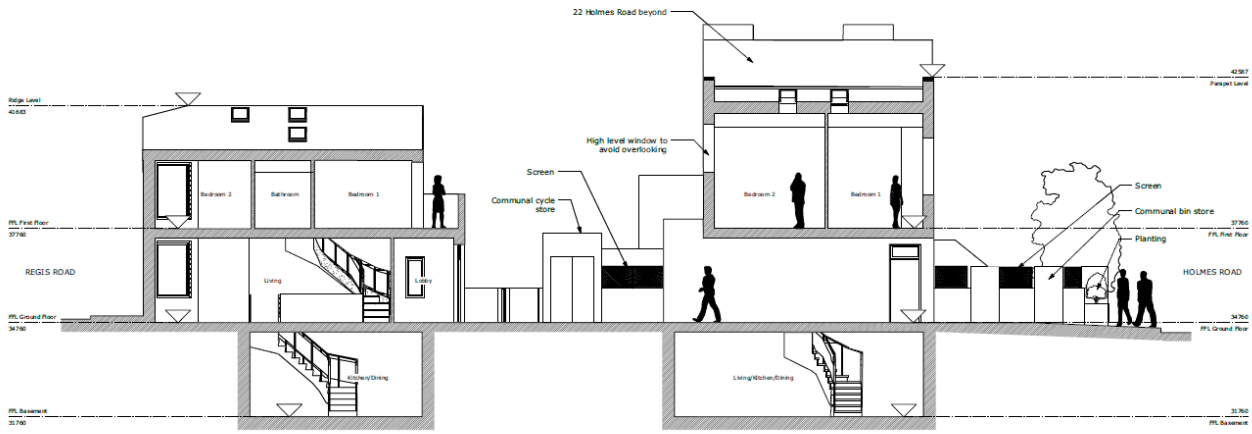
22 Holmes Road NW5 3AB - Basement Impact Assessment

Surface Water & Groundwater



25 September 2019

T1.01

22 Holmes Road NW5 3AB - Basement Impact Assessment

Prepared for

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Report reference:

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22 HOLMES ROAD NW5 3AB - BASEMENT IMPACT ASSESSMENT

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Revision record:

Issue	Date	Status	Comment	Author	Checker	Reviewer
1	May 2019	Draft		TKT	HRS	HJK / HRS
2	May 2019	Final		TKT	HRS	HJK / HRS
3	September 2019	Final	Updated following Campbell Reith audit	TKT	HRS	MOR

Impact summary

The assessment findings are summarised as follows:

1. Impacts to surface water flows and related flooding	High	
	Med	
	Low	
2. Impacts to ground water flows and related flooding	High	
	Med	
	Low	
3. Overall risk posed by the Site	High	
	Med	
	Low	

Key:

High		*There is a high potential risk*
Med		*There is medium potential risk*
Low		*There is a low potential risk*

Summary

Based on the Site-specific data reviewed, it is considered that the proposed basement extension will not cause impacts to the surface water or groundwater regimes at the Site.

The overall impermeable surface area will be unchanged and potential flood risk to adjacent and downstream properties will not be affected. There are no surface water features that may be impacted by the proposed scheme.

No groundwater was recorded during the ground investigation in February 2019, however subsequent monitoring recorded the presence of groundwater deeper than the proposed depth of the basement. Further testing confirmed the Site is located above low permeability London Clay and therefore the proposed development is not expected to have any impact on groundwater levels or flows. Based on this no mitigation measures are required for groundwater flow, although monitoring should be continued through the construction process to confirm the rest water level.

There are neighbouring basements to the Site, however these are deeper than the proposed development and there are no concerns regarding cumulative impacts.

Contents

1 Introduction

1.1 Introduction

Stantec was commissioned by Norton Mayfield Architects (the Client) to undertake the surface water and groundwater aspects of a Basement Impact Assessment (BIA) for the proposed development at 22 Holmes Road, London, NW5 3AB (the Site). The Site location is shown in Figure 1.1. Instruction to proceed in accordance with a Stantec proposal dated 4th February 2019 was provided by the Client on 12th February 2019.

This document considers the potential impact relating to the proposed development in terms of surface water and groundwater and complies with the London Borough of Camden Policy Guidance (CPG) regarding basements and lightwells (London Borough of Camden, 2018).

1.2 Background

The Site is located in the jurisdiction of the London Borough of Camden (the Council) and comprises a two-storey residential property. A planning application is to be submitted to the Council which includes extension works to both the property and existing semi-basement. Therefore, a BIA is required to demonstrate that further subterranean development will not cause harm to the built and natural environment and local amenity.

1.3 Scope of works

The requested scope of works includes an assessment of the impacts of the proposed development on surface water and groundwater flow in accordance with the guidance published by the Council (ARUP, 2010; Camden Borough Council, 2018). The analysis takes into account the findings of a Site Investigation (SI) undertaken by Key Geosolutions Ltd in February 2019 (Key GeoSolutions Ltd ref: 19-088-R-001), which is included in Appendix B and should be read in conjunction with this report.).

This report considers the hydrological and hydrogeological conditions of relevance to expansion of the basement at the Site. The assessment pertaining to ground stability has been undertaken by Key GeoSolutions Ltd, which is also included in Appendix B.

1.4 Proposed basement works

The proposed development involves the construction of three residential properties, comprising two three storey buildings each with a basement (see Appendix A). The total depth of the basements is approximately 3m below ground level.

1.5 Surrounding basements

Based on information from the client, it is understood that two properties adjacent to the Site have existing basements, both of which are deeper than the proposed development.

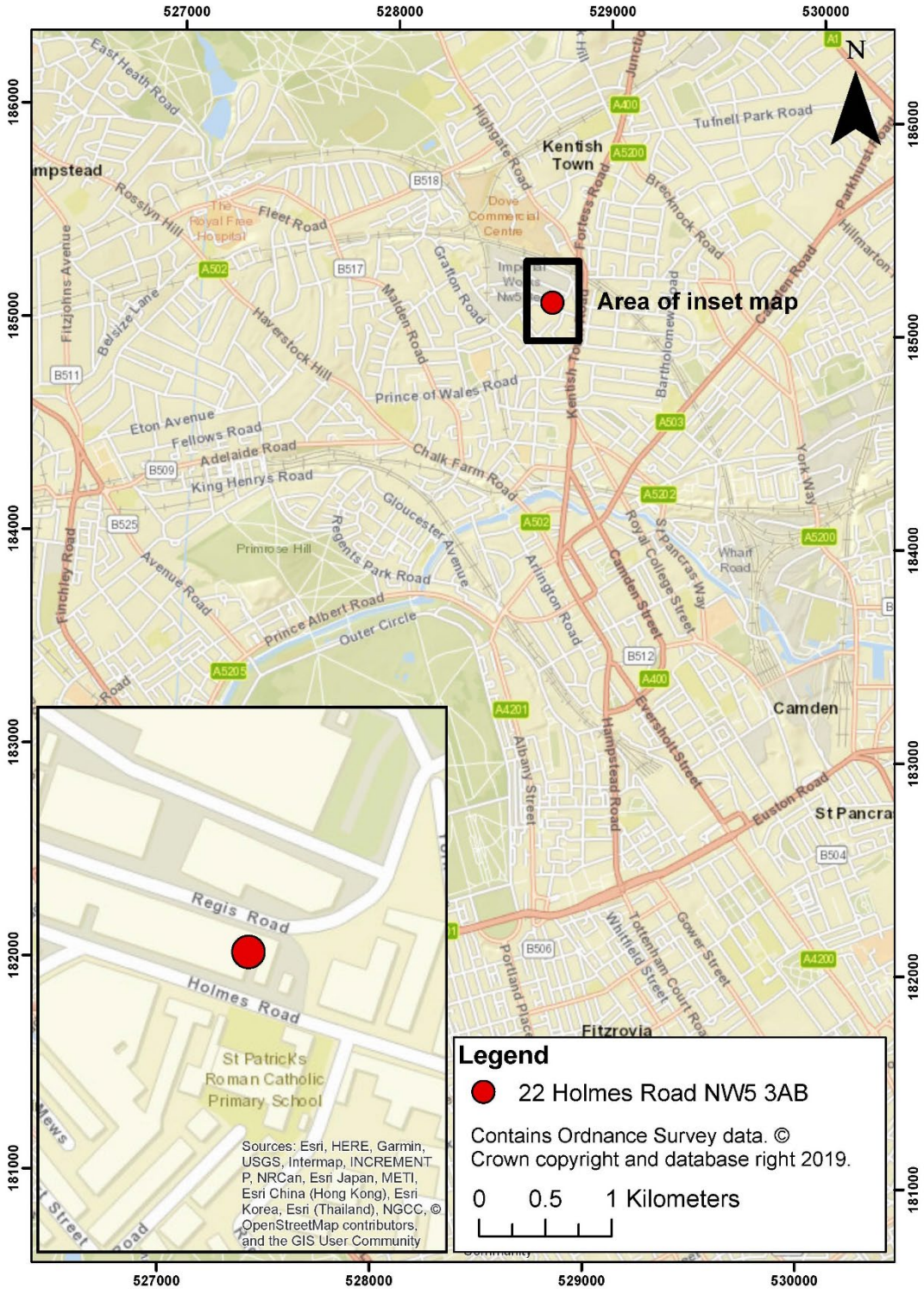


Figure 1.1 Site location

2 Screening & scoping

2.1 Screening

The screening stage results are provided in Table 2.1 (surface water) and Table 2.2 (groundwater) below. The structure of the assessment is based on the screening questions as set out in CPG (Camden Council, 2018) and the results have been tabulated below. Where responses are 'Yes' to the questions raised in the assessment, those issues are considered further in section 5. It is noted that in some cases the answer 'Yes' relates to a positive outcome (e.g. a reduction in run-off) and this is stated under Justification in Table 2.1 and Table 2.2.

Table 2.1 Surface Water screening

Impact question	Answer	Justification	Reference
1) Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is outside all four of the catchments identified in Figure 4 of the Camden Geological, Hydrogeological and Hydrological Study	ARUP, 2010
2) As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	The existing drainage arrangements will be kept for the proposed development. Therefore there will be no material change to the existing route of the surface water flows.	Site plans (Appx A)
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	Although a proportion of the existing garden will be lost to the proposed basement, the site is currently 100% hard surfaced and will remain so. Therefore there will be no change to the proportion of hard surfaced area.	Site plans (Appx A)
4) Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	The Site is currently 100% hard surfaced, which the proposed development does not alter. Therefore there will be no change to the profile of inflows received by adjacent properties	Site plans (Appx A)

5) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	The proposed development is residential and is not expected to alter the quality of surface water received by adjacent properties or downstream watercourses.	Site plans (Appx A)
6) Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water?	No	The site is not in an area identified to have surface water flood risk (or any historical flooding) in either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment. There are no nearby surface water features that could have static water levels in connection with the area of the Site.	Arup, 2010; Camden Council, 2013; URS, 2014; OS, 2019

Table 2.2 Groundwater screening

Impact question	Answer	Justification	Reference
1a) Is the site located directly above an aquifer?	No	The Site is above the London Clay Formation which is not considered to be an aquifer, and there are no superficial deposits in the area (Figure 2.1)	BGS, 2019
1b) Will the proposed basement extend beneath the water table surface?	Uncertain	There is no aquifer directly beneath the Site. The ground beneath the site is generally of a low permeability, as demonstrated by the lack of groundwater encountered during drilling of the site boreholes and the low rate of groundwater level rise following the rising head test (Figure 3.1). Since the drilling, groundwater has been encountered in the borehole which is continuing to rise and may yet rise above the base of the proposed basement (Table 3.2).	BGS, 2019
2) Is the site within 100 m of a watercourse, well (used/disused) or potential spring line?	No	The Site is not within 100 m of surface watercourses, well or potential spring line.	Ordnance Survey, 2019; ARUP 2010 (Figure 2)

3) is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is outside all four of the catchments identified in Figure 4 of the Camden Geological, Hydrogeological and Hydrological Study	ARUP, 2010
4) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	Although a proportion of the existing garden will be lost to the proposed basement, the site is currently 100% hard surfaced and will remain so. Therefore there will be no change to the proportion of hard surfaced area.	Site plans
5) As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	Pending confirmation from the final drainage plans it is not expected that any surface water will be discharged via soakaways and/or SUDS.	Site plans
6) Is the lowest point of the proposed excavation close to, or lower than, the mean water level in any local pond or spring line.	No	There are no local ponds or spring lines that may be considered in connection with the Site.	Ordnance Survey, 2019

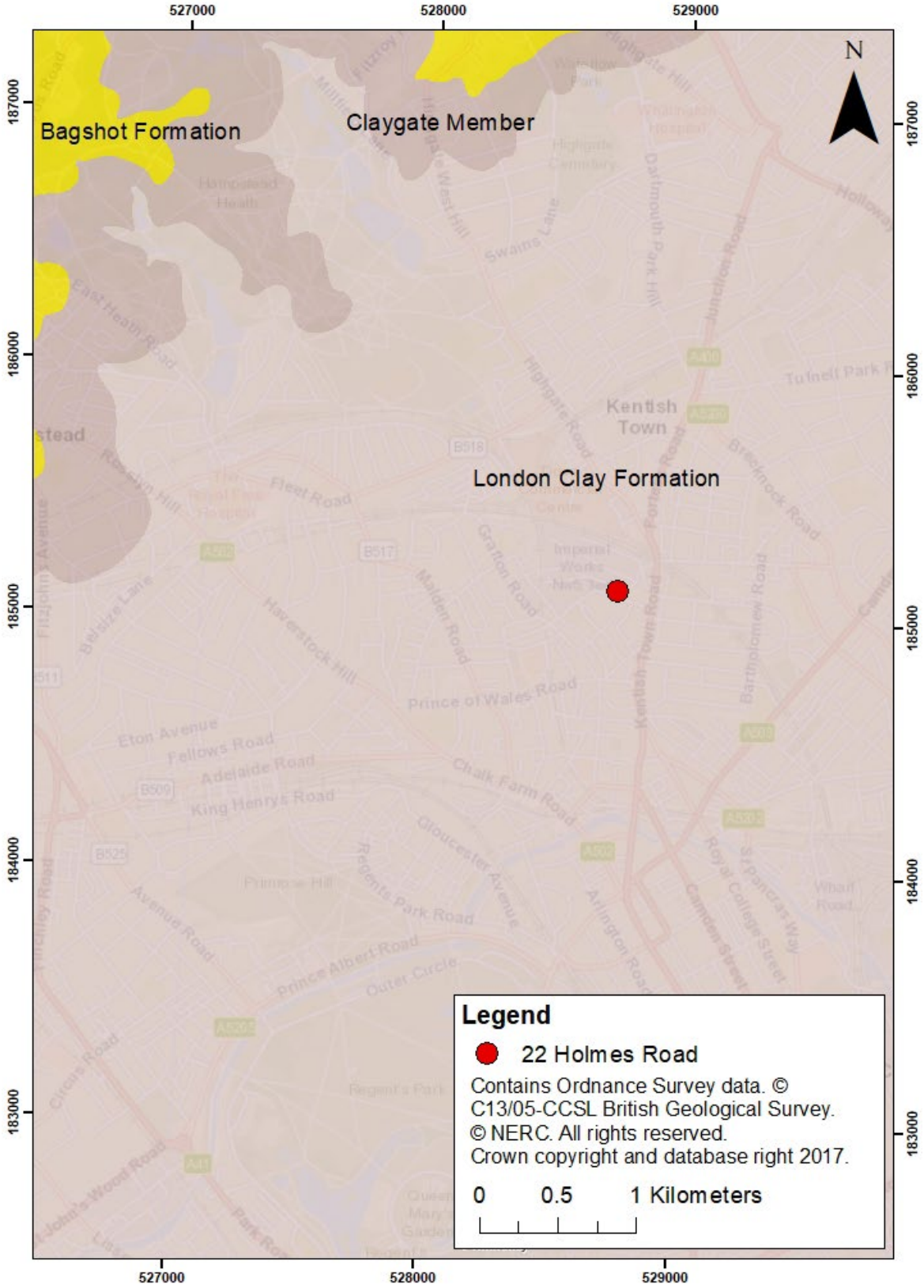


Figure 2.1 Site Geology

2.2 Scoping

Where impact questions could not be justified at the screening stage, they are taken forward to the Scoping stage for further assessment. Table 2.3 summarises the scoping assessment.

