

10 Chorlton Green Structural Strategy

Ref: LM22254-DYSE-XX-ZZ-RP-S-0001

Rev: P01

Date: 06/01/2023

Client: Jo Dogherty

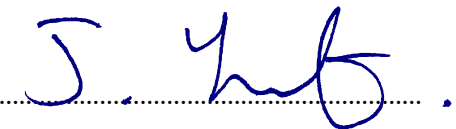
Document Control

Originator:

J Yusuf MEng CEng MStructE

Date:

06/01/2023



Checker:

J Billington MEng (Hons)

Date:

06/01/2023

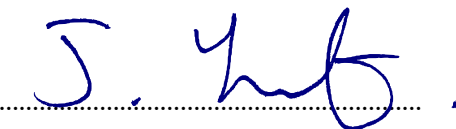


Approver:

J Yusuf MEng CEng MStructE

Date:

06/01/2023



Rev	Issue	Date	Originator	Checker	Approver
P01	First Issue	06/01/2023	JDY	JB	JDY

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- Appendix E - DYSE project team

1 Introduction

DYSE have been appointed by the client to act as consulting structural engineers for the proposed development at 10 Chorlton Green. The development proposes to refurbish and rationalise a former dairy.

This report outlines the concept structural design for the proposed development and has been undertaken to RIBA work stage 2, concept design.

The purpose of this report is to provide outline structural design and specifications for informing architectural design and to inform the approach to conservation. The structural scheme considered is subject to detailed design and further consideration with both architectural and services design.

2 Site

2.1 Location

10 Chorlton Green

2.2 Site history

The site is a former dairy and listed. It has most recently been, and is currently being, used as a residential dwelling.

2.3 Listing

The existing building is listed. The listed is recorded as the following:

'Farmhouse, now house. Probably early C19; altered. Red brick in Flemish bond, slate roof. Double-depth 4-room plan plus service wing attached to right-hand rear corner and half-sunk dairy in angle. Two storeys and 2 windows, symmetrical; central doorway with pitched wooden canopy and altered door; 2 segmental-headed windows on each floor (all now top-hung casements imitating sashes). Casement windows at rear. Forms group with Gatehouse and bell-turret opposite, and Green's Farmhouse to right.'

2.4 Existing building

The existing building is a two storey building of traditional construction comprising of cut timber roofs, suspended timber first floors and load bearing masonry internal and external walls. Some non load bearing partitions are present. Lintels are anticipated to be generally historic timber, and foundations are anticipated to be brick corbelled foundations.



Figure 1 Architects visual of rear entrance

2.5 Geology

2.5.1 Intrusive ground investigations

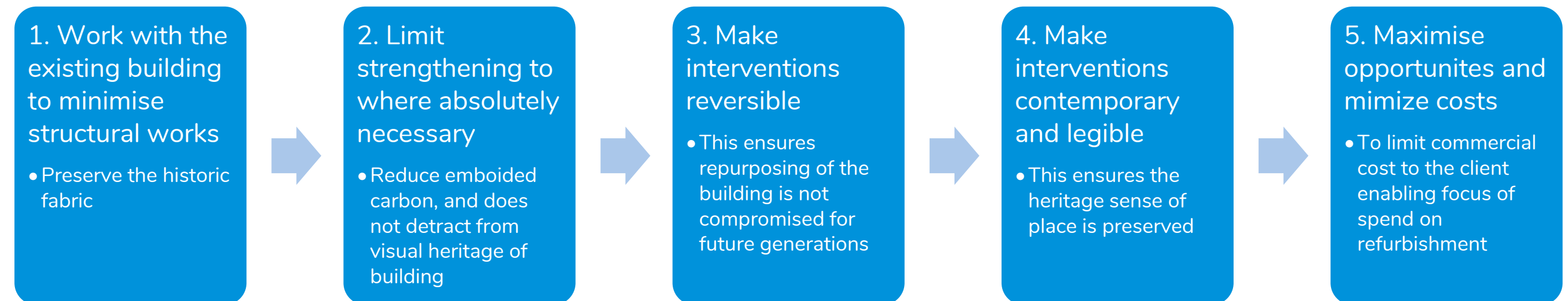
Intrusive ground investigations were undertaken by Murray Rix in December 2022. Results are appended to this document.

Generally foundations were noted as shallow brick corbel and shallow concrete strip foundations, founded on MADE GROUND and medium dense SAND.

3 Structural conservation approach

There are several interventions proposed to the existing building fabric, as summarised below. The aim to the interventions will be to provide low embodied carbon and cost effective structural refurbishment whilst protecting and preserving the historic building fabric.

The key structural design principles considered in this design, in order or priority, are:



4 Structural interventions

The below table summarises the key structural interventions and the structural approach. The proposed structural scheme is also appended to this document.

Intervention reference	Description	Floor	Demolition / addition / reinstatement	Structural approach	Structural principles	Further work required
2	Formation of new internal doorway to GLD between proposed extension and existing building.	Ground	Demolition	Installation of steel beam. Beam to be exposed and supported on exposed padstones.	1 – reduce extension size by improving function of existing building. 4 – exposed structure in contemporary construction.	
3	Reinstatement of internal doorway.	Ground	Reinstatement	Installation of proprietary steel box lintel.	1 – reduce extension size by improving function of existing building. 3 – reversed intervention, formed in sympathetic construction.	
4	Removal of existing stair case to GLC.	Ground/First	Demolition	Installation of steel beam. Beam to be exposed and supported on exposed padstones.	1 – reduce extension size by improving function of existing building. 4 – exposed structure in contemporary construction.	
5	Formation of new internal opening adjacent to stair landing.	First	Demolition	Installation of proprietary steel box lintel.	1 – reduce extension size by improving function of existing building.	
6	Formation of new internal doorway to GL3.	First	Demolition	Installation of pair of proprietary steel box lintels.	1 – reduce extension size by improving function of existing building.	
7	Formation of new internal doorway from master bedroom to en-suite.	First	Demolition	Installation of pair of proprietary steel box lintels.	1 – reduce extension size by improving function of existing building.	
8	Extension.	First	Addition	Extension to be lightweight, timber frame. Consideration to be given to cladding and roofing the extension in alternative to brick and slate.	3 – lightweight construction, reversible. 4 – legible addition.	Investigation of existing foundations and ground conditions.
9	Reinstatement of original wall on GL4.	Ground	Reinstatement	Use recycled brickwork for the infill and rebuild in lime mortar.	3 – reversed intervention, formed in sympathetic construction.	
10	Replacement of sash windows.	Ground/First	Reinstatement	Reinstatement of like for like timber sash windows. Provisionally allow for replacement timber lintel to the window head.	3 – reversed intervention, formed in sympathetic construction.	Investigation of condition of existing timber lintels.
12	Extension.	Ground	Addition	Structure formed in engineered timber. Interface with existing structure to be minimised where possible.	3 – lightweight construction, reversible, minimal interface with existing. 4 – legible addition.	

Intervention reference	Description	Floor	Demolition / addition / reinstatement	Structural approach	Structural principles	Further work required
13	Removal of canopy.	Ground	Demolition	Demolition of existing canopy.	5 – allows for extension to improve function of building.	

5 Considerations for refurbishment

5.1 Vertical loading

The building has most recently been used as a residential dwelling so it is not proposed to change the use of the building, providing the building is currently serviceable and free of significant defects, it should remain serviceable.

The most significant change in loading is the addition of a first floor extension over the part subterranean vaulted arch room.

It is proposed to form a lightweight timber frame structure over this to minimise additional load on the existing structure.

Based on the ground investigation data, a load appraisal has been undertaken to compare the existing and proposed load on the foundations. The calculations are appended to this document. The below table summarises the findings.

