BUROHAPPOLD ENGINEERING

No.4 Angel Square, Manchester.

Ground Engineering Summary Report

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Contents

1 Executive Summary 7

2 Introduction and The Site 9

3 Ground Investigation 11

3.1 General 11

3.2 Material Type and Distribution 12

3.3 In Situ Testing 13

3.3.1 Made Ground 13

3.3.2 Superficial Deposits 13

3.3.3 Weathered Sandstone/Sandstone 13

3.4 Core recovery 14

3.5 Groundwater 14

3.6 Ground Gas 15

4 Development Considerations 17

4.1 Obstructions 17

4.2 Unexploded Ordnance (UXO) 17

5 Geoenvironmental Assessment 18

5.1 General 18

5.2 Soil Chemical Tests 18

5.3 Asbestos 18

5.4 Waste Acceptance Criteria 18

5.5 pH and Sulphate 19

6 Geotechnical Considerations 20

6.1 General 20

6.2 Excavation and Earthworks 20

6.3 Foundations 21

6.3.1 General 21

6.3.2 Shallow Foundations 21

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6.3.3 Piled Foundations 21

6.4 Ground Bearing Slabs 22

6.5 Highways and Permissions 23

7 Anticipated Design for Costing Purposes 24

Appendix A – Socotec 2019 Exploratory Hole location Plan and Logs.

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1 Executive Summary

A site specific ground investigation was undertaken by Socotec Limited between the 30th September 2019 and the 17th October 2019, under the supervision of BuroHappold Engineering Ltd (herein referred to as the SSGI). It should be noted that post fieldwork ground gas and groundwater monitoring is currently ongoing. The ground conditions encountered comprise varying depths of Made Ground which is underlain by Superficial Deposits (sand, gravel and clay), underlain by very weak to weak Sandstone bedrock (Chester Formation). Numerous obstructions were recorded within the Made Ground during the SSGI which are likely to be associated with relic substructure from historic buildings located on site.

Groundwater has been recorded at a number of locations across the site. Based on the monitoring data obtained to date, 1 No. groundwater regime has been recorded within the sandstone bedrock. It should also be noted that perched groundwater was also recorded locally within the made ground and Superficial Deposits. Although some localised shallow groundwater was recorded onsite, it is not anticipated that groundwater ingress will cause significant problems for the envisaged excavation works in the temporary case. Any perched water seepages which may be encountered during excavation construction works are likely to be relatively minor and could be controlled by localised sump pumping methods. It should be noted, however, that should more significant water ingress be encountered, then more substantial water control measures may be required.

Ground gas monitoring has been undertaken during the SSGI and is ongoing. To date, the ground gas monitoring data has classified the site as Characteristic Situation 1 (CS1).

The existing documentation in relation to unexploded ordnance (UXO) advises that the site is 'medium risk' from UXO and therefore UXO mitigation is considered to be required during ground investigation and construction phases of work.

A series of chemical tests have been undertaken on the material encountered during the SSGI. None of the results for all determinands exceeded the relevant 'commercial threshold' criteria.

Asbestos fibres were recorded within samples testing in the Made Ground. Asbestos quantification tests were subsequently undertaken on the 3 No. samples that recorded asbestos fibres. The results identify 0.001% in MTP03, 0.012% in MTP04 and <0.001% in MTP05. In accordance with CAR-SOIL[1] Watch Point 12 the concentrations of asbestos recorded is 'low'.

Some chemical samples were also tested for the Waste Acceptance Criteria. A number meet the inert waste criteria for inert landfill however some also exceeded the inert criteria indicating the material would be suitable for a non-hazardous landfill. Notwithstanding this preliminary assessment, it is the contractor's responsibility, in association with the operator and / or owner of the landfill to classify the materials for disposal in line with current guidance. Landfill waste acceptance criteria (WAC) leachate testing and classification prior to disposal to landfill should be undertaken to confirm the waste classification of the natural soils.

[1] CAR-SOIL Control of Asbestos Regulations (2012), Interpretation for Managing and working with asbestos in soil and construction demolition materials – Industry Guidance. Published by Comtaminated Land: Applications if Real Environments (CL;AIRE).

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In terms of substructure, due to building height, envisaged column loads and the basement construction, it is envisaged that a piled foundation will be the most cost-effective solution along with a vertical embedded retaining wall comprising a contiguous piled wall. Due to the envisaged clashes between the old relic foundations remaining in situ (obstructions) and the new proposed foundation/wall locations, obstruction removal is likely to be required prior to installation of the new proposed foundations.

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2 Introduction and The Site

The Site is located approximately 100 m to the northeast of Victoria Station, Manchester (National Grid Reference SJ842990). The site is bounded to the north by Munster Street, the east by Beswick Row, the south by Miller Street and the west by Corporation Street. At present the site predominantly comprises hard standing which is used for car parking. Oswald Street orientated northeast-southwest is located approximately central to the site, Ducie Bridge Inn (no longer in use) and some industrial buildings are located in the southern portion of the site.

The current development proposal for the Site consists of a new BCO Grade A office space and is approximately 11 stories with a single storey basement for car parking. The site will be the gateway building to the NOMA Masterplan from Manchester Victoria Station.



Figure 1—1 Site Location Plan

A site specific ground investigation (SSGI) was undertaken on site by Socotec Limited between the 30th September 2019 and the 17th October 2019, under the supervision of BuroHappold Engineering Limited, (herein referred to as the SSGI). It should be noted that post fieldwork monitoring is currently ongoing. The following sections of this document outline the findings of the SSGI and assess the ground associated risk for the proposed development.

The data sources reviewed can be summarised as follows:

- British Geological Survey (BGS) – England & Wales Sheet 85 'Manchester'.
- BuroHappold Ground Engineering Desk Study report entitled "4 Angel Square and NOMA Primary Sub-Station Manchester", dated March 2019.

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- Landmark Envirocheck Report (Ref No. 185665947_1_1) dated January 2019.
- British Geological Survey (BGS) Geology of Britain Viewer – Borehole Scans (http://mapapps.bgs.ac.uk/geologyofbritain/home.html accessed February 2019) obtained by BuroHappold.
- Socotec (2019) Factual Report on Ground Investigation (DRAFT) – NOMA Plot P (Ref: A9023-19)
- Published technical reports;
- Historical literature;
- Documents found during internet searches.

All the aforementioned reports/information should be read in conjunction with this report.

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3 Ground Investigation

3.1 General

Information from the BGS along with historic GI data available from the surrounding area was initially reviewed to generally establish the envisaged ground conditions across the development area. A site specific ground investigation (SSGI) was then scoped and undertaken between the 30th September 2019 and the 17th October 2019 to further investigate the ground conditions and the associated potential risks highlighted in the BuroHappold Ground Engineering Desk Study. Laboratory testing, and 4 No. ground gas and groundwater monitoring visits have also been completed at the time of writing this report, as part of the SSGI. 2 No. further ground gas and ground monitoring visits are proposed to be undertaken. The SSGI exploratory hole location plan (EHLP) is included in Appendix A. The following ground investigation works were undertaken on site as part of the SSGI:

Socotec Limited (2019)

- 2 No. combined dynamic sampling with rotary core drilling boreholes and associated in-situ testing to record and allow an assessment of shallow and deep ground conditions for foundation design and to allow groundwater and ground gas monitoring wells to be installed;.
- 2 No. dynamic window sample boreholes to records and allow an assessment of the shallow ground conditions and to allow groundwater and ground gas monitoring wells to be installed;
- 7 No. Machine Dug Trial Pits to allow an assessment of the shallow ground conditions and record any existing sub-surface obstructions (basement walls/floor slabs etc.);
- 3 No. Hand Dug Trial Pits to allow an assessment of the shallow ground conditions, floor slab thickness and foundation construction in the Ducie Bridge Pub basement;
- 2 No. Horiontal Concrete Core in the Ducie Bridge Public House Basement Walls to allow an assessment of the construction and thickness and the ground conditions behind the wall;
- Geoenvironmental laboratory testing to determine the chemical properties of the Made Ground and natural deposits for Human Health Assessment and Waste Acceptance Criteria assessment.
- Geotechnical laboratory testing to determine the physical properties and characteristics of the ground mass for foundation design; and
- Programme of gas and groundwater monitoring to allow ground gas and groundwater regimes beneath the site to be assessed.

The Draft Socotec Factual Report on Ground Investigation (ref: A9023-19) should be read in conjunction with this design note.

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3.2 Material Type and Distribution

The ground conditions have been assessed on the basis of the available information. The general sequence of strata encountered based on available BGS borehole logs in the surrounding area and that of the ground conditions encountered during the Socotec SSGI is summarized in Table 1.

Table 1: Conceptual Ground Model based on BGS data and Socotec Site Specific Ground Investigation (SSGI).

Depth to Top of Strata (m BGL)	Typical Thickness (m)	Generalized Description
0.00	>0.50-5.80	Black brown slightly clayey slightly sandy angular to subangular GRAVEL of brick and ash with high cobble and medium boulder content. Gravel comprises various materials including sandstone, mudstone, limestone, glass, tarmac, coal, slag, concrete, slate, clinker, brick (demolition rubble), rare granite and ceramic fragments. [MADE GROUND]
0.50-4.18	>0.30-4.00	Firm to very stiff brown/red brown slightly sandy gravelly CLAY. Gravel is fine to coarse angular to rounded of sandstone & mudstone. AND Orange brown, slightly clayey, slightly gravelly fine to coarse SAND. Gravel is fine to coarse, subangular to rounded of quartzite, limestone, sandstone and ironstone. Occasional layers of brown, sandy, gravel. [GLACIAL TILL]
5.80-7.50	>22.50	Soft becoming medium hard, red/brown, medium to coarse grained sandstone with occasional layers of marl. [CHESTER FORMATION]

Note: During the SSGI groundwater seepages were recorded at 2.55 m bgl in MTP01, 1.85 m bgl in MTP05 and 1.80 m bgl in MTP07.

The ground conditions comprise varying depths of Made Ground which is underlain by Superficial Deposits (medium dense to dense sands, gravels and firm to very stiff Clay), which in turn is underlain by sandstone bedrock (Chester Formation). Exploratory hole logs are included in Appendix A. During the Socotec SSGI, groundwater seepage was encountered in 3 No. exploratory positions across the site and were recorded to range between 1.80 m BGL (MTP07 in Superficial Deposits) and 2.55 m BGL (MTP01 in Superficial Deposits). It is considered that the seepages encountered are localised and variable perched groundwater could within the Made Ground and Superficial Deposits.

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3.3 In Situ Testing

In-situ testing undertaken during the Socotec Ltd SSGI included 23 No. standard penetrations tests (SPTs). The results are summarized in the subsequent sections of this report. Standard Penetration Tests (SPTs) were undertaken in both the 2 No. Window Samples and 2 No. Borehole drilled during the Socotec SSGI. The results are presented in the Socotec Ltd. Factual Report and are summarized below:

3.3.1 Made Ground

A total of 9 No. SPTs are available for Made Ground and can be summarized as follows:

- Minimum Value: N = 2 – recorded in BH01 at 1.20 m bgl (35.09 m AOD)
- Maximum Value: N = 35 – recorded in BH03 at 4.00 m bgl (33.37 m AOD)

The interpolated material strength assessment based on the SPT results indicates the Made Ground (predominantly granular) to range typically between Medium Dense to Dense.

3.3.2 Superficial Deposits

A total of 8 No. SPTs are available in the Superficial Deposits and can be summarized as follows:

- Minimum Value: N = 20 – recorded in BH04 at 1.200 m bgl (34.81 m AOD)
- Maximum Value: N = 600* - recorded in BH02 at 6.00 m bgl (31.37 m AOD).
- Typical Values: N 28-300*

*Extrapolated 'N' value where full penetration was not achieved. Extrapolated 'N' values where SPT reached refusal indicate a material strength that is greater than that of which the test was designed.

The interpolated material strength assessment based on the SPT results indicates the Superficial Deposits to be Medium Dense to Very Dense. It should be noted that 6 No. SPT results undertaken in the Superficial Deposits reached refusal indicating a material strength greater than that for which the test was originally designed.

3.3.3 Weathered Sandstone/Sandstone

A total of 6 No. SPTs are available in the Weathered Sandstone/Sandstone deposits and can be summarized as follows:

- Minimum Value: N = 231* – recorded in BH01 at 5.00 m bgl (31.29 m AOD)
- Maximum Value: N = 3000* - recorded in BH02 at 6.00 m bgl (31.18 m AOD).
- Typical Values: N 231*-3000*

*Extrapolated 'N' value where full penetration was not achieved. Extrapolated 'N' values where SPT reached refusal indicate a material strength that is greater than that of which the test was designed. It should be noted that SPTs were requested by BuroHappold in the Sandstone bedrock where 2 No. consecutive core runs achieved <95% core recovery.

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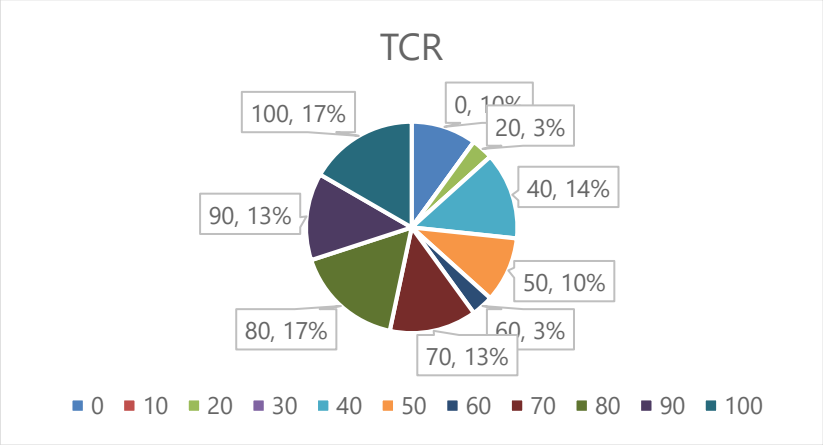
The interpolated material strength assessment based on the SPT results indicates the Weathered Sandstone/Sandstone to be Very Dense. It should be noted that all 6 No. SPT results undertaken in the exploratory holes reached refusal indicating a material strength greater than that for which the test was originally designed.

