

# Former Holloway Prison

Contamination - Ground  
Investigation Strategy and  
Specification







# **Ground Investigation Strategy and Specification**

Former Holloway Prison, London

October 2021

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### Quality Assurance – Approval Status

This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

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Issue	Date	Prepared by	Checked by	Approved by
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### Comments

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- 1.3.1 Updated with comments from Avison Young
- 1.4.1 Updated with final Development description and plans



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## 1. Introduction

### 1.1 Objectives

Potter Raper instructed Waterman Infrastructure & Environment Limited (“Waterman”) on behalf of Peabody Construction Limited to prepare a Ground Investigation (GI) Strategy and Specification for the proposed development of Former HMP Holloway, Parkhurst Road, London N7 0NU (hereafter referred to as “the Site”). A Site location plan and existing Site plan are included in Appendix A.

Objectives of the GI are to

- Geo-environmental assessment of the Site, to quantify potential contaminant linkages identified in the Preliminary Environmental Risk Assessment (*WIE16172-100-R-1.3.1-PERA, September 2021*);
- Waste characterisation assessment to help inform the potential cost of disposal of excavated soils from Site during redevelopment;
- Geotechnical assessment of the Site to facilitate foundation and drainage design and design of areas of paving and hardstanding;
- Determination of the Site’s baseline condition in relation to the proposed developments.

This document is split into two distinct parts. The first part will detail the rationale behind the GI, the objectives of the GI locations, and how the objectives will be achieved. The second part will specify the methodology to which the GI is to be completed by the Contractor to ensure the results are representative of ground conditions on-site.

### 1.2 Proposed Development

The Site is currently disused and comprises the Former Holloway Prison; a complex of low-rise buildings of two to five storeys in height, with areas of hardstanding alongside landscaped green spaces.

Existing ground level is variable across the Site, generally lower in the north and east trending higher to the south and west.

#### 1.2.1 Development Description

The description of the development as set out in the approved planning permission is as follows:

*‘Phased comprehensive redevelopment including demolition of existing structures; site preparation and enabling works; and the construction of 985 residential homes including 60 extra care homes (Use Class C3), a Women’s Building (Use Class F.2) and flexible commercial floorspace (Use Class E) in buildings of up to 14 storeys in height; highways/access works; landscaping; pedestrian and cycle connections; publicly accessible park; car (blue badge) and cycle parking; and other associated works.’*

#### 1.2.2 Detailed Development Proposals

It is proposed to demolish all buildings on-Site, along with re-levelling works to form new development platforms. Following levelling, the Site will be redeveloped to include

- 985 residential units (Use Class C3). This includes 60 extra care homes (Use Class C3).
- 1,489 sqm (GIA) Women’s Building (Use Class F.2)
- 1,822 sqm (GIA) Commercial Floorspace (Use Class E),

New hardstanding footpaths and roads, and managed soft landscaping will be installed surrounding all buildings.

Shared soft landscaped areas will be included in the development, however these will be centrally managed as part of landscaping maintenance. The development will include private hard landscaped terraces, but will not include private soft landscaped gardens. Plant uptake and direct contact with soil in a private setting is considered not relevant as a potential contaminant linkage at the completed development.

Breakdown for the development is as follows:

Plot A

- 235 residential units. The tenures in this Plot are social rent, London Shared Ownership and market. With communal outdoor space for residents.

Plot B

- 321 residential units. The tenures in this Plot are social rent, London Shared Ownership and market. With communal outdoor space for residents.
- Commercial floorspace.

Plot C

- 155 residential units. The tenure in this Plot is social rent only. With communal outdoor space for residents.
- Women's Building.
- Commercial floorspace.

Plot D

- 183 residential units. The tenures in this Plot are London Shared Ownership and market. With communal outdoor space for residents.
- Residents' facilities including concierge (1334 sqm).

Plot E

- 91 residential units, including 60 extra care units. The tenures in this Plot are social rent and market.

Proposed development plans are included in Appendix A.

## 2 Environmental Site Setting

### 2.1 Site Description

The Site is currently vacant and comprises the Former HMP Holloway; a complex of low-rise buildings of two to five storeys in height. Buildings cover 40% of the Site with hardstanding and landscaped green spaces covering 35% and 25% respectively.

Potentially contaminative Site uses identified during the PERA are set out in Table 1.

Table 1: Summary of potentially contaminative activities on-Site

Potential Issue	Description	Condition
Aboveground Storage Tanks (and fuel lines)	Two 151,370 litre steel diesel tanks, stored in a brick bund. The presence of underground pipework could not be verified.	No evidence of staining around the fill point or outside of the brick bund. Steel tanks showed evidence of rust.
	One metal skinned tank of unknown capacity and construction. Fuel hose hung externally on tank side, not provided with secondary containment. No evidence of underground pipework.	Tank appeared to be in good condition. No evidence of staining around the fill point or outside of the brick bund.
Drainage	Separate surface and foul water drainage systems are assumed.	The maintenance and integrity of drainage systems is not known.
Hazardous Materials	One Intermediate Bulk Container (IBC) of unknown contents, labelling indicted hydrochloric acid to be contained within. Numerous 25L containers of water treatment chemicals, hydrochloric acid and herbicide. Some were provided with bunding, some were stored over hardstanding.	Some bottles open. Given the poor storage conditions the potential for leakage cannot be discounted.
Solid and Liquid Waste Storage	Six metal coffins on hardstanding on the north-eastern boundary. Labelling of the coffins indicated electrical waste to be stored within.	Evidence of rust to all coffins, the potential for leakage cannot be discounted.

### 2.2 History

Earliest available historical mapping information from 1852 indicates the Site as being occupied by a prison, with ancillary buildings including an infirmary, workshop, artesian well, pump, brick kiln, chapel, drying green and prison ward. Hospital blocks and an electricity sub-station were constructed in the 1940s/1950s. The prison was entirely redeveloped between 1971 and 1985, closed in 2016 and has remained vacant since.

### 2.3 Geology and Hydrogeology

The Site's geology has been established from the British Geological Survey (BGS) 1:50,000 scale Geological Map, Sheet 256 (North London), a BGS borehole record on Site (*Reference TQ38NW5*).

