

AIR STUDIOS

INITIAL APPRAISAL OF THE IMPACTS ON LYNDHURST
HALL OF THE PROPOSED BASEMENT CONSTRUCTION AT
11 ROSSLYN HILL, NW3

Prepared for
Richard Boote

Project no.
1580

Date
27 May 2015

Revision History

Revision	Date	Purpose / Status	Document Ref.	Comments
-	27.05.2015	For comment/Preliminary	1580/R01	First Draft
A	05.06.2015	Final	1580/R01	Incorporating GEA review
B	18.06.2015	Final	1580/R01	Incorporating additional information on ground water pumping

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1. Background

Corbett and Tasker Ltd. are appointed by Air Studios (Lyndhurst) Ltd. to provide a technical review of their neighbours' Planning Application for 11 Rosslyn Hill, which includes the construction of two new basements in the London Borough of Camden.

Our Client is concerned that the construction of the proposed basements, which are in close proximity to the structural fabric of Lyndhurst Hall, will have an adverse effect on the structure of Lyndhurst Hall, and has queried the accuracy and completeness of the Basement Impact Assessment (BIA) submitted in support of the Planning Application; he has instructed us to carry out a technical review accordingly. The majority of this review will focus on the BIA submitted as part of the Application, with particular regard to the basement's impact on our Client's property. A specialist review by Geotechnical and Environmental Associates (GEA) Ltd. has been commissioned into the ground water and ground movement assessments contained within the BIA, which is appended to this report.

Air Studios is a renowned recording studio and our Client is also concerned that the construction noise and vibration of the works at the adjacent property, which in some locations is directly adjacent to the foundations and side wall of Lyndhurst Hall, may well result in the recording studios being unable to operate for the duration of the construction project, which is planned to take place over many months. It is not practical to sound proof the main hall of the recording studio due to the special nature of the structure. It is thought that ground borne vibration will be the most damaging aspect of the proposed construction works. A separate report on this is being prepared by specialist acoustic engineers Vanguardia Consulting.

This report has been prepared for the sole use of our Client in support of his objection to the planning application for the basement construction at 11 Rosslyn Hill; reliance cannot be placed on it by third parties or for any other projects than which it is intended. It is written to highlight shortcomings in the BIA prepared for the above planning application.

2. Initial review of BIA

i) Brief description of the structural fabric of Lyndhurst Hall

Lyndhurst Hall was constructed in the Romanesque style and designed by the renowned Victorian architect Alfred Waterhouse in 1883-4 as a chapel. It is listed and in the past all alterations to the historic fabric have been carefully reviewed and agreed with English Heritage. The structure appears to be a combination of load-bearing masonry and steel framing, with both timber and concrete floors, and the foundations are corbelled brick; in some areas the foundations are supported on mass concrete strips footings, possibly the result of underpinning. There is a vaulted roof structure over the main studio of Lyndhurst Hall which is around 27m at the highest point, supported on masonry walls inlaid with carefully preserved and fragile stained glass windows.



Figure 1: Image of main studio of Lyndhurst Hall (Heber-Percy and Parker Architects)

The structure underwent extensive alterations and renovations in the early 1990s when it was converted to its present use as a prestigious recording studio for Air Studios.

ii) Sensitive nature of the construction of Lyndhurst Hall

The special nature of Lyndhurst Hall's construction make it particularly susceptible to damage from ground movement, however very limited consideration of this is demonstrated in the BIA. We understand from our Client that the Engineers for 11 Rosslyn Hill have not inspected or visited Lyndhurst Hall, and there are no studies of its construction or full assessment of the impact of the proposed basement construction on its structural fabric contained within the BIA.

Clause 2.41 of Camden Planning Guidance 4 (CPG 4) specifically requires a Structural Stability Assessment for basement construction at or adjacent to listed buildings and it is clear to us from our review of the BIA that this has not been carried out. No drawings of Lyndhurst Hall are provided in the BIA and there are no section drawings showing the new basement's relationship with the structure of Lyndhurst Hall.

We have sketched out some approximate sections through Lyndhurst Hall and the proposed basements which begin to investigate and demonstrate the effects of the basement construction on the Hall, as well as highlight some potential issues that the Hall's presence may have on the setting out, design and construction of the basements. These are included in Appendix A of this report.

iii) Structural damage assessment

Contained within the BIA is a crack assessment using the Burland scale, related to the length of Lyndhurst Hall, following a process set out in a CIRIA technical guide; however, no consideration has been given to ground movements, horizontal or vertical, on the stability or cracking of the triple height vaulted roof structure of Lyndhurst Hall main studio. See figure 2 below for an approximate assessment we have sketched out based on the limited information to hand.

It is well known that the Burland damage assessment procedure cannot be used on its own as a direct measure of damage to property yet this is the only approach used in the BIA.

