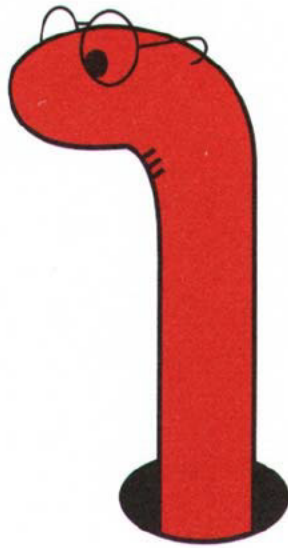


Electronic Report



Our Ref: Northcote Road/BB6 8BG/2024
Date: 13 June 2024

John Holland
Broak Oaks
Northcote Road
Langho
BB6 8DG

Copy to : [REDACTED]

BROAK OAKS, NORTHCOTE ROAD, LANGHO, BB6 8BG
SITE INVESTIGATION REPORT – Updated 13/6/24

INTRODUCTION

A pool house is proposed. Instructions were to carry out boreholes and tests to investigate geotechnical conditions. This is an updated version of our report dated 21/5/24 following further inspection of nearby trees.

SITE LOCATION

The existing property is a detached house located to the northeast of Northcote Road in Langho and at OS Grid reference 370708, 434613. The existing house is at the northwest of the plot, with a summer house along the southeast boundary, a driveway at the southwest and extensive gardens at the northeast.

A main sewer crosses the plot from northeast to southwest, passing just to the southeast of the summer house.

PROPOSED DEVELOPMENT

It is proposed to demolish the summer house and build a pool house, containing plant room and swimming pool, over a larger footprint along the southeast boundary. A reinforced masonry basement retaining structure will be constructed to the entire perimeter with the underside of the concrete raft at 2.1m below finished floor level.

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GEOLOGY OF SITE

The geology map indicates that underlying solid rocks are mudstone of the Bowland Shale Formation.

Surface drift is shown as glacial till (boulder clay) of unknown thickness.

GROUND INVESTIGATIONS

A series of two boreholes, preceded by a shallow starter pit, and two dynamic probes were carried out. Details are given on the enclosed location plan, borehole logs dynamic probe logs.

BH1, at the northeast of the proposed pool house, found topsoil to about 0.15m overlying soft to firm clay becoming medium strength below 1.0m. High strength clay was encountered below 1.8m and continued to the base of the borehole at 4.8m deep.

Probe 1, adjacent to BH1, had very high strength strata between 6.4m and 8.4m where it stopped.

BH2, southwest of the proposed pool house, found gravel to about 0.15m overlying firm clay which became high strength below 0.9m, continuing in high strength clay to the base of BH2 at 4.2m deep.

Probe 2, adjacent to BH2, found very high strength strata between 5.7m and 6.9m where it stopped.

The following approximates to a section looking northwest.

Findings	BH2/Pr2	BH1/Pr1
Topsoil/gravel	0.0 – 0.25	0.0 – 0.20
Soft to firm CLAY	-	0.15 – 1.0
Firm CLAY	0.15 – 0.9	-
Medium strength CLAY	-	1.0 – 1.8
High strength CLAY	0.9 – 4.2+	1.8 – 4.8+
Probe (very high strength)	5.7 – 6.9+	6.4 – 8.4+
Water (monitored)	0.56	1.04
Water (0.48	0.84

PLASTICITY TESTS

Two samples of clay, one per BH at 1.0m deep, have been tested to determine their plasticity index (PI). These results are included and show the clay to have a medium shrinkage potential.

CONCLUSION

Trees

There is a medium shrinkage potential clay and the nearest deciduous trees on site are 20m northeast. Assuming a high water demand shows these trees will not affect footings below 1.7m.

The next nearest trees are as follows.

