RSA GEOTECHNICS LTD

PROPOSED TEMPORARY BASKETBALL VENUE

AT

LEA BRIDGE ROAD, LEYTON, LONDON

FOR

NUSSLI (SCHWEIZ) AG

INTERPRETATIVE REPORT

GROUND INVESTIGATION REPORT NUMBER 13004GI

JANUARY 2012

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INSTRUMENTATION DETAILS

LIST OF SYMBOLS

KEY TO SOIL TYPES

BOREHOLE LOGS

DYNAMIC CONE PENETROMETER (DCP) LOGS

SOAKAWAY TEST RESULTS

GAS AND GROUNDWATER MONITORING RECORDS

LABORATORY TEST REPORTS

CHEMICAL CONTAMINATION ANALYSES RESULTS

	Drawing No.
EXPLORATORY HOLE LOCATION PLAN	13004GI/1
PROPOSED DEVELOPMENT LAYOUT	13004GI/2A 13004GI/2B
PROPOSED DEVELOPMENT LAYOUT SECTIONS	13004GI/2C
PROPOSED DESIGN LOADINGS	13004GI/3

1. INTRODUCTION

Consideration is being given by the Olympic Development Authority (ODA) to the construction of a temporary basketball training venue located near Lea Bridge Road, Leyton, London, E10 7QL for use during the 2012 London Olympic and Paralympic Games.

The proposed development comprises three temporary structures. One structure includes Ancillary Services such as staff and athletes facilities, and the other two each include a basketball court. There are also areas proposed for parking, storage and plant, an access road into and out of the facility and an external boundary fence. The topsoil removed beneath the footprint of the buildings is to be stock piled between the boundary fence and the north western elevation of the buildings, and the remainder of the site appears from the drawings provided by the Client to be 'soft' ground.

The development layout is shown in drawing numbers 13004GI/2A and 13004GI/2B with sections on drawing number 13004GI/2C. Drawing 13004GI/3 shows the proposed foundation arrangement and design loadings. It is proposed that the columns will be supported on pads and that 5 m square slabs will form the floors and will also be supported on pads.

Following completion of the Games (September 2012) it is proposed that the facility will be dismantled and the site returned to its current use parkland.

This interpretive report describes a limited ground investigation carried out by RSA Geotechnics Limited, to the specification and directions of Momentum Engineering, who were acting as the Consultant Engineer on behalf of the Client, Nussli (Schweiz) AG.

The purposes of the investigation were to determine ground conditions beneath the site and to provide recommendations for use in the design of the project.

The brief for the investigation was as follows:-

i) carry out an intrusive investigation including soil sampling and geotechnical and geoenvironmental laboratory testing

ii) provide recommendations with respect to the geotechnical design of foundations and advice on construction aspects

iii) provide general advice relating to the geoenvironmental test results and guidance for the classification of contaminated materials for waste disposal.

This report has been prepared for the sole internal use and reliance of Nussli (Schweiz) AG. It shall not be relied upon by other parties without the express written authority of RSA Geotechnics Limited. If an unauthorised third party comes into possession of this report they rely on it at their own risk and the authors owe them no duty of care and skill.

RSA Geotechnics Limited have based this report on the results of the intrusive investigation and testing carried out, as well as the other sources detailed within this

report, which are believed to be reliable. However, RSA Geotechnics Limited cannot and does not guarantee the authenticity or reliability of the third party information it has relied upon.

The investigation was authorised by Mr Graham Johnstone of Momentum Engineering, on behalf of the Client, Nussli (Schweiz) AG in an email dated 23 November 2011.

Advice and recommendations have been based on the findings of the investigation. It must be appreciated that not finding indicators does not mean that hazardous substances do not exist on the site.

2. SITE SETTING

2.1 Site Location

The site is located just north of the Lea Valley Ice Centre which is situated on the A104 Lea Bridge Road, Leyton, London, E10 7QL. The site can be located approximately by National Grid Reference TQ 355 869.

2.2 Geography and Topography

A reconnaissance visit, undertaken by an engineer from RSA Geotechnics Limited on 29 November 2011, disclosed the following:-

The site was located in the Leyton area of north east London within the Lee Valley National Parks. Vehicular access to the site was gained via the Lea Valley Ice Centre car park and a track which led from the car park to the site (Figures 1 and 2).

Figure 1

Figure 2

The area which included the proposed site was grass covered parkland, bounded by the River Lea to the south west, the grounds of the Lea Valley Ice Centre to the south east and open grassland to the north west and north east.

The proposed site formed a rectangular plot (135 m x 112 m) with access routes in and out joined to an existing track alongside the River Lea.

A footpath (Figure 3) was present between the south eastern site boundary and the Ice Centre (Figure 4).

Figure 3

Figure 4

The ground level between the south western site boundary and the River Lea rose up gently to the vehicle access track which ran alongside the river and this area was covered in long uncut grass and low scrub (Figure 5). The site itself was grass covered and relatively level (Figures 4 to 8).

Figure 5

Figure 6

Figure 7

Figure 8

Information on a drawing provided by the Client showed an underground 'Sewer Pipe' was present which ran approximately along the centre line of the site from the north east to the south west (refer to drawing number 13004GI/2A). An inspection cover was shown along the line of the pipe approximately 20 m from the north eastern site boundary. No details of the sewer pipe diameter or depth below ground level were given.

3. GROUND INVESTIGATION

3.1 Fieldwork

The ground investigation works comprised the drilling of three cable percussion boreholes (BH1, BH2 and BH3) and five dynamic cone penetrometer (DCP) tests (DCP1 to DCP5). Tests to determine soil infiltration rates were carried out in boreholes BH1 and BH2. The site work, the scope of which was agreed by the Consulting Engineer on behalf of the Client, was carried out on 8 December 2011.

The positions of the exploratory holes are recorded on drawing number 13004GI/1 which accompanies this report. Boreholes BH1 and BH2 were located in the west and east of the site respectively, and BH3 was positioned towards the middle. The DCP tests were positioned along the access route, and within the car park area and basketball courts.

Information provided by the Client indicated that there was a medium/high possibility of Unexploded Ordnance (UXO) present on the site. An Explosive Ordnance Disposal (EOD) engineer was therefore present at the time of the site work to check for ferromagnetic anomalies using a magnetometer, as the site work progressed.

The cable percussion boreholes were drilled using a Dando light cable percussion (LCP) drilling rig. It was originally intended to drill two boreholes to a completion depth of 4 m. However, high magnetometer readings were detected in BH1 and BH2 and these holes were terminated on instruction from the EOD engineer at depths of 2 m and 3.1 m, respectively. Following agreement with the Client a further borehole

(BH3) was drilled. This was also terminated prematurely on instruction from the EOD engineer, at 1.7 m.

Small ‘disturbed’ samples were retrieved and sealed in suitable containers, at approximately 1.0 m intervals as drilling progressed for material identification and testing. Standard Penetration Tests (SPTs) were undertaken in BH1 and BH2 to assess relative density (N value) at approximately 1 m intervals. The results of the penetration tests are recorded as 'N' values and given on the borehole logs.

Falling head percolation tests were carried out in boreholes BH1 and BH2, using methods similar to those set out in BRE Digest 365 'Soakaway design', to assess soil infiltration rates. The results of the tests are discussed later in this report.

In order to monitor ground gas emissions and groundwater levels, a 50 mm internal diameter well was installed in borehole BH2. The details of the construction are shown on the borehole log. A protective cover was installed at ground level over the well. The well was subsequently monitored on one occasion to measure ground gas and groundwater levels.

Dynamic Cone Penetrometer (DCP) tests (DCP1 to DCP5) were carried out to determine in-situ CBR values, in accordance with Interim Advice Note (IAN) 73/06 (Rev.1 2009).

The fieldwork and laboratory testing for the investigation were carried out generally in accordance with BS 5930: 1999, 'Code of Practice for Site Investigations' and BS 1377: 1990, 'Methods of test for soils for civil engineering purposes', respectively.

Full details of the fieldwork and the ground conditions are shown on the logs later in this report. The ground levels of the borehole and DCP positions have been interpolated from a topographic plan provided by the Client and added to the logs.

3.2 Laboratory Testing

The programme of laboratory testing was designed to obtain the following data:-

i) Particle Size Distribution (PSD) tests of granular material

ii) pH and water soluble sulphate levels

iii) a California Bearing Ratio (CBR) test on a recompacted bulk sample

iv) concentrations of a standard contaminant soil suite including speciated polyaromatic hydrocarbons (PAH)

v) Waste Acceptance Criteria (WAC) tests

vi) asbestos screen.

The geotechnical laboratory testing was carried out at RSA Geotechnics' UKAS accredited laboratory between 17 December 2011 and 9 January 2012, in accordance with BS 1377: 1990, British Standard 'Methods of test for soils for civil

engineering purposes'. The laboratory is accredited for most of its testing activities by the United Kingdom Accreditation Service (UKAS). This is the sole organisation recognised by the UK Government for assessing the competence of testing organisations. A copy of the current UKAS accreditation schedule is available on request.

Chemical contamination analyses were carried out between 19 and 23 December 2011 on selected samples to determine potential contaminant levels and for waste disposal purposes. The chemical analyses were undertaken by the Environmental Labs Ltd (ELabs) who has MCERTS and UKAS accreditation.

The results of the laboratory testing are given on the test reports later in the report.

4. GROUND CONDITIONS

4.1 Geology

The British Geological Survey (BGS) 1:50,000 Series Geological Survey Sheet 256 'North London', Bedrock and Superficial Deposits Edition, 2006, indicated that the site was underlain wholly by Made Ground. Nearby superficial deposits along the route of the River Lea are shown as Alluvium (mainly sand, silt and clay) and River Terrace Deposits. The Lambeth Group (Woolwich and Reading Formations) is shown below the superficial material.

4.2 Ground Investigation Data

The ground investigation disclosed a thin covering of topsoil over made ground across the site. In one borehole (BH2), the made ground was fully penetrated and River Terrace Deposits were encountered below.

The following ground conditions were revealed by the intrusive ground investigation:-

- Topsoil
- Made Ground
- River Terrace Deposits.

4.2.1 Topsoil

Topsoil was encountered across the site in all of the boreholes. It was 0.1 m in thickness and described by the driller as 'brown sand'.

4.2.2 Made Ground

Made ground was encountered below the topsoil to depths of 2 m and 1.7 m in BH1 and BH3, respectively, where it was not fully penetrated, and in BH2 to 2.4 m. The made ground disclosed was somewhat variable, but was predominantly granular and described as loose, dark grey/brown, black or grey, occasionally reddish brown or green, slightly silty, fine to coarse sand or angular to subangular, medium to coarse gravel. In BH2 between 0.1 and 0.8 m, the made ground comprised firm to stiff, brown slightly silty clay, which included medium to coarse gravel sized lumps of clay. In BH1 at around 1.6 m depth, the made ground contained medium to coarse gravel sized pockets of claybound sand. The made ground became medium dense in BH2 from 2.1 m depth.

The made ground contained a variety of foreign constituents which included angular to subangular, fine to coarse, gravel sized fragments of brick, concrete, mortar, slate, clinker, ash, soft clay, weak chalk, glass, possible asbestos cement, flint, siltstone nodules, slate, coal, metal, ceramic pipe and metal pipe. Rootlets were occasionally present and a spark plug was disclosed in BH2.

4.2.3 River Terrace Deposits

River Terrace Deposits were disclosed in BH2 only, below the made ground from 2.4 to 3.1 m at the base of the borehole. This material was described as medium dense, brown, slightly sandy, angular to subangular, fine to coarse, flint gravel.

4.2.4 Groundwater Levels

Groundwater was not encountered in BH1 or BH3 whilst drilling. In BH2 slow groundwater seepage was noted from 2.5 m depth at the base of the made ground.

Groundwater was added to aid the drilling process through the River Terrace Deposits (BH2 only) and it may be that further groundwater strikes were obscured by this process.

The groundwater level in the monitoring well (BH2) was measured on 13 December 2012. The well was installed to 3 m depth and was found to be 'dry' at the time of monitoring.

4.2.5 Summary of Ground Conditions Encountered

A summary of the ground conditions encountered during the ground investigation is provided in Table 4.2.5.

Table 4.2.5 - Summary of Ground Conditions

Stratum	Min/Max Depths to Top of Stratum (mbgl)	Min/Max Depths to Base of Stratum (mbgl)	Min/Max Thickness of Stratum (m)
Topsoil	GL	0.1	0.1
Made Ground	0.1	1.7* to 2.4	1.6* to 2.3
River Terrace Deposits	2.4	3.1*	0.7*
Groundwater	BH2 – seepage at 2.5 m (base of Made Ground/top River Terrace Deposits) BH2 – monitored level in standpipe (13/12/11) – dry.		

* - not fully penetrated

4.2.6 Visual and Olfactory Evidence of Contamination

Around the site there was no obvious visual or olfactory evidence of contamination recorded at ground level. However, the made ground deposits disclosed whilst drilling contained various foreign objects such as brick, concrete, mortar, slate, clinker, ash, soft clay, weak chalk, glass, possible asbestos cement, flint, siltstone nodules, slate, coal, metal, ceramic pipe, metal pipe and a spark plug, as described in subsection 4.2.2.

5. GEOTECHNICAL CONSIDERATIONS

5.1 The Proposed Scheme

The proposed development comprises three temporary structures. One structure includes Ancillary Services such as staff and athlete facilities, and the other two each include a basketball court. Details provided by the Client indicate that the buildings will have an aluminium frame, a PVC canvas roof, a steel substructure, and a mix of hard and moulded fibre glass panels forming the walls. There are also proposed areas for parking, storage and plant, an access road into and out of the facility and an external boundary fence. The topsoil removed beneath the footprint of the buildings is to be stock piled between the boundary fence and the north western elevation of the buildings, and the remainder of the site appears from the drawings provided by the Client to be 'soft' ground. The proposed development layout and sections are shown in drawing numbers 13004GI/2A, 13004GI/2B and 13004GI/2C.

This section of the report describes the general suitability of geotechnical foundation solutions which may be appropriate for use considering the underlying ground conditions. The geotechnical considerations made within this report would need to be reconsidered in light of a finalised development scheme for the site.

5.2 Structural Foundations

The ground conditions, which were generally consistent between the three boreholes, comprised a covering of topsoil overlying between 1.6 and 2.3 m of made ground.

River Terrace Deposits were disclosed at one location (BH2) below the made ground at a depth of 2.4 m.

The made ground disclosed was quite variable but was predominantly granular and described as loose, dark grey/brown, black or grey, occasionally reddish brown or green, slightly silty, fine to coarse sand or angular to subangular, medium to coarse gravel. In BH2 between 0.1 and 0.8 m, the made ground comprised firm to stiff, brown slightly silty clay, which included medium to coarse gravel sized lumps of clay. In BH1 at around 1.6 m depth, the made ground contained medium to coarse gravel sized pockets of claybound sand. The made ground became medium dense in BH2 from 2.1 m depth.

The made ground also contained a variety of foreign constituents as described in subsection 4.2.2.

The River Terrace Deposits disclosed in BH2 only, were described as medium dense, brown, slightly sandy, angular to subangular, fine to coarse, flint gravel.

A discrete seepage of groundwater was encountered at a depth of 2.5 m in BH2. The standpipe was, however, dry to a depth of 3 m when monitored.

It is understood that the Client is considering the adoption of spread footings (pads) at a depth of 0.5 m below ground level, which would place the underside of the foundation within the made ground. The proposed structure will include lightly loaded columns (with combined live and dead loads up to a maximum of 72 kN) that are

understood to be capable of tolerating considerable differential movement between neighbouring columns. It is also proposed that pads are used to support 5 m square floor slabs (refer to drawing 13004GI/3).

Nett allowable bearing pressures (NABPs) have been calculated for conventional strip/trenchfill and pad foundations at 0.5 m depth, based upon restricting settlements to acceptable levels (taken as 50 mm for the purposes of this assessment) at 0.5 m depth. The nett allowable bearing pressures (NABP) in Table 5.2A are based upon a lower bound very loose/loose relative density, equivalent to an SPT 'N' value of 4 and engineering judgement.

Nett allowable bearing pressure is the maximum permissible change in vertical stress at foundation level in excess of the existing overburden pressure. A soil density of 20 kN/m^3 may be assumed in the calculation of overburden pressure. Settlement will be relatively rapid and occur during the construction period. Long-term consolidation settlements will be minimal unless the loadings are increased during the lifetime of the structures.

Table 5.2A – Nett Allowable Bearing Pressures for Spread Foundations Bearing Upon the Made Ground

Width (m)	**Nett Allowable Bearing Pressure (kN/m^2)**
0.75 strip	65
1.0 strip	70
0.75 pad	68
1.0 pad	75
2.0 pad	105

Table 5.2B provides the imposed pad foundations pressures based on the design loadings (dead and live loads) provided by the Client (drawing number 13004GI/3)

Table 5.2B – Imposed Pressures (kN/m^2) for Pad Foundations Bearing Upon the Made Ground

Pad	Maximum Load (kN)	Pad Size (m)		
		0.75 x 0.75	1.0 x 1.0	2.0 x 2.0
A	35	62	35	9
B	72	128*	72	18
C	25	44	25	6
D	8.5	15	8.5	2
E	9.5	17	9.5	2.4

* exceeds allowable bearing pressure.

It is understood that there is also a requirement to provide resistance to column uplift up to a maximum of 46 kN for Pad B (refer drawing number 13004GI). The parameters in Table 5.2C can be adopted for preliminary ground anchor design assuming the anchors take the form of vertical or sub-vertical piles bored or driven into the made ground and River Terrace Deposits.

