Eastwood&Partners
CONSULTING ENGINEERS

GEOTECHNICAL AND GEO-ENVIRONMENTAL SITE INVESTIGATION

PHASE 3, BARNBURGH LANE, GOLDTHORPE

FOR

GLEESON DEVELOPMENTS LTD

ISSUE 1

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Catherine Topliss

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APPENDICES

1.0 EXECUTIVE SUMMARY

1. The 2.2 hectare greenfield site comprises a rough grassed field located to the west of the current Gleeson Developments' site, which is in turn located south of Barnburgh Lane in Goldthorpe.

2. Topsoil was encountered across the site to a maximum depth of 0.4 m. The natural ground consisted of firm to stiff clay over mudstone, encountered from around 1.4 to 2.9 m.

3. Groundwater was encountered at depths of 2.2 to 3.1 m in five trial pits in the southern half of the site within the mudstone. The monitoring wells recorded water at around 0.5 to 1.1 m depth in the south of the site. Very shallow groundwater or standing water may be expected in the southern part of the site during the wetter months of the year.

4. Eight of the ten rotary boreholes recorded workings in the Shafton coal seam. The base of the seam was found from around 6 m near the southern boundary, deepening to 18.5 m in the far northern corner. These workings will require grouting below all plots and adoptable highways. Broken ground was found as shallow as 2.5 m near the southern boundary.

5. A crown hole was encountered in TP05. Other mining features and unrecorded shafts are expected. During the topsoil surface strip, an inspection of the ground surface should be undertaken to look for evidence of mining features.

6. Suitable foundations for the site are considered to be thickened reinforced strip or trench fill footings, taken through any made or soft ground and into the firm to stiff natural clay at minimum 900 mm depth. These will need to be deepened near trees and constructed in accordance with the NHBC Standards, based on medium volume change potential clay. Shallow groundwater is expected in the southern half of the site, with ingresses noted as soon as the bedrock is reached. This may impact on deeper foundations and drainage excavations.

7. Where a narrow grout hole spacing is required, the footing should be at least 450 mm thick, minimum 600 mm wide and reinforced with a layer of B785 mesh in the top and bottom.

8. Where a wider grout hole spacing is used, the footing should be 300 mm thick, minimum 600 mm wide and reinforced with a layer of B785 mesh in the top and bottom.

9. Additional superstructure precautions will be required for the proposed development since the coal seam will lie at shallow depth across the site.

10. Excavations are generally expected to be stable. There is a potential for instability, typically in the southern part of the site, where in close vicinity of very shallow coal workings or where

shallow groundwater is encountered. A sewer crosses the north western quarter of the site and will therefore need diverting or incorporating into the development.

11. Due to the presence of cohesive strata and a shallow water table, soakaway drainage will not be viable.

12. No radon protective measures are necessary. A gas monitoring programme is currently ongoing. The most recent monitoring results recorded no methane and carbon dioxide concentrations up to 4.3%; no positive gas flow was recorded. At this stage, we anticipate that no gas measures would be required, but further gas monitoring will be required to confirm this.

13. Three samples of topsoil obtained from the southern quarter of the site contain elevated PAH concentrations. At this stage the topsoil is considered unsuitable for use within gardens without a 600 mm capping. However, it may be possible to demonstrate suitability through further testing. The topsoil is suitable for re-use within areas of public open space.

14. 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 coal-bearing strata, DS-2 AC-2 precautions should be installed.

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 instructions 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 Desk Study has been previously undertaken for this site, referenced 39657-001 and dated March 2016. A summary is included as part of this report.

Eastwood & Partners are not aware of any previous investigations having been undertaken on this site. However, Eastwood & Partners have undertaken various investigations on the adjacent land to the east for Gleeson Developments Limited. The associated reports are listed below:

- 34041-001 Desk Study, dated August 2011;
- 34041-005 Site Investigation, dated September 2011;
- 34041-010 Gas Monitoring Results [Phase 1], dated 18 January 2012;
- 34041-022 Grouting Completion [Phase 1], dated 24 March 2015;
- 34041-025 Additional Site Investigation [Phase 2], dated 6 July 2016;
- 34041-020 Phase 2 Site Investigation Issue 2, dated November 2016; and
- 34041-028 Grouting Completion [Phase 2], dated 4 May 2020.

2.3 Aims and Objectives

The aims and objectives of this investigation were as follows:

- Refine the conceptual model through ground investigation and chemical testing of soils;
- 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;
- Identify feasible remediation options if unacceptable risks are highlighted;
- Develop an appropriate remediation strategy where remediation is required; and

- Detail the ground conditions and their geotechnical properties enabling outline foundation proposals to be made.

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 rotary 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;
- Investigation of the potential for shallow coal mining beneath the site;
- Assessment of any contamination identified using visual and olfactory methods;
- Collection of soil samples for geotechnical and chemical 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, 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.

3.0 THE SITE

3.1 Description

The 2.2 hectare site comprises a field located to the west of the current Gleeson Developments' site, which is in turn located south of Barnburgh Lane in Goldthorpe. It is centred on grid reference 446560, 403710 and currently comprises rough grassland with areas of dense scrub vegetation. Vegetation consistent with seasonally wet or boggy ground is noted in the southern part of the site. However, no standing water or notably wet ground was recorded during the investigation works.

The site is bordered by properties off Lindale Gardens (off Barnburgh Lane) to the north, a housing development to the east, fields to the south and allotment gardens to the west. The boundaries are marked by hawthorn hedges with occasional elder and sycamore trees. The aerial photograph shows a footpath crossing the site from the north east to south western corner.

The sewer records indicate that there is a 450 mm diameter combined sewer crossing the north western corner of the site, orientated approximately north east to west. The records also show a surface water sewer from offsite, discharging into a drain which runs parallel to the site's western boundary.

The site slopes at a gradient of around 1 in 30 from approximately 30 m AOD in the north to 20 m AOD in the south.

3.2 Site and Surrounding Area History

The earliest map reviewed, dated 1851, shows the site to comprise an agricultural field. There are no significant changes to the present day with the exception of a footpath shown to cross the field in a north-east to south-west direction from 1961 onwards.

The 1854 map shows the surrounding area to be agricultural. Approximately 110 m north of the site is Barnburgh Lane. The village of Goldthorpe is 500 m west of the site. There is a small area of marshland shown beyond the boundary to the south east of the site.

Major residential development occurred around Goldthorpe and up to the northern site boundary by 1930. Allotment gardens are shown immediately west of the site and the Dearne Valley Railway 100 m to the north. Two collieries have been constructed, Goldthorpe Colliery 250 m north east of the site and Barnburgh Main Colliery 1 km to the east.

By 1976 the land to the north and east of the Goldthorpe Colliery is shown as active workings and two fields immediately south west of the site are shown as colliery spoil or a tip.

The only changes to present day are the closure and demolition of the collieries and dismantling of the nearest railway by the end of the 20th Century, and residential development of the land east of the site over the past decade.

3.3 Geology

The geological map, Sheet 275 SE (1:10,560 scale) shows the solid geology beneath the site to comprise mudstone of the Middle Carboniferous Coal Measures, with the southern boundary of the site underlain by alluvial deposits; these deposits are not shown to extend onto site.

No faults are shown to cross the site at surface.

The solid strata have been calculated to dip at approximately 1.5° to the north east.

3.4 Hydrogeology, Hydrology and Flooding

The Envirocheck indicates the site to overlie a Secondary A Aquifer with no water abstractions within 500 m of the site boundary.

The nearest surface water feature is a drain which runs along the western and southern boundaries.

3.5 Coal Mining

The shallowest named coal seam underlying the site is expected to be the Shafton Coal.

The investigation on the adjoining site recorded the seam to be around between 5 m depth in the south and 19 m below the northern site boundary. The seam was found to be up to 1.6 m thick and extensively worked. Drilling and grouting of shallow workings was carried out where there was less than 10 times workable thickness in competent rock between the top of the seam and underside of the foundation.

Below this site, the Shafton seam is expected from a similar depth i.e. 5 m in the south to around 17 m in the north. Using a seam thickness of 1.6 m, it is likely that the whole site will require drilling and grouting, although a borehole investigation will be required to confirm this.

A Coal Authority report was obtained and is included in the Desk Study. This states that the site is within the likely zone of influence on the surface from workings in five seams of coal at shallow depth to 650 m last worked in 1981.

A number of shafts and crown holes were encountered within the Phase 2 site typically where the seam was present within the upper 12 m.

The site is within an area for which a notice of entitlement to withdraw support was published in 1982. This has not yet been revoked, but future coal mining is considered unlikely.

3.6 Ground Gas

Information provided within the Envirocheck states that no radon precautions will be required.

The site is greenfield, therefore deep made ground is not expected to be present.

It is almost certain that the Shafton seam has been worked at shallow depth below the site. There is consequently the possibility of mine gas migrating to the surface.