	Existing (kN/m)	Proposed (kN/m)	% Increase
Permanent load	51	53.2	+4.3
Variable load	1	3.4	+240
Total load	52	56.6	+8.8

The total load increase on the foundations is less than 10%. We consider a load increase of this magnitude on a relatively heavy load bearing masonry structure to be negligible and acceptable. The additional load is applied at high level and will distribute through the structure to result in a uniformly applied load to the foundations.

The ground conditions are recorded as medium dense SAND. This has a bearing capacity in the

range of 70 – 210kN/m². The applied bearing capacity in the proposed building configuration is 147kN/m², circa the median of the range.

The residual risk of the load increase is the occurrence of marginal settlement as the new storey is added. This will be small in magnitude, occur instantaneously and not be of structural significant.

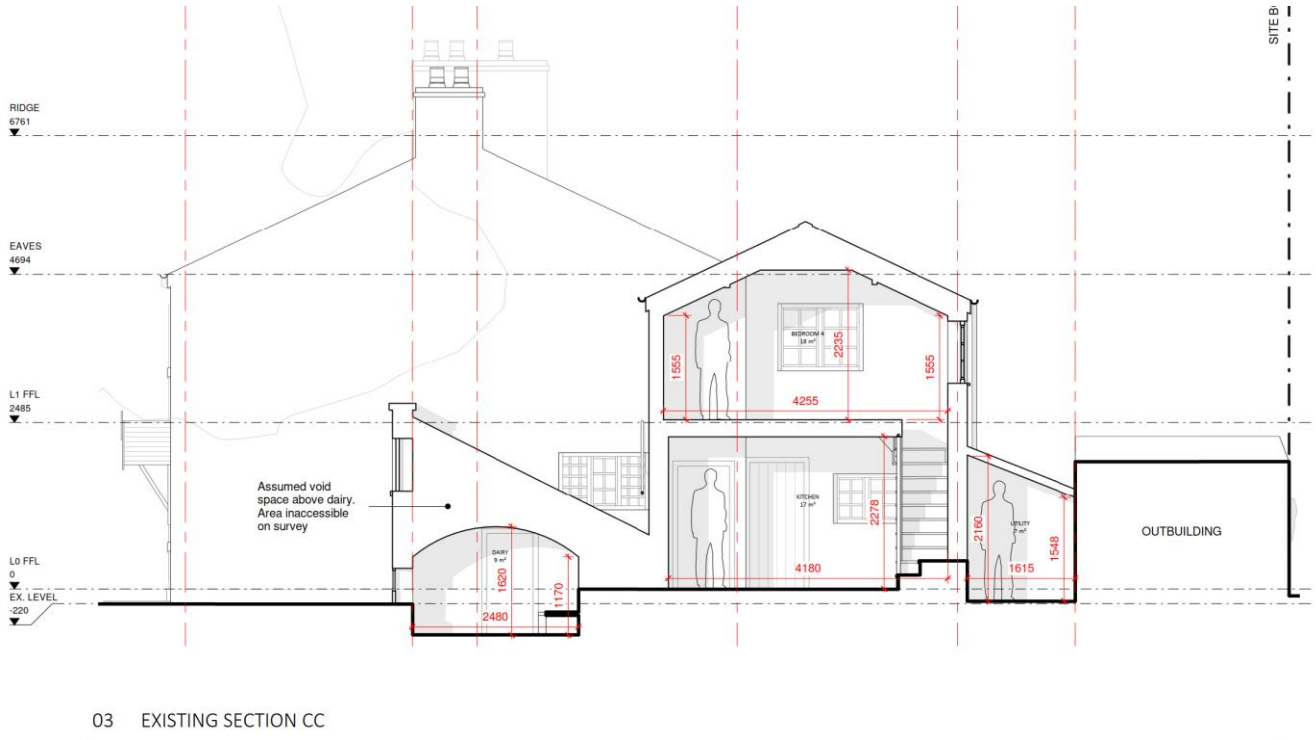


Figure 2 Extract from Space AP drawing indicating existing section

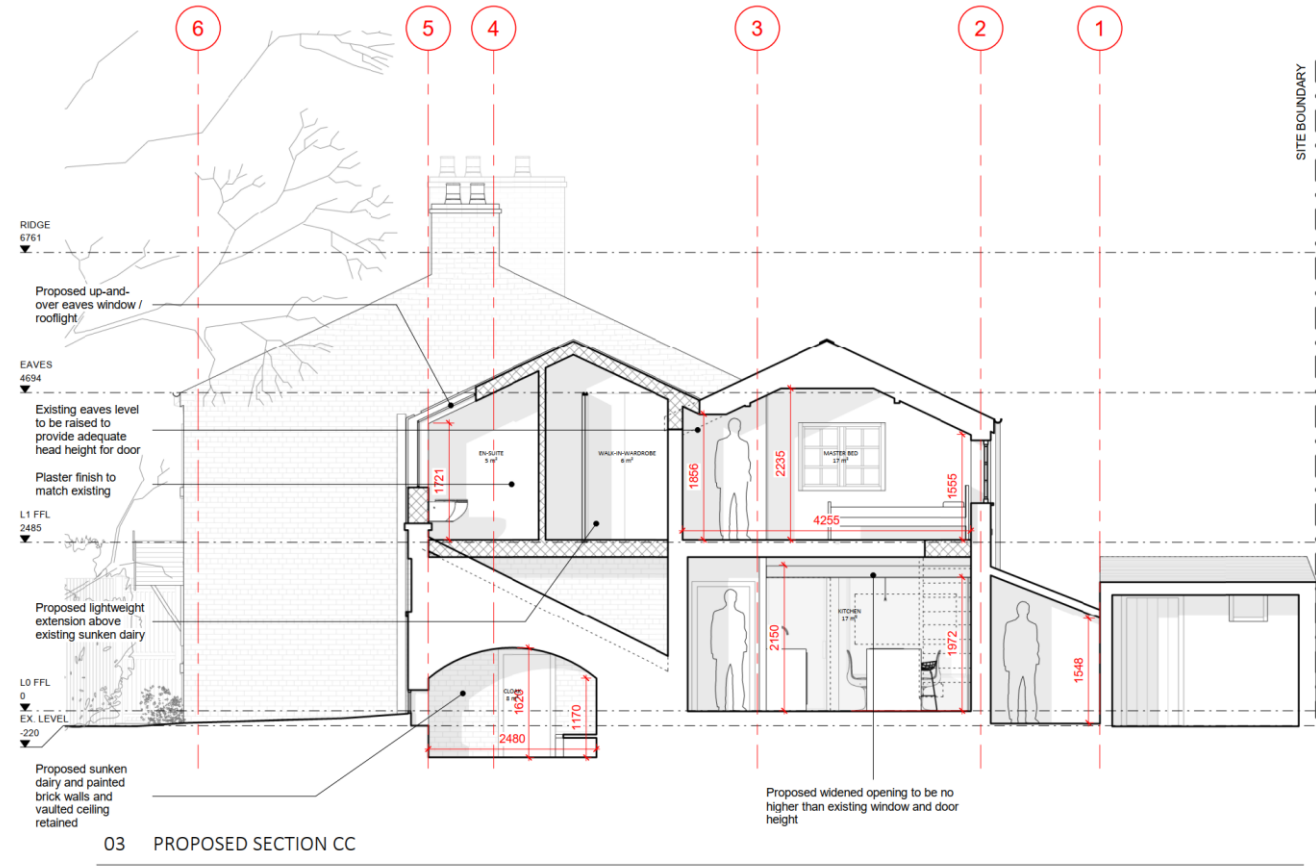


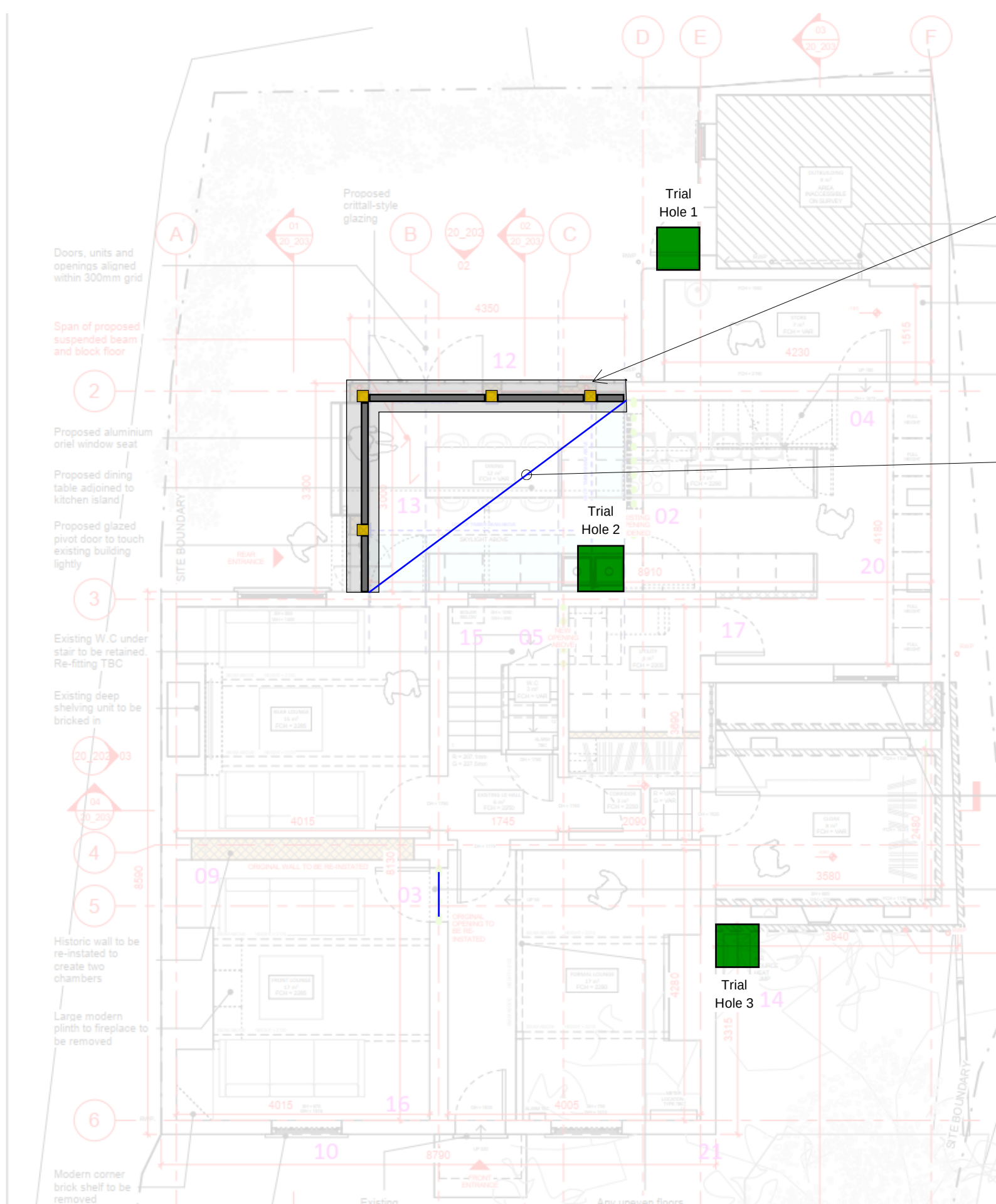
Figure 3 Extract from Space AP drawing indicating proposed section

Appendix A - Structural sketches

LM22254-DYSE-XX-ZZ-SK-S-0011 P01 Proposed foundation scheme

LM22244-DYSE-XX-ZZ-SK-S-0012 P01 Proposed ground floor scheme

LM22244-DYSE-XX-ZZ-SK-S-0013 P01 Proposed first floor scheme



Mass concrete strip foundations founded a minimum of 450mm below ground level.

125mm RC ground bearing slab.

General Notes

- The scheme shown is indicative and subject to detailed structural design.

Ground Investigation Summary

Ground investigations were undertaken by Murray Rix in December 2022 (Murray Rix Report Reference MRN 4282/20).

Trial Hole 1