Table 5.2C – Preliminary Ground Anchor Design Parameters

Stratum	Made Ground	River Terrace Deposits
Earth Pressure Coefficient (K_s)	Bored and cast-in-place = 0.35 Driven = 0.375	Bored and cast-in-place = 0.315 Driven = 0.335
Overburden pressure (p'_o)	Bulk Density = 18 kN/m^2	Bulk Density = 18 kN/m^2
Angle of wall friction (δ)	Φ = δ = 27º (cast-in-situ concrete) δ = 0.8 Φ (precast concrete) δ = 0.7 Φ (rough steel)	Φ = δ = 30º (cast-in-situ concrete) δ = 0.8 Φ (precast concrete) δ = 0.7 Φ (rough steel)

The ground conditions have only been confirmed to a depth of 3.1 m and at only one location. Preliminary calculations based on these ground conditions and including the weight of the pile indicate that skin friction achievable for a single 0.6 m diameter pile at 3.1 m depth would be considerably less than required. Further investigation would be necessary to a greater depth to confirm the ground conditions and suitability for use of piles in excess of 3 m in length to resist uplift.

Alternatively resistance to uplift could be provided simply by the weight of the foundations supporting the columns. Assuming a concrete density of 24 kN/m^3 and including the skin friction that would be generated, a foundation size of 1 m x 1 m (x 0.5 m thick) would be sufficient for pads A, D and E to resist the design uplift loadings. Pad B will require a larger foundation to resist uplift of up to 46 kN. Assuming a thickness (depth) of 0.5 m, a 2 m x 2 m foundation size would be required. Alternatively the foundation plan size could be reduced to 1.5 m x 1.5 m, with an increased thickness of 0.85 m. (There is no requirement for Pad C to resist uplift – drawing number 13004GI/3).

Information provided by the Client indicated that there was a medium/high possibility of Unexploded Ordnance (UXO) present on the site. The advice of an Explosive Ordnance Disposal (EOD) engineer should therefore be sought prior to any excavation being undertaken on the site.

A 'Sewer Pipe' was shown passing beneath the site as discussed in subsection 2.2 and shown in drawing 13004GI/2A. It would be advisable to establish the alignment, elevation and size of the pipe to determine the effect, if any, that it could have on the proposed scheme.

Prior to placement of pads it is recommended that the subgrade is compacted using vibrating plate equipment and any 'soft spots' identified should be removed and replaced with recompacted, free draining granular material.

The allowable pressures, settlement and pile loadings have been established from minimal ground investigation information and the assumption that the made ground is of consistent thickness, composition and relative density across the site. The possibility that different conditions may exist other than at the exploratory hole positions, or at greater depth, should not be ruled out.

5.3 Ground Floors

In view of the presence of the made ground in excess of 0.6 m thick it is recommended that suspended floors are adopted throughout the scheme. The

Consulting Engineer has stated that the proposed scheme incorporates 5 m x 5 m slabs suspended on pads.

5.4 Access Roads and Areas of Hardstanding

Five Dynamic Cone Penetration (DCP) tests were carried out to determine in-situ CBR values.

Assuming a sub-grade depth of approximately between 0.3 and 0.5 m which would be within made ground, the DCP tests reflected somewhat variable in-situ CBR values which ranged between 4.0 and 31%. In DCP1 and DCP4, it was not possible to penetrate beyond 0.53 m depth where in each case an obstruction was encountered which prevented further probing. In DCP2, DCP3 and DCP5, the in-situ CBR varied between 27 and 52% from approximately 0.5 to 0.9 m depth.

A laboratory CBR test undertaken on recompacted made ground retrieved from BH1 gave CBR values of 31% (top of sample) and 35% (base of sample).

Considering the CBR values determined and the potential variation within the made ground, a preliminary subgrade California Bearing Ratio (CBR) design value of 4% is recommended for the initial design of access roads and parking areas. It is recommended that all prepared subgrades are proof rolled with a heavy dead-weight roller and any ‘soft’ or ‘loose’ spots identified by the passing of the roller should be removed and replaced with locally thickened subbase materials. Consideration could

be given to undertaking in-situ CBR measurements on prepared formations to provide final pavement design parameters.

Prepared formations will be prone to deterioration in periods of wet weather and should be protected by the prompt placing of the subbase layers.

5.5 Groundworks

All excavations requiring entry by site personnel will require temporary support or battering back to a stable angle in accordance with the requirements of Health and Safety legislation, to enable work to be carried out safely within them. Excavations within any made ground or the superficial deposits, should be considered unstable irrespective of depth. Collapse of unsupported excavations could be sudden and without warning.

It is possible that ephemeral seepages of groundwater may be encountered originating from made ground or the superficial deposits. Excavations in excess of 2.5 m deep could encounter the 'true' groundwater table in the River Terrace Deposits. Inflows should be controllable in the short-term by standard sump pumping.

5.6 Drainage

Percolation tests were undertaken in BH1 and BH2 to calculate soil infiltration rates for soakaway design. The test results were as follows in Table 5.6:-

Table 5.6 – Infiltration Rate (k) Calculated from Percolation Tests

Borehole	Depth (m)	Infiltration Rate (k) m/s	Soakage Medium
BH1	1.50	5.9×10^{-3} *	Made ground
BH2	2.60	8.7×10^{-4} **	River Terrace Deposits

* - average of two test runs

** - single test run

Both material types exhibited infiltration rates indicating that they would form a suitable stratum for receiving water.

Care should be taken in locating soakaways. Ideally they should be designed only to discharge into the River Terrace Deposits and not be placed within 10 m of any structure, services or settlement sensitive external paving, due to the risk of localised settlement from repeated inundation and/or loss of 'fines'. The risk of excessive settlements of ground surface and pavements will be increased if surface water is discharged into the overlying made ground.

Long term monitoring of groundwater was not carried out as part of the investigation. Although the monitoring well was 'dry' at the time of measuring, groundwater seepage was noted at 2.5 m in BH2 whilst drilling. Due to the risk of soil borne contamination being carried by percolating waters into Controlled Waters in the underlying River Terrace Deposits, permission for shallow soakaway drainage should be sought from the Environment Agency (EA).

5.7 Buried Concrete

Five soil samples analysed for contamination testing and two samples scheduled for geotechnical testing have been analysed for pH and water soluble sulphate contents. The results were compared with the guidelines outlined in BRE Special Digest 1. This publication attributes a Design Sulphate Class and an Aggressive Chemical Environment for Concrete (ACEC) class for the site under consideration, based upon the nature of the site, sulphate concentrations, pH values and mobility of groundwater.

The pH values of all five samples ranged between 7.4 and 10.3, reflecting mildly alkaline to alkaline conditions. Soluble sulphate contents from 2:1 water:soil extracts ranged between 0.65 and 1.43 g/l.

Using the mean of the two highest of the results, as recommended in BRE Special Digest 1, the appropriate Design Sulphate Class was indicated to be DS-2. The ACEC Class for foundations within the made ground on the site, assuming static groundwater conditions would therefore be AC-1s.

6. GEOENVIRONMENTAL CONSIDERATIONS

6.1 Chemical Analyses and End User Assessment

Five samples of made ground were analysed for a range of commonly occurring contaminants including heavy metals and speciated polycyclic aromatic hydrocarbons (PAH). The analysis suite gives the concentrations of sixteen PAHs that are of particular concern. The samples were also screened for asbestos.

6.1.1 Published Guidelines

The results of the chemical analyses have been interpreted by comparing them with the various published guidelines that are available, as appropriate. The following guidelines and other documents have been used during this assessment:-

i) Contaminated Land Exposure Assessment Model (CLEA) including the 2009 SGVs for certain determinands

ii) LQM-CIEH Generic Assessment Criteria for Human Health Risk Assessment, 2009

iii) ATRISK Soil Generic Soil Screening Values, 2009

iv) Framework for the Classification of Contaminated Soils as Hazardous Waste, Version 1, 2004.

6.1.2 Generic Qualitative Assessment

The risk assessment takes the physical, chemical and biological conditions of the site under consideration and examines the relevant pollutant linkages in the context of end user behaviour patterns, the environment and the nature of the proposed development.

In order to clarify the anticipated risk associated with any contamination identified on site, the classification system in Table 6.1.2 has been adopted.

Table 6.1.2 – Classification of Terms for Qualitative Risk Assessment

Term	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate risk	It is possible that without appropriate remedial action harm could arise to a designated receptor but it is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that at worst, this harm if realised would normally be mild.
Negligible risk	The presence of an identified hazard does not give rise to the potential to cause significant harm to a designated receptor.

6.1.3 End Users

The proposed development comprises three temporary structures. One includes Ancillary Services such as staff and athlete facilities, and the other two each include a basketball court. There are also areas for parking, storage and plant, an access road into and out of the facility and an external boundary fence. It is planned that soil removed to make way for the development will be stockpiled on site (between the north west of the buildings and the boundary fence) and that otherwise there will be 'soft' areas between the buildings and the boundary fence (south east of the buildings), and around the access road.

In order to take account of the sensitivity of the end users of the site, a 'commercial' end use has been considered. Should the nature of the redevelopment be modified then this risk assessment should be reviewed.

As part of the general suite of contamination testing carried out, organic matter within all five samples was measured. The average soil organic matter (SOM) content of the samples was calculated to be 1.7%. A SOM value of 1.0% was adopted for the site, where CLEA SGVs and LQM CIEH GAC values are sensitive to organic matter contents.

6.1.3.1 Inorganic Contaminants

The screening values for inorganic contaminants in Table 6.1.3.1 have been compiled for use in the Tier 1 generic risk assessment.

Table 6.1.3.1 – Tier 1 Human Health Screening Values for Inorganic Determinands (Commercial End Use)		
Determinand	**Tier 1 Screening Values (mg/kg)**	**Source of Data to Derive the Tier 1 Screening Values**
Arsenic	640	CLEA v1.06 (2009)
Boron	190,000	CLEA v1.06 (2009)
Cadmium	230	CLEA v1.06 (2009)
Chromium 3	8,840	CLEA SGV
Chromium 6	35	CLEA SGV
Copper	72,000	CLEA v1.06 (2009)
Cyanide	34	ATRISK SOILS
Lead	750	CLEA SGV
Mercury	3,600	CLEA v1.06 (2009)
Nickel	1,800	CLEA v1.06 (2009)
Selenium	13,000	CLEA v1.06 (2009)
Zinc	670,000	CLEA v1.06 (2009)

Elevated concentrations of lead were present in two samples of made ground submitted for analysis (2129 mg/kg in BH1 at 0.4 m and 9371 mg/kg in BH3 at 0.6 m). A statistical analysis in accordance with current guidance was carried out on the results of the testing on the made ground (5 No samples) in order to determine if the elevated concentrations recorded were statistically significant, and whether they represented isolated hotspots or a site-wide problem.

The statistical analysis gave an upper bound value (95th%ile) of 10111 mg/kg which is above the Tier 1 Screening Value for lead, considering the adopted commercial end use.

A low risk, given the temporary nature of the scheme has been determined for lead within the made ground.

6.1.3.2 Organic Contaminants

As part of the general suite of contaminants, analysis was undertaken for phenol and speciated polyaromatic hydrocarbons (PAHs). This analysis gives the concentrations of sixteen PAHs that are of particular concern.

i) Phenol

The phenol analysis carried out is a general screen that mainly identifies the presence of phenol and to a lesser extent other monohydric phenols such as cresol and chlorinated phenols. The derived Tier I screening level for Phenol (1.0% organic content) is 3200 mg/l. Concentrations of phenol in the five contamination test suites, were found to be below the level of detection of the test.

Therefore the risk to end users from phenol is considered to be negligible.

ii) Polycyclic Aromatic Hydrocarbons (PAH)

The CLEA guidelines do not give a soil guideline value for total PAH. However, the Land Quality Management (LQM) group has provided toxicological data for the sixteen PAHs that are of main concern and this information has been used to derive in-house Generic Assessment Criteria (GAC) values using the most recent version of

the CLEA model (version 1.06). The in-house derived GAC values have been summarised in Table 6.1.3.2 and are based upon a 1.0% soil organic matter content.

Table 6.1.3.2 - Tier 1 Human Health Screening Values for Organic Determinands for a Residential With Plant Uptake End Use (1.0% SOM)

Determinand	Tier 1 Screening Values (mg/kg)	Source of Data to Derive Tier 1 Screening Values
Naphthalene	200	CLEA v1.06 (2009)
Acenaphthylene	84,000	CLEA v1.06 (2009)
Acenaphthene	85,000	CLEA v1.06 (2009)
Fluorene	64,000	CLEA v1.06 (2009)
Phenanthrene	22,000	CLEA v1.06 (2009)
Anthracene	530,000	CLEA v1.06 (2009)
Fluoranthene	23,000	CLEA v1.06 (2009)
Pyrene	54,000	CLEA v1.06 (2009)
Benz(a)anthracene	90	CLEA v1.06 (2009)
Chrysene	140	CLEA v1.06 (2009)
Benzo(b)fluoranthene	100	CLEA v1.06 (2009)
Benzo(k)fluoranthene	140	CLEA v1.06 (2009)
Benzo(a)pyrene	14	CLEA v1.06 (2009)
Indeno(123-cd)pyrene	60	CLEA v1.06 (2009)
Dibenz(ah)anthracene	13	CLEA v1.06 (2009)
Benzo(ghi)perylene	650	CLEA v1.06 (2009)

Concentrations of all of the potential organic contaminants analysed for were found to be either below the detection limit of the analytical method, or below the respective CLEA soil guideline values for a commercial end use. Organic contaminants are therefore considered to pose a negligible risk to end users.

6.1.3.3 Asbestos Containing Materials (ACM)

Cement sheeting fragments were disclosed in the made ground in BH1. The asbestos screening testing did not identify the presence of asbestos. The potential for ACM within the made ground cannot be ruled out and vigilance should be maintained by groundworkers for the presence of this potential contaminant. Asbestos is considered to pose a negligible risk to end users of the proposed buildings.

6.1.3.4 Conclusion of End User Risk Assessment

The low concentrations of organic contaminants recorded in the samples were considered to present a negligible risk to end users of the development.

A negligible risk is considered to exist from inorganic determinands, with the exception of lead, from which, given the temporary nature of the scheme, there is considered to be a low risk to end users without appropriate remedial action.

End users are considered to be at negligible risk from asbestos containing materials present within the made ground.

To prevent end users of the development from coming into direct contact with the contaminants identified within the made ground, it is considered that a clean cover or barrier system will be necessary in any areas proposed for soft landscaping to prevent any contact between end users and the affected soils. The existing topsoil

and grass could be left in place or the topsoil scraped away beneath the buildings could be utilised. Testing of the topsoil would be required to determine if it is suitable for use as clean cover. Alternatively, ready access to proposed soft areas could be restricted for end users.

6.2 Ground Gas

A desk study was not within the remit of this report, however, information provided by the Consulting Engineer indicated that the site was located on an historic landfill site, operational between 1940 and 1960. Also, the published geological map indicated that the site was underlain wholly by Made Ground. Ground gas monitoring was therefore undertaken as defined by the Consulting Engineer.

A gas monitoring well was installed within borehole BH2 at 3 m with the response zone within the made ground, the most likely source of hazardous ground gas beneath the site, and the underlying superficial deposits a potential pathway for ground gas. One ground gas monitoring visit was undertaken on 13 December 2011.

The concentration of methane was below the detection limit of the apparatus (0.1% v/v). Carbon dioxide was measured at 4.9% v/v, which corresponded with a depleted oxygen level of 17.6% v/v.

Concentrations of hydrogen sulphide and carbon monoxide were below the detection limit of the apparatus (1 ppm).

The gas flow rate was below the detection limit of the apparatus (0.1 l/hr).

The monitoring visit was conducted at a time of rising atmospheric pressure, as interpolated from regional records supplied by the Met Office. Full details of the ground gas monitoring are included in the gas monitoring record sheets at the end of this report.

The results of the ground gas monitoring have been reviewed in line with the current guidelines presented in CIRIA C665. This guidance recommends typical monitoring periods and frequency, depending on the potential ground gas source and the sensitivity of the development, to determine the ground gas regime. For this scheme monitoring to establish the ground gas regime would be required on specific occasions over a number of months. Only a single monitoring visit has been undertaken as part of the investigation.

As the proposed development is to comprise three buildings making up the basketball training facility, reference has been made to 'Situation A': All Development Types, Except Low Rise Housing', which uses the modified Wilson and Card classification system to determine appropriate ground gas protection measures.

Gas Screening Values (GSV) were calculated based on the maximum methane and carbon dioxide concentration multiplied by the maximum gas flow rate encountered. A worst case GSV of 0.0049 l/hr for carbon dioxide was calculated, characterising the site as a Characteristic Situation 1 (very low risk), where no special gas precautionary measures are required for adoption in the development. However, given the limited

scope of the monitoring undertaken, it would be prudent to carry out further monitoring to confirm the ground gas regime.

A slightly depleted oxygen level could pose a potential risk of asphyxiation to groundworkers in confined spaces. No obvious source for the de-oxygenated conditions other than the made ground was identified from the investigation.

Groundworkers entering confined spaces will be at low risk from asphyxiation. Safe methods of working must therefore be devised to minimise the need for personnel to enter confined spaces. When this cannot be avoided the atmosphere should be regularly monitored for hazardous gases and oxygen depletion before and during the work. Alternatively forced ventilation could be provided to ensure a safe atmosphere exists in all confined spaces. Adequate personal protective equipment (PPE) may be required, subject to the results of the monitoring, including personal gas monitors/alarms, escape breathing apparatus, safety harness and recovery winches whilst a banksman remains on watch outside the confined space.

6.3 Groundworkers

Construction workers are likely to be exposed to the made ground on site. To mitigate the potential low risk to adverse effects, appropriate levels of personal protective equipment will be required.

Groundworkers should be made aware of the presence of lead and the potential presence of asbestos containing materials within the made ground. The relevant

levels of personal protective equipment will be required to mitigate the risk of adverse effects. Any asbestos containing materials identified should be appropriately removed and disposed of by a specialist contractor.

