

**ACADEMY BUSINESS PARK
LEES ROAD
KNOWSLEY**

PHASE 2 GEO-ENVIRONMENTAL INVESTIGATION AND ASSESSMENT

UNDERTAKEN FOR

ORBIT INVESTMENTS (PROPERTIES) LIMITED

WML Consulting Ltd
No. 8 Oak Green
Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

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Drafted By:	T P Booth 
Reviewed By:	SC Seddon 
Authorised By:	PG Davies 

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Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
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EXECUTIVE SUMMARY

Site Location	The site is located to the south of Kirkby at the junction with Arbour Lane and County Road at Knowsley Industrial Park, Knowsley, Liverpool, at approximate Ordnance Survey National Grid Reference 342502E, 398291N with an indicative postcode of L33 7RW.
Development Proposals	Redevelopment will comprise the construction of two commercial/storage units with associated access route, loading bays (presumably with dock-levellers) car parking and limited soft landscaping.
Site History	Historically, the site has been developed extensively for industrial purposes comprising a paper factory and later generic works with ancillary buildings including a boiler house, electricity substation and several tanks. Surrounding development has been a mixture of industrial retail and leisure uses.
Ground Conditions	Ground conditions comprise Made Ground to depths of between 0.20m and 3.00mbgl underlain, in the majority of holes by the Shirdley Hill Sand Formation and locally a very thin horizon of cohesive Glacial Clay to depths of between 2.70m and 4.00m where in was underlain by weathered Sherwood Sandstone strata.
Site Preparation and Earthworks	No demolition should proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor. Similarly, any demolition materials present on site and considered for re-use should be inspected with any ACM removed accordingly prior to crushing. Significant buried structures in the form of foundations, floor slabs and a concrete water tank should be anticipated and these will need to be removed so that they do not form ground obstructions during proposed construction works. Consideration should be given to crushing and re-using such ground obstructions as bulk fill to resulting hollows, subject to suitability and compliance testing. The proposed development indicates the removal of the existing electricity sub-stations which dates back to at least 1976. Due to their age, it is advised that discussions should be held with the statutory service provider regarding the status of the facility and particularly whether any equipment potentially containing PCB's has been appropriately de-commissioned. Therefore, it cannot be discounted that a degree of ground remediation may be required local to the facilities. This should be confirmed by additional testing when access to the areas is more readily available. The underground water tank in the north-west of the site is located beneath an area where HGV access and parking is currently proposed. Where it is desirable to retain the tank beneath the proposed development, the contained water, following decommissioning of any water supply and connections, should be removed to facilitate a detailed confined access structural survey. Alternatively, it may be more desirable, following dewatering operations, to break out the tank roof and walls prior to in-filling with well compacted granular fill. The presence of buried hydrocarbon tanks may also be envisaged with their removal being undertaken following appropriate decommissioning and de-gassing by specialist contractors. The site is relatively flat therefore significant earthworks to provide level platforms are not envisaged.
Retaining Walls	New retaining walls should be appropriately designed and are anticipated to be supported by spread foundations on competent natural soils where a net allowable bearing pressure of 75kN/m² is considered appropriate. The structural integrity of the existing retaining wall along the south-west boundary should be checked if it is to be incorporated into the development.
Decommissioning of Groundwater Abstraction wells	The suspected groundwater abstraction well located adjacent to the central-northern section of the site would need to be decommissioned as part of the proposed development. This would need to be undertaken in accordance with the Environment Agency document "Good practice for decommissioning redundant boreholes and wells" dated October 2012.
Foundations and Floor Slabs	Depths to competent bearing strata are such that the use of traditional foundations and deeper mass concrete trench fill foundations are considered impractical and uneconomical. Subsequently, consideration should be given to adopting a reinforced semi-raft foundation option, bearing on ground which has been improved by vibro-treatment. Subsequent vibro-treatment of any re-introduced (crushed) fill, insitu Made Ground and underlying Shirdley Hill Sand Deposits would likely provide a net allowable bearing pressure of 125kN/m². The option should therefore only be considered after further consultation with a specialist vibro-treatment contractor. Alternatively a piled foundation solution would need to be adopted with piles being taken down through the Made Ground and Shirdley Hill Sand to bear on or be socket into the underlying Sherwood Sandstone Formation. The final choice and design of pile type should be undertaken in conjunction with a reputable, specialist piling contractor, ideally with local experience.

	In consideration of the loose and unconsolidated nature of the Made Ground, floor slabs should be constructed as suspended although they may be constructed as ground bearing where the Made Ground and underlying natural soils are improved by vibro-treatment.
Pavements	New pavements should be designed on a CBR value for natural granular formation soils of 3%.
Concrete Classification	On the basis of the majority of chemical test results, the typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1 respectively.
Soakaways	Due to the generally granular and therefore relatively permeable nature of the Shirdley Hill Sand and the underlying Sherwood Sandstone, soakaways are considered to be viable for the new development subject to confirmation by appropriate testing at drainage design stage.
Ground Gas	The site is indicated to classify as Characteristic Gas Situation (CGS) 1 – 'Very Low Gas Risk' in accordance with BS8485:2015. Under such circumstances, and in consideration of the site conceptual model, no specific gas protection measures would be required for the proposed structures. Notwithstanding the above, further monitoring visits are required to be undertaken before the assessment can be finalised with at least 1no further visit undertaken at low and falling atmospheric pressure (worst case conditions).
Contamination Assessment	Chemical analysis has indicated that the site does not contain any significant and/or widespread contamination sources with no specific environmental remediation required. Natural soils would classify as Inert if considered for disposal to landfill.
Potable Water Supplies	In light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination is not envisaged, but would need to be confirmed with the service provider.

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1.0 INTRODUCTION

Appointment

- 1.1 WML Consulting was commissioned by Orbit Investments (Properties) Limited to undertake a Phase 2 Geo-environmental Investigation and Assessment of a site referred to as Lees Road, located within the western section of the Academy Business Park at Knowsley Industrial Park, Knowsley, Liverpool.

Proposed Development

- 1.2 Redevelopment will comprise the construction of two commercial/storage units with associated access route, loading bays (presumably with dock-levellers) car parking and limited soft landscaping.
- 1.3 A copy of the proposed development by Orbit Investments (Properties) Limited (referenced 389-SCH 1022, dated 14th November 2014) is presented in Appendix 01.

Objective

- 1.4 The objective of the Ground Investigation and Assessment was to provide geotechnical recommendations for construction design purposes together with a geo-environmental risk assessment in terms of possible ground contamination.
- 1.5 To achieve the objective, the following tasks were undertaken:
- Establish, through undertaking a Phase 1 Desk Study, the geological, hydrogeological and environmental setting of the site so as to identify any potential ground constraints to development through a site specific conceptual model and to design an appropriate Phase 2 Ground Investigation in accordance with the Environment Agency (2004) Model Procedures for the Management of Land Contamination, CLR11.
 - Characterise the ground conditions in terms of geology, soil geotechnical parameters, mining and ground contamination from information provided by an appropriate Ground Investigation.
 - Provide recommendations regarding suitable foundations, floor slabs and new pavement construction, together with any other geotechnical considerations that could affect possible future development.
 - Determine a ground conceptual model for the site so as to undertake an appropriate Phase 2 Generic Quantitative Risk Assessment (GQRA).

Scope

- 1.6 The Phase 1 Desk Study has been undertaken and is presented in the following WML Consulting report:
- Phase 1 Desk Study and Preliminary Geo-environmental Assessment (Reference 6483/G/01, dated November 2014).
- 1.7 This report includes the findings of an appropriate Phase 2 Ground Investigation designed on conclusions and recommendations provided in the Phase 1 Report. For ease of reference, the

findings of the Phase 1 Desk Study are summarised in the following sections. The two reports however are not exclusive and should be read in conjunction.

- 1.8 The investigation comprised the formation of 17no window sample probeholes (WS1 – WS11, WS6A and T1 – T5) and 10no machine excavated trial pits, taking into consideration the proposed development layout, access restrictions due to current operations and existing services.
- 1.9 The Ground Investigation has been undertaken in general accordance with BS5930:1999 *Code of Practice for Site Investigation* (since withdrawn and replaced by the recently published BS5930:2015 *Code of Practice for Ground Investigations*) together with BS10175:2011 and A1:2013, *Investigation of Potentially Contaminated Sites - Code of Practice* except where superseded by EN ISO 22475-1 “*Geotechnical Investigation and Assessment – Sampling by Drilling and Excavation and Groundwater Measurements*”.
- 1.10 Geotechnical soil testing has been undertaken in accordance with guidelines provided in BS1377:1990 – Parts 1-9, “*Method of Test for Soils for Civil Engineering Purposes*”. Samples for chemical analysis were obtained and handled generally in accordance with the current guidelines (BS10175: 2011 and A1:2013) relating to the anticipated nature of possible contamination sources and the intended end use.
- 1.11 The ground investigation has also been undertaken in general accordance with BS8576:2013, *Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*.

2.0 SITE LOCATION AND DESCRIPTION

Site Location

- 2.1 The site is located to the south of Kirkby at the junction with Arbour Lane and County Road at Knowsley Industrial Park, Knowsley, Liverpool at approximate Ordnance Survey National Grid Reference 342502E, 398291N and an indicative postcode of L33 7RW.
- 2.2 It is bounded to the north and east by commercial structures and to the south by County Road with Knowsley Industrial Park to the south-east and a school to the south-west. To the west the site is bordered by Arbour Lane and a sports centre.
- 2.3 A site location plan is presented in Appendix 01 with the site indicated within the red boundary.

Site Description

- 2.4 The subject site is irregular in plan shape and covers an area of approximately 4.72 Hectares.
- 2.5 The majority of the site is surfaced with hardstanding together with several large brick and steel framed buildings, the majority of which are disused but are still in reasonable condition. The former Maintenance Workshop in the north of the site is, however, in dis-repair and exposed to the elements. Units 6A and 6B were occupied and inaccessible during the site inspection.
- 2.6 Three electricity sub-stations are indicated within the existing buildings, namely within Unit 3, 4 and 5. It is not known whether these have been decommissioned.
- 2.7 An underground water storage tank associated with a former fire hydrant pump-house, is present in the north-eastern area of the site. The extent of the underground structure is not known but an open manhole is currently present at its southern extent, this being full of water during the site inspection.
- 2.8 Site buildings are surrounded mainly by concrete surfacing which is only locally broken up and disaggregated. The north-western area unsurfaced and covered by rough vegetation while the extreme southern area is covered by mown grass.
- 2.9 The extreme western area is also covered by rough grass which extends westwards as a steep grassed slope towards Arbour Road.

Topography

- 2.10 The majority of the site is generally level at approximately 40.70m Above Ordnance Datum (AOD) with a slight increase in gradient towards the south and east to levels of around 41.80m AOD. However, the site is elevated by approximately 3.00m above the surrounding land to the west, with Arbour Lane at around 38.20mAOD. The change in elevation is accommodated by the steep, westerly facing grassed / vegetated slope.
- 2.11 A topographical survey undertaken for Orbit (referenced 389-SUR-001, dated May 2008) is presented in Appendix 01.

3.0 SUMMARY OF ENVIRONMENTAL AND HISTORICAL SETTING

- 3.1 The following paragraphs summarise the most relevant findings of the Phase 1 Desk Study report.
- 3.2 The BGS plans indicate that the northern section of the site is underlain by the Devensian Shirdley Hill Sand Formation (Blown Sand). Drift deposits are indicated to be absent beneath the southern section of the site which is directly underlain by Triassic Sherwood Sandstone Group.
- 3.3 The property is not in a Radon Affected Area as defined by the Health Protection Agency as less than 1% of properties are above the Action Level of exposure. No radon protection measures are therefore necessary for new properties as described in publication BR211 by the Building Research Establishment.
- 3.4 The Sherwood Sandstone is classified as a Principal Aquifer (formerly Major Aquifer). The Drift Deposits beneath the northern section of the site are classified as a Secondary A Aquifer. The nearest recorded groundwater abstractions are located approximately 120m and 130m north of the site and relate to 2no boreholes for general / irrigation use.
- 3.5 There are no watercourses within 1km of the site.
- 3.6 There are no operational or non-operational landfill records within 500m of the site. There are 4no non-operational licensed waste treatment, transfer or disposal site within 250m of the site. The closest relates to an aggregate recycling yard 30m north which accepts inert and excavation waste for treatment.
- 3.7 There are 3no potentially contaminative industrial processes within the site boundaries, relating to historical tanks and a former vehicle recovery service. The onsite electricity sub-stations are not indicated in the Groundsure report.
- 3.8 There are 3no Part B Activity and Enforcement sites within 250m of the site. These related to concrete batching plants 33m north-east and 234m north and a historical permit for a metal coating plant 199m east.
- 3.9 There are 2no Health and Safety Executive COMAH and NIHHS Authorised sites within 250m of the site. The historical NIHHS site located some 160m east was operated by Mersey Gas with a current Lower Tier COMAH site 165m east run by Potter Logistics for unknown use.
- 3.10 There is also 1no national Incident Record located some 140m east of the site relating to the significant impacted of contaminated topsoil on both land and water.
- 3.11 There are no records of sites which have been determined as Contaminated Land under Section 78R of the Environmental Protection Act 1990 within 500m of the study site.
- 3.12 Historically, the site has been developed extensively for industrial purposes comprising a paper factory and later generic works with ancillary buildings including a boiler house, electricity substation and several tanks. Surrounding development has been a mixture of industrial retail and leisure uses.

4.0 SUMMARY OF PREVIOUS SITE INVESTIGATION REPORTS

Overview

4.1 The following reports have been made available for review by the client:

- Worms Eye, Site Investigation. Letter Report reference GGC/DA.rpt99, dated November 1999.
- Geodelft, Desk Study and Tier 2 Risk Assessment, Report reference C1945 dated August 2002.

4.2 The following sections provide a brief summary of the salient issues highlighted in the above documents.

Wormseye - 1999

4.3 The site investigation was undertaken immediately south of the subject site, in the garden of the former Basildon Bond Paper Factory. This comprised the formation of eight trial pits and four boreholes to a maximum depth of 2.35m below ground level (bgl) in November 1999.

4.4 The exploratory holes encountered Topsoil and Made Ground to depths of between 0.15m and 1.70mbgl. The thickness of the Made Ground generally increased from south to north and mainly comprised dark brown topsoil with brick, loose brown sand and gravel of brick in an ashy matrix.

4.5 The Made Ground was underlain by loose / medium dense red sand considered to represent completely weathered sandstone to depths of between 0.68m and 2.00mbgl where it graded into the less weathered sandstone with Standard Penetration Test (SPT) N values in excess of 50.

4.6 No groundwater was encountered during the formation of the exploratory holes.

4.7 No visual / olfactory evidence of contamination was noted within the exploratory holes during formation.

4.8 In situ California Bearing Ratio (CBR) tests undertaken across the site produced values of between 1% and 4% but generally around 2.5%. However, the majority were undertaken on shallow materials described as topsoil and are therefore not considered representative of pavement sub-grade soils beneath the site.

4.9 Chemical analysis of selected soil samples did not indicate any significant / widespread contamination when the results were compared against now withdrawn National screening levels relevant at the time for non-residential 'Buildings' end use.

4.10 The Phase 2 report did not include any ground gas monitoring within the subject site area.

4.11 Relevant excerpts of the report are presented in Appendix 03.

Geodelft - 2002

4.12 The site investigation was undertaken across the larger former paper factory site, with the formation of eight trial pits and four narrow diameter probeholes within the subject site to a maximum depth of 3.65mbgl in August 2002.

- 4.13 The exploratory holes encountered hardstanding and Made Ground to depths of between 0.30m and 3.00mbgl which mainly comprised granular horizons containing ash, sand, brick, concrete and localised deposits of sandy clayey silt.
- 4.14 The Made Ground was locally underlain by strata considered to represent Shirdley Hill Sand comprising loose / medium dense red sand and sand and gravel to depths of between 0.90m and 3.20mbgl. The granular drift deposits were locally interbedded with sandy clays and silty sand with gravel.
- 4.15 The Shirdley Hill Sand was underlain by strata considered to represent Sherwood Sandstone which was encountered at depths of between 0.90m and 3.20mbgl and locally as shallow as 0.50mbgl. SPT N values in the sandstone were measured in excess of 50.
- 4.16 No significant groundwater strikes were encountered during the formation of the exploratory holes. Subsequently, standing groundwater levels were recorded between 1.57m and 2.40mbgl.
- 4.17 No visual / olfactory evidence of contamination was encountered within the exploratory holes during formation.
- 4.18 Chemical analysis of selected soil samples did not indicate any significant / widespread contamination when compared against screening criteria relevant for a 'Commercial' end use.
- 4.19 However, the testing did encounter a localised elevated concentration of arsenic, mercury, nickel, selenium, lead and diesel range organics when compared to the stringent Drinking Water Standards. The report concluded that further exploratory holes should be undertaken in order to fully assess the risks to controlled waters.
- 4.20 The Phase 2 report did not include any ground gas monitoring within the subject site area.
- 4.21 Relevant excerpts of the report are presented in Appendix 04.

5.0 PRELIMINARY CONTAMINATION RISK ASSESSMENT

5.1 Based on the above findings, the Phase 1 Desk Study report provided the following Preliminary Conceptual Model and Risk Assessment for development of the site for new commercial units with landscaped areas.

Source	Pathway	Receptor	Linkage	Comment
Limited historical investigations have not encountered significant and / or widespread contamination beneath the site. Nevertheless, on the basis of the site's past use, localised areas of significant contamination cannot be discounted at this preliminary stage.	Direct contact, ingestion of soil, dermal contact, dust exposure pathways.	Current Site Users	Unlikely	The site in the main is currently surfaced with hardstanding and disused, therefore subject to only transient use. Subsequently, no plausible pollution linkage exists with risks to current site users considered LOW .
		Site End Users	Possible	Although localised significant contamination sources may be present, the majority of the site will be covered by hardstanding thus breaking any perceived direct pollution linkage. Notwithstanding this a potential exposure pathway could exist in future landscaped areas although the preliminary contamination risk is considered MEDIUM subject to site investigation.
		Construction Workers	Possible	Construction workers could potentially be exposed to contaminated soils during earthworks and foundation construction. Any perceived contamination risks will however be mitigated by adopting good site working practices including appropriate Health and Safety measures during the works, thus providing a LOW preliminary risk.
		Adjacent land users	Unlikely	Contact via wind-blown dust/debris, particularly during the development phase is possible. The current risk is considered LOW although this would increase during construction works. Appropriate control measures, including dust suppression, adopted as part of good site working practices will mitigate any perceived risk in this respect.
The presence of significant soluble and/or liquid and therefore mobile contaminants occurring at the site due to its past use is unlikely but cannot be discounted at this preliminary stage.	Direct downward migration through leaching and/or mobile liquids.	Groundwater	Possible	The underlying solid geology is classified as a Principal Aquifer with drift deposits either absent or comprising the granular Shirdeley Hill Sand which are also classified as a Secondary A Aquifer. Therefore, a precautionary principal determines that a LOW locally MEDIUM risk to groundwater is assessed until such time as ground investigations are undertaken.
	Off-site migration in groundwater or surface water flow.	Surface water	Unlikely	No surface watercourses are identified within influencing distance of the site. Therefore, the perceived risk to surface water is considered VERY LOW .
		Groundwater / surface water abstractions	Unlikely	The site is not within an Environment Agency Source Protection Zone with no nearby groundwater abstraction. The risk to groundwater/surface water abstractions is therefore considered LOW .
		Adjacent Properties	Possible	Localised sources of mobile contamination cannot be discounted and may undergo some lateral movement due to the granular nature of the underlying strata. Therefore, a LOW locally MEDIUM risk is assessed until such time as ground investigations are undertaken.

Source	Pathway	Receptor	Linkage	Comment
		Ecology	Unlikely	There are no ecologically sensitive sites within influencing distance of the subject site. The risk to ecology is therefore considered VERY LOW .
The presence of significant volatile and therefore mobile contaminants occurring at the site due to its past use is unlikely but cannot be discounted at this preliminary stage.	Inhalation of harmful vapours (indoor and outdoor airspaces)	Current Site Users	Unlikely	The site is currently disused, therefore site use is transient and short term with no significant plausible exposure scenario envisaged. The risk to current site users from inhalation of volatile contaminants is therefore considered LOW .
		Site End Users	Possible	The commercial use of the site would result in exposure frequencies being relatively low. Therefore, a LOW risk is assessed until such time as ground investigations are undertaken to provide further information on the site conceptual model.
	Inhalation of harmful vapours (indoor and outdoor airspaces)	Construction Workers	Possible	In the event of construction workers coming into contact with possible volatile compounds, the exposure time will be relatively short. The risk to construction workers, assuming that appropriate health and safety measures will be adopted, is therefore assessed as LOW although this will need to be confirmed by ground investigations.
		Adjacent Properties	Possible	Volatile contamination sources at the site cannot be discounted however such sources are considered to be localised. Therefore, a LOW locally MEDIUM risk is assessed until such time as ground investigations are undertaken.
The presence of Made Ground with potential to produce significant volumes of hazardous ground gas is considered unlikely although the presence of hazardous ground gases originating from degraded hydrocarbons cannot be wholly discounted. Risks from mine gas can be discounted. There are no landfills within influencing distance of the site.	Emissions from the ground collecting in confined spaces and excavations	Construction/ services maintenance workers	Possible	Although the potential to generate significant volumes of toxic and/ or flammable/ explosive gas beneath the site is considered low, local sources of ground gas cannot be wholly discounted. However, assuming that appropriate health and safety measures will be adopted during construction, the preliminary risk is considered LOW/MEDIUM .
	Migration of gases on/off site and collecting in confined spaces on/off site.	Adjoining site users	Unlikely	The potential for significant volumes of toxic and/or flammable/ explosive gases to be generated beneath the site is considered low. The potential risk to adjoining site users from the site is therefore considered LOW .
		Current/future site users	Possible	Although the potential to generate significant volumes of toxic and/ or flammable/ explosive gas beneath the site is considered low, local sources of ground gas cannot be wholly discounted. The preliminary risk from ground gas is therefore considered LOW/MEDIUM until such time as further ground investigations are undertaken.
The site is not located within an area which is affected by naturally occurring radon gas.	Natural emissions from the ground collecting in confined spaces within buildings	Site end users	Unlikely	The site is located in an area where radon protection measures are not required. Further action is therefore not necessary regarding radon protection as the risk is VERY LOW .
Chemicals which could prove aggressive to construction materials may be present on site.	Direct contact	Construction concrete, plastic water pipes.	Unlikely	Any risks to construction materials identified after site investigation and assessment will be mitigated as part of the structural design. The perceived risk is therefore considered LOW .

- 5.2 Under the proposed development scenario, several pollution linkages are considered possible although the overall preliminary risk is assessed as low.
- 5.3 The potential for medium risks were assessed locally, mainly in relation to the possible presence of localised mobile and volatile contamination sources together with the potential, albeit low, for the presence of hazardous ground gas.
- 5.4 It was therefore concluded further ground investigations were required to provide a more detailed understanding of the site conceptual model so that contamination risks could be fully assessed.

6.0 SITE INVESTIGATION

Rationale

- 6.1 Intrusive investigations were undertaken primarily to provide geotechnical parameters for structural design purposes but also to provide further information on the preliminary site conceptual model and confirm or otherwise the anticipated environmental risk.
- 6.2 Window sample probeholes and machine excavated trial pits were undertaken to provide information on near surface deposits, taking into consideration the locations of previous exploratory holes, and to provide samples for geotechnical testing and chemical analysis. A general coverage of the site and beneath proposed development footprints was considered appropriate. Trial pits were undertaken primarily within unsurfaced areas with window sampling probes being undertaken within the buildings where minimal surface disruption was specified.
- 6.3 The following table indicates the trial pits and window sample probes specifically located to investigate historical features, as indicated on Drawing 6483G-SK-03 in Appendix 01.

Investigation		Historical Feature
Geodelft	WML	
-	T1 to T5	Underground Water Storage Tank
-	TP1, TP1A,	Pump House
-	WS4	Gum Bay
-	TP3	Boiler house
PHH, PHG, TP10	TP2	Oil storage/Fuel tanks

- 6.4 The exploratory holes undertaken by Wormseye were located within the grassed area to the south of Unit 6 and although not within the area of proposed development during the current phase of work, provide valuable information with regards to depths to the underlying Sherwood Sandstone. The information, where relevant, is therefore included within the current assessment. The locations of the exploratory holes are indicated on the Wormseye drawing in Appendix 03.
- 6.5 The investigation locations were chosen so as not to impact on the presence of known/suspected services beneath the site. At the time of the investigation Unit 6A and 6B were still in use and could not be accessed while investigations were also restricted in Unit 5 due to it being used for storage.
- 6.6 Gas monitoring standpipes were installed in selected probeholes for the measurement of ground gas and groundwater levels. Where still evident, the standpipes installed by Geodelft are also monitored as part of this investigation.
- 6.7 Chemical analysis of a general suite of contaminants was undertaken on selected samples of soil. This was to confirm the anticipated low contamination risk and to establish the chemical suitability of soils for possible re-use within the development.
- 6.8 In addition, selected samples were analysed for asbestos fibres in view of the recorded historical development of the site.

