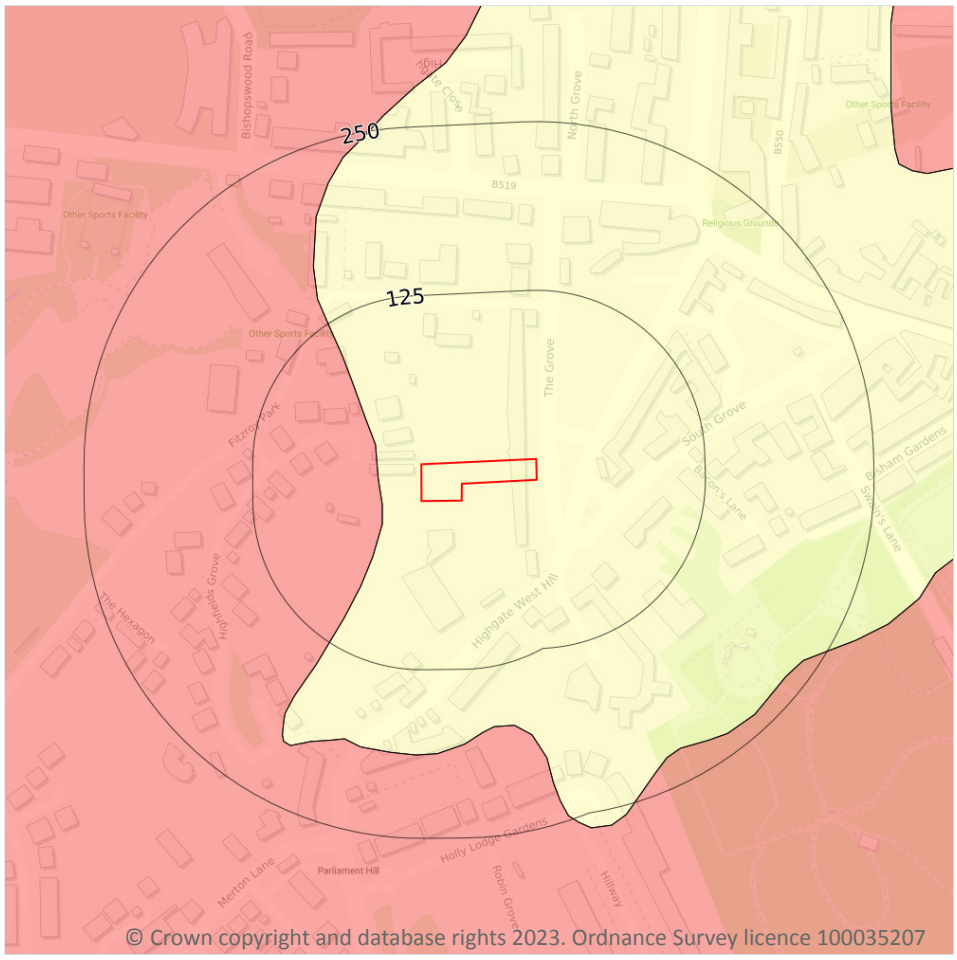
17 Natural ground subsidence - Shrink swell clays



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.1 Shrink swell clays

Records within 50m	2

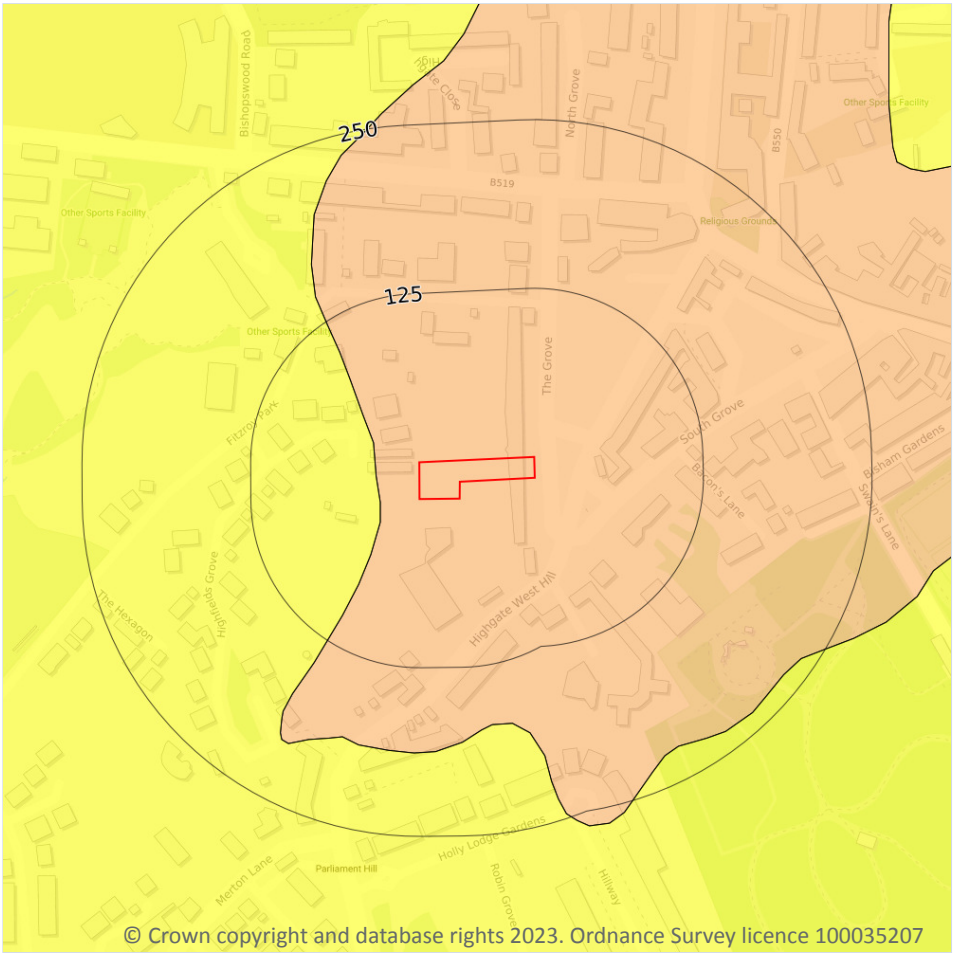
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 85**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**
29m W	Moderate	Ground conditions predominantly high plasticity.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.2 Running sands

Records within 50m	2

The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

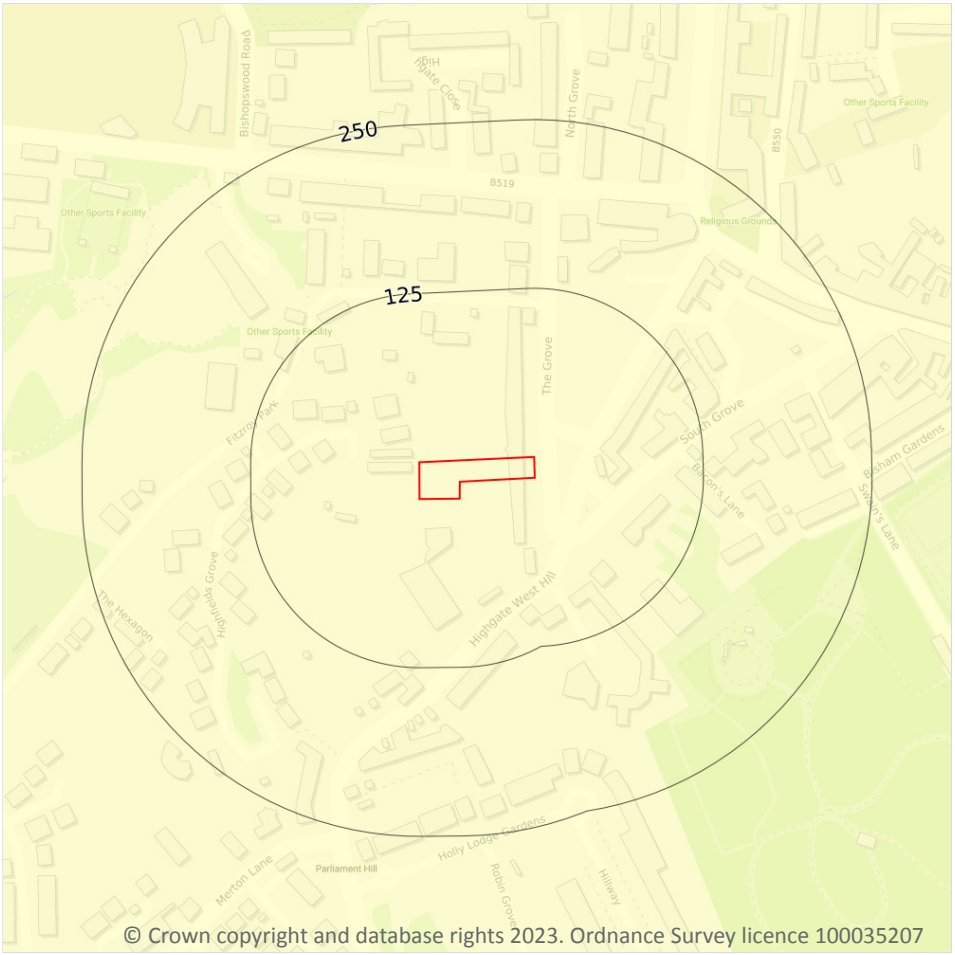
Features are displayed on the Natural ground subsidence - Running sands map on **page 86**

Location	Hazard rating	Details
On site	**Low**	**Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.**

Location	Hazard rating	Details
29m W	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	1

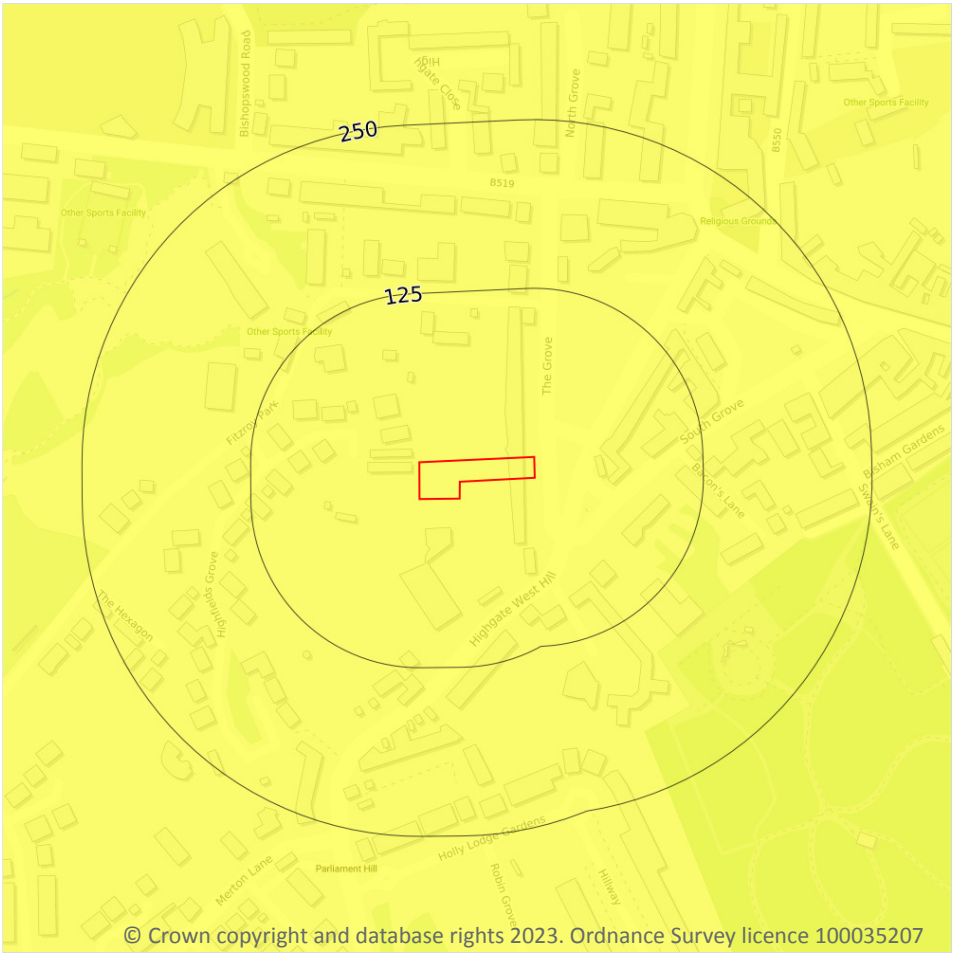
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 88**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	1

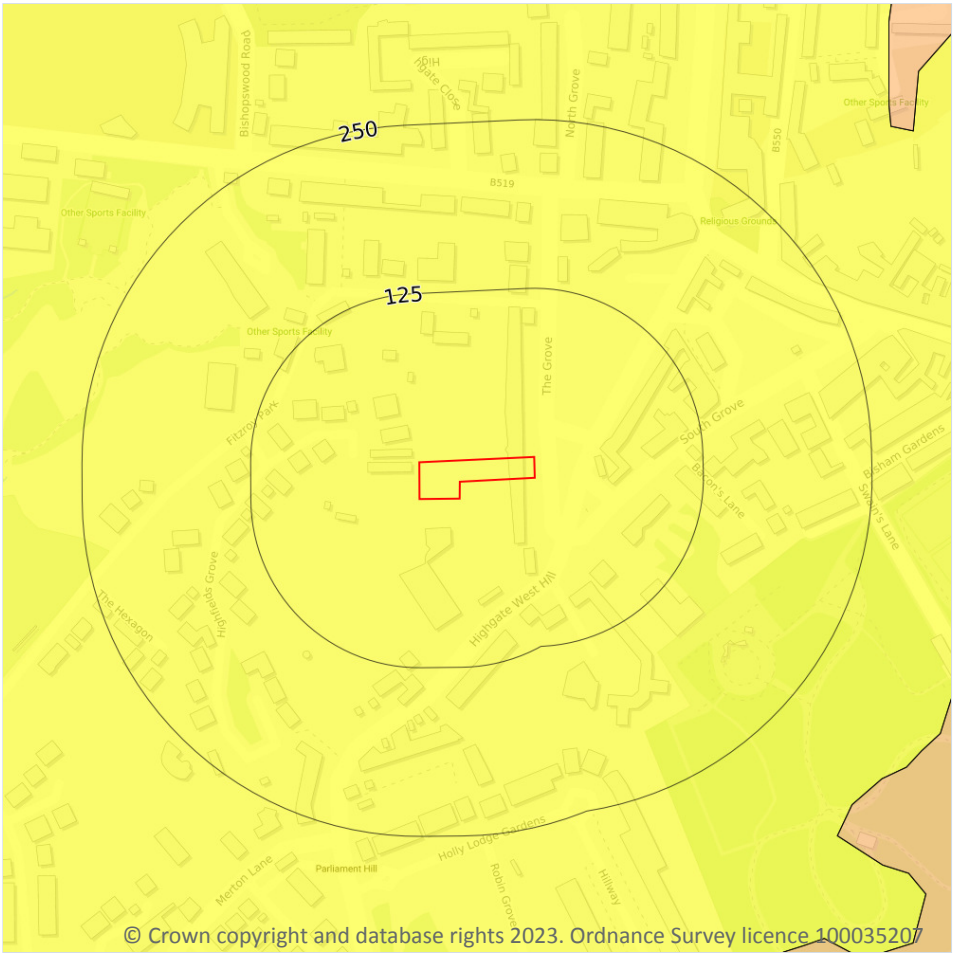
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 89**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.5 Landslides

Records within 50m	1

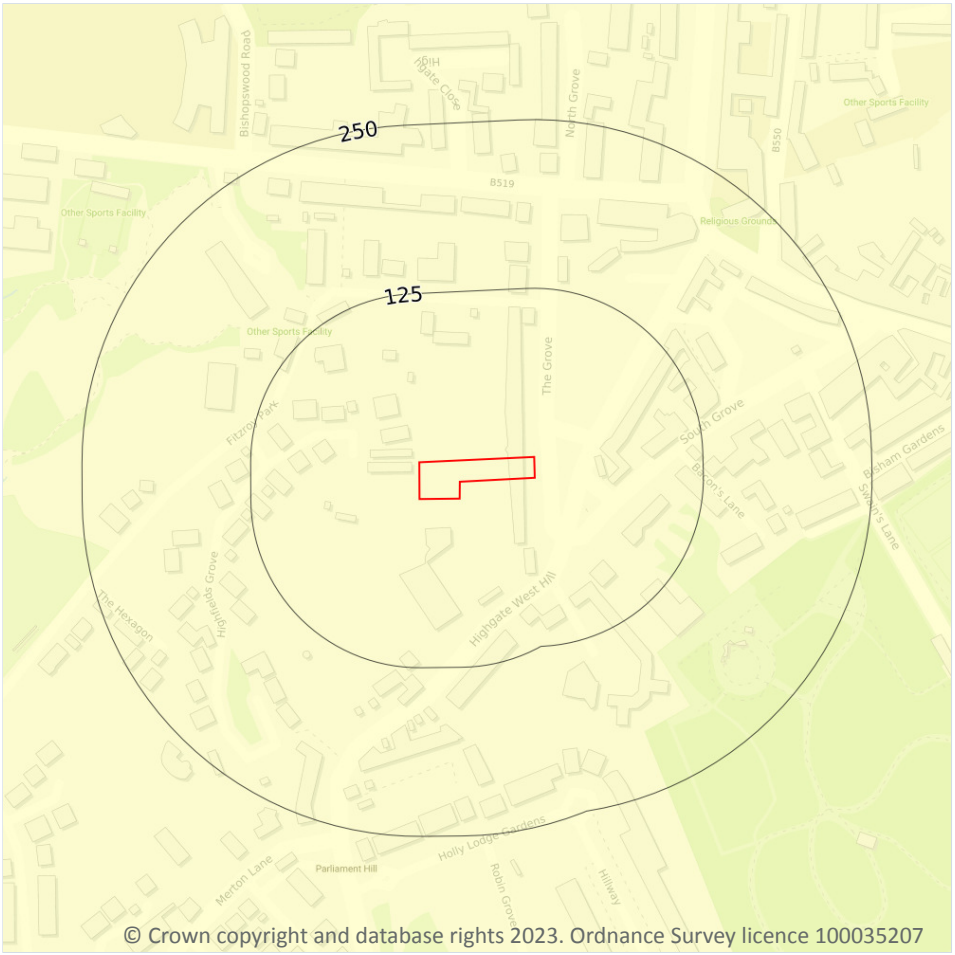
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 90**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.6 Ground dissolution of soluble rocks

Records within 50m	1

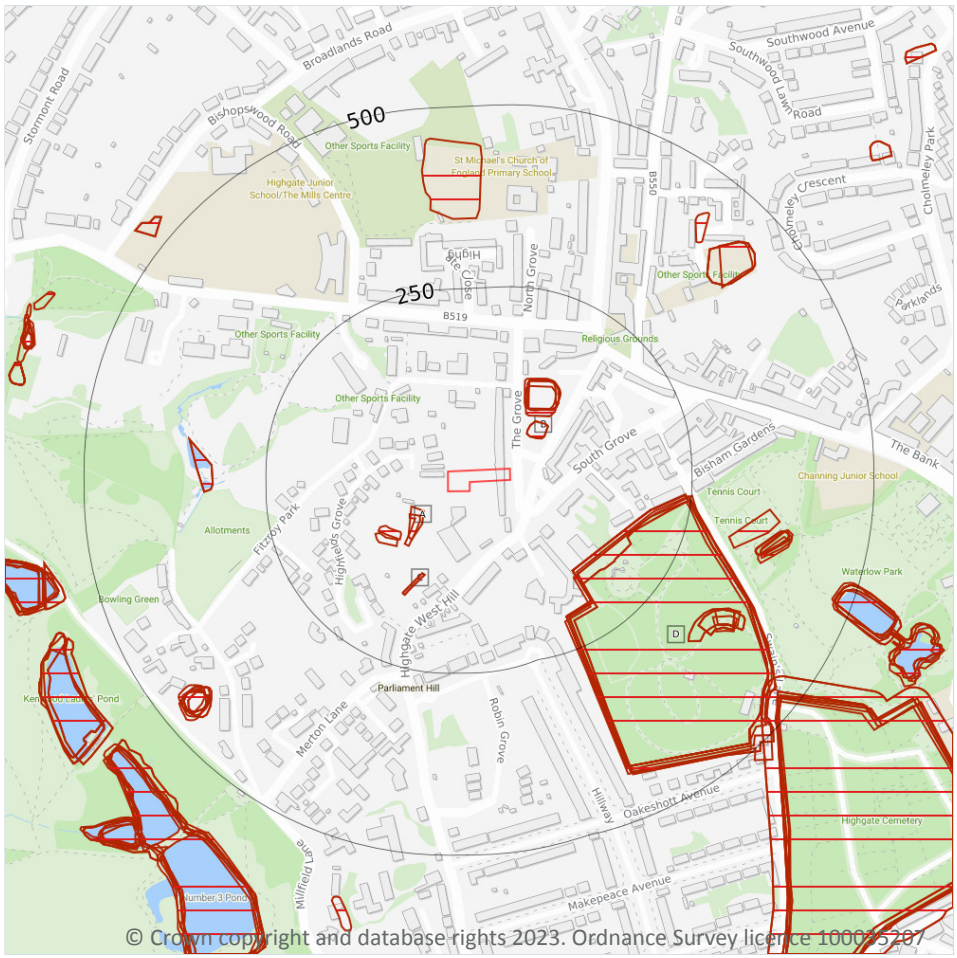
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 91**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



Site Outline

Search buffers in metres (m)

- Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- Surface ground workings
- Underground workings
- Historical Mineral Planning Areas
- Mining Cavities

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

18.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

18.2 BritPits

Records within 500m	0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m	24

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 92**

ID	Location	Land Use	Year of mapping	Mapping scale
A	43m SW	Unspecified Heap	1938	1:10560
A	51m SW	Unspecified Ground Workings	1920	1:10560
B	52m NE	Unspecified Pit	1869	1:10560
B	52m NE	Unspecified Pit	1879	1:10560
B	77m NE	Reservoir	1920	1:10560
B	86m NE	Reservoir	1965	1:10560
B	86m NE	Covered Reservoir	1974	1:10000
B	86m NE	Covered Reservoir	1996	1:10000
A	86m SW	Unspecified Ground Workings	1938	1:10560
B	86m NE	Reservoir	1949	1:10560
B	87m NE	Reservoir	1938	1:10560
A	95m SW	Unspecified Ground Workings	1920	1:10560
C	118m SW	Pond	1879	1:10560
C	118m SW	Pond	1869	1:10560
D	151m SE	Cemetery	1949	1:10560
D	151m SE	Cemetery	1958	1:10560
D	151m SE	Cemetery	1965	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
D	151m SE	Cemetery	1974	1:10000
D	151m SE	Cemetery	1996	1:10000
D	156m SE	Cemetery	1938	1:10560
D	159m SE	Cemetery	1894	1:10560
D	159m SE	Cemetery	1920	1:10560
D	174m SE	Cemetery	1879	1:10560
D	174m SE	Cemetery	1869	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m **17**

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining, ground workings and natural cavities map on **page 92**

ID	Location	Land Use	Year of mapping	Mapping scale
-	832m E	Unspecified Shaft	1965	1:10560
-	832m E	Unspecified Shaft	1974	1:10000
-	832m E	Unspecified Shaft	1995	1:10000
-	941m NE	Tunnels	1965	1:10560
-	941m NE	Tunnels	1974	1:10000
-	941m NE	Tunnels	1995	1:10000
-	941m NE	Tunnels	1958	1:10560
-	942m NE	Tunnel	1869	1:10560
-	942m NE	Tunnel	1879	1:10560
-	942m NE	Tunnel	1879	1:10560
-	959m NE	Tunnels	1965	1:10560
-	959m NE	Tunnels	1974	1:10000
-	959m NE	Tunnels	1995	1:10000

ID	Location	Land Use	Year of mapping	Mapping scale
-	959m NE	Tunnels	1958	1:10560
-	960m NE	Tunnel	1869	1:10560
-	960m NE	Tunnel	1879	1:10560
-	960m NE	Tunnel	1879	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	**0**

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	**0**

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m	**0**

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Stantec UK Ltd.

