

Date: 07 December 2022
Our ref: R150095/LN
Planning Portal refs: PP-11687977 and PP-11689202

Haringey Council London Borough
Planning, Regeneration & Economy,
Level 6, River Park House,
225 High Road,
Wood Green,
N22 8HQ

Dear Sir/Madam,

Discharge of planning conditions pertaining to Ashley House and Cannon Factory permission ref. HGY/2016/4165 and Reserved Matters Permission ref. HGY/2018/2353 and Ashley Park permission ref. HGY/2019/0108 (Appeal ref. APP/Y5420/W/19/3232707)

On behalf of our client Notting Hill Home Ownership, the following Ground Contamination Reports and Remediation Strategy has been prepared to facilitate the discharge of Part B of Condition 25 of the Ashley House and Cannon Factory permission ref. HGY/2016/4165 and Reserved Matters Permission ref. HGY/2018/2353 and Parts B of Condition 8 of the Ashley Park permission ref. HGY/2019/0108 (Appeal ref. APP/Y5420/W/19/3232707).

Notting Hill Home Ownership (NHHO) intends to progress delivery of the two schemes together on an integrated basis. This single technical report provides the necessary information to cover the conditions attached to the two respective planning permissions. The applicant has agreed this approach to discharge the corresponding conditions attached to both planning permissions in pairs with Officers at Haringey.

Yours faithfully,



Liam Norris MRICS
Partner
For and on behalf of calfordseaden LLP

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Remediation Strategy

Ashley House & Cannon Factory, London

September 2022

Waterman Infrastructure & Environment Ltd

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Client Name: Calford Seaden
Document Reference: WIE16248-100-S-1-1-3-RMS
Project Number: WIE16248

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)

Issue	Date	Prepared by	Checked by	Approved by
1-1-3	September 2022	Ben Greenfield Associate Director	Freddie Alcock Senior Associate	Freddie Alcock Senior Associate

A handwritten signature in black ink, appearing to read 'Freddie Alcock', written over the printed name in the 'Approved by' column.

Comments

Disclaimer

This report has been prepared by Waterman Infrastructure & Environment Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

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1. Introduction

1.1 Objectives

Calford Seaden on behalf of Notting Hill Genesis (client) instructed Waterman Infrastructure & Environment Limited (Waterman) to prepare a Remediation Strategy and complete a Detailed Ground Gas Risk Assessment for the Ashley House & Cannon Factory, Ashley Road South, Tottenham Hale, London.

A Site plan and Site location plan are included in Appendix A

The Remediation Strategy's purpose is to set out the mitigation measures required to break the pollutant linkages, so post development there will be no valid pollutant linkages remaining.

The detailed ground gas risk assessment is included in Appendix D.

This Remediation Strategy is supported by the following documents;

- RSK, April 2015, Environmental Site Assessment, Cannon Factory, Ashley Road, Tottenham Hale, London, N17 9LH, 27782R01 (00); and
- RSK, February 2015, Geo-Environmental Assessment, Ashley House, Tottenham Hale, 27663 R01 (00).
- WSP, April 2017, Preliminary Environmental Risk Assessment – Ashley Gardens Site, 70022931-GB1
 - Land subject to report located off-site, immediately to the north.
- Socotec, August 2019, Factual and Interpretative Report on Ground Investigation, D8061-18

1.2 Proposed Development

Proposed buildings on the Ashley House site will comprise a four and a seven storey building, primarily in residential use with the exception of the ground floor which will also include commercial uses. Soft and hard landscaping will surround the buildings. Private soft landscaping or basements are not proposed.

Proposed buildings on the Cannon Factory site will comprise a nine to seventeen storey building with residential uses on the second to seventeenth floor, and commercial use on the ground and first floor. Undercroft parking will be present on the Cannon House site. The area surrounding the building will be a mix of soft and hard landscaping. Basements or private soft landscaping is not proposed.

1.3 Development Constraints

Development constraints identified include existing Thames Water Sewers on both the Ashley House and Cannon Factory Site, and the Victoria Line (below ground rail line) close to both land parcels (Figure 1).



December 2016, and also detailing any post remedial monitoring shall be submitted to, and approved in writing by, the Local Planning Authority prior to that remediation being carried out on site.

This Remediation Strategy has been prepared to facilitate the discharge of Condition 25 Part B.

2. Environmental Site Setting

The two pieces of land (Ashley House, and Cannon Factory) are located 200 – 250m north/north west of Tottenham Hale Railway Station at National grid reference (TQ344987).

Ashley House is generally level at 9.0mAOD and is occupied by a two storey building along the western boundary, warehouse along the northern boundary, and the remainder of the land used as a yard and parking area. Previous walkovers reported two underground diesel tanks, a fuel pump, an effluent tank, waste oil tank, and an electrical sub-station on the Ashley House site (Appendix A).

Historically the Ashley House site was a farm between 1850 – 1898 prior to becoming occupied by multiple factories in 1913 (braid and bootlace factory, woollen factory and a pencil factory). In 1936 the Ashley House site was occupied by a printing ink and varnish factory which included various tanks chimneys and a water cooling tower. From 1972 to present the Site has remained as it currently exists.

The Cannon Factory site is generally level at 8.80mAOD and is occupied by a two storey building along the western boundary, adjoining warehouses along the northern and eastern boundaries, and the remainder of the Site surfaced with hardstanding. A small electrical sub-station was observed on the Cannon Factory site during the walkover in 2015.

The Cannon Factory site was undeveloped until the 1940's when warehouses and a rubber factory occupied the site. From 1970 to present partial redevelopment to the large warehouse in the northern Site portion has occurred.

Geology generally encountered are included in Table 1.

Table 1: Site Geology

Stratum	Thickness (m)	Description
Ashley Road		
Made Ground	0.59 – 1.2	Sub-base underlain by a sandy gravelly clay with fragments of brick, concrete
Enfield Silt Member	1.10 – 1.27	Orangish/yellowish brown slightly sandy gravelly CLAY
Kempton Park Gravel Member	1.14 – 3.50	Orangish brown very gravelly SAND to very sandy GRAVEL.
London Clay Formation	15.0	Grey and dark brown CLAY
Cannon Factory		
Made Ground	0.25 – 2.17	Sub-base underlain by a silty gravelly sand.
Enfield Silt Member	0.7 – 1.60	Orangish/yellowish brown slightly sandy gravelly CLAY
Kempton Park Gravel Member	3.20 – 4.60	Orangish brown very gravelly SAND to very sandy GRAVEL.
London Clay Formation	15.80 – 16.30	Grey and dark brown CLAY

The Made Ground and London Clay Formation are both unproductive strata. The Enfield Silt Member and the Kempton Park Gravel Member are both Secondary A Aquifers. The Site is within a groundwater Source Protection Zone II, however it is understood this relates to abstractions to the aquifer underlying the London Clay Formation. The London Clay Formation is of sufficient thickness to be an aquiclude preventing the migration to the underlying sensitive aquifers.

Surface water receptors include the Pymmes Brook and River Lea 380m east. Surface water or groundwater abstractions are absent within 500m of the Site. Given the distance to the surface water receptors (Pymmes Brook and River Lea) 380m east, and the intervening industrial and commercial land uses they are unlikely to be sensitive receptors with any impact unlikely to be directly attributable to the Site.

Landfills are absent within 250m of the Site, with the closest being 465m north.

2.1 Ground Investigation Results

Soil

Ground investigations completed by RSK (2015) and by Socotec (2018) recorded visual and olfactory evidence of contamination in both the Ashley House and Cannon Factory sites. These included; potential Asbestos Containing Material (ACM) in the shallow Made Ground, and evidence of gross petroleum hydrocarbon contamination. ACM was generally widespread across both sites and gross petroleum hydrocarbon contamination localised in one location on the Cannon Factory site, and generally widespread on the Ashley House site.

Soil samples were tested by Socotec Laboratories for metals, BTEX (benzene, ethyl benzene, toluene, xylene), TPH CWG (petroleum hydrocarbons), asbestos (ID and quantification), and Volatile Organic Contaminants (VOC).

The soil laboratory results were assessed against Generic Assessment Criteria (GAC) relevant for a residential land use without plant uptake (1% Soil Organic Matter (SOM) content). The assessment undertaken by Socotec identified several contaminants in exceedance of the residential land use without plant uptake GAC. These were primarily recorded on the Ashley House site and included heavy metals, Poly-cyclic Aromatic Hydrocarbons (PAH), and asbestos. On the Cannon House site with the exception of asbestos only one exceedance of PAH was recorded.

Groundwater

The Secondary A Aquifer in the Kempton Park Gravel Member is potentially at risk from contaminants originating on-site, and is likely being in hydraulic continuity with the Pymmes Brook and River Lea east of the Site.

The sensitive Secondary A Aquifers in the Lambeth Group and Thanet Sands, and the Principal Aquifer in the Chalk Formation are protected from the vertical migration of contaminants by the London Clay Formation which forms an aquiclude.

Groundwater samples from both the Socotec and RSK investigations were assessed against the Environment Agency derived Environmental Quality Standards (EQS) and the UK Drinking Water Standards for petroleum hydrocarbons only.

The groundwater contaminant concentrations are generally consistent with soil contaminant

concentrations with elevated metals and petroleum hydrocarbons in exceedance. A petroleum hydrocarbon hotspot is recorded in BH02 (Ashley House) and WS107 (RSK) (Cannon Factory).

The petroleum hydrocarbon contamination on Ashley House is understood to be associated with an off-site contamination source.

The previous ground investigations have concluded an unacceptable risk to controlled water receptors is present for the Ashley House site given the ground investigation results. The requirement for remedial measures in relation to groundwater will be confirmed following the additional ground investigation detailed in this Remediation Strategy.

On the Cannon Factory site the risk to controlled waters has been assessed as low, and further ground investigation or remedial measures is not required.

Ground Gas

The previous ground investigations have identified a significant ground gas regime as being present for Ashley House (Characteristic Situation 2 (CS2)) requiring ground gas protection measures in built structures.

