



e3p

Phase I Geoenvironmental Site Assessment  
Fairways Lodge, Prestwich

Reference: 17-206-R1-1  
Date: September 2023



# PHASE I GEOENVIRONMENTAL SITE ASSESSMENT

Fairways Lodge  
George Street  
Prestwich  
Greater Manchester  
M25 9WS

Prepared for:  
**McCarthy & Stone Ltd**

**McCARTHY STONE**  
*Life, well lived*

**Report Ref: 17-206-R1-1**  
**Date Issued: September 2023**

## E3P

Taylor Road  
Trafford Park  
Urmston  
Manchester  
M41 7JQ

+ 44 (0) 161 707 9612  
<https://e3p.co.uk>

Registered in England  
CRN: 08725262

## QUALITY ASSURANCE

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| AUTHOR     | QUALIFICATIONS            | DATE           |
|------------|---------------------------|----------------|
| N. Sellars | MSci (Hons), FGS, MEnvSc, | September 2023 |

| REVIEWER | QUALIFICATIONS                     | DATE           |
|----------|------------------------------------|----------------|
| B. Hall  | BSc (Hons), FGS, MEnvSc,,<br>PIEMA | September 2023 |

| SIGNATURE | QUALIFICATIONS                         | DATE           |
|-----------|----------------------------------------|----------------|
| M. Dyer   | BSc(Hons), FGS, AIEMA,<br>MEnvSc, CEnv | September 2023 |

## EXECUTIVE SUMMARY

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site Address</b>         | Fairways Lodge, George Street, Prestwich, Greater Manchester, M25 9WS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Grid Reference</b>       | E 381724, N 402447                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Site Area</b>            | 0.61 Ha                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Proposed Development</b> | McCarthy & Stone proposes to construct a retirement home comprising c. 32 one bed apartments and 20 two bed apartments with associated infrastructure, car parking and soft landscaping.                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Current Site Use</b>     | <p>The site comprises an irregular shaped parcel of land located to the south of George Street in Prestwich. The recently constructed Bellway Homes development site is located adjacent to the east and south.</p> <p>Fairways Lodge (hotel and leisure club) covers the majority of the site, with hardstanding car park areas in the north and east of the site.</p> <p>Mature trees are present along the northern and western site boundaries, with additional sporadic trees and areas of soft standing. Himalayan Balsam was noted in the southeast sector.</p>          |
| <b>Site History</b>         | <p>Historical mapping from 1848 suggests that pond/reservoirs were present on site, likely associated with the adjacent Bleach and Dye Works to the south.</p> <p>The reservoir furthest north was no longer recorded by 1932 and a Bowling Green was installed in the centre of the site with a small Pavilion. The reservoir in the south appears to have been infilled by 1973.</p> <p>The current building was constructed by 1988 and recorded as a Club. The building was later noted to be the Village Hotel. No significant changes have occurred since circa 1988.</p> |

## ENVIRONMENTAL SETTING

|                          |                                                                                                                                                                                                                                                                   |                                                                                                                                                                              |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Geology</b>           | Drift Geology                                                                                                                                                                                                                                                     | Hummocky Glacial Deposits – SAND and GRAVEL                                                                                                                                  |
|                          | Bedrock Geology                                                                                                                                                                                                                                                   | <p>Chester Sandstone Formation (northern sector)</p> <p>Pennine Upper Coal Measures Formation (southern sector)</p> <p>Collyhurst Sandstone Formation (southwest sector)</p> |
|                          | Faults                                                                                                                                                                                                                                                            | A fault is recorded through the central southern sector of the site, trending NW to SE, with the downthrow to the northeast.                                                 |
| <b>Hydrogeology</b>      | <p>Secondary A Aquifer (drift) overlying Secondary A Aquifer and Principal Aquifer (solid).</p> <p>The closest groundwater abstraction is located 222 m southwest at Prestwich Golf Club for spray irrigation. There are no potable abstractions within 1 km.</p> |                                                                                                                                                                              |
| <b>Hydrology</b>         | Singleton Brook is located 151 m south.                                                                                                                                                                                                                           |                                                                                                                                                                              |
| <b>Utility Locations</b> | <p>A utility survey has been completed which has identified foul sewers and surface water sewers in the north and west of the site.</p> <p>BT and LV cables enter the building from the north.</p>                                                                |                                                                                                                                                                              |



|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Landfill Sites and Ground Gases</b> | <p>Two historical landfill sites are located within 250 m. The closest is located 80 m southeast at the former Mountheath Industrial Park, however the site has now been remediated to form the Bellway Homes development. The landfill received waste from 1979 to 1980, the material is recorded as originating from general construction works and is not domestic refuse.</p> <p>A historical landfill is also recorded 195 m southwest at Heathlands Drive. No further details are available.</p> <p>The site has undergone some historical development and ground working, the Made Ground associated with the historical development may produce hazardous ground gases such as methane and carbon dioxide.</p> |
| <b>Radon</b>                           | Less than 1% of houses above the 'Action Level' – no special precautions required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hazardous Installations</b>         | No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## PRELIMINARY CONTAMINATED LAND ASSESSMENT

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Human Health</b>      | <p>Made Ground associated with the infilled ponds/reservoirs and construction and demolition activities may contain heavy metals, PAHs, TPHs and ACM.</p> <p>The former tanks located at the southern site boundary are a potential source of PAHs, TPHs, SVOCs and VOCs. However, investigation completed as part of the E3P works on the adjacent site did not identify any evidence of contamination in the location of the historical tanks.</p> <p>The former bleach and dye works to the south of the site has been remediated, therefore no residual impact is anticipated.</p>                                                                                                                 |
| <b>Controlled Waters</b> | <p>The former bleach and dye works historically located to the south of the site is a potential source of mobile contamination, however the site has been remediated and no impact was identified in the deep borehole drilled into the bedrock aquifer.</p> <p>Granular soils may provide a potential pathway, however cohesive drift deposits will inhibit migration towards the underlying aquifers. The sensitivity of the aquifers is reduced, given there are no potable abstractions within 1km.</p> <p>Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.</p> |
| <b>Ground Gas</b>        | <p>Made Ground and potential organic deposits may produce hazardous ground gases such as carbon dioxide and methane which have associated asphyxiation and explosive risks.</p> <p>An appropriate ground gas risk assessment will be required as part of the ground investigation works to assess this risk.</p>                                                                                                                                                                                                                                                                                                                                                                                       |

## PRELIMINARY COAL MINING ASSESSMENT

|                                   |                                                                                                                                                                                                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Coal Mining/Land Stability</b> | The site is not located within a Coal Authority deemed High-Risk Development Area. There are no outcrops or mine shaft entries in close proximity. No further assessment is required in relation to coal mining. |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



## PRELIMINARY GEOTECHNICAL ASSESSMENT

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Initial Geotechnical Assessment</b> | Several historically infilled ponds and reservoirs are present within the site boundary, which are potential sources of alluvial deposits, silts and possible organic peat deposits, and potential depths of Made Ground. An investigation will be required to assess these and undertake in-situ geotechnical testing to determine the potential foundation solution for plots in these areas. |
| <b>Brine Workings</b>                  | The site is not located within an area affected by brine workings.                                                                                                                                                                                                                                                                                                                              |
| <b>Civil and Structural</b>            | Significant cut and fill works are not anticipated.<br><br>It is likely there will be significant Made Ground fill deposits and obstructions. The existing building will require demolition, with all relict foundations grubbing out before the proposed development's construction.                                                                                                           |
| <b>Abnormal Foundations</b>            | Foundations will be dependent on proposed ground levels. An abnormal engineering solution may be required where there is significant thickness of Made Ground, tree influence, loose granular soils or soft cohesive deposits.                                                                                                                                                                  |

## CONCLUSIONS AND RECOMMENDATIONS

A detailed Phase II intrusive Geoenvironmental Site Assessment should be undertaken to confirm the findings of the initial conceptual site model and value engineer a development solution.



