Camden Planning Guidance

Basements and lightwells

CPG 4

London Borough of Camden

July 2015

Camden

CPG4 Basements and Lightwells

1 Introduction

What is Camden Planning Guidance?

1.1 We have prepared this Camden Planning Guidance to support the policies in our Local Development Framework (LDF). This guidance is therefore consistent with the Core Strategy and the Development Policies, and forms a Supplementary Planning Document (SPD) which is an additional "material consideration" in planning decisions. The Council adopted CPG4 Basements and lightwells on 6 April 2011 following statutory consultation. This document was updated in 2013 and again in 2015 to expand and refine the guidance. Details on these updates and the consultation process are available at camden.gov.uk/cpg.

1.2 The Camden Planning Guidance covers a range of topics (such as housing, sustainability, amenity and planning obligations) and so all of the sections should be read in conjunction, and within the context of Camden's LDF.

Basements in Camden

1.3 With a shortage of development land and high land values in the borough the development of basements is a popular way of gaining additional space in homes without having to relocate to larger premises. Basements are also a typical feature of the Central London part of Camden and used for various purposes including commercial, retail and leisure uses, servicing and storage. However, while basement developments can help to make efficient use of the borough's limited land, in some cases they may cause harm to the amenity of neighbours, affect the stability of buildings, cause drainage or flooding problems, or damage the character of areas and the natural environment.

What does this guidance cover?

1.4 This guidance provides information on basement and lightwell issues and includes the following sections:

- Planning and design considerations;
- Assessing basements and Basement Impact Assessments; and
- Impacts to neighbours from demolition and construction;

1.5 This guidance supports policy DP27 - Basements and lightwells in Camden Planning Guidance and the following other Local Development Framework policies:

Core Strategy

- CS5 Managing the impact of growth and development
- CS14 Promoting high quality places and conserving our heritage
- CS15 Protecting and improving our parks and open spaces & encouraging biodiversity

- CS17 Making Camden a safer place
- CS18 Dealing with our waste and encouraging recycling

1.6 Development Policies

- DP23 Water
- DP24 Securing high quality design
- DP25 Conserving Camden's heritage
- DP26 Managing the impact of development on occupiers and neighbours

1.7 It should be noted that the guidance covered in this section only forms part of the range of considerations that applicants should address when proposing new basement development. In addition to these specific matters wider issues such as design, heritage, sustainability and the water environment should also be considered. Further guidance on these, and other issues, is contained within the Local Development Framework documents and the Camden Planning Guidance.

When does this guidance apply?

1.8 This guidance applies to all developments in Camden that propose a new basement or other underground development, or an extension to existing basement or other underground development where planning permission is required. Permitted development rights mean that some basements will not require planning permission. Underground developments may include ground or lower ground floors where excavation is required, for example when a ground floor is extended further into sloping land requiring excavation.

PERMITTED DEVELOPMENT

Permitted development rights are nationally set and allow certain building works and changes of use to be carried out without having to make a planning application. Permitted development rights are set out in The Town and Country Planning (General Permitted Development) Order 1995 as amended, which permits "the enlargement, improvement, or other alteration of a dwellinghouse" within the limits laid down for extensions.

In certain situations such 'Permitted Development' rights are removed, such as:

- For listed buildings;
- Within a conservation area if there are any trees which will be affected by the development;
- Outside a conservation area if any protected trees are to be affected (further guidance on the protection of trees is on page 10); and
- For works classified as 'engineering operations'.
- You should also check any relevant Article 4 Directions which may remove Permitted Development rights. For guidance on permitted development rights, please visit the Camden Council website.

2 Basements and lightwells

KEY MESSAGES

The Council will only permit basement and underground development that does not:

- cause harm to the built and natural environment and local amenity;
- result in flooding; or
- lead to ground instability.

We will require applicants to demonstrate by methodologies appropriate to the site that schemes:

- maintain the structural stability of the building and neighbouring properties;
- avoid adversely affecting drainage and run-off or causing other damage to the water environment; and
- avoid cumulative impacts upon structural stability or the water environment in the local area.

Applicants will be required to submit information relating to the above within a Basement Impact Assessment (BIA) which is specific to the site and particular proposed development.

In certain situations we will expect an independent verification of Basement Impact Assessments, funded by the applicant.

2.1 This guidance gives detailed advice on how we will apply planning policies when making decisions on new basement development or extensions to existing basement accommodation.

2.2 Policy DP27 Basements and lightwells of Camden's Local Development Framework requires applicants to consider a scheme's impact on local drainage and flooding and on the structural stability of neighbouring properties through its effect on groundwater conditions and ground movement. Section 3 of this guidance document sets out how basement impact assessments need to provide evidence on these matters.

Planning and design considerations

2.3 We recognise that there can be benefits from basement development in terms of providing additional accommodation, but we need to ensure that basement schemes:

- do not cause undue harm to the amenity of neighbouring properties;
- do not have a detrimental impact on the groundwater environment, including ponds and reservoirs;
- do not have any effects on surface water run-off or ground permeability;

- do not harm the recognised architectural character of buildings and surrounding areas, including gardens and nearby trees, and that conservation area character is preserved or enhanced;
- conserve the biodiversity value of the site;
- achieve sustainable development; and
- do not place occupiers at risk or have any effects on the stability or bearing capacity of adjacent land generally.

Size of development

2.4 Often with basement development, the only visual features are lightwells and skylights, with the bulk of the development concealed wholly underground, away from public view. However, just as overly large extensions above the ground level can dominate a building, contributing to the over-development of a site, an extension below ground can be of an inappropriate scale. There may be more flexibility with the scale of a development when it is proposed underground, but there are a number of factors that would mean basement development would be overdevelopment.

SKYLIGHT
A window, dome, or opening in the roof or ceiling, to admit natural light.

LIGHTWELL
An opening within or next to a building that allows natural light to reach basement windows, that would otherwise be obscured.

2.5 Larger basement developments, such as those of more than one storey in depth or which extend outside of the footprint of the building, can have a greater impact than smaller schemes. Larger basement developments require more extensive excavation resulting in longer construction periods, and greater numbers of vehicle movements to remove the spoil. These extended construction impacts can have a significant impact on adjoining neighbours through disturbance through noise, vibration, dust, and traffic and parking issues. Larger basements also can have a greater impact on the water environment by reducing the area for water to runoff and soak away. Basement development that extends below garden space can also reduce the ability of that garden to support trees and other vegetation leading to poorer quality gardens and a loss in amenity and the character of the area.

2.6 The Council's preferred approach is therefore for basement development to not extend beyond the footprint of the original building and be no deeper than one full storey below ground level (approximately 3 metres in depth). The internal environment should be fit for the intended purpose, and there should be no impact on any trees on or adjoining the site, or to the water environment or land stability. Larger schemes, including those consisting of more than one storey in depth or extending beyond the footprint of the above ground building, will be expected to provide appropriate evidence to demonstrate to the Council's satisfaction that the development does not harm the built and natural environment or local amenity.

2.7 The Council recognises that in the case of larger buildings in central London and on large comprehensively planned sites (for example on large sites that occupy an urban block) the impacts of basements will differ to basement schemes in primarily residential neighbourhoods and in such circumstances larger basements are likely to be appropriate.