A significant ground gas regime is absent for the Cannon Factory (Characteristic Situation 1 (CS1)). Ground gas protection measures would not be required for the Cannon Factory.

As part of this Remediation Strategy the ground gas regime on the Ashley House site will be re-assessed, to clarify whether a CS2 is appropriate or an overly conservative assessment. The re-assessment is included in Appendix D.

Vapour

A significant vapour regime has not been identified on either site (Ashley House or Cannon Factory) and vapour protection measures would not be required in built structures.

2.2 Conceptual Model

Pollutant linkages which require breaking through application of remedial/mitigation measures based on the results of the previous ground investigation include the following;

- In areas of soft landscaping a risk to future Site users exists due to elevated contaminants and asbestos within the Made Ground. A clean cover system is required in all areas of soft landscaping of sufficient thickness and quality to prevent future Site users coming into direct contact with these soils in areas of soft landscaping and thereby breaking the pollutant linkage.
- Due to the elevated contaminants and asbestos recorded on-site a risk to surrounding human health receptors exists where the contaminants become mobile during construction works. To mitigate the risk dust suppression methods and appropriate stockpile management will be required throughout construction to minimise dust creation and migration.
- Construction workers should wear the appropriate Personal Protective Equipment (PPE) to the contaminants recorded, adhere to good hygiene and safety measures, confined space regulations 1997, and the Control of Asbestos Regulations 2012.
- Barrier supply pipes should be used for the installation of all new potable water supply pipes.
- According to the previous assessment a significant ground gas regime has been identified on the

Ashley House site which would require the installation of ground gas measures, however Appendix D of this document presents a Detailed Gas Assessment the purpose of which is to determine if the current CS2 classification is justified.

3. Remediation Strategy

This Remediation Strategy sets out mitigation measures required to ensure the pollutant linkages identified in the Conceptual Site Model are broken and a risk to receptors post Development completion is not present.

3.1 Protection of Workers and the General Public

The health and safety of all construction workers will be managed appropriately during the works providing appropriate welfare facilities, decontamination facilities and personal protective equipment (PPE) and respiratory protective equipment (RPE) commensurate with the contaminants present on the Site and the activities being undertaken.

During construction the Contractor will undertake all required and appropriate protective and mitigation measures to reduce the risk to construction workers from asbestos within the soil matrix. This will include but not limited to an Asbestos Risk Assessment and Plan of Work in accordance with the Control of Asbestos Regulations 2012 (CAR 2012).

Appropriate mitigation measures and segregation of the works (including hoardings, damping down, odour suppression and road sweeping) will be undertaken to ensure the general public are protected throughout the duration of the works. The details of the dust suppression methodologies employed will be set out in an associated Construction Environmental Management Plan (CEMP).

3.2 Site Clearance

Above Ground Structures

The Contractor will demolish all existing above ground structures including foundations, and associated services. Prior to demolition the Contractor will undertake a Refurbishment and Demolition Survey (in accordance with CAR 2012) to identify all ACMs. Where ACM's are present within the buildings the Contractor will remove dispose of them to a suitably licensed facility.

Above ground tanks will be decommissioned and disposed of to an appropriate facility in accordance with all relevant regulations.

Below Ground Structures

Below ground tanks have not been identified on the Cannon Factory, however potential remains for them to be present given the Site's former use.

The Ashley House site includes two below ground diesel tanks and associated fuel pump. The below ground tanks on the Ashley House site will be decommissioned and removed. Prior to their removal they will be investigated for the presence of liquids prior to disturbance. Any liquids will be appropriately pumped out. Their excavation and removal should be supervised by an appropriately qualified independent environmental consultant.

Post tank and cradle structure removal the excavation sides and base should be reviewed, and any visual/olfactory contamination encountered chased out. Photographs demonstrating the tank sides and base are free of visual/olfactory contamination or demonstrating all visual/olfactory contamination has been removed will be included in the Verification Report.

Fuel lines and other infrastructure associated with the below ground fuel tanks will be decommissioned, with all liquids removed prior to removal. Following removal of the fuel lines and associated infrastructure the excavation sides and base should be reviewed, and any visual/olfactory contamination encountered chased out.

Brick, concrete, and metal obstructions will be removed to a depth agreed prior to commencement of the works. Obstructions left in the ground greater than this depth will be surveyed to National Grid co-ordinates and reduced levels recorded and the information presented in the Verification Report.

Services

The Contractor will remove redundant services not required in the proposed Development. The Contractor will ensure services are disconnected by the relevant company/authority prior to removal. The redundant services will be capped at the Site boundaries. The cap installed will prevent the service runs becoming preferential pathways for the migration of contaminants and will likely comprise grout injected into the utility cavity.

The services due to be retained in the proposed Development will be protected by the Contractor throughout the duration of their works to ensure they remain usable post remediation.

Where services are encountered during the works which are not recorded on the service plans the Contractor will inform the wider project team who with the Contractor will determine whether the service is to be protected and retained or can be removed and capped at the Site boundaries.

Asbestos

The ground investigation has recorded asbestos fibres in the Made Ground across the Site in addition to ACM.

Where identifiable bulk ACM material is encountered the Contractor will remove and dispose of these materials in accordance with CAR 2012, including the completion of an Asbestos Plan of Work. Where the removal of asbestos falls under licensable work the Contractor will ensure licensed asbestos contractors are employed to supervise/remove the ACM.

The Contractor will employ the appropriate mitigation and protection measures during removal and disposal of ACM to ensure asbestos fibres are not liberated from the material, construction workers removing the asbestos fibres are protected and members of the public are protected. It will be the Contractors responsibility to ensure suitable mitigation and protective measures are employed. These will be detailed in an Asbestos Plan of Work.

3.3 Excavation

Formation Levels

The Contractor will excavate the Site to the formation levels agreed prior to the commencement of the development works.

The excavation of material will be undertaken in a controlled and phased manner, to ensure contamination where encountered is contained.

If there is a considerable period of time before the follow-on development starts, control measures will be placed to protect against dust generation and deterioration of the formation surface.

Soil Treatment Process

Soil remediation will primarily comprise the provision of clean cover layers in areas of soft landscaping and the use of hardstanding to break the direct contact pollutant linkage. Therefore, the anticipated soil treatment activities will likely be restricted to the processing of excavated material generated during the required earthworks, or through the excavation/remediation of contamination hotspots encountered during the enabling works.

Anticipated soil treatments are likely to comprise the following;

- Careful segregation at the point of the excavation into the different material types including geotechnical and chemical properties.
- The excavation and removal of encountered contamination hotspots.
- Where possible concrete and brick will be recovered and crushed to generate a potential geotechnical fill material for re-use on-site. The use of crushers or screeners would be subject to the relevant permits. The production of secondary aggregates will be through an environmental permit or in accordance with the WRAP Quality protocol for the production of aggregates from inert waste.

ACM were encountered during the ground investigations completed on both sites. Prior to re-use of Site won material visible ACM's should be removed as far as reasonably practicable and disposed of off-site

A proportion of the excavated material may require disposal off-site due to its unsuitability for re-use on-site. As much material as possible will be sent to a reclamation/recycling centre to maximise the sustainable off-site re-use of material. Where necessary the material due to be disposed off-site should be subject to segregation/screening/processing to reduce the quantum of mixed wastes.

3.4 Supplementary Ground Investigation

Following demolition of above ground structures supplementary ground investigation should be completed on both the Ashley House and Cannon Factory Site. The purpose of the additional ground investigation is to understand whether there are additional tanks and associated pipework's in areas of the Site previously covered during the main ground investigation.

The supplementary ground investigation will comprise the completion of trial pits on a 10m x 10m grid with the trial pits completed at the centre of each grid square. The grid will be positioned in areas of the Site where structures are currently present prior to demolition. The supplementary ground investigation will be completed post demolition of above ground structures by an appropriately qualified environmental consultant, with all ground conditions logged in accordance BS5930, and record of any visual/olfactory evidence of contamination or below ground structures including tanks made.

The supplementary investigation should also include delineation of a possible asbestos hotspot centred on PH3 and PH3A (Ashley House site) in which suspected Asbestos Containing Material (ACM) was encountered at 0.9mbgl and 0.25mbgl during the 2019 Socotec ground investigation.

Post completion of the supplementary ground investigation this Remediation Strategy should be updated with the results, and any changes made to the remedial approach/mitigation measures applied. The supplementary ground investigation results should be shared with the regulatory authorities and any amendments to the Remediation Strategy agreed with the regulatory authorities prior to commencing the earthworks.

3.5 Soil Re-use

The Contractor will where possible re-use excavated soils providing, they are chemically and geotechnically suitable for their intended location. The Contractor will be responsible for determining the most appropriate framework through which the soils are re-used. However, it is likely it would be through the CL:AIRE document The Definition of Waste Code of Practice (DoWCoP).

Where the DoWCoP route is followed the Contractor will prepare a Materials Management Plan (MMP) which will collate all the relevant information to demonstrate the soils are not waste (quantities, quality, and certainty of use) and will include details of the tracking system, contingency, and verification requirements. The MMP will also state what works are due to be undertaken, how they have been assessed and who will be carrying them out. The MMP will be signed off by a Qualified Person (QP) who is not part of the design team.

3.5.1 Chemical Criteria

Soil re-used/imported onto Site will fall into one of two categories;

- **Cover Layer Material**
- **General Fill** (Material below the Cover Layer/hardstanding)

Geotechnical Requirements

The geotechnical requirements for material re-used on-site and at formation level will be set out in a separate Earthworks Specification. The Contractor will refer to and follow the requirements of this document during construction works on-site.

Cover Layer Material

The proposed Development will contain areas of communal soft landscaping, Site won Cover Layer Material will comply with the GAC presented Appendix B.

Benzo(a)pyrene will be used as a surrogate marker in accordance with Public Health England guidance to assess PAH exceedances in material re-used.