100mm deep brick corbel with 200mm projection founded on MADE GROUND. below the made ground was medium dense SAND.

Trial Hole 2

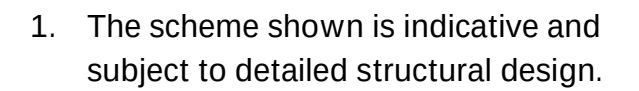
150mm deep concrete foundation with 70mm projection founded at 0.55m BGL on medium dense SAND.

Trial Hole 3

150mm deep brick corbel with 80mm projection founded at 1.25m BGL on medium dense SAND.

Foundation Layout

Project:	10 Chorlton Green	Eng:	JDY
Title:	Foundation Layout	Date:	Jan'23
No:	LM22254-DYSE-XX-ZZ-SK-S-0021	Rev:	P01



Project:	10 Chorlton Green	Eng:	JDY
Title:	Ground Floor Scheme	Date:	Jan'23
No:	LM22254-DYSE-XX-ZZ-SK-S-0022	Rev:	P01

Appendix B - Preliminary calculations

LM22254-DYSE-XX-ZZ-CA-S-0001 Preliminary loading calculations



10 Chorlton Green Calculations 1 Load Appraisal

Ref: LM22254-DYSE-XX-ZZ-CA-S-0001

Rev: P01

Date: 05/01/2023

Client: Jo Dogherty

10 Chorlton Green
Calculations 1

Ref: LM22254-DYSE-XX-ZZ-CA-S-0001
Rev: P01

Document Control

Originator: J Yusuf MEng CEng MStructE

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Date: 05/01/2023

J. Billington

Approver: J Yusuf MEng CEng MStructE

Date: 05/01/2023

J. Yusuf

Rev	Issue	Date	Originator	Checker	Approver
P01	First Issue	05/01/2023	JDY	JB	JDY

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1 Introduction

1.1 Overview

The following calculations have been completed with respect to an additional storey on an existing masonry wall.

These calculatiosn provide a load appraisal to consider whether the existing foundations can support an increase in load.

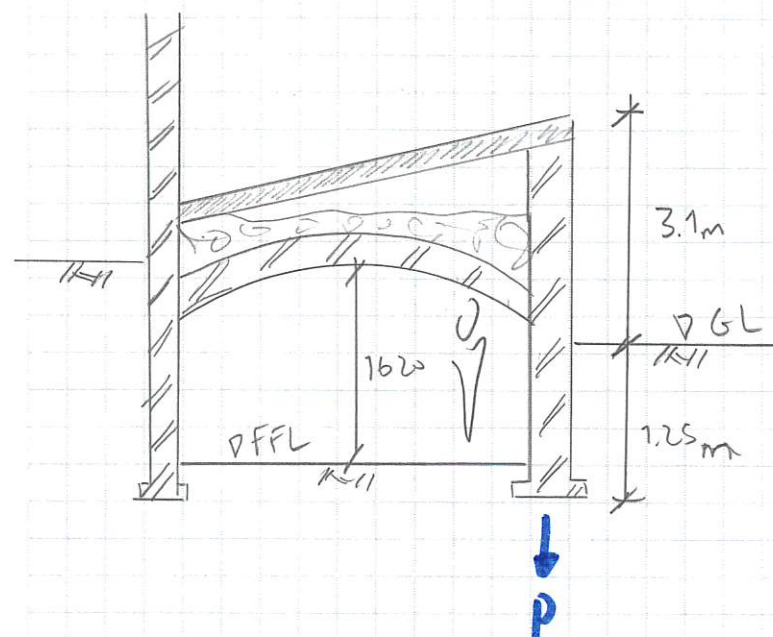
2 Structural Analysis and Design

Part	Part	Page
1	Loading	1

DYSE STRUCTURAL ENGINEERS	Project Name: 10 Chorlton Green			
	Project Number: LM22254			
	Calculation: Loading			
Eng: JDY		Date: Jan'22	Chk' by:	Sheet: 1 Rev: P01