Information contained within the Envirocheck indicates that there is one historic landfill site within 250 m of the site. This relates to Marsh Tip, immediately south of the site. The licence for this was held by South Yorkshire County Council. The waste was deposited between 1970 and 1979 and included inert, industrial, commercial, household waste and liquid sludge. As part of the 2014 investigation of the Phase 2 site, gas monitoring was undertaken in the south western corner to target this landfill; the report stated:

It is unlikely that the adjacent landfill is still gassing 35 years after its closure. We have discussed this landfill with Barnsley MBC. Whilst they did monitor it early on, they do not have any recent data. This would indicate that the council is not particularly concerned with its gassing state. Barnsley MBC also expects the landfill is relatively thin, as the levels in this area are relatively flat, indicating that a significant thickness of made ground is not expected.

As part of the investigation of the Phase 2 site, six gas monitoring wells were installed and six gas monitoring rounds were undertaken. No methane was recorded alongside a maximum carbon dioxide concentration of 7.3% and a maximum flow of 1 l/hr. Since the maximum concentration of 7.3% was determined to be anomalous (all other concentrations were 1.8% or below) and given that a shallow groundwater table is expected, the gassing regime for Phase 2 was classified as Green or Characteristic Situation 1.

Although similar cohesive ground conditions and shallow water table are expected on this site, a new gas monitoring programme is still recommended to determine the risk from the shallow mine workings.

3.7 Outline Conceptual Model

The following table details the possible sources and associated contaminants of concern, pathways and receptors, highlighted by the Desk Study as potentially present.

Source	Potential Contaminants	Potential Pathways	Potential Receptors
Natural ground, coal-bearing strata	Sulphates, Low pH	Direct Contact	Below ground concrete
Mine gas Offsite landfills and areas of infilled land	Ground gases	Inhalation Migration through ground	Future residents and visitors to the site Site construction workers Buildings

4.0 PHASE 2 INVESTIGATION

4.1 Site Works

We visited site on 14 July 2020 and excavated twelve trial pits (TP01 to TP12) to determine the underlying ground conditions and to collect samples for laboratory analysis. The trial pits reached depths of between 2.0 m and 3.4 m below ground level (bgl).

Ten rotary boreholes (BH01 to BH10) were also completed. The rotary boreholes were sunk to a depth of between 9 and 30 m bgl. Gas and groundwater monitoring wells were installed in BH04, BH08 and BH09 to 3 m and BH10 to a depth of 4 m.

Copies of all the trial pit and borehole logs are presented in Appendix 2, and their approximate locations are plotted on the Exploratory Hole Location Plan, drawing number 39657/001 in Appendix 1. Selected photographs of the trial pits are also provided in Appendix 3.

4.2 Laboratory Testing

Four samples of clay and two samples of mudstone were despatched for geotechnical testing to determine the natural moisture content and Atterberg limits of the natural ground. The geotechnical results are present in Appendix 3 and discussed in Section 6.

Ten samples of topsoil and five of natural clay were despatched for chemical testing. Soil samples were taken in 500 g plastic tubs and 100 ml amber glass jars and analysed at 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

All of the trial pits encountered topsoil to depths between 0.2 m and 0.4 m. The topsoil generally comprised dark brown slightly sandy, slightly gravelly clay with gravel of mudstone.

5.2 Natural Ground

Natural ground was encountered below the topsoil in all of the trial pits, and comprised firm slightly sandy clay, to depths of between 0.7 to 2.1 m. This was underlain by a stiff slightly silty slightly sandy clay, to depths of between 1.4 to 2.9 m. Bedrock consisting of extremely weak mudstone, predominantly recovered as a slightly sandy clayey gravel, was encountered at the base of all of the trial pits.

5.3 Coal and Coal Mining Related Features

Within the trial pits, coal was found in TP02 and TP03, both excavated near the southern boundary where the Shafton seam is expected to be at its shallowest. Within TP02, 100 mm of coal was encountered at 2.1 m, on top of the mudstone bedrock. In TP03, a 300 mm thick band of coal was found at 2.9 m, again overlying the mudstone.

Completely weathered coal comprising a black slightly sandy gravelly clay was also encountered in TP05, excavated centre-south of the site. This material was encountered between 0.8 and 1.1 m depth. Reworked or disturbed soils comprising firm orange slightly sandy clay were encountered to the full depth in the eastern side of the trial pit. The wider area around the trial pit was exposed to around 700 mm deep to reveal an elliptical feature approximately 2.5 m long by 1.5 m wide. The feature is considered likely to relate to a crown hole collapse from historical workings within the underlying Shafton seam that have migrated to surface.

Boreholes encountered what is considered to be the base of the Shafton Coal or workings within the same seam at depths of between 18.5 m in the northern part of the site to as shallow as 6 m in the south. Two of the ten boreholes encountered intact coal between 1.4 and 2 m thick. The remainder encountered between 1.5 m and 5 m of broken ground or soft strata indicative of backfilled and collapsed workings. More detailed discussion and risk assessment is provided in section 6.2.

5.4 Groundwater

A fast ingress of groundwater was encountered in TP01 to TP05 from 2.2 to 3.1 m bgl. This is within or just above the mudstone in the southern half of the site. Within TP02 and TP04, the groundwater rose to 1.5 and 2.8 m respectively within 10 minutes.

Within the boreholes, water strikes were noted at the following locations:

BH01	13 m - in mudstone above workings	BH06	8 m - just above workings
BH02	11.7 m - in mudstone above solid coal	BH07	7 m - just above broken ground
BH03	11 m - in mudstone above workings	BH08	-
BH04	10 m - at the top of the broken ground	BH09	2 m - just above broken ground
BH05	9 m - at the top of the broken ground	BH10	2.5 m - above workings

The monitoring well installed within BH10 in the south eastern corner of the site recorded water at around 0.5 and 0.6 m depth. Within BH09, the water was found at around 1.1 and 1.2 m bgl. Further north in BH04, water was between 2.2 and 2.9 m.

The above is consistent with vegetation typically associated with seasonally wet or boggy ground noted in the southern part of the site. No standing water or notably wet ground was recorded during the investigation works. However, groundwater is expected to be at very shallow in this part of the site during the wetter months of the year. Standing water may also be expected.

6.0 GEOTECHNICAL APPRAISAL

6.1 General

Ground Conditions

Topsoil was encountered across the site to a maximum depth of 0.4 m. The natural ground consisted of firm to stiff clay over mudstone, encountered from around 1.4 to 2.9 m.

Groundwater was encountered at depths of 2.2 to 3.1 m in five trial pits in the southern half of the site within the mudstone. Rotary boreholes recorded groundwater strikes between 13 m in the north to as shallow as 2 m in the south. It should be noted that the rotary boreholes were drilled using water flush. Therefore, less significant water strikes may have been masked by the flush media.

Subsequent monitoring has recorded ground water at around 0.5 to 1.1 m bgl in the south of the site.

Geotechnical Testing

Seventeen hand shear vane tests (typically reported as a set of three) undertaken within the natural cohesive soils at depths of between 0.5 and 2.2 m recorded average shear strengths of between 48 and 153 kPa (mean and median of 88 and 87 kPa, respectively) indicative of stiff, locally firm soils. The majority of tests recorded shear strength in excess of around 75 kPa. The exception was within TP03 where the clays were found to be firm with average shear strengths of 48 kPa and 65 kPa recorded at 0.7 and 2.2 m bgl, respectively. The reduction in strength is considered to relate to influence from shallow mining given that broken ground was encountered from 2.5 m bgl in BH09 drilled nearby. This feature is discussed in more detail in section 6.2 below.

An allowable bearing pressure of 125 kN/m^2 is considered to be appropriate for foundation design within the clay outside the influence of shallow mining features.

Four samples of natural clay and two samples of mudstone were sent for geotechnical testing. The results are enclosed in Appendix 3 (PSL 20/3576) and summarised below:

Sample	Depth (m bgl)	E&P Material Description	Modified Plasticity Index (%)	Volume Change Potential*
TP01	1.1	Clay	37	Medium
TP06	1.6	Clay	36	Medium
TP09	1.0	Clay	18.7	Low
TP09	2.2	Mudstone	Non-Plastic	-
TP11	0.9	Clay	24	Medium
TP12	1.6	Mudstone	26	Medium

* In accordance with NHBC Chapter 4.2 Standards.

Given the above, the natural clay and mudstone at the site should be regarded as being of medium volume change potential in accordance with NHBC Chapter 4.2 guidance.

The Party Wall Act will need to be considered for structures associated with neighbouring properties along the site boundaries.

6.2 Coal Mining Assessment

Workings

Within the borehole investigation, the following evidence of coal and workings was encountered:

Borehole	Depth (m bgl)	Thickness (m)	Borehole	Depth (m bgl)	Thickness (m)
BH01	17 to 18.5 Soft	1.5	BH06	8.5 to 10.5 Soft with Coal Traces	2.0
BH02	16.6 to 18 Coal	1.4	BH07	7.5 to 10 Broken Ground	2.5
BH03	12.5 to 14.5 Broken Ground	2.0	BH08	6.0 to 8.0 Coal	2.0
BH04	10 to 15 Broken Ground	5.0	BH09	2.5 to 6.0 Broken Ground	3.5
BH05	9.0 to 11.8 Broken Ground	2.8	BH10	3.4 to 6.0 Broken Ground	2.6

The depth of the coal and workings found in this investigation correlates with the findings of the investigation and grouting works carried out on the adjacent Phase 2 development.

