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***PHASE I REVIEW & PHASE II STRATEGIC
GEO-ENVIRONMENTAL ASSESSMENT***



***LAND SOUTH AND EAST OF ADASTRAL PARK
MARTLESHAM HEATH
IPSWICH
SUFFOLK
IP10 0BL***

JANUARY 2017 (Rev01)

Prepared for:

Brookbanks
Consulting

COMMERCIAL ESTATES GROUP

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**REPORT TITLE: PHASE I REVIEW &
PHASE II STRATEGIC
GEO-ENVIRONMENTAL
ASSESSMENT**

Site Address: Land south and east of Adastral Park
Ipswich Road
Martlesham Heath
Ipswich
IP10 0BL

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EXECUTIVE SUMMARY

Current Site Status The entire proposed development area (hereafter referred to as the 'main site') covers an area of approximately 100.59 hectares. It is located to the east of Adastral Park in Martlesham Heath at the approximate National Grid Reference 625788E, 244800N.

The site covers a large area of land between Adastral Park to the north and west, and Ipswich Road to the south. The site comprises an active quarry (Brett Aggregates) with associated areas of historical landfill currently used as agricultural fields or set aside land with the Brett Aggregates site offices, cement works, warehouse and aggregate stock piles in the centre of the site. Topographically, the site falls broadly from the north to the south at a fairly gentle angle, but natural levels have been disturbed by quarrying and landfill activity. A relatively steep slope makes up the gap between Area 1 and Area 2, and the active quarry areas in the centre of the main site are significantly lower than the landfill areas in the north and south.

Geology, Hydrogeology, Hydrology & Landfills

The solid geology directly beneath the majority of the site comprises the Red Crag Formation (a Principal Aquifer) of the Pliocene epoch. The Thames Clay Formation of the Eocene epoch is indicated as underlying the Red Crag Formation at depth.

The solid geology is indicated to be overlain by Superficial Deposits (a Secondary A Aquifer) comprising the Kesgrave Catchment Subgroup (formerly the Kesgrave Formation) of the Pleistocene epoch. This is shown to be absent across much of the central, eastern and western sections of the site, presumably removed by quarrying.

The nearest surface water feature, approximately 500m north west, is an unnamed tributary stream which flows into the River Deben. There is a fishing pond located within the main site, approximately 15m south west of Area 1 and 55m south east from Area 2. There are 4 No. manmade lakes in the north east edge of Area 1, which are associated with the quarry.

There is 1 No. active landfill on site operated by Brett Aggregates Ltd which broadly coincides with Area 1. There is 1 No. historical landfill on site which includes the part of the north west of Area 1 and south west of Area 2, operated by Wilding and Smith Ltd.

Flooding

According to the Environment Agency, the site is not located within a Flood Zone 2 or 3.

Site History

The history of the site has been traced back to 1884 when it comprised rough grassland and heath. No significant changes are indicated until 1957 when much of the central section of the site was shown as an unnamed Sand Pit. A Sewage Works was shown from 1965 to 1986 along the northern boundary of the south western section of the site, approximately 750m south west of Area 2. According to the Environment Agency, from 1996 to 1980 much of the central and



southern section of the site became a landfill known as The Swale. Historical map data from 1996 to present shows ponds along the north boundary of Area 1 (former sand pits), and from 2000 to present shows the site as an active quarry and landfill, which according to the Environment Agency is still active and is known as the Waldringfield Quarry.

Diesel tanks for refuelling were noted on site in the western section of Area 1, behind the large building. 2 No. petrol ASTs were also shown directly to the south of Area 1, however, these were not evident on site. Both sets of tanks were identified on a drawing in the previous Phase I report undertaken by Environ in 2007, and highlighted by the recent Brookbanks Phase I.

Intrusive Investigations

Area 1 (main quarry area in the central and eastern sections of the site) of the intrusive investigation was undertaken on 21st to 23rd September 2016 and comprised trial pitting, window sample boreholes, and cable percussive boreholes.

Area 2 of the intrusive investigation was carried out on 17th and 18th October 2016 and included trial pits and cable percussive boreholes in the Uncontrolled Landfill Area to the west of the main quarry site.

According to the Unexploded Ordnance (UXO) report provided by the client (due to the proximity to a historical airfield) the risk of finding unexploded ordnance is considered moderate. However, due to the fact that much of the site has since been disturbed by quarrying and landfilled, it is considered that any ordnance is likely to have already been removed or dealt with. As such, supervision by a UXO trained engineer was deemed unnecessary for the intrusive investigation.

Ground Conditions Area 1

Made Ground was encountered across the majority of the site. In the north west area of the site the Made Ground was encountered to depths of up to 0.05 to 2.40m in 6 No. locations and typically consisted of clayey gravelly medium SAND with occasional flint and sandstone gravel and cobbles.

The Made Ground in the central and southern sections of the site was significantly deeper (to depths of up to 5.70-12.60m), and typically comprised loose to medium dense medium silty gravelly SAND, or as very sandy gravelly silt CLAY, with occasional to numerous gravel to cobble-sized fragments of concrete, brick, tarmacadam and with occasional cobble-sized pockets of clay and of silt. Gravel is of sub-rounded flint. With occasional ash fragments in 8 No. locations; a slight peaty odour in 5 No. locations; and cobble-sized timber fragments in 5 No. locations.

The Kesgrave Catchment Subgroup was encountered underlying the Made Ground in 4 No. of the exploratory holes. It generally comprised loose to medium dense slightly gravelly medium SAND. Gravel is of sub angular flint, quartzite and occasionally sandstone.



The Red Crag Formation was encountered underlying the Made Ground in 11 No. locations; and underlying the Kesgrave Catchment Subgroup in 2 No. locations. It generally comprised medium dense to very dense SAND with occasional whole shells.

The Thames Clay Formation was encountered under the Made Ground in 2 No. locations as weak MUDSTONE, and as stiff brown silty CLAY.

Area 2

Made Ground was encountered across the site.

It generally comprised loose to medium dense fine to medium SAND over medium dense to very dense clayey gravelly medium to coarse SAND with occasional to numerous gravel-sized to boulder-sized fragments of concrete and brick; with rare to occasional gravel to cobble-sized fragments of tarmacadam rope, plastic and fabric. And with occasional metal fragments in 5 No. locations, and cobble to boulder-sized timber fragments in 6 No. locations. Gravel is of sub-rounded flint and quartzite. Numerous cobble-sized peaty pockets were encountered in TP20, and a slight peaty odour was encountered in 2 No. locations.

The Kesgrave Catchment Subgroup was not encountered during the investigation.

The Red Crag Formation was encountered underlying the Made Ground in 4 No. locations. It generally comprised medium dense to very dense SAND with numerous shell fragments and occasional whole shells, over extremely weak SANDSTONE in 3 No. locations.

Groundwater

Groundwater was encountered in 4 No. trial pits during the intrusive investigation from 0.50m to 4.50m as damp to wet ground.

Groundwater was encountered in the installed boreholes during subsequent monitoring visits in 8 No. of the 12 No. cable percussion boreholes locations from 3.00m to 11.80m, and in 1 No. of the 8 No. window sample locations at 4.10m.

Proposed Development

The masterplan phasing overlay of the entire development site comprises 4 No. proposed residential areas (R1 to R4) covering a total of 53.63 ha and 5 No. surrounding proposed open space areas (OS1 to OS5) covering a total of 46.96 ha. The present report covers parts of OS1, OS2 and R2 (Area 1), and an unnamed parcel of land adjacent to western boundary of OS1 (Area 2).

Geotechnical Conclusions & Recommendations

Shallow/Trench Fill Foundations

Based on the information to date, current site levels and subject to the final layout, shallow/trench fill foundations are likely to be suitable only



for the north western part of Area 1 where the Made Ground was significantly shallower than the rest of the site (0.05m to 2.40m). Area 2 is proposed for POS therefore no structures are envisaged here.

It is recommended that foundation loads are transferred onto the medium dense granular soils of the Kesgrave Catchment Group or Red Crag Formation, utilising traditional strip/trench foundations.

An allowable bearing pressure of 100 kN/m² is recommended based on total settlements of less than 25mm for 0.60m wide foundations for this stratum.

Further investigation of localised loosening of the natural strata is recommended (e.g. in the area WSO4) to confirm suitability of shallow foundations and bearing capacity in this area.

Alternative Foundations

The Made Ground is not considered suitable bearing strata due to its inherent variability which may result in unacceptable differential settlements.

Consequently, consideration is given below to the following potential foundation solutions:

1. Raft foundations
2. Vibro stone columns
3. Piled foundations

Raft foundations are not considered suitable at this stage for the site based on the significant variability in the Made Ground and presence of biodegradable materials including timber and metal fragments, the proportions of which are significant in selected locations. Further delineation of the Made Ground may however, be beneficial.

Vibro stone columns are similarly considered potentially unsuitable for the site based on the significant variability in the Made Ground and presence of biodegradable materials together with soft layers which could affect the integrity of the columns.

Consequently, it is recommended that foundation loads are transferred onto the medium dense to very dense granular or extremely weak to weak sandstone of the weathered Red Crag Formation utilising piled foundations.

The piled foundations are likely to be required to extend into the competent strata (very weak SANDSTONE) at around 9.00m to 15.45m.

Driven piles are likely to be the most economic pile type, however, it is recommended that a specialist piling contractor is contacted to design and warrant a suitable system. Given the risk to the underlying Aquifers, the Environment Agency may require CFA piles to reduce the



potential creation of a preferable migration pathway for residual contaminants.

Other information

Suspended floor slabs are envisaged for the majority of Area 1.

For both Areas 1 and 2, ACEC Class AC-1s (Design Class DS-1) conditions are indicated to typically prevail in the near surface soils on the most of the site.

Slope stability associated with exposed and buried high walls is likely to be a localised issue related to the edges of the existing and historical quarrying. On the site and will require addressing as part of a more detailed investigation

At this stage, prior to in situ CBR testing, a CBR design value of 20% is recommended locally for the natural granular soils and <2% for geotechnically suitable Made Ground.

Environmental Risk Assessment & Liabilities

Risks to Site Users

Identified Sources: 'Hotspots' / localised exceedances of mercury, lead, coal tar PAHs and potential widespread coal tar PAHs in Area 1 in the Made Ground. 1 No. benzo(a)pyrene concentration in Area 1 was in the vicinity of quarry vehicle parking and a fuel tank which likely represents its source.

'Hotspots' / localised exceedances of arsenic and coal tar PAHs in the Made Ground of Area 2.

Potential Risks: End users of the site and construction/maintenance workers are potentially at significant risk from the sources identified above and further testing and assessment is required. The PAHs represent a potential risk via the inhalation pathway.

Risks to Controlled Waters

Potential Sources: Elevated TPHs, total PAHs and benzo(a)pyrene in the groundwater in Area 2.

Localised lead, mercury and coal tar PAHs in the soils of Area 1.
Potential widespread coal tar PAHs in Area 1.

Localised arsenic and car tar PAHs in the soils of Area 2.

Potential Risks: Risks to the underlying Principal Aquifer are considered potentially significant particularly based on the levels of TPHs and PAHs recorded in the groundwater in Area 2. Further assessment is recommended below.



Ground Gases

Radon protective measures are not required.

Due to the fact that the much of the site (a significant part of Area 1 and the whole of Area 2) lies either on or directly adjacent to a historical landfill and there are significant depths of Made Ground, it is considered that Area 1 should be categorised as 'Amber 2' in accordance with the NHBC traffic light system detailed in CIRIA C665, and as such special gas protection measures are deemed necessary.

In addition, further monitoring and possible venting of Area 2 is recommended to reduce risks to the proposed development and off site receptors.

VOC membranes will be required in Area 1 where elevated PAHs remain beneath buildings.

Remediation

Human Health Remedial Measures

Based on the information available the following remedial measures are anticipated to protect human health:

- Delineation and capping of the identified areas of contamination. (In view of the history of the site this may comprise the majority of both areas subject to the proposed end use of Area 2).
- Where capping is required, front gardens and landscape areas will require 300mm of capping, whilst rear gardens will require 600mm, subject to approval of the Local Authority and NHBC.
- The thickness and source of any capping materials should be independently verified by GEG. Site won material outside the identified areas of contamination could be used.
- Removal of any contaminated soils to facilitate placement of the capping layer should also be independently verified by GEG to ensure regulatory approval.
- VOC membranes where elevated PAHs remain beneath buildings.

Protection of Controlled Waters

Subject to further investigation and DQRA if required, based on the information available the following localised remedial measures are potentially required to controlled waters:

- Removal of any gross soil hydrocarbon contamination in the area of the tanks etc.
- Treatment of the localised TPH and PAH groundwater contamination utilising Enhanced Natural Attenuation including for example oxygen release compounds (ORC) and subsequent monitoring. Chemical oxidation is not considered suitable at this stage due to the levels of potentially explosive gases present.



However, liaison with a specialist contractor is advised.

- Backfilling of excavations with approved inert verified material.
- Validation Reporting.

Further Investigation Requirements

The following further work is recommended:

- Further detailed investigation is required around the quarry buildings and in particular in the vicinity of the assumed fuel tanks to determine whether any soil and groundwater hydrocarbon contamination and asbestos are present.
- Delineation of the identified 'hotspots' across both areas and further investigation of potential widespread coal tar PAHs in Area 1.
- Further gas and groundwater monitoring in Area 1 and Area 2.
- Detailed Quantitative Risk Assessment (DQRA) for groundwater (if required following the above).

This executive summary is intended to provide an outline of the site assessment in relation to ground contamination and geotechnical parameters. It does not provide a definitive analysis of the information obtained.



1. INTRODUCTION

1.1 General

Geo Environmental Group (GEG) were commissioned by Brookbanks Consulting Limited (Brookbanks) on behalf of Commercial Estates Group (CEG) and Carlyle Land Ltd (Carlyle Land) (the Clients) to undertake a Phase I Review & Phase II Strategic Geo-Environmental Assessment of a site known as 'Land south and east of Adastral Park' in order to provide relevant information with respect to the proposed development of the site.

The report has been staged to encompass two areas of investigation referred to as 'Area 1' and 'Area 2'. (These are sections of a much larger development area which in total cover approximately 101 hectares). Area 1 comprises the larger of the two sites and includes the Brett Aggregate quarry as well as an historical associated landfill. Area 2 lies directly to the north west of Area 1 and covers a large part of an uncontrolled historical landfill.

The purpose of this report was to determine:

- Potential environmental risks and liabilities associated with any potential soil and shallow groundwater contamination in accordance with current UK guidance (CLR 11) for a future residential end use.
- Geotechnical requirements for foundations, buried concrete, excavations, earthworks and slope stability with respect to the proposed residential development of the site.

A Preliminary Earthworks Specification was previously undertaken by GEG on behalf of the client (Ref. GEG-16-458_EW_Spec, dated 18th July 2016).

1.2 Available Information

The following information was supplied by Brookbanks:

- 'Masterplan Phasing Overlay,' Brookbanks.
- 'Illustrative Framework Masterplan,' BroadwayMalyan, Drawing Ref. 31677 01, dated 3rd March 2017.
- 'Geo-Environmental Phase I Desk Study,' Brookbanks, Ref. 10391/DS/01 DRAFT, dated 9th December 2016.
- 'Earthworks Strategy Report,' WSP (on behalf of BT Telereal), Ref. 12220424 Rev01, dated September 2009.
- 'Environmental Statement,' ENVIRON UK Ltd, dated April 2009.
- 'Phase 1 Environmental Assessment of Undeveloped Land, Martlesham Heath,' ENVIRON UK Ltd, Ref. 64-C12305, dated 21st September 2007.
- 'Preliminary Unexploded Ordnance (UXO) Risk Assessment of Advanced Communications Technology Centre, Adastral Park,' Landmark, Ref. P5507, dated 20th February 2016.



- Various historical maps and map data.

GEG also purchased various utility company service drawings of the site.

1.3 Proposed Site Development

The current proposed development of the site comprises up to 2000 homes, an employment area of c0.6ha (use class B1), a secondary local centre (comprising use classes A1, A3, A5 and D2), a school, green infrastructure (including Suitable Accessible Natural Greenspace (SANGs), outdoor play areas, sports ground and allotments/ community orchards, public footpaths and cycleways, vehicle access, and associated infrastructure.

1.4 Scope

The works performed by GEG included:

- A Phase I Review of available information.
- A staged Phase II intrusive investigation undertaken as follows:
 - i. Area 1 comprising machine-excavated trial pits, cable percussive boreholes and window sample boreholes across the central section of the site;
 - ii. Area 2 comprising additional machine-excavated trial pits, and additional cable percussive boreholes in the area of the uncontrolled landfill in the western section of the site.
- Chemical analysis and geotechnical testing of selected soil samples.
- Chemical testing of groundwater samples (in Area 2 only).
- Gas and groundwater monitoring.
- Development of the conceptual model and generic quantitative human health and qualitative Controlled Waters environmental risk assessments in accordance with CLR11.
- A qualitative/quantitative ground gas risk assessment in accordance with NHBC and CIRIA guidance.
- A geotechnical assessment (including foundations, floor slabs, buried concrete, road pavement design etc.) and including recommendations for suitability of the site for soakaway drainage.
- Recommendations for further investigation and/or remedial work (if required).
- Provision of a report documenting the above.

Limitations to the scope of the report are outlined in Section 12.



2. SITE SETTING

2.1 Site Location

The entire proposed development area (hereafter referred to as the 'main site') covers an area of approximately 100.59 hectares. It is located to the east of Adastral Park in Martlesham Heath at the approximate National Grid Reference 625788E, 244800N.

Area 1 is approximately 18.2 hectares and is located in the centre of the main site at the approximate National Grid Reference 625863E, 244792N.

Area 2 is approximately 3.01 hectares and is located in the west of the main site at the approximate National Grid Reference 625593E, 245024N.

A section of the 1:25,000 Ordnance Survey (OS) map identifying the site location is shown in Figure 1 of Appendix A. The site layout plan is presented in Figure 2 (Appendix A) and a photographic record is provided in Appendix B.

2.2 Site Description

The site covers a large area of land between Adastral Park to the north and west, and Ipswich Road to the south. The site comprises an active quarry (Brett Aggregates) with associated areas of historical landfill currently used as agricultural fields or set aside land with the Brett Aggregates site offices, cement works, warehouse and aggregate stock piles in the centre of the site. Topographically, the site falls broadly from the north to the south at a fairly gentle angle, but natural levels have been disturbed by quarrying and landfill activity. A relatively steep slope makes up the gap between Area 1 and Area 2, and the active quarry areas in the centre of the main site are significantly lower than the landfill areas in the north and south.

With reference to Figure 2, the following physical characteristics of the site for Area 1 and Area 2 have been obtained from the site walkover which was undertaken on the 21st September 2016.

2.2.1 Area 1

Access

Area 1 was accessed via Ipswich Road to the south east, via Brett Aggregates.

Current site status and boundaries

The majority of the central and southern sections of Area 1 are an active quarry run by 'Brett Aggregates' with aggregate washing facilities and machinery parking; a series of fishing lakes lie in the western central section; the land to the east and west of the main quarry area are agricultural set-a-side land over landfill, and the land to the north comprises the BT testing strip, (for telecom and communication research) associated with Adastral Park, and scrub-covered landfill. Three large lakes/silt pits are located in the eastern section of the site, and are associated with the quarry works.



Ground levels / slopes on or close to the site	Area 1's levels undulate naturally from north to south, but much of the natural topography has been disturbed by quarrying activities. The central section, the fishing lakes and the two sections currently being quarried, represent the lowest site levels, with the topography gently increasing to the south west, and more steeply to the north east. The ground levels of the quarry in the centre and north of the site are lower than the landfill in the south.
Depressions in the ground surface	None observed.
Waterlogged or marshy ground	None observed.
Surface water	The lakes in the eastern section and the fishing lakes in the western central section.
Trees or hedges	Trees and hedges bound the fields around the edges of the site, with a few sporadic trees around the fishing lakes.
Existing buildings on site	<p>In the centre of Area 1 there were two single storey temporary buildings associated with the quarry: the site office and the office for the cement works. There was also a large single storey building to the west of the site office.</p> <p>There was an aggregate washing plant to the north east of the site office, and a concrete mixing plant to the east of the site office.</p>
Basements on site	None observed.
External hardstanding	Various across the active quarry site associated with vehicle parking and internal road systems.
Made Ground, earthworks or quarrying	The central section of Area 1 was an active quarry, two sections to the north and the south east were still being actively worked at the time of the site works. Much of the rest of the site comprised historical landfill (presumably associated with infilling of former areas of the quarry). Significant depths of Made Ground are anticipated
Overhead / buried Services present	Buried electricity and BT cables associated with the site offices and the BT testing facility in the north.

The following environmental observations regarding the site were made during the site walkover:



Tank storage and dispensing facilities	Diesel tanks for refuelling were present in the western section of Area 1, behind the large building.
Potentially hazardous materials	None observed.
Asbestos-containing materials	The quarry office buildings may potentially contain asbestos, with a full asbestos survey is recommended prior to development.
Waste storage	None observed.
Electricity sub-stations	None observed.

2.2.2 Area 2

Access	Area 2 was accessed from Ipswich Road to the south east via a farm/BT access track. The site could also be accessed through Brett Aggregates via a haulage road.
Current site status and boundaries	Area 2 was part of a larger agricultural field with bramble overgrowth and hedge boundaries to the north, east and west, with no physical boundary to the south. It has been designated as an Uncontrolled Landfill as records of disposed material are limited.
Ground levels / slopes on or close to the site	The site levels sloped gently from north to south. However, it should be noted that much of the natural topography has been disturbed by quarrying activities.
Depressions in the ground surface	None observed.
Waterlogged or marshy ground	None observed.
Surface water	The fishing lake was directly southwest of the site.
Trees or hedges	Deciduous semi mature trees and hedges bound the fields around the edges of the site, with a few sporadic trees around the fishing lake.
Existing buildings on site	None observed.
Basements on site	None observed.
External hardstanding	None observed.



Made Ground, earthworks or quarrying	Area 2 was previously used as landfill. Significant depths of Made Ground are anticipated.
Overhead / buried Services present	None observed.

The following environmental observations regarding the site were made during the site walkover:

Tank storage and dispensing facilities	None observed.
Potentially hazardous materials	None observed.
Asbestos-containing materials	None observed, but a full asbestos survey is recommended prior to development.
Waste storage	None observed.
Electricity sub-stations	None observed.

2.3 Adjacent Land Uses

2.3.1 Area 1

A summary of surrounding land-use in the immediate vicinity of Area 1 of the site including neighbouring properties is provided below.

North	Commercial properties to the northwest, fields and the BT testing strip directly north and a caravan park to the north east.
West	Area 2, Adastral Park (commercial development), the A12, and Martlesham Heath
East	Agricultural fields and Wadringfield Heath Golf Course
South	Ipswich Road and agricultural fields.

2.3.2 Area 2

A summary of surrounding land-use in the immediate vicinity of Area 2 the site including neighbouring properties is provided below.



North	Commercial properties to the northwest, fields directly north and a caravan park to the north east.
West	Adastral Park (commercial development), the A12, and Martlesham Heath
East	Area 1, agricultural fields and Wadringfield Heath Golf Course
South	Ipswich Road and agricultural fields.

3. REVIEW OF AVAILABLE DESK STUDY INFORMATION

Available information relating to the history and current status of the site is summarised in the following sections extracted from the Geo-Environmental Phase I Desk Study Report undertaken by Brookbanks on behalf of their client CEG. The review encompasses the entire 101 hectare site which incorporates the sections covered by this report unless otherwise stated.

3.1 Landfills

There is 1 No. active landfill on site operated by Brett Aggregates Ltd which broadly coincides with Area 1:

- Waldringfield Quarry (Brett Aggregates), A05 Landfill taking Non-Biodegradable Waste

There is 1 No. historical landfill on site which includes the part of the north west of Area 1 and south west of Area 2, operated by Wilding and Smith Ltd.

- The Swale (Wilding and Smith Ltd), Landfill taking inert waste, operating from December 1980 to December 1996.

There are 3 No. historical landfills within 1000m of the main site:

- Waldringfield Caravan Site, approximately 400m north east of Area 1, waste type unspecified, operating dates unspecified.
- Foxhall Road, Brightwell (Suffolk County Council), approximately 1000m south west of Area 1, Landfill taking various waste types (including inert, industrial, commercial, special waste and household), operating from September 1963 to an unspecified date.
- Foxhall Road, Brightwell (Felixstowe Urban District Council), approximately 1000m south west of Area 1, Landfill taking various waste types (including inert, industrial, commercial, special waste and household), operating from December 1994 to an unspecified date.



3.2 Radon

According to the Desk Study report, the site is in an area where between 1% and 3% of properties are above the radon action level. However, according to current guidance no radon protection measures are required.

3.3 Pollution Controls

Brett Aggregates Ltd hold an IPC permit for waste landfilling on site.

3.4 Pollution Incidents

No pollution incidents to Controlled Waters are recorded within 250m of the site.

3.5 Hazardous Substances

There are no records of List 1 or List 2 Dangerous Substances Inventory Sites within 500m of the site. No records of Control of Major Accident Hazard (COMAH) or Notification of Installations Handling Hazardous Substances (NIHHS) sites within 500m of the site.

3.6 Fuel Stations

No fuel station entries are recorded within 500m of the site.

3.7 Ordnance

According to the desk study, the site lies in an area of medium/high risk in regards to unexploded ordnance. However, the suggested mitigation measures in UXO Report will only apply to areas of previous undisturbed ground. Area 1 and Area 2 have been extensively quarried and landfilled since 1971, and as such no mitigation measures are deemed necessary.

3.8 Conservation

According to the desk study, there are no records of National Nature Reserves (NNR), Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), Special Protection Areas (SPA), Special Areas of Conservation (SAC), Ancient Woodlands, Ramsar Sites or World Heritage Sites within 500m of the site.

1 No. Site of Special Scientific Interest (SSSI) lies in the north east of the site and is known as Waldringfield Pit SSSI (Geological Interest). This falls within Area 1 and covers an area of approximately 0.19 acres.

The majority of the site lies within two Nitrate Vulnerable Zones.

3.9 Site History (Areas 1 & 2)

The dates, approximate location and description of pertinent features of the site history as identified from the desk study and historical maps are summarised as follows. Capitalised words denoting structures are taken directly from historical maps.



The history of the site has been traced back to 1884 when it comprised rough grassland and heath.

No significant changes are indicated until 1957 when much of the central section of the site was shown as an unnamed Sand Pit. A Sewage Works was shown from 1965 to 1986 along the northern boundary of the south western section of the site, approximately 750m south west of Area 2.

According to the Environment Agency, from 1996 to 1980 much of the central and southern section of the site became a landfill known as The Swale as detailed in Section 3.1.

Historical map data from 1996 to present shows ponds along the north boundary of Area 1 (former sand pits), and from 2000 to present shows the site as an active quarry and landfill, which according to the Environment Agency is still active and is known as the Waldringfield Quarry as detailed in Section 3.1.

An oil AST and petrol UST is shown in the west of Area 1 (around the existing quarry buildings), and on the 1986 map a Tank is shown in the centre of the site, in Area 1.

3.10 Historical Uses of Adjacent Land (Areas 1 & 2)

The dates, approximate location and description of pertinent features of the site's surroundings as identified from the historical maps are summarised as followed. Please note, capitalised words denoting structures are taken directly from historical maps.

The history of the site surroundings has been traced back to 1884 when it comprised rough grassland and heath with the Swale Plantation adjacent to the north east. Tumuli were also shown on land to the west.

No significant changes are indicated until 1917 when the land approximately 500m northwest of the main site had a military presence, including an air strip (the nearest point of which is approximately 200m from Area 2). The strip and surrounding area were bombed in 1941. The airfield was closed in 1963.

From 1957 a number of small buildings are shown approximately 1000m south west of Area 1, which by 1965 was labelled as Sheep-Drift Farm. By 1971 the north and west of the site was shown as developed, with Tennis Courts, a Sports Field and Works.

From 1979 Adastral Park to the west was shown with several warehouses, BT Research Laboratories, Post Office Research Centre, chemical storage buildings and Tanks.

Residential development expanded to the west between 1980 and 1988, until 2000-2006 when it is marked as Martlesham Heath. A Caravan Park (now the Moon & Sixpence Holiday Park) was first shown on the 1993 map to present approximately 350m to the north east of Area 1.



2 No. petrol ASTs are shown directly to the south of Area 1 on Figure 2 in the 2007 Environ report referenced by the Brookbanks Phase I, however, these were not evident on site.

4. GEOLOGY, HYDROLOGY, HYDROGEOLOGY

4.1.1 Published Geology

Reference to the British Geological Society (BGS) the 1:50,000 BGS digital mapping indicates that the solid geology directly beneath the majority of the site comprises the Red Crag Formation of the Pliocene epoch, and is described as abundantly shelly coarse grained sandstone with ferruginous concretions and a basal bed of flint cobbles. The Thames Clay Formation of the Eocene epoch is indicated as underlying the Red Crag Formation at depth, and is described as sandy silty clay/mudstone of marine origin.

The solid geology is indicated to be overlain by Superficial Deposits comprising the Kesgrave Catchment Subgroup (formerly the Kesgrave Formation) of the Pleistocene epoch that consists of sand and gravel. This is shown to be absent across much of the central, eastern and western sections of the site, presumably removed by quarrying.

No faults are conjectured to intersect the site at the surface.

4.1.2 BGS Boreholes

There is a borehole record referenced on the BGS records that related to a borehole, approximately 50m south of Area 1, at Sheep Drift, Martlesham (Ref.: TM24SE28) sunk in 1961 to a full depth of 250ft.

The geology is summarised below:

- Sand & Gravel to 3.20m
- Red Crag Formation to 11.28m
- London/Thames Clay Formation to 24.30m
- Unclassified Chalk to 76m

Another borehole record referenced on the BGS records relates to a borehole approximately 100m to the north of Area 1, (Ref.: TM24NE17) sunk in 1966 to a depth of 62ft.

The geology is summarised below:

- Sand & Gravel to 0.50m
- Red Crag Formation to 9.40m
- London/Thames Clay Formation 62m

There are no BGS Boreholes recorded in the close vicinity of Area 2.



4.1.3 WSP Boreholes

A previous intrusive investigation adjacent to the north of the site includes several boreholes, 5 No. of which are adjacent to the northern boundary of Area 1, and 2 No. are near the northern boundary of Area 2.

No further information has been provided.

4.1.4 Potential Geo-Hazards

No significant potential geo-hazards such as underground workings, natural cavities, soluble rocks, landslips, compressible deposits, running sands or swelling clays are identified in the Brookbanks Phase I Desk Study.

4.2 Hydrogeology

4.2.1 Groundwater Designation

According to the Environmental Agency the Superficial Deposits are considered a Secondary A Aquifer and the solid geology a Principal Aquifer.

Principal Aquifers are assigned where geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers.

Secondary A Aquifers are defined as permeable layers capable of supporting water supplies at a local rather than a strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

4.2.2 Groundwater Abstractions

According to the Environment Agency there are 2 No. groundwater abstraction licences within Area 1. Both are for mineral washing from an unspecified groundwater source for Brett Aggregates.

There are no groundwater abstraction licences within Area 2.

There is 1 No. groundwater abstraction licence approximately 500m north of Area 1 which is used for a Private Water Supply.

4.2.3 Groundwater Source Protection Zone

According to the Environment Agency, there are no Groundwater Source Protection Zones in the area of the site.

4.3 Hydrology

3.5.1 Nearest Watercourse

The nearest surface water feature, approximately 500m north west, is an unnamed tributary stream which flows into the River Deben.



There is a fishing pond located within the main site, approximately 15m south west of Area 1 and 55m south east from Area 2.

There are 4 No. manmade lakes in the north east edge of Area 1, which are associated with the quarry.

4.3.1 Surface Watercourse Abstractions

According to the Environment Agency there are 2 No. surface water abstraction licences over 500m of the site.

- 1 No. abstraction licence approximately 75m southwest of Area 1 and approximately 200m south of Area 2, which is used for agriculture (irrigation).
- 1 No. abstraction licence approximately 500m south of Area 1, which is used for agriculture (irrigation).

4.3.2 Flooding

According to the Environment Agency, the site is not located within a Flood Zone 2 or 3.

5. ENVIRONMENTAL RISK ASSESSMENT METHODOLOGY

5.1 Regulatory Controls

Contaminated land in England is principally controlled by:

- Part 2A of the Environmental Protection Act (1990) and accompanying Statutory Guidance.
- Planning and Development Controls.

Part 2A relates to contaminated land risks from land in its current condition, whilst the planning and development control essentially is applicable to new developments which fall within the planning regime and applies to the proposed end use of the land.

These two key pieces of legislation are discussed further in the following sections together with other potentially relevant systems.

5.2 Environmental Protection Act - Part 2A

Part 2A of the Environmental Protection Act (1990) [EPA], which was introduced by section 57 of the Environment Act 1995, requires an overall risk-based approach to dealing with contaminated sites, to ensure that they are 'suitable for use'.

DETR Circular 02/2000 'Contaminated Land' which came into force in England on 1st April 2000 provided accompanying regulations and Statutory Guidance. This was superseded by DEFRA Circular 01/2006 'Contaminated Land' which included amendments to address land contaminated by radioactivity.



Definition of Contaminated Land

Contaminated land is defined in section 78A(2) of Part 2A as:

‘Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in on or under the land, that –

- Significant harm is being caused or there is a significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be caused.’

The Water Act 2003 s86 modified the definition of contaminated land to:

Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in on or under the land, that –

- Significant harm is being caused or there is a significant possibility of such harm being caused; or
- Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.’

Recent changes to Part 2A require the local authority to use a four category system in order to decide whether or not land is designated as contaminated land.

Category 1 describes land which is clearly problematic e.g. because similar sites are known to have caused a significant problem in the past.

Categories 2 and 3 cover the less straightforward land where detailed consideration is needed before deciding whether it is contaminated land. The test rests on whether or not the Local Authority believes there is a strong case for regulatory action – and thus whether it should be placed into Category 2 (contaminated land) or Category 3 (not contaminated land). The decision basis is initially related to human health risks, and if this is not conclusive due to uncertainty over risks, wider socio-economic factors (e.g. cost, views of local people etc.).

Category 4 describes land that is clearly not contaminated land. The new Category 4 test is particularly important in terms of reducing uncertainty over when land is clearly not contaminated land in the legal sense. Land at or below SGV/GAC levels derived using the CLEA methodology is likely to be well within Category 4. DEFRA are currently in the process of producing Category 4 screening levels. PT2A states that normal levels of contaminants in soil should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise. DEFRA have commissioned BGS to produce a report determining normal levels of contaminants in UK soils.

Once land has been determined as contaminated land, the enforcing authority must consider how it should be remediated and, where appropriate, it must issue a remediation notice to require such remediation. The enforcing authority for the purposes of remediation may be the local authority which determined the land, or the Environment Agency, which takes on responsibility once land has been determined if the land is deemed to be a “special site”. The rules on what land is to



be regarded as special sites, and various rules on the issuing of remediation notices, are set out in the Contaminated Land (England) Regulations 2006.

'Special Sites'

In certain cases, the Environment Agency is the regulatory authority for the contaminated land legislation. This arises if the site under investigation has been used for certain processes, or if the site is situated on bedrock classed as a Principal Aquifer (i.e. water-bearing strata). In the legislation, these sites are referred to as "Special Sites".

5.3 Planning and Development Controls

The Part 2A contaminated land regime will not normally apply where land is being managed within the normal cycle of land redevelopment and regeneration, where planning and development control will continue to be the primary means of control.

Land contamination, or the possibility of it, is a material consideration for the purposes of town and country planning. Current planning control on contaminated land is set out in **National Planning Policy Framework (England), which replaced PPS23 in March 2012.**

National Planning Policy Framework (England) is intended to complement the pollution control framework under the Pollution Prevention and Control Act 1999 and the PPC Regulations 2000.

In addition to the planning system, the **Building Regulations 1991** (made under the Building Act 1984) may require measures to be taken to protect the fabric of new buildings, and their future occupants, from the effects of contamination. Approved Document Part C (Site Preparation and Resistance to Contaminates and Moisture) 2004 edition gives guidance on these requirements.

5.4 Environmental Protection Act 1990 Part III – Statutory Nuisance

Statutory nuisance provisions will no longer apply where the nuisance arises in relation to land in a 'contaminated state'. However, nuisance provisions could still apply where land gives rise to a nuisance (such as an odour) that is an offence to human senses but which is not covered under the various categories of harm set out in the Contaminated Land Statutory Guidance.

5.5 Permitted Installations

Part 2A will not apply where the Environment Agency or the Local Authority has powers under Integrated Pollution Prevention and Control (IPPC) provisions of the Environmental Permitting Regulations 2007 to take action to remedy contamination resulting from the breach of an installation permit.

Waste Management Licensing (Part II of EPA 1990)

Part 2A will not normally apply where contamination has resulted from land subject to a waste management licence, although it may apply where adverse effects arise from causes other than a breach of licence conditions or from activities



that are permitted under the licence. Licences are regulated and issued by the Environment Agency.

Waste management licensing is currently being incorporated into the Environmental Permitting Regulations (see Permitted Installations).

5.6 Water Resources Act (WRA) 1991

Sections 161 to 161D of the Water Resources Act 1991 give the Environment Agency powers to take action to prevent or remedy the pollution of controlled waters. The Agency can serve a 'works notice' on any person who has 'caused or knowingly permitted' potential pollution to be in a place from which it is likely to enter controlled waters, or to have caused or knowingly permitted a pollutant to enter controlled waters. The works notice specifies what actions have to be taken in what time periods. Where urgent action is required or a works notice is not complied with, the Agency has the power to carry out the works itself and recover costs from the appropriate person.

The Water Resources Act may apply where the Part 2A regime does not, for example where there is historical pollution of groundwater.

The Water Act 2003 includes a provision, not yet commenced, to amend the current Part 2A definition of pollution of controlled waters to introduce a 'significance' test. The Government propose to return to this issue when a significance test for radioactive and non-radioactive contamination can be considered together.

5.7 Groundwater Regulations (GWR) 2009

The existing Groundwater Directive (80/68/EEC) aims to protect groundwater from pollution by controlling discharges and disposals of certain dangerous substances to groundwater. In the UK, the directive is implemented through the Groundwater Regulations (GWR) 2009.

Groundwater is protected under these regulations by preventing or limiting the inputs of polluting substances into groundwater. Substances controlled under these regulations fall into two categories:

- **Hazardous** substances are the most toxic and must be prevented from entering groundwater. Substances in this list may be disposed of to the ground, under a permit, but must not reach groundwater. They include pesticides, sheep dip, solvents, hydrocarbons, mercury, cadmium and cyanide. Hazardous substances replace the previous List 1 substances which came under the 1998 GWR.
- **Non-hazardous pollutants** are less dangerous, and can be discharged to groundwater under a permit, but must not cause pollution. Examples include sewage, trade effluent and most wastes. Non-hazardous pollutants include any substance capable of causing pollution and the list is much wider than the previous List 2 substances. For example, nitrate is included as a pollutant but it was excluded from List 2 in the 1998 GWR.



The existing Groundwater Directive is to be repealed by the Water Framework Directive 2000/60/EC (WFD) in 2013. The GWR 2009 has recently been made law to enact both the WFD and its Daughter Directive 2006/118/EC on the protection of groundwater. This new Groundwater Directive (2006/118/EC) is commonly referred to as the Groundwater Daughter Directive (GWDD).

5.8 Suitable for Use Approach

In practice, most sites with a previous potentially contaminating history are remediated to a condition 'suitable for use' under the planning regime rather than the Part 2A legislation.

The 'suitable for use' approach outlined in DEFRA Circular 01/2006 consists of the following three elements:

- Ensuring that land is suitable for its current use.
- Ensuring that land is made suitable for any new use, as planning permission is given for that new use.
- Limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of land for which planning permission is being sought.

Where new development is taking place, it will be the responsibility of the developer to carry out the necessary remediation. In most cases, the enforcement of any remediation requirements will be through planning conditions and building control, rather than through a remediation notice issued under Part 2A.

5.9 Assessment Methodology

The DEFRA and Environment Agency Contaminated Land Report 11 (CLR11) 'Model Procedures for the Management of Land Contamination' provides a technical framework for structured decision making about land contamination.

Definition of Risk

CLR11 defines risk as:

- A combination of probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

The Concept of the 'Pollutant Linkage'

In the context of contaminated land, there are three essential elements to any risk:

- A **contaminant (or source)** – a substance that is in, on or under land and has the potential to cause harm or cause pollution of Controlled Waters.
- A **receptor** - humans, ecological system, water body or property.
- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.



Each of these elements can exist separately; however, they create a risk only where they are linked together forming a **pollutant linkage**.

Conceptual Site Models

A conceptual site model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors.

The Tiered Risk Assessment Approach

CLR11 presents a tiered approach to risk:

Tier 1 *Preliminary risk assessment (PRA)*

The purpose of the preliminary risk assessment is to develop an initial conceptual model of the site and to establish whether or not there are potentially unacceptable risks. If potential risks are identified the initial conceptual model is developed in subsequent tiers of the risk assessment process.

Tier 2 *Generic quantitative risk assessment (GQRA)*

The purpose of the generic quantitative risk assessment is to establish whether generic assessment criteria and assumptions are appropriate for assessing the risks and, if so, to apply them to establish whether there are actual or potential unacceptable risks. It also determines whether further detailed quantitative risk assessment is required.

Tier 3 *Detailed quantitative risk assessment (DQRA)*

The purpose of the detailed quantitative risk assessment is to establish and use more detailed site specific information and criteria to decide whether there are unacceptable risks. It may be used as the sole method of quantitative assessments of risks, or it may be used to refine earlier assessments using generic assessment criteria.

6. PRELIMINARY RISK ASSESSMENT AND OUTLINE CONCEPTUAL MODEL

6.1 Potential Contaminants of Concern

6.1.1 Area 1 & 2

Based on the historical and current usage of the site as formerly agricultural land and latterly as a quarry and landfill potential **on-site** contamination sources are likely to be limited to:

- Soil contaminants, landfill gas and leachates associated with the landfilled material and any general Made Ground.



- Any localised spillages or leakages of fuel or oils from machinery/vehicles or from the identified oil AST and petrol UST in the area of the large building in the western section of the site).
- Asbestos associated with the existing and former buildings etc.

6.1.2 Area 1 & 2

The potential **off-site** contamination sources are likely to be associated with the following current and historical uses:

- Contamination from a number of ASTs and USTs, and a chemical storage building (approximately 500m from Area 2) at Adastral Park which lies directly adjacent to the west boundary of Area 2 and the petrol USTs to the south of Area 1. A Phase II investigation was undertaken in the area of these potential sources on Adastral Park, and the limited contamination identified was not considered to be of significant risk.
- Landfill gas and leachates associated with the landfilled material.
- Potential ordnance associated with the adjacent airfield.

The potential limited contaminants of concern associated with the current and historical land uses outlined above include:

- Herbicides / pesticides (including DDT and dieldrin).
- Petroleum hydrocarbons (TPH) and polyaromatic hydrocarbons (PAHs).
- General contaminants including metals, semi-metals and non-metals, inorganic chemicals, organics and asbestos.
- Landfill gas and leachates.

A diagrammatic illustration for Area 1 and Area 2 of the outline conceptual model is presented in Figures 3A and 3B of Appendix A.

6.2 Preliminary Human Health Conceptual Model

Potential Sources: Potential contamination associated with the usage of the site and adjacent land as detailed in Section 6.1.

Potential Pathways: Dermal contact with soil and dust, ingestion of home grown produce and attached soil (residential areas only), inhalation of soil and dust, and the inhalation of indoor and outdoor vapours and ground gases. Potential combustion or explosion of ground gases in confined spaces.

Potential Receptors: Future site users (residents, site workers, visitors, construction/maintenance workers and potential trespassers). Also site flora and fauna and future



buildings/structures and construction materials (e.g. water supply pipes).

6.3 Preliminary Controlled Waters Conceptual Model

Potential Sources: Potential contamination associated with the usage of the site and adjacent land as detailed in Section 6.1.

Potential Pathways: Infiltration of precipitation through the site's surface and leaching of potential contaminants and subsequent vertical migration to the aquifer or horizontal migration to the watercourse.

Potential Receptors: Underlying groundwater in the Principal and Secondary A Aquifers; 4 No. manmade lakes in the north east edge of Area 1, which are associated with the quarry; the fishing pond located within the main site, approximately 15m south west of Area 1 and 55m south east from Area 2; and, the unnamed tributary stream which flows into the River Deben approximately 500m north west.

The 2 No. on site groundwater abstraction licences associated with the quarry which will presumably have terminated/sealed by the time of development, but if remaining will potentially be at risk. The surface water abstraction approximately 75m to the south west of Area 1 is also potentially at risk. (The other surface water abstraction is considered too distant from the site to be at significant risk.)

6.4 Preliminary Ground Gas Assessment

6.4.1 Areas 1 & 2

Due to the historical landfills and anticipated significant thickness of Made Ground on the site, risks associated with ground gas are considered medium at this stage. (Further assessment is presented in Section 8.4 following the intrusive investigation.)

As previously described, the site is in an area where between 1% and 3% of properties are above the action level. Therefore, based on current guidance radon protective measures are not required.

7. INTRUSIVE INVESTIGATION

The following section outlines the scope of the intrusive investigation carried out by GEG and details the ground conditions encountered and the chemical testing undertaken.



7.1 Site Works

7.1.1 General

The following sections outline the scope of the intrusive investigation carried out by GEG and details the ground conditions encountered and the chemical testing undertaken.

All work was undertaken in accordance with current British Standard guidance (BS:5930 and BS:10175) and the ICE UK Specification for Ground Investigation (2nd Edition 2012) guidelines.

Prior to commencement of the works, service plans obtained from the client were viewed in order to identify the location of all major services.

The exploratory holes were logged and sampled by an experienced geo-environmental engineer from GEG. The ground conditions encountered were recorded on the exploratory hole logs (Appendix C). Where strengths and relative densities are in brackets on the exploratory hole logs, these are based on visual assessment in accordance with BS:5930, in the absence of in-situ or laboratory tests.

The locations of the exploratory holes are shown on Figure 4A for Area 1, and Figure 4B for Area 2 presented in Appendix A.

7.2 Ordnance

According to the Unexploded Ordnance (UXO) report provided by the client due to the proximity to a historical airfield the risk of finding unexploded ordnance is considered medium. However, due to the fact that much of the site has since been disturbed by quarrying and landfilled, it is considered that any ordnance is likely to have already been removed or dealt with. As such, supervision by a UXO trained engineer was deemed unnecessary for the intrusive investigation.

No evidence of unexploded ordnance, ordnance residues or remnants of crashed aircraft was identified during the intrusive investigation.

7.3 Site Works – Area 1

7.3.1 General

Area 1 (main quarry area in the central and eastern sections of the site) of the intrusive investigation was undertaken on 21st to 23rd September 2016 and comprised trial pitting, window sample boreholes, and cable percussive boreholes as detailed in the following sections:

7.3.2 Limitations of Intrusive Investigation

Some exploratory hole positions were subject to relocation to avoid spoil heaps, active working areas and areas of public access (i.e. by Brett Aggregate customers).

Further post demolition investigation is required around the office buildings, areas inaccessible due to quarry machinery and workings, and in the vicinity of the



assumed refuelling tank to determine whether any soil and groundwater hydrocarbon contamination is present.

7.3.3 Cable Percussion Boreholes

9 No. 150mm diameter cable percussion boreholes (CP01-CP09) were drilled to a maximum depth of 15.45m. Disturbed samples were taken at each major strata change and regular intervals in between. In-situ standard penetration tests (SPTs) were carried out at regular intervals to confirm the strength/relative density.

5 No. positions were installed with 50mm diameter standpipes to depths detailed on the exploratory hole logs, for subsequent gas and groundwater monitoring.

7.3.4 Window Sample Holes

8 No. window sample boreholes (WS01-WS08) were drilled using a Competitor Dart dynamic sampling rig to a maximum depth of 6.45m. Continuous sampling was undertaken using a liner system and standard penetration tests (SPTs) were carried in each hole to confirm the strength/relative density.

All positions except WS01 were installed with 50mm diameter standpipes to depths detailed on the exploratory hole logs, for subsequent gas and groundwater monitoring.

7.3.5 Trial Pits

13 No. trial pits (TP03-TP15) were excavated using a JCB-3CX to a maximum depth of 4.30m to facilitate investigation of the near surface soils.

7.3.6 Sampling

Samples were taken from the exploratory holes for geotechnical and chemical testing as described in Section 7.5 and 7.66 respectively.

7.3.7 Gas and Groundwater Monitoring

Gas and groundwater monitoring was undertaken on 3rd, 15th and 24th November 2016 targeting periods of falling atmospheric pressure where possible. The standpipes were monitored for methane, carbon dioxide, oxygen, hydrogen sulphide and the borehole gas flow rate using a GA2000 gas analyser. Atmospheric pressure and trend was also recorded.

Table 1. Area 1 Gas Monitoring Results

Borehole	Date	Atmospheric Pressure (mb)	Atmospheric Pressure Trend	Methane (% Vol.)	Carbon Dioxide (% Vol.)	Oxygen (% Vol.)	Hydrogen Sulphide (ppm)	Borehole Flow (l/hr)
CP03	3/11/16	1014	Rising	15.5	2.4	2.3	0	0.0
	15/11/16	1007	Falling	12.5	5	0.6	0	0.2
	24/11/16	1016	Rising	0.0	0.1	20.7	0	0.1
CP05	3/11/16	1014	Rising	0.0	0.2	18.9	0	0.2
	15/11/16	1007	Falling	0.1	0	21.2	0	0
	24/11/16	1016	Rising	0.0	0.1	20.6	0	0.2
CP06	3/11/16	1014	Rising	0.0	2.2	13.5	0	0.0



Borehole	Date	Atmospheric Pressure (mb)	Atmospheric Pressure Trend	Methane (% Vol.)	Carbon Dioxide (% Vol.)	Oxygen (% Vol.)	Hydrogen Sulphide (ppm)	Borehole Flow (l/hr)
	15/11/16	1007	Falling	0.1	2.4	11.3	0	1.2
	24/11/16	1016	Rising	0.0	2.6	10.8	0	0.1
CPo7	3/11/16	1014	Rising	7.8	2.1	3.0	0	0.0
	15/11/16	1007	Falling	6.9	2.5	0.1	0	0.4
	24/11/16	1016	Rising	0.0	0.1	21	0	0.1
CPo9	3/11/16	1014	Rising	0.1	2.0	8.0	0	0.0
	15/11/16	1007	Falling	0.5	1.5	0.3	0	0.1
	24/11/16	1016	Rising	0.0	0.1	20.7	0	0.0
WSO2	3/11/16	1014	Rising	0.1	7.2	3.6	0	0.0
	15/11/16	1007	Falling	0.3	5.5	0.5	0	0.4
	24/11/16	1016	Rising	0.3	7.5	0.4	0	0.1
WSO3	3/11/16	1014	Rising	0.1	1.1	19.8	0	0.0
	15/11/16	1007	Falling	0.1	0.1	20.46	0	0.1
	24/11/16	-	-	-	-	-	-	-
WSO4	3/11/16	1014	Rising	0.1	1.0	18.3	0	0.0
	15/11/16	1007	Falling	0.1	1.0	19.5	0	0.4
	24/11/16	1016	Rising	0.0	0.05	20.8	0	0.3
WSO5	3/11/16	1014	Rising	0.1	1.9	6.1	0	0.0
	15/11/16	1007	Falling	0.1	1.5	7.5	0	0.1
	24/11/16	1016	Rising	0.0	0.1	19.6	0	0.0
WSO6	3/11/16	1014	Rising	0.1	3.7	13.0	0	0.0
	15/11/16	1007	Falling	0.1	3.1	12.4	0	0.4
	24/11/16	1017	Rising	0.0	3.4	12.3	0	0.1
WSO7	3/11/16	1014	Rising	9.2	3.1	2.8	0	0.0
	15/11/16	1007	Falling	9.7	2.2	0.1	0	0.2
	24/11/16	1016	Rising	0.4	1.3	8.4	0	0.0
WSO8	3/11/16	1014	Rising	0.0	1.1	18.3	0	0.0
	15/11/16	-	-	-	-	-	-	-
	24/11/16	-	-	-	-	-	-	-

Notes: WSO8 was accidentally destroyed by quarry works between the 3rd November and 15th November 2016. WSO3 was inaccessible on 24th November due to surface water.

The gas monitoring results recorded elevated methane concentrations of 0.0% to 15.5% and carbon dioxide concentrations of 0.0% to 7.2% with a maximum borehole flow rate 1.2 l/hr.

The water levels were monitored using a dip meter; results are presented in Section 7.7.2.5.

7.4 Site Works – Area 2

7.4.1 General

Area 2 of the intrusive investigation was carried out on 17th and 18th October 2016 and included trial pits and cable percussive boreholes in the Uncontrolled Landfill Area to the west of the main quarry site.

7.4.2 Limitations of Intrusive Investigation

Some exploratory hole positions were subject to relocation to avoid spoil heaps, active working areas and areas of public access (i.e. Brett Aggregate customers) as for Area 1.



Some of the trial pits and cable percussive boreholes (CP17a, CP17-20, and TP01) refused within the Made Ground (from depths of 1.41m up to 15.20m) due to large concrete boulders.

7.4.3 Cable Percussion Boreholes

8 No. 150mm diameter cable percussion boreholes (CP17a, CP17-CP20, CP25, CP26, and CP28) were drilled to a maximum depth of 15.45m. Disturbed samples were taken at each major strata change and regular intervals in between. In-situ standard penetration tests (SPTs) were carried out at regular intervals to confirm the strength/relative density.

7.4.4 Trial Pits

11 No. trial pits (TP01-TP02, TP16-TP18, and TP20-TP25) were excavated using a JCB-3CX to a maximum depth of 4.10m to facilitate investigation of the near surface soils.

7.4.5 Sampling

Samples were taken from the exploratory holes for geotechnical and chemical testing as described in Section 7.5 and 7.6 respectively.

7.4.6 Gas and Groundwater Monitoring

Gas and groundwater monitoring was undertaken on 3rd, 15th and 24th November 2016, targeting periods of falling atmospheric pressure where possible. The standpipes were monitored for methane, carbon dioxide, oxygen, hydrogen sulphide and the borehole gas flow rate using a GA2000 gas analyser. Atmospheric pressure and trend was also recorded.

Table 2. Area 2 Gas Monitoring Results

Borehole	Date	Atmospheric Pressure (mb)	Atmospheric Pressure Trend	Methane (% Vol.)	Carbon Dioxide (% Vol.)	Oxygen (% Vol.)	Hydrogen Sulphide (ppm)	Borehole Flow (l/hr)
CP17a	3/11/16	1014	Rising	24.3	0.2	1.4	0	0.1
	15/11/16	1006	Falling	25.8	0.5	0.2	0	1.3
	24/11/16	1015	Falling	17.2	0.8	2.7	0	0.5
CP18	3/11/16	1014	Rising	57.8	8.6	1.0	0	0.1
	15/11/16	1006	Falling	60.3	7	2.2	0	0.3
	24/11/16	1015	Falling	0.2	1.4	20.2	0	0.0
CP19	3/11/16	1014	Rising	0.3	2.2	4.6	0	0.0
	15/11/16	1006	Falling	8.6	1.4	1.3	0	0.2
	24/11/16	1016	Falling	0.0	0.5	20.1	0	0.5
CP20	3/11/16	1014	Rising	89.5	2.2	0.0	0	0.2
	15/11/16	1006	Falling	74.2	2.5	0.7	0	1.4
	24/11/16	1015	Falling	15.9	2.6	13.4	0	0.2
CP25	3/11/16	1014	Rising	4.6	10.9	1.3	0	0.1
	15/11/16	1006	Falling	4.9	7.1	6.7	0	0.6
	24/11/16	1015	Falling	0.0	8.1	4.3	0	0.6
CP26	3/11/16	1014	Rising	0.1	4.7	15.8	0	0.0
	15/11/16	1006	Falling	0.0	1.1	19.7	0	0.3



Borehole	Date	Atmospheric Pressure (mb)	Atmospheric Pressure Trend	Methane (% Vol.)	Carbon Dioxide (% Vol.)	Oxygen (% Vol.)	Hydrogen Sulphide (ppm)	Borehole Flow (l/hr)
	24/11/16	1015	Falling	0.0	1.8	19.0	0	0.1
CP28	3/11/16	1014	Rising	0.6	3.1	13.4	0	0.0
	15/11/16	1006	Falling	0.6	6.4	6.4	0	0.2
	24/11/16	1016	Falling	0.0	0.1	21.1	0	0.0

The gas monitoring results recorded elevated methane concentrations of 0.0% to 89.5% and carbon dioxide concentrations of 0.2% to 10.9% with a maximum borehole flow rate 1.4 l/hr. The results are assessed in Section 8.4.

The water levels were monitored using a dip meter; results are presented in Section 7.7.2.5.

7.5 Geotechnical Laboratory Testing

Selected samples were despatched to Geo Site and Testing Services Limited and scheduled for geotechnical testing. The schedule of testing comprised:

7.5.1 Area 1

- 14 No. Particle Size Distribution Wet Sieve Method (BS1377: Part 2: 1990: 9.2)

13 No. water soluble sulphate and pH determinations were also undertaken on the natural soils as part of the chemical testing (Section 7.6).

7.5.2 Area 2

- 10 No. Particle Size Distribution Wet Sieve Method (BS1377: Part 2: 1990: 9.2)

8 No. water soluble sulphate and pH determinations were also undertaken on the natural soils as part of the chemical testing (Section 7.6).

The results of the geotechnical testing are presented in Appendix H.

7.6 Chemical Laboratory Testing

Samples were despatched to Scientific Analysis Laboratories Limited for chemical analysis.

7.6.1 Area 1

- 26 No. representative samples of Made Ground and 3 No. natural ground were scheduled for general chemical analysis.

7.6.2 Area 2

- 24 No. representative samples of Made Ground and 1 No. natural ground were scheduled for general chemical analysis.



- 11 No. groundwater samples were scheduled for general chemical analysis.

7.6.3 Areas 1 & 2

The schedule of analysis comprised a combination of a range of contaminants commonly identified on brownfield sites, together with specific determinands based on the former and current site and adjacent site uses, as identified below. All soil analysis was MCerts accredited where possible. The results of the chemical analysis are located in Appendix D.

Soils & Waters

<i>Metals:</i>	Cadmium, chromium (total, III and VI), copper, lead, nickel, zinc, mercury, antimony#.
<i>Semi-Metals and Non-Metals:</i>	Arsenic, boron, selenium, asbestos*#.
<i>Inorganic Chemicals:</i>	Cyanide (total and free), sulphate (soluble), sulphide.
<i>Others:</i>	pH, soil organic matter#, hardness^.
<i>Organics:</i>	Total phenols, banded petroleum hydrocarbons (TPHs), speciated polycyclic aromatic hydrocarbons (PAHs).

* Selected samples only

Soils only

^ Waters Only

7.7 Ground Conditions Encountered

The ground conditions encountered are described below and broadly confirmed the published geology. The strength/relative density of the strata is detailed further in the geotechnical assessment in Section 9.1.

7.7.1 Area 1

7.7.1.1 Made Ground

Made Ground was encountered across the majority of the site.

In the north west area of Area 1 the Made Ground was encountered to depths of up to 0.05 to 2.40m (TP09, TP10, CPO4-CPO6 and WSo8) and typically consisted of clayey gravelly medium SAND with occasional flint and sandstone gravel and cobbles.

