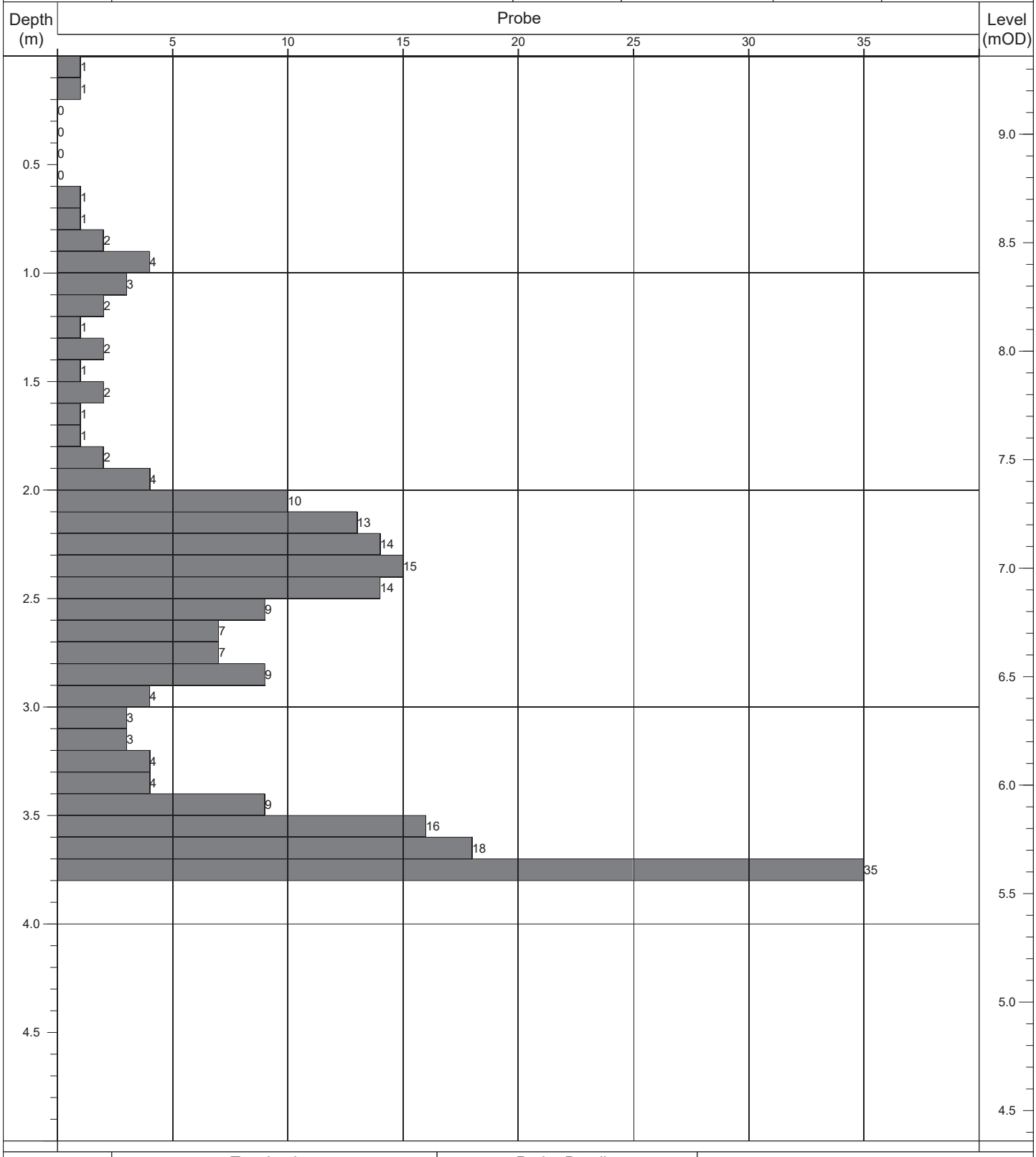
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP049**
Contract:	Hollybank	Easting:	717698.841	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748184.016	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.19	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



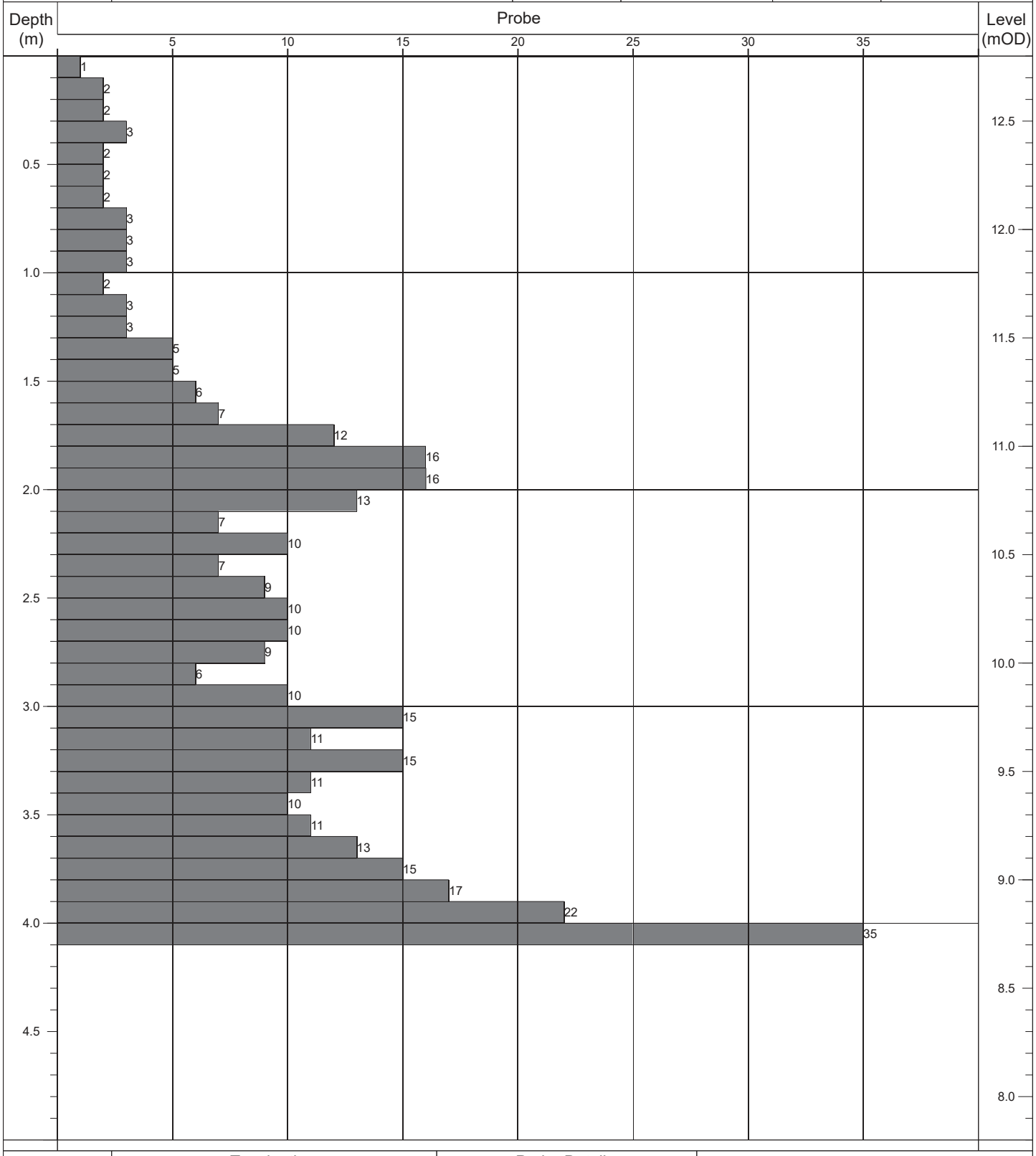
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	# Dynamic Probe Log				Probe No: **DP050**
Contract:	Hollybank	Easting:	717695.407	Date Started:	07/10/2020
Location:	Swords, Co. Dublin	Northing:	748201.390	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.36	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



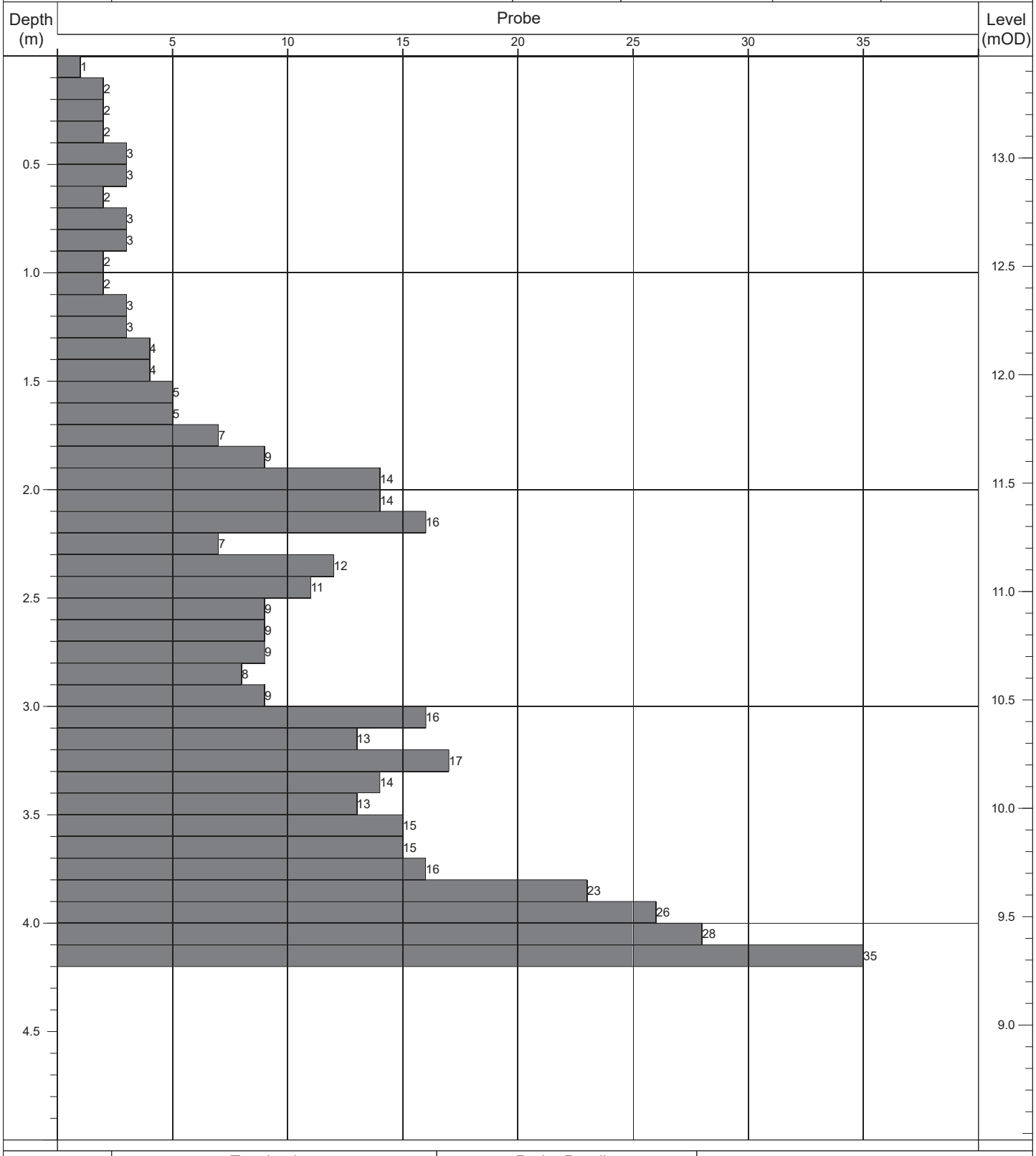
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP051**
Contract:	Hollybank	Easting:	717634.050	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748136.937	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.80	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



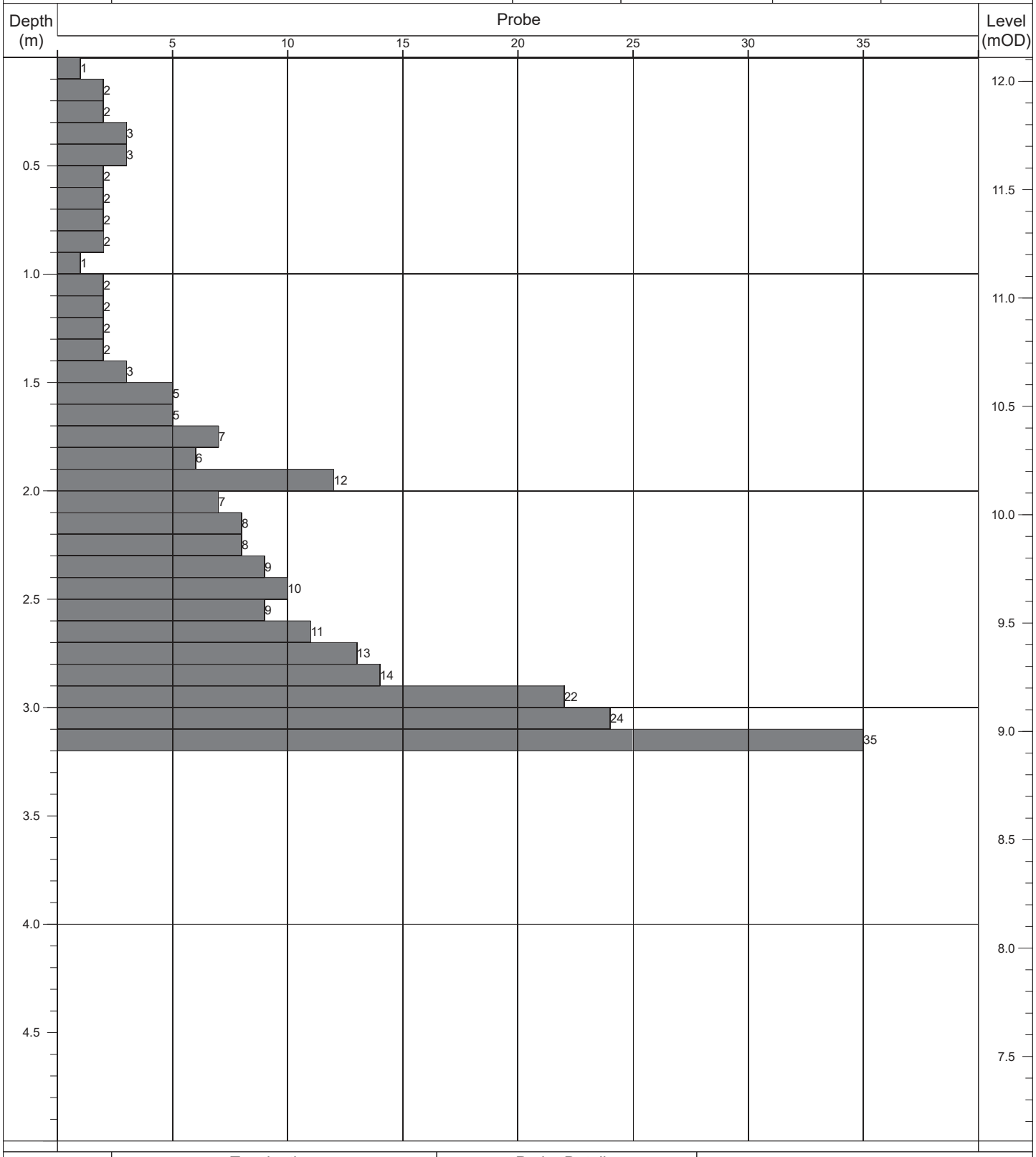
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP052**
Contract:	Hollybank	Easting:	717641.398	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748124.740	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.47	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



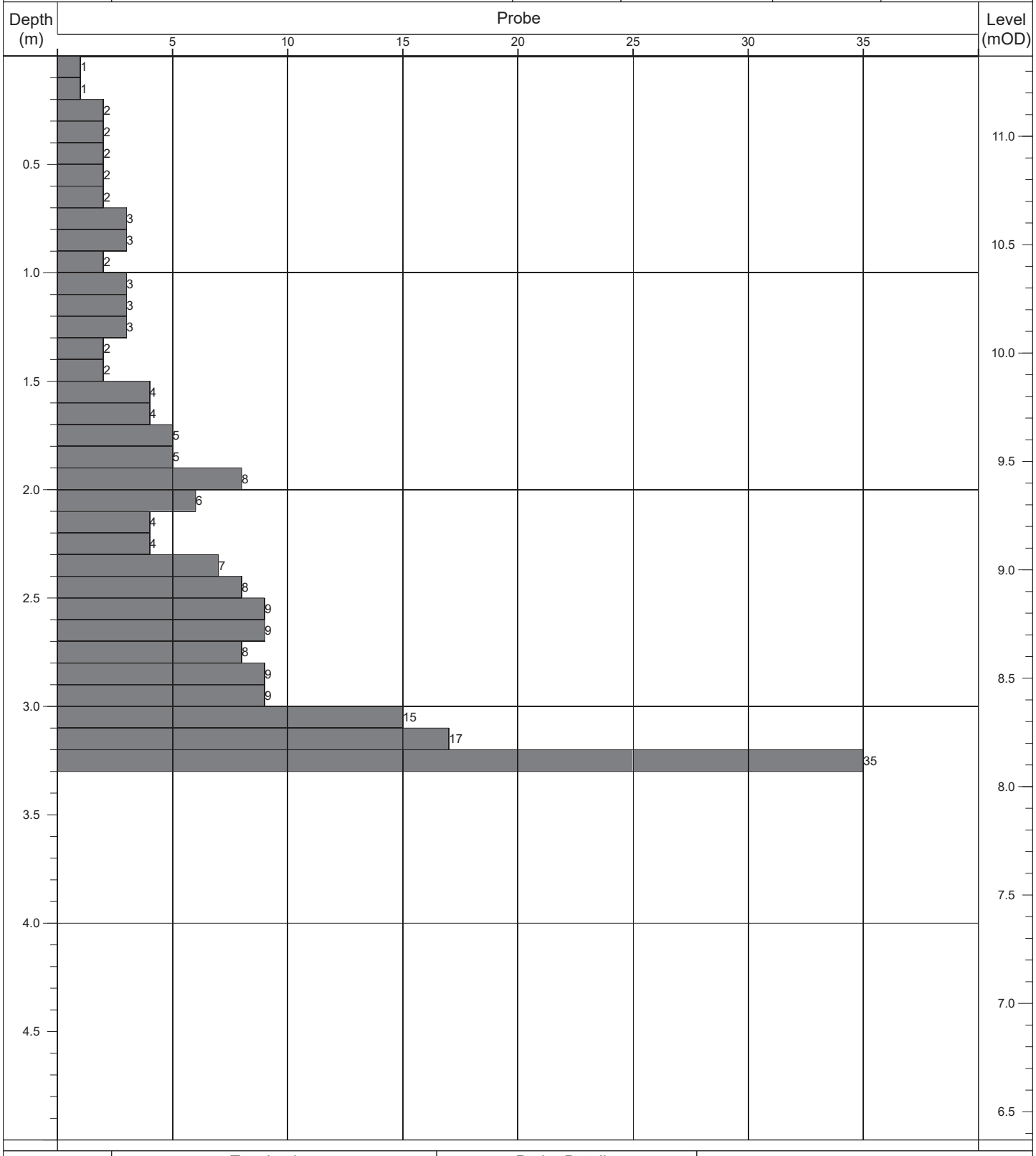
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP053**
Contract:	Hollybank	Easting:	717650.720	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748141.034	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.11	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



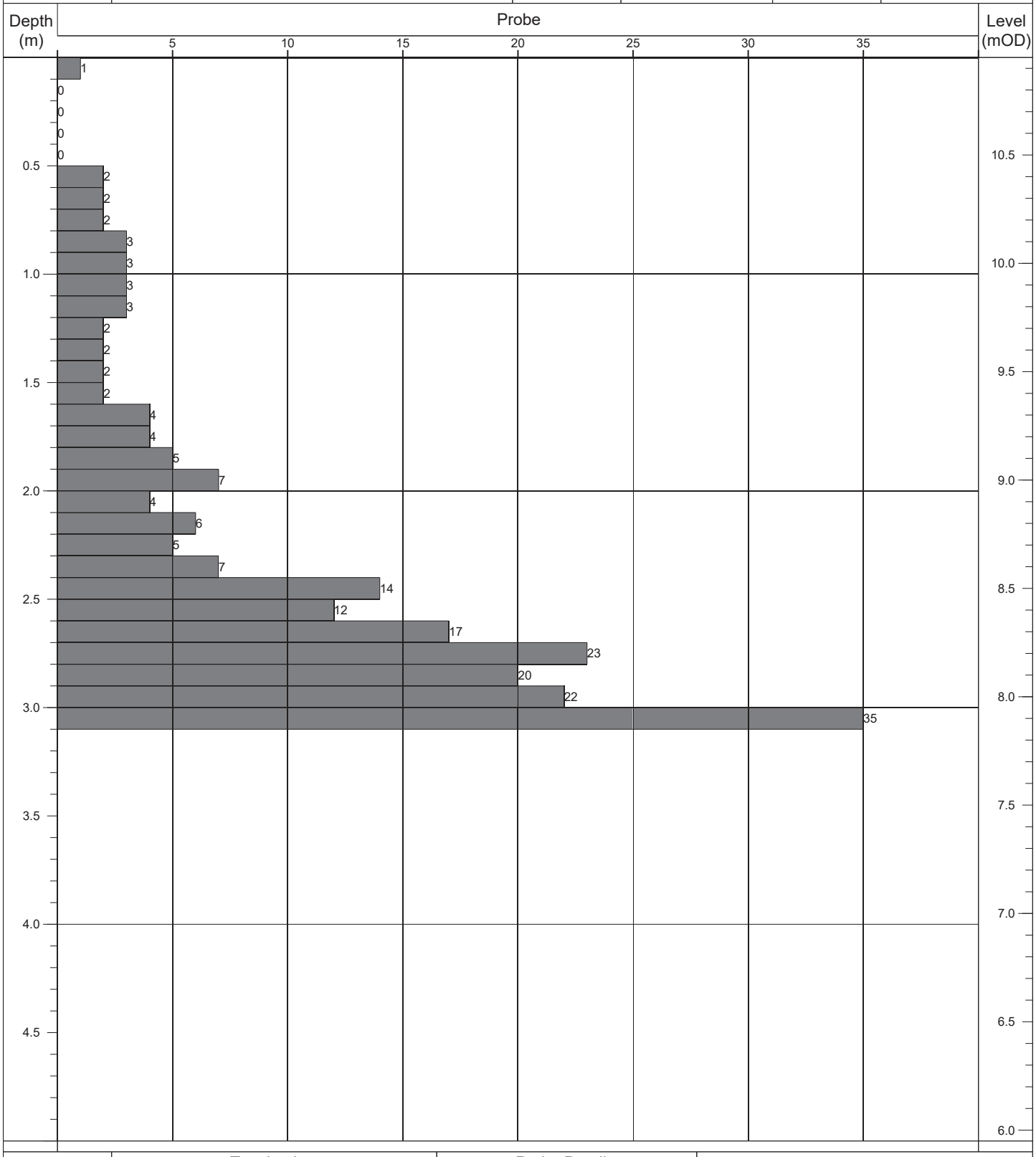
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP054**
Contract:	Hollybank	Easting:	717664.916	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748145.816	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	11.37	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



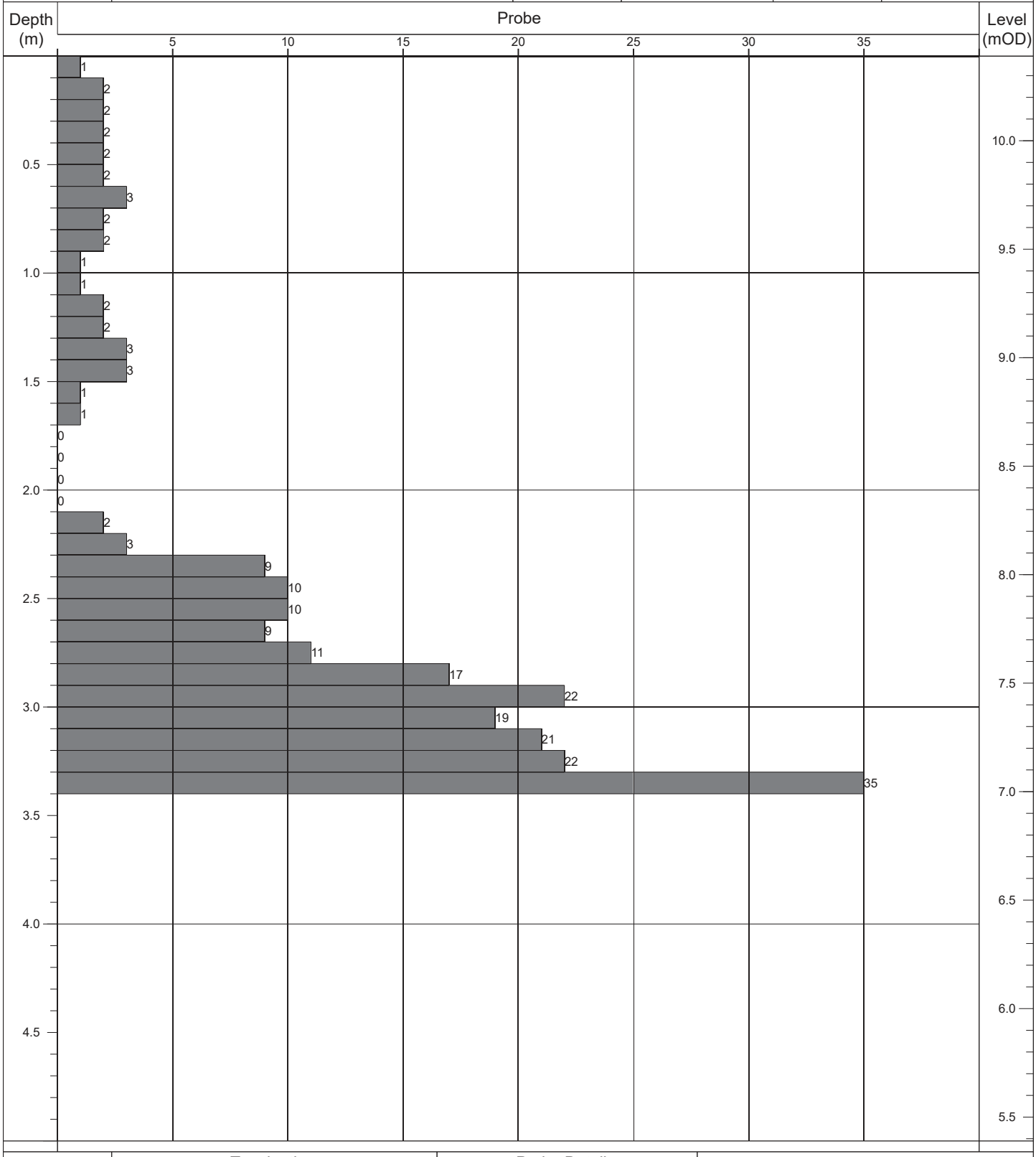
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP055**
Contract:	Hollybank	Easting:	717679.802	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748145.638	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.95	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



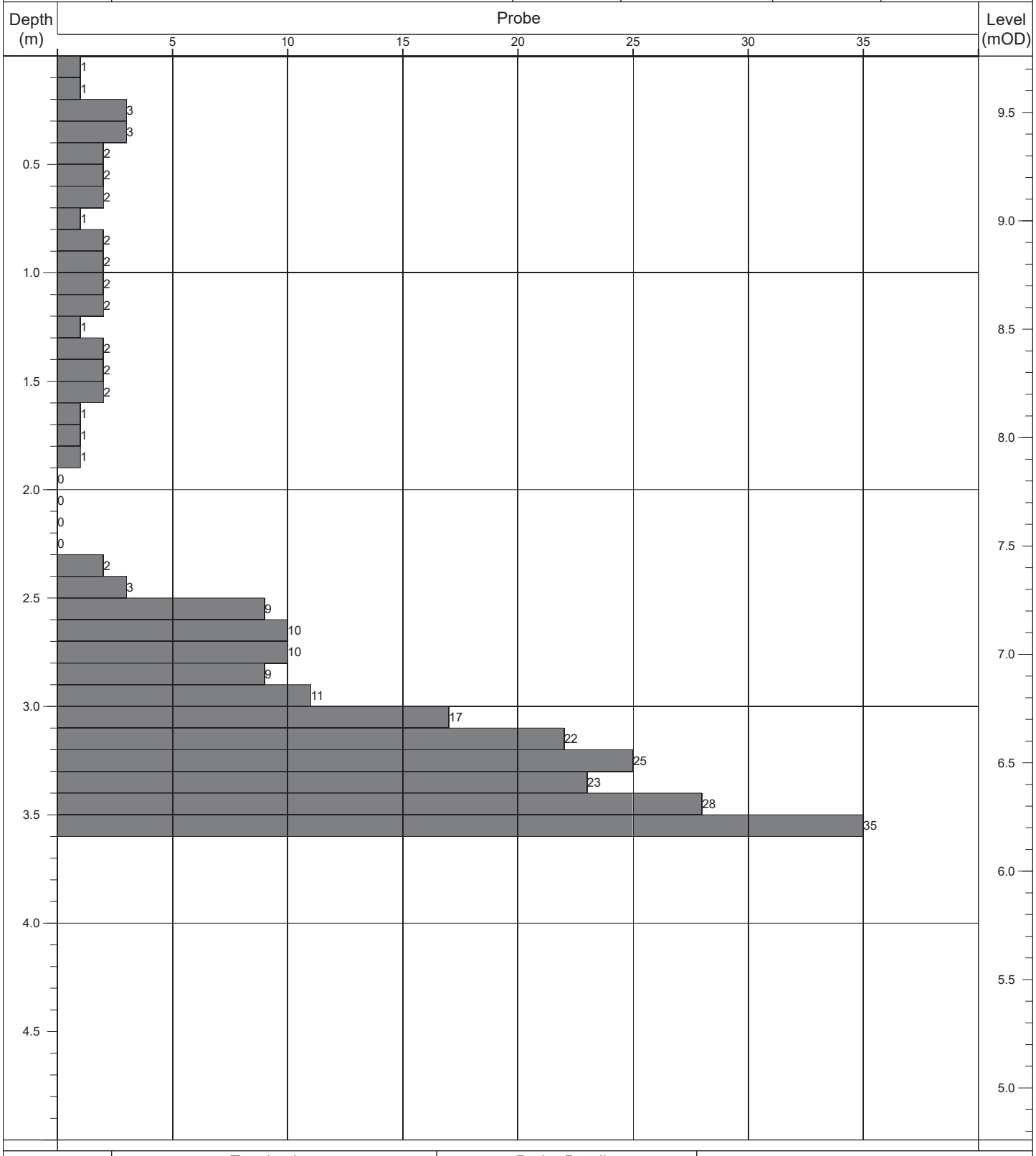
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP056**
Contract:	Hollybank	Easting:	717692.623	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748153.275	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.39	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



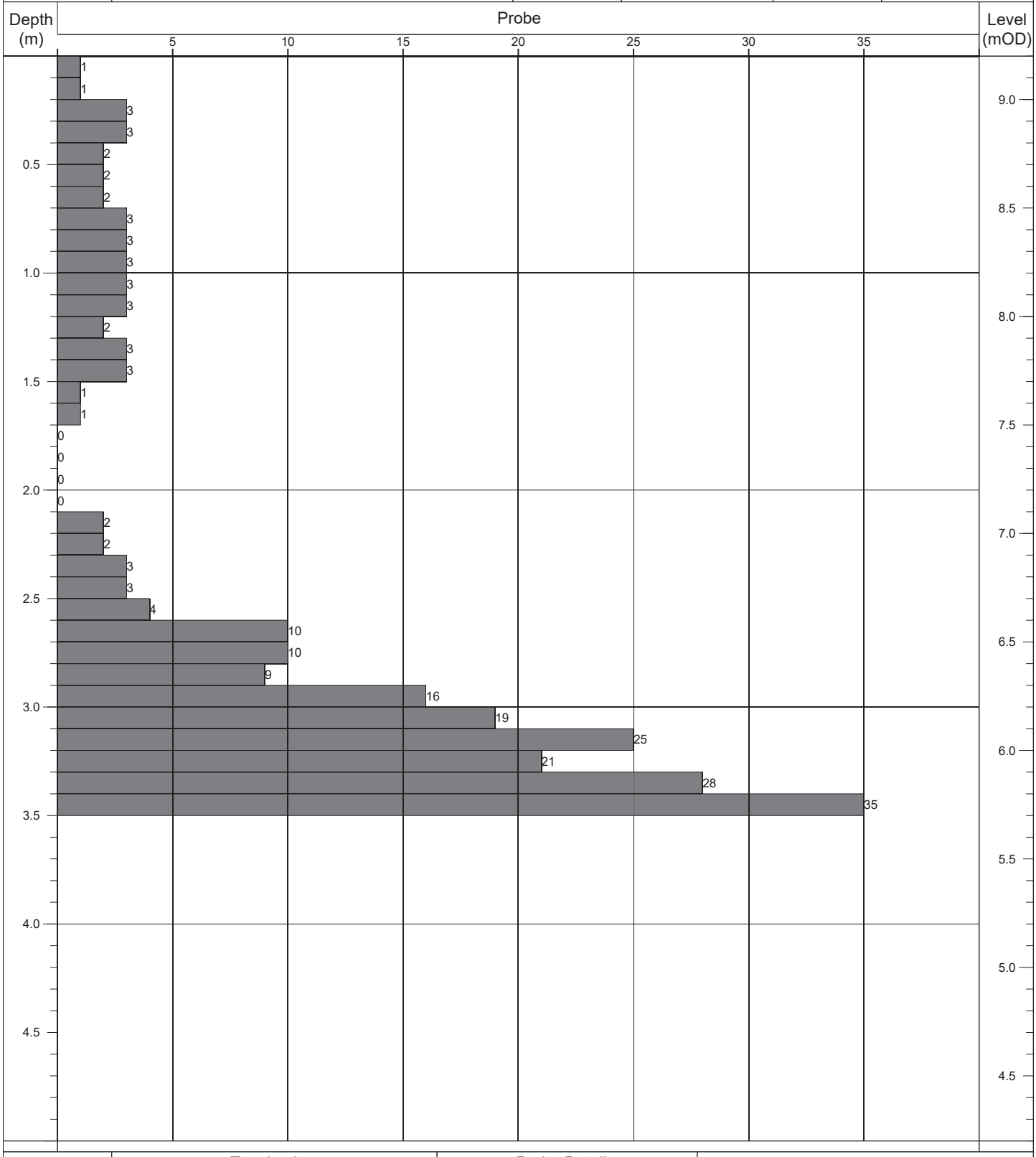
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP057**
Contract:	Hollybank	Easting:	717712.288	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748154.862	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.76	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



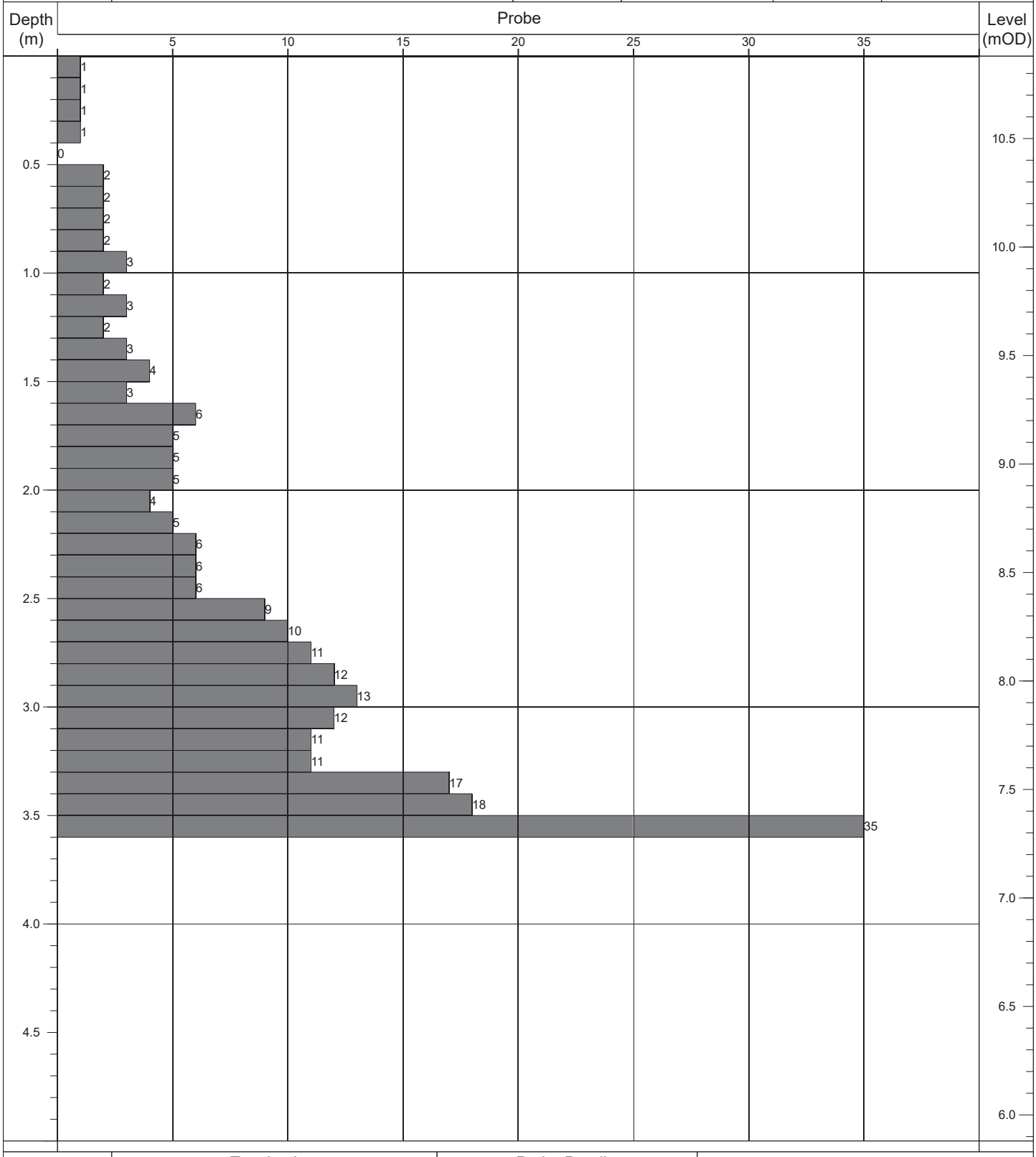
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP058**
Contract:	Hollybank	Easting:	717723.505	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748160.244	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.20	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



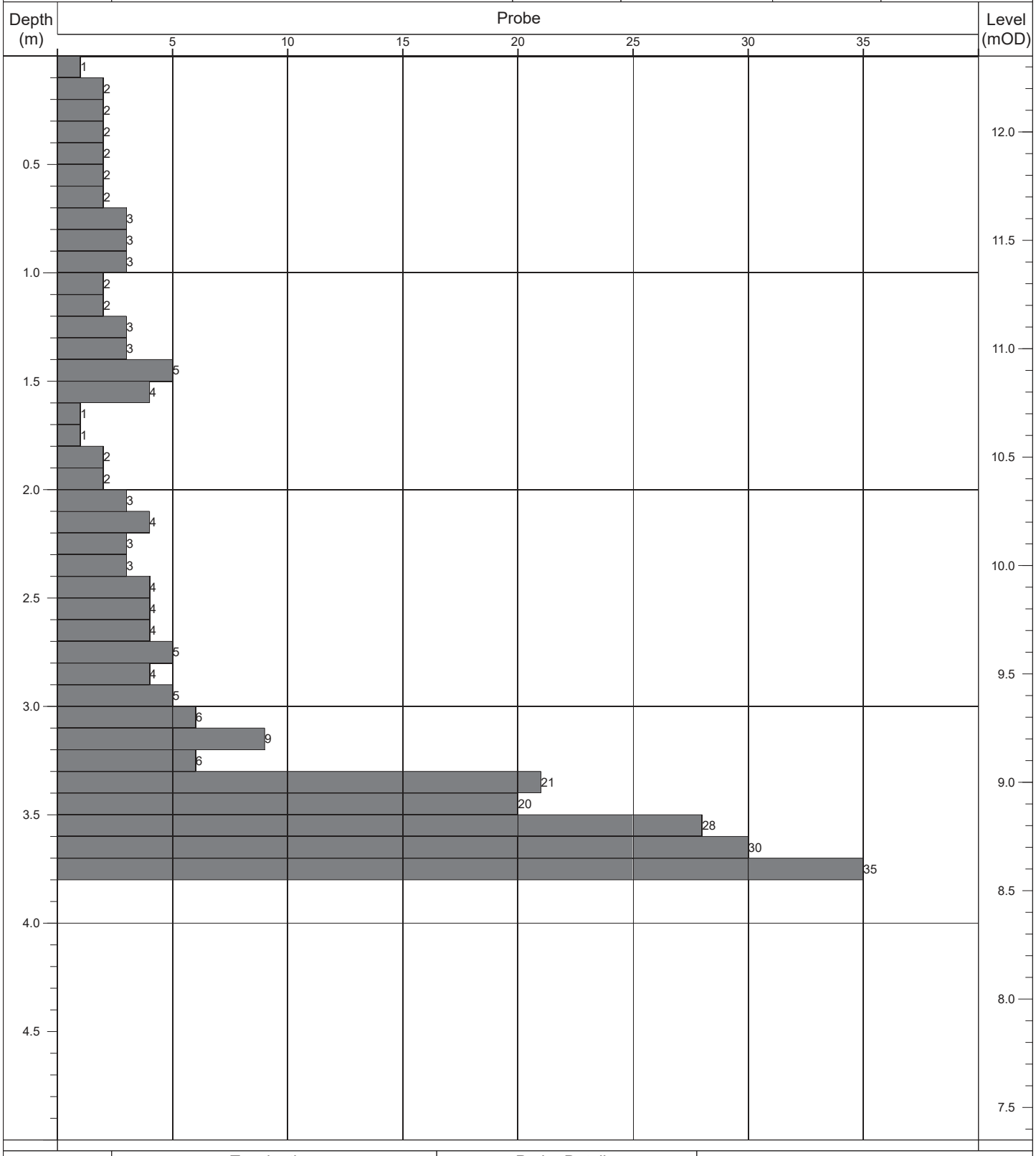
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.50m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP059**
Contract:	Hollybank	Easting:	717732.257	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748139.239	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	10.88	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



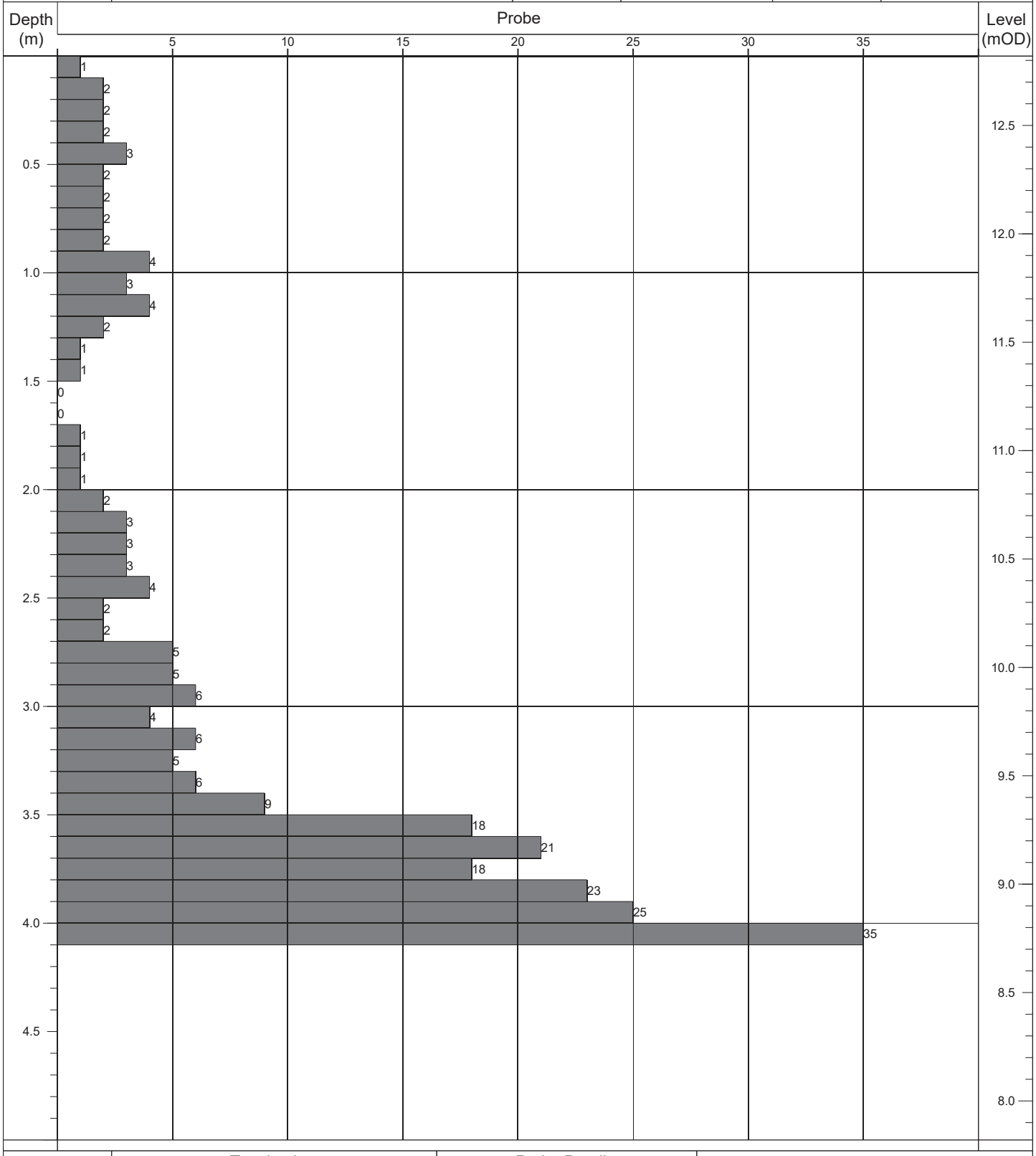
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP060**
Contract:	Hollybank	Easting:	717743.718	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748126.180	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.35	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



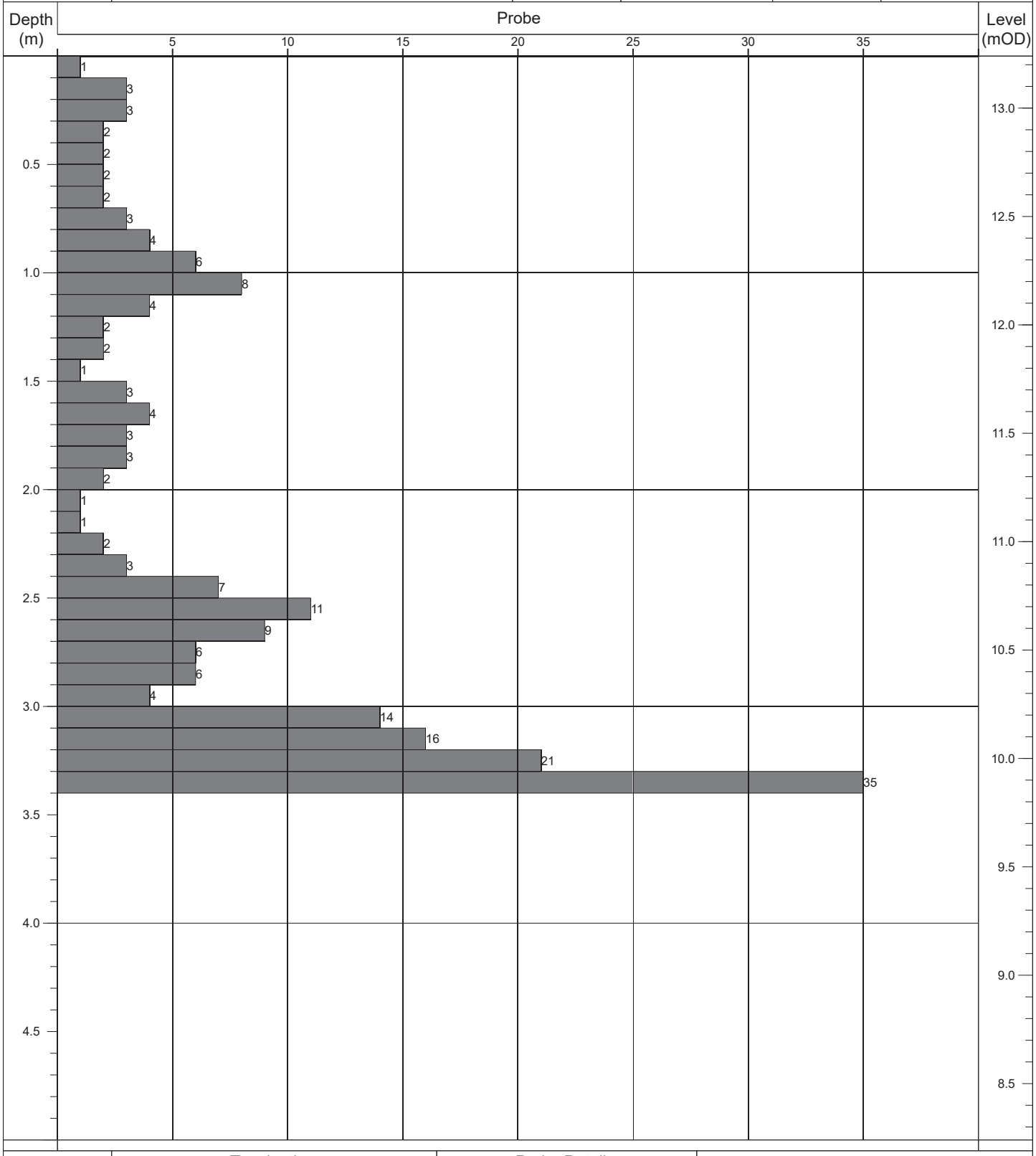
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP061**
Contract:	Hollybank	Easting:	717717.642	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748122.065	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.82	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



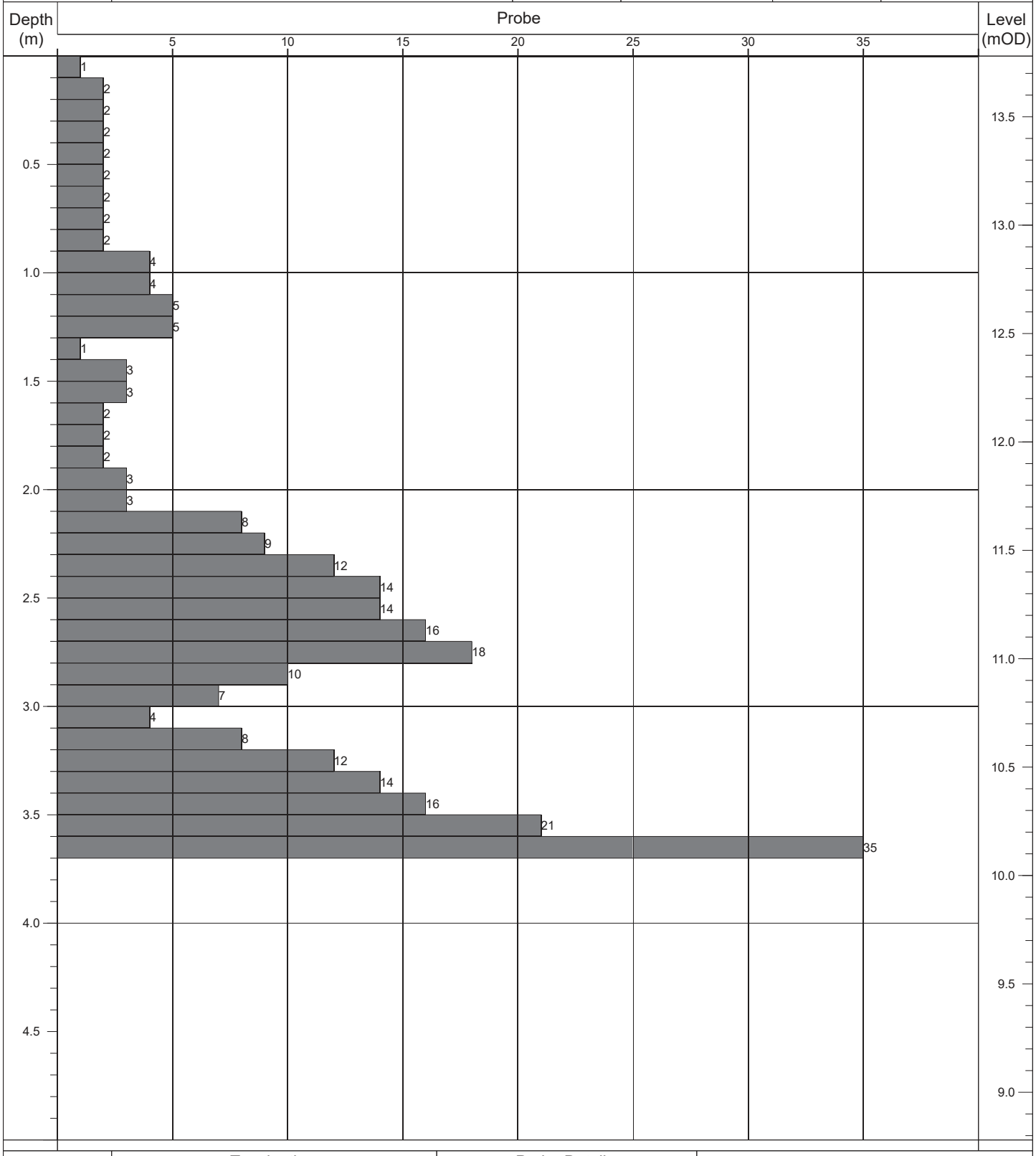
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP062**
Contract:	Hollybank	Easting:	717706.066	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748121.286	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.24	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



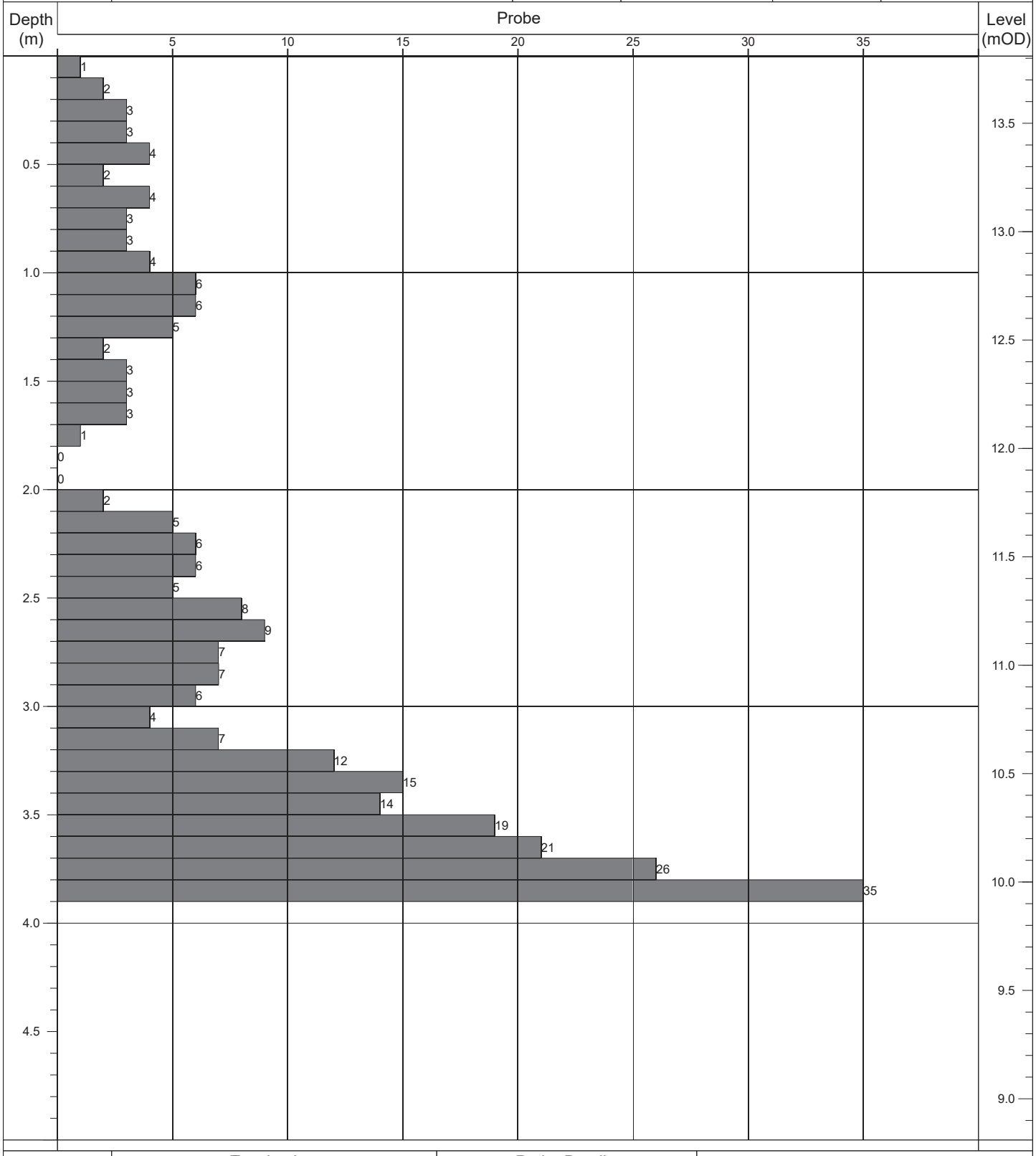
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP063**
Contract:	Hollybank	Easting:	717694.499	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748113.925	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.78	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



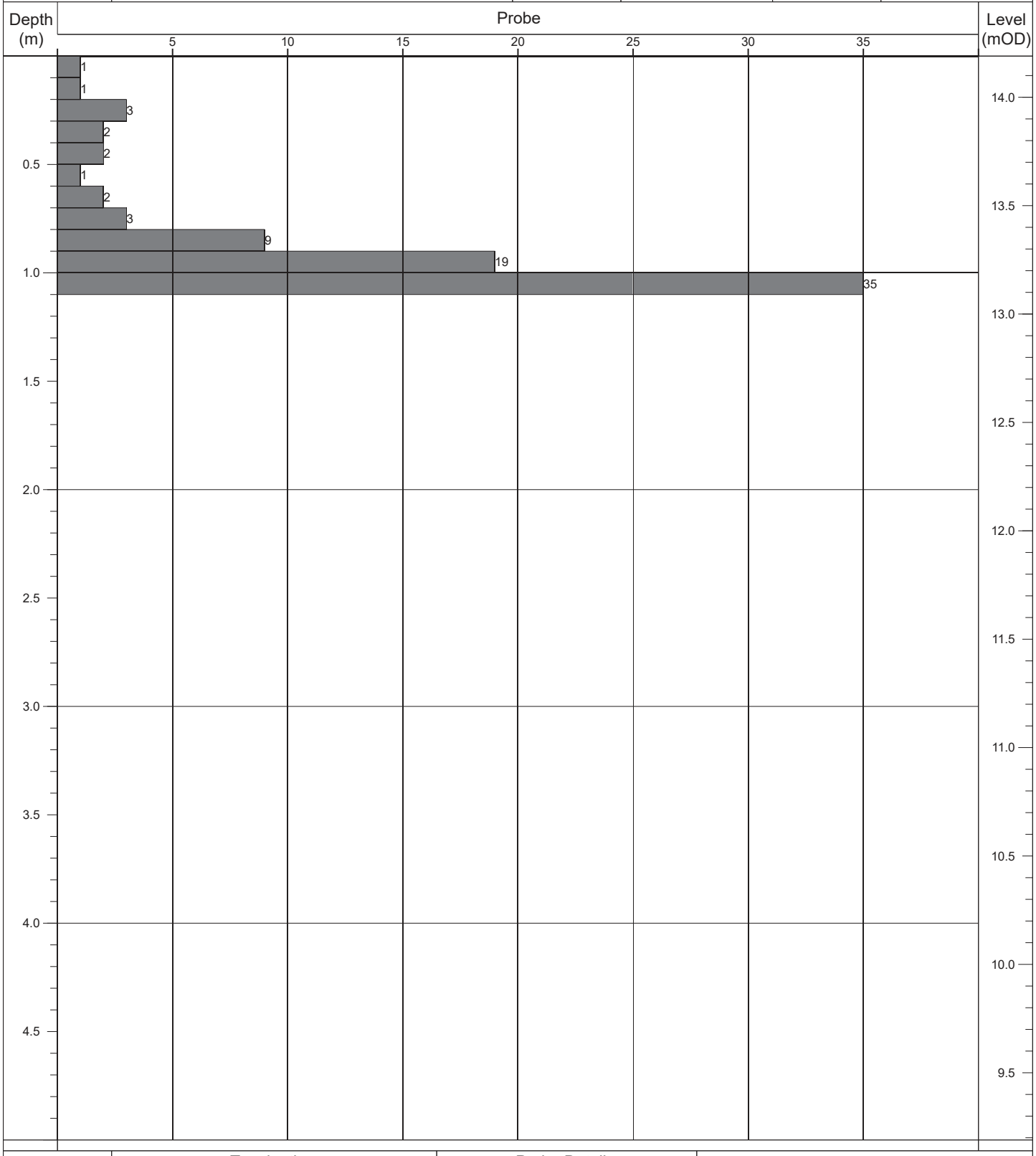
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP064**
Contract:	Hollybank	Easting:	717679.956	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748114.269	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.81	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



