Basement Impact Assessment Rev1.02

at
15 Landor Road, Lambeth, London SW9 9RX

for
KK Facades Ltd

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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Commission

Soils Limited was commissioned by KK Facades Ltd to undertake a Basement Impact Assessment on land at 15 Landor Road, Lambeth, London SW9 9RX. The scope of the investigation was outlined in the Soils Limited quotation reference Q22834/rev102, dated 28th April 2020.

This document comprises Rev1.02 of the Basement Impact Assessment (BIA) and incorporates the results, discussion and conclusions to this intrusive works following to minor changes to the layout received from the Client's consultants. This report, therefore, supersedes every previous version.

No Phase I Preliminary Report was undertaken at the site and no Conceptual Site Model (CSM) was produced, as this did not form part of the Client's brief. Contamination laboratory testing, however, was undertaken for providing basic information about the safety of workers and future occupants from the soils recovered.

Standards

The site works, soil descriptions and geotechnical testing was undertaken in accordance with the following standards:

- BS 5930:2015
- BS EN ISO 22476-3:2005+A1:2011
- BS EN 1997-1:2004+A1:2013 Eurocode 7
- BS EN ISO 14688-1:2002+A1:2013
- BS EN ISO 14688-2:2004+A1:2013
- BS 10175:2011+A1:2013
- BRE Digest 240
- NHBC Standards 2020
- CIRIA SP200 – Building response to tunnelling
- CIRIA C760 – Guidance on embedded retaining wall design.
- Burland J.B., et al (2001). Building response to tunnelling. Case studies from the Jubilee line Extension, London. CIRIA Special Publication 200.
- Gaba A.R., et al (2003). Embedded retaining walls – guidance for economic design. CIRIA Report C580.
- Camden geological, hydrogeological and hydrological study, Guidance for subterranean development, Issue01/November 2010
- Environment Agency Water Framework Directive
- Strategic Flood Risk Assessment (SFRA)
- Property Asset Register Public Web Map, Transport for London

- The Lost Rivers of London, Historical Publications Ltd, 1992, N Barton

The geotechnical laboratory testing was performed by GEO Site & Testing Services Ltd (GSTL) in accordance with the methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accredited test methods.

For the preparation of this report, the relevant BS code of practice was adopted for the geotechnical laboratory testing technical specifications, in the absence of the relevant Eurocode specifications (ref: ISO TS 17892).

The chemical analyses were undertaken by Derwentside Environmental Testing Services Limited (DETS) in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to produce a trial hole.

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Section 1 Introduction

1.1 Objective of Investigation

Soils Limited was commissioned by KK Facades Ltd to undertake an intrusive ground investigation and to produce a Basement Impact Assessment (BIA). The objective of this investigation was to establish the impact and risk of the proposed basement at 15 Landor Road, Lambeth, London SW9 9RX.

This document comprises Rev1.02 of the Basement Impact Assessment (BIA) and incorporates the results, discussion and conclusions to this intrusive works following to minor changes to the layout received from the Client's consultants. This report, therefore, supersedes every previous version.

The report provides details on the ground and groundwater conditions on-site and presents calculations to determine the potential impact of the proposed development on neighbouring properties. In addition, the report provides a qualitative risk assessment of the potential impacts the proposed development might have on groundwater levels, surface water flows and flooding.

It is recognised that any Basement Impact Assessment is a live document and that further detailed assessments will be ongoing, if appropriate, as the design and construction progresses.

No Phase I Preliminary Report was undertaken at the site and no Conceptual Site Model (CSM) was produced, as this did not form part of the Client's brief. Limited contamination laboratory testing, however, was undertaken for providing basic information about the safety of workers and future occupants from the soils recovered.

1.2 Limitations and Disclaimers

This Basement Impact Assessment relates to the site located at 15 Landor Road, Lambeth, London SW9 9RX and was prepared for the sole benefit of KK Facades Ltd (The "Client"). The report was prepared solely for the brief described in Section 1.1 of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Conditions of Contact of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot by plot basis prior to the construction of foundations. Supplied site surveys may not include substantial shrubs or bushes and is also unlikely to have data or any trees, bushes or shrubs removed prior to or following the site survey.

Where trees are mentioned in the text this means existing trees, substantial bushes or shrubs, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping).

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Section 2 Site Context

2.1 Location

The site was located at 15 Landor Road, Lambeth, London SW9 9RX, had an approximate O.S Land Ranger Grid Reference of TQ 30121 75727 and fell within the administrative boundaries of the London Borough of Lambeth.

The site location plan is given in Figure 1.

2.2 Site Description

At the time of reporting, the site comprised a Georgian end of terrace house, incorporating both 13 and 15 Landor Road, with front and rear soft landscaped areas. One semi-mature tree was observed in the north-west corner of the rear garden, at the boundary between 11 and 13 Landor Road. Both semi-mature and mature trees were recorded within neighbouring gardens. The site was bounded by Landor Road and Atherfold Road respectively along the south and east boundaries with residential properties beyond, and by the residential properties at 11 Landor Road to the west and by 74 Atherfold Road to the north.

An aerial photograph of the site and its close environs has been included in Figure 2.

2.3 Proposed Development

The drawings received from the Client showed that the proposed development comprised the construction of a basement under the eastern half of the existing building, extending into both the front and the rear garden. The revised layout in report Rev1.02 considered a reduction in the footprint of the front lightwell.

In compiling this report reliance was placed on drawing number DWG-AT-020-106-01 Rev. P1, DWG-AT-020-106-02 Rev.P1, DWG-AT-020-106-03 Rev. P1 and DWG-AT-020-106-04 Rev. P1, dated 30th July 2020 and prepared by BETA Design Consultants. Any change or deviation from the scheme outlined in the drawing could invalidate the foundation design and remediation recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix C.

2.4 Topography

On site topography was substantially flat and level. The wider topography sloped downwards in a north/north-west direction, towards the River Thames. The average gradient was estimated as not exceeding 3° using online available data.

2.5 Published Geological Data

The 1:50,000 BGS map showed the site to be located upon the bedrock London Clay Formation with overlying superficial deposits of Head.

2.5.1 Head

Head deposit are drifts produced by solifluxion, the downslope movement of debris outwash during the periglacial period, and characteristically comprise poorly sorted sands gravels and chalk of local derivation.

2.5.2 London Clay Formation

The London Clay Formation comprises stiff grey fissured clay, weathering to brown near surface. Concretions of argillaceous limestone in nodular form (Claystones) occur throughout the formation. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.

The upper boundary member of the London Clay Formation is known as the Claygate Member and marks the transition between the deep water, predominantly clay environment and succeeding shallow-water, sand environment of the Bagshot Formation.

The lower boundary is generally marked by a thin bed of well-rounded flint gravel and/or a glauconitic horizon. The formation overlies the Harwich Formation or where the Harwich Formation is absent the Lambeth Group.

In the north London area the upper part of the London Clay Formation has been disturbed by glacial action and may contain pockets of sand and gravel.

2.6 Web Based Geology Data

A review of historic boreholes drilled to depths >30m below ground level within 500m from the site obtained from the BGS suggest the following sequence and final depth of strata.

Made Ground/Superficial Deposits: 3.0m to 6.7m

London Clay Formation: >32.0m to >46.0m

Lambeth Group: 48.9m to 54.2m

Thanet Sand Formation: 62.2m to 66.0m

Chalk: >152.4m

2.6.1 Groundwater

Deep boreholes from the BGS recorded groundwater at a depth of 6.7m below ground level within granular superficial deposits, where present, and at depths of 31.1m to 44.8m below ground level within granular beds of the Lambeth Group.

2.7 Hydrology

The nearest permanent water feature was Long Pond at Clapham Common (>1100m SW). The Boating Lake at Battersea Park was recorded at >2000m NW. The River Thames was recorded at >2000m N.

The site was recorded at an elevation of circa 15m AOD. The Long Pond was estimated at circa 23m AOD while the Boating Lake and the River Thames at circa 3m and 2m AOD respectively.

The vicinity of lost rivers was also investigated, and it was estimated that the culverted River Falcon was at more than 2500m to the south-west of the site. The map of the lost rivers of London was reported in Figure 4.

2.8 Hydrogeology

The Environment Agency has produced an aquifer designation system consistent with the requirements of the Water Framework Directive. The designations have been set for superficial and bedrock geology and are based on the importance of aquifers for potable water supply and their role in supporting water bodies and wetland ecosystems.

The London groundwater model was generally split into three aquifers, the Upper, Intermediate and Lower Aquifer.

> The Upper Aquifer was confined to the River Terrace Deposits, which were not anticipated onsite, overlying the London Clay Formation, which acts as an aquiclude.
>
> The Intermediate Aquifer was generally associated with granular layers within the Lambeth Group.
>
> The Lower Aquifer was principally associated with the Chalk, but can include the Thanet Sand Formation.

Information presented by the Environment Agency classifies the London Clay Formation bedrock as unproductive strata.

Published geological data shows the site on soils of Head and overlying the London Clay Formation, therefore the Upper Aquifer would not be present onsite, unless limited to granular horizons within the Head. Any water infiltrating the London Clay Formation will generally tend to flow either with the topography or vertically downwards at a very slow rate towards the Intermediate and subsequently Lower Aquifer. Due to the predominantly cohesive nature of the soils, the groundwater flow rate is anticipated to be very slow. Published permeability data for the London Clay Formation indicates the horizontal permeability to generally range between 10^{-10} m/s and 10^{-8} m/s, with an even lower vertical permeability.

The Upper Aquifer, if present, was considered to be relevant to the proposed development and basement impact assessment and must be confirmed via a ground investigation. The Intermediate and Lower Aquifers would not be affected in any way by the proposed works so were not considered further.

2.9 Flood Risk

The risk of flooding was assessed taking into account the information available from the National Flood Information Service (NFIS), the Preliminary Flood Risk Assessment (PFRA), the Strategic Flood Risk Assessment (SFRA) and the Surface Water Management Plan (SWMP) prepared for the London Borough of Lambeth.

The NFIS showed the site to be at very low risk of flooding for the action of rivers and sea, from the failure of reservoirs and from surface water. Information from the NFIS was reported on Figure 5 to Figure 7.

The SWMP prepared for the London Borough of Lambeth showed the site was not located within any Critical Drainage Area. Information from the SWMP was reported on Figure 8.

The SFRA showed that the site did not fall within any of the Flood Warning Areas identified within the boundaries of the London Borough of Lambeth. Information from the SFRA was reported on Figure 9.

The PFRA showed the site to be located within an area with anticipated permeable deposits. No flooding incidents were recorded at the site for surface water or elevated groundwater. Moderate risk of flooding from sewer failure was instead recorded. Information from the PFRA was reported on Figure 10 to Figure 12.

2.10 Underground Infrastructure

The Property Asset Register Public Web Map prepared by Transport for London was used for determining the presence of underground infrastructure within the area of influence of the proposed development and the results were presented in Figure 13.

The site was observed at a distance of >25m from the boundaries of the exclusion zone of underground tunnels and structures in the area.

2.11 UXO Risk

The web-based service Bomb Sight was used for undertaking a preliminary appraisal of the risk for unexploded ordnance from the Second World War. A map of the area was presented in Figure 14, where it can be observed that the area was subjected to intense bombing between 7th October 1940 and 6th June 1941. High-explosive bombs were deployed within a radius of 100m from the site.

The above results were compared with the information available on-line from Zetica UXO. The map in Figure 15 showed the site to be located within an area at high risk for the presence of UXO.

Considering the results of the preliminary appraisal, it is recommended to consider the undertaking of a specific UXO risk assessment.

Section 3 Screening

3.1 Introduction

Soils Limited has adopted a screening process to meet the requirements of the London Borough of Lambeth Supplementary Planning Document (SPD) to identify potential risks to the ground, groundwater/surface water, land stability, adjacent properties and infrastructure.

The assessment is undertaken in the form of tabulated questions, based upon the Ove Arup 2008 Scoping Study prepared for the London Borough of Camden, setting out relevant considerations for conditions in the Borough. The assessment requires that any development proposal that includes a subterranean basement should be screened to determine whether or not a full BIA is required.

A number of screening tools are included in the Arup document, which includes a series of questions within a screening flowchart for three categories: surface water flow, groundwater flow and land stability. Where simple answers may be provided without further analysis, these are provided. Responses to the questions are tabulated below.

3.2 Surface Flow and Flooding Screening Assessment

The response to the Surface Flow and Flood Screening Assessment is given in Table 3.1.

Table 3.1 – Surface Flow and Flooding Screening

Question	Response
1. 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 –Drainage will be taken to combined sewers in public highway.
2. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	Yes – Minimal changes expected due to the proposed lower ground floor slightly extending to the rear and under the front garden.
3. Will the proposed basement development 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 – Changes to site drainage strategy not part of the proposed development.
4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No – The quality of surface water would not be affected.
5. Is the site in an area known to be at risk from surface water flooding?	Yes – Very low risk was recorded from the NFIS.

3.3 Subterranean (Groundwater) Screening Assessment

The response to the Subterranean (Groundwater) Screening Assessment is given in Table 3.2.

Table 3.2 – Subterranean (Groundwater) Screening

Question	Response
1a. Is the site located directly above an aquifer?	**Unknown** – Superficial deposits capable of supporting local water supplies could be present.
1b. Will the proposed basement extend beneath the water table surface?	**Unknown** – Superficial deposits capable of supporting local water supplies could be present.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	No – The nearest Surface Water Feature was recorded at >1100m SW of the site.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	**Yes** – Area of hardstanding will slightly increase.
4. 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 – No changes to the existing conditions were anticipated.
5. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than, the mean water level in any local pond or spring line?	No – Nearest surface water feature located >1100m SW.

3.4 Stability Screening Assessment

The response to the Stability Screening Assessment is given in Table 3.3.

Table 3.3 – Stability Screening

Question	Response
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No – Site not characterised by relevant slopes.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No – No reprofiling part of the proposed redevelopment.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No – No localised slopes within the neighbouring properties.
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No – The average slope towards the River Thames did not exceed 3°.
5. Is the London Clay the shallowest strata at the site?	No – Superficial deposits of Head were anticipated at the site.
6. Will any trees be felled as part of the proposed development and / or are any works proposed within any tree protection zones where trees are to be retained?	No – No felling of trees was anticipated on the Client's drawings.
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	**Unknown** – Anticipated geology was Head over London Clay Formation. The London Clay Formation would potentially be subject to shrink-swell subsidence. There was no visual evidence of subsidence at the site or properties in the vicinity.
8. Is the site within 100 m of a watercourse or potential spring line?	No – The nearest Surface Water Feature was recorded at >1100m SW of the site.

Question	Response
9. Is the site within an area of previously worked ground?	No - The relevant geological map did not show any Made Ground or Worked Ground within or in close proximity to the site.
10. Is the site within an aquifer?	**Unknown** – Superficial deposits capable of supporting local water supplies could be present.
11. Is the site within 5 m of a highway or pedestrian right of way?	**Yes** – The site was adjoining Landor Road.
12. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	**Unknown** – It was unknown whether the neighbouring property had a basement.
13. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No – The exclusion zone of known underground structures was >25m away from the site.

3.5 Summary

Based on the screening exercise, further stages of the basement impact assessment are required. A summary of the basement impact assessment requirements has been provided in Table 3.4, Table 3.5 and Table 3.6.

Table 3.4 – Surface Flow and Flooding Screening

Item	Description
Q2	Minimal changes expected due to the proposed lower ground floor slightly extending to the rear and under the front garden.
Q5	Very low risk was recorded from the NFIS.

Table 3.5 – Subterranean (Groundwater) Screening Assessment

Item	Description
Q1a	Superficial deposits capable of supporting local water supplies could be present.
Q1b	Superficial deposits capable of supporting local water supplies could be present.
Q3	Hardstanding will slightly increase.

Table 3.6 – Stability Screening Assessment

Item	Description
Q7	Anticipated geology was Head over London Clay Formation. The London Clay Formation would potentially be subject to shrink-swell subsidence. There was no visual evidence of subsidence at the site or properties in the vicinity.
Q10	Superficial deposits capable of supporting local water supplies could be present.
Q11	The site was adjoining Landor Road.
Q12	It was unknown whether the neighbouring property had a basement.

Section 4 Scoping

4.1 Introduction

The purpose of scoping is to assess in more detail the issues of concern identified in the screening process (i.e. where the answer is “yes” or “unknown” to any of the questions posed) to be investigated in the impact assessment. Potential hazards are assessed for each of the identified potential impact factors.

The scoping stage is furthermore to assist in defining the nature of the investigation required to assess the impact of the issues of concern identified in the screening process. The scope of the investigation must comply with the guidance issued by the London Borough of Camden Council and be a suitable basis on which to assess the potential impacts.

4.2 Potential Impacts

The following potential impacts were identified in Table 4.1.

Table 4.1 – Potential Impacts

Screening Flowchart Question	Potential Impacts	Discussion
Is the site located directly above an aquifer? Is the site within an aquifer? Will the proposed basement extend beneath the water table surface? Is the site in an area known to be at risk from surface water flooding? Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	The proposed development could be affected by flooding in both the short and the long term. Basement could extend into an underling aquifer and thus affect the groundwater flow regime, which in turn could potentially cause local increase or decrease of groundwater levels. The proposed basement construction could require dewatering, which can cause ground subsidence. Reduction of hard landscaping could increase the surface water flooding rise. Reductions in permeable areas could result in ponding and/or increased runoff.	A ground investigation would be required to determine the geology and groundwater levels. In the short term, water entering the excavations must be pumped out on a very local basis to ensure a safe and comfortable environment for the workers and avoiding eventual subsidence phenomena. In the long term, the premises must be waterproofed and pumps must be introduced into sumps. Positive pumped devices and/or anti-return valves must be applied to drainage systems in the basement to avoid flooding from sewers. Effects to be mitigated at design stage.
Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	Changes to vegetation on site could adversely affect foundations of adjoining structures.	Ground investigation to establish soil conditions and details of existing foundations by means of trial pits or boreholes.
Is the site within 5m of a highway or pedestrian right of way?	Excavation of a basement could result in structural damage to the roads/ footways or buried services.	Ground investigation to establish soil conditions. Effects mitigated at design stage.

Screening Flowchart Question	Potential Impacts	Discussion
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Basement construction can result in undermining of foundations of neighbouring properties and cause excessive ground movements resulting in structural instability.	It was unknown if the adjoining property had a lower ground floor. Ground investigation to establish soil conditions. Full Ground Movement Assessment to be undertaken. Effects mitigated at design stage.

Section 5 Intrusive Investigation

5.1 Proposed Project Works

The proposed intrusive investigation was designed to provide information on the ground conditions and to aid the design of foundations for the proposed residential development. The intended investigation, as outlined within the Soils Limited quotation (Q22834/rev102, dated 28th April 2020), was to comprise the following items:

- 1No. 10m deep cable percussive borehole
- 1No. groundwater monitoring well
- 3No. post site works groundwater monitoring visits
- 2No. hand excavated external trial pits for foundation exposure tests
- Geotechnical laboratory testing.

5.1.1 Actual Project Works

The actual project works were undertaken on 1st May 2020 and comprised:

- 1No. 8m deep windowless sampler borehole
- 1No. 9m deep dynamic probe
- 1No. groundwater monitoring well
- 3No. post site works groundwater monitoring visits
- 2No. hand excavated external trial pits for foundation exposure tests
- Geotechnical laboratory testing.

One windowless sampler borehole (WS1) was backfilled with gravel and bentonite following the installation of one monitoring well.

Two trial pits (FE1 and FE2) were backfilled with arisings.

All trial hole locations have been presented in Figure 3.

Following completion of site works, soil cores were logged and sub sampled so that samples could be sent to the laboratory for both contamination and geotechnical testing.

5.2 Ground Conditions

On 1st May 2020 one windowless sampler borehole (WS1) was drilled, using a Premier 110 Compact rig, to a depth of 8.00m below ground level (bgl) at locations selected by Soils Limited using a development plan provided by the client. The initially proposed cable percussive borehole was replaced with the windowless sampler borehole due to issues with access.

One dynamic probe (DP1), super heavy (DPSH), was driven prior and adjacent to the corresponding windowless sampler borehole to a depth of 9.00m bgl.

One standpipe was installed within window sample borehole location (WS1) to allow for continued monitoring of groundwater, where present.

Two trial pits for foundation exposure tests were hand excavated to depths ranging between 1.00m (FE2) and 1.20m bgl (FE1).

The maximum depths of trial holes have been included in Table 5.1.

All trial holes were scanned with a Cable Avoidance Tool (C.A.T.) and GENNY prior to excavation to ensure the health and safety of the operatives.

Table 5.1 – Final Depth of Trial Holes

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
WS1 (w)	8.00	DP1	9.00
FE1	1.20	FE2	1.00

Note: w - well installation

The approximate trial hole locations are shown on Figure 3.

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the trial hole logs and quoted in this report were measured from ground level.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots, or has been identified as part of the in-situ weathering profile, it has been described as Topsoil both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered, with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the log and within this report.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for the purposes of discussion, the succession of conditions encountered in the trial holes in descending order can be summarised:

Made Ground (MG)
Head (HEAD)
London Clay Formation (LCF)

The ground conditions encountered in the trial holes are summarised in Table 5.2.

Table 5.2 – Ground Conditions

Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
MG	Anthropocene	GL	0.80 – 1.20[1]	0.90	Yellowish orange building SAND/concrete over soft black, slightly sandy, gravelly PEAT overlying soft, light and dark brown sandy, slightly gravelly CLAY with flint, concrete, brick, glass, clinker and wood gravel.
HEAD	Holocene	0.80	1.90	1.10	Soft to firm light orangish brown mottled grey very sandy CLAY.
LCF	Eocene	1.90	8.00[1] – 9.00[13]	Not proven[2]	Firm, orange brown mottled grey, slightly sandy CLAY becoming stiff, dark grey, slightly sandy CLAY.

Note: [1] Final depth of trial hole. [2] Base of strata not encountered. [3] Inferred from the results of dynamic probing.

5.3 Ground Conditions Encountered in Trial Holes

The ground conditions encountered in trial holes have been described below in descending order. The engineering logs are presented in Appendix A.1.

5.3.1 Made Ground

Soils described as Made Ground were encountered in all the three trial holes from ground level to depths ranging between 0.80 (WS1) and 1.20m bgl, the final depth of trial pit FE1.

The Made Ground typically comprised yellowish orange building SAND/concrete over soft black, slightly sandy, gravelly PEAT overlying soft, light and dark brown sandy, slightly gravelly CLAY. Sand was fine to coarse. Gravel was fine to medium, rounded and well-rounded to angular flint with occasional to frequent brick fragments, cement, glass fragments and occasional clinker. Rare brick cobbles. Frequent wood pieces and wooden sheet material at the base and along the faces of trial pit FE1. Frequent pockets of ash and suspected peat in trial pit FE2.

The depths of Made Ground have been included in Table 5.3.

Table 5.3 – Final Depth of Made Ground

Trial Hole	Depth (m bgl)
WS1	0.80
FE1	1.20[1]
FE2	1.00[1]

Note: [1] Final depth of trial hole.

5.3.2 Head

Soils described as Head were encountered in one trial hole (WS1) from directly below the Made Ground to a depth of 1.90m bgl.

The Head comprised soft to firm, light orangish brown mottled grey, very sandy CLAY. Sand was fine to coarse. Rare subangular fine chalk gravel.

The depth of Head has been included in Table 5.4.

Table 5.4 – Final Depth of Head

Trial Hole	Depth (m bgl)
WS1	1.90

5.3.3 London Clay Formation

Soils described as London Clay Formation were encountered in one trial hole (WS1) from directly below the Head to the final depth of 8.00m bgl.

The London Clay Formation comprised firm, orange brown mottled grey, slightly sandy CLAY becoming stiff, dark grey, slightly sandy CLAY. Localised layers of firm, brown, sandy, fragmented CLAYSTONE and occasional fine to medium, sub-rounded to sub-angular, claystone pockets. Sand was fine to coarse.

The depth of London Clay Formation has been included in Table 5.4.

Table 5.5 – Final Established Depth of London Clay Formation

Trial Hole	Depth (m bgl)
WS1	8.00[1]
DP1	9.00[12]

Note: [1] Final depth of trial hole. [2] Inferred from the results of dynamic probing.

5.4 Roots

Roots were encountered in all the three trial holes at depths ranging between 1.00m, the final depth of trial pit FE2, and 1.90m bgl (WS1). The depths of root penetration have been included in Table 5.6.

Table 5.6 – Depth of Root Penetration

Trial Hole	Depth (m bgl)
WS1	1.90
FE1	1.20[1]
FE2	1.00[1]

Note: [1] Final depth of trial hole.

Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole is low. A direct observation such as from within a trial pit is necessary to gain a better indication of the maximum root depth.

5.5 Groundwater

Groundwater was not encountered within any of the trial holes at the time of the intrusive investigation. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in May (2020), when groundwater levels should be lowering from their annual maximum (highest) elevation, which typically occurs around March.

Further groundwater monitoring was conducted within the standpipe installed on site following completion of site works.

The results of the agreed three monitoring visits have been presented in Table 5.7.

Table 5.7 – Groundwater Monitoring

Trial Hole	Well Depth (m bgl)	Depth to Water (m bgl)		
		12/6/2020	19/6/2020	30/06/2020
WS1	8.00	3.80	2.50	2.39

Groundwater was recorded at a minimum(shallowest) depth of 2.39m bgl, therefore likely to interact with the construction of the proposed basement development.

Groundwater equilibrium conditions may only be conclusively established, if a series of observations are made via groundwater monitoring wells.

5.6 Foundation Exposures

Foundations exposures were carried out in FE1 and FE2 at locations selected by Soils Limited and agreed with the client prior to the commencement of in-situ operations.

5.6.1 Foundation Exposure FE1

Trial pit FE1 was located within the rear garden, at the intersection of two walls, one belonging to the original building (FE1A) and the other to a more recent extension (FE1B).

The excavation at location FE1A was 0.50m wide. Brick and cement foundations stepped out by 0.13m at a depth of 0.15m bgl. Concrete strip footings were then observed stepping out by 0.09m from the brick and concrete foundations, corresponding to a total of 0.22m from the outside of the building wall, at a depth of 0.40m bgl and persisted to the final depth of the excavation of 1.20m bgl. The base of the strip footings was not observed within the excavated depth. Wood panels and boards, probably used as shoring at the time of foundation construction, were recorded along the sides and at the base of the excavation from a depth of circa 0.90m bgl and persisted to the final excavated depth.

The excavation at location FE1B was 0.40m wide. Concrete strip footings were observed stepping out by 0.08m from the brick wall at a depth of 0.40m bgl and persisted to the final depth of the excavation of 1.20m bgl. The base of the strip footings was not observed within the excavated depth. Wood panels and boards, probably used as shoring at the time of foundation construction, were recorded at the base of the excavation.

5.6.2 Foundation Exposure FE2

Trial pit FE2 was located within the front garden and the excavation was 0.50m wide. Brick and cement foundations stepped out by 0.10m above ground level and were 0.14m thick. Concrete strip footings were then observed stepping out by 0.30m from the brick and concrete foundations, corresponding to a total of 0.40m from the outside of the building wall, and persisted to a depth of 0.80m bgl, being 0.66m thick. The base of the foundations was clearly identified, with the final excavated depth recorded as 1.00m bgl.

The full foundations sketched for FE1A, FE1B and FE2 are presented in Appendix A.1.

Section 6 Discussion of Geotechnical In-Situ and Laboratory Testing

6.1 Dynamic Probe Tests

Dynamic probing (DPSH) was undertaken at one locations (DP1) adjacent and prior to the drilling of WS1 to a depth of 9.00m bgl. The results were converted to equivalent SPT "N60" values based on dynamic energy using commercial computer software (Geostru). The results were then interpreted based on the classifications outlined in Appendix B.1, Table B.1.1 and Table B.1.2.

The SPT "N60" values presented have been corrected in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the 'N' values should therefore not be necessary. The energy ratio of the drilling rig was 87.96%. The energy ratio is presented on the individual logs within Appendix A.1.

The Head recorded equivalent SPT "N60" values between 0 and 8, classifying the cohesive soils as extremely low to very low strength and inferred undrained cohesive strength of <10kPa to 40kPa.

The London Clay Formation recorded equivalent SPT "N" values between 4 and >60, classifying the cohesive soils as very low to extremely high strength and inferred undrained cohesive strength of 20kPa to >300kPa. Considering the results of dynamic probing, the high blow counts were interpreted as due to the presence of claystone bands. It was therefore considered that the London Clay Formation was characterised by SPT "N60" blow counts ranging between 4 and 37, classifying the cohesive soils as extremely low to very high strength and inferred undrained cohesive strength of 20kPa to 185kPa.

It should be noted that SPT 'N' values quoted within Table B.2.1, presented in Appendix B.2 and referred to within this report, are presented as corrected values in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the 'N' values should therefore not be necessary. Raw field data is archived within the Soils Limited project file and can be provided on request.

A full interpretation of the DPSH tests are outlined in Appendix B.2, Table B.2.1.

6.2 Atterberg Limit Tests

Atterberg Limit tests were performed on four samples, one obtained from the Head and the remaining three from the London Clay Formation. The results were classified in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

The cohesive beds of Head were classified as medium volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

The cohesive soils of the London Clay Formation were classified as medium volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

A full interpretation of the Atterberg Limit tests are outlined in Table B.2.2, Appendix B.2 and the laboratory report in Appendix B.3.