Table 2.3 Scoping Assessment

Impact question	Answer	Justification	Reference
1b) Will the proposed basement extend beneath the water table surface?	Uncertain	Monitoring of the groundwater level following the SI in February 2019 recorded a rising groundwater level, however after 2 months the groundwater level was still below the anticipated depth of the proposed basement.	Key GS, 2019

3 Site Investigation

The ground investigation was carried out on the 28th February 2019 by Key GS on behalf of the Client and is presented in Appendix B.

Three window sample holes (WS01, WS02 and WS03) and one trial pit were sunk on the site and the window sample holes were equipped with water monitoring standpipe installations. Groundwater monitoring was undertaken on three subsequent occasions. Locations are presented in Key GS, 2019 (Appx. B). The main information relevant to the present report is presented in Table 3.1.

Table 3.1 Ground investigation summary

	WS01	WS02	WS03
Position	Front of Site	Middle of Site	Rear of Site
Datum	Ground level	Ground level	Ground level
Made ground	Up to 0.5 mbgl	Up to 0.8 mbgl	Up to 0.9 mbgl
London Clay	At least 1.00 mbgl	At least 5.45 mbgl	At least 5.45 mbgl
Depth to base	1.00 mbgl	5.45 mbgl	5.45 mbgl
Base of installation	0.5 mbgl	5.45 mbgl	0.9 mbgl
Groundwater	Groundwater not encountered		

Groundwater was not encountered during the SI, however a confirmatory monitoring visit was carried out on 21st March 2019; WS01 was still dry, 0.02m was recorded at the base of WS03 and 0.38m of groundwater was recorded in WS02. Two further rounds of monitoring were carried out and the results shown in Table 3.2

Table 3.2 Groundwater levels (mBGL)

Date	WS01	WS02	WS03
28/02/2019	0.5 (Dry)	4.92 (Dry)	0.9 (Dry)
21/03/2019	0.5 (Dry)	4.54	0.88
02/04/2019	0.5 (Dry)	3.9	0.87
17/04/2019	0.5 (Dry)	3.25	0.9 (Dry)

As part of the final monitoring visit a rising head test was carried out on WS02 to determine the rate of rise of the groundwater; after the window sample hole was dipped, a bailer was used to remove the standing water and then the water level recorded at regular intervals. The results are plotted in Figure 3.1.

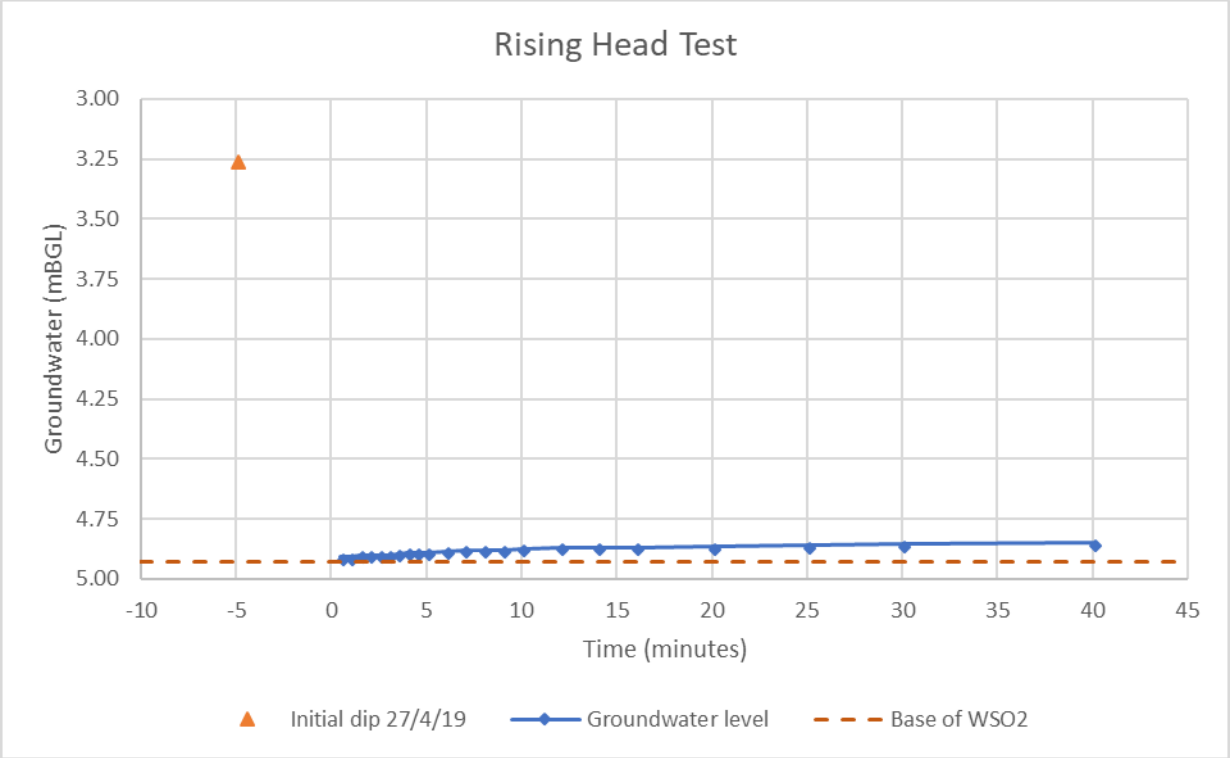


Figure 3.1 Rising head test groundwater levels

The rate of rise of the groundwater recorded during the monitoring and rising head test indicates a low permeability, typical of the London Clay such that groundwater flow will be negligible.

4 Impact Assessment

4.1 Surface water impact

The available evidence indicates no risk of surface water flooding at the site as defined by the flood maps prepared by Arup (2010), URS (2014) and the Flood Map for Planning (2018). There is also no change to the quality of surface waters. The proposed development will not change the proportion of impermeable surfaces.

4.2 Groundwater impact

The London Clay deposits that underlie the Site are not considered to be an aquifer and typically are low permeability. Groundwater is generally not encountered during drilling within London Clay although sometimes there may be some groundwater associated with localised partings of silt or sand. The groundwater monitoring and rising head test carried out at the Site indicate a low permeability as expected in London Clay and any horizontal flow of groundwater would be negligible. Therefore it is not expected that the proposed development will have any impact with regard to groundwater flows or levels on neighbouring properties or basements.

Although the monitoring has so far recorded a groundwater level deeper than the proposed basement it is possible that the proposed basement may encounter localised groundwater. Therefore, it is recommended that groundwater monitoring is continued through the construction phase and, as a precautionary measure, provision should be made for the implementation of pumps to manage any significant groundwater ingress during construction. An appropriate design for the development foundations may need to be implemented if groundwater is present at depths less than the proposed basement.

5 Conclusions & Recommendations

5.1 Conclusions

Potential impacts of the proposed basement development at 22 Holmes Road have been considered.

Surface water: The proposed development is unlikely to impact flood risk in the local area, or local surface water features.

Groundwater: The low permeability of the deposits indicates that the proposed development is not expected to have any impact on groundwater levels or flows. There is a possibility that the groundwater level may be shallower than the proposed basement, which would require an appropriate design for the foundations.

5.2 Recommendations

As the Window Samples have been equipped with water monitoring standpipe installations, it is recommended that they are monitored during the construction phase to confirm the groundwater level. In addition, as a precautionary measure, provision should be made for the implementation of pumps to manage any significant groundwater ingress during construction. An appropriate design for the development foundations may need to be implemented if groundwater is present at depths less than the proposed basement.

References

Arup, 2010. Camden Geological, Hydrogeological and Hydrological Study.

Barton, N. and Myers S., 2016. The Lost Rivers of London, revised and extended edition. Historical Publications Ltd.

British Geological Survey, 2019. http://mapapps2.bgs.ac.uk/geoindex/home.html (Accessed April 2019)

Camden Council, 2013. Managing flood risk in Camden. The London Borough of Camden Flood Risk Management Strategy

Camden Council, 2018. Camden Planning Guidance: Basements and lightwells. London Borough of Camden.

Key GS, 2019. 22 Holmes Road, London NW5 3AB. Basement Impact Assessment (Land Stability) (April 2019). Report reference 19-088-R-001.

Ordnance survey mapping, 1:10,000. © Crown copyright. All rights reserved. Licence number AL 100015683 (Accessed April 2019)

URS, 2014. London Borough of Camden Strategic Flood Risk assessment. Ref 47070547

Appendices

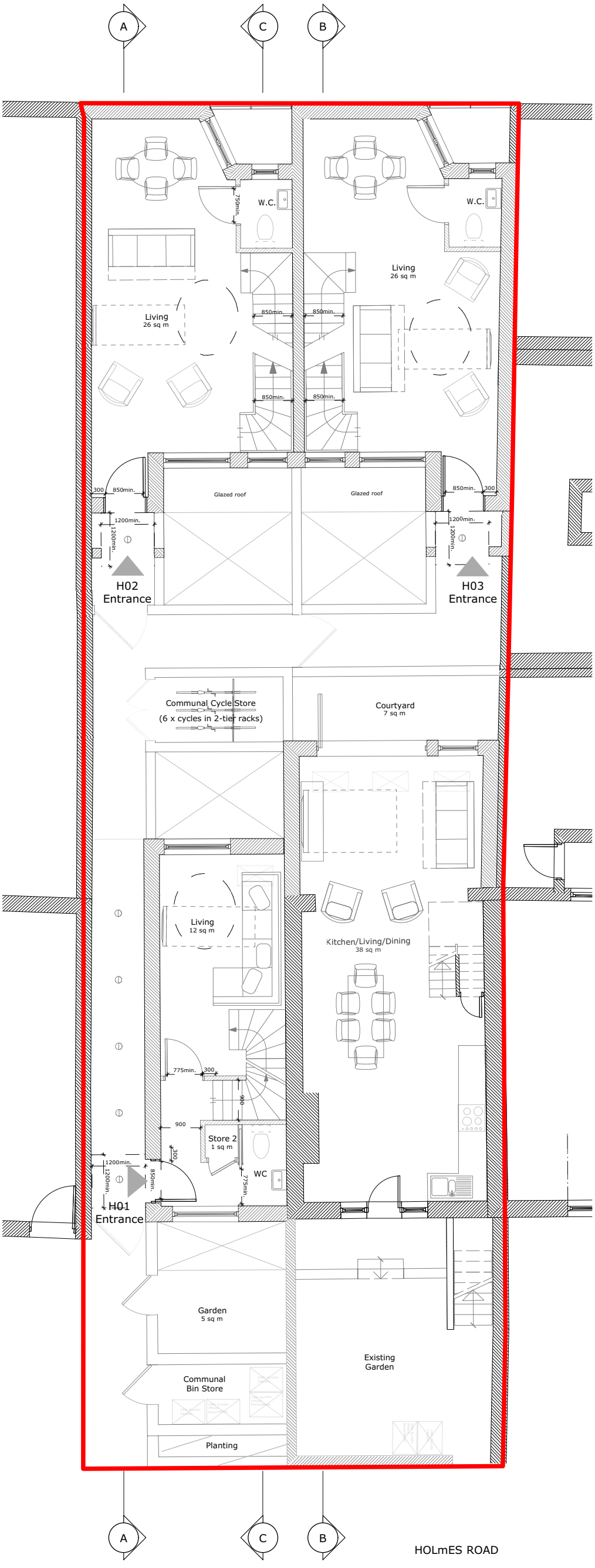
Appendix A

Site Plans

KEY:

Existing Walls

Proposed Walls



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P8 14/05/2019 For Planning

revisions:

All dimensions and areas are approximate and are to be verified on site. Do not scale.