A summary of the anticipated geology and hydrogeology is provided in Table 2.

Table 2: Geology and Hydrogeology

Stratum	Area Covered	Estimated Thickness (m)	Typical Description	EA Classification
Made Ground		1-5	Clay and sands with brick and concrete fragments	N/A
London Clay Formation		41	Clay, silt and sand	Unproductive Strata
Lambeth Group	Entire Site	21	Green or yellow sand and clay.	Secondary A Aquifer
Thanet Formation		3.9	Greenish grey fine to medium sand.	Secondary A Aquifer
Seaford Chalk and Newhaven Chalk Formations		31.1 (thickness not proven)	Pale grey to white calcareous limestone.	Principal Aquifer

Made Ground is anticipated across the Site from previous building demolition, and is likely to comprise brick and concrete fragments in a cohesive matrix. Superficial deposits are not recorded on-Site or in the immediate surrounding area.

Historical mapping from 1872 indicates an artesian well in the central to north of the Site. The BGS log dated pre-1889 indicates that in June 1946 the Prison Commission confirmed the well was disused and that the well was located in a building which had been demolished. No information on installation details or decommissioning was provided in the log.

The Groundsure dataset indicates a 66kV underground electricity transmission cable is located beneath the Site, recorded as 'DC Decommissioned Cable Section 07'. A Thames Water potable water main also traverses the Site.

The Site is not located within a groundwater Source Protection Zone.

Limited shallow groundwater is anticipated beneath the Site owing to the low permeability of the bedrock which directly underlies the Site. A small volume of perched water may be present in the Made Ground.

There are no recorded groundwater abstractions or discharges within a 1km radius of the Site.

## 2.4 Previous Ground Investigations

Amec Foster Wheeler prepared a phase 1 Desk Study Assessment for the Site to support proposed redevelopment in October 2016.

The assessment included a Site walkover, review of historical records, geological setting, hydrogeology and hydrology of the Site and its surrounds, development of a conceptual model and identification of assessment of potential development abnormalities.

A Pre-Desk Study Unexploded Ordnance (UXO) Assessment by Zetica undertaken as part of the assessment indicated during WWII High Explosive (HE) bombs fell on the Site, which has a high recorded bombing density.

Potentially significant contamination linkages were identified in relation to current and historical land uses. Identified receptors included future Site users, and properties (building, buried services and water pipes). Identified pathways include inhalation, ingestion and dermal contact for human health receptors. Where required, it is anticipated that these pathways may be negated through the installation of a suitable capping layer (dermal contact/ingestion) or adequate gas/vapour protection measures (inhalation) in buildings in affected areas of the Site.

A ground investigation was recommended for the Site. It was also recommended that topsoil should be tested to ascertain its suitability for re-use, along with waste characterisation for material likely to be

excavated and sent off-site. An attempt to locate the historic on-Site abstraction well was also recommended as part of future demolition works.

## 2.5 Contaminants of Concern

Contaminants of concern based on the Site and surrounding area current and historical use, and the Department of Industry Profile where applicable are detailed in Table 3.

Table 3: Potential Contaminants Of Concern

Source	Associated Contaminants
<b>On-Site (current)</b>	
Made Ground	Potentially contains asbestos, metal/metalloids, polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbon (TPH) and volatile/semi-volatile organic compound (VOC/SVOC) contamination.
Aboveground storage tanks	PAHs, TPH and VOCs/SVOCs.
Hazardous substance storage (Water treatment chemicals, acids)	VOCs, SVOCs, sulphate, chloride, metal/metalloids.
Chimney	Asbestos, metal/metalloids, PAHs, VOCs, SVOCs
<b>On-Site (historic)</b>	
Workshop, brick kiln	Asbestos, metal/metalloids, PAHs, TPH and VOCs/SVOCs.
Electricity sub-station	PBCs, TPH.
<b>Off-site (current)</b>	
None identified	
<b>Off-site (historic)</b>	
Electricity sub-station	PCBs, TPH.
Tramway	
Garages, depot, workshop	Asbestos, metal/metalloids, PAHs, TPH and VOCs/SVOCs.

### 3 Ground Investigation Strategy

#### 3.1 Scope of Works

The ground investigation will comprise the following exploratory holes and main activities;

- Clearing all locations for buried services;
- Presence of a UXO engineer at all exploratory hole locations to clear investigation works to maximum bomb penetration depth;
- Breaking out exploratory locations as required;
- 1.2m hand dug inspection pits at all borehole/window sample locations to confirm service clearance;
- 21No. cable percussive boreholes to varying depths between 20m and 40m;
- Purge boreholes following drilling;
- 13No. window sample holes extended to 1m into the London Clay Formation at approximately 1-5m bgl;
- 8No. trial pits to a depth of 3.0mbgl with recovery of environmental and geotechnical disturbed (bulk and airtight sealed tub) samples and hand vane testing on suitable materials. 4No. CBR tests to be carried out as part of trial pitting;
- 3No. Soakaway pits, soakaways test to completed in a separate pit in accordance with BRE 365;
- Alternating standard penetration tests and collection of UT100 samples at 1.0m intervals in cohesive strata;
- Collection of soil samples for environmental, geotechnical, and waste classification testing;
- In-situ headspace analysis of soil samples using a Photo-Ionisation Detector (PID);
- Installation of 50mm standpipes in 14No. boreholes and 5No. window sample holes to identify any shallow perched groundwater present in the Made Ground and uppermost London Clay Formation;
- Reinstatement of all exploratory holes to leave them safe and level, reinstating the site surface is not required;
- Geotechnical laboratory testing on recovered samples;
- Completion of two rounds of post fieldwork monitoring in all monitoring wells, to include groundwater level monitoring and sampling if groundwater is present;
- Surveying of all borehole locations to National Grid and m relative to Ordnance Datum (OD); and
- Factual Reporting on all aspects of the ground investigation.

An Exploratory Hole Location Plan showing the proposed exploratory hole locations is included in Appendix B.

A table detailing the borehole depths and installation requirements is included in Appendix B.

#### 3.2 Ground Investigation Rationale

Findings of the ground investigation will be interpreted in a Geo-Environmental Report, which shall include an updated conceptual model. The laboratory results will also inform baseline conditions at the Site.