6.3 Sulphate and pH Tests

One sample was taken from the Head (WS1:1.50m bgl) and two from the London Clay Formation (WS1: 2.80m, 5.50m bgl) for water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment Special Digest 1, 2005, ‘Concrete in Aggressive Ground’.

The tests recorded water soluble sulphate between 57mg/l and 2180mg/l with pH values of 7.5 to 8.1.

The significance of the sulphate and pH Test results are discussed in Section 7.4 and the laboratory report in Appendix B.3.

Section 7 Foundation Design

7.1 General

An engineering appraisal of the soil types encountered during the site investigation and likely to be encountered during the redevelopment of this site is presented. Soil descriptions are based on analysis of disturbed samples taken from the trial holes.

7.1.1 Made Ground

The terms *Fill* and *Made Ground* are used to describe material, which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, the Fill and/or Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

The BSI Code of Practice for Foundations, BS 8004:1986, Clause 2.2.2.3.5 Made Ground and Fill, includes the caveat that *'all Topsoil should be treated as suspect, because of the likelihood of extreme variability'*.

The BSI Code of Practice for Foundations, BS8004: 1986, Clause 2.2.2.3.4 Peat and organic soils, includes the caveat that 'all these soils are highly compressible, and even lightly loaded foundations will be subject to considerable settlements over a long period if placed on them. For this reason, these soils are not suitable for carrying the loads for important structures'.

Soils described as Made Ground were encountered in all the three trial holes from ground level to depths ranging between 0.80 (WS1) and 1.20m bgl, the final depth of trial pit FE1. The Made Ground typically comprised yellowish orange building SAND/concrete over soft black, slightly sandy, gravelly PEAT overlying soft, light and dark brown sandy, slightly gravelly CLAY. Sand was fine to coarse. Gravel was fine to medium, rounded and well-rounded to angular flint with occasional to frequent brick fragments, cement, glass fragments and occasional clinker. Rare brick cobbles. Frequent wood pieces and wooden sheet material at the base and along the faces of trial pit FE1. Frequent pockets of ash and suspected peat in trial pit FE2. The depths of Made Ground have been included in Table 5.3.

A result of the inherent variability, particularly of uncontrolled Topsoil, Fill and/or Made Ground is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Topsoil and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

7.1.2 Head

Soils described as Head were encountered in one trial hole (WS1) from directly below the Made Ground to a depth of 1.90m bgl. The Head comprised soft to firm, light orangish brown mottled grey, very sandy CLAY. Sand was fine to coarse. Rare subangular fine chalk gravel.

The results from DPSH testing inferred that the cohesive soils of the Head were of an **extremely low to very low strength,** with undrained cohesions of between **<10kPa and 40kPa**.

The results from Atterberg Limits tests confirmed that the cohesive soils of the Head had **medium volume change potential** in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Soils of the Head are normally consolidated cohesive soils and are expected to display low bearing capacities with high settlement characteristics. The soils of the Head were not considered suitable for the proposed development due to likely variations both in composition and deposition thickness.

7.1.3 London Clay Formation

Soils described as London Clay Formation were encountered in one trial hole (WS1) from directly below the Head to the final depth of 8.00m bgl. The London Clay Formation comprised firm, orange brown mottled grey, slightly sandy CLAY becoming stiff, dark grey, slightly sandy CLAY. Localised layers of firm, brown, sandy, fragmented SANDSTONE and occasional fine to medium, sub-rounded to sub-angular, claystone pockets. Sand was fine to coarse.

The results from DPSH testing inferred that the cohesive soils of the London Clay Formation were of a very low to extremely high strength and inferred undrained cohesive strength of 20kPa to >300kPa. Considering the results of dynamic probing, the high blow counts were interpreted as due to the presence of claystone bands. It was therefore considered that the London Clay Formation was characterised by SPT "N60" blow counts ranging between 4 and 37, classifying the cohesive soils as **extremely low to very high strength** and inferred undrained cohesive strength of **20kPa to 185kPa** increasing with depth.

The results from Atterberg Limits tests showed that the cohesive soils of the London Clay Formation had **medium volume change potential** in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Soils of the London Clay Formation are overconsolidated cohesive soils and are expected to display moderate bearing capacities with moderate settlement characteristics at the site. The soils of the London Clay Formation were generally considered as a suitable foundation layer for the proposed development. However, the results of dynamic probing undertaken at the site showed low blow counts (1 – 2, uncorrected) at the depth of the proposed basement foundations and down to circa 4.00m bgl. Considering the information available at present, therefore, basement foundations must be placed at a depth of at least 4.00m bgl.

7.1.4 Roots
Roots were encountered in all the three trial holes at depths ranging between 1.00m, the final depth of trial pit FE2, and 1.90m bgl (WS1). Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

7.1.5 Groundwater
Groundwater was not encountered within any of the trial holes at the time of the intrusive investigation. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in May (2020), when groundwater levels should be lowering from their annual maximum (highest) elevation, which typically occurs around March.

Further groundwater monitoring was conducted within the standpipe installed on site following completion of site works. The results of the agreed three monitoring visits have been presented in Table 5.7 and showed groundwater at depths of between 3.80m and 2.39m bgl, and therefore likely to interact with the construction of the proposed basement development.

Groundwater equilibrium conditions may only be conclusively established, if a series of observations are made via groundwater monitoring wells.

7.2 Foundation Scheme
The drawings received from the Client showed that the proposed development comprised the construction of a basement under the eastern half of the existing building, extending into both the front and the rear garden. The revised layout in report Rev1.02 considered a reduction in the footprint of the front lightwell.

In compiling this report reliance was placed on drawing number DWG-AT-020-106-01 Rev. P1, DWG-AT-020-106-02 Rev.P1, DWG-AT-020-106-03 Rev. P1 and DWG-AT-020-106-04 Rev. P1, dated 30th July 2020 and prepared by BETA Design Consultants. Any change or deviation from the scheme outlined in the drawing could invalidate the foundation design and remediation recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix C.

7.2.1 Guidance on Shrinkable Soils
The Building Research Establishment (BRE) Digests 240, 241 and 242 provide guidance on ‘best practice’ for the design and construction of foundations on shrinkable soils.

The results from Atterberg Limits Tests showed that the cohesive beds of Head and the cohesive soils of the London Clay Formation had **medium volume change**

potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Medium volume change potential must therefore be adopted where foundations pass through the Head and are set onto or into the London Clay Formation.

The BRE Digest 241 states: "An increasingly common, potentially damaging situation is where trees or hedges have been cut down prior to building. The subsequent long-term swelling of the zone of clay desiccated by the roots, as moisture slowly returns to the ground, can be substantial. The rate at which the ground recovers is very difficult to predict and if there is any doubt that recovery is complete then bored pile foundations with suspended beams and floors should be used".

The stated intention of the NHBC is to ensure that shrinkage and swelling of plastic soils does not adversely affect the structural integrity of foundations to such a degree that remedial works would be required to restore the serviceability of the building. It must be borne in mind that adherence to the NHBC tables and design recommendations may not, in all cases, totally prevent foundation movement and cracking of brickwork might occur.

The BRE Digest 240 suggests: *"Two courses of action are open:*

Estimate the potential for swelling or shrinkage and try to avoid large changes in the water content, for example by not planting trees near the foundations.

Accept that swelling or shrinkage will occur and take account of it. The foundations can be designed to resist resulting ground movements or the superstructure can be designed to accommodate movement without damage."

The design of foundations suitable to withstand movements is presented in BRE Digest 241 "Low-rise buildings on shrinkable clay soils: Part 2"

7.3 Foundation Scheme

Foundations **must not** be constructed within any Made Ground/Topsoil and Head due to the likely variability and potential for large load induced settlements both total and differential.

Roots were encountered in all the three trial holes at depths ranging between 1.00m, the final depth of trial pit FE2, and 1.90m bgl (WS1). If roots are encountered during the construction phase foundations **must not be placed within any live root penetrated** or desiccated **cohesive soils or those with a volume change potential**. Should the foundation excavations reveal such materials, the excavations **must** be extended to greater depth in order to bypass these unsuitable soils. Excavations must be checked by a suitable person prior to concrete being poured.

Considering the type of development, the use of foundations within the basement set into the cohesive soils of the London Clay Formation was considered possible. However, the results of dynamic probing undertaken at the site showed low blow counts (1 - 2) at the depth of the proposed basement formation level down to circa 4.00m bgl.

Traditional foundations within the basement, therefore, cannot be recommended at depths shallower than 4.00m bgl considering the information available at the time of reporting. The undertaking of additional testing in the form of windowless sampler boreholes and dynamic probes is strongly recommended to provide a better coverage of the site and confirm the suitability of the soils for the adoption of shallow foundations within the basement.

7.3.1 Shallow Foundations within Basement

Foundations constructed within the basement excavation could be considered under the mentioned hypotheses and the bearing capacity of such foundations is given below. If the foundation is to include lateral load from retained soil, then the distribution of loads on the foundation will be trapezoidal and the maximum pressure will be at the toe of the foundation. In such cases additional analyses must be requested by the client such that the appropriate analyse is undertaken.

If the wall is to have backfill placed on both sides, the backfill must be placed in shallow rises on both sides to maintain similar lateral forces on both sides of the wall.

A proposed basement excavation maximum 3.20m deep would remove an overburden pressure of circa 60kPa, based on a unit weight of 18kN/m^3, for the overlying soil.

An “**net**” allowable bearing capacity of **85kPa** was calculated, founding at a minimum depth of 4.00m bgl within the London Clay Formation, based on a 5m by 0.75m strip foundation.

Taking account of the removed overburden pressure the “**gross**” bearing value could be taken as **140kPa**.

For the allowable bearing value given above, settlements **should not** exceed **25mm**, provided that excavation bases are carefully bottomed out and blinded, or concreted as soon after excavation as is possible and kept dry. Settlements may be taken as proportional to the applied foundation pressure for the given size of the foundations.

The use of reinforced trench fill foundations must be used to reduce the potential of differential settlement across foundations, which was anticipated to be up to 15mm.

Settlements may be taken as proportional to the bearing capacity given for the same configuration of foundation i.e. halving the applied loads the settlements would halve.

Special care **must** be taken during foundation excavation in order to establish that any soft/loose spots found within the soils are removed from the base of excavations.

Foundations must not be cast over foundations of former structures and other hard spots.

7.3.2 Basement and Stability Requirements

This report comprises a basement impact assessment (BIA) and calculations of the impact of the proposed works on the surrounding ground and/or structures was requested by the client. The following comments are of a very general non-specific nature.

The excavation of the proposed basement was estimated at 3.00-3.20m bgl, with underpinning foundations set at depths of not less than 4.00m bgl. Groundwater was encountered during the agreed monitoring period at depths of between 3.80m and 2.39m bgl, therefore at depths likely to interact with the proposed basement development.

Groundwater levels could rise, particularly after prolonged periods of wet weather.

If the construction works take place during the winter months or during/after prolonged periods of wet weather perched water could accumulate or groundwater could be found migrating through the granular deposits of the Head. If any water ingress is not prevented by dewatering, the basement slab could become “buoyant” whilst empty. This must be taken into account in the design. Support of excavation and dewatering with pumps from sumps introduced into the floor of the excavation must be considered.

In the absence of robust long-term groundwater monitoring data from the well installed, full hydrostatic pressure (worst credible case) **must** be taken into account for the design of the proposed basement slab/walls or the worst credible levels as defined by EC – 7.

7.3.3 Stability Issues

The excavation of the basement **must not** affect the integrity of any adjacent structures beyond the site boundaries. Where there is a sufficient distance between the site boundary and the basement excavation, support may be permitted using a strip foundation to form an earth retaining structure. In other cases, the most suitable form of construction should be within a coffer dam structure using a sheet piles, secant or contiguous concrete piled wall around the periphery of the structure.

Traditional underpinning would represent a suitable solution for the current case.

7.3.4 Ground Floor Slab

The NHBC states that where their Practice notes dictate a foundation depth of 1.5m bgl or greater, then suspended slabs must be adopted. Due to the volume change potential of the soils of the Head and of the London Clay Formation and for the thickness of Made Ground, exceeding 0.60m, suspended slabs should be considered for the proposed redevelopment.

7.4 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts fell into Class **DS-3** of the BRE Special Digest 1 2005, *'Concrete in Aggressive Ground'.* Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classifications of **AC-3**. The pH of the soils tested ranged between 7.5 and 8.1. The classification given was determined using the mobile groundwater case, in the view of groundwater being encountered flowing through eventual granular layers of the Head. The laboratory results are presented in Appendix B.3.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1 2005, *'Concrete in Aggressive Ground'* taking into account any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

7.5 Excavations

Shallow excavations in the Made Ground and Head are likely to be marginally stable in the short term at best.

Deeper excavations taken into the London Clay Formation are to be retained in both the short and the long term. Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose before excavations are entered by personnel.

Excavations beneath the groundwater table are likely to be unstable and dewatering of foundation trenches may be necessary.

Section 8 Basement Impact Assessment

8.1 Mitigation of Adverse Effects

This section of the report addresses the potential impacts identified by the scoping study and the relevant findings of the ground investigation and mitigation measures, where required.

8.1.1 Aquifer Impact

Is the site located directly above an aquifer?

And

Is the site within an aquifer?

And

Will the proposed basement extend beneath the water table surface?

And

Is the site in an area known to be at risk from surface water flooding?

And

Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?

Potential Impacts: Alteration of existing groundwater flow regime, which in turn could potentially cause local increase or decrease of groundwater levels.

Ground Investigation Findings: The ground investigation identified a Made Ground overlying the Head and the London Clay Formation. The Made Ground contained granular material and granular horizons are likely to be encountered within the superficial deposits of Head due to the intrinsic variability in composition. Groundwater was encountered at depths of between 2.39m and 3.80m bgl during the agreed monitoring period, therefore at depths likely to interact with the proposed basement development.

The basement would extend through the Made Ground and superficial deposits of Head into the London Clay Formation. The London Clay Formation has a very low permeability. Basement walls and piles across the groundwater flow direction could act as a barrier to the shallow groundwater.

Mitigation: The soils of Head encountered at the site were predominantly cohesive and unlikely to be store relevant amounts of water. However, the soils of Head are intrinsically variable in composition and the site fell within an area considered at moderate risk of flooding from elevated groundwater. Groundwater was also recorded at 2.39m bgl during the third monitoring visit. The risk of flooding from sewer malfunctions was also considered at a moderate level.

At the time of the excavations, therefore, the localised pumping out of water must be considered to allow for a safe and comfortable development. In the long-term, the premises must be provided with pumps immersed into sumps. Dewatering must be undertaken on a local basis and not intended to induce changes in the surrounding groundwater table, to avoid the triggering of undesirable consolidation settlements that could harm the surrounding buildings.

Eventual drainage in the basement must be provided with anti-return valves and/or positive pumped devices to mitigate the risk of flooding from sewers.

8.1.2 Seasonal Shrink-swell Subsidence

Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?

Potential Impacts: Changes to vegetation on site or directly offsite could adversely affect foundations of adjoining structures.

Ground Investigation Findings: The ground investigation identified Made Ground overlying the Head and the London Clay Formation. The basement would extend through the Made Ground and superficial deposits of Head, predominantly cohesive, into the cohesive London Clay Formation. No felling of trees was anticipated by the Client to be part of the proposed development.

Mitigation: No trees were planned to be removed from the site. Foundations to be designed in accordance with a medium volume change potential, where passing through cohesive soils of Head and London Clay Formation.

8.1.3 Highway or Pedestrian Right of Way

Is the site within 5m of a highway or pedestrian right of way?

And

Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?

Potential Impacts: Excavation of a basement could result in structural damage to the roads/ footways or buried services.

Ground Investigation Findings: The basement would be constructed through the Made Ground and Head, which could be stable in the short term at best. Excavations in the London Clay Formation must be retained.

Mitigation: Design of permanent works to ensure induced ground movements are within tolerable limits and temporary works to prevent damage during construction.

Structural design and method statements will draw on established successful practices follow to completing a Basement Impact Assessment with Ground Movement Assessment. Pre-start, in due course and completion surveys will be made of the adjoining and neighbouring properties within the area of influence of the proposed development.

8.2 Surrounding Buildings

This section considers the potential effects of basement construction on nearby properties.

Detrimental effects would be manifested as cracking and more serious structural damage. Many old buildings in do exhibit signs of historic movement and repair. In practice, it is often difficult to attribute cracks visible in a structure to specific site construction activities unless a detailed survey of the affected structure and its founding strata had been undertaken before the construction works.

Any observed changes in the state of the building can then be causally linked to the works with more confidence and less debate than if no pre-works condition survey had been undertaken. Surveys require the cooperation of the property owners, as entry by surveyors into the property will be necessary. This would normally be undertaken in collaboration with the neighbour's party wall surveyors.

Close supervision must be made during the construction phase. Movement monitoring of neighbouring and nearby structures will be undertaken before construction starts and continued through the construction phase and for an appropriate period thereafter.

The data from the site investigation has established soil and groundwater conditions. The client's engineer can prepare working drawings and construction method statements that will mitigate adverse effects of nearby properties.

8.3 Cumulative Effects

The proposed development comprised the redevelopment of the property with the construction of a basement underneath the eastern half of the building.

The proposed alterations considered basement excavations to establish formation level at circa 3.00 – 3.20m bgl The proposed basement, therefore, was understood to be set within the cohesive soils of the London Clay Formation, that were identified by the Environment Agency as an Aquiclude. The overlying soils of Head were identified as predominantly cohesive, therefore unlikely to host significant water flow.

It is therefore considered that groundwater flow at the site will be minimal. As a consequence, very slight changes can be expected on the groundwater regime at the site due to the proposed construction.

Section 9 Ground Movement Assessment

9.1 Introduction

This section provides calculations to determine ground movements that may result from the construction of the basement level and to assess how these may affect the conditions of neighbouring buildings.

The Ground Movement Assessment (GMA) was undertaken considering traditional underpinning foundations set at a depth of not less than 4.00m bgl, unless the undertaking of the recommended additional testing would allow to re-define underpinning depths. It must be clear that if different foundations/depths are adopted, the GMA must be redeveloped to account for the different solution adopted and for the different distribution of applied loads.

Movements are likely to occur through the following mechanisms:

9.1.1 Heave Movements

The excavation was anticipated to develop within cohesive beds of Head and the cohesive soils of the London Clay Formation. The unloading of the London Clay Formation may cause a degree of heave in both the short and the long term.

The unloading of the London Clay Formation may cause a degree of heave and/or settlement after construction, depending on the final ground loading.

9.1.2 Settlement Movements

The imposition of loads on the new foundations, if in excess of the existing load on the ground will result in settlement of the foundations.

9.1.3 Foundation Construction

Construction of foundations can lead to movements due to retaining wall construction and net increase in loading.

The influence of the installation of traditional shallow underpinning, as would be required on this development, can be considered as negligible when excavations are carried out in small bays, not wider than 1.00 - 1.20m, retained with appropriate shoring and propped at suitable intervals. The casting of concrete must be carried out in the short-term to avoid the development of drained conditions. However, the dry pack placed between the cast bays and the former overlying foundation, will result in about 5mm settlement, even in works undertaken to the highest standards.

The nature of final movements depends on the level of loading achieved. Downwards movements (settlements) must be expected when the applied load is greater than the weight of soil removed. On the contrary, a certain degree of heave will remain in the long term when the applied load is lower than the weight removed. Settlement may potentially also occur where foundation loads are transferred to deeper, previously unloaded soil.

Where foundations are not shared, or the properties linked, workmanship will not affect the adjoining structure and will not be considered within the ground movement analysis.

9.2 Ground Movement Arising From Basement Excavation

Given the age of the structure ground movements induced by the construction of the existing building can be considered as completed, therefore the analysis of the expected ground movements must focus on the variations in loads induced by the excavation and construction of the proposed premises.

The soils at formation level will be subject to stress relief due to the excavation, as up to about 4.00m of overburden is to be removed according to the proposed plans. This is likely to give rise to a minimal degree of heave over both the short and the long term. The removed overburden pressure, therefore, would account for circa 70kPa for a 4.00m deep excavation. The excavation must then be backfilled to achieve the proposed basement floor slab finished depth.

A ground movement assessment has been undertaken using OASYS Limited PDISP (Pressure induced DISPlacement analysis) analysis software. PDISP assumes that the ground behaves as an elastic material under loading, with movements calculated based on the applied loads and the soil stiffness (E_u and E') for each stratum input by the user. PDISP assumes perfectly flexible loaded areas and as such tends to overestimate movements in the centre of loaded areas and underestimate movements around the perimeters. Piled foundations were considered in the analysis and the effects on neighbouring buildings were assumed as negligible, with ground movements only derived from the removal of the overburden and the deflection of basement walls. In the case a different solution is adopted within the final design the GMA must be edited accordingly.

The mechanical properties of the soils involved in the analyses were defined based upon the results of the intrusive ground investigation and compared with the reference values reported in CIRIA SP200. The worst case scenario was adopted and the Young's Modulus was defined according to the values suggested within CIRIA SP200.

Excavations will take place within the predominantly cohesive beds of Head and the cohesive soils of London Clay Formation. The above described approach must be considered as conservative and the parameters adopted within the calculation were summarised in Table 9.1 and Table 9.2.

Table 9.1 – Soil Parameters – Undrained Conditions

Stratum	Depth to Top of Stratum (m bgl)	Undrained Cohesion (kPa)	Young's Modulus (MPa)	Poisson's Ratio
MG	0.00	15	5	0.50
HEAD	0.80	25	5	0.50
LCF	1.90	35 + 8z	35+8z	0.50

Table 9.2 – Soil Parameters – Drained Conditions

Stratum	Depth to Top of Stratum (m bgl)	Friction Angle (ϕ˚)	Effective Cohesion (kPa)	Young's Modulus (MPa)	Poisson's Ratio
MG	0.00	20	0	3	0.35
HEAD	0.80	20	0	4.5	0.35
LCF	1.90	22	0	26 + 6z	0.32

Note: The depth to the top of the London Clay Formation was chosen as a conservative assumption.

Basement walls design can be carried out using the parameters in Table 9.1 and Table 9.2, respectively with reference to undrained and drained conditions. In particular, active and passive thrust coefficients can be evaluated with reference to the friction angle values of Table 9.2 for the three soil units encountered. The values calculated according to the Rankine's Theory were provided in Table 9.3. Soils Limited can assist in the evaluation of the parameters according to different theories, provided that the needed information is made available from the Client's consultants (e.g. soil-wall friction, back face inclination of the structure, etc.).

Table 9.3 – Soil Parameters – Drained Conditions

Stratum	Depth to Top of Stratum (m bgl)	Friction Angle (ϕ˚)	Coefficient of Thrust at Rest (k_0)	Active Thrust Coefficient (k_A)	Passive Thrust Coefficient (k_P)
MG	0.00	20	0.658	0.490	2.040
HEAD	0.80	20	0.658	0.490	2.040
LCF	1.90	22	1.251	0.455	2.198

Note: The depth to the top of the London Clay Formation was chosen as a conservative assumption.

The excavation of the proposed basement could induce movements and potential damages on the adjoining building to the west (11 Landor Road), on the building to the south (1-29 Fenwick Place) and on the building to the east (19 Landor Road). Three scenarios were used for the undertaking of the Damage Category Assessment (DCA).

9.2.1 Scenario SC1

Scenario SC1 considered the effects of excavation and construction on the adjoining building at 11 Landor Road, sharing foundations with the building for the proposed development, but located at a distance of circa 5.45m from the outer face of the excavation.

9.2.2 Scenario SC2

Scenario SC2 considered the effects of excavation and construction on the building at 1-29 Fenwick Place, located to the at a distance of 8.80m from the outer face of the excavation, beyond Landor Road.

9.2.3 Scenario SC3

Scenario SC3 considered the effects of excavation and construction on the neighbouring building at 19 Landor Road, located at circa 11.70m from the outer face of the excavation, beyond Atherfold Road.

The ground movements considered for scenario SC1 were due to excavation (heave in the short and long term), to the application of structural loads and to workmanship errors deriving from the application of the dry pack. No workmanship error was considered for scenarios SC2 and SC3, as they did not comprise shared foundations.

No information was made available to Soils Limited with regards to the structural layout of the adjoining buildings, therefore a critical distance of 5.45m was adopted for the case in SC1, due to the similarities with the building for the proposed development. Critical distances of 6.00m and of 6.50m were estimated respectively for scenarios SC2 and SC3.

Building height was estimated as of the order of 10m for SC1 and SC3 and of circa 13m for SC2, respectively corresponding to foundation length (L) to building height (H) ratios of 0.545 (SC1), 0.50 (SC2) and 0.60 (SC3).

No structural design was available at the time of reporting regarding the details of the underpinning. It was assumed to consider preliminarily 300mm thick underpinning, characterised by a second moment of inertia of 225,000cm^4 per metre. The final thickness of the basement walls, however, must be defined to suit the thickness of the overlying, existing walls. In the case a reduction in the second moment of inertia is obtained according to the structural designer, then Soils Limited must be informed and a reassessment of the GMA must be done.

Additional potential settlement due to the construction process of the underpinning works has been taken into account in the report. For the concrete underpinning works, the bays must be excavated and cast to a prescribed schedule with formwork only struck after the concrete has reached a prescribed strength or when the structural engineers specify. Soils Limited was not appointed for the production of a construction method statement, which must be prepared by a competent professional following to design finalisation.

It is the Client's responsibility to provide information on eventual changes to the layout and the structural characteristics of the basement. Soils Limited must be immediately informed of any changes, as this could potentially invalidate the results of this Basement Impact Assessment.

No basements were confirmed underneath the neighbouring buildings, therefore the analyses were conservatively carried out considering them absent to maximise wall deflection. For the purpose of this Basement Impact Assessment, the horizontal deflection was conservatively calculated using a full excavated height of 4.00m for all the scenarios considered.

Temporary propping was considered applied at the top, the middle and the base of the wall. Once underpinning foundations are completed, excavations can be backfilled to the proposed depth, without removing props at the base of the excavation, and allow the construction of the basement floor slab. In the long term, the basement walls must be propped by the ground floor and the basement floor slabs.

Horizontal movements induced by basement wall deflection on the neighbouring structures were reduced due to dissipation with distance, in agreement with information on CIRIA C760. Horizontal movements reduce to zero at distances in excess of 1.5 times the maximum excavated depth (6.00m), therefore zero horizontal movements were considered for scenarios SC2 and SC3. A deflection of 10% of the maximum movement at the outer face of the excavation was instead considered in the case of SC1.

The critical sections considered in scenarios SC1 – SC3 were presented in Figure 16 and chosen in order to maximise the calculated damage category.

9.2.4 Short Term Heave

The soils at formation level will be subject to stress relief due to the excavation, as up to about 4.00m of overburden is to be removed according to the proposed plans before backfilling for establishing the proposed finished basement floor level. This is likely to give rise to a minimal degree of heave over both the short and the long term or settlement over the longer term as structural loads are reapplied. The removed overburden pressure, therefore, would account for circa 70kPa.

Calculated short term heave, due to the removal of soils above the formation level, was evaluated by adopting the parameters in Table 9.1 and intended as deriving from the unloading of the soils of the London Clay Formation.

The largest short-term heave across the footprint of the proposed development was predicted to be of a maximum of -4.0mm (negative values indicate an upwards movement throughout this text). The movement decreases towards the boundaries of the excavation, along the boundary lengths of the basement. Heave was noted to occur within these areas ranging between -2.0mm and 0.0mm due to the net increase of surcharge load. A contour plot showing the variation of short-term movements across the entire basement footprint is presented in Figure 17.

9.2.5 Long Term Ground Movement

The backfilling of the excavation for establishing the required basement finished floor level would require the placement of circa 0.80m of selected granular materials, compacted to suitable standard in layers not exceeding 300mm thickness, corresponding to an applied load of circa 15kPa.

The maximum load applied by the construction of the structure was conservatively considered as not exceeding 50kPa for all the strip foundations and not more than 15kPa underneath the basement floor level, including for 2kPa variable loads.

Long term movements generally depend on the development of the increase of heave (negative settlements) in the long-term due to the reduction in stiffness of the soils, with the dissipation of negative pore-water pressures, and the development of (positive) settlements due to the construction of the basement and the application of the loads from the upper structure to greater depths. Those movements develop contemporarily and generally cannot be distinguished, but an evaluation of the long-term heave, as independent values, was also reported for completeness on the contour plot in Figure 18. The maximum expected heave was calculated as circa -6.0mm within the footprint of the building.

The maximum overall long-term ground movements under the proposed building footprint were calculated as of a maximum of -3.0mm (residual upwards movement due to applied load lower than the weight removed). Movements along the excavation boundaries ranged between -1.5mm and -0.50mm. A contour plot with the variation of long-term movements across the basement footprint is presented in Figure 19.

9.2.6 Settlements Due To Workmanship

The heave/settlement assessment undertaken within PDisp assumes perfect workmanship in the underpin construction and does not allow for settlement due to the installation of the of the dry pack between existing footings and the new concrete. With good construction practice, these would be expected to not exceed 5mm (assuming 5mm per underpin lift). This value will be applied to the overall ground movement and corresponding impact assessment to give a worst-case damage category for the adjacent party wall properties. The effect of workmanship movement does not influence structures that do not share foundations with the existing building, such as the buildings in SC2 and in SC3.

9.3 Ground Movement Due to Retaining Wall Lateral Deflection

The excavation of the proposed basement will comprise the construction of retaining structures to preserve the stability of soils and of neighbouring structures. The excavations would be 4.00m deep for the construction of the underpins and then reduce to 3.20m bgl for the construction of the basement floor slab.