Purpose of issue:

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Client:

Project Title:

22 Holmes Road, London
NW5 3AB

Drawing No:

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Drawing title:

Ground Floor - Proposed

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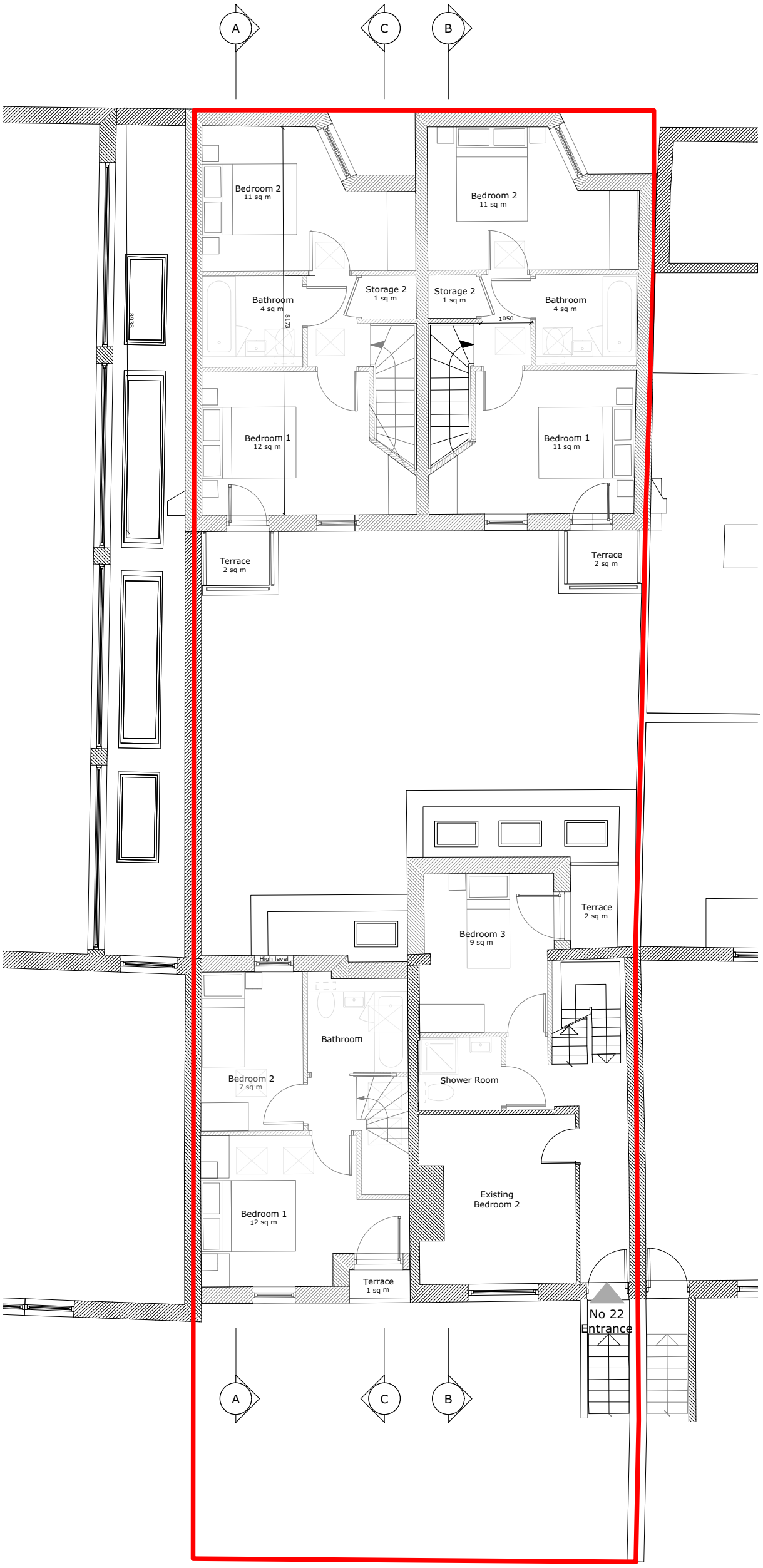
Proposed Walls



HOLmES ROAD

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Project Title:

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Drawing title:

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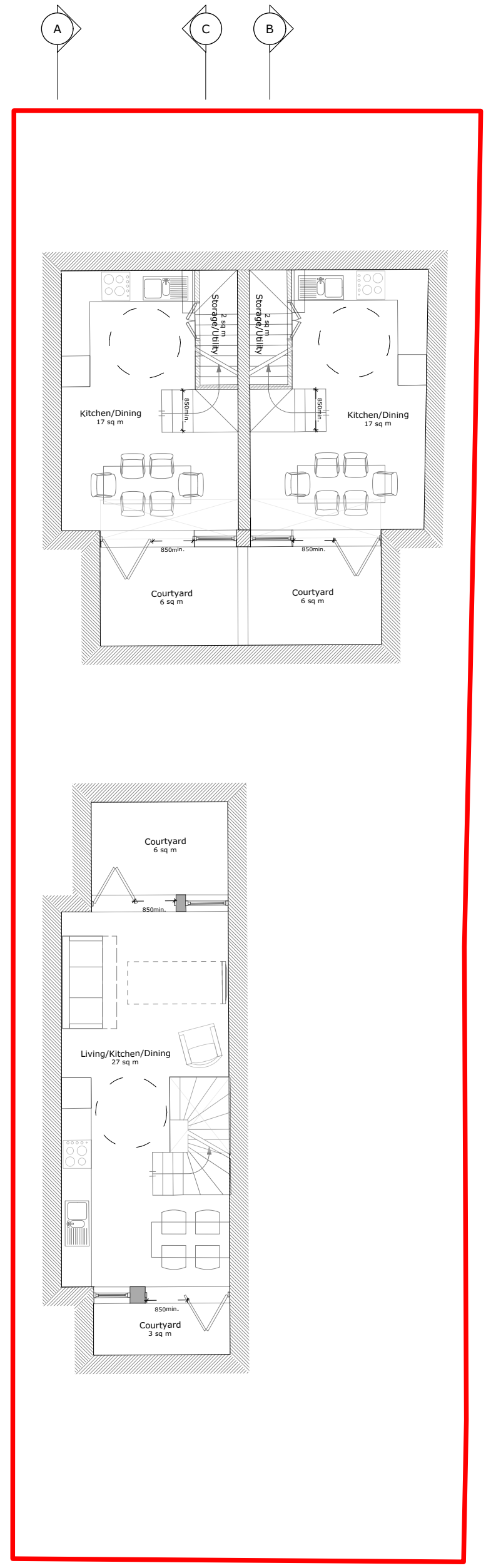

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Drawing No:

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Drawing title:

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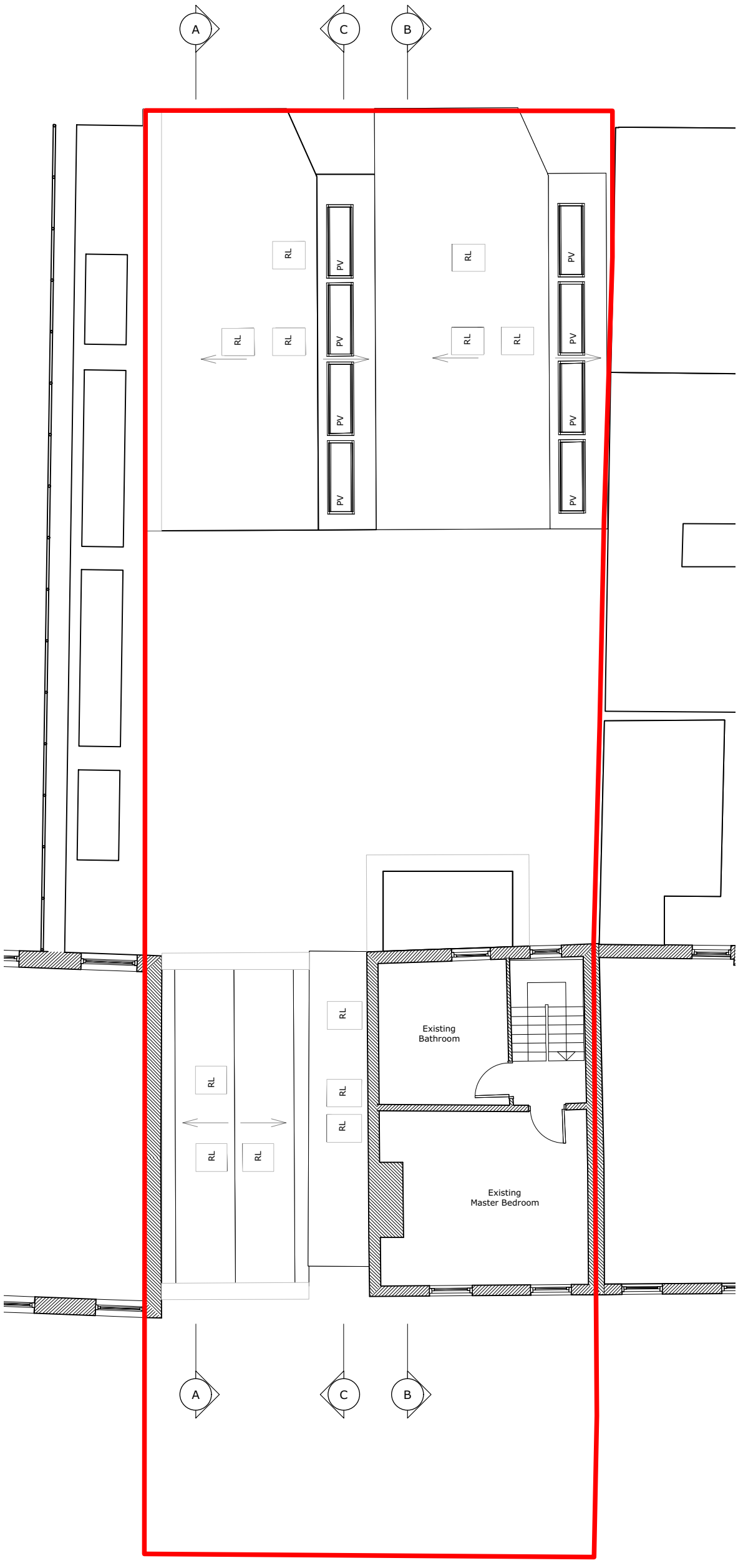

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Project Title:

22 Holmes Road, London NW5 3AB

Drawing No:

1617-NMA-00-R1-DR-A-00100

Drawing title:

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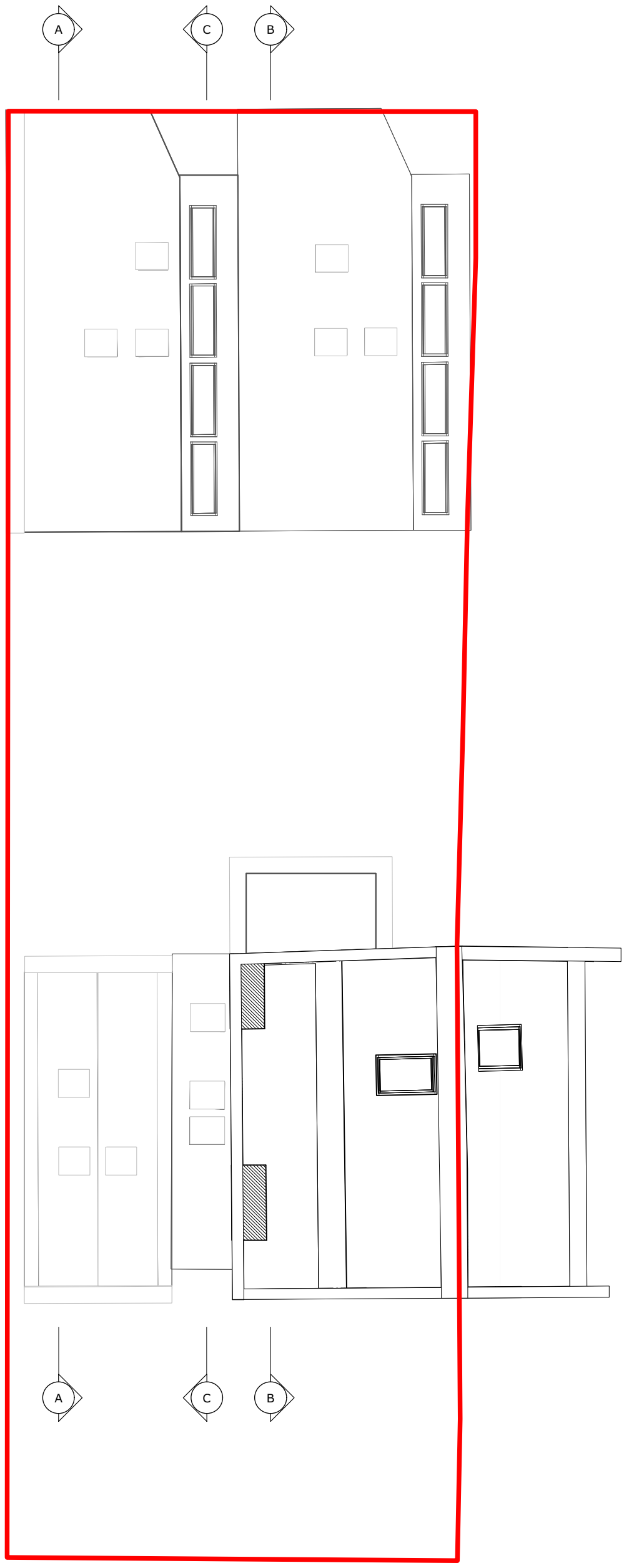

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Project Title:
22 Holmes Road, London NW5 3AB

Drawing No:
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Drawing title:
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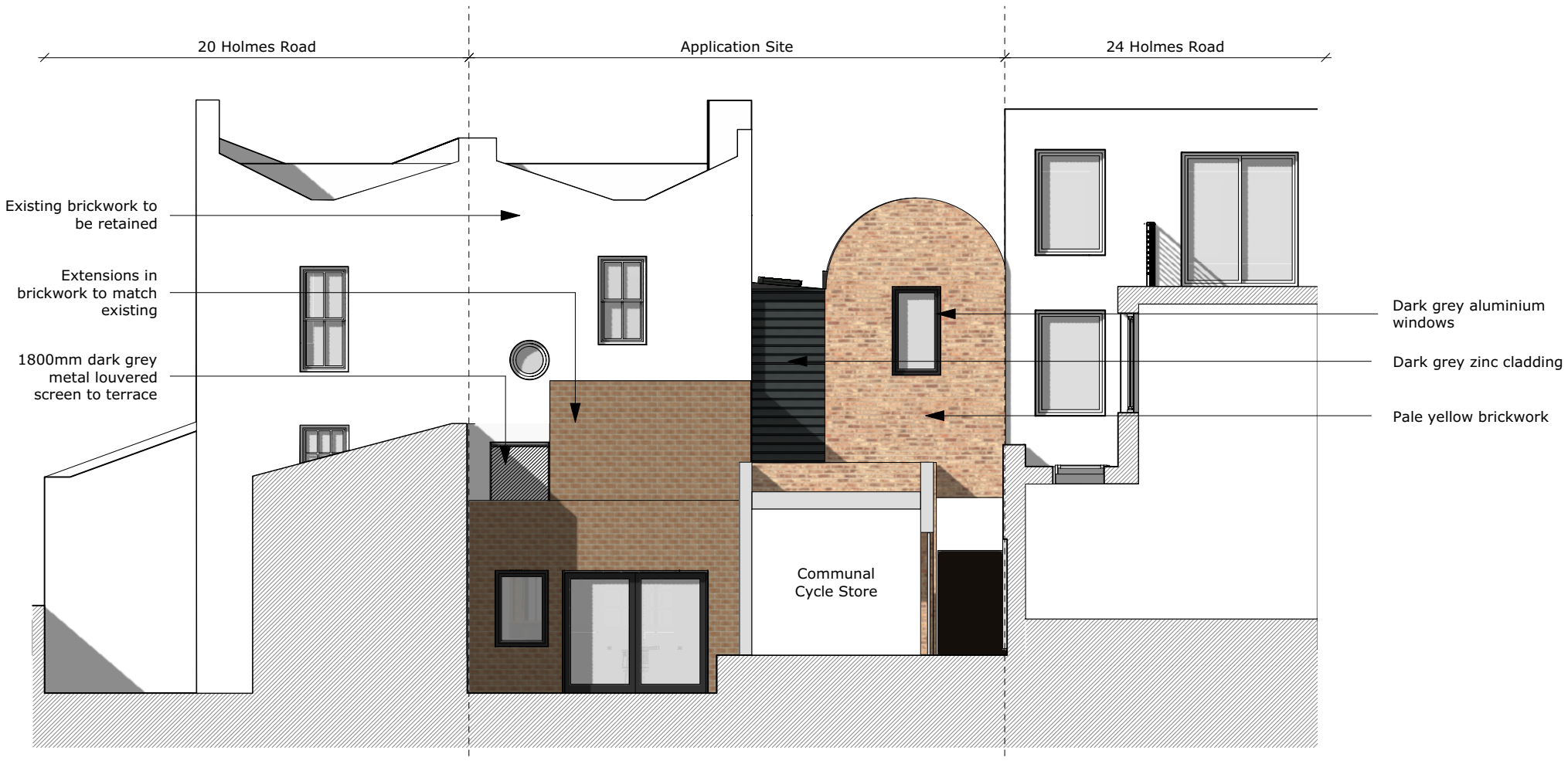

