

Site	AG3268-21 LAND ADJACENT TO JUNCTION 10, M40, ARDLEY
Client	Applied Geology Limited
Engineer	

Contract No	B26845
Hole ID	TP70
Sample No	
Depth (m)	0.80-0.80
Sample Type	B

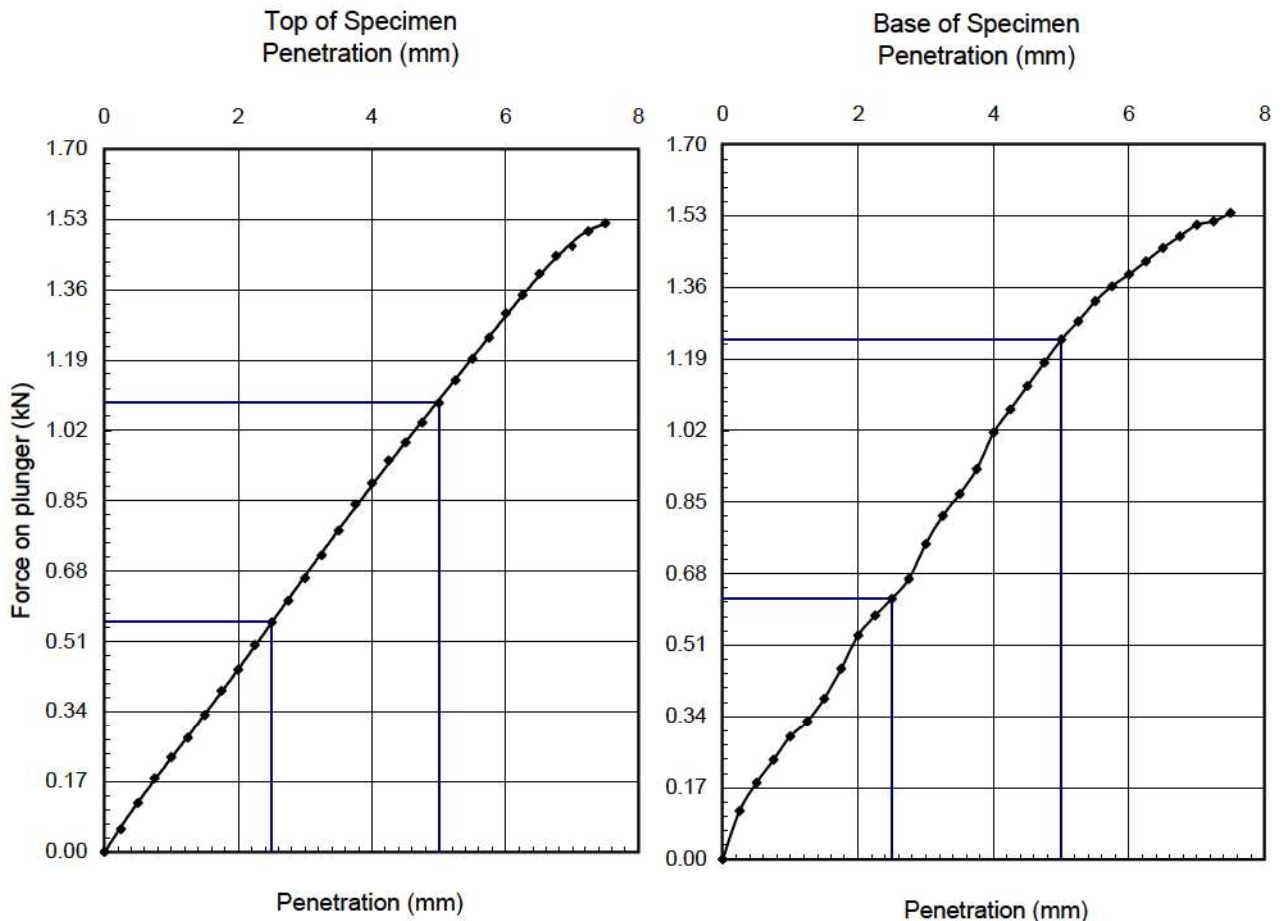
Non Engineering

Description: Brown gravelly sandy CLAY. Gravel is fine to coarse

Preparation Details:

Specimen was prepared at Natural Moisture Content
 Compaction using 2.5kg compactive effort
 Specimen Bulk Density 2.13 Mg/m³
 Specimen Dry Density 1.83 Mg/m³
 Mass of sample > 20 mm 33.6 %
 Specimen Unsoaked

Test Details:	Top	Base
Surcharge:	2.0 kg	2.0 kg
Seating Load:	50 N	50 N
Moisture Content:	18 %	15 %
CBR Value:	5.4 %	6.2 %



Non standard test due to % retained on 20mm sieve

Originator	Checked & Approved
SK	CD 10/08/2021

CALIFORNIA BEARING RATIO
BS1377 : Part 4 : Clause 7 : 1990



1440 - CBR Lab TP75 00.80 B - B26845-782567.xls : Sample ID 782567



SITE INVESTIGATION AND LABORATORY SERVICES

Site	AG3268-21 LAND ADJACENT TO JUNCTION 10, M40, ARDLEY
Client	Applied Geology Limited
Engineer	

