



The Heath & Hampstead Society

The Society examines all Planning Applications relating to Hampstead and Hampstead Heath Fringes, and assesses them for their impact on conservation and on the local environment.

To London Borough of Camden, Development Control Team

Planning Ref: 2019/5141/P

Address: 33 Willow Cottages NW3 1TN

Case Officer: Rachel English

Date: 4th May 2020

While investigating the causes of subsidence in Hampstead, I came across this application, not yet determined, which shows inaccuracies and omissions in the Basement Impact Assessment: either ignorance of the tendency of parts of Hampstead to be susceptible to landslide or deliberate ignoring of known risks.

It is clear that parts of the BIA are actually inaccurate. The red circle defining the position of 33 Willow Cottages on Arup's 'Camden Geological, Hydrogeological and Hydrological Study: Slope Angle Map' Figure 16 for example is actually centred over 13 Gayton Crescent, and on Arup's Figure 12 over 12 Pilgrims Lane! It doesn't help that poorly reproduced maps are given.

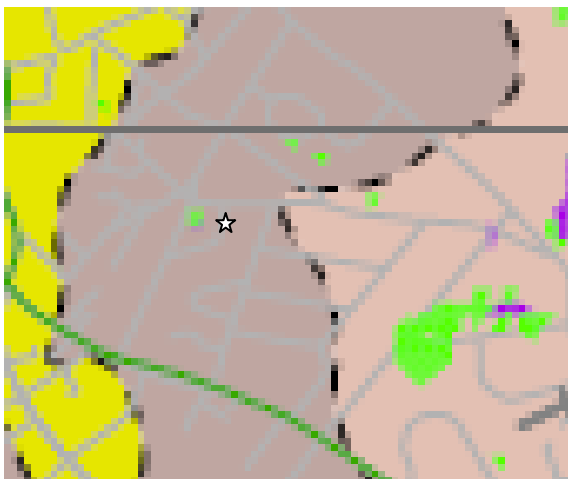
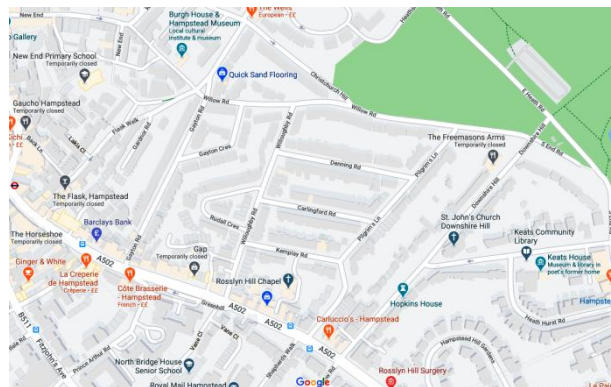


