Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Tel: 0208 594 8134
Fax: 0208 594 8072
E-Mail: services@siteanalytical.co.uk

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons). MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Your Ref:

Our Ref: **19/31225-2**
January 2020

111 CANFIELD GARDENS

LONDON, NW6 3DY

BASEMENT IMPACT ASSESSMENT

Prepared for

Martin Redston Associates

Acting on behalf of

Mr Guy Ziser

CONTENTS

1.0 NON-TECHNICAL SUMMARY

1.1 Project Objectives

At the request of Martin Redston Associates, working on behalf of Mr Guy Ziser, a Basement Impact Assessment has been carried out at 111 Canfield Gardens, London, NW6 3DY in support of a planning application for a proposed development which includes the construction of a car lift beneath front drive. It is understood that the proposed lift is at a level of approximately 3.30mbgl.

1.2 Desk Study Findings

From historical map evidence it would appear that the site was first built on between 1871 and 1896, with minor changes taking place to the property since its construction. The surrounding area has been residential from the end of the 19th century.

1.3 Ground Conditions

The trial holes revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 1.80m in thickness resting on deposits of the London Clay formation. The Made Ground extended down to depths of between 0.65m and 1.80m. The material generally comprised a surface layer of either concrete or resin over brick rubble and concrete fragments and brown clay with brick fragments. The London Clay formation was encountered below the Made Ground and consisted of stiff clay with occasional pockets and partings of silty fine sand and scattered gypsum crystals. These deposits extended down to the full depth of investigation of 15.00m below ground level in Borehole 1. Following drilling operations, a groundwater monitoring standpipe was installed in Borehole 1 to approximately 8.00m.

Water encountered at a depth of 7.51mbgl on 4th December 2019 and 6.76mbgl on 12th December 2019. Due to the nature of the strata, it is likely the water encountered within the standpipe is from surface water infiltration.

1.4 Recommendations

A monitoring plan should be set out at design stage and should include a monitoring strategy, instrumentation and monitoring plans and action plans. Trigger levels on movements will need to be defined. Precise levelling or reflective survey targets should be installed at the garden walls and neighbouring buildings. It would be prudent to continue to monitor the standpipes for as long as possible in order to determine equilibrium level and the extent of any seasonal variations. The chosen contractor should also have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure.

The qualifications required by L. B. Camden are fulfilled as documented in Table A below. All assessors meet the qualification requirements of the council guidance.

Subject	Qualifications Required by CPG4	Relevant persons and qualifications/experience	
		Name/Qualifications	Experience
Surface flow and flooding	A hydrologist or a Civil Engineer specialising in flood risk management and surface water drainage, with either: • The 'CEng' (Chartered Engineer) qualification from the Engineering Council; or a Member of the Institution of Civil Engineers ('MICE') • The CWEM (Chartered Water and Environmental Manager) qualification from the Chartered Institution of Water and Environmental Management	Martin Redston BSc CEng MICE	40+ years' experience in geotechnics and hydrogeology.
		Mr Thomas Murray BSc(hons) MSc FGS	6+ years of hydrogeological experience
		Mr Andrew Smith BSc(Hons) MSc CGeol	10+ years of hydrogeological experience
Subterranean (ground water flow)	A hydrogeologist with the 'CGeol' (Chartered Geologist) qualification from the Geological Society of London	Mr Andrew Smith BSc(Hons) MSc CGeol	10+ years of hydrogeological experience
Land Stability	A Civil Engineer with the 'CEng (Chartered Engineer) qualification from the Engineering Council or specialising in ground engineering; or A Member of the Institution of Civil Engineers ('MICE') and a Geotechnical Specialist as defined by the Site Investigation Steering Group	Martin Redston BSc CEng MICE	40+ years' experience in geotechnics and hydrogeology.

Table A – Qualifications

2.0 INTRODUCTION

2.1 Project Objectives

At the request of Martin Redston Associates, working on behalf of Mr Guy Ziser, a Basement Impact Assessment has been carried out at the above site in support of a planning application.

The purpose of this assessment is to consider the effects of a proposed basement construction on the local slope stability, surface water and groundwater regime at the existing residential property.

The recommendations and comments given in this report are based on the information contained from the sources cited and may include information provided by the Client and other parties, including anecdotal information. It must be noted that there may be special conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

2.2 Planning Policy Context

The information contained within this BIA has been produced to meet the requirements set out by Camden Planning Guidance – Basements and Lightwells (CPG4) including Camden Development Policies DP27 – Basements and Lightwells (Ref. 1) in order to assist London Borough of Camden with their decision making process.

As recommended by the Guidance for Subterranean Development (Ref. 1) the BIA comprises the following steps

1. **Initial screening** to identify where there are matters of concern

2. **Scoping** to further define the matters of concern

3. **Site Investigation and study** to establish baseline conditions

4. **Impact Assessment** to determine the impact of the basement on baseline conditions

5. **Review and Decision Making** (to be undertaken by LBC)

3.0 SITE DETAILS

(National Grid Reference: TQ-257843)

3.1 Site Location

111 Canfield Gardens is a residential property, located on the southern side of Canfield Gardens, South Hampstead at approximate postcode NW6 3DY. The residential dwelling has five levels of accommodation; basement, ground floor, first floor, second floor, third floor and fourth floor loft conversion. The site covers an approximate area of 0.07 Hectares with the general area being under the authority of the London Borough of Camden.

The site is located on the southern side of Canfield Gardens with residential properties to the south, east and west with a roadway to the north.

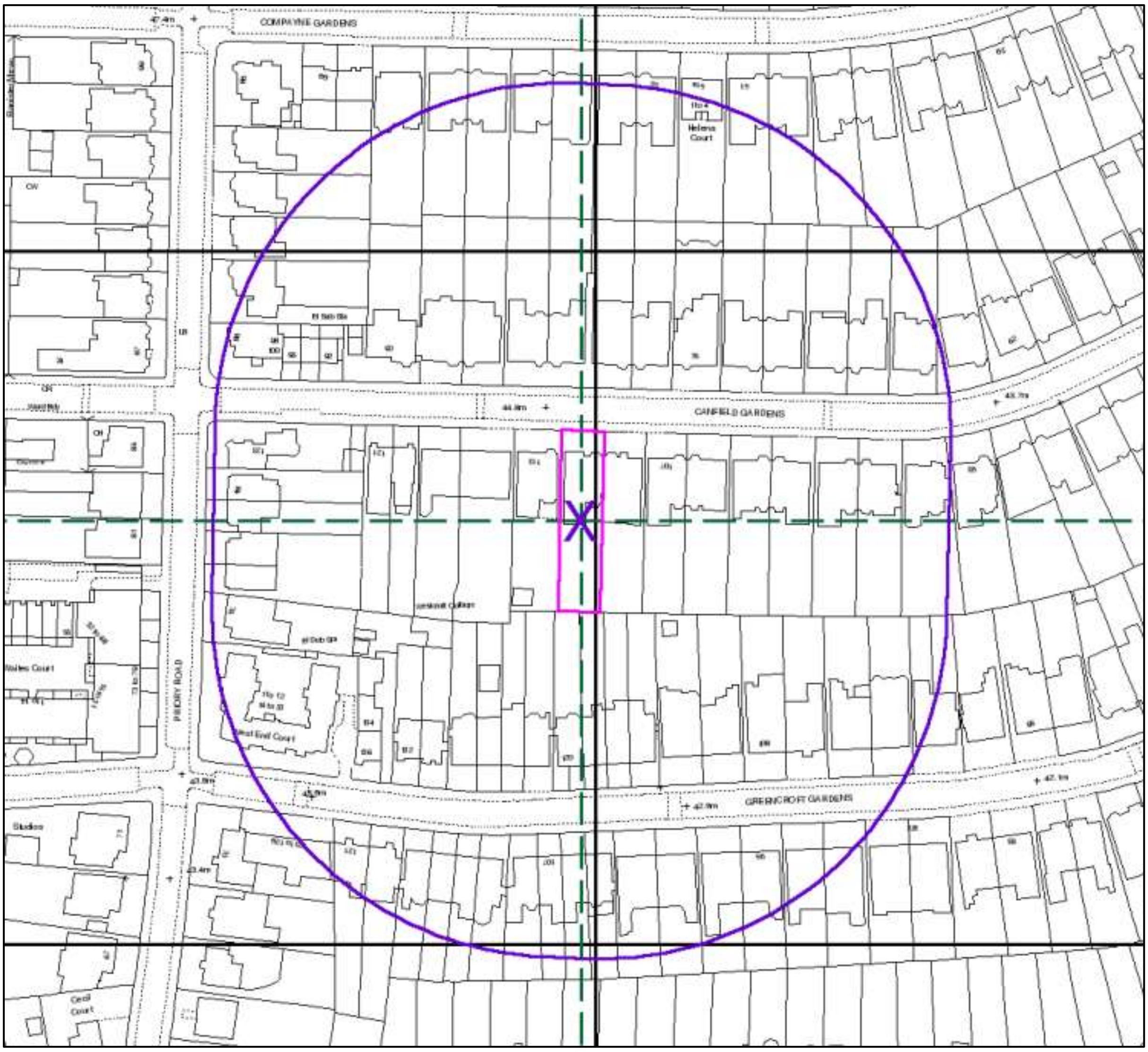


Figure 1. Site Location Plan

3.2 Site Layout and History

The site is accessed from Canfield Gardens located to the north and comprises of a three storey residential property, with existing basement level beneath the property, as well as front driveway and rear garden areas.

The property is bound by Canfield Road to the north, with residential properties with residential properties to the east, south and west.

The property contains a concrete paving finish in front of the property where as the rear of the property contains a rear porch area followed by a soft landscaped lawn.

The front of the property contains four large trees. Vegetation is present around the perimeter fence of the rear garden and comprises small to large trees and bushes.

With reference to available spot height data from Ordnance Survey (OS) mapping, an assumed ground level of approximately 44.8m AOD is anticipated at the site. The site topography is flat.

The site slopes very gently to the south-west. The slope angle is less than 7 degrees. Also with reference to the Camden Geological, Hydrogeological and Hydrological Study, (Figure 2 below), the neighbouring properties also have slopes less than 7 degrees.

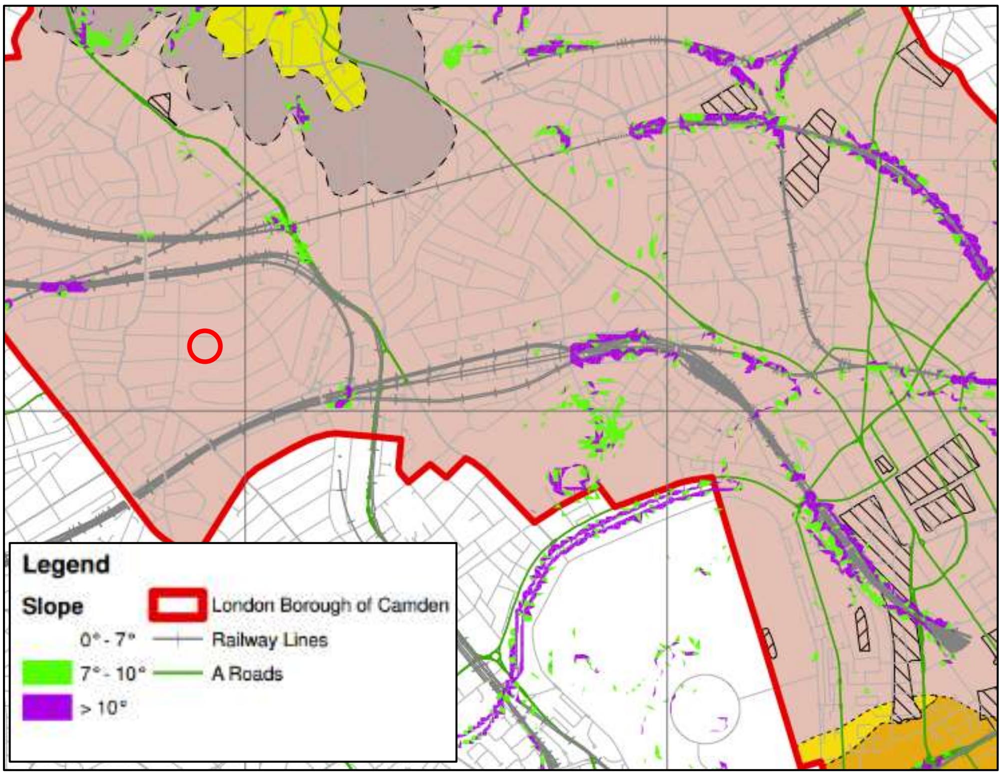


Figure 2. Exact from Figure 16 of the Camden CPG4 showing slope angles within the borough

From historical map evidence it would appear that the site was first built on between 1871 and 1896, with minor changes taking place to the property since its construction. The surrounding area has been residential from the end of the 19th century.

3.3 Previous Reports

A Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 19/31225) and Site Investigation (SAS Report Ref: 19/31225-1) were undertaken across the site by Site Analytical Services Limited and reported in January 2020 and the results are discussed in this BIA.

3.4 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain the London Clay Formation at depth.

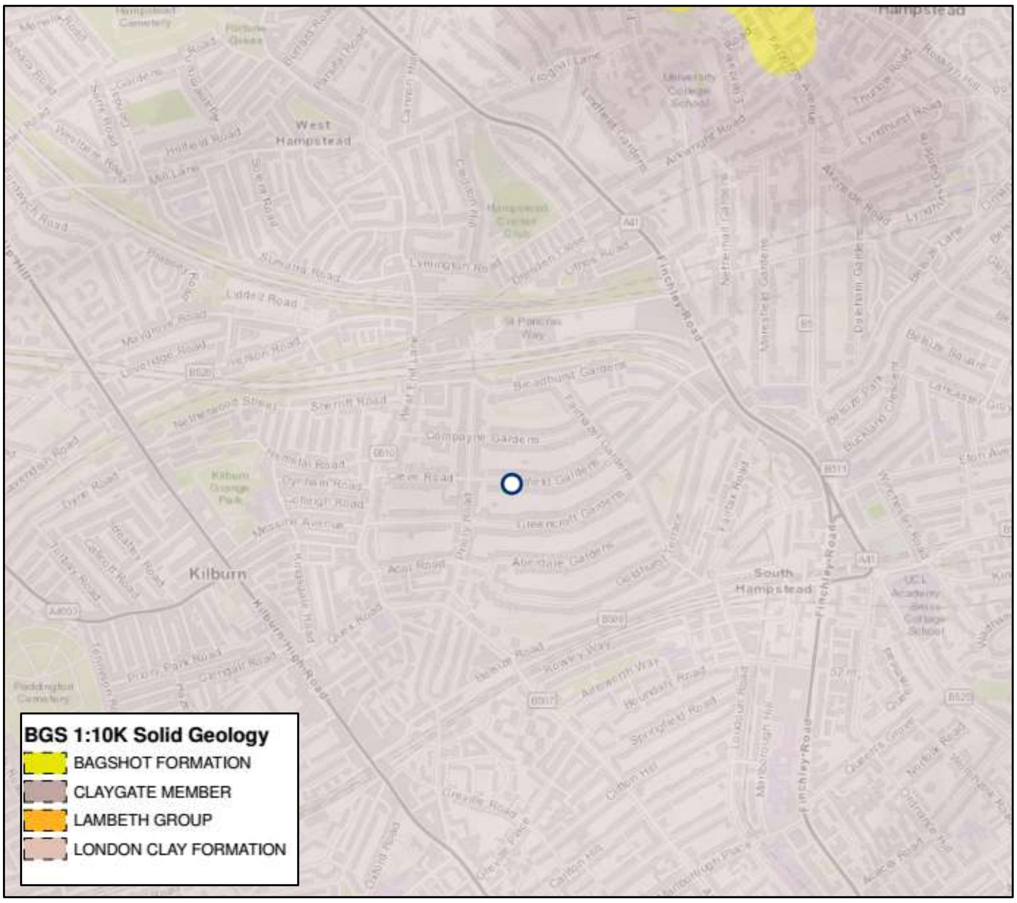


Figure 4. Geology of the Site (Ref. BGS Geoindex)

The British Geological Survey maintains an archive of historical exploratory borehole logs throughout the UK. SAS Limited has searched the database and has found 9 boreholes located within 250m of the site. The closest is located 200m south-west of the site and indicates the area to be surfaced by 1.25m of Made Ground over the London Clay Formation to the maximum depth of excavation at 10.00m.

3.5 Hydrology and drainage

3.5.1 Surface Water

According to Mayes (1997) rainfall in the local area averages around 610mm and significantly less than the national average of around 900mm.

Evapotranspiration is typically 450mm/year resulting in about 160mm/year as 'hydrologically effective' rainfall which is available to infiltrate into the ground or run-off as surface water flow.

With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located approximately within close proximity to the site (Figure 5).

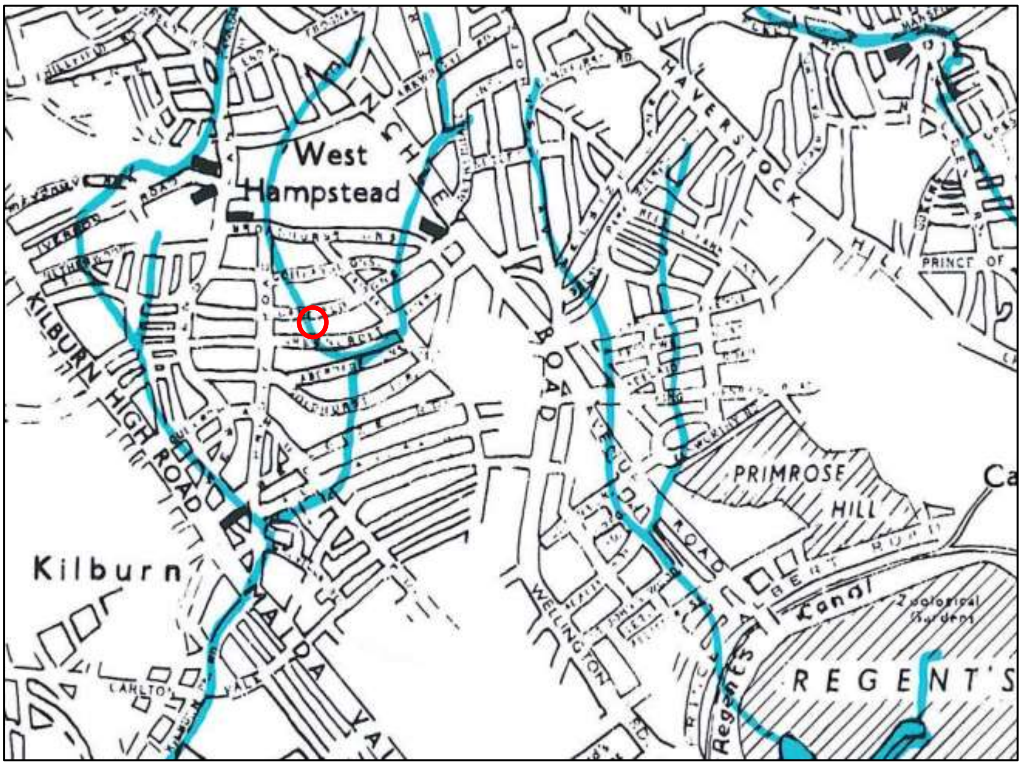


Figure 5. Location of site (circled) relative to the 'Lost Rivers' of London (Source: Barton, 1992)

The River Westbourne flowed in a southerly direction from West Hampstead. From the tributaries it flowed southwards towards Kilburn, across Bayswater Road and into Hyde Park, where it entered the Serpentine. From the Serpentine it flowed southwards under Knightsbridge before entering the River Thames within the grounds of Chelsea Hospital.