Contract No	B26845
Hole ID	TP75
Sample No	
Depth (m)	0.80-0.80
Sample Type	B

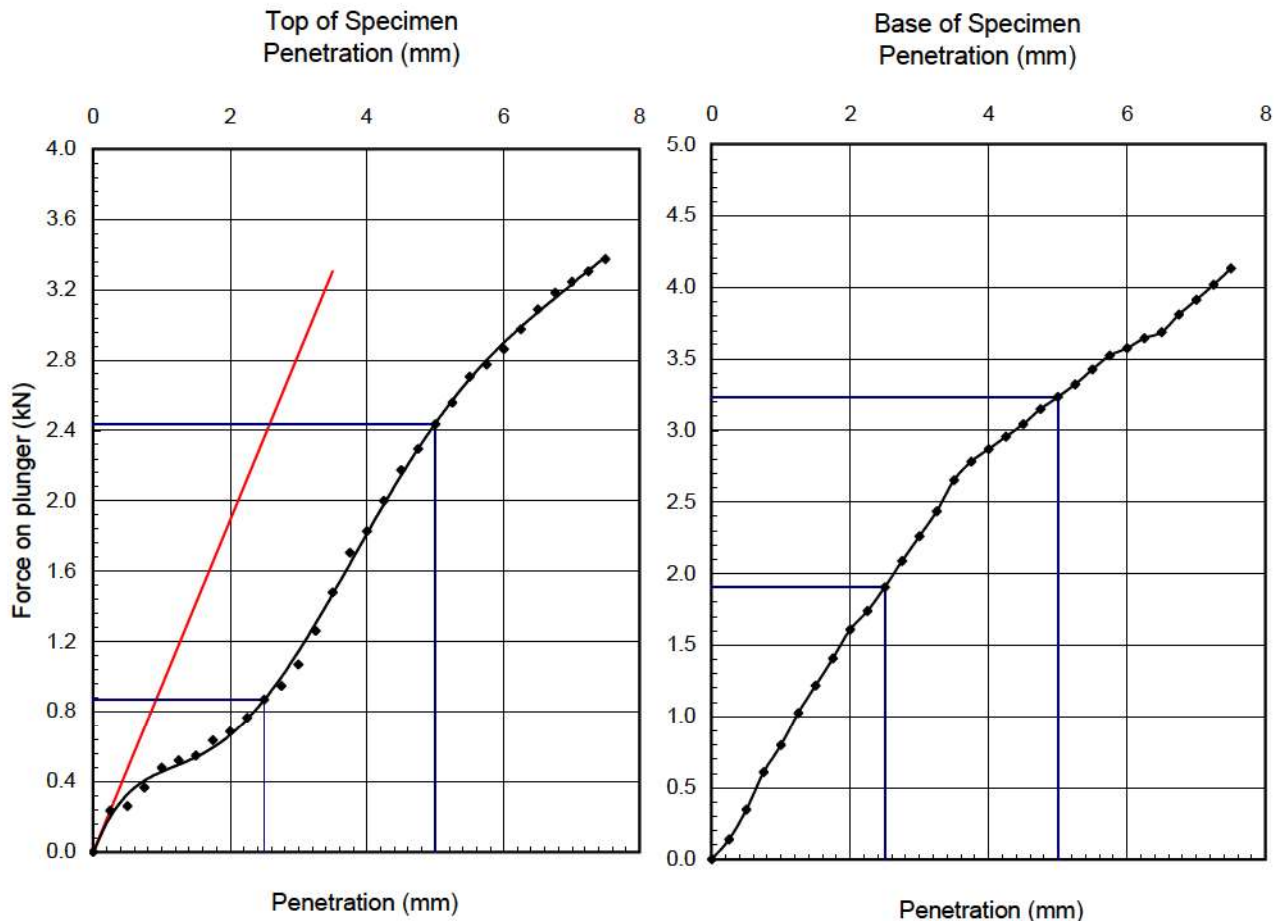
Non Engineering

Description: Brown sandy clayey fine to coarse GRAVEL with cobbles

Preparation Details:

Specimen was initially oven-dried
 Compaction using 2.5kg compactive effort
 Specimen Bulk Density 2.13 Mg/m³
 Specimen Dry Density 1.92 Mg/m³
 Mass of sample > 20 mm 39.6 %
 Specimen Unsoaked

Test Details:	Top	Base
Surcharge:	2.0 kg	2.0 kg
Seating Load:	50 N	50 N
Moisture Content:	10 %	11 %
CBR Value:	12.2 %	16.2 %



Curve Corrections Applied

Non standard test due to % retained on 20mm sieve

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62 Rochsolloch Road, Airdrie, ML6 9BG
 Lab Project No B26845 : 10/08/2021 19:09:07

Site	AG3268-21 LAND ADJACENT TO JUNCTION 10, M40, ARDLEY
Client	Applied Geology Limited
Engineer	