## Table of Contents

|                                                                |           |
|----------------------------------------------------------------|-----------|
| <b>EXECUTIVE SUMMARY .....</b>                                 | <b>1</b>  |
| <b>1. INTRODUCTION .....</b>                                   | <b>6</b>  |
| 1.1. Background .....                                          | 6         |
| 1.2. Proposed Development.....                                 | 6         |
| 1.3. Objectives .....                                          | 7         |
| 1.4. Sources of Information .....                              | 7         |
| 1.5. Limitations .....                                         | 7         |
| 1.6. Risk Classification .....                                 | 7         |
| 1.7. Confidentiality .....                                     | 8         |
| <b>2. SITE SETTING .....</b>                                   | <b>9</b>  |
| 2.1. Site Details .....                                        | 9         |
| 2.2. Current Site Use .....                                    | 9         |
| 2.3. Surrounding Area .....                                    | 10        |
| <b>3. SITE HISTORY .....</b>                                   | <b>11</b> |
| 3.1. On-Site Historical Development.....                       | 11        |
| 3.1.1. Summary Of On-Site Historical Development .....         | 16        |
| 3.2. Off-Site Historical Development .....                     | 16        |
| 3.3. Planning History .....                                    | 17        |
| 3.4. Previous Reports .....                                    | 17        |
| <b>4. ENVIRONMENTAL SETTING.....</b>                           | <b>20</b> |
| 4.1. Geology and Hydrogeology .....                            | 20        |
| 4.2. Hydrogeology.....                                         | 21        |
| 4.3. Natural Landform and Geomorphology .....                  | 21        |
| 4.4. Radon Risk Potential .....                                | 21        |
| 4.5. Hydrology .....                                           | 22        |
| 4.6. Landfill Sites and Waste Treatment Sites.....             | 22        |
| 4.6.1. Waste Management Licenses & Environmental Permits ..... | 23        |
| 4.7. Unexploded Ordnance .....                                 | 23        |
| 4.8. Industrial Land Uses.....                                 | 24        |
| 4.9. Site Sensitivity Assessment.....                          | 24        |
| 4.10. Regulatory Database .....                                | 25        |
| 4.11. Regulatory Consultations .....                           | 26        |
| <b>5. PRELIMINARY GEOTECHNICAL ASSESSMENT .....</b>            | <b>27</b> |
| 5.1. Geotechnical Data .....                                   | 27        |
| 5.2. Preliminary Geotechnical Assessment .....                 | 27        |
| 5.3. Coal Mining .....                                         | 27        |
| 5.4. Preliminary Geotechnical Risk Register .....              | 28        |
| <b>6. INITIAL CONCEPTUAL SITE MODEL.....</b>                   | <b>29</b> |
| 6.1. Initial Conceptual Site Model .....                       | 30        |
| <b>7. CONCLUSIONS .....</b>                                    | <b>34</b> |
| 7.1. Site Summary.....                                         | 34        |
| 7.2. Contaminated Land Assessment .....                        | 34        |
| 7.3. Geotechnical Assessment .....                             | 35        |



|                                               |           |
|-----------------------------------------------|-----------|
| <b>APPENDIX I LIMITATIONS.....</b>            | <b>36</b> |
| <b>APPENDIX II GLOSSARY .....</b>             | <b>38</b> |
| <b>APPENDIX III RISK CLASSIFICATION .....</b> | <b>41</b> |
| <b>APPENDIX IV DRAWINGS .....</b>             | <b>43</b> |
| <b>APPENDIX V PHOTOGRAPHS .....</b>           | <b>45</b> |
| <b>APPENDIX VI HISTORICAL MAPS .....</b>      | <b>49</b> |

#### **DRAWING LIST**

17-206-001 - Site Location Plan  
17-206-002 - Proposed Development Plan  
17-206-003 - Historical Features Plan  
17-206-004 - Site Features Plan



## 1. INTRODUCTION

### 1.1. BACKGROUND

E3P has been commissioned by McCarthy & Stone (the client) to undertake a detailed Phase I Geoenvironmental Site Assessment for Fairways Lodge in Prestwich, Greater Manchester; herein referred to as the site.

This report is required to determine potentially contaminated land and geotechnical liabilities for the proposed site redevelopment.

### 1.2. PROPOSED DEVELOPMENT

McCarthy & Stone proposes to construct a retirement home comprising c. 32 one bed apartments and 20 two bed apartments with associated infrastructure, car parking and soft landscaping. Drawing 17-206-002 (Appendix IV) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 PROPOSED DEVELOPMENT PLAN



### 1.3. OBJECTIVES

The objectives of the geoenvironmental site assessment are as follows:

- ✿ Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a desk study in line with Environment Agency (EA) document *Land Contamination: Risk Management (LCRM)* (July 2023).
- ✿ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site concerning the site's future use and in relation to off-site receptors.
- ✿ Assess the desk study information and, where possible, provide preliminary recommendations concerning foundations, pavement construction, general geotechnical issues, floor slabs and coal mining related issues.
- ✿ Provide recommendations regarding future works required.

### 1.4. SOURCES OF INFORMATION

- ✿ Groundsure Enviro+Geo Insight Search Reference GS-IF9-3X6-WN2-T89;
- ✿ Historical mapping dated 1848 - 2023. A selection of historical maps are reproduced in Appendix VI;
- ✿ Online planning records held by Bury Metropolitan Borough Council;
- ✿ Consultations with representatives of Bury Metropolitan Borough Council;
- ✿ Magic Map Groundwater Vulnerability Map;
- ✿ Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2007);
- ✿ British Geological Survey Map and Borehole Records;
- ✿ UXO - <https://zeticauxo.com/downloads-and-resources/risk-maps/>; and,
- ✿ Flood Risk - <https://map.sepa.org.uk/floodmap/map.htm>.

### 1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

### 1.6. RISK CLASSIFICATION

The description of risk classification and the likely action required as set out in CIRIA C552 are included in Appendix III.



## **1.7. CONFIDENTIALITY**

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such consent.



## 2. SITE SETTING

### 2.1. SITE DETAILS

|                                |                                                                       |
|--------------------------------|-----------------------------------------------------------------------|
| <b>Site Address</b>            | Fairways Lodge, George Street, Prestwich, Greater Manchester, M25 9WS |
| <b>National Grid Reference</b> | E 381724, N 402447                                                    |
| <b>Site Area</b>               | 0.61 Ha                                                               |

The Glossary presented in Appendix II defines all acronyms used within this report.

A site location map is presented in Appendix IV as Drawing 17-206-001.

### 2.2. CURRENT SITE USE

A site walkover was completed by an E3P representative on Tuesday 12<sup>th</sup> September, with the full details included in Table 2.2.

TABLE 2.1 SITE DESCRIPTION

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Occupancy/Use</b>              | <p>The site comprises an irregular shaped parcel of land located to the south of George Street in Prestwich. The recently constructed Bellway Homes development site is located adjacent to the east and south.</p> <p>Fairways Lodge (hotel and leisure club) covers the majority of the site, with hardstanding car parking areas in the north and east of the site.</p> <p>Mature trees are present along the northern and western site boundaries, with additional sporadic trees and areas of soft standing. Himalayan Balsam was noted in the southeast sector.</p> |     |
| <b>Structures</b>                 | The Lodge building covers the majority of the site area. No further structures are present.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |
| <b>Access</b>                     | Vehicular and pedestrian access is present from George Street to the north.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |
| <b>Slope</b>                      | There is little topographic variance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |
| <b>Retaining Structures</b>       | No retaining structures are present within the site boundary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
| <b>Surface Cover (%)</b>          | <b>Buildings</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 60% |
|                                   | <b>Hardstand</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 35% |
|                                   | <b>Soft Cover</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5%  |
| <b>Vegetation/Ecology</b>         | <p>The site is predominantly covered in hardstanding and buildings.</p> <p>Mature trees are present along the northern and western site boundaries, with additional sporadic trees and areas of soft standing. Invasive plant species including Himalayan Balsam were noted in the south of the site.</p>                                                                                                                                                                                                                                                                 |     |
| <b>Hazardous Material Storage</b> | Above-ground storage tanks (AST) were historically located at the southern site boundary. No further hazardous material storage has been identified.                                                                                                                                                                                                                                                                                                                                                                                                                      |     |



|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Asbestos-Containing Material (ACM)</b> | The building present on-site was constructed prior to 1988 and therefore ACM may have been used within the building fabric. However, as ACM cannot be entirely discounted, it is recommended that copies of any asbestos surveys / registers are requested from the vendor. ACM may have been used in the former structures on-site and may not have been correctly managed during demolition. ACM (fibres and fragments) may therefore be present within the underlying Made Ground soils. |
| <b>Polychlorinated Biphenyls (PCBs)</b>   | No equipment that may contain PCBs, such as transformers or electric substations, are identified on site or in close proximity to the site.                                                                                                                                                                                                                                                                                                                                                 |
| <b>PFAS/PFOA</b>                          | No potential on-site sources have been identified.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Waste Storage</b>                      | None known within the site boundary and no licenced waste activities are identified within data searches on-site.                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Drainage</b>                           | A utility survey has been completed which has identified foul sewers and surface water sewers in the north and west of the site.                                                                                                                                                                                                                                                                                                                                                            |

## 2.3. SURROUNDING AREA

The surrounding area land uses are summarised in Table 2.2.