18.8 JPB mining areas

Records on site	0

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	0

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

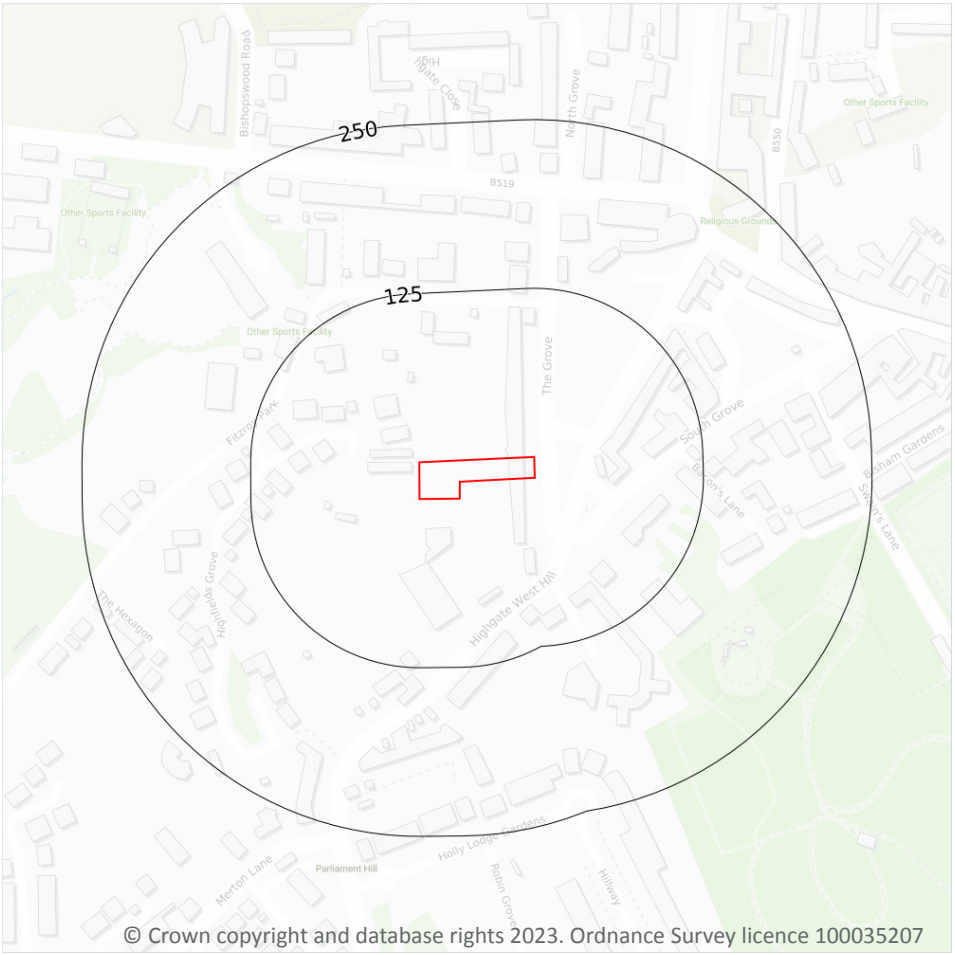
18.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon



Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

19.1 Radon

Records on site	1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on **page 98**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None**

This data is sourced from the British Geological Survey and UK Health Security Agency.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m	2

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**No data**	**No data**	**No data**	**No data**	**No data**	**No data**	**No data**
29m W	No data	No data	No data	No data	No data	No data	No data

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m	6

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
On site	**22**	**3.8**	**368**	**253**	**0.5**	**86**	**46**	**22**	**16**
6m E	22	3.8	379	260	0.5	85	46	22	16
8m W	19	3.3	307	211	0.5	90	44	20	18
13m NE	21	3.7	370	254	0.5	86	47	21	17
14m NE	21	3.7	374	257	0.5	84	47	21	16
18m NW	19	3.3	327	225	0.5	88	46	20	20

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

Records within 50m	**1**

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

Location	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Lead (mg/kg)	Tin (mg/kg)	Sample Type
20m E	22.4	0.5	84.5	45.9	21.9	382.2	15.4	Topsoil

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects

21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: https://www.groundsure.com/terms-and-conditions-jan-2020/.

APPENDIX D – PREVIOUS INVESTIGATION REPORT EXTRACTS

GEA

Geotechnical & Environmental Associates

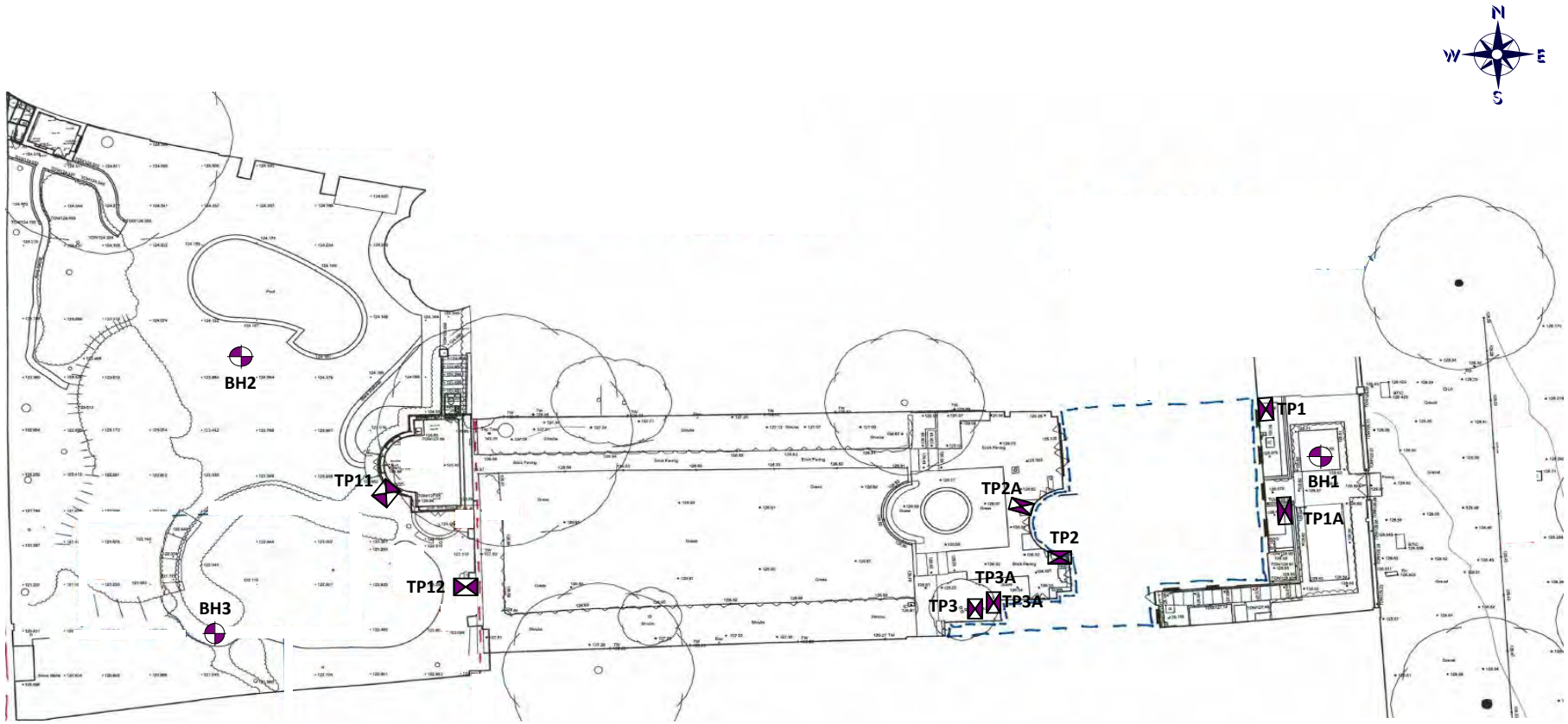
www.gea-ltd.co.uk

Site Plan

Site	5 The Grove, London N6 6JU
Client	Mr Stephen Cameron
Engineer	Constructure

Job Number J21179

Sheet 1 / 1



GEA	Geotechnical & Environmental Associates Widbury Barn | Widbury Hill | Ware | SG12 7QE	Site 5 The Grove, London N6 6JU	Borehole Number BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Demountable Cable Percussion Rig	200mm cased to 12.00m 150mm cased to 16.00m		Mr Stephen Cameron	J21179
	Location	**Dates** 29/06/2021- 02/07/2021	**Engineer** Constructure	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.10 (0.20)	Made Ground (Brick paving)		
0.30	D1					0.30	Made Ground (Sand and cement)		
0.50	B2					(0.50)	Made Ground (Brown clayey sand with grave and brick fragments)		
						0.80	Medium dense orange-brown clayey SAND with occasional gravel		
1.20-1.65 1.20-1.65	SPT N60=18 D3	1.20	DRY	2,3/3,4,4,5		(1.20)			
1.75	D4								
2.00-2.45	U5					2.00	Firm orange-brown sandy CLAY with bands of clayey sand		
2.75	D6								
3.00-3.45 3.00-3.45	SPT N60=15 D7	2.00	DRY	2,3/3,3,3,4					
3.75	D8								
4.00-4.45	U9								
4.75	D10								
5.00-5.45 5.00-5.45	SPT N60=17 D11	2.00	DRY	3,3/3,4,4,4		(7.00)			
6.00	D12								
6.50-6.95 6.50-6.95	SPT N60=22 D13	2.00	DRY	3,3/4,5,5,6					
7.50	D14								
8.00-8.45	U15								
9.00	D16					9.00	Dense fine brown SAND		
9.50-9.95 9.50-9.95	SPT N60=35 D17	2.00	DRY	4,5/6,7,8,10		(1.00)			

Remarks
Groundwater monitoring standpipe installed to a depth of 10.00 m.

Scale (approx)	Logged By
1:50	AT

Figure No.
J21179.BH1

GEA Geotechnical & Environmental Associates Widbury Barn | Widbury Hill | Ware | SG12 7QE	Site 5 The Grove, London N6 6JU	Borehole Number BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Demountable Cable Percussion Rig	200mm cased to 12.00m 150mm cased to 16.00m		Mr Stephen Cameron	J21179
	Location	**Dates** 29/06/2021- 02/07/2021	**Engineer** Constructure	**Sheet** 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						10.00	Firm grey and brown sandy CLAY with lenses of fine sand		
10.50	D18								
11.00-11.45	SPT N60=30	11.00	DRY	3,4/5,6,7,9		(2.00)			▼2
11.00-11.45	D19								▼1
12.00	D20			Fast Inflow(1) at 12.00m, rose to 11.50m in 20 mins.		12.00	Medium dense orange-brown fine SAND with bands of sandy clay		▽1
12.50-12.95	SPT N60=51	12.00	DRY	5,7/9,10,12,15					
12.50-12.95	D21								
13.50	D22					(3.00)			
14.00-14.45	D23			Fast Inflow(2) at 14.00m, rose to 11.00m in 20 mins.					▽2
14.00-14.45	SPT N60=26	14.00	DRY	3,4/5,5,5,8					
15.00	D24					15.00	Firm grey sandy CLAY with lenses of fine sand		▼3
15.50-15.95	SPT N60=36	15.00	DRY	4,5/7,8,8,9					
15.50-15.95	D25								
16.50	D26								
17.00-17.45	SPT N60=40	16.00	DRY	4,5/7,8,10,11					
17.00-17.45	D27					(5.45)			
18.00	D28			Fast Inflow(3) at 18.00m, rose to 15.00m in 20 mins.					▽3
18.50-18.95	SPT N60=31	16.00	DRY	5,7/8,7,6,7					
18.50-18.95	D29								
19.50	D30								
20.00-20.45	SPT N60=36	16.00	DRY	6,7/7,8,8,9					

Remarks

Scale (approx)	Logged By
1:50	AT

Figure No.
J21179.BH1

GEA Geotechnical & Environmental Associates Widbury Barn | Widbury Hill | Ware | SG12 7QE	Site 5 The Grove, London N6 6JU	Borehole Number **BH1**

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Demountable Cable Percussion Rig	200mm cased to 12.00m 150mm cased to 16.00m		Mr Stephen Cameron	J21179
	Location	**Dates** 29/06/2021- 02/07/2021	**Engineer** Constructure	**Sheet** 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.00-20.45	D31					20.45	Complete at 20.45m		

Remarks	Scale (approx)	Logged By
	1:50	AT
	Figure No. J21179.BH1	

GEA	Geotechnical & Environmental Associates Widbury Barn | Widbury Hill | Ware | SG12 7QE	Site 5 The Grove, London N6 6JU	Number **BH2**
Excavation Method Opendrive Percussive Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Mr Stephen Cameron	**Job Number** J21179
	Location	**Dates** 28/06/2021	**Engineer** Constructure	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D1				(0.50) 0.50	Made Ground (dark brown clayey sand with gravel, brick fragments and occasional glass and ash fragments)		
0.70	D2				(0.80)	Made Ground (brown nd dark brown very sandy slightly silty clay with gravel, brick and ash fragments)		
1.00-1.45	SPT		1,1/1,2,2,2		1.30			
1.70	D3				(0.70)	Firm becoming stiff orange-brown mottled grey slightly silty sandy CLAY		
2.00-2.45	SPT		1,0/0,1,2,2		2.00			
2.10	D4				(0.30) 2.30	Firm becoming stiff orange-brown mottled grey slightly silty sandy CLAY with sub-rounded fine to medium gravel		
					(0.70)	Stiff becoming stiff orange-brown mottled grey slightly silty sandy CLAY		
3.00-3.45	SPT		4,5/6,4,4,3		3.00	Medium dense to dense brown and orange-brown silty slightly clayey fine to medium SAND		
3.50	D5							
4.00-4.45	SPT		1,2/2,2,2,3					
					(3.80)			
5.00-5.45	SPT		3,3/4,5,3,3					
5.50	D6							
6.00-6.45	SPT		Water strike(1) at 6.00m. 2,2/2,3,3,3		6.80			▽1
						Complete at 6.80m		

Remarks
Borehole terminated at a depth of 6.80 m due to density of the soil.
Groundwater monitoring standpipe installed to 6.80 m.

Scale (approx)	Logged By
1:50	AT

Figure No.
J21179.BH2

GEA	Geotechnical & Environmental Associates Widbury Barn | Widbury Hill | Ware | SG12 7QE	Site 5 The Grove, London N6 6JU	Number **BH3**
Excavation Method Opendrive Percussive Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Mr Stephen Cameron	**Job Number** J21179
	Location	**Dates** 29/06/2021	**Engineer** Constructure	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Made Ground (dark brown clayey sand with gravel, brick fragments and occasional glass and ash fragments)		
0.50	D1							
1.00-1.45	SPT N60=7		1,1/1,1,1,2		(2.00)			
					2.00			
2.00-2.45	SPT N60=17		1,2/2,3,4,3			Firm brown silty sandy CLAY with rounded to sub-rounded gravel		
					(1.00)			
2.80	D2							
					3.00			
3.00-3.45	SPT N60=18		2,2/2,2,4,5		(0.40)	Orange-brown SAND and fine to coarse sub-angular to sub-rounded gravel		
					3.40			
						Firm brown silty sandy CLAY with rare fine to medium sib-rounded gravel		
4.00-4.45	SPT N60=21		2,2/3,4,3,5		(1.60)			
4.80	D3							
					5.00			
5.00-5.45	SPT N60=62		5,9/10,11,12,11			Firm orange-brown very sandy silty CLAY		
					(1.00)			
5.80	D4							
			Water strike(1) at 6.00m.		6.00			▽1
6.00-6.45	SPT N60=51		5,7/7,7,10,12			NO RECOVERY		
6.45-6.90	SPT N60=96		13,13/14,19,19,16		(1.00)			
					7.00			
7.00-7.33	SPT 63/175		13,15/21,22,20			Complete at 7.00m		

Remarks
Borehole terminated at a depth of 7.00 m due to density of the soil.
Groundwater monitoring standpipe installed to 6.00 m.

Scale (approx)	Logged By
1:50	AT

Figure No.
J21179.BH2

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 1

Site 5 The Grove, London N6 6JU

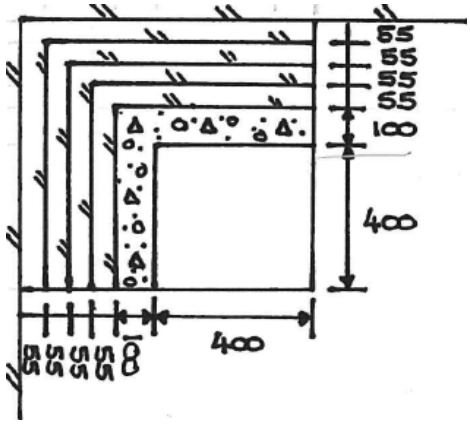
Client Mr Stephen Cameron

Engineer Constructure

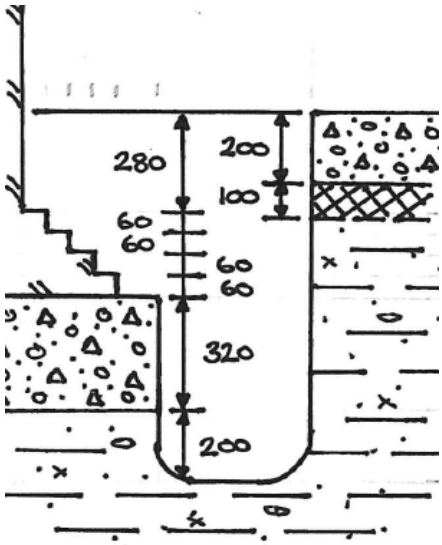
Job Number
J21179
Sheet
1'1
Dates
28/06/2021

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Location**
Manual	720 x 720 x 1040		

PLAN:



SECTION:



Concrete

Made Ground (orange-brown clayey sand with gravel, brickand concrete fragments)

Firm orange-brown mottled pale brown firm sandy slightly silty CLAY

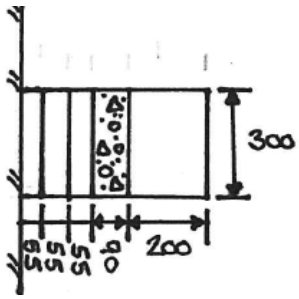
Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 1A

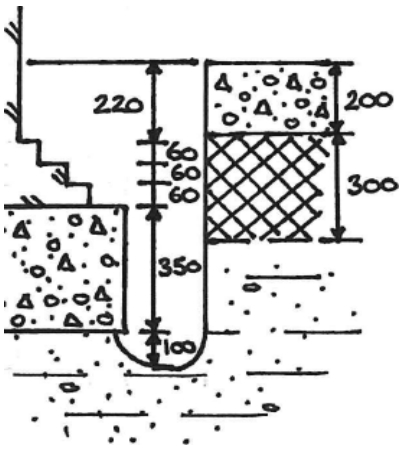
Site 5 The Grove, London N6 6JU	**Job Number** J21179
Client Mr Stephen Cameron	**Sheet** 1'1
Engineer Constructure	**Dates** 28/06/2021

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Location**
Manual	300 x 455 x 850		

PLAN:



SECTION:



Concrete

Made Ground (orange-brown clayey sand with gravel, brickand concrete fragments)

Orange-brown mottled pale brown firm sandy slightly silty CLAY

Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 2

Site 5 The Grove, London N6 6JU

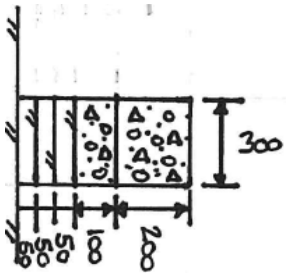
Client Mr Stephen Cameron

Engineer Constructure

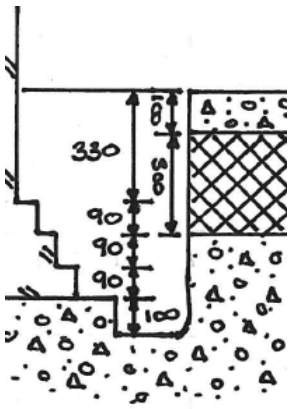
Job Number
J21179
Sheet
1'1
Dates
28/06/2021

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Location**
Manual	300 x 450 x 700		

PLAN:



SECTION:



Concrete

Made Ground (pale brown and brown very clayey sand with gravel, brick, concrete and clay pipe fragments and

Possible concrete service

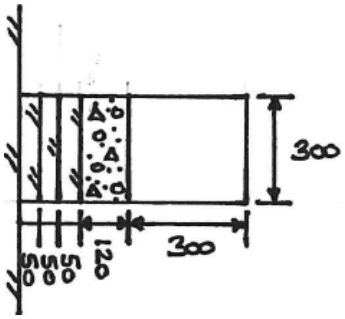
Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 2A

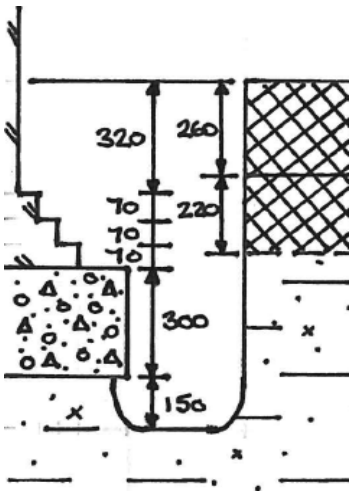
Site 5 The Grove, London N6 6JU	**Job Number** J21179
Client Mr Stephen Cameron	**Sheet** 1'1
Engineer Constructure	**Dates** 28/06/2021

Excavation Method	Dimensions	Ground Level (mOD)	Location
Manual	300 x 570 x 980		

PLAN:



SECTION:



Made Ground (brown clayey sand with gravel and occasional brick fragments)

Made Ground (orange-brown sandy clay with gravel and brick fragments)

Firm orange-brown mottled pale brown firm sandy slightly silty CLAY

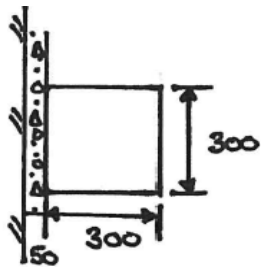
Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 3

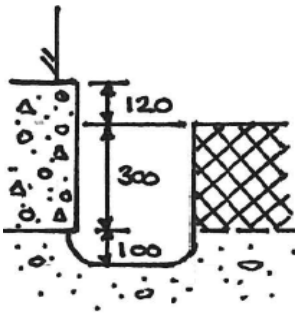
Site 5 The Grove, London N6 6JU	**Job Number** J21179
Client Mr Stephen Cameron	**Sheet** 1'1
Engineer Constructure	**Dates** 28/06/2021

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Location**
Manual	300 x 300 x 400		

PLAN:



SECTION:



Made Ground (brown clayey sand with gravel, brick and concrete fragments)

Orange-brown sandy slightly clayey fine to medium sub-angular to sub-rounded

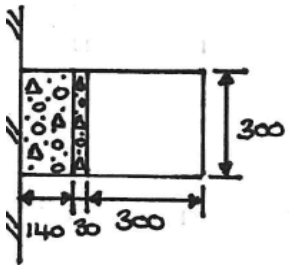
Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 3A

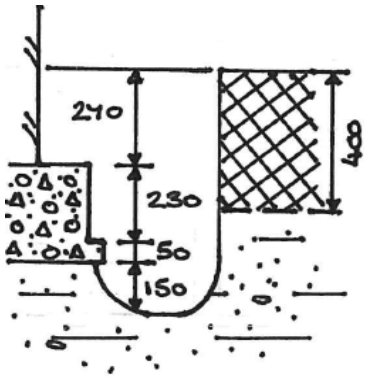
Site 5 The Grove, London N6 6JU	**Job Number** J21179
Client Mr Stephen Cameron	**Sheet** 1'1
Engineer Constructure	**Dates** 28/06/2021

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Location**
Manual	300 x 520 x 700		

PLAN:



SECTION:



Made Ground (brown clayey sand with gravel, brick and concrete fragments)

Orange-brown clayey fine to medium SAND with occasional gravel

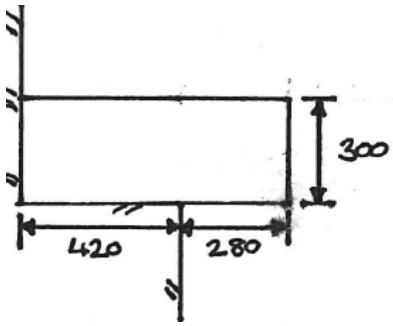
Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 11

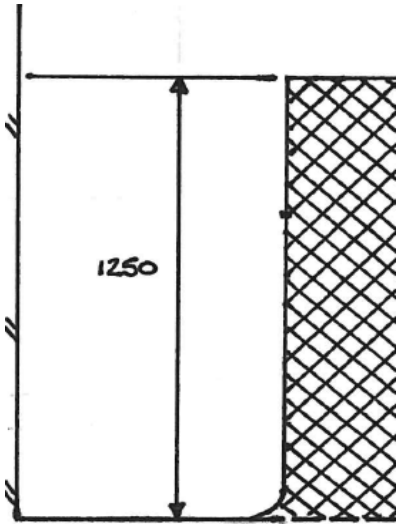
Site 5 The Grove, London N6 6JU	**Job Number** J21179
Client Mr Stephen Cameron	**Sheet** 1'1
Engineer Constructure	**Dates** 28/06/2021