Cover Layer material, a minimum of three samples of soil per source will be submitted for analysis to confirm its suitability. Samples shall be submitted for the chemical analysis listed in Appendix B and will comply with the listed limits. If the volume from any source exceeds 750m³, samples at a rate of one sample per 250m³ over and above 750m³ should be submitted to confirm suitability.

Prior to use the soil will be assessed to ensure it is a suitable growing medium, free from obvious contamination, is not odorous, is free from invasive species such as Japanese Knotweed, or Giant Hogweed, has no obvious signs of asbestos containing material, and is free from of vegetation.

Natural undisturbed material free of visual/olfactory evidence of contamination present within the Cover Layer will be deemed as not posing a risk to human health receptors and will not be subject to sampling, testing, and assessment against the Cover Layer criteria. Material re-used within the cover layer must also meet the following requirements in soft landscaping areas;

- BS3882 (2015) – Specification for topsoil and requirements for use, and BS8601 (2013) – Specification for subsoil and requirements for use; and
- Requirements of the landscape specification.

General Fill

Future Site users will be restricted from direct contact with material re-used below the cover layer, or below hardstanding removing the direct contact, and ingestion pollutant pathways. Site won General Fill;

- Free of visual/olfactory evidence of contamination (oil staining or odours, discolouration of soil, free product);
- Free of visually identifiable ACM such as chrysotile cement sheets; and
- Free of visually identifiable vegetation.

3.6 Imported Material

Material imported for use on-site will either be used in the Cover Layer or as General Fill including below hardstanding, roads, or buildings.

Imported material will also be subject the following limitations;

- Free of visual/olfactory evidence of contamination (oil staining or odours, discolouration of soil, free product);
- Free of visually identifiable ACM such as chrysotile cement sheets; and
- Free of vegetation.

The assessment criteria included in Appendix C will be adhered to. Concentrations above the GAC included in Appendix C may be further assessed using;

- Land use specific GAC; or
- Pathway specific GAC.

A minimum of three samples per source will be required. Where the source exceeds 1500m³ samples per 500m³ will be submitted to confirm it meets the assessment criteria in Appendix C.

Imported material used in soft landscaping areas must also meet the following requirements;

- BS3882 (2015) – Specification for topsoil and requirements for use, and BS8601 (2013) – Specification for subsoil and requirements for use; and
- Requirements of the landscape specification.

Where imported material is from a virgin source, or the material has been demonstrated to have been produced in accordance with the WRAP Quality protocol and is used Below the Cover Layer the sampling and testing of the material would not be required. A visual/olfactory assessment of the material once imported onto Site would however be required.

3.7 Cover Layer Thickness

The proposed Development will comprise communal residential multi-storey blocks surrounded by communal soft landscaping. Areas of soft landscaping will require a cover layer 0.45m minimum thickness. The Cover Layer will be underlain by a coloured marker layer demarcating where the cover layer ends, and Made Ground/natural material begins.

The cover layer thickness will be confirmed through photographs taken alongside a scale to demonstrate it has met the minimum thickness required (0.45m), in addition to evidence the marker layer had been installed.

3.8 Waste

Waste soils requiring removal off-site, will be subject to waste classification analysis to confirm the materials correct waste classification, and identify a suitable licensed facility to accept the waste. Copies of all relevant licenses for the disposal/treatment site will be provided and retained.

A Site Waste Management Plan (SWMP) will be prepared covering the management of excavated material and their removal off-site.

Full records of the material quantities disposed off-site and the receiving facilities licenses will be retained by the Contractor, in addition to the consignment notes.

3.9 Stockpiles

The generation of stockpiles of excavated material will be minimised as far as is reasonably practical. Any soils stockpiled on-site will be managed in a controlled manner, with different material types segregated and clearly labelled. Each stockpile will be identified according to assumed or confirmed categorisation, source, type, and deposition date, and details of any chemical analysis. A tracking system that can readily interrogate and issue output information is expected to be used.

Stockpiles will be physically separated to avoid cross contamination and temporary road access provided for placement and loading. Stockpiles of material which is unsuitable for re-use on-site or materials with visual or olfactory evidence of contamination will be positioned on impervious surfaces/membrane to collect drainage and prevent loss of entrained water and leachate to ground.

Mitigation measures will be employed to minimise wind whip from stockpiled materials. The Contractor will determine the methods for appropriate handling and storage of materials which may include damping down and covering of stockpiles.

3.10 Watching Brief and Discovery Strategy

For the duration of the work the Contractor will maintain a watching brief and discovery strategy. The purpose of the watching brief will be twofold;

- To identify visual/olfactory evidence of gross contamination, and to ensure appropriate controls and mitigation measures are actioned.
- To assist material management, segregating material at the point of excavation by its geotechnical/chemical properties.

Where unforeseen/unchartered contamination or unexpected ground conditions are encountered it shall be reported immediately, and the working methods and control measures reviewed. As required alternative methods of working will be reported to the regulatory authorities for approval.

The watching brief will include the following actions;

- The Site manager (provided by the Contractor) will have overall responsibility for delivering the watching brief and will be responsible for notifying the geo-environmental specialist.
- The Contractor will prepare inductions, risk assessments, method statements, CEMP and toolbox talks taking account of this Remediation Strategy.
- All staff should have a general asbestos in soils awareness training which will include what has previously been found on-site and what might be encountered during the works.

- The toolbox talks on-site should include a specific section on ground contamination including the findings of the ground investigation undertaken previously on-site. All staff should be aware of the possible actions to take should potential contamination be identified.

If previously unidentified contamination including gross visual or olfactory contamination is encountered the following steps should be taken;

- Works should cease in the affected area and cordoned off;
- A specialist should be consulted, who will advise on the next steps specific to the contamination encountered and prepare a method statement detailing these measures. The details of the additional remedial measures where required will be shared and agreed with the regulatory authorities prior to implementation.
- Soils should be sampled either in-situ (and left undisturbed whilst the samples are tested) or if safe to do so the soils should be excavated and stockpiled separately in an appropriate manner.
- Measures should be taken to restrict dust generation and surface water run-off;
- On receipt of the results, if deemed necessary the soils should be remediated and/or disposed off-site to a suitably licensed facility.

The watching brief shall be documented in the Verification Report. Where no unexpected/uncharted contamination is encountered a written statement from a competent individual confirming the brief was implemented and no significant contamination was encountered will be provided.

3.11 Odour Management

Odour management measures will be implemented during the remedial works. These may include damping down, boundary mist sprays, curtains, and use of odour suppression sprays. The details of the odour management mitigation measures employed will be set out in an Environmental Management Plan.

3.12 Environmental Monitoring

The Site is in a relatively high populated area surrounded by potentially sensitive receptors, during the remedial work the following will be monitored; noise, vibration, dust, and odour. The threshold levels for each monitored parameter will be agreed with the regulatory authorities prior to works commencing. The details of the mitigation measures employed will be set out in an Environmental Management Plan.

3.13 Archaeology

The Contractor will undertake all works in accordance with the requirements of archaeological consultant including completion of an archaeological watching brief where required.

3.14 Statutory Approvals

All necessary approvals from the statutory authorities will be obtained by the Contractor for the duration of their work. Statutory consultees may include Haringey Council, Environment Agency, Network Rail, and Thames Water.

3.15 New Services

Thames Water should be consulted regarding the appropriate pipe material specification of potable water

supply pipes and precautions to mitigate the effects associated with contamination may be required.

New below ground services, laid into residual Made Ground in which there is a reasonable chance maintenance activity will be required, should be laid in material which would not pose a contamination risk to future workers undertaking maintenance of the services.

4. Groundwater

4.1 Groundwater in Excavations

The Contractor will ensure groundwater/surface water is managed throughout the construction works. Where groundwater/surface water is discharged off-site via the foul sewer the Contractor will undertake sufficient treatment and verification testing as required to ensure they meet the requirements of Thames Water and/or the Environment Agency (EA) prior to discharge.

Details of the agreed discharge consent, and relevant testing as required will be included in Verification Report.

4.2 Monitoring Well Decommissioning

The previous ground investigation included a borehole (BH103A – 2015 RSK Ashley House (Plan in Appendix A) which extended through the London Clay Formation and were installed in the Lambeth Group. This borehole may be preferential pathways allowing the vertical migration of contaminants between the superficial deposits and the bedrock deposits underlying the London Clay Formation. The boreholes where encountered will be decommissioned in accordance with the 2012 EA Guidance – Good Practice for Decommissioning Redundant Boreholes and Wells.

The general methodology through which the boreholes will be decommissioned will include the following;

- Where possible the removal of the full standpipe length as part of the decommissioning process;
- The use of a bentonite/cement grout in a 3:1 ratio as determined by the contractor, which will be mixed at the surface before being pumped to the base of the borehole via a tremie pipe which is withdrawn as the borehole fills;
- Once backfilled the tremie pipe will be fully withdrawn and the headworks removed.

The contractor undertaking the borehole decommissioning will ensure the following information is recorded which will be included in the Verification Report for the proposed Development;

- The groundwater level prior to decommissioning;
- The type and quantity of the bentonite /cement grout used to backfill each monitoring well;
- Any problems encountered during the decommissioning procedure;
- Pictures of the monitoring well prior to and post completion of the decommissioning procedure;

The location of the decommissioned monitoring wells will be included in the completed development's CDM Health and Safety File.

5. Development Mitigation Measures

5.1 Ground Gas Protection Measures

5.1.1 Cannon Factory

Previous ground investigations have identified the Site's ground gas regime on the Cannon Factory site as not being significant with a classification of CS1 identified. Ground gas protection measures would therefore not be required on the Cannon Factory site.

5.1.2 Ashley House

The ground gas regime for the Ashley House site has been re-assessed based on a holistic review of the ground investigation and desktop data (Appendix D). A significant ground gas regime has not been recorded with CS1 classification identified. Ground gas protection measures would therefore not be required for built structures on the Ashley House site.