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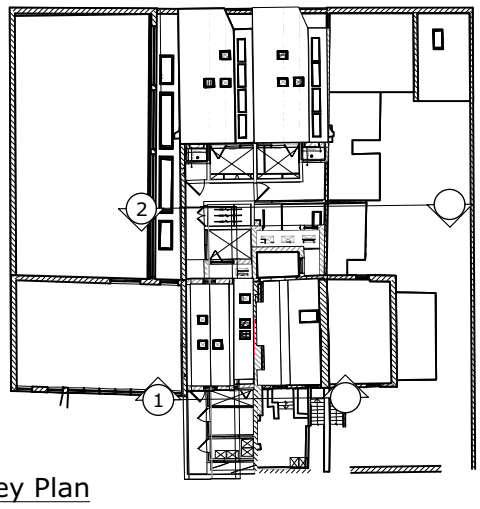

K Key Plan

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Project Title:
22 Holmes Road, London NW5 3AB

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Drawing title:
Proposed Elevations Front

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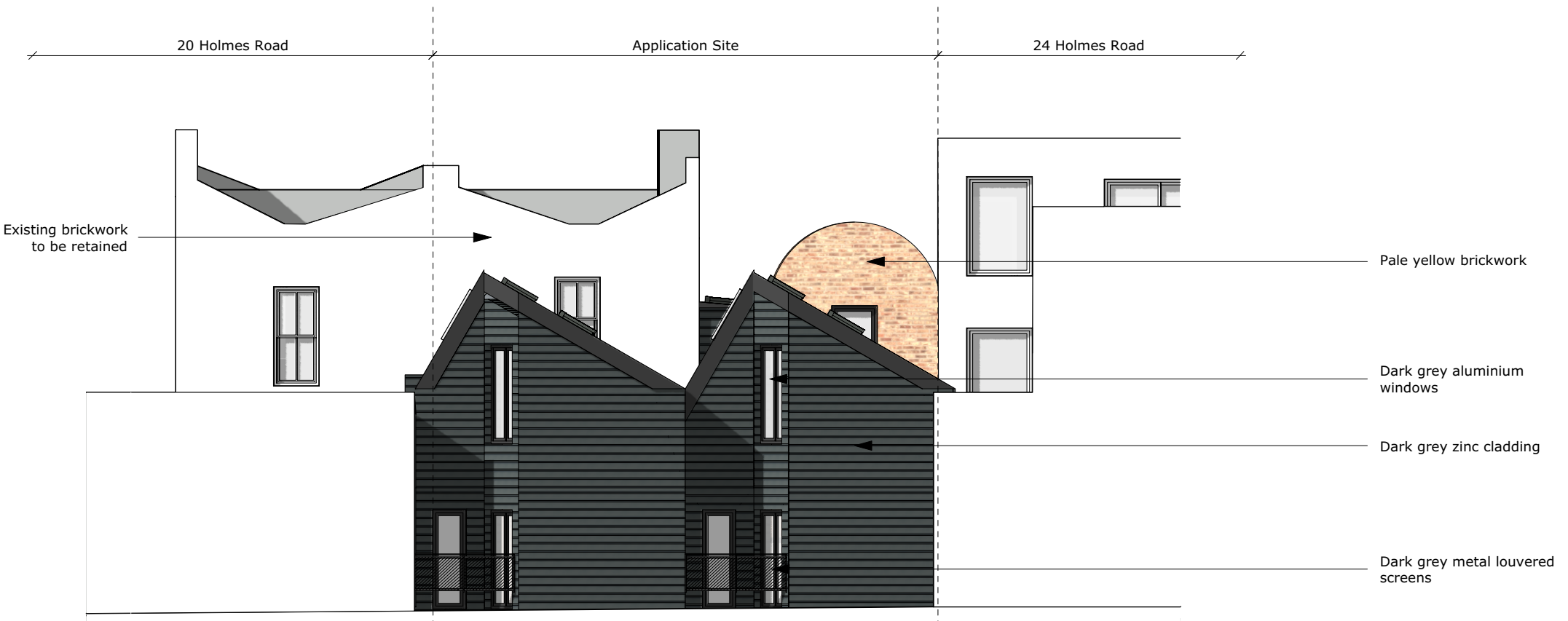

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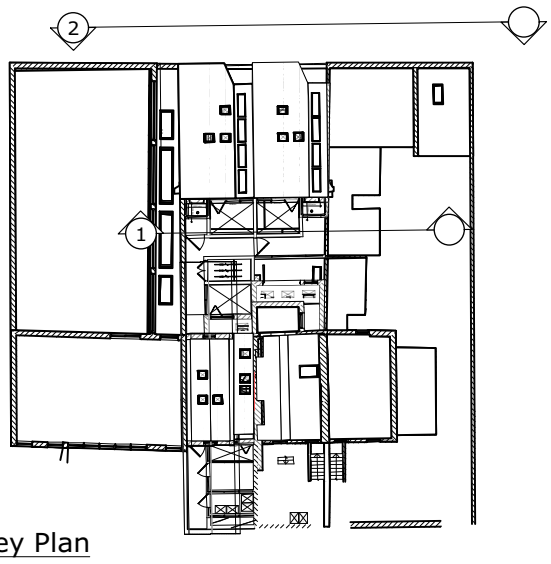

K Key Plan

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Project Title:
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Drawing No:
1617-NMA-00-ZZ-DR-A-00201

Drawing title:
Proposed Elevations Rear

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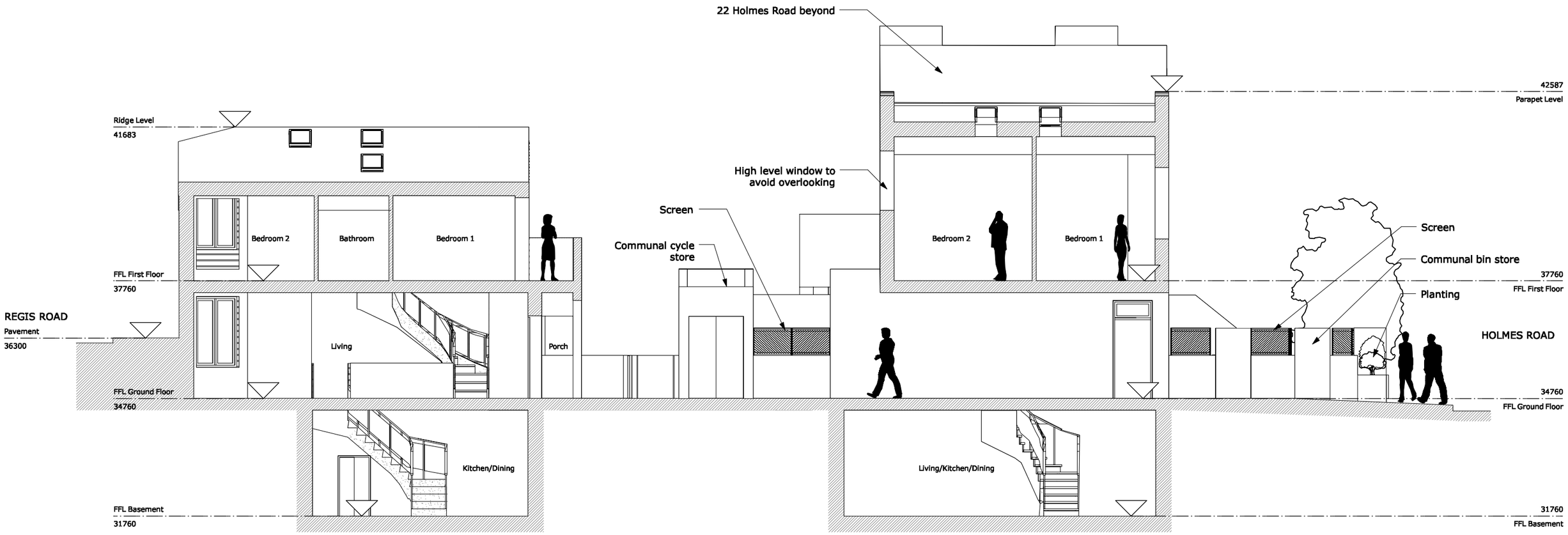

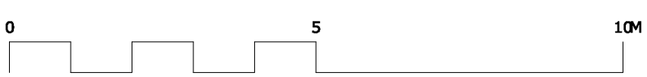

P7 27/09/19 Regis Rd level corrected

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Drawing title:

Section AA - Proposed

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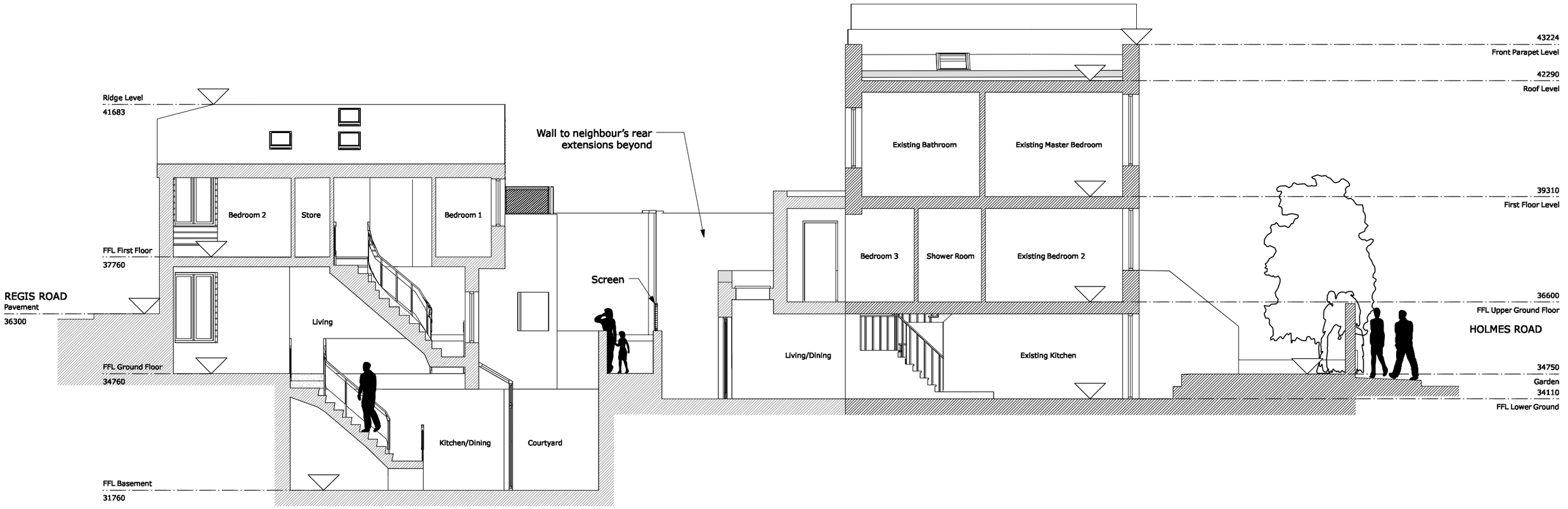

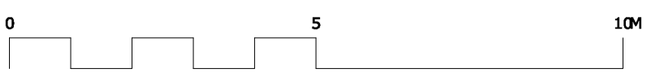

KEY:

Existing Walls

Proposed Walls

P7	27/09/19	Regis Rd level corrected

revisions:

Purpose of issue:

For Planning

Norton Mayfield Architects
Harland Works, Unit 7
70 John Street
Sheffield
S2 4QU
Tel. 0114 270 0014
Sheffield & London
www.nortonmayfield.co.uk

Client:

•

Project Title:

22 Holmes Road, London NW5 3AB

Drawing No:

1617-NMA-00-ZZ-DR-A-00301

Drawing title:

Section BB - Proposed

Project No:	Status:	Rev:	Scale:
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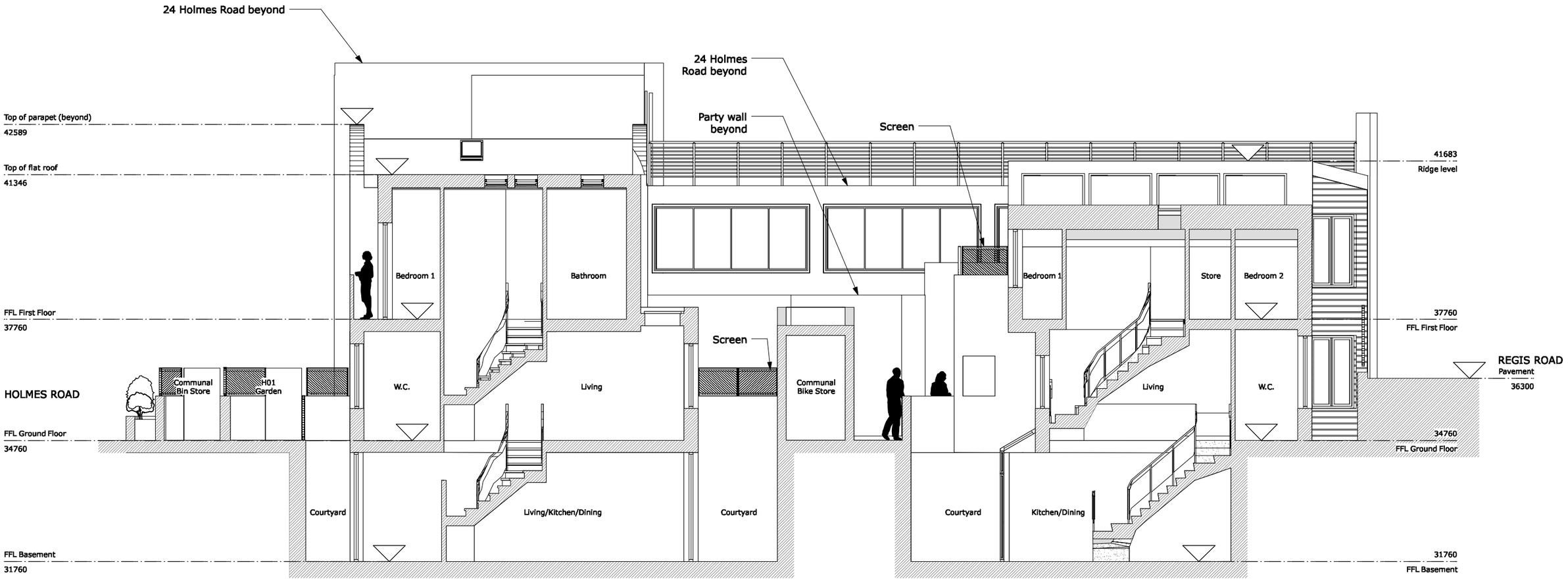

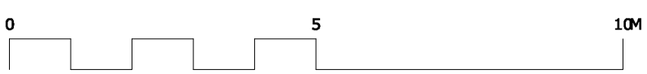

P7 27/09/19 Regis Rd level corrected

revisions:

All dimensions and areas are approximate and are to be verified on site. Do not scale.