Tree	Distance (m)	Mature Height (m)	Water Demand	Minimum Foundation Depth (m)	Notes
Sycamore (stump)	1.7	22	Moderate	1.8	Felled with limited regrowth.
Western Red Cedar	1.5	Up to 65m	Moderate	Approx 1.9	We understand the trees are to be removed
Elder	8	10	Low	0.9	
Ashe Juniper	8.5	12	High	0.9	
Common Yew	13	12	Moderate	0.9	
Wild Cherry	19	17	Moderate	0.9	
Deodar Cedar	21	50	Moderate	0.9	

Footings

The boreholes show slightly differing conditions at shallow depth, which, in BH1, are not suitable for strip footings. However, due to the construction of the pool and raft footings need to go to at least 2.1m deep, taking them into the high strength clay where a bearing capacity of 220 KN/m² could be used. For higher loadings footings could be taken down to 2.4m where a bearing capacity of 280 KN/m² could be used.

The findings show footings below 2.1m should not be affected by nearby trees. However, a nearby Sycamore has been felled, and we understand nearby Cedar trees will be felled. Appropriate heave precautions (voids, void formers or compressible materials) will be required for the sub-structure.

Water

The monitoring shows water to be at about 0.5 to 1.0m deep. This may pose difficulties for excavations and will need to be taken into account with the pool design.

Yours faithfully

[Redacted Signature]

[Redacted Block]

[Redacted Line]

[Redacted Line]

[Redacted Line]

