

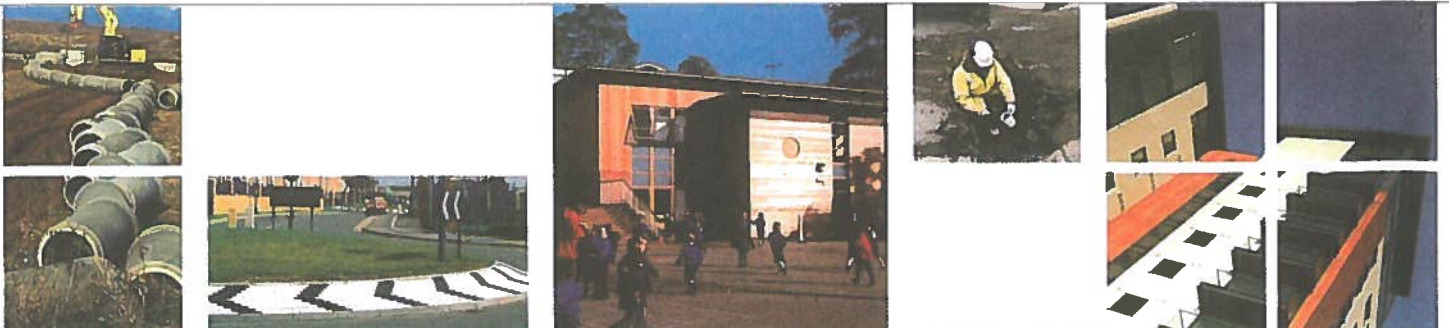
# STRUCTURAL DESK TOP STUDY REPORT

Old Rectory, Little Gransden

client: Little Gransden Parish Council

April 2012

Job no: 43968



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## 1. INTRODUCTION

- 1.1. We received written instructions from Little Gransden Parish Council on 23<sup>rd</sup> March 2012 to undertake a desk top study report on the structural effect that two trees (a Cedar and Wellingtonia) could be exerting on the foundations of the Old Rectory building.
- 1.2. The owner, Mr Seabright of the Old Rectory has been advised by his Insurance Company that the tree roots from the Cedar and Wellingtonia trees are influencing the foundations of his property and causing subsidence. As a result he is proposing to remove them to prevent progressive subsidence in the future.
- 1.3. The Parish Council is investigating whether these mature Cedar and Wellingtonia trees, which are believed to be over three hundred years old, are causing the recent subsidence issues. They wish to see them preserved as they form a valuable landmark of the village.
- 1.4. This Report gives the results of our desktop study, discusses these results and gives any recommendations for further action.
- 1.5. The Parish Council were unable to gain permission from the current owners to visit the property to enable us to carry out our own inspection of the structural damage.
- 1.6. We were provided with the following documents from Little Gransden Parish Council to assist us in preparing this report:
  - a. Document One  

Crawford and Company Adjusters (UK) letter addressed to Mr Seabright dated 23<sup>rd</sup> January 2012. This letter included results from a levelling survey carried out between 23/3/10 to 20/12/11 and crack width monitoring results.
  - b. Document Two  

Mat Lab Site Investigation report dated 23<sup>rd</sup> March 2010 - Ref 44334.
  - c. Document Three  

Arboricultural Consultant, Margaret MacQueen Report dated 28<sup>th</sup> May 2010.
  - d. Document Four  

Addendum Technical Report by Crawford and Company dated 4<sup>th</sup> May 2010.

e. Document Five

PG Biddle Arboricultural Consultant report dated 15<sup>th</sup> March 2012.

f. Document Six

Planning Application made on behalf of Mr Seabright dated 17/11/08 - Ref S/1986/08/F

- 1.7. We were not provided with a copy of the original structural inspection which presumably Crawford would have carried out to log the actual positions of structural damage and crack patterns.
- 1.8. The property is a Grade II Listed Building comprising a cellar, in the south east corner, with two storeys above, originally constructed circa 16th Century.
- 1.9. There are a number of trees and bushes on the site. The Cedar and Wellingtonia trees in question appear to be approximately 18m–19m from the face of the building. However there are a number of other trees and bushes on the site including a mature Horse Chestnut tree on the south west boundary that appears to be only 14m away from the opposite side of the property where subsidence is being claimed to occur. There are also a number of smaller trees and bushes, some of which appear very close to the building.
- 1.10. The site slopes down from north east side of the house.
- 1.11. Cracking was first noticed, presumably, sometime before the monitoring was implemented, circa 2007.

