36 FLASK WALK NW3 1HE

A geotechnical and structural assessment of a basement planning application 2015/3753/P and its potential impact on 34 and 38 Flask Walk

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Summary of brief and conclusions

The brief

1. This report concerns planning application 2015/3753/P to Camden Council (Camden) which proposes a new basement with front lightwell below the existing building of 36 Flask Walk NW3 1HE. I am instructed to advise The Flask Walk Neighbourhood Association of whether or not the application provides sufficient information to satisfy the engineering aspects of Camden planning policy DP27. These are that planning applications should demonstrate by methods appropriate to the site that basement schemes:-

   (a) Maintain the structural stability of the building and neighbouring properties.

   (b) Avoid adversely affecting drainage and runoff or causing other damage to the water environment.

   (c) Avoid cumulative impacts upon structural stability or the water environment in the local area.

Conclusions

2. 36 Flask Walk is a three storey house on the south side of Flask Walk and is part of a terrace of four dissimilar properties, Nos 30-36, built in the mid 1970s as one development with masonry walls, timber floors and a rear basement garage. It is intended to construct a basement below the entire ground floor footprint of No 36, extending forward to the back of pavement in Flask Walk to create a small light well. This will require the existing front wall to be supported over the basement width and different parts of the application disagree over how that is to be done.

3. Both the basement and ground floors are designed to be completely open plan without cross walls or bracing, the front and rear ground floor walls would provide little bracing and the stair arrangement proposed would prevent the ground floor from providing a bracing diaphragm. The application does not consider the lateral stability of the building and its impact on the terrace.

4. During the assessment leading to this report the absence of detail about the existing and proposed construction above the ground floor on the Architect's drawings and the absence of the building survey drawings (referred to but not part of the application) caused concern.

5. The scoping requirement set out in the basement impact assessment report provided was not fulfilled as intended by the ground investigation described in the report. Groundwater issues were resolved by judgement of a worst case situation but reliable ground strength information for geotechnical design does not exist. In commenting upon construction methods, the report describes a method of construction for the

basement walls that is entirely different from that shown by the structural engineers' report.

6. The structural engineering scheme and report are far from complete in their coverage of the engineering proposal, even considering the preliminary nature of the work required at planning stage. Scanning procedures for posting the application on the website may be partly the cause, but the report content is difficult to scrutinise and required considerable interpretive effort to establish what was intended.

7. DP27 requires the impact of all aspects of an application and all relevant features of neighbouring property to be accounted for and compliance with policy requirements clearly demonstrated. Questions relating to such matters in this specific case have been listed in the following table. Answers state whether the application as a whole demonstrates compliance with policy DP27. In case of non-compliance, the subsequent part of the report referred to discusses relevant aspects of component parts of the application.

Permanent State (Construction Complete)			
Item	Question: are the following matters demonstrated	Answer	DP27 clause contravened Reason/Reference
1	Stability of the front wall	No	DP27(a). See section 5.1.
2	Overall lateral stability of the basement and building above	No	DP27(a) & (c) See section 5.2
3	Stability of the basement walls	No	DP27(a) See section 5.3
4	Stability of the basement floor	No	DP27(a) See section 5.3
5	Vertical stability of the basement and building above against hydraulic uplift and ground heave.	No	DP27(a) See section 5.4
Temporary State (During Construction)			
Item	Question: are the following matters demonstrated	Answer	Reason/Reference
6	Stability of ground during basement excavation	No	DP27(a) See section 5.5
7	Adequate support and stability of No.34 vehicle access and stairway.	No	DP27(a) See section 5.5
8	Adequate support and stability of No. 38 ground floor.	No	DP27(a) See section 5.5
9	Stability of party walls	No	DP27(a) See section 5.6
10	Building damage due to ground movement is within acceptable limits	No	DP27(a) See section 5.7

8. I conclude that the application fails in all respects to comply with DP27.

1 Introduction and purpose of report

9. Planning application 2015/3753/P to Camden Council (Camden) proposes a new basement with front lightwell below the existing house at 36 Flask Walk NW3 1HE. I am instructed to advise The Flask Walk Neighbourhood Association of whether or not the application provides sufficient information to satisfy the engineering aspects of planning policy DP27.

