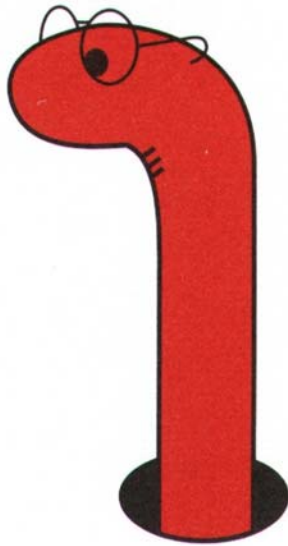


Electronic Report



WORMS EYE

**52 Bank Parade
Burnley
BB11 1TS
Phone
01282 414649 / 458410
Fax 01282 721916**

Our Ref: Roundthorn Road/M24 1FT/2018
Date: 23 June 2020

Terence Connor
TEC Services Northwest Ltd
Eagar Street
Newton Heath
M40 1EP

Copy to: Kevin Kelly
Email: kevin-kelly@hotmail.co.uk

Email: admin@tecservicesNWLimited.co.uk

RAMSDEN FARM, ROUNDTORN ROAD, MIDDLETON, MANCHESTER, M24 1FT
Landfill/Ground Gas – Updated June 2020

INTRODUCTION

A residential development is proposed. This report is an updated version of previous reports, following additional rounds of gas monitoring.

PREVIOUS REPORTS

- Preliminary Risk Assessment (PRA) 19th September 2019 - summarised in this report.
- Coal Mining Risk Assessment (CMRA) 2nd April 2019 – Findings summarised in this report.
- Exploratory Intrusive Report 12th June 2019 – Incorporated into this report.
- Soil Contamination Report 11th September 2019 – Incorporated into this report.
- Intrusive Investigation Report 17th November 2019

SITE LOCATION AND PROPOSALS

The site is almost horn shaped with a main part about 150 x 90 metres narrowing to the south, located to the north of Roundthorn Road in Middleton and at OS Grid Reference 387650, 405370. The site comprises a vacant plot with two mounds, one in the centre up to 5 metres high and a mound along the southeast boundary up to about 8 metres.

PROPOSED DEVELOPMENT

It is proposed to build four houses with associated roadway, gardens, driveways and garages. To obtain an access from Roundthorn Road, a road is proposed running north from Roundthorn Road.

LEGAL/COPYRIGHT

Material included in this report from Ordnance Survey (Licence No. AL100031635), Landmark, Environment Agency, the Coal Authority and others (if any) may be copyright and the usual restrictions apply. This report can only be relied upon if the invoice has been paid promptly and in full. This report may be signed by an individual, but only on behalf of Worms Eye Limited.

PRELIMINARY RISK ASSESSMENT

Worms Eye carried out a PRA dated 19/9/18, the salient points regarding landfill/ground gas were:

The site is within 250 metres of an historical landfill sites and six filled features. These are potential sources of landfill and ground gases which could migrate to and present a risk to the development.

The underlying coal measures are a further possible gas source.

Bearing in mind the size of the filled areas, distance from the site and river between the site and the landfill, it is considered there is likely to be a low risk to the development, a gas testing programme is required.

End of PRA Re-Cap

GROUND INVESTIGATIONS

Eight machine dug trial holes were carried out in May 2019. In November 2019 five dynamic probes were drilled in the area of the proposed houses, gas wells were created in four of these.

Trial Holes

Trial holes A to K were excavated to almost 2 metres deep.

TH A (north corner) had made ground (topsoil, bricks, steel and concrete) to 1.8 metres deep over sand to 1.9 metres.

TH B (northwest/middle) had made ground (sand, topsoil, brick and plastic bags) to 0.25 metres, overlying sand, becoming silty between 1.7 metres and the base of the trial hole at 1.0 metres deep.

THs I and J were excavated to 0.9 metres, along the access track, to collect shallow samples for testing. These showed made ground (topsoil, sand, brick, gravel, and ash) to their base.

The remaining deep trial holes (C to O) were on the main housing part of the site. These had a thin band of topsoil (up to 0.35 metres deep) overlying sand, proved to about 2 metres.

GAS TESTING

Gas Monitors

Probes 1, 2, 3 and 4 were converted to gas monitors as follow:

	Pr1 (m)	PR2 (m)	PR3 (m)	Pr4 (m)
Plain pipe	0.0 – 1.0	0.0 – 1.0	0.0 – 1.0	0.0 – 1.0
Base of slotted pipe	2.7	1.9	2.1	2.6
Response zone	1.0 – 2.7	1.0 – 1.9	1.0 – 2.1	1.0 – 2.6

Gas Test Results

Fourteen gas tests have been carried out on four occasions over a period of 7 months. The results show varying conditions between Pr1 (plot 4) and Pr2-4 (Plots 1, 2 and 3).

Pr1/Plot 4

Worst-case values for Pr1 (plot 4) are:

Gas	Site Value	Limit of detection
Methane %	8.5	0.1
Oxygen %	0.0	0.1
Carbon dioxide %	11.3	0.1
Flow rate l/hr	0.0	0.1

Assessing Risks - CIRIA

The method recommended in CIRIA Report **C665 (2007)** "Assessing risks posed by hazardous ground gases to building, Table 8.7", is used to classify the site. These range from a Characteristic Situation 1 (negligible gas) through to 6 (very high gas).

The gas screening values (GSV) are calculated from the worst-case values as follows:

	Site Value	Characteristic Situation 1		Characteristic Situation 2	
		Threshold	Pass/Fail	Threshold	Pass/Fail
Outflow (l/hr)	<0.1	-	-	70	P
Methane - Total (%)	8.5	1	F	-	P
Methane GSV (l/hr)	0.0085	0.07	P	0.7	P
CO ₂ -Total (%)	11.3	5	F	-	P
CO ₂ GSV (l/hr)	0.013	0.07	P	0.7	P

Gas screening value = gas concentration (%) multiplied by outflow (l/hr)

These results classify the site as situation 2, based on maximum methane and carbon dioxide levels.

Pr2, 3 and 4/Plot 1, 2 and 3

Worst-case values for Pr1 (plot 4) are:

Gas	Site Value	Limit of detection
Methane %	0.1	0.1
Oxygen %	0.1	0.1
Carbon dioxide %	2.6	0.1
Flow rate l/hr	0.0	0.1

Assessing Risks - CIRIA

The method recommended in CIRIA Report **C665 (2007)** "Assessing risks posed by hazardous ground gases to building, Table 8.7", is used to classify the site. These range from a Characteristic Situation 1 (negligible gas) through to 6 (very high gas).

The gas screening values (GSV) are calculated from the worst-case values as follows:

	Site Value	Characteristic Situation 1		Characteristic Situation 2	
		Threshold	Pass/Fail	Threshold	Pass/Fail
Outflow (l/hr)	<0.1	-	-	70	P
Methane - Total (%)	0.1	1	P	-	P
Methane GSV (l/hr)	0.0001	0.07	P	0.7	P
CO ₂ -Total (%)	2.6	5	P	-	P
CO ₂ GSV (l/hr)	0.00026	0.07	P	0.7	P

Gas screening value = gas concentration (%) multiplied by outflow (l/hr)

These results classify the site as situation 1.

DISCUSSION

Landfill/Ground Gas

The PRA indicates potential gas sources as a landfill, 108 metres northeast, and mine gas from shallow workings. The landfill is to the northeast of Wince Brook which flows through a valley. The valley will act as a venting trench to migrating gases and the landfill is therefore not a risk to the site.

The rotary boreholes showed that the shallow coal seams are intact, and not mined beneath the site. Mine gases from these seams are therefore not considered a risk to the development.

Gas test results show worst case methane 8.5% and carbon dioxide 11.3% in Pr 1 (Plot 4) with levels in Pr 2, 3 and 4 (Plots 1, 2 and 3) showing worst case levels 0.1% methane, 2.7% carbon dioxide and 15.0% oxygen. There was no detectable outflow in any monitor.

Trial holes show limited made ground, with THA indicating possible localised pockets on the northeast side. This is consistent with raised gases seen on Plot 4 and normal levels on Plots 1, 2 and 3. Although this suggests a localised risk to Plot 4, the spacing, and location, of wells is such that it is not possible to conclude there is no spread to Plot 3. However, the results from Pr 2, 3 and 4, which show near normal levels, suggest no spread of gases to Plots 1 and 2.

Bearing in mind gas outflow, and GSV levels, it is considered the findings show a low risk to Plot 4, and a very low risk to Plots 1, 2 and 3. Levels of methane and carbon dioxide on Plot 4 are significantly elevated and suggest it is appropriate to raise the classification to a gas situation 2 and adjacent Plot 3 as a precaution, with Plots 1 and 2 classed as a gas situation 1.

BREAKING PATHWAYS (Including Soil Contamination)

Construction Workers

Normal precautions for an urban renewal type project are required. These would include the use of gloves and the provision of washing facilities to avoid ingestion of contaminants.

Garden/Landscaped Areas

Raised levels of lead and DbA were seen in THA, with raised levels of pesticides in THA and THK4 at 0.3 metres. These are to the rear (northwest) of Plot 4 and heading southwest towards Plot 3.

One solution would be to remove the source by excavating the contaminated material and disposing off site. This would require:

- Excavate to 0.6 metres centred on THA for 2 metres to the northwest, northeast and southeast, and 4 metres to the southwest, and dispose off site.
- Test northwest/southwest/southeast sides of excavation for pesticides. Levels to be below appropriate target levels.
- If levels remain high, extend the excavation in that direction and re-test (repeat is levels remain high).
- Back fill with clean, imported, soils comprising (bottom up):
 - 450mm sub-soil.
 - 150mm topsoil.

