CampbellReith
consulting engineers

53 Elsworthy Road, London NW3 3BS

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12336-70

Revision: F1

September 2016

Campbell Reith Hill LLP
Friars Bridge Court
41-45 Blackfriars Road
London
SE1 8NZ

T:+44 (0)20 7340 1700
F:+44 (0)20 7340 1777
E:london@campbellreith.com
W:www.campbellreith.com

Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	July 2016	Comment	GHam12336-70-060716-53 Elsworthy Road-D1.doc	G Harper	A Marlow	E Brown
F1	September 2016	Planning	GHam12336-70-020916-53 Elsworthy Road-F1.doc	G Harper	A Marlow	E Brown

Document Details

Last saved	02/09/2016 10:00
Path	GHam12336-70-020916-53 Elsworthy Road-F1.doc
Author	G Harper, BEng (Hons)
Project Partner	E Brown, MSc BSc CGeol FGS
Project Number	12336-70
Project Name	53 Elsworthy Road, London, NW3 3BS
Planning Reference	2016/2251/P

Contents

Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 53 Elsworthy Road, London, NW3 3BS (planning reference 2016/2251/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The Basement Impact Assessment (BIA) has been prepared by firms of engineering consultants using individuals who possess suitable qualifications.

1.5. The new basement is proposed under the rear two-thirds of the property with a small lightwell in the back garden. The BIA has confirmed that the proposed basement will be founded within London Clay, with founding levels between 2.5m below ground level at the rear and 3.5m below ground level at the front due to the fall across the site. An assessment of the likely heave and uplift is presented, and it is accepted that damage to neighbouring properties as a result of heave and uplift is unlikely.

1.6. A construction sequence with temporary propping works details and the design of the reinforced concrete retaining wall and slab is presented and accepted.

1.7. Ground water was not encountered during the site investigation, and is unlikely to be encountered during basement foundation excavation. Mitigation measures in the form of pumps, trench sheeting and trench propos are proposed in the unlikely event of water being encountered.

1.8. The adjoining property, 53A Elsworthy Road, is founded at the same depth as the proposed basement, so it is accepted that it should not be affected by any ground movements associated with the excavations. A basic Ground Movement Assessment (GMA) was performed for 51 Elsworthy Road that lies just east of the property, with damage determined as Negligible (Burland Category 0). Monitoring and condition surveys are required and will be undertaken to comply with the Party Wall process.

1.9. It is accepted that the surrounding slopes to the development site are stable.

1.10. It is accepted that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding.

1.11. It is accepted that the BIA has adequately identified the potential impacts of the proposed basement construction and proposes sufficient mitigation.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 7 June 2016 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 53 Elsworthy Road, London, NW3 3BS.

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment;

c) avoid cumulative impacts upon structural stability or the water environment in the local area, and;

evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as *"Excavation of single storey basement; erection of rear extension; infill of entrance porch to side excavation; replacement of rear ground floor window with door."*

The Audit Instruction also confirmed that the basement proposal does not involve a listed building nor does the site neighbour any listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 29 June 2016 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (Structural Report) dated April 2016 by Michael Chester & Partners,
- Basement Impact Assessment (Hydrogeological Report) dated April 2016 by JH Groundwater Ltd
- Planning Design and Access Statement undated by Webb Architects Limited,
- Planning Application Drawings by Webb Architects Limited consisting of:

  Location Plan

  Site Plan

  Existing Plans

  Proposed Plans

2.7. Following the initial audit, supplementary information has been provided on 16 August 2016 via email, and included:

- Response to Queries Raised in Campbell Reith's Basement Impact Assessment Audit.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	
Is data required by Cl.233 of the GSD presented?	Yes	BIA.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	BIA.
Are suitable plan/maps included?	Yes	BIA and supplementary drawings.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Structural Report Section 2.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Hydrogeological Report Section 2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Hydrogeological Report Section 3.
Is a conceptual model presented?	Yes	BIA Hydrogeological Report Section 4.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Structural Report Section 3.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Hydrogeological Report Section 5.1.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Hydrogeological Report Section 5.2.
Is factual ground investigation data provided?	Yes	Ground investigation conducted by S Chick Investigations in September 2013.
Is monitoring data presented?	No	Groundwater not encountered during investigation, although no evidence of monitoring is presented.
Is the ground investigation informed by a desk study?	Yes	BIA Structural Report Section 4.
Has a site walkover been undertaken?	Yes	BIA Structural Report Section 4.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA Structural Report Section 5.
Is a geotechnical interpretation presented?	Yes	BIA Structural Report Appendix D.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Structural Report Appendix D.
Are reports on other investigations required by screening and scoping presented?	Yes	Site investigation included within BIA.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	BIA Structural Report Section 5.

