STRUCTURAL FEASIBILITY REPORT

PROJECT: Mourne House
Maresfield Gardens
London

REF: 9949

DATE: 29th June 2011

BRIEF

Paul Carpenter Associates were appointed by the Freeholder of Mourne House, Maresfield Gardens, London to prepare a pre planning structural feasibility report prior to a scheme development by Peter Newson Associates.

INTRODUCTION

Following instructions from the client via Peter Newson Associates, Paul Carpenter Associates visited the property on 24th February and 9th June 2011. An additional visit was undertaken on 20th June 2011 following the excavation of 3No. external trial pits.

The initial visit on the 24th February 2011 was undertaken in the presence of Peter Newson Associates, access being available to the main flat roof and lower ground floor car parking areas only.

The second visit was undertaken on 9th June 2011, with access to Flat 3 at ground floor level only. This visit was undertaken with Paul Carpenter Associates acting under the guise of the freeholders checking engineer, the leaseholder of this flat having proposed internal structural alterations.

The third visit was undertaken on 20th June 2011 to view the exposed trial pits and external access within the grounds of the property were made available.

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GENERAL DESCRIPTION AND CONSTRUCTION OF THE PROPERY

Mourne House comprises a 5-storey building arranged as 4 storeys of apartments over a single storey of lower ground floor parking. The building, believed to be built the 1970's appears to comprise of a load bearing masonry structure, cellular in layout, with reinforced concrete intermediate floor slabs and roof slab. The slab at ground floor level, over the car parking level appears to be arranged as a transfer structure comprising either one or two way spanning insitu slabs spanning between downstand beams and existing brick masonry walls that subdivide the lower storey into private parking bay/garages. The downstand beams appear to be afforded support by the same intermediate brickwork walls and by reinforced concrete columns at the two flank end wall of the building where they have in turn been built into the masonry wall at this level.

It would appear from first viewing that a good proportion of the brick walls in the lower ground floor storey line up with apartment separating walls above. Within the length of the parking bays, the majority of upper level walls would appear to line up with brick subdividing walls at car park level (See Structural Mark-up 9949/SK01 in Appendix A) All other walls appear to situated within the width of the parking bays and therefore must utilise the ground floor slab to transfer loads back to the local brickwork walls.

From the copies of agents details provided for two typical apartments, in general it would appear that the main separating walls line up with sub dividing walls at car park level. Given the width of the apartments and the likely span of the insitu concrete floor slabs, the internal walls of the apartments could well also be load bearing. Access to Flat 3 at ground floor level has confirmed the presence of masonry walls within the footprint of the flat between bedrooms to the front of the property. This wall appears to afford support to the floor slabs and a similar arrangement is assumed to be present in the other flats. It is noted that the line of this apparent structural wall is not common with the location of the upstand walls visible at roof level. The line and location of all main load-bearing walls would need to be ascertained during the course of the future design works.

We understand the building was constructed in two phases and as such a movement joint was noted to the front and rear elevations together with a corresponding movement joint across the full width of the lower ground floor car park structure.

At the existing main roof level, there are a number of masonry walls that project above the roof slab. In general these walls do not line up with the sub-dividing load bearing masonry walls at car park level. The mark-up 9949/SK01 shows that only walls on grids A, D, I, L, N & Q sit over the lowest level load bearing walls. It is assumed at this stage that the remainder of the upstand walls carry on down through the apartment levels and spring off the ground floor reinforced concrete slab as mentioned above. The primary end elevations to the existing solarium blocks were seen to appear to line up with the subdividing walls at car park level, namely on grids C,G K & O.

We understand that there is little or no archive information held at the local authority. The existing foundations are therefore unknown, however review of the British Geological Survey Sheet 256 Solid and Drift Geology would indicate that the site is underlain with the London Clay Formation with no head deposits over. 3No trial pits were excavated on 14th June 2011 and viewed on 20th June 2011. Trial pit locations together with sketch sections are contained within Appendix A.