The watercourses have since been largely lost through a culverting system as the urban extent of the borough has grown over time.

Envirocheck data noted the closest surface water feature is located 967m east of the site.

The area located immediately around the site is highly developed with more than 80% of the surface covered with hardstanding. Most of the rainfall in the area will run-off hard surface areas and be collected by the local sewer network.

Surface drainage from the site is assumed to be directed to drains flowing downhill to the south-west along Canfield Road.

Further investigation into the 'lost river' using Ordnance survey maps taken from the Desk Top Study (Figure 6) indicate a small drainage ditch running between two field boundaries (1871) which is the only indication of a water source for the River Westbourne approximately 200m east of the site and a small pond 110m west. By 1896 this ditch/stream and pond have either been culverted and running beneath the roads, or has been removed as it is no longer needed.

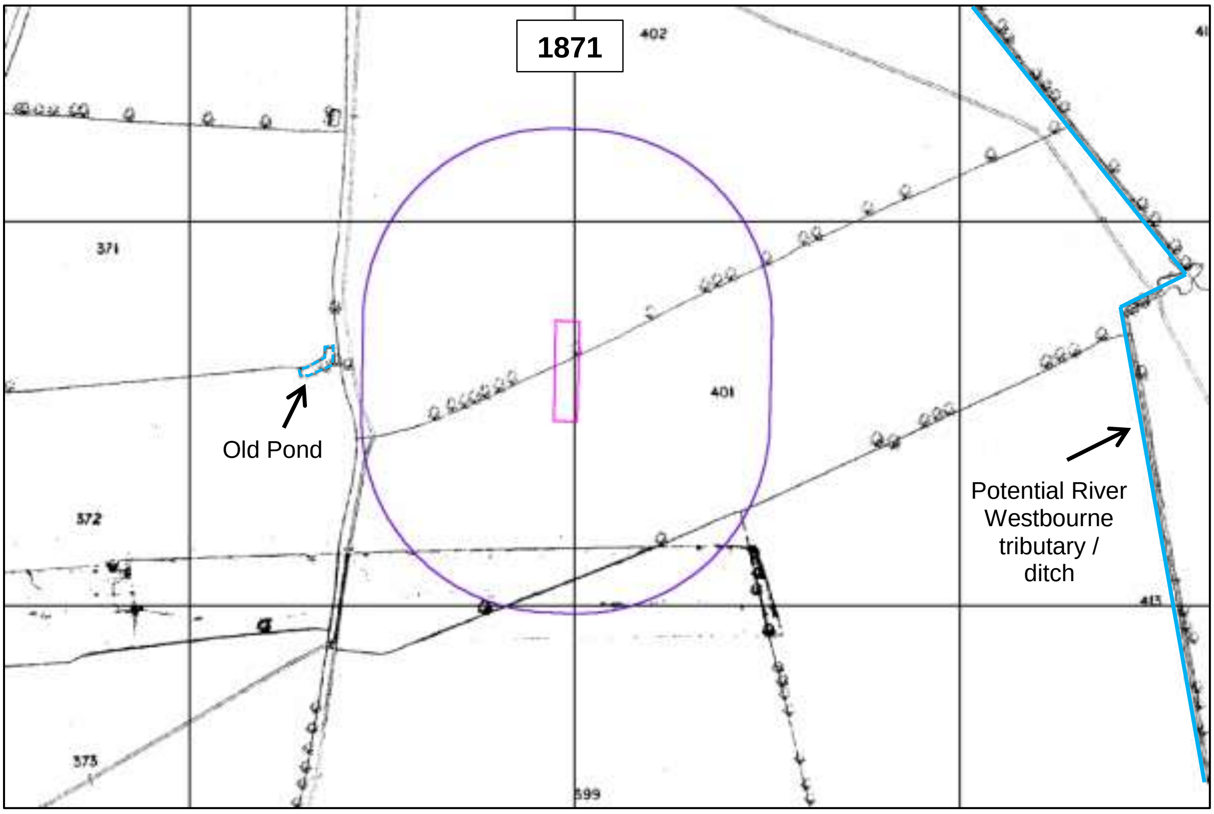


Figure 6a. Location of site from Ordnance Survey Maps (1871)

Figure 6b. Location of site from Ordnance Survey Maps (1896)

Due to the small size of the ditch, any possible flooding that may have occurred is unlikely to have caused anything but very thin layers of Alluvium, but is unlikely to extend as far as No. 111 as such there is no influence on-site.

3.5.2 Flood Risk

3.5.2.1 River or Tidal flooding

According to Environment Agency Flood maps there are no flood risk zones within 1 kilometre of the site. The EA's website also shows that this area does not fall within an area at risk of flooding from reservoirs. Based on this information a flood risk assessment will not be required.

3.5.2.2 Surface water flooding

Figure 7 shows that Canfield Gardens flooded during the 2002 event, but not in the 1975 flood event.

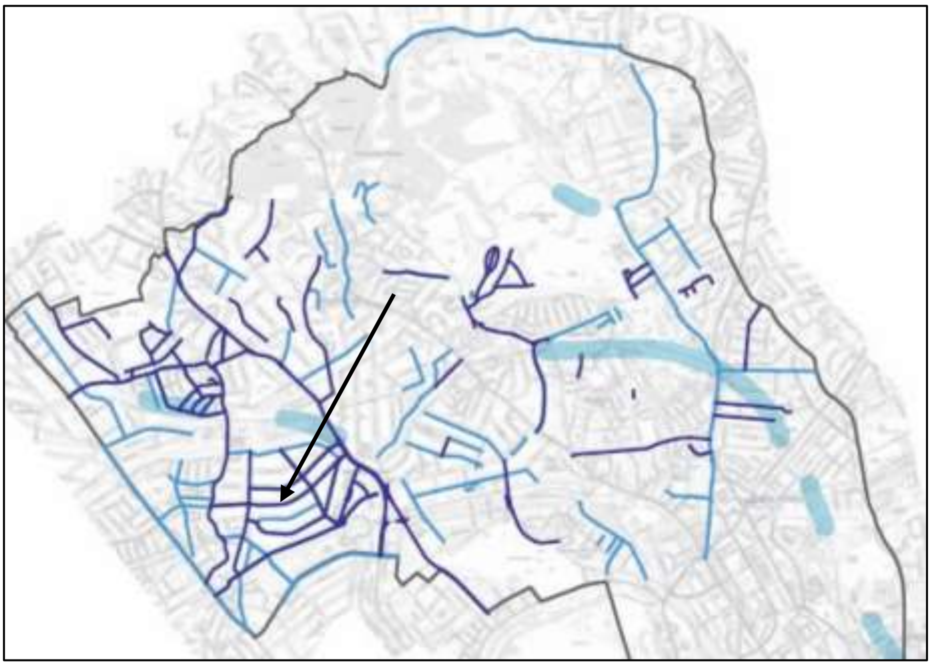


Figure 7. Exact from Figure 15 of the Camden CPG4 showing roads which flooded in 1975 (light blue), in 2002 (dark blue) and 'areas with potential to be at risk from surface water flooding' (wide light blue bands)

Further modelling of surface water flooding has been undertaken by the Environment Agency and was published on its website in January 2014; an extract from their model is presented in Figure 7. Whilst this map identifies four levels of risk (high, medium, low and very low) it is understood that it is based at least in part on depths of flooding. This modelling shows a 'Very Low' risk of flooding (the lowest category for the national background level of risk) for No.111 and the surrounding area. However, the site is within the Goldhurst Local Flood Risk Zone.

A Flood Risk Assessment has not been completed for the site; however the following is taken into consideration when assessing the site:

The site is considered to lie within Flood Zone 1 as confirmed by the Environment Agency and local authority data.

The site is currently a residential development, in accordance with Table 2 of (PPG2014, Planning Practice Guidance 2014) its current use is classed as being 'More Vulnerable' in terms of flood risk vulnerability. The proposed residential use of the site, in accordance with Table 2 (PPG 2014, Planning Practice Guidance 2014) is classed as being 'More Vulnerable' in terms of flood risk vulnerability.

In accordance with Table 3 (PPG 2014, Planning Practice Guidance 2014) a 'More Vulnerable' development located in Flood Zone 1 is an appropriate development, therefore the full Sequential or Exception Test would not be required as part of a planning application for this development.

As the impermeable ground within the area of the proposed development is to be decreased as part of this scheme, the risk of flooding will be lower than in its current state as there will be more pathways for any water to drain through.

3.5.2.3 Sewer flooding

The London Regional Flood Risk Appraisal (2009) advises that foul sewer flooding is most likely to occur where properties are connected to the sewer system at a level below the hydraulic level of the sewage flow, which in general are often basement flats or premises in low lying areas. There is no record of sewer flooding having occurred at 111 Canfield Gardens and therefore the risk of sewer flooding is considered low.

3.6 Hydrogeological setting

The Environment Agency Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) and also their role in supporting surface water flows and wetland ecosystems.

The Bedrock geology underlying the site (London Clay) has been classified as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Other hydrogeological data obtained from the Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 19/31255) for the site include:

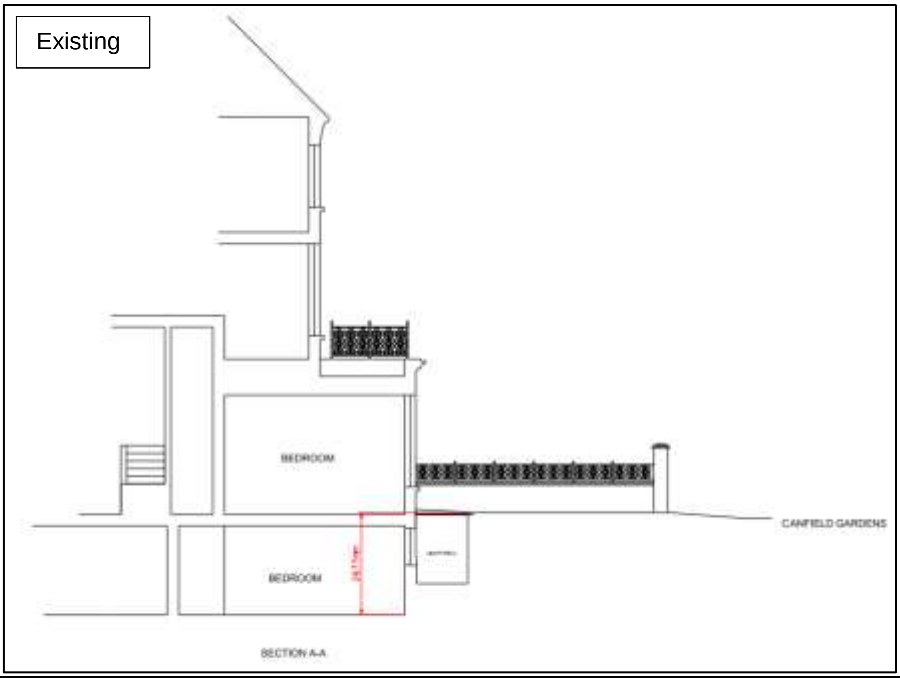
- The underlying soil classification of the site is of high leaching potential.
- A Zone II (Outer Protection Zone) Groundwater Source Protection Zone is evident 781m east of the site.
- There are 4 non-potable water abstraction licences within 1 kilometre of the site. All four are located 950m east of the site and relates to municipal ground use including spray irrigation and general washing from groundwater. The permitted start date for these abstractions is the 5th December 2013.

3.7 Proposed Development

It is proposed construct a car lift system down to the depth of the existing basement and converting part of this basement into a garage.

It is understood that the proposed lift is at a level of approximately 3.30mbgl.

Sections showing the proposed developments are detailed in Figure 8 below.



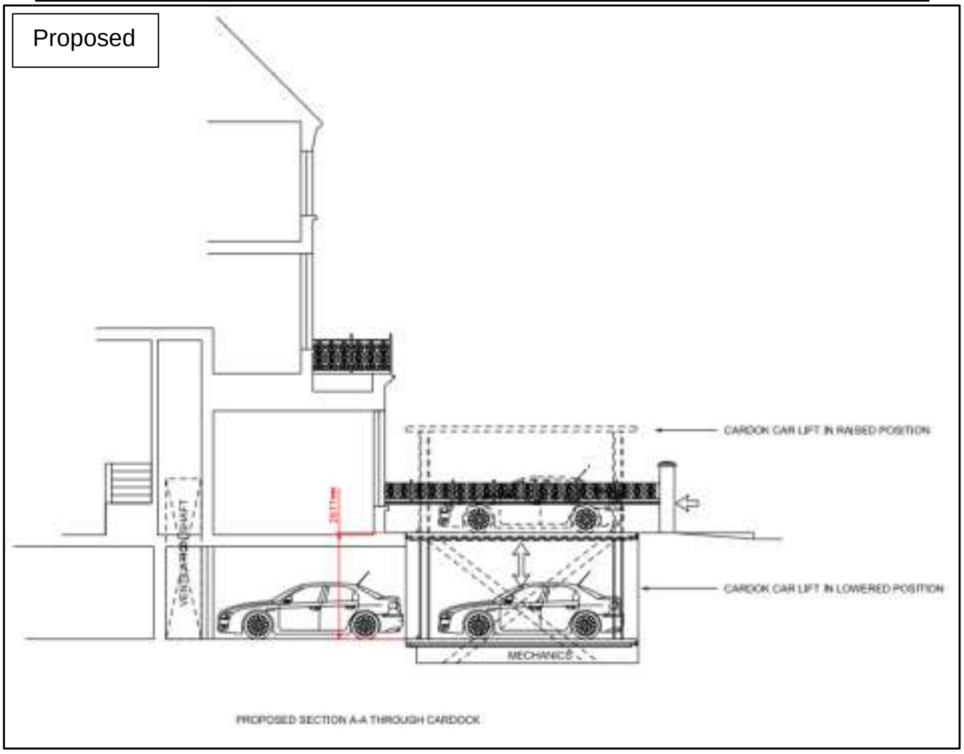


Figure 8. Sections of the existing and proposed elevations

3.8 Results of Basement Impact Assessment Screening

A screening process has been undertaken for the site and the results are summarised in Table 1 below:

Table 1: Summary of screening results

Item	Description	Response	Comment
Sub-terranean (Ground water Flow)	1a. Is the site located directly above an aquifer.	No	The site has been classified as being situated above an unproductive (negligibly permeable) formation (London Clay) that is generally regarded as containing insignificant quantities of groundwater.
	1b. Will the proposed basement extend beneath the water table surface?	Unknown – to be confirmed by Ground Investigation	Given the presence of a non-aquifer below the site it is unlikely that groundwater will be encountered during any excavations for the proposed basement, however this will be confirmed by the ground investigation.
	2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line.	No	Envirocheck data noted the closest surface water feature is located 967m east of the site. With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located within close proximity to the site (Figure 5), however, the oldest Ordnance Survey map available from 1971 (Figure 6) indicate that the closest potential tributary is not within 100m of the site. From the British Geological Society 'Geoindex' the nearest water well is located approximately 1.0 km east of the site.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas.	No	The amount of hardstanding on-site will not be changed.
	4. As part of 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	Existing drainage paths are to be utilised where possible. Whether soakaways/SUDS are used on the proposed development is to be confirmed (beyond the scope of this report). An appropriately qualified engineer should be engaged to ensure mandatory requirements are met.

	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	Envirocheck data noted the closest surface water feature is located 967m east of the site. With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located within close proximity to the site (Figure 5), however, the oldest Ordnance Survey map available from 1971 (Figure 6) indicate that the closest potential tributary is not within 100m of the site. From the British Geological Society 'Geoindex' the nearest water well is located approximately 1.0 km east of the site.
Slope Stability	1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8).	No	There is a very slight slope from north to south across the site, but is below 7 degrees.
	2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8).	No	Re-profiling of landscaping at the site is not proposed.
	3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8).	No	The surrounding area drops to the south-east, but from survey information and with reference to Figure 16 from Camden CPG 4, this is at angles of less than 7 degrees.
	4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately 1 in 8).	No	There is a general slope in the area towards the south down to the south-east, but this is at an angle of less than 7 degrees.
	5. Is the London Clay the shallowest strata at the site.	Yes	With reference to available BGS records, the London Clay formation is expected to be encountered from ground level.
	6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained.	No	No trees are to be felled as part of the development.
	7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	Yes	The site lies above the London Clay formation well known as having a high tendency to shrink and swell.

	8. Is the site within 100m of a watercourse or a potential spring line.	No	Envirocheck data noted the closest surface water feature is located 967m east of the site. With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located within close proximity to the site (Figure 5), however, the oldest Ordnance Survey map available from 1971 (Figure 6) indicate that the closest potential tributary is not within 100m of the site.
	9. Is the site within an area of previously worked ground.	No	According to records from the BGS the site is not in the vicinity of any recorded areas of worked ground.
	10. Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction.	No	The site has been classified as being situated above an unproductive (negligibly permeable) formation (London Clay) that is generally regarded as containing insignificant quantities of groundwater.
	11. Is the site within 50m of the Hampstead Heath Ponds	No	With reference to the Camden Geological, Hydrogeological and Hydrological Study, the site is not within the catchment of the pond chains on Hampstead, nor the Golder's Hill Chain.
	12. Is the site within 5m of a highway or pedestrian right of way.	Yes	The site lies within 5m of Canfield Gardens.
	13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	No	The proposed development will not be increasing the depths of foundations, as there is already an existing basement on site and the car lift will not be going deeper.
	14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines.	No	A full statutory service search has not been completed as part of this investigation.
Surface Water and Flooding	1. Is the site within the catchment of the ponds chains on Hampstead Heath	No	With reference to the Camden Geological, Hydrogeological and Hydrological Study, the site is not within the catchment of the pond chains on Hampstead, nor the Golder's Hill Chain.

	2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route.	No	The proportion of hard-surface / paved areas will be the same; however a higher proportion will be permeable.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	No	The proportion of hard-surface / paved areas will be the same; however a higher proportion will be permeable.
	4. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses.	No	All surface water for the site will be contained within the site boundaries and collected as described above; hence there will be no change from the development on the quantity or quality of surface water being received by adjoining sites.
	5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses.	No	The surface water quality will not be affected by the development, as in the permanent condition collected surface water will be generally be from roofs, domestic hard landscaping or collected from beneath the landscaping layer over the basement.
	6. Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature	Yes	Canfield Gardens flooded during the 2002 flood event. According to modelling by the Environment Agency, there is a 'Very Low' risk of surface water flooding (the lowest category for the national background level of risk) for No.111 and the surrounding area however the site is classified as being within the Goldhurst Local Flood risk Zone.

3.9 Non-Technical Summary of Chapter 3.0

111 Canfield Gardens is a residential property, located on the southern side of Canfield Gardens, South Hampstead at approximate postcode NW6 3DY. The residential dwelling has five levels of accommodation; basement, ground floor, first floor, second floor and third floor loft conversion. The site covers an approximate area of 0.07 Hectares with the general area being under the authority of the London Borough of Camden.

The property is constructed on a relatively flat topography with no noticeable slope.

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain the London Clay Formation at depth.

Envirocheck data noted the closest surface water feature is located 967m east of the site.

With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the 'lost rivers' River Westbourne was located approximately within close proximity to the site (Figure 5).

Further investigation into the 'lost river' using Ordnance survey maps taken from the Desk Top Study (Figure 6) indicate a small drainage ditch running between two field boundaries (1871) which is the only indication of a water source for the River Westbourne approximately 200m east of the site and a small pond 110m west. By 1896 this ditch/stream and pond have either been culverted and running beneath the roads, or has been removed as it is no longer needed.

According to Environment Agency Flood maps there are no flood risk zones within 1 kilometre of the site. The EA's website also shows that this area does not fall within an area at risk of flooding from reservoirs.