5.2 Piled Foundations

Piled foundations which penetrate the London Clay Formation risk creating preferential pathways for the migration of contaminants between the superficial deposits and the sensitive aquifers underlying the London Clay Formation. Where piles are proposed which penetrate the London Clay Formation a Foundation Works Risk Assessment (FWRA) will be prepared detailing the assessment of the risk posed by piled foundations and the mitigation measures required to prevent future preferential pathways being created.

6. Verification Report

General Contents

The Verification Report will include the following information;

- Details of the parties involved, a summary of the works including; works methodology, specific health and safety measures and environmental controls.
- Evidence of communication with the regulatory authorities where required, and compliance with any permit consent/license required.
- Waste management details and records including; volumes, destinations, waste disposal permit details (haulage contractors and disposal sites), and consignment notes.
- Details of the location and type of water supply pipes.
- Details of any outstanding Site constraints and actions including how these will be addressed.
- Description of final conditions.
- Details of the below ground tanks/interceptors removed, and the location entrained liquids were disposed of.
- Records demonstrating redundant boreholes have been appropriately decommissioned in accordance with the procedure detailed in this Remediation Strategy, or photographs prior to works commencing detailing the boreholes which could not be decommissioned due to damage occurring prior to works commencing.

The verification report should form part of the health and safety file in accordance with the Construction Design and Management (CDM) Regulations 2015 and the development operations & maintenance (O&M) manual or maintenance plan. This will allow the future building management to protect against any residual ground contamination risks associated with future operations and maintenance.

Unexpected/Uncharted Contamination

If unexpected contamination is identified, the following information shall be reported in the Verification Report is:

- A general description of the situation including the background, location, depth, the events resulting in the find and the immediate steps taken to make the area safe in accordance with this Remediation Strategy.
- A pause of work in the area, ensuring contamination encountered cannot spread.
- A location plan showing the contamination and the cordoned off area.
- Photographs of the suspected contamination and cordoned off area.
- Details of sampling and testing carried out. This should include details of sampling and laboratory analysis, accredited laboratory certificates and associated information.
- A record of the assessment carried out and the proposed actions.
- Records of consultation with the planning/regulatory authority and additional measures agreed with the planning authority.
- Records of the implementation of the agreed actions and lines of evidence confirming it was dealt with.

Records should be maintained throughout the excavation works confirming the watching brief was implemented. This will include:

- Details of the responsible site manager.
- Level of attendance by the Environmental Consultant .
- Confirmation of inductions, tool box talks and briefings.
- Confirmation of asbestos awareness training.
- In the area(s) where no unexpected contamination was encountered, a written confirmation that the brief was undertaken and that nothing was identified.

If tanks are encountered, the verification report should include:

- Photographs and a description of the tanks, location and depth.
- A description and record, including photographs of the removal.
- Waste records and duty of care information (as described earlier in this plan).
- The results and assessment of testing of sides and base of excavation after removal of the tank.

Supplementary Ground Investigation

Details of the supplementary ground investigation completed, the results, and any changes required to the Remediation Strategy following completion of the supplementary ground investigation.

Cover Layers

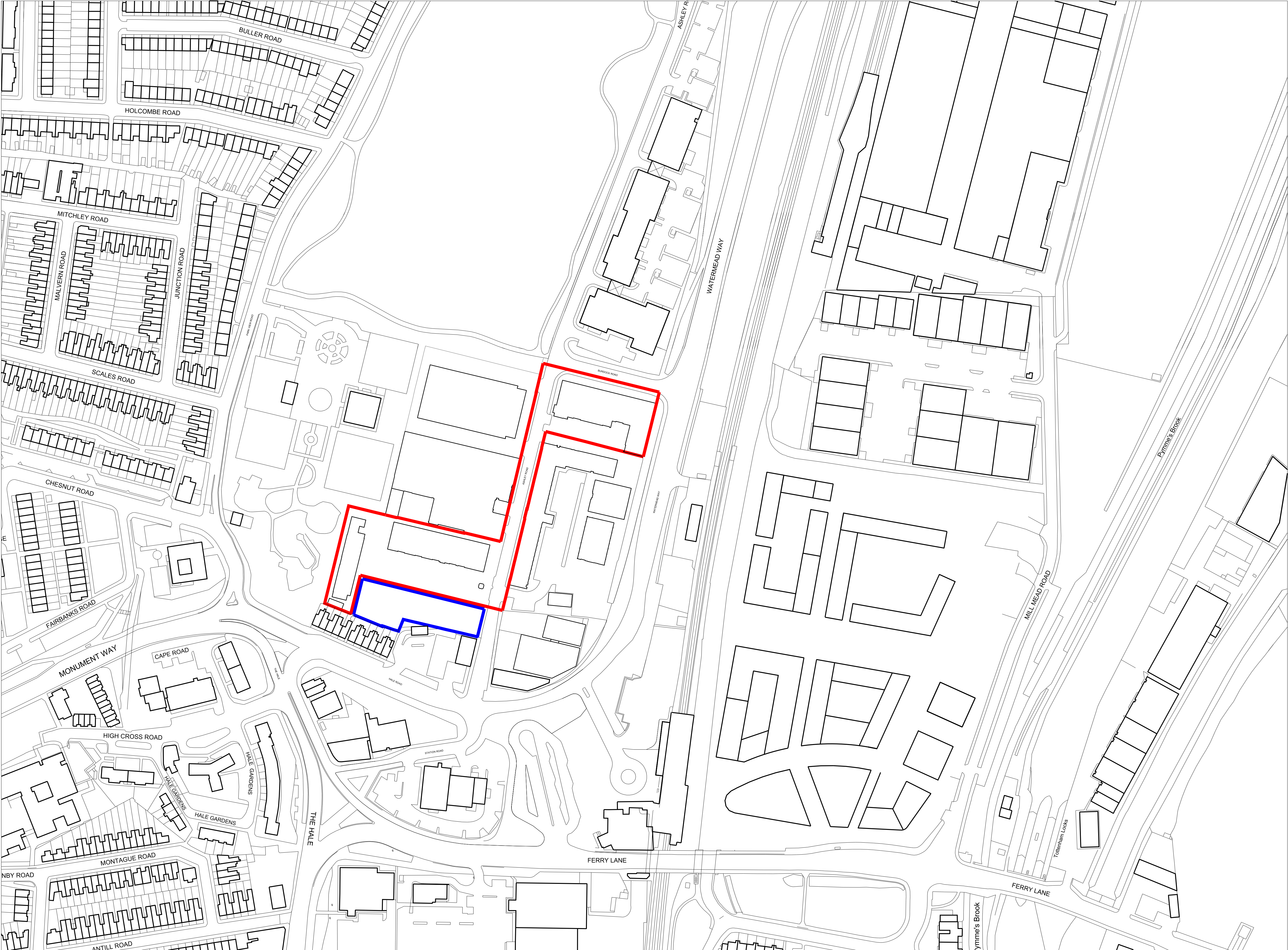
The Verification Report shall provide evidence confirming the placement of cover layers including;

- Photographs (with a scale) and plans demonstrating the thickness of soils placed.
- The volumes and chemical testing, with assessment against the relevant criteria.
- As-built survey plans (pre and post placement).



APPENDICES

A. Site Plans



Project Logo					
Notes					
Do not scale from this drawing.					
All dimensions are to be checked on site and any discrepancies noted in writing to the Project Manager.					
All dimensions are in millimeters unless noted otherwise.					
Rev.	Date	Description	Drawn	Checked	
A	17.10.16	Amended red line	LP	XA	

JOHN McASLAN + PARTNERS

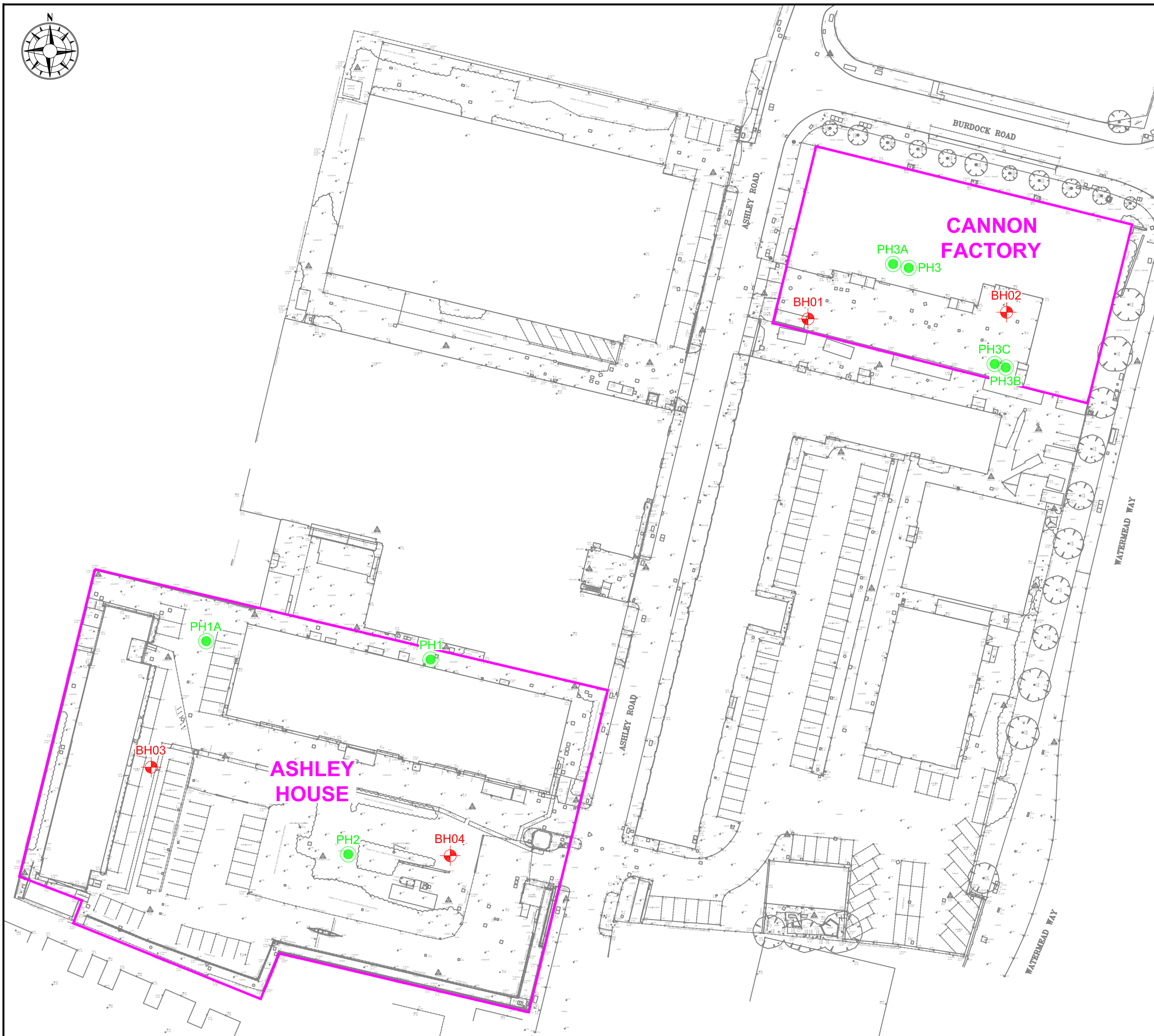
7-9 William Road
London NW1 3ER
T +44 (0)20 7313 6000
F +44 (0)20 7313 6001
www.mcaslan.co.uk