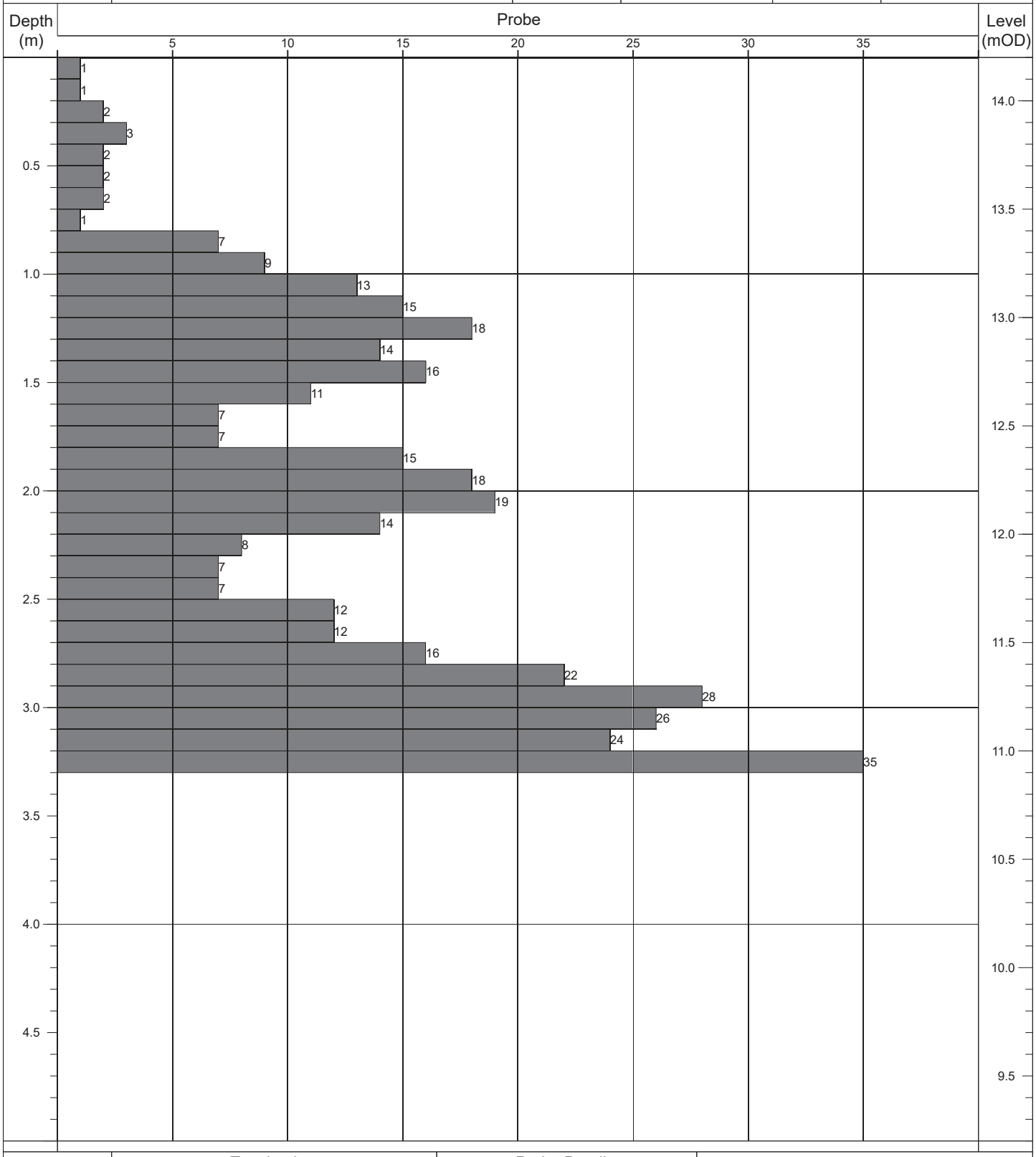
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP065**
Contract:	Hollybank	Easting:	717667.343	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748106.987	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.19	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



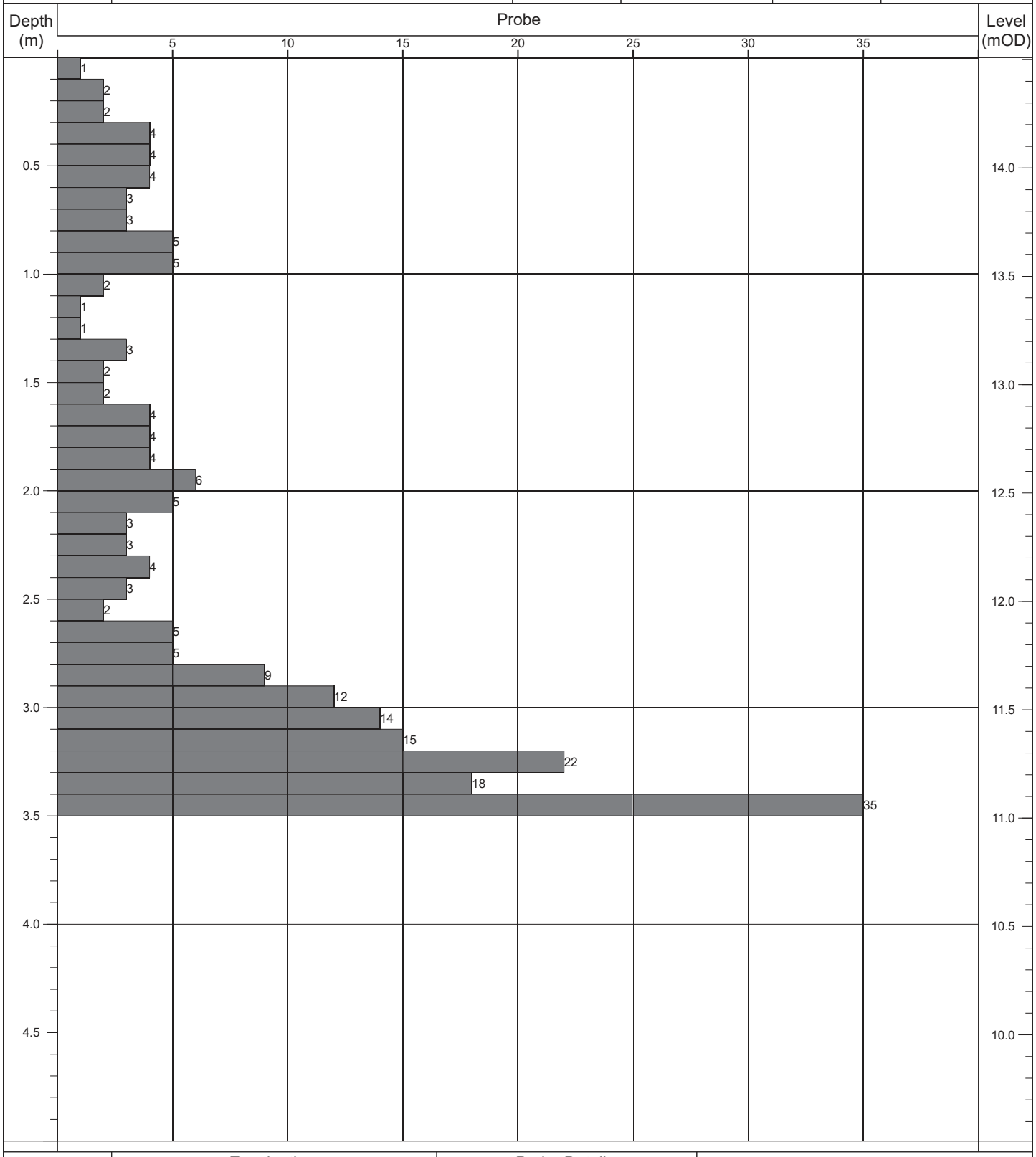
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
1.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP066**
Contract:	Hollybank	Easting:	717654.072	Date Started:	09/10/2020
Location:	Swords, Co. Dublin	Northing:	748107.597	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.20	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



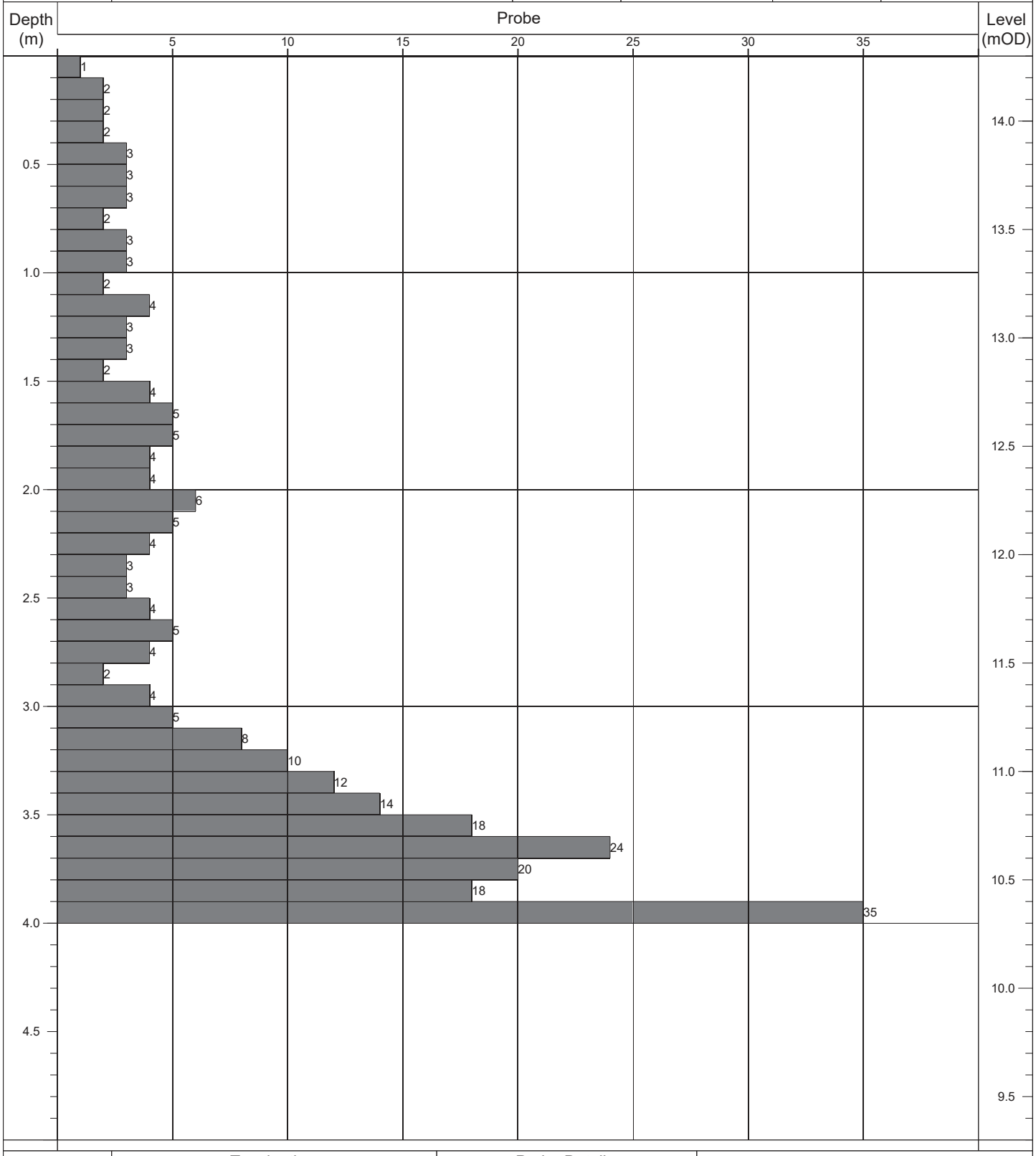
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP067**
Contract:	Hollybank	Easting:	717662.774	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748075.882	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.51	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



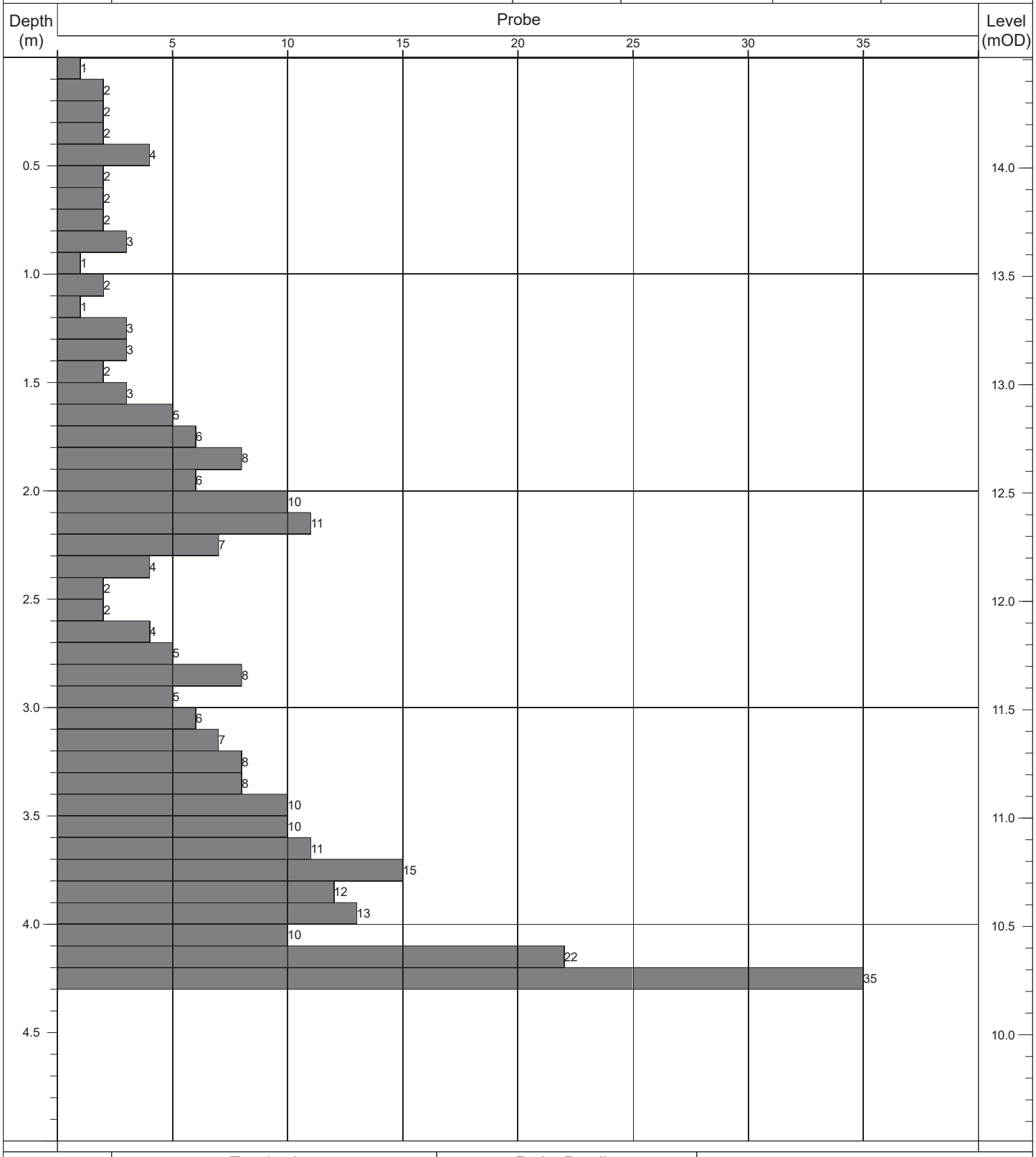
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.50m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP068**
Contract:	Hollybank	Easting:	717668.516	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748064.681	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.30	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



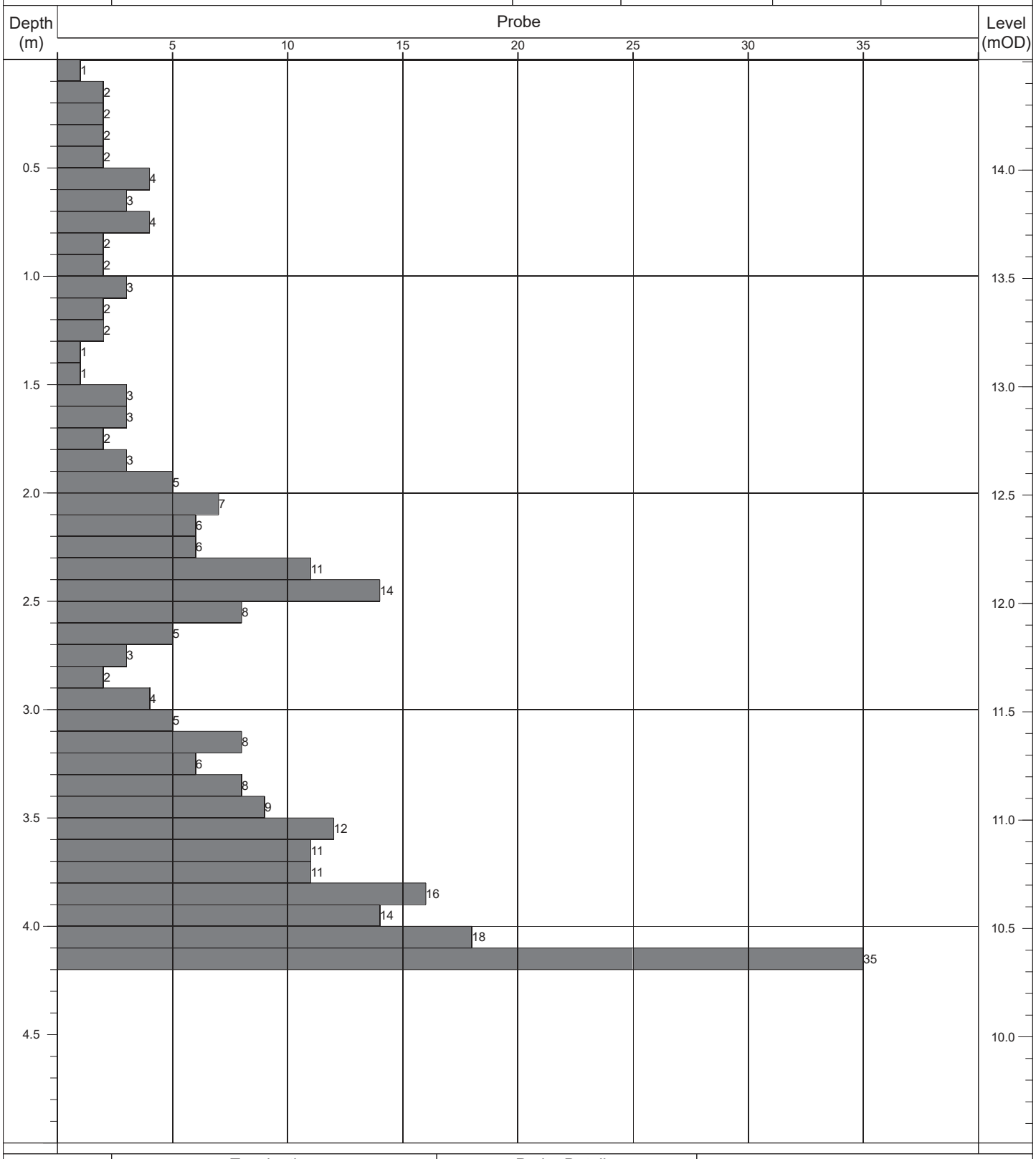
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP069**
Contract:	Hollybank	Easting:	717678.123	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748079.265	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.51	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



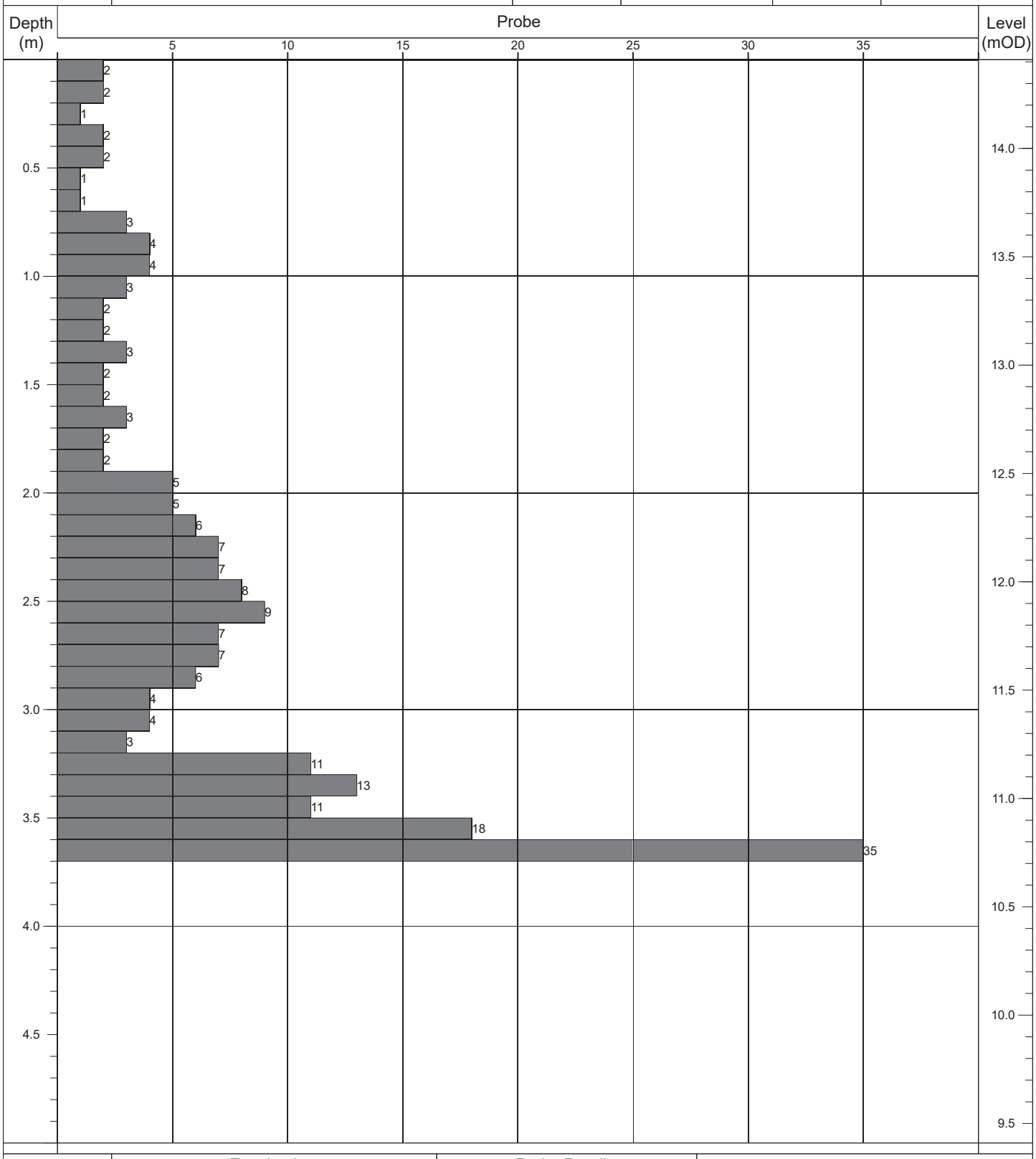
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP070**
Contract:	Hollybank	Easting:	717692.633	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748082.524	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.51	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



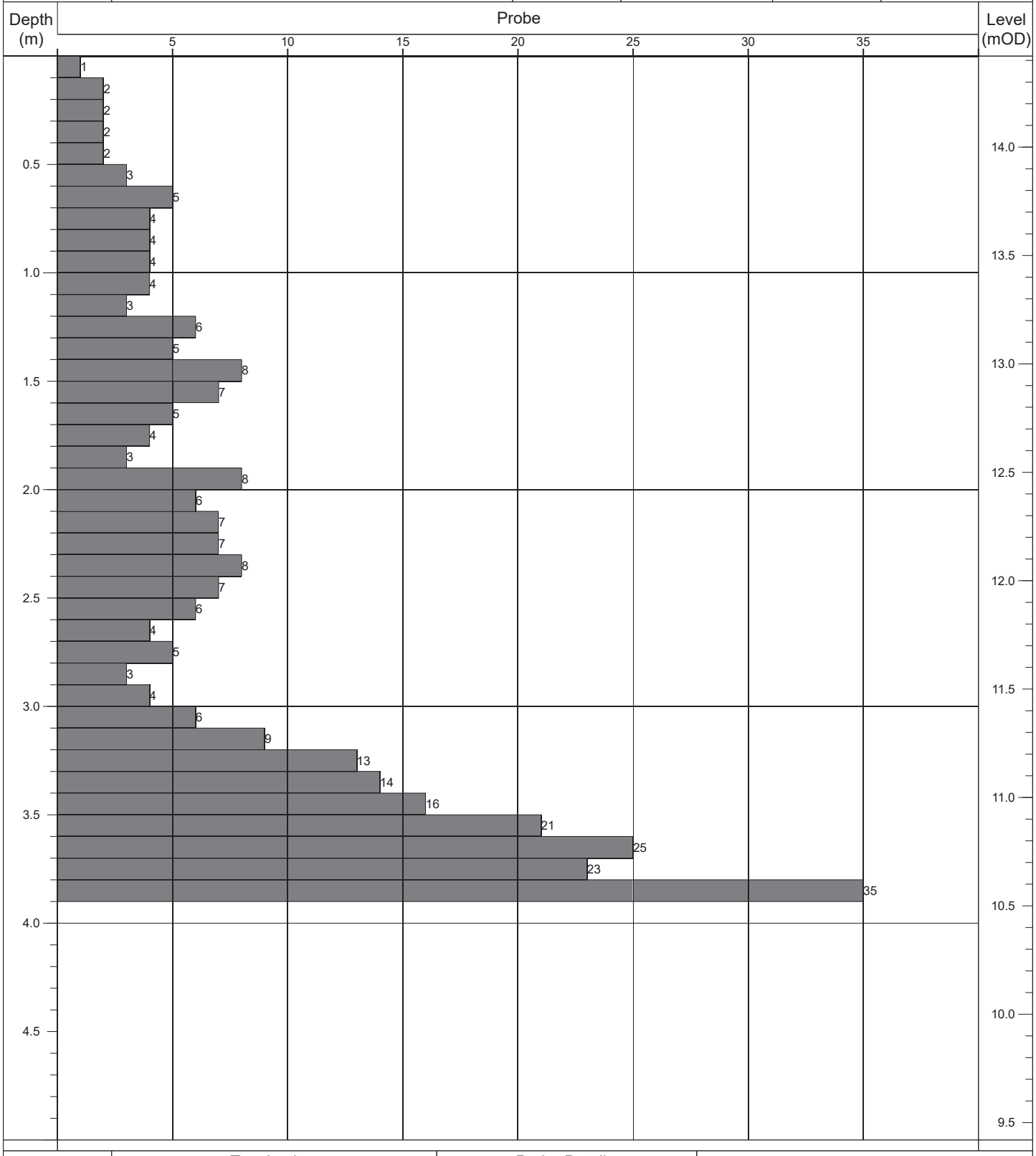
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP071**
Contract:	Hollybank	Easting:	717705.910	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748083.471	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.41	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



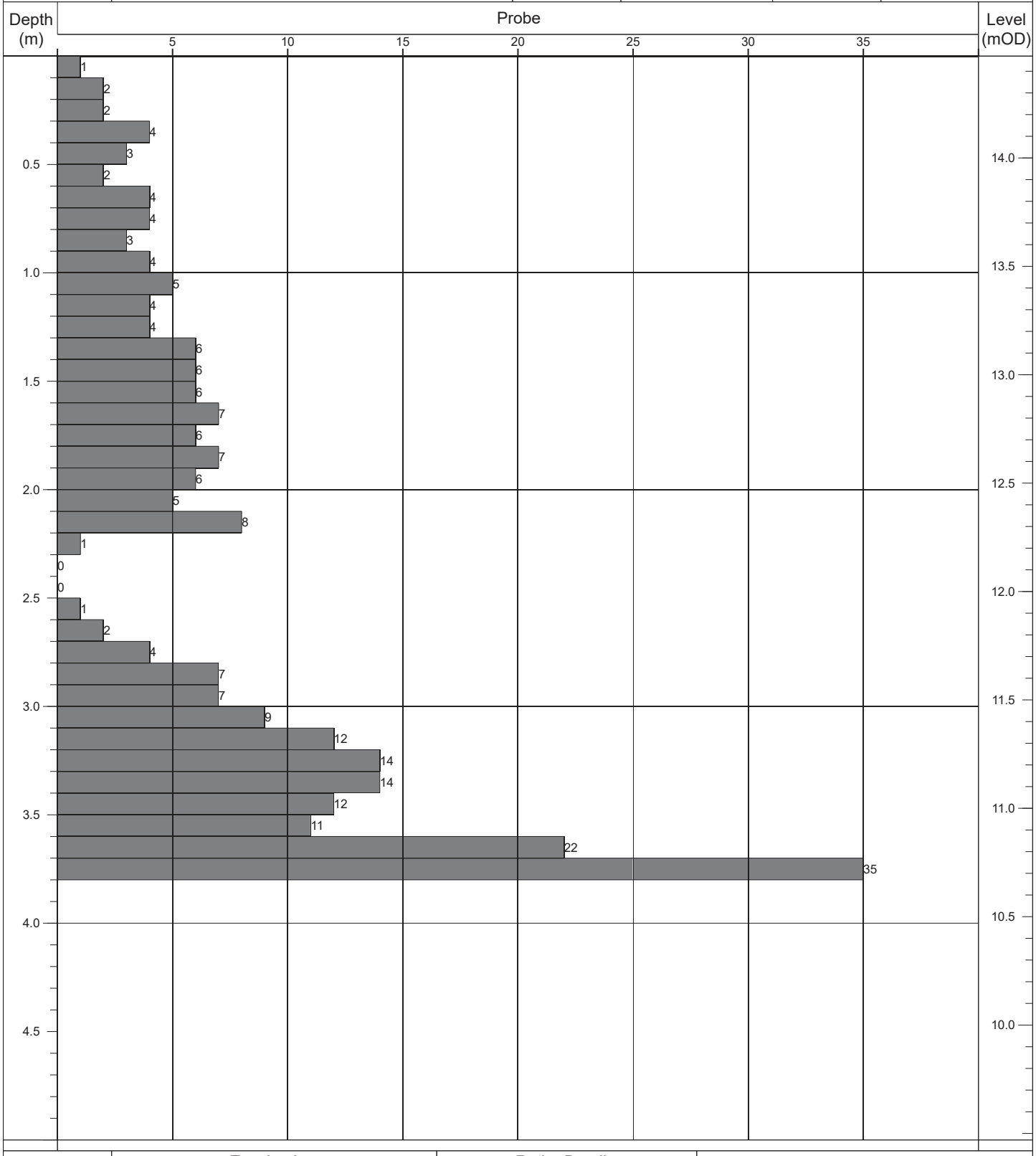
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	# Dynamic Probe Log				Probe No: **DP072**
Contract:	Hollybank	Easting:	717723.622	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748091.618	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.42	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



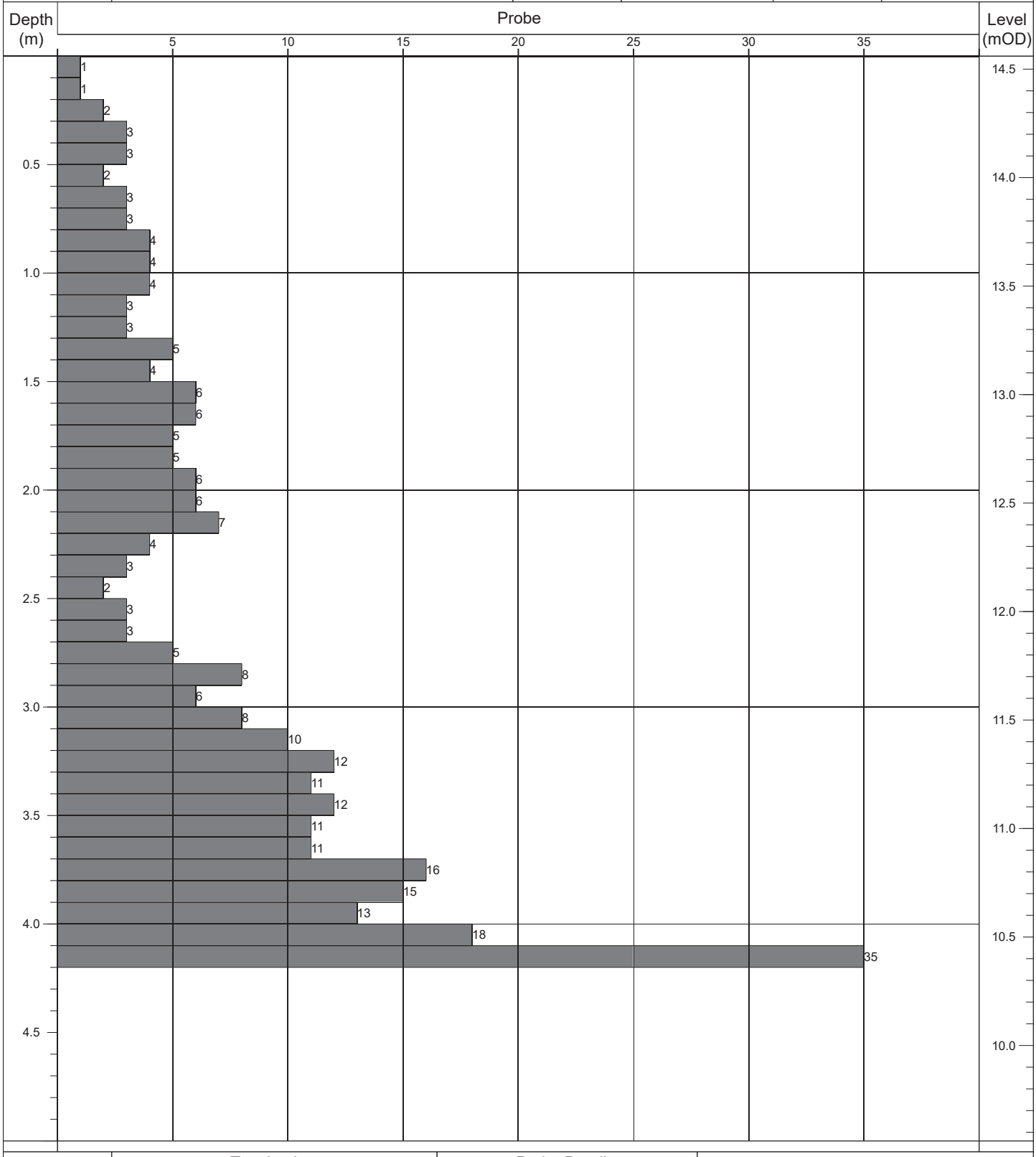
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP073**
Contract:	Hollybank	Easting:	717747.677	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748098.209	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.47	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



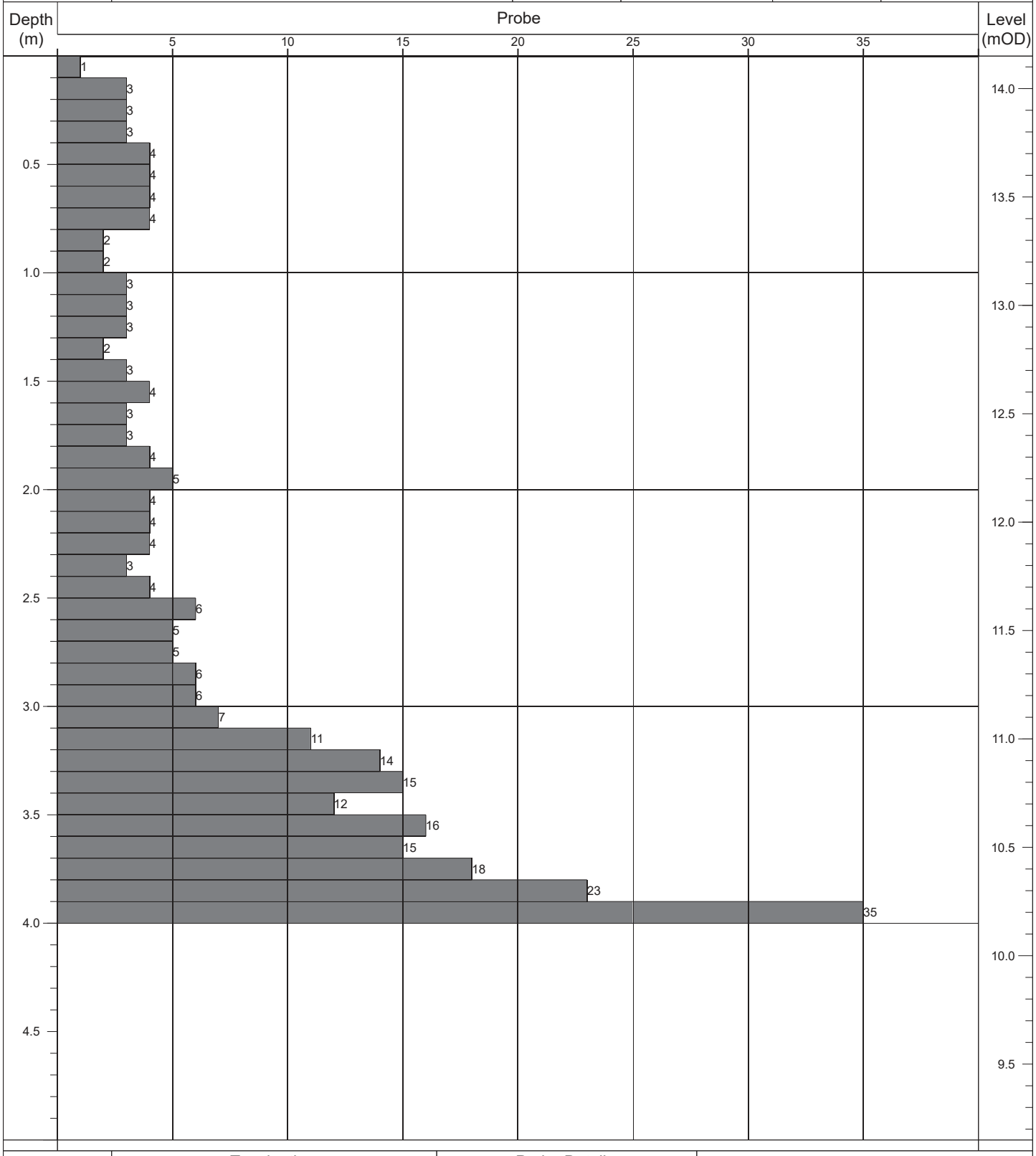
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP074**
Contract:	Hollybank	Easting:	717751.899	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748084.825	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.56	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



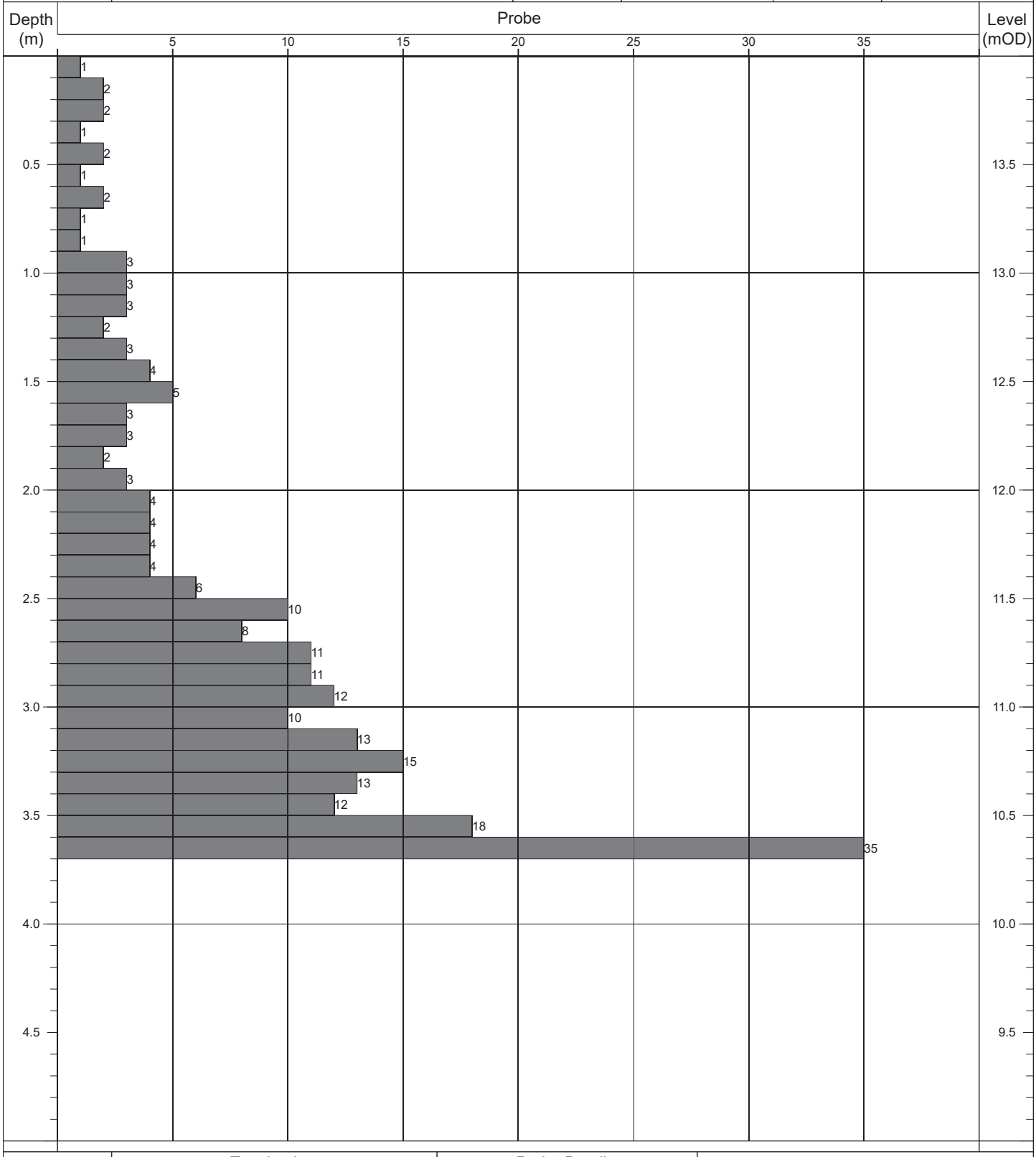
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP075**
Contract:	Hollybank	Easting:	717757.548	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748073.877	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.15	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



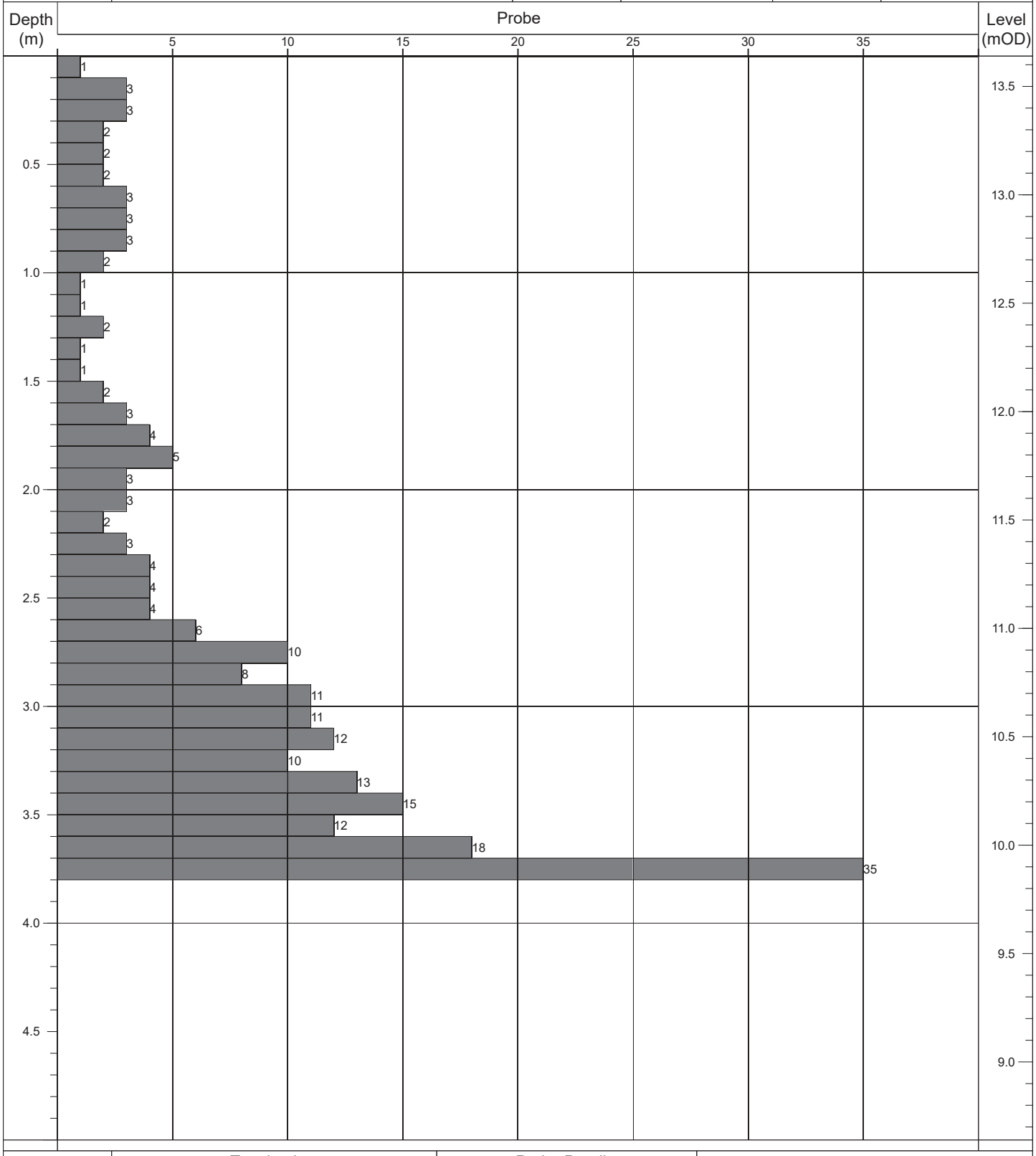
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP076**
Contract:	Hollybank	Easting:	717736.469	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748065.406	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.00	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



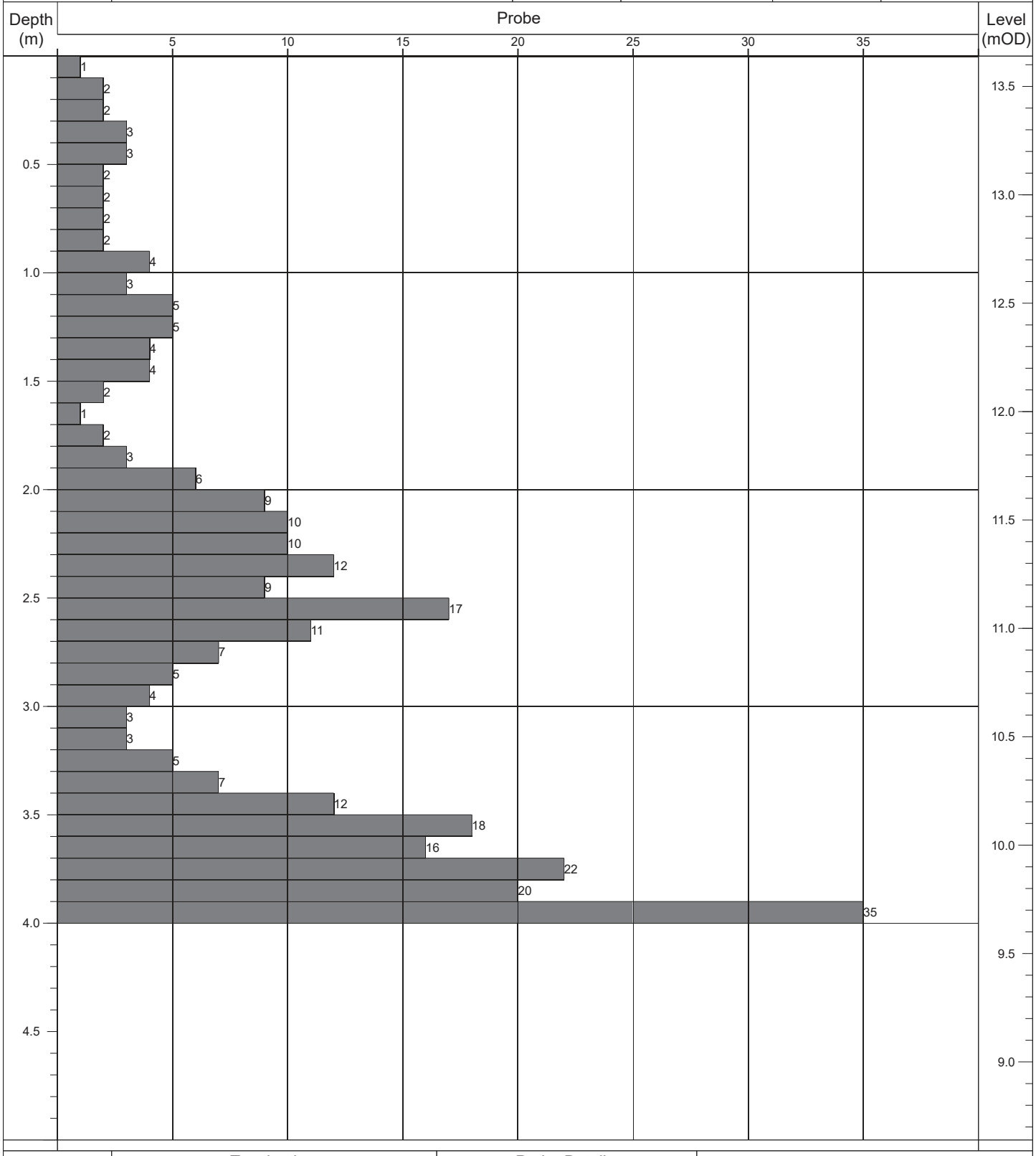
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP077**
Contract:	Hollybank	Easting:	717725.647	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748059.173	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.64	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



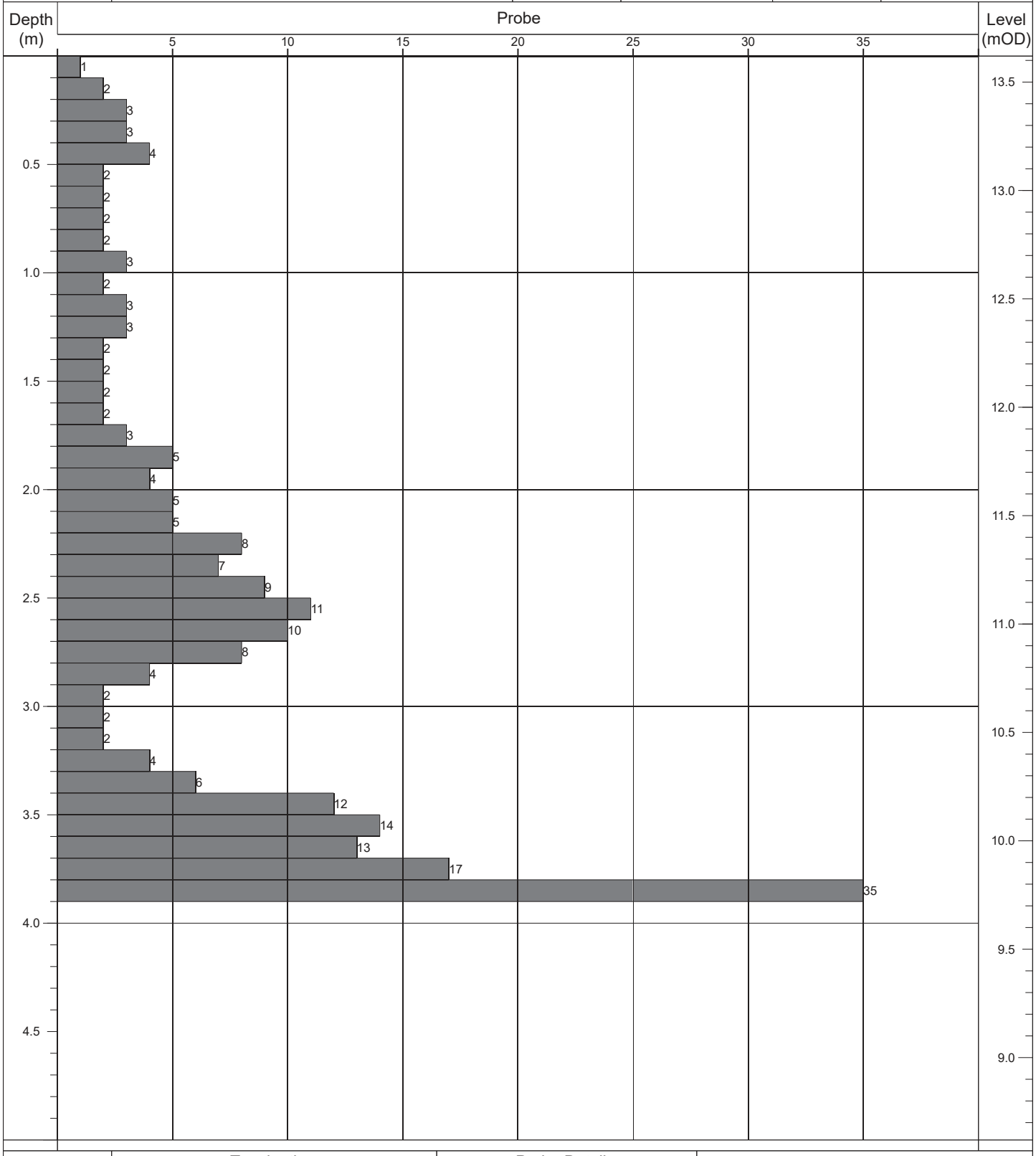
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP078**
Contract:	Hollybank	Easting:	717710.742	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748059.448	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.64	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



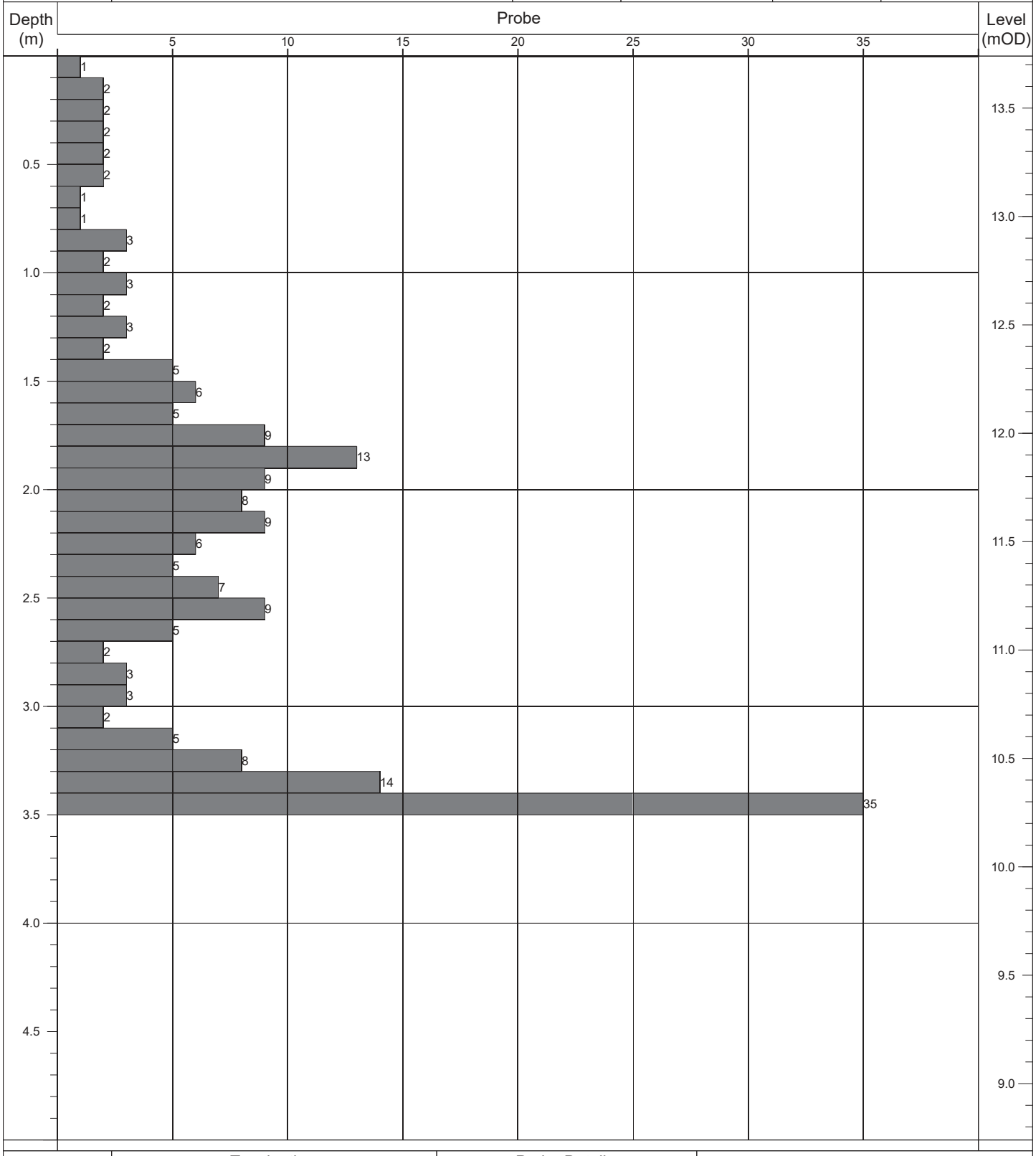
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP079**
Contract:	Hollybank	Easting:	717696.176	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748052.283	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.62	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



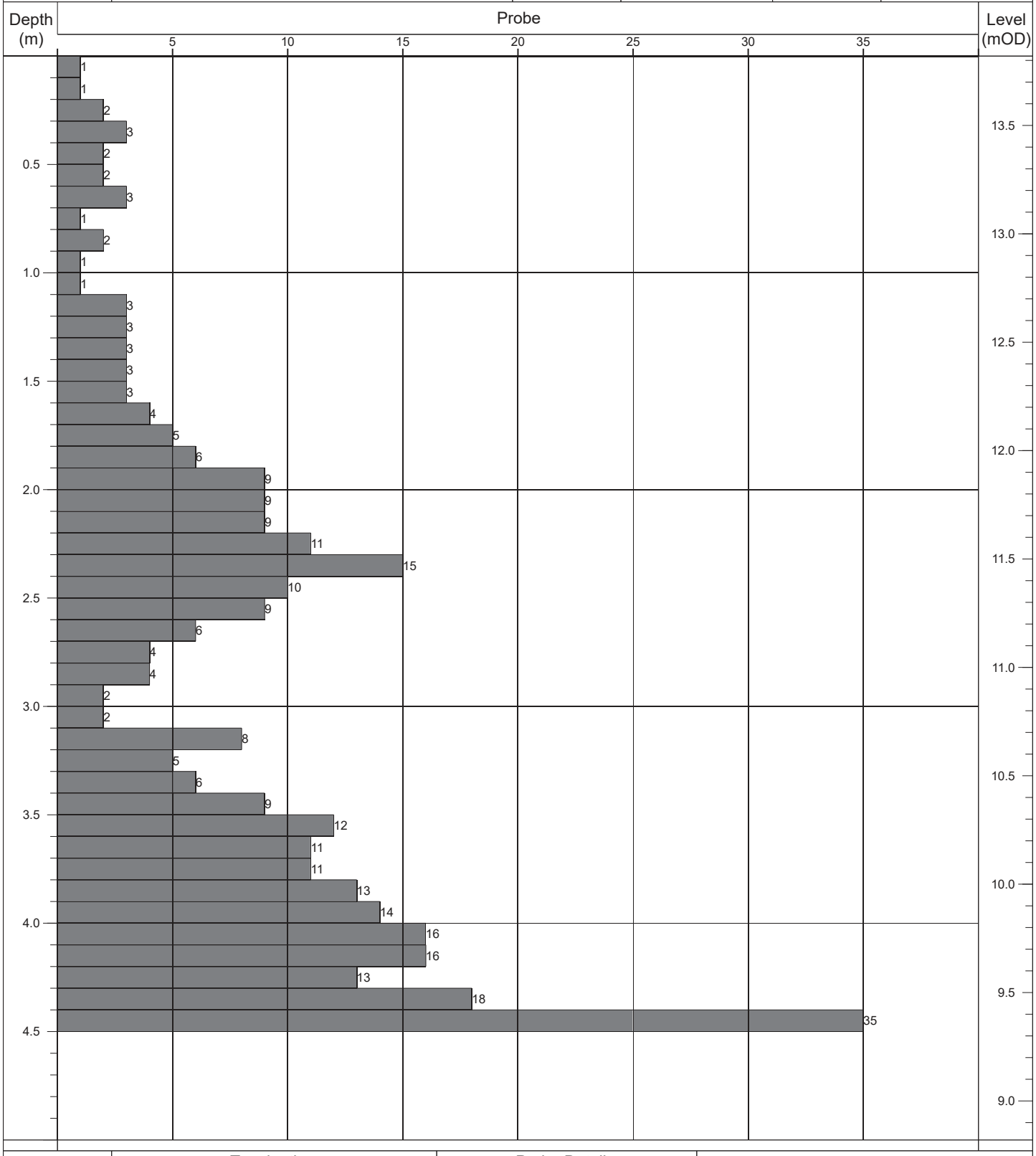
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP080**
Contract:	Hollybank	Easting:	717687.599	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748053.138	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.74	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



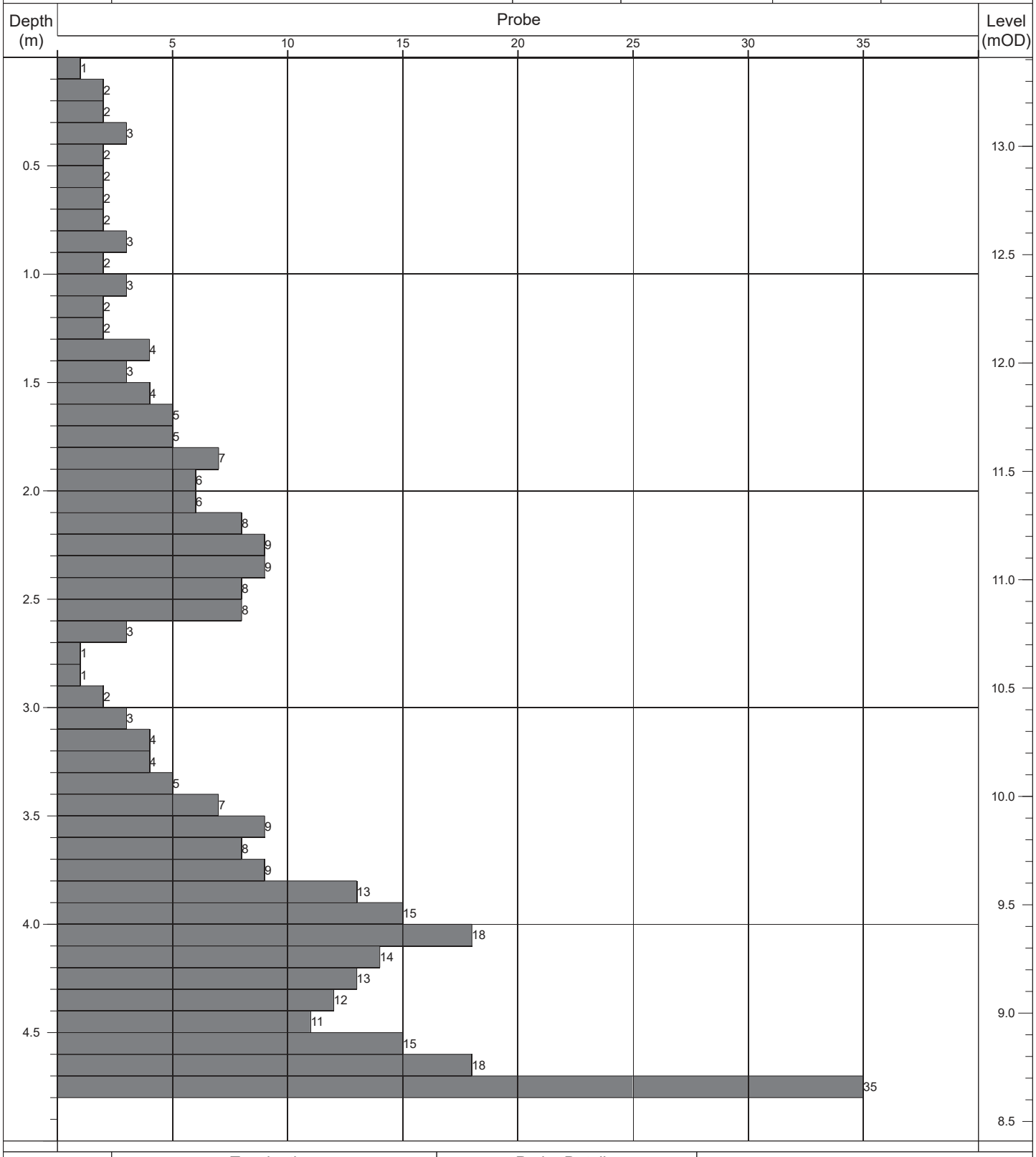
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.50m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP081**
Contract:	Hollybank	Easting:	717674.669	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748046.612	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.82	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