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Location**
Manual	300 x 700 x 1250		

PLAN:



SECTION:



Made Ground (brown clayey sand with gravel and occasional brick fragments)

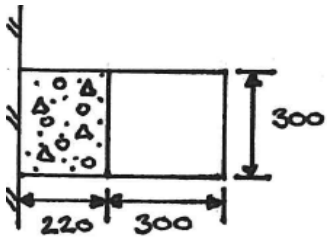
Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

GEA	www.gea-ltd.co.uk Herts | 01727 824666 Notts | 01509 674888	**Trial Pit No** 12

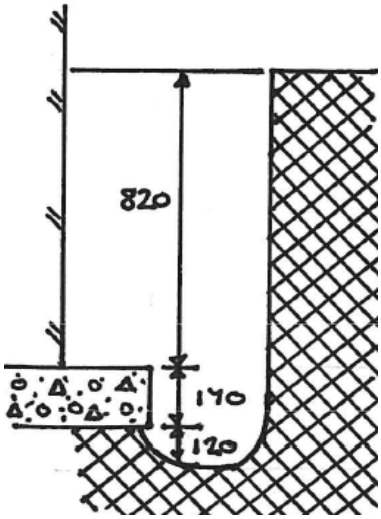
Site 5 The Grove, London N6 6JU	**Job Number** J21179
Client Mr Stephen Cameron	**Sheet** 1'1
Engineer Constructure	**Dates** 28/06/2021

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Location**
Manual	300 x 520 x 1110		

PLAN:



SECTION:



Made Ground (brown clayey sand with gravel and occasional brick fragments)

Remarks:	Scale:
All dimensions in millimetres	01:20
Sides of trial pit remained stable during excavation	Logged by:
Groundwater not encountered	AT

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Location	Depth (m)	Sample Ref	Type	Description	WC %	LL %	PL %	PI %	<425 µm %	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 g/L	W/S Mg mg/L	
BH1	1.20		D	Orange brown mottled grey gravelly sandy silty CLAY.	12.1	39	18	21	50										
BH1	1.75		D													8.4	< 0.010		
BH1	2.00-2.45		U	Firm brown mottled grey CLAY	24.6					1.94	1.56	Undisturbed	40	90	45				
BH1	3.75		D													6.7	< 0.010		
BH1	8.00-8.45		U	Stiff orange brown mottled grey sandy CLAY.	9.2					2.02	1.85	Undisturbed	160	169	84				
BH1	9.50		D	Yellowish brown mottled brown silty SAND. Sand is fine.	23.9		NP		99										
BH1	13.50		D	Yellowish brown sandy silty CLAY.															Particle Size Distribution
BH1	14.00		D	Orange brown mottled grey sandy SILT / CLAY with rare fine gravel.	36.2	33	24	9.0	99										
BH1	18.50		D	Yellowish brown mottled grey silty SAND. Sand is fine.	25.7		NP		99										
BH2	1.70		D	Orange brown mottled grey sandy silty CLAY with rare fine to medium gravel.	25.1	43	18	25	98										

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed) NP=Non Plastic

Checked and Approved by

S Burke

S Burke - Senior Technician
29/07/2021

Project Number:

GEO / 33547

Project Name:

5 THE GROVE
J21179

GEOLABS®

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Location	Depth (m)	Sample Ref	Type	Description	WC %	LL %	PL %	PI %	<425 µm %	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 g/L	W/S Mg mg/L	
BH2	2.10		D													7.9	< 0.010		
BH2	3.50		D	Yellowish brown very slightly silty slightly clayey SAND.															Particle Size Distribution
BH3	2.80		D													8.0	< 0.010		
BH3	5.80		D	Orange brown mottled grey sandy silty CLAY with rare fine to medium gravel.	35.5	41	21	20	99										

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed) NP=Non Plastic

Checked and Approved by

S Burke

S Burke - Senior Technician
29/07/2021

Project Number:

GEO / 33547

Project Name:

5 THE GROVE
J21179

GEOLABS®

BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

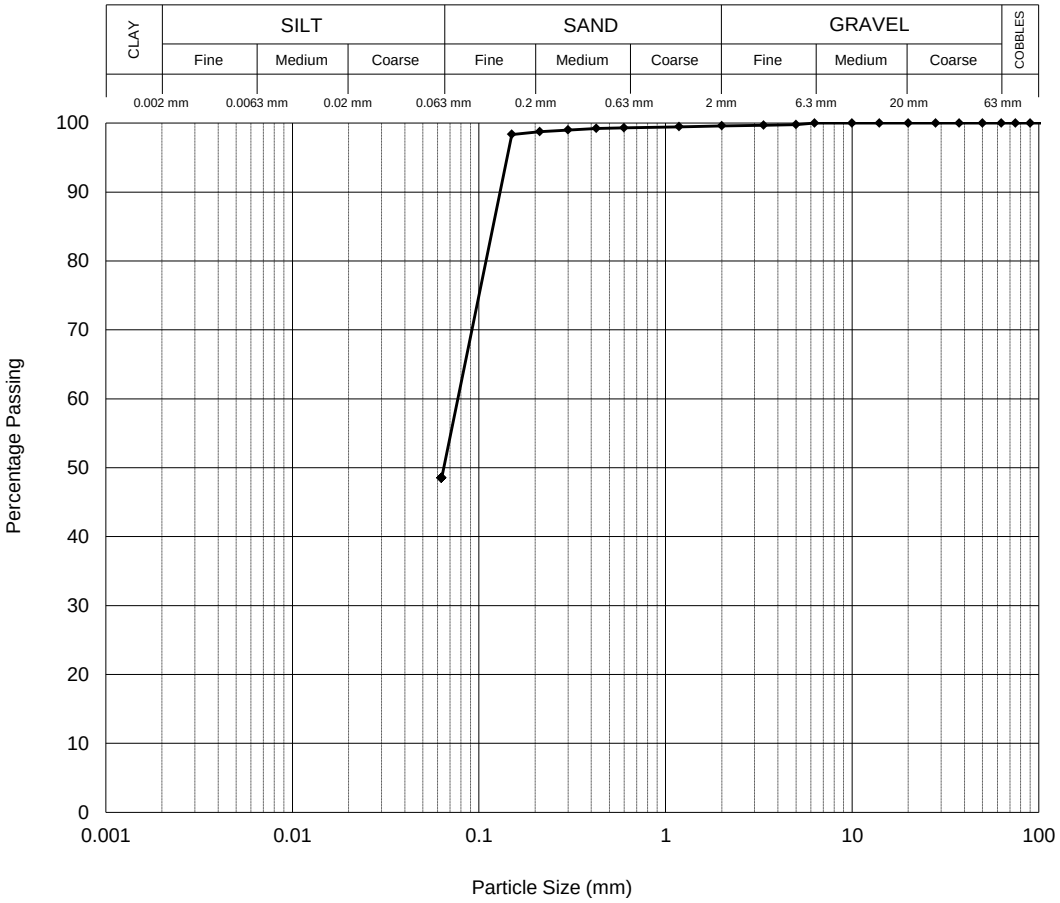
Location	BH1
Depth (m)	13.50
Sample Type	D

Description

Yellowish brown sandy silty CLAY.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Wet Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	99
600 µm	99
425 µm	99
300 µm	99
212 µm	99
150 µm	98
63 µm	49



Particle Proportions	
Cobbles	0.0
Gravel	0.4
Sand	51.1
Silt & Clay	48.5

Tested by AW
Checked and Approved by

S Burke - Senior Technician
29/07/2021

Project Number:

GEO / 33547

Project Name:

5 THE GROVE
J21179

GEOLABS®
UKAS TESTING
1982

BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

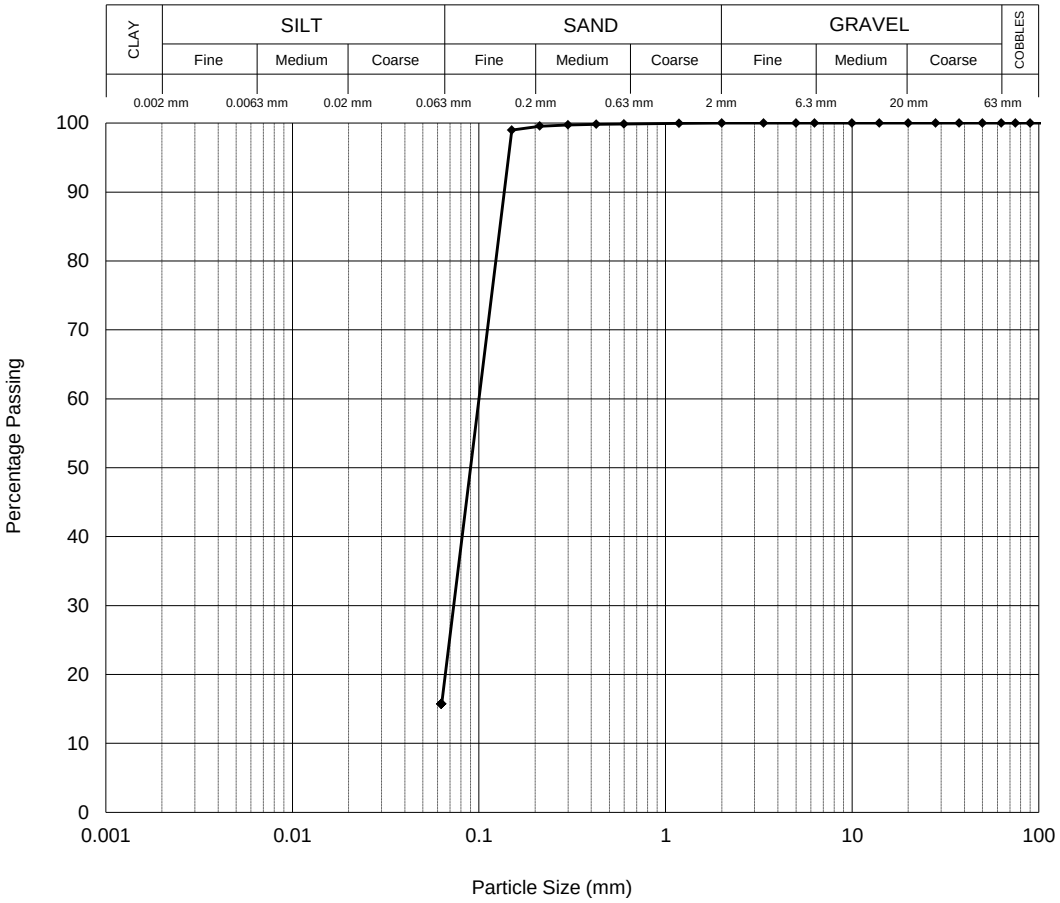
Location	BH2
Depth (m)	3.50
Sample Type	D

Description

Yellowish brown very slightly silty slightly clayey SAND.

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Wet Sieve

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	100
212 µm	100
150 µm	99
63 µm	16



Particle Proportions	
Cobbles	0.0
Gravel	0.0
Sand	84.3
Silt & Clay	15.7

Tested by AW
Checked and Approved by

S Burke

S Burke - Senior Technician
29/07/2021

Project Number:

GEO / 33547

Project Name:

5 THE GROVE
J21179

GEOLABS ®
UKAS TESTING
1982

BS EN ISO 17892-8 : 2018

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION

Location	BH1
Depth (m)	2.00-2.45
Sample Type	U

Description:

Firm brown mottled grey CLAY

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	201.7
Diameter	(mm)	103.1
Moisture content	(%)	24.6
Bulk density	(Mg/m³)	1.94
Dry density	(Mg/m³)	1.56
Test Details		
Latex membrane thickness	(mm)	0.3
Specimen height prior to shearing	(mm)	201.6
Membrane correction	(kPa)	1.1
Mean rate of shear	(%/min)	2.0
Cell pressure	(kPa)	40
Strain at failure	(%)	19.8
Maximum deviator stress	(kPa)	90
Shear Stress Cu	(kPa)	45

Mode of failure

Orientation of the sample	Vertical
Distance from top of tube mm	30

Tested by SB
Checked and Approved by

S Burke

S Burke - Senior Technician
29/07/2021

Project Number:

GEO / 33547

Project Name:

5 THE GROVE
J21179

GEOLABS®
UKAS TESTING
1982

BS EN ISO 17892-8 : 2018

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION

Location	BH1
Depth (m)	8.00-8.45
Sample Type	U

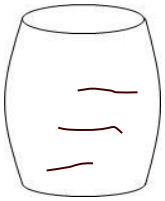
Description:

Stiff orange brown mottled grey sandy CLAY.

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	202.0
Diameter	(mm)	101.3
Moisture content	(%)	9.2
Bulk density	(Mg/m³)	2.02
Dry density	(Mg/m³)	1.85
Test Details		
Latex membrane thickness	(mm)	0.3
Specimen height prior to shearing	(mm)	201.9
Membrane correction	(kPa)	1.0
Mean rate of shear	(%/min)	2.0
Cell pressure	(kPa)	160
Strain at failure	(%)	16.3
Maximum deviator stress	(kPa)	169
Shear Stress Cu	(kPa)	84

Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	150

Tested by SB
Checked and Approved by

S Burke - Senior Technician
29/07/2021

Project Number:

GEO / 33547

Project Name:

5 THE GROVE
J21179

GEOLABS
UKAS TESTING
1982

GEOLABS®

Client	Geotechnical & Environmental Associates Limited
Project No.	33547
Project Name	**5 THE GROVE**

TEST RESTRICTION

The following tests have been scheduled on the above project and **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Laboratory ID	BH / TP No.	Sample Ref.	Depth (m)		Type	Test(s) Scheduled			Reason for Restriction	Description
399298	BH1		4.00	4.45	U100		UU TXL		Sample filled with wax and too short to test with open cracks.	Firm brown CLAY.

Comments / remarks

Test restriction raised by

S Burke

Ref. WS 04 - TERE - Issue 1B (12/18)

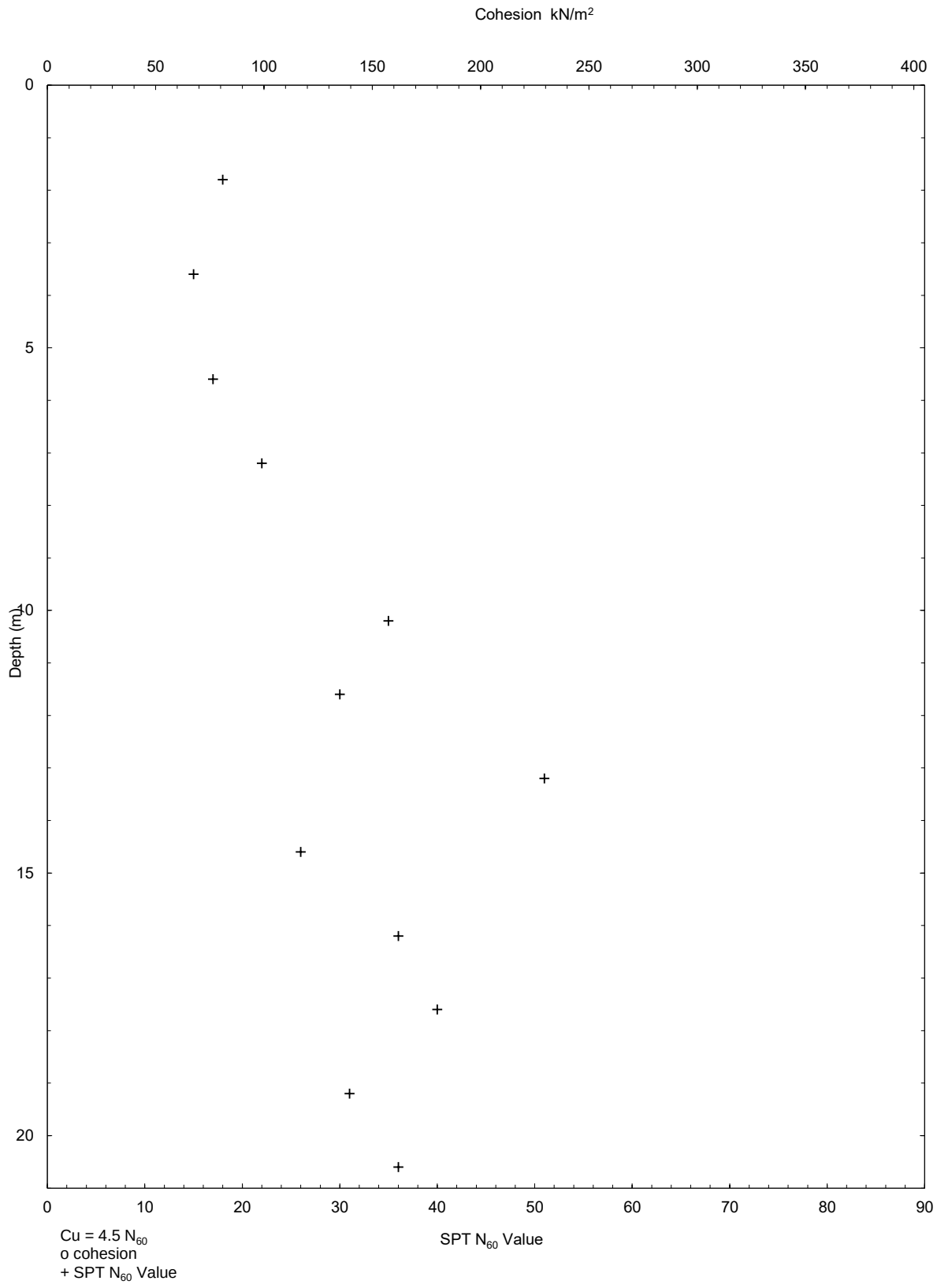
GEA
www.gea-ltd.co.uk
Herts | 01727 824666 Notts | 01509 674888

SPT & Cohesion / Depth Graph

Site	5 The Grove, London N6 6JU
Client	Mr Stephen Cameron
Agent	Constructure

Job Number J21179

Sheet 1 / 1



Alex Taylor
Geotechnical & Environmental Associates
Widbury Barn
Widbury Hill
Ware
Hertfordshire
SG127QE

e: AlexTaylor@gea-ltd.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 21-84454

Project / Site name:	5 The Grove London	**Samples received on:**	01/07/2021
Your job number:	J21056	**Samples instructed on/ Analysis started on:**	01/07/2021
Your order number:		**Analysis completed by:**	08/07/2021
Report Issue Number:	1	**Report issued on:**	08/07/2021
Samples Analysed:	5 soil samples		

Signed: Karolina Marek

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-84454
Project / Site name: 5 The Grove London

Lab Sample Number				1923806	1923807	1923808	1923809	1923810
Sample Reference				TP2	TP11	BH2	BH3	TP1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.40	0.30	0.50	0.30
Date Sampled				28/06/2021	28/06/2021	28/06/2021	28/06/2021	28/06/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	16	14	18	18	14
Total mass of sample received	kg	0.001	NONE	1.4	1.2	1.3	1.2	1.2
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	10.7	8.0	7.9	7.9	10.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	1.2	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1700	1100	950	1100	1500
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.16	0.043	0.027	0.038	0.14
Sulphide	mg/kg	1	MCERTS	2.4	3.6	< 1.0	< 1.0	1.5
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	32	29	8.2	6.0	52
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.5	2.9	2.3	2.6	0.3
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.20	2.0	0.41	0.62	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.48	< 0.05	0.18	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.31	3.7	1.0	1.8	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.25	3.1	0.91	1.6	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	2.1	0.69	1.2	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	1.3	0.43	0.79	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.5	0.83	1.1	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.94	0.22	0.61	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.5	0.64	1.0	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.79	0.36	0.61	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.17	< 0.05	0.12	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.96	0.43	0.71	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	18.4	5.95	10.3	< 0.80
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19	26	27	30	12
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	21	25	29	29	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	23	60	75	77	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	330	600	800	690	82
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7	1.1	1.7	1.2	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11	20	19	25	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	59	180	210	270	53

Analytical Report Number: 21-84454
Project / Site name: 5 The Grove London

Lab Sample Number				1923806	1923807	1923808	1923809	1923810
Sample Reference				TP2	TP11	BH2	BH3	TP1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.40	0.30	0.50	0.30
Date Sampled				28/06/2021	28/06/2021	28/06/2021	28/06/2021	28/06/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	46	74	16	62	< 10
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	11	21	3.1	15	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	24	42	13	41	< 1.0

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-84454
Project / Site name: 5 The Grove London

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1923806	TP2	None Supplied	0.3	Brown clay and sand with gravel.
1923807	TP11	None Supplied	0.4	Brown loam with gravel and vegetation.
1923808	BH2	None Supplied	0.3	Brown clay and loam with gravel.
1923809	BH3	None Supplied	0.5	Brown clay and loam with gravel and vegetation.
1923810	TP1	None Supplied	0.3	Brown clay and sand with gravel.

Analytical Report Number : 21-84454
Project / Site name: 5 The Grove London

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS

Analytical Report Number : 21-84454
Project / Site name: 5 The Grove London

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

GEA
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	5 The Grove, London N6 6JU	**Job Number**	J21179
Client	Mr Stephen Cameron	**Sheet**	1 / 1
Agent	Constructure		

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 1.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	37	C4SL
Cadmium	26	C4SL
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	21	C4SL
Copper	2,330	LQM/CIEH
Lead	200	C4SL
Elemental Mercury	1	SGV
Inorganic Mercury	170	SGV
Nickel	97	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.2	C4SL
Toluene	120	SGV
Ethyl Benzene	65	SGV
Xylene	42	SGV
Aliphatic C5-C6	30	LQM/CIEH
Aliphatic C6-C8	73	LQM/CIEH
Aliphatic C8-C10	19	LQM/CIEH
Aliphatic C10-C12	93	LQM/CIEH
Aliphatic C12-C16	740	LQM/CIEH
Aliphatic C16-C35	45,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	27	LQM/CIEH
Aromatic C10-C12	69	LQM/CIEH
Aromatic C12-C16	140	LQM/CIEH
Aromatic C16-C21	250	LQM/CIEH
Aromatic C21-C35	890	LQM/CIEH
PRO (C_5 –C_{10})	269	Calc
DRO (C_{12} –C_{28})	46,130	Calc
Lube Oil (C_{28} –C_{44})	45,890	Calc
TPH	**1000**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
Anions		
Soluble Sulphate	500 mg/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	184	SGV
PAH		
Naphthalene	2.20	C4SL exp & LQM/CIEH
Acenaphthylene	170	LQM/CIEH
Acenaphthene	210	LQM/CIEH
Fluorene	160	LQM/CIEH
Phenanthrene	92	LQM/CIEH
Anthracene	2,300	LQM/CIEH
Fluoranthene	260	LQM/CIEH
Pyrene	560	LQM/CIEH
Benzo(a) Anthracene	4.3	C4SL exp & LQM/CIEH
Chrysene	8	C4SL exp & LQM/CIEH
Benzo(b) Fluoranthene	7.7	C4SL exp & LQM/CIEH
Benzo(k) Fluoranthene	12.1	C4SL exp & LQM/CIEH
Benzo(a) pyrene	4.35	C4SL
Indeno(1 2 3 cd) Pyrene	4.4	C4SL exp & LQM/CIEH
Dibenzo(a h) Anthracene	1.10	C4SL exp & LQM/CIEH
Benzo (g h i) Perylene	65	C4SL exp & LQM/CIEH
Screening value for PAH	**62.1**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	11.7	LQM/CIEH
tetrachloroethane (PCA)	0.56	LQM/CIEH
tetrachloroethene (PCE)	1.01	LQM/CIEH
trichloroethene (TCE)	0.134	LQM/CIEH
1,2-dichloroethane (DCA)	0.0054	LQM/CIEH
vinyl chloride (Chloroethene)	0.000953	LQM/CIEH
tetrachloromethane (Carbon tetra	0.018	LQM/CIEH
trichloromethane (Chloroform)	0.888	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which pose 'LOW' risk to human health. Concentrations measured in excess of these values indicate a potential risk which require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

C4SL exp & LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health criteria values

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experience indicates that Benzo(a) pyrene (one of the most common and most carcinogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

APPENDIX E – EXPLORATORY HOLE LOGS

Trial Pit Log

Trialpit No
HDP01
Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: - Level:	Date 14/02/2023
Location: Camden		Dimensions (m): Depth 1.20	Scale 1:25
Client: Tier Consult			Logged SM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			MADE GROUND: Dark brown, clayey, sandy, organic rich SILT with many roots and rootlets. MADE GROUND
	0.60	ES					MADE GROUND: Dark brown, clayey, slightly gravelly, fine to medium SAND. Gravel is subangular to subrounded, fine to medium, pottery and flint. Occasional rootlets. MADE GROUND
				1.20			End of pit at 1.20 m

Remarks: 1) Hand dug pit to 1.20m in rear garden raised border.