The Made Ground in the central and southern sections of the site was significantly deeper (to depths of up to 5.70-12.60m), and typically comprised loose to medium dense brown to yellowish brown medium silty gravelly SAND, or as brown to greyish brown very sandy gravelly CLAY, with occasional to numerous gravel to



cobble-sized fragments of concrete, brick, tarmacadam and with occasional cobble-sized pockets of clay and of silt. The gravel was sub-rounded flint.

Occasional ash fragments were encountered in WSo1B, WSo5, WSo7, TPO3, TPO5-TPO7 and TP15. Occasional cobble-sized timber, and metal fragments were found in TPO3 and TPO7, TP14, and TP15. Selected trial pits also encountered occasional cobble-sized fabric and plastic fragments. Numerous cobble-sized timber, metal and plastic fragments were encountered in TPO8 from 2.10m to at least 4.20m.

Occasional tyre in TPO3 from 3.20m to 3.30m, a slight peaty odour was encountered in 5 No. locations (TPO6, TPO7, TP12, TP14 and TP15) from depths of 1.10m to 3.80m.

Significant softened or low density horizons deeper than 1.00m but less than 2.50m are presented in Table 3A, and those in excess of 2.50m are presented in Table 3B.

Table 3A. Shallow Softened/Low Density Horizons in the Made Ground

Exploratory Hole	Depth (m)	Strength/Density
CPo1	1.50-2.00	Very Loose to Loose
CPo7	1.50-4.50m	Loose
CPo8	1.50-4.50m	Loose
CPo9	1.50-2.50m	Loose
WSo2	1.00-3.00m	Loose
TP13	0.00-0.60m	Loose

Table 3B. Deeper Softened/Low Density Horizons in the Made Ground

Exploratory Hole	Depth (m)	Strength/Density
CPo2	3.00-5.50m	Loose
CPo3	6.00-8.40m	Soft
CPo9	4.50-5.20m	Soft
	7.50-9.00m	
	12.00-12.60m	Soft to Firm
WSo2	3.00-4.00m	Soft
	4.00m-4.50m	Very Soft
WSo4	3.00-3.50m	Very Loose to Loose
WSo7	4.00-4.50m	Soft
TP11	3.30-4.30m	Soft to Firm

7.7.1.2 Topsoil

Natural topsoil was not encountered during the intrusive investigation.

7.7.1.3 Superficial Deposits

The Kesgrave Catchment Subgroup was encountered underlying the Made Ground in 4 No. of the exploratory holes (WSo4, WSo8, TPO9, and TP10). It generally comprised loose to medium dense yellowish brown and orangish brown slightly gravelly medium SAND. The gravel was of sub angular flint, quartzite and occasionally sandstone.



7.7.1.4 The Red Crag Formation

The Red Crag Formation was encountered underlying the Made Ground in CP01-CP09, TP13 and WSO6 commencing from depths of 0.60-15.45m and underlying the Kesgrave Catchment Subgroup in WSO4 and WSO8, from depths of 3.50 and 2.00 respectively. It generally comprised medium dense to very dense yellowish brown to brown SAND with occasional whole shells.

7.7.1.5 Thames Clay Formation

The Thames Clay Formation was encountered underlying the Made Ground in 2 No. locations (CP04 and CP05 from depths of 12.00m and 10.70m respectively), as weak MUDSTONE, and as stiff brown silty CLAY.

7.7.1.6 Groundwater

Groundwater was encountered in some of the exploratory holes during the investigation as shown in Table 4A.

Table 4A. Groundwater Depths during the Investigation

Exploratory Hole	Groundwater Depth (m)	Stratum	Nature of Inflow
WS01	0.50	Made Ground	Ground Wet
WS02	4.50	KCS	Ground Wet
WS05	4.00	Made Ground	Ground Wet
WS07	4.50	Made Ground	Ground Wet
TP06	3.20	Made Ground	Ground Damp
TP07	3.00	Made Ground	Ground Damp
TP08	3.90	Made Ground	Ground Damp
TP15	3.00	Made Ground	Ground Damp

Notes: KCS = Kesgrave Catchment Subgroup

Groundwater levels recorded in the boreholes during the subsequent monitoring visits are summarised in Table 4B.

Table 4B. Groundwater Depths during the Monitoring Visits

Borehole	Date	Depth of Installation (m)	Groundwater Depth (m)
CP03	3/11/16	10.00	DRY
	16/11/16		DRY
	24/11/16		8.50
CP05	3/11/16	10.00	3.00
	16/11/16		3.20
	24/11/16		2.90
CP06	3/11/16	10.00	8.23
	16/11/16		8.10
	24/11/16		8.10
CP07	3/11/16	10.00	DRY
	16/11/16		DRY
	24/11/16		DRY
CP09	3/11/16	10.00	8.74
	16/11/16		8.50



Borehole	Date	Depth of Installation (m)	Groundwater Depth (m)
	24/11/16		8.50
WS02	3/11/16	6.00	DRY
	16/11/16		2.40
	24/11/16		2.40
	3/11/16		DRY
WS03	16/11/16	1.00	0.10
	24/11/16		-
	3/11/16		DRY
WS04	16/11/16	4.00	DRY
	24/11/16		DRY
	3/11/16		DRY
WS05	16/11/16	4.50	4.10
	24/11/16		3.43
	3/11/16		3.50
WS06	16/11/16	4.10	DRY
	24/11/16		DRY
	3/11/16		DRY
WS07	16/11/16	6.00	DRY
	24/11/16		DRY
	3/11/16		DRY
WS08	16/11/16	6.00	DRY
	24/11/16		-
	3/11/16		-

Notes: WS08 was accidentally destroyed by quarry works between the 3rd November and 16th November 2016. WS03 was inaccessible on 24th November due to surface water.

Groundwater levels may vary due to seasonal and other effects, including the relatively short time periods for which the trial pits remained open and the speed of drilling of the window sample boreholes.

7.7.1.7 Stability of Trial Pits

The sides of all trial pit excavations in Area 1 were stable with the exception of slight instability from 0-0.20m in TP04, and 2.70m to 4.10m in TP05.

7.7.2 Area 2

7.7.2.1 Made Ground

Made Ground was encountered across the site.

It generally comprised loose to medium dense fine to medium SAND over medium dense to very dense clayey gravelly medium to coarse SAND with occasional to numerous gravel-sized to boulder-sized fragments of concrete and brick; with rare to occasional gravel to cobble-sized fragments of tarmacadam, rope, plastic and fabric. Occasional metal fragments were encountered in TP18, TP20, TP21, CP18, and CP26); and cobble to boulder-sized timber fragments (in TP18, TP20, TP23, TP25, CP18, and CP26). Gravel is of sub-rounded flint and quartzite. Numerous cobble sized peaty pockets were encountered in TP20 from 1.10m to 1.20m, and a slight peaty odour in TP23 from 1.30m to 1.40m and 3.00m to 3.39m, and in TP24 from 3.00m to 3.50m,



Significant softened or low density horizons deeper than 1.00m but less than 2.50m are presented in Table 5A, and those in excess of 2.50m are presented in Table 5B.

Table 5A. Shallow Softened/Low Density Horizons in the Made Ground

Exploratory Hole	Depth (m)	Strength/Density
CP17	1.60-2.50	Soft to firm
CP18	0.10-1.50m	Soft
CP20	1.50-3.00m	Loose
CP25	1.50-3.00m	Loose
CP28	1.50-2.50m	Loose

Table 5B. Deeper Softened/Low Density Horizons in the Made Ground

Exploratory Hole	Depth (m)	Strength/Density
TP20	3.00-3.85m	Loose
CP18	1.50-2.00m	Very soft to soft
CP18	4.50-6.00m	Soft to firm
CP18	6.00-7.00m	Soft
CP18	10.50-12.00m	Soft to firm
CP20	10.50-10.95m	Loose
CP25	4.50-5.00m	Loose
CP25	6.00-7.50m	Loose
CP28	4.50-6.00m	Loose

7.7.2.2 Topsoil

Natural topsoil was not encountered during the intrusive investigation.

7.7.2.3 Superficial Deposits

The Kesgrave Catchment Subgroup was not encountered during the investigation.

7.7.2.4 Solid Geology

The Red Crag Formation was encountered underlying the Made Ground in CP25, CP26, CP28 and TP17 commencing from depths of 1.70m-6.80m. It generally comprised medium dense to very dense yellowish brown to brown SAND with numerous shell fragments and occasional whole shells, over orangish brown weak SANDSTONE in CP25 from 10.50m to 15.00m, CP26 from 12.00m to 14.00m, and in CP28 from 9.00m to 15.45m.

7.7.2.5 Groundwater

No groundwater was encountered during the intrusive investigation.

Groundwater levels recorded in the boreholes during the subsequent monitoring visits are summarised in Table 6.



Table 6. Groundwater Depths during the Monitoring Visits

Borehole	Date	Depth of Installation (m)	Groundwater Depth (m)
CP17a	3/11/16	6.50	DRY
	16/11/16		DRY
	24/11/16		DRY
CP18	3/11/16	15.20	9.01
	16/11/16		9.10
	24/11/16		9.50
CP19	3/11/16	5.60	4.53
	16/11/16		4.21
	24/11/16		4.50
CP20	3/11/16	11.00	8.80
	16/11/16		9.50
	24/11/16		9.50
CP25	3/11/16	15.00	11.07
	16/11/16		11.10
	24/11/16		11.00
CP26	3/11/16	14.00	11.80
	16/11/16		11.50
	24/11/16		11.20
CP28	3/11/16	15.00	10.78
	16/11/16		10.45
	24/11/16		10.50

Groundwater levels may vary due to seasonal and other effects, including the relatively short time periods for which the trial pits remained open.

7.7.2.6 Stability of Trial Pits

The sides of all trial pit excavations were stable in Area 2.

7.7.3 Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of contamination was encountered in any of the exploratory holes undertaken, with the exception of rare to occasional medium gravel-sized fragments of tarmacadam and ash, locally within the Made Ground.

7.7.4 Ordnance

No visual evidence of ordnance was encountered in any of the exploratory holes undertaken.

8. GENERIC HUMAN HEALTH QUANTITATIVE RISK ASSESSMENT

8.1 Generic Human Health QRA

8.1.1 CLEA

A generic human health quantitative risk assessment has been undertaken primarily using the CLEA software.



Generic assessment criteria (GAC) derived in CLEA, assuming a 'sand' soil type of pH 7 and SOM of 1% were used in the assessment of the Made Ground and natural ground of Areas 1 & 2.

The 'residential with home grown produce' for a semi-detached property has been used in the assessment as this is the most sensitive generic land use and building type in the CLEA model as the current worst case scenario applicable to the proposed development. However sections of the site maybe re-assessed upon finalisation of the proposed layout plan.

The exposure pathways used in the CLEA model were:

- Ingestion of soil and dust
- Ingestion of home grown produce and attached soil
- Dermal contact with soil and dust
- Inhalation of soil and dust
- Inhalation of vapours outdoors
- Inhalation of vapours indoors

8.1.2 *Other Assessment Criteria*

The Risk Based Corrective Action (RBCA) Toolkit has been used to derive assessment criteria for organic compounds not covered by the CLEA Model.

A GEG in-house GAC for total cyanide (for all end uses) has been derived based on acute toxicity and a one-time soil ingestion event.

The following contaminants were not assessed as they are not generally considered to represent a significant risk to human health: sulphate and sulphide.

8.1.3 *PAH Profiling*

Methodology

HPA (2010) has recommended benzo(a)pyrene as a surrogate marker for the assessment of the risks posed by genotoxic PAH compounds where sufficiently similar to the 2 No. coal tar mixtures investigated by Culp *et al.* (1998).

By using a PAH profiling tool, it is possible to assess how closely the ratio of benzo(a)pyrene correlates to the standard mixtures of PAHs. If the mean results are within $\pm 10\%$ of the 2 No. coal tar mixtures then it is possible to use benzo(a)pyrene as a surrogate PAH marker.

Assessment

The assessment is presented in Appendix E and confirms that samples which recorded PAH levels in the Made Ground for both Area 1 (7 No. samples) & Area 2 (13 No. samples) above the laboratory detection limit showed PAH profiles sufficiently similar to the Culp coal tar profiles to allow benzo(a)pyrene to be used



as a surrogate marker. The majority of positive results were found to be within ± 5.0 and all were within the HPA limit of ± 10 the coal tar profiles. The remaining samples for Area 1 (7 No. samples) and Area 2 (10 No. samples) were classified as non-coal tar PAHs.

Benzo(a)pyrene was not detected in the natural ground; consequently PAH profiling was not appropriate and as such the individual PAHs were assessed separately.

8.2 Statistical Analysis of Soil Chemical Data

8.2.1 Methodology

The chemical analysis results from this investigation have been subjected to statistical analysis as detailed in the guidance produced by the Chartered Institute of Environmental Health (CIEH) (CIEH/CL:AIRE, May 2008) where sufficient data is available.

For details of the statistical tests and hypotheses, reference should be made to the aforementioned publication. However, a brief overview is presented below.

In the first instance, a Null Hypothesis (H_0) and Alternative Hypothesis (H_1) are defined as below, in this case based on the Planning Scenario:

H_0 $\mu \geq Cc$ i.e. the true mean concentration (μ) is equal to or greater than the critical concentration (Cc)

H_1 $\mu < Cc$ i.e. the true mean concentration (μ) is less than the critical concentration (Cc)

The data is firstly split into averaging areas based on historical site uses etc. For this site the data has been designated as Made Ground and natural ground soil concentrations for Areas 1 & 2 where random sampling was undertaken (as the statistical analysis is not applicable for targeted sampling). The PAH data has been split into coal tar PAH's and non-coal tar PAH's.

An outlier test (Grubb's Test) is undertaken to determine whether the soil concentrations for each determinand and averaging area belong to the same or are part of a separate population i.e. represent outliers or 'hot spots'.

A normality test is then undertaken to determine if the data is normally distributed, or otherwise.

A significance test (dependent upon the distribution of the data) is then applied to the data to test H_0 and H_1 , and determine the associated level of evidence against H_0 .

The GAC are used as critical concentrations in the assessment.

The one sample t-test is undertaken for Normal data and the Chebychev test for Non-normal data. The former derives a single value for the level of evidence against H_0 , whereas the latter derives upper and lower bound values.



The ESI Ltd Contaminated Land Statistical Calculator has been used to undertake the aforementioned statistical assessments and the output tables are presented in Appendix F and summarised in the following sections.

8.2.2 *Made Ground*

8.2.2.1 *Area 1 Outliers ('Hotspots')*

The following 5 No. hotspots comprising 6 No. 'outliers' were identified in the Made Ground by the statistical analysis of the chemical data:

- 1 No. 'hotspot' in TPO6 at 0.60m of mercury 2 mg/kg.
- 1 No. 'hotspot' in TP11 at 0.30m of lead 260 mg/kg; benzo(a)pyrene (coal tar PAH surrogate marker) 1.4 mg/kg.
- 1 No. 'hotspot' in TP14 at 0.10m of benzo(a)pyrene (coal tar PAH surrogate marker) 1.1 mg/kg.
- 1 No. 'hotspot' in TP15 at 0.10m of benzo(a)pyrene (coal tar PAH surrogate marker) 1.5 mg/kg.
- 1 No. 'hotspot' in WSO6 at 0.10m of benzo(a)pyrene (coal tar PAH surrogate marker) 2.6 mg/kg.

The levels of benzo(a)pyrene recorded in selected 'hotspots' were above the generic GEG CLEA derived inhalation health criteria value of 1.74 mg/kg and as such further assessment of all the volatile PAHs is recommended to confirm risks associated with the inhalation pathway and requirements for VOC membranes.

8.2.2.2 *Area 1 Significance Tests (Widespread Contaminants)*

Statistical analysis of the chemical data from the samples of Made Ground in Area 1 with the outliers excluded identified that the upper confidence limits of the true mean for benzo(a)pyrene (coal tar PAH surrogate marker) (1.72 mg/kg) was above the relevant critical concentration (0.98 mg/kg). This indicates potential widespread coal tar PAH contamination in the Made Ground in the areas of TPO5, TP10, TP11, TP13-TP15 and WSO6. However, the evidence level of 34% was below the required 95% indicating the requirement for additional data

The upper confidence limits of the true mean for all other determinands listed below were below the relevant critical concentrations indicating the absence of further widespread contamination:

- Metals (arsenic, cadmium, total chromium (chromium (total, III and VI), copper, lead, mercury, nickel and zinc).
- Semi-metals and non-metals (boron and selenium).
- Inorganic chemicals (total and free cyanide).
- Organics (total phenols, C6-C40 banded petroleum hydrocarbons, USEPA 16 polycyclic aromatic hydrocarbons [naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene,



indeno(123-cd)pyrene, dibenzo(ah)anthracene and benzo(ghi)perylene].

8.2.2.3 Area 2 Outliers ('Hotspots')

The following 3 No. hotspots were identified in the Made Ground:

- 1 No. 'hotspot' in TPO2 at 0.20m of arsenic 33 mg/kg.
- 1 No. 'hotspot' in TP24 at 0.25m of arsenic 36 mg/kg.
- 1 No. 'hotspots' in TP21 at 3.00m of benzo(a)pyrene (coal tar PAH surrogate marker) 20 mg/kg.

The levels of benzo(a)pyrene recorded in the above 'hotspot' was above the generic GEG CLEA derived inhalation health criteria value of 1.74 mg/kg and as such further assessment of all the volatile PAHs is recommended to confirm risks associated with the inhalation pathway and requirements for VOC membranes.

8.2.2.4 Area 2 Significance Tests (Widespread Contaminants)

Statistical analysis of the chemical data from the samples of Made Ground from Area 2 with the outliers excluded identified that the upper confidence limits of the true mean were below the relevant critical concentrations (indicating the absence of widespread contamination in the Made Ground) for all determinands including:

- Metals (arsenic, cadmium, total chromium (chromium (total, III and VI), copper, lead, mercury, nickel and zinc).
- Semi-metals and non-metals (boron and selenium).
- Inorganic chemicals (total and free cyanide).
- Organics (total phenols, C6-C40 banded petroleum hydrocarbons, USEPA, coal tar polycyclic aromatic hydrocarbons, 16 polycyclic aromatic hydrocarbons [naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(123-cd)pyrene, dibenzo(ah)anthracene and benzo(ghi)perylene].

Low levels of TPHs (up to a total of 170 mg/kg) in the C12-C40 range and PAHs (up to a total of 17mg/kg) were also identified in the shallow Made Ground of Area 2 which, although below the relevant GAC, are a potential risk to underground plastic services (see Section 9.5).

8.2.3 Areas 1 & 2 Asbestos - Made Ground

No asbestos was identified in the 14 No. samples of Made Ground screened in Area 1 and 24 No. samples of Made Ground screened in Area 2.



8.2.4 Areas 1 & 2 Natural Ground

The natural ground chemical analyses were screened directly against the critical concentrations as shown in Table 1A and 1B (Appendix G) as the data set was limited (1 No. sample in Area 1, and 1 No. sample in Area 2).

The following 'exceedance' / localised contaminant has been identified in the natural ground in Area 2:

- 1 No. 'exceedance' in TP17 at 2.30m of lead 360 mg/kg.

All other determinands were below the relevant critical concentrations including:

- Metals (arsenic, cadmium, total chromium, chromium VI, copper, lead (in Area 1), mercury, nickel and zinc).
- Semi-metals and non-metals (boron and selenium).
- Inorganic chemicals (total and free cyanide).
- Organics (total phenols, C6-C40 banded petroleum hydrocarbons, USEPA 16 polycyclic aromatic hydrocarbons [naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(123-cd)pyrene, dibenzo(ah)anthracene and benzo(ghi)perylene].

8.2.4.1 Asbestos - Natural Ground

No asbestos was identified in the 1 No. sample of natural ground screened in Area 1.

8.2.5 Summary of Soil Contamination

8.2.5.1 Area 1

The following 'hotspots' / localised contaminants have been identified in the Made Ground:

- 1 No. 'hotspot' in TPO6 at 0.60m of mercury 2 mg/kg.
- 1 No. 'hotspot' in TP11 at 0.30m of lead 260 mg/kg; benzo(a)pyrene (coal tar PAH surrogate marker) 1.4 mg/kg.
- 1 No. 'hotspot' in TP14 at 0.10m of benzo(a)pyrene (coal tar PAH surrogate marker) 1.1 mg/kg.
- 1 No. 'hotspot' in TP15 at 0.10m of benzo(a)pyrene (coal tar PAH surrogate marker) 1.5 mg/kg.
- 1 No. 'hotspot' in WS06 at 0.10m of benzo(a)pyrene (coal tar PAH surrogate marker) 2.6 mg/kg.



Potential widespread coal tar PAH contamination was identified in the Made Ground in the areas of TP05, TP10, TP11, TP13-TP15 and Wso6, and further data is required.

No exceedances / localised contaminants have been identified in the natural ground.

No asbestos was identified in the soils.

8.2.5.2 Area 2

The following 'hotspots' / localised contaminants have been identified in the Made Ground:

- 1 No. 'hotspot' in TP02 at 0.20m of arsenic 33 mg/kg.
- 1 No. 'hotspot' in TP24 at 0.25m of arsenic 36 mg/kg.
- 1 No. 'hotspots' in TP21 at 3.00m of benzo(a)pyrene (coal tar PAH surrogate marker) 20 mg/kg.

The following 'exceedances' / localised contaminants have been identified in the natural ground:

- 1 No. 'exceedance' in TP17 at 2.30m of lead 360 mg/kg.

The PAHs identified also represent a potential vapour risk and as such further assessment is required to confirm risks associated with the inhalation pathway and requirements for VOC membranes.

No asbestos was identified in the soils.

8.2.5.3 Areas 1 & 2

Low levels of TPHs (up to a total of 170 mg/kg) in the C12-C40 range and PAHs (up to a total of 17 mg/kg) were also identified in the shallow Made Ground which although below the relevant GAC are a potential risk to underground plastic services (see Section 9.5).

8.2.6 Source of Identified Soil Contamination

The contaminants are likely to be principally associated with the historical landfilling of the site. Current quarrying activities (including associated tanks) may also have contributed to the contamination detected e.g. the coal tar PAHs in the area of WSO6 which were located in an area where quarrying plant was parked.

8.3 Generic Controlled Waters Quantitative Risk Assessment

In view of the Preliminary Controlled Waters Conceptual Site Model, which has identified the underlying aquifers as the principle receptors, the Water Quality (Water Supply) Regulations 2000 (Drinking Water Standards [DWS]) were used in preference as generic assessment criteria for the assessment of the potential risks to Controlled Waters from contaminants within groundwater, as the underlying Secondary A and Principal Aquifers are considered to be the closest controlled water receptors. Environmental Quality Standards (EQS), Surface Water



(Abstraction for Drinking Water) Regulations 1996 (SWAD) and World Health Organisation guidelines (WHO) have been used where DWS are not available. Benzo(a)pyrene and naphthalene have been used as marker compounds for the individual PAH.

8.3.1 Area 1

No groundwater analyses were undertaken during the investigation.

8.3.2 Area 2

The 10 No. groundwater chemical test results from the uncontrolled landfill area undertaken on the 16th and 24th November 2016 are summarised in Table 2A and 2B in Appendix G and compared with the assessment criteria.

All determinands were below their respective assessment criteria with the exception of TPH, and total PAHs as described below.

TPHs

TPH (sum of C6-C40) was recorded at a level of 1.7 mg/l in CP18; 10 mg/l in CP19; and 20 mg/l in CP20; on the first visit on the 16th November 2016 which are two to three orders of magnitude above the screening criteria of 0.05 mg/l.

TPH (sum of C6-C40) was recorded at a level of 1.5 mg/l in CP19, and 1.8 mg/l in CP20 on the second visit on the 24th November 2016 which are two to three orders of magnitude above the screening criteria of 0.05 mg/l.

PAHs

Total PAHs were recorded at a level of 570 ug/l in CP18, 330 ug/l in CP19; 650 ug/l in CP20, and 1.6 ug/l in CP26; on the first visit on the 16th November 2016 which are one to three of magnitude above the DWS of 0.1 ug/l.

Total PAHs were recorded at a level of 2.7 ug/l in CP18, 10 ug/l in CP19; 1.6 ug/l in CP20, and 0.3 ug/l in CP28; on the second visit on the 24th November 2016 which are one to two orders of magnitude above the DWS of 0.1 ug/l.

Benzo(a)pyrene

Elevated benzo(a)pyrene was recorded in 3 No. locations during the first visit on the 16th November 2016, at levels of 45ug/l in CP18; 27ug/l in CP19; and 44 ug/l in CP20, which are three orders of magnitude above the DWS of 0.01ug/l.

Elevated benzo(a)pyrene was recorded in 3 No. locations during the first visit on the 24th November 2016, at levels of 0.12ug/l in CP18; 0.56ug/l in CP19; and 0.02 ug/l in CP20, which are one to two orders of magnitude above the DWS of 0.01ug/l.

8.3.2.1 Source of Identified Groundwater Contamination

Elevated concentrations of TPHs, total PAHs and benzo(a)pyrene have been identified in the groundwater. In light of the historical and current history of the



site and its surroundings (landfill and quarry workings including associated tanks) the identified groundwater concentrations are considered most likely to relate to background levels.

8.4 Ground Gas Risk Assessment

As previously described, the site is in an area where between 1% and 3% of properties are above the action level. Therefore, based on current guidance radon protective measures are not required.

The assessment below is based on the levels recorded to date. 3 No. of the monitoring wells showed significant borehole flow results on the 2nd visit (1.2l/hr in CPO6 in Area 1; and 1.3l/hr in CP17, and 1.4l/hr in CP20 in Area 2).

8.4.1 Area 1

The gas monitoring results obtained have been assessed against CIRIA C665 'Assessing risks posed by hazardous ground gas to buildings' for 'low rise traditional housing' in order to reflect the most sensitive aspects of the proposed development. Using a maximum concentrations of carbon dioxide and methane of 7.5% and 15.5% respectively and the maximum recorded borehole flow rate of 1.2 l/hr, this corresponds to gas screening values (GSV) of 0.09 l/hr and 0.18 l/hr respectively for carbon dioxide and methane. Therefore, according to Table 8.7 of CIRIA C665 (for use for low-rise traditional housing) using the typical maximum concentrations of carbon dioxide and methane the site is characterised as 'Amber 2'.

8.4.2 Area 2

The gas monitoring results obtained have been assessed against CIRIA C665 'Assessing risks posed by hazardous ground gas to buildings' for 'low rise traditional housing' in order to reflect the most sensitive aspects of the proposed development. Using a maximum concentrations of carbon dioxide and methane of 10.9% and 89.5% respectively and the maximum recorded borehole flow rate of 1.4 l/hr, this corresponds to gas screening values (GSV) of 0.15 l/hr and 1.25 l/hr respectively. Therefore, according to Table 8.7 of CIRIA C665 (for use for low-rise traditional housing) using the typical maximum concentrations of carbon dioxide and methane the site is characterised as from 'Red'.

However, with reference to Figure 5, it is noted that Area 2 is proposed for POS (OS1).

9. GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

9.1 Overview

9.1.1 Summary of Strata Encountered

9.1.2 Area 1

Made Ground was encountered across the majority of the site.



In the north west area of the site the made ground was encountered to depths of up to 0.05 to 2.40m in 6 No. locations and typically consisted of clayey gravelly medium SAND with occasional flint and sandstone gravel and cobbles.

The Made Ground in the central and southern sections of the site was significantly deeper (to depths of up to 5.70-12.60m), and typically comprised loose to medium dense medium silty gravelly SAND, or as very sandy gravelly silt CLAY, with occasional to numerous gravel to cobble-sized fragments of concrete, brick, tarmacadam and with occasional cobble-sized pockets of clay and of silt. Gravel is of sub-rounded flint. With occasional ash fragments in 8 No. locations; a slight peaty odour in 5 No. locations; and cobble-sized timber fragments in 5 No. locations.

Natural topsoil was not encountered during the intrusive investigation.

The Kesgrave Catchment Subgroup was encountered underlying the Made Ground in 4 No. of the exploratory holes. It generally comprised loose to medium dense slightly gravelly medium SAND. Gravel is of sub angular flint, quartzite and occasionally sandstone.

The Red Crag Formation was encountered underlying the Made Ground in 11 No. locations; and underlying the Kesgrave Catchment Subgroup in 2 No. locations. It generally comprised medium dense to very dense SAND with occasional whole shells.

The Thames Clay Formation was encountered under the made ground in 2 No. locations as weak MUDSTONE, and as stiff brown silty CLAY.

9.1.3 Area 2

Made Ground was encountered across the site.

It generally comprised loose to medium dense fine to medium SAND over medium dense to very dense clayey gravelly medium to coarse SAND with occasional to numerous gravel-sized to boulder-sized fragments of concrete and brick; with rare to occasional gravel to cobble-sized fragments of tarmacadam rope, plastic and fabric. And with occasional metal fragments in 5 No. locations, and cobble to boulder-sized timber fragments in 6 No. locations. Gravel is of sub-rounded flint and quartzite. Numerous cobble-sized peaty pockets were encountered in TP20, and a slight peaty odour was encountered in 2 No. locations.

Natural topsoil was not encountered during the intrusive investigation.

The Kesgrave Catchment Subgroup was not encountered during the investigation.

The Red Crag Formation was encountered underlying the Made Ground in 4 No. locations. It generally comprised medium dense to very dense SAND with numerous shell fragments and occasional whole shells, over extremely weak SANDSTONE in 3 No. locations.



9.1.4 *Groundwater*

Groundwater was encountered in 4 No. trial pits during the intrusive investigation from 0.50m to 4.50m as damp to wet ground.

Groundwater was encountered in the installed boreholes during subsequent monitoring visits in 8 No. of the 12 No. cable percussion boreholes locations from 3.00m to 11.80m, and in 1 No. of the 8 No. window sample locations at 4.10m.

9.1.5 *Trial Pit Stability*

The sides of all trial pit excavations were stable with the exception of slightly unstable sides in 2 No. locations in Area 1: from 0-0.20m in TPO4, and 2.70m to 4.10m in TPO5.

9.1.6 *Relative Density*

9.1.6.1 *Area 1*

A total of 50 No. standard/cone penetration tests (SPTs/CPTs) were undertaken in the Made Ground, which recorded 'N' values from 4 to 50 corresponding to a relative density of very loose to very dense, and soft to stiff at depths of 1.00m to 12.60m.

5 No. standard/cone penetration tests (SPTs/CPTs) were undertaken in the granular soils of the Superficial Deposits, which recorded 'N' values from 4 to 39 corresponding to a relative density of very loose to dense at depths of 1.00m to 3.50m. The data is shown in Graph 1 (Appendix I).

A total of 17 No. standard/cone penetration tests (SPTs/CPTs) were undertaken in the granular soils of the weathered solid geology, which recorded 'N' values from 1 to 50 corresponding to a relative density of very loose to very dense at depths of 0.30m to 15.45m. The data is shown in Graph 2 (Appendix I).

17 No. standard/cone penetration tests (SPTs/CPTs) were undertaken in the cohesive soils of the weathered solid geology, which recorded 'N' values from 21 to 23 corresponding to a relative density of stiff at depths of 10.70m to 15.45m. The data is shown in Graph 3 (Appendix I).

9.1.6.2 *Area 2*

A total of 39 No. standard/cone penetration tests (SPTs/CPTs) were undertaken in the Made Ground, which recorded 'N' values from 4 to 0/0mm corresponding to a relative density of very loose to very dense, and soft to very stiff at depths of 1.50m to 15.20m.

8 No. standard/cone penetration tests (SPTs/CPTs) were undertaken in the granular soils of the weathered solid geology, which recorded 'N' values from 8 to 14 corresponding to a relative density of loose to medium dense at depths of 5.00m to 10.50m. The data is shown in Graph 4 (Appendix I).



9.1.7 *Rock Strengths*

9.1.7.1 *Area 1*

A total of 42 'N' values greater than 50 (from 50/294mm to 10/0mm) were recorded in the weathered solid geology from depths of 3.00m to 15.45m indicating extremely weak to weak bedrock (based on the Geological Society Working Party Report - 1970).

9.1.7.2 *Area 2*

A total of 11 'N' values greater than 50 (from 50/287mm to 50/133mm) were recorded in the weathered solid geology from depths of 9.00m to 15.45m indicating extremely weak to weak bedrock (based on the Geological Society Working Party Report - 1970).

9.1.8 *Proposed Development*

As previously outlined, the current proposed development of the site comprises up to 2000 homes, an employment area of c0.6ha (use class B1), a secondary local centre (comprising use classes A1, A3, A5 and D2), a school, green infrastructure (including Suitable Accessible Natural Greenspace (SANGs), outdoor play areas, sports ground and allotments/ community orchards, public footpaths and cycleways, vehicle access, and associated infrastructure.

9.2 **Foundations**

9.2.1 *Geotechnical Constraints*

The following potential geotechnical constraints have been identified in both Area 1 and Area 2:

- Significant and varying depths of Made Ground (from depths of 0.05 up to 15.2m)
- Local softening and low density horizons and variability in the Made Ground.
- Localised shallow instability in excavations from depths of up to 0.20m to 2.50m in 6 No locations in Area 1, and 5 No. locations in Area 2.
- Local low density horizons in the natural ground (e.g. in the area of WSO2, WSO4 and WSO6 in Area 1, and CP25 and CP28 in Area 2).

9.2.2 *Foundation Types*

9.2.2.1 *Shallow/Trench Fill Foundations*

Based on the information to date, current site levels and subject to the final layout, shallow/trench fill foundations are likely to be suitable only for the north western part of Area 1 where the Made Ground was significantly shallower than the rest of the site (0.05m to 2.40m). Area 2 is proposed for POS therefore no structures are envisaged here.



It is recommended that foundation loads are transferred onto the medium dense granular soils of the Kesgrave Catchment Group or Red Crag Formation, utilising traditional strip/trench foundations.

An allowable bearing pressure of 100 kN/m² is recommended based on total settlements of less than 25mm for 0.60m wide foundations for this stratum.

Further investigation of localised loosening of the natural strata is recommended (e.g. in the area WSO4) to confirm suitability of shallow foundations and bearing capacity in this area.

9.2.2.2 *Alternative Foundations*

The Made Ground is not considered suitable bearing strata due to its inherent variability which may result in unacceptable differential settlements.

Consequently, consideration is given below to the following potential foundation solutions:

1. Raft foundations
2. Vibro stone columns
3. Piled foundations

Raft foundations are not considered suitable at this stage for the site based on the significant variability in the Made Ground and presence of biodegradable materials including timber and metal fragments, the proportions of which are significant in selected locations. Further delineation of the Made Ground may however, be beneficial.

Vibro stone columns are similarly considered potentially unsuitable for the site based on the significant variability in the Made Ground and presence of biodegradable materials together with soft layers which could affect the integrity of the columns.

Consequently, it is recommended that foundation loads are transferred onto the medium dense to very dense granular or extremely weak to weak sandstone of the weathered Red Crag Formation utilising piled foundations.

The piled foundations are likely to be required to extend into the competent strata (very weak SANDSTONE) at around 9.00m to 15.45m

Driven piles are likely to be the most economic pile type, however, it is recommended that a specialist piling contractor is contacted to design and warrant a suitable system. Given the risk to the underlying Aquifers, the Environment Agency may require CFA piles to reduce the potential creation of a preferable migration pathway for residual contaminants.

9.2.3 *Anticipated Foundation Depths*

Shallow/Trench Fill Foundations

Based on NHBC Chapter 4.2, for any potential shallow foundations in the north west area, minimum foundation depths of 0.75m are recommended for the



granular soils. However, based on the strata encountered, likely foundation depths of 0.75m to 2.40m are anticipated.

Piled Foundations

9.2.3.1 *Area 1*

Depths of piled foundations are likely to range from 5.00m-15.00m.

9.2.3.2 *Area 2*

This is currently outside the proposed development area. However, should development be proposed for this zone, depths of piled foundations would be likely to be in the range of 6.00m to in excess of 15.20m under the Made Ground.

9.2.4 *Reinforcement of Foundations*

It is unlikely that reinforcement will be required as the foundation formation is anticipated to be uniform. However, should variation of the natural granular strata be identified on the site in the foundation formation, it is recommended that foundations are suitably reinforced due to the potential for differential settlement across the foundation.

9.2.5 *Deepening of Foundations due to Trees*

Deepening of foundations with respect to former, current, and proposed trees is unlikely to be required due to the granular nature of the underlying strata.

9.2.6 *Deepening of Foundations due to Made Ground*

Deepening of foundations due to Made Ground will be required across those parts of Area 1 where traditional foundations are utilized.

9.2.7 *Deepening of Foundations due to Soft/Loose Strata*

Foundations should be deepened below any very loose to loose strata.

9.2.8 *Former Structures/Footings*

Deepening of foundations in the areas of former structures/footings is unlikely to be required, except in the area of any former and current quarry buildings.

9.2.9 *Inspection of Foundation Excavations*

It is recommended that the proposed founding formations are inspected by a suitably qualified geotechnical engineer prior to construction.

9.2.10 *Floor Slabs*

Suspended floor slabs are envisaged for the majority of Area 1.



9.2.11 Heave Precautions

Heave Precautions Heave precautions are unlikely to be required based on the predominantly granular nature of the weathered solid strata. However, where required, these should be incorporated in accordance with NHBC Ch. 4.2.

9.3 Chemical Attack on Buried Concrete

For both Areas 1 and 2, on the basis of the maximum soil soluble sulphate concentration for the majority of the site of 0.2 g/l (200mg/l), and most acidic pH of 6.6, ACEC Class AC-1s (Design Class DS-1) conditions are indicated to typically prevail in the near surface soils on the most of the site as defined in BRE Special Digest 1 (2005) for foundations, based on static groundwater conditions.

9.4 Flooding

According to the Environment Agency, the site is not located within an area at risk from flooding.

9.5 Underground Plastic Services

Special precautions with respect to protection of underground plastic water mains are not considered necessary for the majority of the site. However, total PAH level of 600mg/kg and low levels of TPH (up to 440mg/kg) were identified locally in the Made Ground which will either require removal or localised specific water mains pipe work resistant to organic compounds, subject to confirmation by the local water company.

9.6 Slope Stability and Retaining Walls

As outlined in Section 2.2, a moderate slope exists in the northern section of the main site, falling southwards between Area 2 and Area 1. However, based on the initial visible inspection, it currently appears stable.

Slope stability associated with exposed and buried high walls is likely to be a localised issue related to the edges of the existing and historical quarrying. On the site and will require addressing as part of a more detailed investigation.

Any proposed retaining walls would need to be designed by a suitably experienced engineer.

It should be noted that any additional loading of the slope from buildings or infrastructure on the slope, leaking drainage, steepening or undercutting etc. may affect the stability and cause failure.

9.7 Earthworks

In general shallow excavations are likely to be stable for short periods of time. Shoring/battering back or 'banking' is required in all cases where access for personnel is required to trenches in excess of 1.2m in accordance with current Health and Safety requirements and is considered essential.



Potential earthworks are unknown at this stage. Subject to further testing, suitable compaction and control of moisture content, the natural granular soils are potentially suitable as engineering fill on the site.

For more information, reference should be made to the Earthworks Specification Report completed by GEG on 18th June 2016.

9.8 Fault Reactivation

No significant faults are indicated on the site.

9.9 Excavations

Dewatering of excavations is unlikely to be required except during periods of heavy precipitation or if excavations are to remain open for prolonged periods.

Shallow excavations are likely to be stable for short periods of time. However, where excavations extend beyond 1.20m depth, and access for personnel is required, appropriate shoring will be required in accordance with current Health and Safety requirements.

9.10 Road Pavement Design

At this stage, prior to in situ CBR testing, a CBR design value of 20% is recommended locally for the natural granular soils and <2% for geotechnically suitable Made Ground.

9.11 Loose/Soft Spots

The formation (of foundations, floor slabs and roads etc.) should be inspected for soft/loose spots by a suitably experienced geotechnical engineer. Soft spots if encountered should be removed and replaced with suitable well compacted granular material/lean mix concrete as deemed appropriate. Soft spots beneath roads may also require the use of additional geotextiles. Any loose soils at formation level may need to be proof rolled to increase their relative density.

10. ENVIRONMENTAL CONCLUSIONS & RECOMMENDATIONS

Following the findings of the intrusive investigation and generic quantitative risk assessment, the preliminary conceptual site model has been revised as outlined below in Sections 10.1.1 and 10.1.2 and as illustrated in Figures 6A, 6B, 7A and 7B of Appendix A.

10.1 Revised Conceptual Model

10.1.1 Revised Human Health Conceptual Model

Identified Sources: 'Hotspots' / localised exceedances of mercury, lead, coal tar PAHs and potential widespread coal tar PAHs in Area 1 in the Made Ground. 1 No. benzo(a)pyrene concentration in Area 1 was in the vicinity of quarry vehicle parking and a fuel tank which likely represents its source.



‘Hotspots’ / localised exceedances of arsenic and coal tar PAHs in the Made Ground of Area 2.

Potential Pathways: Dermal contact with soil and dust, ingestion of home grown produce and attached soil (residential areas only), inhalation of soil and dust, and the inhalation of indoor and outdoor vapours and ground gases. Potential combustion or explosion of ground gases in confined spaces.

Potential Receptors: Future site users (residents, site workers, visitors, construction/maintenance workers and potential trespassers). Also site flora and fauna and future buildings/structures and construction materials (e.g. water supply pipes).

Potential Risks: End users of the site and construction/maintenance workers are potentially at significant risk from the sources identified above and further testing and assessment is required. The PAHs represent a potential risk via the inhalation pathway.

10.1.2 Revised Controlled Waters Conceptual Model

Identified Sources: Elevated TPHs, total PAHs and benzo(a)pyrene in the groundwater in Area 2.
Localised lead, mercury and coal tar PAHs in the soils of Area 1. Potential widespread coal tar PAHs in Area 1.

Localised arsenic and car tar PAHs in the soils of Area 2.

Potential Pathways: Infiltration of precipitation through the site’s surface and leaching of potential contaminants and subsequent vertical migration to the aquifer or horizontal migration to the watercourse.

Potential Receptors: Underlying groundwater in the Principal and Secondary A Aquifers; the fishing pond located within the main site, approximately 55m south east from Area2; and, approximately 500m north west of Area 1, the unnamed tributary stream which runs into the River Deben.

The 2 No. on site groundwater abstraction licences associated with the quarry are assumed to be terminated by the time of development. The surface water abstraction approximately 200m to the south of Area 2 is also potentially at risk.



Potential Risks: Risks to the underlying Principal Aquifer are considered potentially significant particularly based on the levels of TPHs and PAHs recorded in the groundwater in Area 2. Further assessment is recommended in Section 10.9 to confirm any necessary remedial measures / DQRA.

10.2 Ground Gases

As previously mentioned, the site is in an area where between 1% and 3% of properties are above the radon action level. Therefore, based on current guidance radon protective measures are not required.

Due to the fact that the much of the site (a significant part of Area 1 and the whole of Area 2) lies either on or directly adjacent to a historical landfill and there are significant depths of Made Ground, it is considered that Area 1 should be categorised as 'Amber 2' in accordance with the NHBC traffic light system detailed in CIRIA C665, and as such special gas protection measures are deemed necessary.

In areas of the site where 'Amber 2' classification applies, the following gas protection measures are recommended for residential properties:

- Provision of a minimum 1200 gauge gas membrane for all buildings, with taped and lapped seams fitted by a specialist contractor.
- Above ground service entries were possible.
- Sealing of all floor slab penetrations.
- Passively ventilated sub floor void (minimum 150mm) to allow one complete volume change per 24 hours.
- Certification to confirm that gas protection measures have been installed correctly.

In addition, further monitoring and possible venting of Area 2 is recommended to reduce risks to the proposed development and off site receptors.

VOC membranes will be required in Area 1 where elevated PAHs remain beneath buildings.

10.3 Risks to Adjacent Land and Third Parties

The information available indicates that risks to adjacent land in particular from ground gases in Area 2, require further assessment.

10.4 Potential Geo-Environmental Liabilities

Potential geo-environmental liabilities under Pt2A of the Environmental Protection Act (1990) and the Groundwater Regulations (GWR) 2009, relating to the site in its current condition require further assessment.



10.5 Waste Classification

It is recommended that the chemical analysis undertaken to date are issued to a local waste treatment centre to confirm classification.

10.6 Remediation

10.6.1 Human Health Remedial Measures

Based on the information available the following remedial measures are anticipated to protect human health:

- Delineation and capping of the identified areas of contamination. (In view of the history of the site this may comprise the majority of both areas subject to the proposed end use of Area 2).
- Where capping is required, front gardens and landscape areas will require 300mm of capping, whilst rear gardens will require 600mm, subject to approval of the Local Authority and NHBC. The thickness and source of any capping materials should be independently verified by GEG. Site won material outside the identified areas of contamination could be used.
- Removal of any contaminated soils to facilitate placement of the capping layer should also be independently verified by GEG to ensure regulatory approval.
- VOC membranes where elevated PAHs remain beneath buildings.

10.6.2 Protection of Controlled Waters

Subject to further investigation and DQRA if required, based on the information available the following localised remedial measures are potentially required to controlled waters:

- Removal of any gross soil hydrocarbon contamination in the area of the tanks etc.
- Treatment of the localised TPH and PAH groundwater contamination utilising Enhanced Natural Attenuation including for example oxygen release compounds (ORC) and subsequent monitoring. Chemical oxidation is not considered suitable at this stage due to the levels of potentially explosive gases present. However, liaison with a specialist contractor is advised.
- Backfilling of excavations with approved inert verified material.
- Validation Reporting.

10.6.3 Unidentified Contamination

Should any unidentified contamination be encountered during development GEG should be contacted to undertake further assessment and determine the best course of action.



10.6.4 Budget Remedial Costings

Budget remedial costings will be confirmed following the recommended additional investigation.

10.7 Further Investigation

The following further work is recommended:

- Further detailed investigation is required around the quarry buildings and in particular in the vicinity of the assumed fuel tanks to determine whether any soil and groundwater hydrocarbon contamination and asbestos are present.
- Delineation of the identified 'hotspots' across both areas and further investigation of potential widespread coal tar PAHs in Area 1.
- Further gas and groundwater monitoring in Area 1 and Area 2.
- Detailed Quantitative Risk Assessment (DQRA) for groundwater (if required following the above).

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12. LIMITATIONS

As with all intrusive site investigations, there is a possibility that localised contamination 'hot spots'/geotechnical features remain undetected on the site. Therefore, as with standard practices, this report does not provide a warranty to cover limited localised contamination 'hot spots'/geotechnical features or any post-investigation importation of contamination.

The conclusions and recommendations stated herein are based on information available at the time of production. These may not necessarily apply if the site is to be utilised for a more or less sensitive purpose in the future, or if operational procedures or management alter over time.

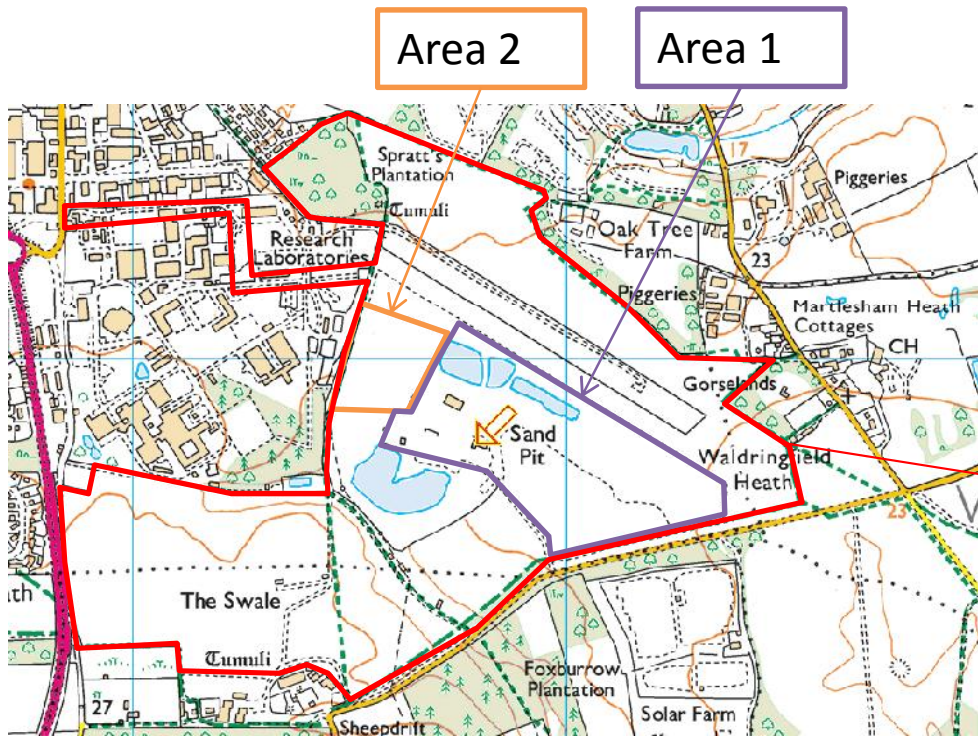
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APPENDIX A

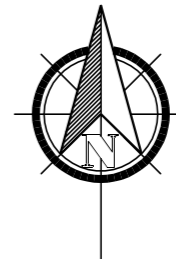
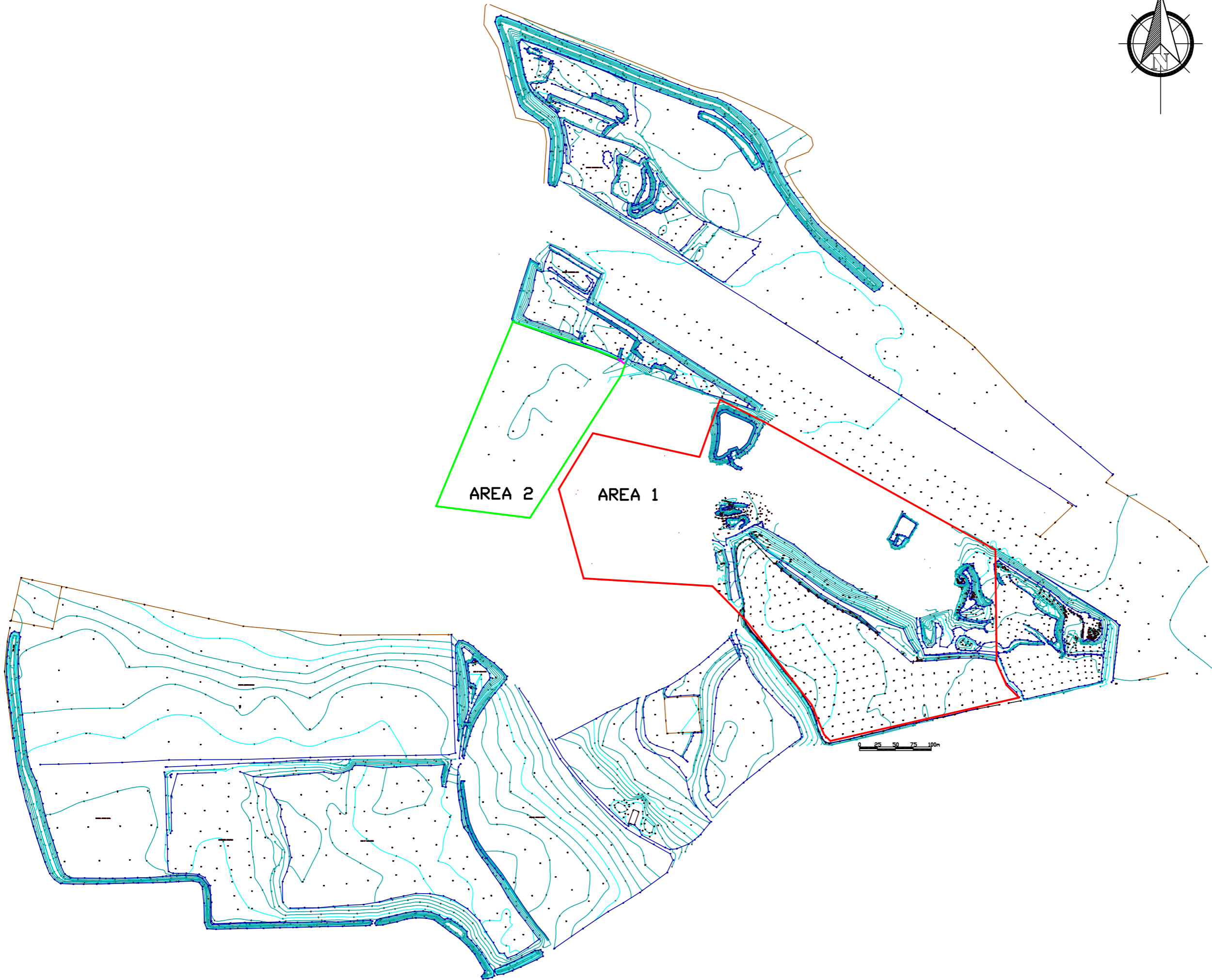
FIGURES AND PLANS



SITE LOCATION

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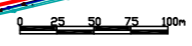
TITLE: FIGURE 1: SITE LOCATION PLAN		CLIENT: BROOKBANKS/CEG/CARLYLE LAND		DRAWN/CHECKED: FT/MP		GEG House, 17 Graham Road Malvern, WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk, www.g-eg.co.uk	Geo Environmental Group 
SITE: ADASTRAL PARK, IPSWICH		PROJECT No.: GEG-16-458	SCALE: NTS	DATE: 20/10/16	REVISION: A		




LEGEND

- APPROXIMATE BOUNDARY AREA 1
- APPROXIMATE BOUNDARY AREA 2

AREA 2 AREA 1



- NOTES:
1. BASE IMAGE PROVIDED BY BROOKBANKS CONSULTING.
 2. DRAWING TO BE USED IN CONJUNCTION WITH GEG REPORT GEG-16-458/PII.

JOB NUMBER GEG-16-458		 Geo Environmental Group		
PROJECT TITLE LAND SOUTH AND EAST OF ADASTRAL PARK				
DRAWING TITLE FIGURE 2: CURRENT LAYOUT PLAN		DRAWING NO. GEG-16-458_003		
CLIENT BROOKBANKS CEG/CARLYLE	REVISION NO. A	ORIGINAL SIZE A3	DIMENSIONS METRES	SCALE AS SHOWN
DRAWN BY FT	CHECKED BY MP	APPROVED BY MR	ISSUE FINAL ISSUE	DATE 21/10/16

West

POTENTIAL DEVELOPMENT SITE (AREA1):

East

LANDFILL/AGRICULTURAL LAND

QUARRY

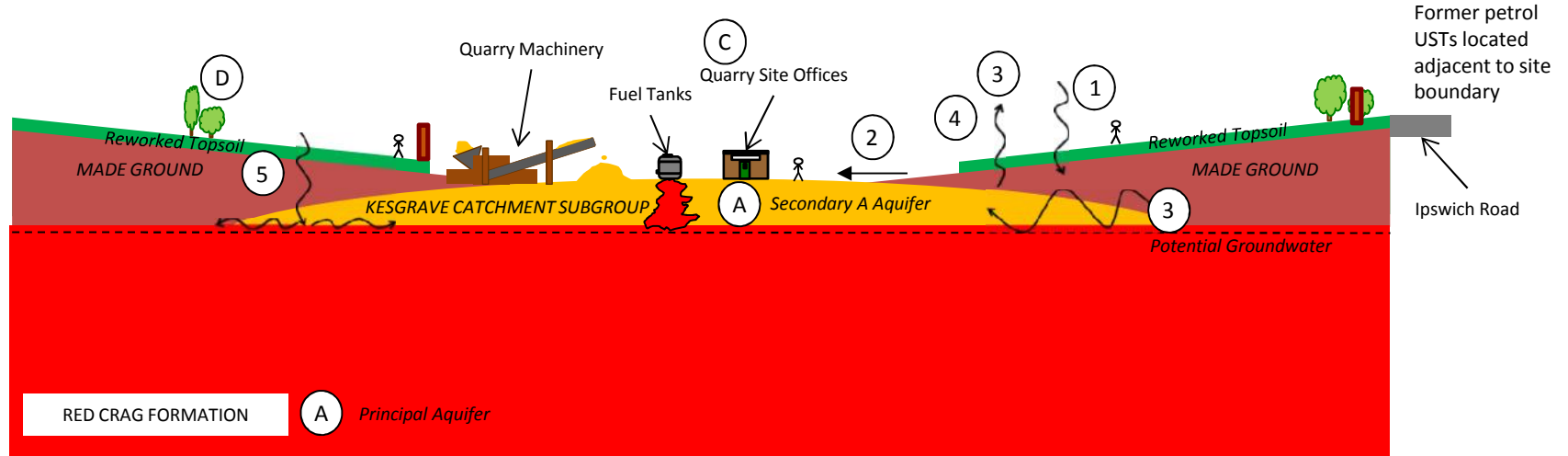
LANDFILL/AGRICULTURAL LAND

Site Boundary

Site Boundary

Nearest Natural watercourse is a tributary to the River Deben (approx 500m to the north east)

The fishing lake lies to the south west of the site.



PATHWAYS

- ① Infiltration of precipitation
- ② Surface water run off
- ③ Migration of ground gases (methane and carbon dioxide)
- ④ Potential dermal contact, ingestion of contaminated soil and/or dust and inhalation of gases/vapours
- ⑤ Potential leaching/mobilisation of contaminants and lateral and vertical migration


RECEPTORS

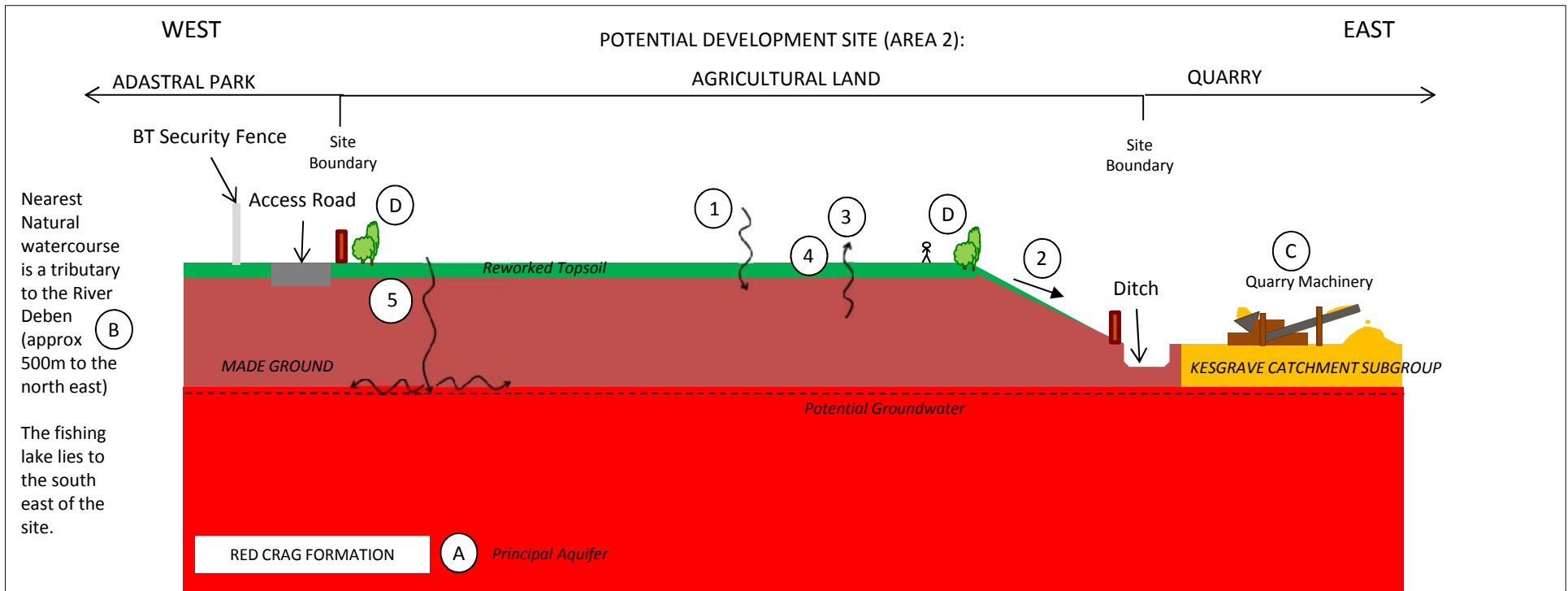
- ⤴ Site users
- Ⓐ Aquifer type
- Ⓑ Watercourse
- Ⓒ Building Materials (including plastic pipes) (not applicable)
- Ⓓ Flora and fauna

SIGNIFICANT SOURCES

- Potential sources of contamination associated with historic/current site usage (see text)
- MADE GROUND

Please refer to the text of the report for further information relating to this diagram.

