Greencroft Gardens

Structural Condition Report

For Charles Squire

31st October 2023

02018-ENG-XX-RP-XXX-0001

Rev S2

Structural Condition Report

Contents

Revision History

Rev	Date	Status	Comments
S1	20/10/23	For Information	For Client Review
S2	31/10/23	For Information	Updated following Client Review

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1 Introduction

1.1 General

Engenuiti has been appointed to undertake a Structural Condition Report to inform possible site strategies for 134 Greencroft Gardens, an existing single residential property in West Hampstead, London. The purpose of this report is to summarise the works completed by Engenuiti to date including:

- Summary of structural information found in records provided by the client
- Summary of structural condition of existing property as investigated by Engenuiti on site
- Material audit and recommendations for re-use
- Summary of findings and recommendations for further works

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1.2 Existing Building

134 Greencroft Gardens is an existing two storey detached cottage, which sits at the end of a private access road off Greencroft Gardens in West Hampstead in North London. The road is shared with 2 other properties. There are 8 neighbouring properties in total around the site, 7 of which have gardens against the property line. Three of these neighbouring properties have gardens tight to the external walls of the house. 134 Greencroft Gardens was likely constructed in the late 1800's, appearing on historical maps around 1893. It is assumed that it was originally constructed as a coach house likely for the surrounding buildings.

The main property sits to the East boundary line of the site, and is constructed of external masonry walls, with mainly non-structural timber stud partitions internally. The age of the materials used differs throughout, as the property has gone through several extensions and internal renovations. There is an existing garage to the West boundary line of the site. An existing substation sits to the South-Eastern boundary line of the site.

The site has limited existing planting, with much of the site being paved in paving slabs or brickwork. There is an existing Magnolia tree to the North edge of the site. From a desk study of BGS maps, the ground conditions on the site were found to be London Clay.

Front Entrance to Property

There have been previous investigative works carried out on the property in 1994, 2008 and 2020. From correspondence provided by the client, it seems likely that in 1994 after initial consideration of underpinning, underpinning was not undertaken, and work limited to repairs of the superstructure. The same correspondence suggests (but is not definitively clear) that underpinning was then undertaken around 2008. The extent of any underpinning works, if undertaken at all, is unknown.

The Engineer's report from 2020 shows extensive cracking to three of the external walls of the property, along with cracking to the internal walls in similar areas. It is possible that in 2008 no remedial works were completed to the superstructure and finishes, and therefore the cracks visible in 2020 may predate any underpinning works. From visual comparison of cracking to the external walls from the 2020 report and Engenuiti's site inspection, the crack patterns and sizes do not appear to differ, suggesting that there has been limited (if any) ongoing building movement between 2020 and 2023 despite some particularly extreme summer and winter conditions. The building was extensively refurbished internally in 2021 after it was purchased by Charles Squire. There is very little evidence of cracking to finishes internally, suggesting that there has been little in the way of building movement during the last 2 years. Therefore, it is possible that the underpinning carried out circa 2008 was sufficient to prevent any significant further movement of the building.

Engenuiti did identify small internal cracks on the First-Floor South wall, located at the position of a wall that was removed during the refurbishment works. The crack is thought to relate to the transfer of load to a new beam inserted during the refurbishment works, rather than overall building movement. The refurbishment works included remedial works in the form of Heli-Bar masonry stitching to the internal East wall at Ground Floor. Engenuiti did not identify any masonry cracks to this wall, suggesting that the remedial works were successful and that there as been little movement to the building in the last 2 years.

2 Existing Structure Overview

2.1 Available Information

Engenuiti have been supplied with full plans, sections and elevations of the property as drawn by Holland Harvey Architects. The Client completed internal refurbishment works in Spring 2021 and has supplied extensive photographs of the existing structure whilst stripped out during the works. Engenuiti visited the property on 3rd October 2023, completing an internal and external visual inspection and intrusive works to the external property walls.

2.2 Existing Structure

The existing building consists of load bearing masonry walls, with a concrete ground bearing slab at ground floor, timber floors at first floor and a timber framed roof supporting slate tiles above. Almost all internal walls of the property are constructed in non-structural timber stud walls, with one wall on the Ground Floor being constructed partially in solid masonry. It is understood that the property has previously had several extensions and refurbishments, resulting in mixed ages of materials and re-supporting steelwork internally.

Refer to Appendix A for further details on the existing structure.

2.3 Existing Structural Condition

Structural Engineers, Ian Hamilton and Rachel Haven from Engenuiti, visited 134 Greencroft Gardens on the 3rd October 2023 along with the client, Charles Squire, and the contractor from the previous refurbishment works, Richard Dennis. A visual inspection was conducted of the interior of the property and of the external walls from pavement level. Intrusive exploratory works were carried out on external party walls of the property to confirm the extent of visual cracking. Photos from the 2021 refurbishment were reviewed with the Client, and the Contractor who carried out the works. These were used to obtain an understanding of the structural makeup of the property, the condition of the property prior to previous works being carried out and the extent of remedial works already completed on the property.

The previous works in 2021 comprised the removal of internal masonry walls at ground and first floor with new steel beams to re-support the structure over, removal and installation of timber stud partition walls, installation of a new raised timber floor in the kitchen at ground floor, and installation of new timber roof ties in one area. Remedial works were also carried out, comprising Heli-Bar masonry stitching to the internal face of the East facing external wall and installation of a Bituthene lining to the internal face of the North, East and South facing external walls due to damp. It is likely that the property was also underpinned in 2008, however the depth or extent of this underpinning is unknown. No photos of the property or record of the condition of the property from prior to the 2008 works has been made available to Engenuiti, therefore it is unknown if the current condition of the external walls has stayed the same since the assumed 2008 underpinning was completed, or whether it has worsened.

2.4 Existing Roof Condition

The roof build-up comprises slate tiles supported off timber rafters and purlins. A perimeter gutter is formed by a masonry parapet at the roof edge, which is capped with stone/concrete coping stones. The exact structural arrangement of the roof build-up differs throughout the property, due to previous extensions and refurbishments carried out. All roof types are constructed in timber rafters, with additional structural elements dependent on roof type. Most of the roof timbers appear to be in good condition, with no photographic evidence of water ingress or rot. There are signs of limited localised water ingress to roof type 1, with water staining to the ceiling.

Given the age of the structure it is likely that the gutter detail has failed in some locations resulting in water ingress and subsequent rotting of rafters, it should be expected that some rafter ends will need replacement.

2.5 Existing Floor Condition

The first floor is constructed in timber joists primarily spanning between the external masonry walls, which from limited photographic evidence appear to be in good condition. However, it is to be noted that floor joists are likely built into the external masonry walls, and therefore there is potential for damp and rot at the ends of the joists, particularly to the northern side of the property. Additionally, there is water staining to the ceiling on the ground floor below the first-floor bathroom indicative of leaking, therefore there is potential for water damage or rot in the joists in this area. The ground floor is constructed in a ground bearing concrete slab. The concrete slab appeared to be of poor quality with visible cracking. It appears that there is limited or no reinforcement in the slab, as heating pipes were cut into the top of the slab during the 2021 works, and do not appear to have encountered any reinforcement.

2.6 Existing Internal Wall Condition

The internal walls are built in timber stud, of different ages due to previous works. Visual inspection of older and newer stud walls show the timber to be in good condition.

Refer to Appendix A for further details into structural build-up, and Appendix E for further site photographs.

2.7 Existing External Wall Condition

The external masonry walls of the property are of variable condition. Walls forming the principal elevation facing west appear competent and in good condition, with no obvious signs of cracking or movement. The external walls to the three remaining elevations however show signs of significant cracking, indicative of current or historic building movement. Photographs from previous inspection circa 2020 to the property also showed cracking to the internal faces of these walls. Remedial works to the internal face of the East wall at Ground Floor were undertaken in 2021, and no further cracks are visible on the internal wall following these works. However, it is to be noted that the works were only completed 2 years ago, and therefore could prove to be less effective in future years.

Engenuiti carried out visual investigative works on the North and South facing walls, determining the extent of the cracking into the brickwork. No access was available to inspect the East facing wall, however previous investigative works have been carried out on this face, as referred to in Section 2.6 of this report. Refer to Appendices B in depth sketches and photographs of condition of external facades.

2.8 Condition of North Facing External Wall

The North elevation wall is fully rendered. The top of the wall steps down in three levels, reflecting different phases of development of the property. The base of the wall steps out on the outside face by about half a brick width up to about 1m in height and is rendered in a different material. The ground in front of the wall appears to have been built up over time, resulting the ground banking steeply up to the building in the garden to the north. Several trees and tree stumps exist within this banked area. There is an existing climbing plant wrapping around the North-East corner of the property into the existing gutter; the extent of the implications of this plant are unknown. Refer to Appendix B for sketches and photographs.

North Elevation

Extensive cracks are visible in the render along the external wall, with cracks running through the brickwork in several areas. Vertical cracking from ground level to roof is visible at two of the steps in roof level, with diagonal cracking visible at two of the steps in roof level as well. One of the longer vertical cracks appears to have been previously patched, however it is still visible from ground level to the step in then brickwork. It is unknown when this crack was patched. A horizontal crack is visible along over half of the façade, across the top of an existing vent. Much of the cracking is visible on the LHS of the façade, in a mix of vertical, horizontal, and diagonal hairline and larger cracks. Two sections of intrusive investigative works were undertaken to remove the external render of the facade, both revealing that the cracking extended to the brickwork behind and was not just superficial in the render. It is unknown how far into the wall this cracking extends, or how much of the cracking in the render over the facade extends into the brickwork. Refer to Appendix B for a sketch markup of the extent of the cracking in the façade.

The finding that cracking is extending through the brickwork strongly suggests that the cracks are caused by structural movement, and not say by shrinkage/thermal movement within the render.

Due to the ground conditions, it is likely that the cracking in the façade is due to clay heave. Clay heave is when a clay-based soil expands, or contracts, depending on its moisture content. There can seasonal variation resulting from changing moisture levels within the soil, similarly trees can take moisture out of a soil causing it to shrink locally, and subsequently causing a building founded on the same soil to move. Potential causes for clay heave in the area could be the existing trees in the ground adjacent to the wall, the removal of the trees next to the external wall and the installation of the garden shed against the wall. The tree stumps are thought to date from 1993, although this cannot be definitively confirmed. Similarly, it is not known when the shed was constructed. The cracking in this area was found to go through to the brickwork behind the render and was min. 1mm wide in areas.

An existing plum tree and three tree stumps sit to the centre and East of the garden on this façade, which are likely to be the cause of the cracking to this side of the wall, due to the re-saturation of the soil following the removal of the trees.

The banked ground against the wall is likely to be the cause of the damp previously found on the internal face of this wall. Due to the construction techniques from when the wall was constructed, the brickwork is likely constructed in lime mortar. Lime mortar is porous, therefore allowing water to wick up the wall. It is important to let the wall breathe to enable it to dry out. The soil against the wall prevents drying, resulting in the water progressing up the wall above the level of the foundations, resulting in damp patches inside the property. The works completed in 2021 installed Bituthene waterproofing internally to this façade, however it is unknown if there is further damp within the property due to the dot and dab plasterboard finishes that could be preventing the damp from getting to the visible face of the internal finishes.

2.9 Condition of South Facing External Wall

The South Elevation is fully rendered and steps down at one point, reflecting different phases of development of the property. The façade is visibly in poor condition, with the paint peeling in several areas. The wall sits up against low level planting, with several large bushes and small trees in the near vicinity. There is an existing climbing plant wrapping around the South-East corner of the property; the extent of the implications of this plant are unknown. Refer to Appendix C for sketches and photographs.

South Elevation

Extensive cracks are visible in the render along the external wall, with cracks running through the brickwork in several areas. There are two main vertical cracks from ground level up to the top of the wall, one in line with a previous extension to the property, reaching the step in the façade at the top. From visual inspection, the cracks appear to increase in width towards the top of the wall. Horizontal cracking is visible at first floor level to the West, along the assumed line of a previous extension to the property. It is unknown if this crack extends through to the brickwork. Refer to Appendix C for a sketch markup of the extent of the cracking in the façade.

Whilst the cracks to the East correlate with previous building alterations, the cause of the vertical cracks to the West and associated cracks at lower levels are unclear. It is likely that the vegetation within the garden has caused shrinking from change in moisture content, or that there has been previously removed larger planting that has allowed for re-saturation of the ground below, causing swelling of the clay soil. From visual inspection of the East elevation, it appears that the base of the climbing plant has been removed, although it is unknown when this was done. This is likely to have caused the re-saturation of the soil below, and therefore has potential to be the cause for the vertical cracking to the East.

2.10 Condition of East Facing External Wall

The East Elevation is fully rendered, with a chimney extending up to the South. The base of the wall steps out on the outside face, it is assumed that this is by about half a brick width to around 2m in height. The ground in front of the wall appears to be paved. There is an existing climbing plant wrapping around the South-East corner of the property, around the chimney and into the existing gutter. It appears that the base of the plant has been removed. The extent of the implications of this plant are unknown. There also appears to be an existing tree to the North corner of the wall.

East Elevation

From visual inspection of photographs and previous investigative works carried out, the East elevation has a large visible vertical crack to the North. As discussed in the 2020 report in Appendix F, visible cracking was seen internally on this face and to the North-East corner, correlating with the external cracks seen here. The crack was measured to be around 1mm side at ground level, but increased in width higher up, appearing to exceed 2mm in places. It is unknown whether this cracking extends into the brickwork, however it can be reasonably assumed that due to the internal and external cracking in the same region, it may also be affecting the brickwork. There are also at least 2 other vertical cracks in the wall, as seen in photographs. Refer to Appendix D for a sketch markup of the extent of the cracking in the façade.