BROAK OAKS, NORTHCOTE ROAD, LANGHO, BB6 8BG

List of Appendices – Site Investigation Report

List of Acronyms

Existing site plan – showing borehole and probe locations

Proposed site plan – showing borehole and probe locations

Window Samper Borehole Logs

Dynamic Probe Logs

Plasticity Test Results

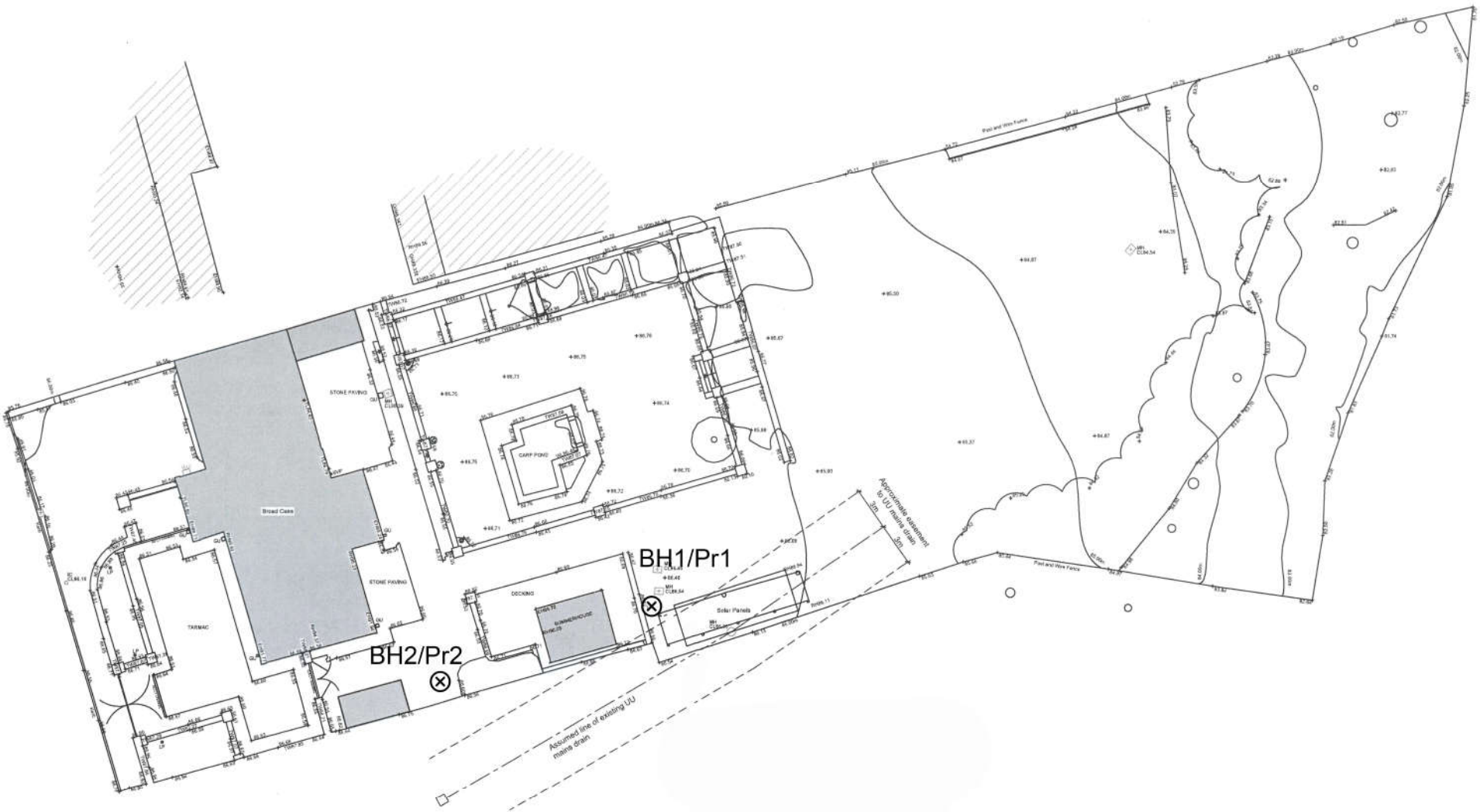
CONTAMINATION TEST UNITS

Conversion factor	Name	Symbol	Numerical Value	Alternative description	Commonly used for:
	per cent	%	1 in 100 (10 ²)		total sulphur, hazardous waste
% x10	parts per thousand	‰	1 in 1000 (10 ³)	g/l (grams per litre)	water soluble sulphate test
‰ x 1,000	parts per million	ppm	1 in 1,000,000 (10 ⁶)	mg/kg (milligrams per kilogram)	most soil tests
				mg/l (milligrams per litre)	water tests
ppm x 1,000	parts per billion	ppb	1 in 1,000,000,000 (10 ⁹)	µg/kg (micrograms per kilogram)	PAH soil tests
				µg/l (micrograms per litre)	water/leachate tests
ppb x 1,000	parts per trillion	ppt	1 in 1,000,000,000,000 (10 ¹²)	ng/kg (nanograms per kilogram)	PAH soil tests
				ng/l (nanograms per litre)	water/leachate tests

ABBREVIATIONS

<u>Chemical</u>	BAP	Benzo(a)pyrene	
	BTEX	Benzene, toluene, ethylbenzene, xylene	
	DAHA	Dibenzo(ah)anthracene	
	MTBE	Methyl tertiary-butyl ether (additive to petrol)	
	EPH	Extractable petroleum hydrocarbons (formerly diesel range organics – DRO)	
	NFD	No fibres detected (asbestos test)	
	PAH	Polycyclic aromatic hydrocarbons	
	PCB	Polychlorinated biphenyls	
	PCE	Perchloroethylene or tetrachloroethylene	
	PID	Photo ionisation detector (screen for VOC)	
	PRO/GRO	Petrol range organics/gasoline range organics	
	SVOC	Semi-volatile organic compounds	
	TCE	Trichloroethylene	
	TPH	Total petroleum hydrocarbons	
	VOC	Volatile organic compounds	
	<u>Other</u>	AGS	Association of Geotechnical Specialists
		BGS	British Geological Survey
		BRE	Building Research Establishment
		CBR	California Bearing Ratio
		CIEH	Chartered Institute of Environmental Health
CIRIA		Construction Industry Research and Information Association	
CLEA		Contaminated Land Exposure Assessment (Environment Agency/DEFRA)	
CLR 8		Contaminated Land Research Report 8 (Environment Agency/DEFRA)	
DWQ		Drinking water quality	
EA		Environment Agency	
EQS		Environmental quality standards (for rivers etc.)	
ICRCL		Inter-departmental Commission for the Reclamation of Contaminated Land	
LQM		Land Quality Management Ltd (Land and Environmental Consultancy).	
NHBC		National House Builders Council	
SGV		Soil Guideline Values	
SPT	Standard penetration test		