No basements were considered under the neighbouring buildings, therefore the horizontal deflection in correspondence of the excavated face was calculated considering a full retained height of 4.00m.

No structural design was available at the time of reporting regarding the details of the underpinning. It was assumed to consider preliminarily 300mm thick underpinning, characterised by a second moment of inertia of 225,000cm^4 per metre. The final thickness of the basement walls, however, must be defined to suit the thickness of the overlying, existing walls. In the case a reduction in the second moment of inertia is obtained according to the structural designer, then Soils Limited must be informed and a reassessment of the GMA must be done.

It is the Client's responsibility to provide information on eventual changes to the layout and the structural characteristics of the basement. Soils Limited must be immediately informed of any changes, as this could potentially invalidate the results of this Basement Impact Assessment.

Temporary propping was considered applied at the top, the middle and the base of the wall. Once underpinning foundations are completed, excavations can be backfilled to the proposed depth, without removing props at the base of the excavation, and allow the construction of the basement floor slab. In the long term, the basement walls must be propped by the ground floor and the basement floor slabs.

The analyses were developed considering information provided by the Client with regards to the final building layout, to construction sequence and temporary works. The results are therefore site specific, provide ground movements to be considered as limit values for a satisfactory development and must not be exceeded.

Different solutions could be adopted by the structural consultants or the contractor, but it is recommended to undertake the monitoring of ground and structure movements before, during and after the construction in order to avoid the limit values to be exceeded. Soils Limited must be immediately notified in the case of unexpected large movements, or movements in excess of those presented.

Horizontal deflections were calculated using the dedicated software Wallap by Geosolve. A surcharge of 2kPa was considered underneath the buildings at 13 and 11 Landor Road, while surcharge values of 10kPa were used to account for traffic loads in scenarios SC2 and SC3. The maximum calculated horizontal deflections at the outer face of the excavations were therefore not greater than 2.2mm for scenarios SC1, while a maximum deflection of 2.4mm was estimated for scenarios SC2 and SC3.

Horizontal movements induced by basement wall deflection on the neighbouring structures were reduced due to dissipation with distance, in agreement with information on CIRIA C760. Horizontal movements reduce to zero at distances in excess of 1.5 times the maximum excavated depth (6.00m), therefore zero horizontal movements were considered for scenarios SC2 and SC3. A deflection of 10% of the maximum movement at the outer face of the excavation was instead considered in the case of SC1, corresponding to horizontal movements of 0.22mm in correspondence of the building in SC1.

The movements calculated for the three scenarios were summarised within Table 9.4 and the related ground movements identified on Figure 20 to Figure 24.

Table 9.4 – Summary of Movements

Scenario	Critical Distance (mm)	Horizontal Movement (mm)	Vertical Deflection (mm)
SC1	(5450) + 5450	0.2	0.22
SC2	(8800) + 6000	0.2	0.0
SC3	(11700) + 6500	0.2	0.0

Note: The distance in bracket represents the distance between the excavation and the closest point of the critical section.

Section 10 Damage Category Assessment

10.1 Introduction

The ground movements reported in Section 8 were considered for assessing the expected potential damage category that the construction of a new basement was supposed to induce onto the adjoining properties. The assessment was carried out considering the method described in CIRIA Special Publication 200 (Burland et al., 2001) and CIRIA C760 (Gaba et al., 2017), based upon the method proposed by Burland et al. (2001) and taking into account the works by Burland and Wroth (1974) and Boscardin and Cording (1989).

The general categories of damage entity were summarised in Table 10.1.

Table 10.1 – Classification of Visible Damage To Walls

Category	Description
0 (Negligible)	Negligible – hairline cracks
1 (Very slight)	Fine cracks that can easily be treated during normal decoration (crack width <1mm)
2 (Slight)	Cracks easily filled, redecoration probably required. Some repointing may be required externally (crack width <5mm)
3 (Moderate)	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced (crack width 5 to 15mm or a number of cracks > 3mm).
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows (crack width 15mm to 25mm but also depends on number of cracks).
5 (Very severe)	This requires a major repair involving partial or complete re-building (crack width usually >25mm but depends on number of cracks).

10.2 Summary of Ground Movements and Evaluation of Relative Deflection

The analysis of the ground movements reported in Section 8 allowed to estimate the relative vertical and horizontal deflections on the neighbouring properties (SC1, 11 Landor Road, 1-29 Fenwick Place and SC3, 19 Landor Road).

The evaluation of the vertical deflections and of the horizontal movements for the scenarios considered was reported on Figure 20 to Figure 24.

The results of the assessment were reported within Table 10.2 and on Figure 25 were defined the expected damage categories on the neighbouring structures and highway according to the classification by Burland (2001) reported within CIRIA SP200 and CIRIA C760.

Table 10.2 – Expected Damage Category

Section	Critical Distance (mm)	Horizontal Deflection (mm)	Vertical Deflection (mm)	Horizontal Strain ε_h (%)	Deflection Ratio Δ/L (%)	Damage Category
SC1	(5450) + 5450	0.2	0.22	0.004	0.004	0 (Negligible)
SC2	(8800) + 6000	0.2	0.0	0.003	0.000	0 (Negligible)
SC3	(11700) + 6500	0.2	0.0	0.003	0.000	0 (Negligible)

Note: The distance in bracket represents the distance between the excavation and the closest point of the critical section.

The general approach from London Boroughs is to consider valid proposed developments inducing expected damage categories not beyond Category 2 (slight). It can be observed that the analysis presented expected Damage Categories of 0 (Negligible) for all the three scenarios considered. The values reported within Table 10.2 are indicative of the stiffness adopted in the calculations and refer to the ground movements calculated within the report.

The analyses were developed considering the information provided by h the Client's engineer with regards to the final building layout, to construction sequence and temporary works. The results are therefore site specific and provide ground movements to be considered as limit values for a satisfactory development and must not be exceeded.

Different solutions could be adopted by the structural consultants or the contractor, but it is recommended to undertake the monitoring of ground and structure movements before, during and after the construction in order to avoid the limit values to be exceeded. Soils Limited must be immediately notified in the case of unexpected large movements, or movements in excess of those presented.

The above reported was specifically determined for the case considered and can be invalidated if changes in the layout or sequences are applied.

Section 11 Conclusions and Recommendations of BIA

11.1 General

The findings of this report are informed by site investigation data and information regarding construction methods, sequence and loading provided by the Client. The analysis is undertaken on the assumption of high-quality workmanship.

Groundwater monitoring showed groundwater at a minimum (shallowest) depth of 2.39m bgl, therefore likely to interact with the proposed basement development.

The NFIS, PFRA, SFRA and SWMP produced for the London Borough of Lambeth considered the site not falling within any Critical Drainage Area or Flood Warning Areas. The site was recorded at very low risk of flooding from surface water, action of rivers and sea and of failure of reservoirs, while it was recorded at moderate risk of flooding from sewer failure.

In the short term, water entering the excavations must be pumped out on a very local basis to ensure a safe and comfortable environment for the workers and avoiding eventual subsidence phenomena within the cohesive soils of the London Clay Formation.

In the long term, the premises must be waterproofed, and pumps must be introduced into sumps. Positive pumped devices and/or anti-return valves must be applied to drainage systems in the basement to avoid flooding from sewers.

Foundations must be constructed in accordance with medium volume change potential when passing through the cohesive soils of the Head and of the London Clay Formation, in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

An appropriate monitoring regime must be adopted to manage risk and potential damage to neighbouring structures, prior to, during and after construction onsite.

The permanent works must be designed to ensure induced ground movements surrounding the site are within tolerable limits and temporary works sufficiently designed to prevent damages during construction. It was recommended monitoring of surrounding structure was undertaken during construction.

Overall, it was considered that the impact of the proposed development on the neighbouring structures would be acceptable provided a suitable basement construction was selected and the construction implemented to a suitable Method Statement.

It is the Client's responsibility to respect the assumptions provided within this report and to inform Soils Limited in the case they are not confirmed entirely or in part at the time of the final design, as this could invalidate the results and conclusions presented. Eventual changes to design, excavation and construction procedures could require the expected damage on the surrounding properties to be re-assessed.

Section 12 Determination of Chemical Analysis

12.1 General

Soils Limited have undertaken chemical analysis on two selected samples from WS1 at GL – 1.00m bgl. Sampling was undertaken to assist the client with off-site disposal costs of soils arising from the construction of the basement.

The results of the chemical analyses are presented in Appendix C.

List of Figures

List of Appendices

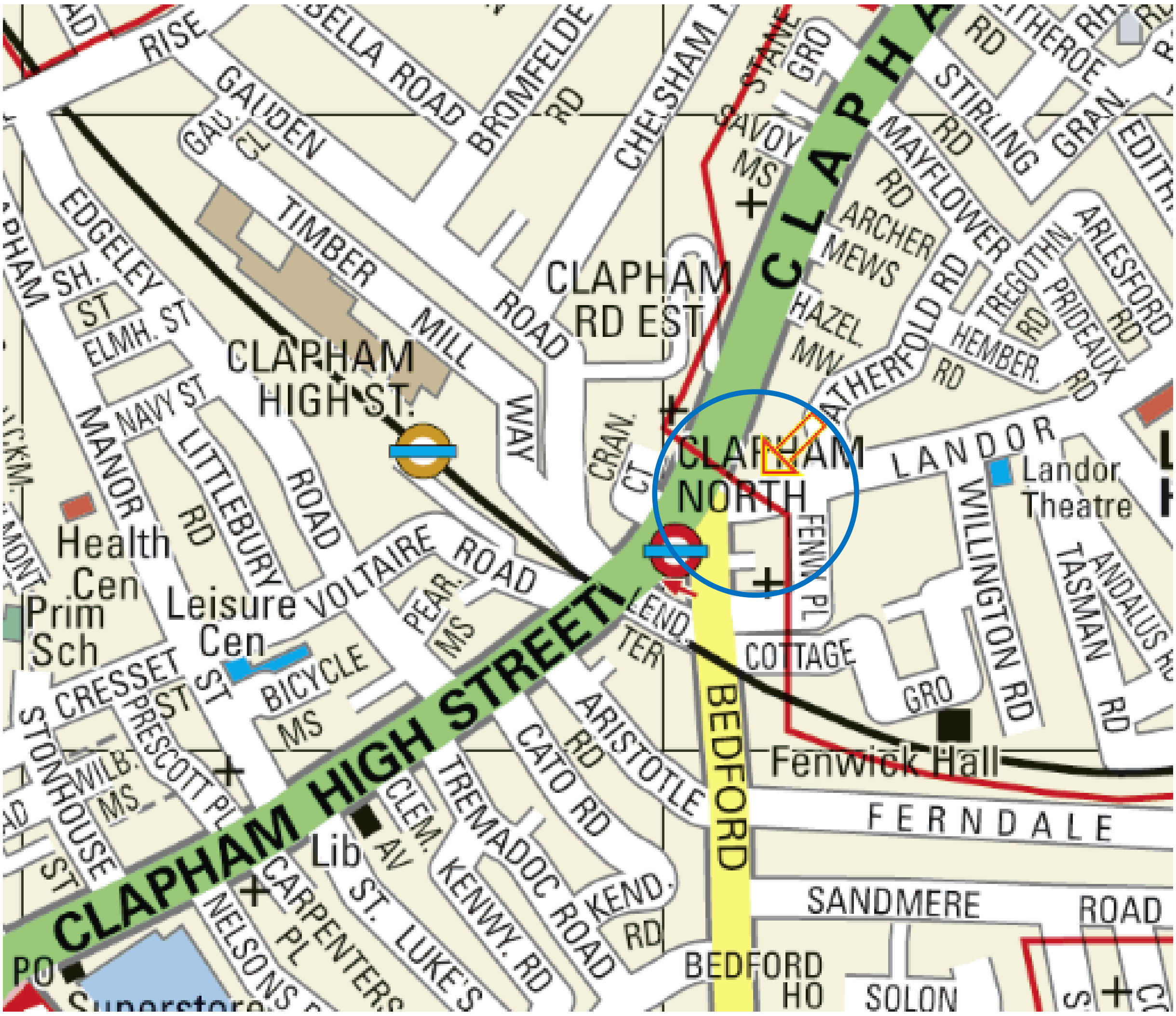

Figure 1 – Site Location Map

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Client KK Facades Ltd	**Date** June 2020

Figure 2 – Aerial Photograph

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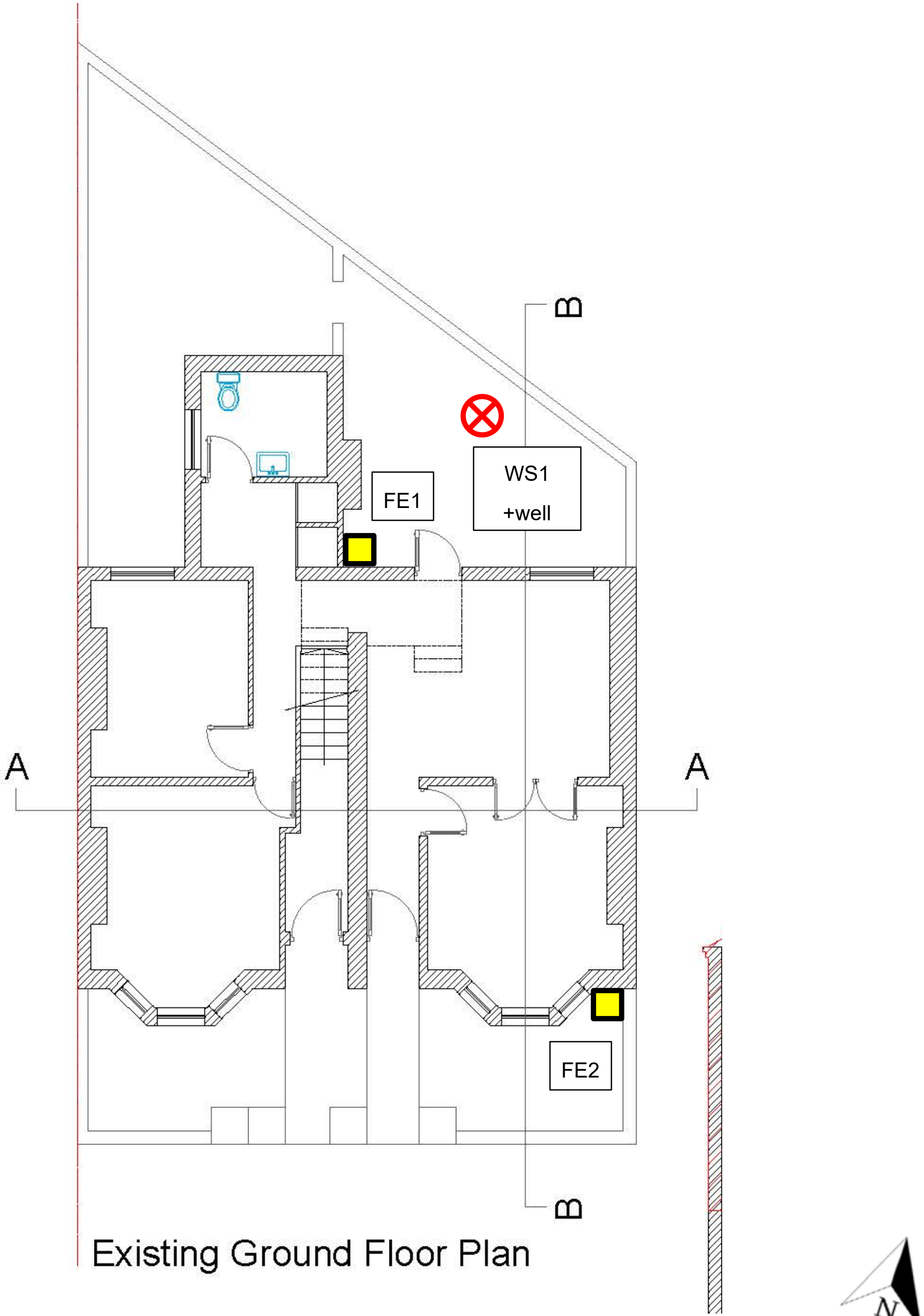

Figure 3 – Trial Hole Plan

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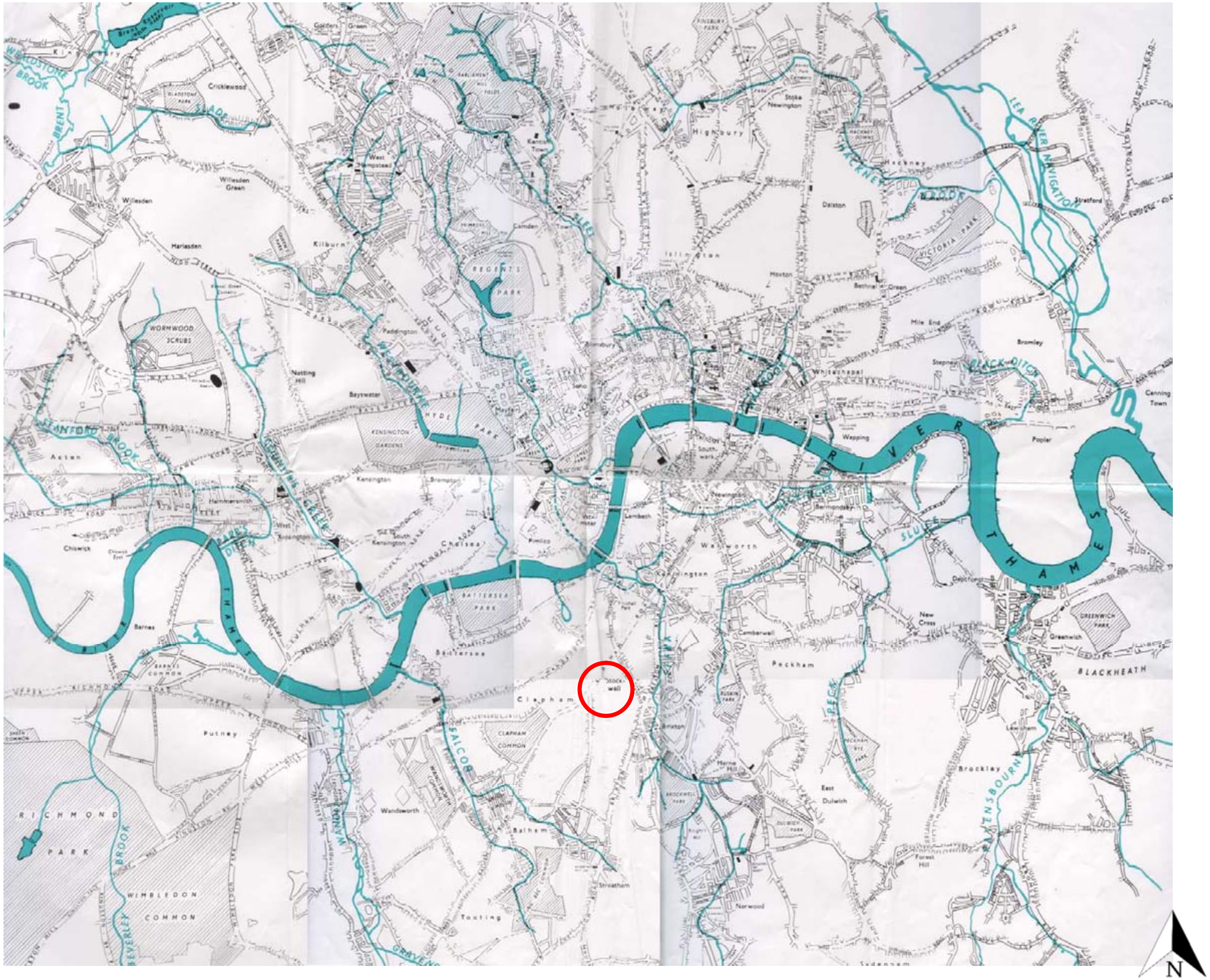

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Figure 4 – Lost Rivers of London

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Figure 5 – NFIS, Flooding from Surface Water

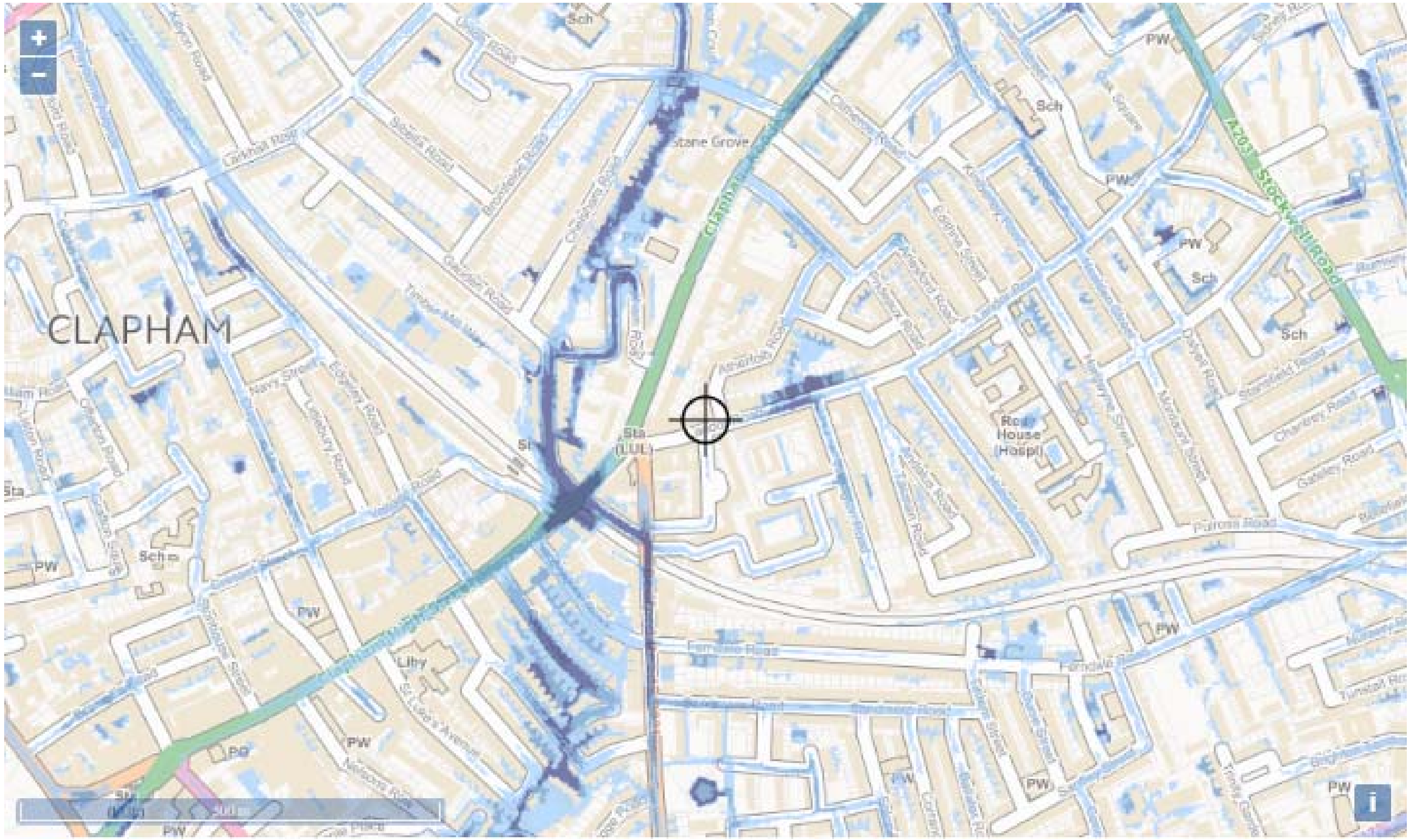

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Figure 6 – NFIS, Flooding from Rivers and Sea

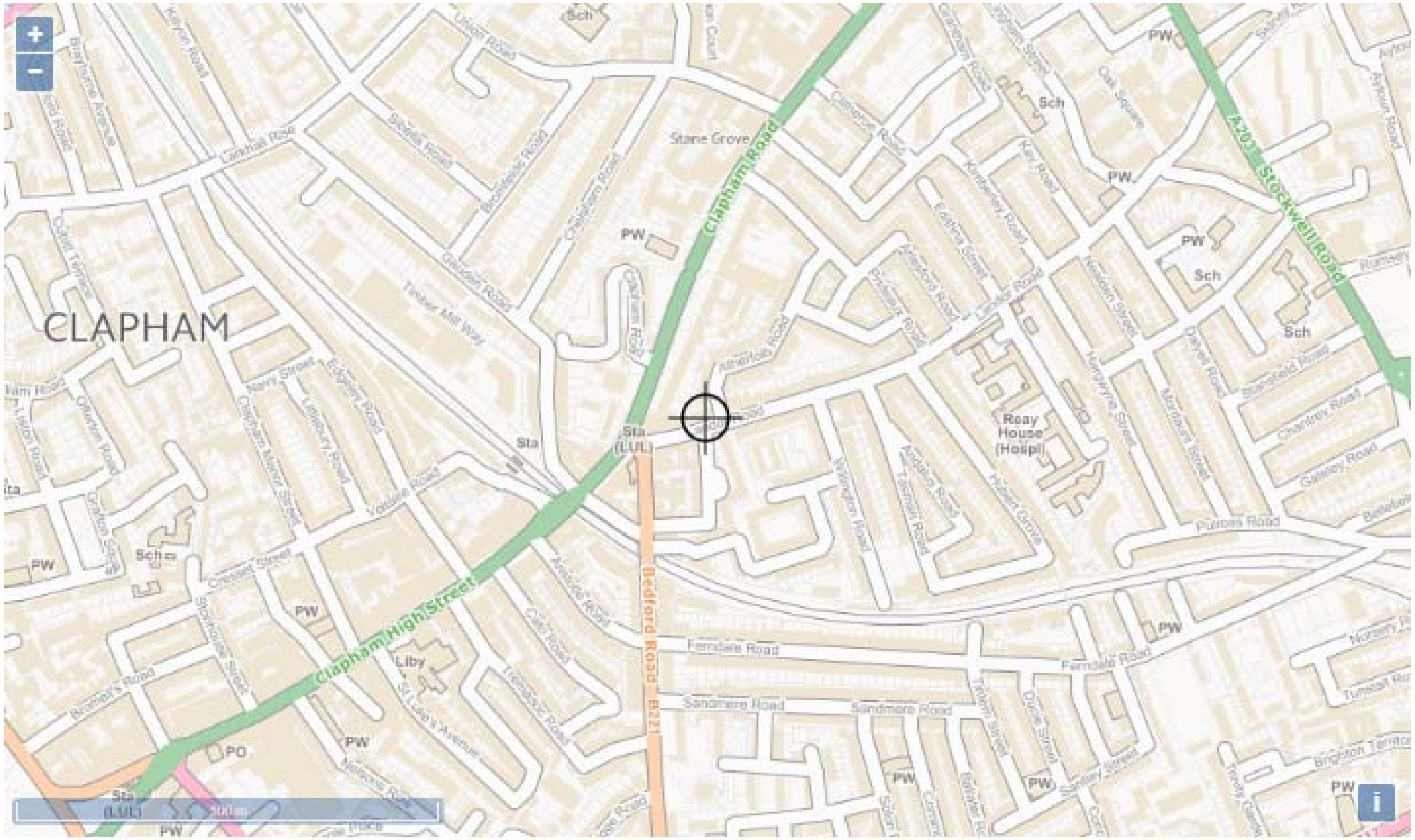

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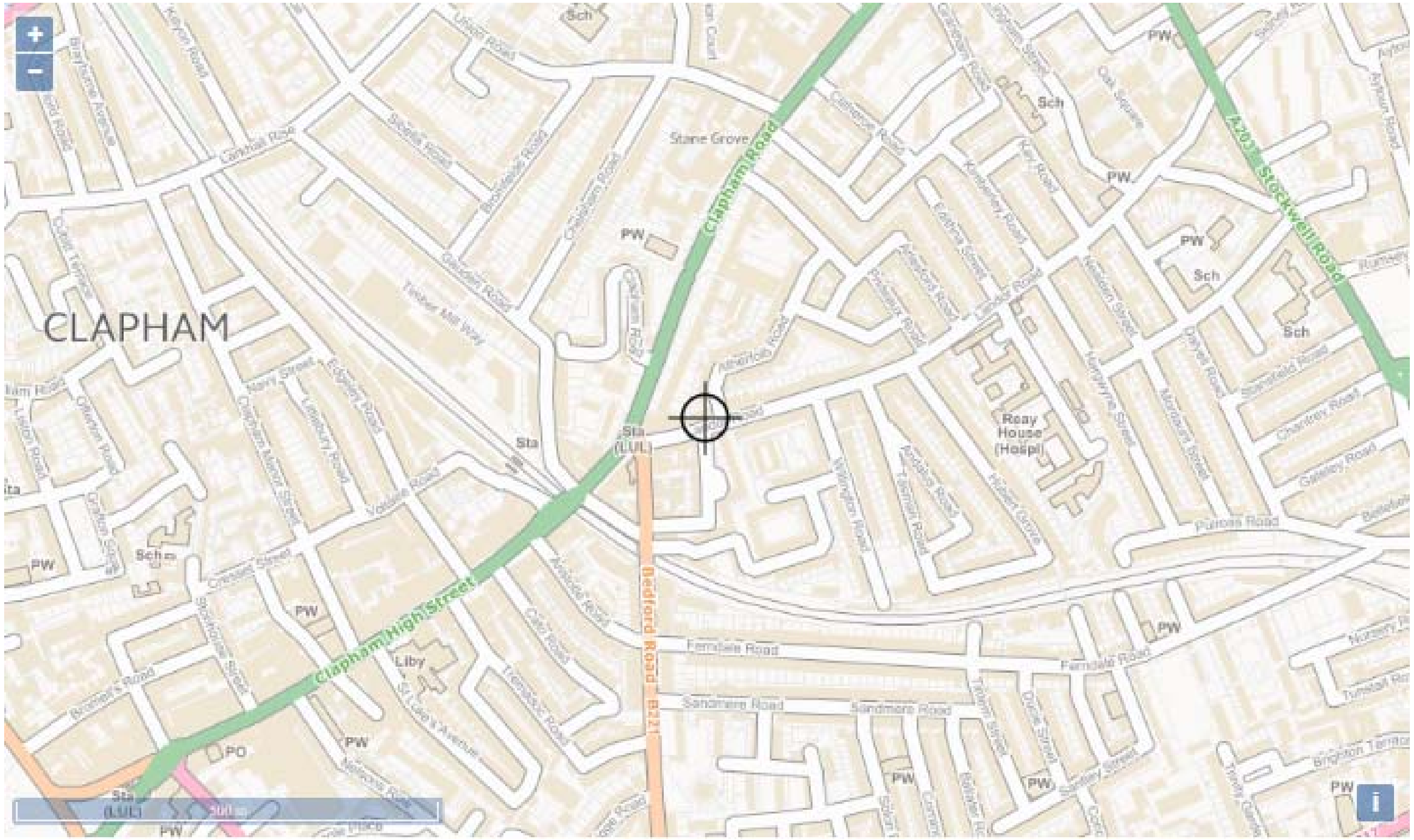
Figure 7 – NFIS, Flooding from Reservoirs