It is likely that the removal of the climbing plant to the South, and the growth of the existing tree to the North are the cause of the vertical cracking seen in this façade. The removal of the climbing plant would cause swelling of the soil below due to re-saturation of the soil, whereas the growth of the existing tree would cause shrinkage of the soil.

3 Possible Site Strategies

3.1 Overview

With the view to solve the current issues with the property, there are three main options that would be implemented. The options have varying differences to their improvements in structural stability, thermal and acoustic performance, cost, impact on neighbouring properties and environmental impact.

The first option would be to complete only necessary remedial works to the property, retaining the geometry and structural build-up of the property. The second option would be to partially demolish the property, and complete remedial works to the remaining external walls. The third option would be to fully demolish the structure, and re-use the existing materials to re-build a new building on the site.

3.2 Option 1: Remedial Works

One option for moving forwards would be to solely complete further remedial works to the property, retaining the entire building as it currently stands. Based on the findings above, as a minimum, remedial works would entail extensive Heli-Bar masonry stitching repairs to the North, South and East elevations, combined with any additional underpinning required to found the building at a minimum of circa 2.50m below ground level. In this case, there is potential that existing planting on neighbouring properties will need to be regularly pruned to maintain the ground conditions, which is likely to cause increased difficulty to both neighbours and the client.

To reduce the future impact of the trees, underpinning to the North, South and East elevations would be required. Based on the NHBC guidelines, when looking at the current largest tree in the vicinity, the underpins would need to extend to a minimum of around 2.50m below ground level. This depth would correlate to a moderate water demand tree of up to 10m tall, and therefore will need to be considered in any future planting in the vicinity. To undertake these works, the existing ground bearing slab would need to be locally broken out around the walls, and re-instated with a new concrete slab after the works are completed.

Depending on future new planting or removal of existing trees or maintenance of existing vegetation, this level of intervention may not be sufficient to future-proof the property against any further movement, which may result in multiple instances of remedial works needing to be done in future years. This could result in multiple periods of disturbance to both the client and neighbouring properties.

Further repairs to the property would be required to the First Floor. Heli-Bar repair to the cracking on the internal face of the South Wall, and underpinning along this wall would be required. Additionally, in the Western most room on the First Floor, the visible leaking through the roof would need waterproofing, inspection of the existing structure and any further repairs to maintain the roof's structural integrity.

The existing property is a detached, single skin masonry building, and therefore is likely to have poor thermal performance. Should the client wish to improve the thermal performance of the property, for example to enable installation of heat pumps to reduce the property's whole life carbon emissions, further works would be required to improve the buildings thermal performance. As the property sits on the boundary line with the neighbouring properties, there is no scope to provide external insulation to the walls, therefore any insulation will need to be installed on the internal wall face. In comparison with external insulation, internally insulating a space results in lower overall benefit with a greater risk for moisture problems, due to multiple cold bridges through the foundation line. Internal insulation also prevents the benefit of thermal mass that can be achieved from masonry structures, potentially resulting in greater energy usage within the property.

The existing layout of the property is constrained by the existing building volume, with difficult access to one of the rooms from the stairs, limiting the opportunities for generational and long-term living in the property.

3.3 Option 2: Partial Demolition & Re-build (retaining external walls)

Another option is to partially demolish and rebuild the property, whilst retaining the external walls to the neighbouring properties. This would allow for new internal configurations, and for the re-built portion of the property to benefit from new foundations and improved thermal insulating properties. As discussed in Appendix A, there is a case for re-use of the structural materials within the building, which can be implemented into the new structure, reducing the need for new materials to be brought to site. This reduces the environmental impact of the works and reduces the impact on the neighbouring properties by reducing the number of deliveries required to the property.

In this case, to partially retain the structure, not only will temporary works be required for the external walls, but extensive remedial works will still be required to these walls, including Heli-bar masonry repairs and underpinning to the North, South and East elevations. The temporary and remedial works to the property will result in an extended programme causing greater disruption to the neighbouring properties and likely greater costs to the Client overall.

In the case of the client requiring improved thermal performance in the property, the the retained external walls will still require additional insulation to their internal face, this will need to either be through internal insulation, which as previously discussed would have cold bridging issues through the foundations and result in a loss of internal area, or through external insulation which would reach into the neighbouring gardens. Either option would still creating thermal bridging around the foundations, resulting in less efficient thermal performance and therefore greater whole life carbon emissions. The re-built walls can benefit from improved insulating properties, achieving any level of thermal performance required. This will reduce the overall energy consumption in the property, reducing its environmental impact and long-term in-use costs for the Client.

3.4 Option 3: Full Demolition & Re-build

The third option would be to fully demolish and re-build on the plot. This would allow for new internal configurations, new foundations to eliminate any further movement and improved thermal properties. As discussed in Appendix A, there are many opportunities for re-using the existing structural materials within the building fabric. This would reduce the need for new materials being brought to site and can be detailed into the programme to reduce the overall disruption to the neighbouring properties. The re-use of the existing materials also gives cost benefits to the Client and reduces the environmental impact of the project, through reducing the total amount of new materials in the scheme. As detailed in Appendix A, there is a significant amount of good quality timber and masonry that can be carefully demolished and re-used within a new scheme.

Existing timber members can be utilised in new timber floors and timber stud partitions. This would make up much of the internal structure within the property, reducing the quantity of new material needing to be brought to site. Additionally, having existing timber to use on site can help to reduce any programme delays due to delivery delays, reducing the disturbance of the project on neighbouring properties. Any new timber needing to be brought to site can be transported to site by hand, rather than needing a crane or any other machinery to transport it from delivery vehicles, further reducing any disturbance on the neighbouring properties. By implementing timber stud walls internally, any level of thermal and acoustic insulation can be specified, further reducing future energy consumption and cost to the Client.

A full demolition can allow for the elimination of movement due to clay heave from changes in planting in neighbouring gardens. This can be achieved through new foundations, either in the form of piled foundations or strip foundations established at a minimum depth of circa 2.50m below ground level to ensure that any changes in planting will not affect the property. By re-working the overall configuration of the building, the area of the external walls can be minimised to reduce the volume of new foundations required. Additionally, without needing to retain any structure, the construction of the foundations on a clear site become much easier and therefore quicker. This would reduce the impact on neighbours, as any noise pollution or deliveries can be completed over a much shorter period. This results in a shorter programme, minimising disruption to neighbours. In the long term, this will also reduce disturbance to neighbours, as the need for any external remedial works from the neighbouring property's side will be eliminated.

Re-configuring the arrangement of the property can have further benefits, including future proofing the building layouts by providing level access, and appropriate access for all generations of users. This allows the property to be used for multiple generations and is likely to result in fewer further building changes in the future.

In the case for improved thermal performance, by re-building the property, the external wall and roof build ups can be detailed to achieve any desired level of thermal and acoustic performance. This could be detailed to solve any thermal bridging issues, would reduce the overall energy consumption of the property in the long term, and, with potential for new interventions in terms of installation of heat pumps or similar, can result in decreased whole life carbon emissions.

3.5 Conclusion

All three options considered above are structurally viable. However, when regarding long term value from the site, it is suggested that a thoughtfully designed layout that allows for best use of existing materials presents the best long-term opportunities for the property, as set out in Option 3.

Such an approach would most likely deliver the greatest opportunity for reducing whole life carbon emissions particularly by delivering much improved thermal performance, whilst also minimising the risk of future ground movement impacting on the structure over and minimising the impact of construction works on those neighbouring the site.

3.6 Further Works & Investigations

Further investigations would be required for all three options above.

For Option 1 or 2, trial pits would be required to confirm the depth and extent of the existing foundations. The existing masonry and mortar would require testing to determine the properties of the existing walls.

For Option 3, the existing masonry and timber would require testing to determine the properties of the existing structure and viability for re-use. As discussed in Appendix A, it is likely that the existing timbers will require trimming at the ends to remove any areas of rot.

Appendix A
Material Audit

Greencroft Gardens

Material Audit Report

For Charles Squire

20th October 2023

02018-ENG-XX-RP-XXX-0001

Rev P1

Material Audit Report

Contents

Revision History

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S1	20/10/23	Status	For Client Review

Prepared by	Approved by
	
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1 Introduction

1.1 General

Engenuiti has been appointed to undertake a Material Audit for 134 Greencroft Gardens, an existing single residential property in West Hampstead, London. The purpose of this report is to collate the extent of materials in the existing property and review their viability for re-use.

The quantities of materials indicated in this report are based on photographs provided to Engenuiti by the Client and reasonable assumptions made by Engenuiti and are intended as an estimate to inform options for the future use of the site. No reliance should be made for the purpose of determining contract values, dimensions or material grades for future design. All quantities should be checked and confirmed with a site measure prior during future strip out activities, prior to committing to quantities, design sizes, and grades.

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1.2 Site and Building Summary

The property sits at the end of a private access road off Greencroft Gardens in West Hampstead in North London. The road is shared with 2 other properties. There are 8 neighbouring properties in total around the site, 7 of which have gardens against the property line. Three of these neighbouring properties have gardens tight to the external walls of the house. 134 Greencroft Gardens was likely constructed in the late 1800's, appearing on historical maps around 1893. It is assumed that it was originally constructed as a coach house likely for the surrounding buildings.

The main property sits to the East boundary line of the site, and is constructed of external masonry walls, with mainly non-structural timber stud partitions internally. The age of the materials used differs throughout, as the property has gone through several extensions and internal renovations. There is an existing garage to the West boundary line of the site. An existing substation sits to the South-Eastern boundary line of the site.

The site has limited existing planting, with much of the site being paved in paving slabs or brickwork. There is an existing Magnolia tree to the North edge of the site.

1.3 Summary of Materiality

The existing building consists of load bearing masonry walls, with a concrete ground bearing slab at ground floor, timber floors at first floor and a timber framed roof supporting slate tiles above. Almost all internal walls of the property are constructed in non-structural timber stud walls, with one wall on the Ground Floor being constructed partially in solid masonry. It is understood that the property has previously had several extensions and refurbishments, resulting in mixed ages of materials and re-supporting steelwork internally.

2 Summary of Structural Materials

2.1 Ground Floor Materials

The ground bearing concrete runs throughout the entire building with a total area of circa 60m^2, the thickness of which is unknown. In the kitchen & toilet/utility area, a raised timber floor sits on top of existing terracotta tiles. The total area of tiles is 16m^2. The contemporary raised access timber floor was constructed in 2021, estimated to be constructed with 145 x 47 C24 joists at 400c/c with 145 x 47 noggins in the opposite direction at approx. 1.0m c/c. This results in a volume of 0.36m^3 of timber. The ground floor is finished in timber veneer floorboards, likely with an engineered timber floor below, with a total area of 45m^2.

Based on visual inspection of the property and discussions with the Contractor responsible for the most recent refurbishment works to 134 Greencroft Gardens, it is assumed that 3No. steel beams sit at high level or within the first-floor structure to account for previous internal alterations carried out on the property. Existing beams assumed to be 203 UCs, to be measured on site to verify assumptions.

Refer to Appendix A for plan diagrams and site photographs, and Appendix D for tabulated calculations. Refer to Appendix E for further general site photographs.

2.2 First Floor Materials

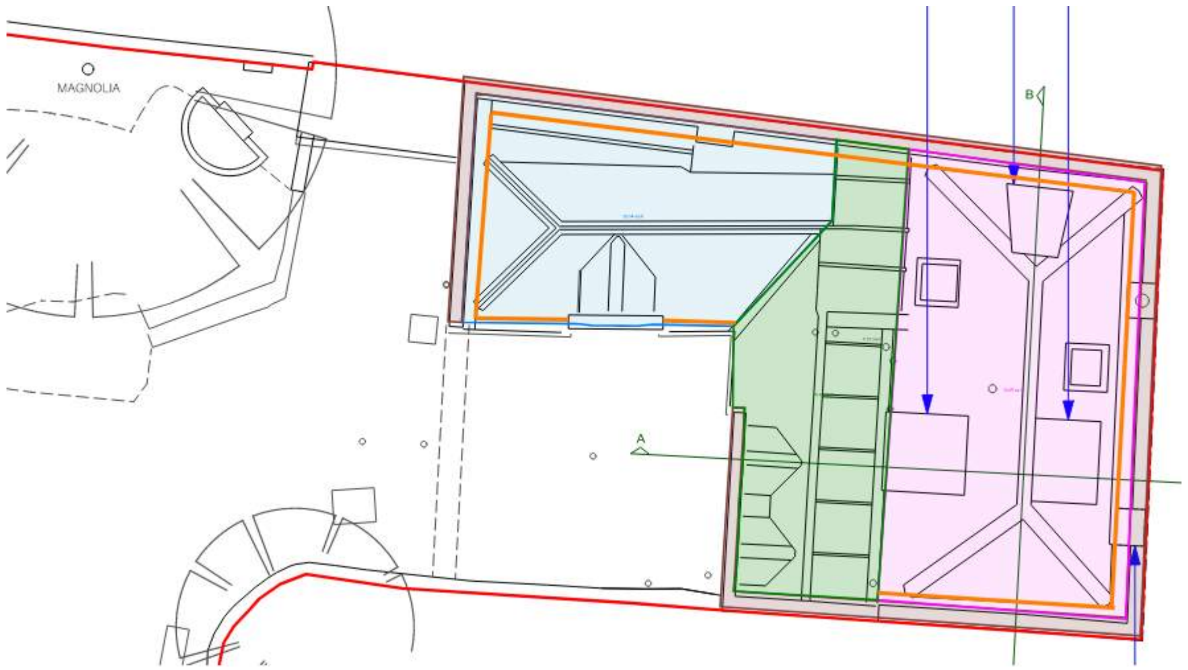
Timber joists are run throughout the entire first floor, assumed to be constructed in approx. 195 x 47 joists at 400c/c with 195 x 47 noggins in the opposite direction at approx. 1.0m c/c. This results in a volume of 1.92m^3 of timber. The first floor is finished in 18mm thk structural timber floorboards throughout, with a total area of 61m^2.