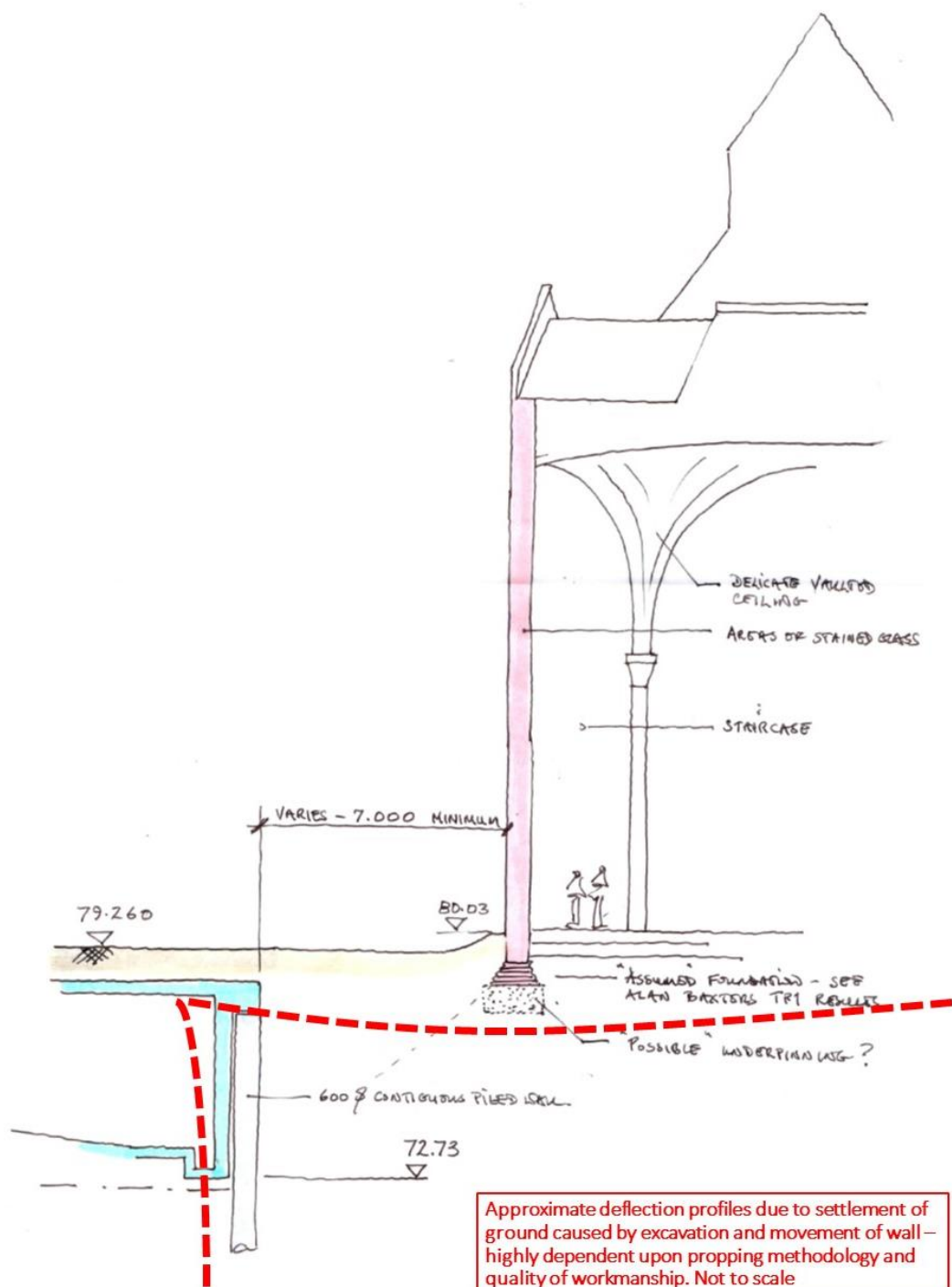


Figure 2: Approximate ground movement due to installation of underground swimming pool adjacent to the vaulted main studio of Lyndhurst Hall

iv) Foundations and geotechnical surveys

A single trial pit has been dug to expose the foundations of Lyndhurst Hall, the results of which have been extrapolated across the entire building by the engineers compiling the BIA, based on the assumption that it represents the footings to the entire building. The trial pit however is unlikely to be typical. Neither is it clear from the BIA as to where the trial pit was made, as the sketches and drawings provided are contradictory. It is understood from our client that Lyndhurst Hall was partially underpinned during its conversion in the early 1990s and in some areas beneath the building there are basements, resulting in the foundations being of variable depth.

The foundation construction of Lyndhurst Hall will strongly influence the proposed adjacent basement design and construction and requires more extensive consideration in the BIA. Where the foundations are shallower they may not prevent perched groundwater flows through the made ground layer over the London Clay beneath our Client's building, as assumed in the BIA, and where there are underground features this needs to be considered properly in the design, construction and location of the new basement. See figure 3 below for a detailed section showing the existing foundations and the proposed basement, deduced from the information provided, which suggests that the basement is too close to Lyndhurst Hall.

Please also refer to the GEA review in appendix B.

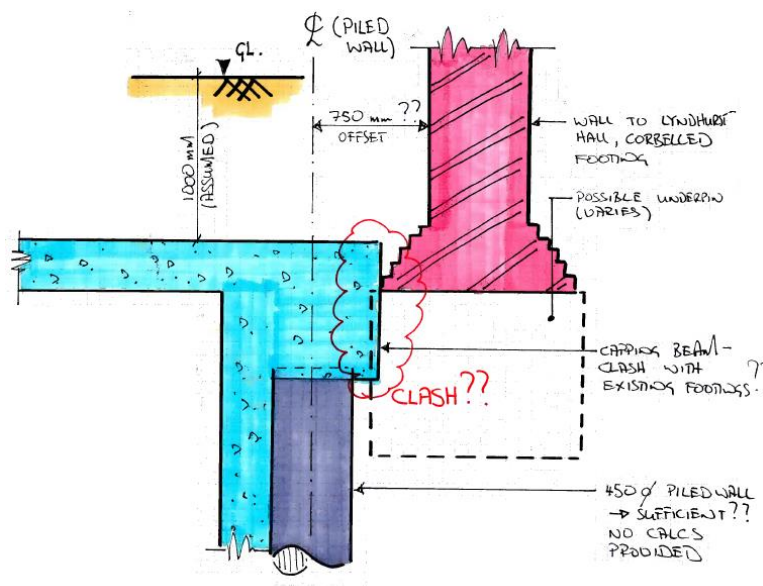


Figure 3: Sketch showing proximity of new underground cinema in relation to the foundations of Lyndhurst Hall (including various measurements taken from BIA)