Intrusive Investigations

- 6.9 Ground Investigations were undertaken by WML and Geo-Ventures (UK) Ltd between 1st July and 21st July 2015. This comprised the formation of 11no window sample probeholes (WS1 to WS11, WS6A and T1 to T5) to a maximum depth of 3.80mbgl and 10no machine excavated trial pits to a maximum depth of 4.00mbgl.
- 6.10 The exploratory hole records are presented in Appendix 04 of this report while the exploratory hole locations are shown on the drawing 6483G-SK-01.
- 6.11 Drawing 6483G-SK-02 in Appendix 01 shows the positions of all the exploratory holes including those of the previous investigations.

Monitoring Standpipes

- 6.12 Monitoring wells for groundwater and ground gas measurements were installed in 3no probeholes as indicated on the logs presented in Appendix 05.

Geotechnical and Chemical Testing

- 6.13 In-situ geotechnical testing was undertaken at regular intervals during the formation of the probeholes in the form of Standard Penetration Tests (SPT's). The results are presented on the descriptive logs in Appendix 05.
- 6.14 Geotechnical soils testing was undertaken on selected samples for the following:
- Natural Moisture Content.
 - Liquid Limit and Plasticity Index.
- 6.15 The result of the geotechnical testing is presented in Appendix 06.
- 6.16 Chemical analysis was undertaken on selected soil samples for the following contaminants of concern:
- Total Arsenic, Boron, Cadmium, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc.
 - Total Cyanide, Phenols, Suphur, Sulphate.
 - Speciated USEPA Polyaromatic Hydrocarbons (PAH).
 - Banded Total Petroleum Hydrocarbons (TPH by CWG) (1no).
 - Semi Volatile Organic Compounds (SVOC) (1no).
 - Asbestos Screen and Identification.
 - 2:1 water/soil suphate extract, pH.
 - Soil Organic Matter (SOM).
- 6.17 In order to assess the potential risk to controlled waters, two samples of shallow soils underwent leachate preparation for the following suite of contaminants:
- Arsenic, Boron, Cadmium, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc.
 - Sulphur, Sulphate, Total Cyanide, Phenols.
 - pH,

6.18 A sample of water taken from the underground water tank in the north of the site was also submitted for chemical analyses for the following contaminants:

- Total Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc.
- Total Cyanide, Phenols, Sulphur, Sulphate.
- Total Polyaromatic Hydrocarbons (PAH).
- Total Petroleum Hydrocarbons (TPH).
- 2:1 water/soil sulphate extract, pH.
- Ammonia.
- Biological Oxygen Demand, Chemical Oxygen Demand.
- Total Organic Carbon.

6.19 The results of the chemical analysis are presented in Appendix 07.

Gas and Groundwater Monitoring

6.20 Gas and groundwater monitoring has been carried out on three occasions, to date, between 15th July and 12th August 2015.

6.21 The monitoring results to date are presented in Appendix 08.

7.0 GROUND CONDITIONS

- 7.1 In order to provide as detailed an assessment as possible on the ground conditions beneath the site, information from the previous investigation (Wormseye 1999 and Geodelft 2002) have been reviewed together with the current information, which is summarised in the following sections.
- 7.2 The locations of the previous investigations and current investigations are presented in the drawing referenced 6543G-SK-02 in Appendix 01.

Stratigraphy

- 7.3 Ground conditions encountered during the intrusive investigation generally confirm those identified in the published literature and, in summary comprise Made Ground locally underlain by granular Shirdley Hill Sand to proven depths of 4.00m below ground level (bgl). The Shirdley Hill Sand Formation is in turn underlain by a thin cohesive layer possibly representing Glacial Till, this being underlain by weathered Sherwood Sandstone.

Made Ground

- 7.4 Made Ground was encountered beneath a surface cover of grass or hardstanding, within the majority of the exploratory holes from ground level to depths of between 0.20m and 3.00mbgl, with the thicker deposits being in the west of the site, reflecting the plateaued ground surface at this location.
- 7.5 In many places, the Made Ground comprises a surface horizon of concrete or asphalt extending from ground level to depths of between 0.10m and 0.30mbgl, this being underlain by a variable thickness of granular sub-base.
- 7.6 Elsewhere and beneath the granular sub base, the Made Ground generally comprises dark brown, brown and grey, locally clayey and silty, variably gravelly sand and sandy gravel with horizons of grey / brown sandy gravelly clay. The gravel sized particles are noted to be angular to sub-angular, fine to coarse, including brick, sandstone, concrete, ash, clinker, and locally metal, glass, slate and plastic.
- 7.7 Localised sub-angular brick and sandstone cobbles are also noted in several exploratory holes, with a high cobble and boulder content encountered within TP5 in the western area of the site.
- 7.8 Concrete and more locally brick obstructions occur locally as was encountered within WS1, WS6A, WS9, WS11, TP7 and TP7A (WML) and TP12 (Geodelft) at depths of between 0.24m and 2.00mbgl. These are considered to represent relict foundations and floor slabs.
- 7.9 SPT 'N' values in the Made Ground range between 4 and 23, indicating a loose to medium dense state of compaction.
- 7.1 Natural moisture contents of between 13% and 15% were recorded within the granular Made Ground.
- 7.2 Natural moisture contents of 15% and 23% were recorded within the cohesive Made Ground with Liquid Limits of 33% and 39% together with corresponding Plasticity Indices of 14% and 18% (modified to 13% and 14%) indicating clay of low to intermediate plasticity and low volume change potential.

Shirdley Hill Sand

- 7.3 The Made Ground is generally underlain by strata considered to represent Shirdley Hill Sand at depths of between 0.90m and 3.00mbgl, extending to depths of between 2.70m and 4.00mbgl with thickness increasing generally towards the north and west of the site.
- 7.4 The deposit, in the main comprises loose becoming medium dense, brown and grey, variably silty, sand with gravel in places.
- 7.5 SPT 'N' values in the sand range between 6 and 21 confirming an initially loose, becoming medium dense state of compaction.

Possible Glacial Till

- 7.6 In places the sand is underlain by firm grey variably sandy, silty clay at depths of between 2.30m and 3.00mbgl and generally between 0.10m and 0.50m in thickness. This deposit may represent a very thin layer of Glacial Till beneath the more recent granular horizon.
- 7.7 Hand Shear Vane readings undertaken by Geodelft in the cohesive layer range between 42 and 62kN/m² indicating a soft to firm and firm consistency respectively.
- 7.8 A single natural moisture content of 19% was recorded within the cohesive horizon with a Liquid Limit of 32% together with corresponding Plasticity Indices of 16% (modified to 14%) indicating clay of low plasticity and low volume change potential.

Highly to Completely Weathered Sherwood Sandstone

- 7.9 The drift deposits are underlain by Sherwood Sandstone at depths of between 0.20m and 3.50mbgl.
- 7.10 The sandstone is generally highly to completely weathered, being recovered as orange and yellow brown, fine to coarse sand with pieces of very weak, poorly cemented sandstone.
- 7.11 SPT 'N' values in the weathered sandstone range between 35 and 50 confirming a dense to very dense compacted/cemented state.

Underground Water Tank

- 7.12 An underground water-storage tank is located in the north-eastern corner of the site. Investigations to determine its approximate dimensions comprised window sample probing (T1 to T5) and trial pitting (TP1 and TP1A).
- 7.13 A sketch plan of the probehole and trial pit locations, together with the assumed tank dimensions, is provided in Appendix 01 with selected photographs in Appendix 02.
- 7.14 The tank is located beneath a concrete surface comprising eight concrete slabs each approximately 6.5m by 4.25m in size.
- 7.15 T1, T2, T3 and T5 were located around the external area of the tank to determine its rough dimensions with T1, T3 and T5 encountering gravel backfill to the sides of the tank walls. T2 encountered Made Ground consistent with the material encountered across the remaining areas of the site.

- 7.16 T4 was undertaken above the suspected tank position and encountered around 0.30m of reinforced concrete slab directly overlying reinforced concrete beams with the underlying water filled (internal tank area) to a depth of 3.20mbgl.
- 7.17 TP1 was carried out immediately adjacent to the south-west corner of the tank and encountered loosely backfilled granular material considered to represent backfill around the exterior of the tank to a depth of at least 2.80mbgl. However, as the base appeared to include a layer of rubble the exact depth could not be determined.
- 7.18 In consideration of the exploratory hole locations the tank is anticipated to be approximately 8.50m in width and no longer than 26.65m in length and contained in its entirety beneath the concrete slabs. This would provide a tank with a capacity of approximately 725m³ or 750,000 litres.
- 7.19 During the 2015 stage of the investigation a possible groundwater abstraction well was also located immediately south-west of the underground water tank close to the location of the pump house in the north-eastern section of the subject site.
- 7.20 The locations of the tank, abstraction well and sump are depicted on the drawing 6483-SK-01.

Visual/Olfactory Evidence of Contamination

- 7.21 No visual and/or olfactory evidence of significant or widespread ground contamination was encountered during the previous or current investigations.
- 7.22 However, a localised hydrocarbon odour was noted within the granular Made Ground at a depth of between 0.50 and 0.90mbgl in TP3 (WML), in the vicinity of the now demolished Boiler House in the north of the site.

Groundwater

- 7.23 Groundwater inflows were not encountered in any of the investigations with the exception of TP2 and TP3 (WML) in the north of the site at depths of between 2.90m and 3.20mbgl within the weathered Sherwood Sandstone.
- 7.24 Standing groundwater levels were recorded at depths of between 1.57m and 2.40mbgl in the Geodelft standpipes during the 2002 monitoring. During the monitoring visit by WML in July and August 2015, standpipes in WS3, WS5 and WS9 were recorded as being dry.
- 7.25 It should be appreciated that the groundwater monitoring described above has been undertaken during a very short period of time. Significant variations in the long term groundwater regime may occur at other times, particularly with prolonged, extreme weather conditions, and that no account can be taken of such in this report.

General

- 7.26 It should also be appreciated that ground conditions may vary between and away from the exploratory hole positions, and that no account can be taken in this report of such variations.

8.0 GEOTECHNICAL APPRAISAL

Site Preparation and Earthworks

- 8.1 It is anticipated that site development will include the demolition of existing structures which should not proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor. Similarly, any demolition materials present on site and considered for re-use should be inspected with any ACM removed accordingly prior to crushing.
- 8.2 Although not anticipated to be of a significant volume, any topsoil stripped from the area of redevelopment should be stockpiled and protected from inclement weather for future use in garden/landscaped areas subject to confirmatory laboratory testing.
- 8.3 Significant buried structures in the form of foundations, floor slabs and possible basements may be anticipated in excavations and these will need to be removed so that they do not form ground obstructions during proposed construction works. Consideration should be given to crushing and re-using such ground obstructions as bulk fill to resulting hollows, subject to suitability and compliance testing.
- 8.4 The proposed development indicates the removal of the existing electricity sub-stations which dates back to at least 1976. Due to their age, it is advised that discussions should be held with the statutory service provider regarding the status of the facility and particularly whether any equipment potentially containing PCB's has been appropriately de-commissioned. Therefore, it cannot be discounted that a degree of ground remediation may be required local to the facilities. This should be confirmed by additional testing when access to the areas is more readily available.
- 8.5 The underground water tank in the north-west of the site is located beneath an area where HGV access and parking is currently proposed. As such, the tank may be subject to additional loading from vehicular movements and, without knowing its precise make-up, may be subject to overstressing as a result.
- 8.6 Where it is desirable to retain the tank beneath the proposed development, the contained water, following decommissioning of any water supply and connections, should be removed to facilitate a detailed confined access structural survey, the findings of which should provide recommendations on any work required to maintain its integrity throughout the life of the development.
- 8.7 Alternatively, it may be more desirable, following dewatering operations, to break out the tank roof and walls prior to in-filling with well compacted granular fill. In this respect, the tank walls should be broken down to a depth of at least 0.60mbgl to prevent differential settlement of proposed delivery/loading bay surfaces resulting from hard spots. The base of the tanks should also be broken up to allow drainage of the area.
- 8.8 Due to the possibility of unforeseen ground contamination, it is recommended that excavations should be overseen by an environmental specialist who will provide appropriate advice where any suspected contamination such as hydrocarbons or ACM is encountered during site preparation and/or subsequent groundworks.

- 8.9 Although considered unlikely, the presence of unrecorded buried tanks cannot be discounted with their removal being undertaken following appropriate decommissioning and de-gassing by specialist contractors.
- 8.10 The site is relatively flat therefore significant earthworks, other than localised regrading to provide level platforms are not envisaged.

Decommissioning of Groundwater Abstraction Well

- 8.11 The redundant boreholes / wells would need to be made both safe and structurally stable, and also backfilled or sealed to prevent groundwater pollution and flow of water. Therefore, it is anticipated that the well would need to be decommissioned as part of the proposed development. This would need to be undertaken in accordance with the Environment Agency document "Good practice for decommissioning redundant boreholes and wells" dated October 2012.

Slopes and Retaining Walls

- 8.12 If existing retaining walls are required to remain in place, their structural integrity will need to be confirmed before they are incorporated into the development. This will also be the case where relatively heavy plant, would be sited in close proximity to the walls.
- 8.13 Any new retaining walls should be appropriately designed and are anticipated to be supported by spread foundations on competent natural soils where a net allowable bearing pressure of 75kN/m² is considered appropriate.
- 8.14 Any new/modified slopes should be stable at angles of up to 1 vertical in 3 horizontal (18 degrees). Where steeper slopes are envisaged, specific detailed analysis may be required to ensure their stability both in the short and long-term, resulting in the possibility of requiring reinforced soil slopes or retaining structures.
- 8.15 Under such circumstances, retaining walls would need to be supported by spread foundations on competent bearing strata, being the weathered sandstone at depths of around 1.00 to 2.50m below existing ground level.
- 8.16 Suitable crest, toe and slope drainage will need to be incorporated into any new slopes and/or retaining structures constructed at the site.

Foundations

- 8.17 Made Ground at the site is considered unsuitable for the direct support of structural loads as it is generally loosely compacted and variable in nature, resulting in the potential for unacceptable total and differential settlements.
- 8.18 The underlying Shirdley Hill Sand is also recorded as loose in places and may not therefore be laterally consistently competent to provide a suitable bearing medium.
- 8.19 Therefore, it is considered that foundations for new buildings should be taken down to the underlying highly to completely weathered sandstone where a net allowable bearing pressure of at least 250kN/m².

- 8.20 However, the depths to the sandstone, particularly in the western area of the site, will be in excess of 3.00mbgl. Excavations to this depth would require substantial support measures which may render the use of traditional spread foundations impractical and uneconomical.
- 8.21 Consequently, consideration should be given to adopting a reinforced semi-raft foundation option, bearing on ground which has been improved by vibro-treatment. Subsequent vibro-treatment of any re-introduced (crushed) fill, insitu Made Ground and underlying Shirdley Hill Sand Deposits would likely provide a net allowable bearing pressure of at least 125kN/m².
- 8.22 Any sub-surface structures such as relict foundations, floor slabs and road pavements would need to be excavated to their full depth beneath the building footprints, crushed and replaced in accordance with the an appropriate backfill specification.
- 8.23 Any unsuitable materials such as soft clay, timber and metal should be removed prior to crushing of selected material to a suitable grading.
- 8.24 Potential vibration effects on nearby existing structures and buried services will need to be considered if a vibro-treatment option is to be adopted.
- 8.25 The option should therefore only be considered after further consultation with a specialist vibro-treatment contractor who will provide an indication of the suitability of the ground and anticipated allowable bearing pressures that can be achieved to minimise differential settlements to tolerable limits.
- 8.26 Alternatively, a piled foundation solution could be adopted with piles being taken down through the Made Ground and Shirdley Hill Sand to bear on or be socketed into the underlying Sherwood Sandstone.
- 8.27 The final choice and design of pile type should to be undertaken in conjunction with a reputable, specialist piling contractor, ideally with local experience.
- 8.28 However, for preliminary considerations, the use of pre-cast or cast in-situ driven concrete piles may be considered suitable provided proposed pile locations were cleared of obstructions. This option would have the advantage of minimising waste soil arisings although potential noise and vibration effects would need to be considered. In addition, a driven pile solution would need to be undertaken with the approval of the Environment Agency with respect to the risk of providing a potential pollution pathway to the underlying Principal Aquifer.
- 8.29 Such environmental effects would be minimised by the use of a bored pile solution, although construction of such piles would need to consider the disposal cost of potentially contaminated soil arisings.

Floor Slabs

- 8.30 In consideration of the loose and unconsolidated nature of the Made Ground, floor slabs should be constructed as suspended although they may be constructed as ground bearing where the Made Ground and underlying natural soils are improved by vibro-treatment.

Excavations and Groundwater

- 8.31 Excavations at the site should be feasible using an appropriate scale of hydraulic plant. All excavations will require adequate lateral support, or battering back to a safe angle, to ensure

their stability. Support to excavations in proximity to existing properties or infrastructure will need to be designed so as to prevent loss of ground beneath such areas resulting from excessive lateral movement.

- 8.32 The presence of significant volumes of groundwater inflow into shallow excavations is not anticipated across the majority of the site, although groundwater should be anticipated within the granular deposits below a depth of around 1.50mbgl. Notwithstanding this, conventional 'sump and pump' dewatering measures are likely to be adequate to keep excavations dry.

Pavement Design

- 8.33 In consideration of the ground conditions encountered, it is likely that Made Ground will be exposed at formation level beneath areas of proposed hardstanding.
- 8.34 It is therefore recommended that new road pavement construction design should be based on a California Bearing Ratio value of no more than 3%, to be reviewed and confirmed by site inspection and possibly suitable in-situ testing at formation levels following any earthwork operations and prior to pavement construction.

Concrete Design

- 8.35 Design/mix of buried concrete should be undertaken in accordance with the "Aggressive Chemical Environment for Concrete" (ACEC) classification, of BRE Special Digest 1:2005 (Concrete in Aggressive Ground). With reference to the site history, it is deemed appropriate to classify the site as "Brownfield", with respect to BRE Special Digest.
- 8.36 Values of 2:1 water/soil extract for sulphate do not exceed 100mg/l. Values of pH range from 6.3 to 10.1 indicating slightly acidic to alkaline conditions.
- 8.37 Values for Total Sulphur range between 0.03% and 0.09% which provides corresponding Potential Sulphate ranges between 0.06% and 0.27% with the average of the highest two values being 0.21%.
- 8.38 On the basis of these results, the typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1 respectively.

Drainage and Soakaways

- 8.39 In consideration of the granular and thus relatively permeable nature of the Shirdley Hill Sand and underlying Sherwood Sandstone, soakaways could be considered a feasible drainage option for the site.
- 8.40 This would need to be explored further by the development design civils/drainage engineer and confirmed by appropriate testing at drainage design stage.

9.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

General

- 9.1 A review of information provided in previous ground investigations has concluded that the potential for a significant pollution linkage to be present at the site is low.
- 9.2 This has been confirmed to a large degree by the current ground investigation with no visual and/or olfactory evidence of significant ground contamination being encountered.
- 9.3 However, it has been considered prudent to adopt a precautionary principal and undertake chemical analysis of selected samples of sub-surface soils to provide further information on the conceptual model and hence confirm the low human health risk status of the site.
- 9.4 The results of this analysis, together with those from the previous investigations have been assessed and discussed in the following sections.

Human Health

- 9.5 Selected samples have been analysed for a general suite of contaminants of concern and compared against Screening Levels (SL's) for human health to determine the significance of the measured concentrations in relation to the site conceptual model. Thus a Generic Quantitative Risk Assessment has been undertaken in line with guidelines provided in CLR11, Model Procedures for the Management of Land Contamination, 2004.GQRA).
- 9.6 Until relatively recently, the screening criteria used in GQRA primarily comprised published Soil Guideline Values (SGV) together with values that had been derived using the Contaminated Land Exposure Assessment (CLEA) guidance as provided by DEFRA and the EA. In the latter case, values derived by Land Quality Management Limited (LQM) on behalf of the Chartered Institute of Environmental Health (CIEH) and presented in their publication 'Generic Assessment Criteria for Human Health Risk Assessment', 2009, were widely considered appropriate as initial screening criteria.
- 9.7 Subsequent to this, new criteria for a limited number of contaminants have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.
- 9.8 Within the document, Category 4 Screening Levels (C4SL's) are described as being more pragmatic than previous screening criteria and represent concentrations in soil that present an 'acceptable' level of risk within the context of Part 2A.
- 9.9 The National Planning Policy Framework states that 'after development, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990'. Therefore by inference, the C4SL's are appropriate for use in the planning context.
- 9.10 Although the SP1010 document states that C4SL only apply for a 'sandy loam soil with 6% soil organic matter', it is generally accepted that assessment criteria for metals are not sensitive to changes in soil organic content (SOM). The C4SL's have therefore been adopted as assessment criteria in this report for the listed metals within the SP1010.

- 9.11 More recently, LQM/CIEH have published a revised document entitled 'The LQM/CIEH S4ULs for Human Health Risk Assessment' 2015. In brief, the document provides updated assessment criteria which have been derived in accordance with UK legislation, national as well as EA policy and using a modified version of the CLEA software and available guidance. The new screening criteria, or Suitable 4 Use Levels (S4ULs), are intended to provide a complete and updated replacement to the previous LQM/CIEH GAC of 2009. As such they are considered appropriate for use in this assessment for other contaminants not covered by C4SL's and/or for organic contaminants assuming a worst case Soil Organic Matter (SOM) of 1% as an initial conservative assessment.
- 9.12 For each contaminant, S4UL's and C4SL's have been calculated for six land use scenarios, namely:
- Residential with homegrown produce.
 - Residential without homegrown produce.
 - Allotments.
 - Commercial.
 - Public Open Space near residential housing.
 - Public Parks (remote from residential housing).
- 9.13 In light of the proposed development, the screening levels for a "Commercial" end-use are considered appropriate for an initial assessment at this stage.
- 9.14 A table of relevant Screening Levels protective of human health is provided in Appendix 08.

Controlled Waters

- 9.15 Generic Assessment Criteria for the assessment of potential pollution to Controlled Waters and the environment have been derived from very conservative guidelines protective of drinking water and environmental quality, namely:
- UK Drinking Water Standards as defined by The Water Supply (Water Quality) Regulations 2000;
 - UK Environmental Quality Standards (EQS) for Freshwater;

Soil Test Results

- 9.16 Chemical analysis results of 19no shallow soil samples (6no WML, 9no Geodelft and 4no Wormseye) have been compared against the SL's for a "Commercial" end-use. This indicates that all the concentrations were below the relevant reference values with no exceptions.
- 9.17 Additionally 3no samples (2no WML and 1no Geodelft) have been analysed for speciated TPH and SVOC's. All of the concentrations measured were below the SL's for "Commercial" end use.
- 9.18 No asbestos fibres were detected in any of the samples analysed.

Leachate Test Results

- 9.1 During the 2015 WML investigation, 2no samples of Made Ground and were submitted for leachate preparation and testing for a range of metals and semi-metals. The majority of

determinands were below the SLs when compared to stringent drinking water and environmental standards with the following exceptions.

Determinant	GAC (ug/l)	Recorded Concentrations (ug/l)
Chromium VI	5	<30

- 9.2 It is considered that the apparent elevated concentration of leachable Chromium VI is due to the laboratory Lowest Order of Detection being higher than their SLs. In addition, no significant concentrations of the determinand were measured in the soil. Therefore, risks to controlled groundwater are considered to be negligible.

Water Test Results – Storage Tank

- 9.3 1no sample of water obtained from the underground water tank and submitted for the analysis of metals, semi-metals, PAH and TPH. All of the results were below the SL when compared to stringent drinking water standards (DWS) with no exceptions.

Conclusions

- 9.4 Past and current ground investigations have not recorded any notable visual and/or olfactory signs of significant ground contamination at the site.
- 9.5 In addition, the results of chemical test results undertaken on soil samples do not exceed the relevant Screening Level for a 'Commercial' end use with leachability testing indicating no significant exceedences above the assessment criteria.
- 9.6 Consequently, the likelihood of widespread significant ground contamination occurring beneath the site is considered low.
- 9.7 Further to this, following development, the site will be in most parts covered by relatively impermeable concrete floors and external hardstanding, thus breaking the direct contact human health pollution linkage. This, together with a well-constructed positive drainage system, will also limit the potential for significant surface water infiltration and resulting vertical and lateral mobilisation of contaminants to the sensitive underlying aquifer.
- 9.8 The contamination risks to human health and the controlled waters are therefore considered low with no specific environmental remediation considered necessary.
- 9.9 However, it may be considered prudent to make provision for dealing with unrecorded contamination sources during the groundwork operations and, to this end it is recommended that a 'watching brief' is undertaken by an environmental specialist during the site enabling works.

10.0 GROUND GAS RISK ASSESSMENT

Methodology

- 10.1 Current guidance for the assessment of risk associated with the presence of hazardous ground gases (principally methane and carbon dioxide) is provided in two key documents, namely:
- Code of practice for the Characterisation and remediation from Ground Gas in Affected Developments. British Standard Institution (BS 8485: 2015); and
 - Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA (C665, 2007).
- 10.2 The assessment presented herein is primarily based on the BS8485 document.
- 10.3 Hazardous ground gas qualitative risk assessment is based on a conceptual model similar to that used for soil and groundwater contamination sources (i.e., source-pathway-receptor pollutant linkages). A semi-quantitative estimate of risk can be assessed based on knowledge of the conceptual model and a measure of hazardous gas concentration and gas flow at the site within monitoring standpipes.
- 10.4 Based on the measured flow rates and hazardous gas concentrations, individual “hazardous gas flow rates” (Q_{hg}) can be derived for each monitoring point, from which the “gas screening value” (GSV), and then the “Characteristic Situation” (CS) can be determined.
- 10.5 BS8485 provides guidance on the level of gas protection requirements based upon the CS and the proposed development based on building type as outlined in Table 3 of the document.

