Geotechnical
Ground Investigation Report

Site
31 Culross Street
W1K 7HF

Client
SW3 Design and Build Ltd

Report Reference
GT-2022-000023

Prepared by
STM Environmental Consultants Ltd

Date
17/04/2022

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1 DOCUMENT CONTROL

GEOTECHNICAL GROUND INVESTIGATION REPORT

Site Address:	31 Culross Street W1K 7HF
Site Coordinates:	528065, 180676
Prepared for:	SW3 Design and Build Ltd
Report Reference:	GT-2022-000023
Version No:	1.0
Date:	17/04/2022
Report Author:	Simon Makoni (MSc) Director & Gregory Northwood (MSc) Junior Geo-environmental Consultant
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2 DISCLAIMERS

This report and any information or advice which it contains, is provided by STM Environmental Consultants Ltd (STM) and can only be used and relied upon by SW3 Design and Build Ltd (Client).

STM has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. However, STM gives no warranty, representation or assurance as to the accuracy or completeness of any information, assessments or evaluations presented within this report. Furthermore, STM accepts no liability whatsoever for any loss or damage arising from the interpretation or use of the information contained within this report. Any party other than the Client using or placing reliance upon any information contained in this report, do so at their own risk.

Due to budgetary and physical constraints, sampling and in-situ testing was not possible over the entire site during the ground investigation. Therefore, we can offer no guarantee as to the validity of the data in any areas other than those investigated. While this Report may offer comments and opinions on the nature of the strata, both between the excavations and below the maximum depth achieved by the investigation, these are for guidance only and no liability can be accepted for their accuracy.

It should also be noted that some of the findings presented in this report are based on information obtained from third parties (i.e. laboratory). Whilst we assume that all information presented is accurate, we can offer no guarantee as to the validity.

The undertaking of an aboricultural/tree survey was not part of the scope of works. Therefore, the opinions provided in relation to tree heights and species are provided for information only and should not be relied upon. It is recommended that a tree identification survey is undertaken by a suitably qualified Aboriculturist if accurate information is required.

We recommend careful observations during construction to verify our interpretations. Should variation from our interpretations be noted, we recommend that a competent Geotechnical Engineer be engaged to advise and to evaluate what, if any, revisions should be made to our recommendations.

3 EXECUTIVE SUMMARY

SECTION	SUMMARY
Site Location and Description	The site is located at 31 Culross Street W1K 7HF at grid reference 528065, 180676.942 and has an area of approximately 98m^2.
Proposed Development	The development proposal is to construct a basement extension under the existing.
Published Geology and Hydrogeology	According to mapping provided by the BGS, the site is located on superficial deposits consisting of Lynch Hill Gravel Member (SAND and GRAVELS). The bedrock consists of London Clay Formation (CLAY, SILT and SAND). According to BGS mapping information, groundwater is likely to be more than 5 m below the ground surface for at least part of the year.
Summary of Ground Investigation and Findings	The initial ground investigation works were carried out between the 23rd February and 4th March 2022. 1no. borehole was advanced to a maximum depth of 4.8mbgl using a dynamic windowless sampler rig. In-situ Standard Penetration Tests (SPT) were carried out at 1m intervals. Windowless sampling ceased at 4.8mbgl, due to refusal of the rig to advance further into the very dense SAND and GRAVEL strata encountered. Supplementary Dynamic Probing was therefore undertaken to a maximum depth of 9mbgl. The borehole was installed with a standpipe with 1no. round of groundwater monitoring being carried out 1 week after the site investigation. 8 disturbed soil samples were collected at depths ranging from 1 – 4.8 mbgl and submitted to a UKAS/MCERTS accredited laboratory for Plasticity Index, total Sulphate water soluble and pH and Waste Acceptance Criteria analysis. The investigation encountered ground conditions consistent with the published geological records of the area. Made Ground was encountered to a maximum depth of 1.2mbgl. The Made Ground was underlain by cobbly silty CLAY with lenses of sand to 4.2mbgl, in turn underlain by very dense SAND to 4.8mbgl, the maximum depth of the boreholes. The results of the SPT testing gave N values that ranged from 8 to greater than 50 in shallow and deeper soils respectively. The tested CLAY samples were found to have Modified Plasticity Indexes ranging between 8% and 11% indicating that the Clay has low to intermediate plasticity and low to medium volume change potential.

SECTION	SUMMARY
	The results of the Sulphate tests ranged from 15 mg/l SO4 to 123 mg/l SO4 indicating that the tested soils fall into Class DS-1 of the Building Research Establishments (BRE) classification system Special Digest Part 1:2005 “Concrete in aggressive ground”. No significant trees were noted within the potential zone of influence of the development. Root activity was not encountered in any of the boreholes. Groundwater was not encountered during the investigation or subsequent monitoring.
Conclusions and Recommendations	Given the depth of Made Ground and granular nature of the underlying soils, any excavations are likely to become unstable requiring temporary support (i.e. props) or shoring up in order to comply with current statutory safety regulations and to maintain the stability of the excavation sides. The design of basement support in the temporary and permanent conditions should take account of the need to maintain the stability of both the excavation, and the surrounding structures. A robust system of lateral support will therefore need to be adopted during the excavation. A risk assessment In line with BS:6031 (2009), should be undertaken by a competent person. Although groundwater was not encountered during the investigation and the subsequent ground water monitoring, some seepages could occur requiring pumping to be undertaken. No particular difficulties are envisaged in removing such water by conventional internal pumping methods from open sumps. Any dewatering should avoid lowering the groundwater table outside the works outside acceptable limits as it could result in loss of fines and unacceptable settlement of the surrounding ground. Based on what is known of the proposed development, it is considered that shallow foundations (i.e., mass concrete underpins, strip, mass fill, pads and rafts) are likely to be appropriate for the proposed development. It is recommended that they are formed within the very dense Lynch Hill Gravels encountered at 4.5mbgl and for which an allowable bearing capacity of 200kPa was inferred. If due to the magnitude of the anticipated loads, shallow foundations are not deemed suitable, the installation of pile foundations at depth could be undertaken as an alternative. Assuming a basement depth of 3.0m, the excavation of soils will result in an unloading of approximately 60 - 70kPa which may result in heaving of the underlying Clay. It is recommended that the effects any potential movements associated with heave are incorporated into the basement and slab design. The results of the Water-Soluble Sulphate tests indicate that conditions in which the deterioration of buried concrete due to sulphate or acid attack are unlikely to

SECTION	SUMMARY
	exist at the site. The final design of buried concrete should therefore be in accordance with Class DS-1 of the Building Research Establishments (BRE) classification system Special Digest Part 1:2005 “Concrete in aggressive ground” and ACEC Site Class AC-1.

4 INTRODUCTION

4.1 Commissioning

STM Environmental Consultants Limited (STM) were commissioned by SW3 Design and Build Ltd (Client) to undertake a ground investigation at 31 Culross Street W1K 7HF (the Site).

4.2 Development Proposal

It is understood that the development proposal is to construct a basement extension under the existing property.

4.3 Report Objectives

The purpose of the investigation was to provide an interpretive report on current ground conditions to assist with the design of foundations for structures associated with a planned redevelopment at the Site.

This report should be read in conjunction with the Basement Impact Assessment produced for the site by STM Environmental Consultants in April 2022.

5 SITE DESCRIPTION

5.1 Site Location and Current Use

The Site is located at 31 Culross Street W1K 7HF at grid reference 528065, 180676 and has an area of approximately 98m^2.

The site lies within the jurisdiction of City of Westminster Council in terms of the planning process. It is currently used as a 3-storey mews house.

5.2 Published Geology and Hydrogeology

5.2.1 Geology

According to mapping provided by the BGS, the site is located on superficial deposits consisting of Lynch Hill Gravel Member (SAND and GRAVELS). The bedrock consists of London Clay Formation (CLAY, SILT and SAND).

Borehole logs from nearby investigations are presented in Appendix 8.

5.2.2 Hydrogeology

The Environment Agency classifies the superficial deposits as a secondary aquifer and the bedrock aquifer as unproductive. There are no groundwater source protection zones within the vicinity of the site.

According to BGS mapping information, groundwater is likely to be more than 5 m below the ground surface for at least part of the year.

5.3 Topography

The topography of the Site and surrounding area is generally flat. Lidar data indicates that the ground level at the site is approximately 36mAOD.

Figure 1 – Maps showing location of site

6 SUMMARY OF GROUND INVESTIGATION WORKS

The ground investigation works were carried out between the 23rd February and the 4th of March 2022 and were generally in accordance with the following standards where relevant:

- BS5930:2015 Code of Practice for Ground Investigation.
- BS EN 1997-2 Ground investigation and testing
- BS EN ISO 14688 Geotechnical investigation and testing – Identification and classification of soil
- BS EN ISO 14689 Geotechnical investigation and testing – Identification and classification of rock
- BS EN ISO 22476 Geotechnical investigation and testing - Field testing

6.1 Service and Utility Plans

The Client was unable to supply service and utility plans prior to undertaking the works. The free Linesearchb4Udig service was used, however, only limited information was provided.

6.2 Boreholes

1no. borehole was excavated within the existing garage at the property at the site for the purpose of undertaking geotechnical soil sampling and in-situ testing. The borehole was advanced to a maximum depth of 4.8mbgl using a dynamic windowless sampling rig. Windowless sampling was ceased at 4.8mbgl due to refusal of the rig to advance further as a result of the dense geology encountered.

Dynamic probing was continued to a depth of 9mbgl in the borehole in order to supplement the information obtained from windowless sampling. The main aim was to identify at which depth the London Clay is encountered.

A summary of the boreholes undertaken is provided in Table 1 below.

Table 1: Summary of boreholes

Borehole ID	Easting*	Northing*	Level at surface (mAOD)	Level at Base (mAOD)	Depth (m)
BH01	528062	180679	36	31.2	4.8

*Note: coordinates and levels are approximate based on OS mapping and LIDAR data

All exploratory locations were cleared for buried services using a Catscan device and hand pits were excavated to a depth of 1.0mbgl at each exploratory hole location prior to commencing drilling.

A map showing the locations of the boreholes is available in Appendix 1.

6.3 Groundwater Level Monitoring

The borehole was installed with a standpipe to allow for the estimation of groundwater levels. The well was constructed using 50mm HDPE plain pipe in a bentonite seal from existing ground level to 1.00mbgl and 63mm HDPE slotted pipe in a gravel surround to the base of pipe.

1no. groundwater level monitoring visits was carried out.

6.4 Standard Penetration Tests

In-situ Standard Penetration Tests (SPT) were undertaken at the base of the initial hand dug hole and at 1.00m intervals as the borehole was advanced.

The tests were carried out in accordance with BS EN ISO 22476-3 and consisted of driving a 50 mm split spoon sampler into the soil with a 64 kg weight having a free fall of 760 mm. The blows required to drive the split–barrel sample a distance of 305 mm, after an initial penetration of 152 mm, is referred to as the SPT–N value.

6.5 Dynamic Probing

Dynamic Probing Test as per BS1377: Part 9: 1990 involves the driving of a metal cone into the ground through a series of 1-metre length steel rods. The rods are driven from the surface by the hammer system on the rig which drops 63.5 kg weight onto the rods through a fall of 760mm. The number of blows that is required to drive the cone down each 100mm increment is then recorded until a required depth is reached or a refusal is achieved. The data obtained was used to estimate the depths of at the interface between the strata.

6.6 Soil Sampling and Laboratory Testing

Disturbed and undisturbed samples were recovered for geotechnical analysis from a range of depths within each borehole.

The samples were put into sample containers which were typically tubs, jars or polyethylene bags and tightly sealed. The samples were then transported to the laboratory for analysis.

A programme of geotechnical laboratory testing agreed with the Client and was carried out by i2 Analytical an MCERTS/UKAS accredited laboratory. The requested testing consisted of the following:

- Plasticity Index (2no.)
- Sulphate water soluble (6no.)
- pH (6no.)
- Waste Acceptance Criteria (1no)

7 GROUND INVESTIGATION FINDINGS

7.1 Ground Conditions

7.1.1 Geology

Made Ground consisting of a 0.2m reinforced concrete slab underlain by of sandy SILT/sandy CLAY with occasional brick and concrete fragments was encountered to 1.2mbgl. This was underlain by light brown, mottled cobbly, silty CLAY interspersed with occasional thin (i.e. 0.3m) lenses of yellow SAND to 4.2mbgl in turn underlain by very dense mottled light and dark orange SAND to 4.8mbgl, the maximum depth of the borehole.

The borehole logs from the site investigation are available in Appendix 3. Photographs of the soils extracted from the boreholes are presented in Appendix 6.

7.1.2 Groundwater

Groundwater was not encountered in the borehole during the investigation.

1no. round of groundwater monitoring was carried out after period of 1 week following the ground investigation. Groundwater was not recorded.

It should be noted that due to seasonal variations, accurate groundwater levels can only be determined through long term measurements in monitoring wells.

7.2 Trees

No significant trees were noted within the potential zone of influence of the development.

7.2.1 Root Activity

Root activity was not recorded within any of the boreholes.

7.3 Results of Standard Penetration Tests

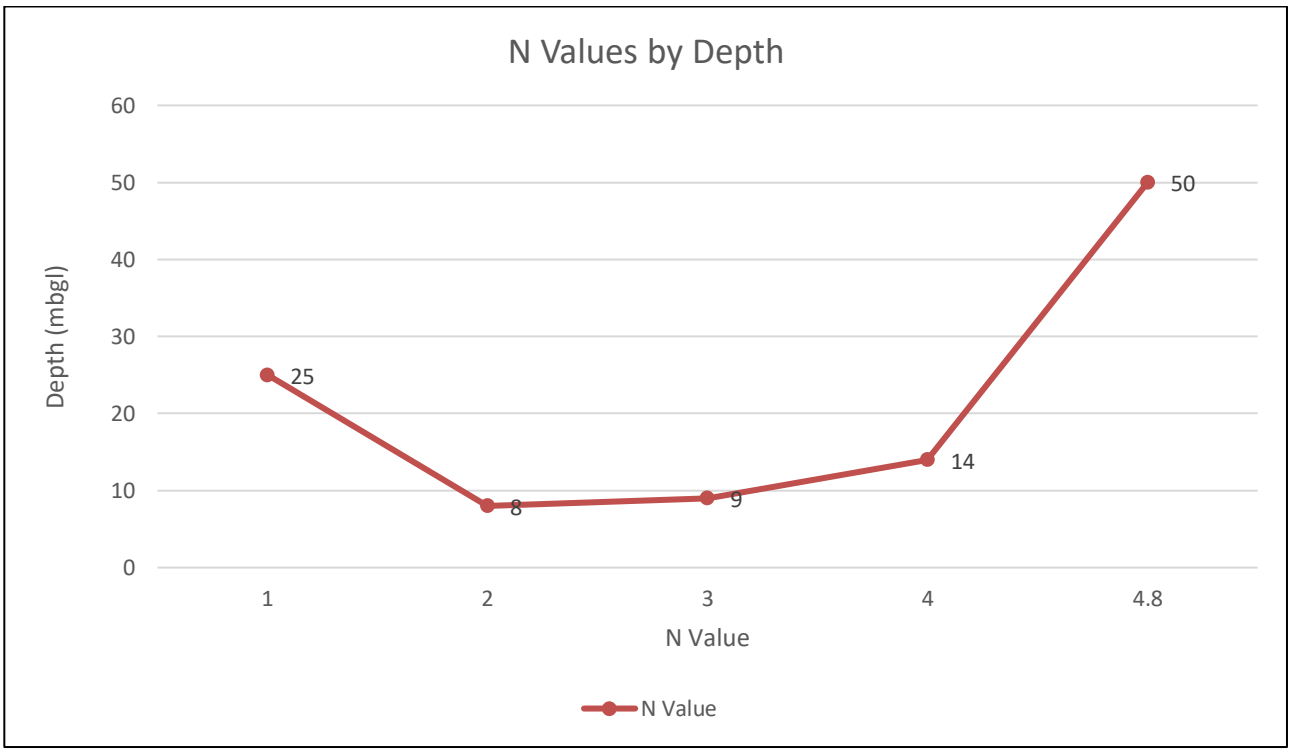
The results of the in-situ Standard Penetration Tests (SPT) are presented on the borehole logs in Appendix 3 and in tabular form in Appendix 6.