TITLE: FIGURE 3A: AREA 1 PRELIMINARY CONCEPTUAL SITE MODEL		Geo Environmental Group 
SITE: LAND SOUTH AND EAST OF ADASTRAL PARK		
CLIENT: BROOKBANKS/CEG/CARLYLE LAND		
PROJECT No.: GEG-16-458	DRAWN/CHECKED: FT / MP	GEG House 17 Graham Road Malvern WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk www.g-eg.co.uk
SCALE: NTS	DATE: 20/10/16	



Nearest Natural watercourse is a tributary to the River Deben (approx 500m to the north east)

The fishing lake lies to the south east of the site.

PATHWAYS

- ① Infiltration of precipitation
- ② Surface water run off
- ③ Migration of ground gases (methane and carbon dioxide)
- ④ Potential dermal contact, ingestion of contaminated soil and/or dust and inhalation of gases/vapours
- ⑤ Potential leaching/mobilisation of contaminants and lateral and vertical migration

RECEPTORS

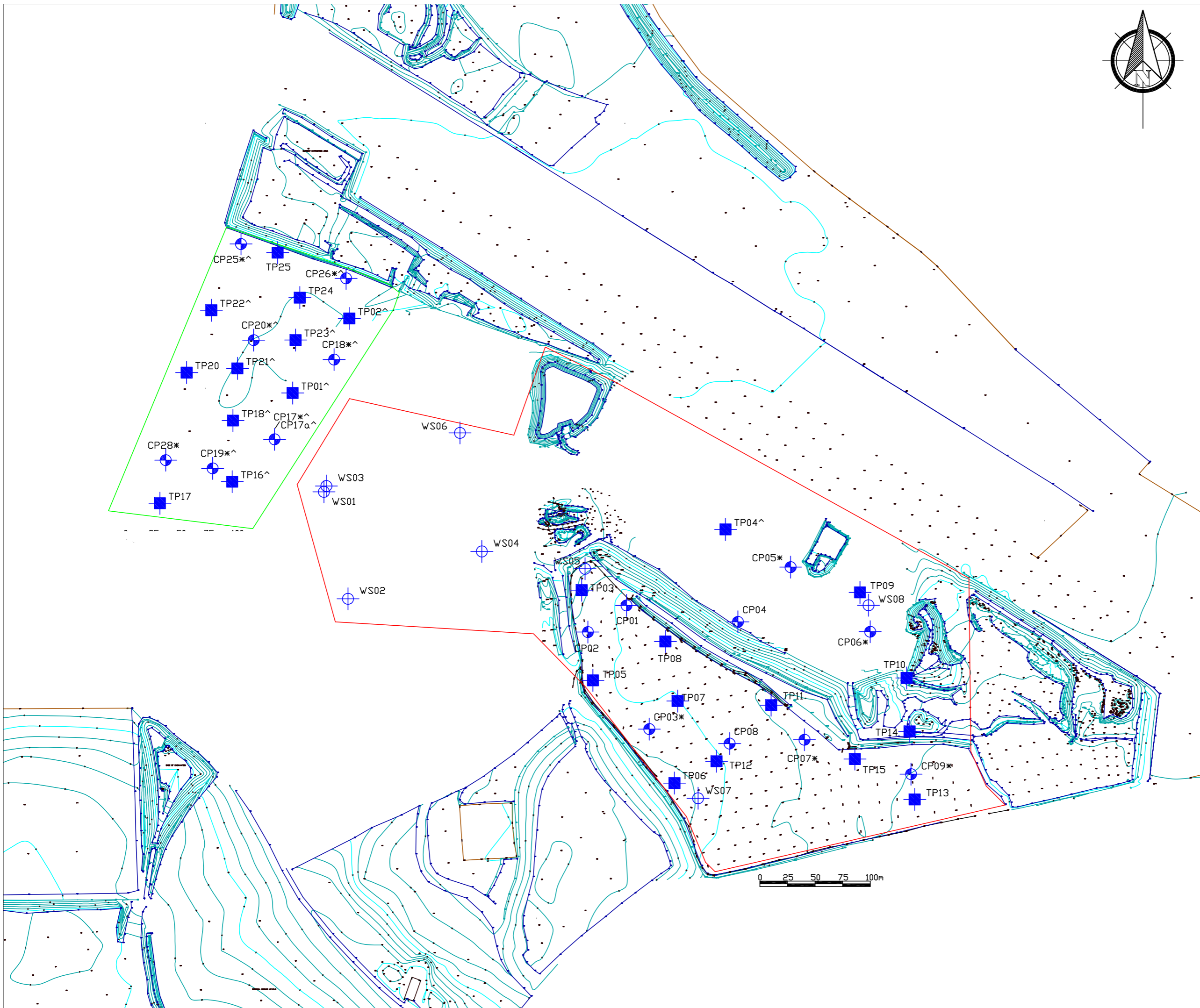
- Site users
- Aquifer type
- Watercourse
- Building Materials (including plastic pipes) (not applicable)
- Flora and fauna

SIGNIFICANT SOURCES

- Potential sources of contamination associated with historic/current site usage (see text)
- MADE GROUND

Please refer to the text of the report for further information relating to this diagram.

TITLE: FIGURE 3B: AREA 2 PRELIMINARY CONCEPTUAL SITE MODEL		Geo Environmental Group
SITE: LAND SOUTH AND EAST OF ADASTRAL PARK		
CLIENT: BROOKBANKS/CEG/CARLYLE LAND		
PROJECT No.: GEG-16-458	DRAWN/CHECKED: FT / MP	GEG House 17 Graham Road Malvern WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk www.g-eg.co.uk
SCALE: NTS	DATE: 18/11/16	



LEGEND


- CP01 GEG CABLE PERCUSSION BOREHOLE LOCATION
- TP1 GEG TRIAL PIT LOCATION
- WS1 GEG WINDOW SAMPLE LOCATION
- APPROXIMATE BOUNDARY AREA 1
- APPROXIMATE BOUNDARY AREA 2

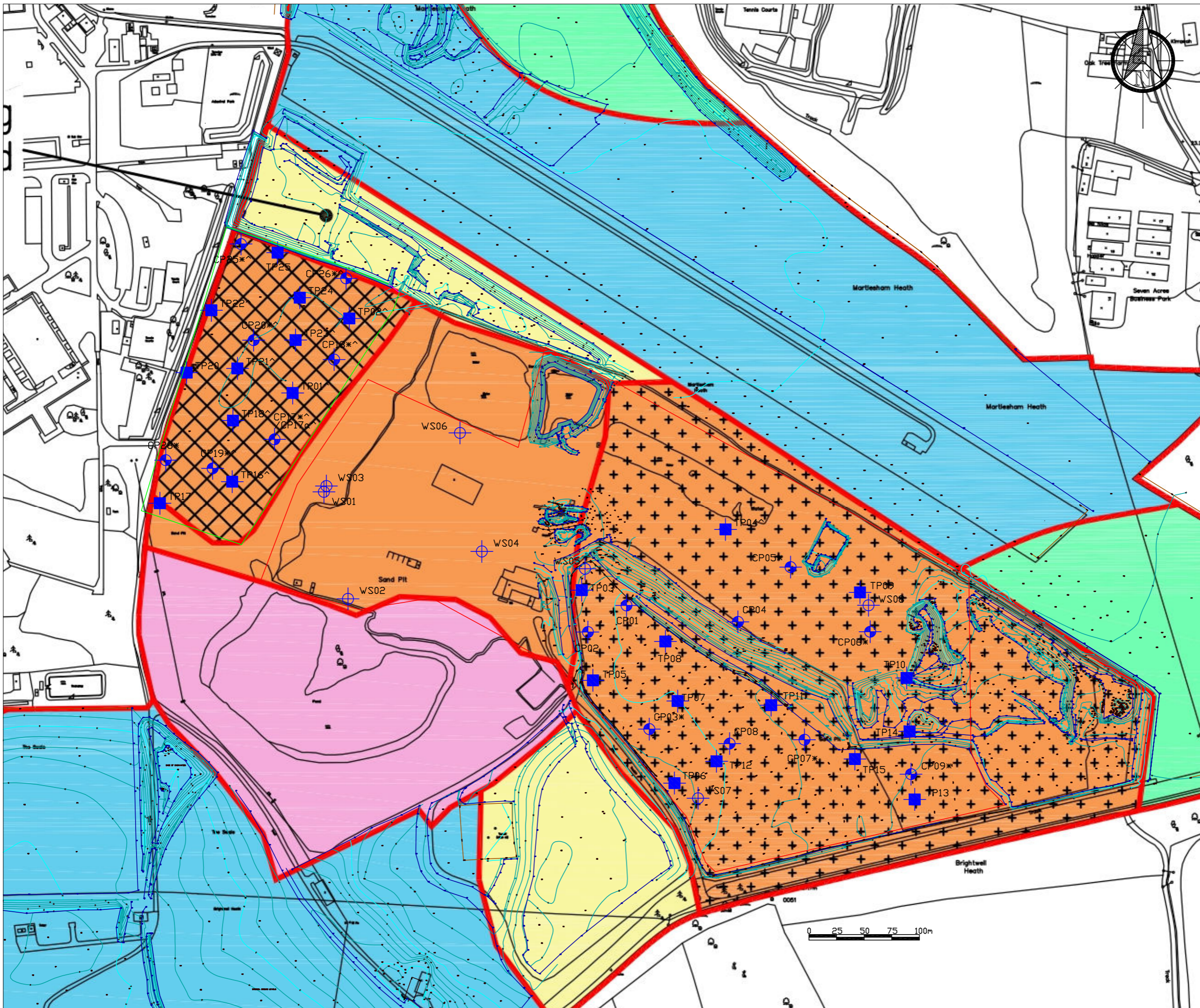
NOTES:

1. BASE IMAGE PROVIDED BY BROOKBANKS CONSULTING.
2. DRAWING TO BE USED IN CONJUNCTION WITH GEG REPORT GEG-16-458/PII.

* POSITION WITH GAS MONITORING INSTALLATION

^ POSITION APPROXIMATE

JOB NUMBER GEG-16-458		 Geo Environmental Group		
PROJECT TITLE LAND SOUTH AND EAST OF ADASTRAL PARK				
DRAWING TITLE FIGURE 4A: EXPLORATORY HOLE LOCATION PLAN AREAS 1 & 2		DRAWING NO. GEG-16-458_004a		
CLIENT BROOKBANKS CEG/CARLYLE	REVISION NO. A	ORIGINAL SIZE A3	DIMENSIONS METRES	SCALE AS SHOWN
DRAWN BY FT	CHECKED BY MP	APPROVED BY MR	ISSUE FINAL ISSUE	DATE 01/12/16



LEGEND

- CP01 GEG CABLE PERCUSSION BOREHOLE LOCATION
- TP1 GEG TRIAL PIT LOCATION
- WS1 GEG WINDOW SAMPLE LOCATION
- APPROXIMATE BOUNDARY AREA 1
- APPROXIMATE BOUNDARY AREA 2

Key

Quarrying Activities

- Worked to depths below water table (11.3-15.8m bgl)
- Worked to depths 8-9m bgl
- Worked to depths 3-4m bgl
- To be worked to depths 3-4m bgl
- Not to be worked

Landfilling Activities


- Deep historic landfill before current inert licence
- Deep landfill deposited in accordance to current inert licence.

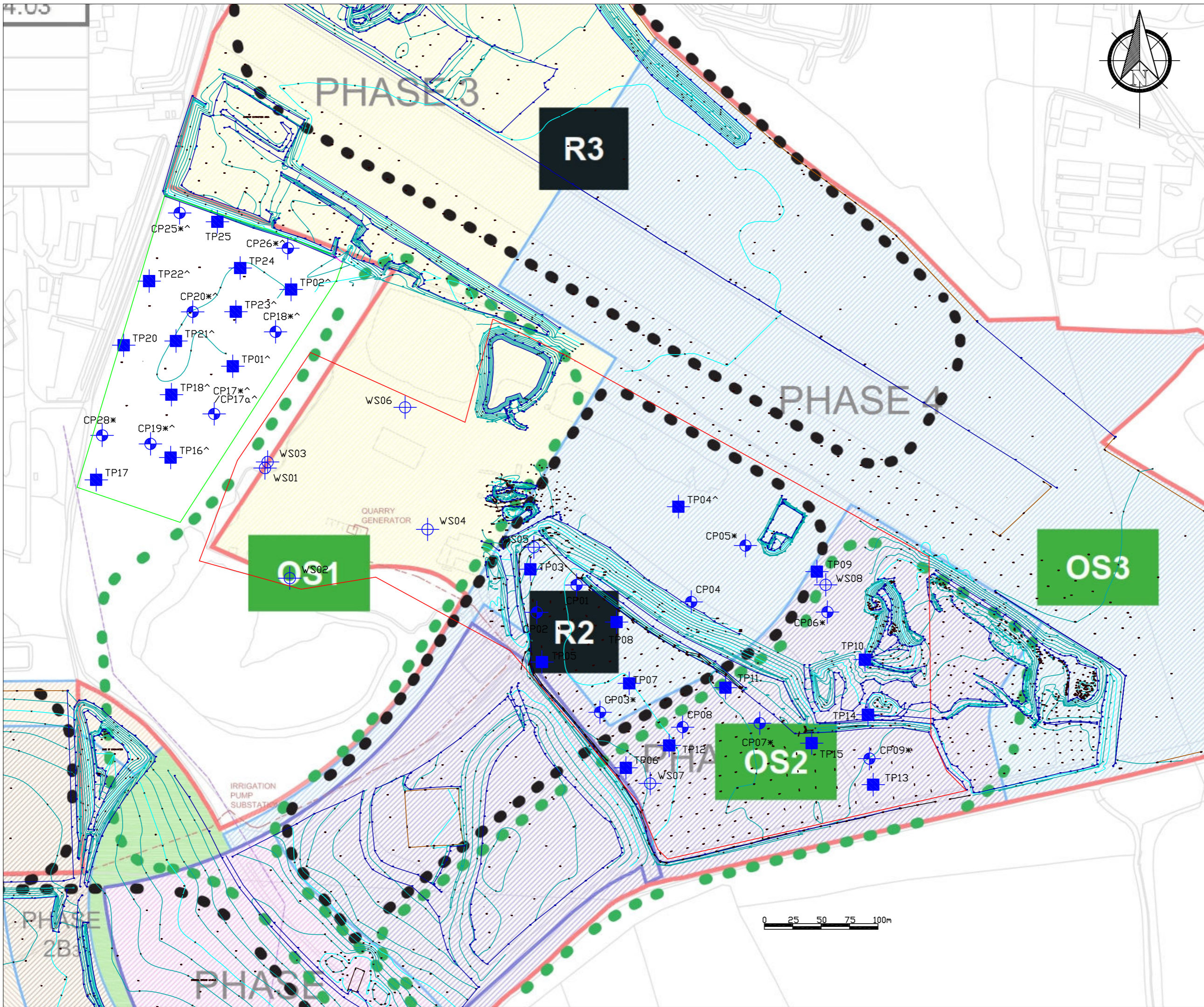
NOTES:

1. BASE IMAGE PROVIDED BY BROOKBANKS CONSULTING.
2. DRAWING TO BE USED IN CONJUNCTION WITH GEG REPORT GEG-16-458/PII.







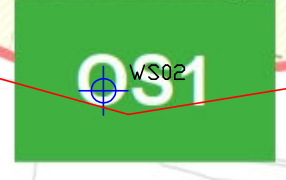
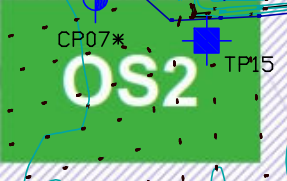
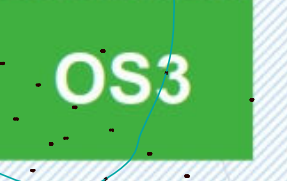
* POSITION WITH GAS MONITORING INSTALLATION

^ POSITION APPROXIMATE

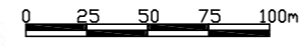
JOB NUMBER GEG-16-458		 Geo Environmental Group		
PROJECT TITLE LAND SOUTH AND EAST OF ADASTRAL PARK				
DRAWING TITLE FIGURE 4B: LANDFILLING ACTIVITIES AND EXPLORATORY HOLE LOCATION PLAN AREAS 1 & 2		DRAWING NO. GEG-16-458_005		
CLIENT BROOKBANKS CEG/CARLYLE	REVISION NO. A	ORIGINAL SIZE A3	DIMENSIONS METRES	SCALE AS SHOWN
DRAWN BY FT	CHECKED BY MP	APPROVED BY MR	ISSUE FINAL ISSUE	DATE 09/12/16




LEGEND

-  CP01 GEG CABLE PERCUSSION BOREHOLE LOCATION
 -  TP1 GEG TRIAL PIT LOCATION
 -  WS1 GEG WINDOW SAMPLE LOCATION
 -  APPROXIMATE BOUNDARY AREA 1
 -  APPROXIMATE BOUNDARY AREA 2
 -  R2 RESIDENTIAL DEVELOPMENT AREA
 -  OS1 OPEN SPACE AREA
 -  OS2 OPEN SPACE AREA
 -  OS3 OPEN SPACE AREA
- AREA 2 IS IN AN UNALLOCATED DEVELOPMENT AREA

- NOTES:
1. BASE IMAGE PROVIDED BY BROOKBANKS CONSULTING.
 2. DRAWING TO BE USED IN CONJUNCTION WITH GEG REPORT GEG-16-458/PII.
- * POSITION WITH GAS MONITORING INSTALLATION
- ^ POSITION APPROXIMATE



JOB NUMBER GEG-16-458		 Geo Environmental Group		
PROJECT TITLE LAND SOUTH AND EAST OF ADASTRAL PARK				
DRAWING TITLE FIGURE 5: PROPOSED LAYOUT AND EXPLORATORY HOLE LOCATION PLAN AREAS 1 & 2		DRAWING NO. GEG-16-458_006		
CLIENT BROOKBANKS CEG/CARLYLE	REVISION NO. A	ORIGINAL SIZE A3	DIMENSIONS METRES	SCALE AS SHOWN
DRAWN BY FT	CHECKED BY MP	APPROVED BY MR	ISSUE FINAL ISSUE	DATE 09/12/16

WEST

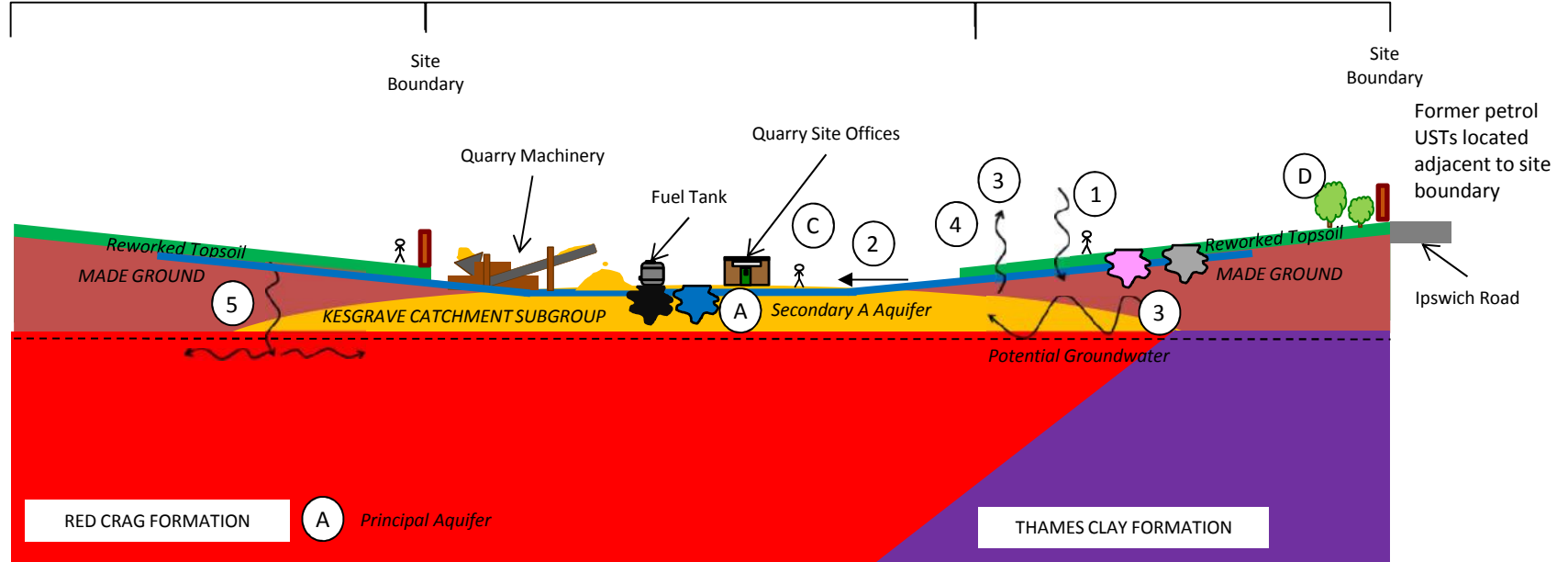
POTENTIAL DEVELOPMENT SITE:

EAST

LANDFILL/AGRICULTURAL LAND

QUARRY

LANDFILL/AGRICULTURAL LAND



Nearest Natural watercourse is a tributary to the River Deben (approx 500m to the north east) (B)

The fishing lake lies in the western section of the site.

PATHWAYS

- 1 Infiltration of precipitation
- 2 Surface water run off
- 3 Migration of ground gases (methane and carbon dioxide)
- 4 Potential dermal contact, ingestion of contaminated soil and/or dust and inhalation of gases/vapours
- 5 Potential leaching/mobilisation of contaminants and lateral and vertical migration

RECEPTORS

- Site users
- A Aquifer type
- B Watercourse
- C Building Materials (including plastic pipes) (not applicable)
- D Flora and fauna

SIGNIFICANT SOURCES

- Potential hydrocarbons (Subject to further investigation)
- Potential widespread coal tar PAHs
- PAH 'hotspot'
- Mercury 'hotspot'
- Lead 'hotspot'

Please refer to the text of the report for further information relating to this diagram.

TITLE: FIGURE 6A: Area 1
CONCEPTUAL SITE MODEL (EXISTING)

SITE: LAND SOUTH AND EAST OF
ADASTRAL PARK

CLIENT:
BROOKBANKS/CEG/CARLYLE LAND

PROJECT No.:
GEG-16-458

DRAWN/CHECKED:
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SCALE:
NTS

DATE:
20/10/16

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WEST

POTENTIAL DEVELOPMENT SITE:

EAST

LANDFILL/AGRICULTURAL LAND

QUARRY

LANDFILL/AGRICULTURAL LAND

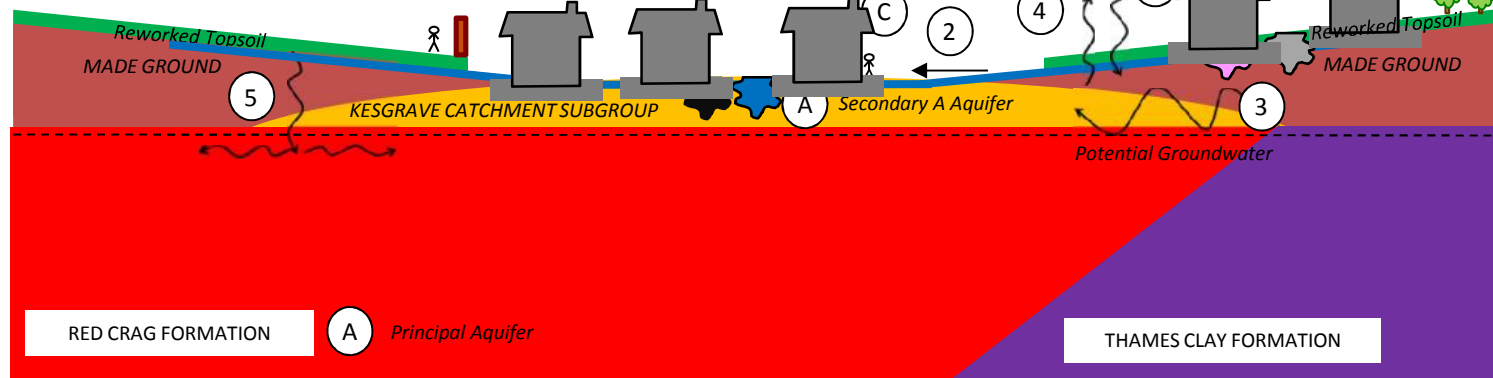
Site Boundary

Site Boundary

Nearest Natural watercourse is a tributary to the River Deben (approx 500m to the north east)

The fishing lake lies in the western section of the site.

Former petrol USTs located adjacent to site boundary



PATHWAYS

- ① Infiltration of precipitation
- ② Surface water run off
- ③ Migration of ground gases (methane and carbon dioxide)
- ④ Potential dermal contact, ingestion of contaminated soil and/or dust and inhalation of gases/vapours
- ⑤ Potential leaching/mobilisation of contaminants and lateral and vertical migration

RECEPTORS

- ⤴ Site users
- Ⓐ Aquifer type
- Ⓑ Watercourse
- Ⓒ Building Materials (including plastic pipes) (not applicable)
- Ⓓ Flora and fauna

SIGNIFICANT SOURCES

- Potential hydrocarbons (Subject to further investigation)
- Potential widespread coal tar PAHs
- PAH 'hotspot'
- Mercury 'hotspot'
- Lead 'hotspot'

Please refer to the text of the report for further information relating to this diagram.

TITLE: FIGURE 6B: Area 1
CONCEPTUAL SITE MODEL (PROPOSED)

SITE: LAND SOUTH AND EAST OF
ADASTRAL PARK

CLIENT:
BROOKBANKS/CEG/CARLYLE LAND

PROJECT No.:
GEG-16-458

DRAWN/CHECKED:
FT / MP

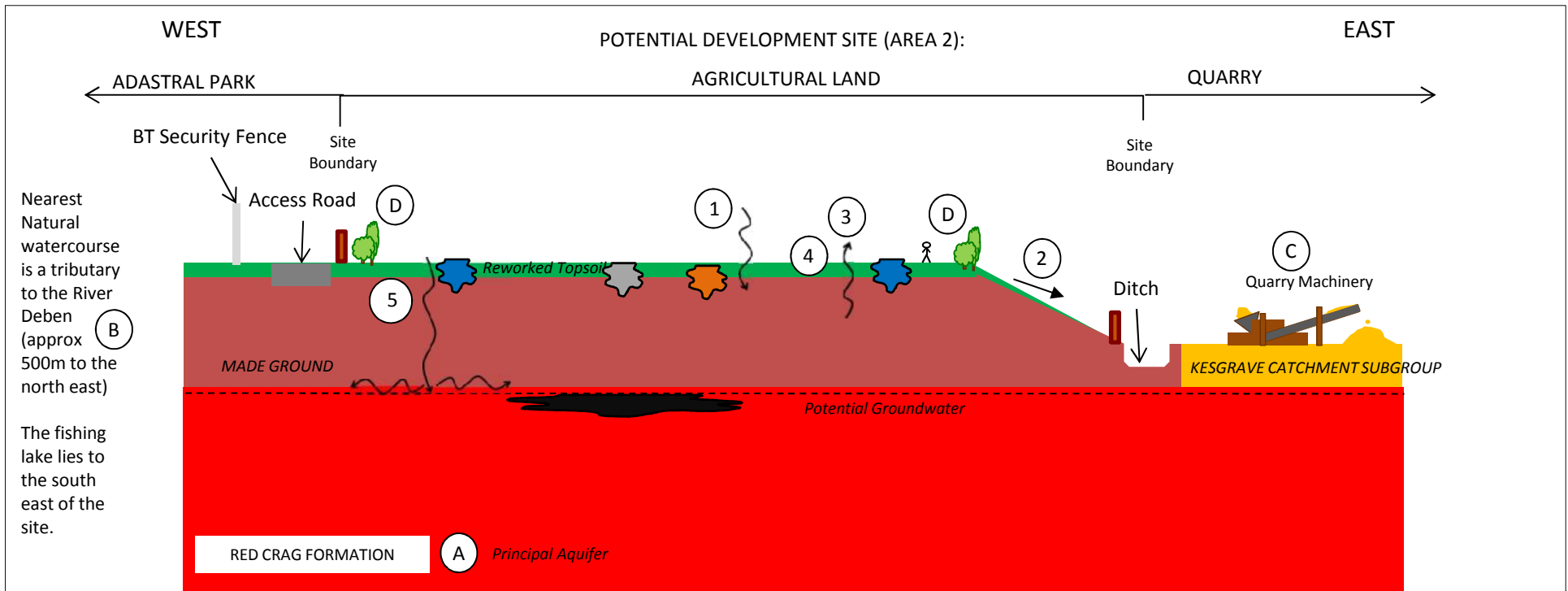
SCALE:
NTS

DATE:
20/10/16

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PATHWAYS

- (1) Infiltration of precipitation
- (2) Surface water run off
- (3) Migration of ground gases (methane and carbon dioxide)
- (4) Potential dermal contact, ingestion of contaminated soil and/or dust and inhalation of gases/vapours
- (5) Potential leaching/mobilisation of contaminants and lateral and vertical migration

RECEPTORS

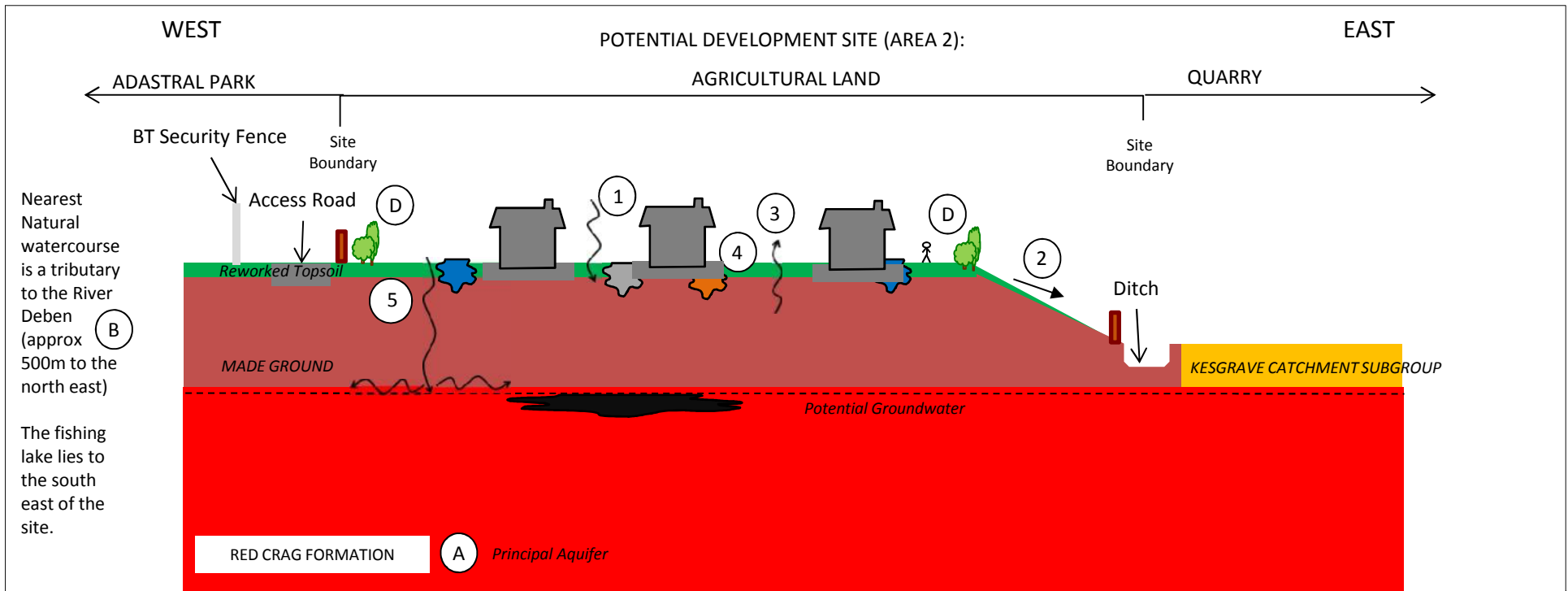
- ⤴ Site users
- (A) Aquifer type
- (B) Watercourse
- (C) Building Materials (including plastic pipes) (not applicable)
- (D) Flora and fauna

SIGNIFICANT SOURCES

- Mercury 'hotspot'
- TPH 'hotspot'
- Arsenic 'hotspot'
- TPH and PAH groundwater contamination

Please refer to the text of the report for further information relating to this diagram.

TITLE: FIGURE 7A: AREA 2 CONCEPTUAL SITE MODEL (EXISTING)		Geo Environmental Group
SITE: LAND SOUTH AND EAST OF ADASTRAL PARK		
CLIENT: BROOKBANKS/CEG/CARLYLE LAND		
PROJECT No.: GEG-16-458	DRAWN/CHECKED: FT / MP	GEG House 17 Graham Road Malvern WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk www.g-eg.co.uk
SCALE: NTS	DATE: 29/11/16	



Nearest Natural watercourse is a tributary to the River Deben (approx 500m to the north east)

The fishing lake lies to the south east of the site.

PATHWAYS

- ① Infiltration of precipitation
- ② Surface water run off
- ③ Migration of ground gases (methane and carbon dioxide)
- ④ Potential dermal contact, ingestion of contaminated soil and/or dust and inhalation of gases/vapours
- ⑤ Potential leaching/mobilisation of contaminants and lateral and vertical migration

RECEPTORS

- Site users
- (A)** Aquifer type
- (B)** Watercourse
- (C)** Building Materials (including plastic pipes) (not applicable)
- (D)** Flora and fauna

SIGNIFICANT SOURCES

- Mercury 'hotspot'
- TPH 'hotspot'
- Arsenic 'hotspot'
- TPH and PAH groundwater contamination

Please refer to the text of the report for further information relating to this diagram.

TITLE: FIGURE 7B: AREA 2 CONCEPTUAL SITE MODEL (EXISTING)		Geo Environmental Group
SITE: LAND SOUTH AND EAST OF ADASTRAL PARK		
CLIENT: BROOKBANKS/CEG/CARLYLE LAND		
PROJECT No.: GEG-16-458	DRAWN/CHECKED: FT / MP	GEG House 17 Graham Road Malvern WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk www.g-eg.co.uk
SCALE: NTS	DATE: 29/11/16	



APPENDIX B

PHOTOGRAPHIC RECORD



Photo 1: View north of site office in the foreground, weighbridge in the middle ground, and concrete plant in the back ground. (Area 1)



Photo 2: View north west of large building. (Area 1)



Photo 3: View north of fuel tank in the area behind the large building. (Area 1)



Photo 4: View north west of machine parking area behind the warehouse. (Area 1)

Geo Environmental Group
Geotechnical, Environmental &
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**Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR**

**Client: Brookbanks/CEG/
Carlyle Land**

**Project: Land south and east of
Adastral Park**

Project No.: GEG-16-458



Photo 5: View north west of site office and weighbridge. (Area 1)



Photo 6: View south east of haul road to south eastern section of Area 1.



Photo 7: View of access route into eastern area of Area 1, with water pump in the foreground.



Photo 8: View of lakes and pump piping along the north eastern boundary of Area 1.

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Ecological Consultants



**Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR**

**Client: Brookbanks/CEG/
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**Project: Land south and east of
Adastral Park**

Project No.: GEG-16-458



Photo 9: View north east of scrap metal container in the eastern section of Area 1.



Photo 10: View south east of eastern section of Area 1.



Photo 11: View of access into southern section of Area 1.



Photo 12: View of access into southern section of Area 1.

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**Client: Brookbanks/CEG/
Carlyle Land**

**Project: Land south and east of
Adastral Park**

Project No.: GEG-16-458



Photo 13: View east of southern section of Area 1.



Photo 14: View west of southern section of Area 1.



Photo 15: View north across southern section of Area 1, with the BT facility in Adastral park in the background.



Photo 16: View east of access out of eastern section of the site.

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Photo 17: View north of mineral washing plant in the central section of Area 1.



Photo 18: View south of bagging area for Brett Aggregates in northern central section of Area 1.



Photo 19: View of mineral storage heaps in central section of Area 1.



Photo 20: View of concrete mixing plant on the north western corner of Area 1.

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Photo 21: View north west from southern section of Area 1.



Photo 22: View north from southern section of Area 1.



Photo 23: View of southern boundary of Area 1.



Photo 24: View west of southern section of Area 1.

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Photo 25: View north west of access into Area 2.



Photo 26: View south of Area 2.



Photo 27: View of south west corner of Area 2, with the adjacent concrete mixing plant in Area 1 in the background.



Photo 28: View along western boundary of Area 2.

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Photo 29: View north of Area 2.



Photo 30: View of north eastern corner of Area 2.



Photo 31: Updated view north of new access into southern section of Area 1.



Photo 32: Updated view north of eastern section of Area 1, after spoil had been removed (WS08 now destroyed).

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Photo 33: Excavation of trial pit TP01.



Photo 34: Arisings from trial pit TP01.



Photo 35: Excavation of trial pit TP02.



Photo 36: Arisings from trial pit TP02.

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Photo 37: Excavation of trial pit TP03.



Photo 38: Arisings from trial pit TP03.



Photo 39: Excavation of trial pit TP04.



Photo 40: Arisings from trial pit TP04.

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Photo 41: Excavation of trial pit TP05.



Photo 42: Arisings from trial pit TP05.



Photo 43: Excavation of trial pit TP06.



Photo 44: Arisings from trial pit TP06.

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Photo 45: Excavation of trial pit TP07.



Photo 46: Arisings from trial pit TP07.



Photo 47: Excavation of trial pit TP08.



Photo 48: Arisings from trial pit TP08.

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Photo 49: Excavation of trial pit TP09.



Photo 50: Arisings from trial pit TP09.



Photo 51: Excavation of trial pit TP10.



Photo 52: Arisings from trial pit TP10.

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Photo 53: Excavation of trial pit TP11.



Photo 54: Arisings from trial pit TP11.



Photo 55: Excavation of trial pit TP12.



Photo 56: Arisings from trial pit TP12.

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Photo 57: Excavation of trial pit TP13.



Photo 58: Arisings from trial pit TP13.



Photo 59: Excavation of trial pit TP14.



Photo 60: Arisings from trial pit TP14.

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Photo 61: Excavation of trial pit TP15.



Photo 62: Arisings from trial pit TP15.



Photo 63: Excavation of trial pit TP16.



Photo 64: Arisings from trial pit TP16.

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Photo 65: Excavation of trial pit TP17.



Photo 66: Arisings from trial pit TP17.



Photo 67: Excavation of trial pit TP18.



Photo 68: Arisings from trial pit TP18.

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Photo 69: Excavation of trial pit TP20.



Photo 70: Arisings from trial pit TP20.



Photo 71: Excavation of trial pit TP21.



Photo 72: Arisings from trial pit TP21.

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Photo 73: Excavation of trial pit TP22.



Photo 74: Arisings from trial pit TP22.



Photo 75: Excavation of trial pit TP23.



Photo 76: Arisings from trial pit TP23.

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Photo 77: Excavation of trial pit TP24.



Photo 78: Arisings from trial pit TP24.



Photo 79: Excavation of trial pit TP25.



Photo 80: Arisings from trial pit TP25.

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Project No.: GEG-16-458



APPENDIX C

EXPLORATORY HOLE LOGS



AREA 1



BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP01	
Job No GEG-16-458	Date 04-10-16 04-10-16	Ground Level (m)	Co-Ordinates () E 625,900.6 N 244,783.4		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill	
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)			DESCRIPTION
0.10	D					(0.50)	MADE GROUND - Dark brown slightly clayey medium SAND with occasional rootlets. (REWORKED TOPSOIL)		
0.30	D						0.50	MADE GROUND - Dark brown slightly clayey medium SAND.	
1.50	D	N4				(1.50)	1.50 - 2.00 Becoming very loose to loose		
2.00	D					2.00	MADE GROUND - Brown clayey gravelly medium SAND with occasional cobble-sized pockets of clay. Gravel is medium fragments of brick and concrete.		
3.00	D	N16				(2.00)	3.00 - 4.00 Becoming medium dense		
4.00	D					4.00	MADE GROUND - Loose to medium dense brown sandy gravelly CLAY. Gravel is medium fragments of brick and concrete.		
4.50		N10				(1.00)			
5.00	D					5.00	MADE GROUND - Brown clayey slightly gravelly medium SAND with occasional cobble-sized pockets of clay. Gravel is medium fragments of brick and concrete.		
5.40	D					(0.40) 5.40	5.00 - 5.40 Becoming medium dense		
6.00		N16				(1.20)	MADE GROUND - Greyish brown medium gravelly SAND. Gravel is medium fragments of brick and concrete. 6.00 - 6.60 Becoming medium dense		
6.50	D					6.60			
6.60	D					(0.80)	MADE GROUND - (Firm) greyish brown sandy CLAY.		
7.40						7.40			
7.50	D	N22					MADE GROUND - Orangish brown slightly clayey slightly gravelly SAND. Gravel is medium fragments of brick. 7.50 - 9.00 Becoming medium dense		

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Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole backfilled upon completion.
All dimensions in metres Scale 1:50			Client Brookbanks / CEG			Method/ Plant Used Cable Percussion Rig			Logged By FT		



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP01	
Job No GEG-16-458	Date 04-10-16 04-10-16	Ground Level (m)	Co-Ordinates () E 625,900.6 N 244,783.4		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
8.50	D	N10/ 0mm				(1.60)	MADE GROUND - Orangish brown slightly clayey slightly gravelly SAND. Gravel is medium fragments of brick. <i>(continued)</i>		
9.00						9.00			
9.20	D					9.30	Weak light brown SANDSTONE. (RED CRAG FORMATION)		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
						9.1	9.3	0.5hr			1. No groundwater encountered. 2. Hole backfilled upon completion.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP02	
Job No GEG-16-458	Date 03-10-16 03-10-16	Ground Level (m)	Co-Ordinates () E 625,866.2 N 244,759.3		
Contractor					Sheet 1 of 2

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill		
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)			DESCRIPTION	
0.10	D					(0.40)	MADE GROUND - Dark brown slightly clayey medium SAND with occasional rootlets. (REWORKED TOPSOIL)			
0.40	D							MADE GROUND - Greyish brown clayey SAND & GRAVEL with numerous cobble-sized pockets of sandy gravelly clay. Gravel is medium sub-rounded flint.		
1.50	D	N13						1.50 - 3.00 Becoming medium dense		
2.50	D									
3.00	D	N5					(5.10)	3.00 - 5.50 Becoming loose with occasional pockets of (very soft to soft) clay		
3.50	D									
4.50	D	N9						4.50 - 5.50 With occasional cobble-sized fragments of concrete and brick		
5.50	D						5.50			
6.00	D	N26					(0.80)	MADE GROUND - Medium dense SAND & GRAVEL. Gravel is medium sub-rounded flint.		
6.50	D						6.30			
7.50	D	N19				(2.50)	MADE GROUND - Medium dense dark brown slightly clayey SAND & GRAVEL with numerous cobble-sized fragments of brick and concrete, and cobble-sized pockets of clay. Gravel is medium sub-rounded flint and fragments of brick and concrete.			

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Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole backfilled upon completion.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP02	
Job No GEG-16-458	Date 03-10-16 03-10-16	Ground Level (m)	Co-Ordinates () E 625,866.2 N 244,759.3		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
8.50	D					8.80	MADE GROUND - Medium dense dark brown slightly clayey SAND & GRAVEL with numerous cobble-sized fragments of brick and concrete, and cobble-sized pockets of clay. Gravel is medium sub-rounded flint and fragments of brick and concrete. <i>(continued)</i>	
8.80	D					9.00	Very dense light brown medium to coarse clayey SAND with numerous shell fragments and occasional whole shells. (WEATHERED RED CRAG FORMATION) Weak light brown SANDSTONE with numerous whole shells and shell fragments. (RED CRAG FORMATION)	
9.00	D	N10/ 0mm						
9.50	D							
10.50	D						10.50 - 15.45 Becoming extremely weak	
10.50	D	N50/ 158mm						
11.50	D						11.50 - 15.45 Becoming coarse	
12.00	D					(6.45)		
12.50	D	N50/ 136mm						
13.50	D							
13.50	D	N50						
14.50	D							
15.00	D	N50/ 178mm				15.45		

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Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole backfilled upon completion.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP03	
Job No GEG-16-458	Date 30-09-16 30-09-16	Ground Level (m)	Co-Ordinates () E 625,921.8 N 244,670.9		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	D					0.30	MADE GROUND - Brown medium SAND with occasional rootlets. (REWORKED TOPSOIL)	
0.30	D					(1.40)	MADE GROUND - Grey brown SAND & GRAVEL. Gravel is medium fragments of brick, concrete and various lithologies.	
1.00	D					1.70	1.00 - 1.70 With occasional cobble-sized fragments	
1.50		N11				1.80	MADE GROUND - Medium dense very clayey SAND & GRAVEL with occasional cobble-sized pockets of clay. Gravel is medium fragments of brick, concrete and various lithologies.	
1.70	D						2.50 - 3.50 Becoming slightly clayey	
2.50	D					(1.80)		
3.00		N16				3.50	MADE GROUND - Brown SAND & GRAVEL. Gravel is medium fragments of brick, concrete and various lithologies.	
3.50	D					(0.80)		
4.30	D					4.30	MADE GROUND - Firm grey sandy gravelly CLAY. Gravel is medium various lithologies.	
4.50		N10				(2.00)	4.50 - 6.30 With occasional gravel-sized fragments of brick and concrete.	
5.50	D					6.30	6.00 - 6.30 Becoming soft	
6.00		N5				(1.70)	MADE GROUND - Soft grey sandy gravelly CLAY. Gravel is medium fragments of brick, concrete and sub-rounded flint.	
6.30	D							
7.50		N6				8.00		
7.50	D							

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Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.
All dimensions in metres Scale 1:50			Client Brookbanks / CEG			Method/ Plant Used Cable Percussion Rig			Logged By FT		



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP03	
Job No GEG-16-458	Date 30-09-16 30-09-16	Ground Level (m)	Co-Ordinates () E 625,921.8 N 244,670.9		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
8.00	D					(0.40) 8.40	MADE GROUND - Grey sandy GRAVEL. Gravel is medium sub-rounded flint.	
8.40	D						Brown clayey coarse SAND with occasional shell fragments and whole shells. (WEATHERED RED CRAG FORMATION)	
9.00		N39				(2.10)	9.00 - 10.50 Becoming dense	
9.50	D							
10.50	D	N50/ 145mm				10.50	Extremely weak brown coarse slightly clayey SANDSTONE with numerous shell fragments and occasional whole shells. (RED CRAG FORMATION)	
10.50								
11.50	D							
12.00		N50/ 176mm						
12.50	D							
13.50						(4.95)		
13.50	D	N15/ 0mm					13.50 - 15.00 Becoming weak	
14.50	D							
15.00		N50/ 147mm				15.45		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP04	
Job No GEG-16-458	Date 10-10-16 10-10-16	Ground Level (m)	Co-Ordinates () E 626,002.0 N 244,768.5		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill	
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)			DESCRIPTION
0.10	D					(0.60) 0.60	MADE GROUND - Greyish brown slightly gravelly medium SAND with occasional gravel-sized fragments of glass. Gravel is medium fragments of brick, concrete and flint.		
0.60	D					(0.70) 1.30	MADE GROUND - Brown SAND & GRAVEL. Gravel is medium fragments of brick, concrete and various lithologies.		
1.50 1.50	D	N25				(1.70)	Medium dense light brown coarse SAND with numerous shell fragments and occasional whole shells. (WEATHERED RED CRAG FORMATION)		
2.50	D					3.00	2.50 - 12.00 With numerous shell fragments and whole shells		
3.00	D	N50/ 235mm					Extremely weak brown SANDSTONE. (RED CRAG FORMATION) 3.00 - 12.00 Becoming very dense		
3.50	D								
4.50 4.50	D	N50/ 210mm							
5.50	D								
6.00	D	N50/ 100mm							
6.50	D								
7.50 7.50	D	N50/ 160mm				(9.00)			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Groundwater encountered at 6.90m, rising to 5.40m after 20mins. 2. Hole backfilled upon completion.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP04	
Job No GEG-16-458	Date 10-10-16 10-10-16	Ground Level (m)	Co-Ordinates () E 626,002.0 N 244,768.5		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
8.50	D	N50/ 170mm					Extremely weak brown SANDSTONE. (RED CRAG FORMATION) <i>(continued)</i>		
9.00									
9.50	D								
10.50	D	N50/ 168mm							
10.50									
11.50	D	N50/ 100mm				12.00	Extremely weak grey MUDSTONE. (THAMES CLAY FORMATION)		
12.00	D								
12.00									
12.40	D								
12.50	D								
						12.70			

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
						12.5	12.70	0.5hr			1. Groundwater encountered at 6.90m, rising to 5.40m after 20mins. 2. Hole backfilled upon completion.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP05	
Job No GEG-16-458	Date 06-10-16 06-10-16	Ground Level (m)	Co-Ordinates () E 626,049.7 N 244,818.6		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	D		↓			(1.00) 1.00	MADE GROUND - Brown clayey gravelly medium SAND. Gravel is medium fragments of brick, concrete.	
1.00	D					(0.60) 1.60	MADE GROUND - Brown slightly clayey SAND & GRAVEL with cobble-sized fragments of concrete. Gravel is sub-rounded to sub-angular flint and concrete.	
1.50	D	N50/ 245mm					Very dense brown coarse SAND with numerous shell fragments and occasional whole shells. (WEATHERED RED CRAG FORMATION) 1.60 - 2.50 Becoming slightly clayey	
1.60	D							
2.50	D							
3.00	D	N50/ 215mm	↓					
3.50	D							
4.50	D							
4.50	D	N50/ 180mm	↓					
5.50	D							
6.00	D	N50/ 154mm				(8.90)		
6.50	D							
7.50	D							
7.50	D	N50/ 104mm						

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Groundwater encountered at 5.50m, rising to 3.00m after 20mins. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP05	
Job No GEG-16-458	Date 06-10-16 06-10-16	Ground Level (m)	Co-Ordinates () E 626,049.7 N 244,818.6		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill	
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
8.50	D	N50/ 184mm					Very dense brown coarse SAND with numerous shell fragments and occasional whole shells. (WEATHERED RED CRAG FORMATION) <i>(continued)</i>			
9.00										
9.50	D									
10.50	D	N21				10.50	Stiff brown sandy CLAY. (WEATHERED THAMES CLAY FORMATION) 10.50 - 10.70 Becoming medium dense (Stiff) brown CLAY. (WEATHERED THAMES CLAY FORMATION) (Stiff) grey silty CLAY. (WEATHERED THAMES CLAY FORMATION)			
10.50						10.70				
10.70	D								10.90	
10.90	D									
12.00	D	N23								
12.00										
13.00	D	N22				(4.55)				
13.50										
14.50	D									
15.00	D	N27								
15.00									15.45	

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Groundwater encountered at 5.50m, rising to 3.00m after 20mins. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.
All dimensions in metres Scale 1:50			Client Brookbanks / CEG			Method/ Plant Used Cable Percussion Rig			Logged By FT		



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP06	
Job No GEG-16-458	Date 07-10-16 07-10-16	Ground Level (m)	Co-Ordinates () E 626,121.8 N 244,759.0		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	D		1 ▽			(0.70)	MADE GROUND - Brownish grey clayey gravelly medium SAND with occasional gravel-sized fragments of concrete and brick. Gravel is sub-rounded flint and quartzite.	
0.70	D					0.70	Brown slightly clayey medium SAND. (WEATHERED RED CRAG FORMATION)	
1.50 1.50	D	N23				(5.60)	1.50 - 6.30 Becoming medium dense slightly gravelly. Gravel is sub-angular to sub-rounded sandstone.	
2.50	D					(5.60)		
3.00	D	N26				(5.60)		
3.50	D					(5.60)		
4.50 4.50	D	N24				(5.60)		
5.50	D				(5.60)			
6.00	D	N26			(5.60)	6.30		
6.30	D				(5.60)		Brown coarse SAND with numerous shell fragments and occasional whole shells. (WEATHERED RED CRAG FORMATION)	
7.50 7.50	D	N50/ 160mm			(2.70)		7.50 - 15.45 Becoming very dense	

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Groundwater encountered at 9.20m, rising to 6.00m after 20mins. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.
All dimensions in metres Scale 1:50			Client Brookbanks / CEG			Method/ Plant Used Cable Percussion Rig			Logged By FT		



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP06	
Job No GEG-16-458	Date 07-10-16 07-10-16	Ground Level (m)	Co-Ordinates () E 626,121.8 N 244,759.0		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
8.50	D		↓ Water			9.00	Brown coarse SAND with numerous shell fragments and occasional whole shells. (WEATHERED RED CRAG FORMATION) <i>(continued)</i>	
9.00		N50/56mm					Very weak brown coarse SANDSTONE with occasional whole shells and shell fragments. (RED CRAG FORMATION)	
9.50	D							
10.50	D	N50/182mm						
11.50	D							
12.00		N50/175mm				(6.45)		
12.50	D							
13.50	D	N50/137mm						
14.50	D							
15.00		N50/203mm				15.45		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Groundwater encountered at 9.20m, rising to 6.00m after 20mins. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP07	
Job No GEG-16-458	Date 04-10-16 05-10-16	Ground Level (m)	Co-Ordinates () E 626,062.3 N 244,661.3		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	D					(0.40)	MADE GROUND - Dark brown clayey medium SAND with occasional to numerous rootlets. (REWORKED TOPSOIL)	
0.40	D					0.40	MADE GROUND - Very clayey slightly gravelly SAND with occasional to numerous gravel-sized fragments of brick and concrete. Gravel is sub-rounded flint.	
1.50	D	N5					1.50 - 4.50 Becoming loose	
2.50	D						2.50 - 5.70 With occasional gravel-sized fragments of brick and concrete	
3.00	D	N5				(5.30)		
3.50	D							
4.50	D	N12					4.50 - 5.70 Becoming medium dense	
4.50	D							
5.50	D					5.70		
5.70	D						Very dense light brown slightly clayey medium SAND. (WEATHERED RED CRAG FORMATION)	
6.00	D	N50/ 243mm						
6.50	D							
7.50	D	N25					7.50 - 10.80 Becoming medium dense	
7.50	D							

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3, 1.GDT, 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP07	
Job No GEG-16-458	Date 04-10-16 05-10-16	Ground Level (m)	Co-Ordinates () E 626,062.3 N 244,661.3		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
8.50	D					(5.10)	Very dense light brown slightly clayey medium SAND. (WEATHERED RED CRAG FORMATION) <i>(continued)</i>		
9.50 9.50	D	N13							
10.50 10.50 10.80	D D	N31				10.80			
							Brown coarse SAND with numerous shell fragments and occasional whole shells. (WEATHERED RED CRAG FORMATION)		
12.00 12.00	D	N50/ 268mm				12.00	Extremely weak brown coarse SANDSTONE with numerous shell fragments. (RED CRAG FORMATION)		
13.00	D								
13.50		N50/ 249mm				(3.45)			
14.00	D								
15.00 15.00	D	N50/ 150mm				15.45			

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP08	
Job No GEG-16-458	Date 27-09-16 28-09-16	Ground Level (m)	Co-Ordinates () E 625,994.5 N 244,658.8		
Contractor					Sheet 1 of 2

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill	
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)			DESCRIPTION
0.10	D					(0.40)	MADE GROUND - Dark brown clayey medium SAND with occasional to numerous rootlets. (REWORKED TOPSOIL)		
0.40	D					(1.30)	MADE GROUND - Greyish brown clayey very gravelly medium SAND with occasional gravel-sized fragments of brick and concrete. Gravel is sub-rounded to sub-angular flint.		
1.50	D	N8				1.70	MADE GROUND - Soft to firm light greyish brown very sandy gravelly CLAY with numerous gravel to cobble-sized fragments of brick and concrete.		
1.50	D								
1.70	D								
2.50	D					(1.80)			
3.00		N7							
3.50	D					3.50	MADE GROUND - Loose greyish brown very clayey SAND & GRAVEL with occasional cobble-sized pockets of clay, and with occasional gravel-sized fragments of concrete.		
4.50	D	N8							
4.50									
5.50	D								
6.00		N19					6.00 - 9.50 Becoming medium dense		
6.50	D					(6.00)			
7.50									
7.50	D	N19							

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole backfilled upon completion.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP08	
Job No GEG-16-458	Date 27-09-16 28-09-16	Ground Level (m)	Co-Ordinates () E 625,994.5 N 244,658.8		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
8.50	D	N17				9.50	MADE GROUND - Loose greyish brown very clayey SAND & GRAVEL with occasional cobble-sized pockets of clay, and with occasional gravel-sized fragments of concrete. <i>(continued)</i>	
9.00								
9.50	D					(1.00)	Brown medium to coarse SAND with occasional shell fragments and whole shells. (WEATHERED RED CRAG FORMATION)	
10.50	D	N50/ 294mm				10.50	Extremely weak brown SANDSTONE with occasional whole shells and shell fragments. (RED CRAG FORMATION)	
10.50								
11.50	D						12.50 - 15.45 Becoming coarse with numerous shell fragments and occasional whole shells	
12.00		N60/ 253mm						
12.50	D					(4.95)		
13.50	D	N50/ 168mm						
13.50								
14.50	D	N50/ 186mm				15.45		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole backfilled upon completion.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP09	
Job No GEG-16-458	Date 05-10-16 05-10-16	Ground Level (m)	Co-Ordinates () E 626,158.8 N 244,630.0		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10	D					(0.60) 0.60	MADE GROUND - Dark brown clayey medium SAND with occasional to numerous rootlets. (REWORKED TOPSOIL)		
0.60	D					(0.60) 1.20	MADE GROUND - brown medium SAND.		
1.20	D	N4				(1.30) 2.50	MADE GROUND - Loose grey clayey gravelly SAND with occasional gravel-sized pockets of clay.		
2.00	D					2.50			
2.50	D					(2.70)	MADE GROUND - Firm brown sandy CLAY with numerous gravel to cobble-sized fragments of brick, chalk, and with occasional cobble-sized pockets of sand.		
3.00	D	N9							
3.50	D								
4.50	D	N7				5.20	4.50 - 5.20 Becoming soft		
4.50	D					(0.60) 5.80	MADE GROUND - Greenish brown clayey gravelly SAND. Gravel is sub-rounded quartzite and flint.		
5.20	D					5.80			
5.80	D	N8				6.10	MADE GROUND - Greyish brown sandy CLAY with occasional gravel-sized fragments of chalk. 6.00 - 6.10 Becoming soft to firm		
6.00	D						MADE GROUND - Soft to firm greenish brown sandy CLAY with numerous gravel to cobble-sized fragments of brick and concrete.		
6.10	D								
7.00	D								
7.50	D	N7					7.50 - 9.00 Becoming soft		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.
All dimensions in metres Scale 1:50			Client Brookbanks / CEG			Method/ Plant Used Cable Percussion Rig			Logged By FT		



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No CP09	
Job No GEG-16-458	Date 05-10-16 05-10-16	Ground Level (m)	Co-Ordinates () E 626,158.8 N 244,630.0		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
8.00	D						MADE GROUND - Soft to firm greenish brown sandy CLAY with numerous gravel to cobble-sized fragments of brick and concrete. <i>(continued)</i> 8.00 - 9.00 Becoming very sandy	
9.00 9.00	D	N11				(6.50)	9.00 - 12.00 Becoming firm	
10.00	D							
10.50		N9						
11.00	D							
12.00 12.00	D	N7				12.60	12.00 - 12.60 Becoming soft	
12.60	D					Extremely weak brown clayey coarse SANDSTONE with occasional shell fragments and whole shells. (RED CRAG FORMATION)		
13.50 13.50	D	N50/ 212mm				(2.85)		
14.50	D							
15.00		N50/ 110mm				15.45		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 10m, response zone 10-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No WS01	
Job No GEG-16-458	Date 23-09-16	Ground Level (m)	Co-Ordinates () E 625,627.5 N 244,885.9		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
1.00		N50/ 220mm	Water			(0.30) 0.30	MADE GROUND - (Soft) brown very sandy gravelly CLAY. Gravel is sub-rounded quartzite.	
						(1.07)	MADE GROUND - light brown clayey COBBLES of flint.	
						1.37	0.99 - 1.00 Becoming very dense	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Ground wet from 0.50m. 2. Hole refused at 1.37m on potential obstruction/cobbles. 3. Upon completion hole backfilled with arisings.