Figure 7 shows that Canfield Gardens flooded during the 2002 event, but not in the 1975 flood event. Further modelling of surface water flooding has been undertaken by the Environment Agency and was published on its website in January 2014; an extract from their model is presented in Figure 7. Whilst this map identifies four levels of risk (high, medium, low and very low) it is understood that it is based at least in part on depths of flooding. This modelling shows a 'Very Low' risk of flooding (the lowest category for the national background level of risk) for No.111 and the surrounding area. However, the site is within the Goldhurst Local Flood Risk Zone.

The Screening Exercise has identified the following potential issues which will be carried forward to the Scoping Phase

Subterranean Groundwater Flow

- Will the proposed basement extend beneath the water table surface?

Slope Stability

- Is the London Clay the shallowest strata at the site?
- Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?
- Is the site within 5m of a highway or pedestrian right of way?

Surface Water and Flooding

- Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?

4.0 SCOPING PHASE

4.1 Introduction

This purpose of the scoping phase is to assess in more detail the factors to be investigated in the impact assessment. Potential impacts are assessed for each of the identified impact factors and recommendations are stated.

A conceptual ground model is usually complied at the scoping stage however, because the ground investigation has already been undertaken for this project, the conceptual ground model including the findings of the ground investigation is described under Chapter 4.

Subterranean (Groundwater Flow)

Potential Issue (Screening Question)		Potential impacts and actions
1	Will the proposed basement extend beneath the water table surface?	**Potential impact:** Local restriction of groundwater flows (perched groundwater or below groundwater table). **Action:** Ground investigation required, then review.

Slope Stability

3	Is the London Clay the shallowest strata at the site?	**Potential impact:** The London Clay is prone to seasonal shrink-swell (subsidence and heave). **Action:** Ground investigation required, then review.
4	Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	**Potential Impact:** Ground movements will occur during and after the basement construction. **Action:** Ground investigation required, then review.
5	Is the site within 5m of a highway or a pedestrian right of way?	**Potential impact:** Excavation of basement causes loss of support to footway/highway and damage to the services beneath them. **Action:** Ensure adequate temporary and permanent support by use of best practice working methods.

Surface Water and Flooding

Potential Issue (Screening Question)		Potential impacts and actions
8	Is the site in an area known to be at risk from surface water flooding?	**Potential impact**: Flooding occurs during the excavation of the basement **Action**: A flood risk assessment should be carried out to assess whether a groundwater exception test should be carried out prior to any construction works.

These potential impacts have been further assessed through the ground investigation, as detailed in Section 4 below.

4.2 Non-Technical Summary of Chapter 4.0

The scoping exercise has reviewed the potential impacts for each of the items carried forward from Stage 1 screening, and has identified the following actions to be undertaken:

- A ground investigation is required (which has already been undertaken).
- Review of site's hydrogeology and groundwater control requirements.

All these actions are covered in Stage 4 or Stage 3 for the ground investigation.

5.0 SITE INVESTIGATION DATA

5.1 Records of site investigation

A site-specific ground investigation was undertaken by Site Analytical Services Limited (SAS) in November to December 2019 and included one Rotary Percussive borehole (Borehole 1) and two trial pits to expose existing foundations (Trial Pits 1 and 2).

The factual findings from the investigation are presented in Appendix B, including a site plan, exploratory hole logs, groundwater monitoring and laboratory test results.

5.2 Ground conditions

The borehole and trial pits revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 1.80m in thickness resting on deposits of the London Clay Formation.

5.2.1 Made Ground

The Made Ground extended down to depths of between 0.65m and 1.80m in the borehole and trial pits. The material generally comprised a surface layer of either concrete or resin over brick rubble and concrete fragments and brown clay with brick fragments.

5.2.2 London Clay Formation

The London Clay formation was encountered below the Made ground and consisted of stiff clay with occasional pockets and partings of silty fine sand and scattered gypsum crystals. These deposits extended down to the full depth of investigation of 15.00m below ground level in Borehole 1.

5.3 Groundwater

Groundwater was not encountered within the borehole or trial pits and the soils remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the borehole and hence be detected, particularly within more cohesive soils.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

Following drilling operations a groundwater monitoring pipe was installed in Borehole 1 to approximately 8.00m depth respectively.

Water was encountered at a depth of 7.51mbgl on 4th December 2019 and 6.76mbgl on 12th December 2019. Due to the nature of the strata, it is likely the water encountered within the standpipe is from surface water infiltration.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (November to December 2019) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

5.4 Foundations

Trial Pit 1 was excavated adjacent to the wall of the existing property on the site in order to expose the foundations and founding soils. Trial Pit 1 showed the lightwell walls are supported on outstepped brick and concrete foundations resting on the London Clay Formation at a depth of approximately 1.20m below ground level.

5.5 In-Situ and Laboratory Testing

The results of the laboratory and in-situ tests are presented in the factual report contained in Appendix A.

5.5.1 Standard Penetration Tests

The results of the Standard Penetration Tests carried out in the natural soils are shown on the exploratory hole records in Appendix A. SPT ‘N’ values range between 9 and 34.

5.5.2 Undrained Triaxial Compression Test Results

Quick Undrained Triaxial Compression tests were carried out on five selected undisturbed 100mm diameter samples taken from Borehole 1 at varying depths. The results show the samples to be of very high strength in accordance with BS 5930 2015.

5.5.3 Hand Vane Tests

In the essentially cohesive natural soils encountered in Trial Pit 1, an in-situ shear vane test was carried out in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930:2015.

5.5.4 Classification Tests

Atterberg Limit tests have been conducted on two selected samples taken from Borehole 1, and showed the samples tested to fall into Class CH according to the British Soil Classification System.

These are fine grained silty clay soils of high plasticity and as such generally have a low permeability and a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values of between 44% and 45%, with both samples being above the higher 40% boundary between soils assessed as being of medium swelling and shrinkage potential and those assessed as being of high swelling and shrinkage potential.

5.5.5 Sulphate and pH Analyses

The results of the sulphate and pH analyses show the natural soil samples to have water soluble sulphate contents of up to 3.6g/litre associated with near neutral to slightly alkaline pH values.

5.6 Non-Technical Summary of Chapter 5.0

A site-specific ground investigation was undertaken by Site Analytical Services Limited (SAS) in November 2019 and included one rotary percussive borehole (Borehole 1) drilled to 15m below ground level and two trial pits to expose existing foundations (Trial Pits 1 and 2).

The trial holes revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 1.80m in thickness resting on deposits of the London Clay Formation.

Following drilling operations a groundwater monitoring pipe was installed in Borehole 1 to approximately 8.00m depth respectively.

Water was encountered at a depth of 7.51mbgl on 4th December 2019 and 6.76mbgl on 12th December 2019. Due to the nature of the strata, it is likely the water encountered within the standpipe is from surface water infiltration.

6.0 FOUNDATION DESIGN

6.1 Introduction

It is proposed construct a car lift system down to the depth of the existing basement and converting part of this basement into a garage.

It is understood that the proposed lift is at a level of approximately 3.30mbgl.

6.2 Site Preparation Works

The main contractor should be informed of the site conditions and risk assessments should be undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions. It is recommended that extensive searches of existing man-made services are undertaken over the site prior to final design works.

6.3 Ground Model

On the basis of the fieldwork, the ground conditions at the site can be characterised as follows:

- Made Ground extends to depths of between 0.65m to 1.80m depth below ground level.
- The London Clay formation comprising stiff silty sandy clay with gypsum crystals to the full depth of investigation of 15.00m below ground level.
- Water was encountered at a depth of 7.51mbgl on 4th December 2019 and 6.76mbgl on 12th December 2019. Due to the nature of the strata, it is likely the water encountered within the standpipe is from surface water infiltration.

6.4 Basement Excavation

Groundwater is not expected to be encountered in the basement excavation, but it would be prudent for the chosen contractor to have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure. Trial excavations to the proposed basement depth could be carried by the main contractor to confirm the stability of the soil and to further investigate the presence of any groundwater inflows.

6.5 Ground Movement Assessment

A ground movement assessment was carried out at the site by Fairhurst under the instruction of Site Analytical Services Limited (Report Reference 136072/R0). The report is provided as Appendix B to this report and concludes; providing that appropriate consideration is given to the detailed design of party wall and return wall junctions with the basement in order to limit future movement, that good workmanship and construction sequences are used with appropriate support during excavations, then the proposed basement construction is unlikely to cause significant damage to the surrounding structures. Based on the predicted ground movements, the adjacent structures are expected to be within the CIRIA C760 Damage Category 0 (Negligible).

Early movement monitoring of the boundary walls to the neighbouring buildings is recommended during the construction stage and trigger levels should be set in order to protect the neighbouring properties, especially at the junctions between the property's. A specification for movement monitoring should be incorporated into the final construction scheme for the proposed development to monitor the adjacent properties and establish the extent of any future potential movement to the building. Any temporary and permanent works should be designed to limit eventual movement.

6.6 Conventional Spread Foundations

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

Based on the ground and groundwater conditions encountered in the borehole, it should be possible to support the proposed new development on conventional strip or basement raft foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff sandy silty clay deposits which occur at depths of between approximately 0.65m and 1.80m below ground level over the site.

Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 110kN/m^2 at 3.00m depth in order to allow for a factor of safety of 2.5 against general shear failure. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from "Foundation Design and Construction", Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, "Building near Trees" and it is considered that this document is relevant in this situation.

6.7 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

6.8 Retaining Walls

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure’s construction. The excavation of the basement must not compromise the integrity of adjacent structures.

The full design of temporary and permanent retaining structures is beyond the scope of this report. However, the following design parameters for each element of soil recorded in the relevant exploratory holes are provided in Table 2 below to assist the design of these structures.

Stratum	**Depth to top (mbgl)**	**Bulk Density (Mg/m3) (ɣ)**	**Effective Angle of Internal Friction (Φ)**
Made Ground	-	2.00	28
London Clay Formation	0.65 to 1.80	2.00	23

Table 2. Retaining Wall Design Parameters

The designer should use these parameters to derive the active and passive earth pressure coefficients ka and kp. The determination of appropriate earth pressure coefficients, together with factors such as the pattern of the earth pressure distribution, will depend upon the type/geometry of the wall and overall design factors.

6.9 Chemical Attack on Buried Concrete

The results of the chemical analyses show the natural soil samples tested to have water soluble sulphate contents of up to 3.6g/litre associated with near neutral to slightly alkaline pH values.

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack is likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-4 conditions.

In addition, segregations of gypsum were noted within the London Clay and also are well known to occur within London Clay deposits. Consequently, it is considered that any buried concrete at depth may be attacked by such sulphates in solution and that it would be prudent to design any such concrete in accordance with full Class DS-4 conditions.

6.10 Non-Technical Summary of Chapter 6.0

On the basis of the fieldwork, the ground conditions at the site can be characterised as follows: Made Ground extends to depths of between 0.65m to 1.80m depth below ground level. The London Clay formation extends to the full depth of investigation of 15.00m below ground level. Groundwater was encountered at a depth of 6.76m within the standpipe in Borehole 1 after a period of approximately three weeks.

Groundwater is not expected to be encountered in the basement excavation, but it would be prudent for the chosen contractor to have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure.

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure’s construction. The excavation of the basement must not compromise the integrity of adjacent structures.

Based on the water soluble sulphate tests carried out as part of these works, it is considered that deterioration of buried concrete due to sulphate or acid attack is likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-4 conditions.

In addition, segregations of gypsum were noted within the London Clay and also are well known to occur within London Clay deposits. Consequently, it is considered that any buried concrete at depth may be attacked by such sulphates in solution and that it would be prudent to design any such concrete in accordance with full Class DS-4 conditions.

7.0 BASEMENT IMPACT ASSESSMENT / CONCEPTUAL SITE MODEL

7.1 Summary

The screening identified a number of potential impacts. The table below summarises the previously identified potential impacts and the additional information that is now available from the site investigation in consideration of each impact.

Potential Impact	Site Investigation conclusions	Impact sufficiently addressed without further justification?
The proposed basement extends beneath the water table surface.	Water was encountered at a depth of 7.51mbgl on 4th December 2019 and 6.76mbgl on 12th December 2019 This is below the depth of the proposed basement. It is likely that the water encountered within the standpipes is not representative of the true groundwater level and is likely caused by perched water from the Made Ground or surface water infiltration	Yes
There a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	The London Clay was proven below the site and was recorded as having a high susceptibility to shrinkage and shrinkage. However, the base of proposed basement will extend well below the potential depth of root action.	Yes
The site is within 5m of a highway or pedestrian right of way.	The proposed basement is not to be extended below Canfield Gardens and therefore it is suggested that the impact on these access roads is likely to be minimal. There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.	Yes.
The site is in an area known to be at risk from surface water flooding.	There is a potential risk of surface water following the construction. however the following is taken into consideration when assessing the site: In accordance with Table 3 (PPG 2014, Planning Practice Guidance 2014) a 'More Vulnerable' development located in Flood Zone 1 is an appropriate development, therefore the full Sequential or Exception Test would not be required as part of a planning application for this development. As the impermeable ground within the area of the proposed development is to be decreased as part of this scheme, the risk of flooding will be lower than in its current state as there will be more pathways for any water to drain through.	No – See comments below

7.2 Outstanding risks and issues

The site is in an area known to be at risk from surface water flooding.

Canfield Gardens flooded during the 2002 flood event. According to modelling by the Environment Agency, there is a 'Very Low' risk of surface water flooding (the lowest category for the national background level of risk) for No.111 and the surrounding area.

As the impermeable ground within the area of the proposed development is to be decreased as part of this scheme, the risk of flooding will be lower than in its current state as there will be more pathways for any water to drain through.

The proposed development will not increase flood risk at the site or the surrounding area. Also since the development is on already developed land, it will not adversely impact the Council's sustainability objectives.

7.3 Advice on Further Work and Monitoring

A monitoring plan should be set out at design stage and should include a monitoring strategy, instrumentation and monitoring plans and action plans. Trigger levels on movements will need to be defined. Precise levelling or reflective survey targets should be installed at the garden walls and neighbouring buildings. Monitoring should take place in advance of the proposed works as a base-line survey, during the works and for a period following the completion of the works, to understand the long term effects.

It would be prudent to continue to monitor the standpipe for as long as possible in order to determine equilibrium level and the extent of any seasonal variations. The chosen contractor should also have a contingency plan in place to deal with any perched groundwater inflows as a precautionary measure.

7.4 Non-Technical Summary of Chapter 7.0

The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground if not properly managed. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures during the works. It is not considered that the proposed basement would result in a significant change to the groundwater flow regime in the vicinity of the proposal. Also, given limited scope of the scheme and limited increase in impermeable areas, the scheme is also considered compliant with the surface water management and flood risk elements of NPPF and Camden policy.

Given good workmanship, the basement to No. 111 Canfield Gardens can be constructed without imposing more than negligible damage on the adjoining properties. The development is not likely to significantly affect the existing local groundwater regime.

It would be prudent to continue to monitor the standpipes for as long as possible in order to determine equilibrium level and the extent of any seasonal variations.

8.0 REFERENCES

1. CIRIA Special Publication 69, 1989. The engineering implications of rising groundwater levels in the deep aquifer beneath London

2. Environment Agency, 2006. Groundwater levels in the Chalk-Basal Sands Aquifer in the London Basin

3. Tomlinson, M J, 2001. “Foundation Design and Construction”, Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

4. British Standards Institution, 2015. Code of Practice for Site Investigations, BS5930, BSI, London

5. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

6. British Standards Institution, 2009. Code of Practice for Protection of Below Ground Structures Against Water from the Ground. BS 8102, BSI, London

7. CIRIA, 2000. Sustainable Urban Drainage Systems: Design Manual for England and Wales. CIRIA C522, Construction Industry Research and Information Association, London

8. Environment Agency Status Report 2010. Management of the London Basin Chalk Aquifer. Environment Agency

9. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

10. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

Appendix A. Ground Investigation Factual Report

Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons), MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Tel: 0208 594 8134
Fax: 0208 594 8072
E-Mail: services@siteanalytical.co.uk

Your Ref: Our Ref: **Ref: 19/31225-1**
January 2020

111 CANFIELD GARDENS,

LONDON, NW6 3DY

FACTUAL REPORT ON A GROUND INVESTIGATION

Prepared for

Martin Redston Associates

Acting on behalf of

Mr Guy Ziser

CONTENTS

1.0 INTRODUCTION

1.1 Outline and Limitations of Report

At the request of Martin Redston Associates, working on behalf of Mr Guy Ziser, a ground investigation was carried out in connection with a proposed residential basement development at the above site. A Phase 1 Preliminary Risk Assessment (Desk Study) is presented under separate cover in Site Analytical Services Limited Report Reference 19/31225.

The information was required for the design and construction of foundations and infrastructure for the proposed development at the existing site.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.0 SITE DETAILS

(National Grid Reference: TQ- 257 843)

2.1 Site Location

111 Canfield Gardens is a residential property, located on the southern side of Canfield Gardens, South Hampstead at approximate postcode NW6 3DY. The residential dwelling has five levels of accommodation; basement, ground floor, first floor, second floor and third floor loft conversion. The site covers an approximate area of 0.07 Hectares with the general area being under the authority of the London Borough of Camden.

The site is located on the southern side of Canfield Gardens with residential properties to the south, east and west, with a roadway to the north.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, ‘North London’, Solid and Drift Edition) indicates the site to be underlain by the London Clay formation.

The British Geological Survey maintains an archive of historical exploratory borehole logs throughout the UK. SAS Limited has searched the database and has found 9 boreholes located within 250m of the site.

The closest is located 200m south-west of the site and indicates the area to be surfaced by 1.25m of Made Ground over the London Clay Formation to the maximum depth of excavation at 10.00m.

2.3 Previous Investigations

A Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 19/31225, dated January 2020) has been undertaken across the site by Site Analytical Services Limited.

3.0 SCOPE OF WORK

3.1 Site Works

The exploratory investigation included for an inspection of the site and near surface soils in order to: -

- Determine the presence, extent and significance of potential contaminants in the sub-surface strata associated with current and former activities at the site and surrounds identified during the Phase 1 PRA.
- Assess the significance of potential impacts on sensitive receptors at or adjacent to the site.
- Assess the potential environmental liabilities and consequences associated with the site.
- Identify requirements for further works, including the design of any additional investigative/monitoring works and remedial measures if deemed necessary.

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of one rotary percussive borehole to a depth of 15.00m below ground level (Borehole 1).
- The excavation of two trial pits to 1.50m maximum depth to expose existing foundations within the front lightwells (Trial Pits 1 and 2). In the event, Trial Pit 2 was terminated on site at 0.38m depth due to impenetrable concrete.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the borehole and trial pits.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.
- Factual reporting on the results of the investigation.

3.2 Ground Conditions

The locations of the exploratory holes are shown on the site sketch plan, Figure 1.

The borehole and trial pits revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 1.80m in thickness resting on deposits of the London Clay formation.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the boreholes, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Depth to base of strata (mbgl)	Description
Made Ground	0.00	0.65 to 1.80	Resin surface over brick and concrete followed by sand gravelly clay containing occasional brick fragments.
London Clay Formation	0.65 to 1.80	15.00 (base of BH1)	Stiff clay with occasional pockets and partings of silty fine sand and scattered gypsum crystals.

Table A: Summary of Ground Conditions in Exploratory Holes

3.3 Groundwater

Groundwater was not encountered within the borehole or trial pits and the soils remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and hence be detected, particularly within more cohesive soils.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

Water was encountered at a depth of 6.76mbgl within Borehole 1 after a period of approximately three weeks. Due to the nature of the strata, it is likely the water encountered within the standpipe is from surface water infiltration.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (November to December 2019) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

4.0 IN-SITU TESTING AND LABORATORY TESTS

4.1 Standard Penetration Tests

The results of the Standard Penetration Tests carried out in the natural soils are shown on the exploratory hole records in Appendix A.