Intrusive investigation works are dynamic, and during the works issues may arise resulting in an inability to complete a borehole (for example, early termination of an investigation location due to below-ground obstructions). In the event an investigation location cannot be completed as planned, Waterman will assess what impact the loss of this data will have on gaining a full understanding of ground conditions. If

it is determined the investigation location is critical to the assessment, an alternative location will be sought, with the substitution and reasoning detailed in the report.

### 3.2.1 Soil Contamination Testing

A review of current and historical Site uses in the surrounding area have identified several contaminants of concern, as detailed in Section 2.5, Table 3. These contaminants will be tested for in the contaminated land soils samples taken. The soil testing strategy will be further informed by the visual and olfactory evidence encountered during the GI, and the soil headspace analysis results from the samples taken.

The proposed Development will incorporate mixed residential and commercial end-uses, and will include areas of open spaces. The Generic Assessment Criteria (GAC) used to assess the soil contamination results will therefore be dictated by the proposed end use and will include the following;

- Areas to be occupied by buildings; Residential GAC and
- Areas of shared landscaping – Public Open Space GAC for land close to housing

In areas of proposed hardstanding future Site users will be prevented from coming into direct contact with contaminants. Valid pathways to future Site users in proposed hardstanding areas are therefore limited to the inhalation of vapours (indoor) pathway. Soil laboratory results for proposed hardstanding areas will therefore be initially screened against the residential GAC. Where exceedances are recorded, the proportion potentially attributable to indoor vapour inhalation risk will be reviewed.

The assessment of Polycyclic Aromatic Hydrocarbons will be undertaken through the use of benzo(a)pyrene as a surrogate marker for all carcinogenic PAHs. This approach was set out by the Health Protection Agency (now Public Health England) and adopted in the 2013 C4SL guidance. The surrogate marker approach assumes the cancer risk of PAHs in a complex mixture is proportional to the concentration of a surrogate marker benzo(a)pyrene, and therefore accounts for the insufficiencies present in the toxicity database for the less well studied PAH contaminants.

The use of benzo(a)pyrene as a surrogate marker will only be valid where the PAH soil profile is sufficiently similar to the coal tars mixtures used as the toxicological benchmarks in tests by Culp et al (1998). The LQM 2015 profiling tool will therefore be used to screen PAH soil mixtures are sufficiently consistent with the coal tars prior to application of the surrogate marker approach.

### 3.2.2 Controlled Water Receptors

The Site is not anticipated to be underlain by significant groundwater, and no potential controlled waters receptors are identified within 1km. Groundwater samples will be taken where possible to assist future groundwater management, and to assess the potential for contaminants ability to migrate off-site. However it is recognised this will be limited due to the likely poor connectivity between localised perched groundwater pockets.

Shallow monitoring wells will be installed in the Made Ground and uppermost London Clay Formation to identify if any perched groundwater is present and to assess its quality. Two rounds of follow-up groundwater level monitoring will be undertaken, with collection of samples if present. Deeper installations will be placed within in the London Clay Formation to assess water level for geotechnical purposes. It is not proposed to sample from these for contamination purposes.

Deeper groundwater in the Secondary A Aquifer (Lambeth Group, Thanet Formation) and Principal Aquifer (Chalk Formation) are overlain by a significant thickness of London Clay Formation which will restrict vertical migration of contaminants. Therefore, a risk to the bedrock deposits aquifers is considered not to be present and will not be assessed as part of this investigation. If significant gross contamination is recorded within the Made Ground, further investigation works including direct sampling of the deeper aquifers may be required.

### 3.2.3 Ground Gas and Vapours

Identified geology beneath the Site does not identify any significant sources of ground gas. Waterman undertook a ground gas risk assessment for the Site as part of the PERA, and concluded that the potential risk for ground gas issues at the Site is very low.

Due to the absence of any potential ground gas source, no further investigation is considered necessary. Throughout the ground investigation the ground conditions will be reviewed and conceptual site model updated inline with industry guidance. Where a potentially significant ground gas generating source is encountered ground gas monitoring in installed wells will be undertaken to clarify the materials ground gas generation potential and in extension the Site's ground gas regime and risk to future Site users.

Potential sources of vapours have been identified at the Site, including diesel tanks and electrical substations. Ground investigation locations have been targeted to identify if any spills or leaks have occurred from these features, and delineate the extent of any contamination if found. Findings of headspace testing during investigation works, and volatile soil and groundwater (where sampled) laboratory analysis will be used to determine the Site's vapour regime and requirement for vapour protection measures. Additional investigation techniques will be undertaken including vapour monitoring/vapour sampling in appropriately installed wells should a risk be identified using the initial investigation techniques.

The results from the analysis will be assessed in the interpretative report to confirm the Site's vapour regime.



## 4 Ground Investigation Specification

The Contractor should ensure they are happy with the GI specification contents prior to commencing works. Where subcontractors are employed by the Contractor they should be made aware of the required procedures included in this specification.

The investigation works shall be undertaken in accordance with the 2012 UK Specification for Ground Investigation, Second Edition, published by the Institution of Civil Engineers.

Any queries associated with the GI shall be directed towards the Waterman personnel included in Table 4.

Table 4: Waterman Contact Details

Name	Job Title	Phone number (office/mobile)	Email address
<b>Contaminated Land Enquiries</b>			
Robbie Moore	Consultant (Contaminated Land)	0330 060 4367 07786 193977	Robbie.moore@watermangroup.com

Waterman will be the Investigation Supervisor for the duration of the works.

For the purposes of the investigation works only, the Contractor shall be the Principal Contractor under the Construction (Design and Management) Regulations (2015).

### 4.1 General Requirements

The works will be undertaken in outdoors areas of hardstanding and soft landscaping at the Site.

At the end of each working day the Contractor shall ensure any equipment left on-Site is in a safe and secure position and condition. The Client will not accept any liability for security of plant and equipment during the works. Unless otherwise agreed the working hours on-Site shall be 08:00 to 18:00 Monday to Friday. Weekend working if required shall be planned and agreed with the team prior to taking place.

The Contractor will be responsible for ensuring all employees have access to suitable hygiene facilities during the works.