3.4 Core recovery

During the Socotec SSGI difficult ground and drilling conditions lead locally to the loss of core recovery during drilling. Where 2 No. consecutive core runs achieved less than (<) 95% total core recovery (TCR) a SPT was requested by BuroHappold to be undertaken. A total of 77% of the core achieved <95% recovery. This was attributed by the drillers and the site engineer down to difficult ground conditions and highly fractured rock with the sand being washed out by the drilling fluid. However, 60% of the rotary drilling achieved 70% core recovery or better. A simple summary of core recovery is provided in Table 2.

Table 2: Summary of Total Core Recovery (TCR) across all exploratory boreholes drilled during the Socotec SSGI 2019.



3.5 Groundwater

During the SSGI a total of 6 No. groundwater monitoring wells were installed and are summarised in Table 3 below;

Table 3: Summary of groundwater monitoring installations

Borehole Identification	Installation Type	Response Zone	Stratum
BH01	50 mm standpipe	1.6.0-4.00	Superficial Deposits
BH01	19 mm piezometer	14.50-15.50	Sandstone
BH02	50 mm standpipe	4.00-7.00	Superficial Deposits
BH02	19 mm piezometer	15.00-20.50	Sandstone
BH03	50 mm standpipe	3.00-6.00	Made Ground & Superficial Deposits
BH04	50 mm standpipe	1.50-3.00	Superficial Deposits

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To date, 4 No. post-fieldwork monitoring visits have been undertaken at the time of writing this design note between the 25th October 2019 and 6th December 2019. A further 2 No. monitoring visits are yet to be undertaken. The SSGI groundwater data indicates static water level (SWL) at around ~26.95 m AOD within the Sandstone bedrock (Chester Formation). Localised perched groundwater is also recorded within the Made Ground/Superficial Deposits. The hydraulic regime within the bedrock is considered to be controlled by the nature of the cementation and fracturing of the rock mass. It is also important to note that the Chester Formation is classified as a Principal Aquifer by the Environment Agency.

Based on the data available to date, it is not anticipated that groundwater ingress will cause significant problems for shallow excavation works above the water table. Any perched water seepages which may be encountered during excavation construction works within the Made Ground and Superficial Deposits are likely to be relatively minor and could be controlled by localised sump pumping methods. It should be noted, however, that should more significant water ingress be encountered, then more substantial water control measures may be required.

3.6 Ground Gas

As part of the Socotec SSGI, 5 No. of the ground monitoring wells have been monitored for ground gas. The wells are summarised below in Table 4.

Table 4: Summary of ground gas monitoring installations

Borehole Identification	Installation Type	Response Zone	Stratum
BH01	50 mm standpipe	1.6.0-4.00	Superficial Deposits
BH02	50 mm standpipe	4.00-7.00	Superficial Deposits
BH02	19 mm piezometer	15.00-20.50	Sandstone
BH03	50 mm standpipe	3.00-6.00	Made Ground & Superficial Deposits
BH04	50 mm standpipe	1.50-3.00	Superficial Deposits

To date, 4 No. monitoring visits have been undertaken at the time of writing this design note between the 25th October 2019 and 6th December 2019. A further 2 No. monitoring visits are due to be undertaken. The ground gas concentrations and flow rates obtained from the installations to date have been assessed against the classification scheme presented in CIRIA C665 (Assessing risks posed by hazardous ground gas to buildings (2007)). A short summary is provided below;

- Gas flow rates recorded to date suggest very low flow ranging between 0.0 and 0.2 l/hr.
- Oxygen (O2) levels range between 3.5 and 21.2 % in all boreholes. 3.5 % was recorded in BH02 (response zone 4.00-7.00 m bgl in Superficial Deposits) on the 6th December 2019.
- Carbon Dioxide (CO2) levels range between 0.00 and 1.90%.
- Methane (CH4) levels ranged between 0.00 and 0.20%.

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During the 4 No. monitoring visits the results from the 5 No. monitoring wells classifies the site as Characteristic Situation 1 (CS-1). This could be subject to change during the 2 No. remaining site visits and as such, a residual risk will remain until all monitoring visits have been completed.

With regards to the risk to human receptors/the buildings, the nature of the proposed development is envisaged to provide protection against ground gas as standard, comprising:

- Ventilation of confined spaces within the building, as good practice.
- Well constructed ground slab as a structural requirement.
- Low permeability gas membrane will be incorporated.
- Minimum penetration of ground slab by services as good practice.

Notwithstanding the foregoing, it should be noted that ground gas data and any associated ground gas protection requirement will need to be agreed with the Local Authority during subsequent design stages and as such, until the above can be agreed, a residual risk remains. It would be prudent to make allowance for a ground gas membrane within the cost plan until this item has been fully closed out and all ground gas monitoring has been completed.

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4 Development Considerations

4.1 Obstructions

The No. 4 Angel Square site has an extensive and rich development history (BH Desk Study refers). Based on the historic data and prior to the Socotec 2019 investigation, it was envisaged that large amounts of the substructure were likely to be encountered during the GI. As anticipated, the information obtained during the Socotec GI indicates that a large amount of relic substructure currently remains in-situ below the site and as such, a number of these are likely to cause obstructions during the installation of the new substructure. As such, in advance of the new substructure installation it is envisaged that any such areas where old and new substructure clash, then these areas of old substructure will need to be removed in advance of the new foundation installation. These areas are likely to be focused on the proposed line of the new retaining wall and the locations of piling within the building footprint. During the reduced level dig within the area of basement, numerous obstructions will also need to be removed. It is currently envisaged that such obstructions will be removable using conventional plant and equipment including the use of pneumatic breakers.

4.2 Unexploded Ordnance (UXO)

The proposed development is situated in an area identified as being at 'high risk from unexploded ordnance (UXO) as detailed in the relevant Zetica UXB (Unexploded Bomb) risk map for the site[2]. An Explosive Ordnance Desk Top Study (EODTP) was undertaken by EOD Contracts Limited on behalf of the Co-operative Group for the Co-operative masterplan which includes the site. The conclusion of the EODTP was that the site is 'medium risk' therefore UXO mitigation is considered to be required during ground investigation and construction phases of work.

During the Socotec Ground Investigation, UXO engineer supervision was provided to prove positions 'clear' of UXO. No UXO were identified or uncovered as part of the Ground Investigation works.

[2] Zetica, Regional Unexploded Bomb Risk Map, Site Location Map Centre 399468,651513

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5 Geoenvironmental Assessment

5.1 General

A geoenvironmental assessment of the proposed No.4 Angel Square development Site has been undertaken to assess the degree of contamination present, if any, in respect of the proposed development, the health and safety of the construction work force and to allow characterization of material for the waste disposal of surplus arisings.

Soil samples have been obtained during the site specific investigation and submitted for chemical testing as summarised in subsequent sections.

5.2 Soil Chemical Tests

As part of the Socotec Ground Investigation, soil samples were taken for chemical testing in respect of end use, health and safety considerations in addition to waste disposal categorization. The results are summarized in the sections below.

As part of the Socotec Ground Investigation a total of 9 No. soils chemical tests were undertaken (7 No. in Made Ground and 2 No. in natural ground). Based on the proposed development end use and in respect of contaminated land threshold criteria for the site, 'commercial' threshold criteria are considered to be most relevant. However, chemical data obtained for the site has been compared against the 'commercial' threshold criteria along with the much more onerous 'residential without plant uptake' threshold criteria. The chemical data has been screened against the C4SL and S4UI criteria for each associated threshold. Of the 9 No. samples tested only a small number of determinands exceeded the most onerous 'residential without plant uptake' criteria whilst none of the results for all determinands exceeded the relevant 'commercial threshold' criteria.

5.3 Asbestos

Of the 9 No. soil chemical tests, the 7 No. tests on samples within Made Ground deposits were screened for asbestos. Of these 7 No. Made Ground samples, 3 No. recorded the presence of asbestos fibres, namely Chrysotile in MTP03 at 0.50 m bgl, Amosite in MTP04 at 0.50 m bgl and Amosite and Chrysotile in MTP05 at 1 m bgl. As such, subsequent asbestos quantification tests were undertaken on the 3 No. samples that recorded asbestos. The results identify 0.001% in MTP03, 0.012% in MTP04 and <0.001% in MTP05. In accordance with CAR-SOIL[3] Watch Point 12 the concentrations of asbestos recorded is 'low'.

5.4 Waste Acceptance Criteria

A two-tier Waste Acceptance Criteria assessment has been undertaken on a total of 6 No. soil samples as part of the Socotec ground investigation and the results are summarised below.

[3] CAR-SOIL Control of Asbestos Regulations (2012), Interpretation for Managing and working with asbestos in soil and construction demolition materials – Industry Guidance. Published by Comtaminated Land: Applications if Real Environments (CL;AIRE).

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Tier One – Hazwaste online

9 No. soil samples were tested for a suite of chemical determinands. The results of the chemical tests were input into the HazWaste online software to establish if the samples were 'Non-Hazardous' or 'Hazardous'. Based on the Tier One assessment, all 9 No. soil samples tested were classified as 'Non-Hazardous'.

Tier Two – Waste Acceptance Critera

6 No. soil samples were tested for the Waste Acceptance Criteria leachate test to further understand which landfill the materials tested would likely be accepted at. Based on the test thresholds, 3 No. of the 6 No. soil samples tested recorded determinands that were slightly in exceedance of the 'Inert' threshold criteria, namely MTP02 at 0.30 m bgl, MTP03 at 0.50 m bgl and MTP05 at 1.00 m bgl.

- MTP02 at 0.30 for 'Mineral oil C10-C40 (519 m/kg – threshold 500 mg/kg) and
- MTP05 at 1.00 m bgl for Loss on Ignition (LOI) (4.97 % - threshold 3 %) and Mineral oil C10-C40 (520 m/kg – threshold 500 mg/kg) and
- MTP03 at 0.50 m bgl for Mineral oil C10-C40 (1200 m/kg – threshold 500 mg/kg),

In summary, of the 9 No. non-hazardous samples tested, 6 No. also had the Tier Two Waste Acceptance Criteria (WAC) tests undertaken. A total of 3 No. meet the inert waste criteria for inert landfill. 3 No. exceeded the inert criteria indicating the material would be suitable for a non-hazardous landfill.

Notwithstanding this preliminary assessment, it is the contractor's responsibility, in association with the operator and / or owner of the landfill to classify the materials for disposal in line with current guidance. Landfill waste acceptance criteria (WAC) leachate testing and classification prior to disposal to landfill should be undertaken to confirm the waste classification of the natural soils.

5.5 pH and Sulphate

The site is classified as 'Brownfield' in accordance with BRE Special Digest 1 in respect to chemical attack on buried concrete. As part of the SSGI, 11 No. pH and Sulphate tests (2:1 water extract) were undertaken. Based on the laboratory data available to date, the results identify that a concrete class of DS2-AC2 is suitable.

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6 Geotechnical Considerations

6.1 General

An engineering assessment of the geotechnical constraints of the proposed development has been carried out on the basis of the information available. The key elements in respect of the groundworks and foundations to the proposed development are summarised in the following sections.

6.2 Excavation and Earthworks

The proposed No. 4 Angel Square development site generally slopes down in a northwesterly direction. The maximum elevation across the site (to the nearest half metre) is 38.50 m AOD recorded in the northeastern corner. The minimum elevation across the site is 35.50 m AOD in the northwestern corner. There is therefore a change of approximately 3.00 m in height across the Site falling to the northwest.

The current No. 4 Angel Square development proposals, comprise a BCO Grade A office space and is approximately 11 stories with a single storey basement for car parking. The development proposals outlined above will involve some significant changes in level across the No. 4 Angel Square development plot to accommodate the construction of the basement.

Reduce level excavations to achieve formation level and those excavations for internal structural foundations and service trenches are likely to encounter Made Ground, Superficial Deposits and Sandstone (Chester Formation). Excavations should be feasible using conventional plant although allowance should be made for the use of pneumatic breakers to assist in the removal of any buried foundations or similar obstructions along with excavations into rock. All excavations should be supported in accordance with the guidelines presented in CIRIA Report 97[4].

During construction, it is envisaged that any perched water seepages will be relatively minor and could be controlled by sump pumping methods. It should be noted, however, that where locally more significant water ingress is encountered then more substantial water control measures may be required.

Any cohesive materials encountered during excavation are likely to be prone to deterioration from moisture and uncontrolled seepages. As such, any excavations in such materials should be covered by a blinding layer of concrete or other approved material as soon as they are exposed and formations for infrastructure should be protected by a sacrificial layer until the Permanent Works are installed.

Due to such a constrained building footprint and the creation of a full basement below the building footprint, it is unlikely that any excavated material can be re-used elsewhere on site, however large amounts of material are likely to be suitable for re-use and this should be considered during the excavation of the basement. In addition, any existing below ground obstructions encountered could be crushed and processed for re-use elsewhere subject to suitability and acceptability testing. Any unsuitable material/arisings leaving site will need to be classified for waste disposal purposes in the usual way.

[4] CIRIA Report 97. *Trenching Practice*. CIRIA R97, 1983.

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6.3 Foundations

6.3.1 General

The current development proposals for No. 4 Angel Square comprise a BCO Grade A office space and is approximately 11 stories with a single storey basement for car parking.

Based on the available information, a reasonably accurate ground model has been created in respect of the ground conditions under the site, which are likely to influence the proposed foundation solution. The majority of the development is underlain by basement car parking requiring significant excavation.

Assessment has been made in respect of shallow and deep options for foundation solutions (see below). However, based on the information obtained to date it is considered likely that a piled solution will provide the most cost-effective foundation solution for the proposed basement, external columns and internal columns. The piles will be used to transfer the loads of the buildings down to a suitable bearing stratum, namely the Sandstone (Chester Formation).

An option for shallow foundations has also been considered but this is primarily associated with the buildings core as the internal columns are unlikely to encounter material strong enough to support the building loads at the envisaged formation depth.

The sulphate content and pH of soil indicate that a minimum concrete class of DS-2 with an ACEC Class of AC-2 could be adopted for buried structures in accordance with BRE Special Digest 1.

6.3.2 Shallow Foundations

Based on the current development proposals and the borehole information available, material likely to be encountered at a sensible founding level for a shallow foundation solution for internal columns will include Superficial Deposits. Due to the indicative in-situ strengths of these materials, allowable bearing capacities are likely to be low.