4.2 Undrained Triaxial Compression Test Results

Undrained Triaxial Compression tests were carried out on five undisturbed 100mm diameter samples taken from within Borehole 1.

The test results are given in Table 1, contained in Appendix B.

4.3 Hand Vane Tests

In the essentially cohesive natural soils encountered in Trial Pit 1, an in-situ shear vane test was carried out in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930:2015.

4.4 Classification Tests

Atterberg Limit tests were conducted on two samples taken at depth in Borehole 1 and showed the samples tested to fall into Class CH according to the British Soil Classification System.

The test results are given in Table 2, contained in Appendix B.

4.5 Sulphate and pH Analyses

The results of the sulphate and pH analyses made on three samples are given within the i2 Analytical Report Number : 19-74278, contained in Appendix B

p.p. SITE ANALYTICAL SERVICES LIMITED

T P Murray MSc BSc (Hons) FGS
<u>Geotechnical Engineer</u>

5.0 REFERENCES

1. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

2. British Standards Institution, 1990. Methods for test for soils for civil engineering purposes, BS1377, BSI, London

3. British Standards Institution, 1994. Code of practice for earth retaining structures, BS8002, BSI, London

4. British Standards Institution, 20. Code of Practice for Site Investigations, BS5930: 2015, BSI, London

5. British Standards Institution, 2004. Geotechnical Design, BS EN 1997-1 BSI, London

6. Building Research Establishment Special Digest 1, 2005, "Concrete in Aggressive Ground – Third Edition."

7. Driscoll, R (1983) "The influence of vegetation on the shrinking and swelling of clay soils in Great Britain", Geo-technique 33, 93-107

8. Eurocode 1: Actions on structures – BS EN 1991-1-1:2002: General actions – Densities, self weight and imposed loads, BSI, London

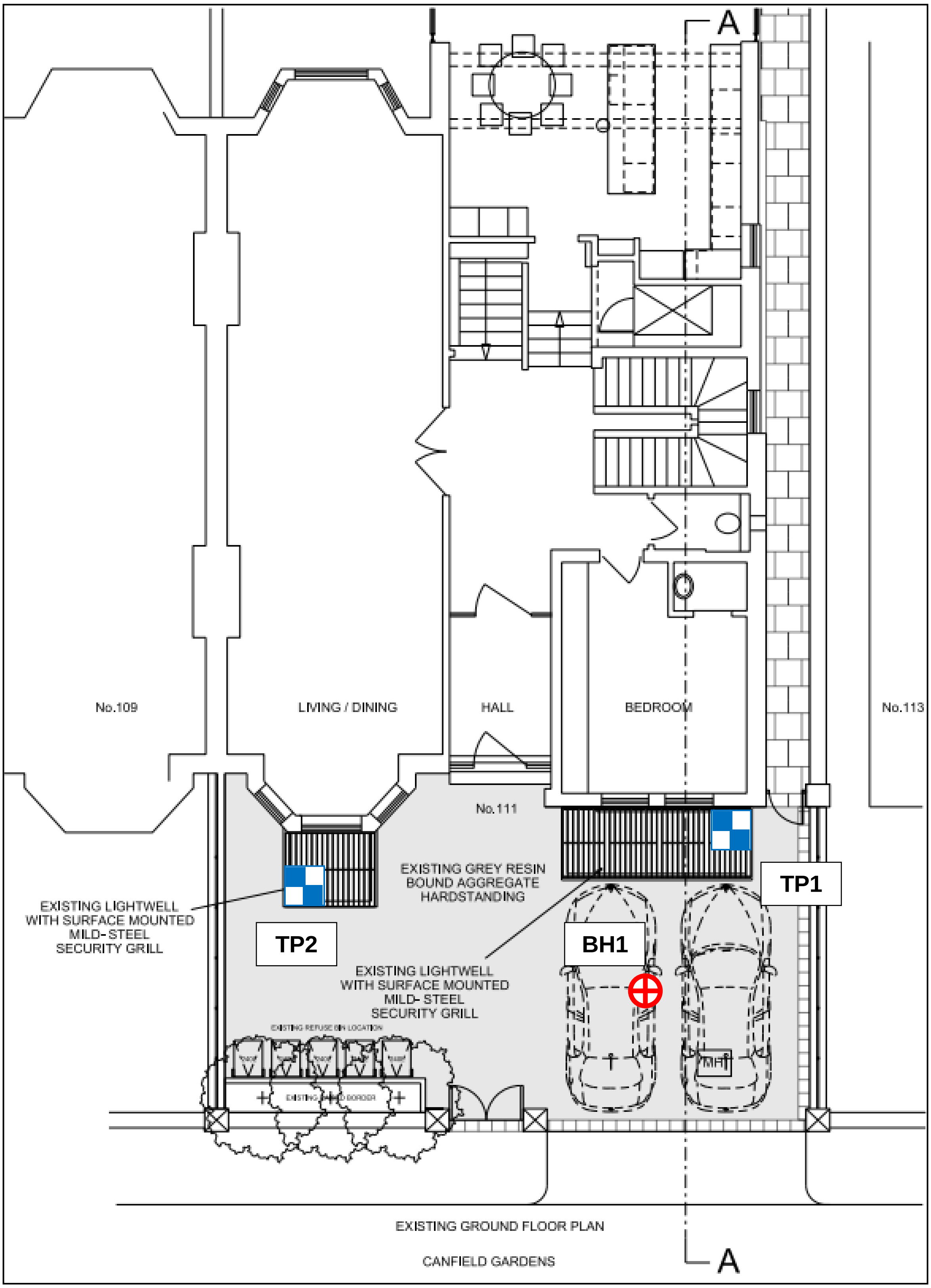
9. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

10. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

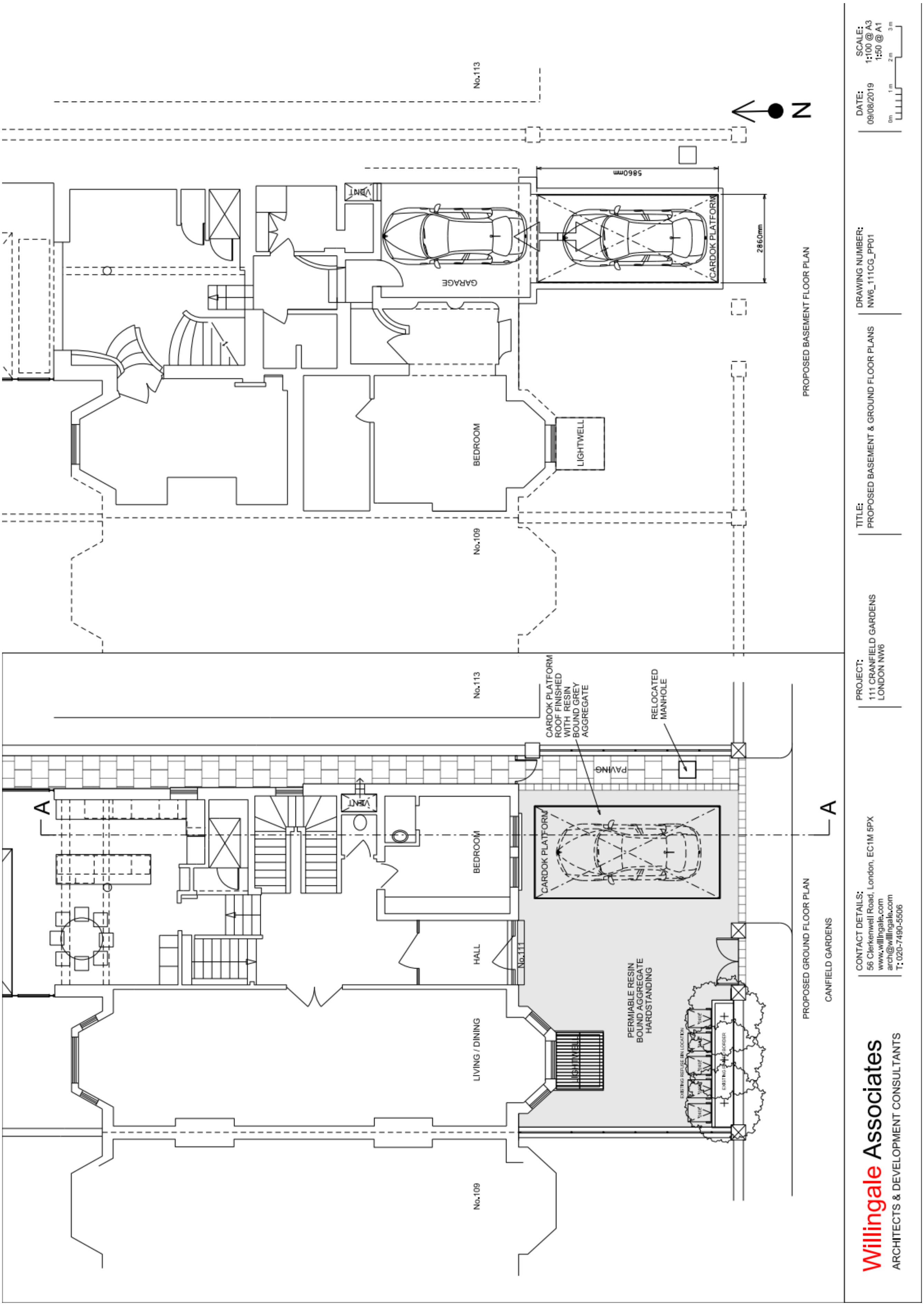
11. Stroud M.A. and Butler F.G. (1975) Symposium on the Engineering Behaviour of Glacial Materials; the Midland Soil Mechanics and Foundation Engineering Society; pgs 124 et seq.

12. Tomlinson, M J, 2001. “Foundation Design and Construction”, Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

Site Analytical Services Ltd.			REF: 19/31225-1
LOCATION:	111 Canfield Gardens, London, NW6 3DY		FIG: 1
TITLE:	Site Sketch Plan	DATE: Jan' 2020	SCALE: NTS



Site Analytical Services Ltd.	REF: 19/31225-1
LOCATION: 111 Canfield Gardens, London, NW6 3DY	FIG: 2
TITLE: Proposed Site Plan DATE: Jan' 2020	SCALE: NTS



A P P E N D I X `A'

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site	Borehole Number
111 CANFIELD GARDENS, LONDON, NW6 3DY	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m		MR GUY ZISER	1931225
	Location	**Dates**	**Engineer**	**Sheet**
	TQ257843	20/11/2019	MARTIN REDSTON ASSOCIATES	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.12	MADE GROUND: Resin surface over reinforced concrete		
						0.18	MADE GROUND: Brick and concrete		
0.25	D1					(0.32)			
0.50	D2					0.50 (0.40)	MADE GROUND: Dark brown sandy clay containing brick fragments		
0.75	D3								
						0.90	MADE GROUND: Brown slightly gravelly desiccated clay containing occasional brick fragments		
1.00	D4						MADE GROUND: Firm, brown desiccated clay containing occasional brick fragments		
1.20-1.65	SPT(C) N=9		DRY	1,2/2,2,2,3		(0.90)			
						1.80	Firm, brown slightly desiccated silty sandy CLAY		
1.85	D5								
2.00-2.45	U1			35 blows		(0.90)			
						2.70	Firm, brown silty sandy CLAY		
2.75	D6								
3.00-3.45	SPT N=12		DRY	2,2/3,3,3,3					
3.00	D7								
3.75	D8								
4.00-4.45	U2			55 blows					
4.75	D9								
5.00-5.45	SPT N=16		DRY	2,3/3,4,4,5					
5.00	D10					(5.10)			
6.00	D11								
6.50-6.95	U3			80 blows					
7.50	D12								
						7.80	Stiff, dark grey blue silty sandy CLAY with partings of silty fine grained sand and occasional gypsum crystals		
8.00-8.45	SPT N=25		DRY	5,5/6,6,6,7					
8.00	D13								
						(2.20)			
9.00	D14								
9.50-9.95	U4			110 blows					

Remarks
D= Disturbed Sample
U= Undisturbed 100mm Diameter Sample
C= Dynamic Penetration Test - Cone
S= Standard Penetration Test - Cone
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 1931225.BH1

Site Analytical Services Ltd.

Site	Borehole Number
111 CANFIELD GARDENS, LONDON, NW6 3DY	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m		MR GUY ZISER	1931225
	Location	**Dates**	**Engineer**	**Sheet**
	TQ257843	20/11/2019	MARTIN REDSTON ASSOCIATES	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						10.00	Stiff becoming very stiff, dark grey blue silty sandy CLAY with partings of silty fine grained sand and occasional gypsum crystals		
10.50	D15								
11.00-11.45 11.00	SPT N=30 D16		DRY	6,7/7,8,7,8					
12.00	D17								
12.50-12.95	U5			135 blows		(5.00)			
13.75	D18								
14.55-15.00 14.55	SPT N=34 D19		DRY	7,8/8,8,9,9					
						15.00	Complete at 15.00m		

Remarks
D= Disturbed Sample
U= Undisturbed 100mm Diameter Sample
C= Dynamic Penetration Test - Cone
S= Standard Penetration Test - Cone
Groundwater was not encountered during boring/excavation

Scale (approx)	Logged By
1:50	EW

Figure No.
1931225.BH1

Site Analytical Services Ltd.

Standard Penetration Test Results

Site : 111 CANFIELD GARDENS, LONDON, NW6 3DY

Client : MR GUY ZISER

Engineer : MARTIN REDSTON ASSOCIATES

Job Number 1931225

Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.20	1.35	1.65	CPT	1	2	2	2	2	3	N=9	
BH1	3.00	3.15	3.45	SPT	2	2	3	3	3	3	N=12	
BH1	5.00	5.15	5.45	SPT	2	3	3	4	4	5	N=16	
BH1	8.00	8.15	8.45	SPT	5	5	6	6	6	7	N=25	
BH1	11.00	11.15	11.45	SPT	6	7	7	8	7	8	N=30	
BH1	14.55	14.70	15.00	SPT	7	8	8	8	9	9	N=34	

Site Analytical Services Ltd.

Site	Borehole Number
111 CANFIELD GARDENS, LONDON, NW6 3DY	BH1

Installation Type	Dimensions		Client	Job Number
Single Installation	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 128 mm		MR GUY ZISER	1931225
	Location	**Ground Level (mOD)**	**Engineer**	**Sheet**
	TQ257843		MARTIN REDSTON ASSOCIATES	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Bentonite Seal
				1.00	Slotted Standpipe
				8.00	Bentonite Seal
				9.00	General Backfill
				15.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks
Lockable cover set in cement

Site Analytical Services Ltd.

Site	111 CANFIELD GARDENS, LONDON, NW6 3DY		**Trial Pit Number**	TP1
Excavation Method HAND EXCAVATION	**Dimensions** 0.30m(W) x 0.30m(L) x 1.30m(D)	**Ground Level (mOD)**	**Client** MR GUY ZISER	**Job Number** 1931225
	Location TQ257843	**Dates** 20/11/2019	**Engineer** MARTIN REDSTON ASSOCIATES	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	MADE GROUND: Concrete		
0.25	D1				(0.35) 0.50	MADE GROUND: Brick rubble, concrete cobbles and builders rubble		
0.50	D2				(0.15) 0.65	MADE GROUND: Pea gravel		
0.75	D3				(0.65) 1.30	Stiff, mottled brown silty sandy CLAY		
1.00	D4							
1.20	D5							
1.20	V1 130+					Complete at 1.30m		

Plan

Remarks

Excavating from 0.00m to 1.00m for 1 hour.
D= Disturbed Sample
V= Vane Test - Results in kPa
Groundwater was not encountered during boring/excavation

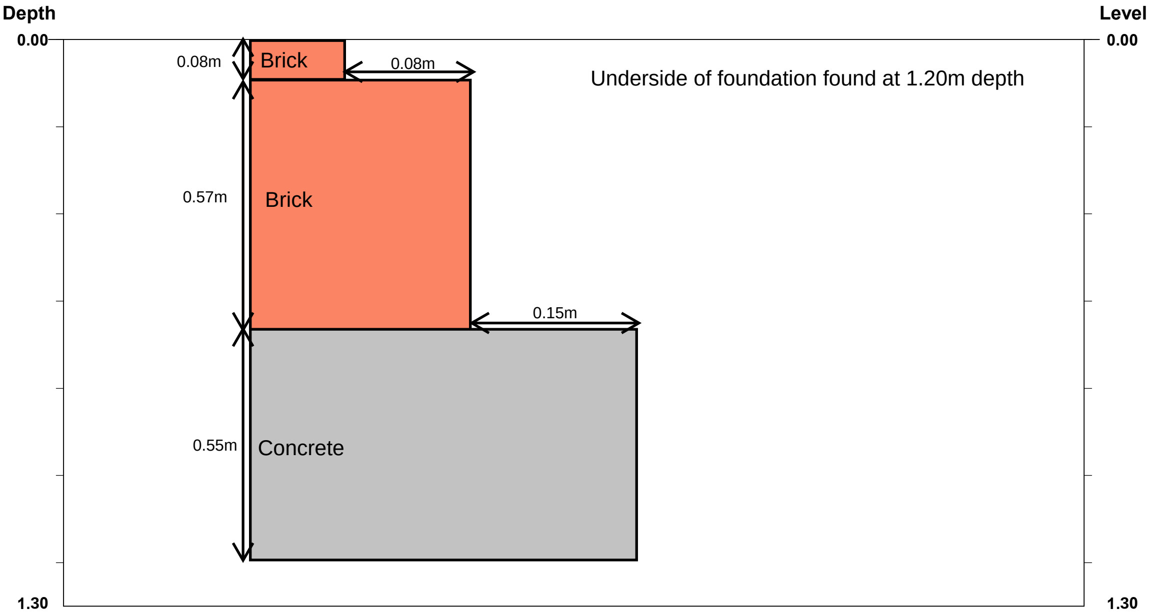
Scale (approx)	Logged By	Figure No.
1:50	EW	1931225.TP1

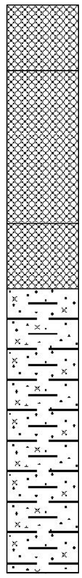
Site Analytical Services Ltd.

Site	Trial Pit Number
111 CANFIELD GARDENS, LONDON, NW6 3DY	TP1

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 1.30m(D)		MR GUY ZISER	1931225

Orientation	Location	Dates	Engineer	Sheet
A / B / C / D	TQ257843	20/11/2019	MARTIN REDSTON ASSOCIATES	1/1





Strata

Depth (m)	No.	Description
0.00-0.15	1	MADE GROUND: Concrete
0.15-0.50	2	MADE GROUND: Brick rubble, concrete cobbles and builders rubble
0.50-0.65	3	MADE GROUND: Pea gravel
0.65-1.30	4	Stiff, mottled brown silty sandy CLAY

Samples and Tests

Depth (m)	Type	Field Records
0.25	D1	
0.50	D2	
0.75	D3	
1.00	D4	
1.20	D5	
1.20	V1 130+	

Excavation Method:
HAND EXCAVATION

Shoring / Support:
GOOD

Stability:
N/A

Backfill:
ARISINGS

Remarks
D= Disturbed Sample
V= Vane Test - Results in kPa
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Logged By : EW
Checked By :
Figure No. : 1931225.TP1

Site Analytical Services Ltd.