Another method is to use a cover layer. However, as this is a localised risk, a cover layer is not considered to be a suitable option, unless site levels need to be raised.

Service Pipes

To avoid hydrocarbons seeping into drinking water pipes, high specification coated pipes to Water Company approval (e.g. Protectaline barrier pipe A) are required on the southwest leg of the site (southwest of THI).

Landfill/Ground Gases

Test results show a Characteristic Situation 2 is appropriate for Pots 3 and 4, and the following are considered suitable based on the results:

- Ventilation of confined spaces within building.
- A suspended ground floor with ventilated underfloor void >150 mm.
- A low-permeability gas membrane (see membranes below).
- Minimum penetration of ground slab by services.
- Also gas precautions should continue across the cavity.

The following membrane (or equivalent) is suggested:

- Visqueen gas barrier (blue with foil layer - resists methane, carbon dioxide and radon), or ?

Each membrane should be used with the appropriate matching cavity tray (or cavity membrane), DPC and service duct 'top hat'. Joints to be lapped and sealed.

Validation of gas membrane will require:

The installed membrane will need to be independently inspected before any follow on work, this might include, but not be limited to:

- Details of who carried out installation.
- Details of who carried out verification and inspection regime.
- Details of non-conformances and how they were rectified (if any).
- A signed statement confirming that the gas protection measures were installed as agreed, the membrane was free from tears and punctures, lapped and sealed as agreed at joints around services. This to be included in the Verification Report.

Imported Soils

All soils (e.g. topsoil, bulk fill hardcore) and similar materials imported on-site to be proved to be uncontaminated. Imported material will require testing as follows:

- Greenfield soils – minimum of 3 tests or 1 test per 100m³ (whichever is greater). Testing to include arsenic, cadmium, chromium (total), chromium VI, copper, mercury, nickel, lead, selenium, zinc, PAH (16 USEPA speciation), asbestos, TPHs (speciated), boron, cyanide, thiocyanate, sulphide, sulphur, sulphate, pH, Som.
- Brownfield/screened/manufactured soils – minimum of 3 tests or 1 test per 50m³ (whichever is greater). Testing to include arsenic, cadmium, chromium (total), chromium VI, copper, mercury, nickel, lead, selenium, zinc, PAH (16 USEPA speciation) asbestos, TPHs (speciated), boron, cyanide, thiocyanate, sulphide, sulphur, sulphate, pH, Som.

Soil Screen Values

Tests carried out on the imported material, either by the supplier or the consultant, to be screened against residential values, based on 1% SOM. If these are exceeded, site specific value may be derived, subject to them being appropriate.

Mine Shaft

The southwest access road is at risk if the nearby mine shaft was to collapse. It is recommended that sheet piles, or similar, are installed along the boundary between the site and the shaft down to about 16 metres, or rockhead.

Validation

A validation report will be required on completion, this will require but not necessarily be limited to:

- Waste transfer notes.
- Contamination test results for tests on imported soils.
- Photographs to confirm thickness of imported soil types.
- Document (receipt, delivery notes) to show soil types and sources.
- Independent inspection of gas membrane.
- Confirmation from the Water Authority of final water pipe connection.
- Certificate/invoice from supplier to confirm appropriate water pipes have been used.

This report is usually a collaboration between the contractor, who will collect the above documentation and Worms Eye, who can assist in preparing the Validation Report

CONCLUSION**Landfill/Ground Gas**

The findings suggest a very low risk, based on gas screening values, with maximum methane and carbon dioxide levels suggesting a characteristic situation 2 is appropriate for Plot 4 and, as a precautionary measure, to Plot 3.

The findings also suggest a very low risk for Plots 1 and 2 and a gas situation 1 is considered appropriate for those plots.

With this in mind it is suggested that gas protection measures, suitable for a situation 2, are incorporated into Plots 3 and 4.

These proposals should be submitted to the Local Authority for their comments before proceeding.