It is assumed that 1No. steel beam sits at high level within the ceiling build up to re-support existing roof structure following previous internal alterations, assumed to be 203 x 133 UB. Beam to be measured on site to verify assumptions. A 150 x 100 timber beam sits across the Master Bedroom at high level, assumed to provide stability to the overall structure. The total volume of this beam is $0.05m^3$.

Refer to Appendix B for plan diagrams and site photographs, and Appendix D for tabulated calculations. Refer to Appendix E for further general site photographs.

2.3 Roof Materials

Due to the alterations and extensions that the property has undergone, there are 3 roof types throughout the building. Refer to diagram below for extent of each roof type.



Roof Type Layout

Roof Type 1, highlighted in blue, comprises 95 x 47 timber rafters at 400c/c with 145 x 47 timber ties between rafters at high level, with a total timber volume of $0.49m^3$.

Roof Type 2, highlighted in pink, comprises 145 x 47 timber rafters at 400 c/c with 145 x 75 timber purlins at mid-height. For simplicity, the ridge beam and wall plate are also assumed to be 145 x 75 and included in the purlin volume. Roof type 2 has a total timber volume of $1.93m^3$.

Roof Type 3, highlighted in green, comprises 195 x 47 timber rafters at 400 c/c, with 2No. 145 x 47 rafters around dormer window openings, totalling a timber volume of $0.46m^3$.

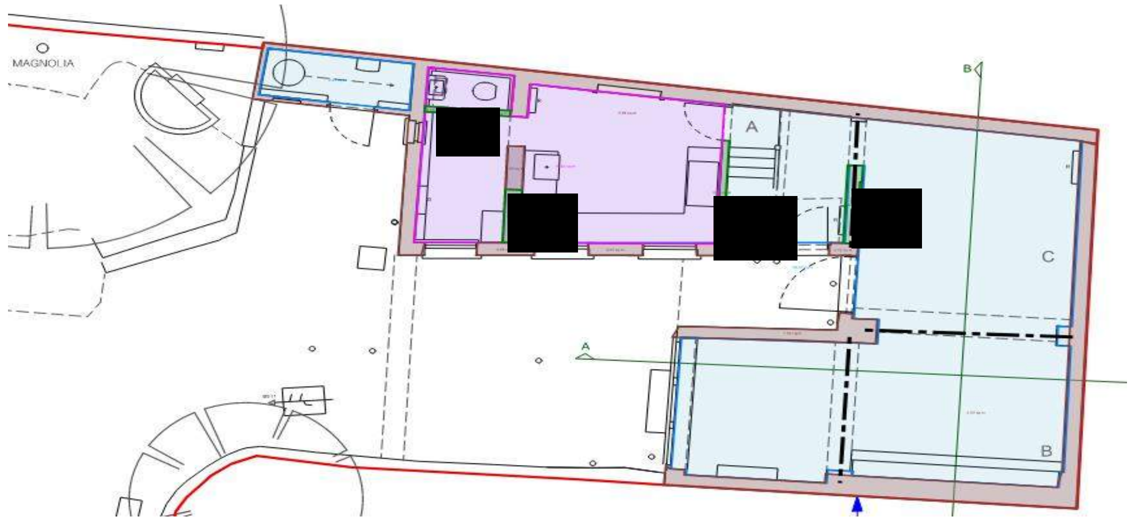
Between all the roof types, the roof timers give a total volume of $2.88m^3$. Timber reinforcing boards can be seen around the edge of Roof Type 1 & 2, assumed to be 200 x 18thk boards, to provide additional support to the gutter. The boards total 52m in length and look to be in good condition.

The external finishes of the roof comprise slate tiles over an area of $133m^2$, with ventilations tiles built in. From limited visual inspection, it can be approximated that there are 12 ventilation tiles in total. Stone and concrete coping stones sit on the parapet along the roof, totalling a length of 34m.

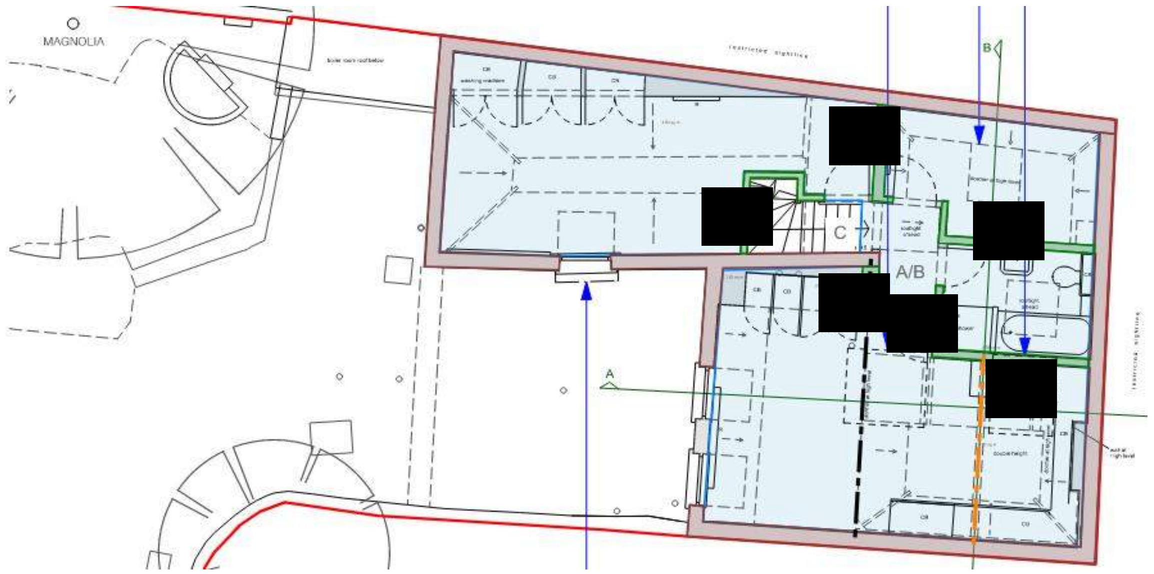
Refer to Appendix C for plan diagrams and site photographs, and Appendix D for tabulated calculations. Refer to Appendix E for further general site photographs.

2.4 Internal Walls

Timber stud partitions form almost all of the internal walls of the Ground Floor. Wall A is constructed in 2No. layers of 45 x 45 timbers at 300c/c with 45 x 45 noggins between at approx. 1.0m c/c. This is to allow for a sliding door within the wall. Wall B, C and D are assumed to be constructed in 145 x 47 timbers at 300c/c with 145 x 47 noggins at 1.0m c/c vertically. It is assumed that Wall C is constructed in 2No. layers of this build up, to account for the increased wall thickness. In total, the 145 x 47 walls total a volume of $0.48m^3$, and with the additional 45 x 45 wall the total volume of timber in the wall equals $0.05m^3$.



Ground Floor Partition Wall Layout



First Floor Partition Wall Layout

Timber stud partitions form the internal walls of the First Floor. All walls are estimated to be constructed in 145 x 47 timbers at 300c/c with 145 x 47 noggins at 1.0m c/c vertically. Wall A is believed to be an original wall, with older structural elements and original lath and plaster finishes. The total timber volume of the partition walls is 1.04m^3.

Refer to Appendix A and B for plan diagrams and site photographs, and Appendix D for tabulated calculations. Refer to Appendix E for further general site photographs.

2.5 External Walls

The external walls to the building are comprised of 225thk solid yellow stock masonry with small areas of red brick detailing on the West elevation. The North, East and South elevations are fully rendered in a sand/cement mix. From visual inspection, the masonry appears to be constructed in lime mortar, with some of the masonry from the newer extension in cement mortar. The masonry has been pointed in a mix of lime and cement.

From visual inspection, the brickwork appears to be around 5.0m in height, with an area of 11.6m^2 of brickwork at Ground Floor, and of 10.5m^2 at First Floor. It is assumed that the building is founded on traditional masonry footings, extending min. 3 layers of brick below the ground level at 45 degrees. A brick patio extends in front of the stepped back portion of the house, in line with the West external wall. From these, we can approximate a total volume of around 81m^3 of brickwork for the property.

Refer to Appendix A and B for plan diagrams and site photographs, and Appendix D for tabulated calculations. Refer to Appendix E for further general site photographs.

2.6 Garage

From visual inspection, the garage appears to be constructed in 1No. layer of brickwork with an approximate volume of 2.45m^3, with an internal 1No. layer of blockwork with an approximate volume of 2.35m^3. The brickwork is currently painted. The roof construction is unknown but can be assumed to be constructed with timber rafters on a central ridge rafter and bitumen felt finish.

3 Re-use of existing materials

3.1 Timber

The timber throughout the property is visually in good condition. Roof type 1 has signs of water ingress; however the rest of the timber showed no visible signs of degradation or rot. It is likely that the joists are built into and supported off the external masonry walls and may have damp ends, but there has been no visible confirmation of this. Based on the previous work completed on the property and the age of the building, it is likely that some joists have been inappropriately cut and as such it is considered appropriate that 80% of the timber could be viably reclaimed for re-use.

Floor joists appear to be around 3.0m in length on both the ground and first floor, making them viable to be utilised again in typical residential rooms. The roof rafters appear to range between 1.85m to 2.5m in length. This makes them viable to be utilised again in a typical pitched or mansard roof. Where larger rafters are used, e.g. Roof Type 2 and 3, these could be re-used in new timber floors or stud walls. There is potential to splice shorter sections of timber together to accomplish larger floor spans or wall heights, or to re-use existing members in shorter spans or as noggins.

Stud walls are typically 3.0m in height across the property, and they will likely be able to be carefully deconstructed on site and re-built as required to form new partition walls. Where any proposed wall heights differ from existing, there is potential for packing shorter walls tight to floors over, finger jointing members to extend their length or trimming members to reduce the overall constructed height.

On the assumption that 80% of the timber in the property can be re-used, we can estimate that this would allow for a saving of 648kgCO2e compared to purchasing new timber.

3.2 Masonry

Whilst there is significant evidence of movement in the masonry on the external faces of the property, the individual bricks are visually in good condition. The existing masonry is constructed with lime mortar, and crumbles with light force on site. Therefore, it can be assumed that with careful deconstruction, the masonry can be re-used within the property. Additionally, there is previous evidence of this from the works completed in 2021, with photographic evidence of brickwork having been deconstructed and still in good condition.

Taking into account the movement of the building and removal process, it can be assumed that some bricks will be cracked and not suitable for re-use. Additionally, the newer areas of masonry that are constructed in cement mortar will be more difficult to deconstruct and more likely to have a lower reclaim rate. The rendered elevations of the property will also reduce the reclaim percentage as the render will need to be broken off in places where it cannot be removed easily, increasing the chances of the brickwork also being broken from this process. Considering these factors and the quality of brickwork as seen on site and in photographs, it is considered appropriate that 70-80% of the masonry could be viably reclaimed for re-use.

A significant benefit of deconstruction and re-use of masonry is the ability to increase the strength of mortar joints and type of wall construction, allow for improvements in the insulating properties of the walls. This can provide additional thermal performance within the property, improving overall energy efficiency.

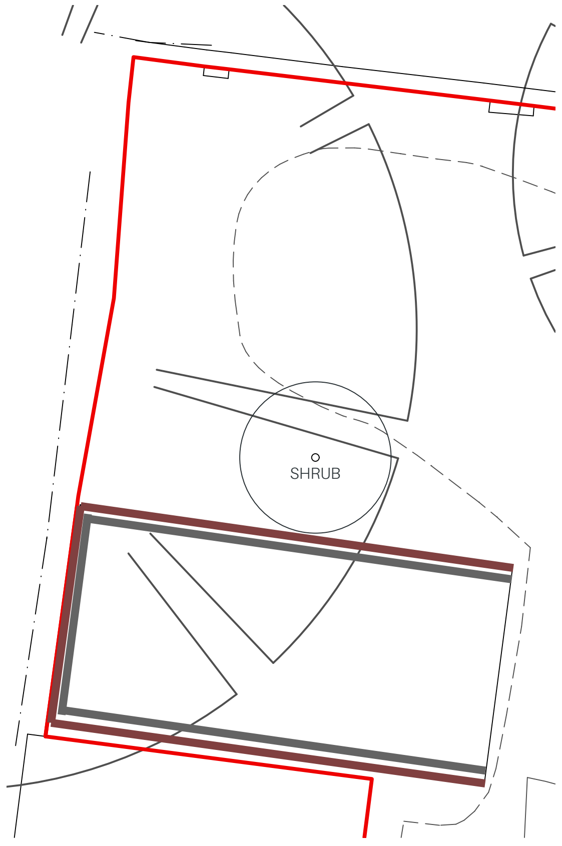
On the assumption that 70% of the masonry in the property can be re-used, we can estimate that this would allow for a saving of 30,568kgCO2e compared to purchasing new bricks.