Element 1	Cavity wall (brick and brick)			Load	t, (m)	Total	
	Brick	Density (kN/m3)	Brick, clay	20.00	0.10	2.00	kN/m ²
	Insulation	Density (kN/m3)	Insulation, expanded board	0.50	0.10	0.05	kN/m ²
	Brick	Density (kN/m3)	Brick, clay	20.00	0.10	2.00	kN/m ²
	Services	Area (kN/m2)	Services	0.05	-	0.05	kN/m ²
	Wallboard & Skimcoat	Area (kN/m2)	Plaster, 13mm wallboard and skim coat	0.12	-	0.12	kN/m ²
				-	-	0.00	kN/m ²
						4.22	kN/m ²
Element 2	Cut roof (slate tiles)			Load	t, (m)	Total	
	Roof Tiles	Area (kN/m2)	Roofing tiles, slate	0.63	-	0.63	kN/m ²
	Battens & Felt	Area (kN/m2)	Battens and felt	0.05	-	0.05	kN/m ²
	Rafters	Area (kN/m2)	Rafters	0.15	-	0.15	kN/m ²
	Services	Area (kN/m2)	Services	0.05	-	0.05	kN/m ²
				-	-	0.00	kN/m ²
				-	-	0.00	kN/m ²
						0.88	kN/m ²
Element 3	Vaulted roof (slate tiles)			Load	t, (m)	Total	
	Roof Tiles	Area (kN/m2)	Roofing tiles, slate	0.63	-	0.63	kN/m ²
	Battens & Felt	Area (kN/m2)	Battens and felt	0.05	-	0.05	kN/m ²
	Rafters	Area (kN/m2)	Rafters	0.15	-	0.15	kN/m ²
	Insulation	Density (kN/m3)	Insulation, Rockwool	1.50	0.15	0.23	kN/m ²
	Services	Area (kN/m2)	Services	0.05	-	0.05	kN/m ²
	Ceiling	Area (kN/m2)	Plaster, 13mm wallboard and skim coat	0.12	-	0.12	kN/m ²
						1.23	kN/m ²
Element 4	Timber floor			Load	t, (m)	Total	
	Finishes	Area (kN/m2)	Finishes, general	0.25	-	0.25	kN/m ²
	Chipboard	Density (kN/m3)	Chipboard	7.00	0.01	0.07	kN/m ²
	Floor Joists	Area (kN/m2)	Joists, floor	0.15	-	0.15	kN/m ²
	Services	Area (kN/m2)	Services	0.05	-	0.05	kN/m ²
	Insulation	Density (kN/m3)	Insulation, expanded board	0.50	0.10	0.05	kN/m ²
	Ceiling	Area (kN/m2)	Plaster, 13mm wallboard and skim coat	0.12	-	0.12	kN/m ²
						0.69	kN/m ²
Element 5	External timber stud (timber clad)			Load	t, (m)	Total	
	Timber cladding	Density (kN/m3)	Timber, softwood	4.00	0.03	0.10	kN/m ²
	Battens & Felt	Area (kN/m2)	Battens and felt	0.05	-	0.05	kN/m ²
	Waterproofing	Area (kN/m2)	Waterproofing	0.10	-	0.10	kN/m ²
	Stud & Insulation	Area (kN/m2)	Studs, 600mm c/c with insulation	0.40	-	0.40	kN/m ²
	Chipboard	Density (kN/m3)	Chipboard	7.00	0.02	0.11	kN/m ²
	Plaster	Area (kN/m2)	Plaster, 13mm wallboard and skim coat	0.12	-	0.12	kN/m ²
						0.90	kN/m ²

EXISTING LOADING

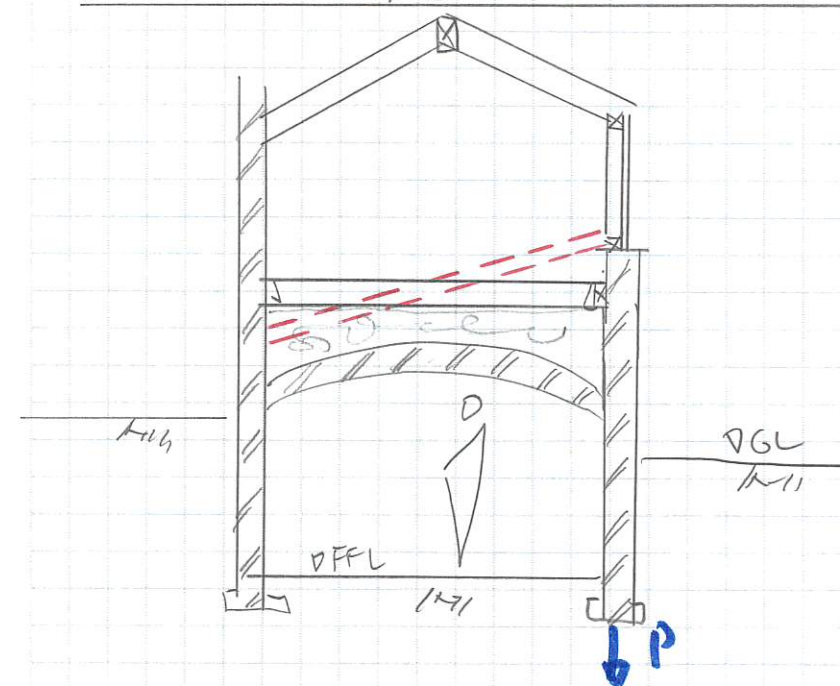


CONSIDER LOAD ON EXISTING FOUNDATION

Roof	$g_h = 3.7/2 \times 0.88 =$	7.63 kN/m
	$g_h = 3.7/2 \times 0.60 =$	7.11 kN/m
Wall	$g_h = 4.35 \times 4.22 =$	78.4 kN/m
Arch	$g_h = 4/2 \times 0.225 \times 22 =$	70 kN/m
ANCHORING & FILL	$g_h = 0.5 \times 22 \times 3.7/2 =$	21 kN/m

Σg_h	51 kN/m
Σq_h	1 kN/m
Σ	52 kN/m

PROPOSED LOADING



CONSIDER LOAD ON EXISTING FOUNDATION

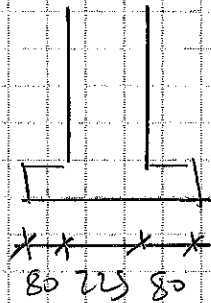
Roof	$g_h = 3.7/4 \times 1.23 =$	1.17 kN/m
	$g_h = 3.7/4 \times 0.60 =$	0.6 kN/m
Timber with	$g_h = 7.5 \times 0.40 =$	7.4 kN/m
Timber Fin	$g_h = 3.7/2 \times 0.69 =$	7.3 kN/m
	$g_h = 3.7/2 \times 7.5 =$	2.8 kN/m
Arch	$g_h = 4/2 \times 0.225 \times 22 =$	70 kN/m
Arch BRICK & FILL	$g_h = 0.5 \times 22 \times 3.7/2 =$	21 kN/m

Wall	$g_h = 4.35 \times 4.22 =$	78.4 kN/m
------	----------------------------	-----------

Σg_h	53.2
Σq_h	3.4
Σ	56.6 kN/m

	EXISTING	PROPOSED	% INCREASE
DL	51 kN/m	53.2 kN/m	+4.3%
QL	1 kN/m	3.4 kN/m	+240%
Σ	52 kN/m	56.6 kN/m	+8.8%