TABLE 2.2 SURROUNDING LAND USES

| <b>DIRECTION</b> | <b>LAND USE</b>        |
|------------------|------------------------|
| <b>North</b>     | Residential dwellings. |
| <b>East</b>      | Residential dwellings. |
| <b>South</b>     | Residential dwellings. |
| <b>West</b>      | Prestwich Golf Club    |

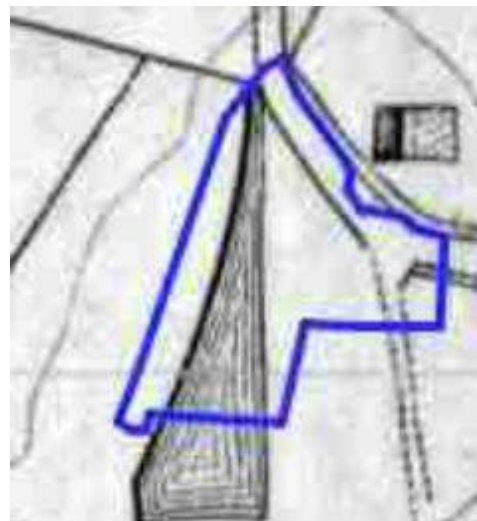


### 3. SITE HISTORY

#### 3.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 3.1. In addition, historical site features are presented on Drawing 17-206-003 in Appendix IV.

TABLE 3.1 HISTORICAL DEVELOPMENT

| MAP EDITION      | HISTORICAL LAND USE                                                                                                                                 | HISTORICAL MAP EXCERPT                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1848<br>1:10,560 | A pond/reservoir appears to be located across the majority of the site, likely associated with the Myrtle Grove Dye Works to the south of the site. |  |

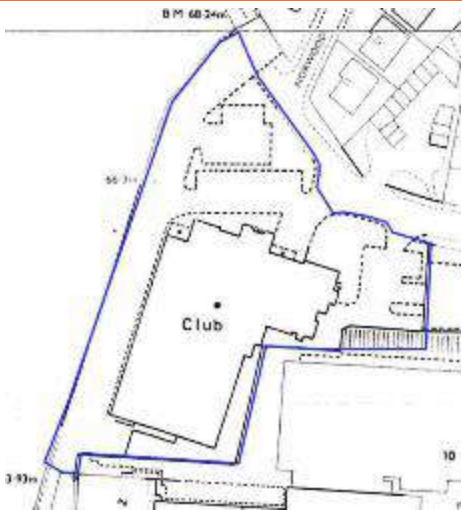


| MAP EDITION                           | HISTORICAL LAND USE                                                                                                                                                                                                                                             | HISTORICAL MAP EXCERPT                                                               |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>1893</b><br/><b>1:2,500</b></p> | <p>Reservoirs are recorded in the south of the site.</p> <p>A rectangular structure is present in the northern sector.</p> <p>Tracks are present in the north and east of the site.</p>                                                                         |   |
| <p><b>1932</b><br/><b>1:2,500</b></p> | <p>The reservoir furthest north is no longer recorded.</p> <p>A Bowling Green is recorded in the centre of the site with a small Pavilion.</p> <p>Small tanks are recorded at the southern site boundary associated with the adjacent Bleach and Dye Works.</p> |  |



| MAP EDITION                           | HISTORICAL LAND USE                                                                                                                                                                                                                | HISTORICAL MAP EXCERPT                                                               |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>1952</b><br/><b>1:1,250</b></p> | <p>The buildings in the north of the site are no longer present. A footpath is recorded to the north of the Bowling Green.</p>                                                                                                     |   |
| <p><b>1973</b><br/><b>1:1,250</b></p> | <p>The reservoir in the south appears to have been infilled. A Pavilion is now present to the west of the Bowling Green, rather than to the north.</p> <p>An area of ground workings/land raising is present in the southeast.</p> |  |



| MAP EDITION                           | HISTORICAL LAND USE                                                                                                                                                          | HISTORICAL MAP EXCERPT                                                               |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>1988</b><br/><b>1:1,250</b></p> | <p>The reservoir in the south has been infilled.</p> <p>The Bowling Green is no longer present and a Club building has been constructed across the majority of the site.</p> |   |
| <p><b>2003</b><br/><b>1:1,250</b></p> | <p>The Club building is now recorded as the Village Hotel.</p>                                                                                                               |  |



## Fairways Lodge, Prestwich

Phase I Site Assessment

September 2023

| MAP EDITION                  | HISTORICAL LAND USE                                                                             | HISTORICAL MAP EXCERPT                                                              |
|------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 2019<br>Aerial<br>Photograph | There are no significant changes. The area to the north of the hotel is utilised as a car park. |  |



### 3.1.1. SUMMARY OF ON-SITE HISTORICAL DEVELOPMENT

The following summary points have been highlighted after a detailed review of the historical mapping series.

#### POTENTIAL HISTORICAL CONTAMINATION ISSUES

- ☛ Made Ground associated with infilled ground (including ponds/ reservoirs), demolition and construction activities may contain contaminants.
- ☛ The former tanks at the southern boundary associated with the historical bleach and dye works are a potential source of contamination.

#### POTENTIAL HISTORICAL GEOTECHNICAL ISSUES

- ☛ Organic deposits may be present in the location of infilled ponds and reservoirs.
- ☛ Obstructions will be present beneath the existing building.

### 3.2. OFF-SITE HISTORICAL DEVELOPMENT

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 150 m radius of the site is summarised in Table 3.2.

TABLE 3.2 SURROUNDING HISTORICAL DEVELOPMENT

| SURROUNDING FEATURE                                                                                 | DISTANCE   | DATES                                                            | DIRECTION  |
|-----------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------|------------|
| Myrtle Grove Bleach & Dye Works<br>...then Mountheath Industrial Park<br>...then no longer recorded | 0 m        | Pre 1848 – Pre 1984<br>Pre 1984 – Pre 2020<br>Pre 2020 – Present | South      |
| Tanks<br>...then no longer recorded                                                                 | 0 m        | Pre 1909 – Pre 1970<br>Pre 1970 – Present                        | South      |
| Tanks<br>...then no longer recorded                                                                 | 75 – 100 m | Pre 1970 – Pre 1984<br>Pre 1984 – Present                        | South      |
| Electricity Substation<br>...then no longer recorded                                                | 80 m       | Pre 1984 – Pre 2020<br>Pre 2020 – Present                        | East       |
| Tanks<br>...then no longer recorded                                                                 | 90 m       | Pre 1970 – Pre 1984<br>Pre 1984 – Present                        | East       |
| Reservoirs<br>...then no longer recorded                                                            | 80 – 150 m | Pre 1893 – Pre 1984<br>Pre 1984 – Present                        | East       |
| Sand Pit<br>...then no longer recorded                                                              | 100 m      | Pre 1907 – Pre 1922<br>Pre 1915 – Present                        | North East |
| Filter Tanks/Beds<br>...then no longer recorded                                                     | 120 m      | Pre 1909 – Pre 1984<br>Pre 1984 – Present                        | South      |



### 3.3. PLANNING HISTORY

E3P has undertaken a review of the Bury Council planning website and the following pertinent information has been identified.

- ✿ Planning ref (59705) confirms that Units 1-4 at the former Sedgley Park Trading Estate (adjacent to the south of the site) were reconstructed due to fire damage.

### 3.4. PREVIOUS REPORTS

No previous reports have been provided for the subject site area.

