

Date : September 2020

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Brief Report of Soil Investigation and Subsidence Findings at St Marys Church, Great Henny, Essex.

For

The PCC of St Mary's Church

Structural Report on structural damage to the North Transept Chapel & Vestry at St Mary's Church, Great Henny, Nr Sudbury.

1.0 Introduction

Steven James Allen Limited were instructed by the PCC of St Mary's Church via Mr David Whymark to organise some trial pits to expose the existing foundations and a soil investigation with soil testing at St Marys Church, Great Henny and to prepare a brief report on the findings.

We attended site on Monday 7th September 2020 to assess the condition and report on the findings. The weather was dry and bright.

The North Transept Chapel and Vestry is a later addition to the main church Chancel and Nave. The extension has suffered some movement which has manifested in cracking to walls and stone arch lintels etc. with some distortion which can be also be seen with columns being out of level etc. Refer to photographic evidence by David Whymark for details or damage.

There was underpinning to the Eastern Chancel wall down to a depth of approx. 1.8m.

2.0 Site Layout and Trial Pits

The North Transept Chapel and Vestry extension sits on the North Eastern end of the Church and is surrounded by various large mature trees. Refer to attached plan and investigations by Barry Turner.

Trial Pit 1 showed that the foundations to the North Transept Chapel and Vestry extension to have a 700mm deep concrete foundation which protruded from the wall face by 230mm. The foundation was taken through 700mm of turf/topsoil and brick fill made ground to bear onto a very stiff clay. There were roots of up to 5mm from GL to the u/s of foundation and then roots of up to 3mm from u/s of foundation to completion which was 200mm below u/s.

Trial Pit 2 showed that the foundations to the main church Chancel and Nave to have a 550mm deep flint and mortar foundation which protruded from the wall face by 150mm. The foundation was taken through 550mm of turf/topsoil and brick fill made ground to bear onto a very stiff clay. There were roots of up to 12 & 4mm from GL to the u/s of foundation and then roots of up to 6mm from u/s of foundation to completion which was 200mm below u/s.

3.0 Borehole and Soil Testing

Refer to Barry Turners Borehole Log. Borehole 1 is positioned to the north East corner of the North Transept Chapel and Vestry extension. The bore hole showed turf over topsoil to 200mm depth and then a 300mm layer of brick fill. After this layer of Fill was the Natural Virgin stratum which is Stiff Chalky Clay. The borehole shows roots down to 2.1m. The borehole ended at 4.2m as the ground became too stiff to progress.

From the borehole various samples were taken and sent for testing. Please refer to soil testing by Meridian Soils. Two Plasticity Indexes were taken one at 1m depth and another at 2.5m the tests gave modified plasticity Indexes of 20% & 31%, this indicates a Clay of Medium volume change potential according to NHBC standards chapter 4.2, this means that as moisture is added or removed to the clay then the volume of the clay increases or decreases accordingly.

The testing also includes a moisture content profile. The rule of thumb for stating a clay is desiccated is that if the moisture content is less than 0.4xliquid limit then it is likely to be desiccated.

From the two PI tests the liquid limit was 21 & 13 with NMC of 18% & 13%, therefore at 1m depth 0.4 of the LL = 18% and the Natural moisture content is 18% and at 2.5m depth 0.4 of the LL = 18.8% and the Natural moisture content is 13%. From the testing it can be seen that the underlying clay is likely to be desiccated down to a depth of at least 2.5m.

4.0 Tree influences and Crack Monitoring

The NHBC standards for building near trees in shrinkable soils (Chapter 4.2) gives minimum foundation depth for a 20m mature oak tree of a distance 14.4m away gives a minimum foundation depth of 1.8m for medium shrinkable soils. This is a work case indicator but if the foundation depth was to be calculated today then that is the depth that the foundation will require to be taken down to as a minimum- along with the requirement for 300mm below any signs of root or desiccation.