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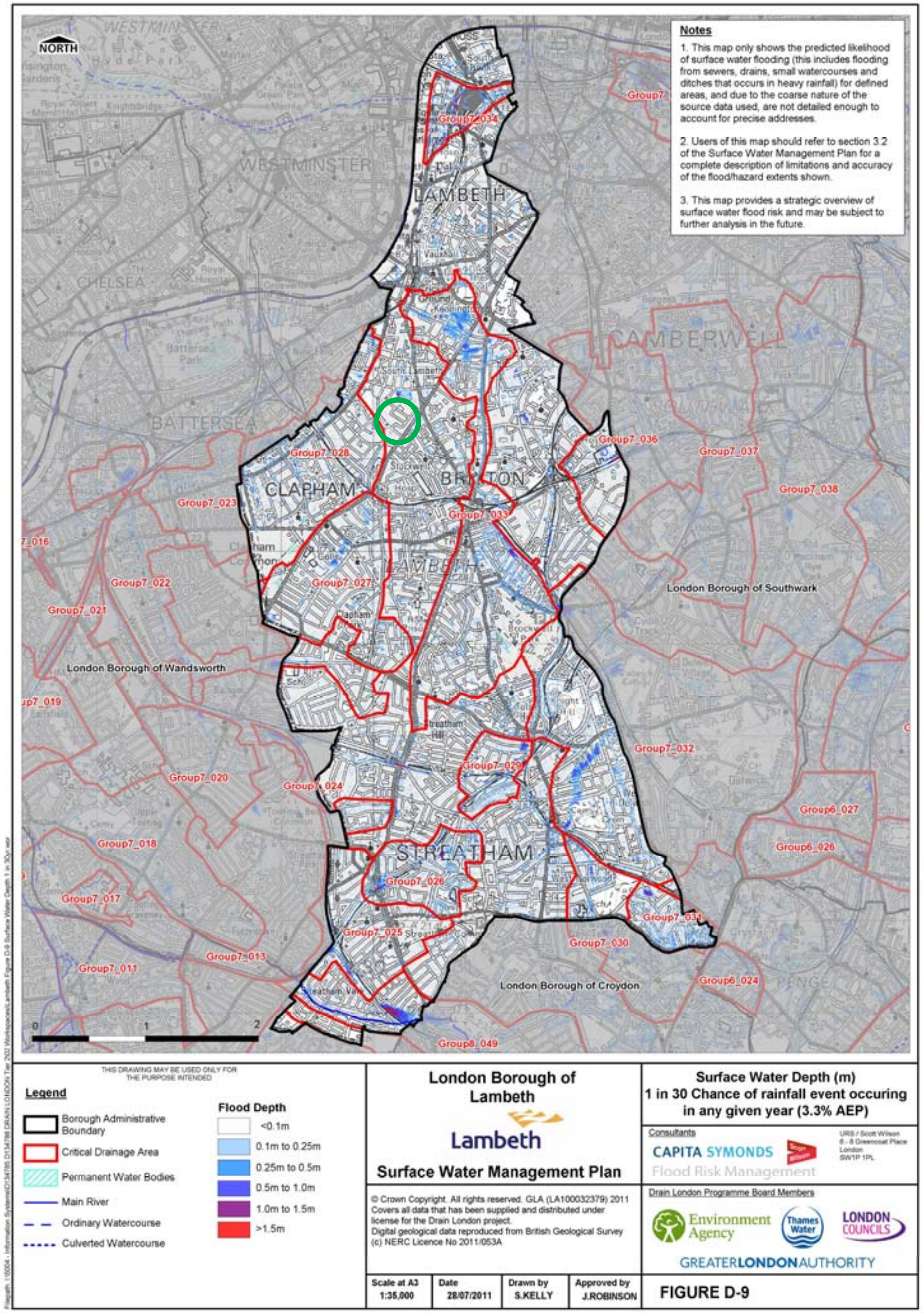

Figure 8 – SWMP, Critical Drainage Areas

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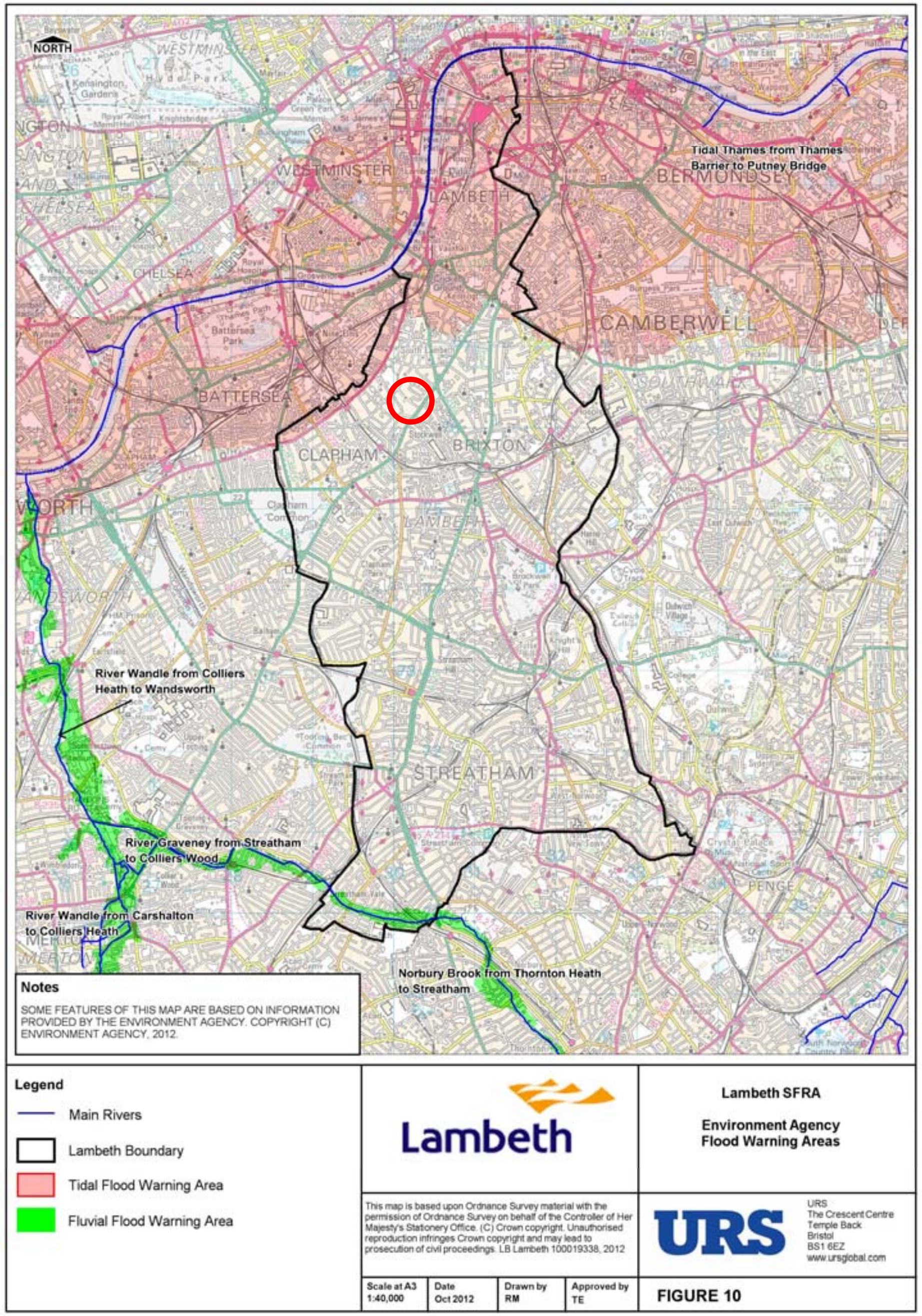

Figure 9 – SFRA, Flood Warning Areas

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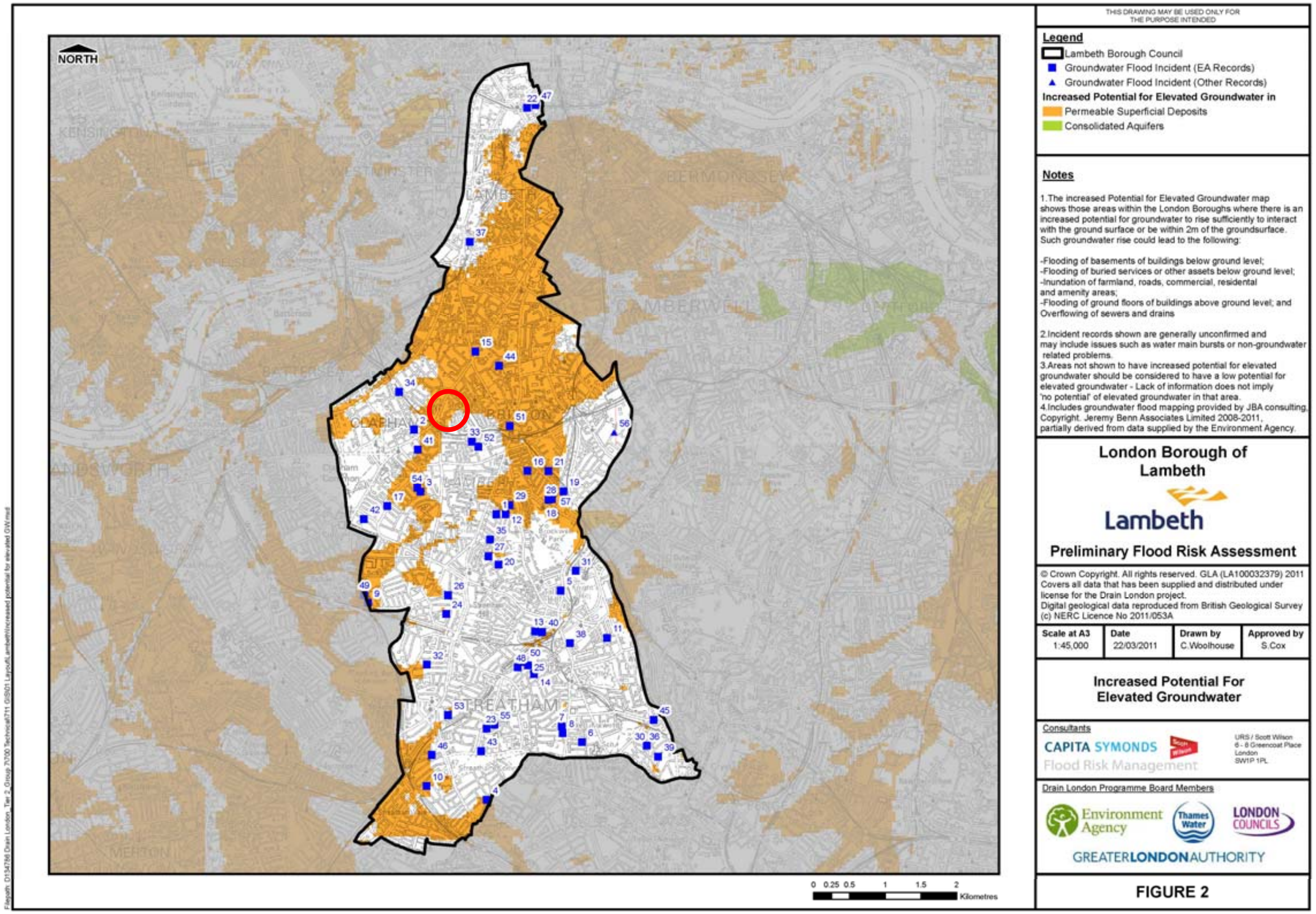

Figure 10 – PDFRA, Flooding from Elevated Groundwater

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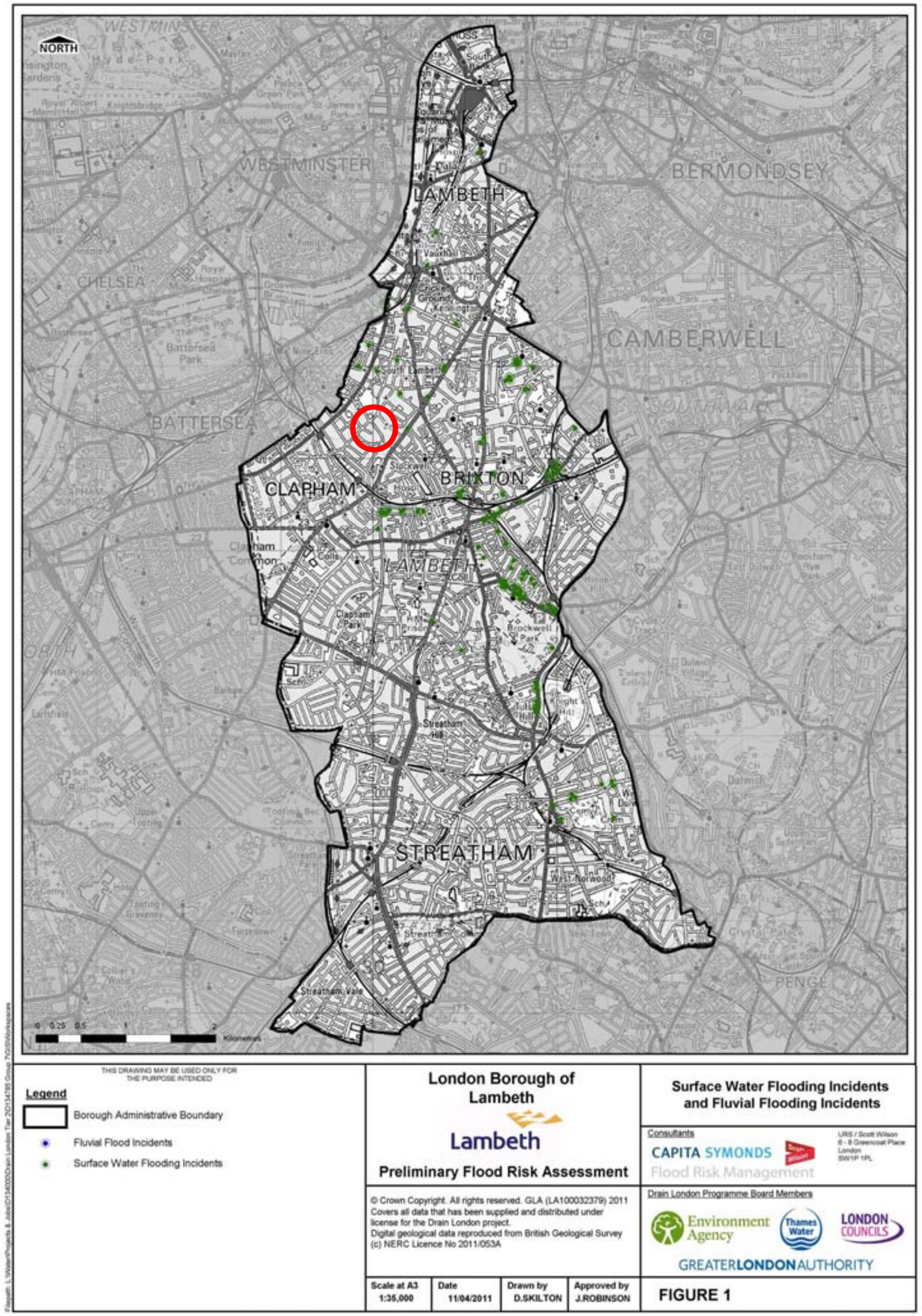

Figure 11 – PDFRA, Flooding from Surface Water

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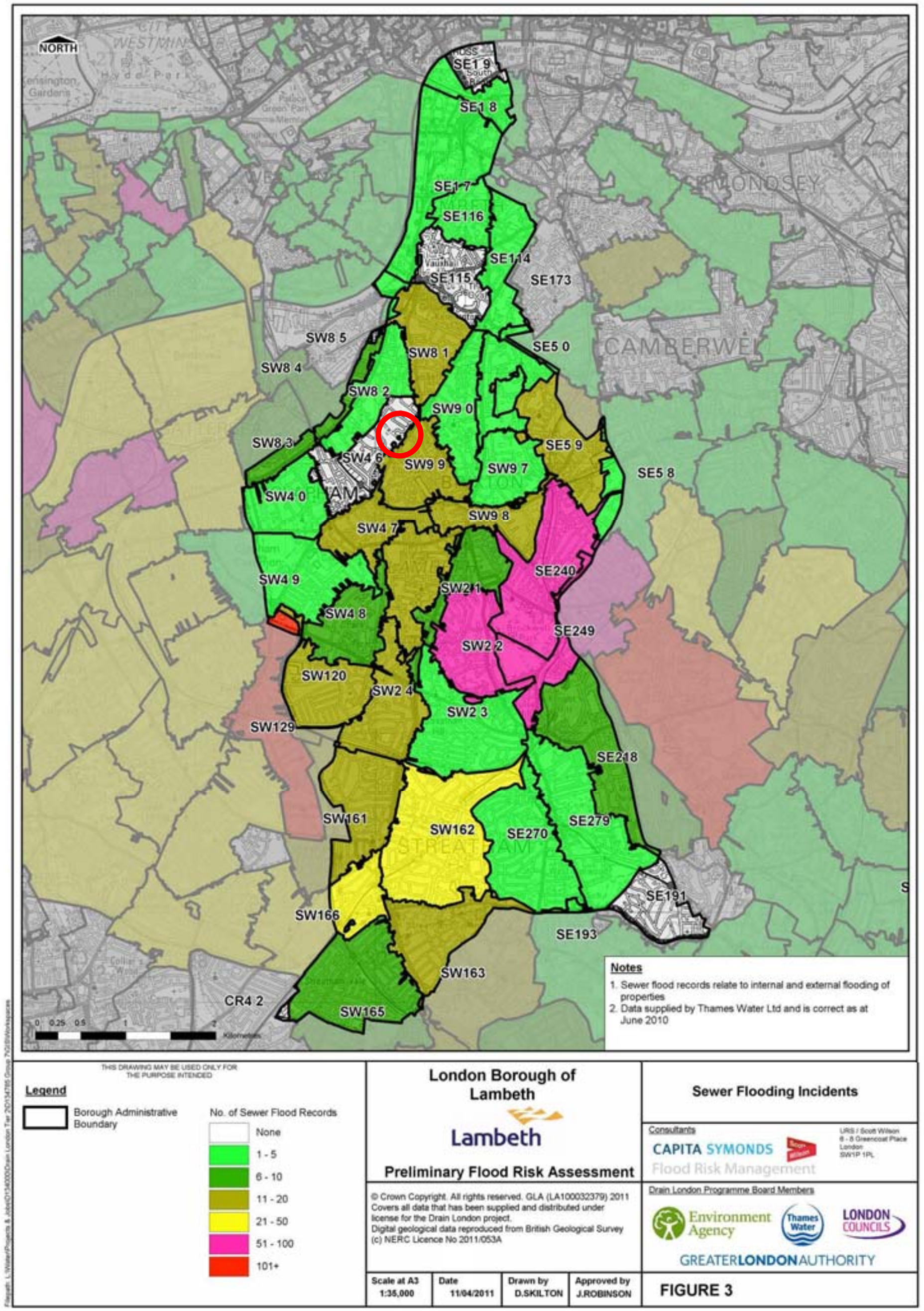

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Figure 12 – PDFRA, Flooding from Sewers

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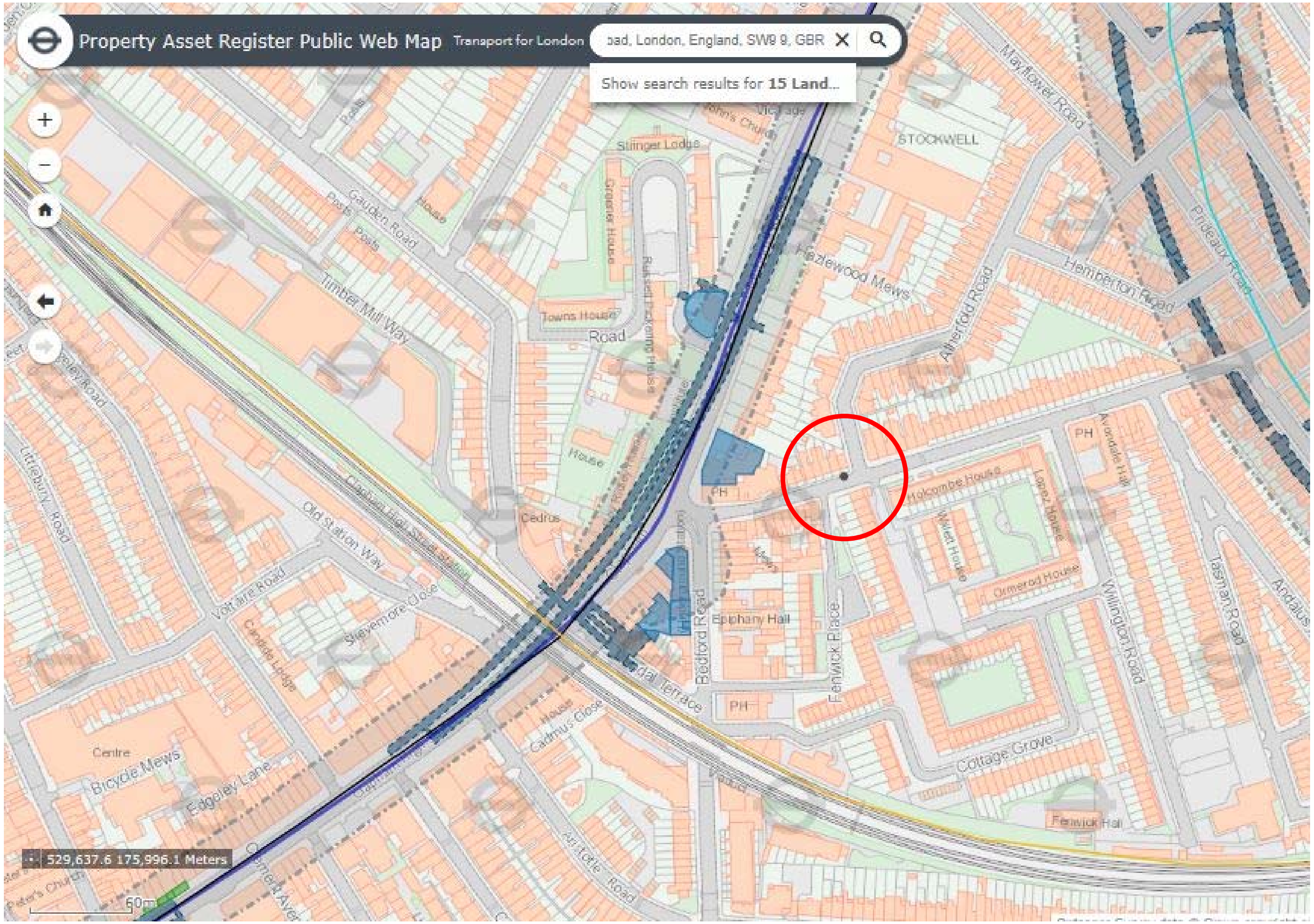

Figure 13 – Underground Infrastructure

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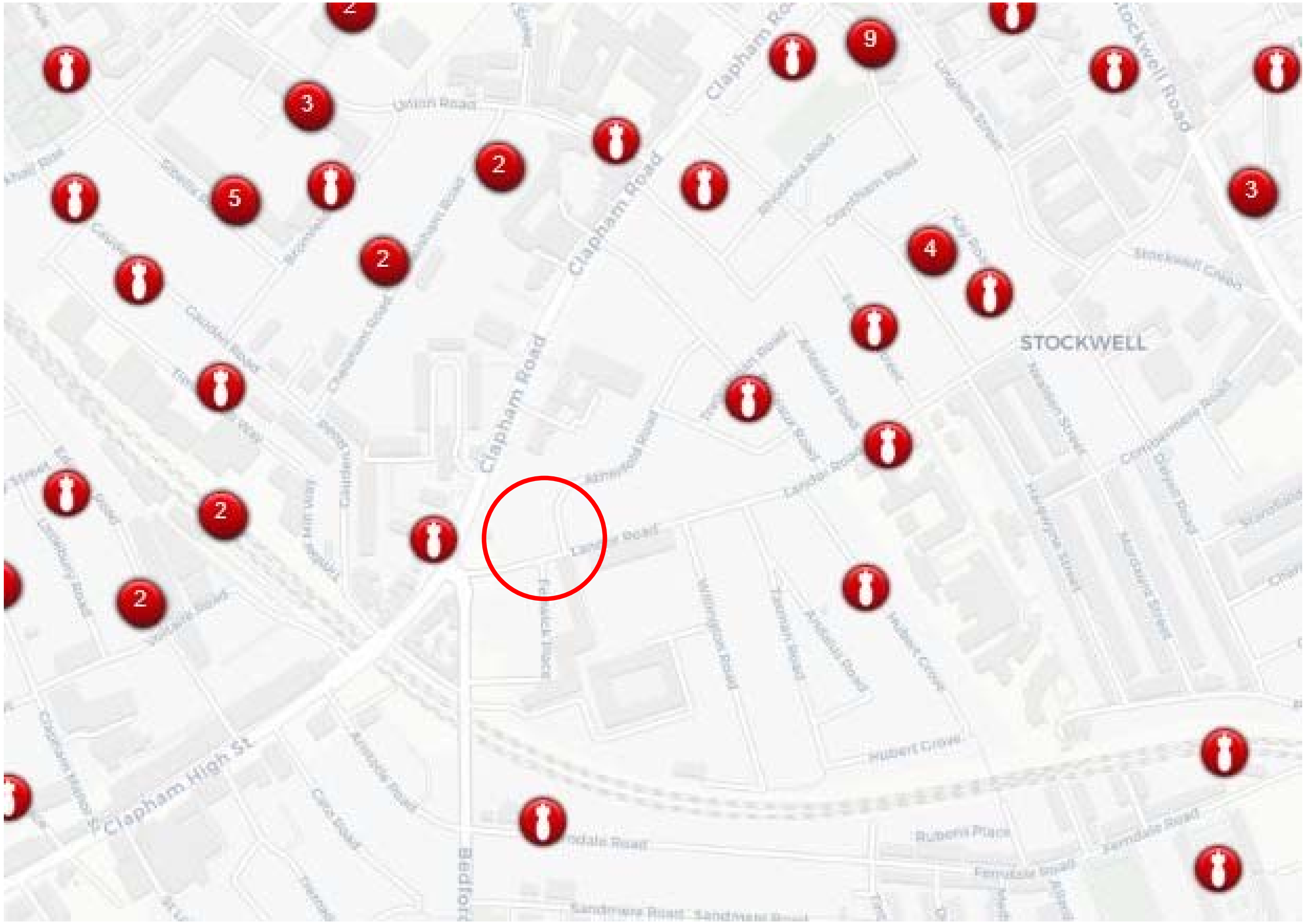