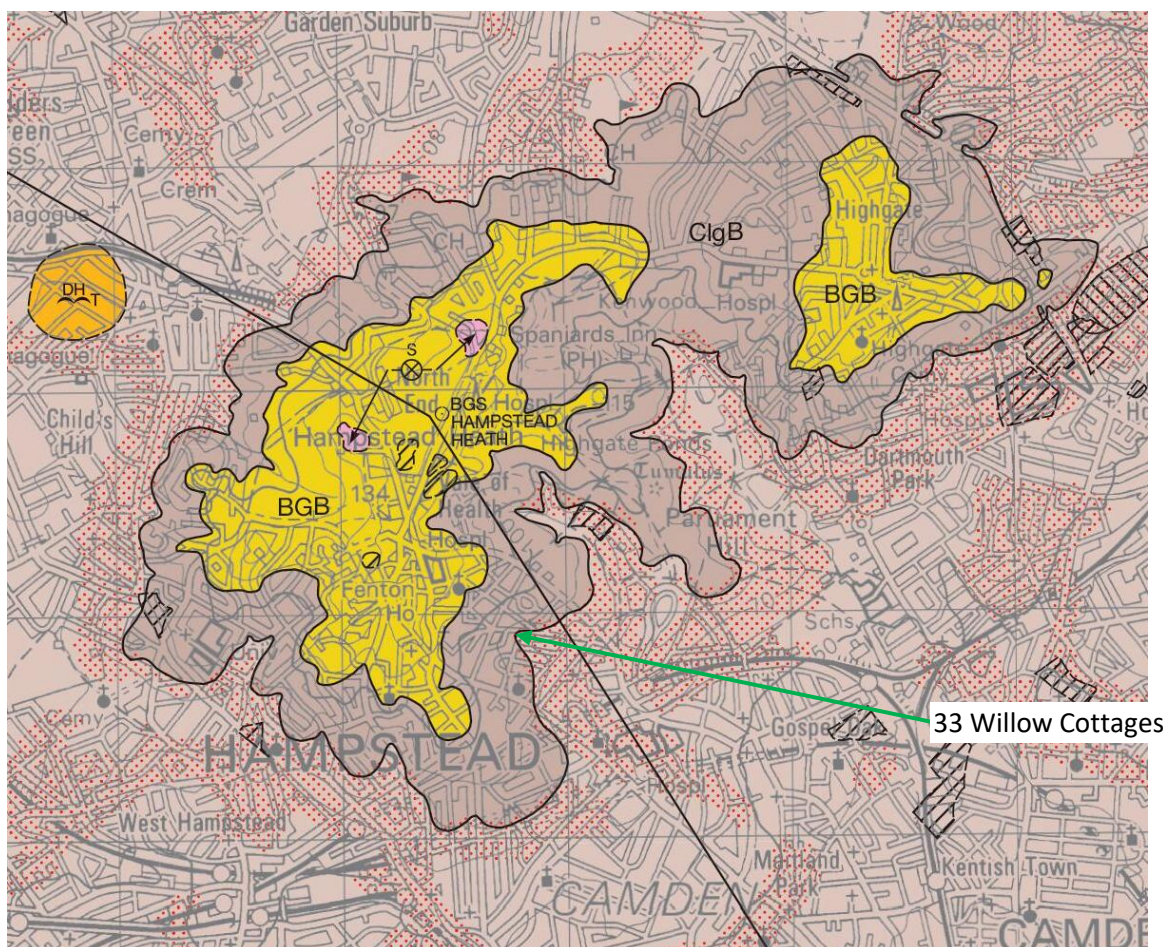
Figure 16 actually centred over 13 Gayton Cresc

Figure 12 actually centred over 12 Pilgrims Lane

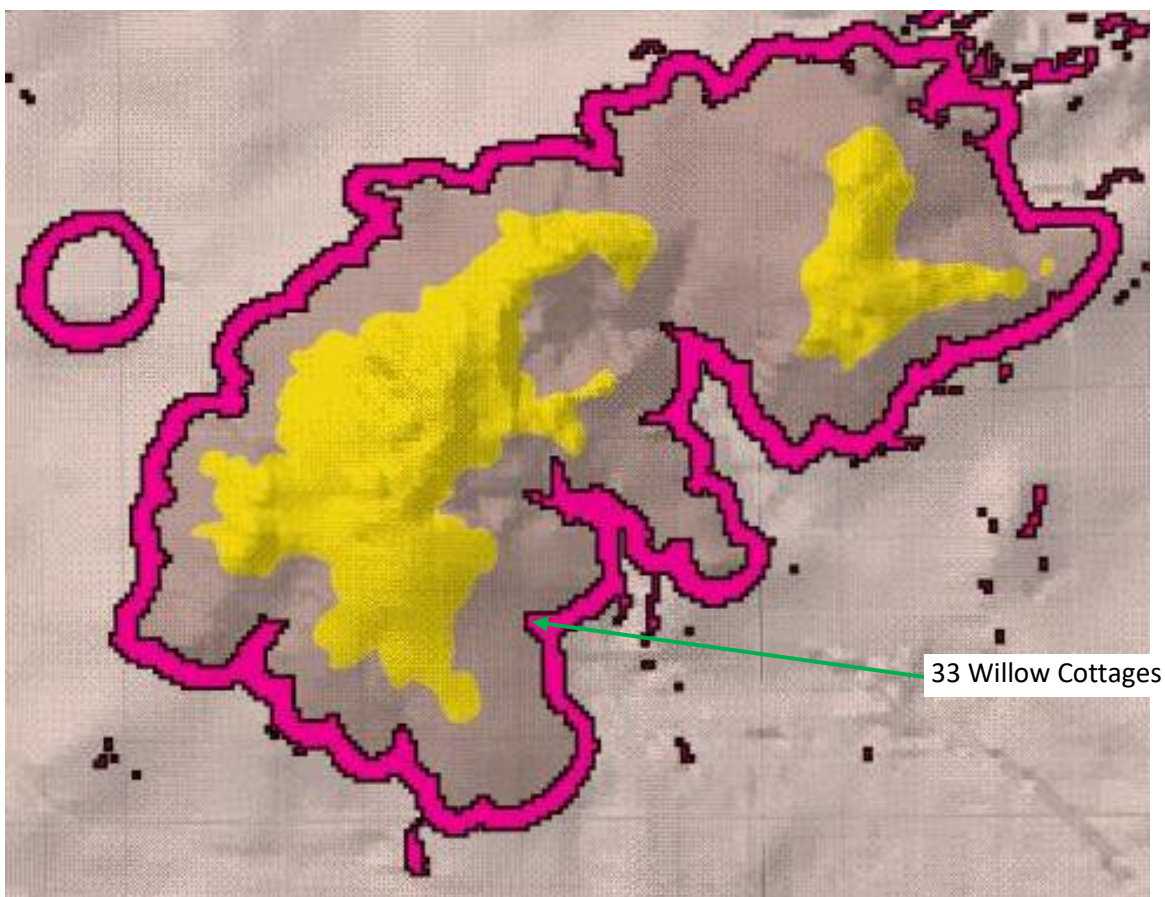
3.2.5 Slope Stability states that '...the site area is outwith the "Areas of significant Landslide potential" defined by the BGS on map sheet 256 and included in the ARUP report as Figure 17.'