Site	Trial Pit Number
111 CANFIELD GARDENS, LONDON, NW6 3DY	TP2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.38m(D)		MR GUY ZISER	1931225
	Location	**Dates**	**Engineer**	**Sheet**
	TQ257843	20/11/2019	MARTIN REDSTON ASSOCIATES	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.38) 0.38	MADE GROUND: Concrete		
						Complete at 0.38m		

Plan

Remarks

Excavating from 0.00m to 1.00m for 1 hour.
Groundwater was not encountered during boring/excavation
Concrete obstruction

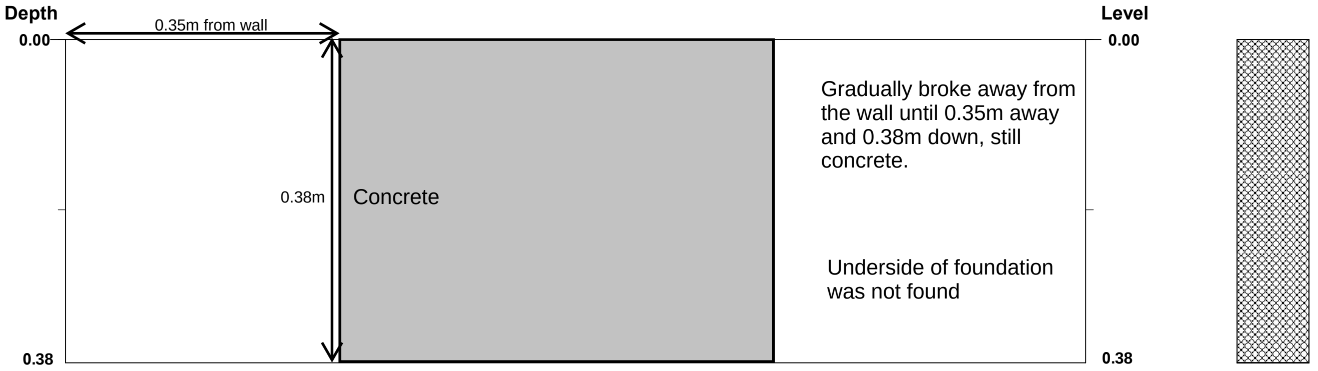
Scale (approx)	Logged By	Figure No.
1:50	EW	1931225.TP2

Site Analytical Services Ltd.

Site	Trial Pit Number
111 CANFIELD GARDENS, LONDON, NW6 3DY	TP2

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.38m(D)		MR GUY ZISER	1931225

Orientation	Location	Dates	Engineer	Sheet
A, B, C, D	TQ257843	20/11/2019	MARTIN REDSTON ASSOCIATES	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-0.38	1	MADE GROUND: Concrete			

Excavation Method:
HAND EXCAVATION

Shoring / Support:
GOOD

Stability:
N/A

Backfill:
ARISINGS

Remarks
Groundwater was not encountered during boring/excavation
Concrete obstruction
Excavating from 0.00m to 1.00m for 1 hour.

Logged By	: EW
Checked By	:
Figure No.	: 1931225.TP2

A P P E N D I X `B'

Laboratory Test & Groundwater Monitoring Data

Ref: 19/31225-1

UNDRAINED TRIAXIAL COMPRESSION TEST

LOCATION 111 Canfield Gardens, London, NW6 3DY

BH/TP No.	MOISTURE CONTENT %	BULK DENSITY Mg/m^3	LATERAL PRESSURE kN/m^2	COMPRESSIVE STRENGTH kN/m^2	COHESION kN/m^2	ANGLE OF SHEARING RESISTANCE degrees	DEPTH m
BH1	20	2.11	50	346	173		2.25
	26	1.97	80	340	170		4.25
	27	1.96	130	384	192		6.75
	26	2.05	190	399	199		9.75
	24	2.01	250	435	217		12.75

Ref: 19/31225-1

**PLASTICITY INDEX &
MOISTURE CONTENT
DETERMINATIONS**

LOCATION 111 Canfield Gardens, London, NW6 3DY

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 μm %	Modified Plasticity Index %	Class
BH1	1.85	25	64	19	45	100	45	CH
	3.00	20	63	19	44	100	44	CH

Table 2

Ref: 19/31225-1

GROUNDWATER MONITORING

LOCATION 111 Canfield Gardens, London, NW6 3DY

GROUNDWATER MONITORING RECORD			
Date	**Weather Conditions**	**Ground Conditions**	**Temperature (°C)**
04/12/19	Sunny with occasional clouds	Dry	9
Monitoring Point Location	**Depth to water (mBGL)**		**Depth to Base of well (mBGL)**
BH1	7.51		7.82

Ref: 19/31225-1

GROUNDWATER MONITORING

LOCATION 111 Canfield Gardens, London, NW6 3DY

GROUNDWATER MONITORING RECORD			
Date	**Weather Conditions**	**Ground Conditions**	**Temperature (°C)**
12/12/19	Raining	Wet	7
Monitoring Point Location	**Depth to water (mBGL)**		**Depth to Base of well (mBGL)**
BH1	6.76		7.82

Table 3a

Aubrey Davidson
Site Analytical Services Ltd
Units 14 -15
River Road Business Park
33 River Road
Barking
Essex
IG11 0EA

t: 0208 5948134
f: 0208 5948072
e: SAS -

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-74278

Project / Site name:	111 Canfield Gardens	**Samples received on:**	27/11/2019
Your job number:	19-31225	**Samples instructed on:**	27/11/2019
Your order number:	6411	**Analysis completed by:**	04/12/2019
Report Issue Number:	1	**Report issued on:**	04/12/2019
Samples Analysed:	3 soil samples		

Signed: K. Lewicka

Katarzyna Lewicka
Head of Reporting Section

For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

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

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

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

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

Analytical Report Number: 19-74278

Project / Site name: 111 Canfield Gardens
Your Order No: 6411

Lab Sample Number				1374616	1374617	1374618		
Sample Reference				BH1	BH1	BH1		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				4.75	8.00	11.00		
Date Sampled				Deviating	Deviating	Deviating		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Moisture Content	%	N/A	NONE	20	19	18		
Total mass of sample received	kg	0.001	NONE	0.90	0.30	0.30		
Whole Sample Crushed		N/A	NONE	Crushed	Crushed	Crushed		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.9	8.5	8.4		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	3.6	0.83	0.91		

Analytical Report Number : 19-74278

Project / Site name: 111 Canfield Gardens

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1374616	BH1	None Supplied	4.75	Brown clay and sand.
1374617	BH1	None Supplied	8.00	Brown clay.
1374618	BH1	None Supplied	11.00	Brown clay.

Analytical Report Number : 19-74278

Project / Site name: 111 Canfield Gardens

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Crush Whole Sample	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis; OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis.	In house method, applicable to dry samples only.	L019-UK	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS

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

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
BH1		S	19-74278	1374616	a			
BH1		S	19-74278	1374617	a			
BH1		S	19-74278	1374618	a			

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

Appendix B. Ground Movement Assessment

Ground Movement Assessment

111 Canfield Gardens, London, NW6 3DY

January 2020

FAIRHURST

FAIRHURST

CONTROL SHEET

CLIENT:	**SITE ANALYTICAL SERVICES LIMITED (SASL)**
PROJECT TITLE:	**111 CANFIELD GARDENS**
REPORT TITLE:	**GROUND MOVEMENT ASSESSMENT**
DOCUMENT NUMBER:	**136072/R0**
STATUS:	**FINAL**

Issue & Approval Schedule	ISSUE 1	Name	Signature	Date
	Prepared by	Harry Brock	Signatures held on file.	17/01/2020
	Checked by	Andrew Smith		17/01/2020
	Approved by	Andrew Smith		17/01/2020

Revision Record	Rev.	Date	Status	Description	Signature	

This document has been prepared in accordance with procedure OP/P02 of the *Fairhurst Quality and Environmental Management System. This document has been prepared in accordance with the instructions of the client, Site Analytical Services Limited, for the client's sole and specific use. Any other persons who use any information contained herein do so at their own risk.*

CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 Background

Fairhurst has been commissioned by Site Analytical Services Limited (SASL) to complete a Ground Movement Assessment (GMA) in connection with a proposed residential development at 111 Canfield Gardens, NW6 3DY. The location of the site is detailed on Figure 1. The purpose of this assessment is to determine what effects the proposed permanent construction may have upon nearby structures.

A site specific Ground Investigation has previously been carried out by SASL in November 2019. The ground investigation was designed by SASL and the results have been used in the derivation of parameters utilised in this assessment. Fairhurst cannot be held responsible for any inaccuracy in the factual data provided. It is understood that this report will be included as part of a Basement Impact Assessment (BIA) to be submitted to Camden Council by the client.

1.2 Proposed Development

The architect drawings and Design and Access Statement, presented in Appendix A, detail the construction of a basement garage which will include 2No. off-street car parking spaces. This will be achieved via excavation in the front garden to accommodate a car lift which will enable a car to be lowered and driven forward into the basement front room, with the existing lightwell also being lowered to form the garage.

The existing ground level in the area of the site in the area of the site is estimated from google earth to be at a level of approximately c.43m AOD.

In accordance with the proposed development plans, the maximum excavation depth for the car lift is 3.30m bgl, including a 1.40m excavation below the existing lightwell (currently founded at 1.90m bgl). The existing bedroom at basement level, currently founded at approximately 2.60m bgl, is to be converted to a car parking space. No further excavation is proposed within the existing bedroom.

Further information on the proposed construction is detailed on the architect drawings, presented in Appendix A, whilst the proposed structural loads are presented in Appendix B.

1.3 Limitations

The conclusions and recommendations made in this report are made on the basis of the site specific ground investigations undertaken by SASL undertaken in November 2019. The ground investigation was designed by SASL and the results of the work should be viewed in the context of the range of data sources consulted and the information provided along with the number of locations where the ground was sampled. No liability can be accepted for inaccuracies in the factual data, information in other data sources or conditions not revealed by the sampling or testing.

The effect of the proposed construction on existing subterranean assets (including services and tunnels) is outside the scope of this report.

It should be noted that the movements described in this report are indicative only for the purposes of providing pre-planning guidance with regards to the development. It is anticipated the actual movement observed on site will be heavily affected by the level of workmanship and therefore should be reviewed at detailed design following discussions with the structural engineer and appointed contractor. It has been assumed for the purposes of this assessment that the existing buildings surrounding the site are already structurally competent.

2.0 BASELINE CONDITIONS

2.1 Site Description

The site is located at 111 Canfield Gardens, Camden, NW6 3DY, at approximate grid reference 525801 184340. A site location plan is included in this report as Figure 1.

The site is located on the southern side of Canfield Gardens and covers an approximate area of 0.05 hectares, with the general area being under the authority of the London Borough of Camden. The semi-detached building comprises three storeys with roof space along with an existing basement and lightwell and is currently being used for residential purposes. The driveway at the front of the site is noted to slope up to the south towards the property. Details of the buildings in close proximity to the site which have been considered in the ground movement analysis are provided in Table 1.

The existing ground level surrounding the site is estimated from available to be at a level of approximately c.43m AOD.

Table 1 - Summary of buildings surrounding the site

Building Name	Description	Approximate Height (m)	Distance from the site
No.109 Canfield Gardens	2 storey semi-detached residential dwelling with roof space	13m	Shares Party Wall with site
No.113 Canfield Gardens	2 storey detached residential dwelling with roof space	13m	2m to the west.

2.2 Geology

The British Geological Survey (BGS) map of the area (North London, Sheet 256) indicates that the site is underlain directly by the London Clay Formation. The BGS does not record any superficial deposits underlying the site.

According to the BGS Lexicon, the underlying London Clay (LC) Formation comprises “bioturbated or poorly laminated, blue-grey or grey brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.

There are no available BGS historical boreholes within 250m of the site.

2.3 Hydrogeology and Hydrology

There are no surface water features within 200m of the site.

The Magic Maps application the DEFRA website lists the London Clay Formation as Unproductive Strata.

3.0 GROUD INVESTIGATION AND MONITORING

A site specific Ground Investigation (GI) was undertaken by SASL on the 20th November 2019.

The works undertaken at the site comprised the following:

- 1No. Rotary Percussive Borehole (BH1) to a depth of 15.00m bgl;
- Standard Penetration Testing (SPT) within the borehole;
- 2No. Hand Excavated Trial Pits (TP1-TP2) to depths of 0.38 - 1.30m bgl;
- Collection of undisturbed and disturbed soil samples for geotechnical laboratory testing;
- Installation of 1No. groundwater monitoring well in BH1 to a depth of 8.00m bgl;
- 2No. rounds of groundwater monitoring following completion of the site works.

The factual SASL Ground Investigation data is included within Appendix A of the SASL BIA report.

3.1 Ground Conditions

The borehole and trial pits revealed ground conditions that were generally consistent with the geological records and known history of the area. A summary of the ground conditions encountered is presented below in Table 2.

Table 2 - Summary of the SASL Ground Investigation

Strata	Depth (m bgl		Maximum Thickness (m)	Description
	Top	Bottom		
Made Ground (Hardstanding)	0.00	0.15 - 0.38	0.15 – 0.38*	Resin surface over reinforced concrete/brick and concrete/brick.
Made Ground	0.18 – 0.65	0.65 - 1.80	0.5 - 1.62	Brick and builders rubble/Dark brown/brown sandy clay/gravelly desiccated clay containing brick fragments.
Weathered London Clay	0.65 - 1.80	1.30 - 7.80	0.65 - 6.00**	Firm, brown silty sandy clay.
London Clay	7.80	15.00	7.20***	Stiff, dark grey blue silty sandy clay with partings of fine grained and occasional gypsum crystals

**Maximum thickness of hardstanding not proven in TP2*
***Maximum thickness of Weathered London Clay not proven in TP1*
****Maximum thickness of London Clay Formation not proven in any exploratory hole*

3.2 Groundwater

Groundwater was not encountered within the borehole and trial pits and the soils remained effectively dry throughout.

Following completion of ground investigation works the monitoring well installed in BH1 was monitored on 2 No. occasions in December 2019 with the results summarised in Table 3 overleaf.

Table 3 - Monitoring Summary

Date	Borehole ID	Response Zone		Groundwater Level
		m bgl	(Strata)*	m bgl
04/12/2019	BH1	1.0 – 8.0	MG & LC	7.82
12/12/2019	BH1	1.0 – 8.0	MG & LC	7.82

**MG: Made Ground, LC: London Clay*

The water monitoring undertaken indicates that the groundwater level in BH1 was recorded at a depths of between 6.76 – 7.51m bgl.

The above interpretation is based on two monitoring visits and it would be prudent to continue monitoring of the existing standpipe for as long as possible in order to determine equilibrium level and the extent of any seasonal variations.

3.3 In-situ and Laboratory Testing

A summary of laboratory and in-situ test results undertaken within the geological strata encountered during the SASL GI is presented below. Detailed results are available in the SASL Geotechnical Investigation records as shown in Appendix A of the SASL BIA Report.

Standard Penetration Testing (SPT)

A total of 6No. SPT's were undertaken within BH1. The results are summarised in Table 4 below.

Table 4 – SPT Results

Strata	No. Tests	Depth of testing (m bgl)	SPT Value
Made Ground	1	1.20 – 1.65	9
Weathered London Clay	2	3.00 – 5.45	12 - 16
London Clay	3	8.00 – 15.00	25 - 34

3.4 Laboratory Testing

Atterberg Limits and Moisture Contents

A total of 2No, Atterberg Limit tests and Moisture Content Determinations were undertaken on samples collected from the LCF in BH1 at depths of 1.85 & 3.00m bgl. The results revealed moisture contents ranging between 20 – 25% and modified plasticity indices ranging between 44 – 45%. The tested samples of the London Clay Formation were found to have a high volume change potential on the Casagrande plasticity chart.

Undrained Triaxial Compression Testing

5No. Undrained Triaxial Compression Tests were undertaken within BH1 at depths of between 2.25 – 12.75m bgl. The results showed undrained shear strength values ranging between 173 – 217kPa indicative of material of very high strength in accordance with BS EN ISO 14688-2:2004. The results were found to generally increase with depth. A plot detailing undrained shear strength vs depth is presented in Figure 2 of this report.

4.0 PREDICTION OF GROUND MOVEMENT AND DAMAGE ASSESSMENT

4.1 Introduction

In connection with the proposed basement construction, a ground movement and damage assessment has been undertaken at the site. The purpose of this assessment is to determine the effects of the proposed basement excavation upon the existing building and the neighbouring structures.

The soil behaviour over the footprint of the excavated area is different from the behaviour outside and the associated ground movements require assessment using different approaches.

In the area of the new basement the soil will tend to move as a result of change in vertical load on the ground due to excavation and demolition. Movements in the long term would also be expected as a result of changes in the pore pressure in the clay layer/cohesive band under the basement.

Around the site the construction activities that may result in ground movements during and after the works are mainly related to the excavation, which would induce a reduction of vertical and lateral stresses in the ground along the excavation boundaries.

The magnitude and distribution of ground movements inside and outside the excavated area are a function of changes of load in the ground and also, critically, are a function of workmanship.

Ground movements within the area of the proposed excavation have been estimated using Geotechnical Software (PDISP by OASYS) whilst the expected movements and impact assessment of the area around the site and surrounding structures have been estimated using Geotechnical Software (XDISP by OASYS). The latter software relies on CIRIA report C580 Embedded Retaining Walls - Guidance for Economic Design (superseded by C760, 2017) which is based on field measurements of movements from a number of basement constructions across London.

Proposals include to excavate a car lift within the existing front garden to a maximum depth of 3.30m bgl.

The calculations provided are specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

4.2 Adjacent Properties

The properties or structures more likely to be affected by the ground movements associated with the proposed basement construction are summarised in Table 1 and include the following:

- No.109 Canfield Gardens (shares party wall with site);
- No. 113 Canfield Gardens (2m to the west);

4.3 Ground Model

The ground model utilised for this assessment is based on the site specific ground investigation undertaken by SASL at the site (November 2019). It should be noted that Fairhurst can take no liability for inaccuracies in the factual data from the SASL investigation and that reliance on this data has been sought by the client.

The ground conditions adopted within the model and analysis are in accordance with the results of the only internal borehole (BH1) at 111 Canfield gardens and comprises:

- Made Ground to a depth of 1.80m bgl;
- Weathered London Clay to a depth of 7.80m bgl;
- London Clay to a depth of 15.00m bgl.

The method of Ground Movement Analyses undertaken requires soils stiffness parameters to be used. In accordance with BS8004:2015 section 4.3.1.6 ‘Soil Stiffness’ it is acknowledged that both the drained and undrained stiffness moduli of soils (*E', E_u*) are highly dependent on the strain level applicable to the engineering problem considered. The change in axial strain will directly influence the resultant stiffness of the soil, and in turn the stiffness of the soil will influence the strain exhibited.

Therefore in order to define stiffness modulus applicable to the engineering problem considered, it is necessary to assess the magnitude of axial strain which the soil will be subjected to. In accordance with the recommendations made in BS8004:2015 the strain generally applicable to foundations design is in the range of 0.075 to 0.2%. The material stiffness values used for the analysis of the ground movements have been interpreted as follows:

Made Ground

The Made Ground was described in the borehole logs as clayey gravelly sand/soft to stiff brown silty sandy clay. For the purposes of this assessment, a conservative approach has been taken and the Made Ground will be treated as a soft clay. The Elastic modulus values for a soft clay typically range from 2 to 7MPa (short term, Eu) and 1 to 5MPa (long term, E') based on Table 11.7, Handbook of Geotechnical Investigation and Design Tables, Look (2007).

Poisson's ratio for soft clays are typically 0.50 (short term) and 0.40 (long term) based on Industrial Floors and Pavement Guidelines (1999).

In the absence of laboratory test results, a bulk unit weight of 16kN/m^2 has been adopted for design, in accordance with BS8002 (2015).

Table 5 below shows the values for Made Ground adopted for this analysis.