All dimensions in metres Scale 1:31.25	Client Brookbanks / CEG	Method/ Plant Used Window Sampling Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No WS02	
Job No GEG-16-458	Date 23-09-16	Ground Level (m)	Co-Ordinates () E 625,649.4 N 244,789.1		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00		N10				(0.70)	MADE GROUND - COBBLES of crushed concrete.		
						0.70	MADE GROUND - Loose to medium dense brown slightly gravelly medium SAND. Gravel is sub-rounded flint.		
2.00		N5				(1.00)	MADE GROUND - (Loose) brown and yellowish brown GRAVEL of sub-rounded flint.		
						1.70	MADE GROUND - Loose greyish brown medium SAND.		
3.00		N6				(1.00)	MADE GROUND - Soft grey very sandy clayey SILT.		
						3.00			
4.00		N5				(1.50)			
						4.50	Dense greyish brown medium SAND. (WEATHERED RED CRAG FORMATION)		
5.00		N1				(1.47)	5.00 - 5.70 Becoming very loose		
						5.97	5.70 - 5.97 Becoming very dense		
5.70		N50/ 145mm							

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Ground wet from 4.50m. 2. 50mm standpipe installed 5.97m, response zone 5.97-1m, bentonite seal 1-0.3m, flush cover 0.3-0m.

All dimensions in metres Scale 1:43.75	Client Brookbanks / CEG	Method/ Plant Used Window Sampling Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No WS03	
Job No GEG-16-458	Date 23-09-16	Ground Level (m)	Co-Ordinates () E 625,629.8 N 244,891.2		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
1.00		N50/ 95mm	Water			0.30	MADE GROUND - (Soft) brown very sandy gravelly CLAY. Gravel is sub-rounded quartzite.	
						0.60	MADE GROUND - light brown clayey COBBLES of flint.	
						(1.00)	MADE GROUND - dark brown clayey silty gravelly SAND with occasional cobble-sized pockets of concrete and brick; and with occasional gravel-sized pockets of ash. Gravel is sub-angular flint.	
						1.60		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused at 1.60m due to potential obstruction/cobbles. 3. 50mm standpipe installed 1.6m, response zone 1.6-0.5m, bentonite seal 0.5-0.3m, flush cover 0.3-0m.

All dimensions in metres Scale 1:43.75	Client Brookbanks / CEG	Method/ Plant Used Window Sampling Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No WS04	
Job No GEG-16-458	Date 23-09-16	Ground Level (m)	Co-Ordinates () E 625,770.5 N 244,832.0		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00		N15				(3.50)	Orangish brown slightly gravelly medium SAND. Gravel is sub-rounded flint. (KESGRAVE CATCHMENT SUBGROUP)		
2.00		N11					1.00 - 3.00 Becoming medium dense		
3.00		N4					3.00 - 3.50 Becoming very loose to loose		
4.00		N50/ 115mm				(0.50)	Brown occasionally white medium SAND. (WEATHERED RED CRAG FORMATION)		
						4.00			
						4.23	Extremely weak brown SANDSTONE. (RED CRAG FORMATION)		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3, 1.GDT, 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused at 4.23m. 3. 50mm standpipe installed 4m, response zone 4-1m, bentonite seal 1-0.3m, flush cover 0.3-0m.

All dimensions in metres Scale 1:43.75	Client Brookbanks / CEG	Method/ Plant Used Window Sampling Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No WS05	
Job No GEG-16-458	Date 23-09-16	Ground Level (m)	Co-Ordinates () E 625,684.0 N 244,816.3		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00		N11				(0.50) 0.50	MADE GROUND - Brown silty fine SAND with occasional rootlets. (REWORKED TOPSOIL)		
						0.75	MADE GROUND - Orangish brown gravelly medium SAND.		
2.00		N47				(1.45)	MADE GROUND - (Firm) greyish brown gravelly CLAY with occasional gravel-sized fragments of ash; and with numerous cobble-sized pockets of sand. Gravel is sub-rounded to sub-angular chert, flint, brick and concrete.		
						2.20	2.00 - 2.20 Becoming stiff to very stiff		
3.00		N17				(1.10)	MADE GROUND - Dense greyish brown slightly gravelly SAND. Gravel is sub-angular flint.		
						3.30	3.00 - 3.30 Becoming medium dense		
4.00		N33				(0.70)	MADE GROUND - White slightly gravelly SILT with occasional gravel-sized fragments of ash. Gravel is sub-angular chalk and brick.		
						4.00	MADE GROUND - Dense greyish brown very silty very clayey sandy GRAVEL of sub-rounded quartzite and flint, with occasional cobble-sized pockets of clay.		
5.00		N21				(1.93)	5.00 - 5.93 Becoming dense		
						5.93			
5.70		N50/ 130mm							

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3, 1.GDT, 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Ground wet from 4.00m. 2. Hole refused at 5.93 on potential obstruction. 3. 50mm standpipe installed 5m, response zone 5-1m, bentonite seal 1-0.3m, flush cover 0.3-0m.

All dimensions in metres Scale 1:43.75	Client Brookbanks / CEG	Method/ Plant Used Window Sampling Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No WS06	
Job No GEG-16-458	Date 23-09-16	Ground Level (m)	Co-Ordinates () E 625,750.7 N 244,939.3		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10	D					0.20	MADE GROUND - COBBLES of crushed tarmacadam.		
						0.30	MADE GROUND - brown medium SAND & GRAVEL. Gravel is sub-rounded flint. Brown occasionally dark brown medium SAND. (WEATHERED RED CRAG FORMATION)		
1.00	D	N15				(3.00)	1.00 - 3.00 Becoming medium dense		
1.50	B								
2.00		N11							
3.00		N7				3.30	3.00 - 3.30 Becoming loose		
						(1.09)	Brown occasionally white medium SAND. (WEATHERED RED CRAG FORMATION)		
4.00		N50/ 235mm				4.39	4.00 - 4.10 Becoming very dense		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused at 4.10m. 3. 50mm standpipe installed 4m, response zone 4-1m, bentonite seal 1-0.3m, flush cover 0.3-0m.

All dimensions in metres Scale 1:43.75	Client Brookbanks / CEG	Method/ Plant Used Window Sampling Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				BOREHOLE No WS08	
Job No GEG-16-458	Date 23-09-16	Ground Level (m)	Co-Ordinates () E 626,120.7 N 244,783.2		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00		N27				1.00	MADE GROUND - Dark brown gravelly medium SAND. Gravel is sub-rounded to sub-angular flint and quartzite.		
2.00		N18				1.00 2.00	Medium dense light yellowish brown slightly gravelly fine to medium SAND. Gravel is sub-rounded to sub-angular flint and quartzite. (KESGRAVE CATCHMENT SUBGROUP)		
3.00		N12					Medium dense orangish brown medium SAND. (WEATHERED RED CRAG FORMATION)		
4.00		N15				(4.45)	4.00 - 5.00 Becoming brown		
5.00		N33					5.00 - 6.45 Becoming dense brown, orangish brown occasionally white		
6.00		N41				6.45			

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3, 1.GDT, 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 6m, response zone 6-1m, bentonite seal 1-0.3m, flush cover 0.3-0m.

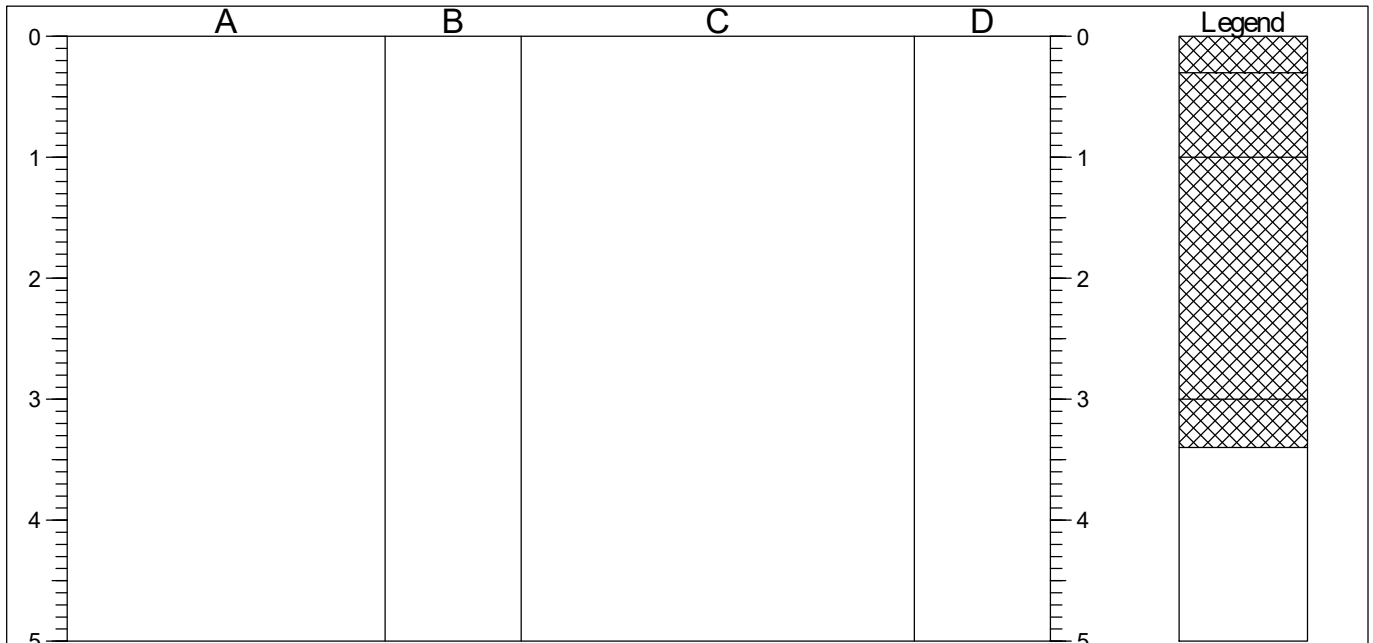
All dimensions in metres Scale 1:43.75	Client Brookbanks / CEG	Method/ Plant Used Window Sampling Rig	Logged By FT
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP03
Job No GEG-16-458	Date 22-09-16	Ground Level (m)	Co-Ordinates () E 625,865.0 N 244,796.0	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets. (REWORKED TOPSOIL)			
0.30-1.00		MADE GROUND - (Medium dense) yellow brown slightly gravelly medium SAND. Gravel is sub-rounded ferrous sandstone.	0.40	D	
1.00-3.00		MADE GROUND - (Firm) friable grey gravelly CLAY with occasional cobble-sized fragments of concrete. Gravel is sub-rounded chert. 2.30 - 3.00 With occasional cobble-sized fragments of metal, tarmacadam and brick	1.60	B	
3.00-3.40		MADE GROUND - (Medium dense) brown and grey brown very clayey very silty gravelly medium SAND with occasional gravel to cobble-sized fragments of ash, tarmacadam, timber, plastic; and with numerous cobble-sized pockets of grey clay. Gravel is sub-rounded to sub-angular flint, brick and concrete. 3.20 - 3.30 With tyre 3.39 - 3.40 With large boulders of concrete			

Shoring/Support: None Stability: Sides Stable 	GENERAL REMARKS 1. No groundwater encountered. 2. Refused at 3.40m on large boulders of concrete. 3. Upon completion trial pit backfilled with arisings.
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All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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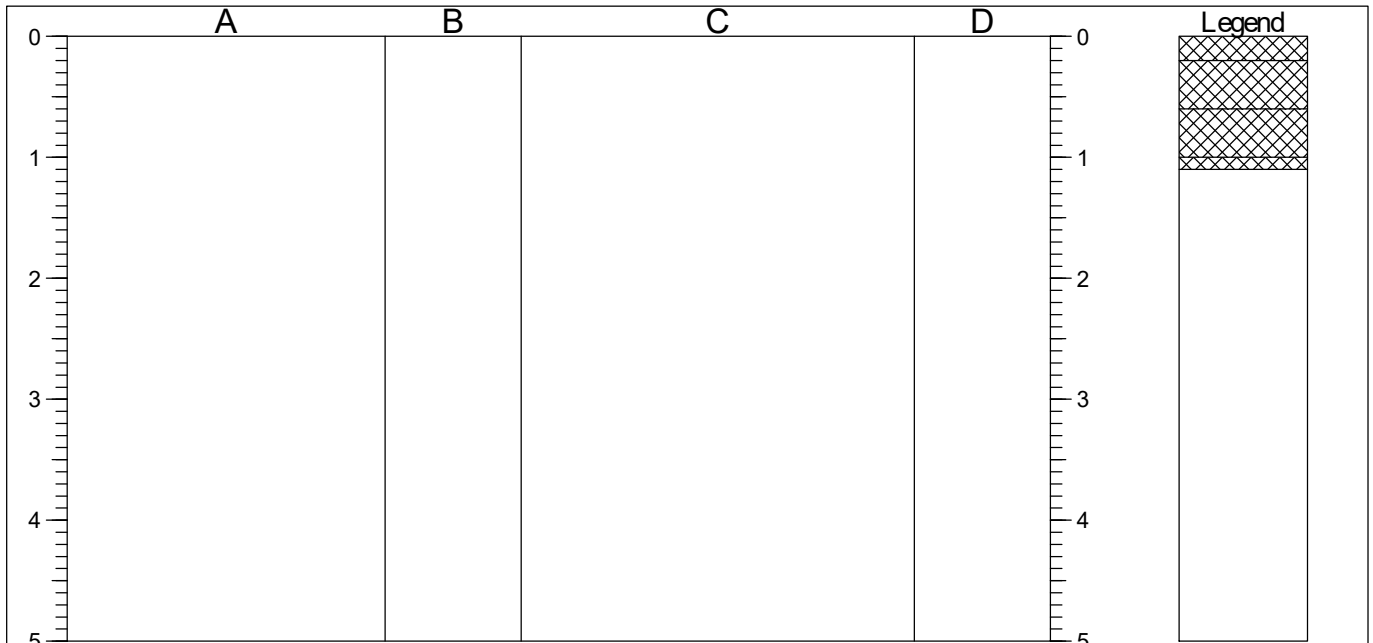
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP04
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 625,990.9 N 244,851.8	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) yellowish brown slightly clayey gravelly medium SAND. Gravel is sub-rounded quartzite, flint.	0.30	D	
0.20-0.60					
0.60-1.00		MADE GROUND - (Loose to medium dense) brown slightly clayey slightly gravelly medium SAND. Gravel is sub-angular various lithologies.	0.50	D	
1.00-1.10		MADE GROUND - (Medium dense) grey and greyish brown very gravelly medium SAND with occasional gravel to cobble-sized fragments of tarmacadam, rebar, pottery and glass. Gravel is sub-rounded quartzite and flint, and sub-angular brick and concrete.			
		MADE GROUND - (Very dense) reddish brown and grey COBBLES of brick and concrete.			

<p>Shoring/Support: None Stability: Sides slight unstable from 0.00-0.20m</p> <div style="text-align: center;"> </div>	<p>GENERAL REMARKS</p> <p>1. No groundwater encountered. 2. Refused at 1.10m on hard excavations. 3. Upon completion trial pit backfilled with arisings.</p>
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All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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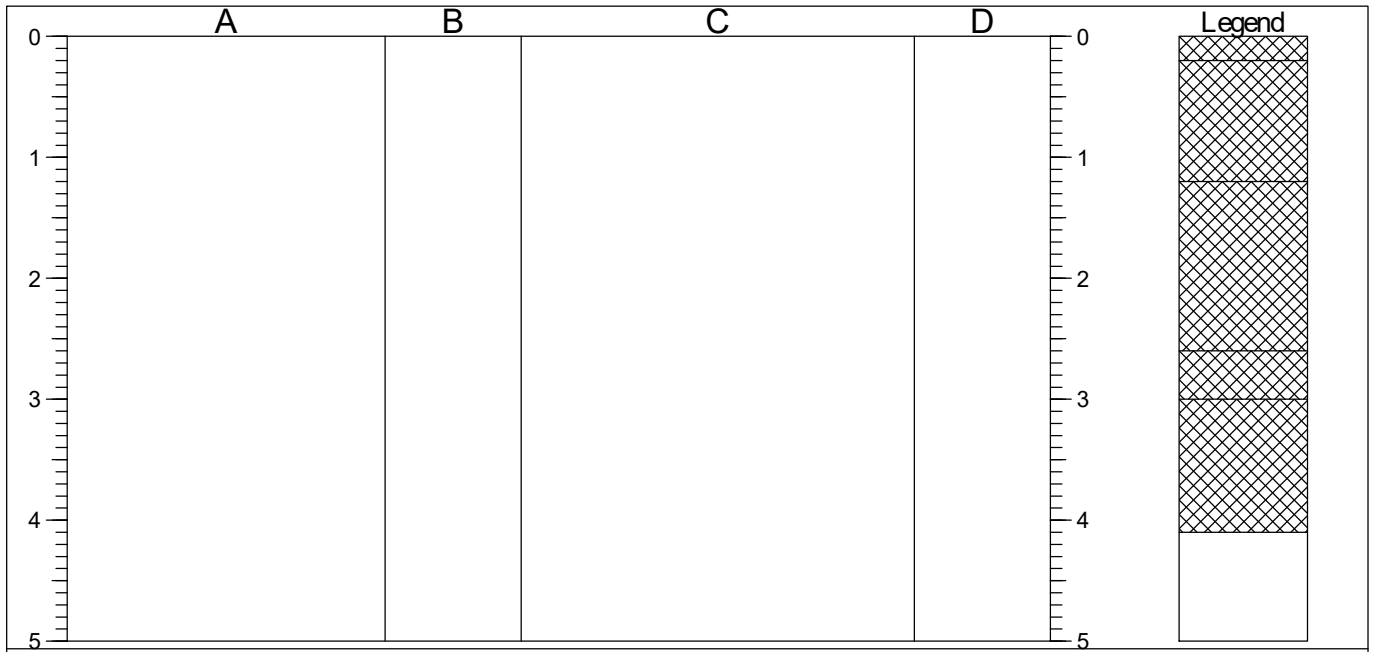
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP05
Job No GEG-16-458	Date 22-09-16	Ground Level (m)	Co-Ordinates () E 625,870.9 N 244,715.6	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets.			
0.20-1.20		(REWORKED TOPSOIL) MADE GROUND - (Medium dense) brown gravelly medium SAND. Gravel is sub-rounded quartzite and flint.	0.45	D	
1.20-2.60		MADE GROUND - (Medium dense) brown and dark brown clayey silty gravelly medium SAND with occasional gravel-sized fragments of charcoal, ash, metal and tarmacadam; and with occasional cobble-sized pockets of clay. Gravel is sub-rounded to sub-angular flint, brick and concrete.	1.00	B	
2.60-3.00		MADE GROUND - (Medium dense) brown and greyish brown slightly gravelly SAND. Gravel is sub-rounded to sub-angular flint.			
3.00-4.10		MADE GROUND - (Medium dense) brown and dark brown clayey silty gravelly medium SAND with occasional gravel-sized fragments of ash, metal, plastic, glass, tarmacadam and rebar; and with occasional boulder-sized pockets of clay. Gravel is sub-rounded to sub-angular flint, brick and concrete.			

Shoring/Support: None
 Stability: Sides slight unstable from 2.70-4.10m

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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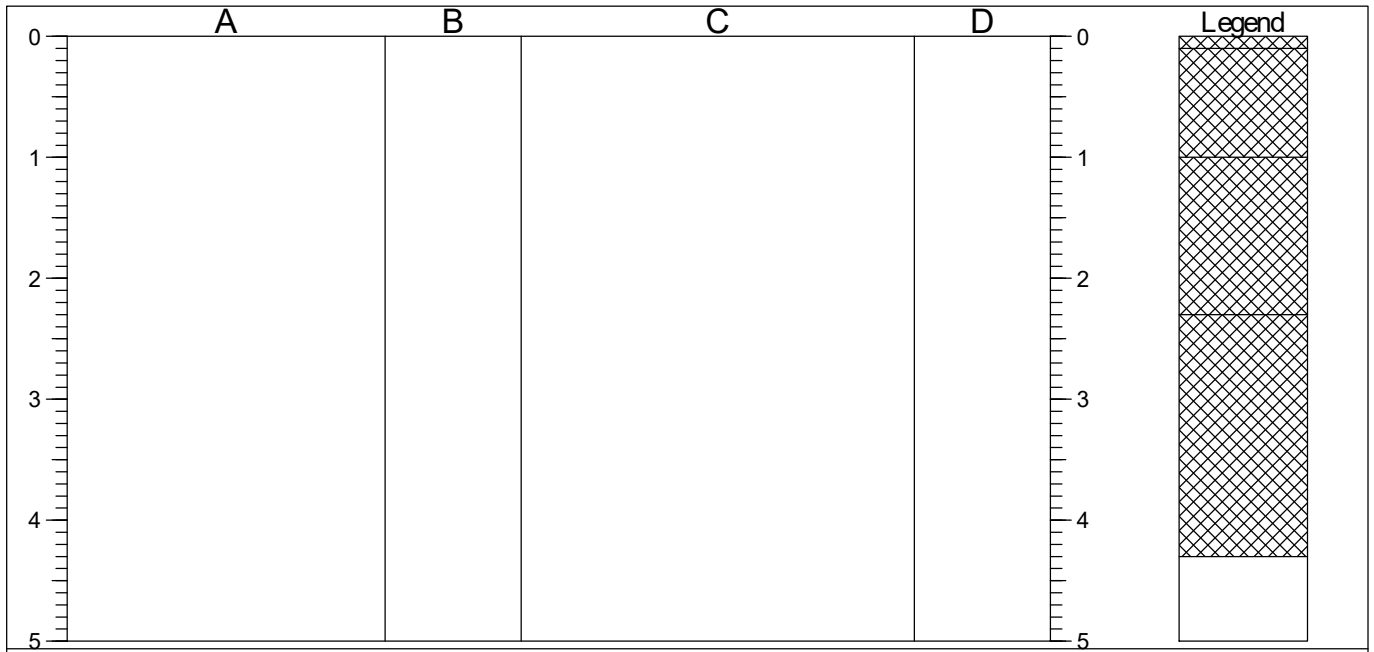
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP06
Job No GEG-16-458	Date 22-09-16	Ground Level (m)	Co-Ordinates () E 625,944.8 N 244,622.5	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets.			
0.10-1.00		(REWORKED TOPSOIL) MADE GROUND - (Medium dense) brown slightly gravelly fine SAND with occasional gravel-sized fragments of ash. Gravel is sub-rounded quartzite and flint.	0.60	D	
1.00-2.30		MADE GROUND - (Medium dense) dark brown clayey silty gravelly medium SAND with occasional gravel to cobble-sized fragments of metal, timber and tarmacadam; and with occasional cobble-sized pockets of clay. Gravel is sub-rounded to sub-angular quartzite, flint, brick and concrete.	1.30	B	
2.30-4.30		MADE GROUND - (Medium dense) dark brown very clayey gravelly medium SAND with occasional cobble-sized fragments of plastic. 2.40 - 2.50 With slight peaty odour 2.40 - 3.30 With occasional gravel-sized pockets of white chalky silt 3.30 - 4.30 Becoming greyish brown and black clayey slightly gravelly			

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. Ground damp from 3.20m. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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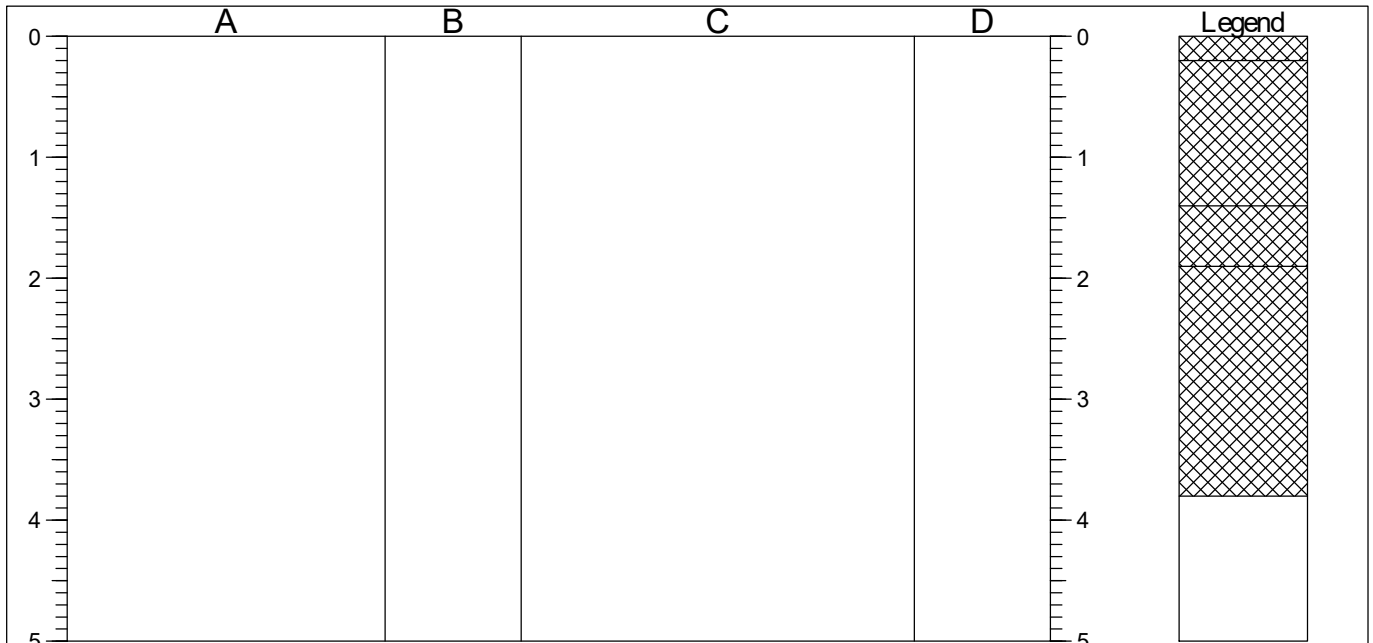
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP07
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 625,947.7 N 244,696.8	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets.	0.30	D	
0.20-1.40		(REWORKED TOPSOIL) MADE GROUND - (Medium dense) brown slightly clayey gravelly medium SAND with occasional gravel-sized fragments of timber. Gravel is sub-rounded quartzite and flint, and sub-angular brick.			
1.40-1.90		MADE GROUND - (Medium dense) greyish brown and brown clayey silty gravelly medium SAND with occasional boulder-sized pockets of clay and silt.	1.60	B	
1.90-3.80		MADE GROUND - (Medium dense) grey slightly clayey slightly silty slightly gravelly medium to coarse SAND with occasional gravel-sized fragments of ash and plastic; and occasional cobbles. Gravel and cobbles are sub-rounded to sub-angular flint. 2.90 - 3.80 With occasional cobble-sized fragments of tarmacadam, metal, rebar, whole bricks and timber 3.10 - 3.80 With slight peaty odour; and with occasional cobble to boulder-sized pockets of silt and clay			

Shoring/Support: None
 Stability: Sides Stable

2.50m
A
D
C
0.60m

GENERAL REMARKS

1. Ground becoming wet from 3.00m. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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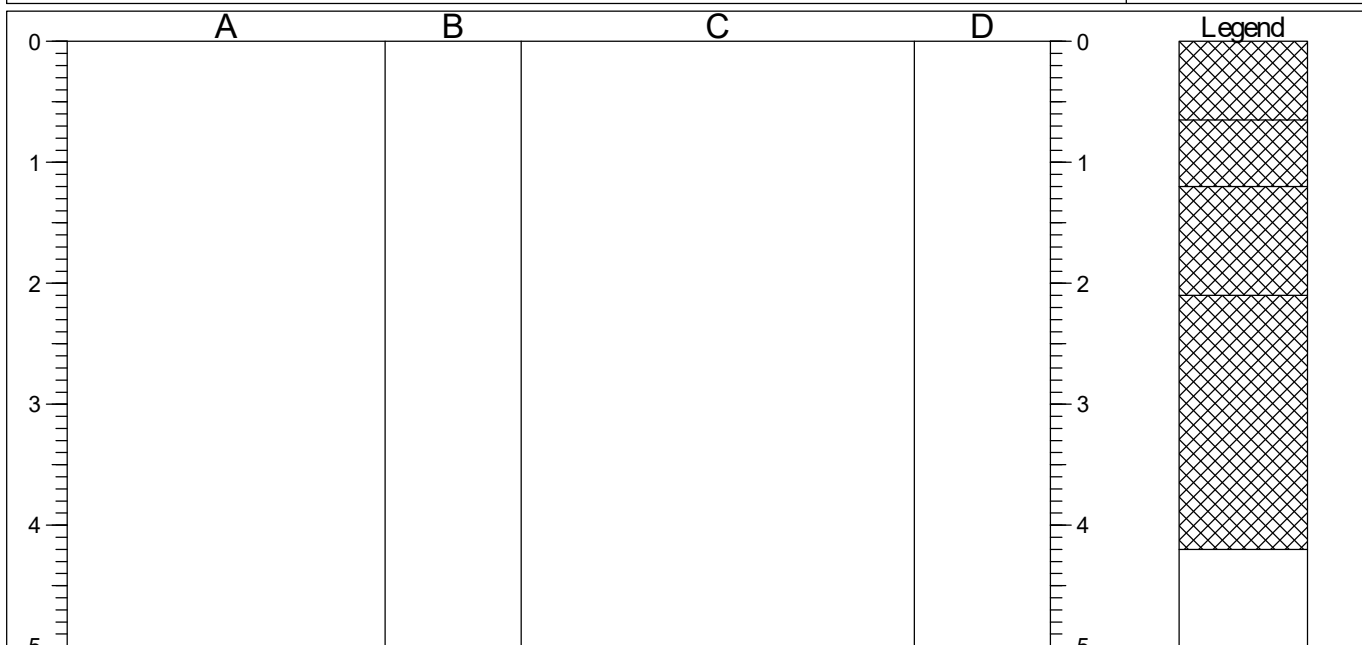
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP08
Job No GEG-16-458	Date 22-09-16	Ground Level (m)	Co-Ordinates () E 625,936.6 N 244,750.8	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.65		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets. (REWORKED TOPSOIL)	0.60	D	
0.65-1.20		MADE GROUND - (Medium dense) yellowish grey medium SAND.			
1.20-2.10		MADE GROUND - (Firm) friable grey slightly sandy gravelly CLAY with occasional cobble-sized fragments of brick and concrete. Gravel is sub-rounded chert, brick and concrete.			
2.10-4.20		MADE GROUND - (Firm) friable grey gravelly CLAY with occasional cobble to boulder-sized pockets of brown sand; and with numerous cobble-sized fragments of timber, plastic and metal. Gravel is medium fragments of brick and concrete.			

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. Ground damp from 3.90m. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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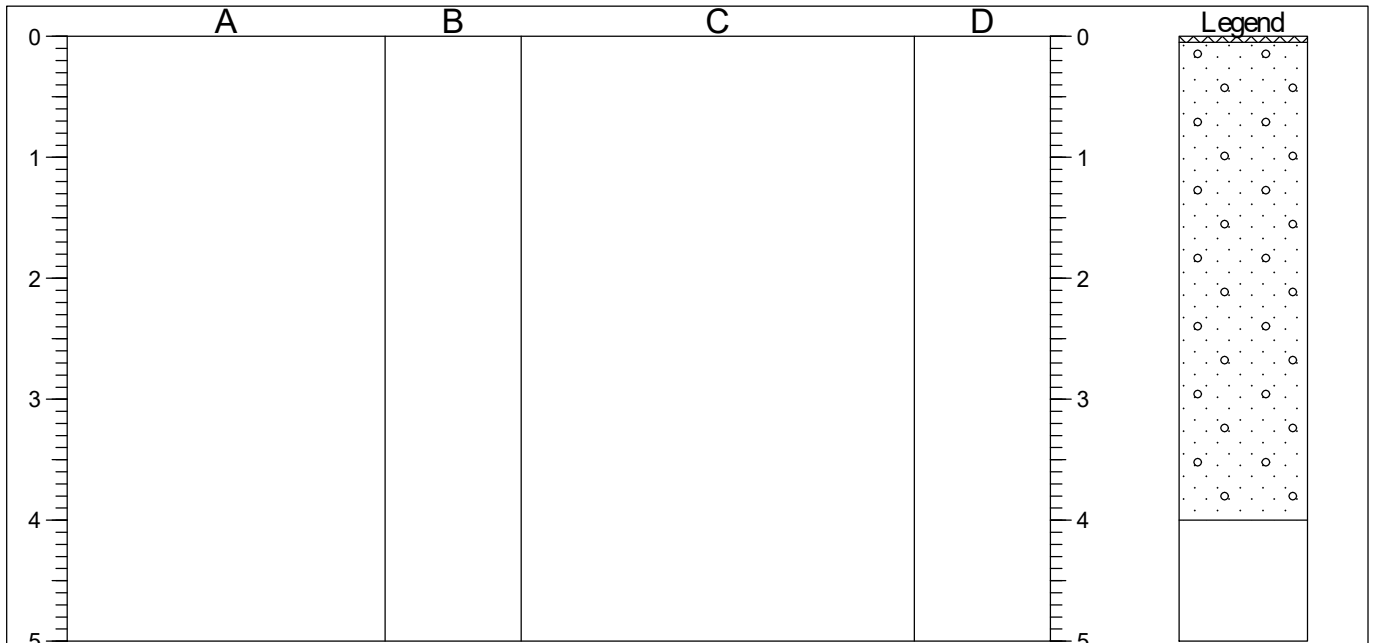
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP09
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 626,112.7 N 244,795.1	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.05		MADE GROUND - (Loose) brown clayey gravelly medium SAND with occasional gravel-sized metal fragments.			
0.05-4.00		(Medium dense) yellowish brown and orangish brown slightly gravelly medium SAND. Gravel is sub-angular to sub-rounded ferrous sandstone. (KESGRAVE CATCHMENT SUBGROUP)	0.50	D	
		1.40 - 4.00 Becoming orangish brown with occasional cobbles	1.40	B	

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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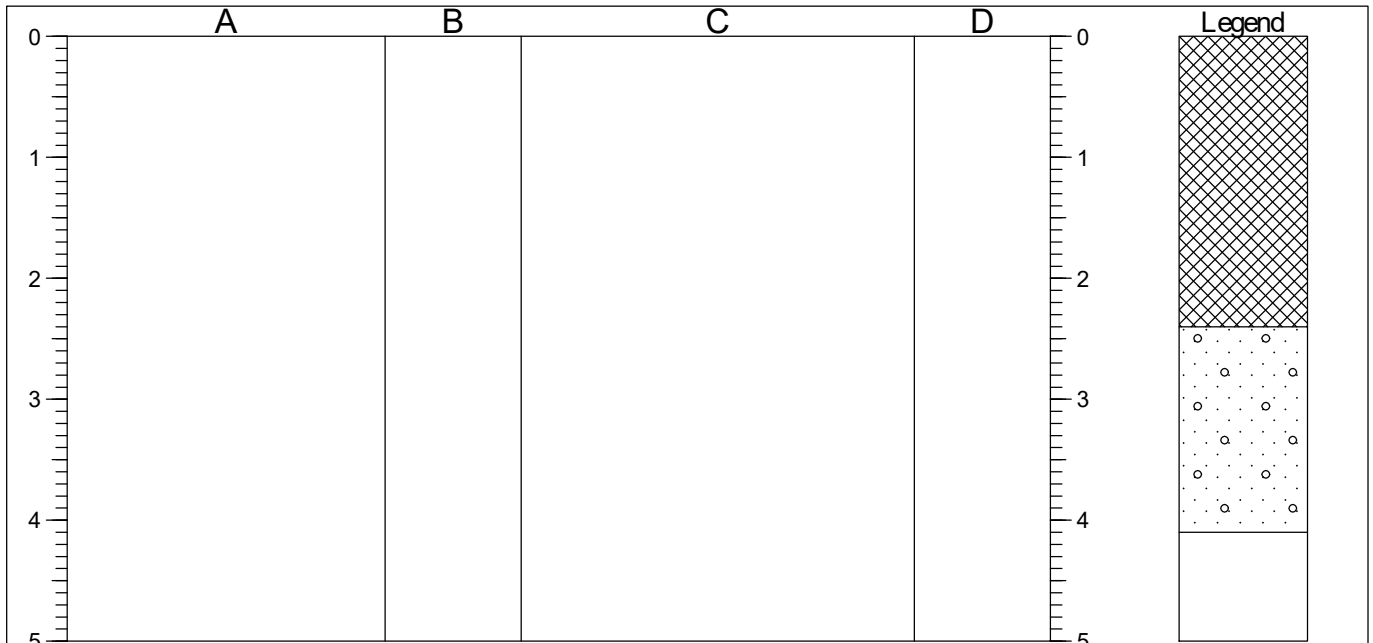
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP10	
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 626,160.2 N 244,715.1		
Contractor				Sheet 1 of 1	



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-2.40		MADE GROUND - (Loose to medium dense) brown very clayey gravelly medium SAND with occasional gravel-sized fragments of concrete, glass and road gravel. Gravel is sub-rounded quartzite and flint.	0.30	D	
2.40-4.10		(Medium dense) yellowish brown and orangish brown slightly gravelly medium SAND. Gravel is sub-angular to sub-rounded sandstone and ferrous sandstone. (KESGRAVE CATCHMENT SUBGROUP) 3.00 - 4.10 Becoming reddish brown with occasional cobbles.	1.70	B	

Shoring/Support: None Stability: Sides Stable <div style="text-align: center;"> </div>	GENERAL REMARKS 1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.
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All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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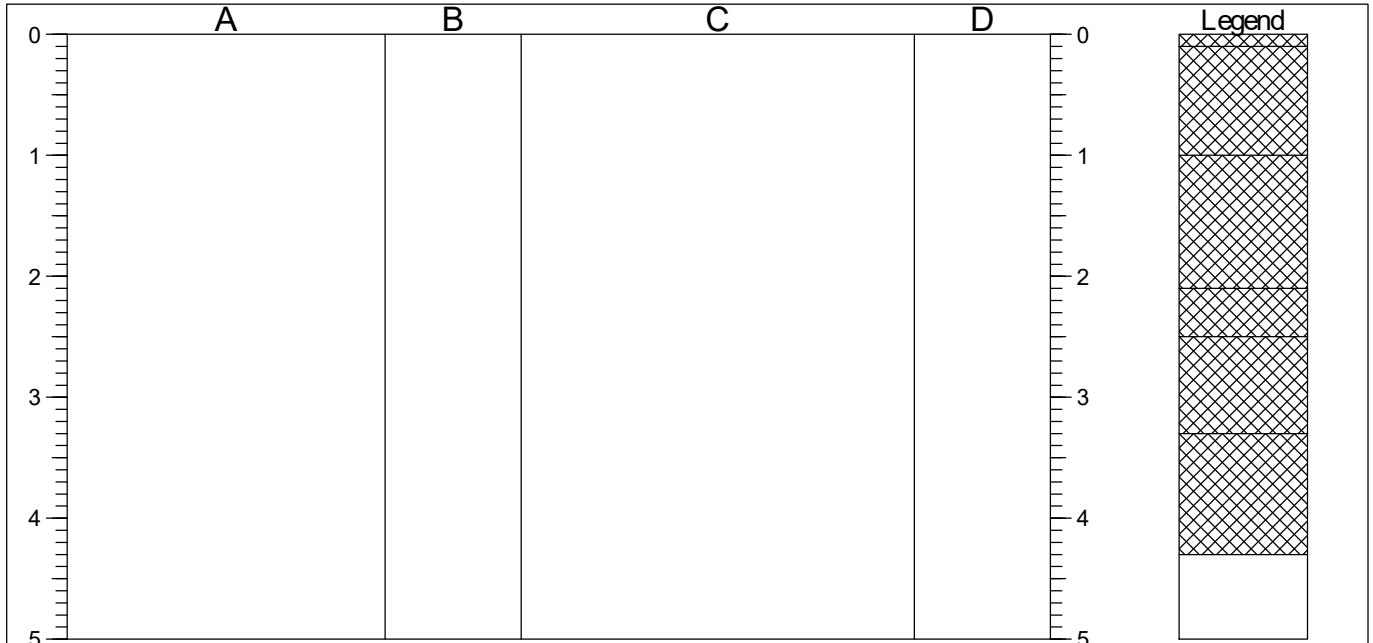
AGS3 UK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP11
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 626,032.3 N 244,693.0	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets.	0.30	D	
0.10-1.00		(REWORKED TOPSOIL) MADE GROUND - (Medium dense) brown slightly gravelly to gravelly medium SAND with occasional gravel-sized fragments of glass. Gravel is sub-rounded quartzite and flint, and sub-angular brick and concrete.			
1.00-2.10		MADE GROUND - (Firm) greyish brown and brown sandy gravelly CLAY with occasional gravel to cobble-sized fragments of brick, concrete and glass. Gravel is sub-rounded quartzite and flint.	1.10	B	
2.10-2.50		MADE GROUND - (Medium dense) brown clayey silty slightly gravelly medium SAND with occasional gravel-sized fragments of glass, brick and concrete. Gravel is sub-rounded quartzite and flint.			
2.50-3.30		MADE GROUND - (Medium dense) brown and greenish brown clayey silty slightly gravelly fine to medium SAND with occasional cobbles; and with occasional cobble-sized fragments of plastic and brick. Gravel and cobbles are sub-rounded to sub-angular quartzite and flint.			
3.30-4.30		3.00 - 3.30 With occasional cobble-sized fragments of tarmacadam and whole bricks			
		MADE GROUND - (Soft to firm) greyish brown slightly gravelly CLAY with occasional whole bricks. Gravel is sub-rounded chert.			

Shoring/Support: None
 Stability: Sides Stable

AGS3 LUK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

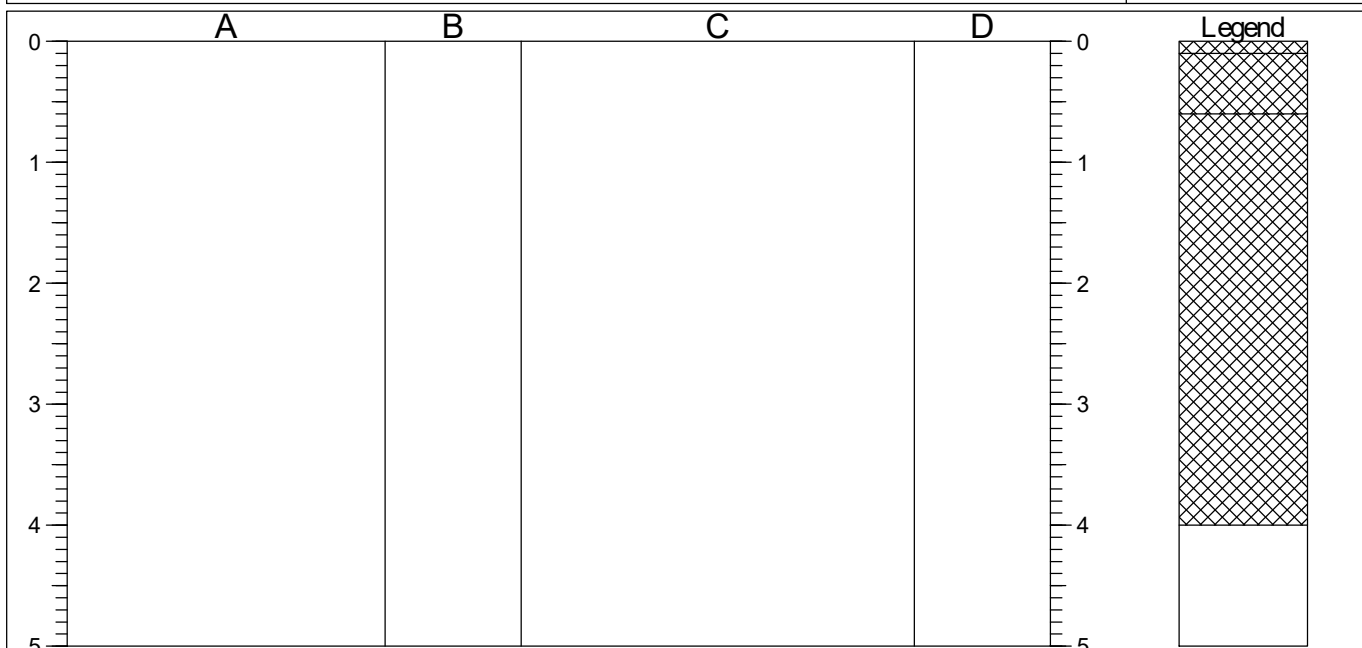
All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP12
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 625,982.7 N 244,645.2	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets.			
0.10-0.60		(REWORKED TOPSOIL)			
0.60-4.00		MADE GROUND - (Medium dense) brown slightly gravelly medium SAND. Gravel is sub-rounded quartzite and flint.	0.50	D	
		MADE GROUND - (Firm) friable greyish brown and brown silty slightly sandy gravelly CLAY with occasional cobble to boulder-sized pockets of sand. Gravel is sub-rounded chert and flint.	1.00	B	
		3.00 - 3.20 Becoming dark brown with slightly peaty odour			
		3.70 - 4.00 With occasional cobble-sized fragments of brick and flint			

Shoring/Support: None
 Stability: Sides Stable

All dimensions in metres
Scale 1:62.5

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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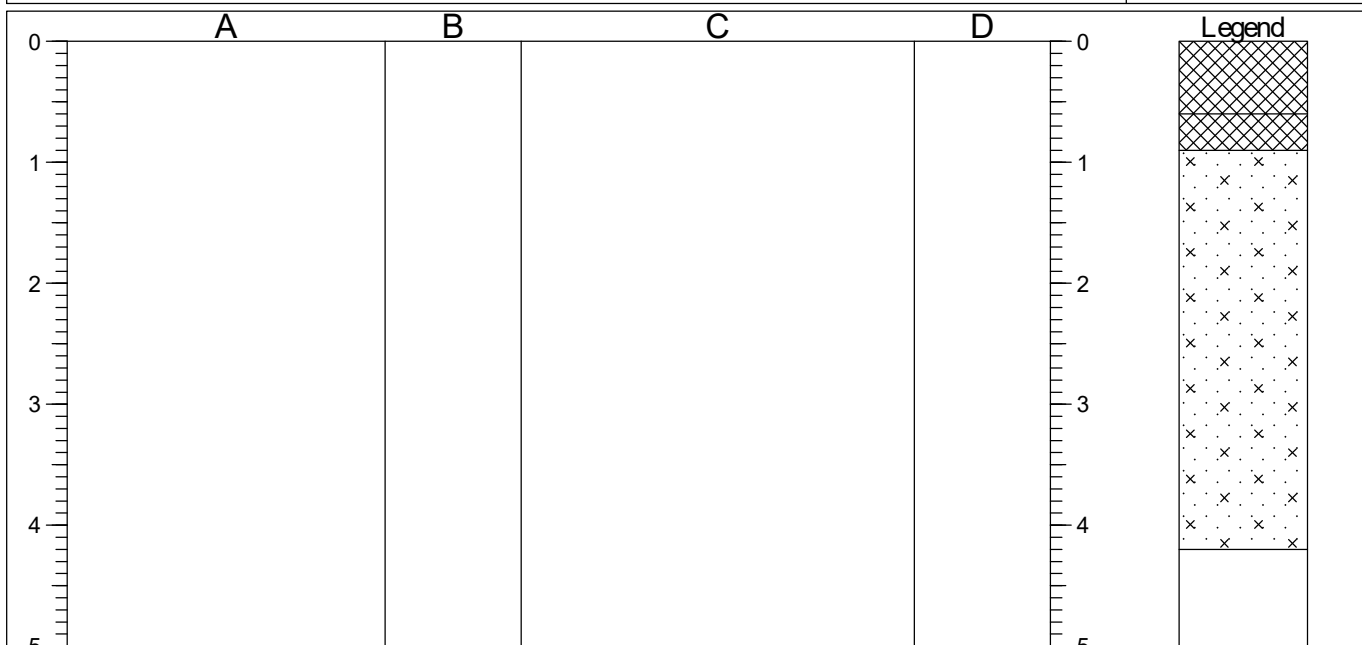
AGS3 UK TP GEG-16-458 ADASTRAL PARK_IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP13
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 626,164.8 N 244,609.1	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		MADE GROUND - (Loose) brown silty fine SAND with occasional rootlets. (REWORKED TOPSOIL)	0.40	D	
0.60-0.90		MADE GROUND - (Medium dense) brown slightly silty gravelly fine to medium SAND. Gravel is sub-rounded quartzite and flint.	0.95	B	
0.90-4.20		(Medium dense) bluish grey and brownish grey silty fine to medium SAND with occasional whole shells. (WEATHERED RED CRAG FORMATION) 1.20 - 4.20 Becoming bluish grey very silty slightly gravelly. Gravel is sub-rounded to sub-angular siltstone and flint.			

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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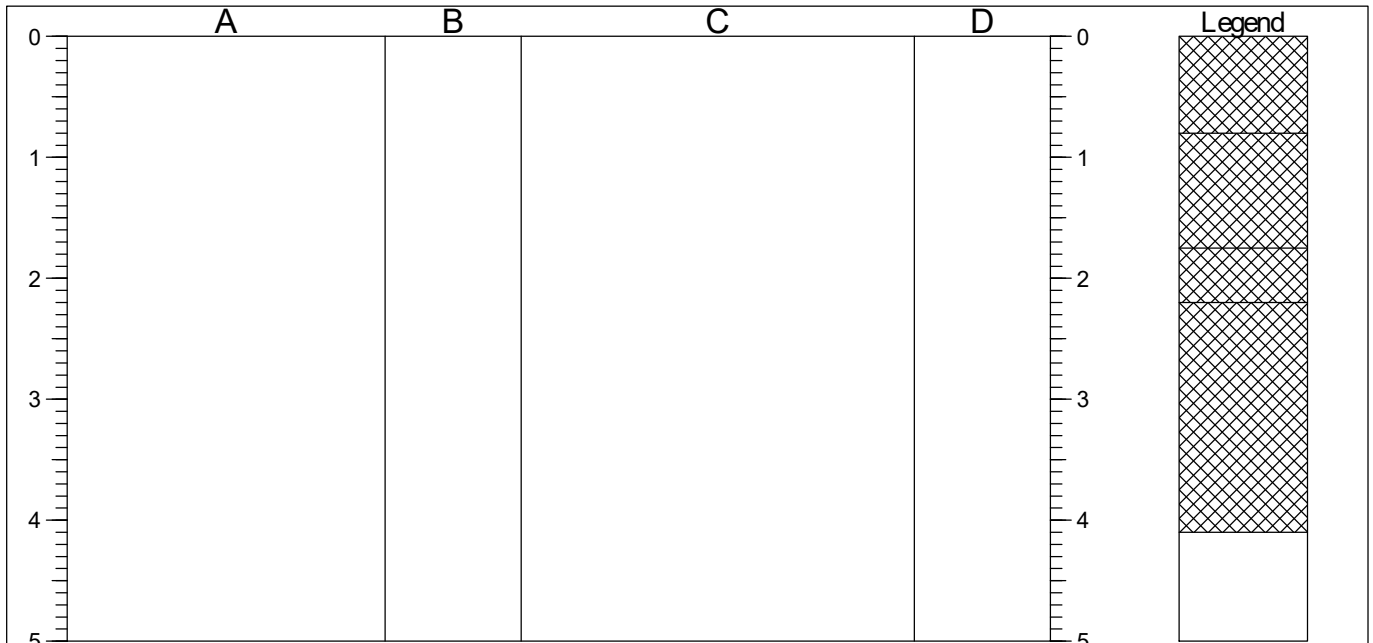
AGS3 UK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP14
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 626,158.7 N 244,667.0	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.80		MADE GROUND - (Loose to medium dense) brown very clayey gravelly medium SAND. Gravel is sub-rounded to sub-angular flint and brick.	0.40	D	
0.80-1.75		MADE GROUND - (Medium dense) orangish brown and brown gravelly SAND with occasional cobble-sized fragments of brick and concrete. Gravel is medium fragments of brick and concrete. 1.10 - 1.15 With slight peaty odour 1.30 - 1.75 With occasional cobble-sized fragments of timber, fabric and plastic	1.80	B	
1.75-2.20		MADE GROUND - (Medium dense) yellowish brown occasionally light grey slightly clayey slightly gravelly SAND. Gravel is sub-rounded to sub-angular flint.			
2.20-4.10		MADE GROUND - (Medium dense) brown grey and yellowish brown clayey gravelly medium SAND with occasional whole bricks and cobble to boulder-sized pockets of clay and fragments of concrete. Gravel is sub-rounded to sub-angular flint.			