Previously, the Shafton coal has been found to be 1.6 m thick. In this investigation, solid coal was only found intact in two of the ten boreholes with a thickness of 1.4 and 2 m. However, it is considered that the variation in the thickness encountered is likely a result of the water flush media and the associated delay for chippings to reach the surface. Therefore, for this assessment, we will continue to use the 1.6 m seam thickness.

The base of the seam was found from around 6 m near the southern boundary, deepening to 18.5 m in the far northern corner. Ground levels are expected to rise to the north, which would account for the slightly deeper than expected seam level.

Grouting of a shallow coal seam is recommended where the depth from bedrock to the top of the coal seam is less than 10 times the extracted seam thickness. Since the seam is 1.6 m thick, this would require 16 m of cover. Bedrock was found on average at around 2 m depth, therefore where the base of the seam lies at a depth shallower than 19.6 m, grouting is expected to be required below all plots and adoptable roads.

It is not considered to be standard practice to grout beneath proposed gardens and driveways and may not be economically viable.

The workings in the south of site were recorded as shallow as 2.5 and 3.4 m in BH09 and BH10, almost to rockhead. Where the competent cover is less than 4 times the seam thickness, we recommend narrowing the grid spacing.

Mining Features

The Phase 2 development directly to the east featured a mine shaft (ref: 446403-021) already documented by the Coal Authority on their records. A further seven shafts and eight crown holes were identified during the grouting works.

A suspected crown hole feature was identified during the excavation of TP05. Reduced strength clays were also encountered in TP03 close to BH09 where broken ground was recorded within 2.5 m of the surface. Given the above, the reduced strength clays in TP03 may have been influenced by the near surface disturbance and/or the effects of water softening as a result of surface depressions and standing water.

It is possible that other unrecorded shafts and crown holes may be present on this site, and care should be taken accordingly. During the topsoil surface strip, an inspection of the ground surface should be undertaken to look for evidence of mining features.

6.3 Foundations

Shallow coal workings are present and drilling and grouting will be required. Suitable foundations for the site are considered to be thickened reinforced strip or trench fill footings taken through any made or soft ground and into the firm to stiff natural clay at 900 mm depth from original or finished ground level, whichever is lowest.

Foundations within influence of trees or hedgerows will need to be deepened in accordance with the NHBC guidance. Where foundations are deepened over 1500 mm due to past or present trees, heave precautions will be required.

Where a narrow grout hole spacing is required, there is a risk of localised weakness in the ground at formation level. The footing should therefore be at least 450 mm thick, minimum 600 mm wide and reinforced with a layer of B785 mesh in the top and bottom.

Where a wider grout hole spacing is used, the footing should be 300 mm thick, minimum 600 mm wide and reinforced with a layer of B785 mesh in the top and bottom.

Shallow groundwater is expected in the southern half of the site, with ingresses noted as soon as the bedrock is reached. This will impact on deeper foundations and drainage excavations.

6.4 Superstructure Precautions

Additional superstructure precautions will be required for the proposed development since the coal seam will lie at shallow depth across the site.

This should comprise proprietary stainless steel masonry reinforcement, two courses above ground floor windows and two courses below the upper storey windows in the inner leaf and outer leaf of external and party walls. The reinforcement should have a grid area of at least 20 mm^2 and be laid in accordance with the manufacturer's recommendations.

This can be reviewed upon completion of the grouting works and where the seam is found to be solid, or where grout takes are low, the additional precautions may not be necessary.

6.5 Ground Slabs

Where there is less than 600 mm of made ground / fill below the ground floor slab, a ground bearing slab could be considered.

Where there is more than 600 mm of made ground / fill, a reinforced suspended or precast concrete floor with an underlying minimum 150 mm ventilated void will be required.

Where heave precautions are required, precast concrete floors should be used with a minimum 250 mm high void.

6.6 Road Works

A CBR value of at least 2% may be appropriate for road design, however there may be softer areas present, particularly in the south and during wetter times of the year. The ground should be assumed to be frost susceptible. It is recommended that CBR tests are undertaken along any proposed roads prior to construction so that more accurate CBR values can be obtained.

6.7 Excavation Problems

Excavation of the natural ground can generally be anticipated to be relatively stable however, there may be the potential for side instability and collapse in deeper trenches within the clay where the depth to the worked coal is very shallow. Some instability may also be expected within the upper weathered mudstone due to groundwater ingress in the southern part of the site.

TP01 to TP04, excavated in the southern part of the site, were terminated due to sub-artesian groundwater ingress. Where drilling and grouting works extend through the cohesive soils into the

water bearing strata beneath, efforts must be made to adequately seal penetrations with grout. However, given the extremely shallow nature of the workings in the southern part of the site, it may not be possible to prevent migration of groundwater to the surface during the wetter months. Therefore, excavation in this part of the site should, where possible, be scheduled during drier times of the year (i.e. summer and autumn) where the hydrostatic head of water is expected to be at its lowest.

Mining features such as shafts and crown holes are expected to be present and will need treating accordingly.

A sewer crosses the north western quarter of the site and will therefore need diverting or incorporating into the development.

Support will be required in accordance with current Health & Safety Regulations wherever access is required to trenches deeper than 1.2 m or less where there is risk of collapse.

6.8 Surface Water Drainage

Due to the presence of cohesive strata and a shallow water table, soakaway drainage will not be viable.

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 Desk Study 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

No unexpected visual or olfactory evidence of contamination was noted during the investigation.

7.3 Ground Gas

A gas monitoring programme is ongoing; two rounds of monitoring have been undertaken so far. The results are summarised below:

- No detectable methane concentrations have been recorded;
- A maximum carbon dioxide concentration of 4.3% was recorded in BH09 on the second round. The remaining wells recorded concentrations between 1.4% and 3.7%;
- No detectable steady state gas flows were recorded; and
- Groundwater was present at depths of between 0.54 m and 2.9 m bgl. BH10 recorded groundwater above the response zone of the well at depths of between 0.54 m and 0.58 m.

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

7.4 Chemical Testing

Ten samples of topsoil and five samples of natural clay were sent for testing. Each of the samples was analysed for the suite of contaminants listed below.

Contaminant Type	Actual Contaminants
Metals/Metalloids	Arsenic, cadmium, chromium, lead, mercury, nickel, selenium, copper and zinc
pH	pH
PAHs	Speciated PAH
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

The results have been compared to the assessment values derived using 1% soil organic matter (SOM) where applicable.

7.6.1 Topsoil

Ten samples of topsoil were tested. Elevated concentrations of arsenic and PAHs were recorded and are presented in the table below:

Determinand	Assessment Value (mg/kg) 2.5% SOM		Range of Concentrations (mg / kg)	Exceedances (mg/kg)		Modified Mean (mg/kg)
	Residential with Homegrown Produce	Public Open Space		Residential with Homegrown Produce	Public Open Space	
Arsenic	37	79	16 to 40	40 (TP11 at 0.1 m)	-	28.85
Benzo(b)fluoranthene	3.3	7.2	<0.1 to 14	6.3 (TP01 at 0.2 m) 5.8 (TP02 at 0.1 m) 14 (TP03 at 0.2 m)	14 (TP03 at 0.2 m)	5.4
Benzo(a)pyrene	2.7	5.7	<0.1 to 11	7.2 (TP01 at 0.2 m) 4.7 (TP02 at 0.1 m) 11 (TP03 at 0.2 m)	7.2 (TP01 at 0.2 m) 11 (TP03 at 0.2 m)	4.64
Dibenz(a,h)anthracene	0.28	0.57	<0.1 to 1.4	0.47 (TP01 at 0.2 m) 0.54 (TP02 at 0.1 m) 1.4 (TP03 at 0.2 m)	1.4 (TP03 at 0.2 m)	0.55 0.3 (Outlier removed)

*Text in red denotes statistical outlier

*at least 2.5% SOM assumed for topsoil

Analysis of the data has identified the concentration of Dibenz(a,h)anthracene recorded in TP03 at 0.2 m to be a statistical outlier. No other outliers were identified.

The same sample also recorded an elevated concentration of zinc of 220 mg/kg, marginally above the respective phytotoxic assessment value of 200 mg/kg.

No asbestos fibres were identified in any of the samples.

7.6.2 Natural Ground

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

7.6.3 Sulphates

In accordance with BRE Special Digest 1 (2005), the site has been taken as greenfield in relation to the Aggressive Chemical Environment. Groundwater is assumed to be mobile through the near surface soils.

The four samples of natural ground recorded a maximum water-soluble sulphate of 74 mg/l and maximum total potential sulphur of 0.23%. The pH varies between 7.1 and 8.2.

7.7 Significant Pollutant Linkages

The following significant pollution linkages have been identified.

Contaminants	Pathway	Receptor
Elevated arsenic, zinc, PAHs within topsoil	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 Buildings

8.0 RISK ASSESSMENT

8.1 Human Health – Construction Workers

Ground workers 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 PAHs within the topsoil are present, and 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, 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

Topsoil

Elevated concentrations of arsenic and PAHs were recorded within the topsoil.