A statistical summary of the results is presented in Table 2 below.

Table 2: Statistical Summary of N Values

Depth	N Value
1	25
2	8
3	9
4	14
4.8	>50 (Refusal)

Figure 2: Graph of N Values by Depth



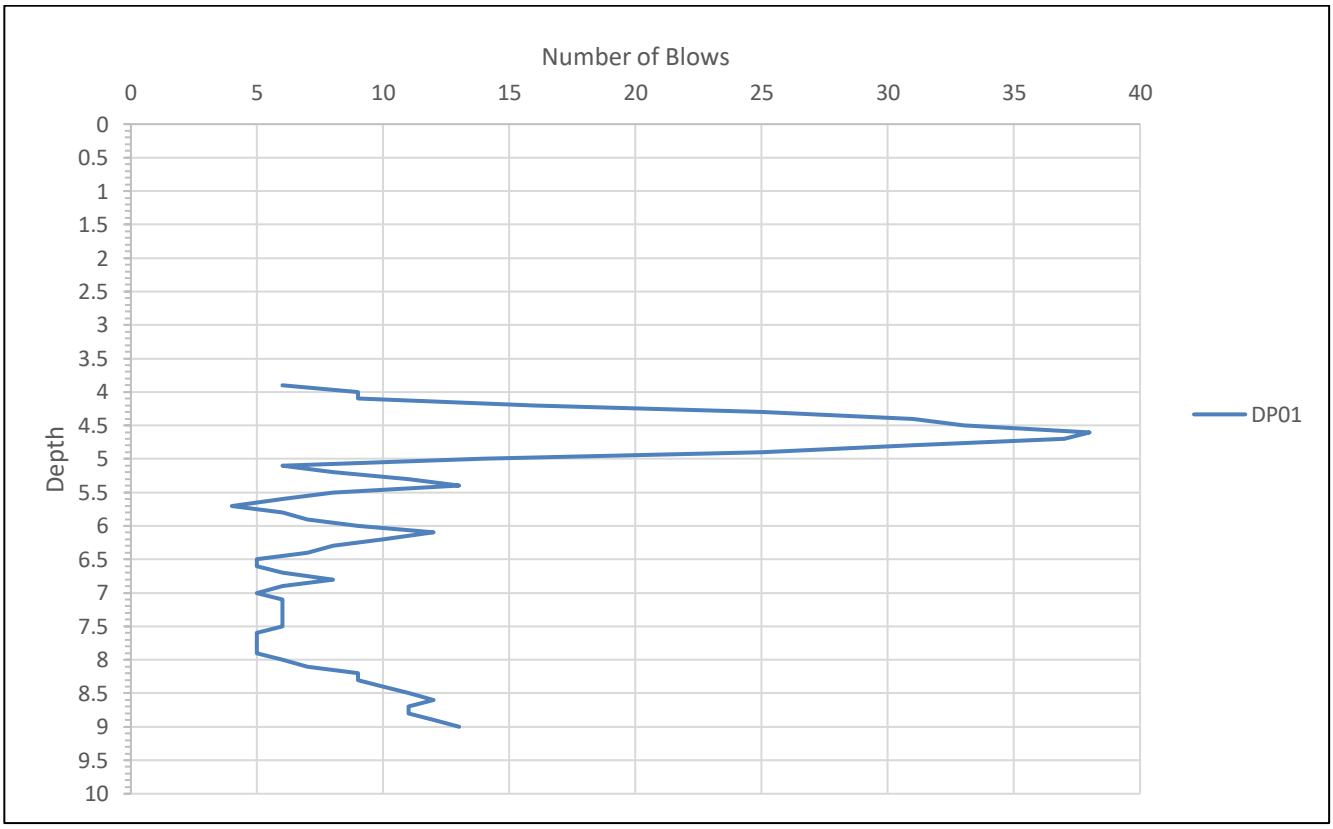
7.4 Results of Dynamic Probing

Dynamic probing was undertaken at the site to a depth of 9mbgl. Equivalent SPT 'N' values (NDP), were derived from the DP results in order to determine general strength properties of the ground. The last 3no. consecutive DP results from each metre were summed to give a lower estimate of the equivalent N value (NDPL). The NDPL was then multiplied by a factor of 1.5 to give an upper range equivalent N value (NDPU) in order to account for the reduction in friction experienced when undertaking dynamic probing, when compared to when undertaking standard SPTs. The results are summarised in Table 2 below.

Table 3: Dynamic Probe Results with estimated N values

DEPTH (M)	DYNAMIC PROBING READINGS (100MM INCREMENTS)										ESTIMATED N VALUE RANGE (NDP)
BH01	100	100	100	100	100	100	100	100	100	100	
3-4	-	-	-	-	-	-	-	-	6	9	n/a
4-5	9	16	25	31	33	38	37	31	25	14	70-105
5-6	6	8	11	13	8	6	4	6	7	9	22-33
6-7	12	10	8	7	5	5	6	8	6	5	19-29
7-8	6	6	6	6	6	5	5	5	5	6	16-24
8-9	7	9	9	10	11	12	11	11	12	13	36-54

Figure 3 - Graph showing Results of Dynamic Probing



7.5 Laboratory Test Results

Copies of all laboratory test certificates are available in Appendix 5

7.5.1 Plasticity Index Analysis

Atterberg Limit tests were carried out on 2no. samples retrieved from borehole BH01 at depths between 2 and 4mbgl. The results of the index testing are summarised in Table 4 below.

Table 4: Summary of Classification Test Results

Borehole ID	Depth (mbgl)	Sample Description	Plasticity Index (PI) (%)	Modified Plasticity Index (MPI) (%)	Classification	Volume Change Potential
BH01	2	Gravelly CLAY	21	8	CI	Medium
BH01	4	CLAY	18	11	CL	Low

The samples tested produced results ranging from Clay of low plasticity at 4mbgl to Clay of intermediate plasticity at 2mbgl.

The samples were found to have Modified Plasticity Index values ranging between 8% at 2mbgl to 11% at 4mbgl indicating that the volume change potential of the CLAY ranges from Low to Medium.

7.5.2 Sulphate and pH Analyses

pH and Water-Soluble Sulphate contents analyses were carried out on 6no. soil samples. The results are available in Appendix 4 and are summarised in Table 5 and Table 6 below.

Table 5: Summary of pH Test Results

Borehole ID	BH01	BH01	BH01	BH01	BH01	BH01
Sample Depth (m)	1	2	2.5	3	4	4.8
pH	9.2	8.5	6.9	7.6	7.8	8.7

The pH values were variable and ranged from 6.9 at 9.2 indicating that acidic to alkaline soil conditions exist at the site.

Table 6: Summary of Sulphate Test Results

Borehole ID	BH01	BH01	BH01	BH01	BH01	BH01
Sample Depth (m)	1	2	2.5	3	4	4.8
Sulphate Results (mg/l)	123	80	15	52	19	18

The results of the Sulphate tests ranged from 15 mg/l SO4 to 123 mg/l SO4.

7.5.3 Waste Acceptance Criteria Testing

1no. soil sample taken from a depth of 1.5mbgl was submitted for Waste Acceptance Criteria (WAC) testing. The results indicated that the sample was generally uncontaminated and that it was suitable for disposal at an inert landfill.

8 DISCUSSION AND CONCLUSIONS

8.1 Ground Model

Based on the results of ground investigation to date the simplified conceptual ground model for preliminary design is given in Table 7 below.

Table 7: Simplified Conceptual Ground Model

Stratum	Depth (mbgl)	Inferred Geological Member	Comments
Made Ground	0 – 1.2	N/A	-
Silty CLAY (with Sand lenses)	1.2 – 4.2	Lynch Hill Gravel Member	-
SAND	4.2 – 5.0		Inferred from dynamic probing
CLAY	>5	London Clay	

8.2 Allowable Bearing Capacity of the Soils

The investigation encountered ground conditions that were generally consistent with the published geological records of the area.

The in-situ SPT testing carried out within the CLAY gave N Values that ranged from a minimum of 8 at 2mbgl to a maximum of 14 at 4mbgl indicating that its consistency can be described as ranging from firm to stiff.

The in-situ SPT testing carried out within the SAND gave an N Value of greater than 50 indicating that its consistency can be described as Very Dense.

The inferred allowable bearing capacities by depth are summarised in Table 8 below. It should be noted that for prudence, the values are based on the minimum measured N values obtained from testing. Also, the inferred bearing capacities have been restricted to a maximum of 300kPa for the purposes of minimising unacceptable settlement.

The bearing capacity values inferred for strata residing between depths of 5-9mbgl are based on the estimated N values derived from dynamic probing conducted at the site.

Table 8: Inferred Allowable Bearing Capacities

Depth (mbgl)	Strata Description	Minimum N Value	Estimated N value derived from Dynamic Probing	Presumptive Bearing Capacity (kPa) [(a)]	Allowable Bearing Capacity (kPa)
1	Made Ground	25	-	-	-
2	Firm CLAY	8	-	75 - 150	75[b]
3		9	-		85[b]
4	Stiff CLAY	14	-	150 - 300	130[b]
5	Very Dense SAND	>50	70-105	>600	200[c]
6	Stiff CLAY*	N/A	22-33	150 - 300	200[b]
7			19-29	150 - 300	175[b]
8			16-24	150 - 300	145[b]
9	Very Stiff CLAY*		36-54	300 - 600	300[b]

*Inferred from Dynamic Probing

a. For preliminary design purposes, BS 8004:2015 Code of practice for foundations gives typical values of allowable bearing capacity which should result in an adequate factor of safety against shear failure without accounting for the settlement criteria. Acceptable settlement is often taken to lie within the range of 10-25mm, but is structure dependent. Anticipated settlement can be calculated using elastic methods and will vary according to foundation shape and soil stiffness.
b. Stroud and Butler's (1975) graph which shows Cu=4.5N for PI>30%, and increasing to Cu=8N for low plasticity clays (PI=15%). Allowable Bearing Capacity is assumed to be equal to 2 * Cu.
c. Meyerhof (1956) and Terzaghi & Peck (1996).

8.3 Basement Construction

The information presented in this section is concerned with the potential applicability of a variety of foundation types for the proposed development. It largely based on technical guidance issued by the NHBC (to which the user is referred for further clarification). Materials and workmanship should meet the requirements set out in this guidance. It is strongly recommended that the advice of a specialist Chartered Structural Engineer (and a specialist piling contractor if relevant) is sought before proceeding with any foundation design.

It is proposed to construct a basement at the property. It is assumed that the new basement will be single level with excavations being undertaken to a depth of approximately 3mbgl and that underpinning will be the main technique used to build the main structural elements.

The full details of the development were not available at the time of writing so the observations below are relatively generic.

8.3.1 Excavations

It is assumed that the new basement will be single level with excavations being undertaken to a depth of approximately 3.0mbgl. Based on the findings of the site investigation, the excavations are expected to encounter Made Ground, CLAY and SAND deposits.

Shallow excavations (i.e. <1.5mbl) for foundations and services are likely to require nominal side support in the short term. Temporary trench support, or battering of excavation sides, is likely to be

required for all excavations that are to be left open for any length of time or where man entry is required. Normal safety precautions should be taken if excavations are to be entered.

Given the granular nature of the underlying soils, Deeper excavations (i.e. > 1.50mbgl) are likely to become unstable requiring temporary support (i.e. props) or shoring up in order to comply with current statutory safety regulations and to maintain the stability of the excavation sides.

The design of basement support in the temporary and permanent conditions should take account of the need to maintain the stability of both the excavation, and the surrounding structures. The ground movements associated with the basement excavation will depend on the method of excavation and support and the overall stiffness of the basement structure in the temporary condition.

Any earth retaining systems used will be subject to lateral earth pressures from the surrounding soil, groundwater and surcharge loads. Prior to construction, the lateral earth pressures should be computed and the earth retaining designed to adequately withstand these pressures.

If is anticipated that ground movements resulting from the excavation may give rise to an unacceptable impact on any adjacent structures, the temporary supports for the retaining walls should be strengthened to further reduce the wall deflection.

In line with BS:6031 (2009), a risk assessment of the stability of any open excavation should be undertaken by a competent person and appropriate measures adopted to ensure safe working practise in and around open excavations. Further guidance on responsibilities and requirements for working near, and in, excavations can be obtained from the Construction Design and Management Regulations (2015).

8.3.2 Groundwater Control

Although groundwater was not encountered during the investigation and the subsequent round of ground water monitoring, some seepages could occur requiring pumping to be undertaken. No particular difficulties are envisaged in removing such water by conventional internal pumping methods from open sumps.

Any dewatering should avoid lowering the groundwater table outside the works outside acceptable limits as it could result in loss of fines and unacceptable settlement of the surrounding ground.

Any water pumped from excavations is likely to need to be passed via settlement tanks before being discharged to the sewer; discharge consents will also be required.

8.3.3 Foundations

It should be noted that the information given below is for guidance purposes only. The foundation design is the responsibility of the selected structural engineer.

8.3.3.1 Shallow Foundations

Shallow foundations (i.e., mass concrete underpins, strip, mass fill, pads and rafts) are typically used where the loads imposed by a structure are low relative to the bearing capacity of the surface soils.

Based on the results of the in-situ SPT tests, the Lynch Hill Gravels encountered between 4 - 5mbgl were inferred to have an allowable bearing capacity of in order of 200kPa. The dynamic probe testing carried out indicates that Stiff London Clay, also with an inferred allowable bearing capacity of 200kPa is encountered at approximately 6mbgl.

Based on what is known of the proposed development, it is considered that conventional strip, mass fill or pads are likely to be appropriate for the proposed development if formed within the very dense Lynch Hill Gravels first encountered at 4.5mbgl and for which an allowable bearing capacity of 200kPa can be assumed.

All excavations should be carefully inspected by a foundation engineer prior to forming the foundations and any Made Ground/Fill and soft, organic or otherwise unsuitable materials removed.