Stability: Stable

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: -	Hole Type WS
Location: Camden		Level: 119.55	Scale 1:50
Client: Tier Consult		Dates: 13/02/2023 -	Logged By SM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30	119.25		MADE GROUND: Dark brown, sandy organic rich SILT. Some roots and rootlets. MADE GROUND
		1.20	D		1.10	118.45		MADE GROUND: Dark brown, silty, slightly gravelly fine and medium SAND. Gravel is angular and subangular, fine to coarse brick and pottery. MADE GROUND
		1.20	SPTL					
		1.20	S	N=5 (1,1/1,1,2,1)	1.65	117.90		MADE GROUND: Soft brown, slightly gravelly, slightly sandy CLAY. Gravel is angular to subrounded, fine to coarse, flint, brick and rare ash. MADE GROUND
		2.00	UT					
		2.00	U	Ublow=40				Firm, orangish brown, gravelly sandy CLAY. Gravel is subangular to subrounded, fine to coarse flint.
		2.45	SPTL		2.50	117.05		
		2.45	S	N=5 (1,1/1,1,1,2)				Soft, orangish brown, mottled brown, slightly gravelly, sandy CLAY. Gravel is subrounded, medium and coarse flint.
		3.00	SPTL					
		3.00	S	N=6 (0,0/1,1,2,2)				
		3.00 - 3.45	D					
		3.80	D		3.70	115.85		Firm, orangish brown, very gravelly, sandy CLAY. Gravel is subangular, fine to coarse flint.
		4.00	SPTL					
		4.00	S	N=12 (1,2/3,3,3,3)				
		4.50 - 5.00	D		4.45	115.10		Firm orange. mottled grey, thinly laminated, sandy, silty CLAY.
	▼	5.00	SPTL		5.00	114.55		
		5.00	S	N=15 (1,1/3,3,5,4)				Medium dense dark brown, clayey, thinly laminated, fine to medium SAND.
		5.50 - 6.00	D		5.30	114.25		Firm, orangish brown, thinly laminated sandy, silty CLAY. Sand is fine.
		6.00	SPTL					
		6.00	S	N=8 (1,1/2,2,2,2)				
					6.45	113.10		End of borehole at 6.45 m

Remarks

1) Groundwater encountered at 5.00m bgl. 2) Borehole installed to 5.50m depth on completion.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: -	Hole Type WS
Location: Camden		Level: 120.74	Scale 1:50
Client: Tier Consult		Dates: 13/02/2023 -	Logged By HC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.35	120.39		MADE GROUND: Dark brown, sandy SILT with frequent rootlets. MADE GROUND
					0.80	119.94		MADE GROUND: Dark brown, silty, slightly gravelly, fine to medium SAND. Gravel is angular to subrounded, fine to coarse flint and brick. Minor rootlets. MADE GROUND
		1.20	SPTL		1.10	119.64		
		1.20	S	N=15 (1,1/3,4,4,4)				MADE GROUND: Dark brown, mottled orange, gravelly, clayey, fine to coarse SAND. Gravel is subangular and subrounded, fine to coarse, flint and brick. MADE GROUND
					1.85	118.89		
		2.00	SPTL					MADE GROUND: Medium dense, red brown, sandy, GRAVEL of subangular, fine to coarse, brick and mortar. Medium cobble content of brick. MADE GROUND
		2.00	S	N=13 (1,3/4,3,2,4)	2.15	118.59		
		2.20 - 2.50	D					
					2.60	118.14		MADE GROUND: Orange, gravelly, medium to coarse SAND. Gravel is subangular and subrounded, fine to coarse, flint. MADE GROUND
		3.00	SPTL					
		3.00	S	N=7 (1,0/1,2,2,2)				
		3.00 - 3.50	D					
	▼	3.50 - 4.00	D		3.50	117.24		Firm, silty, slightly gravelly, sandy CLAY. Gravel is subangular and subrounded, fine to medium flint.
								Soft and locally very soft, sandy, silty CLAY.
		4.00	SPTL					Loose, orange brown, mottled, thinly laminated, clayey, fine to medium SAND.
		4.00	S	N=7 (1,1/2,1,2,2)				
		4.80 - 5.00	D		4.80	115.94		Firm, pale greyish brown, mottled orange, sandy, silty CLAY.
		5.00	SPTL		5.05	115.69		
		5.00	S	N=6 (1,1/1,1,2,2)				Loose, pale brown, very clayey, fine to medium SAND.
					5.60	115.14		Firm, pale greyish orange, silty, very sandy CLAY.
					6.00	114.74		End of borehole at 6.00 m

Remarks

1) Groundwater seepage encountered at 3.70m bgl. 2) Backfilled with arisings on completion.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: -	Hole Type WS
Location: Camden		Level: 121.35	Scale 1:50
Client: Tier Consult		Dates: 13/02/2023 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.35	121.00		MADE GROUND: Dark brown, sandy SILT with frequent rootlets. MADE GROUND
					0.60	120.75		MADE GROUND: Dark brown, silty, slightly gravelly, fine to medium SAND. Gravel is angular to subrounded, fine to coarse flint and brick. Some rootlets. MADE GROUND
		1.20	SPTL		1.20	120.15		MADE GROUND: Soft brown, mottled orange brown, sandy, slightly gravelly CLAY. Gravel is subangular, fine brick and flint with frequent rootlets. MADE GROUND
		1.20	S	N=3 (0,0/1,0,1,1)				
		1.50 - 2.00	D		1.55	119.80		MADE GROUND: Very loose, dark brown, silty SAND with frequent rootlets. MADE GROUND
		2.00	SPTL S					
		2.00	UT	Ublow=35	2.30	119.05		Very soft, orangish brown, sandy CLAY.
		2.50	D		2.70	118.65		Soft brown, slightly gravelly, sandy CLAY. Gravel is subrounded, medium and coarse flint.
		3.00	SPTL					Loose, orangish brown, mottled pale grey, thinly laminated, silty, clayey, fine and medium SAND.
		3.00	S	N=8 (1,1/2,2,2,2)				
					3.55	117.80		Firm, orange, mottled brown, thinly laminated, sandy CLAY.
					3.70	117.65		Loose, pale brown, mottled orange brown, thinly laminated, silty, fine and medium SAND.
		4.00	SPTL					
		4.00	S	N=11 (1,1/2,2,3,4)				
					4.45	116.90		Firm, orange brown, mottled brown, thinly laminated, sandy CLAY.
		5.00	SPTL		5.00	116.35		Soft and locally very soft, orangish brown, sandy CLAY.
		5.00	S	N=6 (2,1/1,1,2,2)				
					5.60	115.75		Loose, pale brown, mottled grey, clayey, fine to medium SAND.
		6.00	SPTL					
		6.00	S	N=9 (1,2/2,2,3,2)				
					6.45	114.90		End of borehole at 6.45 m

Remarks

1) No groundwater encountered. 2) Backfilled with arisings upon completion.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: -	Hole Type WS
Location: Camden		Level: 128.82	Scale 1:50
Client: Tier Consult		Dates: 14/02/2023 -	Logged By HC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	128.72		Brick paving.
		0.70	ES					MADE GROUND: Soft, orangish brown, very gravelly, sandy CLAY. Gravel is angular to subrounded, fine to coarse brick, flint and mortar. Some rootlets.
					0.80	128.02		MADE GROUND
		1.00 - 1.50	B					MADE GROUND: Soft, brown, gravelly, sandy CLAY. Gravel is subangular and subrounded, fine to coarse brick and flint.
		1.20	SPTL		1.25	127.57		MADE GROUND
		1.20	S	N=6 (1,0/1,2,2,1)				MADE GROUND: Loose, greyish brown, slightly gravelly, fine to medium SAND. Gravel is angular and subangular, fine to coarse brick. Occasional ash.
		1.20 - 1.45	D		1.65	127.17		MADE GROUND
		2.00	SPTL					MADE GROUND: Loose, orangish brown, very clayey, gravelly, fine to medium SAND. Gravel is subangular and subrounded, fine to coarse of flint and brick.
		2.00	S	N=5 (0,0/0,2,1,2)				MADE GROUND
					2.70	126.12		*Becoming sandy CLAY from 2.20m bgl to 2.40m bgl.*
		3.00	SPTL					Firm, orange, brown, mottled pale grey, silty, sandy CLAY.
		3.00	S	N=9 (1,1/1,3,2,3)				
		3.00 - 3.45	D					
		3.00 - 4.00	B					
		4.00 - 4.45	U	Ublow=70				
		4.50	D					
		5.00	SPTL					
		5.00	S	N=8 (1,2/2,2,2,2)				
					5.50	123.32		Orangish brown, thinly laminated, clayey, fine to medium SAND.
		6.00	SPTL					
		6.00	S	N=9 (1,1/2,2,2,3)	6.10	122.72		Firm, orange, brown mottled pale grey, silty, sandy CLAY.
		6.00 - 6.45	D		6.45	122.37		End of borehole at 6.45 m

Remarks

1) No groundwater encountered. 2) Borehole installed to 5.00m depth on completion.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: -	Hole Type WS
Location: Camden		Level: 128.77	Scale 1:50
Client: Tier Consult		Dates: 14/02/2023 -	Logged By HC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	128.67		Brick paving.
					0.70	128.07		MADE GROUND: Soft, orangish brown, very gravelly, sandy CLAY. Gravel is angular to subrounded, fine to coarse brick, flint and mortar. Some rootlets. MADE GROUND
		1.20 1.20 1.20 - 1.45 1.30	SPTL S D ES	N=6 (1,2/1,2,1,2)	1.50	127.27		MADE GROUND: Soft orangish brown, very gravelly, sandy CLAY. Gravel is subangular and subrounded, fine to coarse flint and brick. MADE GROUND
		2.00 2.00 2.00 - 3.00	SPTL S B	N=8 (1,1/2,1,3,2)	2.20	126.57		Soft, pale brown, gravelly, very sandy CLAY. Gravel is subangular and subrounded, fine to coarse flint. *Orangish brown clayey SAND.* Firm, orangish brown, silty, slightly sandy CLAY.
		3.00 - 3.45	U	Ublow=30				
		3.50	D					*Becoming very thinly laminated with ferrous staining.*
		4.00 4.00	SPTL S	N=12 (2,3/3,3,3,3)	3.90	124.87		Medium dense, orange brown, mottled brown, thinly laminated, very silty, fine SAND.
		5.00 5.00 5.00 - 5.45 5.20 - 6.00	SPTL S D B	N=22 (3,3/5,5,6,6)	4.80 5.20	123.97 123.57		Firm, orangish brown, sandy, silty CLAY. Medium dense, orange brown, mottled pale grey, clayey, silty, fine and medium SAND.
		6.00 6.00	SPTL S	N=24 (3,4/5,5,6,8)	6.45	122.32		End of borehole at 6.45 m

Remarks

1) No groundwater encountered. 2) Borehole backfilled with arisings on completion.

Borehole Log

Borehole No. **WS106A**

Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: -	Hole Type WS
Location: Camden		Level: 128.87	Scale 1:50
Client: Tier Consult		Dates: 14/02/2023 -	Logged By SM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	128.77		Brick Paving.
								MADE GROUND: Soft, orangish brown, very gravelly, sandy CLAY. Gravel is angular to subrounded, fine to coarse brick, flint and mortar. Minor rootlets.
					0.80	128.07		MADE GROUND
		1.20 1.20	SPTL S	N=2 (1,1/0,1,0,1)				MADE GROUND: Soft orangish brown, very gravelly, sandy CLAY. Gravel is subangular and subrounded, fine to coarse flint and brick.
								MADE GROUND
					1.95	126.92		MADE GROUND: Red brick.
		2.00 2.00	SPTL S	20 (9,13/20 for 150mm)	2.15	126.72		MADE GROUND
								End of borehole at 2.30 m

Remarks

1) No groundwater encountered. 2) Borehole terminated at 2.30m depth on brick obstruction, possibly the existing basement or a service. 3) Borehole backfilled with arisings on completion.

Borehole Log

Borehole No. **WS106B**

Sheet 1 of 1

Project Name: 4 The Grove	Project No. TE1723	Co-ords: -	Hole Type WS
Location: Camden		Level: 128.87	Scale 1:50
Client: Tier Consult		Dates: 14/02/2023 -	Logged By SM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.25	128.62		MADE GROUND: Dark brown, sandy SILT with some rootlets. MADE GROUND
					0.75	128.12		MADE GROUND: Soft, orangish brown, very gravelly, sandy CLAY. Gravel is angular to subrounded, fine to coarse brick, flint and mortar. Some rootlets. MADE GROUND
		1.50 - 2.00	B		1.40	127.47		MADE GROUND: Soft orangish brown, very gravelly, sandy CLAY. Gravel is subangular and subrounded, fine to coarse flint and brick. MADE GROUND
		2.00 2.00	SPTL S	N=7 (2,3/2,1,2,2)	2.20	126.67		POSSIBLE MADE GROUND: Orangish brown, very gravelly, medium and coarse SAND. Gravel is subangular to subrounded, fine to coarse flint. POSSIBLE MADE GROUND
		3.00 - 3.45	U					Soft to firm, orange, mottled pale grey, silty, locally sandy CLAY. Occasional relict rootlets.
		3.50	D		3.60	125.27		Firm, orange brown, mottled pale brown, very sandy, silty CLAY, some thin fine sand laminations.
		4.00 4.00 4.00 - 5.00	SPTL S B	N=14 (2,2/3,3,4,4)	4.10	124.77		Medium dense, orange brown, mottled brown, very clayey, thinly laminated fine SAND.
		5.00 5.00	SPTL S	N=18 (2,2/4,4,5,5)				
		5.50 - 6.00	D					
		6.00 6.00	SPTL S	N=24 (3,3/5,6,6,7)				
					6.45	122.42		End of borehole at 6.45 m

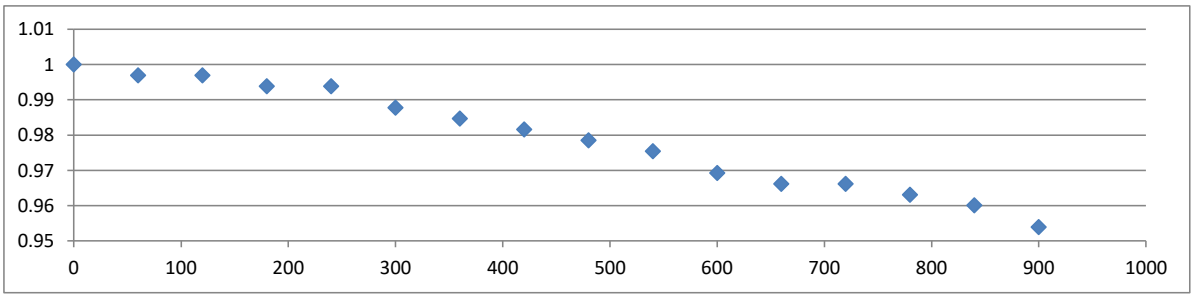
Remarks

1) No groundwater encountered. 2) Borehole installed to 5.00m depth on completion.

APPENDIX F – IN-SITU RESULTS – FALLING HEAD PERMEABILITY TESTS

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS101	TEST No.:	1			
	DEPTH (m)	5.45	DATE	14/02/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	2.2	3.25	1
60	2.21	3.24	0.99692308
120	2.21	3.24	0.99692308
180	2.22	3.23	0.99384615
240	2.22	3.23	0.99384615
300	2.24	3.21	0.98769231
360	2.25	3.2	0.98461538
420	2.26	3.19	0.98153846
480	2.27	3.18	0.97846154
540	2.28	3.17	0.97538462
600	2.3	3.15	0.96923077
660	2.31	3.14	0.96615385
720	2.31	3.14	0.96615385
780	2.32	3.13	0.96307692
840	2.33	3.12	0.96
900	2.35	3.1	0.95384615

Test Section Depth	m	5.45			
Borehole Depth	m	5.45			
Borehole Diameter	m	0.05			
Casing Depth	m	1			
Depth to Standing Water Level (d_1)	Assumed m	4.6			
Height of casing agl (h_c)	m	0			
Height of top of casing above water table	m	4.6			
Depth to Water at Start of Test below casing level (d_0)	m	2.2			
Depth to Water at End of Test below casing level	m	3.25			
Depth to Filter at Start of Test	m	NA			
Depth to Filter at End of Test	m	NA			
Response Zone Length	m	4.45			
Borehole Diameter in Test Section	m	0.05			
Cross-sectional Area of Borehole	m2	0.002			
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14			
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00		
t_2=	900.00	$s.h_2$ =	0.95		
Coefficient of Permeability (k) ms-1 =			9.01E-08		

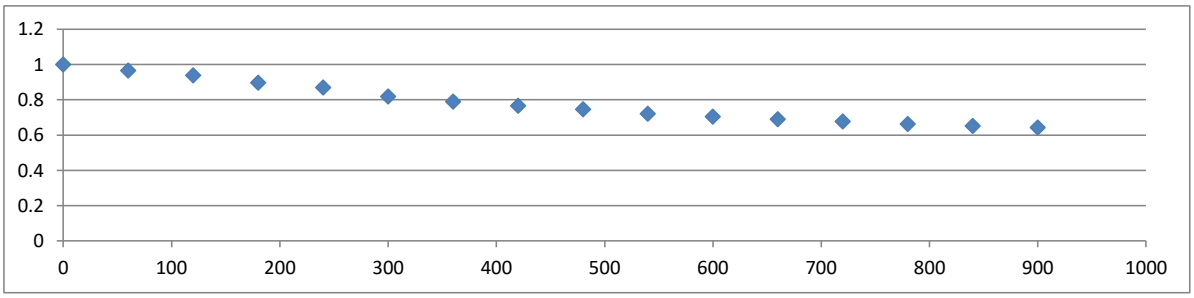
Remarks	Borehole cleaned out prior to test.
Compiled By	SM
Date	14/02/2023
Checked By	AH
Date	07/03/2023
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS101	TEST No.:	1			
	DEPTH (m)	5.45	DATE	06/03/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	2.55	2.9	1
60	2.65	2.8	0.96551724
120	2.73	2.72	0.93793103
180	2.85	2.6	0.89655172
240	2.93	2.52	0.86896552
300	3.08	2.37	0.81724138
360	3.16	2.29	0.78965517
420	3.23	2.22	0.76551724
480	3.29	2.16	0.74482759
540	3.36	2.09	0.72068966
600	3.41	2.04	0.70344828
660	3.45	2	0.68965517
720	3.49	1.96	0.67586207
780	3.53	1.92	0.66206897
840	3.56	1.89	0.65172414
900	3.59	1.86	0.64137931

Test Section Depth	m	5.45		
Borehole Depth	m	5.45		
Borehole Diameter	m	0.05		
Casing Depth	m	1		
Depth to Standing Water Level (d_1)	Assumed m	4.2		
Height of casing agl (h_c)	m	0		
Height of top of casing above water table	m	4.2		
Depth to Water at Start of Test below casing level (d_0)	m	2.55		
Depth to Water at End of Test below casing level	m	3.59		
Depth to Filter at Start of Test	m	NA		
Depth to Filter at End of Test	m	NA		
Response Zone Length	m	4.45		
Borehole Diameter in Test Section	m	0.05		
Cross-sectional Area of Borehole	m2	0.002		
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14		
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00	
t_2=	900.00	$s.h_2$ =	0.64	
Coefficient of Permeability (k) ms-1 =			8.47E-07	

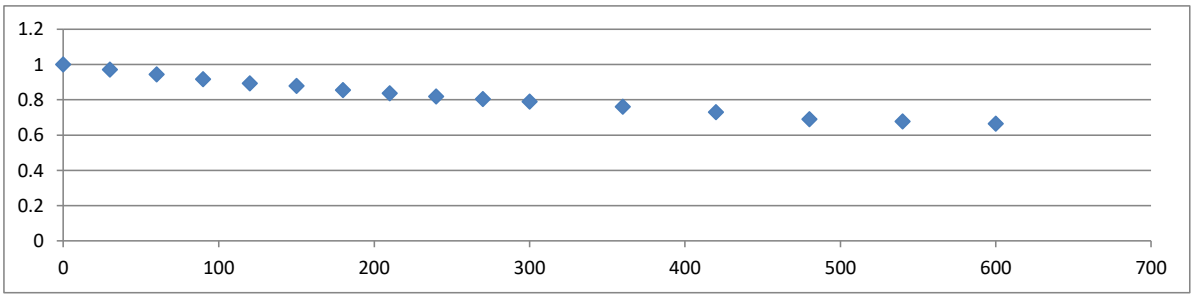
Remarks	Borehole cleaned out prior to test.			
Compiled By	SM	Date	06/03/2023	
Checked By	AH	Date	07/03/2023	
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)			

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS101	TEST No.:	2			
	DEPTH (m)	5.45	DATE	06/03/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	2.08	3.37	1
30	2.18	3.27	0.97032641
60	2.27	3.18	0.94362018
90	2.36	3.09	0.91691395
120	2.44	3.01	0.89317507
150	2.49	2.96	0.87833828
180	2.57	2.88	0.85459941
210	2.63	2.82	0.83679525
240	2.69	2.76	0.8189911
270	2.74	2.71	0.8041543
300	2.79	2.66	0.78931751
360	2.89	2.56	0.75964392
420	2.99	2.46	0.72997033
480	3.13	2.32	0.6884273
540	3.17	2.28	0.67655786
600	3.21	2.24	0.66468843

Test Section Depth	m	5.45		
Borehole Depth	m	5.45		
Borehole Diameter	m	0.05		
Casing Depth	m	1		
Depth to Standing Water Level (d_1)	Assumed m	4.2		
Height of casing agl (h_c)	m	0		
Height of top of casing above water table	m	4.2		
Depth to Water at Start of Test below casing level (d_0)	m	2.08		
Depth to Water at End of Test below casing level	m	3.21		
Depth to Filter at Start of Test	m	NA		
Depth to Filter at End of Test	m	NA		
Response Zone Length	m	4.45		
Borehole Diameter in Test Section	m	0.05		
Cross-sectional Area of Borehole	m2	0.002		
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14		
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00	
t_2=	600.00	$s.h_2$ =	0.66	
Coefficient of Permeability (k) ms-1 =			1.17E-06	

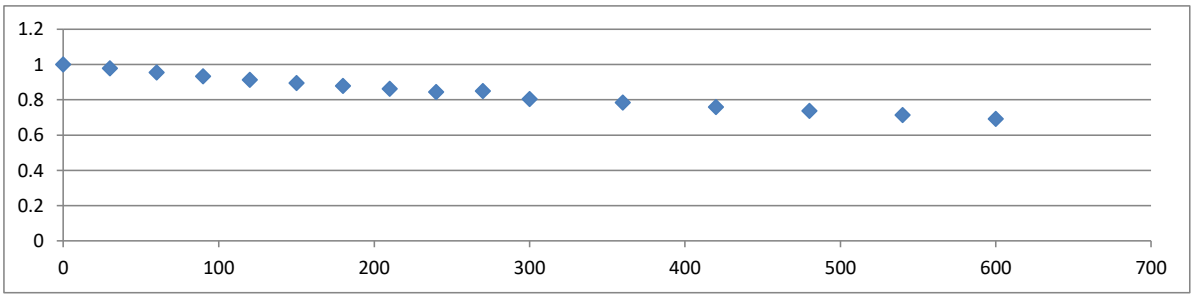
Remarks	Borehole cleaned out prior to test.				
Compiled By	SM	Date	06/03/2023		
Checked By	AH	Date	07/03/2023		
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)				

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS101	TEST No.:	3				
	DEPTH (m)	5.45	DATE	06/03/2023	SHEET	1	



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	1.93	3.52	1
30	2.01	3.44	0.97727273
60	2.09	3.36	0.95454545
90	2.17	3.28	0.93181818
120	2.24	3.21	0.91193182
150	2.3	3.15	0.89488636
180	2.36	3.09	0.87784091
210	2.42	3.03	0.86079545
240	2.48	2.97	0.84375
270	2.46	2.99	0.84943182
300	2.62	2.83	0.80397727
360	2.69	2.76	0.78409091
420	2.78	2.67	0.75852273
480	2.86	2.59	0.73579545
540	2.94	2.51	0.71306818
600	3.02	2.43	0.69034091