One sample recorded arsenic at a concentration of 40 mg/kg, marginally exceeding the human health assessment criteria of 37 mg/kg. The modified mean for all ten samples has been calculated at 28.85 mg/kg and no statistical outliers were identified. Given the above, arsenic within the topsoil is not considered to pose a significant risk to human health.

Elevated concentrations of three PAH determinands (benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene) were recorded in three samples of topsoil recovered from trial pits (TP01, TP02 and TP03) in the southernmost part of the site. Modified means remain elevated above the relevant assessment criteria. The concentration of dibenz(a,h)anthracene recorded in the sample recovered from TP03 at 0.2 m has been identified as a statistical outlier. No notable variation within the topsoil was noted when compared to the other exploratory holes. Therefore, it is not possible to designate this material as a ‘hot-spot’. Nevertheless, even with the outlier removed from the dataset, the modified mean still marginally exceeds the relevant assessment value.

Double ratio plots prepared for all three samples indicate the PAHs to be coal derived.

Given the above, the topsoil is not considered suitable for re-use within gardens. Where this material is to remain beneath gardens it is considered that it could be placed in layers no more than 400 mm in thickness beneath at least 600 mm of clean permeable capping including at least 100 mm of clean topsoil.

Given that the elevated PAHs are likely be coal derived and that they are typically confined to the southern part of the site, it may be possible to demonstrate suitability for re-use through further testing and also delineation where possible.

None of the modified mean calculations exceed the assessment value for public open space. Therefore, following mixing from excavation and stockpiling, the topsoil is considered suitable for re-use within areas of public open space.

Natural Ground

None of the samples of natural ground recorded elevated concentrations above their respective assessment values, with respect to human health. Natural ground is considered suitable to remain beneath gardens provided at least 100 mm of clean topsoil is placed as a growing medium. This may need to be increased in areas of proposed tree planting.

Coal is not expected within the upper 1 m, therefore a capping with regards to protection against spontaneous combustion is not considered necessary.

8.3 Plants

One sample of topsoil recorded an elevated concentration of zinc, in excess of the respective phytotoxic assessment criteria. This one elevated concentration is not however, considered to pose a significant risk to plants.

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 coal-bearing strata, 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

Although the topsoil contains slightly elevated concentrations of heavy metals/metalloids and a number of PAH compounds, the underlying natural ground did not encounter any elevated concentrations. No significant risk is considered to be posed to nearby water courses from the materials on site.

8.6 Ground Gas

No radon protective measures are necessary.

A gas monitoring programme is currently ongoing; two rounds of monitoring have been undertaken so far.

The most recent monitoring results recorded no detectable methane concentrations and carbon dioxide concentrations of up to 4.3%; no positive gas flows were recorded.

The traffic light system, as detailed in C665, uses “typical maximum concentrations” for initial screening purposes and risk-based gas screening values (GSVs) for consideration in scenarios where the typical maximum concentrations are exceeded.

Assuming a flow of 0.1 l/hr, a carbon dioxide GSV of 0.004 l/hr can be calculated. According to the ‘traffic light’ system, this carbon dioxide GSV falls below the upper threshold of 0.78 l/hr for a ‘Green’ classification and the upper threshold of 0.07 l/hr for Characteristic Situation 1. At this stage, we anticipate that no gas measures would be required, but further gas monitoring will be required to confirm this.

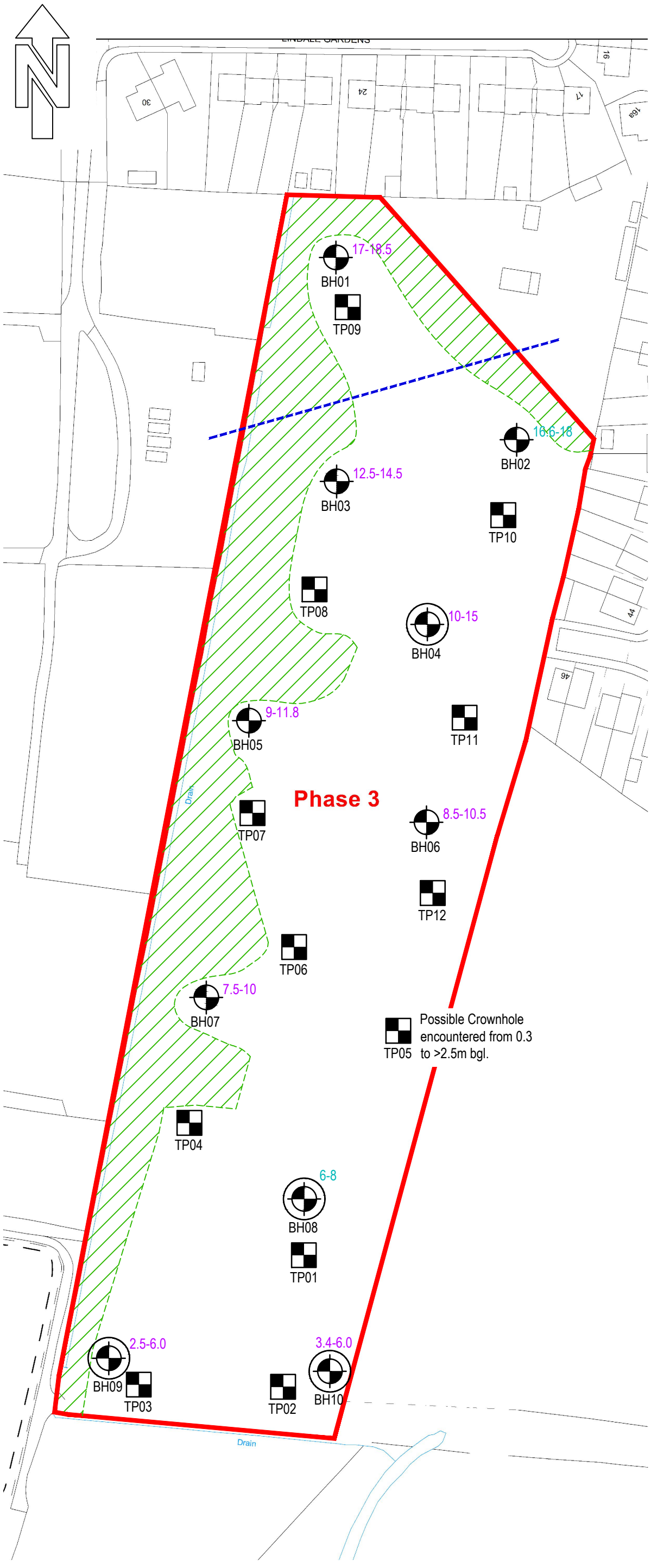
8.7 Disposal of Material

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 39657/001A



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

NOTES

KEY:

- Approximate location of trial pit excavated by Eastwood and Partners on 14.07.2020.
- Approximate location of rotary borehole drilled by Eastwood and Partners on 14/15.07.2020.
- Approximate location of rotary borehole with Gas & groundwater monitoring well installed by Eastwood and Partners on 14/15.07.2020.
- 5-10 Depth of workings.
- 5-10 Depth of intact coal.
- Dense Vegetation.
- Approximate location of sewer

REV	DESCRIPTION	SIG	CHK	DATE
A	First Issue.			

GLEESON DEVELOPMENTS LTD

PHASE 3 SITE, BARNBURGH LANE, GOLDTHORPE

EXPLORATORY HOLE LOCATION PLAN

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SCALE WHEN PLOTTED AT A3	DRAWING STATUS
1:1000	INFORMATION

DRAWN	CHECKED	DATE	DRAWING NUMBER	REV
JRB	GCB	04.09.20	39657/001	A

Appendix 2

Trial Pit Logs (TP01 to TP12)

Borehole Logs (BH01 to BH10)

Photographs of Trial Pits

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TrialPit No
TP01
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m (0.80m) Depth: 2.50m	Scale 1:25
Client: Gleeson Developments Limited			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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.40			
0.50	ES					Firm orange slightly sandy CLAY.
0.60		HVP=61				
0.60		HVP=67				
0.60		HVP=74				
			0.90			
1.10	ES					Stiff blue mottled orange slightly silty slightly sandy CLAY.
1.20		HVP=108				
1.20		HVP=81				
1.20		HVP=94				
2.00		HVP=62				
2.00		HVP=79				
2.00		HVP=83				
			2.20			
2.30	ES					Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.50			Trialpit Complete at 2.500m

Remarks: Terminated due rapid groundwater ingress from 2.2 m bgl.

Stability: Sides typically stable. Some spalling from 2.2 m due to groundwater ingress.

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TrialPit No
TP02
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m, 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 2.30m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.30			Firm orange slightly sandy CLAY.
0.50	ES					*from 0.5 m becoming stiff.*
0.50		HVP=67				
0.50		HVP=81				
0.50		HVP=92				
			1.40			Stiff to very stiff blue mottled orange slightly silty slightly sandy CLAY.
1.70	ES					
1.70		HVP=148				
1.70		HVP=153				
1.70		HVP=159				
			2.10			Extremely weak black COAL recovered as a slightly sandy clayey gravel.
2.20	ES		2.20			Extremely weak to weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.30			Trialpit Complete at 2.300m

Remarks: Terminated due to rapid groundwater ingress from 2.2 m bgl. After 10 minutes the water rose to 1.5 m bgl.