v) Structural design of basements

Appendix J of the BIA contains some very basic calculations for a 600mm diameter contiguous piled wall with a 10kN/m^2 surcharge load behind the wall; however the section of proposed basement containing the cinema, which abuts our clients foundations and southern boundary wall, is constructed using piles of 450mm diameter and the surcharge load behind this wall will be the bearing force underneath the foundations, significantly higher than the 10kN/m^2 allowed for. Therefore the structural calculations of the basement provided do not appear to consider the actual loads being imparted to the soil by our clients building, nor does it seem that there is a justification in the selection of 450mm diameter piles for the cinema basement and neither was consideration of the deflection noted in the calculations, either immediate or in the long term due to creep, that the walls may experience due to the load on them.

Please also refer to the GEA review in appendix B.

vi) Buildability aspects

The most sensitive time during the construction of the basement will be the installation of the piled walls, followed by excavation of the soil; it should be noted that the movements experienced by the surrounding ground and structures they support are predominantly dependent on the quality of workmanship and the construction methodologies deployed by the contractor. Generally speaking the most damaging type of movement is horizontal movement and one way this is controlled is through ensuring the wall is sufficiently stiff and adequately propped.

The BIA has very little information on the details of workmanship to be deployed during the basement construction, mentioning only that the walls will be propped, but not giving detail on how this will be done or explaining how movement of the ground and our clients' structure will be monitored. Therefore the BIA offers little protection in this regard to our Client.

It should also be noted that extended construction periods increase the risk of ground movements. Groundworks and basement construction is notoriously risky and frequently takes longer than anticipated; it is noted that there may be Archaeology present in the neighbouring site which increases the risk of an extended construction period to the one currently planned.

The proposed basement drawings describing the cinema show this to be located extremely close to our Clients' building; further study may show

this to be too close – the proximity will make it practically very difficult to construct as can be seen from the sketch in figure 4 below, as the extents of the concrete underpinning to Lyndhurst Hall has not been investigated in the BIA.

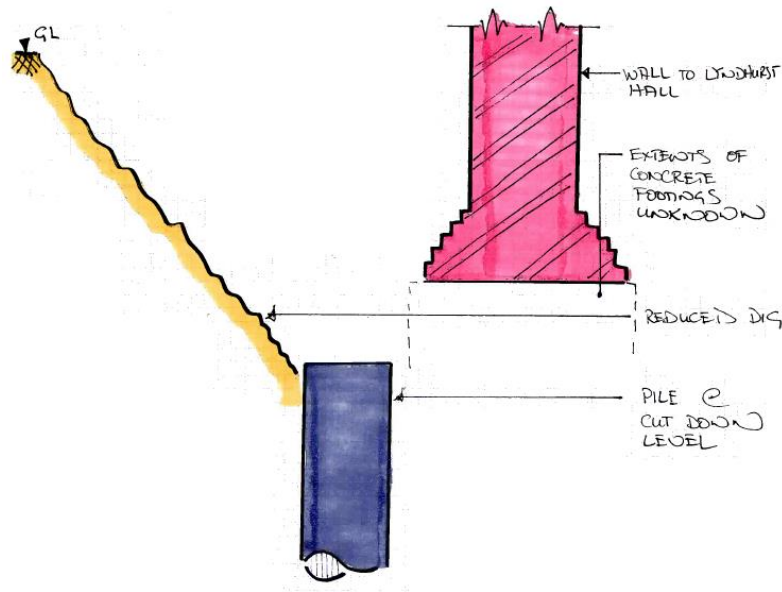


Figure 4: Potential undermining of foundations to Lyndhurst Hall during construction of adjacent basements (depending upon extents of existing concrete footings)

It is understood that the method used to predict ground movements in the BIA are based on limited empirical data and is uncorroborated by numerical analysis; they are indicative only and therefore it should be noted that there is a risk that actual movements may be higher.

Please also refer to the GEA review in appendix B.

vii) Ground water studies

We have obtained first hand recollections of the major refurbishment works undertaken at Lyndhurst Hall in the early 1990s by the project architect George Kounnou BA (Hons), B Arch (Hons), RIBA, formerly of Heber Percy and Parker Architects, and Martin Jenkinson, a quantity surveyor working for the contractor (Transformation). The refurbishment works included the construction of a basement and lift pit beneath Lyndhurst Hall.

George and Martin both recall that when the new basement and lift pit were constructed there was a very significant flow of ground water – of

sufficient flow and quantity for them to attribute this, rightly or wrongly, to the River Fleet. We understand that the specified basement tanking was insufficient to counter the water pressure and so a pressurized grouting procedure was then used around the new basement area, which also proved ineffective to withstand the flow of water. The solution finally adopted was to construct a well with a pump to actively dewater the ground. Through consultation with Air Studio's Technical Director Tim Vine-Lott we understand the well to be approximately 1200mm diameter with a depth of around 5.5m below ground floor level, and to be effectively 'de-watering' the area local to Lyndhurst Hall. Permanent pumps were fitted to the well, pumping out the water to effect this de-watering. These pumps are still in operation today and we understand from Tim that the pumps are rated at 9 litres/second. We have been informed by George that the initial exploratory holes carried out to inform the basement design at Lyndhurst Hall did not pick up the water flow that was later experienced and that the excavation works may have been carried out during a period of heavy rainfall.

