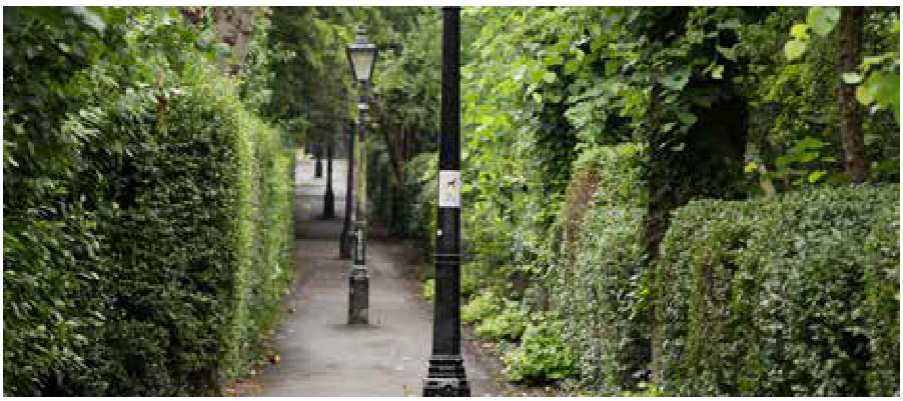

Redington Frognal

Neighbourhood Development Plan

20XX - 20XX

August 2018

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UWF: UNDERGROUND WATER FEATURES AND BASEMENT EXCAVATION

UWF 1: SCREENING

Intent

1. When applications for basement development are submitted, applicants generally possess only limited understanding of the geological, hydrological and hydrogeological complexity of the Redington Frognal Area.

2. This has meant that complex engineering issues affecting neighbouring properties have been left to be settled by section 106 agreements and under the Party Wall Act 1996, leaving many unresolved issues and typically incurring high levels of expenditure by neighbours for the commission of reports by expert consultants 137, 138, 139, 140, 141.., , , , .

3. Basements are often substantial engineering operations142. The need to submit engineering calculations prior to determination of a planning application was affirmed by the Planning Inspectorate, in appeal decision APP/X5210/W16/3164577 in relation to 28 Redington Road. In this case, the Inspector noted, “that basement development will only be permitted once it has been demonstrated that the proposal would not cause harm to neighbouring properties.”

Ground Movements

4. The ground beneath Redington Frognal is a complex layering of Bagshot Sand, Claygate Member and band D of the London Clay Formation. The top two layers have a high silt and sandy component rendering them susceptible to high water conductivity, as well as being potentially less stable: even band D of the London Clay Formation, while less permeable, still has a variable but significant silt content with a degree of erodibility, and can contain water under pressure in sand partings.

5. Excavation of the earth creates stresses in the ground: vertical, horizontal and water stress. Prior to excavation all these stresses are perfectly balanced. Digging will cause the sides of the trench to cave in, the base to rise and the water to drain out of the soil, unless the ground is appropriately supported and its groundwater managed.

6. The excavation for a basement also causes change to the water pressures in the ground. Groundwater flow becomes diverted beneath neighbouring properties, requiring water drainage measures to be

incorporated, if calculations indicate such drainage measures to be advisable. When the water pressure in the soil decreases, this causes the soil to consolidate. This can lead to brittle failure and plastic failure, if the water pressure in the soil is affected. If drainage is introduced, the water pressure decreases and soil particles move, creating soil consolidation. These changes in the ground, once started, are 99% irreversible143..

7. Very little evidence exists of damage to neighbouring properties, because home owners do not wish to affect the saleability of their properties. However, it has been demonstrated that soil consolidation can take ten years to complete and that this is the time lag between construction and cracks and distortions beginning to appear.

Groundwater movements

8. Redington Frognal is situated on the southern and western slopes of Hampstead, one of the largest and highest hills in London, with the highest rainfall of the Greater London area, and much of it located on the flank of this large hill. As a consequence, a significant number of Redington Frognal streets are downward sloping, where hard standing or building footprint enlargement produces additional surface run-off and drainage requirement, increasing flood risk in storm periods to vulnerable lower areas such as Frognal and West Hampstead.

9. In parts of Redington Frognal the 'water table' ground water flow (across the top of both the Claygate beds and band D of the London Clay Formation) is constantly present and at times it can be rapid. Basement excavation can sometimes break into continuous flow of these water tables, but also will constrain and divert the ground water present throughout the area. Sometimes velocities of flow can be sufficient to cause erosion of the high silt and sand content of Redington Frognal's soil types leading to small but significant volume loss. This can result in the subsidence and cracking of neighbouring buildings, causing water ingress, and the formation of cavities under roadways and services.