Groundworkers in confined spaces such as excavations may be at moderate risk from depleted oxygen levels. Safe methods of working accounting for current Health and Safety regulations and best practice will have to be followed where a need is identified for personnel to work in confined spaces such as trenches and deep excavations.

6.4 Waste Disposal

The categorisation of the made ground for waste disposal purposes was defined by comparing the results of the chemical analysis with the guidance given in the Environment Agency document 'Framework for the Classification of Contaminated Soils as Hazardous Waste' Version 1, dated July 2004. Based on the contamination test results, three of the made ground samples tested were categorised as Hazardous for waste disposal purposes.

Waste Acceptance Criteria (WAC) testing was also undertaken on two samples of made ground. Sulphate leachate levels were above the Inert Waste Landfill threshold in both samples.

The waste disposal testing is based on a limited data set. It would therefore be prudent to test a representative stock pile sample of material intended for disposal off-

site. It is recommended that contact is made with the receiving landfill prior to disposal in order to confirm the classification of the material for waste disposal purposes.

If any asbestos containing materials are found on site then these will need to be regarded as Hazardous Waste and should be disposed of to an appropriately licensed landfill site by a specialist contractor.

7. CONCLUSIONS

Consideration is being given by the Olympic Development Authority (ODA) to construction of a temporary basketball training venue located near Lea Bridge Road, Leyton, London, E10 7QL for use during the 2012 London Olympic and London Paralympic Games. The proposed development comprises three structures to include Ancillary Services such as staff and athletes facilities, and two basketball courts. Around the buildings there are areas for parking, storage and plant, an access road into and out of the facility, a stockpile of topsoil, 'soft' areas and an external boundary fence. It is proposed that the columns will be supported on pads and that 5 m square slabs will form the floors and will also be supported on pads. Following completion of the Games (September 2012) it is proposed that the facility will be dismantled.

The ground conditions, which were generally consistent between the three boreholes, comprised a covering of topsoil overlying between 1.6 and 2.3 m of made ground. River Terrace Deposits were disclosed at one location (BH2) below the made ground at a depth of between 2.4 and 3.1 m. The River Terrace Deposits comprised medium dense, brown, slightly sandy, angular to subangular, fine to coarse, flint gravel.

A discrete seepage of groundwater was encountered at a depth of 2.5 m in BH2. The standpipe was dry at 3 m depth when subsequently monitored.

Guidance regarding the design of the foundations is presented in subsection 5.2. The Client has expressed a preference for precast pad foundations to support columns

and the floor slabs. A range of safe working loads and sizes to resist uplift forces are given in for use in the preliminary design.

A preliminary California Bearing Ratio (CBR) value of 4% is recommended for the design of the access road and areas of hardstanding constructed on the made ground.

A Design Sulphate Class of DS-2 and an ACEC Class of AC-1s has been recommended for below ground concrete, assuming static groundwater conditions.

Drainage via soakaways could be considered, however, careful consideration should be given to their location. Ideally they should be designed only to discharge into the River Terrace Deposits below foundation level and not be placed within 10 m of any structure, services or settlement sensitive external paving, due to the risk of localised settlement from repeated inundation and/or loss of 'fines'. The risk of excessive settlements of ground surface and pavements will be increased if surface water is discharged into the overlying made ground. Due to the risk of soil borne contamination being carried by percolating waters into Controlled Waters in the underlying River Terrace Deposits, permission for shallow soakaway drainage should be sought from the Environment Agency (EA).

Geoenvironmental considerations have been discussed in section 6. In order to protect end users of the development, a clean cover or barrier system will be necessary in any areas proposed for soft landscaping to prevent any contact between

end users and the affected soils. Alternatively ready access to these areas could be restricted for end users.

No gas precautionary measures were considered to be required within the proposed development based on the results of a single monitoring visit. Further monitoring would be prudent to confirm the ground gas regime.

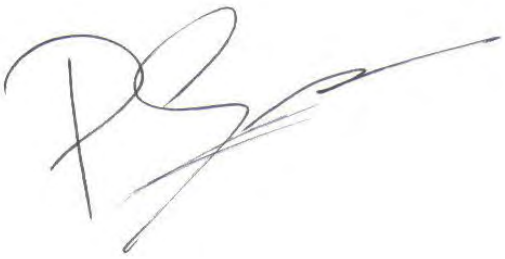
All of the recommendations made in this report will need to be approved by the Local Authority prior to any development works commencing on site.

This report is based on the results of the fieldwork, examination of the recovered samples and the laboratory testing carried out. The possibility that different conditions may exist other than at the exploratory hole positions, or at greater depth, should not be ruled out.

Samples from the investigation will be retained for a period of three weeks from the date of this report, unless instructions to the contrary are received.

N A BRAY, BSc, MCs, CGeol, FGS

Principal Geotechnical Engineer



P A GAWNE, BSc, MSc, DIC, FGS

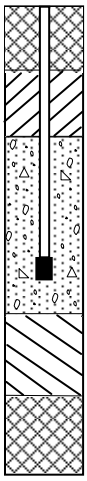
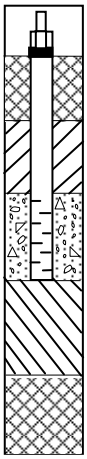
Technical Director

Report Number 13004GI

Report Issued 17 January 2012

INSTRUMENTATION DETAILS

LIST OF SYMBOLS

Symbol	Description
	Groundwater Monitoring
	19 mm diameter standpipe piezometer installed through backfilled material or cement/bentonite grout upper seal Standpipe piezometer installed through permeable sand of gravel filter medium Depth of porous Casagrande piezometer tip shown in bold Cement/bentonite grout lower seal Backfilled material beneath installation
	Gas Monitoring
	Gas valve and protective vandal proof lockable cover installed at ground level over each position Plain 50 mm diameter HDPE pipework installed through backfilled materials or cement/bentonite grout upper seal Slotted or perforated pipework installed through permeable sand or gravel filter medium Cement/bentonite grout lower seal Backfilled material beneath installation

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LABORATORY TEST RESULTS

LIST OF SYMBOLS

Symbol	Type of Test	Unit
	Classification Tests	
<425	Mass of oven dried soil passing 425 μm BS Test Sieve	%
w	Natural Moisture Content, oven dried method	%
w_p	Plastic Limit	%
w_L	Liquid Limit	%
I_p	Plasticity Index	%
LS	Linear Shrinkage	%
NP	Non-plastic	
Prep	Method of Preparation; N: Natural State, W: Wet Sieved	
Temp	Drying Temperature	°C
	Undrained Shear Strength	
Type	Type of test and nominal diameter of test specimen Ts - single point test on 100 mm nominal diameter Tm - multistage test on 100 mm nominal diameter T38 - single point tests on 38 mm diameter specimens	
ρ	Bulk density of specimen	Mg/m^3
w	Moisture content of specimen after test	%
σ_3	Cell Pressure	kN/m^2
σ_1-σ_3	Deviator Stress	kN/m^2
c	Apparent Undrained Cohesion	kN/m^2
	Chemical Tests	
pH Value	pH Value, electrometric method	
Total	Total Sulphate as percentage of oven dried mass, expressed as SO_4	%
2:1 Extract	Sulphate Content of 2:1 water:soil extract, expressed as SO_4	g/litre
Groundwater	Sulphate content of groundwater, expressed as SO_4	g/litre

KEY TO SOIL TYPES

Symbol	Description
MG	Made Ground
RTD	River Terrace Deposits

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Project	TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Client	NUSSLI (SCHWEIZ) AG	Boring Methods	LIGHT CABLE PERCUSSION 150 mm DIAMETER CASED 150 mm DIAMETER G.L. TO 2.00 m UNCASED 2.00 TO 2.00 m	Hole No.	**BH1**
		Engineer	MOMENTUM			Sheet	1 of 1
Ground Level	7.80 m.A.O.D.	Coordinates	m.E. m.N.			Job No	**13004GI**

WATER				STRATA				SAMPLING/IN SITU TEST			LAB TESTING							
Date/Time at Depth	Depth of Casing m	Depth to Water m	Inst.	Description	Legend	Level m.A.O.D.	Depth m	Depth m	Type & No.	Blows/ Strength	% < 425	w %	w_P %	w_L %	ρ_d Mg/m^3	c_u kN/m^2	OTHER TESTS AND NOTES
				Topsoil (Grass over brown sand)		7.70	0.10										Hand excavated from ground level to 1.20m (45mins)
				Made Ground (Loose dark grey brown and grey slightly silty sand with some fine-medium gravel sized angular-subangular fragments of yellow brick, concrete, mortar, slate and clinker with occasional pockets of ash, soft clay, very weak chalk and pieces of glass and cement sheeting)				0.40	D1								CLEA screen with speciated polyaromatic hydrocarbons, asbestos screen and waste acceptance criteria - total waste suite (D1)
																	Particle size distribution,
								1.20-1.65	C1	N=4							pH and sulphate, and
								1.20-1.65	B1								California Bearing Ratio
								1.50	K1								Soakage test at 1.50m (K1)
				- containing medium-coarse gravel sized pockets of claybound sand and some tabular angular fragments of flint and ash													
08/12/11	2.00	DRY	C														No groundwater encountered
						5.80	2.00										Borehole complete at 2.00m on instructions from EOD engineer

Water Level observations during boring, depths below GL.					
Strike	Depth Obs.	Depth after			
		5min	10 min	15 min	20 min

WATER
- ▼ 1 First Strike
- ▽ 2 Subsequent Strike
- N - Overnight Depth
- C- Completion Depth
- S Seepage not rising

SAMPLE KEY
- D Small disturbed sample
- B Bulk disturbed sample
- W Water sample
- U Undisturbed sample
- P Piston sample

TEST KEY
- S Standard penetration test
- C Cone penetration test
- K Permeability test
- V In situ vane test

BLOWS / STRENGTH
- N = N value
- 26/150 blows, for 150mm, drive after seating
- 26*, blows for part or whole of seating drive only
- (26) U sample blow count
- V = Vane Strength - kN/m^2

Fieldwork By	MW
Dates	08/12/11
Log	JMK

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Project	TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Client	NUSSLI (SCHWEIZ) AG	Boring Methods	LIGHT CABLE PERCUSSION 150 mm DIAMETER CASED 150 mm DIAMETER G.L. TO 3.10 m UNCASED 3.10 TO 3.10 m	Hole No.	**BH2**
		Engineer	MOMENTUM			Sheet	1 of 1
Ground Level	7.70 m.A.O.D.	Coordinates	m.E. m.N.			Job No	**13004GI**

WATER				STRATA				SAMPLING/IN SITU TEST			LAB TESTING							
Date/Time at Depth	Depth of Casing m	Depth to Water m	Inst.	Description	Legend	Level m.A.O.D.	Depth m	Depth m	Type & No.	Blows/ Strength	% < 425	w %	w_P %	w_L %	ρ Mg/m^3	c_u kN/m^2	OTHER TESTS AND NOTES
				Topsoil (Grass over brown sand)		7.60	0.10										Hand excavated from ground level to 1.20m (30mins)
				Made Ground (Firm-stiff brown slightly silty clay with occasional fine gravel sized siltstone nodules and rootlets, recovered as subangular medium-coarse gravel sized lumps of clay in a matrix of dark brown slightly silty sand with occasional medium gravel sized fragments of mortar, slate, coal and a spark plug)				0.50	D1								CLEA screen with speciated polyaromatic hydrocarbons and asbestos screen
				Made Ground (Loose grey, brown, black and occasionally green and red brown angular-subangular medium-coarse gravel composed of fused clinker, metal, mortar, brick, slate, ceramic pipe, ash and occasional metal pipe (10mm diameter) and glass in a matrix of dark grey brown silty sand)		6.90	0.80										
								1.20-1.65	C1	N=4							Particle size distribution, pH and sulphate,
								1.20-1.65	B1								CLEA screen with speciated polyaromatic hydrocarbons, asbestos screen and waste acceptance criteria - total waste suite (B1)
								2.10-2.55	C2	N=13							Particle size distribution
								2.10-2.55	B2								
08/12/11	2.50	2.50 S		Medium dense brown slightly sandy angular-subangular fine-coarse flint GRAVEL (River Terrace Deposits)		5.30	2.40	2.50	K1								Water added to borehole between 2.40 and 3.10m to assist drilling (100 litres)
								2.60	D2								Groundwater seepage recorded at 2.50m, slow inflow
08/12/11	3.10	2.60 C															Falling head soakage test carried out at 2.50m (60mins)
						4.60	3.10										Borehole complete at 3.10m on instructions by EOD engineer
																	50mm diameter HDPE pipe installed to 3.00m
																	Pipework capped and protected with flush lockable cover

Water Level observations during boring, depths below GL.					
Strike	Depth Obs.	Depth after 5min	10 min	15 min	20 min

WATER
- ▼ 1 First Strike
- ▽ 2 Subsequent Strike
- N - Overnight Depth
- C- Completion Depth
- S Seepage not rising

SAMPLE KEY
- D Small disturbed sample
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- W Water sample
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BLOWS / STRENGTH
- N = N value
- 26/150 blows, for 150mm, drive after seating
- 26*, blows for part or whole of seating drive only
- (26) U sample blow count
- V = Vane Strength - kN/m^2

Fieldwork By	MW
Dates	08/12/11
Log	JMK

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Project	TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Client	NUSSLI (SCHWEIZ) AG	Boring Methods	LIGHT CABLE PERCUSSION 150 mm DIAMETER CASED 150 mm DIAMETER G.L. TO 1.70 m UNCASED 1.70 TO 1.70 m	Hole No.	**BH3**
		Engineer	MOMENTUM			Sheet	1 of 1
Ground Level	7.70 m.A.O.D.	Coordinates	m.E. m.N.			Job No	**13004GI**

WATER				STRATA				SAMPLING/IN SITU TEST			LAB TESTING							
Date/Time at Depth	Depth of Casing m	Depth to Water m	Inst.	Description	Legend	Level m.A.O.D.	Depth m	Depth m	Type & No.	Blows/ Strength	% < 425	w %	w_P %	w_L %	ρ Mg/m^3	c_u kN/m^2	OTHER TESTS AND NOTES
				Topsoil (Grass over brown sand)		7.60	0.10										Hand excavated from ground level to 1.20m (45mins)
				Made Ground (Loose light grey brown silty fine-coarse sand with some angular-subangular fine-coarse gravel sized fragments of brick, mortar and occasional coal, ash and traces of rootlets)		7.10	0.60	0.60	D1								Particle size distribution and CLEA screen with speciated polyaromatic hydrocarbons and asbestos screen (D1)
				Made Ground (Loose dark reddish brown slightly silty fine-coarse sand with many angular-subangular fine-coarse gravel sized fragments of brick and concrete)				1.20	D2								CLEA screen with speciated polyaromatic hydrocarbons and asbestos screen (D2)
						6.30	1.40										No groundwater encountered
08/12/11	1.70	DRY	C	Made Ground (Gravel sized angular fragments of brick and concrete) [Driller's description]		6.00	1.70										Borehole complete at 1.70m on instructions from EOD engineer

Water Level observations during boring, depths below GL.					
Strike	Depth Obs.	Depth after 5min	10 min	15 min	20 min

WATER
- ▼ 1 First Strike
- ▽ 2 Subsequent Strike
- N - Overnight Depth
- C- Completion Depth
- S Seepage not rising

SAMPLE KEY
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- (26) U sample blow count
- V = Vane Strength - kN/m^2

Fieldwork By	MW
Dates	08/12/11
Log	JMK

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TEST REPORT

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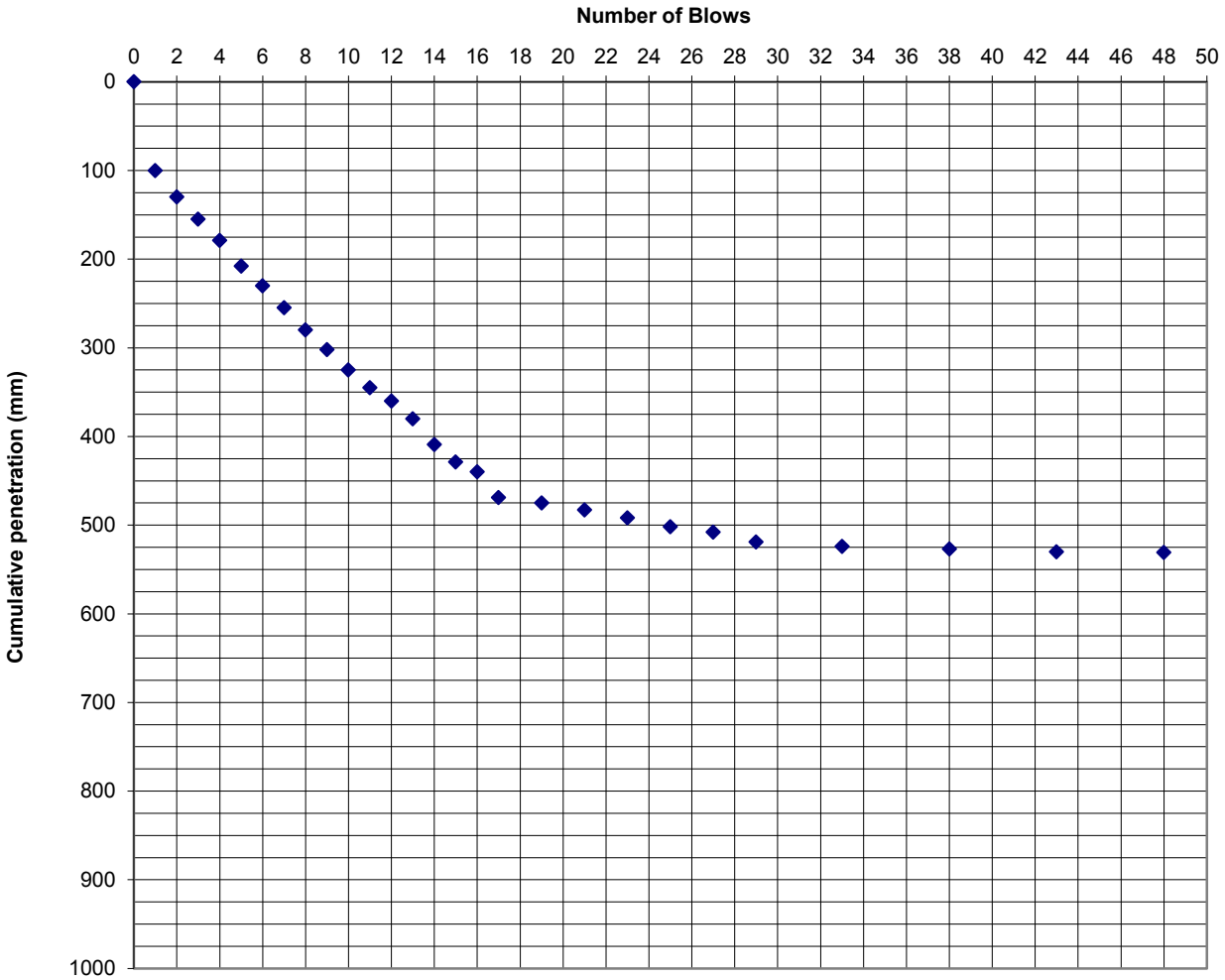
DYNAMIC CONE PENETROMETER