3.3 Roof Finishes

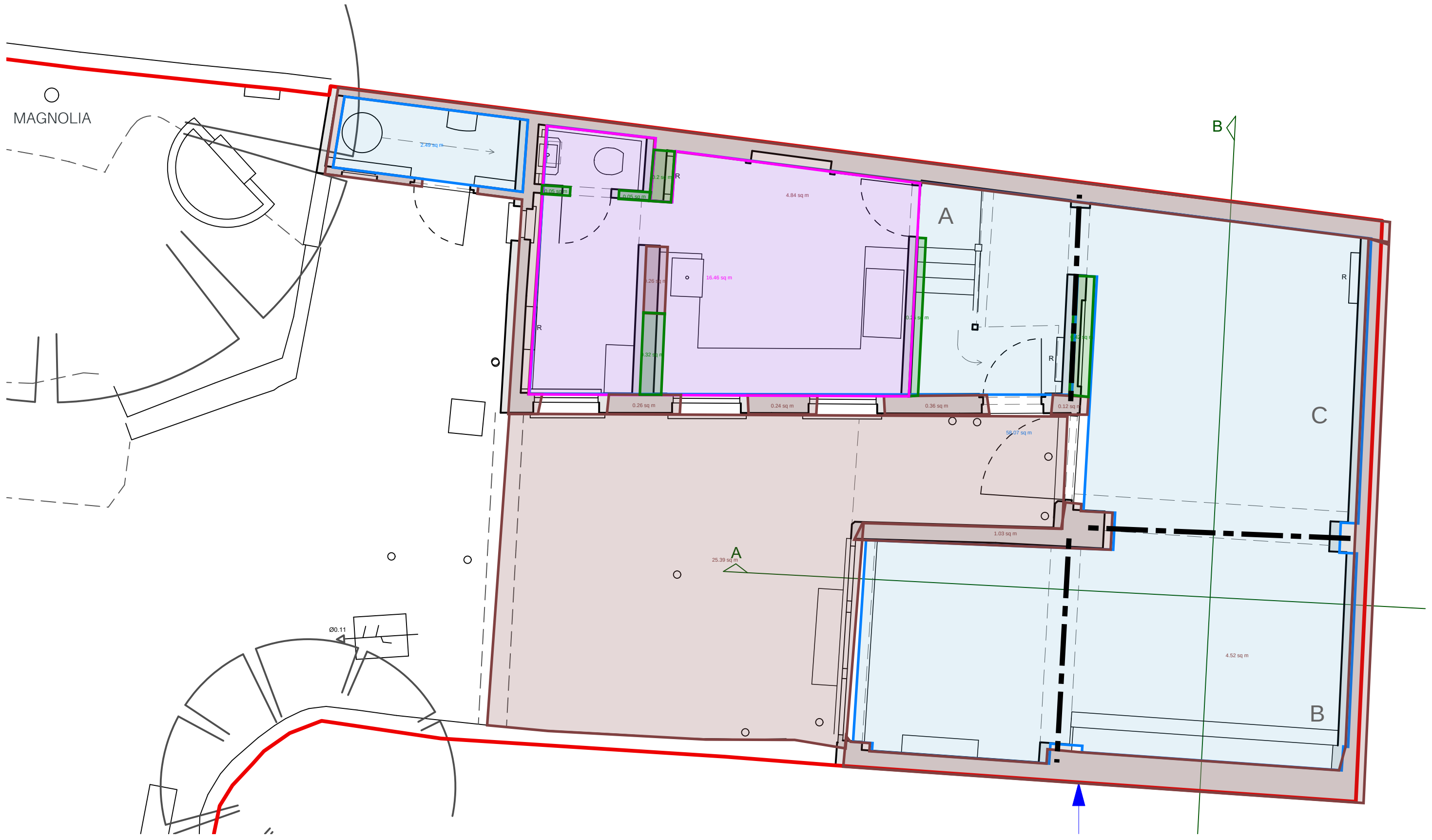
Overall, the roof finishes appear to be in good condition, however this is from limited visual inspection and the age of the roof may differ as sections of the roof have been built at different times. As the client has not reported any issues in the roof, such as water damage, we can assume that the roof materials are in sufficient condition for re-use. Assuming a worst-case rate of 40% for slate roof tiles, a total area of 53.29m^2 could be re-used.

Appendix A

Ground Floor Area
Sketch



Garage Plan



Ground Floor Plan

View A: Terracotta tiles, raised timber floor, masonry & stud wall (plastered)

View B: Existing concrete slab, masonry wall (plastered) & stud wall in background

View C: Timber stud wall, masonry wall, raised floor in background

Summary of Materials:

Concrete Ground Bearing Slab = **60m^2**

18mm thk Timber Floorboards =**60m^2**

Terracotta Tiles = **15m^2**

Raised Timber Floor = 15m^2
Assumed build up: 145 x 47 at 400mm c/c + 145 x 47 at 1.0m c/c in opposite direction
Total volume of timber = **0.36m^3**

Existing masonry walls at Ground Floor = 11.60m^2
Existing masonry walls at First Floor = 10.50m^2
Total average height = 4.88m
Patio = 26.50m^2
Garage (outer leaf) = 1.42m^2
Total volume of masonry = **76.94m^3**

Garage Blockwork = 1.36m^2
Total volume of blockwork = **2.35m^3**

1No. wall built in 2No layer 45 x 45 timbers at 300mm c/c + 45 x 45 at 1.0m c/c vertically
Other walls assumed to be 145 x 47 at 300c/c + 145 x 47 at 1.0m c/c vertically
Total volume of timber = **0.48m^3**

Steel Beam over (assumed)

Project			
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Sketch Title		Date	
Ground Floor Area Sketch		20 / 10 /2023	
Project No	Sketch No	Rev	By
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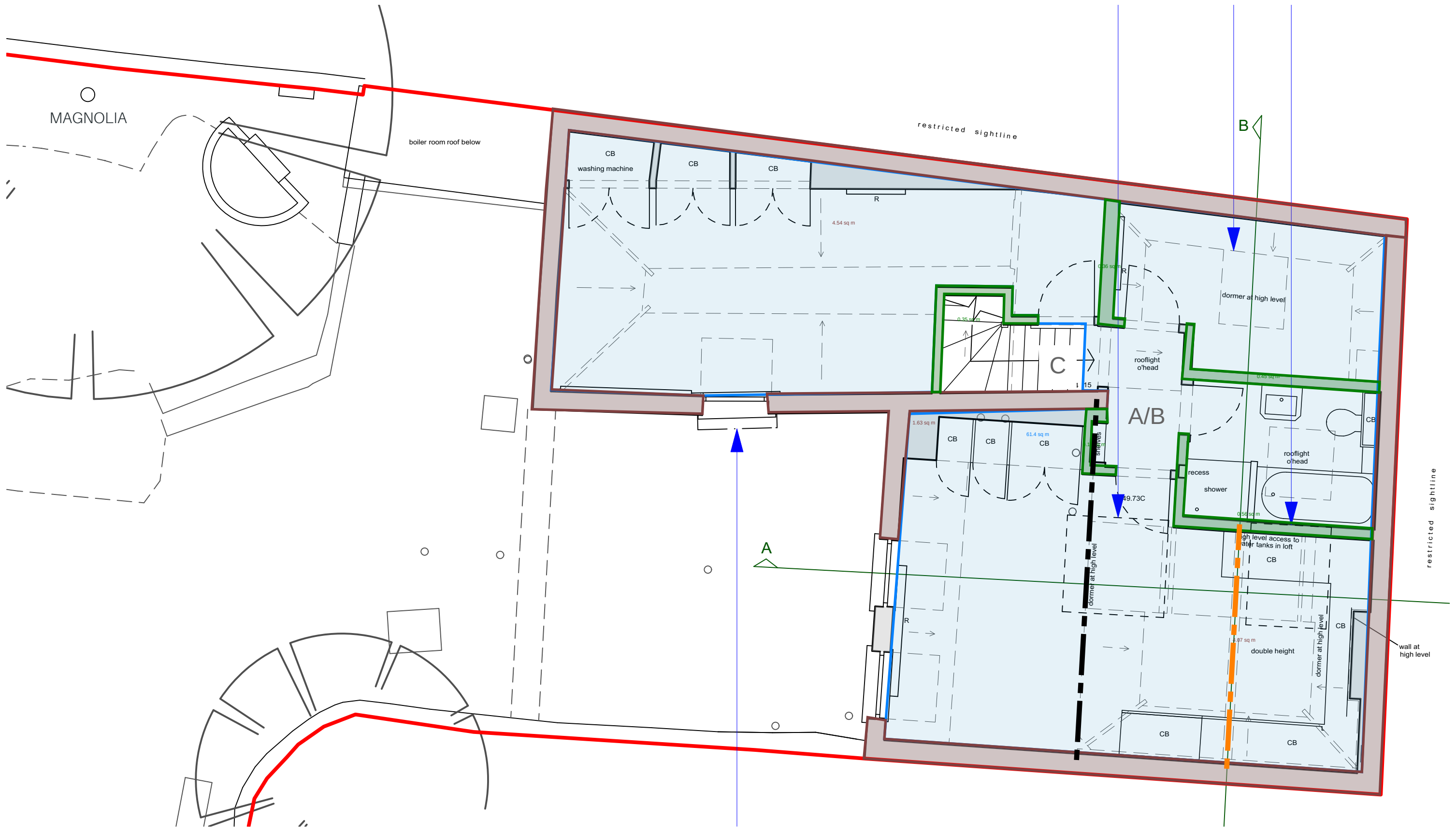
Appendix B
First Floor Area Sketch



FIrst Floor Plan

View A: Masonry walls & older stud wall

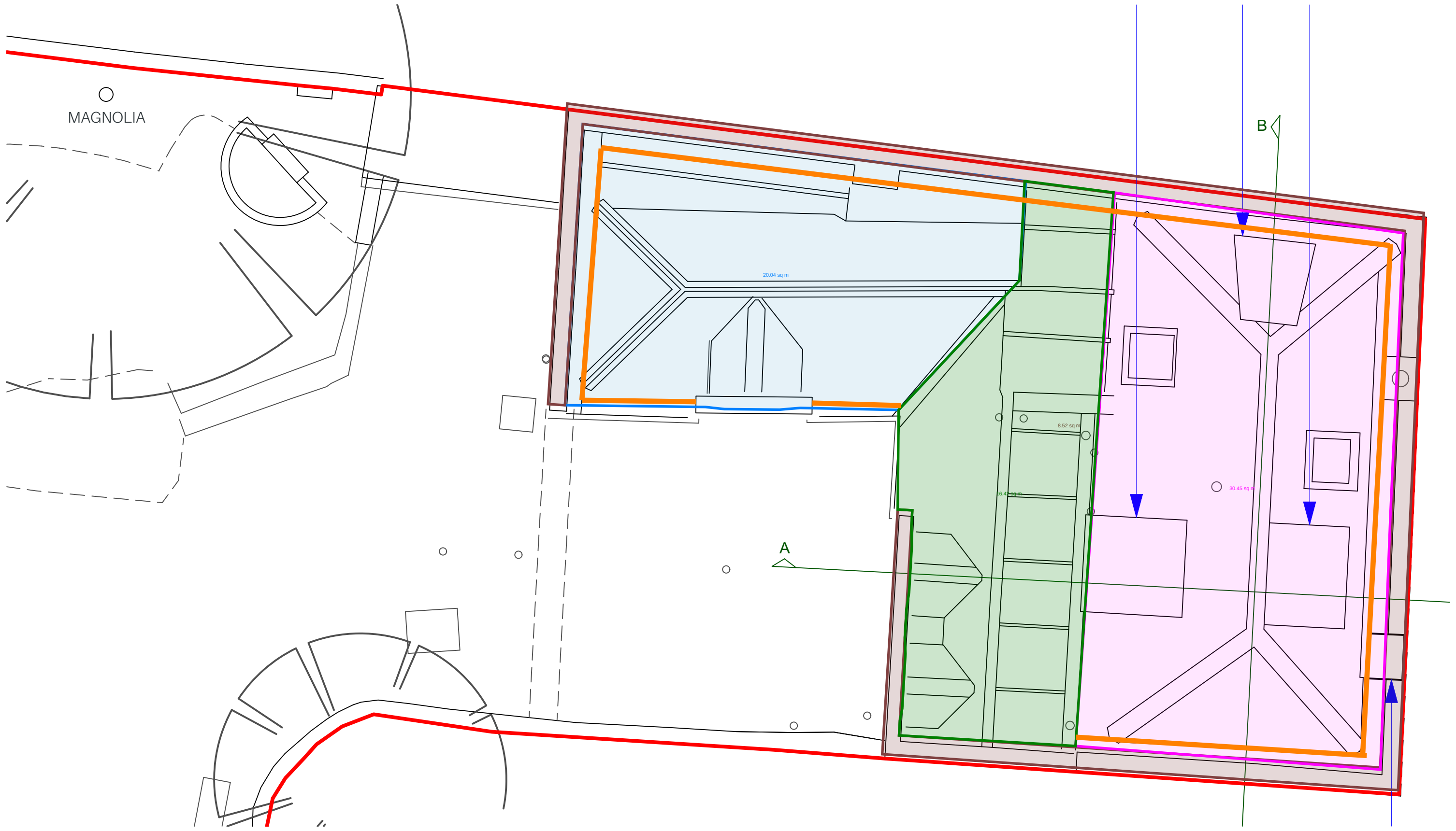
View B: Newer timber stud wall & floorboards

View C: Timber floor joists

Summary of Materials:

- Timber Floor = 60m^2
  Assumed build up: 195 x 47 at 400mm c/c + 195 x 47 at 1.0m c/c in opposite direction
  Total volume of timber = **1.92m^3**
- 18mm thk Timber Floorboards = **61.40m^2**
- Refer to SK01 for masonry details
- Walls assumed to be 145 x 47 @ 300c/c with 145 x 47 at 1.0m c/c vertically
  Total volume of timber = **1.04m^3**
- Steel beam over (assumed)
- Timber Beam over
  150 x 100 beam
  (refer to SK03 for site photograph)

Appendix C
Roof Area Sketch



Roof Plan

Summary of Materials:

Roof Type 1
Assumed build up: 95 x 47 rafters at 400mm c/c + 145 x 47 ties at 300mm c/c
Rafters = 0.44m^3, Ties = 0.05m^3
Total timber volume in Roof Type 1 = **0.49m^3**

Roof Type 2
Assumed build up: 145 x 47 rafters at 400c/c + 145 x 75 purlins at mid-height.
Rafters = 1.32m^3, Purlins = 0.61m^3
Total timber volume in Roof Type 2 = **1.93m^3**

Roof Type 3
Assumed build up: 195 x 47 rafters at 400c/c + 2No. 145 x 47 timbers around window openings
Rafters = 0.38m^3, Window framing = 0.09m^3
Total timber volume in Roof Type 3 = **0.46m^3**

Stone/Concrete Coping Stones = 8.52m^2
Width of coping stone = 250mm
Total length of Coping Stones = **34m**

Timber reinforcing boards
Assumed width of boards = 200mm
Total length of boards = 26m x 2 = **52m**

View A: External Roof showing slates, ventilation slates & coping stones

View B: Roof Type 1

View D: Roof Type 2, Timber Beam & Roof Type 3 in background

View C: Roof Type 2 (LHS), Celing Joists & Roof Type 3 (RHS)
Note: Masonry partition wall and ceiling joists in photograph now removed

Project Greencroft Gardens			
Sketch Title Roof Area Sketch		Date 20 / 10 /2023	
Project No 2018	Sketch No 2018-S-SK03	Rev	By RH

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Appendix D

Material Calculations & Summary

Ground & First Floor Materials:

Ground Floor	Area on plan (m2)	Width (m)	Depth (m)	Centres (m)	Length (m)	Area of material per metre (m2/m)	Volume of material (m3)	Grade	Notes
Raised Timber Floor	15.00	0.05	0.15	0.40	3.00	0.02	0.36	C24	Assuming noggins at 1.0m c/c
Terracotta Tiles	15.00	-	-	-	-	-	-	-	
Engineered timber floorboards	60.00	-	0.02	-	-	-	-	-	
Timber veneer	60.00	-	-	-	-	-	-	-	

First Floor	Area on plan (m2)	Width (m)	Depth (m)	Centres (m)	Length (m)	Area of material per metre (m2/m)	Volume of material (m3)	Grade	Notes
Raised Timber Floor	60.00	0.05	0.20	0.40	-	0.03	1.92	C24	Assuming noggins at 1.0m c/c

Roof Materials:

	Rafters							
Roof	Length on plan (m)	Width (m)	Depth (m)	Centres (m)	Height (m)	Area of material per metre (m2/m)	Volume of material (m3)	Grade
Roof Type 1	10.69	0.05	0.10	0.40	3.70	0.01	0.44	C24
Roof Type 2	15.46	0.05	0.15	0.40	5.00	0.02	1.32	C24
Roof Type 3	5.29	0.05	0.20	0.40	3.10	0.02	0.38	C24

	Ties/Purlins/Window framing								
Roof	Length on plan (m)	Width (m)	Depth (m)	Centres (m)	Length of tie (m)	No. of elements	Area of material per metre (m2/m)	Volume of material (m3)	Grade
Roof Type 1	0.65	0.05	0.15	0.40	4.40	-	0.02	0.05	C24
Roof Type 2	56.53	0.08	0.15			-	0.01	0.61	C24
Roof Type 3	1.70	0.09	0.15			4.00	-	0.09	C24

Total	
Roof Type 1:	0.49
Roof Type 2:	1.93
Roof Type 3:	0.46

Timber Stud walls:

Internal Walls	No. of posts	No. of noggins	Length on plan (m)	Width (m)	Depth (m)	Centres (m)	Height (m)	Grade	Area of material per metre (m2/m)	Volume of material (m3)	Notes
GF Wall A	5.00	8.00	-	0.05	0.05	0.30	3.00	C24	-	0.05	Noggins at 1.0m c/c, 2No. Thin layers of structure to allow for sliding door
GF Wall B	-	-	2.20	0.05	0.15	0.30	3.00	C24	0.03	0.19	Assume noggins at 1.0m c/c
GF Wall C	-	-	1.10	0.05	0.15	0.30	2.50	C24	0.06	0.16	Assume Noggins at 1.0m c/c + 2 layers of structure
GF Wall D	-	-	0.80	0.05	0.15	0.30	3.00	C24	0.03	0.07	
									Total =	0.48	
1F Wall A	7.00	5.00	2.70	0.05	0.15	0.30	3.00	C16	-	0.08	Existing lath and plaster wall with diagonal noggin
1F Wall B	-	-	1.20	0.05	0.15	0.30	3.00	C24	0.03	0.11	
1F Wall C	-	-	3.30	0.05	0.15	0.30	3.00	C24	0.03	0.29	
1F Wall D	-	-	1.70	0.05	0.15	0.30	3.00	C24	0.03	0.15	
1F Wall E	-	-	3.40	0.05	0.15	0.30	3.00	C24	0.03	0.30	
1F Wall F	-	-	1.20	0.05	0.15	0.30	3.00	C24	0.03	0.11	
									Total =	1.04	
									Total (GF + 1F) =	1.52	

Masonry Walls:

External Walls	Area on Plan (m2)	Length on plan (m)	No. of bricks on elevation	Total height (m)	Height per floor (m)	Footing Depth (m)	Volume of material (m3)	Notes
GF	11.60	-	-	-	-	-	-	
1F	10.50	-	-	-	-	-	-	
Total	22.10	-	65.00	4.88	2.44		53.87	
Footing	22.10	-	-	-	-	0.23	7.46	
Patio	26.50	-	-	-	-	-	19.88	
Garage (brickwork)	-	14.20	23.00	1.73	-	-	2.45	
Garage (blockwork)	-	13.60		1.73	-	-	2.35	
						Total =	81.20	

Total Volumes/Lengths of Available Structural Materials:

Timber	Volume of Material (m3)	Total Length of available material (m)	Grade
145 x 47	1.81	481.73	C16
195 x 47	2.30	250.96	C16
95 x 47	0.44	98.84	C16
75 x 45	0.61	56.53	C16
45 x 45	0.05	26.00	C16

Masonry	Volume of Material (m3)
Brickwork	79.39
Blockwork	2.35

Concrete	Volume of Material (m3)
Concrete Slab (assumed 200thk)	12.00

Note: Amount of materials available for re-use to be less than shown, to allow for any rot on ends of timbers, or breaking of brickwork during demolition.

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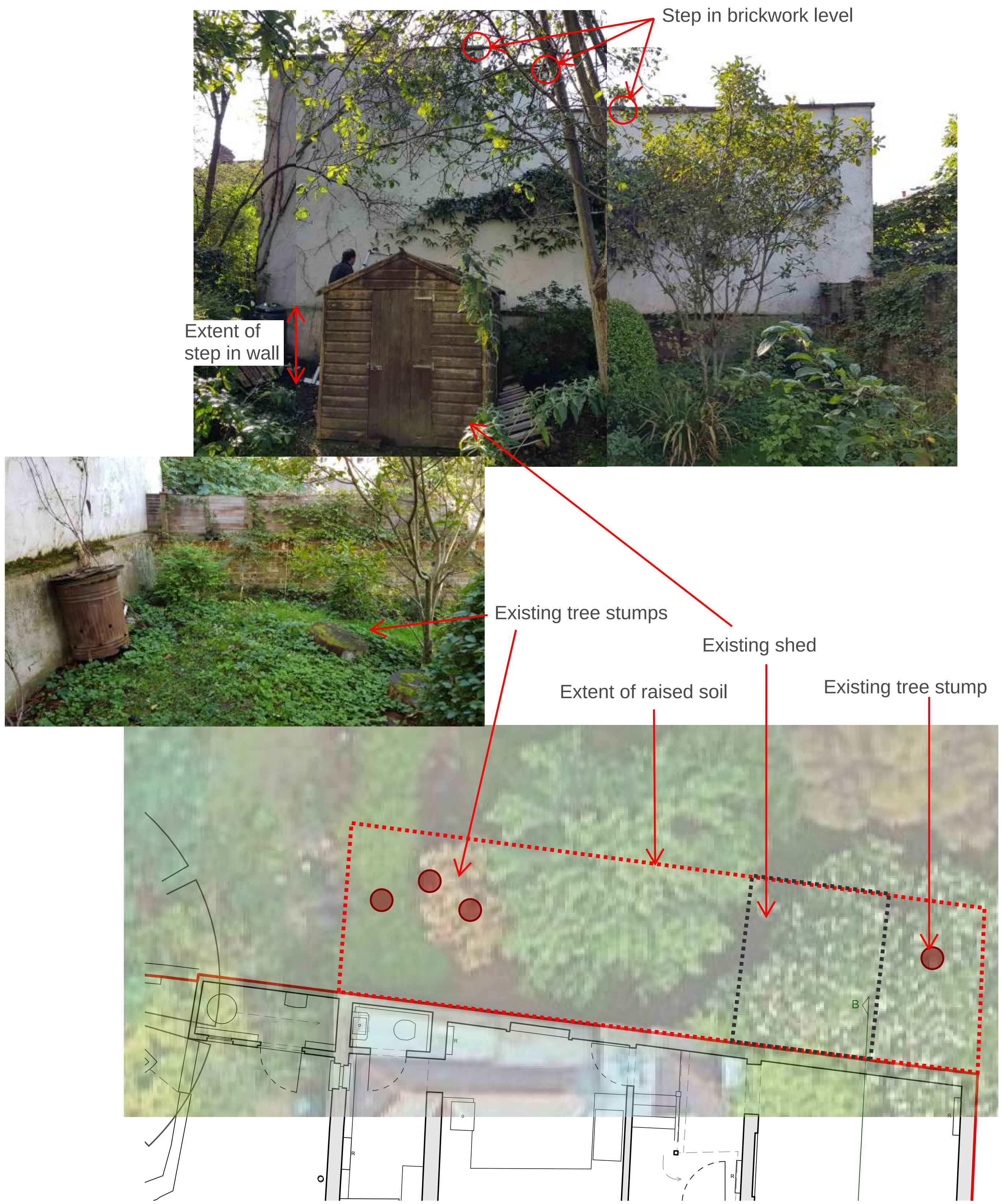
Appendix B
North Elevation
Condition Sketch



Overview of Surrounding Area

Crack Location Elevation Sketch

Key:

- Crack <0.5mm
- Crack >0.5mm
- Previously repaired crack
- Visual Confirmation of crack extending into masonry

Photo of Crack A

Photo of Crack B

Project			
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Sketch Title		Date	
North Elevation Condition Sketch		20 / 10 / 2023	
Project No	Sketch No	Rev	By
2018	2018-S-SK05		RH

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Appendix C
South Elevation
Condition Sketch

Crack Location Elevation Sketch

Overview of Surrounding Area

Key:

- Crack <0.5mm
- Crack >0.5mm
- Visual Confirmation of crack extending into masonry

Photo of Crack A

Photo of Crack B

Project			
Greencroft Gardens			
Sketch Title		Date	
South Elevation Condition Sketch		20 / 10 / 2023	
Project No	Sketch No	Rev	By
2018	2018-S-SK06		RH

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Appendix D

East Elevation Condition
Sketch

Existing tree adjacent
to property wall

Existing climbing plant
with removed base

Overview of Surrounding Area

Crack Location Elevation Sketch

Note: East wall was not accessible, therefore cracks shown indicatively from photographic evidence provided.

Key:

Crack >0.5mm

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Appendix E

2020 Structural Report

Residential

MMC

Carbon Zero

99

Westcroft Cottage, 134 Greencroft Gardens, West Hampstead, London, NW6 3PJ

99 structural engineers

Structural Report
01g-99SE-Report-0100-B01
J. Hurle 18-Dec 20

1 Introduction

1.1 Version History

Date	Engineer	Revision
17-Dec 20	J. Hurle	B01 - Issue for Information

1.2 Scope, Definitions and Usage

99 Structural Engineers (“We, Our, Us”) were appointed by Mr Charles Squire (“You, Your”) in December 2020 to inspect cracking referred to in the Surveyor’s Report (“the Damage”) at Westcroft Cottage, West Hampstead, NW6 3PJ (“the Property”).

The Property is a two-storey detached Mews house on a private road between Canfield Gardens to the North and Greencroft Gardens to the south. It is L-shaped in plan with the main entrance accessible from the West. Directions are given as if standing on Greencroft Gardens facing the South Elevation (Figure 01).

A non-intrusive inspection of the inside and external elevations of the Property was undertaken from 14:15 on Monday 14th December 2020 lasting about an hour (“the Visit”). The North Elevation was accessed from 117 Canfield Gardens, the South Elevation from 130 Greencroft Gardens and the East Elevation from 128 Greencroft Gardens respectively.

Figure 01:- The Property (Google satellite imagery)

During the Visit there was light rain. John Hurle attended and was shown around the inside of the Property by Joshua, Your agent from Savill’s (“the Agent”). You then showed Us around the external elevations. A tape measure was used to measure the crack widths where these could be reached from ground level. Furniture was not moved as the Property was habited. We discussed the main findings with You before the Visit concluded. A plan of the Property is included in the Appendix.