Architect
Landscape

Key Plan

Cannon Factory and Ashley House
Outline Planning Application
Site Location

Scale At A1:	1:1250	Job Number:	1824
Date:	12/10/2016	Drawing:	LP
Drawing Status:	FOR APPROVAL	Checked:	JL
Drawing Number:	1824-JMP-02-XX-DR-A-0001	Revision:	A



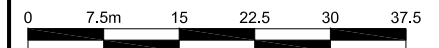
GENERAL NOTES

1. Reproduced from Lane & Frankham Limited's Drawing No. LF684-Ashley Road-Site Survey-01 & LF684-Ashley Road-Site Survey-02.
2. Hole Locations to National Grid Co-ordinate Reference System.

LEGEND TO SYMBOLS

- Borehole
- Window Sample

Scale: 1:750



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

AMENDMENTS

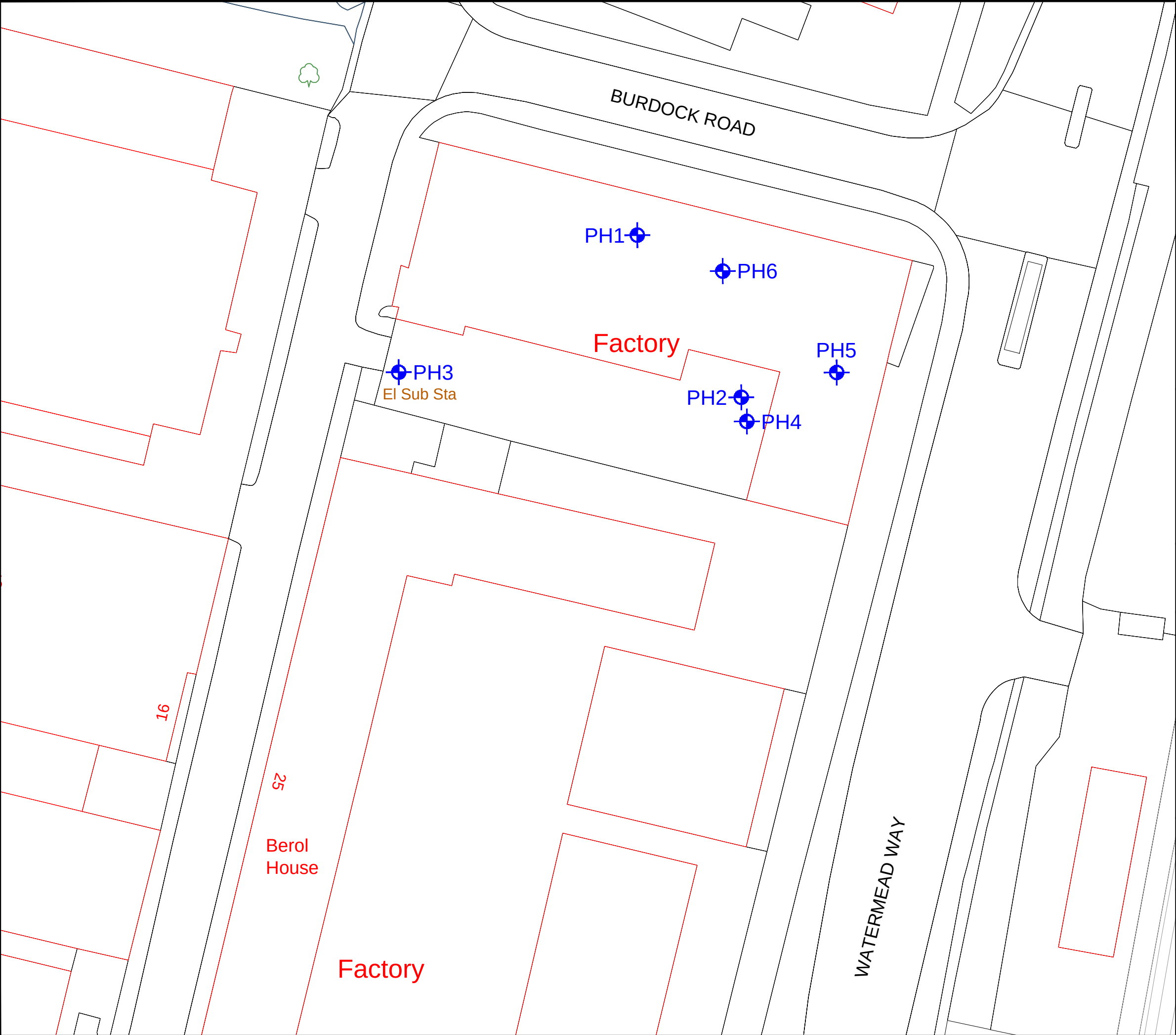
Title
EXPLORATORY HOLE LOCATION PLAN

Project
ASHLEY HOUSE & CANNON FACTORY, ASHLEY ROAD SOUTH, TOTTENHAM HALE, LONDON

Client
NOTTING HILL HOME OWNERSHIP LTD



Date	Drawn By	Approv. By
11/03/2019	BS	PK
Sheet Size	Scale	Project No
A3	1:750	D8061-18
Drawing No	Rev	
A2	0	



LEGEND

 Probehole Location

Rev.	Date	Amendment	Drawn	Chkd.	Appd.



18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT
United Kingdom

Tel: +44 (0) 1442 437500
Fax: +44 (0) 1442 437550
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client

NOTTING HILL HOUSING

Project Title

CANNON FACTORY,
ASHLEY ROAD,
TOTTENHAM HALE

Drawing Title

EXPLORATORY HOLE
LOCATION PLAN

Drawn	Date	Checked	Date	Approved	Date
RS	28.04.15	AL	28.04.15	AL	28.04.15

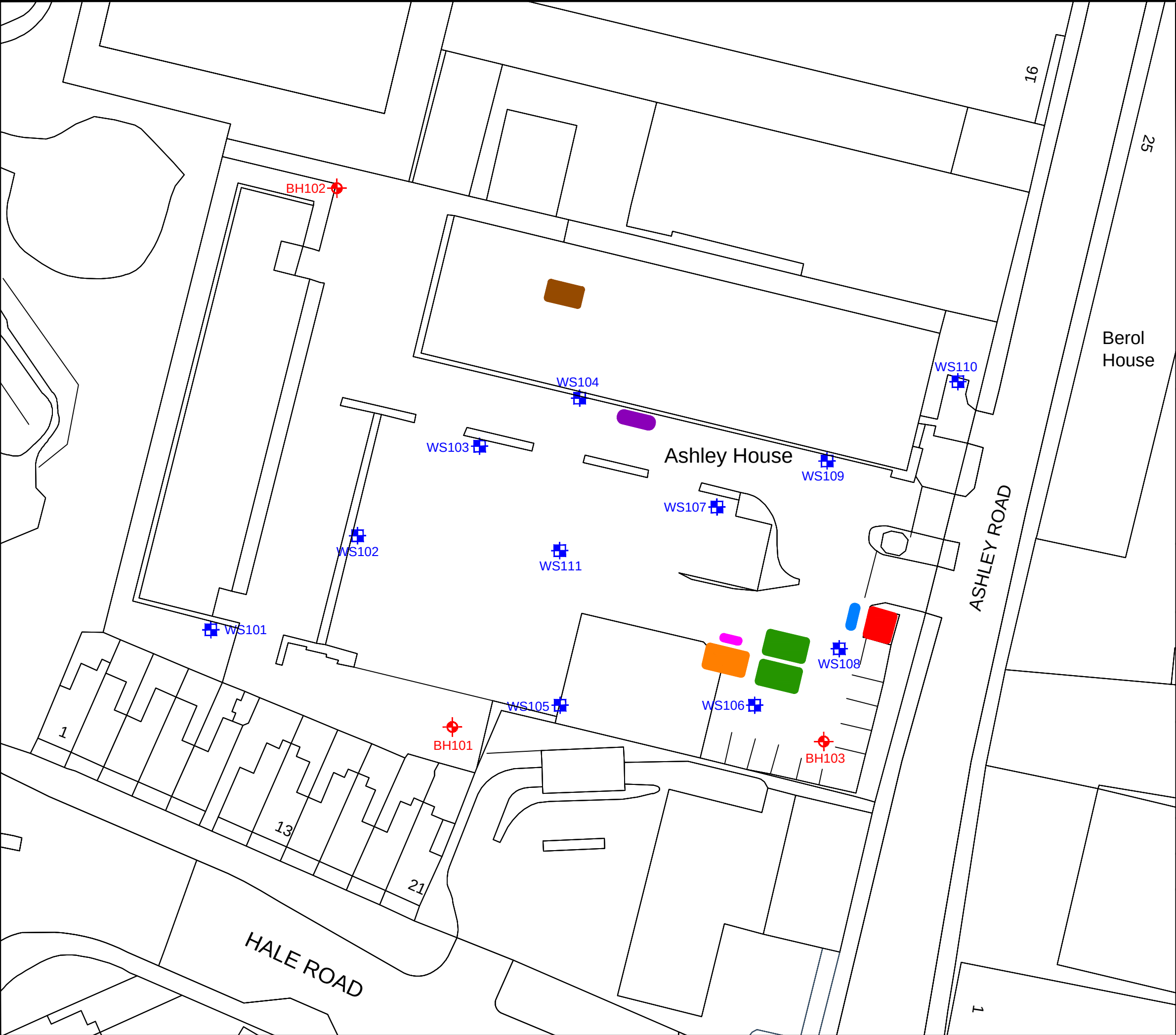
Scale	Orig Size	Dimensions
1:500	A3	m

Project No.	Drawing File
27782-1 (00)	27782 (R01-00).dwg

Drawing No.	Rev.
FIGURE 3	P1

Scale 1 : 500





LEGEND

Deep Borehole Location

Shallow Window Sample Location

Fuel Pumps

Weigh Bridge

Approximate Locations of Diesel Tanks

Effluent Tank

Waste Oil Tank

Electrical Substation

Interceptor

Rev.	Date	Amendment	Drawn	Chkd.	Appd.