Unless to be incorporated within the new development, any previous foundations encountered should be fully penetrated by all new foundations and broken well away from any new construction. Any soil disturbed by excavation of foundations and tanks/services should also be fully penetrated by new foundations.

The allowable bearing pressures recommended above should not result in differential settlements exceeding 25mm provided that excavation bases are carefully prepared and concreted as soon as possible after excavation. The use of reinforcements would reduce the possibility of differential settlements.

8.3.3.2 Piled Foundations

If due to the magnitude of the anticipated loads, or for economic reasons, shallow foundations are not deemed suitable, the installation of a pile foundations at depth could be undertaken as an alternative.

8.3.4 Retaining Walls

The retaining wall should be designed to support the vertical loads from the proposed structure and resist the horizontal forces from the ground, hydrostatic pressure and from any other surcharge loads such as the foundations of nearby structures or vehicles on roads.

For retaining wall design, careful selection of the appropriate parameters will be needed, incorporating allowances for factors such as the presence of groundwater and the possibility of soil softening. The following table of unfactored coefficients has been assessed using data from the site investigation as well as data from published information. The soil parameters listed below are given strictly for guidance purposes only and should be used for the preliminary design purposes only.

Table 9: Soil parameters for retaining wall design

Stratum/Depth	Depth (mbgl)	Unit Weight (kN/m3)[a, c]	Effective Cohesion c' (kPa)[a]	Effective Friction Angle ϕ˚(degrees)[a]
Made Ground	0 - 1.2	18 – 20	0	26
Gravelly CLAY	1.2 – 4.2	18 – 21	0	22 – 27
SAND	4.2 – 5.0	18 – 21	0	35 – 45
London Clay	>5.0	20	0	20 – 25

Sources:
a) Burt Look – Handbook of Geotechnical Investigations and Design Tables (2007)
b) Obrzud and Truty (2012)
c) Dry to saturated conditions

8.3.5 Basement Slab

The basement slab could be designed as either a fully suspended structure supported on the main foundations or alternatively, as a ground bearing slab.

When designing the basement slab, the potential long term effects of heave in the underlying Clay as it recovers from the removal of overburden associated with the excavation should be taken into account.

In the case of a suspended slab, the incorporation of an appropriate effective void or a proprietary compressible material is likely to be sufficient to mitigate against heave.

8.3.6 Basement Heave

Assuming a basement depth of 3.0m, the excavation of gravel soils will result in an unloading of approximately 60 - 70 kPa which may result in heaving of the underlying Clay. The movements are likely to mainly be short term elastic movements with subsequent longer-term swelling occurring in following years. Although the anticipated heave will be mitigated to some extent by the proposed load of the new structure is recommended that the effects any potential movements are considered in more detail once levels and loads have been finalised.

8.4 Chemical Attack on Buried Concrete

The soil samples tested were found to have water soluble sulphate contents ranging from 15 mg/l SO4 to 123 mg/l SO4, associated with acidic to alkaline pH values. The characteristic value (i.e. average of the highest two values) was calculated to be 101 mg/l indicating that the tested soils fall into Class DS-1 of the Building Research Establishments classification system Special Digest Part 1:2005 “Concrete in aggressive ground” (BRESD).

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack is not likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRESD should be in accordance with Class DS-1 conditions and Aggressive Chemical Environment for Concrete ACEC Site Class AC-1.

9 INFORMATION GAPS AND UNCERTAINTIES

A number of assumptions have been made regarding the nature of the strata present at the site and its properties. It is possible that there may be areas of the site that have different characteristics to those observed during the ground investigation and outlined in this report. Should ground conditions differing significantly from those described in our report be encountered during foundation excavation, then the authors should be contacted immediately so that the details of this report can be updated accordingly.

10 ABBREVIATIONS

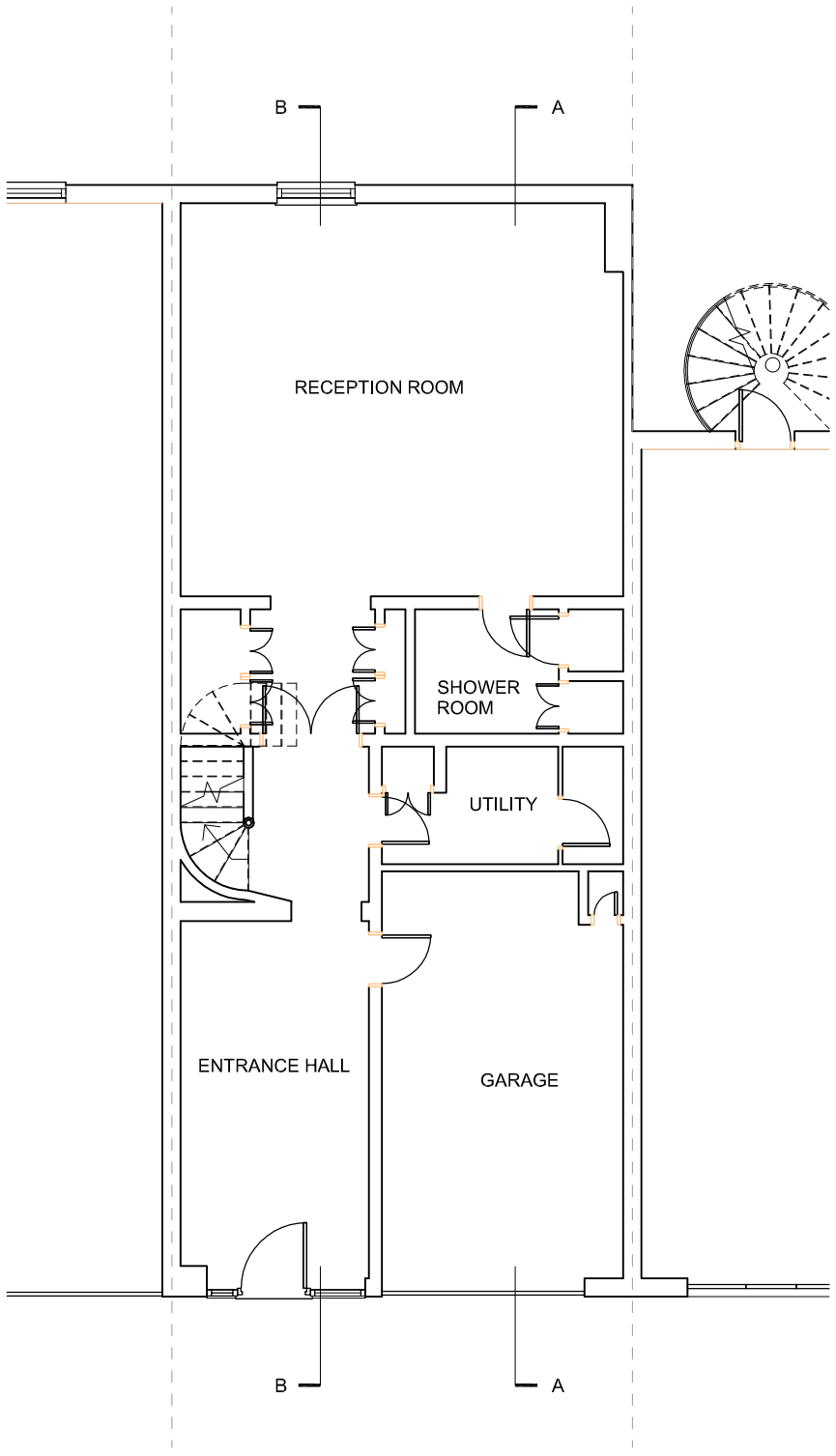
ABBREVIATION	DESCRIPTION
mbgl	metres below ground level
OS	Ordnance Survey
NPPF	National Planning Policy Framework
PI	Plasticity Index
MPI	Modified Plasticity Index
VCP	Volume Change Potential

11 REFERENCES

1. NHBC Standards 2018
2. BS 8004: (1986): Code of practice for foundations
3. Craig, R. F. (1986), Soil Mechanics, 4th ed., ISBN 0-412-38430-2
   Terzaghi, K. (1943): Theoretical soil mechanics, John Wiley and sons, New York

12 APPENDICES

12.1 Appendix 1 - Development Proposals



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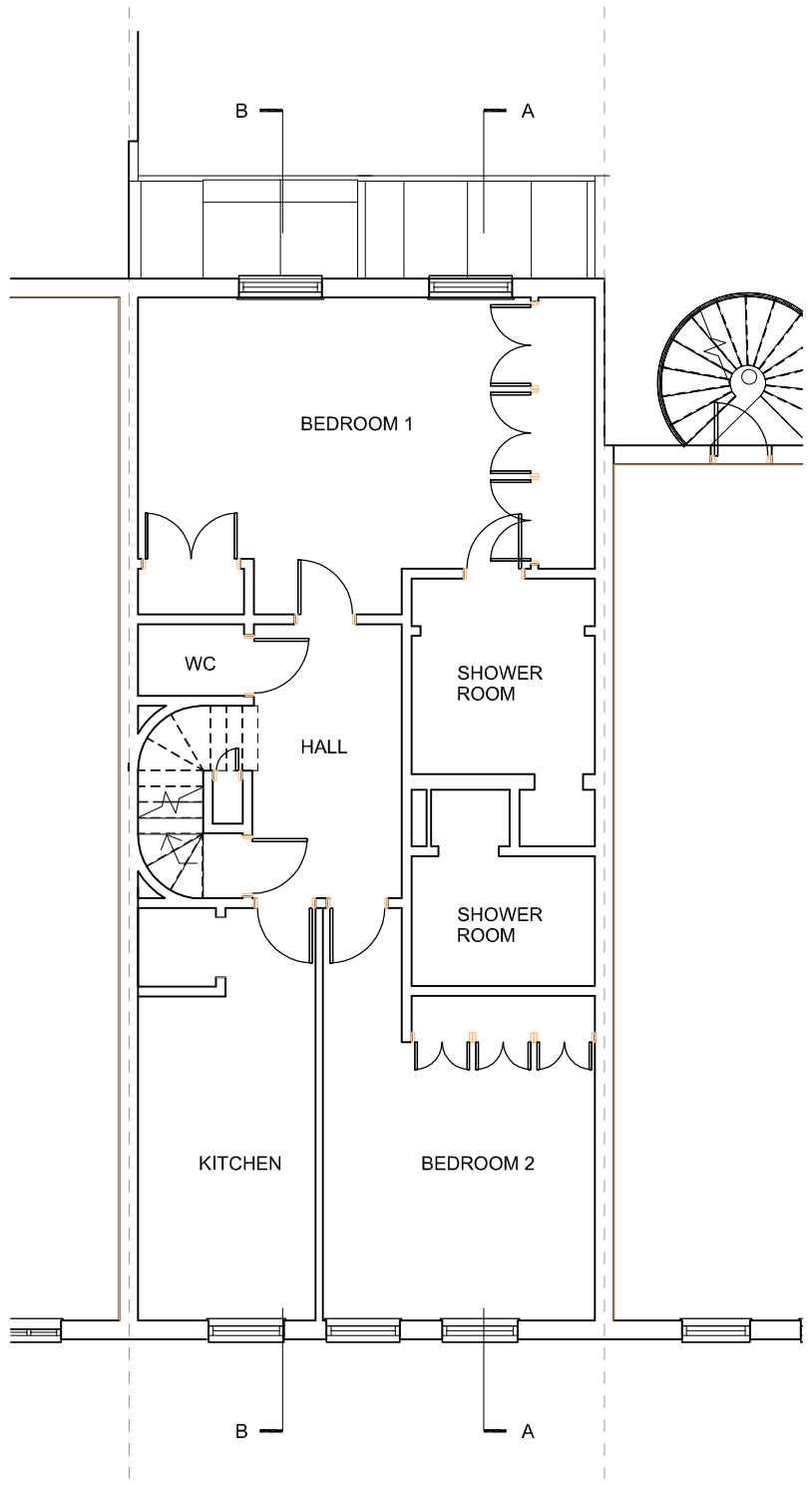

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Rev.	Revision note	Date	Initial

SCALE 250 500 1000 2000 millimeters

PLANNING APPLICATION

N

CKW architects
+44 (0) 20 7183 7791
info@ckwgroup.co.uk
www.ckwarchitects.co.uk

Client:

Drawing title: Existing Plan Layouts

Project: 31 Culross Street London, W1K

Scale: 1: 100 @ A3 1: 50 @ A1

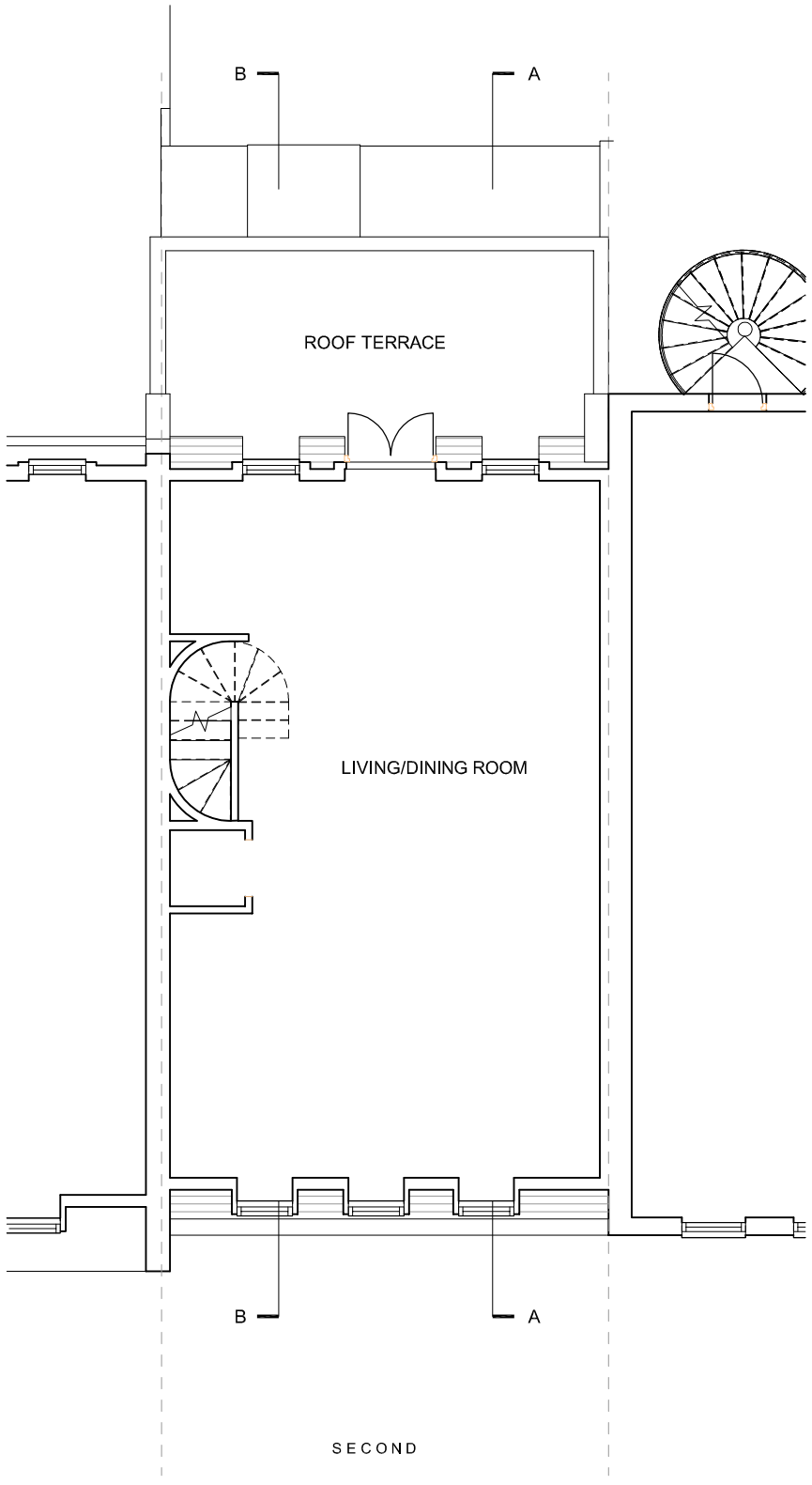
Drawn by: CW

Checked by:

Date: March '21

Drawing No: 181-S01

Rev:



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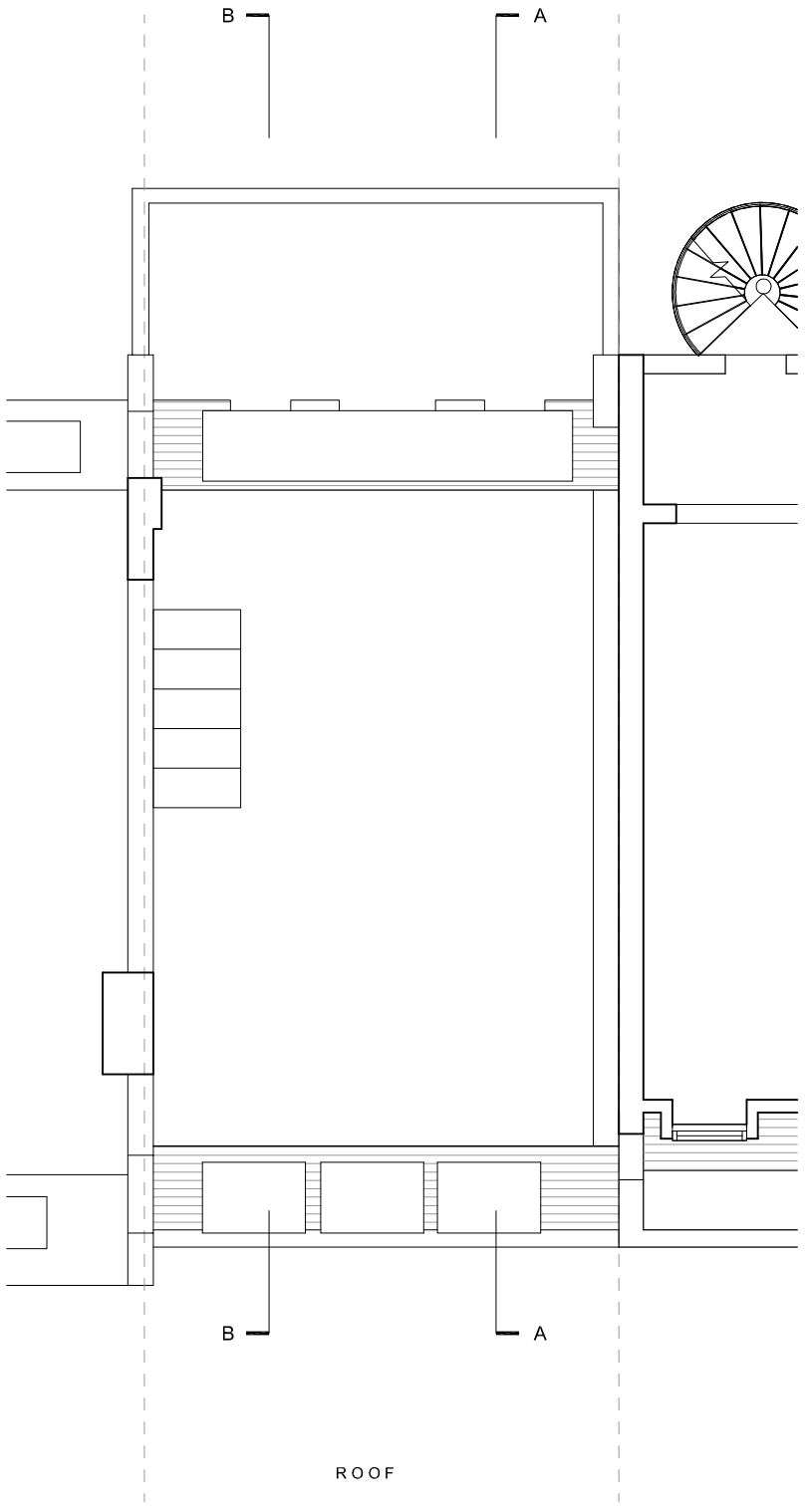

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Drawing title: Existing Plan Layouts

Project: 31 Culross Street
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Scale: 1: 100 @ A3
1: 50 @ A1

Drawn by: CW

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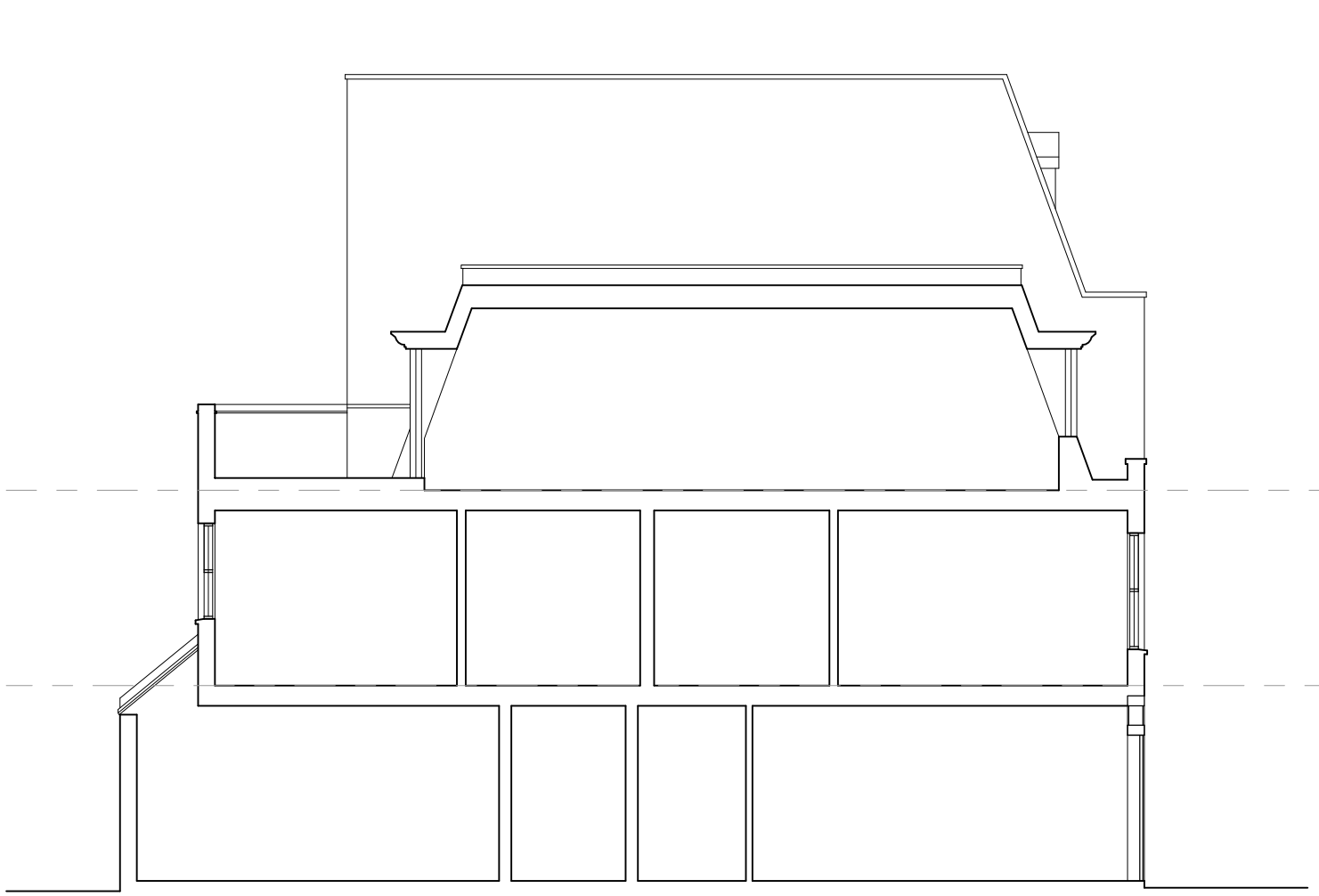
Date: March '21

Drawing No: 181-S02

Rev:



SECTION A-A

SECTION B-B

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Client:

Drawing title: Existing Sections A-A & B-B

Project: 31 Culross Street
London, W1K

Scale: 1: 100 @ A3
1: 50 @ A1

Drawn by: CW

Checked by:

Date: March '21

Drawing No: 181-S04

Rev:

FRONT

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Client:

Drawing title: Existing Elevations

Project: 31 Culross Street
London, W1K

Scale: 1: 100 @ A3
1: 50 @ A1

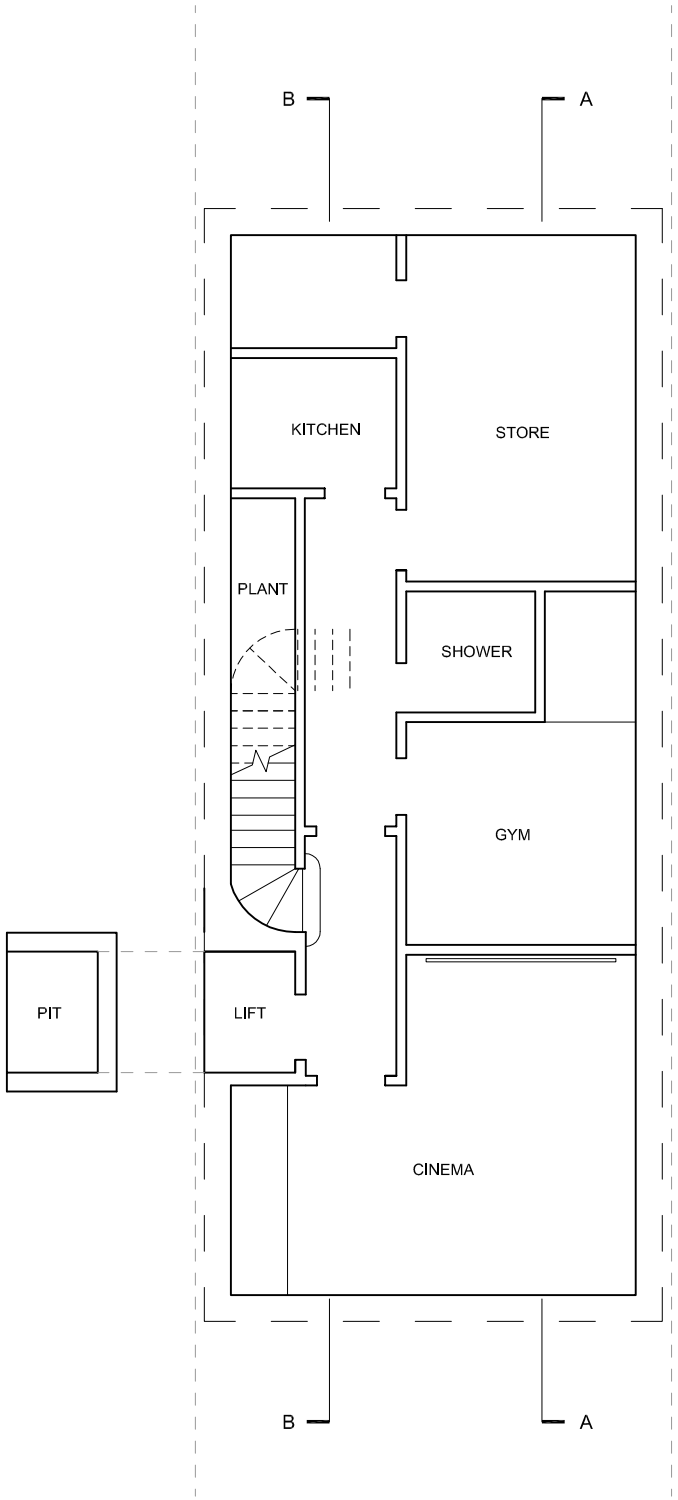
Drawn by: CW

Checked by:

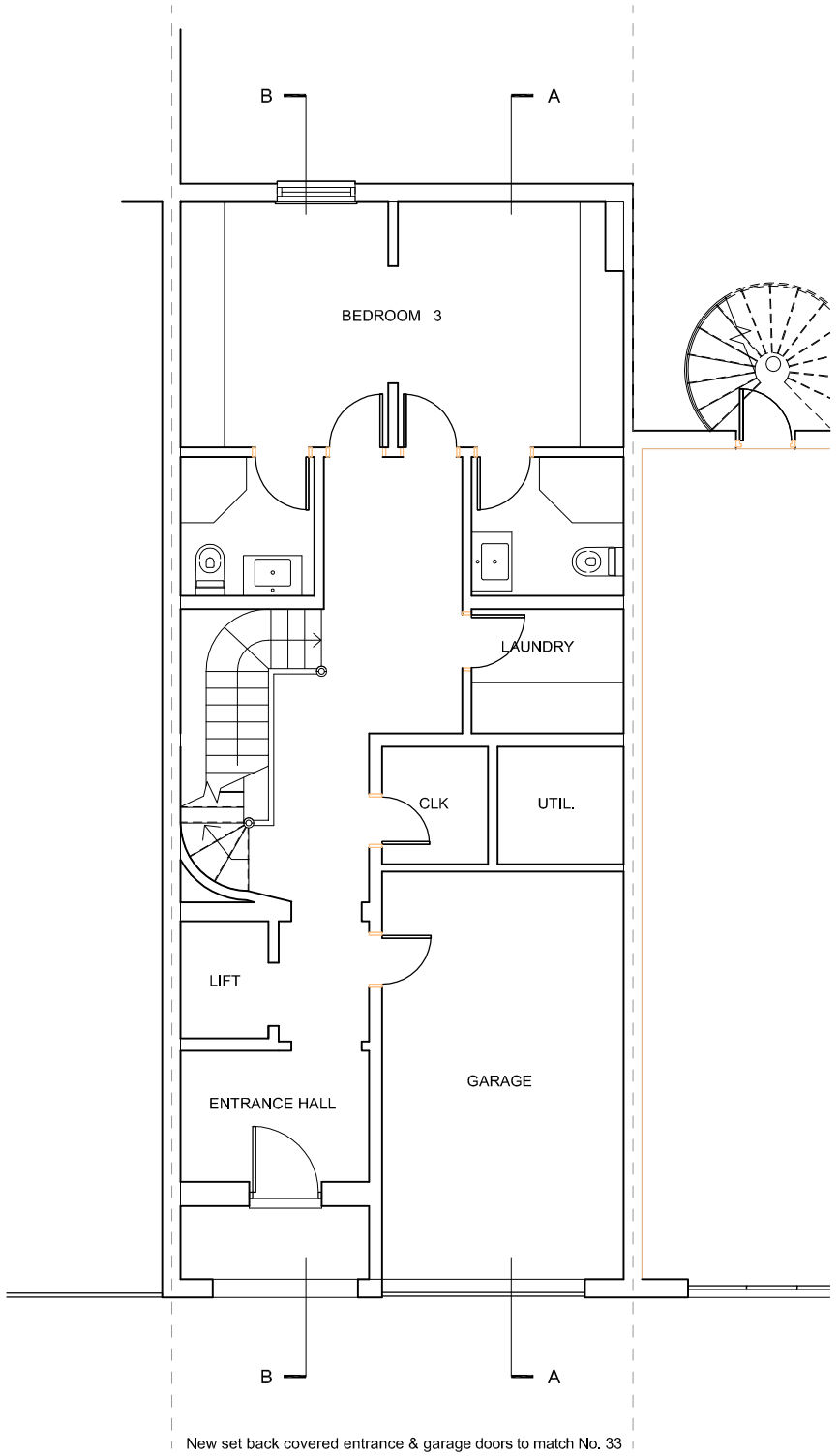
Date: March '21

Drawing No: 181-S03

Rev:

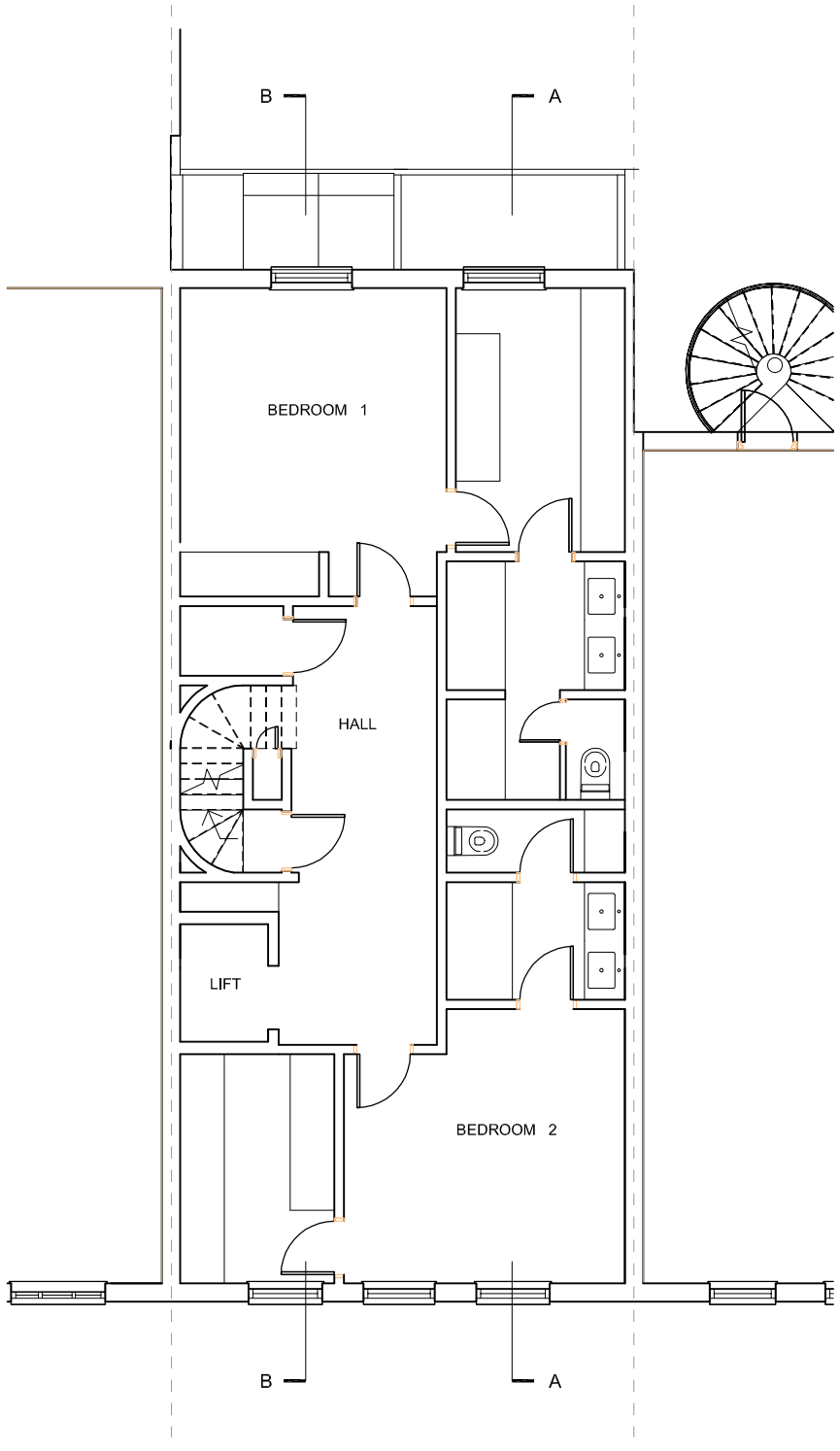


LOWER GROUND



New set back covered entrance & garage doors to match No. 33

GROUND



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Client:

Project: 31 Culross Street
London, W1K

Drawing title: Proposed Plan Layouts

Scale: 1: 100 @ A3
1: 50 @ A1

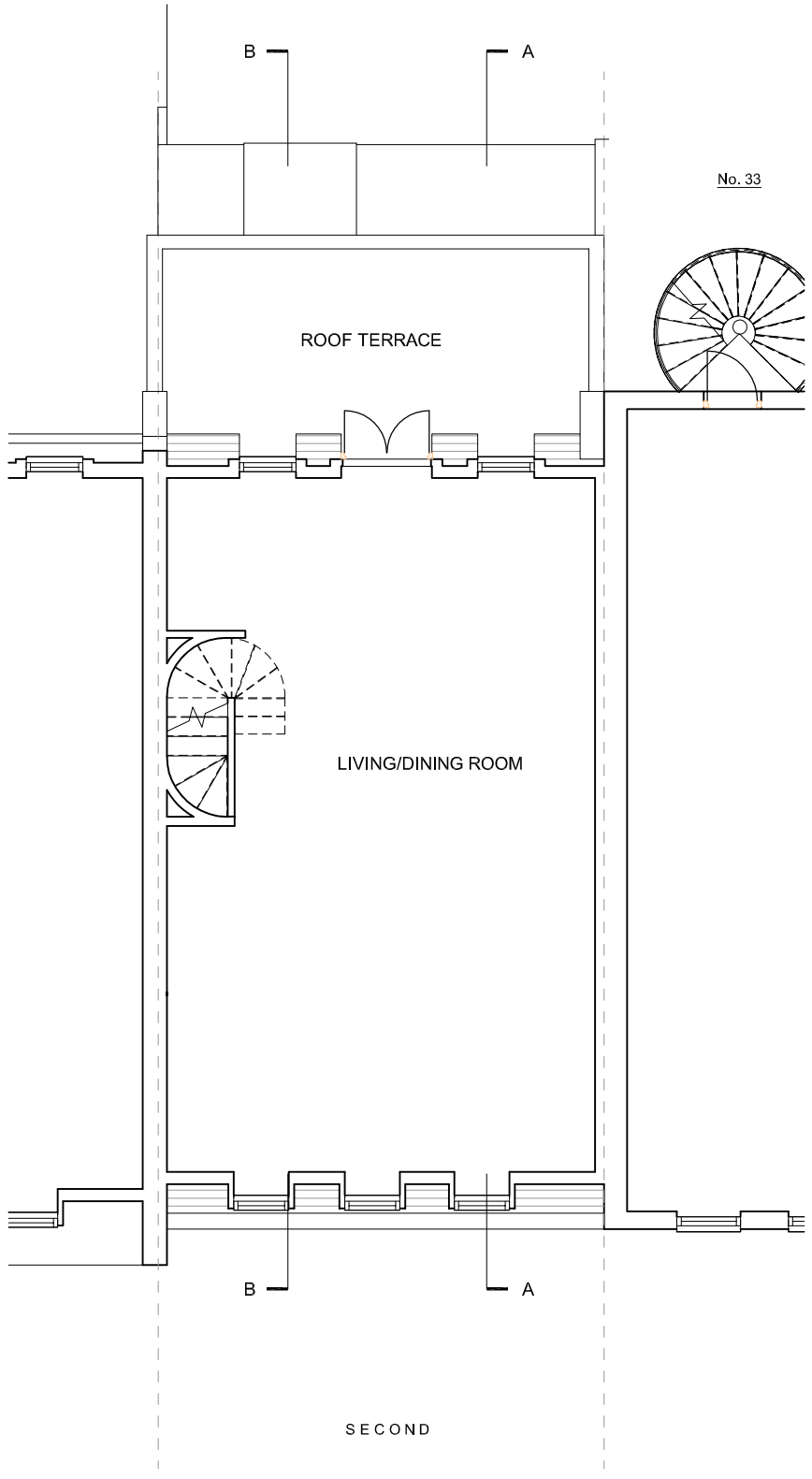
Drawn by: CW

Checked by:

Date: Nov '21

Drawing No: 181-01

Rev:



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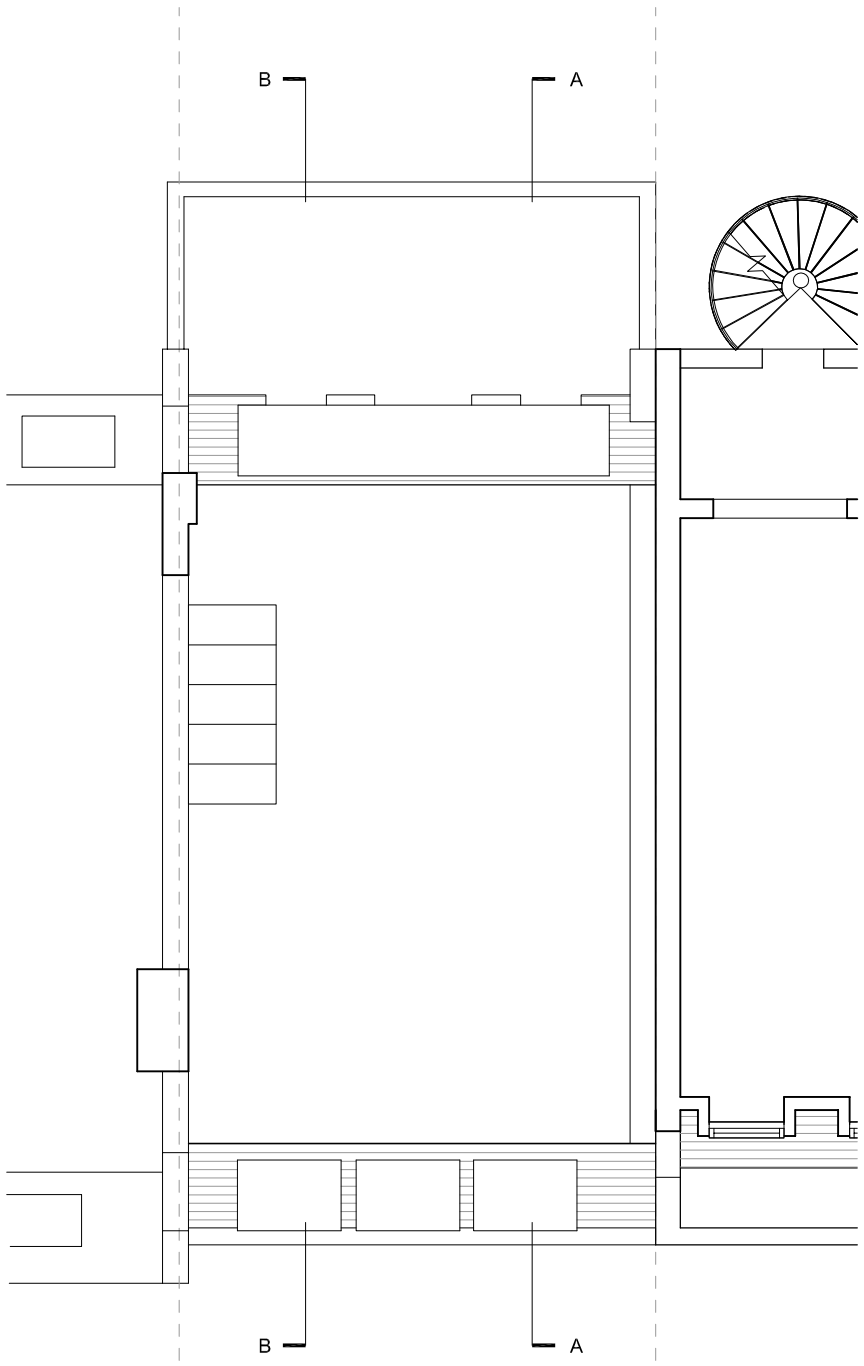

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SCALE 250 500 1000 2000 millimeters

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Client:

Drawing title: Proposed Plan Layouts

Project: 31 Culross Street
London, W1K

Scale: 1: 100 @ A3
1: 50 @ A1

Drawn by: CW

Checked by:

Date: Nov '21

Drawing No: 181-02

Rev:

New set back covered entrance & garage doors to match No. 33

FRONT

REAR

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SCALE 250 500 1000 2000 millimeters

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Client:

Drawing title: Proposed Elevations

Project: 31 Culross Street
London, W1K

Scale: 1: 100 @ A3
1: 50 @ A1

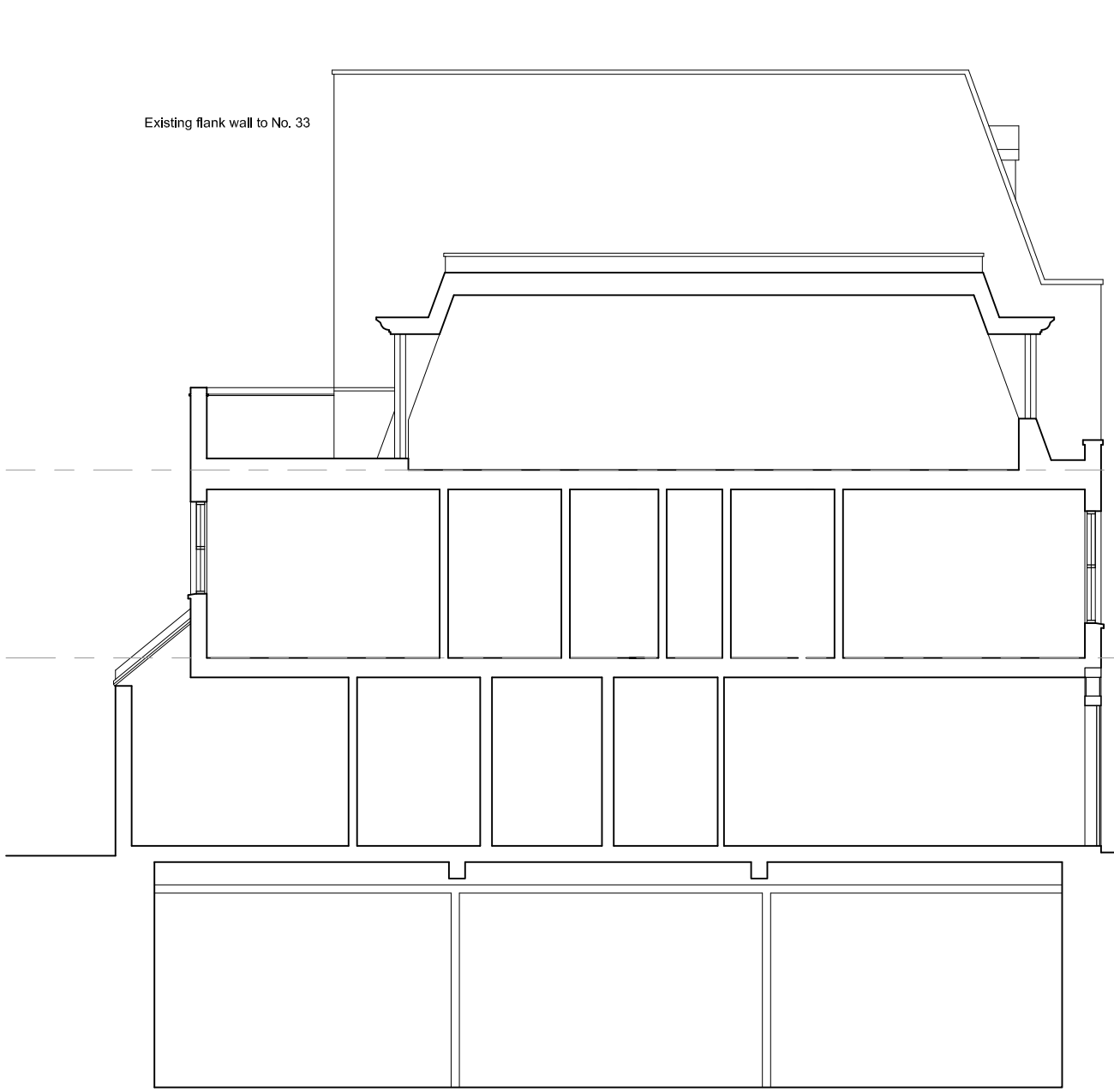
Drawn by: CW

Checked by:

Date: Nov '21

Drawing No: 181-03

Rev:



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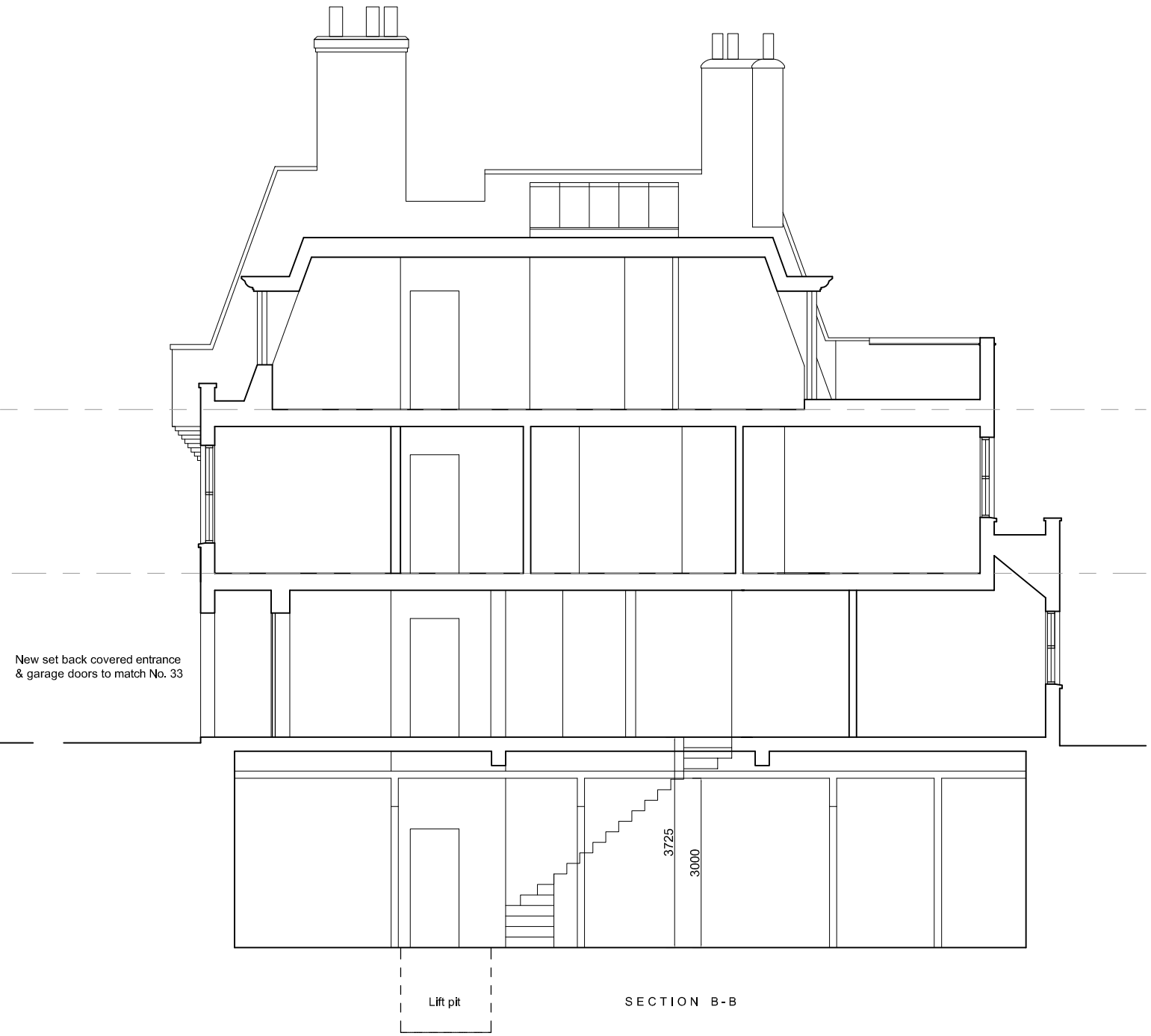

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Rev.	Revision note	Date	Initial

SCALE 250 500 1000 2000 millimeters

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Client:

Drawing title: Proposed Sections A-A & B-B

Project: 31 Culross Street
London, W1K

Scale: 1: 100 @ A3
1: 50 @ A1

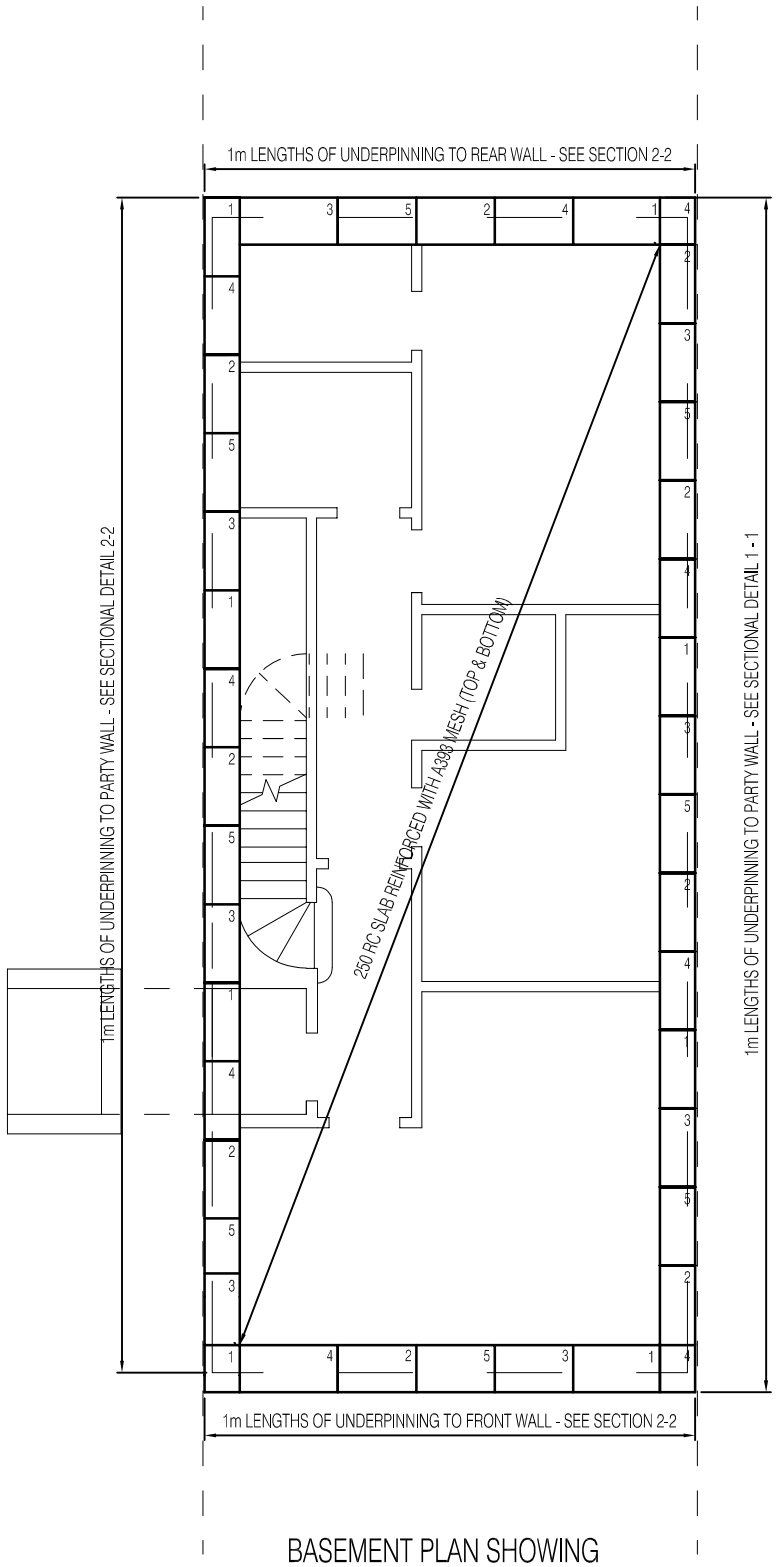
Drawn by: CW

Checked by:

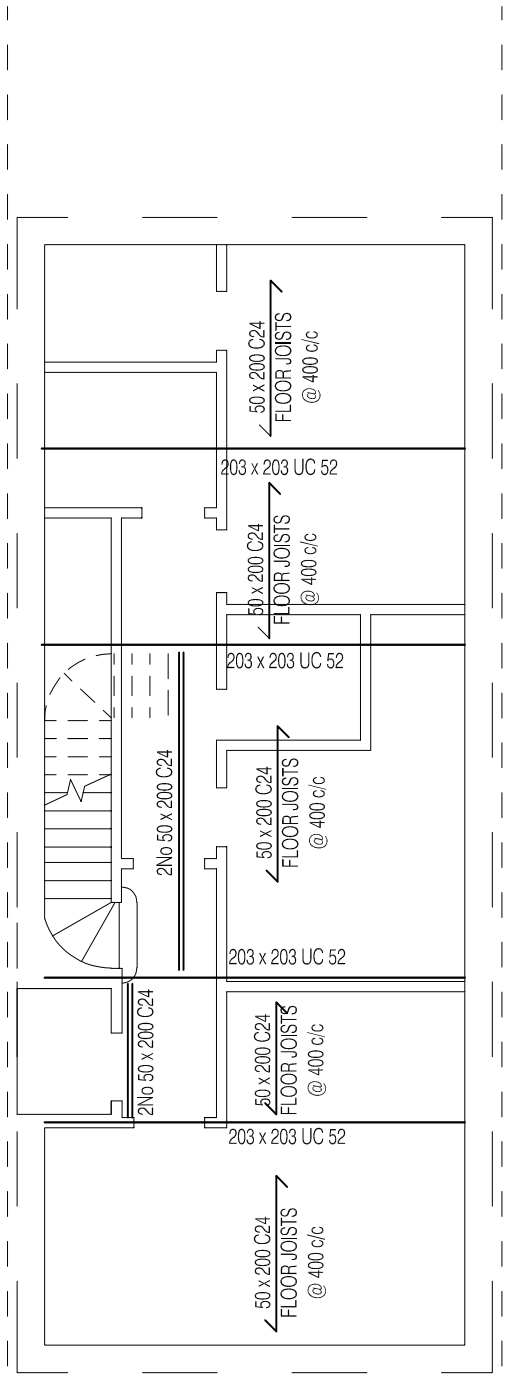
Date: Nov '21

Drawing No: 181-04

Rev:



BASEMENT PLAN SHOWING
UNDERPINNING



BASEMENT PLAN SHOWING
GROUND FLOOR

UNDERPINNING NOTES:-

1. UNDERPINNING IS TO BE UNDERTAKEN IN MAXIMUM 1 METRE LENGTHS. NO MORE THAN ONE BAY IN THREE TO BE UNSUPPORTED AT ANY ONE TIME.
2. PROVIDE TEMPORARY PROPPING AND/OR SHORING AS DEEMED NECESSARY TO CARRY OUT THE WORKS IN A SAFE MANNER.
3. ALL UNDERPIN BAYS TO HAVE 'KEYS' FORMED IN THEM SO THAT WHEN THE WORKS ARE COMPLETE THE BAYS ARE ALL TIED TOGETHER.
4. BEFORE THE CONSTRUCTION OF A BAY THE UNDERSIDE OF THE EXISTING FOOTING SHOULD BE CLEANED AND MADE LEVEL.
5. ALL JOINTS TO UNDERPIN BAYS ALREADY CONSTRUCTED SHOULD BE THOROUGHLY CLEANED, AND LATIANCE REMOVED TO EXPOSE THE AGGREGATE.
6. THE UNDERPIN TO BE TAKEN DOWN TO A DEPTH TO THE APPROVAL OF THE ENGINEER AND/OR BUILDING INSPECTOR.
7. THE BAY IS TO BE CONCRETED AS SOON AS POSSIBLE AFTER THE COMPLETION OF THE EXCAVATION, AND CAST TO 75mm OF THE UNDERSIDE OF THE EXISTING FOOTING.
8. THE TOP OF THE CONCRETE SHOULD BE LEFT SMOOTH AND FLAT TO FACILITATE FINAL UNDERPINNING.
9. THE CONCRETE IN THE UNDERPINNING SHOULD BE GRADE RC40 WITH SULFATE RESISTING CEMENT.
10. 24 HOURS AFTER THE CONCRETE IS POURED, THE GAP BETWEEN THE UNDERSIDE OF THE EXISTING FOOTING AND THE TOP OF THE CONCRETE IS TO BE FILLED WITH 3:1 SHARP SAND:CEMENT DRY PACK WELL RAMMED TO ENSURE THAT NO VOIDS ARE LEFT BETWEEN THE SURFACES.
11. ADJACENT BAYS SHOULD NOT BE EXCAVATED FOR AT LEAST 48 HOURS AFTER THE DRY PACKING HAS BEEN COMPLETED.