Purpose of issue:

For Planning

Norton Mayfield Architects
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Client:

•

Project Title:

22 Holmes Road, London NW5 3AB

Drawing No:

1617-NMA-00-ZZ-DR-A-00302

Drawing title:

Section CC - Proposed

Project No:	Status:	Rev:	Scale:
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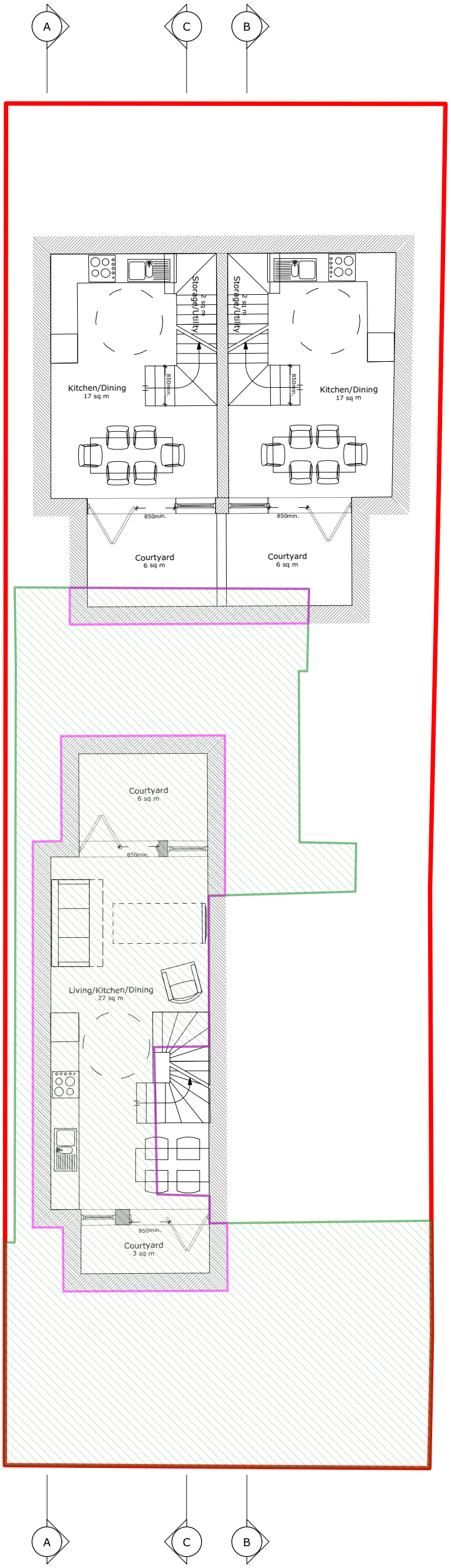

KEY:

Existing Walls

Proposed Walls

Area of existing 'garden' at Ground Level = approx. 126sqm

Area of 'garden' lost due to new Basement = approx. 49sqm

Note:
'Garden' according to the Camden Local Plan includes all outdoor (unbuilt) space on the property.

The area of 'garden' lost due to the proposed Basement level accommodation is less than 50% of its original area.

P3 14/05/2019 For Planning
revisions:

All dimensions and areas are approximate and are to be verified on site. Do not scale.

Purpose of issue:
For Planning

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Client:

Project Title:

22 Holmes Road, London NW5 3AB

Drawing No:
1617-NMA-XX-B1-DR-A-20102

Drawing title:
Basement To Garden Ratio

Project No:	Status:	Rev:	Scale:
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1617-NMA-XX-ZZ-M2-A-00100.vwx

Appendix B

Land Stability and Site Investigation reports

Report Reference: 67109 R1Rev1

Report Status: Final

KEY GS

Geological & Geotechnical Consultants

22 Holmes Road, London NW5 3AB

Basement Impact Assessment (Land Stability)

(April 2019)

Prepared for Stantec UK Ltd

Geological & Geotechnical Consultants

Key GeoSolutions Ltd
Nova House
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Job Number: 19-088

Report Number: 19-088-R-001

Stantec UK Ltd

22 Holmes Road, London NW5 3AB

Basement Impact Assessment (Land Stability)

(April 2019)

Prepared by:

B Duthie BEng CGeol FGS
UK Registered Ground Engineering Adviser

H Clarke BEng PhD CEng MICE MIStructE

Report Distribution List

Name	Copies	Rev.	Date	Copies	Rev.	Date	Copies	Rev.	Date
M Rouge	1(pdf)	Draft	30/04/19						

CONTENTS

Appendices

Appendix 1 22 Holmes Road NW5 3AB, Report on Ground Investigation (March 2019), Key GeoSolutions Ltd report reference 19-088-R-001

Drawings

1617-NMA-XX-00-DR-A-20101	Ground Floor Option 2
1617-NMA-XX-01-DR-A-20101	First Floor Option 2
1617-NMA-XX-B1-DR-A-20101	Basement Option 2
1617-NMA-XX-R1-DR-A-20101	Roof Plan Option 2
1617-NMA-XX-ZZ-DR-A-20301	Section AA
1617-NMA-XX-ZZ-DR-A-20302	Section BB
1617-NMA-XX-ZZ-DR-A-20303	Section CC

1.0 INTRODUCTION

Key GeoSolutions Ltd (KGS) have been commissioned by Stantec Limited to undertake a land stability assessment in relation to a proposed basement development at 22 Holmes Road, NW5 3AB.

1.1 Proposed Development

The property is described in the Camden Local List (2015) as 'semi-detached mid-19th century villa, semi basement plus two storeys, set behind front garden.

The proposed development will comprise:

- The demolition of the existing lean-to store room at the side of the house and former studio building, closing off of the existing house at the off-shot;
- Erection of a two-bed, three storey house, in-filling the gap between the existing house and the neighbouring office building, fronting onto Holmes Road;
- Erection of two connected two-bed houses over three storeys within a courtyard arrangement at the rear of the site.

1.2 Scope of Work

The purpose of this assessment is to consider if the proposed basement can be constructed without having a detrimental impact on the surroundings with respect to land stability and in particular whether the development will affect the stability of neighbouring properties.

1.3 Qualifications

This assessment has been undertaken by Brian Duthie and Howard Clarke. Brian holds a BEng in Engineering Geology and Geotechnics, is a chartered geologist, Fellow of the Geological Society and UK Registered Ground Engineering Adviser with 30 years' experience in geotechnical engineering. Howard holds a BEng in Civil Engineering, is a chartered engineer and Member of the Institution of Civil Engineers and Member of the Institute of Structural Engineers with 13 years' experience in civil engineering. Both assessors satisfy the qualification requirements given in the Camden Planning Guidance 4.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made

on the basis of the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside the stated scope of the research. The assessment does not constitute a detailed structural design for the basement structure, as would be required to allow construction to take place.

This report has been prepared for the information, benefit and use of Stantec UK Ltd only and any liability of Key GeoSolutions Ltd to any third party, whether in contract or in tort, is specifically excluded. Any third party finding themselves in possession of this report may not rely upon it without first obtaining the written authority of Key GeoSolutions Ltd.

2.0 SITE DESCRIPTION

The site, 22 Holmes Road in the London Borough of Camden, post code NW5 3AB and National Grid Reference 528865mE, 185057mN. The site is approximately rectangular in plan and covers an area of 290m², being approximately 9.5m by 30.6m with the long axis running front to back at approximately south south-west to north north-east.

The general topography of the area slopes gently down from Hampstead Heath to the north-east, the overall topographical gradient in the area is approximately 1 vertical in 10 horizontal (c. 5.7°) from north-east to south-west. The approximate location of the site is shown on Figure 1 below.

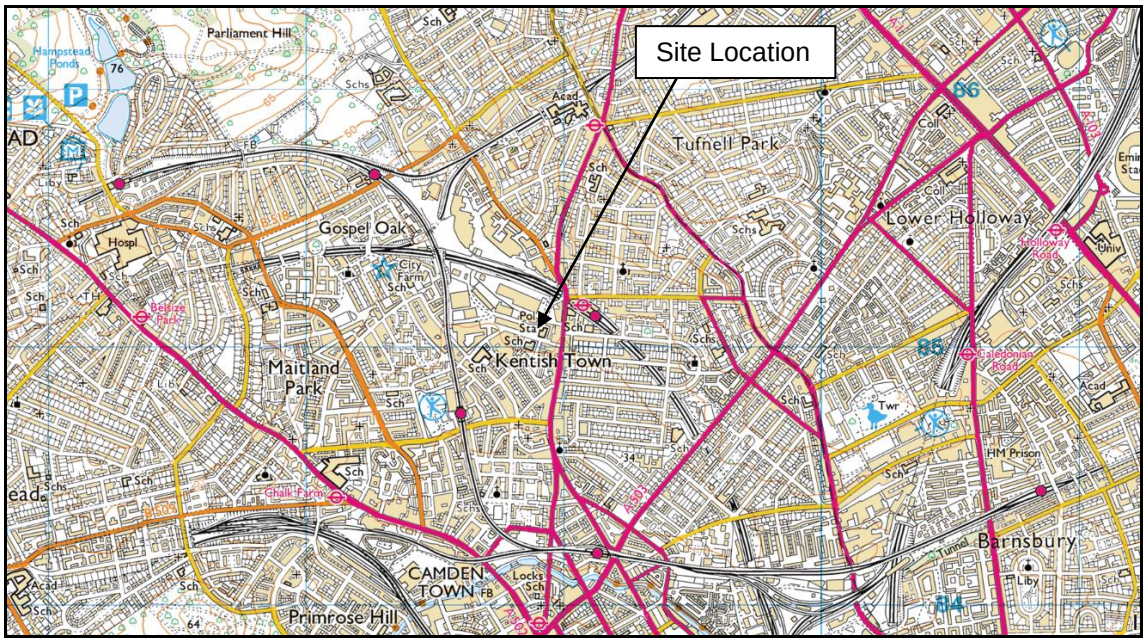

Figure 1 – Approximate Site Location

3.0 PROJECT SCREENING AND SCOPING

Following the guidance given in the London Borough of Camden document CPG4 'Basements and lightwells' (2013) it is required to identify the potential impacts of the proposed scheme. The flowchart entitled 'Slope stability screening flowchart' in Figure 2 of CPG4 assists with understanding the potential impacts that a basement may have.

SLOPE STABILITY (Slope stability screening flowchart (Figure 2, CPG4 (Camden Council, 2013))			
Impact question	**Answer**	**Justification**	**Reference**
1) Does the existing site include slopes, natural or manmade, greater than 7°?	**No**	Figure 10 Camden Topographic Map Figure 16 Slope Angle Map From a walkover of the site and surrounding areas topography is essentially flat.	Ove Arup, 2010 Ordnance Survey Mapping.
2) Will the proposed re-profiling or landscaping at site change slopes at the property boundary to more than 7°?	**No**	No re-profilling of the site is proposed	Drawings of proposed development
3) Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	**No**		
4) Is the site within a wider hillside setting in which the general slope is greater than 7°?	**No**	Figure 10 Camden Topographic Map	Ove Arup, 2010
5) Is the London Clay the shallowest strata at the site?	**Yes**	Figure 5 South Camden Geological Map	Ove Arup, 2010, BGS Geoindex, site investigation
6) Will any trees be felled as part of the proposed development and / or any works proposed within any tree protection zones where trees are to be retained?	**No**		Drawings of proposed development
7) Is there any history of seasonal shrink-swell subsidence in the local area, and / or evidence of such effects at the site?	**No**	None reported by home-owner and on inspection no evidence in property or immediate neighbours of subsidence. Proposed foundation depths will be beyond depth of influence of vegetation.	

8) Is the site within 100m of a watercourse or potential spring line?	**No**	The route of a tributary of the River Fleet is shown approximately 120m to the east of the site, Figure 2, Camden 1:10,560 Geological Map (1920) and Figure 11 Watercourses.	Ove Arup, 2010
9) Is the site within an area of previously worked ground?	**No**	An area of worked ground is shown approximately 150m to the west north-west of the site, Figure 4 North Camden Geological Map. The boreholes drilled at the site found only shallow made ground, less than 1.0m deep.	Ove Arup, 2010 Site Investigation
10) Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	**No**	No groundwater was encountered in the boreholes during the site investigation. Subsequent monitoring of the piezometers has found a rising water level in borehole WS02. Given the very slow rate of water rise it is likely that this represents a seepage from a very thin silt bed in the London Clay.	Ove Arup, 2010
11) Is the site within 50m of Hampstead Heath ponds?	**No**	The ponds are approximately 1.5km to the north-west.	Ove Arup, 2010 OS Mapping
12) Is the site within 5m of a highway or pedestrian right of way?	**Yes**	The proposed basements in the two properties to the rear will be within 5m of Regis Road.	OS Mapping and Google Maps Drawings of proposed development
13) Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	**Yes**	Basements to two properties adjacent to north-west boundary will be significantly deeper than the foundations of the adjacent property. A trial pit was excavated to expose the foundations of the adjacent property.	OS Mapping and Google Maps Site investigation
14) Is the site over (or within the exclusion zone of) any tunnels e.g. railway lines?	**No**	Figure 18 Transport Infrastructure	Ove Arup, 2010

4.0 GROUND CONDITIONS

4.1 Soil Conditions

The site is covered by British Geological Survey 1:50,000 Geological Sheet No. 256 (North London), which indicates the site to be underlain by deposits of the London Clay Formation of Eocene age, no superficial deposits are shown to overlie the London Clay.

An intrusive site investigation was undertaken at the site on 28th February 2019, report reference 19-088-R-001, a copy of which is included as Appendix 1. The site investigation comprised three windowless sampling boreholes and a hand dug trial pit. All encountered made ground, with the depth varying from 0.5 to 0.9m, consisting of predominantly sand, overlying London Clay. Boreholes WS02 and WS03 were taken to a depth of 5.45m into the London Clay.

Trial TP01 was excavated in order to determine the depth of the foundation of the party wall with 24 Holmes Road. The top of the foundation was encountered at 0.5m depth and the underside of the foundation was at 0.9m.

4.2 Groundwater Conditions

No groundwater was encountered by the boreholes or trial pit. Standpipes were installed in each of the three boreholes, WS01 and WS03 were installed at shallow depths in order to monitor any perched water on the surface of the London Clay and in WS02 to the full depth of the borehole.

Monitoring of the standpipes has been undertaken on three occasions, 21/03/19, 02/04/19 and 17/04/19. WS01 has been dry on all occasions. WS03 had water at 0.87 and 0.88m depth below ground on the first two visits and was dry on the third visit, suggesting some surface water percolation through the made ground. WS02 has shown a rise in water level on each monitoring occasion, when the rise is plotted against time there appears to be a linear relationship. This suggests that the rise is due to a seepage from a thin low permeability silt / sand parting. For further assessment of groundwater conditions refer to Stantec Ltd report reference 67109 R1 D1, 22 Holmes Road NW5 3AB - Basement Impact Assessment: - Surface Water and Groundwater.