18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT
United Kingdom

Tel: +44 (0) 1442 437500
Fax: +44 (0) 1442 437550
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client

NOTTING HILL HOUSING

Project Title

ASHLEY HOUSE,
TOTTENHAM HALE

Drawing Title

EXPLORATORY HOLE LOCATION
PLAN AND CURRENT POTENTIAL
SOURCES OF CONTAMINATION

Drawn	Date	Checked	Date	Approved	Date
RS	02.03.15	DA	02.03.15	DA	02.03.15

Scale	Orig Size	Dimensions
1:500	A3	m

Project No.	Drawing File
27663-1 (00)	27663 (R01-00).dwg

Drawing No.	Rev.
FIGURE 2	P1

Scale

0

5

10

15

20

25m

B. Cover Layer – Site Won

Cover layer material could include for example:

- Topsoil and subsoil in landscape area.
- Tree pits.
- Topsoil and subsoil placed in planters

All cover layer material (regardless of whether it is site-won or imported) must conform to the following general requirements:

- Be free of anthropogenic and deleterious material, including asbestos and gross contamination, such as oil free product, staining and odours.
- Meet the project landscaping specification requirements and conform to BS3882:2015 Specification for topsoil, including specific criteria for phytotoxic metals.
- Any recycled material should meet the WRAP Quality Protocol Aggregates from inert waste: End of waste criteria for the production of aggregates from inert waste, dated October 2013. As a minimum, the material should be tested for asbestos.

Proposed End Use	units	Public Open Space Close to Residential Housing (POS _{RESI})	Source
Arsenic	mg/kg	79	DEFRA C4SL
Beryllium	mg/kg	2.2	LQM S4UL
Boron (Water Soluble)	mg/kg	21000	LQM S4UL
Cadmium	mg/kg	220	DEFRA C4SL
Chromium (Total)	mg/kg	1500	LQM S4UL
Chromium (VI)	mg/kg	21	DEFRA C4SL
Copper ¹	mg/kg	200 (>7.0pH) 135 (6.0-7.0pH) 100 (<6.0)	BS3882:2015
Lead	mg/kg	630	DEFRA C4SL
Mercury	mg/kg	16	LQM S4UL
Nickel ¹	mg/kg	110 (>7.0pH) 75 (6.0-7.0pH) 60 (<6.0)	BS3882:2015
Selenium	mg/kg	1100	LQM S4UL
Vanadium*	mg/kg	2000	LQM S4UL
Zinc ¹	mg/kg	300 (>7.0pH) 200 (6.0-7.0pH) 200 (<6.0)	BS3882:2015
Aliphatic EC5 - EC6	mg/kg	1000 ²	Waterman ¹
Aliphatic EC6 - EC8	mg/kg	1000 ²	Waterman ¹

Proposed End Use	units	Public Open Space Close to Residential Housing (POS _{RESI})	Source
Aliphatic EC8-EC10	mg/kg	1000 ²	Waterman ¹
Aliphatic EC10-EC12	mg/kg	1000 ²	Waterman ¹
Aliphatic EC12-EC16	mg/kg	1000 ²	Waterman ¹
Aliphatic EC16-EC35	mg/kg	1000 ²	Waterman ¹
Aliphatic EC35-EC44	mg/kg	1000 ²	Waterman ¹
Aromatic C5-C7	mg/kg	1000 ²	Waterman ¹
Aromatic C7-C8	mg/kg	1000 ²	Waterman ¹
Aromatic C8-C10	mg/kg	1000 ²	Waterman ¹
Aromatic C10-C12	mg/kg	1000 ²	Waterman ¹
Aromatic C12-C16	mg/kg	1000 ²	Waterman ¹
Aromatic C16-C21	mg/kg	1000 ²	Waterman ¹
Aromatic C21-C35	mg/kg	1000 ²	Waterman ¹
Aromatic C35-C44	mg/kg	1000 ²	Waterman ¹
Benzene	mg/kg	72	LQM S4UL
Toluene	mg/kg	1000 ²	Waterman ¹
Ethyl Benzene	mg/kg	1000 ²	Waterman ¹
Xylene - m	mg/kg	1000 ²	Waterman ¹
Xylene - o	mg/kg	1000 ²	Waterman ¹
Xylene - p	mg/kg	1000 ²	Waterman ¹
Naphthalene	mg/kg	1000 ²	Waterman ¹
Acenaphthylene	mg/kg	1000 ²	Waterman ¹
Acenaphthene	mg/kg	1000 ²	Waterman ¹
Fluorene	mg/kg	1000 ²	Waterman ¹
Phenanthrene	mg/kg	1000 ²	Waterman ¹
Anthracene	mg/kg	1000 ²	Waterman ¹
Fluoranthene	mg/kg	1000 ²	Waterman ¹
Pyrene	mg/kg	1000 ²	Waterman ¹
Benzo(a)anthracene	mg/kg	29	LQM S4UL
Chrysene	mg/kg	57	LQM S4UL
Benzo(b)fluoranthene	mg/kg	7.1	LQM S4UL
Benzo(k)fluoranthene	mg/kg	190	LQM S4UL

Proposed End Use	units	Public Open Space Close to Residential Housing (POS _{RESI})	Source
Benzo(a)pyrene	mg/kg	5.7	LQM S4UL
Indeno(1,2,3-cd)pyrene	mg/kg	82	LQM S4UL
Di-benzo(a,h.)anthracene	mg/kg	0.57	LQM S4UL
Benzo(g,h,i.) Perylene	mg/kg	640	LQM S4UL
Asbestos ²	%	<0.001 and no visible fibres	Waterman

1 - 1,000mg/kg limit applied to ensure hazardous waste is not present and visual/olfactory contamination is absent.

C. Imported Material

All imported must conform to the following general requirements:

- Be free of anthropogenic and deleterious material, including asbestos and gross contamination, such as oil free product, staining and odours.
- Meet the project landscaping specification requirements and conform to BS3882:2015 Specification for topsoil, including specific criteria for phytotoxic metals where used within the cover layer.
- Any recycled material should meet the WRAP Quality Protocol Aggregates from inert waste: End of waste criteria for the production of aggregates from inert waste, dated October 2013. As a minimum, the material should be tested for asbestos.

Proposed End Use	units	Residential with plant uptake	Residential without plant uptake	Public Open Space Close to Residential Housing (POS _{RESI})
Arsenic	mg/kg	37	40	79
Beryllium	mg/kg	1.7	1.7	2.2
Boron (Water Soluble)	mg/kg	290	11000	21000
Cadmium	mg/kg	22	150	220
Chromium (Total)	mg/kg	910	910	1500
Chromium (VI)	mg/kg	21	21	21
Copper ¹	mg/kg	200 (>7.0pH) 135 (6.0-7.0pH) 100 (<6.0)	200 (>7.0pH) 135 (6.0-7.0pH) 100 (<6.0)	200 (>7.0pH) 135 (6.0-7.0pH) 100 (<6.0)
Lead	mg/kg	200	310	630
Mercury	mg/kg	1.2	1.2	16
Molybdenum	mg/kg	N/A	670	N/A
Nickel ¹	mg/kg	110 (>7.0pH) 75 (6.0-7.0pH) 60 (<6.0)	110 (>7.0pH) 75 (6.0-7.0pH) 60 (<6.0)	110 (>7.0pH) 75 (6.0-7.0pH) 60 (<6.0)
Selenium	mg/kg	250	430	1100
Vanadium*	mg/kg	410	1200	2000
Zinc ¹	mg/kg	300 (>7.0pH) 200 (6.0-7.0pH) 200 (<6.0)	300 (>7.0pH) 200 (6.0-7.0pH) 200 (<6.0)	300 (>7.0pH) 200 (6.0-7.0pH) 200 (<6.0)
Free Cyanide	mg/kg	26	N/A	N/A
Aliphatic EC5 - EC6	mg/kg	42	42	1000 ²
Aliphatic EC6 - EC8	mg/kg	100	100	1000 ²
Aliphatic EC8-EC10	mg/kg	27	27	1000 ²
Aliphatic EC10-EC12	mg/kg	130	130	1000 ²
Aliphatic EC12-EC16	mg/kg	1000 ²	1000 ²	1000 ²
Aliphatic EC16-EC35	mg/kg	1000 ²	1000 ²	1000 ²