The Contractor shall provide sufficient professional attendance on-site to technically supervise Site activities, Site liaison, logistics, logging, in situ testing, and sampling, photography and the preparation of daily records and preliminary logs.

The Contractor shall take all necessary precautions to prevent the pollution and/or discoloration of the ground on and off-site resulting from their operations on-Site.

At the end of the works no spoil shall be left at Site surface, excess spoil shall be removed from the Site and disposed at a licenced facility.

No discharge to controlled waters, sewers or drains shall be permitted.

Included with this Specification is a Bill of Quantities (BoQ) to allow the GI requirements to be priced. The BoQ has been intentionally left blank.

All works shall be carried out in accordance with (2015) "BS5930: Code of Practice for Site Investigations".

The Contractor is expected to visit the Site as part of tendering for the GI work.

## 4.2 Exploratory Hole Requirements

The requirement for the breaking out/coring of exploratory hole position shall be determined by the Contractor in advance of their works.

The Contractor if not capable themselves shall appoint a specialist subsurface clearance company to “clear” all intrusive locations as well as their surroundings for services, prior to any subsurface penetrations. Immediately before commencement of ground penetration, it shall be confirmed that the position is free from buried services. Buried utility service clearance shall be undertaken to allow relocation of the investigation locations if required without having to remobilise the service clearance team.

A 1.20m deep inspection pit shall be excavated at all boreholes/window samples prior to the undertaking of the drilling works. Photographs shall be taken of all inspection pits with a clear label used at all locations.

The method of drilling for all exploratory holes shall be appropriate to facilitate the following:

- The collection of discrete environmental samples;
- The accurate logging and geotechnical sampling to BS:5930 (2015) of all strata encountered during the drilling works;
- Detailed photographs of all exploratory holes and arisings.
- The installation of monitoring wells in selected boreholes, as specified by Waterman;
- The prevention of vertical migration of contamination into the groundwater;
- No drilling flush or other fluids should enter the drainage network; and
- Collect all required geotechnical samples and undertake all required geotechnical tests in accordance with the requirements in Section 4.10.

In all cases, Waterman's approval shall be sought prior to terminating a borehole.

The casing used shall be specified by the Contractor in full consideration of the likely ground/groundwater conditions. The number of strings of casing utilised shall ensure optimal drilling progress delay or costs for mobilising additional casing to Site following commencement of the work shall not be borne by the Client.

Lubricant used should be minimised and only be used on temporary casing or drilling equipment and not on well screen or permanent casing. Lubricants shall be restricted to degradable or inert lubricants, such as vegetable oil or PTFE (Teflon) based. Metallic greases such as those containing copper or lead and hydrocarbon-based lubricants must not be used. If lubricants of any description are used, this shall be noted in the drilling records.

In the event, potentially asbestos containing material is encountered during the ground investigation works, the Contractor shall notify Waterman, who will instruct whether it should be sampled. The ongoing health and safety of the works with respect of asbestos will be the responsibility of the GI contractor.

## 4.3 Constraints

Possible GI constraints the Contractor should be aware of prior to commencing works include the following;

- Buried redundant and live services, including a HV line and potable water main traversing the Site;
- Gross contamination on-site, including the potential for Asbestos Containing Materials (ACM) within Made Ground from previous demolition of older buildings; and
- The risk from unexploded ordnance.

The Contractor shall take all necessary precautions and measures prior to, during and post completion of the investigation to ensure the above constraints are considered, including provision of a UXO engineer to be present throughout the works to supervise each location to maximum bomb penetration depth.

The Contractor shall undertake their own classification of the Site in accordance with the British Drilling Association classification system. All procedures and equipment required as per the BDA classification should be present on-site throughout the works. Where standing time occurs because of equipment not being available, no claim for this standing time will be entertained.

At the end of each working day, the Contractor shall ensure any equipment left on-site is left in a safe and secure condition.

The Client will not accept liability for security of plant and equipment during the works and the Contractor is responsible for providing security for their plant equipment and other material required to carry out the works.

#### **4.4 Aquifer Protection Measures**

The Contractor shall take all necessary precautions to prevent the pollution and/or discoloration of the ground on and off-site resulting from his operations on the Site. Where gross contamination is encountered the Contractor shall implement clean drilling techniques to minimise the vertical migration of contaminants along the preferential pathway.

#### **4.5 Accuracy of Exploratory Hole Locations**

Exploratory holes shall be set out by the Contractor to the nearest metre prior to the exploratory point being drilled. The Contractor shall satisfy himself that no services are present at the location prior to commencement of the exploratory hole.

The elevation of the ground at each exploratory hole shall be related to ordnance datum to the nearest 0.05m OD.

#### **4.6 Instrumentation**

Prior to the installation of groundwater monitoring wells, the Contractor shall contact Waterman who shall advise on the specific installation details relevant to the exploratory hole. The well installation shall be dependent on the ground conditions encountered, and the exploratory hole objectives.

##### **4.6.1 Standpipe Installations**

50mm UVPC pipe shall be used in all monitoring wells, where a dual installation is required 19mm will be used. The Contractor must ensure sufficient 50mm UVPC pipework is available on-site throughout the works. Bentonite will surround plain pipe sections, and 6 - 10mm pea gravel will surround slotted pipe sections. A 300mm sand bridge shall be installed between the bentonite and the pea gravel. Installed boreholes shall be purged following installation.

#### **4.7 Reinstatement requirements**

The exploratory hole/borehole locations not installed with ground gas and groundwater monitoring wells, shall be backfilled and finished flush with the surrounding ground surface. Suitable compaction shall be made of each layer to prevent unacceptable differential settlement in all exploratory holes/boreholes. Backfill shall be such exploratory holes do not result in preferential pathways being created.

Should spoil remain it shall be removed from Site and disposed of in line with all relevant legislation.

As far, as is practically possible the Site shall be returned to its original state, although reinstatement of the site surface is not required. Throughout the works the Site will be left in a safe and tidy state.

Excavations shall not be left open overnight, and where it is not possible to backfill an excavation at the end of the working day it shall be fenced/covered and adequately signposted.