Except where other sources are referenced, all the observations in this report are based on what was inspected during the Visit. This document has been produced for Your exclusive use and should not be used in whole or in part by any other third parties without Our written permission.

1.3 Further Information

In case You require any further clarification, please contact

John Hurle
MEng CEng MICE PMP
Managing Director

john@99structuralengineers.com
07956 013942

2 Executive Summary

In Our opinion the Property is safe in its current state.

There is cracking to the North, East and South elevations which is believed to be caused by thermal expansion. It is not deemed a structural concern, however it is unsightly and may lead to damp patches forming inside the Property if not properly repaired and regularly maintained.

The tree (“T1”) in the North-East corner is believed to be causing that corner of the house to go down. The width of the cracking at high level couldn’t be verified with the available access equipment but is suspected to be more than the damage threshold of 2mm indicating subsidence.

If the cracking is caused by T1 this will become more severe as the tree grows. To prevent the cracking becoming more severe ideally the owner of T1 should be approached to ask if they can prune their tree or even remove it. Alternatively if this cannot be arranged with sufficient regularity then we would recommend underpinning this corner of the Property.

Once the root causes of the cracking have been addressed there will need to be suitable internal redecoration internally and externally.

3 Observations

3.1 The Property

The Property is a Mews house faced with brick (Figure 02). The age of the property could not be ascertained from a desk study but based on appearances it is assumed to be of traditional construction with a timber framed roof and floors resting on masonry walls. The depth of the foundations is unknown.

Figure 02:- Front Elevation of the Property

Subsequent to the Visit a desk study of the British Geological Survey geological maps suggest that the local geology is London Clay - clay, silt and sand with no superficial deposits (Figure 03).

London Clay is a cohesive soil (as opposed to granular) which means changes in the soil moisture content can result in shrinkage or heave. It typically has a plasticity index above 40% and is therefore classified as ‘High Volume Change Potential’. This is an important variable for calculating the possible impact of any surrounding trees.

Figure 03:- The Geological Map for the Property (shown circled) indicates London Clay Formation - Clay, silt and sand.

3.2 The Damage

Figure 04:- Ground Floor North-East corner, facing North

Internal

The Agent pointed us to the relevant cracking internally, principally one location at ground floor and one location at first floor. Cracking was observed within the main reception room at ground floor, in the north-east corner of the Property. There were very fine hairline cracks extending vertically down from the coving on the north wall and then horizontally (Figure 04). These were visible with the naked eye but may not be clear in the photos.

Figure 05:- Ground Floor North-East corner, facing East

On the east wall there was a larger crack, measured as 1mm wide, extending diagonally down from mid-height at the corner (Figure 05).

Figure 06:- First Floor North Elevation approximately a third of the way along the elevation from the North-East corner

Cracking was noted at the first floor within the north-east corner bedroom approximately a third of the way along the North Elevation. Vertical cracks had formed close to the return wall. The cracks were measured as approximately 0.5mm in width.

Figure 07:- North Elevation

North Elevation

From the North Elevation the roof is stepped in three levels. A vertical crack was visible coming down from where the highest roof level steps down. This was measured near ground level as 0.5mm wide. As it occurs approximately at the same height and lateral position as the crack noted internally at first floor it may be that the crack has penetrated through the wall.

The North-East corner of the house has a climbing plant attached to it believed to be Ivy. There is a tree ("T1") at the North-East corner of the house which is believed to be a Buckthorn although an arboriculturalist would be able to identify it more conclusively. The neighbour said the tree in their garden ("T2") is a Plum, it was measured as being 3m away from the North Elevation.

Figure 08:- South Elevation

South Elevation

The finishes on the South Elevation (Figure 08) are in a very poor state of repair with an established climbing plant at the south-east corner which appears to have withered.

Cracks less than 1mm wide were observed on the South Elevation at the mid-point extending from the valley line at roof level to ground approximately vertically. Vertical cracking was also visible at the three quarters point which was more pronounced at ground level suggesting that it is propagating vertically upwards. Some horizontal cracking was also observed (Figure 09).

Figure 09:- Bottom Right-Hand Side Detail of South Elevation

East Elevation

The East Elevation has a large crack (Figure 10) approximately a third of the width of the wall away from the North-East corner where cracking was observed internally.

The external crack is vertical and was measured at ground level as 1mm wide but appeared to be more pronounced at height and is thought to exceed 2mm in places.

Figure 10:- East Elevation looking up

Figure 11:- East Elevation detail of crack

4 Conclusions

4.1 The Pattern of Damage

The Damage we observed appears to coalesce around two patterns related to different sources of movement.

Firstly vertical cracking was noted to the north, east and south elevations suggestive of horizontal movement. This was visible in the render although it is not clear to what extent if any it has propagated into the brickwork behind, except on the north elevation at first floor where it has manifested on the internal face.

Secondly there is a suggestion of movement downwards and outwards at the North-East corner evidenced by the diagonal crack internally in the Reception Room, the crack on the North Elevation propagating through the wall at first floor suggesting that it is opening up starting at the top, also a similar phenomenon of the crack widening with height was observed on the East Elevation.

4.2 Possible Causes

Thermal Expansion

The former pattern of cracking is characteristic of thermal expansion and contraction due to seasonal variations and the passage of the sun.

Contemporary best practice is to detail movement joints in the masonry and any render applied. This controls where the movement occurs rather than it propagating at a weak point. As a minimum movement joints for brickwork are required every 12m run or within 6m of a corner. They should also be considered at changes in massing for instance the cracks at the Property seem to have initiated at transition points in the roofline which act as nucleation points for stress build-up.

Subsidence

The latter pattern of cracking is suggestive of external factors. When movement caused by external factors exceeds the ‘Damage Threshold’ then it is referred to as subsidence. Definitions of the Damage Threshold vary but one authoritative version is defined in the quote below.

“a crack in a property which is 2mm or less in width and which does not vary by more than 1mm in width during the course of an annual seasonal cycle of ground movements, atmospheric and temperature changes, may be regarded as inconsequential.”

Definition of the Damage Threshold, Institution of Structural Engineer’s Guidance Document on Subsidence of Low Rise Buildings 2nd Edition (2000) section 2.2.1

Subsidence can be caused by a variety of external factors such as mining, sinkholes or the presence of underwater rivers; which are unlikely in this particular case. As the Property is built on shrinkable soil (Section 3.1) concentrations of water could cause subsidence such as by over-flowing gullies or external taps flowing onto the ground. This does not appear to pertain to this Property. Therefore by elimination We think the most likely cause of the subsidence is T1, the Common Buckthorn planted up against the North-East corner of the Property.

We have done a calculation to assess what would be required to negate the risk of T1 causing subsidence. The foundations would have to be based below the desiccated layer created by the tree’s roots. Our calculations suggest that this would need to be 2.30m below ground level or underpinning installed to the same depth. This is based on the widely accepted NHBC guidance on the Impact of Trees. The Common Buckthorn is broad leafed, assumed to be Moderate water demand and our research suggests it can grow to 10m tall. Although the NHBC data does not include that specific species We have used Alder with those parameters to give a reasonable proxy.

4.3 Recommendations

In Our opinion the Property is safe in its current state.

The cracking from thermal expansion is not a structural concern, however it is unsightly and may lead to damp patches forming inside the Property if not properly repaired and regularly maintained.

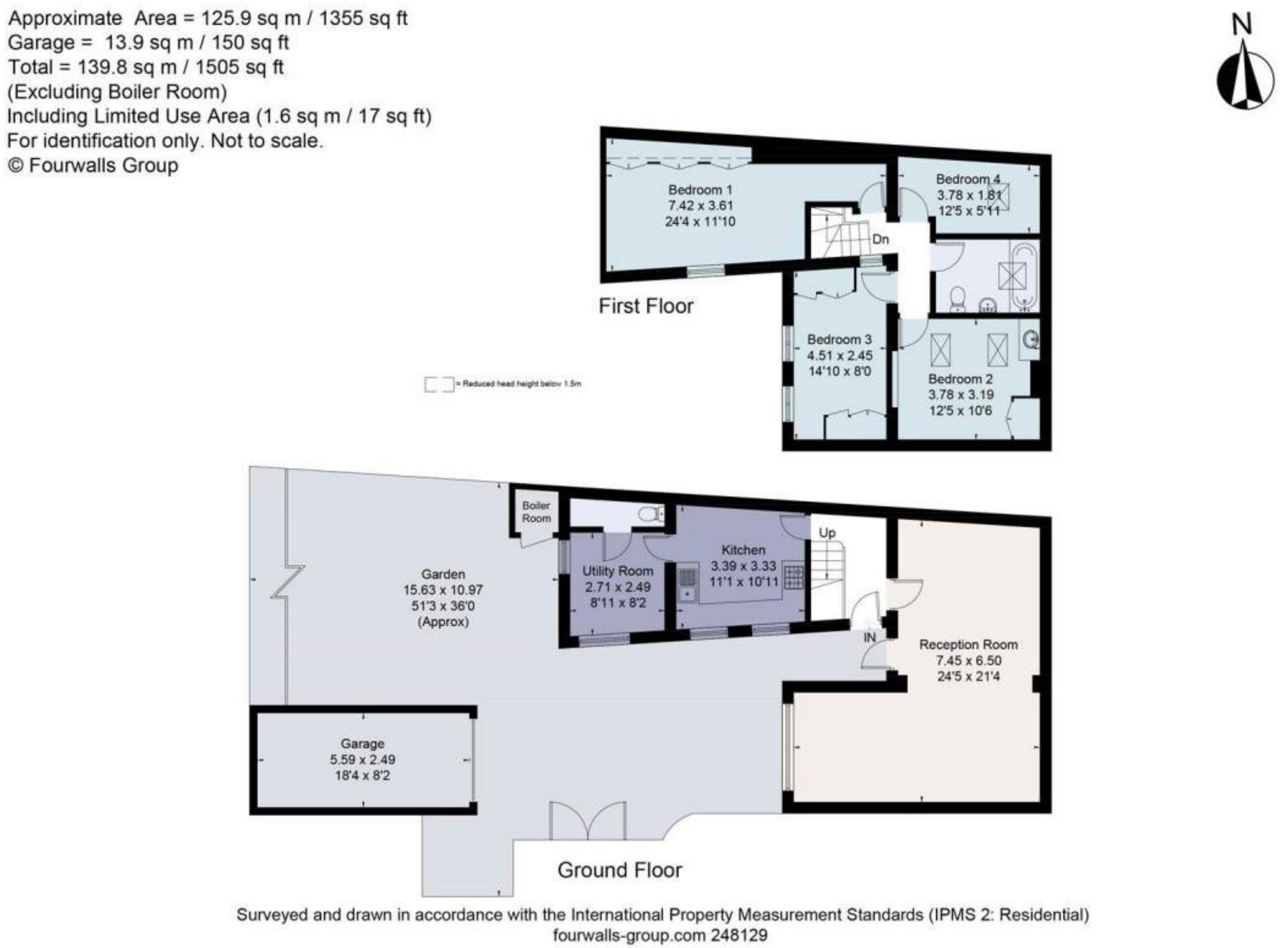
The cracking caused by T1 is suspected to be above the damage threshold of 2mm and therefore to have caused subsidence. This needs to be verified by someone with the appropriate access equipment as it can only be inferred from ground level.

If the cracking is caused by T1 this will become more severe as the tree grows. It is estimated to be 5m high at present and may grow to 10m high. To prevent the cracking becoming more severe ideally the owner of T1 should be approached to ask if they can prune their tree or even remove it. Alternatively if this cannot be arranged with sufficient regularity then we would recommend underpinning this corner of the Property.

Once the root causes of the cracking have been addressed there will need to be suitable internal redecoration internally and externally.