Figure 14 – UXO Risk Map, Bomb Sight

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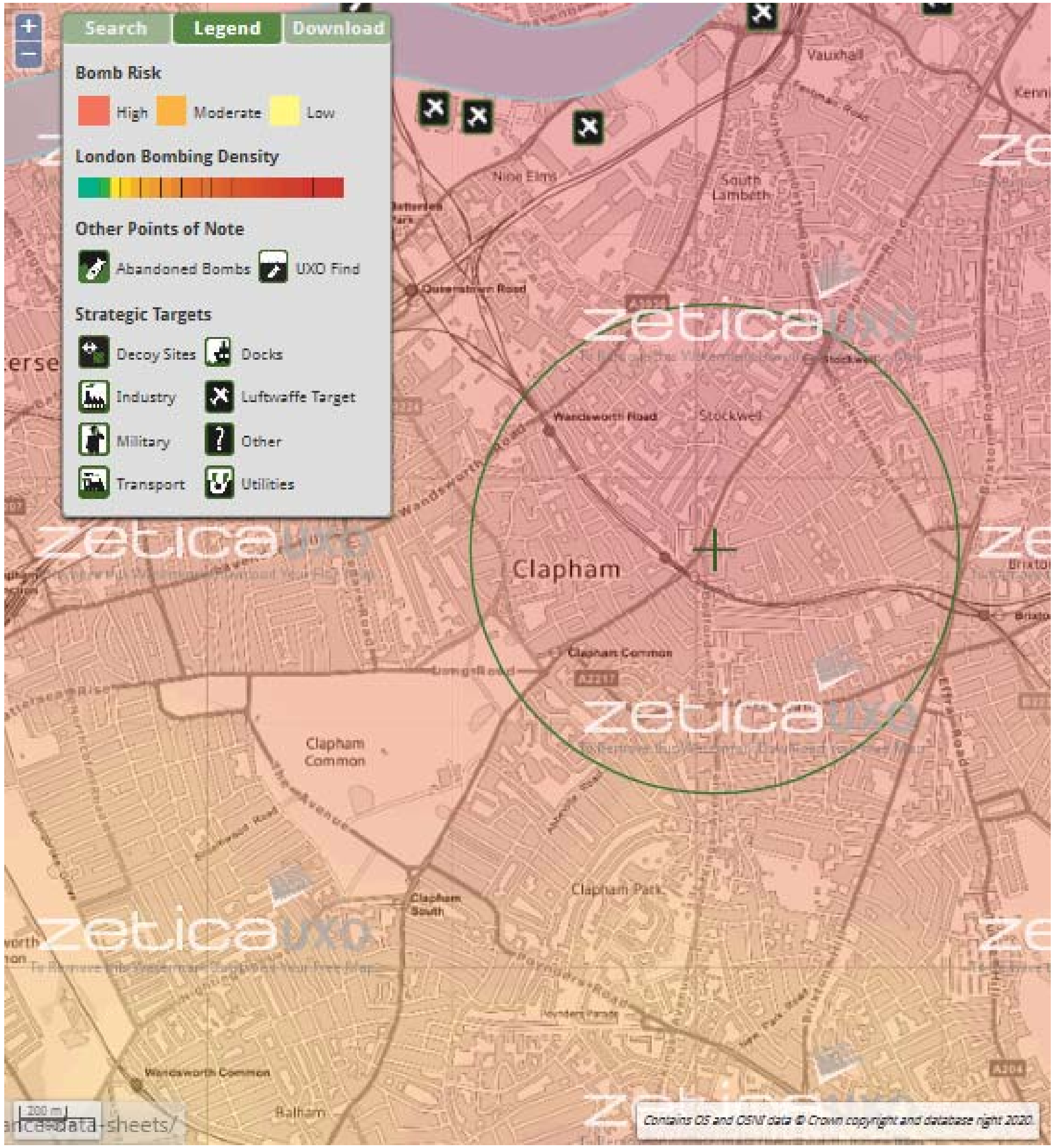

Figure 15 – UXO Risk Map, Zetica UXO

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Figure 16 – Critical Sections

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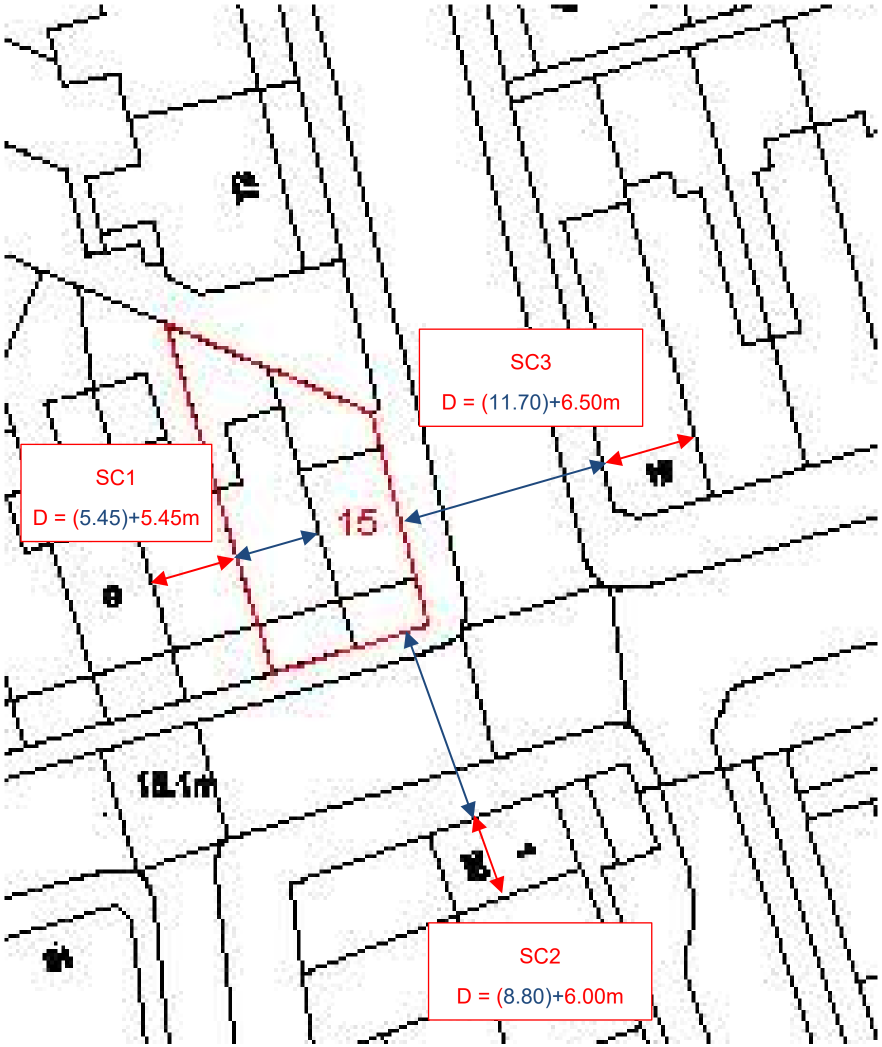

Note: distances in brackets (in blue in the drawing) represent the distance of the critical section from the outer face of the excavation and must be considered for estimating the dissipation of ground movements with distance only. They do not contribute to the calculation of vertical strain and horizontal deflection ratio.

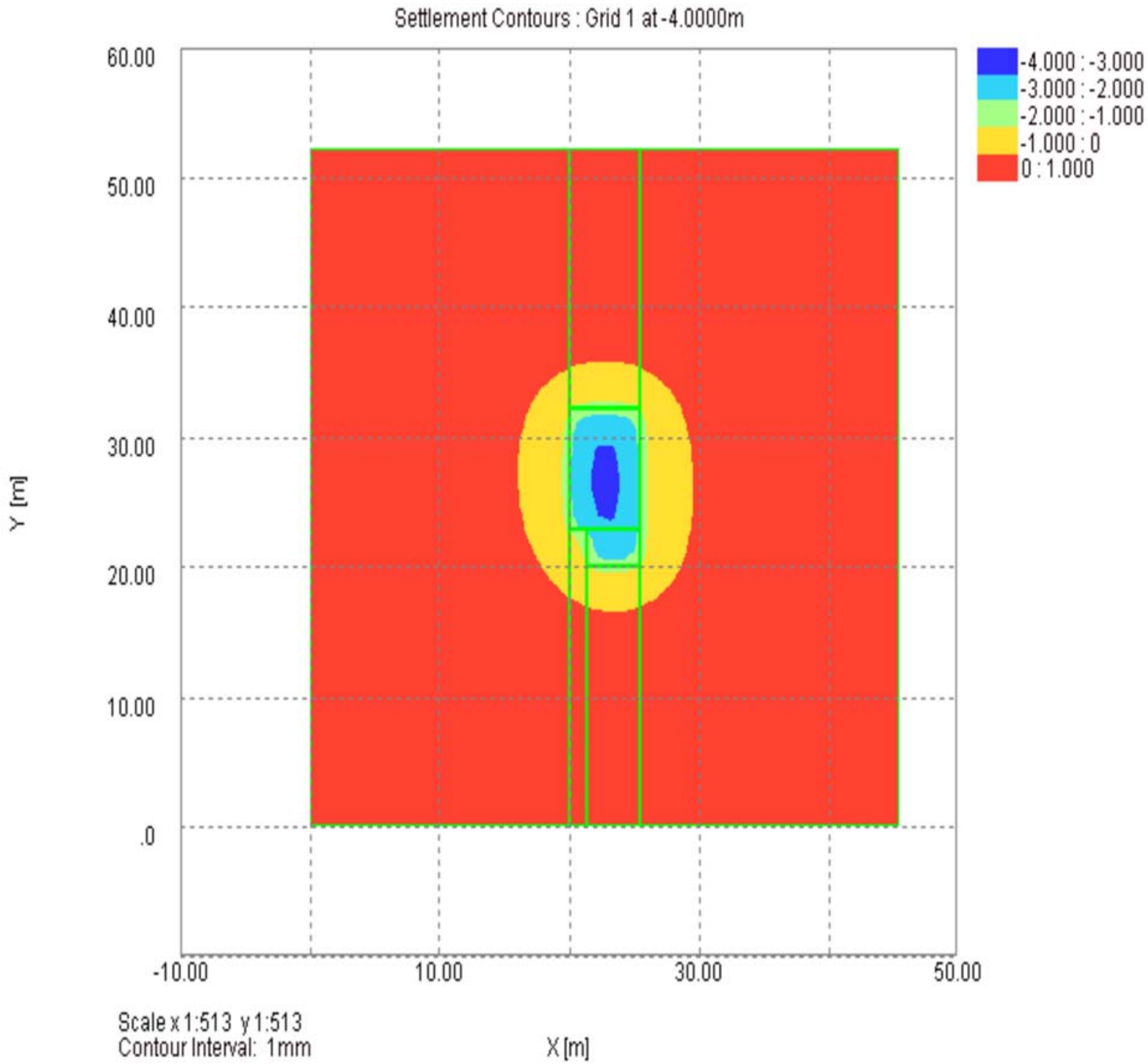

Figure 17 – Short-Term Heave Contour Plot

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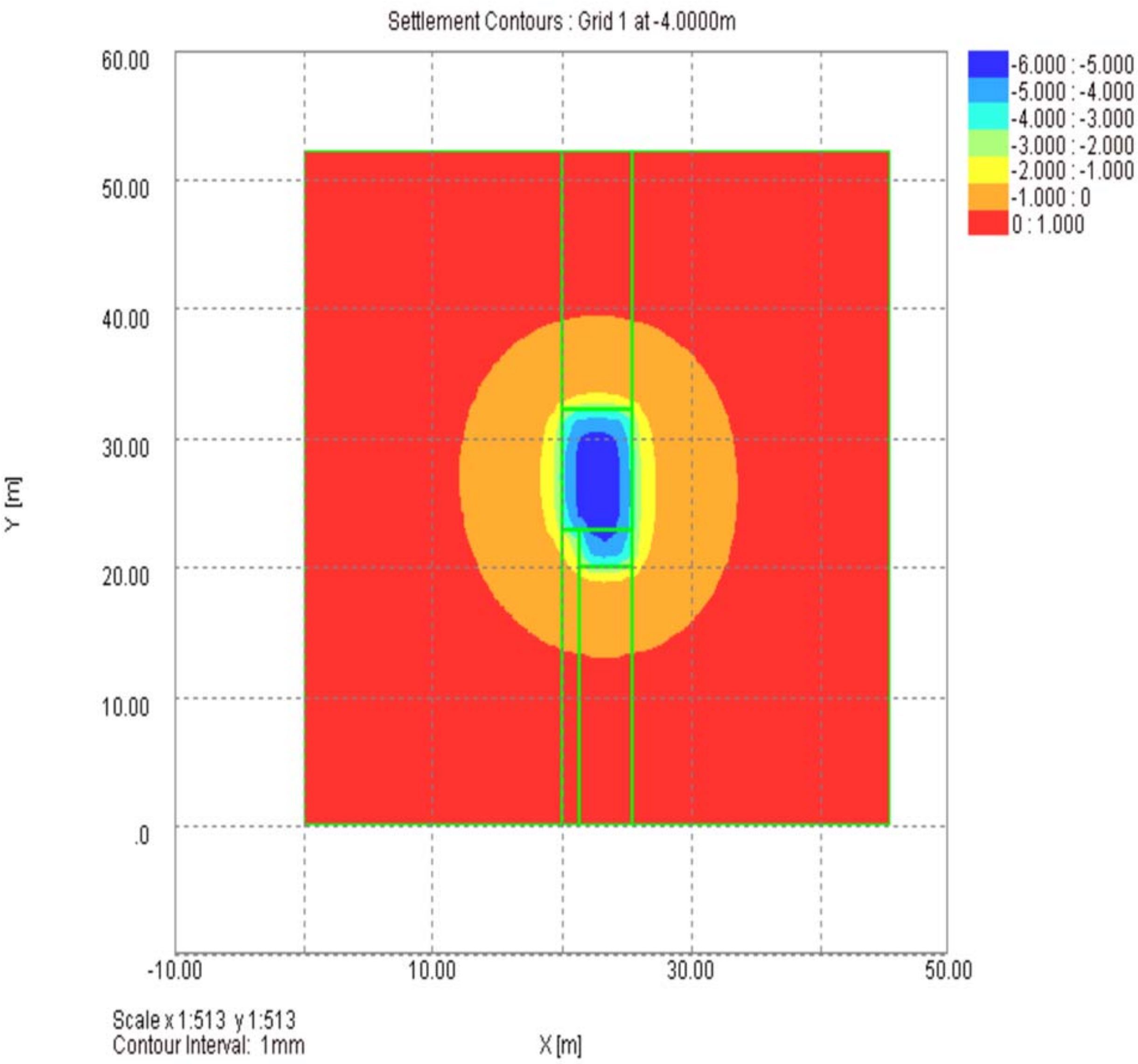

Figure 18 – Long-Term Heave Contour Plot

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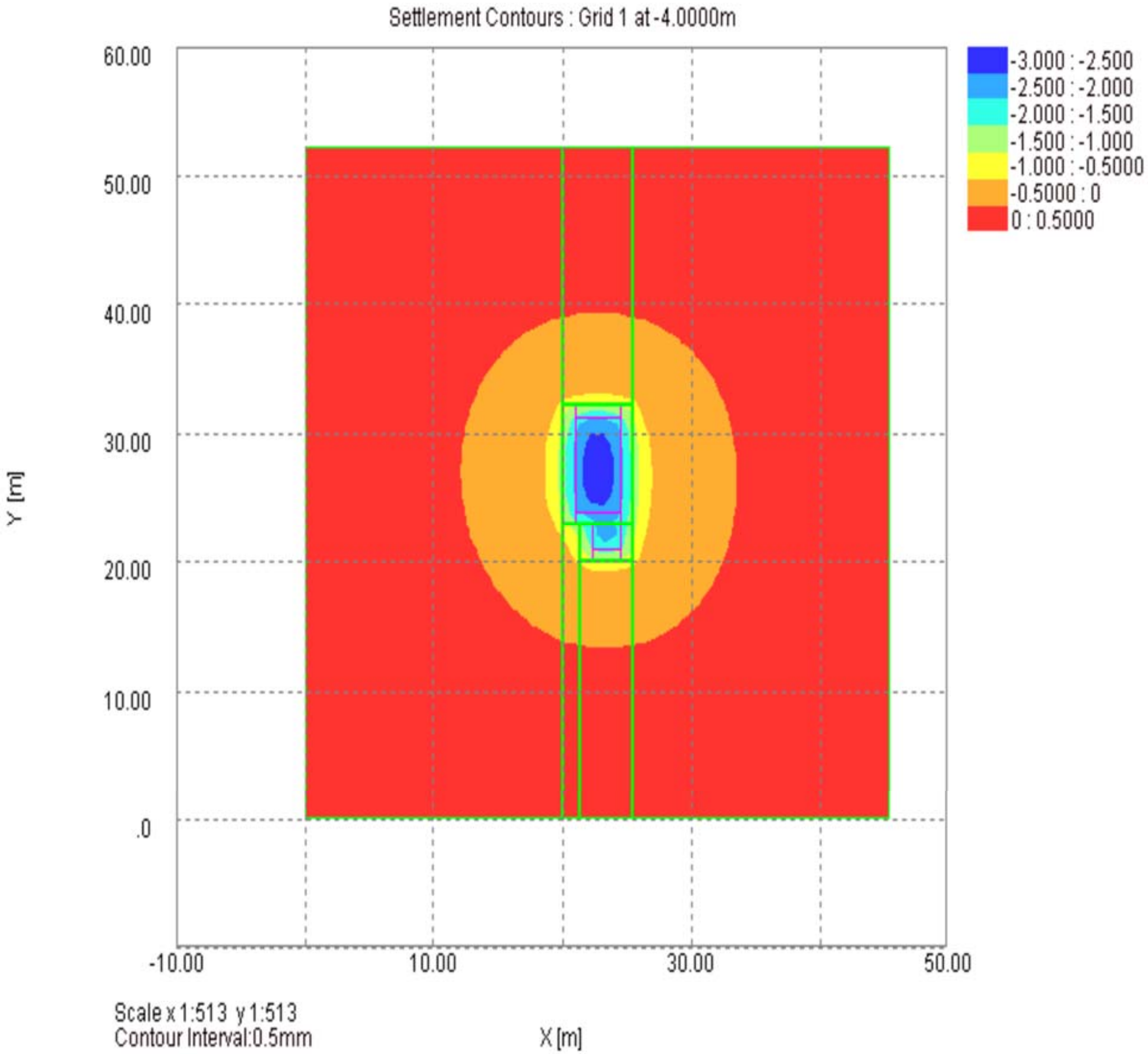

Figure 19 – Long-Term Movements Contour Plot

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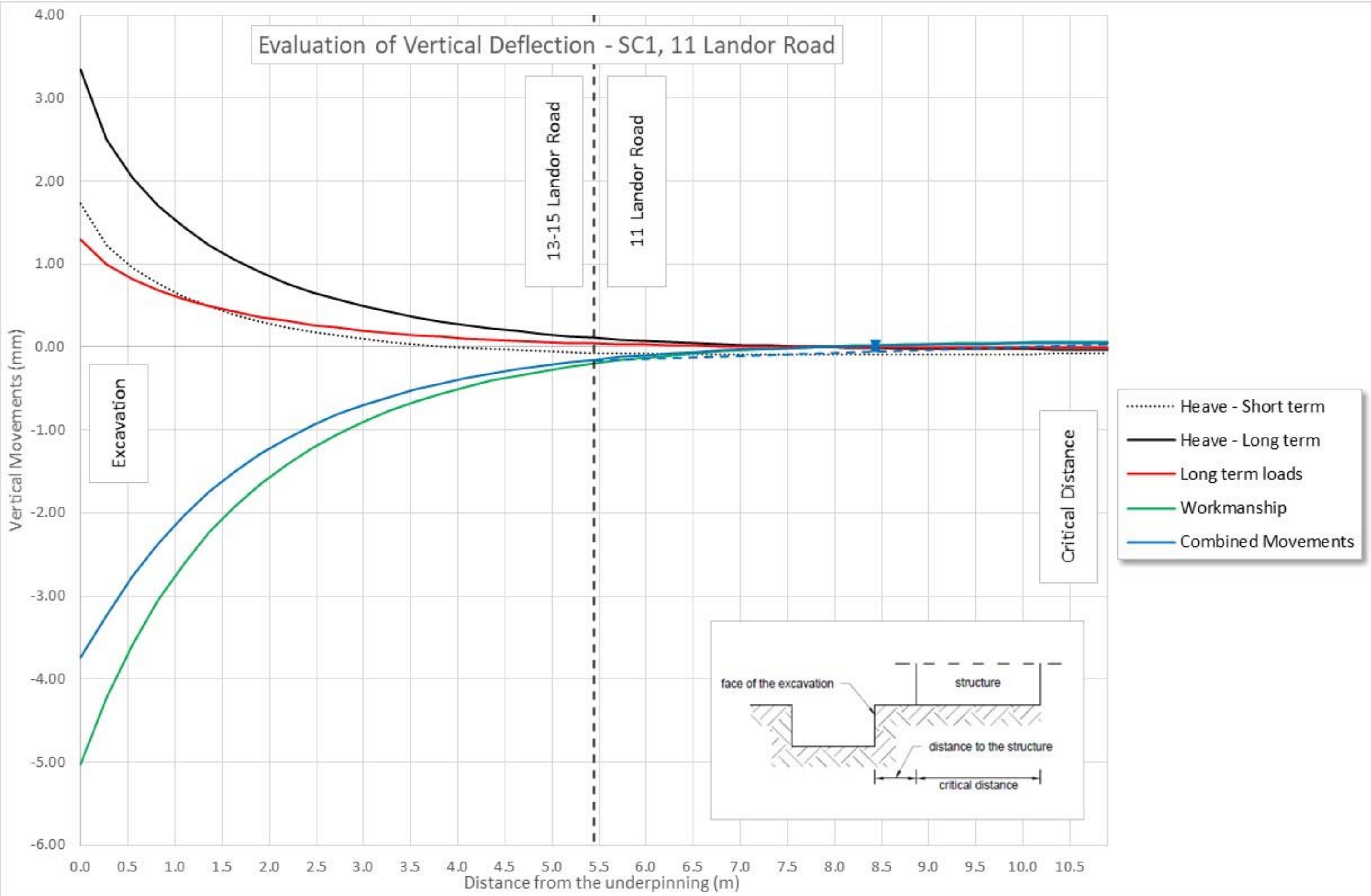

Figure 20 – SC1, Vertical Deflection

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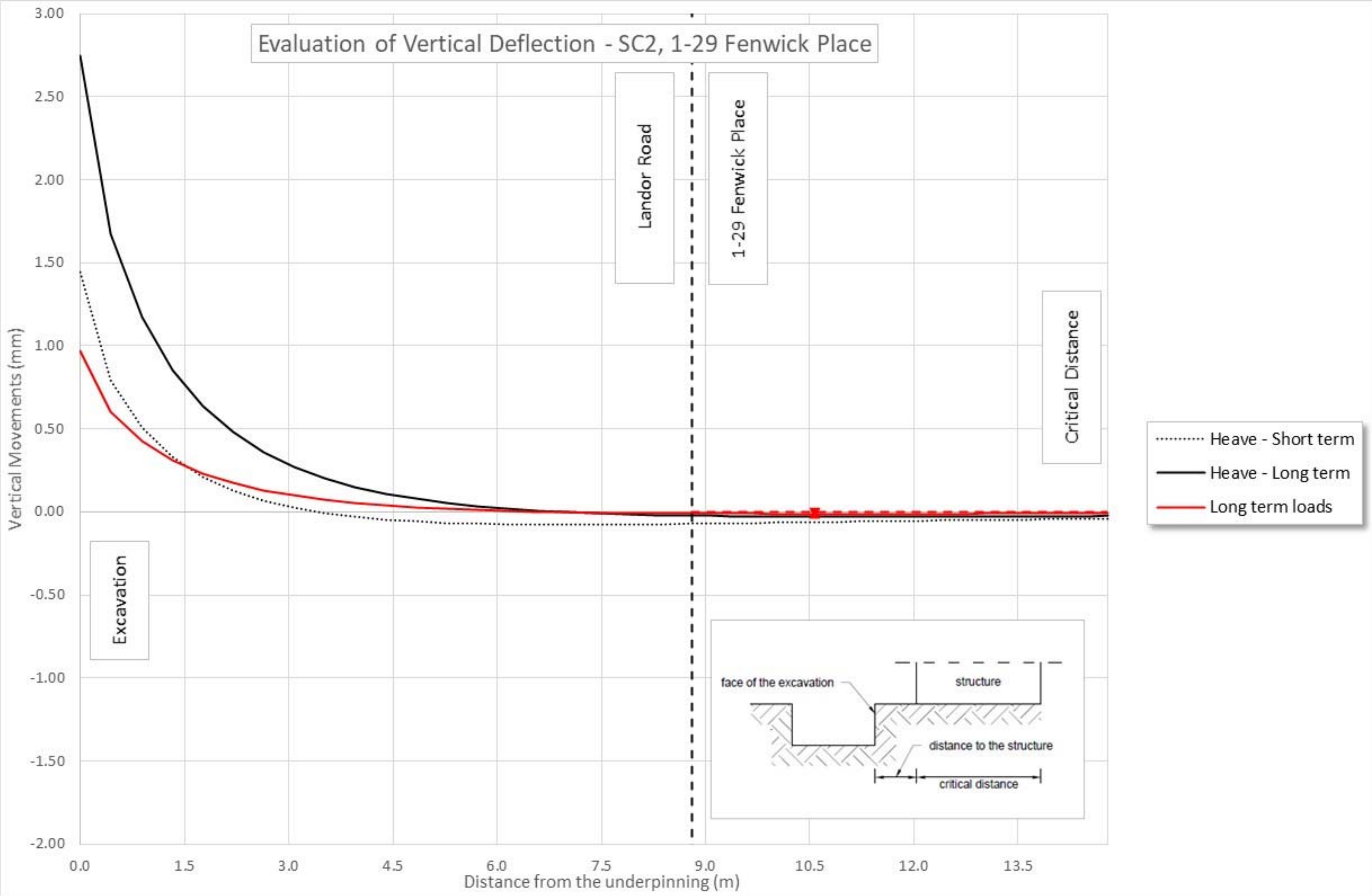

Figure 21 – SC2, Vertical Deflection

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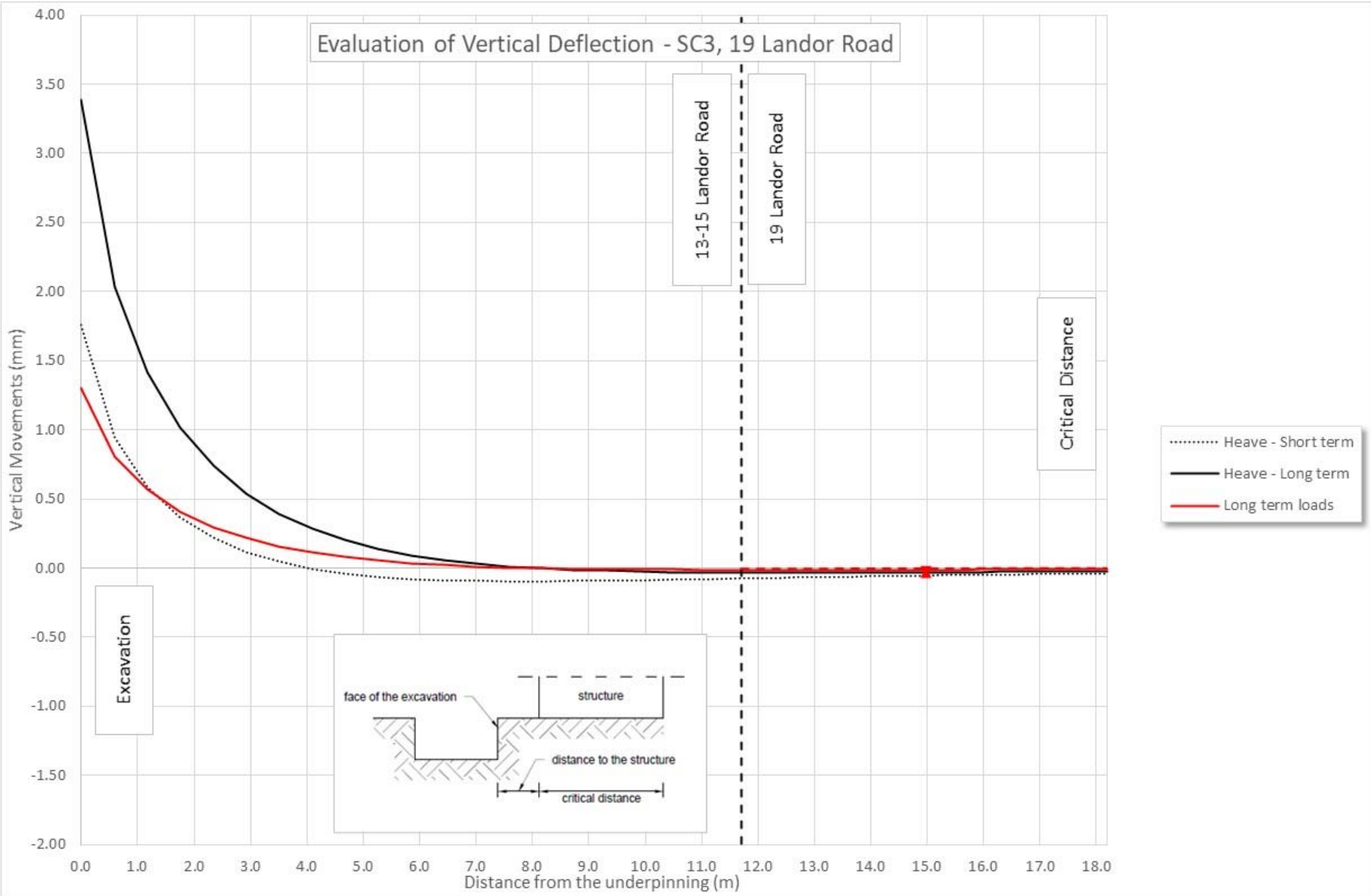