Test Section Depth	m	5.45	
Borehole Depth	m	5.45	
Borehole Diameter	m	0.05	
Casing Depth	m	1	
Depth to Standing Water Level (d_1)	Assumed m	4.2	
Height of casing agl (h_c)	m	0	
Height of top of casing above water table	m	4.2	
Depth to Water at Start of Test below casing level (d_0)	m	1.93	
Depth to Water at End of Test below casing level	m	3.02	
Depth to Filter at Start of Test	m	NA	
Depth to Filter at End of Test	m	NA	
Response Zone Length	m	4.45	
Borehole Diameter in Test Section	m	0.05	
Cross-sectional Area of Borehole	m2	0.002	
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14	
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00
t_2=	600.00	$s.h_2$ =	0.69
Coefficient of Permeability (k) ms-1 =			1.06E-06

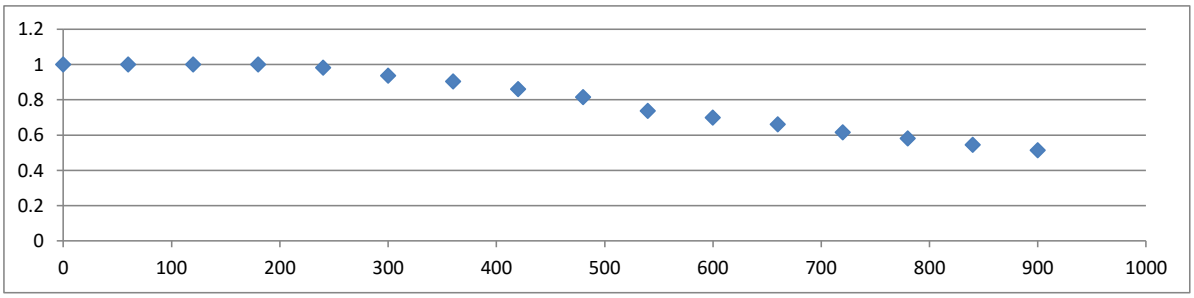
Remarks	Borehole cleaned out prior to test.			
Compiled By	SM	Date	06/03/2023	
Checked By	AH	Date	07/03/2023	
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)			

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS104	TEST No.:	1			
	DEPTH (m)	5.20	DATE	06/03/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	3.64	1.56	1
60	3.64	1.56	1
120	3.64	1.56	1
180	3.64	1.56	1
240	3.67	1.53	0.98076923
300	3.74	1.46	0.93589744
360	3.79	1.41	0.90384615
420	3.86	1.34	0.85897436
480	3.93	1.27	0.81410256
540	4.05	1.15	0.73717949
600	4.11	1.09	0.69871795
660	4.17	1.03	0.66025641
720	4.24	0.96	0.61538462
780	4.295	0.905	0.58012821
840	4.35	0.85	0.54487179
900	4.4	0.8	0.51282051

Test Section Depth	m	5.2		
Borehole Depth	m	5.2		
Borehole Diameter	m	0.05		
Casing Depth	m	1		
Depth to Standing Water Level (d_1)	Assumed m			
Height of casing agl (h_c)	m	0		
Height of top of casing above water table	m	0		
Depth to Water at Start of Test below casing level (d_0)	m	3.64		
Depth to Water at End of Test below casing level	m	4.4		
Depth to Filter at Start of Test	m	NA		
Depth to Filter at End of Test	m	NA		
Response Zone Length	m	4.2		
Borehole Diameter in Test Section	m	0.05		
Cross-sectional Area of Borehole	m2	0.002		
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14		
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00	
t_2=	900.00	$s.h_2$ =	0.51	
Coefficient of Permeability (k) ms-1 =			1.27E-06	

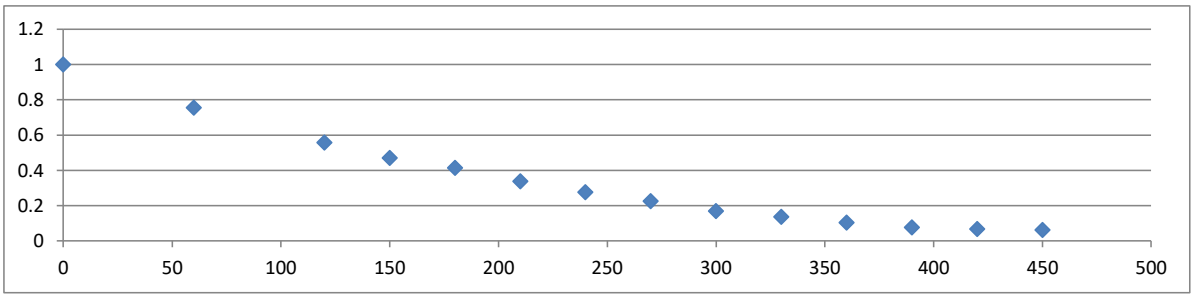
Remarks	Borehole cleaned out prior to test.			
Compiled By	SM	Date	06/03/2023	
Checked By	AH	Date	07/03/2023	
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)			

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS104	TEST No.:	2			
	DEPTH (m)	5.20	DATE	06/03/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	3.24	1.96	1
60	3.72	1.48	0.75510204
120	4.11	1.09	0.55612245
150	4.28	0.92	0.46938776
180	4.39	0.81	0.41326531
210	4.54	0.66	0.33673469
240	4.66	0.54	0.2755102
270	4.76	0.44	0.2244898
300	4.87	0.33	0.16836735
330	4.935	0.265	0.13520408
360	5	0.2	0.10204082
390	5.05	0.15	0.07653061
420	5.07	0.13	0.06632653
450	5.08	0.12	0.06122449

Test Section Depth	m	5.2	
Borehole Depth	m	5.2	
Borehole Diameter	m	0.05	
Casing Depth	m	1	
Depth to Standing Water Level (d_1)	Assumed m		
Height of casing agl (h_c)	m	0	
Height of top of casing above water table	m	0	
Depth to Water at Start of Test below casing level (d_0)	m	3.24	
Depth to Water at End of Test below casing level	m	5.08	
Depth to Filter at Start of Test	m	NA	
Depth to Filter at End of Test	m	NA	
Response Zone Length	m	4.2	
Borehole Diameter in Test Section	m	0.05	
Cross-sectional Area of Borehole	m2	0.002	
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14	
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00
t_2=	450.00	$s.h_2$ =	0.06
Coefficient of Permeability (k) ms-1 =			1.06E-05

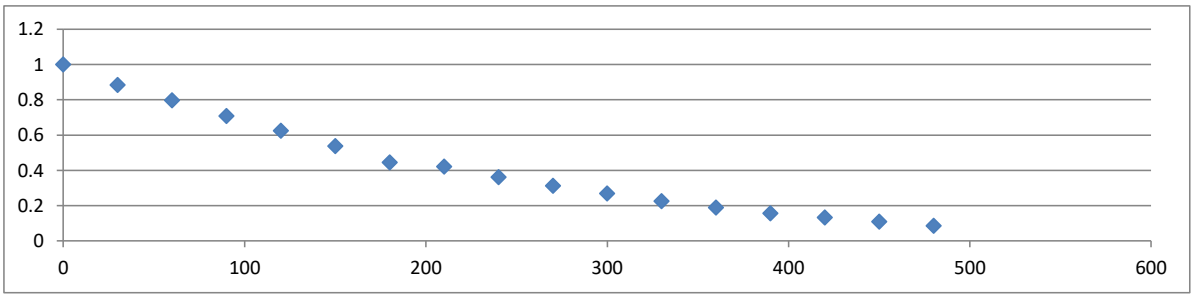
Remarks	Borehole cleaned out prior to test.			
Compiled By	SM	Date	06/03/2023	
Checked By	AH	Date	07/03/2023	
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)			

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS104	TEST No.:	3				
	DEPTH (m)	5.20	DATE	06/03/2023	SHEET	1	



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	2.7	2.5	1
30	2.99	2.21	0.884
60	3.21	1.99	0.796
90	3.43	1.77	0.708
120	3.64	1.56	0.624
150	3.86	1.34	0.536
180	4.09	1.11	0.444
210	4.15	1.05	0.42
240	4.3	0.9	0.36
270	4.42	0.78	0.312
300	4.53	0.67	0.268
330	4.64	0.56	0.224
360	4.73	0.47	0.188
390	4.81	0.39	0.156
420	4.87	0.33	0.132
450	4.93	0.27	0.108
480	4.99	0.21	0.084

Test Section Depth	m	5.2			
Borehole Depth	m	5.2			
Borehole Diameter	m	0.05			
Casing Depth	m	1			
Depth to Standing Water Level (d_1)	Assumed m				
Height of casing agl (h_c)	m	0			
Height of top of casing above water table	m	0			
Depth to Water at Start of Test below casing level (d_0)	m	2.7			
Depth to Water at End of Test below casing level	m	4.99			
Depth to Filter at Start of Test	m	NA			
Depth to Filter at End of Test	m	NA			
Response Zone Length	m	4.2			
Borehole Diameter in Test Section	m	0.05			
Cross-sectional Area of Borehole	m2	0.002			
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14			
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00		
t_2=	480.00	$s.h_2$ =	0.08		
Coefficient of Permeability (k) ms-1 =			8.85E-06		

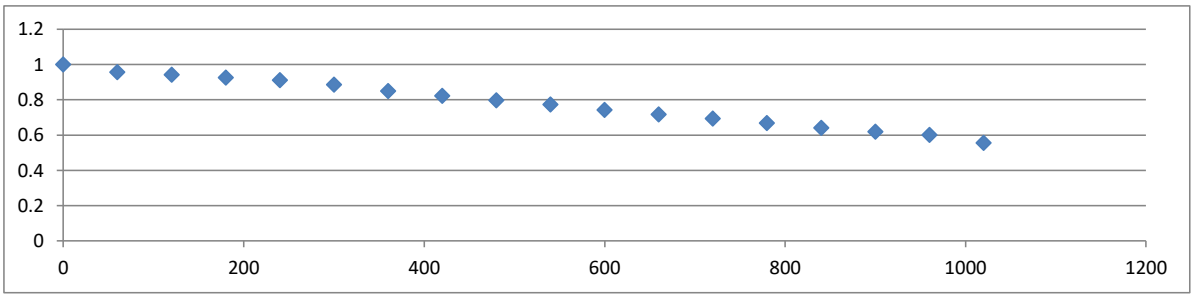
Remarks	Borehole cleaned out prior to test.				
Compiled By	SM	Date	06/03/2023		
Checked By	AH	Date	07/03/2023		
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)				

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723		
Project Name	4 The Grove		
Client			

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS106B	TEST No.:	1			
	DEPTH (m)	5.30	DATE	06/03/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	3.05	2.25	1
60	3.15	2.15	0.95555556
120	3.18	2.12	0.94222222
180	3.22	2.08	0.92444444
240	3.25	2.05	0.91111111
300	3.31	1.99	0.88444444
360	3.39	1.91	0.84888889
420	3.45	1.85	0.82222222
480	3.51	1.79	0.79555556
540	3.56	1.74	0.77333333
600	3.63	1.67	0.74222222
660	3.69	1.61	0.71555556
720	3.74	1.56	0.69333333
780	3.8	1.5	0.66666667
840	3.86	1.44	0.64
900	3.91	1.39	0.61777778
960	3.95	1.35	0.6
1020	4.05	1.25	0.55555556

Test Section Depth	m	5.3	
Borehole Depth	m	5.3	
Borehole Diameter	m	0.05	
Casing Depth	m	1	
Depth to Standing Water Level (d_1)	Assumed m		
Height of casing agl (h_c)	m	0	
Height of top of casing above water table	m	0	
Depth to Water at Start of Test below casing level (d_0)	m	3.05	
Depth to Water at End of Test below casing level	m	4.05	
Depth to Filter at Start of Test	m	NA	
Depth to Filter at End of Test	m	NA	
Response Zone Length	m	4.2	
Borehole Diameter in Test Section	m	0.05	
Cross-sectional Area of Borehole	m2	0.002	
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14	
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00
t_2=	1020.00	$s.h_2$ =	0.56
Coefficient of Permeability (k) ms-1 =			9.89E-07

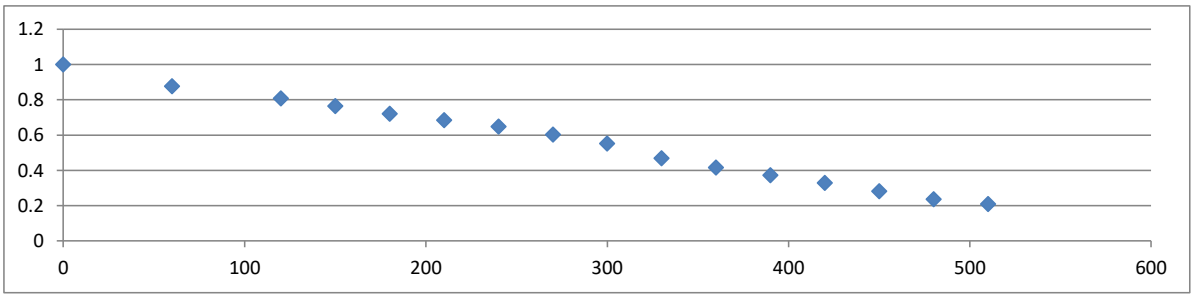
Remarks	Borehole cleaned out prior to test.			
Compiled By	SM	Date	06/03/2023	
Checked By	AH	Date	07/03/2023	
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)			

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS106B	TEST No.:	2			
	DEPTH (m)	5.30	DATE	06/03/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	2.8	2.5	1
60	3.11	2.19	0.876
120	3.28	2.02	0.808
150	3.39	1.91	0.764
180	3.5	1.8	0.72
210	3.59	1.71	0.684
240	3.68	1.62	0.648
270	3.795	1.505	0.602
300	3.92	1.38	0.552
330	4.13	1.17	0.468
360	4.26	1.04	0.416
390	4.37	0.93	0.372
420	4.48	0.82	0.328
450	4.6	0.7	0.28
480	4.71	0.59	0.236
510	4.78	0.52	0.208

Test Section Depth	m	5.3	
Borehole Depth	m	5.3	
Borehole Diameter	m	0.05	
Casing Depth	m	1	
Depth to Standing Water Level (d_1)	Assumed m		
Height of casing agl (h_c)	m	0	
Height of top of casing above water table	m	0	
Depth to Water at Start of Test below casing level (d_0)	m	2.8	
Depth to Water at End of Test below casing level	m	4.78	
Depth to Filter at Start of Test	m	NA	
Depth to Filter at End of Test	m	NA	
Response Zone Length	m	4.2	
Borehole Diameter in Test Section	m	0.05	
Cross-sectional Area of Borehole	m2	0.002	
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14	
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00
t_2=	510.00	$s.h_2$ =	0.21
Coefficient of Permeability (k) ms-1 =			5.28E-06

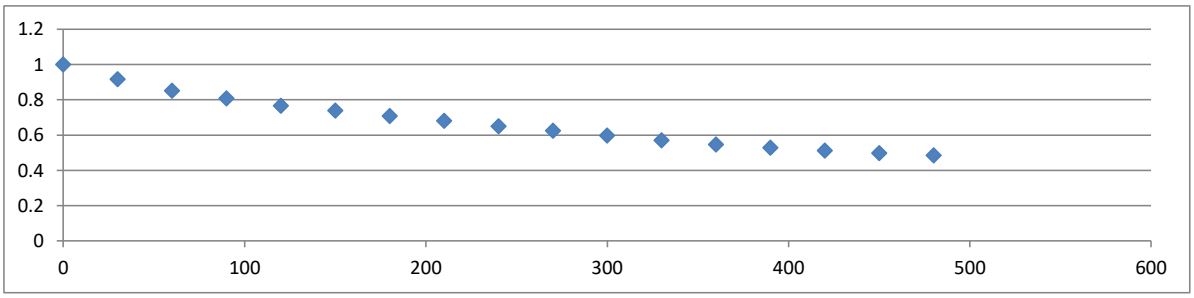
Remarks	Borehole cleaned out prior to test.			
Compiled By	SM	Date	06/03/2023	
Checked By	AH	Date	07/03/2023	
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)			

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

VARIABLE HEAD PERMEABILITY TEST IN BOREHOLE

BOREHOLE No.:	WS106B	TEST No.:	3			
	DEPTH (m)	5.30	DATE	06/03/2023	SHEET	1



Time Elapsed (secs)	Depth of water below top of casing - d_t (m)	h (m) - (d_1-d_t)	h_t/h_0
0	2.6	2.6	1
30	2.82	2.38	0.91538462
60	2.99	2.21	0.85
90	3.1	2.1	0.80769231
120	3.21	1.99	0.76538462
150	3.28	1.92	0.73846154
180	3.36	1.84	0.70769231
210	3.43	1.77	0.68076923
240	3.51	1.69	0.65
270	3.58	1.62	0.62307692
300	3.65	1.55	0.59615385
330	3.72	1.48	0.56923077
360	3.78	1.42	0.54615385
390	3.83	1.37	0.52692308
420	3.87	1.33	0.51153846
450	3.91	1.29	0.49615385
480	3.94	1.26	0.48461538

Test Section Depth	m	5.2	
Borehole Depth	m	5.2	
Borehole Diameter	m	0.05	
Casing Depth	m	1	
Depth to Standing Water Level (d_1)	Assumed m		
Height of casing agl (h_c)	m	0	
Height of top of casing above water table	m	0	
Depth to Water at Start of Test below casing level (d_0)	m	2.6	
Depth to Water at End of Test below casing level	m	3.94	
Depth to Filter at Start of Test	m	NA	
Depth to Filter at End of Test	m	NA	
Response Zone Length	m	4.2	
Borehole Diameter in Test Section	m	0.05	
Cross-sectional Area of Borehole	m2	0.002	
Intake factor (BS5930 p51):	Figure 7 (F) =	1.14	
Basic Time Lag = (T) t_1=	0.00	$s.h_1$ =	1.00
t_2=	480.00	$s.h_2$ =	0.48
Coefficient of Permeability (k) ms-1 =			2.59E-06

Remarks	Borehole cleaned out prior to test.			
Compiled By	SM	Date	06/03/2023	
Checked By	AH	Date	07/03/2023	
Geology of Test Section:	Laminated very sandy silt Clays and clayey Sands (Bagshot Formation)			

Tier Environmental Ltd
Chadwick House
Birchwood Park
Warrington, WA3 6AE
Tel. 01925 818 388

Project Number	TE1723
Project Name	4 The Grove
Client	

APPENDIX G – LABORATORY RESULTS – GEOTECHNICAL TESTING

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
33019	4 The Grove	Samples received	16/02/2023
		Schedule received	16/02/2023
Project No.	Client	Project started	17/02/2023
TE1723	Tier Environmental	Testing Started	27/02/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
WS101	-	2.00	2.45	UT	Medium strength orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and angular to sub-rounded)	17					
WS101	-	3.80	-	D	Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)	15	46	28	15	13	
WS102	-	3.50	4.00	D	Brown silty clayey SAND	24					
WS103	-	2.50	-	D	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)	18	71	31	16	15	
WS104	-	3.00	4.00	B	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)	23	90	45	23	22	
WS104	-	4.00	4.45	U	Low strength light brown mottled orangish brown fine sandy silty CLAY with rare fine mudstone fragments	23					
WS106B	-	3.00	3.45	U	Brown slightly sandy silty CLAY	24	100	42	21	21	
WS106B	-	5.00	6.00	B	Brown sandy silty CLAY with rare fine gravel	24					

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3 and 5.0
These results only apply to the items tested

NOTE: The report shall not be reproduced except in full without authority of the laboratory

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

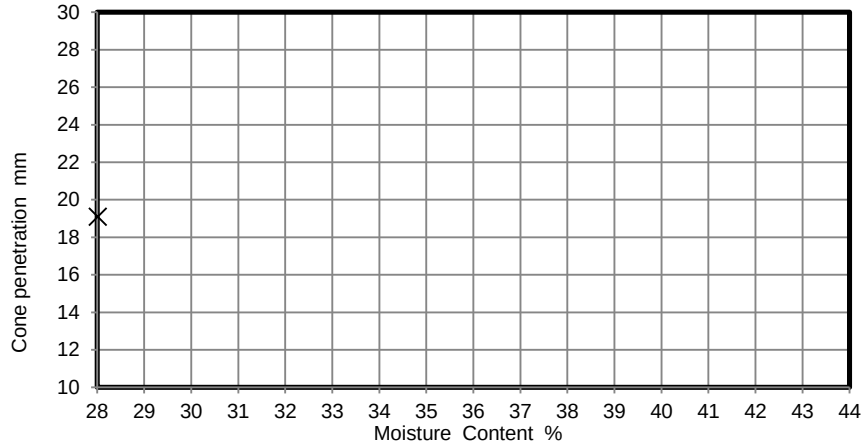
Initials J.P

Date: 10/03/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	33019
				Borehole/Pit No.	WS101
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top m	3.80
Soil Description	Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)			Depth Base m	-
				Sample Type	D
				Samples received	16/02/2023
				Schedules received	16/02/2023
				Project Started	17/02/2023
				Date Tested	27/02/2023

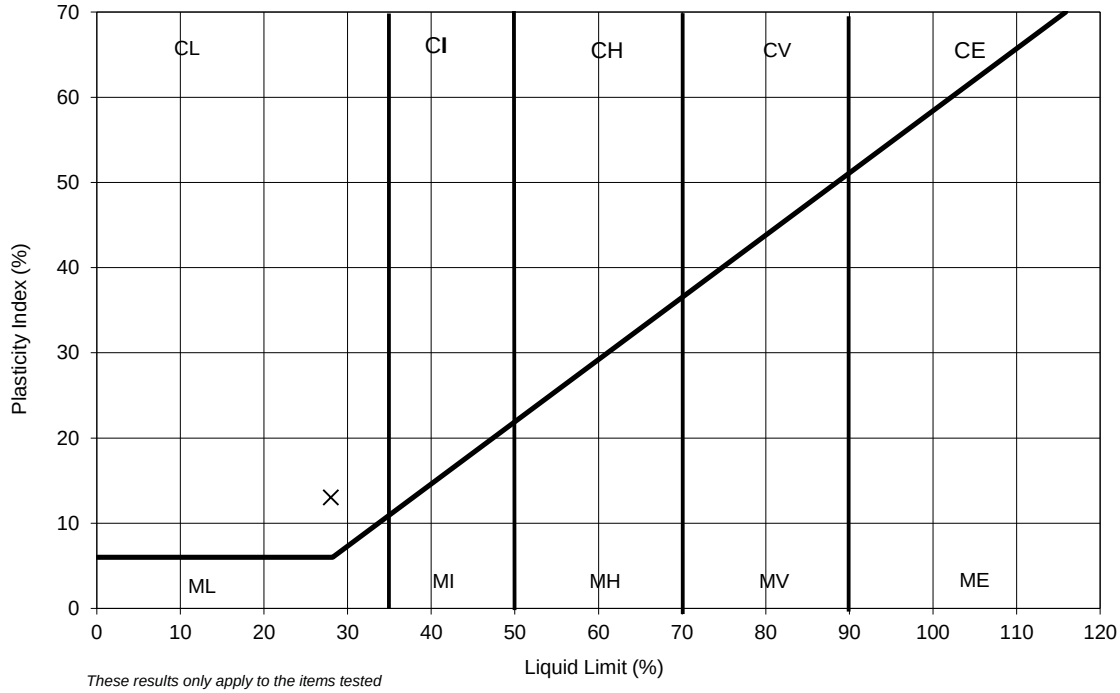


NATURAL MOISTURE CONTENT	**15**	**%**
% PASSING 425µm SIEVE	**46**	**%**
LIQUID LIMIT	**28**	**%**
PLASTIC LIMIT	**15**	**%**
PLASTICITY INDEX	**13**	**%**

Remarks

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



These results only apply to the items tested

TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 10/03/2023

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

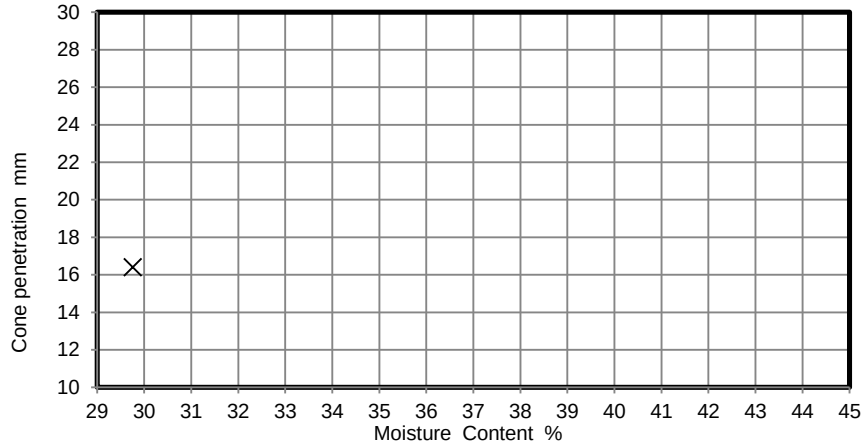
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