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	BIA Structural Report Section 5.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	N/A	BIA Structural Report Section 5.
Has the need for monitoring during construction been considered?	Yes	Although considered, the recommendation is that it is not necessary. BIA Structural Report Section 5.11.
Have the residual (after mitigation) impacts been clearly identified?	N/A	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	BIA Hydrogeological Report.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	BIA Structural Report Section 5.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by a team of engineering and geology consultants, Michael Chester & Partners (MCP) and JH Groundwater Limited, and the individuals concerned in its production have suitable qualifications.

4.2. The existing building is a three-storey house, with a small single-storey conservatory to the rear. Planning permission has already been obtained to build a small extension at the rear. The new basement is proposed under the rear two-thirds of the property with a small lightwell in the back garden. The adjoining property, 53A Elsworthy Road recently constructed a lower ground floor (Camden reference: 2013/7018/P) with no adverse effects recorded in any structures, or effect on the hydrology and geology of the area.

4.3. Michael Chester & Partners' report indicates that the proposed basement will need to be underpinned, with retaining structures extended out into the rear to form the lightwell. This is an acceptable methodology using established techniques. This technique was also used for the adjacent basement with no negative impacts.

4.4. A construction sequence is presented in Appendix C of the MCP report, and the reinforced concrete retaining wall and slab design is presented in Appendix D. Temporary works propping details were provided in a separate letter from MCP on 16 August 2016 (Ref. 15163).

4.5. It is noted that the ground investigation was completed in September 2013, and was specific to 53A Elsworthy Road. From this investigation, Made Ground was found to vary in thickness across the site between 1.0m and 1.5m, underlain by London Clay. As proposed founding levels vary between 2.5m and 3.5m below ground level, due to the fall across the site, the basement will be founded in London Clay. An assessment of likely heave and uplift pressures was subsequently presented.

4.6. Groundwater was not encountered during the site investigation, conducted to a depth of 5.0m. Available geological information also indicates that there is no aquifer beneath the site. During the excavation and construction of the adjoining basement, small amounts of water were encountered but none that caused structural concerns. It is thus accepted that risks due to groundwater are low, and adequate mitigation measures are proposed in the unlikely event of water being encountered. There are no significant groundwater flows to be affected by this development.

4.7. In the design of the retaining wall, groundwater level is assumed at 850mm below ground level to accommodate future rise in groundwater level. This assumption and the adopted soil parameters are accepted as reasonable.

4.8. The adjoining property, 53A Elsworthy Road, is founded at the same depth as the proposed basement, therefore it is accepted that it should not be affected by ground movements associated with the excavations, provided the underpinning is carried out to a good level of workmanship.

4.9. A basic Ground Movement Assessment (GMA) was performed for 51 Elsworthy Road that lies just east of the property, with damage determined as Negligible (Burland Category 0). Monitoring and condition surveys are required to comply with Party Wall Process.

4.10. The BIA has shown that the surrounding slopes to the development are stable.

4.11. The proposed basement will result in a small increase in impermeable area of some $37m^2$ at the rear of the property. As a result, it is acknowledged that there will be a small change to the amount, timing and quality of surface water runoff. The proposed mitigation measure, in the form of a green roof, is considered acceptable to offset the impacts of the development.

4.12. A small Magnolia tree is to be removed at the rear of the property, located at least 5m away from the neighbour's flank wall. It is accepted that its removal will have no structural implication for the neighbouring property.

4.13. It is accepted that the proposed basement will not have an impact on surrounding roads or pedestrian walkways as the extension is to the rear of the property. Additionally, no railway tunnels are known to pass below or close to the site.

4.14. It is accepted that the site is not located within the catchment area of the Hampstead Heath pond chain.

4.15. It is accepted that the site has no risk of groundwater or fluvial flooding and has no past history of flooding.

5.0 CONCLUSIONS

5.1. The BIA has been carried out by firms of engineering consultants using individuals who possess suitable qualifications.