#### **4.8 UXO**

The contractor shall allow for the presence of a UXO engineer as required. UXO assessment is not expected to be required in the deeper London Clay. Drilling techniques and equipment shall account for the UXO engineer's works and no charges for lost time due to normal UXO activities will be tolerated. The UXO report is provided in Appendix C.

#### **4.9 Traffic Management**

The Contractor shall assess the need for any traffic management requirements and clearly state in the tender return the requirements and associated costs.

#### **4.10 Geotechnical Sampling and Testing**

The Contractor will undertake the following geotechnical in-situ tests;

- In boreholes Standard Penetration Tests (SPT) at 1.0m intervals to 15mbgl then at 1.5m thereafter. SPT tests are to be undertaken in accordance with BS EN ISO 22476-3 and shall commence at the base of the inspection pit;
- SPTs will alternate with UT100 samples where appropriate. In cohesive strata, samples shall alternate between SPT and UT100 at the intervals prescribed previously;
- Bulk/large bulk and tub disturbed samples shall be recovered from all exploratory holes at minimum 1m intervals or whenever there is a change in strata. The Investigation Supervisor shall schedule all geotechnical laboratory testing on receipt of draft exploratory hole logs;
- Californian Bearing Ratio testing is to be undertaken 0.50m below surface following service clearance, using a TRL DCP at each trial pit locations as indicated on the Proposed Exploratory Hole Location plan;

Geotechnical laboratory testing may include but not limited to the following tests, and will be confirmed based on ground conditions encountered in exploratory holes:

##### Classification

- a. Moisture content*
- b. Atterberg Limits*
- c. Dry density and saturation moisture content of chalk*
- d. Particle Size distribution*
- e. Sedimentation by hydrometer*

##### Chemical and Electrochemical

- f. Mass loss on ignition*
- g. Organic matter content*
- h. Resistivity*

Compaction Related

- i. Dry density/moisture content relationship using 2.5kg rammer*
- j. Moisture Condition Value at natural moisture content*
- k. Moisture Condition Value/moisture content relationship*

Compressibility, Permeability, Durability

- l. One-dimensional consolidation properties, test period 5 days*
- m. Measurement of swelling, test period 2 days*

Shear Strength (total stress)

- n. Shear strength of a set of three 60mm x 60mm square specimens by direct shear*
- o. Unconsolidated undrained triaxial compression test (UU) without the measurement of pore pressure*
- p. Undrained strength of a single 100mm diameter specimen in triaxial compression without the measurement of pore pressure*

Shear Strength (effective stress)

- q. Consolidated undrained triaxial compression test (CU) with measurement of pore pressure (set of three 38mm specimens), test duration not exceeding 4 days per specimen*
- r. Consolidated drained triaxial compression test with measurement of volume change (set of three 38mm specimens) test duration not exceeding 4 days per specimen multi-stage test using 100mm diameter specimen.*
- s. Consolidated drained triaxial compression and extension test with measurement of volume change*
- t. Measurement shear wave velocity in unconfined specimens from rotary cored and pushed thin wall tube samples*

Ground/Groundwater Aggressivity

- u. Suite D (Brownfield site- pyrite present Schedule 1.19.6)*

Geotechnical samples to be despatched daily to i2 Analytical, Croxley Green Business Park, Watford, WD18 8YS under a Chain of Custody procedure. The samples will be scheduled by Waterman who will also be responsible for the payment of laboratory testing. The Contractor is not required to allow for geotechnical testing costs in their tender price.

#### **4.11 Contaminated Land**

Environmental samples to be despatched daily to i2 Analytical, Croxley Green Business Park, Watford, WD18 8YS under a Chain of Custody procedure. The samples will be scheduled by Waterman who will also be responsible for the payment of laboratory testing.

The Contractor shall be responsible for the provision of all sample containers (tubs, jars, and phials) and associated equipment (e.g. Chain of Custody sheets, address labels, and cool boxes). Sample containers should be sufficient to enable the contamination testing included in Table 3 (Contaminants of Concern) to be undertaken.

Prior to collection, samples shall be appropriately stored within cool boxes containing ice packs. The Contractor shall ensure samples are below the maximum temperature permitted by i2 Analytical to prevent the sample being assessed as deviant.

Disposable gloves shall be worn by the sample collector and shall be disposed of following the collection of each sample. Any tools used in the collection of a sample shall be cleaned prior to the collection of additional samples.

Each sample container shall be accurately labelled.

All samples are clearly labelled as follows:

**Client:** Waterman  
**Site:** WIE16172 HMP Holloway  
**SI location number:** BH/TP/WS  
**Depth:** \*\*m  
**Date:** \*\*/\*\*/20

(\*\* to be inserted)

All glass and/or fragile samples shall be secured in bubble wrap and carefully packed into the provided cool boxes.

All cool boxes shall be labelled with the address details of the receiving laboratory.

Any bulk samples shall be placed in a clearly defined area for collection.

Wherever possible courier collections shall be via refrigerated vehicles. However, where this is not possible the Contactor is responsible for ensuring that ice packs are placed within the cool boxes. Please note that as part of the MCERTS accreditation many laboratories are now required to measure the temperature of the cool box upon receipt in at the test facility; and

The Chain of Custody sheets shall be distributed as follows:

**White:** Receiving Laboratory (in cool box)

**Yellow:** To be retained by the Contractor and a digital copy provided to Waterman for scheduling purposes.

Made Ground soil samples shall be collected at a starting depth of 0.5m bgl, then at 0.5m intervals. Additional samples should be taken in changes in strata, or evidence of visual or olfactory contamination.

In natural material samples shall be collected at 1.0m intervals up until 5.0mbgl, after which samples will be collected at 5.0m intervals to borehole base. At the interface between each natural stratum encountered, a sample shall be taken from the base of the terminating stratum and beginning of the new stratum.

A PID shall be used to monitor head space concentrations of the soils. The methodology will be as the following;

- Soil sample placed within a bag which is partly filled and includes a small headspace.
- The soil sample is gently broken up in the bag.
- Following a period of fifteen minutes the PID is inserted through the bag and the volatile concentration recorded.

Samples are to be kept out of direct sunlight during this measuring.

All samples shall be logged in general accordance with BS5930 and Eurocode 7, with care taken to ensure any visual or olfactory evidence of contamination is noted.