This factual account contradicts the ground water flow drawing presented in the BIA for 11 Rosslyn Hill, which indicates that water flows would be around Lyndhurst Hall, principally to the North rather than through or under the building. From the account above, which is corroborated in contemporary written journal accounts of the construction, it is clear that the hydrological characteristics of this area are more complicated and potentially more damaging than currently assumed and a more detailed study is required to fully understand the implications of the proposed basements on the adjacent listed buildings of 11 Rosslyn Hill and Lyndhurst Hall, which should include, for example, an identification of the source of this water and measurement of its flow rate.

Consultation with our client would have led to consideration of the local ground water conditions beneath Lyndhurst Hall in the preparation of the BIA; it is noted that consultation with neighbours is an integral part of the BIA process, see section 2.85 of CPG 4.

Please also refer to the GEA review in appendix B.

3. Conclusions

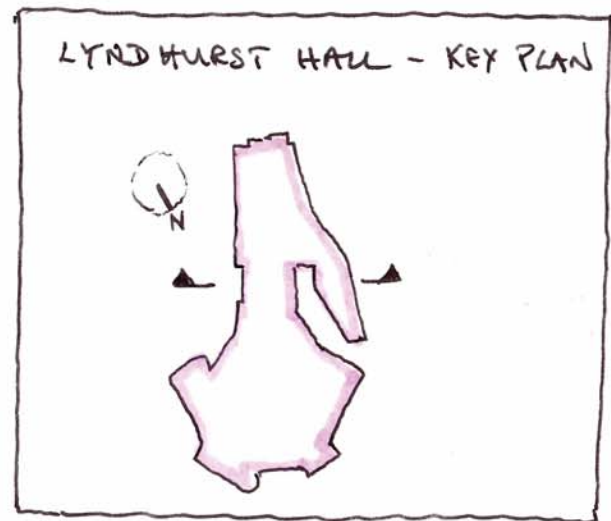
A full review of 'As Built' drawings of Lyndhurst Hall is required, corroborated by site surveys, with in-depth analyses and assessments of the interaction between the proposed ground works and existing structural fabric of our Client's building, to fully assess the impacts of the proposed basement construction.

In particular the following points are noted:

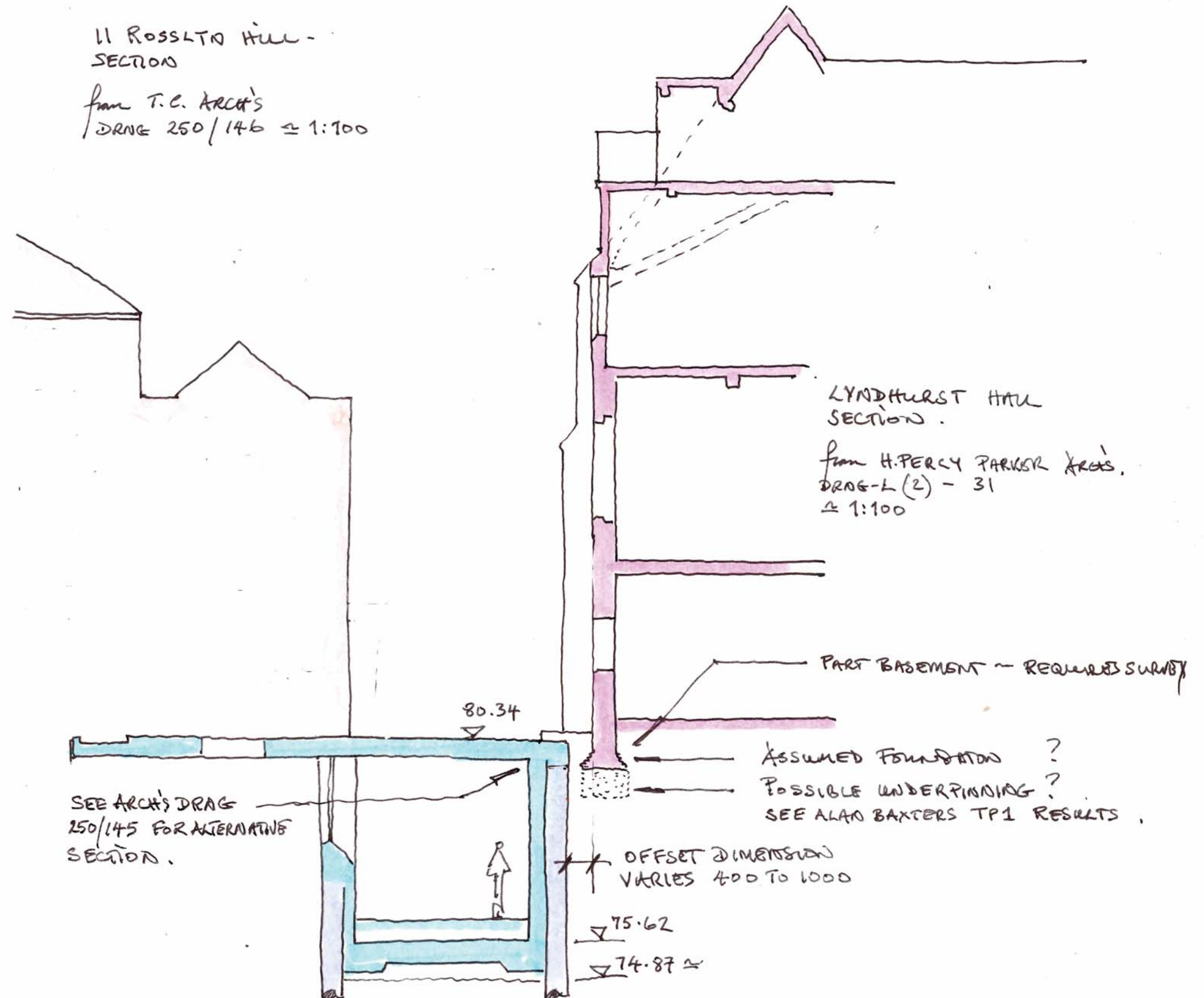
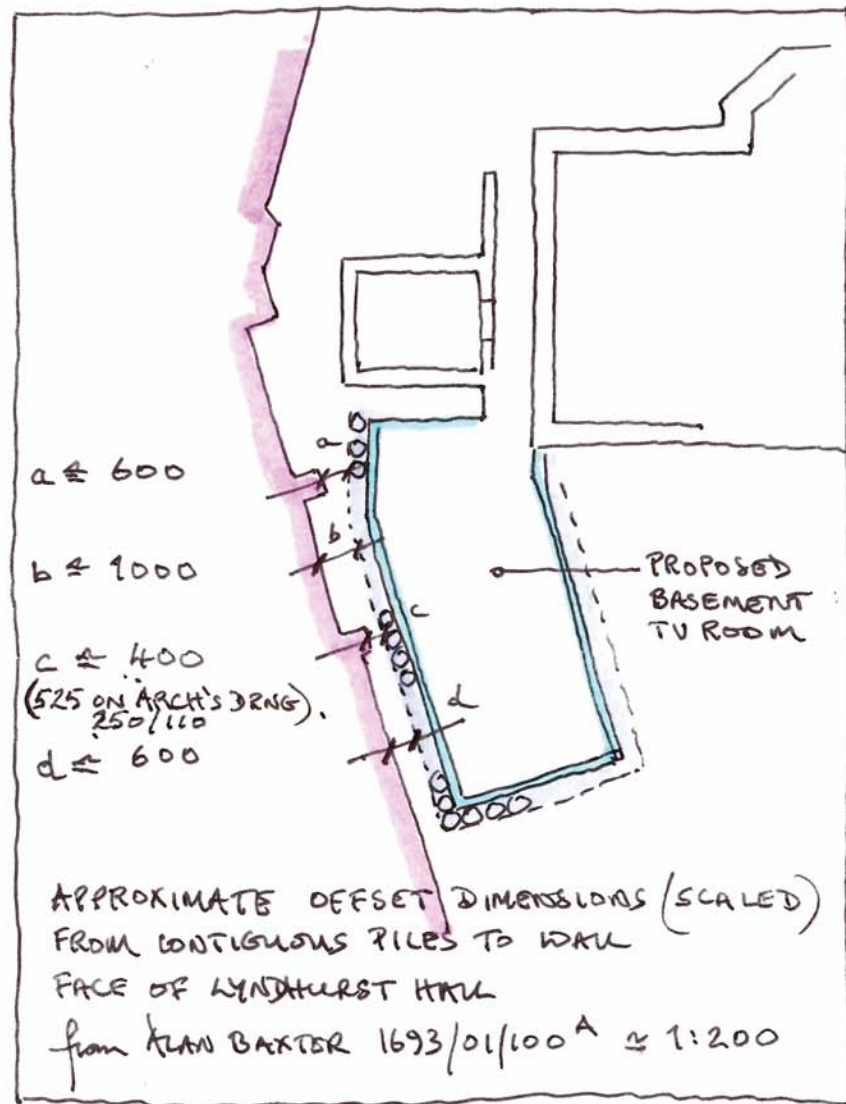
1. There is insufficient consideration of the potential damage to the fragile structure of the main Hall vaulted roof structure and large masonry panels with inlaid historic stained glass windows, contrary to the requirements of CPG 4
2. The foundations assumed for the Hall have not been investigated sufficiently which may affect the conclusions drawn in the BIA; more trial holes are required
3. There is anecdotal evidence of a local ground water feature beneath Lyndhurst Hall which has not been investigated or considered in the BIA
4. There is insufficient detail given on workmanship and propping details of the proposed basement and movement monitoring of Lyndhurst Hall
5. The structural proposals for the basement do not consider the forces on the ground due to the weight of Lyndhurst Hall
6. There has been no consultation with Lyndhurst Hall which would enable sufficient understanding of the structure and discussion of suitable mitigation measures to reduce the impact of the basement construction on our Client's building and business. This mitigation step is recommended in Clause 2.85 of CPG 4.
7. More section drawings are required, showing the interface between new basement and existing structures, to fully understand the structural interaction
8. New piles are proposed extremely close to Lyndhurst Hall's corbelled brick foundations; a more detailed study may well reveal the close proximity is impractical
9. There is insufficient information contained within the BIA to ascertain the effects on our Client's building