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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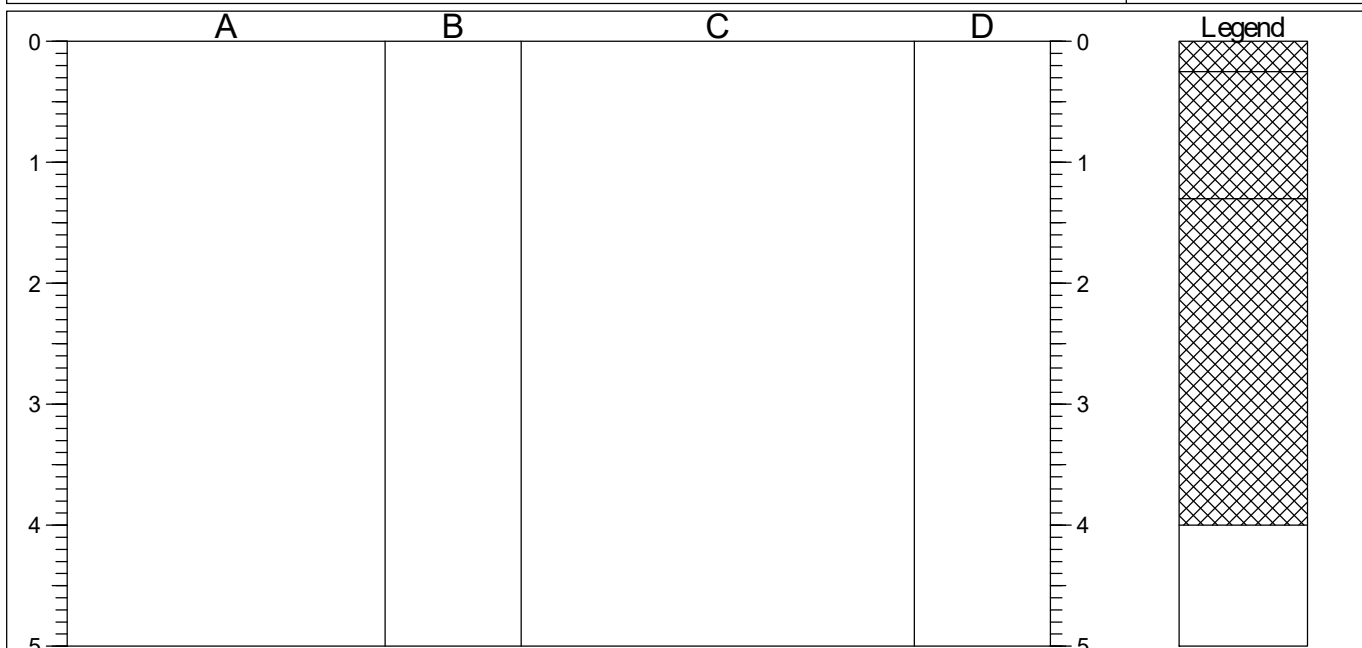
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 1				TRIAL PIT No TP15
Job No GEG-16-458	Date 21-09-16	Ground Level (m)	Co-Ordinates () E 626,108.1 N 244,644.2	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.25		MADE GROUND - (Loose) dark brown slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint. (REWORKED TOPSOIL)	0.30	D	
0.25-1.30					
1.30-4.00		MADE GROUND - (Medium dense) brown slightly gravelly to gravelly fine to medium SAND. Gravel is sub-rounded quartzite and flint.	1.40	B	
		1.40 - 4.00 With occasional cobble to boulder-sized fragments of timber, concrete, plastic, ash and charcoal. Gravel is sub-rounded quartzite and flint, and sub-angular brick and concrete. 2.00 - 3.00 Becoming brownish grey with a slight peaty odour			
		3.00 - 4.00 Becoming brownish grey very clayey very silty gravelly with numerous cobbles.	3.90	D	

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. Ground damp from 3.00m. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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AGS3 UK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



AREA 2



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP17	
Job No GEG-16-458	Date 21-10-16	Ground Level (m)	Co-Ordinates () E 625,575.5 N 244,933.9		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	D	N10	Water			0.10	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.	
				(1.60)		MADE GROUND - Dark brown slightly clayey slightly silty gravelly medium SAND. Gravel is fine fragments of brick and concrete.		
1.00	D			1.00 - 1.70 Becoming clayey silty				
1.50				1.50 - 1.70 Becoming loose to medium dense				
1.70	D							
2.00	D					(1.09)	2.00 - 2.79 With numerous cobble-sized fragments of concrete	
						2.79		
2.80	D					2.80	MADE GROUND - CONCRETE	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused due to hard drilling.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP17a	
Job No GEG-16-458	Date 21-10-16	Ground Level (m)	Co-Ordinates () E 625,582.2 N 244,933.9		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.10	D					0.10	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.		
						(0.60)			
0.70	D					0.70	MADE GROUND - Dark brown slightly clayey slightly silty gravelly medium SAND. Gravel is fine fragments of brick and concrete.		
						(0.90)			
1.50	D	N10				1.60	MADE GROUND - Firm slightly silty sandy slightly gravelly CLAY. Gravel is medium fragments of brick and concrete.		
1.60						(0.90)			
1.80	D					2.50	MADE GROUND - (Medium dense) brown SAND & GRAVEL of sub-rounded flint, quartzite and fragments of concrete.		
2.50	D	N22				(1.40)			
3.00						3.50 - 3.90 Becoming clayey			
3.50	D					3.90	MADE GROUND - COBBLES of CONCRETE		
3.90	D					(0.40)			
4.30	D	N23				4.30	MADE GROUND - (Medium dense) brown clayey SAND & GRAVEL of sub-rounded flint, quartzite and fragments of concrete.		
4.50						(2.00)			
5.50	D					6.30			
6.00	D	N17/ 150mm				6.50	MADE GROUND - CONCRETE		
6.40									

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 6.50m, response zone 6.50-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.
All dimensions in metres Scale 1:50			Client Brookbanks / CEG			Method/ Plant Used Cable Percussion Rig			Logged By FT		



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP18	
Job No GEG-16-458	Date 25-10-16 26-10-16	Ground Level (m)	Co-Ordinates () E 625,636.3 N 245,006.3		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill		
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)			DESCRIPTION	
0.10	D					0.10	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.			
1.00	D					(2.90)	MADE GROUND - (Soft) brown very sandy gravelly CLAY with occasional cobble-sized fragments of concrete and brick. Gravel is medium fragments of brick and concrete.			
1.50		N4					1.50 - 2.00 Becoming very soft to soft			
2.00	D						2.00 - 3.00 Becoming (firm) slightly sandy			
3.00	D						3.00	MADE GROUND - Medium dense dark brown slightly clayey medium SAND with occasional relic rootlets.		
3.00		N22					(1.00)	(BURIED TOPSOIL)		
4.00	D						4.00	MADE GROUND - (Firm) brown slightly sandy slightly gravelly CLAY. Gravel is medium fragments of brick, concrete and sub-rounded flint and quartzite.		
4.50		N9						4.50 - 6.00 Becoming soft to firm sandy		
5.00	D									
6.00	D							6.00 - 7.00 Becoming soft		
6.00		N7								
7.00	D						7.00 - 7.50 Becoming (very soft)			
7.50		N6					7.50 - 9.00 Becoming soft light brown sandy			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Groundwater encountered at 9.30m. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 15.20m, response zone 15.20-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP18	
Job No GEG-16-458	Date 25-10-16 26-10-16	Ground Level (m)	Co-Ordinates () E 625,636.3 N 245,006.3		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
8.00	D					(9.00)	MADE GROUND - (Firm) brown slightly sandy slightly gravelly CLAY. Gravel is medium fragments of brick, concrete and sub-rounded flint and quartzite. <i>(continued)</i>		
9.00 9.00	D	N10					9.00 - 10.50 Becoming firm light brown		
10.00	D								
10.50		N8					10.50 - 10.95 With occasional dark brown cobble-sized pockets of very gravelly sand 10.50 - 12.00 Becoming soft to firm		
11.00	D								
12.00 12.00	D	N9					12.00 - 13.00 Becoming firm		
13.00	D					13.00	MADE GROUND - Very dense brown and grey brown slightly clayey very sandy GRAVEL of sub-rounded flint and quartzite, with occasional cobble-sized fragments of concrete, brick, metal and timber.		
13.50		N50/ 167mm							
14.00	D					(2.19)			
15.00 15.00	D	N0/ 0mm				15.19 15.20	MADE GROUND - CONCRETE		

AGS3 UK BH GEG-16-458 ADASTRAL PARK_IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. Groundwater encountered at 9.30m. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 15.20m, response zone 15.20-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP19	
Job No GEG-16-458	Date 20-10-16	Ground Level (m)	Co-Ordinates () E 625,526.2 N 244,907.8		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10	D					0.10	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.		
0.80	D					(1.90)	MADE GROUND - Brown clayey silty medium gravelly SAND with occasional gravel to cobble-sized pockets of clay. Gravel is medium fragments of brick and concrete.		
1.50		N10/0mm				2.00	1.70 - 2.00 Becoming dense with occasional cobbles of concrete		
2.00	D						MADE GROUND - Brown slightly silty sandy GRAVEL of sub-rounded quartzite, flint, brick and concrete; with occasional gravel-sized fragments of tarmacadam.		
3.00	D	N45				(3.40)	3.00 - 4.50 Becoming dense		
4.00	D						4.00 - 5.40 Becoming very clayey with occasional cobbles of concrete and brick.		
4.50	D	N15				4.50 - 5.40 Becoming medium dense			
4.60									
5.39	D					5.40			
5.60		N0/0mm				5.60	MADE GROUND - CONCRETE		

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 5.60m, response zone 5.60-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP20	
Job No GEG-16-458	Date 25-10-16	Ground Level (m)	Co-Ordinates () E 625,563.3 N 245,023.9		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10	D					0.10	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.		
1.00	D					(3.40)	MADE GROUND - Brown and dark brown slightly clayey slightly silty slightly gravelly medium SAND. Gravel is sub-rounded flint, quartzite and sub-angular concrete. 1.00 - 3.50 Becoming clayey silty slightly gravelly		
1.50		N4					1.50 - 3.00 Becoming very loose to loose		
2.00	D								
3.00	D					3.50	3.00 - 3.50 Becoming medium dense		
4.00	D					(1.50)	MADE GROUND - Firm brown sandy gravelly CLAY. Gravel is sub-rounded flint and quartzite.		
4.50		N12							
5.00	D					5.00	MADE GROUND - Brown clayey gravelly SAND. Gravel is sub-rounded flint and quartzite, and sub-angular brick and concrete.		
6.00	D								
6.00		N13					6.00 - 10.50 Becoming medium dense		
7.00	D								
7.50		N11							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 11m, response zone 11-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP20	
Job No GEG-16-458	Date 25-10-16	Ground Level (m)	Co-Ordinates () E 625,563.3 N 245,023.9		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
8.00	D	N13			[Cross-hatched pattern]	(5.95)	MADE GROUND - Brown clayey gravelly SAND. Gravel is sub-rounded flint and quartzite, and sub-angular brick and concrete. <i>(continued)</i>	[Dotted pattern]	
9.00 9.00	D								
10.00	D	N6			[Cross-hatched pattern]		10.50 - 11.00 Becoming loose	[Dotted pattern]	
10.50	D								
11.00	D					10.95 11.00	MADE GROUND - CONCRETE.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 11m, response zone 11-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP25	
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,551.8 N 245,110.9		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill	
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
0.10	D					0.10	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.			
1.00	D							MADE GROUND - Dark brown slightly clayey slightly silty gravelly medium to coarse SAND with occasional gravel-sized fragments of plastic. Gravel is medium fragments of brick and concrete.		
1.50		N4						1.50 - 3.00 Becoming loose		
2.00	D									
3.00							(4.90)			
3.00	D	N25						3.00 - 4.50 Becoming medium dense		
4.00	D									
4.50								4.50 - 5.00 Becoming loose		
5.00	D						5.00			
5.00								Brown medium SAND. (WEATHERED RED CRAG FORMATION)		
5.60	D									
6.00							6.00 - 7.50 Becoming loose			
6.50	D									
7.50										
7.50	D	N11				(4.45)	7.50 - 9.50 Becoming medium dense			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 15m, response zone 15-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH, GPJ GINT STD AGS 3, 1, GDT, 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP25	
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,551.8 N 245,110.9		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
8.50	D	N12				9.45	Brown medium SAND. (WEATHERED RED CRAG FORMATION) <i>(continued)</i>		
9.00						9.50	Orangish brown slightly clayey medium SAND with occasional shell fragments. (WEATHERED RED CRAG FORMATION)		
10.50	D	N50/ 213mm				10.50	Extremely weak orangish brown SANDSTONE with occasional shell fragments. (RED CRAG FORMATION)		
11.50	D					11.50 - 15.45 With numerous shell fragments and whole shells			
12.00		N50/ 133mm							
12.50	D					(4.95)			
13.50	D	N50/ 220mm							
14.50	D								
15.00		N50/ 180mm				15.45			

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD.AGS 3.1.GDT 12/12/16

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 15m, response zone 15-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP26	
Job No GEG-16-458	Date 24-10-16	Ground Level (m)	Co-Ordinates () E 625,647.3 N 245,079.9		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill	
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick-ness)			DESCRIPTION
0.10	D					0.10	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite. MADE GROUND - Dark brown slightly clayey slightly gravelly medium SAND. Gravel is medium fragments of brick and concrete.		
1.00	D						1.00 - 6.00 With occasional cobble-sized fragments of concrete and brick 1.50 - 3.00 Becoming loose to medium dense		
1.50		N10							
2.00	D								
3.00	D						(5.90)	3.00 - 4.50 Becoming dense slightly clayey slightly gravelly. Gravel is sub-rounded flint and quartzite	
3.00		N42							
4.00	D								
4.50		N15						4.50 - 6.00 Becoming medium dense with occasional cobble-sized fragments of timber and metal	
5.00	D								
6.00	D						6.00	MADE GROUND- Firm dark brown slightly sandy slightly gravelly CLAY with occasional gravel-sized fragments of metal. Gravel is sub-rounded flint and quartzite, and sub-angular brick and concrete.	
6.00		N12				(0.80)			
7.00	D					6.80	Brown slightly clayey medium SAND with occasional shell fragments. (WEATHERED RED CRAG FORMATION)		
7.50		N14					7.50 - 12.00 Becoming medium dense		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 14m, response zone 14-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH, GPJ GINT STD AGS 3.1.GDT. 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP26	
Job No GEG-16-458	Date 24-10-16	Ground Level (m)	Co-Ordinates () E 625,647.3 N 245,079.9		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
8.00	D						Brown slightly clayey medium SAND with occasional shell fragments. (WEATHERED RED CRAG FORMATION) <i>(continued)</i>		
9.00 9.00	D	N16				(5.20)			
10.00	D								
10.50		N22							
11.00	D								
12.00 12.00	D	N50/ 178mm				12.00	Extremely weak brown SANDSTONE with numerous shell fragments and occasional whole shells. (RED CRAG FORMATION)		
13.00	D					(2.00)			
13.50		N50/ 200mm							
14.00	D					14.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. Hole refused due to hard drilling. 3. 50mm standpipe installed 14m, response zone 14-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.

All dimensions in metres Scale 1:50	Client Brookbanks / CEG	Method/ Plant Used Cable Percussion Rig	Logged By FT
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AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3.1.GDT 12/12/16



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BOREHOLE LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				BOREHOLE No CP28	
Job No GEG-16-458	Date 19-10-16	Ground Level (m)	Co-Ordinates () E 625,483.3 N 244,915.4		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10	D					0.10 (0.40) 0.50	MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.		
0.50	D						MADE GROUND - Dark brown clayey gravelly medium SAND. Gravel is medium fragments of brick and concrete. MADE GROUND - Dark brown very clayey SAND & GRAVEL of sub-rounded to sub-angular flint, quartzite, brick and concrete.		
1.50 1.50	D	N9				(2.00)	1.50 - 2.50 Becoming loose		
2.50	D					2.50	MADE GROUND - Brown slightly clayey sandy GRAVEL sub-rounded to sub-angular flint and quartzite.		
3.00		N26				(1.50)	3.00 - 4.00 Becoming medium dense		
3.50	D					4.00			
4.00	D						Orangish brown slightly clayey medium SAND with occasional shell fragments. (WEATHERED RED CRAG FORMATION)		
4.50		N9					4.50 - 6.00 Becoming loose		
5.00	D								
5.30	D								
6.00		N18					6.00 - 9.00 Becoming medium dense		
6.50	D					(5.00)			
7.50	D								
7.50		N15							

AGS3 UK BH GEG-16-458 ADASTRAL PARK, IPSWICH, GPJ GINT STD AGS 3, 1, GDT, 12/12/16

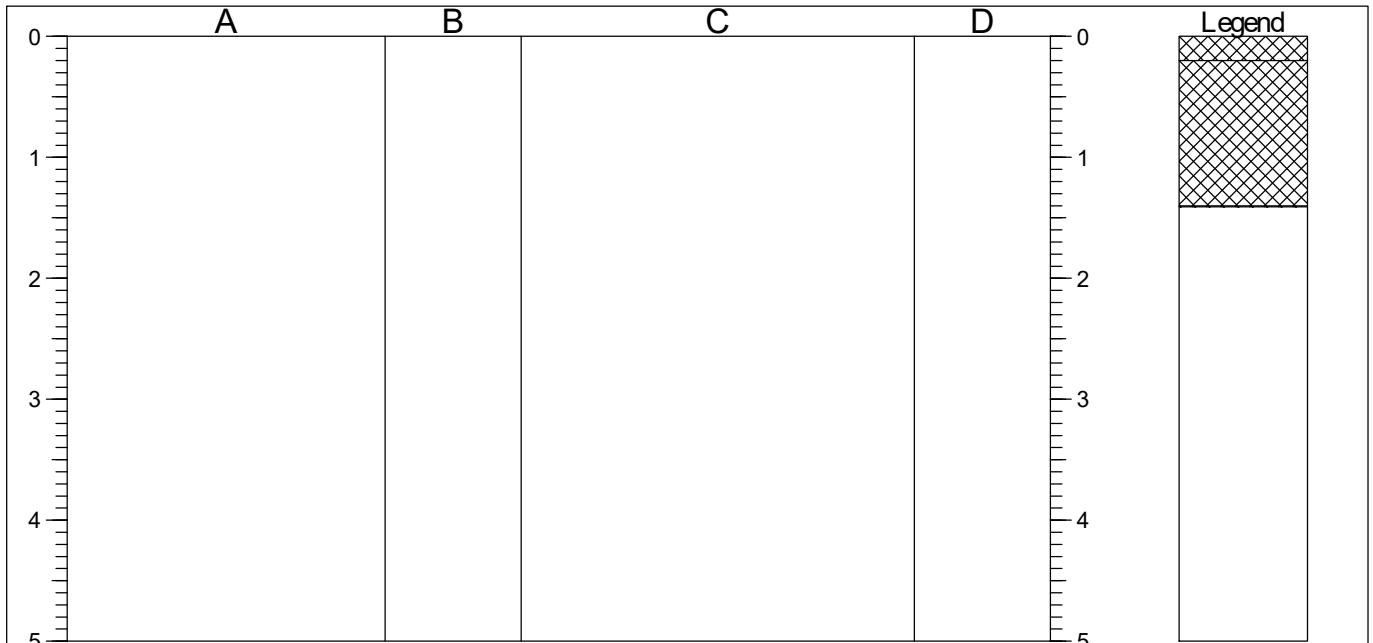
Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater encountered. 2. 50mm standpipe installed 15m, response zone 15-1m, bentonite seal 1-0.2m, flush cover 0.2-0m.
All dimensions in metres Scale 1:50			Client Brookbanks / CEG			Method/ Plant Used Cable Percussion Rig			Logged By FT		



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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP01
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,599.8 N 244,975.2	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.	0.90	D	
0.20-1.40		MADE GROUND - (Medium dense to dense) light brown fine to medium clayey slightly gravelly SAND with rare to occasional cobble-sized fragments of concrete. Gravel is sub-rounded to sub-angular flint, chert, chalk and concrete.			
1.40-1.41		MADE GROUND - (Very dense) grey COBBLES of concrete.			

Shoring/Support: None Stability: Sides Stable 	GENERAL REMARKS 1. No groundwater encountered. 2. Refused at 1.41m on hard excavations. 3. Upon completion trial pit backfilled with arisings.
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All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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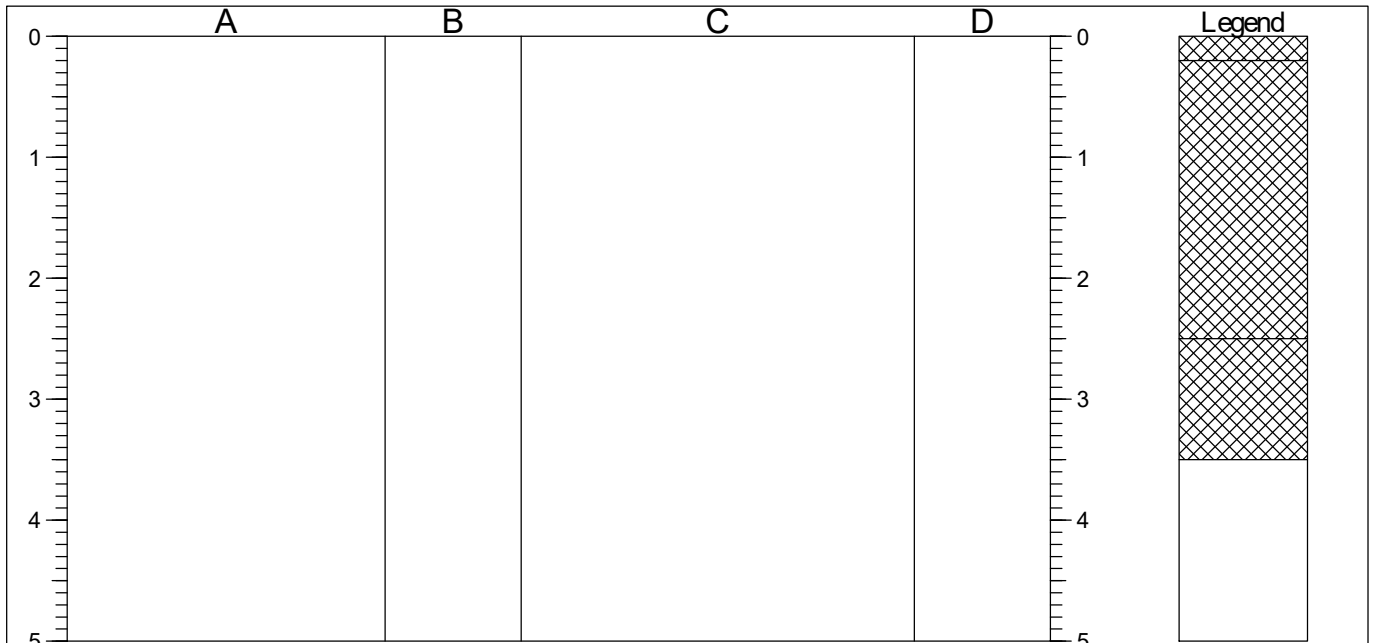
AGS3 UK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP02
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,650.3 N 245,043.4	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.	0.20	D	
0.20-2.50			MADE GROUND - (Medium dense) brown slightly gravelly fine to medium SAND with occasional gravel-sized fragments of tile. Gravel is medium fragments of brick and concrete.	1.30	
2.50-3.50		MADE GROUND - (Medium dense) greyish brown gravelly medium SAND with rare gravel-sized fragments of tarmacadam. Gravel is medium fragments of brick and concrete.	2.70	D	

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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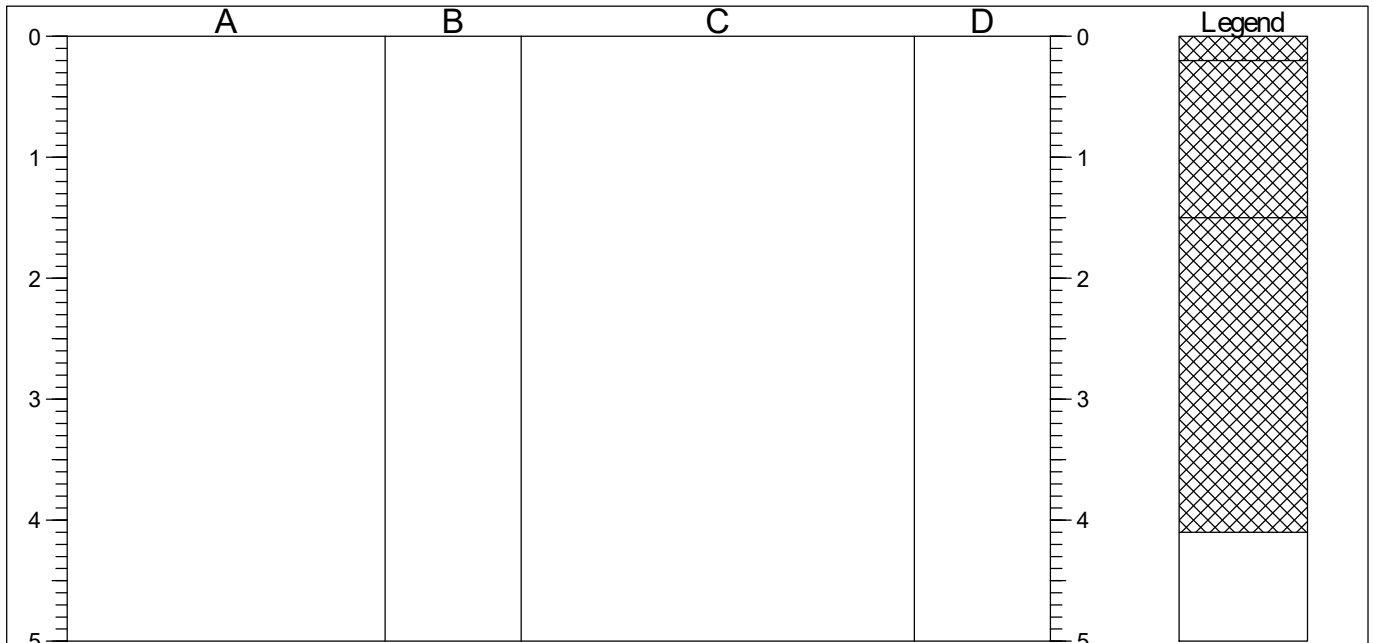
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP16
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,543.9 N 244,895.6	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) dark brown slightly clayey slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite.			
0.20-1.50		MADE GROUND - (Medium dense) light brown gravelly fine to medium SAND. Gravel is sub-rounded to sub-angular flint, brick and concrete.			
		0.50 - 1.50 Becoming greyish brown with occasional gravel to cobble-sized fragments of brick, concrete and tarmacadam.			
1.50-4.10		MADE GROUND - (Medium dense) greenish brown and greyish brown slightly clayey slightly gravelly medium SAND with rare gravel-sized and boulder-sized fragments of concrete. Gravel is sub-rounded flint.	1.40	B	
		3.00 - 4.10 With occasional whole bricks and plastic piping			
			4.10	D	

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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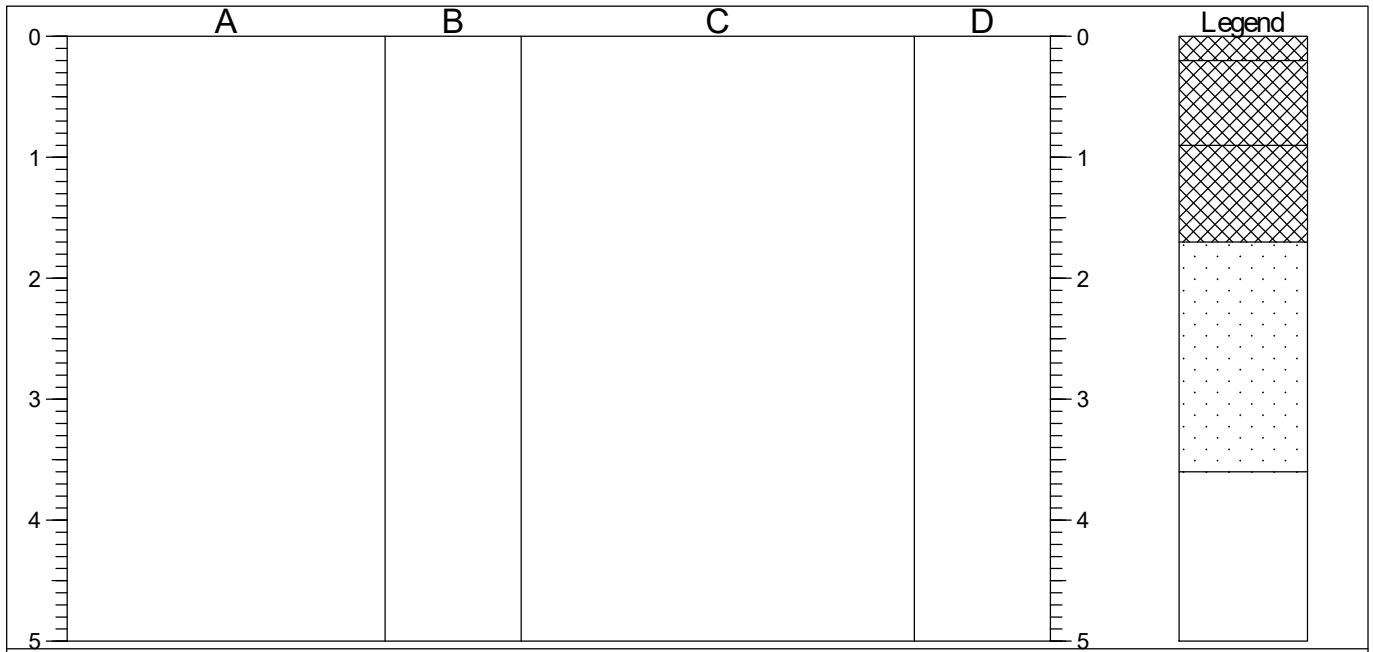
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP17
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,478.3 N 244,876.1	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) slightly gravelly medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint. (FILL)			
0.20-0.90					
0.90-1.70		MADE GROUND - (Medium dense) light brown gravelly medium SAND with occasional gravel-sized fragments of tarmacadam. Gravel is sub-rounded to sub-angular flint, chert, quartzite, brick and concrete.	0.80	D	
1.70-3.60		MADE GROUND - (Very dense) brown very gravelly medium SAND with numerous cobble-sized fragments of brick and concrete. Gravel is sub-rounded to sub-angular flint, chert, quartzite, brick and concrete.			
		1.10 - 1.70 Becoming dark greyish brown with occasional timber fragments			
		(Medium dense) orangish brown medium to coarse SAND.	2.30	D	
		(WEATHERED RED CRAG FORMATION)			
		2.40 - 3.50 Becoming (dense) slightly gravelly. Gravel is sub-angular sandstone	2.80	B	
		3.50 - 3.60 Becoming (dense)			

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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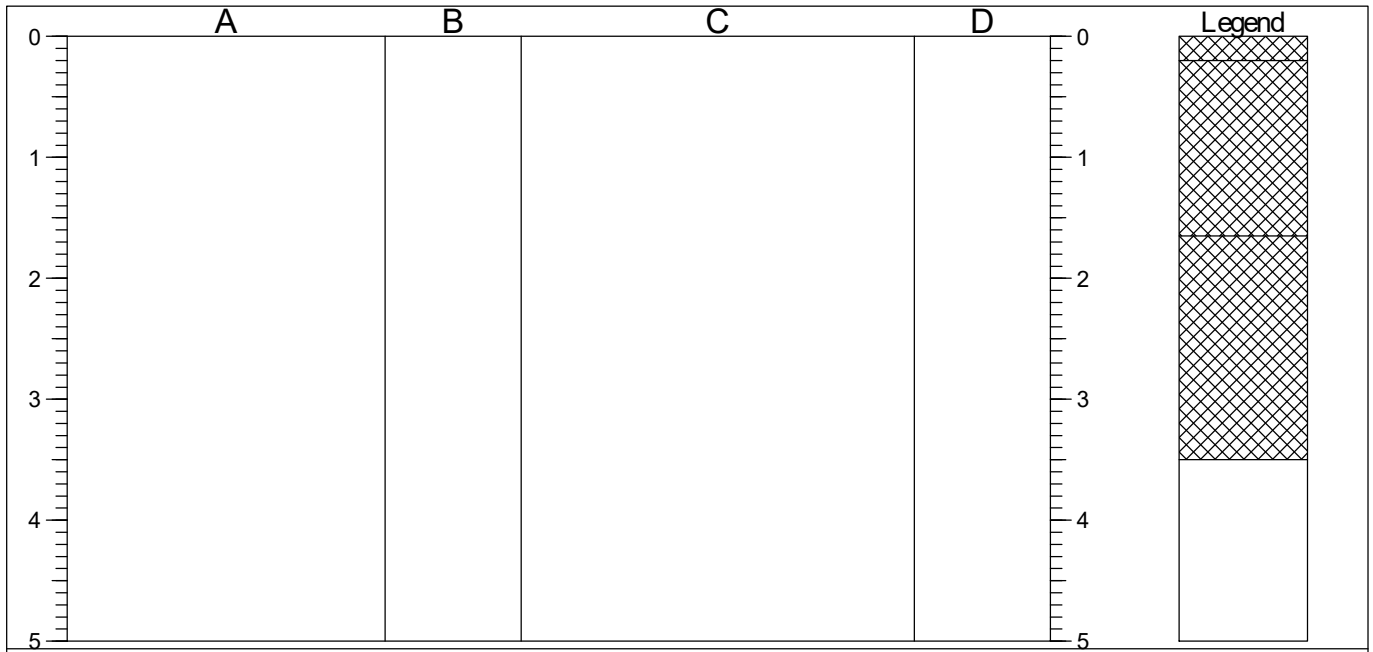
AGS3 LUK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP18
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,544.5 N 244,950.9	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) slightly gravelly medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint.	0.20	D	
0.20-1.65		MADE GROUND - (Medium dense) light brown gravelly medium SAND with occasional gravel to boulder-sized fragments of concrete, brick, rope, plastic, fabric, metal, rebar and tarmacadam; and with occasional cobble-sized pockets of clay. Gravel is sub-rounded to sub-angular flint and quartzite. 1.10 - 1.65 With numerous boulder-sized fragments of concrete, bricks & mortar, rebar and tarmac.	1.10	D	
1.65-3.50		MADE GROUND - (Medium dense) dark greyish brown very clayey slightly gravelly medium SAND with occasional gravel to cobble-sized fragments of tarmacadam, concrete, brick and rebar. Gravel is sub-rounded to sub-angular flint and quartzite. 2.50 - 2.55 With large metal beam 3.00 - 3.50 With cobble to boulder-sized fragments of polystyrene, timber planks and metal strips.	1.85	B	

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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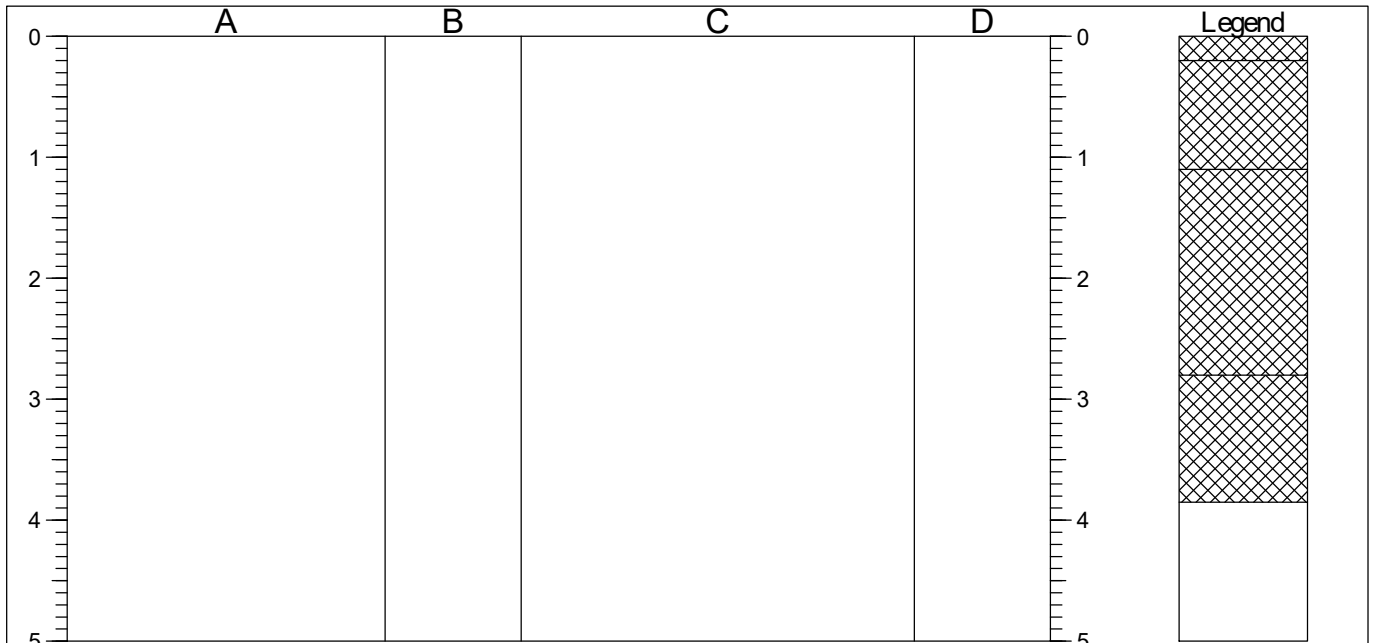
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP20
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,502.5 N 244,994.5	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) slightly gravelly medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint.	0.20	D	
0.20-1.10			MADE GROUND - (Medium dense) yellowish brown and greyish brown slightly clayey gravelly medium SAND with occasional gravel to cobble-sized fragments of concrete, brick, tarmacadam, wiring and sandstone; and with occasional cobble-sized pockets of clay. Gravel is sub-rounded flint and sub-angular brick and concrete.	0.90	
1.10-2.80		MADE GROUND - (Dense) dark greyish brown very clayey slightly gravelly medium SAND with occasional gravel to cobble-sized fragments of brick, concrete, plastic and metal. Gravel is sub-rounded flint and sub-angular brick and concrete. 1.10 - 1.20 With numerous cobble-sized odourous peaty pockets. 1.50 - 1.80 With occasional fragments of timber and boulder-sized fragments of concrete. 2.00 - 2.80 Becoming (loose to medium dense)			
2.80-3.85		MADE GROUND - (Loose to medium dense) greyish brown slightly gravelly medium SAND with rare gravel to cobble-sized fragments of concrete. Gravel is sub-rounded flint and quartzite. 3.00 - 3.85 Becoming (loose)			

Shoring/Support: None Stability: Sides slightly unstable from 2.00-2.80m 	GENERAL REMARKS 1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.
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All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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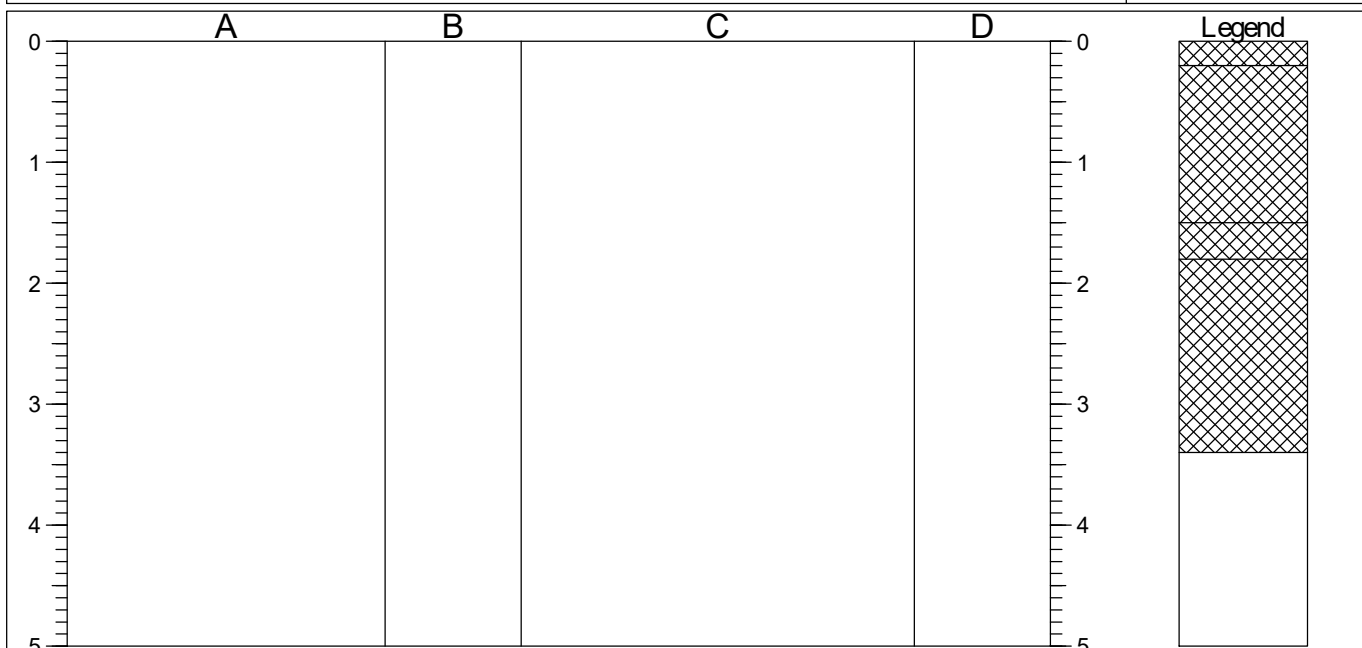
AGS3 LUK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1_GDT_12/12/16



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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP21
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,548.7 N 244,998.8	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		MADE GROUND - (Loose) slightly gravelly medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint.			
0.20-1.50					
1.50-1.80		MADE GROUND - (Medium dense) brown slightly gravelly medium SAND. Gravel is sub-rounded to sub-angular flint.	1.45	B	
1.80-3.40		0.50 - 1.50 Becoming clayey slightly gravelly 1.00 - 1.50 Becoming brown and greyish brown MADE GROUND - (Firm) greyish brown friable slightly sandy CLAY with numerous shell fragments.			
		MADE GROUND - Dark brown slightly clayey slightly gravelly medium SAND with occasional gravel to cobble-sized fragments of brick, building blocks, concrete, metal and tarmacadam.	3.00	D	
		3.39 - 3.40 With large metal beam			

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Refused on large metal beam. 3. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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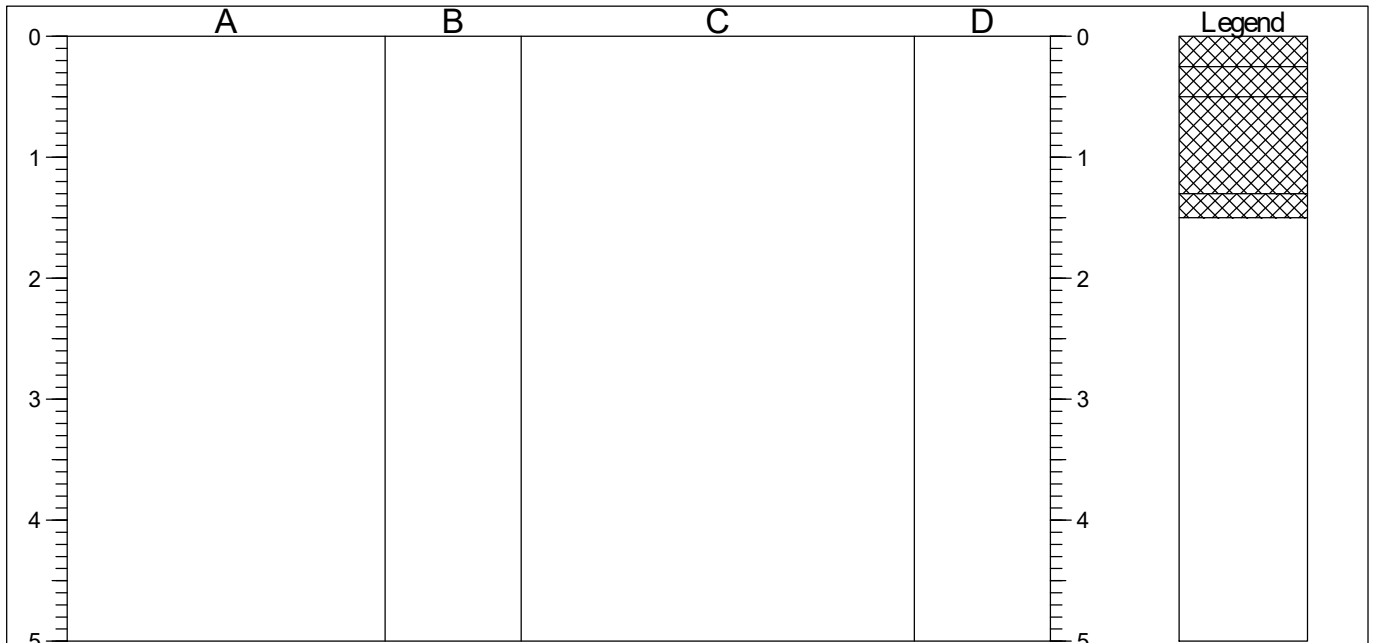
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP22
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,525.6 N 245,050.7	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.25		MADE GROUND - (Loose) slightly gravelly medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint.	0.50	D	
0.25-0.50					
0.50-1.30					
1.30-1.50		MADE GROUND - (Medium dense) brown slightly gravelly medium SAND. Gravel is sub-rounded to sub-angular flint.	1.40	D	
		MADE GROUND - (Medium dense) greyish brown slightly gravelly SAND with occasional to numerous gravel to cobble-sized fragments of brick, concrete and road core. Gravel is sub-rounded to sub-angular flint.			
		MADE GROUND - (Medium dense) grey and light brown clayey slightly gravelly medium SAND with numerous cobble-sized pockets of (stiff) clay, and with occasional gravel-sized fragments of tarmacadam, concrete and ash.			
		0.70 - 0.85 With boulder-sized fragments of concrete slabs			
		0.80 - 1.30 Becoming (very dense) with occasional whole bricks and flint cobbles			
		1.49 - 1.50 With large boulder of concrete			

Shoring/Support: None Stability: Sides Stable 	GENERAL REMARKS 1. No groundwater encountered. 2. Refused at 1.41m on hard excavations. 3. Upon completion trial pit backfilled with arisings.
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All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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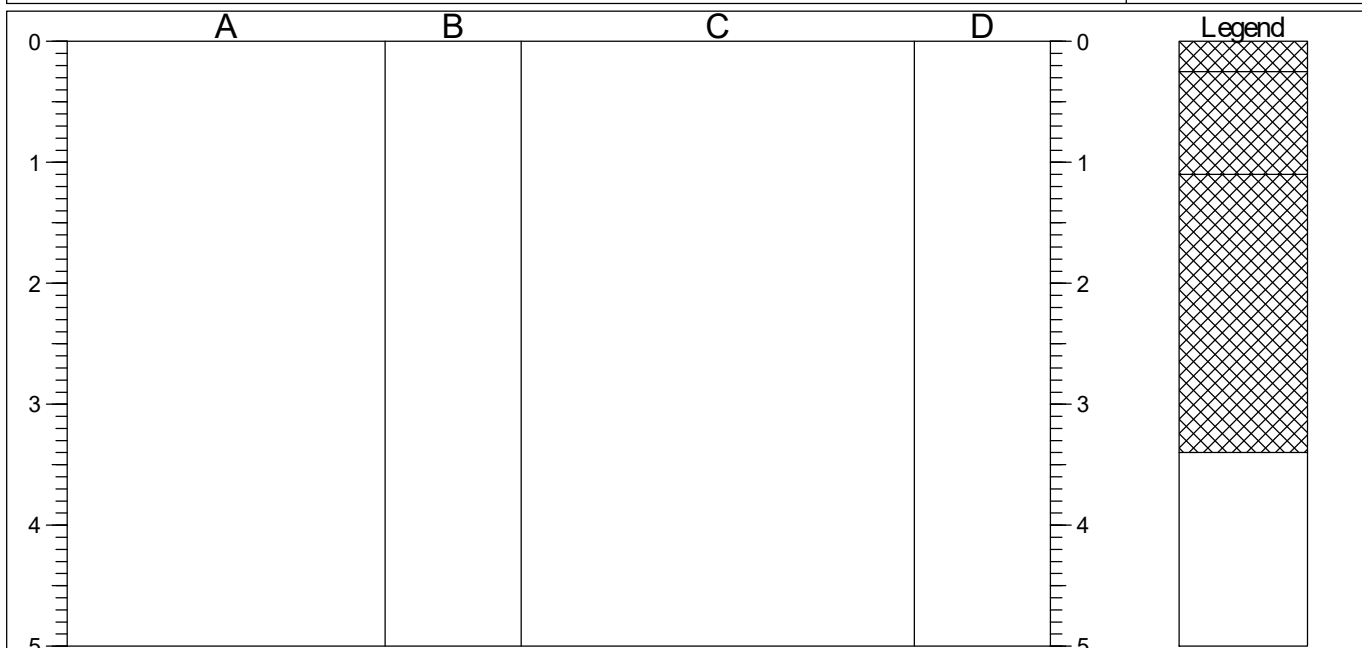
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TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP23
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,601.7 N 245,023.9	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.25		MADE GROUND - (Loose) slightly gravelly medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint.	0.20	D	
0.25-1.10			MADE GROUND - (Medium dense) dark brown and grey clayey gravelly medium SAND with numerous cobble-sized fragments of concrete, brick and timber. Gravel is medium fragments of brick and concrete.	1.00	
1.10-3.40		MADE GROUND - (Medium dense) greyish brown clayey fine to medium SAND with occasional cobble-sized fragments of brick, concrete and tarmacadam. Gravel is sub-rounded to sub-angular flint, brick and concrete. 1.30 - 1.40 With slight peaty odour	2.00	B	
		2.20 - 3.40 With occasional boulder-sized timber and fabric frags, and whole bricks	3.00	D	
		3.00 - 3.39 With plastic piping, and with slight odour			
		3.39 - 3.40 With large boulder of concrete			

<p>Shoring/Support: None Stability: Sides Stable</p> <div style="text-align: center;"> </div>	<p style="text-align: center;">GENERAL REMARKS</p> <p>1. No groundwater encountered. 2. Refused on hard excavations. 3. Upon completion trial pit backfilled with arisings.</p>
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All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
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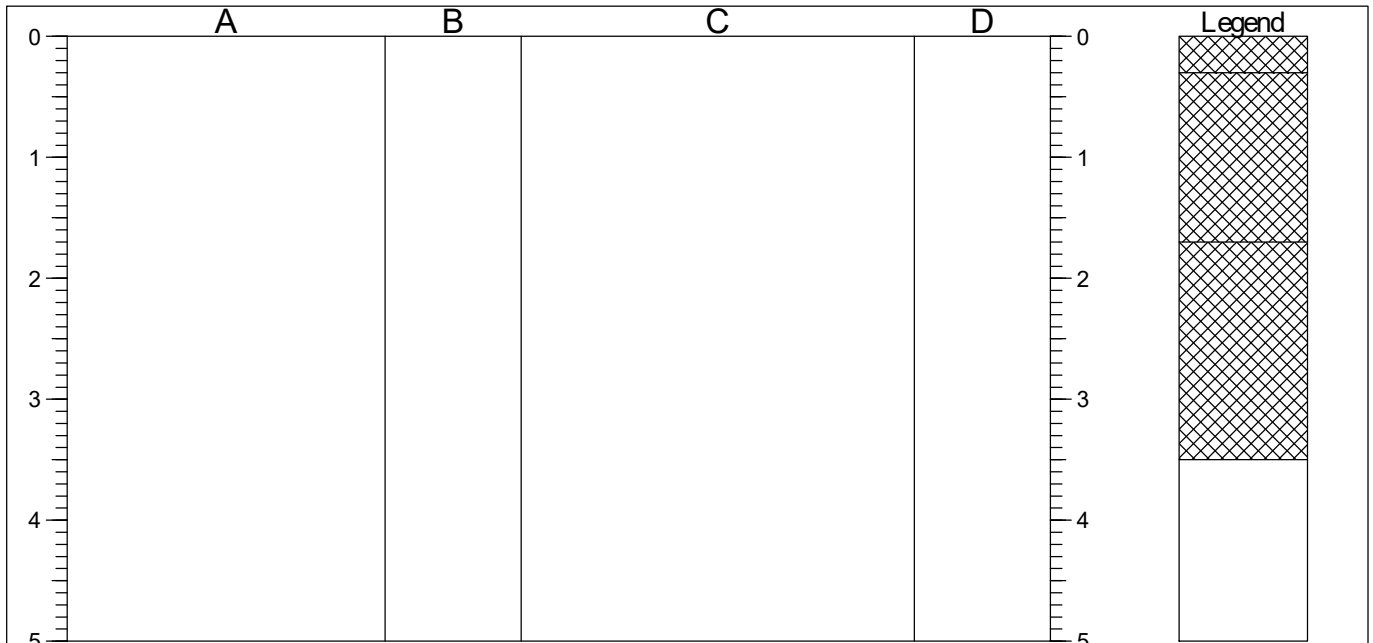
AGS3 LUK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



Geo Environmental Group
 GEG House, 17 Graham Road
 Malvern, WR14 2HR
 Telephone: 01684 212526
 Fax: 01684 576917

TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP24
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,605.0 N 245,062.4	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		MADE GROUND - (Loose) slightly gravelly medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint.	0.25	D	
0.30-1.70			1.00	B	
1.70-3.50		MADE GROUND - (Medium dense) brown and greyish brown slightly clayey to clayey medium SAND with occasional gravel to cobble-sized fragments of brick, concrete and tarmacadam. Gravel is sub-rounded to sub-angular flint.	2.00	D	
		3.00 - 3.50 With slight peaty odour	3.50	D	

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
------------------------------------------	--------------------------------	-----------------------------------------	------------------------

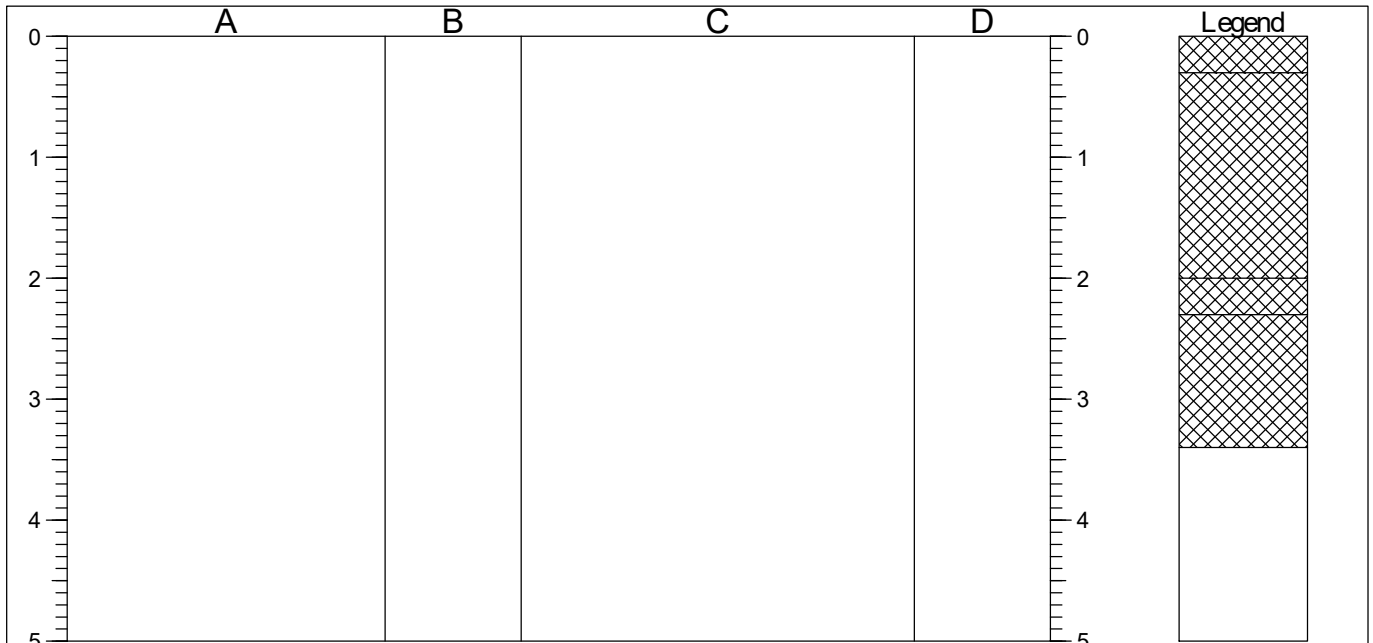
AGS3 UK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



Geo Environmental Group
 GEG House, 17 Graham Road
 Malvern, WR14 2HR
 Telephone: 01684 212526
 Fax: 01684 576917

TRIAL PIT LOG

Project Adastral Park, Ipswich, IP10 0BL - Area 2				TRIAL PIT No TP25
Job No GEG-16-458	Date 18-10-16	Ground Level (m)	Co-Ordinates () E 625,584.9 N 245,103.1	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		MADE GROUND - (Loose) slightly gravelly fine to medium SAND with occasional rootlets. Gravel is sub-rounded quartzite and flint.			
0.30-2.00		MADE GROUND - (Medium dense) light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is fine fragments of brick.	0.95	B	
		1.50 - 2.00 Becoming clayey to very clayey silty to very silty with occasional shell fragments			
2.00-2.30		MADE GROUND - (Firm) greyish brown silty sandy slightly gravelly CLAY. Gravel is medium fragments of chalk, brick and concrete.			
2.30-3.40		MADE GROUND - (Medium dense) greyish brown clayey silty slightly gravelly medium SAND. Gravel is sub-rounded flint and quartzite, and sub-angular chalk, brick and concrete. 2.50 - 3.40 With occasional timber fragments	3.40	D	

Shoring/Support: None
 Stability: Sides Stable

GENERAL REMARKS

1. No groundwater encountered. 2. Upon completion trial pit backfilled with arisings.

All dimensions in metres Scale 1:62.5	Client Brookbanks / CEG	Method/ Plant Used JCB-3CX	Logged By FT
------------------------------------------	--------------------------------	-----------------------------------------	------------------------

AGS3 UK TP GEG-16-458 ADASTRAL PARK, IPSWICH.GPJ GINT STD AGS 3_1.GDT 12/12/16



APPENDIX D

CHEMICAL ANALYSIS RESULTS



SCIENTIFIC ANALYSIS
LABORATORIES
DELIVERING SCIENCE

Scientific Analysis Laboratories is a
limited company registered in England and
Wales (No 2514788) whose address is at
Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 603058-1

Date of Report: 04-Oct-2016

Customer: Geo Environmental Group
17 Graham Road
Malvern
Worcestershire
WR14 2HR

Customer Contact: Mr Matthew Perks

Customer Job Reference: GEG-16-458

Customer Purchase Order: 2296

Customer Site Reference: Adastral Park, Ipswich

Date Job Received at SAL: 28-Sep-2016

Date Analysis Started: 28-Sep-2016

Date Analysis Completed: 04-Oct-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with SAL SOPs

All results have been reviewed in accordance with Section 25 of the SAL Quality Manual



Report checked
and authorised by :
Aleksandra Pacula
Project Manager

Issued by :
Aleksandra Pacula
Project Manager

SAL Reference: 603058
Project Site: Adastral Park, Ipswich
Customer Reference: GEG-16-458

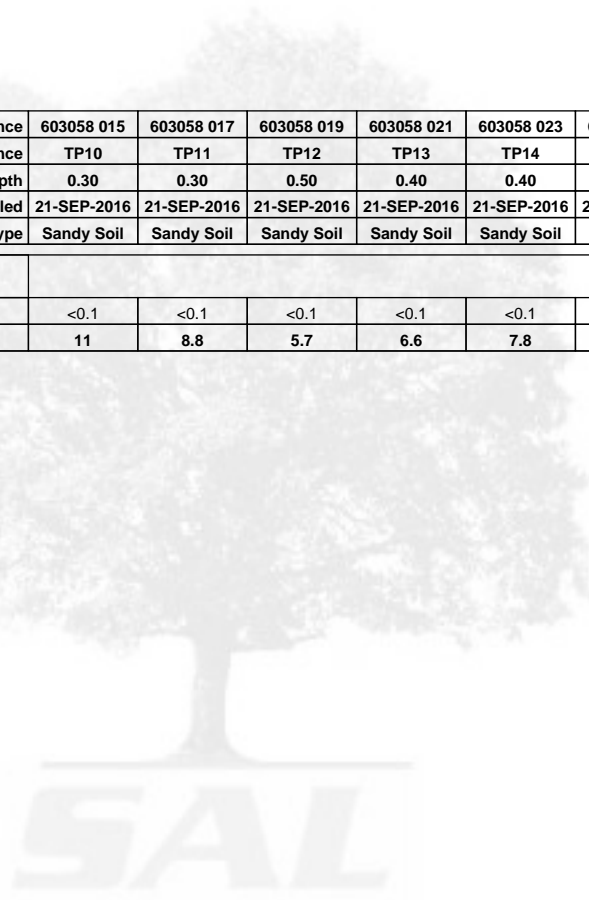
Soil Analysed as Soil
MCERTS Preparation

SAL Reference	603058 001	603058 003	603058 005	603058 006	603058 007	603058 009	603058 011	603058 013
Customer Sample Reference	TP03	TP04	TP05	TP05	TP06	TP07	TP08	TP09
Bottom Depth	0.30	0.30	0.45	1.85	0.60	0.30	0.60	0.50
Date Sampled	22-SEP-2016	21-SEP-2016	22-SEP-2016	22-SEP-2016	22-SEP-2016	21-SEP-2016	22-SEP-2016	21-SEP-2016
Type	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units				
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1
Moisture @105C	T162	AR	0.1	%	7.3	8.7	4.0	6.9
					3.7	6.2	8.1	2.0

SAL Reference: 603058
Project Site: Adastral Park, Ipswich
Customer Reference: GEG-16-458

Soil Analysed as Soil
MCERTS Preparation

SAL Reference	603058 015	603058 017	603058 019	603058 021	603058 023	603058 025	603058 027
Customer Sample Reference	TP10	TP11	TP12	TP13	TP14	TP15	WS06
Bottom Depth	0.30	0.30	0.50	0.40	0.40	0.30	0.10
Date Sampled	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	23-SEP-2016
Type	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units			
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1
Moisture @105C	T162	AR	0.1	%	11	8.8	5.7
					6.6	7.8	6.6
					4.2		

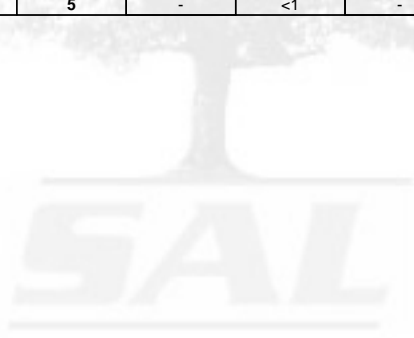


SAL Reference: 603058
 Project Site: Adastral Park, Ipswich
 Customer Reference: GEG-16-458

Soil
 GEG Suite 2

Analysed as Soil

SAL Reference					603058 001	603058 002	603058 003	603058 004	603058 005	603058 006	603058 007	603058 008
Customer Sample Reference					TP03	TP03	TP04	TP04	TP05	TP05	TP06	TP06
Bottom Depth					0.30	1.60	0.30	0.95	0.45	1.85	0.60	1.30
Date Sampled					22-SEP-2016	22-SEP-2016	21-SEP-2016	21-SEP-2016	22-SEP-2016	22-SEP-2016	22-SEP-2016	22-SEP-2016
Type					Sandy Soil		Sandy Soil		Sandy Soil	Sandy Soil	Sandy Soil	
Determinand	Method	Test Sample	LOD	Units								
Arsenic	T6	M40	2	mg/kg	4	-	13	-	3	13	7	-
Boron (water-soluble)	T6	AR	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
Cadmium	T6	M40	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
Chromium	T6	M40	1	mg/kg	7	-	19	-	9	18	12	-
Chromium (trivalent)	T85	AR	2	mg/kg	7	-	19	-	9	18	12	-
Chromium VI	T6	AR	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
Copper	T6	M40	1	mg/kg	12	-	13	-	3	23	5	-
Cyanide(Total)	T4	AR	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
Cyanide(free)	T4	AR	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
Lead	T6	M40	1	mg/kg	20	-	14	-	6	21	14	-
Mercury	T6	M40	1	mg/kg	1	-	<1	-	<1	1	2	-
Nickel	T6	M40	1	mg/kg	4	-	26	-	5	15	7	-
pH	T7	AR			7.3	-	7.3	-	6.6	8.2	8.1	-
Phenols(Mono)	T4	AR	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
Selenium	T6	M40	3	mg/kg	<3	-	<3	-	<3	<3	<3	-
Soil Organic Matter	T287	M40	0.1	%	2.9	-	0.5	-	0.7	0.7	0.7	-
SO4(Total)	T6	M40	0.01	%	0.04	-	0.03	-	<0.01	0.05	0.02	-
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulphide	T4	AR	10	mg/kg	<10	-	<10	-	<10	<10	<10	-
Zinc	T6	M40	1	mg/kg	29	-	44	-	13	57	23	-
TPH (C10-C12)	T8	M105	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
TPH (C12-C16)	T8	M105	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
TPH (C16-C21)	T8	M105	1	mg/kg	<1	-	<1	-	1	3	<1	-
TPH (C21-C35)	T8	M105	1	mg/kg	5	-	<1	-	3	26	2	-
TPH (C35-C40)	T8	M105	1	mg/kg	<1	-	<1	-	<1	37	<1	-
TPH (C6-C8)	T54	AR	100	µg/kg	<100	-	<100	-	<100	<100	<100	-
TPH (C8-C10)	T8	M105	1	mg/kg	<1	-	<1	-	<1	<1	<1	-
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	5	-	<1	-	4	66	2	-

