

Phase 1 & 2 Desk Study & Ground Investigation  
157-159 Hornsey Park Road, Wood Green



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Contract No./Report Type: 22-009/P1&P2  
Produced for Trinity International Properties Limited

# AG Geo-Consultants Ltd

| Report Title                                  |
|-----------------------------------------------|
| Phase 1 & 2 Desk Study & Ground Investigation |

| Project                               | Project No./Report Type |
|---------------------------------------|-------------------------|
| 157-159 Hornsey Park Road, Wood Green | 22-009/P1&P2            |

| Client Name                              |
|------------------------------------------|
| Trinity International Properties Limited |

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## Executive Summary

| Client                                 | Trinity International Properties Limited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------|--------|--------------------------|--|------------------------|-----|--------|--------------------------|---|--------------|--------------------------------------------|-----------------------------|------|------|--------------------------------------------------------------------|--------------------------|--------------|-------------|----------------------------------------|-----------------------|------------|-----------------------------|--------------------------------------------------------------------------|----------------------------------------|------------------|------------------|---------------------------------------------------------------------------------------|--------------------|---------------------------------------|--------------|-----------------------------------------------------------------------|
| Site and Location                      | 157-159 Hornsey Park Road, Wood Green.<br>Approximate postcode = N8 0JX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| Proposed Development                   | Demolition of existing structures and erection of two buildings to provide residential units and Class E floorspace; and provision of associated landscaping, a new pedestrian route, car and cycle parking, and refuse and recycling facilities. Some gardens are planned.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| Client Brief                           | Undertake Phase 1 and 2 investigations and test for contamination .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| History of Site & Surroundings         | <p><b>On Site</b><br/>Buildings then a <b>coach works</b>, then unlabeled buildings. A stream became culverted along the site's western boundary. Currently a warehouse and breakers yard.</p> <p><b>In the Surroundings</b><br/>Residences and fields with gas works to the far south. Later a gas holder appears, abutting the site. Currently residences, a car park and the old gas holder.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| Ground Conditions                      | <p><u>BGS Mapping Suggests:</u></p> <ul style="list-style-type: none"> <li>• <b>Drift Deposits:</b> None</li> <li>• <b>Solid Geology:</b> London Clay (LC)(silt &amp; clay).</li> <li>• <b>The nearest BGS boreholes suggests</b> 0.3m of made ground, over firm clay to ~5m, then stiff clay, becoming stiffer with depth.</li> <li>• <b>Fault Lines:</b> None lie significantly close enough to the site.</li> </ul> <p>Our work found:</p> <table border="1"> <thead> <tr> <th rowspan="2">Strata</th><th colspan="2">Depth Encountered (mBGL)</th><th rowspan="2">Description &amp; Comments</th></tr> <tr> <th>Top</th><th>Bottom</th></tr> </thead> <tbody> <tr> <td><b>MG:</b> Concrete slab</td><td>0</td><td>0.05 to 0.22</td><td>Reinforced in DS4.<br/>Weak in DS6 and DS7.</td></tr> <tr> <td><b>MG:</b> black sand &amp; ash</td><td>0.05</td><td>0.90</td><td>DS5 only.<br/>With slate fragments and a brick layer at 0.6m depth.</td></tr> <tr> <td><b>MG:</b> gravel &amp; sand</td><td>0.10 to 0.15</td><td>0.45 to 0.6</td><td>Anthropogenic components= brick rubble</td></tr> <tr> <td><b>MG:</b> Brown clay</td><td>0.2 to 0.6</td><td>0.60, 0.70,<br/>&gt;.1.10, 1.70</td><td>Anthropogenic components= brick fragments and earthenware pipe fragments</td></tr> <tr> <td><b>Head Deposits;</b><br/>Clayey gravel</td><td>0.50, 0.60, 1.70</td><td>1.40, 1.50, 2.10</td><td>Only in DS1, DS2 &amp; DS3.<br/>Loose to medium dense, brown clayey fine to coarse gravel.</td></tr> <tr> <td><b>London Clay</b></td><td>0.50, 0.70, 0.90,<br/>1.40, 1.50, 2.10</td><td>&gt;5 (DS1-DS4)</td><td>Firm becoming stiff, then very stiff, brown and grey, very silty CLAY</td></tr> </tbody> </table> |                             |                                                                                       | Strata | Depth Encountered (mBGL) |  | Description & Comments | Top | Bottom | <b>MG:</b> Concrete slab | 0 | 0.05 to 0.22 | Reinforced in DS4.<br>Weak in DS6 and DS7. | <b>MG:</b> black sand & ash | 0.05 | 0.90 | DS5 only.<br>With slate fragments and a brick layer at 0.6m depth. | <b>MG:</b> gravel & sand | 0.10 to 0.15 | 0.45 to 0.6 | Anthropogenic components= brick rubble | <b>MG:</b> Brown clay | 0.2 to 0.6 | 0.60, 0.70,<br>>.1.10, 1.70 | Anthropogenic components= brick fragments and earthenware pipe fragments | <b>Head Deposits;</b><br>Clayey gravel | 0.50, 0.60, 1.70 | 1.40, 1.50, 2.10 | Only in DS1, DS2 & DS3.<br>Loose to medium dense, brown clayey fine to coarse gravel. | <b>London Clay</b> | 0.50, 0.70, 0.90,<br>1.40, 1.50, 2.10 | >5 (DS1-DS4) | Firm becoming stiff, then very stiff, brown and grey, very silty CLAY |
| Strata                                 | Depth Encountered (mBGL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             | Description & Comments                                                                |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
|                                        | Top                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Bottom                      |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| <b>MG:</b> Concrete slab               | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.05 to 0.22                | Reinforced in DS4.<br>Weak in DS6 and DS7.                                            |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| <b>MG:</b> black sand & ash            | 0.05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.90                        | DS5 only.<br>With slate fragments and a brick layer at 0.6m depth.                    |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| <b>MG:</b> gravel & sand               | 0.10 to 0.15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.45 to 0.6                 | Anthropogenic components= brick rubble                                                |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| <b>MG:</b> Brown clay                  | 0.2 to 0.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.60, 0.70,<br>>.1.10, 1.70 | Anthropogenic components= brick fragments and earthenware pipe fragments              |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| <b>Head Deposits;</b><br>Clayey gravel | 0.50, 0.60, 1.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1.40, 1.50, 2.10            | Only in DS1, DS2 & DS3.<br>Loose to medium dense, brown clayey fine to coarse gravel. |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| <b>London Clay</b>                     | 0.50, 0.70, 0.90,<br>1.40, 1.50, 2.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | >5 (DS1-DS4)                | Firm becoming stiff, then very stiff, brown and grey, very silty CLAY                 |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| Hydrogeology & Hydrology               | <p><b>Watercourses:</b> One now culverted along the site's western boundary.</p> <p><b>Aquifers:</b> Unproductive strata.</p> <p><b>Groundwater:</b> All of the (up to 5m deep) holes were dry during their formation.</p> <p><b>Source Protection Zones (SPZ):</b> Zone 1.</p> <p><b>Abstractions:</b> not checked.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |
| Geotechnical Considerations            | <p><b>Excavations</b></p> <ul style="list-style-type: none"> <li>• Temporary excavations in the made ground and some of the (granular) Head Deposits are not expected to stand unsupported in the short term.</li> <li>• Unlikely that shallow excavations will encounter significant groundwater, but any should be controllable by sump pumping. Excavations close to the culvert could encounter deep made ground and possible fast water ingress.</li> <li>• Should be possible with conventional earthmoving plant although pneumatic tools are likely to be required to break out existing foundations, etc.</li> </ul> <p><b>Foundations &amp; Ground Floor Slabs</b></p> <ul style="list-style-type: none"> <li>• The London Clay should be taken as having <b>high volume change potential</b>.</li> <li>• The made ground (of 0.5m to 1.7m proven thickness) is unsuitable to bear within.</li> <li>• We recommend foundations found no shallower than 1.0m.</li> <li>• The proposed 2-storey building could found in firm to stiff (<math>C_u \geq 80\text{kPa}</math>) London Clay lying at ~1-2m depth (or in the overlying natural sands and gravels) using an allowable bearing pressure of 190kPa and 0.45m wide strip footings.</li> <li>• Depending on loads, 5- to 6- storey buildings could found in firm to stiff (<math>C_u \geq 80\text{kPa}</math>) London Clay lying at ~2m depth using an allowable bearing pressure of 200kPa and 1m wide strip footings.</li> </ul>                                                                                                                                                                                                                     |                             |                                                                                       |        |                          |  |                        |     |        |                          |   |              |                                            |                             |      |      |                                                                    |                          |              |             |                                        |                       |            |                             |                                                                          |                                        |                  |                  |                                                                                       |                    |                                       |              |                                                                       |



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Phase 1 & 2 Desk Study & Ground Investigation  
157-159 Hornsey Park Road, Wood Green

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|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | <p>Founding at ~3mbegl could permit 0.6m wide strips. However, due to the proximity to trees, trench widths &amp; depths, concrete volume and large amounts of surplus soil arisings, then such buildings would be better piled.</p> <ul style="list-style-type: none"> <li>Suspended slabs are recommended.</li> </ul> <p><b>Drainage</b></p> <ul style="list-style-type: none"> <li>Soakage testing has not been carried out as part of this investigation, due to the impermeable nature of the London Clay under the site. Standard soakaways are unlikely to be feasible.</li> </ul> <p><b>Ground Aggressivity to Buried Concrete</b></p> <ul style="list-style-type: none"> <li>Design Sulphate Classes increase with depth from DS-2 to DS-4 and ACEC classes increase with depth from AC-1s to AC-3s.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Contamination Considerations              | <ul style="list-style-type: none"> <li>Anthropogenic components of the made ground comprise fragments of brick and rare bits of earthenware pipe.</li> <li>Apart from an ashy layer in DS5, there were no visual or olfactory indications of contamination.</li> <li>There are significantly elevated concentrations of Lead and PAHs in the soil across the whole site, vs Human Health. The driver for risk from the sols is Dibenzo(ah)anthracene where the results are 4.6x to 13.3x the <i>residential with plant uptake</i> guidelines.</li> <li>No significant risks to plants, nor groundwater have been found on site.</li> <li>PE and PVC water supply pipes should be acceptable.</li> </ul> <p><b>Ground Gases, Radon and Chemical Vapours</b></p> <ul style="list-style-type: none"> <li>There is no ground gas risk.</li> <li>No protection is required for Radon and chemical vapours (but see hotspots below).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Strategy for Remediation & Risk Reduction | <p>The investigation has revealed the development site to only exhibit a risk from soil contamination, with such contamination being the same type and degree as found on most urban brownfield sites. Such risks are easily remedied and therefore this report concludes that the principle of residential development is a suitable use for the site in terms of contamination.</p> <ul style="list-style-type: none"> <li>No remediation is required.</li> <li>For the garden and landscaping area, a “clean cover” layer should be placed over <b>any made ground that remains in place</b>. If, to accommodate the clean cover, all made ground gets removed, then the clean cover layer is not required and only a growing medium layer is required. If food crops/fruit trees could be planted in the above area, then the <b>clean cover layer needs to be 0.54m thick</b>. If there will just be landscaping areas with no food crops/fruit trees, <b>then clean cover can reduce to 0.3m thickness</b>.</li> <li>No long-term monitoring and maintenance of remediation is required.</li> <li>A watching brief should be kept for any unforeseen/unsuspected contamination. If such is found, then work should stop and a competent person should be contacted for advice and assessment.</li> <li>An example of this is that <b>hotspots could be found when the breakers yard is cleared</b> of cars and scarp and when the concrete surfacing is removed. Such could pose a risk to the watercourse within the culvert. For this reason and for water supply pipes, hotspots should be removed.</li> <li>The coach works could have had vehicle service pits and sometimes waste oils were poured into these when the pits were no longer required.... causing potential hotspots.</li> <li>Any recycled aggregates that are planned to be imported to site, should be assessed for contamination (especially asbestos) prior to import and relevant records retained for validation purposes.</li> <li>Topsoil and subsoil should be assessed for contamination prior to import.</li> <li>Site, landscape and maintenance workers should wear gloves, boots and overalls and wash their hands before eating, drinking and smoking. Excessive dust generation should be avoided.</li> <li>Given the former usage of the site then excavations or below ground voids should be checked for the presence of harmful gases and vapours prior to personnel entry.</li> </ul> |
| Waste Advice                              | <p>The chemical test results should be given to the waste disposal site for classification, along with the exploratory hole logs to show which soils are natural and which are man-made. WAC tests will be required.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

***This is only a summary and should not be read in isolation from the main text.***

# AG Geo-Consultants Ltd

Phase 1 & 2 Desk Study & Ground Investigation  
157-159 Hornsey Park Road, Wood Green

## 1 Introduction

### 1.1 Introduction and Brief

AG Geo-Consultants Ltd (AGGC) were commissioned by Orbital Development on behalf of Trinity International Properties Limited (the Client) to produce a Phase I & II Desk Study and Ground Investigation report for a site known as 157-159 Hornsey Park Road, Wood Green, N8 0JX (the "Site") (see location plan in Appendix A).

The client's brief was to:

- Undertake Phase 1 and 2 investigations and test for contamination.

### 1.2 Proposed Development

The outline development comprises demolition of existing structures and erection of two buildings to provide residential units and Class E floorspace; and provision of associated landscaping, a new pedestrian route, car and cycle parking, and refuse and recycling facilities. Some gardens are planned.

### 1.3 Scope of Works

The client accepted AGGC's proposed detailed scope of work for the Phase 1 Desk Study and Phase 2 investigation (based on the findings of the desk study). The scope was designed to identify primarily foundation requirements and if any significant contamination could exist across the site, with recommendations on remediation measures considered necessary should any material contamination risks be identified.

The objectives of the work were to determine the sub-surface conditions in respect of:

#### **Contamination/Environmental**

- Contamination assessment to consider potential significant pollutant linkages arising from the historic land uses on and off site.

#### **Geotechnical Engineering**

- Likely foundations for proposed structures.
- Likely ground floor slab types.

This report should be submitted to the LPA to satisfy the relevant planning conditions, but also to seek their no objection to the potential employment of the CL:AIRE *Definition of Waste Code of Practice* (DoWCoP) at the site (i.e. transfer of surplus natural soils to other development sites for reuse) (see Section 7.2.3).

### 1.4 Limitations

The client reduced our planned scope of works from 2 days on site, to 1 day, and as such we had a time constraint upon us.

This report is provided for the benefit only of the party to whom it is addressed and their advisors. We do not accept responsibility to any other third party for the whole or any part of the contents and we exercise no duty of care in relation to this report to any third party.

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Where intrusive investigations have been completed, information, comments and opinions given in this report are based on the ground conditions encountered during the site work and on the results of laboratory and field tests performed during the investigation. However, subsoils are inherently variable and hidden from view such that no investigation can be exhaustive to the extent that all soil conditions are revealed. Conditions may therefore be present beneath the site that were not apparent in the data reviewed as part of this assessment. In particular, it should be noted that groundwater levels vary due to seasonal and other effects and may at times differ to those measured during the investigation.