Habitable rooms

2.8 Development Policy DP27 (Paragraph 27.6) states that the Council will not allow habitable rooms and other sensitive uses for self-contained basement flats and other underground structures in areas at risk of flooding. Outside of these areas, where basement accommodation is to provide living space (possibly for staff), it will be subject to the same standards as other housing in terms of space, amenity and sunlight. Suitable access should also be provided to basement accommodation to allow for evacuation. Further guidance is contained in CPG2 Housing (refer to section 4 on residential development standards).

Conservation areas and listed buildings

2.9 In the case of listed buildings applicants will be required to consider whether basement and underground development preserves the existing fabric, structural integrity, layout, interrelationships and hierarchy of spaces, and any features that are architecturally or historically important. Where the building is listed, new basement development or extensions to existing basement accommodation will require listed building consent, even if planning permission is not required. The acceptability of a basement extension to a listed building will be assessed on a case-by-case basis, taking into account the individual features of the building and its special interest. Applicants should contact the Council at the earliest opportunity to discuss such proposals.

LISTED BUILDING CONSENT
Legally required in order to carry out any works to a Listed Building which will affect its special value. This is necessary for any major works, but may also be necessary for minor alterations and even repairs and maintenance. Listed Building Consent may also be necessary for a change of use of the property.

2.10 As with all basement schemes, we will need to be satisfied that effective measures will be taken during demolition and construction works to ensure that damage is not caused to the listed building and any buildings it directly adjoins. Poor demolition and construction methods can put neighbouring properties at risk and so can have considerable effects on the character and appearance of heritage buildings and conservation areas.

2.11 We will seek the submission of a management plan for demolition and/or construction where basement works are proposed in conservation areas or adjacent to a listed building. Further guidance on this is contained within CPG6 Amenity (refer to section 8 on construction management plans).

Basement walls, windows, and doors

2.12 The development of a basement and the introduction of light wells will result in an area of exposed basement wall and will usually mean new window or door openings. Any exposed area of basement development to the side or rear of a building will be assessed against the guidance in CPG1 Design (refer to section 4 on extensions, alterations and conservatories). In general, this expects that any exposed area of basement to be:

- subordinate to the building being extended;
- respect the original design and proportions of the building, including its architectural period and style; and
- retain a reasonable sized garden.

2.13 The width of any visible basement wall should not dominate the original building.

2.14 In number, form, scale and pane size, basement windows should relate to the façade above. They should normally be aligned to the openings above and be of a size that is clearly subordinate to the higher level openings so as not to compete with the character and balance of the original building. On the street elevation, and on certain rear elevations where there is a distinguishable pattern to the fenestration, the width and height of windows should be no greater than those above.

FAÇADE
The face or front of a building

FENESTRATION
The arrangement of windows in a building.

Trees, landscape, and biodiversity

2.15 Proposals for basement development that take up the whole front and / or rear garden of a property are very unlikely to be acceptable. Sufficient margins should be left between the site boundaries and any basement construction to enable natural processes to occur and for vegetation to grow naturally. These margins should be wide enough to sustain the growth and mature development of the characteristic tree species and vegetation of the area. The Council will seek to ensure that gardens maintain their biodiversity function for flora and fauna and that they are capable of continuing to contribute to the landscape character of an area so that this can be preserved or enhanced.

GREEN ROOF
A roof that has vegetation growing on it, which can help improve visual appeal, reduce the environmental impact of the building and create habitat for native flora and fauna.

DETENTION POND
A stormwater management facility that is designed to protect against flooding by storing water for a limited period of a time.

2.16 The basement development should provide an appropriate proportion of planted material to allow for rain water to be absorbed and/or to compensate for the loss of biodiversity caused by the development. This will usually consist of a green roof or detention pond on the top of the underground structure. It will be expected that a minimum of 1 metre of soil be provided above basement development that extends beyond the footprint of the building, to enable garden planting and to mitigate the effect on infiltration capacity. The use of SUDS is sought in all basement developments that extend beyond the footprint of the original building. For further guidance on SUDS, see CPG3 Sustainability (section 7 on water efficiency).

2.17 Consideration should be given to the existence of trees on or adjacent to the site, including street trees and the required root protection zone of these trees. CPG1 Design, (refer to section 6 on landscape and trees) sets out the evidence that the Council requires with respect to the protection of trees, including tree surveys and arboricultural method statements.

ROOT PROTECTION ZONE
The area around the base or roots of the tree that needs to be protected from development and compaction during construction to ensure the survival of the tree.

Lightwells

2.18 The building stock in Camden is varied. Some areas contain basements developments that include front lightwells taking up part, or all, of the front garden. Other areas do not have basements or lightwells that are visible from the street. The presence or absence of lightwells helps define and reinforce the prevailing character of a neighbourhood.

2.19 Where basements and visible lightwells are not part of the prevailing character of a street, new lightwells should be discreet and not harm the architectural character of the building, or the character and appearance of the surrounding area, or the relationship between the building and the street. In situations where lightwells are not part of the established street character, the characteristics of the front garden or forecourt will help to determine the suitability of lightwells.

2.20 In plots where the depth of a front garden is quite long, basement lightwells are more easily concealed by landscaping and boundary treatments, and a substantial garden area can be retained providing a visual buffer from the street. In these situations new lightwells that are sensitively designed to maintain the integrity of the existing building may be acceptable, subject to other design requirements and environmental considerations.

2.21 In plots where the front garden is quite shallow, a lightwell is likely to consume much, or all, of the garden area. This will be unacceptable in streets where lightwells are not part of the established character and where the front gardens have an important role in the local townscape.

2.22 Excessively large lightwells will not be permitted in any garden space.

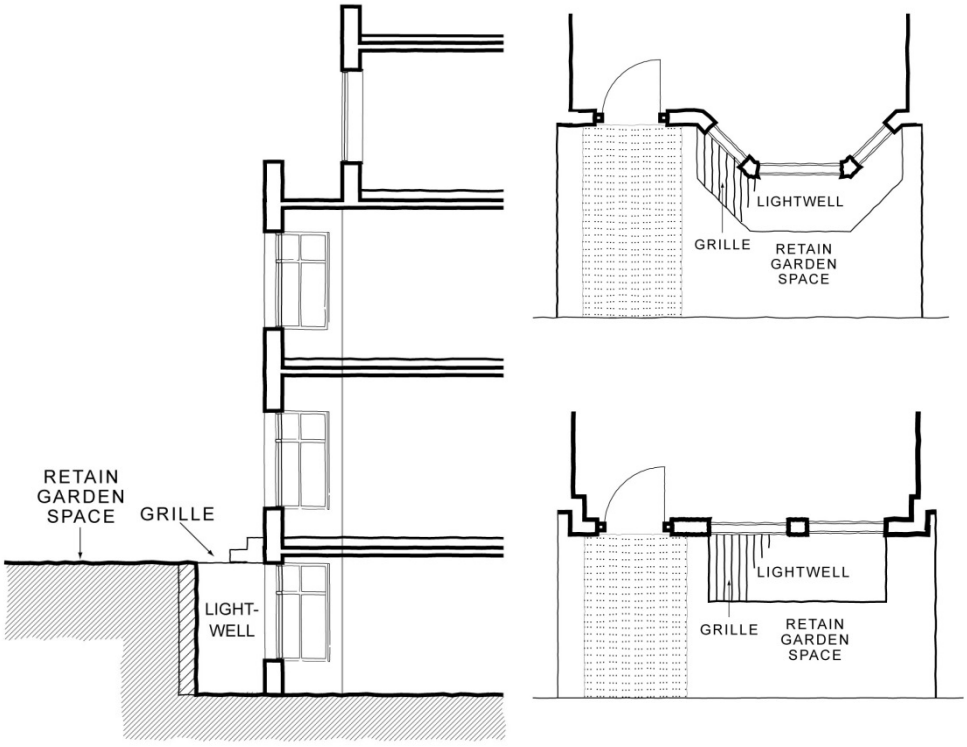
2.23 A lightwell to the side or rear of a property is often the most appropriate way to provide a means of providing light to a new or extended basement development, and can often provide a link to the rear garden. Lightwells to the side or rear of a property should be set away from the boundary to a neighbouring property.