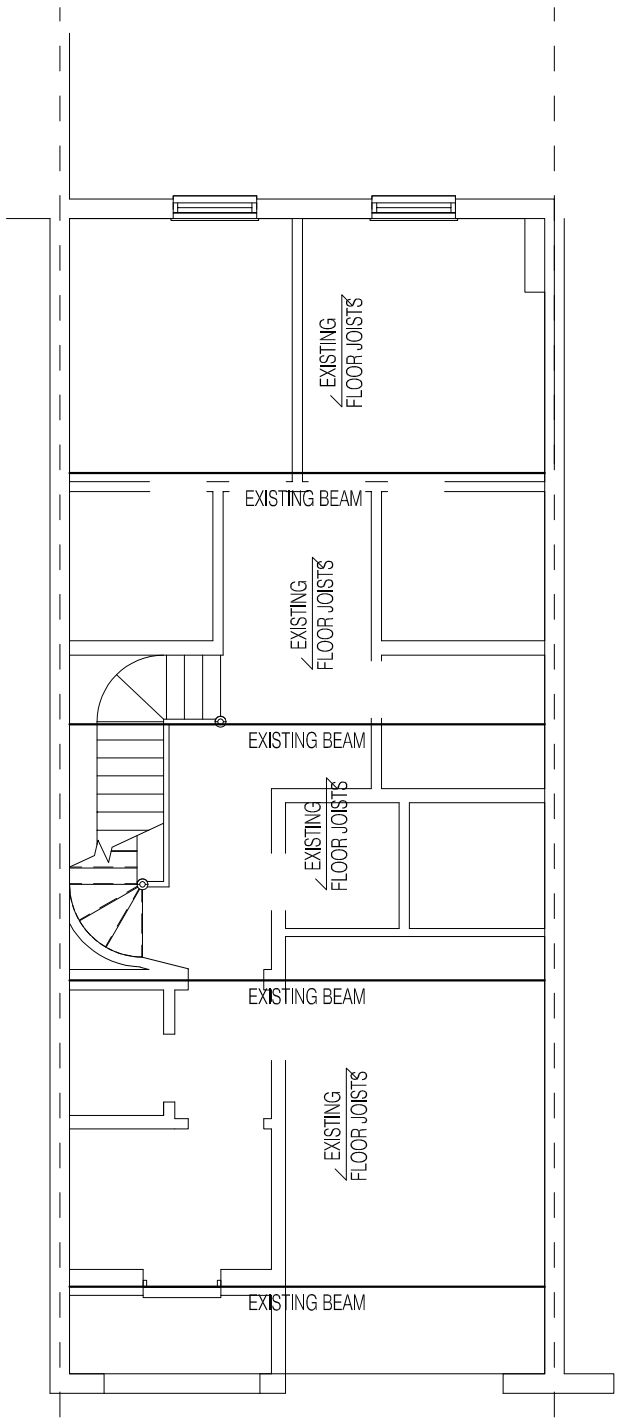
Mark	Revision	Drawn	Date	Chkd

Drawing Status: COMMENT

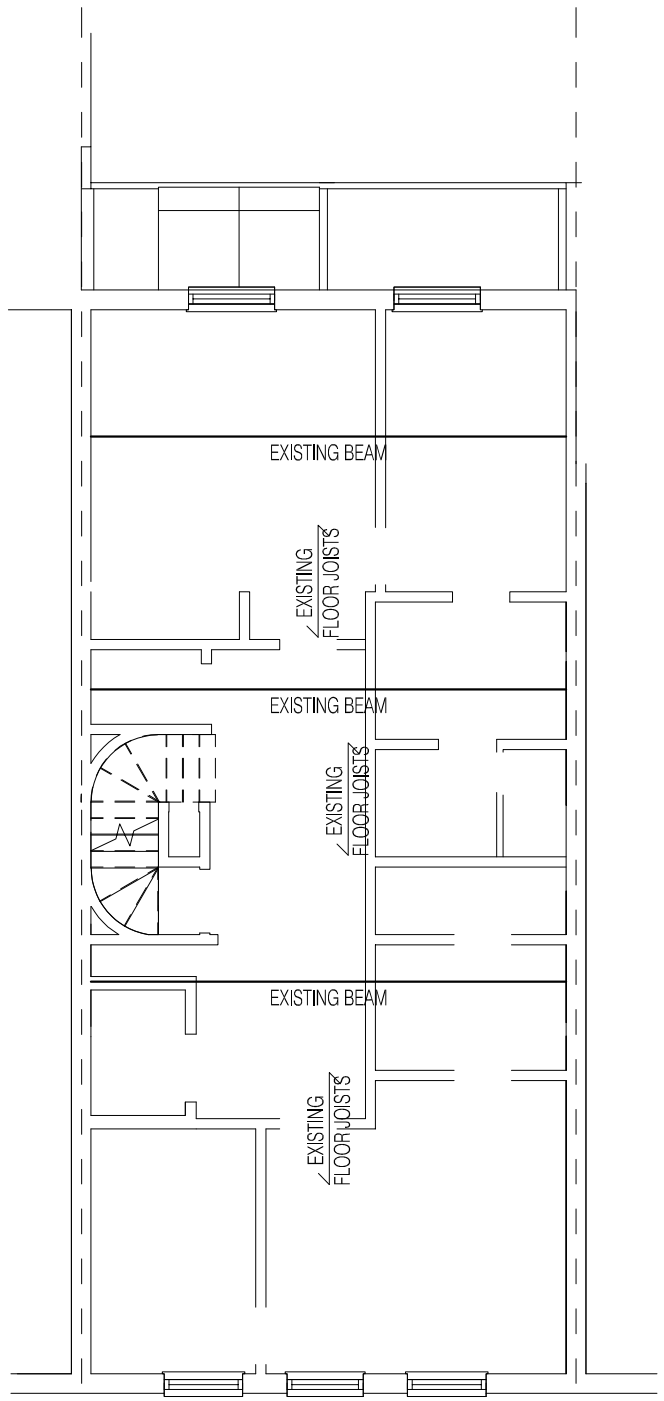
BASEMENT PLAN
SHOWING UNDERPINNING
31 CULROSS STREET
LONDON W1

VERSI ASSOCIATES LTD
STRUCTURAL ENGINEERS
6 VERWOOD ROAD, NORTH HARROW, MIDDLESEX, HA2 6LD.
Telephone :- 020 8537 6234, 079 58721212 (Mob), email :- riyaz@versiassociates.co.uk

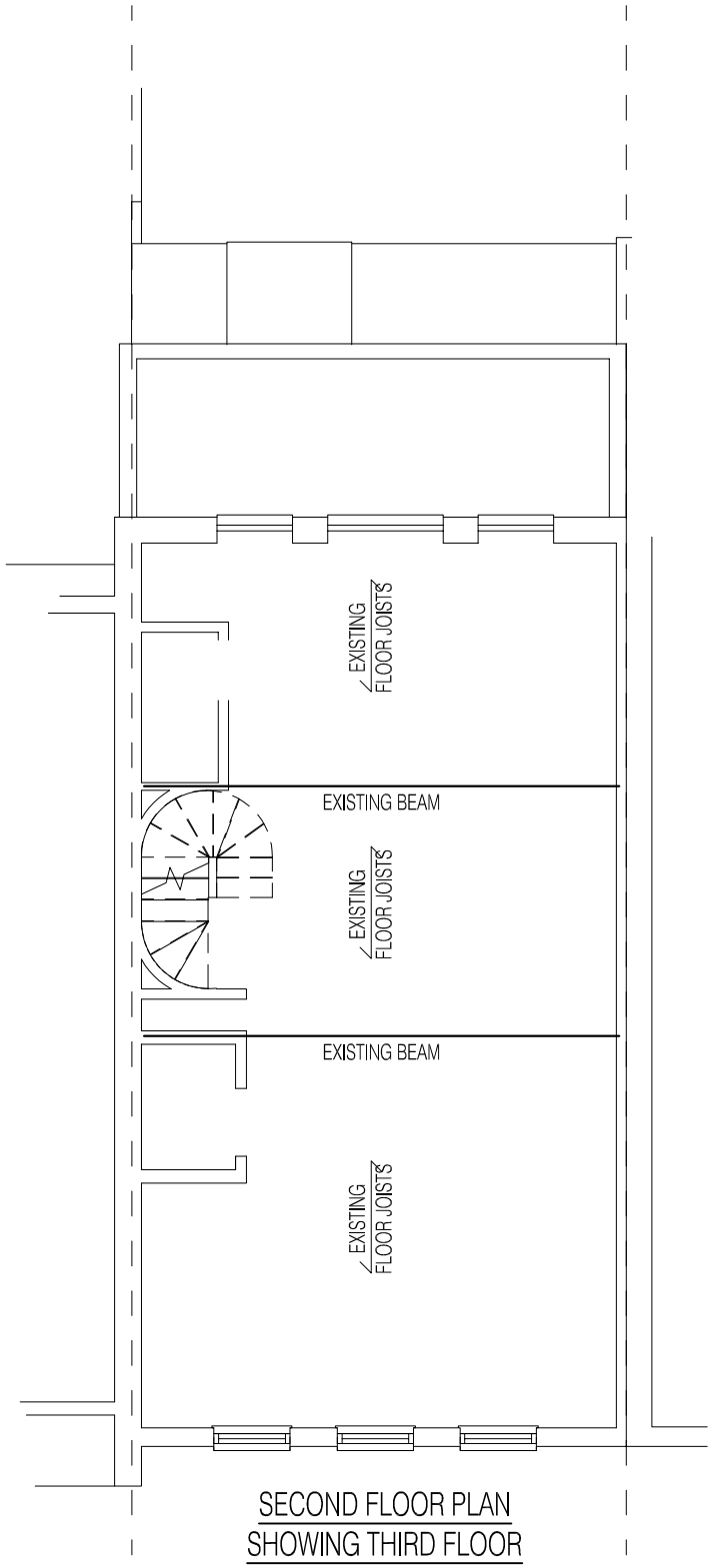
Date	Drawn by	Drawing Number	Revision
NOV 2021	RJV	7865059 / 100	
A3 Scale 1 : 100	Checked by rjv		



GROUND FLOOR PLAN
SHOWING FIRST FLOOR



FIRST FLOOR PLAN
SHOWING SECOND FLOOR



SECOND FLOOR PLAN
SHOWING THIRD FLOOR

Mark	Revision	Drawn	Date	Chkd

Drawing Status
COMMENT

UPPER FLOOR PLANS

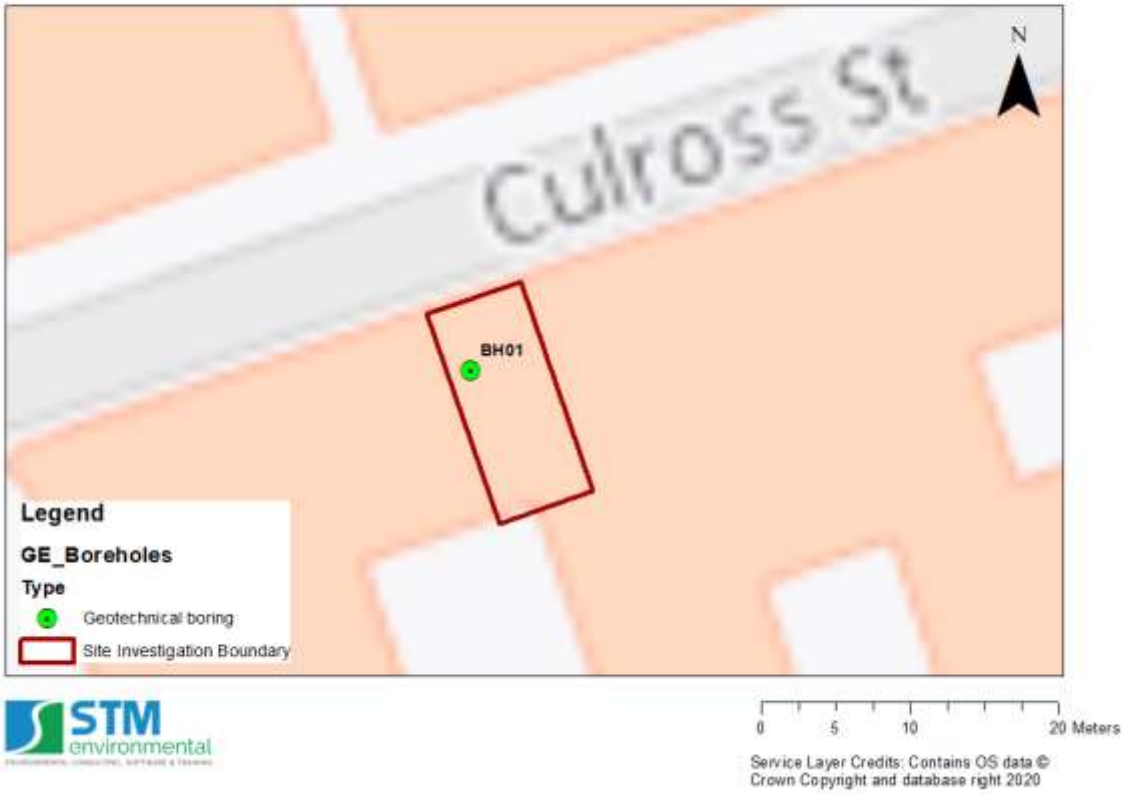
31 CULROSS STREET
LONDON W1

VERSI
ASSOCIATES LTD
STRUCTURAL ENGINEERS

6 VERWOOD ROAD, NORTH HARROW, MIDDLESEX, HA2 6LD.
Telephone :- 020 8537 6234, 079 58721212 (Mob), email :- riyaz@versiassociates.co.uk

Date	Drawn by	Drawing Number	Revision
NOV 2021	RJV	7865059 / 101	
A3 Scale 1 : 100	Checked by rjv		

12.2 Appendix 2 - Borehole Location Plan



12.3 Appendix 3 - Borehole Logs

Borehole Log

STM environmental			Borehole No. **BH01** Sheet 1 of 1
Project Name: 31 Culross Street, London W1K 7HF	Project No. 31 Culross Street	Co-ords: 528062.00 - 180679.00	Hole Type WLS
Location: 31 Culross Street, London W1K 7HF		Level: 36.00	Scale 1:50
Client: SW3 Design and Build Ltd		Dates: 23/02/2022 - 23/02/2022	Logged By MF/GN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	35.80		Made Ground - Concrete Hardstand
					0.50	35.50		Made Ground - Mottled dark greyish brown gravelly sandy SILT. Abundant concrete and brick fragments
		1.00 1.00	D	N=25 (1,1/4,5,8,8)	1.20	34.80		Made Ground - Mottled dark greyish brown and light brown slightly gravelly slightly sandy CLAY. Abundant small brick fragments, occasional concrete fragments
					1.50	34.50		Dark yellow and dark orange SAND
		2.00 2.00	D	N=8 (1,1/2,2,2,2)				Firm mottled light brown and dark brown gravelly cobbly slightly silty CLAY
		2.50	D		2.70	33.30		Mottled light brown and dark brown gravelly cobbly slightly silty CLAY
		3.00 3.00	D	N=9 (2,2/2,2,2,3)	3.00	33.00		Firm mottled light brown and dark brown gravelly cobbly slightly silty CLAY
					3.50	32.50		Light yellow SAND
		4.00 4.00	D	N=14 (1,1/1,1,6,6)	3.80	32.20		Stiff mottled greenish light grey and dark brown silty slightly sandy CLAY
					4.20	31.80		Very dense mottled light and dark orange SAND
		4.80 4.80	D	50 (15,19/50 for 225mm)	4.80	31.20		End of borehole at 4.80 m

Remarks
Borehole advanced to a maximum depth of 4.8mbgl. No water encountered. Elevation levels and borehole location grid references are approximated based on satellite imagery (not measured).

