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EXECUTIVE SUMMARY

BRIEF

This report describes the findings of a desk study and ground investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Mason Navarro Partnership, on behalf of Central European Commodities, with respect to the redevelopment of this site by the construction of a seven storey building. The purpose of the investigation was to assess the ground conditions, investigate the presence of contamination and to provide information for the design of piled foundations.

SITE HISTORY

The history of the site has been researched by reference to historical Ordnance Survey maps and local archive information. The earliest map studied, dated 1875, shows the southern half of the site to be occupied by a terraced house and the northern half to be unoccupied. By 1896, the northern half had been developed and was depicted on the 1954 map as a warehouse. By 1960, the building in the southern half of the site had been demolished and replaced by a similar building and the site appears to have remained this way until present day.

GROUND CONDITIONS

The investigation has encountered a significant thickness of made ground extending to a depth of 4.2 m. The material generally comprised clayey demolition rubble. London Clay was found to underlie the made ground to the maximum depth of investigation at 25 m. Groundwater was not encountered during this investigation.

The results of contaminations tests have indicated elevated concentrations of lead and zinc to be present in the made ground.

RECOMMENDATIONS

Due to the significant thickness of made ground encountered, piled foundations will be necessary. It has been estimated that a 450 mm augered pile founding at a depth of 18 m could provide a safe working load of around 675 kN. Alternatively, a 600 mm diameter pile founding at a depth of 23 m could provide a safe working load of around 1370 kN.

It is understood that the proposed development will incorporate some soft landscaped areas. The results of the chemical analyses have identified elevated levels of lead and zinc to be present in the made ground.

The made ground at this site is unlikely to be suitable for retention in landscaped areas for aesthetic reasons. At this stage, it is recommended that further testing is carried out at formation level in landscaped areas.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Mason Navarro Partnership on behalf of Central European Commodities to carry out a desk study and ground investigation at 139-143 York Way, London, N7.

1.1 Proposed Development

It is proposed to redevelop this site by the construction of a new seven storey residential and commercial building with associated communal gardens. This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows.

- to check the history of the site with respect to contaminative uses;
- to determine the ground conditions and their engineering properties;
- to provide recommendations for the design of piled foundations; and
- to provide an assessment of the preliminary presence of soil contamination.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by ground investigation. The desk study comprised:

- a review of readily available geological maps;
- a review of Ordnance Survey (OS) maps and publicly available environmental data sourced from the Envirocheck database; and
- information obtained from Kelly's Directories sourced from the London Metropolitan Archive.

The ground investigation comprised, in summary, the following activities:

- a single cable percussion borehole drilled to a depth of 25 m;
- testing of selected soil samples for geotechnical and contamination purposes; and

- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the number of locations where the ground was sampled and the number of soil, gas or ground water samples tested and no liability can be accepted for conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third party information has been made by GEA.

2.0 THE SITE

2.1 Site Description

The site is located on the western side of York Way and is bounded by warehouse type buildings to the north and south and houses to the west. The site is roughly square in shape with dimensions of approximately 20 m by 20 m and may additionally be located by National Grid Reference 529940 184850.

The site is currently occupied by a disused tyre centre with two storey and four storey elements fronting onto York Way with single storey elements to the rear. The surface is sensibly level, covered with hardstanding, and is devoid of vegetation.

Towards the rear of the four storey element, there was a battery store which had a small bunded area within it. In this bunded area was an area of sand on the floor where there had been an oil spillage.

2.2 Site History

The site history has been researched by reference to historical Ordnance Survey (OS) maps sourced from the Landmark database and information obtained from the London Metropolitan Archive.

Reference to historical Ordnance Survey (OS) maps indicates that by 1875, the date of the earliest map studied, the southern half of the site had been developed through the construction of No143, which, according to Kelly's Directories, was a private residence owned by Mr John Jones. York Way was named Brecknock Road at this time. The next map studied, dated 1896, shows the northern part of the site to have been developed and Brecknock Road had been renamed York Road. The 1897 Kelly's Directories identified No 139 to be occupied by Mrs May Richeter's Dining Rooms, No 141 to be the York Road Mission Room and No143 to be the premises of the Cocoa and Chocolate Company and Blooders Cocoa Agency.

Subsequent maps studied show very little change in the layout of the site with the exception of some alterations to the building in the southwestern corner of the site. The 1916 Kelly's Directory does not identify any significant changes of use, however, by 1953 Nos 139-143 are identified as a motor tyre manufacturer owned by a company called Rubberine Limited. At some time between 1916 and 1954, York Road was renamed York Way.