Railings, grilles and other lightwell treatment

2.24 In order to comply with building regulation standards, light wells should be secured by either a railing (1,100mm high) or a grille. In gardens that front a street, railings can cause a cluttered appearance to the front of the property and can compete with the appearance of the front boundary wall, or obscure front windows. This is particularly the case in shallow gardens. Where front light wells are proposed, they should be secured by a grille which sits flush with the natural ground level, rather than railings (refer to **Error! Reference source not found.** on the following page). In certain publicly accessible locations grilles should be locked to prevent lightwells being misused for casual sleeping and drug use.

2.25 Railings will be considered acceptable where they form part of the established street scene, or would not cause harm to the appearance of the building.

Figure 1. Lightwells and railings



2.26 The lowering of the natural ground level to the rear of the property should be minimised as much as is practicable. It is recommended that the rear garden should be graded rather than secured by railings.

2.27 Where a basement extension under part of the front or rear garden is considered acceptable, the inclusion of skylights designed within the landscaping of a garden will not usually be acceptable, as illumination and light spill from a skylight can harm the appearance of a garden setting and cause light pollution.

3 Assessing the impact of basement development

3.1 The Council will only permit basements and other underground development where the applicant can demonstrate it will not cause harm to the built and natural environment and local amenity, including to the local water environment, ground conditions and biodiversity. Addressing these issues may require the submission of a variety of information to provide us with a basis for determining applications. The level of information required is defined by Policy DP27 Basements and Lightwells and will be commensurate with the scale, location and complexity of the scheme.

Basement impact assessments

3.2 This information must be contained within a Basement Impact Assessment (BIA) which is specific to the site and particular proposed development. Basement Impact Assessments should be submitted with the other details at planning application stage. The BIA will include the following stages:

- Stage 1 - Screening;
- Stage 2 - Scoping;
- Stage 3 - Site investigation and study;
- Stage 4 - Impact assessment; and
- Stage 5 - Review and decision making.

3.3 The purpose of a BIA is to enable the Council to ‘assess whether any predicted damage to neighbouring properties and the water environment is acceptable or can be satisfactorily ameliorated by the developer’ as stated in DP27.3.

3.4 Each of these stages is explained in full in this section. Please also refer to Chapter 6 of the Camden Geological, Hydrogeological and Hydrological Study, which is available on the Camden Council website. All the technical analysis and recommendations in this guidance are taken from the Study which should be treated as the evidence base and technical advice for this guidance and will be used when we are checking BIA reports.

3.5 We will expect a ‘non technical summary’ of the evidence that applicants have gathered against each stage of the BIA. This should be presented in a format which can be fully understood by those with no technical knowledge.

3.6 At each stage in the process the person(s) undertaking the BIA process should hold qualifications relevant to the matters being considered. We will only accept the qualifications set out in the following table:

Qualifications required for assessments

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"); or • The "C.WEM" (Chartered Water and Environmental Manager) qualification from the Chartered Institution of Water and Environmental Management.
Subterranean (groundwater) flow	A Hydrogeologist with the "CGeol" (Chartered Geologist) qualification from the Geological Society of London.
Land stability	A Civil Engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and specialising in ground engineering; A Member of the Institution of Civil Engineers ("MICE") and a Geotechnical Specialist as defined by the Site Investigation Steering Group; or A Chartered Member of the Institute of Structural Engineers with some proof of expertise in engineering geology. With demonstrable evidence that the assessments have been made by them in conjunction with an Engineering Geologist with the "cGeol" (Chartered Geologist) qualification from the Geological Society of London.

A combination of these may be required to address a variety of site conditions.

Stage 1 - Screening

3.7 The first stage of the BIA is the identification of any matters of concern which should be investigated. Screening is a process of determining whether or not a full BIA is required. All basement proposals should be subjected to the screening stage of a BIA to identify the matters relevant to assessment of local flooding and/or neighbour amenity and structural risks.

3.8 In order to assist in identifying what issues are relevant to a proposed scheme we have developed a series of screening flow charts over the following pages of this guidance, covering three main issues:

- Groundwater flow (see Paragraphs 2.36 to 2.38);
- Land stability (see Paragraphs 2.39 to 2.42); and
- Surface flow and flooding (see Paragraphs 2.43 to 2.47).

3.9 We will expect applicants to identify how these issues impact on neighbouring properties and the natural environment.

3.10 At the screening stage the applicant will need to set out clearly why or why not a full BIA is required. This will need to include an assessment against the flowcharts below and be presented along with the information set out at the end of Paragraph 233 of the Camden Geological, Hydrogeological and Hydrological Study.

3.11 Where a respondent answers “yes” or “unknown” to any of the questions in the flowcharts these matters will need further investigation. “No” answers will require written justification.

Stage 2 - Scoping

3.12 The scoping stage of the BIA requires applicants to identify the potential impacts of the proposed scheme as set out in chapter 5 of the Camden Geological, Hydrogeological and Hydrological Study which are shown by the screening process to need further investigation. Applicants should use this stage to identify the potential impacts for each of the matters of concern identified in the previous screening stage, this may require some preliminary data collection and field work. Appendix F of the Camden Geological, Hydrogeological and Hydrological Study provides guidance on linking the potential impacts to the screening flowcharts. A conceptual ground model is often a useful of carrying out the scoping stage as it can include the known and suspected features on, below and adjacent to a proposed site. (refer to Section 6.3.3 and Figure 28 in the Camden Geological, Hydrogeological and Hydrological Study for further details and an example).

3.13 During the scoping stage the applicant should enter pre-consultation or set up a working group with local residents and amenity groups who may be impacted by a proposed basement in order to fully understand and address the concerns of local residents. The Council will expect consultation with local residents on all basement developments unless the proposed construction work is minimal and will have a negligible effect on the adjoining or nearby properties as evidenced by the applicant to the satisfaction of the Council.