AGS

12.4 Appendix 4 – Laboratory Certification and Results

Environmental
Chemistry

Certificate of Analysis

Client:	STM ENVIRONMENTAL
Project:	22030047
Quote:	BEC210720760
Project Ref:	STM
Site:	31 Culross Street
Contact:	Lab Info
Address:	Unit 6, Crane Mews 32 Gould Road Twickenham London TW2 6RS
E-Mail:	labinfo@stmenvironmental.co.uk
Phone:	07554 195 695
No. Samples Received:	6
Date Received:	01/03/2022
Analysis Date:	07/03/2022
Date Issued:	07/03/2022
Report Type:	Final Version 01

This report supercedes any versions previously issued by the laboratory

Account Manager

Amy Tave

01283 54447

Authorised by the Operations Manager
Becky Batham

Client: STM ENVIRONMENTAL
Project Name: STM
Project No: 22030047
Date Issued: 07/03/2022

Samples Analysed

Sample Reference	Text ID	Sample Date	Sample Type
BH01/1-0-ES-1.00	22030047-001	23/02/2022 00:00:00	SOLID
BH01/3-0-ES-2.00	22030047-002	23/02/2022 00:00:00	SOLID
BH01/5-0-ES-2.50	22030047-003	23/02/2022 00:00:00	SOLID
BH01/6-0-ES-3.00	22030047-004	23/02/2022 00:00:00	SOLID
BH01/7-0-ES-4.00	22030047-005	23/02/2022 00:00:00	SOLID
BH01/9-0-ES-4.80	22030047-006	23/02/2022 00:00:00	SOLID

Client: STM ENVIRONMENTAL
Project Name: 31 Culross Street
Project No: 22030047
Date Issued: 07/03/2022

1252

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	BH01/1-0-ES-1.00	BH01/3-0-ES-2.00	BH01/5-0-ES-2.50	BH01/6-0-ES-3.00	BH01/7-0-ES-4.00	BH01/9-0-ES-4.80
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	23/02/2022	23/02/2022	23/02/2022	23/02/2022	23/02/2022	23/02/2022
pH (2.5:1 extraction)	PHSOIL	1	pH units	U		9.2	8.5	6.9	7.6	7.8	8.7
Water Soluble Sulphate as SO4 2:1 Ext	ICPWSS	10	mg/l	U		123	80	15	52	19	18
Total Moisture at 105°C	TMSS	0.1	%	U		17.5	11.8	20.0	5.3	13.2	5.5
Total Moisture at 35°C	CLANDPREP	0.1	%	N		9.0	4.5	16.1	3.2	6.4	2.2
Description of Solid Material	CLANDPREP		-	N		CLAY	CLAY	CLAY	CLAY	CLAY	SAND

Client: STM ENVIRONMENTAL
Project Name: 31 Culross Street
Project No: 22030047
Date Issued: 07/03/2022

Deviating Sample Report

Sample Reference	Text ID	Reported Name	Incorrect Container	Incorrect Label	Headspace	Incorrect/No Preservative	No Sampling Date	Holding Time

Analysis Method

Analysis	Analysis Type	Analysis Method
CLANDPREP	PHYS	As Received
ICPWSS	METALS	Air Dried & Ground
PHSOIL	INORGANIC	As Received
TMSS	PHYS	As Received

Result Report Notes

Letters alongside results signify that the result has associated report notes.
The report notes are a follows:

Letter	Note
A	Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
B	The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
C	Due to matrix interference the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
D	A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
E	Due to recoveries beyond our calibration range and following the maximum size of dilution allowed, the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.
F	Based on the sample history, appearance and smell a dilution was applied prior to testing . Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
G	The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.

Client:	STM ENVIRONMENTAL
Project Name:	31 Culross Street
Project No:	22030047
Date Issued:	07/03/2022

HWOL Acronym Key

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total

Additional Information

This report refers to samples as received, and SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

In the accreditation column of analysis report the codes are as follows:

U = UKAS accredited analysis
M = MCERT accredited analysis
N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 105° C.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35° C.

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Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

IS = Insufficient Sample to complete analysis
NA = Sample is not amenable for the required analysis
ND = Results cannot be determined

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the Subcontracted lab for information regarding any deviancies for this analysis.

End of Certificate of Analysis

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SOCOTEC

UKAS TESTING
0001

TEST REPORT

Liquid and Plastic Limit and Plasticity Index

Report No:	**UXB0540153/830/M1**	**Report Date:**	**21 March 2022**
		Our Contract Ref:	51067967
Client:	STM ENVIRONMENTAL LTD		
Address:	Unit 6 Crane Mews 32 Gould Road Twickenham TW2 6RS GB	Sample No.	26589830
		Client Sample Ref:	3
		Date Sampled:	23 Feb 2022
		Date Received:	24 Feb 2022
Client Contact:	Not Advised	Date Tested:	9 Mar 2022
Site:	**31 Culross Street**	Material Supplier:	Site
Location:	BH01/4	Material Source:	Site
Description:	Gravelly Clay	Sampling Certificate:	Received
Material Specification:	Not given	Samples Submitted by:	SOCOTEC Uxbridge
Sample Type:	Bulk Bags	Sampled by:	Client
Depth (m):	2.00 - 2.00	Tested By:	SOCOTEC Uxbridge
Method of Preparation:	BS 1377-1:1990 7.4.3 & BS1377-2:1990 4.2.4		

Results :

As Received Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	% Passing 425µm
19	40	19	40	40

Sample Preparation: **Washed over 425um BS test sieve**

Certified that the laboratory testing was carried out in accordance with BS1377-2:1990 Method 3.2, 4.4 and 5

Signed: MAhlawat

Manprit Ahlawat - QA & Technical Support
for and on behalf of SOCOTEC UK Limited

Form S1 v9 7/06

The results relate to the items tested only. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
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SOCOTEC UK Limited. Registered in England No. 2880501. Registered Office: SOCOTEC House, Bretby Business Park, Ashby Road, Burton Upon Trent, DE15 0YZ

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SOCOTEC

UKAS TESTING
0001

TEST REPORT

Liquid and Plastic Limit and Plasticity Index

Report No:	**UXB0540153/834/M1**	**Report Date:**	**21 March 2022**
		Our Contract Ref:	51067967
Client:	STM ENVIRONMENTAL LTD		
Address:	Unit 6 Crane Mews 32 Gould Road Twickenham TW2 6RS GB	Sample No.	26589834
		Client Sample Ref:	7
		Date Sampled:	23 Feb 2022
		Date Received:	24 Feb 2022
Client Contact:	Not Advised	Date Tested:	9 Mar 2022
Site:	**31 Culross Street**	Material Supplier:	Site
Location:	BH01/8	Material Source:	Site
Description:	Clay	Sampling Certificate:	Received
Material Specification:	Not given	Samples Submitted by:	SOCOTEC Uxbridge
Sample Type:	Bulk Bags	Sampled by:	Client
Depth (m):	4.00 - 4.00	Tested By:	SOCOTEC Uxbridge
Method of Preparation:	BS 1377-1:1990 7.4.3 & BS1377-2:1990 4.2.4		

Results :

As Received Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	% Passing 425µm
14	34	16	18	62

Sample Preparation: **Washed over 425um BS test sieve**

Form S1 v9 7/06

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Lab Info
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t: 01923 225404
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e: reception@i2analytical.com

Analytical Report Number : 22-42572

Project / Site name:	31 Culross Street, W1K 7HF	**Samples received on:**	01/03/2022
Your job number:	31 CULROSS STREET	**Samples instructed on/ Analysis started on:**	01/03/2022
Your order number:		**Analysis completed by:**	11/03/2022
Report Issue Number:	1	**Report issued on:**	11/03/2022
Samples Analysed:	1 10:1 WAC Sample		

Izabela Wójcik
Signed:

Izabela Wójcik
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

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Fax: 01923 237404
email:reception@i2analytical.com

Waste Acceptance Criteria Analytical Results

Report No:	**22-42572**						
					Client:	**STM ENVIRON**	
Location	**31 Culross Street, W1K 7HF**						
Lab Reference (Sample Number)	2189100 / 2189101				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	27/02/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH01/2						
Depth (m)	1.50						
Solid Waste Analysis							
TOC (%)**	0.2				3%	5%	6%
Loss on Ignition (%) **	0.3				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	7.7				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	0.62				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0056			0.0534	0.5	2	25
Barium *	0.0059			0.0558	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0015			0.014	0.5	10	70
Copper *	< 0.0007			< 0.0070	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0018			0.0175	0.5	10	30
Nickel *	0.0041			0.039	0.4	10	40
Lead *	0.0046			0.044	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0033			0.031	4	50	200
Chloride *	2.1			20	800	15000	25000
Fluoride	0.17			1.7	10	150	500
Sulphate *	8.0			76	1000	20000	50000
TDS*	31			300	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	8.65			82.2	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.80						
Dry Matter (%)	97						
Moisture (%)	3.1						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 22-42572
Project / Site name: 31 Culross Street, W1K 7HF

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2189100	BH01/2	None Supplied	1.5	Brown clay and sand with tar and gravel

Analytical Report Number : 22-42572
Project / Site name: 31 Culross Street, W1K 7HF

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025

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Analytical Report Number : 22-42572
Project / Site name: 31 Culross Street, W1K 7HF

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

12.5 Appendix 6 – Site Photographs

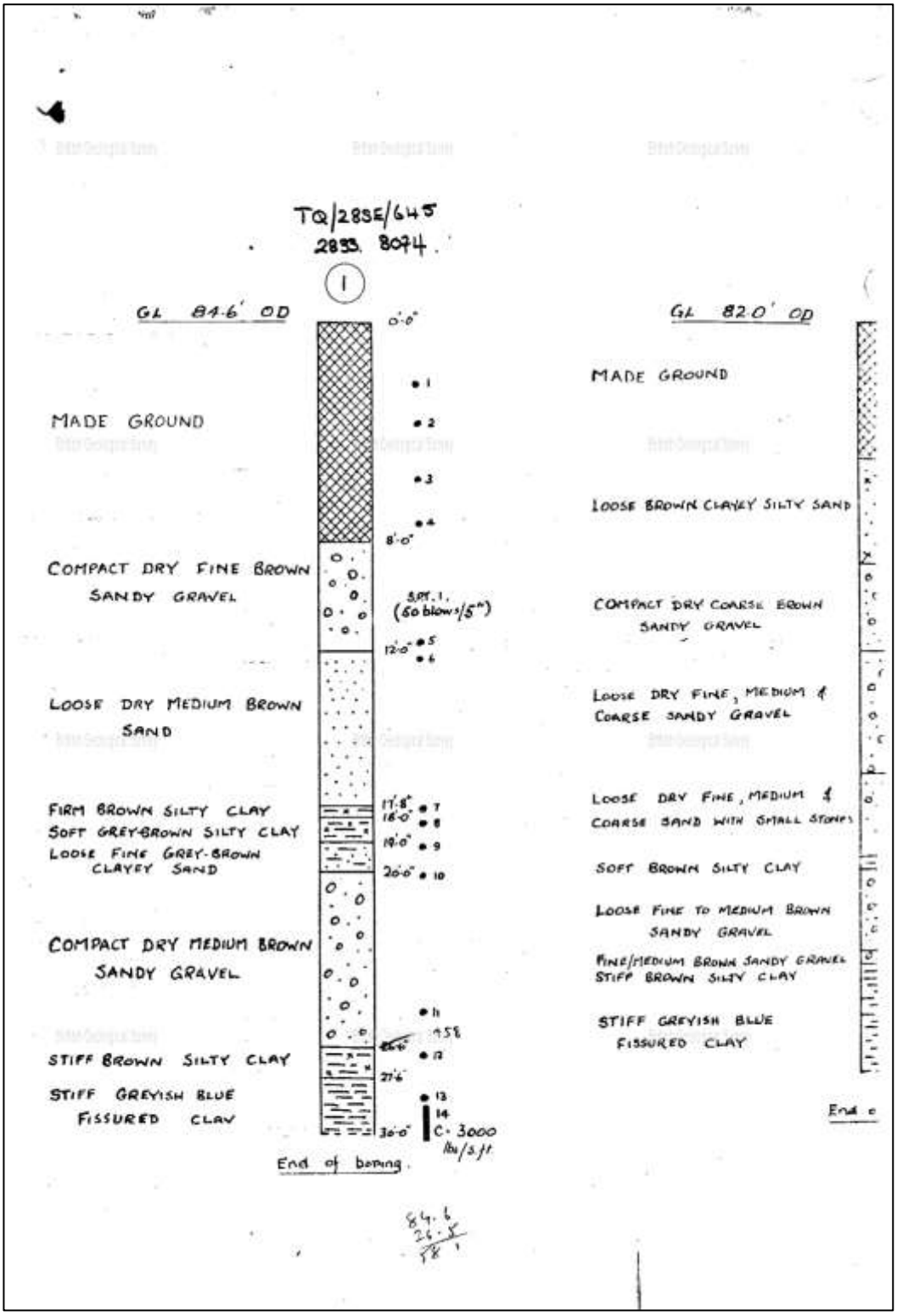
Windowless sampler rig in operation at location BH01

4.8m of soil extracted from location BH01

12.6 Appendix 7 – Results of Standard Penetration Testing

Location ID	Depth Top (m)	Blows Seating 1	Blows Seating 2	Blows Main 1	Blows Main 2	Blows Main 3	Blows Main 4	N Value
BH01	1	1	1	4	5	8	8	**25**
	2	1	1	2	2	2	2	**8**
	3	2	2	2	2	2	3	**9**
	4	1	1	1	1	6	6	**14**
	4.8	15	19	18	15	17		**>50**

12.7 Appendix 8 - Borehole logs from nearby investigations

12.7.1 Previous Borehole Log No.1

Previous borehole log recorded approximately 120m E of the site at grid reference: 528330, 180740.