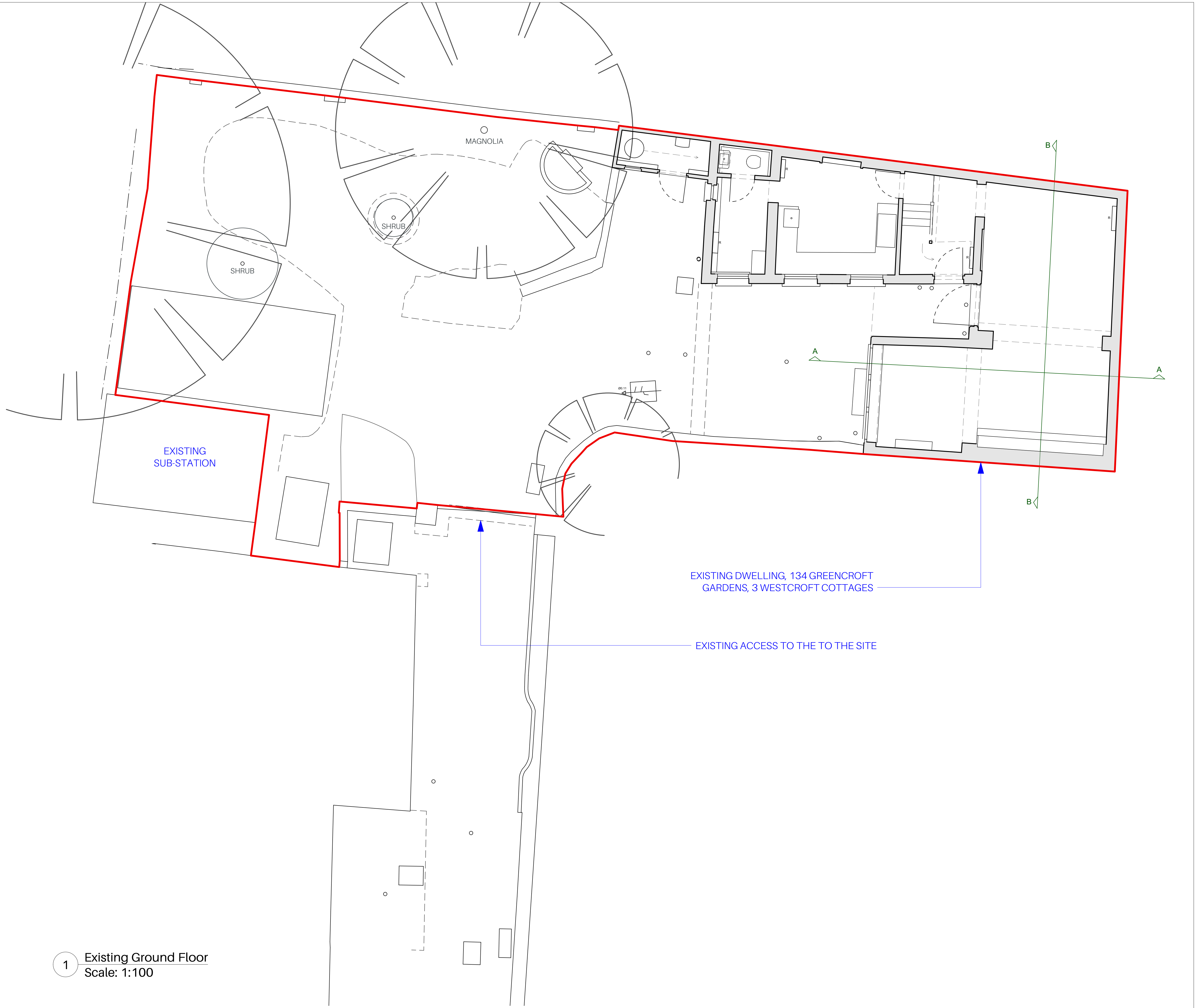
5 Appendix A

Floor Plan



Appendix F

Architectural Drawings



1 Existing Ground Floor
Scale: 1:100

Notes

Site Boundary

N

0m 1m 2m 3m 4m 5m

REV	DATE	DESCRIPTION	BY	CHK
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Site Address
134 Greencroft Gardens, 3 Westcroft Cottage, London, NW6 3PJ

Drawing
Ground Floor Plan - Existing

Job Number	Drawing Number		Rev
22028	0100		0
Drawn	**Date**	**Status**	**Scale @ A3**
CD	21/02/23	PRE-APP	1:100

Holland Harvey Architects
Unit 1.4
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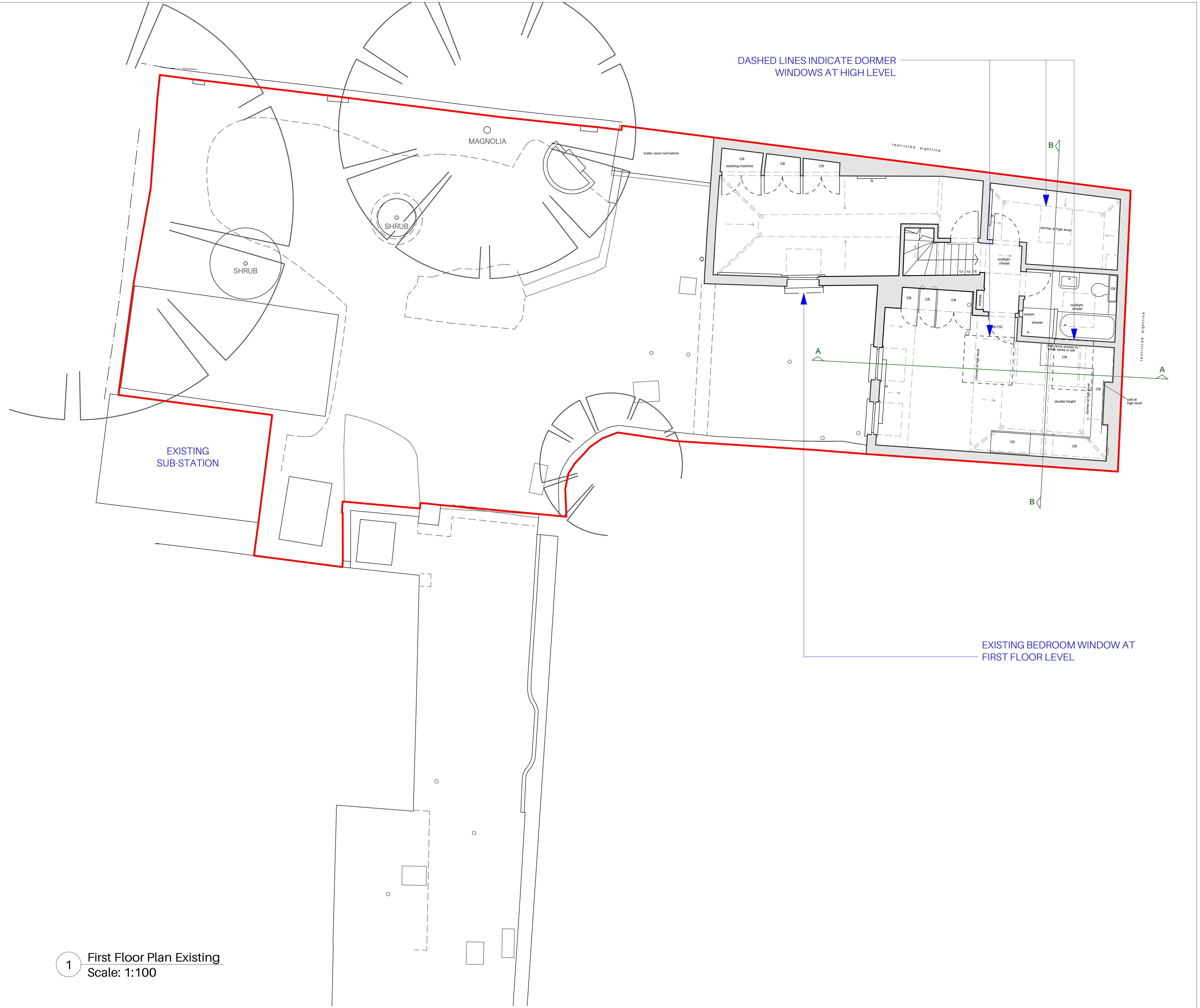
London E2 9DG
hello@hollandharvey.com
+44 203 327 0340

Client

Mr and Mrs Squire

134 Greencroft Gardens, 3 Westcroft Cottage, London, NW6 3PJ

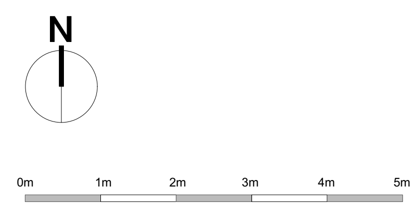
Do not scale from this drawing. All dimensions are to be checked on site. This drawing is to be read in conjunction with all consultants information.



1 First Floor Plan Existing
Scale: 1:100

Notes

Site Boundary



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Site Address
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Drawing
First Floor Plan - Existing

Job Number	Drawing Number		Rev
22028	0101		0
Drawn	**Date**	**Status**	**Scale @ A3**
CD	21/02/23	PRE-APP	1:100

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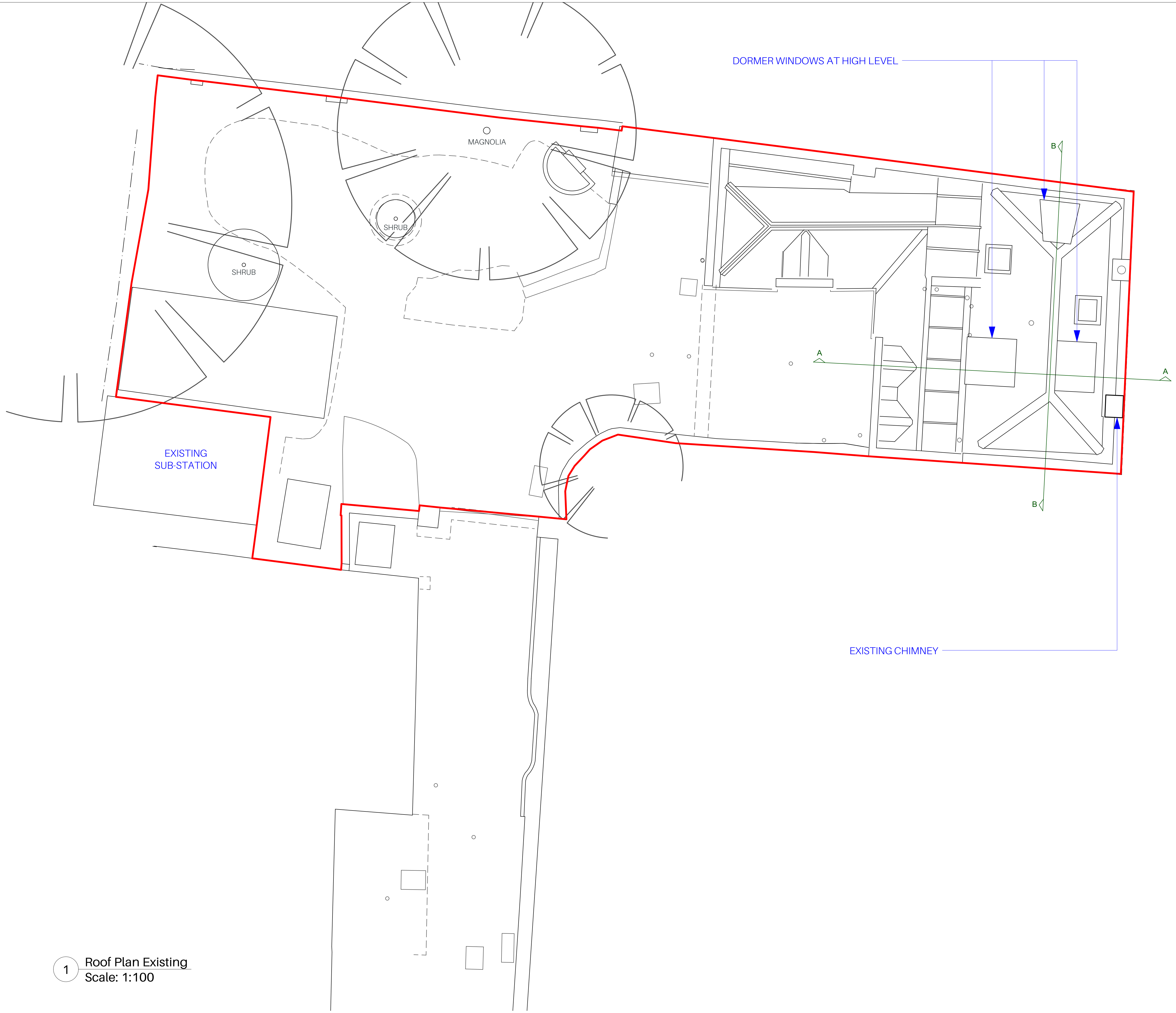
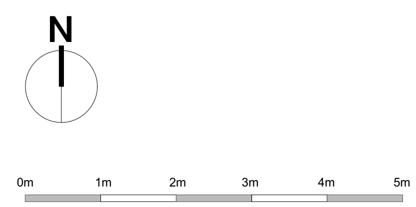


1 Roof Plan Existing
Scale: 1:100

Notes

Site Boundary



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Site Address
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Drawing
Roof Plan - Existing

Job Number	Drawing Number	Rev
22028	0102	0

Drawn	Date	Status	Scale @ A3
CD	21/02/23	PRE-APP	1:100

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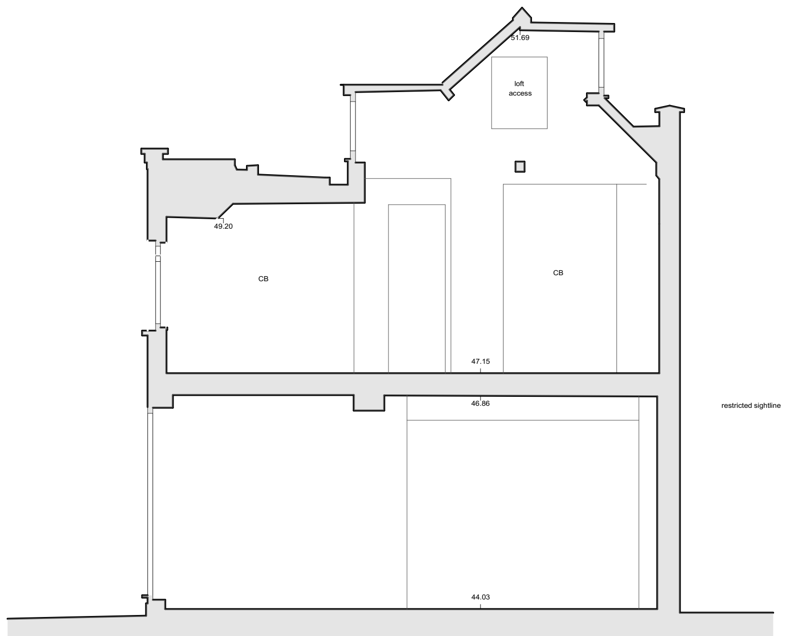
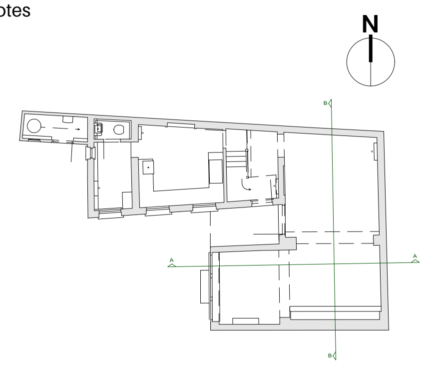


