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Dear Eric

PROJECT ORIEL: RADON ASSESSMENT

Introduction

This report provides a desk-based assessment of risk in relation to radon in basements, for the proposed development at 4 St Pancras Way, London.

The following planning condition relating to radon assessment has been applied to the site, as part of planning application 2020/4825/P:

- *Condition 21: Prior to first use of the basement areas an appropriate radon gas and vapour investigation (incorporating the results of environmental and historical searches and detailed assessment of the risks to all receptors that may be affected) is undertaken and a ground gas vapour assessment report (GVAR) [where necessary incorporating a Remediation Strategy (RS)], is submitted to, and approved in writing by, the local planning authority. The condition will not be discharged until the approved RS is implemented and a Verification Report (VR) is submitted to, and approved in writing by the local planning authority. Where Remedial measures are implemented to protect end-users of the development shall be retained in perpetuity.*

It is anticipated that the assessment contained within this report will negate the need for a radon-specific investigation as required by condition 21, although this letter should be submitted to the Local Planning Authority in order that they can confirm this.

This report should be read in conjunction with the AECOM Geotechnical and Geo-environmental Interpretive Report (ref.60588325-ACM-HGT-Z_Z_Z_Z-RP-GIR-0001), dated September 2021.

Site Setting

The site is located within St Pancras Hospital, 4 St Pancras Way, London, NW1 0PE. It is currently occupied by six buildings which form part of the wider St Pancras Hospital estate. It is proposed to demolish the existing buildings and construct a single building between seven and ten storeys in height, with a lower ground floor and basement beneath. Anticipated uses are to comprise clinical, research and educational, and will include an accident and emergency department, outpatients, operating theatres, research areas, café and retail areas, facilities management, office and plant space.

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Investigations undertaken by AECOM in 2021 confirm that the site is underlain by Made Ground to a maximum depth of 3.60m bgl (+17.95m AOD) with the London Clay proven to depths between 22.70 and 25.65m bgl (-2.75 and -3.20m AOD). This was underlain by the Lambeth Group, the base of which was not proven. Whilst not encountered during the investigations the Thanet Sand and White Chalk Subgroup are anticipated at depth.

Reference to the UK Health Security Agency (UKHSA) interactive radon map (https://www.ukradon.org/information/ukmaps) indicates the site is located in an area where less than 1% of homes are above the radon action level. In addition, reference to the maps contained within BRE 211: Radon – Guidance on Protective Measures for New Buildings (2015) indicates the site is not located in an area where basic or full radon protection measures are not required.

Background

Reference to BRE 211 notes that all basements are at increased risk of elevated levels of radon regardless of geographic location, because more walls are in contact with the ground as well as the floor, and reduced natural ventilation below ground level increases the risk of elevated radon levels. In addition, the Management of Health and Safety at Work Regulations (1999) require the assessment of health and safety risks and both the Health and Safety Executive (HSE) and UKHSA state that this should include the measurement of radon for occupied below ground workplaces (occupied for more than 1 hour per week / 52 hours of the year), irrespective of whether a site is situated in a radon affected area.

Radon is a natural radioactive gas produced by the radioactive decay of radium, which in turn is produced from uranium-238. Inhalation of the short-lived decay products of radon has been linked to an increase in the risk of developing lung cancer. Soil gas radon enters buildings through the cracks and openings in the foundations, aided by the pressure differential between the soil and the building.

The average indoor radon concentration in the UK is 20 becquerels per m3 (Bq/m3). Based on the estimated risks of lung cancer from prolonged exposure, an action level for radon in homes of 200 Bq/m3 was established in the UK (NRPB, 1990). The UKHSA has recommended that parts of the UK with 1% probability or more of homes being above the action level should be designated as radon affected areas. However, as noted above, basements must be considered separately since exposure will be increased due to the presence of soils around the occupied space, rather than just beneath it as is the case for above ground buildings. This is the reason that HSE and UKHSA state the need for monitoring of basements. Also, for some basements it is noted that there is potential for several strata with differing radon generation potential to be associated with the construction; for Project Oriel the proposed basement is associated with London Clay only.

Much of the technical assessment relating to radon and specifically geology has been taken from a paper by Schieb et al.[1] which details the use of geological mapping in radon assessment. This paper should be referred to for further detail, as required. The release of radon from rocks and soils is controlled largely by the types of minerals in which uranium and radium occur and as such, geology is the most important factor controlling the source and distribution of radon. Relatively high levels of radon emissions are associated with particular types of bedrock and unconsolidated deposits; for example, some (but not all) granites, limestones, ironstones, phosphatic rocks, and shales rich in organic materials. It is noted that some clays, e.g., those associated with the Wealdon Group in south east England, can be associated with elevated radon concentrations.

Importantly, the presence or absence of deposits which are known to be associated with high radon concentrations cannot be used in isolation to determine whether there will be a significant radon risk for buildings in the area. This is because there are a number of other factors which must be considered before the risk can be better understood, notably the geomorphology of the deposits as well as factors such as the presence of superficial deposits.