Method of Test: In-house method based on manufacturers operating instructions and IAN 73/06

Method of Calculations: Refer IAN 73/06 Section 4, Annex A

Material Description: Made Ground - Obstruction at approximately 0.5 m

Depth (mbgl) from	to	Inferred CBR (%)
0.00	**0.47**	**9.1**
0.47	**0.53**	**145**

Operative: LG/PF
Calculated: JMK
Checked: PAG

Project

Temporary Basketball Venue, Lea Bridge Road, Leyton

Location: **DCP1**
Start Depth: **0.00** mOD: 7.9
Co-ordinates:
Date of Test: **08/12/2011**
Job No. **13004GI**

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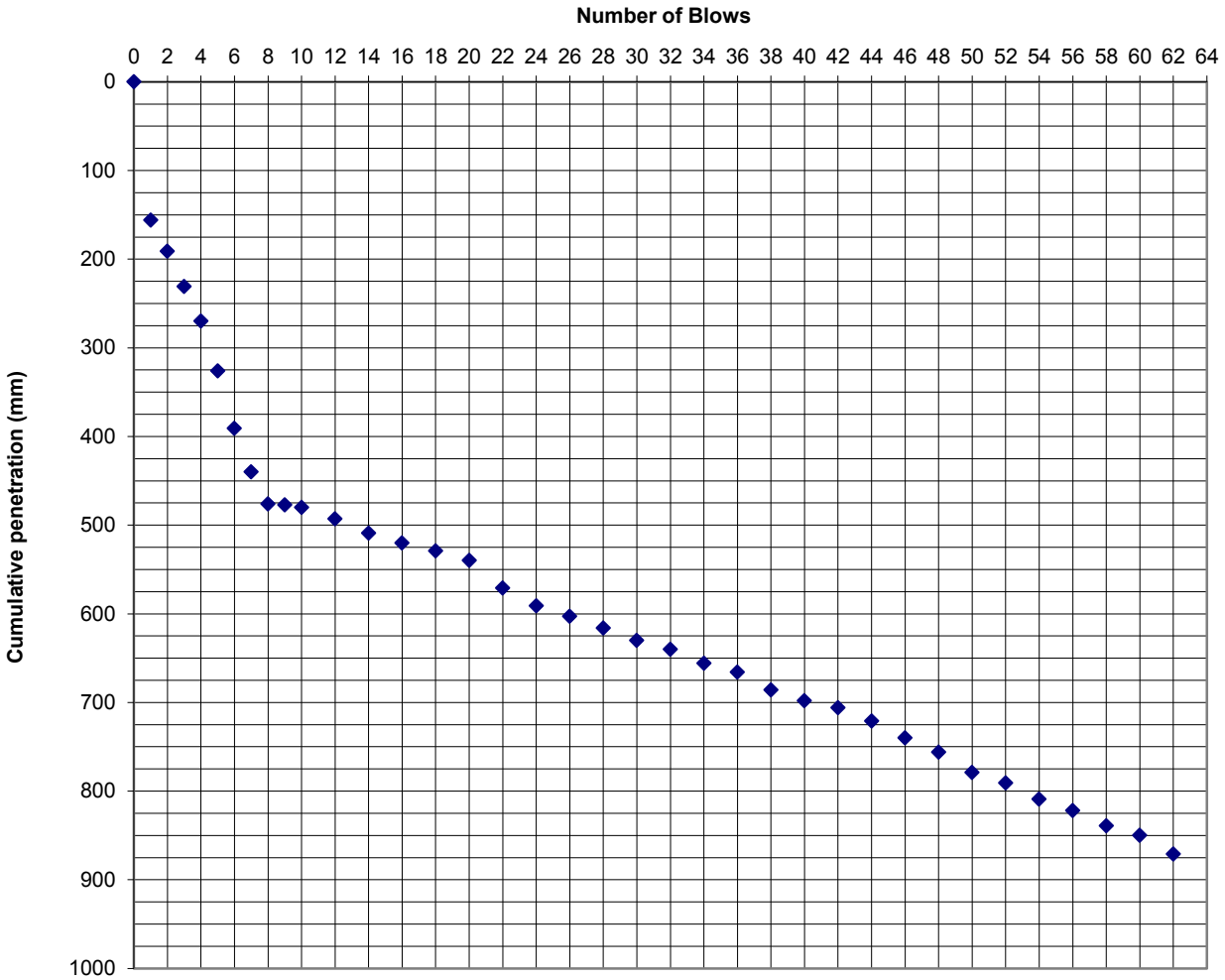
DYNAMIC CONE PENETROMETER



Method of Test: In-house method based on manufacturers operating instructions and IAN 73/06

Method of Calculations: Refer IAN 73/06 Section 4, Annex A

Material Description: Made Ground

Depth (mbgl) from	to	Inferred CBR (%)
0.00	**0.48**	**4.0**
0.48	**0.87**	**37**

Operative: LG/PF
Calculated: JMK
Checked: PAG

Project

Temporary Basketball Venue, Lea Bridge Road, Leyton

Location: **DCP2**
Start Depth: **0.00m** mOD: 7.8
Co-ordinates:
Date of Test: **08/12/2011**
Job No. **13004GI**

TEST REPORT

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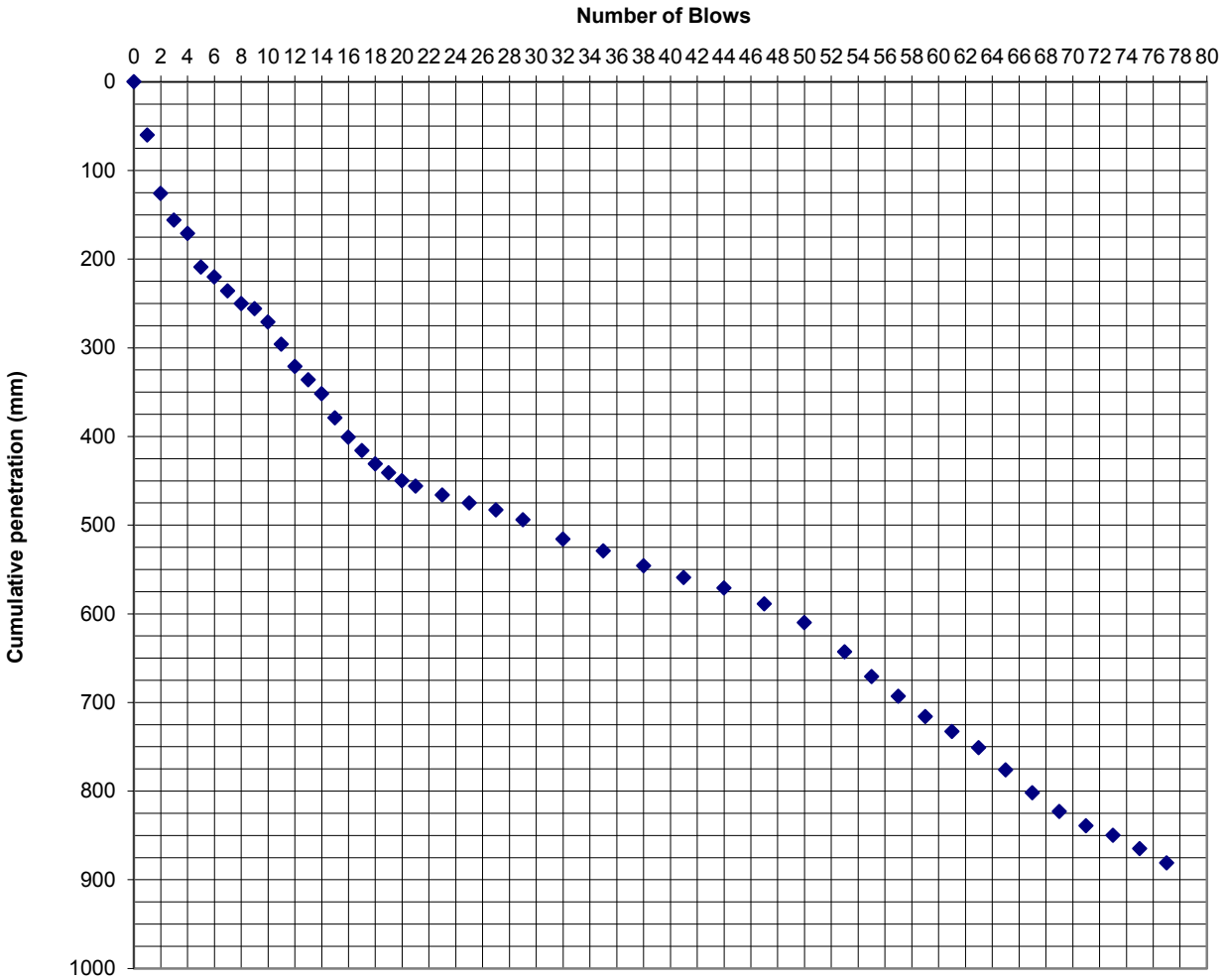
DYNAMIC CONE PENETROMETER



Method of Test: In-house method based on manufacturers operating instructions and IAN 73/06

Method of Calculations: Refer IAN 73/06 Section 4, Annex A

Material Description: Made Ground

Depth (mbgl) from	to	Inferred CBR (%)
0.00	**0.17**	**5.7**
0.17	**0.44**	**14**
0.44	**0.59**	**52**
0.59	**0.88**	**27**

Operative: LG/PF
Calculated: JMK
Checked: PAG

Project

Temporary Basketball Venue, Lea Bridge Road, Leyton

Location: **DCP3**
Start Depth: **0.00m** mOD: 7.9
Co-ordinates:
Date of Test: **08/12/2011**
Job No. **13004GI**

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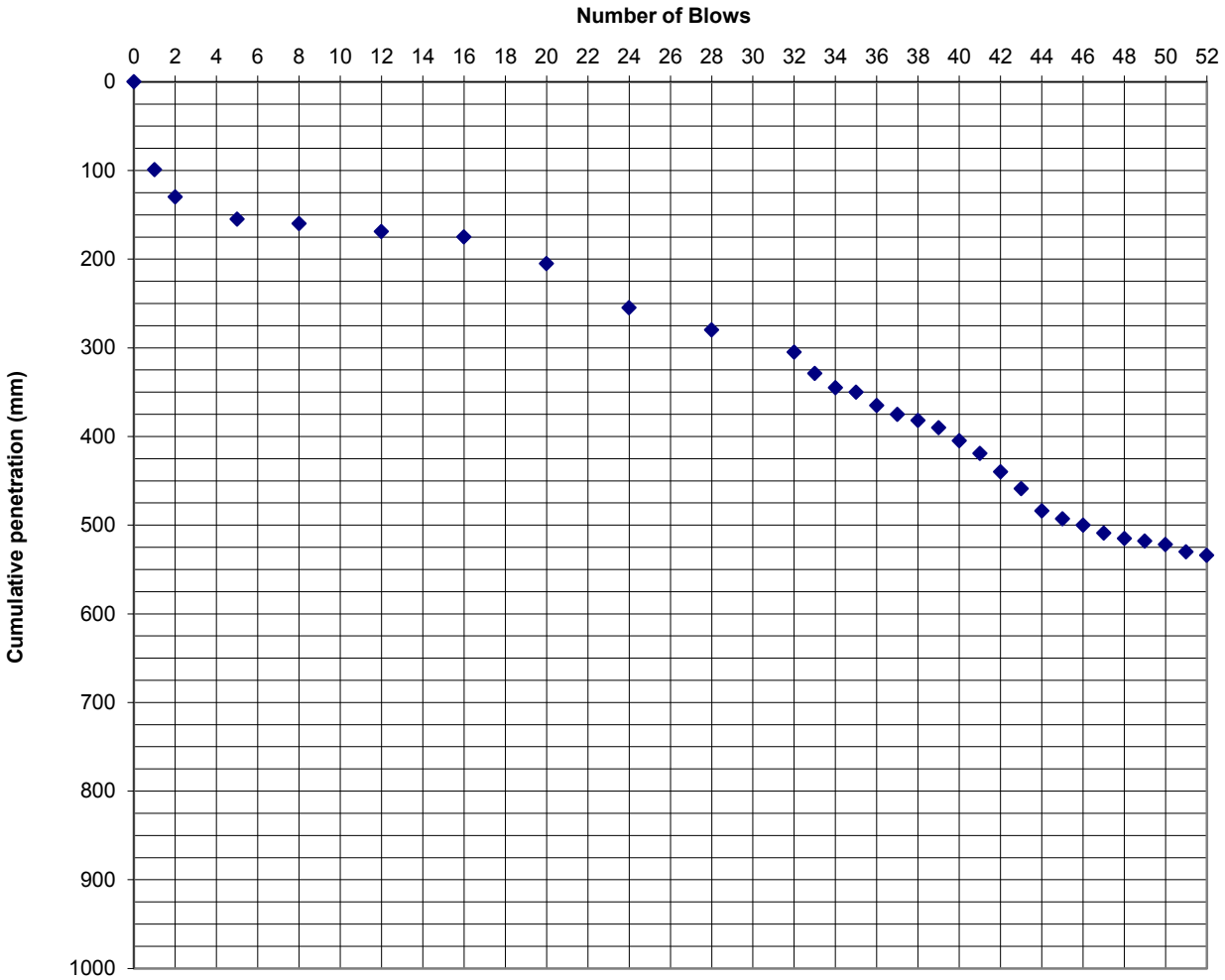
DYNAMIC CONE PENETROMETER



Method of Test: In-house method based on manufacturers operating instructions and IAN 73/06

Method of Calculations: Refer IAN 73/06 Section 4, Annex A

Material Description: Made Ground - Obstruction at 0.53m, further probing not possible.

