The Morton Partnership

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Our ref: BAM\BEB\16749~Appraisal of Excavating Foundations

1 December 2015

ST STEPHEN'S CHURCH, ROSSLYN HILL, LONDON NW3 2EP

GENERAL APPRAISAL OF THE POSSIBLE EFFECTS OF EXCAVATING FOUNDATIONS ON A LOWER PART OF THE HILL FOR THE PROPOSED NEW PEARS BUILDING ON ROWLAND HILL STREET

PLANNING APPLICATION 2014/6845/P

CLIENT'S BRIEF

This appraisal document has been prepared as requested by Michael Taylor, on behalf of the St Stephen's Restoration and Preservation Trust; a registered Charity (No.1075080).

I have been requested by Michael Taylor to write a simplistic report on the overall situation related to the Planning Application to excavate and build the Pears Building on the slope below the Church.

I met Michael Taylor at the Church in mid October 2015, when I was able to inspect the structure whilst being given a description of the proposals for the Pears Building related to the possible effects on the Grade I listed building, St Stephen's Church and the adjoining School building.

I advised Michael Taylor that I have known the Church for many years, as a member of the Buildings Committee of the Victorian Society; a Committee that I still remain part of. My involvement in the past related to possible restoration of the building which was in a poor state at the time of my first visit in the early 1980s, when a possible occupier was being sought.

EXTENT OF MY EXPERIENCE: Brian A. Morton MBE C.Eng FICE Dip Conservation (AA) IHBC

I have been involved in carrying out appraisals, preparing schemes, and implementing works to historic buildings since I formed The Morton Partnership in 1966, with some early experiences of looking at Cathedrals prior to that date.

At this time, I am acting as Consultant to The Morton Partnership, an organisation with a principal office in London and two other offices in the south-east; a Practice now employing some 25 people, with the Engineers all being trained to inspect, look after and, as far as possible, protect historic buildings.

In the New Year's Honours List in January 2005, I was honoured by Her Majesty with an MBE. The wording associated with this Award was *Conservation Engineering – Assisting the Heritage.*

Until I retired, or resigned, in recent years, I was Engineer to Lincoln Cathedral for eleven years; Canterbury Cathedral for eleven years; and was on the Fabric Commission of Westminster Abbey for some twelve years, remaining by request of the Dean and the Faculty Committee for six years beyond the normal retirement age.

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The Morton Partnership, with my son, Edward Morton, as the Managing Director and Corporate Director, Ian Miller, now look after many of the most important historic buildings in the United Kingdom and indeed, overseas. The Morton Partnership currently, for example, are involved in the continuous ten year project restoring the Palace of Westminster.

Edward Morton now acts as Engineer for ten Cathedrals throughout the United Kingdom, including Westminster Abbey, Canterbury, York Minster, Ely and Peterborough.

We act as advisers to Historic England, and all of the larger amenity groups, as well as many local organisations involved in protecting the Heritage.

DOCUMENTS REFERRED TO:

The Geological Problems of Pond Street, dated 15 December 2014, prepared by Dr Eric Robinson, who until recently was Emeritus Professor, Department of Geology, University College London; Honorary Vice President of the Royal Archaeological Institute. I understand Dr Robinson has now retired.

A Geo-Tech Report from Michael de Freitas.

Documents obtained from the Institution of Civil Engineers' Archive and my own library

From the Institution of Civil Engineers:

Extracts from FW Simms *Practical Tunnelling* 4th Edition 1896
Building of the London and Birmingham Railway, Robert Stephenson 1838
Further extract from Robert Stephenson's book: *The London and Birmingham Railway*

The Morton Partnership Library
George and Robert Stephenson, Samuel Smiles 1864
Stephenson's Britain, Derrick Beckett 1984
The Lives of George and Robert Stephenson, Samuel Smiles 1975
George and Robert Stephenson: A Passion for Success, David Ross 2010

PURPOSE OF THIS DOCUMENT

When first approached by our Client, Michael Taylor, I was handed the documents prepared by Dr Eric Robinson (now retired) and the document entitled: *Technical Matters for Concern Arising from the Excavations Proposed for the Pears Building on Rowland Hill Street, Hampstead*

As an Engineer with significant experience of advising Clients on matters associated with foundation movement of buildings, I felt that I should write a summary of, particularly the information provided in the *Geo-Tech Report* from Michael de Freitas, and the brief report from Dr Eric Robinson. I found that there was particularly very detailed technical information given in the report by Michael de Freitas and indeed, briefly by Dr Eric Robinson. However, there was no simplistic appraisal of the overall situation in my view necessary for lay people to understand and thus, I have set out below a description of the situation and the risks to the Church and School buildings as I see them.

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SIMPLIFIED INDICATION OF RISKS TO ST STEPHEN'S CHURCH AND THE SCHOOL

One of the first projects of any substance that I was involved in when I first started The Morton Partnership was associated with providing and agreeing an underpinning solution to safeguard Barlaston Hall in Staffordshire, a Georgian mansion of rectangular proportions which had diagonally cracked from corner to corner, and to some degree had settled across that crack unevenly. Three other Engineers had presented solutions and I was able to suggest a double underpinning design scheme associated with the overall settlement of the ground in the area up to 3.0m due to mining subsidence. My proposals were accepted and the building now stands perfectly satisfactorily.

In the late 1950's, 1960's and 1970's when houses that had been built with hard bricks and hard mortars settled and cracked, we as a Practice became experts at assessing the extent of work necessary to stabilise these buildings.

