Eastwood&Partners
CONSULTING ENGINEERS

PHASE 2
GEOTECHNICAL AND GEO-ENVIRONMENTAL SITE INVESTIGATION

LOCKWOOD ROAD, GOLDTHORPE

FOR

GLEESON DEVELOPMENTS LIMITED

ISSUE 2

44271-003

20 May 2021

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Kate Edwards (Issue 2)

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APPENDICES

1.0 EXECUTIVE SUMMARY

1. The around 5.3 hectare site is located to the east of Lockwood Road and to the north of East Street in Goldthorpe.

2. Suspected Japanese Knotweed was noted in the south western part of the site during the initial walkover.

3. Eastwood & Partners visited site on 8 and 9 December 2020 and 3 March 2021, with 28 trial pits and nine window-sample boreholes advanced to between 1.0 and 2.2 m. Gas and groundwater monitoring wells were installed within selected boreholes and infiltration tests were undertaken within four trial pits.

4. Around 300 mm of topsoil was encountered across the site. Made ground was recorded locally, in three trial pits, to a maximum depth of 0.8 m. The natural ground typically comprised residual granular soils and terminated on extremely weak sandstone bedrock.

5. Groundwater was not typically encountered, with the exception of four trial pits in the central eastern part of the site where water was recorded at around 2 m. The monitoring wells were often noted to be 'wet at base' with only two wells in the second round recording perched water at around 1.0 to 1.4 m depth.

6. Conventional strip or trench fill foundations are considered appropriate, taken down onto natural sand at a minimum depth of 600 mm.

7. Based on the soakaway test results, infiltration drainage may well not be viable.

8. No radon protective measures are necessary. Six rounds of gas monitoring have been completed. BH1 recorded one elevated carbon dioxide concentration; plots within 50 m of BH1 should be installed with PCV floors and an underlying ventilated void. The gassing regime for the remainder of the site can be classed as Green or Characteristic Situation 1.

9. Stockpiles of suspected asbestos containing roofing materials were noted at surface within the allotment area. Any significant visible fragments of asbestos containing material should be hand-picked and removed by a specialist contractor.

10. The site won topsoil is expected to be suitable for re-use. However, additional checks will be required following the removal of asbestos containing materials from the surface of the allotment area.

11. Elevated concentrations of heavy metals and polycyclic aromatic hydrocarbons were recorded within the made ground. A 600 mm thick capping layer, of which at least 100 mm should consist of topsoil, is recommended where made ground remains below private

gardens or other areas of soft landscaping. Alternatively, the made ground can be removed from these areas and placed beneath hardstanding.

12. DS-1 AC-1 sulphate measures are required for concrete in contact with the natural ground. Where concrete is in contact with made ground, this should be increased to DS-2 AC-2.

2.0 INTRODUCTION

2.1 Terms of Reference

This report presents the findings of a Phase 2 Geotechnical and Geo-environmental Site Investigation carried out by Eastwood & Partners (Consulting Engineers) Limited for, and on the behalf of, Gleeson Developments Ltd. Any other parties using the information in this report do so at their own risk and any duty of care is excluded.

2.2 Context

A Phase 1 Site Investigation has previously been undertaken for this site, referenced 44271-001 and dated August 2019, and should be read in conjunction with this report. A brief summary is included as part of this report.

2.3 Aims and Objectives

The aims and objectives of this investigation were as follows:

- To detail the ground conditions and their general properties enabling outline foundation proposals to be made;
- To undertake chemical testing enabling refinement and subsequent further testing of the conceptual model;
- Carry out a tiered risk assessment to establish the likely risks to future receptors, involving the use of generic assessment criteria and where unacceptable risks are identified, site specific assessment criteria within a detailed quantitative risk assessment;
- To Identify feasible remediation options if unacceptable risks are highlighted; and
- To develop an appropriate remediation strategy where remediation is required.

2.4 Scope of Investigation

The investigation consisted of intrusive works and laboratory analysis. The findings were used to test the conceptual model and produce a final risk assessment. The intrusive works comprised trial pits and window sample boreholes to enable:

- Examination of the upper few metres of ground;
- In situ description of soils, enabling any localised lateral and vertical changes in soil conditions to be logged;
- Assessment of any contamination identified using visual and olfactory methods;

- Collection of soil samples for chemical testing;
- Infiltration testing; and
- Installation of gas and groundwater monitoring wells.

2.5 Limitations of Investigation

This report is based on the assumption that the site will be developed with residential properties of conventional construction with private gardens, associated hard standing and soft landscaped areas. It is assumed that existing ground levels will not alter significantly. If this is not the case, then the advice given in this report may not be appropriate.

Where assessments of site areas affected in particular ways are given, these are approximate. All information, comments and opinions given in this report are based on the ground conditions encountered during the site work, on the results of laboratory testing carried out as part of the investigation and information gained from the desk study. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata and water conditions between or below investigation points. It should be noted that groundwater and gas levels vary due to seasonal or other effects, and may at times differ from those measured during the investigation.

Access to the north eastern corner of the site was not possible during the investigation due to dense vegetation.

This report only considers the ground and groundwater and does not cover any buildings or hardstanding. Generally, testing has only been carried out for contaminants identified as potentially present with no assessment made of biological contamination. Risks to ecological receptors, such as bats, have not been considered.

3.0 SUMMARY OF PHASE 1 REPORT

3.1 Description

The around 5.3-hectare site is located to the east of Lockwood Road and to the north of East Street in Goldthorpe. It is irregular on plan and is centred on grid reference 446540, 404680. Ground level typically lies at around 50 m AOD, raising to around 55 m and 55.7 m AOD at the south western and eastern corners respectively.

The site comprises a grassed field to the north and partially overgrown fields in the south used for grazing. The central part of the site is formed by a complex of allotment gardens with associated sheds, outbuildings and caravans. Small localised stockpiles of suspected asbestos containing roofing materials were noted during the investigation at surface within the allotment area.

An access track runs between the allotments and the southern fields from Hamilton Road. A concrete slab understood to comprise a floor slab or a former stable, measuring approximately 10 m by 15 m is present south of the access track. The surface of the southern field is noted to be uneven, with localised remains of small brick structures. A brick building is also observed at the eastern boundary. Anecdotal evidence suggests the larger structure comprised an above ground air raid shelter with the remaining smaller structures relating to former pig sties. Localised areas of fly tipping were noted throughout the southern field area.

The boundaries are typically formed by hedgerows and fencing. Mature / semi-mature trees and hedgerows are present within the southern field and allotment area and on, or in close vicinity of, the site boundaries.

A stand of suspected Japanese Knotweed was identified in the southern field during the site walkover. The location of which is shown on the Exploratory Hole Location Plan (Reference 44271/001) in Appendix 1. The presence of invasive plant species should be confirmed by a suitably qualified ecologist or invasive plant specialist.

The site is bordered by the A635 to the north, fields to the east and by houses, a church and a school to the west and south. A drainage ditch is present around 3 m beyond the site's north western boundary.

11 kV overhead power lines cross the northern part of the site approximately from west to east. A surface water sewer crosses the site from the south east to the north west with associated manhole covers visible at surface within the site.

3.2 Site and Surrounding Area History

The site remained undeveloped up until the start of the 20th Century when the southern part of the site is shown as allotment gardens. Around this time residential development has extended up to the southern boundary of the site and three collieries (Hickleton Main, Highgate, and Goldthorpe Colliery) and an associated brick works are present around 700 m north, west and south of the site. The spoil heap associated with Hickleton Main Colliery has extended up to the northern boundary of the site by the 1980s.

The A635 was constructed on a raised embankment just beyond the site's northern boundary in the 1990s. By this time the spoil heap is annotated as 'disused'.

3.3 Geology

The geological map sheet SE40SE (1:10,000) shows the majority of the site to overlie sandstone of the Ackworth Rock, a named sandstone unit of the Pennine Upper Coal Measures Formation. The eastern corner of the site is shown to be underlain by undifferentiated mudstone, siltstone and sandstone of the Upper Coal Measures. The strata are shown to dip to the north east at around 3 degrees.

No superficial deposits are shown overlying the site.

No faults of other lines of weakness are shown to cross the site at surface. However, the Hangmanstone Fault is shown, trending approximately west to east, around 20 m north of the site.

3.4 Hydrogeology, Hydrology and Flooding

The nearest surface water feature is a drain around 3 m north west of the site.

The site does not lie within flood zones 2 or 3.

The Envirocheck records the site to overlie a Secondary A Aquifer. No water abstractions are recorded within 500 m of the site.

The site does not lie within a Groundwater Source Protection Zone.

3.5 Coal Mining

The surface stability of the proposed development is not considered to be at risk from shallow coal mining. Notwithstanding the above, the presence of unrecorded mine entries accessing coal seams at depth cannot be discounted.

3.6 Ground Gas

No radon protective measures are required.

A large colliery spoil heap extends up to the northern boundary of the site. The heap is also noted as a Local Authority Recorded Landfill operated by Doncaster Metropolitan Borough Council. Although the majority of the material appears to lie above ground, a gas monitoring programme has been undertaken to characterise the site and to determine if any gas precautions are required.

3.7 Outline Conceptual Model

The following table details the possible sources and associated contaminants of concern, pathways and receptors, highlighted by the Phase 1 Site Investigation as potentially present.

Source	Potential Contaminants	Potential Pathways	Potential Receptors
Made ground, topsoil within allotment areas, fly tipping Fuel/oil leaks from old vehicles	Heavy metals/metalloids, Polycyclic aromatic hydrocarbons, Asbestos Hydrocarbons	Ingestion, inhalation, direct contact Migration through ground	Future residents and visitors to the site Site construction workers Plants Water supply pipes Secondary A Aquifer
Made ground	Sulphates	Direct contact	Subsurface concrete
Colliery spoil heap/landfill	Ground gas	Migration through ground Inhalation	Future residents and visitors to the site Site construction workers Buildings

4.0 PHASE 2 INVESTIGATION

4.1 Site Works

We visited site on 8 and 9 December 2020 and excavated 17 trial pits (SA1 to SA4 and TP01 to TP13) to depths of between 1.2 m and 1.8 m below ground level (bgl) to determine the underlying ground conditions and to collect samples for laboratory analysis. Infiltration tests were undertaken within the four trial pits referenced SA1 to SA4. Five window sample boreholes (BH1 to BH5) were also advanced to depths of between 1.5 m and 2 m bgl for the purpose of installing gas and groundwater monitoring wells.

A significant proportion of the allotment area was occupied and not accessible during our visit in December. Therefore, once this area had been vacated, we returned to site on 3 March 2021 to excavate a further eleven trial pits (TP101 to TP111) to depths of between 1 m and 2.2 m bgl. A further four window sample boreholes (BH6 to BH9) were undertaken to depths of between 1.6 m to 1.8 m bgl to install the remainder of the gas monitoring wells and to undertake in-situ geotechnical testing to determine a strength profile of the shallow strata.

A total of seven gas and groundwater monitoring wells were installed across both phases of work within boreholes BH1 to BH7. Six rounds of gas and groundwater monitoring have been undertaken between January and May 2021. The results are discussed in Sections 7 and 8 and enclosed in Appendix 4.

Copies of the exploratory hole logs and selected photographs are presented in Appendix 2, and their approximate locations are plotted on the Exploratory Hole Location Plan (drawing no. 44271/001) in Appendix 1.

4.2 Laboratory Testing

Twenty samples of topsoil, two samples of made ground and twelve samples of natural residual soils were despatched for chemical testing. Soil samples were taken in 500 g plastic tubs and 100 ml amber glass jars and analysed at Eurofins Chemtest using MCERTs accredited methodologies where available. The chemical test results are presented in Appendix 3 and discussed further in Sections 7 and 8.

5.0 GROUND CONDITIONS

5.1 Surface Covering

The majority of the trial pits and all of the boreholes encountered topsoil to depths of between 0.2 m and 0.4 m. The topsoil generally comprised dark brown slightly silty sandy clay.

5.2 Made Ground

TP102, TP110 and TP111 encountered made ground to depths of between 0.2 m and 0.8 m. The made ground in TP102 comprised a 100 mm thick concrete slab with a similar thickness of sub-base below. In TP110 and TP111, slightly silty slightly clayey gravelly sand with low cobble content and inclusions of plastic and metal fragments was recorded to depths of 0.8 m and 0.5 m, respectively. The granular component typically comprised brick and concrete.

5.3 Natural Ground

Natural ground was encountered below the topsoil and made ground in the all of the trial pits, and typically comprised slightly gravelly silty sand with gravel of poorly cemented sandstone and increasing gravel and cobble content at depth. The above is considered to be consistent with completely weathered / residual soils of the Ackworth Rock Sandstone Formation.

Around half of exploratory hole positions recorded an upper band of slightly silty slightly clayey sand. The stratum was encountered in the central western part of the site (TP04, TP10, BH5, BH8 and BH9), locally in BH1 and BH2 at the northern boundary and in a more significant band (TP01, TP03, TP101, TP102, TP104, BH3, BH4, BH6 and BH7) trending north – south in the eastern part of the site. The band typically does not extend beyond 1 m bgl with the exception of the north east where the strata locally deepen to around 2 m bgl. The material is considered to represent a more pronounced, localised, weathering profile of the Ackworth Rock.