Weathered London Clay (WLC) / London Clay (LC)

Based on the maximum (i.e. most conservative) axial strain of 0.2% prescribed in BS8004:2015, the following correlation has been used to determine the Young's Modulus (Eu) of the London Clay. The relation has been taken from ICE manual of geotechnical engineering (2012), Volume II, chapter 53.7 and matches ratio of Eu/Cu at 0.2% axial strain recommended in Tomlinson (7th, 2001) based on works by Jardine et al. (1986):

$$Eu = 330Cu\ (kN/m^2)$$

The ratio of end of construction (Undrained) settlement to total settlement (fully drained) was taken as taken as 60% as specified in ICE manual of geotechnical engineering (2012), Volume II, chapter 53.6.

Therefore:

$$Eu = 200Cu\ (kN/m^2)$$

Utilising a plasticity index of 45% a drained (υ') and undrained (υ) poisson's ratio of 0.40 and 0.45 respectively were utilised based on Industrial Floors and Pavement Guidelines (1999). A plot of Young's modulus versus depth is presented as Figures 3 – 4 to this report.

In the absence of laboratory test results, a bulk unit weight of 18kN/m^2 for the WLC and 19kN/m^2 has been adopted for design, in accordance with BS8002 (2015).

Table 5 - Soil stratigraphy and stiffness parameters adopted

Strata	Level at top (m bgl)	Short-term (undrained)		Long-term (drained)	
		E_u kPa	Poisson's Ratio (υ)	E' kPa	Poisson's Ratio (υ')
Made Ground	GL	5000	0.5	2500	0.4
WLC/LC	1.8	16000+2575z	0.45	10000+1515z	0.4

4.4 Construction and load cases

With reference to the proposed drawings presented within Appendix A, the existing lower ground floor is expected to be extended as follows:

1. Design of Temporary Works:
    - All temporary works should be designed by an appropriately qualified structural engineer. It is likely that the designs may require checking by a party wall surveyor on the neighbouring properties;
2. **Unloading** (including excavations or for underpins & temporary foundations & installation of temporary works):
    - Excavate down and underpin/construct to proposed foundations formation level (maximum depth of 3.30m bgl). To include excavation of existing lightwell (formed at 1.90m bgl) by an additional 1.40m.;
    - Insert temporary bases and propping as and where required during the excavation process.
    - Installation of appropriate temporary works and propping should occur simultaneously as excavation progresses;
3. **Reloading:**
    - Construction of car lift mechanics and foundation slab to proposed basement FFL. Construct load-bearing external RC walls & internal walls/columns;
    - Construct new ground floor slab to provide permanent horizontal support to underpinnings and contiguous piled wall as required;
    - Removal of any temporary props once permanent supports are in place.

Structural Loading at foundation level for use in the ground movement analysis has been calculated by the structural engineer (Martin Redston Associates) as shown in Appendix B. The model considers a load of 50kN/m spread across a 1.0m wide column along the southern, eastern and western boundaries of the car lift (50kN/m^2) and a 0.60m wide column along the northern boundary (84kN/m^2). Loads from the proposed floor slabs are deemed to be negligible and therefore have not been modelled in this assessment. This assessment is specific to the construction sequence and load case described above. If any changes are made to the proposed development then this assessment should be updated.

4.5 Ground movement inside the proposed basement

Following excavation to the proposed foundation formation level the soil at this level and along the boundary of the excavation will tend to heave as a result of the change in the soil stress conditions. The magnitude and distribution of ground movements inside the excavated area are a function of the excavation size and shape.

The stress conditions and resultant settlement/heave have been assessed using the Boussinesq's method and geotechnical software PDISP by OASYS. PDISP calculates vertical movements due to a uniformly distributed load applied to a specific plane of geometry within a 3-D space. The Boussinesq analysis method is used in this analysis.

The following assumptions have been made within the PDISP analysis;

- Assumes Boussinesq stress distributions;
- Uniform pressure loading;
- No allowance has been made for the stiffness of the structures (foundation slab).

Three stages have been set up to create a simplified model of the redevelopment. These are as follows:

1. **Stage 1:** A first stage has been analysed to simulate excavation across the site with unloading due to the removal of soil. Assuming that no delays occur during the

construction process, this stage has been simulated using short term soil parameters only (i.e. undrained conditions).

It is proposed to excavate the lower ground floor down to a maximum depth of 3.30m bgl for the basement (although it should be noted that foundations may need to have deeper excavations locally due to additional excavations for temporary works). The undrained removal of the overburden, calculated using assumed unit weights (16kN/m^3 for Made Ground and 18kN/m^2 for the Weathered London Clay), will therefore cause a maximum unloading pressure of approximately -56kN/m^2 at the base of the floor slab within the lift pit area and -26kN/m^2 within the lightwell area. The PDISP analysis outputs at ground level are presented in Appendix C.

2. **Stage 2:** A second simulates a long term condition after construction, when the stress conditions within the soil have been allowed to equilibrate under the new pressures and pore pressures in the soil have stabilised (i.e. fully drained conditions). The model and tabular outputs for this stage are presented in Appendix D - E.

The elastic parameters for the soil have been chosen as appropriate for the short and long term conditions. A short term analysis has used undrained parameters and for long term assessments fully drained parameters were used. The vertical boundary of the model was fixed at 15m bgl where the effective vertical stress due to foundation unloading decreases to 20% of the effective overburden as required in EC7.

The results of the PDISP analysis are based on an unrestrained excavation as the model is unable to take account of the mitigating effect of the temporary works bounding the excavation, which in reality will combine to restrict these movements within the basement excavation. The movements predicted at or just beyond the site boundaries are unlikely to be realised and should not therefore have a detrimental impact upon any nearby structures.

It should be noted that the heave movements detailed below are cumulative.

PDISP results

The results for each stage of the analysis are detailed in Appendix C to Appendix E.

Conclusions and recommendations

The results show that initially upon excavation and before construction the ground is expected to heave upwards by a maximum of 8mm at the centre of the basement. In long term conditions, the centre of the basement is expected to heave upwards by 4mm, while settlement of <2mm is detailed in the columns surrounding the site.

The heave values are considered to be overestimated and therefore conservative. It should be noted, Bowls in his text (Foundation Analysis and Design-Fifth Edition, page 542) states that "In general, where heave is involved, considerable experience and engineering judgement are necessary in estimating probable soil response, for currently there are no reliable theories for the problem".

Final designs for the basement retaining walls, basement slabs and columns should be designed to support the heave and settlement movements predicted. Any proposed drainage system or pipe works underlying the ground floor should be designed to accommodate the predicted movements.

The results of the PDISP analysis indicate movement beyond the site boundaries as shown on the output models. However, these movements are minimal and should not have a detrimental impact upon any nearby structures assuming good workmanship is employed by the main contractor.

4.6 Ground Movements outside the Area of the New Basement

Excavations and Assessment Methodology

Ground movements have been analysed using XDISP by Oasys and a building damage assessment has been undertaken based on the results of the analysis. Contours of vertical and horizontal ground movement and tabular output of the analysis are presented in Appendix F. Summary tables are provided in the section below.

As detailed in the architectural drawings presented in Appendix A, the basement is to be constructed using traditional underpinning techniques. A ground floor slab is also proposed. It is understood that the ground floor slab will prop the reinforced concrete walls in the permanent case. Given that propping will generally be included in the temporary and permanent cases over the proposed structure, a low stiffness approach would not apply to this situation. The proposed retaining walls will also be propped by the ground floor slab in the permanent case.

It is important to note that vertical wall movement related to underpinning is not defined by the CIRIA C580 / C760 data. Instead the short term settlement will be controlled by movements occurring during the underpin construction process.

With this in mind, the XDISP analysis considers both 'installation of contiguous bored pile wall in stiff clay' (CIRIA 760 Fig. 6.8) and 'excavation in front of a high stiffness wall in stiff clay' (CIRIA C760 Fig. 6.15(a)) to simulate the effects from the underpinning and excavation on neighbouring structures as the most conservative approach. The combined cumulative movements resulting from the wall installation (which includes the underpinning) and basement excavation have been used to carry out an assessment of the likely damage to adjacent properties.

Due to the irregular shape of the proposed basement, several polygons or composite excavations have been modelled in XDISP to replicate the basement as a whole. In accordance with guidance from Oasys (https://www.oasys-software.com) and to avoid re-entrant corners, no movements have been modelled to those sides of the excavations that form attachments within the centre of the proposed basement but cannot be eliminated.

Building Damage Assessment

The building damage assessment was carried out on the relevant adjacent structures, as detailed in Figure 5 and summarised below in Table 4-6.

Table 4-6: Summary of structures

Property	Structure (Refer Figure 5)	Structure ID (Shown in Appendix F)	Assumed Structural Height (m)	Approximate Wall Length (m)
109 Canfield gardens	Party Wall 1	Wall 1	13	14.69
	Wall 1	Wall 2	13	11.43
113 Canfield Gardens	Wall 1	Wall 1	13	11.61
	Wall 2	Wall 2	13	18.77

Results

Table 4-4 presents the damage assessments for the structures listed above. The table also presents the CIRIA C760 approximate crack widths corresponding to the damage categories. The tabular XDISP program output for the basement is presented as Appendix F.

Table 4-7: Ground movement / Building Damage Summary

Property	Structure (Refer Figure 5)	Maximum settlement (mm)	Average Horizontal Strain (%)	Maximum Tensile Strain (%)	Damage Category*	Approximate Crack Width (mm) (CIRIA C760)
109 Canfield Gardens	PW1	0.28554	-0.0051658	0.0010656	Negligible	<0.01
	W1	0.28554	0.025506	0.025506	Negligible	<0.01
113 Canfield Gardens	W1	2.0270	0.022510	0.023997	Negligible	<0.01
	W2	2.0270	-0.038204	0.015221	Negligible	<0.01

Based on these predicted ground movements, the properties surrounding the site are expected to be within CIRIA C760 Damage Category 0 (Negligible).

It should be noted however that these movements are likely to be more affected by the quality of the workmanship and propping of the basement excavations. The construction details adopted at the junctions with the party walls and at return walls will also have a significant influence on the likelihood of any future movement at these locations. Extra care should be taken in these sections to provide appropriate support to the existing walls to prevent any excessive deflection.

Despite these results it is considered that appropriate consideration to the support & stability of neighbouring walls (especially party walls and party wall junctions/return walls will still be needed to be addressed during the detailed structural design of the basement. Movement monitoring of these walls is recommended during the construction stage and trigger levels should be set in order to protect the neighbouring properties as a precautionary measure.

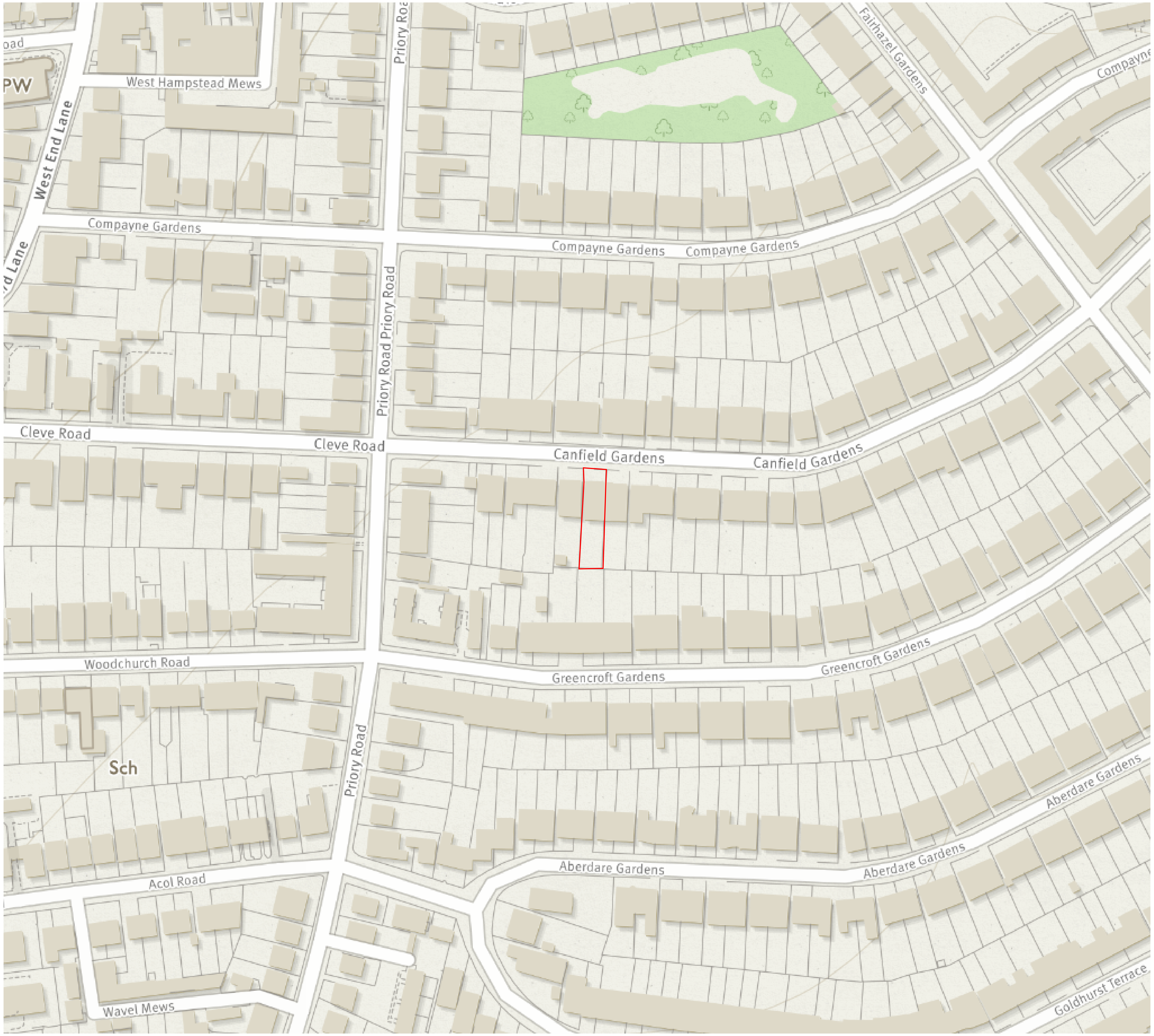
5.0 CONCLUSIONS

A Ground Movement Assessment has been carried out for 111 Canfield Gardens, London, NW6 3DY to assist with pre-planning document submissions to the Camden Council.

Providing that appropriate consideration is given to the detailed design of party wall and return wall junctions with the basement in order to limit future movement, that good workmanship and construction sequences are used with appropriate support during excavations, then the proposed basement construction is unlikely to cause significant damage to the surrounding structures. Based on the predicted ground movements, the adjacent structures are expected to be within the CIRIA C760 Damage Category 0 (Negligible).

Early movement monitoring of the boundary walls to the neighbouring buildings is recommended during the construction stage and trigger levels should be set in order to protect the neighbouring properties, especially at the junctions between the property's. A specification for movement monitoring should be incorporated into the final construction scheme for the proposed development to monitor the adjacent properties and establish the extent of any future potential movement to the building. Any temporary and permanent works should be designed to limit eventual movement.

FIGURES



Do not scale from this drawing.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.

RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM NO.

CONSTRUCTION

DEMOLITION

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

Rev.	Date	Description	Drwn.	Chkd.	Appd.

FAIRHURST
135 Park Street
LONDON
SE1 9EA

Tel: 020 7828 8205
Fax: 084 4381 4412
Fairhurst.co.uk

Client:
Site Analytical Services Limited

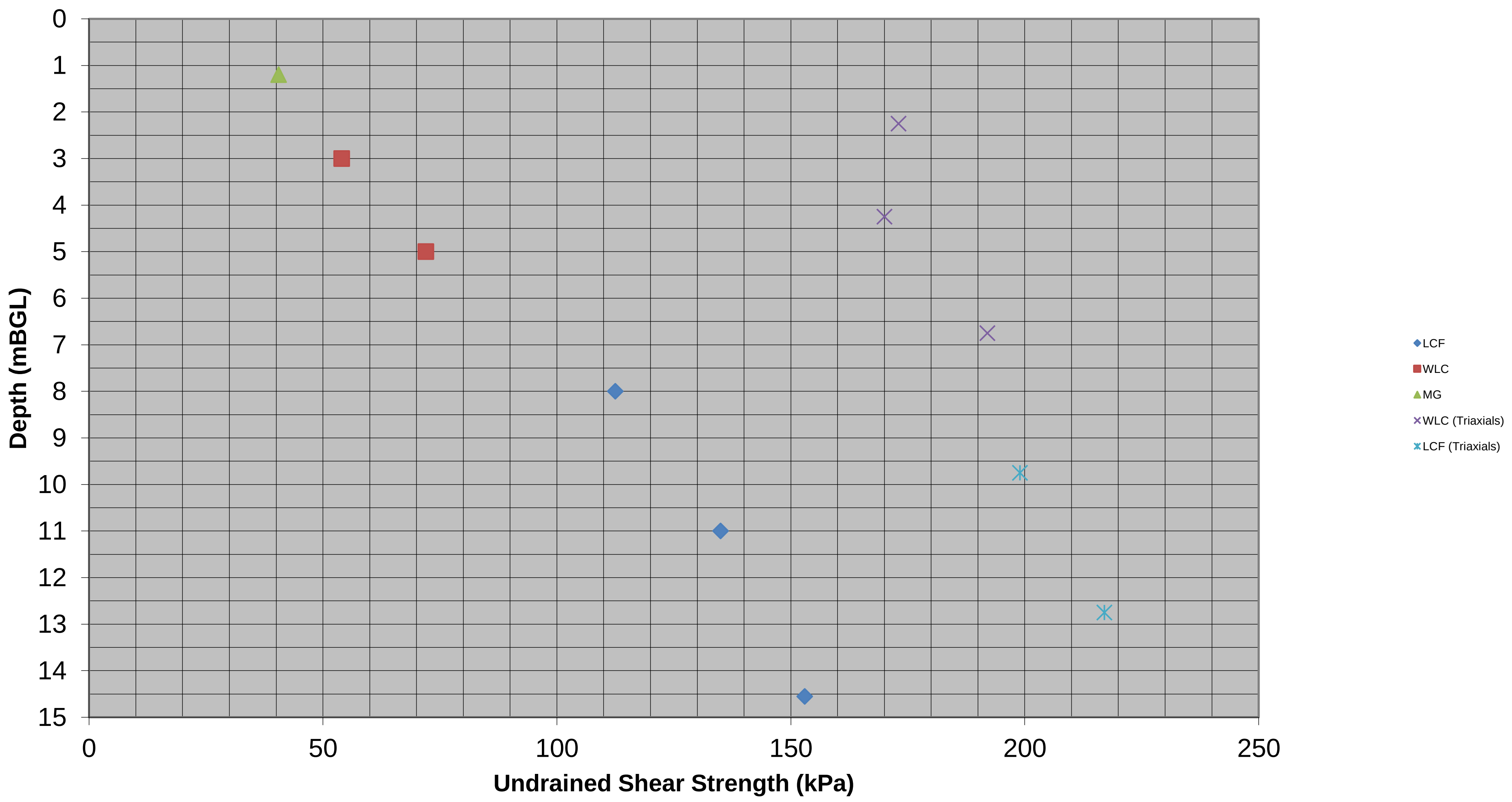
Project Title:
111 Canfield Gardens
Camden
London

Drawing Title:
SITE LOCATION PLAN

Scale at A3: Not to Scale	Status: ISSUE	
Drawn: HB	Checked: AS	Approved: AS
Date: 08/01/20	Date: 08/01/20	Date: 08/01/20
Drawing No.: 136072 FIGURE 1		Revision: -