Due to the church being situated on higher ground on the Eastern boundary and the fact that the trees are on a bank the roots are probably more extensive on the church side of the boundary which may be why the ground is desiccated to a great depth than NHBC states.

There are many other trees which must also be having an effect on the site and the building. Please refer to Barry Turners site plan for details.

The crack monitoring carried out by Jeremy Milbank clearly shows that the cracks are opening and closing which is a definitive indicator that the building is being affected by seasonal clay movement.

5.0 Conclusion

The clay around the church is being effected by the trees, the clay appears desiccated at least down to a depth of 2.5m locally.

The clays volume changes are causing the foundation to heave or subside depending on moisture content and with the movement other areas less effected are being subjected to lateral forces, as can be seen with the internal wall & column that leads to the North Transept Chapel and Vestry. The extension is pulling the roof and wall down and away from the original position. The floor to the Chancel is also being affect by the clay movement.

There are issues with the existing structure that need addressing and I will be happy to provide services to report and provide details for remediation, if you require a quotation for these additional items then please do not hesitate to contact me.

I gave David Whymark verbal requirements on issues and remedial work required to the structure and how to determine the severity with verticality surveys. My remit for this report was only a brief one to give indications on the best way forward. I will be happy to provide a quotation for any additional structural works that you require.

Possible remedial works to the church are available and I suggest that these may be:

1. Additional Underpinning
2. Root Barriers
3. Tree management

Underpinning on this scale will be very expensive and could involve replacing floors etc.

Root barriers are costly and may permanently damage the trees. I understand that some of the trees around the church have TPO's.

The most cost effective way of trying to stabilise the church with regards to clay heave is to control the moisture being removed from the ground. This is achieved by tree management which will include pollarding trees, removing some trees where viable and cutting back bushes etc. It requires the pollarding to be structured to the foundation depth to ensure that the long term current heights of trees only effect the soil to certain depth levels. It is a timely procedure as it may take the ground many years to fully recover. Monitoring of the ground and cracks etc should be carried out through this period at monthly intervals to ensure that the ground is recovering in the way that we require and when it has stopped moving (reached its equilibrium moisture content) making good and be carried out.

I will be happy to prepare a specification for this work which you can then present to the TPO officer and church etc. to gain permission from all relevant authorities and also to gain quotes from Arboriculturalists for budgeting needs going forward.

I hope that the above and enclosed is clear but should you require any further information then please do not hesitate to contact me.

Yours sincerely

A handwritten signature in black ink, appearing to read 'SJA', with a long horizontal flourish extending to the right.

Steven James Allen BEng(Hons)CivilEng

Director

7.0 Structural Engineers Report Conditions

- 1.0 Inspections A Specific Structural Inspection is restricted to visual observations of the matters, concerns, or problems stated in the report. The inspection will be undertaken externally and internally as necessary and you must provide us with access to all necessary parts including any basements and roof spaces if possible. We do not normally move heavy furniture, lift floor coverings or make exploratory holes during and inspection. If our Engineer considers that access to any area would be unsafe, or potentially unsafe, we will be unable to access such areas unless safety measures are arranged, this may incur an additional cost.
- 1.1 A General Structural Inspection of the structural load bearing elements does not include those aspects normally dealt within a Surveyors report, such as services, decorations, roof coverings and the like, the position of the property with respect to local amenities and the condition of the property with regards to dry rot, timber infestation, dampness, vermin and the like.
- 1.2 The structural load bearing elements normally comprise items such as the roof trusses, rafters, purlins, floor slabs, joists, beams, columns, external walls, internal walls which support other elements, foundations and the like. The inspection is limited to the main building and excludes any detached garages, outbuildings, walls, fences etc unless specifically included in the request. The report is a considered opinion of the structure at the time of the survey only.
- 1.3 Unless noted in the report we have not considered matters such as contaminated land, asbestos or other potentially hazardous materials, nor high alumina cement or other potentially deleterious materials.
- 1.4 Our report will include details of the inspection, being the condition of the property at the time of our inspection, our conclusions on the findings and our recommendations for any investigations, monitoring, repair or remedial works, or other action required.
- 1.5 A General Structural Inspection is not 'A Full Building Survey' in accordance with conditions of engagement of the Royal Institute of Chartered Surveyors (see note 1.2)
- 1.6 Our inspections will be carried in safe manner as advised by the HSE and no undue risks will be taken. Roof areas will only be have a head and shoulder inspection.
- 1.7 We do not check electrical installations or appliances as this has to be done by members of the IEE institute.
- 1.8 We do not test gas installations or appliances as this has to be a CORGI registered gas engineer we will however advise if this is necessary.
- 1.9 We will advise if we note timber infestation however we will not check for timber infestation as this has to be carried out by a member of the British Wood Preserving and Damp proofing association (BWPDA). Similarly with damp this also has to be checked and reported on by a member of (BWPDA).
- 1.10 No opening up of areas or lifting of carpets, or moving of furniture is carried out.
- 1.11 Roof inspections will normally be head and shoulders inspections unless specifically having been requested for a roof survey, where we require the roof to be boarded or safe access arrangements made for the inspection. In any case old roofs will not be entered as potentially unsafe.
- 1.12 Where we arrange for other Contractors to carry out specialist reports we are not responsible for their content.
- 1.13 Where costs are quoted for remedial works these are budget costs and not fixed costs and may vary depending on a contractor's availability and location of works.