Table 3 - Building Types

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial/ Public, possible multiple	Commercial / Public	Commercial / Industrial
Control (Change of use, structural alteration, ventilation)	None	Some but not all	Full	Full
Room Sizes	Small	Small/ medium	Small to Large	Large Industrial/ Retail Park style

- 10.6 It is assumed that the proposed development classifies as a Type D building which includes industrial style buildings having large volume internal spaces that are well ventilated and are corporately owned with building management controls.
- 10.7 The internal smaller rooms such as offices, kitchens and bathrooms are classified as Type C which includes single occupancy of the smaller ground-floor spaces.

Ground Gas Conceptual Model

- 10.8 The site is not in an area recorded as being affected by naturally occurring radon gas.
- 10.9 The site is not within influencing distance of any operational, non-operational or historical landfills.

- 10.10 The underlying geology does not include shallow coal seams which could have the potential to release hazardous ground gas.
- 10.1 Made Ground beneath the site does not contain significant quantities of degradable material with the potential to generate significant volumes of ground gas therefore being low.

Conclusions and Recommendations

- 10.2 In consideration of the above, the preliminary risk to the development from ground gas has been assessed as low. Nevertheless, it has been considered prudent to undertake ground gas monitoring, primarily for methane and carbon dioxide, with associated flow rates, on 3no occasions, to date, between the 15th July and 12th August 2015.
- 10.3 The results indicated no detectable concentration of methane with carbon dioxide concentrations generally ranging from 0.5% to 4.9% by volume in air (v/v) and a single reading in excess of 5%, namely 6.3% in WS3). No detectable ground gas flows have been recorded during the initial monitoring visits.
- 10.4 The Characteristic Gas Flow Rate has been calculated for each standpipe, on each occasion for both methane and carbon dioxide using a flow rate of 0.1l/hr. The results are presented on Table 1 in Appendix 08.
- 10.5 The concentrations of all the individual characteristic gas flow rates fall below 0.07l/hr with all the carbon dioxide concentrations below 5% with only one exception. However, in consideration of the age of the Made Ground and general lack of potential gas generating sources, the single reading of 6.3% in WS3 is not considered to be representative of the gas regime at the site.
- 10.6 Consequently, the site is indicated to classify as Characteristic Gas Situation (CGS) 1 – ‘Very Low Gas Risk’ in accordance with BS8485:2015. Under such circumstances, and in consideration of the site conceptual model, no specific gas protection measures would be required for the proposed structures.
- 10.7 Notwithstanding the above, further monitoring visits are required to be undertaken before the assessment can be finalised with at least 1no further visit undertaken at low and falling atmospheric pressure (worst case conditions).
- 10.8 These recommendations will then need to be confirmed with the Building Control/Contaminated Land Officer prior to construction.

11.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS**Waste Soils Characterisation**

- 11.1 Excavation works undertaken during the development will produce waste soils for which appropriate waste management will be required. In line with current sustainability principals, any waste soils should be considered for re-use where possible by incorporation into the development.
- 11.2 Site-won granular Made Ground may be re-used as bulk fill, subject to screening and crushing to an engineering suitability under proposed hardstanding.
- 11.3 Waste arisings comprising uncontaminated natural soil would be suitable, subject to confirmatory analysis, for re-use as bulk fill or as sub-soil within any planned landscaped areas.
- 11.4 On the basis of the current information it is likely that the majority of Made Ground would be classified as Non-Hazardous with natural deposits classified as Inert for landfill disposal.
- 11.5 However, in event that excavated Made Ground, following inspection, is found to include significant hydrocarbon contamination or ACM and/or fibres that cannot be segregated, it may classify as Hazardous, subject to further quantification testing.
- 11.6 For Inert Waste disposal (and in the unlikely event of Hazardous Waste disposal), allowance will need to be made for adequate Waste Acceptance Criteria (WAC) testing with appropriate consideration of the additional time and cost associated with this.

Imported Fill

- 11.7 Imported fill will be subject to specific quality requirements. Allowance should be made for testing imported fill materials prior to emplacement to ensure suitability.

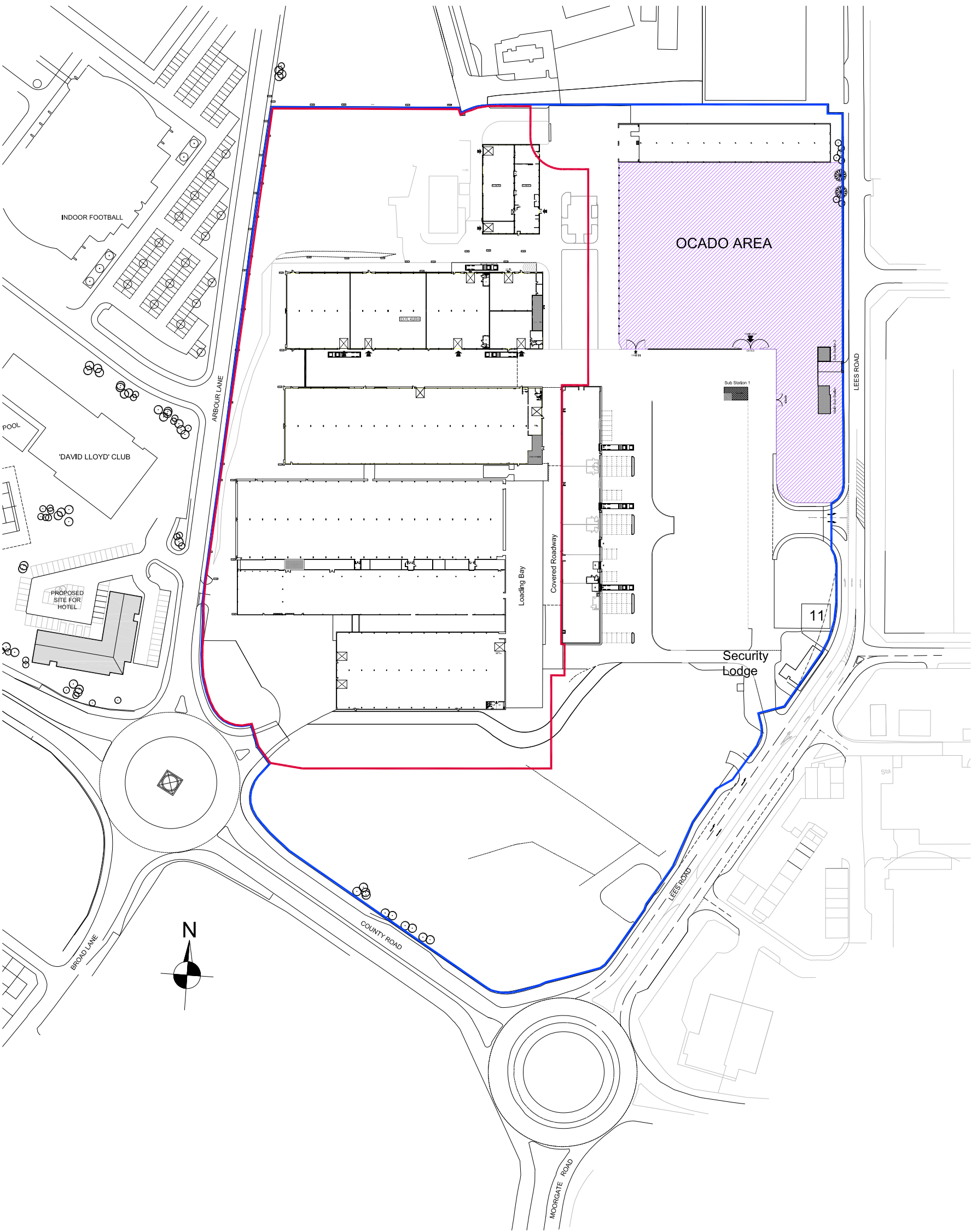
Water Supply Pipes

- 11.8 United Utilities Water will need to be consulted with regards the selection of suitable water supply pipe materials for the development. However, in light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination is not envisaged.
- 11.9 This may need to be review further should unidentified ground contamination be encountered during the site enabling works.

APPENDIX 01 - DRAWINGS

The Contractor is responsible for checking dimensions and any discrepancy to be verified with the Architects before proceeding. Figured dimensions to be worked to only. Subject to all Local Authority and Statutory approvals.
DO NOT SCALE

SCHEME



REV	DESCRIPTION	DATE
-----	-------------	------

EMERSON HOUSE, HEYES LANE,
ALDERLEY EDGE,
CHESHIRE SK9 7LF
Tel: (01625) 588400. Fax: (01625) 588276



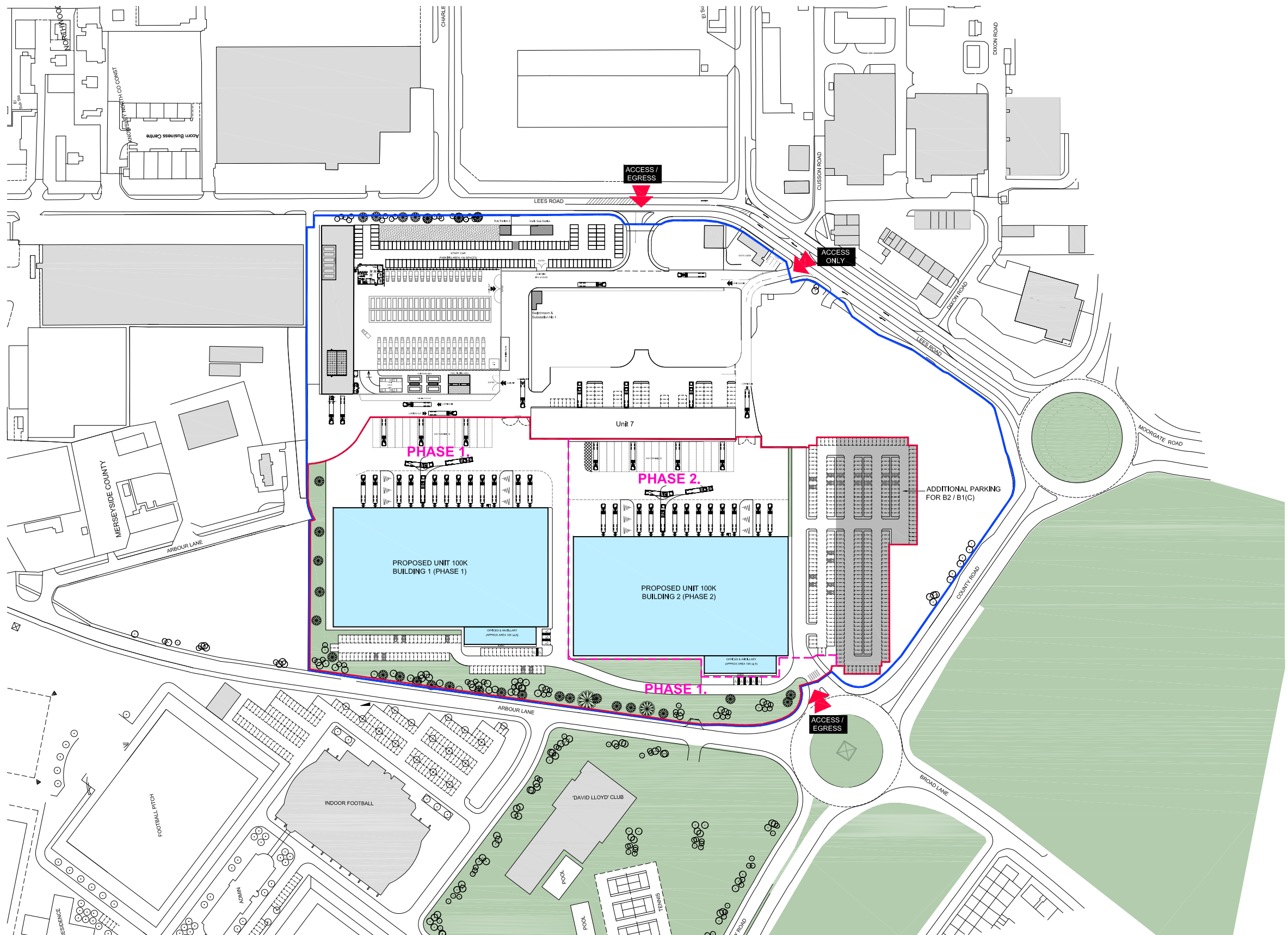
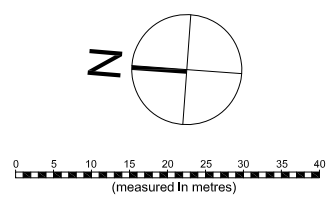
location
ACADEMY BUSINESS PARK
KNOWSLEY

title
KNOWSLEY INDUSTRIAL ESTATE

scale 1:1000 @ A1	ref	checked	date 30.09.14
----------------------	-----	---------	------------------

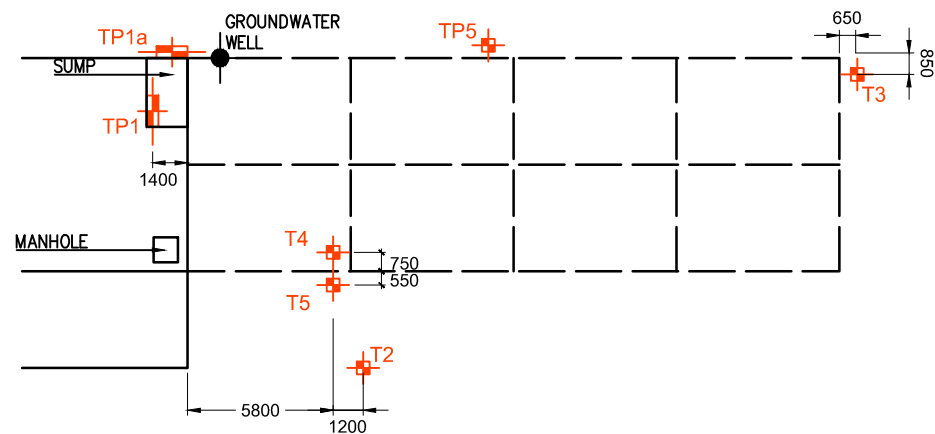
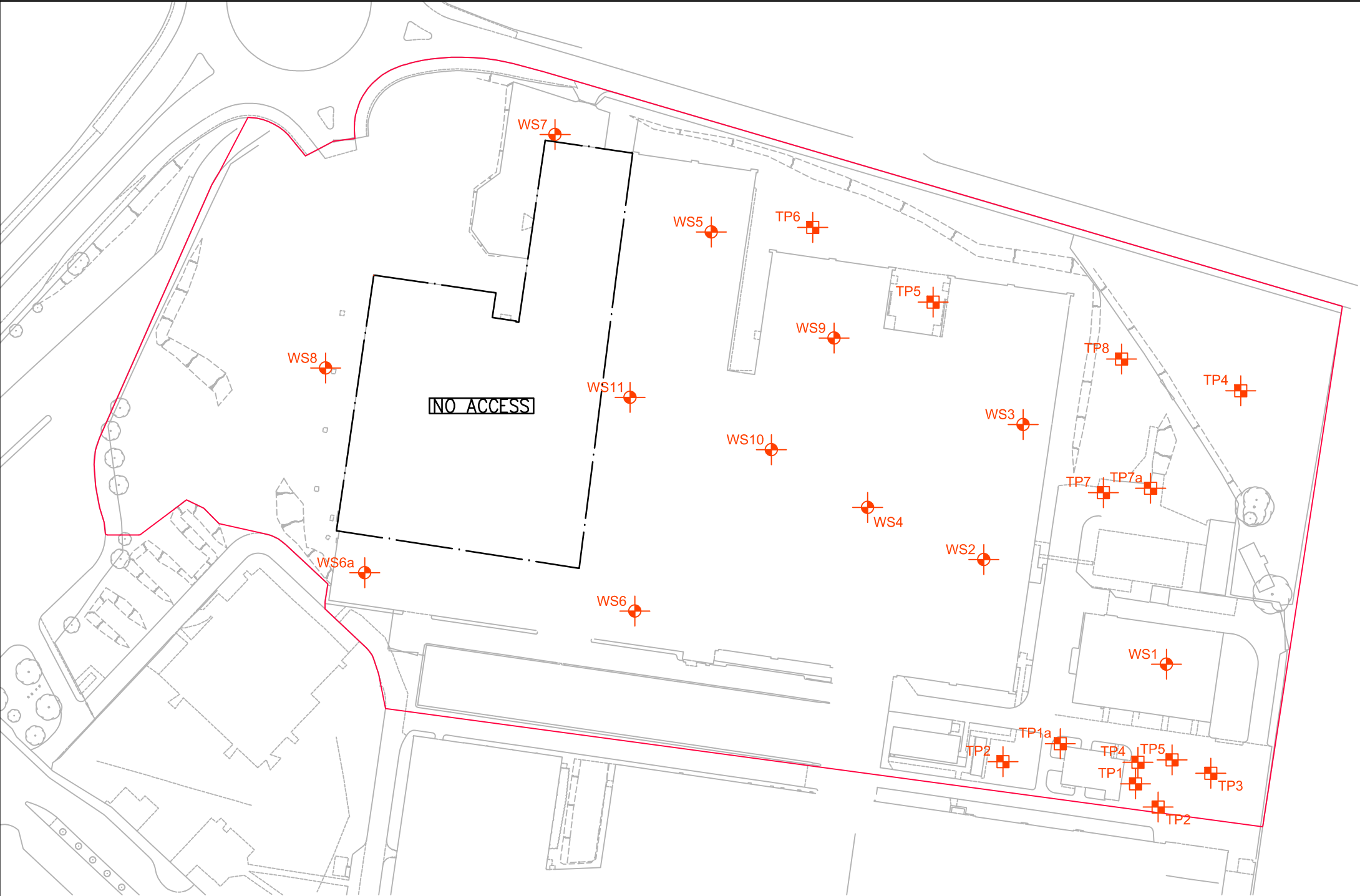
drawing no.
389-SCH-1950

The Contractor is responsible for checking dimensions and any discrepancy to be verified with the Architects before proceeding. Figured dimensions to be worked to only. Subject to all Local Authority and Statutory approvals.
DO NOT SCALE



SITE PLAN scale 1:1250

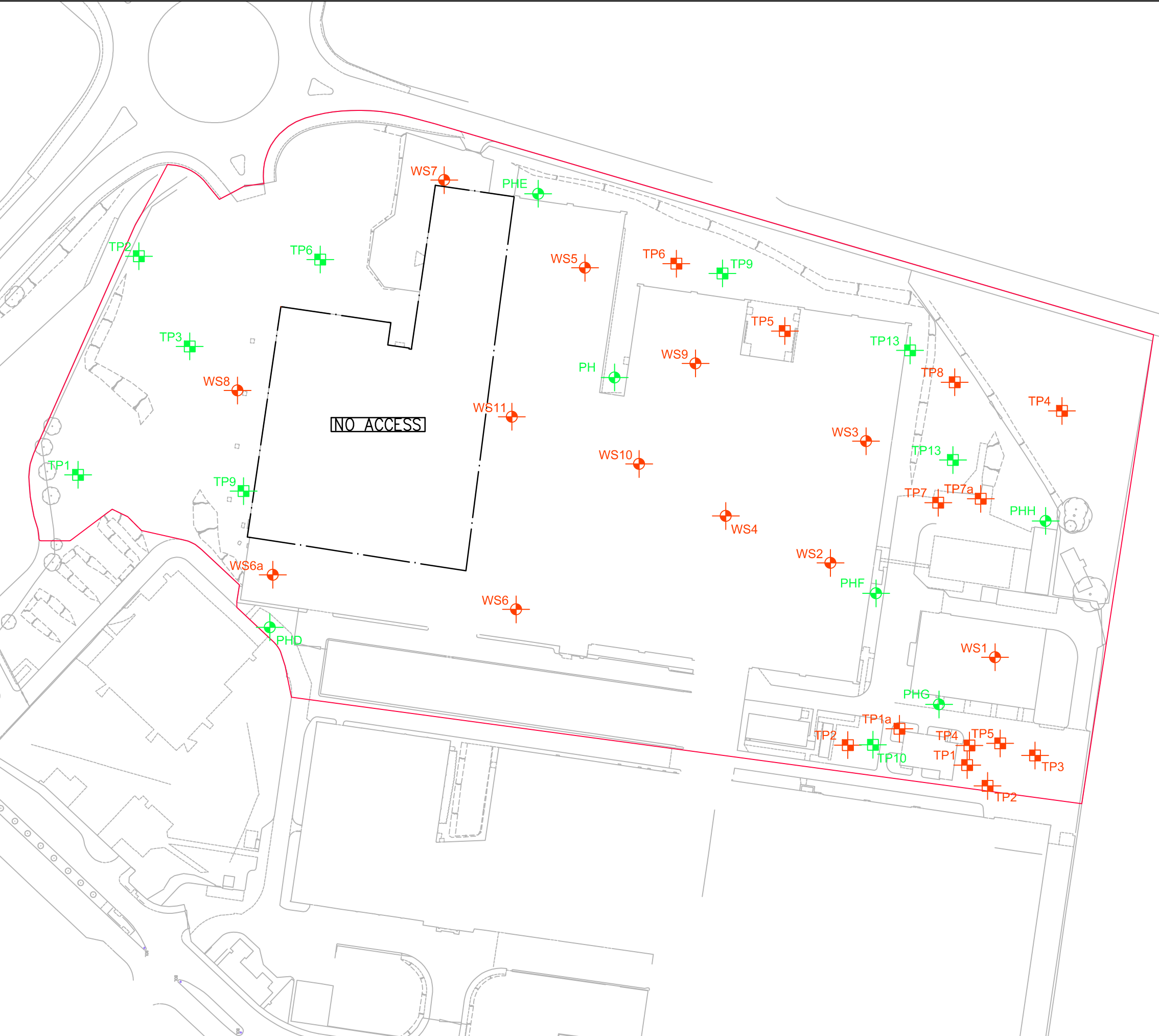
REV	DESCRIPTION	DATE
EMERSON HOUSE, HEYES LANE, ALDERLEY EDGE, CHESHIRE SK9 7LF Tel: (01625) 588400. Fax: (01625) 588276		
Orbit Developments		
Location ACADEMY BUSINESS PARK KNOWSLEY		
Title PROPOSED DISTRIBUTION WAREHOUSE SCHEME - OVERALL SITE PLAN		
Scale 1:1250 @ A1	Ref	Checked date 14.11.14
Drawing no. 389-SCH-1022		



KEYS:

-  TRIAL PIT (WML 2015)
-  WINDOW SAMPLE (WML 2015)
-  SITE BORDER

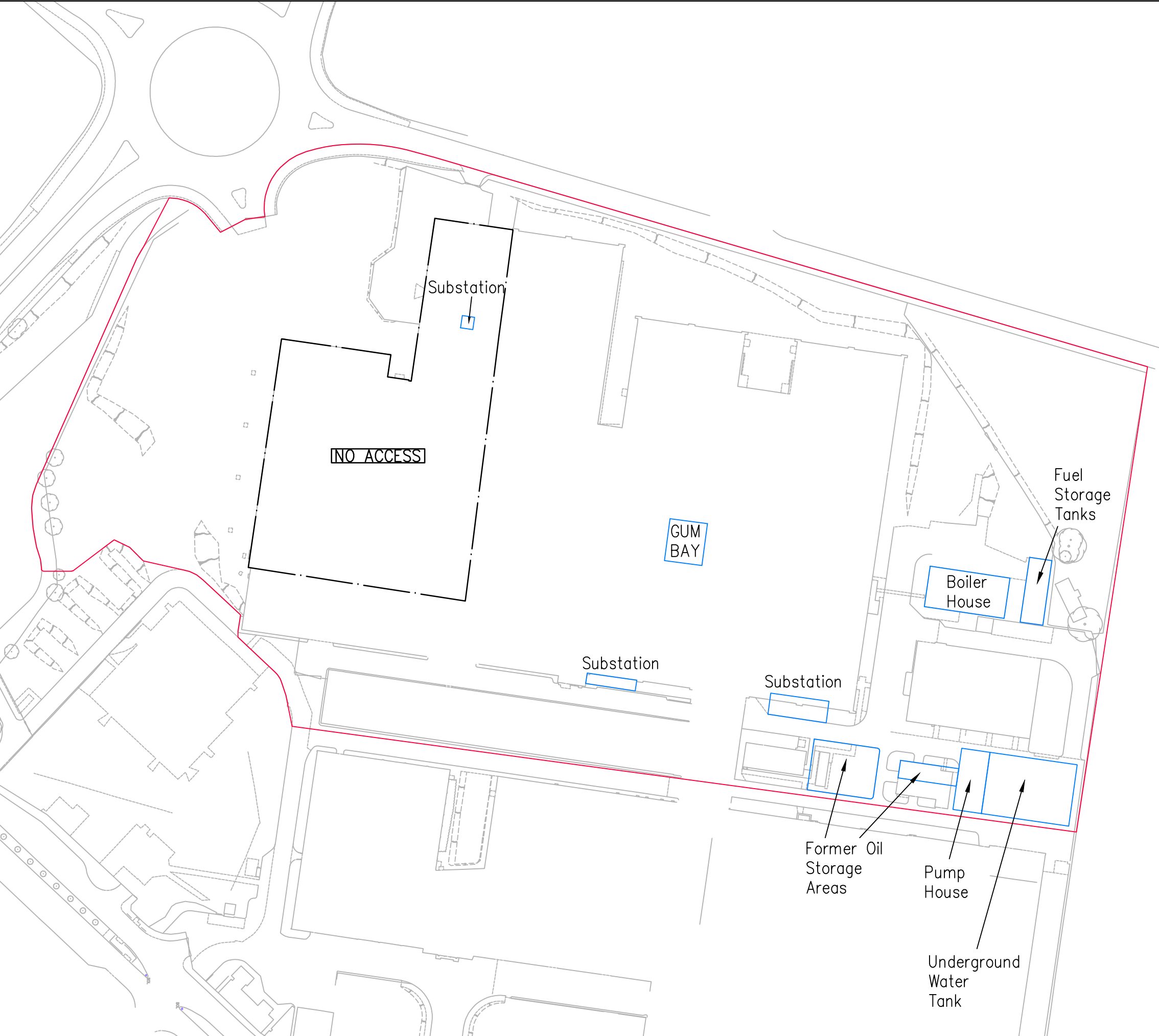
Rev.	Amendment	Date	By	Ch
Project LEES ROAD, KNOWSLEY				
Client ORBIT				
Title EXPLORATORY HOLE LOCATION PLAN				
Drawn AG	Checked	Date 12/08/2015	Scale NTS	
WML CONSULTING Civil, Structural & Geotechnical Engineers			No.8 Oak Green Earl Road Stanley Green Business Park Cheadle Hulme Cheshire SK8 6QL Tel 0161 482 0600 Fax 0161 486 9210 e-mail info@wmlconsulting.co.uk www.wmlconsulting.com	
Job No. 6483G		Drawing No. SK-01		



KEYS:

- TRIAL PIT (WML 2015)
- WINDOW SAMPLE (WML 2015)
- TRIAL PIT (Geodelft 2002)
- WINDOW SAMPLE (Geodelft 2002)
- SITE BORDER

Rev.	Amendment	Date	By	C
Project LEES ROAD, KNOWSLEY				
Client ORBIT				
Title COMBINED EXPLORATORY HOLE LOCATION PLAN				
Drawn AG	Checked	Date 12/08/2015	Scale NTS	
WML CONSULTING Civil, Structural & Geotechnical Engineers			No.8 Oak Green Earl Road Stanley Green Business Park Cheadle Hulme Cheshire SK8 6QL Tel 0161 482 0600 Fax 0161 486 9210 e-mail info@wmlconsulting.co.uk www.wmlconsulting.com	
Job No. 6483G		Drawing No. SK-02		



KEYS:

- SITE BORDER
- EXISTING BUILDINGS

Rev.	Amendment	Date	By	C
Project LEES ROAD, KNOWSLEY				
Client ORBIT				
Title EXISTING SITE FEATURES				
Drawn AG	Checked	Date 18/08/2015	Scale NTS	
WML CONSULTING Civil, Structural & Geotechnical Engineers			No.8 Oak Green Earl Road Stanley Green Business Park Cheadle Hulme Cheshire SK8 6QL Tel 0161 482 0600 Fax 0161 486 9210 e-mail info@wmlconsulting.co.uk www.wmlconsulting.com	
Job No.	6483G	Drawing No.	SK-03	

APPENDIX 02 - PHOTOGRAPHS



Photograph 1

View south-west towards the sump and manhole at the southern end of the water tank.