The trial pits would tend to indicate that the building is founded via spread foundations at shallow near surface depths (approx 900mm to 1.35m below existing ground level). The substructure and foundations were slightly usual in form, adopting blockwork shuttering with infill concrete. Overall widths are unknown but from the trial pit are assumed to be of the order of 800 to 900mm wide. The ground conditions at formation level could be described as yellow London clay with an "at best" firm consistency. An insitu visual "guesstimate" of the net bearing capacity would be of the order of 100KN/m2

An approximate existing load run down has been undertaken to assess the rough magnitude of ground bearing pressure due to the current building. This is based on an assumed arrangement of internal load bearing walls and would need to be verified during the course of any design work. Calculations sheets in Appendix B show that the existing ground bearing pressure (circa 175KN/m2) are far in excess of the assumed guesstimated net bearing capacity of 100KN/m2. Basic geotechnical investigation and advice would be required to establish accurate insitu ground bearing conditions. However, it should be borne in mind that the building has existed for over 30 years and does not show any immediate effects of foundation problems.

Trial pit 2 excavated in the soft landscaped area exhibited many tree roots. It would appear that the existing foundations are not deep enough to satisfy the requirements of NHBC Chapter 4.2 in relation to depths of foundations in shrinkable soils where certain types of trees are present.

DISPROPORTIONATE COLLAPSE CONSIDERATIONS – EXISTING BUILDING.

In terms of Disproportionate Collapse requirements under A3 of Approved Document A, the existing lower ground floor car parking level cannot be classified as a basement level under A3 and the building is therefore considered as a 5 storey building. The building is classified under the current regulations as a class 2B building. This means that were it new building it would have to be framed to meet the vertical tying and continuity requirements. The building in its current form does not meet the current requirements for a class 2B building in terms of measures against the avoidance of disproportionate collapse. It should be noted that the omission or lack of gas services to the building does not relinquish the requirement for measures against the avoidance of progressive collapse.

PROPOSED PENTHOUSE SCHEME

The current sketch proposal consists of forming a full-length single storey single dwelling penthouse. The penthouse is to be developed around the existing accommodation to the rear half of the roof area with the existing tank rooms relocated or abandoned to create continuity along the length of the dwelling. The front facade is set back from the main elevation of the building fronting onto Maresfield Gardens with the rear facade aligning approximately with the rear elevation of the existing accommodation.

We have reviewed the sketch proposals and set out below are outline thoughts on the structural form of the proposed additional storey:

Penthouse Floor.

A new raised "solid" floor is understood to be required to avoid costly and disruptive works to the existing main roof floor slab along with providing a sufficiently robust level of sound attenuation and separation measures. The slab could be formed via the use of a reinforced insitu concrete slab over metal decking spanning between primary and secondary steel floor beams which in turn span onto existing load bearing upstand walls. It is noted that some spans between upstand walls are in excess of 7.5metres. In order to reduce these longer spans and therefore keep structure depths to a minimum it maybe necessary to gain midspan support along the line loading bearing walls below the main roof line (i.e. with the footprint of the existing 4th floor apartment) The location and nature of loading bearing walls would need to be ascertained via an inspection of some of the internal properties. In order to reduce additional dead loads on the building superstructure and the foundations beyond, it is proposed to use a lightweight concrete to form any raised penthouse floor areas.

Any proposed structure at penthouse level bridging the main building movement joint would have to be carefully detailed to provide continuity of structure and accommodate the existing movement provisions.

Penthouse Walls.

In order to maintain a lightweight building approach and therefore minimising net load increases on the existing building sub and superstructure, any proposal should adopt a lightweight wall system. This could either be via a proprietary SIPS panel solution of with the use of a cold-formed metal stud system. In terms of overall structural stability the single storey penthouse would need to be developed as a framed solution. This could take the form of a structural steel frame with infill SIPS of loose metal stud panels. Given the large amount of glazing to the Penthouse storey, structural stability would probably need to be achieved by a portal or moment frame solution as opposed to lateral steel stability cross bracing. Internally the layout is generally open plan in nature. Where internal partitioning is required this can be formed via lightweight partitioning springing off of the new raised slab.

Penthouse Roof.

Due to the open nature of the internal accommodation, there are some larger spans at roof level. The assumed flat roof could be formed via solid timber rafters or engineered TJI joists or posijoists which would deal with the larger uninterrupted spans and the distribution of services should a drop ceiling not be formed.

DISPROPORTIONATE COLLAPSE CONSIDERATIONS – EXISTING BUILDING WITH PROPOSED SCHEME.