The site has most recently been in use as a tyre repair workshop by Motorway Tyres although the site now stands boarded up and derelict.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database, which has indicated that no recorded landfill site or waste treatment sites are located within 500 m of the site. Two registered waste transfer sites are located 496 m northeast of the site.

The search has indicated that the site is located in an area where less than 1% of homes are affected by radon emissions; which is the lowest classification given by the National Radiological Protection Board (NRPB) and therefore no radon protective measures will be necessary.

The Geological Survey map of the area indicates that the site is underlain by London Clay from the surface. The soils underlying the site are classified on the former National Rivers Authority groundwater vulnerability map as a non aquifer with soils of negligible permeability.

The site does not lie within any ground water source protection zones nor does it lie within a flood plain.

3.0 EXPLORATORY WORK

In order to meet the objectives described in Section 1.2 a single cable percussion borehole was drilled using a low headroom rig with Standard Penetration Tests (SPTs) carried out at regular intervals. Disturbed and undisturbed samples were recovered from the boreholes for subsequent laboratory examination and testing.

Two samples of made ground were tested for the presence of contamination. The analytical suite of contamination testing was selected to identify a range of typical industrial contaminants for the purposes of general coverage. For this investigation the analytical suite included a range of metals, water soluble sulphate, cyclohexane extractable material (CEM), chloride, organic content and total cyanide.

The borehole record and the results of the laboratory analyses are appended, together with a site plan indicating the exploratory position.

4.0 GROUND CONDITIONS

The investigation has generally confirmed the expected ground conditions in that, beneath a significant thickness of made ground, London Clay was encountered which was proved to the full depth of investigation.

4.1 Made Ground

Beneath a surface layer of concrete, a substantial thickness of made ground was encountered which generally comprised clayey building debris to a depth of 3.9 m whereupon a weak concrete slab was encountered. It is thought that this made ground represents demolition rubble which has

been used to fill a former basement. Selected samples of the made ground were submitted for laboratory contamination analyses, the results of which are discussed in Section 4.4.

4.2 London Clay

This stratum initially comprised stiff brown fissured clay which became very stiff, grey and occasionally silty at 12.8 m and was proved to 25.0 m. Selenite crystals were noted from approximately 7.0 m.

4.3 Ground Water

Ground water was not encountered during this investigation.

4.4 Soil Contamination

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides a new regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a "suitable for use" approach, which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

The use of a risk-based approach, which is presented in Part 2 of this report, means that it is no longer appropriate to determine the significance of contamination test results by simply comparing individual contaminant concentrations to a single "trigger" or "target" concentration. It is however useful to have a means of performing an initial screening of the test results to assess the need for subsequent risk assessments and to this end the results have been compared to an "uncontaminated value", where contaminant concentrations measured below this value are not deemed to require further consideration.

The results have indicated slightly elevated concentrations of lead and zinc to be present in the made ground at depths of 1.0 m and 2.0 m.

Part 2: DESIGN BASIS REPORT

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations for foundations and other aspects of the development.

5.0 INTRODUCTION

Consideration is being given to the redevelopment of the site through the construction of a new seven storey building for mixed residential and commercial use. Communal gardens are also planned. Column loads are expected to be up to 1350 kN.

6.0 GROUND MODEL

The desk study has revealed that the site was developed prior to 1874 and had a potentially contaminative history being owned by a tyre manufacturers during the 1950s. On the basis of the investigation, the ground conditions at this site can be characterised as follows.

- A significant thickness of made ground, extending to a depth of 4.2 m was underlain by London Clay. The base of the made ground was marked by a concrete slab;
- firm brown fissured London Clay was initially encountered and became stiff and grey from an approximate depth of 12.8 m. The clay is proved to the maximum depth investigated;
- groundwater was not encountered during the investigation; and
- the results of the soil contamination testing have indicated slightly elevated concentrations of lead and zinc to be present in the made ground.

7.0 ADVICE AND RECOMMENDATIONS

The thickness of made ground and the expected loads will make the use of spread foundations impractical and piled foundations are therefore considered to be the most appropriate solution.

7.1 Piled Foundations

For the ground conditions encountered at this site, either a driven or bored type of pile may be appropriate, although consideration would need to be given to the effect of noise and vibrations associated with the installation of driven piles, which could render their use unacceptable.

If bored piles are adopted a conventional rotary augered pile should be appropriate as only nominal lengths of temporary casing should be required through the made ground. Consideration should, however, be given to the presence of silty layers in the London Clay.