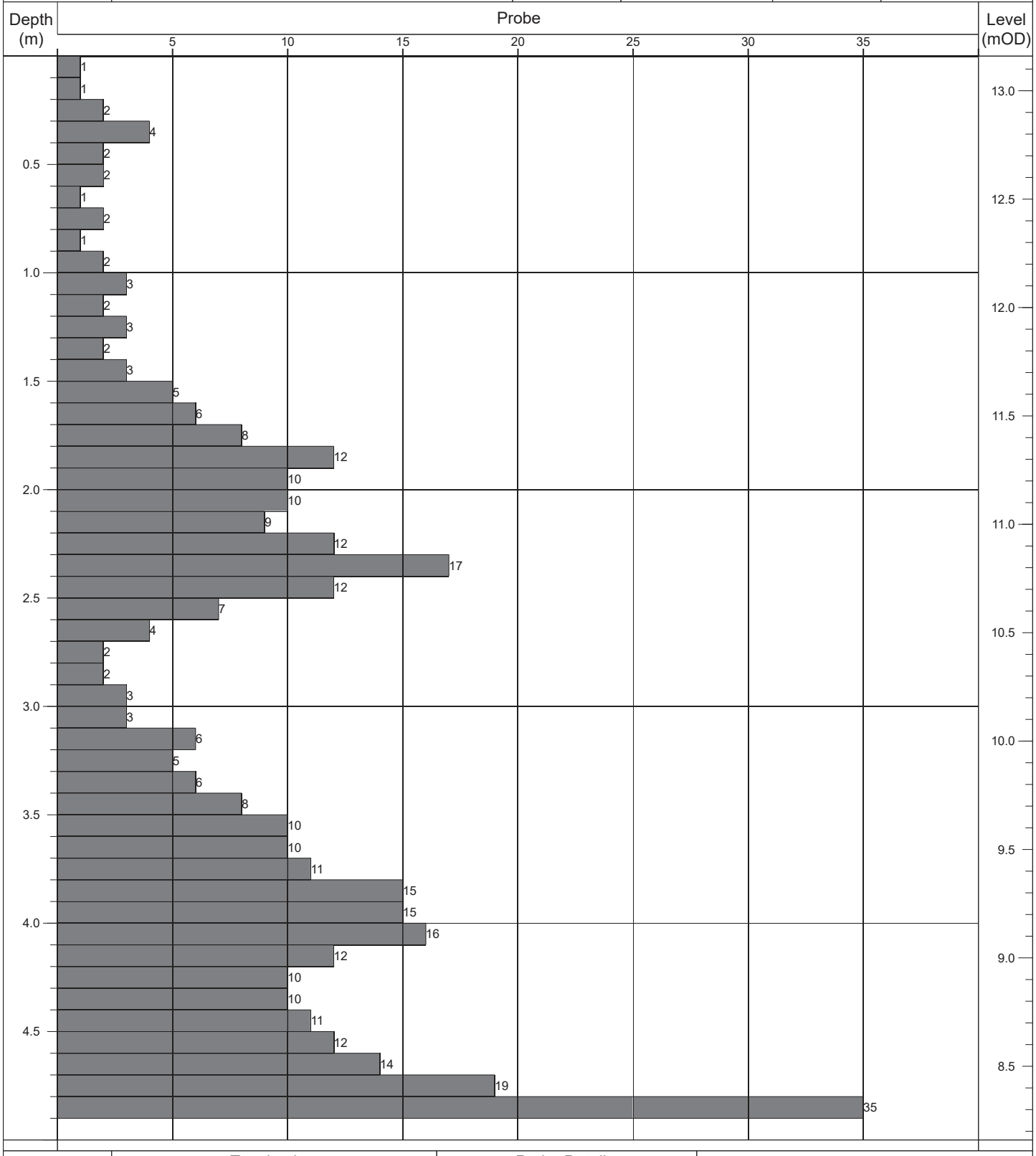
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.50m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP082**
Contract:	Hollybank	Easting:	717685.508	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748018.117	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.41	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



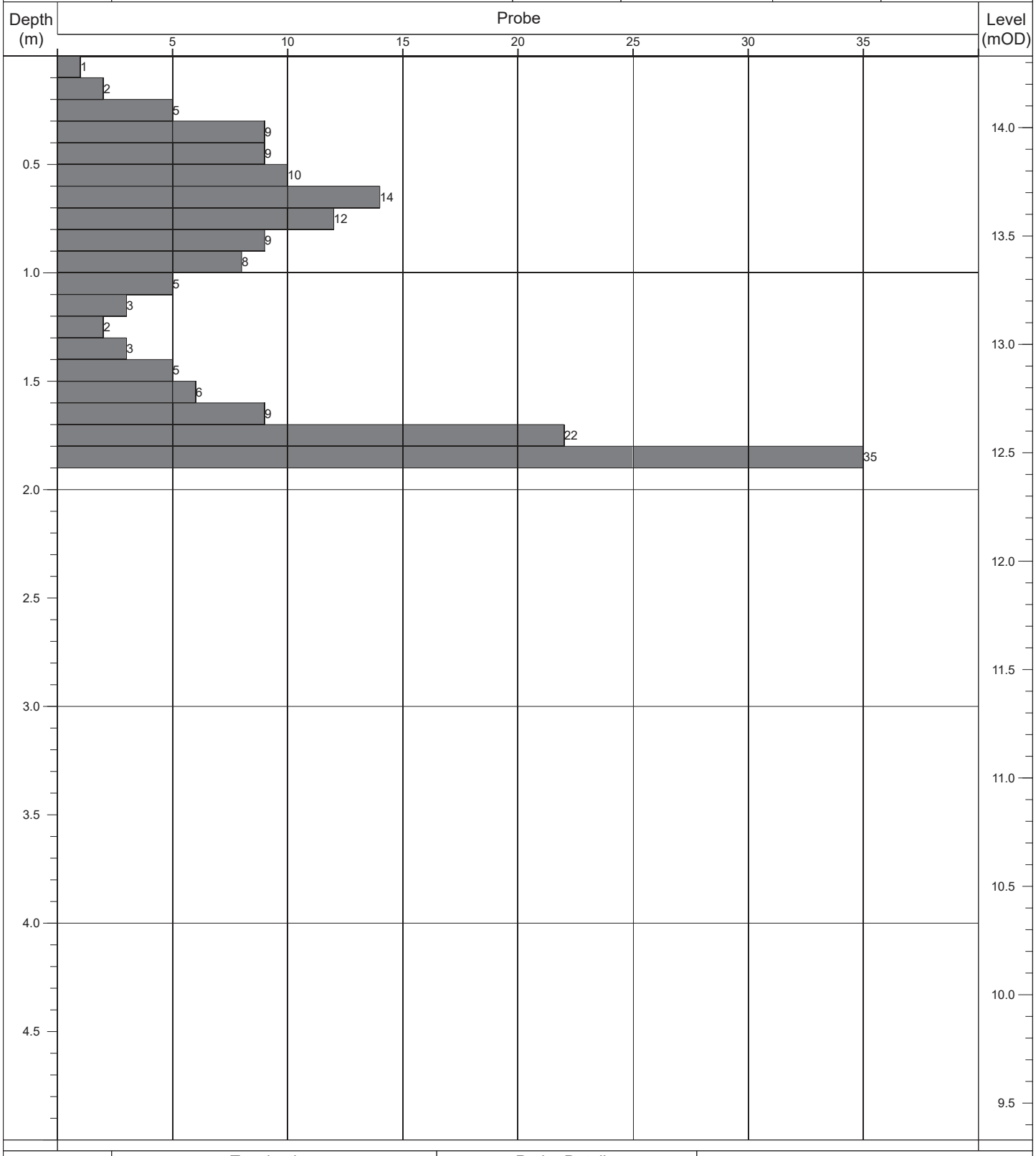
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP083**
Contract:	Hollybank	Easting:	717698.044	Date Started:	12/10/2020
Location:	Swords, Co. Dublin	Northing:	748021.035	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.16	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



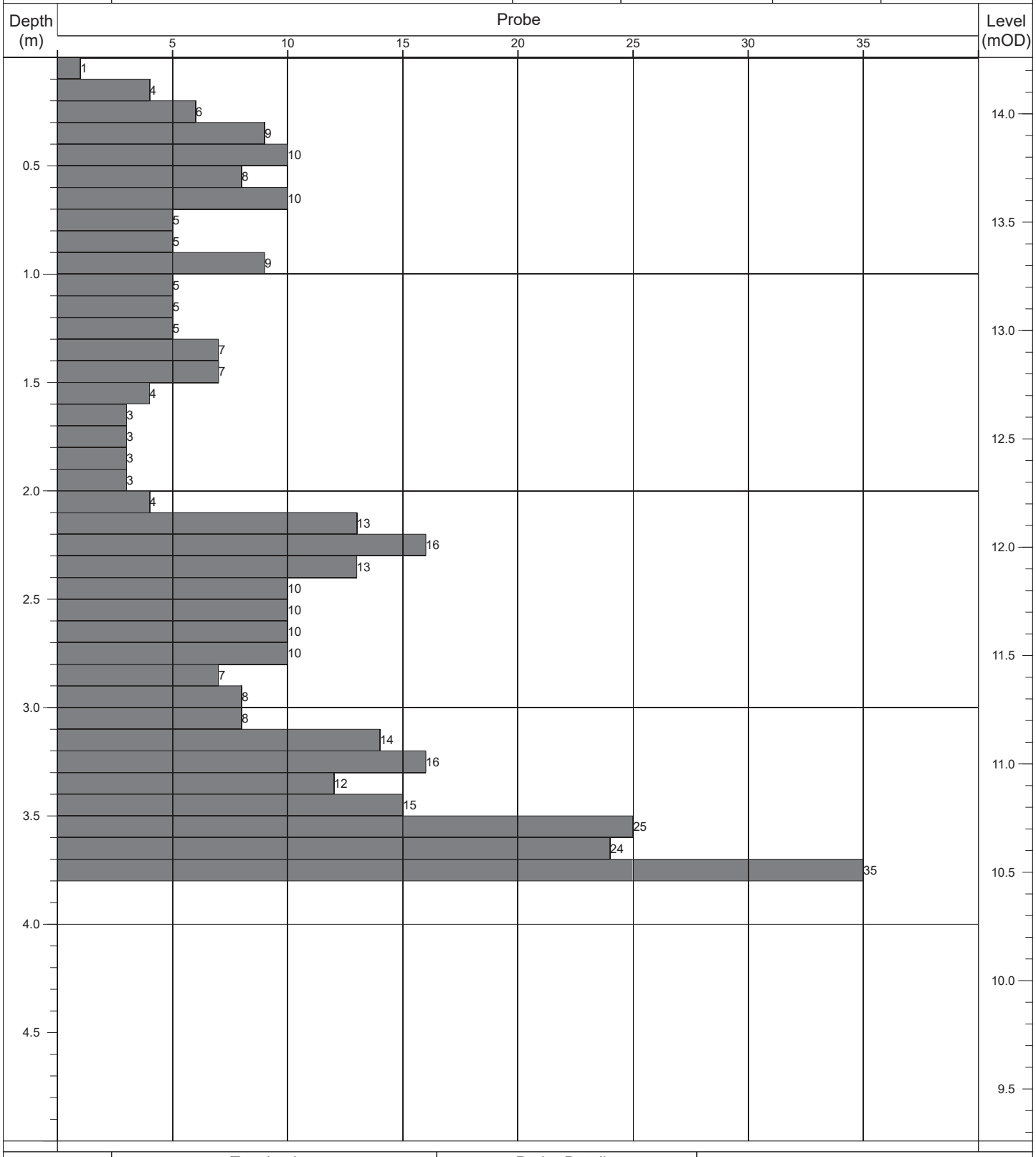
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP084**
Contract:	Hollybank	Easting:	717688.961	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747994.392	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.33	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



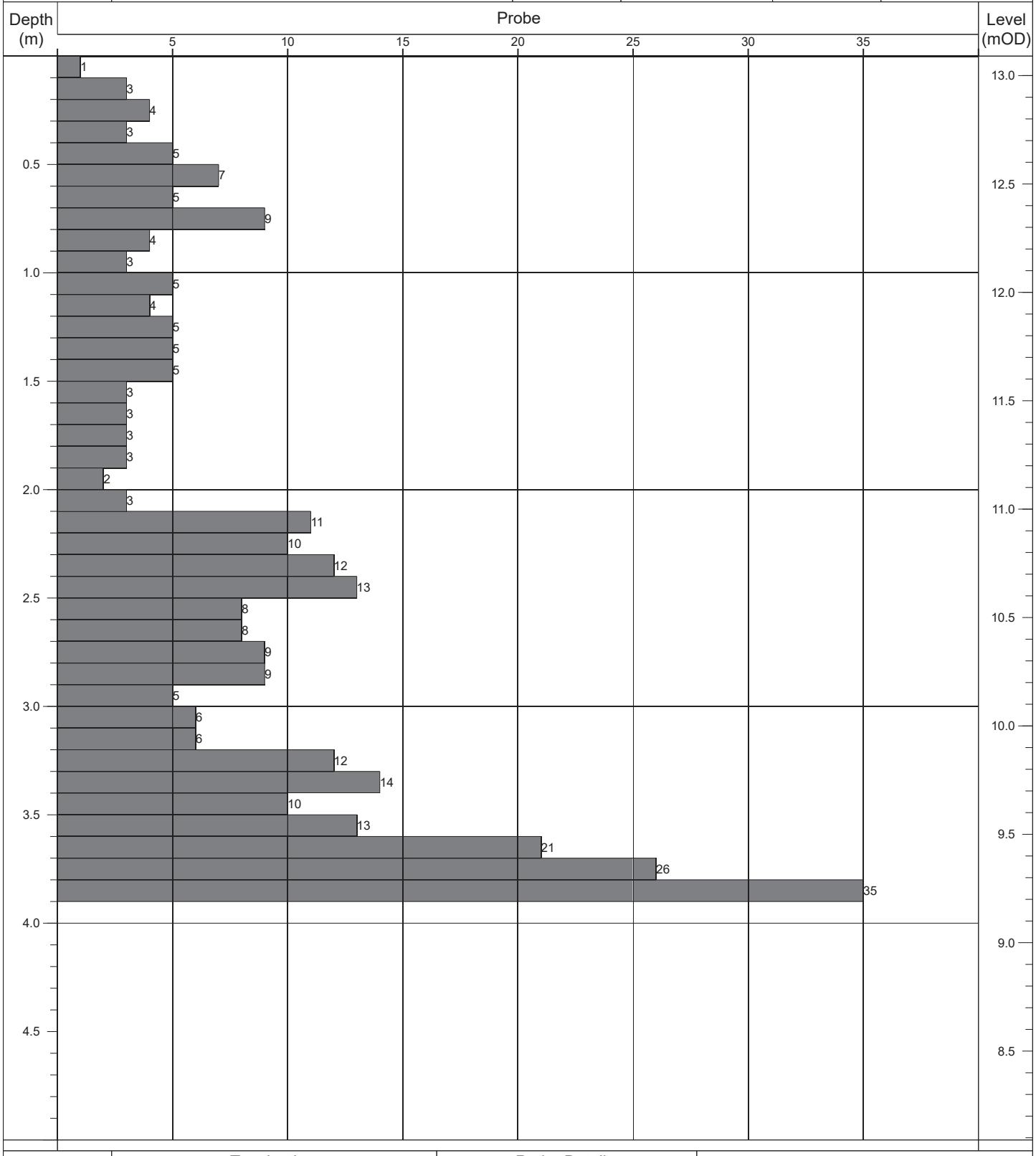
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
1.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP085**
Contract:	Hollybank	Easting:	717708.334	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747990.117	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.26	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



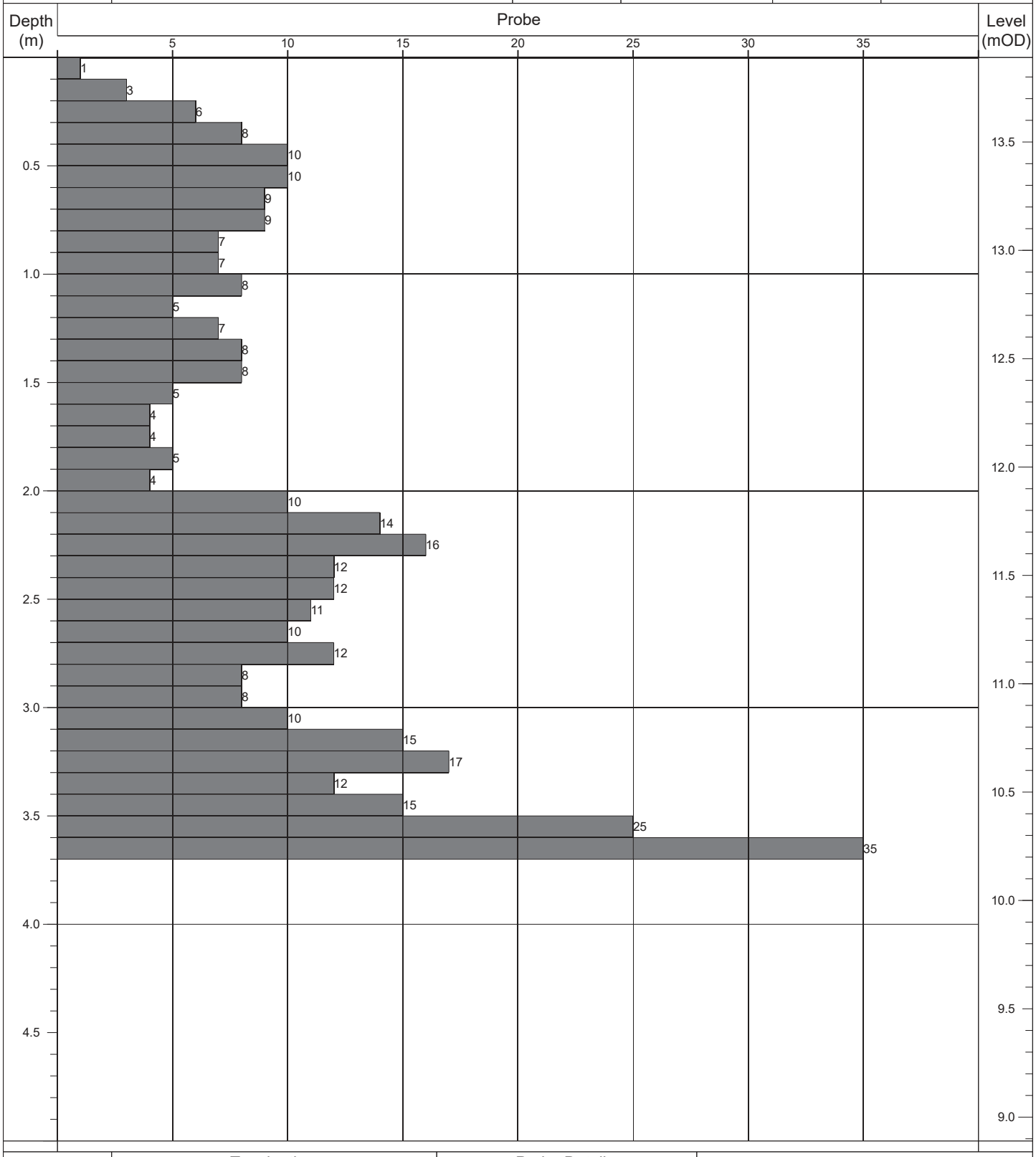
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP086**
Contract:	Hollybank	Easting:	717720.231	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748003.719	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.09	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



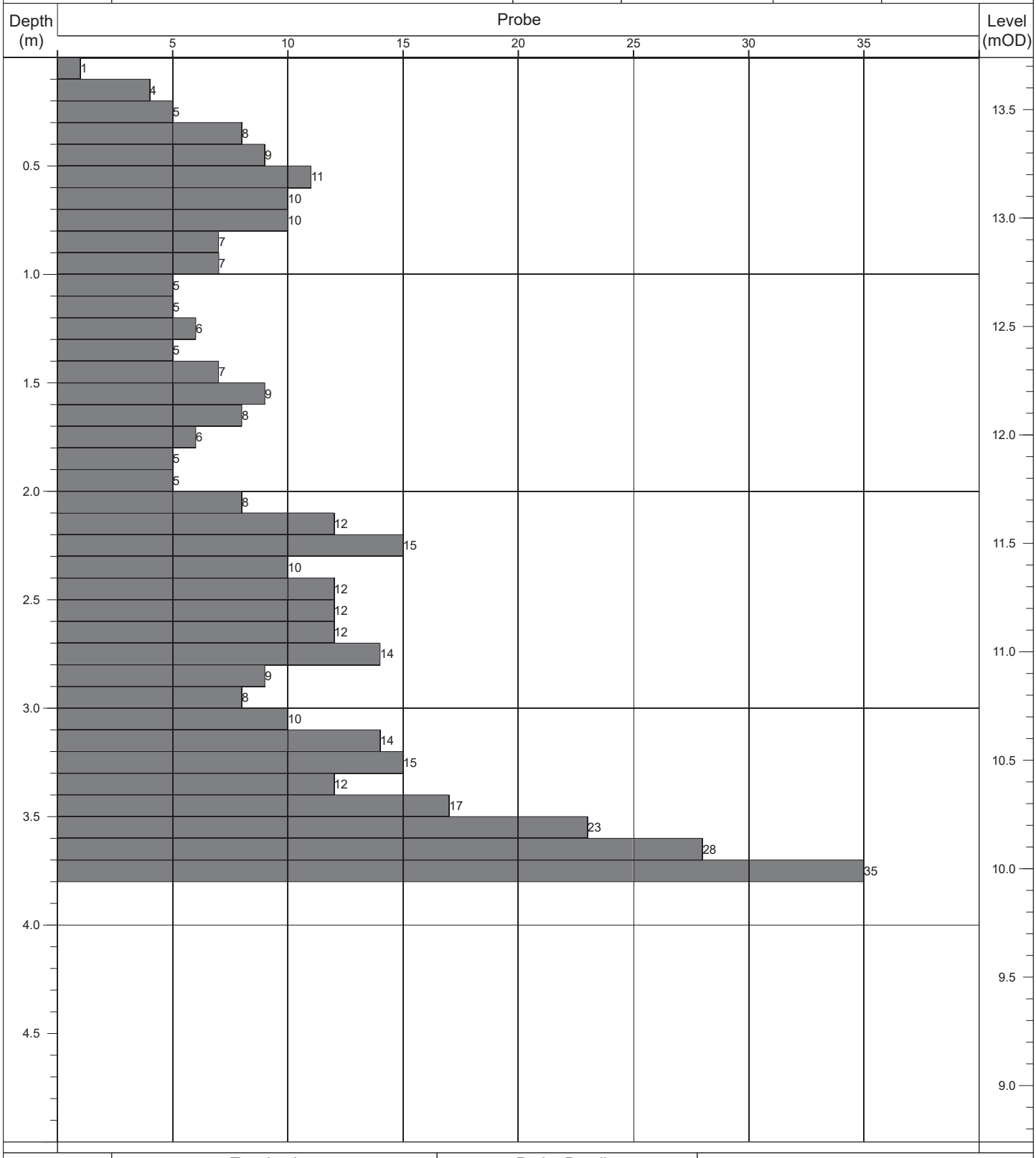
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP087**
Contract:	Hollybank	Easting:	717721.191	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747989.770	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.89	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



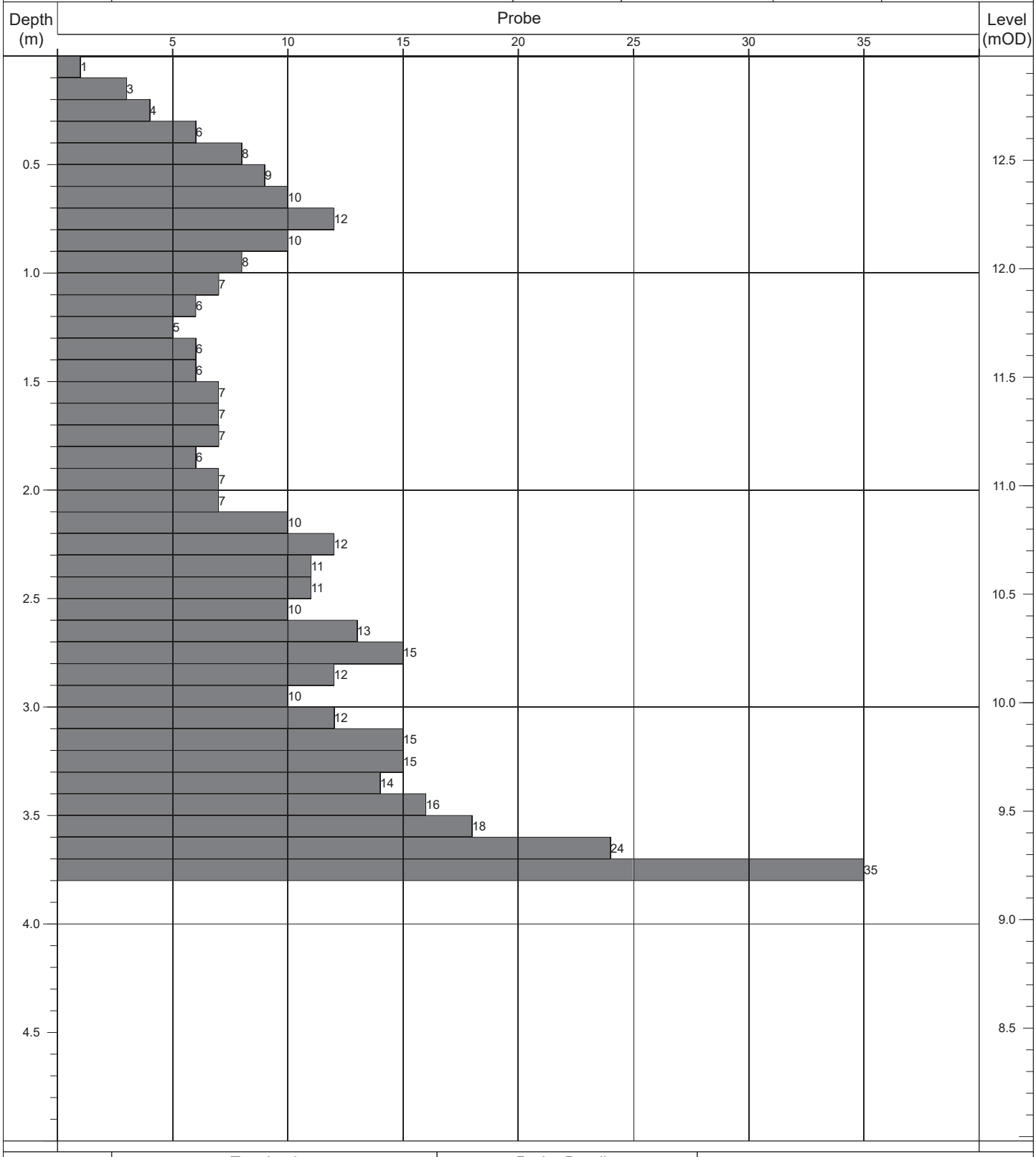
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP088**
Contract:	Hollybank	Easting:	717740.405	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747985.766	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.74	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



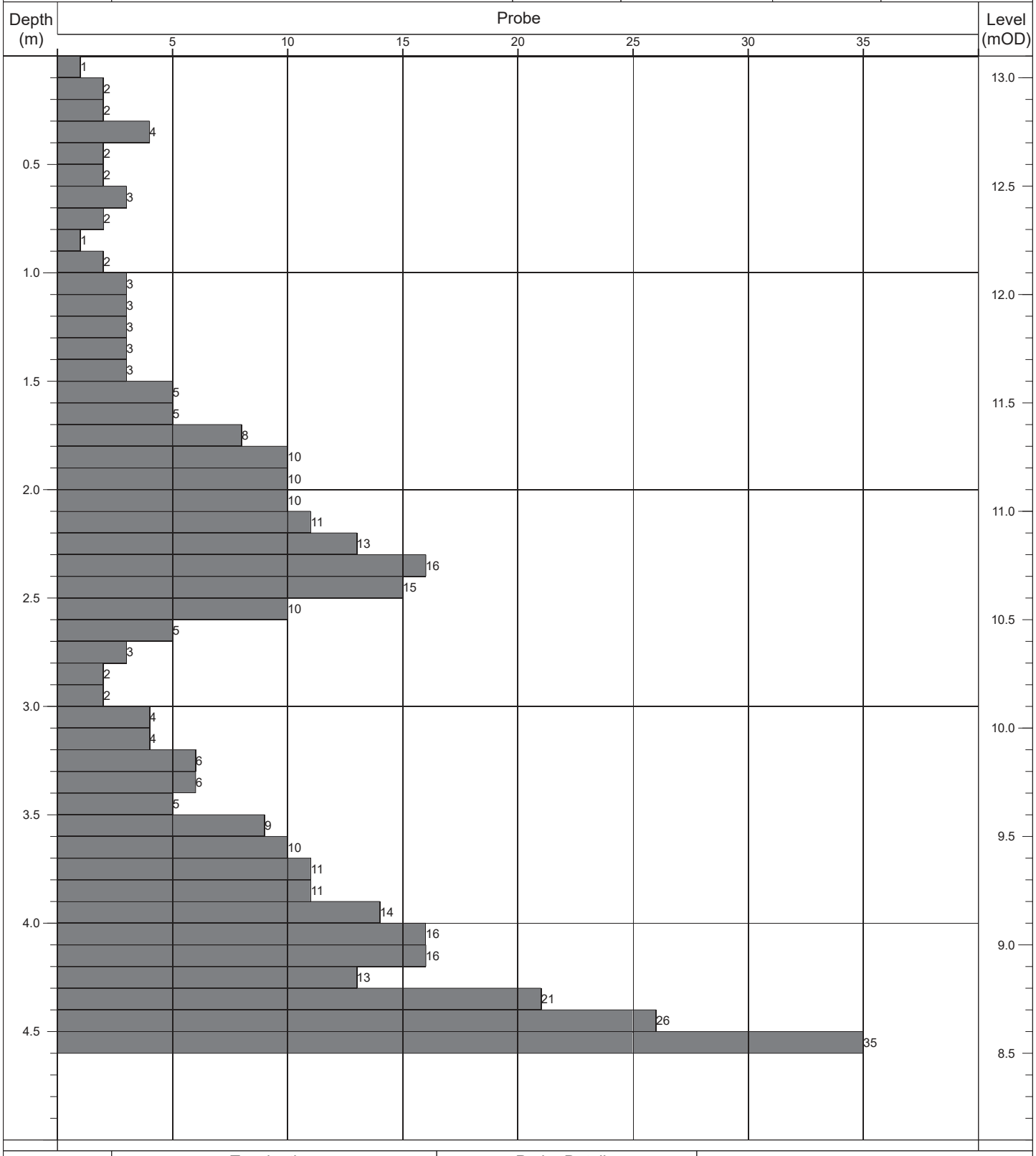
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	Dynamic Probe Log				Probe No: DP089
Contract:	Hollybank	Easting:	717741.902	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748001.565	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.98	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



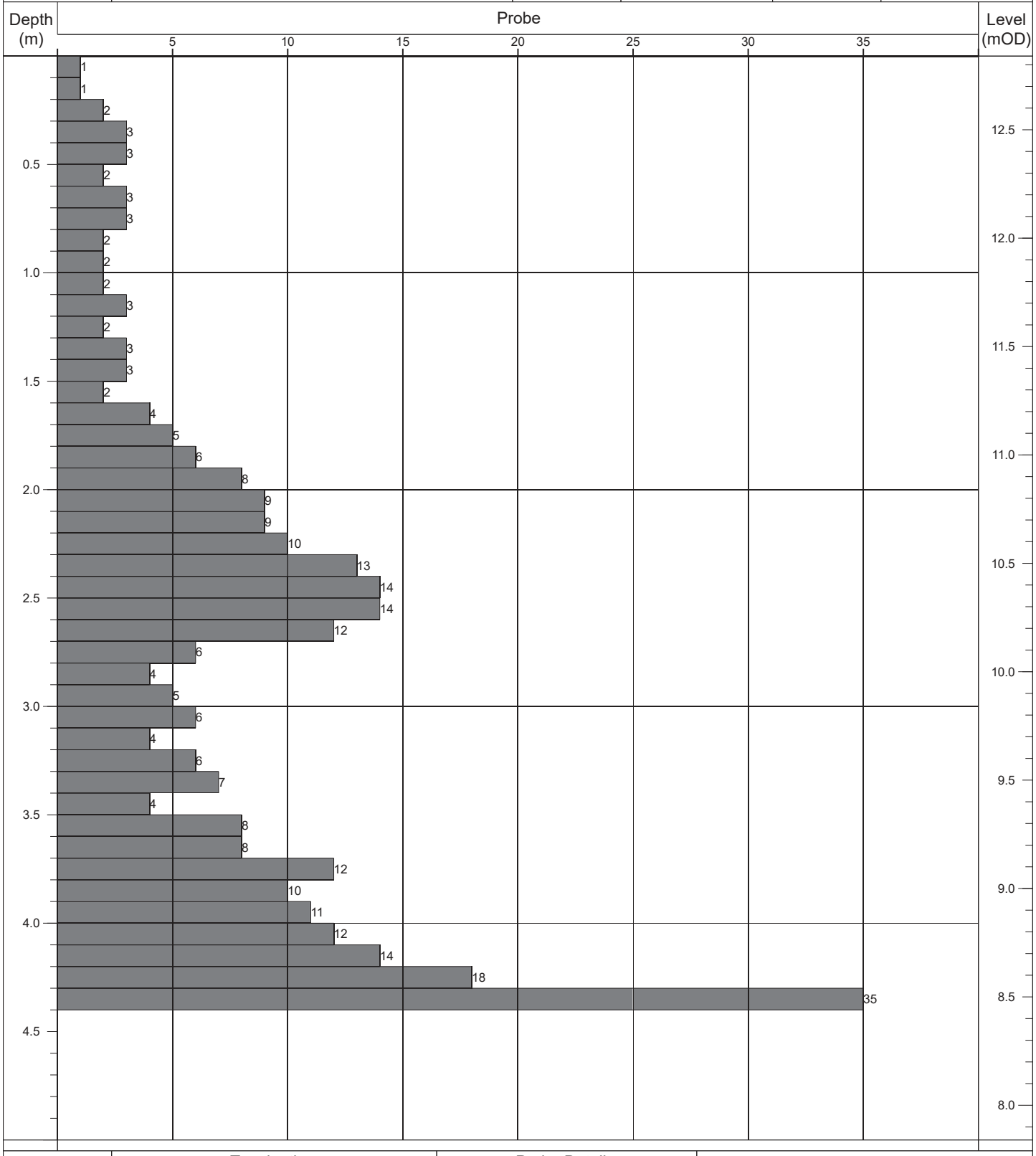
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP090**
Contract:	Hollybank	Easting:	717707.994	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748032.761	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.10	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



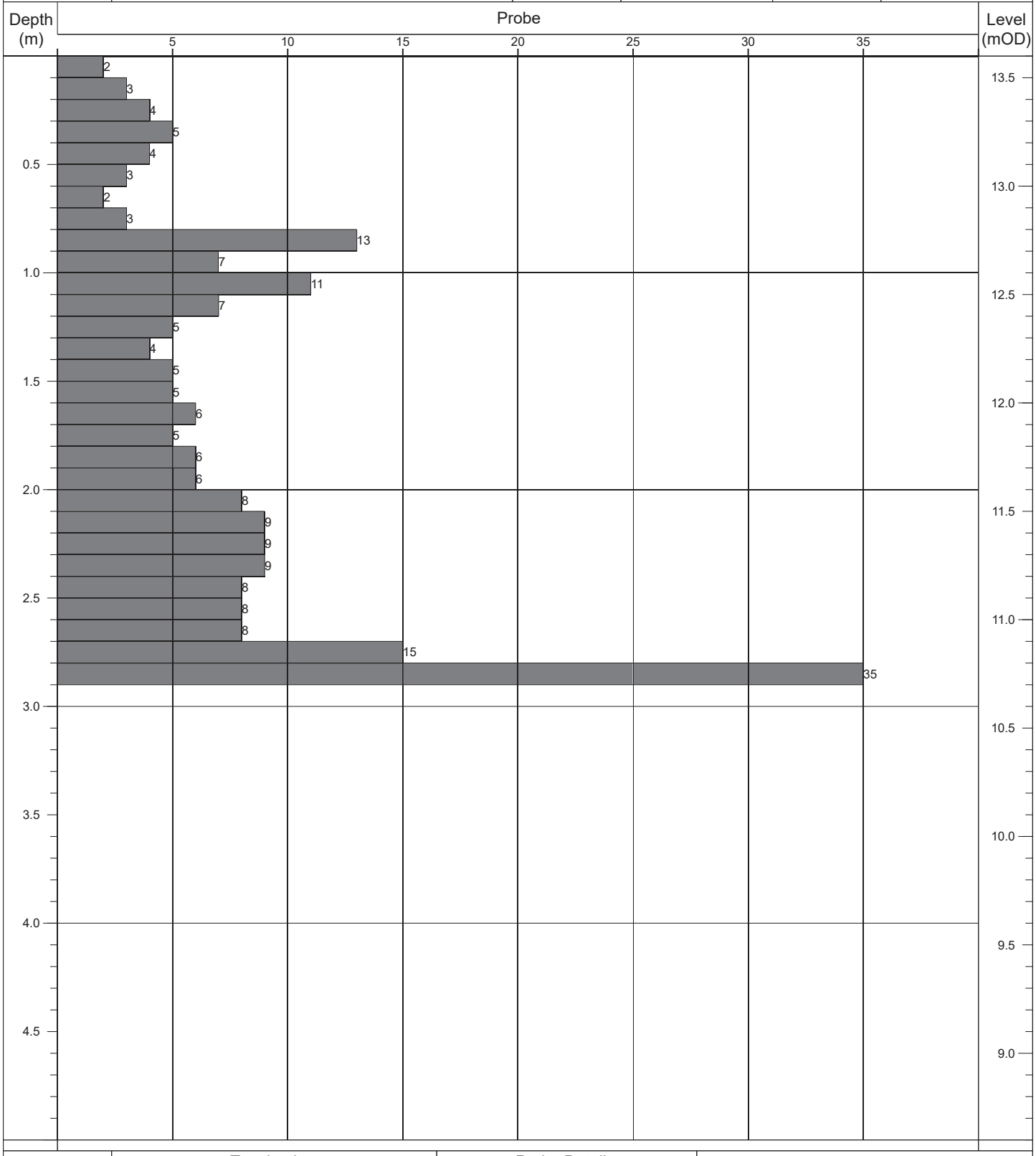
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP091**
Contract:	Hollybank	Easting:	717711.779	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748015.794	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.84	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



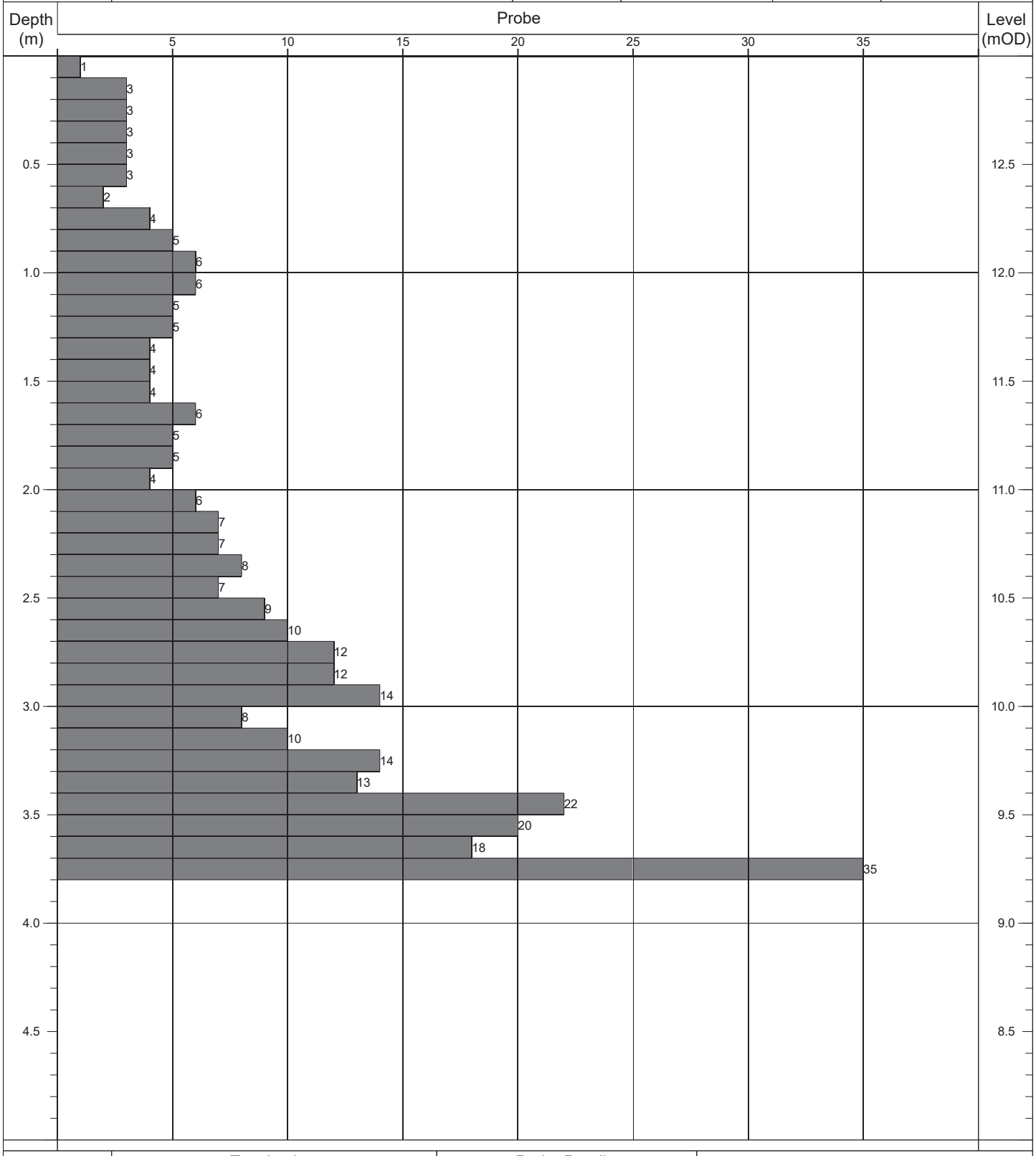
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP092**
Contract:	Hollybank	Easting:	717735.149	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748038.607	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.60	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



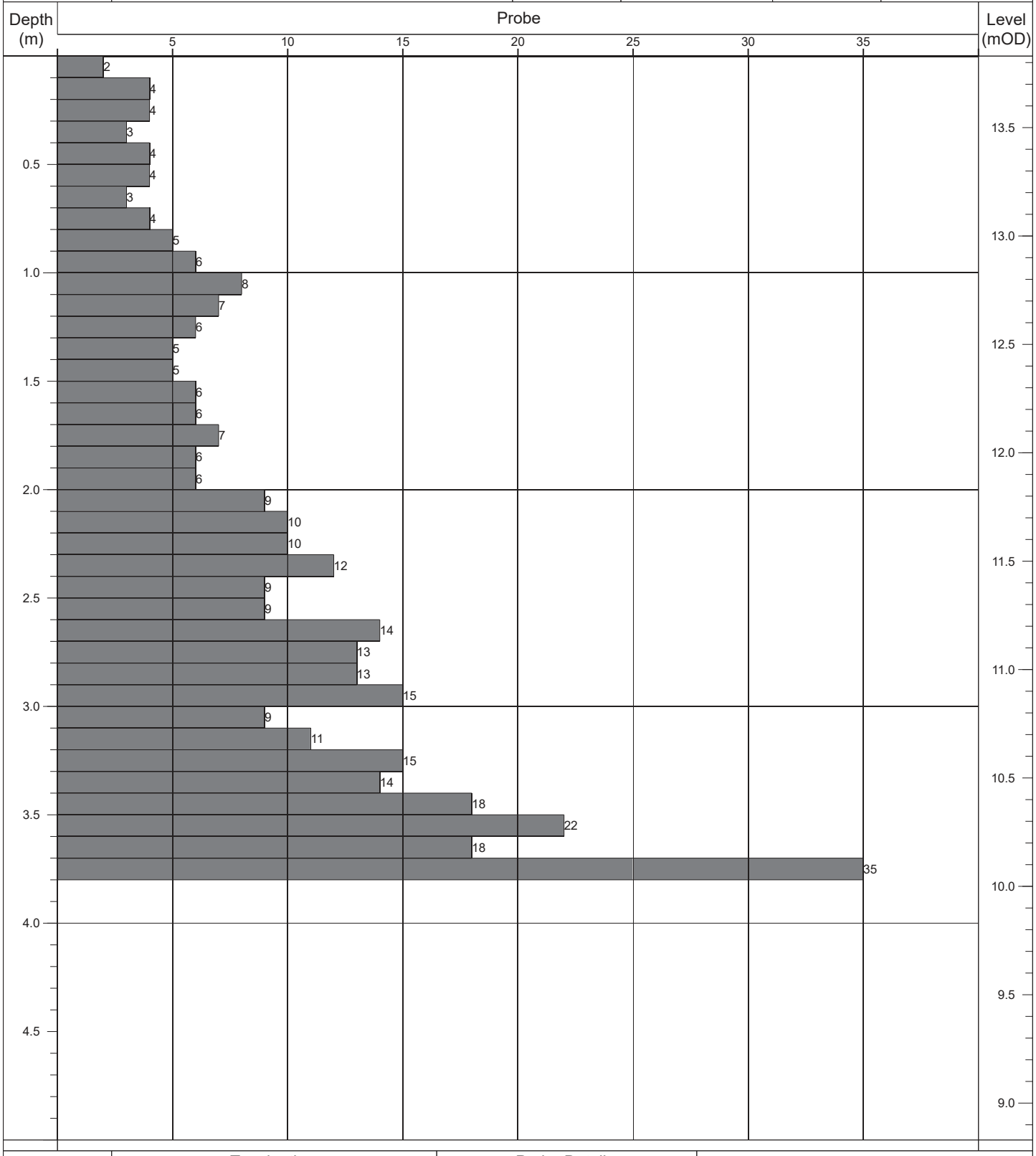
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP093**
Contract:	Hollybank	Easting:	717729.270	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748019.016	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.00	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



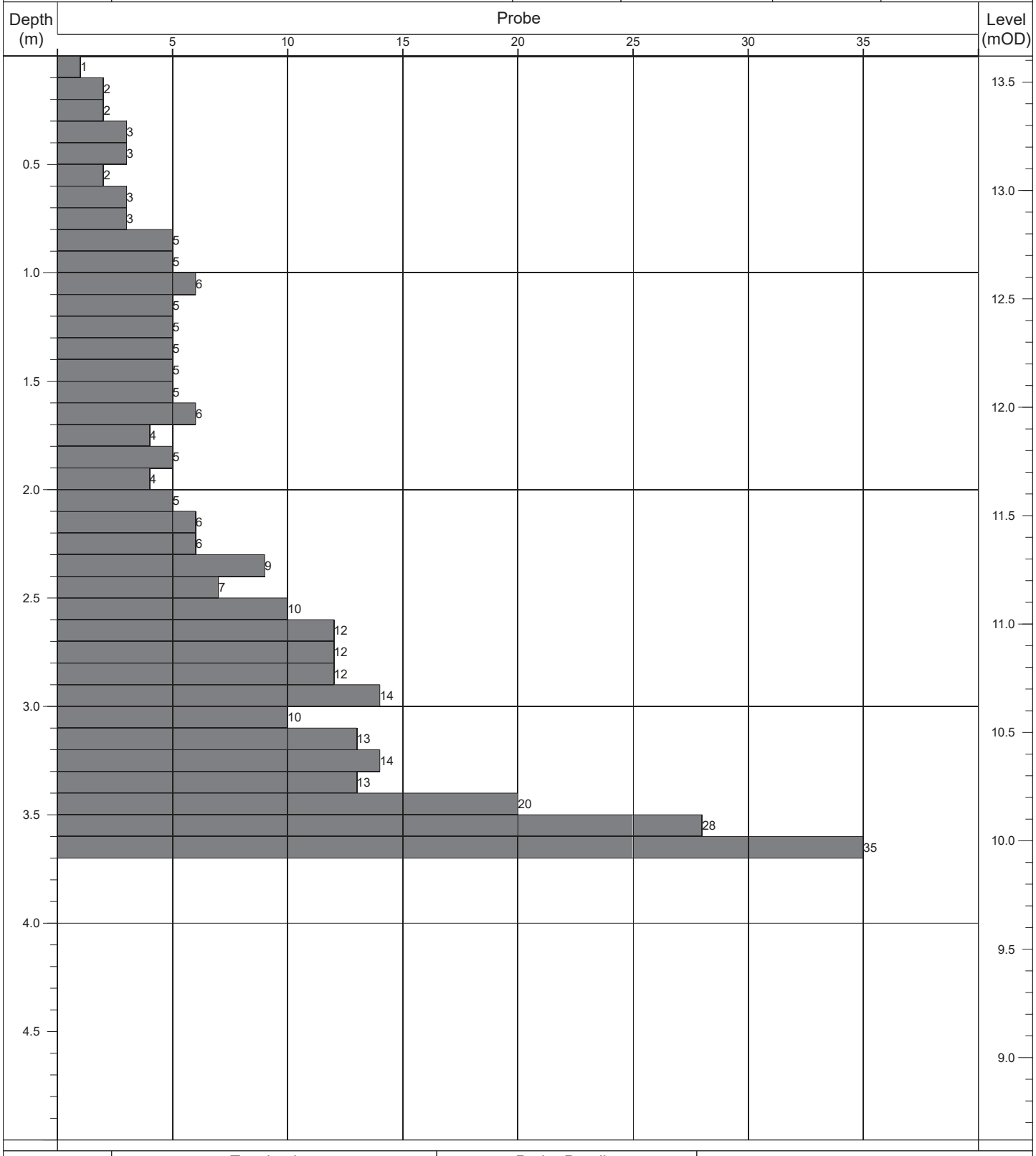
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP094**
Contract:	Hollybank	Easting:	717753.368	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748035.874	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.83	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



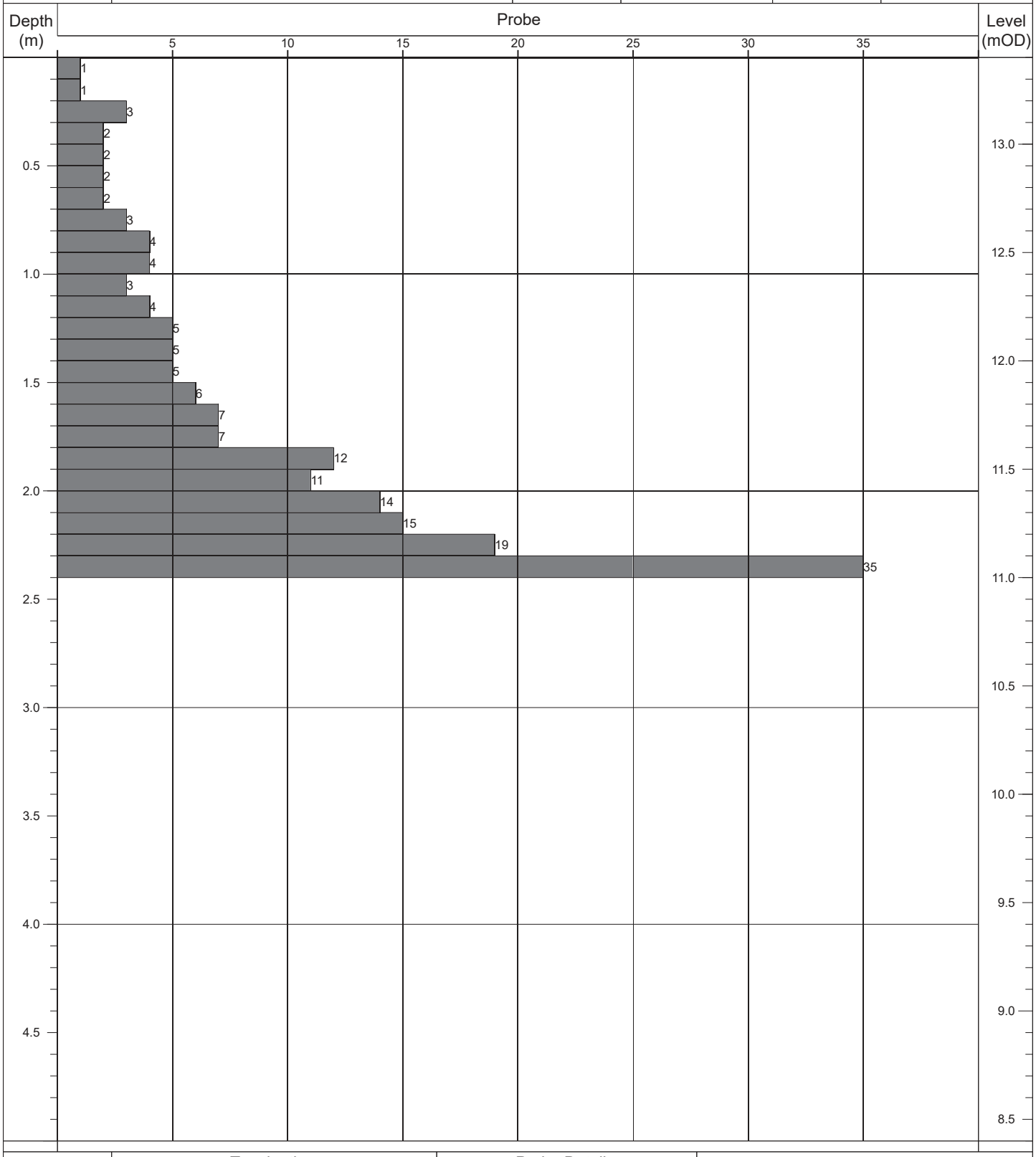
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP095**
Contract:	Hollybank	Easting:	717751.185	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748023.203	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.62	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



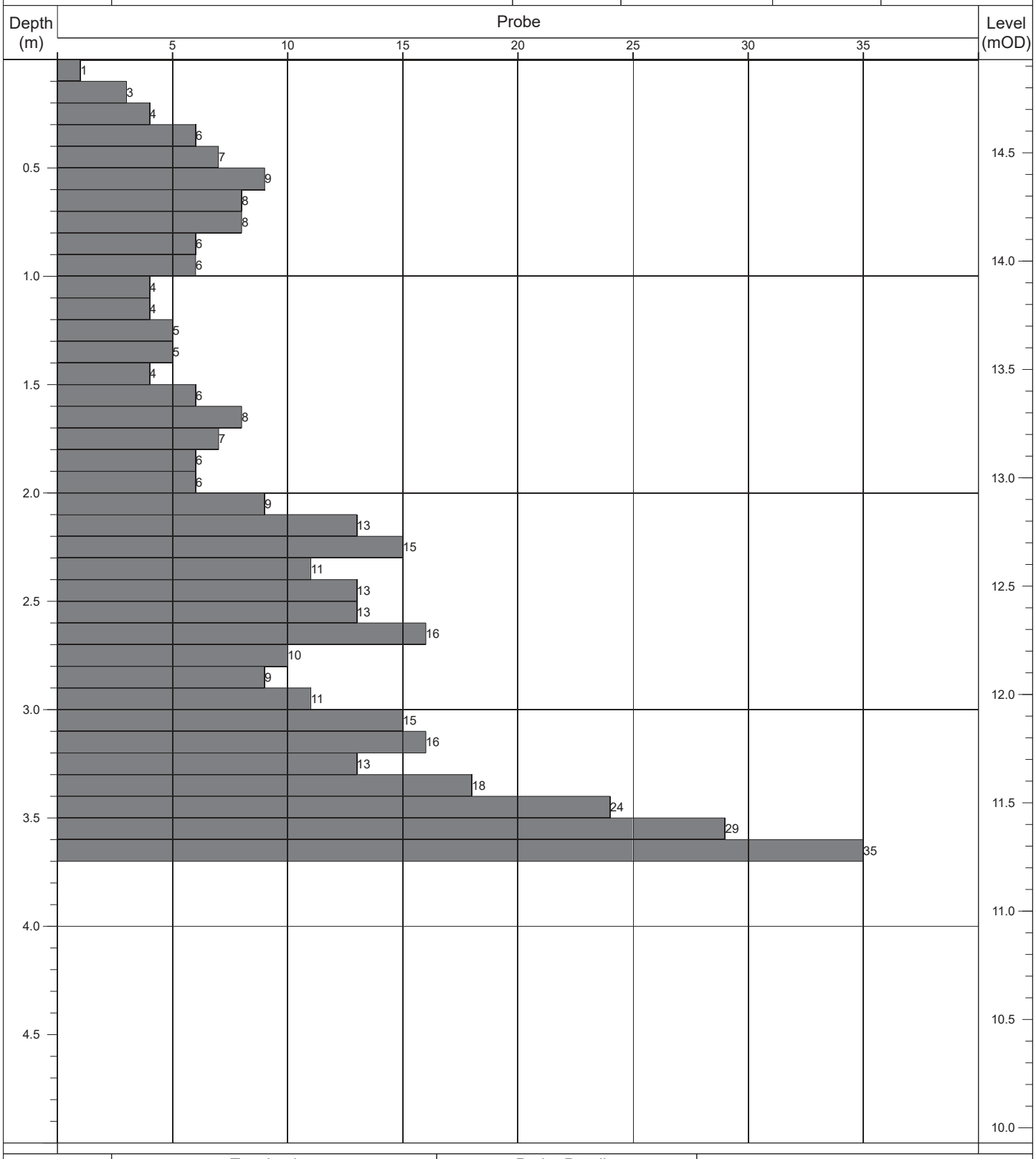
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	Dynamic Probe Log				Probe No: DP096
Contract:	Hollybank	Easting:	717757.987	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747996.274	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.40	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



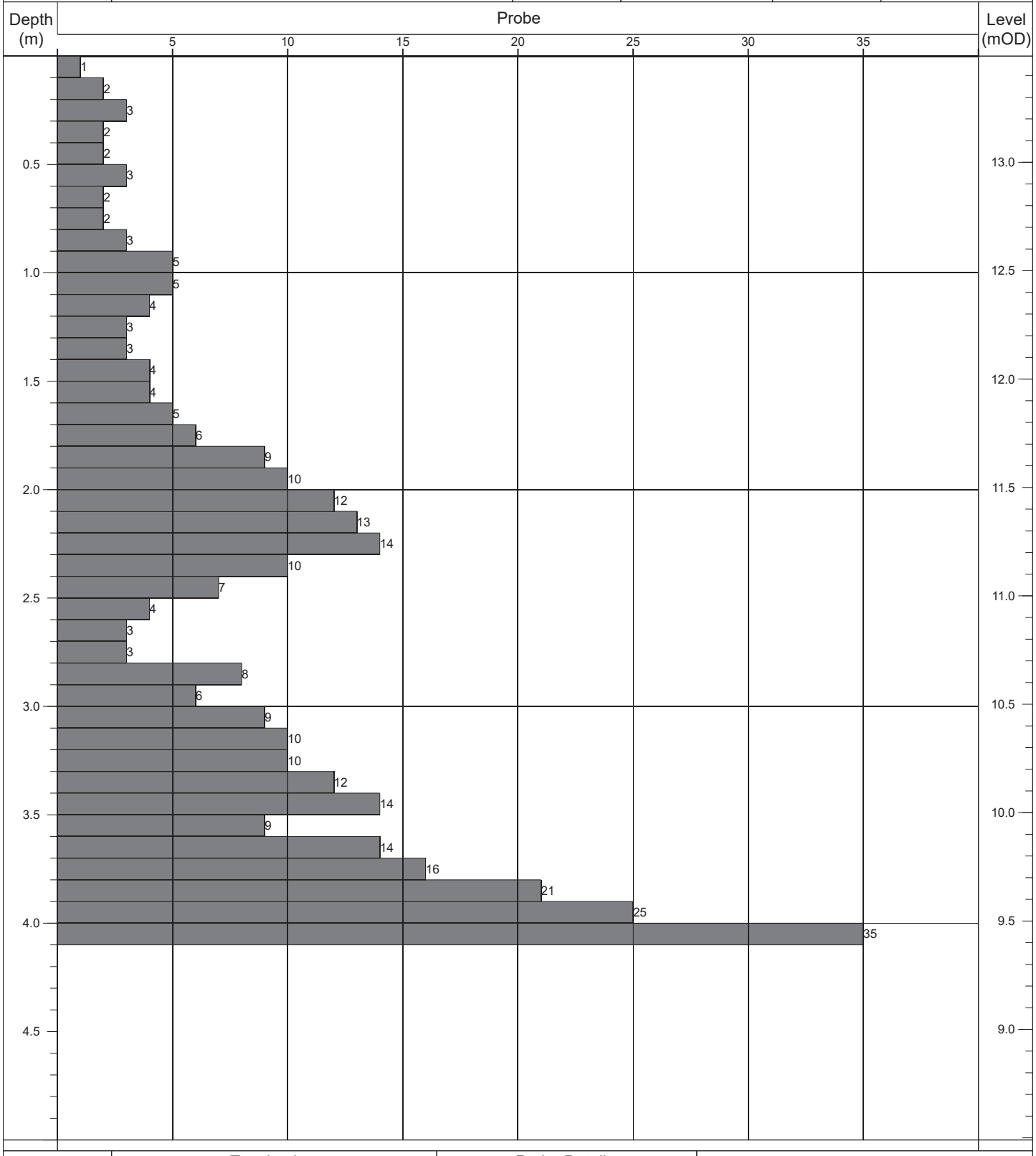
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP097**
Contract:	Hollybank	Easting:	717766.665	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747982.701	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.93	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