E3P previously completed the ground investigation and remediation validation works on the adjacent Bellway Homes land parcel. The pertinent E3P reports are listed below, and the reports are available on the public planning portal:

- ✿ **E3P** – E3P Phase I & II Geo-Environmental Report (ref:12-197-R1-Rev 1) dated November 2018, Prepared for Bellway Homes
- ✿ **E3P** – E3P Tier II DQRA Controlled Waters Risk Assessment (ref:12-197-R2-Rev 5) dated July 2020, Prepared for Bellway Homes
- ✿ **E3P** – E3P Remediation and Enabling Works Strategy (ref:12-197-R3-Rev 6) dated August 2020, Prepared for: Bellway Homes
- ✿ **E3P** – E3P Remediation Validation Report (ref:12-197-R6-3) dated September 2020, Prepared for: Bellway Homes

A summary of the pertinent information from the above reports is included below:

#### Ground Conditions

- ✿ Made Ground was encountered in all exploratory hole locations to depths of between 0.10 m and 5.00 m bgl.
- ✿ Concrete obstructions were prevalent in the southern sector of the site.
- ✿ A sweet odour indicative of TCE/PCE was observed in TP104 at 1.90 m bgl.
- ✿ Drift deposits were encountered to a maximum depth in excess of 15.00 m bgl and generally comprised light orange brown fine to medium SAND over firm becoming very stiff brown slightly gravelly CLAY.
- ✿ Historical (~1850) borehole records for the site suggest that sandstone bedrock is present at ~25.0m bgl. A deep E3P borehole identified red weathered SANDSTONE was identified at 26.50 m bgl.
- ✿ Occasional groundwater seepages were identified between 1.00 m bgl – 6.00 m bgl, no definitive saturated aquifer was identified.



### Contaminated Land Assessment

- ✚ Chemical Analysis confirmed the presence of elevated inorganic heavy metals, PAH, non-volatile TPH and Asbestos within the anthropogenic soils.
- ✚ Concentrations of chlorinated volatile organic compounds above the limit of detection were identified throughout the western sector. Elevated concentrations of PCE and TCE were identified in WS103.
- ✚ A vapour assessment indicated that vapour concentrations would not exceed the tolerable daily limits, therefore subject to the delineation and removal of PCE and TCE as isolated 'hotspots' exceeding the Tier 2 GAC, the residual impact to soil and groundwater would not present an unacceptable degree of risk to chronic human health.
- ✚ Deeper boreholes identified impermeable clay from circa 5.00 m to in excess of 15.00 m bgl underlying the Made Ground and overlying granular drift deposits, offering protection to the underlying Principal Aquifer.
- ✚ The groundwater sampling identified exceedances of PCE and VOC's above the limit of detection.
- ✚ The upstream sample of the culvert did not identify any VOC's, whereas the downstream sample identified exceedances of PCE, indicating that the site was having an effect on the culvert water quality.
- ✚ A review of the hydrological information from the Ground Investigation identified a groundwater body which appeared to flow in a southerly direction to a topographic low point where Singleton Brook flows in a culvert.
- ✚ Given that a complete pollutant linkage was identified associated with impact to Singleton Brook (flowing in a culvert across the site) in conjunction with proven impact within the Secondary Aquifer (superficial drift deposits), a process of remediation works was required to ensure no significant risk to controlled waters or the wider environs remains post site development.
- ✚ A Detailed Quantitative Risk Assessment Model was developed utilising the EA Remedial Targets Methodology (RTM P20) to define the site specific remediation criteria for soil.

### Remediation/Validation Works

- ✚ Prior to the commencement of the remediation works in the south west sector, a single deep borehole was installed to the underlying aquifer (50 m) to confirm the absence of any vertical migration of chlorinated solvent impact through the clay aquitard to this receptor. Groundwater sampling did not identify any impact to the principal aquifer.
- ✚ The historical BGS boreholes mapped on site were not located and it is assumed that these have been historically abandoned, and therefore no conduit for pollution migration remains.
- ✚ A deep well was identified which was decommissioned in accordance with EA guidance.
- ✚ Surface water samples were collected throughout the remediation works. Given the initial concentrations of VOCs downstream are similar to those identified during the remediation works, no unacceptable risk was identified.



- ✚ Previously defined hotspots for volatile contaminants were delineated and excavated. The excavated soils were either re-used in an area of low sensitivity or removed from site.
- ✚ The historical mapping from 1909 records a small tank adjacent to the southern site boundary. E3P completed soil sampling in this location and no contamination was identified.
- ✚ A large pipe was identified which was considered to be the main source of chlorinated solvent impact. The pipe was excavated with validation sampling completed along the base and sides of the pipe route.
- ✚ The old culvert was excavated and removed and Singleton Brook was realigned to the south of the site.
- ✚ Japanese Knotweed was identified in the south east of the site. The knotweed was excavated and removed under the supervision of a knotweed specialist.
- ✚ No organic material or geotechnically unsuitable material was identified in any of the trial pit excavations in the location of the former reservoirs.
- ✚ No landfill material was identified in the eastern sector.
- ✚ The asbestos within the buildings was removed by specialists and personal and reassurance air testing was completed.
- ✚ Asbestos impacted soils were placed in accordance with the asbestos CSM. Visible ACM was removed from site.
- ✚ The substation located in the west of the site was decommissioned and disposed of at a licensed facility.
- ✚ The majority of plots were prepared for vibro stone columns.
- ✚ A site wide cover system was constructed utilising certified sub-soil and topsoil.
- ✚ Vapour membranes were required for specific plots due to residual contamination, however vapour membranes were not required for plots adjacent to the subject site boundary.
- ✚ The ground gas classification was a combination of Characteristic Situation 1 and Characteristic Situation 2.
- ✚ Basic radon protective measures were required, however the revised UK radon map suggests the site is unaffected by radon.



## 4. ENVIRONMENTAL SETTING

### 4.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map for the site, (Sheet 85) and online records indicate the site is underlain by the geological sequence presented in Table 4.1.

TABLE 4.1 SUMMARY OF UNDERLYING GEOLOGY

| GEOLOGICAL UNIT | CLASSIFICATION                                          | DESCRIPTION                    | AQUIFER CLASSIFICATION                               |
|-----------------|---------------------------------------------------------|--------------------------------|------------------------------------------------------|
| <b>Drift</b>    | Hummocky (moundy) Glacial Deposits                      | SAND and GRAVEL                | Secondary A Aquifer                                  |
| <b>Solid</b>    | Chester Sandstone Formation (northern sector)           | SANDSTONE                      | Principal Aquifer<br>Secondary A Aquifer (southwest) |
|                 | Pennine Upper Coal Measures Formation (southern sector) | MUDSTONE, SILTSTONE, SANDSTONE |                                                      |
|                 | Collyhurst Sandstone Formation (southwest sector)       | SANDSTONE                      |                                                      |

E3P has reviewed the BGS database, which identified boreholes in close proximity, from which to compare the published geology above.

The borehole logs are summarised in Table 4.2.

TABLE 4.2 SUMMARY OF BGS BOREHOLE RECORDS

| LOCATION                          | DEPTH    | MADE GROUND        | DRIFT                                         | SOLID                                                                          |
|-----------------------------------|----------|--------------------|-----------------------------------------------|--------------------------------------------------------------------------------|
| <b>5m S</b><br>(ref: SD80SW14)    | 148.74 m | 0.00–3.66 m        | SAND and CLAY<br>3.66–24.84 m                 | SANDSTONE and MARL 24.84–75.44 m<br>SHAPE, SANDSTONE and MARL 75.44 – 148.74 m |
| <b>41 m SW</b><br>(ref: SD80SW16) | 83.36 m  | Soil 0.00 – 0.30 m | SAND and GRAVEL, MARL Drift<br>0.30 – 21.79 m | MARL 21.79 – 34.75 m<br>Red Rock 34.75 – 83.36 m                               |
| <b>64 m S</b><br>(ref: SD80SW15)  | 83.67    | Soil 0.00 – 0.30 m | GRAVEL, MARL Drift<br>0.30 – 28.04 m          | Red Rock 28.04 – 83.67 m                                                       |

The BGS mapping also identifies the location of faults, as presented in Table 4.3.