Depth (mbgl) from	to	Inferred CBR (%)
0.00	**0.18**	**24**
0.18	**0.31**	**33**
0.31	**0.48**	**17**
0.48	**0.53**	**44**

Operative: LG/PF
Calculated: JMK
Checked: PAG

Project

Temporary Basketball Venue, Lea Bridge Road, Leyton

Location: **DCP4**
Start Depth: **0.00m** 8.0
Co-ordinates:
Date of Test: **08/12/2011**
Job No. **13004GI**

TEST REPORT

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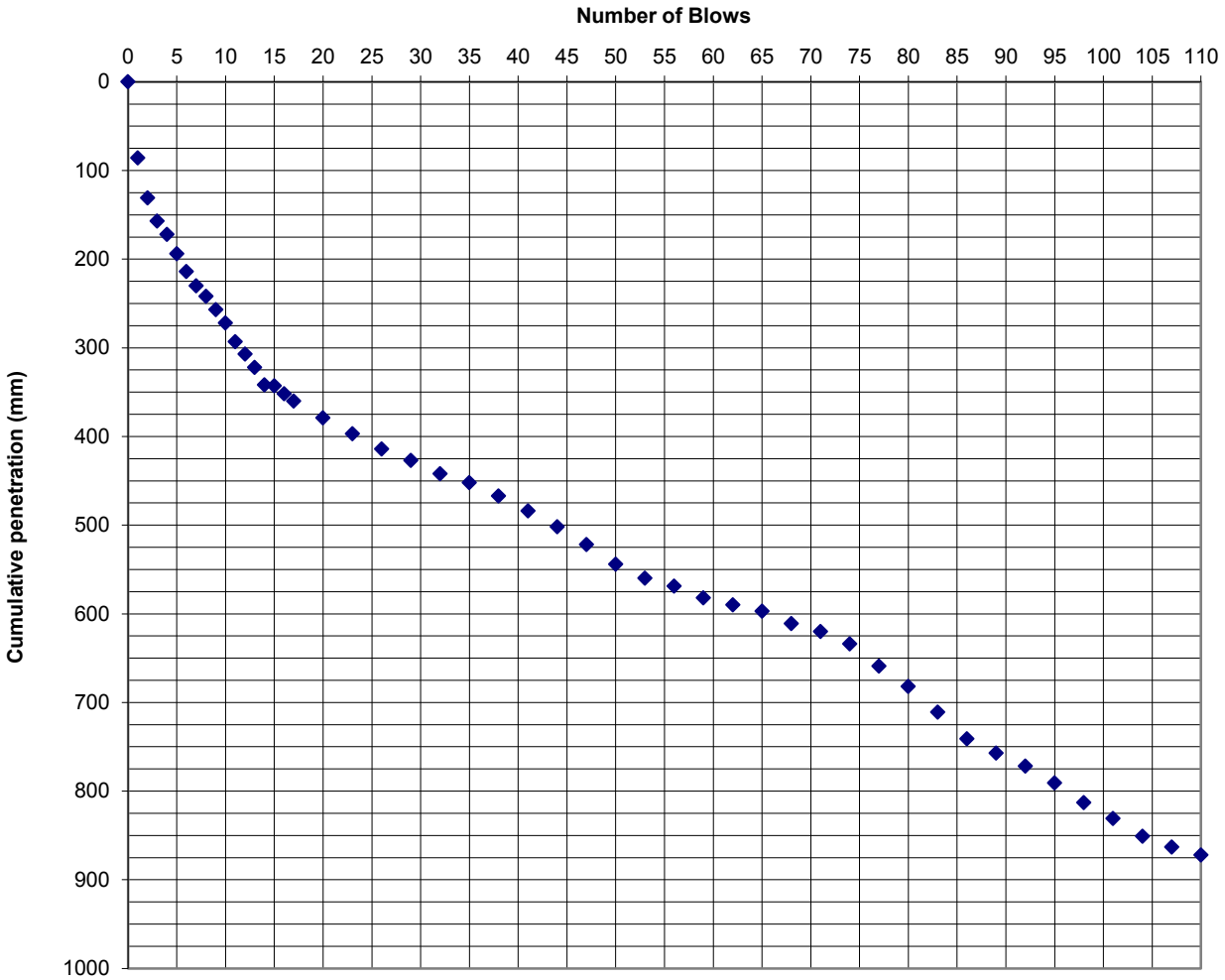
DYNAMIC CONE PENETROMETER



Method of Test: In-house method based on manufacturers operating instructions and IAN 73/06

Method of Calculations: Refer IAN 73/06 Section 4, Annex A

Material Description: Made Ground

Depth (mbgl) from	Depth (mbgl) to	Inferred CBR (%)
0.00	**0.13**	**3.6**
0.13	**0.35**	**16**
0.35	**0.87**	**50**

Operative: GD/PF
Calculated: JMK
Checked: NAB

Project

Temporary Basketball Venue, Lea Bridge Road, Leyton

Location: **DCP5**
Start Depth: **0.00m** mOD: 7.8
Co-ordinates:
Date of Test: **08/12/2011**
Job No. **13004GI**

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Borehole Number BH1, Test 1, 1.50m

Borehole Diameter $B := 150mm$

Borehole Depth $D := 1.50m$

Depth from ground level to base of casing $D_c := 1.40m$

Depth from ground level to top of test interval $D_w := 0.40m$

Porosity $n := 100\%$ no gravel used

Time (mins)	Water Levels (mbGL)
0	0.4
0.5	1.14
0.75	1.5

Depths when borehole is 75% and 25% full

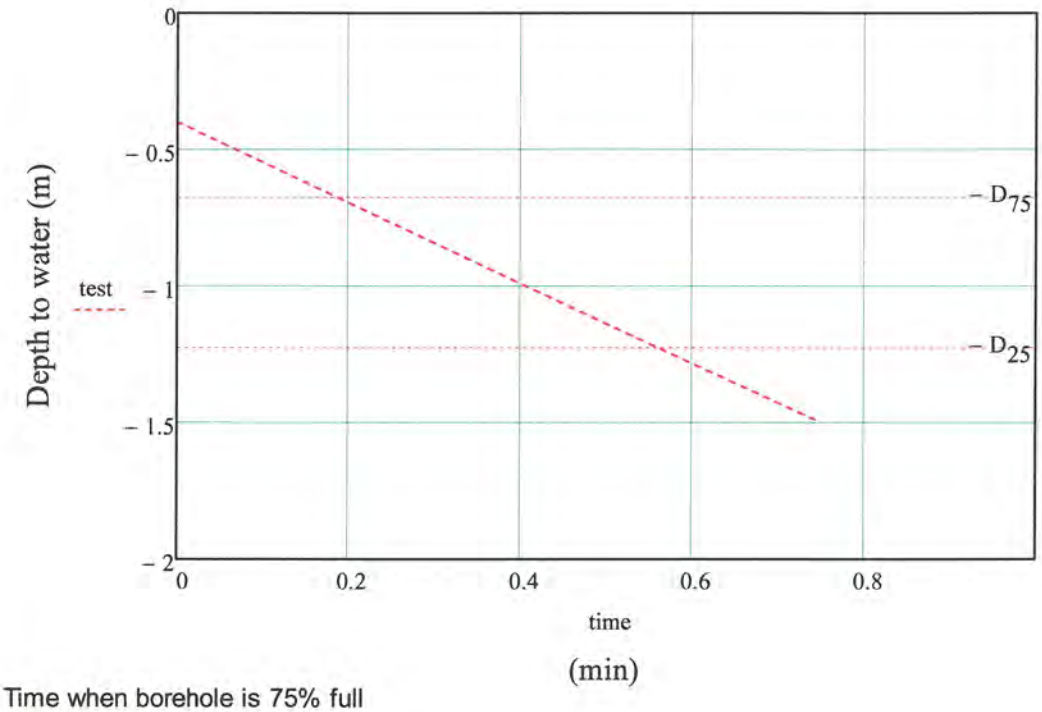
$D_{75} = 0.675\,m$ $D_{25} = 1.225\,m$

Mean Surface Area for Outflow

$a_{p50} = 0.065\,m^2$

Volume from 75% to 25% full

$V_{75_25} = 9.719\,L$



Time when borehole is 75% full

$t_{75} := 0.18min$

Time when borehole is 25% full

$t_{25} := 0.56min$

Soil Infiltration Rate

$f = 6.579 \times 10^{-3} \cdot m \cdot s^{-1}$

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Borehole Number BH1, Test 2, 1.50m

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Borehole Diameter	$B := 150mm$	
Borehole Depth	$D := 1.50m$	
Depth from ground level to base of casing	$D_c := 1.40m$	
Depth from ground level to top of test interval	$D_w := 0.30m$	
Porosity	$n := 100\%$	no gravel used

Time (mins)	Water Levels (mbGL)
0	0.3
0.5	1
1	1.4
1.1	1.5

Depths when borehole is 75% and 25% full

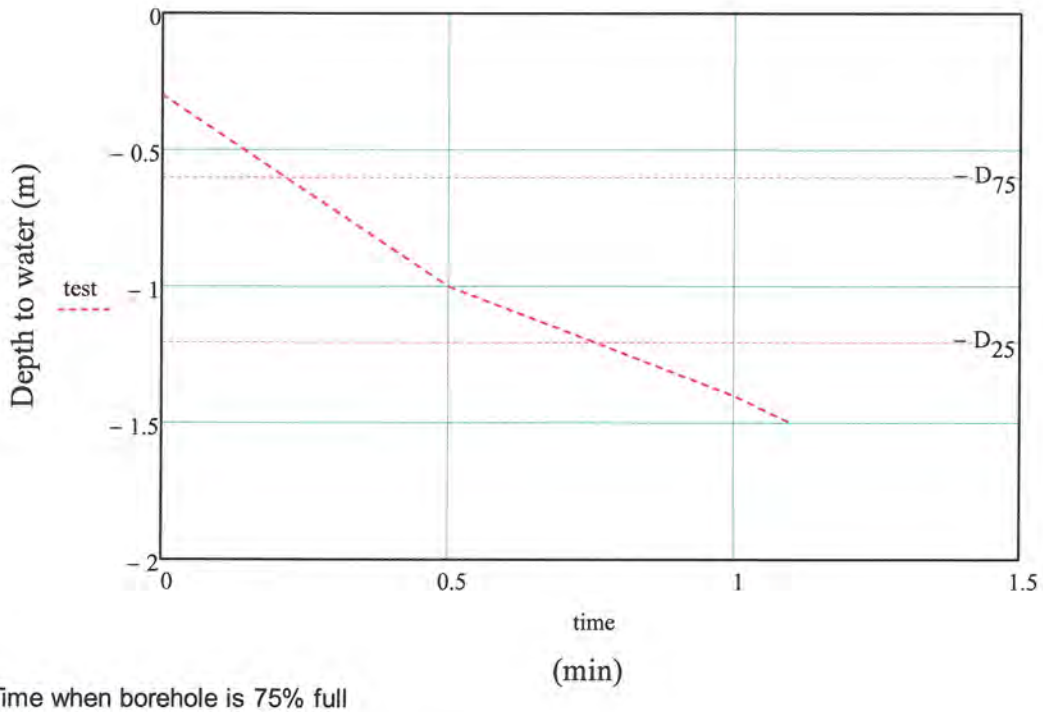
$D_{75} = 0.6\,m$ $D_{25} = 1.2\,m$

Mean Surface Area for Outflow

$a_{p50} = 0.065\,m^2$

Volume from 75% to 25% full

$V_{75_25} = 10.603\,L$



Time when borehole is 75% full

$t_{75} := 0.22min$

Time when borehole is 25% full

$t_{25} := 0.75min$

Soil Infiltration Rate

$f = 5.146 \times 10^{-3} \cdot m \cdot s^{-1}$

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Test carried out by MW
Date of test 08/12/11
F:\Reports\13004GI Basketball Venue, Lea Bridge Rd, Leyton, London, NAB\Calculations and File Notes\

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Borehole Number BH2, TEST 1, 2.60m

Borehole Diameter	$B := 150mm$
Borehole Depth	$D := 2.60m$
Depth from ground level to base of casing	$D_c := 2.60m$
Depth from ground level to water level at start of the test	$D_s := 0.00m$
Depth to natural groundwater	$D_w := 2.50m$
Pipe diameter	$B_p := 150mm$
Porosity	$n := 100\%$ no gravel used

Time (mins)	Water Levels (mbGL)
0	0
0.5	0.01
1	0.014
1.5	0.019
2	0.022
3	0.03
4	0.039
5	0.054
7	0.06
9	0.068
12	0.078
15	0.12
20	0.68
25	1.07
30	1.46
40	1.76
50	2.08
60	2.4

Depths when borehole is 75% and 25% full

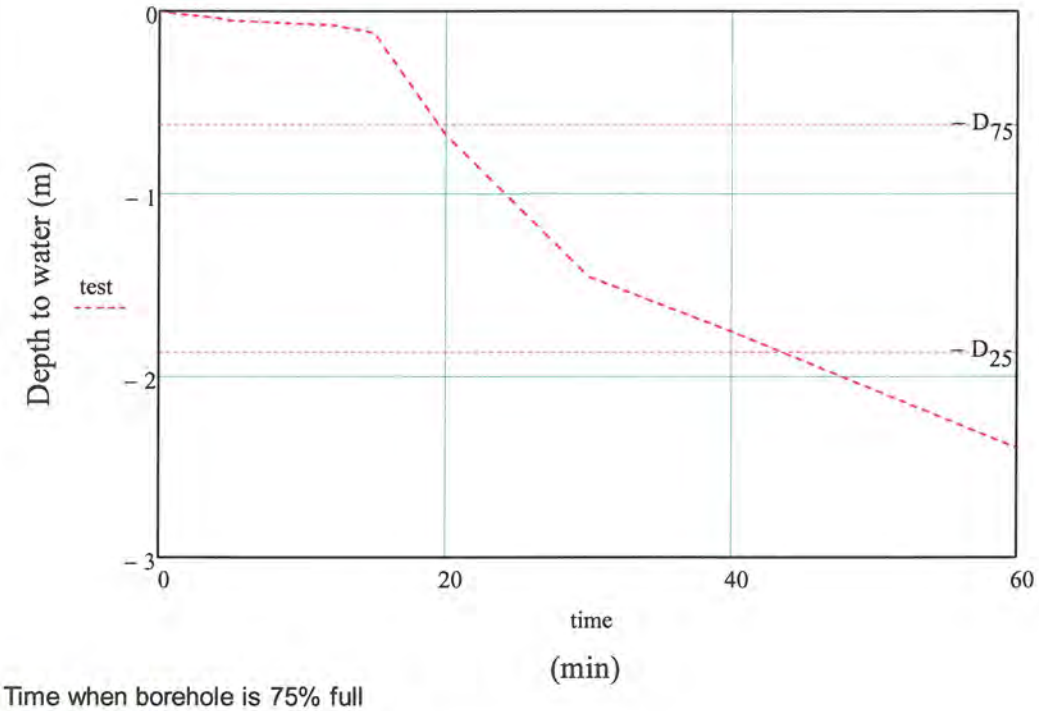
$D_{75} = 0.625\,m$ $D_{25} = 1.875\,m$

Mean Surface Area for Outflow

$a_{p50} = 0.018\,m^2$

Volume from 75% to 25% full

$V_{75_25} = 22.089\,L$



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Time when borehole is 75% full

$t_{75} := 19min$

Time when borehole is 25% full

$t_{25} := 43min$

Soil Infiltration Rate

$f = 8.7 \times 10^{-4} \cdot m \cdot s^{-1}$

GAS AND GROUNDWATER MONITORING RECORD SHEETS

Type of Test: 1st Return Visit **Date of Test:** 13/12/2011

Location	Date of Installation	Time of Monitoring (hours)	Flow (litres/hr)	Methane Content (% v/v)	Methane Content (% LEL)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Other Gases (ppm) Hydrogen Sulphide	Other Gases (ppm) Carbon Monoxide	Other Gases (ppm) Photoionisation Detector	Water Level (mbgl)
BH2	08/12/2011	1045	<0.1	<0.1	<2	4.9	17.6	<1	<1	-	Dry

Notes:
1% by volume = 10000 ppm
1% LEL = 520 ppm
1 cm^3/min = 0.06 l/hr

Weather conditions as observed at time of monitoring:	Time (hours)	Air Temperature (°C)	Barometric Pressure (mb)	Trend in Barometric Pressure	Weather	Remarks
	0700	8	987	Rising	Clear	Weather records are not site specific but have been interpolated from local information supplied by the Met Office
Cold, cloudy, dry and very windy	1100	7	992	Rising	Rain showers	
	1500	5	992	Rising	Rain showers	

UKAS TESTING
1351

TEST REPORT

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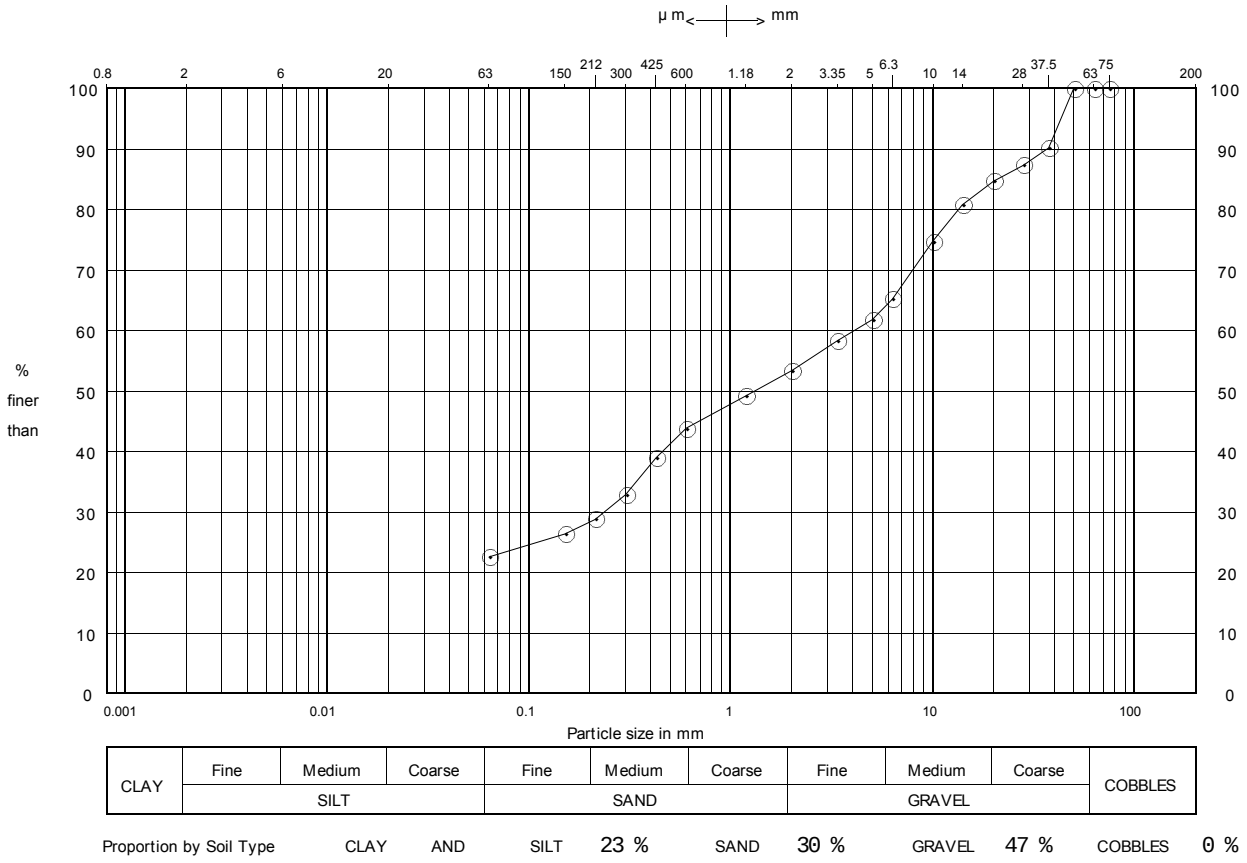
DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION

	Size (microns)																Size (mm)												
Sieve Size											63	150	212	300	425	600	1.18	2	3.35	5	6.3	10	14	20	28	37.5	50	63	75
Percentage by Mass passing Sieve											23	26	29	33	39	44	49	53	58	62	65	75	81	85	87	90	100	100	100



Proportion by Soil Type CLAY AND SILT 23 % SAND 30 % GRAVEL 47 % COBBLES 0 %

Sample Description based on BS 5930:Clause 41

Soil Type

MG

Made Ground (Loose dark grey brown and grey slightly silty sand with some fine-medium gravel sized angular-subangular fragments of yellow brick, concrete, mortar, slate and clinker with occasional pockets of ash, soft clay, very weak chalk and pieces of glass and cement sheeting)

Method of Test Wet Sieve

METHOD OF PREPARATION BS 1377:PART 1:1990: 7.3, 7.4.5

METHOD OF TEST BS1377:Part 2:1990: 9.2

REMARKS Result not determined where entry is blank.