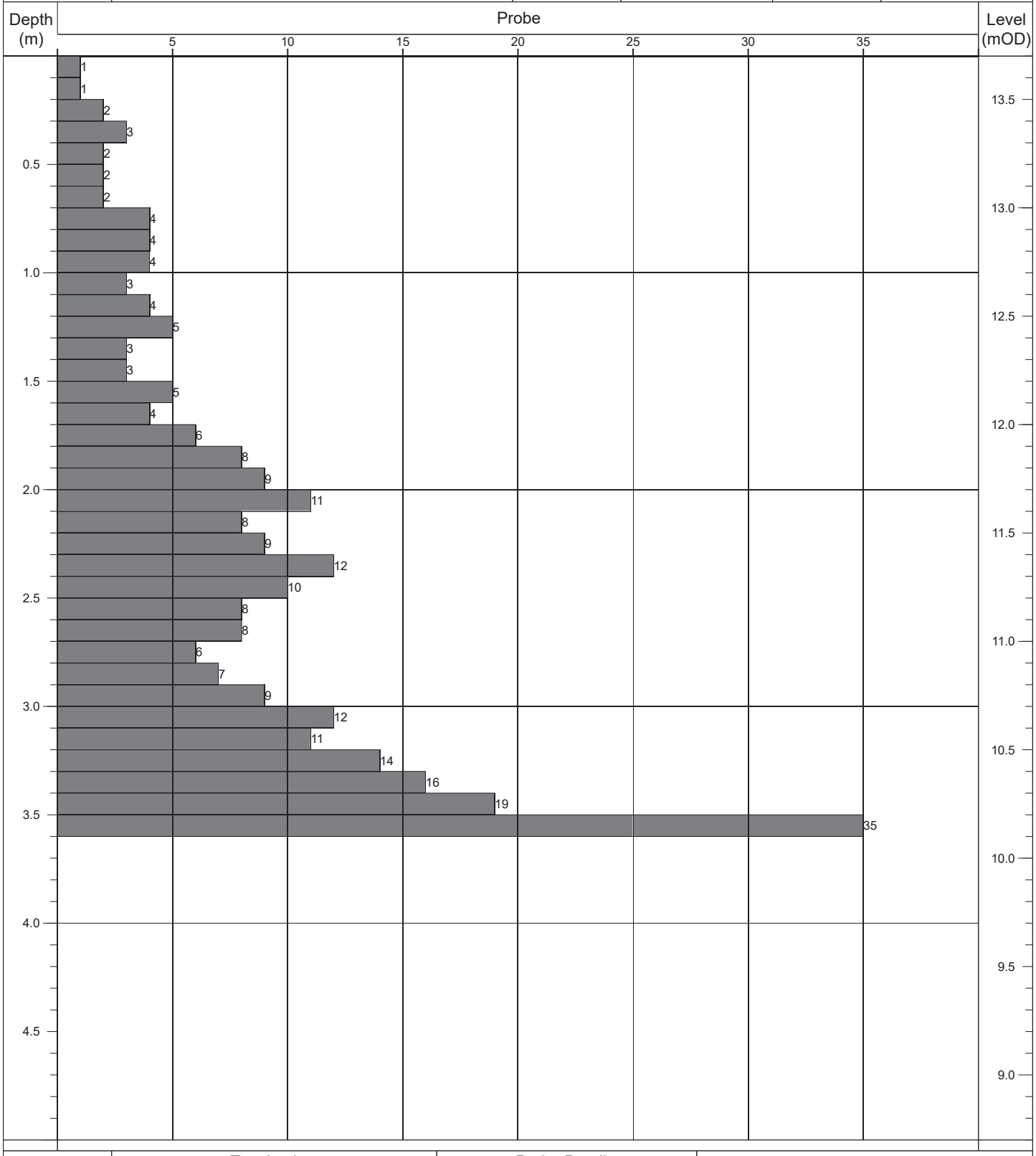
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP098**
Contract:	Hollybank	Easting:	717772.182	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747996.169	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.49	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



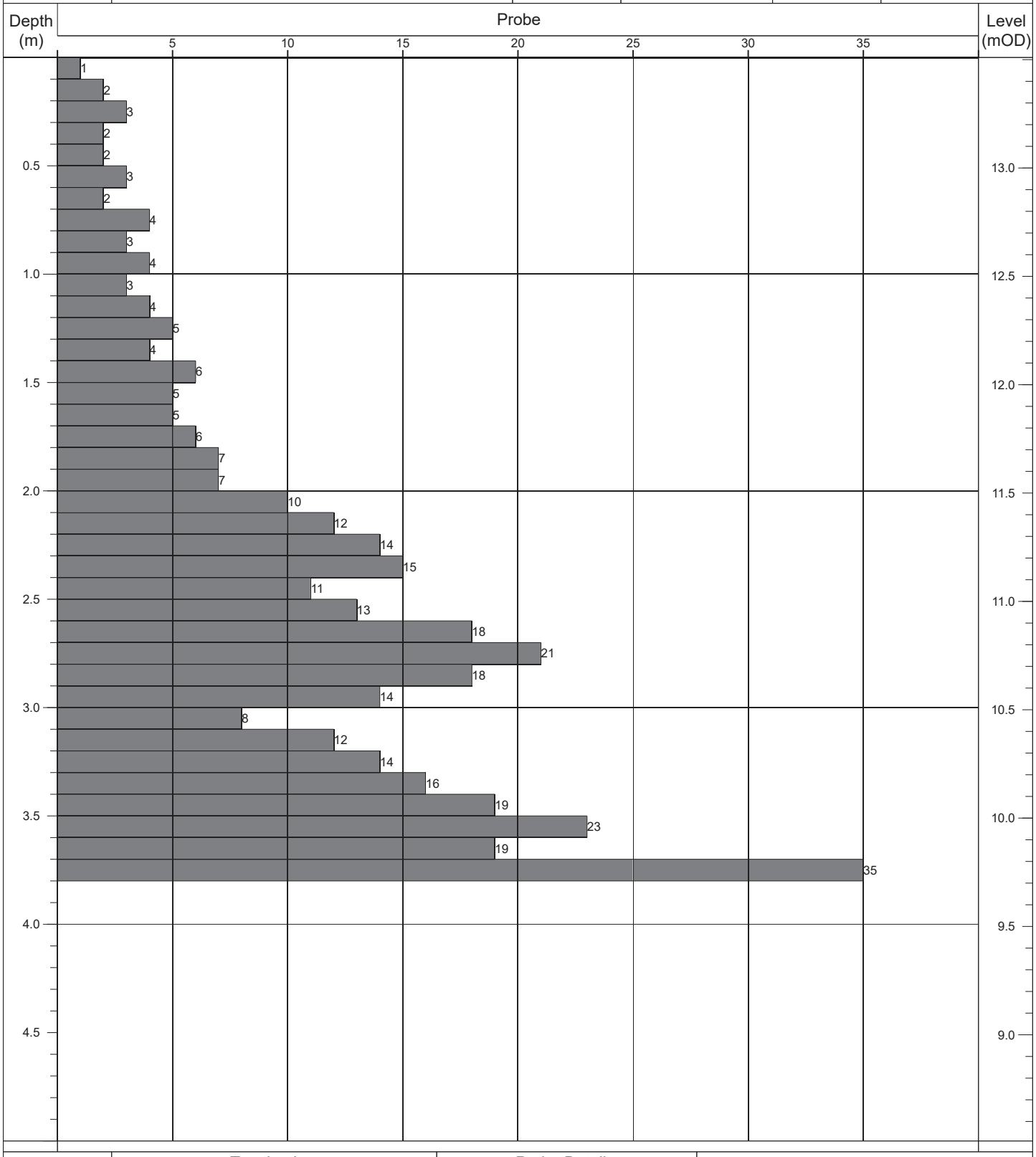
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP099**
Contract:	Hollybank	Easting:	717759.082	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748013.529	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.70	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



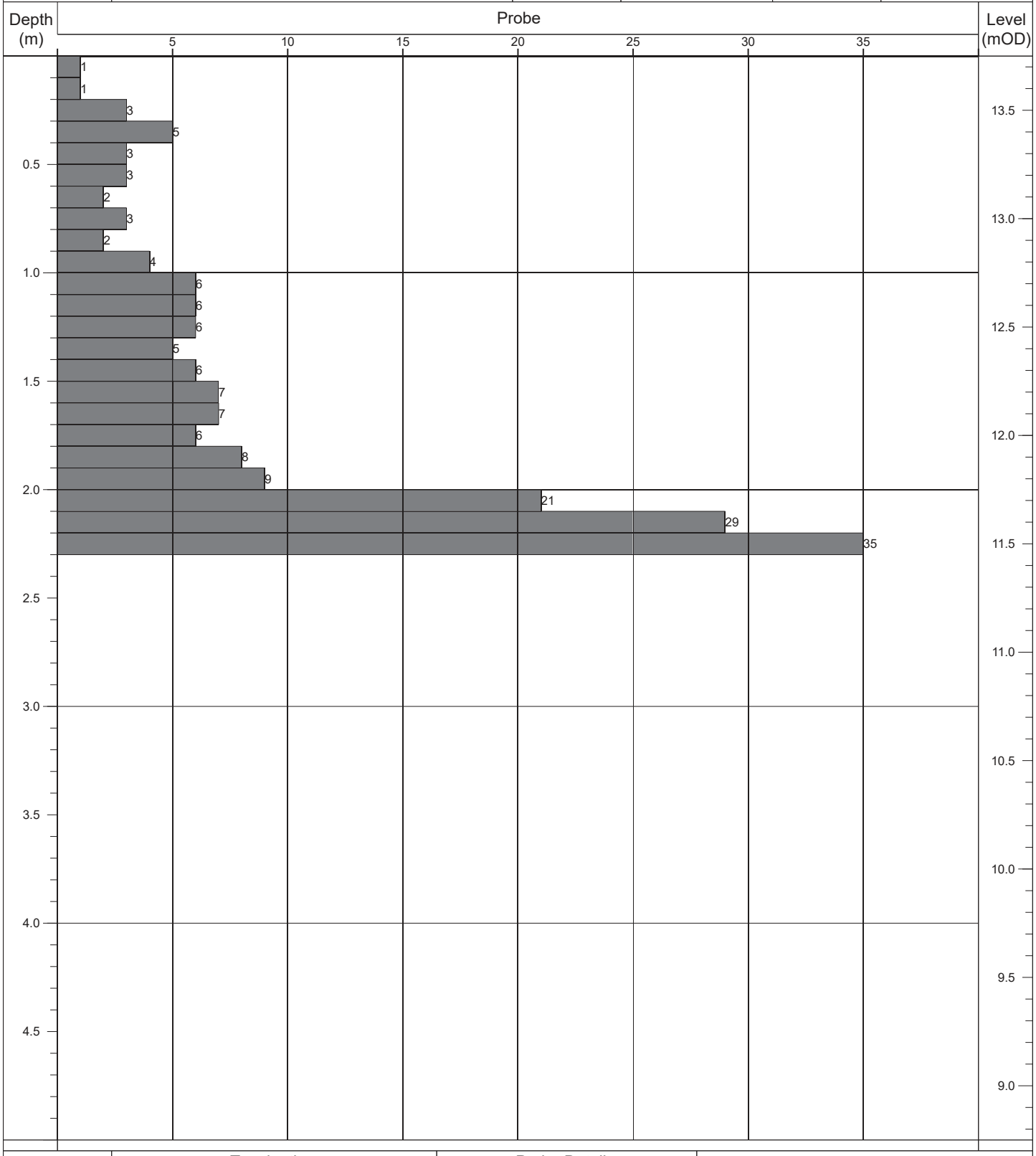
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP100**
Contract:	Hollybank	Easting:	717770.966	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748016.255	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.51	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



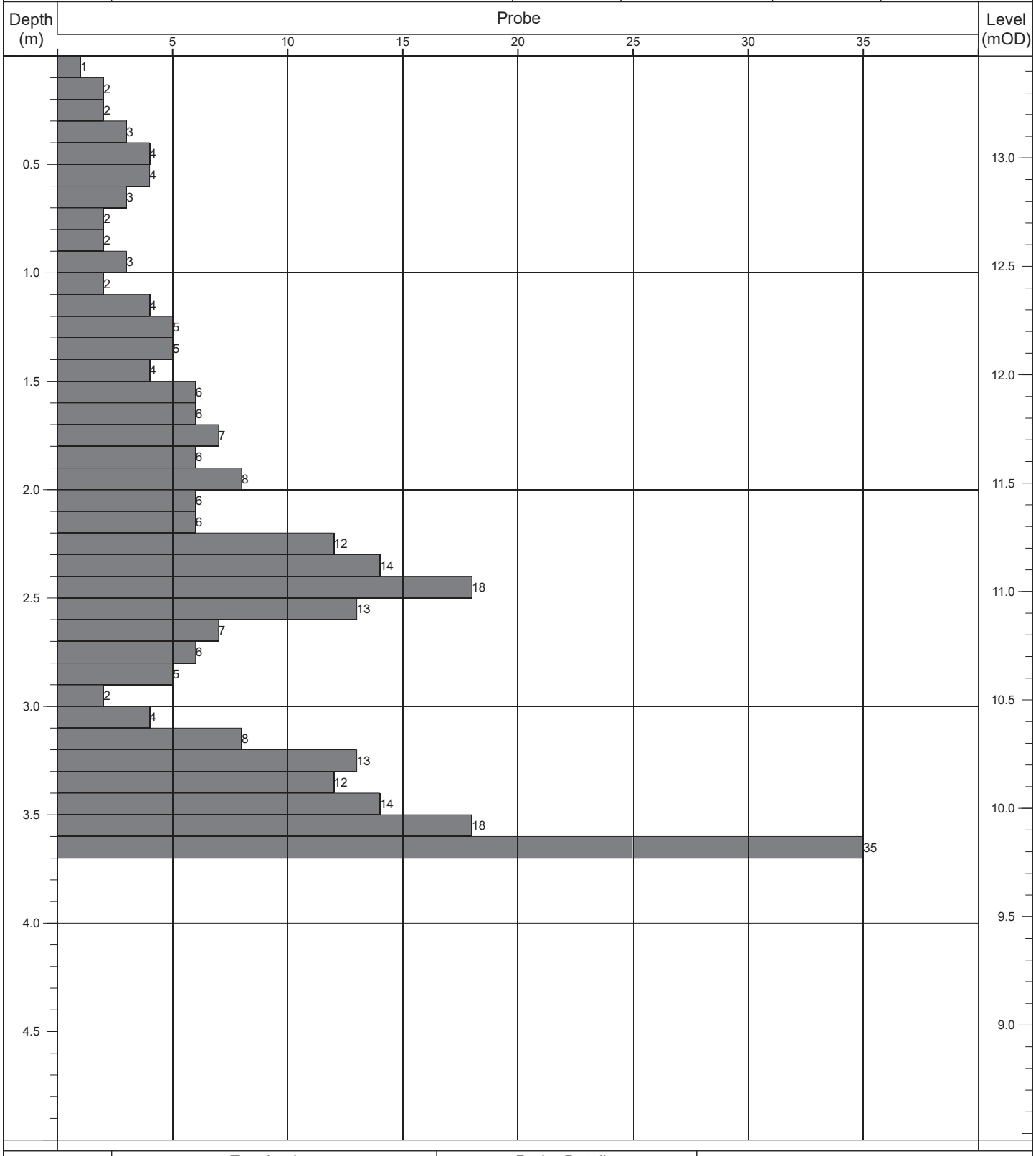
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP101**
Contract:	Hollybank	Easting:	717793.758	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	747993.440	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.75	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



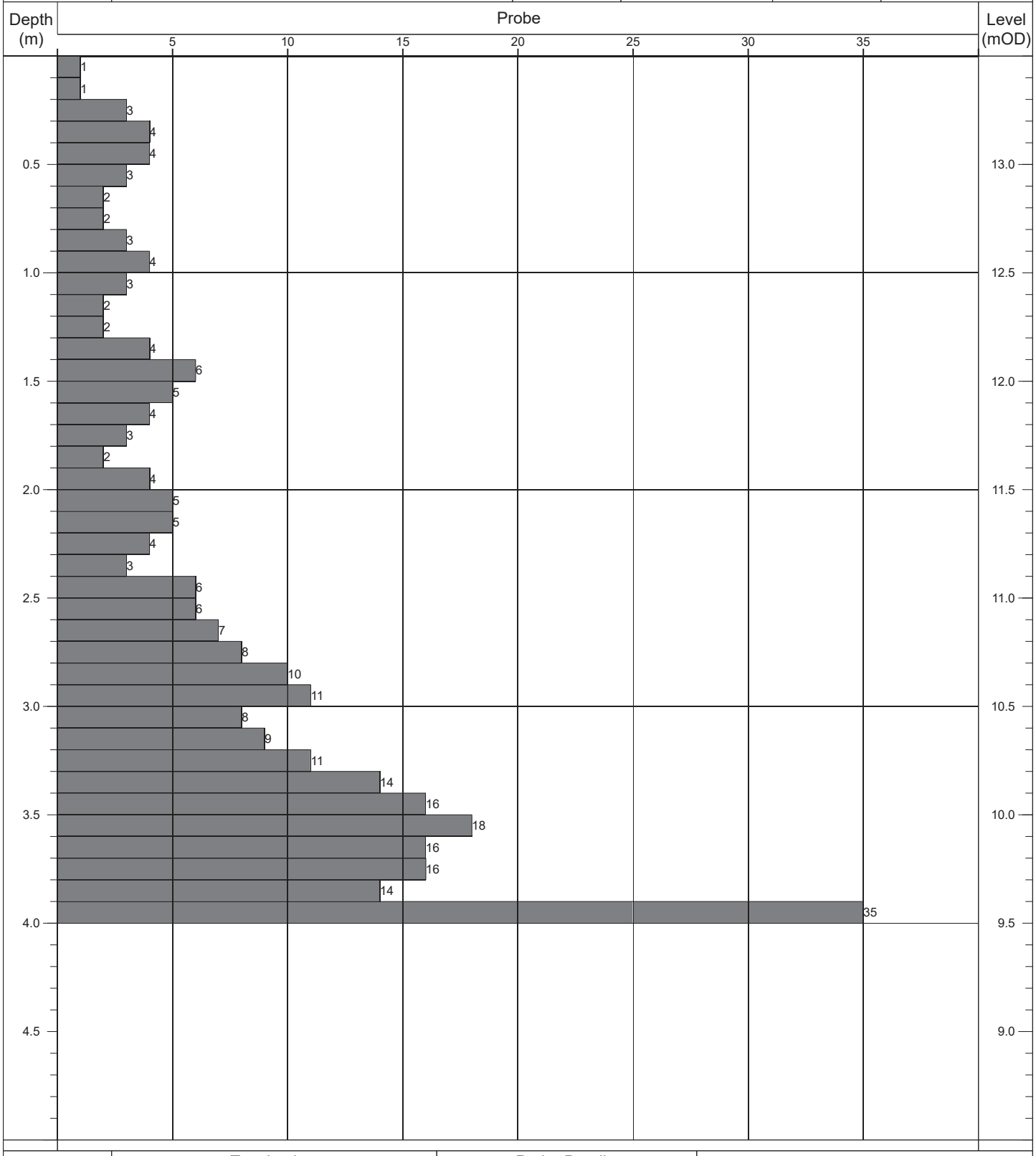
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP102**
Contract:	Hollybank	Easting:	717790.242	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748015.065	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.47	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



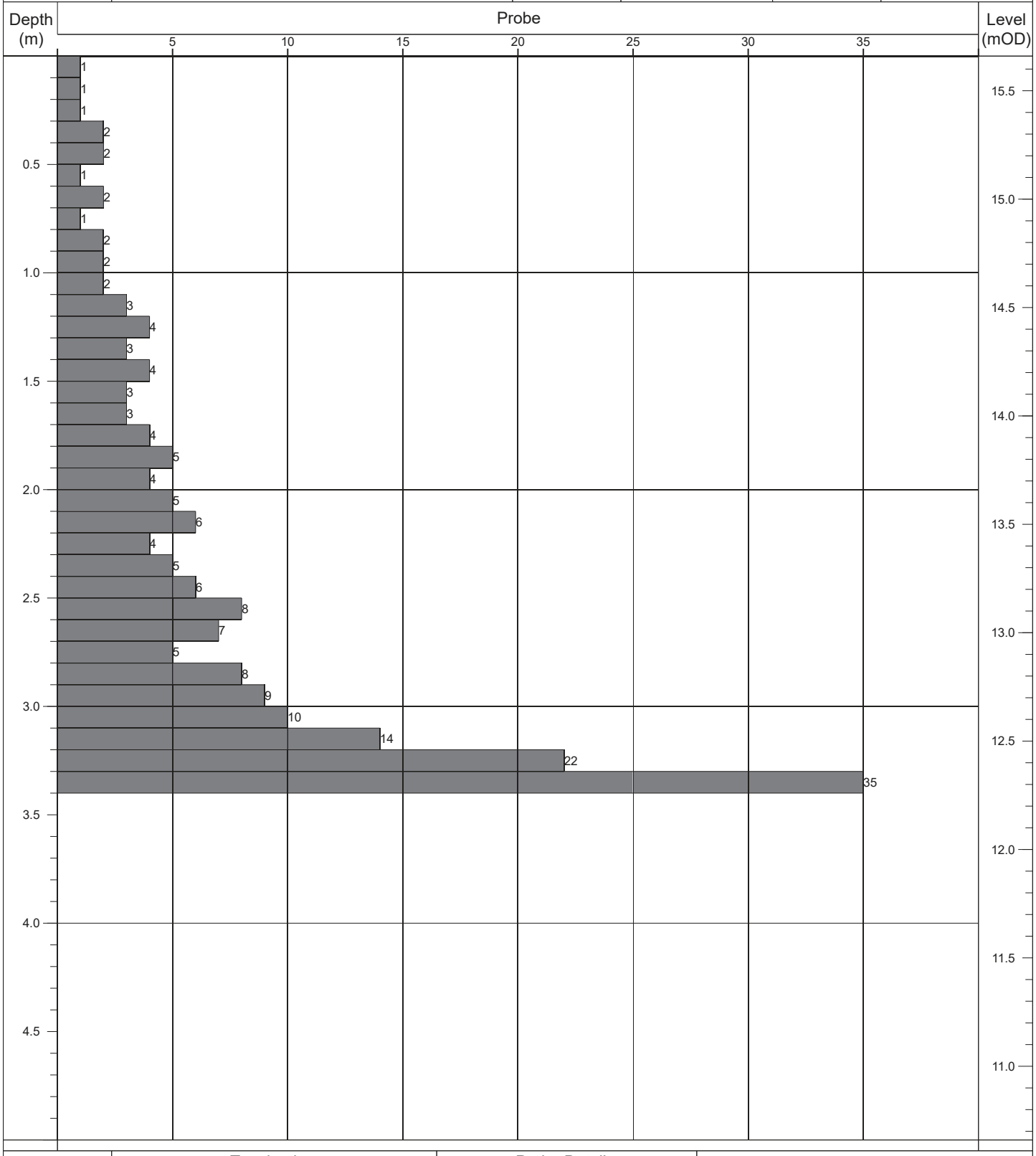
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP103**
Contract:	Hollybank	Easting:	717784.821	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748048.612	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.50	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



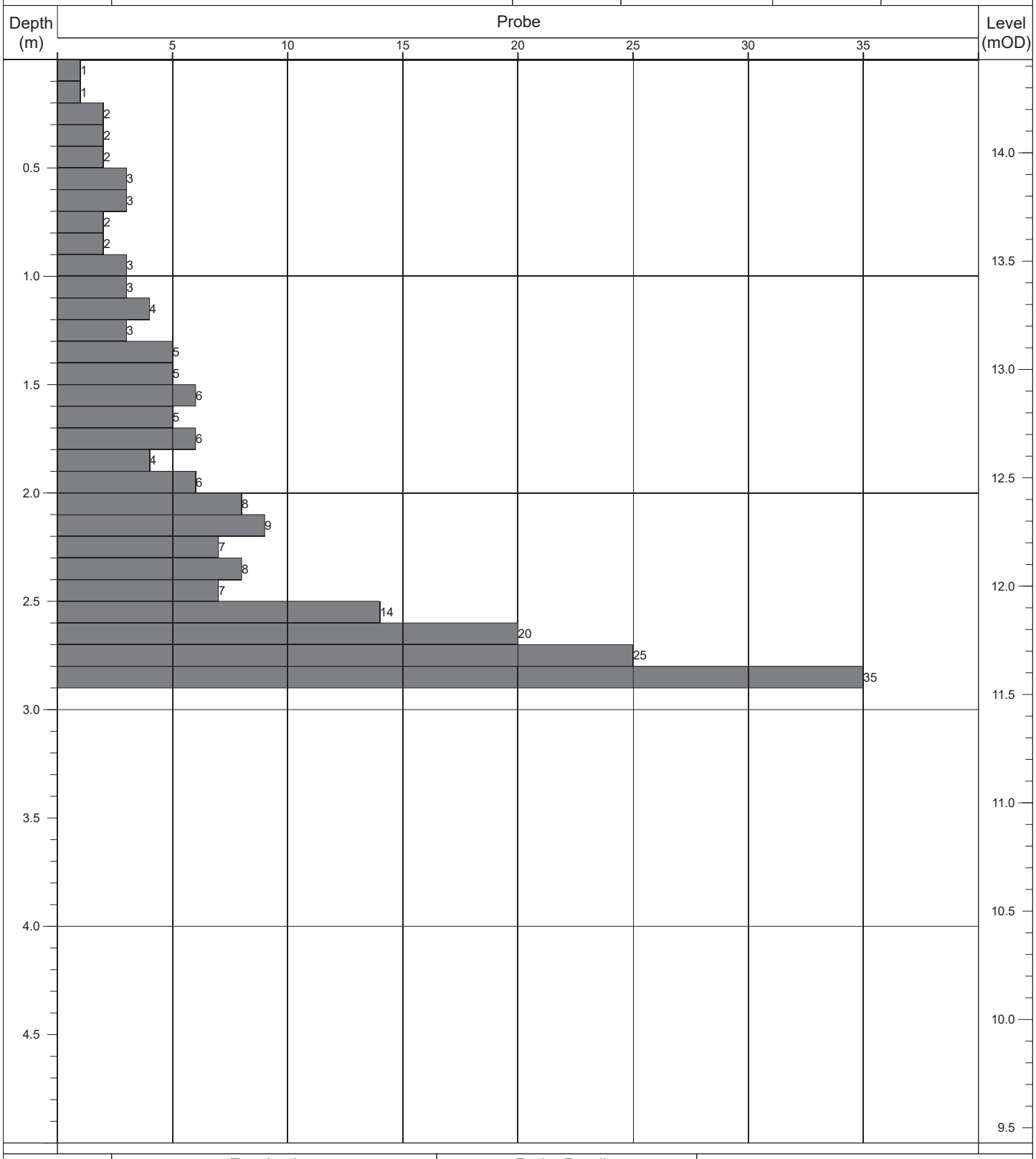
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
4.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP104**
Contract:	Hollybank	Easting:	717814.955	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	747978.284	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	15.66	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



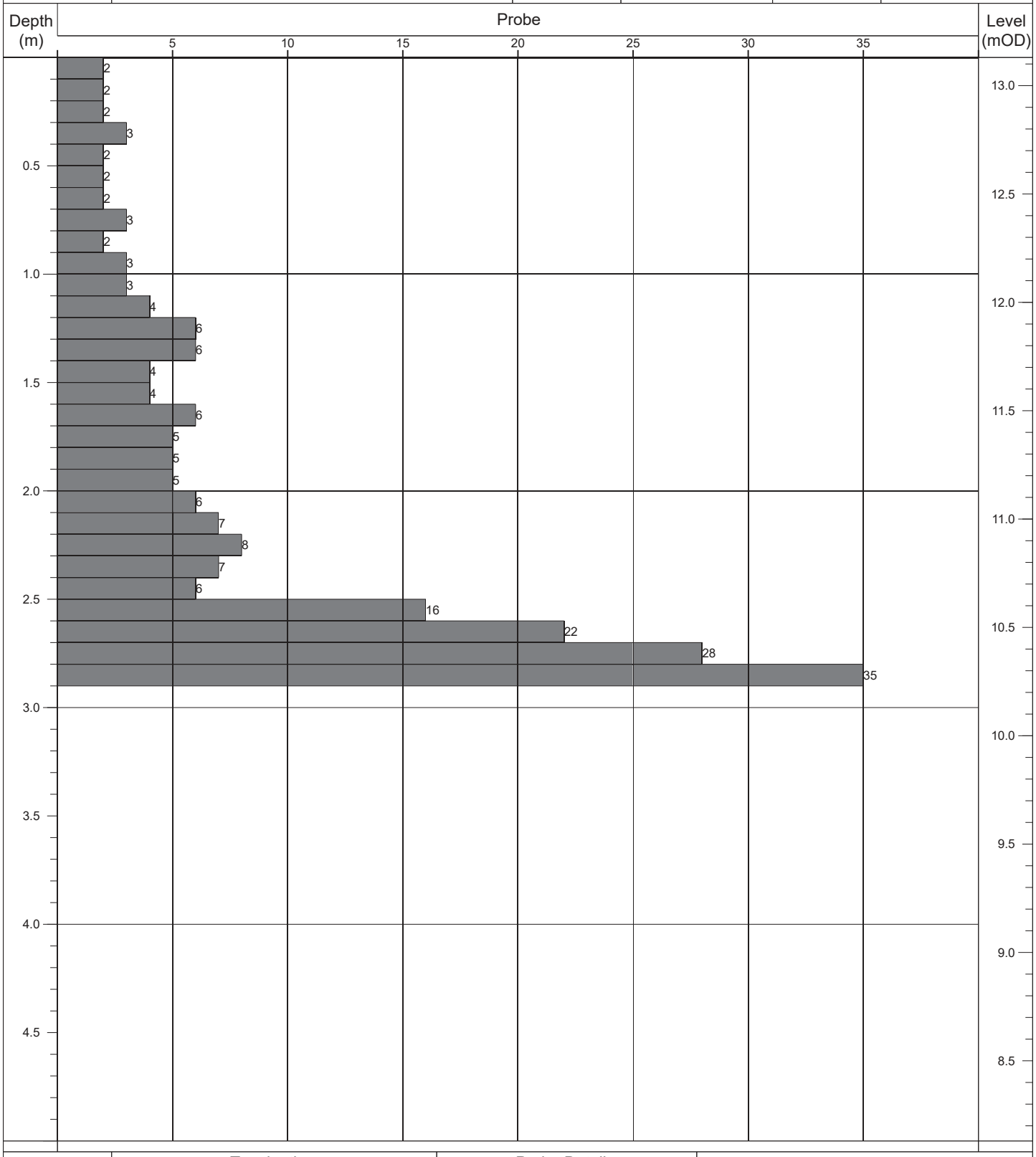
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP105**
Contract:	Hollybank	Easting:	717828.806	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	747990.370	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	14.43	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



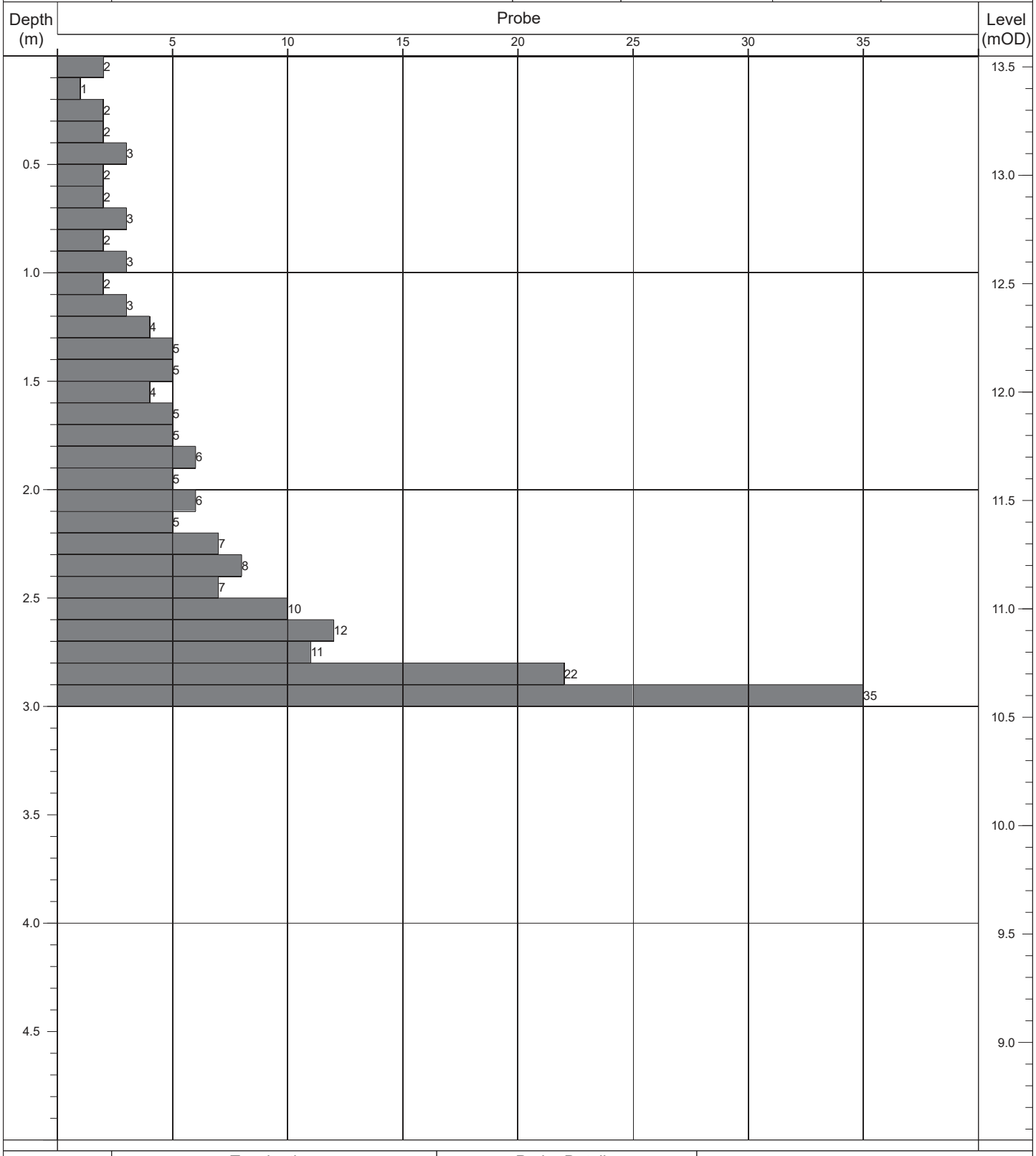
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP106**
Contract:	Hollybank	Easting:	717820.182	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748008.384	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.13	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



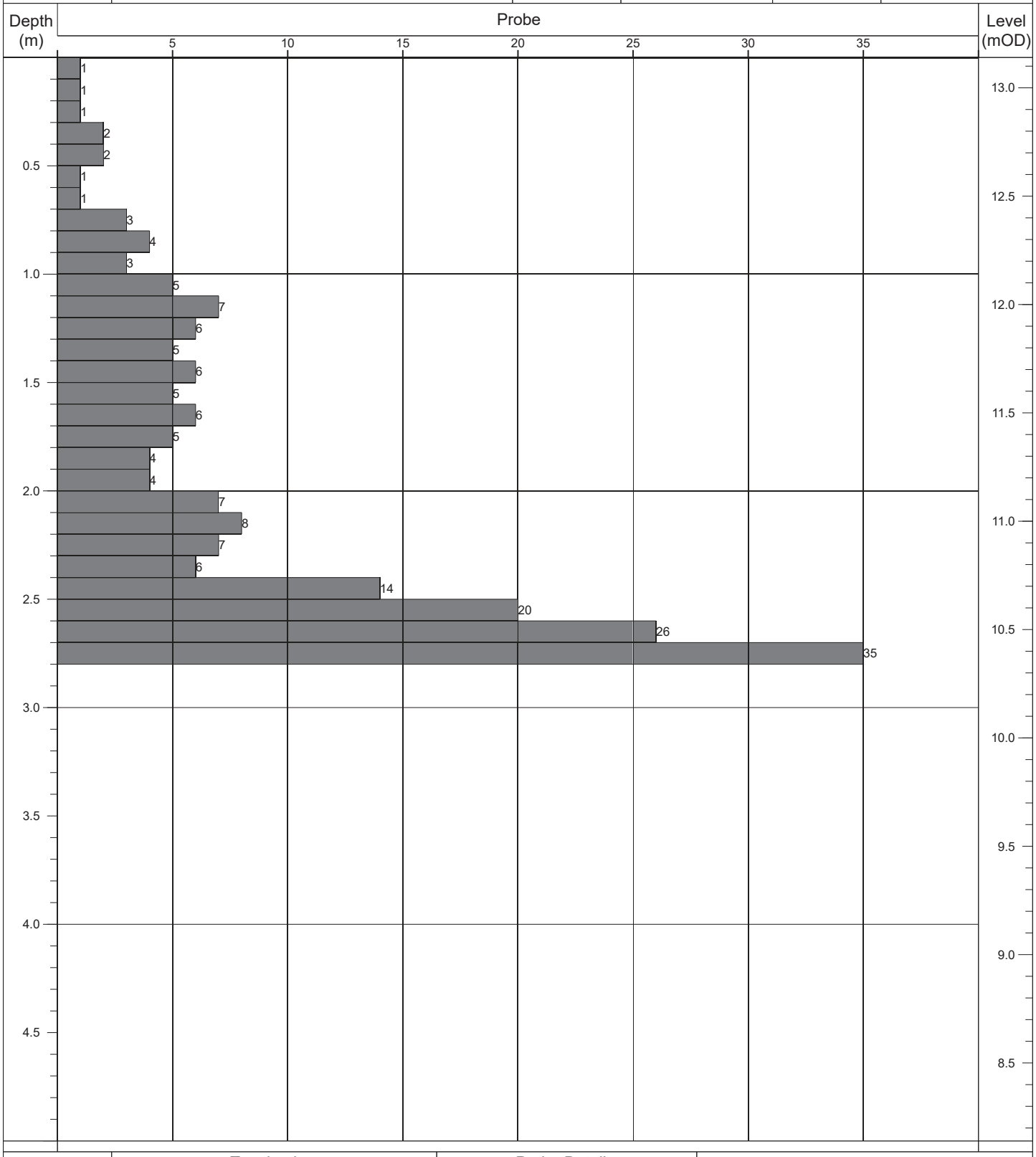
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP107**
Contract:	Hollybank	Easting:	717850.010	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	747995.104	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.55	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



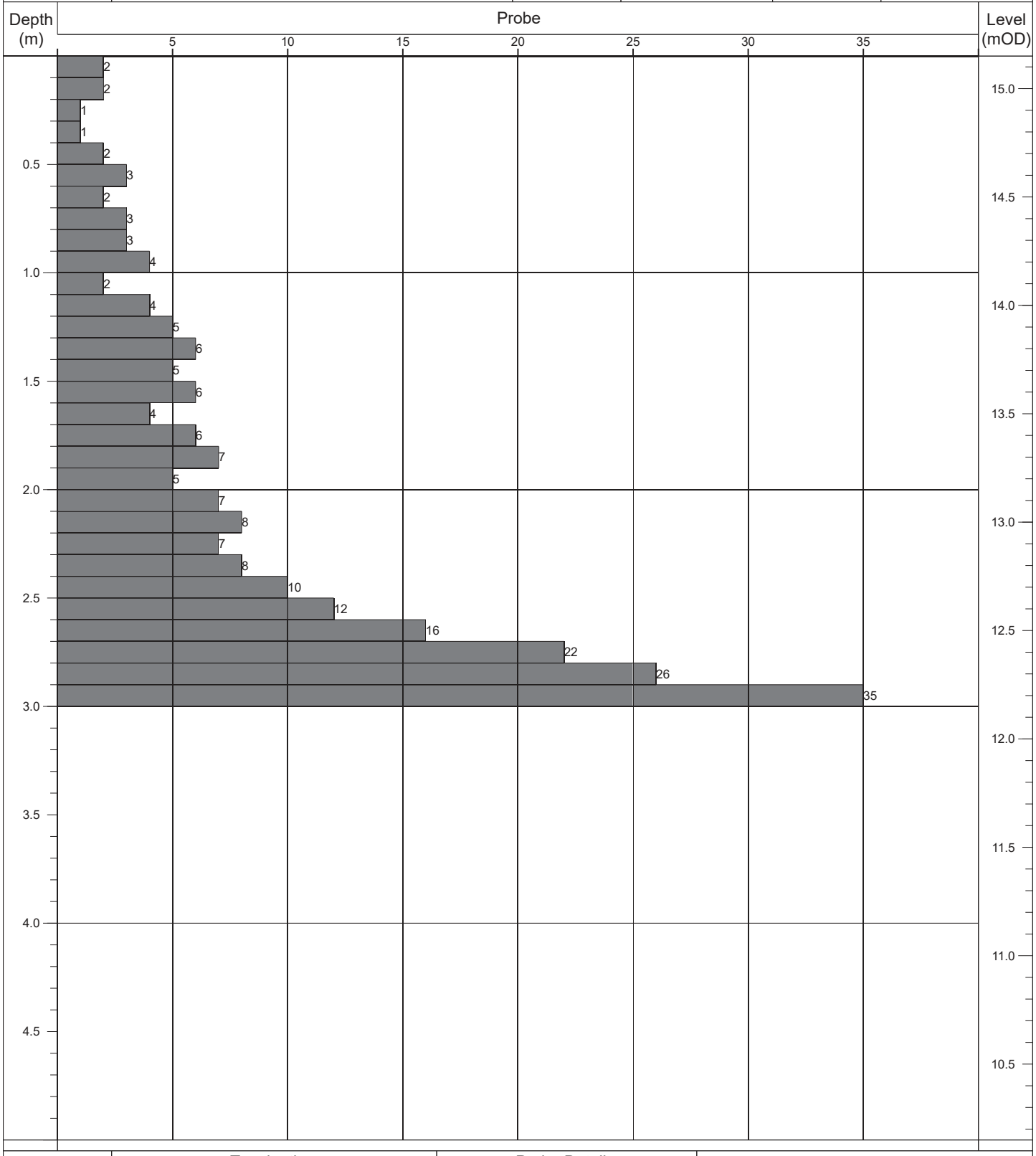
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP108**
Contract:	Hollybank	Easting:	717842.054	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748008.675	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.14	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



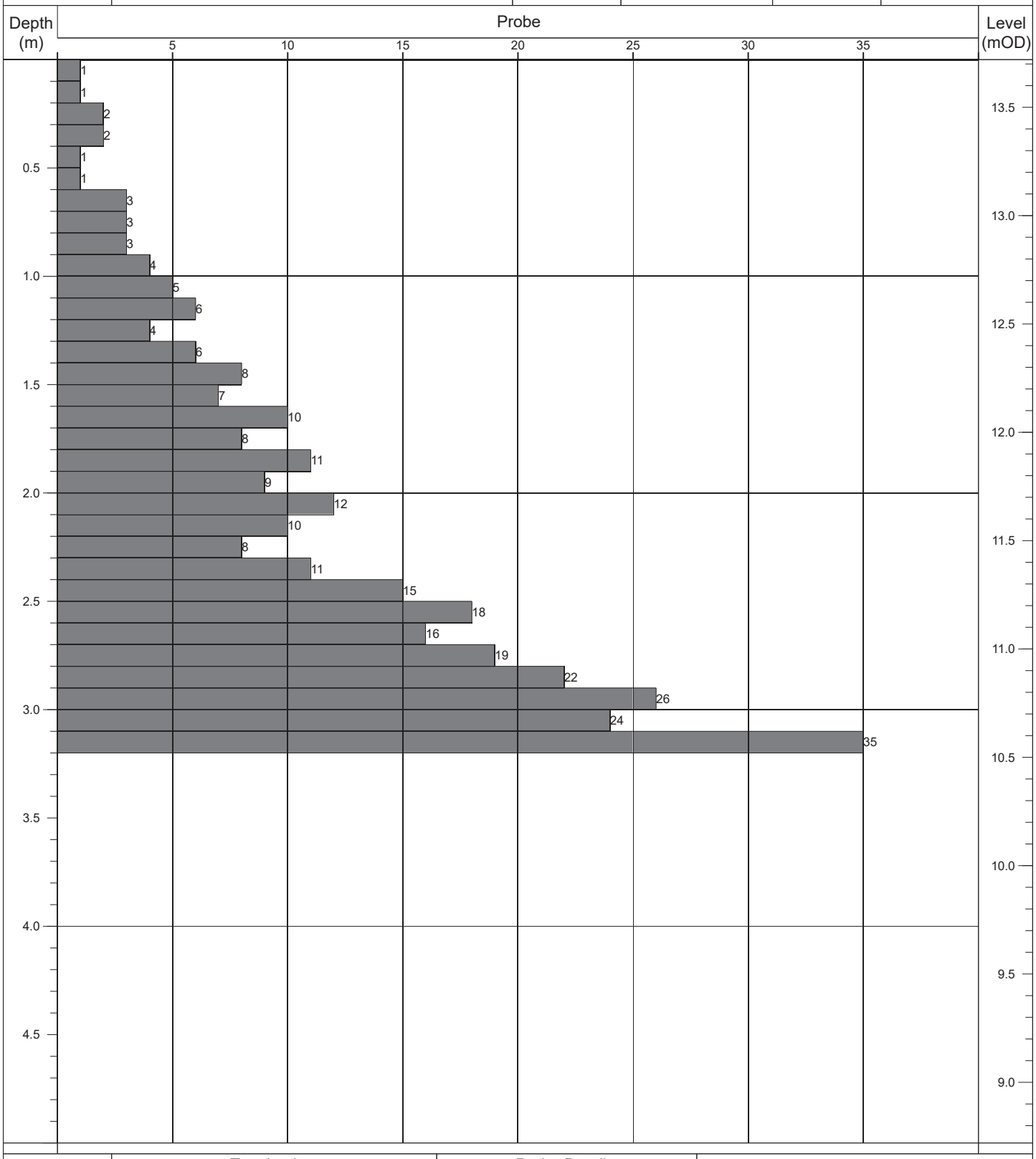
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP109**
Contract:	Hollybank	Easting:	717856.771	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	747973.738	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	15.15	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



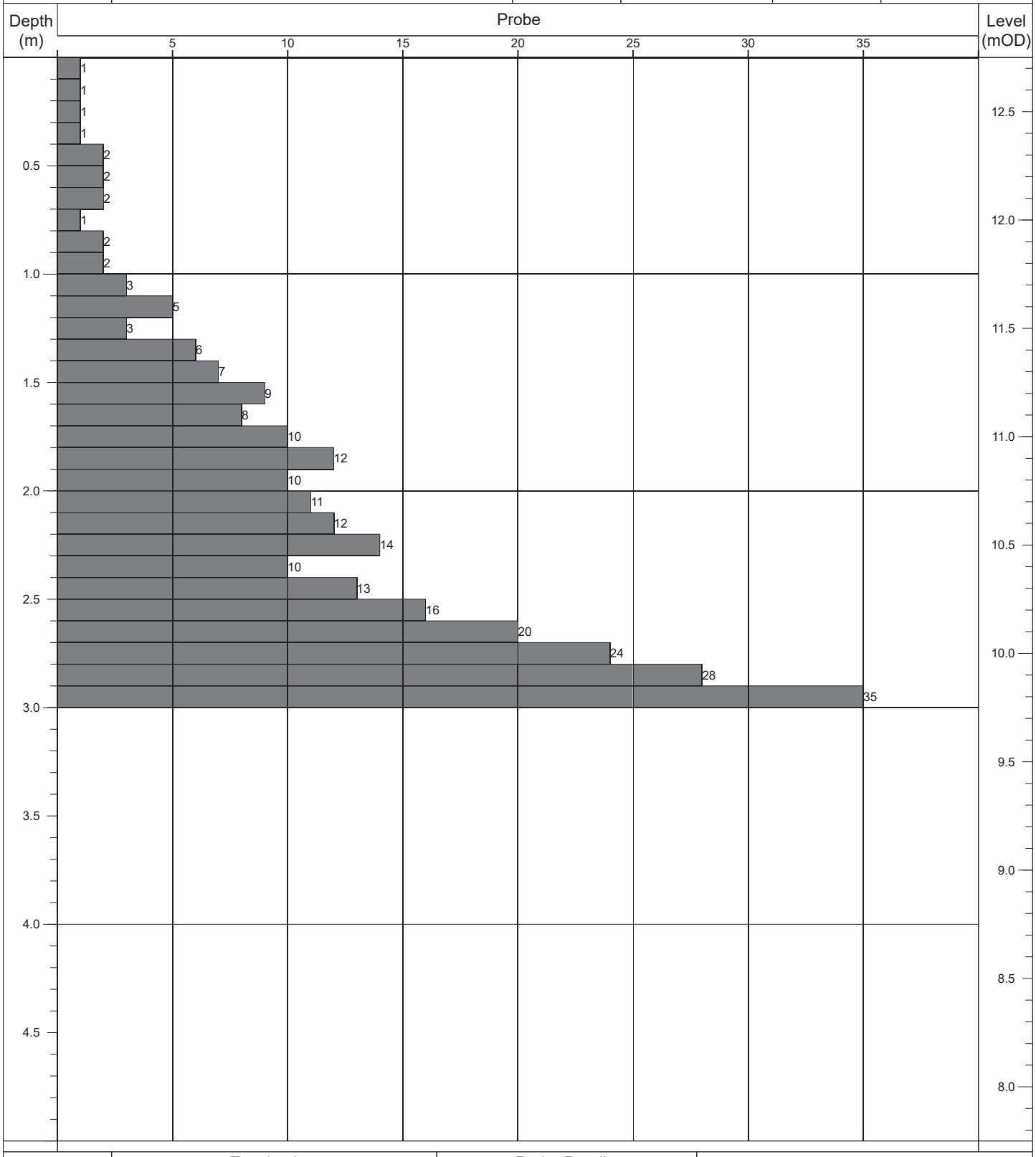
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP110**
Contract:	Hollybank	Easting:	717877.141	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	747982.034	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.72	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



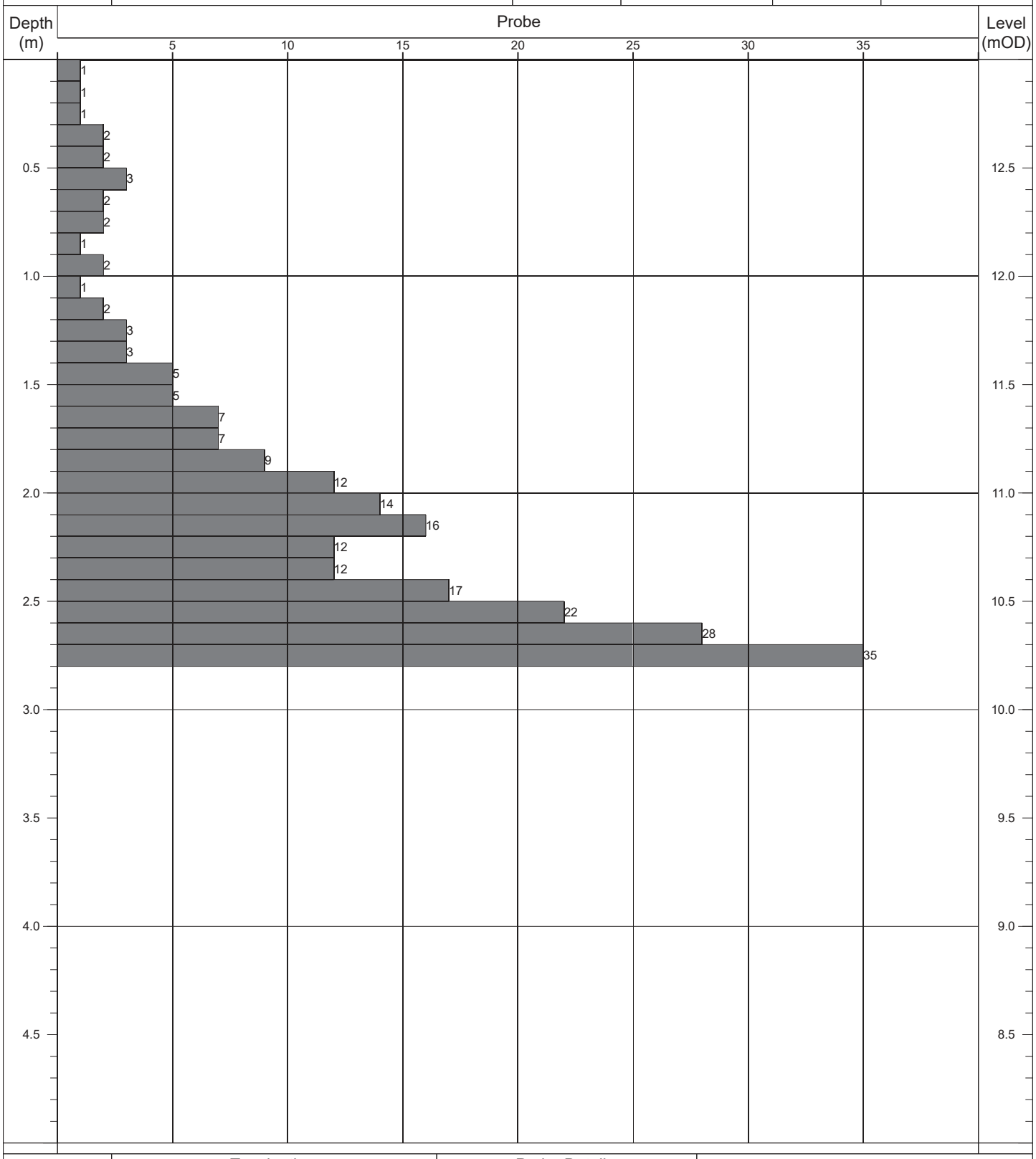
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP111**
Contract:	Hollybank	Easting:	717861.776	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748003.809	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.75	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



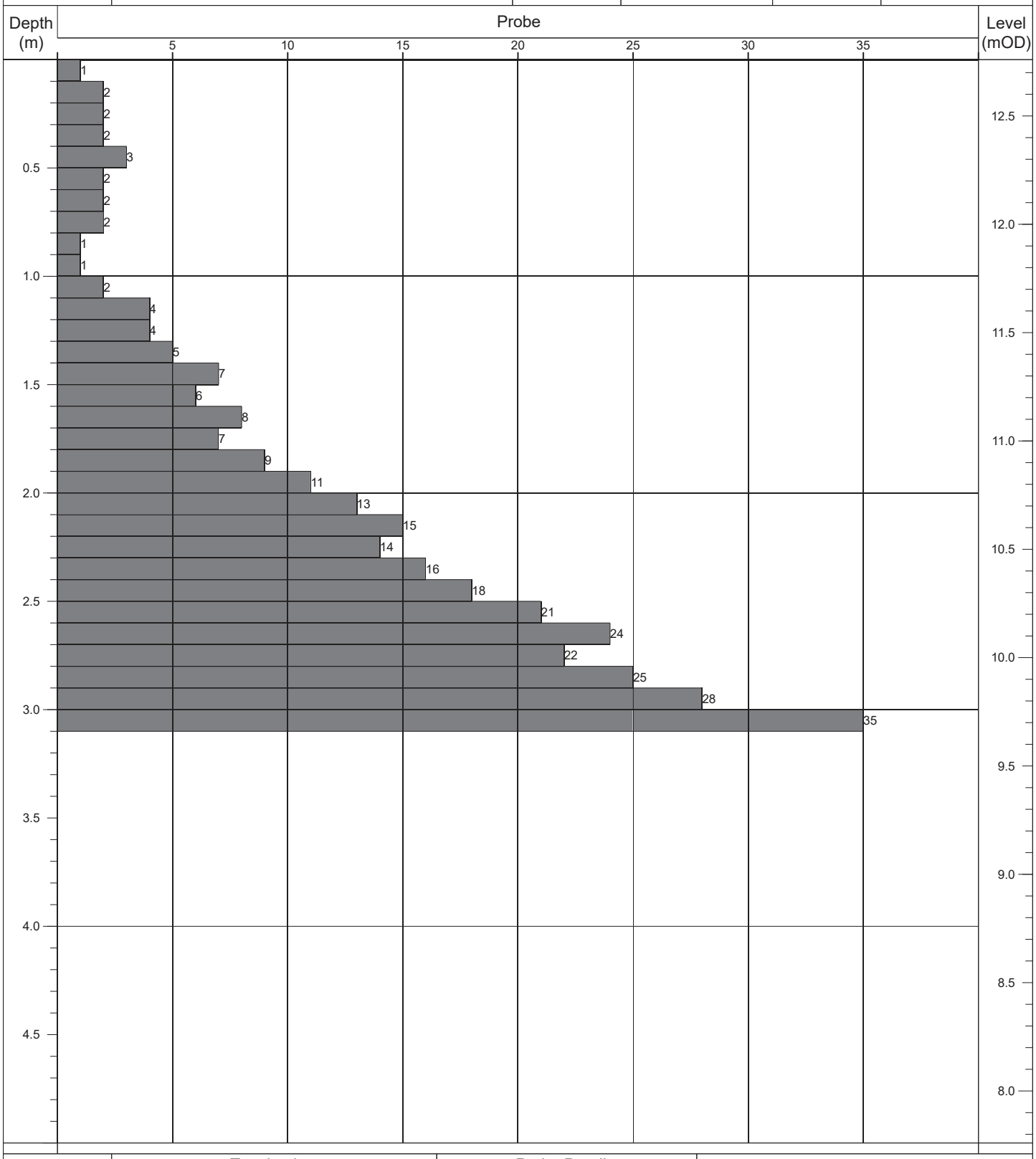
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP112**
Contract:	Hollybank	Easting:	717826.624	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748020.078	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.00	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



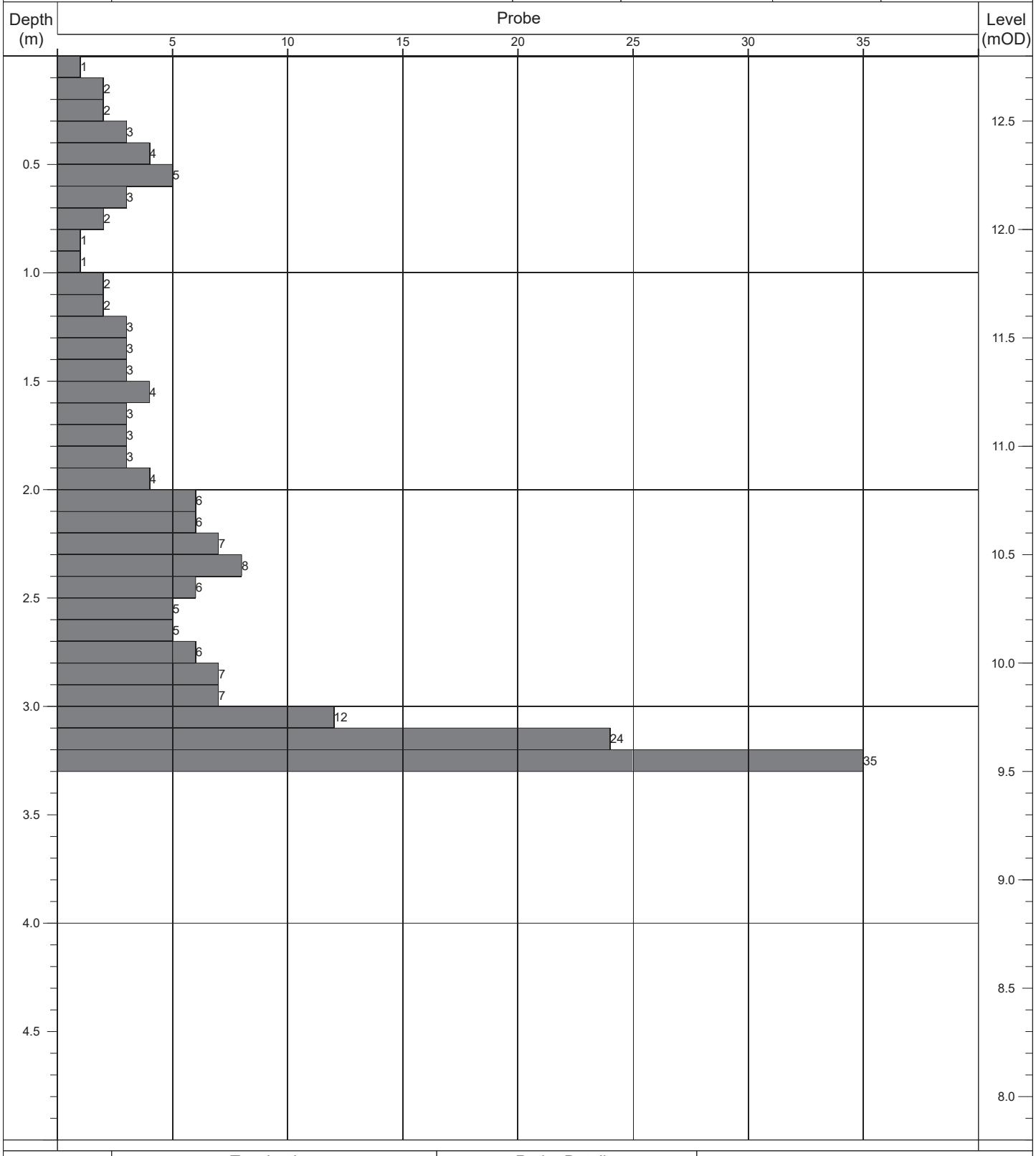
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.80m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP113**
Contract:	Hollybank	Easting:	717845.456	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748022.410	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.76	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



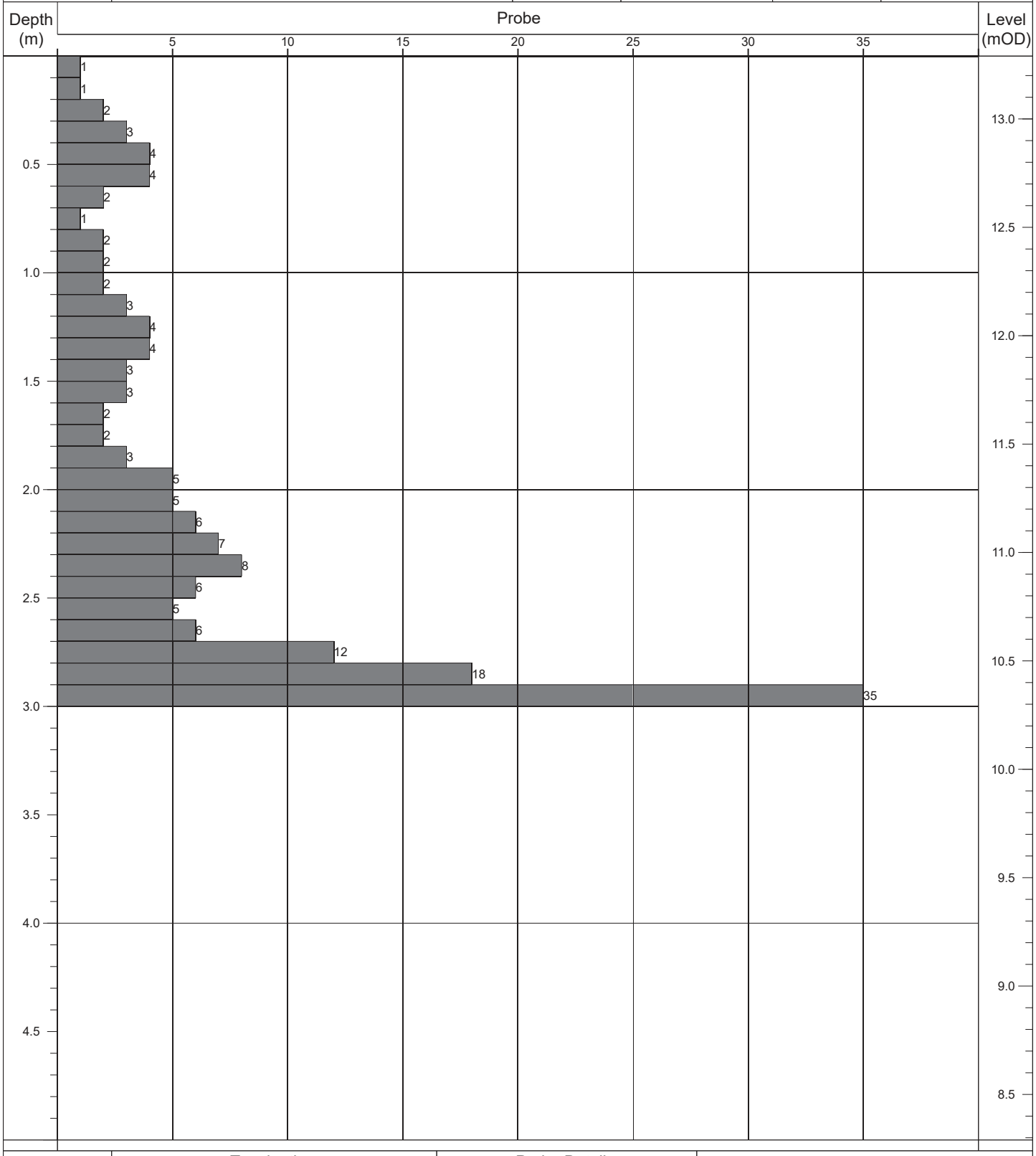
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP114**
Contract:	Hollybank	Easting:	717872.562	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748020.583	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.80	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



