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I am a structural engineer who has worked his whole career in Cambridge. I am familiar with reading the signs of movement in buildings and interpreting the possible reasons for distortion or cracking of the structure. I have been asked to review the Crawford report on 193 Sturton St (23 April 2025) which describes the extent of cracking first reported in 2019, precise level monitoring (May 2020 to December 2022), soil investigations, arboricultural considerations, and previous planning decisions which favoured keeping the plane trees in St Matthews Piece because of their amenity value.

1. **Signs of Movement**. First observed in 2019, there are 6 internal cracks, in the plaster, and one external crack in brickwork under the west facing rear kitchen/dining room window. All cracks are 1-3mm in width, classified as "slight". Recently, on October 28 2024, the cracks were inspected again and found not to have changed over the 5 year period. The cracks are no worse than they were in the summer of 2019. One of the internal cracks is associated with a vertical movement joint behind the rainwater downpipe on the East (front) elevation. Movement is to be expected at this location. It is no surprise to find a vertical crack in the plaster here. Two other cracks are associated with slight movement of lintels over window and french doors at the rear. Again, this hairline cracking is quite common, and it is caused by local stress at the lintel bearings. It happens in most houses. I believe that the size, location and pattern of these cracks suggest thermal or moisture movement of masonry, but definitely not subsidence of foundations.

2. **Precise Level data** . The graph of level data shows upward and downward movement at 8 locations - 4 at the front (East side facing the Plane trees in St Matthews Piece) , and 4 at the rear (West side facing other houses and private gardens). Over 2 years, the readings show upward movement of about 5mm above the datum, and downward movement of 10 - 28mm below datum. The datum chosen was a public manhole cover in Young St, about 10m from the building. It is not good practice to rely upon a drain cover as a completely stable datum, from which other levels can be compared. The manhole and drain cover is likely to move if there is seasonal volume change in clay subsoil beneath, especially if the drain was to leak. In my experience, if there had been 20mm to 30mm of cyclical upward and downward movement of the foundations, then cracking would be much worse in the walls and foundations. Cracks widths of 10mm to 30mm might be expected. Repeated upwards and downwards movement creates a "ratchet" effect, and the cracks grow steadily wider because the gaps never close as much as they open at every cycle. On clay soil, it is normal to see level data points go **up in winter** as the soil swells

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due to wetter conditions, and **down in summer** when the clay shrinks as it dries out. In this case, the normal pattern happened in 2020. Then there were no readings from June 2021 to March 2022, and from summer 2022 to December 2022 the readings curiously showed no recovery during the autumn - the level data implies that the building continued to go down throughout the autumn from August until December 2022. One plausible explanation for this long period of *apparent* downward movement is that the felling of 2 acacia trees caused heave, this lifted the datum and the garden wall which cracked badly, the house cracking got no worse, and the house foundations **did not go downwards very much at all**. Rather, the datum moved upwards, and this explains the *apparent* downward movement of the house, which actually has not happened.

In investigations of this kind, precise level monitoring is normally used to prove that there is a linkage between foundation movement and the growth of cracking. In this particular case, the 'slight' cracking reported in the summer of 2019 has not grown any worse, yet the level data appears to show cyclical upward and downward movement. If the foundations had moved up and down by the amount shown in the graph (up 5mm, down 28mm), cracking would have got worse year on year. Since the cracking remains unchanged, the foundations and walls of the house cannot have moved up and down as much as the data suggests. Rather, it seems that the datum (manhole cover in Young St) has moved up and down cyclically, and this means that the house has moved very little. The level data on the house walls are only compared to the datum, so if the datum moves, the house readings falsely show movement when in fact there is very little. In any case, the crack widths are so small and now stable, there is no proven linkage between tree roots, moisture content of the clay, and seasonal movement of foundations. Rather, the cracking is wholly due to thermal and moisture movement in the above ground masonry, not movement of foundations.

3. **Repairs To the Cracks** Since the crack are so minor - widths vary from hairline to 3 mm - it is normal to repair such minor cracking using grout and local stainless steel helifix bars inserted into the mortar joints of the masonry. The grout fills the narrow void restoring the compressive strength, and the bars give some tensile strength bridging over the crack. Internal plaster hairline cracks are normally repaired by cutting out a Vee shaped joint which is then covered using scrim and filler.

4. **Risk of Heave.** 2 False Acacia trees were felled by the applicant on the north part of the site in June 2021, and soon afterwards, the dwarf garden wall on the Young St boundary close to these Acacias cracked and moved upwards quite

dramatically (crack widths 20mm to 30mm, and horizontal movement 30mm to 40mm). The 2 felled Acacia trees were about 5m high, and trunks about 250mm diam, so they were far from mature (mature height of Acacia is 18m, and recommended distance from building 8.5m). The dwarf garden wall would almost certainly not have had deep strip foundations (like the house), and hence damage from heave of the clay near the surface would be expected. So, the damage to this little garden wall from clay heave does show that the re-hydration of clay after tree felling is a real possibility. It follows, therefore, that the proposed felling the of the three mature Plane trees, with far greater leaf area than the Acacias, would present a much greater risk of heave to the walls of 193 Sturton St .

5. **Comments on 2023 Structural Engineer's Report - John Bowstead of Peter Dann Ltd.** In **t**his letter 12 July 2023, I consider that the answers to the 4 questions cannot all be true. The 4 answers are inconsistent. If cracking is caused by thirsty trees sucking water from the clay, then, if the trees are felled, it is inconsistent to assert that there will be no risk of heave. If the trees are the agent causing movement, then once they are gone, desiccated clay will regain moisture and swell, and upward movement and cracking is very likely.

This letter explains that the author has reviewed lots of pertinent documents, and concludes that technical site inspections followed best practice. I would question the 4 paragraphs, as follows:

A) Is the manhole cover of the sewer in Young St a stable datum? Given that clay down to a depth of at least 3 or 4m may shrink or swell, it is normal practice to install a datum "pile" at least 6m deep, anchored within clay deep enough to be outside the "active" zone too deep for thirsty tree roots to have any effect. I would have expected the structural engineer to question this datum.

B) No reasons are given to concur that there is a causal link between the trees, the geology, and the damage to the building. The fact that the cracking has got no worse than it was in 2019 has not been mentioned. Was this considered alongside the apparent cyclical level data? It seems not.

C) Again, no comments on heave have been made, not even any mention of the impact of the felling of 2 Acacia trees in 2021, and the likely causal link to the damaged garden wall.

D) Without any mention of the level data and what it might mean, it is hard to understand how the author has concluded that heave would not be a problem if the Plane trees were removed. Again, I would ask for substantiation of this point.

6. **Summary**. The slight cracking, first recorded in 2019, has not grown any worse. I believe that this cracking is not caused by foundation movement, by clay, or by tree roots. The cracks, mainly next to lintel bearings and a formal movement joint in the front elevation, are caused by normal changes in temperature and moisture content in the masonry. There is not enough damage to warrant underpinning using a piled raft. Instead relatively inexpensive repairs to each crack using simple masonry reinforcement could be carried out, paid for by insurers. To blame the Plane trees for these minor signs of movement is simply wrong, and to remove the Plane trees would probably make matters worse. There is no evidence proving that the Plane trees are causing continuing nuisance to 193 Sturton St.

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