10. I am Michael Eldred MSc. CEng. FIStructE MICE, Director of Eldred Geotechnics Ltd and a Consultant in the disciplines of Geotechnical, Geoenvironmental, Civil and Structural engineering. The assessment which follows is exclusively of matters falling within these disciplines. My assessment follows examination of the application and other documents on the Camden planning website, and brief external view of the fronts of the subject and neighbouring properties. The timing of my instructions prevented internal inspection.

2 Planning policy requirements

11. Policy DP27 states that the Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability. The Council will require developers to demonstrate by methods appropriate to the site that basement schemes:-

    (a) Maintain the structural stability of the building and neighbouring properties.

    (b) Avoid adversely affecting drainage and runoff or causing other damage to the water environment.

    (c) Avoid cumulative impacts upon structural stability or the water environment in the local area.

12. The requirement to *demonstrate* compliance with these things is or should be of the utmost significance.

13. Camden policy guidance CPG4 [2] describes how applicants must undertake three stages of investigation, assess the results and use them in a 4th stage to show that the scheme satisfies DP27. In principle these four stages demand no more than the rational approach adopted by a reasonable human being who is desirous of undertaking any sort of project no matter how simple or complex. That is to say:-

    1. Decide upon the project and consider what is known of the circumstances capable of affecting its success. (Screening)

    2 Decide what other information is needed. (Scoping)

3. Enquire, investigate and consult with others having particular knowledge to fill gaps in the immediately available information; this sufficiently to engender a measure of confidence that the circumstances have been properly defined. (Site investigation and study)

4. Look carefully at what the results of 1 -3 mean for the plan, think about what might go wrong and do whatever is needed to offset the risk. (Impact assessment).

14. CPG4 and its charts constitute *guidance*, not a set of absolute rules; not a system of pass/fail charts that define the limits of investigation etc. needed. Those assisting applicants are expected to be competent in their fields and to extend and validate investigations as required by the circumstances.

3 Subject property and application

3.1 The property

15. Figure 1 may assist understanding of parts of the following account.

16. 36 Flask Walk is a three storey house on the south side of Flask Walk and is part of a terrace of four dissimilar properties, Nos 30-36, built in the mid 1970s as one development with masonry walls, timber floors and a rear basement garage. Planning references 15660 and 20659 refer. Seen from the road, ground in front of the houses slopes down noticeably from No. 30 at the right hand end of the terrace. According to the planning drawings Nos 38-40 Flask Walk, to the left of 36, predated the development.

17. Behind No.36 is a ground floor patio which extends to the rear boundary slightly more than 4m from the back of the house. At the boundary, there is a sharp drop of 3m to 4m into the gardens of a large housing development.

18. The ground floor of No 34 comprises a stairwell and bin stores next to the party wall with No 36 and a vehicle access sloping down to the 2m deep basement garage that extends across the back of Nos 30 to 36 below the rear patios. A beam spanning between the 34/36 and 34/32 party walls supports the rear wall of No 34 over the garage entrance. The garage was built into the ground slope and both the rear patio and ground floor of No.36 appear to be raised to minimise excavation depth and maximise headroom for the garage. Consequently the ground floor of 36 is significantly higher than those of Nos. 34 and 38.

19. No 36 has a ground floor footprint measuring approximately 11m long and 4.5m wide. At first floor and above, the rear part of the house projects about 1m beyond the ground floor below and the overhanging rear wall is supported by a beam spanning between the party walls. The end of the 34/36 party wall supporting the beam, part of the 34 and 36 patios and the party fence wall between them are supported in turn by

a beam spanning over the garage between the rear boundary and the end of the basement party wall. The application describes a concrete pillar at this point.

20. In consequence the rear end of the 34/36 party wall in the basement carries a high concentration of load. An account of the existing property in the application notes cracking around the end of the first floor beam where it rests upon the 36/38 party wall.

21. The stairwell of No. 36 is at about the mid length of the building and at first floor level the opening is shown by framed by steel beams spanning between party walls.