However, in the area below the core and due to the thickness of the concrete requirements in this area of the building to accommodate the stair core, lift shafts etc, the underside of the core is likely to be nearing rock head. As such, with an element of over digging in this part of the site, the core is likely to reach material that is stronger and achieve an allowable bearing capacity more in line with that required. Based on the information available to date, an allowable bearing capacity of ~500 kN/m2 has been assumed at ~30.00 m AOD. Upon reaching this depth, a visual inspection by a suitably qualified professional on the contractor team will be required. This will also need to be supplemented as necessary by field or laboratory tests to validate that the required bearing capacity has been achieved.

6.3.3 Piled Foundations

Due to the relatively heavy column loads envisaged and the envisaged insufficiently strong nature of the Superficial Deposits around formation level, a piled foundation solution is considered to be the most appropriate foundation solution that is practical and comparatively predictable in terms of buildability.

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The piling technique, method of installation and design will depend on many factors, such as applied load, groundwater level, bearing strata, presence of obstructions, cost and speed of construction. Given the ground conditions encountered and that the current development proposal includes a structure with large spans and/or high loads, it is anticipated that piled foundations will be the most cost-effective solution.

If a piled foundation solution is adopted, the pile design and piled wall design should be undertaken by a specialist piling contractor but for guidance purposes a rock socketed pile, socketed into the Sandstone bedrock strata (Chester Formation) should provide the following capacities:

Internal piles.

- 600 mm piles, 16.00 - 18.00 m in length (~8 to 10m rock socket) – approximately 2000 kN.

Wall piles.

- 600 mm piles, 18.00 - 20.00 m in length (~10 to 12m rock socket) – approximately 2000 kN.

Based on the current anticipated building heights and associated envisaged loads, internal columns are likely to require multiple piles per column. Although multiple piles per column will generally be used in this instance, due to the relatively high column loadings the pile design will need to allow for any minor eccentric loadings arising from the offset between the axis of the pile and the axis of the structural column caused by the limitations in the tolerance of installation. It should also be noted that due to the piling platform level likely being significantly higher than the envisaged pile cut off levels, the limitations on such tolerances is likely to be challenging and as such, internal pile caps are likely to require oversizing to manage any associated risks.

In the area of basement, retaining measures will be required to accommodate the changes in level. Due to the extremely limited site area around the proposed basement extents, the works are envisaged to comprise a vertical embedded retained solution. A Contiguous Flight Auger (CFA) contiguous piled wall is likely to be the most cost effective solution. The piled wall will need to retain the site periphery in the temporary case (propped where necessary) whilst in the permanent case, the wall will still retain the site periphery but will be propped by floor slabs, and the wall will also support the external building column loads.

The basement retaining structure will need to be protected from water ingress. As such, a suitable tanking system is to be incorporated in accordance with the architect's specification and detailing

6.4 Ground Bearing Slabs

The use of ground bearing slabs can be considered within the proposed No. 4 Angel Square development, assuming typical loadings of 20 kN/m^2. A typical under slab formation may generally comprise 150 mm of compacted stone, sand layer and a damp proof membrane.

The formation will need to be proof rolled to ensure suitability. It should be noted that any soft spots encountered should be removed and replaced with appropriate structural fill. Any obstructions encountered should also be removed.

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The compacted stone should be DTp Type 1[5] in frost susceptible areas but in non-frost susceptible areas, such as within the confines of the proposed buildings, alternative materials such as DTp Class 6F2[6] may be considered. Recycled site won material could be considered for re-use subject to suitability.

6.5 Highways and Permissions

The No. 4 Angel Gardens development site is currently bounded to the northwest by Corporation Street and to the southwest by Miller Street. Appropriate permits and permissions will be required from the relevant authorities to allow the construction works to be undertaken.

It is currently understood that any existing site services are to be diverted around the proposed No.4 Angel Square development site prior to commencement on the main construction works and as part of a separate works package, however this should be verified prior to commencement on site.

Any such works will need to be undertaken in accordance with the relevant permits and permissions from the relevant authorities.

[5] DTp (2001). *Specification for Highway Works, Volume 1 Series 800: Clause 803*. Department of Transport, HMSO, May 2001.
[6] DTp (2003). *Specification for Highway Works, Volume 1 Series 600: Table6/1*. Department of Transport, HMSO, November 2003.

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7 Anticipated Design for Costing Purposes

The anticipated design for costing purposes can be summarised as follows:

- Site clearance and removal of obstructions in areas of proposed substructure.
- Installation of the vertical embedded retaining wall (contiguous piled wall currently envisaged) along with the installation of the internal piled foundations.
- Installation of associated piled wall capping beam.
- Reduce level dig for basement excavation along with temporary propping as required by the wall design.
- A new build 11 No. Storey office building with a single storey basement car parking.
- Core foundation currently envisaged to be a raft – NOTE: over excavation envisaged to achieve an allowable bearing capacity of ~500kPa (assumed at ~30.00 m AOD) in the Sandstone Bedrock.
- The core base formation will need to be verified on site by a suitably qualified professional from the contractor team and verified by means of field testing and/or laboratory testing.
- Based on the pH and Sulphate test results it is considered that a concrete class of DS2-AC2 is suitable for the proposed development in respect to chemical attack on buried concrete;
- The ground floor slab is proposed to be ground bearing.

General Risk Items

- Final piled foundation and wall design should be undertaken by a specialist piling contractor as part of the detailed design.
- Physical obstructions from historic basement walls/floor slabs – potential risk for installation of contiguous piled wall and piled foundation solution. A series of trial trenches are likely to be required to reduce/remove the risk of obstructions prior to pile installation.
- Demolition of the existing buildings on-site with the exiting foundations/ground floor slabs to be grubbed out during demolition and the excavation of the basement. Dependent on the construction sequencing, there is a risk of associated obstructions in the form of relic substructure should piled foundations be installed prior to the excavation of the basement.
- The site is located in a busy city centre environment and as such, noise and vibration restrictions may be imposed.
- Post fieldwork groundwater levels from the SSGI undertaken to date identify a groundwater regime within the sandstone bedrock (26.95 m AOD). It should be noted that any localised groundwater encountered within the Made Ground and Superficial Deposits may vary across the site. An allowance should be made for sump pumping within the cost plan. It should also be noted that groundwater monitoring is ongoing.
- The SSGI ground gas monitoring data available to date indicates a typical ground gas regime of Characteristic Situation 1 (CS-1). However, it should be noted that ground gas monitoring is currently ongoing and as such a residual risk remains. As such. it may be prudent to make an allowance for a ground gas membrane below all ground bearing elements of the structures at this stage.

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- The site is classified as 'Brownfield' in accordance with BRE Special Digest 1 in respect to chemical attack on buried concrete. A concrete class of DS2 –AC2 is suitable for the proposed development.
- Any Temporary Works requirements are the responsibility of the Main Contractor (MC). Where temporary excavations are required, temporary support is likely to be needed. Subject to sequencing and proposed construction methodology from the MC, temporary excavations requiring backfill should be replaced with suitable fill material in accordance with the BuroHappold Excavation and Filling Specification. In addition, when preparing formations, all soft spots are to be removed and replaced with suitable fill material/upfill concrete.
- Where the required presumed bearing resistance is not achieved at formation level beneath the core (~30.00 m AOD currently envisaged), further excavation down to a suitable bearing stratum will be required with upfill concrete placed below foundations.

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Appendix A – Socotec 2019 Exploratory Hole location Plan and Logs.

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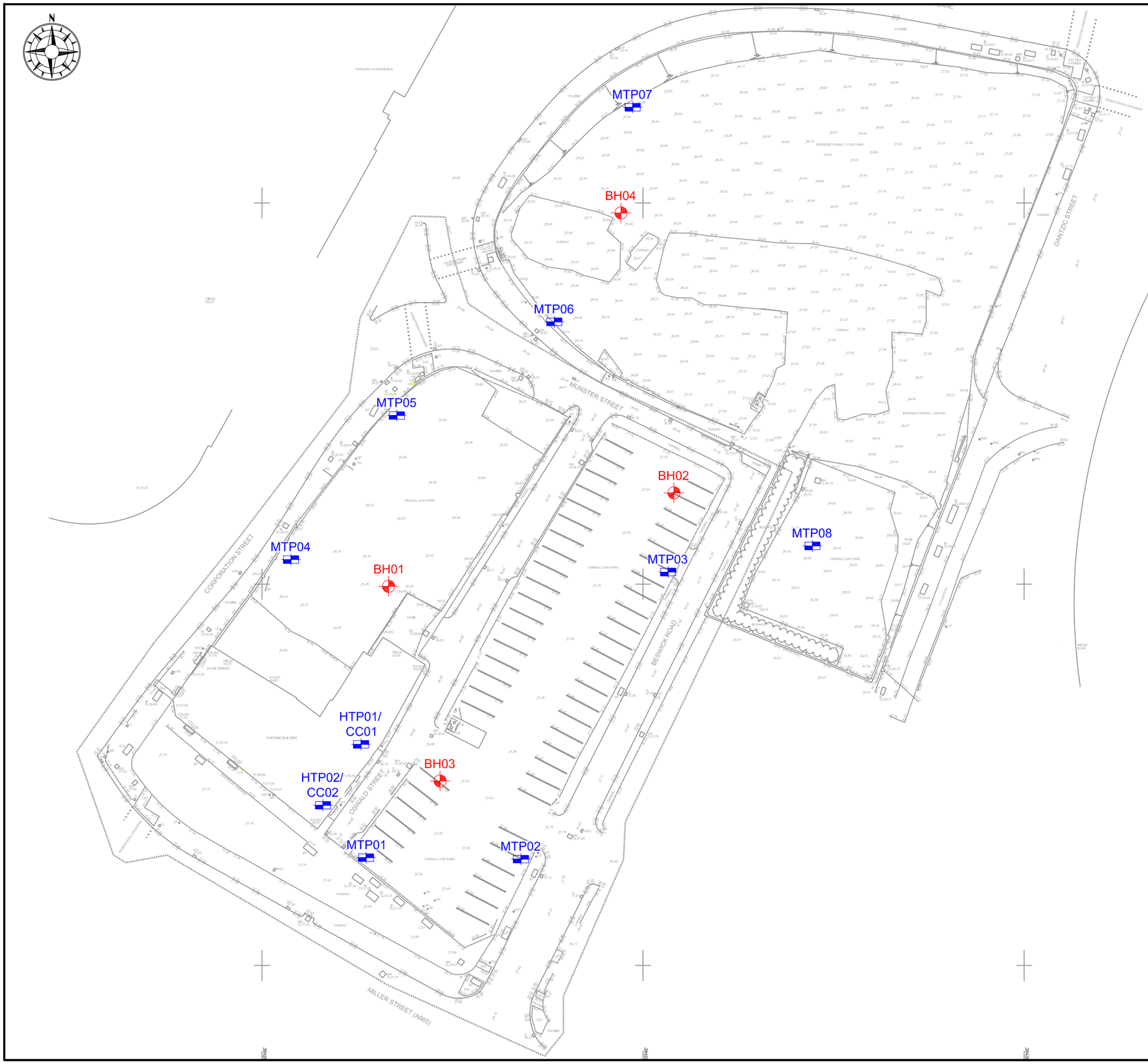


GENERAL NOTES

1. Reproduced from Survey Operations Drawing No. 18J248/001.
2. Hole Locations to National Grid Co-ordinate Reference System.

LEGEND TO SYMBOLS

Borehole

Trial Pit

Scale: 1:500

0 5m 10 15 20 25

x	x	x	x	x	x
Rev	Drawn	Date	Approv.	Date	Modification Details

AMENDMENTS

Title

SITE PLAN

Project

PROJECT NOMA PLOT P
GROUND INVESTIGATION

Client

GARDINER & THEOBALD LLP

SOCOTEC

Date	Drawn By	Approv. By
21/11/2019	BS	MS

Sheet Size	Scale	Project No
A3	1:500	A9023-19

Drawing No	Rev
A2	0

Key to Exploratory Hole Records

SOCOTEC

SAMPLES

Undisturbed

U	Driven tube sample	nominally 100 mm diameter and full recovery unless otherwise stated
UT	Driven thin wall tube sample	
TW	Pushed thin wall tube sample	
P	Pushed piston sample	
L	Liner sample from dynamic (windowless) sampling. Full recovery unless otherwise stated	
CBR	CBR mould sample	
BLK	Block sample	
C / CS	Core sample (from rotary core) taken for laboratory testing.	
AMAL	Amalgamated sample	

Disturbed

D	Small sample
B	Bulk sample

Other

W	Water sample
G	Gas sample
	Environmental chemistry samples (in more than one container where appropriate)
ES	Soil sample
EW	Water sample

Comments

Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that, while an attempt was made to take a tube sample, there was no recovery.

Samples taken from borehole installations (ie water or gas) after hole construction are not shown on the exploratory hole logs.

Specimens for point load testing undertaken on site (or other non-lab location) are not shown on the log.

IN SITU TESTS

SPT S or SPT C — Standard Penetration Test, open shoe (S) or solid cone (C)

The Standard Penetration Test is defined in BS EN ISO 22476-3:2005+A1:2011.
The incremental blow counts are given in the Field Records column; each increment is 75 mm unless stated otherwise and any penetration under self-weight in mm (SW) is noted. Where the full 300 mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach 50 the total blow count beyond the seating drive is given (without the N = prefix).

IV	*in situ* vane shear strength, peak (p) and remoulded (r)
HV	Hand vane shear strength, peak (p) and remoulded (r)
PP	Pocket penetrometer test, converted to shear strength
KFH, KRH, KPI	Permeability tests (KFH = falling head, KRH = rising head; KPI = packer inflow); results provided in Field Records column (one value per stage for packer tests)

DRILLING RECORDS

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930:2015

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacing measurements are presented.
NI	Non-intact - used where the core is fragmented (ie no Solid Core).
NA	Not-applicable - used where a measurement is not applicable (eg. If, SCR and RQD in non-rock materials).

Flush returns, estimated percentage with colour where relevant, are given in the Records column

CRF	Core recovered in the following run (length in m)
AZCL	Assessed zone of core loss

GROUNDWATER

▼	Groundwater entry
▽	Depth to groundwater after standing period

Key to Exploratory Hole Records

INSTALLATION Details of standpipe/piezometer installations are given on the Record. Legend column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill.

Standpipe/ piezometer The type of instrument installed is indicated by a code in the Legend column at the depth of the response zone:

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer

Plain Pipe 

Slotted Pipe 

Piezometer Tip 

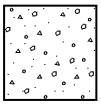
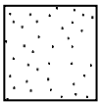
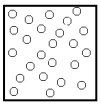
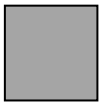
Inclinometer or Slip Indicator The installation of vertical profiling instruments is indicated on the Record. The base of tubing is shown in the Legend column.