Yours faithfully
on behalf of Worms Eye Ltd

David Lord
BSc (Hons)
FGS, MEnvSc, AIEMA

RAMSDEN FARM, ROUNDTORN ROAD, MIDDLETON, MANCHESTER, M24 1FT

Landfill/Ground Gas Report

List of Appendices

List of Acronyms

Existing site plan - showing trial hole, borehole and dynamic probe locations

Enlarged plan showing area of investigation

Proposed plan

Proposed site plan - showing trial hole, borehole and dynamic probe locations

Trial Hole Logs

Dynamic Probe Logs

Gas 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

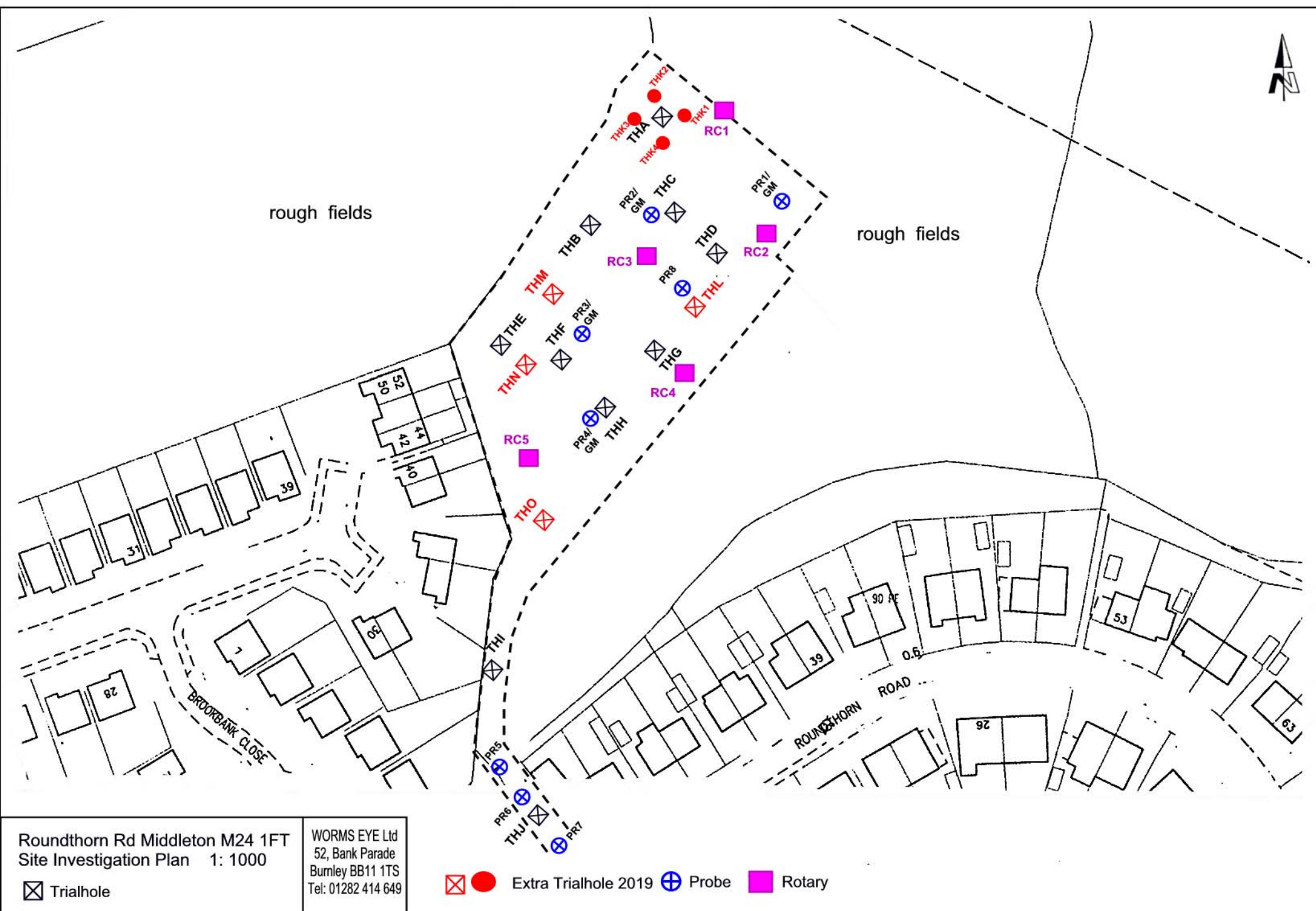
Chemical

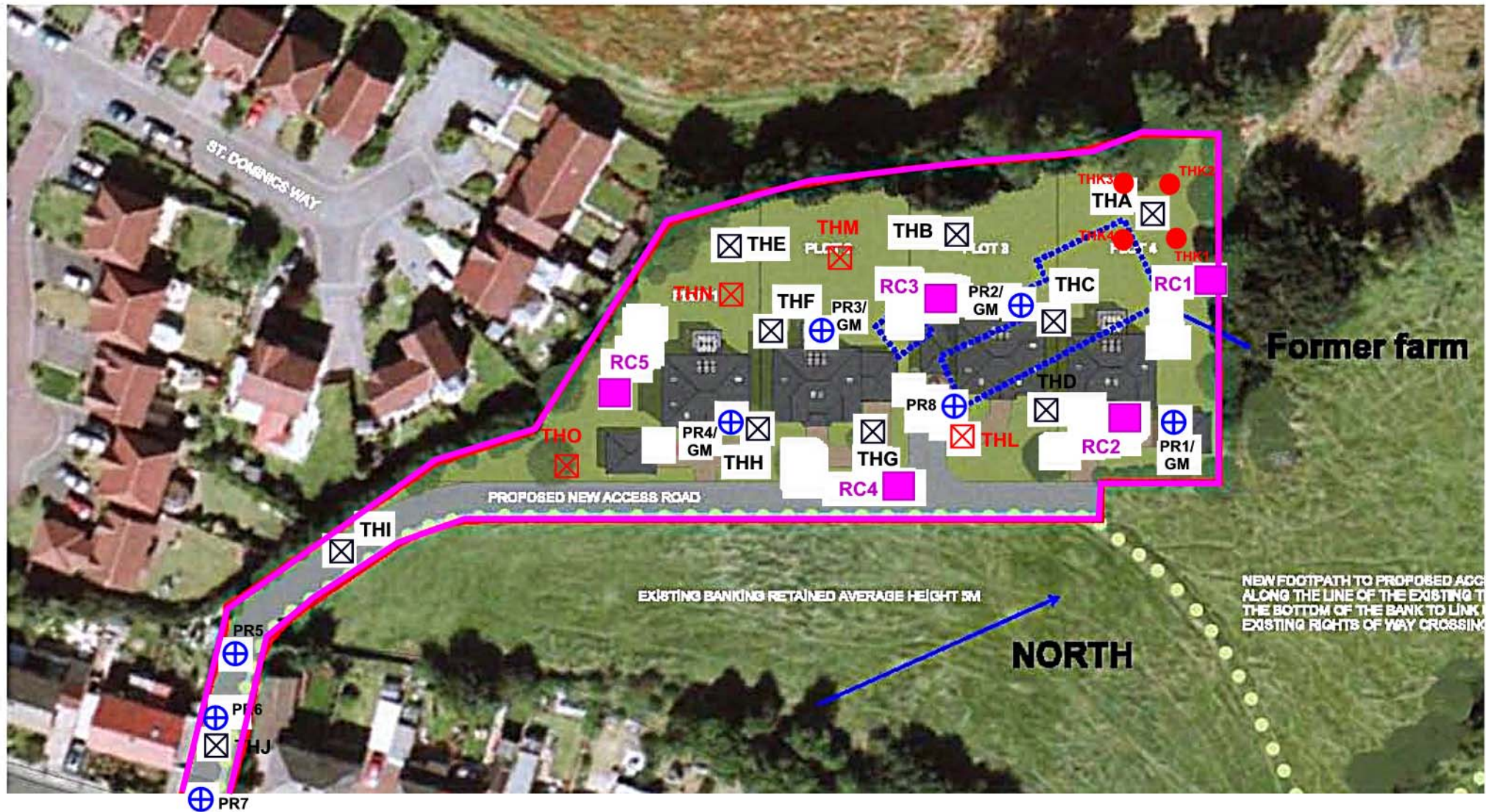
BAP	Benzo(a)pyrene
BTEX	Benzene, toluene, ethylbenzene, xylene
DAHA	Dibenzo(ah)anthracene
MTBE	Methyl tertiaryt-butyl ether (additive to petrol)
EPH	Extractable petroleum hydrocarbons (formerly diesel range organics – DRO)
NFD	No fibres detected (asbestos test)
PAH	Polycyclic aromatic hydrocarbons
PCB	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

Other

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 Worms Eye 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.
8. Worms Eye cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright of this report, and other plans or documents prepared by Worms Eye, is owned by them, and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies may be made and distributed by the client, as expected, in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability, or warranties, shall be extended to other parties by Worms Eye, without their written agreement.
9. New information, revised practices, or changes in legislation, may necessitate the re-interpretation of the report, in whole or in part.