TABLE 4.3 SUMMARY OF FAULTS

| LOCATION       | DEPTH                                                                  |
|----------------|------------------------------------------------------------------------|
| <b>On site</b> | Normal fault, inferred, trending NW to SE, downthrow to the northeast. |



## 4.2. HYDROGEOLOGY

The Groundsure report indicates that the site is not located within a groundwater source protection zone. Furthermore, there are no potable abstractions within 1km of the site.

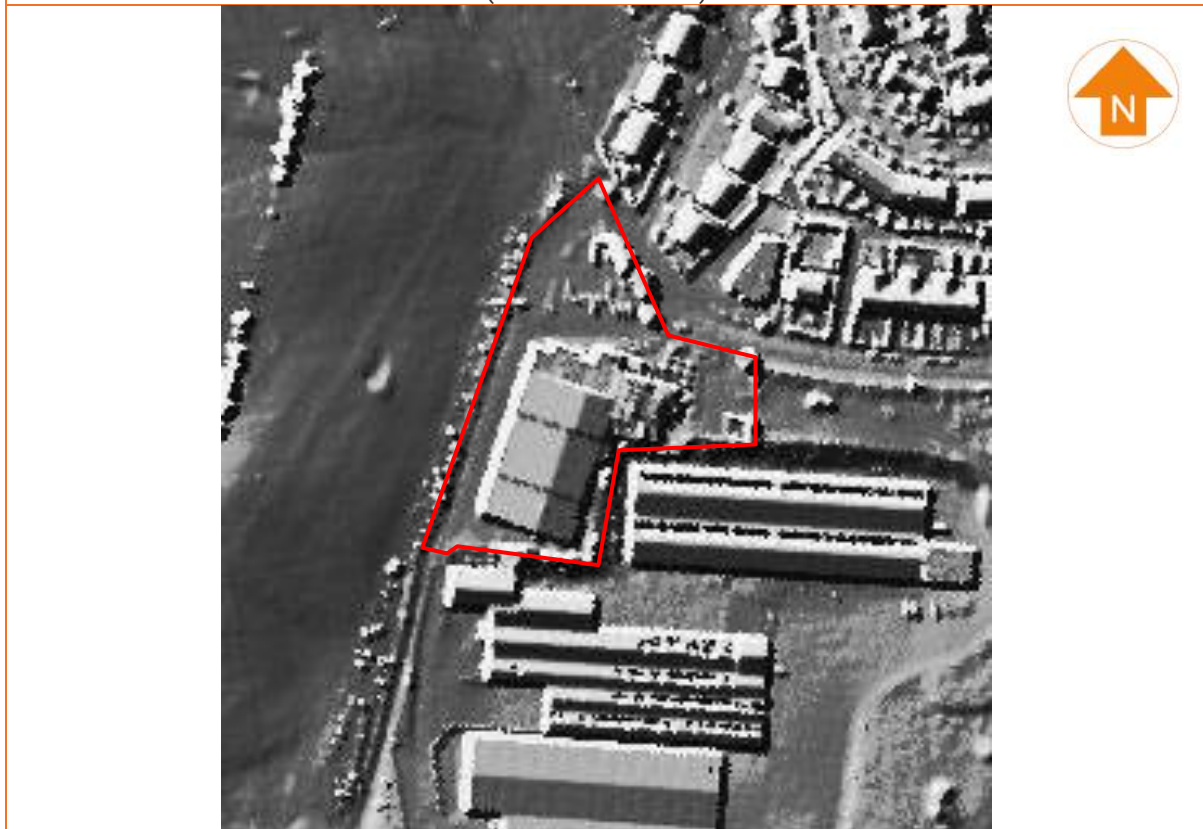
The closest groundwater abstraction is located 222 m southwest for spray irrigation at Prestwich Golf Club. There are no further groundwater abstractions within 1km.

## 4.3. NATURAL LANDFORM AND GEOMORPHOLOGY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological evaluation of the landform and its possible mechanism for formation.

It would appear that the placement and upfilling of material will have formed the current site level plateau before the construction of the existing building.

FIGURE 4.1 SURFACE LIDAR DATA (HOUSEPRICES.IO)



## 4.4. RADON RISK POTENTIAL

The Groundsure report indicates that the site is situated in an area where less than 1% of homes are above the "Action Level" and that the BGS reports that full protective measures are not necessary for the construction of new dwellings or extensions.



## 4.5. HYDROLOGY

Surface water features within 250 m of the subject site are summarised in Table 4.4 below.

TABLE 4.4 SURFACE WATER FEATURES

| SURFACE WATER FEATURE | QUALITY | DISTANCE (m) | DIRECTION |
|-----------------------|---------|--------------|-----------|
| Singleton Brook       | Unknown | 151          | South     |

The site is predominantly located within a currently defined area deemed as not being at risk from river, coastal or surface water flooding. The site is defined as having a moderate risk of groundwater flooding.

The Fluvial Flood Risk Map is presented in Figure 4.2.

FIGURE 4.2 FLUVIAL FLOOD RISK MAP



Source – <https://flood-map-for-planning.service.gov.uk/>

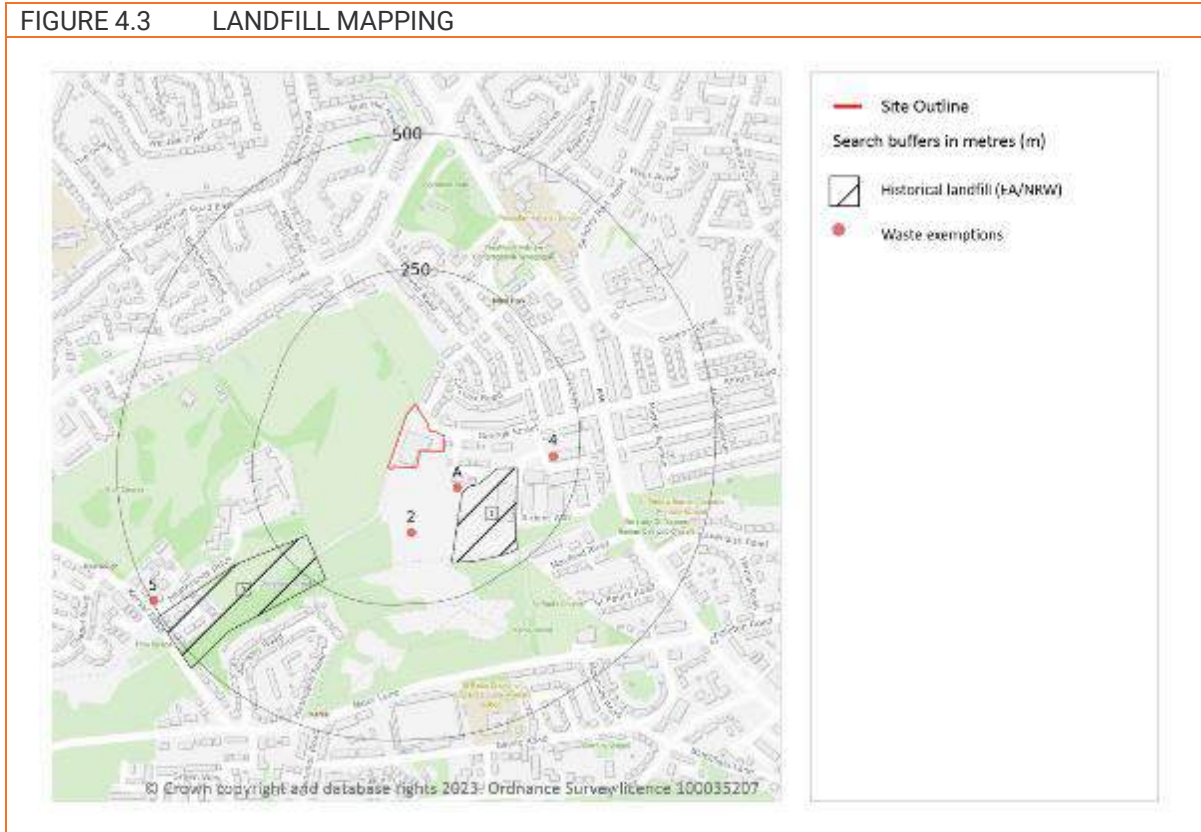
## 4.6. LANDFILL SITES AND WASTE TREATMENT SITES

Two historical landfill sites are located within 250 m. The closest is located 80 m southeast at the former Mountheath Industrial Park, however the site has now been remediated to form the Bellway Homes development. The landfill received waste from 1979 to 1980, the material is recorded as originating from general construction works and is not domestic refuse.