Photograph 2

View of the sump in the south-western corner of the water tank.



Photograph 3
View of the eastern side of the sump.



Photograph 4
View of the borehole adjacent to the sump.



Photograph 5
View south-west towards the sump with the borehole in the foreground.



Photograph 6
View south-east towards the southern end of the tank showing location of T1 east of the tank.



Photograph 7
View east showing the location of T3 north of the tank.



Photograph 8
View south showing the location of T4 within the tank.



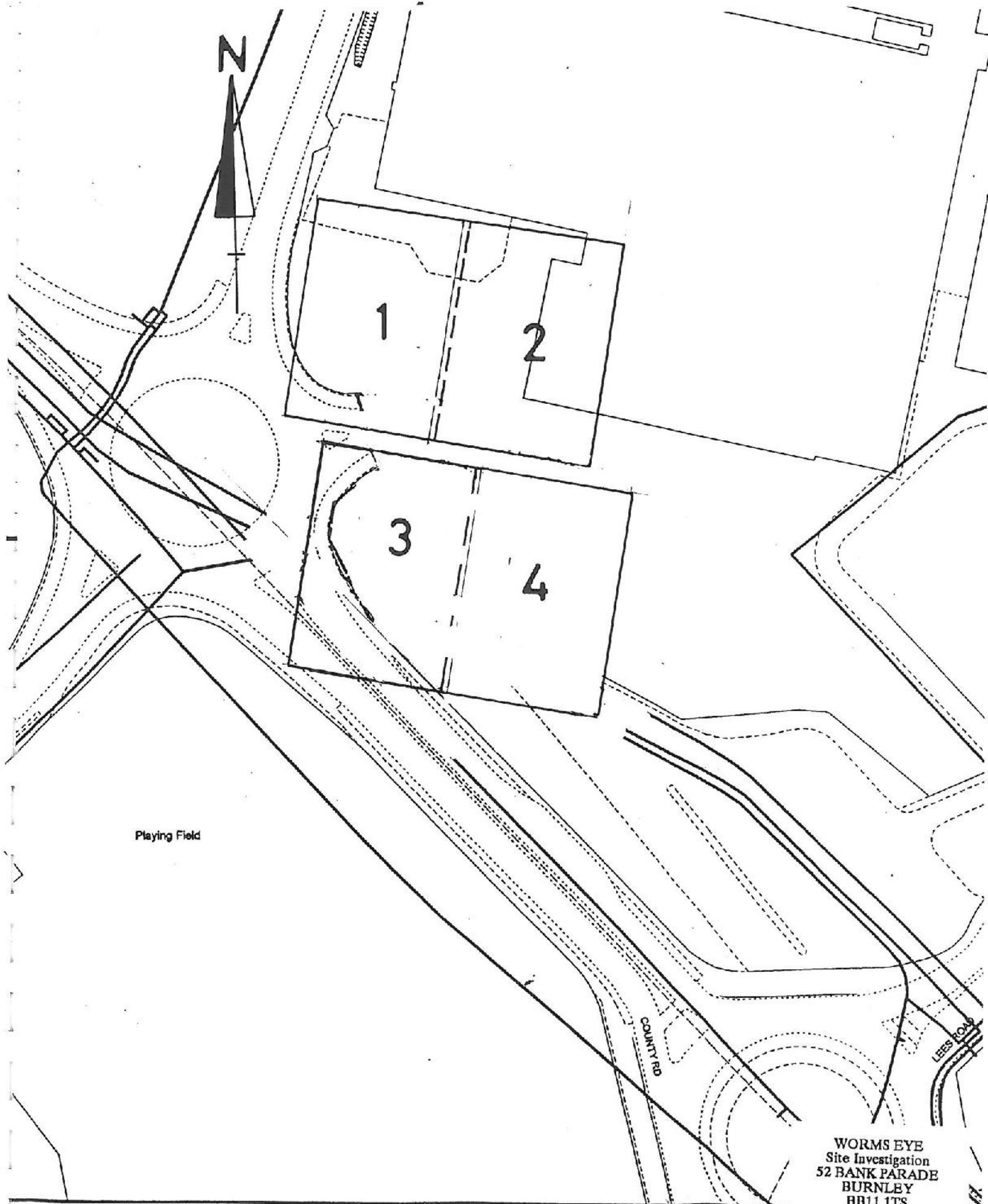
Photograph 9
View of T4 located within the tank.



Photograph 10
View of T4 located within the tank.

APPENDIX 03 – EXCERPTS OF WORMSEYE INVESTIGATION 1999

Location Plan
Moorgate Retail & Business Park
Knowsley
Scale 1:1250



WORMS EYE
Site Investigation
52 BANK PARADE
BURNLEY
BB11 1TS
01282 414649

⊗ CBR1

Location Plan
Moorgate Retail & Business Park
Knowsley
Scale 1:200

2

N

⊗ CBR3

WORMS EYE
Site Investigation
52 BANK PARADE
BURNLEY
BB11 1TS
01282 414649

Location Plan
Moorgate Retail & Business Park
Knowsley
Scale 1:200

3

Location Plan
Moorgate Retail & Business Park
Knowsley
Scale 1:200

4

CBR6

50 CAR PACES

CBR8

CBR7



THD

THC

BH1

DRIVE
THROUGH
RESTAURANT

CBR9



THA

BH2

THB

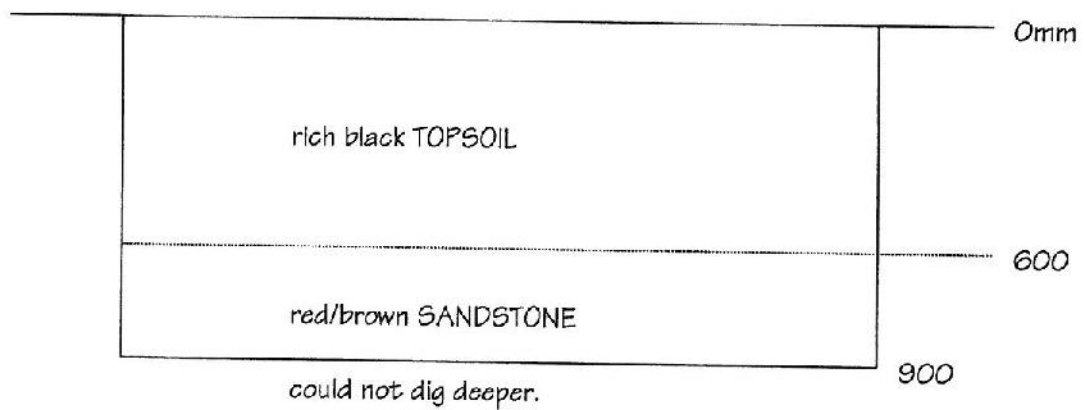
COURT

CBR10

WORMS EYE
Site Investigation
52 BANK PARADE
BURNLEY
BB11 1TS
01282 414649

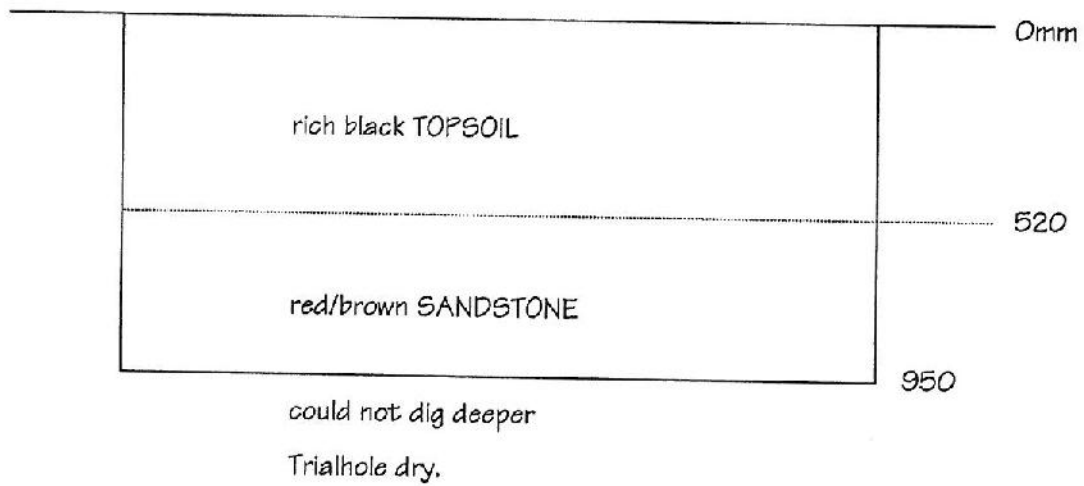
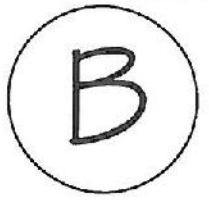
WORMS EYE
Site Investigation
52 BANK PARADE
BURNLEY
BB11 1TS
01282 414649

Trialhole A
Moorgate Retail Park
Knowsley
Scale 1:20

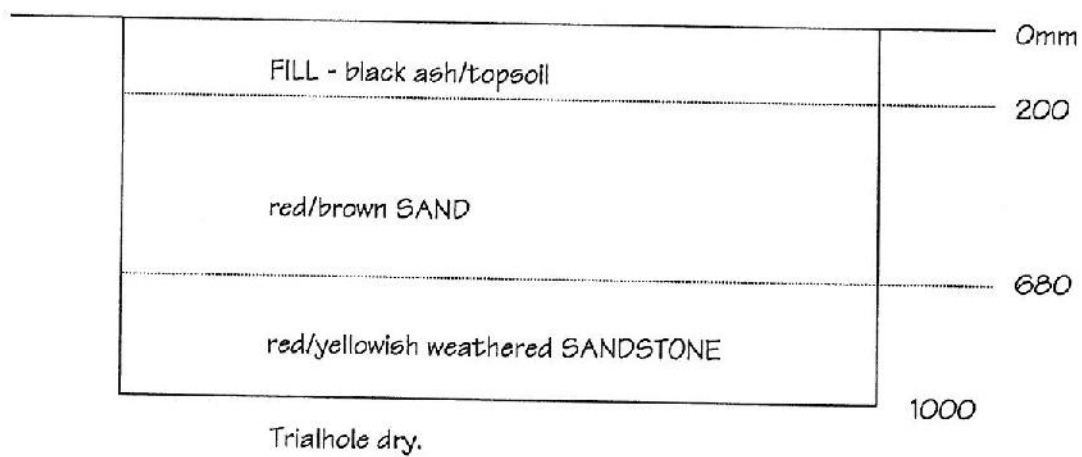
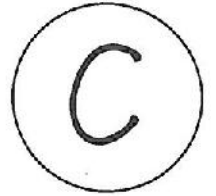


Trialhole dry.

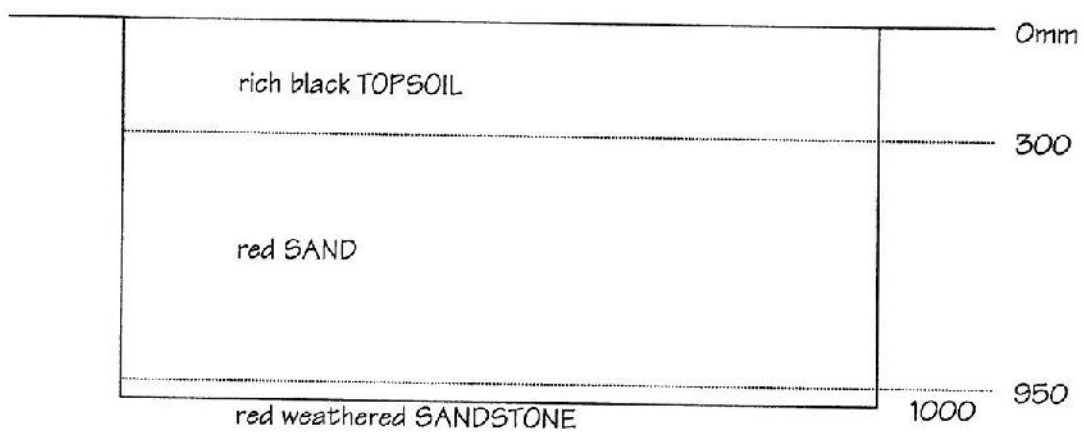
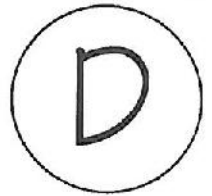
Trialhole B
Moorgate Retail Park
Knowsley
Scale 1:20



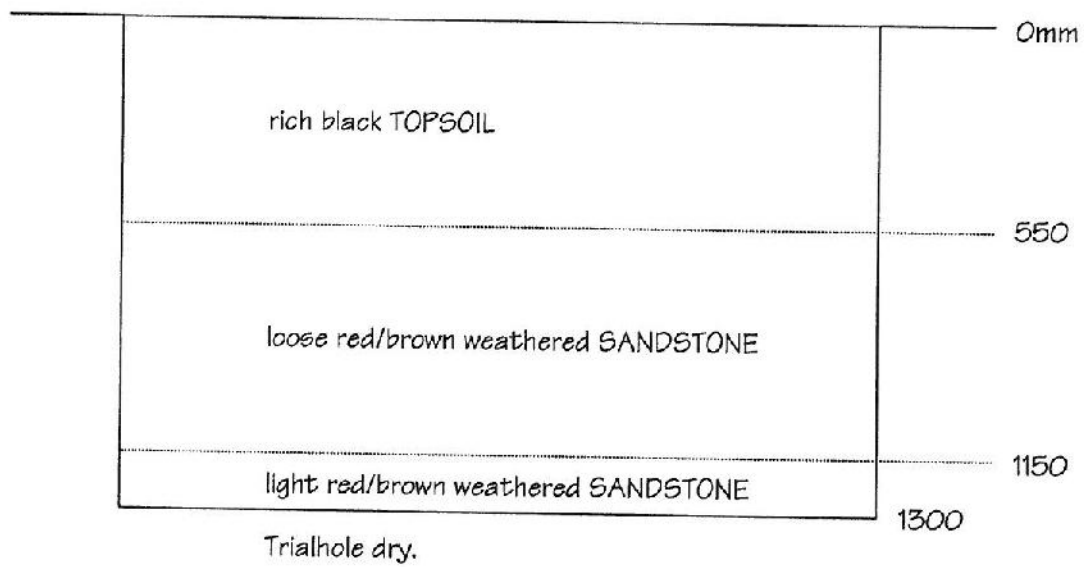
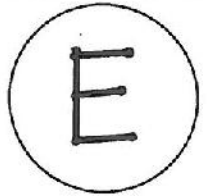
Trialhole C
Moorgate Retail Park
Knowsley
Scale 1:20



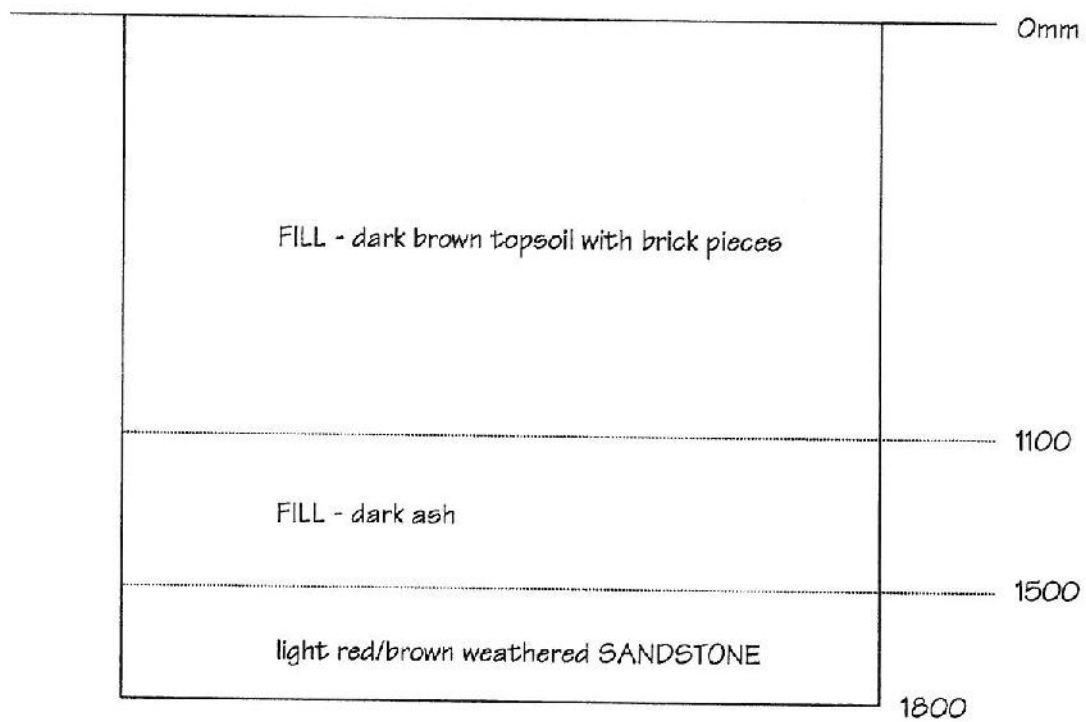
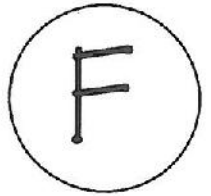
Trialhole D
Moorgate Retail Park
Knowsley
Scale 1:20



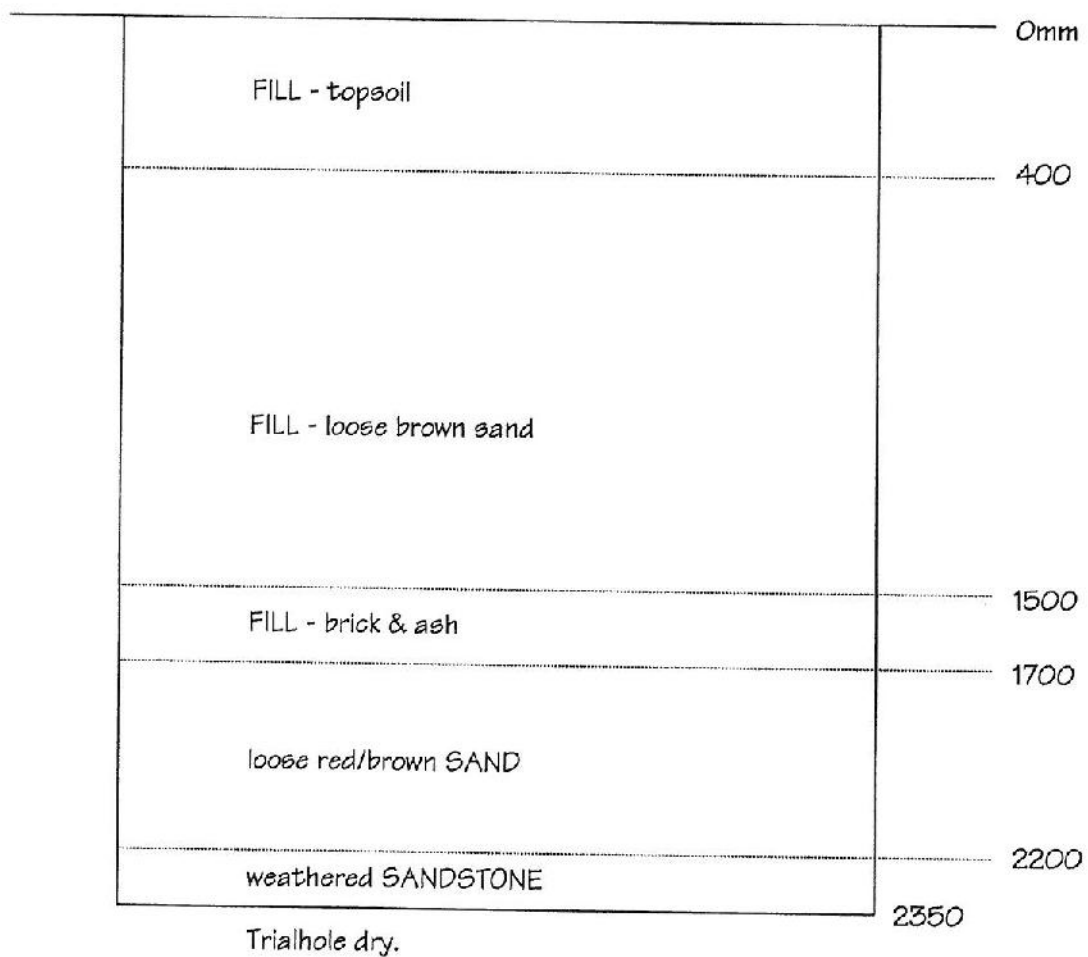
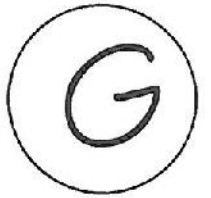
Trialhole E
Moorgate Retail Park
Knowsley
Scale 1:20



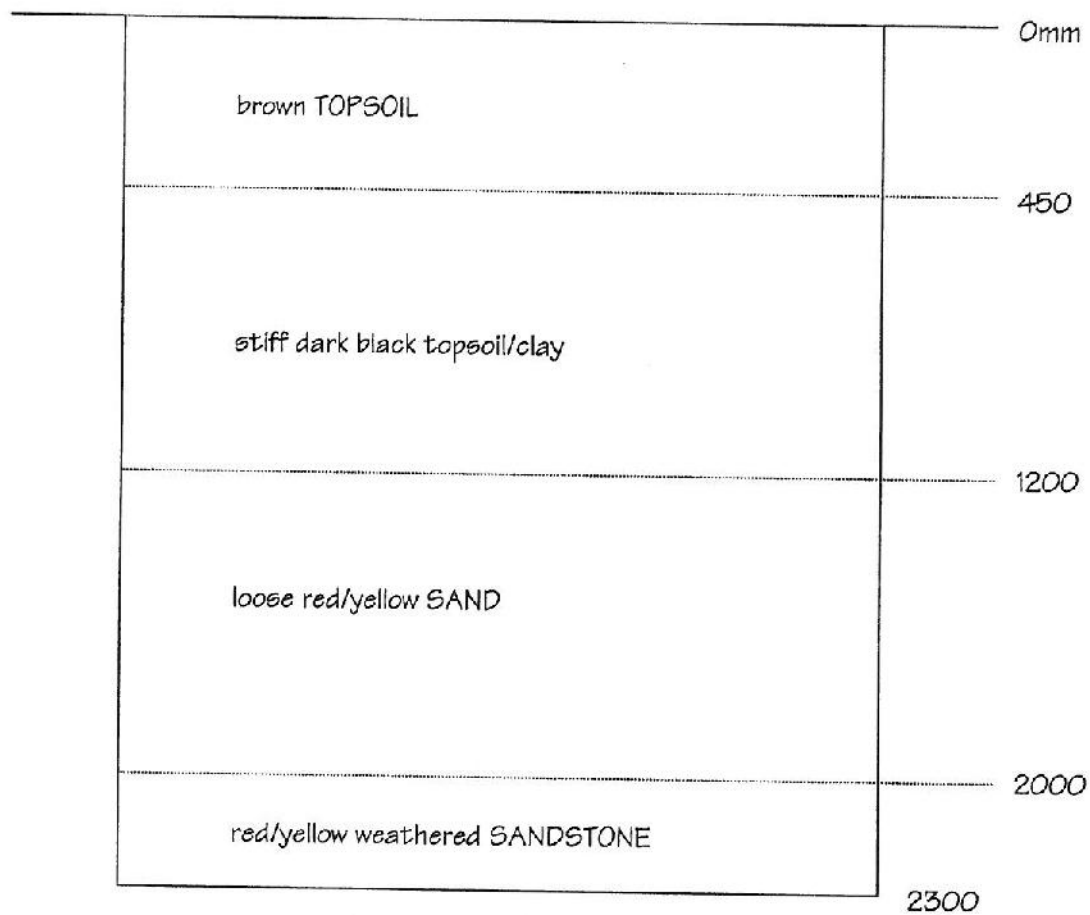
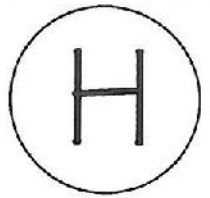
Trialhole F
Moorgate Retail Park
Knowsley
Scale 1:20



Trialhole G
Moorgate Retail Park
Knowsley
Scale 1:20



Trialhole H
Moorgate Retail Park
Knowsley
Scale 1:20



Trialhole dry, sides stable.