5.0 LAND STABILITY ASSESSMENT

Where the screening checklist has returned a 'yes' response to any question that matter is carried forward to the scoping stage. The scoping produces a statement which defines the matters of concern identified in the screening stage.

5.1 Proposed Development

The proposed development is shown on the Norton Mayfield Architects drawings, which are included at the rear of this report;

- 1617-NMA-XX-00-DR-A-20101 Ground Floor Option 2
- 1617-NMA-XX-01-DR-A-20101 First Floor Option 2
- 1617-NMA-XX-B1-DR-A-20101 Basement Option 2
- 1617-NMA-XX-R1-DR-A-20101 Roof Plan Option 2
- 1617-NMA-XX-ZZ-DR-A-20301 Section AA
- 1617-NMA-XX-ZZ-DR-A-20302 Section BB
- 1617-NMA-XX-ZZ-DR-A-20303 Section CC

The proposed basements are within 5m of the public highway and will significantly increase the differential depth of foundations relative to neighbouring properties. The rear basements will be approximately 1.5m from the public footpath and 3.5m from Regis Road. The basements on the western side of the site will be of the order of 2.1m deeper than the underside of the foundations of the party wall between 22 and 24 Holmes Road. The floor of the existing basement / lower ground floor is approximately 1.0m below ground level. It is proposed that the floor of the new basements will be 3.0m below ground level.

5.2 Movement Assessment

No detailed structural design for the proposed development has been provided to KGS however we have been informed by Norton Mayfield that the perimeter walls of the basement will be formed using bored pile walls. It will be necessary to underpin the foundations of the existing house on the side that it will share with the proposed basement.

The embedded length of the bored piles will be wholly in stiff London Clay, from Figure 6.15 of CIRIA C760 Guidance on embedded retaining wall design (2017) it is possible to estimate the horizontal and vertical movements that could be expected from the excavation of the basements. Assuming a high stiffness support system with temporary propping and an excavation depth of 3.5m it could be expected that a horizontal movement of the order of 4.5mm and vertical movement of the order of 2mm will occur at the party wall with 24 Holmes Road. It is considered that these levels of movement would not have a detrimental effect on the neighbouring properties,

the public highway or any services within the highway or footpath.

Whilst a rising water level has been encountered in WS02 and the water level in the most recent monitoring visit was at around the depth of the proposed basement excavation it is considered unlikely that significant volumes of water will be encountered within the excavation, rather localised seepages from silt / sand partings, which should be dealt with as they are encountered.

The work should be carried out in accordance with the Party Wall etc. Act 1996 and a condition survey of the adjacent properties will be required.

5.3 Monitoring

It will be necessary to monitor the impact of the works on the adjoining properties and the public highway to ensure that movements are not excessive. The monitoring should comprise the following;

- Visual inspection of the party wall and any pre-existing cracking
- Attachment of tell tales to accurately record movement of any pre-existing cracks
- Installation of levelling targets to monitor settlement of the party walls and the public highway, to be monitored by standard optical equipment.

The levelling targets on the party walls should be no greater than 2m apart and located as close to the top of the existing foundations as possible. The maximum allowable movement should be no more than 3mm between adjacent levelling targets.

The limits on maximum movement and proposed actions are given in the table below;

Movement	Category	Action
0 - 5 mm	Green	No action required
5 – 10 mm	Amber	Crack monitoring: Carry out local structural review; Preparation for the implementation of remedial measures should be required
>10 mm	Red	Crack monitoring: Implement structural support as required; Cease works with exception of necessary works for the safety and stability of the structure and personnel; Review monitoring data and implement revised method of works

Monitoring should be undertaken at weekly intervals during excavation works and if no significant

movement is identified monitoring can be reduced to fortnightly.

5.4 Damage Category

If it is assumed that a suitable structural design, including temporary works, is produced and a suitably experienced contractor is appointed, then past experience of basement construction in London has shown that ground movements caused by the proposed construction technique to this depth in London Clay should not exceed 5mm in either horizontal or vertical directions. When relating this to the damage categories given in CIRIA C580 Table 2.5 (after Burland, 1995) it would be expected that possible damage to the adjacent properties would fall into Category 1 (very slight).

6.0 CONCLUSIONS

An assessment has been made of the potential impacts of the proposed basement construction at 22 Holmes Road with respect to slope stability and ground movement. This assessment does not constitute a detailed structural design for the basement.

Given that the natural topography of the area is essentially flat it is considered that the proposed basement will not have an impact on the overall slope stability within the area.

With regard to impact on the adjacent properties and the public highway it is considered that the expected movement, vertical and horizontal, will not exceed 5mm. It is concluded that the risk of any damage to adjacent properties will fall into Category 1 of the Damage Categories after Burland 1995, with the degree of severity being very slight, which in relation to damage to the buildings would equate to fine cracks which are easily treated in normal decoration.

Hence, it is concluded, based upon the information currently available, that the proposed basement could be constructed employing appropriate construction methods without any significant impact on either the slope stability within the area or on the adjacent properties or the public highway.

7.0 REFERENCES

7.1 22 Holmes Road NW5 3AB, Report on the Ground Investigation, Key GeoSolutions Ltd report reference 19-088-R-001, March 2019.

7.2 Norton Mayfield Architects drawings;

- 1617-NMA-XX-00-DR-A-20101 Ground Floor Option 2
- 1617-NMA-XX-01-DR-A-20101 First Floor Option 2
- 1617-NMA-XX-B1-DR-A-20101 Basement Option 2
- 1617-NMA-XX-R1-DR-A-20101 Roof Plan Option 2
- 1617-NMA-XX-ZZ-DR-A-20301 Section AA
- 1617-NMA-XX-ZZ-DR-A-20302 Section BB
- 1617-NMA-XX-ZZ-DR-A-20303 Section CC

7.3 22 Holmes Road NW5 3AB - Basement Impact Assessment - Surface Water and Groundwater, Stantec Ltd report reference 67109 R1 D1, April 2019.

7.4 CIRIA C760 Guidance on embedded retaining wall design, 2017

7.5 Assessment of risk of damage to buildings due to tunnelling and excavation, Burland J B, 1995

7.6 Ground movements resulting from urban tunnelling: predictions and effects, Rankin W J, 1988

APPENDICES

APPENDIX 1
GROUND INVESTIGATION REPORT

KEY GS

Geological & Geotechnical Consultants

22 Holmes Road NW5 3AB

Report on Ground Investigation (March 2019)

Prepared for Stantec UK Limited

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Geological & Geotechnical Consultants

Job Number: 19-088

Report Number: 19-088-R-001

Stantec UK Limited

22 Holmes Road NW5 3AB

Report on Ground Investigation (March 2019)

Prepared by:

W Roberts BSc (Hons) FGS .....

Approved by:

B Duthie BEng CGeol FGS FIQ .....

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T Taylor	PDF	DRAFT	20/03/19						

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Page Number

Figures

Appendices

1.0 INTRODUCTION

Key GeoSolutions Ltd (KGS) have been commissioned by Stantec UK Limited (Stantec) to undertake a ground investigation at 22 Holmes Road in order to ascertain the ground conditions for the assessment of a proposed extension.

The property is described in the Camden Local List (2015) as 'semi-detached mid-19th century villa, semi basement plus two storeys, set behind front garden.

The proposed development will comprise:

- The demolition of the existing lean-to store room at the side of the house and former studio building, closing off of the existing house at the off-shot;
- Erection of a two-bed, three storey house, in-filling the gap between the existing house and the neighbouring office building, fronting onto Holmes Road;
- Erection of two connected two-bed houses over three storeys within a courtyard arrangement at the rear of the site.

The comments given in this report and any opinions expressed are based on the ground conditions encountered during the site work, the results of tests made in the field and on information made available by Stantec. There may be, however, conditions pertaining to the site which have not been disclosed by the investigation and which therefore could not be taken into account in this report. In particular old foundations or underground services may be present that could affect the proposed development. The term 'topsoil' is used in this report to describe the surface, usually organic, layer including turf and shallow soils, weathered material with roots etc. and should not be taken to imply agricultural soil suitable for sale.

2.0 SITE OVERVIEW

2.1 Site Location

The site, which may be located by approximate National Grid Reference 528865mE, 185057mN, is situated on the north side of Holmes Road, near the centre of Kentish Town, in the Borough of Camden, London (Figure 1).

2.2 Geology of the Site

The site is covered by BGS 1: 50,000 Geological Sheet No. 256 (North London). This indicates the site to be underlain by deposits of the London Clay Formation of Eocene age, no superficial deposits are shown to overlie the London Clay.

3.0 GROUND INVESTIGATION

Three boreholes (WS01, WS02 and WS03) were sunk at the front, rear and eastern side of the property in order to investigate the ground conditions in accordance with the guidelines laid down in BS EN 1997-2:2007. A hand dug trial pit (TP01) was excavated along the eastern boundary of the site in order to expose the existing foundations of the adjacent building.

The boreholes were sunk using a windowless sampling rig, the approximate locations of the boreholes are shown on Figure 1. The depths of the boreholes and trial pits and descriptions of the soils encountered are given in the records in Appendix 1.

Disturbed samples and SPT's (Standard Penetration Tests) were taken at the depths shown on the borehole records. The results of the SPT's are provided on the window sample logs within Appendix 1. Physical and chemical testing was carried out on four representative samples of the ground encountered; the results are given in Appendix 2.

On completion of each borehole a standpipe was installed; the standpipes in boreholes at the front and rear of the building were installed within the made ground, and the standpipe in the borehole at the side of the house was installed within the London Clay to a depth of approximately 5.00mbgl. Details of the installations are given on the borehole records.

The site work was carried out on the 28th February 2019 and generally in accordance with the guidelines laid down in BS EN 1997-2:2007.

4.0 GROUND CONDITIONS

The following strata were encountered during the investigation:-

- Made Ground
- Sandy gravelly Clays (re-worked London Clay)
- Clays (London Clay Formation)

All boreholes were terminated in the London Clay Formation.

- WS01 was terminated at a depth of 1.00m bgl. Groundwater was not encountered.
- WS02 was terminated at a depth of 5.45m bgl. Groundwater was not encountered.
- WS03 was terminated at a depth of 5.45m bgl. Groundwater was not encountered.

The trial pit uncovered bricks down to a concrete foundation at 0.50m bgl, the concrete foundation continued down to natural ground at 0.90m bgl, and was seen to be founded on the London Clay.

- TP01 was terminated at a depth of 1.00m bgl. Groundwater was not encountered.

A summary of the geotechnical testing is given in the table below;

	Range (number of results)				
Strata	Moisture Content %	Plasticity Index	SPT N Value	Undrained Triaxial kN/m²	Notes
London Clay	32-33 (5)	44-49 (3)	7-20 (10)	53-85 (3)	

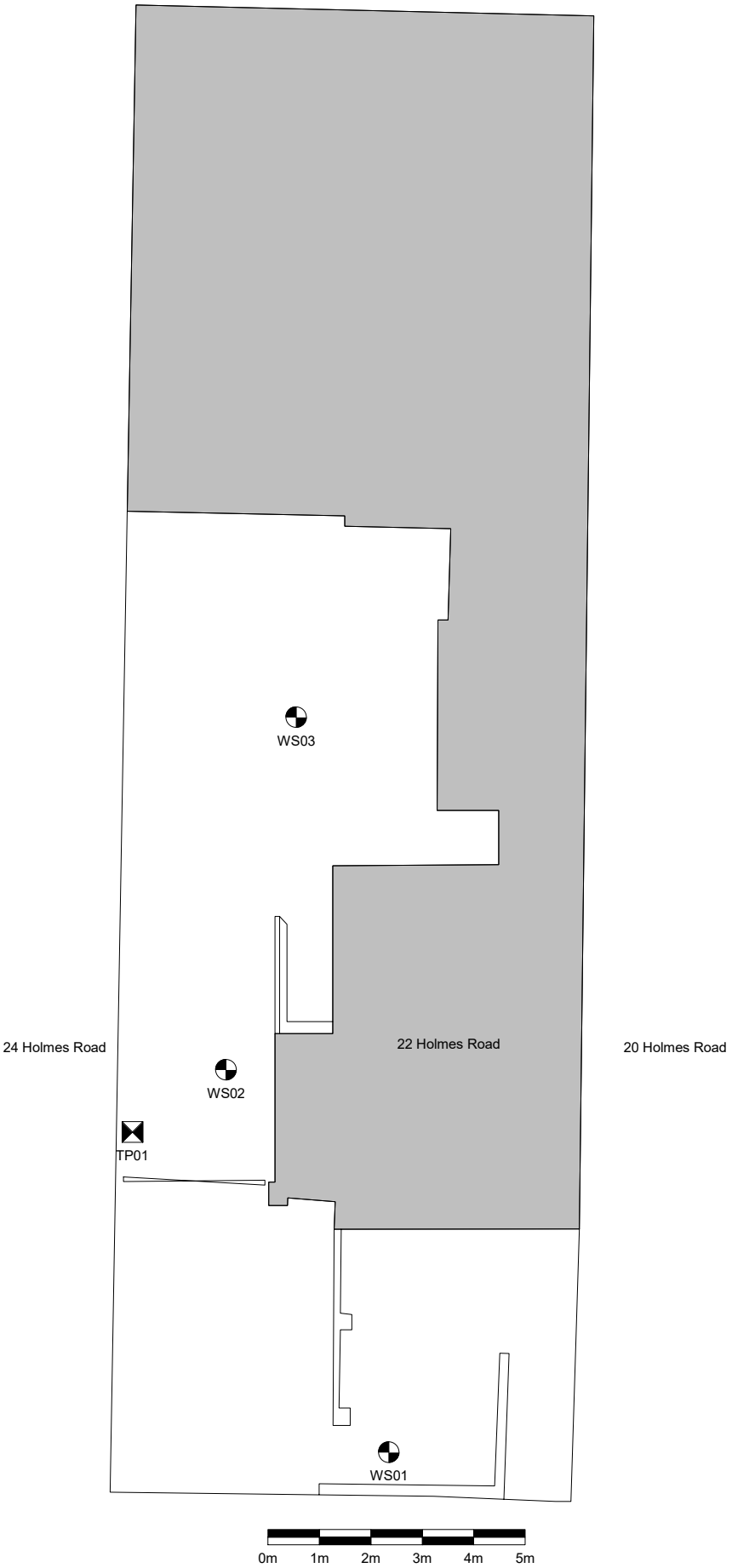
5.0 PRELIMINARY GEOTECHNICAL ASSESSMENT

Shallow spread foundations should be taken down to a minimum firm CLAY, foundations should be designed with an allowable bearing pressure of 100 kN/m². Given the high plasticity of the clay floor slabs should be suspended construction.

Given the high potential for volume change foundations should be designed in accordance with the NHBC Standards.

The chemical testing indicates Design Sulphate Class of DS1 and AC-1, in accordance with BRE SD1 (BRE, 2005).