#### **4.12 Soakaway Testing**

The Contractor will undertake 3No. soakaway tests in trial pits as specified. All soakaway tests will be completed in accordance with the requirements of the BRE:365 Soakaway Digest.

#### **4.13 Post Fieldwork Monitoring**

The Contractor will complete the following post-fieldwork sampling and monitoring regime;

- 2 week post GI completion – First round of groundwater level monitoring with sampling if present
- 4 weeks post GI completion – Second round of groundwater level monitoring with sampling if present

The standing level of the groundwater in the monitoring wells shall be monitored using a dip meter prior to any groundwater sampling.

The Contractor shall check for the presence of floating product using a bailer. If a free product layer is present its thickness shall be measured with an interface meter prior to obtaining the water sample and shall report the results of this investigation on fieldwork monitoring sheets. The Contractor shall record the time and date of the monitoring event, in addition to the colour, turbidity, odour, and sheen of the groundwater sampled on a fieldwork record sheet.

Groundwater samples will be collected from monitoring wells specified by Waterman, and in accordance with the following requirements

Sampling shall be undertaken using low flow techniques. Dedicated tubing will be used for each monitoring well. Groundwater samples shall be collected at each location once the parameters detailed below:

##### Parameter Stabilisation Levels

- Dissolved Oxygen  $\pm 10\%$  of reading or  $\pm 0.2\text{mg/l}$ , whichever is greater
- Temperature  $\pm 0.2\text{oC}$
- Total Dissolved Solids  $\pm 10\%$  of reading
- pH  $\pm 0.2$  pH units
- Eh or ORP  $\pm 20\text{mV}$
- Conductivity  $\pm 3\%$  of reading

The water samples shall be stored in appropriate sample containers and kept in cool boxes before transit to the laboratory.

All groundwater sampled shall be transferred immediately into the correct containers as provided by the as supplied by the laboratory. All water samples shall be handled in accordance with the methods outlined above for soils.

The groundwater sample containers should be obtained from i2 Analytical Laboratories. The Contractor shall ensure where required all samples are suitably filtered using the correct medium. The requirement for filtering will be confirmed with i2 Analytical.

#### **4.14 Daily Report**

At the end of each working day the Contractor will provide Waterman with a progress report detailing the work completed, and day sheets. These are required to allow environmental and geotechnical laboratory testing to be specified during the ground investigation.

Throughout the intrusive investigation, the Contractor shall take photographs of all exploratory holes and of each environmental sample. The photographs shall be forwarded onto Waterman at the end of each day and included within the final factual report.

#### **4.15 Factual Report**

The Contractor shall allow for the submission of one draft copy of an interim Factual GI Report in electronic format and the incorporation of any comments by Waterman. The interim Factual GI Report shall be submitted within 2 weeks of completing the GI and include all exploratory hole/borehole logs, headspace analysis, sample records, exploratory hole location plan, and available laboratory results.

- In addition, the Contractor shall allow for the submission of an electronic copy of the agreed final version of the Factual GI Report. The final Factual GI Report shall be issued one week post completion of all laboratory testing and shall include;
- A description of work carried out
- A description of any visual or olfactory contamination encountered
- Details of buried structures encountered including cross section drawings
- Details of buried services encountered
- The final logs for all investigation locations on the Site,
- Details regarding excavation/borehole abandonment and/or borehole/excavation relocation,
- Final results of all in-situ testing report in standard units
- All laboratory testing undertaken
- Groundwater level and vapour (if required) monitoring results in the format included in Appendix F where completed.
- An as-built plan of all GI locations (also to be provided in DWG format),
- a list of X, Y, Z coordinates of all GI locations and encountered obstructions (also to be provided in Excel format)
- Exploratory logs shall include the following;
- A diagram indicating the nature, extent, depth and levels of strata encountered;
- Level or levels at which water was met and level of standing water in the complete exploratory hole;
- PID reading from the headspace analysis;
- Co-ordinates of the exploratory holes/boreholes.
- The levels at the top of the exploratory holes; and
- Installation details.

All levels shall refer to Ordnance Datum.

All descriptions and classifications of soils shall be in accordance with British Standard BS 5930/ Eurocode 07. Exploratory hole logs shall include fully detailed descriptions of the materials encountered and not generic descriptions like 'spoil'. The report shall contain details of sampling, including the type and depth of soil samples collected.

All exploratory holes shall be logged by the drillers and the Contractor's engineer.

The Contractor is to provide all GI data in AGS format (version 4.0) in a single file. A complete set of digital data is to be supplied with draft and approved final copies of the report.