Contract No	B26845
Hole ID	TP79
Sample No	
Depth (m)	0.90-0.90
Sample Type	B

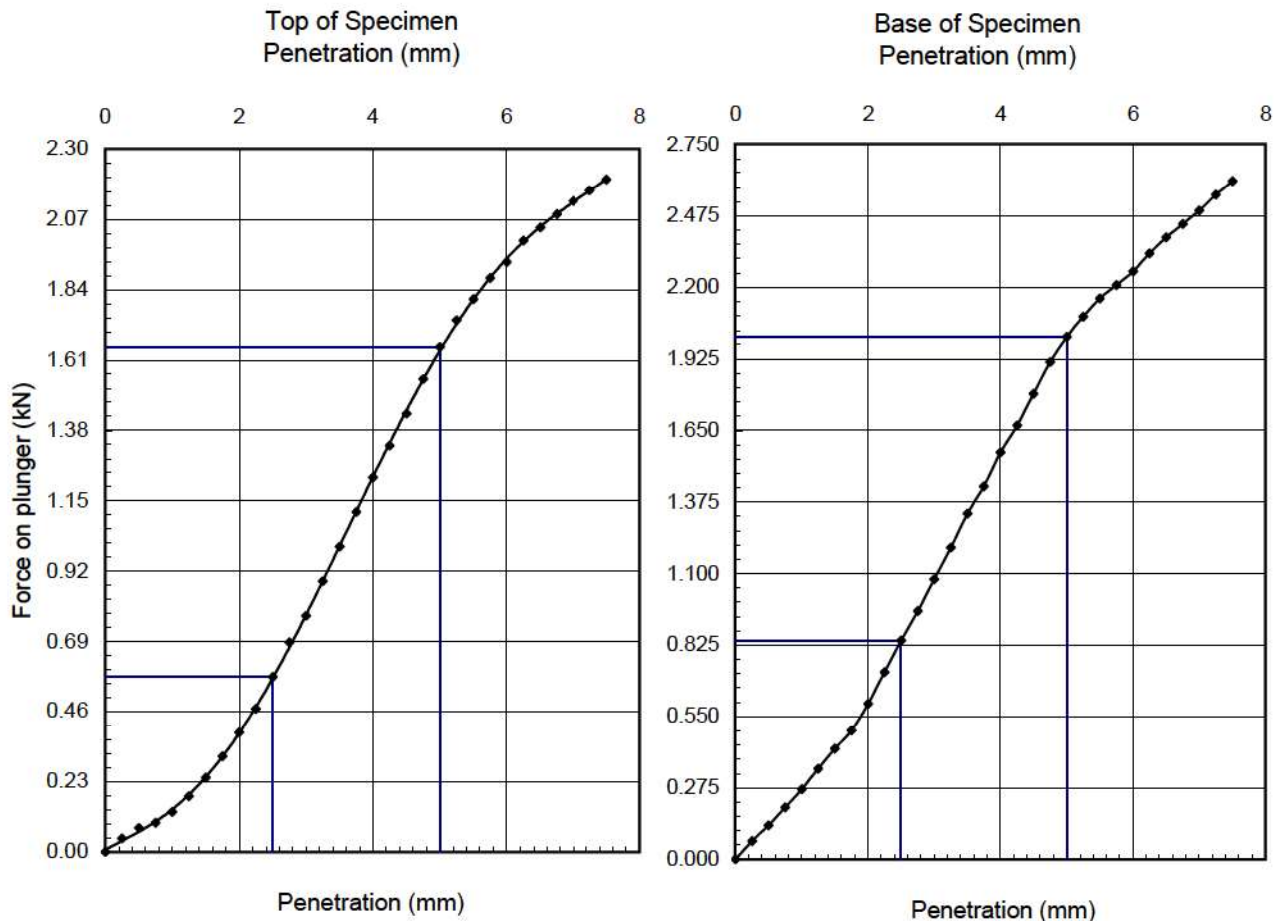
Non Engineering

Description: Dark brown very gravelly very clayey SAND. Gravel is fine to coarse

Preparation Details:

Specimen was initially oven-dried
 Compaction using 2.5kg compactive effort
 Specimen Bulk Density 2.07 Mg/m³
 Specimen Dry Density 1.86 Mg/m³
 Mass of sample > 20 mm 0.0 %
 Specimen Unsoaked

Test Details:	Top	Base
Surcharge:	2.0 kg	2.0 kg
Seating Load:	10 N	10 N
Moisture Content:	11 %	11 %
CBR Value:	8.3 %	10.0 %



Originator	Checked & Approved
SM	CD 10/08/2021

Site	AG3268-21 LAND ADJACENT TO JUNCTION 10, M40, ARDLEY
Client	Applied Geology Limited
Engineer	

Contract No	B26845
Hole ID	TP89
Sample No	
Depth (m)	0.80-0.80
Sample Type	B

Non Engineering

Description: Brown clayey SAND and GRAVEL with cobbles. Gravel is fine to coarse

Preparation Details:

Specimen was prepared at Natural Moisture Content

Compaction using 2.5kg compactive effort

Specimen Bulk Density 2.13 Mg/m³

Specimen Dry Density 1.86 Mg/m³

Mass of sample > 20 mm 57.8 %

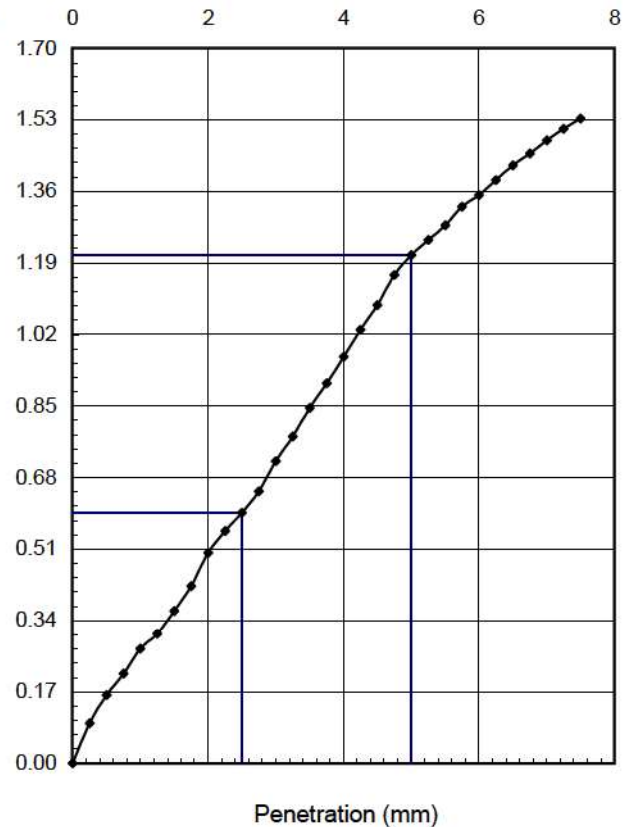
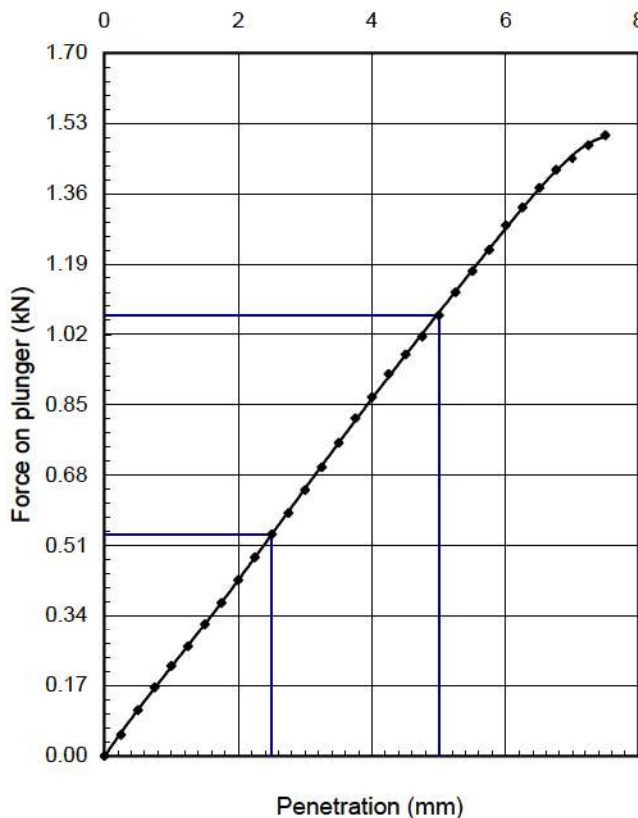
Specimen Unsoaked

Test Details:

	Top		Base	
Surcharge:	2.0	kg	2.0	kg
Seating Load:	50	N	50	N
Moisture Content:	15	%	14	%
CBR Value:	5.3	%	6.0	%

Top of Specimen Penetration (mm)

Base of Specimen Penetration (mm)



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Site	AG3268-21 LAND ADJACENT TO JUNCTION 10, M40, ARDLEY
Client	Applied Geology Limited
Engineer	

Contract No	B26845
Hole ID	TP94
Sample No	
Depth (m)	0.70
Sample Type	Bx2

Non Engineering

Description: COBBLES with brown sandy clayey fine to coarse gravel

Preparation Details:

Specimen was prepared at Natural Moisture Content

Compaction using 2.5kg compactive effort

Specimen Bulk Density 2.07 Mg/m³

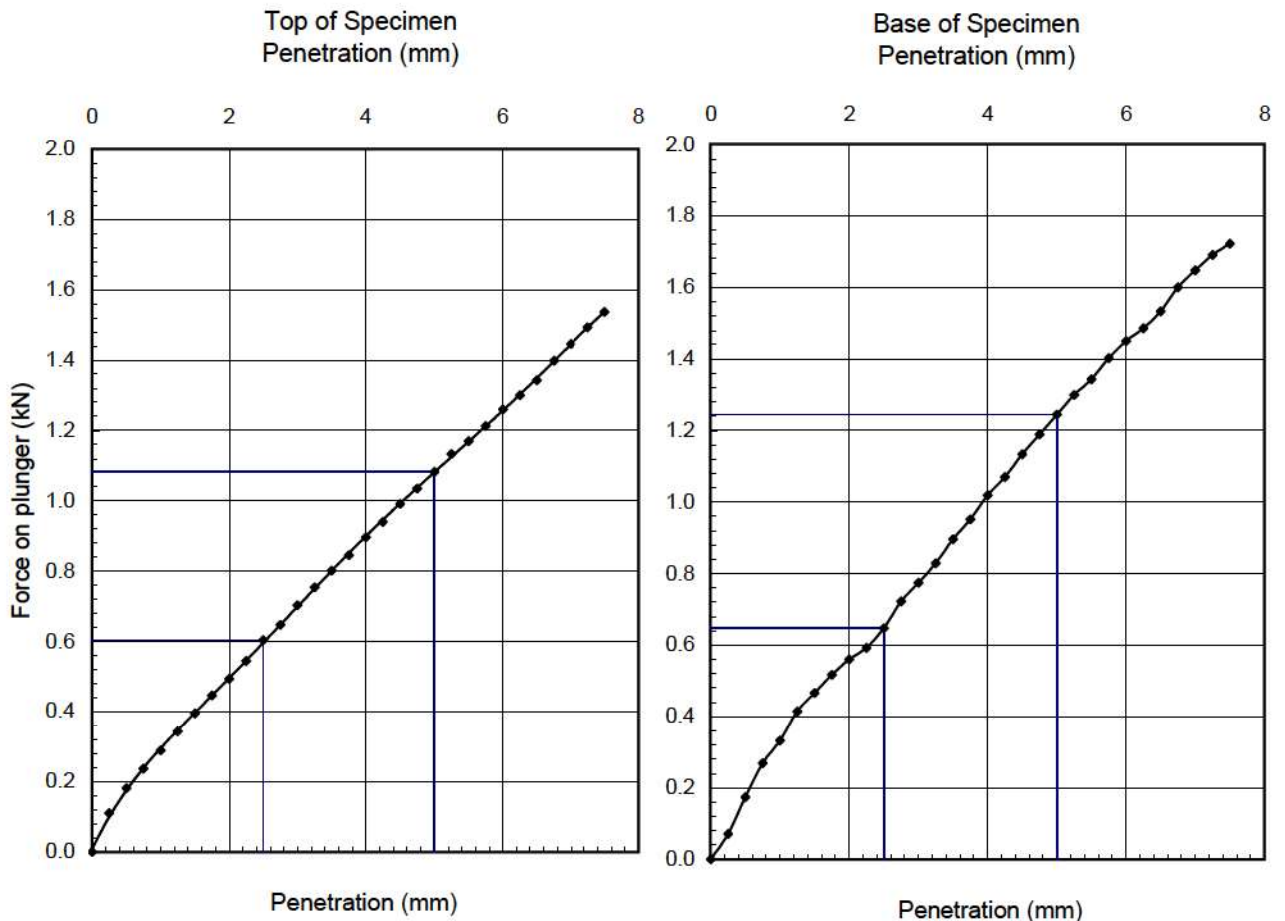
Specimen Dry Density 1.78 Mg/m³

Mass of sample > 20 mm 63.4 %

Specimen Unsoaked

Test Details:

	Top		Base	
Surcharge:	2.0	kg	2.0	kg
Seating Load:	50	N	50	N
Moisture Content:	17	%	17	%
CBR Value:	5.4	%	6.2	%



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Site	AG3268-21 LAND ADJACENT TO JUNCTION 10, M40, ARDLEY
Client	Applied Geology Limited
Engineer	

Contract No	B26845
Hole ID	TP97
Sample No	
Depth (m)	1.00-1.10
Sample Type	B

Non Engineering

Description: Brown gravelly very sandy very silty CLAY with cobbles. Gravel is fine to coarse

Preparation Details:

Specimen was prepared at Natural Moisture Content

Compaction using 2.5kg compactive effort

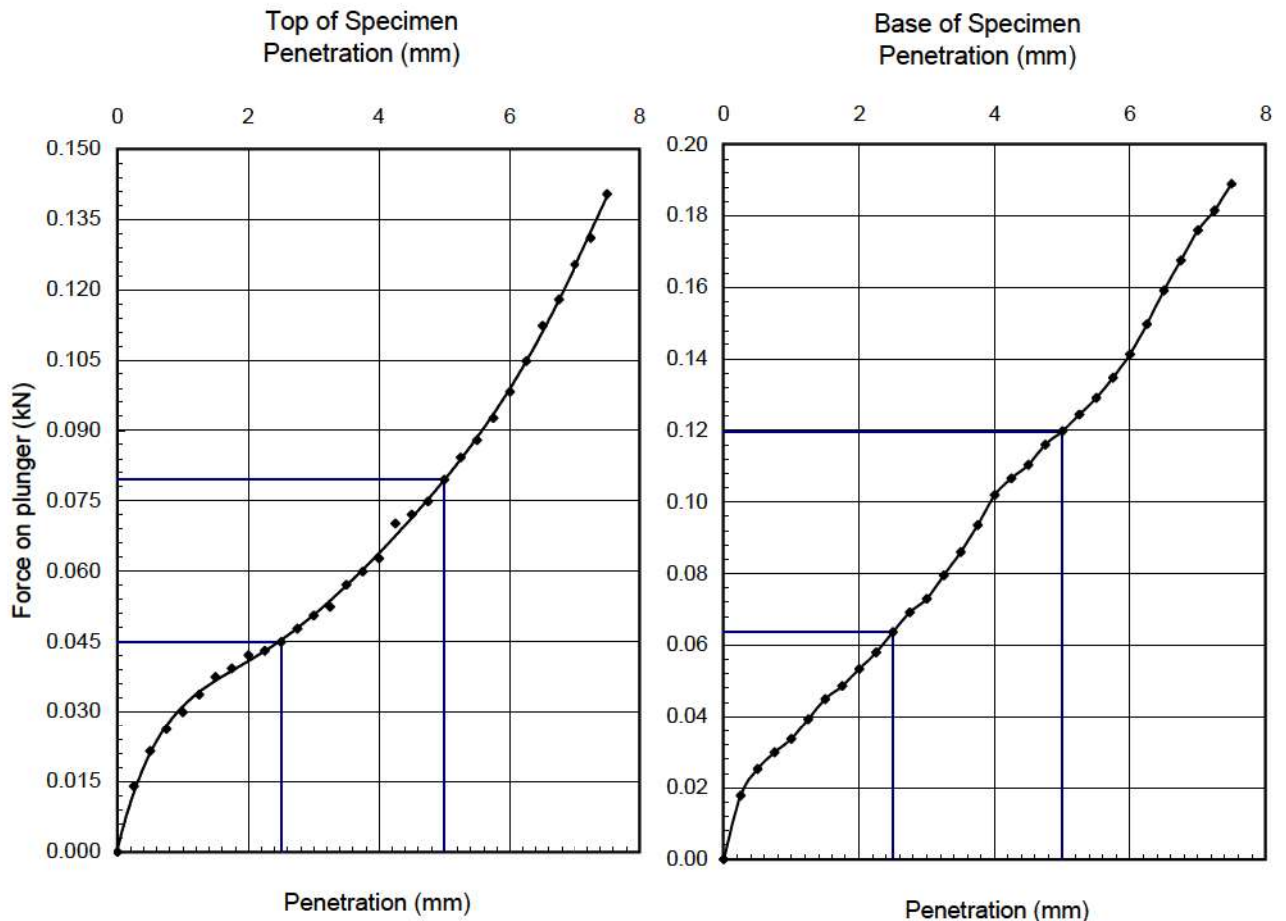
Specimen Bulk Density 2.02 Mg/m³

Specimen Dry Density 1.63 Mg/m³

Mass of sample > 20 mm 27.6 %

Specimen Unsoaked

Test Details:	Top	Base
Surcharge:	2.0 kg	2.0 kg
Seating Load:	10 N	10 N
Moisture Content:	24 %	24 %
CBR Value:	0.4 %	0.6 %



Non standard test due to % retained on 20mm sieve

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APPENDIX F

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STANDARD FIELDWORK AND ASSESSMENT PROCEDURES

Scope of Work

The scope of work undertaken is defined in Section 1 of the Report. It should be noted that Applied Geology Limited does not provide arboricultural surveys, specialist surveys for the detection of invasive plant species (such as Japanese Knotweed) or protected species of wildlife. Information from environmental and ecological datasets is included from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website, however, if a full assessment of Environmental or Ecological aspects is required, it is recommended that other specialists are consulted. Similarly, information on flood risk is included; obtained from the Environment Agency Web site and the GroundSure report; but this is not intended to be a full hydrological study and, if a flood risk assessment is needed, additional analysis by others is recommended to confirm this aspect of the development. Also, whilst our field staff have undergone asbestos awareness training, Applied Geology does not undertake asbestos surveys or provide specific advice relating to asbestos-containing materials. Any suspected asbestos-containing materials observed by our field staff will be mentioned in the report but further assessment by others may be required.

Fieldwork

Fieldwork is generally carried out in accordance with BS5930 (2015) "Code of Practice for Site Investigations" and BS10175 (2011) Investigation of Potentially Contaminated Sites, unless otherwise stated.

Prior to commencement on site, statutory services plans are generally obtained and verbal enquiries are also made regarding the positions of private or statutory services on site. Prior to excavation or drilling, locations are scanned with a cable avoidance tool (CAT) and service pits are generally excavated at borehole positions, where possible.

Descriptions and depths of the various strata recovered are presented on the exploratory hole records, reproduced in the report appendices, together with sample depths, the results of in-situ testing, comments on groundwater inflows, and any other pertinent information. The strata descriptions are in general accordance with BS5930:2015. Disturbed plastic pot and glass amber jar samples are recovered from the various strata and stored and transported in cool boxes, where relevant, for possible future laboratory testing.