ICE The type of instrument installed is indicated by a code in the Legend column at the base of the tubing:
ICM Biaxial inclinometer
SLIP Inclinometer tubing for use with probe
Slip indicator

Settlement Points or Pressure Cells The installation of single point instruments is indicated on the Record. The location of the measuring device is shown in the Legend column. The type of instrument installed is indicated by a code in the Legend column:

ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point
EPCE	Electronic embedment pressure cell
PPCE	Electronic push in pressure cell

INSTALLATION / BACKFILL LEGENDS A legend describing the installation is shown in the rightmost column. Legend symbols used to describe the backfill materials are indicated below.

Macadam 
Concrete 
Grout 
Bentonite 
Sand 
Gravel 
Arisings 

STRATUM LEGENDS The legend symbols used for graphical representation of soils, rocks and other materials on the borehole logs are shown below. For soils with significant proportions of secondary soil types, a combination of two or more symbols may be used.

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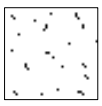
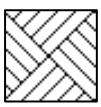
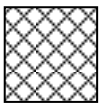
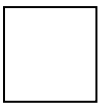
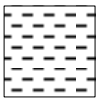
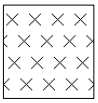
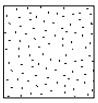
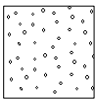
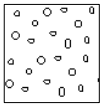
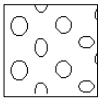
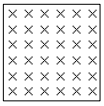
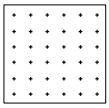
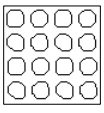
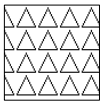
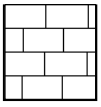
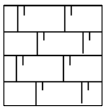
Concrete 
Topsoil 
Made Ground / Fill 
Peat 
Void or No Information 

Clay 
Silt 
Sand 
Gravel 
Cobbles 
Boulders 
Coal 

Mudstone 
Siltstone 
Sandstone 
Conglomerate 
Breccia 
Limestone 
Chalk 

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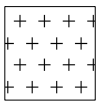
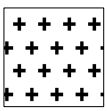
Igneous (Med) 
Igneous (Coarse) 
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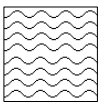
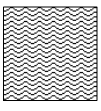
Metamorphic (Med) 
Metamorphic (Coarse) 
Tuff 

Notes:

See report text for full references of standards.

Updated October 2018

Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Key

Key to Exploratory Hole Records

SOCOTEC

NOTES

1 Soils and rocks are described in accordance with BS EN ISO 14688-1:2018 and 14689-1:2018 respectively and the guidance of BS 5930:2015.

2 For fine soils, consistency determined during description is reported for those strata where undisturbed samples are available. Where the logger considers that the sample may not be representative of the condition in situ, for whatever reason, the reported consistency is given in brackets. The reliability of the sample is indicated by Probably or Possibly as appropriate. Hence (Probably firm) indicates the logger is reasonably confident of the assessment, but (Possibly firm) means less certainty. Where the samples available are too disturbed to allow a reasonable assessment of the in situ condition, no consistency is given.

3 Evidence of the occurrence of very coarse particles (cobbles and boulders) is presented on the logs. However, because of their size in relation to the exploratory hole these records may not be fully representative of their size and frequency in the ground mass.

4 The declination of bedding and joints is given with respect to the normal to the core axis. Thus in a vertical borehole this will be the dip.

5 The assessment of SCR, RQD and Fracture Spacing excludes artificial fractures.

6 Observations of discernible groundwater entries during the advancement of the exploratory hole are given at the foot of the log and in the Legend column. The absence of a recorded groundwater entry should not, however, be interpreted as a groundwater level below the base of the borehole. Under certain conditions groundwater entry may not be observed, for instance, drilling with water flush or overwater, or boring at a rate faster than water can accumulate in the borehole. Similarly, where water entry observations do exist, groundwater may also be present at higher elevations in the ground than where recorded in the borehole. In addition, where appropriate, water levels in the hole at the time of recovering individual samples or carrying out in situ tests and at shift changes are given in the Records column.

7 The borehole logs present the results of Standard Penetration Tests recorded in the field without correction or interpretation. However, in certain ground conditions (eg high hydraulic head or where very coarse particles are present) some judgement may be necessary in considering whether the results are representative of in situ mass conditions.

REFERENCES

1 BS EN ISO 14688-1:2018 : Geotechnical investigation and testing - Identification and classification of soil. Part 1 Identification and description. British Standards Institution

2 BS EN ISO 14689-1 : 2018 : Geotechnical investigation and testing - Identification and classification of rock. Part 1 Identification and description. British Standards Institution

3 BS EN ISO 22476-3:2005+A1 : 2011 : Geotechnical investigation and testing - Field testing. Part 3 Standard penetration test. British Standards Institution

4 BS 5930 : 2015 : Code of practice for ground investigations. British Standards Institution



Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling uk ltd
5-8 victory parkway
victory road
Derby
DE24 8ZF

Hammer Ref:	SC01
Test Date:	20/05/2019
Report Date:	20/05/2019
File Name:	SC01.spt
Test Operator:	TP

Instrumented Rod Data

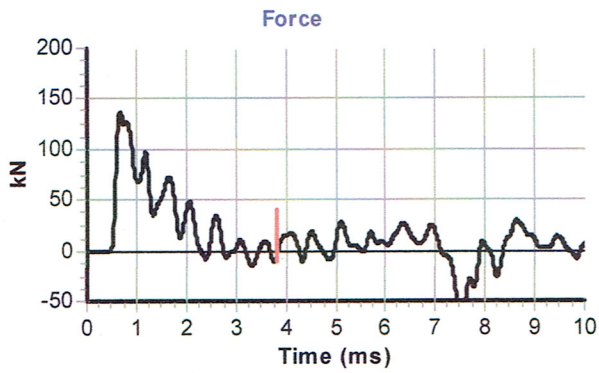
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	9603
Accelerometer No.2:	6457

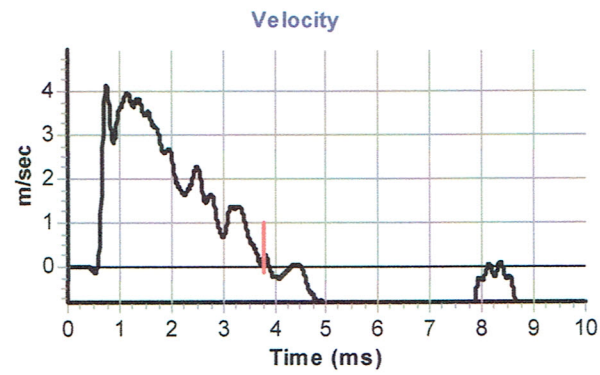
Hammer Information

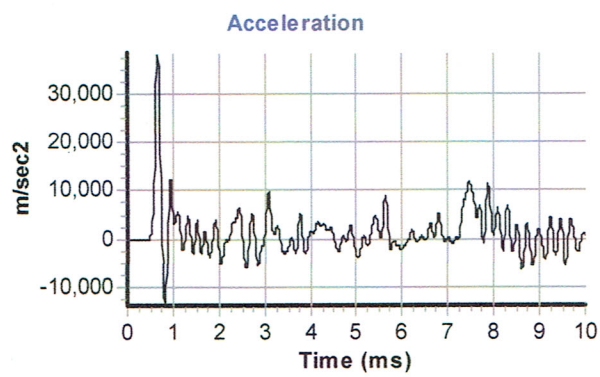
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	15.0

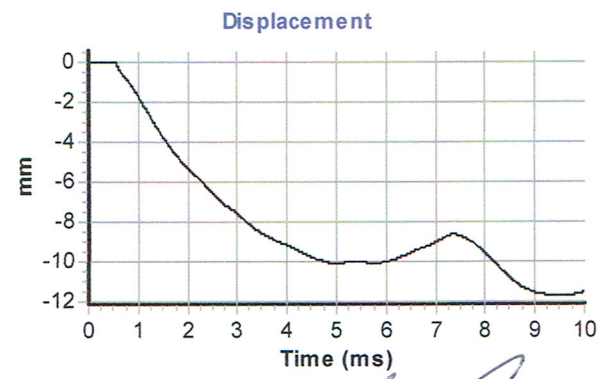
Comments / Location

Rotory hammer tested at Dynamic samplings yard.





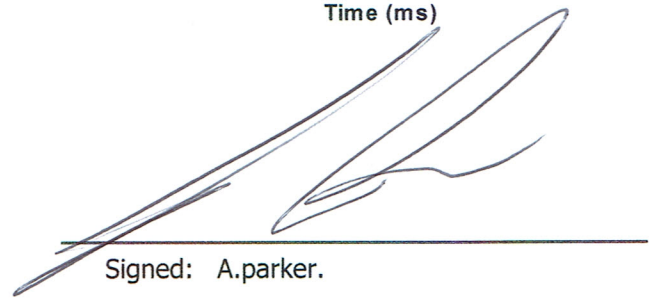




Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	372

Energy Ratio E_r (%): **79**



Signed: A.parker.

Title: Associate Director.

The recommended calibration interval is 12 months

SPTMAN ver.Hammer Energy ver. 1.93 All rights reserved, Testconsult ©2010

Borehole Log

DRAFT

SOCOTEC

Drilled	DSUK	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	36.29 mOD
Logged	JH	10/10/2019	Comacchio Geo 205.	1.20	2.00	115	2.00	**Coordinates (m)**	E 384216.61
Checked	MS	**End**	Dynamic sampling followed by rotary core drilling (PWF and HWF size) using water flush.	2.00	3.00	97	3.00	**National Grid**	N 399049.72
Approved		17/10/2019	SPT Hammer ID: SC01, Rod type: NWY.	3.00	5.00	77	5.00		
				5.00	20.00	121	12.00		
				20.00	28.00	99	22.00		

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.10 - 0.45	B 3		0.00-1.20 Hand excavated inspection pit.			Black sandy angular to rounded fine to coarse GRAVEL of roadstone, slag, brick, coal and macadam. (MADE GROUND)		(0.45)		
0.20	ES 1							0.45 +35.84		
0.20	D 2					Multicoloured slightly sandy gravelly CLAY with high cobble content. Gravel is angular fine to coarse of brick. Cobbles are angular of brick. Some rare sandstone cobbles. (MADE GROUND)		(1.10)		
0.50	ES 4									
0.50	D 5									
0.50 - 1.20	B 7									
1.00	ES 6									
1.00	D 8									
1.20 - 1.65	SPTS		N=2 (1,0/1,0,1,0)		Dry					
1.20 - 2.00	L		81% rec, diameter 115mm							
1.50	ES 9							1.55 +34.74		
1.55 - 2.00	B 10					Very loose yellowish brown and grey sandy slightly clayey rounded to subrounded fine to coarse GRAVEL of sandstone and mudstone with frequent lenses of purple and red sand. Sand is medium. Strong hydrocarbon odour. (Possible MADE GROUND)				
2.00 - 2.45	SPTS		N=3 (2,2/1,1,1,)	2.00	Dry					
2.00	ES 11									
2.00 - 3.00	L		100% rec, diameter 97mm					(1.45)		
2.50	ES 13									
2.50	D 12									
2.60 - 3.00	B 14									
3.00 - 3.45	SPTS		N=28 (4,4/6,6,8,8)	3.00	Dry			3.00 +33.29		
3.00	ES 15									
3.00 - 4.00	L		100% rec, diameter 77mm			Medium dense orangish brown, mottled black, red and purple slightly gravelly silty fine SAND. Gravel is rounded fine of sandstone. Strong hydrocarbon odour. (Possible MADE GROUND)		(1.00)		
3.50	D 16									
3.50 - 4.00	B 17									
4.00 - 4.23	SPTS		50 (2,5/42,8 for 8mm)	4.00	Dry	Dense red fine SAND Residual bedrock. Description based on SPT sample.		4.00 +32.29		
								(1.00)		
5.00 - 5.14			50 (25 for 75mm/50 for 65mm)	5.00	Dry	Assessed zone of core loss. Core loss due to fine SAND. (Completely weathered SANDSTONE)		5.00 +31.29		
5.00			D 18					(0.50)		
	61 24 17									
5.00 - 6.00						Extremely weak thinly bedded reddish brown fine to coarse grained SANDSTONE. Distinctly to highly weathered with loss of strength and colour penetration at joints 2-3mm. Fractures are 0 to 5 degree, very closely to closely spaced, undulating, stepped with locally clayey sand infill.	5.80 1no. joint 20 degree undulating smooth clean. Joint set is very widely spaced.	5.50 +30.79		
5.70			ES 19							
		NI 65 170	Flush: 5.00 - 7.50 Water 0%							
	57 17 7									
6.00 - 7.50										
				10/10/19 5.00	1800 Dry					
				11/10/19 5.00	0800 5.80		7.40 becoming slightly gravelly. Gravel is rounded fine of quartz 7.50-7.90 AZCL			
	73 43 35							(5.00)		
7.50 - 9.00							8.25 tabular mudstone inclusion			
		NI 70 130								
			Flush: 7.50 - 10.50 Water 20%							
	92 74 44									
9.00 - 10.50										

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks
0.00 - 28.00	No groundwater encountered during drilling.