All trial pits and boreholes terminated due to refusal on sandstone of the Ackworth Rock at depths of between 1 m and 2.2 m bgl. Where recovered, the bedrock is typically described as extremely weak, becoming very weak, sandstone.

5.4 Groundwater

Groundwater was not typically recorded during the intrusive works. However, slow groundwater ingress was encountered locally in four of the trial pits (TP101 to TP104) at depths of between 1.8 m and 2.2 m.

Six rounds of groundwater monitoring have been undertaken. Groundwater was recorded in BH2 and BH3 at a depth of 1.43 and 1.05 m in the second monitoring round; both of these depths lie around 0.5 m above the base of the well. In subsequent rounds, the wells were noted to be ‘wet at

base' indicating the water noted previously may have been perched. Other wells were also 'wet at base' or occasionally recorded water within 100 mm of the base of the well.

5.5 Obstructions

A concrete slab was encountered at the surface of TP102 and another concrete slab of a former stables is also present to the south of the access track. No further obstructions were encountered during the investigation.

Extremely weak, becoming very weak, sandstone bedrock was encountered at depths of between 1 m and 2.2 m. All exploratory holes were terminated due to refusal at, or no more than 100 mm into, the rock.

5.6 Evidence of Contamination

Localised stockpiles of suspected asbestos containing roofing materials were noted at surface within the allotment area.

No visual or olfactory evidence of significant contamination was identified within any exploratory holes excavated.

6.0 GEOTECHNICAL APPRAISAL

6.1 General

Between 200 mm and 400 mm of topsoil was encountered across the vast majority of the site. Made ground was encountered locally within three trial pits to a maximum depth of 0.8 m.

The natural ground was generally found to comprise residual granular soils of the Ackworth Rock. The weathering profile typically extends from a slightly silty slightly clayey sand in the upper part to an increasingly gravelly sand with low to medium cobble content at depth.

Sandstone bedrock was typically encountered between around 1 to 2 m bgl.

Groundwater was not typically encountered, with the exception of four trial pits in the centre-east of the site where slow ingress was noted at around 2 m bgl. The monitoring wells were often noted to be 'wet at base' with only two wells in the second round recording perched water at around 1 to 1.4 m depth.

Four Standard Penetration Tests (SPTs) were undertaken in the residual sand at a depth of 1 m. SPT 'N' values of between 29 and 37 (mean and median of 34 and 36, respectively) have been recorded and are considered to be representative of dense soils.

Three SPTs undertaken within the sandstone bedrock all recorded 'N' values of >50 for which extrapolated 'N' values of between 200 and 600, indicative of extremely weak, becoming very weak rock, have been calculated.

Given the above, the natural residual granular soils are expected to provide a safe bearing capacity of at least 150 kPa, increasing to at least 200 kPa in the sandstone beneath.

6.2 Foundations

For the proposed low rise housing scheme, the most suitable foundations are considered to be conventional strip or trench fill footings, taken down onto natural sand at a minimum depth of 600 mm below ground level.

Deepening due to tree influence is not expected to be required as shallow cohesive ground was not encountered. Should cohesive strata be encountered within foundation excavations, then further consideration of tree influence will be required.

The foundations of individual plots should be founded on the same material type (i.e. sand or sandstone). If differing materials are encountered within the same plot then the foundation should be deepened until the founding material is consistent across the plot or reinforced to span the different ground types.

6.3 Superstructure Precautions

No additional superstructure precautions are considered to be required based on the ground conditions encountered.

6.4 Ground Slabs

Should less than 600 mm of made ground be present below the ground floor slab, ground bearing slabs could be appropriate. If more than 600 mm of made ground is present, reinforced suspended in-situ slabs or precast concrete floors with an underlying 150 mm ventilated void should be used.

6.5 Road Works

The ground should be assumed to be frost susceptible. A CBR value of at least 2% may be appropriate for road design, however some contingency for removing and filling soft / loose spots should be made. It is recommended that CBR tests are undertaken along any proposed roads prior to construction so that more accurate CBR values can be obtained.

6.6 Excavation Problems

Trial pits were generally noted to be stable. Temporary shoring or support will be required where access to trenches greater than 1.2 m depth, or less where there is risk of collapse, in accordance with current Health & Safety Regulations.

Extremely weak becoming very weak sandstone bedrock was encountered between around 1 m and 2 m bgl. The variation in depth generally appears to be consistent across the site with no significant change from one part of the site to another.

Localised groundwater ingress has been encountered at around 1 to 2 m bgl.

A surface water sewer crosses the site from the south east to the north west, inspection covers are visible at surface. 11 kV overhead power lines cross the northern part of the site approximately from west to east.

6.7 Surface Water Drainage

Infiltration tests were carried out in SA1 to SA4.

The trial pit logs are included in Appendix 2 whilst the results and infiltration calculations are provided in Appendix 3.

The results of the testing are summarised in the following table:

Pit	Test	Depth (m)	BRE365 Infiltration Rate ($x10^{-6}$) m/s	Average Infiltration Rate ($x10^{-6}$) m/s
SA1	1	1.6	18	21
	2		N/A	8
SA2	1	1.2	15	17
SA3	1	1.6	N/A	1.3
SA4	1	1.4	N/A	1.2

An infiltration rate was unable to be calculated in accordance with BRE365 for the majority of tests. The second test in SA1 showed a reduction in the average infiltration rate, suggesting that the sides and base of the test pit have silted up / become saturated during the previous test.

Based on the variable results of these infiltration tests, the ground below the site is considered to be a poor receptor for surface water disposal. At this stage, it is expected that the longevity of soakaway drainage cannot be guaranteed.

7.0 REFINEMENT OF OUTLINE CONCEPTUAL MODEL

7.1 Source Characterisation

An outline conceptual model, detailing the possible sources and associated contaminants of concern, potential pathways and receptors identified in the Phase 1 Site Investigation is detailed in Section 3.7.

This section of the report documents the works undertaken to obtain information to test and refine this model enabling a risk assessment to be produced and, where significant risks are expected, remediation recommendations.

7.2 Unexpected Contamination

Localised stockpiles of suspected asbestos containing roofing materials were noted at surface within the allotment area. No unexpected visual or olfactory evidence of contamination was encountered within any of the exploratorily holes.

7.3 Ground Gas

A colliery spoil heap extends close to the northern boundary of the site. A gas monitoring programme is underway to determine the ground gas regime beneath the site. Six rounds have been completed at times of low or falling atmospheric gas pressures. The results are summarised below:

- No detectable methane concentrations have been recorded;
- A maximum carbon dioxide concentration of 6.8% was recorded in BH1 on the second round. The next highest concentration was 3.8% recorded in the same well on the fourth visit;
- Steady state gas flows of between -0.3 and 0.3 l/hr were recorded; and
- Perched groundwater was recorded in three wells (BH1 to BH3) at depths of between 1.05 m and 1.99 m.

Although wells BH6 and BH7 have only been monitored 4 of the six times, it can be considered that this amount of monitoring is sufficient given the low results recorded.

The results of the gas monitoring are discussed further in Section 8.6.

7.4 Chemical Testing

Twenty samples of topsoil, two samples of made ground and twelve samples of residual soils were sent for testing. Each of the samples was analysed for the suite of contaminants listed overleaf.

Contaminant Type	Actual Contaminants
Metals/Metalloids	Arsenic, cadmium, chromium, lead, mercury, nickel, selenium, copper and zinc
pH	pH
PAHs	Speciated polycyclic aromatic hydrocarbons
Asbestos*	Fibres
Sulphates**	Water soluble sulphate, acid soluble sulphate and sulphur

*Topsoil samples only

**Natural ground samples only

7.5 Assessment Criteria

Assessment criteria relating to a residential end use with home-grown produce have been used. Tables detailing the relevant assessment concentrations used are included in Appendix 3.

7.6 Chemical Test Results

7.6.1 Topsoil

Twenty samples of topsoil were submitted for laboratory testing. Given the current and historical usage of the central and southern parts of the site as allotment gardens, the seven samples of topsoil recovered from the previously undeveloped field area to the north have been considered separately below.

Northern Field

Seven samples of topsoil were recovered from the northern field and submitted for laboratory testing. No elevated concentrations were recorded in respect to human health or phytotoxicity. No asbestos fibres were recorded.

Central and Southern Areas (current and former allotment gardens)

Thirteen samples of topsoil were recovered from the central and southern areas. Elevated concentrations of arsenic, lead and three PAH compounds were recorded in respect to human health. Phytotoxic metals lead and zinc were also recorded in excess of the phytotoxic assessment values. Elevated concentrations in respect to human health and phytotoxicity are presented in the table overleaf:

Determinand	Assessment Value (mg/kg) 2.5% SOM*		Range of Concentrations (mg / kg)	Exceedances (mg/kg)		Modified/ Corrected Mean (mg/kg)
	Residential with Homegrown Produce	Phytotoxicity		Residential with Homegrown Produce	Phytotoxicity	
Arsenic	37	50	15 to 44	42 (TP02 at 0.3 m) 44 (TP03 at 0.1 m) 44 (TP105 at 0.2 m) 38 (TP109 at 0.2 m)	-	32.86
Lead	200	300	42 to 470	470 (TP105 at 0.2 m) 300 (TP106 at 0.3 m)	470 (TP105 at 0.2 m)	151
Cadmium	11	3	0.29 to 3.7	-	3.7 (TP106 at 0.3 m)	**Outlier**
Zinc	3700	300**	100 to 630	-	480 (TP03 at 0.1 m) 630 (TP105 at 0.2 m) 520 (TP106 at 0.3 m) 400 (TP109 at 0.2 m)	**393.5**
Benzo(b) fluoranthene	3.3	-	<0.1 to 6.2	6.2 (TP01 at 0.2 m)	-	2.37
Benzo(a) pyrene	2.7	-	<0.1 to 5.5	5.5 (TP01 at 0.2 m)	-	1.98
Dibenz(a,h) anthracene	0.28	-	<0.1 to 0.28	0.26 (TP02 at 0.3 m) 0.28 (TP105 at 0.2 m)	-	0.18

*at least 2.5% SOM assumed for topsoil

**based on average pH of 7.7

No statistical outliers were identified with the exception of the phytotoxic metal cadmium. Since the modified mean for arsenic and the three PAH determinants, and the corrected mean for lead, do not exceed the human health assessment value, the original concentrations are not considered to pose a significant risk to human health.

The modified mean for zinc still marginally exceeds the phytotoxic assessment value. The elevated phytotoxic concentration of cadmium of 3.7 mg/kg recorded in TP106 at 0.3 m is indicated to be a statistical outlier.

No other determinants were recorded in excess of their relevant assessment criteria.

No asbestos fibres were identified in any of the samples.

7.6.2 Made Ground

Two samples of made ground were tested. A SOM of 1% has been assumed as ‘worst case’. One sample (TP110 at 0.4 m) recorded elevated concentrations of lead and two PAH determinants, with respect to human health. Lead was recorded at a concentration of 320 mg/kg, in excess of the assessment value of 200 mg/kg. Benzo[b]fluoranthene and dibenz[a,h]anthracene were found at

concentrations of 3.1 mg/kg and 0.36 mg/kg, exceeding their assessment criteria of 2.6 mg/kg and 0.24 mg/kg, respectively.

The same sample of made ground recorded concentrations of lead and zinc of 320 mg/kg and 350 mg/kg. Marginally exceeding their respective phytotoxic assessment values of 300 mg/kg.

No asbestos fibres were identified in either of the samples of made ground analysed.

7.6.3 Natural Ground

Twelve samples of natural ground were tested. None of the samples recorded elevated concentrations above their respective human health or phytotoxicity assessment values.

7.6.4 Sulphates

The site has been taken as a brownfield location in relation to the Aggressive Chemical Environment for concrete classifications and groundwater is assumed to be mobile.

Made Ground

The two samples of made ground recorded a maximum water-soluble sulphate concentration of 61 mg/l and a maximum total potential sulphate of 0.28%. The pH varies between 8.6 and 8.7.

Natural Ground

The twelve samples of natural ground recorded water-soluble sulphate concentration of between <10 mg/l and 36 mg/l and a total potential sulphate of between 0.03% and 0.05%. The pH varies between 7.5 and 8.9.

7.7 Significant Pollutant Linkages

The following significant pollution linkages have been identified.

Contaminants	Pathway	Receptor
Elevated phytotoxic metals (zinc and cadmium) within former allotment topsoil	Root uptake	Plants
Elevated lead, zinc and PAHs within the made ground	Ingestion, inhalation, direct contact Migration through ground	Future residents or visitors to the site Construction workers Plants Secondary A Aquifer
Ground gas	Inhalation Migration through ground	Future residents and visitors to the site Site construction workers

8.0 RISK ASSESSMENT

8.1 Human Health – Construction Workers

Groundworkers employed during the construction phase of the development are most at risk of harm due to them having direct contact with the affected soils. However, the contact is generally of short duration, and all competent ground workers will be aware of the potential risks associated with soils of this nature. Therefore, the overall risk to the health of construction workers is considered to be low.