WORMS EYE GEOTECHNICAL Borehole Log

52 Bank Parade
Burnley
Lancashire
BB11 1TS
01282 414649

Site : Moorgate Retail & Business Park, Borehole No : 1
Knowsley

Located : Burger King, middle/north Date : 3 November 1999

Shell & auger

<u>Depth</u> <u>(m)</u>	<u>Key</u>	<u>Description</u>	<u>Test</u>	<u>Depth</u> <u>(m)</u>	<u>Result</u>
0.00	~~~~~	TOPSOIL	SPT	0.0	33
0.07	~~~~~				
0.30	:o::::O::	loose red SAND with GRAVEL	SPT	0.5	50
0.80		medium dense/dense weathered red SANDSTONE			
1.00		bedded red SANDSTONE	SPT	1.2	50 blows for 80mm
1.40					

SPT/CPT result in blows/300mm (N Value)

Chiesling - 2 hours

Groundwater

Slight water seepage at 0.8m

Borehole generally dry at end of drilling.

WORMS EYE GEOTECHNICAL

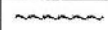
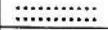
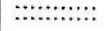
Borehole Log

52 Bank Parade
Burnley
Lancashire
BB11 1TS
01282 414649

Site : Moorgate Retail & Business Park, **Borehole No : 2**
Knowsley

Located : Burger King, middle/south Date : 3 November 1999

Shell & auger

<u>Depth</u> (m)	<u>Key</u>	<u>Description</u>	<u>Test</u>	<u>Depth</u> (m)	<u>Result</u>
0.00		TOPSOIL	SPT	0.5	38
0.65					
0.80		medium dense/dense red weathered SANDSTONE	SPT	0.9	50 blows
1.00		bedded red SANDSTONE	SPT	1.2	50 blows for 170mm
1.40					
					

SPT/CPT result in blows/300mm (N Value)

Chiselling - 2 hours

Groundwater

Slight water seepage at 0.7m

Borehole generally dry at end of drilling.

WORMS EYE GEOTECHNICAL

Borehole Log

52 Bank Parade
Burnley
Lancashire
BB11 1TS
01282 414649

Site : Moorgate Retail & Business Park, **Borehole No : 3**
Knowsley

Located : Petrol Station, middle/south Date : 3 November 1999

Shell & auger

<u>Depth</u> <u>(m)</u>	<u>Key</u>	<u>Description</u>	<u>Test</u>	<u>Depth</u> <u>(m)</u>	<u>Result</u>
0.00	>>>>>	FILL - topsoil	SPT	0.5	7
0.15	<<<<<				
	>>>>>				
	<<<<<		SPT	1.1	50 blows for 140mm
1.00	>>>>>	FILL - loose black clayey sandy silty with occasional ash			
1.10	<<<<<				
1.20		medium dense weathered red SANDSTONE	SPT	1.4	50 blows for 70mm
					
1.50	>>>>>	bedded red SANDSTONE			

SPT/CPT result in blows/300mm (N Value)

Chiselling - 2 hours

Groundwater

Borehole dry throughout.

(ref 4)

WORMS EYE GEOTECHNICAL Borehole Log

52 Bank Parade
Burnley
Lancashire
BB11 1TS
01282 414649

Site : Moorgate Retail & Business Park, Borehole No : 4
 Knowsley

Located : Petrol Station, middle/north Date : 3 November 1999

Shell & auger

<u>Depth</u> <u>(m)</u>	<u>Key</u>	<u>Description</u>	<u>Test</u>	<u>Depth</u> <u>(m)</u>	<u>Result</u>
0.00	>>>>>	FILL - topsoil	SPT	0.5	8
0.15	<<<<<				
0.20	>>>>>	FILL - bricks			
	<<<<<		SPT	1.0	39
1.00	>>>>>	FILL - loose black clayey silty			
1.30	<<<<<	sand with occasional ash			
1.40		medium dense red weathered SANDSTONE	SPt	1.5	50 blows for 120mm
					
1.80		bedded red SANDSTONE			

SPT/CPT result in blows/300mm (N Value)

Chiselling - 2 hours

Groundwater

Borehole dry throughout.

MOORGATE RETAIL AND BUSINESS PARK, KNOWSLEY, L32 1TSCBR TESTSPetrol Filling Station

Location	CBR %	
1	4	Topsoil
2	3	Topsoil
3	1	Topsoil

Burger King Takeaway

Location	CBR %	
5	3	Topsoil
6	>5	
7	4	
8	2.5	Topsoil
9	2.5	Topsoil
10	3	Topsoil

Contamination Test Results
Moorgate Retail Park
Knowsley

Borehole Depth	THA 0.5m	THC 0.2-0.68m	THE 0.0-0.55m	THG 1.0m
Arsenic	12	3	6	4
Boron	<1	<1	<1	<1
Cadmium	<1	<1	<1	<1
Chromium (Total)	3	2	2	2
Chromium (VI)	<1	<1	<1	<1
Copper	50	<1	19	11
Cyanide (Total)	<10	<10	<10	<10
Cyanide (Free)	<10	<10	<10	<10
Lead	115	3	60	12
Mercury	<1	<1	<1	<1
Nickel	8	2	4	3
PAH (Screening)	68	54	82	81
pH	6.63	5.49	6.15	6.54
Phenol Index	<0.5	<0.5	<0.5	<0.5
Selenium	<1	<1	<1	<1
Sulphide	<10	<10	<10	<10
Thiocyanate	<5	<5	<5	<5
TEM/SEM	736	456	1,187	480
Total Sulphur (%)	0.05	0.01	0.03	0.04
Total Sulphate (%)	0.05	<0.01	<0.04	0.05
Zinc	133	7	20	11

Results expressed as mg/kg Air Dried unless stated.

APPENDIX 04 - EXCERPTS OF GEODELFT INVESTIGATION 2002

APPENDIX 3

Probehole Records and Field Testing Data

PROBEHOLE LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		PROBEHOLE No PHD
Project No. C1945	Date 05-07-02	Ground Level (m) 100.00	Co-Ordinates () E 392.2 N 463.4		Diameter (mm) 50	
Method Nested window sampler		Contractor	Logged By CM		Scale 1:25	
						Sheet 1 of 1

SAMPLES & TESTS			STRATA					Instrument/ Backfill
Depth	Type No	Field Test Results	Water	Reduced Level	Depth (Thick- ness)	DESCRIPTION	Legend	
				99.90	0.10	TARMAC		   
				99.70	(0.20) 0.30	HARDCORE		
0.50	J	V=0.5			(0.60)	Orangey brown SAND with much fragments of weathered sandstone.		
0.90		V=0.5		99.10	0.90	SANDSTONE obstruction, PH abandoned at 0.9m.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	

PROBEHOLE LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		PROBEHOLE No PHE
Project No. C1945	Date 05-07-02 05-07-02	Ground Level (m) 100.00	Co-Ordinates O E 585.3 N 801.4		Diameter (mm) 50	
Method Nested window sampler		Contractor	Logged By CM		Scale 1:25	
Sheet 1 of 1						

SAMPLES & TESTS			STRATA					
Depth	Type No	Field Test Results	Water	Reduced Level	Depth (Thickness)	DESCRIPTION	Legend	Instrument/ Backfill
				99.80	(0.20) 0.20	HARDCORE		
					(0.50)	MADEGROUND: dark brown sandy topsoil with much crushed brick.		
				99.30	0.70	Sandstone obstruction. PH abandoned at 0.7m		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (h:mm)	From	To	

PROBEHOLE LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		PROBEHOLE No PHF	
Project No. C1945		Date 05-07-02		Ground Level (m) 100.00		Co-Ordinates () E 860.7 N 484.7	
		Diameter (mm) 50					
Method Nested window sampler		Contractor		Logged By CM		Scale 1:25	
						Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Field Test Results		Reduced Level	Depth (Thick- ness)	DESCRIPTION	Legend	
0.50		V=0.3		99.80	(0.20) 0.20	MADEGROUND: dark brown very sandy topsoil with occasional crushed brick.		
				99.60	(0.20) 0.40	MADEGROUND: crushed brick and tiles.		
						MADEGROUND: orangey brown sand with some crushed brick.		
1.00		V=0.3			(1.40)			
2.00	J	V=0.3				Orangey brown SAND with occasional fine to medium sub rounded gravels of sandstone.		
				97.70	(0.50) 2.30			
						Orange slightly silty SAND with occasional fine subrounded sandstone gravels.		
3.00	J	V=0.4						
				96.80	(0.90) 3.20			
						SANDSTONE obstruction, PH abandoned at 3.2m.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	

PROBEHOLE LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		PROBEHOLE No PHG	
Project No. C1945	Date 04-07-02	Ground Level (m) 100.00	Co-Ordinates () E 882.9 N 381.9		Diameter (mm) 50		
Method Nested window sampler		Contractor	Logged By CM		Scale 1:25	Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Instrument/ Backfill
Depth	Type No	Field Test Results	Water	Reduced Level	Depth (Thickness)	DESCRIPTION	Legend	
0.50	J	V=0.4		99.80	(0.20) 0.20	MADEGROUND: dark brown very sandy topsoil with some crushed brick.		
					(0.80)	MADEGROUND: orangey brown sand with some crushed brick and occasional fine to medium sub rounded sandstone gravels.		
				99.00	1.00			
1.00		V=0.4			(0.30)	MADEGROUND: dark brown very sandy clay.		
1.20		V=0.4		98.70	1.30			
						Orangey brown SAND.		
2.00	J	V=0.5			(1.40)			
				97.30	2.70			
						Grey very sandy CLAY with some fine to medium sub angular sandstone gravels.		
3.00		V=0.4			(0.40)			
				96.90	3.10			
						Orangey brown SAND with occasional fine sub angular sandstone gravels.		
3.50		V=0.4			(0.40)			
				96.50	3.50			
						SANDSTONE obstruction, PH abandoned 3.5m.		

Boring Progress and Water Observations

Date	Time	Depth	Casing	Water Strike	Water Rise

Chiselling

From	To	Time (hh:mm)

Water Added

From	To

GENERAL REMARKS

No groundwater encountered. Reinstated with flush fit lockable well covers and gas valves.

PROBEHOLE LOG

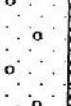
Project Knowsley Retail and Business Park				Client Clancy Consulting		PROBEHOLE No PHH
Project No. C1945	Date 04-07-02	Ground Level (m) 100.00	Co-Ordinates () E 979.1 N 538.6		Diameter (mm) 50	
Method Nested window sampler		Contractor	Logged By CM		Scale 1:25	
Sheet 1 of 1						

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Field Test Results		Reduced Level	Depth (Thick- ness)	DESCRIPTION	Legend	
0.50	J	V=0.3			(1.60)	MADEGROUND: brown sand with much crushed brick/ concrete and fine to medium sub angular to sub rounded sandstone gravels.		
1.00		V=0.4						
			98.40	1.60				
2.00		V=0.4			(1.40)	Orangey brown SAND with occasional fine to medium sub rounded sandstone gravels.		
3.00	J	V=0.5	97.00	3.00		Sandstone obstruction. PH abandoned at 3m.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	
											No groundwater encountered. Reinstated with flush fit lockable well covers and gas valves.

TRIAL PIT LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		TRIAL PIT No TP9
Project No. C1945	Date 03-07-02 03-07-02	Ground Level (m) 100.00	Co-Ordinates () E 730.7 N 730.6		Diameter (mm)	
Method JCB 3CX		Contractor	Logged By CM		Scale 1:31.2	
Sheet 1 of 1						

SAMPLES & TESTS			Water	STRATA			
Depth	Type No	Field Test Results		Reduced Level	Depth (Thickness)	DESCRIPTION	Legend
0.50	J	V=0.7	99.50	(0.50) 0.50	HARDCORE		
1.00		V=0.7	97.00	(2.50) 3.00	MADEGROUND: dark brownish orange sand with some brick fragments and organic matter and occasional fine to coarse sandstone gravels.		
2.00		V=0.7					
2.50		V=0.8					
3.30	J	V=0.7	96.70	(0.30) 3.30	Firm orangey brown very sandy CLAY with occasional fine to medium sandstone gravels.		
			96.50	3.50	Damp orangey brown SAND with occasional clay intrusions and occasional fine to medium sandstone gravels.		
			96.00	(0.50) 4.00	Orangey brown SAND with much weathered sandstone fragments.		
4.00		V=0.6			TP completed at 4m.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	

TRIAL PIT LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		TRIAL PIT No TP10	
Project No. C1945	Date 04-07-02	Ground Level (m) 100.00	Co-Ordinates () E 853.1 N 362.6		Diameter (mm)		
Method JCB 3CX		Contractor		Logged By CM	Scale 1:25	Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Instrument/ Backfill
Depth	Type No	Field Test Results	Water	Reduced Level	Depth (Thickness)	DESCRIPTION	Legend	
0.40	J	V=0.6		99.50	0.50	MADEGROUND : Dark brown very sandy TOPSOIL with much organic matter and some brick fragments.		
					(0.50)			
1.00		V=0.6		98.90	1.10	MADEGROUND: orangey brown sand with much brick rubble and fragments of crushed brick and some fragments of weathered sandstone.		
					(0.60)			
1.20	J	V=0.6		98.70	1.30	Dark brown/ black very silty SAND.	x x	
					(0.20)			
					(1.20)	Dark brown SAND with much fine to coarse sandstone gravels and cobbles.		
2.50	J	V=0.5		97.50	2.50			
				97.35	2.65	Firm grey very sandy CLAY with much fine to medium sub angular to sub rounded sandstone gravels.		
3.00		V=0.5			(1.00)	Damp orange SAND with some fine to coarse sandstone gravels.		
3.65	J	V=0.5		96.35	3.65			
						SANDSTONE obstruction, TP abandoned at 3.65m.		

BOREHOLE BHLOGS.GPJ GEODELFT.GDT 01/08/02

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	
				3.40							

TRIAL PIT LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		TRIAL PIT No TP11
Project No. C1945	Date 04-07-02 04-07-02	Ground Level (m) 100.00	Co-Ordinates () E 651.5 N 651.4		Diameter (mm)	
Method JCB 3CX		Contractor	Logged By CM		Scale 1:25	
						Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Field Test Results		Reduced Level	Depth (Thick- ness)	DESCRIPTION	Legend	
						HARDCORE		
				99.65	(0.35) 0.35			
0.50		V=0.4		99.30	(0.35) 0.70	MADEGROUND: dark brown very sandy slightly clayey topsoil with much brick rubble.		
1.00	J	V=0.5		98.50	(0.80) 1.50	MADGROUND: orangey brown slightly clayey sand with much crushed brick and fine to coarse sandstone gravel and some coke.		
1.50		V=0.5		97.70	(0.80) 2.30	MADEGROUND: dark brown very clayey slightly sandy topsoil with some crushed brick and organic material.		
2.50		V=0.4		96.90	(0.80) 3.10	Firm orangey brown slightly silty very sandy CLAY with some fine to coarse sub rounded sandstone gravel.		
				96.50	(0.40) 3.50	Orangey brown, slightly silty SAND.		
3.50	J	V=0.3				TP completed 3.5m.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	
				2.00							Reinstated with flush fit lockable well covers and gas valves.

TRIAL PIT LOG

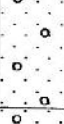
Project Knowsley Retail and Business Park				Client Clancy Consulting		TRIAL PIT No TP12
Project No. C1945	Date 03-07-02 03-07-02	Ground Level (m) 100.00	Co-Ordinates () E 886.7 N 673.5		Diameter (mm)	
Method JCB 3CX		Contractor	Logged By CM		Scale 1:25	
						Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Field Test Results		Reduced Level	Depth (Thick- ness)	DESCRIPTION	Legend	
				99.90	0.10	TOPSOIL		
1.00	J	V=0.8			(1.90)	MADEGROUND: brick rubble and sandstone fragments.		
2.00	J	V=0.6		98.00	2.00	Brick obstruction, TP abandoned at 2m.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	

TRIAL PIT LOG

Project Knowsley Retail and Business Park				Client Clancy Consulting		TRIAL PIT No TP13	
Project No. C1945	Date 03-07-02	Ground Level (m) 100.00	Co-Ordinates () E 910.7 N 596.4		Diameter (mm)		
Method JCB 3CX		Contractor		Logged By CM		Scale 1:25	
Sheet 1 of 1							

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Field Test Results		Reduced Level	Depth (Thick- ness)	DESCRIPTION	Legend	
0.50	J	V=0.6			(0.50)	MADEGROUND: dark brown/ black very sandy topsoil with some brick rubble and hardcore and fine to coarse sandstone gravel.		
				99.50	0.50			
1.00		V=0.6			(0.40)	Pale orange SAND with occasional fine to medium sandstone gravels.		
				99.10	0.90			
					(0.40)	Dark orange SAND with some fine to coarse sandstone gravels.		
2.00		V=0.5			(0.70)	Pale orange SAND with some fine to coarse sandstone gravels.		
				98.00	2.00			
					(0.60)	Dark orange SAND (wcl) with some fragments of weathered sandstone.		
2.60	J	V=0.5		97.40	2.60	SANDSTONE obstruction, TP abandoned at 2.6m.		

BOREHOLE BHLOGS.GPJ GEODELFT.GDT 01/08/02

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing	Water Strike	Water Rise	From	To	Time (hh:mm)	From	To	
				2.00							

APPENDIX 5

Laboratory Analyses Results

TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference AS REPORTED
Ceram Sample(s) 602012564-602012588

Date Reported	19-Jul-02	Order/Job No	1753/2002
Date Received	10-Jul-02	Date(s) of Test(s)	10/17-Jul-02

**ANALYSIS - TPH SUITE 1, PHENOLS, CYANIDE, SULPHIDE,
THIOCYANATE & pH VALUE**

Please find attached the results for the samples recently submitted for analysis.

Tests marked with an asterisk are not UKAS Accredited. Tests marked not UKAS Accredited are not included in the UKAS Accreditation schedule for our laboratory.

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

CERAM - TEST RESULTS

[illegible]

Note: If total cyanide is <1 ppm it is assumed that complex and free cyanide are also <1 ppm.

D. c. - *lutea*.

DC Poole

Authorised Signatory

CERAM - TEST RESULTS

[illegible]

D. c. Rich.

DC Poole
Authorised Signatory

CERAM - TEST RESULTS

Sample Number Sample Reference Soil Project C1945 Knowsley Ind Park		602012574 TP14/1.0M	602012575 TP13/0.5M	602012576 TP12/2.0M	602012577 TP1/0.4M	602012578 TP2/0.2M
Method (Ref)	Units	Determinands				
GC-MS (C209)	ppm	Petrol Range (C ₆ - C ₁₀)				
GC (C73)	ppm	<1.0	<1.0	<1.0	-	-
		<20	20	169	-	-
GC (C73+C209)	ppm	<20	20	169	-	-
		BTEX Compounds:				
GC-MS (C209)	ppm	<0.05	<0.05	<0.05	-	-
GC-MS (C209)	ppm	<0.05	<0.05	<0.05	-	-
GC-MS (C209)	ppm	<0.05	<0.05	<0.05	-	-
GC-MS (C209)	ppm	<0.05	<0.05	<0.05	-	-
GC-MS (C209)	ppm	<0.05	<0.05	<0.05	-	-
GC-MS (C209)	ppm	<0.05	<0.05	<0.05	-	-
GC-MS (C209)	ppm	<0.05	<0.05	<0.05	-	-
		MTBE (not included in TPH result)				
Dist-FIA (C55)	ppm	-	-	-	-	-
Dist-FIA (C55)	ppm	-	-	-	<1	-
Dist-FIA (C55)	ppm	-	-	-	<1	-
difference	ppm	-	-	-	<1	-
Dist-FIA (C55)	ppm	-	<1	-	-	-
Spectro	ppm	-	-	-	-	-
Meter (C27)	- pH	-	-	-	1	-
					-	-

D. C. Poole
DC Poole
Authorised Signatory

CERAM - TEST RESULTS

Sample Number Sample Reference Soil Project C1945 Knowsley Ind Park			602012579 TP3/0.5M	602012580 TP7/0.3M	602012581 TP8/0.5M	602012582 TP12/1.0M	602012583 TP15/0.5M
Method (Ref)	Units	Determinands					
GC-MS (C209)	ppm	Petrol Range (C ₆ - C ₁₀)	-	-	-	-	-
GC (C73)	ppm	Diesel Range (>C ₁₀ - C ₄₀)	-	-	-	-	-
GC (C73+C209)	ppm	Total Petroleum Hydrocarbons	-	-	-	-	-
		BTEX Compounds:					
GC-MS (C209)	ppm	Benzene	-	-	-	-	-
GC-MS (C209)	ppm	Toluene	-	-	-	-	-
GC-MS (C209)	ppm	Ethyl Benzene	-	-	-	-	-
GC-MS (C209)	ppm	m,p-Xylene	-	-	-	-	-
GC-MS (C209)	ppm	o-Xylene	-	-	-	-	-
GC-MS (C209)	ppm	MTBE (not included in TPH result)	-	-	-	-	-
Dist-FIA (C55)	ppm	Total Phenols (phenol index)	-	-	-	-	-
Dist-FIA (C55)	ppm	Total Cyanide	-	-	<1	-	-
Dist-FIA (C55)	ppm	Free Cyanide	-	-	<1	-	-
	ppm	Complex Cyanide	-	-	<1	-	-
Dist-FIA (C55)	ppm	Acid Soluble Sulphide	-	-	-	-	-
Spectro	ppm	Thiocyanate*	-	-	-	<1	-
Meter (C27)	-	pH	7.5	-	-	-	-

P. C. Poole
DC Poole
Authorised Signatory



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CERAM

Queens Road Penkhull
Stoke-on-Trent ST4 7LQ
Tel: +44 (0) 1782 764444
Fax: +44 (0) 1782 412331
E-mail: info@ceram.com
<http://www.ceram.com>

TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference GDPHG/1.0M
Ceram Sample(s) 602012568

Date Reported	19-Jul-02	Order/Job No	1753/2002
Date Received	10-Jul-02	Date(s) of Test(s)	10/17-Jul-02

ANALYSIS - TPH SPECIATED

Please find attached the results for the sample recently submitted for analysis.

Tests marked with an asterisk are not UKAS Accredited. Tests marked not UKAS Accredited are not included in the UKAS Accreditation schedule for our laboratory.

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

Notes: The speciation into aromatic and aliphatic fractions is not covered by our UKAS Accreditation.



CERAM - TEST RESULTS

Sample Number Sample Reference Soil Project C1945 Knowsley Ind Park			602012568
Method (Ref)	Units	Determinands	
Aliphatics			
GC-MS (C209)	ppm	C5-C8	<1.0
GC-MS (C209)	ppm	>C8-C10	<1.0
GC (C73)	ppm	>C10-C12	<1.0
GC (C73)	ppm	>C12-C16	<1.0
GC (C73)	ppm	>C16-C21	<5.0
GC (C73)	ppm	>C21-C35	<5.0
	ppm	Total Aliphatics	<10
Aromatics			
GC-MS (C209)	ppm	C5-C8 (Benzene+Toluene)	<1.0
GC-MS (C209)	ppm	>C8-C10	<1.0
GC (C73)	ppm	>C10-C12	<1.0
GC (C73)	ppm	>C12-C16	<1.0
GC (C73)	ppm	>C16-C21	<5.0
GC (C73)	ppm	>C21-C35	<5.0
	ppm	Total Aromatics	<10
Total Petroleum Hydrocarbons			
	ppm		<15
GC-MS (C209)			
GC-MS (C209)	ppm	Benzene	<0.05
GC-MS (C209)	ppm	Toluene	<0.05
GC-MS (C209)	ppm	Ethyl Benzene	<0.05
GC-MS (C209)	ppm	m,p-Xylene	<0.05
GC-MS (C209)	ppm	o-Xylene	<0.05
GC-MS (C209)	ppm	MTBE	<0.05

P. C. Poole

DC Poole
Authorised Signatory



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CERAM

Queens Road Penkhull
Stoke-on-Trent ST4 7LQ
Tel: +44 (0) 1782 764444
Fax: +44 (0) 1782 412331
E-mail: info@ceram.com
<http://www.ceram.com>

TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference AS REPORTED
Ceram Sample(s) 602012565, 602012567, 602012571 & 602012572

Date Reported 19-Jul-02 Order/Job No 1753/2002
Date Received 10-Jul-02 Date(s) of Test(s) 10/17-Jul-02

ANALYSIS - POLYNUCLEAR AROMATIC HYDROCARBONS

Please find attached the results for the samples recently submitted for analysis.