Related to my experience of settlement of buildings, I became involved, and now act as Honorary Engineer to four Diocesan Advisory Committees. These appointments have led me to advise many churches on the movements that have occurred over the last 40 years due to the excessive periods of drought associated with churches built onto all types of soil, making decisions on a continuing basis as to whether any foundation work would be appropriate.

Generally my attitude to unequal settlement of church structures, mainly the Chancels and Vestries falling away from the main body of the churches, I have been able to advise on how to retain these structures, sometimes doing nothing if the unattached structure is one structural unit.

In addition to this, I was fortunate enough to be involved in discussions in Mexico City with regard to the settlement of the Cathedral that occurred over its lifetime. It happened I was in Mexico City at the Cathedral when discussions were taking place between six eminent Geotechnical Engineers about the solution to stop the continued settlement of the building on the peat strata on which it was built.

Over the years, the building had gradually settled end to end and the solution had been to continuously underpin until the Engineer involved in Pisa, and the lean of the Tower there, came to the meeting in Mexico to suggest levelling the building by sucking out of the soft wet peat under the high end of the building, letting it settle down. This process was adopted after discussion and the Cathedral has been substantially brought back to a reasonable level, halving the settlement that had continued to occur.

DISCUSSION OF THE SITUATION RELATED TO ST STEPHEN'S CHURCH, ROSSLYN HILL

St Stephen's Church is a Grade 1 listed building which means that it is not to be damaged at all in any way, and if the building is at risk, Historic England, should be advised of the situation. It is against the law to allow a listed building to be damaged.

The geotechnical reports on behalf of the Church indicate that, in the opinion of the authors, there is a significant risk of structural cracking or settlement of the Church.

The underlying strata beneath the Church is London Blue Clay, and it is helpful to consider the situation that occurred when the London to Birmingham railway tunnel was constructed through the Blue Clay under Primrose Hill close to the site.

Robert Stephenson, who was the Engineer responsible for the tunnel, found himself in a very difficult position, as explained in some of the extracts provided by the Institute of Civil Engineers in that, as exposed to the air, the Blue Clay which was absolutely dry when excavated for the tunnel. It expanded very quickly, applying enormous pressure to the brick tunnel lining causing bricks to fail and mortar to fly out of joints.

The London clay is considered to be a unique material posing special challenges. The clay contains fine grained iron pyrites which, exposed to air and moisture, change chemically with the generations of heat which makes it swell like bread dough before baking. In that state, the clay will move on slopes deemed safe for other clay in the experience of Architects.

Another factor affecting the slope is the hydro geology of Hampstead, which represents unseen problems relevant to Pond Street. The street is a stream notch into the clay heights of Hampstead, now partly hidden by tarmac; after heavy rains the stream runs down to South End Green. Below the surface however, bands of silt and fine sand within the London clay act as aquifers for water flowing unseen and lubricating the down slope movement of the ground towards the low points of the Hospital site.

In another reference, in the construction of the Primrose Hill tunnel through the London clay, the lengths of tunnel dealt with in one section would be limited to 9', and strongly timbered until the arching was completed.

In virtue of its mobility however, the moist clay exerted so great a pressure on the brickwork so as to squeeze the mortar from the joints.

In another extract from the *Railway Companion 1838*, which describes the London clay found in the Primrose Hill tunnel contract: 'the most unmanageable and treacherous of all materials, the difficulty of tunnelling through, which can only be appreciated by practical men'.

Simplistically, it needs to be considered that the ground formation was formed naturally with layout of material sliding down the slopes forming slip plains, as described geotechnically in the summary twenty page document prepared by Michael de Freitas.

He highlights in the conclusions to his report that there has been significant movement after building works in 1901, 1948-49, 1968-70, 2015 in response to demolition works for the LINAC Centre.

This 114 year history of movement in response to work downhill has been ignored in the Developer's conclusions indicating that further movement is unlikely. The conclusion in Michael de Freitas' report need to be read item by item; he is of the opinion that the numerical modelling has not worked in forming conclusions because it uses an incorrect ground model. He further states that: **'The ground model for the Pears Building project, on the basis for which Camden approved the work, is not fit for purpose; Camden has been misinformed'.**

CONCLUSION

We have a situation where there is almost a certainty that ground movement will continue, simply because of the history of the site and the fact that we have a set of circumstances with Blue Clay with water channels running through it which change course when one channel blocks, and it simply forms another. The movement of this water below ground can certainly cause significant movement of the slope below foundation level, causing landslide type slippage of the buildings on the slope.

The overall problem is that the diversity of ground conditions is not fully understood. Calculations on possible ground movements cannot be relied upon to give any reasonable answers to ensure that the Church and School will not be damaged, or indeed destroyed if there is a serious land slip which could occur.

I am of the opinion that St Stephen's Restoration and Preservation Trust should ask the Developers of the Pears Building site on Rowland Hill Street to provide **Non Negligent Liability insurance**, which I believe is JCT Clause 21.2.1 contained in the JCT Standard Form of Building Contract. This insurance is required to be arranged in joint names of the Employer and the Contractor, the Cover protects the Employer in respect to their legal liability where loss is incurred by adjoining owners.

I am advised that the Insurers will investigate the risk and offer appropriate insurance cover. In my opinion, there is significant risk in this matter, and it may be found that there is not an acceptable insurance risk associated with saving the Church.