3.14 The scoping stage should build on the information obtained for the screening stage. When doing work for scoping stage, it is mostly likely that there will need to be some works under Stage 3 of the BIA – Site investigation and study

Stage 3 – Site investigation and study

3.15 The third stage of the BIA – site investigation – is undertaken to develop an understanding of the site and its immediate surroundings. The degree of investigation will vary depending upon the matters of concern identified in the screening and scoping stages, and therefore will be dependent on the location of the proposed basement within the borough, its size and setting in relation to existing development on the site and its relationship to adjacent properties and nearby features of importance.

3.16 The BIA site investigation comprises several stages, including:

- Desk study, including site walkover;
- Field investigation, including intrusive investigation;
- Monitoring;
- Reporting; and
- Interpretation.

3.17 Each of these stages should reflect both the site of the proposed basement scheme and beyond the site boundary.

3.18 Section 7 of the Camden Geological, Hydrogeological and Hydrological Study sets out in further detail how this investigation should be carried out.

3.19 Appendix G of the Camden Geological, Hydrogeological and Hydrological Study provides typical contents lists for reporting these stages of the site investigation and we will be looking for submissions that contain comparable content.

Stage 4 – Impact assessment

3.20 This stage is concerned with evaluating the direct and indirect implications of the proposed project. Essentially this involves a comparison between the present situation (the baseline) with the situation as it would be with the basement in place (i.e. constructed). Therefore the BIA should describe, quantify and then aggregate the effects of the development on those attributes or features of the geological, hydrogeological and hydrological environment which have been identified (in the scoping stage) as being potentially affected. Section 7 of the Camden Geological, Hydrogeological and Hydrological Study provides more detail on what is required at this stage.

3.21 The recommendations in Section 7 on boreholes and trial pits set out the sort of thorough, up to date and professional methodologies of subsurface investigation and analysis, which the Council will expect. It is important to recognise as stated in Paragraph 287 and 288 of the Camden Geological, Hydrogeological and Hydrological Study that DP27 is particularly concerned with the potentially significant impact a development can have beyond the site boundary. Where permission is not given by adjacent landowners for structural surveys or subsurface investigations to be carried out, the undetermined structural conditions and ground conditions beyond the site boundary should be identified as a risk in the impact and should be assessed and mitigated against accordingly.

3.22 Hydrogeological processes are subject to seasonal and longer term cyclical influences. Measurements taken at one particular time may not indicate how conditions might be in one or six months from that time. Monitoring of groundwater levels in areas where it is more likely to be present over a period of time is therefore necessary. Please refer to paragraphs 291 to 294 of the Camden Geological, Hydrogeological and Hydrological Study for more detail on monitoring periods.

3.23 The BIA will comprise a factual report and an interpretative report. This is explained in more detail in Section 7 of the Camden Geological, Hydrogeological and Hydrological Study. The interpretative report will have three sections:

- detailed site geology;
- the geotechnical properties of the ground; and
- an engineering interpretation of the implications of the ground conditions for the development of the site.

3.24 Appendix G3 of the study sets this out in more detail from which it should be noted that it must contain details of the retaining wall design for the basement excavation. It is essential for the Council to make the assessment called for by DP27 and to be able to consider, if planning approval is to be given, how the terms of any planning conditions or planning agreements should be drafted.

3.25 The engineering interpretation will require calculations of predicted ground movements and structural impact to be provided. Examples of these calculations are given in appendix D of the Camden Geological, Hydrogeological and Hydrological Study. The sides of excavation always move to some extent no matter how they are supported. The movement will typically be both horizontal and vertical and will be influenced by the engineering properties of the ground, groundwater level and flow, the efficiency of the various support system employed during the underpinning and the efficiency or stiffness of any support frames used.

WATER INGRESS
Change to water flows and levels both above and below ground.

3.26 If the identified consequences are not acceptable, mitigation should be incorporated into the proposed scheme and the new net consequences determined. For example, where there is predicted structural damage to neighbouring property, or where water ingress to neighbouring gardens or properties is predicted to be damaging to residential amenity. Any proposed mitigation measures should be described in the BIA report with details of how they reduce and/or alter the impact of the proposed basement on the surrounding environment. Mitigation measures which may be included in basement development proposals include (but are not limited to):

- Controlled or adequate drainage;
- High permeability corridors;
- Underpinning of neighbouring structures; and
- Setting the basement in from property boundaries.

Burland Scale

3.27 Where a BIAs identifies risk of damage to properties by subsidence this risk should be described using the Burland Scale. The Burland Scale methodology has been adopted for projects internationally and has been used by the Building Research Establishment and the Institution of

Structural Engineers, London. The classification system of the scale is based on the ease or repair of visible damage. Subsidence is only one element in the many potential impacts assessed in a BIA and other methods will be employed when describing these other impacts.

3.28 In the Burland Scale the damage to properties caused by subsidence may be considered in three broad categories:

- (i) visual appearance or aesthetics,
- (ii) serviceability and function, and
- (iii) stability.

3.29 Burland Scale categories 0, 1, and 2 refer to (i) aesthetic damage, category 3 and 4 relate to (ii) serviceability and function, and 5 represents damage which relates to stability.

Figure 2. Burland Scale

Category of damage	Description of typical damage	Approximate crack width (mm)	Limiting tensile strain ε_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0-0.05
1 Very slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection	<1	0.05-0.075
2 Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly.	<5	0.075-0.15
3 Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable lining. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5-15 or a number of cracks > 3	0.15-0.3
4 Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15-25 but also depends on number of cracks	>0.3
5 Very severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion, Danger of instability.	Usually > 25 but depends on number of cracks	

Damage Category Chart (CIRIA C580)

3.30 In line with policy DP27 the Council will ensure that harm is not caused to neighbouring properties by basement development. Burland states that it is a major objective of design and construction to maintain a level of risk to buildings no higher than category 2, where there is only risk of aesthetic damage to buildings (see Burland, J. “The assessment of the

risk of damage to buildings due to tunnelling and excavations", Imperial College London, 1995). However the Council considers that neighbouring residential properties are particularly sensitive to damage, where relatively minor internal damage to a person's home can incur cost and considerable inconvenience to repair and redecorate. The Council therefore will expect BIAs to provide mitigation measures where any risk of damage is identified of Burland category 1 'very slight' or higher. Following inclusion of mitigation measures into the proposed scheme the changes in attributes are to be re-evaluated and new net consequences determined.

Cumulative impacts of basement development

3.31 The cumulative effect of the incremental development of basements in close proximity, particularly when these are large, can potentially create a significant impact. Therefore Basement Impact Assessments must identify neighbouring basements and make the assessment considering all nearby basements. Both existing and planned (with planning permission) underground development must be included in this assessment. To ensure cumulative impacts are considered Basement Impact Assessments must respond to the issues raised in paragraph 168 to 174 of the Camden Geological, Hydrogeological and Hydrological Study.

Stage 5 – Review and decision making

3.32 The final stage of the BIA is undertaken by LB Camden and consists of an audit of the information supplied by the applicant and a decision on the acceptability of the impacts of the basement proposal. Section 8 of the Camden Geological, Hydrogeological and Hydrological Study outlines in more detail what Council officers will be looking for, as a minimum.