## **2. DISCUSSION**

- 2.1. No investigation appears to have taken place on the possible effects of damaged drains from the property.
- 2.2. Document One concludes that only the Cedar and Wellingtonia trees, are effecting the house foundations, ignoring the possible effect of other vegetation on the site. It is claimed that roots from these trees are drying out the clay stratum causing it to shrink thereby resulting in subsidence on the foundations above.
- 2.3. The reported structural damage is cracking in the supporting walls of Category 2 (slight) in accordance with BRE digest 251. This digest is a guide to assessment of damage in low rise buildings. Category 2 represents crack widths greater than 1.0 wide up to a width of 5.0mm. The digest concludes that causes for damage up to level 2 are difficult to identify and ground movement is usually associated with Category 3 and above.

- 2.4. The level survey carried out during the summer part of the year confirmed seasonal movements have taken place. Often recovery of subsidence will occur during the wetter winter months as the clay recovers its moisture content and heaves. A more accurate picture would be gained if the monitoring had been carried out for a full twelve months so that full seasonal effects could be observed
- 2.5. Document five disagrees with Crawford's Arboricultural report. This report is much more detailed regarding the root pattern of the Cedar and Wellingtonia trees which tends to be predominately vertical rather than horizontal. The added incentive for these roots to extend downwards is to penetrate the sand stratum beneath the clay, being their natural root habitat.
- 2.6. The house is on very shallow foundations being only 270mm below ground level. These are founded on clayey subsoils of moderate shrinkage potential. NHBC have published guidelines (Chapter 4.2) for building foundations in clayey subsoils and recommends a minimum depth of 900mm is used for foundations on clay with medium shrinkage potential, to avoid seasonal foundation movements. Clearly, these foundations have always been vulnerable to movement in the past. It is likely that a history of minor cracking in the supporting masonry walls has always been experienced.
- 2.7. The foundation movement has occurred close to a new build part of the building. Document Six gives details of a new basement that was constructed in 2009. This basement would be founded approximately 2.4m below ground level on the sand stratum. Having foundations founded on different subsoils increases the risk of differential foundation movement. Whilst the shallow house foundation is extremely likely to move up and down during the seasons the foundations for the basement will not. As a result damage in supporting walls can be expected where the cracking has been reported, close to the new basement.
- 2.8. The clay stratum is very thin being only approximately 1.5m thick before being underlain by sandy material. If the Cedar and Wellingtonia trees are effecting the house foundations we would expect this to have happened many decades before the reported damage since they have reached mature height for some time, since the clay would have been fully desiccated as the trees approached the mature height.
- 2.9. In accordance with NHBC Chapter 4.2 the recommendation for foundation depths of this house in relation to the possible influence of Cedar and Wellingtonia trees is no greater than the minimum depth of 900mm quoted above, i.e. the tree roots are having no effect below the normal depth of seasonal variation.

- 2.10. By contrast, Chapter 4.2 states the mature Horse Chestnut tree roots would be having a detrimental effect on the house foundations since a foundation depth of 420mm below the minimum level of seasonal variations is required.

### **3. SUMMARY AND RECOMMENDATIONS**

- 3.1. On the basis of the documents presented it is questionable whether the Cedar and Wellingtonia trees are having any detrimental effect on the house foundations.
- 3.2. The thickness of the clay layer is comparatively thin and if the two trees are affecting the foundations they would have caused this problem decades ago.
- 3.3. If Crawford's logic is correct, the Horse Chestnut is more likely to be causing subsidence than the Cedar and Wellingtonia trees.
- 3.4. The foundation movement and associated cracking is more likely to effect the foundations of the main house since they are too shallow to resist the effects of seasonal variations on moisture content in the clay subsoils.
- 3.5. Any property founded on shrinkable clay on foundations of inadequate depth can expect damage up to level two as classified by BRE Digest 251.
- 3.6. Based on the foregoing we see no reason why these two trees should be removed since by doing so it is unlikely to stop foundation movement under this house.
- 3.7. We would recommend a full Arboricultural survey is undertaken detailing the effects of all the vegetation on this site and the influence this is having on the foundations.
- 3.8. Recommence the monitoring exercise to determine if the movement is truly progressive.
- 3.9. Investigate whether a movement joint has been incorporated at the junction of the new build over the basement to the existing property.

- 3.10. Upon completion of the monitoring it can be advised whether underpinning the property to avoid the effects of seasonal variations of moisture content of the clay subsoils is necessary.



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