FIGURES



Rev.	Revision Detail	Drawn	Date
01	First Issue	WR	20/03/18

CLIENT:

STANTEC UK

PROJECT:

22 HOLMES ROAD

TITLE:

SITE INVESTIGATION
LOCATION PLAN

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Drawn:	Checked:	Date:
WR	BD	Feb '19
Scale:	Original Sheet Size:	Status:
NTS	A4	DRAFT

Drawing No.: **FIGURE 1**

Revision: **01**

APPENDICES

APPENDIX 1

BOREHOLE LOGS

Key GeoSolutions Ltd
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Fax: 01952 822961

WELL NUMBER WS01

CLIENT Stantec **PROJECT NAME** 22 Holmes Road

PROJECT NUMBER 19-088 **PROJECT LOCATION** London

DATE STARTED 28/2/19 **COMPLETED** 28/2/19 **CO-ORDINATES** mE, mN

DRILLING CONTRACTOR Dynamic Sampling UK **GROUND ELEVATION** **HOLE SIZE** 200

DRILLING METHOD Hand Dug Trial Pit **LOGGED BY** Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
			0.15 Grass onto MADE GROUND consisting dark grey slightly silty gravelly SAND including brick fragments ash clinker and stones	
			MADE GROUND consisting brown very silty gravelly SAND with roots and stones including rare to occasional brick fragments and clinker	
			0.50 Firm mottled orange brown CLAY with roots and occasional gravel of stones and flint	
			0.80 Stiff brown CLAY	
1			1.00	

Bottom of borehole at 1.00 metres.

NOTES Groundwater not encountered.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

Key GeoSolutions Ltd
info@keygs.com
Telephone: 01952 822960
Fax: 01952 822961

WELL NUMBER WS02

CLIENT Stantec **PROJECT NAME** 22 Holmes Road

PROJECT NUMBER 19-088 **PROJECT LOCATION** London

DATE STARTED 28/2/19 **COMPLETED** 28/2/19 **CO-ORDINATES** mE, mN

DRILLING CONTRACTOR Dynamic Sampling UK **GROUND ELEVATION** **HOLE SIZE** 110

DRILLING METHOD Windowless Sampler **LOGGED BY** Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
					0.10 CONCRETE	
					MADE GROUND consisting light grey to grey very gravelly SAND. Gravel is fine to coarse angular to sub-angular brick and concrete	
					0.40m; becoming dark grey slightly silty with coal fragments and ash	
					0.70 0.60m; becoming very clayey	
					0.80 MADE GROUND consisting soft brown occasionally sandy CLAY with occasional fine to coarse angular to sub-rounded brick stones and ash	
1	SPT	2-1-2-2 (7)			Soft to firm brown CLAY	
2	B	()	Cu = 53 kPa			
	SPT	2-3-3-3 (11)			2.50m; becoming stiff	
3	B	()				
	SPT	4-4-4-5 (17)	Cu = 61 kPa			
4	SPT	4-4-4-4 (16)				
5	SPT	5-5-5-5 (20)			5.45	

Bottom of borehole at 5.45 metres.

NOTES Groundwater not encountered.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

Key GeoSolutions Ltd
info@keygs.com
Telephone: 01952 822960
Fax: 01952 822961

WELL NUMBER WS03

CLIENT Stantec **PROJECT NAME** 22 Holmes Road

PROJECT NUMBER 19-088 **PROJECT LOCATION** London

DATE STARTED 28/2/19 **COMPLETED** 28/2/19 **CO-ORDINATES** mE, mN

DRILLING CONTRACTOR Dynamic Sampling UK **GROUND ELEVATION** **HOLE SIZE** 110

DRILLING METHOD Windowless Sampler **LOGGED BY** Will Roberts **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
					0.10 CONCRETE	
					MADE GROUND consisting dark grey silty gravelly to very gravelly SAND with occasionaly ash. Gravel is fine to coarse angular to sub-angular including brick concrete glass coal and stones	
					0.80	
1					0.90 MADE GROUND consisting soft brown gravelly slightly sandy CLAY. Gravel is fine to medium occasionally coarse sub-angular to rounded brick flint and stones	
	SPT	2-4-4-6 (16)			Firm orange brown slightly sandy to sandy gravelly CLAY. Gravel is fine to coarse angular to sub-rounded stones and flint	
					1.2m; becoming very gravelly	
2					2.00	
	B SPT	() 2-3-3-4 (12)			Stiff brown CLAY	
					2.5m; with blue grey sub-vertical intersecting planar features	
3						
	B SPT	() 2-3-3-3 (11)	Cu = 85 kPa			
4						
	SPT	4-4-4-5 (17)				
5						
	SPT	5-5-5-5 (20)			5.45	

Bottom of borehole at 5.45 metres.

NOTES Groundwater not encountered.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

KEY | GS
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info@keygs.com
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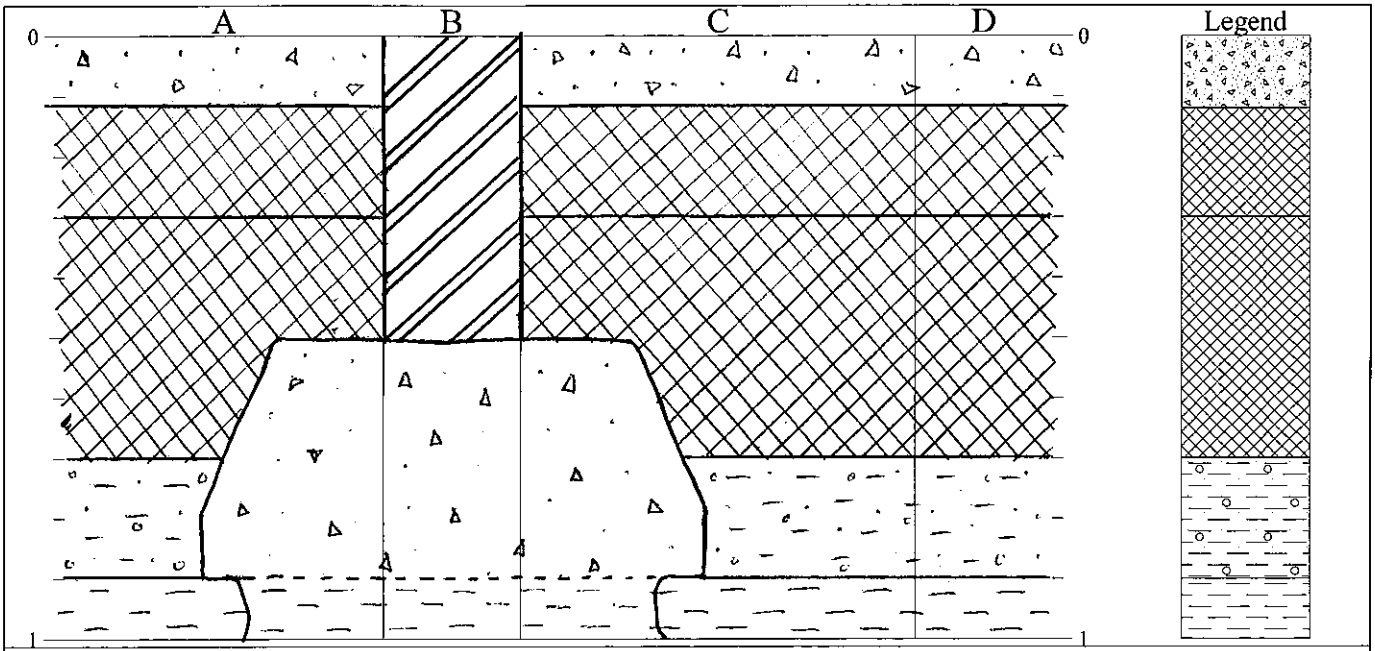
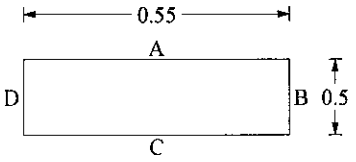
TRIAL PIT LOG

Project				TRIAL PIT No
London - 22 Holmes Road				TP01
Job No: 19-088	Date: 28-02-19 28-02-19	Ground Level (m):	Co-Ordinates (m):	
Contractor: Dynamic Sampling UK				Sheet: 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.12		CONCRETE			
0.12-0.30		MADE GROUND consisting brick fragments and gravel in a dark grey sandy slightly silty ash matrix			
0.30-0.70		MADE GROUND consisting soft grey brown occasionally sandy slightly gravelly CLAY with occasional ash. Gravel is fine to coarse angular to sub-rounded brick stones coal 0.50 FOUNDATION: Base of bricks onto concrete.			
0.70-0.90		Soft mottled orange brown CLAY with rare to occasional gravel and sand. Gravel is fine to medium stones and brick			
0.90-1.00		Firm mottled orange brown CLAY 0.90 FOUNDATION: Base of concrete onto natural ground.			

Shoring/Support:
Stability:



GENERAL REMARKS

All dimensions in metres Scale 1:12.5	Client: Stantec	Method/ Plant Used:	Logged By: WR

APPENDIX 2

LABORATORY TESTING RESULTS

8180

GROUND ENGINEERING LIMITED

Newark Road Peterborough

t: 01733 566566

e: admin@groundengineering.co.uk

TEST CERTIFICATE

Determination of Liquid & Plastic Limits

Tested in accordance with BS 1377-2:1990: Clause 4.4 & 5: One Point Method

Client:	Key GeoSolutions Ltd	Certificate Number:	PL6616-1/1/704
Client Address:	Nova House Audley Ave Newport Shropshire TF10 7DW	Client Reference:	L9632
		Job Number:	PL6616-1
		Date Sampled:	Unknown
Contact:	Will Roberts	Date Received:	06.03.2019
		Date Tested:	12.03.2019
Site Name:	22 Holmes Road	Certificate of Sampling:	N/A
Site Address:		Sampling Certificate No.:	N/A
		Sampled By:	Client

Test Results:

Laboratory Reference: PL6616-1/1

Sample Reference: Not Given

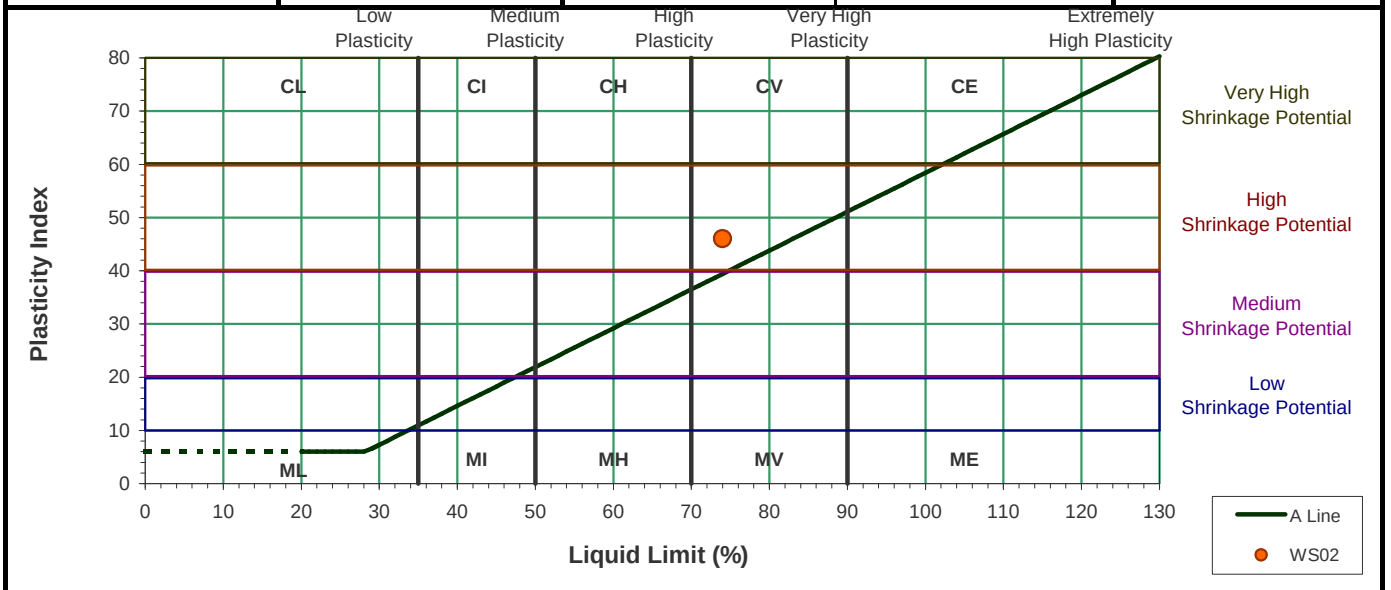
Sample Description: Firm brown orange-brown grey slightly silty CLAY.

Location: WS02 **Depth Top:** 1.80m

Sample Preparation: As Received **Depth Base:** 2.00m

Estimated % Passing 425µm BS Test Sieve

Moisture Content (%)	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index	% Passing 425µm BS Test Sieve
32	74	28	46	100



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 20.03.2019 Page 1 of 1

Form Number: GELab/C/704 Version 44

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Determination of Liquid & Plastic Limits

Tested in accordance with BS 1377-2:1990: Clause 4.4 & 5: One Point Method

Client:	Key GeoSolutions Ltd	Certificate Number:	PL6616-1/2/704
Client Address:	Nova House Audley Ave Newport Shropshire TF10 7DW	Client Reference:	L9632
		Job Number:	PL6616-1
		Date Sampled:	Unknown
Contact:	Will Roberts	Date Received:	06.03.2019
		Date Tested:	12.03.2019
Site Name:	22 Holmes Road	Certificate of Sampling:	N/A
Site Address:		Sampling Certificate No.:	N/A
		Sampled By:	Client

Test Results:

Laboratory Reference: PL6616-1/2

Sample Reference: Not Given

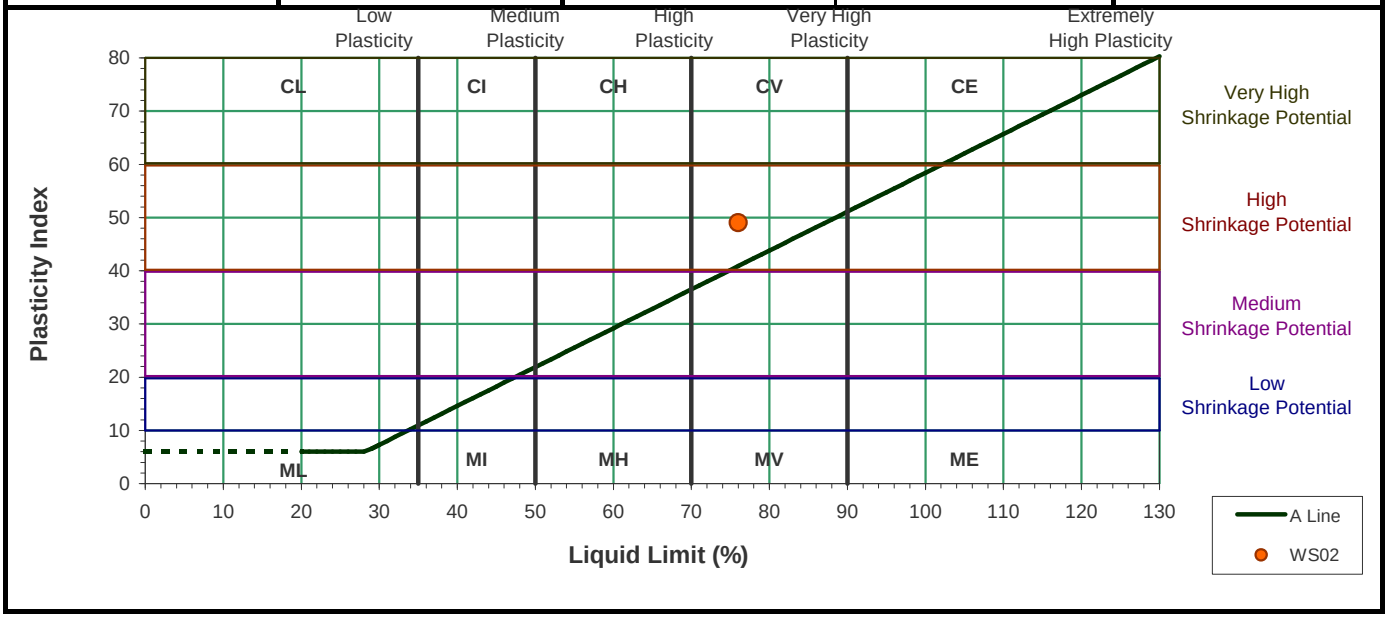
Sample Description: Firm brown orange-brown grey slightly silty CLAY with rare fine calcareous concretions.