All ground workers employed on the site should be made aware that elevated concentrations of heavy metals and polycyclic aromatic hydrocarbons may be present within the topsoil and made ground, and that normal site procedures such as the wearing of gloves when handling soils, and the washing of hands prior to eating should be implemented.

Any unusual, brightly coloured, ashy, oily or odorous material or material suspected of containing asbestos encountered during construction should be brought to the attention of the site staff and investigated.

8.2 Human Health – Future Site Users

Elevated concentrations of arsenic, lead and three polycyclic aromatic hydrocarbon determinants were identified within the former allotment topsoil. However, since the modified means, and the corrected mean for lead, do not exceed the human health assessment criteria, the original concentrations are not considered to pose a significant risk to human health. Therefore site-won topsoil is considered to be chemically suitable for re-use.

Notwithstanding the above, stockpiles of suspected asbestos containing cement bound roofing product were noted locally at surface within the allotment area. Any significant visible pieces of asbestos containing material should be handpicked and removed by a specialist contractor prior to clearance of vegetation. Further checks of the allotment topsoil will be required following removal of the asbestos containing materials prior to re-use.

Elevated concentrations of lead and polycyclic aromatic hydrocarbons were recorded within the made ground. The elevated levels may be considered representative for the made ground. Therefore, the made ground is not considered suitable to remain beneath gardens or soft landscaping. It is recommended that a 600 mm thick capping layer of clean soil (of which at least 100 mm should consist of topsoil) is placed over the made ground wherever it remains below private gardens or other areas of soft landscaping. Alternatively, the made ground can be removed from these areas and placed below hardstanding areas, such as driveways or parking areas.

8.3 Plants

Four samples of topsoil recovered from the central and southern parts of the site (former allotments) recorded elevated concentrations of zinc and one recorded an elevated concentration of cadmium, in excess of the respective phytotoxic assessment criteria. The modified mean for zinc exceeds the phytotoxic assessment value of 300 mg/kg at 393.5 mg/kg and the concentration of cadmium of 3.7 mg/kg recovered from TP106, exceeding the relevant assessment criteria of 3 mg/kg, is highlighted as a potential statistical outlier.

Given that the material recovered from TP106, where the statistical outlier is recorded, cannot be physically differentiated from the rest of the topsoil encountered. It is not considered as a 'hot-spot'.

Notwithstanding the above, given that the exceedances of both the zinc and cadmium are relatively small, the concentrations are not expected to pose a significant risk to plants following mixing of the topsoil prior to placement. Furthermore, no visual evidence of distress was noted to the existing vegetation during the works.

8.4 Construction Materials

The chemical test results indicate that DS-1 AC-1 sulphate measures i.e. no precautions are required for concrete in contact with the natural ground.

Where concrete is in contact with any made ground, DS-2 AC-2 precautions should be installed.

All chemical test results should be forwarded to the water supplier to determine the level of protection required for water supply pipes.

8.5 Controlled Waters

The underlying strata are classified as a Secondary A Aquifer. The site does not lie within a Groundwater Source Protection Zone. The nearest surface water feature is a drainage ditch around 3 m north west of the site.

Although slightly elevated concentrations of lead and polycyclic aromatic hydrocarbons have been recorded in the small volume of made ground encountered on site. These determinands do not appear to be migrating in any significant concentration into the natural soils below. Therefore the risk posed to controlled waters is considered to be low.

8.6 Ground Gas

No radon protective measures are necessary.

Gas monitoring wells have been installed primarily to target the colliery spoil heap/landfill which lies adjacent to the northern site boundary; the majority of the heap is expected to lie above ground.

Given that the potentially permeable sandy ground below the site could act as a pathway for ground gas to migrate onto site, five wells were installed along or near to the northern boundary whilst two wells were installed further in site to monitor ground gas. Six monitoring rounds have been undertaken.

No detectable methane concentrations have been recorded. For the purpose of this assessment a concentration of 0.1% will be assumed.

A maximum steady state concentration of carbon dioxide of 6.8% has been recorded in BH1. All other concentrations from this well were 3.8% or less. In other wells, concentrations were below 2.2%.

Using a maximum flow of 0.3 l/hr, gas screening values (GSVs) of 0.0003 and 0.0204 l/hr are calculated for methane and carbon dioxide, respectively. These GSVs fall below the upper threshold for 'Green' (0.16 l/hr for methane; 0.78 l/hr for carbon dioxide). However, the maximum concentration for carbon dioxide exceeds the lower threshold for Amber 1.

The ground conditions in BH1 recorded 250 mm of topsoil over natural sand to 2 m, with sandstone terminating the window sample hole at this depth. There was no significant difference in ground conditions in this well to others installed nearby. The 6.8% concentration was recorded during the round which took place at the lowest atmospheric pressure. Although flows have been found to be relatively low throughout the monitoring programme, we recommend plots within 50 m of BH1 should be installed with a precast concrete floor and underlying 150 mm ventilated void. Across the remainder of the site, the gassing regime can be considered to be Characteristic Situation 1 or Green, depending on the floor type to be installed.

8.7 Disposal of Material

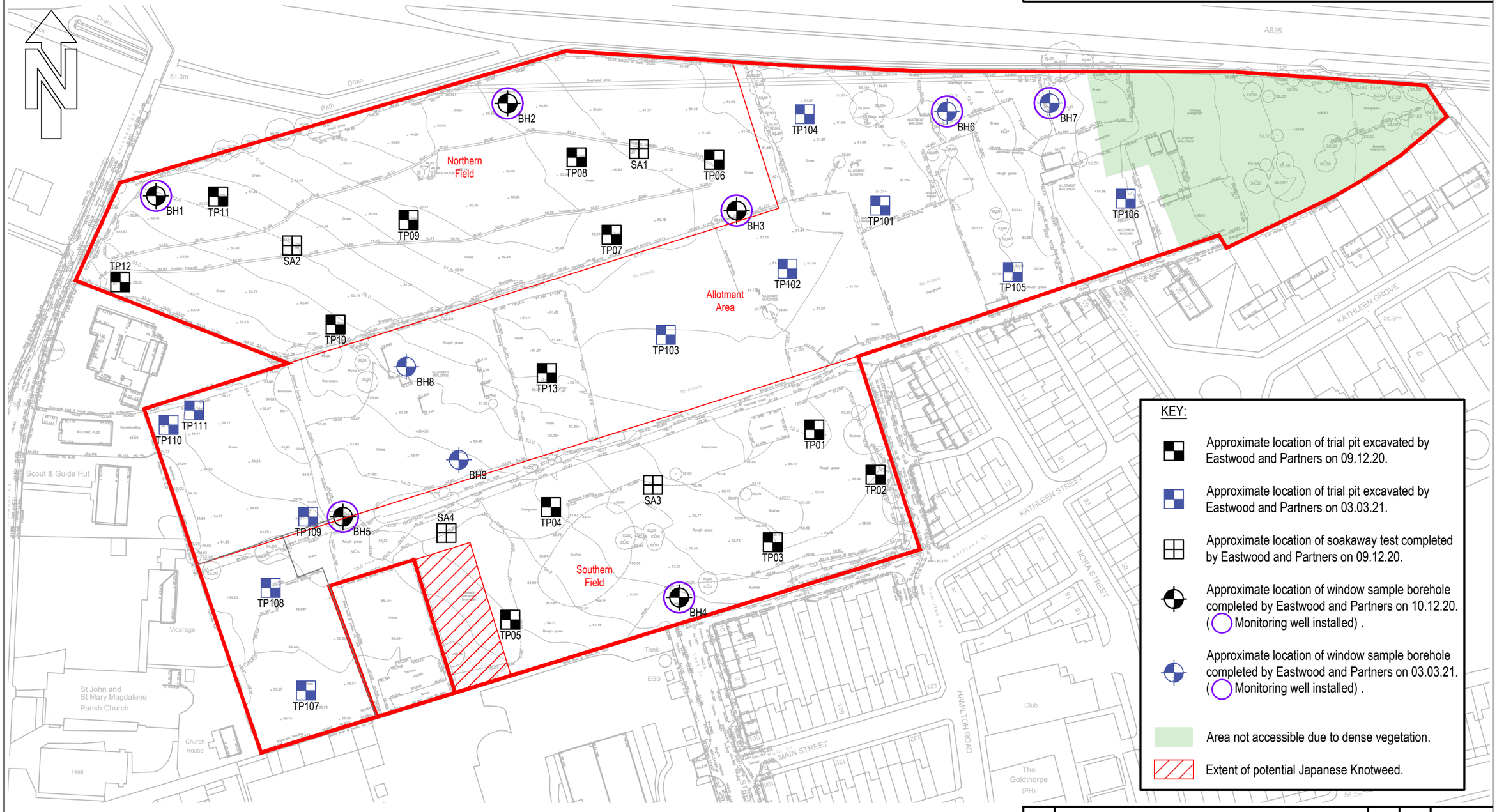
If material needs to be removed, it should to be taken to a suitably licensed landfill or waste treatment facility. The costs of disposal and landfill tax can be substantial. The disposal of material should therefore be seen as a last resort with options such as treatment and reuse either on-site or off-site considered where possible.

The category of landfill which can accept the waste (inert, non-hazardous or hazardous) would need to be determined and will also have a significant effect on the costs. Additional testing may be required by the landfill operator and the acceptance of material is generally at their discretion.

Appendix 1

Exploratory Hole Location Plan, drawing 44271/001B

INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.



KEY:

- Approximate location of trial pit excavated by Eastwood and Partners on 09.12.20.
- Approximate location of trial pit excavated by Eastwood and Partners on 03.03.21.
- Approximate location of soakaway test completed by Eastwood and Partners on 09.12.20.
- Approximate location of window sample borehole completed by Eastwood and Partners on 10.12.20. (◯ Monitoring well installed) .
- Approximate location of window sample borehole completed by Eastwood and Partners on 03.03.21. (◯ Monitoring well installed) .
- Area not accessible due to dense vegetation.
- Extent of potential Japanese Knotweed.

REV	DESCRIPTION	SIG	CHK	DATE
B	Trial pit positions updated to suit topographical survey.	JL	KE	20.05.21
A	First Issue.			

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GLEESON DEVELOPMENTS LTD

LOCKWOOD ROAD, GOLDTHORPE

EXPLORATORY HOLE LOCATION PLAN

SCALE WHEN PLOTTED AT A3	DRAWING STATUS
1:1250	INFORMATION

DRAWN	CHECKED	DATE	DRAWING NUMBER	REV
JRB	LW	06.04.21	44271/001	B

Appendix 2

Trial Pit Logs (SA1 to SA4, TP01 to TP13 and TP101 to TP111)

Borehole Logs (BH1 to BH9)

Photographs of Trial Pits

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TrialPit No
SA1
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	09/12/2020
Location: South Yorkshire		Dimensions: 1.40m, 0.80m, Depth: 1.60m	Scale 1:25
Client: Gleeson Developments Ltd.			Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
1.10	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
						Becoming gravelly from 1.4 m bgl.
			1.60			Trialpit Complete at 1.600m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone. Infiltration test undertaken (refer to test sheet SA1).

Stability: Stable

Eastwood&Partners
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TrialPit No
SA2
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	09/12/2020
Location: South Yorkshire		Dimensions: 1.40m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.20m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.30			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone increasing in frequency with depth.
						Becoming gravelly from 0.8 m bgl.
1.00	ES					*Becoming very gravelly from 1.1 m bgl.*
			1.20			Trialpit Complete at 1.200m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone. Infiltration test undertaken (refer to test sheet SA2).

Stability: Stable

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TrialPit No
SA3
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	09/12/2020
Location: South Yorkshire		Dimensions: 1.30m × 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.60m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
0.90	ES					Orange/Yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone increasing in frequency with depth. *Becoming gravelly from 1.0 m bgl.* *Becoming very gravelly from 1.4 m bgl.*
			1.60			Trialpit Complete at 1.600m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone. Infiltration test undertaken (refer to test sheet SA3).

Stability: Stable

Eastwood&Partners
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TrialPit No
SA4
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	09/12/2020
Location: South Yorkshire		Dimensions: 1.40m x 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.40m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.30			Orange/Yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone increasing in frequency with depth.
0.70	ES					*Becoming gravelly from 0.8 m bgl.*
						Becoming very gravelly from 1.1 m bgl.
			1.40			Trialpit Complete at 1.400m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone. Infiltration test undertaken (refer to test sheet SA4).