Figure 22 – SC3, Vertical Deflection

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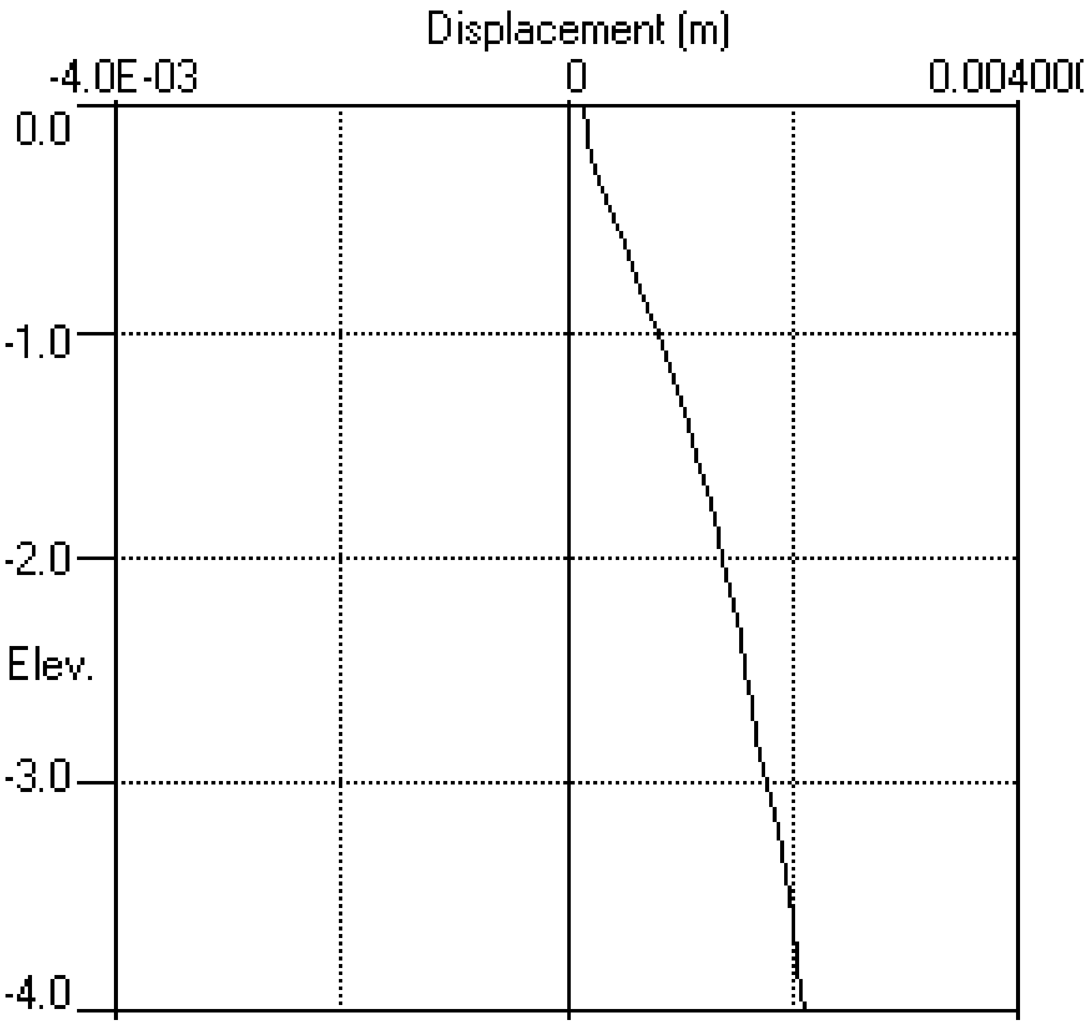

Figure 23 – SC1, Horizontal Movements

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18372

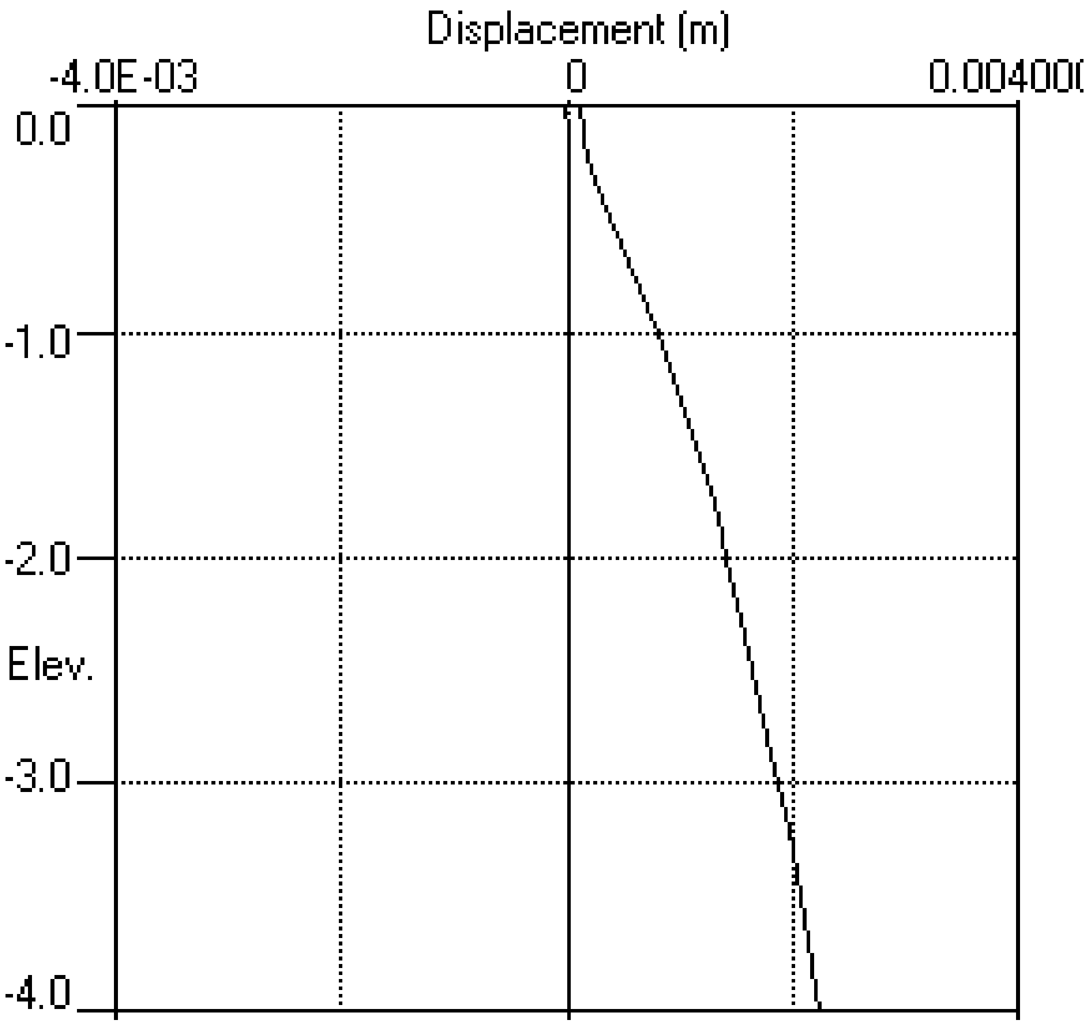


Figure 24 – SC2 - SC3, Horizontal Movements

Project
15 Landor Road, Lambeth, London SW9 9RX

Client
KK Facades Ltd

Date
June 2020

Job Number
18372

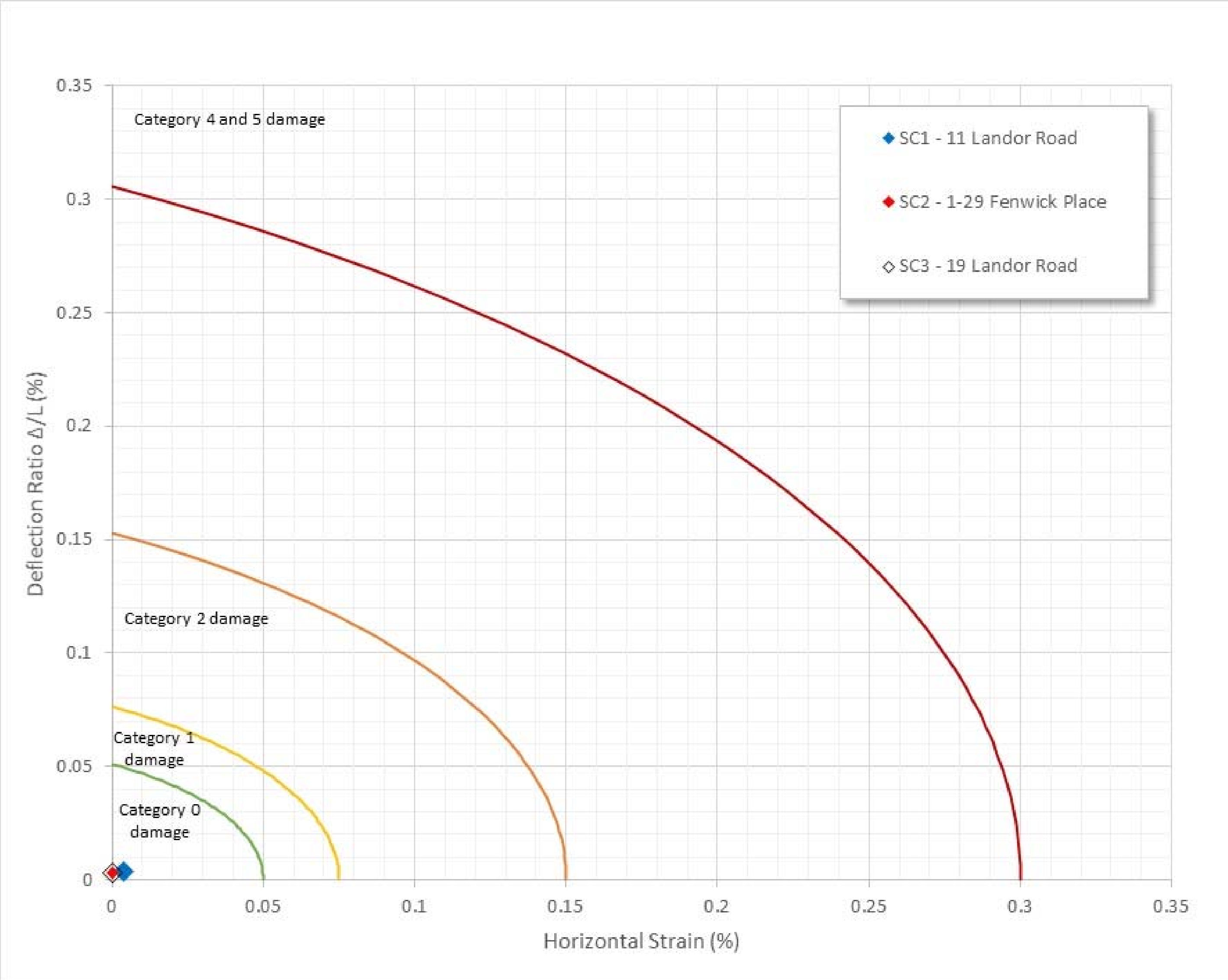


Figure 25 – Damage Category

Project
15 Landor Road, Lambeth, London
SW9 9RX

Client
KK Facades Ltd

Date
June 2020

Job Number
18372

Appendix A Field Work

Appendix A.1 Engineers Logs

soils LIMITED	Contract Name: 15 Landor Road		Client: MrLeopold Ngouoto		Hole ID: WS1
	Contract Number: 18372	Start and End Date: 01/05/20	Logged By: CVB/JO	Checked By: DVT	Status: FINAL	Hole Type: WS
	Easting:	Northing:	Ground Level:	Plant Used: Premier 1	Print Date: 18/06/2020	Scale: 1:50

Weather: | Termination: | Sheet 1 of 1

Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.00 - 1.00	B J			0.20		Yellowish orange building sand. Reworked ground. MADE GROUND.		
				(0.30) 0.50		Dark brown very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium angular flint. Occasional to frequent fragments of brick. MADE GROUND.		
0.70	D			0.60		Light brown very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium angular flint. Occasional fragments of brick. MADE GROUND.		
				0.80		Soft light brown very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium angular flint. Occasional fragments of brick. MADE GROUND.		
1.20 1.50 1.80	D D D			(1.10) 1.90		Soft to firm light orangish brown mottled grey very sandy CLAY. Sand is fine to coarse. Rare sub-angular fine chalk gravel. HEAD.		
2.30 2.80 3.50	D D D			(2.20) 4.10		Firm orange brown mottled grey slightly sandy CLAY. Sand is fine to coarse. LONDON CLAY FORMATION.		
				4.20		firm brown sandy fragmented CLAYSTONE. LONDON CLAY FORMATION.		
4.50 5.50 6.50	D D D			(2.90) 7.10		Firm orange brown mottled grey slightly sandy CLAY. With occasional fine to medium, sub-rounded to sub angular claystone pockets Sand is fine to coarse. LONDON CLAY FORMATION.		
7.50	D			(0.90) 8.00		Stiff dark grey slightly sandy CLAY. LONDON CLAY FORMATION.		
						End of Borehole at 8.00m		

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter Depth (m)	Borehole Diameter Dia (mm)	Casing Diameter Depth (m)	Casing Diameter Dia (mm)

Remarks:
Roots and rootlets encountered to 1.90m bgl.
No groundwater encountered.

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	8.00	SLOTTED	50

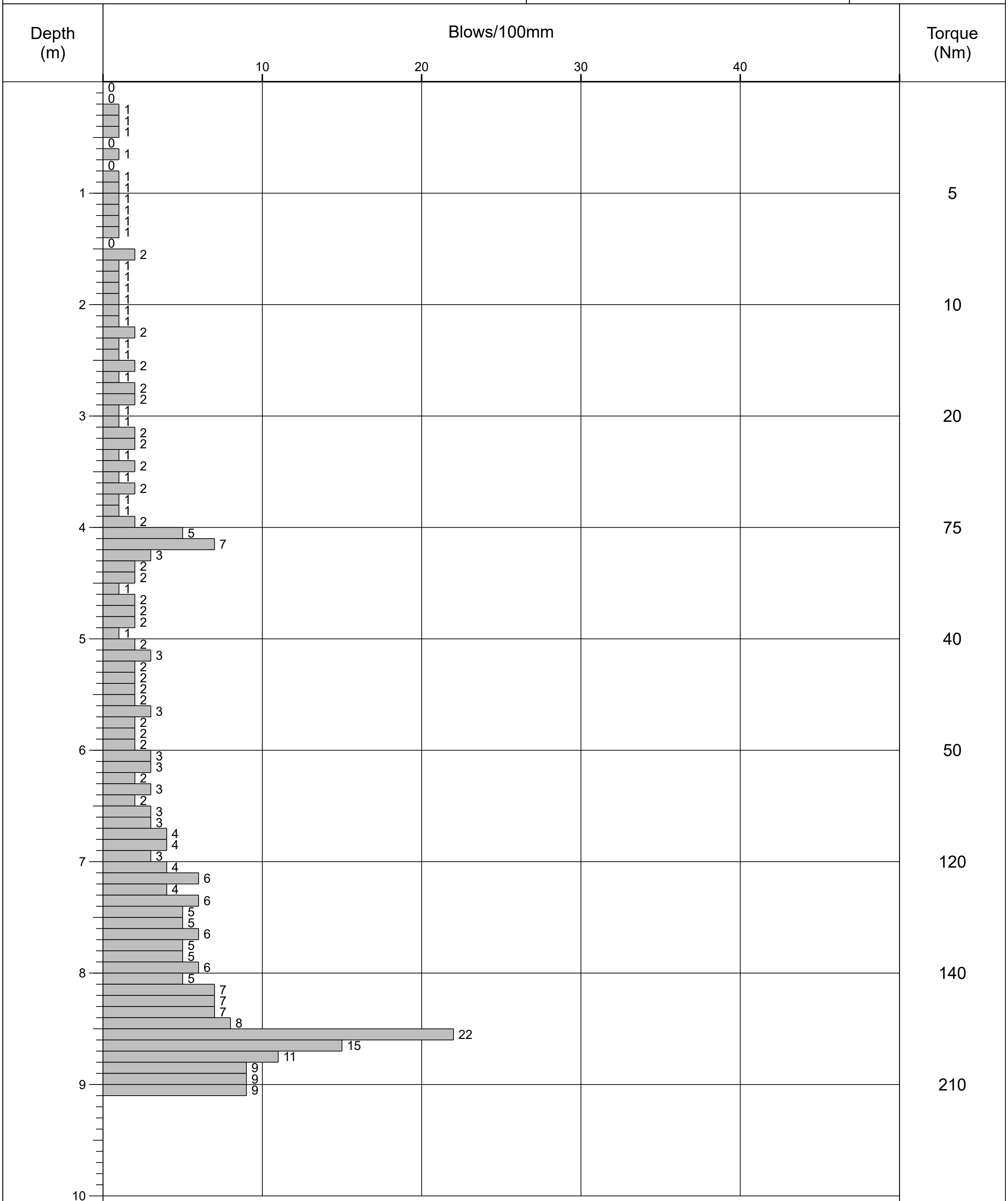
Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk		# Probe Log	Probe No. **DP1** Sheet 1 of 1

Project Name:	15 Landor Road	Project No. 18372	Co-ords:		Hole Type DP
Location:	15 Landor Road, London SW9 9RX		Level:	m AOD	Scale 1:50
Client:	MrLeopold Ngouoto		Dates:	01/05/2020	Logged By



Remarks	Fall Height	750mm	Cone Base Diameter	50.5mm
	Hammer Weight	63.5kg	Final Depth	9m
	Probe Type	DPSH-B	Energy Ratio (Er)	87.96%

AGS REGISTERED USER 2020

Soils Limited
Newton House, Cross Road, Tadworth KT20 5SR
Tel: 01737 814221 Email: admin@soilslimited.co.uk

Trial Pit Log

Trial Pit No. **FE1**
Sheet 1 of 1

Project Name: 15 Landor Road	Project No.: 18372	Method:	Hole Type: TP
Location: 15 Landor Road, London SW9 9RX		Plant:	
		Support:	Scale: 1:25
Client: MrLeopold Ngouoto	Trial Pit Length: m	Trial Pit Width: m	Logged By: JC
Dates: 01/05/2020	Level:	Co-ords:	

Water Strike	Sample Depth	Type	Results	Depth (m)	Level (mAOD)	Stratum Description
				0.10		Concrete.
	0.20	ES		0.50		Dark brown and orange sandy silty gravelly CLAY. Gravel is angular to rounded, fine to medium, made of flint. Occasional small clinker pieces, rare brick cobbles. MADE GROUND.
	0.50	ES		1.10		Dark brown and orange sandy slightly gravelly CLAY. Gravel is angular to rounded, fine to medium, made of flint and cement. Occasional small clinker pieces and wood rare brick cobbles. MADE GROUND.
	1.10	ES		1.20		Dark brown and orange sandy slightly gravelly CLAY. Gravel is angular to rounded, fine to medium, made of flint and cement. Frequent wood pieces. MADE GROUND.
				1.20		Wooden sheet material at bottom of hole and around hole. MADE GROUND.

End of Pit at 1.200m

General Remarks:
Roots and rootlets encountered to 1.20m bgl.
No groundwater encountered.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

Soils Limited
Newton House, Cross Road, Tadworth KT20 5SR
Tel: 01737 814221 Email: admin@soilslimited.co.uk

Trial Pit Log

Trial Pit No. **FE2**
Sheet 1 of 1

Project Name: 15 Landor Road	Project No.: 18372	Method:	Hole Type: TP
Location: 15 Landor Road, London SW9 9RX		Plant:	
		Support:	Scale: 1:25
Client: MrLeopold Ngouoto	Trial Pit Length: m	Trial Pit Width: m	
Dates: 01/05/2020	Level:	Co-ords:	Logged By: JC

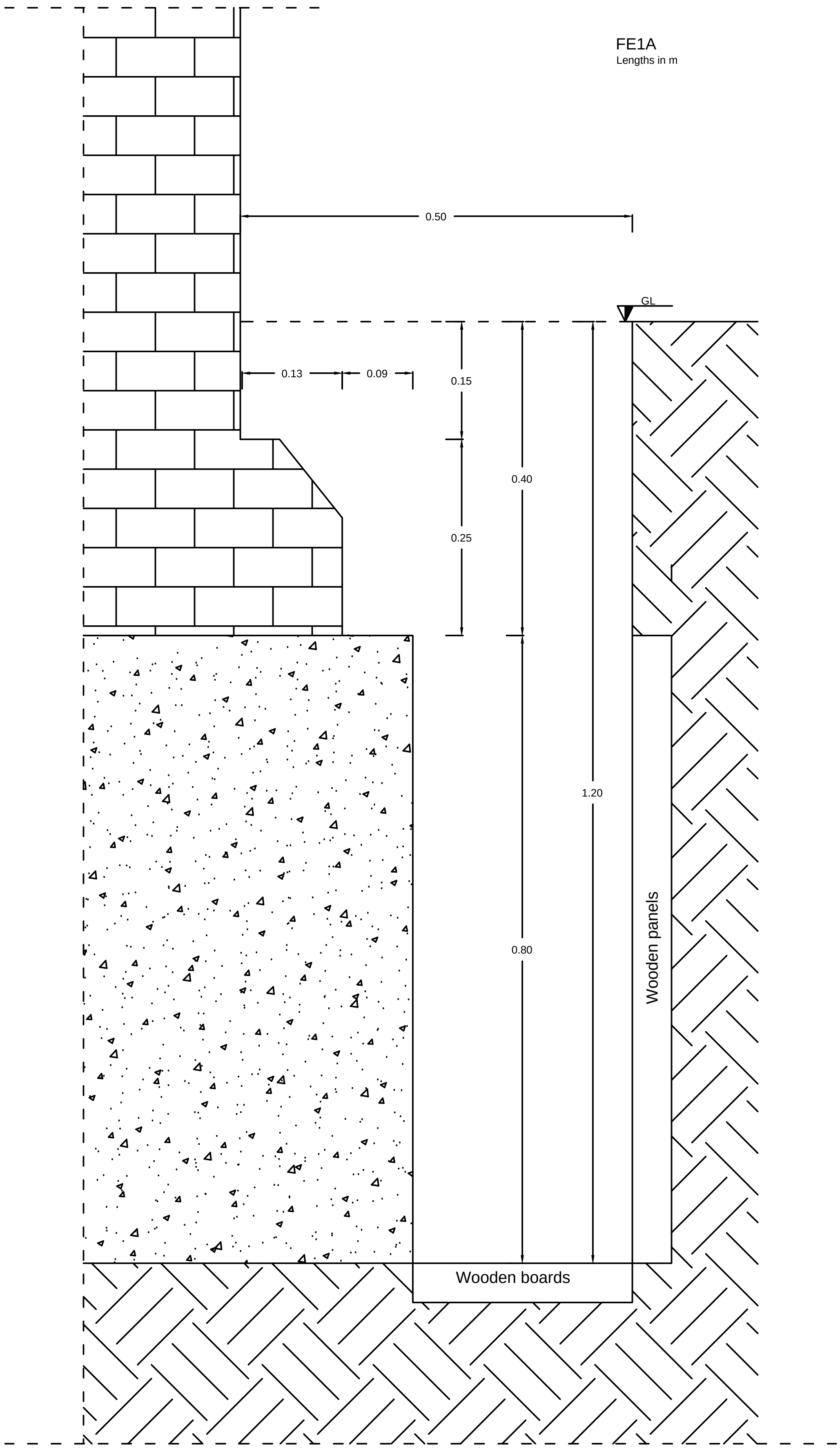
Water Strike	Samples & In Situ Testing – Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
				0.10			Concrete.
	0.20	ES		0.40			Soft black slightly sandy gravelly suspected PEAT, gravel is angular to well rounded fine to medium and made of flint and concrete. Frequent brick and glass fragments. MADE GROUND.
	0.50	ES		0.80			Dark brown sandy CLAY. Frequent brick, concrete and flint pieces from fine to medium. frequent pockets of ash. MADE GROUND.
	1.00	ES		1.00			Dark brown sandy CLAY, frequent pockets of suspected peat. Rare ash pieces. Suspect MADE GROUND.
							End of Pit at 1.000m

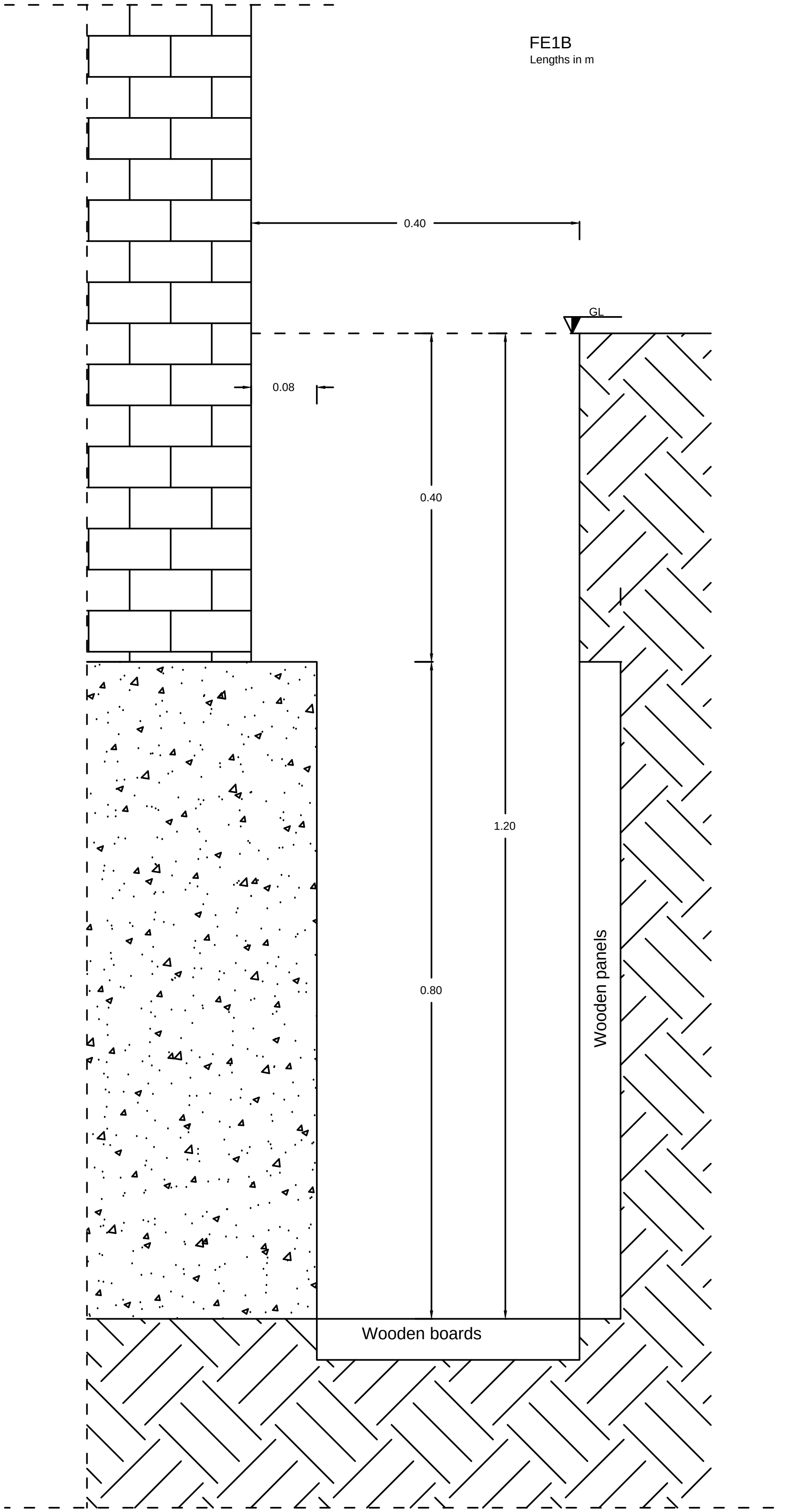
Depth scale: 1, 2, 3, 4, 5

General Remarks:
Roots and rootlets encountered to 1.00m bgl.
No groundwater encountered.