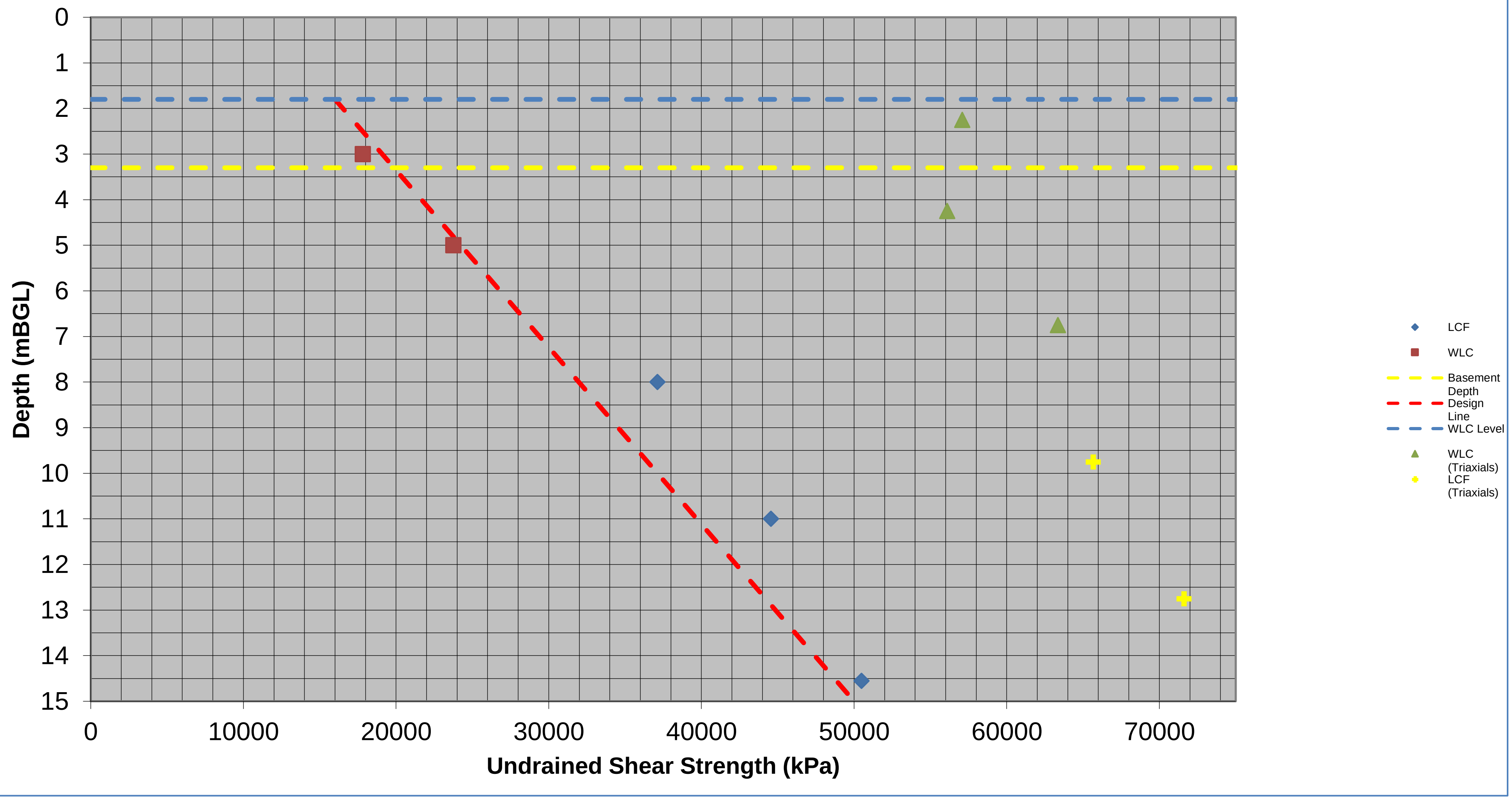
FAIRHURST

Fig 2 - Undrained Shear Strength vs Depth (m BGL)



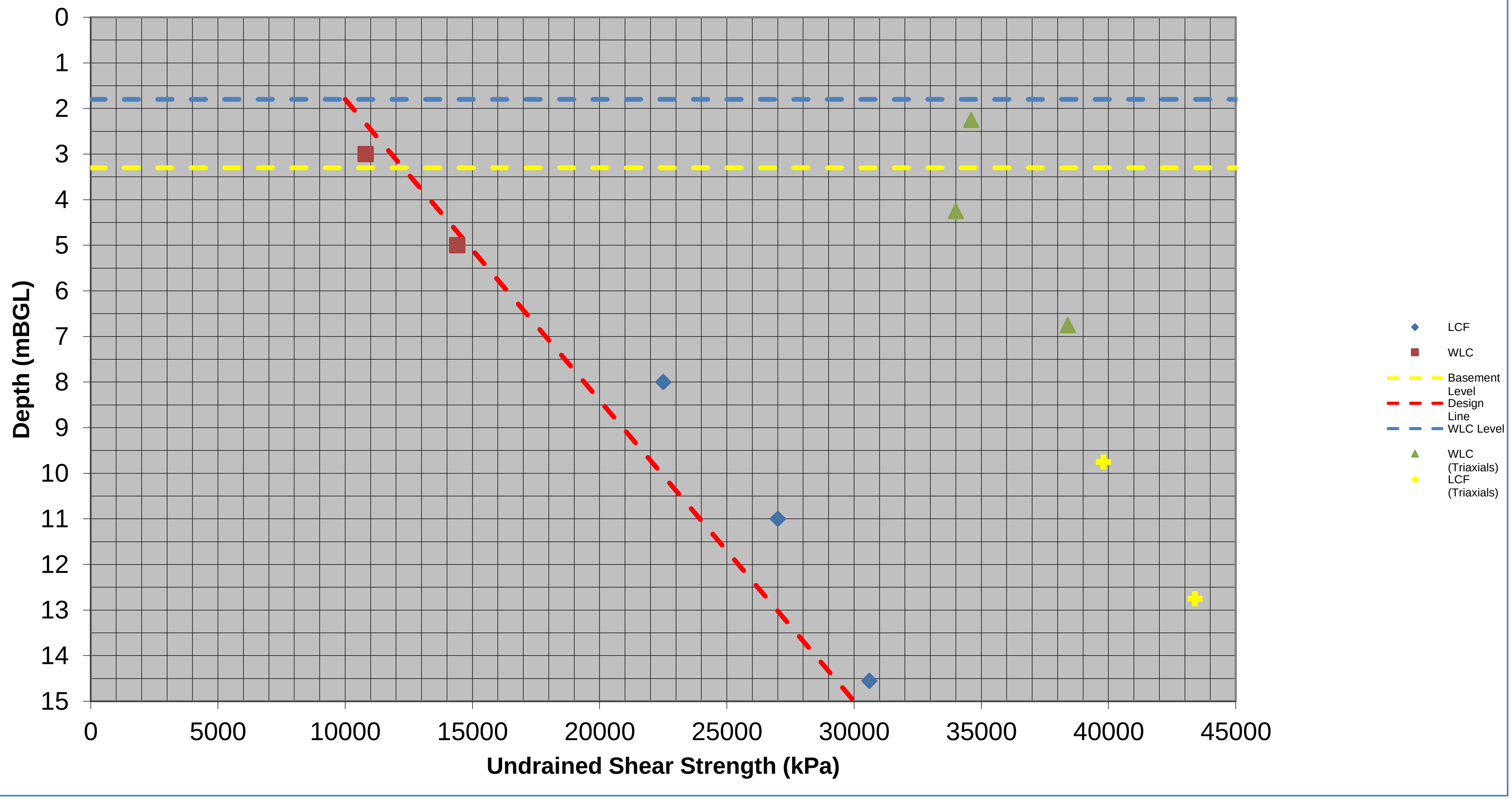
FAIRHURST

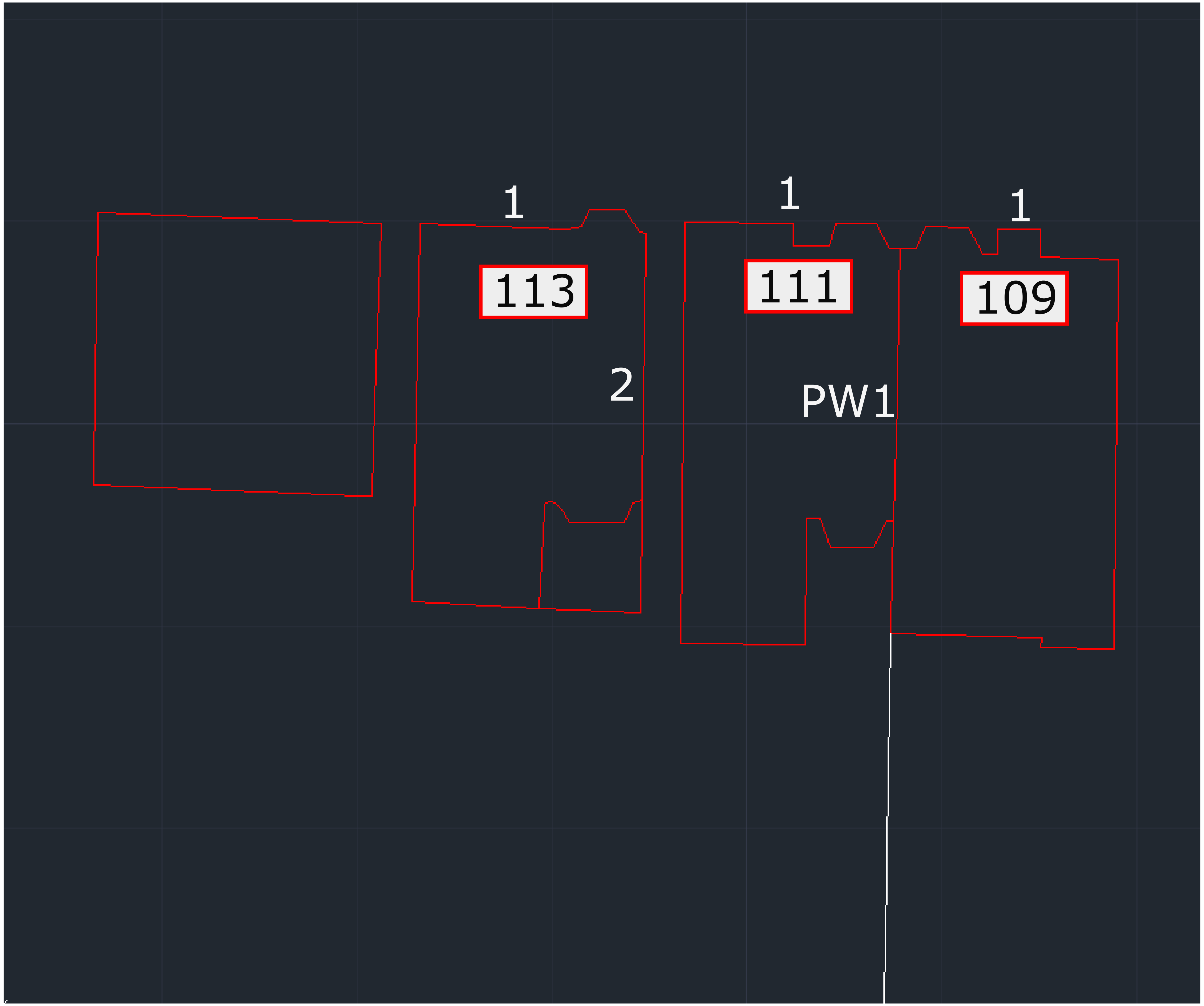
Fig 3 - Young's Modulus (Undrained) vs Depth (m BGL)



FAIRHURST

Fig 4 - Young's Modulus (Drained) vs Depth (m BGL)





Do not scale from this drawing.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.

RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM NO.

CONSTRUCTION

DEMOLITION

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

Rev.	Date	Description	Drwn.	Chkd.	Appd.

FAIRHURST
135 Park Street
LONDON
SE1 9EA

Tel: 020 7828 8205
Fax: 084 4381 4412
Fairhurst.co.uk

Client:
Site Analytical Services Limited

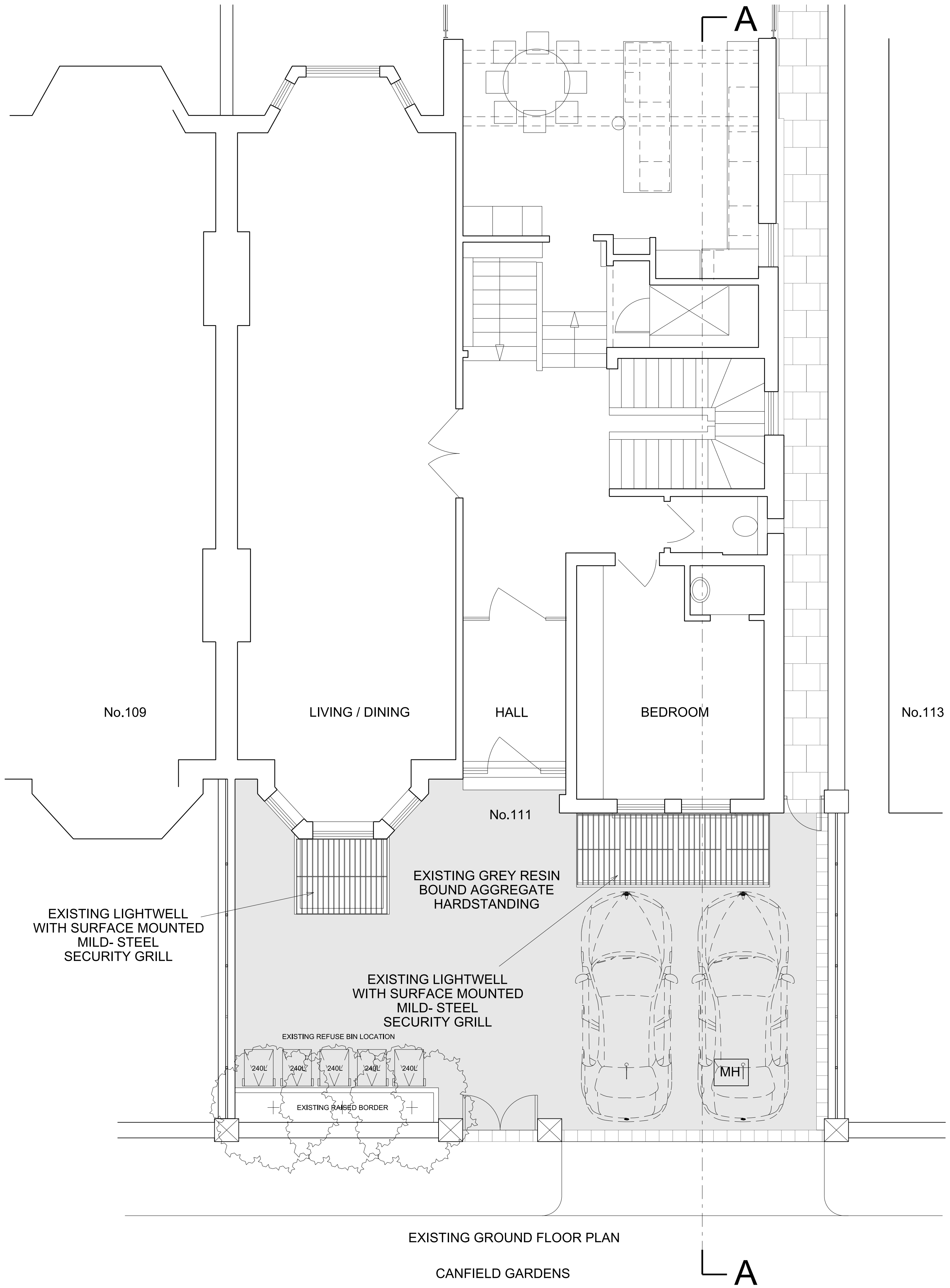
Project Title:
111 Canfield Gardens
Camden
London

Drawing Title:
Ground Movement Assessment Wall Location Plan

Scale at A3: Not to Scale	Status: ISSUE	
Drawn: HB	Checked: AS	Approved: AS
Date: 08/01/20	Date: 08/01/20	Date: 08/01/20
Drawing No.: 136072 FIGURE 5		Revision: -

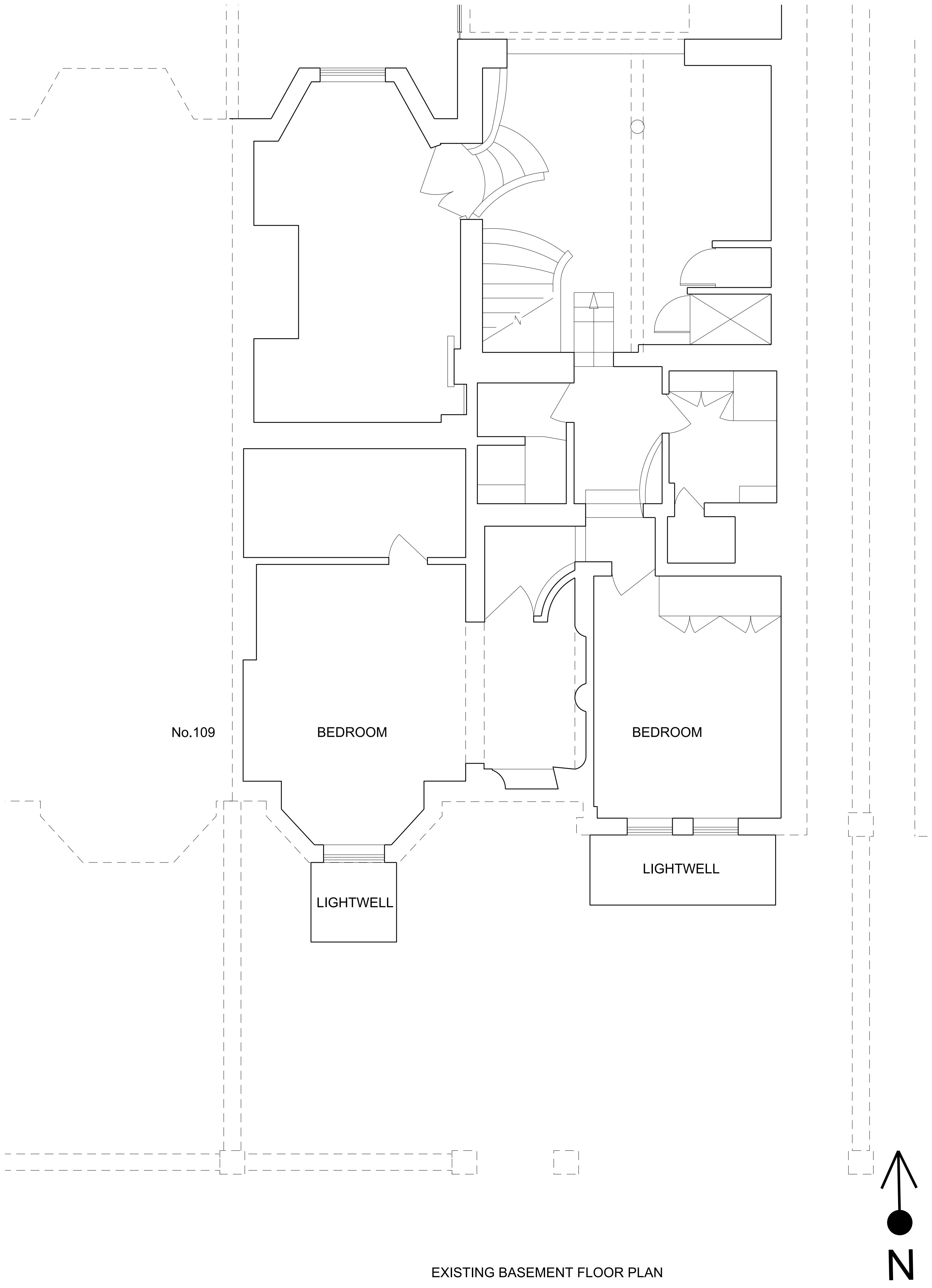
APPENDIX A

DEVELOPMENT PLANS



EXISTING GROUND FLOOR PLAN

CANFIELD GARDENS



EXISTING BASEMENT FLOOR PLAN

Willingale Associates
ARCHITECTS & DEVELOPMENT CONSULTANTS

CONTACT DETAILS:
56 Clerkenwell Road, London, EC1M 5PX
www.willingale.com
arch@willingale.com
T: 020-7490-5506