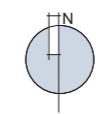
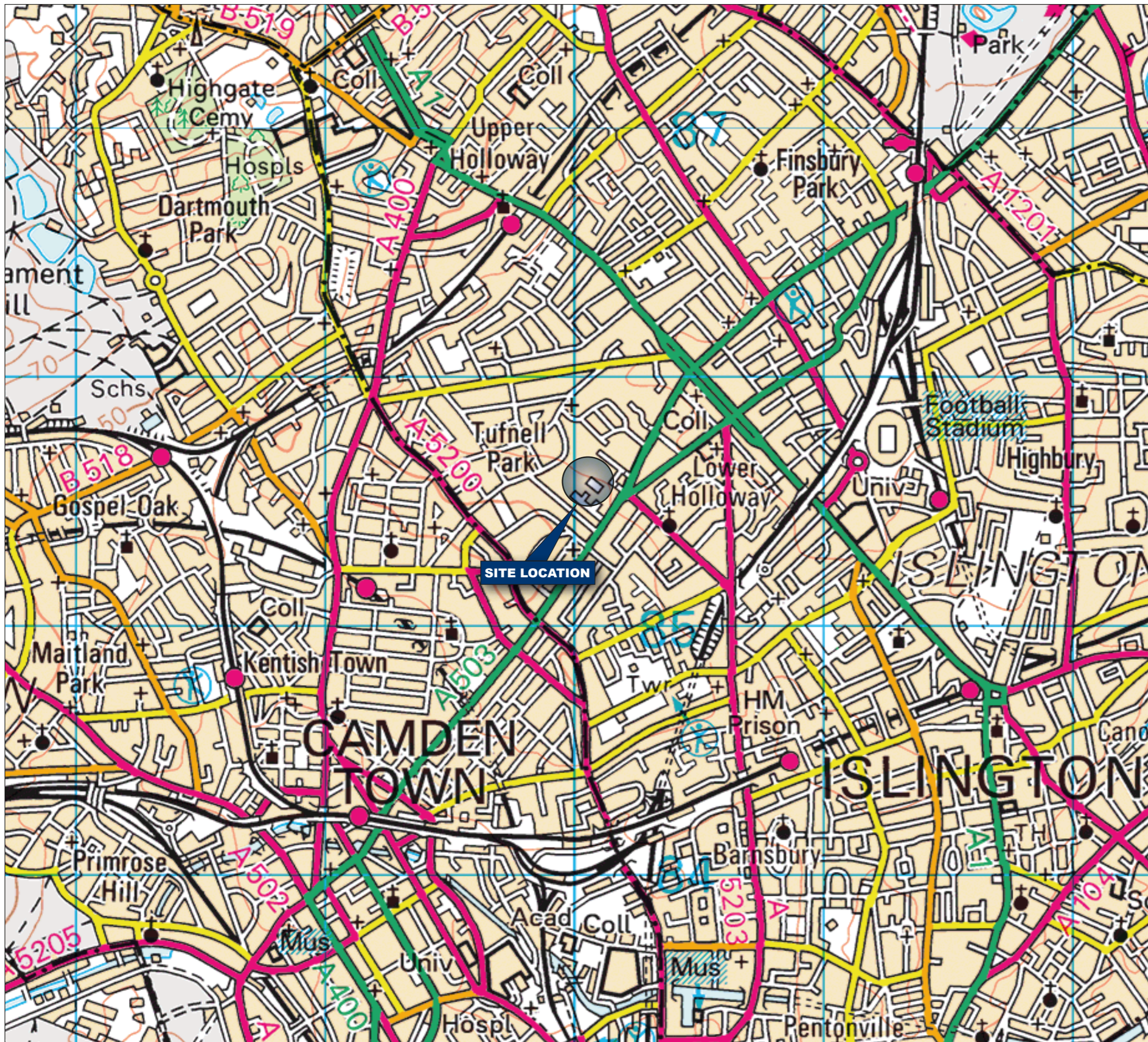


## APPENDICES

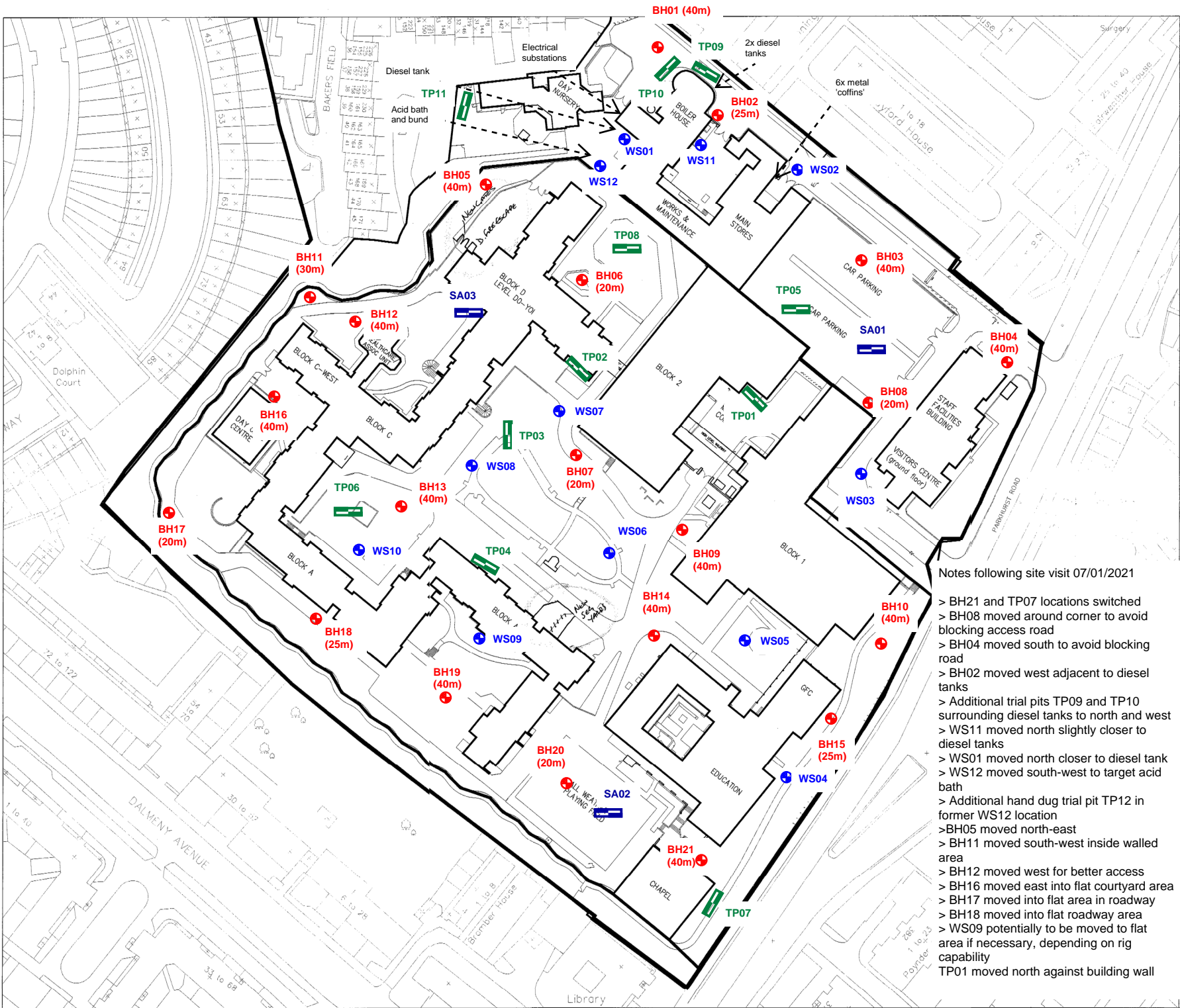


## **Appendix A Site Plans**

- **A1: Site Location Plan**
- **A2: Proposed Ground Investigation Plan**
- **A3: Proposed Development Plans, Plots A-E**