22. Existing ground floor level in the building is 0.7m above the Flask Walk pavement and 1.2m above ground level under the building. Undersides of the party wall footings are a maximum of 2.8m below ground floor level.

3.2 Proposal

23. It is intended to construct a basement below the entire ground floor footprint of No 36, extending forward to the back of pavement in Flask Walk to create a small light well. Floor level in the basement is intended to be 1m below floor level in the existing garage. The lowest excavation depth, without allowance for accidental excess, is likely to be 3.8m below existing ground floor, 2.5m below ground level under the building, and about 1m below the lowest party wall footing.

24. Both the basement and ground floors are designed to be completely open plan without cross walls or bracing. In case of the ground floor, the rear enclosure is shown as a glazed screen and it will be only the front façade wall that will provide bracing between the party walls. Since this wall does not extend to a foundation (the open plan of the basement is intended to extend below the three storey façade), its bracing effect will be much reduced.

25. In this context, it is relevant to note that the planning drawings for the terrace, including revisions for No 34, show full width fenestration without significant lateral bracing above sill level in each of the ground floors.

26. The stair arrangement in No. 36 is designed to be altered so that the stairs rise against the 36/38 party wall to at least first floor level. The effect of this will be to produce a slot 9.5m long and 1m wide against the party wall in the ground floor and an opening of increased size at first floor level.

3.3 Application

27. XUL Architecture drawings show plans and sections of the existing and proposed building arrangement at ground floor and proposed basement levels; sections imply alteration at first floor level also. No information about existing arrangements of the upper floors and any intended alterations there has however been provided.

28. On Centre Surveys have, according to other documents in the application, produced a topographical and measured building survey. It does not form part of the application, although use of an extract from it in one report prepared for the applicant has enabled comment above on the existing stair arrangement.

29. Trigram Partnership have prepared a subterranean method statement and structural engineering report. In introduction it limits its scope to "*that which is necessary to demonstrate a suitable construction method and sequence that will ensure the structural integrity of the building, the adjoining structures, public thoroughfares and buried structures."*

30. The report provides: (a) general descriptive matter, in part taken interactively from other parts of the application; (b) an indicative construction sequence; (c) a generic underpinning detail together with an appended note that the contractor will provide other necessary drawings; (d) two conceptual sectional sketches of the intended construction at the 34 and 38 party walls; (e) two conceptual sectional sketches showing a four stage underpinning sequence; (f) a mixture of mainly handwritten and some computer generated calculations related to the basement floor, front retaining wall and a steel frame to support the front elevation; (g) an appended note that the contractor will be responsible for temporary works design.

31. It is usual for engineers responsible for basement schemes to use preliminary general arrangement drawings to demonstrate how proposed structural alterations and additions will be integrated within an existing building so as to account for ground conditions and resist forces caused by the works proposed. Items (c) (d) and (e) do not constitute such drawings.

32. Items (d), (e) and the handwritten part of (f) are so illegible as to prevent scrutiny.

33. Chelmer Consultancy Services have provided a report entitled Basement Impact Assessment. It is a large document having a text with eleven sections and seven appendices. For the purposes of this assessment, its content will be considered as having four parts:

Part 1. Published current and historical knowledge; site specific screening for the existence of circumstances known to have hazard potential for basements in Camden; scope of further investigations required to define hazard probability.

Part 2. Report of necessary further investigations.

Part 3. Residual natural circumstances made hazardous by the proposal.

Part 4. Assessment of potential ground movement and building damage.

4 Application response to DP27

4.1 Method and presentation of this assessment.

Although only one of the reports submitted in support of the planning application is termed a basement impact assessment, the basement impact assessment required for the purposes of DP27 is one in which the impact of all aspects of an application and all relevant features of neighbouring property are accounted for. To this end, a number of questions relating to such matters in this specific case have been listed in the following table. Corresponding answers state whether or not the application as a whole demonstrates compliance with policy DP27. In case of non-compliance, the fourth column identifies which of DP27 (a) to (c) is not satisfied and either explains why or refers to a subsequent part of the report which discusses relevant aspects of component parts of the application.