With regard to Disproportionate Collapse requirements under A3. It has been stated that the existing building does not meet the current regulations for a class 2B building. The addition of a 6th Penthouse storey means, in broad terms, the building will consist of a 6 storey building that cannot be justify against the current requirements as opposed to a 5 storey building (pre development) that cannot be justify against the current requirements. Requirement A3 requires consideration of the whole building as opposed to the existing building and an additional storey.

It has been discussed and verbally agreed, with the Department Structural Engineer at Camden Building Control, in principal, the approach for dealing with the A3 requirement. The existing 5 storeys are currently non compliant with current regulations and therefore the existing 5 stories will remain non compliant even with the additional 6th storey. It will need to be demonstrated that the additional storey does not make the existing storeys below more sensitive to disproportionate collapse than it already is. The crucial point to note is that there is not a need to increase the protection of the existing building or on other words reduce the sensitivity of the existing building to disproportionate collapse because an additional storey has been added. In simple terms it has to be demonstrated that the additional storey can maintain it's structural integrity should an event happen below the existing main roof level and that collapse of the additional storey does not causes collapse of the existing building disproportionate to the cause.

Moving forward this requires the additional storey to be designed with an increased level of redundancy, allowing the penthouse structure to bridge across the notional removal of supports below. This creates a trickier design scenario but importantly can be engineered out, as the provisions are all taken care of and dealt with within the new build. In practical terms, the elements of steel frame structure will be more substantial to contain a level of redundancy to deal with this accidental load case.

The structural redundancy will need to be built in to the new steel framing to the penthouse structure. If this is achieved at penthouse floor level, the primary floor beams spanning between load bearing walls will have considerable depth and may well have an effect on the cill level to the glazed elevations. An option to reduce this structural depth would be to form the penthouse structure as a storey height vierendeel truss that would be designed to span between load bearing walls and for the notional removal of intermediate supporting walls. The vierendeel truss will allow the lower levels beams at penthouse floor level (bottom chord of the truss) to be of shallower depth thus reducing the structural zone and impact on the glazed elevations. However, a vierendeel truss would require vertical chords (structural posts) along its length and thus the location and set out of the fenestration would need to be carefully considered with this structural form.

CONCLUSION AND RECOMMENDATIONS

Survey

At car park level, the existing subdividing walls will need to be surveyed in order to enable correlation with the ground floor level apartment load bearing walls over. Access to plant / boiler rooms and storage areas yet to be surveyed will be required. In addition access will be required into further apartments to verify wall and floor arrangement. This will be required at ground floor and 4th floor levels. A measure of floor thicknesses / makeup to enable accurate load assessment. This could be undertaken in the communal service cupboard riser to avoid disturbance to the apartments.

Quality of masonry (upstand walls) at points of new load transfer will need to be investigated. If found to be poor it would need to be replaced.

Design

We have not undertaken any outline or detailed design at this feasibility stage.

The main issues to be considered during the development of any deign are that the new roof top structure will need to be kept as light as possible, but with inherent structural redundancy to bridge across the notional removal of existing walls below for disproportionate collapse requirements.

Upstand walls will be utilised to support the new penthouse floor deck and structural frame. The structural frame could either take the form of a portalised steel frame with primary support beams above roof deck level or via the use of a storey height vierendeel truss spanning between load bearing upstand walls. Any new intermediate upstand walls that maybe required to reduced the spans within the penthouse will be required to be positioned to line with internal load bearing walls between the apartments below. These new walls will need to be constructed off the existing roof deck. The exact location of existing internal load bearing walls at 4th floor level will need to be ascertained in the further survey / inspection work during the development of any design.

During the detailed design works, the existing building will require a load down to ground floor instiu slab level as existing, and a comparison with a load down including the additional penthouse loads. The capacity of the existing foundations will also require a similar detailed review. At this stage our general opinion is that it appears likely that there is sufficient redundant load bearing capacity within the existing heavy masonry construction, to carry a lightweight additional penthouse storey above the main roof level.

Feasibility

In summary at this stage, given the dialogue with Building Control regarding disproportionate collapse and our review of the building form to date, our opinion is that a scheme to place a light weight single storey penthouse structure on the main roof appears to be feasible and warrants further detailed development towards planning.