1.14 This report is for the sole use of the person instructing the survey and cannot be passed to a third party without the consent of Steven James Allen Limited as the content will not be guaranteed to be correct as to when the report was transferred.

1.15 This report is only valid for 6 months from the date of the survey as stated within the report

B. A. Turner Site Investigations Ltd.

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Email: bturnersiteinvestigation@yahoo.co.uk

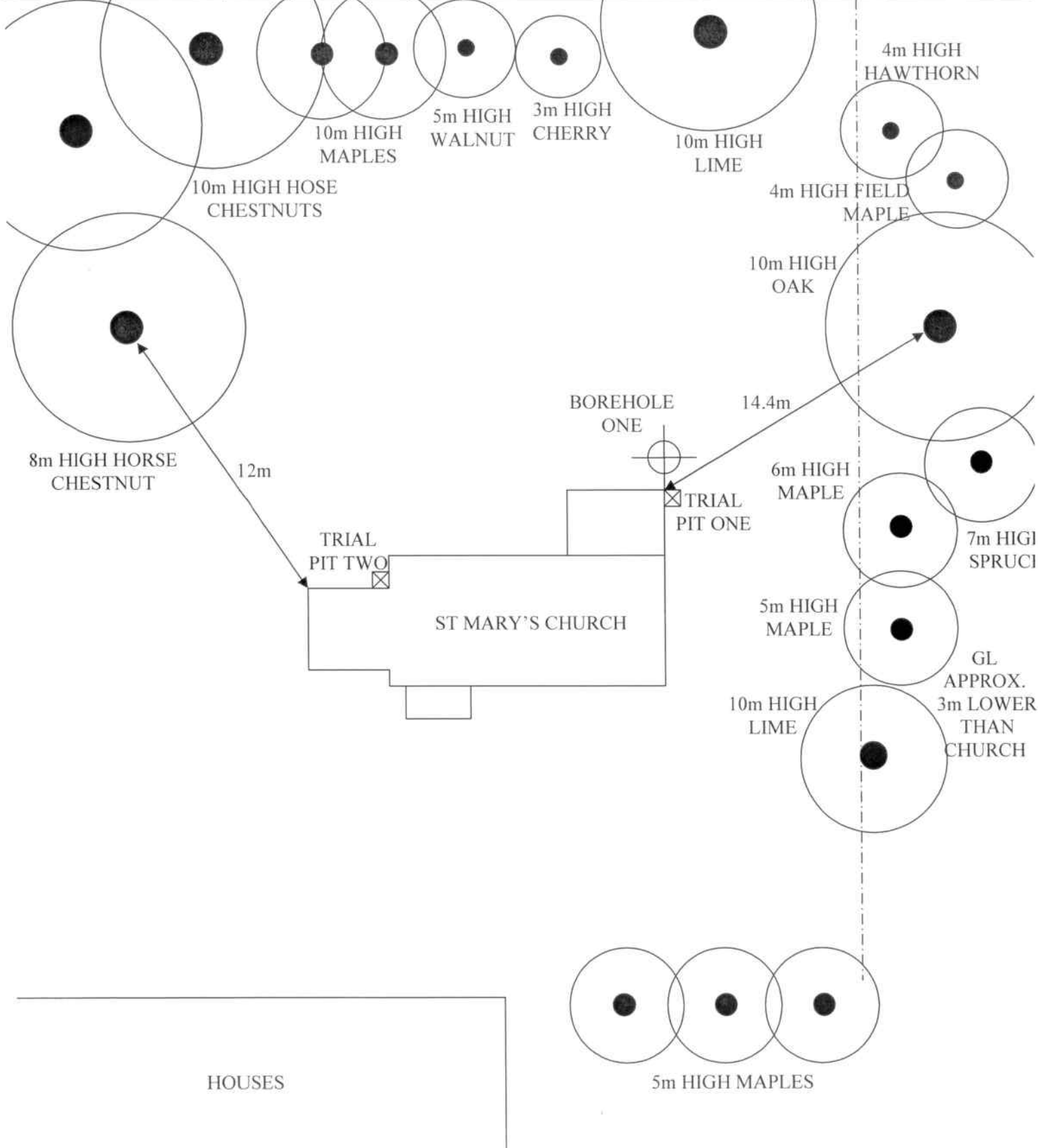
Tel/Fax: (01245) 364030 Mobile (07768) 073119