A historical landfill is also recorded 195 m southwest at Heathlands Drive. No further details are available.

A screenshot of the mapping showing landfill locations within 250 m radius of the site is included in Figure 4.3.

**FIGURE 4.3 LANDFILL MAPPING**



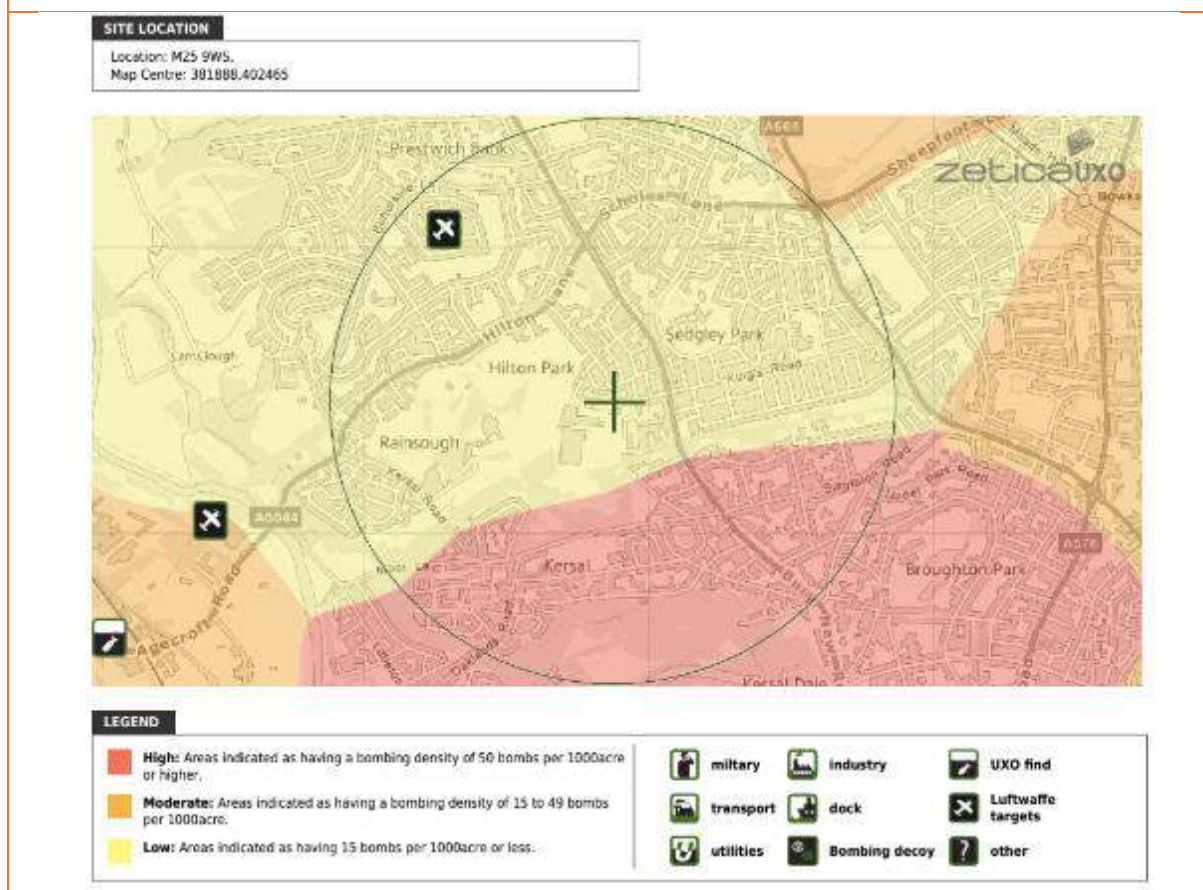
#### **4.6.1. WASTE MANAGEMENT LICENSES & ENVIRONMENTAL PERMITS**

There are three waste exemptions registered within 250 m. Two of these are associated with the adjacent Bellway Homes development site for use of waste in construction and treating waste. A waste exemption is also registered to Howden Joinery located 202 m east for storing waste.

#### **4.7. UNEXPLODED ORDNANCE**

The regional unexploded bomb risk map from Zetica (2014) indicates that the Site is in an area at low risk from possible unexploded ordnance (UXO) resulting from the Second World War. The Zetica UXO Risk Map is presented in Figure 4.4.

FIGURE 4.4 ZETICA UXO RISK MAP



Source – <https://zeticauxo.com/downloads-and-resources/risk-maps/>

## 4.8. INDUSTRIAL LAND USES

There are 14No. recent industrial land uses recorded within 250 m of the site boundary, however a number of these relate to the former Mountheath Industrial Estate to the south of the site, which is now the Bellway Homes development.

## 4.9. SITE SENSITIVITY ASSESSMENT

The site is assessed to be located within a “Moderate” sensitivity setting as discussed within Table 4.5 overleaf.



TABLE 4.5 SITE SENSITIVITY ASSESSMENT

| SENSITIVITY PROFILE                                                                                   | DISCUSSION                                                                                                                                                                        | RATING   |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Groundwater Source Protection Zone or Drinking Water Safeguard Zone                                   | None identified.                                                                                                                                                                  | Low      |
| Distance to the Closest Groundwater Abstraction Point                                                 | The closest groundwater abstraction is located 222 m southwest for spray irrigation at Prestwich Golf Club. There are no further groundwater abstractions within 1 km.            | Moderate |
| Aquifer Classification in Superficial Drift Deposits                                                  | Secondary A Aquifer                                                                                                                                                               | Moderate |
| Aquifer Classification in Bedrock                                                                     | Principal Aquifer and Secondary A Aquifer                                                                                                                                         | High     |
| Is the Site Underlain by Low-Permeability Drift to Depths in Excess of 10 m?                          | Drift strata is likely to comprise sand and clay to depths in excess of 15.00 m bgl.                                                                                              | Moderate |
| Is the Site Located Within 50 m of a Surface Watercourse?                                             | No surface water features are located within 50 m of the site boundary.                                                                                                           | Low      |
| Sensitive Land Uses Within Close Proximity (e.g. Residential, School, Nursery, Local Nature Reserves) | The closest residential properties are located adjacent to the east and south of the site.<br><br>The site is located within a Nitrate Vulnerable Zone and SSSI Impact Risk Zone. | High     |
| OVERALL SITE ENVIRONMENTAL SENSITIVITY                                                                |                                                                                                                                                                                   | Moderate |

#### 4.10. REGULATORY DATABASE

The information summarised in Table 4.6 has been obtained from a commercially available environmental database. The summary table only includes records from within 250 m of the subject site and not otherwise detailed in the report.



TABLE 4.6 SUMMARY OF ENVIRONMENTAL DATA

| RECORD                                                             | ENTRIES WITHIN<br>250 m | DETAILS          |
|--------------------------------------------------------------------|-------------------------|------------------|
| Contaminated Land Register Entries and Notices                     | 0                       | None Identified. |
| Authorised Industrial Processes (IPC/IPPC/LAPPC)                   | 0                       | None Identified. |
| Fuel Stations Entries                                              | 0                       | None Identified. |
| Licensed Radioactive Substances                                    | 0                       | None Identified. |
| Enforcements, Prohibitions or Prosecutions                         | 0                       | None Identified. |
| Discharge Consents                                                 | 0                       | None identified. |
| Pollution Incidents                                                | 0                       | None Identified. |
| Consents Issued Under the Planning (Hazardous Substances) Act 1990 | 0                       | None Identified. |
| Control of Major Accident Hazard (COMAH) Sites                     | 0                       | None Identified. |

#### 4.11. REGULATORY CONSULTATIONS

E3P contacted the Environmental Health Department at Bury Council and a response is awaited.



## 5. PRELIMINARY GEOTECHNICAL ASSESSMENT

### 5.1. GEOTECHNICAL DATA

Geotechnical data presented within a commercially available environmental database is summarised in Table 5.1.