5.2. The BIA has confirmed that the proposed basement will be founded within London Clay, with underpinning beneath existing walls to support the basement retaining structures. This is an acceptable methodology using established techniques, as demonstrated with the construction of the adjoining basement at 53A Elsworthy Road.

5.3. Drawings indicating the construction sequence, including temporary works, and retaining wall and basement slab design have been presented in the BIA and are considered acceptable.

5.4. It is unlikely that the ground water table will be encountered during basement foundation excavation. Adequate mitigation measures are proposed in the unlikely event of water being encountered.

5.5. The basic Ground Movement Assessment undertaken indicated damage to neighbouring properties to be Burland Category 0 (Negligible).

5.6. Monitoring and condition surveys are required to comply with Party Wall Process.

5.7. It is accepted that the surrounding slopes to the development site are stable.

5.8. It is accepted that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding. The provision for SUDS, in the form of a green roof, is an acceptable measure to mitigate the small increase in impermeable area.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Mitigation measures required should groundwater be encountered to be discussed.	Closed	02/09/2016
2	Stability	Indicative temporary works propping proposal.	Closed	02/09/2016
3	Stability	Assessment required, and mitigation of, likely heave pressures	Closed	02/09/2016
4	Stability	Condition surveys to satisfy the Party Wall Process to be discussed.	Closed	02/09/2016

Appendix 3: Supplementary Supporting Documents

MCP Response to CR Queries

MICHAEL CHESTER & PARTNERS Consulting Civil and Structural Engineers
8 Hale Lane London NW7 3NX tel 020 8959 9119 fax 020 8959 9662 mail@michaelchester.co.uk

Our Ref: 15163 August 2016

53 ELSWORTHY ROAD, LONDON NW3

RESPONSE TO QUERIES RAISED IN CAMPBELL REITH'S BASEMENT IMPACT ASSESSMENT AUDIT

INTRODUCTION:

Michael Chester & Partners prepared a structural Basement Impact Assessment (BIA) to accompany a planning application for the above site by Webb Architects. The application included some internal alterations at ground floor level, a small single storey extension to the rear and the excavation of a small basement.

Campbell Reith act on behalf of London Borough of Camden and they have prepared an Audit Report of the BIA. The following addresses the queries raised by Campbell Reith in the Audit Tracker contained within Appendix 2 of their report. The queries are reproduced for ease of reference.

QUERIES RAISED IN AUDIT TRACKER REPORT:

1. Mitigation measures required should groundwater be encountered to be discussed.

Campbell Reith accept that it is highly unlikely that significant ground water will be encountered during the excavations and, indeed, very little water was encountered during the very much larger excavation for the basement directly next door for which MCP were the Structural Engineers. The underlying subsoil is London Clay and is not, at these depths, especially susceptible to collapse even if water is present but, nonetheless, some small risk does remain. As such, the contractor will be expected to have adequate spare trench sheeting and trench props available on site at all times to deal with the event that unexpected water creates difficult ground conditions. The contractor will also be expected to have sufficient pumps available on site to clear any unwanted water. See Hydrologist's supplementary report on measures to be adopted.

2. Indicative temporary works propping proposal.

A sequence of construction was provided with the original BIA and indicated props within the excavations to retain the subsoils. Calculations for these props have been requested and are provided below –

- From the calculations for the retaining wall contained in the BIA it can be seen that the maximum total horizontal force applied to the retaining wall is 78.7kN per metre.
- 3No pairs of props are indicated in each excavation. The excavations are a maximum of 1.0m wide.
- Design only the most heavily loaded pair of props at the base of the excavation.
- Conservatively assuming a purely triangular distribution of load, the bottom pair of props carry approximately 55% of the total load = 21.7kN per prop.
- For excavations where props will be up to 2m long, provide two No.2 acrows, capacity = 24kN each. See Appendix A for details.
- For excavations where props will be over 2m long, provide two No.6 Titan Super Props, capacity = 42kN each to 4.3m long. See Appendix B for details.