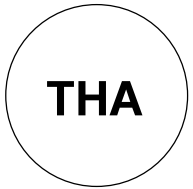




Roundthorn Road, Middleton, Manchester. M24 1FT

X Trialhole
 X Extra Trialhole 2019
 + Probe
 ■ Rotary

Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT



Scale 1: 10 16.05.19

360⁰ JCB light excavator

black topsoil and peat? with bricks
cloth, metal and flags
MADE GROUND

1800

light brown sand

2500

dry, no smell

All dimensions in millimetres

WORMS EYE

52 Bank Parade
Burnley, BB11 1TS

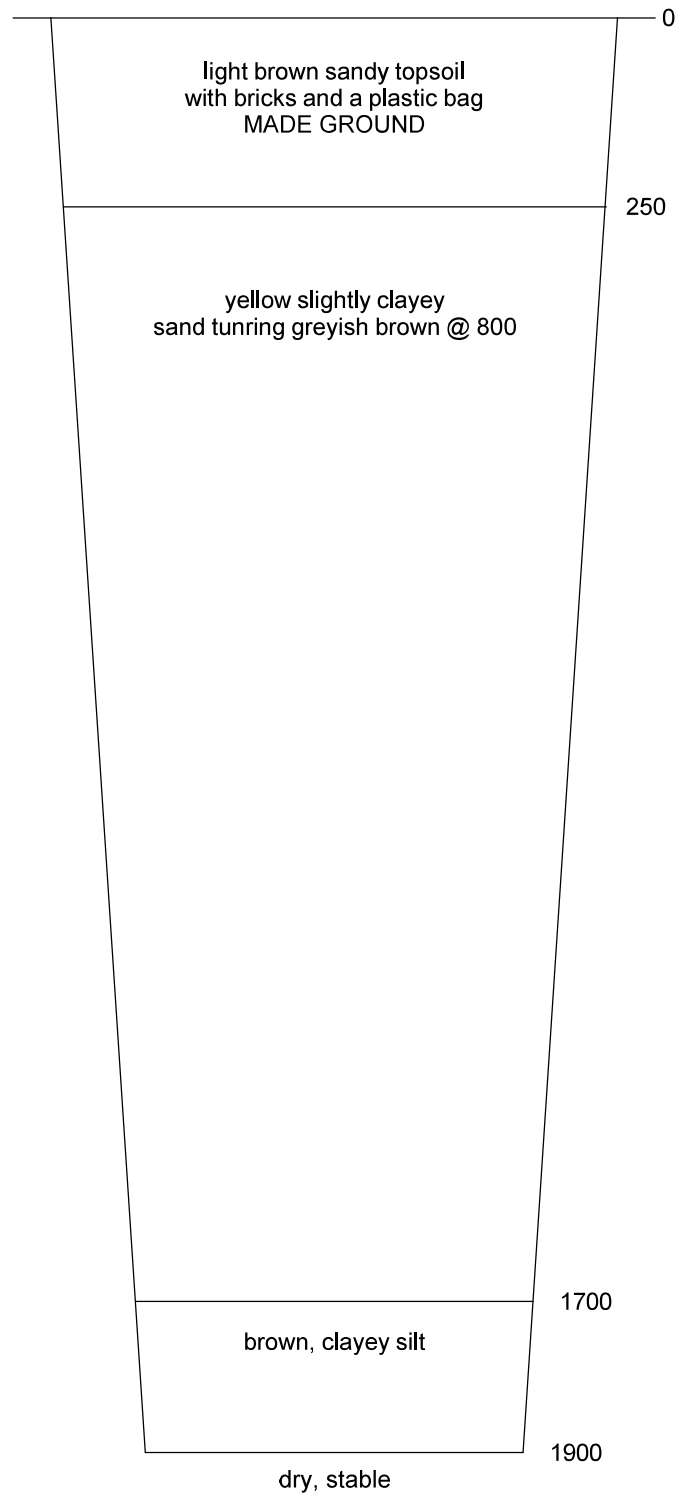
01282 414 649

Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT

Scale 1: 10 16.05.19

THB

360⁰ JCB light excavator

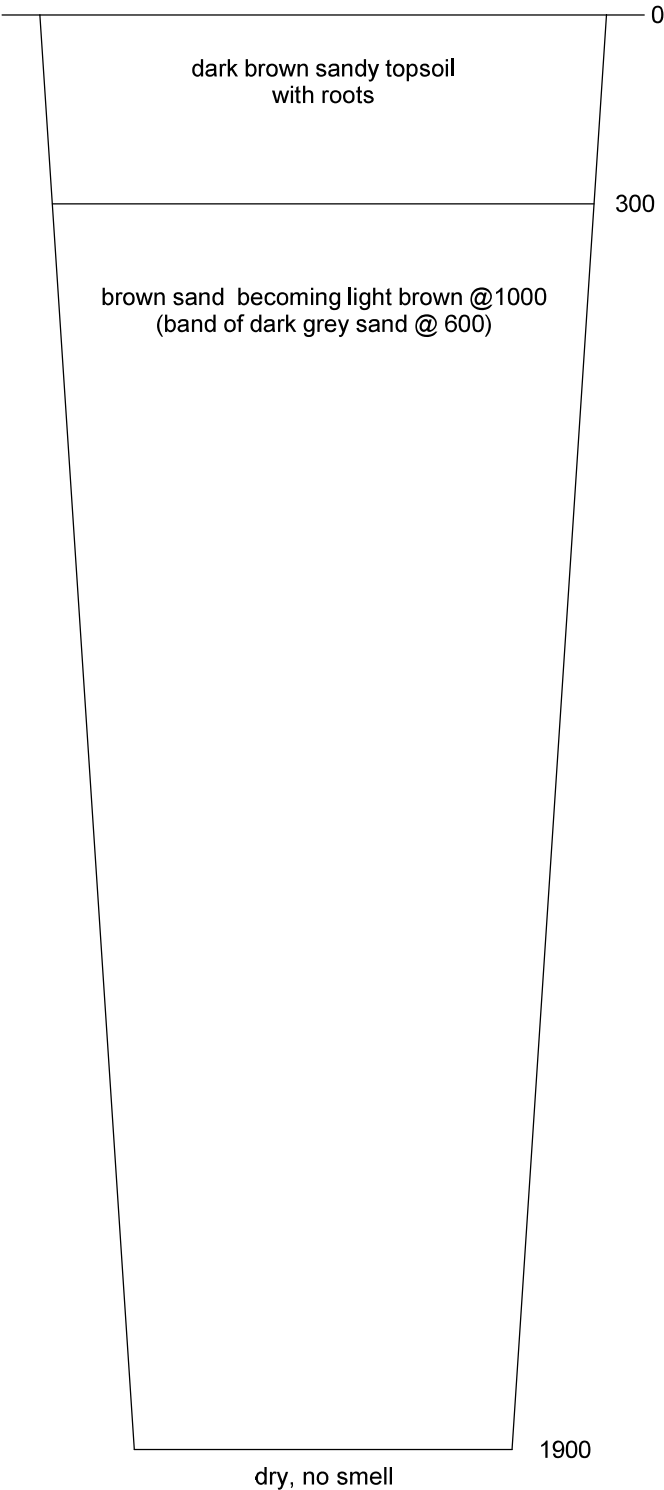


Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT

Scale 1: 10 16.05.19

THC

360⁰ JCB light excavator

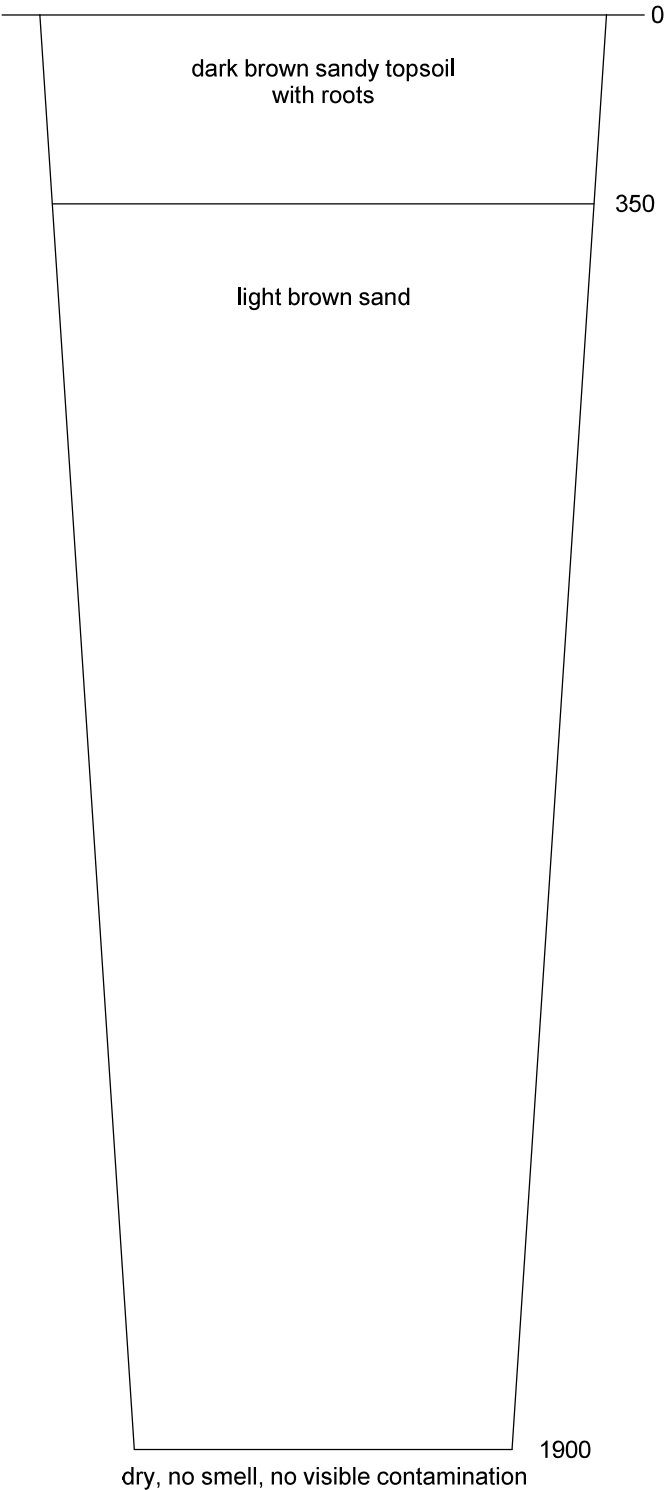


Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT

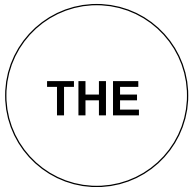
Scale 1: 10 16.05.19

THD

360⁰ JCB light excavator

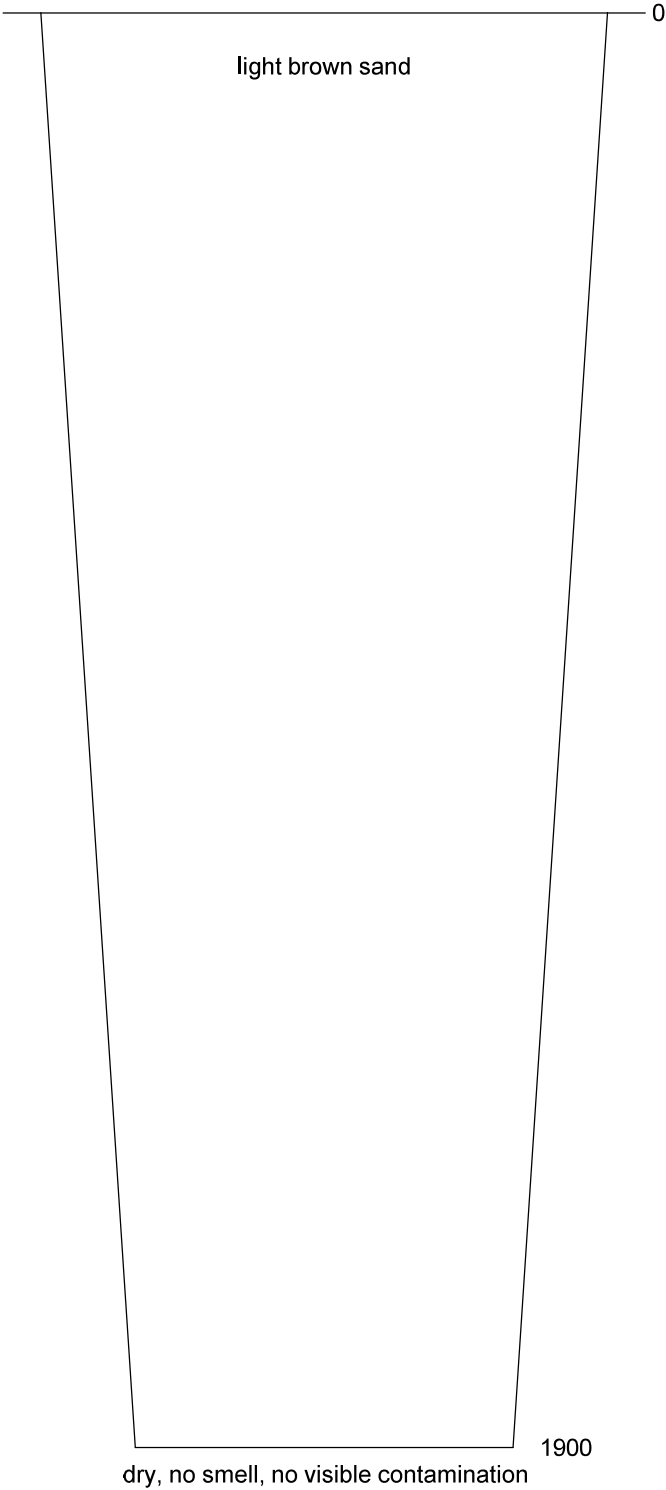


Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT



Scale 1: 10 16.05.19

360⁰ JCB light excavator



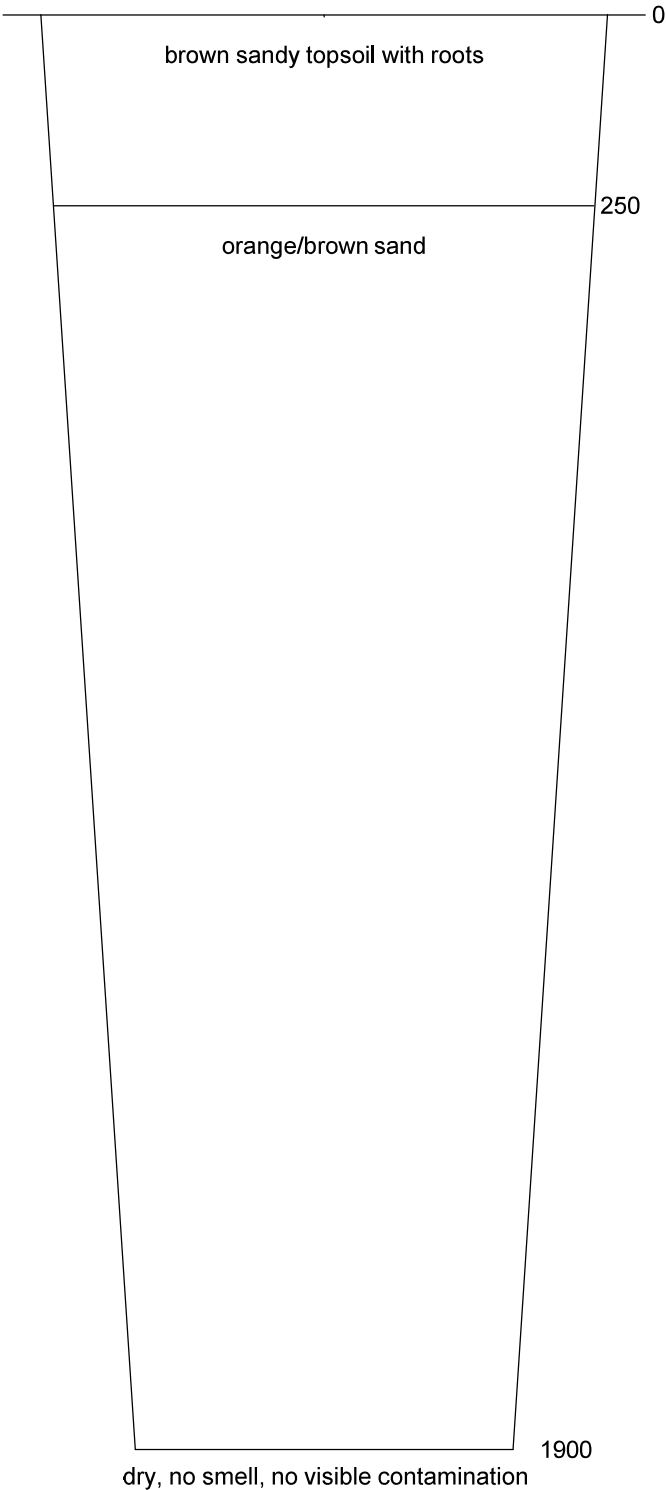
WORMS EYE
52 Bank Parade
Burnley, BB11 1TS
01282 414 649

Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT

THF

Scale 1: 10 16.05.19

360⁰ JCB light excavator

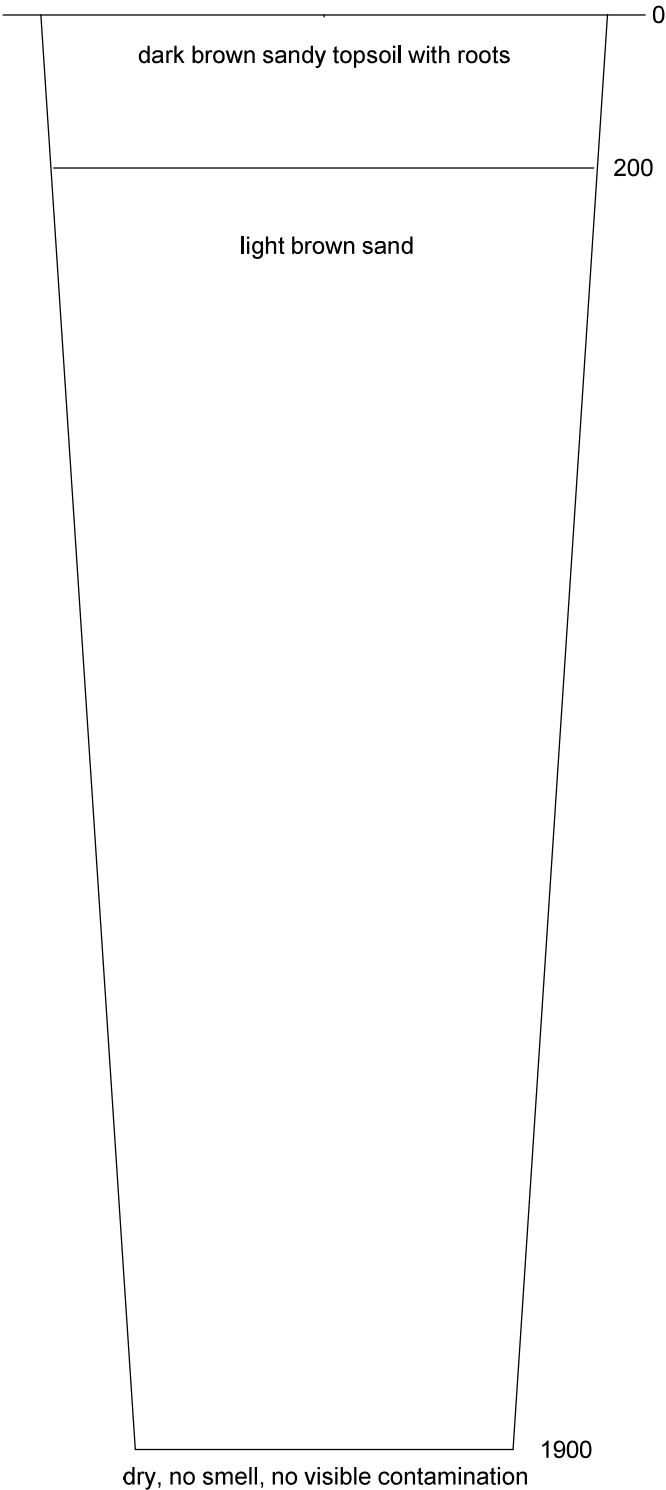


Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT

THG

Scale 1: 10 16.05.19

360⁰ JCB light excavator

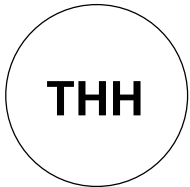


WORMS EYE

52 Bank Parade
Burnley, BB11 1TS

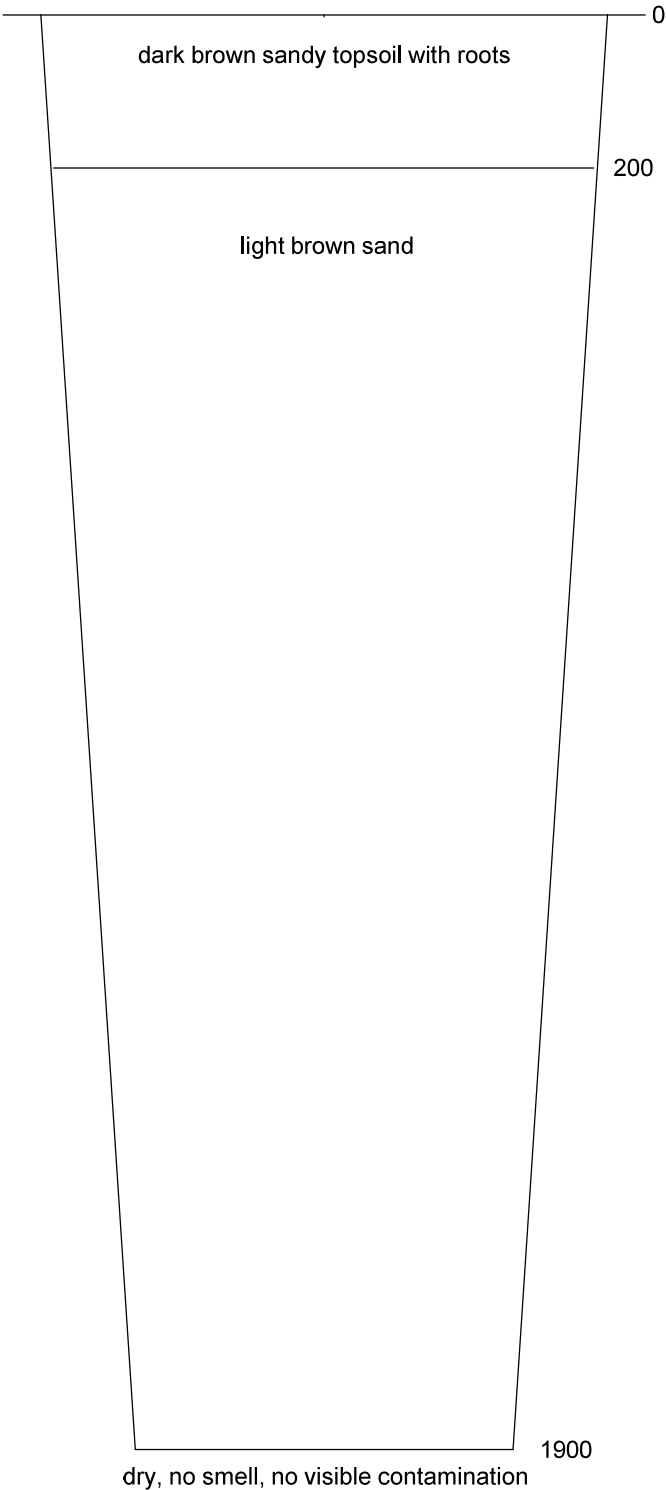
01282 414 649

Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT



Scale 1: 10 16.05.19

360⁰ JCB light excavator

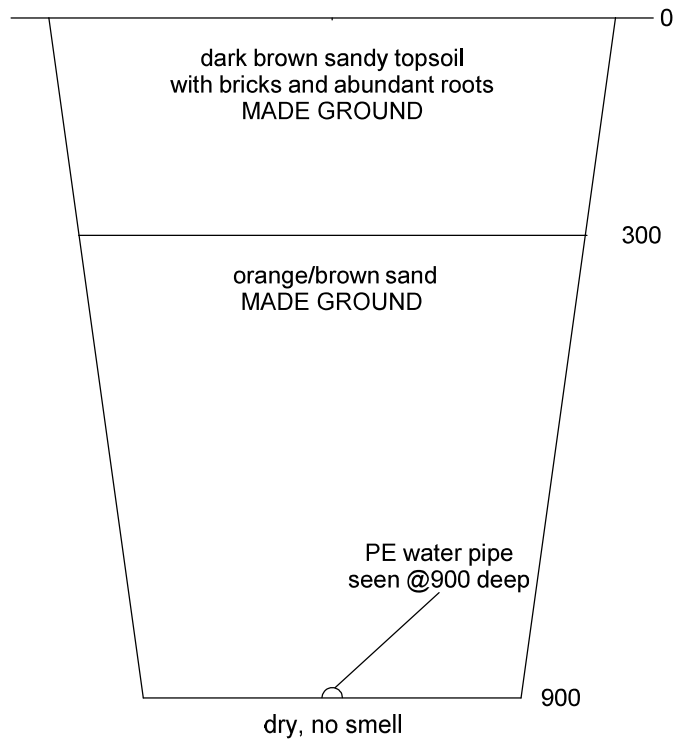


Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT

Scale 1: 10 16.05.19

THI

360⁰ JCB light excavator



WORMS EYE

52 Bank Parade
Burnley, BB11 1TS

All dimensions in millimetres

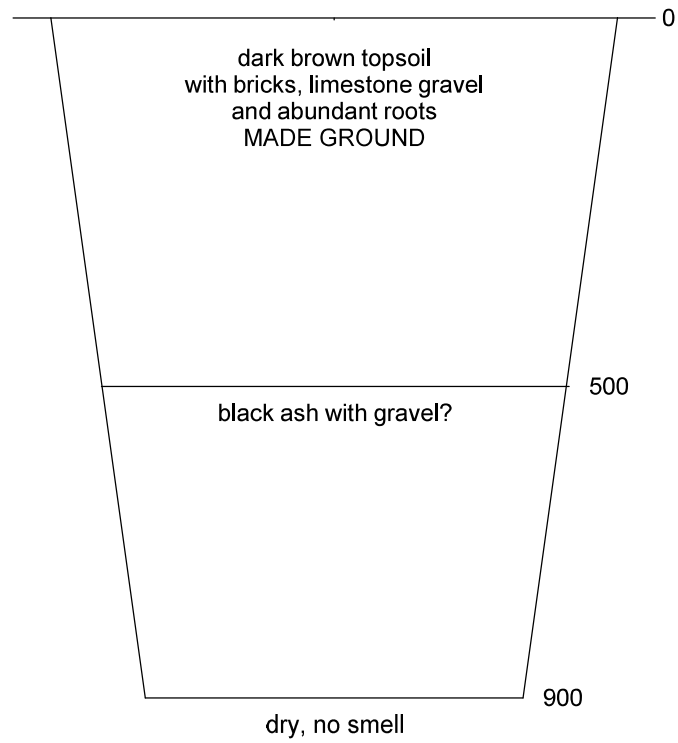
01282 414 649

Ramsden Farm, Roundthorn Road
Middleton, Manchester, M24 1FT

Scale 1: 10 16.05.19

THJ

360⁰ JCB light excavator



WORMS EYE

52 Bank Parade
Burnley, BB11 1TS

All dimensions in millimetres

01282 414 649

Roundthorn Road, Middleton, Manchester. M24 1FT

Trial Holes – September 2019

Trial Hole K

Depth (m)	Findings
K1 – 0.3	Orangish brown SAND
K2 – 0.3	Orangish brown SAND
K3 – 0.3	Light brown SAND
K4 – 0.3	Brown TOPSOIL with brick fragments (MADE GROUND)

Trial Hole L

Depth (m)	Findings
0.0 – 0.8	Light brown SAND

Trial Hole M

Depth (m)	Findings
0.0 – 0.3	Light brown SAND

Trial Hole N

Depth (m)	Findings
0.0 – 0.3	Light brown SAND

Trial Hole O

Depth (m)	Findings
0.0 – 0.7	Light brown SAND

WORMS EYE LTD
DYNAMIC PROBE LOG

Site: Roundthorn Road, Middleton M24 1FT

Probe: PR1

Location: Southeast corner

Date: 7th November 2019

Method: 63.5KG Weight with 750mm drop.

JSH

<u>Depth (m)</u>	<u>Blows/ 100mm</u>	<u>Blows/ 300mm (N value)</u>	<u>Diagram</u>	<u>Strength</u>
0	1	5	0 5 10 15 20 25 30 35 40	
	2		*	
	2		**	
	1		**	
0.5	1	3	*	
	1		*	
	1	5	*	
	3		***	
1	4		****	
	2	9	**	
	3		***	very low/low
	1		*	
1.5	0	1		
	0			
	1	3	*	
	1		*	
	1		*	
2	0	2	*	
	1		*	
	1	2		
	0			
	0	2	**	
2.5	2		*	
	1	5	**	
	2		**	
	3		***	
3	4	11	****	
	4		****	
	2		**	
	2	6	**	low
	2		**	
3.5	3		***	
	3	9	***	
	3		***	
3.9	3	9	***	
	3		***	
	3		***	

Continued

Dynamic Probe Log Continued

Probe: PR1

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
3.9	-----			
4	3		***	
	2	9	**	
	4		****	low
	3		***	
	2	8	**	
4.5	3		***	
	3		***	
	4	10	****	
	3		***	
	3		***	
5	4	10	****	
	3		***	
	3		***	
	4	11	****	
	4		****	
5.5	4		****	
	4	12	****	
	4		****	
	4		****	
	5	14	*****	
6	5		*****	medium/high
	5	15	*****	
	5		*****	
	6	16	*****	
	5		*****	
	4		****	
	4	14	****	
	6		*****	
7	6		*****	
	7	20	*****	
	7		*****	
	7		*****	
	6	20	*****	
7.5	7		*****	
	7	22	*****	
	8		*****	
	7		*****	
	8	22	*****	
8	8		*****	
8.1	7		*****	

Continued

Dynamic Probe Log Continued

Probe: PR1

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
8.1	----- 4		****	
	7	18	*****	
	7		*****	