2 Section AA
Scale: 1:100

Notes



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Project Greencroft Gardens			
Drawing Section AA - Existing			
Job Number 22028	Drawing Number 0200		Rev 0
Drawn CD	Date 21/02/23	Status PRE-APP	Scale @ A3 1:100

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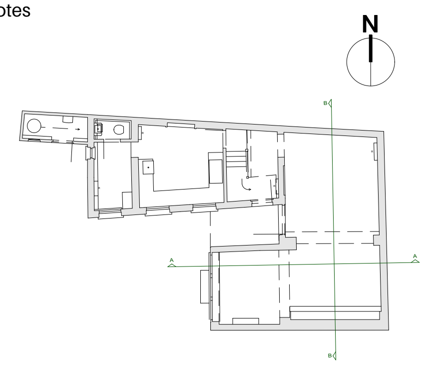
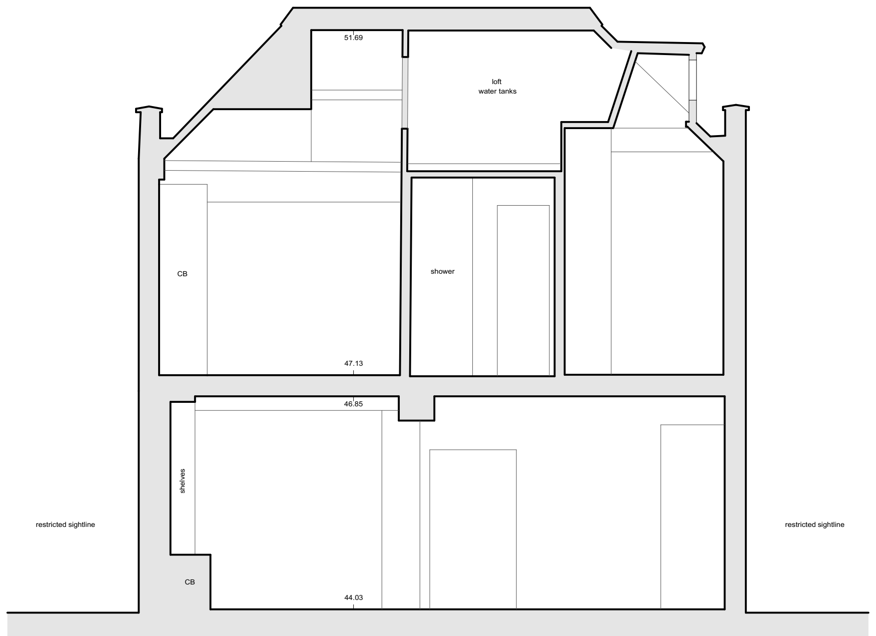
Notes





1 Section BB
Scale: 1:100

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Project
Greencroft Gardens

Drawing
Section BB - Existing

Job Number	Drawing Number		Rev
22028	0201		0
Drawn	Date	Status	Scale @ A3
CD	21/02/23	PRE-APP	1:100

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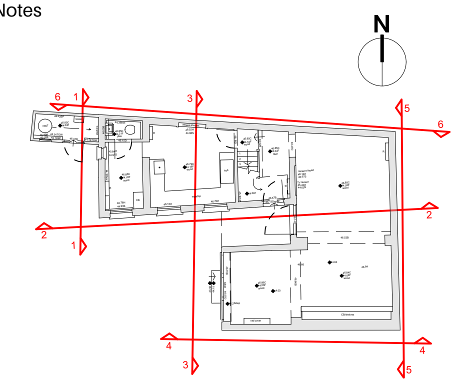
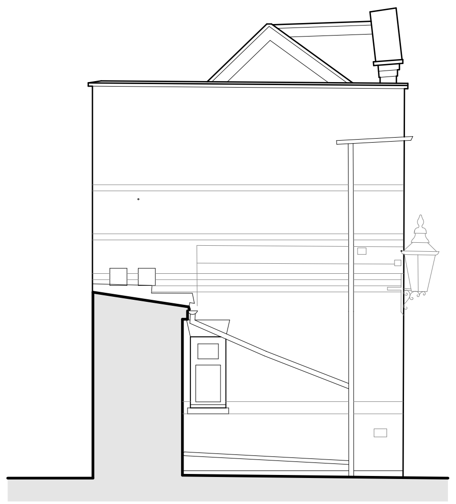
Notes





1 Elevation 1
Scale: 1:100

2 Elevation 6
Scale: 1:100

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Project
Greencroft Gardens

Drawing
Elevation 01 & 02 - Existing

Job Number	Drawing Number		Rev
22028	0300		0
Drawn	Date	Status	Scale @ A3
CD	21/02/23	PRE-APP	1:100

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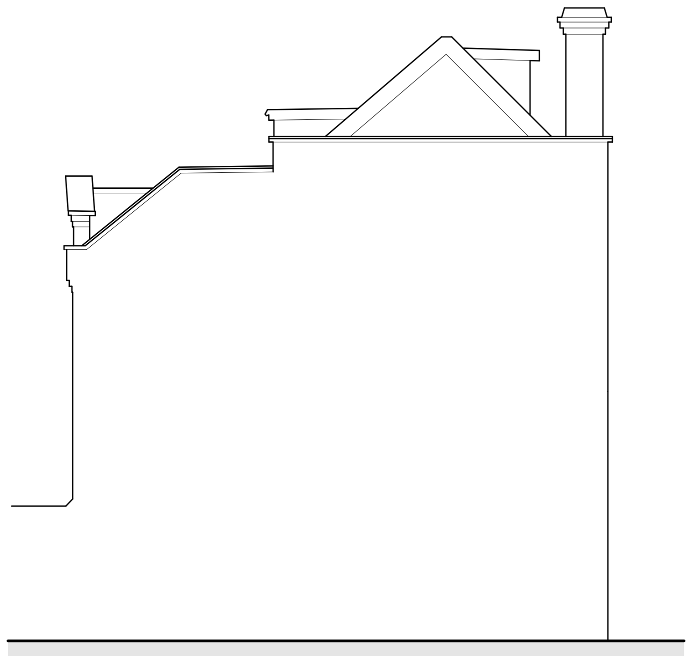
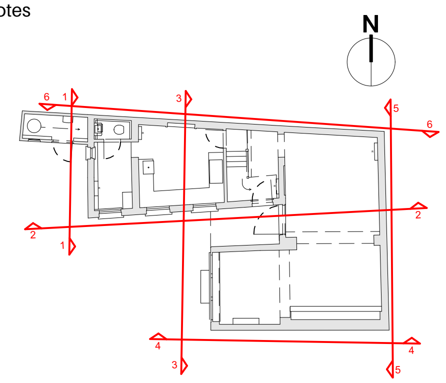
1 Elevation 3
Scale: 1:100



2 Elevation 4
Scale: 1:100

Notes



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Project
Greencroft Gardens

Drawing
Elevation 03 & 04 - Existing

Job Number	Drawing Number		Rev
22028	0301		0
Drawn	Date	Status	Scale @ A3
CD	21/02/23	PRE-APP	1:100

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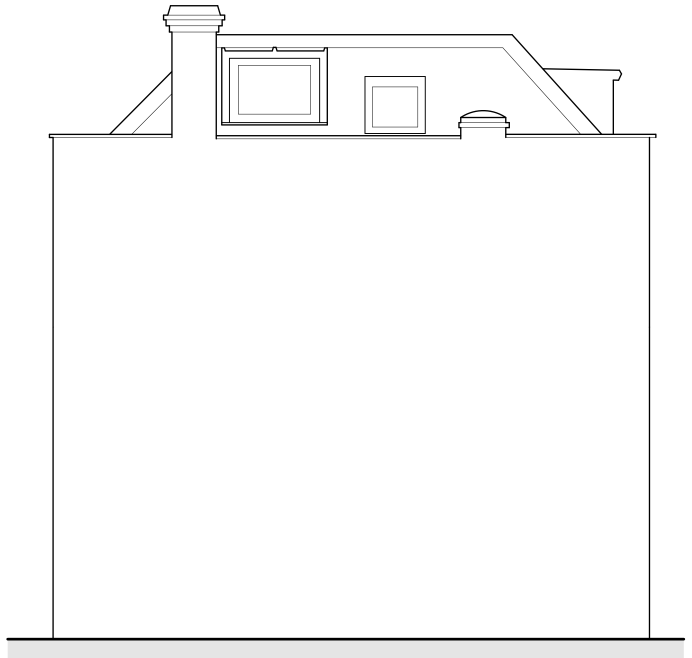
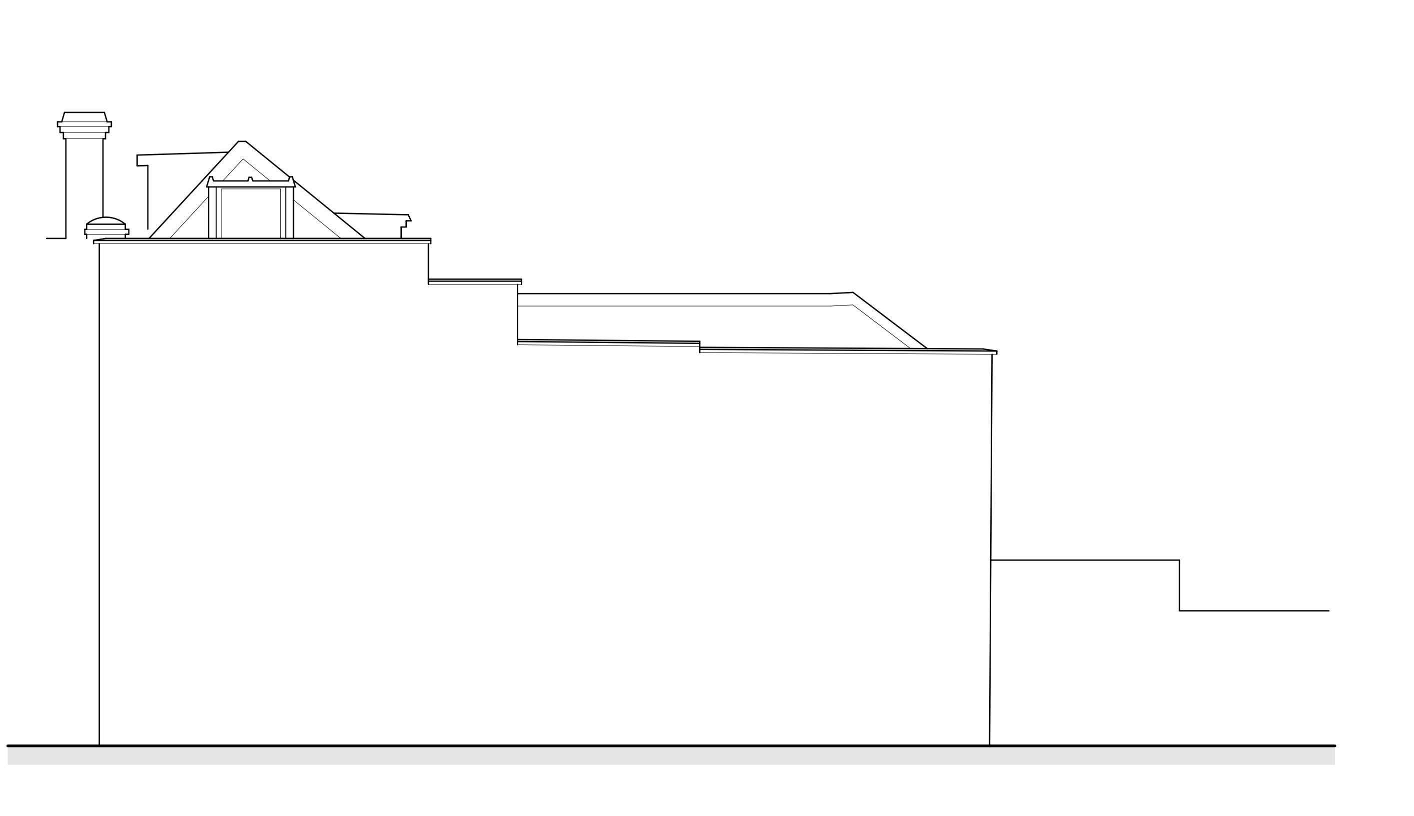
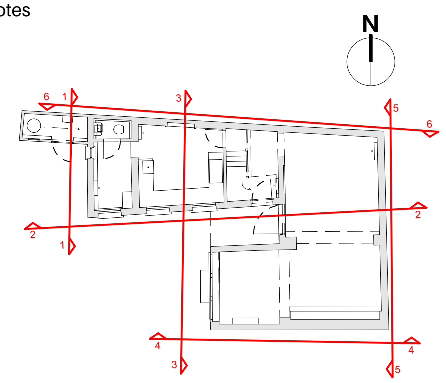


1 Elevation 5
Scale: 1:100



2 Elevation 6
Scale: 1:100

Notes



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Project Greencroft Gardens			
Drawing Elevation 05 & 06 - Existing			
Job Number 22028	Drawing Number 0302		Rev 0
Drawn CD	Date 21/02/23	Status PRE-APP	Scale @ A3 1:100

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