This assessment has been based to some extent on data acquired from Third Parties. This data has been accepted as correct and has not been subjected to any additional validation.

Unless specifically noted to the contrary, it should be assumed that this report has not been submitted to any other regulatory authorities for approval. Redevelopment sites in particular may have planning conditions attached in respect of contaminated land assessment. Where we are made aware of such conditions in advance of scoping the works, we can tailor the report to the regulatory authority requirements. Where we are not made aware of any such requirements there can be no certainty that our investigation will meet any or all of the regulatory authority requirements.



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## 2 Phase 1 Desk Study (Inc Preliminary Risk Assessment)

### 2.1 Desk Study

Table 2.1 Desk Study

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Planning conditions                  | We have inspected the planning portal and found no planning application yet. The <b>NPPF</b> reminds developers that they are responsible for providing developments that are free of significant risks (both contamination and geotechnical). Furthermore, there are ground assessment requirements within <b>Building Regulations</b> .                                                                                                                                                                                                                                     |
| Current Use of Site and Surroundings | <b>On Site</b><br>Warehouse and small breakers yard.<br><b>In the Surroundings</b><br>Residences, car park and old gas holder.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Anticipated Ground Conditions        | <u>BGS Mapping Suggests:</u> <ul style="list-style-type: none"> <li>• <b>Made ground (MG):</b> None shown on or near to the site.</li> <li>• <b>Drift Deposits:</b> None</li> <li>• <b>Solid Geology:</b> London Clay (LC)(silt &amp; clay).</li> <li>• <b>The nearest BGS boreholes suggests</b> 0.3m of made ground, over firm clay to ~5m, then stiff clay, becoming stiffer with depth.</li> <li>• <b>Fault Lines:</b> None lie significantly close enough to the site.</li> </ul> <u>Other</u><br>From our significant experience, we'd expect ~1-2m of man-made ground. |
| Hydrology and Hydrogeology           | <b>Watercourses:</b> One now culverted along the site's western boundary.<br><b>Aquifers:</b> Unproductive Strata<br><b>Groundwater:</b> expected to lie at >7m depth.<br><b>Source Protection Zones (SPZ):</b> Zone 1.<br><b>Abstractions:</b> not checked.                                                                                                                                                                                                                                                                                                                  |
| Historical Site Use                  | <b>On Site</b><br>Buildings then a <b>coach works</b> , then unlabeled buildings. A stream became culverted along the site's western boundary.<br><b>In the Surroundings</b><br>Residences and fields with gas works to the far south. Later a gas holder appears, abutting the site, but beyond the watercourse.                                                                                                                                                                                                                                                             |
| Aerial Photographs                   | Nothing significant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Landfills?                           | No licensed ones shown on or significantly near to the site.<br>No other potential unlicensed landfilling is evident.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Potential UXO Risk?                  | <b>Possible.</b> From a basic map search, the Site is assessed as <b>low to moderate</b> risk of UXO being present.<br><b>Bomb Map:</b> no bomb strikes shown near to the site.                                                                                                                                                                                                                                                                                                                                                                                               |
| Potential Ground Risks               | The following <b>Contaminated Land Type</b> risks could exist, which we recommend further assessment of: <ul style="list-style-type: none"> <li>• <b>Made ground.</b></li> <li>• <b>Former site usage as coach works then breakers.</b></li> </ul> The <b>gasworks</b> are not considered a significant risk due to the underling London Clay and the stream that would intercept any pathways to our site.<br>There is no significant recorded <b>Radon</b> risk (<1% above the action level).                                                                               |

There could also be **Geotechnical Risks** (e.g. to foundations, etc) which one should consider assessment of:

- shrink/swell risks especially from removal or retention of trees (a tree survey is recommended before any are removed),
- possible soft ground,
- possible sulphate attack on buried concrete.

## 2.2 Preliminary Conceptual Model & Risk Assessment

### 2.2.1 General

The assessment of contamination risks and other environmental risks uses the **Source-Pathway-Receptor** principle.

The site characterisation attempts to identify potential previous and existing **sources** of contamination (or environmental risk) on-site, as well as off-site ones sufficiently close to the site to potentially affect it. The conceptual model links the identified sources likely to cause harm, via **pathways** to identified critical **receptors**.

In the event of a change of land use to a more sensitive use, the town planning regime will require assessment of the new site development layout within the context of the sources of risk and introducing new exposure pathways. The assessment is also used to determine if the site, once developed, would be classed as “contaminated land” under the definition provided by the Part 2A of the Environment Act 1990 as defined in the Environment Protection Act 1995.

The conceptual model is therefore based on a number of identified source-pathway-receptor scenarios. For land to pose a risk (or be classified as “contaminated” under Part 2a) a significant pollutant linkage between source and receptor needs to be identified, which will include each component of the conceptual model.

**The absence or removal of a source, or interception of a pathway, will ‘break’ the pollutant linkage and remove the risk.**

The conceptual model is characterised by identification of plausible pathways between the following:

- **On-site** sources, which may impact **on-site** receptors.
- **On-site** sources, which may impact **off-site** receptors.
- **Off-site** sources, which may impact **on-site** receptors.

A **preliminary** conceptual model is indicated in the following tables (the model is finalised following intrusive site investigation, see Section 6).

The hazard, consequence and degree of risk all remain as ‘potential’ until assessed by intrusive investigation.

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## 2.2.2 Preliminary Conceptual Model & Risks

**Table 2.2 Potential Risks**

| Feature                                                        | Risks and Contaminants of Concern <sup>#</sup> (CoC)                                                                              |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>On-Site</b>                                                 |                                                                                                                                   |
| Unknown <b>made ground</b> .                                   | Heavy Metals, hydrocarbons (TPH, PAHs), asbestos.                                                                                 |
| Former site usage as <b>coach works</b> then <b>breakers</b> . | Heavy Metals, hydrocarbons (TPH, PAHs), asbestos.                                                                                 |
| <b>Unexploded Ordnance</b> .                                   | The slight potential for UXO poses a low risk to construction workers forming excavations, but a much higher risk to piling rigs. |
| <b>Off-Site</b>                                                |                                                                                                                                   |
| None.                                                          |                                                                                                                                   |

<sup>#</sup>: From industry profiles, etc.

Given that there are no significant potential sources of gas and given the presence of London Clay (probably to near ground level), then there is not considered to be any significant **gas risk**.

The **gasworks** to the far south of our site, and the gas holder next to the site, are not considered a significant risk due to the underling London Clay and the stream (now culvert) that would intercept any migration pathways to our site.

**Table 2.3 On-Site to the On-Site Source – Pathway – Receptor Model**

| Source                                                                                                                      |                              | Pathway                                                                                                                    | Receptor                                                                     | Potential Linkage? |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------|
| General                                                                                                                     | Hazard                       |                                                                                                                            |                                                                              |                    |
| Total soils concentrations (e.g. heavy metals and hydrocarbons):<br><br>General impact (made ground) from former site usage | Contamination of groundwater | Migration of leachate through unsaturated zone;<br><br>Then Migration through saturated zone/groundwater.                  | Groundwater and/or surface waters, and/or eco-system (i.e. culverted stream) | Yes                |
|                                                                                                                             | Impact on Human health       | Ingestion of and dermal contact with soil & household dust;<br>Inhalation of dust (indoor household and outdoor fugitive). | Construction workers                                                         | Yes                |
|                                                                                                                             |                              |                                                                                                                            | Site end-users                                                               | Yes                |
|                                                                                                                             | Vegetation poisoning.        | Growing then eating food crops.                                                                                            | Site end-users                                                               | Yes                |
|                                                                                                                             |                              | Plant root uptake                                                                                                          | Plants                                                                       | Yes                |
| UXO                                                                                                                         | Explosion                    | Hit during excavations, piling or borehole drilling                                                                        | Construction workers & Drillers                                              | Yes, but Unlikely  |

There is a slight risk that the breakers yard could be causing some contamination to enter the culvert.

There are not considered to be any significant **off-site to on-site** pathways or risks.

## 3 Phase 2 Site Investigation

### 3.1 General

An intrusive site investigation, using Dynamic (windowless) Sampling (DS), was carried out on 23<sup>rd</sup> May 2022.

The holes are summarised as follows, with any targeted and non-targeted holes/sampling shown:

**Table 3.1 Exploratory Hole Details**

| Exploratory Hole ID | Technique                     | Hole Depth (mBGL) | Cored? | Targeted or not?   | Comments & Reasons for Holes                                                                                                         |
|---------------------|-------------------------------|-------------------|--------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| DS1                 | Dynamic (windowless) sampling | 5.0               | Yes    | No                 | For geotechnical aspects (e.g. pile design)                                                                                          |
| DS2                 |                               | 5.0               | Yes    | No                 | For geotechnical aspects (e.g. pile design)                                                                                          |
| DS3                 |                               | 5.0               | Yes    | No                 | For geotechnical aspects (e.g. pile design)                                                                                          |
| DS4                 |                               | 5.0               | Yes    | No                 | Prove base of MG                                                                                                                     |
| DS5                 |                               | 1.1               | No ##  | Yes, breakers yard | Prove base of MG in breakers yard                                                                                                    |
| DS6                 |                               | 1.1 #             | Yes    | No                 | Inside warehouse. For geotechnical aspects (e.g. pile design)                                                                        |
| DS7                 |                               | 1.0 #             | Yes    | No                 | Inside warehouse. For geotechnical aspects (e.g. pile design). Concrete obstruction to >1m depth and so moved and redrilled as DS7a. |
| DS7a                |                               | 1.0               | Yes    | No                 | Redrill of DS7.                                                                                                                      |

#: it had been expected that the warehouse would not offer any constraints to DS holes sampling, such as fumes, but DS could not be undertaken due to fumes risk. Holes were therefore formed by hand pitting to the depths shown.

##: breaker used.

DS8 and DS9 had been planned in the breakers yard, but there were too many H&S risks (e.g. trip hazards) and the breakers yard had been expected to be soil cover, but was in fact concrete covered. Due to time constraints to core DS8 & DS9 and due to H&S risks, they were cancelled (DS8 was also found to be outside of the tithe site boundary).

DS6 and DS7 could not be safely dynamic sampled (they could only be hand pitted to 1.1m depth), because the warehouses were in complete darkness with no roof lights, windows or lighting.

A plan showing the exploratory hole locations is presented as Appendix B. Final hole locations are measured or estimated and were not surveyed.

### 3.2 Dynamic Sampling

8no. dynamic sample holes (DS)(windowless, WS) , designated DS1 to DS7 inclusive, plus DS7a, were advanced using a tracked drilling rig.

The dynamic sampling retrieved continuous soil samples from the holes, which were logged by an onsite engineer. In addition, SPT/SPT(c) tests were taken at regular intervals to give an indication of the strength/density profile of the underlying strata.

Representative samples were taken for geotechnical and chemical analysis. Detailed log sheets for the dynamic sample holes are included in Appendix C.

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## 3.3 Backfilling

On completion the holes were backfilled with arisings and then the concrete cores.

No gas/groundwater monitoring wells were installed (since no gas risk and no groundwater was found).

## 3.4 In-Situ Testing

As well as the SPT testing, where possible hand shear vane (HV) tests were undertaken on recovered soil samples that were as undisturbed as possible.

## 3.5 Sample Collection and Analysis

Samples obtained during the investigation were subjected to a range of geotechnical and chemical testing at appropriate UKAS accredited laboratories.

Samples were submitted for **geotechnical laboratory testing** to characterise the engineering properties of the soil. The following testing was scheduled:

- Moisture Content.
- Classification tests (Atterberg Limits).

Geotechnical laboratory test data is presented in Appendix D.

Soil samples were sent for **chemical analysis** to be analysed for:

**Table 3.2 Soil Sample Chemical Tests**

| Testing:                                                                                                                                                                                                                                                                                  | Number of Samples Tested |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------------|
|                                                                                                                                                                                                                                                                                           | Made Ground              | Natural Soils |
| <b>AGGC Full suite</b> comprising: arsenic, cadmium, copper, total chromium, chromium VI, lead, mercury, nickel, selenium, zinc, Speciated Polyaromatic Hydrocarbons (PAH), speciated Total Petroleum Hydrocarbons (TPH-CWG), soil organic matter content (SOM), pH and soluble sulphate. | 6                        | 0             |
| Asbestos Screen & ID.                                                                                                                                                                                                                                                                     | 6                        | 0             |
| pH, total sulphur, soluble sulphate and total sulphate (for buried concrete design).                                                                                                                                                                                                      | 0                        | 7             |
| Total sulphur and total sulphate (for buried concrete design).                                                                                                                                                                                                                            | 1                        | 0             |

No natural soils were tested for contamination, as given the site usage and natural clays, then they were considered unlikely to be contaminated (also no visual or olfactory indications of contamination were found in our holes).

All soil samples were collected using either clean stainless steel utensils or clean disposable gloves and placed directly into clean containers provided by the laboratory.

The chemical laboratory test results are presented in Appendix E.

## 4 Ground Conditions

### 4.1 General

The following table provides a summary of the strata encountered in the exploratory holes and the depth to the base of each stratum. MG = man-made ground.

**Table 4.1 Typical Strata**

| Strata                              | Depth (mBGL) Encountered           |                         | Description & Comments                                                                |
|-------------------------------------|------------------------------------|-------------------------|---------------------------------------------------------------------------------------|
|                                     | Top                                | Bottom                  |                                                                                       |
| <b>MG:</b> Concrete slab            | 0                                  | 0.05 to 0.22            | Reinforced in DS4.<br>Weak in DS6 and DS7.                                            |
| <b>MG:</b> black sand & ash         | 0.05                               | 0.90                    | DS5 only.<br>With slate fragments and a brick layer at 0.6m depth.                    |
| <b>MG:</b> gravel & sand            | 0.10 to 0.15                       | 0.45 to 0.6             | Anthropogenic components= brick rubble                                                |
| <b>MG:</b> Brown clay               | 0.2 to 0.6                         | 0.60, 0.70, >1.10, 1.70 | Anthropogenic components= brick fragments and earthenware pipe fragments              |
| <b>Head Deposits;</b> Clayey gravel | 0.50, 0.60, 1.70                   | 1.40, 1.50, 2.10        | Only in DS1, DS2 & DS3.<br>Loose to medium dense, brown clayey fine to coarse gravel. |
| <b>London Clay</b>                  | 0.50, 0.70, 0.90, 1.40, 1.50, 2.10 | >5 (DS1-DS4)            | Firm becoming stiff, then very stiff, brown and grey, very silty CLAY                 |

Groundwater observations are detailed in Section 4.3.

### 4.2 Strata Encountered

#### Made Ground

The made ground comprised as shown in the above table.