Independent verification of basement impact assessments

3.33 In order to provide the Council with greater certainty over the potential impacts of proposed basement development, we will expect an independent verification of Basement Impact Assessments to be funded by the applicant. Independent verification will be required in the following circumstances:

- Where a scheme requires applicants to proceed beyond the Screening stage of the Basement Impact Assessment (i.e. where a matter of concern has been identified which requires the preparation of a full Basement Impact Assessment);
- Where the proposed basement development is located within an area of concern regarding slope stability, surface water or groundwater flow; or
- For any other basement applications where the Council feels that independent verification would be appropriate (e.g. where conflicting evidence is provided in response to a proposal).

3.34 This independent verification will be commissioned by the Council.

Basement construction plans

3.35 In some circumstances the Council may require a basement construction plan secured through a Section 106 Agreement. The Council may require provision of a basement construction plan when the proposed development involves excavation or construction that if improperly undertaken could cause damage to neighbouring properties. In most instances this will be on larger and more complex basement schemes and where excavation is close to neighbouring buildings and structures or involve listed buildings.

3.36 A basement construction plan sets out detailed information to demonstrate how the design and construction of the basement has been prepared in order to minimise the impacts on neighbouring properties and the water environment, and provides a programme of measures to be undertaken by the owner to with the objective of minimise the impact on the structural integrity of neighbouring properties and sensitive structures such as the public highway.

3.37 A basement construction plan should contain:

- a method statement detailing the proposed method of ensuring the safety and stability of neighbouring properties throughout the construction phase including temporary works sequence drawings,
- appropriate monitoring including details of risk assessment thresholds and contingency measures,
- detail demonstrating that the basement has been designed using evidence of local factors including ground conditions, the local water environment and the structural condition of neighbouring properties, in order to minimise the impact on them.
- provision to retain at the property throughout the construction phase a suitably qualified engineer from a recognised relevant professional body to monitor, inspect, and approve the permanent and temporary basement construction works, and
- measures to ensure the ongoing maintenance and upkeep of the basement.

3.38 The basement construction plan should ensure that:

- a suitably qualified and experienced engineer has agreed the design,
- the modelling of ground conditions and water environment is appropriately conservative; and
- best endeavours are undertaken to prevent any impact on the structural integrity of the neighbouring properties.

3.39 Prior to final submission to the Council for approval, basement construction plans will need to be certified by a suitably qualified and experienced engineer who is independent of the design team. The certification will need to be funded by the applicant.

Principal impacts of basements in Camden

3.40 This section sets out the principal impacts that basement development can have upon the built and natural environment, and neighbour amenity. Each of these impacts should be considered when undertaking the Basement Impact Assessment, particularly stages 1 and 2: Screening and Scoping (see Paragraphs 2.12 to 2.19 of this report).

GROUNDWATER FLOW
The movement of water that travels and seeps through soil and rock underground.

HYDROGEOLOGY
The study of groundwater moving through soils and rock formations

Groundwater flow

3.41 Basement development may affect groundwater flows, and even though the displaced water will find a new course around the area of obstruction this may have other consequences for nearby properties, trees, etc. Given the nature of the ground in many higher parts of the borough, or those where streams once flowed, basement development may have the potential to divert or displace groundwater which can cause a rise in groundwater and cause flooding, upstream of the development, whilst immediately downstream the groundwater level may decline, which may affect wells, springs and ponds. Figure 23 of the Camden Geological, Hydrogeological and Hydrological Study sets out diagrammatically the potential impacts.

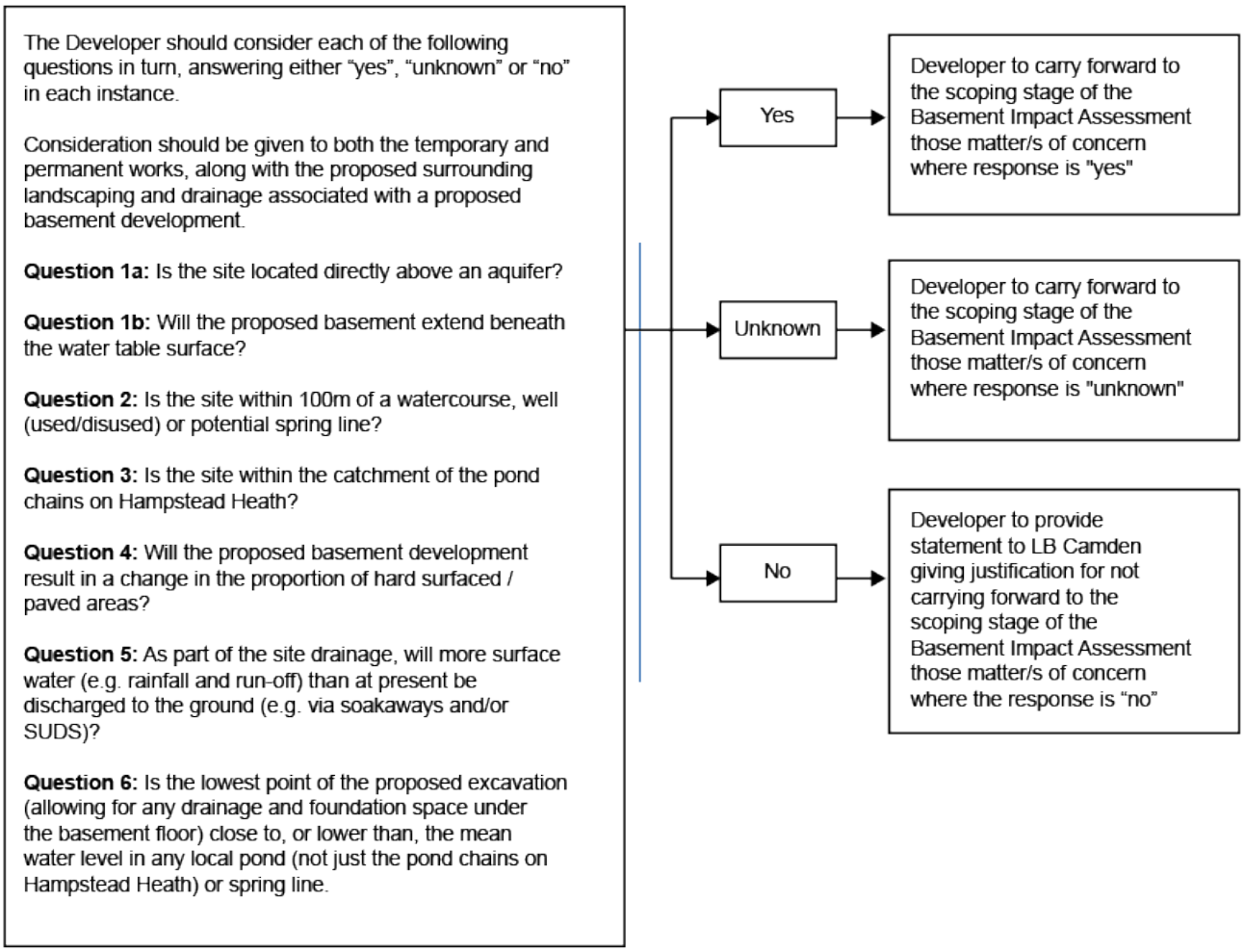
3.42 Applicants should consider the flowchart below to determine whether or not to carry forward to the scoping stage of the Basement Impact Assessment. Where certain factors are present or proposed, for example geological setting, proximity to Hampstead Heath Ponds catchment, or an intention to undertake dewatering as part of the site works, this flowchart will identify that a hydrogeological assessment will be required. If this is the case, it should be prepared by:

- A Hydrologist with the “CGeol” (Chartered Geologist) qualification from the Geological Society of London; and
- A Fellow of the Geological Society of London.