10. A report by Alan Baxter for the Royal Borough of Kensington and Chelsea144notes that, where basements constructed in clay, they "effectively form a hole in the clay which can fill up with water and which is not able to drain away naturally. Although the hole appears to be completely filled in by the new basement structure which displaces water, the hydrostatic water pressures in the basement are present because of water at the interface between the clay and the basement construction up to the top of the clay or slightly higher than this depending on the ground conditions above the clay. This issue needs to be carefully considered in the design. The structure needs to be designed to resist the hydrostatic pressure, unless something is done to relieve it. Flotation can also be an issue, particularly for basements in clay subsoil beneath rear gardens or internal basements with little load on top of them." This problem is accentuated where swimming pools are constructed, as care must be taken to ensure their structure remains stable when they are emptied. This can be dealt with by designing in accordance with current standards and codes (e.g. BS8012 and BS EN 1997).

11. Groundwater is present throughout the neighbourhood Plan Area. To better understand the complexity of the area and its sub surface water features, Redington Frognal Neighbourhood Forum commissioned a study by Arup of the area's sub surface water features. This includes a detailed map which records the manifestation of water at or near ground level in the form of known spring lines, underground streams, ponds, wells, soggy gardens and pumps, showing that many streets lie above, or in very close proximity to, underground streams and spring lines.

12. The policy seeks to ensure that potential problems arising from basement excavation are addressed at application stage. It also aims to prevent water damage to nearby properties arising from the diversion of underground water features and incorporates guidance in Supplementary Planning Document adopted by the Royal Borough of Kensington and Chelsea. The policy applies to all applications involving excavation for basement development. Basement development is defined as the construction or extension of one or more storeys of accommodation below the prevailing ground level of a site or property.

UWF 1 Screening and Analysis

i. Screening measures to be undertaken, at the earliest possible stage in the planning application process, include review of the map developed for Redington Frognal Neighbourhood Forum, Arup Fig 7 – Results Map - latest version. A copy of the map is to be marked with all existing and proposed basements and sub surface water features within a radius of 100 metres, to help assess the cumulative impact.

These maps are to form part of a the BIA, alongside the documents cited in the latest Camden Planning Guidance for Basements and are to be submitted in the BIA report.

ii. Contours of predicted vertical settlement and predicted impacts, including cumulative impacts, on neighbours, both upstream and downstream, must accompany all planning applications, at the earliest possible stage. This relates to both ground-water induced and excavation-induced movement.

iii. Evidence must be provided, at the earliest possible stage, that damage to neighbouring properties will be less than or equal to 1 ("very slight") on the Burland Scale.

iv. It is encouraged that the number, type and expected position of cracks to neighbouring properties are indicated, at the earliest possible stage.

v. An assessment of current ground and geology conditions, topography and groundwater levels will be required. This should include details of the structure and foundations of the existing building and neighbouring properties.

Application

13. A copy of the review of the map developed for Redington Frognal Neighbourhood Forum, Arup Fig 7 – Results Map (latest version) is to accompany all planning applications involving basement excavation. The map is hosted on the Redingtopn Frognal Neighbourhood Forum website at: http://www.redfrogforum.org/underground-rivers/

14. Developers are encouraged to also provide detailed calculations of the design, based on site-specific facts, i.e. not merely the preliminary design calculations, to neighbours within 20 metres or four times the basement depth, according to which ever measure is greater. The calculations must include contours of predicted vertical settlement and the predicted impacts on neighbours.

15. The cumulative effect of several underground developments in proximity can be more significant than the impact of a single basement. Applicants must provide a map showing all existing and proposed basements within a distance which is determined at the scoping stage of the Basement Impact Assessment. The distance to be considered will depend on the site's geology, topography, the basement proposals, the nature and density of surrounding structures and infrastructure etc. including the basement's extent and ground conditions, in order to assess the cumulative basement impact. The map must also show all known sub surface water features, as identified by Arup in the "Arup Fig 7 – Results Map" (latest version).

16. Differing soil types, e.g. claygate member beds, Bagshot sands, gravel and band D of the London Clay Formation must also be mapped, indicating the site of the proposed basement and existing and other proposed basements around all surrounding properties, and further afield, if the circumstances warrant this.

17. Burland Scale tests and a ground movement assessment will be required from the applicant, prior to the determination of the planning application. Applicants must understand that the Burland calculations relate to walls with no windows or doors, and judge accordingly when assessing the relevance of their calculations to nearby structures.

18. Justification for the assessment of the Burland Scale damage level assessment is also to be provided.

Recommendation

19. It is desirable to daylight the clean water section of the underground Cannon Streams between Redington Gardens and Heysham Lane. This will relieve pressure on the sewer network and reduce the risk of surface water flooding downstream in West Hampstead, where floods occurred in 2002,[1], [2]

[1] Managing flood risk in Camden: The London Borough of Camden flood risk management strategy

UWF 2: BASEMENT IMPACT ASSESSMENTS

Intent

20. Camden's Local Plan Policy A5 has a clear requirement to demonstrate that basement development "does not cause harm to the amenity of neighbours, affect the stability of buildings, cause drainage or flooding problems, or damage the character of areas or the natural environment".