#### Superficial Deposits – Head Deposits

These were only (obviously) found in DS1, DS2 & DS3 and extended to 1.4-2.1m depth.

Standard Penetration Tests (SPT) were carried out at regular intervals, in accordance with BS EN ISO 22476-3. The recorded SPT N-values are summarised on the borehole logs.

Plasticity tests in this stratum show it to be **non-shrinkable and also of low plasticity**.

#### Solid Geology - London Clay

Plasticity indices (Appendix D)(Liquid limits= 63% to 83%) indicate the London Clay to be of **high and very high plasticity**. The plasticity indices (PI) range from 38% to 54%.

The modified plasticity indices (MPI) indicate the soils to possess medium and high volume change potentials with changes in moisture content, according to the criteria of NHBC Standards, Chapter 4.2 (2022) Building Near Trees. Based on these results, it is recommended that a **high volume change potential** be assumed for design purposes, with corresponding minimum founding depths of 1.0m (in areas away from existing and proposed trees).

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Hand vane (HV) results, in this stratum can be summarized as follows:

**Table 4.2 Hand Vane Results**

| Test depth | DS1       | DS2       | DS3       | DS4       |
|------------|-----------|-----------|-----------|-----------|
| 1m         | -         | -         | -         | -         |
| 2m         | -         | HV=95kPa  | HV=85kPa  | HV=75kPa  |
| 3m         | HV=130kPa | HV=165kPa | HV=145kPa | HV=120kPa |
| 4m         | HV=145kPa | HV>180kPa | HV=130kPa | HV=165kPa |
| 5m         | HV=130kPa | HV>180kPa | HV=150kPa | HV=135kPa |
| 6m         | -         | -         | -         | -         |

We recommend assuming a strength profile of:

- 2m depth: Cu=80kPa
- 3m depth: Cu=125kPa
- 4m depth: Cu=130kPa
- 5m depth: Cu=135kPa.

## 4.3 Groundwater

All of the (up to 5m deep) holes were dry during their formation.

## 4.4 Contamination Indications

Apart from a black ashy layer in DS5, there were no visual or olfactory indications of contamination noted in the soils and any groundwater during the site works.



## 5 Geotechnical Assessment

### 5.1 Introduction

The current development proposals are discussed in Section 1.2.

Likely wall loadings are currently unknown, but a standard construction is assumed, for which wall loadings are likely to be as follows.

**Table 5.1 Potential Building Loads**

| House size | Potential Maximum Line load (kN per m run of wall) | Max' bearing pressure (kPa) for |                    |                    |
|------------|----------------------------------------------------|---------------------------------|--------------------|--------------------|
|            |                                                    | 0.45m wide footings             | 0.6m wide footings | 1.0m wide footings |
| 2-storey   | 63                                                 | 140                             | 105                | 63                 |
| 5-storey   | 140                                                | -                               | 235                | 140                |
| 6-storey   | 165                                                | -                               | 275                | 165                |

### 5.2 Excavations & Earthworks

Excavations should be suitable with conventional earthmoving plant, although pneumatic tools are likely to be required to break out existing foundations and masonry obstructions.

It is unlikely that shallow excavations will encounter significant groundwater. Groundwater could occur as seepages and should this happen, excavations can be kept dry by pumping from a conveniently located sump to a nearby sewer. If this is required, a temporary discharge licence will be required from the water authority. Excavations close to the culvert could encounter deep made ground and possible fast water ingress.

Temporary excavations in the made ground and some of the (granular) Head Deposits are not expected to stand unsupported in the short term, either vertically, or with steep cut gradients, and therefore may require shoring or to be battered back to a safe angle of repose. Excavations below approximately 1m depth will require sheeting and shoring for personnel to enter safely. The stability of all excavations could deteriorate on wetting either from groundwater or surface water. Excavations could therefore be protected from rain and surface water runoff.

Any areas of particularly poor quality underlying soils (i.e. wet, soft, loose materials) should be removed from beneath all proposed foundation and hardstanding areas, and the deficit made good with suitable compacted granular fill (placed to an engineering specification).

No significant earthworks are envisaged.

To avoid **Landfill Tax**, all surplus soils could be reused on other sites, but such reuse requires assessment to prove that the soils do not class as “waste” (e.g. a certain, legitimate and pre-determined reuse that does not create new risks), via waste exemption, *Definition of Waste Code of Practice* (DoWCoP) assessment and/or Materials Management Plan. Soils that are “waste” cannot be reused without an exemption, or permit, or use of the DoWCoP (see Section 7). Otherwise, they must be disposed of to a licensed waste disposal site or a Soil Treatment Hub.

## 5.3 Existing Foundations & Floor Slabs

The existing floor slab at DS7 was cored, but hit what was believed to be a 2<sup>nd</sup> slab. An extension rod was added and found >0.6m concrete and so it appears that was an old foundation.

## 5.4 Foundation Assessment

### General

Made Ground (of 0.5m to 1.7m proven thickness) was present across the site and should not be relied upon to form a suitable bearing stratum for buildings, due to the high potential for varying strengths/densities and compositions, that such soils usually have.

Based on the *Modified Plasticity Indices* range showing up to **high volume change potentials** with changes in moisture content, then we recommend a minimum founding depth of 1.0m away from existing or former tree locations.

Taking account of the strata revealed by this investigation we recommend that piled foundations are adopted for the proposed development.

The various options for foundations are discussed as follows, starting with an assessment of shallow foundations, then assessing other options of increasing complexity and cost.

The following foundation guidance should be reviewed if the ground conditions vary significantly from those highlighted in Section 4.

### Shallow Strips/Trench Fill Foundations

For the proposed 2-storey building, the allowable bearing pressure (ABP) for 0.45m wide strip foundations founded at ~1-2m depth in the firm to stiff London Clay ( $C_u \geq 80\text{kPa}$ ), is (adopting a factor of safety of 3 on the ultimate calculated value):

$$Q_{a(\sim 1-2\text{mBGL})} = 190\text{kN/m}^2$$

The 2-storey building could found within the overlying natural sands and gravels, using the same capacity.

The allowable bearing pressure (ABP) for 0.6m wide strip foundations founded at ~2m depth in the firm to stiff London Clay ( $C_u \geq 80\text{kPa}$ ), is (adopting a factor of safety of 3 on the ultimate calculated value):

$$Q_{a(\sim 2\text{mBGL})} = 200\text{kN/m}^2$$

This capacity will probably not suit loads from 5- to 6- storey buildings (see Section 5.1), unless they were 1m wide.

For strips founded at ~3m depth the ABP would be 315kPa. **There are however the issues of proximity to trees, trench depth, concrete volume and large amounts of surplus soil arisings.**

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At the intensities of loading given above, total settlements should not exceed 25mm, with differential settlements between adjacent pad footings of approximately half this value. In the event that shallow foundations are employed for the development, the detailed design should include a serviceability check for settlement between differentially loaded foundation elements when foundation loads are determined.

The above values are based on a fresh cut formation for foundation level. If the formation is left exposed to the weather for a period of time, then further excavation may be required until the strengths/densities discussed above for the bearing stratum are obtained.

Foundations may need to be deepened if they lie in the within the influencing distance of either existing trees that are to be retained, **ones that have been (or are to be) removed**, or new ones that are to be planted. Such could mean the use of deeper trench fill foundations or piled foundations.

All foundation formations should be inspected and approved by a suitably qualified geotechnical engineer. Any 'soft' spots where exposed should be excavated and replaced with suitably compacted engineering fill.

## Traditional Piles

Given the **proximity to trees, foundation trench depths & widths, foundation concrete volume and large amounts of surplus soil arisings**, then piled foundations are expected to be a more feasible and economical foundation solution for the 4/5-storey and 6-storey buildings.

With the first few metres of the London Clay having been proven, then using to information herein, an experienced piling contractor should know the depth to which piles will need to go.

An economical solution could be **pin piles** (small diameter, installed with 360° excavator).

A copy of this report should be provided to suitable piling contractors and they should be asked to demonstrate the suitability of their equipment in these ground conditions. Furthermore, it is recommended that pile integrity and load testing be carried out as part of the quality assurance process.

The design of a piling mat will be required.

## 5.5 Floor Slabs

Suspended floor slabs (designed in accordance with NHBC guidelines) are recommended at the site because made ground exceeds 0.6m thickness and the shallow soils are susceptible to volume change with changes in moisture content.

Any requirements for membranes to be placed within ground floor slabs to protect against ground/landfill gas, chemical vapours, or Radon, are discussed in later sections of this report.

## 5.6 Roads and Pavements

The founding strata for road pavements will be the variable made ground, for which an equilibrium CBR value cannot currently be established.

No CBR testing has been undertaken. Such should be carried out prior to construction, or when formation level has been reached.

## 5.7 Drainage

There are simple ways to approach a drainage design differently and provide multiple benefits, without increasing cost or build complexity to the scheme, e.g. **large rainwater harvesting tanks**, rain gardens, tree pits, swales, etc.

The long-term maintenance and ownership responsibility has advanced recently with the release of the Design & Construction Guidance (Sewers for Adoption 8th Edition) and the increasing use of new appointments and variations (NAVs), with the scope to adopt and maintain infrastructure not usually accepted by the water authorities.

Soakage testing has not been carried out as part of this investigation, due to the impermeable nature of the London Clay under the site. Standard soakaways are unlikely to be feasible.

## 5.8 Chemical Attack on Buried Materials

### Concrete

Samples were tested for sulphate suites as outlined in *BRE Special Digest 1, Concrete in Aggressive Ground: 2005*.

The site can be classed as Brownfield<sup>1</sup>.

The water-soluble sulphate results were as follows:

- Made Ground and Head Deposits: 58-970mg/l.
- London Clay: 310 & 420mg/l at 2m depth  
1200, 1500 & 2000mg/l below 2m depth.

From Table C2 of BRE Special Digest 1 (SD1), we therefore suggest Design Sulphate Classes:

- **DS-2 above ~2m depth and**
- **DS-3 below ~2m depth.**

As the geology (London Clay) at the site may be potentially pyritic, and assuming that the concrete (e.g. foundations, drainage pipes, etc) may be exposed to disturbed ground in which pyrite may oxidize to sulphate, the oxidisable sulphide content of the soils must be calculated, using the total sulphur and acid soluble sulphate results. If piles are used, then below the pile cap they will not cause disturbed ground that could oxidise.

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<sup>1</sup> The definition of "Brownfield" adopted by SD1 is one that has been *subject to industrial development, storage of chemicals, or deposition of waste, and which may contain aggressive chemicals in residual surface materials or in ground penetrated by leachates.*

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The results show that for all of the results below say ~2.5m depth, the oxidisable sulphide contents **significantly exceed** the 0.3% level given in the Digest and therefore pyrite is probably present below ~2.5m.

For those potentially pyritic samples, the calculated values of total potential sulphate (TPS) are 1.56%, 5.7% and 6.0% and these give classifications of DS-4, DS-5 and DS-5.

The latter 2no. TPS values exceed DS-5, but the characteristic water-soluble sulphate results do not exceed DS-3. Therefore, because this approach can be conservative, a limitation can be applied such that the design sulphate class is limited to DS-4. So **below ~2.5m say, we have class DS-4.**

Soil pH values varying from 7.9 to 9.3 were recorded and from these results a 'Characteristic Value' of 7.9 is derived.

From consideration of the sulphate, sulphur, pH and groundwater conditions it is concluded that the Aggressive Chemical Environment for Concrete (ACEC) classes are:

## Excavations for footings, pile caps, concrete pipes, etc:

- <2m depth: DS-2, AC-1s
- ~2m to ~2.5m depth: DS-3, AC-2s
- >2.5m depth: DS-4, AC-3s (potentially pyritic)

## Piled foundations below pile cap level:

- <2m depth: DS-2, AC-1s
- >2m depth: DS-3, AC-2s

The designer should utilise these classifications in order to produce the concrete specification.

## Other Materials

The parties responsible for selecting all other materials that will be placed in the ground as part of this development, shall ensure that they are resistant to the chemical concentrations identified in the appendix of this report (e.g. pipe joint seals).

## 6 Assessment of Contamination & Environmental Risks

### 6.1 Tier 1 Generic Quantitative Risk Assessment - Soil Risks to Humans

#### 6.1.1 General

The proposed redevelopment of the Site is residential with landscaping and some gardens, therefore, to identify chemicals of potential concern, the analytical data has initially been compared against the relevant available guidelines for **residential with-** and **without- plant uptake** end-uses (i.e. with and without food crops, including fruit trees).

In some cases, the measured concentrations of contaminants may have been statistically analysed, whilst in other cases the maximum test results have been used. Statistical assessment follows guidance given in:

- *Contaminated Land: Applications in Real Environments* (CL:AIRE), February 2021. Professional Guidance: *Comparing Soil Contamination Data with a Critical Concentration*.

The mean values of the test results, or maximum results, have then been used for subsequent comparison with the following 4no. sets of GAC:

1. Firstly against **Category 4 (Cat 4) Screening Levels**, SP1010, 24th September 2014, by CL:AIRE.
2. Then:
  - a. CL:AIRE/EIC/AGS **Soil Generic Assessment Criteria** (GAC) for Human Health Risk assessment, January 2010.
  - b. The LQM/CIEH **S4ULs** for Human Health Risk Assessment. Ref: S4UL3269, released January 2015 (with update in August 2015), Land Quality Press, Nottingham.
3. **EA Science Reports** SC050021, SR2 & SR3.

#### 6.1.2 Metals

The CLEA model has separate Soil Guideline Values (SGVs) for different forms of mercury. However, the SGV report states that for general surface contamination, and to simplify the assessment, the chemical analysis results for total mercury content can just normally be compared with the SGVs for inorganic mercury (e.g. 40mg/kg for private gardens)(this is because the equilibrium concentrations of elemental and methyl mercury compounds are likely to be very low).

The following table summarises the results (**Bold** and/or **highlight** shows exceedances):

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**Table 6.1 Values for Metals in Soils**

| Compound            | Number of samples | UCL (mg/kg) | Maximum values Or All Results (mg/kg) | SGV or GAC (Residential <u>with</u> plant uptake) mg/kg | SGV or GAC (Residential <u>without</u> plant uptake) mg/kg |
|---------------------|-------------------|-------------|---------------------------------------|---------------------------------------------------------|------------------------------------------------------------|
| Arsenic             | 6                 | n/a         | 25                                    | 37                                                      | 40                                                         |
| Cadmium             | 6                 | n/a         | 0.49                                  | 11                                                      | 85                                                         |
| Chromium            | 6                 | n/a         | 30                                    | 910 #                                                   | 910 #                                                      |
| Chromium VI         | 6                 | n/a         | <0.5                                  | 6                                                       | 6                                                          |
| Copper              | 6                 | n/a         | 170                                   | 2400                                                    | 7100                                                       |
| Lead                | 6                 | n/a         | 330-760                               | 200                                                     | 310                                                        |
| Mercury (Inorganic) | 6                 | n/a         | 1.7                                   | 40                                                      | 56                                                         |
| Nickel              | 6                 | n/a         | 29                                    | 180                                                     | 180                                                        |
| Selenium            | 6                 | n/a         | 1.2                                   | 250                                                     | 430                                                        |
| Zinc                | 6                 | n/a         | 440                                   | 3700                                                    | 40000                                                      |

#Chromium III

All 6no. Lead results exceeded the GAC values for *residential with plant uptake* and *residential without plant uptake* end-uses.