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10	Building damage due to ground movement is within acceptable limits	No	DP27(a) See section 5.7

5 Failure to demonstrate DP27 requirement

5.1 Questionnaire item 1 – Stability of the front wall

Trigram Report (see Section 3 above for lettered divisions)

34. Although its location is not depicted, the various parts of the report can be construed as meaning that a steel box frame is intended as the means of resupporting the front wall after the part below ground floor level is removed. A box frame is a rectangular structure. It has a top beam to support structure above an opening, and side columns to transfer the beam load down to the bottom beam, which is then supposed to spread the column loads to some extent along the beam length thus avoiding excessive pressure on the ground.

35. Part (a), descriptive matter, does not refer to the need of support for the front wall above the basement. Part (b), construction sequence, removes the front wall as the first process, constructs the basement walls and floor, and installs a steel box frame to support the front wall as the last stage before clearing away all temporary supports.

36. The need of a foundation for the frame below the basement floor (designated to be constructed before the frame installation) is not considered by part (b).

37. Part (f), calculations, gives a computer graphic of the intended frame analysis. I judge by its shape that some attempt was made to allow for interaction with the ground but no information is provided about foundations and ground properties required for analysis, or consequent ground stress and deformation.

38. Part (a), in considering ground conditions, refers to a reported safe bearing pressure of 160KN/m2 at the underside of the new foundations. I have found no such report in the application and believe that value would be too high for the ground conditions at the relevant depth when the basement was excavated.

Chelmer Consultancy Services Report (see Section 3 above for numbered divisions)

39. Part 1 of the report refers to the possibility of mapped geological deposits being overlaid by made ground and natural, locally derived “reworked” soils called “Head”. Dr Michael de Freitas has graphically described the formation of Head as an unstructured and variable semi frozen downhill ooze of material released from higher ground during freeze/thaw cycles in the ice age. The flows filled local channels in the material below and eventually drained and consolidated to form ground with often widely varying engineering qualities.

40. Part 2 of the report had the task of defining ground properties in relation to groundwater level and flow, the needs of foundation and retaining wall design, and ground movement. To some extent understandably, in view of the physical constraints of the property and equipment used, it failed to do so.

41. Boreholes were excavated with a small diameter portable auger with samples being taken as they rose to the surface on the auger spiral. Part 3 of the report refers to the reworked ground as containing brick fragments and assumes the material, 5m deep, was reworked by humans. The possibility that it is natural and was contaminated as it rose through and was pressed against a significant thickness of near surface made ground containing brick seems not to have been considered. This, even considering that trial pits excavated subsequently found natural material immediately below the made ground.

42. The strength of the soils encountered by the boreholes was measured down the holes at 1m intervals using a Pilcon hand shear vane. It is generally accepted that this is an unsatisfactory method of measuring soil strength for the purposes of engineering design and the report states quite firmly that the results are too high and should not be used for design. Nevertheless, no other guidance is provided for foundation design.

43. In this respect the report offers no comment upon the different existing foundation widths below the 34/36 and 36/38 party walls. As far as can be seen, the existing party wall foundation loads in the Trigram report suggest that the 34/36 foundation was designed for a ground bearing pressure of about 60KPa as opposed to about 100KPa for 36/38. A strip footing width of 2m below a residential house is not usual. Perhaps ground conditions varied across the width of No.36 to make the wide footing necessary. It would be unwise to refer simply to the similar soil descriptions in the trial pit records in this respect before being certain that whoever recorded them was looking for signs of differing ground compressibility as well as foundation dimensions.

44. Part 4 of the report states an understanding that the front wall remaining above ground floor level is to be bridged so that its load is carried entirely by the two party walls. This is at direct variance from the limited design proposal in the Trigram report.

XUL Architecture Drawings

45. The drawings make no reference to a box frame below the front wall or show it by surface profiles. If installed entirely within the basement, a frame with columns having the lateral stability required (see 5.2 below) seems unlikely to be readily accommodated by the current architectural arrangement. If buried in the 34/36 party wall column installation might affect the safe access to No. 34 and thus use of that property for the time required for such installation.