21. Camden currently requires a staged approach to screening and scoping. However, the process assumes that the excavation and construction work will proceed according to plan. But, works have not always proceeded according to plan, and there have been examples of harm which has been caused to properties in Redington Frognal, as a result of nearby basement excavation147. Moreover, the independent assessor does not always meticulously scrutinise the basement impact assessments148, 149..

22. The requirements adopted by the Royal Borough of Kensington and Chelsea, as set out in its Basement Supplementary Planning Document, are appropriate, as a minimum, for the substantially more complex hydrogeological structure of the north west slopes of Hampstead.

23. This policy, therefore, requires rigorous site investigations and seeks to ensure that potential problems arising from basement excavation are addressed at or before application stage. It also aims to prevent water damage to nearby properties arising from the diversion of underground water features.

UWF 2 Basement Impact Assessments

The requirements below are additional to those set out in the latest Camden Planning Guidance for Basements and apply to both excavation and basement construction.

i. Engineering design should be advanced to Detailed Proposals Stage (equivalent to RIBA Stage D), as set out in the Services of ACE (Association of Consultancy and Engineering) Agreement 1: Design, 2009 Edition).

ii. As a minimum, BIAs must incorporate the following information and data:

   a) The sequencing of the basement excavation and construction.

   b) Soil samples, including those near boundaries with neighbours must be taken to a depth below the footing of the proposed base of the basement. The boreholes measurements may need to be conducted in periods of contrasting rainfall and over a period of several months covering wet and dry seasons. In some cases, when boreholes measurements show a groundwater risk, an automatic log water measurements recorder may need to be left activated in the boreholes over a sustained period of contrasting rain cycles to demonstrate local groundwater and water table levels and the local extent of groundwater surges during and immediately following storms.

   c) In some cases, when boreholes measurements show a groundwater risk, an automatic log water measurements recorder may need to be left activated in the boreholes over a sustained period of contrasting rain cycles to demonstrate local groundwater and water table levels and the local extent of groundwater surges during and immediately following storms.

   d) Bore holes data, ground movement and ground water flow calculations must be included as part of a factual report. An interpretative report will not be sufficient.

iii. In accordance with best practice, lateral drainage and digging by hand will be required, where basement excavation necessitates the installation of drainage.

iv. The BIA must include appropriate drawings that describe the detail of the engineering designs and illustrate how the construction addresses the following:

a) Groundwater
b) Drainage
c) SuDS
d) Flooding
e) Vertical loads
f) Lateral loads
g) Cumulative impacts on ground stability and underground water movements
h) Ground conditions
i) Trees and planting
j) Infrastructure
k) Vaults
l) Existing structures
m) Adjoining buildings and structures
n) Overall stability (permanent and temporary works
o) o) Underpinning (if proposed)
p) Piling (if proposed)
q) Special considerations e.g. cantilevered stone stairs and landings, balconies or other important functions or features in an existing building which need special consideration.

v.

vi. The BIA must also demonstrate that trees will not be felled or liable to die.

vii. Where appropriate, a BCP, written by a structural engineer, is to accompany the BIA, to be submitted at the time of applying for planning consent. The BCP should set out ways in which potential problems arising from cumulative impacts on ground stability and underground water movements will be resolved.

In order to protect against sewer flooding, Thames Water recommends the installation of a positive pumping device. This should be installed in each new basement development, unless a strong case for alternative measures can be made.

viii. Basement applications should not be determined until all technical outstanding issues are resolved to the largest extent possible, prior to the commissioning of a building contractor.

Application

24. Due to the potential damage from basement development, all issues related to the BIA, or raised by the Independent Assessor appointed by Camden, must be resolved to the fullest extent possible prior to the determination of the planning application, rather than being deferred as a requirement of the Section 106 agreement. The purpose of this policy to promote sustainability in development.

25. The sequencing of the basement excavation and construction, and how the work affects ground movements, are of utmost importance, and this must be set out in the BIA. Planning consent is to be linked to geotechnical instrumentation, if the results of the screening and analysis show this to be advisable.

26. For the BIA, it will be necessary to dig holes in the soil, inspect the soil below ground and identify the different soil layers. The soil must be inspected and the sides of the holes checked for signs of caving in during different weather conditions, including how the sides of the holes respond to rain.

27. The BIA is to include estimations of ground and underground water movements, including cumulative impacts, by a qualified structural engineer, to be prepared in accordance with Camden's latest Basements Planning Guidance and based on ground characterisation provided by a qualified geologist. Both the engineer and the geologist should be chartered. Ground movements and ground water flow calculations will be required for different soil types and conditions, taking account of the differing rates at which water travels through differing soil types.

APPENDICES

BD 1

BD 3

BD 4

BGI 1

BGI 2

BGI 3

BGI 4

BGI 5

CF 1

CF 2

CF 3

FR 1

FR 2

UWF 1

UWF 2