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:50

22/11/2019 11:13:28

Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Borehole

BH01

Borehole Log

DRAFT

SOCOTEC

Drilled	DSUK	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	36.29 mOD
Logged	JH	10/10/2019	Comacchio Geo 205. Dynamic sampling followed by rotary core drilling (PWF and HWF size) using water flush. SPT Hammer ID: SC01, Rod type: NWY.	1.20	2.00	115	2.00	**Coordinates (m)**	E 384216.61
Checked	MS	**End**		2.00	3.00	97	3.00	**National Grid**	N 399049.72
Approved		17/10/2019		3.00	5.00	77	5.00		
				5.00	20.00	121	12.00		
				20.00	28.00	99	22.00		

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
10.02 - 10.21		NI 85 200	CS 1			Extremely weak thinly bedded reddish brown fine to coarse grained SANDSTONE. Distinctly to highly weathered with loss of strength and colour penetration at joints 2-3mm. Fractures are 0 to 5 degree, very closely to closely spaced, undulating, stepped with locally clayey sand infill. Assessed zone of core loss.	10.40 1no. joint 20 degree undulating smooth clean. Joint set is very widely spaced	10.50 +25.79 (0.80)		
10.50 - 12.00	48 4 0	- NA -				Recovered as reddish brown clayey SAND. (Completely weathered)		11.30 +24.99 (0.40)		
			40 80 100			Extremely weak thinly bedded reddish brown fine to coarse grained SANDSTONE. Distinctly to highly weathered with loss of strength and colour penetration at joints 2-3mm. Fractures are 0 to 5 degree, very closely to closely spaced, undulating, stepped with locally clayey sand infill. Assessed zone of core loss.		11.70 +24.59 (0.30) 12.00 +24.29 (0.90)		
12.00 - 13.50	40 20 18	- NA -								
12.90			CS 20			Extremely weak thinly bedded reddish brown fine to coarse grained SANDSTONE. Distinctly to highly weathered with loss of strength and colour penetration at joints 2-3mm. Fractures are 0 to 5 degree, very closely to closely spaced, undulating, stepped with locally clayey sand infill. Assessed zone of core loss.	12.90-13.10 grey cobbles (possible cavings)	12.90 +23.39 (0.60) 13.50 +22.79 (0.65)		
		45 80 120								
13.50 - 13.58			SPTS 50 (25 for 45mm/50 for 30mm)	12.00						
13.50 - 15.00	57 21 19	- NA -				Extremely weak thinly bedded reddish brown fine grained SANDSTONE. Rare rounded fine gravel of quartz and igneous clasts.	14.15-16.50 highly fractured 14.37 1no. joint 80 to 85 degree undulating rough 14.40 1no. joint 20 degree undulating smooth clean. Joint set is very widely spaced	14.15 +22.14 (0.85)		
14.37 - 14.59			CS 2							
14.66 - 14.82		65 80 175	CS 21							
						Assessed zone of core loss.		15.00 +21.29 (0.80)		
15.00 - 16.50	47 0 0	- NA -				Reddish brown slightly gravelly SAND. Gravel is subrounded fine to coarse of quartz. (Completely weathered SANDSTONE)		15.80 +20.49 (0.70)		
16.50 - 16.59			SPTS 50 (25 for 50mm/50 for 40mm) CS 22	12.00						
16.50						NO RECOVERY. Possible band of sand.		16.50 +19.79 (1.50)		
16.50 - 18.00	0 0 0	- NA -								
				11/10/19 12.00	1730 16.20					
				14/10/19 12.00	0800 10.60	Assessed zone of core loss.		18.00 +18.29 (0.70)		
18.00 - 19.50	52 0 0	- NI -				Reddish brown subrounded coarse GRAVEL of sandstone, quartz and mudstone.		18.70 +17.59 (0.16) 18.86 +17.43		
			Flush: 10.50 - 28.00 Water 0%	14/10/19 12.00	1600	Reddish brown fine SAND. Frequent fine to coarse rounded gravel lithorelicts of sandstone. (Completely weathered SANDSTONE)		(0.64)		
19.50 - 19.56			SPTS 50 (25 for 35mm/50 for 25mm)	15/10/19 12.00	0800 11.30	NO RECOVERY. Core barrel stuck in hole. Back hammering destroyed core.		19.50 +16.79		
19.50 - 20.00	0 0 0	- NI -								

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:50

22/11/2019 11:13:28

Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Borehole BH01

Borehole Log

DRAFT

SOCOTEC

Drilled	DSUK	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	36.29 mOD
Logged	JH	10/10/2019	Comacchio Geo 205. Dynamic sampling followed by rotary core drilling (PWF and HWF size) using water flush. SPT Hammer ID: SC01, Rod type: NWY.	1.20	2.00	115	2.00	**Coordinates (m)**	E 384216.61
Checked	MS	**End**		2.00	3.00	97	3.00	**National Grid**	N 399049.72
Approved		17/10/2019		3.00	5.00	77	5.00		
				5.00	20.00	121	12.00		
				20.00	28.00	99	22.00		

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
20.00 - 22.00	0 0 0	- NA -			
22.37 - 22.50			CS 3		
22.00 - 23.50	82 38	20 50	CS 23		
22.77 - 22.84	15	130			
		-			
		NA			
		-			
			NI		
			NI		
			NI		
23.50 - 25.00	77 23 0	 15 65 95			
			NI		
			NI		
			NI		
25.33 - 25.44			CS 24		
25.00 - 26.50	100 77 56	NI 80 160			
26.24 - 26.31			CS 4		
26.40 - 26.51			CS 25		
26.50 - 28.00	95 28 7	NI 40 110			
27.55 - 27.62			CS 26		
				15/10/19 22.00	1800
27.94 - 28.00			CS 27		
27.94 - 28.00			CS 28		

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
NO RECOVERY. Core barrel stuck in hole. Back hammering destroyed core.		(2.50)		
Extremely weak to very weak thinly cross bedded reddish brown fine to coarse grained SANDSTONE. Completely weathered at fractures into sand. Rock material fresh.	22.00-22.30 AZCL	22.00 +14.29		
	22.90 1no. joint 20 degree undulating smooth clean			
	23.30-24.15 85 degree subvertical joint 23.50-23.90 AZCL	(3.00)		
	24.80-24.95 90 degree planar smooth with clayey sand infill	25.00 +11.29		
Extremely weak to very weak thinly cross bedded reddish brown fine to coarse grained SANDSTONE. Completely weathered at fractures into sand. Rock material fresh.	25.75 1no. joint 20 degree undulating smooth clean. Joint is closely/medium spaced			
		(3.00)		
	26.70-26.90 non intact			
	27.30-27.67 90 degree planar smooth with clayey sand infill 27.55-28.00 locally weak 27.70-27.85 non intact			
END OF EXPLORATORY HOLE		28.00 +8.29		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:50

22/11/2019 11:13:28

Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Borehole

BH01

Borehole Log

DRAFT

SOCOTEC

Drilled	DSUK	**Start**		**Equipment, Methods and Remarks**		**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	37.50 mOD
Logged	JH/RT	30/09/2019		Comacchio Geo 205.		1.20	2.00	101	2.00	**Coordinates (m)**	E 384254.05
Checked	MS	**End**		Dynamic sampling followed by rotary core drilling (PWF size) using water flush.		2.00	8.00	87	6.50	**National Grid**	N 399061.99
Approved		04/10/2019		SPT Hammer ID: SC01, Rod type: NWY.		8.00	25.50	121	12.00		

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
			0.00-1.20 Hand excavated inspection pit.		
0.20	ES 1				
0.20 - 0.50	B 3				
0.50	ES 2				
0.50	D 4				
0.50 - 1.20	B 7				
1.00	ES 5				
1.00	D 6				
1.20 - 1.65	SPTC		N=25 (10,11/7,7,7,4)		
1.20 - 2.00	L		100% rec, diameter 101mm		
1.50	ES 8				
2.00 - 2.45	SPTC		N=21 (1,2/7,5,5,4)		
2.00	ES 9				
2.00 - 2.80	L		100% rec, diameter 87mm		
2.50	ES 10				
2.80 - 3.50	B 12				
2.80 - 3.20	L		100% rec, diameter 87mm	30/09/19 3.10	1700 Dry
3.20 - 4.50	L		23% rec, diameter 87mm	01/10/19 3.10	0800 1.10
4.50 - 4.77	SPTC		50 (10,4/28,22 for 45mm)	4.50	
4.50 - 6.00	L		15% rec, diameter 87mm		
6.00 - 6.08	SPTS		50 (25 for 60mm/50 for 25mm)	6.00	
6.00 - 7.50	L		15% rec, diameter 87mm		
7.50 - 8.00	D 11				
7.50 - 8.00	L		100% rec, diameter 87mm		
			N/A		
			NA		
			N/A		
	47	-			
8.00 - 9.00	13	NI			
	9	-			
		20			
9.33 - 9.42	84	80	CS 13		
	76	145			
9.00 - 10.50	41				

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend
MACADAM. (MADE GROUND)		(0.20) 0.20 +37.30	
Black slightly sandy subrounded to angular fine to coarse GRAVEL of macadam, concrete and brick. (MADE GROUND)		(0.10) 0.30 +37.20	
Greyish brown gravelly fine to coarse SAND with medium cobble content. Gravel is angular to subangular fine to coarse of brick, macadam, tile and slag. Cobbles (100x60mm) are tabular and angular of brick. (MADE GROUND)		(0.90) 1.20 +36.30	
Greyish brown and orangish brown very sandy subrounded to angular fine to coarse GRAVEL of brick and construction rubble with low cobble content. Sand is fine to coarse. Cobbles are angular and tabular of brick and concrete. (MADE GROUND)		(1.60) 2.80 +34.70	
CONCRETE basement slab reinforced with 20mm rebar. (MADE GROUND)		(0.70) 3.50 +34.00	
Zone of low recovery. Recovered material comprises of brown and grey subangular to subrounded COBBLES (120x80mm) of igneous and metamorphic origin. (Possible GLACIAL TILL)		(4.00) 7.50 +30.00	
Extremely weak reddish brown fine to medium grained SANDSTONE. Recovered as subrounded cobbles (80x70mm). (Distinctly weathered SANDSTONE)	8.00-8.30 AZCL	(1.10) 8.60 +28.90	
Extremely weak thinly bedded reddish brown fine to coarse, predominantly medium grained, SANDSTONE. Slightly weathered with some orange discolouration. Fractures are 2 degree, very closely to closely spaced, undulating, rough with clayey sand infill.	9.00-9.24 AZCL 9.93 stained orange band slightly weathered	(1.90)	

Backfill

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:50

22/11/2019 11:13:29

Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Borehole

BH02

Borehole Log

DRAFT

SOCOTEC

Drilled	DSUK	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	37.50 mOD
Logged	JH/RT	30/09/2019	Comacchio Geo 205.	1.20	2.00	101	2.00	**Coordinates (m)**	E 384254.05
Checked	MS	**End**	Dynamic sampling followed by rotary core drilling (PWF size) using water flush.	2.00	8.00	87	6.50	**National Grid**	N 399061.99
Approved		04/10/2019	SPT Hammer ID: SC01, Rod type: NWY.	8.00	25.50	121	12.00		

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
10.07 - 10.21			CS 5			Extremely weak thinly bedded reddish brown fine to coarse, predominantly medium grained, SANDSTONE. Slightly weathered with some orange discolouration. Fractures are 2 degree, very closely to closely spaced, undulating, rough with clayey sand infill.	10.50-10.80 AZCL	10.50 +27.00		
11.10 - 11.19	85		CS 14			Extremely weak to weak very thinly to thinly bedded reddish brown fine to coarse, predominantly medium, SANDSTONE. Slightly weathered with some black discolouration penetrating 1-2mm at discontinuities. Fractures are 2 degree, very closely to closely spaced, undulating, rough with clayey sand infill.				
10.50 - 12.00	85	45								
	48	100								
		180								
11.82 - 12.00			CS 6							
12.00 - 12.42			SPTC 50 (3,4/4,8,12,26 for 45mm)					(3.00)		
							12.12-12.32 interbedded with cross laminated brownish orange siltstone			
	100						12.65-13.90 becoming slightly gravelly. Gravel is rounded fine to medium of quartz			
12.00 - 13.50	90	40								
12.96 - 13.10	74	90	CS 15							
		140		01/10/19	1800					
				6.50	12.90					
				02/10/19	0800	Extremely weak thickly bedded reddish brown fine to coarse, predominantly coarse grained, SANDSTONE with frequent rounded fine to medium gravel of quartz and igneous clasts. Fractures are 0 to 5 degree, very closely to closely spaced undulating rough with clayey sand smearing.		13.50 +24.00		
				6.50	8.10		13.90-14.30 thin cross bedding	(0.80)		
13.50 - 15.00	87	25						14.30 +23.20		
	87	45				Weak very thinly cross bedded reddish brown fine to coarse, predominantly medium grained, SANDSTONE. Fractures are 0 to 2 degree, closely spaced, planar, rough.	14.40-15.00 gravel absent			
	47	50						(0.88)		
15.00 - 15.08			CS 16							
15.08 - 15.18			CS 17			Assessed zone of core loss. No recovery due to core barrel being stuck and back hammering.		15.18 +22.32		
		-								
	21	NA						(1.02)		
15.00 - 16.50	21	-								
	10									
			40			Weak reddish brown weak thickly bedded medium to coarse grained SANDSTONE with frequent rounded fine to coarse gravel of sandstone, mudstone and quartz. Fractures are 0 to 2 degree predominantly closely spaced, one medium, undulating, rough.		16.20 +21.30		
			80	02/10/19	1800			(0.30)		
			100	12.00	12.30		16.50-16.90 AZCL	16.50 +21.00		
				03/10/19	0800					
				12.00	12.50					
17.00 - 17.20		40	CS 18			Very weak to weak thinly bedded reddish brown coarse grained SANDSTONE with frequent rounded fine to medium gravel of sandstone, mudstone and quartz. Fractures are 0 to 2 degree, predominantly closely spaced, one medium, undulating.				
	73	120								
16.50 - 18.00	63	240					17.58-17.80 5 to 8 degree very closely to extremely closely spaced stepped rough joint set			
	41									
			19							
			7							
			9					(3.34)		
		40								
18.59 - 19.04	97	90	CS 19							
18.00 - 19.50	85	155								
	62									
		50								
		130								
		215								
19.95 - 20.22			CS 7			Extremely weak thinly laminated brownish red		19.84 (0.06) 19.90 (0.15) +17.66 +17.60		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:50

22/11/2019 11:13:29

Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Borehole

BH02

Borehole Log

DRAFT

SOCOTEC

Drilled	DSUK	**Start**	30/09/2019
Logged	JH/RT		
Checked	MS	**End**	04/10/2019
Approved			

Equipment, Methods and Remarks

Comacchio Geo 205.
Dynamic sampling followed by rotary core drilling (PWF size) using water flush.
SPT Hammer ID: SC01, Rod type: NWY.

Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)
1.20	2.00	101	2.00
2.00	8.00	87	6.50
8.00	25.50	121	12.00

Ground Level	37.50 mOD
Coordinates (m)	E 384254.05
National Grid	N 399061.99

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
20.05 - 20.13			CS 20		
19.50 - 21.00	100 91 67	40 180 270		03/10/19 12.00	1800 13.20
21.13 - 21.31			CS 21	04/10/19 12.00	0800 13.40
21.00 - 22.50	95 95 77	50 145 290			
23.06 - 23.12	100 97 81		CS 22		
22.50 - 24.00					
23.62 - 23.82		60 150 200	CS 8		
24.00 - 25.50	82 82 76	80 110 310			
24.91 - 25.00		100 120 140	CS 23	04/10/19 12.00	1800 13.40

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Extremely weak thinly laminated brownish red MUDSTONE. Fractures are 0 to 2 degree predominantly closely spaced, one medium, undulating, rough.	20.32-23.80 35 to 40 degree medium spaced stepped smooth likely clean insitu	20.05 +17.45		
Weak thinly bedded reddish brown CONGLOMERATE in a coarse grained sandstone matrix. Clasts are angular to subangular fine to coarse of quartz, mudstone, sandstone, quartzite and igneous material. Fractures are 0 to 2 degree predominantly closely spaced, one medium, undulating, rough.				
Weak, locally very weak, thickly bedded reddish brown fine grained SANDSTONE with some (30x5mm) brown mudstone fragments and frequent siderite nodules. Fractures are 0 to 2 degree predominantly closely spaced, one medium, undulating, rough joint set (probably sand infill lost).	22.35 35 to 40 degree medium spaced stepped smooth clean 22.80 green reduction spots 23.60 green reduction spots 24.92-24.98 recovered as dense red fine sand 25.20-25.50 extremely weak thinly laminated brownish red mudstone. Recovered as tabular coarse gravel of mudstone	(5.45)		
END OF EXPLORATORY HOLE		25.50 +12.00		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:50

22/11/2019 11:13:29

AGS

Project	**PROJECT NOMA PLOT P**
Project No.	**A9023-19**
Carried out for	**Buro Happold**

Borehole

BH02

Borehole Log

DRAFT

SOCOTEC

Drilled	DSUK	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	37.21 mOD
Logged	RT/JH	07/10/2019	Comacchio Geo 205.	1.20	1.50	115	1.50	**Coordinates (m)**	E 384223.37
Checked	MS	**End**	Dynamic sampling followed by rotary core drilling (PWF size) using water flush.	1.50	4.00	95	1.50	**National Grid**	N 399024.19
Approved		08/10/2019	SPT Hammer ID: SC01, Rod type: NWY.	4.00	5.00	88	1.50		
				5.00	6.00	95	5.00		
				6.00	7.50	121	6.00		

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.15 ES 1 0.25 ES 2 0.25 - 0.50 B 3 0.50 B 4			0.00-1.20 Hand excavated inspection pit.			Dark grey MACADAM. (MADE GROUND)		0.10 (0.10) +37.11 0.20 (0.10) +37.01		
						Dark grey sandy subangular fine to coarse GRAVEL of roadstone, concrete and macadam. (MADE GROUND)	0.50 steel obstruction, pit extended	(1.00)		
1.00 ES 5 1.00 D 6				07/10/19	1800 Dry	Brown fine to coarse SAND AND angular to subangular fine to coarse GRAVEL of brick, concrete and limestone. Occasional fragments (<100x50x70mm) of brick. (MADE GROUND)				
1.20 - 1.65 SPTS 1.20 - 1.50 L			N=8 (1,2/2,1,2,3) 100% rec, diameter 110mm	08/10/19	0800 Dry	Firm dark greyish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of sandstone, concrete and brick. (MADE GROUND)		1.20 +36.01		
1.50 ES 7 1.50 D 8 1.50 - 2.50 L			85% rec, diameter 95mm					(0.80)		
2.00 - 2.45 B 9						Grey CONCRETE slab. (MADE GROUND)		2.00 +35.21		
								(0.45)		
2.50 - 2.95 SPTS 2.50 D 10 2.50 - 4.00 L			N=20 (2,10/2,15,2,1) 37% rec, diameter 95mm	1.50	Dry	1no. angular cobble of brick recovered. (MADE GROUND)		2.45 +34.76		
								(1.00)		
3.60 ES 11						Light brown slightly gravelly sandy CLAY. Gravel is subrounded to rounded medium to coarse of various sedimentary rock. (MADE GROUND)		3.45 +33.76		
								(0.55)		
4.00 - 4.45 SPTS 4.00 - 5.00 L			N=35 (2,3/5,5,20,5) 100% rec, diameter 88mm	1.50	Dry	Dense dark brown, mottled black, slightly gravelly medium to coarse SAND with low cobble content. Gravel is rounded fine of brick and concrete. Cobbles are angular of brick and concrete. Slight hydrocarbon odour. (MADE GROUND)		4.00 +33.21		
								(0.50)		
4.50 ES 12 4.50 D 13								4.50 +32.71		
5.00 - 5.45 SPTS 5.00 D 14 5.00 - 6.00 L			5.00-6.00 Open hole drilling. N=28 (3,6/6,7,7,8) 0% rec, diameter 95mm	1.50	Dry	Medium dense dark brown, mottled orange and black, sandy clayey rounded fine to coarse, predominantly coarse, GRAVEL of various sedimentary rock. Sand is medium to coarse. (Possible MADE GROUND)		(1.30)		
								5.80 +31.41		
						Reddish brown fine to coarse SAND. (Completely weathered SANDSTONE)		(0.20)		
6.00 - 6.14		-	50 (25 for 65mm/40,10 for 5mm)	1.50	Dry			6.00 +31.21		
		NI				Extremely weak reddish brown medium to coarse grained SANDSTONE. Recovered as dense slightly gravelly sand. Gravel is subrounded coarse.		(0.40)		
		-						6.40 +30.81		
6.50 - 6.59			CS 15							
6.00 - 7.50	100 47 30	60 80 150				Extremely weak reddish brown medium to coarse grained SANDSTONE. Partially weathered with colour penetration of lighter brown 1mm on joint surfaces. Fractures are 0 to 5 degree very closely spaced, undulating and rough.		(1.10)		
			NI NI NI	08/10/19 6.00	1700 Dry			7.50 +29.71		
						END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:50

22/11/2019 11:13:30

Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Borehole

BH03

Sheet 1 of 1

Borehole Log

DRAFT

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Drilled	DSUK	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	35.99 mOD
Logged	JH	09/10/2019	Comacchio Geo 205.	1.20	6.00	77	6.00	**Coordinates (m)**	E 384247.11
Checked	MS	**End**	Dynamic sampling followed by rotary core drilling (PWF size) using water flush.	6.00	7.50	121	6.00	**National Grid**	N 399098.70
Approved		10/10/2019	SPT Hammer ID: SC01, Rod type: NWY.						

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
			0.00-0.70 Hand excavated inspection pit.		
0.20	ES 1				
0.20	D 2				
0.20 - 0.55	B 5				
0.50	ES 3				
0.50	D 4				
			0.70-1.20 Open hole drilling.		
1.20 - 1.65	SPTS		N=20 (4,4/5,5,5,5)	1.20	Dry
1.20 - 2.00	L		100% rec, diameter 77mm		
1.30	ES 6				
1.50	D 7				
1.50 - 2.00	B 8				
2.00 - 2.45	SPTS		N=30 (4,5/5,6,9,10)	1.20	Dry
2.00 - 3.00	L		80% rec, diameter 77mm		
2.50	D 9				
2.70 - 3.00	B 10				
3.00 - 3.16	SPTS		50 (25 for 65mm/38,12 for 15mm)	4.00	Dry
3.00 - 4.00	L		0% rec, diameter 77mm		
4.00 - 4.24	SPTS		50 (25 for 40mm/16,16,18 for 45mm)	4.00	Dry
4.00 - 6.00	B 11				
4.00 - 4.50	L		10% rec, diameter 77mm		
4.50 - 6.00	L		33% rec, diameter 77mm		
				09/10/19	1730
				4.50	Dry
6.00 - 6.22		NI	50 (7,18/50 for 65mm)	10/10/19	0800
		NI		4.50	2.45
		NI			
	75				
6.00 - 7.50	58				
	58	NI			
		80			
		160			
				10/10/19	1200
				6.00	

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Black sandy subangular fine to coarse GRAVEL of macadam. (MADE GROUND)		0.05 (0.05) +35.94		
Reddish grey and brown very gravelly fine to coarse SAND. Gravel is angular fine to coarse of predominantly brick and mortar. (MADE GROUND)		(0.50)		
CONCRETE slab. (MADE GROUND)		0.55 +35.44		
Dark brown slightly sandy rounded fine to coarse GRAVEL of various lithologies.		(0.63)		
Medium dense brown slightly gravelly silty coarse SAND. Gravel is rounded medium to coarse of various lithologies. Rare organic lenses (<60mm).		1.18 (0.07) +34.81 1.25 +34.74		
		(1.15)		
Stiff dark brown slightly gravelly sandy CLAY. Sand is predominantly medium. Gravel is rounded fine to coarse of various lithologies.		2.40 +33.59		
Reddish brown slightly gravelly coarse SAND. Gravel is rounded fine to coarse of various lithologies.		(0.25)		
Zone of low recovery. Recovered material comprises grey and brown subangular to subrounded COBBLES (100x80x60mm) of various lithologies. (Possible GLACIAL TILL)		2.65 +33.34		
		(0.35)		
		3.00 +32.99		
		(3.00)		
Greenish grey rounded coarse GRAVEL of igneous lithologies. (Possible GLACIAL TILL)	6.00-6.38 AZCL	6.00 +29.99		
		(0.39)		
Extremely weak cross laminated reddish brown medium to fine grained SANDSTONE. Slightly weathered with lightening colour penetration at joint 1mm. Fractures are 0 to 5 degree, very closely to closely spaced, planar, rough.		6.39 +29.60		
		(1.11)		
	7.41 1no 2 degree planar stepped. Some evidence of clay infill preserved in stepped joint	7.50 +28.49		
END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks
0.00 - 7.50	No groundwater encountered during drilling.

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Project PROJECT NOMA PLOT P

Project No. A9023-19

Carried out for Buro Happold

Borehole

BH04

Sheet 1 of 1

Trial Pit Log

DRAFT

SOCOTEC

Logged RT **Checked** MS **Approved**	**Start** 09/10/2019 **End** 09/10/2019	**Equipment, Methods and Remarks** Hand excavated to 0.80m.	**Dimension and Orientation** Width 0.40 m Length 1.55 m A / D / B / C 0 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
			Paving SLABS. (MADE GROUND)		(0.10) 0.10		
0.20 0.20 - 0.40	ES1 B2		Dark brown fine to coarse SAND AND subangular to subrounded fine to coarse GRAVEL of brick, concrete, macadam and sandstone. (MADE GROUND)		(0.30)		
0.40 - 0.80	B4		Reddish brown slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of poorly cemented sandstone.		0.40 (0.40)		
0.60	ES3	09/10/19 damp			0.80		
			END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks
1		Damp throughout.

Remarks

Depth (m)	Remarks

Stability Stable
Shoring None
Weather Indoors

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:23:49

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Project **PROJECT NOMA PLOT P**

Project No. **A9023-19**

Carried out for **Buro Happold**

Trial Pit

HTP03

Trial Pit Log

DRAFT

SOCOTEC

Logged RT **Checked** MS **Approved**	**Start** 09/10/2019 **End** 09/10/2019	**Equipment, Methods and Remarks** Hand excavated to 1.10m.	**Dimension and Orientation** Width 0.40 m Length 1.55 m A / D / B / C 0 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
			Paving SLABS. (MADE GROUND)		(0.10) 0.10		
0.20	ES1		Dark brown fine to coarse SAND AND subangular to subrounded fine to coarse GRAVEL of brick, flint and concrete. (MADE GROUND)		(0.20) 0.30		
0.20 - 0.30	B2						
0.30 - 0.50	B4						
0.40	ES3		Yellowish brown fine to coarse SAND AND subangular to subrounded fine to coarse GRAVEL of brick, sandstone and flint with low cobble content. Cobbles are subangular of brick. (MADE GROUND)		(0.20) 0.50		
0.50 - 0.80	B5						
			Reddish brown and dark grey slightly gravelly fine to coarse SAND. Gravel is subangular to well rounded of various lithologies.				
0.70	ES6				(0.60)		
		09/10/19 damp					
			END OF EXPLORATORY HOLE		1.10		

Groundwater Entries

No.	Depth Strike (m)	Remarks
1		Damp throughout.

Remarks

Depth (m)	Remarks

Stability Stable

Shoring None

Weather Indoors

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Project **PROJECT NOMA PLOT P**

Project No. **A9023-19**

Carried out for **Buro Happold**

Trial Pit

HTP04

Sheet 1 of 1

Trial Pit Log

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Logged JH **Checked** MS **Approved**	**Start** 04/10/2019 **End** 04/10/2019	**Equipment, Methods and Remarks** JCB 3CX. Machine excavated.	**Dimension and Orientation** Width 1.00 m Length 2.30 m A / D / B / C 270 (Deg)	**Ground Level** 37.28 mOD **Coordinates (m)** E 384213.66 **National Grid** N 399014.14	

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.10	ES1		Dark grey and black MACADAM. (MADE GROUND)		0.05 (0.05) +37.23		
0.20 - 0.50	B4		Dark grey and black sandy subangular fine to coarse GRAVEL of roadstone. Sand is fine to coarse. (MADE GROUND)		0.15 (0.10) +37.13		
0.30	ES2						
0.30	D3		Brown sandy angular to subrounded fine to coarse GRAVEL of brick, flint, concrete, broken wall tile and chalk with rare strips of aluminium door runner or window strips. Sand is fine to coarse. Frequent full and half brick cobbles. (MADE GROUND)		(0.75)		
0.90	D5		CONCRETE slab. (MADE GROUND)		0.90 (0.05) +36.38 0.95 +36.33		
			Brown sandy angular to subrounded fine to coarse GRAVEL of brick, flint, concrete, broken wall tile and chalk. Sand is fine to coarse. (MADE GROUND)		(0.60)		
1.55 - 1.80	B8		Brownish orange gravelly fine to medium SAND with low cobble content. Gravel is rounded fine to coarse of igneous lithologies. Cobbles are rounded of igneous lithologies.		1.55 +35.73		
1.60	ES6						
1.60	D7				(0.75)		
		04/10/19	Dark brown sandy rounded fine to coarse GRAVEL of igneous lithologies with medium cobble content. Sand is fine to coarse. Cobbles are rounded of igneous lithologies.		2.30 +34.98 (0.25)		
			END OF EXPLORATORY HOLE		2.55 +34.73		

Groundwater Entries

No.	Depth Strike (m)	Remarks
1	2.55	Seepage. Slow inflow.