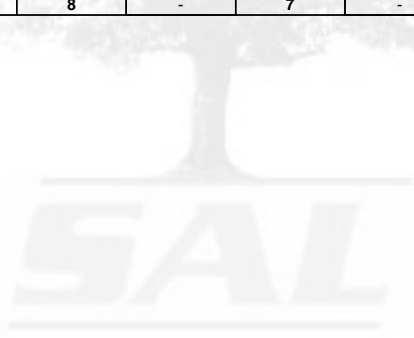


SAL Reference: 603058
 Project Site: Adastral Park, Ipswich
 Customer Reference: GEG-16-458

Soil
 GEG Suite 2

Analysed as Soil

SAL Reference					603058 009	603058 010	603058 011	603058 012	603058 013	603058 014	603058 015	603058 016
Customer Sample Reference					TP07	TP07	TP08	TP08	TP09	TP09	TP10	TP10
Bottom Depth					0.30	1.60	0.60	1.60	0.50	1.40	0.30	1.70
Date Sampled					21-SEP-2016	21-SEP-2016	22-SEP-2016	22-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016
Type					Sandy Soil		Sandy Soil		Sandy Soil		Sandy Soil	
Determinand	Method	Test Sample	LOD	Units								
Arsenic	T6	M40	2	mg/kg	4	-	6	-	11	-	14	-
Boron (water-soluble)	T6	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Cadmium	T6	M40	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Chromium	T6	M40	1	mg/kg	8	-	8	-	12	-	19	-
Chromium (trivalent)	T85	AR	2	mg/kg	8	-	8	-	12	-	19	-
Chromium VI	T6	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Copper	T6	M40	1	mg/kg	18	-	14	-	2	-	21	-
Cyanide(Total)	T4	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Cyanide(free)	T4	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Lead	T6	M40	1	mg/kg	26	-	21	-	7	-	66	-
Mercury	T6	M40	1	mg/kg	<1	-	<1	-	<1	-	1	-
Nickel	T6	M40	1	mg/kg	5	-	5	-	7	-	15	-
pH	T7	AR			7.4	-	8.0	-	6.8	-	8.3	-
Phenols(Mono)	T4	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Selenium	T6	M40	3	mg/kg	<3	-	<3	-	<3	-	<3	-
Soil Organic Matter	T287	M40	0.1	%	4.0	-	2.7	-	0.1	-	1.3	-
SO4(Total)	T6	M40	0.01	%	0.05	-	0.04	-	0.03	-	0.10	-
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2
Sulphide	T4	AR	10	mg/kg	<10	-	<10	-	<10	-	<10	-
Zinc	T6	M40	1	mg/kg	41	-	36	-	17	-	77	-
TPH (C10-C12)	T8	M105	1	mg/kg	<1	-	<1	-	<1	-	<1	-
TPH (C12-C16)	T8	M105	1	mg/kg	<1	-	<1	-	<1	-	<1	-
TPH (C16-C21)	T8	M105	1	mg/kg	1	-	<1	-	1	-	5	-
TPH (C21-C35)	T8	M105	1	mg/kg	7	-	5	-	16	-	39	-
TPH (C35-C40)	T8	M105	1	mg/kg	<1	-	2	-	2	-	19	-
TPH (C6-C8)	T54	AR	100	µg/kg	<100	-	<100	-	<100	-	<100	-
TPH (C8-C10)	T8	M105	1	mg/kg	<1	-	<1	-	<1	-	<1	-
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	8	-	7	-	19	-	63	-

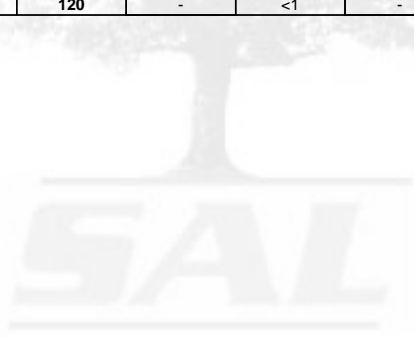


SAL Reference: 603058
 Project Site: Adastral Park, Ipswich
 Customer Reference: GEG-16-458

Soil
 GEG Suite 2

Analysed as Soil

SAL Reference					603058 017	603058 018	603058 019	603058 020	603058 021	603058 022	603058 023	603058 024
Customer Sample Reference					TP11	TP11	TP12	TP12	TP13	TP13	TP14	TP14
Bottom Depth					0.30	1.10	0.50	1.00	0.40	0.95	0.40	1.80
Date Sampled					21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016
Type					Sandy Soil		Sandy Soil		Sandy Soil		Sandy Soil	
Determinand	Method	Test Sample	LOD	Units								
Arsenic	T6	M40	2	mg/kg	12	-	3	-	15	-	11	-
Boron (water-soluble)	T6	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Cadmium	T6	M40	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Chromium	T6	M40	1	mg/kg	19	-	9	-	17	-	15	-
Chromium (trivalent)	T85	AR	2	mg/kg	19	-	9	-	17	-	15	-
Chromium VI	T6	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Copper	T6	M40	1	mg/kg	44	-	4	-	43	-	19	-
Cyanide(Total)	T4	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Cyanide(free)	T4	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Lead	T6	M40	1	mg/kg	260	-	9	-	69	-	50	-
Mercury	T6	M40	1	mg/kg	<1	-	<1	-	1	-	<1	-
Nickel	T6	M40	1	mg/kg	16	-	7	-	16	-	14	-
pH	T7	AR			8.1	-	6.9	-	8.1	-	8.1	-
Phenols(Mono)	T4	AR	1	mg/kg	<1	-	<1	-	<1	-	<1	-
Selenium	T6	M40	3	mg/kg	<3	-	<3	-	<3	-	<3	-
Soil Organic Matter	T287	M40	0.1	%	2.7	-	0.6	-	1.6	-	1.6	-
SO4(Total)	T6	M40	0.01	%	0.06	-	0.01	-	0.06	-	0.12	-
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Sulphide	T4	AR	10	mg/kg	<10	-	<10	-	<10	-	<10	-
Zinc	T6	M40	1	mg/kg	110	-	18	-	92	-	79	-
TPH (C10-C12)	T8	M105	1	mg/kg	<1	-	<1	-	<1	-	<1	-
TPH (C12-C16)	T8	M105	1	mg/kg	<1	-	<1	-	<1	-	1	-
TPH (C16-C21)	T8	M105	1	mg/kg	17	-	<1	-	5	-	23	-
TPH (C21-C35)	T8	M105	1	mg/kg	83	-	<1	-	40	-	82	-
TPH (C35-C40)	T8	M105	1	mg/kg	15	-	<1	-	19	-	20	-
TPH (C6-C8)	T54	AR	100	µg/kg	<100	-	<100	-	<100	-	<100	-
TPH (C8-C10)	T8	M105	1	mg/kg	<1	-	<1	-	<1	-	<1	-
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	120	-	<1	-	64	-	130	-



SAL Reference: 603058
 Project Site: Adastral Park, Ipswich
 Customer Reference: GEG-16-458

Soil Analysed as Soil
 GEG PAH (USEPA 16)

SAL Reference					603058 001	603058 003	603058 005	603058 006	603058 007	603058 009	603058 011	603058 013
Customer Sample Reference					TP03	TP04	TP05	TP05	TP06	TP07	TP08	TP09
Bottom Depth					0.30	0.30	0.45	1.85	0.60	0.30	0.60	0.50
Date Sampled					22-SEP-2016	21-SEP-2016	22-SEP-2016	22-SEP-2016	22-SEP-2016	21-SEP-2016	22-SEP-2016	21-SEP-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units								
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1
Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH(total)	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	0.6	<0.1	<0.1	<0.1	<0.1

SAL Reference: 603058
 Project Site: Adastral Park, Ipswich
 Customer Reference: GEG-16-458

Soil Analysed as Soil
 GEG PAH (USEPA 16)

SAL Reference					603058 015	603058 017	603058 019	603058 021	603058 023	603058 025	603058 027
Customer Sample Reference					TP10	TP11	TP12	TP13	TP14	TP15	WS06
Bottom Depth					0.30	0.30	0.50	0.40	0.40	0.30	0.10
Date Sampled					21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	23-SEP-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units							
Naphthalene	T207	M105	0.1	mg/kg	<0.1	0.8	<0.1	<0.1	<0.1	<0.1	(9) <1.0
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	(9) <1.0
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1	0.2	(9) <1.0
Fluorene	T207	M105	0.1	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1	0.2	(9) <1.0
Phenanthrene	T207	M105	0.1	mg/kg	0.5	1.8	<0.1	0.3	0.5	2.1	1.4
Anthracene	T207	M105	0.1	mg/kg	0.1	0.4	<0.1	<0.1	0.3	0.5	(9) <1.0
Fluoranthene	T207	M105	0.1	mg/kg	1.2	2.6	<0.1	1.1	1.7	3.1	4.1
Pyrene	T207	M105	0.1	mg/kg	1.1	2.2	<0.1	1.0	1.6	2.7	3.8
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	0.6	1.6	<0.1	0.7	1.0	1.6	2.3
Chrysene	T207	M105	0.1	mg/kg	0.6	1.5	<0.1	0.6	0.9	1.4	2.6
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	0.6	1.7	<0.1	0.8	1.6	1.8	2.8
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	0.4	0.9	<0.1	0.5	0.5	1.0	2.0
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	0.5	1.4	<0.1	0.6	1.1	1.5	2.6
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	0.3	0.8	<0.1	0.4	0.6	0.9	1.6
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	0.2	<0.1	<0.1	0.1	0.2	(9) <1.0
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	0.4	0.8	<0.1	0.5	0.7	1.0	2.2
PAH(total)	T207	M105	0.1	mg/kg	6.3	17	<0.1	6.5	11	18	25

SAL Reference: 603058												
Project Site: Adastral Park, Ipswich												
Customer Reference: GEG-16-458												
Soil Analysed as Soil												
Miscellaneous												
SAL Reference				603058 001	603058 002	603058 003	603058 004	603058 005	603058 006	603058 007	603058 008	
Customer Sample Reference				TP03	TP03	TP04	TP04	TP05	TP05	TP06	TP06	
Bottom Depth				0.30	1.60	0.30	0.95	0.45	1.85	0.60	1.30	
Date Sampled				22-SEP-2016	22-SEP-2016	21-SEP-2016	21-SEP-2016	22-SEP-2016	22-SEP-2016	22-SEP-2016	22-SEP-2016	
Type				Sandy Soil		Sandy Soil		Sandy Soil	Sandy Soil	Sandy Soil		
Determinand	Method	Test Sample	LOD	Units								
pH	T7	A40			-	7.2	-	7.3	-	7.5	-	9.3
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID	T27	AR			N.D.	-	N.D.	-	N.D.	N.D.	N.D.	-
Antimony	T6	A40	1	mg/kg	<1	-	2	-	<1	-	<1	-
(Water soluble) Mg	T251	AR	1	mg/l	-	6	-	<1	-	2	-	1

SAL Reference: 603058												
Project Site: Adastral Park, Ipswich												
Customer Reference: GEG-16-458												
Soil Analysed as Soil												
Miscellaneous												
SAL Reference				603058 009	603058 010	603058 011	603058 012	603058 013	603058 014	603058 015	603058 016	
Customer Sample Reference				TP07	TP07	TP08	TP08	TP09	TP09	TP10	TP10	
Bottom Depth				0.30	1.60	0.60	1.60	0.50	1.40	0.30	1.70	
Date Sampled				21-SEP-2016	21-SEP-2016	22-SEP-2016	22-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	
Type				Sandy Soil		Sandy Soil		Sandy Soil		Sandy Soil		
Determinand	Method	Test Sample	LOD	Units								
pH	T7	A40			-	9.9	-	8.1	-	6.1	-	7.9
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2
Asbestos ID	T27	AR			N.D.	-	N.D.	-	N.D.	-	N.D.	-
Antimony	T6	A40	1	mg/kg	<1	-	<1	-	2	-	1	-
(Water soluble) Mg	T251	AR	1	mg/l	-	1	-	2	-	2	-	6

SAL Reference: 603058												
Project Site: Adastral Park, Ipswich												
Customer Reference: GEG-16-458												
Soil Analysed as Soil												
Miscellaneous												
SAL Reference				603058 017	603058 018	603058 019	603058 020	603058 021	603058 022	603058 023	603058 024	
Customer Sample Reference				TP11	TP11	TP12	TP12	TP13	TP13	TP14	TP14	
Bottom Depth				0.30	1.10	0.50	1.00	0.40	0.95	0.40	1.80	
Date Sampled				21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	21-SEP-2016	
Type				Sandy Soil		Sandy Soil		Sandy Soil		Sandy Soil		
Determinand	Method	Test Sample	LOD	Units								
pH	T7	A40			-	7.9	-	7.6	-	8.1	-	8.0
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Asbestos ID	T27	AR			N.D.	-	N.D.	-	N.D.	-	N.D.	-
Antimony	T6	A40	1	mg/kg	3	-	<1	-	2	-	1	-
(Water soluble) Mg	T251	AR	1	mg/l	-	2	-	2	-	3	-	2

SAL Reference: 603058 Project Site: Adastral Park, Ipswich Customer Reference: GEG-16-458							
Soil		Analysed as Soil					
Miscellaneous							
SAL Reference		603058 025	603058 026	603058 027			
Customer Sample Reference		TP15	TP15	WS06			
Bottom Depth		0.30	1.40	0.10			
Date Sampled		21-SEP-2016	21-SEP-2016	23-SEP-2016			
Type		Sandy Soil		Sandy Soil			
Determinand	Method	Test Sample	LOD	Units			
pH	T7	A40			-	7.8	-
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1
Asbestos ID	T27	AR			N.D.	-	N.D.
Antimony	T6	A40	1	mg/kg	1	-	1
(Water soluble) Mg	T251	AR	1	mg/l	-	1	-

Index to symbols used in 603058-1

Value	Description
AR	As Received
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C.
A40	Assisted dried < 40C
N.D.	Not Detected
110	LOD raised due to low internal standard recovery.
9	LOD raised due to dilution of sample
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.

Method Index

Value	Description
T287	Calc TOC/0.58
T8	GC/FID
T207	GC/MS (MCERTS)
T162	Grav (1 Dec) (105 C)
T4	Colorimetry
T6	ICP/OES
T27	PLM
T85	Calc
T251	2:1 Extraction/ICP/OES
T2	Grav
T7	Probe
T54	GC/MS (Headspace)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
pH	T7	A40			U	002,004,006,008,010,012,014,016,018,020,022,024,026
Asbestos ID	T27	AR			SU	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Antimony	T6	A40	1	mg/kg	U	001,003,005,007,009,011,013,015,017,019,021,023,025,027
(Water soluble) Mg	T251	AR	1	mg/l	N	002,004,006,008,010,012,014,016,018,020,022,024,026
Arsenic	T6	M40	2	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Boron (water-soluble)	T6	AR	1	mg/kg	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Cadmium	T6	M40	1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Chromium	T6	M40	1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Chromium (trivalent)	T85	AR	2	mg/kg	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Chromium VI	T6	AR	1	mg/kg	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Copper	T6	M40	1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Cyanide(Total)	T4	AR	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Cyanide(free)	T4	AR	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Lead	T6	M40	1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Mercury	T6	M40	1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Nickel	T6	M40	1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
pH	T7	AR			M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Phenols(Mono)	T4	AR	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Selenium	T6	M40	3	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Soil Organic Matter	T287	M40	0.1	%	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
SO4(Total)	T6	M40	0.01	%	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
SO4(2:1)	T6	M40	0.1	g/l	N	001-027
Sulphide	T4	AR	10	mg/kg	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Zinc	T6	M40	1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH (C10-C12)	T8	M105	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH (C12-C16)	T8	M105	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH (C16-C21)	T8	M105	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH (C21-C35)	T8	M105	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH (C35-C40)	T8	M105	1	mg/kg	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH (C6-C8)	T54	AR	100	µg/kg	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH (C8-C10)	T8	M105	1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Naphthalene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Acenaphthylene	T207	M105	0.1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Acenaphthene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Fluorene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Phenanthrene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Anthracene	T207	M105	0.1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Fluoranthene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Pyrene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Chrysene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001,003,005-007,009,011,013,015,017,019,021,023,025,027
PAH(total)	T207	M105	0.1	mg/kg	U	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Retained on 10mm sieve	T2	M40	0.1	%	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027
Moisture @105C	T162	AR	0.1	%	N	001,003,005-007,009,011,013,015,017,019,021,023,025,027





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Certificate of Analysis

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Report Number: 604634-1

Date of Report: 10-Oct-2016

Customer: Geo Environmental Group
17 Graham Road
Malvern
Worcestershire
WR14 2HR

Customer Contact: Mr Matthew Perks

Customer Job Reference: GEG-16-458

Customer Purchase Order: 2296

Customer Site Reference: Adastral Park, Ipswich

Date Job Received at SAL: 28-Sep-2016

Date Analysis Started: 04-Oct-2016

Date Analysis Completed: 10-Oct-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

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Tests covered by this certificate were conducted in accordance with SAL SOPs

All results have been reviewed in accordance with Section 25 of the SAL Quality Manual



1549

Report checked
and authorised by :
Aleksandra Pacula
Project Manager

Issued by :
Aleksandra Pacula
Project Manager



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Certificate of Analysis

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Report Number: 608749-1

Date of Report: 27-Oct-2016

Customer: Geo Environmental Group
17 Graham Road
Malvern
Worcestershire
WR14 2HR

Customer Contact: Mr Matthew Perks

Customer Job Reference: GEG-16-458

Customer Purchase Order: 2337

Customer Site Reference: Adastral Oark, Ipswich

Date Job Received at SAL: 20-Oct-2016

Date Analysis Started: 21-Oct-2016

Date Analysis Completed: 27-Oct-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

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Tests covered by this certificate were conducted in accordance with SAL SOPs

All results have been reviewed in accordance with Section 25 of the SAL Quality Manual



Report checked
and authorised by :
Aleksandra Pacula
Project Manager

Issued by :
Aleksandra Pacula
Project Manager

SAL Reference: 608749 Project Site: Adastral Oark, Ipswich Customer Reference: GEG-16-458 Soil Analysed as Soil MCERTS Preparation												
SAL Reference		608749 001	608749 002	608749 003	608749 004	608749 005	608749 006	608749 007	608749 008			
Customer Sample Reference		TP01	TP02	TP02	TP02	TP16	TP16	TP17	TP17			
Bottom Depth		0.90	0.20	1.30	2.70	1.40	4.10	0.80	2.30			
Date Sampled		18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016			
Type		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units								
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Moisture @105C	T162	AR	0.1	%	8.8	6.4	7.0	10	10	19	6.6	5.5

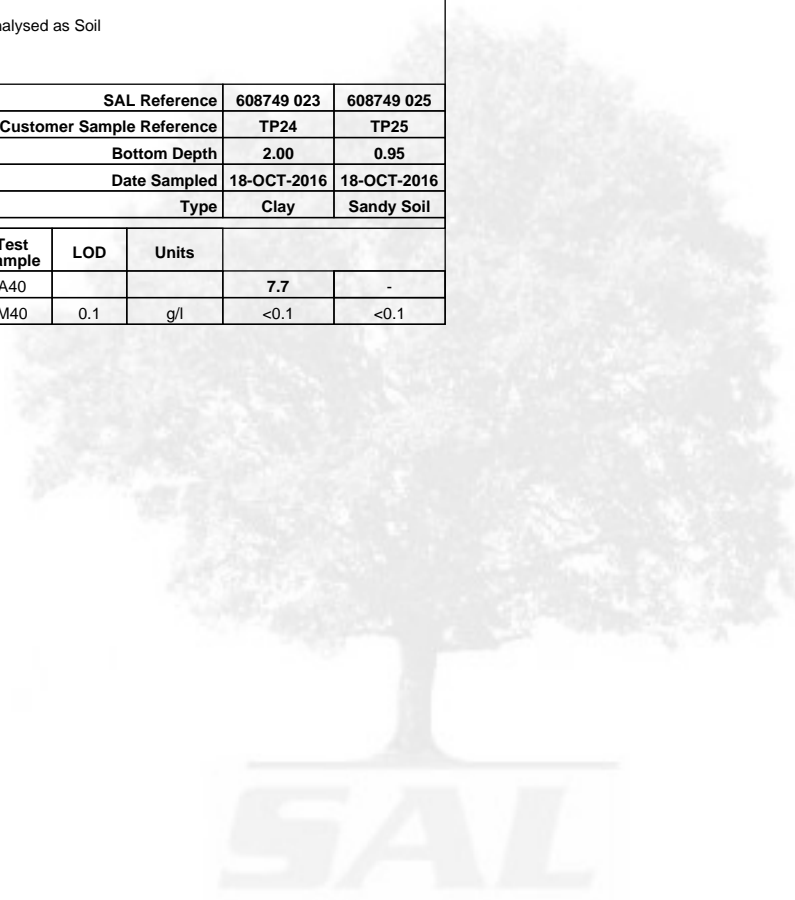
SAL Reference: 608749 Project Site: Adastral Oark, Ipswich Customer Reference: GEG-16-458 Soil Analysed as Soil MCERTS Preparation												
SAL Reference		608749 009	608749 010	608749 011	608749 012	608749 013	608749 014	608749 015	608749 016			
Customer Sample Reference		TP18	TP18	TP18	TP20	TP20	TP21	TP21	TP22			
Bottom Depth		0.20	1.10	1.85	0.20	0.90	1.45	3.00	0.50			
Date Sampled		18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016			
Type		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units								
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Moisture @105C	T162	AR	0.1	%	5.6	8.2	9.4	6.5	11	28	13	10

SAL Reference: 608749 Project Site: Adastral Oark, Ipswich Customer Reference: GEG-16-458 Soil Analysed as Soil MCERTS Preparation												
SAL Reference		608749 017	608749 018	608749 019	608749 020	608749 021	608749 022	608749 024	608749 025			
Customer Sample Reference		TP22	TP23	TP23	TP23	TP24	TP24	TP24	TP25			
Bottom Depth		1.40	0.20	1.00	3.00	0.25	1.00	3.50	0.95			
Date Sampled		18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016			
Type		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units								
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Moisture @105C	T162	AR	0.1	%	13	7.1	18	12	12	14	24	13

SAL Reference: 608749 Project Site: Adastral Oark, Ipswich Customer Reference: GEG-16-458 Soil Analysed as Soil MCERTS Preparation												
SAL Reference		608749 026										
Customer Sample Reference		TP25										
Bottom Depth		3.40										
Date Sampled		18-OCT-2016										
Type		Sandy Soil										
Determinand	Method	Test Sample	LOD	Units								
Retained on 10mm sieve	T2	M40	0.1	%	<0.1							
Moisture @105C	T162	AR	0.1	%	13							

SAL Reference: 608749 Project Site: Adastral Oark, Ipswich Customer Reference: GEG-16-458 Soil Analysed as Soil GEG Suite 4												
		SAL Reference		608749 001	608749 003	608749 005	608749 010	608749 013	608749 014	608749 015	608749 019	
		Customer Sample Reference		TP01	TP02	TP16	TP18	TP20	TP21	TP21	TP23	
		Bottom Depth		0.90	1.30	1.40	1.10	0.90	1.45	3.00	1.00	
		Date Sampled		18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	
		Type		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil	
Determinand	Method	Test Sample	LOD	Units								
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1

SAL Reference: 608749 Project Site: Adastral Oark, Ipswich Customer Reference: GEG-16-458 Soil Analysed as Soil GEG Suite 4						
		SAL Reference		608749 023	608749 025	
		Customer Sample Reference		TP24	TP25	
		Bottom Depth		2.00	0.95	
		Date Sampled		18-OCT-2016	18-OCT-2016	
		Type		Clay	Sandy Soil	
Determinand	Method	Test Sample	LOD	Units		
pH	T7	A40			7.7	-
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1

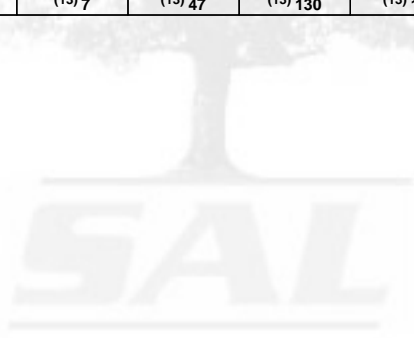


SAL Reference: 608749
 Project Site: Adastral Oark, Ipswich
 Customer Reference: GEG-16-458

Soil
 GEG Suite 2

Analysed as Soil

SAL Reference					608749 001	608749 002	608749 003	608749 004	608749 005	608749 006	608749 007	608749 008
Customer Sample Reference					TP01	TP02	TP02	TP02	TP16	TP16	TP17	TP17
Bottom Depth					0.90	0.20	1.30	2.70	1.40	4.10	0.80	2.30
Date Sampled					18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units								
Arsenic	T6	M40	2	mg/kg	12	33	11	9	9	7	16	16
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	17	52	12	14	14	10	21	20
Chromium (trivalent)	T85	AR	2	mg/kg	17	52	12	14	14	10	21	20
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Copper	T6	M40	1	mg/kg	24	15	14	15	15	13	40	53
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Cyanide(free)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Lead	T6	M40	1	mg/kg	53	28	41	25	35	37	55	360
Mercury	T6	M40	1	mg/kg	<1	1	<1	<1	<1	<1	<1	1
Nickel	T6	M40	1	mg/kg	17	22	13	10	12	9	23	17
pH	T7	AR			8.0	7.8	7.5	7.6	7.9	7.7	8.0	7.2
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3	<3	<3	<3
Soil Organic Matter	T287	M40	0.1	%	1.4	2.3	2.5	1.4	2.7	0.9	2.3	0.4
SO4(Total)	T6	M40	0.01	%	0.04	0.04	0.06	0.04	0.06	0.03	0.15	0.03
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulphide	T4	AR	10	mg/kg	<10	<10	<10	32	<10	<10	100	<10
Zinc	T6	M40	1	mg/kg	88	77	84	46	50	53	88	370
TPH (C10-C12)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1
TPH (C12-C16)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) 3	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1
TPH (C16-C21)	T8	M105	1	mg/kg	(13) <1	(13) 7	(13) 14	(13) 1	(13) <1	(13) <1	(13) 1	(13) <1
TPH (C21-C35)	T8	M105	1	mg/kg	(13) 5	(13) 31	(13) 80	(13) 8	(13) 4	(13) <1	(13) 13	(13) <1
TPH (C35-C40)	T8	M105	1	mg/kg	(13) 2	(13) 9	(13) 31	(13) 6	(13) 3	(13) 1	(13) 6	(13) <1
TPH (C6-C8)	T54	AR	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	(13) 7	(13) 47	(13) 130	(13) 15	(13) 7	(13) 1	(13) 20	(13) <1

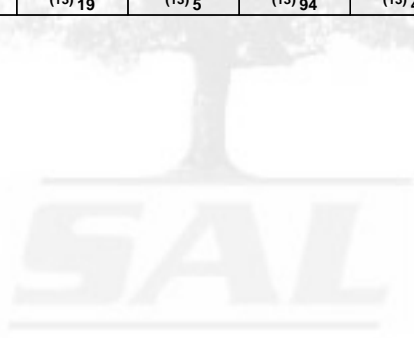


SAL Reference: 608749
 Project Site: Adastral Oark, Ipswich
 Customer Reference: GEG-16-458

Soil
 GEG Suite 2

Analysed as Soil

SAL Reference					608749 009	608749 010	608749 011	608749 012	608749 013	608749 014	608749 015	608749 016
Customer Sample Reference					TP18	TP18	TP18	TP20	TP20	TP21	TP21	TP22
Bottom Depth					0.20	1.10	1.85	0.20	0.90	1.45	3.00	0.50
Date Sampled					18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units								
Arsenic	T6	M40	2	mg/kg	19	9	7	18	10	8	15	12
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	41	9	11	19	16	13	10	16
Chromium (trivalent)	T85	AR	2	mg/kg	41	9	11	19	16	13	10	16
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Copper	T6	M40	1	mg/kg	57	6	16	14	15	12	7	27
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1	1	<1	<1	<1	<1	<1
Cyanide(free)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Lead	T6	M40	1	mg/kg	13	10	36	42	55	26	10	130
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	1
Nickel	T6	M40	1	mg/kg	35	8	9	16	12	10	13	13
pH	T7	AR			7.1	7.8	7.9	7.8	7.8	7.9	7.5	8.0
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3	<3	<3	<3
Soil Organic Matter	T287	M40	0.1	%	2.3	2.7	1.0	4.0	0.6	0.6	5.7	5.5
SO4(Total)	T6	M40	0.01	%	0.04	0.12	0.06	0.06	0.02	0.05	0.21	0.16
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Sulphide	T4	AR	10	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10
Zinc	T6	M40	1	mg/kg	81	22	67	65	94	44	30	140
TPH (C10-C12)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1
TPH (C12-C16)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) 2	(13) <1	(13) <1	(13) <1	(13) 15	(13) 1
TPH (C16-C21)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) 7	(13) 7	(13) <1	(13) <1	(13) 100	(13) 6
TPH (C21-C35)	T8	M105	1	mg/kg	(13) 15	(13) 2	(13) 51	(13) 41	(13) <1	(13) 4	(13) 280	(13) 39
TPH (C35-C40)	T8	M105	1	mg/kg	(13) 4	(13) 3	(13) 44	(13) 9	(13) <1	(13) <1	(13) 45	(13) 17
TPH (C6-C8)	T54	AR	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	(13) 19	(13) 5	(13) 94	(13) 47	(13) <1	(13) 4	(13) 440	(13) 63

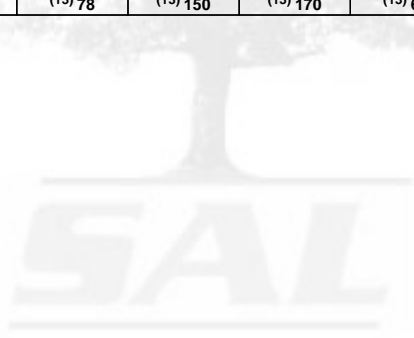


SAL Reference: 608749
 Project Site: Adastral Oark, Ipswich
 Customer Reference: GEG-16-458

Soil
 GEG Suite 2

Analysed as Soil

SAL Reference					608749 017	608749 018	608749 019	608749 020	608749 021	608749 022	608749 024	608749 025
Customer Sample Reference					TP22	TP23	TP23	TP23	TP24	TP24	TP24	TP25
Bottom Depth					1.40	0.20	1.00	3.00	0.25	1.00	3.50	0.95
Date Sampled					18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units								
Arsenic	T6	M40	2	mg/kg	6	13	10	12	36	10	<2	5
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	19	15	15	18	56	20	160	32
Chromium (trivalent)	T85	AR	2	mg/kg	19	15	15	18	56	20	160	32
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Copper	T6	M40	1	mg/kg	17	14	15	27	15	15	54	53
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Cyanide(free)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Lead	T6	M40	1	mg/kg	12	27	26	100	31	27	6	25
Mercury	T6	M40	1	mg/kg	1	1	1	<1	1	<1	2	<1
Nickel	T6	M40	1	mg/kg	13	13	13	17	24	17	210	36
pH	T7	AR			7.9	8.1	7.9	8.5	7.6	7.7	8.1	8.1
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3	<3	<3	<3
Soil Organic Matter	T287	M40	0.1	%	1.7	2.8	1.5	1.5	3.7	2.6	2.1	0.9
SO4(Total)	T6	M40	0.01	%	0.07	0.08	0.06	0.11	0.06	0.06	0.09	0.02
SO4(2:1)	T6	M40	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulphide	T4	AR	10	mg/kg	110	<10	<10	53	<10	<10	33	<10
Zinc	T6	M40	1	mg/kg	38	52	50	110	85	51	85	110
TPH (C10-C12)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1
TPH (C12-C16)	T8	M105	1	mg/kg	(13) 1	(13) 1	(13) 3	(13) 3	(13) <1	(13) <1	(13) 4	(13) <1
TPH (C16-C21)	T8	M105	1	mg/kg	(13) 8	(13) 9	(13) 29	(13) 10	(13) 5	(13) 2	(13) 15	(13) <1
TPH (C21-C35)	T8	M105	1	mg/kg	(13) 54	(13) 100	(13) 110	(13) 35	(13) 85	(13) 14	(13) 67	(13) 2
TPH (C35-C40)	T8	M105	1	mg/kg	(13) 15	(13) 44	(13) 28	(13) 14	(13) 25	(13) 8	(13) 22	(13) <1
TPH (C6-C8)	T54	AR	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10)	T8	M105	1	mg/kg	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1	(13) <1
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	(13) 78	(13) 150	(13) 170	(13) 62	(13) 120	(13) 24	(13) 110	(13) 2

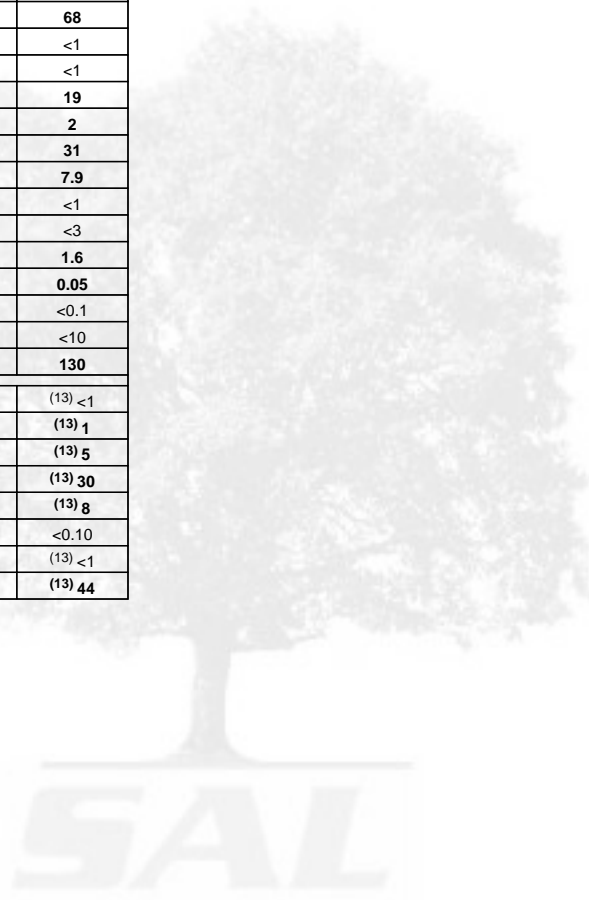


SAL Reference: 608749
Project Site: Adastral Oark, Ipswich
Customer Reference: GEG-16-458

Soil Analysed as Soil
GEG Suite 2

SAL Reference	608749 026
Customer Sample Reference	TP25
Bottom Depth	3.40
Date Sampled	18-OCT-2016
Type	Sandy Soil

Determinand	Method	Test Sample	LOD	Units	
Arsenic	T6	M40	2	mg/kg	<2
Boron (water-soluble)	T6	AR	1	mg/kg	<1
Cadmium	T6	M40	1	mg/kg	<1
Chromium	T6	M40	1	mg/kg	31
Chromium (trivalent)	T85	AR	2	mg/kg	31
Chromium VI	T6	AR	1	mg/kg	<1
Copper	T6	M40	1	mg/kg	68
Cyanide(Total)	T4	AR	1	mg/kg	<1
Cyanide(free)	T4	AR	1	mg/kg	<1
Lead	T6	M40	1	mg/kg	19
Mercury	T6	M40	1	mg/kg	2
Nickel	T6	M40	1	mg/kg	31
pH	T7	AR			7.9
Phenols(Mono)	T4	AR	1	mg/kg	<1
Selenium	T6	M40	3	mg/kg	<3
Soil Organic Matter	T287	M40	0.1	%	1.6
SO4(Total)	T6	M40	0.01	%	0.05
SO4(2:1)	T6	M40	0.1	g/l	<0.1
Sulphide	T4	AR	10	mg/kg	<10
Zinc	T6	M40	1	mg/kg	130
TPH (C10-C12)	T8	M105	1	mg/kg	⁽¹³⁾ <1
TPH (C12-C16)	T8	M105	1	mg/kg	⁽¹³⁾ 1
TPH (C16-C21)	T8	M105	1	mg/kg	⁽¹³⁾ 5
TPH (C21-C35)	T8	M105	1	mg/kg	⁽¹³⁾ 30
TPH (C35-C40)	T8	M105	1	mg/kg	⁽¹³⁾ 8
TPH (C6-C8)	T54	AR	0.10	mg/kg	<0.10
TPH (C8-C10)	T8	M105	1	mg/kg	⁽¹³⁾ <1
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	⁽¹³⁾ 44



SAL Reference: 608749
 Project Site: Adastral Oark, Ipswich
 Customer Reference: GEG-16-458

Soil Analysed as Soil
 GEG PAH (USEPA 16)

SAL Reference					608749 001	608749 002	608749 003	608749 004	608749 005	608749 006	608749 007	608749 008
Customer Sample Reference					TP01	TP02	TP02	TP02	TP16	TP16	TP17	TP17
Bottom Depth					0.90	0.20	1.30	2.70	1.40	4.10	0.80	2.30
Date Sampled					18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units								
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	1.1	0.5	<0.1	<0.1	<0.1	0.3	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1	0.3	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	<0.1	2.5	1.1	0.1	<0.1	<0.1	0.7	<0.1
Pyrene	T207	M105	0.1	mg/kg	<0.1	2.5	1.0	0.1	<0.1	<0.1	0.6	<0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1	1.3	0.6	<0.1	<0.1	<0.1	0.4	<0.1
Chrysene	T207	M105	0.1	mg/kg	<0.1	1.3	0.6	<0.1	<0.1	<0.1	0.4	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1	1.9	0.8	<0.1	<0.1	<0.1	0.5	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1	0.9	0.5	<0.1	<0.1	<0.1	0.3	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1	1.4	0.6	<0.1	<0.1	<0.1	0.4	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	1.0	0.4	<0.1	<0.1	<0.1	0.3	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	0.3	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	1.1	0.4	<0.1	<0.1	<0.1	0.3	<0.1
PAH(total)	T207	M105	0.1	mg/kg	<0.1	16	6.8	0.3	<0.1	<0.1	3.9	<0.1

SAL Reference: 608749
 Project Site: Adastral Oark, Ipswich
 Customer Reference: GEG-16-458

Soil Analysed as Soil
 GEG PAH (USEPA 16)

SAL Reference					608749 009	608749 010	608749 011	608749 012	608749 013	608749 014	608749 015	608749 016
Customer Sample Reference					TP18	TP18	TP18	TP20	TP20	TP21	TP21	TP22
Bottom Depth					0.20	1.10	1.85	0.20	0.90	1.45	3.00	0.50
Date Sampled					18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units								
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	(9) <1.0	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4.0	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	(9) <1.0	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.3	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	1.0	<0.1	<0.1	28	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	5.6	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	0.2	0.3	<0.1	1.7	<0.1	<0.1	40	0.1
Pyrene	T207	M105	0.1	mg/kg	0.2	0.3	<0.1	1.5	<0.1	<0.1	36	0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	0.1	0.2	<0.1	0.7	<0.1	<0.1	18	<0.1
Chrysene	T207	M105	0.1	mg/kg	0.1	0.2	<0.1	0.7	<0.1	<0.1	23	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	0.2	0.2	<0.1	0.9	<0.1	<0.1	25	0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1	0.2	<0.1	0.5	<0.1	<0.1	14	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	0.1	0.1	<0.1	0.7	<0.1	<0.1	20	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	0.1	<0.1	0.4	<0.1	<0.1	14	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	4.5	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	0.1	<0.1	0.5	<0.1	<0.1	14	<0.1
PAH(total)	T207	M105	0.1	mg/kg	1.0	1.7	<0.1	9.1	<0.1	<0.1	250	0.4

SAL Reference: 608749
 Project Site: Adastral Oark, Ipswich
 Customer Reference: GEG-16-458

Soil Analysed as Soil
 GEG PAH (USEPA 16)

SAL Reference					608749 017	608749 018	608749 019	608749 020	608749 021	608749 022	608749 024	608749 025
Customer Sample Reference					TP22	TP23	TP23	TP23	TP24	TP24	TP24	TP25
Bottom Depth					1.40	0.20	1.00	3.00	0.25	1.00	3.50	0.95
Date Sampled					18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016
Type					Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	Method	Test Sample	LOD	Units								
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	0.4	0.3	0.9	0.2	0.1	<0.1	0.3	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	0.7	1.3	2.6	0.9	0.4	0.2	1.8	<0.1
Pyrene	T207	M105	0.1	mg/kg	0.6	1.2	2.5	0.9	0.4	0.2	2.0	<0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	0.3	0.8	1.5	0.5	0.2	<0.1	1.2	<0.1
Chrysene	T207	M105	0.1	mg/kg	0.3	0.6	1.3	0.4	0.2	<0.1	1.0	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	0.4	1.1	2.2	0.5	0.3	<0.1	1.6	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	0.2	0.4	1.1	0.3	0.1	<0.1	0.6	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	0.3	0.7	1.6	0.4	0.2	<0.1	1.0	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	0.2	0.5	1.1	0.2	0.1	<0.1	0.5	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	0.2	0.4	0.1	<0.1	<0.1	0.2	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	0.2	0.5	1.2	0.3	0.1	<0.1	0.5	<0.1
PAH(total)	T207	M105	0.1	mg/kg	3.5	7.7	17	4.7	2.3	0.3	11	<0.1

SAL Reference: 608749
 Project Site: Adastral Oark, Ipswich
 Customer Reference: GEG-16-458

Soil Analysed as Soil
 GEG PAH (USEPA 16)

SAL Reference					608749 026
Customer Sample Reference					TP25
Bottom Depth					3.40
Date Sampled					18-OCT-2016
Type					Sandy Soil
Determinand	Method	Test Sample	LOD	Units	
Naphthalene	T207	M105	0.1	mg/kg	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	<0.1
Pyrene	T207	M105	0.1	mg/kg	<0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1
Chrysene	T207	M105	0.1	mg/kg	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1
PAH(total)	T207	M105	0.1	mg/kg	<0.1

SAL Reference: 608749												
Project Site: Adastral Oark, Ipswich												
Customer Reference: GEG-16-458												
Soil Analysed as Soil												
Miscellaneous												
SAL Reference		608749 001	608749 002	608749 003	608749 004	608749 005	608749 006	608749 007	608749 008			
Customer Sample Reference		TP01	TP02	TP02	TP02	TP16	TP16	TP17	TP17			
Bottom Depth		0.90	0.20	1.30	2.70	1.40	4.10	0.80	2.30			
Date Sampled		18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016			
Type		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units								
Asbestos ID	T27	AR			N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
(Water soluble) Mg	T251	AR	1	mg/l	3	-	5	-	6	-	-	-

SAL Reference: 608749												
Project Site: Adastral Oark, Ipswich												
Customer Reference: GEG-16-458												
Soil Analysed as Soil												
Miscellaneous												
SAL Reference		608749 009	608749 010	608749 011	608749 012	608749 013	608749 014	608749 015	608749 016			
Customer Sample Reference		TP18	TP18	TP18	TP20	TP20	TP21	TP21	TP22			
Bottom Depth		0.20	1.10	1.85	0.20	0.90	1.45	3.00	0.50			
Date Sampled		18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016			
Type		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units								
Asbestos ID	T27	AR			N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
(Water soluble) Mg	T251	AR	1	mg/l	-	3	-	-	5	3	-	-

SAL Reference: 608749												
Project Site: Adastral Oark, Ipswich												
Customer Reference: GEG-16-458												
Soil Analysed as Soil												
Miscellaneous												
SAL Reference		608749 017	608749 018	608749 019	608749 020	608749 021	608749 022	608749 023	608749 024			
Customer Sample Reference		TP22	TP23	TP23	TP23	TP24	TP24	TP24	TP24			
Bottom Depth		1.40	0.20	1.00	3.00	0.25	1.00	2.00	3.50			
Date Sampled		18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016	18-OCT-2016			
Type		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units								
Asbestos ID	T27	AR			N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	-	N.D.
(Water soluble) Mg	T251	AR	1	mg/l	-	-	5	-	-	-	7	-

SAL Reference: 608749						
Project Site: Adastral Oark, Ipswich						
Customer Reference: GEG-16-458						
Soil Analysed as Soil						
Miscellaneous						
SAL Reference		608749 025	608749 026			
Customer Sample Reference		TP25	TP25			
Bottom Depth		0.95	3.40			
Date Sampled		18-OCT-2016	18-OCT-2016			
Type		Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units		
Asbestos ID	T27	AR			N.D.	N.D.
(Water soluble) Mg	T251	AR	1	mg/l	3	-

Index to symbols used in 608749-1

Value	Description
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
A40	Assisted dried < 40C
AR	As Received
N.D.	Not Detected
9	LOD raised due to dilution of sample
13	Results have been blank corrected.
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.

Method Index

Value	Description
T287	Calc TOC/0.58
T27	PLM
T54	GC/MS (Headspace)
T85	Calc
T8	GC/FID
T207	GC/MS (MCERTS)
T6	ICP/OES
T7	Probe
T162	Grav (1 Dec) (105 C)
T4	Colorimetry
T251	2:1 Extraction/ICP/OES
T2	Grav

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos ID	T27	AR			SU	001-022,024-026
(Water soluble) Mg	T251	AR	1	mg/l	N	001,003,005,010,013-014,019,023,025
Arsenic	T6	M40	2	mg/kg	M	001-022,024-026
Boron (water-soluble)	T6	AR	1	mg/kg	N	001-022,024-026
Cadmium	T6	M40	1	mg/kg	M	001-022,024-026
Chromium	T6	M40	1	mg/kg	M	001-022,024-026
Chromium (trivalent)	T85	AR	2	mg/kg	N	001-022,024-026
Chromium VI	T6	AR	1	mg/kg	N	001-022,024-026
Copper	T6	M40	1	mg/kg	M	001-022,024-026
Cyanide(Total)	T4	AR	1	mg/kg	U	001-022,024-026
Cyanide(free)	T4	AR	1	mg/kg	U	001-022,024-026
Lead	T6	M40	1	mg/kg	M	001-022,024-026
Mercury	T6	M40	1	mg/kg	M	001-022,024-026
Nickel	T6	M40	1	mg/kg	M	001-022,024-026
pH	T7	AR			M	001-022,024-026
Phenols(Mono)	T4	AR	1	mg/kg	U	001-022,024-026
Selenium	T6	M40	3	mg/kg	M	001-022,024-026
Soil Organic Matter	T287	M40	0.1	%	N	001-022,024-026
SO4(Total)	T6	M40	0.01	%	N	001-022,024-026
SO4(2:1)	T6	M40	0.1	g/l	N	001-026
Sulphide	T4	AR	10	mg/kg	N	001-022,024-026
Zinc	T6	M40	1	mg/kg	M	001-022,024-026
TPH (C10-C12)	T8	M105	1	mg/kg	U	001-022,024-026
TPH (C12-C16)	T8	M105	1	mg/kg	U	001-022,024-026
TPH (C16-C21)	T8	M105	1	mg/kg	U	001-022,024-026
TPH (C21-C35)	T8	M105	1	mg/kg	U	001-022,024-026

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
TPH (C35-C40)	T8	M105	1	mg/kg	N	001-022,024-026
TPH (C6-C8)	T54	AR	0.10	mg/kg	N	001-022,024-026
TPH (C8-C10)	T8	M105	1	mg/kg	U	001-022,024-026
TPH C6-C40 (Sum)	T85	M105	1	mg/kg	N	001-022,024-026
Naphthalene	T207	M105	0.1	mg/kg	M	001-022,024-026
Acenaphthylene	T207	M105	0.1	mg/kg	U	001-022,024-026
Acenaphthene	T207	M105	0.1	mg/kg	M	001-022,024-026
Fluorene	T207	M105	0.1	mg/kg	M	001-022,024-026
Phenanthrene	T207	M105	0.1	mg/kg	M	001-022,024-026
Anthracene	T207	M105	0.1	mg/kg	U	001-022,024-026
Fluoranthene	T207	M105	0.1	mg/kg	M	001-022,024-026
Pyrene	T207	M105	0.1	mg/kg	M	001-022,024-026
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001-022,024-026
Chrysene	T207	M105	0.1	mg/kg	M	001-022,024-026
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	M	001-022,024-026
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	M	001-022,024-026
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001-022,024-026
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001-022,024-026
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	001-022,024-026
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001-022,024-026
PAH(total)	T207	M105	0.1	mg/kg	U	001-022,024-026
pH	T7	A40			U	023
Retained on 10mm sieve	T2	M40	0.1	%	N	001-022,024-026
Moisture @105C	T162	AR	0.1	%	N	001-022,024-026





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Certificate of Analysis

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Report Number: 615234-1

Date of Report: 01-Dec-2016

Customer: Geo Environmental Group
17 Graham Road
Malvern
Worcestershire
WR14 2HR

Customer Contact: Mr Matthew Perks

Customer Job Reference: GEG-16-458

Customer Purchase Order: 2387

Customer Site Reference: Adastral Park, Ipswich

Date Job Received at SAL: 17-Nov-2016

Date Analysis Started: 18-Nov-2016

Date Analysis Completed: 01-Dec-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

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Tests covered by this certificate were conducted in accordance with SAL SOPs

All results have been reviewed in accordance with Section 25 of the SAL Quality Manual

SCIENTIFIC ANALYSIS
LABORATORIES



1549

Report checked
and authorised by :
Aleksandra Pacula
Project Manager

Issued by :
Aleksandra Pacula
Project Manager

SAL Reference: 615234										
Project Site: Adastral Park, Ipswich										
Customer Reference: GEG-16-458										
Water					Analysed as Water					
GEG Suite 2										
SAL Reference					615234 001	615234 002	615234 003	615234 004	615234 005	
Customer Sample Reference					CP18	CP19	CP20	CP26	CP28	
Date Sampled					17-NOV-2016	17-NOV-2016	17-NOV-2016	17-NOV-2016	17-NOV-2016	
Determinand	Method	Test Sample	LOD	Units						
As (Dissolved)	T281	AR	0.2	µg/l	5.2	8.3	10	0.4	0.2	
Boron	T6	AR	0.01	mg/l	0.23	0.31	0.19	0.08	0.04	
Cd (Dissolved)	T281	AR	0.02	µg/l	<0.02	0.08	0.05	0.03	<0.02	
Cr (Dissolved)	T281	AR	1	µg/l	<1	<1	<1	<1	<1	
Chromium VI	T4	AR	0.03	mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	
Cu (Dissolved)	T281	AR	0.5	µg/l	1.1	1.8	1.2	0.9	0.8	
Cyanide(Total)	T4	AR	0.05	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	
Pb (Dissolved)	T281	AR	0.3	µg/l	0.3	3.3	1.8	0.3	<0.3	
Hg (Dissolved)	T281	AR	0.05	µg/l	0.16	0.12	<0.05	<0.05	<0.05	
Ni (Dissolved)	T281	AR	1	µg/l	7	8	11	3	<1	
pH	T7	AR			7.1	8.4	7.5	7.9	7.6	
Se (Dissolved)	T281	AR	0.5	µg/l	1.1	0.9	2.1	<0.5	<0.5	
Sulphate	T686	F	0.5	mg/l	33	120	70	72	37	
Sulphide	T4	AR	0.05	mg/l	<0.05	0.06	<0.05	<0.05	<0.05	
Total Phenols	T99	AR	0.1	µg/l	(13,9) <1.0	(13,9) <1.0	(13,9) <1.0	(13) <0.1	(13) <0.1	
Zn (Dissolved)	T281	AR	2	µg/l	8	7	15	14	5	

SAL Reference: 615234										
Project Site: Adastral Park, Ipswich										
Customer Reference: GEG-16-458										
Water					Analysed as Water					
GEG TPH (6-Band)										
SAL Reference					615234 001	615234 002	615234 003	615234 004	615234 005	
Customer Sample Reference					CP18	CP19	CP20	CP26	CP28	
Date Sampled					17-NOV-2016	17-NOV-2016	17-NOV-2016	17-NOV-2016	17-NOV-2016	
Determinand	Method	Test Sample	LOD	Units						
TPH (C6-C8)	T215	AR	0.010	mg/l	<0.010	<0.010	(110) <0.020	<0.010	<0.010	
TPH (C8-C10) DW	T81	AR	0.01	mg/l	(100,13) <0.02	(100,13) <0.10	(100,13) <0.10	(100,13) <0.10	(100,13) <0.10	
TPH (C10-C12) DW	T81	AR	0.01	mg/l	(13,100) <0.02	(13,100) <0.10	(13,100) <0.10	(100,13) <0.10	(100,13) <0.10	
TPH (C12-C16) DW	T81	AR	0.01	mg/l	(13) 0.07	(13) 0.56	(13) 1.4	(100,13) <0.10	(13,100) <0.10	
TPH (C16-C21) DW	T81	AR	0.01	mg/l	(13) 0.27	(13) 1.7	(13) 3.9	(100,13) <0.10	(13,100) <0.10	
TPH (C21-C35) DW	T81	AR	0.01	mg/l	(13) 1.5	(13) 6.0	(13) 12	(100,13) <0.10	(100,13) <0.10	
TPH (C35-C40)	T81	AR	0.01	mg/l	(13) 0.39	(13) 2.2	(13) 3.0	(13,100) <0.10	(100,13) <0.10	
TPH (Sum of Bands)	T85	AR			(13) 1.7	(13) 10	(13) 20	(13,100) <0.10	(100,13) <0.10	

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SAL Reference: 615234 Project Site: Adastral Park, Ipswich Customer Reference: GEG-16-458 Water Analysed as Water GEG PAH (USEPA 16)										
		SAL Reference		615234 001	615234 002	615234 003	615234 004	615234 005		
		Customer Sample Reference		CP18	CP19	CP20	CP26	CP28		
		Date Sampled		17-NOV-2016	17-NOV-2016	17-NOV-2016	17-NOV-2016	17-NOV-2016		
Determinand	Method	Test Sample	LOD	Units						
Naphthalene	T149	AR	0.01	µg/l	(9,13,100) <1.0	(100,9,13) <0.50	(100,13,9) <1.0	(13,100) <0.05	(13,100) <0.05	
Acenaphthylene	T149	AR	0.01	µg/l	(13) 2.0	(13) 2.5	(13) 15	(100,13) <0.05	(13,100) <0.05	
Acenaphthene	T149	AR	0.01	µg/l	(13) 2.0	(13) 2.5	(13) 14	(13,100) <0.05	(100,13) <0.05	
Fluorene	T149	AR	0.01	µg/l	(13) 3.0	(13) 2.5	(13) 15	(13,100) <0.05	(100,13) <0.05	
Phenanthrene	T149	AR	0.01	µg/l	(13) 38	(13) 24	(13) 68	(13) 0.05	(13,100) <0.05	
Anthracene	T149	AR	0.01	µg/l	(13) 17	(13) 7.5	(13) 25	(13) 0.05	(13,100) <0.05	
Fluoranthene	T149	AR	0.01	µg/l	(13) 110	(13) 64	(13) 130	(13) 0.40	(100,13) <0.05	
Pyrene	T149	AR	0.01	µg/l	(13) 97	(13) 58	(13) 110	(13) 0.40	(100,13) <0.05	
Benzo(a)Anthracene	T149	AR	0.01	µg/l	(13) 48	(13) 25	(13) 44	(13) 0.15	(100,13) <0.05	
Chrysene	T149	AR	0.01	µg/l	(13) 53	(13) 31	(13) 50	(13) 0.20	(13,100) <0.05	
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	(13) 40	(13) 22	(13) 38	(13) 0.10	(13,100) <0.05	
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	(13) 42	(13) 29	(13) 37	(13) 0.15	(13,100) <0.05	
Benzo(a)Pyrene	T149	AR	0.01	µg/l	(13) 45	(13) 27	(13) 44	(13,100) <0.05	(100,13) <0.05	
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	(13) 26	(13) 16	(13) 25	(13) 0.05	(100,13) <0.05	
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	(13) 9.0	(13) 5.0	(13) 7.0	(13,100) <0.05	(100,13) <0.05	
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	(13) 30	(13) 19	(13) 30	(13) 0.05	(100,13) <0.05	
PAH(total)	T149	AR	0.01	µg/l	(13) 570	(13) 330	(13) 650	(13) 1.6	(13,100) <0.05	

SAL Reference: 615234 Project Site: Adastral Park, Ipswich Customer Reference: GEG-16-458 Water Analysed as Water Miscellaneous					
		SAL Reference		615234 001	
		Customer Sample Reference		CP18	
		Date Sampled		17-NOV-2016	
Determinand	Method	Test Sample	LOD	Units	
Hardness expressed as CaCO ₃	T6	AR	10	mg/l	820

Index to symbols used in 615234-1

Value	Description
AR	As Received
F	Filtered
9	LOD raised due to dilution of sample
100	LOD determined by sample aliquot used for analysis
13	Results have been blank corrected.
110	LOD raised due to low internal standard recovery.
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Method Index

Value	Description
T281	ICP/MS (Filtered)
T99	GC/MS (LV)
T686	Discrete Analyser
T4	Colorimetry
T6	ICP/OES
T7	Probe
T149	GC/MS (SIR)
T85	Calc
T215	GC/MS (Headspace)(LV)
T81	GC/FID (LV)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
As (Dissolved)	T281	AR	0.2	µg/l	U	001-005
Boron	T6	AR	0.01	mg/l	N	001-005
Cd (Dissolved)	T281	AR	0.02	µg/l	U	001-005
Cr (Dissolved)	T281	AR	1	µg/l	U	001-005
Chromium VI	T4	AR	0.03	mg/l	N	001-005
Cu (Dissolved)	T281	AR	0.5	µg/l	U	001-005
Cyanide(Total)	T4	AR	0.05	mg/l	U	001-005
Pb (Dissolved)	T281	AR	0.3	µg/l	U	001-005
Hg (Dissolved)	T281	AR	0.05	µg/l	U	001-005
Ni (Dissolved)	T281	AR	1	µg/l	U	001-005
pH	T7	AR			N	001-005
Se (Dissolved)	T281	AR	0.5	µg/l	U	001-005
Sulphate	T686	F	0.5	mg/l	U	001-005
Sulphide	T4	AR	0.05	mg/l	N	001-005
Total Phenols	T99	AR	0.1	µg/l	N	001-005
Zn (Dissolved)	T281	AR	2	µg/l	U	001-005
TPH (C6-C8)	T215	AR	0.010	mg/l	N	001-005
TPH (C8-C10) DW	T81	AR	0.01	mg/l	U	001-005
TPH (C10-C12) DW	T81	AR	0.01	mg/l	U	001-005
TPH (C12-C16) DW	T81	AR	0.01	mg/l	U	001-005
TPH (C16-C21) DW	T81	AR	0.01	mg/l	U	001-005
TPH (C21-C35) DW	T81	AR	0.01	mg/l	U	001-005
TPH (C35-C40)	T81	AR	0.01	mg/l	N	001-005
TPH (Sum of Bands)	T85	AR			N	001-005
Naphthalene	T149	AR	0.01	µg/l	U	001-005
Acenaphthylene	T149	AR	0.01	µg/l	U	001-005
Acenaphthene	T149	AR	0.01	µg/l	U	001-005
Fluorene	T149	AR	0.01	µg/l	U	001-005
Phenanthrene	T149	AR	0.01	µg/l	U	001-005
Anthracene	T149	AR	0.01	µg/l	U	001-005
Fluoranthene	T149	AR	0.01	µg/l	U	001-005
Pyrene	T149	AR	0.01	µg/l	U	001-005
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	001-005
Chrysene	T149	AR	0.01	µg/l	U	001-005
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	U	001-005
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	001-005
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	001-005
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	001-005
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	001-005
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	001-005
PAH(total)	T149	AR	0.01	µg/l	U	001-005
Hardness expressed as CaCO3	T6	AR	10	mg/l	N	001