1. This report should be considered in relation to the objectives agreed between [REDACTED] and the Client, outlined in the introduction.
2. For the work, reliance has been placed on publicly available data, obtained from the sources identified in the report. The information is not exhaustive and further information may be available from other sources. When using the information it has been assumed it is correct, and no attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and guidelines, for land and groundwater contamination, enforced by the Local Authority and the Environment Agency.
4. During the site walkover, reasonable effort was made to obtain an overview of the site. However, no attempt was made to enter areas that are unsafe, a risk to health and safety, locked, barricaded, overgrown, or areas not made accessible.
5. Access, the presence of services and activities on the site, limited locations where sampling could be carried out and the techniques that could be used.
6. Assessments are based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. The conclusions and recommendations provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
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EXISTING SITE PLAN
SCALE 1:200



EXISTING SITE PLAN
SCALE 1:200

[REDACTED]				[REDACTED]		Site Broad Oaks, Northcote Road, Langho		Number BH1	
Machine : Trecker Method : Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John Holland		Job Number BB6 8BG	
		Location Northeast (see Probe 1)		Dates 17/04/2024		Project Contractor [REDACTED]		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.20) 0.20	Topsoil (excavated by hand)			
					(0.80)	Soft to firm brown sandy, gravelly, CLAY (excavated by hand)			
1.30	VANE 62kPa				1.00	Medium strength dark brown and grey mottled, sandy, gravelly, CLAY becoming high strength below 1.8m deep			
1.80	VANE 108kPa								
2.40	VANE 130kPa								
3.00	VANE 130kPa				(3.80)				
3.70	VANE 130kPa								
4.20	VANE 130kPa								
					4.80	Complete at 4.80m			
Remarks See Probe 1 Standing water at 1.04m deep during monitoring							Scale (approx) 1:25	Logged By DL	Figure No. BB6 8BG.BH1

[REDACTED]					Site Broad Oaks, Northcote Road, Langho		Number BH2		
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client John Holland		Job Number BB6 8BG	
		Location Southwest (see Probe 2)		Dates 17/04/2024		Project Contractor [REDACTED]		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					0.25	Grave/topsoil/hardcore (excavated by hand)	[Cross-hatch pattern]		
					0.65	Firm brown sandy, gravelly, CLAY (excavated by hand)	[Dotted pattern]		
1.60	VANE 130kPa				0.90	High strength brown and grey mottled sandy, very gravelly, CLAY with stone cobbles	[Stippled pattern]		
2.10	VANE 130kPa								
2.50	VANE 130kPa				(3.30)				
3.00	VANE 130kPa								
3.60	VANE 130kPa								
					4.20	Complete at 4.20m			
Remarks See Probe 2 Standing water at 0.56m deep during monitoring							Scale (approx) 1:25	Logged By DL	
							Figure No. BB6 8BG.BH2		

[Redacted]				Site Broad Oaks, Northcote Road, Langho		Probe Number PR 1											
Method Dynamic Probing		Cone Dimensions		Ground Level (mOD)		Client John Holland											
		Location Northeast, by BH1		Dates 18/04/2024		Engineer [Redacted]											
						Job Number BB6 8BG											
						Sheet 1/2											
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment												
					0	7	14	21	28	35	42	49	56	63	70		
0.00-0.30	3			0.00	[Bar chart data]												
0.30-0.60	1			0.30	[Bar chart data]												
0.60-0.90	2			0.60	[Bar chart data]												
0.90-1.20	0			0.90	[Bar chart data]												
1.20-1.50	10			1.20	[Bar chart data]												
1.50-1.80	8			1.50	[Bar chart data]												
1.80-2.10	7			1.80	[Bar chart data]												
2.10-2.40	9			2.10	[Bar chart data]												
2.40-2.70	14			2.40	[Bar chart data]												
2.70-3.00	24			2.70	[Bar chart data]												
3.00-3.30	20			3.00	[Bar chart data]												
3.30-3.60	17			3.30	[Bar chart data]												
3.60-3.90	16			3.60	[Bar chart data]												
3.90-4.20	15			3.90	[Bar chart data]												
4.20-4.50	19			4.20	[Bar chart data]												
4.50-4.80	17			4.50	[Bar chart data]												
4.80-5.10	19			5.00	[Bar chart data]												
Remarks						Scale (approx)		Logged By									
						1:25		DL									
						Figure No.		BB6 8BG.PR 1									