3.43 The Camden Geological, Hydrogeological and Hydrological Study contains a number of maps and plans relevant to groundwater flow, including:

- Figures 2 and 3 showing geology for the whole borough;
- Figure 4 which shows the geology for Hampstead Heath;
- Figure 5 showing the geology for the south of the borough;
- Figure 11 which maps the water courses within and around the borough; and
- Figure 14 which identifies Hampstead Heath surface water catchments and drainage.

Figure 3. Subterranean (ground water) flow screening chart



SUBTERRANEAN (GROUND WATER) FLOW SCREENING CHART NOTES AND SOURCES OF INFORMATION

Question 1: In LB Camden, all areas where the London Clay does not outcrop at the surface are considered to be an aquifer. This includes the River Terrace Deposits, the Claygate Member and the Bagshot Formation. The location of the geological strata can be established from British Geological Survey maps (e.g. 1:50,000 and 1:10,000 scale). Note that the boundaries are indicative and should be considered to be accurate to ±50m at best.

Additionally, the Environment Agency (EA) "Aquifer Designation Maps" can be used to identify aquifers. These can be found on the "Groundwater maps" available on the EA website (www.environment-agency.gov.uk) follow "At home & leisure" > "What's in Your Backyard" > "Interactive Maps" > "Groundwater". Knowledge of the thickness of the geological strata present and the level of the groundwater table is required. This may be known from existing information (for example nearby site investigations), however, it may not be known in the early stages of a project. Determination of the water table level may form part of the site investigation phase of a BIA.

Question 2: Watercourses, wells or spring lines may be identified from the following sources:

- Local knowledge and/or site walkovers
- Ordnance Survey maps (e.g. 1:25,000 or 1:10,000 scale). If features are marked (they are not always) the following symbols may be present: W; Spr; water is indicated by blue colouration. (check the key on the map being used)
- British Geological Survey maps (e.g. 1:10,000 scale, current and earlier editions). Current maps will show indicative geological strata boundaries which are where springs may form at the ground surface; of relevance are the boundary between the Bagshot Formation with the Claygate Member and the Claygate Member with the London Clay. Note that the boundaries are indicative should be considered to be accurate to ±50m. Earlier geological maps (e.g. the 1920's 1:10560 scale) maps show the location of some wells.
- Aerial photographs
- "Lost Rivers of London" by Nicolas Barton, 1962. Shows the alignment of rivers in London and their tributaries.
- The British Geological Survey (BGS) GeoIndex includes "Water Well" records. See www.bgs.ac.uk and follow "Online data" > "GeoIndex" > "Onshore GeoIndex".
- The location of older wells can be found in well inventory/catalogue publications such as "Records of London Wells" by G. Barrow and L. J. Wills (1913) and "The Water Supply of the County of London from Underground Sources" by S Buchan (1938).
- The Environment Agency (EA) "Source Protection Zone Maps" can be used to identify aquifers. These can be found on the "Groundwater maps" available on the EA website (www.environment-agency.gov.uk) follow "At home & leisure" > "What's in Your Backyard" > "Interactive Maps" > "Groundwater".
- The EA hold records of licensed groundwater abstraction boreholes. LB Camden is within the North East Area of the
- Thames Region. Details can be found on the EA website.
- LB Camden Environmental Health department may hold records of groundwater wells in the Borough.

Where a groundwater well or borehole is identified, it will be necessary to determine if it is extending into the Lower Aquifer (Chalk) or the Upper Aquifer (River Terrace Deposits, Bagshot Formation, Claygate Member etc). It is water wells extending into the Upper Aquifer which are of concern with regard to basement development.

Question 3: Figure 14 in the attached study, (prepared using data supplied by the City of London Corporation's hydrology consultant, Haycocks Associates) shows the catchment areas of the pond chains on Hampstead Heath.

Question 4: This will be specific to the proposed development and will be a result of the proposed landscaping of areas above and surrounding a proposed basement.

Question 5: This will be specific to the proposed development and will be a result of the chosen drainage scheme adopted for the property.

Question 6: The lowest point will be specific to the proposed development. Knowledge of local ponds may be taken from

- Local knowledge and/or site walkovers
- Ordnance Survey maps (e.g. 1:25,000 or 1:10,000 scale). If features are marked (they are not always) the following symbols may be present: W; Spr; water is indicated by blue colouration. (check the key on the map being used)
- Aerial photographs

Land stability

LAND STABILITY
Steep areas and a change in geological layers can have vulnerable land stability.

3.44 The Council will expect all basement development applications to provide evidence that the structural stability of adjoining or neighbouring buildings is not put at risk. In the first instance applicants should consider the screening flowcharts to determine whether to progress to the scoping stage of the Basement Impact Assessment. If so, it should be prepared by:

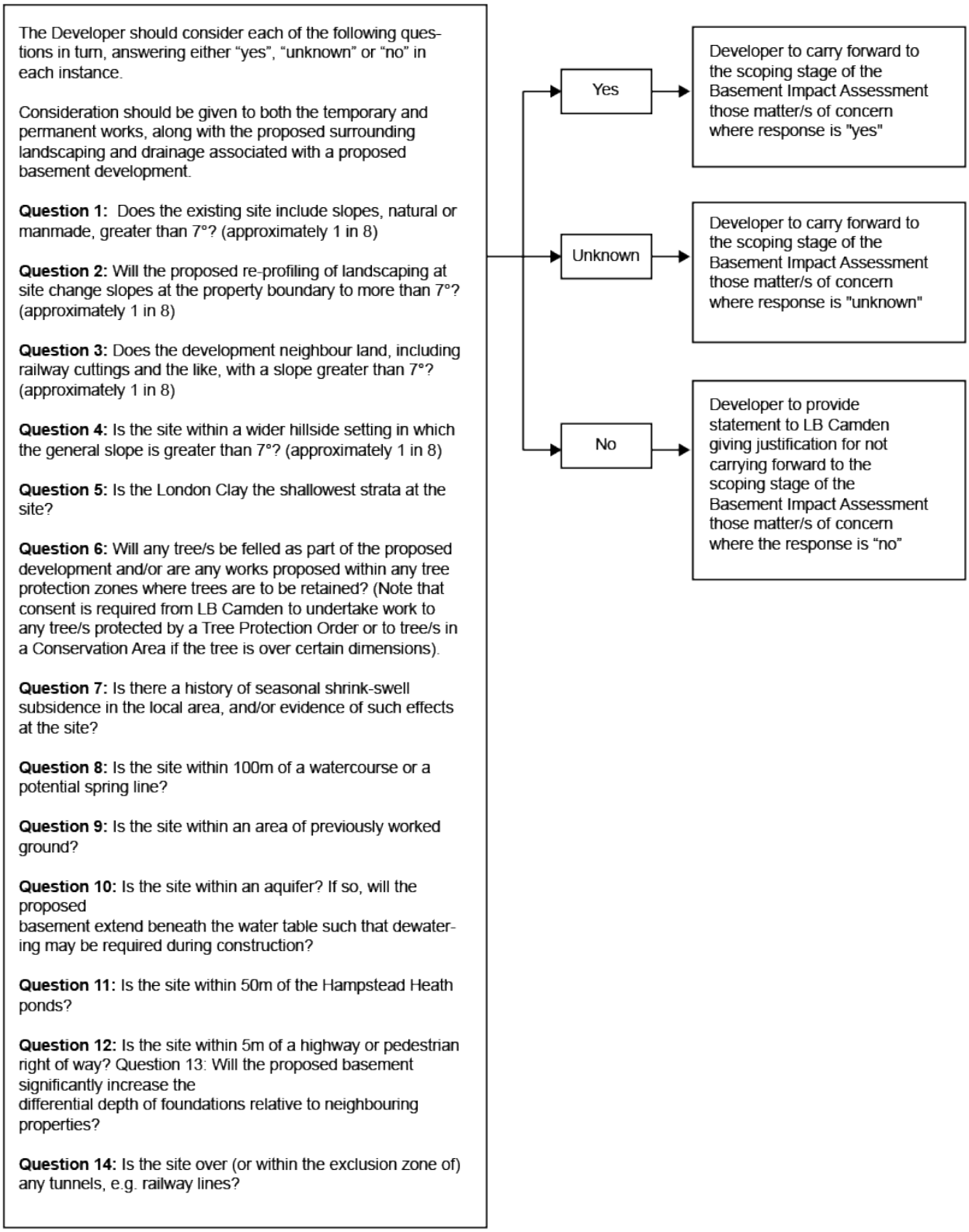
- A Civil Engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and specialising in ground engineering;
- A Member of the Institution of Civil Engineers ("MICE") and a Geotechnical Specialist as defined by the Site Investigation Steering Group; or
- A Chartered Member of the Institute of Structural Engineers with some proof of expertise in engineering geology, with demonstrable evidence that the assessments have been made by them in conjunction with an Engineering Geologist with the "cGeol" (Chartered Geologist) qualification from the Geological Society of London.

3.45 For listed buildings, or properties adjoining or adjacent to listed buildings, we will require a structural stability report before we validate applications.

3.46 The Camden Geological, Hydrogeological and Hydrological Study contains a number of maps and plans relevant to land stability, including:

- Figures 2 and 3 showing geology for the whole borough;
- Figure 4 which shows the geology for Hampstead Heath;
- Figure 5 showing the geology for the south of the borough;
- Figure 11 which maps the water courses within and around the borough;
- Figure 16 which is a land stability slope angle map; and
- Figure 17 which outlines areas of significant landslide potential.

Figure 4. Slope stability screening flowchart



SLOPE STABILITY SCREENING FLOWCHART
NOTES AND SOURCES OF INFORMATION

Question 1, 3 & 4: The current surface slope can be determined by a site topographical survey. Slopes may be estimated from

1:25,000 OS maps, however in many urban areas such maps will not show sufficient detail to determine surface slopes on a property-by-property scale, just overall trends. With regard to slopes associated with infrastructure, e.g. cuttings, it should be ensured that any works do not impact on critical infrastructure.

Question 2: This will be specific to the proposed development and will be a result of the proposed landscaping of areas above and surrounding a proposed basement.

Question 5: The plan footprint of the outcropping geological strata can be established from British Geological Survey maps (e.g. 1:50,000 and 1:10,000 scale). Note that the boundaries are indicative and should be considered to be accurate to ±50m at best.

Question 6: this is a project specific determination, subject to relevant Tree Preservation Orders etc.

Question 7: this can be assessed from local knowledge and on-site observations of indicative features, such as cracking, Insurance firms may also give guidance, based on post code. Soil maps can be used to identify high-risk soil types. Relevant guidance is presented in BRE Digest 298 "Low-rise building foundations: the influence of trees in clay soils" (1999); BRE Digest 240 "Low-rise buildings on shrinkable clay soils: part 1" (1993); and BRE Digest 251 "Assessment of damage in low- rise buildings" (1995).

Question 8: Watercourses or spring lines may be identified from the following sources:

- Local knowledge and/or site walkovers
- Ordnance Survey maps (e.g. 1:25,000 or 1:10,000 scale). If features are marked (they are not always) the following symbol may be present "Spr"; water is indicated by blue colouration. (check the key on the map being used)
- Geological maps will show indicative geological strata boundaries which are where springs may form at the ground surface; of relevance are the boundary between the Bagshot Formation with the Claygate Member and the Claygate Member with the London Clay. Note that the boundaries are indicative should be considered to be accurate to ±50m at best. British Geological Survey maps (e.g. 1:10,000 scale, current and earlier editions).
- Aerial photographs
- "Lost Rivers of London" by Nicolas Barton, 1962. Shows the alignment of rivers in London and their tributaries.

Question 9: Worked ground includes, for example, old pits, brickyards, cuttings etc. Information can be gained from local knowledge and/or site walkovers, and from historical Ordnance Survey maps (at 1:25,000 or 1:10,000 scale, or better) and British Geological Survey maps (at 1:10,000 scale, current and earlier editions). Earlier geological maps (e.g. the 1:10560 scale series from the 1920s) include annotated descriptions such as "old pits", "formerly dug", "brickyard" etc.

Question 10: In LB Camden, all areas where the London Clay does not outcrop at the surface are considered to be an aquifer.

This includes the River Terrace Deposits, the Claygate Member and the Bagshot Formation. The general footprint of the geological strata can be assessed from British Geological Survey maps (e.g. 1:50,000 and 1:10,000 scale). Note that the boundaries are indicative and should be considered to be accurate to ±50m at best.

The Environment Agency (EA) Aquifer Designation Maps can be used to identify aquifers. These are available from the EA website (www.environment-agency.gov.uk), by clicking on 'At home & leisure' > 'What's in Your Backyard' > 'Interactive Maps' > 'Groundwater'.

Details are required of the thickness of the geological strata present and the level or depth of the groundwater table. This may be known from existing information (for example nearby site investigations); however, it may not be known in the early stages of a project. Determination of the water table level may form part of the site investigation phase of a BIA and may require specialist advice to answer. Depth of proposed development is project specific.

Question 11: From local knowledge and/or site walkovers, and from Ordnance Survey maps (e.g. 1:25,000 or 1:10,000 scale). In relation to the stability and integrity of the pond structures and dams, the guidance of a Panel Engineer should be sought. (Details of Panel Engineers can be found on the Environment Agency website: http://www.environment-agency.gov.uk/ business/sectors/64253.aspx). Duty of care needs to be undertaken during any site works in the vicinity of the ponds.

Question 12: From local knowledge and/or site walkovers, and from Ordnance Survey maps (e.g. 1:25,000 or 1:10,000 scale). Any works should not impact on critical infrastructure.

Question 13: From local knowledge and/or site walkovers. May find some details on neighbouring properties from searches of LB Council databases, e.g. planning applications and/or building control records.