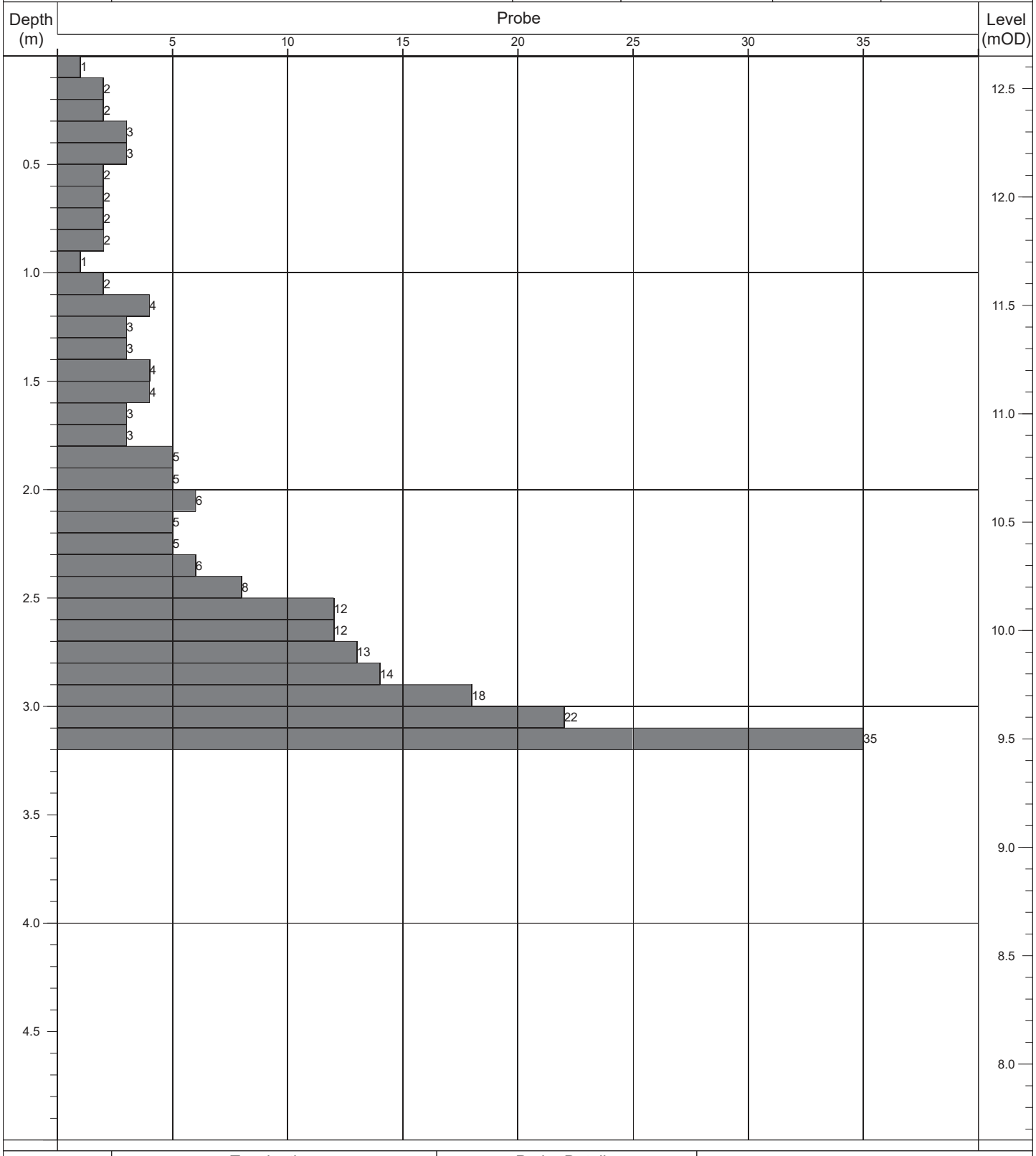
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP115**
Contract:	Hollybank	Easting:	717810.277	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748057.547	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.29	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



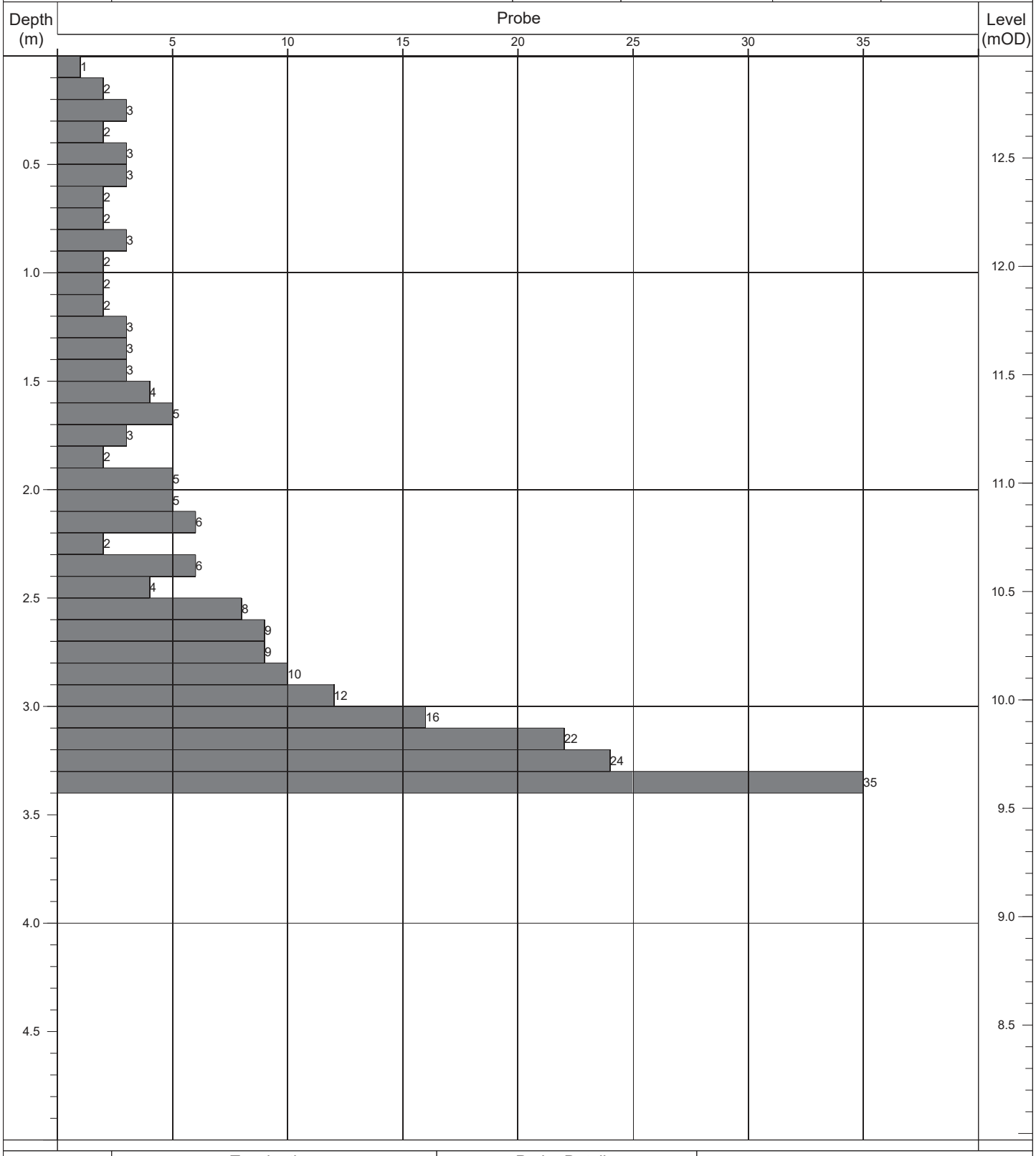
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP116**
Contract:	Hollybank	Easting:	717863.920	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748041.751	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.65	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



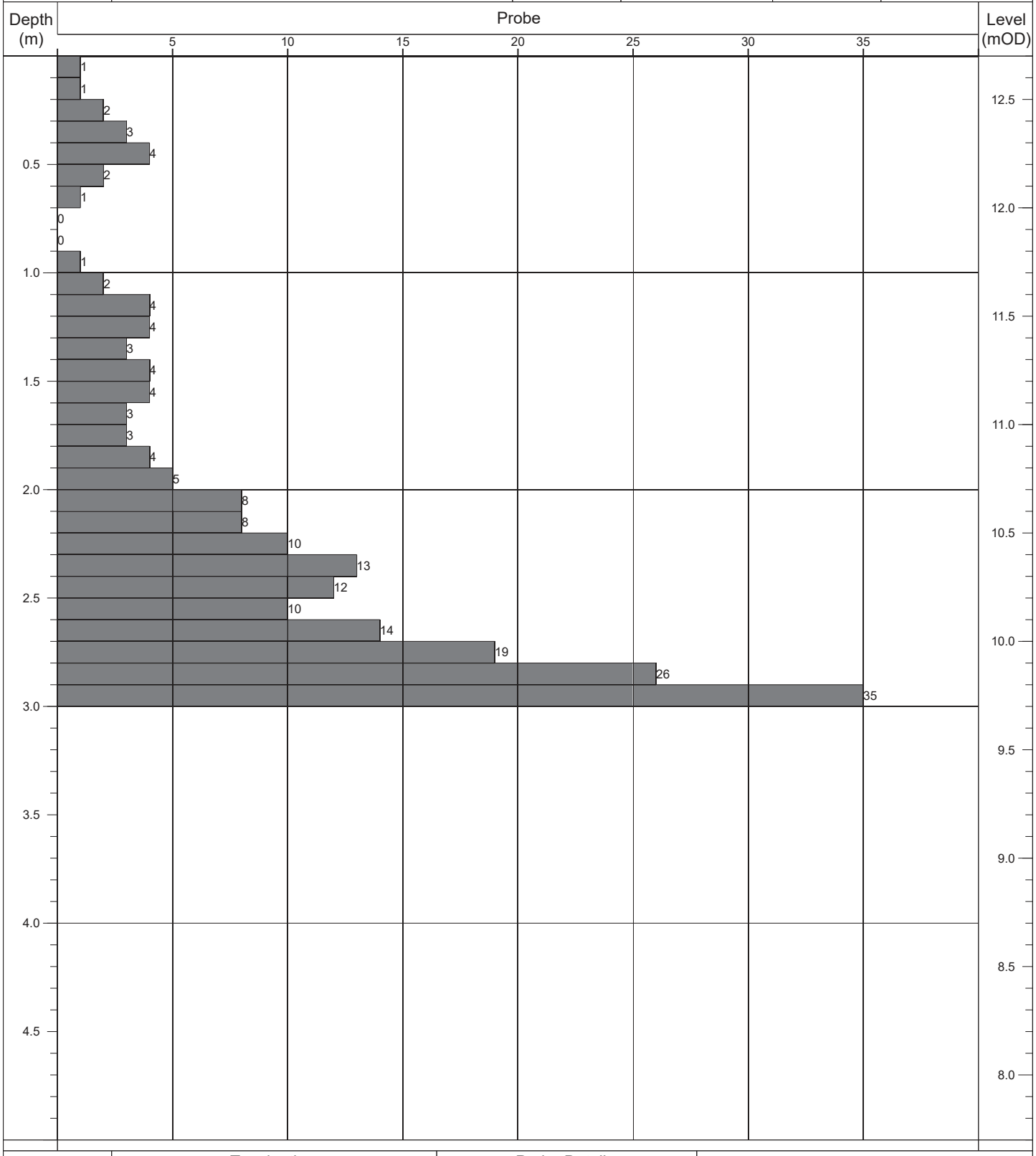
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP117**
Contract:	Hollybank	Easting:	717828.600	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748056.264	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.97	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



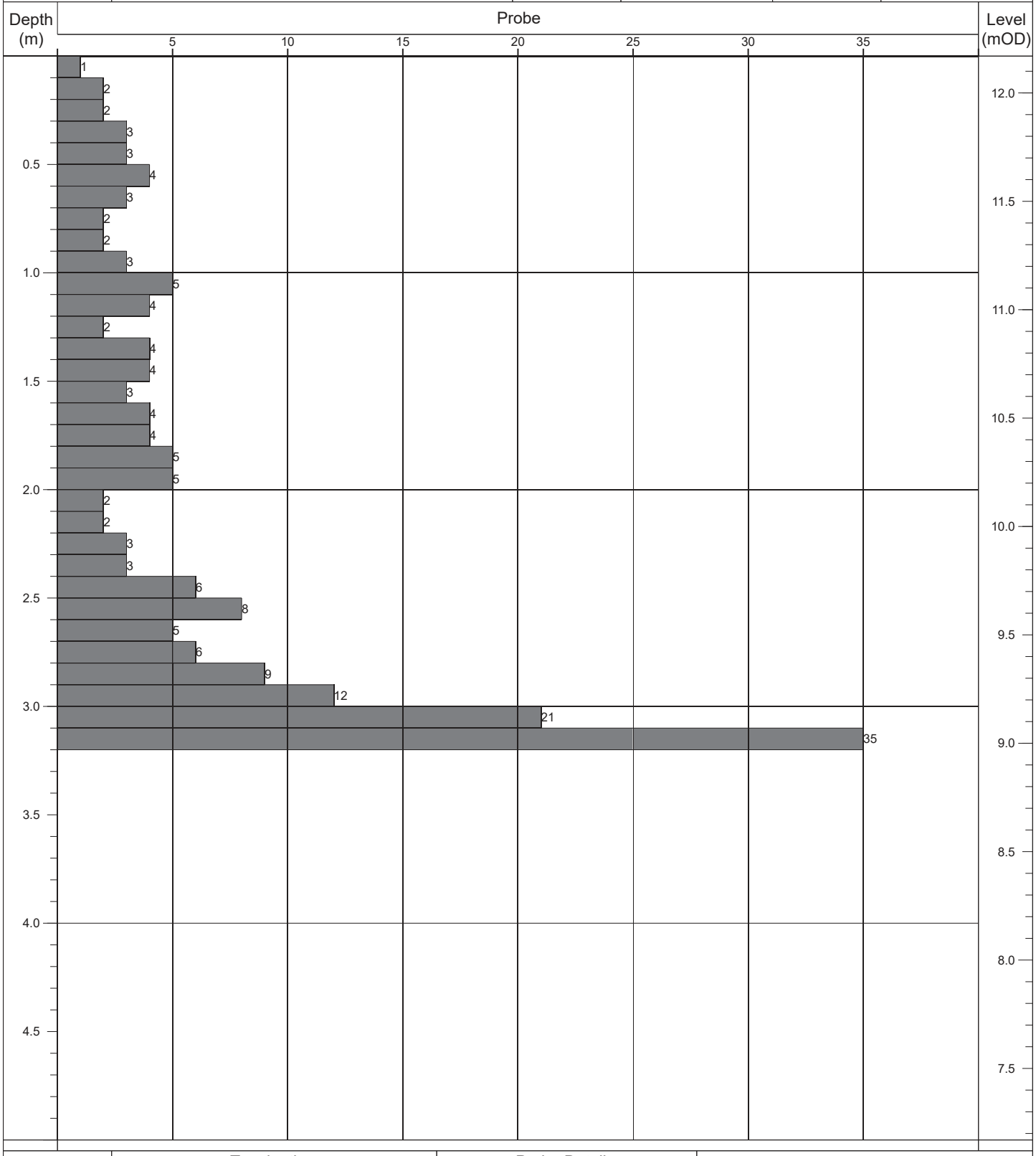
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP118**
Contract:	Hollybank	Easting:	717845.581	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748058.000	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.70	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



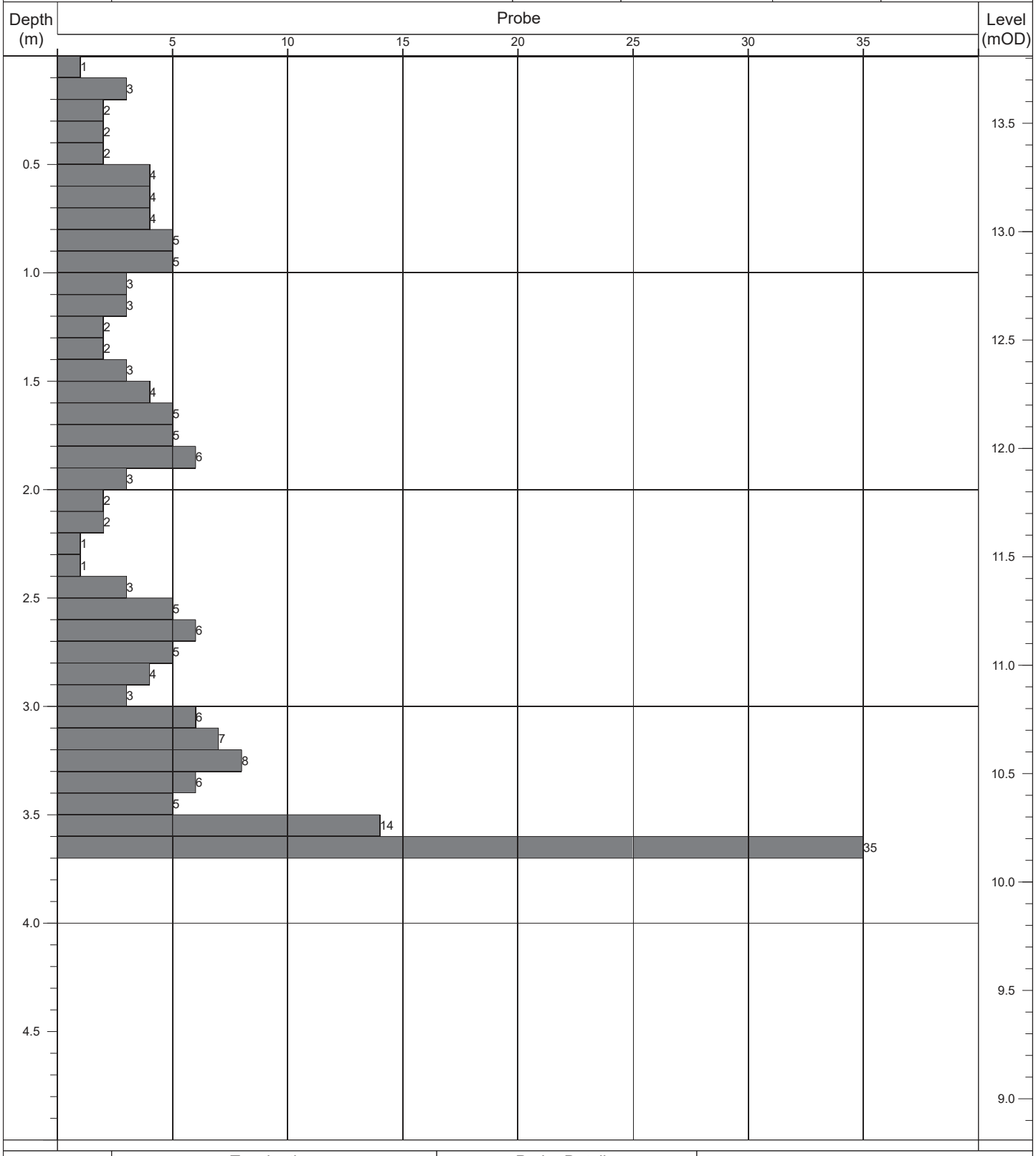
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP119**
Contract:	Hollybank	Easting:	717865.986	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748059.193	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.17	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



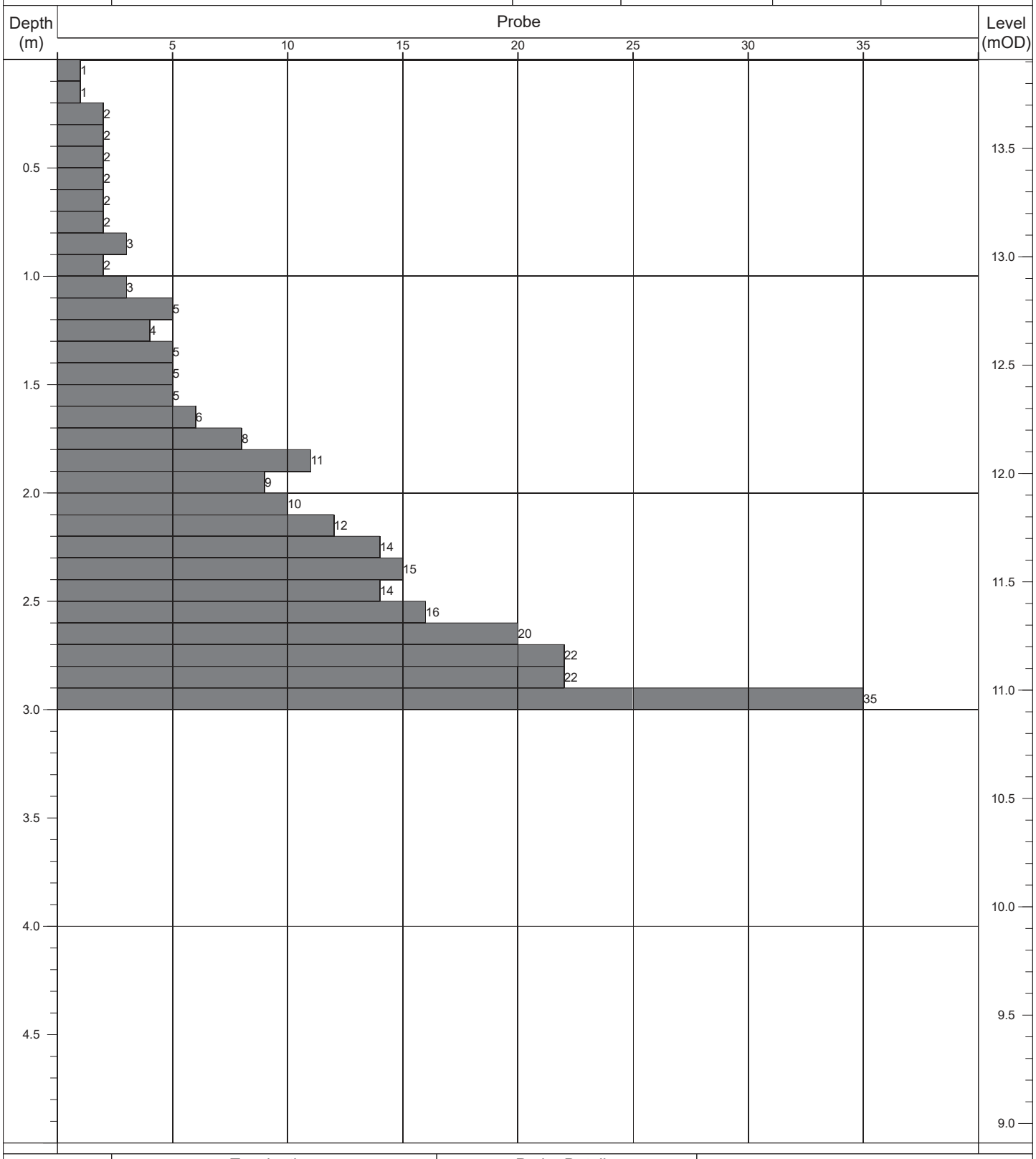
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP120**
Contract:	Hollybank	Easting:	717818.030	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748088.538	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.81	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



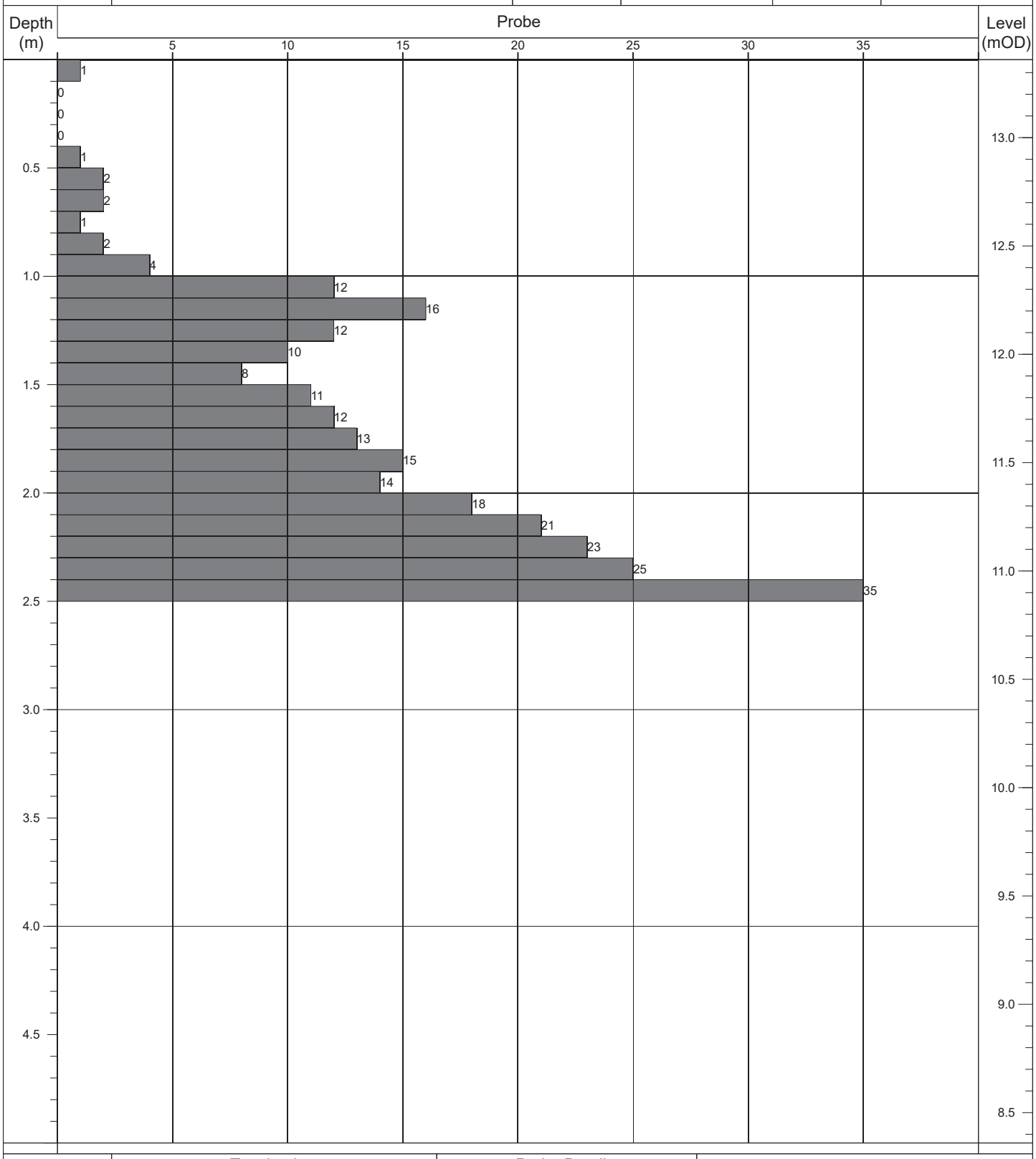
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP121**
Contract:	Hollybank	Easting:	717815.603	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748107.978	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.91	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



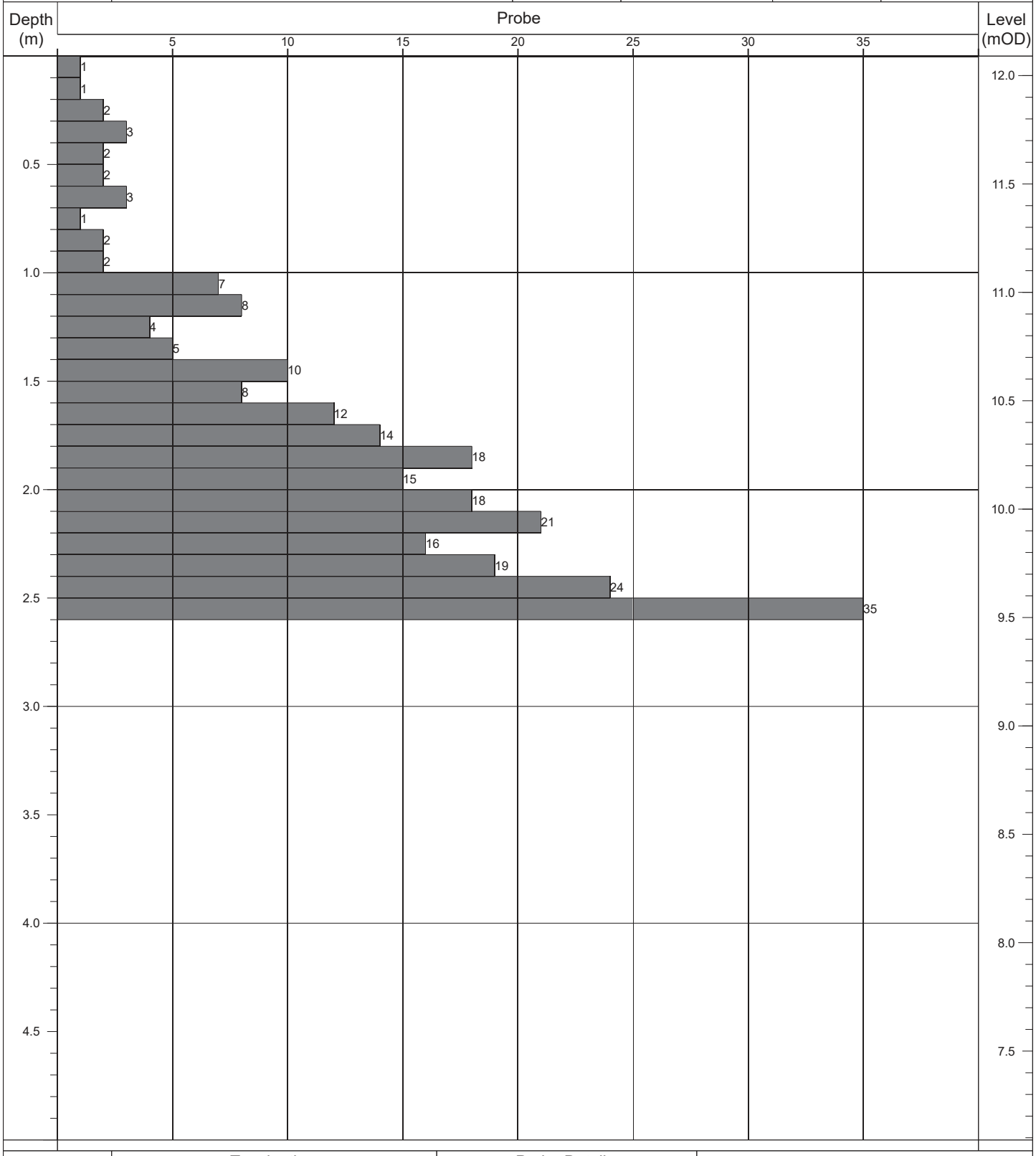
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP122**
Contract:	Hollybank	Easting:	717807.117	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748128.824	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	13.36	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



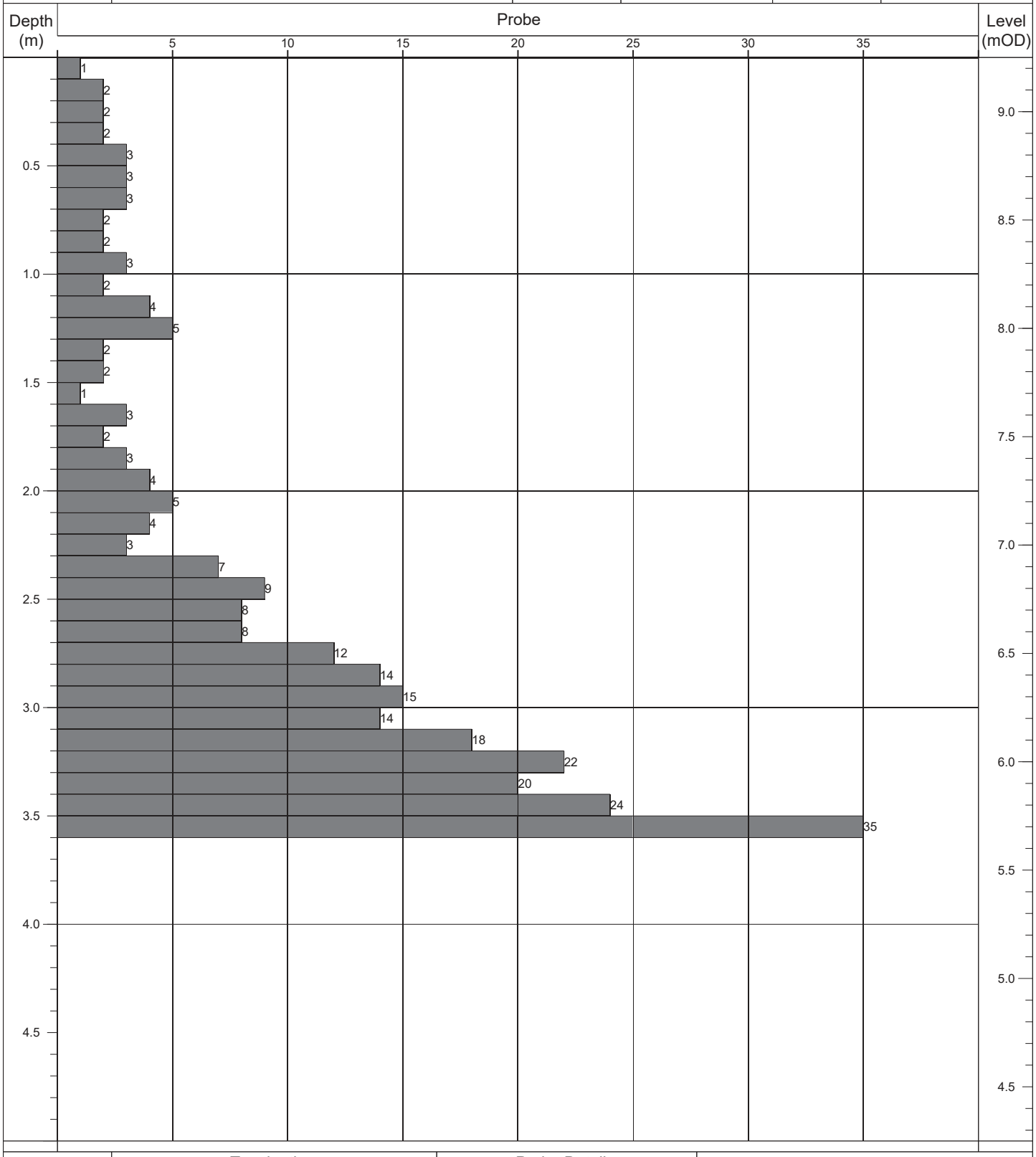
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.50m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP123**
Contract:	Hollybank	Easting:	717805.575	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748147.552	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	12.09	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



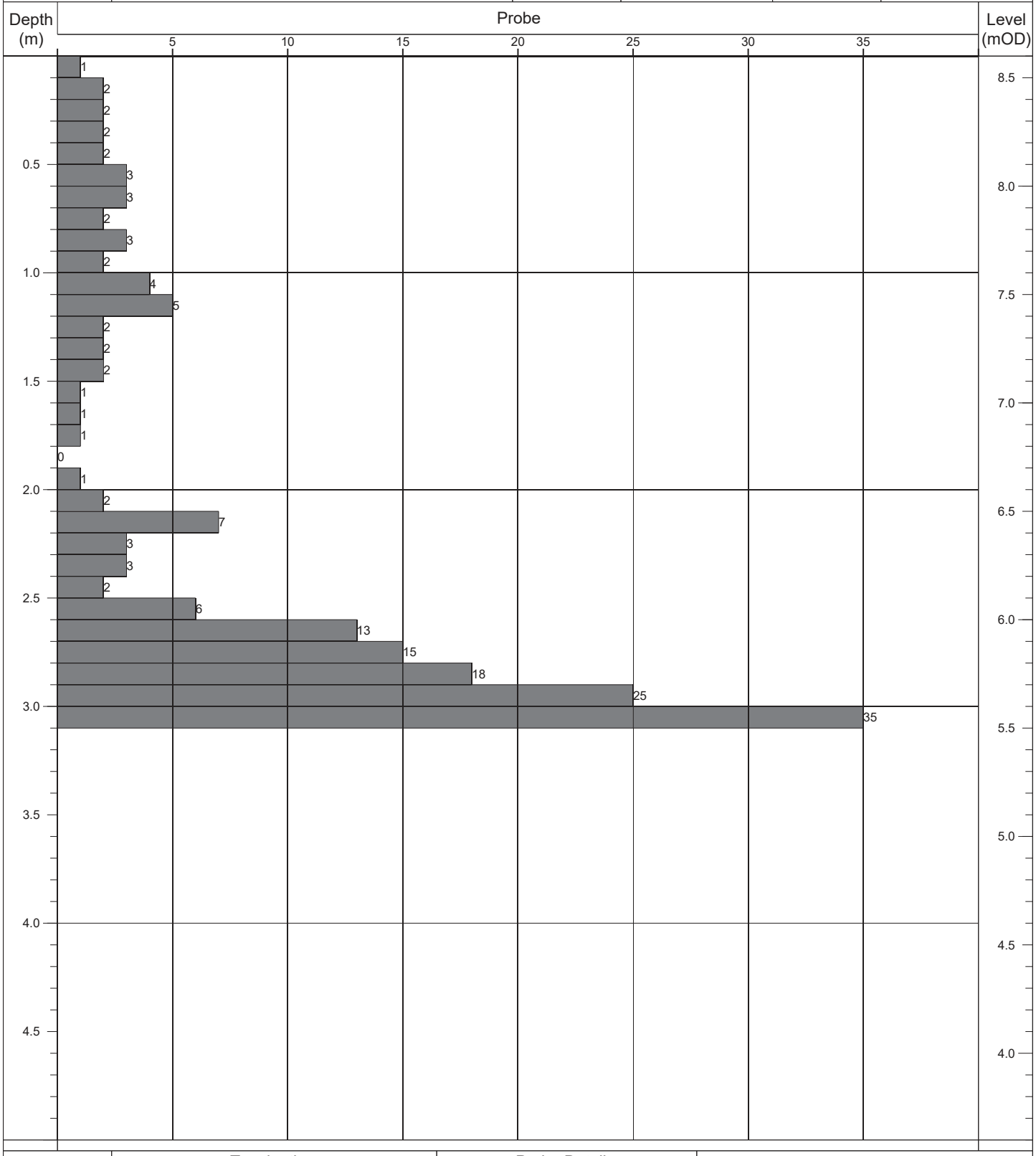
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP124**
Contract:	Hollybank	Easting:	717801.192	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748177.289	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.25	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



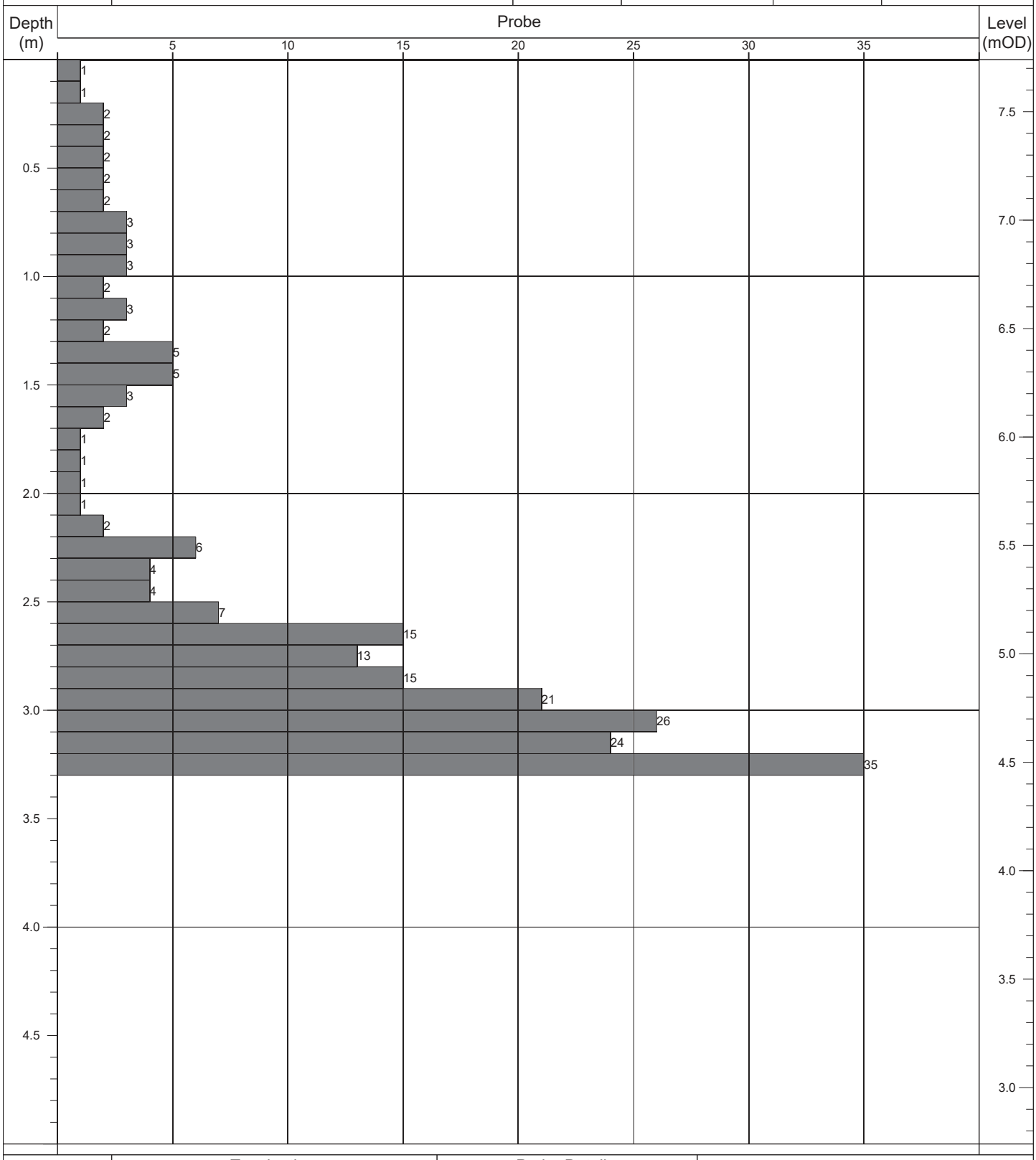
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP125**
Contract:	Hollybank	Easting:	717806.790	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748186.929	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.60	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



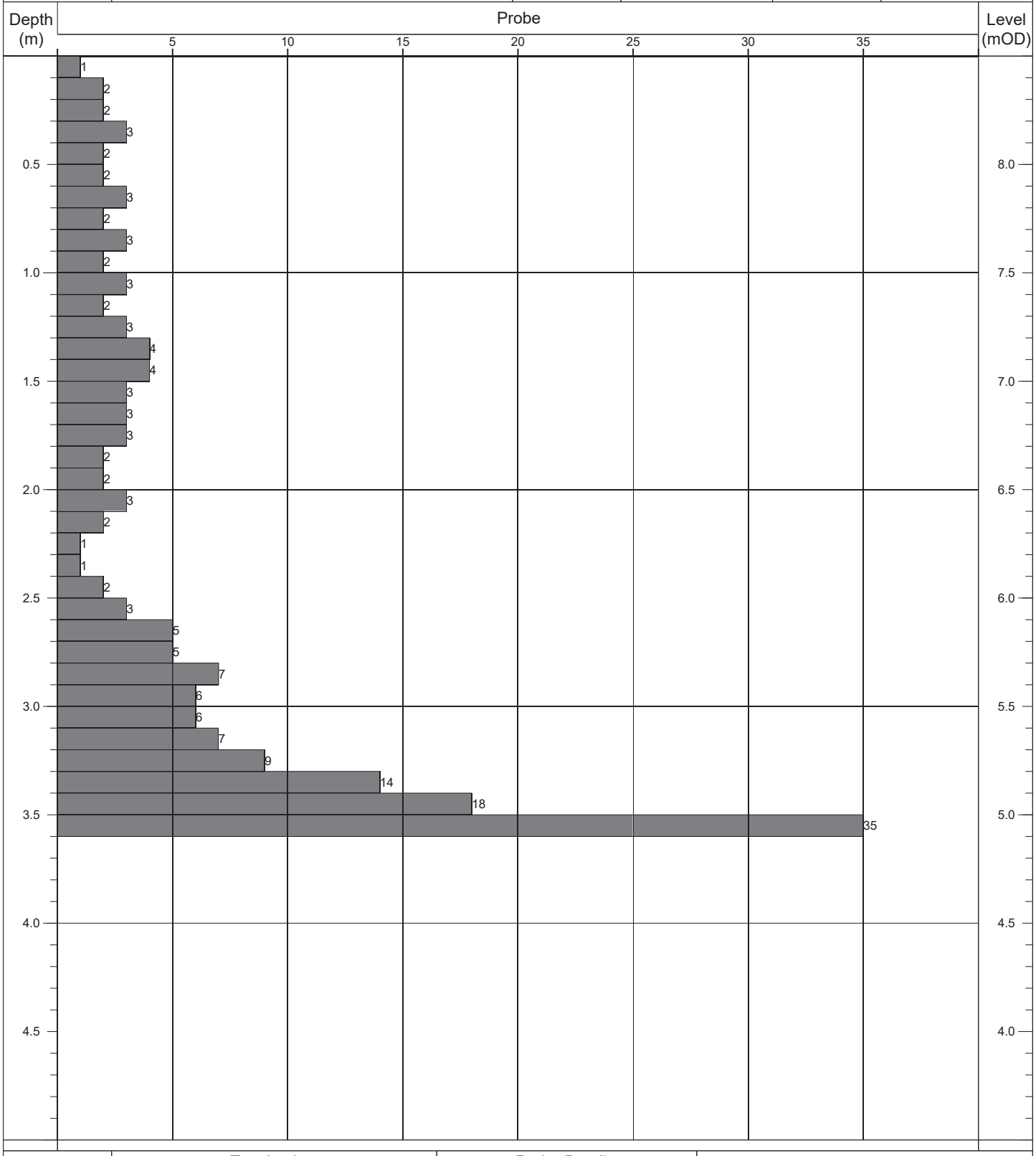
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP126**
Contract:	Hollybank	Easting:	717806.606	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748204.912	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.74	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



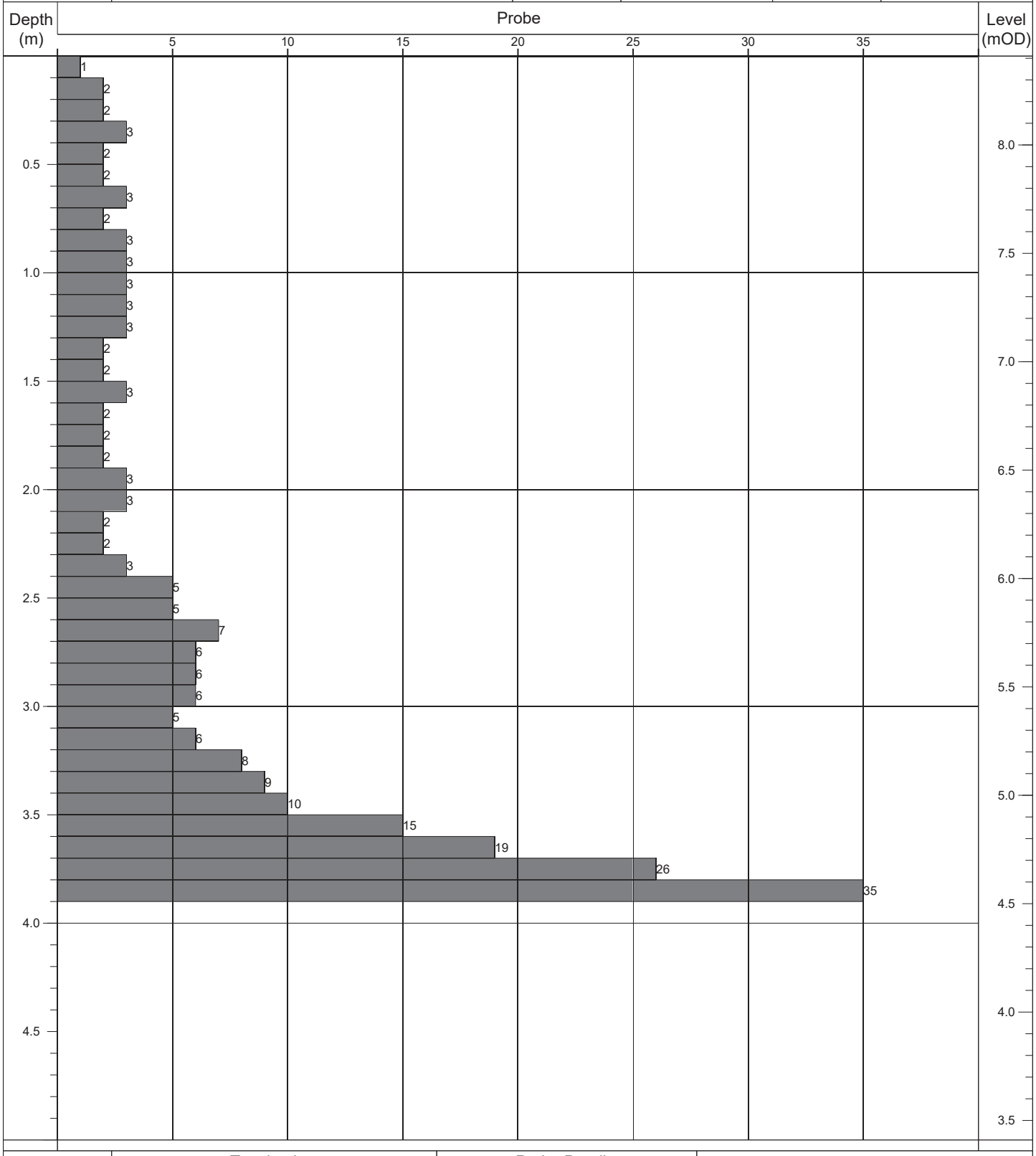
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP127**
Contract:	Hollybank	Easting:	717825.768	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748188.795	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.50	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



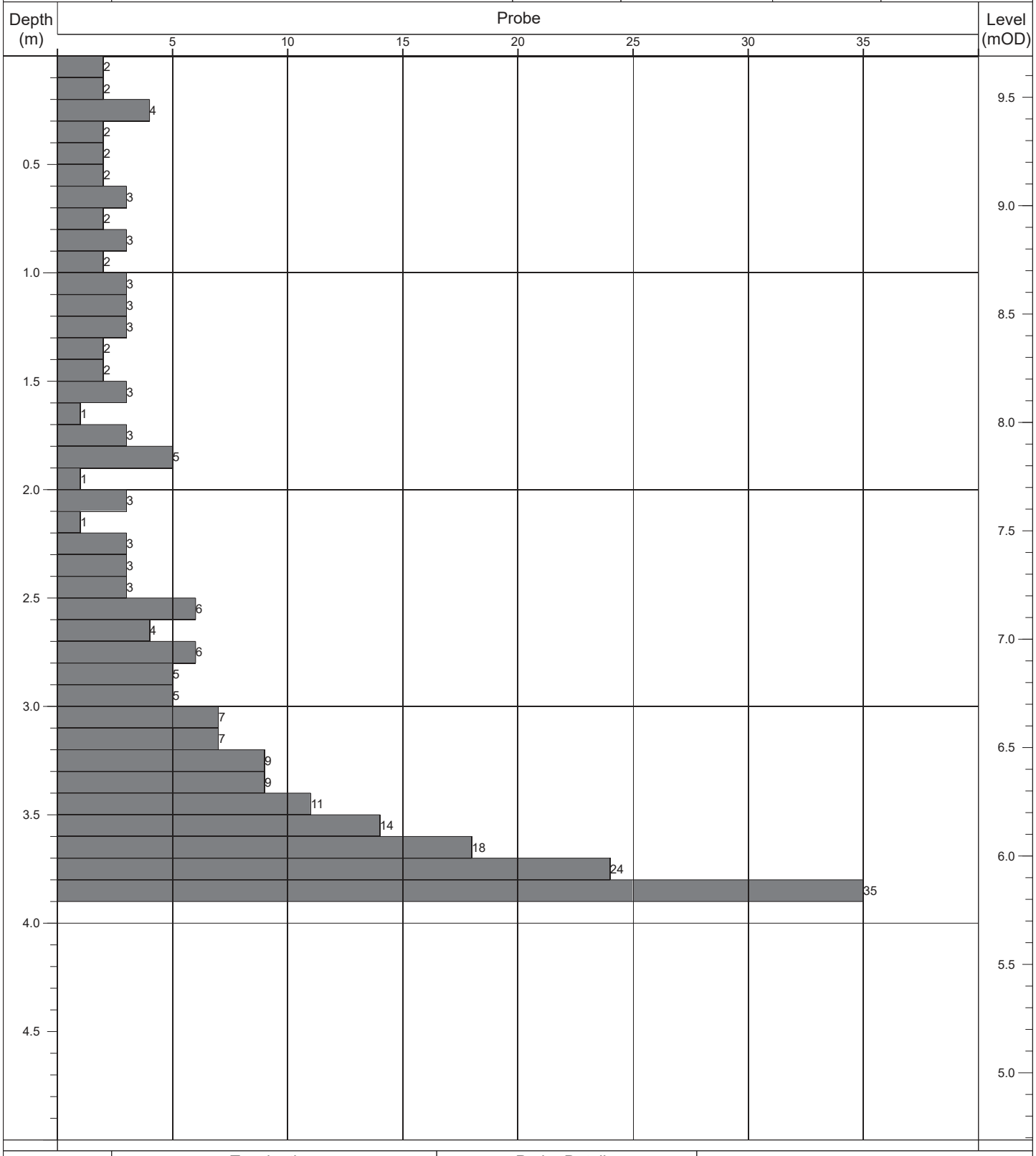
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP128**
Contract:	Hollybank	Easting:	717847.814	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748189.811	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.41	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



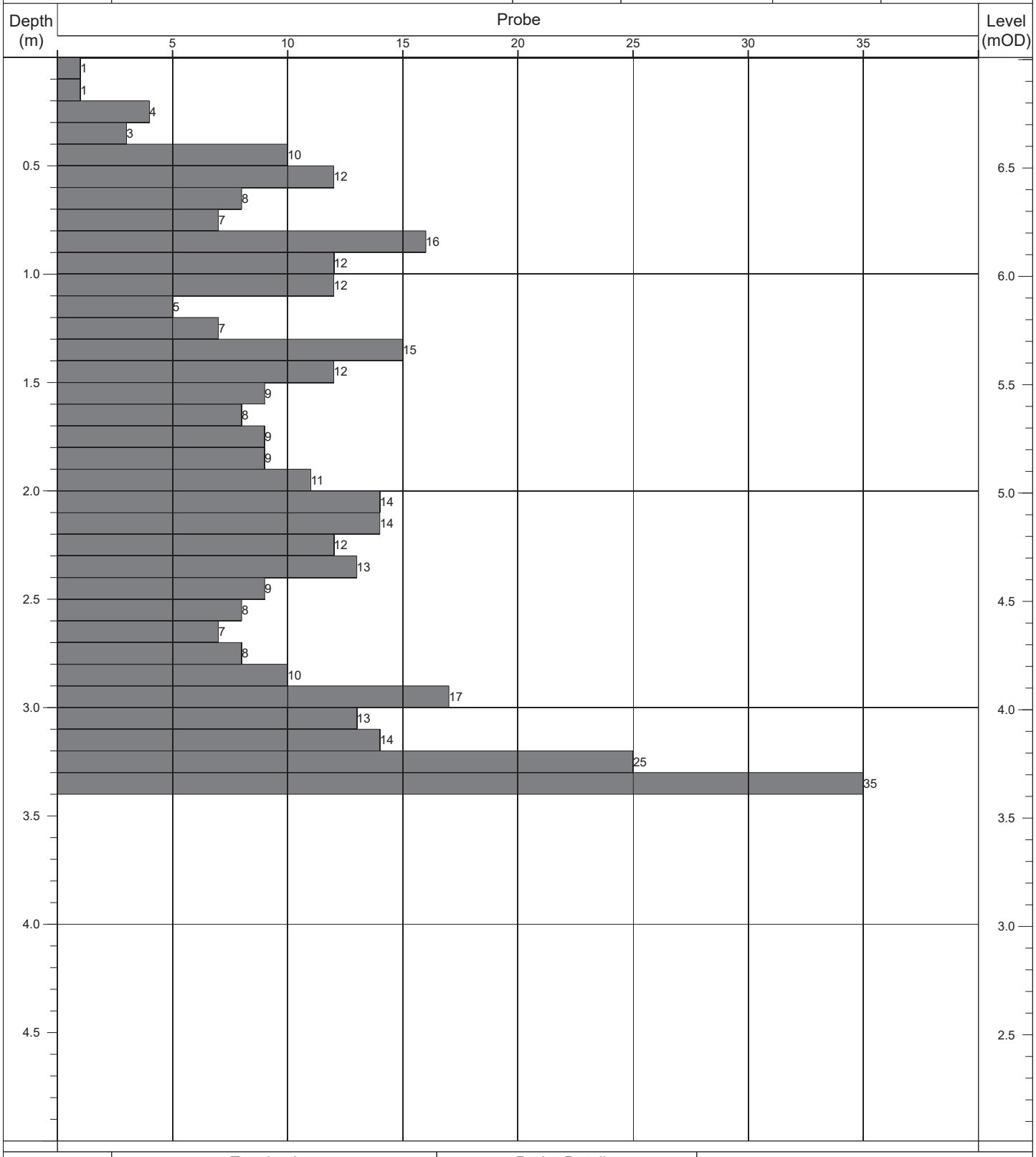
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP129**
Contract:	Hollybank	Easting:	717864.686	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748173.312	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	9.69	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



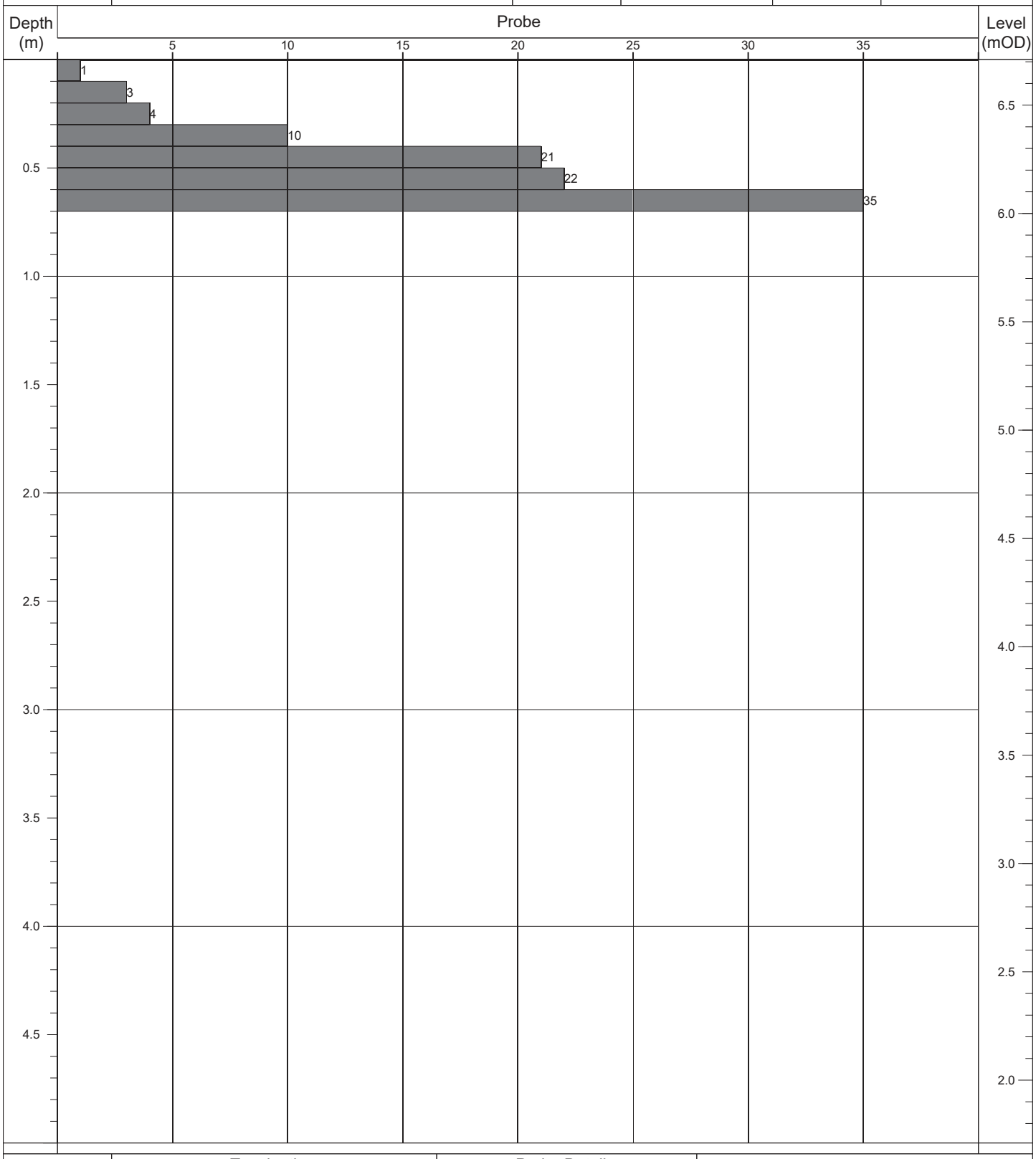
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP130**
Contract:	Hollybank	Easting:	717877.040	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748221.243	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.01	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