Light cable percussion boreholes are generally drilled using a Pilcon Wayfarer or Dando rig and are advanced using equipment to bore 200/150mm diameter boreholes. Disturbed plastic pot samples are recovered from all deposits encountered to allow examination and laboratory testing. Certain strata are cased off due to their tendency to collapse, particularly in the presence of groundwater inflows and/or to reduce the risk of cross contamination. In situ Standard Penetration Tests, using Split Spoon (SPT) and Cone (CPT) are undertaken in the boreholes to provide a measure of the relative density of the granular (coarse grained) deposits or shear strength of the clay/chalk/ weathered rock deposits using industry recognised correlation guidelines of shear strength against SPT "N" value results. Within the fine grained (cohesive) deposits, "undisturbed" 100mm driven open tube samples were recovered from the various deposits to provide samples for examination and laboratory testing. On encountering groundwater, boring is usually suspended for 20 minutes while any rise in water level is recorded. Full details of the groundwater observations and monitoring results during boring operations are included on the borehole records. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion, unless otherwise stated on the individual logs.

Unless otherwise stated on the relevant logs, trial pits are excavated using a wheeled backhoe excavator, usually with a 0.6m wide bucket. The excavations are logged from the ground surface by an Engineering Geologist / Geo-environmental Engineer and relevant field testing, appropriate to the soils encountered, is carried out on samples brought to the surface. Representative disturbed soil

samples are collected from selected horizons for subsequent laboratory testing. The trial pits are usually unshored and where reasonable, left open for a period of time to allow observations of pit stability and depth and inflow rate of any groundwater ingress. The excavations are backfilled with arisings prior to moving on to the next position. Any trial pits carried out as part of this or previous investigations may represent soft spots and conduits/sumps for groundwater or surface water. In excavations, such materials may also be loose and unstable.

Driven Continuous Sampling (DCS) boreholes are drilled using a track mounted Global mini-rig or similar using sampling tubes of varying diameter (decreasing with depth). Samples of the deposits encountered are recovered in 1m long clear plastic liners, which are logged and sub-sampled on site by an Engineering Geologist. Generally for geotechnical investigations, during the drilling process in-situ Standard Penetration Tests (SPTs) are undertaken at selected depths to provide a measure of the relative density of the granular (coarse grained) deposits or shear strength of the clay/chalk/ weathered rock deposits using industry recognised correlation guidelines of shear strength against SPT "N" value results. Groundwater seepages are noted during drilling if encountered. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion.

Unless specifically stated in the report, exploratory hole locations should be regarded as approximate. Consideration should be given to accurate location of the exploratory holes where it is considered they may impact on proposed development.

It should be noted that groundwater levels at any particular site may fluctuate due to rainfall, seasonal variations etc and, therefore, levels may be different to those measured during the course of the fieldwork and monitoring period.

Laboratory Testing

The geotechnical testing was carried out in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes and was undertaken by a UKAS accredited specialist laboratory. Chemical testing was undertaken by a UKAS accredited specialist chemical testing laboratory and MCERTS accredited methods, in accordance with Environment Agency recommendations, were specified where available.

Contamination Assessment – Human Health

Applied Geology Limited has followed the guidance given in the CLR 11 publication and other available guidance to assess the contaminant concentrations. Details of the methodology followed are briefly outlined below.

The available chemical data is sorted into appropriate datasets depending on sampling regime and ground conditions. An initial generic quantitative risk assessment is undertaken on this data using statistical tests, where appropriate, and relevant screening values. Risk to human health has been initially assessed by comparing soil results against various published screening criteria. These have been sourced from the following, in order of preference:

- DEFRA. Category 4 Screening Levels (C4SL), March 2014;
- LQM/CIEH S4UL for Human Health Risk Assessment (S4UL), 2015*;
- Environment Agency/DEFRA, Soil Guideline Values (SGV) published in 2009;
- EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (GAC), 2010.

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Except for lead and benzo(a)pyrene, the assessments will be carried out by comparing results against the LQM/CIEH S4UL in the first instance, where these values are exceeded, then reference will be made to the C4SLs where such exist. Lead will only be compared to the C4SL because no S4UL exists for lead. For Benzo(a)pyrene, Applied Geology has chosen to adopt the approach presented by the C4SL committee rather than the approach proposed by LQM/CIEH. Further discussion on this is presented below.

It is our view, and the view of others in the industry, that the C4SL were derived for use in both the Part IIA system and through the planning system, as they allow identification of those sites that fall within Category 4 (not contaminated) and are therefore able to be developed with no further remedial action. The C4SLs are considered to represent a contamination level that is 'low' from a toxicological view point, which we therefore consider to be 'acceptable' under planning.

Historically, the level of contamination has been assessed with reference to SGV values which were derived to represent a 'minimal' level of contamination. The SGVs are still valid and can be used alongside C4SL, however both screening values are only intended to provide guidance as to the level of contamination and, where concentrations fall below these screening values, the site is not contaminated (and is within Category 4). Exceedance of a SGV/S4UL/C4SL does not automatically indicate that an 'unacceptable' risk exists at a site; simply that further consideration of that particular contaminant is required.