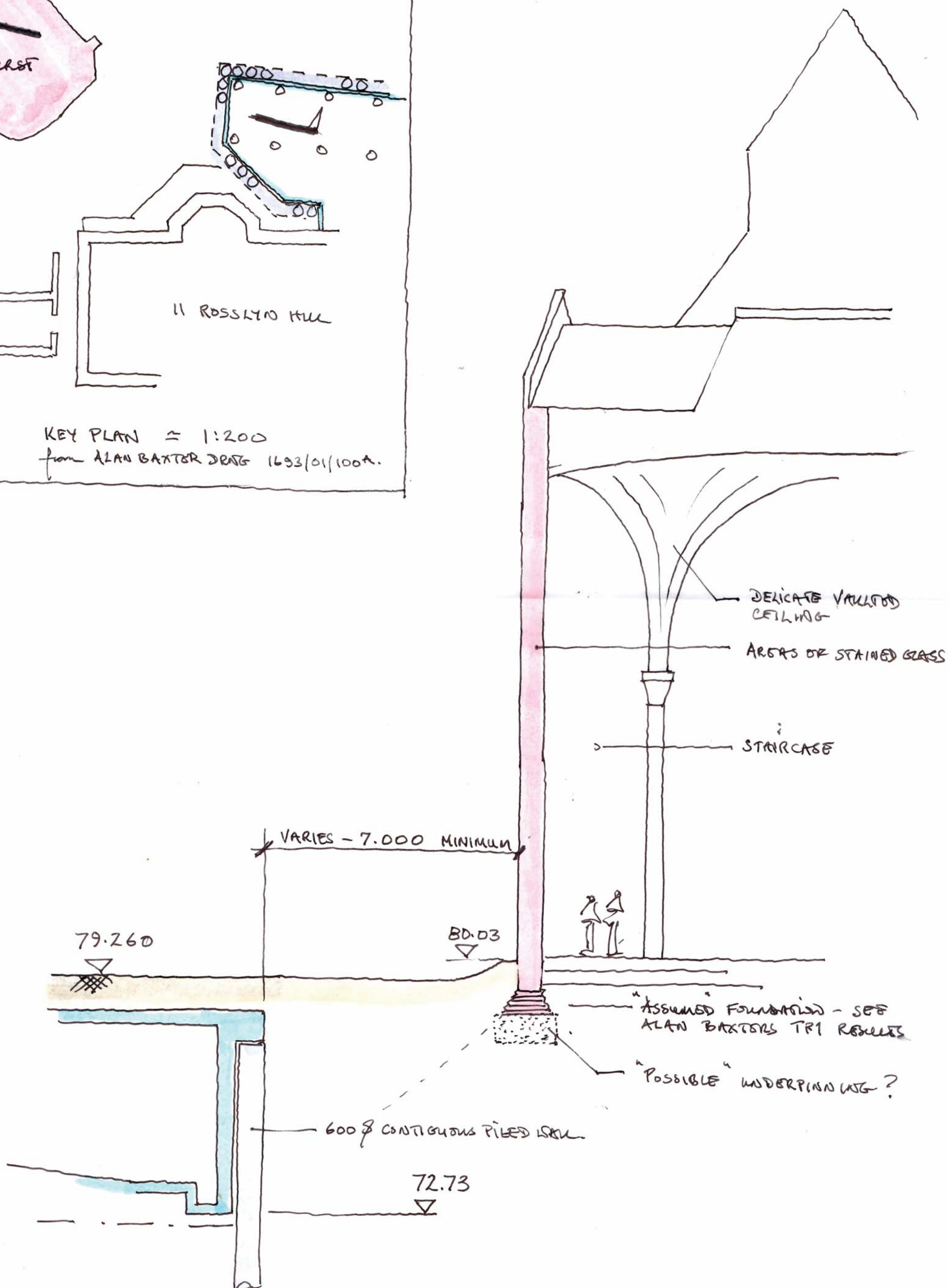
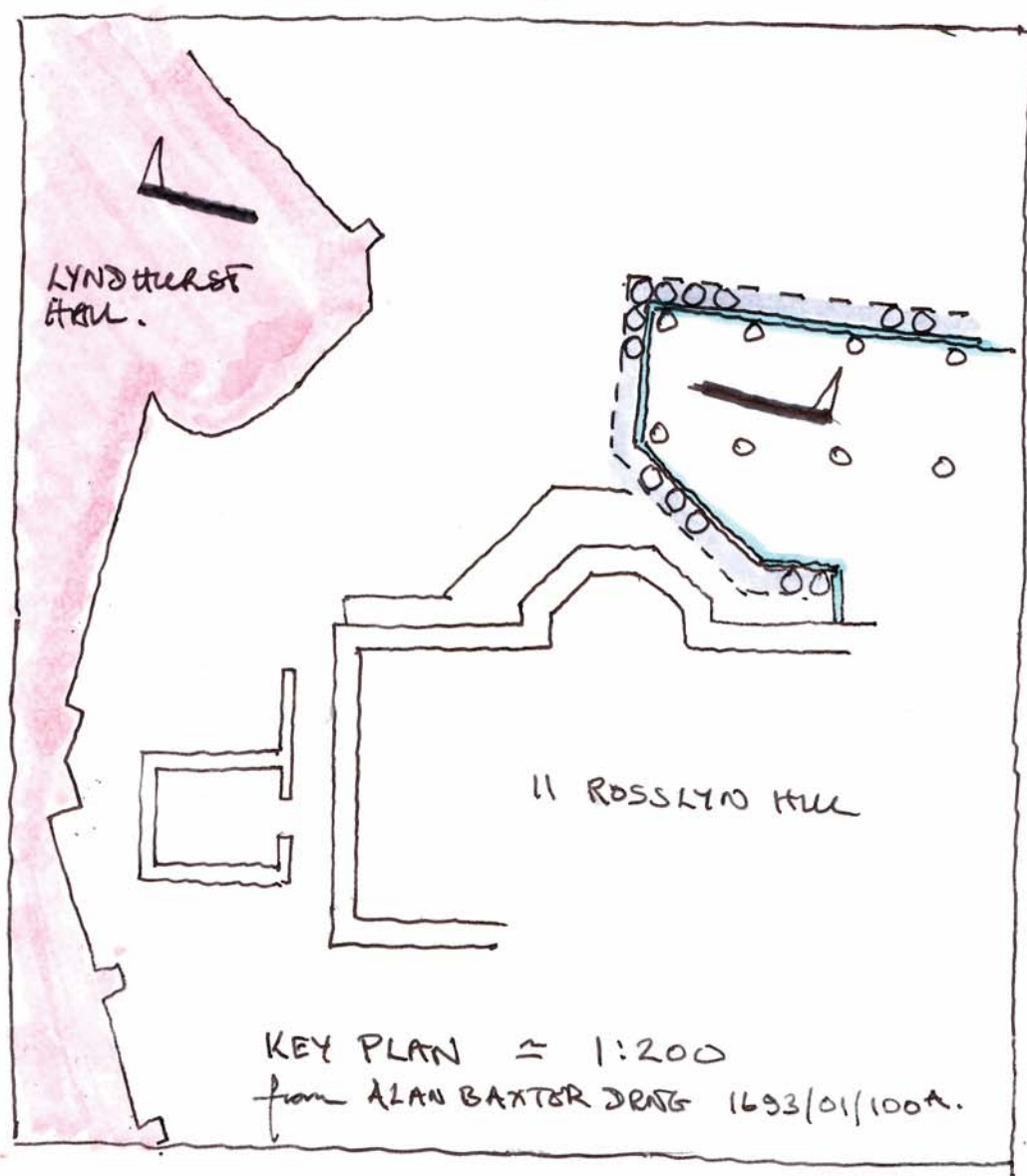
A fuller review of the BIA and the structure of Lyndhurst Hall may well show up further issues requiring further study. From our initial review, as a result of the significant shortcomings, omissions and inconsistencies noted, we conclude that this BIA in its current form is unacceptable and does not provide a credible assessment of the impacts of the proposed basements on Lyndhurst Hall.