Project

TEMPORARY BASKETBALL VENUE,
LEA BRIDGE ROAD, LEYTON, LONDON

Hole No BH1 Sample Ref B1

Depth 1.20 - 1.65 m

Specimen Location 1.20 - 1.65 m

Level 6.60 - 6.15 mOD

Job No 13004GI

RSAR2M

UKAS TESTING
1351

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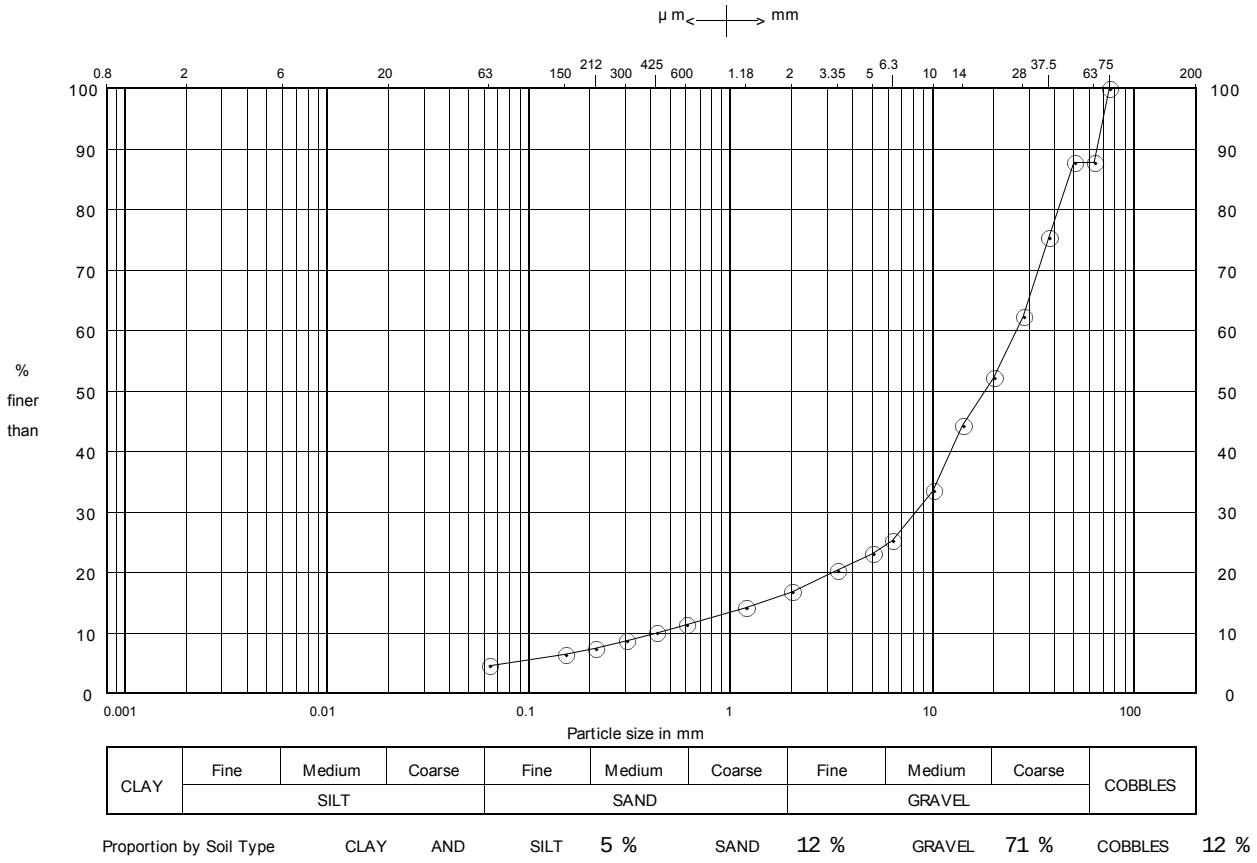
DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION

	Size (microns)																Size (mm)												
Sieve Size											63	150	212	300	425	600	1.18	2	3.35	5	6.3	10	14	20	28	37.5	50	63	75
Percentage by Mass passing Sieve											5	6	7	9	10	11	14	17	20	23	25	33	44	52	62	75	88	88	100



Proportion by Soil Type CLAY AND SILT 5 % SAND 12 % GRAVEL 71 % COBBLES 12 %

Sample Description based on BS 5930:Clause 41

Soil Type

Made Ground (Loose grey, brown, black and occasionally green and red brown angular-subangular medium-coarse gravel composed of fused clinker, metal, mortar, brick, slate, ceramic pipe, ash and occasional metal pipe (10mm diameter) and glass in a matrix of dark grey brown silty sand)

MG

Method of Test Wet Sieve

METHOD OF PREPARATION BS 1377:PART 1:1990: 7.3, 7.4.5

METHOD OF TEST BS1377:Part 2:1990: 9.2

REMARKS Result not determined where entry is blank.

Project

TEMPORARY BASKETBALL VENUE,
LEA BRIDGE ROAD, LEYTON, LONDON

Hole No BH2 Sample Ref B1

Depth 1.20 - 1.65 m

Specimen Location 1.20 - 1.65 m

Level 6.50 - 6.05 mOD

Job No 13004GI

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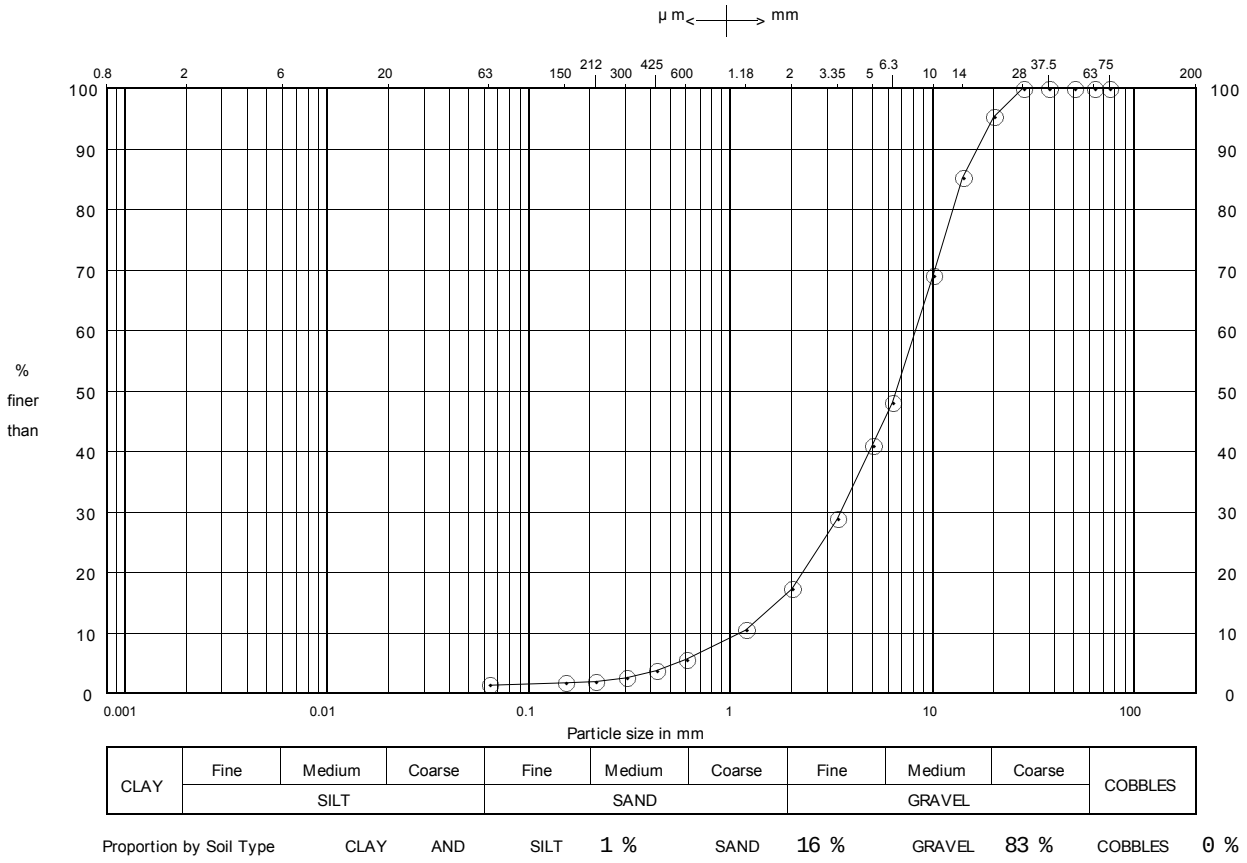
DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION

	Size (microns)																Size (mm)												
Sieve Size											63	150	212	300	425	600	1.18	2	3.35	5	6.3	10	14	20	28	37.5	50	63	75
Percentage by Mass passing Sieve											1	2	2	3	4	6	10	17	29	41	48	69	85	95	100	100	100	100	100



Proportion by Soil Type CLAY AND SILT 1 % SAND 16 % GRAVEL 83 % COBBLES 0 %

Sample Description based on BS 5930:Clause 41

Soil Type

Made Ground (Loose grey, brown, black and occasionally green and red brown angular-subangular medium-coarse gravel composed of fused clinker, metal, mortar, brick, slate, ceramic pipe, ash and occasional metal pipe (10mm diameter) and glass in a matrix of dark grey brown silty sand)

MG

Method of Test Wet Sieve

METHOD OF PREPARATION BS 1377:PART 1:1990: 7.3, 7.4.5

METHOD OF TEST BS1377:Part 2:1990: 9.2

REMARKS Result not determined where entry is blank.

Project

TEMPORARY BASKETBALL VENUE,
LEA BRIDGE ROAD, LEYTON, LONDON

Hole No BH2 Sample Ref B2

Depth 2.10 - 2.55 m

Specimen Location 2.10 - 2.55 m

Level 5.60 - 5.15 mOD

Job No 13004GI

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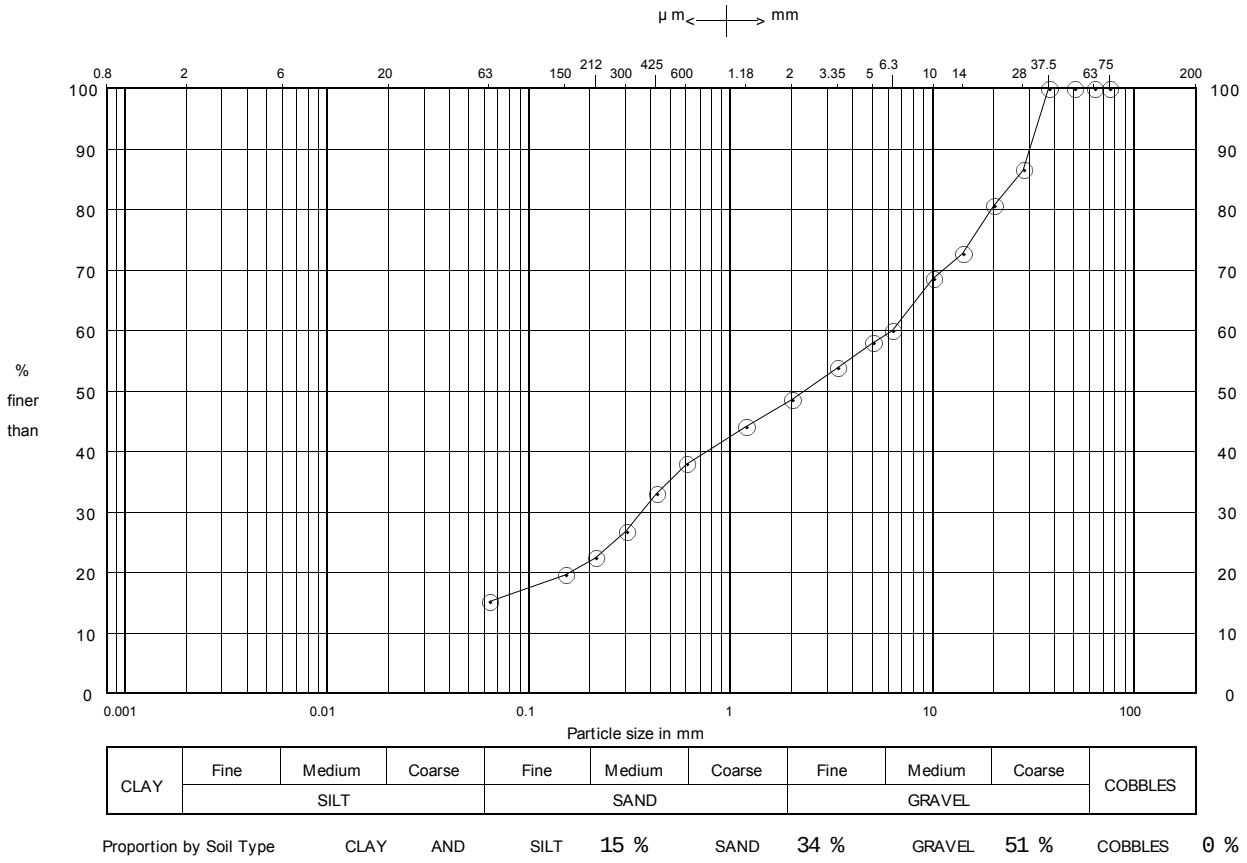
DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION

	Size (microns)																Size (mm)												
Sieve Size											63	150	212	300	425	600	1.18	2	3.35	5	6.3	10	14	20	28	37.5	50	63	75
Percentage by Mass passing Sieve											15	20	22	27	33	38	44	49	54	58	60	69	73	81	86	100	100	100	100



Proportion by Soil Type CLAY AND SILT 15 % SAND 34 % GRAVEL 51 % COBBLES 0 %

Sample Description based on BS 5930:Clause 41 — Soil Type

Made Ground (Loose dark reddish brown slightly silty fine-coarse sand with many angular-subangular fine-coarse gravel sized fragments of brick and concrete) — MG

Method of Test Wet Sieve

METHOD OF PREPARATION BS 1377:PART 1:1990: 7.3, 7.4.5

METHOD OF TEST BS1377:Part 2:1990: 9.2

REMARKS Result not determined where entry is blank.

Project

TEMPORARY BASKETBALL VENUE,
LEA BRIDGE ROAD, LEYTON, LONDON

Hole No BH3 Sample Ref D1

Depth 0.60 m

Specimen Location 0.60 m

Level 7.10 mOD

Job No 13004GI

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DETERMINATION OF THE pH VALUE AND SULPHATE CONTENT

Sulphate Content Determination is Not UKAS Accredited.

Hole No.	Sample Ref.	Depth m	Specimen Location m	pH Value	Acid-soluble Sulphate SO_4 %	Water-soluble Sulphate SO_4 g/l	Ground-water Sulphate SO_4 g/l	% passing 2mm sieve	Sample Description Based on BS5930: Clause 41	Soil Type
BH1	B1	1.20-1.65	1.20-1.65	7.6		1.43		53	Made Ground (Loose dark grey brown and grey slightly silty sand with some fine-medium gravel sized angular-subangular fragments of yellow brick, concrete, mortar, slate and clinker with occasional pockets of ash, soft clay, very weak chalk and pieces of glass and cement sheeting)	MG
BH2	B1	1.20-1.65	1.20-1.65	7.4		0.87		21	Made Ground (Loose grey, brown, black and occasionally green and red brown angular-subangular medium-coarse gravel composed of fused clinker, metal, mortar, brick, slate, ceramic pipe, ash and occasional metal pipe (10mm diameter) and glass in a matrix of dark grey brown silty sand)	MG

METHOD OF PREPARATION BS 1377:PART 1:1990: 7.3, 7.4

METHOD OF TEST In-house test procedure based on BRE BR279 and BS 1377:Part 3:1990: 5, 9

REMARKS Result not determined where entry is blank.
pH unit value measured using a 2.5:1 water:soil extract.
Water-soluble sulphate measured using a 2:1 water:soil extract.