CONSIDER BEARING CAPACITY



80 225 80

$$B = 0.385 \text{ m}$$

$$\text{EXISTING } BP = 52 / 0.385 = 135 \text{ kN/m}^2$$

$$\text{PROPOSED } BP = 56.6 / 0.385 = 147 \text{ kN/m}^2$$

FOR MEDIUM DENSE SAND, $N = 70 - 80$

$$PRN \approx 7N \approx 70 \text{ kN/m}^2 = 210 \text{ kN/m}^2$$

Appendix C - Ground investigation report

Murray Rix MRN 4282/20



TEST REPORT

Client Jo Dogherty

Address 10 Chorlton Green
Chorlton-cum-Hardy
Manchester
M21 9HS

Contract 10 Chorlton Green
Chorlton-cum-Hardy, Manchester M21 9HS

Job Number MRN 4282/20
Date of Issue 15 December 2022
Pages 1 of 9

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
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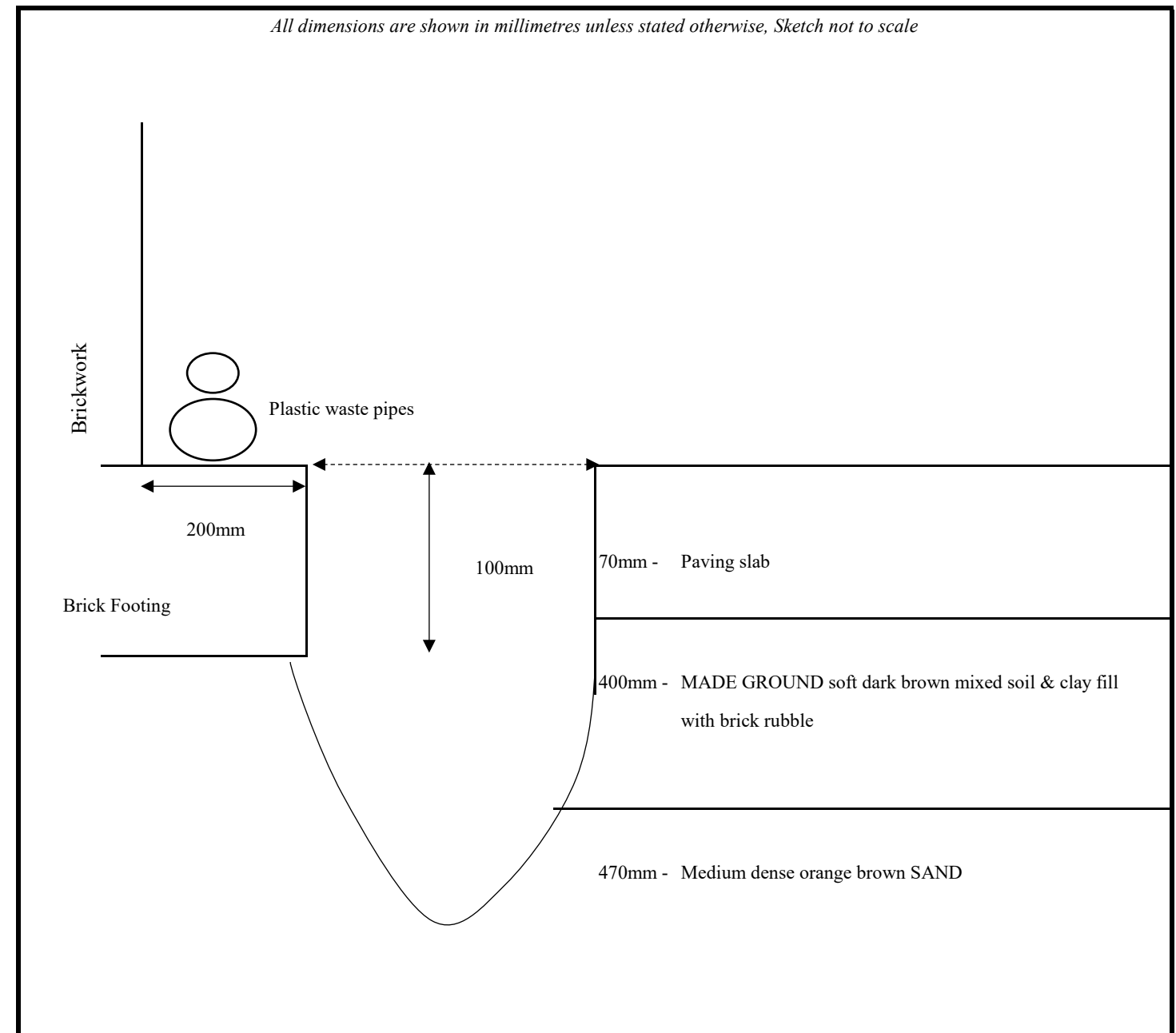
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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

Trial Pit Cross Section

Job Number	MRN 4282/20
Date of Site Visit	18/11/2022
Client	Jo Dogherty
Location	10 Chorlton Green, Chorlton-cum-Hardy, Manchester M21 9HS
Trial Pit	T/P 1A