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Scientific Analysis Laboratories Ltd

Certificate of Analysis

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Report Number: 617639-1

Date of Report: 05-Dec-2016

Customer: Geo Environmental Group
17 Graham Road
Malvern
Worcestershire
WR14 2HR

Customer Contact: Mr Matthew Perks

Customer Job Reference: GEG-16-458

Customer Purchase Order: 2393

Customer Site Reference: Adastral Park, Ipswich

Date Job Received at SAL: 29-Nov-2016

Date Analysis Started: 29-Nov-2016

Date Analysis Completed: 05-Dec-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

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Tests covered by this certificate were conducted in accordance with SAL SOPs

All results have been reviewed in accordance with Section 25 of the SAL Quality Manual

SCIENTIFIC ANALYSIS
LABORATORIES



1549

Report checked
and authorised by :
Aleksandra Pacula
Project Manager

Issued by :
Aleksandra Pacula
Project Manager

T85	Calc
T99	GC/MS (LV)
T281	ICP/MS (Filtered)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
As (Dissolved)	T281	AR	0.2	µg/l	U	001-006
Boron	T6	AR	0.01	mg/l	N	001-006
Cd (Dissolved)	T281	AR	0.02	µg/l	U	001-006
Cr (Dissolved)	T281	AR	1	µg/l	U	001-006
Chromium VI	T4	AR	0.03	mg/l	N	001-006
Cu (Dissolved)	T281	AR	0.5	µg/l	U	001-006
Cyanide(Total)	T4	AR	0.05	mg/l	U	001-006
Pb (Dissolved)	T281	AR	0.3	µg/l	U	001-006
Hg (Dissolved)	T281	AR	0.05	µg/l	U	001-006
Ni (Dissolved)	T281	AR	1	µg/l	U	001-006
pH	T7	AR			N	001-006
Se (Dissolved)	T281	AR	0.5	µg/l	U	001-006
Sulphate	T686	F	0.5	mg/l	U	001-006
Sulphide	T4	AR	0.05	mg/l	N	001-006
Total Phenols	T99	AR	0.1	µg/l	N	001-006
Zn (Dissolved)	T281	AR	2	µg/l	U	001-006
TPH (C6-C8)	T215	AR	0.010	mg/l	N	001-006
TPH (C8-C10) DW	T81	AR	0.01	mg/l	U	001-006
TPH (C10-C12) DW	T81	AR	0.01	mg/l	U	001-006
TPH (C12-C16) DW	T81	AR	0.01	mg/l	U	001-006
TPH (C16-C21) DW	T81	AR	0.01	mg/l	U	001-006
TPH (C21-C35) DW	T81	AR	0.01	mg/l	U	001-006
TPH (C35-C40)	T81	AR	0.01	mg/l	N	001-006
TPH (Sum of Bands)	T85	AR			N	001-006
Naphthalene	T149	AR	0.01	µg/l	U	001-006
Acenaphthylene	T149	AR	0.01	µg/l	U	001-006
Acenaphthene	T149	AR	0.01	µg/l	U	001-006
Fluorene	T149	AR	0.01	µg/l	U	001-006
Phenanthrene	T149	AR	0.01	µg/l	U	001-006
Anthracene	T149	AR	0.01	µg/l	U	001-006
Fluoranthene	T149	AR	0.01	µg/l	U	001-006
Pyrene	T149	AR	0.01	µg/l	U	001-006
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	001-006
Chrysene	T149	AR	0.01	µg/l	U	001-006
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	U	001-006
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	001-006
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	001-006
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	001-006
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	001-006
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	001-006
PAH(total)	T149	AR	0.01	µg/l	U	001-006
Hardness expressed as CaCO3	T6	AR	10	mg/l	N	001





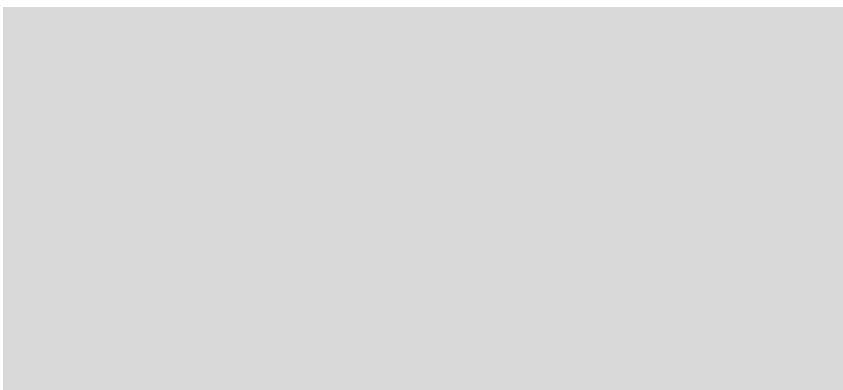
APPENDIX E

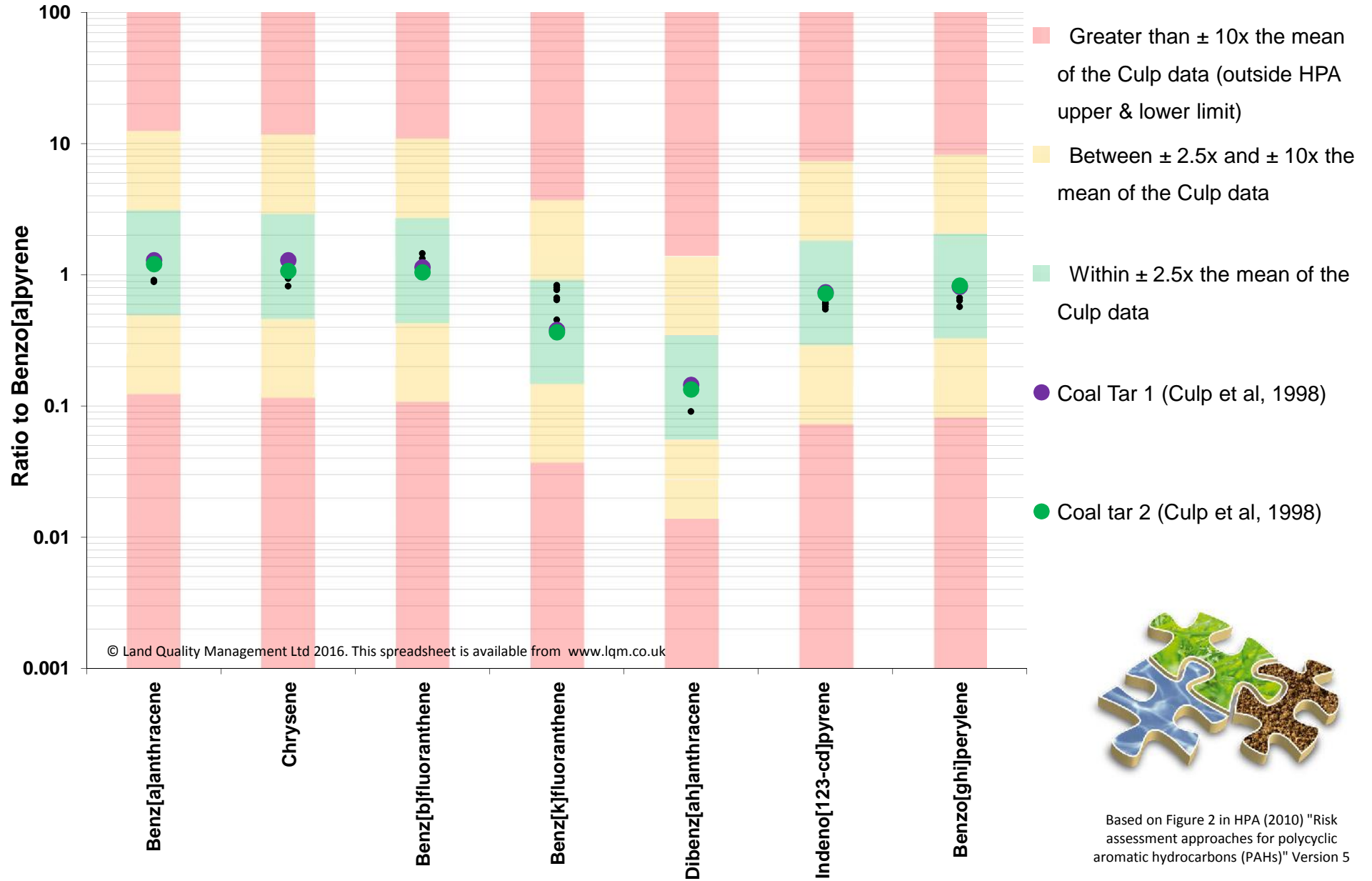
PAH PROFILING

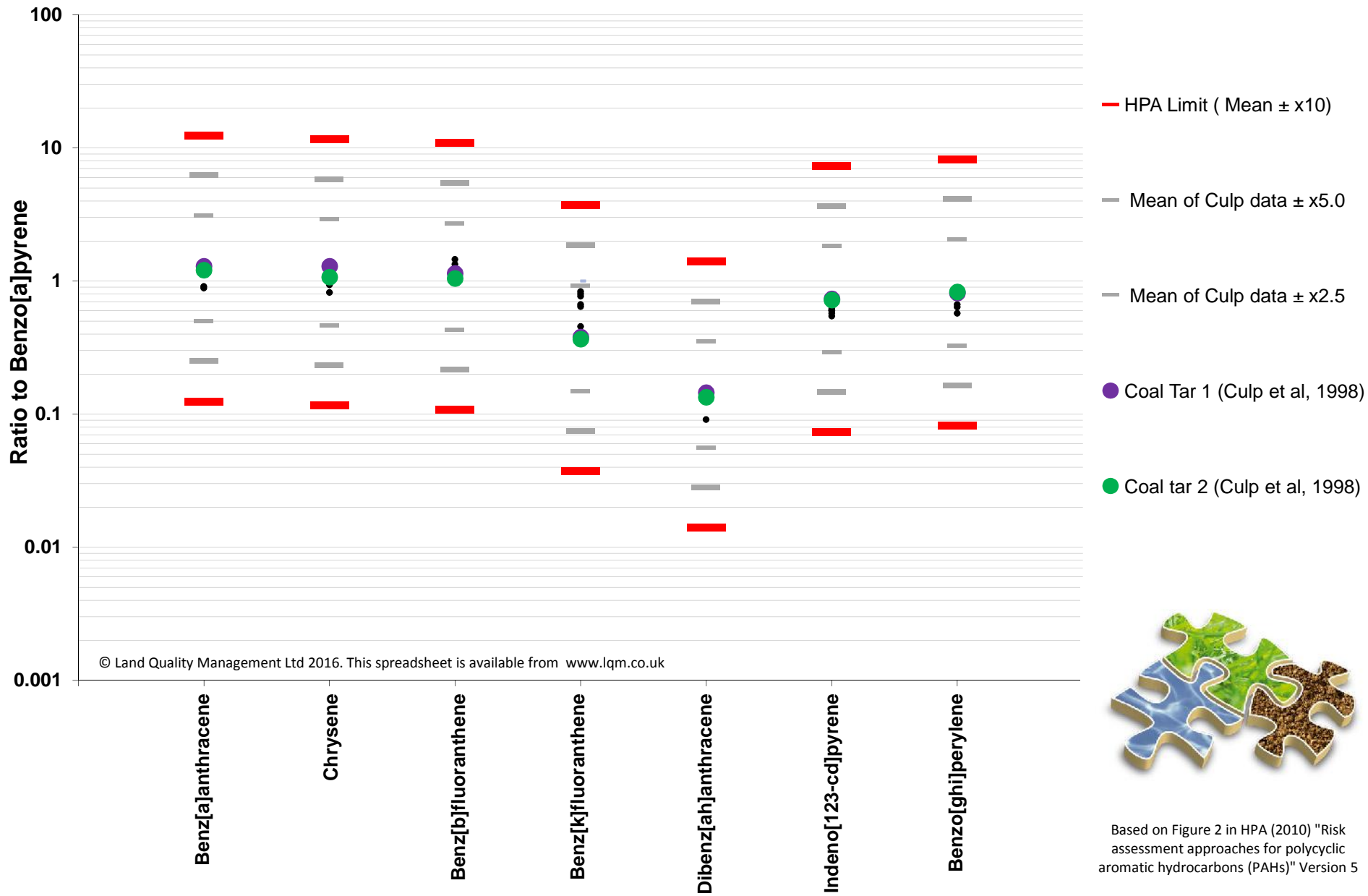


AREA 1

<i>Fluorene</i>	<i>Indeno(1,2,3-c,d)pyrene</i>	<i>Naphthalene</i>	<i>Phenanthrene</i>	<i>Pyrene</i>	<i>Total PAH</i>	
<0.1	<0.1	<0.1	<0.1		0.2	0.6
<0.1		0.3	<0.1	0.5	1.1	6.3
	0.2	0.8	0.8	1.8	2.2	17
<0.1		0.4	<0.1	0.3	1	6.5
<0.1		0.6	<0.1	0.5	1.6	11
	0.2	0.9	<0.1	2.1	2.7	18
<0.1		1.6	<0.1	1.4	3.8	25





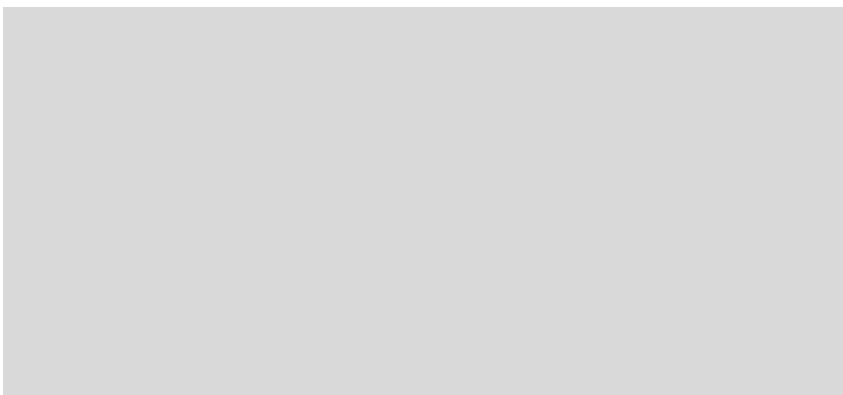


Based on Figure 2 in HPA (2010) "Risk assessment approaches for polycyclic aromatic hydrocarbons (PAHs)" Version 5



AREA 2

<i>Fluorene</i>	<i>Indeno(1,2,3-c,d)pyrene</i>	<i>Naphthalene</i>	<i>Phenanthrene</i>	<i>Pyrene</i>	<i>Total PAH</i>	
<0.1		1 <0.1	1.1	2.5	16	
<0.1		0.4 <0.1	0.5	1	6.8	
<0.1		0.3 <0.1	0.3	0.7	3.9	
<0.1	<0.1	<0.1	<0.1	0.2	1	
<0.1		0.1 <0.1	<0.1	0.3	1.7	
<0.1		0.4 <0.1	1	1.5	9.1	
	1.3	14 <0.1	28	36	250	
<0.1		0.2 <0.1	0.4	0.6	3.5	
<0.1		0.5 <0.1	0.3	1.2	7.7	
<0.1		1.1 <0.1	0.9	2.5	17	
<0.1		0.2 <0.1	0.2	0.9	4.7	
<0.1		0.1 <0.1	0.2	0.4	2.3	
<0.1		0.5	0.1	0.3	2	11





APPENDIX F

STATISTICAL ASSESSMENT OF CHEMICAL RESULTS



AREA 1



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	As to Phenol
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	13 October 2016
User details	FT

Statistics calculator (version 1)

Input data

This spreadsheet has been produced based on the document 'Guidance on Comparing Soil Contamination Data with a Critical Concentration (CIEH/CL:AIRE, 2008)'. Users of this spreadsheet should always refer to this guidance, the User Manual and to relevant guidance on UK legislation and policy, in order to understand how the procedure should be applied in an appropriate context.

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): As to Phenol
 Test scenario: Planning
 Date: 13 October 2016
 User details: FT

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (total) (mg/kg)	Chromium (VI) (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Cyanide (total) (mg/kg)	Cyanide (free) (mg/kg)	pH	Phenols(Mono) (mg/kg)	Soil Organic Matter (%)	Outliers: Lead (mg/kg)	Outliers: Mercury (mg/kg)	Outliers: Soil Organic Matter (%)
Critical concentration, C_c	32	5	130	4.3	200	1	130	350	43	43		198	32	200	1	32
Notes																
Sample size, n	14	14	14	14	13	13	14	14	14	14	14	14	13	1	1	1
Sample mean, \bar{x}	8.85714286	0.5	13.4285714	0.5	32.4615385	0.65384615	11.3571429	1.5	0.5	0.5	7.72142857	0.5	1.71538462	260	2	8.7
Standard deviation, s	4.34753941	0	4.58617128	0	23.4187083	0.24019223	6.2463176	0	0	0	0.53805715	0	1.1149336	0	0	0
Number of non-detects	0	14	0	14	0	9	0	14	14	14	0	14	0	0	0	0
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A (n<3)	N/A (n<3)	N/A (n<3)
Distribution	Normal	Single value	Normal	Single value	Non-normal	Non-normal	Normal	Single value	Single value	Single value	Non-normal	Single value	Normal	Single value	Single value	Single value
Statistical approach	Auto: One-sample t	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?										Evidence level required: 95%		Use Normal distribution to test for outliers				
t statistic, t₀ (or k₀)	-19.91762104	N/A	-95.105551	N/A	-25.79427125	-5.196152423	-71.06922054	N/A	N/A	N/A			N/A	-97.93653545	N/A	N/A	N/A
Upper confidence limit (on true mean concentration, μ)	10.9148413	0.5	15.5992148	0.5	60.7733762	0.9442244	14.3135366	1.5	0.5	0.5	8.34824618	0.5	2.26651594	260	2	8.7	
Evidence level	100%	100%	100%	100%	100%	96%	100%	100%	100%	100%			100%	100%	0%	0%	100%
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	lower bound	evidence level	evidence level	evidence level	evidence level	evidence level	
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$		$\mu < C_c$	$\mu < C_c$	$\mu \geq C_c$	$\mu \geq C_c$	$\mu < C_c$	
Select dataset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

[Back to data](#)

[Go to outlier test](#)

[Go to normality test](#)

[Show individual summary](#)



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	Cu, Zn & B
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	13 October 2016
User details	FT

Statistics calculator (version 1)

Input data

This spreadsheet has been produced based on the document 'Guidance on Comparing Soil Contamination Data with a Critical Concentration (CIEH/CL:AIRE, 2008)'. Users of this spreadsheet should always refer to this guidance, the User Manual and to relevant guidance on UK legislation and policy, in order to understand how the procedure should be applied in an appropriate context.

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): Cu, Zn & B
 Test scenario: Planning
 Date: 13 October 2016
 User details: FT

Copper (mg/kg)	Zinc (mg/kg)	Boron (mg/kg)														
2330	3550	291														
Critical concentration, C_c																
Notes																
Sample size, n	14	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample mean, \bar{x}	18.2857143	52.9285714	0.5	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	12.4864762	29.1295892	0													
Number of non-detects	0	0	14													
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No													
Distribution	Normal	Normal	Single value													
Statistical approach	Auto: One-sample t	Auto: One-sample t	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?	Evidence level required:	95%	Use Normal distribution to test for outliers
t statistic, t₀ (or k₀)	-692.7208841	-449.1942215	N/A	
Upper confidence limit (on true mean concentration, μ)	24.1955866	66.71566	0.5	
Evidence level	100%	100%	100%	
Base decision on:	evidence level	evidence level	evidence level	
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	
Select dataset	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	PAHs (Naphthalene - Pyrene)
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	13 October 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): PAHs (Naphthalene - Pyrene)
 Test scenario: Planning
 Date: 13 October 2016
 Hws: 40000, CT

	Naphthalene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Fluorene (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)								
Critical concentration, C_c	0.85	165	199	161	92	2232	257	565								
Notes																
Sample size, n	7	7	7	7	7	7	7	7	0	0	0	0	0	0	0	0
Sample mean, \bar{x}	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	1.499E-17	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18								
Number of non-detects	7	7	7	7	7	7	7	7								
Set non-detect values to:	Detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	No								
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal								
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?		Evidence level required: 95%		Use Normal distribution to test for outliers											
t statistic, t₀ (or k₀)	-1.32378E+17	-5.82288E+19	-7.02311E+19	-5.68167E+19	-3.24591E+19	-7.87898E+20	-9.07056E+19	-1.99432E+20								
Upper confidence limit (on true mean concentration, μ)	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05								
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%								
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level								
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$								
Select dataset	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	PAHs (Benzo(a)anthracene - Benzo(ghi)perylene)
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	13 October 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): PAHs (Benzo(a)anthracene - Benzo(ghi)perylene)
 Test scenario: Planning
 Date: 13 October 2016
 Hws: 464616 CT

Benzo(a)anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Benzo(a)pyrene (mg/kg)	Indeno(123-cd)Pyrene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Benzo(ghi)perylene (mg/kg)									
5.9	12	1.9	56	2	21	0.17	213									
Notes																
Sample size, n	7	7	7	7	7	7	7	7	0	0	0	0	0	0	0	0
Sample mean, \bar{x}	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	1.499E-17	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18	7.4949E-18								
Number of non-detects	7	7	7	7	7	7	7	7								
Set non-detect values to:	Detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	No								
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal								
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto
Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?		Evidence level required:		95%	Use Normal distribution to test for outliers										
t statistic, t_0 (or k_0)	-1.02373E+18	-4.21845E+18	-6.53066E+17	-1.97508E+19	-6.88367E+17	-7.39553E+18	-4.2361E+16	-7.51732E+19								
Upper confidence limit (on true mean concentration, μ)	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05								
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%								
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level								
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$								
Select dataset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Back to data	Go to outlier test		Go to normality test		Show individual summary											



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	TPH (banded)
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	13 October 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): TPH (banded)
 Test scenario: Planning
 Date: 13 October 2016
 User details: FT

	TPH (C6-C8) (mg/kg)	TPH (C8-C10) (mg/kg)	TPH (C10-C12) (mg/kg)	TPH (C12-C16) (mg/kg)	TPH (C16-C21) (mg/kg)	TPH (21-C35) (mg/kg)	TPH (C35-40)	Outliers: TPH (C16-C21) (mg/kg)	Outliers: TPH (21-C35) (mg/kg)	Outliers: TPH (C35-40)			
Critical concentration, C_c	7	13	61	185	474	1770	1770	474	1770	1770			
Notes													
Sample size, n	14	14	14	14	11	13	12	3	1	2	0	0	0
Sample mean, \bar{x}	0.05	0.5	0.5	0.5	1.90909091	25.5384615	7.5	16	220	208.5	No Data	No Data	No Data
Standard deviation, s	0	0	0	0	1.64039906	29.671438	8.64186428	7.54983444	0	242.537626			
Number of non-detects	14	14	14	14	6	2	6	0	0	0			
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	No	N/A (n<3)	N/A (n<3)			
Distribution	Single value	Single value	Single value	Single value	Non-normal	Non-normal	Non-normal	Normal	Single value	N/A (n<3)			
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?				Evidence level required: 95%		Use Normal distribution to test for outliers						
t statistic, t₀ (or k₀)	N/A	N/A	N/A	N/A	-954.4923831	-211.9798013	-706.5002297	-105.0724061	N/A	-9.104956268			
Upper confidence limit (on true mean concentration, μ)	0.05	0.5	0.5	0.5	4.06499765	61.4094809	18.3741074	28.7279221	220	956.051169			
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%	100%	99%			
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level			
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$			
Select dataset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Client/client ref	Brookbanks
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	Benzo(a)pyrene surrogate marker
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	2 December 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): Benzo(a)pyrene surrogate marker
 Test scenario: Planning
 Date: 2 December 2016

Benzo(a)pyrene (mg/kg)									
0.98									
Notes									
Sample size, n	7	0	0	0	0	0	0	0	0
Sample mean, \bar{x}	1.11428571	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	0.82750342								
Number of non-detects	0								
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No								
Distribution	Normal								
Statistical approach	Auto: One-sample t	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)	Evidence level required:	95%	Use Normal distribution to test for outliers
t statistic, t_0 (or k_0)	0.429347598			
Upper confidence limit (on true mean concentration, μ)	1.72204817			
Evidence level	34%			
Base decision on:	evidence level			
Result	$\mu \geq C_c$			
Select dataset	<input checked="" type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y
	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y

Back to data

Go to outlier test

Go to normality test

Show individual summary



AREA 2



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	As to Phenol
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	1 November 2016
User details	FT

Statistics calculator (version 1)

Input data

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Go to summary

Data sheet

Project details

Easting	Northing	Sample ID	Arsenic	Cadmium	Chromium (total)	Chromium (VI)	Lead	Mercury	Nickel	Selenium	Cyanide (total)	Cyanide (free)	pH	Outliers: Arsenic	Outliers: Chromium (total)	Outliers: Lead	Outliers: Mercury	Outliers: Nickel	Outliers: Cyanide (total)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TP01	0.9	MG	12 <1		17 <1		53 <1		17 <3		<1	<1	8						
TP01	0.2	MG	<1		<1		28	1	22 <3		<1	<1	7.8	33	52				
TP02	1.3	MG	11 <1		12 <1		41 <1		13 <3		<1	<1	7.5						
TP02	2.7	MG	9 <1		14 <1		25 <1		10 <3		<1	<1	7.6						
TP16	1.4	MG	9 <1		14 <1		35 <1		12 <3		<1	<1	7.9						
TP16	4.1	MG	7 <1		10 <1		37 <1		9 <3		<1	<1	7.7						
TP17	0.8	MG	16 <1		21 <1		55	1	23 <3		<1	<1	8						
TP18	0.2	MG	19 <1		<1		13 <1		17 <3		<1	<1	7.2		41				
TP18	1.1	MG	9 <1		9 <1		10 <1		35 <3		<1	<1	7.1						
TP18	1.85	MG	7 <1		11 <1		36 <1		8 <3		<1	<1	7.8						1
TP20	0.2	MG	18 <1		19 <1		42 <1		9 <3		<1	<1	7.9						
TP20	0.9	MG	10 <1		16 <1		55 <1		16 <3		<1	<1	7.8						
TP21	1.45	MG	8 <1		13 <1		26 <1		12 <3		<1	<1	7.8						
TP21	3	MG	15 <1		10 <1		10 <1		10 <3		<1	<1	7.8						
TP22	0.5	MG	12 <1		16 <1			1	13 <3		<1	<1	7.9			130			
TP22	1.4	MG	6 <1		19 <1		12	1	13 <3		<1	<1	7.9						
TP23	0.2	MG	13 <1		15 <1		27	1	13 <3		<1	<1	8.1						
TP23	1	MG	10 <1		15 <1		26	1	13 <3		<1	<1	7.9						
TP23	3	MG	12 <1		18 <1		<1		17 <3		<1	<1	8.5			100			
TP24	0.25	MG	<1		<1		31	1	24 <3		<1	<1	7.6	36	56				
TP24	1	MG	10 <1		20 <1		27 <1		17 <3		<1	<1	7.7						
TP24	3.5	MG	<2		<1		6		<3		<1	<1	8.1		160		2	210	
TP25	0.95	MG	5 <1		<1		25 <1		36 <3		<1	<1	8.1		32				

Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): As to Phenol
 Test scenario: Planning
 Date: 1 November 2016
 User details: FT

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (total) (mg/kg)	Chromium (VI) (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Cyanide (total) (mg/kg)	Cyanide (free) (mg/kg)	pH	Outliers: Arsenic (mg/kg)	Outliers: Chromium (total) (mg/kg)	Outliers: Lead (mg/kg)	Outliers: Mercury (mg/kg)	Outliers: Nickel (mg/kg)	Outliers: Cyanide (total) (mg/kg)
Critical concentration, C_c	32	5	130	4.3	200	1	130	350	43	43		32	130	200	1	130	43
Notes																	
Sample size, n	21	23	18	23	21	22	22	23	22	23	23	2	5	2	1	1	1
Sample mean, \bar{x}	10.4285714	0.5	14.9444444	0.5	29.5238095	0.65909091	16.3181818	1.5	0.5	0.5	7.81304348	34.5	68.2	115	2	210	1
Standard deviation, s	4.30780023	0	3.63758521	0	14.5657785	0.23836565	7.6306797	0	0	0	0.29588749	2.12132034	52.1747065	21.2132034	0	0	0
Number of non-detects	1	23	0	23	0	15	0	23	22	23	0	0	0	0	0	0	0
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	No	No	No	No	N/A (n<3)	Yes	N/A (n<3)	N/A (n<3)	N/A (n<3)	N/A (n<3)
Distribution	Normal	Single value	Normal	Single value	Normal	Non-normal	Non-normal	Single value	Single value	Single value	Normal	N/A (n<3)	Non-normal	N/A (n<3)	Single value	Single value	Single value
Statistical approach	Auto: One-sample t	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev
Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?										Evidence level required: 95%		Use Normal distribution to test for outliers				
t statistic, t₀ (or k₀)	-22.94737428	N/A	-134.19325	N/A	-53.63393686	-6.708203932	-69.87778447	N/A	N/A	N/A		1.666666667	-2.648582239	-5.666666667	N/A	N/A	N/A
Upper confidence limit (on true mean concentration, μ)	12.049874	0.5	16.4359607	0.5	35.0058496	0.88060896	23.409528	1.5	0.5	0.5	7.9189858	41.0383484	169.907227	180.383484	2	210	1
Evidence level	100%	100%	100%	100%	100%	98%	100%	100%	100%	100%		0%	88%	97%	0%	0%	100%
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	lower bound	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$		$\mu \geq C_c$	$\mu \geq C_c$	$\mu < C_c$	$\mu \geq C_c$	$\mu \geq C_c$	$\mu < C_c$
Select dataset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Back to data](#)

[Go to outlier test](#)

[Go to normality test](#)

[Show individual summary](#)



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	Cu, Zn & B
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	1 November 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): Cu, Zn & B
 Test scenario: Planning
 Date: 1 November 2016
 User details: FT

	Copper (mg/kg)	Zinc (mg/kg)	Boron (mg/kg)													
Critical concentration, C_c	2330	3550	291													
Notes																
Sample size, n	23	23	23	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample mean, \bar{x}	21.7391304	70	0.5	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	14.8391907	28.7054002	0													
Number of non-detects	0	0	23													
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No													
Distribution	Non-normal	Normal	Single value													
Statistical approach	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?	Evidence level required:	95%	Use Normal distribution to test for outliers												
t statistic, t₀ (or k₀)	-745.9995937	-581.4060627	N/A													
Upper confidence limit (on true mean concentration, μ)	35.2263708	80.2779497	0.5													
Evidence level	100%	100%	100%													
Base decision on:	evidence level	evidence level	evidence level													
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$													
Select dataset	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	PAHs (Naphthalene - Pyrene)
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	1 November 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): PAHs (Naphthalene - Pyrene)
 Test scenario: Planning
 Date: 1 November 2016
 Method: FT

	Naphthalene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Fluorene (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)	Outliers: Fluoranthene (mg/kg)	Outliers: Pyrene (mg/kg)						
Critical concentration, C_c	0.85	165	199	161	92	2232	257	565	257	565						
Notes																
Sample size, n	10	10	10	10	10	10	8	8	2	2	0	0	0	0	0	0
Sample mean, \bar{x}	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.15	0.15	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	1.4628E-17	7.3142E-18	7.3142E-18	7.3142E-18	7.3142E-18	7.3142E-18	7.418E-18	7.418E-18	0.07071068	0.07071068						
Number of non-detects	10	10	10	10	10	10	8	8	0	0						
Set non-detect values to:	Detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	No	N/A (n<3)	N/A (n<3)						
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	N/A (n<3)	N/A (n<3)						
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?										Evidence level required: 95%						Use Normal distribution to test for outliers	
t statistic, t₀ (or k₀)	-1.6213E+17	-7.13154E+19	-8.60152E+19	-6.9586E+19	-3.97542E+19	-9.64974E+20	-9.79732E+19	-2.15411E+20	-5137	-11297								
Upper confidence limit (on true mean concentration, μ)	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.36794495	0.36794495								
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%								
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level								
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$								
Select dataset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	PAHs (Benzo(a)anthracene - Benzo(ghi)perylene)
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	1 November 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GE-G-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground Contaminant(s): PAHs (Benzo(a)anthracene - Benzo(ghi)perylene)
 Test scenario: Planning
 Date: 1 November 2016
 Data details: FT

	Benzo(a)anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Benzo(a)pyrene (mg/kg)	Indeno(123-cd)Pyrene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Outliers: Benzo(a)anthracene (mg/kg)	Outliers: Chrysene (mg/kg)	Outliers: Benzo(k)fluoranthene (mg/kg)	Outliers: Benzo(a)pyrene (mg/kg)	Outliers: Indeno(123-cd)Pyrene (mg/kg)	Outliers: Benzo(ghi)perylene (mg/kg)			
Critical concentration, C_c	5.9	12	1.9	56	2	21	0.17	213	5.9	12	56	2	21	213			
Notes																	
Sample size, n	10	10	9	10	10	10	11	10	1	1	1	1	1	1	0	0	0
Sample mean, \bar{x}	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.4	0.4	0.3	0.4	0.3	0.3	No Data	No Data	No Data
Standard deviation, s	1.46285E-17	7.31424E-18	7.35981E-18	7.31424E-18	7.31424E-18	7.31424E-18	7.27757E-18	7.31424E-18	0	0	0	0	0	0			
Number of non-detects	10	10	9	10	10	10	11	10	0	0	0	0	0	0			
Set non-detect values to:	Detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	No	N/A (n<3)	N/A (n<3)	N/A (n<3)	N/A (n<3)	N/A (n<3)	N/A (n<3)			
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Single value	Single value	Single value	Single value	Single value	Single value			
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?		Evidence level required: 95%		Use Normal distribution to test for outliers												
t statistic, t₀ (or k₀)	-1.2538E+18	-5.16653E+18	-7.54096E+17	-2.41897E+19	-8.43074E+17	-9.05764E+18	-5.46879E+16	-9.2068E+19	N/A	N/A	N/A	N/A	N/A	N/A			
Upper confidence limit (on true mean concentration, μ)	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.4	0.4	0.3	0.4	0.3	0.3			
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%			
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$
Select dataset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Client/client ref	Brookbanks Consulting Ltd
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	TPH (banded)
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	1 November 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks Consulting Ltd
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): TPH (banded)
 Test scenario: Planning
 Date: 1 November 2016
 User details: FT

	TPH (C6-C8) (mg/kg)	TPH (C8-C10) (mg/kg)	TPH (C10-C12) (mg/kg)	TPH (C12-C16) (mg/kg)	TPH (C16-C21) (mg/kg)	TPH (21-C35) (mg/kg)	TPH (C35-40)	Outliers: TPH (C12-C16) (mg/kg)	Outliers: TPH (C16-C21) (mg/kg)	Outliers: TPH (21-C35) (mg/kg)			
Critical concentration, C_c	7	13	61	185	474	1770	1770	185	474	1770			
Notes													
Sample size, n	23	23	23	21	20	22	23	2	2	1	0	0	0
Sample mean, \bar{x}	0.05	0.5	0.5	1	4.95	34.5909091	14.673913	9.5	64.5	280	No Data	No Data	No Data
Standard deviation, s	1.419E-17	0	0	0.90829511	4.57078825	34.8567259	14.8420538	7.77817459	50.2045815	0			
Number of non-detects	23	23	23	14	7	2	3	0	0	0			
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	No	No	No	N/A (n<3)	N/A (n<3)	N/A (n<3)			
Distribution	Non-normal	Single value	Single value	Non-normal	Non-normal	Non-normal	Non-normal	N/A (n<3)	N/A (n<3)	Single value			
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?										Evidence level required: 95%			Use Normal distribution to test for outliers			
t statistic, t₀ (or k₀)	-2.34896E+18	N/A	N/A	-928.3259616	-458.9263937	-233.5213631	-567.1889005	-31.90909091	-11.53521127	N/A							
Upper confidence limit (on true mean concentration, μ)	0.05	0.5	0.5	1.86396098	9.40505331	66.9839748	28.1637557	33.4739442	219.240912	280							
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%	99%	100%							
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level							
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$							
Select dataset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- [Back to data](#)
- [Go to outlier test](#)
- [Go to normality test](#)
- [Show individual summary](#)



Client/client ref	Brookbanks
Project ref	GEG-16-458
Site ref	Adastral Park, Ipswich
Data description	Made Ground
Contaminant(s)	Benzo(a)pyrene surrogate marker
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)? ▼
Date	2 December 2016
User details	FT

Statistics calculator (version 1)

Input data

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Client/client ref: Brookbanks
 Project ref: GEG-16-458
 Site ref: Adastral Park, Ipswich
 Data description: Made Ground
 Contaminant(s): Benzo(a)pyrene surrogate marker
 Test scenario: Planning
 Date: 2 December 2016

	Benzo(a)pyrene (mg/kg)	Outliers: Benzo(a)pyrene (mg/kg)						
Critical concentration, C_c	0.98	0.98						
Notes								
Sample size, n	12	1	0	0	0	0	0	0
Sample mean, \bar{x}	0.625	20	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	0.49012985	0						
Number of non-detects	0	0						
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	N/A (n<3)						
Distribution	Normal	Single value						
Statistical approach	Auto: One-sample t-	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?	Evidence level required:	95%	Use Normal distribution to test
t statistic, t_0 (or k_0)	-2.509041361	N/A		
Upper confidence limit (on true mean concentration, μ)	0.87909669	20		
Evidence level	99%	0%		
Base decision on:	evidence level	evidence level		
Result	$\mu < C_c$	$\mu \geq C_c$		
Select dataset	<input checked="" type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y

Back to data

Go to outlier test

Go to normality test

Show individual



APPENDIX G

CONTAMINATION ASSESSMENT TABLES

Table 1A. Direct Comparison with Critical Concentrations - Natural Ground (Area 1)

Determinand	Units	Critical Concentration (Cc)	TP09 (0.50m)	No. of samples exceeding criteria*
Metals, Semi- Metal and Non- Metals				
Arsenic	mg/kg	32	11	0 (1)
Boron	mg/kg	291	<1	0 (1)
Cadmium	mg/kg	5	<1	0 (1)
Chromium (total)	mg/kg	130	12	0 (1)
Chromium VI	mg/kg	4.3	<1	0 (1)
Copper	mg/kg	2330	2	0 (1)
Lead	mg/kg	200	7	0 (1)
Mercury	mg/kg	1	<1	0 (1)
Nickel	mg/kg	130	7	0 (1)
Zinc	mg/kg	3550	17	0 (1)
Selenium	mg/kg	350	<3	0 (1)
Inorganics				
Cyanide (total)	mg/kg	43	<1	0 (1)
Cyanide (free)	mg/kg	43	<1	0 (1)
Petroleum Hydrocarbons				
C ₆ to C ₈ TPH	mg/kg	7	<0.1	0 (1)
C ₈ to C ₁₀ TPH	mg/kg	13	<1	0 (1)
C ₁₀ to C ₁₂ TPH	mg/kg	61	<1	0 (1)
C ₁₂ to C ₁₆ TPH	mg/kg	185	<1	0 (1)
C ₁₆ to C ₂₁ TPH	mg/kg	474	1	0 (1)
C ₂₁ to C ₃₅ TPH	mg/kg	1770	16	0 (1)
C ₃₅ to C ₄₀ TPH	mg/kg	1770	2	0 (1)
Polyaromatic Hydrocarbons				
Naphthalene	mg/kg	0.85	<0.1	0 (1)
Acenaphthylene	mg/kg	165	<0.1	0 (1)
Acenaphthene	mg/kg	199	<0.1	0 (1)
Fluorene	mg/kg	161	<0.1	0 (1)
Phenanthrene	mg/kg	92	<0.1	0 (1)
Anthracene	mg/kg	2232	<0.1	0 (1)
Fluoranthene	mg/kg	257	<0.1	0 (1)
Pyrene	mg/kg	565	<0.1	0 (1)
Benzo(a)Anthracene	mg/kg	5.9	<0.1	0 (1)
Chrysene	mg/kg	12	<0.1	0 (1)
Benzo(b)fluoranthene	mg/kg	1.9	<0.1	0 (1)
Benzo(k)fluoranthene	mg/kg	56	<0.1	0 (1)
Benzo(a)pyrene	mg/kg	2.0	<0.1	0 (1)
Indeno(123-cd)Pyrene	mg/kg	21	<0.1	0 (1)
Dibenzo(ah)anthracene	mg/kg	0.17	<0.1	0 (1)
Benzo(ghi)Perylene	mg/kg	213	<0.1	0 (1)
Others				
Phenol	mg/kg	198	<1	0 (1)
pH	-	-	6.8	-
SOM	%	-	0.1	-

Table 1B. Direct Comparison with Critical Concentrations - Natural Ground (Area 2)

Determinand	Units	Critical Concentration (Cc)	TP17 (2.30m)	No. of samples exceeding criteria*
Metals, Semi- Metal and Non- Metals				
Arsenic	mg/kg	32	16	0 (1)
Boron	mg/kg	291	<1	0 (1)
Cadmium	mg/kg	5	<1	0 (1)
Chromium (total)	mg/kg	130	20	0 (1)
Chromium VI	mg/kg	4.3	<1	0 (1)
Copper	mg/kg	2330	53	0 (1)
Lead	mg/kg	200	360	1 (1)
Mercury	mg/kg	1	1	0 (1)
Nickel	mg/kg	130	17	0 (1)
Zinc	mg/kg	3550	370	0 (1)
Selenium	mg/kg	350	<3	0 (1)
Inorganics				
Cyanide (total)	mg/kg	43	<1	0 (1)
Cyanide (free)	mg/kg	43	<1	0 (1)
Petroleum Hydrocarbons				
C ₆ to C ₈ TPH	mg/kg	7	<0.1	0 (1)
C ₈ to C ₁₀ TPH	mg/kg	13	<1	0 (1)
C ₁₀ to C ₁₂ TPH	mg/kg	61	<1	0 (1)
C ₁₂ to C ₁₆ TPH	mg/kg	185	<1	0 (1)
C ₁₆ to C ₂₁ TPH	mg/kg	474	<1	0 (1)
C ₂₁ to C ₃₅ TPH	mg/kg	1770	<1	0 (1)
C ₃₅ to C ₄₀ TPH	mg/kg	1770	<1	0 (1)
Polyaromatic Hydrocarbons				
Naphthalene	mg/kg	0.85	<0.1	0 (1)
Acenaphthylene	mg/kg	165	<0.1	0 (1)
Acenaphthene	mg/kg	199	<0.1	0 (1)
Fluorene	mg/kg	161	<0.1	0 (1)
Phenanthrene	mg/kg	92	<0.1	0 (1)
Anthracene	mg/kg	2232	<0.1	0 (1)
Fluoranthene	mg/kg	257	<0.1	0 (1)
Pyrene	mg/kg	565	<0.1	0 (1)
Benzo(a)Anthracene	mg/kg	5.9	<0.1	0 (1)
Chrysene	mg/kg	12	<0.1	0 (1)
Benzo(b)fluoranthene	mg/kg	1.9	<0.1	0 (1)
Benzo(k)fluoranthene	mg/kg	56	<0.1	0 (1)
Benzo(a)pyrene	mg/kg	2.0	<0.1	0 (1)
Indeno(123-cd)Pyrene	mg/kg	21	<0.1	0 (1)
Dibenzo(ah)anthracene	mg/kg	0.17	<0.1	0 (1)
Benzo(ghi)Perylene	mg/kg	213	<0.1	0 (1)
Others				
Phenol	mg/kg	198	<1	0 (1)
pH	-	-	7.2	-
SOM	%	-	0.03	-

Table 2A. Groundwater Analysis Results (16th November 2016)

Determinand	Units	CP18 (9.10m)	CP19 (10.45m)	CP20 (9.50m)	CP26 (11.50m)	CP28 (10.45m)	Screening Criteria	No. of samples exceeding criteria*
Metals, Semi- Metal and Non- Metals								
Arsenic	ug/l	5.2	8.3	10	0.4	0.2	10 ^(a)	0 (5)
Boron	mg/l	0.23	0.31	0.19	0.08	0.04	1000 ^(a)	0 (5)
Cadmium	ug/l	<0.02	0.08	0.05	0.03	<0.02	5 ^(a)	0 (5)
Chromium	ug/l	<1	<1	<1	<1	<1	50 ^(a)	0 (5)
Chromium VI	ug/l	<0.03	<0.03	<0.03	<0.03	<0.03	50 ^(a)	0 (5)
Copper	ug/l	1.1	1.8	1.2	0.9	0.8	2000 ^(a)	0 (5)
Lead	ug/l	0.3	3.3	1.8	0.3	<0.3	10 ^(a)	0 (5)
Mercury	ug/l	0.16	0.12	<0.05	<0.05	<0.05	1 ^(a)	0 (5)
Nickel	ug/l	7	8	11	3	<1	20 ^(a)	0 (5)
Selenium	ug/l	1.1	0.9	2.1	<0.5	<0.5	10 ^(a)	0 (5)
Zinc	ug/l	8	7	15	14	5	5000 ^(a)	0 (5)
Inorganics								
Cyanide (Total)	ug/l	<0.05	<0.05	<0.05	<0.05	<0.05	50 ^(a)	0 (5)
Sulphate	mg/l	33	120	70	72	37	250 ^(b)	0 (5)
Sulphide	ug/l	<0.05	0.06	<0.05	<0.05	<0.05	0.25 ^(a)	0 (5)
Total Petroleum Hydrocarbons								
>C ₆ to C ₈ TPH	mg/l	<0.01	<0.01	<0.02	<0.01	<0.01	-	-
>C ₈ to C ₁₀ TPH	mg/l	<0.02	<0.01	<0.01	<0.01	<0.01	-	-
>C ₁₀ to C ₁₂ TPH	mg/l	<0.02	<0.01	<0.01	<0.01	<0.01	-	-
>C ₁₂ to C ₁₆ TPH	mg/l	0.07	0.56	1.4	<0.01	<0.01	-	-
>C ₁₆ to C ₂₁ TPH	mg/l	0.27	1.7	3.9	<0.01	<0.01	-	-
>C ₂₁ to C ₃₅ TPH	mg/l	1.5	6	12	<0.01	<0.01	-	-
>C ₃₅ to C ₄₀ TPH	mg/l	0.36	2.2	3	<0.01	<0.01	-	-
TPH (Sum) Total	mg/l	1.7	10	20	<0.01	<0.01	0.05 ^(c)	3 (5)
Polyaromatic Hydrocarbons								
Naphthalene	ug/l	<0.1	<0.5	<0.1	<0.05	<0.05	10 ^(a)	0 (5)
Acenaphthylene	ug/l	2	2.5	15	<0.05	<0.05	-	-
Acenaphthene	ug/l	2	2.5	14	<0.05	<0.05	-	-
Fluorene	ug/l	3	2.5	15	<0.05	<0.05	-	-
Phenanthrene	ug/l	38	24	68	0.05	<0.05	-	-
Anthracene	ug/l	17	7.5	25	0.05	<0.05	-	-
Fluoranthene	ug/l	110	64	130	0.40	<0.05	-	-
Pyrene	ug/l	97	58	110	0.40	<0.05	-	-
Benzo(a)anthracene	ug/l	48	25	44	0.15	<0.05	-	-
Chrysene	ug/l	53	31	50	0.2	<0.05	-	-
Benzo(b)fluoranthene	ug/l	40	22	38	0.1	<0.05	-	-
Benzo(k)fluoranthene	ug/l	42	29	37	0.15	<0.05	-	-
Benzo(a)pyrene	ug/l	45	27	44	<0.05	<0.05	0.01 ^(a)	3 (5)
Indeno(123-cd)pyrene	ug/l	26	16	25	0.05	<0.05	-	-
Dibenzo(ah)anthracene	ug/l	9	5	7	<0.05	<0.05	-	-
Benzo(ghi)perylene	ug/l	30	19	30	0.05	<0.05	-	-
Total PAHs	ug/l	570	330	650	1.6	<0.05	0.1 ^(a)	4 (5)
Phenols (Total-Mono)	ug/l	<1	<1	<1	<1	<1	0.1 ^(a)	0 (5)
Others								
pH	-	7.1	8.4	7.5	7.9	7.6	-	-
Hardness	mg/l	820					-	-

Notes: *Number of samples in brackets; * Total number of samples in bracket.

#Laboratory Detection above Assessment Criteria

N.D. Not Detected

(a) UK Drinking Water Standard (DWS).

(b) EQS Freshwater

(c) The Surface Water (Abstraction for Drinking Water) Regulations 1996. DW1 value.

Table 2B. Groundwater Analysis Results (24th November 2016)

Determinand	Units	CP18 (9.50m)	CP19 (4.50m)	CP20 (9.50m)	CP25 (11.00m)	CP26 (11.20m)	CP28 (10.50m)	Screening Criteria	No. of samples exceeding criteria*
Metals, Semi- Metal and Non- Metals									
Arsenic	ug/l	5.7	11	8.4	<0.2	0.2	0.3	10 ^(a)	1 (6)
Boron	mg/l	0.22	0.51	0.20	0.06	0.05	0.05	1000 ^(a)	0 (6)
Cadmium	ug/l	<0.02	0.06	0.02	<0.02	<0.02	<0.02	5 ^(a)	0 (6)
Chromium	ug/l	<1	<1	<1	<1	<1	1	50 ^(a)	0 (6)
Chromium VI	ug/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	50 ^(a)	0 (6)
Copper	ug/l	<0.5	1.3	3.0	1.3	0.5	1.1	2000 ^(a)	0 (6)
Lead	ug/l	<0.3	2.4	2.0	<0.3	<0.3	0.3	10 ^(a)	0 (6)
Mercury	ug/l	<0.05	0.13	<0.05	<0.05	<0.05	<0.05	1 ^(a)	0 (6)
Nickel	ug/l	6	6	18	1	1	<1	20 ^(a)	0 (6)
Selenium	ug/l	1.0	0.7	2.1	<0.5	<0.5	<0.5	10 ^(a)	0 (6)
Zinc	ug/l	3	6	49	5	7	4	5000 ^(a)	0 (6)
Inorganics									
Cyanide (Total)	ug/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	50 ^(a)	0 (6)
Sulphate	mg/l	19	150	28	67	67	35	250 ^(b)	0 (6)
Sulphide	ug/l	0.05	0.05	0.05	<0.05	0.05	0.05	0.25 ^(a)	0 (6)
Total Petroleum Hydrocarbons									
>C ₆ to C ₈ TPH	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
>C ₈ to C ₁₀ TPH	mg/l	<0.03	<0.02	<0.02	<0.01	<0.01	<0.01	-	-
>C ₁₀ to C ₁₂ TPH	mg/l	<0.03	<0.02	0.04	<0.01	<0.01	<0.01	-	-
>C ₁₂ to C ₁₆ TPH	mg/l	<0.03	0.03	0.3	<0.01	<0.01	<0.01	-	-
>C ₁₆ to C ₂₁ TPH	mg/l	<0.03	0.26	0.75	<0.01	<0.01	<0.01	-	-
>C ₂₁ to C ₃₅ TPH	mg/l	<0.03	1.0	0.63	<0.01	<0.01	<0.01	-	-
>C ₃₅ to C ₄₀ TPH	mg/l	<0.03	0.20	0.03	<0.01	<0.01	<0.01	-	-
TPH (Sum) Total	mg/l	<0.03	1.5	1.8	N.D	N.D	N.D	0.05 ^(c)	2 (6)
Polyaromatic Hydrocarbons									
Naphthalene	ug/l	0.07	0.60	0.17	<0.01	<0.01	0.01	10 ^(a)	0 (6)
Acenaphthylene	ug/l	0.04	0.15	0.03	<0.01	<0.01	0.05	-	-
Acenaphthene	ug/l	0.10	0.68	0.14	<0.01	<0.01	0.05	-	-
Fluorene	ug/l	0.12	0.53	0.14	<0.01	<0.01	0.04	-	-
Phenanthrene	ug/l	0.35	1.2	0.33	0.01	0.01	0.04	-	-
Anthracene	ug/l	0.20	0.27	0.18	0.01	0.01	0.02	-	-
Fluoranthene	ug/l	0.47	1.2	0.23	0.02	0.02	0.02	-	-
Pyrene	ug/l	0.39	1.1	0.18	<0.01	<0.01	0.02	-	-
Benzo(a)anthracene	ug/l	0.17	0.53	0.05	<0.01	<0.01	0.01	-	-
Chrysene	ug/l	0.14	0.55	0.04	<0.01	<0.01	0.01	-	-
Benzo(b)fluoranthene	ug/l	0.15	0.70	0.03	<0.01	<0.01	0.01	-	-
Benzo(k)fluoranthene	ug/l	0.12	0.56	0.02	<0.01	<0.01	0.01	-	-
Benzo(a)pyrene	ug/l	0.15	0.71	0.03	<0.01	<0.01	<0.01	0.01 ^(a)	3 (6)
Indeno(123-cd)pyrene	ug/l	0.09	0.53	0.02	<0.01	<0.01	0.01	-	-
Dibenzo(ah)anthracene	ug/l	0.03	0.17	0.01	<0.01	<0.01	<0.01	-	-
Benzo(ghi)perylene	ug/l	0.10	0.59	0.02	<0.01	<0.01	<0.01	-	-
Total PAHs	ug/l	2.7	10	1.6	0.04	0.04	0.30	0.1 ^(a)	4 (6)
Phenols (Total-Mono)	ug/l	0.6	1.6	0.4	<0.1	<0.1	<0.1	0.1 ^(a)	3 (6)
Others									
pH	-	7.3	8.9	7.2	7.3	7.5	7.8	-	-
Hardness	mg/l						300	-	-

Notes: *Number of samples in brackets; * Total number of samples in bracket.

#Laboratory Detection above Assessment Criteria

N.D. Not Detected

(a) UK Drinking Water Standard (DWS).

(b) EQS Freshwater

(c) The Surface Water (Abstraction for Drinking Water) Regulations 1996. DW1 value.