Project

TEMPORARY BASKETBALL VENUE,
LEA BRIDGE ROAD, LEYTON, LONDON

Job No 13004GI

UKAS TESTING
1351

TEST REPORT

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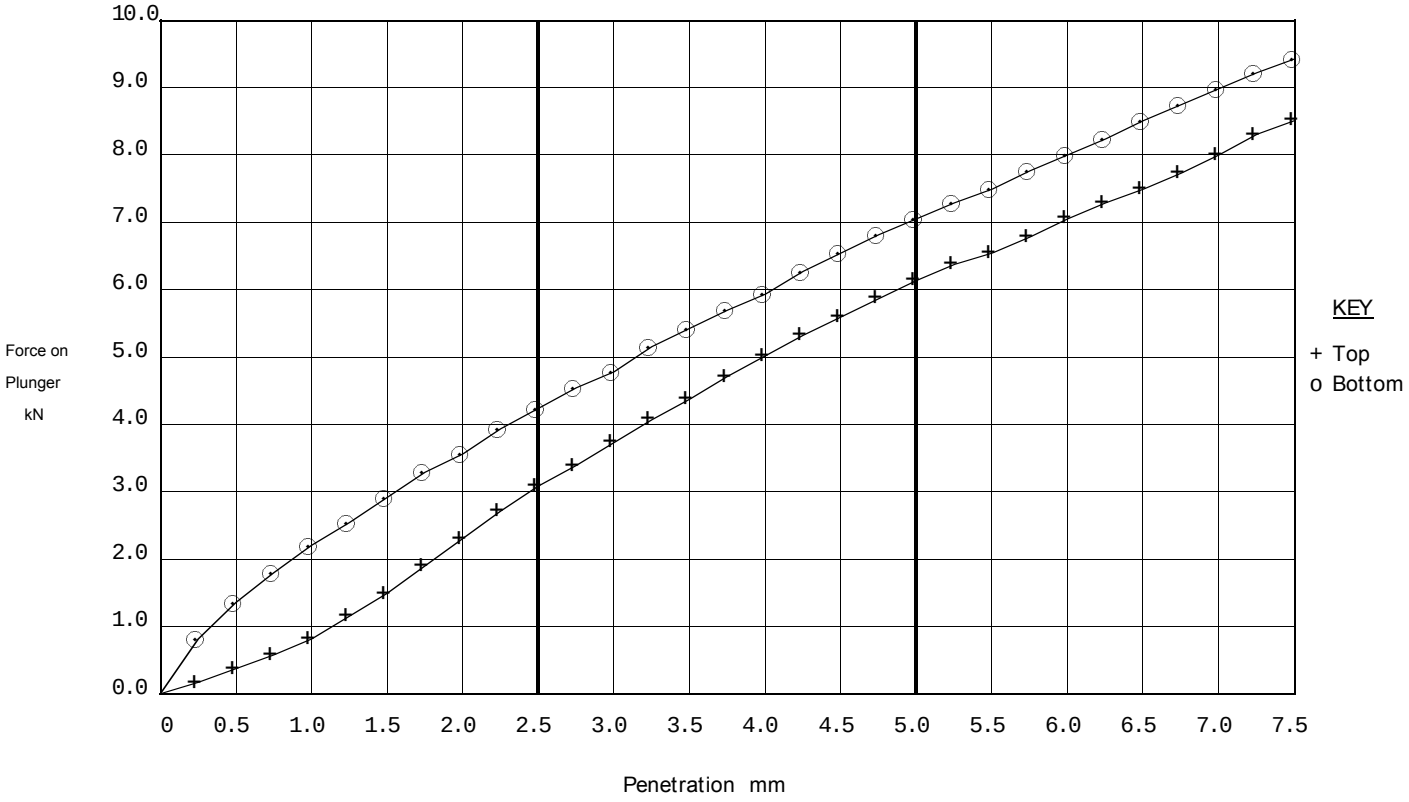
DETERMINATION OF THE CALIFORNIA BEARING RATIO (CBR)



Specimen preparation	2.5kg Rammer Method, Specified Effort.		Surcharge weights	6.80	kg
Material retained on 20mm sieve		16.8 %	Soaked Yes/No	No	
Moisture Content	Top	19.6 %	Bottom	18.9	%
Density	Bulk	1.81 Mg/m^3	Dry	1.52	Mg/m^3
California Bearing Ratio (CBR)	Top	31 %	Bottom	35	%

Sample Description based on BS 5930: Clause 41 — Soil Type

Made Ground (Loose dark grey brown and grey slightly silty sand with some fine-medium gravel sized angular-subangular fragments of yellow brick, concrete, mortar, slate and clinker with occasional pockets of ash, soft clay, very weak chalk and pieces of glass and cement sheeting) — MG

METHOD OF PREPARATION	BS 1377:PART 1:1990: 7.3, 7.6 BS 1377:PART 4:1990: 7.2
METHOD OF TEST	BS 1377:PART 4:1990: 7.4
REMARKS	Result not determined where entry is blank. A surcharge mass of 2kg simulates the effect of approximately 70mm of construction thickness. However, the exact amount of surcharge is not considered critical. Sample combined with BH2 B1

Project

TEMPORARY BASKETBALL VENUE,
LEA BRIDGE ROAD, LEYTON, LONDON

Hole No	BH1	Sample Ref	B1
Depth		1.20 - 1.65m	
Specimen Location		1.20 - 1.65m	
Level		6.60 - 6.15 mOD	
Job No		13004GI	

RSAR4E

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
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TN38 9BY
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2683 2683

THE ENVIRONMENTAL LABORATORY LTD

F.A.O. Phil Gawne
RSA Geotechnics Limited
Ashburnham House, 1 Maitland Road
Lion Barn Estate, Needham Market
Suffolk, IP6 8NZ

Reporting Date: 17/01/12

ANALYTICAL REPORT No. AR36441A (Supplementary Report)

Samples Received By:-	Courier
Samples Received:-	19/12/11
Your Job No:	13004GI
Site Location:	Temporary Basketball Venue, Lea Bridge Road, Leyton, London, E10 7QL
No Samples Received:-	5

Report Checked By:-

Steve Knight
Director

Authorised By:-

Mike Varley BSc, CChem, CSci, FRSC
Chief Chemist

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR36441A

Location: Temporary Basketball Venue, Lea Bridge Road, Leyton, London, E10 7QL

Your Job No: 13004GI

Reporting Date: 17/01/12

2683 2683

F.A.O. Phil Gawne
RSA Geotechnics Limited
Ashburnham House, 1 Maitland Road
Lion Barn Estate, Needham Market
Suffolk, IP6 8NZ

Soils

		Characteristic	Sandy Silt loam	Silt loam	Sandy Silt loam	Silt loam	Sandy Silt loam
		TP/BH	BH1 D1	BH2 D1	BH2 B1	BH3 D1	BH3 D2
		Depth (m)	0.40	0.50	1.20 - 1.65	0.60	1.20
		Our ref	23482	23483	23484	23485	23486
Stone Content	(%)		16	15	27	23	24
Arsenic**	(mg/kg)		119.3	30.4	12.6	18.7	13.9
Cadmium**	(mg/kg)		6.1	0.8	0.5	0.6	<0.5
Chromium**	(mg/kg)		70	44	23	21	23
Lead**	(mg/kg)		2129	519	281	9371	701
Mercury**	(mg/kg)		<0.5	0.7	1.3	0.8	<0.5
Nickel**	(mg/kg)		168	45	38	22	22
Copper**	(mg/kg)		2342	171	74	93	59
Zinc**	(mg/kg)		2927	359	208	241	167
Selenium**	(mg/kg)		1.9	1.6	0.9	1.0	0.9
Hexavalent Chromium	(mg/kg)		<2	<2	<2	<2	<2
Water Soluble Boron	(mg/kg)		5.7	3.3	1.0	0.7	<0.5
pH Value**	(Units)		8.1	7.9	7.9	8.5	10.3
Water Soluble Sulphate	(mg/l as SO_4)		1153	646	803	873	1238
Total Cyanide**	(mg/kg)		<1	<1	<1	<1	<1
Elemental Sulphur**	(mg/kg)		563	<10	17	<10	<10
Phenol**	(mg/kg)		<1	<1	<1	<1	<1
Soil Organic Matter*	(%)		4.2	0.6	2.6	0.5	0.5

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

SBB

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR36441A

Location: Temporary Basketball Venue, Lea Bridge Road, Leyton, London, E10 7QL

Your Job No: 13004GI

Reporting Date: 17/01/12

2683 2683

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Lion Barn Estate, Needham Market
Suffolk, IP6 8NZ

Soils

		Characteristic	Sandy Silt loam	Silt loam	Sandy Silt loam	Silt loam	Sandy Silt loam
		TP/BH	BH1 D1	BH2 D1	BH2 B1	BH3 D1	BH3 D2
		Depth (m)	0.40	0.50	1.20 - 1.65	0.60	1.20
		Our ref	23482	23483	23484	23485	23486
Naphthalene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	0.5
Acenaphthene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene**	(mg/kg)		<0.5	<0.5	1.9	4.0	4.3
Anthracene**	(mg/kg)		<0.5	<0.5	0.8	1.2	1.3
Fluoranthene**	(mg/kg)		<0.5	1.1	3.9	10.0	12.2
Pyrene**	(mg/kg)		<0.5	0.9	3.3	8.3	10.3
Benz(a)anthracene**	(mg/kg)		<0.5	0.7	2.0	6.1	7.5
Chrysene**	(mg/kg)		<0.5	0.8	2.6	6.3	7.9
Benzo(b)fluoranthene**	(mg/kg)		<0.5	0.6	2.4	5.1	7.4
Benzo(k)fluoranthene**	(mg/kg)		<0.5	0.9	3.0	5.2	7.0
Benzo(a)pyrene**	(mg/kg)		<0.5	0.6	2.5	5.4	7.8
Indeno(123-cd)pyrene**	(mg/kg)		<0.5	<0.5	2.6	4.3	7.1
Dibenz(ah)anthracene**	(mg/kg)		<0.5	<0.5	2.1	1.1	1.7
Benzo(ghi)perylene**	(mg/kg)		<0.5	<0.5	2.9	4.1	7.5
Total PAH**	(mg/kg)		<0.5	5.5	30.0	61.1	82.4

All results expressed on dry weight basis

** - MCERTS accredited test

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THE ENVIRONMENTAL LABORATORY LTD

Waste Acceptance Criteria **ANALYTICAL *RESULTS***							
Report No:	ANALYTICAL REPORT No. AR36441A				Page 4 of 9		
					CLIENT:	RSA Geotechnics Limited	
Project Name:	Location: Temporary Basketball Venue, Lea Bridge Road, Leyton, London, E10 7QL						
Lab Reference	23482				Landfill Waste Acceptance Critena Limits		
Sampling Date	Sandy Silt loam				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH1 D1						
Depth	0.40						
Solid Waste Analysis							
TOC (%)	3.8				3%	5%	6%
Loss on Ignition (%)**	8.6				–	–	10%
BTEX (mg/kg)**	<0.01				6	–	–
Sum of PCBs (mg/kg)**	<0.01				1	–	–
Mineral Oil (mg/kg)**	5				500	–	–
Total PAH (mg/kg)**	<0.5				100	–	–
pH (Units)**	8.1				–	–	–
Acid Neutralisation Capacity (mol/kg)	<0.1				–	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic*	0.006	0.006		<0.1	0.5	2	25
Barium*	0.083	0.142		0.8	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	<0.005	<0.005		<0.1	0.5	10	70
Copper*	0.028	0.055		0.3	2	50	100
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*	0.028	0.018		0.1	0.5	10	30
Nickel*	0.043	0.009		0.1	0.4	10	40
Lead*	0.040	0.081		0.4	0.5	10	50
Antimony	0.012	0.009		0.06	0.06	0.7	5
Selenium	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.128	0.100		0.7	4	50	200
Chloride*	12	10		63	800	15000	25000
Fluoride*	<1.0	<1.0		<1	10	150	500
Sulphate*	870	118		1864	1000	20000	50000
TDS	294	58		715	4000	60000	100000
Phenol Index	1	1		3	1	-	-
DOC	14.9	8.3		61	500	800	1000
Leach Test Information							
pH *	7.6	7.4					
EC*	1642	378					
Sample Mass (kg)	0.198						
Dry Matter (%)	89						
Moisture (%)	14						
Stage 1							
Volume Eluate L2 (litres)	0.326						
Filtered Eluate VE1 (litres)	0.264						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepencies with current legislation

*= UKAS accredited

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THE ENVIRONMENTAL LABORATORY LTD

Waste Acceptance Criteria* ANALYTICAL *RESULTS

Report No:	ANALYTICAL REPORT No. AR36441A				Page 5 of 9		
					CLIENT:	RSA Geotechnics Limited	
Project Name:	Location: Temporary Basketball Venue, Lea Bridge Road, Leyton, London, E10 7QL						
Lab Reference	23484				Landfill Waste Acceptance Critena Limits		
Sampling Date	Sandy Silt loam				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH2 B1						
Depth	1.20 - 1.65						
Solid Waste Analysis							
TOC (%)	3.4				3%	5%	6%
Loss on Ignition (%)**	6.1				--	--	10%
BTEX (mg/kg)**	<0.01				6	--	--
Sum of PCBs (mg/kg)**	<0.01				1	--	--
Mineral Oil (mg/kg)**	315				500	--	--
Total PAH (mg/kg)**	30.0				100	--	--
pH (Units)**	7.9				--	--	--
Acid Neutralisation Capacity (mol/kg)	<0.1				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25
Barium*	0.022	0.051		0.3	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	<0.005	<0.005		<0.1	0.5	10	70
Copper*	0.005	0.008		<0.1	2	50	100
Mercury*	<0.0001	0.0001		<0.001	0.01	0.2	2
Molybdenum*	0.013	<0.005		<0.1	0.5	10	30
Nickel*	0.010	0.007		<0.1	0.4	10	40
Lead*	<0.005	0.038		0.2	0.5	10	50
Antimony	<0.005	<0.005		<0.01	0.06	0.7	5
Selenium	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.015	0.032		0.2	4	50	200
Chloride*	15	9		63	800	15000	25000
Fluoride*	<1.0	<1.0		<1	10	150	500
Sulphate*	1344	850		5913	1000	20000	50000
TDS	482	298		2089	4000	60000	100000
Phenol Index	<0.5	<0.5		<0.5	1	-	-
DOC	19.5	9.6		73	500	800	1000
Leach Test Information							
pH *	7.6	7.3					
EC*	2410	1554					
Sample Mass (kg)	0.199						
Dry Matter (%)	88						
Moisture (%)	14						
Stage 1							
Volume Eluate L2 (litres)	0.325						
Filtered Eluate VE1 (litres)	0.258						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepencies with current legislation

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THE ENVIRONMENTAL LABORATORY LTD

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UKAS TESTING 2683

ANALYTICAL REPORT No. AR36441A

Location: Temporary Basketball Venue, Lea Bridge Road, Leyton, London, E10 7QL

F.A.O. Phil Gawne
RSA Geotechnics Limited
Ashburnham House, 1 Maitland Road
Lion Barn Estate, Needham Market
Suffolk, IP6 8NZ

Your Job No: 13004GI

Reporting Date: 17/01/12

Asbestos Identification

Sample ref:	**BH1 D1**
Depth (m)	**0.40**
Our ref:	**23482**
#Description of Sample Matrix:	**Sandy Silt loam**
***Result**	No asbestos identified

Sample ref:	**BH2 D1**
Depth (m)	**0.50**
Our ref:	**23483**
#Description of Sample Matrix:	**Silt loam**
***Result**	No asbestos identified

Sample ref:	**BH2 B1**
Depth (m)	**1.20 - 1.65**
Our ref:	**23484**
#Description of Sample Matrix:	**Sandy Silt loam**
***Result**	No asbestos identified

Sample ref:	**BH3 D1**
Depth (m)	**0.60**
Our ref:	**23485**
#Description of Sample Matrix:	**Silt loam**
***Result**	No asbestos identified

Sample ref:	**BH3 D2**
Depth (m)	**1.20**
Our ref:	**23486**
#Description of Sample Matrix:	**Sandy Silt loam**
***Result**	No asbestos identified

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Analytical result only applies to the sample as submitted by the client

Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client

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THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR36441A
Your Job No:	13004GI
Sample Receipt Date:	19/12/11
Reporting Date:	17/01/12
Registered:	19/12/11
Prepared:	20/12/11
Analysis complete:	23/12/11

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	21/12/11	118	ICPMS
Cadmium**	Air dried sample	21/12/11	118	ICPMS
Chromium**	Air dried sample	21/12/11	118	ICPMS
Lead**	Air dried sample	21/12/11	118	ICPMS
Mercury**	Air dried sample	21/12/11	118	ICPMS
Nickel**	Air dried sample	21/12/11	118	ICPMS
Copper**	Air dried sample	21/12/11	118	ICPMS
Zinc**	Air dried sample	21/12/11	118	ICPMS
Selenium**	Air dried sample	21/12/11	118	ICPMS
Hexavalent Chromium	As submitted sample	22/12/11	110	Colorimetry
Water Soluble Boron	Air dried sample	20/12/11	202	Colorimetry
pH Value**	Air dried sample	20/12/11	113	Probe
Water Soluble Sulphate	Air dried sample	20/12/11	209	Colorimetry
Total Cyanide**	As submitted sample	22/12/11	204	Colorimetry
Elemental Sulphur**	Air dried sample	20/12/11	122	HPLC
Total Monohydric Phenols**	As submitted sample	21/12/11	121	HPLC
Speciated PAH**	As submitted sample	20/12/11	133	Gas Chromatography
Soil Organic Matter*	Air dried sample	20/12/11	111	Titration
Asbestos*	As submitted sample	19/12/11	179	See note

Asbestos analysis qualitative only
Note:- Documented In-house procedure based on HSG 248 2005
* = UKAS Accredited test
** - MCERTS Accredited test
Determinands not marked with * or ** are not accredited
MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

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SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR36441A
Your Ref No:	13004GI
Sample Receipt Date:	19/12/11
Reporting Date:	17/01/12
Registered:	19/12/11
Prepared:	20/12/11
Analysis complete:	23/12/11

TEST METHOD SUMMARY

PARAMETER	Undertaken on	Date Tested	Method Number	Technique
pH Value**	Air dried sample	20/12/11	113	Electrometric
Total Organic Carbon	Air dried sample	22/12/11	210	Automated IR Absorption
Loss on Ignition**	Air dried sample	20/12/11	129	Gravimetric
Neutralization Capacity to pH 7	Air dried sample	20/12/11	-	EA
Benzene**	As submitted sample	20/12/11	181	GCMS
Toluene**	As submitted sample	20/12/11	181	GCMS
Ethyl Benzene**	As submitted sample	20/12/11	181	GCMS
Xylenes**	As submitted sample	20/12/11	181	GCMS
Mineral Oil**	As submitted sample	20/12/11	117	GCFID
PCB 28**	Air dried sample	21/12/11	120	GCMS
PCB 52**	Air dried sample	21/12/11	120	GCMS
PCB 101**	Air dried sample	21/12/11	120	GCMS
PCB 118**	Air dried sample	21/12/11	120	GCMS
PCB 138**	Air dried sample	21/12/11	120	GCMS
PCB 153**	Air dried sample	21/12/11	120	GCMS
PCB 180**	Air dried sample	21/12/11	120	GCMS
Speciated PAH**	As submitted sample	20/12/11	133	GCFID