At this time, there are two toxicological methodologies that can be used in the derivation of screening criteria for PAHs; Relative Potency Factor (RPFs) or the Surrogate Marker approach. Applied Geology has chosen (based on the latest guidance from the Health Protection Agency (HPA) to use the surrogate marker approach proposed in the C4SL methodology, whereby benzo(a)pyrene can be used as a surrogate marker for all 'genotoxic' (gene damaging) PAHs. The surrogate marker approach estimates the toxicity of a mixture of PAHs in an environmental matrix by using data from toxicity studies in which a PAH mixture of known composition was tested. Exposure to the surrogate marker benzo(a)pyrene is assumed to represent exposure to all the PAHs in the environmental matrix. Thus, the level of toxicity ascribed to the surrogate represents the toxicity of the PAH mixture. This allows an assessment of the combined carcinogenic risk associated with genotoxic PAHs using only benzo(a)pyrene. In order to confirm that the mixture of genotoxic PAH in the soil is similar to the coal tar mixture used in the toxicological study, various PAH ratios are plotted and checked to see that they fall within the limits set in HPA, 2010.

Contamination Assessment – Water Quality

Risks to water quality has been assessed by following the Environment Agency guidance on groundwater protection (previously known as GP3), updated on their website in March 2017, see <https://www.gov.uk/government/policies/water-quality> and 'The Environment Agency's approach to groundwater protection' (March 2017 Version 1.0).

For hazardous substances, which should be prevented from entering groundwater, the screening criteria are initially set as the limit of detection, however, if groundwater has already been impacted, an appropriate environmental standard will then be used. For hazardous substances, background quality may also be taken into account.

For non-hazardous compounds, their release should not result in any pollution or significant risk of pollution in the future, as such comparison with UK DWS or EQS standards will allow determination of whether pollution could occur. Typically screening criteria will be sourced from the following:

- Environmental Standards (ES), which are defined in European legislation such as the Water Framework Directive (WFD) (2000/60/EC) and the Priority Substances Directive (PSD) (2008/105/EC) a daughter directive of the WFD.
- The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Direction, 2010.
- UK Water Supply (Water Quality) Regulations, 2010.
- UK quality standards for water to be used for direct abstraction to potable supply e.g. Surface Water (Abstraction for Drinking Water) (Classification) Regulations, 1996.
- World Health Organisation (WHO) Guidelines for Drinking Water Quality.

Re-use of Soils and Waste Soil Disposal

It is noted that if any excavated material is to be reused on site, a Waste Management Plan (WMP) and / or a Materials Management Plan (MMP) will probably be required. Any such materials must be suitable for re-use without further treatment, and only the quantity necessary for the specified works should be used. Any materials not within these definitions may need to be considered as waste whereby a Waste Management Licence Exemption may also be required.

A specific categorisation and assessment of potential waste soils arising from the proposed development has not been undertaken as part of the investigation, unless otherwise detailed in the report text. However, generic comments and advice are made below for the reader.

All waste soils should be sorted to prevent mixtures of waste types. Where possible, any waste soil should be recycled and the volume of soil to be disposed of should be minimised. Any excavated soil material and excess spoil disposed of off-site should be treated as Waste and classified as Inert, Non-hazardous or Hazardous, prior to removal from site, as required by the "Duty of Care" (Environmental Protection Act, 1990) legislation together with Annex II of Directive 1999/31/EC ("Landfill Directive"). Initially, Basic Characterisation of the waste is required whereby the material should be described and its source of origin recorded (a site plan, exploratory hole records and the certificates of chemical analysis in this report should be included). This should also include data on its composition and leaching behaviour, its European Waste Catalogue (EWC) code, and where relevant any hazardous properties according to Annex III of Directive 91/689/EEC. This information should be provided to the licensed waste contractor.

Soils excavated on many sites would generally fall under the EWC description "Soil and Stones", EWC code 17 05 04. Waste Acceptance Criteria (WAC) testing is required for many Inert wastes and generally for all Hazardous Waste but not for non-hazardous waste. There are certain restrictions for inert wastes regarding topsoil and peat. Any asbestos must be disposed of by suitably licensed contractors to a suitably licensed facility.

Health & Safety Aspects

As outlined within the HSE publication 'Successful Health and Safety Management - HSG65', this report should inform your development of safe systems of work and information as an input into the safety management system.

When developing risk control systems we suggest making reference to the CIRIA report 132 "A guide for safe working on contaminated sites" and the HSE document "Protection of workers and the general public during the development of contaminated land – HSG66". All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999.

The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations.

Where excavations are undertaken on site, trench support or the angle of batter should be designed by an appropriately qualified engineer or competent person to suit the required depth and the ground and groundwater conditions. Care should be taken when digging excavations to prevent undermining or causing loss of support to the foundations of the nearby adjoining structures. Surcharging such as from spoil or vehicle movements close to excavation sides should be avoided. Practical guidance on trench excavation is given in CIRIA Report 97 Trenching Practice. Guidance on groundwater control is given in CIRIA Report 113 Control of groundwater for temporary works. Temporary works should be designed by a suitably qualified engineer or a competent person particularly where personnel access is necessary, in accordance with the requirements of the Construction (Design and Management) (CDM) Regulations.