Stability: Sides typically stable. Some spalling from 2.2 m due to groundwater ingress.

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TrialPit No
TP03
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m, 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 3.40m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.30			
0.40	ES					Firm orange slightly sandy CLAY.
0.70		HVP=40				
0.70		HVP=47				
0.70		HVP=57				
			2.10			
2.20		HVP=62				Firm to stiff blue mottled orange slightly silty slightly sandy CLAY.
2.20		HVP=66				
2.20		HVP=67				
2.40	ES					
			2.90			Extremely weak black COAL recovered as a slightly sandy clayey gravel.
			3.20			Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			3.40			Trialpit Complete at 3.400m

Remarks: Terminated due to rapid groundwater ingress from 2.1 m bgl.

Stability: Sides typically stable. Some spalling from 2.1 m due to groundwater ingress.

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TrialPit No
TP04
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m, 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 3.10m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
0.60		HVP=102				Firm orange slightly sandy CLAY.
0.60		HVP=93				
0.60		HVP=94	0.70			
0.90	ES					Stiff blue mottled orange slightly silty slightly sandy CLAY.
2.20		HVP=87				
2.20		HVP=94				
2.20		HVP=98	2.40			
2.60	ES					Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			3.10			Trialpit Complete at 3.100m

Remarks: Terminated due to rapid groundwater ingress from 3.1 m bgl. After 10 minutes the water rose to 2.8 m bgl.

Stability: Sides typically stable. Some spalling from 3.1 m due to groundwater ingress.

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TrialPit No
TP05
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m / 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 2.50m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.30			Firm orange slightly sandy CLAY.
						Made ground comprising firm orange slightly sandy clay encountered to at least 2.5 m bgl in eastern end of trial. Presumed crown hole feature.
0.50	ES					
0.70		HVP=100				*from 0.8 m becoming stiff.*
0.70		HVP=81				
0.70		HVP=94	0.80			Black slightly sandy clayey GRAVEL of coal.
			1.10			Stiff blue mottled orange slightly silty slightly sandy CLAY.
			2.40			Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.50			Trialpit Complete at 2.500m

Remarks: Terminated due to refusal in bedrock. Slow ingress of groundwater at 2.5 m bgl.

Stability: Stable

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TrialPit No
TP06
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m (0.80m) Depth: 2.00m	Scale 1:25
Client: Gleeson Developments Limited			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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.30			Firm becoming stiff orange slightly sandy CLAY.
0.50		HVP=57				
0.50		HVP=94				
0.50		HVP=94				
			0.70			Stiff blue mottled orange slightly silty slightly sandy CLAY.
1.30		HVP=100				
1.30		HVP=102				
1.30		HVP=81				
1.60	ES					
			1.70			Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.00			Trialpit Complete at 2.000m

Remarks: Terminated due to refusal in bedrock. No groundwater encountered.

Stability: Stable

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TrialPit No
TP07
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m, 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 2.50m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
0.80		HVP=81				Firm orange slightly sandy CLAY.
0.80		HVP=94	0.90			
1.10	ES					Stiff blue mottled orange slightly silty slightly sandy CLAY.
			2.00			Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.50			Trialpit Complete at 2.500m

Remarks: Terminated due to refusal in bedrock. No groundwater encountered.

Stability: Stable

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TrialPit No
TP08
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m × 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 2.70m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.30			
0.50	ES					Firm orange slightly sandy CLAY.
1.10		HVP=100				
1.10		HVP=81				
1.10		HVP=81	1.20			
						Stiff blue mottled orange slightly silty slightly sandy CLAY.
1.90		HVP=62				
1.90		HVP=94	2.00			
						Extremely weak blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.70			
						Trialpit Complete at 2.700m

Remarks: Terminated due to refusal in bedrock. No groundwater encountered.

Stability: Stable

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TrialPit No
TP09
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m × 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 2.50m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
1.40		HVP=57				Firm orange slightly sandy CLAY.
1.40		HVP=62				
1.40		HVP=94	1.50			
1.60	ES					Stiff blue mottled orange slightly silty slightly sandy CLAY.
2.20	ES		2.30			Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.50			Trialpit Complete at 2.500m

Remarks: Terminated due to refusal in bedrock. No groundwater encountered.

Stability: Stable

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TrialPit No
TP10
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m × 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 2.50m	Logged LW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						TOPSOIL: Dark brown slightly sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
0.20	ES		0.20			Firm becoming stiff orange slightly sandy CLAY.
0.70	ES					
1.90		HVP=102				
1.90		HVP=153				
1.90		HVP=159	2.00			Stiff blue mottled orange slightly silty slightly sandy CLAY.
			2.20			Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.50			Trialpit Complete at 2.500m

Remarks: Terminated due to refusal in bedrock. No groundwater encountered.

Stability: Stable

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TrialPit No
TP11
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m, 0.80m	Scale 1:25
Client: Gleeson Developments Limited		Depth: 2.90m	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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.40			Firm orange slightly sandy CLAY.
0.90		HVP=81				*from 0.9 m becoming stiff.*
0.90		HVP=81				
			1.50			Stiff blue mottled orange slightly silty slightly sandy CLAY.
1.60	ES					
			2.20			Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.90			Trialpit Complete at 2.900m

Remarks: Terminated due to refusal in bedrock. No groundwater encountered.

Stability: Stable

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TrialPit No
TP12
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Phase 3 - Barnburgh Road, Goldthorpe	39657	Level:	14/07/2020
Location: South Yorkshire		Dimensions: 2.00m, 0.80m, Depth: 2.30m	Scale 1:25
Client: Gleeson Developments Limited			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 sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to medium of mudstone.
			0.80			Firm orange slightly sandy CLAY.
1.20		HVP=81				Stiff blue mottled orange slightly silty slightly sandy CLAY.
1.20		HVP=94				
1.20		HVP=94	1.40			
1.60	ES					Extremely weak dark blue thinly laminated MUDSTONE recovered as slightly sandy clayey gravel. [Pennine Middle Coal Measures Formation].
			2.30			Trialpit Complete at 2.300m

Remarks: Terminated due to refusal in bedrock. No groundwater encountered.

Stability: Stable

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Borehole No.
BH01
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 14/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			MADE GROUND. Brown SANDSTONE.
					5.20			Grey MUDSTONE.
	▼							
					17.00			Soft strata.
					18.50			Grey MUDSTONE.
			Type	Results	30.00			End of Borehole at 30.000m

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole complete at 30 m. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 13 m. Backfilled with arisings and bentonite seal upon completion.

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Borehole No.
BH02
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 14/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown CLAY.
					1.50			Brown SANDSTONE.
					3.50			Grey MUDSTONE.
	▼							
					16.60			Black COAL.
					18.00			Grey MUDSTONE.
					20.00			End of Borehole at 20.000m
			Type	Results				

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole complete at 20 m. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 11.7 m. Backfilled with arisings and bentonite seal upon completion.

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Borehole No.
BH03
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 14/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.80			Brown CLAY.
					3.40			Brown SANDSTONE.
	▼				12.50			Grey MUDSTONE.
					14.50			Broken ground - no flush returns.
					15.50			Hard strata - no flush returns.
								End of Borehole at 15.500m
			Type	Results				

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole terminated at 15.5 m due to loss of flush. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 11 m. Backfilled with arisings and bentonite seal upon completion.

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Borehole No.
BH04
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 14/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown CLAY.
					1.40			Brown SANDSTONE.
					2.80			Grey MUDSTONE.
	▼				10.00			Broken ground - no flush returns.
					15.00			Hard strata - no flush returns.
					16.00			End of Borehole at 16.000m
			Type	Results				

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole terminated at 16 m due to loss of flush. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 10 m. Gas and groundwater monitoring well installed.

Eastwood&Partners
CONSULTING ENGINEERS

Borehole No.
BH05
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 14/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown CLAY.
					2.00			Grey MUDSTONE.
	▼				9.00			Broken ground - no flush returns.
					11.80			Hard strata - no flush returns.
					12.80			End of Borehole at 12.800m
			Type	Results				

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole terminated at 12.8 m due to loss of flush. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 9 m. Backfilled with arisings and bentonite seal upon completion.

Eastwood&Partners
CONSULTING ENGINEERS

Borehole No.
BH06
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 14/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown CLAY.
					2.50			Grey MUDSTONE.
	▼				8.50			Soft strata with coal traces.
					10.50			Grey MUDSTONE.
			Type	Results	30.00			End of Borehole at 30.000m

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole complete at 30 m. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 8 m. Backfilled with arisings and bentonite seal upon completion.

Eastwood&Partners
CONSULTING ENGINEERS

Borehole No.
BH07
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 15/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown CLAY.
					2.50			Grey MUDSTONE.
	▼				7.50			Broken ground - no flush returns.
					10.00			Hard strata - no flush returns.
					12.00			End of Borehole at 12.000m

Type | Results

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole terminated at 12 m due to loss of flush returns. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 7 m. Backfilled with arisings and bentonite seal upon completion.