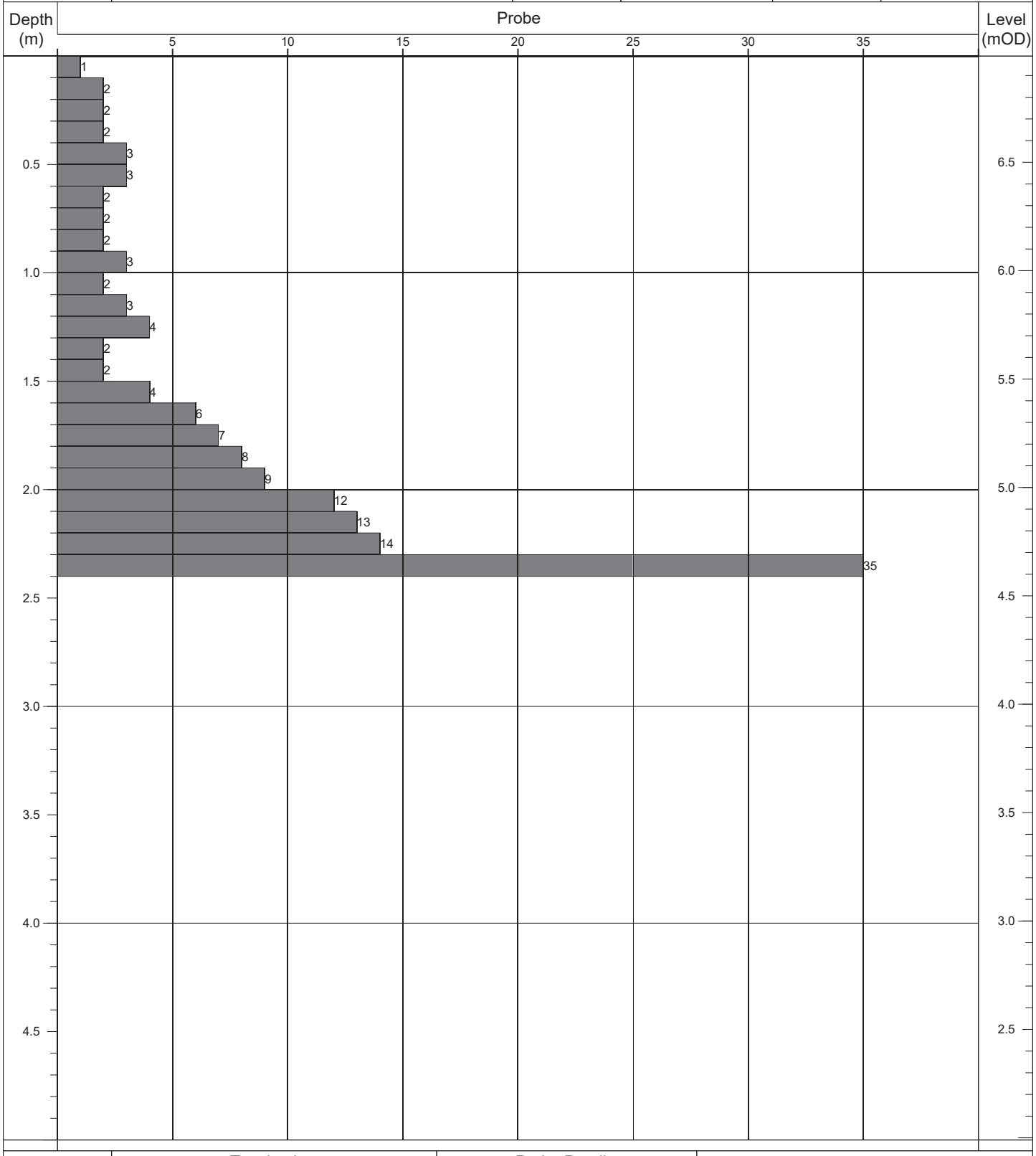
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
3.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP131**
Contract:	Hollybank	Easting:	717867.937	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748230.535	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.71	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



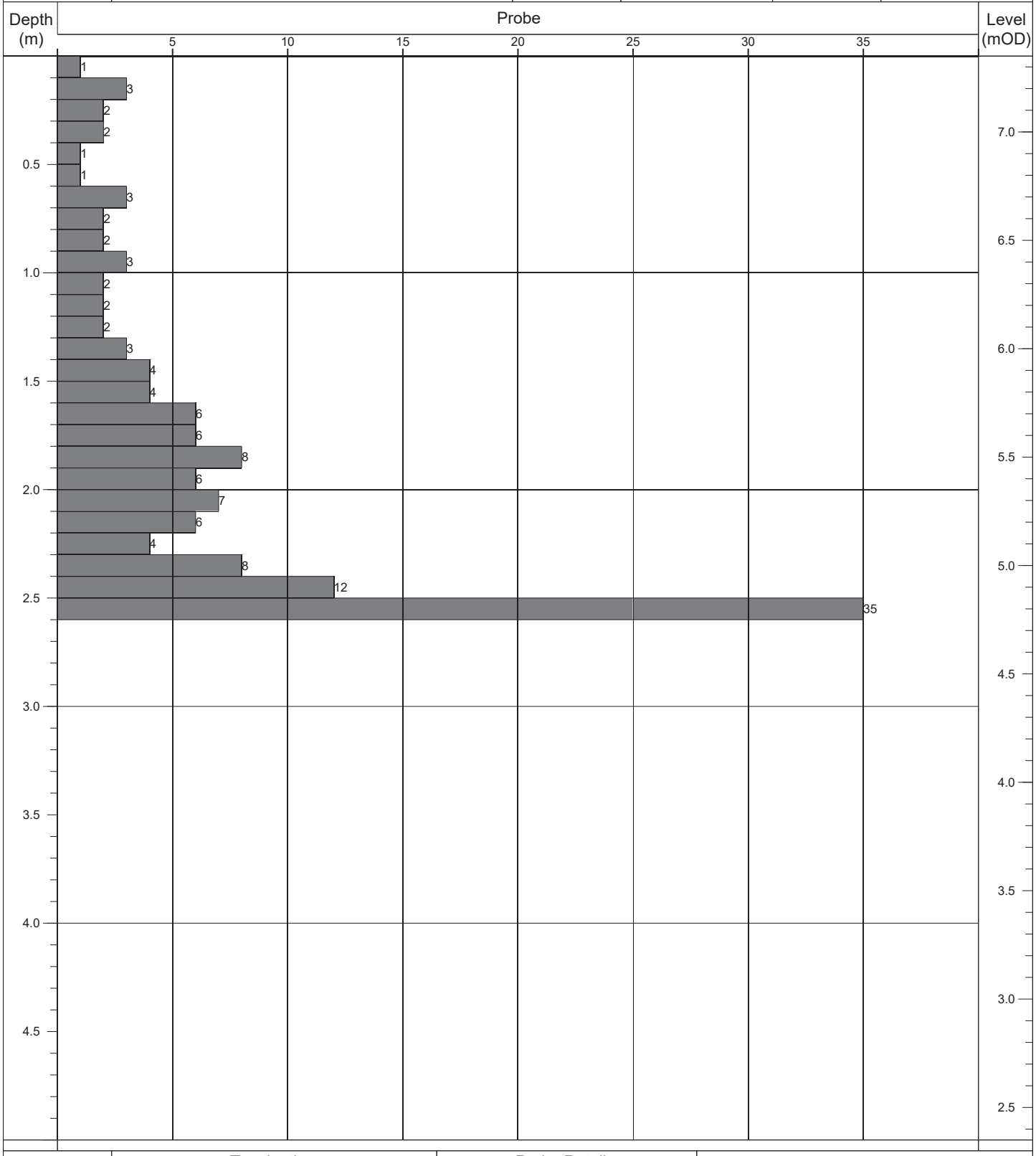
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
0.70m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP132**
Contract:	Hollybank	Easting:	717842.375	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748231.080	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.99	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



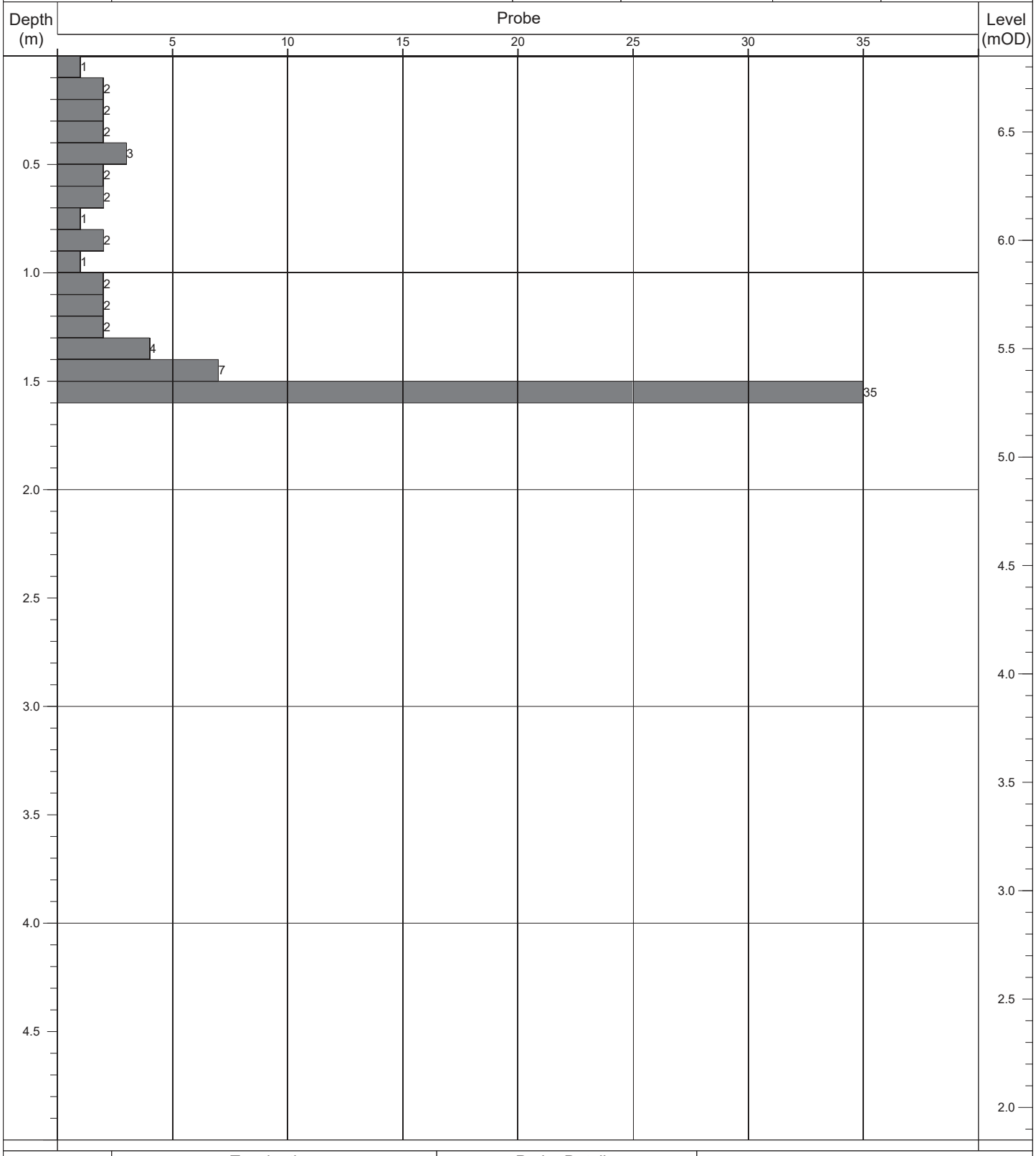
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.40m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP133**
Contract:	Hollybank	Easting:	717815.981	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748231.240	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.35	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



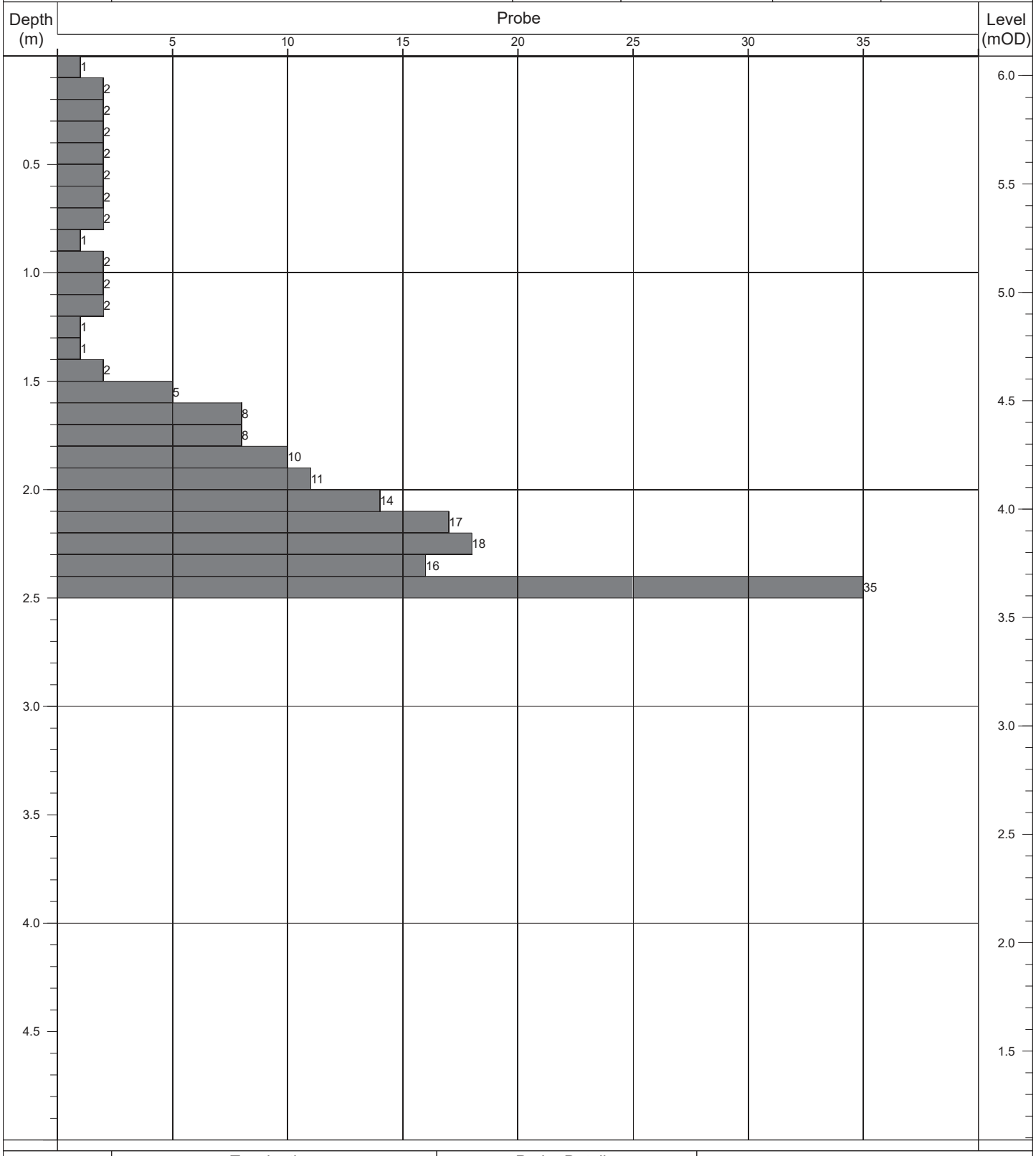
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP134**
Contract:	Hollybank	Easting:	717824.057	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748243.413	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.85	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



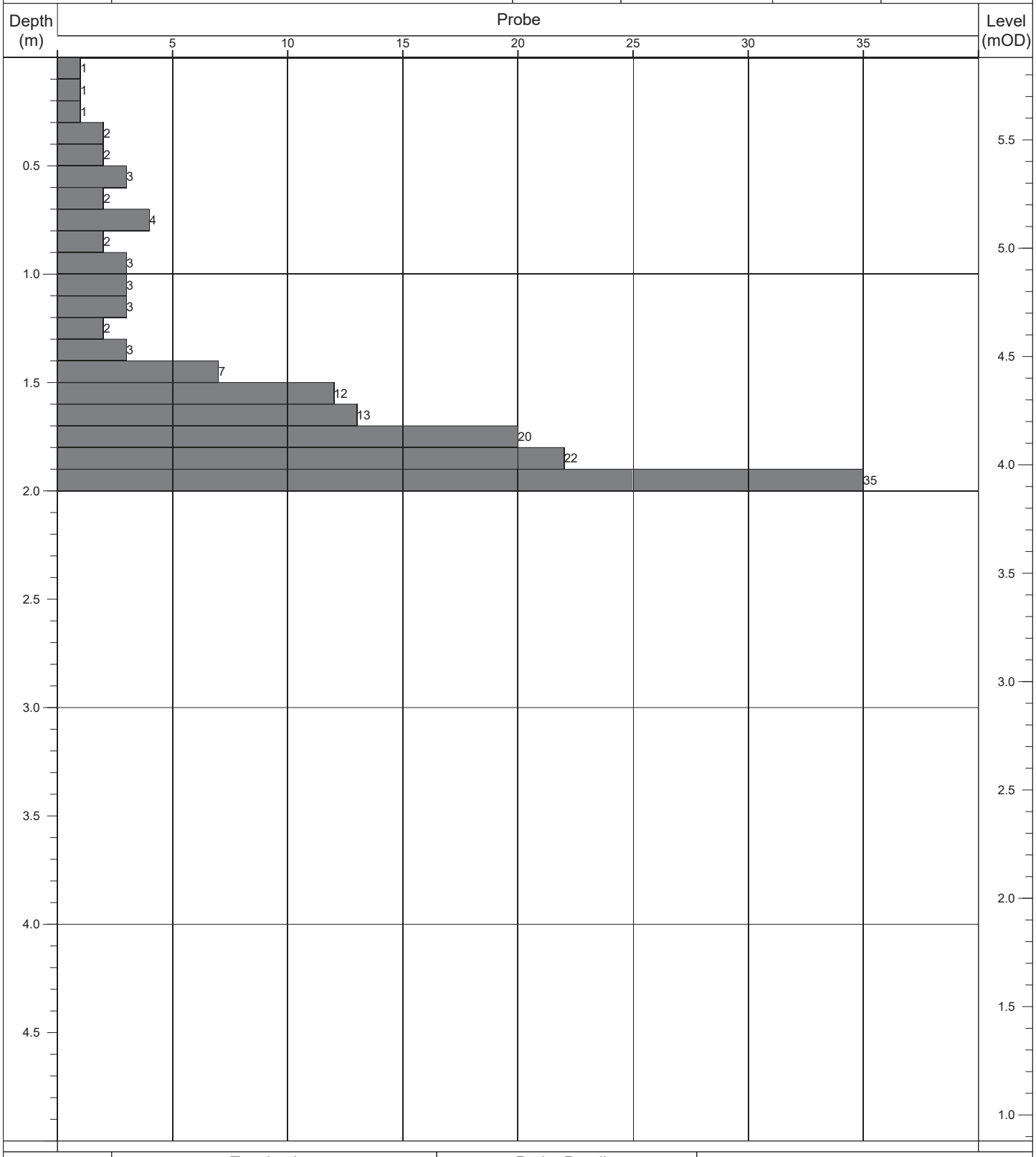
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
1.60m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP135**
Contract:	Hollybank	Easting:	717822.194	Date Started:	13/10/2020
Location:	Swords, Co. Dublin	Northing:	748259.109	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.09	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



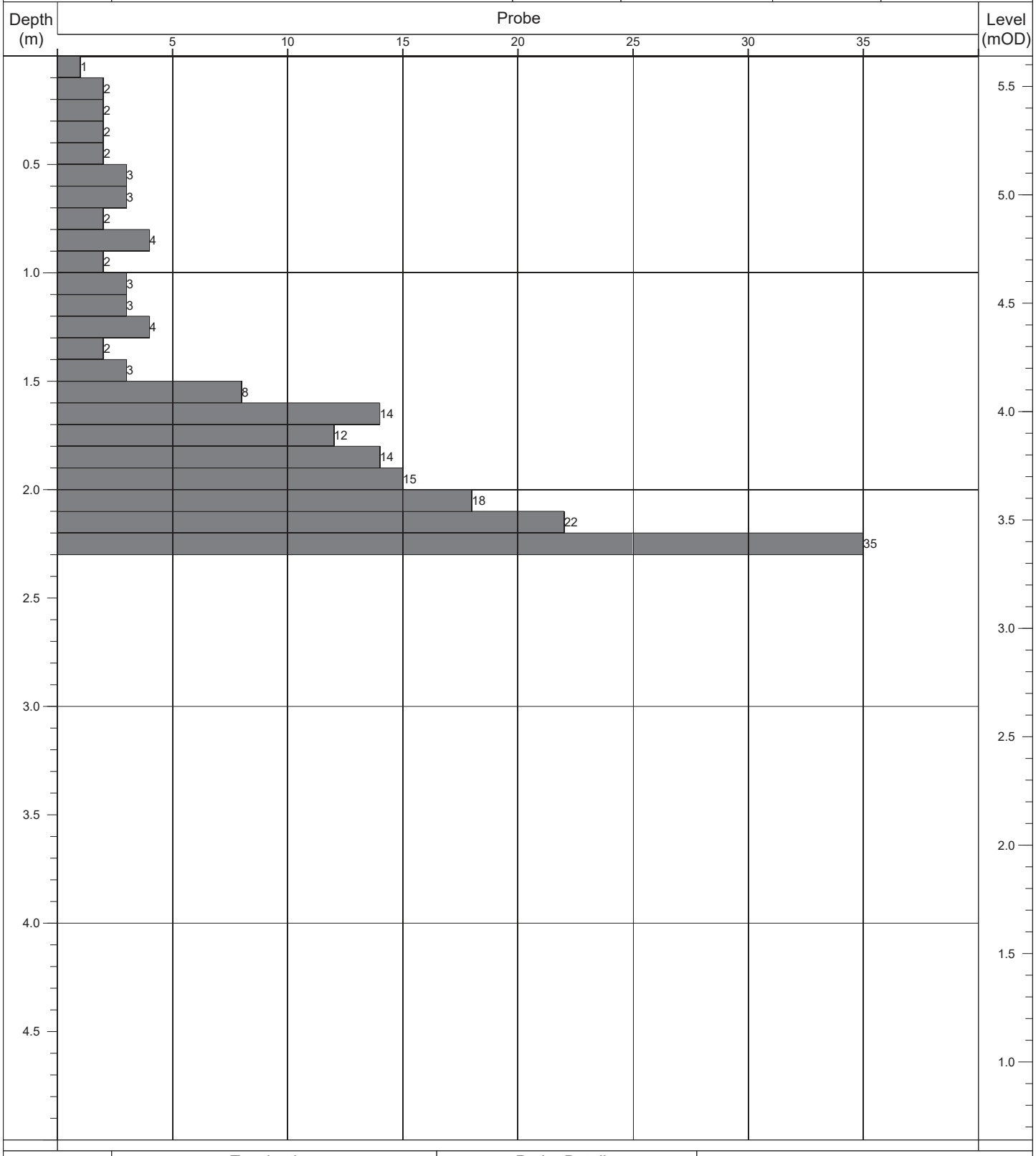
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.50m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP136**
Contract:	Hollybank	Easting:	717832.492	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748274.703	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	5.88	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



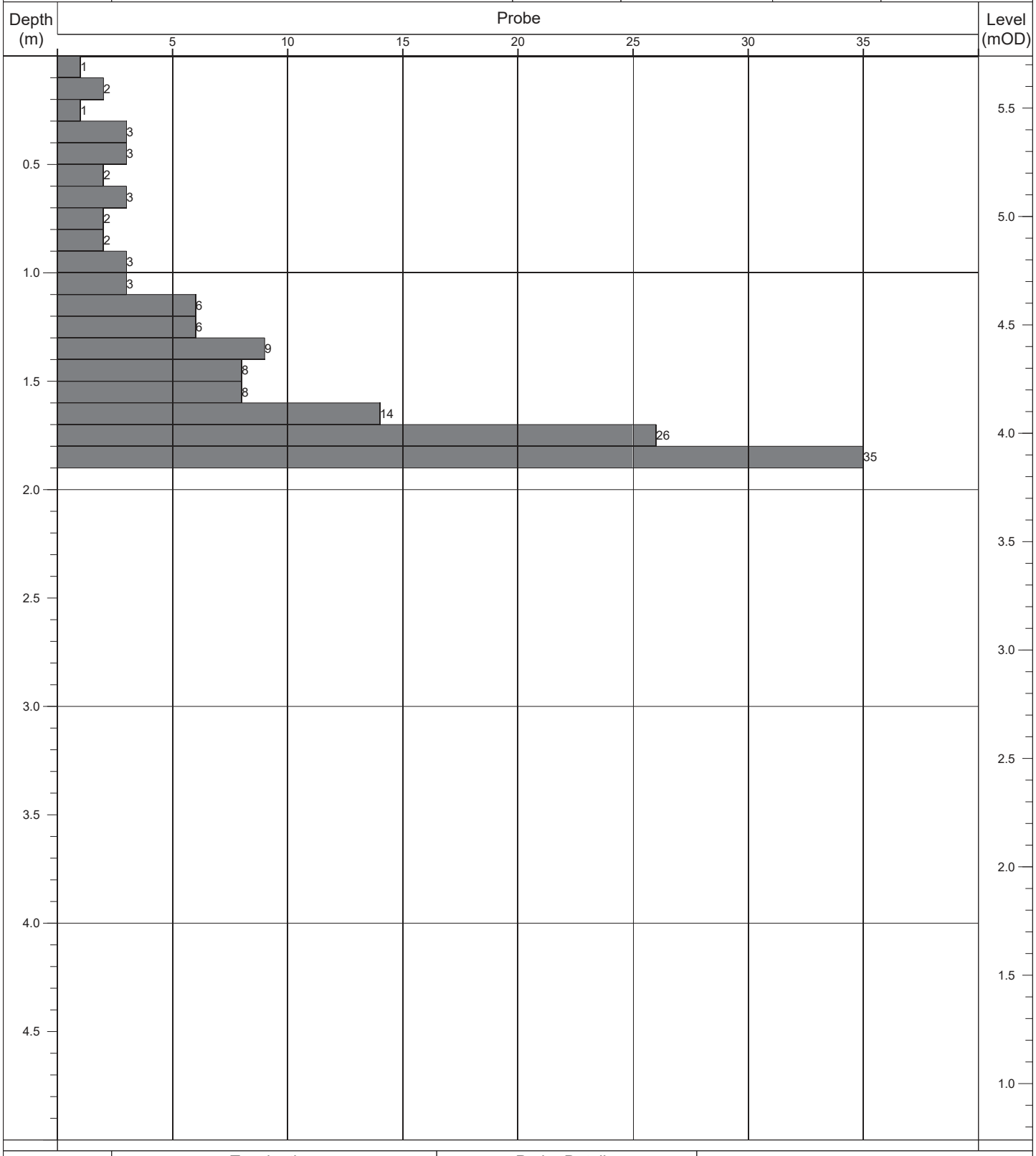
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.00m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP137**
Contract:	Hollybank	Easting:	717853.864	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748270.404	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	5.64	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



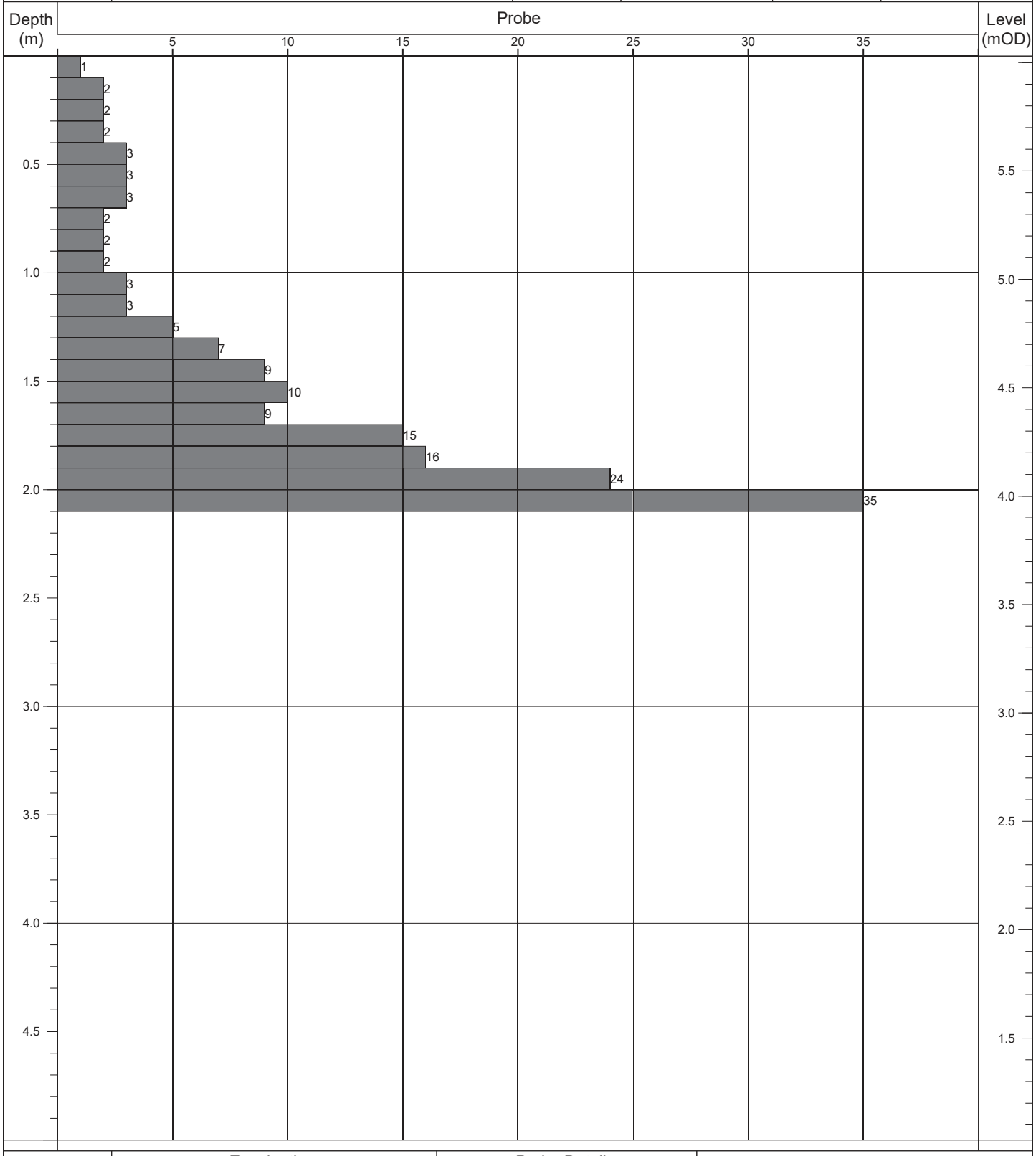
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP138**
Contract:	Hollybank	Easting:	717872.197	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748271.281	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	5.74	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



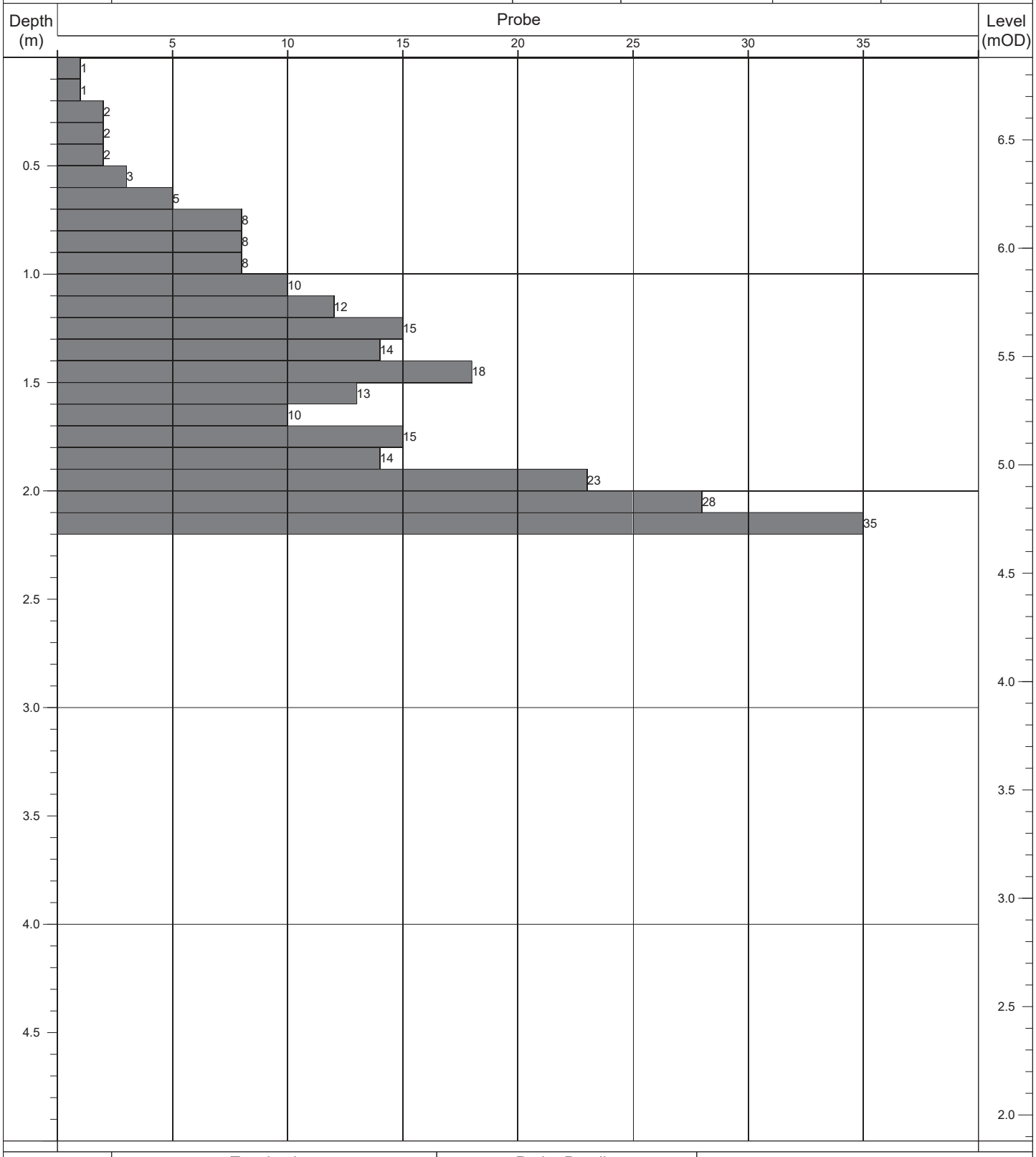
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
1.90m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP139**
Contract:	Hollybank	Easting:	717885.297	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748263.519	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.03	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



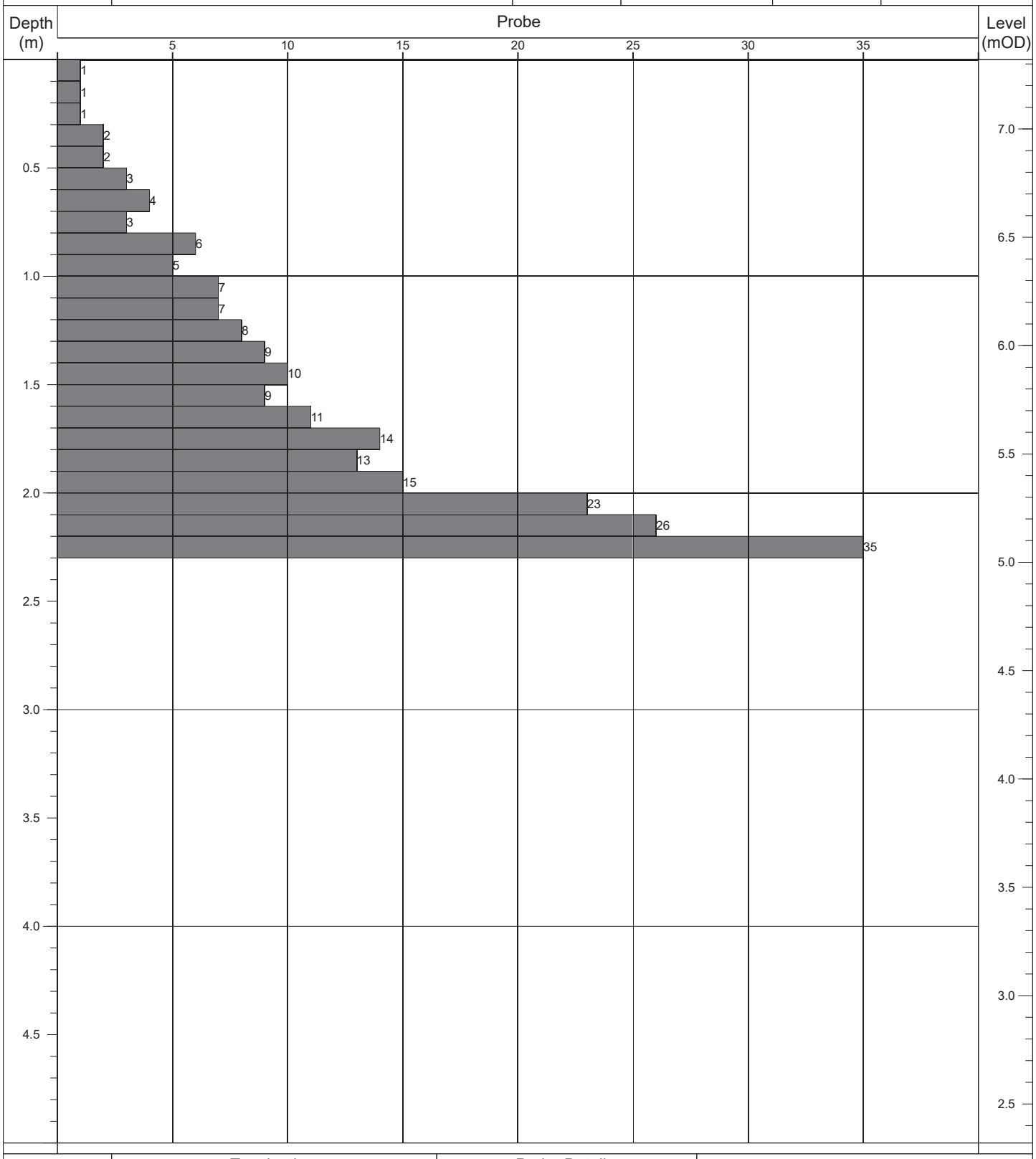
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.10m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP140**
Contract:	Hollybank	Easting:	717776.615	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748282.317	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	6.88	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



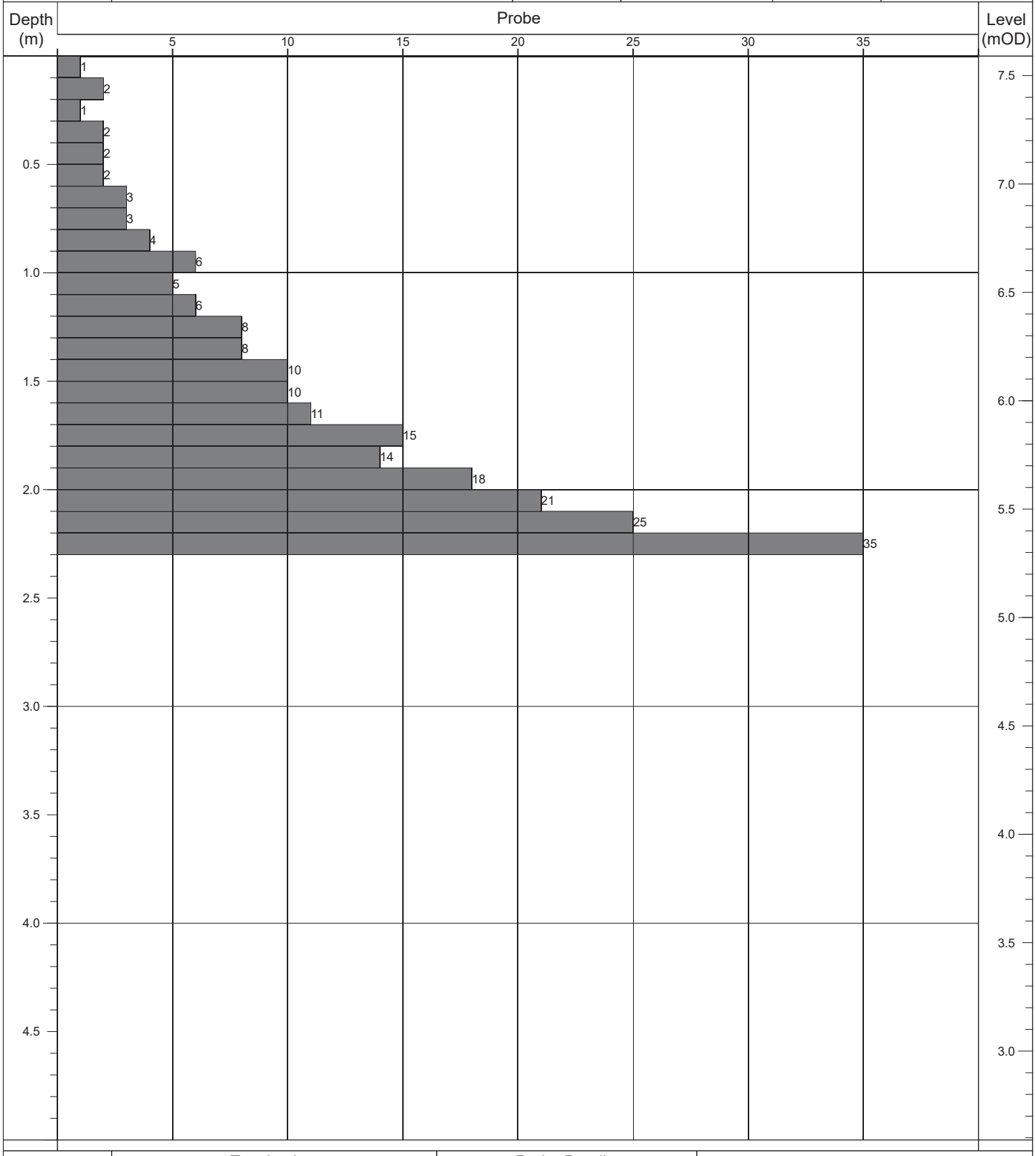
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.20m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP141**
Contract:	Hollybank	Easting:	717768.265	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748272.269	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.32	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



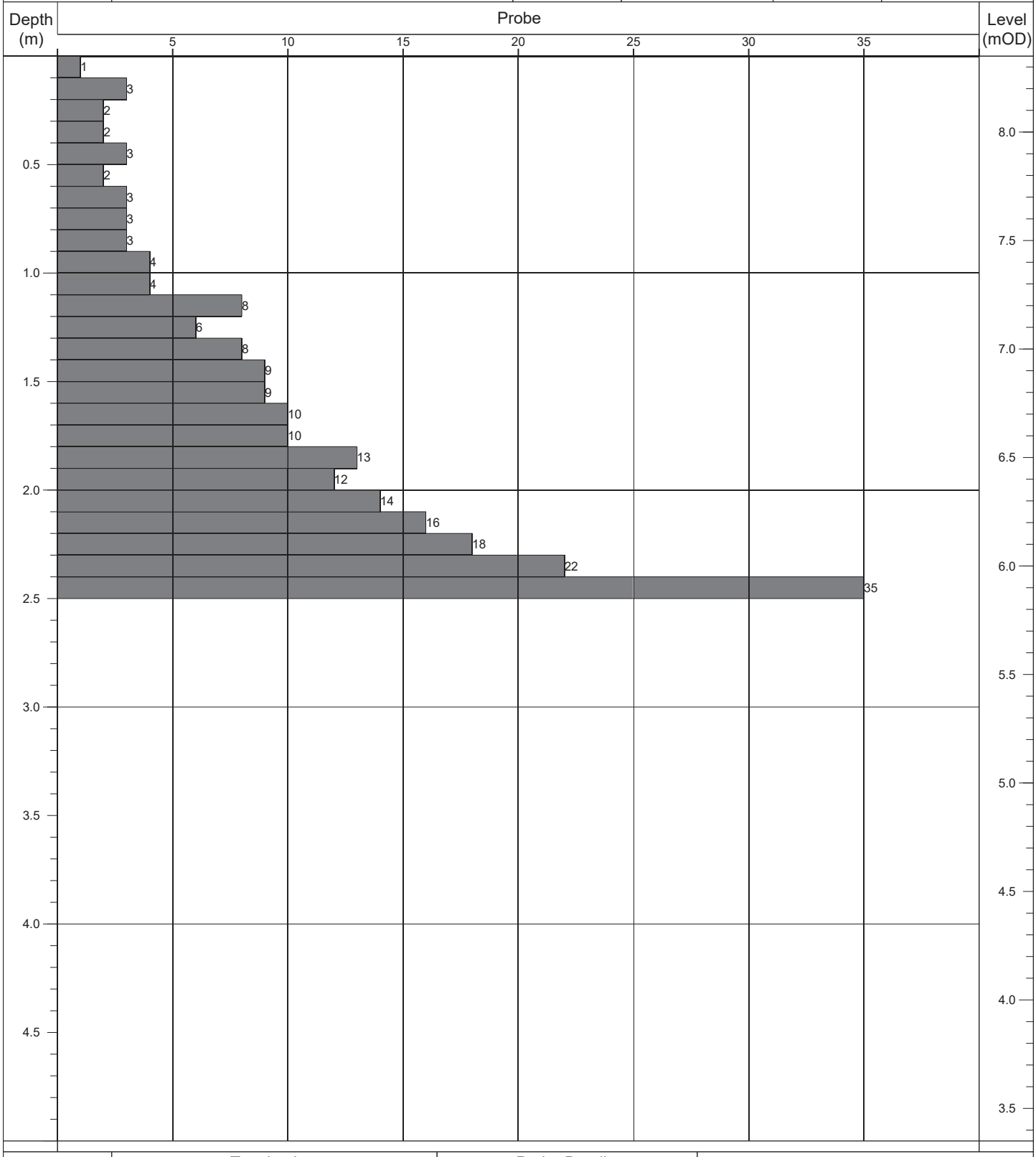
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	**Dynamic Probe Log**				Probe No: **DP142**
Contract:	Hollybank	Easting:	717771.315	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748258.960	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	7.59	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.30m	Obstruction - boulders.	DPH	50kg	500mm	

Contract No: 5769	Dynamic Probe Log				Probe No: DP143
Contract:	Hollybank	Easting:	717760.797	Date Started:	14/10/2020
Location:	Swords, Co. Dublin	Northing:	748244.735	Logged By:	G. Macken
Client:	Cairn Homes PLC	Elevation:	8.35	Scale:	1:25
Engineer:	Waterman Moylan	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	-
2.50m	Obstruction - boulders.	DPH	50kg	500mm	

Appendix 4

Geotechnical Laboratory Test Results

Classification Tests in accordance with BS1377: Part 4

Client	Cairn Homes PLC
Site	Hollybank, Swords
S.I. File No	5769 / 20
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	20th October 2020

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Min. Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
BH101	1.00	TT02	20/1023	B	15.2	34	22	12			76.3		CL
BH103	1.00	TT10	20/1024	B	16.7	33	21	12			75.7		CL
BH105	1.00	TT34	20/1025	B	15.2	34	21	13			71.9		CL
BH106	1.00	TT26	20/1026	B	15.6	36	21	15			85.2		CI

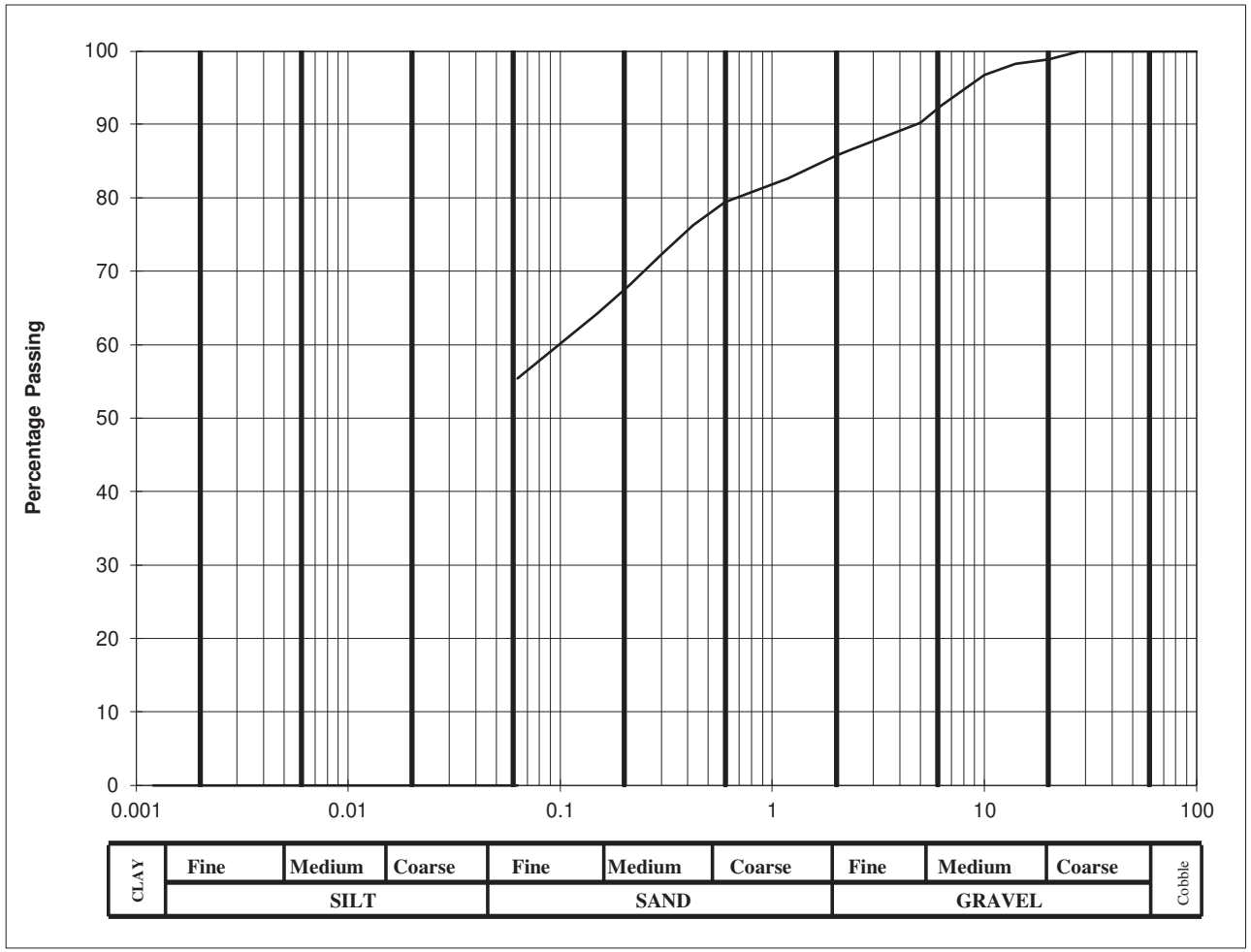
_____Paddy McGonagle
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	98.8		
14	98.2		
10	96.7		
6.3	92.6		
5.0	90.2		
2.36	86.6		
2.00	85.7		
1.18	82.6		
0.600	79.4		
0.425	76.3		
0.300	72.3		
0.212	68.1		
0.150	64.3		
0.063	55		

Cobbles, %	0
Gravel, %	14
Sand, %	31
Clay / Silt, %	55



Client :	Cairn Homes PLC	Lab. No :	20/1023	Hole ID :	BH 101
Project :	Hollybank, Swords	Sample No :	TT02	Depth, m :	1.00

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

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Site Investigations Ltd

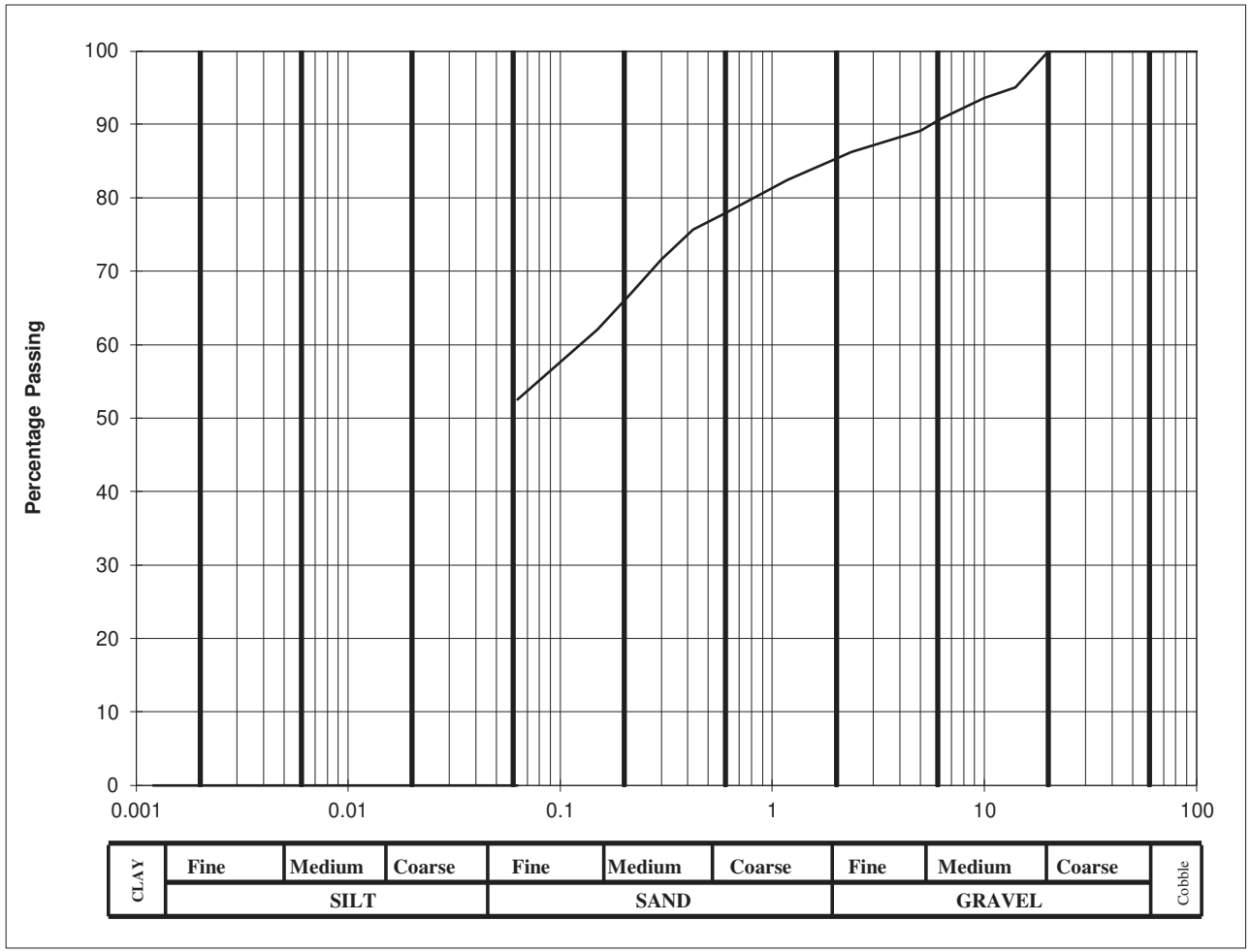
Printed 30/10/2020

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	95		
10	93.6		
6.3	90.8		
5.0	89.1		
2.36	86.2		
2.00	85.3		
1.18	82.4		
0.600	77.9		
0.425	75.7		
0.300	71.6		
0.212	66.7		
0.150	62.1		
0.063	53		

Cobbles, %	0
Gravel, %	15
Sand, %	32
Clay / Silt, %	53



Client :	Cairn Homes PLC	Lab. No :	20/1024	Hole ID :	BH 103
Project :	Hollybank, Swords	Sample No :	TT10	Depth, m :	1.00

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

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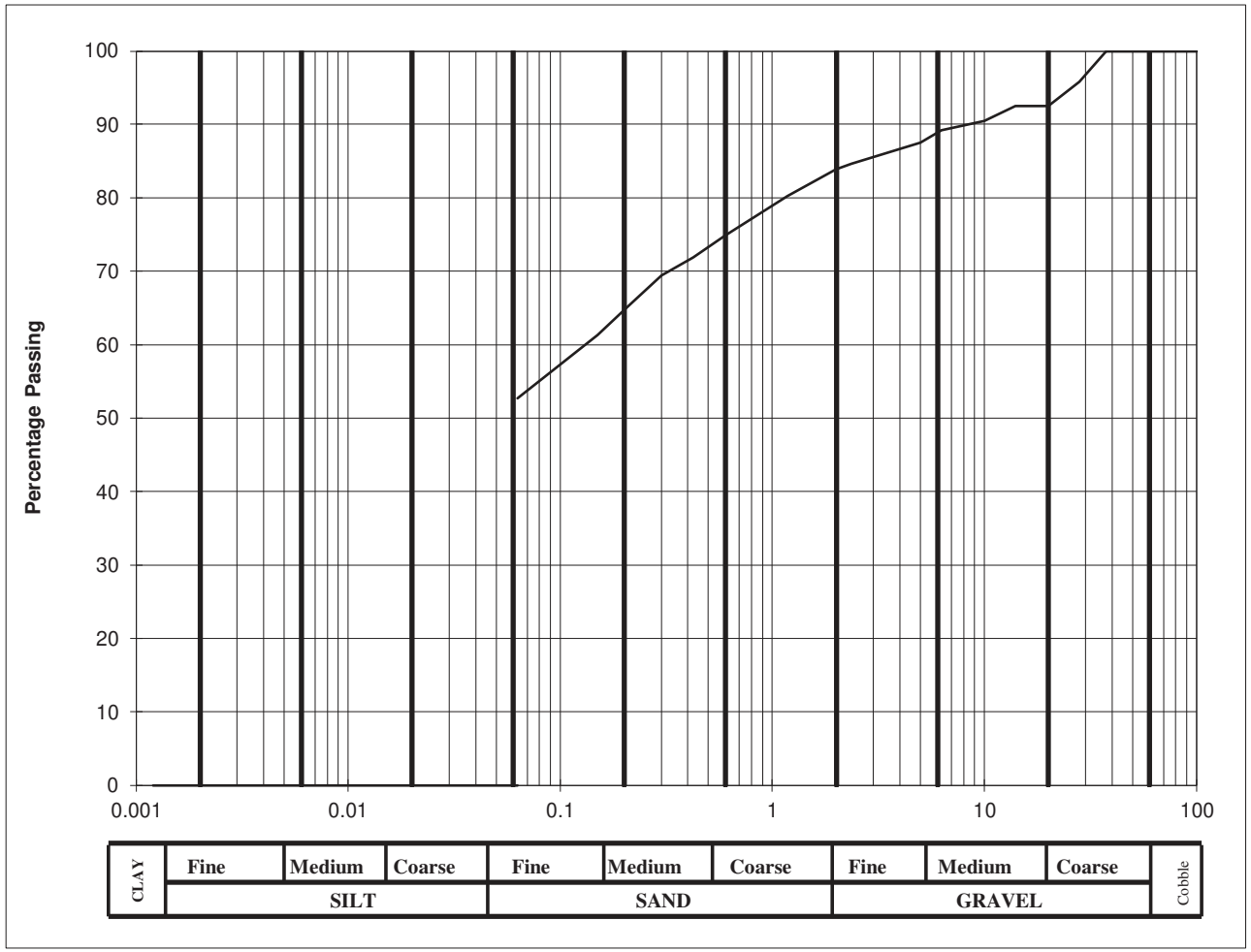
Printed 30/10/2020

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	95.8		
20	92.5		
14	92.5		
10	90.5		
6.3	89.2		
5.0	87.5		
2.36	84.6		
2.00	83.9		
1.18	80.2		
0.600	74.8		
0.425	71.9		
0.300	69.4		
0.212	65.4		
0.150	61.3		
0.063	53		

Cobbles, %	0
Gravel, %	16
Sand, %	31
Clay / Silt, %	53



Client :	Cairn Homes PLC	Lab. No :	20/1025	Hole ID :	BH 105
Project :	Hollybank, Swords	Sample No :	TT34	Depth, m :	1.00

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

_____Paddy McGonagle

Site Investigations Ltd

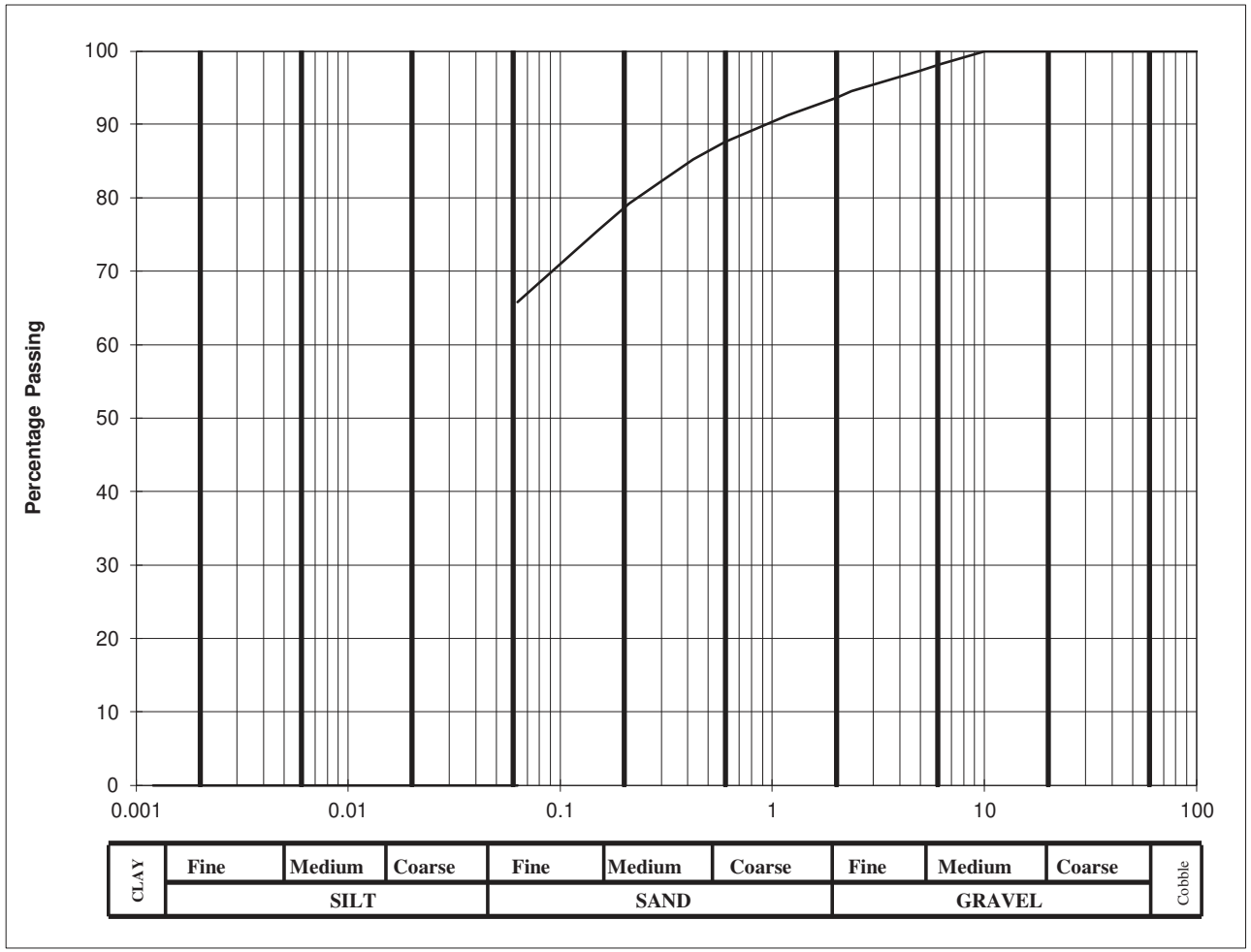
Printed 30/10/2020

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	98.2		
5.0	97.3		
2.36	94.5		
2.00	93.6		
1.18	91.2		
0.600	87.6		
0.425	85.2		
0.300	82.3		
0.212	79.2		
0.150	75.5		
0.063	66		