3. Assessment required, and mitigation of, likely heave pressures

CIRIA C580 states that heave movements at the bases of excavations can be estimated by treating the overburden removal as a negative load on the assumption that, in the short-term, undrained condition the underlying clay acts as a linearly elastic isotropic material. M J Tomlinson in his book "Foundation Construction and Design" provides a suitable method for determining such settlements based on Boussinesq's theories. Conservatively taking a value of c_u of 65 kN/m^2 for the soil strength over the heave bulb, a value for the undrained Young's Modulus (E_u) of London Clay can be estimated based on CIRIA 580's recommendation that $E_u = c_u$ x 425 kN/m^2. Based on these figures Tomlinson's calculation gives an estimate of the total initial heave at the base of the excavation of about 13 to 14mm as the overburden is removed.

Tomlinson also provides a graph of how heave movements relate to surface movements in soft to firm clays and notes that some 80% of the associated settlement will take place within a distance equal to the depth of the excavation (an average of 3m in this instance), tailing off to zero within a distance of 4No basement depths (12m). In overconsolidated clays such as London Clay he notes that some uplift may occur at the sides of the excavations during the excavation stage rather than settlement; this is illustrated in Figure 2.10 of CIRIA 580. Calculations using the above formulae suggest this uplift might be in the order or 6 to 7mm during the initial excavation stage.

No.51 Elsworthy Road is, at its closest, 1.1m from the excavation for the new basement. Interpolating between the settlement and heave effects set out in the preceding paragraph indicates that foundation movement is likely to be negligible at the face of No.51 with perhaps 6 to 7mm occurring over a further distance of 10 to 11m, giving an angular distortion across No.51 of between about 1/700 and 1/900. Tomlinson notes in Table 2.2 of his book that cosmetic damage is not considered a risk even in highly sensitive buildings until angular distortions of 1/500 are reached, with structural damage not occurring until distortions of 1/150 are reached. It is, therefore, highly unlikely that any damage will be experienced by No.51 Elsworthy Road as a result of heave movements associated with the excavation of the basement.

The slab construction and the re-imposition of the building loading will similarly limit long-term heave to negligible levels.

4. Condition surveys to satisfy the Party Wall Process to be discussed.

The work will require Party Wall Awards with the properties on both sides of No.53. Condition surveys will be taken as a matter of course by the appointed Surveyors.

MICHAEL CHESTER & PARTNERS Consulting Civil and Structural Engineers
8 Hale Lane London NW7 3NX tel 020 8959 9119 fax 020 8959 9662 mail@michaelchester.co.uk

APPENDIX A

53 ELSWORTHY ROAD, LONDON NW3

DETAILS OF ACROWS

ACROW PROPS

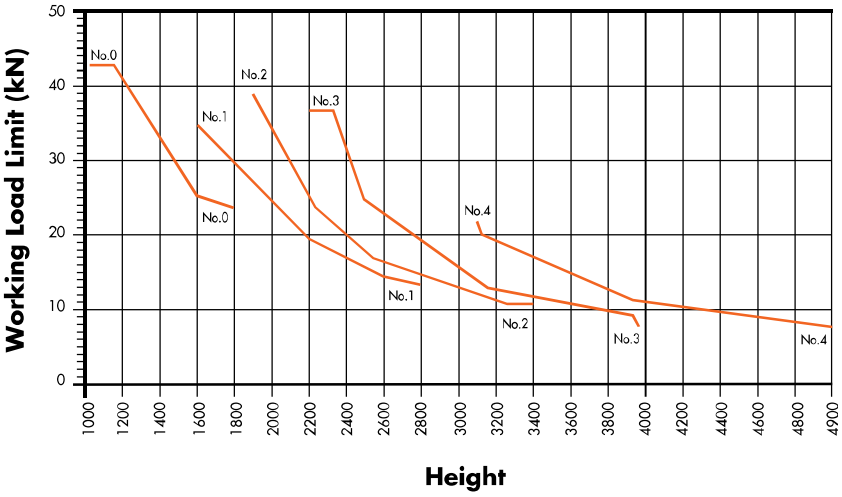
The remarkably versatile Acrow Prop has many uses and it would be hard to find a building site where it is not used in one way or another. The universal popularity of the Acrow Prop is due to the fact that it provides the simplest and quickest method of temporary support.

A MULTITUDE OF USES:

The main use of the Acrow Prop is in the temporary support of formwork for reinforced concrete floors and beams. They are equally useful as raking shores to support formwork for columns, walls and staircases. They are invaluable in repair work, for replacing a permanent support, for supporting canopies, lintels and the like while brick work or concrete is setting.