Stability: Stable

Eastwood&Partners
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TrialPit No
TP01
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.40m × 0.70m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.80m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.30			
0.50	ES					Orange/red slightly silty slightly clayey fine to coarse SAND.
			0.70			
0.90	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
						Becoming very gravelly from 0.9 m bgl.
			1.80			Trialpit Complete at 1.800m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

Eastwood&Partners
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TrialPit No
TP02
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.30m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.80m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	ES		0.40			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
1.00	ES					Orange/Yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone increasing in frequency with depth. *Becoming gravelly from 0.7 m bgl.* *Becoming very gravelly from 1.0 m bgl.*
			1.80			Trialpit Complete at 1.800m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP03
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.50m / 0.80m / Depth: 1.60m	Scale 1:25
Client: Gleeson Developments Ltd.			Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.40			Orange/Red slightly silty slightly clayey fine to coarse SAND.
			0.50			Orange/Yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone increasing in frequency with depth.
0.80	ES					
						Becoming gravelly from 1.4 m bgl.
						Becoming very gravelly from 1.5 m bgl.
			1.60			Trialpit Complete at 1.600m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP04
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.50m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.30m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.20			Orange/red slightly silty slightly clayey fine to coarse SAND.
0.60	ES					
			0.80			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
1.20	ES					*Becoming gravelly and a low cobble content from 1.2 m bgl.*
			1.30			Trialpit Complete at 1.300m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP05
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.70m x 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.70m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.40			
0.60	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to sub rounded of poorly cemented sandstone.
						Becoming gravelly from 1.2 m bgl.
			1.70			Trialpit Complete at 1.700m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP06
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.40m x 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.40m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.40			
0.60	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to sub rounded of poorly cemented sandstone.
						Becoming gravelly with a low cobble content from 1.0 m bgl.
			1.40			Trialpit Complete at 1.400m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP07
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.70m / 0.80m / Depth: 1.80m	Scale 1:25
Client: Gleeson Developments Ltd.			Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
1.20	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to sub rounded of poorly cemented sandstone. *Becoming gravelly with a low cobble content from 1.2 m bgl.*
			1.80			Trialpit Complete at 1.800m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP08
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.70m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.30m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	ES		0.40			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
0.90	ES		1.30			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to sub rounded of poorly cemented sandstone. *Becoming gravelly with a low cobble content from 1.0 m bgl.* Trialpit Complete at 1.300m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP09
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.60m × 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.40m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.40			
0.60	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to sub rounded of poorly cemented sandstone.
						Becoming gravelly from 1.0 m bgl.
						Becoming very gravelly from 1.2 m bgl.
			1.40			Trialpit Complete at 1.400m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP10
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.60m × 0.80m, Depth: 1.50m	Scale 1:25
Client: Gleeson Developments Ltd.			Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.50			
0.70	ES					Orange/red slightly silty slightly clayey fine to coarse SAND.
			0.80			
1.10	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to sub rounded of poorly cemented sandstone.
			1.50			Trialpit Complete at 1.500m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP11
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.60m x 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.60m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.20			
0.40	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
						Becoming gravelly from 1.3 m bgl.
						Becoming very gravelly from 1.5 m bgl.
			1.60			Trialpit Complete at 1.600m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP12
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.70m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.30m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.40			
0.90	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
			1.30			Trialpit Complete at 1.300m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP13
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	08/12/2020
Location: South Yorkshire		Dimensions: 1.40m, 0.80m, Depth: 1.50m	Scale 1:25
Client: Gleeson Developments Ltd.			Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
1.00	ES		1.50			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
						Trialpit Complete at 1.500m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

Eastwood&Partners
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TrialPit No
TP101
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.40m × 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 2.20m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
1.00	ES		1.80			Yellow slightly silty slightly clayey fine to coarse SAND.
			2.20			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to angular of poorly cemented sandstone with a low cobble content.
						Trialpit Complete at 2.200m

Remarks: Slow ingress of groundwater at 1.8 m bgl. Terminated due to refusal on sandstone.

Stability: Stable

Eastwood&Partners
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TrialPit No
TP102
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.40m × 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.90m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.10			MADE GROUND: Concrete slab
			0.20			MADE GROUND: Orange/White sandy sub angular to sub rounded fine to medium GRAVEL of concrete.
0.50	ES					Orange/Red slightly silty slightly clayey fine to coarse SAND.
			1.60			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to angular of poorly cemented sandstone with a low cobble content.
			1.90			Trialpit Complete at 1.900m

Remarks: Slow ingress of groundwater at 1.9 m bgl. Terminated due to refusal on sandstone.

Stability: Stable

Eastwood&Partners
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TrialPit No
TP103
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.50m / 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 2.10m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
0.70	ES		2.10			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to angular of poorly cemented sandstone with a low cobble content.
						Trialpit Complete at 2.100m

Remarks: Slow ingress of groundwater at 2.1 m bgl. Terminated due to refusal on sandstone.

Stability: Stable

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CONSULTING ENGINEERS

TrialPit No
TP104
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.50m × 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 2.20m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
0.20	ES		0.20			Orange/Red slightly silty slightly clayey fine to coarse SAND.
1.10	ES					
			2.10			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to angular of poorly cemented sandstone with a low cobble content.
			2.20			Trialpit Complete at 2.200m

Remarks: Slow ingress of groundwater at 2.2 m bgl. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP105
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.50m x 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.50m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.20			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
0.90	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular to angular of poorly cemented sandstone.
						Low cobble content from 1.3 m bgl.
			1.50			Trialpit Complete at 1.500m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

Eastwood&Partners
CONSULTING ENGINEERS

TrialPit No
TP106
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.40m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.20m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	ES		0.40			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
0.60	ES		1.20			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone. *Medium cobble content from 1.0 m bgl.* Trialpit Complete at 1.200m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

Eastwood&Partners
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TrialPit No
TP107
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.50m / 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.30m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.30			
						Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone with a low cobble content.
0.80	ES					
						Medium cobble content from 1.1 m bgl.
			1.30			Trialpit Complete at 1.300m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP108
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.50m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.00m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES					TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
			0.40			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone with a low cobble content.
			1.00			Trialpit Complete at 1.000m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP109
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.30m, 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.70m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	ES		0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
0.60	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone with a low cobble content.
						Becoming gravelly from 1.0 m bgl.
			1.70			Trialpit Complete at 1.700m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP110
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.40m × 0.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.40m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.40	ES					MADE GROUND: Dark brown slightly silty slightly clayey gravelly fine to coarse SAND with rare fragments of plastic and metal. Gravel is sub angular to angular fine to coarse of brick and concrete with a low cobble content.
			0.80			
1.10	ES					Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone with a low cobble content.
			1.40			Trialpit Complete at 1.400m

Remarks: No groundwater encountered. Terminated due to refusal on sandstone.

Stability: Stable

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TrialPit No
TP111
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Lockwood Road, Goldthorpe	44271	Level:	03/03/2021
Location: South Yorkshire		Dimensions: 1.50m / 1.80m	Scale 1:25
Client: Gleeson Developments Ltd.		Depth: 1.00m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	ES					MADE GROUND: Dark brown slightly silty slightly clayey gravelly fine to coarse SAND with rare fragments of plastic and metal. Gravel is sub angular to angular fine to coarse of brick and concrete with a low cobble content.
			0.50			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
			1.00			Trialpit Complete at 1.000m

Remarks: No groundwater encountered. Terminated at target depth.

Stability: Stable

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Borehole No.
BH1
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 09/12/2020	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.25			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
								Orange/red slightly silty slightly clayey fine to coarse SAND.
					1.00			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
					2.00			End of Borehole at 2.000m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Gas and groundwater monitoring well installed.

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Borehole No.
BH2
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 09/12/2020	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
					0.80			Orange/red slightly silty slightly clayey fine to coarse SAND.
					2.00			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
								End of Borehole at 2.000m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Gas and groundwater monitoring well installed.

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Borehole No.
BH3
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 09/12/2020	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
					0.60			Orange/red slightly silty slightly clayey fine to coarse SAND.
								Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
					1.50			End of Borehole at 1.500m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Gas and groundwater monitoring well installed.

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Borehole No.
BH4
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 09/12/2020	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
					0.70			Orange/red slightly silty slightly clayey fine to coarse SAND.
					1.50			Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
								End of Borehole at 1.500m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Gas and groundwater monitoring well installed.

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Borehole No.
BH5
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 09/12/2020	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			TOPSOIL: Dark brown slightly silty sandy CLAY with occasional rootlets.
					0.60			Orange/red slightly silty slightly clayey fine to coarse SAND.
								Orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
					1.50			End of Borehole at 1.500m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Gas and groundwater monitoring well installed.

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Borehole No.
BH6
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 03/03/2021	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			TOPSOIL: Dark brown slightly silty sandy CLAY.
					0.70			Orange/red sightly silty slightly clayey fine to coarse SAND.
		1.00	SPT	N=37 (2,3/3,4,5,25)				Dense orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
		1.50	SPT	50 (75 for 100mm/50 for 75mm)	1.50			Extremely weak becoming very weak yellow SANDSTONE recovered as a slightly gravelly silty fine to coarse sand.
					1.60			End of Borehole at 1.600m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Gas and groundwater monitoring well installed.

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Borehole No.
BH7
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 03/03/2021	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.40			TOPSOIL: Dark brown slightly silty sandy CLAY.
					0.80			Orange/red sightly silty slightly clayey fine to coarse SAND.
		1.00	SPT	N=36 (3,4/5,5,8,18)	1.60			Dense orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
								End of Borehole at 1.600m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Gas and groundwater monitoring well installed.

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Borehole No.
BH8
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 03/03/2021	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.40			TOPSOIL: Dark brown slightly silty sandy CLAY.
					0.70			Orange/red sightly silty slightly clayey fine to coarse SAND.
		1.00	SPT	N=29 (4,5/7,7,8,8,7)				Dense orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
		1.70	SPT	50 (5,25/50 for 75mm)	1.70 1.80			Extremely weak becoming very weak yellow SANDSTONE recovered as a slightly gravelly silty fine to coarse SAND.
								End of Borehole at 1.800m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Backfilled with arisings on completion.

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Borehole No.
BH9
Sheet 1 of 1

Project Name: Lockwood Road, Goldthorpe	Project No.: 44271	Co-ords:	Hole Type: WS
Location: South Yorkshire		Level:	Scale: 1:50
Client: Gleeson Developments Ltd.		Dates: 03/03/2021	Logged By: LW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.35			TOPSOIL: Dark brown slightly silty sandy CLAY.
		1.00	SPT	N=35 (4,3/5,9,9,12)	1.00			Orange/red sightly silty slightly clayey fine to coarse SAND.
		1.50	SPT	50 (5,25/50 for 25mm)	1.60			Dense orange/yellow slightly gravelly silty fine to coarse SAND. Gravel is sub angular of poorly cemented sandstone.
					1.70			Very weak yellow SANDSTONE recovered as a slightly gravelly silty fine to coarse SAND.
								End of Borehole at 1.700m
			Type	Results				

Remarks
No groundwater encountered. Terminated due to refusal on bedrock. Backfilled with arisings on completion.

TP01

Arisings from TP01

Prepared	LW	Checked	GCB	Date	08.12.2021	Photograph No	1 and 2

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TP03

Arisings from TP03

Prepared	LW	**Checked**	GCB	**Date**	08.12.2021	**Photograph No**	3 and 4

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TP05

Arisings from TP05

Prepared	LW	**Checked**	GCB	**Date**	08.12.2021	**Photograph No**	5 and 6

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TP07

Arisings from TP07

Prepared	LW	**Checked**	GCB	**Date**	08.12.2021	**Photograph No**	7 and 8

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TP08

Arisings from TP08

Prepared	LW	**Checked**	GCB	**Date**	08.12.2021	**Photograph No**	9 and 10

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TP10

Arisings from TP10

Prepared	LW	**Checked**	GCB	**Date**	08.12.2021	**Photograph No**	11 and 12

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TP101

Arisings from TP101

Prepared	LW	**Checked**	GCB	**Date**	03.03.2021	**Photograph No**	13 and 14

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TP110

Arisings from TP110

Prepared	LW	**Checked**	GCB	**Date**	03.03.2021	**Photograph No**	15 and 16

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Appendix 3

Infiltration Test Results (SA1 to SA4)

Chemical Test Results – Chemtest Reports 20-34511, 20-34549 and 21-07298

Table of Assessment Values

Modified Mean Calculations

Arsenic, Lead, Cadmium, Zinc, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene

EASTWOOD & PARTNERS **Sheet 1 of 2**
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PROJECT:	**Lockwood Road, Golthorpe**	**Job No. 44271**	**Date 09.12.20**
SUBJECT:	**Infiltration Test Results and Calculation of Infiltration Rates**	**Prepared LW**	**Checked GCB**

Test No. SA1

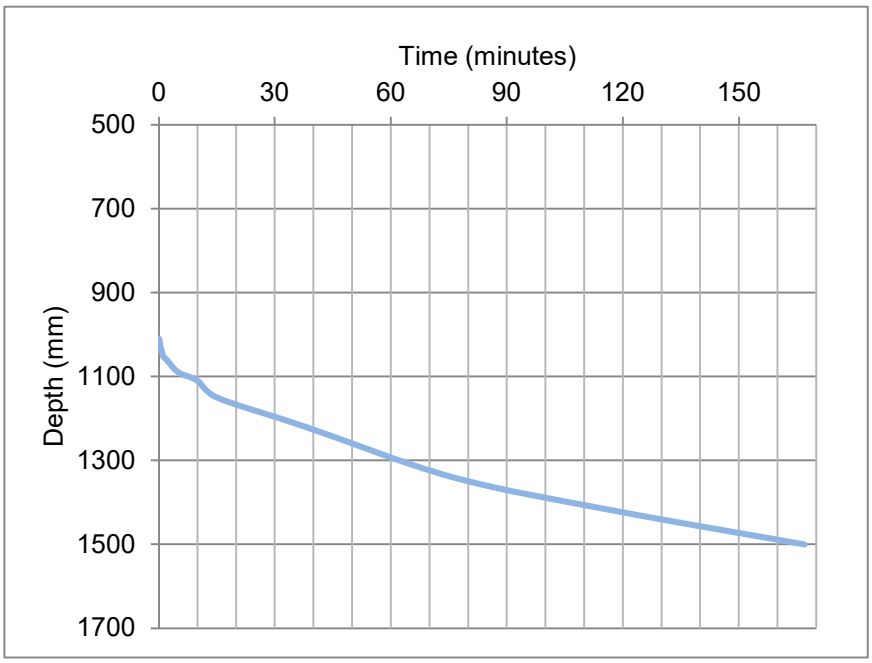
Test Pit Dimensions

Length = **1400** mm
Width = **800** mm
Depth = **1600** mm (Total depth)

Plan area = **1.12** m²

Approximate time to discharge water into the hole: **20** Seconds
Depth to water after completion of pumping: **1010** mm

Time (min)	Depth (mm)
0	**1010**
1	**1050**
2	**1060**
5	**1090**
10	**1110**
15	**1150**
38	**1220**
76	**1340**
118	**1420**
167	**1500**



Test Pit Log

Depth (m)	Description
0.0 - 0.3	TOPSOIL: slightly silty sandy CLAY
0.3 - 1.6	Slightly gravelly silty fine to coarse SAND.

PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1010** mm
Start time = **0** min

Average water depth: **345** mm

Change in water depth: **490** mm

Final parameters

Depth to water = **1500** mm
End time = **167** min

Time interval: **167** min

Effective Storage Volume of Water in the Trial Pit = **0.6608** m³
75% Effective Depth = **1158** mm from ground level
25% Effective Depth = **1453** mm from ground level
Time at 75% Effective Depth = **17** minutes
Time at 25% Effective Depth = **143** minutes

V_{p75-25} = **0.33** m³

a_{p50} = **2.42** m²

t_{p75-25} = **7560** sec

f = **1.8E-05 m/sec**

Average Soakaway Rate = **5.5E-05** m³/sec
Average soakaway area = **2.64** m² (sides + base)

BR365 Soil Infiltration Rate = 1.8E-05 m/sec
Average Infiltration Rate = 2.1E-05 m/sec

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PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA1 (Test 2)

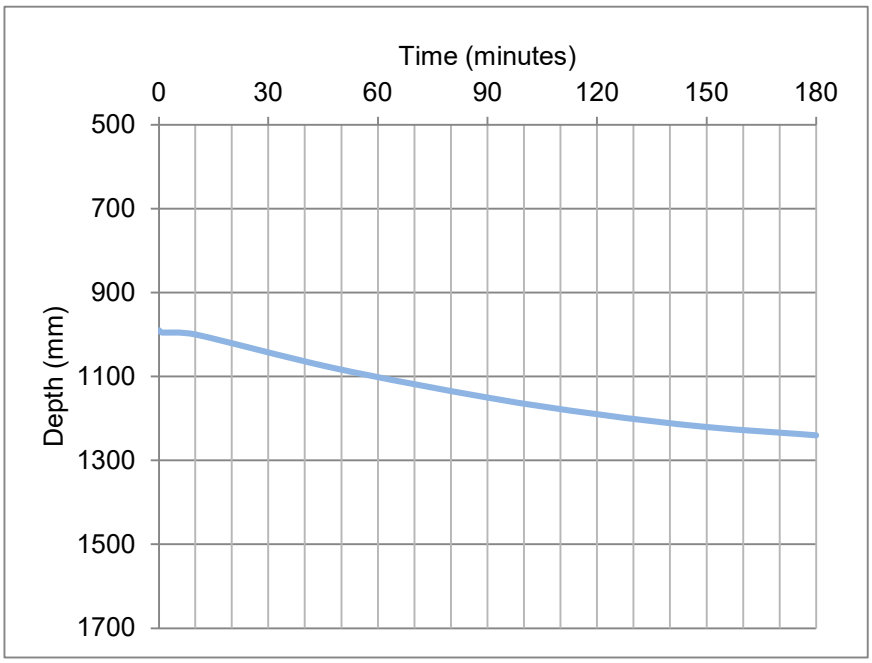
Test Pit Dimensions

Length = **1400** mm
Width = **800** mm
Depth = **1600** mm (Total depth)

Plan area = **1.12** m²

Approximate time to discharge water into the hole: **20** Seconds
Depth to water after completion of pumping: **990** mm

Time (min)	Depth (mm)
0	**990**
1	**995**
10	**1000**
48	**1080**
90	**1150**
120	**1190**
150	**1220**
180	**1240**



Test Pit Log

Depth (m)	Description
0.0 - 0.3	TOPSOIL: slightly silty sandy CLAY
0.3 - 1.6	Slightly gravelly silty fine to coarse SAND.

PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA1 (Test 2)

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **990** mm
Start time = **0** min

Average water depth: **485** mm

Change in water depth: **250** mm

Final parameters

Depth to water = **1240** mm
End time = **180** min

Time interval: **180** min

Effective Storage Volume of Water in the Trial Pit = **0.6832** m³
75% Effective Depth = **1143** mm from ground level
25% Effective Depth = **1448** mm from ground level
Time at 75% Effective Depth = **88** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.34** m³

a_{p50} = **2.46** m²

t_{p75-25} = **-5280** sec

f = **-2.6E-05 m/sec**

Average Soakaway Rate = **2.6E-05** m³/sec
Average soakaway area = **3.25** m² (sides + base)

BR365 Soil Infiltration Rate = N/A m/sec
Average Infiltration Rate = 8.0E-06 m/sec

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PROJECT:	**Lockwood Road, Golthorpe**	**Job No. 44271**	**Date 09.12.20**
SUBJECT:	**Infiltration Test Results and Calculation of Infiltration Rates**	**Prepared LW**	**Checked GCB**

Test No. SA2

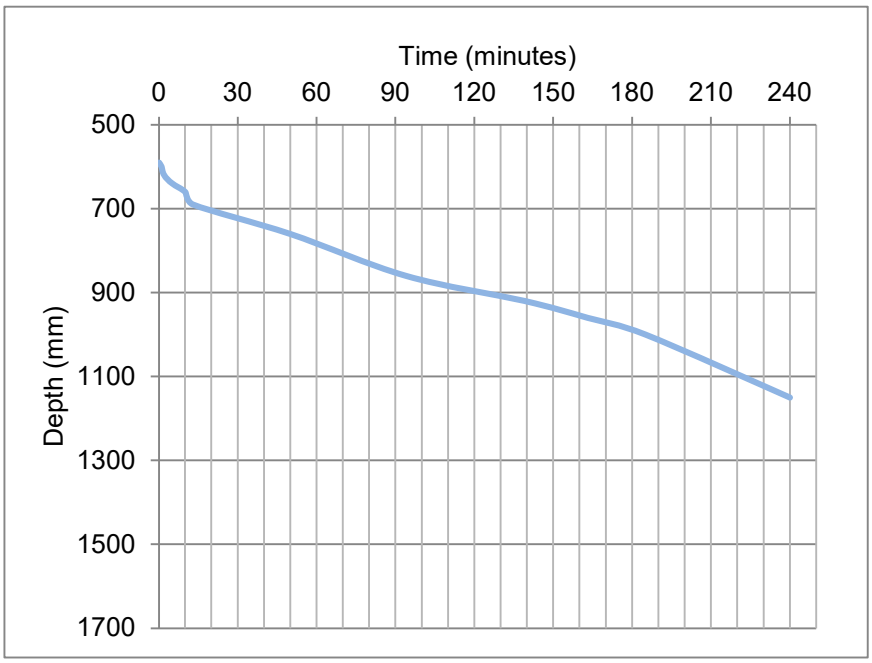
Test Pit Dimensions

Length = **1400** mm
Width = **800** mm
Depth = **1200** mm (Total depth)

Plan area = **1.12** m²

Approximate time to discharge water into the hole: **20** Seconds
Depth to water after completion of pumping: **590** mm

Time (min)	Depth (mm)
0	**590**
1	**600**
2	**620**
5	**640**
10	**660**
13	**690**
50	**760**
94	**860**
139	**920**
163	**960**
185	**1000**
240	**1150**



Test Pit Log

Depth (m)	Description
0.0 - 0.3	TOPSOIL: slightly silty sandy CLAY
0.3 - 1.2	Slightly gravelly silty fine to coarse SAND.

PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **590** mm
Start time = **0** min

Average water depth: **330** mm

Change in water depth: **560** mm

Final parameters

Depth to water = **1150** mm
End time = **240** min

Time interval: **240** min

Effective Storage Volume of Water in the Trial Pit = **0.6832** m³
75% Effective Depth = **743** mm from ground level
25% Effective Depth = **1048** mm from ground level
Time at 75% Effective Depth = **45** minutes
Time at 25% Effective Depth = **200** minutes

V_{p75-25} = **0.34** m³

a_{p50} = **2.46** m²

t_{p75-25} = **9300** sec

f = **1.5E-05 m/sec**

Average Soakaway Rate = **4.4E-05** m³/sec
Average soakaway area = **2.57** m² (sides + base)

BR365 Soil Infiltration Rate = 1.5E-05 m/sec
Average Infiltration Rate = 1.7E-05 m/sec

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PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA3

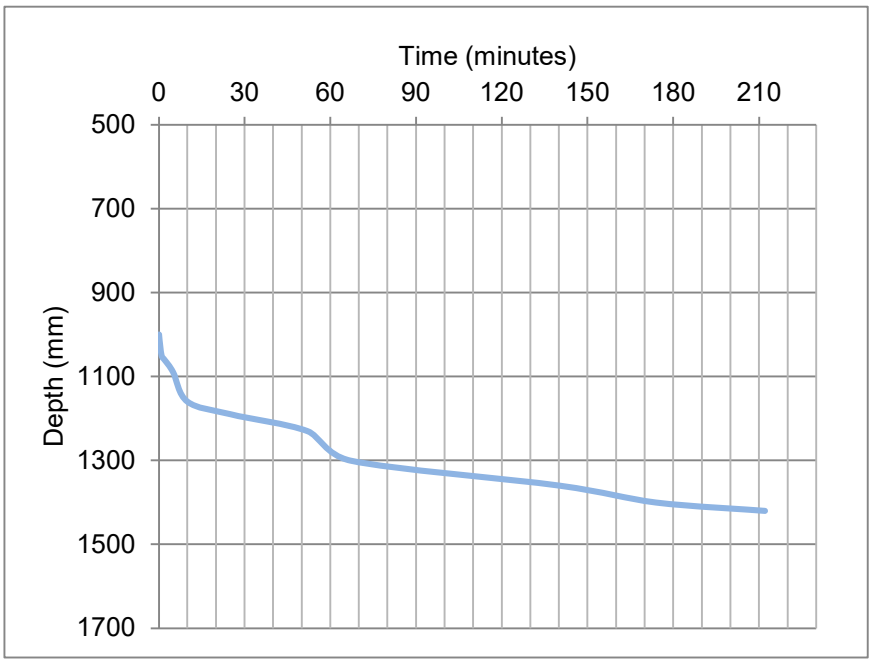
Test Pit Dimensions

Length = **1300** mm
Width = **800** mm
Depth = **1600** mm (Total depth)

Plan area = **1.04** m²

Approximate time to discharge water into the hole: **20** Seconds
Depth to water after completion of pumping: **1000** mm

Time (min)	Depth (mm)
0	**1000**
1	**1050**
2	**1060**
5	**1090**
10	**1160**
25	**1190**
52	**1230**
67	**1300**
140	**1360**
174	**1400**
212	**1420**



Test Pit Log

Depth (m)	Description
0.0 - 0.3	TOPSOIL: slightly silty sandy CLAY
0.3 - 1.6	Slightly gravelly silty fine to coarse SAND.

PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA3

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1000** mm
Start time = **0** min

Average water depth: **390** mm

Change in water depth: **420** mm

Final parameters

Depth to water = **1420** mm
End time = **212** min

Time interval: **212** min

Effective Storage Volume of Water in the Trial Pit = **0.624** m³
75% Effective Depth = **1150** mm from ground level
25% Effective Depth = **1450** mm from ground level
Time at 75% Effective Depth = **9** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.31** m³

a_{p50} = **2.30** m²

t_{p75-25} = **-540** sec

f = **-2.5E-04 m/sec**

Average Soakaway Rate = **3.4E-05** m³/sec
Average soakaway area = **2.68** m² (sides + base)

BR365 Soil Infiltration Rate = N/A m/sec
Average Infiltration Rate = 1.3E-05 m/sec

EASTWOOD & PARTNERS **Sheet 1 of 2**
(Consulting Engineers) Ltd

PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA4

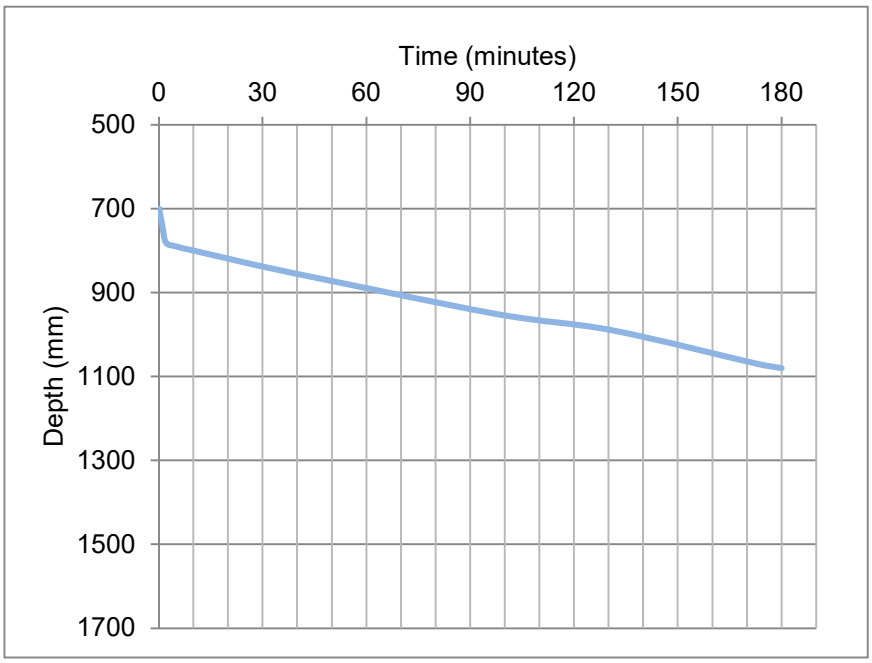
Test Pit Dimensions

Length = **1400** mm
Width = **800** mm
Depth = **1400** mm (Total depth)

Plan area = **1.12** m²

Approximate time to discharge water into the hole: **20** Seconds
Depth to water after completion of pumping: **700** mm

Time (min)	Depth (mm)
0	**700**
1	**740**
2	**780**
5	**790**
10	**800**
37	**850**
97	**950**
131	**990**
173	**1070**
180	**1080**



Test Pit Log

Depth (m)	Description
0.0 - 0.3	TOPSOIL: slightly silty sandy CLAY
0.3 - 1.3	Slightly gravelly silty fine to coarse SAND.

PROJECT:	Lockwood Road, Golthorpe	Job No. 44271	Date 09.12.20
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LW	Checked GCB

Test No. SA4

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **700** mm
Start time = **0** min

Average water depth: **510** mm

Change in water depth: **380** mm

Final parameters

Depth to water = **1080** mm
End time = **180** min

Time interval: **180** min

Effective Storage Volume of Water in the Trial Pit = **0.784** m³
75% Effective Depth = **875** mm from ground level
25% Effective Depth = **1225** mm from ground level
Time at 75% Effective Depth = **38** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.39** m³

a_{p50} = **2.66** m²

t_{p75-25} = **-2280** sec

f = **-6.5E-05 m/sec**

Average Soakaway Rate = **3.9E-05** m³/sec
Average soakaway area = **3.36** m² (sides + base)

BR365 Soil Infiltration Rate = N/A m/sec
Average Infiltration Rate = 1.2E-05 m/sec

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-34511-1		
Initial Date of Issue:	21-Dec-2020		
Client	Eastwood & Partners		
Client Address:	St. Andrews House 23 Kingfield Road Sheffield South Yorkshire S11 9AS		
Contact(s):	Luke Wilson		
Project	44271 Lockwood Road, Goldthorpe		
Quotation No.:		**Date Received:**	15-Dec-2020
Order No.:		**Date Instructed:**	15-Dec-2020
No. of Samples:	12		
Turnaround (Wkdays):	5	**Results Due:**	21-Dec-2020
Date Approved:	21-Dec-2020		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: 44271 Lockwood Road, Goldthorpe

Client: Eastwood & Partners		**Chemtest Job No.:**			20-34511	20-34511	20-34511	20-34511	20-34511	20-34511	20-34511	20-34511	20-34511
Quotation No.:		**Chemtest Sample ID.:**			1114207	1114208	1114209	1114210	1114211	1114212	1114213	1114214	1114215
		Sample Location:			TP01	TP02	TP03	TP04	TP05	TP06	TP07	TP08	TP09
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.2	0.3	0.1	0.1	0.2	0.2	0.2	0.3	0.2
		Bottom Depth (m):			0.2	03	0.1	0.1	0.2	0.2	0.2	0.3	0.2
		Date Sampled:			08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	13	12	14	13	13	13	12	13	13
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Roots	Roots	Roots	Roots	Roots	Roots	Roots	Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		4.0	7.9	7.2	6.8	6.9	7.4	6.7	6.9	7.0	7.4
Arsenic	M	2450	mg/kg	1.0	25	42	44	22	26	13	12	12	16
Cadmium	M	2450	mg/kg	0.10	0.43	0.54	0.60	0.47	0.63	0.35	0.32	0.31	0.29
Chromium	M	2450	mg/kg	1.0	12	15	19	16	16	11	11	9.8	9.8
Copper	M	2450	mg/kg	0.50	55	52	73	46	53	18	18	16	22
Mercury	M	2450	mg/kg	0.10	0.15	0.21	0.33	0.14	0.20	0.10	< 0.10	< 0.10	0.10
Nickel	M	2450	mg/kg	0.50	20	24	28	24	23	16	17	18	16
Lead	M	2450	mg/kg	0.50	78	81	130	160	85	37	36	35	97
Selenium	M	2450	mg/kg	0.20	0.50	0.95	0.89	0.60	0.68	0.38	0.37	0.29	0.40
Zinc	M	2450	mg/kg	0.50	230	230	480	190	250	99	81	88	74
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	0.63	0.48	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	0.78	0.26	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	0.21	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	0.52	0.16	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	7.2	2.1	1.2	2.3	1.3	0.13	0.27	< 0.10	0.16
Anthracene	M	2800	mg/kg	0.10	1.2	0.25	0.35	0.23	0.17	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	10	3.1	3.5	3.5	2.6	0.34	0.41	0.21	0.30
Pyrene	M	2800	mg/kg	0.10	8.7	2.6	3.1	2.6	2.1	0.25	0.35	0.20	0.24
Benzo[a]anthracene	M	2800	mg/kg	0.10	4.3	1.1	1.7	1.2	1.0	< 0.10	0.18	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	4.5	1.1	1.5	1.4	1.1	< 0.10	0.18	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	6.2	1.7	2.6	2.1	1.8	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	1.9	0.62	0.72	0.69	0.53	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	5.5	1.4	2.2	1.5	1.4	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	3.1	0.88	1.3	0.99	1.0	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.21	0.26	0.21	0.18	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	2.8	0.86	1.3	0.89	0.83	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	58	17	20	18	14	< 2.0	< 2.0	< 2.0	< 2.0

Results - Soil

Project: 44271 Lockwood Road, Goldthorpe

Client: Eastwood & Partners		**Chemtest Job No.:**			20-34511	20-34511	20-34511
Quotation No.:		**Chemtest Sample ID.:**			1114216	1114217	1114218
		Sample Location:			TP10	TP11	TP12
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			0.1	0.1	0.1
		Bottom Depth (m):			0.1	0.1	0.2
		Date Sampled:			08-Dec-2020	08-Dec-2020	08-Dec-2020
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	13	14	14
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones and Roots	Roots	Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		4.0	7.6	7.2	7.6
Arsenic	M	2450	mg/kg	1.0	18	14	15
Cadmium	M	2450	mg/kg	0.10	0.35	0.33	0.30
Chromium	M	2450	mg/kg	1.0	12	11	11
Copper	M	2450	mg/kg	0.50	20	19	23
Mercury	M	2450	mg/kg	0.10	0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	20	19	17
Lead	M	2450	mg/kg	0.50	80	36	36
Selenium	M	2450	mg/kg	0.20	< 0.20	0.44	0.39
Zinc	M	2450	mg/kg	0.50	77	77	75
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	0.14	0.13	0.33
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	0.30	0.26	0.76
Pyrene	M	2800	mg/kg	0.10	0.27	0.28	0.61
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.37
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.46
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.77
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.18
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.51
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.34
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.35
Total Of 16 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	4.7

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-34549-1
Initial Date of Issue:	21-Dec-2020
Client	Eastwood & Partners
Client Address:	St. Andrews House 23 Kingfield Road Sheffield South Yorkshire S11 9AS
Contact(s):	Geo Luke Wilson
Project	44271 Lockwood Road, Goldthorpe

Quotation No.:		**Date Received:**	15-Dec-2020
Order No.:		**Date Instructed:**	16-Dec-2020
No. of Samples:	7		
Turnaround (Wkdays):	5	**Results Due:**	22-Dec-2020
Date Approved:	21-Dec-2020		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: 44271 Lockwood Road, Goldthorpe

Client: Eastwood & Partners		**Chemtest Job No.:**			20-34549	20-34549	20-34549	20-34549	20-34549	20-34549	20-34549
Quotation No.:		**Chemtest Sample ID.:**			1114404	1114405	1114406	1114407	1114408	1114409	1114410
Order No.:		Client Sample Ref.:						SST	SST	SST	SST
		Sample Location:			TP01	TP04	TP10	TP06	TP07	TP12	TP03
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.50	0.60	0.70	0.60	1.20	0.90	0.80
		Bottom Depth (m):			0.50	0.60	0.70	0.60	1.20	0.90	0.80
		Date Sampled:			08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020	08-Dec-2020
Determinand	**Accred.**	**SOP**	**Units**	**LOD**							
Moisture	N	2030	%	0.020	16	18	12	7.9	9.7	12	9.7
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	None	None	None	None	None	None	None
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay	Sand	Sand	Sand
pH	M	2010		4.0	8.1	7.5	7.8	7.9	8.1	7.9	8.0
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010	0.018	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	M	2430	%	0.010	0.028	0.015	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Arsenic	M	2450	mg/kg	1.0	8.7	5.7	6.5	3.5	6.3	7.6	5.5
Cadmium	M	2450	mg/kg	0.10	0.25	0.10	0.20	0.18	0.16	0.12	< 0.10
Chromium	M	2450	mg/kg	1.0	15	9.7	9.2	12	12	11	11
Copper	M	2450	mg/kg	0.50	13	6.8	8.8	6.2	7.8	9.2	8.8
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	20	11	16	25	24	19	18
Lead	M	2450	mg/kg	0.50	22	16	36	7.6	20	18	8.8
Selenium	M	2450	mg/kg	0.20	0.25	0.22	0.20	< 0.20	0.21	0.28	0.20
Zinc	M	2450	mg/kg	0.50	90	53	110	68	85	36	33
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	0.34	2.3	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	0.14	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	0.58	2.9	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	0.48	2.2	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.17	0.99	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	0.27	1.0	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	1.2	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	0.40	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	0.98	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	0.59	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	0.45	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	< 2.0	13	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-07298-1		
Initial Date of Issue:	15-Mar-2021		
Client	Eastwood & Partners		
Client Address:	St. Andrews House 23 Kingfield Road Sheffield South Yorkshire S11 9AS		
Contact(s):	Luke Wilson		
Project	44271 Lockwood Road, Goldthorpe		
Quotation No.:		**Date Received:**	09-Mar-2021
Order No.:		**Date Instructed:**	09-Mar-2021
No. of Samples:	15		
Turnaround (Wkdays):	5	**Results Due:**	15-Mar-2021
Date Approved:	15-Mar-2021		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: 44271 Lockwood Road, Goldthorpe