Cobbles, %	0
Gravel, %	6
Sand, %	28
Clay / Silt, %	66



Client :	Cairn Homes PLC	Lab. No :	20/1026	Hole ID :	BH 106
Project :	Hollybank, Swords	Sample No :	TT26	Depth, m :	1.00

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

_____Paddy McGonagle
Site Investigations Ltd

Printed 30/10/2020

Chemical Testing
In accordance with BS 1377: Part 3

Client	Cairn Homes PLC
Site	Hollybank, Swords
S.I. File No	5769 / 20
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	20th October 2020

Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) g/L	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) %	Loss on Ignition (Organic Content) %	Chloride ion Content (water:soil ratio 2:1) %	% passing 2mm	Remarks
BH101	1.00	TT02	20/1023	8.32	0.129	0.110		0.24	85.7	
BH103	1.00	TT10	20/1024	8.30	0.126	0.107		0.27	85.3	
BH105	1.00	TT34	20/1025	8.40	0.127	0.107		0.29	83.9	
BH106	1.00	TT26	20/1026	8.30	0.131	0.123		0.22	93.6	

Printed 30/10/2020

_____Paddy McGonagle
Site Investigations Ltd.

Appendix 5

Environmental Laboratory Test Results

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Site Investigations Ltd
The Grange
Carhugar
12th Lock Road
Lucan
Co. Dublin

Attention: Stephen Letch

CERTIFICATE OF ANALYSIS

Date of report Generation:	29 October 2020
Customer:	Site Investigations Ltd
Sample Delivery Group (SDG):	201017-89
Your Reference:	5769
Location:	Hollybank, Swords
Report No:	573257

We received 6 samples on Saturday October 17, 2020 and 6 of these samples were scheduled for analysis which was completed on Thursday October 29, 2020. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
23056795	BH/01-0.5M		0.50 - 0.50	15/10/2020
23056797	BH/01-1.0M		1.00 - 1.00	15/10/2020
23056798	BH/03-1.0M		1.00 - 1.00	15/10/2020
23056801	BH/05-1.0M		1.00 - 1.00	15/10/2020
23056796	BH/06-0.5M		0.50 - 0.50	15/10/2020
23056803	BH/06-1.0M		1.00 - 1.00	15/10/2020

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)				23056795	23056797	23056798	23056801		23056796	23056803
Customer Sample Reference				BH/01-0.5M	BH/01-1.0M	BH/03-1.0M	BH/05-1.0M		BH/06-0.5M	BH/06-1.0M
AGS Reference										
Depth (m)				0.50 - 0.50	1.00 - 1.00	1.00 - 1.00	1.00 - 1.00		0.50 - 0.50	1.00 - 1.00
Container			1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	250g Amber Jar (ALE210)
Sample Type			S	S	S	S	S	S	S	S	S	S
Anions by Kone (w)	All	NDPs: 0 Tests: 2	X						X			
CEN Readings	All	NDPs: 0 Tests: 2	X						X			
Chromium III	All	NDPs: 0 Tests: 2		X						X		
Coronene	All	NDPs: 0 Tests: 2		X						X		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2	X						X			
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 2	X						X			
EPH by GCxGC-FID	All	NDPs: 0 Tests: 2		X						X		
EPH CWG GC (S)	All	NDPs: 0 Tests: 2		X						X		
Fluoride	All	NDPs: 0 Tests: 2	X						X			
GRO by GC-FID (S)	All	NDPs: 0 Tests: 2			X						X	
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 2		X						X		
Loss on Ignition in soils	All	NDPs: 0 Tests: 6		X		X	X	X		X		X
Mercury Dissolved	All	NDPs: 0 Tests: 2	X						X			
Metals in solid samples by OES	All	NDPs: 0 Tests: 2		X						X		
PAH by GCMS	All	NDPs: 0 Tests: 2		X						X		

Validated

CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)					23056795	23056797	23056798	23056801		23056796		23056803
Customer Sample Reference					BH/01-0.5M	BH/01-1.0M	BH/03-1.0M	BH/05-1.0M		BH/06-0.5M		BH/06-1.0M
AGS Reference												
Depth (m)					0.50 - 0.50	1.00 - 1.00	1.00 - 1.00	1.00 - 1.00		0.50 - 0.50		1.00 - 1.00
Container			1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	250g Amber Jar (ALE210)
Sample Type			S	S	S	S	S	S	S	S	S	S
PCBs by GCMS	All	NDPs: 0 Tests: 2		X						X		
Phenols by HPLC (W)	All	NDPs: 0 Tests: 2	X						X			
Sample description	All	NDPs: 0 Tests: 6		X		X	X	X		X		X
Total Dissolved Solids on Leachates	All	NDPs: 0 Tests: 2	X						X			
Total Organic Carbon	All	NDPs: 0 Tests: 2		X						X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 2		X						X		
VOC MS (S)	All	NDPs: 0 Tests: 2			X						X	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
23056795	BH/01-0.5M	0.50 - 0.50	Dark Brown	Silt Loam	Vegetation	Stones
23056797	BH/01-1.0M	1.00 - 1.00	Light Brown	Silty Clay	Stones	Vegetation
23056798	BH/03-1.0M	1.00 - 1.00	Light Brown	Silty Clay	Stones	Vegetation
23056801	BH/05-1.0M	1.00 - 1.00	Light Brown	Silty Clay	Stones	Vegetation
23056796	BH/06-0.5M	0.50 - 0.50	Dark Brown	Silt Loam	Stones	Vegetation
23056803	BH/06-1.0M	1.00 - 1.00	Light Brown	Clay	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Customer Sample Ref.			BH/01-0.5M	BH/01-1.0M	BH/03-1.0M	BH/05-1.0M	BH/06-0.5M	BH/06-1.0M
Depth (m)			0.50 - 0.50	1.00 - 1.00	1.00 - 1.00	1.00 - 1.00	0.50 - 0.50	1.00 - 1.00
Sample Type			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Date Sampled			15/10/2020	15/10/2020	15/10/2020	15/10/2020	15/10/2020	15/10/2020
Sample Time			-	-	-	-	-	-
Date Received			17/10/2020	17/10/2020	17/10/2020	17/10/2020	17/10/2020	17/10/2020
SDG Ref			201017-89	201017-89	201017-89	201017-89	201017-89	201017-89
Lab Sample No.(s)			23056795	23056797	23056798	23056801	23056796	23056803
AGS Reference								
Component	**LOD/Units**	**Method**						
Moisture Content Ratio (% of as received sample)	%	PM024	24	20	18	17	15	15
Loss on ignition	<0.7 %	TM018	45.6 M	4.28 M	4.22 M	3.95 M	4.38 M	3.5 M
Organic Carbon, Total	<0.2 %	TM132	2.16 M				0.844 M	
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #				<0.6 #	
PCB congener 28	<3 µg/kg	TM168	<3 M				<3 M	
PCB congener 52	<3 µg/kg	TM168	<3 M				<3 M	
PCB congener 101	<3 µg/kg	TM168	<3 M				<3 M	
PCB congener 118	<3 µg/kg	TM168	<3 M				<3 M	
PCB congener 138	<3 µg/kg	TM168	<3 M				<3 M	
PCB congener 153	<3 µg/kg	TM168	<3 M				<3 M	
PCB congener 180	<3 µg/kg	TM168	<3 M				<3 M	
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168	<21				<21	
Chromium, Trivalent	<0.9 mg/kg	TM181	21.5				19.9	
Antimony	<0.6 mg/kg	TM181	<0.6 #				<0.6 #	
Arsenic	<0.6 mg/kg	TM181	18.4 M				11.8 M	
Barium	<0.6 mg/kg	TM181	118 #				111 #	
Cadmium	<0.02 mg/kg	TM181	1.18 M				0.954 M	
Chromium	<0.9 mg/kg	TM181	21.5 M				19.9 M	
Copper	<1.4 mg/kg	TM181	34.9 M				22.2 M	
Lead	<0.7 mg/kg	TM181	74.2 M				27.8 M	
Mercury	<0.14 mg/kg	TM181	0.942 M				<0.14 M	
Molybdenum	<0.1 mg/kg	TM181	3.54 #				1.98 #	
Nickel	<0.2 mg/kg	TM181	41.2 M				36.4 M	
Selenium	<1 mg/kg	TM181	1.45 #				<1 #	
Zinc	<1.9 mg/kg	TM181	102 M				73.9 M	
Coronene	<200 µg/kg	TM410	<200				<200	
Mineral Oil >C10-C40	<5 mg/kg	TM415	11.1				5.57	

14:59:48 29/10/2020

Validated

CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Customer Sample Ref.			BH/01-0.5M	BH/06-0.5M				
Depth (m)			0.50 - 0.50	0.50 - 0.50				
Sample Type			Soil/Solid (S)	Soil/Solid (S)				
Date Sampled			15/10/2020	15/10/2020				
Sample Time			-	-				
Date Received			17/10/2020	17/10/2020				
SDG Ref			201017-89	201017-89				
Lab Sample No.(s)			23056795	23056796				
AGS Reference								
Component	**LOD/Units**	**Method**						
Naphthalene	<9 µg/kg	TM218	<9 M	<9 M				
Acenaphthylene	<12 µg/kg	TM218	<12 M	<12 M				
Acenaphthene	<8 µg/kg	TM218	26.5 M	<8 M				
Fluorene	<10 µg/kg	TM218	21.7 M	<10 M				
Phenanthrene	<15 µg/kg	TM218	314 M	25.6 M				
Anthracene	<16 µg/kg	TM218	42.5 M	<16 M				
Fluoranthene	<17 µg/kg	TM218	398 M	41.8 M				
Pyrene	<15 µg/kg	TM218	339 M	38.1 M				
Benz(a)anthracene	<14 µg/kg	TM218	164 M	24 M				
Chrysene	<10 µg/kg	TM218	173 M	25.4 M				
Benzo(b)fluoranthene	<15 µg/kg	TM218	191 M	32.6 M				
Benzo(k)fluoranthene	<14 µg/kg	TM218	62.7 M	<14 M				
Benzo(a)pyrene	<15 µg/kg	TM218	128 M	21 M				
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	74.6 M	<18 M				
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23 M	<23 M				
Benzo(g,h,i)perylene	<24 µg/kg	TM218	82.8 M	<24 M				
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	2020	209				

Validated

CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

TPH CWG (S)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Customer Sample Ref.			BH/01-0.5M	BH/06-0.5M				
Depth (m)			0.50 - 0.50	0.50 - 0.50				
Sample Type			Soil/Solid (S)	Soil/Solid (S)				
Date Sampled			15/10/2020	15/10/2020				
Sample Time			-	-				
Date Received			17/10/2020	17/10/2020				
SDG Ref			201017-89	201017-89				
Lab Sample No.(s)			23056795	23056796				
AGS Reference								
Component	**LOD/Units**	**Method**						
GRO Surrogate % recovery**	%	TM089	99.7	101				
Aliphatics >C5-C6	<10 µg/kg	TM089	<10	<10				
Aliphatics >C6-C8	<10 µg/kg	TM089	<10	<10				
Aliphatics >C8-C10	<10 µg/kg	TM089	<10	<10				
Aliphatics >C10-C12	<1000 µg/kg	TM414	<1000	<1000				
Aliphatics >C12-C16	<1000 µg/kg	TM414	<1000	<1000				
Aliphatics >C16-C21	<1000 µg/kg	TM414	<1000	<1000				
Aliphatics >C21-C35	<1000 µg/kg	TM414	3170	2610				
Aliphatics >C35-C44	<1000 µg/kg	TM414	<1000	<1000				
Total Aliphatics >C10-C44	<5000 µg/kg	TM414	<5000	<5000				
Total Aliphatics & Aromatics >C10-C44	<10000 µg/kg	TM414	<10000	<10000				
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10	<10				
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10	<10				
Aromatics >EC8-EC10	<10 µg/kg	TM089	<10	<10				
Aromatics > EC10-EC12	<1000 µg/kg	TM414	<1000	<1000				
Aromatics > EC12-EC16	<1000 µg/kg	TM414	<1000	<1000				
Aromatics > EC16-EC21	<1000 µg/kg	TM414	<1000	<1000				
Aromatics > EC21-EC35	<1000 µg/kg	TM414	1240	1690				
Aromatics >EC35-EC44	<1000 µg/kg	TM414	<1000	<1000				
Aromatics > EC40-EC44	<1000 µg/kg	TM414	<1000	<1000				
Total Aromatics > EC10-EC44	<5000 µg/kg	TM414	<5000	<5000				
Total Aliphatics & Aromatics >C5-C44	<10000 µg/kg	TM414	<10000	<10000				
GRO >C5-C6	<20 µg/kg	TM089	<20	<20				
GRO >C6-C7	<20 µg/kg	TM089	<20	<20				
GRO >C7-C8	<20 µg/kg	TM089	<20	<20				
GRO >C8-C10	<20 µg/kg	TM089	<20	<20				
GRO >C10-C12	<20 µg/kg	TM089	<20	<20				
Total Aliphatics >C5-C10	<50 µg/kg	TM089	<50	<50				
Total Aromatics >EC5-EC10	<50 µg/kg	TM089	<50	<50				
GRO >C5-C10	<20 µg/kg	TM089	<20	<20				

Validated

CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

VOC MS (S)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	BH/01-0.5M	BH/06-0.5M				
Customer Sample Ref.								
Depth (m)			0.50 - 0.50	0.50 - 0.50				
Sample Type			Soil/Solid (S)	Soil/Solid (S)				
Date Sampled			15/10/2020	15/10/2020				
Sample Time			-	-				
Date Received			17/10/2020	17/10/2020				
SDG Ref			201017-89	201017-89				
Lab Sample No.(s)			23056795	23056796				
AGS Reference								
Dibromofluoromethane**	%	TM116	106	110				
Toluene-d8**	%	TM116	94.8	96.2				
4-Bromofluorobenzene**	%	TM116	73.4	84				
Methyl Tertiary Butyl Ether	<10 µg/kg	TM116	<10 M	<10 M				
Benzene	<9 µg/kg	TM116	<9 M	<9 M				
Toluene	<7 µg/kg	TM116	<7 M	<7 M				
Ethylbenzene	<4 µg/kg	TM116	<4 M	<4 M				
p/m-Xylene	<10 µg/kg	TM116	<10 #	<10 #				
o-Xylene	<10 µg/kg	TM116	<10 M	<10 M				

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CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Hollybank, Swords
Mass Sample taken (kg)	0.118	**Natural Moisture Content (%)**	32.1
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	75.7
Particle Size <4mm	>95%		

Case	
SDG	201017-89
Lab Sample Number(s)	23056795
Sampled Date	15-Oct-2020
Customer Sample Ref.	BH/01-0.5M
Depth (m)	0.50 - 0.50

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	2.16	3	5	6
Loss on Ignition (%)	45.6	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	11.1	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C_2 Conc^n in 10:1 eluate (mg/l)**		**A_2 10:1 conc^n leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	0.0012	<0.0005	0.012	<0.005	0.5	2	25
Barium	0.00684	<0.0002	0.0684	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00472	<0.0003	0.0472	<0.003	2	50	100
Mercury Dissolved (CVAF)	0.0000238	<0.00001	0.000238	<0.0001	0.01	0.2	2
Molybdenum	0.00545	<0.003	0.0545	<0.03	0.5	10	30
Nickel	0.0013	<0.0004	0.013	<0.004	0.4	10	40
Lead	0.000298	<0.0002	0.00298	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	<0.001	<0.001	<0.01	<0.01	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	0.954	<0.5	9.54	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	94	<10	940	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	4.62	<3	46.2	<30	500	800	1000

Leach Test Information

Date Prepared	24-Oct-2020
pH (pH Units)	7.84
Conductivity (µS/cm)	116.00
Temperature (ºC)	20.40
Volume Leachant (Litres)	0.872

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Hollybank, Swords
Mass Sample taken (kg)	0.110	**Natural Moisture Content (%)**	22.2
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	81.8
Particle Size <4mm	>95%		

Case	
SDG	201017-89
Lab Sample Number(s)	23056796
Sampled Date	15-Oct-2020
Customer Sample Ref.	BH/06-0.5M
Depth (m)	0.50 - 0.50

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	0.844	3	5	6
Loss on Ignition (%)	4.38	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	5.57	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C_2 Conc^n in 10:1 eluate (mg/l)**		**A_2 10:1 conc^n leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	0.000693	<0.0005	0.00693	<0.005	0.5	2	25
Barium	0.133	<0.0002	1.33	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00392	<0.0003	0.0392	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	<0.003	<0.003	<0.03	<0.03	0.5	10	30
Nickel	0.000955	<0.0004	0.00955	<0.004	0.4	10	40
Lead	0.000593	<0.0002	0.00593	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	<0.001	<0.001	<0.01	<0.01	0.1	0.5	7
Zinc	0.00687	<0.001	0.0687	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	0.505	<0.5	5.05	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	93.1	<10	931	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	4.08	<3	40.8	<30	500	800	1000

Leach Test Information

Date Prepared	24-Oct-2020
pH (pH Units)	7.62
Conductivity (µS/cm)	111.00
Temperature (ºC)	20.50
Volume Leachant (Litres)	0.880

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water
TM132	In - house Method	ELTRA CS800 Operators Guide
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC
TM410	Shaker extraction-In house coronene method	Determination of Coronene in soils by GCMS
TM414	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID
TM415	Analysis of Petroleum Hydrocarbons in Environmental Media.	Determination of Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

Validated

CERTIFICATE OF ANALYSIS

SDG:	201017-89	**Client Reference:**	5769	**Report Number:**	573257
Location:	Hollybank, Swords	**Order Number:**	100A/20	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	23056795	23056797	23056798	23056801	23056796	23056803
Customer Sample Ref.	BH/01-0.5M	BH/01-1.0M	BH/03-1.0M	BH/05-1.0M	BH/06-0.5M	BH/06-1.0M
AGS Ref.						
Depth	0.50 - 0.50	1.00 - 1.00	1.00 - 1.00	1.00 - 1.00	0.50 - 0.50	1.00 - 1.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (w)	27-Oct-2020				27-Oct-2020	
CEN 10:1 Leachate (1 Stage)	24-Oct-2020				24-Oct-2020	
CEN Readings	28-Oct-2020				28-Oct-2020	
Chromium III	29-Oct-2020				28-Oct-2020	
Coronene	25-Oct-2020				25-Oct-2020	
Dissolved Metals by ICP-MS	29-Oct-2020				29-Oct-2020	
Dissolved Organic/Inorganic Carbon	29-Oct-2020				28-Oct-2020	
EPH by GCxGC-FID	28-Oct-2020				28-Oct-2020	
EPH CWG GC (S)	27-Oct-2020				28-Oct-2020	
Fluoride	28-Oct-2020				28-Oct-2020	
GRO by GC-FID (S)	24-Oct-2020				24-Oct-2020	
Hexavalent Chromium (s)	28-Oct-2020				28-Oct-2020	
Loss on Ignition in soils	28-Oct-2020	28-Oct-2020	28-Oct-2020	28-Oct-2020	28-Oct-2020	28-Oct-2020
Mercury Dissolved	28-Oct-2020				28-Oct-2020	
Metals in solid samples by OES	29-Oct-2020				27-Oct-2020	
Moisture at 105C	24-Oct-2020				24-Oct-2020	
PAH by GCMS	26-Oct-2020				26-Oct-2020	
PCBs by GCMS	28-Oct-2020				28-Oct-2020	
Phenols by HPLC (W)	29-Oct-2020				29-Oct-2020	
Sample description	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020
Total Dissolved Solids on Leachates	29-Oct-2020				28-Oct-2020	
Total Organic Carbon	29-Oct-2020				28-Oct-2020	
TPH CWG GC (S)	27-Oct-2020				28-Oct-2020	
VOC MS (S)	24-Oct-2020				24-Oct-2020	

Appendix

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

General

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

HazWasteOnline™

Waste Classification Report

FF45V-DVB5M-EQ2DK

Job name

5769

Description/Comments

Client: Cairn Homes PLC
Engineer: Waterman Moylan

Project

Hollybank

Site

Swords, Co. Dublin

Related Documents

#	Name	Description
1	201017-89.hwol	.hwol file used to create the Job

Waste Stream Template

Rilta Suite NEW

WAC Results

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate the samples in this job: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

Classified by

Name:
Stephen Letch
Date:
29 Oct 2020 16:17 GMT
Telephone:
00353 86817 9449

Company:
Site Investigations Ltd

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	09 Apr 2019
Advanced Hazardous Waste Classification	09 Oct 2019

Report

Created by: Stephen Letch
Created date: 29 Oct 2020 16:17 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	WAC Results		Page
					Inert	Non Haz	
1	BH/01-0.5M-151020-0.50-0.50		Non Hazardous		Pass	Pass	3
2	BH/06-0.5M-151020-0.50-0.50		Non Hazardous		Pass	Pass	7

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	11
Appendix B: Rationale for selection of metal species	13
Appendix C: Version	13

Classification of sample: BH/01-0.5M-151020-0.50-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH/01-0.5M-151020-0.50-0.50
Moisture content:
24%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 24% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		TPH (C6 to C40) petroleum group			TPH		<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
2		confirm TPH has NOT arisen from diesel or petrol					☑							
3		antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<0.6	mg/kg	1.197	<0.718	mg/kg	<0.0000718 %		**<LOD**
4		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		18.4	mg/kg	1.534	21.45	mg/kg	0.00214 %	✓	
5		barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		118	mg/kg	1.233	110.62	mg/kg	0.0111 %	✓	
6		cadmium { cadmium sulfate }	048-009-00-9	233-331-6	10124-36-4		1.18	mg/kg	1.855	1.663	mg/kg	0.000166 %	✓	
7		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		34.9	mg/kg	1.126	29.863	mg/kg	0.00299 %	✓	
8		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	74.2	mg/kg		56.392	mg/kg	0.00564 %	✓	
9		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.942	mg/kg	1.353	0.969	mg/kg	0.0000969 %	✓	
10		molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		3.54	mg/kg	1.5	4.036	mg/kg	0.000404 %	✓	
11		nickel { nickel sulfate }	028-009-00-5	232-104-9	7786-81-4		41.2	mg/kg	2.637	82.56	mg/kg	0.00826 %	✓	
12		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1.45	mg/kg	1.405	1.548	mg/kg	0.000155 %	✓	
13		zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		102	mg/kg	2.469	191.42	mg/kg	0.0191 %	✓	
14		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		21.5	mg/kg	1.462	23.882	mg/kg	0.00239 %	✓	

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		**<LOD**
16		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		**<LOD**
17	•	acenaphthylene		205-917-1	208-96-8		<0.012	mg/kg		<0.012	mg/kg	<0.0000012 %		**<LOD**
18	•	acenaphthene		201-469-6	83-32-9		0.0265	mg/kg		0.0201	mg/kg	0.00000201 %	✓	
19	•	fluorene		201-695-5	86-73-7		0.0217	mg/kg		0.0165	mg/kg	0.00000165 %	✓	
20	•	phenanthrene		201-581-5	85-01-8		0.314	mg/kg		0.239	mg/kg	0.0000239 %	✓	
21	•	anthracene		204-371-1	120-12-7		0.0425	mg/kg		0.0323	mg/kg	0.00000323 %	✓	
22	•	fluoranthene		205-912-4	206-44-0		0.398	mg/kg		0.302	mg/kg	0.0000302 %	✓	
23	•	pyrene		204-927-3	129-00-0		0.339	mg/kg		0.258	mg/kg	0.0000258 %	✓	
24		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.164	mg/kg		0.125	mg/kg	0.0000125 %	✓	
25		chrysene	601-048-00-0	205-923-4	218-01-9		0.173	mg/kg		0.131	mg/kg	0.0000131 %	✓	
26		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.191	mg/kg		0.145	mg/kg	0.0000145 %	✓	
27		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.0627	mg/kg		0.0477	mg/kg	0.00000477 %	✓	
28		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.128	mg/kg		0.0973	mg/kg	0.00000973 %	✓	
29	•	indeno[123-cd]pyrene		205-893-2	193-39-5		0.0746	mg/kg		0.0567	mg/kg	0.00000567 %	✓	
30		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.023	mg/kg		<0.023	mg/kg	<0.0000023 %		**<LOD**
31	•	benzo[ghi]perylene		205-883-8	191-24-2		0.0828	mg/kg		0.0629	mg/kg	0.00000629 %	✓	
32	•	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.021	mg/kg		<0.021	mg/kg	<0.0000021 %		**<LOD**
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
34		benzene	601-020-00-8	200-753-7	71-43-2		<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		**<LOD**
35		toluene	601-021-00-3	203-625-9	108-88-3		<0.007	mg/kg		<0.007	mg/kg	<0.0000007 %		**<LOD**
36	•	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.004	mg/kg		<0.004	mg/kg	<0.0000004 %		**<LOD**
37	•	coronene		205-881-7	191-07-1		<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
											Total:	0.0538 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

WAC Results for sample: BH/01-0.5M-151020-0.50-0.50

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	2.16	3	5
2	LOI (loss on ignition)	%	45.6	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.04	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.021	1	-
5	Mineral oil (C10 to C40)	mg/kg	11.1	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	2.02	100	-
7	pH	pH	7.84	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	0.012	0.5	2
10	barium	mg/kg	0.0684	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0472	2	50
14	mercury	mg/kg	0.0002	0.01	0.2
15	molybdenum	mg/kg	0.0545	0.5	10
16	nickel	mg/kg	0.013	0.4	10
17	lead	mg/kg	0.0029	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	<0.01	0.1	0.5
20	zinc	mg/kg	<0.01	4	50
21	chloride	mg/kg	<20	800	15,000
22	fluoride	mg/kg	9.54	10	150
23	sulphate	mg/kg	<20	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	46.2	500	800
26	TDS (total dissolved solids)	mg/kg	940	4,000	60,000

Key

User supplied data

Classification of sample: BH/06-0.5M-151020-0.50-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH/06-0.5M-151020-0.50-0.50
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		TPH (C6 to C40) petroleum group			TPH		<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
2		confirm TPH has NOT arisen from diesel or petrol					☑							
3		antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<0.6	mg/kg	1.197	<0.718	mg/kg	<0.0000718 %		**<LOD**
4		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		11.8	mg/kg	1.534	15.385	mg/kg	0.00154 %	✓	
5		barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		111	mg/kg	1.233	116.38	mg/kg	0.0116 %	✓	
6		cadmium { cadmium sulfate }	048-009-00-9	233-331-6	10124-36-4		0.954	mg/kg	1.855	1.504	mg/kg	0.00015 %	✓	
7		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		22.2	mg/kg	1.126	21.246	mg/kg	0.00212 %	✓	
8		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	27.8	mg/kg		23.63	mg/kg	0.00236 %	✓	
9		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.14	mg/kg	1.353	<0.189	mg/kg	<0.0000189 %		**<LOD**
10		molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		1.98	mg/kg	1.5	2.525	mg/kg	0.000252 %	✓	
11		nickel { nickel sulfate }	028-009-00-5	232-104-9	7786-81-4		36.4	mg/kg	2.637	81.579	mg/kg	0.00816 %	✓	
12		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		**<LOD**
13		zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		73.9	mg/kg	2.469	155.109	mg/kg	0.0155 %	✓	
14		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		19.9	mg/kg	1.462	24.722	mg/kg	0.00247 %	✓	

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		**<LOD**
16		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		**<LOD**
17		acenaphthylene		205-917-1	208-96-8		<0.012	mg/kg		<0.012	mg/kg	<0.0000012 %		**<LOD**
18		acenaphthene		201-469-6	83-32-9		<0.008	mg/kg		<0.008	mg/kg	<0.0000008 %		**<LOD**
19		fluorene		201-695-5	86-73-7		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
20		phenanthrene		201-581-5	85-01-8		0.0256	mg/kg		0.0218	mg/kg	0.00000218 %	✓	
21		anthracene		204-371-1	120-12-7		<0.016	mg/kg		<0.016	mg/kg	<0.0000016 %		**<LOD**
22		fluoranthene		205-912-4	206-44-0		0.0418	mg/kg		0.0355	mg/kg	0.00000355 %	✓	
23		pyrene		204-927-3	129-00-0		0.0381	mg/kg		0.0324	mg/kg	0.00000324 %	✓	
24		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.024	mg/kg		0.0204	mg/kg	0.00000204 %	✓	
25		chrysene	601-048-00-0	205-923-4	218-01-9		0.0254	mg/kg		0.0216	mg/kg	0.00000216 %	✓	
26		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.0326	mg/kg		0.0277	mg/kg	0.00000277 %	✓	
27		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.014	mg/kg		<0.014	mg/kg	<0.0000014 %		**<LOD**
28		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.021	mg/kg		0.0179	mg/kg	0.00000179 %	✓	
29		indeno[123-cd]pyrene		205-893-2	193-39-5		<0.018	mg/kg		<0.018	mg/kg	<0.0000018 %		**<LOD**
30		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.023	mg/kg		<0.023	mg/kg	<0.0000023 %		**<LOD**
31		benzo[ghi]perylene		205-883-8	191-24-2		<0.024	mg/kg		<0.024	mg/kg	<0.0000024 %		**<LOD**
32		polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.021	mg/kg		<0.021	mg/kg	<0.0000021 %		**<LOD**
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
34		benzene	601-020-00-8	200-753-7	71-43-2		<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		**<LOD**
35		toluene	601-021-00-3	203-625-9	108-88-3		<0.007	mg/kg		<0.007	mg/kg	<0.0000007 %		**<LOD**
36		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.004	mg/kg		<0.004	mg/kg	<0.0000004 %		**<LOD**
37		coronene		205-881-7	191-07-1		<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
											Total:	0.0456 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

WAC Results for sample: BH/06-0.5M-151020-0.50-0.50

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	0.844	3	5
2	LOI (loss on ignition)	%	4.38	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.04	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.021	1	-
5	Mineral oil (C10 to C40)	mg/kg	5.57	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	0.209	100	-
7	pH	pH	7.62	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	0.0069	0.5	2
10	barium	mg/kg	1.33	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0392	2	50
14	mercury	mg/kg	<0.0001	0.01	0.2
15	molybdenum	mg/kg	<0.03	0.5	10
16	nickel	mg/kg	0.0095	0.4	10
17	lead	mg/kg	0.0059	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	<0.01	0.1	0.5
20	zinc	mg/kg	0.0687	4	50
21	chloride	mg/kg	<20	800	15,000
22	fluoride	mg/kg	5.05	10	150
23	sulphate	mg/kg	<20	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	40.8	500	800
26	TDS (total dissolved solids)	mg/kg	931	4,000	60,000

Key

User supplied data

Appendix A: Classifier defined and non CLP determinands

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

confirm TPH has NOT arisen from diesel or petrol

Description/Comments: Chapter 3, section 4b requires a positive confirmation for benzo[a]pyrene to be used as a marker in evaluating Carc. 1B; H350 (HP 7) and Muta. 1B; H340 (HP 11)
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

barium sulphide (EC Number: 244-214-4, CAS Number: 21109-95-5)

CLP index number: 016-002-00-X
Description/Comments:
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): EUH031 >= 0.8 %
Reason for additional Hazards Statement(s):
14 Dec 2015 - EUH031 >= 0.8 % hazard statement sourced from: WM3, Table C12.2

lead compounds with the exception of those specified elsewhere in this Annex (worst case)

CLP index number: 082-001-00-6
Description/Comments: Worst Case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following CLP protocols, considers lead compounds from smelting industries, flue dust and similar to be Carcinogenic category 1A
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html (worst case lead compounds). Review date 29/09/2015

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

CLP index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
29 Sep 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **coronene** (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source:
http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2 H371

Appendix B: Rationale for selection of metal species

antimony {antimony trioxide}

Worst case scenario.

arsenic {arsenic pentoxide}

Arsenic pentoxide used as most hazardous species.

barium {barium sulphide}

Chromium VII at limits of detection. Barium sulphide used as the next most hazardous species. No chromate present.

cadmium {cadmium sulfate}

Cadmium sulphate used as the most hazardous species.

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected.

lead {lead compounds with the exception of those specified elsewhere in this Annex (worst case)}

Chromium VII at limits of detection. Lead compounds used as the next most hazardous species. No chromate present.

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight.

nickel {nickel sulfate}

Chromium VII at limits of detection. Nickel sulphate used as the next most hazardous species. No chromate present.

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil.

zinc {zinc sulphate}

Chromium VII at limits of detection. Zinc sulphate used as the next most hazardous species. No chromate present.

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.300.4509.8773 (26 Oct 2020)
HazWasteOnline Database: 2020.300.4509.8773 (26 Oct 2020)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

Appendix 6

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Boreholes					
BH101	717699.038	748009.013	13.31	317773.679	247985.755
BH102	717739.775	747995.675	12.84	317814.425	247972.414
BH103	717777.734	748014.477	13.64	317852.391	247991.220
BH104	717818.977	748031.269	12.94	317893.643	248008.016
BH105	717867.506	748009.768	12.68	317942.183	247986.511
BH106	717863.616	748048.217	12.83	317938.291	248024.968
Trial Pits					
TP101	717594.205	748257.711	9.20	317668.821	248234.506
TP102	717636.728	748329.938	8.52	317711.352	248306.749
TP103	717671.220	748198.270	9.73	317745.853	248175.052
TP104	717725.647	748194.038	8.86	317800.292	248170.820
TP105	717699.425	748083.810	14.45	317774.065	248060.568
TP106	717805.064	748123.603	13.59	317879.726	248100.370
TP107	717849.251	748187.314	8.68	317923.922	248164.095
TP108	717873.490	748253.099	5.99	317948.165	248229.895
Dynamic Probes					
DP01	717531.598	748355.336	8.93	317606.200	248332.152
DP02	717541.212	748340.669	8.71	317615.816	248317.481
DP03	717548.002	748324.724	8.44	317622.607	248301.533
DP04	717560.112	748312.457	8.30	317634.720	248289.263
DP05	717568.568	748326.123	8.22	317643.178	248302.932
DP06	717580.059	748332.528	7.93	317654.671	248309.339
DP07	717590.263	748339.946	7.98	317664.877	248316.759
DP08	717603.527	748347.895	7.91	317678.144	248324.709
DP09	717611.085	748380.992	6.56	317685.703	248357.814
DP10	717629.721	748375.199	6.48	317704.343	248352.019
DP11	717628.243	748358.476	6.96	317702.865	248335.293
DP12	717629.234	748348.875	7.53	317703.856	248325.690
DP13	717563.555	748281.425	9.01	317638.164	248258.225
DP14	717587.106	748267.596	9.05	317661.720	248244.393
DP15	717583.222	748287.800	8.64	317657.835	248264.601
DP16	717591.137	748291.565	8.50	317665.752	248268.367
DP17	717602.602	748293.839	8.83	317677.219	248270.642
DP18	717608.394	748311.913	9.08	317683.012	248288.720
DP19	717624.148	748314.052	9.17	317698.770	248290.859
DP20	717587.420	748252.354	9.31	317662.035	248229.148
DP21	717595.069	748253.367	9.24	317669.685	248230.161
DP22	717611.726	748263.540	9.30	317686.346	248240.336
DP23	717619.173	748267.676	9.31	317693.794	248244.473
DP24	717632.445	748275.424	9.29	317707.069	248252.223
DP25	717643.985	748285.411	9.28	317718.611	248262.212
DP26	717655.775	748332.878	7.68	317730.403	248309.689
DP27	717660.742	748323.352	8.12	317735.371	248300.161
DP28	717667.837	748310.381	8.77	317742.468	248287.188
DP29	717607.887	748184.915	10.63	317682.507	248161.694

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
DP30	717601.356	748197.470	10.30	317675.974	248174.252
DP31	717620.592	748207.962	9.83	317695.214	248184.746
DP32	717633.367	748211.647	9.79	317707.992	248188.432
DP33	717647.498	748214.032	9.65	317722.126	248190.818
DP34	717657.172	748217.311	9.66	317731.802	248194.097
DP35	717671.900	748222.899	9.56	317746.533	248199.687
DP36	717674.236	748205.165	9.61	317748.869	248181.949
DP37	717623.608	748169.160	10.66	317698.231	248145.936
DP38	717637.422	748171.238	10.31	317712.048	248148.014
DP39	717655.466	748175.278	10.04	317730.096	248152.055
DP40	717665.410	748176.993	9.94	317740.042	248153.771
DP41	717678.472	748181.942	9.63	317753.107	248158.721
DP42	717693.830	748222.344	9.35	317768.467	248199.132
DP43	717706.974	748222.284	9.21	317781.614	248199.072
DP44	717721.294	748217.927	9.07	317795.937	248194.714
DP45	717738.174	748214.072	8.81	317812.821	248190.858
DP46	717738.249	748204.809	8.81	317812.896	248181.593
DP47	717729.464	748189.521	8.75	317804.109	248166.302
DP48	717715.346	748185.553	9.02	317789.988	248162.333
DP49	717698.841	748184.016	9.19	317773.480	248160.796
DP50	717695.407	748201.390	9.36	317770.045	248178.173
DP51	717634.050	748136.937	12.80	317708.676	248113.706
DP52	717641.398	748124.740	13.47	317716.025	248101.506
DP53	717650.720	748141.034	12.11	317725.349	248117.804
DP54	717664.916	748145.816	11.37	317739.548	248122.587
DP55	717679.802	748145.638	10.95	317754.437	248122.409
DP56	717692.623	748153.275	10.39	317767.261	248130.048
DP57	717712.288	748154.862	9.76	317786.930	248131.635
DP58	717723.505	748160.244	9.20	317798.149	248137.019
DP59	717732.257	748139.239	10.88	317806.903	248116.009
DP60	717743.718	748126.180	12.35	317818.367	248102.947
DP61	717717.642	748122.065	12.82	317792.286	248098.831
DP62	717706.066	748121.286	13.24	317780.707	248098.052
DP63	717694.499	748113.925	13.78	317769.138	248090.689
DP64	717679.956	748114.269	13.81	317754.592	248091.033
DP65	717667.343	748106.987	14.19	317741.976	248083.750
DP66	717654.072	748107.597	14.20	317728.702	248084.360
DP67	717662.774	748075.882	14.51	317737.406	248052.638
DP68	717668.516	748064.681	14.30	317743.150	248041.435
DP69	717678.123	748079.265	14.51	317752.759	248056.022
DP70	717692.633	748082.524	14.51	317767.272	248059.282
DP71	717705.910	748083.471	14.41	317780.551	248060.229
DP72	717723.622	748091.618	14.42	317798.267	248068.378
DP73	717747.677	748098.209	14.47	317822.327	248074.970
DP74	717751.899	748084.825	14.56	317826.550	248061.583
DP75	717757.548	748073.877	14.15	317832.200	248050.633

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
DP76	717736.469	748065.406	14.00	317811.117	248042.160
DP77	717725.647	748059.173	13.64	317800.293	248035.926
DP78	717710.742	748059.448	13.64	317785.385	248036.201
DP79	717696.176	748052.283	13.62	317770.816	248029.034
DP80	717687.599	748053.138	13.74	317762.237	248029.889
DP81	717674.669	748046.612	13.82	317749.304	248023.362
DP82	717685.508	748018.117	13.41	317760.146	247994.861
DP83	717698.044	748021.035	13.16	317772.684	247997.779
DP84	717688.961	747994.392	14.33	317763.600	247971.130
DP85	717708.334	747990.117	14.26	317782.977	247966.855
DP86	717720.231	748003.719	13.09	317794.876	247980.460
DP87	717721.191	747989.770	13.89	317795.837	247966.508
DP88	717740.405	747985.766	13.74	317815.055	247962.503
DP89	717741.902	748001.565	12.98	317816.552	247978.305
DP90	717707.994	748032.761	13.10	317782.636	248009.508
DP91	717711.779	748015.794	12.84	317786.422	247992.537
DP92	717735.149	748038.607	13.60	317809.797	248015.355
DP93	717729.270	748019.016	13.00	317803.917	247995.760
DP94	717753.368	748035.874	13.83	317828.020	248012.622
DP95	717751.185	748023.203	13.62	317825.837	247999.948
DP96	717757.987	747996.274	13.40	317832.640	247973.013
DP97	717766.665	747982.701	14.93	317841.320	247959.437
DP98	717772.182	747996.169	13.49	317846.838	247972.908
DP99	717759.082	748013.529	13.70	317833.735	247990.272
DP100	717770.966	748016.255	13.51	317845.622	247992.999
DP101	717793.758	747993.440	13.75	317868.419	247970.179
DP102	717790.242	748015.065	13.47	317864.902	247991.809
DP103	717784.821	748048.612	13.50	317859.480	248025.363
DP104	717814.955	747978.284	15.66	317889.621	247955.020
DP105	717828.806	747990.370	14.43	317903.474	247967.108
DP106	717820.182	748008.384	13.13	317894.848	247985.126
DP107	717850.010	747995.104	13.55	317924.683	247971.844
DP108	717842.054	748008.675	13.14	317916.725	247985.418
DP109	717856.771	747973.738	15.15	317931.446	247950.473
DP110	717877.141	747982.034	13.72	317951.820	247958.771
DP111	717861.776	748003.809	12.75	317936.451	247980.551
DP112	717826.624	748020.078	13.00	317901.292	247996.823
DP113	717845.456	748022.410	12.76	317920.128	247999.156
DP114	717872.562	748020.583	12.80	317947.240	247997.328
DP115	717810.277	748057.547	13.29	317884.941	248034.300
DP116	717863.920	748041.751	12.65	317938.595	248018.501
DP117	717828.600	748056.264	12.97	317903.268	248033.017
DP118	717845.581	748058.000	12.70	317920.252	248034.753
DP119	717865.986	748059.193	12.17	317940.662	248035.947
DP120	717818.030	748088.538	13.81	317892.695	248065.298
DP121	717815.603	748107.978	13.91	317890.268	248084.742

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
DP122	717807.117	748128.824	13.36	317881.779	248105.592
DP123	717805.575	748147.552	12.09	317880.237	248124.324
DP124	717801.192	748177.289	9.25	317875.853	248154.068
DP125	717806.790	748186.929	8.60	317881.452	248163.710
DP126	717806.606	748204.912	7.74	317881.268	248181.697
DP127	717825.768	748188.795	8.50	317900.434	248165.576
DP128	717847.814	748189.811	8.41	317922.485	248166.593
DP129	717864.686	748173.312	9.69	317939.360	248150.090
DP130	717877.040	748221.243	7.01	317951.716	248198.032
DP131	717867.937	748230.535	6.71	317942.611	248207.326
DP132	717842.375	748231.080	6.99	317917.044	248207.871
DP133	717815.981	748231.240	7.35	317890.644	248208.031
DP134	717824.057	748243.413	6.85	317898.722	248220.206
DP135	717822.194	748259.109	6.09	317896.858	248235.906
DP136	717832.492	748274.703	5.88	317907.158	248251.503
DP137	717853.864	748270.404	5.64	317928.535	248247.203
DP138	717872.197	748271.281	5.74	317946.872	248248.081
DP139	717885.297	748263.519	6.03	317959.975	248240.317
DP140	717776.615	748282.317	6.88	317851.269	248259.118
DP141	717768.265	748272.269	7.32	317842.918	248249.068
DP142	717771.315	748258.960	7.59	317845.969	248235.756
DP143	717760.797	748244.735	8.35	317835.448	248221.528

Site Investigations Ltd The Grange 12th Lock Road Lucan Co. Dublin T: 01 6108768 e: info@siteinvestigations.ie	Contract No:	5769	Client:	Cairn Homes PLC	Legend Key
	Contract Name:	Hollybank	Engineer:	Waterman Moylan	Locations By Type - CP
	Location:	Swords, Co. Dublin	Scale:	1:1500	Locations By Type - DP
	Title:	Site Plan	Drawn By:	SL	Locations By Type - TP

Site Investigations Ltd The Grange 12th Lock Road Lucan Co. Dublin T: 01 6108768 e: info@siteinvestigations.ie	Contract No:	5769	Client:	Cairn Homes PLC	Legend Key
	Contract Name:	Hollybank	Engineer:	Waterman Moylan	Locations By Type - CP
	Location:	Swords, Co. Dublin	Scale:	1:1500	Locations By Type - DP
	Title:	Site Plan	Drawn By:	SL	Locations By Type - TP

12. Appendix 14.1 – Construction and Demolition Resource and Waste Management Plan

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CONSTRUCTION & DEMOLITION RESOURCE AND WASTE MANAGEMENT PLAN FOR A RESIDENTIAL DEVELOPMENT

AT

GLEN ELLAN ROAD, HOLYBANKS, CO. DUBLIN

APPENDIX 14.1

Report Prepared For

CAIRN HOMES PROPERTIES LTD.

Report Prepared By

Chonaill Bradley, Principal Environmental Consultant

Our Reference

CB/18/10552WMR01

Date of Issue

14 March 2022

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1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Construction & Demolition Resource and Waste Management Plan (C&D RWMP) on behalf of the Cairn Homes Properties Ltd. The proposed development will consist of the construction of a residential-led development with residential units and creche, along with all hard and soft landscaping, amenity areas, road and services.

The purpose of this plan is to provide information necessary to ensure that the management of construction and demolition (C&D) waste at the site is undertaken in accordance with current legal and industry standards including the *Waste Management Acts 1996 - 2011* and associated Regulations [1], *Protection of the Environment Act 2003* as amended [2], *Litter Pollution Act 1997* as amended [3] and the *Eastern-Midlands Region Waste Management Plan 2015 – 2021* [4]. In particular, this Plan aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil and/or water).

This C&D WMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of C&D waste to be generated by the proposed development and makes recommendations for management of different waste streams.

2.0 CONSTRUCTION & DEMOLITION WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998*, Changing Our Ways*[5], which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this report was to recycle at least 50% of C&D waste within a five year period (by 2003), with a progressive increase to at least 85% over fifteen years (i.e. 2013).

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report entitled '*Recycling of Construction and Demolition Waste'* [6] concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of C&D waste.

In September 2020, the Irish Government published a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan, 'A Waste Action Plan for a Circular Economy' [7] (WAPCE), replaces the previous national waste management plan, "A Resource Opportunity" (2012), and was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to an altered economical model, where climate and environmental challenges are turned into opportunities.

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen

engagement, plastics and packaging, construction and demolition, textiles, green public procurement and waste enforcement.

One of the first actions to be taken was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021) [8] to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

The Environmental Protection Agency (EPA) of Ireland issued 'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' in November 2021 [9]. These guidelines replace the previous 2006 guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006 10. The guidelines provide a practical approach which is informed by best practice in the prevention and management of C&D wastes and resources from design to construction of a project, including consideration of the deconstruction of a project. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted C&D wastes and procedures to prevent, minimise, recycle and reuse wastes;
- Design teams roles and approach;
- Relevant EU, national and local waste policy, legislation and guidelines;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for resource manager (RM) and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of consultation with relevant bodies i.e. waste recycling companies, Fingal County Council, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a bespoke RWMP for developments. The new guidance classifies developments on a two-tiered system. Developments which do not exceed any of the following thresholds may be classed as Tier 1 development, which require a simplified RWMP:

- New residential development of less than 10 dwellings.
- Retrofit of 20 dwellings or less.
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2.
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m^2; and
- Demolition projects generating in total less than 100m^3 in volume of C&D waste.

Developments above these thresholds are classed as Tier-2 projects

This development requires a C&D WMP as a Tier 2 development as they are above the following criterion:

- New residential development of less than 10 dwellings.

Other guidelines followed in the preparation of this report include *'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers'* [9], published by FÁS and the Construction Industry Federation in 2002 and the previous guildines 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects'[10] (2006).

These guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.2 Regional Level

The proposed development is located in the Local Authority area of Fingal County Council (FCC).

The *Eastern-Midlands Region Waste Management Plan 2015 – 2021* is the regional waste management plan for the FCC area published in May 2015. Currently the EMR and other regional waste management plans are under review and the Regional Waste Management Planning Offices expect to publish the final plan in early 2022.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of *"70% preparing for reuse, recycling and other recovery of construction and demolition waste"* (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2012.*

The *Fingal Development Plan 2017 – 2023* [11] came into effect on March 2017 and sets out a number of objectives for the Fingal region in line with the objectives of the regional waste management plan.

<u>Objectives:</u>

- Objective **WM03** Implement the provisions of the Eastern Midlands Region Waste Management Plan 2015 -2021 or any subsequent Waste Management Plan applicable within the lifetime of the Development Plan. All prospective developments in the County will be expected to take account of the provisions of the Regional Waste Management Plan and adhere to the requirements of that Plan.
- Objective **WM07** Promote the increased re-use of waste in accordance with the Eastern Midlands Region Waste Management Plan 2015 -2021 (or any subsequent plan).
- Objective **WM18** Ensure that construction and demolition Waste Management Plans meet the relevant recycling / recovery targets for such waste in accordance with the national legislation and regional waste management policy.
- *Objective **DMS36** Ensure all new residential schemes include appropriate design measures for refuse storage areas, details of which should be clearly shown at pre-planning and planning application stage. Ensure refuse storage areas are not situated immediately adjacent to the front door or ground floor window, unless adequate screened alcoves or other such mitigation measures are provided.*
- *Objective **DMS37** Ensure the maximum distance between the front door to a communal bin area does not exceed 50 metres.*

With regard to C&D waste specifically, the Development Plan requires that a 70% target for the re-use, recycling and recovery of man-made C&D waste in Ireland by 2020 is required in compliance with the EC (Waste Directive) Regulations 2011.

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended.
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended [12].

One of the guiding principles of European waste legislation, which has in turn been incorporated into the *Waste Management Act 1996 - 2011* and subsequent Irish legislation, is the principle of *"Duty of Care"*. This implies that the waste producer is responsible for waste from the time it is generated through until its legal recycling, recovery or disposal (including its method of disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final destination. Following on from this is the concept of *"Polluter Pays"* whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the client ensures that the waste contractors engaged by construction contractors are legally compliant with respect to waste transportation, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments* or a waste or IED licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3.0 Design Approach

The client and the design team have integrated the *'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects'* guidelines into the design workshops, to help review processes, identify and evaluate resource reduction measures and investigate the impact on cost, time, quality, buildability, second life and management post demolition and construction. Further details on these design principals can be found within the aforementioned guidance document.

The design team have undertaken the design process in line with the international best practice principles to firstly prevent wastes, reuse where possible and thereafter sustainably reduce and recover materials. The below sections have been the focal point of the design process and material selections and will continued to be analysed and investigated throughout the design process and when selecting material.

The approaches presented are based on international principles of optimising resources and reducing waste on construction projects through:

- Prevention;
- Reuse;
- Recycling;
- Green Procurement Principles;
- Off-Site Construction;
- Materials Optimisation; and
- Flexibility and Deconstruction.

3.1 Designing For Prevention, Reuse and Recycling

Undertaken at the outset and during project feasibility and evaluation the Client and Design Team considered:

- Establishing the potential for any reusable site assets (buildings, structures, equipment, materials, soils, etc.);
- The potential for refurbishment and refit of existing structures or buildings rather than demolition and new build;
- Assessing any existing buildings on the site that can be refurbished either in part or wholly to meet the Client requirements; and
- Enabling the optimum recovery of assets on site.

3.2 Designing for Green Procurement

Waste prevention and minimisation pre-procurement have been discussed and will be further discussed in this section. The Design Team will discuss proposed design solutions, encourage innovation in tenders and incentivise competitions to recognise sustainable approaches. They should also discuss options for packaging reduction with the main Contractor and subcontractors/suppliers using measures such as 'Just-in-Time' delivery and use ordering procedures that avoid excessive waste. The Green procurement extends from the planning stage into the detailed design and tender stage and will be an ongoing part of the long-term design and selection process for this development.

3.3 Designing for Off-Site Construction

Use of off-site manufacturing has been shown to reduce residual wastes by up to 90% (volumetric building versus traditional). The decision to use offsite construction is typically cost led but there are significant benefits for resource management. Some further considerations for procurement which are being investigated as part of the planning stage design process are listed as follows:

- Modular buildings as these can displace the use of concrete and the resource losses associated with concrete blocks such as broken blocks, mortars, etc.;
    - Modular buildings are typically pre-fitted with fixed plasterboard and installed insulation, eliminating these residual streams from site.
- Use of pre-cast structural concrete panels which can reduce the residual volumes of concrete blocks, mortars, plasters, etc.;
- The use of prefabricated composite panels for walls and roofing to reduce residual volumes of insulation and plasterboards;
- Using pre-cast hollow-core flooring instead of in-situ ready mix flooring or timber flooring to reduce the residual volumes of concrete/formwork and wood/packaging, respectively; and
- Designing for the preferential use of offsite modular units.

3.4 Designing for Materials Optimisation During Construction

To ensure manufacturers and construction companies adopt lean production models, including maximising the reuse of materials onsite.. This helps to reduce the

environmental impacts associated with transportation of materials and from waste management activities. This includes investigating the use of standardised sizes for certain materials to help reduce the amount of offcuts produced on site, focusing on promotion and development of off-site manufacture.

3.5 Designing for Flexibility and Deconstruction

Design flexibility has and will be investigated throughout the design process to ensure that where possible products (including buildings) only contain materials that can be recycled and are designed to be easily disassembled. Material efficiency is being considered for the duration and end of life of a building project to produce; flexible, adaptable spaces that enable a resource-efficient, low-waste future change of use; durability of materials and how they can be recovered effectively when maintenance and refurbishment are undertaken and during disassembly/deconstruction.

4.0 DESCRIPTION OF THE PROJECT

4.1 Location, Size and Scale of the Development

The proposed development will consist of a residential scheme of 621 no. units (145 no. 1-bed units, 278 no. 2-bed units, 187 no. 3-bed units and 11 no. 4-bed units) comprising 349 no. apartments, 118 no. houses and 154 no. duplex units. Building heights range from 1 no. to 7 no. storeys (over basement level). The scheme provides for public open space, communal open space areas, a crèche, residential amenities (including concierge, multi-purpose room, meeting room and gym), a new public park to the north of the site as an extension to Broadmeadow Riverside Park and services / bin store areas. The development provides for a total of 705 no. car park spaces (including houses), 856 no. secure bike parking spaces and 21 no. motorbike spaces at basement, under-croft, and surface level.

As part of the proposed development, temporary permission (3 no. years) is sought for a single-storey Marketing Suite and associated signage (including hoarding) during the development construction stage.

Principal vehicular access to the site is from Glen Ellan Road, with an additional new secondary site entrance provided from Jugback Lane/Terrace. Pedestrian connections are provided to the site from Jugback Lane/Terrace, Glen Ellan Road and the proposed Broadmeadow Riverside Park extension. The development also includes infrastructure upgrade works to peripheral roads junctions, and existing Irish Water infrastructure including the construction of a stormwater storage tank and overflow outfall gravity sewer to the Broadmeadow River. All associated site development works above and below ground including hard and soft landscaping, boundary treatments, lighting, SuDs, pumping station, ESB substations and services to facilitate the development..

4.2 Details of the Non-Hazardous Wastes to be produced

There will be waste materials generated from the excavation of soil and stones to facilitate site clearance, construction of new building foundations and installation of services. The volume of material to be excavated has been estimated by the project engineers (Waterman Moylan) at c. 75,800m^3. It is anticipated that 23,300m^3 of this will be suitable for reuse onsite, while the remaining material will be required to be removed offsite.

During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, plastics, metals and tiles generated. There may also be excess concrete during construction which will need to be disposed of. Plastic and cardboard waste from packaging and oversupply of materials will also be generated.

Waste will also be generated from construction workers e.g. organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided onsite during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

4.3 Potential Hazardous Wastes to be produced

4.3.1 Contaminated Soil

Environmental testing (Rilta Suit) was carried out on three samples from the investigation. Landfill acceptability testing (WAC) was carried out to determine whether the material on the site could be accepted as 'inert material' by an Irish landfill. The results were compared with the published waste acceptance limits of BS EN 12457-2.

The disposal suite results indicate that the material would generally be able to be treated as Inert Waste. However, discussions about the acceptance of the material must be undertaken with individual landfills before removal of any material from site.

Only three samples were tested for analysis and although no major contamination was noted at the fieldwork locations, any localised contamination may have been missed. Therefore, a testing regime designed by an environmental engineer should be designed on any material that is to be removed from site to ensure that the material stays within the landfill acceptance criteria.

If any potentially contaminated material is encountered, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled *'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous'* [13] using the *HazWasteOnline* application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the *EC Council Decision 2003/33/EC* [14], which establishes the criteria for the acceptance of waste at landfills.

If Asbestos or Asbestos Containing Material (ACMs) are identified, the removal of asbestos will be carried out by a suitably qualified contractor will only be removed from site by a suitably permitted waste contractor. in accordance with *S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010.* All asbestos will be taken to a suitably licensed or permitted facility.

4.3.2 Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded (or stored in double-skinned tanks) and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

4.3.3 Japanese Knot Weed and Other Invasive Plant Species

Three site survey was undertaken by Openfield ecology in August 2017, October 2019 and then again in May 2020 part of the site walkovers was for the purpose of identifying and managing any schedule 3 (*Regulations SI No. 355/2015)* invasive species such as Japanese Knotweed (*Fallopia japonica)*. This included a walkover survey of the entire site and around part of the outside perimeter.

No Japanese Knotweed plant species were recorded within the property boundary.

4.3.4 Other known Hazardous Substances

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, WEEE (containing hazardous components), printer toner/cartridges, batteries (Lead, Ni-Cd or Mercury) and/or fluorescent tubes and other mercury containing waste may be generated from during C&D activities or temporary site offices. These wastes (if encountered) will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

5.0 Roles and Responsibilities

The *Best Practice Guidelines on the Preparation of Resource Waste Management Plans for Construction and Demolition Projects* promotes that a RM should be appointed. The RM may be performed by number of different individuals over the life-cycle of the Project, however it is intended to be a reliable person chosen from within the Planning/Design/Contracting Team, who is technically competent and appropriately trained, who takes the responsibility to ensure that the objectives and measures within the Project RWMP are complied with. The RM is assigned the requisite authority to meet the objective and obligations of the RWMP. The role will include the important activities of conducting waste checks/audits and adopting construction and demolition methodology that is designed to facilitate maximum reuse and/or recycling of waste.

5.1 Role of the Client

The Client are the body establishing the aims and the performance targets for the project.

- The Client has commissioned the preparation and submission of a preliminary RWMP as part of the design and planning submission;
- The Client is to commission the preparation and submission of an updated RWMP as part of the construction tendering process;
- The Client will ensure that the RWMP is agreed on and submitted to the local authority prior to commencement of works on site;
- The Client is to request the end-of-project RWMP from the Contractor.

5.2 Role of the Client Advisory Team

The Client Advisory Team or Design Team is formed of architects, consultants, quantity surveyors and engineers and is responsible for:

- Drafting and maintaining the RWMP through the design, planning and procurement phases of the project;
- Appointing a RM to track and document the design process, inform the Design Team and prepare the RWMP.
- Including details and estimated quantities of all projected waste streams with the support of environmental consultants/scientists. This should also include data on waste types (e.g. waste characterisation data, contaminated land assessments, site investigation information) and prevention mechanisms (such as by-products) to illustrate the positive circular economy principles applied by the Design Team;

- Managing and valuing the demolition work with the support of quantity surveyors;
- Handing over of the RWMP to the selected Contractor upon commencement of construction of the development, in a similar fashion to how the safety file is handed over to the Contractor;
- Working with the Contractor as required to meet the performance targets for the project.

5.3 Future Role of the Contractor

The future construction Contractors have not yet been decided upon for this RWMP. However, once selected they will have major roles to fulfil. They will be responsible for:

- Preparing, implementing and reviewing the RWMP throughout the demolition and construction phases (including the management of all suppliers and sub-contractors) as per the requirements of these guidelines;
- Identifying a designated and suitably qualified RM who will be responsible for implementing the RWMP;
- Identifying all hauliers to be engaged to transport each of the resources / wastes off-site;
- Implementing waste management policies whereby waste materials generated on site are to be segregated as far as practicable;
- Renting and operating a mobile-crusher to crush concrete for temporary reuse onsite during construction and reduce the amount of HGV loads required to remove material from site;
- Applying for the appropriate waste permit to crush concrete onsite;
- Identifying all destinations for resources taken off-site. As above, any resource that is legally classified as a 'waste' must only be transported to an authorised waste facility;
- End-of-waste and by-product notifications addressed with the EPA where required;
- Clarification of any other statutory waste management obligations, which could include on-site processing;
- Full records of all resources (both wastes and other resources) should be maintained for the duration of the project; and
- Preparing a RWMP Implementation Review Report at project handover.

6.0 Key Materials & Quantities

6.1 Project Resource Targets

Project specific resource and waste management targets for the site have not yet been set and this information should be updated for these targets once these targets have been confirmed by the client. However, it is expected for projects of this nature that a minimum of 70% of waste is fully re-used, recycled or recovered. Target setting will inform the setting of project-specific benchmarks to track target progress. Typical Key Performance Indicators (KPIs) that may be used to set targets include (as per guidelines):

- Weight (tonnes) or Volume (m^3) of waste generated per construction value;
- Weight (tonnes) or Volume (m^3) of waste generated per construction floor area (m^2);
- Fraction of resource reused on site;
- Fraction of resource notified as by-product;

- Fraction of waste segregated at source before being sent off-site for recycling/recovery; and
- Fraction of waste recovered, fraction of waste recycled, or fraction of waste disposed.