Tests marked with an asterisk are not UKAS Accredited. Tests marked not UKAS Accredited are not included in the UKAS Accreditation schedule for our laboratory.

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

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CERAM - TEST RESULTS

[illegible]

End of Test Report

[Handwritten signature]

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CERAM

Queens Road Penkhull
Stoke-on-Trent ST4 7LQ
Tel: +44 (0) 1782 764444
Fax: +44 (0) 1782 412331
E-mail: info@ceram.com
<http://www.ceram.com>

TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH/R HEBDON

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference AS REPORTED
Ceram Sample(s) AS REPORTED

Date Reported 17-Jul-02 Order/Job No 1753/2002
Date Received 10-Jul-02 Date(s) of Test(s) 11/17-Jul-02

DETERMINATION OF METALS

Sample Number	602012565	602012567	602012568	602012570
Reference	GDPHH/0.5M	TP11/1.0M	GDPHG/1.0M	GDPHA/0.5M
Arsenic (As)	9	<5	<5	<5
Cadmium (Cd)	<1	<1	<1	<1
Copper (Cu)	40	15	<10	15
Chromium (Cr)	15	10	<10	10
Lead (Pb)	80	20	<10	20
Mercury (Hg)	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	<0.5	<0.5	<0.5	<0.5
Zinc (Zn)	195	25	15	25
Boron (B)	7	5	4	4
Nickel (Ni)	20	<10	<10	<10

Results quoted as ppm.


Dr KM Johnson
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Ceram Sample(s) AS REPORTED
Your Reference SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Sample Number	602012571	602012575	602012577	602012578
Reference	GDPHD/0.5M	TP13/0.5M	TP1/0.4M	TP2/0.2M
Arsenic (As)	<5	8	10	6
Cadmium (Cd)	<1	<1	<1	<1
Copper (Cu)	<10	45	45	35
Chromium (Cr)	<10	10	<10	10
Lead (Pb)	<10	90	1385	65
Mercury (Hg)	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	<0.5	<0.5	<0.5	<0.5
Zinc (Zn)	<10	50	95	50
Boron (B)	<3	5	<3	4
Nickel (Ni)	<10	15	10	<10

Sample Number	602012579	602012580	602012581	602012582
Reference	TP3/0.5M	TP7/0.3M	TP8/0.5M	TP12/1.0M
Arsenic (As)	<5	7	<5	6
Cadmium (Cd)	<1	<1	<1	<1
Copper (Cu)	<10	45	15	40
Chromium (Cr)	<10	15	15	30
Lead (Pb)	<10	50	15	50
Mercury (Hg)	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	<0.5	<0.5	<0.5	0.9
Zinc (Zn)	10	105	30	65
Boron (B)	<3	7	4	35
Nickel (Ni)	<10	15	15	10

Results quoted as ppm.

KM Johnson

Dr KM Johnson
Authorised Signatory

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Ceram Sample(s) AS REPORTED
Your Reference SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Sample Number	602012583	602012584	602012585
Reference	TP15/0.5M	TP6/0.8M	TP4/0.8M
Arsenic (As)	<5	<5	<5
Cadmium (Cd)	<1	<1	<1
Copper (Cu)	15	<10	<10
Chromium (Cr)	<10	<10	15
Lead (Pb)	15	15	<10
Mercury (Hg)	<0.5	<0.5	<0.5
Selenium (Se)	<0.5	<0.5	<0.5
Zinc (Zn)	25	15	20
Boron (B)	5	<3	3
Nickel (Ni)	<10	<10	<10

Results quoted as ppm.

Metals were determined using Methods C24 and C54.

End of Test Report



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TEST REPORT

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3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

Queens Road Penkhull
Stoke-on-Trent ST4 7LQ
Tel: +44 (0) 1782 764444
Fax: +44 (0) 1782 412331
E-mail: info@ceram.com
<http://www.ceram.com>

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference AS REPORTED
Ceram Sample(s) 602012567, 602012569, 602012575 & 602012585

Date Reported 17-Jul-02 Order/Job No 1753/2002
Date Received 10-Jul-02 Date(s) of Test(s) 11/17-Jul-02

DETERMINATION OF WATER SOLUBLE SULPHATE AND SULPHUR

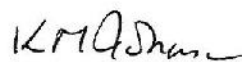
Method C27 & C24

Sample Number	602012567	602012569	602012575	602012585
Reference	TP11/1.0M	TP10/2.5M	TP13/0.5M	TP4/0.8M
Water Soluble Sulphate (as SO ₄)	20	15	90	15
Sulphur (as SO ₄)	540	145	1020	115

Results quoted as ppm.

End of Test Report

Page No. 1 of 1


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TEST REPORT

GEODELFT ENVIRONMENTAL
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REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference TP9/2.5M
Ceram Sample(s) 602012564

Date Reported 17-Jul-02 Order/Job No 1753/2002
Date Received 10-Jul-02 Date(s) of Test(s) 12/17-Jul-02

DETERMINATION OF ORGANIC CARBON

Methods C44 & C45

Total Carbon (as C) including any Carbon from Carbonates	3.66
Carbon Dioxide (CO ₂) from Carbonates	0.06
Organic Carbon (Total Carbon - $^{12}/_{44}$ CO ₂)	3.64

Results are quoted as %.

The above results are the mean of duplicate determinations.

End of Test Report



TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference TP7/1.5M
Ceram Sample(s) 602012572

Date Reported 17-Jul-02 Order/Job No 1753/2002
Date Received 10-Jul-02 Date(s) of Test(s) 12/17-Jul-02

DETERMINATION OF ORGANIC CARBON

Methods C44 & C45

Total Carbon (as C) including any Carbon from Carbonates	0.60
Carbon Dioxide (CO ₂) from Carbonates	0.14
Organic Carbon (Total Carbon - $\frac{12}{44}$ CO ₂)	0.56

Results are quoted as %.

The above results are the mean of duplicate determinations.

End of Test Report



TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference TP14/1.0M
Ceram Sample(s) 602012574

Date Reported 17-Jul-02 Order/Job No 1753/2002
Date Received 10-Jul-02 Date(s) of Test(s) 12/17-Jul-02

DETERMINATION OF ORGANIC CARBON

Methods C44 & C45

Total Carbon (as C) including any Carbon from Carbonates	0.23
Carbon Dioxide (CO ₂) from Carbonates	0.08
Organic Carbon (Total Carbon - $\frac{12}{44}$ CO ₂)	0.21

Results are quoted as %.

The above results are the mean of duplicate determinations.

End of Test Report



TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

REPORT OF TESTS ON SOIL PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference GDPHK/2.0M
Ceram Sample(s) 602012586

Date Reported 17-Jul-02 Order/Job No 1753/2002
Date Received 10-Jul-02 Date(s) of Test(s) 12/17-Jul-02

DETERMINATION OF ORGANIC CARBON

Methods C44 & C45

Total Carbon (as C) including any Carbon from Carbonates	1.17
Carbon Dioxide (CO ₂) from Carbonates	0.12
Organic Carbon (Total Carbon - $^{12}/_{44}$ CO ₂)	1.14

Results are quoted as %.

The above results are the mean of duplicate determinations.

End of Test Report

KM Johnson

Dr KM Johnson
Authorised Signatory





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CERAM

Queens Road Penkhull
 Stoke-on-Trent ST4 7LQ
 Tel: +44 (0) 1782 764444
 Fax: +44 (0) 1782 412331
 E-mail: info@ceram.com
 http://www.ceram.com

TEST REPORT

GEODELFT ENVIRONMENTAL
 3 CHAPEL STREET
 CONGLETON
 CHESHIRE
 CW12 4AB
 FAO : D SUTCH

REPORT OF TESTS ON WATER PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference MW1/WS
 Ceram Sample(s) 602013218

Date Reported 29-Jul-02 Order/Job No 1782/2002
 Date Received 22-Jul-02 Date(s) of Test(s) 24/29-Jul-02

DETERMINATION OF TOTAL METALS

Lead (Pb)	0.27
Cadmium (Cd)	<0.01
Zinc (Zn)	0.16
Nickel (Ni)	0.08
Copper (Cu)	0.13
Chromium (Cr)	0.07
Arsenic (As)	<0.05
Mercury (Hg)	<1
Selenium (Se)	<1
Boron (B)	0.05

Results are quoted as mg/l.

Metals were determined by using Method 24 except for Hg and Se which were determined using Method C54.

End of Test Report

Page No. 1 of 1

KM Johnson
 Dr KM Johnson
 Authorised Signatory





YOUR PARTNER IN MATERIALS AND TECHNOLOGY

CERAM

Queens Road Penkhull
Stoke-on-Trent ST4 7LQ
Tel: +44 (0) 1782 764444
Fax: +44 (0) 1782 412331
E-mail: info@ceram.com
<http://www.ceram.com>

TEST REPORT

GEODELFT ENVIRONMENTAL
3 CHAPEL STREET
CONGLETON
CHESHIRE
CW12 4AB
FAO : D SUTCH

REPORT OF TESTS ON WATER PROJECT C1945 (KNOWSLEY IND PARK)

Your Reference MW1/WS
Ceram Sample(s) 602013218

Date Reported 26-Jul-02 Order/Job No 1782/2002
Date Received 22-Jul-02 Date(s) of Test(s) 23/25-Jul-02

ANALYSIS

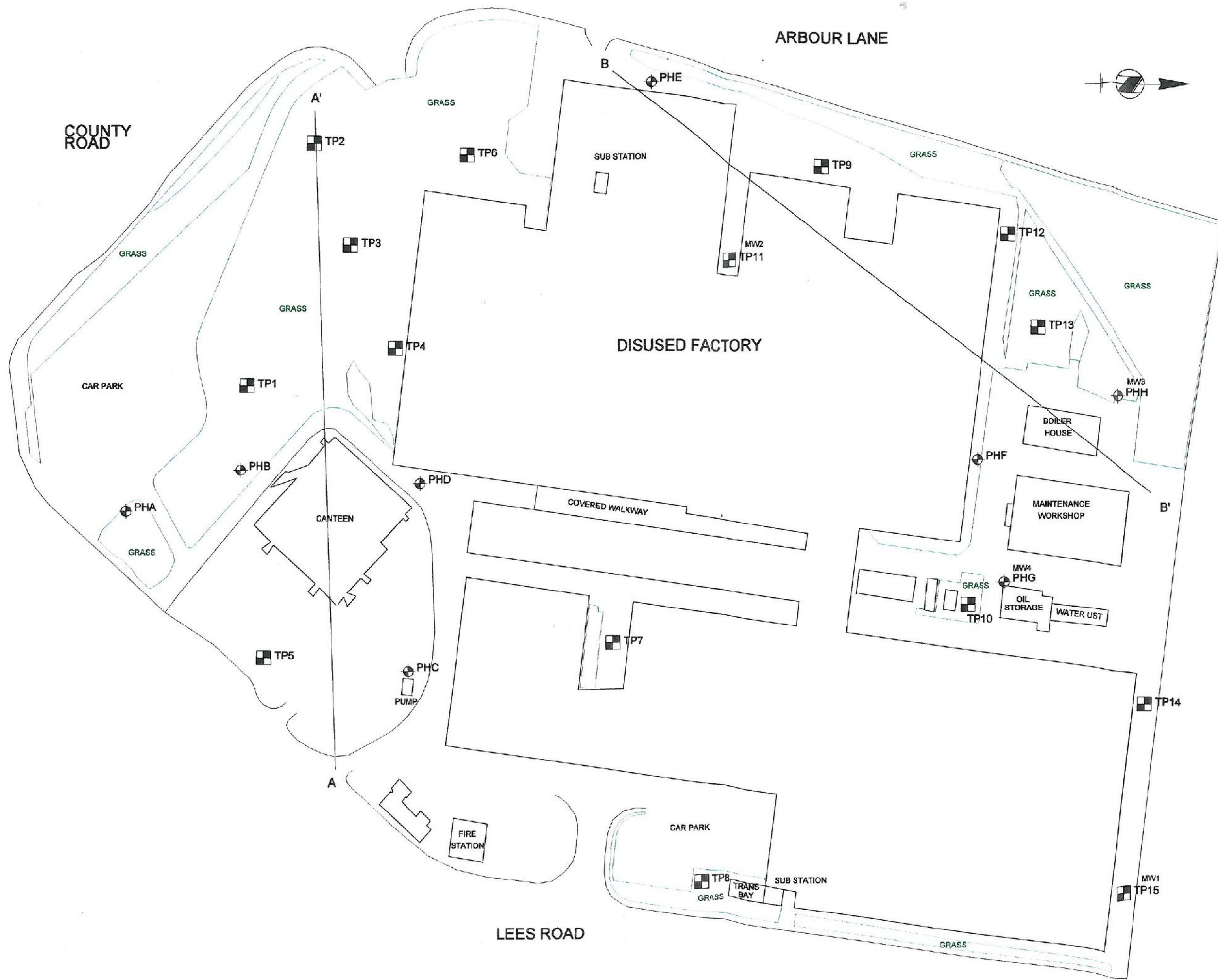
Please find attached the results for the samples recently submitted for analysis.

Tests marked with an asterisk are not UKAS Accredited. Tests marked not UKAS Accredited are not included in the UKAS Accreditation schedule for our laboratory.

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

D. C. Poole
DC Poole
Authorised Signatory





Key						
TP1	Trial Pit Location					
PHF	Probehole Location					
MW1	Monitoring Well Installed					
A — A'	Line of Section					

© 2002 D G Environmental Ltd						
REV	DESCRIPTION	SURVEYED	DRAWN	CHKD	APPRD	DATE
A	Initial Issue		AMC SHF			17/07/02 19/07/02

TITLE	
Site Plan Showing Trial Pit and Probehole Locations Excavated at Knowsley Retail and Business Park, Lees Rd, Knowsley, Liverpool	

CLIENT
Clancy Consulting

GeoDelft
Environmental

Registered Name & Office:
DG environmental Ltd
Black Lion Court
High Street
Congleton
Cheshire CW12 1WL

Telephone :- (01260) - 299495
Telefax :- (01260) - 299836

DRG. No. C1945/1	Not To Scale
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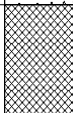
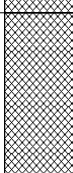
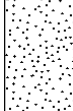
APPENDIX 05 - EXPLORATORY HOLE RECORDS

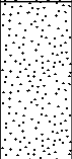
Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 1	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client		Job Number 15-1212	
		Location		Dates 02/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
					(0.24) 0.24	MADE GROUND : concrete			
					Complete at 0.24m				
Remarks Obstruction at 0.24m Core through concrete hardstanding Excavating from 0.70m.						Scale (approx)		Logged By	
						1:50		Dr J Crook	
						Figure No. 15-1212.WS 2			

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 2	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client		Job Number 15-1212	
		Location		Dates 02/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.30	D				(0.22) 0.22	MADE GROUND : concrete			
						MADE GROUND : medium dense brown gravel, broken brick and sandstone fill			
					(1.23)				
1.00-1.45	SPT(C) N=23		12,9/8,6,4,5						
1.00-1.45	D								
1.50	D				1.45 (0.25)	MADE GROUND : red / brown fine sand and broken sandstone fill			
1.80	D				1.70				
2.00-2.45	SPT(C) N=12		2,2/3,4,3,2			MADE GROUND : medium dense black sand and soil fill			
2.00-2.45	D				(0.90)				
					2.60 (0.30)	Soft / firm to firm grey CLAY			
2.70	D				2.90				
3.00-3.45	SPT(C) N=27		3,6/5,6,7,9			Medium dense to very dense brown medium SAND with fragments of very weak poorly cemented sandstone			
3.00-3.45	D				(0.90)				
3.50-3.80	SPT(C) 50/150		10,12/25,25						
3.50-3.80	D				3.80	Complete at 3.80m			
Remarks Core through concrete hardstanding							Scale (approx)	Logged By	
							1:50	Dr J Crook	
							Figure No. 15-1212.WS 2		

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 3	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client		Job Number 15-1212	
		Location		Dates 03/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.50	D				(0.16) 0.16	MADE GROUND : concrete			
						MADE GROUND : medium dense clay and brick fill			
1.00-1.45 1.00-1.45	SPT(C) N=11 D		3,3/3,3,2,3		(1.34)				
1.50	D				1.50	MADE GROUND : firm grey / brown sandy gravelly clay fill			
2.00-2.45 2.00	SPT(C) N=17 d		2,2/3,3,5,6		(0.70)				
2.50	D				2.20 (0.40)	MADE GROUND : brown sand / soil fill with ash and fragments of broken brick			
3.00-3.45 3.00-3.45	SPT(C) N=35 D		6,7/7,9,8,11		2.60 (0.85)	Dense brown medium SAND with pieces of very weak poorly cemented sandstone			
					3.45	Complete at 3.45m			
Remarks Core through concrete hardstanding Excavating from 0.70m.							Scale (approx)	Logged By	
							1:50	Dr J Crook	
							Figure No. 15-1212.WS 2		

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 4	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client		Job Number 15-1212	
		Location		Dates 02/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.30	D		1,1/1,1,1,1		(0.22)	MADE GROUND : concrete			
					0.22	MADE GROUND : brown soil, sand, gravel and broken brick fill			
					(0.28)				
					0.50	MADE GROUND : very loose brown fine / medium soil fill			
					(0.80)				
1.00-1.45	SPT(C) N=4								
1.00-1.45	D				1.30	MADE GROUND : black soil fill			
1.50	D				(0.60)				
					1.90	Loose grey / yellow fine SAND			
2.00-2.45	SPT(C) N=6		1,0/1,2,1,2		(0.30)	Very dense grey fine SAND with pieces of very weak poorly cemented sandstone			
2.00-2.45	D				2.20				
					(1.25)				
3.00-3.70	SPT(C) 50/550		5,10/14,25,11						
3.00	D				3.45	Complete at 3.45m			
Remarks Core through concrete hardstanding Excavating from 0.70m.							Scale (approx)	Logged By	
							1:50	Dr J Crook	
							Figure No. 15-1212.WS 2		

Geo-Ventures (UK) Limited <i>Geotechnical and Environmental Services</i>						Site Academy Business Park, Knowsley		Number WS 5			
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client			Job Number 15-1212		
		Location		Dates 03/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited			Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description			Legend	Water	
0.30	D				(0.21)	MADE GROUND : concrete					
					0.21	MADE GROUND : brown clay, soil and broken brick fill					
					(0.79)						
1.00-1.45	SPT(C) N=18		5,6/5,4,4,5		1.00	MADE GROUND : medium dense brown soil, sand and broken brick fill					
1.00-1.45	D										
1.50	D				(1.10)						
2.00-2.45	SPT(C) N=24		8,6/6,6,6,6		2.10	MADE GROUND : black soil fill					
2.00-2.45	D										
2.20	D				(0.20)	Firm grey / brown very sandy CLAY					
					2.40	Very dense red / brown medium SAND with fragments of very weak poorly cemented sandstone					
3.00-3.25	SPT(C) 14/100		5,11/14		(0.85)						
3.00-3.45	D										
					3.25	Complete at 3.25m					
Remarks Core through concrete hardstanding Excavating from 0.70m.										Scale (approx) 1:50	Logged By Dr J Crook
										Figure No. 15-1212.WS 2	

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 6	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client		Job Number 15-1212	
		Location		Dates 03/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.40	D				(0.20) 0.20	MADE GROUND : concrete			
					0.20 (0.80)	MADE GROUND : brown / black soil and broken brick fill			
1.00-1.45 1.00 1.00-1.45 1.20 1.50	SPT(C) N=21 D D D D		2,2/3,4,5,9		1.00 (0.40) 1.40	Medium dense red / brown medium SAND			
					(1.05)	Very dense red / brown medium SAND with pieces of very weak poorly cemented sandstone			
2.00-2.37 2.00-2.45	SPT(C) 53/220 D		5,5/20,22,11		2.45	Complete at 2.45m			
Remarks Core through concrete hardstanding Excavating from 0.70m.							Scale (approx) 1:50	Logged By Dr J Crook	
							Figure No. 15-1212.WS 2		

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 6A	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client		Job Number 15-1212	
		Location		Dates 03/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40	D				(0.30)	MADE GROUND : concrete			
					0.30	MADE GROUND : broken brick fill			
					(0.50)				
					0.80	Complete at 0.80m			
Remarks Core through concrete hardstanding Excavating from 0.70m.						Scale (approx) 1:50		Logged By Dr J Crook	
						Figure No. 15-1212.WS 2			

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 7		
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client			Job Number 15-1212	
		Location		Dates 02/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited			Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description			Legend	Water
0.10	D				(0.50)	MADE GROUND : grey / black sandy fine / medium angular gravel fill				
0.60	D				0.50 (0.20)	MADE GROUND : brown / black soil fill with rootlets				
0.80	D				0.70 (0.30)	MADE GROUND : brown / black soil / sand fill with pieces of broken sandstone				
1.00-1.45	SPT(C) N=10		3,4/3,2,3,2		1.00	MADE GROUND : loose brown / black soil / sand fill				
1.00-1.45	D				(0.50)					
1.60	D				1.50 (0.20)	Firm red / brown very sandy CLAY				
1.80	D				1.70	Medium dense grey / red / brown fine / medium SAND				
2.00-2.45	SPT(C) N=17		3,3/4,4,5,4		(0.75)					
2.00-2.45	D				2.45	Complete at 2.45m				
Remarks Excavating from 0.70m.									Scale (approx) 1:50	Logged By Dr J Crook
									Figure No. 15-1212.WS 2	

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 8	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client		Job Number 15-1212	
		Location		Dates 02/07/2015		Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.10 0.30	D D				(0.20) 0.20 (0.30) 0.50	Brown gravelly TOPSOIL Yellow / brown medium SAND with pieces of very weak poorly cemented sandstone Complete at 0.50m			
Remarks Excavating from 0.70m.								Scale (approx) 1:50	Logged By Dr J Crook
								Figure No. 15-1212.WS 2	

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley		Number WS 9	
Excavation Method Drive-in Window Sampler		Dimensions		Ground Level (mOD)		Client Wright Mottershaw Lydon Consulting Limited		Job Number 15-1212	
		Location		Dates 03/07/2015				Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
1.00-1.45 1.00	SPT(C) N=13 D		2,2/3,4,3,3		(0.16) 0.16 (1.29) 1.45	MADE GROUND : concrete MADE GROUND : compact stone and brick fill Complete at 1.45m			
Remarks Core through concrete hardstanding Unable to advance borehole beyond 1.10m, obstruction							Scale (approx)		Logged By
							1:50		Dr J Crook
							Figure No.		15-1212.WS 2

		Project Title: Lees Road, Knowsley				WS10	
		Project Number: 6483G		Client: Orbit Developments			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 21/07/2015		Method:		Driller: Geo-Ventures (UK) Ltd		Logged By: TPB	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
		SPT N=2			0.21	CONCRETE		
			0.40		Brown and grey, sandy, subangular, fine to coarse GRAVEL including brick, ash and sandstone. (MADE GROUND)			
		SPT N=21			1.20	Brown, slightly silty, slightly gravelly SAND. Gravel is subangular, fine to coarse, including sandstone and clinker. (MADE GROUND)		
			1.80		Dark grey, silty fine to coarse SAND with rare organic flecks. (SHIRDLEY HILL SAND FORMATION)			
		SPT N=50			2.20	Medium dense, yellow brown, slightly silty, fine to medium SAND. (SHIRDLEY HILL SAND FORMATION)		
			3.45		Dense, red brown, slightly gravelly, fine to coarse SAND. Gravel is subangular, fine to coarse, including weakly cemented sandstone. (WEATHERED SHERWOOD SANDSTONE)			
						End Of Borehole At 3.45 m		

KEY

D - Disturbed Sample
 B - Bulk Sample
 U - Undisturbed
 W - Water Sample
 S - Standard Penetration Test
 C - Cone Penetration Test
 N - Penetration Test 'N' Value
 V - Hand Shear Vane kPa
 - Groundwater Strike
 - Groundwater Level

REMARKS

Scale: 1:25

Water Strikes					
Date	Strike	Level	Minutes	Casing	Sealed
22/07/2015	2.9				

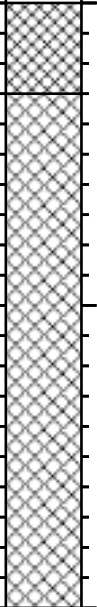
Daily Log Of Depths			Chiselling		
Date	Casing	Water	From	To	Hours