Appendix A – Approximate Section Sketches showing proximity of proposed basements to Lyndhurst Hall



11 ROSSLTON HILL -
SECTION
from T.C. ARCH'S
DRNG 250/146 $\pm 1:100$





CORBETT & TASKER
Structural Engineers

SK. B SKETCH SECTION SHOWING PROPOSED UNDERGROUND SWIMMING SHOWN ADJACENT TO AIR STUDIOS MAIN HALL
~1:100 @ A3

Appendix B – Specialist Geotechnical and Environmental review by
GEA Ltd.

04 June 2015



Our ref J15169/MC/1

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Dear Richard

Re: OPINION OF BASEMENT IMPACT ASSESSMENT FOR 11 ROSSLYN HILL, LONDON NW3 5UL

Further to your instruction, we have now completed our initial review of the ground movement and groundwater aspects of the Basement Impact Assessment (BIA) relating to your neighbours' proposed basement construction adjacent to your building and this letter forms our report on the review.

1.0 INTRODUCTION

1.1 Brief

Geotechnical and Environmental Associates Limited (GEA) has been instructed by Air Studios (Lyndhurst) Limited to undertake an initial review of the geotechnical and groundwater aspects of a BIA for proposed basement at a neighbouring site, namely No 11 Rosslyn Hill. Concerns have been raised in respect of the potential impact of the proposed basement on the Grade II* listed Lyndhurst Hall which is in use as an orchestral recording studio. This report provides an initial review of the BIA and raises items of concern where the submission does not appear to satisfy the requirements of Camden Planning Guidance CPG4¹.

1.2 Proposed Development

The development site is adjacent to Lyndhurst Hall and comprises the Grade II listed No 11 Rosslyn Hill in the Fitzjohn and Netherhall conservation area of the London Borough of Camden (LBC) which is understood to comprise a three-storey building with a single-storey basement.

The proposed redevelopment is understood to comprise the retention of the existing listed building and the construction of two new basements. The eastern basement is located south of 11 Rosslyn Hill and comprises a two-storey basement with a swimming pool and plant room that extends to a depth of roughly 8 m whilst to the west of No 11 is a slightly smaller single-storey basement that extends to a depth of roughly 5 m and is only 1.0 m laterally from Lyndhurst Hall.

Contiguous and secant bored piled walls are proposed to support the excavation and reinforced concrete lining walls are proposed within the piled walls.

¹ London Borough of Camden (2013) Camden Planning Guidance (CPG) 4: *Basements and lightwells*

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1.3 Documentation

A BIA has been prepared by Alan Baxter and Associates (ABA), referenced 1693/10/FN/fn and dated 24th March 2015. The BIA includes a Ground Investigation by Ground Engineering Limited, referenced C13469 and dated March 2015. A number of building sections and elevations by Thomas Croft Architects Limited have also been provided along with calculations by ABA within the appendix.

2.0 REVIEW OF THE BASEMENT IMPACT ASSESSMENT

2.1 Qualifications and Procedure

This review has been undertaken by Martin Cooper, a Chartered Civil Engineer (CEng) and Member of the Institution of Civil Engineers (MICE) with over 25 years of experience in the geotechnical industry and specific experience of the design and construction of bored pile walls close to listed buildings. The review has been undertaken in conjunction with Steve Branch, a Chartered Geologist (CGeol) specialising in engineering geology and geotechnical engineering for over 28 years with specific extensive knowledge and experience of the ground and groundwater conditions in the London Borough of Camden (LBC).