TABLE 5.1 SUMMARY OF GEOTECHNICAL DATA

| HAZARD                | DESIGNATION   |
|-----------------------|---------------|
| Shrink-Swell Clay     | No hazard     |
| Landslides            | Very low risk |
| Ground Dissolution    | No hazard     |
| Compressible Ground   | No hazard     |
| Collapseable Deposits | Very low risk |
| Running Sand          | Very low risk |

### 5.2. PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the desk-study information, the following geotechnical assessment has been made:

- ✿ It is likely there will be significant Made Ground fill deposits and obstructions. The existing building will require demolition, with all relict foundations grubbing out before the proposed development's construction.
- ✿ Several historically infilled ponds and reservoirs are present within the site boundary, which are potential sources of alluvial deposits, silts and possible organic peat deposits, and potential depths of Made Ground. An investigation will be required to assess these and undertake in-situ geotechnical testing to determine the potential foundation solution for plots in these areas.

### 5.3. COAL MINING

The site is not located within a Coal Authority deemed High-Risk Development Area. There are no outcrops or mine shaft entries in close proximity. No further assessment is required in relation to coal mining.



## 5.4. PRELIMINARY GEOTECHNICAL RISK REGISTER

| POTENTIAL<br>CONSTRAINT                    | ABNORMAL | LOCATION<br>ON SITE | ESTIMATED<br>AREA OF SITE<br>AT RISK (%) | ASSESSMENT AND MITIGATION                                                                                                                          |
|--------------------------------------------|----------|---------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Remediation of contaminated soils          |          | All                 | TBC                                      | Ground investigation is required to confirm.                                                                                                       |
| Bedrock                                    |          | All                 | N/A                                      | BGS boreholes suggest that bedrock will be present at depths of >20.00 m bgl.                                                                      |
| Obstructions                               |          | All                 | 60                                       | Obstructions will be present beneath the existing building.                                                                                        |
| Artificially levelled and filled platforms |          | All                 | 100                                      | The site appears to have been artificially infilled.                                                                                               |
| Retaining walls                            |          | N/A                 | N/A                                      | No retaining walls are present.                                                                                                                    |
| Trench collapse                            |          | All                 | TBC                                      | Excavations may be unstable in deep Made Ground or granular soils.                                                                                 |
| Infilled ponds/reservoirs                  |          | All                 | TBC                                      | Investigation will be required to confirm the extent of any organic deposits.                                                                      |
| Mature trees                               |          | All                 | TBC                                      | Sporadic trees are present on site. Dense vegetation is present along the western site boundary. An aboricultural survey is likely to be required. |
| Volume change potential clay               |          | All                 | TBC                                      | If clay soils are present an assessment will be required.                                                                                          |
| Peat                                       |          | TBC                 | TBC                                      | Peat is unlikely to be present and is not mapped on Site.                                                                                          |
| Running sands                              |          | N/A                 | N/A                                      | Very low risk identified.                                                                                                                          |
| Ground dissolution                         |          | N/A                 | N/A                                      | No hazard identified.                                                                                                                              |
| Concrete design                            |          | TBC                 | TBC                                      | Ground investigation required to confirm.                                                                                                          |
| Low-permeability ground                    |          | TBC                 | TBC                                      | Soakaways may not be possible where low permeability cohesive drift deposits are present.                                                          |
| Services/sensitive structures              |          | All                 | TBC                                      | A number of services are present within the site boundary.                                                                                         |
| Abnormal foundation solutions              |          | TBC                 | TBC                                      | Ground investigation required to confirm. Abnormal foundations may be required where deep Made Ground, soft clays or loose sands are identified.   |



## 6. INITIAL CONCEPTUAL SITE MODEL

Under EA LCRM (July 2023) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), and BS EN ISO 21365:2021 (Soil Quality – Conceptual models for potentially contaminated sites), E3P has developed a Tier 1 Risk Assessment comprising an initial conceptual site model (CSM) to identify potential contamination sources, migration pathways and receptors within the study area. An initial screening of the on and potential off-site sources of contamination has been undertaken in Table 6.1, with the more detailed initial CSM included overleaf as Table 6.2.

TABLE 6.1 INITIAL CONTAMINANT SOURCE SCREENING

| SOURCE                                                                | SOIL                                                                                                             | GROUNDWATER                           | GROUND GAS                                         |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------------------------------------------|
| <b>ON-SITE</b>                                                        |                                                                                                                  |                                       |                                                    |
| Made Ground (Infilled Ponds/Reservoirs, Construction, Demolition)     | Polycyclic Aromatic Hydrocarbons (PAHs), Heavy Metals, Total Petroleum Hydrocarbons (TPH), Asbestos              | Unlikely                              | Carbon dioxide & methane                           |
| <b>OFF-SITE</b>                                                       |                                                                                                                  |                                       |                                                    |
| Above Ground Storage Tanks (low risk as the land has been remediated) | PAHs, TPHs, SVOCs, VOCs                                                                                          | PAHs, TPHs, SVOCs, VOCs               | Volatile vapours                                   |
| Bleach and Dye Works (low risk as the land has been remediated)       | Polycyclic Aromatic Hydrocarbons (PAHs), Heavy Metals, Total Petroleum Hydrocarbons (TPH), Asbestos, SVOCs, VOCs | Heavy Metals, PAHs, TPHs, SVOCs, VOCs | Volatile vapours                                   |
| Historical Landfill Sites                                             | Unlikely                                                                                                         | Unlikely                              | Carbon dioxide & methane – limited due to distance |
| Infilled Sand Pit                                                     | Unlikely                                                                                                         | Unlikely                              | Carbon dioxide & methane – limited due to distance |



## 6.1. INITIAL CONCEPTUAL SITE MODEL

Upon assessment of the information collated for the Phase 1 desk study, the initial conceptual site model shown in Table 6.2 has been prepared for the Site.

TABLE 6.2 INITIAL CONCEPTUAL MODEL

| CONTAMINANT LINKAGE                                                                            |                                                                                               |                                   | PLAUSIBLE LINKAGE? | COMMENTARY AND PROPOSED RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOURCES                                                                                        | MIGRATION PATHWAYS                                                                            | RECEPTORS                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| SOIL                                                                                           |                                                                                               |                                   |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Made Ground, Infilled Ponds/Reservoirs<br>Heavy Metals, PAH, Heavy end TPH                     | Accidental ingestion and/or dermal contact with contaminated soil and/or leachate.<br>PL1/PL2 | Human Health – site personnel     | Yes                | Made Ground is a potential source of heavy metals, PAHs and TPH. Site personnel have a greater chance of coming into contact with contaminated soils. Particularly during excavation and soil recovery works.<br><b>Recommendation:</b><br>Construction works to be completed with appropriate PPE and welfare facilities.                                                                                                                 |
|                                                                                                | Inhalation of contaminated dust.<br>PL3                                                       | Human Health – end users          | Yes                | Hard-standing and engineered clean cover system shall likely break migration pathways to end users.<br><b>Recommendation:</b><br>Intrusive investigation and assessment will determine the requirement for a cover system in all soft landscaped areas.                                                                                                                                                                                    |
| Historical Tanks (southern boundary)<br>VOCs, SVOCs, hydrocarbons, volatile PAHs (naphthalene) | Inhalation of vapours.<br>PL4                                                                 | Human Health – end users          | Yes                | Made Ground is a potential source of hydrocarbon compounds and volatile PAHs.                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                | Migration through permeable strata and preferential pathways.                                 | Human Health – Off-site receptors | No                 | The former tanks located at the southern site boundary are a potential source of PAHs, TPHs, SVOCs and VOCs. However, investigation completed as part of the E3P works on the adjacent site did not identify any evidence of contamination in the location of the historical tanks.<br><b>Recommendation:</b><br>Intrusive investigation and assessment will be required to determine the level of mitigation measures and/or remediation. |