Geo-Ventures (UK) Limited <i>Geotechnical and Environmental Services</i>							Standard Penetration Test Results					
Site : Academy Business Park, Knowsley												Job Number 15-1212
Client :												Sheet
Engineer: Wright Mottershaw Lydon Consulting Limited												1 / 1
Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
WS 2	1.00	1.15	1.45	CPT	12	9	8	6	4	5	N=23	Refusal
WS 2	2.00	2.15	2.45	CPT	2	2	3	4	3	2	N=12	
WS 2	3.00	3.15	3.45	CPT	3	6	5	6	7	9	N=27	
WS 2	3.50	3.65	3.80	CPT	10	12	25	25			50/150mm	
WS 3	1.00	1.15	1.45	CPT	3	3	3	3	2	3	N=11	
WS 3	2.00	2.15	2.45	CPT	2	2	3	3	5	6	N=17	
WS 3	3.00	3.15	3.45	CPT	6	7	7	9	8	11	N=35	
WS 4	1.00	1.15	1.45	CPT	1	1	1	1	1	1	N=4	Refusal
WS 4	2.00	2.15	2.45	CPT	1	0	1	2	1	2	N=6	
WS 4	3.00	3.15	3.70	CPT	5	10	14	25	11		50/550mm	
WS 5	1.00	1.15	1.45	CPT	5	6	5	4	4	5	N=18	
WS 5	2.00	2.15	2.45	CPT	8	6	6	6	6	6	N=24	
WS 5	3.00	3.15	3.25	CPT	5	11	14				14/100mm	
WS 6	1.00	1.15	1.45	CPT	2	2	3	4	5	9	N=21	Refusal
WS 6	2.00	2.15	2.37	CPT	5	5	20	22	11		53/220mm	
WS 7	1.00	1.15	1.45	CPT	3	4	3	2	3	2	N=10	
WS 7	2.00	2.15	2.45	CPT	3	3	4	4	5	4	N=17	
WS 9	1.00	1.15	1.45	CPT	2	2	3	4	3	3	N=13	

[illegible]

[illegible]

Geo-Ventures (UK) Limited Geotechnical and Environmental Services						Site Academy Business Park, Knowsley				Borehole Number WS 9					
Installation Type Single Installation			Dimensions Internal Diameter of Tube [A] = 35 mm Diameter of Filter Zone = 70 mm			Client				Job Number 15-1212					
			Location		Ground Level (mOD)					Engineer Wright Mottershaw Lydon Consulting Limited		Sheet 1/1			
Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling									
 	 	 	0.10	Concrete	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)	
					5 min	10 min	15 min	20 min							
				Bentonite Seal	Groundwater Observations During Drilling										
					Date	Start of Shift					End of Shift				
				Time		Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	
				0.50											
				Well Screen	Instrument Groundwater Observations										
					Inst. [A] Type : Slotted Standpipe										
				1.10	Date	Instrument [A]			Remarks						
Time	Depth (m)	Level (mOD)													
Remarks															

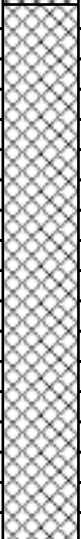
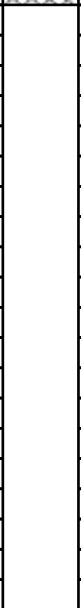
			Project Title: Lees Road, Knowsley				T1																											
			Project Number: 6483G		Client: Orbit Developments						Sheet 1 Of 1																							
			GL (mAOD):		N Coord: 0		E Coord: 0																											
Date: 03/07/2015			Method: Window Sample		Driller: Geo-Ventures (UK) Ltd		Logged By: TPB																											
Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe																										
					0.30	CONCRETE.																												
						Grey, slightly sandy, subangular, fine to coarse GRAVEL including sandstone. (MADE GROUND)																												
					2.00	End Of Borehole At 2.00 m																												
KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level			REMARKS No Groundwater Encountered 			Water Strikes <table border="1"> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>					Date	Strike	Level	Minutes	Casing	Sealed																		
Date	Strike	Level	Minutes	Casing	Sealed																													
			Scale: 1:25			Daily Log Of Depths Chiselling <table border="1"> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>					Date	Casing	Water	From	To	Hours																		
Date	Casing	Water	From	To	Hours																													

			Project Title: Lees Road, Knowsley				T4	
			Project Number: 6483G		Client: Orbit Developments			
			GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 03/07/2015			Method: Window Sample		Driller: Geo-Ventures (UK) Ltd		Logged By: TPB	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.30	CONCRETE with rebar.		
						VOID. (WATER TANK)		
					3.20	End Of Borehole At 3.20 m		

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa - Groundwater Strike - Groundwater Level	REMARKS 	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="6">Water Strikes</th> </tr> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> <tr> <td>22/07/2015</td> <td>0.57</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">Daily Log Of Depths</th> <th colspan="3">Chiselling</th> </tr> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	Water Strikes						Date	Strike	Level	Minutes	Casing	Sealed	22/07/2015	0.57																	Daily Log Of Depths			Chiselling			Date	Casing	Water	From	To	Hours												
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22/07/2015	0.57																																																							
Daily Log Of Depths			Chiselling																																																					
Date	Casing	Water	From	To	Hours																																																			

Scale: 1:25

			Project Title: Lees Road, Knowsley				T5																																		
			Project Number: 6483G		Client: Orbit Developments					Sheet 1 Of 1																															
			GL (mAOD):		N Coord: 0		E Coord: 0																																		
Date: 21/07/2015			Method: Window Sample		Driller: Geo-Ventures (UK) Ltd		Logged By: TPB																																		
Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe																																	
					0.22	CONCRETE.																																			
						Grey, slightly sandy, subangular, fine to coarse GRAVEL including sandstone. (MADE GROUND)																																			
					2.00	End Of Borehole At 2.00 m																																			
KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level			REMARKS No Groundwater Encountered 			Water Strikes <table border="1"> <thead> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>			Date	Strike	Level	Minutes	Casing	Sealed																											
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Date	Casing	Water	From	To	Hours																																				
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Scale: 1:25

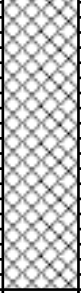
WML CONSULTING	Project Title: Lees Road, Knowsley		TP1
	Project Number: 6483G	Client: Orbit Developments	Sheet 1 Of 1
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
						Grey, angular to subangular, fine to coarse GRAVEL and COBBLES including brick, masonry and wood. (MADE GROUND)	▼
					2.80	End Of Trial Pit At 2.80 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa						REMARKS Hole located within water tank. Top of tank at 0.50mbgl.	

WML CONSULTING	Project Title: Lees Road, Knowsley		TP1A
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.50	J				0.25	Grass over dark brown, slightly silty, slightly gravelly SAND. Gravel is subangular, fine to coarse, including brick. (MADE GROUND)	
					2.20	Brown and grey, sandy, angular to subangular, fine to coarse GRAVEL including brick, sandstone and concrete. High cobble content. Cobbles are subangular, including concrete. (MADE GROUND)	
						End Of Trial Pit At 2.20 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level 						REMARKS No Groundwater Encountered Hole located along outside wall of water tank.	

WML CONSULTING	Project Title: Lees Road, Knowsley		TP2
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.40	J	V=46, 54, 42 kPa			0.65	Grass over dark brown, slightly silty, slightly gravelly SAND. Gravel is subangular, fine to coarse, including brick. (MADE GROUND)	
0.80	J				1.10	Orange brown and grey, slightly clayey, gravelly SAND. Gravel is subangular, fine to coarse, including brick, sandstone and concrete. (MADE GROUND)	
					2.30	Orange brown and grey, slightly silty, fine to medium SAND. (SHIRDLEY HILL SAND FORMATION)	
2.40	J				2.70	Firm, grey, slightly sandy, silty CLAY. (SHIRDLEY HILL SAND FORMATION)	
					3.30	Yellow grey, slightly silty, gravelly, fine to coarse SAND. Gravel is subangular fine to coarse including sandstone. (WEATHERED SHERWOOD SANDSTONE)	
						End Of Trial Pit At 3.30 m	▼
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level 						REMARKS	

WML CONSULTING	Project Title: Lees Road, Knowsley		TP3
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.30	J				0.50	Orange brown, slightly silty, gravelly SAND. Gravel is angular to subangular, fine to coarse, including brick, concrete, glass and metal. (MADE GROUND)	
0.70	J				0.90	Dark grey SAND and subangular, fine to coarse GRAVEL including brick, ash and clinker. Slight hydrocarbon aroma. (MADE GROUND)	
1.50	J				1.20	Dark brown, slightly silty, fine to medium SAND. (SHIRDLEY HILL SAND FORMATION)	
					2.20	Orange brown and grey, slightly silty, fine to medium SAND. (SHIRDLEY HILL SAND FORMATION)	
					2.30	Firm, grey, silty, sandy CLAY. (SHIRDLEY HILL SAND FORMATION)	
						Orange grey, slightly silty, fine to coarse SAND. (SHIRDLEY HILL SAND FORMATION)	▼
					3.50	End Of Trial Pit At 3.50 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa ▼ - Groundwater Strike ▼ - Groundwater Level						REMARKS	



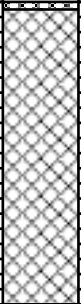
WML CONSULTING	Project Title: Lees Road, Knowsley		TP4
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.30	J					Brown, slightly silty, gravelly SAND. Gravel is angular to subangular, fine to coarse, including brick, concrete, sandstone and metal. (MADE GROUND)	
1.20	J				1.10	Dark brown grey, slightly clayey, gravelly SAND. Gravel is angular to subangular, fine to coarse, including brick, sandstone, concrete and ash. (MADE GROUND)	
					2.40	Brown and grey, slightly silty, fine to medium SAND. (SHIRDLEY HILL SAND FORMATION)	
3.00	J				3.70	End Of Trial Pit At 3.70 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa - Groundwater Strike - Groundwater Level 						REMARKS No Groundwater Encountered	

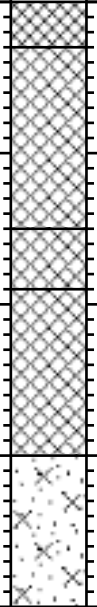
	Project Title: Lees Road, Knowsley		TP5
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.50	J				0.05	Grass over dark brown, slightly silty, slightly gravelly SAND. Gravel is angular to subangular, fine to coarse, including brick. (MADE GROUND)	
1.50	J				2.00	Brown and grey, sandy, subangular, fine to coarse GRAVEL and COBBLES including brick, slate, concrete, metal and sandstone. High boulder content. Boulders are subangular, including sandstone and concrete. (MADE GROUND)	
						End Of Trial Pit At 2.00 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level 						REMARKS No Groundwater Encountered	

	Project Title: Lees Road, Knowsley		TP6
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.40	J				0.30	Grass over grey, subangular, medium to coarse GRAVEL including limestone. (MADE GROUND)	
						Brown, gravelly SAND. Gravel is subangular, fine to coarse, including sandstone, brick, and ash. (MADE GROUND)	
1.60	J				1.50		
					1.90	Dark brown, slightly gravelly SAND. Gravel is subangular, fine to coarse, including sandstone, brick and ash. (MADE GROUND)	
2.10	J					Brown, gravelly SAND. Gravel is subangular, fine to coarse, including ash and clinker. (MADE GROUND)	
					3.00		
						Brown and grey, slightly silty, fine to coarse SAND. (SHIRDLEY HILL SAND FORMATION)	
					4.00		
						End Of Trial Pit At 4.00 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level 						REMARKS No Groundwater Encountered	

WML CONSULTING	Project Title: Lees Road, Knowsley		TP7A
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.20	J					Brown and grey, slightly silty, gravelly SAND. Gravel is angular to subangular, fine to coarse, including brick, concrete, metal and plastic. (MADE GROUND)	
0.90	J				0.70		
					1.70	Orange brown, slightly gravelly SAND. Gravel is subangular, fine to coarse, including brick, plastic, sandstone and metal. (MADE GROUND)	
						End Of Trial Pit At 1.70 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa - Groundwater Strike - Groundwater Level						REMARKS No Groundwater Encountered Concrete slab encountered at 1.70mbgl.	

WML CONSULTING	Project Title: Lees Road, Knowsley		TP8
	Project Number: 6483G	Client: Orbit Developments	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 01/07/2015	Method: Backhoe Loader	Logged By: TPB	Scale: 1:50



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.20	J	V=55, 62, 52 kPa			0.50	Brown grey, slightly silty, gravelly SAND. Gravel is angular to subangular, fine to coarse, including brick, sandstone and concrete. (MADE GROUND)	
0.70	J					Brown grey SAND and angular to subangular, fine to coarse GRAVEL including brick, concrete, metal, sandstone and slate. Medium cobble content. Cobbles are subangular, including brick and concrete. (MADE GROUND)	
1.70	J				1.60	Dark grey, white and orange brown stained, slightly silty SAND and angular to subangular, fine to coarse GRAVEL including ash, clinker, metal nails and brick. (MADE GROUND)	
					2.50	Orange brown and grey, slightly silty, fine to coarse SAND. (SHIRDLEY HILL SAND FORMATION)	
					3.10	Firm, grey, slightly sandy, silty CLAY. (SHIRDLEY HILL SAND FORMATION)	
3.60	J				3.30	Yellow grey, slightly gravelly, fine to coarse SAND. Gravel is subangular, fine to coarse, including sandstone. (WEATHERED SHERWOOD SANDSTONE)	
					3.70	End Of Trial Pit At 3.70 m	
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa ▽ - Groundwater Strike ▼ - Groundwater Level 						REMARKS No Groundwater Encountered	

APPENDIX 06 - GEOTECHNICAL TESTING RESULTS



LABORATORY REPORT



4043

Contract Number: PSL15/3335

Client's Reference:

Report Date: 22 July 2015

Client Name: WML Consulting
No 8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

For the attention of: Sam Seddon

Contract Title: Lees Road, Knowsley

Date Received: 8/7/2015

Date Commenced: 8/7/2015

Date Completed: 22/7/2015

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

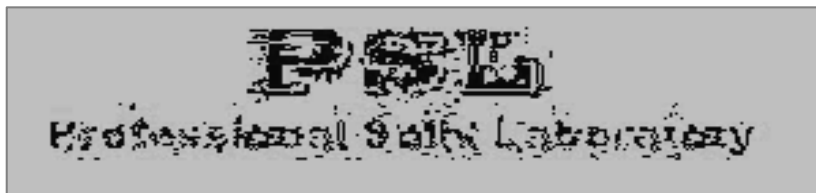
A Watkins
(Director)

M Beastall
(Laboratory Manager)

D Lambe
(Senior Technician)

S Royle
(Senior Technician)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Compiled by	Date	Checked by	Date	Approved by	Date
	22/07/15		22/07/15		22/07/15
LEES ROAD, KNOWSLEY.				Contract No:	PSL15/3335
				Client Ref:	6483G

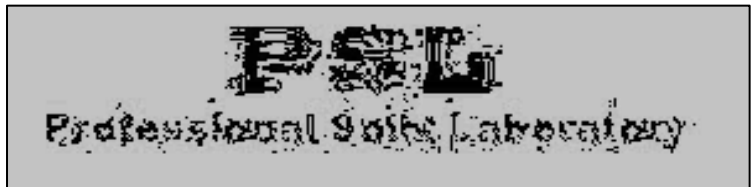
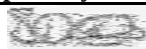
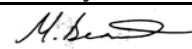
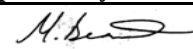
SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m ³ Clause 7.2	Dry Density Mg/m ³ Clause 7.2	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WS2		D	2.70	19				32	16	16	90	Low plasticity CL.
WS3		D	1.50	15				39	21	18	80	Intermediate plasticity CI.
WS4		D	1.50	23				33	19	14	91	Low plasticity CL.
WS5		D	0.30	13					NP			
WS6		D	0.40	13								
WS7		D	0.60	15								

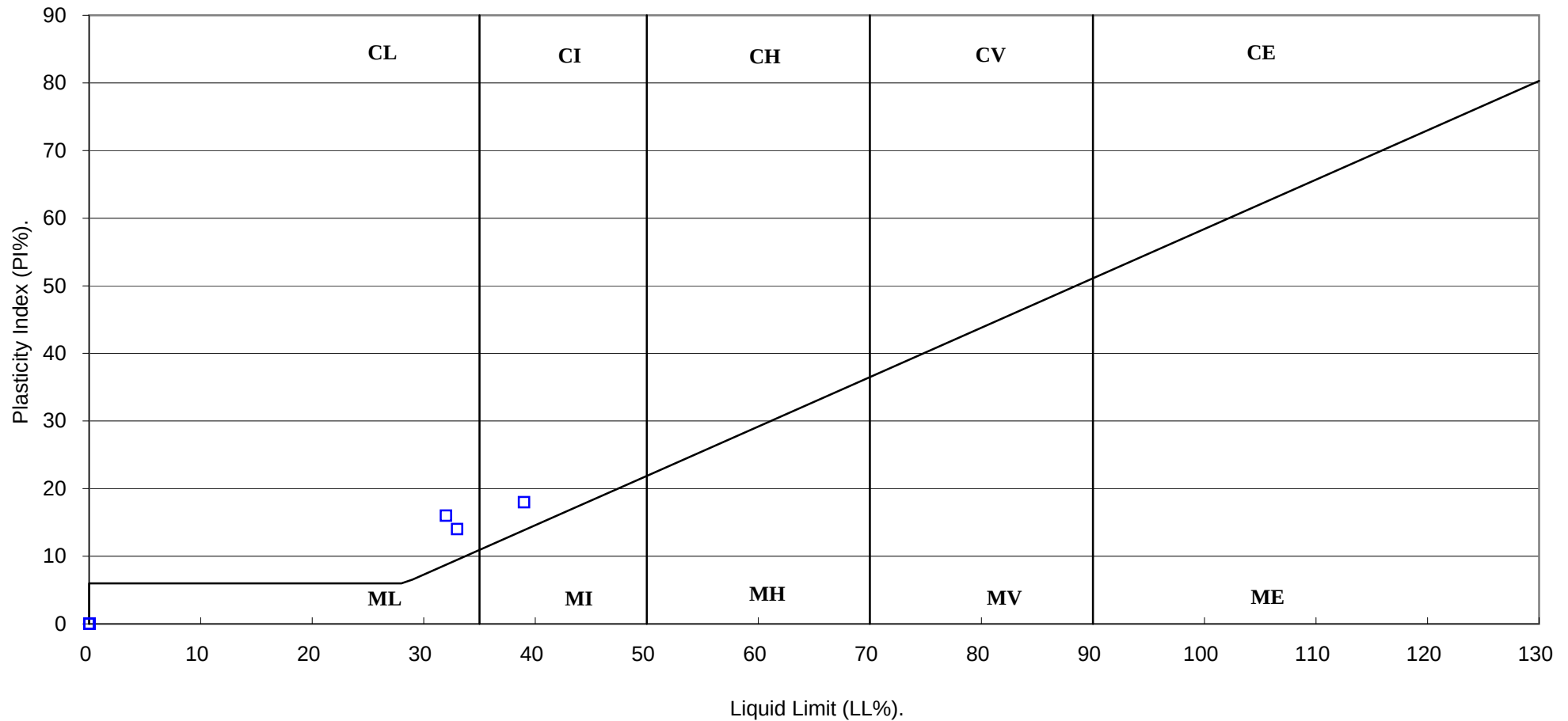
SYMBOLS : NP : Non Plastic

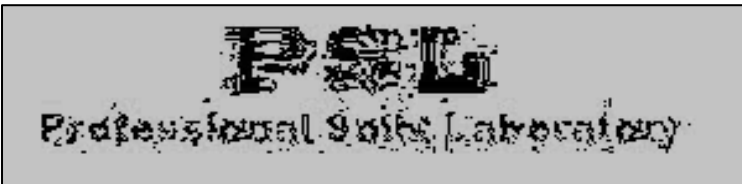
* : Liquid Limit and Plastic Limit Wet Sieved.

	Compiled by	Date	Checked by	Date	Approved by	Date
		22/07/15		22/07/15		22/07/15
	LEES ROAD, KNOWSLEY.					Contract No: PSL15/3335
						Client Ref: 6483G

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



	Compiled by	Date	Checked by	Date	Approved by	Date
		22/07/15		22/07/15		22/07/15
	LEES ROAD, KNOWSLEY.				Contract No: PSL15/3335	
					Client Ref: 6483G	

APPENDIX 07 - CHEMICAL ANALYTICAL RESULTS



Scientific Analysis Laboratories Ltd

Certificate of Analysis

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

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

Report Number: 487761-1

Date of Report: 29-Jun-2015

Customer: WML Consulting Ltd
8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

Customer Contact: Mr Peter Davies

Customer Job Reference: 6483G

Customer Purchase Order: 6483G

Customer Site Reference: Lees Road, Knowsley

Date Job Received at SAL: 22-Jun-2015

Date Analysis Started: 23-Jun-2015

Date Analysis Completed: 29-Jun-2015

The results reported relate to samples received in the laboratory
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



1549

Report checked
and authorised by :
Emma Spear
Project Management

Issued by :
Emma Spear
Project Management



Scientific Analysis Laboratories Ltd

Certificate of Analysis

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

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

Report Number: 491348-2

Date of Report: 16-Jul-2015

Customer: WML Consulting Ltd
8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

Customer Contact: Ms Sam Seddon

Customer Job Reference: 6483G
Customer Purchase Order: 6483G
Customer Site Reference: Lees Road
Date Job Received at SAL: 03-Jul-2015
Date Analysis Started: 07-Jul-2015
Date Analysis Completed: 16-Jul-2015

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



1549

Report checked
and authorised by :
Emma Spear
Project Manager

Issued by :
Emma Spear
Project Manager

SAL Reference: 491348 Project Site: Lees Road Customer Reference: 6483G Soil Analysed as Soil WML Basic Suite										
SAL Reference					491348 001	491348 002	491348 006	491348 008	491348 010	491348 011
Customer Sample Reference					TP01A	TP02	TP04	TP05	TP06	TP07
Date Sampled					06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015
Bottom Depth					0.50	0.40	0.30	0.50	2.10	0.20
Determinand	Method	Test Sample	LOD	Units						
Arsenic	T6	AR	1	mg/kg	10	24	8	15	25	6
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1
Cadmium	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1
Copper	T6	AR	1	mg/kg	48	100	18	28	74	24
Lead	T6	AR	1	mg/kg	87	260	72	300	77	46
Mercury	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1
Nickel	T6	AR	1	mg/kg	19	27	10	10	50	11
Selenium	T6	AR	3	mg/kg	<3	<3	<3	<3	<3	<3
Vanadium	T6	AR	1	mg/kg	28	34	18	21	56	12
Zinc	T6	AR	1	mg/kg	120	170	72	200	100	63
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1
SO4(2:1)	T6	AR	100	mg/l	<100	<100	<100	<100	<100	<100
Sulphur (total)	T6	AR	0.01	%	0.03	0.03	0.02	0.05	0.09	0.05
pH	T7	AR			8.5	7.2	8.4	8.4	7.0	10.1
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1	<1
Soil Organic Matter	T287	AR	0.1	%	2.2	6.4	2.0	2.4	7.8	1.9

SAL Reference: 491348 Project Site: Lees Road Customer Reference: 6483G Soil Analysed as Soil Miscellaneous										
SAL Reference					491348 001	491348 002	491348 003	491348 005	491348 006	
Customer Sample Reference					TP01A	TP02	TP02	TP03	TP04	
Date Sampled					06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	
Bottom Depth					0.50	0.40	2.40	1.50	0.30	
Determinand	Method	Test Sample	LOD	Units						
Asbestos ID	T27	AR			N.D.	N.D.	-	-	N.D.	
SO4(2:1)	T6	AR	100	mg/l	<100	<100	<100	<100	<100	
pH	T7	AR			8.5	7.2	6.3	7.2	8.4	

SAL Reference: 491348 Project Site: Lees Road Customer Reference: 6483G Soil Analysed as Soil Miscellaneous										
SAL Reference					491348 007	491348 008	491348 010	491348 011	491348 012	
Customer Sample Reference					TP04	TP05	TP06	TP07	TP08	
Date Sampled					06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	
Bottom Depth					3.00	0.50	2.10	0.20	3.60	
Determinand	Method	Test Sample	LOD	Units						
Asbestos ID	T27	AR			-	N.D.	-	N.D.	-	
SO4(2:1)	T6	AR	100	mg/l	<100	<100	<100	<100	<100	
pH	T7	AR			7.3	8.4	7.0	10.1	8.3	