Ref. SI 0311

Site Plan NTS

Sheet No: One of One

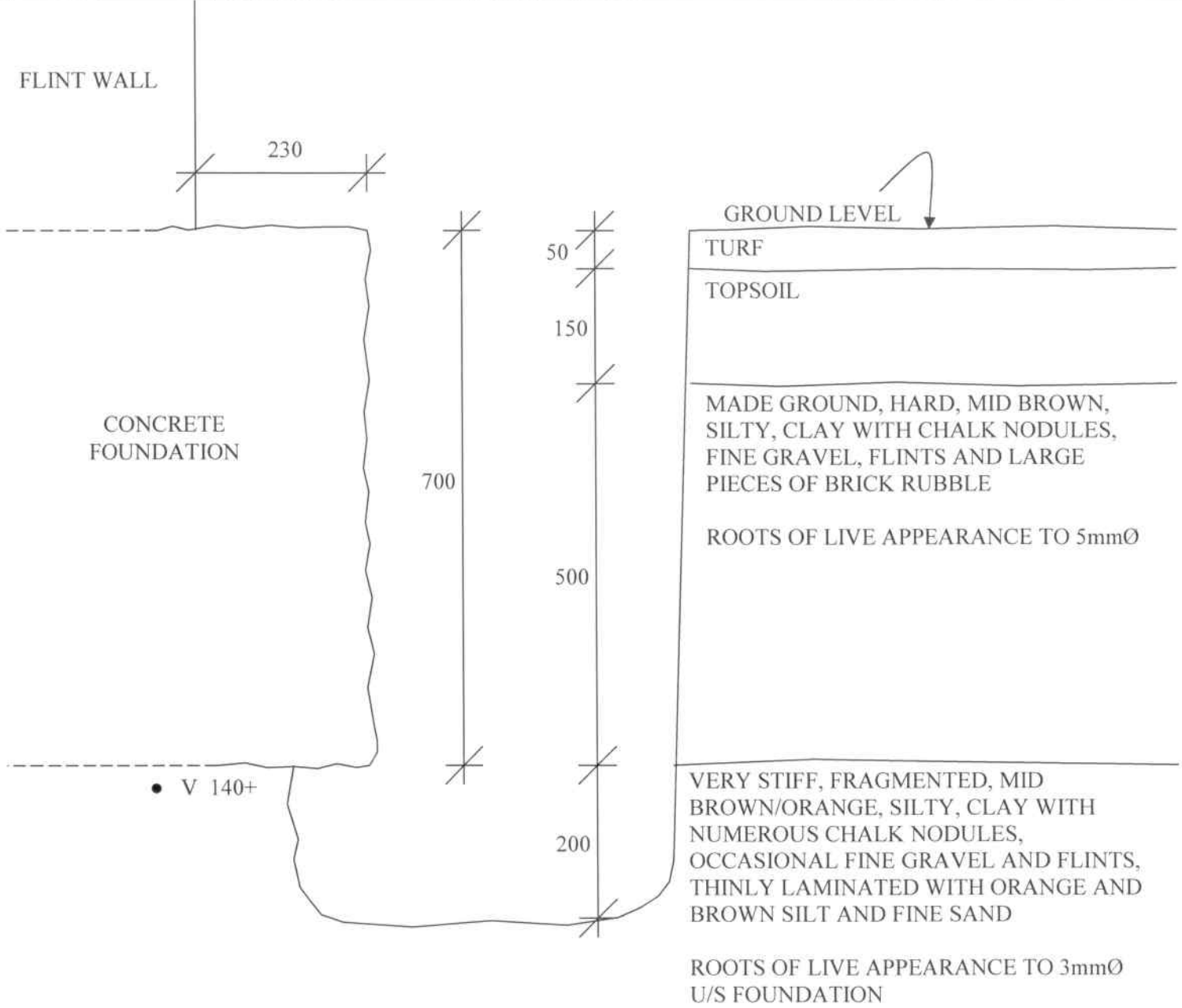
Date: 7th September



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Ref. SI 0311 Trial Pit No. One Sheet No. One of One Date: 7th September 2020