Client: Eastwood & Partners				**Chemtest Job No.:**	21-07298	21-07298	21-07298	21-07298	21-07298	21-07298	21-07298	21-07298	21-07298
Quotation No.:				**Chemtest Sample ID.:**	1155988	1155989	1155990	1155991	1155992	1155993	1155994	1155995	1155996
				Sample Location:	TP101	TP103	TP104	TP105	TP106	TP107	TP108	TP109	TP110
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4
				Bottom Depth (m):	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4
				Date Sampled:	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021
				Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	14	27	18	24	26	15	15	19	19
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots	Glass	Roots	Roots and Stones	Roots	Roots	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		4.0	7.8	7.7	7.7	7.8	7.8	8.0	8.9	8.4	8.7
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010									0.040
Total Sulphur	M	2175	%	0.010									0.094
Sulphate (Acid Soluble)	M	2430	%	0.010									0.10
Arsenic	M	2450	mg/kg	1.0	20	21	20	44	25	18	15	38	29
Cadmium	M	2450	mg/kg	0.10	0.50	0.50	0.50	1.7	3.7	0.30	0.29	0.80	0.69
Chromium	M	2450	mg/kg	1.0	25	20	19	37	27	19	16	21	22
Copper	M	2450	mg/kg	0.50	36	37	27	89	47	22	19	74	46
Mercury	M	2450	mg/kg	0.10	0.15	0.36	0.21	0.27	0.15	0.27	0.10	0.16	0.14
Nickel	M	2450	mg/kg	0.50	26	22	22	48	31	21	20	31	28
Lead	M	2450	mg/kg	0.50	81	69	63	470	300	42	49	160	320
Selenium	M	2450	mg/kg	0.20	0.49	0.52	0.46	0.82	0.62	0.31	0.28	0.76	0.57
Zinc	M	2450	mg/kg	0.50	250	240	200	630	520	110	100	400	350
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	0.90	2.0	2.1	2.6	0.87	< 0.10	< 0.10	< 0.10	1.0
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.19	0.17	0.28	< 0.10	< 0.10	< 0.10	< 0.10	0.37
Acenaphthene	M	2800	mg/kg	0.10	0.43	0.76	0.79	0.51	0.44	< 0.10	< 0.10	< 0.10	0.54
Fluorene	M	2800	mg/kg	0.10	0.14	0.28	0.24	0.31	0.14	< 0.10	< 0.10	< 0.10	0.41
Phenanthrene	M	2800	mg/kg	0.10	0.48	0.67	0.34	1.7	0.36	0.27	0.68	1.3	3.4
Anthracene	M	2800	mg/kg	0.10	0.10	< 0.10	< 0.10	0.45	< 0.10	< 0.10	< 0.10	0.24	0.52
Fluoranthene	M	2800	mg/kg	0.10	1.1	1.5	0.72	3.0	0.69	0.58	1.5	2.3	5.7
Pyrene	M	2800	mg/kg	0.10	0.89	1.2	0.57	2.6	0.64	0.48	1.3	1.9	4.5
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.48	0.61	0.28	1.4	0.28	< 0.10	0.48	0.79	2.1
Chrysene	M	2800	mg/kg	0.10	0.45	0.58	0.33	1.3	0.35	< 0.10	0.58	1.1	2.4
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.43	1.0	< 0.10	2.0	0.32	< 0.10	0.81	1.3	3.1
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	0.16	< 0.10	0.74	< 0.10	< 0.10	0.30	0.34	1.2
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.52	0.77	0.32	1.5	< 0.10	< 0.10	0.57	0.80	2.2
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.38	0.64	0.23	1.1	0.27	< 0.10	0.43	0.70	1.8
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.28	< 0.10	< 0.10	< 0.10	< 0.10	0.36

Results - Soil

Project: 44271 Lockwood Road, Goldthorpe

Client: Eastwood & Partners			**Chemtest Job No.:**		21-07298	21-07298	21-07298	21-07298	21-07298	21-07298	21-07298	21-07298	21-07298
Quotation No.:			**Chemtest Sample ID.:**		1155988	1155989	1155990	1155991	1155992	1155993	1155994	1155995	1155996
			Sample Location:		TP101	TP103	TP104	TP105	TP106	TP107	TP108	TP109	TP110
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4
			Bottom Depth (m):		0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4
			Date Sampled:		03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.30	0.56	0.14	1.0	0.28	< 0.10	0.45	0.67	1.5
Total Of 16 PAH's	N	2800	mg/kg	2.0	6.6	11	6.2	21	4.6	< 2.0	7.1	11	31

Results - Soil

Project: 44271 Lockwood Road, Goldthorpe

Client: Eastwood & Partners			**Chemtest Job No.:**		21-07298	21-07298	21-07298	21-07298	21-07298	21-07298
Quotation No.:			**Chemtest Sample ID.:**		1155997	1155998	1155999	1156000	1156001	1156002
			Sample Location:		TP111	TP103	TP104	TP105	TP107	TP110
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.3	0.8	1.1	0.9	0.8	1.1
			Bottom Depth (m):		0.3	0.8	1.1	0.9	0.8	1.1
			Date Sampled:		03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY			
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-	-	-			
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected			
ACM Detection Stage	U	2192		N/A	-	-	-			
Moisture	N	2030	%	0.020	11	13	17	14	12	12
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones and Roots	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		4.0	8.6	8.9	8.7	8.6	8.8	8.7
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.061	0.036	0.014	0.011	< 0.010	0.016
Total Sulphur	M	2175	%	0.010	0.044	0.015	0.015	0.013	0.010	0.012
Sulphate (Acid Soluble)	M	2430	%	0.010	0.069	0.036	0.022	< 0.010	< 0.010	0.018
Arsenic	M	2450	mg/kg	1.0	14	5.7	5.4	6.1	3.5	8.5
Cadmium	M	2450	mg/kg	0.10	0.53	0.35	0.20	0.26	< 0.10	0.22
Chromium	M	2450	mg/kg	1.0	22	17	13	20	11	19
Copper	M	2450	mg/kg	0.50	32	11	6.8	9.3	4.0	14
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	24	25	20	30	15	28
Lead	M	2450	mg/kg	0.50	120	22	19	15	7.2	28
Selenium	M	2450	mg/kg	0.20	0.29	< 0.20	< 0.20	< 0.20	< 0.20	0.21
Zinc	M	2450	mg/kg	0.50	240	95	92	84	33	73
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	0.79	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	0.26	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	0.51	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	0.26	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	1.8	< 0.10	< 0.10	< 0.10	< 0.10	0.32
Anthracene	M	2800	mg/kg	0.10	0.22	< 0.10	< 0.10	< 0.10	< 0.10	0.29
Fluoranthene	M	2800	mg/kg	0.10	2.5	< 0.10	< 0.10	< 0.10	< 0.10	0.41
Pyrene	M	2800	mg/kg	0.10	2.0	< 0.10	< 0.10	< 0.10	< 0.10	0.40
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.49	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	0.55	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.3	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	1.2	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.0	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.39	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: 44271 Lockwood Road, Goldthorpe

Client: Eastwood & Partners			**Chemtest Job No.:**		21-07298	21-07298	21-07298	21-07298	21-07298	21-07298
Quotation No.:			**Chemtest Sample ID.:**		1155997	1155998	1155999	1156000	1156001	1156002
			Sample Location:		TP111	TP103	TP104	TP105	TP107	TP110
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.3	0.8	1.1	0.9	0.8	1.1
			Bottom Depth (m):		0.3	0.8	1.1	0.9	0.8	1.1
			Date Sampled:		03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY			
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	13	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

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N/E	not evaluated
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>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

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The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

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D - Broken Container
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All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Inorganic Compounds	Human Health - Residential with Homegrown Produce (mg/kg)
Arsenic	37
Cadmium	11
Chromium (III)	910
Chromium (VI)	6
Lead	200
Mercury	1.2
Nickel	180
Selenium	250
Copper	2400
Zinc	3700

Organic Compounds	Human Health - Residential with Homegrown Produce (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Naphthalene	2.3	5.6	13
Acenaphthene	210	510	1100
Acenaphthylene	170	420	920
Fluorene	170	400	860
Phenanthrene	95	220	440
Anthracene	2400	5400	11000
Fluoranthene	280	560	890
Pyrene	620	1200	2000
Benzo(a)anthracene	7.2	11	13
Chrysene	15	22	27
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(k)fluoranthene	77	93	100
Benzo(a)pyrene	2.2	2.7	3.0
Dibenz(a,h)anthracene	0.24	0.28	0.3
Indeno(1,2,3-cd)pyrene	27	36	41
Benzo(g,h,i)perylene	320	340	350
Benzene	0.087	0.17	0.37
Toluene	130	290	660
Ethylbenzene	47	110	260
o-Xylene	60	140	330
m-Xylene	59	140	320
p-Xylene	56	130	310

Prepared	KS	Checked	GCB	Date	08.04.2021	Job No	44271

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LOCKWOOD ROAD, GOLDTHORPE

GLEESON DEVELOPMENTS LIMITED

ASSESSMENT CRITERIA – RESIDENTIAL WITH HOMEGROWN PRODUCE

Contaminant	Phytotoxicity			
	pH 5.0 to 5.5	pH 5.5 to 6.0	pH 6.0 to 6.5	pH >7.0
Arsenic	50			
Cadmium	3			
Chromium	400			
Lead	300			
Mercury	1			
Nickel	50	60	75	110
Copper	80	100	135	200
Zinc	200	200	200	300

The assessment concentration for lead is the Category 4 Screening Level produced by Contaminated Land: Applications in Real Environments (CL:AIRE) and outlined in Appendix H of their report SP1010. The others have been taken from Nathanail, C. P., McCaffrey, C., Gillett, A., Ogden, R., and Nathanail, J., 2015, *'The LQM/CIEH S4ULs for Human Health Risk Assessment'*, Land Quality Press, Nottingham. The metals/metalloids are based on a sandy loam soil and 6% soil organic matter. The assessment values are not intended to be applied to individual sample results where materials are similar, as the levels of contaminants will have a natural variability across the site. Instead, the modified mean value should be compared with the assessment concentration.

The assessment values for phytotoxicity are the levels at which plant growth is thought to be affected. They are taken from the maximum permissible and advisable concentrations in soil after application of soil sludge given in the *'The Code of Good Agricultural Practice for the Protection of Soil*', MAFF, 1998.

The assessment of sulphate, water soluble sulphate, elemental sulphur and sulphide is to determine the aggressive nature of the ground with respect to concrete and consequently the results are compared with BRE Special Digest 1:2005 '*Concrete in Aggressive Ground*'.

Prepared	KS	Checked	GCB	Date	08.04.2021	Job No	44271

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LOCKWOOD ROAD, GOLDTHORPE

GLEESON DEVELOPMENTS LIMITED

ASSESSMENT CRITERIA – RESIDENTIAL WITH HOMEGROWN PRODUCE

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SITE: Lockwood Road, Goldthorpe	Job No. 44271	Date 19.03.21
SUBJECT: Mean and Maximum Value Test- Arsenic in topsoil - former allotments	**Prepared LW**	**Checked GCB**

Results	Sample	Log x = y
25.00	TP01 at 0.2 m	1.398
42.00	TP02 at 0.3 m	1.623
44.00	TP03 at 0.1 m	1.643
22.00	TP04 at 0.1 m	1.342
26.00	TP05 at 0.2 m	1.415
20.00	TP101 at 0.2 m	1.301
21.00	TP103 at 0.2 m	1.322
20.00	TP104 at 0.2 m	1.301
44.00	TP105 at 0.2 m	1.643
25.00	TP106 at 0.3 m	1.398
18.00	TP107 at 0.2 m	1.255
15.00	TP108 at 0.2 m	1.176
38.00	TP109 at 0.2 m	1.580

Number of results : n =	13
Mean : X =	27.69
Standard deviation : s =	10.45
T value : t =	1.782

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 32.86

Max value =	44.00
log xm = ym =	1.643
Number of results : N =	13
Mean y =	1.415
Standard deviation of y : S =	0.158
T = (ym-ya) / S =	1.448
Tcrit (fom table A1.3) =	2.17

Result probably not an outlier

Eastwood & Partners
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SITE: Lockwood Road, Goldthorpe	Job No. 44271	Date 19.03.21
SUBJECT: Mean Value Test for Lead in Topsoil - former allotments	Prepared LW	Checked GCB

The method uses the geometric mean rather than the arithmetic mean which is used for other contaminants.

Results mg/kg	Sample	Log Results
78.00	TP01 at 0.2 m	1.892
81.00	TP02 at 0.3 m	1.908
130.00	TP03 at 0.1 m	2.114
160.00	TP04 at 0.1 m	2.204
85.00	TP05 at 0.2 m	1.929
81.00	TP101 at 0.2 m	1.908
69.00	TP103 at 0.2 m	1.839
93.00	TP104 at 0.2 m	1.968
470.00	TP105 at 0.2 m	2.672
300.00	TP106 at 0.3 m	2.477
42.00	TP107 at 0.2 m	1.623
49.00	TP108 at 0.2 m	1.69
160.00	TP109 at 0.2 m	2.204

Calculations based on log results

Number of results : n =	13
Mean : X =	2.033
Standard deviation : s =	0.297
T value : t =	1.782
Corrected mean (95% confidence) =	
= X + t * s / n^0.5 =	2.180

Final results

Mean : X =	108 mg/kg
Corrected mean (95% confidence) =	**151 mg/kg**

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E P

SITE: Lockwood Road, Goldthorpe	Job No. 44271	Date 19.03.21
SUBJECT: Mean and Maximum Value Test- Zinc in topsoil - former allotments	**Prepared LW**	**Checked GCB**

Results	Sample	Log x = y
230.00	TP01 at 0.2 m	2.362
230.00	TP02 at 0.3 m	2.362
480.00	TP03 at 0.1 m	2.681
190.00	TP04 at 0.1 m	2.279
250.00	TP05 at 0.2 m	2.398
250.00	TP101 at 0.2 m	2.398
240.00	TP103 at 0.2 m	2.380
200.00	TP104 at 0.2 m	2.301
630.00	TP105 at 0.2 m	2.799
520.00	TP106 at 0.3 m	2.716
400.00	TP107 at 0.2 m	2.602
110.00	TP108 at 0.2 m	2.041
400.00	TP109 at 0.2 m	2.602

Number of results : n =	13
Mean : X =	317.69
Standard deviation : s =	153.36
T value : t =	1.782

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 393.50

Max value =	630.00
log xm = ym =	2.799
Number of results : N =	13
Mean y =	2.455
Standard deviation of y : S =	0.211
T = (ym-ya) / S =	1.626
Tcrit (fom table A1.3) =	2.17