SAL Reference: 491348 Project Site: Lees Road Customer Reference: 6483G Soil Analysed as Soil Semi-Volatile Organic Compounds (USEPA 625)					
SAL Reference					491348 004
Customer Sample Reference					TP03
Date Sampled					06-JUL-2015
Bottom Depth					0.70
Determinand	Method	Test Sample	LOD	Units	
1,2,4-Trichlorobenzene	T16	AR	0.1	mg/kg	<0.1
1,2-Dichlorobenzene	T16	AR	0.1	mg/kg	<0.1
1,3-Dichlorobenzene	T16	AR	0.1	mg/kg	<0.1
1,4-Dichlorobenzene	T16	AR	0.1	mg/kg	<0.1
2,4,5-Trichlorophenol	T16	AR	0.1	mg/kg	<0.1
2,4,6-Trichlorophenol	T16	AR	0.1	mg/kg	<0.1
2,4-Dichlorophenol	T16	AR	0.1	mg/kg	<0.1
2,4-Dimethylphenol	T16	AR	0.1	mg/kg	<0.1
2,4-Dinitrophenol	T16	AR	0.1	mg/kg	⁽³⁶⁾ <0.5
2,4-Dinitrotoluene	T16	AR	0.1	mg/kg	<0.1
2,6-Dinitrotoluene	T16	AR	0.1	mg/kg	<0.1
2-Chloronaphthalene	T16	AR	0.1	mg/kg	<0.1
2-Chlorophenol	T16	AR	0.1	mg/kg	<0.1
2-methyl phenol	T16	AR	0.1	mg/kg	<0.1
2-Methylnaphthalene	T16	AR	0.1	mg/kg	2.0
2-Nitroaniline	T16	AR	0.1	mg/kg	<0.1
2-Nitrophenol	T16	AR	0.1	mg/kg	<0.1
3-Nitroaniline	T16	AR	0.1	mg/kg	<0.1
3/4-Methylphenol	T16	AR	0.1	mg/kg	<0.1
4-Bromophenyl phenylether	T16	AR	0.1	mg/kg	<0.1
4-Chloro-3-methylphenol	T16	AR	0.1	mg/kg	<0.1
4-Chloroaniline	T16	AR	0.1	mg/kg	⁽³⁶⁾ <0.5
4-Chlorophenyl phenylether	T16	AR	0.1	mg/kg	<0.1
4-Nitroaniline	T16	AR	0.1	mg/kg	<0.1
4-Nitrophenol	T16	AR	0.1	mg/kg	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	1.5
Acenaphthylene	T16	AR	0.1	mg/kg	0.6
Anthracene	T16	AR	0.1	mg/kg	1.5
Azobenzene	T16	AR	0.1	mg/kg	<0.1
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	13
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	6.1
Benzo(b/k)Fluoranthene	T16	AR	0.1	mg/kg	8.1
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	6.9
Bis (2-chloroethoxy) methane	T16	AR	0.1	mg/kg	<0.1
Bis (2-chloroethyl) ether	T16	AR	0.1	mg/kg	<0.1
Bis (2-chloroisopropyl) ether	T16	AR	0.1	mg/kg	<0.1
Bis (2-ethylhexyl)phthalate	T16	AR	0.1	mg/kg	<0.1
Butyl benzylphthalate	T16	AR	0.1	mg/kg	<0.1
Carbazole	T16	AR	0.1	mg/kg	<0.1
Chrysene	T16	AR	0.1	mg/kg	16
Di-n-butylphthalate	T16	AR	0.1	mg/kg	<0.1
Di-n-octylphthalate	T16	AR	0.1	mg/kg	<0.1
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	2.6
Dibenzofuran	T16	AR	0.1	mg/kg	<0.1
Diethyl phthalate	T16	AR	0.1	mg/kg	<0.1
Dimethyl phthalate	T16	AR	0.1	mg/kg	<0.1
Fluoranthene	T16	AR	0.1	mg/kg	6.2
Fluorene	T16	AR	0.1	mg/kg	1.6
Hexachlorobenzene	T16	AR	0.1	mg/kg	<0.1
Hexachlorobutadiene	T16	AR	0.1	mg/kg	<0.1
Hexachlorocyclopentadiene	T16	AR	0.1	mg/kg	⁽³⁶⁾ <0.5
Hexachloroethane	T16	AR	0.1	mg/kg	<0.1
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	4.2
Isophorone	T16	AR	0.1	mg/kg	<0.1
Naphthalene	T16	AR	0.1	mg/kg	0.9
Nitrobenzene	T16	AR	0.1	mg/kg	<0.1
Pentachlorophenol	T16	AR	0.1	mg/kg	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	3.8
Phenol	T16	AR	0.1	mg/kg	<0.1

SAL Reference: 491348 Project Site: Lees Road Customer Reference: 6483G Soil Analysed as Soil Semi-Volatile Organic Compounds (USEPA 625)					
SAL Reference					491348 004
Customer Sample Reference					TP03
Date Sampled					06-JUL-2015
Bottom Depth					0.70
Determinand	Method	Test Sample	LOD	Units	
Pyrene	T16	AR	0.1	mg/kg	18

SAL Reference: 491348										
Project Site: Lees Road										
Customer Reference: 6483G										
Soil		Analysed as Soil								
Total and Speciated USEPA16 PAH										
SAL Reference					491348 001	491348 002	491348 006	491348 008	491348 010	491348 011
Customer Sample Reference					TP01A	TP02	TP04	TP05	TP06	TP07
Date Sampled					06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015	06-JUL-2015
Bottom Depth					0.50	0.40	0.30	0.50	2.10	0.20
Determinand	Method	Test Sample	LOD	Units						
Naphthalene	T149	AR	0.01	mg/kg	0.07	0.07	0.02	0.01	0.07	0.05
Acenaphthylene	T149	AR	0.01	mg/kg	<0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthene	T149	AR	0.01	mg/kg	0.01	0.12	0.01	0.02	0.02	0.08
Fluorene	T149	AR	0.01	mg/kg	0.01	0.08	0.01	0.01	0.02	0.06
Phenanthrene	T149	AR	0.01	mg/kg	0.11	0.75	0.13	0.16	0.20	0.72
Anthracene	T149	AR	0.01	mg/kg	0.02	0.14	0.04	0.05	0.04	0.22
Fluoranthene	T149	AR	0.01	mg/kg	0.16	0.94	0.37	0.32	0.28	0.91
Pyrene	T149	AR	0.01	mg/kg	0.15	0.93	0.34	0.29	0.25	0.73
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	0.09	0.54	0.21	0.18	0.13	0.36
Chrysene	T149	AR	0.01	mg/kg	0.08	0.56	0.20	0.19	0.13	0.32
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	0.18	1.1	0.52	0.36	0.27	0.64
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	0.08	0.49	0.26	0.16	0.12	0.31
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	0.05	0.26	0.15	0.09	0.07	0.14
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	0.02	0.08	0.03	0.04	0.02	0.03
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	0.06	0.34	0.18	0.11	0.09	0.16
PAH(total)	T149	AR	0.01	mg/kg	1.1	6.4	2.5	2.0	1.7	4.7

N.D.	Not Detected
13	Results have been blank corrected.
100	LOD determined by sample aliquot used for analysis
36	LOD Raised due to low Matrix spike recovery
S	Analysis was subcontracted
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Method Index

Value	Description
T373	ICP/OES (Filtered)
T16	GC/MS
T4	Colorimetry
T27	PLM
T7	Probe
T686	Discrete Analyser
T54	GC/MS (Headspace)
T281	ICP/MS (Filtered)
T287	Calc TOC/0.58
T149	GC/MS (SIR)
T6	ICP/OES
T8	GC/FID

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Arsenic	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Boron (water-soluble)	T6	AR	1	mg/kg	N	001-002,006,008,010-011
Cadmium	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Chromium VI	T6	AR	1	mg/kg	N	001-002,006,008,010-011
Copper	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Lead	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Mercury	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Nickel	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Selenium	T6	AR	3	mg/kg	U	001-002,006,008,010-011
Vanadium	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Zinc	T6	AR	1	mg/kg	U	001-002,006,008,010-011
Cyanide(Total)	T4	AR	1	mg/kg	U	001-002,006,008,010-011
SO4(2:1)	T6	AR	100	mg/l	N	001-003,005-008,010-012
Sulphur (total)	T6	AR	0.01	%	N	001-002,006,008,010-011
Phenols(Mono)	T4	AR	1	mg/kg	U	001-002,006,008,010-011
Soil Organic Matter	T287	AR	0.1	%	N	001-002,006,008,010-011
Asbestos ID	T27	AR			SU	001-002,006,008,011
pH	T7	AR			U	001-003,005-008,010-012
1,2,4-Trichlorobenzene	T16	AR	0.1	mg/kg	U	004
1,2-Dichlorobenzene	T16	AR	0.1	mg/kg	U	004
1,3-Dichlorobenzene	T16	AR	0.1	mg/kg	U	004
1,4-Dichlorobenzene	T16	AR	0.1	mg/kg	U	004
2,4,5-Trichlorophenol	T16	AR	0.1	mg/kg	U	004
2,4,6-Trichlorophenol	T16	AR	0.1	mg/kg	U	004
2,4-Dichlorophenol	T16	AR	0.1	mg/kg	U	004
2,4-Dimethylphenol	T16	AR	0.1	mg/kg	U	004
2,4-Dinitrophenol	T16	AR	0.1	mg/kg	U	004
2,4-Dinitrotoluene	T16	AR	0.1	mg/kg	U	004
2,6-Dinitrotoluene	T16	AR	0.1	mg/kg	U	004
2-Chloronaphthalene	T16	AR	0.1	mg/kg	U	004
2-Chlorophenol	T16	AR	0.1	mg/kg	U	004
2-methyl phenol	T16	AR	0.1	mg/kg	U	004
2-Methylnaphthalene	T16	AR	0.1	mg/kg	U	004
2-Nitroaniline	T16	AR	0.1	mg/kg	U	004
2-Nitrophenol	T16	AR	0.1	mg/kg	U	004
3-Nitroaniline	T16	AR	0.1	mg/kg	U	004
3/4-Methylphenol	T16	AR	0.1	mg/kg	U	004
4-Bromophenyl phenylether	T16	AR	0.1	mg/kg	U	004
4-Chloro-3-methylphenol	T16	AR	0.1	mg/kg	U	004
4-Chloroaniline	T16	AR	0.1	mg/kg	U	004
4-Chlorophenyl phenylether	T16	AR	0.1	mg/kg	U	004
4-Nitroaniline	T16	AR	0.1	mg/kg	U	004

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
4-Nitrophenol	T16	AR	0.1	mg/kg	U	004
Acenaphthene	T16	AR	0.1	mg/kg	U	004
Acenaphthylene	T16	AR	0.1	mg/kg	U	004
Anthracene	T16	AR	0.1	mg/kg	U	004
Azobenzene	T16	AR	0.1	mg/kg	U	004
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	U	004
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	U	004
Benzo(b/k)Fluoranthene	T16	AR	0.1	mg/kg	U	004
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	U	004
Bis (2-chloroethoxy) methane	T16	AR	0.1	mg/kg	U	004
Bis (2-chloroethyl) ether	T16	AR	0.1	mg/kg	U	004
Bis (2-chloroisopropyl) ether	T16	AR	0.1	mg/kg	U	004
Bis (2-ethylhexyl)phthalate	T16	AR	0.1	mg/kg	U	004
Butyl benzylphthalate	T16	AR	0.1	mg/kg	U	004
Carbazole	T16	AR	0.1	mg/kg	U	004
Chrysene	T16	AR	0.1	mg/kg	U	004
Di-n-butylphthalate	T16	AR	0.1	mg/kg	U	004
Di-n-octylphthalate	T16	AR	0.1	mg/kg	U	004
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	U	004
Dibenzofuran	T16	AR	0.1	mg/kg	U	004
Diethyl phthalate	T16	AR	0.1	mg/kg	U	004
Dimethyl phthalate	T16	AR	0.1	mg/kg	U	004
Fluoranthene	T16	AR	0.1	mg/kg	U	004
Fluorene	T16	AR	0.1	mg/kg	U	004
Hexachlorobenzene	T16	AR	0.1	mg/kg	U	004
Hexachlorobutadiene	T16	AR	0.1	mg/kg	U	004
Hexachlorocyclopentadiene	T16	AR	0.1	mg/kg	U	004
Hexachloroethane	T16	AR	0.1	mg/kg	U	004
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	U	004
Isophorone	T16	AR	0.1	mg/kg	U	004
Naphthalene	T16	AR	0.1	mg/kg	U	004
Nitrobenzene	T16	AR	0.1	mg/kg	U	004
Pentachlorophenol	T16	AR	0.1	mg/kg	U	004
Phenanthrene	T16	AR	0.1	mg/kg	U	004
Phenol	T16	AR	0.1	mg/kg	U	004
Pyrene	T16	AR	0.1	mg/kg	U	004
Naphthalene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Acenaphthylene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Acenaphthene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Fluorene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Phenanthrene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Anthracene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Fluoranthene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Pyrene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Chrysene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
PAH(total)	T149	AR	0.01	mg/kg	U	001-002,006,008,010-011
Benzene	T54	AR	1	µg/kg	U	004
Toluene	T54	AR	1	µg/kg	U	004
EthylBenzene	T54	AR	1	µg/kg	U	004
M/P Xylene	T54	AR	1	µg/kg	U	004
O Xylene	T54	AR	1	µg/kg	U	004
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	004
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	004
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	004
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	004
TPH (C10-C12 aliphatic)	T8	AR	1	mg/kg	N	004
TPH (C12-C16 aliphatic)	T8	AR	1	mg/kg	N	004
TPH (C16-C21 aliphatic)	T8	AR	1	mg/kg	N	004
TPH (C21-C35 aliphatic)	T8	AR	1	mg/kg	N	004
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	004
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	004
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	004
TPH (C10-C12 aromatic)	T8	AR	1	mg/kg	N	004
TPH (C12-C16 aromatic)	T8	AR	1	mg/kg	N	004

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
TPH (C16-C21 aromatic)	T8	AR	1	mg/kg	N	004
TPH (C21-C35 aromatic)	T8	AR	1	mg/kg	N	004
As (Dissolved)	T281	2:1-1	10	µg/l	U	009,013
Boron	T6	2:1-1	10	µg/l	N	009,013
Cd (Dissolved)	T281	2:1-1	0.02	µg/l	U	009,013
Chromium VI	T4	2:1-1	30	µg/l	N	009,013
Cu (Dissolved)	T281	2:1-1	0.5	µg/l	U	009,013
Cyanide(Total)	T4	2:1-1	50	µg/l	U	009,013
Pb (Dissolved)	T281	2:1-1	0.3	µg/l	U	009,013
Hg (Dissolved)	T281	2:1-1	0.05	µg/l	U	009,013
Ni (Dissolved)	T373	2:1-1	10	µg/l	U	009,013
Phenols(Mono)	T4	2:1-1	100	µg/l	N	009,013
Se (Dissolved)	T281	2:1-1	10	µg/l	U	009,013
Sulphate ion	T686	2:1-1	500	µg/l	U	009,013
Sulphur (total)	T6	2:1-1	50000	µg/l	N	009,013
V (Dissolved)	T281	2:1-1	2	µg/l	U	009,013
Zn (Dissolved)	T373	2:1-1	10	µg/l	U	009,013
pH	T7	2:1-1			U	009,013



SAL Reference: 487761 Project Site: Lees Road, Knowsley Customer Reference: 6483G Water Analysed as Water WML Basic Suite					
SAL Reference					487761 001
Customer Sample Reference					Water Tank
Date Sampled					18-JUN-2015
Determinand	Method	Test Sample	LOD	Units	
Cu (Dissolved)	T281	AR	0.5	µg/l	8.6
Pb (Dissolved)	T281	AR	0.3	µg/l	4.3
pH	T7	AR			8.2
V (Dissolved)	T281	AR	2	µg/l	24
Hg (Dissolved)	T281	AR	0.05	µg/l	<0.05
Sulphur (total)	T6	AR	50	mg/l	78
Zn (Dissolved)	T373	AR	0.01	mg/l	<0.01
Chromium VI	T4	AR	0.03	mg/l	<0.03
Phenols(Mono)	T4	AR	0.1	mg/l	<0.1
Se (Dissolved)	T281	AR	10	µg/l	<10
Sulphate ion	T686	AR	0.5	mg/l	190
Boron	T6	AR	0.01	mg/l	0.04
Ni (Dissolved)	T373	AR	0.01	mg/l	<0.01
As (Dissolved)	T281	AR	10	µg/l	<10
Cd (Dissolved)	T281	AR	0.02	µg/l	0.06
Cyanide(Total)	T4	AR	0.05	mg/l	<0.05

SAL Reference: 487761 Project Site: Lees Road, Knowsley Customer Reference: 6483G Water Analysed as Water Miscellaneous					
SAL Reference					487761 001
Customer Sample Reference					Water Tank
Date Sampled					18-JUN-2015
Determinand	Method	Test Sample	LOD	Units	
Ammonia expressed as NH3	T686	AR	0.05	mg/l	0.24
Biochemical Oxygen Demand	T7	AR	3	mg/l	7
Chemical Oxygen Demand	T4	AR	5	mg/l	53
PAH(total)	T149	AR	0.01	µg/l	<0.01
SO4(Total)	T6	AR	50	mg/l	230
Total Organic Carbon	T21	AR	1	mg/l	7
Total Petroleum Hydrocarbons	T81	AR	0.01	mg/l	0.11

Index to symbols used in 487761-1

Value	Description
AR	As Received
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.

Method Index

Value	Description
T21	OX/IR
T149	GC/MS (SIR)
T373	ICP/OES (Filtered)
T4	Colorimetry
T281	ICP/MS (Filtered)
T6	ICP/OES

T7	Probe
T81	GC/FID (LV)
T686	Discrete Analyser

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Ammonia expressed as NH3	T686	AR	0.05	mg/l	U	001
Biochemical Oxygen Demand	T7	AR	3	mg/l	N	001
Chemical Oxygen Demand	T4	AR	5	mg/l	N	001
PAH(total)	T149	AR	0.01	µg/l	U	001
SO4(Total)	T6	AR	50	mg/l	N	001
Total Organic Carbon	T21	AR	1	mg/l	U	001
Total Petroleum Hydrocarbons	T81	AR	0.01	mg/l	U	001
As (Dissolved)	T281	AR	10	µg/l	U	001
Boron	T6	AR	0.01	mg/l	N	001
Cd (Dissolved)	T281	AR	0.02	µg/l	U	001
Chromium VI	T4	AR	0.03	mg/l	N	001
Cu (Dissolved)	T281	AR	0.5	µg/l	U	001
Cyanide(Total)	T4	AR	0.05	mg/l	U	001
Pb (Dissolved)	T281	AR	0.3	µg/l	U	001
Hg (Dissolved)	T281	AR	0.05	µg/l	U	001
Ni (Dissolved)	T373	AR	0.01	mg/l	U	001
Phenols(Mono)	T4	AR	0.1	mg/l	N	001
Se (Dissolved)	T281	AR	10	µg/l	U	001
Sulphate ion	T686	AR	0.5	mg/l	U	001
Sulphur (total)	T6	AR	50	mg/l	N	001
V (Dissolved)	T281	AR	2	µg/l	U	001
Zn (Dissolved)	T373	AR	0.01	mg/l	U	001
pH	T7	AR			U	001

APPENDIX 08 - GAS MONITORING RESULTS

Table 1 - Site Specific Gas Risk Assessment

Monitoring Well	Date	Max Flow (l/hr)	Max CH4 (%v/v)	Max CH4 Qhg (l/hr)	Max CO2 (%v/v)	Max CO2 Qhg (l/hr)	Characteristic Situation
WS3	15/07/2015	<0.1	<0.1	0.0001	6.3	0.006	CS2
	27/07/2015	<0.1	<0.1	0.0001	1.6	0.002	CS1
	12/08/2015	<0.1	<0.1	0.0001	4.9	0.005	CS1

Monitoring Well	Date	Max Flow (l/hr)	Max CH4 (%v/v)	Max CH4 Qhg (l/hr)	Max CO2 (%v/v)	Max CO2 Qhg (l/hr)	Characteristic Situation
WS5	15/07/2015	<0.1	<0.1	0.0001	1.7	0.002	CS1
	27/07/2015	<0.1	<0.1	0.0001	0.9	0.0009	CS1
	12/08/2015	<0.1	<0.1	0.0001	2.0	0.002	CS1

Monitoring Well	Date	Max Flow (l/hr)	Max CH4 (%v/v)	Max CH4 Qhg (l/hr)	Max CO2 (%v/v)	Max CO2 Qhg (l/hr)	Characteristic Situation
WS9	15/07/2015	<0.1	<0.1	0.0001	0.5	0.0005	CS1
	27/07/2015	<0.1	<0.1	0.0001	0.7	0.0007	CS1
	12/08/2015	<0.1	<0.1	0.0001	0.9	0.0009	CS1

Note: ND = Not Detected , NI = Not Indicated, Where flows Not Detected, a value of 0.1l/hr has been assumed to calculate the Q_{hg}.

Ground Gas Monitoring Record

Borehole	Gas Flow (l/hr)	Borehole Pressure (Pa)	Methane (% v/v)		Methane (%LEL*)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Nitrogen (%v/v)		Depth to water (m bgl)	Atmospheric Pressure (mB)	Comments
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
WS 3	0.0	0	0.0				6.3		13.9		79.8		Dry	1018	
WS 5	0.0	0	0.0				1.7		19.7		78.5		Dry	1018	
WS 9	0.0	0	0.0				0.5		20.1		79.3		Dry	1018	

Notes:

Monitoring should be for not less than 3 Minutes. However, if high concentrations of gases initially recorded, monitoring should be for up to 10 mins.

* LEL = Explosive Limit = 5%v/v

ND - Not Detected

Relevant Information at times of monitoring

Monitored by: Weather : Equipment used: Visible signs of vegetation stress: Boreholes sampled for laboratory analysis: Other comments / observations:	S. Edwards / P. Platt Dry LMS Type G3 xi Gas Meter	Contract:	Academy Business Park Knowsley
		Date:	15.07.15
		Job No.	
		Sheet No.	1

Geo-Ventures (UK) Limited

70 Riverside Close, Waterside, Howley, Warrington, Cheshire WA1 2JD

Tel. 01925 240476 email: paul.platt@geoventures.co.uk

Ground Gas Monitoring Record

Borehole	Gas Flow (l/hr)	Borehole Pressure (Pa)	Methane (% v/v)		Methane (%LEL*)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Nitrogen (%v/v)		Depth to water (m bgl)	Atmospheric Pressure (mB)	Comments
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
WS 3	0.0	0	0.0				1.6		19.2		79.1		Dry	1001	
WS 5	0.0	0	0.0				0.9		20.3		78.7		Dry	1001	
WS 9	0.0	0	0.0				0.7		20.4		78.8		Dry	1001	

Notes:

Monitoring should be for not less than 3 Minutes. However, if high concentrations of gases initially recorded, monitoring should be for up to 10 mins.

* LEL = Explosive Limit = 5%v/v

ND - Not Detected

Relevant Information at times of monitoring

Monitored by: Weather : Equipment used: Visible signs of vegetation stress: Boreholes sampled for laboratory analysis: Other comments / observations:	J Crook Cloudy showers LMS Type G3 xi Gas Meter	Contract:	Academy Business Park Knowsley
		Date:	27.07.15
		Job No.	
		Sheet No.	2

Geo-Ventures (UK) Limited

70 Riverside Close, Waterside, Howley, Warrington, Cheshire WA1 2JD

Tel. 01925 240476 email: paul.platt@geoventures.co.uk

Ground Gas Monitoring Record

Borehole	Gas Flow (l/hr)	Borehole Pressure (Pa)	Methane (% v/v)		Methane (%LEL*)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Nitrogen (%v/v)		Depth to water (m bgl)	Atmospheric Pressure (mB)	Comments
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
WS 3	0.0	0	0.0				4.9		16.2		78.7		Dry	1026	
WS 5	0.0	0	0.0				2.0		19.6		78.3		Dry	1026	
WS 9	0.0	0	0.0				0.9		20.3		78.8		Dry	1026	

Notes:

Monitoring should be for not less than 3 Minutes. However, if high concentrations of gases initially recorded, monitoring should be for up to 10 mins.

* LEL = Explosive Limit = 5%v/v

ND - Not Detected

Relevant Information at times of monitoring

Monitored by: Weather : Equipment used: Visible signs of vegetation stress: Boreholes sampled for laboratory analysis: Other comments / observations:	S Edwards Sunny LMS Type G3 xi Gas Meter	Contract:	Academy Business Park Knowsley
		Date:	12.08.15
		Job No.	
		Sheet No.	3

Geo-Ventures (UK) Limited

70 Riverside Close, Waterside, Howley, Warrington, Cheshire WA1 2JD

Tel. 01925 240476 email: paul.platt@geoventures.co.uk

APPENDIX 09 – SCREENING LEVELS

Screening Levels for Commercial end use

Contaminant	Screening Levels for Commercial End Use 6% SOM (mg/kg)
Metals	
Arsenic	640
Boron	240000
Cadmium	190
Chromium VI	33
Copper	68000
Lead*	2330
Mercury	58
Nickel	980
Selenium	12000
Vanadium	9000
Zinc	730000
Non – Metals	
Polyaromatic Hydrocarbons (PAHs) 1% SOM (mg/kg)	
Benz[a]anthracene	170
Benzo[a]pyrene	35
Benzo[b]fluoranthene	44
Benzo[ghi]perylene	3900
Benzo[k]fluoranthene	1200
Chrysene	350
Dibenz[ah]anthracene	3.5
Fluoranthene	23000
Indeno[123-cd]pyrene	500
Naphthalene	190
Phenol	440
Pyrene	54000

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

Contaminant	Screening Levels for Commercial End Use (mg/kg)
Volatile Organic Compounds – VOCs (1% SOM)	
Benzene	27
Ethylbenzene	16
Toluene	56000
Xylene	5900
Total Petroleum Hydrocarbons – TPH (1% SOM)	
Aliphatic C5-6	32000
Aliphatic C6-8	7800
Aliphatic C8-10	2000
Aliphatic C10-12	9700
Aliphatic C12-16	59000
Aliphatic C16-35	1600000
Aliphatic C35 - 44	1600000
Aromatic C5 - 7	26000
Aromatic C7 - 8	56000
Aromatic C8-10	3500
Aromatic C10-12	16000
Aromatic C12-16	36000
Aromatic C16-21	28000
Aromatic C21-35	28000
Aromatic C35 - 44	28000

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