TRIAL PIT ONE ENDS AT 900mm

KEY: ●: Disturbed Sample

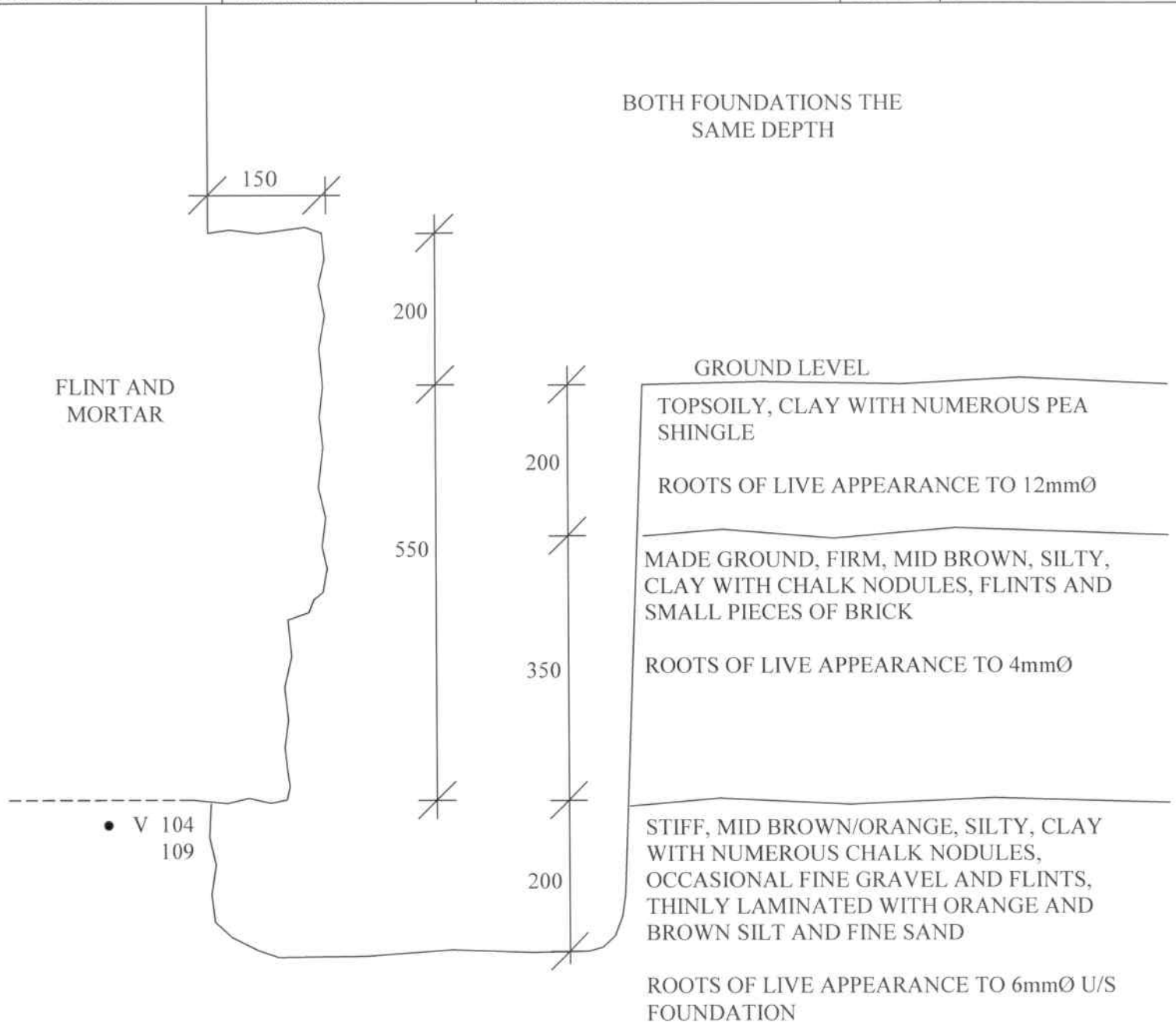
I: Test by Mackintosh Probe

V: Vane Test

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Ref. SI 0311	Trial Pit No. Two	Sheet No. One of One	Date: 7 th September 2020
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TRIAL PIT TWO ENDS AT 750mm

KEY: ●: Disturbed Sample

I: Test by Mackintosh Probe

V: Vane Test

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Ref.	SI 0311	B H No. One	Sheet No. 1 of 1			Date: 7 th September 2020				
Depth Mtrs.	Description of Strata	Thick-ness	Legend	Sample	Test Type	Test Result	Root Information	Depth To Water	Depth Mtrs.	
	Turf	50								
	Topsoil	150								
0.2	Made ground, very stiff, mid brown, silty, clay with numerous flints and occasional small pieces of brick rubble	500					0.1m Roots of live appearance to 3mmØ to 0.7m			
0.7	Very stiff, fragmented, mid brown, silty, clay with occasional chalk nodules, fine gravel and flints, thinly laminated with orange and brown silt and fine sand	3.500		●	V 140+		0.7m Roots of live appearance to 1mmØ to 1.4m		1.0	
				●			1.4m Hair and fibrous roots to 2.1m		1.5	
					●	V 140+				2.0
					●					2.5
					●	V 140+				3.0
					●	V 140+				4.0
4.2	Borehole ends at 4.2m									

Remarks: Borehole dry and open on completion

KEY: ● Disturbed Sample

I: Test by Mackintosh Probe

V: Vane Test

Meridian Soils Limited

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Moisture Content and Index Property Determinations.

Our Ref:- S.10944

Client Ref:-

Location:- St. Mary's Church, Great Henney.

BH/TP No.	Sample No.	Depth m.	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 0.425 um %	Equivalent Moisture %	Class	Modified Plasticity Index %
1		1.00	18	45	21	24	85	21	Cl	20
		1.50	15							
		2.00	12							
		2.50	13	47	13	34	91	14	Cl	31
		3.00	12							
		4.00	12							