APPENDIX H

GEO TECHNICAL TESTING



2788

Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 32568

Client's Reference: **GEG-16-458 PO 2298**

Report Date: **26-10-2016**

Client **GEG Limited**
GEG House
17 Graham Road
Malvern
Worcestershire
WR14 2HR

Contract Title: **Adastral Park, Ipswich**
For the attention of: **Flo Trahair**

Date Received: **28-09-2016**
Date Commenced: **28-09-2016**
Date Completed: **26-10-2016**

Test Description	Qty
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	14
Disposal of Samples on Project	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

Test Report:

Particle Size Distribution Test

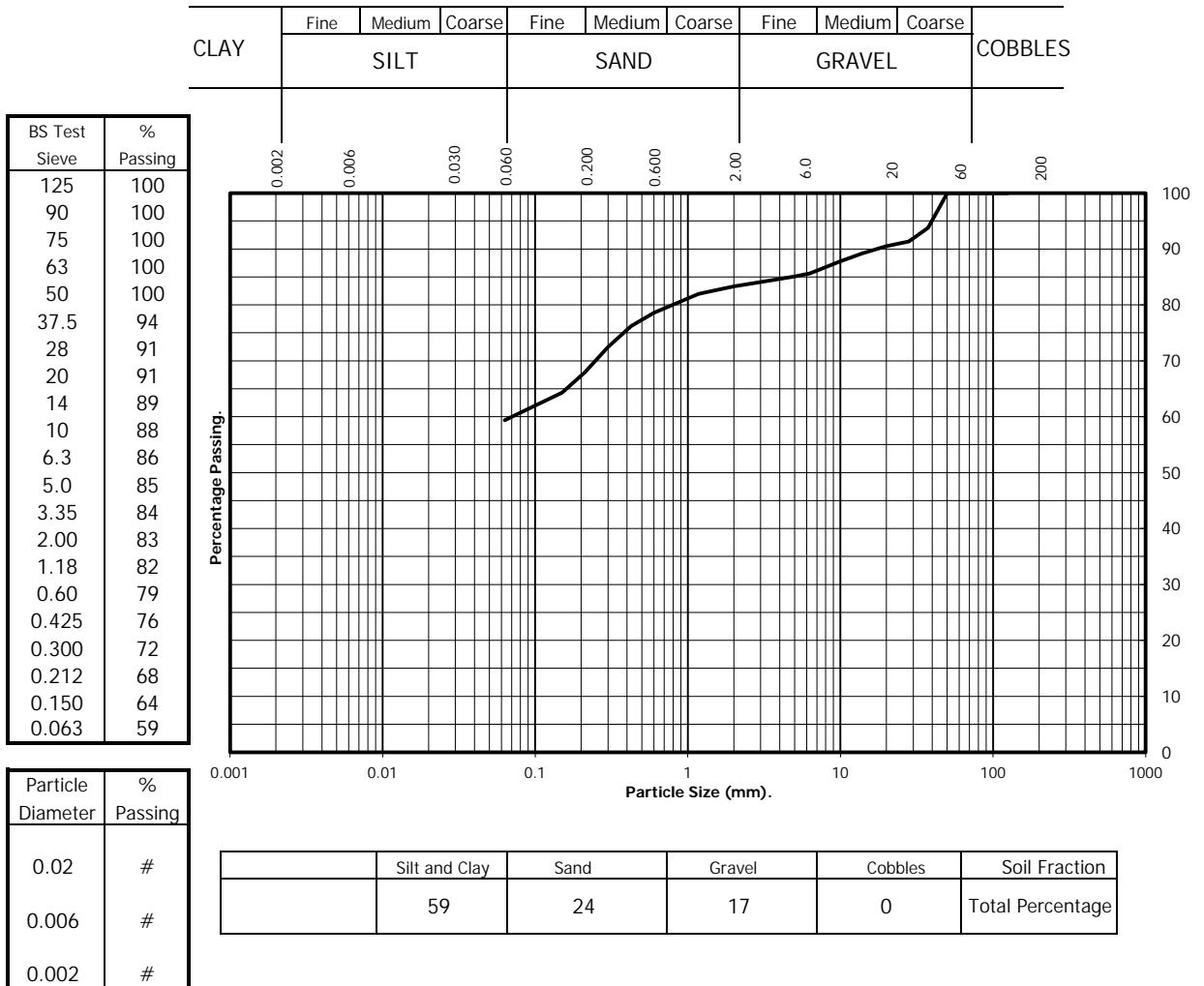
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP3

Sample Number:
 Depth from (m): 1.60
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown gravelly sandy silty CLAY



Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

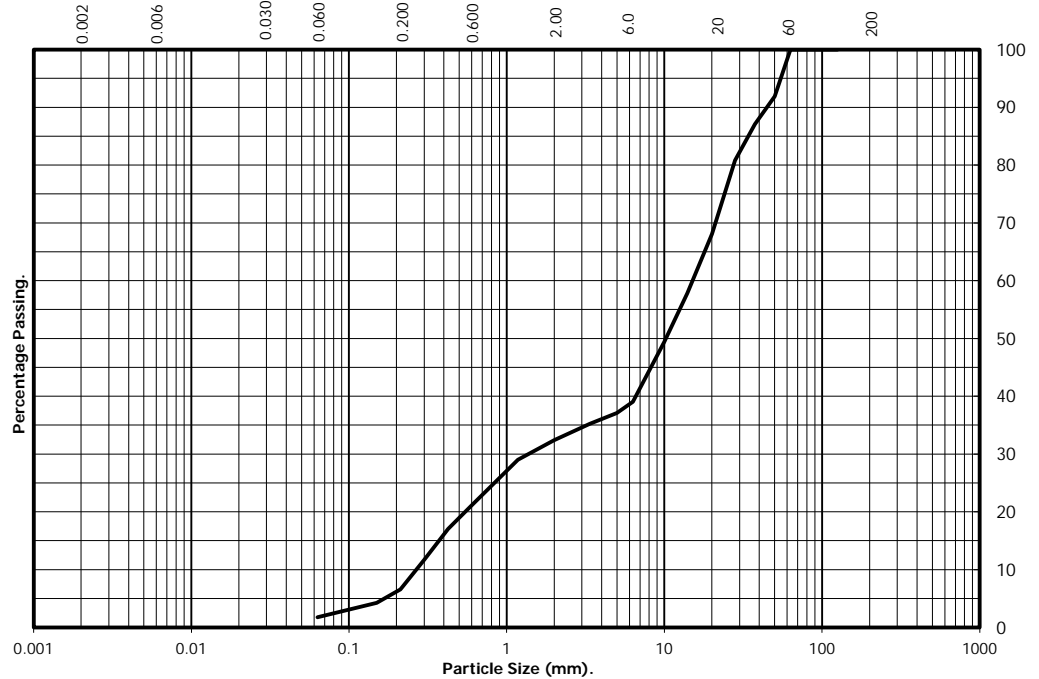
Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP4

Sample Number:
 Depth from (m): 0.95
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown slightly silty sandy GRAVEL

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	92
37.5	87
28	81
20	68
14	58
10	49
6.3	39
5.0	37
3.35	35
2.00	32
1.18	29
0.60	21
0.425	17
0.300	12
0.212	7
0.150	4
0.063	2



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	2	30	68	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

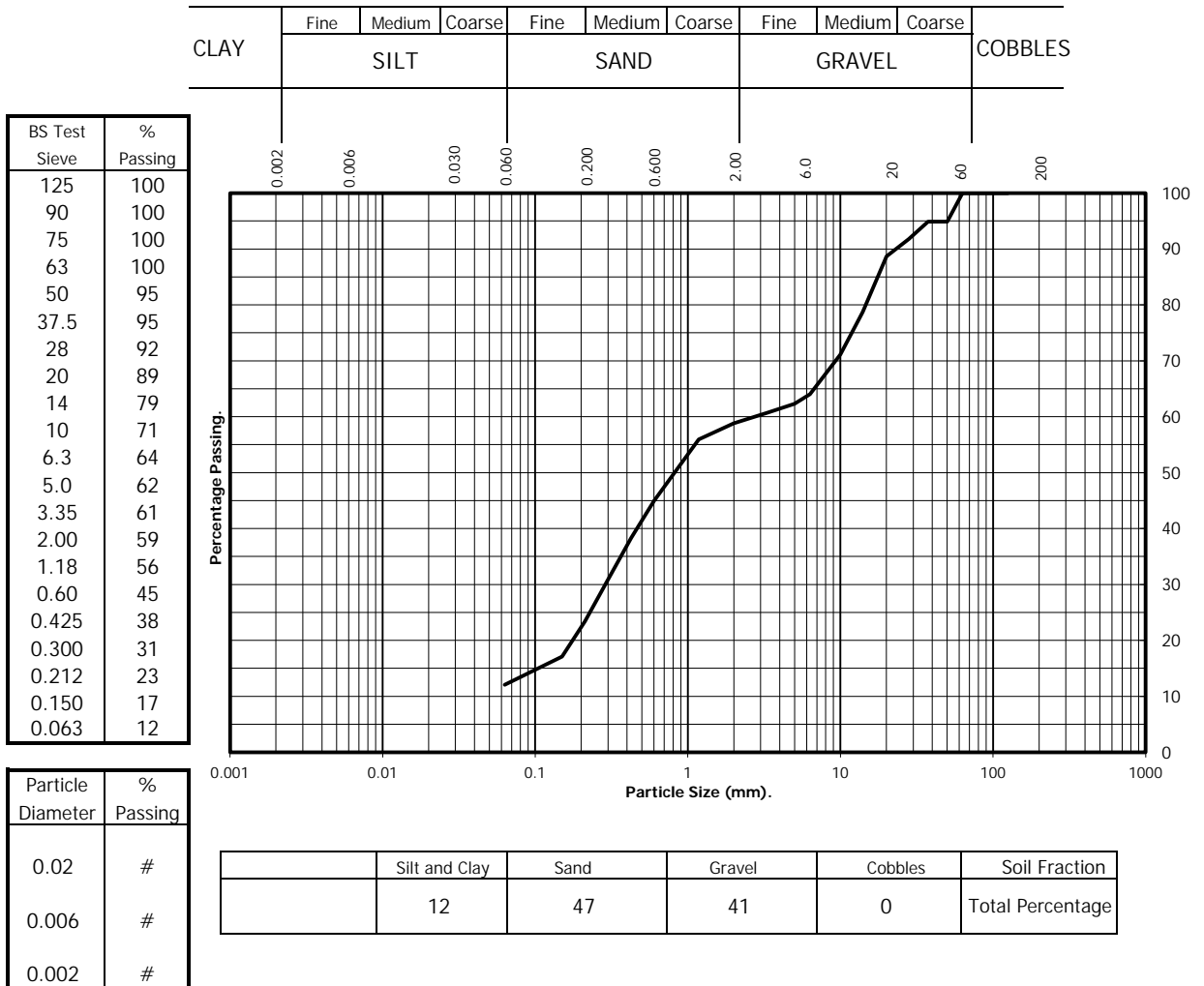
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP5

Sample Number:
 Depth from (m): 1.85
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown slightly clayey silty gravelly SAND



Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

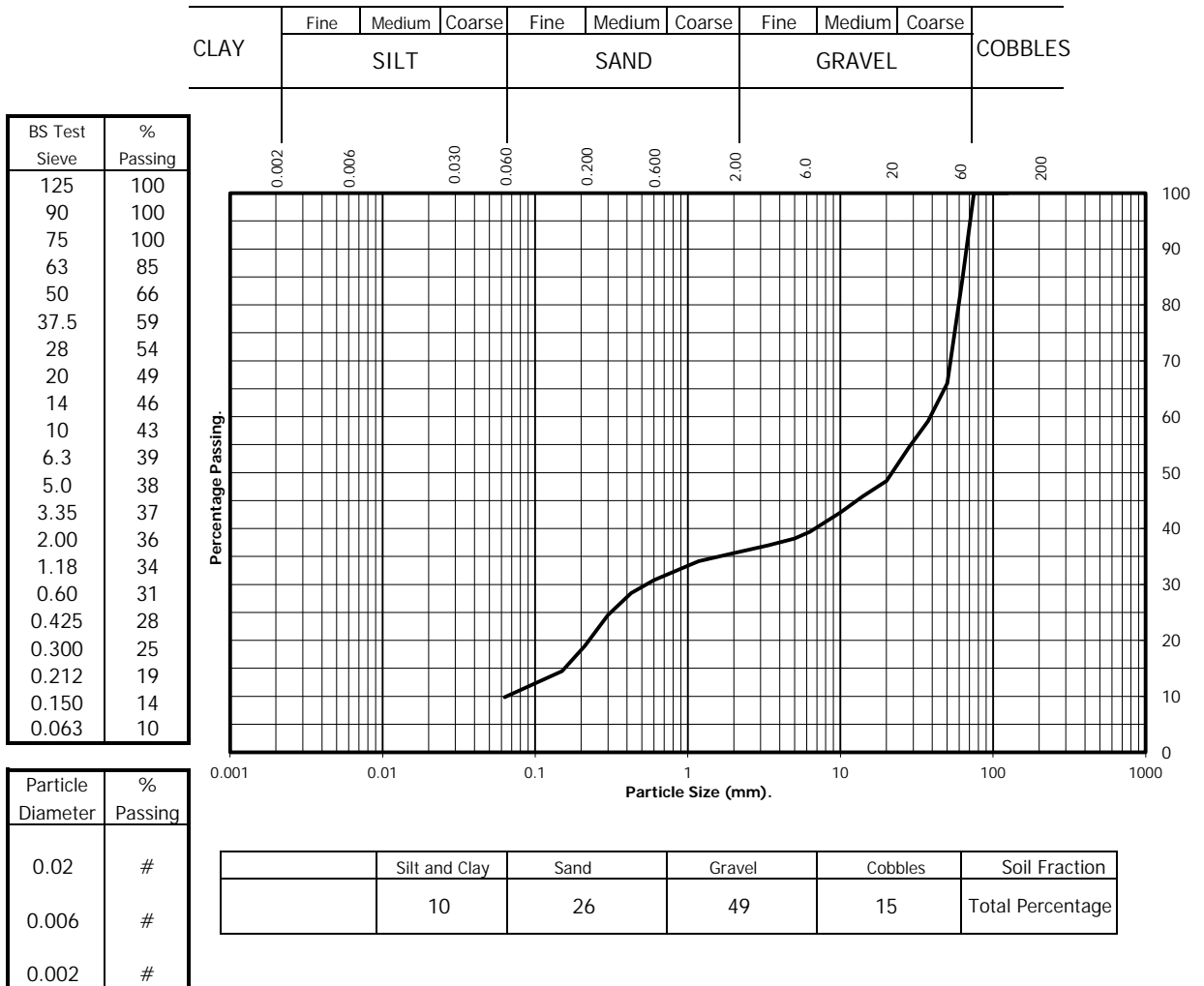
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP7

Sample Number:
 Depth from (m): 1.60
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown slightly clayey silty sandy GRAVEL. With some cobbles



Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

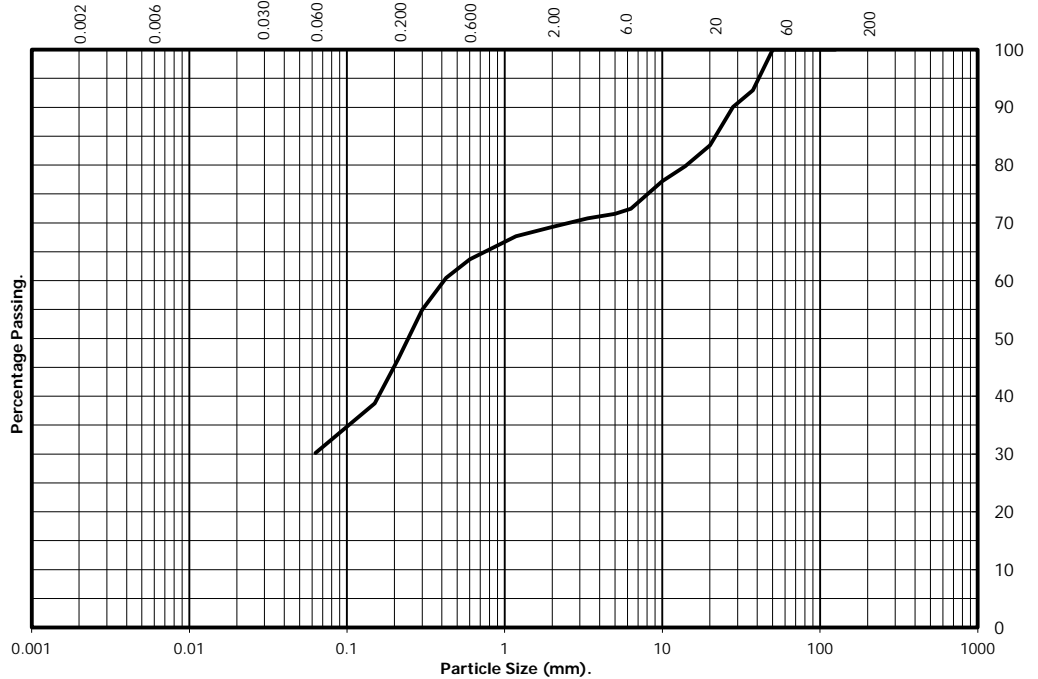
Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP8

Sample Number:
 Depth from (m): 1.60
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown gravelly silty clay SAND

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	93
28	90
20	83
14	80
10	77
6.3	72
5.0	72
3.35	71
2.00	69
1.18	68
0.60	64
0.425	61
0.300	55
0.212	47
0.150	39
0.063	30



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	30	39	31	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

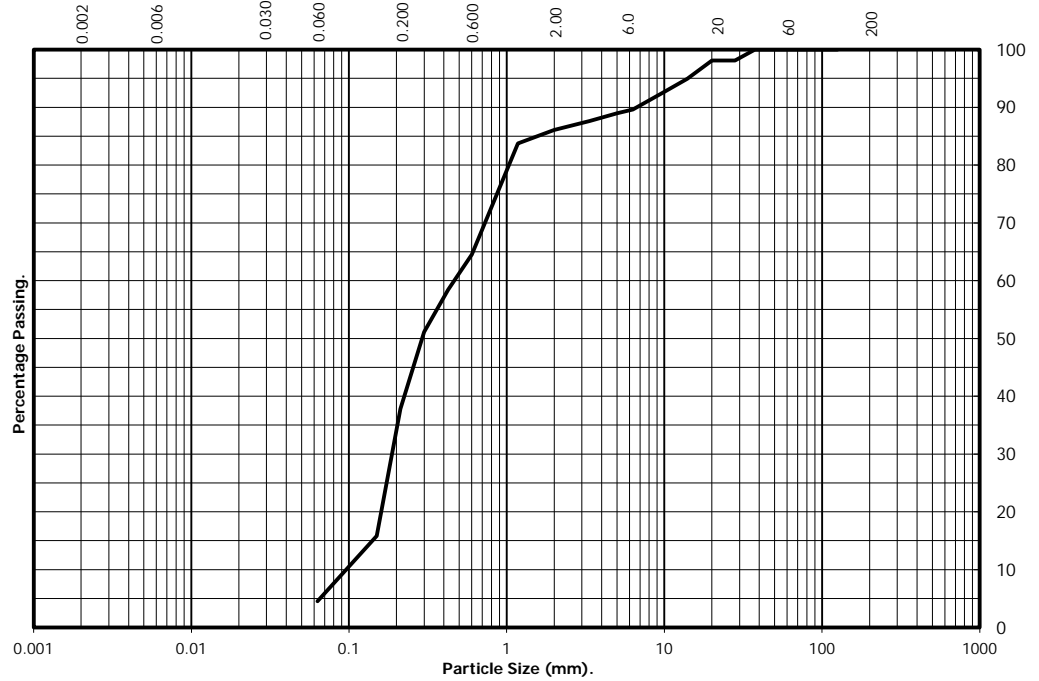
Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP9

Sample Number:
 Depth from (m): 1.40
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown silty gravelly SAND

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	98
20	98
14	95
10	93
6.3	90
5.0	89
3.35	88
2.00	86
1.18	84
0.60	65
0.425	58
0.300	51
0.212	38
0.150	16
0.063	5



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	5	81	14	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP10

Sample Number:
 Depth from (m): 1.70
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown clayey silty gravelly SAND

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	97
14	89
10	84
6.3	78
5.0	77
3.35	75
2.00	72
1.18	69
0.60	60
0.425	53
0.300	43
0.212	31
0.150	22
0.063	15



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	15	57	28	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP11

Sample Number:
 Depth from (m): 1.10
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown silty clay gravelly SAND

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	89
28	86
20	85
14	81
10	77
6.3	73
5.0	72
3.35	71
2.00	68
1.18	66
0.60	60
0.425	55
0.300	49
0.212	43
0.150	37
0.063	31



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	31	37	32	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

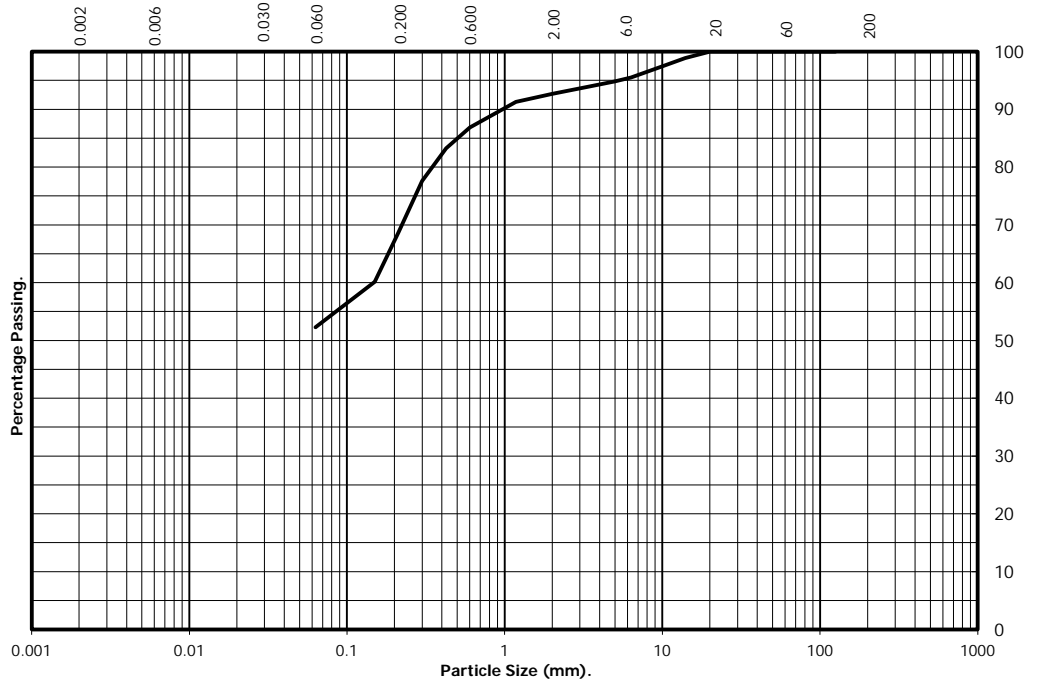
Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP12

Sample Number:
 Depth from (m): 1.00
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown gravelly sandy silty CLAY

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	97
6.3	96
5.0	95
3.35	94
2.00	93
1.18	91
0.60	87
0.425	83
0.300	78
0.212	69
0.150	60
0.063	52



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	52	41	7	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

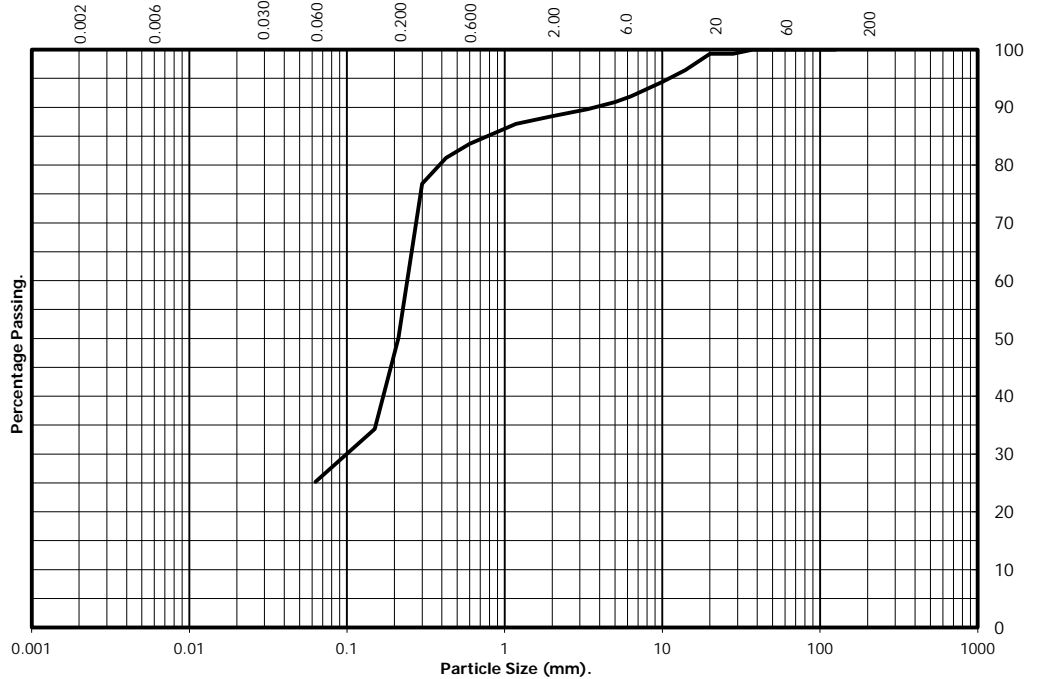
Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP13

Sample Number:
 Depth from (m): 0.95
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown slightly clayey gravelly silty SAND

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	99
14	96
10	94
6.3	92
5.0	91
3.35	90
2.00	88
1.18	87
0.60	84
0.425	81
0.300	77
0.212	50
0.150	34
0.063	25



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	25	63	12	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

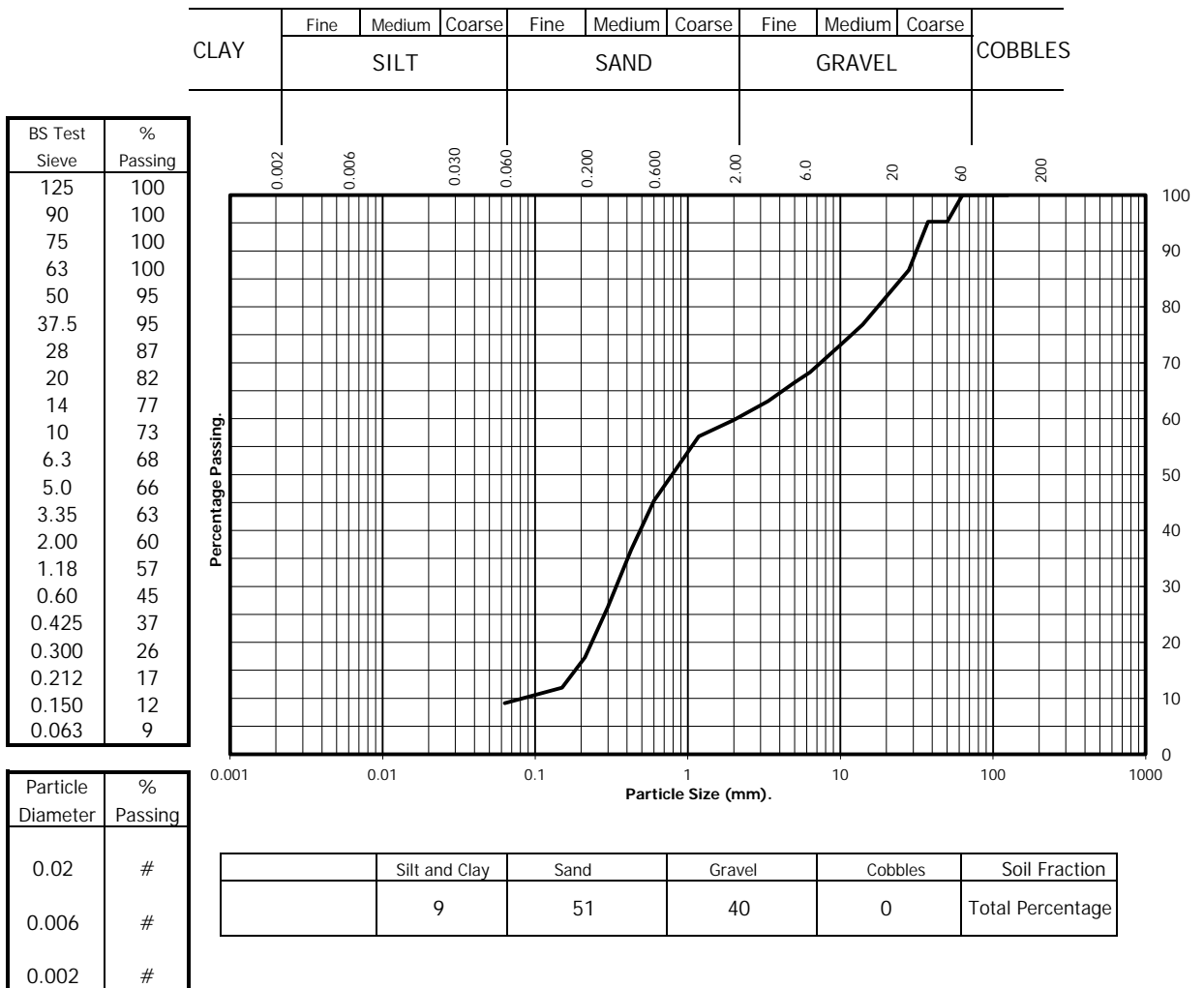
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP14

Sample Number:
 Depth from (m): 1.80
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown slightly clayey silt gravelly SAND



Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: TP15

Sample Number:
 Depth from (m): 1.40
 Depth to (m):
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown slightly clayey silty gravelly SAND

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	97
14	90
10	86
6.3	81
5.0	80
3.35	79
2.00	77
1.18	74
0.60	67
0.425	60
0.300	49
0.212	35
0.150	25
0.063	18



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	18	59	23	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

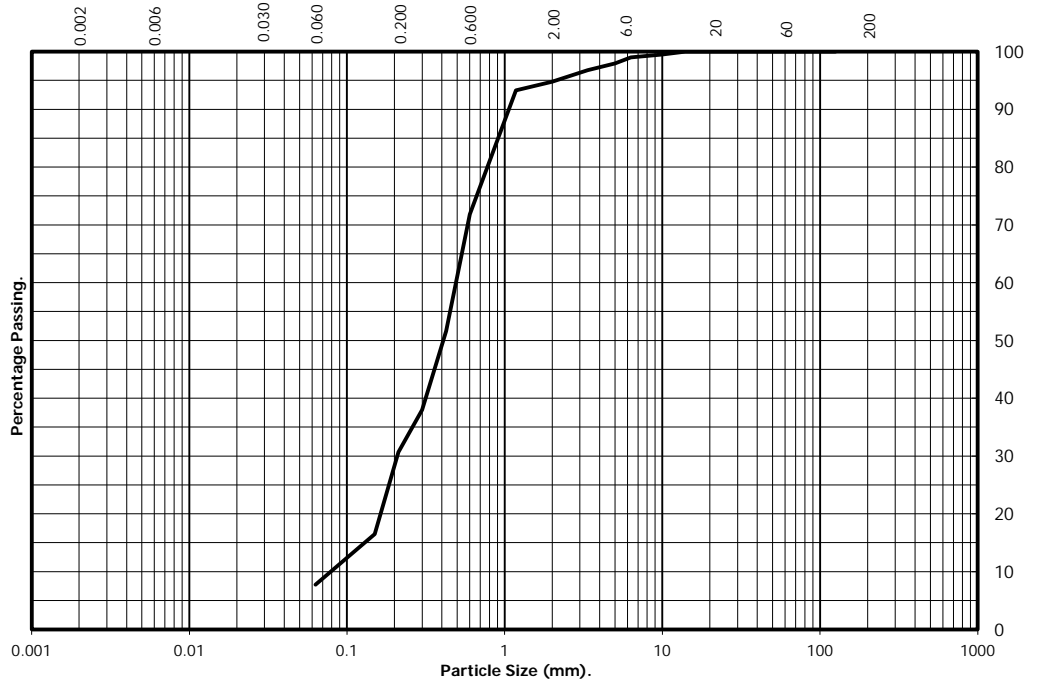
Client ref: GEG-16-458
 Contract Number: 32568
 Hole Number: WS06

Sample Number:
 Depth from (m): 1.00
 Depth to (m): 1.50
 Sample Type: B

Location: Adastral Park, Ipswich
 Description: Brown gravelly silty SAND

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	99
6.3	99
5.0	98
3.35	97
2.00	95
1.18	93
0.60	72
0.425	52
0.300	38
0.212	31
0.150	17
0.063	8



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	8	87	5	0	Total Percentage

Remarks:

- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Ben Sharp (Contracts Manager)

Date: 26.10.16





Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 32810

Client's Reference: **2338**

Report Date: **15-11-2016**

Client **GEG Limited**
17 Graham Road
Malvern
Worcestershire
WR14 2HR

Contract Title: **Adastral Park, Ipswich**
For the attention of: **Matthew Perks**

Date Received: **22-10-2016**
Date Commenced: **22-10-2016**
Date Completed: **15-11-2016**

Test Description	Qty
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	10
Disposal of Samples on Project	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

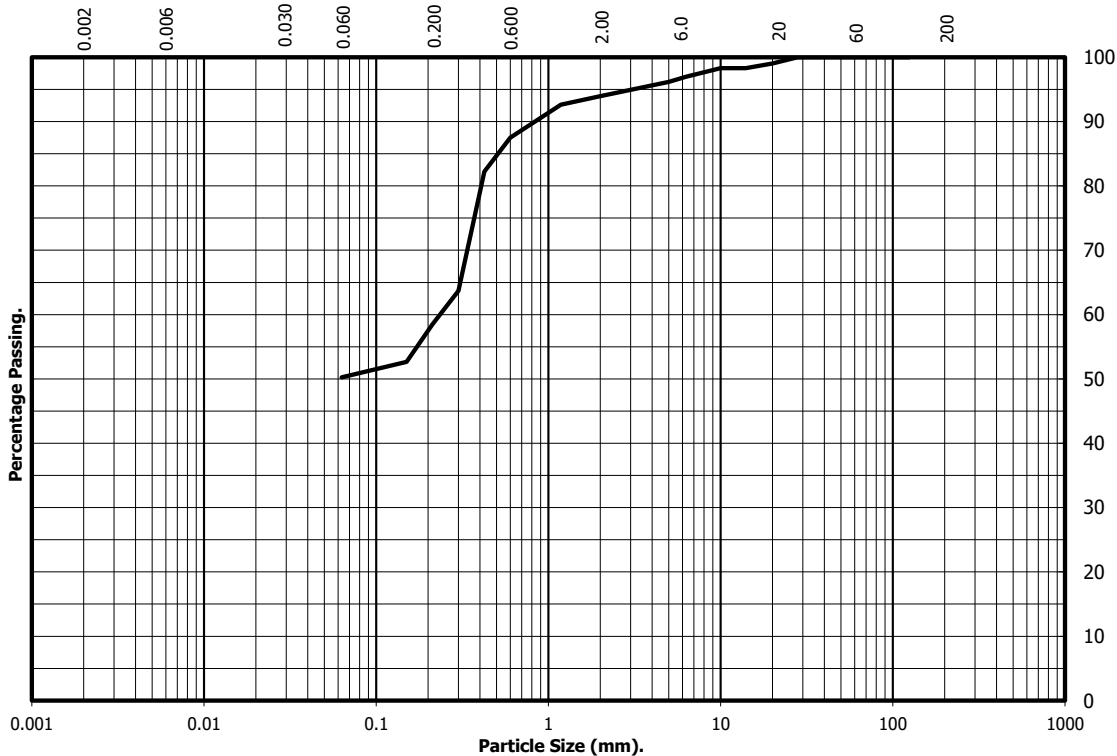
Client ref: **GEG-16-458**
 Contract Number: **32810-201016**
 Hole Number: **TP01**

Sample Number:
 Depth from (m): **0.90**
 Depth to (m):
 Sample Type: **B**

Location: **Adastral Park, Ipswich**
 Description: **Brown slightly gravelly sandy silty CLAY.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	99
14	98
10	98
6.3	97
5.0	96
3.35	95
2.00	94
1.18	93
0.60	87
0.425	82
0.300	64
0.212	58
0.150	53
0.063	50



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	50	44	6	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Paul Evans (Quality/Technical Manager)

Date: **15.11.16**



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

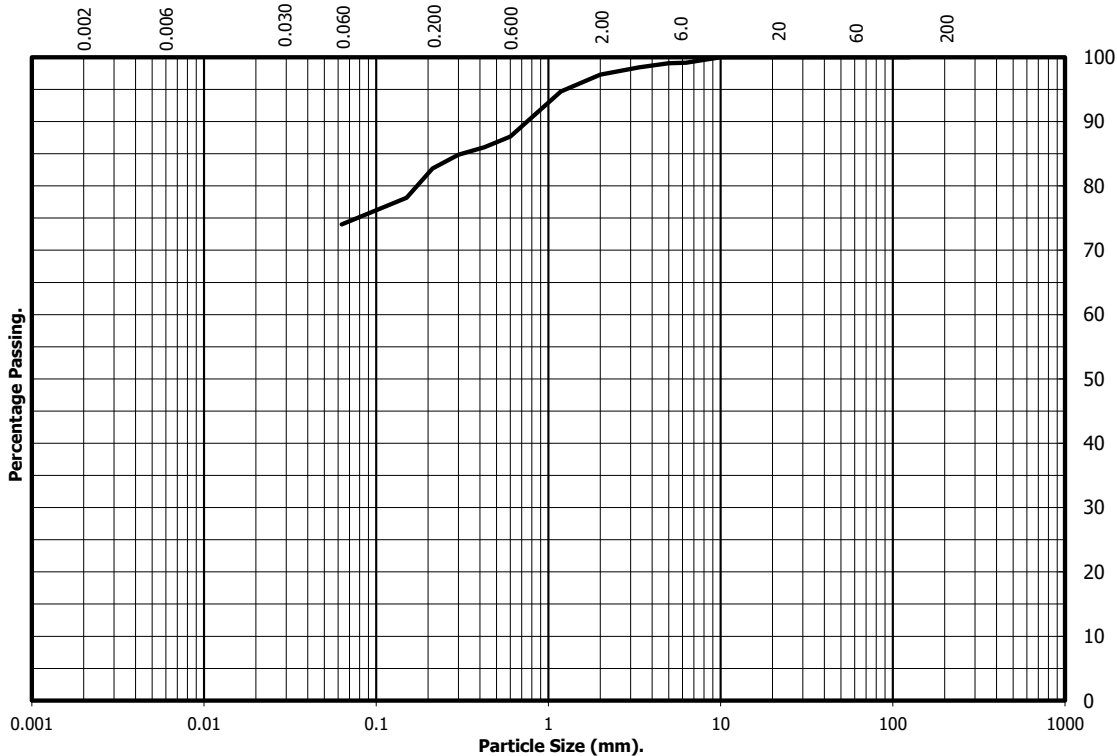
Client ref: **GEG-16-458**
 Contract Number: **32810-201016**
 Hole Number: **TP1**

Sample Number:
 Depth from (m): **1.45**
 Depth to (m):
 Sample Type: **B**

Location: **Adastral Park, Ipswich**
 Description: **Brown slightly gravelly sandy silty CLAY.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	100
6.3	99
5.0	99
3.35	98
2.00	97
1.18	95
0.60	88
0.425	86
0.300	85
0.212	83
0.150	78
0.063	74



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	74	23	3	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Paul Evans (Quality/Technical Manager)

Date: 15.11.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: **GEG-16-458**
 Contract Number: **32810-201016**
 Hole Number: **TP02**

Sample Number:
 Depth from (m): **1.30**
 Depth to (m):
 Sample Type: **B**

Location: **Adastral Park, Ipswich**
 Description: **Brown clayey silty very gravelly SAND.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	92
28	89
20	80
14	76
10	72
6.3	68
5.0	67
3.35	65
2.00	64
1.18	62
0.60	57
0.425	54
0.300	40
0.212	33
0.150	26
0.063	22



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	22	42	36	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Paul Evans (Quality/Technical Manager)

Date: **15.11.16**



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref: **GEG-16-458**
 Contract Number: **32810-201016**
 Hole Number: **TP16**

Sample Number:
 Depth from (m): **1.40**
 Depth to (m):
 Sample Type: **B**

Location: **Adastral Park, Ipswich**
 Description: **Brown gravelly silty clayey SAND.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	96
14	93
10	90
6.3	88
5.0	86
3.35	85
2.00	84
1.18	82
0.60	73
0.425	66
0.300	53
0.212	45
0.150	36
0.063	30



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	30	54	16	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Paul Evans (Quality/Technical Manager)

Date: 15.11.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

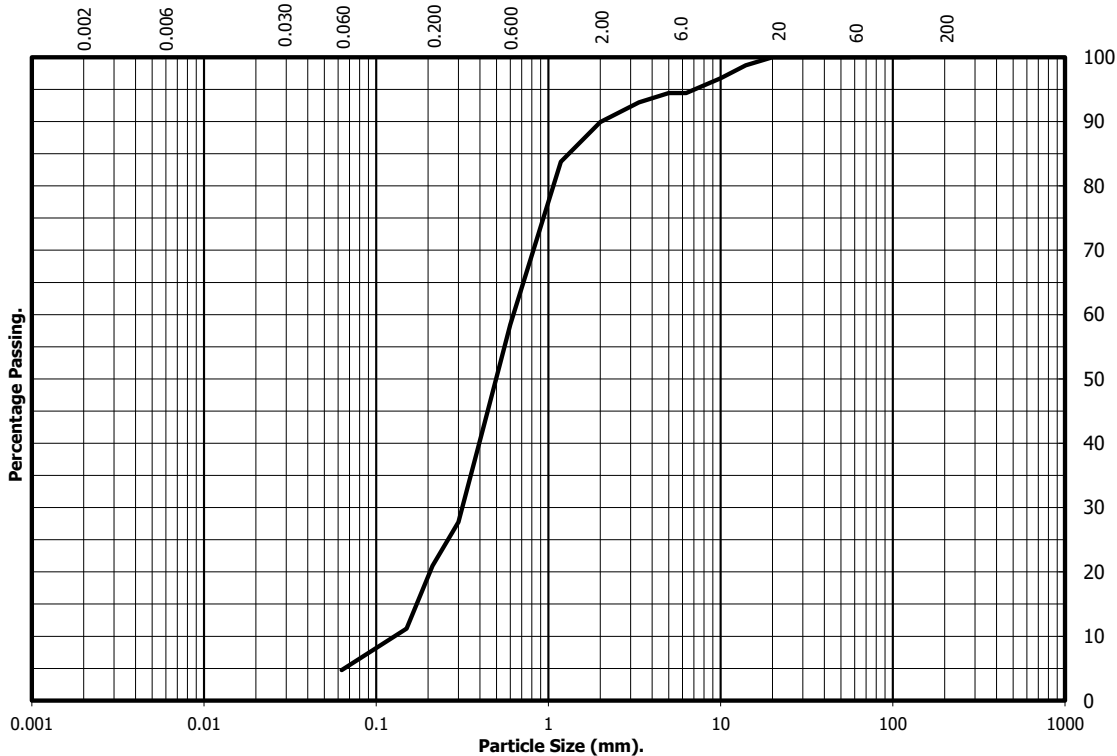
Client ref: **GEG-16-458**
 Contract Number: **32810-201016**
 Hole Number: **TP17**

Sample Number:
 Depth from (m): **2.80**
 Depth to (m):
 Sample Type: **B**

Location: **Adastral Park, Ipswich**
 Description: **Brown silty slightly gravelly SAND.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	97
6.3	94
5.0	94
3.35	93
2.00	90
1.18	84
0.60	58
0.425	43
0.300	28
0.212	21
0.150	11
0.063	5



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	5	85	10	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Paul Evans (Quality/Technical Manager)

Date: **15.11.16**



Test Report:

**Particle Size Distribution Test
BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
Contract Number: 32810-201016
Hole Number: TP18

Sample Number:
Depth from (m): 1.85
Depth to (m):
Sample Type: B

Location: Adastral Park, Ipswich
Description: Brown silty slightly gravelly SAND.

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	97
28	97
20	91
14	90
10	86
6.3	84
5.0	82
3.35	80
2.00	78
1.18	75
0.60	63
0.425	56
0.300	46
0.212	37
0.150	27
0.063	22



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	22	56	22	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Paul Evans (Quality/Technical Manager)

Date: 15.11.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

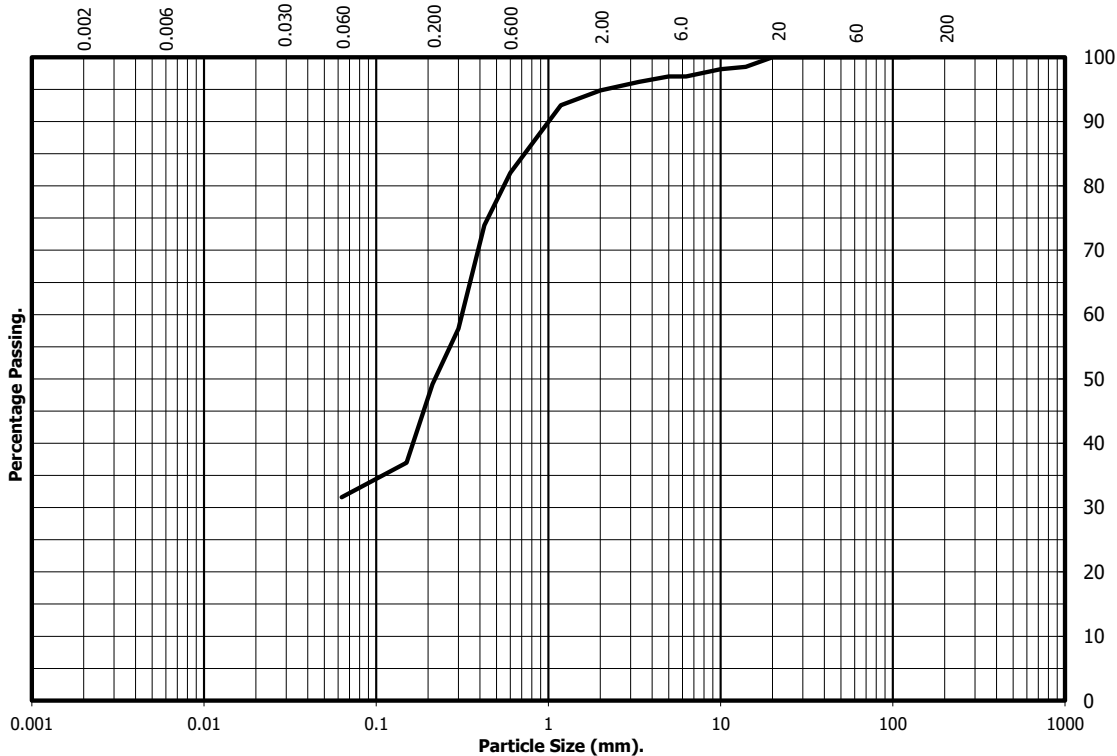
Client ref: **GEG-16-458**
 Contract Number: **32810-201016**
 Hole Number: **TP20**

Sample Number:
 Depth from (m): **0.90**
 Depth to (m):
 Sample Type: **B**

Location: **Adastral Park, Ipswich**
 Description: **Brown slightly gravelly silty SAND.**

	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
CLAY	SILT			SAND			GRAVEL			COBBLES

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	98
6.3	97
5.0	97
3.35	96
2.00	95
1.18	93
0.60	82
0.425	74
0.300	58
0.212	49
0.150	37
0.063	32



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	32	63	5	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Paul Evans (Quality/Technical Manager)

Date: 15.11.16



Test Report:

**Particle Size Distribution Test
BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

Client ref: GEG-16-458
Contract Number: 32810-201016
Hole Number: TP23

Sample Number:
Depth from (m): 2.00
Depth to (m):
Sample Type: B

Location: Adastral Park, Ipswich
Description: Brown slightly gravelly slightly clayey silty SAND.

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	94
14	92
10	90
6.3	89
5.0	88
3.35	87
2.00	87
1.18	86
0.60	82
0.425	79
0.300	64
0.212	59
0.150	52
0.063	48



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	48	39	13	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Paul Evans (Quality/Technical Manager)

Date: 15.11.16



Test Report:

**Particle Size Distribution Test
BS 1377 Part 2:1990.**

Wet Sieve, Clause 9.2

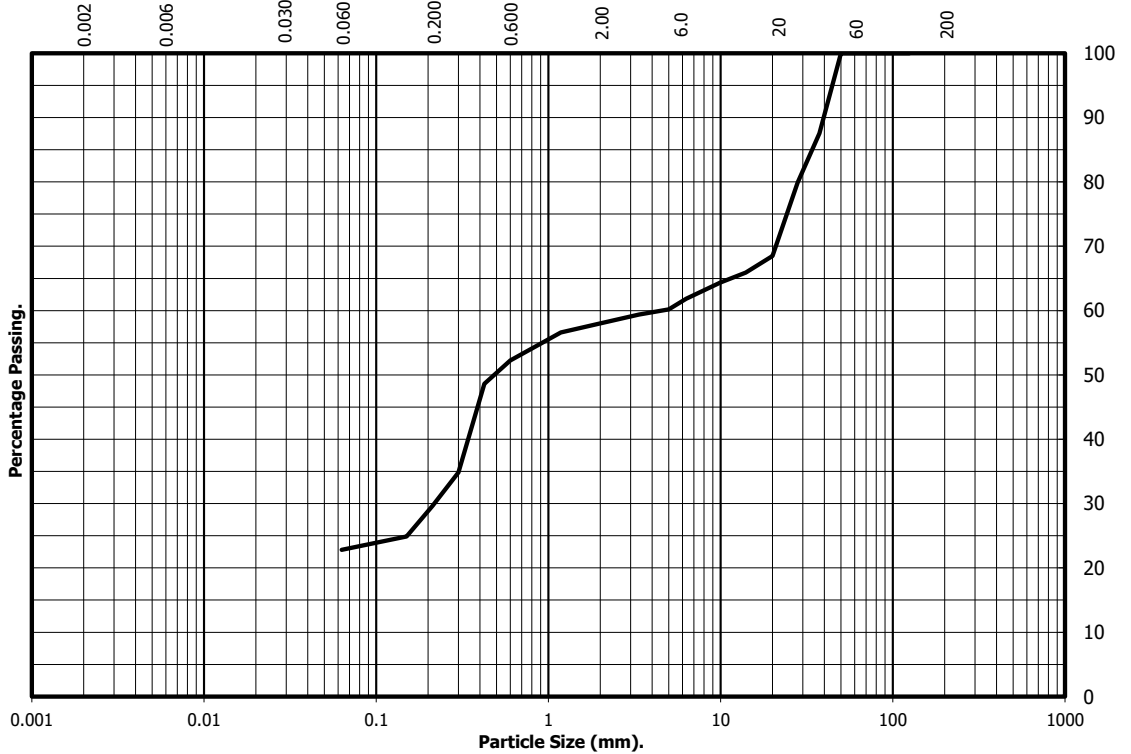
Client ref: GEG-16-458
Contract Number: 32810-201016
Hole Number: TP24

Sample Number:
Depth from (m): 1.00
Depth to (m):
Sample Type: B

Location: Adastral Park, Ipswich
Description: Brown silty very sandy GRAVEL.

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	88
28	80
20	68
14	66
10	64
6.3	62
5.0	60
3.35	59
2.00	58
1.18	57
0.60	52
0.425	49
0.300	35
0.212	30
0.150	25
0.063	23



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	23	35	42	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Paul Evans (Quality/Technical Manager)

Date: 15.11.16



Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

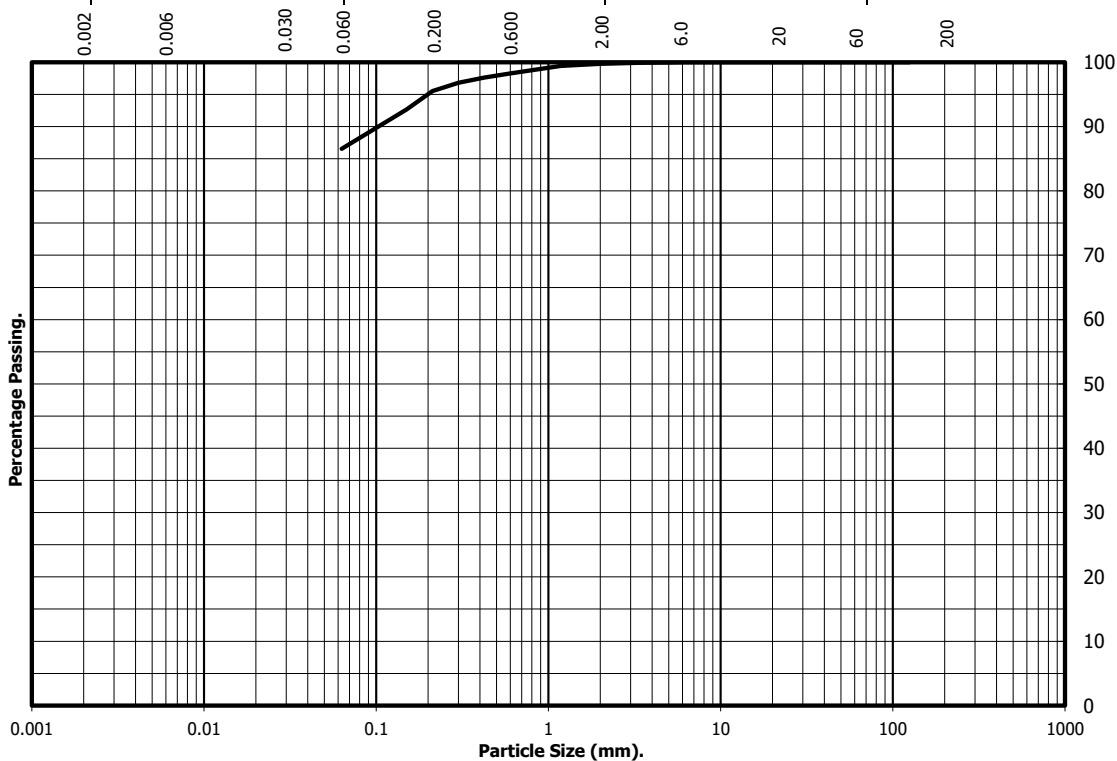
Client ref: **GEG-16-458**
 Contract Number: **32810-201016**
 Hole Number: **TP25**

Sample Number:
 Depth from (m): **0.95**
 Depth to (m):
 Sample Type: **B**

Location: **Adastral Park, Ipswich**
 Description: **Brown sandy silty CLAY.**

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	100
6.3	100
5.0	100
3.35	100
2.00	100
1.18	99
0.60	98
0.425	98
0.300	97
0.212	96
0.150	93
0.063	87



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	87	13	0	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
 Paul Evans (Quality/Technical Manager)

Date: 15.11.16

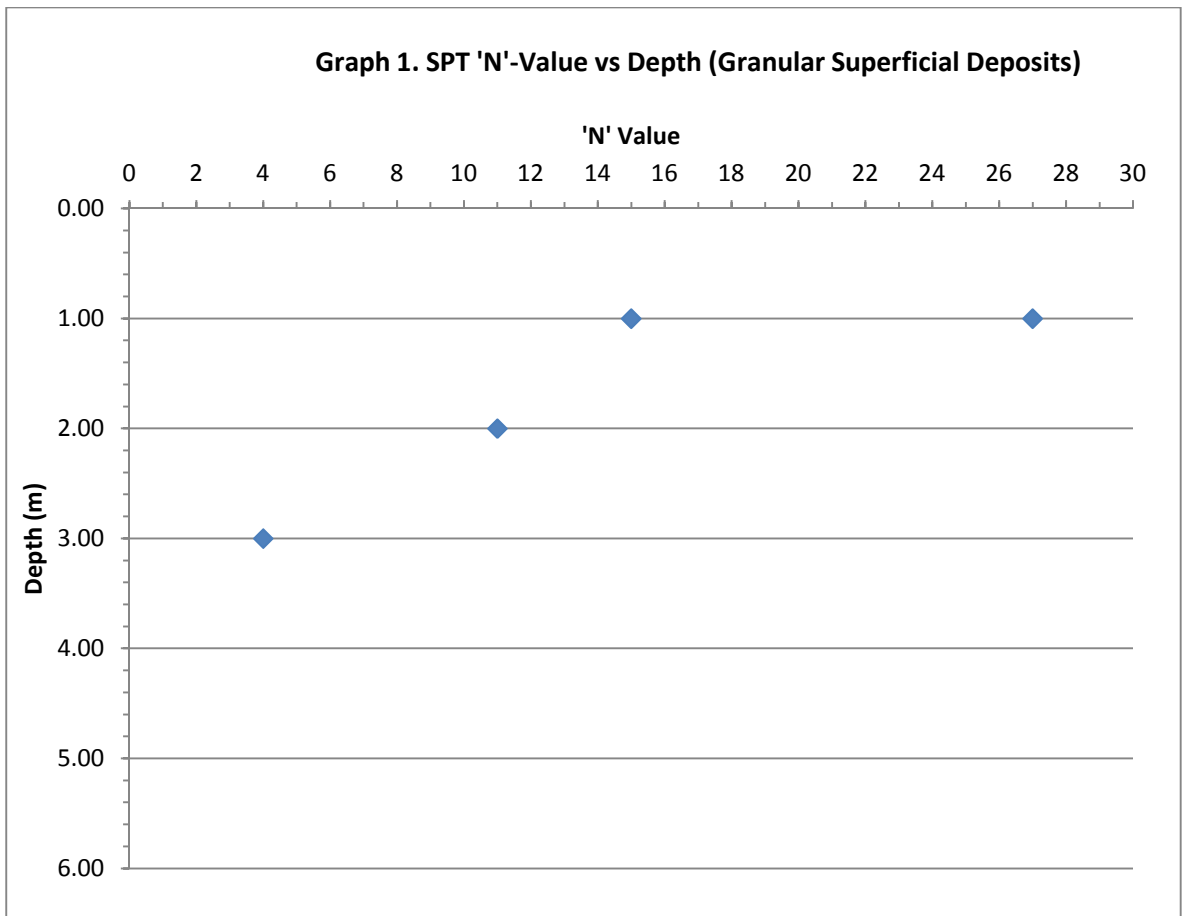




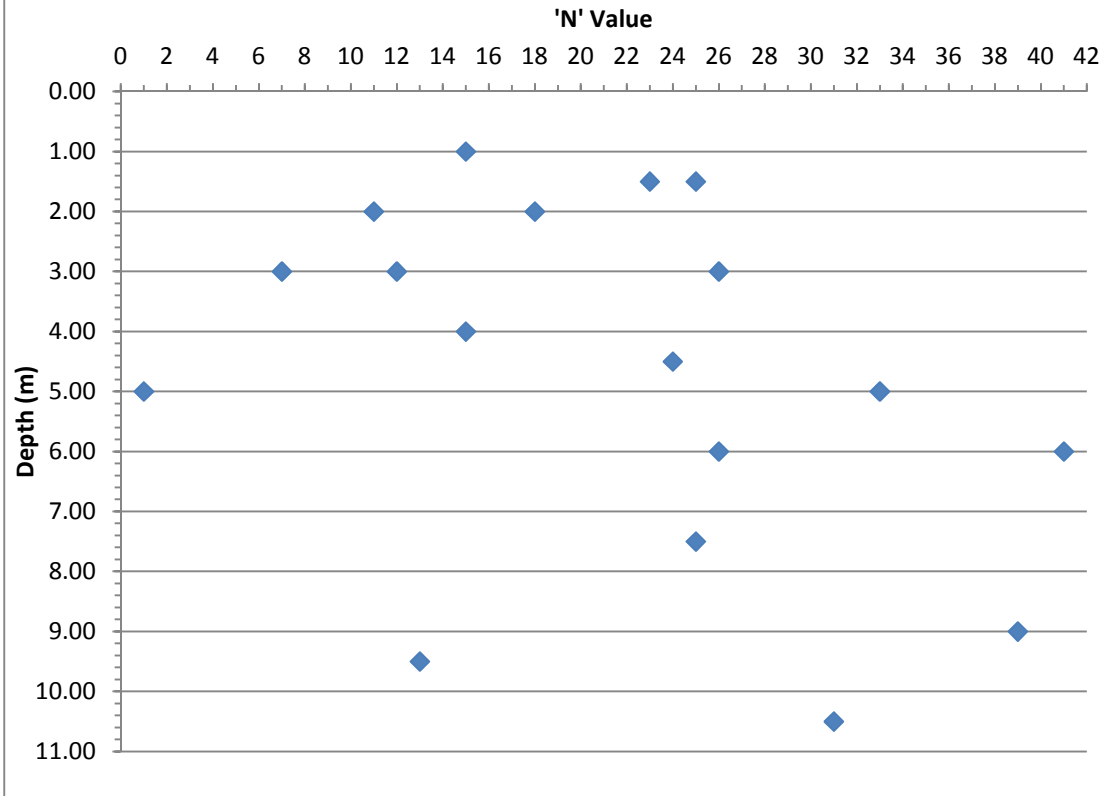
APPENDIX I

GEO TECHNICAL GRAPHS

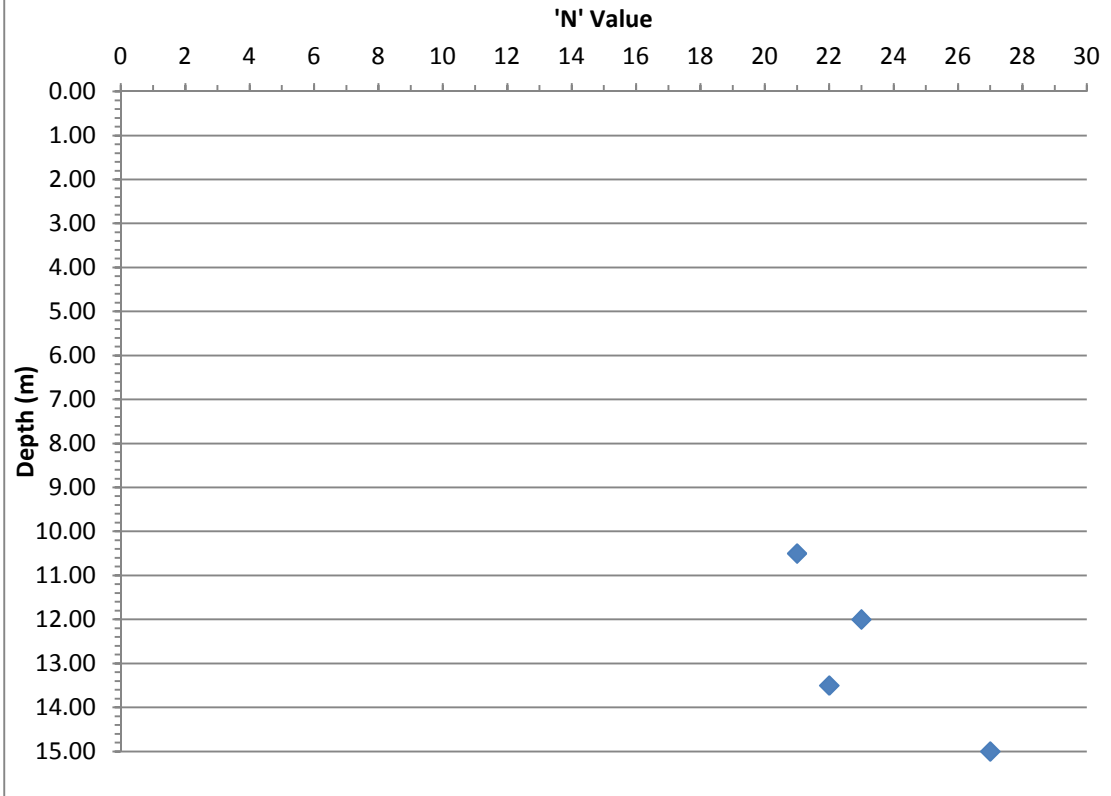
Appendix I



Graph 2. SPT 'N'-Value vs Depth (Granular Solid Strata, Area 1)



Graph 3. SPT 'N'-Value vs Depth (Cohesive Solid Strata)



Graph 4. SPT 'N'-Value vs Depth (Granular Solid Strata, Area 2)