Item 5.1 summary

46. The application fails to demonstrate the adequate support of the front wall of No.36 and does not provide sufficient information to enable such demonstration.

5.2 Questionnaire item 2 – Overall lateral stability

Trigram Report (see Section 3 above for lettered divisions)

47. Neither the basement nor the ground floor are designed to be provided with cross walls or other structure capable of providing restraint against overall lateral distortional instability, otherwise termed sidesway. Walls that exist and provide a measure of such restraint are designed to be removed.

48. The rear enclosure of the ground floor is designed to be of glass and the box frame (see 5.1) has currently been designed without lateral rigidity. Neither are capable of restraining the building against sidesway. The box frame will be subjected to skew loading from the wall above rather than the uniformly distributed load assumed. The skew arrangement will force the frame towards No. 34.

49. The ground floor is designed to include a 1m wide slot about 9.5m long against the 36/38 party wall to accommodate the revised stairway. No significant permanent structure can extend between the party walls over this length to create a horizontal diagram to provide lateral restraint.

50. The 36/38 party wall will have to support lateral thrust from about 2.5m height of earth and water. Opposing this will be a smaller lateral thrust on the 34/36 party wall arising from about a 2.5m height of earth and water at the front, and reducing to 1m at the rear. The imbalance from this and skew loading elsewhere would have to be resisted by the new party wall retaining walls acting as one unit with the basement floor slab.

51. The design does not provide for that. (See 5.3)

52. In fact, the design provided assumes that any tendency for sidesway in No 36 would be resisted by neighbouring properties. Any subsequent alteration of those properties would have to account for the loads imposed upon them by the proposed construction of a basement in No 36. The proposed design would have a potentially damaging structural impact on at least No.34 and the potential also for cumulative structural impact on other buildings in the terrace.

53. The actual isolated and cumulative structural impacts would depend upon the internal arrangements and robustness of the properties concerned. That has not been considered by the application.

Chelmer Consultancy Services Report (see Section 3 above for numbered divisions)

54. Part 4 of the report gives no consideration to these matters when providing opinion about ground movement and building damage.

Item 5.2 Summary

55. The application fails to demonstrate that the overall lateral stability of the basement and building above are adequate.

5.3 Questionnaire items 3&4 – Stability of the basement walls and floor

Trigram Report (see Section 3 above for lettered divisions)

56. Part (d) provides two conceptual sketches of the intended arrangements at the party walls and part (f) provides a computer generated analysis for the basement slab. The intention is for the party walls to be underpinned with reinforced concrete walls that rest upon mass concrete footings. The basement slab is designed to be anchored to the walls to prevent uplift but not to restrain or support the walls in any way.

57. The purpose of conceiving such a design is sometimes to avoid having the foundation defined as a “special foundation” in terms of the Party Wall etc. Act 1996 and thus to prevent adjoining owners from exercising their right to dissent from the form of construction proposed.

58. The application restricts consideration of retaining wall design to the front wall of the lightwell. No attempt has been made to demonstrate the stability and structural adequacy of the conceptual arrangements shown for the party walls. In this case it would not be possible to do so. Having regard for the preceding sections, the party walls would need to achieve stability by resting upon the slab so as to distribute overturning forces into the ground below the slab and also to rest horizontally upon it to prevent being thrust into the basement. For that and to comply with the intention in part (a) to provide watertight reinforced concrete construction, the reinforced concrete underpinning would need to be structurally continuous with the reinforced concrete basement slab, .

Chelmer Consultancy Services Report (see Section 3 above for numbered divisions)

59. Part 3 of the report states that the basement is to be constructed using unreinforced underpinning with a reinforced concrete lining wall within the basement. The note at 10.4.3 of the report refers to Trigram details for this information. Clearly both reports cannot be correct.