| CONTAMINANT LINKAGE                                                                   |                                                                                                       |                                                                            | PLAUSIBLE LINKAGE? | COMMENTARY AND PROPOSED RESPONSE                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOURCES                                                                               | MIGRATION PATHWAYS                                                                                    | RECEPTORS                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Made Ground</b><br>Asbestos (Asbestos containing materials (ACM) and loose fibres) | Inhalation (of fibres). Construction works disturbing bound material and releasing fibres. <b>PL3</b> | Human Health - Site personnel, end land users, and users of adjacent sites | Yes                | Risk of inhalation of fibres during Ground Investigation and construction works. Disturbance of ACMs and dust derivatives from construction would increase risk to adjacent sites.<br><b>Recommendation:</b><br>Intrusive investigation will be required to determine presence of ACMs and develop appropriate mitigation measures. Construction works to be completed with appropriate PPE and welfare facilities. |
| <b>Made Ground</b><br>Sulphate from potential ash within the Made Ground.             | Sulphate attack on concrete. <b>PL6</b>                                                               | Building concrete                                                          | Yes                | Sulphate in ash deposits (associated with Made Ground) may impact the proposed building concrete.<br><b>Recommendation:</b><br>Intrusive investigation will be required to assess the concrete classification. Construction works to be completed with appropriate PPE and welfare facilities.                                                                                                                      |
| <b>Made Ground</b><br>Organic contaminants such as hydrocarbons, solvents             | Ingestion of tainted water supply. <b>PL7</b>                                                         | Human Health – End Users<br><br>Water pipeline                             | Yes                | Made Ground may contain organic contaminants such as hydrocarbons which pose a risk to future site users through the ingestion of tainted water supply. The risk is considered to be low.<br><b>Recommendation:</b><br>Intrusive investigation required.                                                                                                                                                            |
| <b>Made Ground</b><br>Phytotoxic contaminants                                         | Direct contact (plant uptake). <b>PL8</b>                                                             | Flora                                                                      | Yes                | Contamination is considered possible in areas of Made Ground, which may be taken up by flora in soft landscaping/gardens.<br><b>Recommendation:</b><br>Intrusive investigation required.                                                                                                                                                                                                                            |



| CONTAMINANT LINKAGE |                                                                                                                                       |                                                   | PLAUSIBLE LINKAGE? | COMMENTARY AND PROPOSED RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOURCES             | MIGRATION PATHWAYS                                                                                                                    | RECEPTORS                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CONTROLLED WATERS   |                                                                                                                                       |                                                   |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Mobile Contaminants | Leaching of contaminants from Made Ground through infiltration and percolation of rainwater. PL5                                      | Controlled waters, underlying Secondary aquifer A | Yes (limited)      | The former bleach and dye works historically located to the south of the site is a potential source of mobile contamination. The site has been remediated, therefore no residual impact is anticipated.<br><br>Granular soils may provide a potential pathway, however cohesive drift deposits will inhibit migration towards the underlying aquifers. The sensitivity of the aquifers is reduced, given there are no potable abstractions within 1km.<br><b>Recommendation:</b><br>Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment. |
|                     |                                                                                                                                       | Infrastructure and services                       | Yes (limited)      | The development of the proposed infrastructure will reduce the leachate produced from contaminated soils. Infrastructure and services shall be designed to resist chemical attack and ingress.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Groundwater         | Contact with contaminated groundwater. PL2                                                                                            | Human Health – site personnel                     | No                 | Groundwater is known to be below construction level and as such, is expected to not rise above ground level or the final level of the road.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                     | Contaminants leached from the Made Ground and from off-site sources may be mobilised to greater distances through advective flow. PL5 | Human Health – end users                          | No                 | Impacted groundwater could transport contaminants vertically and horizontally through permeable strata. However, the site works will not exacerbate this, and site work will be undertaken above the water table. Groundwater will need to be considered for surrounding developments.                                                                                                                                                                                                                                                                                                                                                                                  |



| CONTAMINANT LINKAGE                                                                              |                                                                           |                               | PLAUSIBLE LINKAGE? | COMMENTARY AND PROPOSED RESPONSE                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOURCES                                                                                          | MIGRATION PATHWAYS                                                        | RECEPTORS                     |                    |                                                                                                                                                                                                              |
| GROUND GAS                                                                                       |                                                                           |                               |                    |                                                                                                                                                                                                              |
| Ground gases (methane and carbon dioxide associated with Made Ground, infilled ponds/reservoirs) | Inhalation of ground gas. PL4                                             | Human Health – site personnel | Yes (limited)      | During excavation work, removal of confining strata may expose workers to volumes of pocketed gas.<br><b>Recommendation</b><br>Protective measures during the works required including appropriate PPE/ RPE. |
|                                                                                                  | Accumulation of ground gas in confined spaces (asphyxiation or explosion) | Human Health – end users      | Yes                | Ground Investigation including gas monitoring is required to confirm the ground gas classification.                                                                                                          |
|                                                                                                  |                                                                           | Infrastructure and services   | No                 | Service conduits will likely be designed with passive venting systems.                                                                                                                                       |

Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants.



## 7. CONCLUSIONS

### 7.1. SITE SUMMARY

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Current Site Use</b>    | <p>The site comprises an irregular shaped parcel of land located to the south of George Street in Prestwich. The recently constructed Bellway Homes development site is located adjacent to the east and south.</p> <p>Fairways Lodge (hotel and leisure club) covers the majority of the site, with hardstanding car parking areas in the north and east of the site.</p> <p>Mature trees are present along the northern and western site boundaries, with additional sporadic trees and areas of soft standing. Himalayan Balsam was noted in the southeast sector.</p>    |
| <b>Historical Site Use</b> | <p>Historical mapping from 1848 suggests that pond/reservoirs were present on site, likely associated with the adjacent Bleach and Dye Works to the south.</p> <p>The reservoir furthest north was no longer recorded by 1932 and a Bowling Green was installed in the centre of the site with a small Pavilion. The reservoir in the south appears to have been infilled by 1973.</p> <p>The current building was constructed by 1988, recorded as a Club. The building was later noted to be the Village Hotel. No significant changes have occurred since circa 1988.</p> |

### 7.2. CONTAMINATED LAND ASSESSMENT

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Human Health</b>      | <p>Made Ground associated with the infilled ponds/reservoirs and construction and demolition activities may contain heavy metals, PAHs, TPHs and ACM.</p> <p>The former tanks located at the southern site boundary are a potential source of PAHs, TPHs, SVOCs and VOCs. However, investigation completed as part of the E3P works on the adjacent site did not identify any evidence of contamination in the location of the historical tanks.</p> <p>The former bleach and dye works to the south of the site has been remediated, therefore no residual impact is anticipated.</p>                                                                                                                 |
| <b>Controlled Waters</b> | <p>The former bleach and dye works historically located to the south of the site is a potential source of mobile contamination, however the site has been remediated and no impact was identified in the deep borehole drilled into the bedrock aquifer.</p> <p>Granular soils may provide a potential pathway, however cohesive drift deposits will inhibit migration towards the underlying aquifers. The sensitivity of the aquifers is reduced, given there are no potable abstractions within 1km.</p> <p>Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.</p> |



|                      |                                                                                                                                                                                                                                                                                                                  |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ground Gas</b>    | <p>Made Ground and potential organic deposits may produce hazardous ground gases such as carbon dioxide and methane which have associated asphyxiation and explosive risks.</p> <p>An appropriate ground gas risk assessment will be required as part of the ground investigation works to assess this risk.</p> |
| <b>Potable Water</b> | <p>Elevated hydrocarbon concentrations may be present in localised areas beneath the site.</p> <p>An intrusive investigation is required to confirm requirements for the proposed water supply.</p>                                                                                                              |

### 7.3. GEOTECHNICAL ASSESSMENT

|                             |                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Geological</b>           | <p>Several historically infilled ponds and reservoirs are present within the site boundary, which are potential sources of alluvial deposits, silts and possible organic peat deposits, and potential depths of Made Ground. An investigation will be required to assess these and undertake in-situ geotechnical testing to determine the potential foundation solution for plots in these areas.</p> |
| <b>Civil and Structural</b> | <p>Significant cut and fill works are not anticipated.</p> <p>It is likely there will be significant Made Ground fill deposits and obstructions. The existing building will require demolition, with all relict foundations grubbing out before the proposed development's construction.</p>                                                                                                           |
| <b>Abnormal Foundations</b> | <p>Foundations will be dependent on proposed ground levels. An abnormal engineering solution may be required where there is significant thickness of Made Ground, tree influence, loose granular soils or soft cohesive deposits.</p>                                                                                                                                                                  |

## END OF REPORT



# APPENDIX I

# LIMITATIONS