## 6.1.1 Organics – General

*Soil Organic Matter* (SOM) tests were undertaken on 6no. samples. The results ranged from 3.1% to 8.1% and so a **conservative** figure of 1% SOM has been adopted when selecting the Generic Assessment Criteria (GAC) screening values for organics in the following sections.

## 6.1.2 Organics – TPH

The following table summarises the results (**Bold** and/or **highlight** shows exceedances):

**Table 6.2 Values for Speciated Hydrocarbons in soils**

| Compound               | Number of samples | UCL mg/kg | Maximum values Or All Results (mg/kg) | SGV or GAC (1% SOM) mg/kg (Residential <u>with</u> plant uptake) | SGV or GAC (1% SOM) mg/kg (Residential <u>without</u> plant uptake) |
|------------------------|-------------------|-----------|---------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Aliphatic</b>       |                   |           |                                       |                                                                  |                                                                     |
| <b>EC 5-6</b>          | 6                 | n/a       | <1                                    | 42                                                               | 42                                                                  |
| EC> 6-8                | 6                 | n/a       | <1                                    | 100                                                              | 100                                                                 |
| EC> 8-10               | 6                 | n/a       | <1                                    | 27                                                               | 27                                                                  |
| EC> 10-12              | 6                 | n/a       | <1                                    | 130                                                              | 130                                                                 |
| EC> 12-16              | 6                 | n/a       | <1                                    | 1100                                                             | 1100                                                                |
| EC> 16-35              | 6                 | n/a       | 170                                   | 65000                                                            | 65000                                                               |
| EC> 35-44              | 6                 | n/a       | <1                                    | 65000                                                            | 65000                                                               |
| <b>Aromatic</b>        |                   |           |                                       |                                                                  |                                                                     |
| <b>EC 5-7(benzene)</b> | 6                 | n/a       | <1                                    | 70                                                               | 370                                                                 |
| EC> 7-8 (toluene)      | 6                 | n/a       | <1                                    | 130                                                              | 860                                                                 |
| EC>8-10                | 6                 | n/a       | <1                                    | 34                                                               | 47                                                                  |
| EC>10-12               | 6                 | n/a       | <1                                    | 74                                                               | 250                                                                 |
| EC>12-16               | 6                 | n/a       | <1                                    | 140                                                              | 1800                                                                |
| EC>16-21               | 6                 | n/a       | 36                                    | 260                                                              | 1900                                                                |
| EC>21-35               | 6                 | n/a       | 930                                   | 1100                                                             | 1900                                                                |
| EC>35-44               | 6                 | n/a       | <1                                    | 1100                                                             | 1900                                                                |

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None of the results exceeded the GAC values for *residential with plant uptake* and *residential without plant uptake* end-use. BTEX (Benzene, Toluene, Ethylbenzene, Xylene) were below the limits of detection.

## 6.1.3 Organics – Polyaromatic Hydrocarbons (PAHs)

The following table summarises the results (**Bold** and/or **highlight** shows exceedances):

**Table 6.3 Values for Speciated PAH in Soils**

| Compound              | No. of samples | UCL mg/kg | Maximum values Or All Results (mg/kg) | GAC (1% SOM) (Residential <u>with</u> plant uptake) mg/kg | GAC (1% SOM) (Residential <u>without</u> plant uptake) mg/kg |
|-----------------------|----------------|-----------|---------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------|
| Naphthalene           | 6              | n/a       | 0.33                                  | 2.3                                                       | 2.3                                                          |
| Acenaphthylene        | 6              | n/a       | 0.37                                  | 170                                                       | 2900                                                         |
| Acenaphthene          | 6              | n/a       | 0.26                                  | 210                                                       | 3000                                                         |
| Fluorene              | 6              | n/a       | 0.56                                  | 170                                                       | 2800                                                         |
| Phenanthrene          | 6              | n/a       | 5.8                                   | 95                                                        | 1300                                                         |
| Anthracene            | 6              | n/a       | 1.3                                   | 2400                                                      | 31000                                                        |
| Fluoranthene          | 6              | n/a       | 8.9                                   | 280                                                       | 1500                                                         |
| Pyrene                | 6              | n/a       | 8.4                                   | 620                                                       | 3700                                                         |
| Benzo(a)anthracene    | 6              | n/a       | 4.0                                   | 7.2                                                       | 11                                                           |
| Chrysene              | 6              | n/a       | 5.3                                   | 15                                                        | 30                                                           |
| Benzo(b)fluorathene   | 6              | n/a       | 3.1, 3.4, 3.5, ... 5.1, 5.7           | 2.6                                                       | 3.9                                                          |
| Benzo(k)fluorathene   | 6              | n/a       | 2.3                                   | 77                                                        | 110                                                          |
| Benzo(a)pyrene        | 6              | n/a       | 2.6, 2.7, 3.3, 4.6, 4.6               | 2.2                                                       | 3.2                                                          |
| Indeno(123-ed)pyrene  | 6              | n/a       | 5.7                                   | 27                                                        | 45                                                           |
| Dibenzo(ah)anthracene | 6              | n/a       | 1.1, 1.1, 1.3, 1.5, 3.2               | 0.24                                                      | 0.31                                                         |
| Benzo(ghi)perylene    | 6              | n/a       | 7.1                                   | 320                                                       | 360                                                          |

In 5no. of 6no. MG samples tested, three PAHs exceeded the GAC values for *residential with plant uptake* and *residential without plant uptake* end-uses.

## 6.1.4 Other

Asbestos was screened for in 6no. made ground samples, plus 1no. fragment of possible asbestos, and none was found.

## 6.2 Tier 2 Detailed Quantitative Risk Assessment - Soil Risks to Humans

The driver for risk from the soils is Dibenzo(ah)anthracene where the results are 4.6x to 13.3x the *with plant uptake* GAC.

The standard guidelines assume worst case conditions for soil type and critical receptors and so can be conservative for some sites/soils, such as this. Additionally, we have assumed a worse case SOM % for the soils.

Even considering the GAC for a higher SOM of 2.5%, we still can only get the **with-uptake GAC** to be 0.28mg/kg for Dibenzo' for example, and 5no. out of 6no. of our sample results are significantly more than that and so a risk still remains to human health at the site.



## 6.3 Soil Risks to Plants (Phytotoxicity)

Copper, nickel and zinc can inhibit plant growth. The GAC for this pollutant linkage (see following table) have been taken from Department of the Environment Publication, Code of Practice for Agricultural Use of Sewage Sludge, 1996.

**Table 6.4 GAC for Phytotoxic Risks**

| Compound | Generic Assessment Criteria (mg/kg) |               |               |         |
|----------|-------------------------------------|---------------|---------------|---------|
|          | pH 5.0 - <5.5                       | pH 5.5 - <6.0 | pH 6.0 - <7.0 | pH >7.0 |
| Zinc     | 200                                 | 200           | 200           | 300     |
| Copper   | 80                                  | 100           | 135           | 200     |
| Nickel   | 50                                  | 60            | 75            | 110     |

The pH results varied from 7.9 to 9.3 and so concentrations determined of these contaminants did not exceed the stated guidelines for any of the three phytotoxic elements. However, other heavy metals, Lead and Mercury (which can also be potentially phytotoxic), were elevated and so could pose risk. From experience there are unlikely to be any significant risks to plant growth.

## 6.4 Soil Risks to Water Supply Pipes

The future routes of water supply pipes had not been provided, hence the investigation and sampling strategy may not be fully compliant with UK Water Industry Research (UKWIR) recommendations.

To assess possible risks to proposed water supply pipes, the laboratory test results have been subject to initial assessment against the GAC presented in UKWIR. Full testing has not been undertaken to determine the suitability of metallic pipe materials.

It is assumed that water pipes will be placed no deeper than 1m below existing ground level and results that relate to strata below 1m are not considered in the following table. Assessment of the results versus the GAC is summarised as follows:

**Table 6.5 GAC for Water Supply Pipes**

| Parameter           | GAC (mg/kg) |           | Results exceeding the GAC (mg/kg) |           |
|---------------------|-------------|-----------|-----------------------------------|-----------|
|                     | PE pipes    | PVC pipes | PE pipes                          | PVC pipes |
| BTEX (<C11)         | 0.1         | 0.03      | None                              | None      |
| Mineral Oil C11-C20 | 10          | Suitable  | 206                               | None      |
| Mineral Oil C21-C40 | 500         | Suitable  | 1,100                             | None      |

Other parameters within UKWIR have not been assessed since they are not potential contaminants of concern for this site.

Visual or olfactory indications of chemicals, or petroleum hydrocarbons (e.g. oil, petrol, diesel) were not noted on site.

The elevated TPH results are considered to be due to ash (such was spotted within the made ground in DS5). As such TPH results do not pose a risk to PVC or PE water pipes. Furthermore, the MG is <0.75m thick at half of the locations investigated and so pipes are thus likely to be laid below the MG (not within it).

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Given the above, then we consider that the local water supply company should accept the use of PVC and PE water supply pipe materials on site.

It is recommended that this assessment be given to the relevant water supply company at an early stage (ideally prior to an application for planning permission being made) to confirm its requirements, which may not necessarily be the same as those recommended by UKWIR.

## 6.5 Summary of Soil Results Exceedances

There are risks to end-users of the site from the proposed ***residential with- and without- plant uptake*** end-uses. Risks are from (dust) inhalation and ingestion of and direct contact with, soils containing Lead and PAHs in garden and landscaped areas.

There are also risks to groundworkers, from (dust) inhalation, (soil) ingestion and direct contact, with soils containing Lead and PAHs.

## 6.6 Tier 1 Generic Quantitative Risk Assessment – Risks to Water Resources

No contamination has been found that could migrate or leach to groundwater. The site is currently mostly hard cover and the proposed development will be entirely (or mostly) hard cover. Given this, then it is unlikely that any significant risk will be posed to groundwater under the site.

## 6.7 Ground/Landfill Gas Risks to Humans

No potential sources of ground gas have been found under the site (i.e. soils with significant organic content that could degrade) and none (including from historic or recent landfills) have been found close enough to the site to pose potential significant risk.

The site is therefore unlikely to be at significant risk from gases (Radon is discussed below).

## 6.8 Radon Risk to Humans

Reference to the UK Radon atlas shows that the site lies in a 1km grid square where the highest risk is 0-1% (low risk) for which **no radon protection** is required for new buildings or extensions on site.

Even though the Radon potential shows “no” Radon protection to be required, many developers are nonetheless adopting “Basic” protection and we would recommend such be considered here. The reason is that protection is obligatory only where >3% of properties exceed the Radon Action Level, but that still leaves 3% potentially at risk from Radon.

## 6.9 Chemical Vapour Risks to Humans

No olfactory indications that could suggest a vapour risk, have been found.

## 6.10 Final Conceptual Model and Risk Assessment

The preliminary conceptual model and risk assessment has been updated in light of the findings of the Phase 2 work as shown in the following tables.

The method used for risk evaluation is qualitative based on interpretation of the available geoenvironmental and geotechnical data in order to provide an overall impression of the potential risks present at the site. This is described in terms of two variables as follows:

- **“Probability”** – being the likelihood that a hazard is present on site or in the surroundings.
- **“Consequence”** – being the potential outcome of the hazard.

The combination of these is used to define the risk. Clearly if a hazard is not present there can be no consequence. Similarly hazards that are potentially present will have different degrees of potential consequence. The combination of the presence of a hazard, and the potential severity of outcome of such a hazard within any event, can be used to manage the approach to management of the risk.

The **probability** (likelihood) of an event can be classified on a four point system using the following terms and definitions based on CIRIA C552:

- **Highly likely:** The event appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution;
- **Likely:** It is probable that an event will occur, or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;
- **Low likelihood:** Circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term;
- **Unlikely:** Circumstances are such that it is improbable the event would occur even in the long term.

An extra class is added to those of C552, that of **“negligible likelihood”**, which is an amount or effect that is negligible (so small that it is not worth considering or worrying about).

The **consequence** (severity) can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to consequence are:

- **Severe:** Short term (acute) risk to human health likely to result in ‘significant harm’<sup>1</sup>. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short term risk to an ecosystem or organism forming part of that ecosystem<sup>1</sup>;
- **Medium:** Chronic damage to human health (‘significant harm’<sup>1</sup>), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem<sup>1</sup>;
- **Mild:** Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services (‘significant harm’<sup>1</sup>). Damage to sensitive buildings, structures or the environment; and
- **Minor:** Harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

<sup>(1)</sup> Defined in Defra Circular on “Contaminated Land”, EPA 1990 Part 2a”, 01/2006, September 2006.)

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Once the probability of an event occurring and its consequence have been classified, a risk category can be assigned as in the following table.

**Table 6.6 Risk Classification System (CIRA 552)**

|             |                | Consequence  |              |              |              |
|-------------|----------------|--------------|--------------|--------------|--------------|
|             |                | Severe       | Medium       | Mild         | Minor        |
| Probability | Highly likely  | Very high    | High         | Moderate     | Moderate/Low |
|             | Likely         | High         | Moderate     | Moderate/Low | Low          |
|             | Low likelihood | Moderate     | Moderate/Low | Low          | Very Low     |
|             | Unlikely       | Moderate/Low | Low          | Very Low     | Very Low     |

| Risk Level               | Action                                                                                                                            |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Low to Very Low          | None                                                                                                                              |
| Moderate to Moderate/Low | Undertake appropriate mitigation measures to reduce the risk level by appropriate on-site practice at little additional cost.     |
| High to Very High        | Designers should take such risks into account and avoid or reduce risk level to acceptable levels. Additional resources required. |

The table that follows provides a summary of the data reference points, together with an indication of the hazards, probabilities, consequences and degrees of risk.

The following discusses aspects that are no longer considered to pose risks and clarifies the conclusions from the tables:

- No contaminants specific to a **coach works** have yet been found.
- The **breakers yard**, being entirely (or mostly) concrete covered, has meant that the underlying made ground is not significantly different from the rest of the site. No obvious breakers yard type contaminants were found in DS5.
- **No mobile contaminants** have been found in DS5 in the breakers yard. The site is currently almost entirely hard cover, and it likely to be so following development, and so **leaching potential** from the breakers yard (and whole site) is unlikely.

This assessment indicates the site and environs are considered as **Very Low to High** risk with respect to contamination. Indicators above low risk comprise:

- Composition of made ground on the site and the risk of dust inhalation and skin contact during groundworks for the development and to end-users contacting garden & landscaped areas.