Item 5.3 Summary

60. The application fails to demonstrate that the stability of the basement walls and floor are adequate.

5.4 Questionnaire item 5 – Overall stability against heave and hydraulic uplift

Chelmer Consultancy Services Report (see Section 3 above for numbered divisions)

61. The ground investigation failed to measure ground water levels appropriate for design and consequently a worst case has been suggested at 10.2.7 to comply with BS EN 1997 (Geotechnical Design).

Trigram Report (see Section 3 above for lettered divisions)

62. Part (f) contains a calculation of uplift and holding down forces acting at basement floor level. The figures are not clear but as far as can be seen, the uplift force

calculated according to Chelmer recommendations is 186KN and the resisting force is 237KN. Factoring these characteristic values according to BS EN 1997 produces design values of 248KN uplift and 213KN resistance.

63. The application fails to demonstrate that the overall stability with respect to heave and hydraulic uplift is adequate.

5.5 Questionnaire item 6 - 8 – Basement excavation; support and stability of ground floor construction in Nos 34 & 38

Trigram Report (see Section 3 above for lettered divisions)

64. Part (g) states that the contractor will be responsible for temporary works design but sketches of construction procedure in part (e) appear to be included as an interim provision to satisfy planning requirements. They fail to do so. Even in good ground, excavating as shown to expose the full depth of footings within the building before all of the walls are strutted apart runs the risk of party and external walls being destabilised even in good ground conditions. When, as in this case, excavation might encounter sudden inflows of water, particularly in storm conditions, such methods are hazardous for humans and property.

65. The remainder of the sequence shown lacks practicality. The intention to dismantle a 340mm thick brick party wall in short lengths and replace it with reinforced concrete underpin sections, all without disturbing backfill behind the wall and the construction it supports is a case in point.

66. The situation worsens when the requirement to deal with existing footings projecting below adjoining buildings is considered. Parts (d) and (e) indicate an intention to excavate to the basement formation level and mine some distance below the party wall footing and adjoining building to install a new mass concrete base. To allow the reinforced concrete underpinning to extend continuously from the new mass concrete footings to the underside of ground floor in the adjoining building, the existing footing would then be cut off and the brick party wall would be removed as noted above.

67. During this process, soil between the mine and the original footing would inevitably be lost and having been cut off, the remaining part of the footing would be free to move. Soil above the footing in the adjoining property would be disturbed, allowing the structure it supported to suffer damage.

68. The application fails to demonstrate adequate support and stability of the basement excavation and ground floor construction in adjoining property.

5.6 Questionnaire item 9 – Stability of the party walls

69. In addition to the party wall stability issues already discussed, it is necessary to demonstrate that the heavily loaded concrete pier at the rear end of the 34/36 party wall will be adequately supported during the basement excavation process. The pier

supports the rear walls of both Nos 34 and 36, the party fence wall between the two properties and some part of both patios (see figure 1).

70. The situation has not been recognised in the application which thus fails to demonstrate adequate support and stability of this element of the structure.

5.7 Questionnaire item 10 – Ground movement and building damage

Chelmer Consultancy Services Report (see Section 3 above for numbered divisions)

71. Two forms of ground movement have been considered; vertical displacement, including ground heave, caused by excavation and removal of soil load from the basement, and both horizontal and vertical displacements caused by inward movement of the excavation sides during construction.

72. In case of the first of these, the report disregards its own advice (section 5.1 above) not to use the unrealistically high test values of soil strength for design. The higher the soil strength used in this type of calculation, the smaller will be the calculated displacement. The matter is of secondary importance in this case but should be noted.