Appendices

Remediation Strategy

Document Reference: WIE16248

WIE16248-100-S-1-1-3-RMS

Proposed End Use	units	Residential with plant uptake	Residential without plant uptake	Public Open Space Close to Residential Housing (POS _{RESI})
Aliphatic EC35-EC44	mg/kg	1000 ²	1000 ²	1000 ²
Aromatic C5-C7	mg/kg	70	370	1000 ²
Aromatic C7-C8	mg/kg	130	860	1000 ²
Aromatic C8-C10	mg/kg	34	47	1000 ²
Aromatic C10-C12	mg/kg	74	250	1000 ²
Aromatic C12-C16	mg/kg	140	1000 ²	1000 ²
Aromatic C16-C21	mg/kg	260	1000 ²	1000 ²
Aromatic C21-C35	mg/kg	1000 ²	1000 ²	1000 ²
Aromatic C35-C44	mg/kg	1000 ²	1000 ²	1000 ²
Benzene	mg/kg	0.087	0.38	72
Toluene	mg/kg	130	880	1000 ²
Ethyl Benzene	mg/kg	47	83	1000 ²
Xylene - m	mg/kg	59	82	1000 ²
Xylene - o	mg/kg	60	88	1000 ²
Xylene - p	mg/kg	56	79	1000 ²
Naphthalene	mg/kg	2.3	2.3	1000 ²
Acenaphthylene	mg/kg	170	1000 ²	1000 ²
Acenaphthene	mg/kg	210	1000 ²	1000 ²
Fluorene	mg/kg	170	1000 ²	1000 ²
Phenanthrene	mg/kg	95	1000 ²	1000 ²
Anthracene	mg/kg	1000 ²	1000 ²	1000 ²
Fluoranthene	mg/kg	280	1000 ²	1000 ²
Pyrene	mg/kg	620	1000 ²	1000 ²
Benzo(a)anthracene	mg/kg	7.2	11	29
Chrysene	mg/kg	15	30	57
Benzo(b)fluoranthene	mg/kg	2.6	3.9	7.1
Benzo(k)fluoranthene	mg/kg	77	110	190
Benzo(a)pyrene	mg/kg	2.2	3.2	5.7
Indeno(1,2,3-cd)pyrene	mg/kg	27	45	82
Di-benzo(a,h.)anthracene	mg/kg	0.24	0.31	0.57
Benzo(g,h,i.) Perylene	mg/kg	320	360	640
Asbestos ²	%	<0.001	<0.001	<0.001

2 - 1,000mg/kg limit applied to ensure hazardous waste is not present and visual/olfactory contamination is absent.



Appendices

Remediation Strategy

Document Reference: WIE16248

WIE16248-100-S-1-1-3-RMS

D. Detailed Ground Gas Assessment

Introduction

Calford Seaden on behalf of Notting Hill Genesis (client) instructed Waterman Infrastructure & Environment Limited (Waterman) to prepare a Detailed Ground Gas Risk Assessment for the Ashley House & Cannon Factory, Ashley Road South, Tottenham Hale, London (Site).

Previous ground investigations have identified the ground gas regime on the Ashley House as being Characteristic Situation 2 (CS2) in which ground gas protection measures are required in built structures. The purpose of this assessment is to undertake a critical review of the ground gas regime on the Ashley House site based on a detailed examination of the Site's environmental setting, ground conditions, surrounding land uses, and previous ground investigation results.

The report will conclude with an assessment of the Site's ground gas regime consistent with the approach detailed in CIRIA C665, and where required determination of the ground gas protection measures required to mitigate the risk to human health receptors.

The ground gas regime on the Cannon Factory has been identified as Characteristic Situation 1 (CS1) in which ground gas protection measures would not be required.

Proposed Development

Proposed buildings on the Ashley House site will comprise;

- A four storey building (Building 2) comprising 15 residential units above commercial units on the ground floor.
- A four to seven storey building (Building 2A) comprising residential units at ground floor alongside commercial units, and residential units on the floors above the ground floor.

Basements are not proposed.

A significant cut and fill is not proposed with finished levels generally remaining as existing.

Soft and hard landscaping will surround the buildings. Private soft landscaping is not proposed.

History

Historically the Ashley House site was a farm between 1850 – 1898 prior to becoming occupied by a multiple factories in 1913 (braid and bootlace factory, woollen factory and a pencil factory). In 1936 the Ashley House site was occupied by a printing ink and varnish factory which included various tanks chimneys and a water cooling tower. From 1972 to present the Site has remained as it currently exists.

Previous Site uses in which extensive fill would have likely occurred have not been identified.

Site Surroundings

Land uses historically in the surrounding area include recreational grounds, school, residential buildings, and works.

Landfills historical or current are absent in the surrounding area, with the closest landfill (historical/current) located 500m north east (Tottenham Marshes 1955 – 1962 – inert and industrial waste).

Ground Conditions

Geology generally encountered on-site is included in Table 1.

Appendices

Remediation Strategy

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WIE16248-100-S-1-1-3-RMS

Table 2: Site Geology

Stratum	Thickness (m)	Description
Made Ground	0.59 – 2.0	Sub-base underlain by a sandy gravelly clay with fragments of brick, concrete
Enfield Silt Member	1.10 – 1.27	Orangish/yellowish brown slightly sandy gravelly CLAY
Kempton Park Gravel Member	1.14 – 3.50	Orangish brown very gravelly SAND to very sandy GRAVEL.
London Clay Formation	15.0	Grey and dark brown CLAY

Thin granular Made Ground deposits is present on-site consistent with the Site's history in which multiple phases of redevelopment or land raising has not occurred. The Site retains the current layout as observed in the 1972 historical maps when the Site was first developed. The Made Ground on-site is therefore associated with the construction of the existing development and is a minimum of 50 years old. Given the age of the Made Ground all readily degradable material would have degraded.

Ground Gas Regime

As identified in the CL:AIRE 2012 RB17 guidance document and CIRIA C665 ground gases only pose a risk to developments when the following can be satisfied, which is in line with source – pathway – receptor model followed by CLR11.

- An accumulation of a **large volume** of gas in the ground in or near the buildings (source).
- A pathway that allows gas to migrate through and/or out of the ground into a building or other structure sufficiently quickly to allow it to build up inside the building (pathway).
- A confined space within the building or structure where gas can build up to unacceptable levels (receptor).

In order for a risk from ground gases a source – pathway – receptor linkage needs to be present. This requires a sufficient quantity of gas to pose a hazard and one or more pathways by which it may cause significant harm to people. Crucially it is the quantity/volume of gas present within the soil/Made Ground matrix which should be considered a risk and not the gas concentration present in the ground (or monitoring well) which is commonly mistaken as posing a risk to future Site users.

Within this report the source – pathway – receptor linkage will be tested through a detailed site specific review of the Site's environmental setting, ground investigation results and the built structure present on-site. The report will conclude with an assessment into what the Site's ground gas regime is and whether ground gas protection measures consistent with BS8485 2017+2019 are required.

Ground Gas Source

A review of the Site's environmental setting identifies an absence of significant ground gas generating sources. Landfills identified as being representative of a significant ground gas generating source are absent on-site and in the surrounding area, and the Site is not in a coal mining area. Made Ground on-site is a relatively thin deposit (0.59 – 2.0m thick) and generally inert, with fragments of brick and concrete making up the anthropogenic fragments. A qualitative assessment of the Made Ground records it as being unlikely to represent a significant ground gas generating source.

As identified in the 2019 Geoff Card, James Lucas, and Steve Wilson, Technical Paper: Risk and Reliability in Gas Protection Design – 20 years on: Part 1, and the 2018 Ambisense and Environmental Protection Group, Using Ternary Plots for Interpretation of Ground Gas Monitoring Results river terrace gravels (Kempton Park Gravel Member, Enfield Silt Member) may contain small quantities of organic matter, which may degrade locally when exposed to oxygen generated during installation of boreholes. However, the rate of gas generation in these circumstances and the volume produced is extremely small and would not represent a risk to structures. The Kempton Park Gravel Formation or Enfield Silt Member would therefore not represent a significant ground gas generating source.

Off-site ground gas sources should only be considered a risk where a significant ground gas generating source is present. A review of historical maps identifies historical land uses similar to those present on-site or residential uses. The surrounding land uses are therefore likely to have a similar Made Ground composition and unlikely to represent a significant ground gas generating source.

Preferential pathways from an off-site significant ground gas generating source have not been identified.

The proposed Development will incorporate the following elements;

- Stripping of the existing hardstanding and sub-base;
- Excavation of the foundation pads and strip footings

The above actions completed as part of the proposed Developments construction will remove a portion of the Made Ground, decreasing the quantum of Made Ground on-site post development completion. The Site's level will be increased using crushed concrete and would therefore not represent a significant ground gas generating source. New ground gas sources will therefore not be introduced onto Site.

Six ground gas monitoring rounds have been completed on the Ashley House site, 4No as part of the 2019 Socotec ground investigation and 2No. as part of the 2015 RSK ground investigation. The ground gas monitoring results from the 6No monitoring rounds are included in Table 3.

Table 3: Ground gas monitoring results – RSK 2015

Borehole	Round 1			Round 2		
	Flow (l/hr)	Carbon Dioxide (%)	Methane (%)	Flow (l/hr)	Carbon Dioxide (%)	Methane (%)
BH101	0.2	1.7	<0.1	<0.1	0.3	<0.1
BH102	NM	NM	NM	0.1	0.3	<0.1
BH103A	NM	NM	NM	0.1	0.1	<0.1
WS101	0.4	2.1	16.3	<0.1	1.0	3.7
WS104	-0.5	3.6	<0.1	0.1	2.1	<0.1
WS107	-0.4	2.5	<0.1	<0.1	2.4	<0.1
WS108	0.3	0.1	<0.1	-0.1	0.3	<0.1
WS109	0.2	2.7	<0.1	<0.1	0.8	<0.1

Table 4: Ground gas monitoring results – Socotec 2019

Appendices

Remediation Strategy

Document Reference: WIE16248

WIE16248-100-S-1-1-3-RMS

Round	BH3			BH4		
	Flow (l/hr)	Carbon Dioxide (%)	Methane (%)	Flow (l/hr)	Carbon Dioxide (%)	Methane (%)
07/04/2019	<0.1	<0.1	<0.1	<0.1	0.7	<0.1
21/04/2019	<0.1	2.3	<0.1	<0.1	1.2	<0.1
24/04/2019	<0.1	2.7	<0.1	<0.1	0.2	<0.1
22/05/2019	<0.1	5.2	<0.1	<0.1	1.9	<0.1

The ground gas monitoring results are consistent with the absence of a significant ground gas source on-site or in the surrounding area. Methane concentrations and the gas flow rate are very low and commonly below the equipment's detection limit, and carbon dioxide is consistent with concentrations from the river terrace gravels (Enfield Silt Member and Kempton Park Gravel Member) in which concentrations up to 21% are not uncommon (EPG 2018 Ternary Plot Guidance, and CIEH 2009, Local Authority Guide to Ground Gas).