[REDACTED]				Site Broad Oaks, Northcote Road, Langho		Probe Number PR 1					
Method Dynamic Probing		Cone Dimensions		Ground Level (mOD)		Client John Holland					
		Location Northeast, by BH1		Dates 18/04/2024		Engineer [REDACTED]					
						Job Number BB6 8BG					
						Sheet 2/2					
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment						
					0	7	14	21	28	35	42
5.10-5.40	15			5.00	[Bar chart showing 15 blows]						
5.40-5.70	16			5.50	[Bar chart showing 16 blows]						
5.70-6.00	15			6.00	[Bar chart showing 15 blows]						
6.00-6.30	17			6.50	[Bar chart showing 17 blows]						
6.30-6.60	26			7.00	[Bar chart showing 26 blows]						
6.60-6.90	32			7.50	[Bar chart showing 32 blows]						
6.90-7.20	41			8.00	[Bar chart showing 41 blows]						
7.20-7.50	38			8.50	[Bar chart showing 38 blows]						
7.50-7.80	46			9.00	[Bar chart showing 46 blows]						
7.80-8.10	52			9.50	[Bar chart showing 52 blows]						
8.10-8.40	63			10.00	[Bar chart showing 63 blows]						
Remarks						Scale (approx)		Logged By			
						1:25		DL			
						Figure No. BB6 8BG.PR 1					

[REDACTED]				Site Broad Oaks, Northcote Road, Langho		Probe Number PR 2									
Method Dynamic Probing		Cone Dimensions		Ground Level (mOD)		Client John Holland									
		Location Southwest, by BH2		Dates 18/04/2024		Engineer [REDACTED]									
						Job Number BB6 8BG									
						Sheet 1/2									
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment										
					0	6	12	18	24	30	36	42	48	54	60
0.00-0.30	4			0.00											
0.30-0.60	0			0.30											
0.60-0.90	0			0.60											
0.90-1.20	4			0.90											
1.20-1.50	7			1.20											
1.50-1.80	7			1.50											
1.80-2.10	10			1.80											
2.10-2.40	19			2.10											
2.40-2.70	18			2.40											
2.70-3.00	27			2.70											
3.00-3.30	23			3.00											
3.30-3.60	28			3.30											
3.60-3.90	20			3.60											
3.90-4.20	18			3.90											
4.20-4.50	18			4.20											
4.50-4.80	20			4.50											
4.80-5.10	23			4.80											
Remarks						Scale (approx)		Logged By							
						1:25		DL							
						Figure No. BB6 8BG.PR 2									

[REDACTED]		[REDACTED]		Site Broad Oaks, Northcote Road, Langho		Probe Number PR 2				
Method Dynamic Probing		Cone Dimensions		Ground Level (mOD)		Client John Holland				
		Location Southwest, by BH2		Dates 18/04/2024		Engineer [REDACTED]				
						Job Number BB6 8BG				
						Sheet 2/2				
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment					
					0	6	12	18	24	30
5.10-5.40	27			5.00	[Bar chart showing 27 blows]					
5.40-5.70	30			5.50	[Bar chart showing 30 blows]					
5.70-6.00	40			6.00	[Bar chart showing 40 blows]					
6.00-6.30	49			6.50	[Bar chart showing 49 blows]					
6.30-6.60	54			7.00	[Bar chart showing 54 blows]					
6.60-6.90	36			7.50	[Bar chart showing 36 blows]					
				8.00	[Bar chart showing 0 blows]					
				8.50	[Bar chart showing 0 blows]					
				9.00	[Bar chart showing 0 blows]					
				9.50	[Bar chart showing 0 blows]					
				10.00	[Bar chart showing 0 blows]					
Remarks						Scale (approx)		Logged By		
						1:25		DL		
						Figure No. BB6 8BG.PR 2				