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**Table 6.7 On-Site to On-Site Source – Pathway Receptor Model**

| Source                                                                                                                      |                              | Pathway                                                                                                                                                      | Receptor                                                                | Probability    | Consequence | Potential Risk? |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------|-------------|-----------------|
| General                                                                                                                     | Hazard                       |                                                                                                                                                              |                                                                         |                |             |                 |
| Total soils concentrations (e.g. heavy metals and hydrocarbons):<br><br>General impact (made ground) from former site usage | Contamination of groundwater | Migration of leachate through unsaturated zone;<br><br>Then Migration through saturated zone/groundwater.                                                    | Groundwater and/or surface waters, and/or eco-system (culverted stream) | Unlikely       | Mild        | Very Low        |
|                                                                                                                             | Human health                 | Ingestion of and dermal contact with soil & household dust; Inhalation of dust (indoor household & outdoor fugitive).<br><br>Growing then eating food crops. | Construction workers                                                    | Highly Likely  | Medium      | High            |
|                                                                                                                             |                              |                                                                                                                                                              | Site end-users                                                          | Likely         | Medium      | Moderate        |
|                                                                                                                             |                              |                                                                                                                                                              | Site end-users                                                          | Low Likelihood | Medium      | Low/Moderate    |
|                                                                                                                             | Vegetation poisoning.        | Plant root uptake                                                                                                                                            | Plants                                                                  | Unlikely       | Mild        | Very Low        |
| UXO                                                                                                                         | Explosion                    | Hit during excavations, piling or borehole drilling                                                                                                          | Construction workers & drillers                                         | Negligible     | Severe      | Low             |

There are not considered to be any significant **on-site to off-site** pathways or risks.

There are not considered to be any significant **off-site to on-site** pathways or risks.

## 6.11 Strategy for Risk Reduction & Remediation

### 6.11.1 Introduction

There are two ways to reduce contamination/environmental type risks:

- **“remediation”** of soil and/or groundwater.
- Other **risk reduction measures** (that can only be completed post-commencement, such as clean cover in final garden areas, gas protection, or special water supply pipe materials).

No unacceptable risks have been found that require **pre-commencement** soil or groundwater remediation, nor any requirement for risk-reduction measures.

No long-term monitoring and maintenance of remediation is required.

Timescales for the construction and implementation of risk-reduction measures, are unknown.

### 6.11.2 Pre-Commencement “Remediation”

There is no “remediation”, and no risk reduction measures that can be completed pre-commencement.

Given the existence of made ground on the site and the site’s past usage, vigilance will be maintained during site clearance, in case any further areas of suspected contamination are

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encountered. If areas are found, then work will stop in that area, a suitably qualified engineer will be contacted to assess the situation and potentially undertake appropriate sampling, testing and further risk assessment. The Engineer may also contact the Local Authority (LA) Environmental Health Officer (EHO) to discuss the situation and agree a way forward.

An example of this is that hotspots could be found when the breakers yard is cleared of cars and scarp and when the concrete surfacing is removed. Such could pose a risk to the watercourse within the culvert.

If any amendments to this Remediation Method Statement are required as a result of unforeseen contamination, then these will be agreed in writing with the Contaminated Land Officer before being carried out on site.

### 6.11.3 Post-Commencement Risk Reduction Measures Requiring Validation

#### **General:**

The following measures are undertaken as part of the development/construction and are “post-commencement”.

Measures to overcome unacceptable risks identified in the previous sections are as follows.

#### **Soil Risks to Humans**

As garden and landscaping areas are proposed, then a practical solution to the presence of soil contaminants that pose a risk to humans is often to provide a clean cover layer in any garden or landscaped areas to any contaminated soils **that will be left in place** (If the full depth of contaminated soil ends up being removed, then clean cover is no longer required). This could be achieved either by placing uncontaminated soil (i.e. **topsoil and subsoil**) directly onto the made ground, hence raising ground levels, or by removal of part of the contaminated soil and backfilling with uncontaminated topsoil and subsoil, or by a combination of these means. The cover system is designed to reduce the exposure to contaminants of residents and other site users to an acceptable level. The cover layer should also reduce any risks to plant growth

The required depth of clean cover can be calculated using BRE report BR465.

The following assumptions have been made:

- using the **UCL** value for Dibenzo(ah)anthracene for the existing ground contamination and
- clean cover concentrations that are a **quarter**# of the guideline values

(#: if actual clean cover concentrations are higher or lower, then the cover thickness will increase or decrease respectively. Any soils used as clean cover should be tested to ensure that they are uncontaminated, and it is generally advisable to test a minimum of three samples so that a representative mean value can be calculated and so the validity of this clean cover model can be checked).

Area-specific assumptions and the results are shown in the table below.

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**Table 6.6: Summary of Clean Cover Requirements**

| Area                                                                                                         | Target Concentration Criteria for clean cover soils #                                                   | Mixing depth assumed (mm) | Clean Cover thickness required (mm) |
|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------------|
| Any areas where owners <u>could grow</u> crops and fruit trees (e.g. Rear gardens)                           | 1/4X Residential <u>with</u> plant uptake GAC                                                           | 600                       | 540mm <sup>1</sup>                  |
| Areas where crops and fruit trees <u>cannot and will not be grown</u> (often, but not always, front gardens) | 1/4X Residential <u>without</u> plant uptake GAC (conservative)                                         | 450 <sup>2</sup>          | 400mm <sup>1</sup>                  |
| Landscaping areas (with no crop or fruit tree growing)                                                       | 1/4X Residential <u>without</u> plant uptake GAC.                                                       | 300 <sup>2</sup>          | 300mm <sup>1</sup>                  |
| Hardstanding areas and below buildings                                                                       | Areas having such construction cut the pathways from the soil and no further "clean cover" is required. |                           | None                                |

#: GAC are given in Tables 6.1, 6.2 & 6.3.

(1): the minimum clean cover system thickness that BRE recommends is 300mm.

(2): BRE465 permits alternative mixing depths for front gardens and other areas where crop growth is unlikely, therefore 450mm mixing depth has been chosen. Similarly for landscaping areas that will experience the bulk of soil mixing during initial planting then 300mm has been used.

As it is expected that BaP could be used as a surrogate marker for the other PAHs and given that the BaP results were much less elevated above the GAC, then the clean cover is deemed suitable.

Given the nature of the made ground and that the designed clean cover thickness assumes full mixing (i.e. **mixing not prevented** by a geo-fabric layer), then **no geo-fabric is required to separate the clean cover from the underlying made ground.**

The clean cover system will also reduce the potential risks that have been identified for plants. Trees will be planted deeper, through any clean cover and into contaminated soil, and so should be placed in decent sized tree pits with associated clean topsoil backfill including all around the root bowl.

The BRE report recommends a minimum clean cover thickness of 300mm and that any clean cover layer should ideally incorporate a topsoil layer at least 150mm thick (or 30% of the total cover depth, whichever is the greater). The report also states that clean cover should not be used on slopes greater than 1 in 12.

The total thickness of clean cover is subject to council approval and the type of soil should be adequate for plant cultivation.

Any proposed imported soils should be tested to confirm that they are uncontaminated (see **Imported Soils Risks** section following) and the final thickness of the cover will require validating. In accordance with clean cover testing recommendations within NHBC Technical Extra Note 8 (Nov 2012), for this site **3no. validation pits should be formed** and should be accompanied by photographic evidence to prove the soil depth (i.e. tape measure against a horizontal bar/staff).

## **Water Supply Pipe Risks**

The local water supply company should accept the use of either PVC or PE water supply pipe materials on site.

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No indications of petrol, diesel, oils etc have been found to date and if such are found during redevelopment works then they would be remediated such that PVC and PE pipe materials would still be acceptable.

## **Hotspot Risks**

Hotspots could be found when the **breakers yard** is cleared of cars and scarp and when the concrete surfacing is removed. Such could pose a risk to the watercourse within the culvert. For this reason and for water supply pipes, hotspots should be removed.

The **coach works** could have had vehicle service pits and sometimes waste oils were poured into these when the pits were no longer required....causing potential hotspots.

## **Imported Soils Risks**

Any recycled aggregates that are planned to be imported to site, should be assessed for asbestos content (and any other contaminants that might be present at the source site), prior to import.

All imported fill, topsoil and sub-soil shall be tested for a general suite of contaminants (e.g. AGGC's suite herein). Topsoil and subsoil can contain naturally occurring contamination such as arsenic and lead. The results shall be assessed for any exceedances of guidelines.

Materials shall be tested at a rate of 1no. sample per 100m<sup>3</sup> (with a minimum of 2 samples per soil source).

It may make commercial sense to import soils that are surplus on other development (donor) sites. Surplus soils become waste as soon as they leave donor sites, unless they are being transferred to another "development" or "construction" (receiver) site for reuse. Such transfer means that such soils do not class as waste, provided that an assessment (Definition of Waste: Industry Code of Practice (DoWCoP), or waste exemption) is completed (see Section 7). There must be a pre-determined use at the receiving site and the soils must be proven, via the assessment, not to pose any unacceptable risks at the receiving site (and not to class as "waste").

## **Unforeseen Contamination**

A site investigation samples a very small portion of the overall site soils. Given the existence of made ground on the site, vigilance should be maintained during site clearance and construction, in case any areas of suspected **unforeseen contamination** are encountered. If areas are found then a suitably qualified person (e.g. AGGC) should undertake appropriate sampling, testing and further risk assessment.

Historically, sometimes asbestos debris/waste was dumped beneath building slabs. There is always a slight risk that may have occurred here, somewhere beneath the slabs.

### **6.11.4 Post-Commencement Risk Reduction Measures Not Requiring Validation**

Site, landscape and maintenance workers should wear gloves, boots and overalls and wash their hands before eating, drinking and smoking. Excessive dust generation should be avoided.

Excavations or below ground voids should be checked for the presence of harmful gases and vapours prior to personnel entry.



## 7 Other Aspects

### 7.1 “Site H&S File”

The remediation and risk-reduction measures discussed earlier are designed to protect end-users of the site. Others at risk comprise post-construction groundworkers and utilities workers etc, for which it is not usually economically viable to remove all risks.

Accordingly, and as with most sites, some sources of risk will remain as follows. **Such should be added to, and discussed in, the “Site H&S File” (or similar document):**

- Made ground remaining in place that contains elevated contaminants.
- UXO.

### 7.2 Waste Advice

#### 7.2.1 General

In order to prevent excessive costs and reduce the environmental impact of the development, it is recommended that removal of wastes from the site, including waste soils, is kept to a minimum by:

- firstly trying to balance cut/fill earthworks operations to retain soils on site,
- or removing from site for reuse:
  - by employing *U1 Waste Exemptions (use of waste in construction)*,
  - and/or *Definition of Waste: Industry Code of Practice (DoWCoP)* assessment,
  - and/or exporting to a soil treatment hub,
- with the last resort being disposal to a licensed waste disposal site (subject to Landfill Tax).

AGGC’s DoWCoP *Qualified Person* can assist with these assessments.

If removing to a licensed disposal site, then **Waste Acceptance Criteria (WAC)** test results and other chemical test results should be given to the waste disposal site for classification, along with the exploratory hole logs (which show sample locations and depths) to show which soils are natural and which are man-made. **Note that WAC alone cannot classify waste soils.**

The lab results to enable *Initial Waste Characterisation*, are contained in Appendix E.

If this report is presented to the Local Authority Environmental Health/Contaminated Land Officer, then we hereby notify the local authority of our potential intent to employ the CL:AIRE DoWCoP in order to transfer surplus soils to other development sites. By accepting this report, the LA provide “*no objection*” to this potential proposal.

#### 7.2.2 Reuse on Site

There is unlikely to be any scope for reuse on site.

#### 7.2.3 Transfer for Reuse on Another Site

Surplus soils become waste as soon as they leave site, unless they are being transferred to another “development” or “construction” site for reuse. Such transfer means that such soils do not class

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as waste, provided that a waste assessment is completed (e.g. by a DoWCoP Qualified Person) to prove compliance with the 4no. (DoWCoP type) factors.

Soil types can be transferred as follows:

- **Utilising DoWCoP:** Currently only natural soils can be transferred via a DoWCoP.
- **Utilising U1 Waste Exemption:** Limited quantities of both natural soils and made ground can be transferred via a U1, provided that they pose no risks to humans, nor the environment.

Certain other materials may also be reused on other “Construction” sites by employing a *U1 Waste Exemption*.

## 7.2.4 Soil Treatment Facilities

**Made ground** and a wide range of hazardous wastes (including Waste Acceptance Criteria (WAC) failing materials), can avoid landfill disposal by being treated at a number of *Soil Treatment Facilities* around the UK. Such disposal is exempt from Landfill Tax.

## 7.2.5 Disposal to Licensed Waste Sites

To evaluate the various on-site soils for potential off-site disposal, soils are classified in accordance with the Hazardous Waste Directive (HWD) that enables the provision of a European Waste Catalogue (EWC) Code for use during offsite disposal and a Hazardous or Non-Hazardous Classification. Non-Hazardous material is suitable for disposal in a Non-Hazardous landfill; however, disposal to an Inert Landfill requires further Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457–3. Material classed as Hazardous also requires WAC testing to assign a suitable hazardous classification.

The Landfill Regulations require that all Hazardous and Non-Hazardous solid waste must be treated prior to offsite disposal to landfill. You can define ‘treatment’ by using the following ‘three-point test’. All three criteria must be satisfied for all of the waste to qualify as being treated:

1. It must be a physical, thermal, chemical or biological process including sorting.
2. It must change the characteristics of the waste.
3. It must do so in order to:
  - a. Reduce its volume; or
  - b. Reduce its hazardous nature; or
  - c. Facilitate its handling; or
  - d. Enhance recovery.

It should be noted that a site investigation is unable to identify all below ground conditions at a site and therefore, if during construction works soils that require offsite disposal are identified as being different to what has been preliminarily tested in this report, additional testing will be required by a suitably qualified environmental consultant prior to disposal or recovery at a licensed offsite facility.

It is also recommended that prior to offsite disposal or recovery of any waste soils; the receiving licensed treatment/landfill facility should be sent copies of all relevant chemical analysis, plus

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**exploratory hole logs** showing the engineering descriptions of the soils to which the sample depths relate.

All producers of waste have a **duty of care** to ensure that any waste they produce is handled safely and within the law. They must **check** that anyone they pass waste on to is **authorised** to take it. This includes the authorised site earmarked to handle the waste and any haulier (licensed waste carrier) used to transport the waste between the sites.

All waste holders must act to keep waste safe against:

1. Corrosion or wear of waste containers;
2. Accidental spilling or leaking or inadvertent leaching from waste unprotected from rainfall;
3. Accident or weather breaking open contained waste and allowing it to escape;
4. Waste blowing away or falling while stored or transported;
5. Scavenging of waste by vandals, thieves, children, trespassers or animals.