Mark Frise

BEng (Hons)

Paul Carpenter Associates

PAUL CARPENTER ASSOCIATES

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APPENDIX A - SKETCHES

PROJECT: Mourne House
Maresfield Gardens
London

REF: 9949

DATE: 29th June 2011

8 Silverdown Office Park
Exeter
Devon
EX5 2UX

Tel: 01392 363497

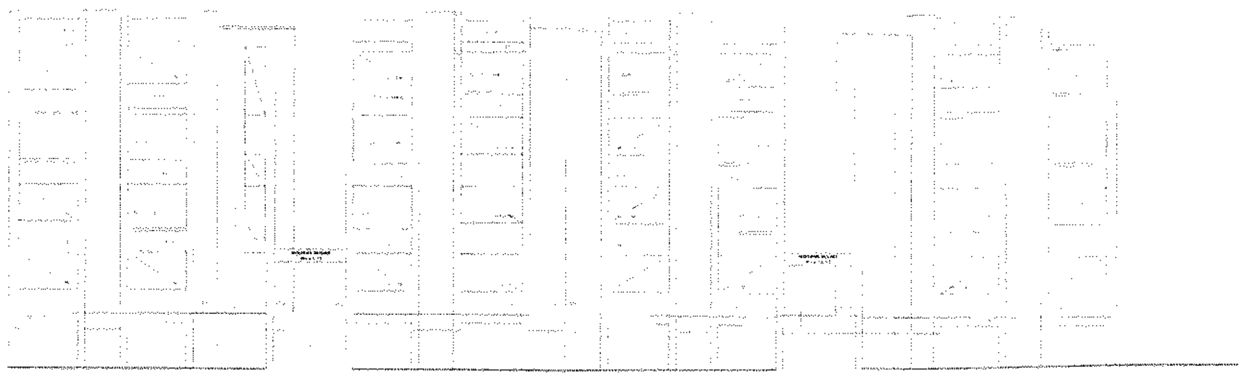
117 Fore Street
Kingsbridge
Devon
TQ7 1AL