* = UKAS Accredited test

** - MCERTS Accredited test

Determinands not marked with a * or ** are not accredited

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THE ENVIRONMENTAL LABORATORY LTD

LEACHATE SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR36441A
Your Ref No:	13004GI
Sample Receipt Date:	19/12/11
Reporting Date:	17/01/12
Registered:	19/12/11
Prepared:	20/12/11
Analysis complete:	23/12/11

LEACHATE TEST METHOD SUMMARY

PARAMETER	Method Number	Technique
Arsenic*	101	ICPMS
Cadmium*	101	ICPMS
Chromium*	101	ICPMS
Lead*	101	ICPMS
Nickel*	101	ICPMS
Copper*	101	ICPMS
Zinc*	101	ICPMS
Mercury*	101	ICPMS
Selenium	101	ICPMS
Antimony	101	ICPMS
Barium*	101	ICPMS
Molybdenum*	101	ICPMS
pH Value*	113	Electrometric
Electrical Conductivity*	136	Probe
Dissolved Organic Carbon	102	TOC analyser
Chloride*	131	Ion Chromatography
Fluoride*	131	Ion Chromatography
Sulphate*	131	Ion Chromatography
Total Dissolved Solids	163	Gravimetric
Phenol Index	121	HPLC

* = UKAS Accredited test
Determinands not marked with * are not accredited

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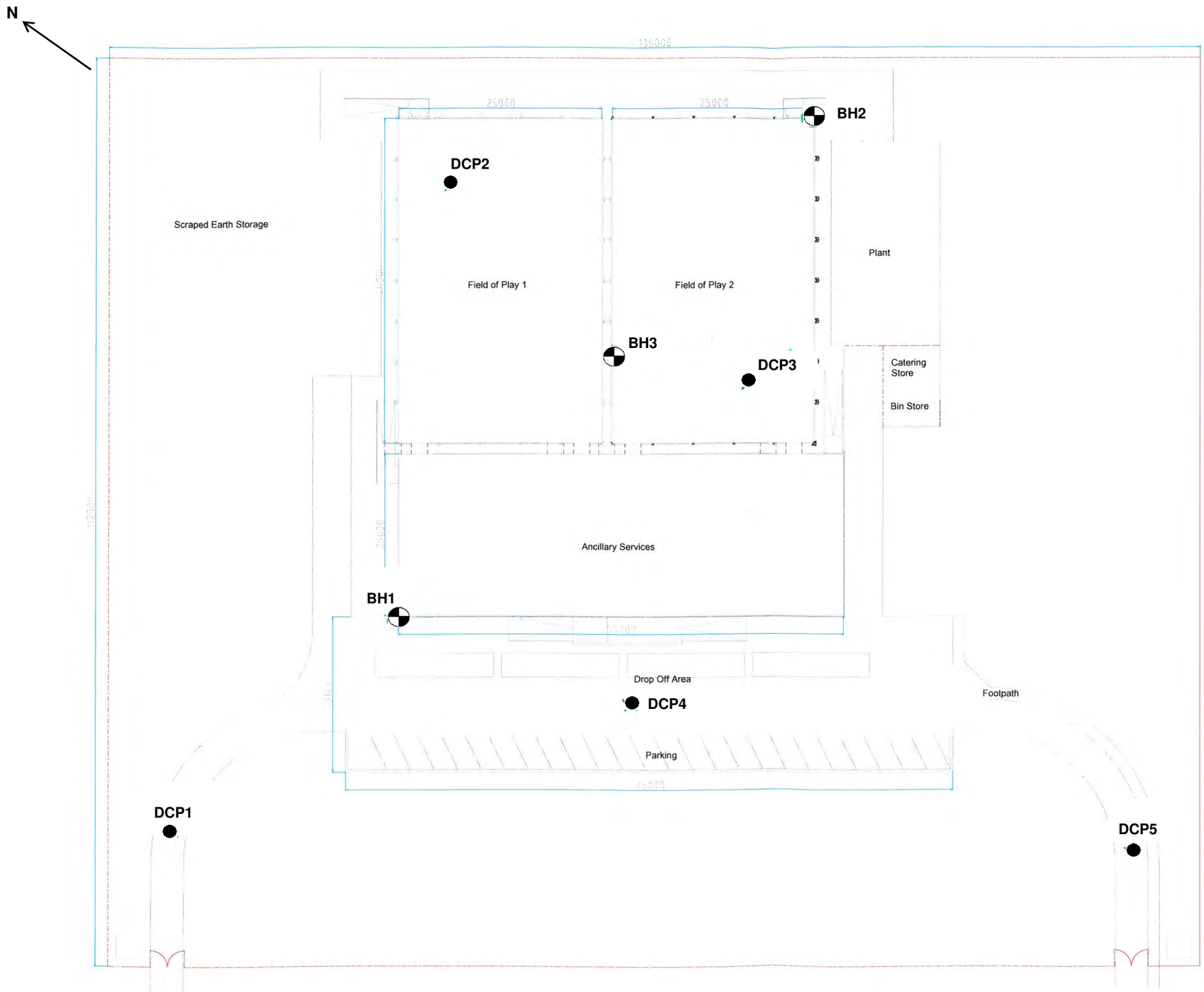

NOTE: All locations are approximate

EXPLORATORY HOLE LOCATION PLAN (Based upon drawing number 6909-TPV-LVP-A-DPL-0001) TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Date 17 JANUARY 2011 Scale NOT TO SCALE
RSA GEOTECHNICS LIMITED	Drawing No 13004GI/1 Version A

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NOTES

1.

KEY

- Temporary tented structure (aluminum portal frame or similar) - 3.5m approx
- Temporary modular building - flat roof eaves height 10m approx
- Security fencing and gates
- Sewer pipe below

LONDON KEY PLAN

VENUE KEY PLAN

NORTH ARROW

0 70m 40m 80m
A1|1:375

0 10m 20m 25m
A3|1:750

Rev	Description	Drawn	Chkd	Date
-	-	-	-	-
P03	FOR PLANNING APPROVAL	MJL	MJL	07.11.11
P02	STAGE D DESIGN	MJL	MJL	07.10.11
P01	STAGE C DESIGN	MJL	MJL	11.08.11

Safety, Health and Environment Information

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following risks and information:

Construction	CA: not detailed at this stage CB: CM:
Dismantling / Demolition (Future)	DA: not detailed at this stage DB: DM:

For information relating to Use, Cleaning and Maintenance see the Health and Safety File. It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

NOTE: All locations are approximate

PROPOSED DEVELOPMENT LAYOUT (Based upon Nussli (Switzerland) Ltd drawing number 6909-TPV-LVP-A-DSP-0007 Rev P03) TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Date 17JANUARY 2012 Scale NOT TO SCALE
RSA GEOTECHNICS LIMITED	Drawing No 13004GI/2A Version A

Scraped Earth Storage

Field of Play 1
608.0 m2

Field of Play 2
608.0 m2

Field of Play
Photo Positions

Field of Play
Photo Positions 2

Plant

Catering
Store

Bin Store

A/C Unit

Athlete Change 1
87.0 m2

Athlete Change 2
87.0 m2

Storage
81.8 m2

wlo wc
unisex
20.8 m2

Medical Private
Treatment
Room 1
17.8 m2

Doping Control -
Urine and Blood
Processing 1
20.0 m2

Venue Security
Command Centre
(VSCC) - Office
21.6 m2

Workforce Check-in
Sport Manager's Office
20.2 m2

Kitchen and
Preparation
Area
27.8 m2

Mixed
Zone -
Press
Quiet Room
8.7 m2

Workforce
Break Area
25.9 m2

Athlete Lounge
Catering

Athlete Lounge
127.4 m2

Sport Reception

Workforce
Catering

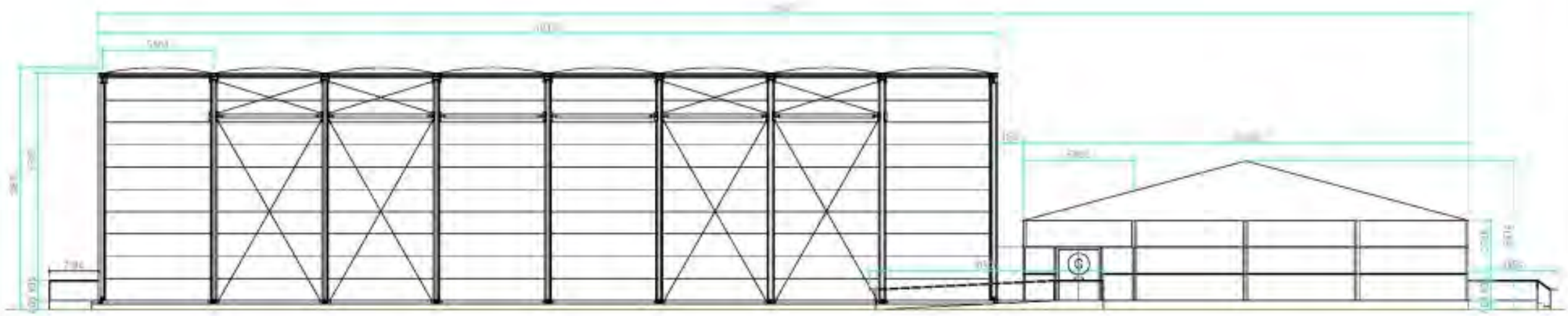
Athlete Change 3
87.0 m2

Athlete Change 4
87.0 m2

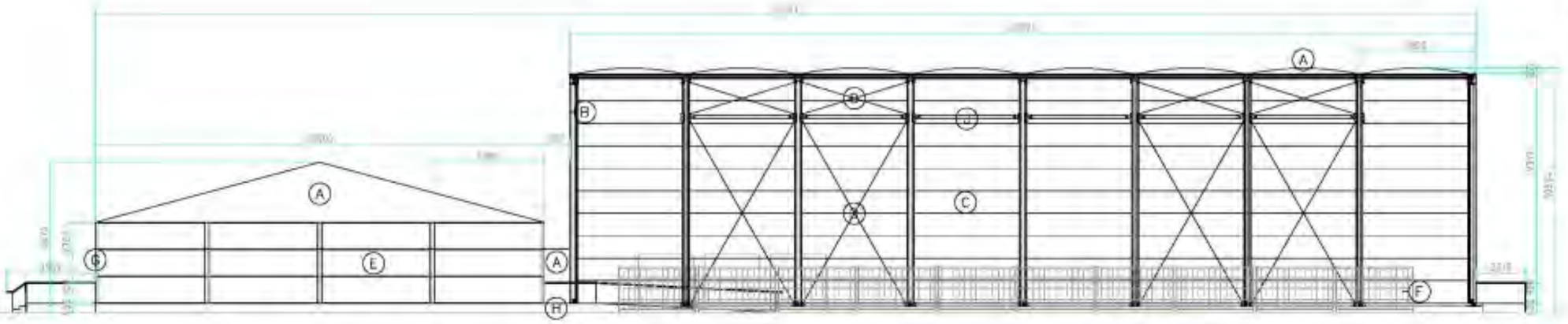
Footpath

NOTE: All locations are approximate

PROPOSED DEVELOPMENT LAYOUT (Based upon Nussli (Switzerland) Ltd drawing number 6909-TPV-LTT-A-DPL-0002 Rev P02) TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Date 17 JANUARY 2012 Scale NOT TO SCALE
RSA GEOTECHNICS LIMITED	Drawing No 13004GI/2B Version A



① North-West Elevation

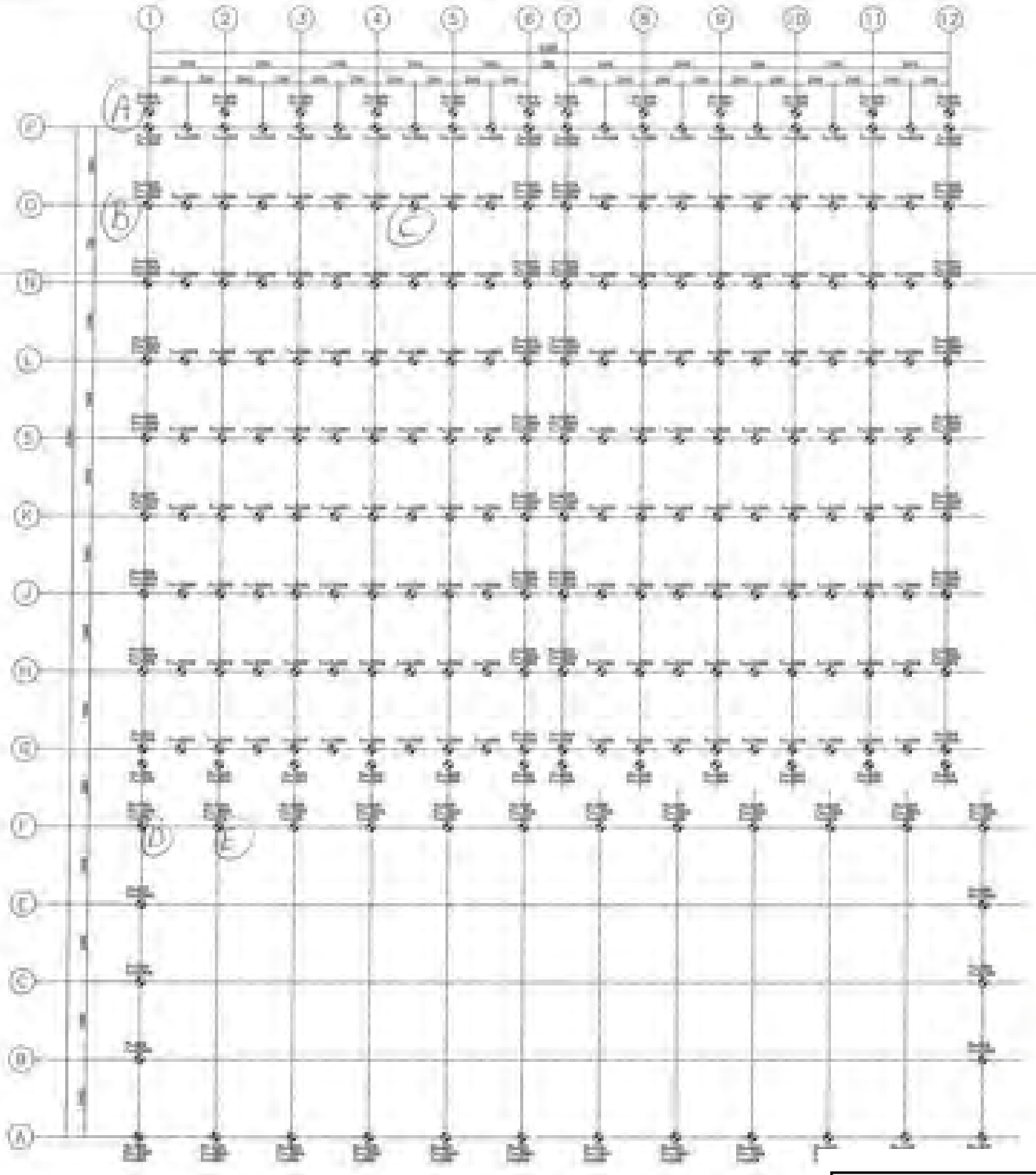


③ South-East Elevation

Ⓐ PVC CANVAS*
Ⓑ ALUMINUM FRAME
Ⓒ HARD WALL PANEL*
Ⓓ CROSS BRACING (CABLES)
Ⓔ MOLDED FIBRE GLASS PANEL*
Ⓕ SECURITY FENCE PANEL
Ⓖ ALUMINUM DOOR FRAME WITH GLAZING
Ⓗ STEEL SUBSTRUCTURE
Ⓘ STRUCTURAL BRACE
*COLOUR WHITE

NOTE: All locations are approximate

PROPOSED DEVELOPMENT LAYOUT (Based upon Nussli (Switzerland) Ltd drawing number 6909-TPV-LTT-A-DSE-0002 Rev P03) TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Date 17 JANUARY 2012 Scale NOT TO SCALE
RSA GEOTECHNICS LIMITED	Drawing No 13004GI/2C Version A



LOADINGS FOUNDATION

DESIGN LOADINGS ON CONCRETE FOUNDATION

partial safety factor for unfavourable permanent actions $\gamma = 1.35$
partial safety factor for favourable permanent actions $\gamma = 1.0$
partial safety factor for variable actions $\gamma = 1.5$

Fv = vertical load
Fh = max horizontal load

A: DL 2[illegible] kN
LL 15 kN
Wind -73 kN

B: DL 41 kN
LL 31 kN
Wind -56 kN

C: DL 12 kN
LL 15 kN
Wind

D: DL 35 kN
LL/Wind 5 kN
Wind -5 kN

E: DL 95 kN
LL/Wind 5 kN
Wind -15 kN

Maximum loads on foundation

11-1 [illegible]

PROPOSED DESIGN LOADINGS (Based on drawing provided by the Consulting Engineer) TEMPORARY BASKETBALL VENUE, LEA BRIDGE ROAD, LEYTON, LONDON	Date 17 JANUARY 2012 Scale NOT TO SCALE
RSA GEOTECHNICS LIMITED	Drawing No 13004GI/3 Version A