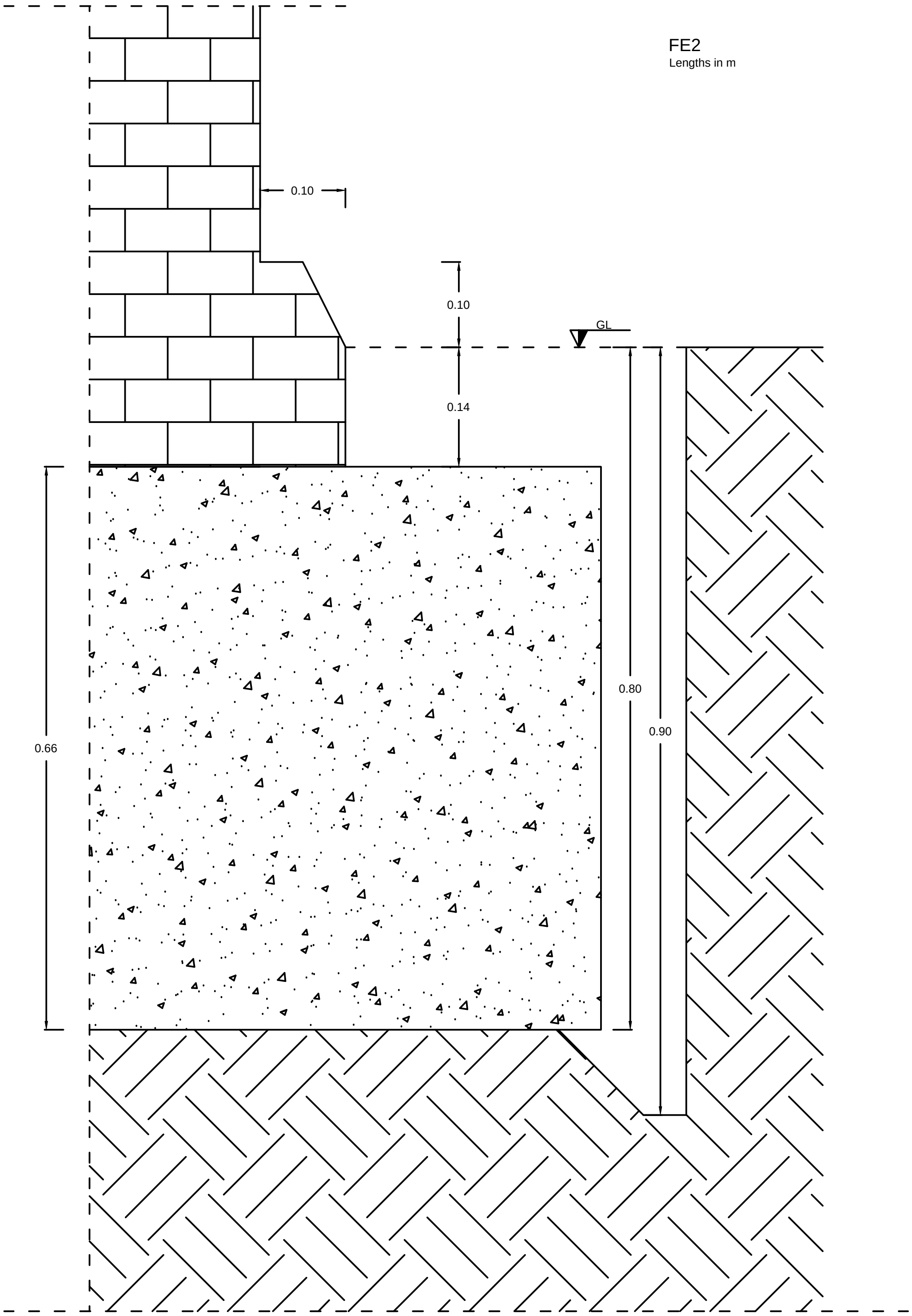
Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water


FE1A
Lengths in m
0.50
GL
0.13
0.09
0.15
0.40
0.25
1.20
0.80
Wooden panels
Wooden boards



FE1B
Lengths in m
0.40
GL
0.08
0.40
1.20
0.80
Wooden panels
Wooden boards



FE2
Lengths in m
0.10
0.10
0.14
GL
0.80
0.90
0.66

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Classification based on SPT "N" values:

The inferred undrained strength of the cohesive soils was based on the SPT "N" blow counts, derived from the relationship suggested by Stroud (1974) and classified using Table B.1.1. (Ref: Stroud, M. A. 1974, "The Standard Penetration Test – its application and interpretation", Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).

Table B.1.1 SPT "N" Blow Count Cohesive Classification

Classification	Undrained Cohesive Strength C_u (kPa)
Extremely low	<10
Very low	10 – 20
Low	20 – 40
Medium	40 – 75
High	75 – 150
Very high	150 – 300
Extremely high	> 300

Note: (Ref: BS EN ISO 14688-2:2004+A1:2013 Clause 5.3.)

The relative density of granular soils was classified based of the relationship given in Table B.1.2.

The *UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing, NA 3.7 SPT test, BS EN 1997-2:2007, Annex F* states "Relative density descriptions on borehole records should also be based on uncorrected SPT N values, unless significantly disturbed, using the density classification in BS 5930:2015, Table 7.

Table B.1.2 SPT "N" Blow Count Granular Classification

Classification	SPT "N" blow count (blows/300mm)
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	Greater than 50

Note: (Ref: The Standard Penetration Test (SPT): Methods and Use, CIRIA Report 143, 1995)

Appendix B.2 Interpretation

Table B.2.1 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N Blow Counts	Inferred Cohesive Strength
DP1	HEAD 0.80 – 1.90 Sandy CLAY	0 - 8	Extremely low to low (C_u = <10 – 40kPa)
	LCF[1] 1.90 – 9.00 Sandy CLAY	4 - >60	Very low to extremely high (C_u = 20 – >300kPa)

Note: [1] Ground conditions inferred past the base of windowless sampler boreholes.

Table B.2.2 Interpretation of Atterberg Limit Tests

Stratum	Moisture Content (%)	Plasticity Index (%)	Passing 425μm Sieve (%)	Modified Plasticity Index (%)	Soil Classification	Volume Change Potential	
						BRE	NHBC
HEAD	26	31	95	29	CH	Medium	Medium
LCF	27 - 31	33 - 38	100	33 - 38	MH/CH - CV	Medium	Medium

Note: BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)
NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2
Soils Classification based on British Soil Classification System
The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240. The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 μm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 μm and some particles, 'rock flour' for example, can be finer than 2 μm but are not clay minerals.
(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Clauses 3.2, 4.3 and 5)

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Laboratory Report

UKAS TESTING 2788

GSTL
GEO Site & Testing Services Ltd

Contract Number: 48824

Client Ref: **18372**
Report Date: **09-06-2020**
Client PO:

Client **Soils Limited**
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

Contract Title: **15 Landor Road, Lambeth, London SW9 9RX**
For the attention of: **Dante Valerio Tedesco**

Date Received: **02-06-2020**
Date Completed: **09-06-2020**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	4
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	4
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL

NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX
(BS 1377 : Part 2 : 1990 Method 5)

Contract Number	48824
Site Name	15 Landor Road, Lambeth, London SW9 9RX
Date Tested	06/06/2020

DESCRIPTIONS

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
WS1		D	1.20	-		Brown fine to medium gravelly silty CLAY
WS1		D	2.30	-		Brown silty CLAY
WS1		D	4.50	-		Brown silty CLAY
WS1		D	7.50	-		Brown silty CLAY
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
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				-		
				-		

Operators	Checked	09/06/2020	Wayne Honey (Administrative/Quality Assistant)
Darren Bourne	Approved	09/06/2020	Paul Evans (Quality/Technical Manager)

UKAS TESTING 2788

GSTL	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	48824	
Project Location	15 Landor Road, Lambeth, London SW9 9RX	
Date Tested	06/06/2020	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
WS1		D	1.20	-		26	60	29	31	95	CH High Plasticity
WS1		D	2.30	-		31	67	33	34	100	MH High Plasticity
WS1		D	4.50	-		27	63	30	33	100	CH High Plasticity
WS1		D	7.50	-		29	71	33	38	100	CV Very High Plasticity
				-							
				-							
				-							
				-							
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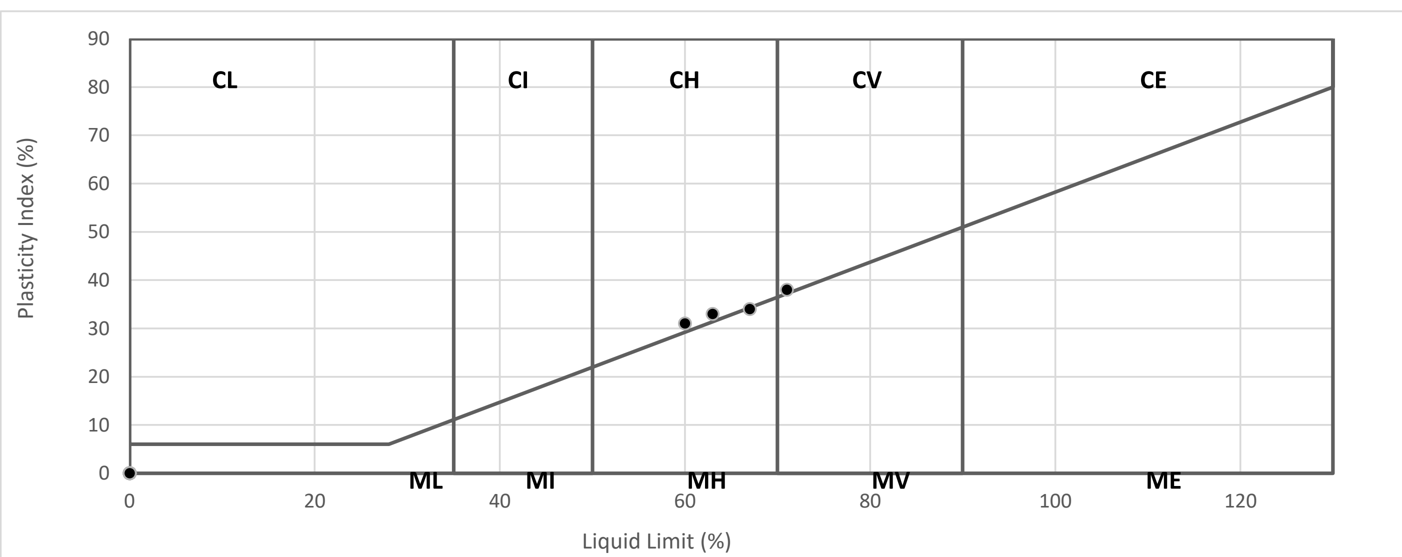
				-							
				-							

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	09/06/2020	Wayne Honey (Administrative/Quality Assistant)
Darren Bourne	Approved	09/06/2020	Paul Evans (Quality/Technical Manager)

UKAS TESTING 2788

Dante Valerio Tedesco
Soils Ltd
Thomas Telford House - Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 20-05784

Site Reference:	15 Landor Road, Lambeth, London, SW9 9RX
Project / Job Ref:	18372
Order No:	18372/BRE
Sample Receipt Date:	02/06/2020
Sample Scheduled Date:	02/06/2020
Report Issue Number:	1
Reporting Date:	08/06/2020

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 20-05784	**Date Sampled**	None Supplied	None Supplied	None Supplied		
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX	**TP / BH No**	WS1	WS1	WS1		
Project / Job Ref: 18372	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: 18372/BRE	**Depth (m)**	1.50	2.80	5.50		
Reporting Date: 08/06/2020	**DETS Sample No**	478902	478903	478904		

Determinand	**Unit**	**RL**	**Accreditation**					
pH	pH Units	N/a	**MCERTS**	7.9	8.1	7.5		
Total Sulphate as SO_4	mg/kg	< 200	NONE	390	771	16220		
Total Sulphate as SO_4	%	< 0.02	NONE	0.04	0.08	1.62		
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	**MCERTS**	57	174	2180		
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	**MCERTS**	0.06	0.17	2.18		
Total Sulphur	%	< 0.02	NONE	< 0.02	0.03	0.66		
Ammonium as NH_4	mg/kg	< 0.5	NONE	3.6	3.9	4.2		
Ammonium as NH_4	mg/l	< 0.05	NONE	0.36	0.39	0.42		
W/S Chloride (2:1)	mg/kg	< 1	**MCERTS**	26	72	135		
W/S Chloride (2:1)	mg/l	< 0.5	**MCERTS**	13.2	36.1	67.4		
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	**MCERTS**	21	21	3		
Water Soluble Nitrate (2:1) as NO_3	mg/l	< 1.5	**MCERTS**	10.3	10.5	1.6		
W/S Magnesium	mg/l	< 0.1	NONE	2.6	6.5	72		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Sample Descriptions
DETS Report No: 20-05784
Soils Ltd
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX
Project / Job Ref: 18372
Order No: 18372/BRE
Reporting Date: 08/06/2020

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 478902	WS1	None Supplied	1.50	18.2	Brown clay
^ 478903	WS1	None Supplied	2.80	17.7	Brown clay
^ 478904	WS1	None Supplied	5.50	18.5	Brown clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S
^ no sampling date provided; unable to confirm if samples are within acceptable holding times

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 20-05784
Soils Ltd
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX
Project / Job Ref: 18372
Order No: 18372/BRE
Reporting Date: 08/06/2020

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D **Dried**
AR **As Received**

Appendix C Chemical Laboratory Testing

Dante Valerio Tedesco
Soils Ltd
Thomas Telford House - Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 20-05652

Site Reference:	15 Landor Road, Lambeth, London, SW9 9RX
Project / Job Ref:	18372
Order No:	18372
Sample Receipt Date:	28/05/2020
Sample Scheduled Date:	28/05/2020
Report Issue Number:	1
Reporting Date:	04/06/2020

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

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Soil Analysis Certificate						
DETS Report No: 20-05652	**Date Sampled**	None Supplied				
Soils Ltd	**Time Sampled**	None Supplied				
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX	**TP / BH No**	WS1				
Project / Job Ref: 18372	**Additional Refs**	None Supplied				
Order No: 18372	**Depth (m)**	GL - 1.00				
Reporting Date: 04/06/2020	**DETS Sample No**	478415				

Determinand	**Unit**	**RL**	**Accreditation**					
Asbestos Screen (S)	N/a	N/a	**ISO17025**	Not Detected				
pH	pH Units	N/a	**MCERTS**	8.2				
Organic Matter	%	< 0.1	**MCERTS**	0.9				
Arsenic (As)	mg/kg	< 2	**MCERTS**	17				
W/S Boron	mg/kg	< 1	NONE	< 1				
Cadmium (Cd)	mg/kg	< 0.2	**MCERTS**	< 0.2				
Chromium (Cr)	mg/kg	< 2	**MCERTS**	22				
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				
Copper (Cu)	mg/kg	< 4	**MCERTS**	27				
Lead (Pb)	mg/kg	< 3	**MCERTS**	159				
Mercury (Hg)	mg/kg	< 1	**MCERTS**	< 1				
Nickel (Ni)	mg/kg	< 3	**MCERTS**	16				
Selenium (Se)	mg/kg	< 2	**MCERTS**	< 3				
Vanadium (V)	mg/kg	< 1	**MCERTS**	41				
Zinc (Zn)	mg/kg	< 3	**MCERTS**	86				
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs							
DETS Report No: 20-05652	**Date Sampled**	None Supplied				
Soils Ltd	**Time Sampled**	None Supplied				
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX	**TP / BH No**	WS1				
Project / Job Ref: 18372	**Additional Refs**	None Supplied				
Order No: 18372	**Depth (m)**	GL - 1.00				
Reporting Date: 04/06/2020	**DETS Sample No**	478415				

Determinand	**Unit**	**RL**	**Accreditation**					
Naphthalene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Acenaphthylene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Acenaphthene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Fluorene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Phenanthrene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Anthracene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Fluoranthene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Pyrene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Benzo(a)anthracene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Chrysene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Benzo(b)fluoranthene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Benzo(k)fluoranthene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Benzo(a)pyrene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Dibenz(a,h)anthracene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Benzo(ghi)perylene	mg/kg	< 0.1	**MCERTS**	< 0.1				
Total EPA-16 PAHs	mg/kg	< 1.6	**MCERTS**	< 1.6				

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MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 4480

Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 20-05652	Date Sampled	None Supplied				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX	TP / BH No	WS1				
Project / Job Ref: 18372	Additional Refs	None Supplied				
Order No: 18372	Depth (m)	GL - 1.00				
Reporting Date: 04/06/2020	DETS Sample No	478415				

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05				
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1				
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1				
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1				
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1				
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	< 6				
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	< 6				

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Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 20-05652	**Date Sampled**	None Supplied	
Soils Ltd	**Time Sampled**	None Supplied	
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX	**TP / BH No**	WS1	
Project / Job Ref: 18372	**Additional Refs**	None Supplied	
Order No: 18372	**Depth (m)**	GL - 1.00	
Reporting Date: 04/06/2020	**DETS Sample No**	478415	

Determinand	**Unit**	**MDL**		**Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
TOC[MU]	%	< 0.1	0.6	3%	5%	6%
Loss on Ignition	%	< 0.01	1.80	--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05	6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1	1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10	500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7	100	--	--
pH[MU]	pH Units	N/a	8.2	--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1	--	To be evaluated	To be evaluated

Eluate Analysis	**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01			< 0.1	0.5	2	25
Barium[U]	< 0.02			< 0.2	20	100	300
Cadmium[U]	< 0.0005			< 0.005	0.04	1	5
Chromium[U]	< 0.005			< 0.05	0.5	10	70
Copper[U]	< 0.01			< 0.1	2	50	100
Mercury[U]	< 0.0005			< 0.005	0.01	0.2	2
Molybdenum[U]	0.008			0.08	0.5	10	30
Nickel[U]	< 0.007			< 0.07	0.4	10	40
Lead[U]	< 0.005			< 0.05	0.5	10	50
Antimony[U]	< 0.005			< 0.05	0.06	0.7	5
Selenium[U]	< 0.005			< 0.05	0.1	0.5	7
Zinc[U]	< 0.005			< 0.05	4	50	200
Chloride[U]	3.3			33	800	15000	25000
Fluoride[U]	0.5			< 5	10	150	500
Sulphate[U]	3.7			37	1000	20000	50000
TDS	65			650	4000	60000	100000
Phenol Index	< 0.01			< 0.1	1	-	-
DOC	23.5			235	500	800	1000

Leach Test Information	
Sample Mass (kg)	0.10
Dry Matter (%)	86.1
Moisture (%)	16.2
Stage 1	
Volume Eluate L10 (litres)	0.89

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 20-05652	
Soils Ltd	
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX	
Project / Job Ref: 18372	
Order No: 18372	
Reporting Date: 04/06/2020	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 478415	WS1	None Supplied	GL - 1.00	13.9	Brown sandy clay

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

^ no sampling date provided; unable to confirm if samples are within acceptable holding times

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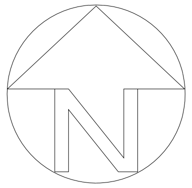
Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 20-05652
Soils Ltd
Site Reference: 15 Landor Road, Lambeth, London, SW9 9RX
Project / Job Ref: 18372
Order No: 18372
Reporting Date: 04/06/2020

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D **Dried**
AR **As Received**

Parameter	Matrix Type	Suite Reference	Expanded Uncertainity Measurement	Unit
TOC	Soil	BS EN 12457	13.49	%
Loss on Ignition	Soil	BS EN 12457	17	%
BTEX	Soil	BS EN 12457	14	%
Sum of PCBs	Soil	BS EN 12457	23	%
Mineral Oil	Soil	BS EN 12457	9	%
Total PAH	Soil	BS EN 12457	20	%
pH	Soil	BS EN 12457	0.399	Units
Acid Neutralisation Capacity	Soil	BS EN 12457	18	%
Arsenic	Leachate	BS EN 12457	16.63	%
Barium	Leachate	BS EN 12457	14.29	%
Cadmium	Leachate	BS EN 12457	14.44	%
Chromium	Leachate	BS EN 12457	18.06	%
Copper	Leachate	BS EN 12457	21.27	%
Mercury	Leachate	BS EN 12457	24.13	%
Molybdenum	Leachate	BS EN 12457	12.55	%
Nickel	Leachate	BS EN 12457	20.08	%
Lead	Leachate	BS EN 12457	13.43	%
Antimony	Leachate	BS EN 12457	18.85	%
Selenium	Leachate	BS EN 12457	18.91	%
Zinc	Leachate	BS EN 12457	13.71	%
Chloride	Leachate	BS EN 12457	16	%
Fluoride	Leachate	BS EN 12457	19.4	%
Sulphate	Leachate	BS EN 12457	19.63	%
TDS	Leachate	BS EN 12457	12	%
Phenol Index	Leachate	BS EN 12457	14	%
DOC	Leachate	BS EN 12457	10	%
Clay Content	Soil	BS 3882: 2015	15	%
Silt Content	Soil	BS 3882: 2015	14	%
Sand Content	Soil	BS 3882: 2015	13	%
Loss on Ignition	Soil	BS 3882: 2015	17	%
pH	Soil	BS 3882: 2015	0.399	Units
Carbonate	Soil	BS 3882: 2015	16	%
Total Nitrogen	Soil	BS 3882: 2015	12	%
Phosphorus (Extractable)	Soil	BS 3882: 2015	24	%
Potassium (Extractable)	Soil	BS 3882: 2015	20	%
Magnesium (Extractable)	Soil	BS 3882: 2015	26	%
Zinc	Soil	BS 3882: 2015	14.9	%
Copper	Soil	BS 3882: 2015	16	%
Nickel	Soil	BS 3882: 2015	17.7	%
Available Sodium	Soil	BS 3882: 2015	23	%
Available Calcium	Soil	BS 3882: 2015	23	%
Electrical Conductivity	Soil	BS 3882: 2015	10	%

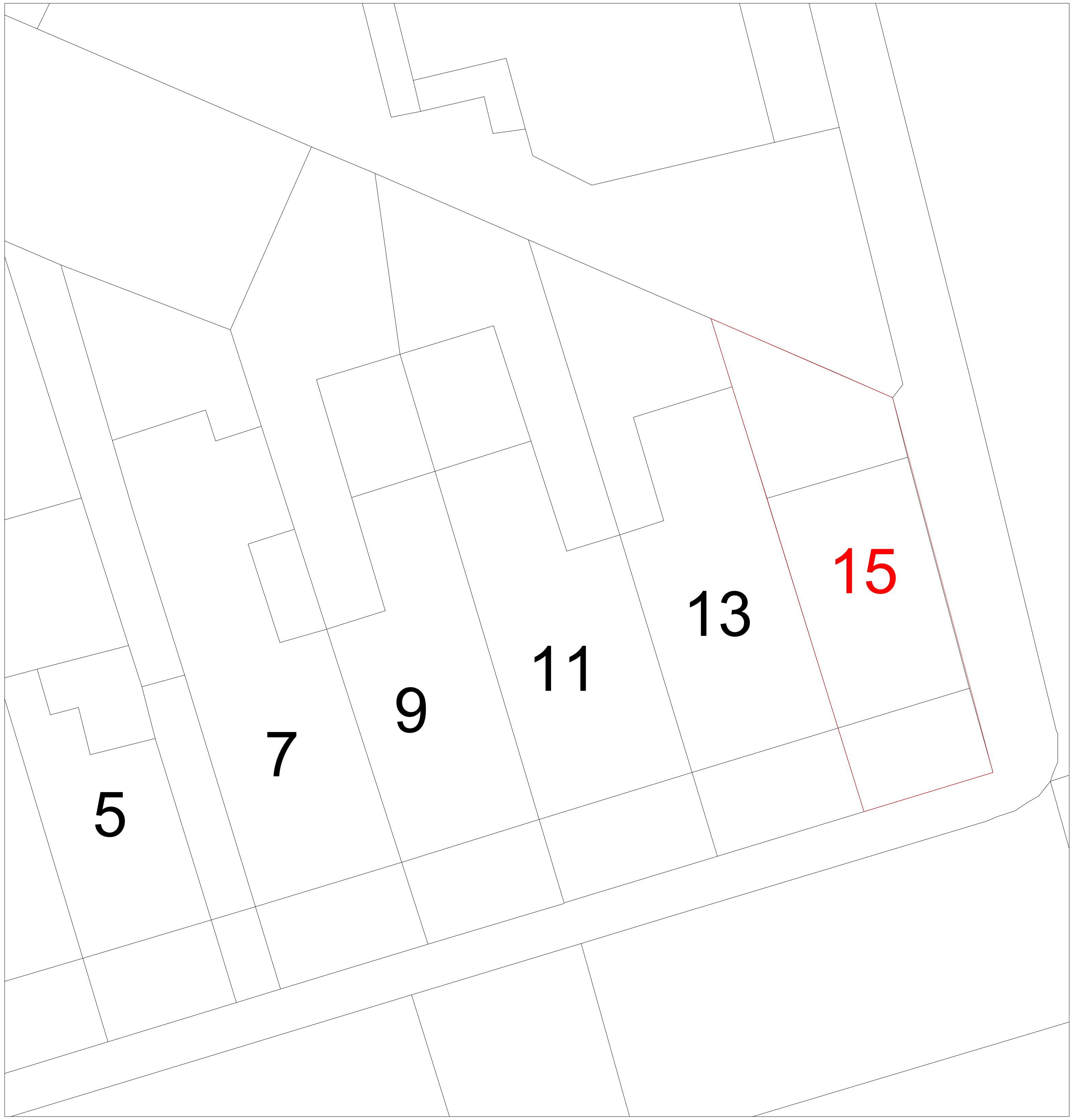
Appendix D Information Provided by the Client



Location Plan Scale 1:1250

1:1250

25m 0 25m 50m 75m 100m 125m



Site Plan Scale1:200

1:200

4m 0 4m 8m 12m 16m 20m

GENERAL NOTES:

DIMENSIONS ARE NOT TO BE SCALED FROM THIS DRAWING

ALL DIMENSIONS ARE TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF ANY WORKS, AND ANY DISCREPANCIES REPORTED IMMEDIATELY TO THE ENGINEER.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DESIGN TEAM DETAILS AND SPECIFICATIONS.