Question 14: From local knowledge and/or site walkovers, from Ordnance Survey maps (e.g. 1:25,000 or 1:10,000 scale) and directly from those responsible for tunnels (e.g. TfL or Network Rail). Any works should not impact on critical infrastructure.

Surface flow and flooding

3.47 While nowhere in the borough is identified by the Environment Agency as being flood prone from rivers or the sea, there are still parts that are identified as being subject to localised flooding from surface water. This is caused during times of heavy rainfall when the local combined sewer system is unable to deal with the volume and rate of flow. Detailed modelling suggests that areas of West Hampstead, Hampstead Town and South Hampstead are at a higher risk of surface water floods, with some risk in Highgate and Gospel Oak.

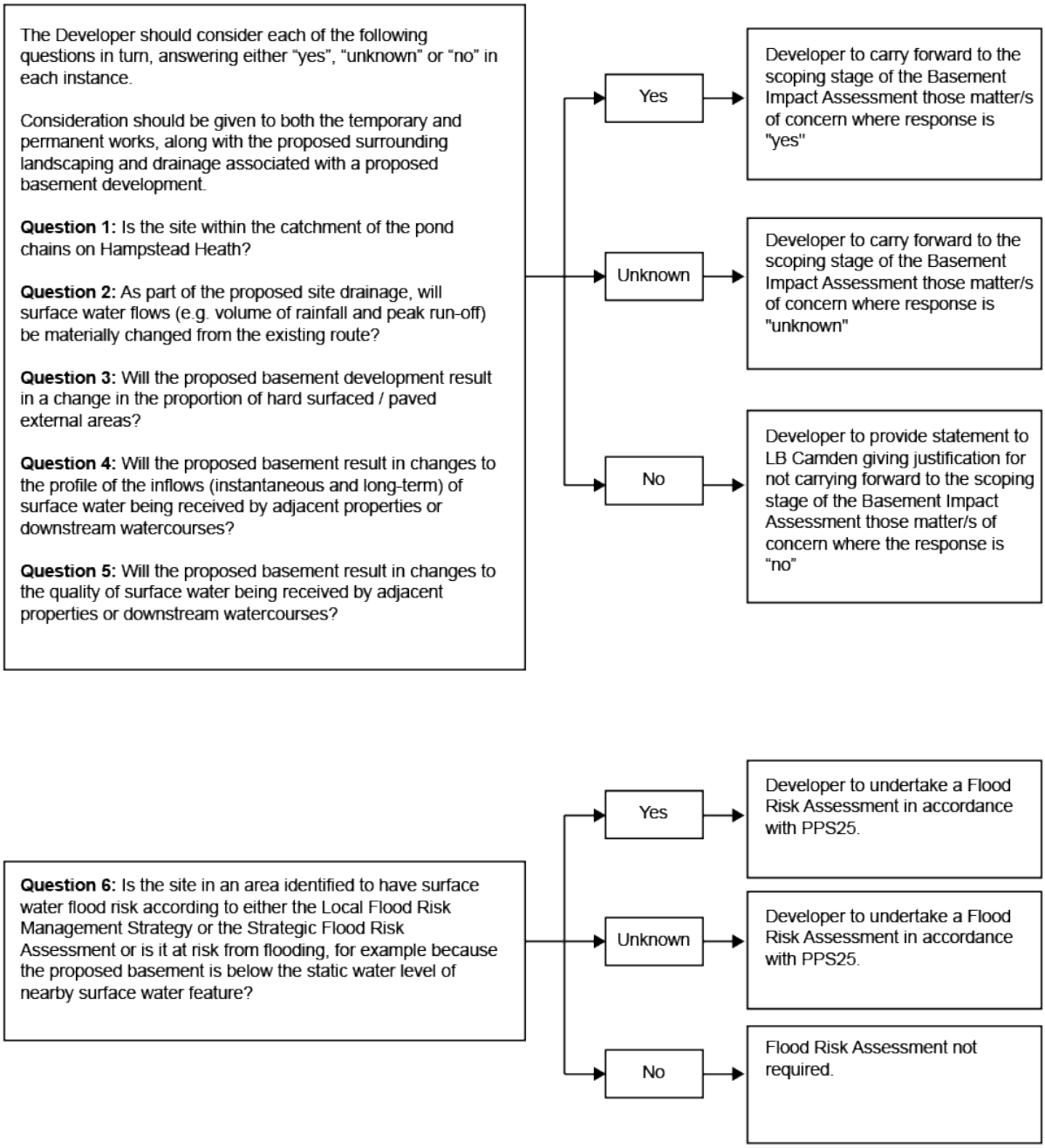
3.48 All applications for a basement extension within flood risk areas identified in the LB Camden Flood Risk Management Strategy or in any future updated Strategic Flood Risk Assessment will be expected to include a Flood Risk Assessment. In line with Policy DP27 in Camden Development Policies, the Council will not allow habitable rooms and other sensitive uses for self contained basement flats and other underground structures in areas at risk of flooding.

3.49 Applicants should consider the flowchart below to determine whether to proceed to the scoping stage of the Basement Impact Assessment and whether a Flood Risk Assessment should be undertaken as part of this. For surface flow and flooding issues the Basement Impact Assessment should be undertaken by 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); or
- The “C.WEM” (Chartered Water and Environmental Manager) qualification from the Chartered Institution of Water and Environmental Management.

3.50 Figure 14 within the Camden Geological, Hydrogeological and Hydrological Study identifies Hampstead Heath surface water catchments and drainage.

Figure 5. Surface flow and flooding screening flowchart



SURFACE FLOW AND FLOODING SCREENING FLOWCHART NOTES AND SOURCES OF INFORMATION

Question 1: Figure 14 in the Camden geological, hydrogeological and hydrological study (prepared using data supplied by the City of London Corporation's hydrology consultant, Haycocks Associates) shows the catchment areas of the pond chains on Hampstead Heath

Question 2: This will be specific to the proposed development and will be a result of the proposed landscaping of areas above and surrounding a proposed basement. The developer should provide documentation of discussion with Thames Water to confirm that the sewers have capacity to receive any increased wastewater flows.

Question 3: This will be specific to the proposed development and will be a result of the chosen drainage scheme adopted for the property

Question 4: This will be specific to the proposed development and will be a result of the proposed landscaping and chosen drainage scheme adopted for the property. SUDS will be required to compensate any increases in peak flow.

Question 5: This will be specific to the proposed development and will be a result of the proposed landscaping and chosen drainage scheme adopted for the property. SUDS will be required to compensate any increases in peak flow.

Question 6: The principles outlined in PPS25 should be followed to ensure that flood risk is not increased.

3.51 Basement development should not displace ground water or surface water flow so it causes flooding on nearby sites or those further away. The Council will require an adequate drainage plan and has a preference for the use of Sustainable Urban Drainage Systems (SUDS). Only where this cannot be achieved should surface/ground water be discharged to combined sewers (refer to the chapter on water efficiency in CPG3 Sustainability and policy DP23 Water).

SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

Low environmental impact approaches to drain away dirty and surface water run-off through collection, storage, and cleaning before allowing it to be released slowly back into the environment, thereby preventing flooding, pollution and contamination of groundwater.