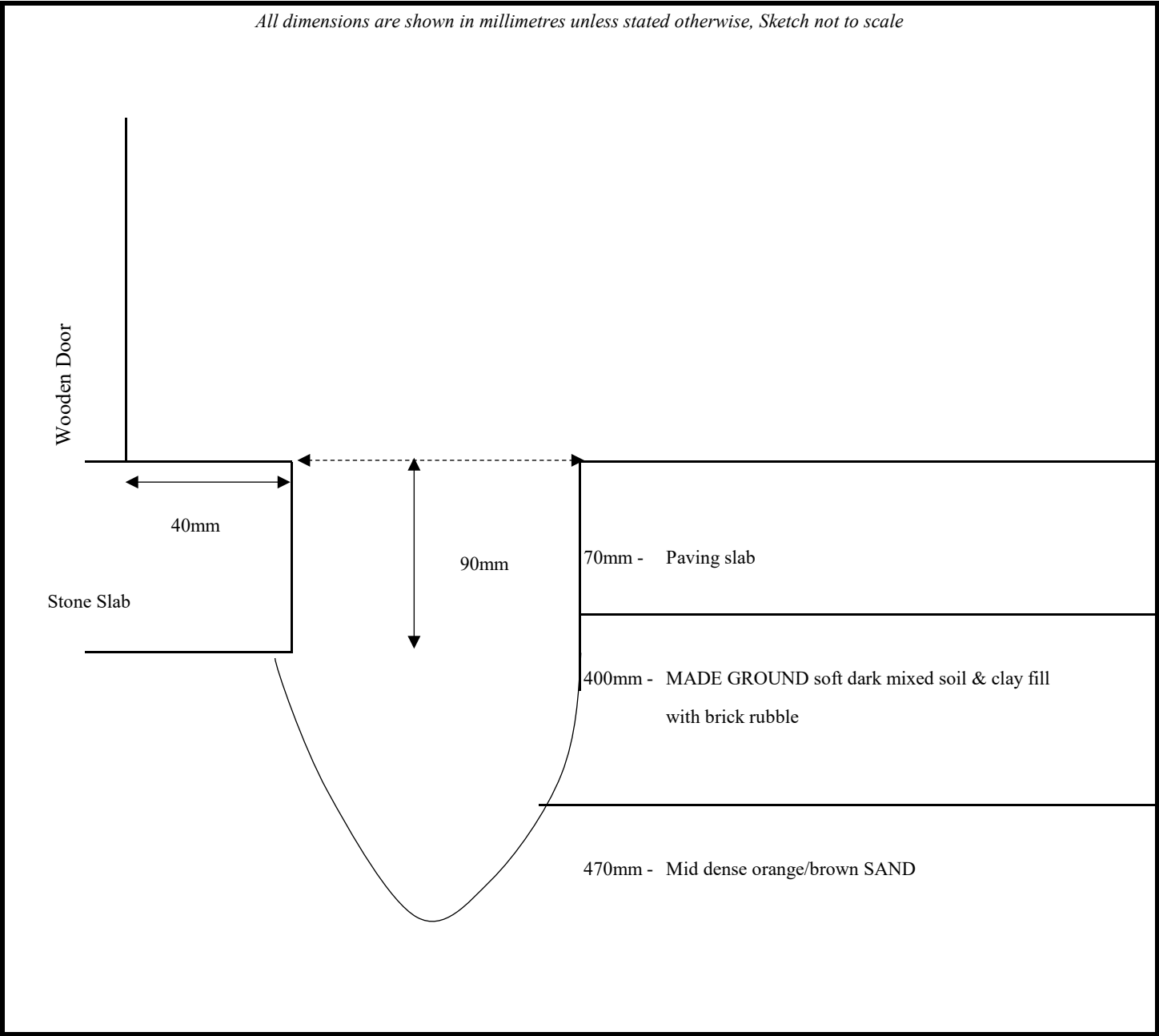


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Trial Pit Cross Section

Job Number	MRN 4282/20
Date of Site Visit	18/11/2022
Client	Jo Dogherty
Location	10 Chorlton Green, Chorlton-cum-Hardy, Manchester M21 9HS
Trial Pit	T/P 1B

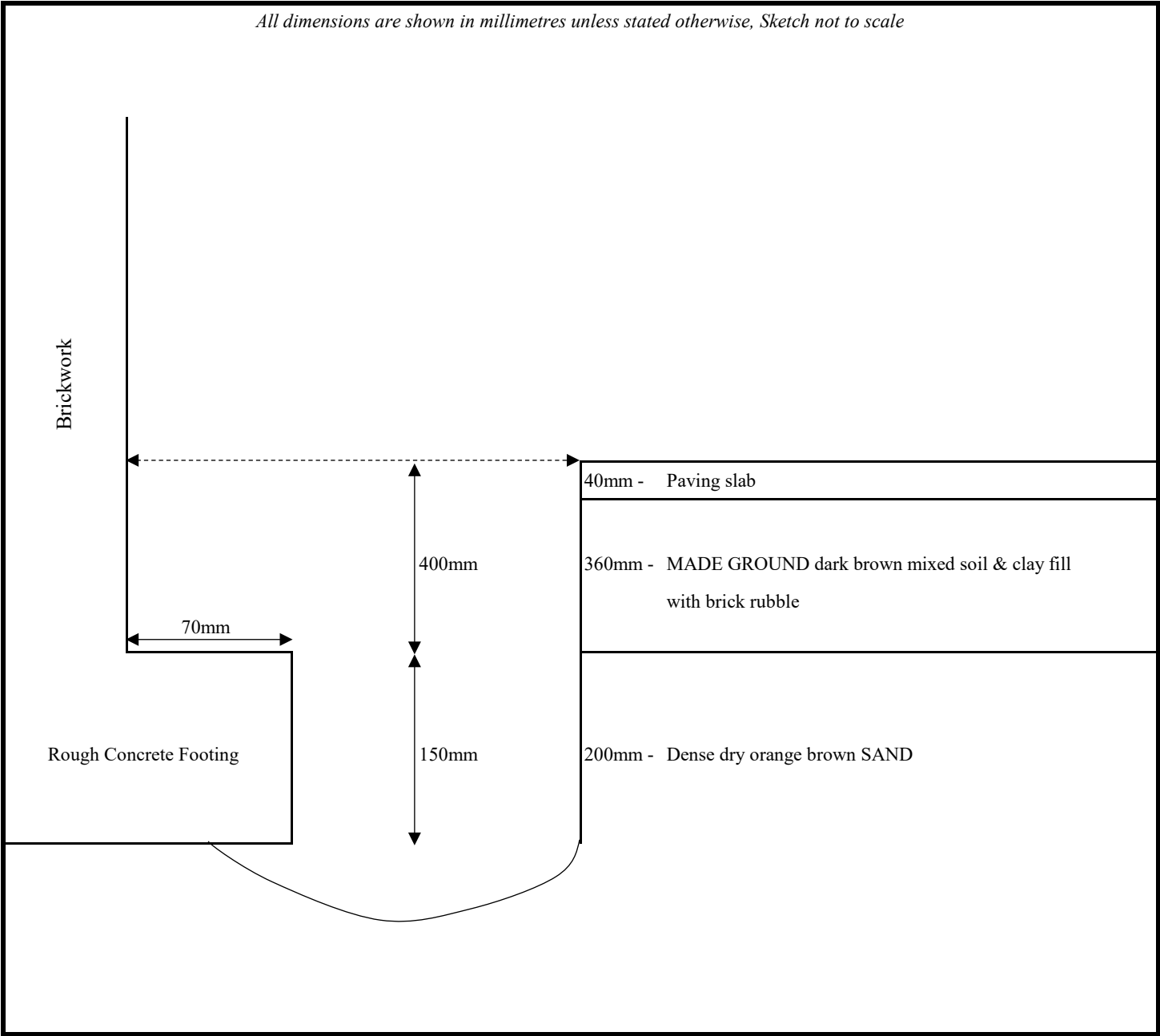


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Client	Jo Dogherty
Location	10 Chorlton Green, Chorlton-cum-Hardy, Manchester M21 9HS
Trial Pit	T/P 2