Rev.	DESCRIPTION	BY	CHKD	APPR	DATE
P1	ISSUED FOR PLANNING	WA	FM	FM	30/07/20
R1	ISSUED FOR INFORMATION	WA	FM	FM	20/03/20

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Client: Leopold Ngouoto

Project: 15 Landor Road

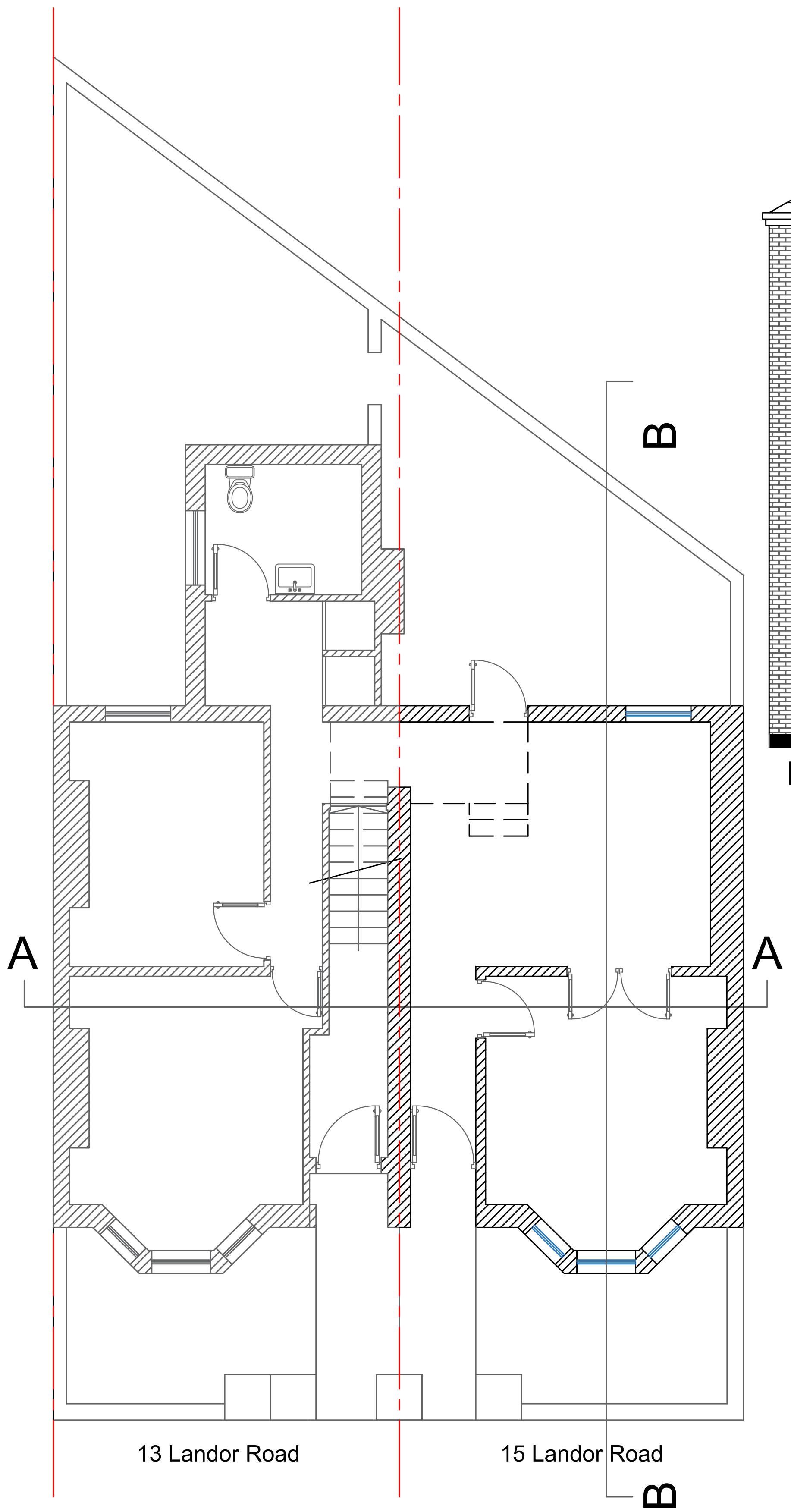
Title: Location & Site Plan

Subject: Planning

Scale:1:250,1:1250@ A3
Drawn: WA
Chkd: FM
Appr: FM

DWG-AT-020-106-01

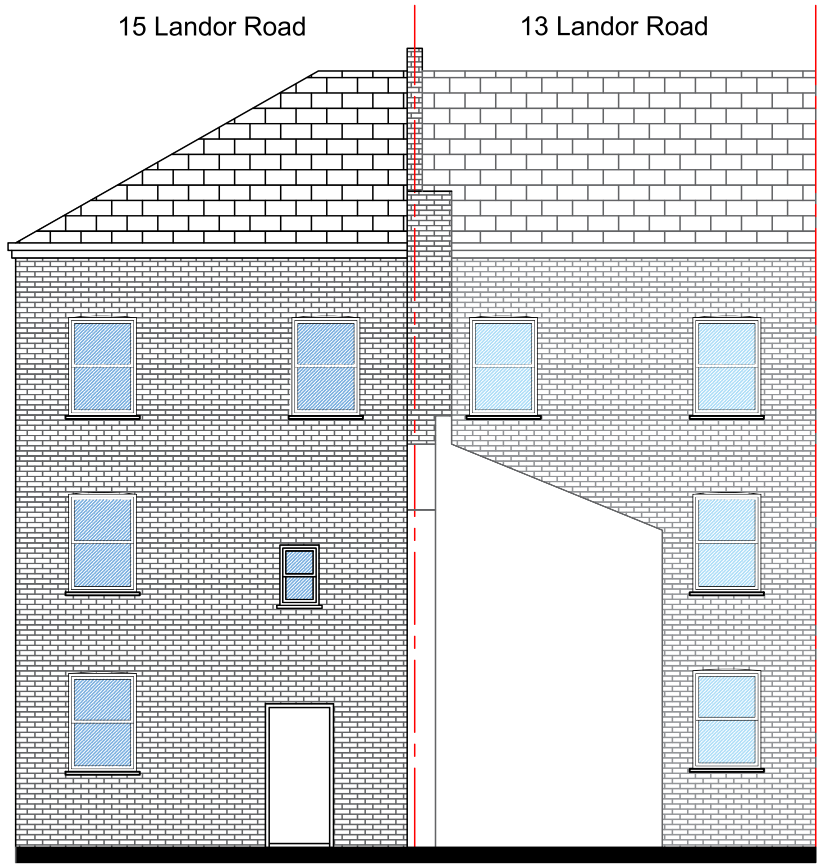
Rev. P1



Existing Ground Floor Plan

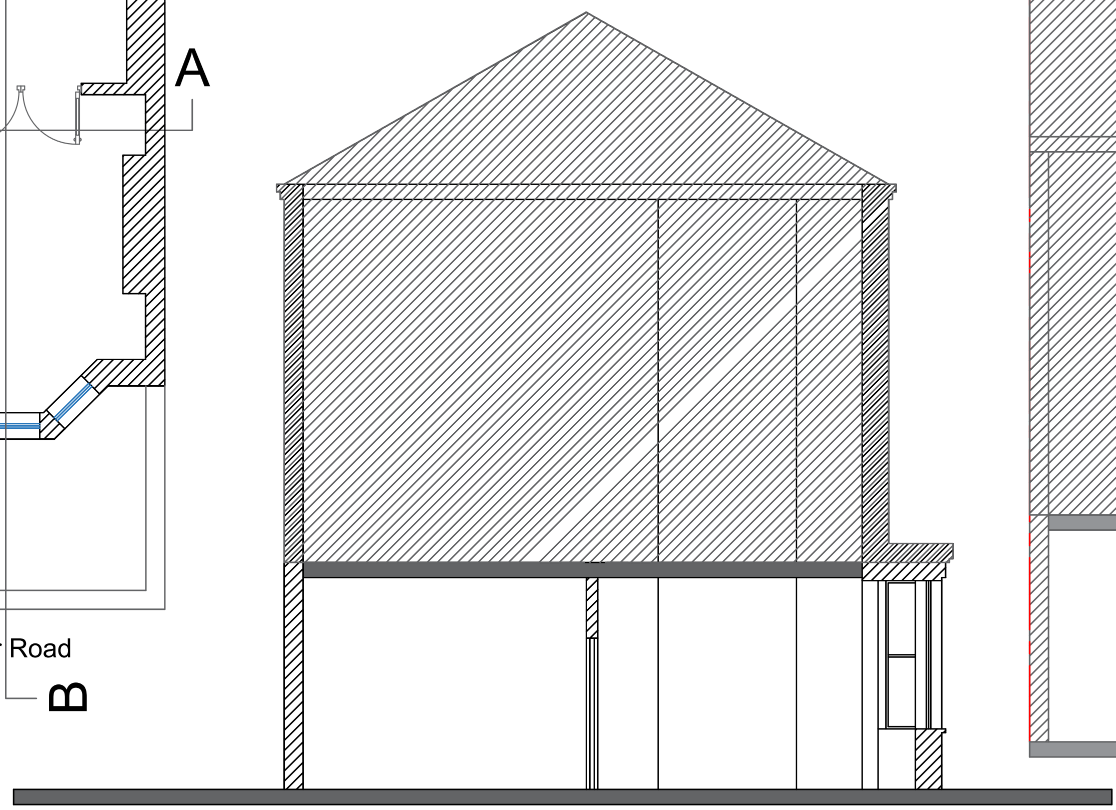
1:100

2m 0 2m 4m 6m 8m 10m

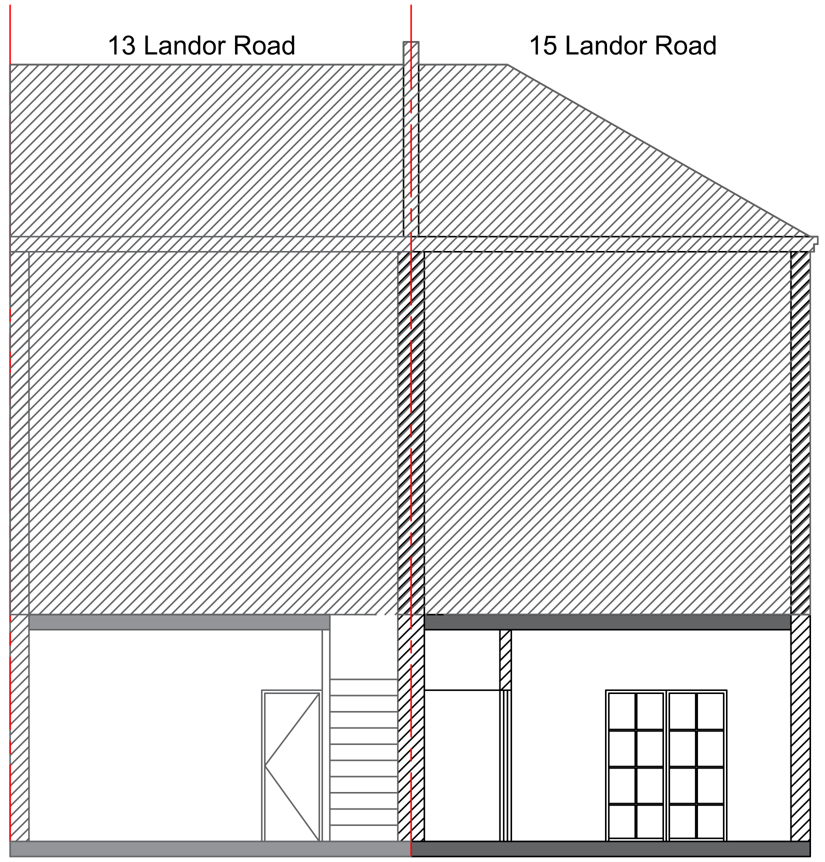


Existing Rear Elevation

Existing Front Elevation



Existing Section B-B



Existing Section A-A

GENERAL NOTES:

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THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DESIGN TEAM DETAILS AND SPECIFICATIONS.

Rev.	DESCRIPTION	BY	CHKD	APPR	DATE
P1	ISSUED FOR PLANNING	WA	FM	FM	30/07/20
R1	ISSUED FOR INFORMATION	WA	FM	FM	20/03/20

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M: +44 (0) 7733 080854

Client: Leopold Ngouoto

Project: 15 Landor Road

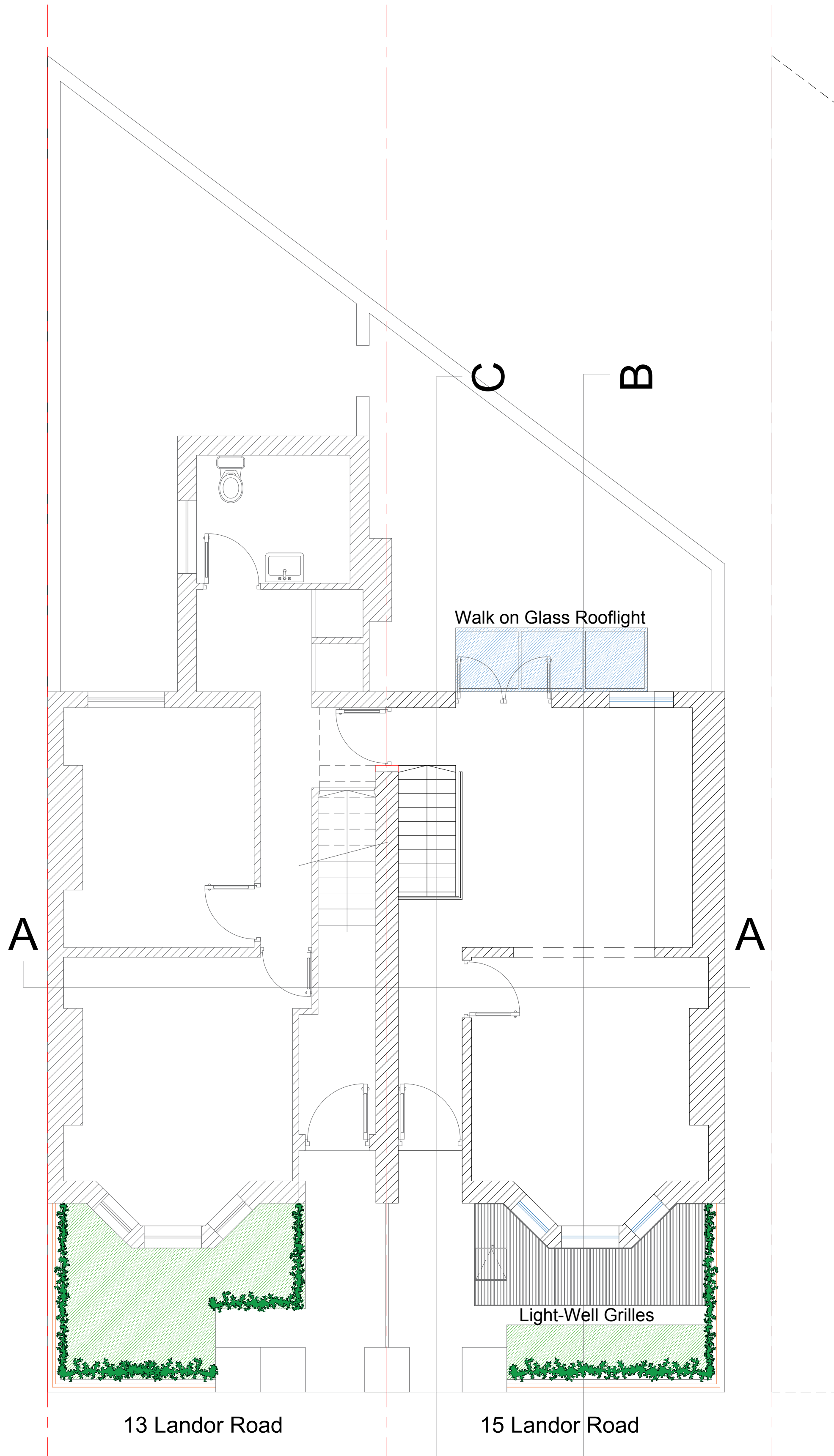
Title: Existing Plans

Subject: Planning

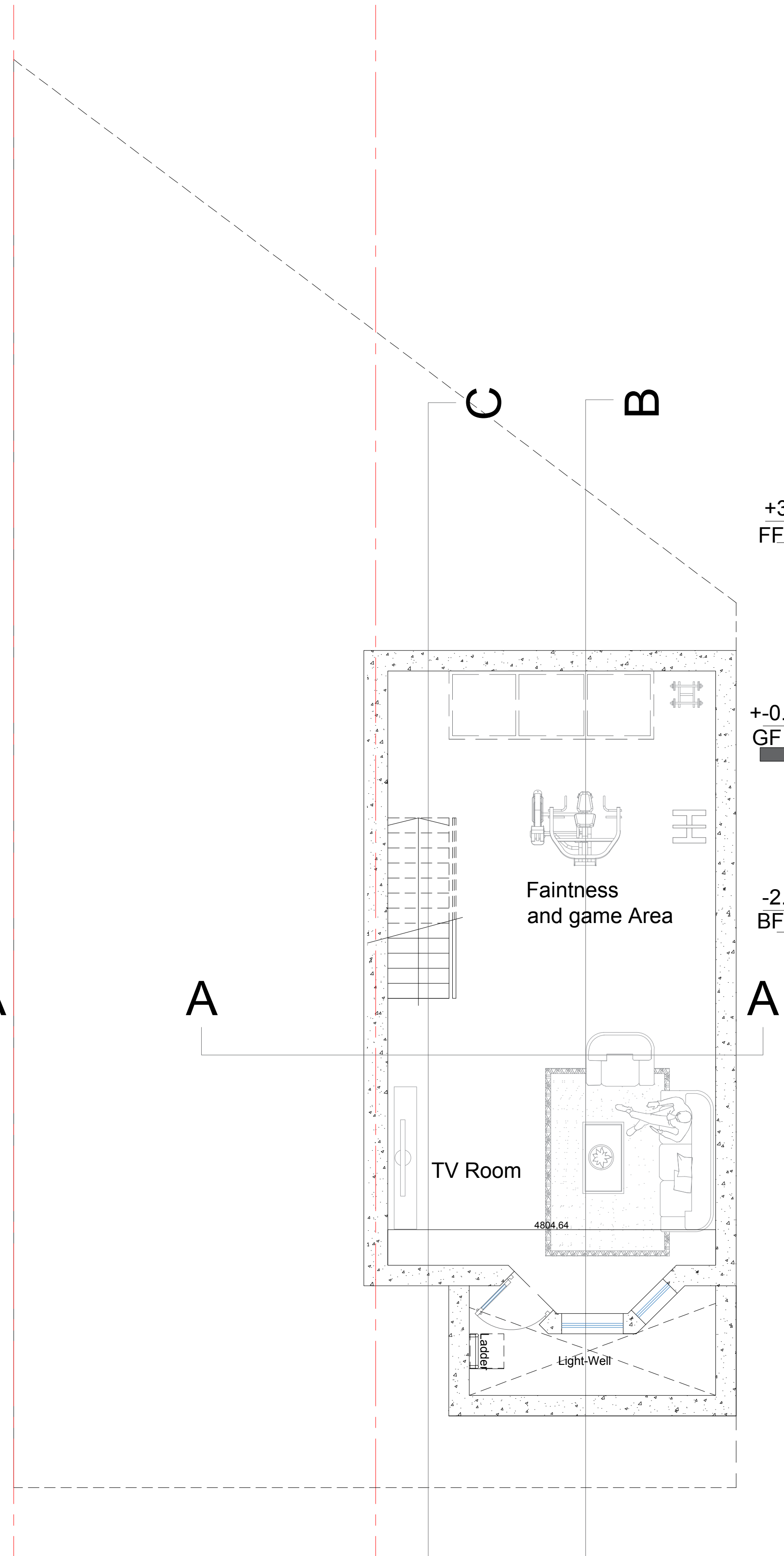
Scale: 1:100 @ A3
Drawn: WA
Chkd: FM
Appr: FM

DWG-AT-020-106-02

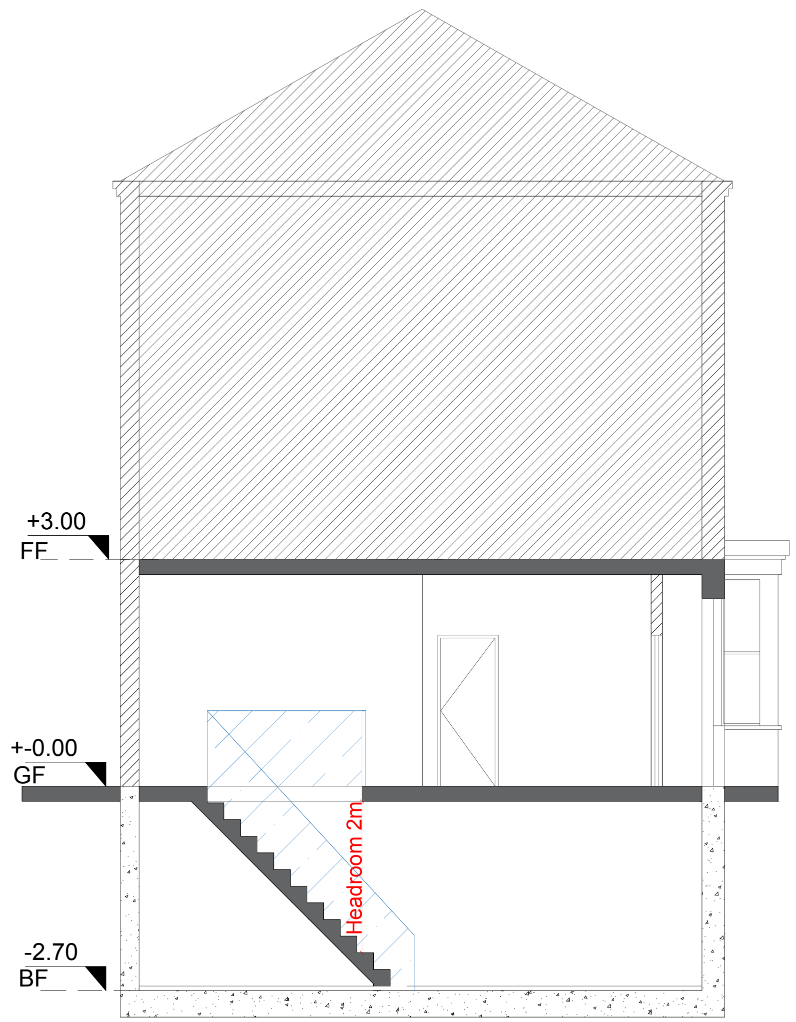
Rev. P1



Proposed Ground Floor Plan



Proposed Basement Floor Plan



Proposed Section C-C

1:100

2m 0 2m 4m 6m 8m 10m

GENERAL NOTES:

DIMENSIONS ARE NOT TO BE SCALED FROM THIS DRAWING

ALL DIMENSIONS ARE TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF ANY WORKS, AND ANY DISCREPANCIES REPORTED IMMEDIATELY TO THE ENGINEER.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DESIGN TEAM DETAILS AND SPECIFICATIONS.

Rev.	DESCRIPTION	BY	CHKD	APPR	DATE
P1	ISSUED FOR PLANNING	WA	FM	FM	30/07/20
R1	ISSUED FOR INFORMATION	WA	FM	FM	20/03/20

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Client: Leopold Ngouoto

Project: 15 Landor Road

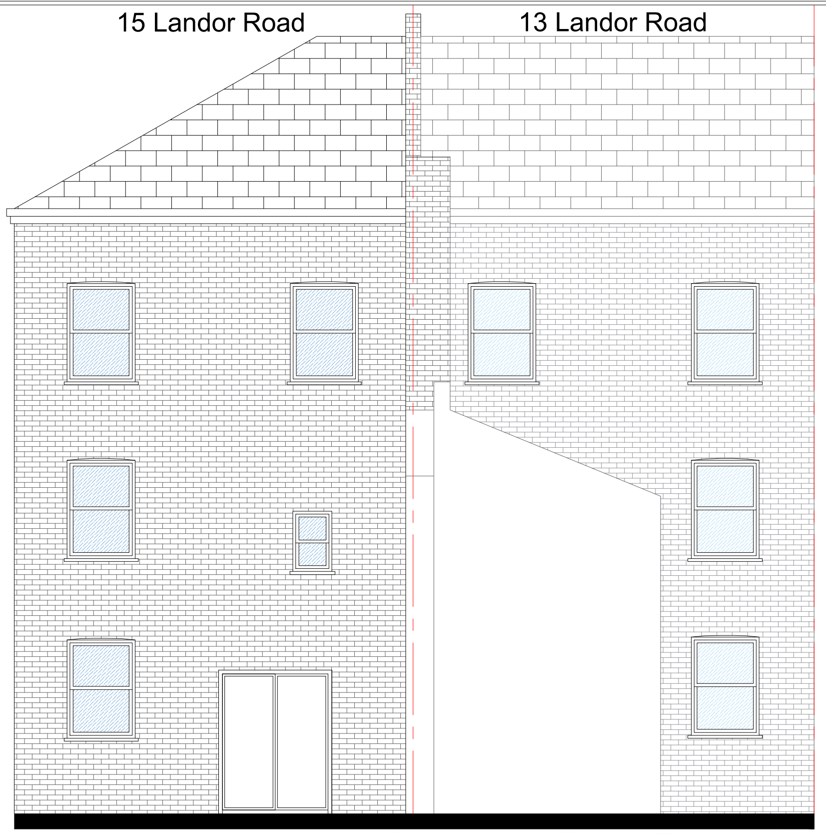
Title: Proposed Plans

Subject: Planning

Scale: 1:100 @ A3
Drawn: WA
Chkd: FM
Appr: FM

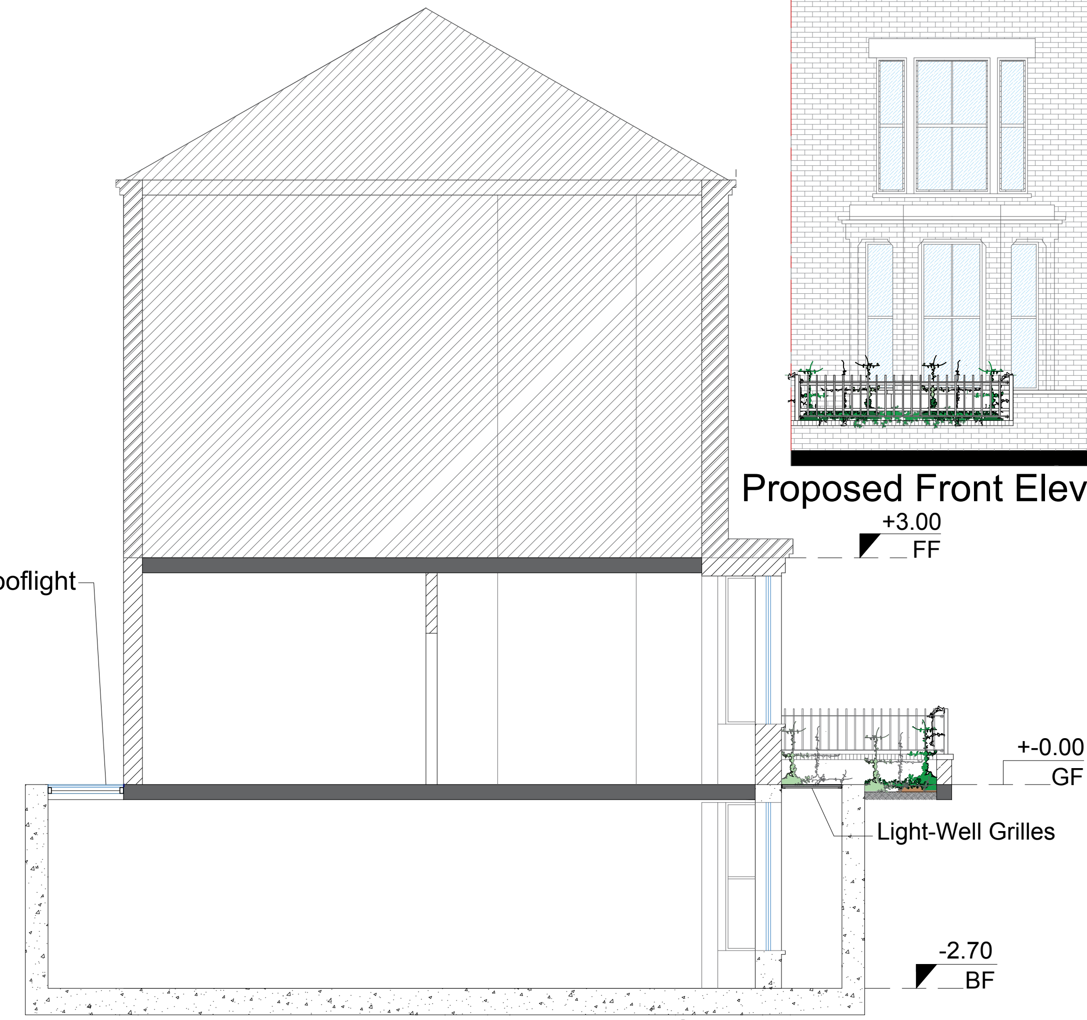
DWG-AT-020-106-03

Rev. P1

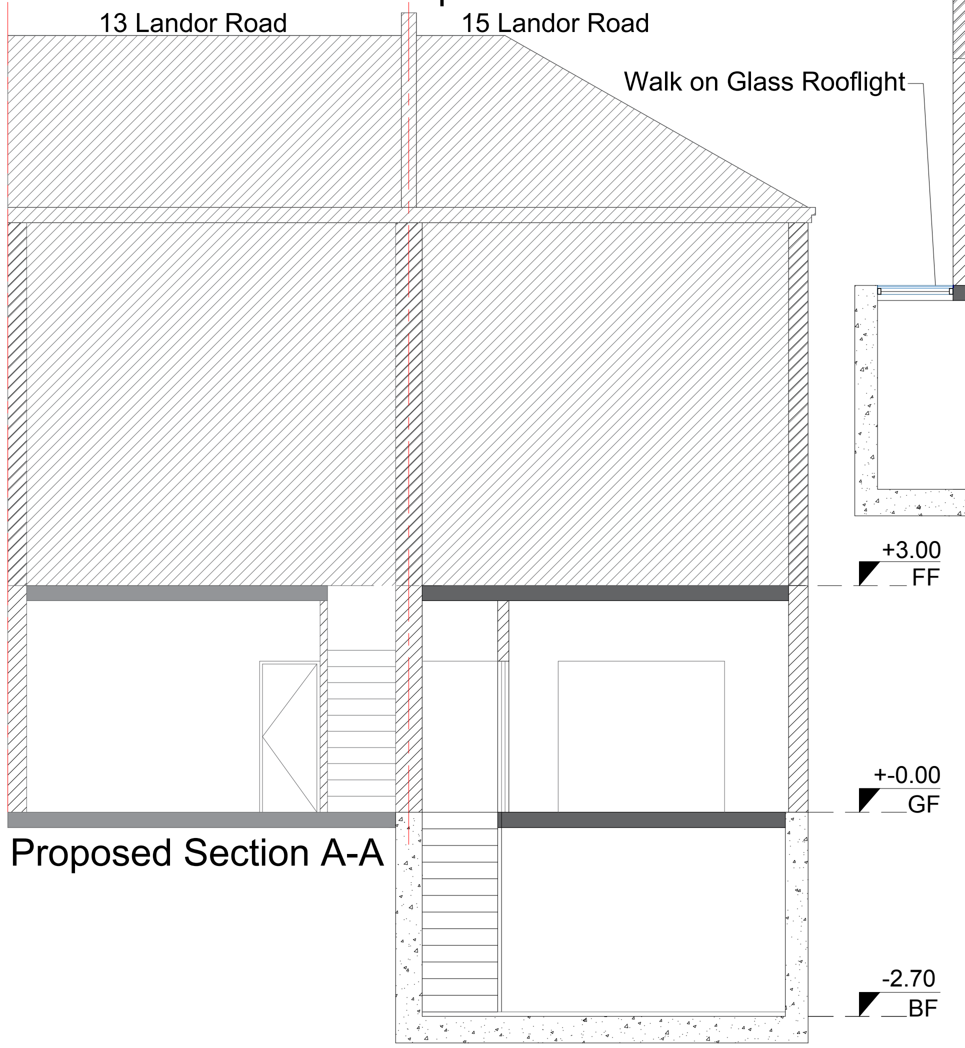


Proposed Rear Elevation

Proposed Front Elevation

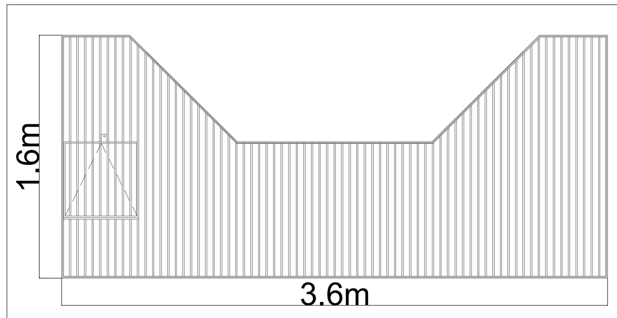


Proposed Section B-B



Proposed Section A-A

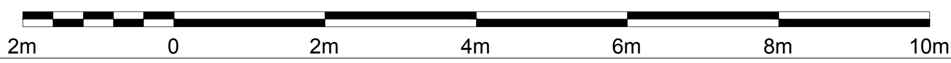
Note:
Lightwell walls, white painted rend
Windows, White UPVC.
Door, White UPVC
Metal Grills over lightwell.



lightwell grilles are made from 50 mm x 50 mm x 6 mm Galvanized steel angle frame and 25 mm x 10 mm Galvanized steel infill bars 50 mm C/C spacing , with 500x500 mm lockable access hatch and wall ladder.

Light-Well Grilles Detail- Plan
Scale 1:50

1:100



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Project: 15 Landor Road

Title: Proposed Sections and Elevations

Subject: Planning

Scale: 1:100 @ A3 Drawn: WA Chkd: FM Appr: FM	DWG-AT-020-106-04	Rev. P1

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