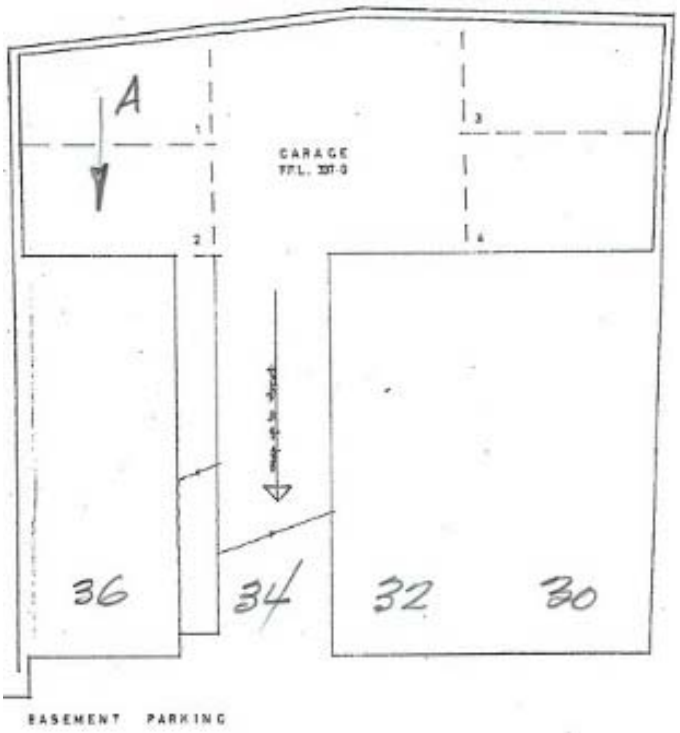
73. The second type of ground movement estimate derives from CIRIA publication C580, “Embedded retaining walls, guidance for economic design” and uses case history data given there. Calculation and classification of the risk of building damage follows what is commonly known as the Burland method. The report makes it clear that the estimates provided assume the use of best practice construction methods which are described elsewhere in the report.

74. The CIRIA publication deals with the way a specific class of retaining wall interacts with the ground and the case histories relate to specific construction methods for that class of wall. Neither has the slightest similarity to retaining walls formed by underpinning. It is also apparent from examination of the Trigram report that the engineers’ proposals, as described there, would not comply with the standards of construction recommended by Chelmer. These matters being so, the movement and damage estimates provided by the application are meaningless.

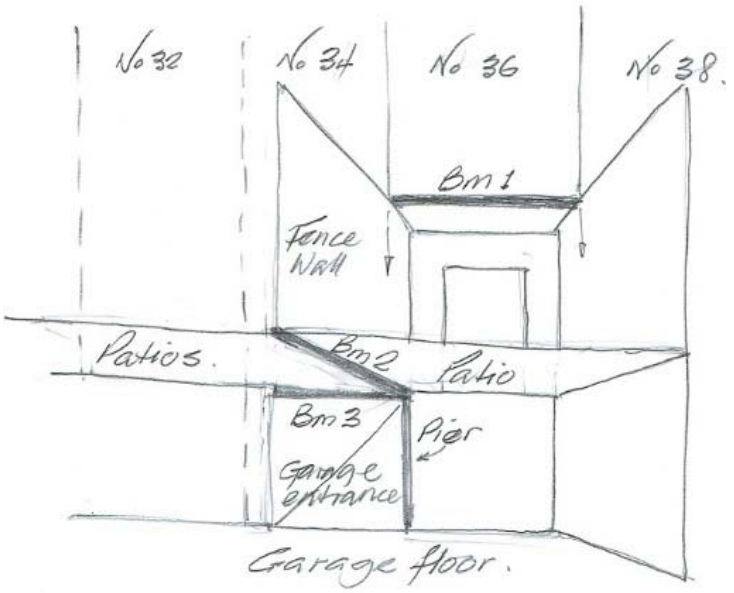
75. Other potential sources of ground movement and building damage are clearly evident in the application but have either not been considered by Chelmer or have been disregarded under cover of their recommendations for best practice construction methods. The application thus fails to demonstrate that building damage will be within acceptable limits.

MICHAEL ELDRED MSc.CEng.FIStructE.MICE
ELDRED GEOTECHNICS LTD
Date 27th August 2015

36 Flask Walk NW3 1HE Figure 1



Garage Key Plan (NTS)
Extract from Planning Application 15660
Drawing 450/23A



Sketched View A
Beam 1 supports the rear wall of No.36 above first floor supports
Beam 2 supports the 34/36 party and fence walls, Beam 1 and part of the patios
Beam 3 supports the rear wall of No 34 and part of the patio
The Pier or end of the 34/36 party wall supports Beams 2 & 3 and would need to be supported by the proposed basement.