PROP RANGE SPECIFICATIONS

Code	Prop Size	Weight	Closed	Open	Est Weight	Load Cap. Closed	Load Cap. Open
506005	No. 0	12kg	1050mm	1830mm	13.0kg	40kN	25kN
506010	No. 1	16.2kg	1600mm	2800mm	17.3kg	34kN	14kN
506015	No. 2	18.9kg	1900mm	3400mm	20.0kg	40kN	11kN
506020	No. 3	21.4kg	2170mm	3975mm	22.6kg	35kN	8kN
506025	No. 4	29kg	3100mm	4900mm	30.0kg	20kN	7kN



STRONG BOY WALL SUPPORTS

Supporting walls while you fit lintels, R.S.J's or beams can be tricky but not with the Strong Boy wall support. Simply hammer the blade into a raked mortar joint and support it with a single Acrow prop while you remove the masonry beneath. (refer to an engineer for load capacities)

STRONG BOY SUPPORT	
WLL = 350kg (maximum working height = 3.2m)	
Code	350051

MICHAEL CHESTER & PARTNERS Consulting Civil and Structural Engineers
8 Hale Lane London NW7 3NX tel 020 8959 9119 fax 020 8959 9662 mail@michaelchester.co.uk

APPENDIX B

53 ELSWORTHY ROAD, LONDON NW3

DETAILS OF TITAN SUPER PROPS

TITAN SUPER PROPS

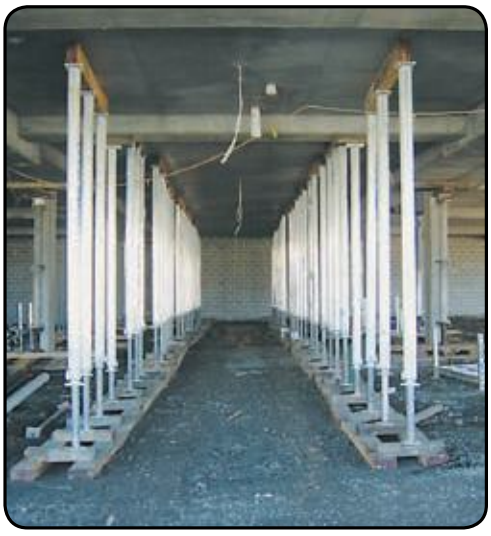
Capable of supporting eight times the load for the same weight of its steel counterpart, this extruded aluminium prop is easily handled in awkward locations. Ideally suited for building remediation and difficult access application due to their light weight and ease of erection.

- **Massive 10t safe working load**
- **Light alloy for easy handling**

Titan Super Props are available in three sizes.

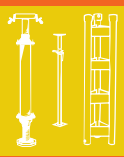
TITAN SUPER PROPS SPECIFICATIONS

Code	Prop Size	Weight	Closed	Open	Load Cap. Closed	Load Cap. Open
350201	No. 2	17kg	1700mm	2900mm	100.0kN	42.0kN
350202	No. 4	21kg	2900mm	4100mm	94.9kN	41.0kN
350203	No. 6	28kg	4300mm	5500mm	42.0kN	27.0kN



TITAN SUPER PROPS (ALUMINIUM)

Extensions	No. 2 1.7 - 2.9m 5' 7" - 9' 6"	No. 4 2.9 - 4.1m 9' 6" - 13' 5"	No. 6 4.3 - 5.5m 14' 1" - 13'5"
Metres	17kg	21kg	28kg
	kN		
1.70	100.0		
1.90	100.0		
2.10	100.0		
2.30	100.0		
2.50	88.0		
2.70	57.0	kN	
2.90	42.0	94.9	
3.10		79.9	
3.30		70.0	
3.50		62.4	
3.70		55.0	
3.90		50.0	
4.10		41.0	kN
4.30			42.0
4.50			39.0
4.70			37.1
4.90			33.0
5.10			31.0
5.30			28.0
5.50			27.0



London

Friars Bridge Court
41- 45 Blackfriars Road
London, SE1 8NZ

T: +44 (0)20 7340 1700
E: london@campbellreith.com

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com

UAE

Office 705, Warsan Building
Hessa Street (East)
PO Box 28064, Dubai, UAE

T: +971 4 453 4735
E: uae@campbellreith.com