Holders should protect waste against the above risks while it is in their possession and they should also protect it for its future handling requirements. Waste should reach not only its next holder but a licensed facility or other appropriate destination without escape. It is recommended that the container used to transport the waste is suitable not only to prevent solid and liquid residues escaping, but also any potentially dangerous vapours or odours associated with the waste.

Segregation of different categories of waste where they are produced may be necessary to prevent the mixing of incompatible wastes. Segregation may assist the disposal of waste to specialist outlets. Where segregation is practiced on sites, the waste holder should ensure that his employees and anyone else handling waste there are aware of the locations and uses of each segregated waste container.

Waste handed over to another person should be in some sort of container, which might include a skip. The only reasonable exception would be loose material loaded into a vehicle and then covered sufficiently to prevent escape before being moved. Waste containers should suit the material put in them.

A waste transfer note (WTN) is a document that must accompany any transfer of waste between different holders. The purpose of a WTN is to allow other people who handle your waste to know what they are dealing with so that they can manage it safely and properly. A WTN must be created for each load of waste that leaves the site and must contain enough information about the waste to enable anyone coming into contact with it to handle it safely, and either dispose of it or allow it to be recovered within the law. If insufficient information is given on the WTN the responsible party may liable to be prosecuted.

Records of all waste transferred or received must keep for at least two years.

## 7.2.6 Asbestos Content to Soils

Since **asbestos cement fragments** contain greater than 0.1 % asbestos by weight, then any waste consignment of soil that contains any obvious asbestos cement fragments will automatically class as **hazardous waste** (hence the recommendation to litter pick any fragments observed).

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If concentrations of **loose asbestos fibres** are all below 0.1% by weight, then any man-made ground will be classed as non-hazardous waste (provided that it contains no obvious asbestos cement fragments).

Any litter picked asbestos cement fragments disposed of separately from the man-made ground would be classed individually as Hazardous Waste.

The man-made ground that contains asbestos/ACM would be classed as a mixed waste (hazardous or non-hazardous, as discussed above) and the waste code would be 17-06-05.

## 7.3 Further Data and Investigation

Once the breakers yard is cleared of cars and scrap (and ideally the concrete surfacing), then further holes should be excavated there to obtain and test soil samples and so to check for contamination (especially risks to the water course in the culvert).

AGGC can assist with most of these aspects if required.

## **Appendices**

- A. Proposed Development Plan
- B. Exploratory Hole Locations
- C. Exploratory Hole Logs
- D. Geotechnical Laboratory Results
- E. Chemical Laboratory Results

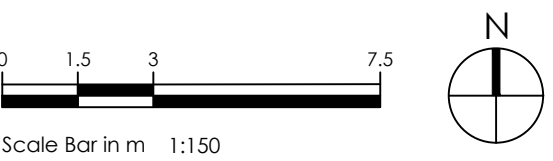
## **Appendix A**





- NOTES:
1. This drawing is to be read in conjunction with all relevant contract documentation from the design team, with any conflicting information to be brought to the attention of Turkington Martin Landscape Architects in writing before commencing on site.
  2. The contractor is to check and verify all levels and dimensions before construction. Any discrepancies are to be brought to the attention of Turkington Martin Landscape Architects in writing before commencing on site.
  3. All dimensions in mm, unless otherwise stated.
  4. Do not scale from this drawing.
  5. All sub base and concrete design and specification to engineer's details. All diagrams provided here are purely indicative.
  6. Waterproofing of any element to be specified by others.
  7. All proprietary products shall be installed in accordance with manufacturers written instructions.
  8. Plant numbers are an indication only and plants should be ordered to suit site areas in accordance with scheduled plant densities.
  9. Any proposed plant substitution shall be agreed with the landscape architect prior to ordering.

- KEY**
- Site boundary
- PAVING**
- Pre-cast concrete block paving (pedestrian areas)
  - Pre-cast concrete block paving (vehicle and parking area)
  - Private gardens
  - Mulch to Play Area
  - Maintenance BOH paving TBC
- PLANTING**
- Perennial Planting
  - Defensible Planting
  - Lawn
  - Proposed Trees (standard)



|          |       |                                                                                                                                                       |                 |            |
|----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|
| 02/02/24 | EN    | Updated plan as per architect's new levels                                                                                                            | P07             | MM         |
| 03/02/24 | EN    | Updated plan. Removed refuse store. New kerb lines.                                                                                                   | P06             | MM         |
| 15/02/24 | EN    | Updated plan as per updated tracking, new ground floor, added parking line                                                                            | P05             | MM         |
| 24/12/23 | EN    | Updated kerb lines as per tracking. Additional parking line as per Transport officers comment. Revised cycle area as per landscape officer's comments | P04             | MM         |
| 16/12/23 | EN    | Updated road width, play area, bike store                                                                                                             | P03             | MM         |
| 08/12/23 | EN    | Updated layout as per comments and revised architectural plans                                                                                        | P02             | MM         |
| DATE     | DRAWN | DESCRIPTION OF REVISION                                                                                                                               | REVISION LETTER | CHECKED BY |

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CLIENT  
Trinity Group

PROJECT TITLE  
Hornsey Park Road

DRAWING TITLE  
Landscape GA - Ground Floor

DRAWING STATUS  
S2 - Suitable for Information

DRAWING SCALE: 1:100  
PAPER SIZE: A1

DRAWN BY: EN  
CHECKED BY: MM

DRAWN DATE: 26.10.23  
CHECKED DATE: 26.10.23

DRAWING NUMBER: 613-TML-XX-00-DR-L-0200

REVISION: P07

Turkington Martin LANDSCAPE ARCHITECTS



# AG Geo-Consultants Ltd

## **Appendix B**





DS1

DS2

DS3

DS4

DS5

DS6

DS7

DS7a

P Davies Joinery

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## Appendix C



# Key to Exploratory Hole Symbols and Abbreviations

## SAMPLE TYPES

|       |                                       |     |                            |    |                              |
|-------|---------------------------------------|-----|----------------------------|----|------------------------------|
| B     | Bulk disturbed sample                 | ES  | Environmental soil sample  | U  | Undisturbed sample           |
| C     | Core sample                           | EW  | Environmental water sample | UT | Undisturbed thin wall sample |
| CBR-D | Disturbed sample from CBR test area   | G   | Gas sample                 | W  | Water sample                 |
| CBR-U | Undisturbed sample from CBR test area | L   | Liner sample               |    |                              |
| D     | Small disturbed sample                | SPT | SPT split spoon sample     |    |                              |

## IN-SITU TESTING

|       |                                                                                   |
|-------|-----------------------------------------------------------------------------------|
| SPTs  | Standard Penetration Test (using a split spoon sampler)                           |
| SPTc  | Standard Penetration Test (using a solid 60 degree cone)                          |
| N     | Recorded SPT 'N' Value *                                                          |
| -/-   | Blows/Penetration (mm) after seating blows totalling 150 mm                       |
| MX    | Mexi Probe Test (records CBR as %)                                                |
| HV    | Hand Shear Vane Test (undrained shear strength quoted in kPa)                     |
| HP    | Hand Penetrometer Test (kg/m <sup>3</sup> )                                       |
| ( )   | Denotes residual test value                                                       |
| PID   | Photo Ionisation Detector (ppm) *                                                 |
| Kf/Kr | Permeability Test (f = falling head, r = rising head quoted in ms <sup>-1</sup> ) |
| HPD   | High Pressure Dilatometer Test (pressure meter)                                   |
| PKR   | Packer / Lugeon Permeability Test                                                 |
| CBR   | California Bearing Ratio Test                                                     |

## ROTARY CORE DETAILS

|      |                                                                                      |
|------|--------------------------------------------------------------------------------------|
| TCR  | Total Core Recovery, %                                                               |
| SCR  | Solid Core Recovery, %                                                               |
| RQD  | Rock Quality Designation (% of intact core >100 mm)                                  |
| FI   | Fracture Spacing (average fracture spacing; in mm, over indicated length of core) ** |
| NI   | Non-Intact Core                                                                      |
| AZCL | Assumed Zone of Core Loss                                                            |

## GROUNDWATER



Groundwater strike



Standing water level after 20 minutes; 1st, 2nd etc (number denotes level order)

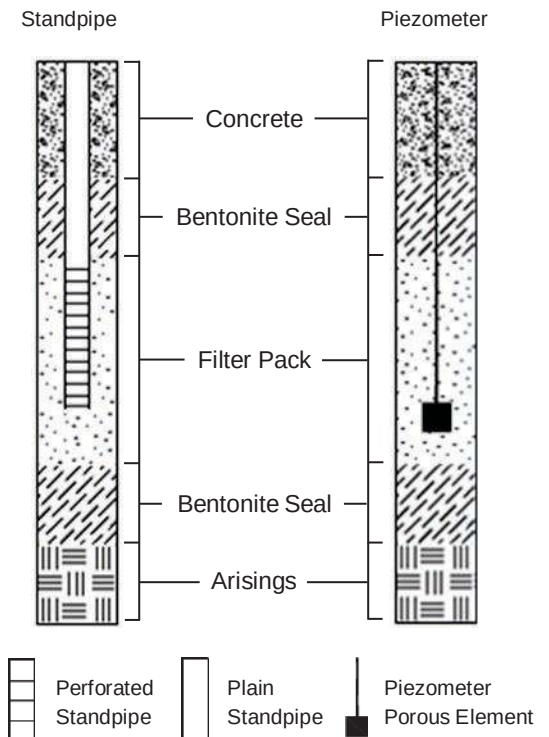
## STRATA LEGENDS - Note: Composite strata types are shown by combining symbols

|  |                            |  |          |  |           |  |                           |
|--|----------------------------|--|----------|--|-----------|--|---------------------------|
|  | Made Ground                |  | Silt     |  | Peat      |  | Limestone                 |
|  | Concrete                   |  | Sand     |  | Void      |  | Chalk                     |
|  | Bituminous Bound Materials |  | Gravel   |  | Mudstone  |  | Coal                      |
|  | Topsoil                    |  | Cobbles  |  | Siltstone |  | Metamorphic Rock          |
|  | Clay                       |  | Boulders |  | Sandstone |  | Fine Grained Igneous Rock |

\* Where a single value is quoted this is the uncorrected 'N' value for a full 300 mm test drive following a seating drive of 150mm. Where the full test drive penetration is not achieved the number of blows is quoted for the penetration below the test total of 300mm, e.g.: 50/75.

\*\* The minimum, average and maximum are shown e.g. 5/45/125.

## INSTALLATION & BACKFILL DETAILS



## STRATUM BOUNDARIES

Unit boundary



|                                                              |          |                          |       |                                                                                                  |                                                                                                         |            |
|--------------------------------------------------------------|----------|--------------------------|-------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------|
| <b>GEOPROBE ENVIRONMENTAL LTD</b>                            |          |                          |       |                                                                                                  | <b>DS</b>                                                                                               | 2          |
| <b>Contract</b> Hornsey Park Road, Wood Green                |          |                          |       |                                                                                                  | <b>Report No</b>                                                                                        | GPE 22.041 |
| <b>Client</b> AG Geo-Consultants Ltd                         |          |                          |       |                                                                                                  | <b>Date</b>                                                                                             | 23.5.22    |
| <b>Site Address</b> Hornsey Park Road, Wood Green, Tottenham |          |                          |       |                                                                                                  | Ground Level                                                                                            | mOD        |
| Type of Excavator                                            |          | Window sampler           |       | Water level after completion, m                                                                  |                                                                                                         | none       |
| Water Strikes, m                                             |          | Pit Dimensions, m        |       | Ease of Excavation, m                                                                            |                                                                                                         |            |
| 1 none                                                       |          | Length 100mmφ<br>Breadth |       | Very Easy <input type="checkbox"/> Difficult<br>Moderate      Very hard <input type="checkbox"/> |                                                                                                         |            |
| Observations: Starter pit excavated to clear services        |          |                          |       |                                                                                                  |                                                                                                         |            |
| Sample Type                                                  | Depth, m | SPT N                    | Depth | Legend                                                                                           | Description                                                                                             |            |
| C                                                            | 0.30     | 4 5/5 5 4 3<br>17        | 0.60  |                                                                                                  | Made ground (Concrete (0.10 m) over hardcore over clay with brick rubble at 0.50m)                      |            |
| D                                                            | 1.00     |                          |       |                                                                                                  | Medium dense orangish brown clayey fine to coarse GRAVEL                                                |            |
| C                                                            | 1.50     | H.V. =<br>95 kPa         | 1.50  |                                                                                                  | Firm becoming stiff brown fissured very silty CLAY with veins of grey clay, flint cobble noted at 1.80m |            |
| D                                                            | 2.00     |                          |       |                                                                                                  |                                                                                                         |            |
| D                                                            | 3.00     | H.V. =<br>165 kPa        |       |                                                                                                  |                                                                                                         |            |
|                                                              |          |                          |       |                                                                                                  |                                                                                                         |            |
| D                                                            | 4.00     | H.V. =<br>>180 kPa       |       |                                                                                                  |                                                                                                         |            |
|                                                              |          |                          |       |                                                                                                  |                                                                                                         |            |
|                                                              |          | H.V. =<br>>180 kPa       |       |                                                                                                  |                                                                                                         |            |
|                                                              |          |                          |       |                                                                                                  |                                                                                                         |            |
| D                                                            | 5.00     |                          | 5.00  |                                                                                                  | END OF BOREHOLE                                                                                         |            |

Code:      D – disturbed sample      W – Water sample

|                                                              |          |                          |                      |                                                                                                  |                                                                            |            |
|--------------------------------------------------------------|----------|--------------------------|----------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------|
| <b>GEOPROBE ENVIRONMENTAL LTD</b>                            |          |                          |                      |                                                                                                  | <b>DS</b>                                                                  | 3          |
| <b>Contract</b> Hornsey Park Road, Wood Green                |          |                          |                      |                                                                                                  | <b>Report No</b>                                                           | GPE 22.041 |
| <b>Client</b> AG Geo-Consultants Ltd                         |          |                          |                      |                                                                                                  | <b>Date</b>                                                                | 23.5.22    |
| <b>Site Address</b> Hornsey Park Road, Wood Green, Tottenham |          |                          |                      |                                                                                                  | Ground Level                                                               | mOD        |
| Type of Excavator                                            |          | Window sampler           |                      | Water level after completion, m                                                                  |                                                                            | none       |
| Water Strikes, m                                             |          | Pit Dimensions, m        |                      | Ease of Excavation, m                                                                            |                                                                            |            |
| 1 none                                                       |          | Length 100mmφ<br>Breadth |                      | Very Easy <input type="checkbox"/> Difficult<br>Moderate      Very hard <input type="checkbox"/> |                                                                            |            |
| Observations: Starter pit excavated to clear services        |          |                          |                      |                                                                                                  |                                                                            |            |
| Sample Type                                                  | Depth, m | SPT N                    | Depth                | Legend                                                                                           | Description                                                                |            |
| C                                                            | 0.25     | 1 1/1 1 2 2<br>6         | 0.50<br><br><br>1.40 |                                                                                                  | Made ground (Concrete (0.10 m) over clay with sand and brick rubble)       |            |
| D                                                            | 1.00     |                          |                      |                                                                                                  | Loose reddish brown clayey fine to coarse GRAVEL                           |            |
| D                                                            | 2.00     |                          |                      |                                                                                                  | Firm becoming stiff brown fissured very silty CLAY with veins of grey clay |            |
| D                                                            | 3.00     |                          |                      |                                                                                                  |                                                                            |            |
| D                                                            | 4.00     | H.V. = 145 kPa           |                      |                                                                                                  |                                                                            |            |
| D                                                            | 5.00     | H.V. = 150 kPa           | 5.00                 |                                                                                                  | END OF BOREHOLE                                                            |            |