Eastwood&Partners
CONSULTING ENGINEERS

Borehole No.
BH08
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 15/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown CLAY.
					2.50			Grey MUDSTONE.
					6.00			Black COAL.
					8.00			Grey MUDSTONE.
					10.00			End of Borehole at 10.000m
			Type	Results				

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole complete at 10 m. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater not recorded. Gas and groundwater monitoring well installed.

Eastwood&Partners
CONSULTING ENGINEERS

Borehole No.
BH09
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 15/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	▼							Brown CLAY.
					2.50			Broken ground - no flush returns.
					6.00			Hard strata - no flush returns.
					9.00			End of Borehole at 9.000m
			Type	Results				

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole terminated at 9 m due to loss of flush returns. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 2 m. Gas and groundwater monitoring well installed.

Eastwood&Partners
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Borehole No.
BH10
Sheet 1 of 1

Project Name: Phase 3 - Barnburgh Road, Goldthorpe	Project No.: 39657	Co-ords:	Hole Type: BH
Location: South Yorkshire		Level:	Scale: 1:150
Client: Gleeson Developments Limited		Dates: 15/07/2020	Logged By: Drillers

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown CLAY.
					2.70			Grey MUDSTONE.
					3.40			Broken ground.
					6.00			Grey MUDSTONE.
			Type	Results	30.00			End of Borehole at 30.000m

Remarks

Borehole drilled with open-hole techniques using water flush. Borehole complete at 30 m. Logs based off drillers description of chippings brought to surface within flush returns. Groundwater strike at 2.5 m. Gas and groundwater monitoring well installed.

TP01

TP01 Arisings

Prepared	LW	Checked	GCB	Date	15.08.20	Photograph No	1/2

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GOLDTHORPE PHASE 3

GLEESON DEVELOPMENTS LIMITED

SITE INVESTIGATON PHOTOGRAPHS

TP03

TP03 Arisings

Prepared	LW	Checked	GCB	Date	15.08.20	Photograph No	3/4

Eastwood & Partners
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GOLDTHORPE PHASE 3

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TP04

TP04 Arisings

Prepared	LW	Checked	GCB	Date	15.08.20	Photograph No	5/6

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GOLDTHORPE PHASE 3

GLEESON DEVELOPMENTS LIMITED

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TP05

TP05 Arisings

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	7/8

E P
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GOLDTHORPE PHASE 3

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TP05 suspected crown hole

TP07

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	9/10

E P Eastwood & Partners CONSULTING ENGINEERS

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TP07 Arisings

TP08

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	11/12

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TP08 Arisings

TP09

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	13/14

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GOLDTHORPE PHASE 3

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TP09 Arisings

TP10

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	15/16

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GOLDTHORPE PHASE 3

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TP10 Arisings

TP11

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	17/18

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GOLDTHORPE PHASE 3

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TP11 Arisings

TP12

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	19/20

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GOLDTHORPE PHASE 3

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TP12 Arisings

Prepared	LW	**Checked**	GCB	**Date**	15.08.20	**Photograph No**	21

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GOLDTHORPE PHASE 3

GLEESON DEVELOPMENTS LIMITED

SITE INVESTIGATON PHOTOGRAPHS

Appendix 3

Geotechnical Test Results – PSL 20/3576

Chemical Test Results – Chemtest Report 20-18627-2

Table of Assessment Values

Modified Mean Calculations

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

LABORATORY REPORT

4043

Contract Number: PSL20/3576

Report Date: 24 July 2020

Client's Reference: 39657

Client Name: Eastwood & Partners
St Andrews House
23 Kingfield Road
Sheffield
S11 9AS

For the attention of: Luke Wilson

Contract Title: Phase 3 Barnburgh Road, Goldthorpe

Date Received: 16/7/2020
Date Commenced: 16/7/2020
Date Completed: 24/7/2020

Notes: **Opinions and Interpretations are outside the UKAS Accreditation**

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
S Royle (Laboratory Manager)	S Eyre (Senior Technician)	L Knight (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP1			1.10		Brown mottled grey slightly sandy CLAY.
TP6			1.60		Brown mottled grey slightly sandy CLAY.
TP9			2.20		Brown slightly clayey GRAVEL.
TP9			1.00		Brown mottled grey gravelly sandy very silty CLAY.
TP11			0.90		Brown mottled grey sandy very silty CLAY.
TP12			1.60		Brown mottled grey sandy very silty CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP1			1.10		24			64	27	37	100	High plasticity CH.
TP6			1.60		25			62	26	36	100	High plasticity CH.
TP9			2.20		9.7				NP			
TP9			1.00		16			45	23	22	85	Intermediate plasticity CI.
TP11			0.90		17			48	24	24	100	Intermediate plasticity CI.
TP12			1.60		17			51	25	26	100	High plasticity CH.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Phase 3 Barnburgh Road, Goldthorpe

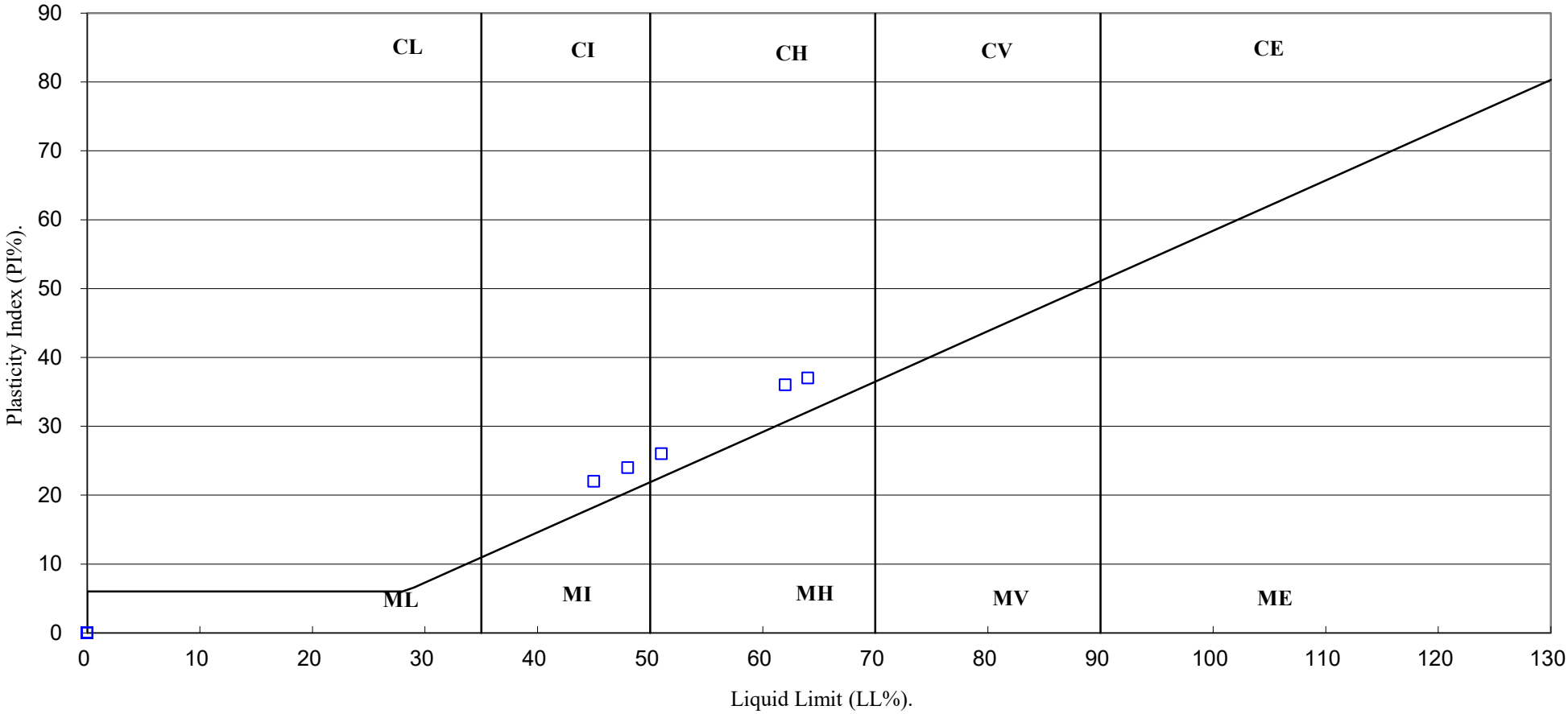
Contract No:

PSL20/3576

Client Ref:

39657

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



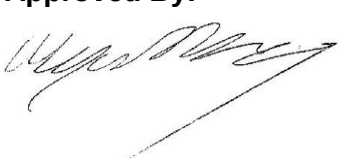
UKAS TESTING 4043	PSL Professional Soils Laboratory	Phase 3 Barnburgh Road, Goldthorpe	**Contract No:** PSL20/3576 **Client Ref:** 39657