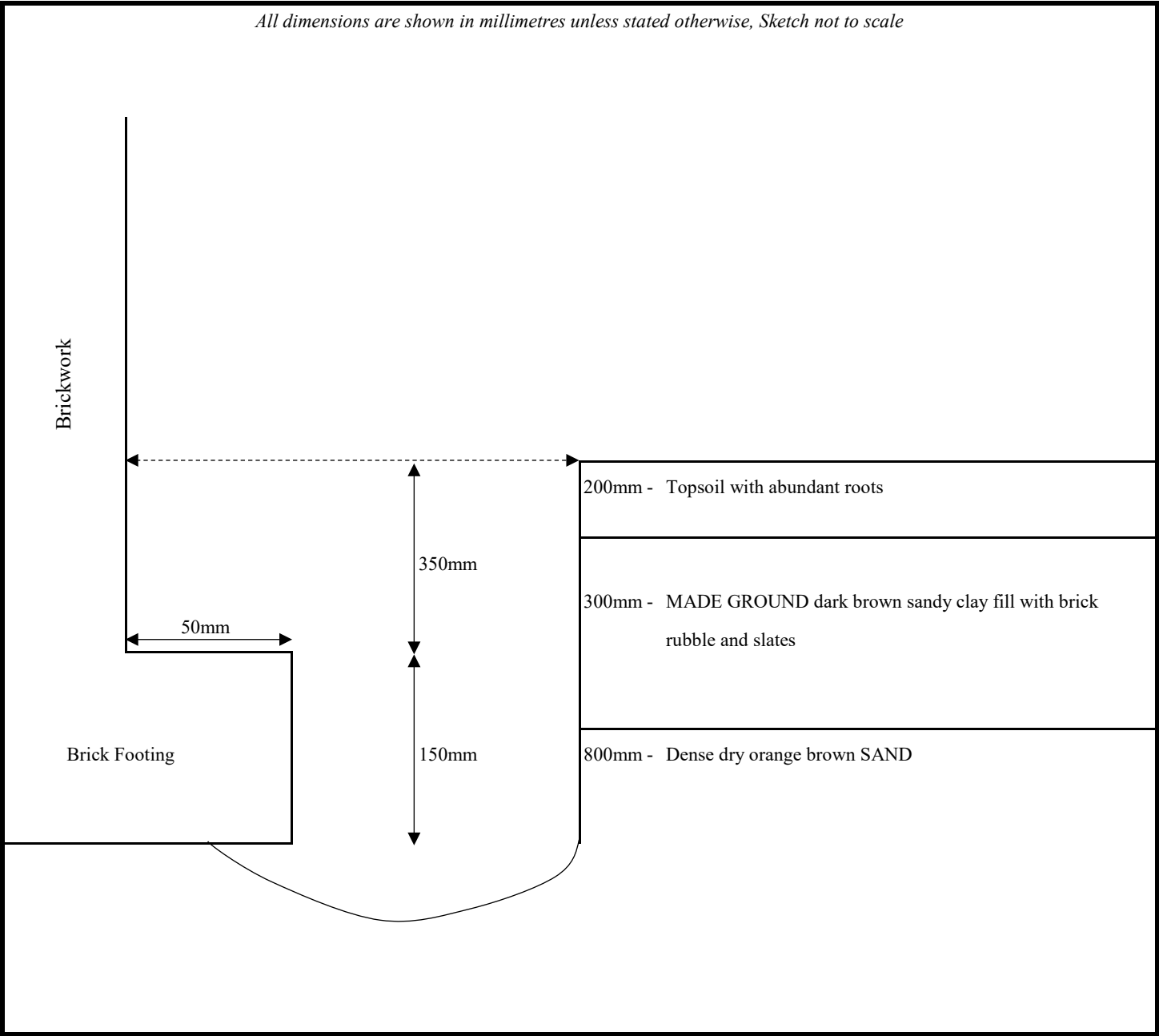


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Date of Site Visit	18/11/2022
Client	Jo Dogherty
Location	10 Chorlton Green, Chorlton-cum-Hardy, Manchester M21 9HS
Trial Pit	T/P 3A

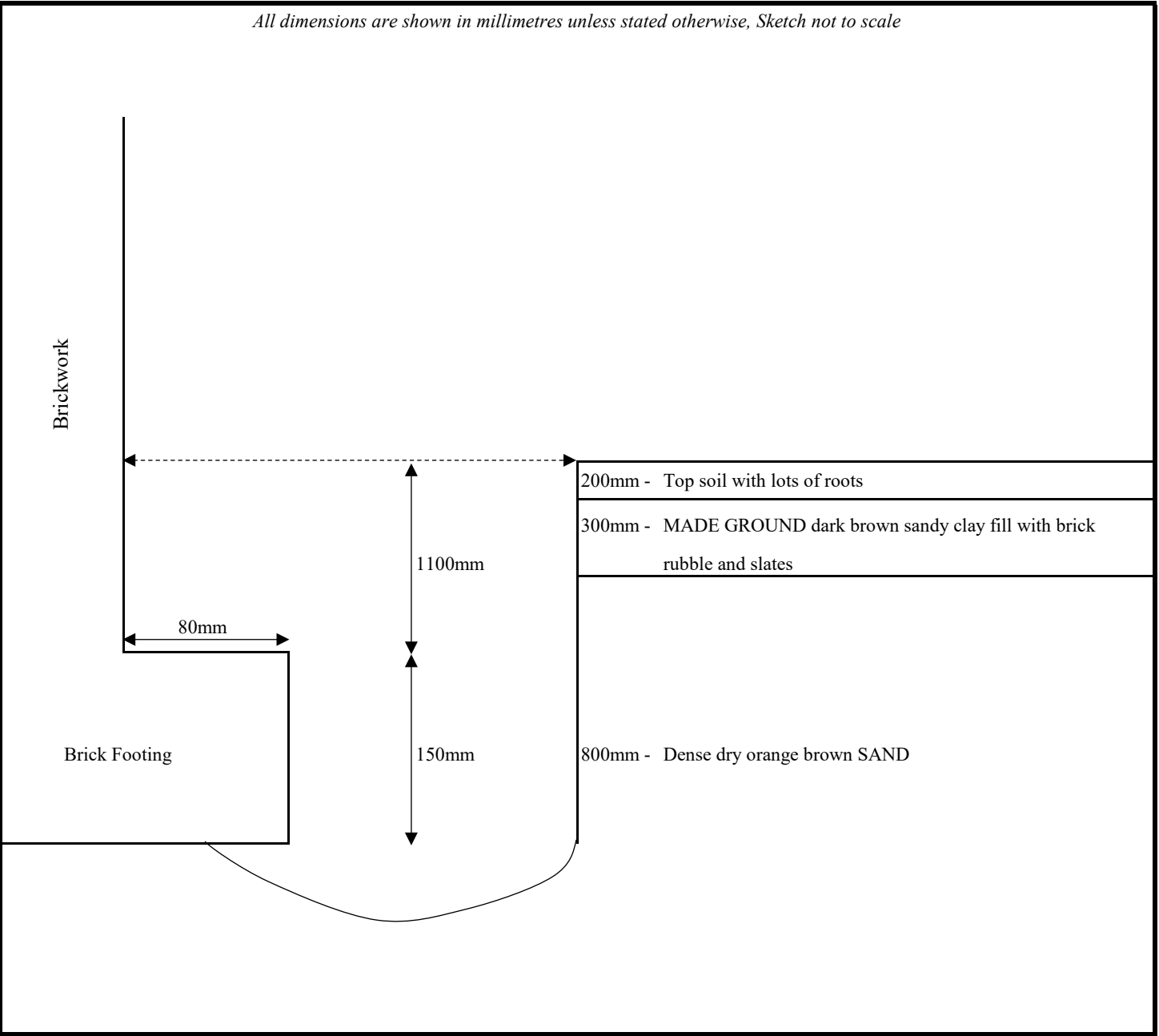


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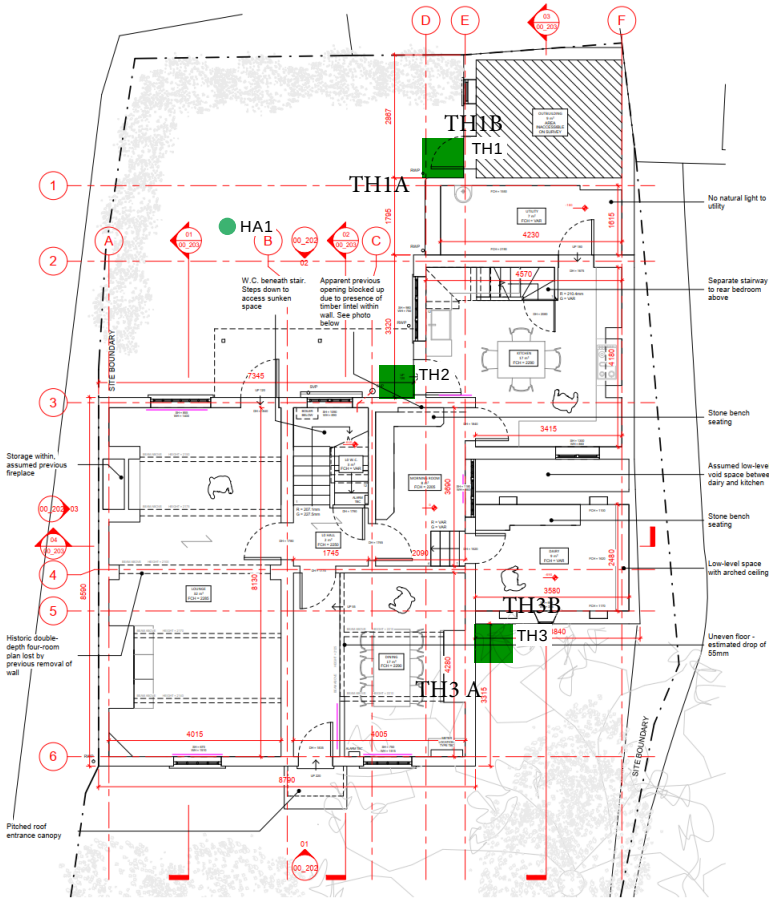
Trial Pit Cross Section