Remarks

Depth (m)	Remarks
1.35	Southern Face is 1.35m to bottom of foundation.

Stability Stable

Shoring None

Weather Raining

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:37:20

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Project **PROJECT NOMA PLOT P**

Project No. **A9023-19**

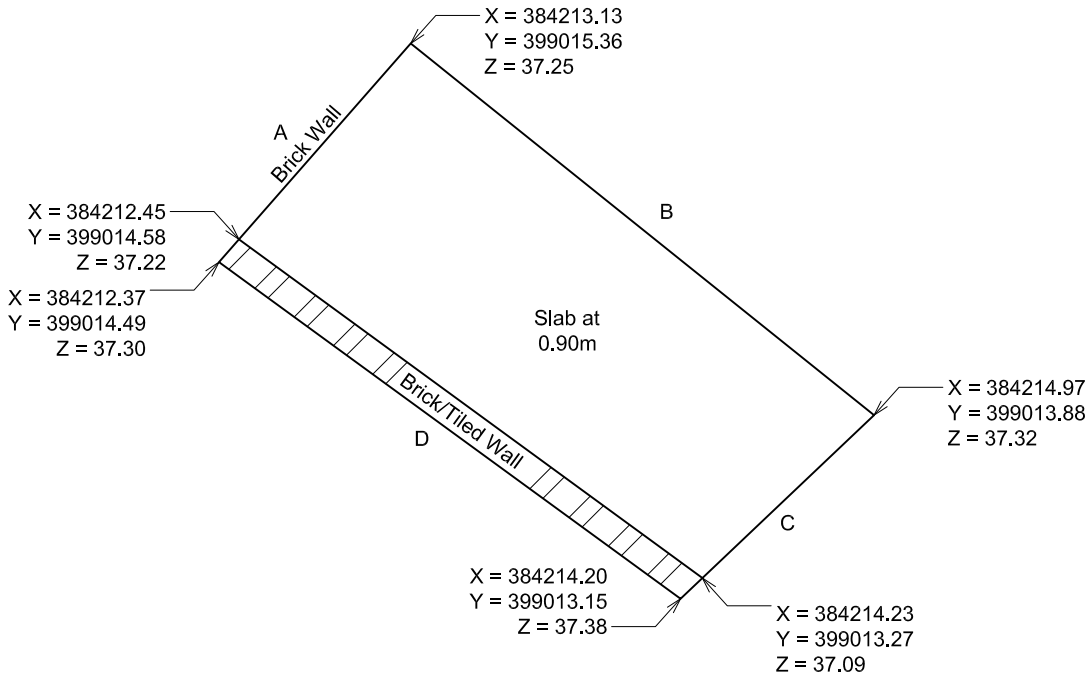
Carried out for **Buro Happold**

Trial Pit

MTP01

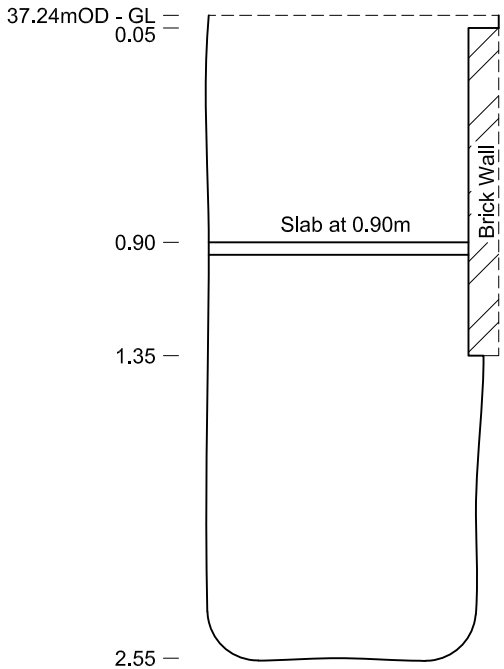
Sheet 1 of 1

Trial Pit Drawing

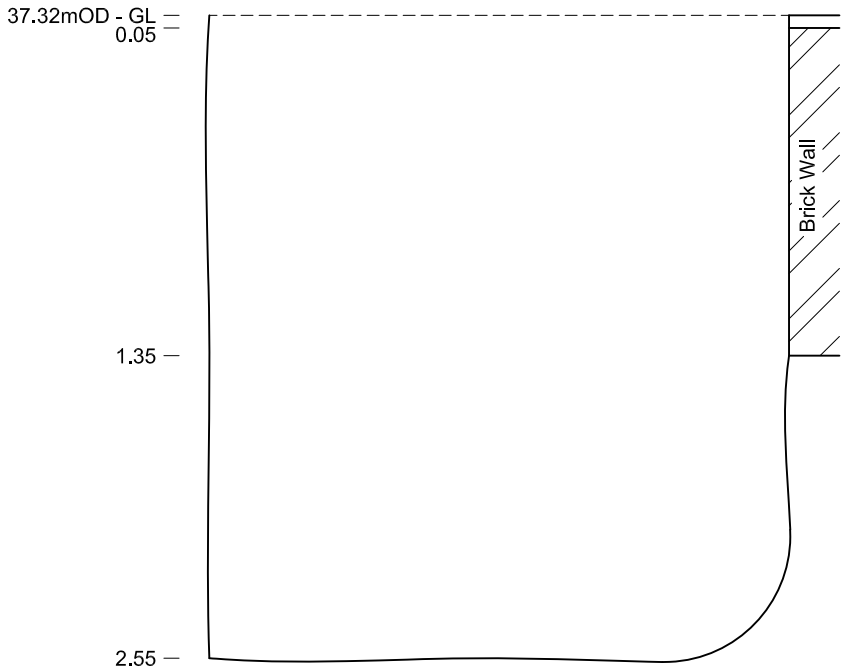


All dimensions in metres. Scale: 1:30 A4	Project	Project NOMA Plot P Ground Investigation	TP No.
	Project no.	A9023-19	MTP01
	Client	Gardiner & Theobald LLP	

Trial Pit Drawing



SECTION B-D



SECTION C-A

All dimensions in metres. Scale: 1:30 A4	Project	Project NOMA Plot P Ground Investigation	TP No.
	Project no.	A9023-19	MTP01
	Client	Gardiner & Theobald LLP	

Trial Pit Log

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Logged JH **Checked** MS **Approved**	**Start** 04/10/2019 **End** 04/10/2019	**Equipment, Methods and Remarks** JCB 3CX. Machine excavated.	**Dimension and Orientation** Width 1.00 m Length 2.30 m A / D / B / C 20 (Deg)	**Ground Level** 37.86 mOD **Coordinates (m)** E 384233.98 **National Grid** N 399013.94	

Samples and Tests

Depth	Type & No.	Records
0.10	ES1	
0.20 - 0.60	B4	
0.30	ES2	
0.50	D3	
0.90	ES5	
1.00	D6	
		04/10/19 Dry

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Dark grey and black MACADAM. (MADE GROUND)		(0.10) 0.10 +37.76		
Black sandy angular to subrounded fine to coarse GRAVEL of macadam and concrete. Sand is fine to coarse. (MADE GROUND)		(0.20) 0.30 +37.56		
Brown and grey sandy angular to subangular fine to coarse GRAVEL of brick with low cobble content. Cobbles are angular of brick. (MADE GROUND)		(0.40) 0.70 +37.16		
Orangish brown fine SAND.		(0.70) 1.40 +36.46		
END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
1.40	Pit terminated due to service.

Stability Stable

Shoring None

Weather Raining

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:37:55

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Project **PROJECT NOMA PLOT P**

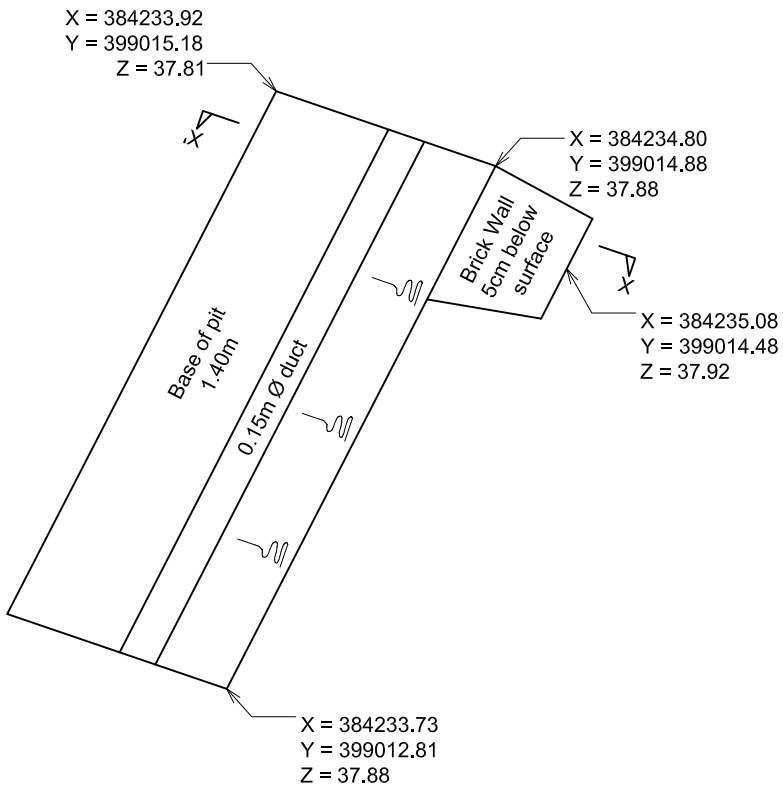
Project No. **A9023-19**

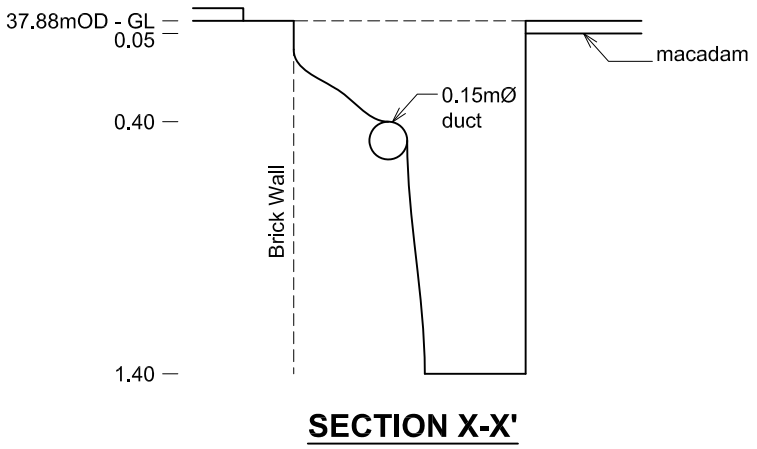
Carried out for **Buro Happold**

Trial Pit

MTP02

Trial Pit Drawing





SECTION X-X'

All dimensions in metres. Scale: 1:30 A4	Project	Project NOMA Plot P Ground Investigation	TP No.
	Project no.	A9023-19	MTP02
	Client	Gardiner & Theobald LLP	

Trial Pit Log

DRAFT

SOCOTEC

Logged JH **Checked** MS **Approved**	**Start** 03/10/2019 **End** 03/10/2019	**Equipment, Methods and Remarks** JCB 3CX. Machine excavated.	**Dimension and Orientation** Width 1.10 m Length 2.50 m A / D / B / C 200 (Deg)	**Ground Level** 37.72 mOD **Coordinates (m)** E 384253.29 **National Grid** N 399051.59	

Samples and Tests

Depth	Type & No.	Records
0.10	ES1	
0.20 - 0.50	B4	03/10/19 Dry
0.50	ES2	
0.50	D3	

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Dark grey MACADAM. (MADE GROUND)		(0.10) 0.10 +37.62		
Black sandy angular to subrounded fine to coarse GRAVEL of concrete, macadam and brick. (MADE GROUND)		(0.10) 0.20 +37.52		
Greyish brown gravelly fine to coarse SAND with medium cobble and boulder content. Gravel is angular to subangular fine to coarse of brick and concrete. Cobbles and boulders (250x120x100mm) are subangular to subrounded of concrete and brick. (MADE GROUND)		(0.30) 0.50 +37.22		
END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 0.50	No groundwater encountered during excavation.
0.50	Pit terminated due to 130mm diameter black service piping, 35mm from western face, orientated 020 degree.

Stability Stable

Shoring None

Weather Dry, overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:38:28

AGS

Project **PROJECT NOMA PLOT P**

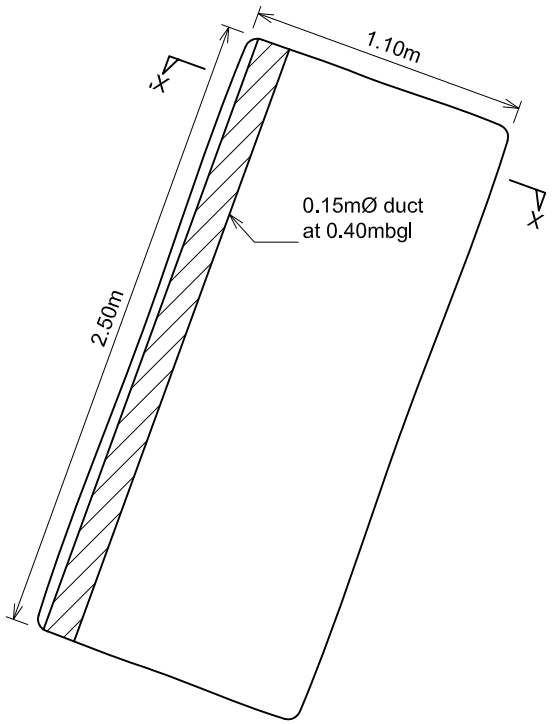
Project No. **A9023-19**

Carried out for **Buro Happold**

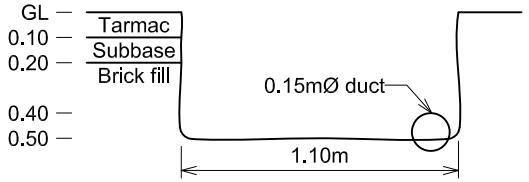
Trial Pit

MTP03

Trial Pit Drawing



PLAN VIEW



SECTION X-X'

All dimensions in metres. Scale: 1:30 A4	Project	Project NOMA Plot P Ground Investigation	TP No.
	Project no.	A9023-19	MTP03
	Client	Gardiner & Theobald LLP	

Trial Pit Log

DRAFT

SOCOTEC

Logged JH **Checked** MS **Approved**	**Start** 03/10/2019 **End** 03/10/2019	**Equipment, Methods and Remarks** JCB 3CX. Machine excavated.	**Dimension and Orientation** Width 0.80 m Length 2.10 m A / D / B / C 120 (Deg)	**Ground Level** 36.20 mOD **Coordinates (m)** E 384203.81 **National Grid** N 399053.22	

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
			TOPSOIL.		0.05 (0.05) +36.15		
			Reddish brown fine SAND. (MADE GROUND)		0.15 (0.10) +36.05		
0.20 0.20 - 0.50	ES1 B4		Greyish brown and red slightly gravelly sandy COBBLES. Gravel is predominantly angular fine to coarse of brick and concrete. Cobbles are subangular of brick, including full bricks and half brick fragments. Cobbles are angular of brick and concrete. Occasional angular and subangular boulders of concrete. (MADE GROUND)				
0.50 0.50	ES2 D3				(1.55)		
1.70 - 1.90	B7	03/10/19 Dry	Orangish brown, mottled grey, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to rounded fine to coarse of metamorphic and igneous lithologies. (GLACIAL TILL)		1.70 (0.30) +34.50		
1.90 1.90	ES5 D6						
			END OF EXPLORATORY HOLE		2.00 +34.20		

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 2.00	No groundwater encountered during excavation. Ground unsuitable for hand vanes.