The following table of ultimate coefficients, based on the measured SPT and cohesion / depth relationship illustrated in the Appendix, may be used for the preliminary design of bored piles.

| Ultimate Skin Friction | | kN/m² |
|-----------------------------------|-----------------|---------------------------------------|
| Made ground | GL to 4.0 m | Ignore |
| London Clay ($\alpha = 0.6$) | 4.0 m to 25.0 m | Increasing linearly from 60 to 135 |
| Ultimate End Bearing | | kN/m² |
| London Clay at 25.0 m | | 2070 |

In the absence of pile tests, it is normal practice to apply a factor of safety of three to the above coefficients in the computation of theoretical safe working loads. A minimum factor of safety of 1.2 is generally specified to determine the length of pile required to resist potential uplift forces.

On the basis of the above coefficients and a factor of safety of three, it has been estimated that a 450 mm diameter pile founding at 18.0 m should provide a safe working load of about 675 kN. Alternatively, a 600 mm diameter pile founding at 23.0 m should provide a safe working load of about 1370 kN.

The examples given above are for guidance and preliminary design only. The advice of a specialist piling contractor should be sought with respect to the final design of a suitable piling scheme for this site.

7.2 Excavations

Shallow excavations for services and foundations are unlikely to remain stable and, in any case, where personnel are required to enter excavations greater than 1.20 m depth, temporary lateral support, or battering of the excavation sides, will be required in order to comply with normal safety requirements.

Significant inflows of ground water are not expected to be encountered in shallow excavations. Inflows of ground water may be encountered from perched water tables, particularly in the vicinity of existing foundations, but any such occurrences should be suitably controlled by sump pumping.

7.3 Ground Floor Slabs

In view of the thickness of made ground fully suspended ground floor slabs will be required.

7.4 Effect of Sulphates

Chemical analyses of selected soil samples have revealed generally low concentrations of soluble sulphate, corresponding to Class DS-1 of Table 2 of BRE Special Digest 1: SD1 Part 1 (August 2001). The guidelines contained in the above digest should be followed in the design of foundation concrete.

7.5 Contamination Risk Assessment

The desk study has indicated that the site has had a potentially contaminative history and the results of contamination tests have indicated slightly elevated concentrations of lead and zinc to be present in the made ground although due to the limited investigation, samples were only taken from one position.

One of the requirements of the Environment Act (1995) is that local authorities carry out inspections of their area with a view to identifying sites that may be contaminated. When assessing whether a site is contaminated the local authority will attempt to establish the presence of a 'pollution linkage'. A pollution linkage requires there to be a source of contamination, a sensitive receptor that can be adversely affected by the contamination and a pathway via which contamination can reach the target.

The investigations have revealed some sources of contamination and the proposed residential development will create contaminant pathways, in particular where a communal garden is proposed. The made ground at this site is unlikely to be suitable for retention in landscaped areas for aesthetic reasons. As the proposed development will not include areas of domestic gardens, there will not be prolonged exposure of end users to any potential contaminants. It is therefore considered that below areas of soft cover a 300 mm thickness of topsoil should be ensured, but below any proposed new trees and shrubs an increased thickness of 600 mm of clean topsoil and subsoil should be provided. Alternatively, isolated planters could be used, or specific testing should be carried out to check the contaminant concentrations within the subsoil in the vicinity of any areas of planting.

Site workers should be made aware of the possible presence of contamination and a programme of working should be identified to protect workers handling any soil. The method of site working should be in accordance with guidelines set out by HSE¹ and CIRIA² and the requirements of the Local Authority Environmental Health Officer. If any suspicious substances are encountered during site work, these should be assessed by a geoenvironmental engineer.

7.6 Waste Disposal

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip. Under the European Waste Directive landfills are due to be classified as accepting inert, non-hazardous or hazardous wastes in accordance with Waste Acceptance Criteria (WAC) based upon the results of CEN method bulk leaching tests or percolation tests. It is anticipated that the made ground from this site is likely to be classified as a 'non-hazardous waste' whilst the uncontaminated natural soils may be classified as an 'inert waste'. The implementation of the WAC has been delayed until 16 July 2005 in the UK and during the interim period a site specific approach is being adopted. It is thus necessary to contact the local waste regulation department of the Environment Agency (EA) to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material.

1 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land*
HMSO

2 *A guide for safe working on contaminated sites*, Report 132, Construction Industry Research and Information Association

8.0 FURTHER WORK

Due to the history of the site, it would be prudent to carry out further investigation in the form of a window sampling exercise to construct a series of shallow boreholes to investigate the presence of contamination across the site. Alternatively, a watching brief should be undertaken when the floor slab is lifted in order to identify any areas of contamination. Additional testing may be required in areas of communal gardens depending on the extent of soft landscaping.