Tel: 01548 853097

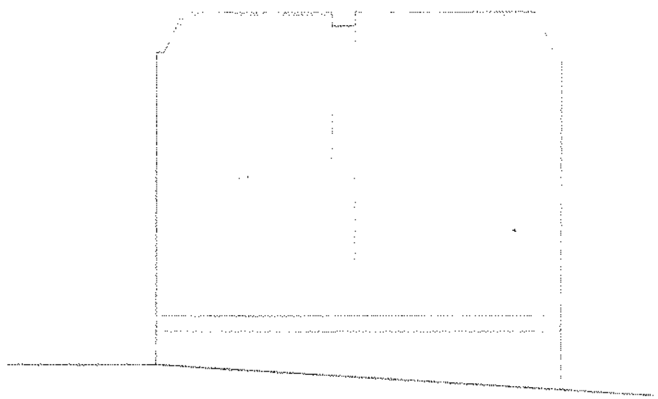
14 The Green
Richmond
Surrey
TW9 1PX

Tel: 0208 9407810

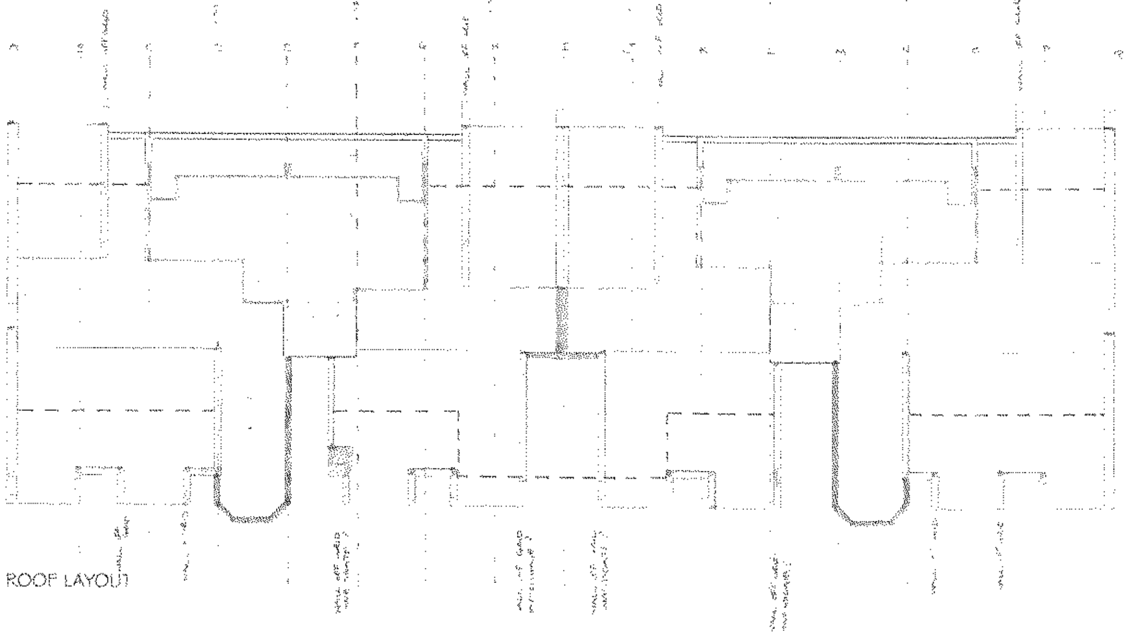
EXETER KINGSBRIDGE LONDON



ELEVATION TO MARESFIELD GARDENS



NORTH ELEVATION



ROOF LAYOUT

KEY

UPSTAND PARAPET WALLS

LOW LEVEL UPSTAND PARAPET WALLS

EXTENT OF EXISTING ACCOMMODATION [illegible]

APPROXIMATE [illegible]

APPROXIMATE [illegible]

DRAWING MARK UP

DWG TITLE [illegible] LAYOUT

DWG NO [illegible]

NOTES [illegible] DATE [illegible]

Peter [illegible] Associates Ltd

[illegible] House
[illegible] Gardens
London NW3

[illegible]
Legal [illegible]

[illegible]