The reviewers have authored a significant number of Basement Impact Assessments in the locality and act as independent auditors for LBC.

2.2 Overview

Detailed design will need to be undertaken together with monitoring before, during and after construction by a reputable contractor and a structural appraisal of Lyndhurst Hall will need to form part of the baseline study. Some of these issues are within the remit of a structural engineer, but GEA has been appointed to provide initial opinion in respect of the ground movement analysis and the groundwater flow aspects of the BIA.

2.3 Ground Movements

Ground movements may be considered to take place during four discrete phases of the basement construction work. In the first instance, the installation of piles will cause settlement around the piles. Secondly, the excavation within the bored pile walls will cause movement of the pile walls into the excavation and settlement of the ground surface retained behind the walls. Thirdly, the excavation of soil down to the basement level will cause heave due to the unloading of soil removed and finally long term swell of the formation will take place as pore water pressures recover to long-term equilibrium.

At this site a very simplistic pile design approach has produced a rudimentary design and been used to predict ground movements on the basis of the approach of CIRIA C580. Unfortunately the analysis undertaken is considered inadequate for this site where excessive ground movements would have a significant impact on Lyndhurst Hall.

The following is considered to be the minimum requirement to demonstrate that Lyndhurst Hall would be protected.

1. Structural assessment of Lyndhurst Hall as required in Section 2.41 of CPG4. The delicate vaulted large span Victorian ceiling suggests that this building would be more sensitive to ground movements than, for example, a three-storey house but no such assessment has been included within the BIA.

2. Whilst a construction sequence has been included within the BIA this is a brief overview of the site operations rather than a detailed stage by stage plan of excavation. A formalised sequence should therefore be set out whereby all excavation stages are defined by level and extent.
3. From the sketches provided, consideration does not appear to have been given to the temporary works that would be required to maintain the stability of Lyndhurst Hall while the piling platform is prepared.
4. A single trial pit has been excavated to determine the nature and depth of the foundations of Lyndhurst Hall's southern elevation. It is considered essential that further information is gathered in respect of the foundations along that elevation.
5. Items 2, 3 and 4 above should be used to inform a pile design. A simply supported beam model is considered wholly inadequate as there is no recognition of the surcharges imposed by the foundations of Lyndhurst Hall. An authentic pile design is required that incorporates the stages of construction, propping forces and levels and incorporates the long term case where the soil parameters will be different from those used in analysis of the short term works. Such a design will provide a pile toe level, bending moment and shear force envelopes and, most importantly, a prediction of wall deflections. It is considered that this level of sophistication in pile design is justified in the sensitivity of the retained structure and that a design undertaken using widely available software such as perhaps Wallap or Frew is recommended.
6. The predicted movements would be used to inform the assessment of wall stiffness category such that the most appropriate CIRIA C580 ground movement curves can be used to predict the movements outside the basement.
7. The unloading forces and any potential reloading of a basement raft or floor slab should be used to predict the maximum heave movements within and surrounding the basement and lines representing sensitive structures can be used to provide a better prediction of movements and damage. These movements should then be compared with the degrees of acceptable strain deriving from Item 1 above to determine if the proposed design is acceptable. If not then a different propping arrangement or stiffer piles will be required.
8. Whilst monitoring is briefly mentioned in Section 5.6 of the BIA, there is no indication of what this might comprise. The BIA is considered deficient in this respect and, as a minimum, inclinometers placed within wall piles and precise levelling and 3D monitoring of Lyndhurst Hall should be specified. In addition, given the sensitivity of Lyndhurst Hall to ground movements, the BIA should also provide details of the mitigation measures that will be in place in case the monitoring indicates movements in excess of those predicted.
9. Clause 2.61 of CPG4 notes that the council will seek a management plan for demolition and / or construction where basements are proposed adjacent to a listed building. The requirements are presented in detail in Section 8 of CPG6²; at this stage it is not considered that these requirements have been met.

2.4 Groundwater Flow

The BIA provides an indication of the perceived ground water flow across the site within the made ground and above the London Clay. It surmises that groundwater flows in a roughly southeasterly direction and is probably about right. However groundwater has been measured as shallow as 0.5 m but the measures do not appear sufficient to address this, particularly in the temporary works to prepare the piling area close to Lyndhurst Hall.

² London Borough of Camden (2011) *Camden Planning Guidance (CPG) 6: Amenity*

Further, the basement closest to Lyndhurst Hall is shown to be a contiguous bored pile wall which seems rather at odds with shallow groundwater conditions. This will mean that there will be a requirement for dealing with shallow groundwater inflows and measures should be proposed for dealing with groundwater inflows and ensuring that pumping does not result in settlement of the adjacent structure. We would also suggest that consideration should be given to whether there is a risk of loss of fine material between the piles.

It is considered that the potential impact of the basements on groundwater flow require further thought.

3.0 SUMMARY

Our review has found that the BIA has not taken adequate cognisance of the presence of Lyndhurst Hall which is immediately adjacent to one of the proposed basements. As such it has not adequately assessed the impacts of the basement which is the key aim of a BIA as set out in CPG4. It is important to note that the burden to demonstrate that a scheme does not adversely impact other interests is upon the developer's professional team. We consider that it falls short in this respect.

We trust that the foregoing comments are sufficient for your needs. We would be pleased to discuss our comments in more detail if required and to provide any additional assistance that may be necessary.

Yours sincerely

GEOTECHNICAL & ENVIRONMENTAL ASSOCIATES



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