PROJECT:
111 CRANFIELD GARDENS
LONDON NW6

TITLE:
EXISTING BASEMENT & GROUND FLOOR PLANS

DRAWING NUMBER:
NW6_111CG_EX01

DATE:
02/08/2019

SCALE:
1:100 @ A3
1:50 @ A1

0m 1 m 2 m 3 m

111 CRANFIELD GARDENS

EXISTING CANFIELD GARDENS (FRONT) ELEVATION AND SECTION THROUGH BEDROOM LIGHTWELLS

Willingale Associates
ARCHITECTS & DEVELOPMENT CONSULTANTS

CONTACT DETAILS:
56 Clerkenwell Road, London, EC1M 5PX
www.willingale.com
arch@willingale.com
T: 020-7490-5506

PROJECT:
111 CRANFIELD GARDENS
LONDON NW6

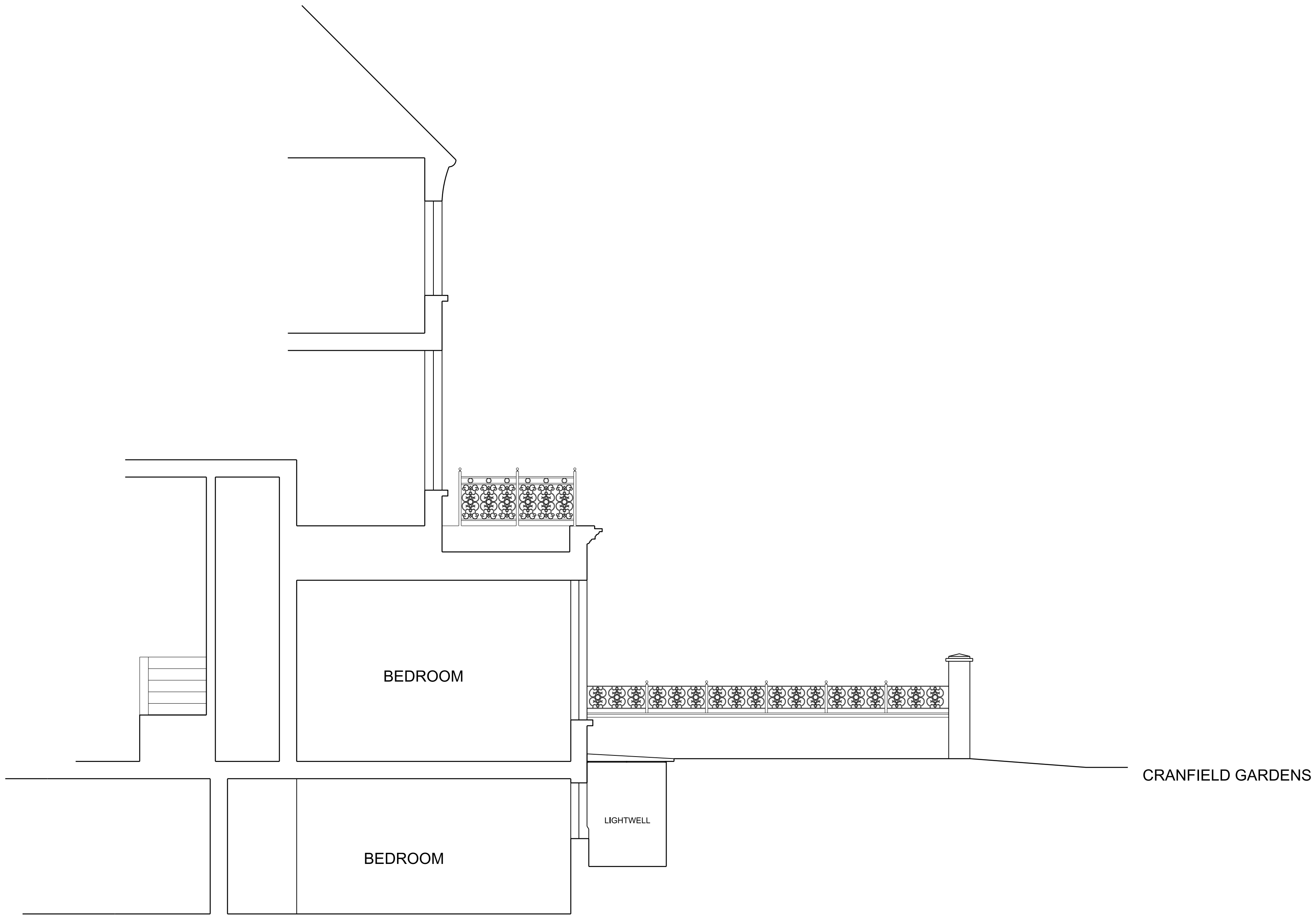
TITLE:
EXISTING FRONT ELEVATION

DRAWING NUMBER:
NW6_111CG_EX02

DATE:
02/08/2019

SCALE:
1:100 @ A3
1:50 @ A1

0m 1 m 2 m 3 m



SECTION A-A

Willingale Associates
ARCHITECTS & DEVELOPMENT CONSULTANTS

CONTACT DETAILS:
56 Clerkenwell Road, London, EC1M 5PX
www.willingale.com
arch@willingale.com
T: 020-7490-5506

PROJECT:
111 CRANFIELD GARDENS
LONDON NW6

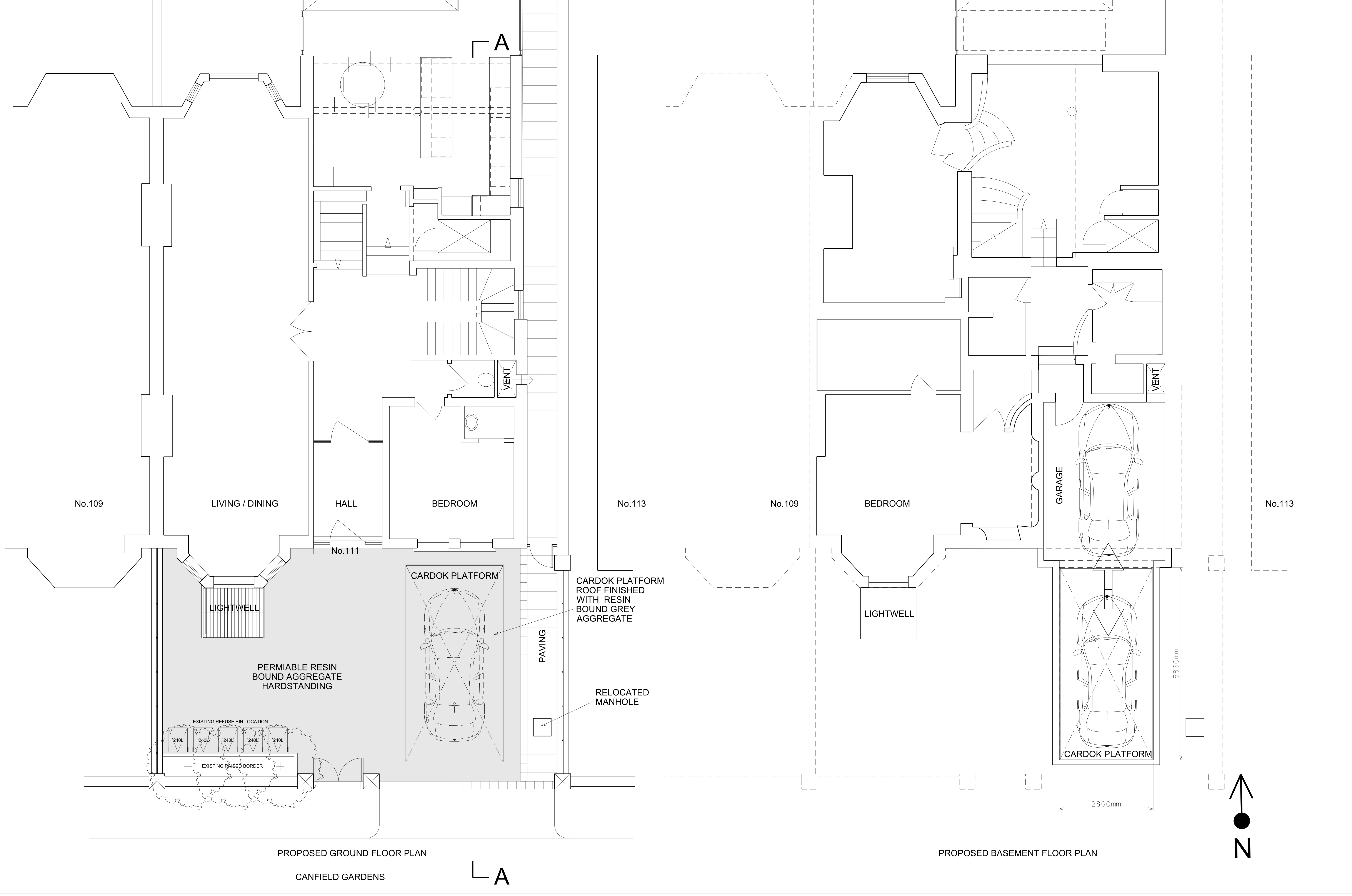
TITLE:
EXISTING SECTION A-A

DRAWING NUMBER:
NW6_111CG_EX03

DATE:
02/08/2019

SCALE:
1:100 @ A3
1:50 @ A1

0m 1 m 2 m 3 m



Willingale Associates
ARCHITECTS & DEVELOPMENT CONSULTANTS

CONTACT DETAILS:
56 Clerkenwell Road, London, EC1M 5PX
www.willingale.com
arch@willingale.com
T: 020-7490-5506

PROJECT:
111 CRANFIELD GARDENS
LONDON NW6

TITLE:
PROPOSED BASEMENT & GROUND FLOOR PLANS

DRAWING NUMBER:
NW6_111CG_PP01

DATE:
09/08/2019

SCALE:
1:100 @ A3
1:50 @ A1

0m 1 m 2 m 3 m

PROPOSED CANFIELD GARDENS (FRONT) ELEVATION AND SECTION THROUGH
BASEMENT CAR LIFT & EXISTING BEDROOM LIGHTWELL

Willingale Associates
ARCHITECTS & DEVELOPMENT CONSULTANTS

CONTACT DETAILS:
56 Clerkenwell Road, London, EC1M 5PX
www.willingale.com
arch@willingale.com
T: 020-7490-5506

PROJECT:
111 CRANFIELD GARDENS
LONDON NW6

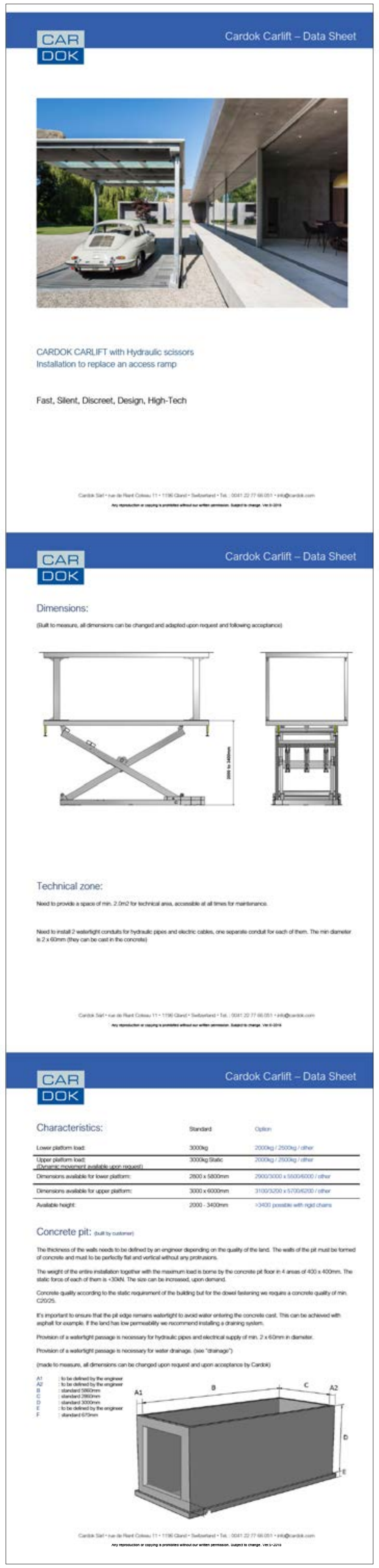
TITLE:
PROPOSED FRONT ELEVATION

DRAWING NUMBER:
NW6_111CG_PP02

DATE:
09/08/2019

SCALE:
1:100 @ A3
1:50 @ A1

0m 1 m 2 m 3 m



Cardok Carlift – Data Sheet

CAR DOK

CARDOK CARLIFT with Hydraulic scissors
Installation to replace an access ramp

Fast, Silent, Discreet, Design, High-Tech

Cardok Carlift – Data Sheet

CAR DOK

Dimensions:

(Built to measure, all dimensions can be changed and adapted upon request and following acceptance)

Technical zone:

Need to provide a space of min. 2.0m2 for technical area, accessible at all times for maintenance.

Need to install 2 watertight conduits for hydraulic pipes and electric cables, one separate conduit for each of them. The min diameter is 2 x 60mm (they can be cast in the concrete)

Cardok Carlift – Data Sheet

CAR DOK

Characteristics:

	Standard	Option
Lower platform load:	3000kg	2000kg / 2500kg / other
Upper platform load: (Dynamic movement available upon request)	3000kg Static	2000kg / 2500kg / other
Dimensions available for lower platform:	2600 x 5800mm	2900/3000 x 5500/6000 / other
Dimensions available for upper platform:	3000 x 6000mm	3100/3200 x 5700/6200 / other
Available height:	2000 - 3400mm	>3400 possible with rigid chains

Concrete pit: (built by customer)

The thickness of the walls needs to be defined by an engineer depending on the quality of the land. The walls of the pit must be formed of concrete and must to be perfectly flat and vertical without any protrusions.

The weight of the entire installation together with the maximum load is borne by the concrete pit floor in 4 areas of 400 x 400mm. The static force of each of them is <30kN. The size can be increased, upon demand.

Concrete quality according to the static requirement of the building but for the dowel fastening we require a concrete quality of min. C20/25.

It's important to ensure that the pit edge remains watertight to avoid water entering the concrete cast. This can be achieved with asphalt for example. If the land has low permeability we recommend installing a draining system.

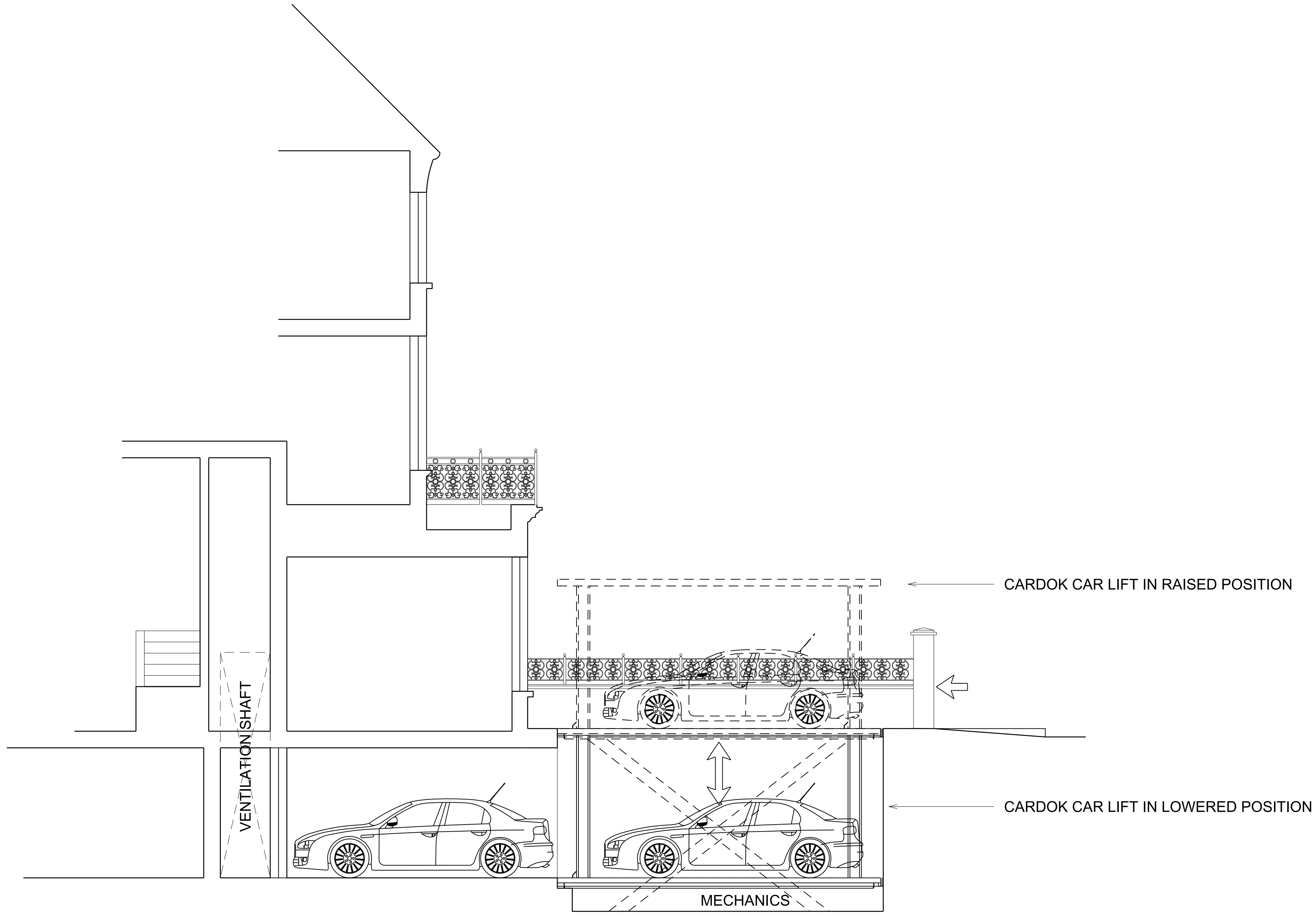
Provision of a watertight passage is necessary for hydraulic pipes and electrical supply of min. 2 x 60mm in diameter.

Provision of a watertight passage is necessary for water drainage. (see "drainage")

(made to measure, all dimensions can be changed upon request and upon acceptance by Cardok)

A1 : to be defined by the engineer
A2 : to be defined by the engineer
B : standard 5860mm
C : standard 2860mm
D : standard 3000mm
E : to be defined by the engineer
F : standard 670mm

CARDOK CARLIFT PRODUCT INFORMATION



PROPOSED SECTION A-A THROUGH CARDOCK

Willingale Associates ARCHITECTS & DEVELOPMENT CONSULTANTS	CONTACT DETAILS: 56 Clerkenwell Road, London, EC1M 5PX www.willingale.com arch@willingale.com T: 020-7490-5506	PROJECT: 111 CRANFIELD GARDENS LONDON NW6	TITLE: PROPOSED SECTION AA	DRAWING NUMBER: NW6_111CG_REV_D_PP_03	DATE: 09/08/2019

SCALE:
1:100 @ A3
1:50 @ A1

0m 1 m 2 m 3 m

APPENDIX B

STRUCTURAL LOADINGS