Job Number	MRN 4282/20
Date of Site Visit	18/11/2022
Client	Jo Dogherty
Location	10 Chorlton Green, Chorlton-cum-Hardy, Manchester M21 9HS
Trial Pit	T/P 3B



BOREHOLE LOG - MURRAY RIX GEOTECHNICAL										HOLE NO. TP1		
CLIENT Jo Dogherty										SITE 16 Chorlton Green, Chorlton-cum-Hardy, Manchester M21 9HS		
DATE OF FIELDWORK 18/11/22 - 18/11/22			SCALE 1:50		LEVEL/POSITION TP1		OPERATOR PA/SA		LOGGED BY PA		JOB NO. MRN 4282/20	
SAMPLE DEPTH		RECORD TYPE	SPT N (Cu-kN/m ²)	Standp/ Piezo	DESCRIPTION OF STRATUM (thickness)				DEPTH	LEGEND		
0.50		D			Paving Slab (0.07)				0.07			
					MADE GROUND soft dark brown mixed soil & clay fill (0.40)				0.47			
					Medium dense orange brown SAND (0.33)				0.80			
					Borehole terminated. Further progress not possible with hand auger.							
GROUNDWATER AND CASING INFORMATION										BORING METHOD AND REMARKS		
DEPTH STRUCK	DEPTH CASED	ELAPSED TIME	WATER LEVEL	DEPTH SEALED	REMARKS ON GROUNDWATER AND CASING					Hand augered borehole. Drillers log.		
N/A	N/A	N/A	N/A	N/A	No Groundwater encountered							
All dimensions are in metres unless otherwise stated												

BOREHOLE LOG - MURRAY RIX GEOTECHNICAL										HOLE NO. HA1		
CLIENT Jo Dogherty										SITE 16 Chorlton Green, Chorlton-cum-Hardy, Manchester M21 9HS		
DATE OF FIELDWORK 18/11/22 - 18/11/22			SCALE 1:50		LEVEL/POSITION HA1		OPERATOR PA/SA		LOGGED BY PA		JOB NO. MRN 4282/20	
SAMPLE DEPTH		RECORD TYPE	SPT N (Cu-kN/m ²)	Standp/ Piezo	DESCRIPTION OF STRATUM (thickness)				DEPTH	LEGEND		
0.50		D			Grass over TOPSOIL (0.15)				0.15			
					MADE GROUND dark brown & black clayey ash fill with brick rubble (0.35)				0.50			
					Medium dense orange brown SAND (0.30)				0.80			
					Borehole terminated. Further progress not possible with hand auger.							
GROUNDWATER AND CASING INFORMATION										BORING METHOD AND REMARKS		
DEPTH STRUCK	DEPTH CASED	ELAPSED TIME	WATER LEVEL	DEPTH SEALED	REMARKS ON GROUNDWATER AND CASING					Hand augered borehole. Drillers log.		
N/A	N/A	N/A	N/A	N/A	No Groundwater encountered.							
All dimensions are in metres unless otherwise stated												



Ground Investigation Layout



Ground Investigation Requirements
Contractor to undertake 0.9x0.9x1.2m deep trial holes and hand auger to 3m BGL. If cohesive (clay) ground is encountered, contractor to undertake in-situ shear vane tests and take samples for plasticity testing.

Contractor to work to their own SSOW and RAMS, and scan the area for services prior to commencement.

Client details
Jo Dogherty
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United Kingdom

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+44 7887548058

Project:	10 Chorlton Green	Eng:	JDY
Title:	Ground Investigations	Date:	Nov.22
No:	LM22254-DYSE-XX-ZZ-SK-S-0001	Rev:	P01

Appendix D - DYSE recent experience

Oak Villa Barn

Location	Lymm, Cheshire
Client	Private
Architect	Artform Architects
Services	Civil Engineering Structural Engineering
Description	Barn conversion
Completed	2022



The proposed scheme aims to re-develop the existing dilapidated barn into a new residential dwelling.

A new contemporary single storey rear extension is added to the original 'L' shaped barn building.

Interesting existing barn features are retained and celebrated within the design.

Pyegreave Farm Cow House

Location	Combs, High Peak
Client	Private
Architect	FiftySevenFiftyFive
Services	Structural Engineering
Description	Barn conversion
Completed	Due 2023



The project seeks to convert the existing historic barn structure into holiday accommodation.

We were commissioned to undertake a structural inspection and outline structural engineering design to convert a 15th century cow shed into holiday accommodation.

The two-storey stone built barn was built as a cow house to the ground floor with hay store to the first floor.

The proposal seeks to provide living accommodation across two storeys, minimising structural interventions, with reversible solutions.

Hillside Farm

Location	Stockport, Cheshire
Client	Detail Group
Architect	CE Candid Architects
Services	Structural Engineering Civil Engineering
Description	Barn conversion
Completed	2021



Hillside farm is a collection of three derelict and decrepit buildings on the side of Werneth Low. The project seeks to renovate and re-use the existing stone barn, whilst providing replacement dwellings by means of a new farmhouse and bungalow.

The buildings are traditional in construction, comprising of load bearing masonry walls with cut timber roofs, suspended timber floors and precast ground floor units. Traditional deep trench footings are provided to overcome issues surrounding shrinkable clays on site. A Sustainable Urban Drainage system (SuDS) is provided to the entire site.

Lower Hooleyhey Barn

Location	Macclesfield, Cheshire
Client	LH H Ltd
Architect	NA
Services	Structural Engineering
Description	Barn conversion
Completed	Due 2023



Lower Hooleyhey Farm is a collation of two historic buildings adjacent to a reservoir within Macclesfield. The project seeks to convert the buildings to habitable accommodation.

The buildings are traditional in construction. We were commissioned to undertake a structural inspection and outline engineering design to convert the structures into habitable accommodation.

Appendix E - DYSE project team



Jonny Yusuf

Director

MEng CEng MIStructE

Jonny has a diverse experience in design, both old and new. He has successfully delivered projects of varying forms and material from small artisan projects to multi-million-pound schemes. He also works with contractors and developers in the strategising, design, implementation and coordination of temporary works.

Jonny is passionate about contemporary architecture and believes architecture should be accessible for everyone. He relishes the opportunity to contribute early in the design process, firmly believing a collaborative process results in good design.

Jonny is a Chartered Structural Engineer and lectures at The University of Manchester. He is actively involved in the Institution of Structural Engineers and is a member of the International Association of Bridge and Structural Engineering. Jonny is a founding director of DYSE.



Mark Saville

Senior Engineer

MEng (Hons)

Mark has over eight years post graduate design experience, working on a diverse variety of projects, which have included the design of multi-storey residential developments, complex steelwork structures and the restoration of a collection of 18th century mill buildings.

Mark graduated from the University of Salford in 2015 with a first-class master's in Civil and Architectural Engineering and was awarded the Institution of Structural Engineers University prize for the University of Salford along with the University of Salford's school of Computing Science and Engineering prize for Civil Engineering.

Mark is currently vice chair of the Lancashire and Cheshire Institution of Structural Engineers Young Members Group, working to arrange activities for young engineers throughout the region. Mark is also a STEM ambassador and is keen to inspire future generations of budding engineers.



Barry Davies

Technical Director

BSc EngTech TIStructE

Barry has over 15 years' experience in the design and coordination of buildings projects including specialist experience detailing steel frames and reinforced concrete. Barry has delivering projects across the UK, Europe and the Middle East.

Prior to joining DYSE, Barry was UK BIM lead for a multi-national engineering consultant.

Barry is degree qualified, a professional qualified Structural Technician, and Technician Member of the Institution of Structural Engineers.