TRIAL PIT LOCATION PLAN

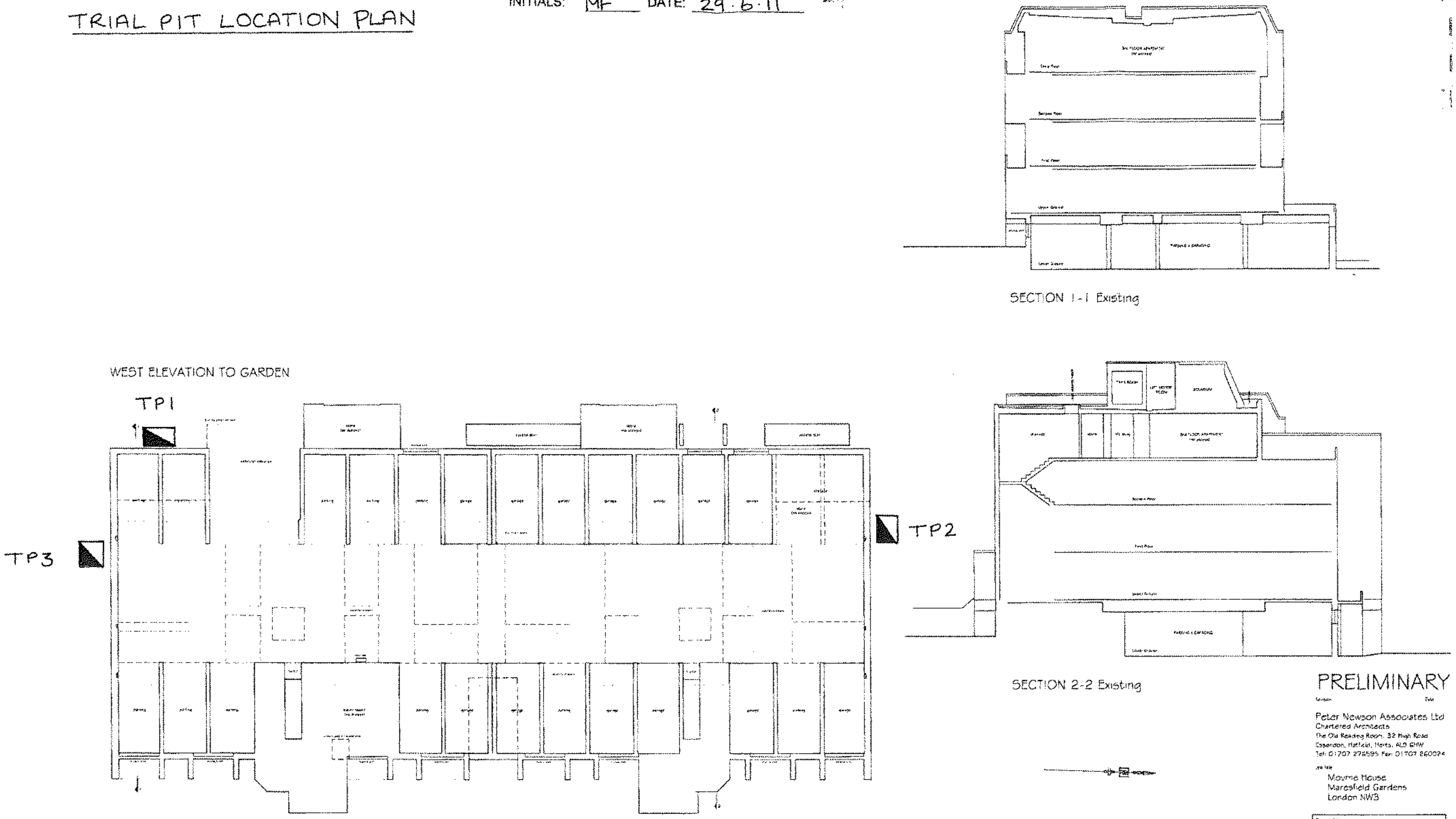
DRAWING MARK UP JOB NO.: 9949

DWG TITLE: LOCATION PLAN FOR TRIAL PITS

DWG NO.: SK 02

INITIALS: MF DATE: 29.6.11

PCA



PRELIMINARY

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Mourne House
Maresfield Gardens
London NW3