Result probably not an outlier

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E P

SITE: Lockwood Road, Goldthorpe	Job No. 44271	Date 19.03.21
SUBJECT: Mean and Maximum Value Test- Zinc in topsoil - former allotments	**Prepared LW**	**Checked GCB**

Results	Sample	Log x = y
230.00	TP01 at 0.2 m	2.362
230.00	TP02 at 0.3 m	2.362
480.00	TP03 at 0.1 m	2.681
190.00	TP04 at 0.1 m	2.279
250.00	TP05 at 0.2 m	2.398
250.00	TP101 at 0.2 m	2.398
240.00	TP103 at 0.2 m	2.380
200.00	TP104 at 0.2 m	2.301
630.00	TP105 at 0.2 m	2.799
520.00	TP106 at 0.3 m	2.716
400.00	TP107 at 0.2 m	2.602
110.00	TP108 at 0.2 m	2.041
400.00	TP109 at 0.2 m	2.602

Number of results : n =	13
Mean : X =	317.69
Standard deviation : s =	153.36
T value : t =	1.782

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 393.50

Max value =	630.00
log xm = ym =	2.799
Number of results : N =	13
Mean y =	2.455
Standard deviation of y : S =	0.211
T = (ym-ya) / S =	1.626
Tcrit (fom table A1.3) =	2.17

Result probably not an outlier

Eastwood & Partners
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SITE: Lockwood Road, Goldthorpe	Job No. 44271	Date 19.03.21
SUBJECT: Mean and Maximum Value Test- Benzo(b)fluoranthene in topsoil - former allotments	**Prepared LW**	**Checked GCB**

Results	Sample	Log x = y
6.20	TP01 at 0.2 m	0.792
1.70	TP02 at 0.3 m	0.230
2.60	TP03 at 0.1 m	0.415
2.10	TP04 at 0.1 m	0.322
1.80	TP05 at 0.2 m	0.255
0.43	TP101 at 0.2 m	-0.367
1.00	TP103 at 0.2 m	0.000
0.10	TP104 at 0.2 m	-1.000
2.00	TP105 at 0.2 m	0.301
0.32	TP106 at 0.3 m	-0.495
0.10	TP107 at 0.2 m	-1.000
0.81	TP108 at 0.2 m	-0.092
1.30	TP109 at 0.2 m	0.114

Number of results : n =	13
Mean : X =	1.57
Standard deviation : s =	1.61
T value : t =	1.782

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 2.37

Max value =	6.20
log xm = ym =	0.792
Number of results : N =	13
Mean y =	-0.040
Standard deviation of y : S =	0.539
T = (ym-ya) / S =	1.543
Tcrit (fom table A1.3) =	2.17

Result probably not an outlier

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E P

SITE: Lockwood Road, Goldthorpe	Job No. 44271	Date 19.03.21
SUBJECT: Mean and Maximum Value Test- Benzo(a)pyrene in topsoil - former allotments	**Prepared LW**	**Checked GCB**

Results	Sample	Log x = y
5.50	TP01 at 0.2 m	0.740
1.40	TP02 at 0.3 m	0.146
2.20	TP03 at 0.1 m	0.342
1.50	TP04 at 0.1 m	0.176
1.40	TP05 at 0.2 m	0.146
0.52	TP101 at 0.2 m	-0.284
0.77	TP103 at 0.2 m	-0.114
0.32	TP104 at 0.2 m	-0.495
1.50	TP105 at 0.2 m	0.176
0.10	TP106 at 0.3 m	-1.000
0.10	TP107 at 0.2 m	-1.000
0.57	TP108 at 0.2 m	-0.244
0.80	TP109 at 0.2 m	-0.097

Number of results : n =	13
Mean : X =	1.28
Standard deviation : s =	1.42
T value : t =	1.782

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 1.98

Max value =	5.50
log xm = ym =	0.740
Number of results : N =	13
Mean y =	-0.116
Standard deviation of y : S =	0.500
T = (ym-ya) / S =	1.712
Tcrit (fom table A1.3) =	2.17

Result probably not an outlier

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SITE: Lockwood Road, Goldthorpe	Job No. 44271	Date 19.03.21
SUBJECT: Mean and Maximum Value Test- Dibenz(a,h)anthracene in topsoil - formar allotments	**Prepared LW**	**Checked GCB**

Results	Sample	Log x = y
0.21	TP01 at 0.2 m	-0.678
0.26	TP02 at 0.3 m	-0.585
0.21	TP03 at 0.1 m	-0.678
0.18	TP04 at 0.1 m	-0.745
0.10	TP05 at 0.2 m	-1.000
0.10	TP101 at 0.2 m	-1.000
0.10	TP103 at 0.2 m	-1.000
0.10	TP104 at 0.2 m	-1.000
0.28	TP105 at 0.2 m	-0.553
0.10	TP106 at 0.3 m	-1.000
0.10	TP107 at 0.2 m	-1.000
0.10	TP108 at 0.2 m	-1.000
0.10	TP109 at 0.2 m	-1.000

Number of results : n =	13
Mean : X =	0.15
Standard deviation : s =	0.07
T value : t =	1.782

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 0.18

Max value =	0.28
log xm = ym =	-0.553
Number of results : N =	13
Mean y =	-0.864
Standard deviation of y : S =	0.184
T = (ym-ya) / S =	1.694
Tcrit (fom table A1.3) =	2.17

Result probably not an outlier

Appendix 4

Gas Monitoring Results

Table of Atmospheric Pressures

Monitoring Date 06.01.21	CH_4 %	CO_2 %	O_2 %	CO	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Level (mbgl)	Base of Pipe (mbgl)
BH1	0	3.2	14.9	1	0	1023	0.1	1.99	2.06
BH2	-	-	-	-	-	1023	-	-	-
BH3	0	2.2	15.7	0	0	1023	0.4 (p), 0.3 (s)	WAB	1.56
BH4	0	1.3	19.2	1	0	1023	0	WAB	1.55
BH5	0	1.5	18.7	2	0	1023	0	Dry	1.50

WAB – Wet At Base

- BH1 and BH3 had water over bung. Bung removed and monitored 20 mins later

Monitoring Date 20.01.21	CH_4 %	CO_2 %	O_2 %	CO	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Level (mbgl)	Base of Pipe (mbgl)
BH1	0	6.8	14.6	0	0	985	0.1 (p), 0 (s)	1.94	2.03
BH2	0	2.2	17.3	1	0	985	0	1.43	2.00
BH3	-	-	-	-	-	985	-	1.05	1.56
BH4	0	1.2	19	4	0	985	0	WAB	1.56
BH5	0	0.6	19.7	0	0	985	0	WAB	1.51

- BH2: Some water around the bung- this was bailed as the well was monitored.
- BH3: Water over bung. Bung removed, but water recharged around the bung immediately, so the well could not be gas monitored.

Monitoring Date 19.03.21	CH_4 %	CO_2 %	O_2 %	CO	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Level (mbgl)	Base of Pipe (mbgl)
BH1	0	3.0	16.6	2	0	1025	0.1 (p), 0 (s)	WAB	2.03
BH2	0	1.4	19.3	1	0	1025	0.1 (p), 0 (s)	1.89	1.96
BH3	0	2.1	17.1	3	0	1025	2.50 (p), -0.3 (s)	WAB	1.58
BH4	0	1.3	19.7	1	0	1025	0	WAB	1.55
BH5	0	0.7	20.1	2	0	1025	0	WAB	1.57
BH6	0	0.3	20.4	5	0	1025	0.1 (p), 0 (s)	WAB	0.96
BH7	0	1.4	16.6	2	0	1025	0	WAB	1.41

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GLEESON DEVELOPMENTS LTD.

LOCKWOOD ROAD, GOLDTHORPE

GROUND GAS AND GROUNDWATER MONITORING RESULTS

JOB NO. 44271

DATE January 2021 - May 2021

Concentration equates to Amber 1

Concentration equates to Amber 2

Monitoring Date 09.04.21	CH_4 %	CO_2 %	O_2 %	CO	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Level (mbgl)	Base of Pipe (mbgl)
BH1	0	3.8	16.6	1	0	1012	0	WAB	2.02
BH2	0	1.5	19.7	1	0	1012	0.1 (p), 0 (s)	WAB	1.96
BH3	0	2.0	19.6	1	0	1012	0.2 (p), 0 (s)	WAB	1.57
BH4	0	1.3	19.8	0	0	1012	0	WAB	1.56
BH5	0	1.3	19.8	2 (p), 0 (s)	-	1012	0	WAB	1.58
BH6	0	0.3	20.5	1	0	1012	0.3 (p), 0 (s)	Dry	0.98
BH7	0	0.9	20	0	0	1012	0.1	Dry	1.42

Monitoring Date 27.04.21	CH_4 %	CO_2 %	O_2 %	CO	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Level (mbgl)	Base of Pipe (mbgl)
BH1	0	2.4	19.4	0	0	1010	4.9 (p), 0.3 (s)	WAB	2.04
BH2	0	1.2	20.2	0	0	1010	0	WAB	1.98
BH3	0	1.6	20.1	1	0	1010	0.4 (p), 0 (s)	WAB	1.57
BH4	0	0.9	20.4	1	0	1010	0.1 (p), 0 (s)	WAB	1.55
BH5	0	1.0	20.4	1 (p), 0 (s)	0	1010	-0.4 (p), 0 (s)	WAB	1.56
BH6	0	0.2	20.8	1 (p), 0 (s)	0	1010	0.1 (p), 0 (s)	Dry	0.98
BH7	0	0.9	20.2	0	0	1010	0.3 (p), 0 (s)	Dry	1.42

Monitoring Date 10.05.21	CH_4 %	CO_2 %	O_2 %	CO	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Level (mbgl)	Base of Pipe (mbgl)
BH1	0	3.2	17.7	1 (p), 0 (s)	0	995	0.1 (p), 0 (s)	WAB	2.02
BH2	0	1.1	19.4	0	0	995	0	WAB	1.97
BH3	0	1.9	19.3	1 (p), 0 (s)	0	995	0.1 (p), 0 (s)	WAB	1.57
BH4	0	1.1	19.6	1 (p), 0 (s)	0	995	-0.1 (p), 0 (s)	WAB	1.56
BH5	0	1.8	19.1	2	0	995	0	WAB	1.58
BH6	0	0.3	20.7	1	0	995	0	Dry	0.99
BH7	0	1.9	18.4	0	0	995	-0.1 (p), 0 (s)	Dry	1.42

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GLEESON DEVELOPMENTS LTD.

LOCKWOOD ROAD, GOLDTHORPE

GROUND GAS AND GROUNDWATER MONITORING RESULTS

JOB NO. 44271

DATE January 2021 - May 2021

Concentration equates to Amber 1

Concentration equates to Amber 2

Date	Atmospheric Pressure (mb)	Atmospheric Trend	Relative Humidity (%)	Temp (ºC)	Weather
02.01.21	1001	Rising	85	6	Cloudy
03.01.21	1013	Rising	84	6	Cloudy
04.01.21	1004	Falling	85	6	Cloud/rain
05.01.21	1026	Rising	90	3	Cloudy
06.01.21	1023	Falling	94	3	Cloudy
07.01.21	1020	Falling	81	3	Cloudy
16.01.21	1014	Falling	86	7	Cloud/rain/snow
17.01.21	1023	Rising	84	6	Cloud/sun
18.01.21	1017	Falling	91	6	Cloudy
19.01.21	991	Falling	95	10	Cloud/rain
20.01.21	985	Falling	85	6	Cloud/rain/sun
21.01.21	988	Rising	79	5	Cloud/sun
15.03.21	1019	Rising	71	11	Cloudy
16.03.21	1029	Rising	79	11	Cloudy
17.03.21	1036	Rising	66	11	Cloud/sun
18.03.21	1029	Falling	73	10	Cloudy
19.03.21	1025	Falling	67	10	Cloudy
20.03.21	1031	Rising	65	13	Cloudy
05.04.21	1010	Falling	58	6	Cloud/sun
06.04.21	1014	Rising	56	7	Cloud/sun
07.04.21	1016	Rising	60	8	Cloud/sun
08.04.21	993	Falling	68	9	Cloudy
09.04.21	997	Rising	70	8	Cloudy
10.04.21	1017	Rising	58	7	Cloud/sun
23.04.21	1027	Steady	62	14	Cloud/sun
24.04.21	1030	Rising	54	15	Cloud/sun
25.04.21	1032	Rising	59	11	Cloud/sun
26.04.21	1027	Falling	62	11	Cloudy
27.04.21	1010	Falling	72	10	Cloudy
28.04.21	1015	Rising	63	10	Cloudy
06.05.21	1005	Falling	67	9	Cloud/rain/sun
07.05.21	1014	Rising	64	12	Cloud/rain/sun
08.05.21	1000	Falling	84	15	Cloud/rain
09.05.21	994	Falling	66	17	Cloudy
10.05.21	995	Rising	62	16	Cloud/sun
11.05.21	1004	Rising	62	15	Cloud/rain/sun

Taken from BBC Weather website
Highlighted rows denote gas monitoring visits.

E P Eastwood & Partners CONSULTING ENGINEERS	**LOCKWOOD ROAD, GOLDTHORPE, BARNSLEY** **ATMOSPHERIC CONDITIONS**