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

Amended Report

Report No.:	20-18627-2		
Initial Date of Issue:	24-Jul-2020	**Date of Re-Issue:**	01-Sep-2020
Client	Eastwood & Partners		
Client Address:	St. Andrews House 23 Kingfield Road Sheffield South Yorkshire S11 9AS		
Contact(s):	Geo Luke Wilson		
Project	39657 Barnburgh Road, Goldthorpe		
Quotation No.:		**Date Received:**	20-Jul-2020
Order No.:	39657/LW	**Date Instructed:**	20-Jul-2020
No. of Samples:	15		
Turnaround (Wkdays):	5	**Results Due:**	24-Jul-2020
Date Approved:	24-Jul-2020		

Approved By:



Details: Glynn Harvey, Technical Manager

Results - Soil

Project: 39657 Barnburgh Road, Goldthorpe

Client: Eastwood & Partners				**Chemtest Job No.:**	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627
Quotation No.:				**Chemtest Sample ID.:**	1034478	1034479	1034480	1034481	1034482	1034483	1034484	1034485	1034486
				Client Sample ID.:	TS	TS	TS	TS	TS	TS	TS	TS	TS
				Sample Location:	TP01	TP02	TP03	TP04	TP06	TP08	TP09	TP10	TP11
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.20	0.10	0.20	0.30	0.10	0.10	0.30	0.20	0.10
				Bottom Depth (m):	0.20	0.10	0.20	0.30	0.10	0.10	0.30	0.20	0.10
				Date Sampled:	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-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	%	0.001	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	20	24	18	16	18	20	19	19	14
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	None	Stones	None	Roots	Roots	Stones
Soil Texture	N	2040		N/A	Loam	Loam	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		4.0	7.5	7.2	6.1	7.4	7.2	7.2	7.2	6.0	7.4
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010									
Total Sulphur	M	2175	%	0.010									
Sulphate (Acid Soluble)	M	2430	%	0.010									
Arsenic	M	2450	mg/kg	1.0	26	26	37	19	23	16	18	17	40
Cadmium	M	2450	mg/kg	0.10	0.64	0.50	0.74	0.31	0.36	0.32	0.33	0.30	0.18
Chromium	M	2450	mg/kg	1.0	25	24	30	17	23	20	19	22	15
Copper	M	2450	mg/kg	0.50	40	36	63	22	24	19	19	23	25
Mercury	M	2450	mg/kg	0.10	0.21	0.18	0.32	0.12	0.12	0.10	0.10	0.10	0.18
Nickel	M	2450	mg/kg	0.50	31	31	39	21	27	22	19	24	19
Lead	M	2450	mg/kg	0.50	88	64	130	43	37	40	37	39	41
Selenium	M	2450	mg/kg	0.20	0.85	0.87	1.2	0.60	0.87	0.56	0.72	0.65	2.0
Zinc	M	2450	mg/kg	0.50	150	130	220	79	82	77	75	77	47
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	< 0.10	0.29	0.63	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.14	0.32	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.50	0.64	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.42	0.60	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	6.1	5.5	9.9	< 0.10	0.31	< 0.10	0.31	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	0.55	1.2	1.6	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	16	12	24	< 0.10	0.51	0.51	0.77	0.27	< 0.10
Pyrene	M	2800	mg/kg	0.10	14	9.9	21	< 0.10	0.43	0.48	0.72	0.24	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	6.7	4.6	9.7	< 0.10	0.20	< 0.10	0.31	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	7.1	4.0	10	< 0.10	0.20	< 0.10	0.27	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	6.3	5.8	14	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	3.6	2.5	5.6	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	7.2	4.7	11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	3.0	3.9	9.6	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.47	0.54	1.4	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: 39657 Barnburgh Road, Goldthorpe

Client: Eastwood & Partners					20-18627	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627
Quotation No.:					1034478	1034479	1034480	1034481	1034482	1034483	1034484	1034485	1034486
					TS	TS	TS	TS	TS	TS	TS	TS	TS
					TP01	TP02	TP03	TP04	TP06	TP08	TP09	TP10	TP11
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					0.20	0.10	0.20	0.30	0.10	0.10	0.30	0.20	0.10
					0.20	0.10	0.20	0.30	0.10	0.10	0.30	0.20	0.10
					14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020
					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	3.7	2.7	6.7	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	75	59	130	< 2.0	< 2.0	< 2.0	2.5	< 2.0	< 2.0

Results - Soil

Project: 39657 Barnburgh Road, Goldthorpe

Client: Eastwood & Partners				**Chemtest Job No.:**	20-18627	20-18627	20-18627	20-18627	20-18627	20-18627
Quotation No.:				**Chemtest Sample ID.:**	1034487	1034488	1034489	1034490	1034491	1034492
				Client Sample ID.:	TS	NAT	NAT	NAT	NAT	NAT
				Sample Location:	TP12	TP08	TP03	TP07	TP10	TP08
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.20	1.10	0.40	1.10	0.70	0.50
				Bottom Depth (m):	0.20	1.10	0.40	1.10	0.70	0.50
				Date Sampled:	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020
				Asbestos Lab:	COVENTRY					
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-					
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected					
ACM Detection Stage	U	2192		N/A	-					
Moisture	N	2030	%	0.020	19	11	5.8	13	9.5	19
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	None	None	None	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Clay
pH	M	2010		4.0	7.3	8.1	8.1	8.2	7.7	7.1
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010		0.074	0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010		0.019	0.018	0.076	< 0.010	0.046
Sulphate (Acid Soluble)	M	2430	%	0.010		0.021	0.014	0.15	< 0.010	0.061
Arsenic	M	2450	mg/kg	1.0	17	4.4	14	28	3.9	18
Cadmium	M	2450	mg/kg	0.10	0.29	0.10	0.63	< 0.10	0.12	0.40
Chromium	M	2450	mg/kg	1.0	18	25	26	18	28	23
Copper	M	2450	mg/kg	0.50	17	24	33	20	24	25
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10	0.13
Nickel	M	2450	mg/kg	0.50	20	44	72	22	36	28
Lead	M	2450	mg/kg	0.50	29	16	24	29	20	68
Selenium	M	2450	mg/kg	0.20	0.54	0.21	1.6	0.46	0.35	0.50
Zinc	M	2450	mg/kg	0.50	67	74	150	34	74	96
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	< 0.10	< 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
Acenaphthene	M	2800	mg/kg	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
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.47
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	0.17	< 0.10	< 0.10	< 0.10	< 0.10	0.89
Pyrene	M	2800	mg/kg	0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	0.78
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.35
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.30
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.34
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.14
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.33
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.29
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: 39657 Barnburgh Road, Goldthorpe

Client: Eastwood & Partners					20-18627	20-18627	20-18627	20-18627	20-18627	20-18627
Quotation No.:					1034487	1034488	1034489	1034490	1034491	1034492
					TS	NAT	NAT	NAT	NAT	NAT
					TP12	TP08	TP03	TP07	TP10	TP08
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					0.20	1.10	0.40	1.10	0.70	0.50
					0.20	1.10	0.40	1.10	0.70	0.50
					14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020
					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	0.19
Total Of 16 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	4.2

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

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

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	GCB	Checked	CAT	Date	02.09.2020	Job No	39657

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GOLDTHORPE PHASE 3

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	GCB	Checked	CAT	Date	02.09.2020	Job No	39657

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GOLDTHORPE PHASE 3

GLEESON DEVELOPMENTS LIMITED

ASSESSMENT CRITERIA – RESIDENTIAL WITH HOMEGROWN PRODUCE

Inorganic Compounds	Human Health – Public Open Space Near Housing (mg/kg)
Arsenic	79
Cadmium	120
Chromium (III)	1500
Chromium (VI)	7.7
Lead	270-760
Mercury	16
Nickel	230
Selenium	1100
Copper	12000
Zinc	81000

Organic Compounds	Human Health – Public Open Space Near Housing (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Naphthalene	4900	4900	4900
Acenaphthene	15000	15000	15000
Acenaphthylene	15000	15000	15000
Fluorene	9900	9900	9900
Phenanthrene	3100	3100	3100
Anthracene	74000	74000	74000
Fluoranthene	3100	3100	3100
Pyrene	7400	7400	7400
Benzo(a)anthracene	29	29	29
Chrysene	57	57	57
Benzo(b)fluoranthene	7.1	7.2	7.2
Benzo(k)fluoranthene	190	190	190
Benzo(a)pyrene	5.7	5.7	5.7
Dibenz(a,h)anthracene	0.57	0.57	0.58
Indeno(1,2,3-cd)pyrene	82	82	82
Benzo(g,h,i)perylene	640	640	640
Benzene	72	72	73
Toluene	56000	56000	56000
Ethylbenzene	24000	24000	25000
o-Xylene	41000	42000	43000
m-Xylene	41000	42000	43000
p-Xylene	41000	42000	43000

Prepared	GCB	Checked	CAT	Date	02.09.20	Job No	36957

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GOLDTHORPE PHASE 3

GLEESON DEVELOPMENTS LIMITED

ASSESSMENT CRITERIA – PUBLIC OPEN SPACE NEAR HOUSING

Contaminant	Phytotoxicity			
	pH 5.0 to 5.5	pH 5.5 to 6.0	pH 6.0 to 7.0	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	GCB	Checked	CAT	Date	02.09.20	Job No	36957