Lower Ground Floor Layout
Rear Elevation & Cross
Sections : Existing

May 2011 1:100

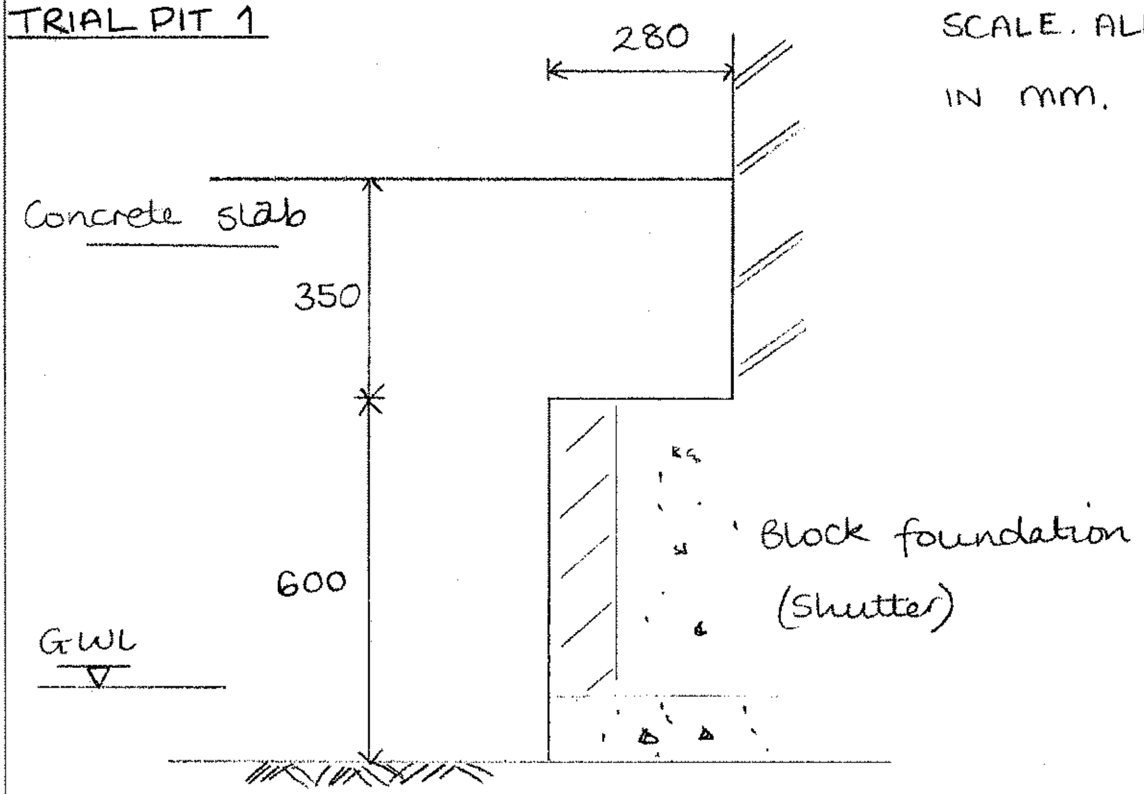
575 03

PAUL CARPENTER ASSOCIATES

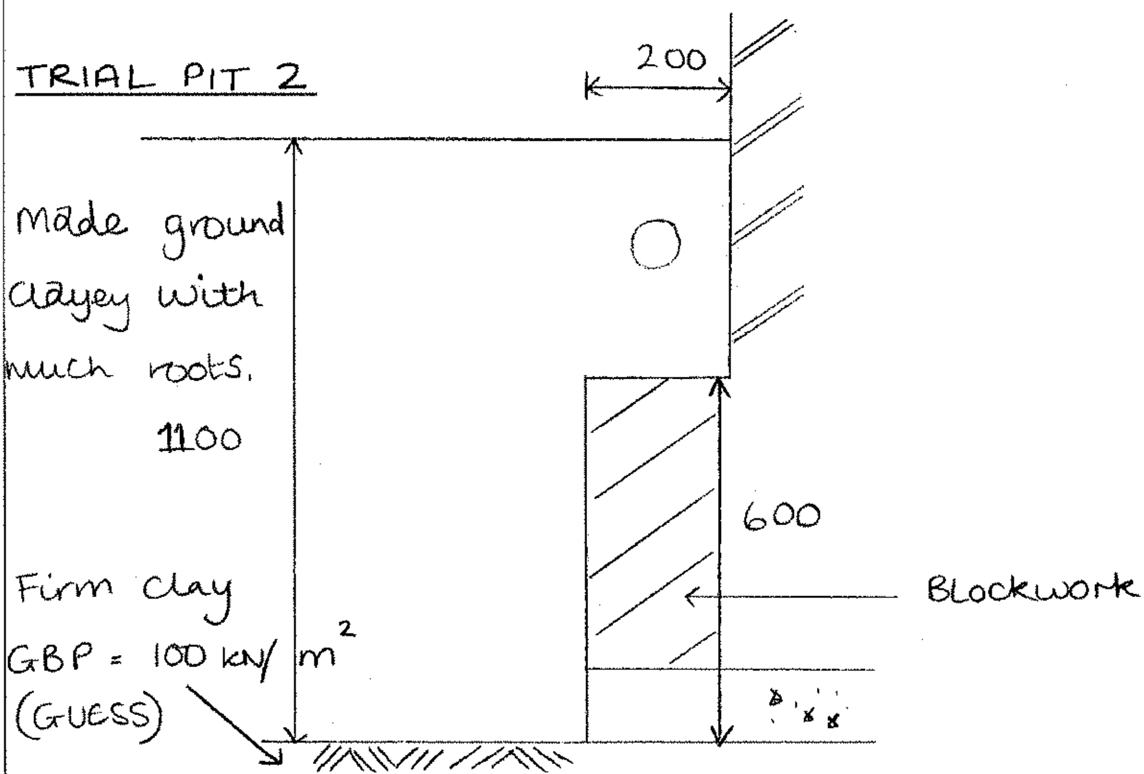
		Ref 9949
		Date 29.6.11
Sketch	Contract Mourne House	Sheet SK 03

SKETCHES NOT TO SCALE. ALL DIMENSIONS IN mm.