Project Details	WIE16172-100: Holloway Prison, Parkhurst Road, London N7 0NU
Figure Title	Figure A1: Site Location Plan
Figure Ref	WIE16172-100_GR_PERA_A1A
Date	September 2019
File Location	\\s-Incs\wie\projects\wie16172\100\graphics\pera\issued figures



- KEY**
- Boundary of HMP Estate
  - New Boundary Plan from 1-10-01 following sale of Bakerfield Quarters. Awaiting info. from Land Registry
  - Secure Perimeter of Prison
  - Area of Perimeter 27634.6m

Revision 26/11/04

- BH01-BH21 (Cable percussion boreholes to various depths between 20 and 40m bgl)
- WS01-WS12 (Window sample holes to extend 1m into London Clay Formation)
- TP01-TP12 (Trial Pits to identify former building foundations)
- SA01-SA03 (Soakaway pits to assess drainage capacity of shallow horizons)

Notes following site visit 07/01/2021

- > BH21 and TP07 locations switched
- > BH08 moved around corner to avoid blocking access road
- > BH04 moved south to avoid blocking road
- > BH02 moved west adjacent to diesel tanks
- > Additional trial pits TP09 and TP10 surrounding diesel tanks to north and west
- > WS11 moved north slightly closer to diesel tanks
- > WS01 moved north closer to diesel tank
- > WS12 moved south-west to target acid bath
- > Additional hand dug trial pit TP12 in former WS12 location
- > BH05 moved north-east
- > BH11 moved south-west inside walled area
- > BH12 moved west for better access
- > BH16 moved east into flat courtyard area
- > BH17 moved into flat area in roadway
- > BH18 moved into flat roadway area
- > WS09 potentially to be moved to flat area if necessary, depending on rig capability
- TP01 moved north against building wall

D	UPDATE WITH COMMENTS FROM HOWS. BLOCK PLAN UPDATED WITH REDESIGNED SURVEY FROM GOLF-10 LOBBY STORES BECOMES MAIN STORES. STAFF CLUB & MESS BECOMES STAFF FACILITIES BUILDING.	SC	12/11/03
E	UPDATE CHECKED WITH HOWS. NO ALTERATIONS REQUIRED.	SC	21/10/02
F	ESTABLISHMENT BOUNDARY AMENDED	DM	12/12/01
G	OS MAP ADDED. OS LOCATED	SC	28/11/00
D	UPDATED WITH COMMENTS FROM HOWS. EXTENSION TO DAY CARE CENTRE ADDED. FIRE ESCAPE TO BLOCK D ADDED. BUILDING USAGE ON DRAWING UPDATED. ALL WEATHER PLAYING FIELDS ADDED.	DM	10/08/00
B	PARTIAL PLAYING FIELDS ADDED		15/08/98
A	PARTIAL UPDATE WITH COMMENTS FROM HOWS		05/02/98
G	revision		12/11/03 date

CONSTRUCTION UNIT  
HM PRISON SERVICE

SECNO 01 CECNO 003  
establishment HMP HOLLOWAY  
drawing BLOCK PLAN

drawn by	KDH	checked by	
scale	1:500	record	BPRN /
date	FEB 98	drwg no	BPLAN/067
		rev	G

do not scale off this drawing. Check all dimensions on site  
0mm 10mm  
Original Scale 1:1



**KEY**

1 BED	CYCLE STORE
2 BED	EXTRA-CARE
3 BED	AFFORDABLE TENURE
4 BED	MARKET TENURE
WOMENS CENTER	ROOF PRIVATE TERRACE
REFUSE STORE	SITE BOUNDARY
COMMERCIAL	
MEP	
HEAT PUMPS	

0 1m 2m 5m 10m

LANDSCAPE AND PUBLIC REALM INDICATIVE. REFER TO LANDSCAPE ARCHITECT INFORMATION.

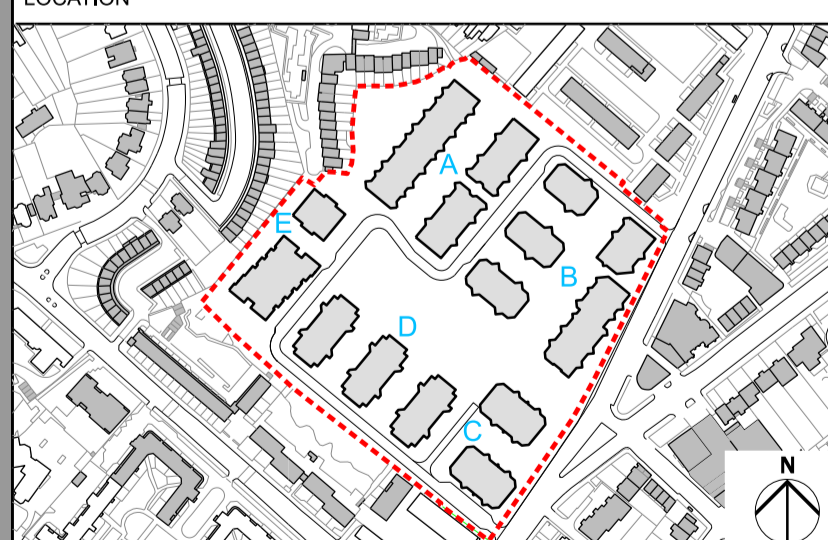
ROAD LAYOUT IS INDICATIVE AND TO BE CO-ORDINATED

REV	DATE
G	31/08/21 DESIGN FREEZE 1
F	24/08/21 INFORMATION
E	13/08/21 INFORMATION
D	02/08/21 INFORMATION
C	02/07/21 INFORMATION
B	30/06/21 INFORMATION
A	25/06/21 INFORMATION
-	10/06/21 INFORMATION

**NOTE**

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job title

**PROJECT HOLLOWAY**

drawing title / location

**MASTERPLAN  
UPPER GROUND FLOOR**

drawn by	checked	scale	status
AC	LL	1:500@A1; 1:1000@A3	INFORMATION

project	zone	source	classification	drawing no.	revision
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