In the Kempton Park Gravel Formation and Made Ground in which low concentrations of readily degradable organic matter is present the carbon dioxide is generated through microbial/geochemical processes at very slow rates such they would not be emitted at the ground surface in sufficient quantities to pose a risk to built structures/future Site users. The installation of a monitoring well also temporarily exaggerates the microbial action through introducing oxygen into the sub-surface immediately surrounding the well, allowing enhanced degradation of the small volumes of organic material present in the Made Ground for a short time period. The presence of very low flow rates further confirms the above process in which carbon dioxide is being generated and emitted at very low rates.

Methane above the limit of detection was recorded solely in WS101. During the first monitoring round methane decreased from 18.7% at the start of the monitoring to 16.3% after 3 minutes. During the second monitoring round a decrease in methane from 20.9% to 3.7% after 10 minutes. The decrease in methane concentrations over the monitoring periods identifies a methane source with a small reservoir of readily degradable material rather than a large methane source as would be present at a landfill for example which would have large reservoir of readily degradable material. A review of the exploratory hole log for WS101 records Made Ground to 1.8m comprising 0.2m of concrete, 0.4m of sub-base, 1.2m of black silty sandy gravelly clay, underlain by the Kempton Park Gravel Member to base of exploratory hole. Between 1.2mbgl and 1.8mbgl black oil is identified in the sandy pockets and is the likely cause behind the high methane concentrations.

Petroleum hydrocarbons degrade and produce methane at very slow rates such hazardous rates of surface emissions are unlikely in the long term, the volume of methane produced is low but sufficient to cause high concentrations in the monitoring well. The absence of high flow rates in WS101 and on-site is further evidence the methane is being produced at a very slow rate. The high methane to low carbon dioxide ratio is consistent with the degradation of methane rather than interference with the meter. The gas from hydrocarbon degradation can become trapped below impermeable layers over time and if below the water table the pockets can become pressurised. There is no significant risk in the long term (because the volumes of gas are typically small). However they can present a short term health and safety hazard during construction if they are penetrated. Typically where a pocket is punctured, the gas pressure will dissipate over a few days. Given the above, the methane recorded in WS101 is unrepresentative of the ground gas regime on-site and is not evidence of a long term of high surface emissions risk, and will not be considered further.

The ground gas results from the monitoring completed have been included in a ternary plot (Figure

Appendices

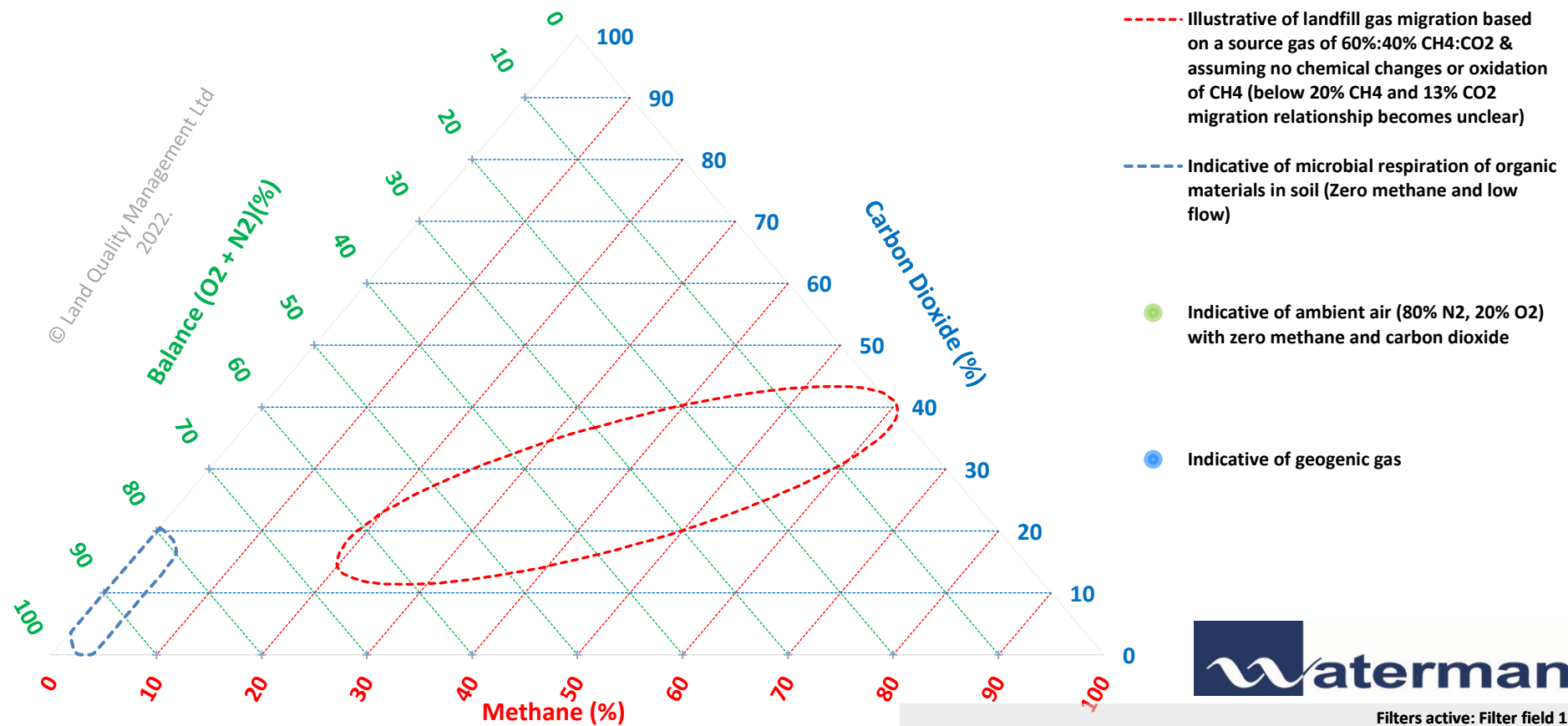
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2) to further characterise the ground gas source and identify whether a significant ground gas risk is present/absent. The Ternary Plot identifies ground gas consistent with the microbial respiration of organic materials in soil, in which a low flow and low volume of ground gas is present.

Figure 2: Ternary Plot Ground Gas Results



Appendices

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Source Conclusion

A review of the Site's environmental Site setting identifies an absence of a significant ground gas source as being present on-site or off-site in the surrounding area. Made Ground is largely inert with a low organic matter content and has a maximum thickness of 2.0m. Landfills which would be a significant ground gas generating source are absent on-site or in the surrounding area, and the Site is not located in a coal mining area.

Pathway

For a risk to a human health receptor from ground gas risk there must be sufficient flow from the ground gas in the sub-surface environment into an enclosed space. The permeability of soil should therefore be considered when determining the potential for ground gas to reach the surface and migrate into a building. The empirical Gas Screening Values (GSV) included in the BS8485:2015+A1:2019 developed by correlations considered by Peckson (1985) did not account for permeability leading to the GSV used being highly conservative due to the absence of permeability which could have significant attenuation factor on ground gas migration.

Made Ground on-site has been recorded as comprising a predominately cohesive deposit with varying proportions of sand/gravel, in addition to anthropogenic material inclusions. The Made Ground would have a permeability in the region of $2.2 \times 10^{-5} \text{ m/s}$ (Environment Agency, SR3 2009), which would restrict the vertical migration of ground gases and would be resistant to pressure driven flows as caused by atmospheric pressure drops.

The proposed Development will incorporate a 250mm thick cast in-situ ground bearing reinforced floor slab with minimal penetrations. The ground floor slab will be tanked with a waterproof membrane with a minimum 200 gauge thickness. The cast in-situ ground bearing floor slab and membrane would restrict ground gas ingress and provide effective restriction of ground gas migration through it.

Receptor

The Development is residential led with buildings up to seven storeys, commercial is predominately located at ground floor with limited residential in Building 2A at ground floor. In areas of commercial use relatively high levels of ventilation will be present limiting the potential for ground gases to accumulate and the risk posed by ground gases to future human health receptors.

Conclusions

A review of the Site's environmental setting, which has been confirmed through completion of ground gas monitoring has not identified significant ground gas generating sources as being present on-site or in the surrounding area.

A review of the possible pathways and receptors identifies a 250mm thick cast in-situ ground bearing floor slab which would restrict the vertical migration of residual ground gas into the building, and a built structure which would inherently restrict the migration of ground gases into the proposed Development.

Following the detailed review of the Site's ground gas regime in-line with the recent guidance the Source – Pathway – Receptor linkage for the Site is broken primarily through removal of a ground gas source. The requirement for ground gas protection measures including ground gas membranes in the proposed Development would not be required.

Appendices

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Recommendations

- Ground gas protection measures would not be required in the completed developments;
- During construction works a watching brief should be maintained during excavations. Should Made Ground which would not be removed be encountered as part of the development construction which differs substantially from that identified in previous ground investigations either in appearance or thickness, works should cease and the environment consultant notified. The environmental consultant should assess the Made Ground encountered and its ground gas generation potential and determine whether there is a requirement for ground gas protection measures. The assessment of the Made Grounds ground gas generation potential, and determination of the requirement for ground gas protection measures should be agreed with the regulatory authority prior to implementation.

Appendices

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UK and Ireland Office Locations