TRIAL PIT 1



TRIAL PIT 2



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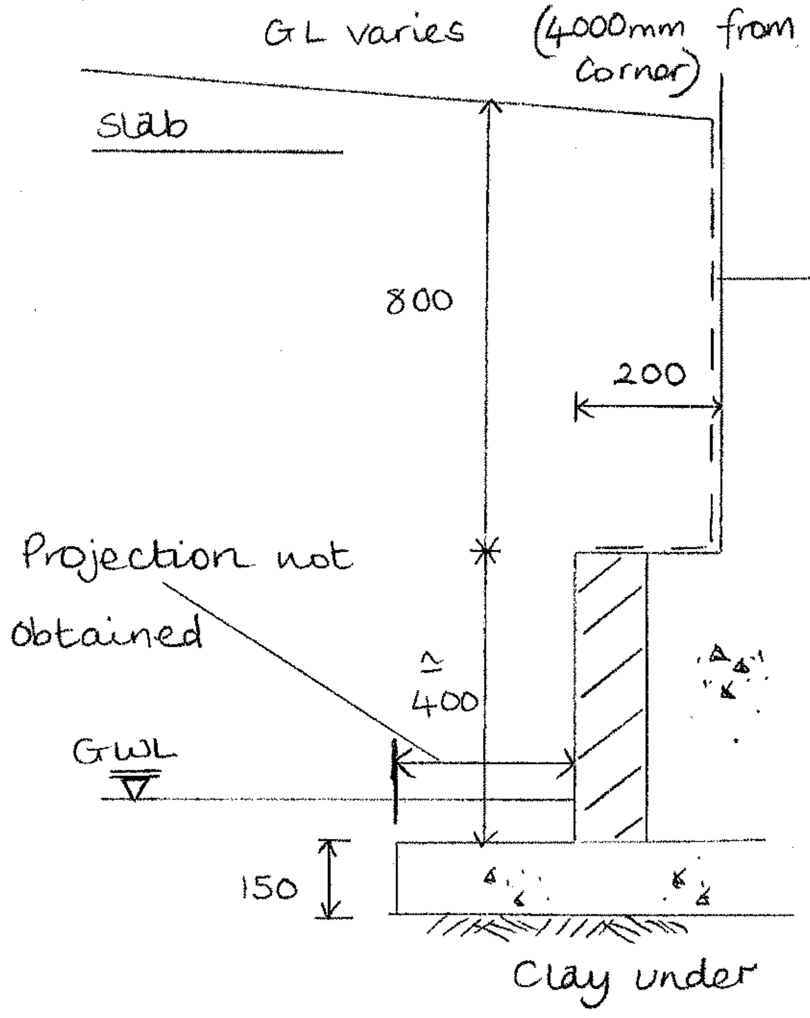
PAUL CARPENTER ASSOCIATES

Sketch	Contract Mourne House	Ref 9949 Date 29.6.11 Sheet SK04

SKETCHES NOT TO SCALE. ALL DIMENSIONS IN MM.

TRIAL PIT 3



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APPENDIX B - CALCULATIONS

ESTIMATED GENERAL LOADS.

		DL	LL
• ROOF			
DEAD	SLAB ALLOW 200MM	4.8.	
	FINISHES ALLOW	1.8	
	CEILINGS	0.5.	
IMPOSED			1.5.
		7.1kN/m²	1.5kN/m²
• UPPER FLOORS.			
DEAD.	SLAB.	4.8.	
	FINISHES	1.8	
	CEILINGS.	0.5.	
IMPOSED			1.5
		7.1kN/m²	1.5kN/m²
• WALLS. – EXTERNAL			
DEAD.	ALLOW. 300MM CAVITY	4.8	
		4.8kN/m²	
• WALLS – SEPERATING			
DEAD	215MM BRICK ASSUMED.	5.3	
		5.3kN/m².	

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ESTIMATED GENERAL LOADS CONTINUED

DL LL

- SUBSTRUCTURE

DEAD. ~ O/A CIRCA 860MM

WIDE SHUTTERED CONCRETE

$24 kN/m^3 \times 0.860 m$ 20.6

20.6 kN/m^2

TYPICAL WALL LOAD DOWN. (FLANK)

		DL	LL
ROOF			
DL	7.1 × 2.7/2	10.0	
LL	1.5 × 2.7/2		2.0
FLOORS – 4NO			
DL	(7.1 × 2.7/2) × 4.	40.0	
LL	(1.5 × 2.7/2) × 4.		8.0.
WALL			
DL	4.8 kN/m² × 13.5 m	65.0	
SUBS.			
DL	20.6 kN/m² × 0.6 m	13.0	
		128 kN/m	10 kN/m

Σ 138 kN/m (SLS).

ESTIMATE FOUNDATION WIDTH.

200 PROJECTION + 400 WALL WIDTH

+ 200 PROJECTION = 800 mm o/a

$$GBP = \frac{138\ kN/m}{0.800\ m} = 173\ kN/m^2 \nless 100\ kN/m^2$$ (ESTIMATE).

∴ ESTIMATED NBC EXCEEDED

FURTHER INVESTIGATION REQUIRED.