				Job No.	33019
				Borehole/Pit No.	WS103
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top m	2.50
Soil Description	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)			Depth Base m	-
				Sample Type	D
				Samples received	16/02/2023
				Schedules received	16/02/2023
				Project Started	17/02/2023
				Date Tested	27/02/2023

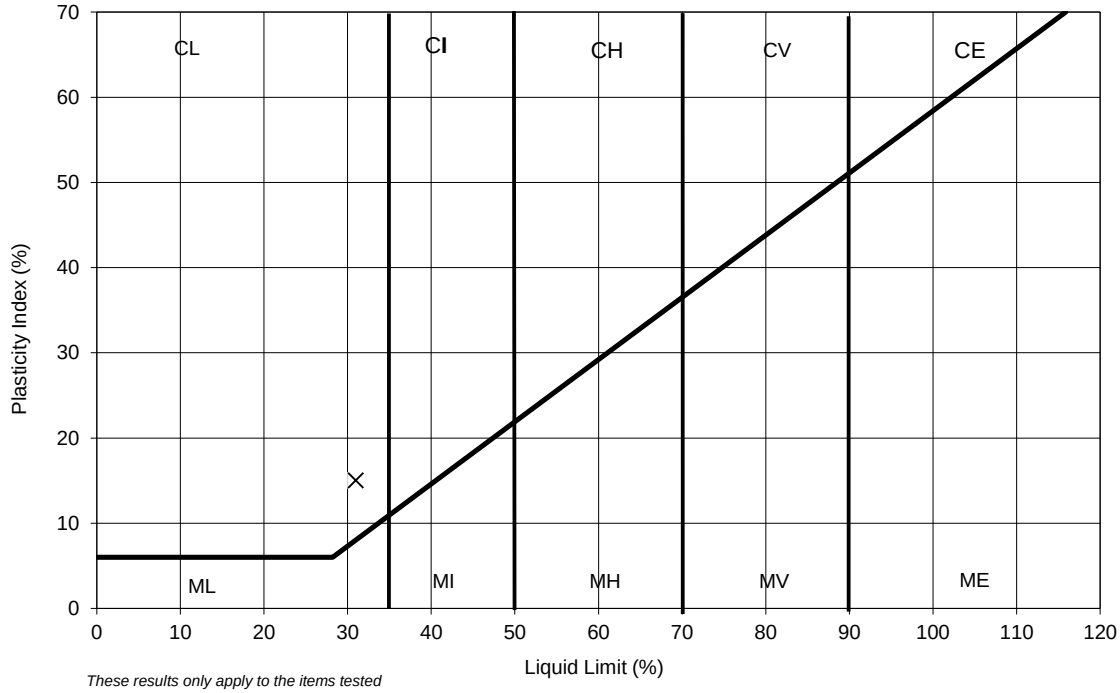


NATURAL MOISTURE CONTENT	**18**	**%**
% PASSING 425µm SIEVE	**71**	**%**
LIQUID LIMIT	**31**	**%**
PLASTIC LIMIT	**16**	**%**
PLASTICITY INDEX	**15**	**%**

Remarks

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



These results only apply to the items tested

TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 10/03/2023

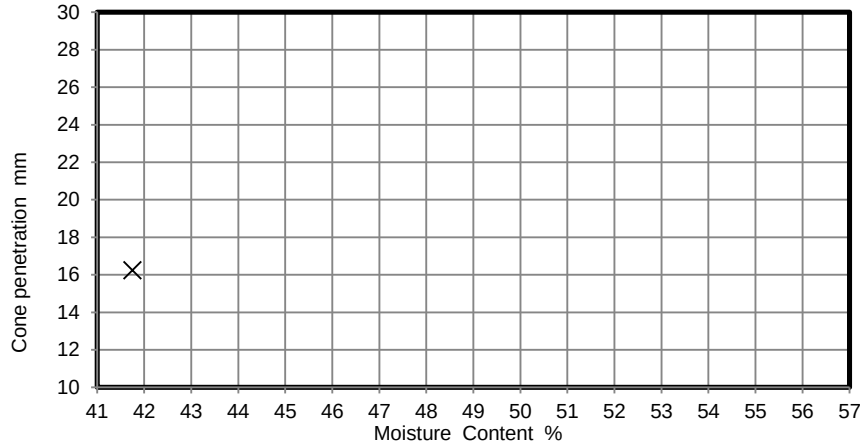
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	33019
				Borehole/Pit No.	WS104
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top m	3.00
Soil Description	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)			Depth Base m	4.00
				Sample Type	B
				Samples received	16/02/2023
				Schedules received	16/02/2023
				Project Started	17/02/2023
				Date Tested	27/02/2023

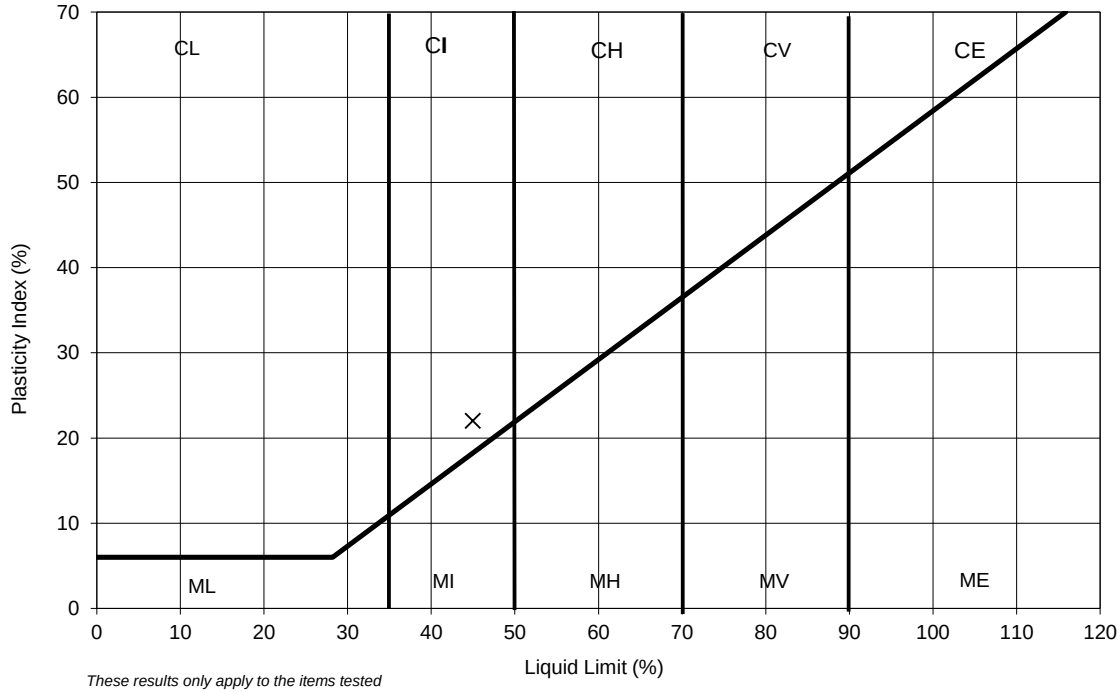


NATURAL MOISTURE CONTENT	**23**	**%**
% PASSING 425µm SIEVE	**90**	**%**
LIQUID LIMIT	**45**	**%**
PLASTIC LIMIT	**23**	**%**
PLASTICITY INDEX	**22**	**%**

Remarks

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



These results only apply to the items tested

TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 10/03/2023

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

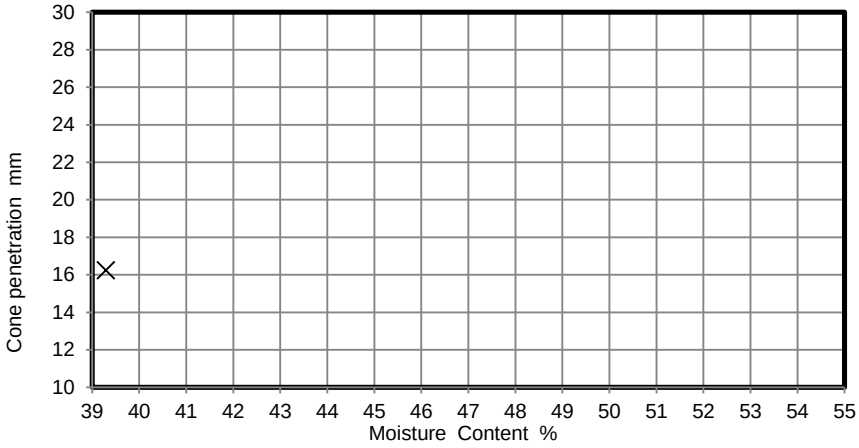
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

				Job No.	33019
				Borehole/Pit No.	WS106B
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top m	3.00
Soil Description	Brown slightly sandy silty CLAY			Depth Base m	3.45
				Sample Type	U
				Samples received	16/02/2023
				Schedules received	16/02/2023
				Project Started	17/02/2023
				Date Tested	27/02/2023

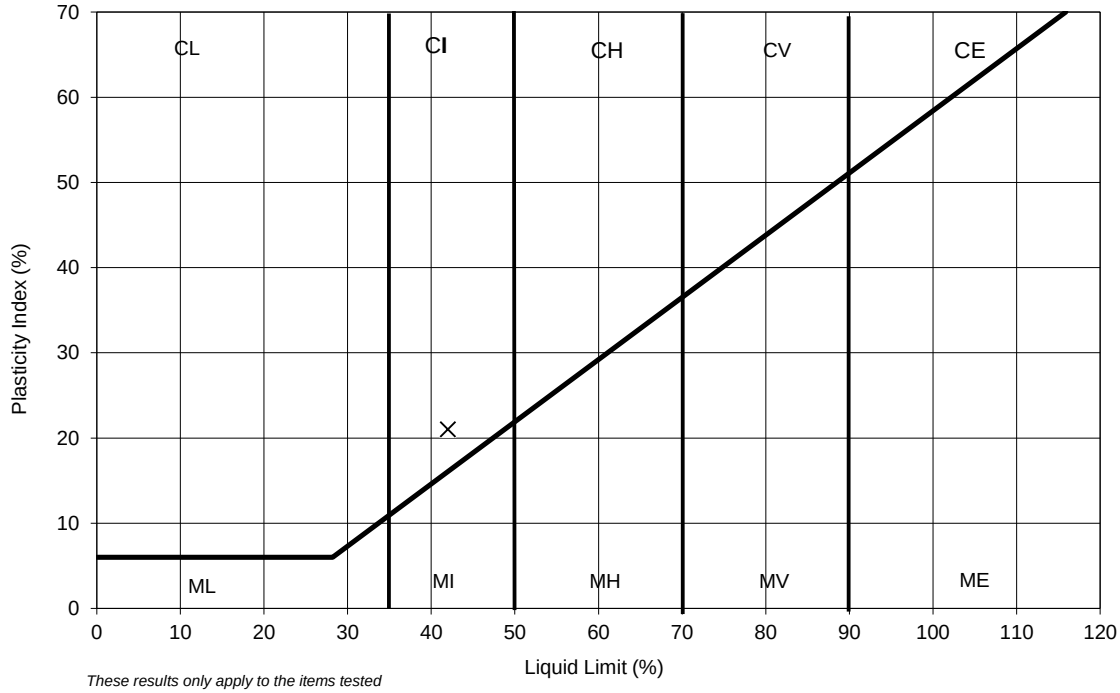


NATURAL MOISTURE CONTENT	**24**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**42**	**%**
PLASTIC LIMIT	**21**	**%**
PLASTICITY INDEX	**21**	**%**

Remarks

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



These results only apply to the items tested

TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 10/03/2023

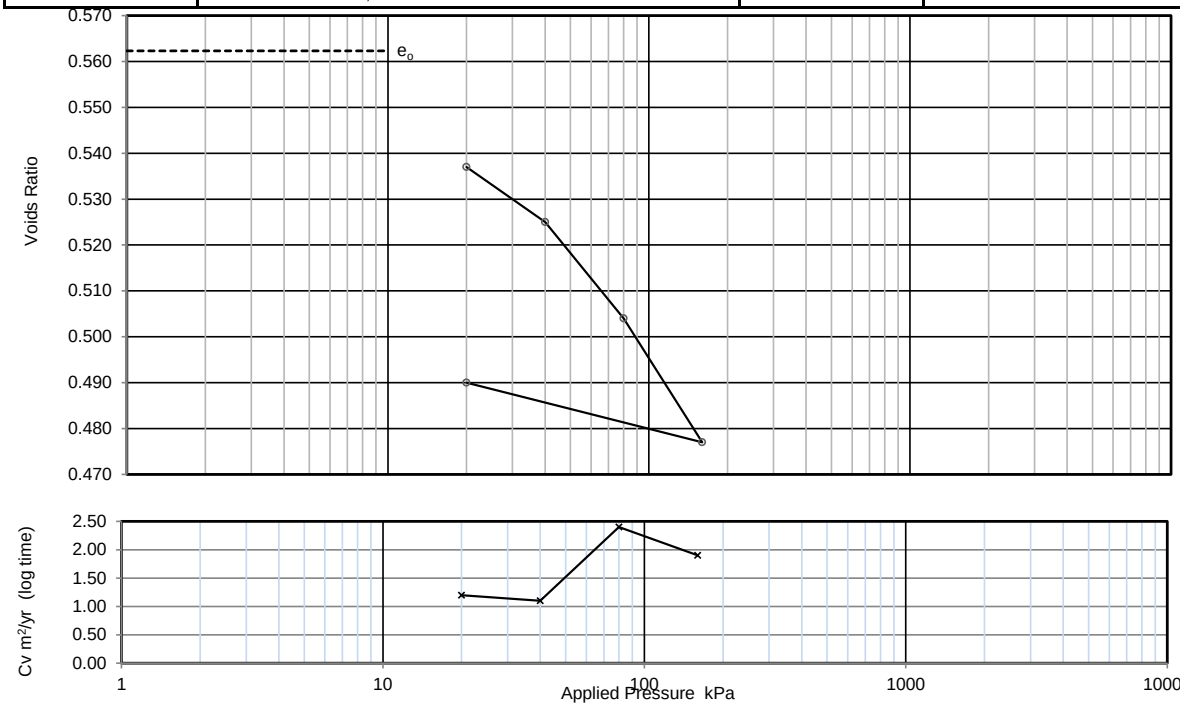
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33019
				Borehole/Pit No.	WS101
				Sample No.	-
Site Name	4 The Grove			Depth Top	2.00 m
Project ID	TE1723	Client	Tier Environmental	Depth Base	2.45 m
Soil Description	Medium strength orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and angular to sub-rounded)			Sample Type	UT
				Sample Received	16/02/2023
				Schedule received	16/02/2023
				Project Started	17/02/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	01/03/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	0.562	-	-	-
20	0.537	0.89	1.2	9.1
40	0.525	0.41	1.1	2.2
80	0.504	0.33	2.4	4.8
160	0.477	0.22	1.9	7.1
20	0.490	0.06		

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.68 Mg/m3

Specimen details	Initial	Final	
Diameter	74.89	-	mm
Height	18.77	17.90	mm
Moisture Content	21	20	%
Bulk density	2.07	2.15	Mg/m3
Dry density	1.72	1.80	Mg/m3
Voids Ratio	0.562	0.490	
Saturation	100	107	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials K.P.

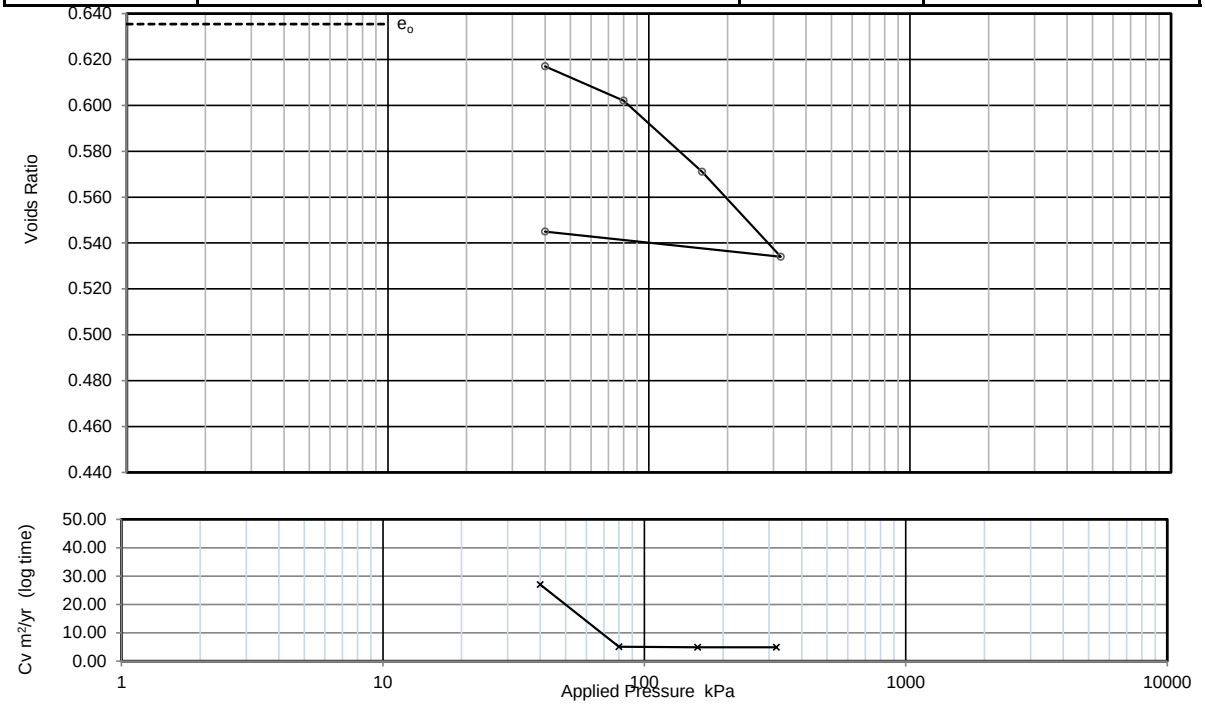
Date: 10/03/2023

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33019
				Borehole/Pit No.	WS104
				Sample No.	-
Site Name	4 The Grove			Depth Top	4.00 m
Project ID	TE1723	Client	Tier Environmental	Depth Base	4.45 m
Soil Description	Low strength light brown mottled orangish brown fine sandy silty CLAY with rare fine mudstone fragments			Sample Type	U
				Sample Received	16/02/2023
				Schedule received	16/02/2023
				Project Started	17/02/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	01/03/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	0.635	-	-	-
40	0.617	0.29	27	120
80	0.602	0.24	5.1	28
160	0.571	0.24	4.9	8.7
320	0.534	0.15	4.9	9.2
40	0.545	0.026		

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.69 Mg/m3

Specimen details	Initial	Final	
Diameter	49.85	-	mm
Height	18.89	17.84	mm
Moisture Content	24	23	%
Bulk density	2.03	2.15	Mg/m3
Dry density	1.64	1.74	Mg/m3
Voids Ratio	0.635	0.545	
Saturation	100	115	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials K.P.

Date: 10/03/2023

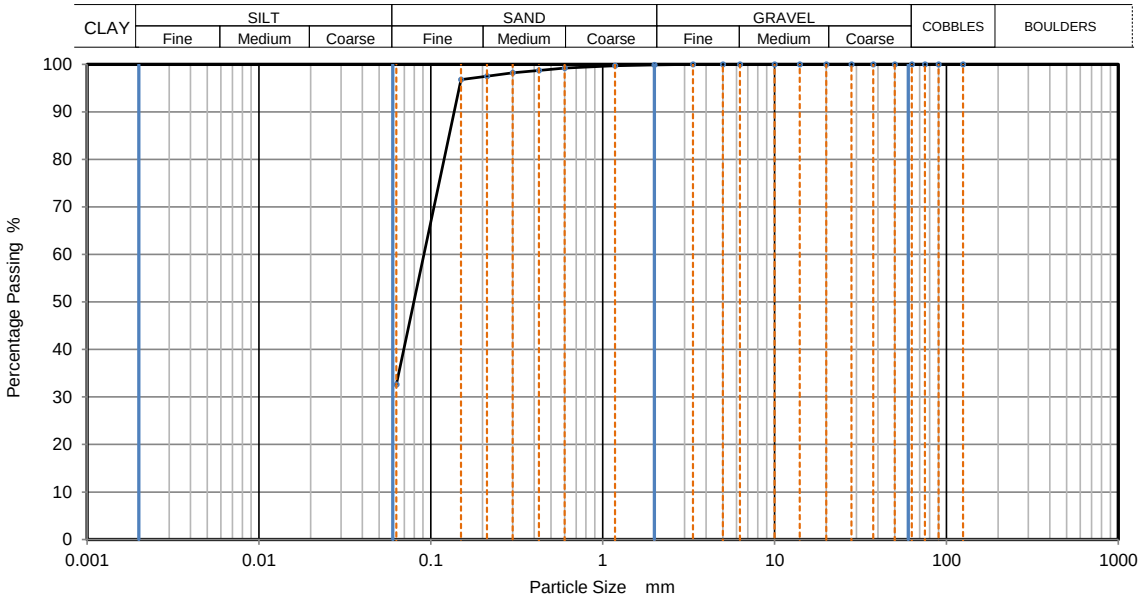
2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

PARTICLE SIZE DISTRIBUTION

				Job Ref	33019
				Borehole/Pit No.	WS102
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top	3.50 m
Soil Description	Brown silty clayey SAND			Depth Base	4.00 m
				Sample Type	D
				Samples received	16/02/2023
				Schedules received	16/02/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	17/02/2023
				Date tested	01/03/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	98		
0.212	98		
0.15	97		
0.063	33		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.1
Sand	67.3
Fines <0.063mm	32.7

Grading Analysis		
D100	mm	
D60	mm	0.0912
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU

Email: james@k4soils.com

Tel: 01923 711288

Checked and Approved

Initials: **J.P**

Date: 10/03/2023

UKAS TESTING

2519

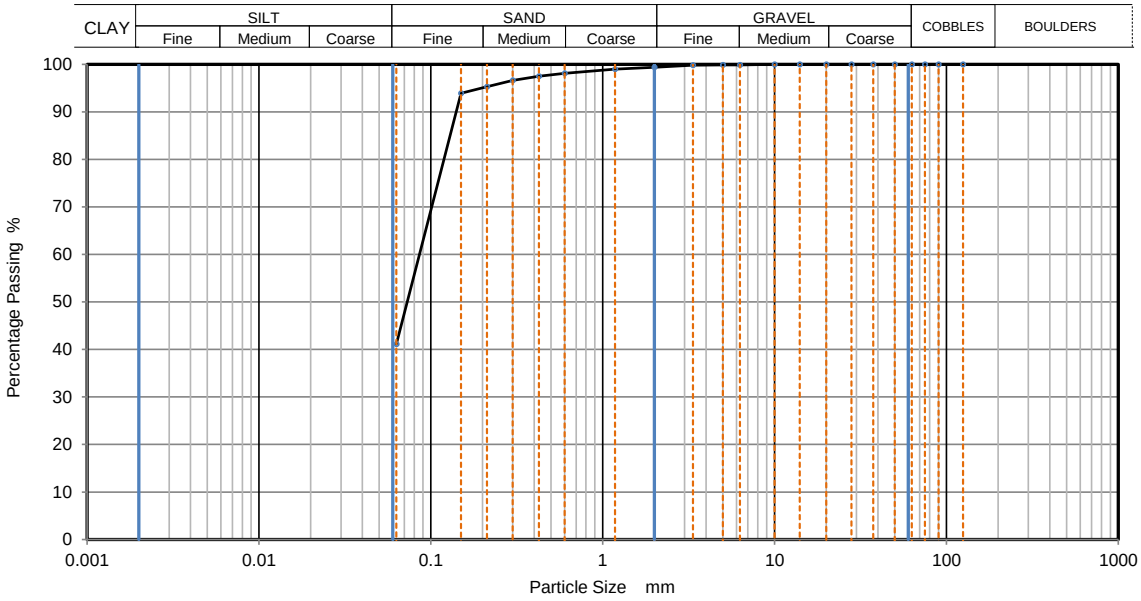
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

				Job Ref	33019
				Borehole/Pit No.	WS106B
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top	5.00 m
Soil Description	Brown sandy silty CLAY with rare fine gravel			Depth Base	6.00 m
				Sample Type	B
				Samples received	16/02/2023
				Schedules received	16/02/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	17/02/2023
				Date tested	02/03/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98		
0.425	98		
0.3	97		
0.212	95		
0.15	94		
0.063	41		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.6
Sand	58.3
Fines <0.063mm	41.1