8.5	4		****	
	4	13	****	medium
	5		*****	
	5		*****	
9	5	15	*****	
	6		*****	
	6	19	*****	
	7		*****	
	7		*****	
9.5	8	24	*****	
	9		*****	
	9		*****	
	10	29	*****	
	10		*****	
10	11		*****	
	9	29	*****	
	9		*****	
	9		*****	
	8	25	*****	high
10.5	8		*****	
	9		*****	
	10	29	*****	
	10		*****	
	11		*****	
11	12	35	*****	
	12		*****	
	12	35	*****	
	12		*****	
	11		*****	
11.5	10	31	*****	
	10		*****	
	11		*****	
	12	36	*****	
12	12		*****	
Continued				

Dynamic Probe Log Continued

Probe: PR1

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
12	-----		*****	high
	12	37	*****	
	12		*****	
	13		*****	
12.5	13	40	*****	high
	14		*****	
	13	46	*****	
	15		*****	
	15		*****	
	16		*****	
13	16	51	*****	very high
	17		*****	
	18		*****	
	19	58	*****	
	19		*****	
13.5	20		*****	
	21	64	*****	
	21		*****	
	22		*****	
	22	69	*****	
14	23		*****	
	24	79	*****	
	25		*****	
	27		*****	
	27		*****	
14.5	29	96	*****	
	31		*****	
	36		*****	
	40		*****	

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
0	1 1 0 0 1	2	0 5 10 15 20 25 30 35 40	
0.5	1	1	*	very low/low
1	0 1 1 4 6	6	* * **** *****	
	5 3 3 3 3	14	***** **** **** **** ****	
	3 2 4 3 4	9	**** ** **** *** *****	
2	4 5 6 3 3	11	***** ***** ***** **** ****	
	4 5 3 4 4	12	***** ***** **** **** ****	
	4 4 4 4 4	12	**** **** **** **** ****	
2.5	4 5 6 3 3	14	***** ***** **** **** ****	medium
	4 5 3 4 4	11	***** ***** **** **** ****	
	4 4 4 4 4	12	**** **** **** **** ****	
3	4 3 4 4 4	11	**** **** **** **** ****	
	4 4 4 4 4	12	**** **** **** **** ****	
	4 3 4 4 4	11	**** **** **** **** ****	
3.5	4 4 4 4 4	12	**** **** **** **** ****	
3.9	4 3 4 4 4	11	**** **** **** **** ****	

Dynamic Probe Log Continued

Probe: PR2

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
3.9	-----			
4	5		*****	
	5	16	*****	
	6		*****	
	5		*****	
	6	18	*****	
4.5	7		*****	
	7		*****	
	6	20	*****	
	7		*****	
	7		*****	
5	6	17	*****	
	4		****	
	4		****	
	3	11	***	
	4		****	
5.5	4		****	
	5	14	*****	
	5		*****	
	6		*****	
	6	19	*****	
6	7		*****	
	6		*****	
	6	19	*****	
	7		*****	
6.5	7	19	*****	
	6		*****	
	7		*****	
	8	22	*****	
	7		*****	
7	8		*****	
	7	22	*****	
	7		*****	
	8		*****	
7.5	10	28	*****	
	10		*****	
	8		*****	
	9	25	*****	
	8		*****	
	8		*****	
8	8	23	*****	
8.1	7		*****	

medium

Continued

Dynamic Probe Log Continued

Probe: PR2

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
8.1	----- 9		*****	
	4	22	*****	
	9		*****	
8.5	4		****	
	4	12	****	
	4		****	
	5		*****	
	5	15	*****	
9	5		*****	
	5		*****	
	6	17	*****	
	6		*****	
	5		*****	
9.5	6	20	*****	
	9		*****	
	9		*****	
	10	28	*****	
	9		*****	
10	9		*****	
	10	29	*****	
	10		*****	
	9		*****	
	9	26	*****	
10.5	8		*****	
	8		*****	
	8	25	*****	
	9		*****	
	8		*****	
11	10	29	*****	
	11		*****	
	11		*****	
	12	35	*****	
	12		*****	
11.5	12		*****	
	13	39	*****	
	14		*****	
	14		*****	
	14	41	*****	
12	13		*****	
Continued				