Code:      D – disturbed sample      W – Water sample

|                                                              |          |                          |                  |                                                                                                                  |                                                                            |            |
|--------------------------------------------------------------|----------|--------------------------|------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------|
| <b>GEOPROBE ENVIRONMENTAL LTD</b>                            |          |                          |                  |                                                                                                                  | <b>DS</b>                                                                  | 4          |
| <b>Contract</b> Hornsey Park Road, Wood Green                |          |                          |                  |                                                                                                                  | <b>Report No</b>                                                           | GPE 22.041 |
| <b>Client</b> AG Geo-Consultants Ltd                         |          |                          |                  |                                                                                                                  | <b>Date</b>                                                                | 23.5.22    |
| <b>Site Address</b> Hornsey Park Road, Wood Green, Tottenham |          |                          |                  |                                                                                                                  | Ground Level                                                               | mOD        |
| Type of Excavator                                            |          | Window sampler           |                  | Water level after completion, m                                                                                  |                                                                            | none       |
| Water Strikes, m                                             |          | Pit Dimensions, m        |                  | Ease of Excavation, m                                                                                            |                                                                            |            |
| 1 none                                                       |          | Length 100mmφ<br>Breadth |                  | Very Easy <input type="checkbox"/> Difficult<br>Moderate                      Very hard <input type="checkbox"/> |                                                                            |            |
| Observations: Starter pit excavated to clear services        |          |                          |                  |                                                                                                                  |                                                                            |            |
| Sample Type                                                  | Depth, m | SPT N                    | Depth            | Legend                                                                                                           | Description                                                                |            |
| C                                                            | 0.35     |                          |                  |                                                                                                                  | Made ground (Reinforced concrete (0.20 m) over brick and clay fill)        |            |
| D                                                            | 1.00     | 1 1/1 1 1 1<br>4         | 0.70<br><br>1.30 |                                                                                                                  | Brown and grey mottled very silty CLAY with frequent fine to coarse gravel |            |
| D                                                            | 2.00     | H.V. =<br>75 kPa         |                  |                                                                                                                  | Firm becoming stiff brown fissured very silty CLAY with veins of grey clay |            |
| D                                                            | 3.00     | H.V. =<br>120 kPa        |                  |                                                                                                                  |                                                                            |            |
| D                                                            | 4.00     | H.V. =<br>165 kPa        |                  |                                                                                                                  |                                                                            |            |
| D                                                            | 5.00     | H.V. =<br>135 kPa        | 5.00             |                                                                                                                  |                                                                            |            |
| END OF BOREHOLE                                              |          |                          |                  |                                                                                                                  |                                                                            |            |

Code:      D – disturbed sample      W – Water sample





|                                                              |          |                          |       |                                                                                                  |                                                                                                            |      |
|--------------------------------------------------------------|----------|--------------------------|-------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------|
| <b>GEOPROBE ENVIRONMENTAL LTD</b>                            |          |                          |       |                                                                                                  | <b>DS</b> 6                                                                                                |      |
| <b>Contract</b> Hornsey Park Road, Wood Green                |          |                          |       |                                                                                                  | <b>Report No</b> GPE 22.041                                                                                |      |
| <b>Client</b> AG Geo-Consultants Ltd                         |          |                          |       |                                                                                                  | <b>Date</b> 23.5.22                                                                                        |      |
| <b>Site Address</b> Hornsey Park Road, Wood Green, Tottenham |          |                          |       |                                                                                                  | Ground Level mOD                                                                                           |      |
| Type of Excavator                                            |          | Window sampler           |       | Water level after completion, m                                                                  |                                                                                                            | none |
| Water Strikes, m                                             |          | Pit Dimensions, m        |       | Ease of Excavation, m                                                                            |                                                                                                            |      |
| 1 none                                                       |          | Length 100mmφ<br>Breadth |       | Very Easy <input type="checkbox"/> Difficult<br>Moderate      Very hard <input type="checkbox"/> |                                                                                                            |      |
| Observations: Starter pit excavated to clear services        |          |                          |       |                                                                                                  |                                                                                                            |      |
| Sample Type                                                  | Depth, m | SPT N                    | Depth | Legend                                                                                           | Description                                                                                                |      |
| C                                                            | 0.20     |                          |       |                                                                                                  | Made ground (Weak concrete (0.10 m) over dark brown gravel, ash, clay, brick rubble and rare granite sett) |      |
| C                                                            | 0.60     |                          | 0.45  |                                                                                                  | Made ground (Brown sandy clay with rare brick fragments)                                                   |      |
|                                                              |          |                          | 1.10  |                                                                                                  | END OF BOREHOLE                                                                                            |      |

Code:      D – disturbed sample      W – Water sample





# AG Geo-Consultants Ltd

## **Appendix D**



## NHBC Volume Change Potential Summary

Project No.

Project Name

**iGeo-22-099A**

**Hornsey Park Road, Wood Green**

[illegible]

Samples classified according to the NHBC Chapter 4.2 building near trees:

Non-shrinkable : Less than 35% passing 63 $\mu$  sieve, or PI less than 10%

**Low Volume Change Potential :** Plasticity Index 10% to 19%

Medium Volume Change Potential :                      Plasticity Index 20% to 39%

High Volume Change Potential :                      Plasticity Index 40% or greater

Note 2. Unless other representative samples, or the soils to depth below the foundations, have a similar or greater coarse sand and/or gravel content to that found in this sample, it is recommended that the design is based on the unmodified PI figure

Key: 1pt = LL 1pt cone (otherwise 4pt), cas = Casagrande method, NP = sample is Non Plastic

All tests performed in accordance with BS1377:1990 unless specified otherwise

Note 1. Modified PI = Normal PI x fraction passing 425 micron sieve. For the modified PI to be used "sufficient sample should be taken to provide confidence that the test results are representative of the soil volume change potential for the site. If in doubt use the higher value of volume change potential"

Note 3. The results of this testing are too close to the non-shrinkable boundary to conclude a 'non-shrinkable' recommendation for this sample. Further testing or engineer judgment is recommended, otherwise it would be prudent to assume the sample is shrinkable

Sheet no: 1

Tested by

Date Printed: 15/06/2022

Approved by

N. B. D. K.

**iGeo Limited**

183 Long Lane, Tilehurst, Reading, Berkshire, RG31 6YW  
Office: 0118 943 9910 Email: [hello@igeo.co.uk](mailto:hello@igeo.co.uk) Web: [www.igeo.co.uk](http://www.igeo.co.uk)

# AG Geo-Consultants Ltd

## **Appendix E**





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# Final Report

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|                               |                                                   |                         |             |
|-------------------------------|---------------------------------------------------|-------------------------|-------------|
| <b>Report No.:</b>            | 22-20775-1                                        |                         |             |
| <b>Initial Date of Issue:</b> | 09-Jun-2022                                       |                         |             |
| <b>Client</b>                 | AG Geo-Consultants Ltd                            |                         |             |
| <b>Client Address:</b>        | 58 Church Road<br>Bishopton<br>Bristol<br>BS7 8SE |                         |             |
| <b>Contact(s):</b>            | Andre Gilleard                                    |                         |             |
| <b>Project</b>                | 22-009 Land to rear of Hornsey Park Rd            |                         |             |
| <b>Quotation No.:</b>         | Q20-20542                                         | <b>Date Received:</b>   | 06-Jun-2022 |
| <b>Order No.:</b>             |                                                   | <b>Date Instructed:</b> | 06-Jun-2022 |
| <b>No. of Samples:</b>        | 7                                                 |                         |             |
| <b>Turnaround (Wkdays):</b>   | 5                                                 | <b>Results Due:</b>     | 10-Jun-2022 |
| <b>Date Approved:</b>         | 09-Jun-2022                                       |                         |             |
| <b>Approved By:</b>           |                                                   |                         |             |



**Details:** Stuart Henderson, Technical Manager

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## Results - Soil

**Project: 22-009 Land to rear of Hornsey Park Rd**

|                                                 |                             |            |              |            |             |             |             |             |             |             |             |
|-------------------------------------------------|-----------------------------|------------|--------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Client: AG Geo-Consultants Ltd</b>           | <b>Chemtest Job No.:</b>    |            |              |            | 22-20775    | 22-20775    | 22-20775    | 22-20775    | 22-20775    | 22-20775    | 22-20775    |
| Quotation No.: Q20-20542                        | <b>Chemtest Sample ID.:</b> |            |              |            | 1441815     | 1441816     | 1441817     | 1441818     | 1441819     | 1441820     | 1441821     |
|                                                 | Sample Location:            |            |              |            | DS1         | DS1         | DS2         | DS3         | DS4         | DS4         | DS4         |
|                                                 | Sample Type:                |            |              |            | SOIL        | SOIL        | SOIL        | SOIL        | SOIL        | SOIL        | SOIL        |
|                                                 | Top Depth (m):              |            |              |            | 2           | 5           | 2           | 3           | 1           | 2           | 4           |
|                                                 | Date Sampled:               |            |              |            | 23-May-2022 | 23-May-2022 | 23-May-2022 | 23-May-2022 | 23-May-2022 | 23-May-2022 | 23-May-2022 |
| <b>Determinand</b>                              | <b>Accred.</b>              | <b>SOP</b> | <b>Units</b> | <b>LOD</b> |             |             |             |             |             |             |             |
| Moisture                                        | N                           | 2030       | %            | 0.020      | 21          | 23          | 25          | 22          | 12          | 26          | 24          |
| pH (2.5:1)                                      | N                           | 2010       |              | 4.0        | 8.1         | 8.0         | 8.1         | 7.9         | 8.3         | 8.2         | 8.1         |
| Sulphate (2:1 Water Soluble) as SO <sub>4</sub> | U                           | 2120       | g/l          | 0.010      | 0.48        | 2.0         | 0.42        | 1.5         | 0.063       | 0.31        | 1.2         |
| Total Sulphur                                   | U                           | 2175       | %            | 0.010      | 0.099       | 2.0         | 0.089       | 1.9         | 0.024       | 0.083       | 0.52        |
| Sulphate (Acid Soluble)                         | U                           | 2430       | %            | 0.010      | 0.33        | 0.17        | 0.14        | 1.2         | 0.022       | 0.11        | 0.71        |

## Test Methods

| SOP  | Title                                                      | Parameters included                  | Method summary                                                                                       |
|------|------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------|
| 2010 | pH Value of Soils                                          | pH                                   | pH Meter                                                                                             |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content                     | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2040 | Soil Description(Requirement of MCERTS)                    | Soil description                     | As received soil is described based upon BS5930                                                      |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium        | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES                                                                         |
| 2175 | Total Sulphur in Soils                                     | Total Sulphur                        | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.           |
| 2430 | Total Sulphate in soils                                    | Total Sulphate                       | Acid digestion followed by determination of sulphate in extract by ICP-OES.                          |

## **Report Information**

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### **Key**

|     |                                                                                                               |
|-----|---------------------------------------------------------------------------------------------------------------|
| U   | UKAS accredited                                                                                               |
| M   | MCERTS and UKAS accredited                                                                                    |
| N   | Unaccredited                                                                                                  |
| S   | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis     |
| SN  | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T   | This analysis has been subcontracted to an unaccredited laboratory                                            |
| I/S | Insufficient Sample                                                                                           |
| U/S | Unsuitable Sample                                                                                             |
| N/E | not evaluated                                                                                                 |
| <   | "less than"                                                                                                   |
| >   | "greater than"                                                                                                |
| SOP | Standard operating procedure                                                                                  |
| LOD | Limit of detection                                                                                            |

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

---

### **Sample Deviation Codes**

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

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### **Sample Retention and Disposal**

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



# Final Report

---

**Report No.:** 22-21043-1

**Initial Date of Issue:** 13-Jun-2022

**Client** AG Geo-Consultants Ltd

**Client Address:** 58 Church Road  
Bishopton  
Bristol  
BS7 8SE

**Contact(s):** Andre Gilleard

**Project** 22-009 Land to Rear of Hornsey Park Rd

**Quotation No.:** Q20-20542      **Date Received:** 07-Jun-2022

**Order No.:**      **Date Instructed:** 07-Jun-2022

**No. of Samples:** 7

**Turnaround (Wkdays):** 5      **Results Due:** 13-Jun-2022

**Date Approved:** 13-Jun-2022

**Approved By:**

**Details:** Stuart Henderson, Technical Manager

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# Bulk Identification Certificate

**Client:** AG Geo-Consultants Ltd

**Site Address:**

**Date Sampled:** 23-May-2022

**Date Received:** 07-Jun-2022

**Your Ref.:**

**Project:** 22-009 Land to Rear of Hornsey  
Park Rd

**Job Number:** 22-21043

**No Samples:**

**Date Reported:** 13-Jun-2022

| Sample No. | Sample ID | Sample Ref. | Description | Top (m) | Bottom (m) | SOP  | Accred. | Laboratory | Material | Result                  |
|------------|-----------|-------------|-------------|---------|------------|------|---------|------------|----------|-------------------------|
| 1442994    |           |             | DS7         | 0.30    |            | 2185 | U       | COVENTRY   | -        | No Asbestos<br>Detected |

The in-house procedure SOP2185 is in accordance with the requirements of Appendix 2 of the Analyst Guide (HSG 248).

The results relate only to items tested as supplied by the client.

Comments and interpretations are beyond the scope of UKAS accreditation.