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GOLDTHORPE PHASE 3

GLEESON DEVELOPMENTS LIMITED

ASSESSMENT CRITERIA – PUBLIC OPEN SPACE NEAR HOUSING

Eastwood&Partners
CONSULTING ENGINEERS

SITE: Phase 3 Barnburgh Lane, Goldthorpe	Job No. 39657	Date 01/09/2020
SUBJECT: Mean and Maximum Value Test - Topsoil Arsenic	Prepared GCB	Checked DN

Results	Sample	Log x = y
26.00	TP01 at 0.2 m	1.415
26.00	TP02 at 0.1 m	1.415
37.00	TP03 at 0.2 m	1.568
19.00	TP04 at 0.3 m	1.279
23.00	TP06 at 0.1 m	1.362
16.00	TP08 at 0.1 m	1.204
18.00	TP09 at 0.3 m	1.255
17.00	TP10 at 0.2 m	1.230
40.00	TP11 at 0.1 m	1.602
17.00	TP12 at 0.2 m	1.230

Number of results : n =	10
Mean : X =	23.90
Standard deviation : s =	8.54
T value : t =	1.833

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 28.85

Max value =	40.00
log xm = ym =	1.602
Number of results : N =	10
Mean y =	1.356
Standard deviation of y : S =	0.143
T = (ym-ya) / S =	1.724
Tcrit (fom table A1.3) =	2.04

Result probably not an outlier

Eastwood&Partners
CONSULTING ENGINEERS

SITE: Phase 3 Barnburgh Lane, Goldthorpe	Job No. 39657	Date 01/09/2020
SUBJECT: Mean and Maximum Value Test - Topsoil Benzo(b)fluoranthene	Prepared GCB	Checked DN

Results	Sample	Log x = y
6.30	TP01 at 0.2 m	0.799
5.80	TP02 at 0.1 m	0.763
14.00	TP03 at 0.2 m	1.146
0.10	TP04 at 0.3 m	-1.000
0.10	TP06 at 0.1 m	-1.000
0.10	TP08 at 0.1 m	-1.000
0.10	TP09 at 0.3 m	-1.000
0.10	TP10 at 0.2 m	-1.000
0.10	TP11 at 0.1 m	-1.000
0.10	TP12 at 0.2 m	-1.000

Number of results : n =	10
Mean : X =	2.68
Standard deviation : s =	4.69
T value : t =	1.833

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 5.40

Max value =	14.00
log xm = ym =	1.146
Number of results : N =	10
Mean y =	-0.429
Standard deviation of y : S =	0.925
T = (ym-ya) / S =	1.704
Tcrit (fom table A1.3) =	2.04

Result probably not an outlier

Eastwood&Partners
CONSULTING ENGINEERS

SITE: Phase 3 Barnburgh Lane, Goldthorpe	Job No. 39657	Date 01/09/2020
SUBJECT: Mean and Maximum Value Test - Topsoil Benzo(a)pyrene	Prepared GCB	Checked DN

Results	Sample	Log x = y
7.20	TP01 at 0.2 m	0.857
4.70	TP02 at 0.1 m	0.672
11.00	TP03 at 0.2 m	1.041
0.10	TP04 at 0.3 m	-1.000
0.10	TP06 at 0.1 m	-1.000
0.10	TP08 at 0.1 m	-1.000
0.10	TP09 at 0.3 m	-1.000
0.10	TP10 at 0.2 m	-1.000
0.10	TP11 at 0.1 m	-1.000
0.10	TP12 at 0.2 m	-1.000

Number of results : n =	10
Mean : X =	2.36
Standard deviation : s =	3.93
T value : t =	1.833

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 4.64

Max value =	11.00
log xm = ym =	1.041
Number of results : N =	10
Mean y =	-0.443
Standard deviation of y : S =	0.901
T = (ym-ya) / S =	1.647
Tcrit (fom table A1.3) =	2.04

Result probably not an outlier

Eastwood&Partners
CONSULTING ENGINEERS

SITE: Phase 3 Barnburgh Lane, Goldthorpe	Job No. 39657	Date 01/09/2020
SUBJECT: Mean and Maximum Value Test - Topsoil Dibenz(a,h)anthracene	Prepared GCB	Checked DN

Results	Sample	Log x = y
0.47	TP01 at 0.2 m	-0.328
0.54	TP02 at 0.1 m	-0.268
1.40	TP03 at 0.2 m	0.146
0.10	TP04 at 0.3 m	-1.000
0.10	TP06 at 0.1 m	-1.000
0.10	TP08 at 0.1 m	-1.000
0.10	TP09 at 0.3 m	-1.000
0.10	TP10 at 0.2 m	-1.000
0.10	TP11 at 0.1 m	-1.000
0.10	TP12 at 0.2 m	-1.000

Number of results : n =	10
Mean : X =	0.31
Standard deviation : s =	0.42
T value : t =	1.833

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 0.55

Max value =	1.40
log xm = ym =	0.146
Number of results : N =	10
Mean y =	-0.745
Standard deviation of y : S =	0.428
T = (ym-ya) / S =	2.080
Tcrit (fom table A1.3) =	2.04

Result probably an outlier

Appendix 4

Gas Monitoring Results

Table of Atmospheric Pressures

Monitoring Date 31.07.20 JSS	CH_4 %	CO_2 %	O_2 %	CO	LEL %	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Depth (m bgl)	Base of Pipe (mbgl)
BH10	0	1.4	20.2	0	0	0	1007	0	0.58	4.02
BH09	0	3.7	16.8	0	0	0	1007	0	1.22	3.15
BH08	-	-	-	-	-	-	-	-	-	-
BH04	0	2.2	19.4	0	0	0	1007	0	2.22	3.06

*Unable to locate BH08
*Text in blue denotes where groundwater recorded above response zone of monitoring well

Monitoring Date 21.08.20 JSS LW	CH_4 %	CO_2 %	O_2 %	CO	LEL %	H_2S	Atmos P. (mb)	Flow (l/hr)	Water Depth (m bgl)	Base of Pipe (mbgl)
BH10	0	1.6	19.3	1	0	0	1003	$-10_{(p)}0_{(s)}$	0.54	4.01
BH09	0	4.3	16.6	0	0	0	1003	0	1.09	3.12
BH08	-	-	-	-	-	-	-	-	-	-
BH04	0	2.3	19.1	0	0	0	1003	0	2.9	3.05

* Unable to locate BH08.
* BH10 initial (peak) flow at -10 l/hr falling rapidly to 0 l/hr (steady).

Date	Atmospheric Pressure (mb)	Atmospheric Trend	Relative Humidity (%)	Temp (ºC)	Weather
26.07.20	1009	Rising	67	20	Sun
27.07.20	1010	Rising	71	19	Sun/rain
28.07.20	1010	Steady	68	19	Sun
29.07.20	1015	Rising	69	21	Sun/rain
30.07.20	1018	Rising	71	21	Rain/sun
31.07.20	1007	Falling	70	23	Cloud
01.08.20	1001	Falling	70	22	Rain
02.08.20	1002	Rising	71	21	Rain/sun
03.08.20	1010	Rising	70	21	Sun
04.08.20	1013	Rising	62	19	Rain
05.08.20	1009	Falling	66	22	Rain
06.08.20	1016	Rising	71	24	Sun/cloud
07.08.20	1017	Rising	46	30	Warm
08.08.20	1022	Rising	54	26	Mild
09.08.20	1020	Falling	73	22	Mild
10.08.20	1016	Falling	58	27	Warm
11.08.20	1016	Steady	68	29	Sun/thunder showers
12.08.20	1015	Falling	66	30	Sun/thunder showers
13.08.20	1012	Falling	76	26	Sun/thunder showers
14.08.20	1013	Rising	81	23	Sun/thunder showers
15.08.20	1015	Rising	72	23	Cloud/rain
16.08.20	1013	Falling	75	22	Rain
17.08.20	1009	Falling	76	22	Rain
18.08.20	1011	Rising	73	21	Rain
19.08.20	1004	Falling	70	20	Rain
20.08.20	999	Falling	71	19	Rain
21.08.20	1003	Rising	72	20	Rain
22.08.20	1006	Rising	69	20	Sun/rain
23.08.20	1015	Rising	71	19	Sun
24.08.20	1012	Falling	78	18	Rain
25.08.20	1012	Steady	74	19	Rain
26.08.20	1018	Rising	72	19	Cloud/rain
27.08.20	1021	Rising	71	19	Sun
28.08.20	999	Falling	73	19	Rain
29.08.20	1015	Rising	73	18	Cloud/rain
30.08.20	1023	Rising	70	19	Sun/rain
31.08.20	1025	Rising	71	19	Cloud
01.09.20	1026	Rising	72	20	Sun/rain
02.09.20	1020	Falling	70	20	sun

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

E P Eastwood & Partners CONSULTING ENGINEERS	**PHASE 3 BARNBURGH LANE, GOLDTHORPE** **GLEESONS DEVELOPMENTS LIMITED** **ATMOSPHERIC CONDITIONS**