Dynamic Probe Log Continued

Probe: PR2

Site: Roundthorn Road, Middleton M24 1FT

<u>Depth</u> <u>(m)</u>	<u>Blows/</u> <u>100mm</u>	<u>Blows/</u> <u>300mm</u> <u>(N value)</u>	<u>Diagram</u>	<u>Strength</u>
			0 5 10 15 20 25 30 35 40	
12	-----		*****	
	18		*****	
	18	55	*****	
	19		*****	
	19		*****	
12.5	20	61	*****	
	22		*****	
	23		*****	
	24	72	*****	
	25		*****	
13	28		*****	
	32	99	*****	
	39		*****	
	45		*****	
		45		

very high

WORMS EYE LTD
DYNAMIC PROBE LOG

Site: Roundthorn Road, Middleton M24 1FT

Probe: PR3

Location: Towards centre of site

Date: 7th November 2019

Method: 63.5KG Weight with 750mm drop.

JSH

<u>Depth (m)</u>	<u>Blows/ 100mm</u>	<u>Blows/ 300mm (N value)</u>	<u>Diagram</u>	<u>Strength</u>
0	4	16	0 5 10 15 20 25 30 35 40 ***** ***** ***** *****	medium
0.5	4	13	***** *****	
	4	14	***** ***** *****	
1	5	15	***** *** *****	
	3	17	***** ***** *****	low/very low
1.5	7		*****	
	6		*****	
	6		*****	
	5		*****	medium
	2	5	** * **	
2	1	3	* * *	
	1	5	* ** **	
2.5	1	10	*** *** ****	medium
	1	14	**** ***** *****	
3	2	13	***** ***** *****	
	4	16	***** ***** *****	
3.5	5	17	***** ***** *****	
	6		*****	
3.9	5		*****	
	6		*****	

Continued

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
3.9	-----			
4	6		*****	
	5	18	*****	
	7		*****	
	6		*****	
4.5	7	20	*****	
	7		*****	
	6	19	*****	
	6		*****	
	7		*****	
5	8	21	*****	
	8		*****	
	5		*****	
	5	13	*****	
5.5	4		****	
	4		****	
	3	11	***	
	4		****	
	4		****	
6	6	20	*****	
	6		*****	
	8		*****	
	7	21	*****	
	7		*****	
	7		*****	
6.5	8	24	*****	
	7		*****	
	9		*****	
	8	26	*****	
	9		*****	
7	9		*****	
	9	24	*****	
	6		*****	
	6		*****	
7.5	4	14	****	
	4		****	
	4		****	
	4	13	****	
	4		****	
8	5		*****	
	6		*****	
	3	13	***	
8.1	4		****	

medium/high

Continued

Dynamic Probe Log Continued

Probe: PR3

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
8.1	----- 5		*****	
	5	17	*****	
	7		*****	
8.5	8		*****	
	7	23	*****	
	8		*****	
	8		*****	
9	7	23	*****	
	8		*****	
	8		*****	
	9		*****	
9.5	9	29	*****	high
	11		*****	
	10		*****	
	9	27	*****	
	8		*****	
10	10		*****	
	11	30	*****	
	9		*****	
	8		*****	
10.5	9	26	*****	
	9		*****	
	12		*****	
	12	36	*****	
	12		*****	
11	11		*****	
	13	39	*****	
	15		*****	
	15		*****	
	18	51	*****	
11.5	18		*****	
	20		*****	very high
	22	65	*****	
	23		*****	
	24		*****	
12	24	74	*****	
	26		*****	
Continued				

Dynamic Probe Log Continued

Probe: PR3

Site: Roundthorn Road, Middleton M24 1FT

<u>Depth</u> <u>(m)</u>	<u>Blows/</u> <u>100mm</u>	<u>Blows/</u> <u>300mm</u> <u>(N value)</u>	<u>Diagram</u>	<u>Strength</u>
			0 5 10 15 20 25 30 35 40	
12	-----		*****	
	27		*****	
	29	85	*****	
	29		*****	very high
	30		*****	
12.5	31	97	*****	
	36		*****	

WORMS EYE LTD
DYNAMIC PROBE LOG

Site: Roundthorn Road, Middleton M24 1FT

Probe: PR4

Location: Towards northwest of site

Date: 7th November 2019

Method: 63.5KG Weight with 750mm drop.

JSH

<u>Depth (m)</u>	<u>Blows/ 100mm</u>	<u>Blows/ 300mm (N value)</u>	<u>Diagram</u>	<u>Strength</u>
0	2	8	0 5 10 15 20 25 30 35 40 ** *** *** ****	
0.5	4	6	*	
	1		*	
	1	3	*	low/very low
	1		*	
1	1	9	*	
	4		****	
	4		****	
	4	10	*****	
1.5	6		*****	
	6	19	*****	
	7		*****	
	6	13	*****	
2	2		**	
	5		*****	
	5	15	*****	
	5		*****	
2.5	6		*****	medium
	6	18	*****	
	6		*****	
	6	18	*****	
3	6		*****	
	5	17	*****	
	6		*****	
	6	18	*****	
3.5	6		*****	
	6	16	*****	
3.9	6		*****	
	6		*****	
	4		****	

Continued

Dynamic Probe Log Continued

Probe: PR4

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
3.9	-----			
4	5		*****	
	6	17	*****	
	6		*****	
	6		*****	
4.5	7	20	*****	
	7		*****	
	7		*****	
	8	23	*****	
	8		*****	
5	8		*****	
	9	20	*****	
	3		***	
	3		***	
5.5	4	12	****	
	5		*****	
	5		*****	
	6	17	*****	
	6		*****	
	7		*****	
6	7	22	*****	
	8		*****	
	7		*****	
	7	21	*****	
	7		*****	
6.5	8		*****	
	8	23	*****	
	7		*****	
	8		*****	
	9	25	*****	
	8		*****	
7	8		*****	
	8	24	*****	
	8		*****	
	9		*****	
7.5	9	26	*****	
	8		*****	
	9		*****	
	9	27	*****	
	9		*****	
8	8		*****	
	9	24	*****	
8.1	7		*****	

medium

Continued

Dynamic Probe Log Continued

Probe: PR4

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
8.1	----- 4		*****	
	3	10	***	
	3		***	
8.5	4		*****	
	5	14	*****	
	5		*****	
	6		*****	
	6	19	*****	
9	7		*****	
	8		*****	
	9	26	*****	
	9		*****	
	9		*****	
9.5	9	28	*****	
	10		*****	
	10		*****	
	11	32	*****	
	11		*****	
10	10		*****	
	11	30	*****	
	9		*****	
	8		*****	
	9	26	*****	
10.5	9		*****	
	10		*****	
	10	31	*****	
	11		*****	
	12		*****	
11	12	37	*****	
	13		*****	
	13		*****	
	14	41	*****	
	14		*****	
11.5	14		*****	
	15	45	*****	
	16		*****	
	16		*****	
	16	49	*****	
12	17		*****	
Continued				

Dynamic Probe Log Continued

Probe: PR4

Site: Roundthorn Road, Middleton M24 1FT

<u>Depth</u> <u>(m)</u>	<u>Blows/</u> <u>100mm</u>	<u>Blows/</u> <u>300mm</u> <u>(N value)</u>	<u>Diagram</u>	<u>Strength</u>
			0 5 10 15 20 25 30 35 40	
12	-----		*****	
	19		*****	
	20	61	*****	
	22		*****	
	23		*****	
12.5	24	72	*****	
	25		*****	
	28		*****	
	28	85	*****	
	29		*****	
13	30		*****	
	32	102	*****	
	40		*****	
				very high

WORMS EYE LTD
DYNAMIC PROBE LOG

Site: Roundthorn Road, Middleton M24 1FT

Probe: PR5

Location: North of entrance

Date: 7th November 2019

Method: 63.5KG Weight with 750mm drop.

JSH

<u>Depth (m)</u>	<u>Blows/ 100mm</u>	<u>Blows/ 300mm (N value)</u>	<u>Diagram</u>	<u>Strength</u>
0			0 5 10 15 20 25 30 35 40	
	2		***	
	3	8	***	
	3		***	
	3		***	
0.5	3	10	***	low
	4		****	
	2		**	
	2	6	**	
	2		**	
1	2		**	
	2	7	**	
	3		***	
	3		***	
1.5	4	11	****	
	4		****	
	5		*****	
	5	15	*****	
	5		*****	
	6		*****	
2	6	15	*****	
	3		***	
	3		***	
	3	9	***	medium
2.5	3		***	
	4	11	****	
	4		****	
	4		****	
3	3	11	***	
	4		****	
	5		*****	
	5	16	*****	
	6		*****	
	6		*****	
3.5	6	17	*****	
	5		*****	
	6		*****	
	6	18	*****	
3.9	6		*****	

Continued

Dynamic Probe Log Continued

Probe: PR5

Site: Roundthorn Road, Middleton M24 1FT

<u>Depth (m)</u>	<u>Blows/ 100mm</u>	<u>Blows/ 300mm (N value)</u>	<u>Diagram</u>	<u>Strength</u>
3.9	-----		0 5 10 15 20 25 30 35 40	
4	6		*****	
	6	19	*****	
	7		*****	
	6		*****	
4.5	5	16	*****	medium
	5		*****	
	6		*****	
	6	18	*****	
	6		*****	
5	5		*****	
	7	12	*****	

WORMS EYE LTD
DYNAMIC PROBE LOG

Site: Roundthorn Road, Middleton M24 1FT

Probe: PR6

Location: Centre of entrance

Date: 7th November 2019

Method: 63.5KG Weight with 750mm drop.