Location: WS02 **Depth Top:** 2.80m

Sample Preparation: As Received **Depth Base:** 3.00m

Estimated % Passing 425µm BS Test Sieve

Moisture Content (%)	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index	% Passing 425µm BS Test Sieve
33	76	27	49	100



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 20.03.2019 Page 1 of 1

Form Number: GELab/C/704 Version 44

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TEST CERTIFICATE

Determination of Liquid & Plastic Limits

Tested in accordance with BS 1377-2:1990: Clause 4.4 & 5: One Point Method

Client:	Key GeoSolutions Ltd	Certificate Number:	PL6616-1/3/704
Client Address:	Nova House Audley Ave Newport Shropshire TF10 7DW	Client Reference:	L9632
		Job Number:	PL6616-1
		Date Sampled:	Unknown
Contact:	Will Roberts	Date Received:	06.03.2019
		Date Tested:	11.03.2019
Site Name:	22 Holmes Road	Certificate of Sampling:	N/A
Site Address:		Sampling Certificate No.:	N/A
		Sampled By:	Client

Test Results:

Laboratory Reference: PL6616-1/3

Sample Reference: Not Given

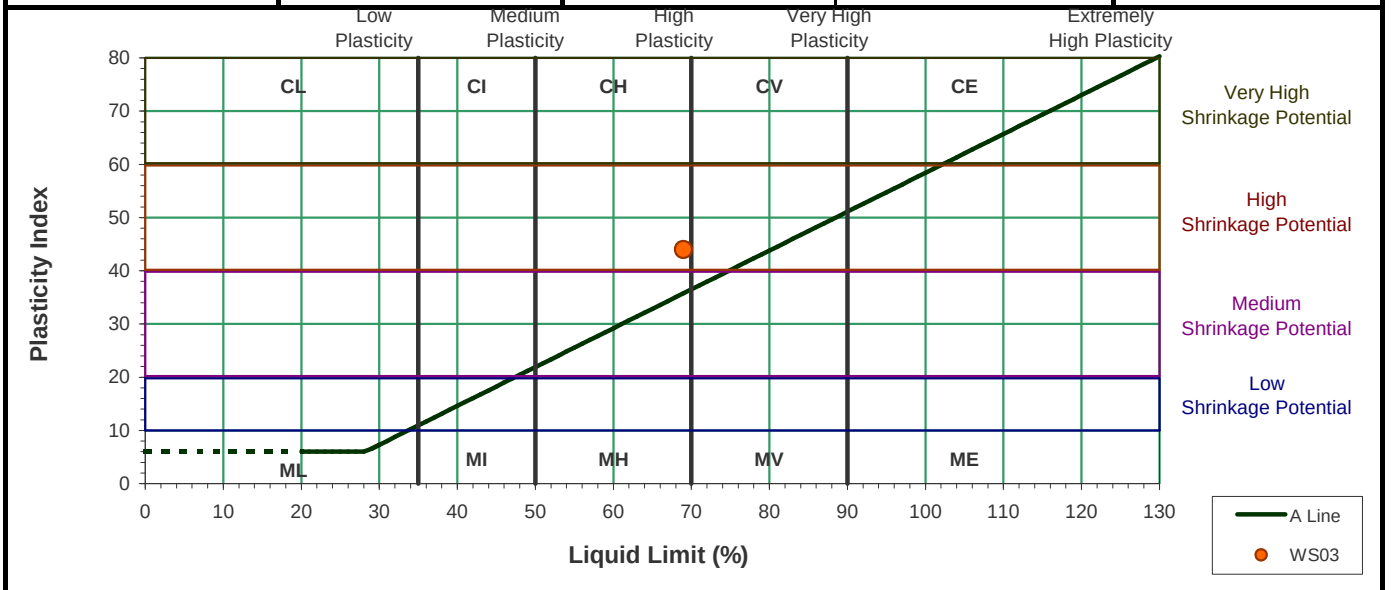
Sample Description: Firm brown grey slightly silty slightly gravelly CLAY. Gravel consists of fine to medium angular to rounded calcareous concretions and flint.

Location: WS03 **Depth Top:** 2.00m

Sample Preparation: As Received **Depth Base:** 2.25m

Estimated % Passing 425µm BS Test Sieve

Moisture Content (%)	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index	% Passing 425µm BS Test Sieve
N/A	69	25	44	92



Comments: Gravel particles removed by hand

Approved Signatory: M. Hartnup - Laboratory Manager Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 20.03.2019 Page 1 of 1

Form Number: GELab/C/704 Version 44

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GROUND ENGINEERING LIMITED

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TEST CERTIFICATE

Determination of Undrained Shear Strength in Triaxial Compression

(Single Stage Test - BS 1377 : Part 7 : Clause 8)

Client:	Key GeoSolutions Ltd	Certificate Number:	PL6616-1-1 / 714-1
Client Address:	Nova House Audley Avenue, Enterprise Park Newport, Shropshire	Client Reference Number:	**L9632**
		Date Sampled:	28.02.2019
		Date Received:	01.03.2019
Postcode:	TF10 7DW	Date Tested:	11.03.2019
Contact:	Will Roberts	Sampling Certificate No.:	N/A
Site Name:	22 Holmes Road	Certificate of Sampling:	N/A
Site Address:	Not Given	Sampled By:	Client

Test Results:

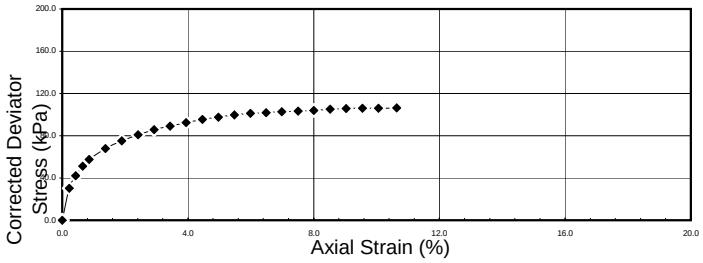
Lab Reference	PL6616-1-1	Sample Ref:	**Not Given**
Location:	**WS02**	Depth (m):	**1.80 to 2.00**
Sample Description:	Firm brown orange-brown grey slightly silty CLAY.		

Variations from Standard: None
Laboratory Temperature (^{o}C): 22.0

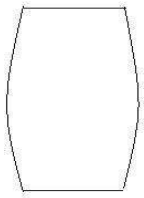
Specimen Details

Initial Height (mm):	135.0	Latex Membrane Thickness (mm):	0.40
Initial Diameter (mm):	85.0	Applied Rate of Strain (%/min):	2.00
Depth within Sample (m):	1.80 to 1.95	Initial Bulk Density (Mg/m^3):	**1.94**
Orientation within Sample:	Vertical	Initial Moisture Content (%):	**32**
Method of Preparation :	Undisturbed (BS 1377:1990:Pt 1:8)	Initial Dry Density (Mg/m^3):	**1.48**

Deviator Stress against Axial Strain



Failure Sketch



Cell Pressure	**50**	kPa
Membrane Correction	1.2	kPa
Corrected Maximum Deviator Stress	106	kPa
Strain	11	%
Undrained Shear Strength	**53**	kPa
Mode of Failure		Plastic

Approved Signatory: [x] M.Hartnup - Laboratory Manager
[ ] L.Petch - Team Leader

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 20/03/2019

Form Number: GELab/C/714-1 Issue 1

Registered in England and Wales
Reg Number 6929574
Reg Office: Ground Engineering Ltd
Newark Rd
Peterborough PE1 5UA

8180

GROUND ENGINEERING LIMITED

Newark Road Peterborough
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e: admin@groundengineering.co.uk

TEST CERTIFICATE

Determination of Undrained Shear Strength in Triaxial Compression

(Single Stage Test - BS 1377 : Part 7 : Clause 8)

Client:	Key GeoSolutions Ltd	Certificate Number:	PL6616-1-2 / 714-1
Client	Nova House	Client Reference Number:	**L9632**
Address:	Audley Avenue, Enterprise Park	Date Sampled:	28.02.2019
	Newport, Shropshire	Date Received:	01.03.2019
Postcode:	TF10 7DW	Date Tested:	11.03.2019
Contact:	Will Roberts	Sampling Certificate No.:	N/A
Site Name:	22 Holmes Road	Certificate of Sampling:	N/A
Site Address:	Not Given	Sampled By:	Client

Test Results:

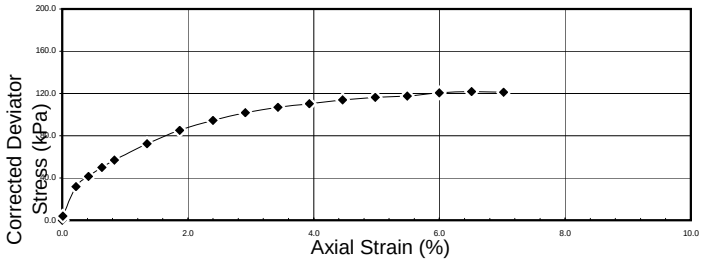
Lab Reference	PL6616-1-2	Sample Ref:	**Not Given**
Location:	**WS02**	Depth (m):	**2.80 to 3.00**
Sample Description:	Firm brown orange-brown grey slightly silty CLAY with rare fine calcareous concretions.		

Variations from Standard: None
Laboratory Temperature (^{o}C): 22.0

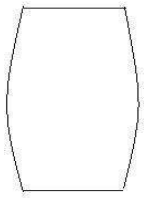
Specimen Details

Initial Height (mm):	157.0	Latex Membrane Thickness (mm):	0.40
Initial Diameter (mm):	83.0	Applied Rate of Strain (%/min):	2.00
Depth within Sample (m):	2.80 to 2.95	Initial Bulk Density (Mg/m^3):	**1.86**
Orientation within Sample:	Vertical	Initial Moisture Content (%):	**33**
Method of Preparation :	Undisturbed (BS 1377:1990:Pt 1:8)	Initial Dry Density (Mg/m^3):	**1.40**

Deviator Stress against Axial Strain



Failure Sketch



Cell Pressure	**50**	kPa
Membrane Correction	0.8	kPa
Corrected Maximum Deviator Stress	122	kPa
Strain	6.5	%
Undrained Shear Strength	**61**	kPa
Mode of Failure		Plastic

Approved Signatory: [x] M.Hartnup - Laboratory Manager
[ ] L.Petch - Team Leader

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 20/03/2019

Form Number: GELab/C/714-1 Issue 1

Registered in England and Wales
Reg Number 6929574
Reg Office: Ground Engineering Ltd
Newark Rd
Peterborough PE1 5UA

8180

GROUND ENGINEERING LIMITED

Newark Road Peterborough
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e: admin@groundengineering.co.uk

TEST CERTIFICATE

Determination of Undrained Shear Strength in Triaxial Compression

(Single Stage Test - BS 1377 : Part 7 : Clause 8)

Client:	Key GeoSolutions Ltd	Certificate Number:	PL6616-1-4 / 714-1
Client	Nova House	Client Reference Number:	**L9632**
Address:	Audley Avenue, Enterprise Park	Date Sampled:	28.02.2019
	Newport, Shropshire	Date Received:	01.03.2019
Postcode:	TF10 7DW	Date Tested:	11.03.2019
Contact:	Will Roberts	Sampling Certificate No.:	N/A
Site Name:	22 Holmes Road	Certificate of Sampling:	N/A
Site Address:	Not Given	Sampled By:	Client

Test Results:

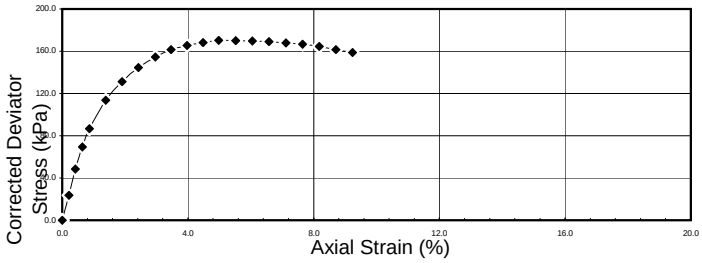
Lab Reference	PL6616-1-4	Sample Ref:	**Not Given**
Location:	**WS03**	Depth (m):	**3.00 to 3.30**
Sample Description:	Stiff brown CLAY.		

Variations from Standard: None
Laboratory Temperature (^{o}C): 22.0

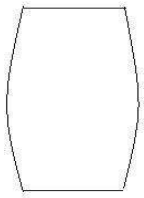
Specimen Details

Initial Height (mm):	129.0	Latex Membrane Thickness (mm):	0.40
Initial Diameter (mm):	74.0	Applied Rate of Strain (%/min):	2.00
Depth within Sample (m):	3.00 to 3.15	Initial Bulk Density (Mg/m^3):	**1.81**
Orientation within Sample:	Vertical	Initial Moisture Content (%):	**32**
Method of Preparation :	Undisturbed (BS 1377:1990:Pt 1:8)	Initial Dry Density (Mg/m^3):	**1.37**

Deviator Stress against Axial Strain



Failure Sketch



Cell Pressure	**50**	kPa
Membrane Correction	0.7	kPa
Corrected Maximum Deviator Stress	170	kPa
Strain	5.0	%
Undrained Shear Strength	**85**	kPa
Mode of Failure		Plastic

Comments: Poor sample - broken

Approved Signatory: [x] M.Hartnup - Laboratory Manager
[ ] L.Petch - Team Leader

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 20/03/2019

Form Number: GELab/C/714-1 Issue 1

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Reg Number 6929574
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