Grading Analysis		
D100	mm	
D60	mm	0.0859
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU

Email: james@k4soils.com

Tel: 01923 711288

Checked and Approved

Initials: **J.P**

Date: 10/03/2023

UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

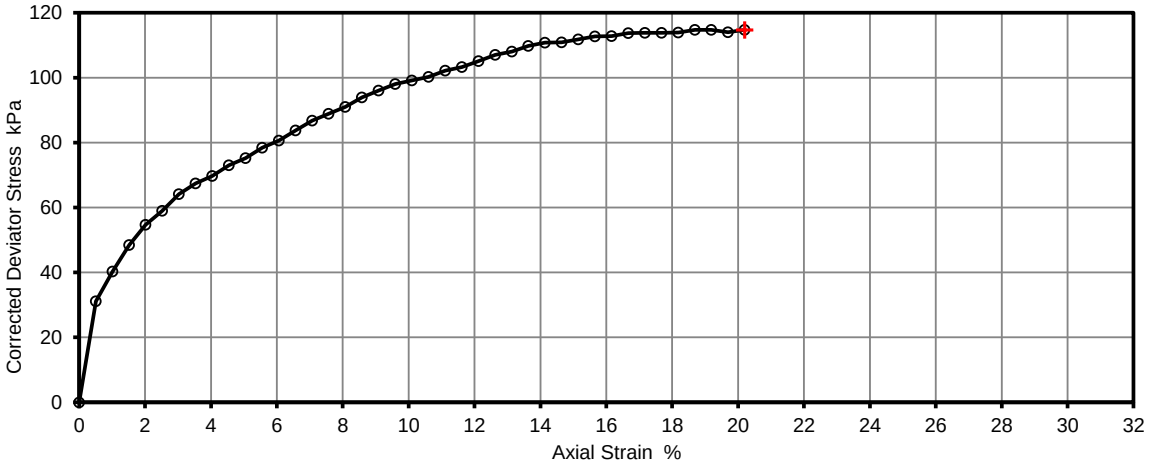
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33019
				Borehole/Pit No.	WS101
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top	2.00 m
Soil Description	Medium strength orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and angular to sub-rounded)			Depth Base	2.45 m
				Sample Type	UT
				Samples received	16/02/2023
				Schedules received	16/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

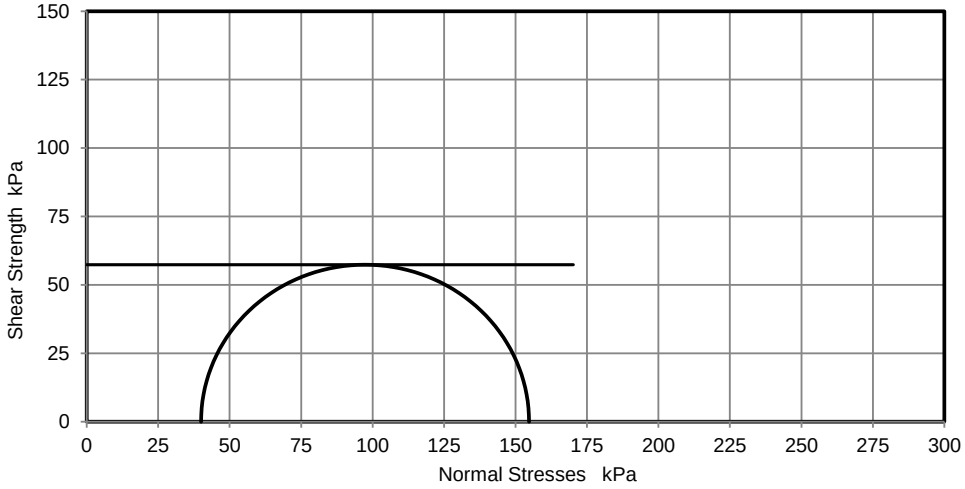
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	103.0	mm
Bulk Density	2.18	Mg/m3
Moisture Content	17	%
Dry Density	1.87	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	40	kPa
Axial Strain	20	%
Deviator Stress, (σ1 - σ3)f	115	kPa
Undrained Shear Strength, cu	57	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 10/03/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

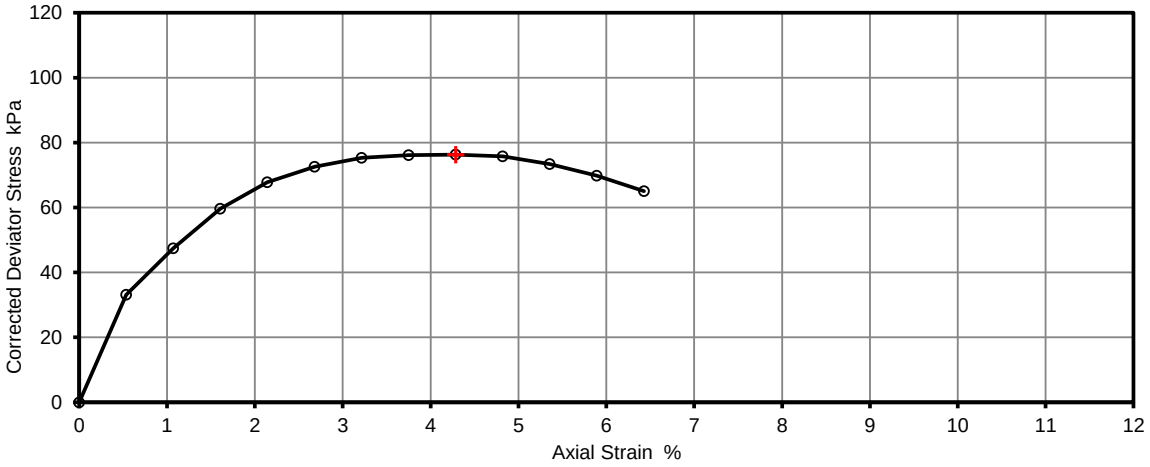
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	33019
				Borehole/Pit No.	WS104
Site Name	4 The Grove			Sample No.	-
Project No.	TE1723	Client	Tier Environmental	Depth Top	4.00 m
Soil Description	Low strength light brown mottled orangish brown fine sandy silty CLAY with rare fine mudstone fragments			Depth Base	4.45 m
				Sample Type	U
				Samples received	16/02/2023
				Schedules received	16/02/2023
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/02/2023

Remarks

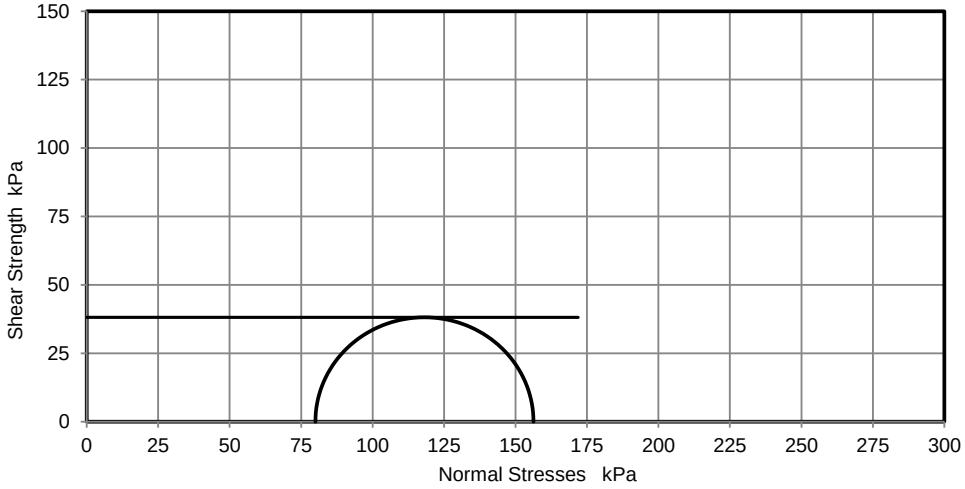
Position within sample

Test Number	1	
Length	140.0	mm
Diameter	70.0	mm
Bulk Density	1.90	Mg/m3
Moisture Content	23	%
Dry Density	1.54	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	80	kPa
Axial Strain	4.3	%
Deviator Stress, (σ1 - σ3)f	76	kPa
Undrained Shear Strength, cu	38	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 10/03/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test

Job No.	Project Name	Programme	
33019	4 The Grove	Samples received	16/02/2023
		Schedule received	16/02/2023
Project No.	Client	Project started	17/02/2023
TE1723	Tier Environmental	Testing Started	28/02/2023

Hole No.	Sample Ref	Sample Top m	Sample Base m	Sample Type	Soil Description	Test Type	Density bulk Mg/m3	Density dry Mg/m3	w %	Length mm	Diameter mm	σ3 kPa	At failure Axial strain %	At failure σ1 - σ3 kPa	At failure cu kPa	At failure Mode	Remarks
WS101	-	2.00	2.45	UT	Medium strength orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and angular to sub-rounded)	UU	2.18	1.87	17	198	103	40	20	115	57	C	
WS104	-	4.00	4.45	U	Low strength light brown mottled orangish brown fine sandy silty CLAY with rare fine mudstone fragments	UU	1.90	1.54	23	140	70	80	4.3	76	38	B	

Legend
UU - single stage test (single and multiple specimens) — σ3 Cell pressure — Mode of failure ; B - Brittle
UUM - Multistage test on a single specimen — σ1 - σ3 Maximum corrected deviator stress — P - Plastic
suffix R - remoulded or recompacted — cu Undrained shear strength, ½ (σ1 - σ3) — C - Compound

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: james@k4soils.com
Email: james@k4soils.com

Checked and Approved

Initials: J.P

Date: 10/03/2023

APPENDIX H – LABORATORY RESULTS – CHEMICAL ANALYSIS

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Tier Environmental
Suite 414, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Adrian Read
Date :	1st March, 2023
Your reference :	TE1723
Our reference :	Test Report 23/2458 Batch 1
Location :	4 The Grove
Date samples received :	17th February, 2023
Status :	Final Report
Issue :	1

Ten samples were received for analysis on 17th February, 2023 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 3rd Floor Davidson Building, 5 Southampton Street, London WC2E 7HA
Company Registration No: 11371415

Client Name: Tier Environmental
Reference: TE1723
Location: 4 The Grove
Contact: Adrian Read
EMT Job No: 23/2458

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1	2	3	4-7	8	10-13	14	15	16-19		LOD/LOR	Units	Method No.
Sample ID	WS101	WS101	WS102	WS104	WS104	WS105	WS105	WS105	HDP1				
Depth	5.50-6.00	2.45	3.00-3.50	0.70	1.20-1.45	1.30	1.20-1.45	5.00-5.45	0.60				
COC No / misc													
Containers	B	B	B	V J T	B	V J T	B	B	V J T				
Sample Date	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023				
Arsenic #	-	-	-	15.0	-	10.7	-	-	14.8		<0.5	mg/kg	TM30/PM15
Cadmium #	-	-	-	<0.1	-	<0.1	-	-	<0.1		<0.1	mg/kg	TM30/PM15
Chromium #	-	-	-	65.1	-	86.9	-	-	71.2		<0.5	mg/kg	TM30/PM15
Copper #	-	-	-	16	-	6	-	-	32		<1	mg/kg	TM30/PM15
Lead #	-	-	-	269	-	13	-	-	486		<5	mg/kg	TM30/PM15
Mercury #	-	-	-	0.3	-	<0.1	-	-	0.8		<0.1	mg/kg	TM30/PM15
Nickel #	-	-	-	12.3	-	5.2	-	-	13.1		<0.7	mg/kg	TM30/PM15
Selenium #	-	-	-	<1	-	<1	-	-	<1		<1	mg/kg	TM30/PM15
Sulphur as S	0.02	0.01	<0.01	-	0.05	-	<0.01	0.04	-		<0.01	%	TM30/PM15
Total Sulphate as SO4 #	-	-	-	224	-	66	-	-	323		<50	mg/kg	TM50/PM29
Total Sulphate as SO4 BRE	0.03	0.02	0.01	-	0.05	-	<0.01	0.06	-		<0.01	%	TM50/PM29
Zinc #	-	-	-	36	-	13	-	-	93		<5	mg/kg	TM30/PM15
Magnesium	0.0050	0.0018	0.0012	-	0.0015	-	0.0005	0.0043	-		<0.0001	g/l	TM30/PM20
PAH MS													
Naphthalene #	-	-	-	<0.04	-	<0.04	-	-	<0.04		<0.04	mg/kg	TM4/PM8
Acenaphthylene	-	-	-	<0.03	-	<0.03	-	-	0.05		<0.03	mg/kg	TM4/PM8
Acenaphthene #	-	-	-	<0.05	-	<0.05	-	-	<0.05		<0.05	mg/kg	TM4/PM8
Fluorene #	-	-	-	<0.04	-	<0.04	-	-	<0.04		<0.04	mg/kg	TM4/PM8
Phenanthrene #	-	-	-	0.05	-	<0.03	-	-	0.24		<0.03	mg/kg	TM4/PM8
Anthracene #	-	-	-	<0.04	-	<0.04	-	-	0.08		<0.04	mg/kg	TM4/PM8
Fluoranthene #	-	-	-	0.09	-	<0.03	-	-	0.66		<0.03	mg/kg	TM4/PM8
Pyrene #	-	-	-	0.08	-	<0.03	-	-	0.58		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	-	-	-	<0.06	-	<0.06	-	-	0.58		<0.06	mg/kg	TM4/PM8
Chrysene #	-	-	-	0.06	-	<0.02	-	-	0.51		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	-	-	-	0.09	-	<0.07	-	-	0.89		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	-	-	-	<0.04	-	<0.04	-	-	0.49		<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	-	-	-	<0.04	-	<0.04	-	-	0.30		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	-	-	-	<0.04	-	<0.04	-	-	0.06		<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	-	-	-	<0.04	-	<0.04	-	-	0.25		<0.04	mg/kg	TM4/PM8
PAH 16 Total	-	-	-	<0.6	-	<0.6	-	-	4.7		<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	-	-	-	0.06	-	<0.05	-	-	0.64		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	-	-	-	0.03	-	<0.02	-	-	0.25		<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	-	-	-	90	-	91	-	-	93		<0	%	TM4/PM8
Total Phenols HPLC	-	-	-	<0.15	-	<0.15	-	-	1.39		<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	27.6	13.1	20.2	27.9	23.1	7.0	10.6	18.5	14.3		<0.1	%	PM4/PM0
Ammoniacal Nitrogen as NH4	<0.6	<0.6	<0.6	-	<0.6	-	<0.6	3.9	-		<0.6	mg/kg	TM38/PM20
Chloride (2:1 Ext BRE) #	0.006	0.004	0.003	-	0.002	-	<0.002	0.005	-		<0.002	g/l	TM38/PM20
Hexavalent Chromium #	-	-	-	<0.3	-	<0.3	-	-	<0.3		<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	0.0081	0.0050	<0.0025	-	0.0028	-	<0.0025	<0.0025	-		<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0218	0.0137	0.0118	0.0064	0.0140	0.0065	0.0174	0.0715	0.0152		<0.0015	g/l	TM38/PM20

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1723
Location: 4 The Grove
Contact: Adrian Read
EMT Job No: 23/2458

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3	4-7	8	10-13	14	15	16-19		LOD/LOR	Units	Method No.
Sample ID	WS101	WS101	WS102	WS104	WS104	WS105	WS105	WS105	HDP1				
Depth	5.50-6.00	2.45	3.00-3.50	0.70	1.20-1.45	1.30	1.20-1.45	5.00-5.45	0.60				
COC No / misc													
Containers	B	B	B	V J T	B	V J T	B	B	V J T				
Sample Date	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023				
Total Organic Carbon #	-	-	-	1.03	-	0.27	-	-	3.13		<0.02	%	TM21/PM24
pH #	7.71	7.63	8.13	8.60	8.58	8.10	8.44	5.56	7.43		<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1723
Location: 4 The Grove
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
23/2458	1	WS104	0.70	6	Simon Postlewhite	01/03/2023	**General Description (Bulk Analysis)**	Brown soil/stones
					Simon Postlewhite	01/03/2023	**Asbestos Fibres**	NAD
					Simon Postlewhite	01/03/2023	**Asbestos ACM**	NAD
					Simon Postlewhite	01/03/2023	**Asbestos Type**	NAD
23/2458	1	WS105	1.30	12	Simon Postlewhite	01/03/2023	**General Description (Bulk Analysis)**	Brown soil/swtones
					Simon Postlewhite	01/03/2023	**Asbestos Fibres**	NAD
					Simon Postlewhite	01/03/2023	**Asbestos ACM**	NAD
					Simon Postlewhite	01/03/2023	**Asbestos Type**	NAD
23/2458	1	HDP1	0.60	18	Matthew Turner	01/03/2023	**General Description (Bulk Analysis)**	Brown soil/Stone
					Matthew Turner	01/03/2023	**Asbestos Fibres**	NAD
					Matthew Turner	01/03/2023	**Asbestos ACM**	NAD
					Matthew Turner	01/03/2023	**Asbestos Type**	NAD

Client Name: Tier Environmental
Reference: TE1723
Location: 4 The Grove
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/2458						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/2458

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/2458

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes

EMT Job No: 23/2458

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

HazWasteOnline™

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

O6KOX-TYCIO-IQOK0

Job name

EMT-23-2458-Batch-1-202303011123

Description/Comments

Project

TE1723

Site

4 The Grove, Camden

Classified by

Name:
Adrian Read
Date:
14 Mar 2023 15:17 GMT
Telephone:
01925 818388

Company:
Tier Environmental
Suite 414
Chadwick House
Warrington
WA3 6AE

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	**Date**
Hazardous Waste Classification	03 Dec 2020

Next 3 year Refresher due by Dec 2023

Purpose of classification

2 - Material Characterisation

Address of the waste

4 The Grove, Highgate, London N6 6JU **Post Code** N6 6JU

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Proposed redevelopment of land

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of soils during development

Description of the waste

Made ground and/or natural soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS101-13/02/2023-5.50-6.00m		Non Hazardous		3
2	WS101-13/02/2023-2.45m		Non Hazardous		4
3	WS102-13/02/2023-3.00-3.50m		Non Hazardous		5
4	WS104-13/02/2023-0.70m		Non Hazardous		6
5	WS104-13/02/2023-1.20-1.45m		Non Hazardous		8
6	WS105-13/02/2023-1.30m		Non Hazardous		9
7	WS105-13/02/2023-1.20-1.45m		Non Hazardous		11
8	WS105-13/02/2023-5.00-5.45m		Non Hazardous		12
9	HDP1-13/02/2023-0.60m		Non Hazardous		13

Related documents

#	Name	Description
1	EMT-23-2458-Batch-1-202303011123.HWOL	Element .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Adrian Read

Created date: 14 Mar 2023 15:17 GMT

Classification of sample: WS101-13/02/2023-5.50-6.00m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS101-13/02/2023-5.50-6.00m
Moisture content:
27.6%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 27.6% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				7.71 pH		7.71 pH	7.71 pH		
				PH							
2		sulfur { sulfur }				200 mg/kg		156.74 mg/kg	0.0157 %	✓	
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.0157 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: WS101-13/02/2023-2.45m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS101-13/02/2023-2.45m
Moisture content:
13.1%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 13.1% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				7.63 pH		7.63 pH	7.63 pH		
				PH							
2		sulfur { sulfur }				100 mg/kg		88.417 mg/kg	0.00884 %	✓	
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.00884 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: WS102-13/02/2023-3.00-3.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS102-13/02/2023-3.00-3.50m
Moisture content:
20.2%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 20.2% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				8.13 pH		8.13 pH	8.13 pH		
				PH							
2		sulfur { sulfur }				<100 mg/kg		<100 mg/kg	<0.01 %		**<LOD**
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.01 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected

Classification of sample: WS104-13/02/2023-0.70m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS104-13/02/2023-0.70m
Moisture content:
27.9%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 27.9% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		15 mg/kg	1.32	15.485 mg/kg	0.00155 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<LOD
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				65.1 mg/kg	2.27	115.541 mg/kg	0.0116 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		16 mg/kg	1.126	14.085 mg/kg	0.00141 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	269 mg/kg	1.56	328.061 mg/kg	0.021 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3 mg/kg	1.353	0.317 mg/kg	0.0000317 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		12.3 mg/kg	2.976	28.622 mg/kg	0.00286 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		36 mg/kg	2.774	78.084 mg/kg	0.00781 %	✓	
10	pH			PH		8.6 pH		8.6 pH	8.6 pH		
11	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
12	acenaphthylene		205-917-1	208-96-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
13	acenaphthene		201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
14	fluorene		201-695-5	86-73-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
15	phenanthrene		201-581-5	85-01-8		0.05 mg/kg		0.0391 mg/kg	0.00000391 %	✓	
16	anthracene		204-371-1	120-12-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
17	fluoranthene		205-912-4	206-44-0		0.09 mg/kg		0.0704 mg/kg	0.00000704 %	✓	

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
18		pyrene				0.08	mg/kg		0.0625	mg/kg	0.00000625 %	✓	
			204-927-3	129-00-0									
19		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
20		chrysene				0.06	mg/kg		0.0469	mg/kg	0.00000469 %	✓	
		601-048-00-0	205-923-4	218-01-9									
21		benzo[b]fluoranthene				0.06	mg/kg		0.0469	mg/kg	0.00000469 %	✓	
		601-034-00-4	205-911-9	205-99-2									
22		benzo[k]fluoranthene				0.03	mg/kg		0.0235	mg/kg	0.00000235 %	✓	
		601-036-00-5	205-916-6	207-08-9									
23		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
24		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
25		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
26		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
										Total:	0.0466 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS104-13/02/2023-1.20-1.45m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS104-13/02/2023-1.20-1.45m
Moisture content:
23.1%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 23.1% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				8.58 pH		8.58 pH	8.58 pH		
				PH							
2		sulfur { sulfur }				500 mg/kg		406.174 mg/kg	0.0406 %	✓	
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.0406 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: WS105-13/02/2023-1.30m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS105-13/02/2023-1.30m
Moisture content:
7%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 7% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10.7 mg/kg	1.32	13.203 mg/kg	0.00132 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<LOD
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				86.9 mg/kg	2.27	184.358 mg/kg	0.0184 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		6 mg/kg	1.126	6.313 mg/kg	0.000631 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	13 mg/kg	1.56	18.951 mg/kg	0.00121 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		5.2 mg/kg	2.976	14.464 mg/kg	0.00145 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		13 mg/kg	2.774	33.705 mg/kg	0.00337 %	✓	
10	pH			PH		8.1 pH		8.1 pH	8.1 pH		
11	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
12	acenaphthylene		205-917-1	208-96-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
13	acenaphthene		201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
14	fluorene		201-695-5	86-73-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
15	phenanthrene		201-581-5	85-01-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
16	anthracene		204-371-1	120-12-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
17	fluoranthene		205-912-4	206-44-0		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
18		pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			204-927-3	129-00-0									
19		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
20		chrysene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
21		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
22		benzo[k]fluoranthene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
23		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
24		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
25		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
26		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
										Total:	0.0268 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS105-13/02/2023-1.20-1.45m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS105-13/02/2023-1.20-1.45m

Moisture content:
10.6%
(dry weight correction)

LoW Code:

Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)

Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 10.6% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				8.44 pH		8.44 pH	8.44 pH		
				PH							
2		sulfur { sulfur }				<100 mg/kg		<100 mg/kg	<0.01 %		**<LOD**
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.01 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected

Classification of sample: WS105-13/02/2023-5.00-5.45m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS105-13/02/2023-5.00-5.45m

Moisture content:
18.5%
(dry weight correction)

LoW Code:

Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)

Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 18.5% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				5.56 pH		5.56 pH	5.56 pH		
				PH							
2		sulfur { sulfur }				400 mg/kg		337.553 mg/kg	0.0338 %	✓	
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.0338 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: HDP1-13/02/2023-0.60m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
HDP1-13/02/2023-0.60m
Moisture content:
14.3%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14.3% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		14.8	mg/kg	1.32	17.096	mg/kg	0.00171 %	✓	
2		cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1	mg/kg	1.142	<0.114	mg/kg	<0.0000114 %		**<LOD**
3		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				71.2	mg/kg	2.27	141.403	mg/kg	0.0141 %	✓	
4		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		32	mg/kg	1.126	31.521	mg/kg	0.00315 %	✓	
5		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	486	mg/kg	1.56	663.228	mg/kg	0.0425 %	✓	
6		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.8	mg/kg	1.353	0.947	mg/kg	0.0000947 %	✓	
7		nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		13.1	mg/kg	2.976	34.111	mg/kg	0.00341 %	✓	
8		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
9		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		93	mg/kg	2.774	225.718	mg/kg	0.0226 %	✓	
10		pH			PH		7.43	pH		7.43	pH	7.43 pH		
11		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
12		acenaphthylene		205-917-1	208-96-8		0.05	mg/kg		0.0437	mg/kg	0.00000437 %	✓	
13		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
14		fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
15		phenanthrene		201-581-5	85-01-8		0.24	mg/kg		0.21	mg/kg	0.000021 %	✓	
16		anthracene		204-371-1	120-12-7		0.08	mg/kg		0.07	mg/kg	0.000007 %	✓	
17		fluoranthene		205-912-4	206-44-0		0.66	mg/kg		0.577	mg/kg	0.0000577 %	✓	

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
18		pyrene				0.58	mg/kg		0.507	mg/kg	0.0000507 %	✓	
			204-927-3	129-00-0									
19		benzo[a]anthracene				0.58	mg/kg		0.507	mg/kg	0.0000507 %	✓	
		601-033-00-9	200-280-6	56-55-3									
20		chrysene				0.51	mg/kg		0.446	mg/kg	0.0000446 %	✓	
		601-048-00-0	205-923-4	218-01-9									
21		benzo[b]fluoranthene				0.64	mg/kg		0.56	mg/kg	0.000056 %	✓	
		601-034-00-4	205-911-9	205-99-2									
22		benzo[k]fluoranthene				0.25	mg/kg		0.219	mg/kg	0.0000219 %	✓	
		601-036-00-5	205-916-6	207-08-9									
23		benzo[a]pyrene; benzo[def]chrysene				0.49	mg/kg		0.429	mg/kg	0.0000429 %	✓	
		601-032-00-3	200-028-5	50-32-8									
24		indeno[123-cd]pyrene				0.3	mg/kg		0.262	mg/kg	0.0000262 %	✓	
			205-893-2	193-39-5									
25		dibenz[a,h]anthracene				0.06	mg/kg		0.0525	mg/kg	0.00000525 %	✓	
		601-041-00-2	200-181-8	53-70-3									
26		benzo[ghi]perylene				0.25	mg/kg		0.219	mg/kg	0.0000219 %	✓	
			205-883-8	191-24-2									
										Total:	0.0883 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

sulfur {sulfur}

Worse case compound.