[1] National Environment Research Council, Geological Controls on Radon Potential in England, 2013

The release of radon from rocks and soils is controlled largely by the types of minerals in which uranium and radium occurs. In sedimentary rocks, phosphate and organic complexes may be a more important source of uranium than primary minerals. Once radon gas is released from minerals, its migration to the surface is controlled by the transmission characteristics of the bedrock and soil including, but not restricted to: soil permeability, drainage, potential for carrier fluids, including carbon dioxide gas and groundwater; and meteorological factors.

Site Specific Assessment

The Schieb et al. paper notes that soils in the urban environment of the Greater London Authority area (GLA) are notably low in uranium. Average soil uranium concentrations associated with the Thames Group (including London Clay) were noted to be 2.00 mg/kg. In addition, reference to the UK Soil Observatory Interactive Map[2] indicates that uranium concentrations for soils in the site area are below average at 1.89 mg/kg.

With respect to the Lambeth Group, Thanet Sands and Chalk, these are generally not noted as having a high radon potential on the UKHSA radon maps, and are generally not noted on the maps contained within BRE 211 as being in areas requiring basic or full protection measures. However, whilst the majority of the White Chalk bedrock is not in a radon affected area, Schieb et al. notes that it has been locally recorded, across its full extent, up to 6.8% above the action level.

The proposed lower ground floor of the development will be at a level of approximately +19.30m AOD whilst the basement will extend to a depth of approximately +17.15m AOD. Excavations to accommodate the basement slab construction and foundations will extend to +15.375m AOD. The lower ground floor and the basement will be founded entirely within the London Clay, which was proven to a maximum depth of -3.20m AOD. As such, the potential radon risk to the basement from direct contact with the London Clay is considered LOW.

Whilst the thickness of the Lambeth Group was not proven during the AECOM Ground Investigation, the surface of the Chalk is expected to be between around -20 and -30m AOD. The Upper Mottled Beds of the Lambeth group were generally described as very stiff clay and were encountered to a maximum depth of -16.05m AOD. As such, a significant thickness of impermeable material associated with both the London Clay and Lambeth Group will be present beneath the basement floor. If radon is present at depth associated with the Chalk, the presence of the clay material would significantly restrict the flow of radon. Although it cannot be stated with certainty that there is a low risk of elevated radon concentrations associated with the White Chalk beneath the site, the probability is low given that the majority of the White Chalk bedrock is not radon affected. As such, the potential risk from radon migration at depth is considered LOW.

The depth of the proposed piled solution is to be confirmed however, these will be founded within either the London Clay or Lambeth Group. As noted above, these geological groups are not noted for being in areas requiring radon protection measures and therefore the potential for the piles to form migration pathways for radon is considered to be LOW

In addition to the above, the Building Control department at the London Borough of Camden was contacted with respect to their knowledge of radon protection measures installed in LB Camden, and specifically, whether these are required for basements. A response is currently awaited, and this assessment will be updated upon receipt of further pertinent information.

Conclusions

Given the geological setting and the proposed construction at the site, the risk of radon migration into the basement is LOW. Further pre or post construction monitoring, or radon protection measures are therefore not considered to be necessary.

[2] https://mapapps2.bgs.ac.uk/ukso/home.html

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This report should be submitted to the Local Planning Authority for review and approval.

We trust the above fulfils your current requirements. Please do not hesitate to contact the undersigned should you have any queries.

Yours sincerely

BRANDON REILLY
For and on behalf of CAMPBELL REITH HILL LLP

LIMITATIONS

1. This report provides available factual data for the site obtained only from the sources described in the text and related to the site on the basis of the location information provided by the client.
2. Where any data or information supplied by the client or other external source, including that from previous studies, has been used, it has been assumed that the information is correct. No responsibility can be accepted by CampbellReith for inaccuracies within this data or information. In relation to historic maps the accuracy of maps cannot be guaranteed and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.
3. This report is limited to those aspects of historical land use and enquiries related to environmental matters reported on and no liability is accepted for any other aspects. The opinions expressed cannot be absolute due to the limit of time and resources implicit within the agreed brief and the possibility of unrecorded previous uses of the site and adjacent land.
4. The material encountered and samples obtained during on-site investigations represent only a small proportion of the materials present on the site. There may be other conditions prevailing at the site which have not been revealed and which have therefore not been taken into account in this report. These risks can be minimised and reduced by additional investigations. If significant variations become evident, additional specialist advice should be sought to assess the implications of these few findings.
5. The generalised soil conditions described in the text are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and have been developed on interpretations of the exploration locations and samples collected.
6. Water level and gas readings have been taken at times and under conditions stated on the exploration logs. It must be noted that fluctuations in the level of groundwater or gas may occur due to a variety of factors which may differ from those prevailing at the time the measurements were taken.
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8. The findings and opinions expressed are relevant to those dates of the reported site work and should not be relied upon to represent conditions at substantially later dates.
9. This report is produced solely for the benefit of the client, and no liability is accepted for any reliance placed upon it by any other party unless specifically agreed in writing.