JSH

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
0	2	5	0 5 10 15 20 25 30 35 40 **	
	2		**	
	1		*	
	1		*	
0.5	1	3	*	very low/low
	1		*	
	1		*	
	3	7	***	
	3		***	
1	3		***	
	2	8	**	
	3		***	
	4		****	
1.5	5	14	*****	
	5		*****	
	4		****	
	4	13	****	
	5		*****	
	5		*****	
2	6	15	*****	
	6		****	
	4		****	
	4		****	
	6	16	*****	
2.5	6		*****	medium
	6		*****	
	5	17	*****	
	6		*****	
	6		*****	
	6		*****	
3	6	18	*****	
	7		*****	
	6	19	*****	
	6		*****	
	7		*****	
3.5	7	20	*****	
	7		*****	
	6		*****	
	6		*****	
3.9	5	14	*****	
	3		***	

Continued

Dynamic Probe Log Continued

Probe: PR6

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
3.9	-----			
4	3		***	
	4	11	****	
	4		****	
	3		***	
	6	15	*****	
4.5	6		*****	medium
	6		*****	
	6	19	*****	
	6		*****	
	7		*****	
	6		*****	
5	6	12	*****	

WORMS EYE LTD
DYNAMIC PROBE LOG

Site: Roundthorn Road, Middleton M24 1FT

Probe: PR7

Location: South of entrance

Date: 7th November 2019

Method: 63.5KG Weight with 750mm drop.

JSH

<u>Depth (m)</u>	<u>Blows/ 100mm</u>	<u>Blows/ 300mm (N value)</u>	<u>Diagram</u>	<u>Strength</u>
0	3 3 3	9	0 5 10 15 20 25 30 35 40 **** **** ****	
0.5	1 1	4	* *	
	2		**	low
	2		**	
	2	6	** **	
1	2		**	
	3	8	****	medium
	3		****	
	4		*****	
1.5	4	13	*****	
	5		*****	
	4		*****	
	4	10	***** **	
	2		*****	
2	4	12	***** *****	
	4		*****	
	4		*****	medium
	6	16	***** *****	
2.5	6		*****	
	4		*****	
	5	15	***** *****	
	6		*****	
	5		*****	
3	6	17	***** *****	
	6		*****	
	6	18	***** *****	
	6		*****	
3.5	5	16	***** *****	
	5		*****	
	6		*****	
3.9	4	12	**** **** ****	

Continued

Dynamic Probe Log Continued

Probe: PR7

Site: Roundthorn Road, Middleton M24 1FT

<u>Depth</u> <u>(m)</u>	<u>Blows/</u> <u>100mm</u>	<u>Blows/</u> <u>300mm</u> <u>(N value)</u>	<u>Diagram</u>	<u>Strength</u>
			0 5 10 15 20 25 30 35 40	
3.9	-----		****	
4	4		*****	
	5	12	*****	
	3		***	
	3		***	
	3	9	***	
4.5	3		***	medium/low
	3		***	
	3	9	***	
	3		***	
	4		*****	
5	4	8	*****	

WORMS EYE LTD
DYNAMIC PROBE LOG

Site: Roundthorn Road, Middleton M24 1FT

Probe: PR8

Location: Towards centre of site

Date: 7th November 2019

Method: 63.5KG Weight with 750mm drop.

JSH

<u>Depth (m)</u>	<u>Blows/ 100mm</u>	<u>Blows/ 300mm (N value)</u>	<u>Diagram</u>	<u>Strength</u>
0	2	7	0 5 10 15 20 25 30 35 40 ** ** *** ***	low
0.5	3	10	*** ****	
	4		****	
	4	11	**** *** ****	
1	3			
	4		****	
	4	12	**** ****	
	4		****	
1.5	4	12	**** **** ****	
	4		****	
	3	10	*** ***	
2	3		***	
	4	10	**** ***	medium
	3		***	
	3	10	*** ****	
2.5	3		****	
	4		****	
	4	12	**** ****	
	4		****	
3	4	12	**** **** ****	
	4		****	
	4	12	**** **** ****	
3.5	5	15	***** ***** *****	
	5		*****	
3.9	4	14	**** ***** *****	
	5		*****	

Continued

Dynamic Probe Log Continued

Probe: PR8

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
3.9	-----			
4	5		*****	
	5	14	*****	
	4		*****	
	5		*****	
4.5	5	15	*****	
	5		*****	
	4		****	
	4	12	****	
	4		****	
5	5		*****	
	6	17	*****	
	6		*****	
	5		*****	
5.5	5	15	*****	
	5		*****	
	6		*****	
	6	17	*****	
	5		*****	
6	6	20	*****	
	7		*****	
	6		*****	
	6	18	*****	
6.5	6		*****	
	7	20	*****	
	7		*****	
	7		*****	
7	7	21	*****	
	7		*****	
	7	22	*****	
	8		*****	
	8		*****	
7.5	8	24	*****	
	8		*****	
	7		*****	
	8	22	*****	
	7		*****	
8	7	20	*****	
8.1	6		*****	

medium/high

Continued

Dynamic Probe Log Continued

Probe: PR8

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
8.1	----- 6		*****	
	4	14	****	
	4		****	medium
8.5	3		***	
	3	9	***	
	3		***	
	6		*****	
9	7	20	*****	
	7		*****	
	9		*****	
	9	27	*****	
	9		*****	
9.5	9	27	*****	
	9		*****	
	10		*****	
	11	32	*****	
	11		*****	
10	11		*****	high
	10	31	*****	
	10		*****	
	9		*****	
	9	27	*****	
10.5	9		*****	
	11	31	*****	
	11		*****	
	11		*****	
11	11	34	*****	
	12		*****	
	12	36	*****	
	12		*****	
11.5	12		*****	
	12	37	*****	
	13		*****	
	13		*****	
	12	39	*****	
12	14		*****	
Continued				

Dynamic Probe Log Continued

Probe: PR8

Site: Roundthorn Road, Middleton M24 1FT

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram	Strength
			0 5 10 15 20 25 30 35 40	
12	-----		*****	high
	14	45	*****	
	15		*****	
	16		*****	
	17	52	*****	
12.5	17		*****	very high

	18	56	*****	
	18		*****	
	19		*****	
	19		*****	
13	20	64	*****	
	22		*****	
	22		*****	
	23	78	*****	
	26		*****	
	29		*****	
13.5		114	*****	
	36		*****	
	37		*****	
	41		*****	

GROUND GAS TESTING RESULTS

RAMSDEN FARM, ROUNDTORN ROAD, MIDDLETON, MANCHESTER, M24 1FT

Date	Barometric Pressure (mb)	Temp. °C	Weather	BH	Methane CH ₄ (%)	Oxygen O ₂ (%)	Carbon Dioxide CO ₂ (%)	Steady State CO ₂ (%)	Outflow from BH (l/hr)	Depth to water (m)	Comments
					0	20.9	0	0	0		Fresh air
					1.0 *		5.0 *		70 ❖		Threshold values
20.11.19	1001	4	Cloudy	Pr1	8.5	0.3	11.3	11.3	0.0	1.56	
				Pr2	0.0	20.9	0.5	0.5	0.0	Dry	
				Pr3	0.0	18.6	1.7	1.7	0.0	0.65	Water level falling
				Pr4	0.0	15.0	0.0	0.0	0.0	1.4	Surround excavated
04.12.19	1009	-1	Sunny/frost	Pr1	6.3	0.0	10.4	10.3	0.0	1.58	
				Pr2	0.0	20.9	1.3	0.4	0.0	Dry	
				Pr3	0.0	19.0	2.7	2.6	0.0	0.2	
				Pr4	0.0	19.7	0.6	0.5	0.0	1.5	
7.2.20	1007	3	Sunny	Pr1	3.4	2.4	10.0	10.0	0.0		
				Pr2	0.0	16.0	1.1	1.1	0.0		
				Pr3	0.0	16.0	0.0	0.0	0.0		
				Pr4	0.0	18.8	0.0	0.0	0.0		
20.2.20	-	7	Sunny	Pr1	-	-	-	-	-	-	Buried
				Pr2	-	-	-	-	-	-	Buried
				Pr3	-	-	-	-	-	-	Flooded
				Pr4	-	-	-	-	-	-	Flooded
18.6.20	1000	14	Rain	Pr1	-	-	-	-	-	-	Buried
				Pr2	-	-	-	-	-	-	Buried
				Pr3	0.0	17.3	0.3	0.3	0.0	0.7	
				Pr4	0.1	16.4	0.2	0.2	0.0	1.5	

Testing machines: GMI Landsurveyor 2 (P405890), Geotechnical Instruments GA45 (G6211/05)

Outflow - 0 taken as < 0.1litres/hour flow of gas from borehole

* NHBC green limit, CIRIA situation 1 limit

❖ CIRIA situation 2 limit