Stability Spalling.

Shoring None

Weather Dry, cloudy

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:39:22

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Project **PROJECT NOMA PLOT P**

Project No. **A9023-19**

Carried out for **Buro Happold**

Trial Pit

MTP04

Trial Pit Log

DRAFT

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Logged RT **Checked** MS **Approved**	**Start** 07/10/2019 **End** 07/10/2019	**Equipment, Methods and Remarks** JCB 3CX. Machine excavated.	**Dimension and Orientation** Width 2.10 m Length 0.90 m A / D / B / C 135 (Deg)	**Ground Level** 35.84 mOD **Coordinates (m)** E 384217.70 **National Grid** N 399072.13	

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.20 0.20	ES1 D2		Brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick and concrete. Frequent pockets (<60mm) of reddish brown fine to coarse sand. Frequent cobbles of whole and half brick. (MADE GROUND)				
0.50 0.50 0.50	ES4 D5 B3						
					(1.85)		
1.00 1.00 1.00 - 1.50	ES6 D7 B8						
1.50 1.50	ES9 D10	07/10/19					
			CONCRETE floor slab. (MADE GROUND)		1.85 (0.00) +33.99	1	
			END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks
1	1.85	Seepage.

Remarks

Depth (m)	Remarks

Stability Unstable.

Shoring None

Weather Raining

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:39:39

AGS

Project **PROJECT NOMA PLOT P**

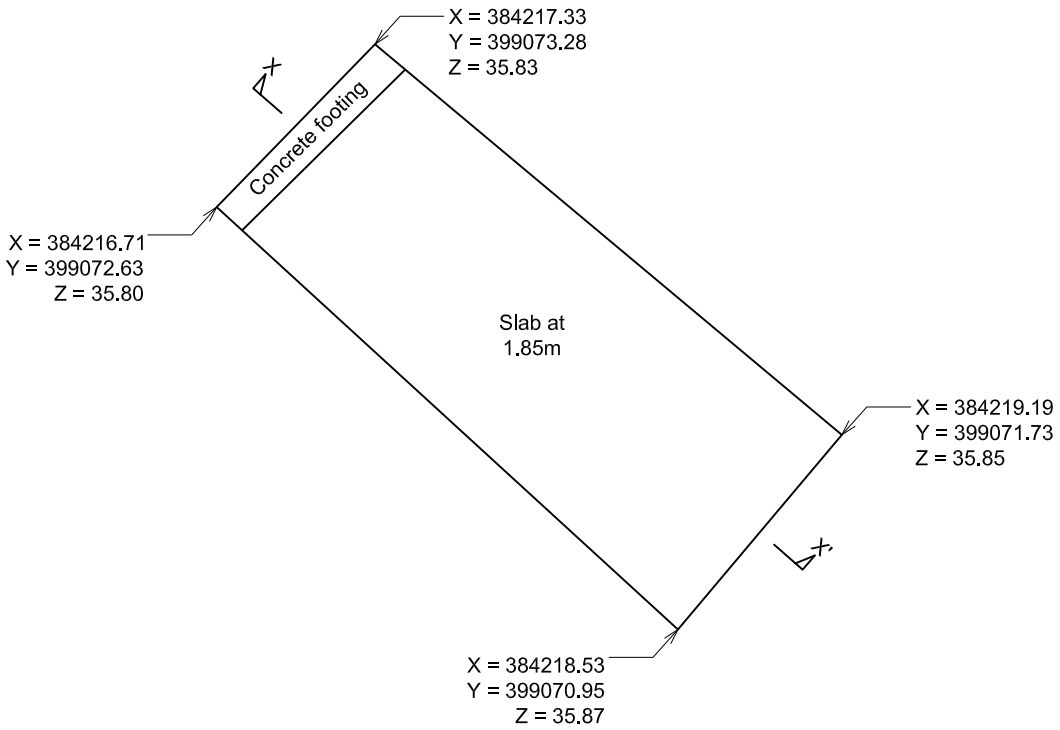
Project No. **A9023-19**

Carried out for **Buro Happold**

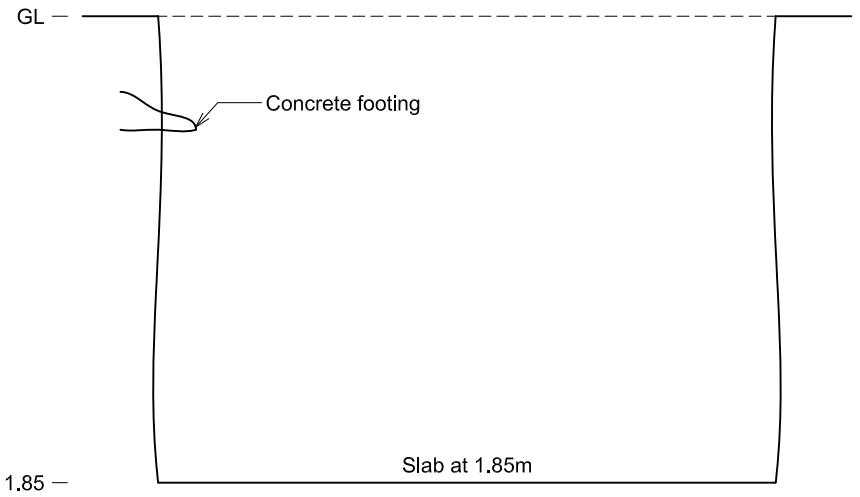
Trial Pit

MTP05

Trial Pit Drawing



PLAN VIEW



SECTION X-X'

All dimensions in metres.	Project	Project NOMA Plot P Ground Investigation	TP No.
Scale: 1:30 A4	Project no.	A9023-19	MTP05
	Client	Gardiner & Theobald LLP	

Trial Pit Log

DRAFT

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Logged JH **Checked** MS **Approved**	**Start** 08/10/2019 **End** 08/10/2019	**Equipment, Methods and Remarks** Hand excavated to 1.00m.	**Dimension and Orientation** Width 0.50 m Length 1.30 m A / D / B / C 60 (Deg)	**Ground Level** 36.08 mOD **Coordinates (m)** E 384238.36 **National Grid** N 399084.41	

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
			Black sandy angular fine to coarse GRAVEL of macadam. (MADE GROUND)		(0.20)		
0.20 0.20 0.20 - 0.40 0.40	ES1 D2 B3 ES4		Light grey slightly sandy angular to subangular fine to coarse GRAVEL of limestone. (MADE GROUND)		0.20 +35.88 (0.30)		
0.60 - 1.00	B7		Orangish brown silty fine to medium, predominantly fine, SAND. Rare rounded cobbles and rounded coarse gravel of sandstone.		0.50 +35.58 (0.50)		
0.80 0.80	ES5 D6	08/10/19 Dry					
			END OF EXPLORATORY HOLE		1.00 +35.08		

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks

Stability Stable

Shoring None

Weather Dry, cloudy

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:40:03

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Project **PROJECT NOMA PLOT P**

Project No. **A9023-19**

Carried out for **Buro Happold**

Trial Pit

MTP06

Trial Pit Log

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Logged RT **Checked** MS **Approved**	**Start** 07/10/2019 **End** 07/10/2019	**Equipment, Methods and Remarks** JCB 3CX. Machine excavated.	**Dimension and Orientation** Width 1.00 m Length 2.20 m A / D / B / C 35 (Deg)	**Ground Level** 35.58 mOD **Coordinates (m)** E 384248.64 **National Grid** N 399112.55

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
			Dark grey subangular to subrounded fine to coarse GRAVEL of roadstone. (MADE GROUND)		(0.30)		
0.20	ES1						
0.25	D2						
0.30 - 0.70	B3				0.30 +35.28		
			Brown sandy slightly clayey subangular to rounded fine to coarse GRAVEL of flint, quartzite, brick and concrete with low cobble content. Sand is fine to coarse. Cobbles (150x100x100mm) are subangular of brick and concrete. Rare boulders (400x 250x100mm). Occasional fragments of plastic sheeting. (MADE GROUND)				
0.50	ES4				(0.80)		
					1.10 +34.48		
1.15	D5		Firm to stiff reddish brown sandy CLAY with rare rounded fine to coarse gravel of various lithologies. (GLACIAL TILL)				
1.20 - 1.60	B7						
1.30	ES6						
1.50	HV	p 71kPa, r 26kPa 07/10/19			(0.70)		
1.80	D8		END OF EXPLORATORY HOLE	1.70-1.80 becoming gravelly. Gravel is subrounded to rounded predominantly medium to coarse of various lithologies	1.80 +33.78		

Groundwater Entries

No.	Depth Strike (m)	Remarks
1	1.80	Slow inflow

Remarks

Depth (m)	Remarks

Stability Spalling at 1.10m.

Shoring None

Weather Raining

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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Scale 1:25

22/11/2019 15:40:23

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Project **PROJECT NOMA PLOT P**

Project No. **A9023-19**

Carried out for **Buro Happold**

Trial Pit

MTP07

Sheet 1 of 1

Trial Pit Log

DRAFT

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Logged JH **Checked** MS **Approved**	**Start** 08/10/2019 **End** 08/10/2019	**Equipment, Methods and Remarks** JCB 3CX. Machine excvated.	**Dimension and Orientation** Width 0.80 m Length 2.30 m A / D / B / C 60 (Deg)	**Ground Level** 39.36 mOD **Coordinates (m)** E 384272.22 **National Grid** N 399055.02	

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
			MACADAM. (MADE GROUND)		0.05 (0.05) +39.31		
0.20 0.20	ES1 D2		Light grey sandy angular to subangular fine to coarse GRAVEL of limestone. Sand is fine to coarse. (MADE GROUND)		(0.40)		
0.50 0.50 0.50 - 1.00	ES3 D4 B5		Brown grey gravelly clayey fine to coarse SAND with low cobble and boulder content. Gravel is angular to subangular fine to coarse of brick, concrete, stone flags and possible asbestos pipe. (MADE GROUND)		0.45 +38.91		
1.00	ES6				(1.55)		
1.50	ES7						
2.00 - 3.00 2.10	B10 ES8		Light brown to dark brown gravelly fine to coarse SAND with low cobble content. Gravel is rounded fine to coarse of various lithologies. Cobbles are rounded of sandstone. (GLACIAL TILL)		2.00 +37.36		
2.50	D9				(1.10)		
		08/10/19 Dry					
			END OF EXPLORATORY HOLE		3.10 +36.26		

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 3.10	No groundwater encountered during excavation.
3.10	Trial pit terminated due to spalling of made ground.

Stability Spalling in natural

Shoring None

Weather Heavy rain.

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

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22/11/2019 15:40:42

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Project **PROJECT NOMA PLOT P**

Project No. **A9023-19**

Carried out for **Buro Happold**

Trial Pit

MTP08

Sheet 1 of 1

Core Log

DRAFT

SOCOTEC

Drilled by DD	**Date Cored** 09/10/2019	**Equipment, Methods and Remarks** Concrete coring horizontal through basement wall.	**Depth (mm) from** 0	**To** 1500	**Diameter (mm)** 107	**Ground Level**	
Logged by RT						**Coordinates (m)**	
Checked by MS						**National Grid**	
Approved by							

Description of Materials	Detail	Legend	Depth (mm)	Thickness (mm)	Remarks
Reddish brown BRICK with dark brown sand/cement mortar joint (10mm thick). (MADE GROUND)				220	
			220		
Cavity wall void.				50	
			270		
Reddish brown BRICK with dark brown sand/cement mortar joint (10mm thick). (MADE GROUND)				230	
			500		
Grey CONCRETE. Aggregate is fine to coarse gravel (approximately 70%) fine to coarse sand. <10% voids in matrix. Voids generally <6mm. (MADE GROUND)				1000	
			1500		
END OF CORE					

Remarks

Core carried out within HTP03.

Core Location

Notes:

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Scale 1:10

22/11/2019 11:23:50

Project	**PROJECT NOMA PLOT P**
Project No.	**A9023-19**
Carried out for	**Buro Happold**

Borehole

CC03

Sheet 1 of 1

Core Log

DRAFT

SOCOTEC

Drilled by DD	**Date Cored** 09/10/2019	**Equipment, Methods and Remarks** Concrete coring horizontal through basement wall.	**Depth (mm) from** 0	**To** 500	**Diameter (mm)** 107	**Ground Level**	
Logged by RT						**Coordinates (m)**	
Checked by MS						**National Grid**	
Approved by							

Description of Materials	Detail	Legend	Depth (mm)	Thickness (mm)	Remarks
Reddish brown BRICK with dark brown sand and cement mortar joint (10mm). (MADE GROUND)				230	
			230		
Cavity wall void.				50	
			280		
Reddish brown BRICK with dark brown sand and cement mortar joint (10mm). (MADE GROUND)				220	
END OF CORE	0.50 subsoil		500		

Remarks

Core carried out within HTP04.

Core Location

Notes:

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Scale 1:10

22/11/2019 11:23:51

Project	**PROJECT NOMA PLOT P**
Project No.	**A9023-19**
Carried out for	**Buro Happold**

Borehole

CC04

Sheet 1 of 1

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