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.72.5542.10253 (13 Mar 2023)
HazWasteOnline Database: 2023.72.5542.10253 (13 Mar 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021

APPENDIX I – CHEMICAL AND GEOTECHNICAL SAMPLING

Samples were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling approach described elsewhere in this report.

Samples for geotechnical and related testing

Bulk samples were placed within robust heavy duty plastic bags and sealed, together with small disturbed samples, within airtight 1 litre plastic containers.

100 mm diameter 'undisturbed' samples ("U100 samples") were obtained where possible from cable percussive and large diameter window sample boreholes within cohesive materials.

Samples for chemical analysis

All samples for chemical analysis were placed into clean new containers as summarised in Table 1. Unless explicitly stated elsewhere in this report, no preservatives were used to eliminate the risk that preservatives cause contaminant dissolution or analytical interference. Containers for VOC analysis were fully filled to exclude headspace.

Soil samples were dispensed as soon as possible after collection using reusable stainless steel spatulas, trowels or similar implements.

Ground water samples were collected from boreholes using single-use Teflon bailers or dedicated Waterra tubing with foot valves, except as otherwise noted within this report. Caution was taken to avoid excessive agitation during collection

New disposable gloves were used by the engineer for the collection of each sample.

Reusable equipment was washed down with distilled or deionised water between samples, except where tarry or similarly sticky materials were present. In such cases specific cleaning procedures were adopted as specifically described elsewhere in this report.

All sub-samples taken for chemical analysis were placed into refrigerators or cool boxes containing frozen ice packs immediately after aliquoting. All samples were transferred in cool boxes containing frozen ice packs to the relevant UKAS/MCERTS accredited laboratory as soon as possible. Recommended maximum holding times before analysis are summarised in Table 1.

Table 1. Sample containers and holding times.

Analysis	**Container/special requirements**	**Max. holding time at 4°C before analysis**
Soil and sediment samples		
VOCs	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner. Must be fully filled.	14 days
TPHCWG	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner **PLUS** 250-500 g brown or green glass jar with unwaxed cap liner.[1] The former must be fully filled.	14 days
All other organics	250-500 g brown or green glass jar with unwaxed cap liner.	7 days
Inorganics	Air-tight 0.5-2.0 kg plastic container (250-500 g brown or green glass jar may also be used).	14 days[2]
Water samples		
VOCs	40-50 ml glass vial with VOC resistant screw cap and inert liner. Must be fully filled.	14 days
TPHCWG	40-50 ml glass vial with VOC resistant screw cap and inert liner **PLUS** 500-1000 ml brown or green glass bottle with screw cap and unwaxed liner.[1] The former must be fully filled, the latter should be filled if possible.	14 days
All other organics	500-1000 ml brown or green glass bottle with screw cap. Fill if possible.	7 days
Inorganics	500-1000 ml translucent or opaque screw cap plastic *or* brown or green glass bottles. Fill if possible.	14 days[3]

1 The smaller vessel is used for analysis of the volatile components within the TPH mixture and the larger one is for the non-volatile components.

2 14 days is set as a reasonable limit for all routine analyses of soil for those inorganic components vulnerable to chemical and/or biological breakdown. Samples for sulphate analysis are vulnerable to biological sulphate-reduction but can be held for up to 28 days. For total metals, a holding period of up to 6 months is acceptable.

3 14 days applies for all routine analyses of most inorganic components that may be vulnerable to chemical and/or biological reactions. In the specific cases of sulphide, nitrite, nitrate and phosphate analyses, storage time must not exceed 48 hours. For total metals, a holding time of up to 6 months is acceptable.

Tier Environmental standard analytical suites

The analyses included with Tier Environmental's standard analytical suites for soil, soil leachate and water samples are presented in Table 2. Other individual analyses were specified as described within this report.

Table 2. Tier Environmental Standard Analytical Suites.

Parameter	**Sample type**					
	Soil		**Leachate[1]**		**Water**	
		LoD[2] **(mg/kg or as stated)**		**LoD** **(µg/l or as stated)**		**LoD** **(µg/l or as stated)**
Metals and metalloids						
Arsenic	✓	1	✓	10	✓	10
Cadmium	✓	1	✓	5	✓	5
Chromium	✓	1	✓	5	✓	5
Mercury	✓	1	✓	1	✓	1
Lead	✓	1	✓	4	✓	4
Selenium	✓	2	✓	10	✓	10
Copper	✓	1	✓	1	✓	1
Nickel	✓	1	✓	50	✓	50
Zinc	✓	1	✓	8	✓	8
Other inorganics						
Ammonia (as NH_4-N)					✓	15
Total sulphate	✓	100			✓	50 mg/l
Water-soluble sulphate	✓	0.1 g/l				
Hardness (as $CaCO_3$)					✓	1 mg/l
Organics						
Monohydric phenol	✓	1	✓	0.5	✓	0.5
Speciated PAHs (USEPA 16)	✓	0.1	✓	0.01	✓	0.01
Total Organic Carbon	✓	0.1 wt%				
Others						
Electrical conductivity					✓	NA
pH	✓	NA	✓	NA	✓	NA

NA - Not applicable

1 Leachate preparation according to NRA (1994), 10:1 liquid to solid ratio.

2 The table presents the desired limit of detection for the analysis. Higher LoDs may be reported on analytical data sheets due to interference between analytes within specific samples or if the laboratory needed to dilute samples to achieve results within the calibrated range for that instrument.

Analytical QA procedures

Introduction

Quality Assurance (QA) is a system of review and audit that assesses the effectiveness of that product and assures the producer and user that defined standards of quality have been met. If we consider site investigation and chemical analysis, QA is the management system that ensures these measures are in place and working as intended.

QA within the laboratory form part of relevant certification programmes (such as UKAS and MCERTS) and, indeed, will be undertaken in some form by any reputable analyst, whether for a certified technique or not. Laboratory QA/QC is beyond the control of Tier Environmental and will not be considered further in this document, although the relevant laboratory documentation can be obtained upon request. QA must also form part of the design and execution of a site investigation.

Two parameters often used to assess measurement quality objectives are bias and precision. Bias is a systematic deviation in the data. For example, a positive bias (concentrations higher than in reality) would be introduced if sampling bottles were a source of the analyte and this fact was unknown. Precision is the variation in the measurements around a central 'expected' value. This could be due both to real variability in the environmental medium being measured and random errors in the analytical process. Both precision and bias can be assessed by the use of appropriate blanks and replicates within the site investigation programme.

The objectives of the QA activities undertaken in this present site investigation were to recognise and quantify systematic bias within the analytical dataset and to obtain an indication of precision. In environmental samples, much of the observed variability is likely to result from heterogeneity in the sampled medium, particularly for soil and sediment samples.

Such QA practice within the sampling programme is required by current guidance (e.g., Environment Agency report P5-065/TR (2000); Environment Agency LFTGN02 (2002); BS 10175:2001).

Alternative QA procedures to the generic approach presented in this appendix may be specified for a project, provided case-specific justification is given.

QA checking procedure (data validation)

The responsible Engineer and Project Reviewer are required to undertake data validation and provide comment on data quality within the main body of the report(s) issued, when noteworthy matters arise. This QA checking should involve:

Confirming that data reported by the laboratory have achieved the standards specified by the certification scheme (MCERTS or UKAS). This will be indicated on the analytical certificates issued by the laboratory.

Checking that the limit of detection (LoD) and limit of quantification (LoQ) achieved by the laboratory for an individual analyte is appropriate for the purposes of the report. LoD and LoQ will vary dependent upon analyte concentrations, sample matrix properties and interference from co-contaminants.

A check that the reported range of concentrations are reasonable for the analyte. For example, the dissolved concentration of an analyte in a water sample should not exceed saturation. If it does, then this merits further consideration (e.g., was colloidal organic matter or other solid-phase material present or could there have been unobserved free-phase organic liquid?) and explicit comment. At its simplest, there may be a unit error.

Where analysis involves reporting of Tentatively Identified Compounds (TICs; normally by mass spectrometry), the reviewers should check that these might reasonably be expected at the site under consideration. The uncertainties in identification by MS mean that it is not uncommon that TICs are incorrectly assigned. In cases of doubt, the analytical laboratory can re-check the raw data and confirm.

A review of the analytical precision by comparing data obtained for duplicate samples. There is no absolute threshold - variability is entirely dependent upon the sample matrix and manner in which the contaminant has entered the sample. Variability that cannot reasonably be assigned to such factors (for example a very high apparent variability in data for sediment-free water samples) should be reviewed with the laboratory. Variability that is attributable to the sample matrix can nevertheless provide important pointers to improve understanding of contaminant transport pathways and the risks posed by pollutant linkages (e.g., soil heterogeneity, the association of contamination with particular soil fractions, the presence of residual NAPL within soil pores or the role of suspended sediments in contaminant transport).

Confirmation that no errors have been introduced by data transcription, unit conversion or corrections between preliminary and certificates issued by the laboratory. The reviewer should audit a proportion (typically 5-10%) of all data from the original (final) certificates of analysis through to the equivalent values in the report for those specific samples.

In is important to consult the analytical laboratory if apparent QA issues arise. Many apparent concerns can be adequately resolved on the basis of revisiting the raw analytical data or by obtaining a better understanding of the inherent limitations of the analysis for a particular matrix or sample type.

APPENDIX J – HUMAN HEALTH GENERIC ASSESSMENT CRITERIA

HUMAN HEALTH ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by the Environment Agency Land contamination risk management (LCRM) - GOV.UK (www.gov.uk)

Land contamination can harm:

- human health
- drinking water supplies, groundwater and surface water
- soils
- ecosystems including wildlife, animals and wetlands
- property

It can also affect the current and future land use. Dealing with land contamination helps make the environment clean and safe. Through regeneration it can:

- enhance the health and wellbeing of all
- add to the economic, ecological and amenity value of the area

Use land contamination risk management (LCRM) to:

- identify and assess if there is an unacceptable risk
- assess what remediation options are suitable to manage the risk
- plan and carry out remediation
- verify that remediation has worked

You can use LCRM in a range of regulatory and management contexts. For example, voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime. The Environment Agency expects you to follow LCRM if you are managing the risks from land contamination.

We support the use of the National Quality Mark Scheme (NQMS). You can use it for any type of land contamination report.

Using the NQMS:

- will make sure all legislative requirements and necessary standards related to managing land contamination are met
- can provide increased confidence by submitting reports of the quality we expect
- can result in cost and time savings by 'getting it right first time'

LCRM is made up of 4 guides.

1. LCRM: Before you start.
2. LCRM: Risk assessment.
3. LCRM: Options appraisal.
4. LCRM: Remediation and verification.

We use a staged risk based approach. There are 3 stages, and each stage is broken down into tiers or steps.

Stage 1: Risk assessment

You will use a tiered approach to risk assessment. The 3 tiers are:

1. Preliminary risk assessment.
2. Generic quantitative risk assessment.
3. Detailed quantitative risk assessment.

Stage 1 includes information for intrusive site investigations.

Stage 2: Options appraisal

There are 3 steps to follow.

1. Identify feasible remediation options.
2. Do a detailed evaluation of options.
3. Select the final remediation option.

Stage 3: Remediation and verification

There are 4 steps to follow.

1. Develop a remediation strategy.
2. Remediate.
3. Produce a verification report.
4. Do long term monitoring and maintenance, if required

You must always start with a preliminary risk assessment.

The risk assessment stage is an iterative process. You can do the 3 tiers in order or progress from a preliminary risk assessment to a detailed quantitative risk assessment. As part of a generic or detailed quantitative risk assessment you will need to collect detailed information about the site. This is usually through an intrusive site investigation.

Depending on the level of risk or regulatory requirements, you can proceed from a preliminary risk assessment to the options appraisal stage. If you proceed direct to the options appraisal stage, you still need to collect the detailed site investigation information required by the generic and detailed quantitative risk assessments. This is to confirm that your approach is viable and acceptable.

Following the risk assessment stage, if you conclude that the risks are acceptable, with agreement from the relevant regulator, you can end the process.

If there are unacceptable risks, then remediation or mitigation is required. Follow stages 2 and 3 in order.

In stage 2 options appraisal, you will:

- look at the most feasible options
- produce a shortlist of options
- use evaluation criteria to assess them
- select which ones are the most suitable to take forward to stage 3

In stage 3 remediation and verification, you will produce a remediation strategy, do the remediation and then produce a verification report.

You will decide at the options appraisal stage if long term monitoring and maintenance is the remediation option. You may need to do post-remediation monitoring for further verification.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the “hazards”), all receptors that may be harmed by these (e.g., human health, controlled waters, ecological receptors) and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage in determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2020 “Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration”.

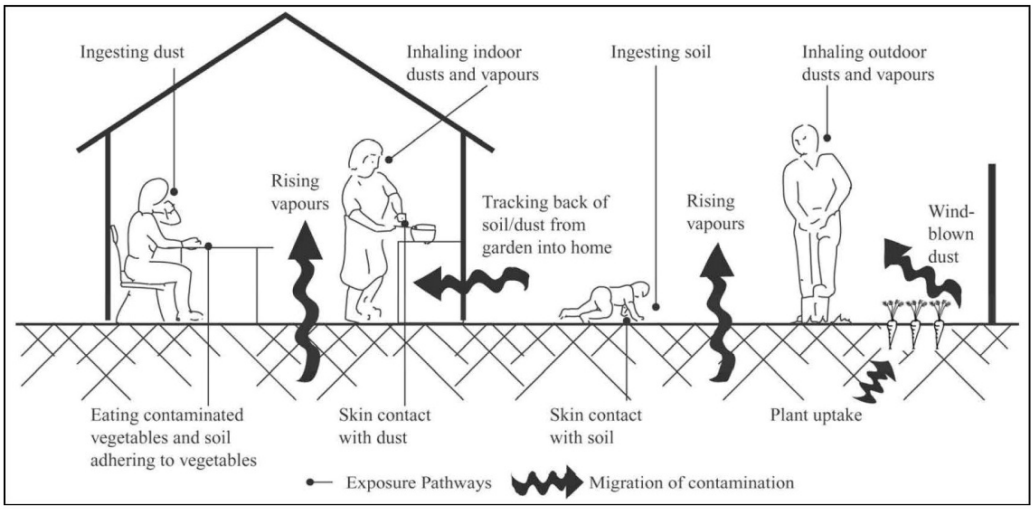
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- "Using Soil Guideline Values"; EA,2009; Land contamination: using soil guideline values (SGVs) - GOV.UK (www.gov.uk)
- "Human Health toxicology assessment of contaminants in soil" EA;, 2009; https://www.gov.uk/government/publications/human-health-toxicological-assessment-of-contaminants-in-soil
- "Update technical background to the CLEA model" 2009; https://www.gov.uk/government/publications/updated-technical-background-to-the-clea-model
- CLEA Software (Version1.05) Handbook 2015; https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration". CL:AIRE:2020 https://www.claire.co.uk/component/phocadownload/category/9-other-cl-aire-documents?download=745:2020-stats-guidance

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in "SR3: Updated technical background to the CLEA model"



(Science Report SC050021/SR3, EA, 2009) and reproduced below.

Ingestion

- Outdoor soil;
- Indoor dust;
- Home grown produce;
- Soil attached to home grown produce.

Dermal Contact

- Outdoor soil;
- Indoor dust.

Inhalation

- Outdoor dust;
- Indoor dust;
- Outdoor vapour;
- Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependent upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

Residential land use;

- A typical residential property consisting of a two-storey terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6-year-old female.
- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour

Allotments

- A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6-year-old female and there is no building present on Site.
- Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

Commercial and industrial land use.

- A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.
- Active exposure pathway is ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs is as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium.
- Benzene, ethylbenzene, toluene and xylenes.
- Phenol.
- Dioxins and dioxin-like polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived for 6 contaminants of concern, Arsenic, Benzene, Benzo(a)pyrene, Cadmium, Chromium VI and Lead.

This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

Public Open Space: Residential

- For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource

for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

Public Open Space: Park

- A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
    - Family visits and picnics;
    - Children's play area;
    - Sporting activities such as football on an informal basis (i.e. not a dedicated sports pitch); and
    - Dog walking.
- The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
- The critical receptor is a female child with CLEA age classes 1 – 6.
- Active exposure pathway are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore, the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009 with the exception of lead (see below).

Lead

The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (2010)

In some instances, EIC/AGC/CL:AIRE GACs for certain VOC / SVOC potential contaminants of concern have been used *in lieu* of available LQM / CIEH S4UL values.

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
PAHs																			
Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)
Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)
2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	LQM (2014)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

APPENDIX K - COMPLYING WITH CONTROL OF ASBESTOS REGULATIONS 2012

Complying with Control of Asbestos Regulations (CAR): Risk Assessments, Licensing and Training

This appendix outlines CAR risk assessments and where they should be applied in relation to assessing and remediating brownfield sites. The information below details the different classifications of work with asbestos under CAR, summarises the legal requirements for asbestos awareness training for all involved in the investigation and management of asbestos containing soil (ACS), and details the potential requirements for suitable proficiency training relating specifically to ACS.

CAR RISK ASSESSMENTS

A CAR Risk Assessment is required for any work which may expose employees to asbestos. It is recommended that a precautionary approach is adopted if there is any doubt about risks associated with asbestos.

There are three main activities for potential asbestos exposure during work on brownfield sites:

- Site reconnaissance visits;
- Site investigation works; and
- Site remediation.

CAR risk assessments are needed at each stage but may be incorporated during the site investigation stage into the overarching health and safety risk assessments.

The CAR risk assessment must:

- Identify the type of asbestos to which employees are liable to be exposed, where possible, or assume it is present in different forms;
- Determine the type and extent of exposures to asbestos that may occur during the work
- Identify the steps to be taken to prevent exposure or reduce it to the lowest level reasonably practicable; and,
- Consider the effects of control measures that have been or will be taken.

The CAR risk assessment should include any information used to inform the risk assessment such as asbestos reports or desk study information. In the event that this information is not available, the assessor should be assumed that all forms of asbestos may be present on Site.

For all investigation and remediation of ACSs, a detailed written work plan should he produced and followed as detailed on the HSE website and in the CAR.

The CAR risk assessments for specific investigations or remediation projects, will determine whether or not work is 'licensable work' (LW)**,** notifiable non-licensable work' (NNLW) or 'non-licensed work' (NLW). In addition, training requirements are also defined by the CAR risk assessment.

Some examples of control measures that apply during site reconnaissance, site investigation works, and site remediation are given below and should be applied depending on the asbestos risks identified for the Site at each stage of investigation:

- Avoiding stirring up dust;
- Cleaning footwear after site works;
- Removing and bagging any overalls for disposal/laundering;
- Respirators and hygiene facilities for high risk sites;
- Segregated welfare units;
- Wetting ground
- Minimising soil disturbances;
- Implementation or retention of capping/break layers;
- Implementation of awareness training;
- Air monitoring;
- Managing stockpiles;
- Area segregation;
- Wheel washing
- Road washing/cleaning

It is important to note that during Site reconnaissance visits, Site investigation works and Site remediation that asbestos should not be considered in isolation and control measures are likely to form part of a wider health and safety precautions.

Respiratory protective equipment (RPE)

RPE is the last line of defence and its requirement would be defined by the CAR risk assessment. HSE (2013b) advises that RPE should have an assigned protection factor of 20 or more for all work with asbestos. In certain instances, full face-piece, positive pressure respirators with a protection factor of 40 are necessary (to EN 12942:1998, TM3).

Suitable types of RPE for most ***short*** duration non-licensed asbestos work:

- Disposable respirator to standards EN149 (type FFP3) or EN1827 (type FMP3)
- Half mask respirator (to standard EN140) with P3 filter
- Semi-disposable respirator (to EN405) with P3 filter

These filters are not suitable for people with beards/stubble or for long or continuous use.

LICENSING

CAR defined certain types of activities involving asbestos as 'licensable work' (LW) or as 'notifiable non-licensable work' (NNLW). All other work would be 'non-licensable work' (NLW).

LW is defined as:

- work where exposure is not 'sporadic and low intensity'
- work where the risk assessment cannot demonstrate that the control limits (four hour and 10 minute limits) will not be exceeded
- work on asbestos coating
- work on AIB or insulation where risk assessment is either of first two points above or not of short duration (where short duration is defined for any work liable to disturb asbestos as taking less than two hours per week (including ancillary work) and no one person carries out that work for more than one hour').

NNLW includes work with:

- AIB or asbestos insulation of short duration that is not licensable
- fire-damaged asbestos cement or asbestos cement damaged so as to create significant dust and debris
- asbestos ropes, yarns, woven cloths in poor condition or handling cutting or breaking up the materials
- asbestos papers, felts and cardboard in poor condition, unencapsulated or not bound into another material.

Work with weathered asbestos cement, air monitoring and collecting samples of ACM in buildings would not normally be notifiable.

It is impossible to specify definitively what activities will and will not be licensable. This decision should be made as part of the CAR risk assessment. CAR is not primarily aimed at work with ACSs and there is little published information on airborne asbestos concentrations during work with ACSs. Nevertheless, CAR will require some remediation projects, and occasionally site investigations, to be LW. Investigations on other sites may involve NNLW. The decision as to whether work is LW or NNLW should be made during the CAR risk assessment by those in charge of the brownfield site investigations and remediation projects.

TRAINING REQUIREMENTS

Asbestos health and safety courses are offered by a number of providers in the UK. Training courses that include the problem of identifying ACMs in soil should be undertaken at regular intervals by those involved in the investigation, assessment and management of sites where ACs are known or suspected. It is the role of the employer to identify the level of training required for an employee based on their role, experience and duties. Reference to Regulation 10 of CAR should be referred to for more information on training requirements.

Recognising asbestos within soils is challenging due to the heterogeneity of such soils and the discolouration of asbestos by smeared soil. Specific training for ground workers should include understanding fibre release potential, potential control measures in the field, how to take representative ACSs safely, sample labelling and what analytical tests are available and when the y should be implemented.

Health and safety training required under CAR includes asbestos awareness, non-licensable work (including notifiable non-licensable work) and licensable work with asbestos.

In addition to health and safety training, some staff involved in the technical identification on site of ACMs, sampling and analysis may require technical proficiency training (competency training).

Training vs. Competence

HSE (2005) identifies that ‘training alone does not make people competent. Training must be consolidated by practical experience so that the person becomes confident, skilful and knowledgeable in practice on the job’. It is critical that ACS surveyors demonstrate competency with details of relevant field experience alongside training and examples of previous works/references.