Samples associated with asbestos in building surveys are retained for six months (HSG 264 refers)

## Results - Soil

**Project: 22-009 Land to Rear of Hornsey Park Rd**

|                                       |                             |            |              |            |                      |                      |                      |                      |                      |                      |
|---------------------------------------|-----------------------------|------------|--------------|------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <b>Client: AG Geo-Consultants Ltd</b> | <b>Chemtest Job No.:</b>    |            |              |            | 22-21043             | 22-21043             | 22-21043             | 22-21043             | 22-21043             | 22-21043             |
| Quotation No.: Q20-20542              | <b>Chemtest Sample ID.:</b> |            |              |            | 1442986              | 1442988              | 1442989              | 1442991              | 1442992              | 1442995              |
|                                       | Sample Location:            |            |              |            | DS1                  | DS2                  | DS3                  | DS5                  | DS6                  | DS7a                 |
|                                       | Sample Type:                |            |              |            | SOIL                 | SOIL                 | SOIL                 | SOIL                 | SOIL                 | SOIL                 |
|                                       | Top Depth (m):              |            |              |            | 0.30                 | 0.30                 | 0.25                 | 0.45                 | 0.20                 | 1.00                 |
|                                       | Date Sampled:               |            |              |            | 23-May-2022          | 23-May-2022          | 23-May-2022          | 23-May-2022          | 23-May-2022          | 23-May-2022          |
|                                       | Asbestos Lab:               |            |              |            | COVENTRY             | COVENTRY             | COVENTRY             | COVENTRY             | COVENTRY             | NEW-ASB              |
| <b>Determinand</b>                    | <b>Accred.</b>              | <b>SOP</b> | <b>Units</b> | <b>LOD</b> |                      |                      |                      |                      |                      |                      |
| ACM Type                              | U                           | 2192       |              | N/A        | -                    | -                    | -                    | -                    | -                    | -                    |
| Asbestos Identification               | U                           | 2192       |              | N/A        | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture                              | N                           | 2030       | %            | 0.020      | 14                   | 23                   | 25                   | 18                   | 13                   | 21                   |
| pH                                    | U                           | 2010       |              | 4.0        | 8.2                  | 8.8                  | 8.4                  | 8.8                  | 9.3                  | 8.9                  |
| Sulphate (2:1 Water Soluble) as SO4   | U                           | 2120       | g/l          | 0.010      | 0.74                 | 0.090                | 0.086                | 0.058                | 0.97                 | 0.57                 |
| Total Sulphur                         | U                           | 2175       | %            | 0.010      |                      |                      |                      | 0.11                 |                      |                      |
| Sulphate (Total)                      | U                           | 2430       | mg/kg        | 100        |                      |                      |                      | 670                  |                      |                      |
| Arsenic                               | U                           | 2455       | mg/kg        | 0.5        | 25                   | 17                   | 24                   | 20                   | 23                   | 21                   |
| Cadmium                               | U                           | 2455       | mg/kg        | 0.10       | 0.30                 | 0.16                 | 0.49                 | 0.24                 | 0.33                 | 0.34                 |
| Chromium                              | U                           | 2455       | mg/kg        | 0.5        | 19                   | 25                   | 30                   | 27                   | 24                   | 23                   |
| Copper                                | U                           | 2455       | mg/kg        | 0.50       | 100                  | 39                   | 91                   | 170                  | 130                  | 54                   |
| Mercury                               | U                           | 2455       | mg/kg        | 0.05       | 1.7                  | 0.60                 | 0.72                 | 1.5                  | 0.68                 | 0.46                 |
| Nickel                                | U                           | 2455       | mg/kg        | 0.50       | 27                   | 21                   | 21                   | 19                   | 29                   | 19                   |
| Lead                                  | U                           | 2455       | mg/kg        | 0.50       | 760                  | 330                  | 690                  | 570                  | 370                  | 330                  |
| Selenium                              | U                           | 2455       | mg/kg        | 0.25       | 1.1                  | 0.83                 | 1.2                  | 0.78                 | 0.75                 | 0.61                 |
| Zinc                                  | U                           | 2455       | mg/kg        | 0.50       | 180                  | 84                   | 440                  | 210                  | 290                  | 220                  |
| Chromium (Hexavalent)                 | N                           | 2490       | mg/kg        | 0.50       | < 0.50               | < 0.50               | < 0.50               | < 0.50               | < 0.50               | < 0.50               |
| Organic Matter                        | U                           | 2625       | %            | 0.40       | 8.1                  | 5.2                  | 4.7                  | 5.3                  | 3.1                  | 6.7                  |
| Aliphatic TPH >C5-C6                  | N                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aliphatic TPH >C6-C8                  | N                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aliphatic TPH >C8-C10                 | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aliphatic TPH >C10-C12                | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aliphatic TPH >C12-C16                | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aliphatic TPH >C16-C21                | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aliphatic TPH >C21-C35                | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] 170              | [B] < 1.0            |
| Aliphatic TPH >C35-C44                | N                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Total Aliphatic Hydrocarbons          | N                           | 2680       | mg/kg        | 5.0        | [B] < 5.0            | [B] < 5.0            | [B] < 5.0            | [B] < 5.0            | [B] 170              | [B] < 5.0            |
| Aromatic TPH >C5-C7                   | N                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aromatic TPH >C7-C8                   | N                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aromatic TPH >C8-C10                  | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aromatic TPH >C10-C12                 | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aromatic TPH >C12-C16                 | U                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aromatic TPH >C16-C21                 | U                           | 2680       | mg/kg        | 1.0        | [B] 36               | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Aromatic TPH >C21-C35                 | U                           | 2680       | mg/kg        | 1.0        | [B] 300              | [B] < 1.0            | [B] < 1.0            | [B] 930              | [B] 280              | [B] 770              |
| Aromatic TPH >C35-C44                 | N                           | 2680       | mg/kg        | 1.0        | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            | [B] < 1.0            |
| Total Aromatic Hydrocarbons           | N                           | 2680       | mg/kg        | 5.0        | [B] 330              | [B] < 5.0            | [B] < 5.0            | [B] 930              | [B] 280              | [B] 770              |
| Total Petroleum Hydrocarbons          | N                           | 2680       | mg/kg        | 10.0       | [B] 330              | [B] < 10             | [B] < 10             | [B] 930              | [B] 450              | [B] 770              |
| Naphthalene                           | U                           | 2700       | mg/kg        | 0.10       | < 0.10               | < 0.10               | < 0.10               | < 0.10               | 0.33                 | < 0.10               |

## Results - Soil

**Project: 22-009 Land to Rear of Hornsey Park Rd**

|                                       |                             |            |              |            |             |             |             |             |             |             |
|---------------------------------------|-----------------------------|------------|--------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Client: AG Geo-Consultants Ltd</b> | <b>Chemtest Job No.:</b>    |            |              |            | 22-21043    | 22-21043    | 22-21043    | 22-21043    | 22-21043    | 22-21043    |
| Quotation No.: Q20-20542              | <b>Chemtest Sample ID.:</b> |            |              |            | 1442986     | 1442988     | 1442989     | 1442991     | 1442992     | 1442995     |
|                                       | Sample Location:            |            |              |            | DS1         | DS2         | DS3         | DS5         | DS6         | DS7a        |
|                                       | Sample Type:                |            |              |            | SOIL        | SOIL        | SOIL        | SOIL        | SOIL        | SOIL        |
|                                       | Top Depth (m):              |            |              |            | 0.30        | 0.30        | 0.25        | 0.45        | 0.20        | 1.00        |
|                                       | Date Sampled:               |            |              |            | 23-May-2022 | 23-May-2022 | 23-May-2022 | 23-May-2022 | 23-May-2022 | 23-May-2022 |
|                                       | Asbestos Lab:               |            |              |            | COVENTRY    | COVENTRY    | COVENTRY    | COVENTRY    | COVENTRY    | NEW-ASB     |
| <b>Determinand</b>                    | <b>Accred.</b>              | <b>SOP</b> | <b>Units</b> | <b>LOD</b> |             |             |             |             |             |             |
| Acenaphthylene                        | U                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      | 0.37        | < 0.10      |
| Acenaphthene                          | U                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      | 0.26        | < 0.10      |
| Fluorene                              | U                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      | 0.56        | < 0.10      |
| Phenanthrene                          | U                           | 2700       | mg/kg        | 0.10       | 2.0         | 0.83        | < 0.10      | 2.5         | 5.8         | 1.6         |
| Anthracene                            | U                           | 2700       | mg/kg        | 0.10       | 0.67        | 0.37        | < 0.10      | 0.73        | 1.3         | 0.33        |
| Fluoranthene                          | U                           | 2700       | mg/kg        | 0.10       | 5.9         | 2.6         | 0.85        | 4.7         | 8.9         | 4.0         |
| Pyrene                                | U                           | 2700       | mg/kg        | 0.10       | 6.2         | 3.1         | 0.89        | 4.5         | 8.4         | 4.0         |
| Benzo[a]anthracene                    | U                           | 2700       | mg/kg        | 0.10       | 3.5         | 2.3         | < 0.10      | 2.2         | 4.0         | 1.9         |
| Chrysene                              | U                           | 2700       | mg/kg        | 0.10       | 4.4         | 2.9         | < 0.10      | 3.3         | 5.3         | 2.4         |
| Benzo[b]fluoranthene                  | U                           | 2700       | mg/kg        | 0.10       | 5.1         | 3.4         | < 0.10      | 3.5         | 5.7         | 3.1         |
| Benzo[k]fluoranthene                  | U                           | 2700       | mg/kg        | 0.10       | 2.0         | 1.3         | < 0.10      | 1.3         | 2.3         | 1.2         |
| Benzo[a]pyrene                        | U                           | 2700       | mg/kg        | 0.10       | 4.6         | 3.3         | < 0.10      | 2.7         | 4.6         | 2.6         |
| Indeno(1,2,3-c,d)Pyrene               | U                           | 2700       | mg/kg        | 0.10       | 3.4         | 2.8         | < 0.10      | 3.5         | 5.7         | 2.7         |
| Dibenz(a,h)Anthracene                 | U                           | 2700       | mg/kg        | 0.10       | 1.1         | 1.1         | < 0.10      | 1.5         | 3.2         | 1.3         |
| Benzo[g,h,i]perylene                  | U                           | 2700       | mg/kg        | 0.10       | 3.6         | 2.9         | < 0.10      | 4.3         | 7.1         | 2.2         |
| Total Of 16 PAH's                     | U                           | 2700       | mg/kg        | 2.0        | 42          | 27          | < 2.0       | 35          | 64          | 27          |
| Benzene                               | U                           | 2760       | µg/kg        | 1.0        | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   |
| Toluene                               | U                           | 2760       | µg/kg        | 1.0        | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   |
| Ethylbenzene                          | U                           | 2760       | µg/kg        | 1.0        | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   |
| m & p-Xylene                          | U                           | 2760       | µg/kg        | 1.0        | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   |
| o-Xylene                              | U                           | 2760       | µg/kg        | 1.0        | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   | [B] < 1.0   |



## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample: | Sample Ref: | Sample ID: | Sample Location: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---------|-------------|------------|------------------|---------------|--------------------|----------------------|
| 1442986 |             |            | DS1              | 23-May-2022   | B                  | Amber Glass 60ml     |
| 1442986 |             |            | DS1              | 23-May-2022   | B                  | Plastic Bottle 250ml |
| 1442986 |             |            | DS1              | 23-May-2022   | B                  | Plastic Tub 500g     |
| 1442988 |             |            | DS2              | 23-May-2022   | B                  | Amber Glass 60ml     |
| 1442988 |             |            | DS2              | 23-May-2022   | B                  | Plastic Bottle 250ml |
| 1442988 |             |            | DS2              | 23-May-2022   | B                  | Plastic Tub 500g     |
| 1442989 |             |            | DS3              | 23-May-2022   | B                  | Amber Glass 60ml     |
| 1442989 |             |            | DS3              | 23-May-2022   | B                  | Plastic Bottle 250ml |
| 1442989 |             |            | DS3              | 23-May-2022   | B                  | Plastic Tub 500g     |
| 1442991 |             |            | DS5              | 23-May-2022   | B                  | Amber Glass 60ml     |
| 1442991 |             |            | DS5              | 23-May-2022   | B                  | Plastic Bottle 250ml |
| 1442991 |             |            | DS5              | 23-May-2022   | B                  | Plastic Tub 500g     |
| 1442992 |             |            | DS6              | 23-May-2022   | B                  | Amber Glass 60ml     |
| 1442992 |             |            | DS6              | 23-May-2022   | B                  | Plastic Bottle 250ml |
| 1442992 |             |            | DS6              | 23-May-2022   | B                  | Plastic Tub 500g     |
| 1442995 |             |            | DS7a             | 23-May-2022   | B                  | Amber Glass 60ml     |
| 1442995 |             |            | DS7a             | 23-May-2022   | B                  | Plastic Bottle 250ml |
| 1442995 |             |            | DS7a             | 23-May-2022   | B                  | Plastic Tub 500g     |

## Test Methods

| SOP  | Title                                                               | Parameters included                                                                                                                                                                                                                                           | Method summary                                                                                                                                                                         |
|------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2010 | pH Value of Soils                                                   | pH                                                                                                                                                                                                                                                            | pH Meter                                                                                                                                                                               |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS)          | Moisture content                                                                                                                                                                                                                                              | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.                                                                                   |
| 2040 | Soil Description(Requirement of MCERTS)                             | Soil description                                                                                                                                                                                                                                              | As received soil is described based upon BS5930                                                                                                                                        |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium                 | Boron; Sulphate; Magnesium; Chromium                                                                                                                                                                                                                          | Aqueous extraction / ICP-OES                                                                                                                                                           |
| 2175 | Total Sulphur in Soils                                              | Total Sulphur                                                                                                                                                                                                                                                 | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.                                                                                             |
| 2185 | Asbestos                                                            | Asbestos                                                                                                                                                                                                                                                      | Polarised light microscopy                                                                                                                                                             |
| 2192 | Asbestos                                                            | Asbestos                                                                                                                                                                                                                                                      | Polarised light microscopy / Gravimetry                                                                                                                                                |
| 2430 | Total Sulphate in soils                                             | Total Sulphate                                                                                                                                                                                                                                                | Acid digestion followed by determination of sulphate in extract by ICP-OES.                                                                                                            |
| 2490 | Hexavalent Chromium in Soils                                        | Chromium [VI]                                                                                                                                                                                                                                                 | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2625 | Total Organic Carbon in Soils                                       | Total organic Carbon (TOC)                                                                                                                                                                                                                                    | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.                                                                                             |
| 2680 | TPH A/A Split                                                       | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44                                                                                 | Dichloromethane extraction / GCxGC FID detection                                                                                                                                       |
| 2700 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)                                                   |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS       | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule                                                                                                                          | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.                             |

## **Report Information**

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### **Key**

|     |                                                                                                               |
|-----|---------------------------------------------------------------------------------------------------------------|
| U   | UKAS accredited                                                                                               |
| M   | MCERTS and UKAS accredited                                                                                    |
| N   | Unaccredited                                                                                                  |
| S   | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis     |
| SN  | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T   | This analysis has been subcontracted to an unaccredited laboratory                                            |
| I/S | Insufficient Sample                                                                                           |
| U/S | Unsuitable Sample                                                                                             |
| N/E | not evaluated                                                                                                 |
| <   | "less than"                                                                                                   |
| >   | "greater than"                                                                                                |
| SOP | Standard operating procedure                                                                                  |
| LOD | Limit of detection                                                                                            |

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

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### **Sample Deviation Codes**

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

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### **Sample Retention and Disposal**

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)