6.2 Main C&D Waste Categories

The main non-hazardous and hazardous waste streams that could be generated by the construction and demolition activities at a typical site are shown in Table 6.1. The List of Waste (LoW) code (as effected from 1 June 2015) (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

Waste Material	LoW/EWC Code
Concrete, bricks, tiles, ceramics	17 01 01-03 & 07
Wood, glass and plastic	17 02 01-03
Treated wood, glass, plastic, containing hazardous substances	17-02-04*
Bituminous mixtures, coal tar and tarred products	17 03 01*, 02 & 03*
Metals (including their alloys) and cable	17 04 01-11
Soil and stones	17 05 03* & 04
Gypsum-based construction material	17 08 01* & 02
Paper and cardboard	20 01 01
Mixed C&D waste	17 09 04
Green waste	20 02 01
Electrical and electronic components	20 01 35 & 36
Batteries and accumulators	20 01 33 & 34
Liquid fuels	13 07 01-10
Chemicals (solvents, pesticides, paints, adhesives, detergents etc.)	20 01 13, 19, 27-30
Insulation materials	17 06 04
Organic (food) waste	20 01 08
Mixed Municipal Waste	20 03 01

Table 6.1 *Typical waste types generated and EWCs (*individual waste types may contain hazardous substances)

7.0 RESOURCE AND WASTE MANAGEMENT

7.1 Demolition Waste Generation

The is no demolition associated with the proposed development

7.2 Construction Waste Generation

Table 7.1 shows the breakdown of C&D waste types produced on a typical site based on data from the EPA *National Waste Reports, the GMIT* [16] and other research reports.

Waste Types	%
Mixed C&D	33
Timber	28
Plasterboard	10
Metals	8
Concrete	6
Other	15
Total	**100**

Table 7.2 *Waste materials generated on a typical Irish construction site*

Table 7.2 shows the predicted construction waste generation for the proposed development based on the information available to date along with the targets for management of the waste streams. The predicted waste amounts are based on an average large-scale development waste generation rate per m^2, using the waste breakdown rates shown in Table 4.1.

Waste Type	Tonnes	Reuse		Recycle/Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	1207.2	10	120.7	80	965.8	10	120.7
Timber	1024.3	40	409.7	55	563.4	5	51.2
Plasterboard	365.8	30	109.7	60	219.5	10	36.6
Metals	292.7	5	14.6	90	263.4	5	14.6
Concrete	219.5	30	65.8	65	142.7	5	11.0
Other	548.7	20	109.7	60	329.2	20	109.7
Total	3658.3		830.4		2484.0		343.9

Table 7.2 *Estimated off-site reuse, recycle and disposal rates for construction waste*

In addition to the information in Table 7.2, the quantity of excavated material that will be generated has been estimated to be c. 75,800 m^3. Any suitable excavated material will be temporarily stockpiled for reuse as fill, where possible, reuse on site is expected to be limited to c. 23,300m^3. It is expected that the remaining c. 52,500m^3 of excavated material is to be removed off site for appropriate reuse, recovery and/or disposal.

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

7.3 Proposed Resource Waste Management Options

Waste materials generated will be segregated on site, where it is practical. Where the on-site segregation of certain wastes types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source where feasible. The appointed waste contractor will collect and transfer the wastes as receptacles are filled. There are numerous waste contractors in the FCC Region that provide this service.

All waste arising's will be handled by an approved waste contractor holding a current waste collection permit. All waste arising's requiring disposal off-site will be reused, recycled, recovered or disposed of at a facility holding the appropriate registration, permit or licence, as required.

Some of the sub-contractors on site will generate waste in relatively low quantities. The transportation of non-hazardous waste by persons who are not directly involved with the waste business, at weights less than or equal to 2 tonnes, and in vehicles not designed for the carriage of waste, are exempt from the requirement to have a waste collection permit (Ref. Article 30 (1) (b) of the Waste Collection Permit Regulations 2007 as amended). Any sub-contractors engaged that do not generate more than 2 tonnes of waste at any one time can transport this waste offsite in their work vehicles (which are not design for the carriage of waste). However, they are required to ensure that the receiving facility has the appropriate COR / permit / licence.

Written records will be maintained by the contractor(s) detailing the waste arising throughout the C&D phases, the classification of each waste type, waste collection permits for all waste contactors who collect waste from the site and COR/permit or licence for the receiving waste facility for all waste removed off site for appropriate reuse, recycling, recovery and/or disposal

Dedicated bunded storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc, if required.

The management of the main waste streams is outlined as follows:

<u>Top Soil & Sub Soil</u>
The Waste Management Hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling/recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction works so the preferred option (prevention and minimisation) cannot be accommodated for the excavation phase.

It is anticipated that the majority of excavated material will remain onsite however c. 12,500m^3 of excavated material is expected to be removed of site. When this material is removed off-site it could be reused as a by-product (and not as a waste), if this is done, it will be done in accordance with Article 27 of the *European Communities (Waste Directive) Regulations 2011*. Article 27 requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. Excavated material should not be removed from site until approval from the EPA has been received. The potential to reuse material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material.

The next option (beneficial reuse) may be appropriate for the excavated material pending environmental testing to classify the material as hazardous or non-hazardous in accordance with the EPA *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* publication. Clean inert material may be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial reuse of surplus excavation material as engineering fill may be subject to further testing to determine if materials meet the specific engineering standards for their proposed end-use.

Any nearby sites requiring clean fill/capping material will be contacted to investigate reuse opportunities for clean and inert material. If any of the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27. Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27. Article 27 will be investigated to see if the material can be imported onto this site for beneficial reuse instead of using virgin materials.

If the material is deemed to be a waste, then removal and reuse/recovery/disposal of the material will be carried out in accordance with the *Waste Management Acts 1996 – 2011* as amended, the *Waste Management (Collection Permit) Regulations 2007* as amended and the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

Bedrock
It is not anticipated that bedrock will be encountered during the excavation phase of this development. However, if encountered it is envisaged that all bedrock will be removed offsite and will not be crushed onsite unless the appropriate waste permit, obtained from FCC.

Silt & Sludge
During the construction phase, silt and petrochemical interception should be carried out on runoff and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed offsite.

Concrete Blocks, Bricks, Tiles & Ceramics
The majority of concrete blocks, bricks, tiles and ceramics generated as part of the construction and demolition works are expected to be clean, inert material and should be recycled, where possible.

Hard Plastic
As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.

Timber
Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be disposed of in a separate skip and recycled off-site.

Metal
Metals will be segregated into mixed ferrous, aluminium cladding, high grade stainless steel, low grade stainless steel etc., where practical and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

Plasterboard
There are currently a number of recycling services for plasterboard in Ireland. Plasterboard from the demolition and construction phases will be stored in a separate skip, pending collection for recycling. The site manager will ensure that oversupply of new plasterboard is carefully monitored to minimise waste.

Glass
Glass materials will be segregated for recycling, where possible.

Waste Electrical and Electronic Equipment (WEEE)
Any WEEE will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.

Other Recyclables
Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed off-site.

Non-Recyclable Waste
C&D waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team (see Section 9.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

Other Hazardous Wastes
On-site storage of any hazardous wastes produced (i.e. contaminated soil if encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

It should be noted that until a construction contractor is appointed it is not possible to provide information on the specific destinations of each construction waste stream. Prior to commencement of construction and removal of any construction waste offsite, details of the proposed destination of each waste stream will be provided to FCC by the project team.

7.4 Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the nominated project RM (see Section 9.0).

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Acts 1996 - 2011*, *Waste Management (Collection Permit) Regulations 2007* as amended and *Waste Management (Facility Permit & Registration) Regulations 2007* and amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project RM (see Section 9.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority waste COR/permit or EPA Waste/IE Licence for that site will be provided to the nominated project RM (see Section 9.0). If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) notification document will be obtained from DCC (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (COR, permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management recording system to be maintained on site.

8.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below.

The total cost of C&D waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

8.1 Reuse

By reusing materials on site, there will be a reduction in the transport and recycle/recovery/disposal costs associated with the requirement for a waste contractor to take the material off-site.

Clean and inert soils, gravel, stones etc. which cannot be reused on site may be used as access roads or capping material for landfill sites etc. This material is often taken free of charge or a reduced fee for such purposes, reducing final waste disposal costs.

8.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips.

Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will charge considerably less to take segregated wastes, such as recyclable waste, from a site than mixed waste.

Timber can be recycled as chipboard. Again, waste contractors will charge considerably less to take segregated wastes such as timber from a site than mixed waste.

8.3 Disposal

Landfill charges in the Leinster region are currently at around €130 - €150 per tonne which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015*. In addition to disposal costs, waste contractors will also charge a collection fee for skips.

Collection of segregated C&D waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a licensed or permitted facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill. Clean soil, rubble, etc. is also used as fill/capping material, wherever possible.

9.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the project RM to ensure commitment, operational efficiency and accountability during the C&D phases of the project.

9.1 Resource Manager Training and Responsibilities

The nominated RM will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid them in the organisation, operation and recording of the waste management system implemented on site. The RM will have overall responsibility to oversee, record and provide feedback to the client on everyday waste management at the site. Authority will be given to the RM to delegate responsibility to sub-contractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The RM will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The RM

will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this C&D WMP.

9.2 Site Crew Training

Training of site crew is the responsibility of the RM and, as such, a waste training program should be organised. A basic awareness course will be held for all site crew to outline the C&D WMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the Waste Storage Areas (WSAs). A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

10.0 TRACKING AND TRACING / RECORD KEEPING

Records should be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arising's on site.

A waste tracking log should be used to track each waste movement from the site. On exit from the site the waste collection vehicle driver should stop at the site office and sign out as a visitor and provide the security personnel or RM with a waste docket (or WTF for hazardous waste) for the waste load collected. At this time, the security personnel should complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by e.g. Contractor or subcontractor
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC/LoW

The waste vehicle will be checked by security personal or the RM to ensure it has the waste collection permit no. displayed and a copy of the waste collection permit in the vehicle before they are allowed to remove the waste from the site.

The waste transfer dockets will be transferred to the RM on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the DCC Waste Regulation Unit when requested.

Each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets / WTF maintained on file and available for inspection on site by the main contractor as required. These subcontractor logs will be merged with the main waste log.

Waste receipts from the receiving waste facility will also be obtained by the site contractor(s) and retained. A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times and will be periodically reviewed by the RM. Subcontractors who have engaged their own waste

contractors, should provide the main contractor with a copy of the waste collection permits and COR / permit / licence for the receiving waste facilities and maintain a copy on file, available for inspection on site as required.

A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be sent to the FCC Waste Regulation Unit prior to any material being removed from site.

11.0 OUTLINE WASTE AUDIT PROCEDURE

11.1 Responsibility for Waste Audit

The appointed RM will be responsible for conducting a waste audit at the site during the C&D phase of the development. Contact details for the nominated RM will be provided to the FCC Waste Regulation Unit after the main contractor is appointed and prior to any material being removed from site.

11.2 Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported off-site should be undertaken mid-way through the project. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established recovery/reuse/recycling targets for the site.

Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

Waste management costs will also be reviewed.

Upon completion of the C & D phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the development.

12.0 CONSULTATION WITH RELEVANT BODIES

12.1 Local Authority

Once construction contractors have been appointed, have appointed waste contractors and prior to removal of any C&D waste materials offsite, details of the proposed destination of each waste stream will be provided to the FCC Waste Regulation Unit.

FCC will also be consulted, as required, throughout the demolition, excavation and construction phases in order to ensure that all available waste reduction, reuse and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

12.2 Recycling/Salvage Companies

Companies that specialise in C&D waste management will be contacted to determine their suitability for engagement. Where a waste contractor is engaged, each company will be audited in order to ensure that relevant and up-to-date waste collection permits and facility COR/permits/licences are held. These permit details will be sent to the FCC Waste Regulation Unit. In addition, information regarding individual construction materials will be obtained, including the feasibility of recycling each material, the costs of recycling/reclamation and the means by which the wastes will be collected and

transported off-site, and the recycling/reclamation process each material will undergo off site.

13.0 REFERENCES

1. Waste Management Act 1996 (No. 10 of 1996) as amended.
2. Environmental Protection Act 2003, (No. 27 of 2003) as amended.
3. Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended
4. Eastern-Midlands Region Waste Management Plan 2015 – 2021 (2015).
5. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998).
6. Forum for the Construction Industry – *Recycling of Construction and Demolition Waste.*
7. Department of Environment, Communities and Local Government (DoECLG), *A Resource Opportunity - Waste Management Policy in Ireland* (2012).
8. Environmental Protection Agency (EPA) *'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021)*
9. Department of Environment, Heritage and Local Government, *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006).
10. DoELG, *Making Ireland's Development Sustainable – Review, Assessment and Future Action (World Summit on Sustainable Development)* (2002)
11. Environmental Protection Agency (EPA) *'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' (December 2021)*
12. FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers* (2002).
13. Fingal County Council (FCC), Fingal Development Plan 2017-2023 (2017)
14. Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended
15. EPA, *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015)
16. Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.
17. Environmental Protection Agency (EPA), *National Waste Database Reports 1998 – 2012*.
18. EPA and Galway-Mayo Institute of Technology (GMIT), *EPA Research Report 146 – A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned* (2015).

13. Appendix 14.2 – Operational Waste Management Plan

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OPERATIONAL WASTE MANAGEMENT PLAN FOR A RESIDENTIAL DEVELOPMENT

AT

GLEN ELLAN ROAD, HOLYBANKS, CO. DUBLIN

APPENDIX 14.2

Report Prepared For

CAIRN HOMES PROPERTIES LTD.

Report Prepared By

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Our Reference

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1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Operational Waste Management Plan (OWMP) on behalf of the Cairn Homes Properties Ltd. The proposed development will consist of the construction of a residential-led development with residential units and creche, along with all hard and soft landscaping, amenity areas, road and services.

This OWMP has been prepared to ensure that the management of waste during the operational phase of the proposed residential development is undertaken in accordance with current legal and industry standards including, the *Waste Management Act 1996 – 2011* as amended and associated Regulations [1], *Protection of the Environment Act 2003* as amended [2], *Litter Pollution Act 2003* as amended [3], the *'Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021'* [4] and the Fingal County Council *Segregation Storage, Presentation and of Household and Commercial Waste (2019)* [5]. In particular, this OWMP aims to provide a robust strategy for storing, handling, collection and transport of the wastes generated at site.

This OWMP aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. The OWMP also seeks to provide guidance on the appropriate collection and transport of waste to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil or water resources). The plan estimates the type and quantity of waste to be generated from the proposed development during the operational phase and provides a strategy for managing the different waste streams.

At present, there are no specific guidelines in Ireland for the preparation of OWMPs. Therefore, in preparing this document, consideration has been given to the requirements of national and regional waste policy, legislation and other guidelines.

2.0 OVERVIEW OF WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Government issued a policy statement in September 1998 entitled *'Changing Our Ways'* [6], which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. A heavy emphasis was placed on reducing reliance on landfill and finding alternative methods for managing waste. Amongst other things, *Changing Our Ways* stated a target of at least 35% recycling of municipal (i.e. household, commercial and non-process industrial) waste.

A further policy document, *'Preventing and Recycling Waste – Delivering Change'* was published in 2002 [7]. This document proposed a number of programmes to increase recycling of waste and allow diversion from landfill. The need for waste minimisation at source was considered a priority.

This view was also supported by a review of sustainable development policy in Ireland and achievements to date, which was conducted in 2002, entitled *'Making Irelands Development Sustainable – Review, Assessment and Future Action'* [8]. This document also stressed the need to decouple economic growth and waste generation, again through waste minimisation and reuse of discarded material.

In order to establish the progress of the Government policy document *Changing Our Ways*, a review document was published in April 2004 entitled *'Taking Stock and Moving Forward'* [9]. Covering the period 1998 – 2003, the aim of this document was to assess progress to date with regard to waste management in Ireland, to consider developments since the policy framework and the local authority waste management plans were put in place, and to identify measures that could be undertaken to further support progress towards the objectives outlined in *Changing Our Ways*.

In particular, *Taking Stock and Moving Forward* noted a significant increase in the amount of waste being brought to local authority landfills. The report noted that one of the significant challenges in the coming years was the extension of the dry recyclable collection services.

In September 2020, the government of Ireland released a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan *'A Waste Action Plan for a Circular Economy'* [10], was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to a new economy, where climate and environmental challenges are turned into opportunities, replacing the previous national waste management plan *"A Resource Opportunity"* (2012).

It aims to fulfil the commitment in the Programme for Government to publish and start implementing a new National Waste Action Plan. It is intended that this new national waste policy will inform and give direction to waste planning and management in Ireland over the coming years. It will be followed later this year by an All of Government Circular Economy Strategy. The policy document shifts focus away from waste disposal and back up the production chain. To support the policy, regulation is already in place (Circular Economy Legislative Package) or in the pipeline. The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen engagement, plastics and packaging, construction and demolition, textiles, green public procurement and waste enforcement.

One of the first actions to be taken is the development of a high-level, whole of Government Circular Economy Strategy to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity. This stratergy was issued for public consultation in April 2021.

Since 1998, the Environmental Protection Agency (EPA) has produced periodic *'National Waste (Database) Reports'* [11] detailing, among other things, estimates for household and commercial (municipal) waste generation in Ireland and the level of recycling, recovery and disposal of these materials. The *2019 National Waste Statistics*, which is the most recent study published, along with the national waste statistics web resource (November 2021) reported the following key statistics for 2019:

- **Generated –** Ireland produced 3,085,652 t of municipal waste in 2019. This is almost a 6% increase since 2018. This means that the average person living in Ireland generated 628 kg of municipal waste in 2019.
- **Managed –** Waste collected and treated by the waste industry. In 2019, a total of 3,036,991 t of municipal waste was managed and treated.
- **Unmanaged –**Waste that is not collected or brought to a waste facility and is, therefore, likely to cause pollution in the environment because it is burned, buried or dumped. The EPA estimates that 48,660 t was unmanaged in 2019.
- **Recovered –** The amount of waste recycled, used as a fuel in incinerators, or used to cover landfilled waste. In 2019, around 83% of municipal waste was recovered – a decrease from 84% in 2018.
- **Recycled –** The waste broken down and used to make new items. Recycling also includes the breakdown of food and garden waste to make compost. The recycling rate in 2019 was 37%, which is down from 38% in 2018.
- **Disposed –** Less than a sixth (15%) of municipal waste was landfilled in 2019. This is an increase from 14% in 2018.

2.2 Regional Level

The proposed development is located in the Local Authority area of Fingal County Council (FCC).

The *EMR Waste Management Plan 2015 – 2021* is the regional waste management plan for the FCC area which was published in May 2015. The regional plan sets out the following strategic targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2012.*

The *Fingal Development Plan 2017 – 2023* [13] came into effect on March 2017 and sets out a number of policies and objectives for the Fingal region in line with the objectives of the regional waste management plan.

Waste objectives with a particular relevance to the proposed development are:

<u>Objectives:</u>

- *Objective **WM03** Implement the provisions of the Eastern Midlands Region Waste Management Plan 2015 -2021 or any subsequent Waste Management Plan applicable within the lifetime of the Development Plan. All prospective developments in the County will be expected to take account of the provisions of the Regional Waste Management Plan and adhere to the requirements of that Plan.*
- *Objective **WM05** Prevent and minimise the generation of waste in accordance with the Eastern Midlands Region Waste Management Plan 2015 -2021 (or any subsequent plans).*
- *Objective **WM07** Promote the increased re-use of waste in accordance with the Eastern Midlands Region Waste Management Plan 2015-2021 (or any subsequent plan)."*
- *Objective **DMS36** Ensure all new residential schemes include appropriate design measures for refuse storage areas, details of which should be clearly shown at pre-planning and planning application stage. Ensure refuse storage areas are not situated immediately adjacent to the front door or ground floor window, unless adequate screened alcoves or other such mitigation measures are provided.*
- *Objective **DMS37** Ensure the maximum distance between the front door to a communal bin area does not exceed 50 metres.*

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 as amended
- Environmental Protection Act 1992 (S.I. No. 7 of 1992) as amended;
- Litter Pollution Act 1997 (Act No. 12 of 1997) as amended and
- Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended [14]

These Acts and subordinate Regulations enable the transposition of relevant European Union Policy and Directives into Irish law.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the *Waste Management Act 1996 - 2011* and subsequent Irish legislation, is the principle of *"Duty of Care"*. This implies that the waste producer is responsible for waste from the time it is generated through until its legal disposal (including its method of disposal.) As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final disposal area, waste contractors will be employed to physically transport waste to the final waste disposal site.

It is therefore imperative that the residents, tenants and proposed facilities management company undertake on-site management of waste in accordance with all legal requirements and employ suitably permitted/licenced contractors to undertake off-site management of their waste in accordance with all legal requirements. This includes the requirement that a waste contactor handle, transport and reuse/recover/recycle/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended or a waste or IED (Industrial Emissions Directive) licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

2.3.1 Fingal County Council Waste Bye-Laws

The FCC "Fingal County Council (Segregation Storage, Presentation and of Household and Commercial Waste) Bye-Laws (2020)" came into operation on the 1st of April 2020. These bye-laws repeal the previous 'Fingal County Council *Bye-Laws for the Storage, Presentation and Collection of Household Waste (2006)'*. The Bye-Laws set a number of enforceable requirements on waste holders with regard to storage, separation and presentation of waste within the FCC functional area. Key requirements under these Bye-Laws of relevance to the proposed development include the following

- Kerbside waste presented for collection shall not be presented for collection earlier than 6.00 pm on the day immediately preceding the designated waste collection day;
- All containers used for the presentation of kerbside waste and any uncollected waste shall be removed from any roadway, footway, footpath or any other public place no later than 9:00am on the day following the designated waste collection day, unless an alternative arrangement has been approved in accordance with bye-law 4;
- Documentation, including receipts, is obtained and retained for a period of no less than one year to provide proof that any waste removed from the premises has been managed in a manner that conforms to these bye-laws, to the Waste Management Act and, where such legislation is applicable to that person, to the European Union (Household Food Waste and Bio-Waste) Regulations 2015; and
- Adequate access and egress onto and from the premises by waste collection vehicles is maintained.

The full text of the Waste Bye-Laws is available from the FCC website.

2.4 Regional Waste Management Service Providers and Facilities

Various contractors offer waste collection services for the residential sector in the FCC region. Details of waste collection permits (granted, pending and withdrawn) for the region are available from the NWCPO.

As outlined in the regional waste management plan, there is a decreasing number of landfills available in the region. Only three municipal solid waste landfills remain operational and are all operated by the private sector. There are a number of other licensed and permitted facilities in operation in the region including waste transfer stations, hazardous waste facilities and integrated waste management facilities. There are two existing thermal treatment facilities, one in Duleek, Co. Meath and a second facility in Poolbeg in Dublin.

The closest civic amenity centre can be found at Estuary Recyling Centre c. 1.70km away to the south east, the civic amenity centre can be used for the disposal of other household wastes as outlined in section 5.5.

A copy of all CORs and waste permits issued by the Local Authorities are available from the NWCPO website and all waste/IE licenses issued are available from the EPA.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location, Size and Scale of the Development

The proposed development is for a residential scheme on a site with an area of c. 14.17gross) hectares within the Estuary West Lands at Holybanks, Swords, Co. Dublin. The scheme will comprise the development of 621 no. residential units comprising 349 no. apartments, 118 no. houses, 154 no. Build to Rent duplexes and a c. 523.6 sq.m créche facility. The development will have a total gross floor area (GFA) c. 61,591 sq.m including all built form on site. The proposal also includes the provision of public open space, vehicular access from Glen Ellan Road, all associated ancillary works including site development works, and hard and soft landscaping.

3.2 Typical Waste Categories

The typical non-hazardous and hazardous wastes that will be generated at the proposed development will include the following:

- Dry Mixed Recyclables (DMR) - includes wastepaper (including newspapers, magazines, brochures, catalogues, leaflets), cardboard and plastic packaging, metal cans, plastic bottles, aluminium cans, tins and Tetra Pak cartons;
- Organic waste – food waste and green waste generated from internal plants/flowers;
- Glass; and
- Mixed Non-Recyclable (MNR)/General Waste.

In addition to the typical waste materials that will be generated at the development on a daily basis, there will be some additional waste types generated in small quantities which will need to be managed separately including:

- Green/garden waste may be generated from internal plants or external landscaping;
- Batteries (both hazardous and non-hazardous);

- Waste electrical and electronic equipment (WEEE) (both hazardous and non-hazardous);
- Printer cartridges/toners;
- Chemicals (paints, adhesives, resins, detergents, etc.) ;
- Lightbulbs;
- Textiles (rags);
- Waste cooking oil (if any generated by the residents or childcare tenants);
- Furniture (and from time to time other bulky wastes); and
- Abandoned bicycles.

Wastes should be segregated into the above waste types to ensure compliance with waste legislation and guidance while maximising the re-use, recycling and recovery of waste with diversion from landfill wherever possible.

3.3 European Waste Codes

In 1994, the *European Waste Catalogue* [15] and *Hazardous Waste List* [16] were published by the European Commission. In 2002, the EPA published a document titled the *European Waste Catalogue and Hazardous Waste List* [17], which was a condensed version of the original two documents and their subsequent amendments. This document has recently been replaced by the EPA '*Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous'* [18] which became valid from the 1st June 2015. This waste classification system applies across the EU and is the basis for all national and international waste reporting, such as those associated with waste collection permits, COR's, permits and licences and EPA National Waste Database.

Under the classification system, different types of wastes are fully defined by a code. The List of Waste (LoW) code (also referred to as European Waste Code or EWC) for typical waste materials expected to be generated during the operation of the proposed development are provided in Table 3.1 below

Waste Material	LoW/EWC Code
Paper and Cardboard	20 01 01
Plastics	20 01 39
Metals	20 01 40
Mixed Non-Recyclable Waste	20 03 01
Glass	20 01 02
Biodegradable Kitchen Waste	20 01 08
Oils and Fats	20 01 25
Textiles	20 01 11
Batteries and Accumulators*	20 01 33* - 34
Printer Toner/Cartridges*	20 01 27* - 28
Green Waste	20 02 01
WEEE*	20 01 35*-36
Chemicals (solvents, pesticides, paints & adhesives, detergents, etc.) *	20 01 13*/19*/27*/28/29*30
Fluorescent tubes and other mercury containing waste*	20 01 21*
Bulky Wastes	20 03 07

** Individual waste type may contain hazardous materials*

Table 3.1 Typical Waste Types Generated and LoW Codes

4.0 ESTIMATED WASTE ARISINGS

A waste generation model (WGM) developed by AWN, has been used to predict waste types, weights and volumes arising from operations within the proposed development. The WGM incorporates building area and use and combines these with other data including Irish and US EPA waste generation rates.

The estimated quantum/volume of waste that will be generated from the residential units has been determined based on the predicted occupancy of the units. While the waste estimates for the creche unit has been based on area use per m^2.

The estimated waste generation for the development for the main waste types is presented in Table 4.1, 4.2 and 4.3.

Waste type	Waste Volume (m^3/week)			
	Residential Block A1/A2 (Combined)	Residential Block B (Combined)	Residential House 3 - Bed (Individual)	Residential House 4 - Bed (Individual)
Organic Waste	2.11	3.09	0.02	0.02
DMR	14.94	21.93	0.13	0.18
Glass	0.41	0.60	0.01	0.01
MNR	7.86	11.53	0.08	0.09
Total	**25.32**	**37.15**	**0.24**	**0.30**

Table 4.1 Estimated waste generation for the proposed development for the main waste types

Waste type	Waste Volume (m^3/week)			
	Duplex Type 1 (Combined) 4 no. 2 bed 4 no. 3 bed	Duplex Type 2 (Combined) 5 no. 2 bed 5 no. 3 bed	Duplex Type 3 (Combined) 6 no. 2 bed 6 no. 3 bed	Duplex Type 4 (Combined) 8 no. 2 bed 8 no. 3 bed
Organic Waste	0.14	0.18	0.22	0.29
DMR	0.98	1.27	1.47	2.03
Glass	0.03	0.03	0.04	0.06
MNR	0.57	0.67	0.85	1.07
Total	**1.72**	**2.15**	**2.58**	**3.44**

Table 4.2 Estimated waste generation for the proposed development for the main waste types

Waste type	Waste Volume (m^3/week)	
	Creche Unit (Individual)	Maisonette 1 – bed (Individual)
Organic Waste	0.04	0.01
DMR	1.47	0.08
Glass	0.01	0.01
MNR	0.80	0.04
Total	**2.32**	**0.14**

Table 4.3 Estimated waste generation for the proposed development for the main waste types

The BS5906:2005 Waste Management in Buildings – Code of Practice [19] was considered in the estimations of the waste arising. It has been assumed that waste will be generated by the residents over a 7-day period, while the childcare facility will operate over a 5-day period. It is anticipated that the conservative estimation of waste quantities from the residential units will be sufficient to cover the small quantities likely to be generated in the communal areas on a weekly basis.

5.0 WASTE STORAGE AND COLLECTION

This section provides information on how waste generated within the development will be stored and how the waste will be collected from the development. This has been prepared with due consideration of the proposed site layout as well as best practice standards, local and national waste management requirements including those of FCC. In particular, consideration has been given to the following documents:

- BS 5906:2005 Waste Management in Buildings – Code of Practice;
- EMR Waste Management Plan 2015 – 2021;
- DoHLGH*, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities* (2020) [20];
- *Fingal County Council Development Plan 2017 – 2023* (2017); and
- Fingal County Council *Segregation Storage, Presentation and of Household and Commercial Waste (2019)*

Unit Block

4 no. shared communal Waste Storage Areas (WSAs) have been allocated within the development design for the residential apartment blocks. Bin storage areas are proposed in the basements for Block B and in the undercroft for block A1/A2 adjacent to circulation cores and in secure well detailed structures located at grade. Stores are typically arranged around the circulation cores for the convenience of end users.

Duplex Units

14 no. shared external WSAs have been allocated in the development design for use by the duplex units. Duplex blocks will be served by communal bin stores in the form of sheltered enclosures. Please refer to PL 63 of Architect`s drawings.

Houses and Maisonettes

Houses and maisonettes will have their own individual WSAs allocated at the rear of their home where external access to the rear yard is possible. When external access to the rear of the property is unavailable (such as the terraced houses), bins will be stored at the front of the unit, shielded from view of the road.

Creche

The creche unit will also have their own WSA allocated externally next to Block B

The waste receptacles from the apartment block and duplex WSAs will be brought by personnel nominated by the facilities management company to the curtilage for collection. Residents in houses will be responsible for taking their owns bins to the curb for collection.

Using the estimated waste generation volumes in Table 4.1, 4.2 and 4.3, the waste receptacle requirements for MNR, DMR, organic waste and glass have been established for the WSAs. These are presented in Table 5.1.

Area/Use	Bins Required			
	MNR*	DMR**	Organic	Glass
Houses (Individual)	1 x 240L	1 x 240L	1 x 120L	Bottle Bank
Childcare Facility	1 x 1100L	2 x 1100L	1 x 240L	1 x 120L
Residential Apartment Block A1 / A2 (Shared)	9 x 1100L	15 x 1100L	10 x 240L	2 x 240L
Residential Apartment Block B (Shared)	11 x 1100L	20 x 1100L	13 x 240L	3 x 240L
Duplex Type 1 (Combined) 4 no. 2 bed 4 no. 3 bed	1 x 1100L	1 x 1100L	1 x 240L	1 x 120L
Duplex Type 2 (Combined) 5 no. 2 bed 5 no. 3 bed	1 x 1100L	2 x 1100L	1 x 240L	1 x 240L
Duplex Type 3 (Combined) 6 no. 2 bed 6 no. 3 bed	1 x 1100L	2 x 1100L	1 x 240L	1 x 240L
Duplex Type 4 (Combined) 8 no. 2 bed 8 no. 3 bed	1 x 1100L	2 x 1100L	2 x 240L	1 x 240L

*Note: * = Mixed Non-Recyclables*
*** = Dry Mixed Recyclables*

Table 5.1 *Waste storage requirements for the proposed development*

The waste receptacle requirements have been established from distribution of the total weekly waste generation estimate into the holding capacity of each receptacle type.

Waste storage receptacles as per Table 5.1 above (or similar appropriate approved containers) will be provided by the facilities management company in the shared residential WSAs. Residents in houses will be responsible for providing their own bins.

The types of bins used will vary in size, design and colour dependent on the appointed waste contractor. However, examples of typical receptacles to be provided in the WSAs are shown in Figure 5.1. All waste receptacles used will comply with the SIST EN 840-1:2020 and SIST EN 840-2:2020 standard for performance requirements of mobile waste containers, where appropriate.

Figure 5.1 *Typical waste receptacles of varying size (240L and 1100L)*

5.1 Waste Storage – Apartment Block & Duplex Units

Residents will be required to segregate waste into the following main waste streams:

- DMR;
- Organic waste;
- Glass; and
- MNR.

Residents will be required to take their segregated waste materials to their designated residential WSA and dispose of their segregated waste into the appropriate bins.

Each bin/container in the WSAs will be clearly labelled and colour coded to avoid cross contamination of the different waste streams. Signage will be posted above or on the bins to show exactly which waste types can be placed in each bin.

Access to the apartment and duplex blocks WSAs will be restricted to authorised residents, facilities management and waste contractors by means of a key or electronic fob access.

Using the estimated figures in Table 4.1, DMR, MNR, organic waste and glass will be collected on a weekly basis. At the designated collection times, bins will be brought by personnel nominated by the facilities management company from the shared WSAs directly to the collection point at the closest road.

Other waste materials such as textiles, batteries, printer toner/cartridges and WEEE may be generated infrequently by the residents. Residents will be required to identify suitable temporary storage areas for these waste items within their own units and dispose of them appropriately. Further details on additional waste types can be found in Section 5.5.

5.2 Waste Storage – Houses and Maisonette

Residents in the houses and maisonette will be required to segregate their waste into the following waste categories within their own units:

- DMR;
- Organic waste;
- Glass; and
- MNR.

It is anticipated that residents with external access to the rear of the property and will store waste in bins at the back of the house. For houses with no external access to the rear, a dedicated shielded area for storage of 1no. 240l and 2 no. 140l litre wheelie bins have been allocated at the front or side of the property.

Residents will be required to place their segregated waste materials into these bins as necessary.

It is anticipated that DMR, MNR and organic waste will be collected on a weekly basis. Glass waste will be required to be brought to the nearest bottle bank for disposal.

Other waste materials such as textiles, batteries, printer toner/cartridges and WEEE may be generated infrequently by the residents. Residents will be required to identify suitable temporary storage areas for these waste items within their own units and dispose of them appropriately. Further details on additional waste types can be found in Section 5.5.

5.3 Waste Storage – Creche

Staff will be required to segregate their waste into the following waste categories within their the creche:

- DMR;
- Organic waste;
- Glass; and
- MNR.

As required, the staff will need to bring segregated DMR, MNR, glass and organic waste to the dedicated commercial WSA.

Each bin/container in the WSAs will be clearly labelled and colour coded to avoid cross contamination of the different waste streams. Signage will be posted above or on the bins to show exactly which waste types can be placed in each bin.

Access to the WSA will be restricted to authorised childcare facility staff and building management by means of a key or electronic fob access.

Based on the recommended bin requirements in Table 5.1, DMR, MNR and organic waste will be required to be collected weekly and glass will be collected as required.

Other waste materials such as textiles, batteries, printer toner/cartridges and WEEE may be generated infrequently by the staff. staff will be required to identify suitable temporary storage areas for these waste items within the creche and dispose of them appropriately. Further details on additional waste types can be found in Section 5.5.

5.4 Waste Collection

There are numerous private contractors that provide waste collection services in the Fingal County area. All waste contractors servicing the proposed development must hold a valid waste collection permit for the specific waste types collected. All waste collected must be transported to registered/permitted/licensed facilities only.

All residential waste from shared WSAs, requiring collection by the appointed waste contractor will be transferred from the WSAs by personnel nominated by facilities management company to the collection point. Residents in houses will be responsible for transferring their own bins to/from their individual WSA to the street for collection. While tenants in the creche will also be responsible for transferring their waste to the street for collection.

It is recommended that bin collection times/days are staggered to reduce the number of bins required to be emptied at once and the time the waste vehicle is onsite. This will be determined during the process of appointment of a suitable waste contractor.

5.5 Additional Waste Materials

In addition to the typical waste materials that are generated on a daily basis, there will be some additional waste types generated from time to time that will need to be managed separately. A non-exhaustive list is presented below.

<u>Green waste</u>
Green waste may be generated from gardens, external landscaping and internal plants/flowers. Green waste generated from landscaping of external areas will be removed by external landscape contractors. Green waste generated from gardens internal plants/flowers can be placed in the organic waste bins.

Batteries

A take-back service for waste batteries and accumulators (e.g. rechargeable batteries) is in place in order to comply with the Waste Management Batteries and Accumulators Regulations 2014 as amended. In accordance with these regulations consumers are able to bring their waste batteries to their local civic amenity centre or can return them free of charge to retailers which supply the equivalent type of battery, regardless of whether or not the batteries were purchased at the retail outlet and regardless of whether or not the person depositing the waste battery purchases any product or products from the retail outlet.

The creche tenant cannot use the civic amenity centre. They must segregate their waste batteries and either avail of the take-back service provided by retailers or arrange for recycling/recovery of their waste batteries by a suiltably permited/licenced contractor. Facilties management may arrange collection depending on the agreement.

Waste Electrical and Electronic Equipment (WEEE)

The *WEEE Directive 2002/96/EC* and associated Waste Management (WEEE) Regulations have been enacted to ensure a high level of recycling of electronic and electrical equipment. In accordance with the regulations, consumers can bring their waste electrical and electronic equipment to their local recycling centre. In addition consumers can bring back WEEE within 15 days to retailers when they purchase new equipment on a like for like basis. Retailers are also obliged to collect WEEE within 15 days of delivery of a new item, provided the item is disconnected from all mains, does not pose a health and safety risk and is readily available for collection.

As noted above, the commercial tenants cannot use the civic amenity centre. They must segregate their WEEE and either avail of the take-back/collection service provided by retailers or arrange for recycling/recovery of their WEEE by a suitably permited/licenced contractor. Facilties management may arrange collection depending on the agreement.

Printer Cartridge/Toners

It is recommended that a printer cartridge/toner bin is provided in the commercial units, where appropriate. The creche tenant will be required to store this waste within their unit and arrange for return to retailers or collection by an authorised waste contractor, as required.

Waste printer cartridge/toners generated by residents can usually be returned to the supplier free of charge or can be brought to a civic amenity centre.

Chemicals (solvents, paints, adhesives, resins, detergents etc)

Chemicals (such as solvents, paints etc) are largely generated from building maintenance works. Such works are usually completed by external contractors who are responsible for the off-site removal and appropriate recovery/recycling/disposal of any waste materials generated.

Any waste cleaning products or waste packaging from cleaning products generated in the creche unit that is classed as hazardous (if they arise) will be appropriately stored within the tenants own space. Facilties management may arrange collection depending on the agreement.

Any waste cleaning products or waste packaging from cleaning products that are classed as hazardous (if they arise) generated by the residents should be brought to a civic amenity centre.

Light Bulbs (Fluorescent Tubes, Long Life, LED and Lilament bulbs)

Waste light bulbs may be generated by lighting at the commercial tenants. It is anticipated that creche tenant will be responsible for the off-site removal and appropriate recovery/disposal of these wastes. Facilties management may arrange collection depending on the agreement.

Light bulbs generated by residents should be taken to the nearest civic amenity centre for appropriate storage and recovery/disposal.

Textiles
Where possible, waste textiles should be recycled or donated to a charity organisation for reuse.

Waste Cooking Oil
If the creche tenant use cooking oil, waste cooking oil will need to be stored within the unit on a bunded area or spill pallet and regular collections by a dedicated waste contractor will need to be organised as required. Under sink grease traps will be installed in any cooking space.

If the residents generate waste cooking oil, this can be brought to a civic amenity centre.

Furniture (and other bulky wastes)
Furniture and other bulky waste items (such as carpet etc.) may occasionally be generated by the creche tenant. The collection of bulky waste will be arranged as required by the tenant. If residents wish to dispose of furniture, this can be brought a civic amenity centre.

5.6 Waste Storage Area Design

The shared WSAs will be designed and fitted-out to meet the requirements of relevant design standards, including:

- Be fitted with a non-slip floor surface;
- Provide ventilation to reduce the potential for generation of odours with a recommended 6-10 air changes per hour for a mechanical system for internal WSAs;
- Provide suitable lighting – a minimum Lux rating of 220 is recommended;
- Be easily accessible for people with limited mobility;
- Be restricted to access by nominated personnel only;
- Be supplied with hot or cold water for disinfection and washing of bins;
- Be fitted with suitable power supply for power washers;
- Have a sloped floor to a central foul drain for bins washing run-off;
- Have appropriate signage placed above and on bins indicating correct use;
- Have access for potential control of vermin, if required; and
- Be fitted with CCTV for monitoring.

The facilities management company will be required to maintain the waste storage areas in good condition as required by the FCC Waste Bye-Laws.

6.0 CONCLUSIONS

In summary, this OWMP presents a waste strategy that complies with all legal requirements, waste policies and best practice guidelines and demonstrates that the required storage areas have been incorporated into the design of the development.

Implementation of this OWMP will ensure a high level of recycling, reuse and recovery at the development. All recyclable materials will be segregated at source to reduce

waste contractor costs and ensure maximum diversion of materials from landfill, thus achieving the targets set out in the *EMR Waste Management Plan 2015 – 2021*.

Adherence to this plan will also ensure that waste management at the development is carried out in accordance with the requirements of the *FCC Waste Bye-Laws.*

The waste strategy presented in this document will provide sufficient storage capacity for the estimated quantity of segregated waste. The designated area for waste storage will provide sufficient room for the required receptacles in accordance with the details of this strategy.

7.0 REFERENCES

1. Waste Management Act 1996 as amended
2. Protection of the Environment Act 2003, (No. 27 of 2003) as amended
3. Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended
4. Eastern-Midlands Waste Region, *Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021* (2015)
5. Fingal County Council (FCC), *Segregation Storage, Presentation and of Household and Commercial Waste (2020).*
6. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998)
7. Department of Environment, Heritage and Local Government (DoEHLG) *Preventing and Recycling Waste - Delivering Change* (2002)
8. DoELG, *Making Ireland's Development Sustainable – Review, Assessment and Future Action (World Summit on Sustainable Development)* (2002)
9. DoEHLG, *Taking Stock and Moving Forward* (2004)
10. Department of Communications, Climate Action and Environment (DCCAE), *Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025* (Sept 2020).
11. DoECLG, *A Resource Opportunity - Waste Management Policy in Ireland* (2012)
12. DoELG, *Making Ireland's Development Sustainable – Review, Assessment and Future Action (World Summit on Sustainable Development)* (2002)
13. Environmental Protection Agency (EPA), *National Waste Database Reports 1998 – 2017*.
14. FCC*, Fingal County Development Plan 2017 – 2023* (2017)
15. Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended 2010 (S.I. No. 30 of 2010) and 2015 (S.I. No. 310 of 2015).
16. European Waste Catalogue - Council Decision 94/3/EC (as per Council Directive 75/442/EC).
17. Hazardous Waste List - Council Decision 94/904/EC (as per Council Directive 91/689/EEC).
18. EPA, *European Waste Catalogue and Hazardous Waste List* (2002)
19. EPA, *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015).
20. BS 5906:2005 Waste Management in Buildings – Code of Practice.
21. Department of Environment, Housing and Local Government (DoEHLG)*, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities* (2020).

13. Appendix 15.1 -

ESB Networks

TITLE: 20190402-021_A3

COLOUR CODE:

- BLACK - 38KV & HIGHER VOLTAGE OVERHEAD LINES
- GREEN - MV(10KV/20KV) OVERHEAD LINES
- BLUE - LV (400V/230V) OVERHEAD LINES
- CYAN - 38KV & HIGHER VOLTAGE UNDERGROUND CABLE ROUTES
- RED - MV/LV (10KV/20KV/400V/230V) UNDERGROUND CABLE ROUTES

DATE: 02-Apr-2019

** SCALE: 1:2200

** SCALE WHEN PRINTED ON AN A3 PAGE
XY COORDINATES DISPLAYED IN IRISH GRID COORDINATE SYSTEM

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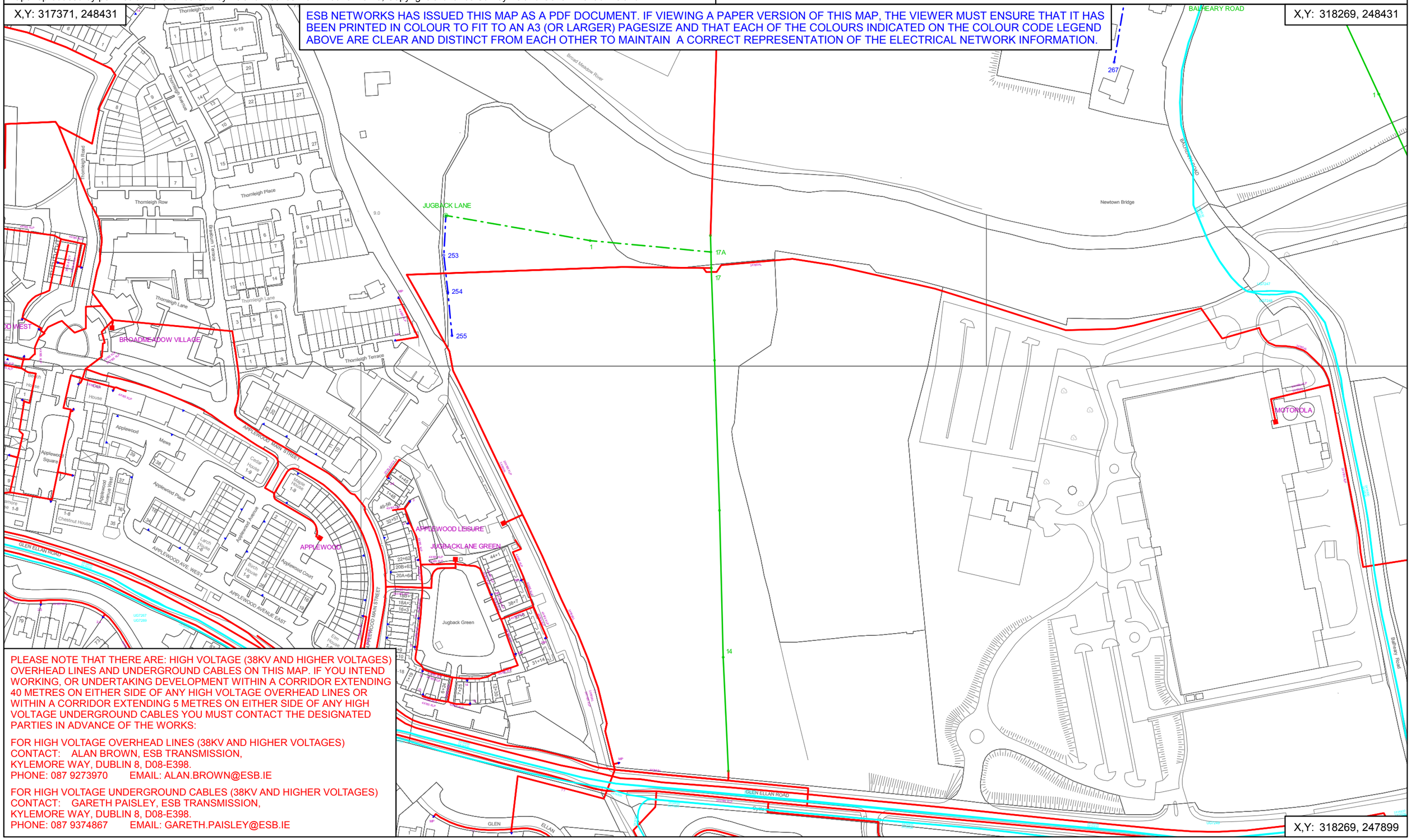
WARNING

THIS MAP INDICATES THE APPROXIMATE LOCATION OF ESB TRANSMISSION (400KV, 220KV, 110KV, 38KV) AND DISTRIBUTION (20KV, 10KV, 230V/400V) UNDERGROUND CABLES AND OVERHEAD LINES IN THE GENERAL AREA OF THE PROPOSED WORKS. ESB NETWORKS TAKES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE MAP. IT IS THE USER'S RESPONSIBILITY TO INDEPENDENTLY VERIFY THE INFORMATION AND THE LOCATION OF UNDERGROUND CABLES AND OVERHEAD LINES. LOW VOLTAGE (230V/400V) SERVICE CABLES (E.G. HOUSE SERVICES, FACTORY/SHOP SERVICES, PUBLIC LIGHTING LAMP SERVICES, ETC) ARE NOT INCLUDED BUT THEIR PRESENCE SHOULD BE ANTICIPATED. THE DEPTHS OF UNDERGROUND CABLES MUST NEVER BE ASSUMED. ADDITIONAL MORE DETAILED INFORMATION IS AVAILABLE FOR HIGH VOLTAGE TRANSMISSION UNDERGROUND CABLES (38KV, 110KV, 220KV, 400KV) FROM THE LOCAL ESB NETWORKS TRANSMISSION REPRESENTATIVE - SEE ATTACHED LIST FOR CONTACT DETAILS OR CALL 1850 372 757. NO WORK SHOULD BE CARRIED OUT IN THE VICINITY OF 38KV OR HIGHER VOLTAGE UNDERGROUND CABLES WITHOUT PRIOR CONSULTATION WITH ESB NETWORKS. BEFORE ANY MECHANICAL EXCAVATION IS UNDERTAKEN, THE ACTUAL LOCATION OF ALL UNDERGROUND ELECTRICITY CABLES MUST BE ESTABLISHED AND VERIFIED ON THE SITE USING: (A) UP-TO-DATE MAP RECORDS; (B) CABLE LOCATER EQUIPMENT OPERATED IN BOTH POWER AND RADIO MODES; (C) CAREFUL HAND DIGGING OF TRIAL HOLES USING 'SAFE DIGGING PRACTICE'. REFER ALSO TO 'HSA CODE OF PRACTICE FOR AVOIDING DANGER FROM UNDERGROUND SERVICES'. ESB TAKES NO RESPONSIBILITY FOR AND SHALL BEAR NO LIABILITY, HOWSOEVER ARISING, IN RELATION TO ANY DAMAGE, INJURY/DEATH OR LOSS OF SUPPLY AS A RESULT OF DAMAGE OR INTERFERENCE WITH ITS NETWORKS.

ESB NETWORKS HAS ISSUED THIS MAP AS A PDF DOCUMENT. IF VIEWING A PAPER VERSION OF THIS MAP, THE VIEWER MUST ENSURE THAT IT HAS BEEN PRINTED IN COLOUR TO FIT TO AN A3 (OR LARGER) PAGESIZE AND THAT EACH OF THE COLOURS INDICATED ON THE COLOUR CODE LEGEND ABOVE ARE CLEAR AND DISTINCT FROM EACH OTHER TO MAINTAIN A CORRECT REPRESENTATION OF THE ELECTRICAL NETWORK INFORMATION.



PLEASE NOTE THAT THERE ARE: HIGH VOLTAGE (38KV AND HIGHER VOLTAGES) OVERHEAD LINES AND UNDERGROUND CABLES ON THIS MAP. IF YOU INTEND WORKING, OR UNDERTAKING DEVELOPMENT WITHIN A CORRIDOR EXTENDING 40 METRES ON EITHER SIDE OF ANY HIGH VOLTAGE OVERHEAD LINES OR WITHIN A CORRIDOR EXTENDING 5 METRES ON EITHER SIDE OF ANY HIGH VOLTAGE UNDERGROUND CABLES YOU MUST CONTACT THE DESIGNATED PARTIES IN ADVANCE OF THE WORKS:

FOR HIGH VOLTAGE OVERHEAD LINES (38KV AND HIGHER VOLTAGES)
CONTACT: ALAN BROWN, ESB TRANSMISSION,
KYLEMORE WAY, DUBLIN 8, D08-E398.
PHONE: 087 9273970 EMAIL: ALAN.BROWN@ESB.IE

FOR HIGH VOLTAGE UNDERGROUND CABLES (38KV AND HIGHER VOLTAGES)
CONTACT: GARETH PAISLEY, ESB TRANSMISSION,
KYLEMORE WAY, DUBLIN 8, D08-E398.
PHONE: 087 9374867 EMAIL: GARETH.PAISLEY@ESB.IE

14. Appendix 15.2 -

Important Safety Notice:
Damage to gas pipelines can result in serious injury or death. Gas network information is provided as a general guide. The exact location and depth of medium or low pressure distribution gas pipes must be verified on site by carrying out necessary investigations, including, for example, hand digging trial holes along the route of the pipe.
Service pipes are not generally shown but their presence should always be anticipated.

High pressure transmission pipelines are shown in red. If a transmission pipeline is identified within 10m of any intended excavations then work must not proceed before GNI has been consulted. The true location and depth of a transmission pipeline must be verified on site by a representative of GNI. Contact can be made through 1850 427 747.

All work in the vicinity of the gas network must be completed in accordance with the current edition of the Health & Safety Authority publication, Code of Practice For Avoiding Danger From Underground Services which is available from the Health and Safety Authority (1890 289 389) or can be downloaded at www.hsa.ie.

Legal Notice:
Gas Networks Ireland (GNI) and its affiliates, accept no responsibility for the accuracy of any information contained in this document including data concerning location and technical designation of the gas distribution and transmission network (the Information). The Information should not be relied on for accurate distance or depth of cover measurements.

Any representations and warranties, express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation, direct, indirect or consequential loss, arising out of or in connection with the use or re-use of the Information.

- Aurora Telecom Fibre Optic Cable
- Aurora Telecom Duct
- Aurora Telecom Sub-duct
- Aurora Telecom Inserted Gas Pipe

Contact Aurora Telecom on 1850-427-399 or (01)203-0120.

- Transmission Pipe (High Pressure)
- Transmission Pipe (Construction Issue)
- Distribution Pipe (Medium Pressure)
- Distribution Pipe (Low Pressure)
- Service Pipe (Medium Pressure)
- Service Pipe (Low Pressure)
- Strategic Pipe (Medium Pressure)
- Strategic Pipe (Low Pressure)
- Inserted Pipe (Medium Pressure)
- Inserted Pipe (Low Pressure)
- Distribution Pipe (Abandoned)

.C=?	Cover (depth in meters)		Pressure Monitor
	CP Test Point		Protection (Sleeve)
	End Cap		Protection (Slabbing)
	Hot Tap		Reducer
	Installation		Service Terminator
	Valve		Tee
	Mains Verification **		Transition

** Please contact GNI on 1850-427747 for specific information.

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Design Department - CORK

Gas Networks Ireland

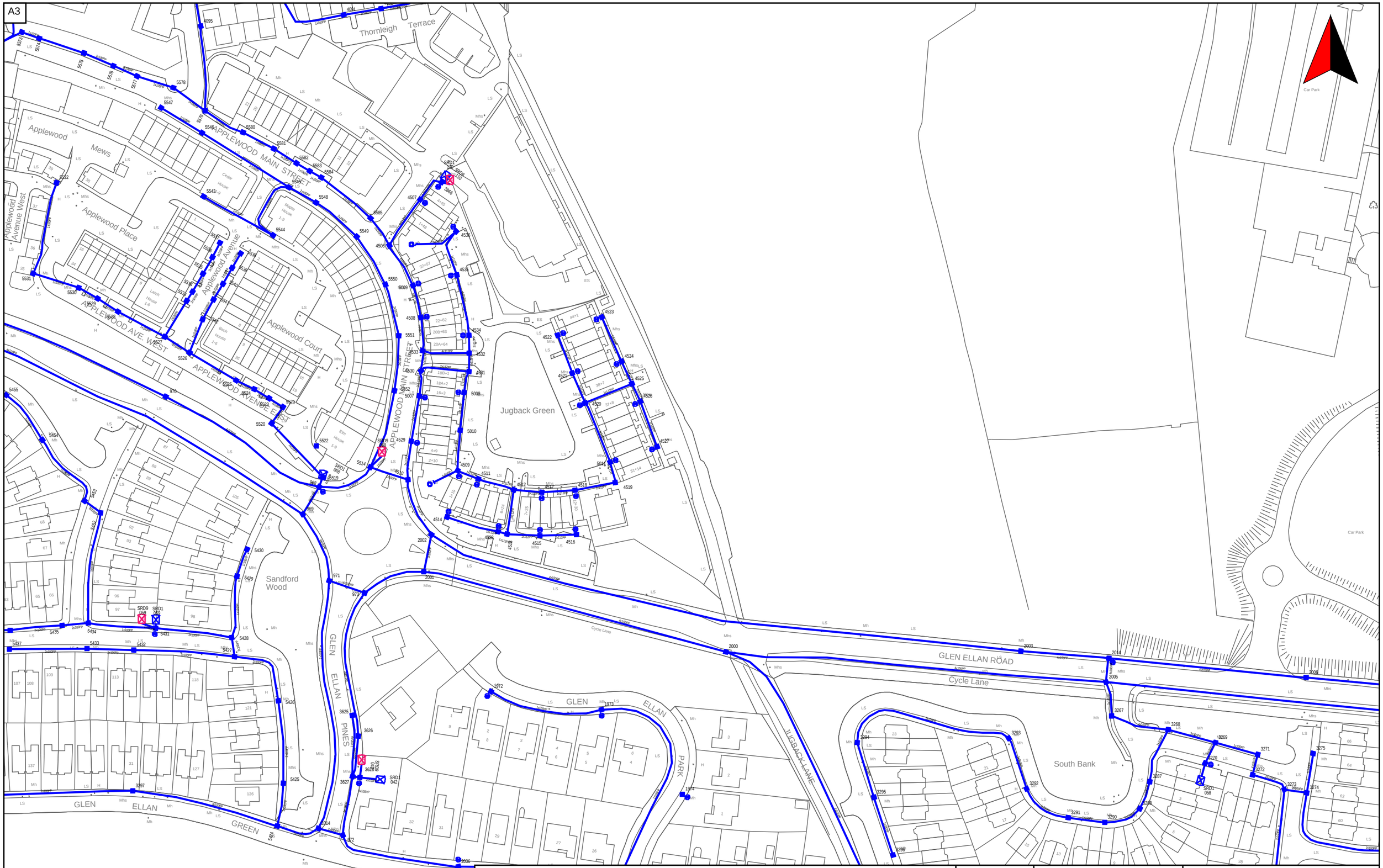
GAS NETWORK INFORMATION

Issue: Waterman Moylan	
Location: Holybanks Swords	
Plot Date: 02/04/2019	Contact: E Pawar
Plotted by: KOC	Scale: 1:1000

Not Archived - Alternative : [Network Maintenance Dublin]2019_Kevin Plots

15. Appendix 15.3 -

A3



PLANT REQUESTED FROM eircom emaps CBYD SERVICE

https://cbyd.emaps.eircom.ie/

Scale: 1:1500	Irish National Grid Co-Ordinates Centre XY: 317737 m, 248003 m
Date 01/04/2019	emaps CBYD

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Scale: 1:1500

Irish National Grid Co-Ordinates
Centre XY: 317961 m, 248029 m

Date
01/04/2019

emaps CBYD

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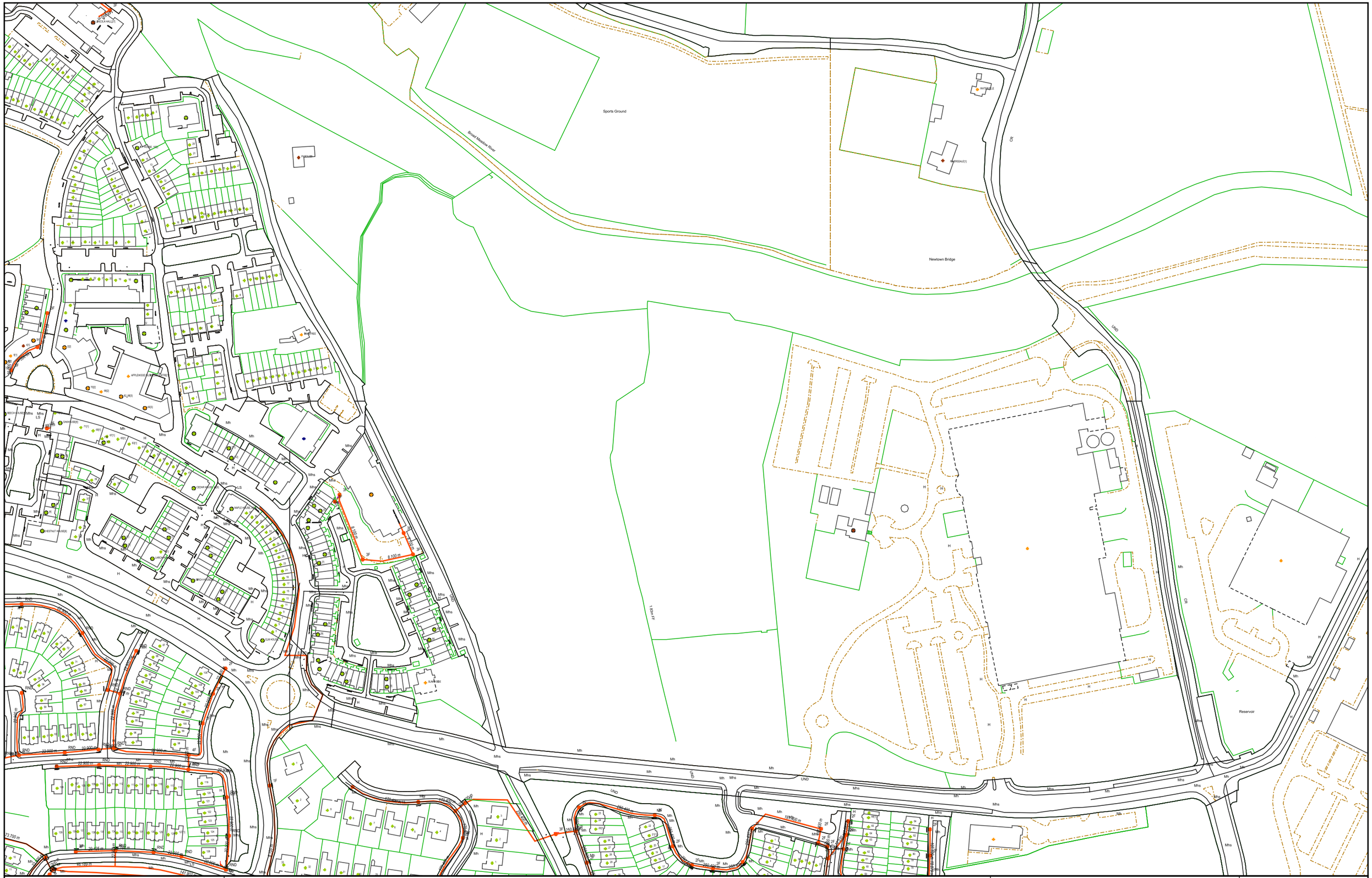
Sports Ground
Broad Meadow River
Newtown Bridge
Reservoir
LINCOLN WALL [27]
APPLEWOOD HOUSE
CEDAR HOUSE
MAPLE HOUSE
CHESTNUT HOUSE
HIGH HOUSE
ELM HOUSE
SUNRISE
HAYSDALE
HAYSDALE [1]
Pumpstation
Mast
Mast Base
8.100 m
8.600 m
8.900 m
9.300 m
10.900 m
22.900 m
23.700 m
24.400 m
25.400 m
26.100 m
26.600 m
27.200 m
27.400 m
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