This is NOT TRUE. It is right over an area of High/Very High risk for slope instability - see British Geological Survey Areas for Greatest Potential for Slope Instability <http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001750> (and see over) based on Forster A, Wildman G & Poulton C. (2003) Landslide potential modelling of North London. British Geological Survey Internal Report, IR/03/122R.

It is interesting that despite reference to it, Arup's Figure 17 is not shown at all, with or without an inaccurate red circle. In fact this shows that 33 Willow Cottages are right bang on this area:



British Geological Survey 1 : 50 000 series North London Sheet 256 Bedrock and Superficial Deposits



British Geological Survey Areas for Greatest Potential for Slope Instability

<http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001750>

While Arup's slope angle map is useful for slopes of more than 7 degrees, this is only appropriate for ground composed purely of clay. Since Weeks¹ paper of 1969, landslide has been reported at angles of 4 degrees or less where related to superficial quaternary deposits such as the Head here. Where this part of London is concerned, Head solifluction on slopes with groundwater present should consider slopes of less than 7 degrees for their tendency to instability. This is particularly so where clay is overlain by Head (here it is particularly thick as it is subject to valley affect, and is itself overlain by potentially unstable Made Ground left when the previous old almshouses were demolished in the early-mid C19), is prone to slip surfaces left from glacial activity, and is lubricated by groundwater.

The superficial slope here masks a more dramatic landscape with steeper slopes of the underlying layers at depth of a few metres, fashioned by mass movements: the quaternary peri-glacial hill wash and mudflows that travelled down the slope from the upper Hampstead area and subsequent landslides. The soles of these movements can be defined by paper thin shear surfaces having a shear strength much lower than the ground above and below them, and lying on slopes *likely to be of significantly more than 7 degrees*. The likely presence of shear surfaces within the Head deposits has implications for the stability of neighbouring properties which have not been considered in the BIA.

There is one mention in the BIA of 'Stability/structural damage - Construction of the extension causing ground movements that could potentially damage adjacent structures', but *no indication is given of how this can be prevented*.

It is horrifying that not only has this BIA deliberately failed to accurately describe the site's position and visually demonstrate its position on Arup's Figure 17 "*Areas of significant Landslide potential*" it also plans to use sheet piling and has merely looked very cursorily at the barrier effect without considering the impact of installation vibration on such a fragile hillside with such fragile neighbours.

Digging out of the basement will cause severe vibration and both vertical and lateral ground pressure release. While accurate modelling of movement potential using *accurate* data may indicate a low level of risk on the Burland scale ***this is irrelevant where slope instability is concerned***. Such ground interference will be like kicking a sleeping dog. I am currently doing a study of subsidence in Hampstead, which I hope to publish in due course, and am encountering many cases of subsidence and severe ground movement in Hampstead over the Areas for Greatest Potential for Slope Instability immediately following nearby basement digging out. This includes three of Camden's own properties: 254 Finchley Road caused by digging out of 252 Finchley Road; 10 Maresfield Gardens caused by sheet piling and digging out of a 5-storey basement into the hill below behind 120 Finchley Road; Camden Arts Centre (begun by three large basements at some distance but then aggravated by silt erosion from prolonged mains water leaking and mains water bursts, with the possibility that construction lorry and heavy plant from other projects are adding to this as they drop down the hill of Arkwright Road and onto Finchley Road). In all cases, while sheet piling and digging out has caused slope movement to begin again, because it takes a while to settle this has enabled silt erosion from the action of diverted groundwater or mains water under pressure to compound the problem and maintain ongoing slope slippage. Vibration from construction vehicles were considered to be a contributory cause of subsidence of other buildings along Finchley Road e.g. 268 Finchley Road.

The ground investigation and CIRIA C760 modelling analyses use methodology developed by Boscardin & Cording (1989) and Burland (2001) and determines that the maximum category of damage is Category 1 (very slight) so cosmetic and non-structural. However, predictions of movement as described by the Burland scale rely on four basic conditions being present:

- 1) That the building conforms to the Burland criteria (i.e. has no windows and doors etc) - *it is not stated if this has been taken into account*.
- 2) That the building is on horizontal ground and not the side of a hill - *far from the case here*.
- 3) That the ground is correctly described by a ground model - *there are questions that this has been done adequately here*.
- 4) That the values used are representative of what is on site - *this has not been demonstrated*.

¹ Weeks, AG (1969) 'The stability of natural slopes in south-east England as affected by periglacial activity'. *Quarterly Journal of Engineering Geology* 2, 49-61.

The method used to estimate likely damage also assumes brick masonry with cement mortar which is not the case for Willow Cottages: these have a preponderance of lime mortar. While the detailed data from ground investigations might have been made available to the modellers they are not given for others to examine. We do not even know that the method of sample extraction was fit for purpose and for the tests used, particularly those regarding ground strength and stiffness.

The prediction for damage thus needs further work, especially if groundwater control which abstracts water were to become necessary as part of the construction process (see below), even if temporary. Groundwater levels within the ground below the excavation should be confirmed across significant storms prior to any construction works. The implications for assuming incorrect groundwater levels could be extremely serious for neighbouring properties.

All the rest of Willow Cottages are listed buildings and must be protected from such damage, as should 33 Willow Cottages itself and 33 Willoughby Road. While underpinning may be considered a solution to slope instability, this is inappropriate for Willow Cottages. The *risk* of causing slope instability here *should not even be entertained*.

Omissions regarding Groundwater

33 Willow Cottages can also be seen to be on the Spring Line between the Claygate Beds and Unit D of the London Clay Formation, and local boreholes - at 31 Willoughby Road almost next door for example - have shown groundwater at the level of the bottom of the superficial Head solifluction, the aquifer here, as would be expected. The BIA states that the basement 'does not penetrate appreciably below the made ground...' but completely fails to realise that this means the parts of the base of the basement in the stiffer Claygate Beds could cause differential subsidence with attached shallower parts and neighbouring buildings. The rest of the building will be sitting virtually in the aquifer here, with the silt in the ground below it gradually washed/eroded away over time. This will eventually leave voids below and around it, thus increasing its tendency to differential subsidence and increasing its vulnerability to vibration in the future if, for example, others were also to indulge in sheet piling. Such a situation could also make it a moveable lever for causing more damage to its immediate vulnerable neighbour if both were subject to landslip generated by vibration.

The temporary sheet piling that will be the cause of damage, likely to be severe in view of the ground conditions and the age and fragility of Willow Cottages, is planned to be installed despite no groundwater level tests having been carried out(? - or at least presented) across time and across a period of heavy rainfall *as is required* for Camden BIAs. While sheet piling is not planned for the party wall with 33 Willoughby Road the northern and western main parts of the planned sheet piling could both dam up groundwater under existing 33 Willow Cottages and back to 34 Willow Cottages and its front garden and divert it either side affecting 33 Willoughby Road and foundations to the roadway of Willow Road. If a storm were to occur during the time it is being installed, this could have disastrous consequences for the site itself as well as the neighbouring and shaken up 34 Willow Cottages made more vulnerable to its damming up of storm water effects. Willow Cottages are known to be vulnerable to flooding so it seems perverse to build a dam to actually encourage and amplify this, even if it is temporary. It is also stated that there are no other penetrating structures within 17.5 metres, but this forgets the application from 31 Willoughby Road 2020/0927/P that if given permission will be nearer.

In view of all the risk to the other neighbouring listed buildings from vibration and landslip in particular, please refuse this inaccurate and inadequate application.

Dr Vicki Harding, Society Tree Officer, Planning Sub-Committee of the Heath & Hampstead Society